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Prepared For:

**West Virginia Department of Transportation - Division of
Highways**

Advanced Traffic Management System and 511 Platform

**TECHNICAL PROPOSAL – COPY 4 OF 5
CRFP No. DOT2000000001**

Prepared By:

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June 24, 2020



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1.0 Cover Letter (CRFP Section 5.3.3)

June 24, 2020

Attn: Crystal G. Hustead
West Virginia Department of Transportation - Division of Highways
2019 Washington Street East, Charleston, WV 25305
RE: Response to Centralized Request for Proposal (CRFP) No. DOT2000000001

Dear Ms. Hustead,

Thank you for the opportunity to respond to CRFP No. DOT2000000001 for an Advanced Traffic Management System & 511 Platform. The following Technical Response illustrates how Q-Free America, Information Logistics ("ILOG"), and Skyline Technology Solutions ("Skyline"), (together "Team Q-Free") are positioned to offer the West Virginia Department of Highways (WVDOH) the overall best value Advanced Traffic Management System (ATMS) and 511 Platform. In the following Technical Response, Team Q-Free has detailed our approach to provide WVDOH an industry leading ATMS and 511 platform that:

- **Significantly improves upon ATMS and 511 System Functionality:** The existing Q-Free ATMS and 511 systems will be fully upgraded with enhanced video management, streamlined data entry, integrated planned event management, upgraded 511 website, improved mobile application, enhanced ESRI GIS integration, additional device integrations, and will meet 100% of WVDOH's mandatory and desirable requirements while minimizing cost and risk to the taxpayers of West Virginia.
- **Ensures a seamless transition:** The ATMS and 511 platform are mission critical software applications that impact the safety of the traveling public. Team Q-Free already has deep knowledge of WVDOH's Intelligent Transportation System (ITS) infrastructure, Transportation Management Center, sparse telecommunications, cyber security policies, unique weather needs, and demanding freight challenges. Q-Free's key personnel have partnered with WVDOH since 2008 and have provided advanced technological solutions for WVDOH including pro-active technology support during the COVID-19 outbreak. By leveraging Q-Free's existing mission critical systems and utilizing an incremental upgrade approach we can drastically reduce transition risk, minimize WVDOH staff impacts, and avoid disruption to the 22 Public Safety Access Point (PSAP e911 center) data feeds.
- **Is the most cost-effective solution:** Team Q-Free's deployment and operations/maintenance costs have been significantly reduced. All firms on Team Q-Free have made major investments in our software products and enhanced our off-the-shelf capabilities. We have consolidated our team and will feature ILOG's cost-effective Integrated Voice Response/Responsive (IVR) solution.


Thank you for your time in reviewing our proposal. As requested in the CRFP, our proposal and pricing will remain firm a minimum of 180 days from June 24, 2020. Q-Free America has read and acknowledges receipt of addenda numbers 1, 2, 3, 4, 5 and 6. If we can be of additional help in the review process, please feel free to call me at 703-973-8711 or email me at tom.phillips@q-free.com. We look forward to participating in the proposal process and working with WVDOH.

Sincerely,

Thomas Phillips
Executive Vice President, Inter-Urban Solutions
Q-Free America, Inc.



2.0 Title Page (CRFP Section 5.3.4)

Q-FREE AMERICA REQUIRED INFORMATION	
CRFP Subject:	Advanced Traffic Management System and 511 Platform
CRFP Number:	CRFP NO. DOT2000000001
Vendor's Name:	Q-Free America, Inc.
Business Address:	4660 La Jolla Village Dr. Suite 100 San Diego, CA 92122
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Name of Contact Person:	Thomas Phillips
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Date:	June 24, 2020
Vendor Signature:	



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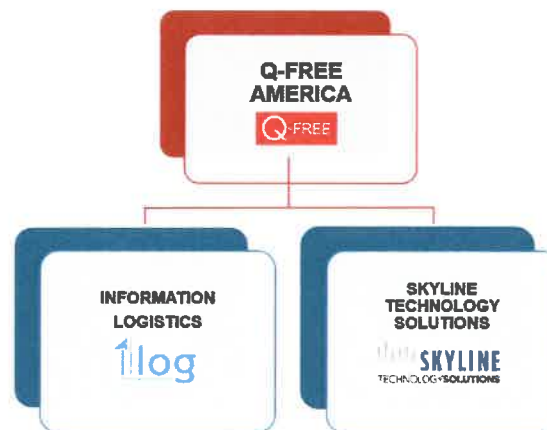
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4.0 Response Reference (CRFP Section 5.3.6.)

5.3.6. Response Reference: Vendor's response should clearly reference how the information provided applies to the RFP request. For example, listing the RFP section number being responded to and restating the RFP request in the proposal would be considered a clear reference.

4.1 Background and Current Operating System (CRFP Section 4.1)

CRFP Section 4.1 describes the robust Advanced Traffic Management System (ATMS) and 511 platform that was developed under the leadership of WVDOH by Q-Free America, ILOG, and Skyline (together "Team Q-Free"). Working in partnership with WVDOH since 2008, Team Q-Free has provided a mission critical ATMS and 511 platform and 24/7/365 software support services to enhance System Operations and help ensure the safety of first responders and the traveling public. During these past 12 years, Team Q-Free has proactively supported WVDOH's efforts to provide actionable information during severe weather events, major incidents, or major construction projects. As our existing system is described in CRFP Section 4.1 (Background and Current Operating Environment), Team Q-Free has implemented and supported a comprehensive transportation management suite that currently fully supports WVDOH's emergency and event response. Q-Free's ATMS and 511 Platform are fully integrated with WVDOH's unique Intelligent Transportation System (ITS) field infrastructure, complex telecommunications systems, and 22 e911 integrations to improve the overall traveler experience and better manage WVDOH's unique freight/commerce challenges. The existing ATMS and 511 platforms are also fully compliant with WVDOH's Information Technology (IT) and cyber security policies.



Working hand-in-hand with WVDOH, Team Q-Free provided technical support and unique software solutions during the Coronavirus outbreak (allowing WVDOH employees to work from home).



Team Q-Free deeply values the existing working relationship with WVDOH and is the only firm that has a comprehensive understanding of WVDOH's business practices and has highly experienced onsite staff that provide software support. With this knowledge and experience and an ATMS and 511 Platform software solution that will meet or exceed 100% of all mandatory and desirable

requirements, Team Q-Free will demonstrate throughout this proposal why we can provide the best value solution for WVDOH and the taxpayers of West Virginia.

4.2 Project Goals and Mandatory Requirements (CRFP Section 4.2)

4.2 Vendor should describe its approach and methodology to providing the service or solving the problem described by meet the goals/objectives identified below. Vendor's response should include any information about how the proposed approach is superior or inferior to other possible approaches.

As stated above, Q-Free has partnered with WVDOH since 2008 (as Open Roads Consulting, Inc.) and, unlike other vendors, already has a thorough understanding of WVDOH's business practices, Information Technology (IT) infrastructure and unique cyber security requirements. Under WVDOH's leadership we have provided software and software support services in parallel as WVDOH's constructed their Intelligent Transportation System (ITS) field infrastructure and telecommunications. Throughout this proposal Team Q-Free will present a vision and roadmap for a partnership with WVDOH that maximizes their return on investment of the current ATMS and 511 platform technology, while significantly minimizing transition risk. Team Q-Free's OpenTMS v9 and our enhanced 511 platform will fulfill all mandatory base functionality and 100% of the desirable functionality defined within CRFP No. DOT2000000001 (Advanced Traffic Management System & 511 Platform). With our highly experienced software support team and on-site System Engineer (SE) we can also fully support WVDOH's operational needs for the entire duration of this contract.



Q-FREE DEPLOYMENT SUCCESS AND APPROACH

Team Q-Free fully understands that the successful deployment of a mature and fully featured ATMS and 511 platform is one of WVDOH's core operational objectives. We also understand that to be successful it takes more than just providing existing software products. A successful ATMS and 511 platform deployment requires dedicated staff working in partnership with WVDOH staff to deliver a fully integrated suite of technology that fits WVDOH's unique mission-critical environment. Finally, it requires a team that is deeply integrated and has documented experience working together with in-depth knowledge of WVDOH's complex communications infrastructure.

Team Q-Free's approach over the last 12 years has relied upon several key factors:

- **Strong ATMS Delivery Record** – Team Q-Free has an excellent record of delivering ATMS, 511 platform services and software support services with WVDOH and other customers. Our ability to successfully plan, design, implement, and deploy stems from a combination of experienced technical leadership and an ATMS and 511 platform that are modular and extensible.
- **Dedication to Long-Term System Maintenance** – Team Q-Free is dedicated to long-term client satisfaction, so much so that we have never lost a client. Part of this is due to the strong focus on system maintenance with regular software updates (patches) applied after delivery.

- **Focus on Customer Satisfaction** - Team Q-Free has worked proactively with a long-term and stable project management team and on-site SE to ensure project continuity. Our goal is to maintain open and honest lines of communication, while delivering on-time, and listening to our clients' needs. Our successful record is attributable to our core corporate values: Integrity, Partnership, and Innovation.



Integrity

Our project team will maintain an open, transparent relationship with WVDOH. We will do what is necessary to meet WVDOH's requirements and deliver the system on-time and within budget.

Partnership

We create long-term partnerships with our clients. WVDOH plans to invest significant resources in their ATMS and it is only fair that Team Q-Free provides a return on their investment beyond the system wide deployment. By continuing with our network of existing ATMS clients, WVDOH will receive cost-effective implementation and system maintenance, sharing of data with other state DOT systems, and access to

quarterly software updates with new functionality deployed for our other customers.

Innovation

WVDOH has unique ITS operational needs. Team Q-Free will deploy OpenTMS v9 with 12 new modules and customize and configure our OpenTMS software to create an innovative ATMS and 511 platform that addresses all of WVDOH's operational needs. Team Q-Free's integrated ATMS platform will enhance WVDOH's ability to manage traffic more effectively and provide actionable traffic information to the traveling public. The solution will provide the ability to control all existing and planned ITS devices along with the ability to aggregate all the disparate field data into a central database.

In 4.2.1 below, we provide more detail to our approach to ensure all WVDOH goals and objectives are met and why Team Q-Free's approach will provide the best value to WVDOH. Our proposed approach will also:

- Ensure that WVDOH gets **100% of all mandatory and desirable functionality** and an ATMS and 511 platform that meets WVDOH's business needs now and in the future.
- Demonstrate how our incremental upgrade process **significantly reduces transition risk** associated with major changes to ATMS and 511 platforms. Today, the existing Q-Free systems provide core functionality to WVDOH's incident management program, first responder notifications, 22 e911 integrations, 24/7/365 availability and provides critical information to the traveling public during times of crisis. In other states and with other vendors, these transition risks have caused major problems with ATMS deployments. Team Q-Free's combined experience and knowledge will reduce project risk and ensure WVDOH's ATMS and 511 platform is deployed on-schedule and within budget.

- Allow WVDOH to **reduce short-term and long-term costs** associated with system deployment and system operations and maintenance by reducing staff training needs, re-using existing telecommunications infrastructure and using new technologies to reduce Integrated Voice Response (IVR) costs while improving the telephone user experience to a more natural “Alexa” like experience.

4.2.1. Approach & Methodology to Goals/Objectives

4.2.1.1 Provide an Advanced Transportation Management System (ATMS), a 511 Traveler Information System, associated software development, and support services that will provide improved functionality to the West Virginia Department of Transportation for the purpose of managing the transportation system throughout the state and partnering with stakeholder agencies to improve emergency and event response and the overall transportation experience in West Virginia.

Fully Upgraded ATMS - OpenTMS v9

Although our current system has been in place serving WVDOH’s mission critical needs for many years, we will enhance our solution with *OpenTMS v9* with 12 new modules. Team Q-Free will customize and configure our OpenTMS software and ILOG’s 511 platform to create an innovative and fully integrated transportation technology platform that addresses all of WVDOH’s operational needs, maintains all existing e911 and external integrations and is optimized for WVDOH’s telecommunications environment.



Delivering Enhanced ATMS Functionality to WVDOH

The ATMS platform is the heart of the system and currently allows WVDOH to effectively manage incidents/crashes planned events and severe weather and share critical information with other stakeholder agencies. Having partnered with WVDOH for so many years we have built functionality that has been customized to meet WVDOH's business needs and roadway network.

Other firms may claim to meet the objective and base requirements in CFRP Section 4.1 however these vendors:

- Lack an understanding of the complexities required to establish 22 e911 integrations;
- Lack knowledge on about WVDOH's telecommunication architecture and sparse cellular coverage; and
- Don't have a full understanding of WVDOH's multi-agency approach to emergency management.

As stated in 4.2.1.1, our current platform has been used daily for "emergency and event response" for WVDOH. Between 2014 and 2020, there were 107,400 incidents and 7,436 planned events entered into and managed within our mission critical platform.



Q-Free will deliver 100% of all mandatory and desirable requirements listed in CFRP Section 4.5 through 4.17 in a compressed schedule with the system deployed within 9 months on Notice to Proceed (NTP). We will also provide other functionality and features at no extra cost to WVDOH as shown in **Table 1 – How Q-Free Exceeds Expectations** below. These enhancements will be tailored to fit WVDOH's unique business processes and Information Technology environment.

Enhanced 511 Platform

Team Q-Free will provide a fully upgraded 511 platform with modern, "Alexa" like experience for telephone users. No other vendor provides this advanced 511 functionality. We have reduced the complexity in our 511 platform by modifying our team of subcontractors and consolidating our 511 platform providers. With this change in our team, Team Q-Free can provide a more cost-effective solution and more consistent data presentation across Web, IVR, Mobile and Social Media. In addition, by moving to a single 511 platform provider, Team Q-Free will provide information where and when it is needed or requested, using the most reliable networking and systems possible, in a fiscally responsible manner. Q-Free's partner, ILOG, uses the newest technologies available so that not only are advanced 511 services provided, but WVDOH is also positioned with tools that support new applications, assist with pilot programs, and that adapt to changing information sources and delivery mechanisms.

The enhanced 511 platform will improve existing services, similar to the improvement in 511 platform services experienced in Pennsylvania when they moved to the ILOG 511 solution. The proposed 511 system rests on a platform that can accept, process and distribute virtually any relevant data source. ILOG has specific experience with incorporating data feeds from multiple interstate and intrastate agencies; from partners/stakeholders such as Waze and NOAA; and from commercial providers such as Vaisala and INRIX. ILOG has modified the 511PA system to merge the DOT and the Turnpike onto one 511 system yet has allowed each agency to retain their identity and specific information requirements. This multi-faceted approach to 511 means that the mobile app can cross state boundaries and continue to provide travel information, and the IVR can address destinations just outside of state borders.

The new ILOG platform proposed for the 511 platform also supports advanced, non-traditional modules such as a two-way emergency communications system for trapped travelers (deployed as 511PAConnect in Pennsylvania) and connected corridor components and has even been used for a connected vehicle pilot program. The system has also undergone upgrades to support innovative commercial vehicle information tools. While other non-traditional 511 components are not included as part of the 511 platform proposed, WVDOH can rest assured that if they wish to move into these other programs, they can leverage the 511 platform to provide new advanced services to the public. Each component of the proposed 511 platform assists the WVDOH with directing the public during daily travel activities and especially in times of emergency.

Innovative Video Distribution

Skyline will continue to provide leading edge video capabilities and their demonstrated ability to manage thousands of internet protocol (IP)-based devices efficiently and provide video distribution for very large Department of Transportation (DOT) customers. As part of the new platform Q-Free will fully integrate Skyline's VERO solution to better manage video and allowing users to create their own personal video walls on workstations.

How We Exceed ATMS and 511 Platform Specifications

Team Q-Free exceeds the mandatory and desirable requirements in many ways and the table below lists a few of the additional functionalities that will be provided to WVDOH as part of our response.

TEAM Q-FREE EXCEEDS EXPECTATIONS FOR WVDOH

Table 1 – How Q-Free Exceeds Expectations

Req ID	Mandatory Requirements	Exceeds Requirement
4.1	<i>There are 22 county or joint-county E-911 centers throughout the state who are in partnership with the WVDOH. The current ATMS solution, successful provides a system that requires no 911 center operational interaction.</i>	✓

How Team Q-Free Exceeds Expectations: The Q-Free Team exceeds this requirement by current interfacing with all E-911 centers in the state of West Virginia. Since this integration already exists, no additional time or cost will be spent on consuming these feeds into OpenTMS. This also means that there will be no transition time required, and that these 911 feeds will be immediately available when the software is deployed. Additionally, the improvements in the OpenTMS architecture make it possible to integrate new systems and vendors at significantly reduced cost in the future.

4.2.2.16	<i>There are current typical expenses incurred annually for systems, software, services and equipment that need to be accounted for in the Vendor's cost proposal, or not included because the Vendor's proposed solution does not require it. Where existing physical servers are currently used, it is required for proposed solution to also include physical servers. If there are any</i>	✓
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Req ID	Mandatory Requirements	Exceeds Requirement
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additional systems, software, services and equipment that the Vendor requires as part of their solution, these should be included in the cost proposal and described in the Vendor's proposal.

How Team Q-Free Exceeds Expectations: The Q-Free Team exceeds this requirement, and as part of this proposal, the current internet circuit will be upgraded to a 500mbps asynchronous circuit with 500mbps up and 500mbps down. The connection between Building 6000 and the capital complex will be upgraded with a gigabit multi-path fiber connection with built in redundancies. A 100MB connection to the turnpike authority with multi path fiber will also be provided.

4.5.1.4

The Vendor must provide a non-revocable and perpetual license to the WVDOT and its current in-state partner agencies for the use of the ATMS software and its associated systems.



How Team Q-Free Exceeds Expectations: The Q-Free Team exceeds this requirement by focusing on product development, rather than a client-based approach. What this means is that WVDOT will gain access to features developed for additional clients, therefore enabling OpenTMS to stay at the front of the industry when it comes to leading edge features and technologies. This provides sustained benefits to WVDOT by keeping them at the forefront of the ATMS industry. This also provides a greater level of flexibility due to newer technologies and practices being introduced into the overall application stack.

4.5.1.5

The ATMS Vendor will be required to develop agreements with third party data providers, software providers, or other system providers required to make the ATMS functional.



How Team Q-Free Exceeds Expectations: The Q-Free Team exceeds this requirement by leveraging our current integrations with several third-party data providers. Current integrations include:

- **Waze** – OpenTMS will consume current traffic alerts and display them for triage in the Alerts Module. From here, operators can decide to act upon alerts as they occur.
- **National Weather Service** – Our current integration with the NWS features radar and severe weather alert map overlays, in addition to alerting feeds that OpenTMS will consume.
- **Inrix** – Our Travel Time Engine can calculate travel times based on configured routes in the system. Travel Times can be posted on associated DMS for traveler awareness.

Req ID	Mandatory Requirements	Exceeds Requirement
4.12.2.2	<i>The ATMS should have the ability to integrate the fog warning/conditions system to activate a DMS.</i>	✓

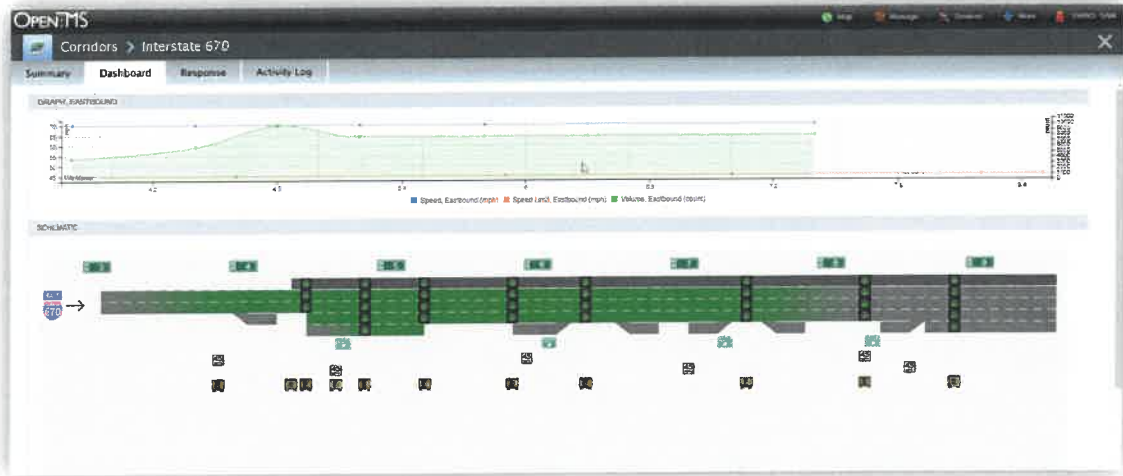


Figure 1 – Integrated Corridor Management Dashboard

How Team Q-Free Exceeds Expectations: The Q-Free Team exceeds this requirement by leveraging our Integrated Corridor Management Module. Features include:

- Ability to configure and define weather sensor thresholds for severity
- Define a set of messages to post based on these conditions
- Automated functions to post messages and notifications to stakeholders, requiring little to no operator input to manage the corridor
- Ability to control Variable Speed Limits, Lane Controls, Dynamic Message Signs from a single, consolidated interface.

Req ID	Mandatory Requirements	Exceeds Requirement
4.10.1.1	The A TMS shall provide a mechanism for operators to manage incidents and events through a dialog box or user interface.	✓

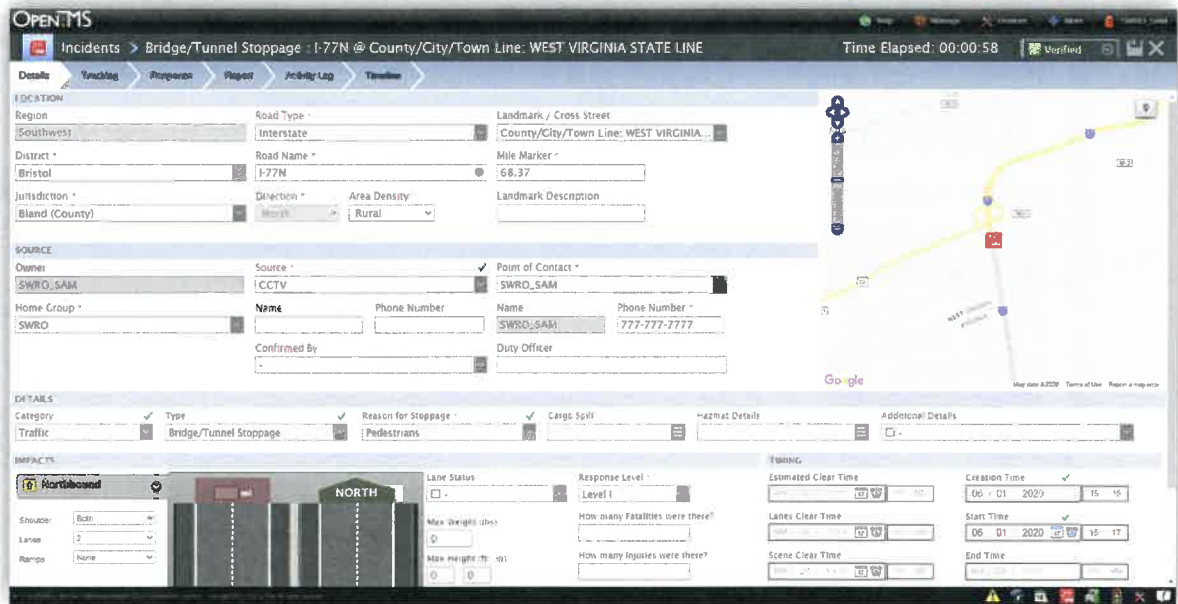


Figure 2 – Incident Details View

How Team Q-Free Exceeds Expectations: The Q-Free Team exceeds this requirement by providing a single and consolidated incident entry form. All relevant incident data can be viewed and edited from the details view. Data elements featured on the single view are location, source, type, lane impacts, restrictions, and timing fields. The incident workflow also requires operators to update public traveler information portals and to update field devices in response as part of the verification and update process. In addition, OpenTMS already features business rules that align with the WVDOH operations, therefore eliminating time to develop these requirements, and significantly reducing transition time to the new system.

Req ID	Mandatory Requirements	Exceeds Requirement
4.6.1.1	<i>The ATMS shall provide security and administration functions.</i>	✓

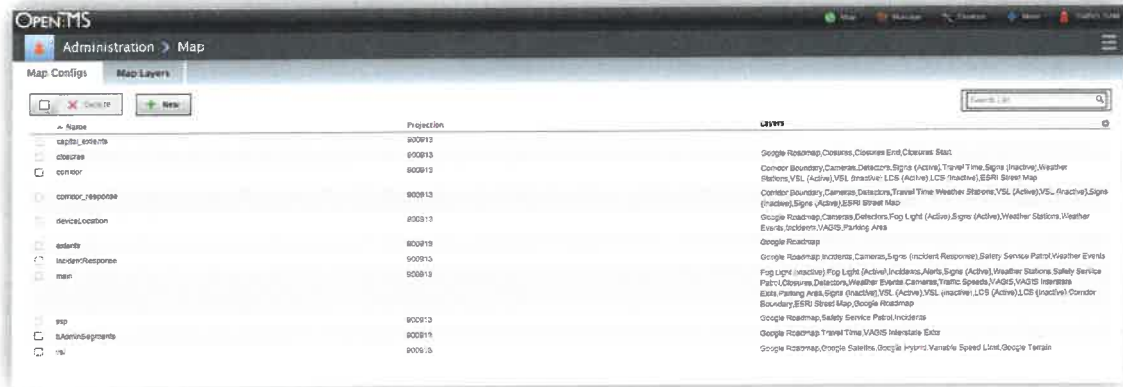


Figure 3 – Map Administration Configuration

How Team Q-Free Exceeds Expectations: The Q-Free Team exceeds this requirement by providing an Administration Portal that features interfaces to control every aspect of OpenTMS. One notable feature is a fully integrated map administration control which allows for the customization of zoom levels, bounding boxes, and associated layers for each distinct map type in the application. These changes require no system restarts and features the ability to pull in virtually any available base map, such as Google or Esri.

Req ID	Mandatory Requirements	Exceeds Requirement
4.17.4.1	<i>Although not required at this time, the ATMS should have the capability of adding a traffic signal control module or third-party application for the centralized control of WVDOT traffic signal systems across the state with communication capabilities.</i>	✓

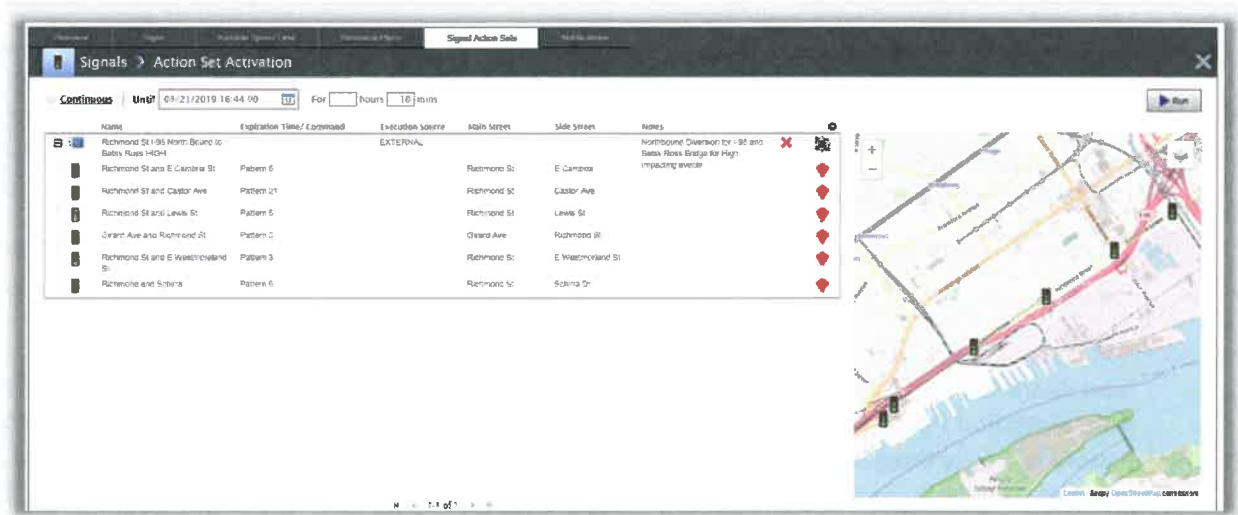


Figure 4 – Traffic Signals Integration List View

How Team Q-Free Exceeds Expectations: The Q-Free Team exceeds this requirement by featuring an integration with INTELIGHT's MaxView software. OpenTMS can consume objects known as signal action sets to route traffic based on arterial conditions. The advantage of this integration is that these action sets can be used as an output for response functions. Our Incident and Corridor Management modules can recommend these action sets as a response. Currently, our I-76 deployment in Philadelphia, can activate action sets to increase traffic flow on side streets when sections of the primary interstate is too congested.

4.2.2.4	<i>Vendor must provide on-site and remote technical support to the WVDOT for the purpose of maintaining and upgrading the proposed ATMS and 511 System software and providing other TMC support services for an initial period of 3 years with two optional 2-year renewals.</i>	✓
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How Team Q-Free Exceeds Expectations: The Q-Free Team exceeds this requirement by having on staff support with extensive familiarity with WVDOT operations. This FTE is located within 15 minutes of the TMC for rapid response. Q-Free also has a team of at least 15 people to support the FTE in critical situations, including a 24/7 on-call support system. In addition, Q-Free has a dedicated product support team, which can respond and repair software inconsistencies with quick turnaround. In



Req ID	Mandatory Requirements	Exceeds Requirement
addition to the maintenance team, a product development team also is available to work with WVDOH on future requirements and needs as the system adapts towards the future.		

4.6.2.2	<i>The ATMS map should display all major freeways and streets with graphical representation for each roadway classification.</i>	✓
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How Team Q-Free Exceeds Expectations: The Q-Free Team exceeds this requirement by interfacing with the ESRI roads and highways data set. Also included in the integration effort is access to the vast library of base maps and data displays for the map views. The ESRI integration allows WVDOH to take advantage of the high level of detail for mapping and gis, allowing for greater precision when identifying incidents and events along the roadway network. In addition, the integration features the ability to ingest detour routes from the ESRI service and allows for ad-hoc detours to be created with turn by turn directions.

4.14.1.1	<i>The ATMS shall have a data archiving capability that stores and provides access to historical data. Data is to be collected from ITS field devices and from system users both in normal operation and during the management of planned and unplanned events. WVDOT has a 5-year data retention requirement</i>	✓
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How Team Q-Free Exceeds Expectations: The Q-Free Team exceeds this requirement by featuring our Data Prism integration for data collection and availability. The Data Prism allows for data feeds to be provided and shared to third-party integrations, including the traveler information and 511 systems.

4.2.1.2 Provide a seamless transition between the current operating environment and user experience to any new software or system version implemented so as not to disrupt transportation operations and management activities within the West Virginia Department of Transportation and partner agencies.

Lowering Risk with an Incremental Transition

Team Q-Free's approach dramatically lowers risk for WVDOH. With our in-depth knowledge of the highly complex suite of systems (ATMS, 511 Platform, Video Distribution System, e911 Integrations, telecommunications network) we can ensure there are no disruptions to WVDOH's mission critical operations. Our OpenTMS V9 platform is built to be 100% backwards compatible with WVDOH's current platform. This ensures all devices, and user interfaces will function similarly to the system in use currently. The incremental approach allows WVDOH to minimize risks involved with:

- Training, WVDOH staff already knows this system;
- Cyber security, current system is complaint today;
- IT policies and hardware compatibility;
- Integration with Telecommunications Networks; and
- Existing e911 integrations and e911 agreements.

A system outage during transition could have major impacts on the traveling public and other “first responder” agencies that aid with crashes, work zones and severe weather response.



Successful Migration Requires Extensive Planning

Team Q-Free will develop and submit a detailed Software and System Deployment Transition Plan for review and approval by the WVDOH. Team Q-Free understands the need for a well thought out transition plan being key to providing a seamless transition. Team Q-Free is experienced in transitioning from legacy systems. Q-Free has successfully transitioned four of five VDOT Traffic Management Center (TMCs) from legacy ATMS to OpenTMS and all regions of Pennsylvania DOT from legacy ATMS and vendor applications to a statewide version of OpenTMS. ILOG has successfully transitioned 511 platforms for the Pennsylvania Turnpike and the Pennsylvania DOT. Most recently, ILOG has merged functions for the two agencies, creating a joint TIS.

Key Components for a Successful Migration Strategy

- Software and System Deployment Transition Plan provides a detailed timeline on pre-transition activities and system transition from legacy systems to the new ATMS-ATIS system
- Identify stakeholders and their role in the transition
- Utilizing an OpenTMS upgrade strategy allows for access to historical production data
- Conduct device verification
- Conduct end to end testing for integrated systems
- Plan to populate production databases with general configuration
- Public website and services ready to go
- Training

In West Virginia, the team will be upgrading the current version of OpenTMS to version 9. This upgrade will roll out the new features as well as allowing the WVDOH to keep their production data. Having access to this data will provide the WVDOH with access to historical information for reporting and analytics. As part of this upgrade the WVDOH will be transitioning to a new 511 web site and IVR system vendor. The plan for this transition will be well documented and reviewed with the WVDOH prior to transition.

Currently, ILOG uses WVDOH data feeds for information that populates the Drive Safe WV mobile app. This means there will be few adjustments for the public to make in navigating the mobile app. The mobile app will be updated to incorporate a new set of features. ILOG is very familiar with website DNS changes and propagation, as well as porting numbers to the new IVR system. The public should make a swift and happy transition to the new 511 platform services by tapping into the experienced staff at WVDOH to work on the actual design for the website.



Team Q-Free will be on-site supporting the WVDOH and WVTPA leading the transition and to support operations staff:

- In the weeks leading up to the deployment, Team Q-Free will meet with stakeholders to finalize the transition plan and review action items;
- Transition will be planned around a detailed schedule with clearly defined activities and strategies;
- Transition will be scheduled for a low-activity period. Team will develop a Go/No-Go checklist to ensure that there are no major traffic events and that the ATMS and 511 Platform are ready to go; and
- The Q-Free project manager will work with the WVDOH to finalize the Operations Support and Maintenance Plan before transition so there is a seamless transition to Maintenance.

4.2.1.3 Provide a cost-effective solution that meets the needs of the West Virginia Department of Transportation and has low, overall ongoing life-of-ownership costs for the term of the contract.

Team Q-Free has examined cost, scope, schedule and risk to minimize software development life-cycle costs and maintenance/operations activities. Team Q-Free has modified the project team (consolidated the 511 platform providers and added geo-spatial capabilities to leverage West Virginia's existing investment in spatial data) to ensure delivery of the most cost-effective ATMS and 511 platform possible for WVDOH. One aspect involves using ILOG's advanced IVR to avoid recording fees for minor changes and add increased flexibility and modern "Alexa" like user experience. In addition, Team Q-Free will introduce OpenTMS v9 that will include 12 new modules (See CRFP requirement 4.5.1.2 in Section 4.5 - General System Requirements of this proposal). and consolidate Incidents and Planned Events into a seamless "Events Manager Module" (See Section 4.10 - Event/Incident Management & Reporting that will make data input much more efficient. Team Q-Free will meet 100% of all mandatory and desirable requirements for the ATMS, 511 platform and provide reliable and highly experienced software support services. We will also ensure full compliance with the required West Virginia IT, cyber security policies and FHWA System Engineering requirements.

In every component, we have selected the best services, software, and created the best methods to provide the functionality and reliability required by the CRFP. Given the extreme weather conditions experienced in the last several years, and their impact on travelers, we have selected the most scalable and robust components at the best possible price.

Lowest Lifecycle Ownership Cost

Designing and deploying an ATMS platform is a small portion of the overall lifecycle cost. Long-term value is created by minimizing the cost to maintain, upgrade, and enhance the ATMS platform. With changes to IVR and full development of OpenTMS v9, the new platforms will provide a stable base for WVDOH's Traffic Operations for the entire period of performance of this contract.

4.2.2. Mandatory Project Requirements

The following mandatory requirements relate to the goals and objectives and must be met by the Vendor as a part of its submitted proposal. Vendor should describe how it will comply with the mandatory requirements and include any areas where its proposed solution exceeds the mandatory requirement. Failure to comply with mandatory requirements will lead to disqualification, but the approach/methodology that the vendor uses to comply, and areas where the mandatory requirements are exceeded, will be included in technical scores where appropriate. The mandatory project requirements are listed below.

Table 2 - Mandatory Project Requirements Summary

Requirement Category	Total Requirements	Total Requirements Met by Team Q-Free	% Met Today
<u>General System Requirements</u>	6	6	100%
<u>Traffic Display Maps/GUI</u>	20	20	100%
<u>Device Controls-Dynamic Message Sign (DMS)</u>	38	32	84%
<u>Device Control-CCTV/CAMERA</u>	35	34	97%
<u>Device Control - RWIS</u>	6	5	83%
<u>Event/Incident Management & Reporting</u>	61	56	91%
<u>Traveler Information</u>	55	53	96%
<u>Integration with Other Systems</u>	15	14	93%
<u>Operator and User Features</u>	64	56	88%
<u>Data Collection & Archiving</u>	30	18	60%
<u>Log Reports System Reports</u>	14	11	78.5%
<u>Security and Administration</u>	19	19	100%
<u>Performance</u>	9	9	100%
Totals	372	333	90%



4.2.2.1 Functionality of the proposed ATMS and 511 software and systems must meet or exceed the current functionality of the existing WVDOH system and elements described in the Background and Current Operating Environment Document, meet the accompanying mandatory high-level Functional Requirements, and respond as necessary to any specific answers to questions submitted to WVDOH through this RFP process. The current third-party agreement is with Alpha Technology for fiber. This Fiber agreement is nontransferable and will need to be acquired by the vendor.

Having partnered with WVDOH for the last 12 years, Team Q-Free fully understands WVDOH's business needs and has worked proactively to ensure our systems meet WVDOH's ATMS, and 511 platform requirements. In Proposal Section 4.5 through 4.17 (CRFP 4.5.1 through CRFP 4.17.3) Team Q-Free has included documentation demonstrating our proposed methodology to meet or exceed all of WVDOH's mandatory and desirable requirements in response to CRFP sections 4.5 – 4.17 below. Details of how the proposed ATMS, 511 platform and our experienced software support services will meet or exceed the current functionalities and business need is described in the section for each functional requirement.

4.2.2.2 The period of service for this contract is 4 years with two optional 2-year renewals.

Team Q-Free will fully support the period of service for this contract as we have done since 2008.

4.2.2.3 The Vendor shall submit a formal Software Development Process proposal and schedule to the WVDOH for their approval prior to beginning any work. Consideration should be given to including an iterative process by which the WVDOH representatives are able to review progress, review GUI mock-ups, provide input to the development team, and participate in acceptance testing and requirements verification. Project progress meetings will be required monthly at a minimum, either in person or by teleconference. Project progress reports shall be submitted monthly.

The Q-Free project manager will work with the team to submit a formal Software Development Process proposal and schedule. WVDOH will be an active participant in the Agile process and have the opportunity to provide feedback during the sprint review meetings in support of the project's iterative design and implementation process. An overview of the process is provided in requirement 4.3.1.6.

The project manager will prepare an agenda and run monthly progress meetings on-site and/or via teleconference. All sub-contractors will participate in the progress meeting. The project manager will prepare and submit monthly a progress report.

4.2.2.4 Vendor must provide on-site and remote technical support to the WVDOH for the purpose of maintaining and upgrading the proposed ATMS and 511 System software and providing other TMC support services for an initial period of 3 years with two optional 2-year renewals. The initial 3-year O&M period is to commence following a 1-year software and system development period and final software and system acceptance by WVDOH. The necessary on-site support for the Year 1 system development period is to be included in the base system costs for the ATMS and 511 System. The O&M support periods will include one person on-site for 40 hours per week (standard work days, excluding holidays and vacation) plus on-call hours as necessary to resolve issues in a timely manner, which may include but not be limited to troubleshooting and resolution of issues related to field devices, communications, networks, software and hardware. In addition, 24/7 phone support shall be provided for the ATMS and 511 System software and associated systems to assist the WVDOH during hours when on-site support is not available. Vendor to include a cost component, if any, for ATMS and 511 System software upgrade/maintenance services and contracts for the term of the contract and renewals. During the system development period (Year 1) and for one year following final acceptance, these upgrade/maintenance costs will be part of the Base System Package costs.

Q-Free will provide an Operations Support and Maintenance Plan that provides a comprehensive plan for providing 24/7/365 on-call support. Components of the plan will include at a minimum:

- Clearly outlined Service Level Agreements;
- Q-Free provides a 24/7 toll free support line that is staffed by our SEs;
- Process for reporting / tracking issues – Q-Free uses JIRA Service Desk (JSD) for reporting and tracking issues;
- Software Release Process;
- Detailed On-site SE Role and Responsibilities; and
- Configuration Management.

As we have provided support for the last 12 years for WVDOH, we will also provide support under this contract period of performance. Q-Free's on-site support personnel assigned to the WVDOH will have expert knowledge of our ATMS and 511 platform in addition to being knowledgeable in ITS technologies, hardware, networking and telecommunications. This on-site resource

will be flexible in shifting hours to support critical events or to help with emergency situations. Some of the expected duties of the SE to support TMC operations are as follows:

- Troubleshoot all reported issues;
- Perform preventive maintenance activities as outlined in the SE checklist within the Operations Support and Maintenance Plan;
- Monitor floor operations and solicit feedback from supervisors to ensure there are no training issues with system users or administrators;

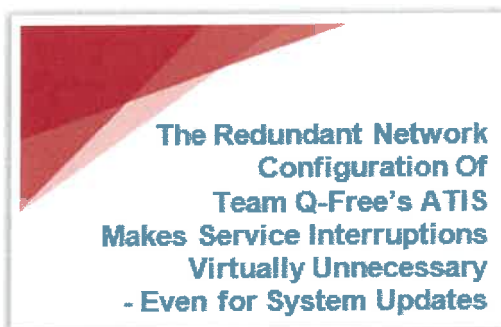
The Q-Free on-site system engineer and project manager provided flexible and dedicated support during the coronavirus pandemic reconfiguring systems and providing hardware so WVDOH staff could work from multiple locations and remain safe.



- Provide support statewide related to ATMS and 511 platform and networking;
- Provide on-site training and demonstrations;
- Provide field device integration;
- Keep the WVDOT PM apprised of all system related issues; and
- Attend project meetings as the WVDOT's ITS subject matter expert as required.

Support via email and telephone for the 511 platform components will be available 24x7. The support staff at ILOG are systems engineers who try to troubleshoot and resolve the problem. When/if needed, these system staff call in programming/database staff to assist in the problem resolution.

4.2.2.5 Vendor is required to not interrupt connectivity and key data transfer functionality without notice and prior approval, during the ATMS software and 511 system installations, between the WVDOT TMC located in Charleston, WV and the remote users and offices that provide information to and/or receive information from the TMC and the current ATMS and 511 software and systems. This includes the E-911 centers located across the state that provide accident data directly to the current WVDOT ATMS platform and the West Virginia Parkways Authority.



The Software and System Deployment Transition Plan will address these concerns and include a notification and approval process in the plan. The transition plan will identify key stakeholders and transition notification procedures.

Continuous 511 platform service availability to the public is critical so that public confidence in the 511 information is not compromised. The redundant network configuration of the 511 platform makes service interruptions virtually unnecessary - even for system updates.

4.2.2.6 The proposed Vendor software and systems must have the ability to be integrated with current WVDOT field devices, including 109 CCTV, 64 DMS, and 41 RWIS. The list of devices is included as Attachment B.

OpenTMS fully meets this requirement today. OpenTMS currently supports all protocols in use by the WVDOT identified in Attachment B.

4.2.2.7 The 511 systems proposed shall maintain the capability for information retrieval via telephone access using voice recognition, the WV511.org website and the WV511 Drive Safe mobile application. The 511 system shall also have a road condition reporting system associated with it that allows for remote user data entry and master user data entry of road conditions from partner agencies and the TMC.

The proposed 511 platform system shall include the specified IVR, website and mobile application. Users will use the new integrated AMTS Road Conditions Module to enter and manage road conditions. Road conditions will be distributed to the 511 systems. For partner agencies, permissions can be set to provide access to only the Road conditions module.

4.2.2.8 The 511-website development and product shall adhere to the requirements noted in the Functional Requirements. In addition, the Vendor shall include and/or provide the following:

- WVDOH to have administrative rights and control over any public facing websites and applications;
- WVDOH personnel shall have the administrative ability to modify links, graphics, language, etc. on the website;
- A resources tab/link shall be included for linking to other WVDOH pages, resource documents, and partner agencies. Resource links might include information/links to construction updates, significant project websites, tolling information, truck permits, rest areas, social media, etc.;
- Ability to place advertising on the website and track advertising metrics;
- Tracking of analytics/usage of the 511 website and the 511 application by the public; and
- Annual review of the 511 website and the 511 application between the Vendor and WVDOH to update design, content, graphics, links, features, etc. This work will be part of the annual maintenance costs. Costs for items, design or equipment upgrades above and beyond normal maintenance will be paid through the materials or IDIQ budget provided by WVDOH.

The 511 platform system will have a standalone web portal that will allow WVDOH authorized staff to control the availability of the public website, to modify identified components of the website, and to access statistics that track site and application usage. This administrative site will also provide a number of reports and other features, and it will be modified to include advertising metrics and placement of advertising as determined during design phase of the project.

The public-facing site will include tabs with links to other resources, tolling, social media, rest areas and other items as identified during design.

It is important to note that site design in general, like most other creative enterprises, goes through trends. Consequently, a site that is several years old may look "dated" compared with current web site trends. An annual review to identify which links, graphics or design elements need to be updated will be included as part of the proposed annual maintenance costs.

4.2.2.9 The Vendor shall provide training on the ATMS and 511 software and systems to operators and supervisors initially and then as specified below for new personnel and upgrades. During the first year, Vendors should plan on two training sessions to be provided at two locations in Charleston. One will be at the WVDOH TMC and the other will be at the West Virginia Parkways Authority office. Facilities will be arranged for by the host agency. Up to 20 trainees should be planned for at the WVDOH TMC site with training to take place across two shifts. Up to 10 trainees should be planned for at the WV Parkways Authority site with training to take place across two shifts. Each ATMS training session will be accomplished within one 8-hour period. In each of the following years, including renewal years, the Vendor shall provide a training session to new employees and software updates/refreshers to previously trained employees at the same locations in a similar format. At every training session, training manuals shall be supplied for trainees as well as prepared presentations and live training on host supplied workstations. The training period should be quoted to include time, materials and travel expenses associated with this task. Alternatives to this training plan can be submitted by the Vendor, but the Vendor shall provide a quote based on the training plan specified above and an alternative bid if desired for consideration by WVDOH.



Team Q-Free will provide training as required. Included with the deployment is a Staging environment that can be utilized for Training. Our Trainer has over 10 years of experience training at various TMCs. Our Trainer will be on-site for a week to conduct 4 training sessions between the two sites for the initial deployment. Training materials will be supplied.

Training for WVDOH staff who will be managing the 511 platform website through the administrative portal will be provided as part of the on-site training. The preview environment will be used for training.

In subsequent years, each year the Trainer will be on-site for a week to conduct new employee and refresher training at both sites. Materials will be provided.

Our Trainer will work with the WVDOH and WV Parkway Authority to develop and execute the training plan as specified in the requirement.

4.2.2.10 The Vendor shall provide a list of servers, computers, workstations, 3rdparty software, and other hardware required to successfully implement their proposed solution. No hardware/software cost data is to be included in the technical proposal. If the hardware or software is to be included with or is already absorbed into the base software cost, that should be noted in the cost proposal response.

Q-Free intends to utilize the hardware and software list provided in the CRFP. Capitalizing on the infrastructure provided Q-Free will be able to provide a staging environment to be used for testing and training as well as the production platform.

In addition, Q-Free will be adding the following 3rd party software:

- OsTicket, <https://osticket.com/>. This software will be integrated to provide maintenance ticket support;
- Tableau, <https://www.tableau.com/>. This software will provide analytics package;
- Jasper Reports Server Professional, <https://www.jaspersoft.com/>. This software will be integrated to provide Reporting functionality through our Reporting module;
- The ATMS Database used will be PostgreSQL; and
- The hosting and software for the 511 platform system is included in the price.

4.2.2.11 The WVDOH will provide a test environment location within the same building and general location of the existing TMC for the Vendor. The Vendor may propose an alternate solution which will be subject to WVDOH approval after award. (Note: The vendor will need to provide servers, computers and workstations during the test environment. The existing hardware will be occupied by the live environment.)

Q-Free will deploy a staging environment within the same facility currently hosting the statewide ATMS platform. This environment can be used to stage releases for testing and training prior to production release.

The test/preview environment for the 511 platform will be hosted in the Amazon cloud, as will the production 511 platform.

4.2.2.12 The Vendor should develop a comprehensive System Security Plan (SSP) for review and approval by the WVDOH and the West Virginia Office of Information Technology prior to system design acceptance. The purpose of the system security plan is to provide an overview of the security requirements of the system and describe the controls in place or planned for meeting those requirements, in addition to delineating security control responsibility as it pertains to the vendor and the state. At a minimum, the SSP should address:

- *Defense-in-depth (layered security) methodology*
- *Risk management, risk assessment, risk analysis*
- *Standards compliance*
- *Access control - user authentication, authorization, permissions and accounting*
- *Network boundary and remote access security*
- *Endpoint security*
- *Application Security*
- *Vulnerability management*
- *Cybersecurity & operations system monitoring*
- *Incident response/management*
- *Logging and log management*
- *Change management*
- *Contingency of operations & disaster recovery*

The ATMS Vendor shall procure, install, configure, manage, maintain, and monitor the Next-Generation Firewall (NGFW) protection at the boundaries of the ATMS network including public Internet and partner network connections. NGFW equipment shall, at a minimum, be capable of traditional firewall functionality (e.g., NAT, PAT, VPN), inline deep packet inspection, intrusion detection systems (IDS), next-generation intrusion prevention systems (NGIPS), SSH/SSL inspection, advanced malware protection, website monitoring, and QoS/bandwidth management.

Team Q-Free will develop and submit a System Security Plan (SSP) for review and approval by the WVDOH and WV Office of Information Technology. SSP will contain the elements identified above.

The 511 platform is included in the System Security Plan and will be supported by cloud-hosted web servers, processing servers, IVR servers, and database servers. All of these will reside in a virtual private network protected with firewall access policies. These servers interact with WVDOH processes for three general purposes: automated data exchange(s), an administrative manual data interface, and an administrative web portal to manage the site and generate reports.

Team Q-Free has 18+ years of network security management. Providing maximum protection utilizing state of the art technology. As part of the WVDOH infrastructure; team Q-Free will manage the core network infrastructure, employing the latest in NGFW technology behind and application level firewall protecting the systems from zero-day attacks. Employing Geo Fencing access to web capable applications restricting traffic to the continental US and Canada.

4.2.2.12.1 Vendor shall develop a comprehensive cyber risk reporting procedure to ensure identified cyber risks are reported to both WVDOH and Office of Technology. The reporting procedure shall address the nature of the risk, as well as a detailed plan of action and milestones to address the risk.

Team Q-Free will develop a cyber risk reporting procedure and train staff on the reporting procedure.

4.2.2.12.2 The Vendor shall inform both WVDOH and the Office of Technology of any confirmed security incident or data breach. The Vendor should report a confirmed security incident as soon as practicable.

Team Q-Free will immediately report all security incidents or data breaches immediately to the WVDOH and Office of Technology.

4.2.2.12.3 The vendor shall comply with the Office of Technology software standards and security policies as outlined in section 4.5.

Team Q-Free will comply with the Office of Technology software standards and security policies.

4.2.2.12.4 The state reserves the right to conduct a cybersecurity audit or to contract a third party to conduct such an audit on the information system, to include the operational management and support provided by the Vendor. The findings shall be shared with both representatives of both WVDOH and OT.

Team Q-Free will support the state's right to conduct a cybersecurity audit.

4.2.2.13 The Vendor shall develop a Software and System Deployment Transition Plan for approval by WVDOH at the project start and update at least quarterly through final acceptance testing. The plan should consider and include:

- *Communications service development for ITS field devices, 911 center connectivity, telephony service for 511, and website access*
- *Development and cut over of public websites, mobile applications and 511 services to existing access methods, phone numbers and URLs.*
- *Development of ATMS/511 software, databases and systems*
- *Installation and testing of ATMS/511 software, databases and systems*
- *Transition from existing ATMS/511 to new ATMS/511 including overlap to ensure functionality is maintained at a satisfactory operating level (Can be done system by system)*
- *Advance notice periods to WVDOH of software/system transitions (minimum 1-week notice, prefer 2 weeks' notice)*
- *Transition approval by WVDOH (Provide minimum 3 days for WVDOH approvals in schedule)*

Team Q-Free will develop and submit a Software and System Deployment Transition Plan for review and approval by the WVDOH. Team Q-Free understands the need for a well thought out transition plan being key to a successful transition. There are several key components critical to the success of an ATMS and 511 Platform system migration. These key components include business processes, impacted systems, system data, and system users. Team Q-Free has successfully transitioned four of five VDOT TMCs from legacy ATMS to OpenTMS and all regions of Pennsylvania DOT from legacy ATMS and vendor applications to a statewide version of OpenTMS. The Plan will contain at a minimum the elements identified above.

The 511 platform plan for the public-facing components and associated site administrative portal will be included in the transition plan. Q-Free's partner, ILOG, is experienced with coordinating DNS cutovers for websites and number porting for IVR systems. Both the preview and production environments for the new system will be operational prior to the cutover date so that all connections are confirmed. The cutover will involve propagation of the new IP address for the website URL and the coordinated change of the IVR telephony numbers.

4.2.2.14 Communication Services: This will require a data service and hosting system by the vendor. The current service is not transferrable.

- The State contracts for and provides wireless communications services between the TMC and all ITS field devices through AT&T. Currently, all ITS field devices are connected to the TMC through wireless telecommunications.*
- The Vendor shall provide 511 IVR hosting and telephony services.*
- The Vendor shall provide for WV 511 Drive Safe application hosting and service agreements.*
- The Vendor shall provide for data communications between the TMC and the 911 centers across the state and the West Virginia Parkway Authority dispatch center. Due to some of the e911 centers integrating the FBI 'WEAPONS' system, the WV State police require approval for all 3rd party system integrations. WVDOH does not have any existing agreements for this work that will need to be transferable.*
- The ATMS vendor provides a Video Distribution System (VDS). The VDS solution takes a single stream from the CCTV in the field and delivers a full quality stream (no down scaling) to the TMC, Turnpike Authority, Fusion Center, e911 Centers as well as y WVDOH approved receiver on a limited or permanent bases. The VDS solution further provides a down scaled feed for the Statewide traveler information system and media partners; per agreements between the WVDOH, Media outlets and the ATMS provider.*

OpenTMS and the Skyline VDS will be deployed on premises at the Data Center located at Building 6000 at the Tech Park located in south Charleston. The Data Center is a central junction for several internet service providers. Using this network node allows for redundant paths to the TMC internet, field devices and e911 centers around the state. This is to ensure that the system has multiple core network providers to route traffic through to ensure maximum uptime for the ATMS, Partner Connections and Video systems. Connectivity to the TMC and TPA will be provided utilizing the Charleston 'Metro Ring' for redundant highspeed connectivity. The use of cloud computing has redefined business continuity, disaster recovery and backup testing. The ILOG 511 platform will be housed in the Amazon cloud, load-balanced across multiple servers in multiple locations, each location supported by Relational Database Service (RDS) databases. ILOG builds redundancy in each of its technology solutions.

The 511 IVR Telephony services are included in this proposal. The Drive Safe mobile app is also included in this proposal.

The below figure is a high-level diagram of the network architecture.

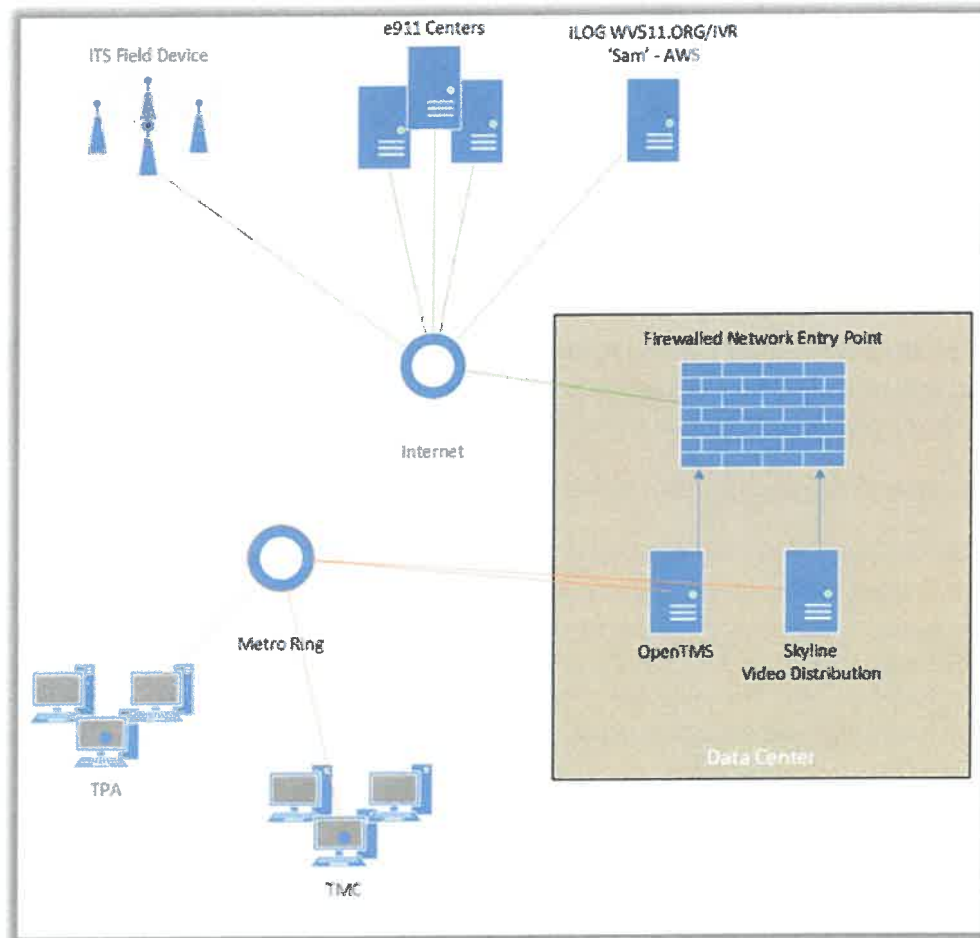


Figure 5 – High-Level Diagram of the Network Architecture

4.2.2.15 Vendor shall provide a comprehensive information system design document, outlined the intended information system physical and logical topology with complete hardware, Operating System (OS) and software lists. All hardware, operating systems, and software must be supported versions throughout the contract term, including any extensions. Required updates and patches will be performed at an agreed upon schedule to maintain system integrity. Vendor shall test upgrades and patches in their own test environments to verify compatibility with the WVDOH systems. If for any reason in the future during the contract term (not including State of West Virginia requirements), the Vendor needs to change hardware, OS, or software it will be the Vendor's responsibility to maintain the operational capability of the WVDOH system at no additional cost.

Team Q-Free will develop and submit a System Design Document for review and approval by the WVDOH. Plan will contain the elements identified above. The 511 platform will be cloud hosted with most components in the Amazon cloud in multiple geographic areas, with periodic security scans, updates and patches performed with no/minimal service impact. Amazon Web Services (AWS) server specifications and the topology will be provided.



4.2.2.15.1 Vendor shall outline in detail hardware infrastructure that will be provided. All hardware components shall be supported by the hardware manufacturer throughout the term of the contract, including any extensions. If the current system is based on a physical server, the vendor's solution must also include a physical server. Hardware provided shall be current supported model equipment. Vendor is required to maintain all hardware components to ensure high availability of the system throughout the life of the contract at no additional cost to WVDOH.

Team Q-Free will include a detail hardware infrastructure with the System Design Document for review and approval by the WVDOH. All hardware components will be maintained for the life of the contract at no additional cost.

The 511 platform will not use physical hardware for the system but will use AWS instances. There will be a virtual backup of the system at a colocation facility in Philadelphia for use in the event of a catastrophic failure at Amazon. All systems will be maintained for the life of the contract at no additional cost.

4.2.2.16 Other Equipment, Systems and Services:

There are current typical expenses incurred annually for systems, software, services and equipment that need to be accounted for in the Vendor's cost proposal, or not included because the Vendor's proposed solution does not require it. If there are any additional systems, software, services and equipment that the Vendor requires as part of their solution, these should be included in the cost proposal and described in the Vendor's proposal. As information, the list below is an example of materials and equipment, including computers, servers, workstations, miscellaneous hardware, 3rd party software, etc. that the vendor may be expected to supply as part of their solution during a typical year.

TMC Items:

- *Alpha Technologies (Douglas Tate 304.201.7485)*
 - *Network Data Line into TMC on Capitol Complex Building 5*
 - *Network Data Line from TMC to WVP A at 3310 Piedmont Rd, Charleston, WV*
 - *Rack Rental off site at Alpha Technologies Building 6000*
 - *Server Storage off site at Alpha Technologies Building 6000*
- *InterAct Interface Maintenance Costs (CAD Integrations with InterAct Systems)*
- *LifeSize Maintenance Costs (Video Conferencing)*
- *Citilog Maintenance/Service (Video Analytics)*

511 Items:

- *IVR Hosting Maintenance*
- *IVR Phone Usage Charges*
- *Drive Safe Service Agreement*
- *Skyline Maintenance/Service*

Miscellaneous Hardware Items:

- *Satellite Phones Data Plan*
- *Ipad Data Plans*
- *Cisco ASA 515x (x1)*
- *Cisco 3560x (x2)*

Service Agreements and Software Licenses:

- Domain Name: Roadsummary; includes .com; .net
- SSL Certificate (Digicert): WVDOH.Roadsummary.com for 1 year
- Cisco SMARTnet Premium - Extended service agreement - replacement - 24x7 - 4h
- Syslog Daemon Software for Firewall and network Gear logfile capture
- SAP Crystal Reports Server, 5 named user license, 1 year maintenance renewal
- Java Service Wrapper Development License (Java Service Wrapper Standard Edition 32/64-bit TSIMS)
- Symantec Endpoint 12.1
- Symantec GOVT UPG-V 12MO BACKUP EXEC 2014 AGT VW AND HV WIN SVR BS ES
- Symantec GOVT UPG-V 12MO BACKUP EXEC 2014 SVR WIN BNDL LIC BS ESS
- LogMeIn licensing
- Cisco SMARTnet 1 Year Extended Service - Service 24x7x4hour
- Cisco SMARTnet Premium - Extended service agreement 8X5 - 4h
- VMWare vSphere Essentials Kit Support
- Barracuda Energized Updates
- Barracuda Web App Firewall 460 1YR
- VMWare Essentials Support
- Windows 2008 R2 Server License
- Oracle Enterprise Named User (Data Base)
- Windows 7 Pro License
- VMWare Essentials
- Dell Hardware (r320 *5)
- ESRI License
- Dell Hardware Service Plans

Below is a list of hardware that is currently in use and owned by WVDOH for the ATMS and 511 System. This hardware is available for use with this contract.:

Data Center Count	Brand	Memory	Hard Drive	Purpose	Comments
14	Dell	TBD	TBD	511 Video Distribution	Redistributes video feeds to 511 users and Media outlets
7	Dell r320	8gb	2TB	Video Analytics	
1	Dell r710	128GB	2TB	VMCORE	Hardware face for Virtualized Servers. Covers Productions/Staging/511 systems
1	Dell r720	128GB	2TB	VMCORE	Hardware face for Virtualized Servers. Covers Productions/Staging/511 systems



<i>Data Center Count</i>	<i>Brand</i>	<i>Memory</i>	<i>Hard Drive</i>	<i>Purpose</i>	<i>Comments</i>
1	Dell r730	256GB	16gb Flash	VMCORE	Hardware face for Virtualized Servers. Covers Productions/Staging/511 systems
1	Dell MD3200i		7 TB	VM Storage - old	Storage for Virtual system, houses the individual servers used for the above. Old
1	Dell MD3800i		10TB	VM Storage - new	Storage for Virtual system, houses the individual servers used for the above. New
1	Dell r720	32GB	1TB	DB Server 1	Oracle 11g Database Server - Production
1	Dell r730	256GB	2TB	DB Server 2	Oracle 11g Database Server
1	Dell NX300	6GB	6TB	Backup Storage	Storage Device - Symantec Backup Exec - Backup location
1	Dell			Truck Parking	TCS Truck Parking System server
1	Dell r410	12GB	100GB	Staging DB	Oracle 11g Database Server - Staging/test system
<i>TMC Count</i>	<i>Brand</i>	<i>Memory</i>	<i>Hard Drive</i>	<i>Purpose</i>	
6	Dell T5810	8GB	500GB	Operator Workstations	Current ATMS workstations for Operators
2	Dell T5810	32GB	500GB	SE Workstation	SE Support workstation

Team Q-Free intends to utilize the hardware and COTS listed above for the ATMS and 511 Platform. The 511 platform services and equipment that will be used in the AWS cloud hosted production environment will be:

- AWS web servers (2 locations);
- AWS processing servers (2 locations);
- AWS database servers (2 locations);
- AWS RDS databases as needed based on demand (2 locations);
- AWS IVR servers (2 locations);
- Telephony charges for IVR phone calls;
- AWS logging server;
- AWS stats server;
- AWS S3 snapshot storage;
- AWS licensing servers for voice recognition software;
- Email servers (2 locations);

- Text to speech licensing/usage;
- Speech to text licensing/usage;
- Google base map licensing with Google Traffic;
- Google API calls supporting required functions;
- Secure certificate (SSL cert); and
- Supporting AWS networking (elastic load balancer, firewalls, VPN server if needed).

4.2.2.17 *IDIQ Time & Materials Cost: In order to allow for equitable comparisons of received cost proposals, each Vendor will be required to list a cost item in the amount of \$1,000,000 in their cost proposal as an Indefinite Delivery/Indefinite Quantity Time & Materials line item, with use to be determined after contract award. The purpose of this line item is to minimize any advantage one vendor may have over another vendor with regard to existing hardware, software, systems, interfaces or existing system knowledge; 2) rectify any unknowns encountered after award that may not have been foreseen by the WVDOH; and 3) rectify complications with integration efforts that are determined solely by WVDOH to be no fault of the Vendor. Additional use of this line item may be for the upgrade or replacement of WVDOH owned hardware and software that may currently be in existence, but that needs to be modified/replaced to meet specifications required by the Vendor. If the Vendor has specific Vendor owned hardware and software that is required to plan, design, program, install, operate and/or maintain their systems, these items shall be included in their overall costs. Any use of State funds for the purposes noted above is solely at the discretion of the WVDOH and should not be assumed. (Note: This line item is for hardware, software and interfaces. Agreements, data plans and licenses are not eligible for this item.)*

Team Q-Free acknowledges that for any requested modifications or enhancements for the ATMS, 511 platform and software support services, Team Q-Free will provide a detailed time and cost estimate for any additional work contracted beyond the scope of this project.

4.3 Qualifications and Experience (CRFP Section 4.3)

4.3. Qualifications and Experience

4.3 Vendor should provide information and documentation regarding its qualifications and experience in providing services or solving problems similar to those requested in this RFP. Information and documentation should include, but is not limited to, copies of any staff certifications or degrees applicable to this project, proposed staffing plans, descriptions of past projects completed (descriptions should include the location of the project, project manager name and contact information, type of project, and what the project goals and objectives where and how they were met.), references for prior projects, and any other information that vendor deems relevant to the items identified as desirable or mandatory below.

4.3.1. Qualification and Experience Information

4.3.1. Vendor should describe in its proposal how it meets the desirable qualification and experience requirements listed below.

4.3.1.1 Prime and subconsultant firm profiles

Q-FREE AMERICA



Q-Free is a global supplier of class-leading Traffic Management and Connected ITS/Connected Vehicle solutions. To us, a society with less congestion, pollution and accidents is achievable through smart and innovative transportation solutions.

Since the time Q-Free founding, rapid urbanization has required new partnerships and solutions to maintain and improve the flow in an increasingly complex traffic environment. Optimizing the multitude of global mobility systems, Q-Free has built a modular product portfolio that covers a broad range of ITS sectors. Our open standard solutions allow for seamless integration with our clients and partners, allowing Q-Free to provide tailored robust and enhanced hard- and software components that meet the project needs, no matter the size. Under the vision “Changing the movements of life”, Q-Free continues to evolve our solutions to meet the needs of a modern world, ensuring efficient, safe, and environmentally friendly transportation, from region to neighborhood, shaping tomorrow’s movements of life.

Founded in 1984, Q-Free is headquartered in Trondheim, Norway and has approximately 400 employees with 18 offices around the world. With an annual revenue around 1 billion NOK/ 130 million USD, the company is listed on Oslo Stock Exchange and certificated in accordance with ISO-9001 and ISO 14001. We have references from more than 50 countries, providing innovative solutions with high capability, flexibility and quality.

As a company, Q-Free is focused solely on transportation with market leading solutions for roadway user charging, parking guidance and management, freeway and urban traffic management, info-mobility, and connected and autonomous vehicles.

To meet West Virginia’s needs and expectations we have assembled a strong team of technology firms for this project including Q-Free America, ILOG, and Skyline (together “Team Q-Free”). Our primary goal is to ensure that all of West Virginia’s transportation technology needs can be met now and in the future.

INFORMATION LOGISTICS (ILOG)



Information Logistics (ILOG) is a privately held technology company that was incorporated in 1997 in Pennsylvania, USA. The company's office is in Pennsauken, NJ, just outside Philadelphia. ILOG's corporate objective is to develop and support innovative traveler information delivery methods for its primary market: the transportation industry. ILOG has been serving this market since 2004.

ILOG provides mobile and web application development and design, and leverages cloud technologies to deliver cost-effective products and services. ILOG is a Woman-Owned Small Business and recognized as a Disadvantaged/Small Business Enterprise in New Jersey, Pennsylvania, Virginia, California, Colorado, Iowa, as an SPSF in North Carolina and as a SWAM in West Virginia.

ILOG has developed both public and private mobile apps. Based on ILOG's GeoTalker platform, ILOG provides mobile applications for 511/Traveler Information Services delivery for several agencies including WVDOH, NJTPA/NJDOT, PA Turnpike Commission (PTC), and Pennsylvania Department of Transportation (PennDOT). The GeoTalker platform is also being used for connected vehicle/connected corridor pilot programs. Other mobile apps assist motorists with congestion pricing for tolls (such as the 66 Express Lanes and 64 Express Lanes in Virginia). ILOG has also developed private mobile apps to support internal maintenance functions and roadway reporting for the PTC.

ILOG's mobile app for traveler information provides a hands-free, eyes-free component, as well as the more conventional components found in most transportation apps. The mobile app platform allows travelers to continue to get agency alerts even as they drive across state boundaries (for participating states). Additionally, the app platform allows agencies to deliver alerts to drivers when they cross a geo-fenced boundary. Referred to as "fast track" alerts, drivers can hear travel information that is relevant only when they are VERY near to an area where special information should be provided – when speed limits change, when dangerous curves approach, when maintenance crews are ahead, or other similar situations. App notifications are being added to the platform to enhance/augment general and fast track alerting. Recent additions to the platform has been an integration with both Google navigation and WAZE, so that drivers can simultaneously use their favorite navigation app, while also hearing the important messages that the agency issues.

This team also developed and hosts web portals for incident/event management and agency adaptive websites. ILOG's 511 platform integrates with multiple data sources, including static camera image feeds, streaming camera feeds, weather feeds, roadway condition data, DMS data, RWIS feeds, plow truck tracking, etc. and produces an assortment of tools for travelers. The data is used in a multitude of ways. Each data source is analyzed, and special business rules are followed based on the flags in the feed – for example, a data component indicates when an event should be made into a special attention ticker on the web site or made into a floodgate message on the IVR. From presentation of winter roadway conditions, to turn-by-turn directions for detour routes for the PTC, to the "check my route" feature of the PennDOT website, ILOG works with the agency to adapt the 511 platform to deliver the services and functions required today or imagined tomorrow.

Over the years, ILOG has developed a number of other web-based management tools for various agency functions including over-dimensional vehicle permitting, employment application and management, CRFP/Bid posting automation, payment processing, and contract administration for Right-to-Know compliance and has integrated contact management software with each of these applications. ILOG has also created specialized interfaces for posting both to and from social sites, and software for project tracking that has both public-facing and internal-admin components.

Many of these products and services have been recognized by professional organizations throughout the transportation industry with awards:

- ILOG's communications suite of services, which links traveler information services with internal communications programs, won the 2011 International Bridge Tunnel and Toll Association (IBTTA) Toll Excellence award for Customer Service & Marketing Outreach as well as the IBTTA President's Award;
- The TRIP program for a comprehensive suite of traveler information services, developed by ILOG staff for the PTC won the 2012 IBTTA Toll Excellence Technology Award;
- ILOG's TripTalk mobile app for the PTC won the 2012 IBTTA Toll Excellence Technology Award and the IBTTA President's Award. TripTalk also won the 2012 Smart CEO Volt award;
- ILOG's SafeTrip NJ mobile app won the ITS NJ technology award.; and
- ILOG's newest product, 511PAConnect, which includes a dynamically created, event specific website, and emergency notification to trapped travelers (without requiring a mobile app), received 5 awards in 2017 from the Institute of Transportation Engineers (ITE) *2017 Transportation Achievement Award for Operations*; the IBTTA *2017 Toll Excellence Award for Technology*; the Intelligent Transportation Society of New Jersey (ITS NJ) *2017 Outstanding ITS Project*; the Mid-Atlantic Section of the Institute of Transportation Engineers (MASITE) *2017 Project of the Year*; and ITS Pennsylvania *2017 Project of the Year*.

Messages from End Users

"You have developed a great app. I just now downloaded it and am amazed. I am a cab driver, so this is a lifeline for me. will tell all my co-workers and friends." - 511PA.

"This is by far the best Traffic/Travel site I have ever seen! The information provided is accurate and up to date and allows for an easy trip both on the Turnpike and surrounding roads.....wish there were sites like this to cover the whole country." - TRIP Talk

"I like this !!" - TrafficMate (NTTA)

"Love this app. Thanks" - Drive Safe WV

"So far love the app. need to find the current construction place. but great app" - 511PA

While Team Q-Free certainly appreciates industry recognition, our true measure of success is our customer service. ILOG's services are provided to two types of customers: the transportation agencies who contract for our services, and the travelers who use the services. Agencies have been satisfied with the products and services we supply. Contracts have been generally renewed to the full allowable term or extended beyond contracted terms.

"Thank you for being great partners and making the West Virginia ITS program a success. BTW we are getting rave reviews about the changes we made at the beginning of the year."

"I have enjoyed working with you and your team. I really appreciate all you have done for PTC."

Traveler approval can be more difficult to obtain. If travelers are angry or disappointed with the agency for any reason, they are quick to express dissatisfaction with every agency service – and yet, travelers do not generally take time to complement the agency on something that they like or appreciate. While there have been messages with suggestions for new features, or to report problems on the

roadway, we have also seen supportive messages from end-users.

SKYLINE



Skyline, a Maryland based company, was established in July 2004, and is headquartered in Glen Burnie, Maryland. Skyline has provided the Video Sharing, Network, System and Infrastructure Products and Services to meet our customer's needs since our inception over 14 years ago. We strive to serve the public sector through effective technology development and management. In 2008, Skyline expanded into the commercial market space and added several other solutions to round out its portfolio.

Skyline's approach is to first understand the business requirements of our customers and then focus on designing and delivering the appropriate technical solutions. We believe this approach brings incredible value to our customers and sets us apart from our competition.

Skyline has a vast array of services we provide to our customers. These diverse services allow us to provide excellent value and maintain long-lasting relationships with our customers.

Skyline has a solid presence in the State of Maryland which serves as our base of operations for customer service delivery. Our Headquarters in Glen Burnie, Maryland provides us extensive capabilities to deliver projects and demonstrates to our customers our commitment to IT management.

The Skyline 24x7x365 Service Desk (NOC and SOC) monitors network elements, coordinates break/fix, performs maintenance, and manages escalations to our engineering resources. The Service Desk, in our 40,000-square foot facility, is located just 10 miles south of Baltimore City, adjacent to the Baltimore /Washington International (BWI) Thurgood Marshall Airport. This central Maryland location allows the Skyline team to quickly deploy across the State to support our customer base and effectively manage projects.



Skyline utilizes our headquarters located at 6956-F Aviation Boulevard, Glen Burnie, Maryland 21061, to successfully deliver our services. Skyline headquarters includes the following features that are utilized in support of our customers:

- **Service Desk** – Provide network operations and security operation services 24x7x365 from our 1,000 square foot facility. The Service Desk includes 14 Tier-1 workstations, 2 Tier-2 workstations and a management office for two (2) Service Desk Managers;
- **Technology Lab** – 950 square foot facility with staging racks and work benches with flexible power distribution and 12 tons of redundant Liebert HVAC;
- **Staging Warehouse** – Our 1,200 square foot warehouse allows for short-term storage during the implementation of customer projects. Skyline also has an adjacent facility with 6,500 square feet of storage for larger projects;
- **Training Center** – Our 1,750 square foot training room allows Skyline to provide in-house technical training, management training and host customer stakeholder meetings with seating for 40+ people;



- **Conference Rooms** – Multiple conference rooms are available to support project and customer meetings;
- **Office Space** – The facility supports over 120 in-house technical, project management and administrative resources, ensuring plenty of space to support State and County's technical needs;
- **Fleet** – Skyline has a fleet of over 50 vehicles to support our technical staff. Specialized vehicles like bucket trucks allow us to perform fiber optic installation and maintenance on aerial fiber or install video surveillance cameras safely on high mounting points. Our organization is well equipped to deliver on projects and maintenance services; and
- **Warehouse Space** – The storage and logistics operations for Skyline include five (5) full-time resources, segregated customer equipment storage areas and multiple receiving bays. With 6,500 square feet of space in our logistics center, Skyline has the capacity to manage any size project. Clients today trust us with over \$5 Million dollars in IT hardware that we receive, inventory, and release utilizing government audited processes.

Skyline has been delivering interoperable video sharing solutions of similar type and size for nearly ten (10) years to state and local government agencies. Skyline currently supports ten (10) state DOT's with their video sharing systems, including some of the largest systems at the Virginia DOT (1,200+ cameras, 5 TOC's), the Maryland State Highway Administration (1,200 + cameras, 20 source agencies and 70 consumer agencies) and New York State DOT (1,100 cameras, nine (9) regional TOC's). These projects demonstrate Skyline's ability to greatly expand from the base system to include many cities, counties, and other agencies on a secure, hosted platform. Skyline's experience delivering large scale, multi-agency, multi-platform integrated video and data solutions along with our network and systems engineering expertise is unparalleled in the ITS market.

Further, Skyline provides an unmatched depth and breadth of IT and ITS services that allows us to understand our customers' complete network environment. Our combined expertise and experience deliver video sharing solutions that fit seamlessly into any network while not compromising security or performance. Skyline delivers IT and ITS solutions across a broad technical base as summarized below.

- | | |
|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| • Network and Systems Engineering; | • Interoperability video, voice and data solutions; |
| • IT Consulting & Professional Services; | • Managed 24x7 Service Desk and remote monitoring; |
| • Project Management; | • Network and IT security services; |
| • IT Security Services; | • Application/Product software development; |
| • CCTV, Video Surveillance, Access Control; | • Application hosting / CDN services; |
| • Fiber Optic/Copper/Coax System design and install; | • Outside and Inside Plant Construction; |
| • Centralized Authentication; | • Storage and virtual infrastructure; |
| • Industry partners: Cisco (Premier); Juniper (Elite); Aruba (Platinum); Palo Alto (Gold); Extreme (Gold); | • Managed / Hosted Services (IAAS); and |
| • IT and ITS System Monitoring; | • Managed backup solutions. |

4.3.1.2 Company and staff qualifications and experience in completing similar projects

Q-FREE COMPANY AND STAFF QUALIFICATIONS

Q-Free has extensive experience implementing, operating, and maintaining web-based, high availability Advanced Transportation Management Systems ("ATMS") for its clients and has consistently met or exceeded their expectations.

Q-Free has been a recognized leader in real-time traffic operations and management for over 17 years and boasts one of the largest dedicated ITS software engineering and technology staffs of all companies who currently provide ATMS solutions. Q-Free employs nearly 50 full-time staff who are exclusively involved in supporting ATMS deployments for our clients.

OpenTMS is the most fully featured, highly productized, and easy-to-use ATMS solution on the market. Version 8 of the system has been field- proven and successful statewide in Virginia, Pennsylvania, West Virginia, and Delaware and regional deployments in Ohio and Illinois. Also, we were recently selected to provide the statewide traffic management solution for Iowa. Please find our references and a description of our similar experiences in the proposal response to CRFP Section 4.3.2 Mandatory Qualification/Experience Requirements below.

Below is a map / list of current Team Q-Free deployments.

OpenTMS Deployments

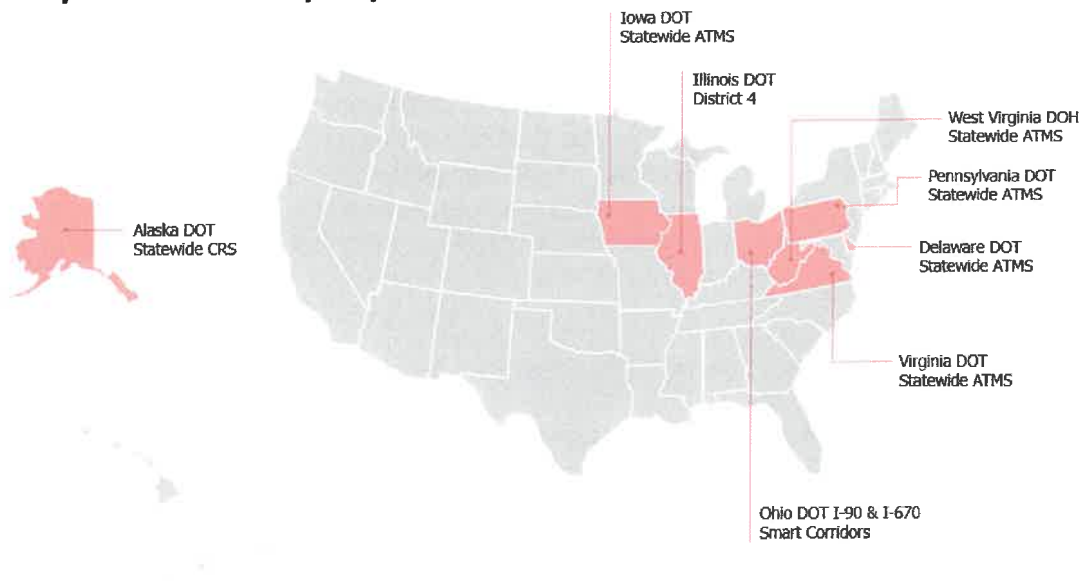


Figure 6 – OpenTMS Deployments

Q-Free Urban Traffic Deployments (MAXVIEW, MAXTIME, Controllers)

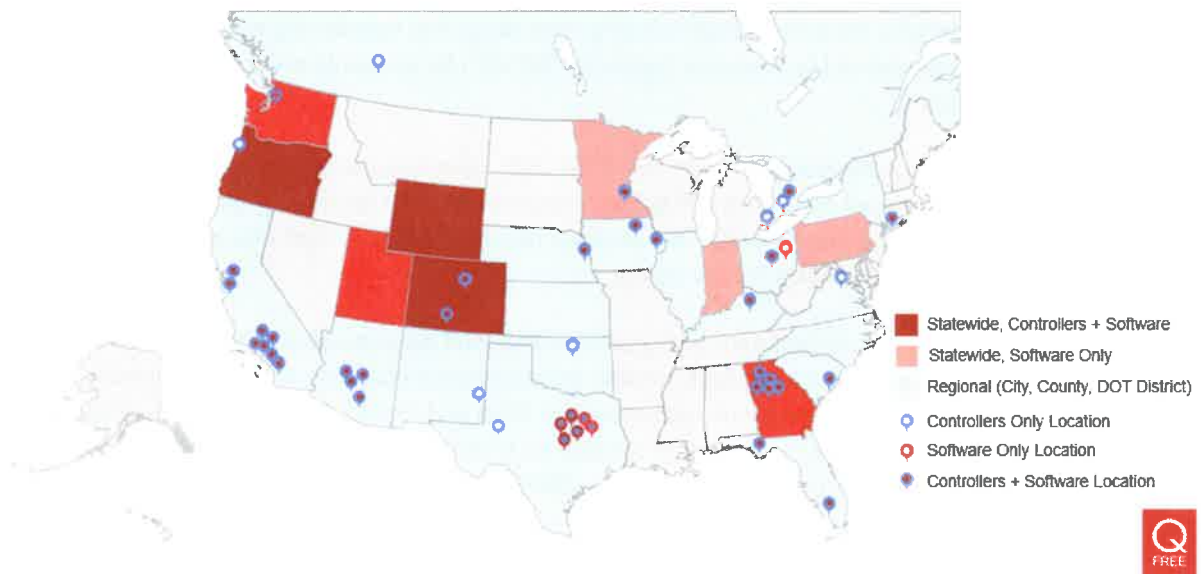


Figure 7 – Q-Free Urban Traffic Deployments

ILOG COMPANY AND STAFF QUALIFICATIONS

ILOG's staff comes from the systems, networking, programming, and electrical engineering sectors and are experienced, top-notch professionals. The ILOG development group is proficient in .NET, MVC, MS-SQL, MySQL, Java, Perl, C++, C#, Objective C, Oracle, VMware, JavaScript, ASP, JSP, Visual Studio, 3DS Max, ActionScript, Adobe Creative Suite, Quark Xpress, CSS and numerous other development and design languages and tools. The systems and network engineering group is focused on security and reliability, as they build redundant and high availability networks. The core ILOG team has been working together for more than a decade, and the key staff are invested in the company. Resource continuity has never been a problem, and none is anticipated.

The ILOG team has been responsible for the design, development, and implementation of literally dozens of programs and special applications for the transportation industry.

ILOG builds redundancy into our staffing plan, which is made possible by the nature of cloud computing. Because none of the machines for the WVDOH 511 platform are located at our business office or in any single facility, our staff does not need to be in a central location to access the systems.

The ILOG team performs the majority of our work from our Pennsauken, NJ office, but each ILOG employee is equipped to work remotely from off-site locations, as needed. While ILOG has identified key staff below, the ability to work remotely includes management, programmers, systems engineers, designers, and even the Quality Control (QC) and administrative teams. This gives our team the ability to continue staffing critical operations from almost any location, and for any reason. There have been several times when this plan has been exercised, including in times of severe weather, and during power and internet outages at our main



office. This same plan has been applied in the current pandemic and would be enacted during other situations where physical travel to our office is impossible or inadvisable.

SKYLINE COMPANY AND STAFF QUALIFICATIONS

Skyline has been delivering interoperable video sharing solutions of similar type and of significantly larger size for nearly ten (10) years to state and local government agencies.

Skyline has developed the expertise to become the DOT industry leader in providing live streaming video sharing systems. Skyline currently supports ten (10) State DOT's with their video sharing systems, utilizing both on-premise (or locally hosted) solutions and solutions hosted completely or partially in the cloud by Skyline. Skyline has developed a consistent approach to delivering hosted video sharing systems over the years and is well versed in the following requirements:

- Designing and Implementing complex IP networks include LAN and WAN designs to provide stable and secure transport of video stream;
- Video Collection from diverse cameras, networks, and locations;
- Normalizing video to a common format that is easy to transport and share;
- Secure and efficient video distribution to the public, media, partners and first responders;
- Integrating with multiple source and destination networks;
- Change Management, Documentation, and Reporting;
- Consistent and Proven Project Implementation Approach;
- Web based portals providing secure access to partners and operational support;
- Innovative products to enhance the video sharing system;
- Support for smart phones and tablets;
- 24/7 Monitoring and Support in our Service Desk; and
- Proven enterprise level products.

Skyline has the experience, expertise, and reliability to perform the requested services in the CRFP. To document our experience of identical or similar in scope, Skyline offers the following past performance examples:

Skyline experience includes:

- **New York** – 1,100+ cameras (MGEG2, MPEG4, H.264), 20 source agencies, 70+ consumer agencies;
- **Maryland** – 1,000+ cameras (MGEG2, MPEG4, H.264), 20 source agencies, 70+ consumer agencies;
- **Virginia** – 1,000+ cameras (MGEG2, MPEG4, H.264), 10+ source agencies, 50+ consumer agencies, hosted solution;
- **Tennessee** – 525 Cameras (MGEG2, MPEG4, H.264), 4 regions, 20+ consumer agencies, hosted solution;

- **Pennsylvania** – 900+ cameras (MGEG2, MPEG4, H.264), 12 regions, 50+ consumer agencies;
- **Missouri** – 391 cameras (MGEG2, MPEG4, H.264), 2 regions, on-premise, locally hosted;
- **Washington D.C.** – 140+ cameras, (MGEG2, MPEG4, H.264);
- **West Virginia** – 50+ cameras;
- **South Carolina** – 333 cameras, 4 regions, hosted solution;
- **Michigan** – 500+ cameras, 4 regions, 30+ consumer agencies;
- **Maryland Coordination and Analysis Center (MCAC)** – 12,000+ cameras, 1,700 agency users across Virginia, District of Columbia and Maryland; 30 state, local and federal agency partners, including local school districts;
- **Iowa DOT** – (Under contract) – 7 regions, 500 cameras;
- **Dallas Region Pilot Project** – 100 cameras, source cameras from 2 TxDOT district TMC's and Cities of Arlington and Grand Prairie. Hosted and on-premise solution.

Skyline employees have been supporting the IT needs of Public Sector Transportation Agencies since our inception. Skyline has built a government focused organization dedicated to providing design, implementation and operational services across a wide breadth of technology. Skyline's organization is currently composed of approximately 240 full-time employees with 7 part-time and no temporary employees, based centrally in Maryland.

Skyline continually invests in training and educational courses for our engineers and non-technical staff to ensure our clients are well served by a team that's on the cutting edge of the latest technologies. Skyline also works closely with vendors that provide the best of breed products to create optimal solutions utilizing the appropriate technology.

Skyline consists of highly qualified resources, each having unique experience in supporting both public and private enterprise systems and networks. Skyline's leadership is comprised of Brian Holsonbake, who has extensive experience working with public and private sector customers. Leveraging this experience, Skyline provides our customers with a cost effective and technically superior solution.

The following bullet points identify our team's unique qualifications:

- **Network Hardware Experience:** Skyline is a leading integrator in the Mid-Atlantic for Cisco, Juniper, Aruba, Palo Alto, and others.
- **Project Management Capabilities:** Skyline has demonstrated the ability to scale up or down the project management and technical staffing needs of our customers across a variety of project sizes, complexity, and disciplines; networks, systems, and infrastructure.
- **Personnel:** Skyline provides an unmatched depth of experience in supporting the goals of our customers operational and engineering needs. Our experience in working with a broad base of customers allows us to share the knowledge and experiences gained for the benefit of all customers. With success in the Government and Non-profit areas, we believe our employees understand the IT needs of our customers and demonstrate both a technical and cultural match that is unique among Managed Service Providers.

4.3.1.3 Project understanding and approach/methodology to achieving project objectives

Based upon Team Q-Free's experience with similar large scale, statewide deployments and **our long history of partnering with WVDOH**, we understand the complexities and importance of a collaborative working relationship and have employed innovative methods to ensure agreement and stakeholder buy-in. For example, with some customers we are utilizing advanced, FHWA approved SE practices and process outlined in "Applying Scrum Methods to ITS Projects - Final Report - August 2017 Publication Number: FHWA- JPO-17-508". This allows flexibility and more input from key stakeholders earlier in the project lifecycle while reducing issues at later stages of the development process. Team Q-Free will work proactively with WVDOH staff on their preferred software development methodology. Some aspects of our solution may be developed in traditional waterfall or hybrid development models if that is WVDOH's preference. Below, we have included some of the high-level areas of focus and some of the pre-delivery documents to be developed to ensure successful project/program delivery. Within these highlights are references to other areas of our response that define the processes in more granular detail.

APPLYING SCRUM METHODS TO ITS PROJECTS

www.its.dot.gov/index.htm
Final Report: August 2017
Publication Number:
FHWA-JPO-17-508



DEDICATED AND EXPERIENCED PROJECT MANAGEMENT

Successful project delivery requires an experienced delivery team and sound project management practices. Team Q-Free's project management approach is fully compliant with FHWA System Engineering policies and strongly relies on Project Management Institute principles and practices. We also have extensive experience successfully delivering statewide systems within other complex State DOT environments. Our core Project Management principles are:

- **Emphasis on Risk Mitigation** – our entire approach is designed to minimize project risk and maximize value throughout the project delivery;
- **Centralized Accountability** – Team Q-Free will take full responsibility for managing our exceptional partners, Skyline, and ILOG to ensure seamless delivery and streamlined communication;
- **Responsiveness and Flexibility** – every project is unique. Our PM will work closely with the WVDOH PM to tailor the execution process that works best for WVDOH, while meeting projects goals; and
- **Open Communication** – Team Q-Free believes in transparency and collaboration as keys to successful execution. Our management team will facilitate information exchange with the WVDOH PM and key stakeholders while keeping project execution on track.

ENSURE A CLEAR SCOPE OF WORK

Regardless of methodologies, a clear and agreed upon scope of work is critical to project success. Team Q-Free's dedicated Project Manager (Chris Butler) and the technical leads from different disciplines will work closely with key WVDOH stakeholders during all project phases to ensure all questions of scope are clearly resolved. Clear and effective communication are critical to project success.

DEVELOP REQUIREMENTS TRACEABILITY MATRIX (RTM)

The purpose of the Requirements Document is to describe everyone's understanding of the various software requirements for the WVDOH ATMS and 511 Platform project. It describes "what" the software must/will do, not the "how". It keeps us all on the "same sheet of music". Team Q-Free will create the baseline Requirements Document based on WVDOH's requirements as well as information gathered from key stakeholders. This Requirements Document will serve as the RTM on the project and will be used to track the requirements from design to testing across the project lifecycle. The RTM will be a living project artifact that is continually updated and refined throughout the project lifecycle.

The RTM will also document the method of verification for each test and provide the linkage between requirements and testing. The RTM will track the number of test cases Run, Passed, Failed or Blocked for every requirement as well as classify the requirements into types and sub-types.

Team Q-Free will map requirements to preliminary design components. As the project progresses, the project team will expand the traceability to include mapping to the design elements in the Software Design Document (SDD), ATMS system components, and to the test cases. The Requirements Document will comply with WVDOH's specifications, including unique identification number, cross-reference to the CRFP, requirement classification, and compliance verification method. Team Q-Free will utilize **SpiraTeam™** software to capture system requirements and link them to test cases, so full traceability will be maintained from acceptance testing back to the originating requirements. The Q-Free PM will submit the initial draft, as well as every update of the RTM to the WVDOH Project Manager for review and acceptance. See CRFP requirement 4.3.1.6 further in this section for more information how SpiraTeam is used in tracking requirements and ensuring traceability.

DEVELOP CHANGE MANAGEMENT PLAN

An equally important aspect of scope management involves the Change Management Process. It is very difficult to define every single variable on a major project such as this and deliver it without making minor changes to the scope of work. With Team Q-Free's experience delivering an ATMS and 511 Platform, we understand the importance of effective Change Management and allowing our customers to have flexibility in scope prioritization. Team Q-Free understands the complex environment where legislative or political business needs may require the project team to make changes. Team Q-Free's Agile approach avoids long duration, "big reveal" deployments. In addition, once the project enters the Operations and Maintenance phase we will roll-out releases on a 60-90-day cycle to accommodate minor fixes, minimize training and reduce TMC impacts. See CRFP requirement 4.3.1.7 further in this section for more information on Change Management.

PROJECT SCHEDULE

As you can see in CRFP requirement 4.3.1.5 further in this section, Team Q-Free has developed a detailed development schedule. The schedule and the RTM will be continuously refined during the life of the project.

CREATE SYSTEM DESIGN DOCUMENTATION

Team Q-Free will create a System Design Document (SDD) that offers a top-down conceptual design of the combined ATMS and 511 Platform. The SDD will identify graphical representations of sub-systems, data integration points, and communications layers. Each element of the ATMS and 511 Platform will then be further defined at a detailed level, with communications protocols, logical and physical system diagrams, video delivery system architecture, data storage, disaster recovery and failover scenarios, security, and workflow model of the major modules and subsystems, including telephone services, public website, and mobile applications. The SDD document shall be developed such that it includes both internal and external elements of the system, to ensure it represents an accurate representation of WVDOH's entire system including cloud-based hosting services, and other external systems. Additionally, the document will contain any references to requirements and/or user stories contained in the RTM. Team Q-Free will conduct multiple working sessions with the WVDOH business and technical subject matter experts identified by the WVDOH Project Manager. Beginning with an outline of the SDD, successive drafts will deepen the concepts and design through additional sessions, resulting in a Final Draft, that is ready for review and approval by the WVDOH PM. More detail on method of verification for all requirements will be provided within the SDD and cross-referenced back to the RTM. In addition, see CRFP requirement 4.2.2.15 further in this section for more information on System Design.

Team Q-Free's PRELIMINARY ENGINEERING AND DESIGN PHASE

will be a
CRITICAL SUCCESS FACTOR
for the
WVDOH ATMS Project



DEVELOP ACCEPTANCE TEST PLANS

One of Team Q-Free's core strategies for ensuring the quality of the ATMS and 511 Platform is having our Quality Assurance (QA) Team be 100% independent of the software customization and development team.

The Q-Free QA Team, led by Mr. Moises Lopez, will be responsible for the planning and execution of the test plans.



Team Q-Free's QA Team will document the plans and procedures for verifying that the resulting system meets all the defined system requirements and objectives, as detailed in the RTM. It will define the testing objectives and needs (e.g., data, location, methods, resources, and detailed testing procedures) and expected outcomes for each test. The Q-Free QA Team will develop comprehensive Test Plans that will cover all aspects of testing; internal testing, component testing, end-to-

end testing, and acceptance criteria. Team Q-Free will develop detailed acceptance test plans that specifies the methods and timing for the tests. The Test Plan will describe in detail the procedures to verify each scenario and requirement, validate the integration with external systems, and confirm connection of all ITS field devices, 511 platform functionality and the entire video architecture. We will also perform end-to-end testing with WVDOH staff. The plan will also include specifications for ATMS performance testing and cyber security testing. Testing will be conducted by development and/or the QA team, as appropriate. QA will oversee all testing

and work directly with WVDOH. See CRFP requirement 4.3.1.7 further in this section for more information on Acceptance Testing.

EXTENSIVE EXPERIENCE WITH TRANSITIONING EXISTING SYSTEMS

When looking at risks to WVDOH, the risks involved with transitioning mission critical systems can have major impacts on the traveling public and other first responder agencies.

WVDOH cannot have downtime and not be 100% ready for any major event to happen at any time.



With OpenTMS v8 in place, ILOG consuming our data feed already and Skyline's technology already functioning, migration risk (cost, schedule risks) is drastically reduced for WVDOH. The only minor risk is transitioning IVR. An ATMS migration is typically VERY challenging. However, migrating to OpenTMS v9 will be a relatively simple upgrade and will minimize training and changes made to TMC staff. Any migration still requires a detailed plan. There are several key components critical to the success of an ATMS and 511 platform migration. These key components include business processes, impacted systems, system data, and system users. Team Q-Free has successfully transitioned four of five VDOT TMCs from legacy ATMS to OpenTMS and all regions of Pennsylvania DOT from legacy ATMS and vendor applications to a statewide version of OpenTMS. This capability ensures an easy and worry-free transition for WVDOH to an improved ATMS/ and 511 platform with continuity and confidence in maintaining or exceeding the performance of current elements.

**MIGRATION RISKS ARE
DRASTICALLY REDUCED
WITH TEAM Q-FREE**

Team Q-Free will develop a deployment Transition Plan that will describe the method and timing of installation and cutover. This plan will outline the general strategy for how Team Q-Free will configure the system and how we will create a customized transition plan for bringing the system online with minimal disruptions to normal operations. See Section 4.2.1.2 for more information on our Transition Deployment Planning process.

DEVELOP OPERATIONS AND SUPPORT AND MAINTENANCE PLAN

Team Q-Free has provided 24/7/365 support to numerous customers performing real-time operations over many years. This experience will help guide the development of the WVDOH Operations Support and Maintenance Plan. The plan will be the underpinning and will describe all activities to maintain the ATMS and 511 Platform during the operations and support period.

The Operations and Support OSM Plan shall contain a comprehensive approach to OSM including a User Training Plan, System Administrator Training Plan, Operations Support Plan, System Maintenance Plan, Software Maintenance Plan, Issues Management Plan, Communications Plan, and QA Plan at a minimum. The OSM Plan shall be incorporated into the overall Project Management Plan and describe all activities to maintain the system during the operations and support period. A companion set of detailed training materials will be developed and provided to the WVDOH PM for review prior to training delivery to WVDOH.

The OSM Plan will also define:

- Project staff roles and responsibilities and key points of contact that need to receive training and define which type of training (ATMS and 511 Platform)
- Training objectives, content, strategies, and audience
- Logistics needed (e.g., location, equipment needs, data preparations, etc.)
- “Train the Trainer” sessions
- Public facing training of 511 platform related information (i.e. YouTube videos and information on website)

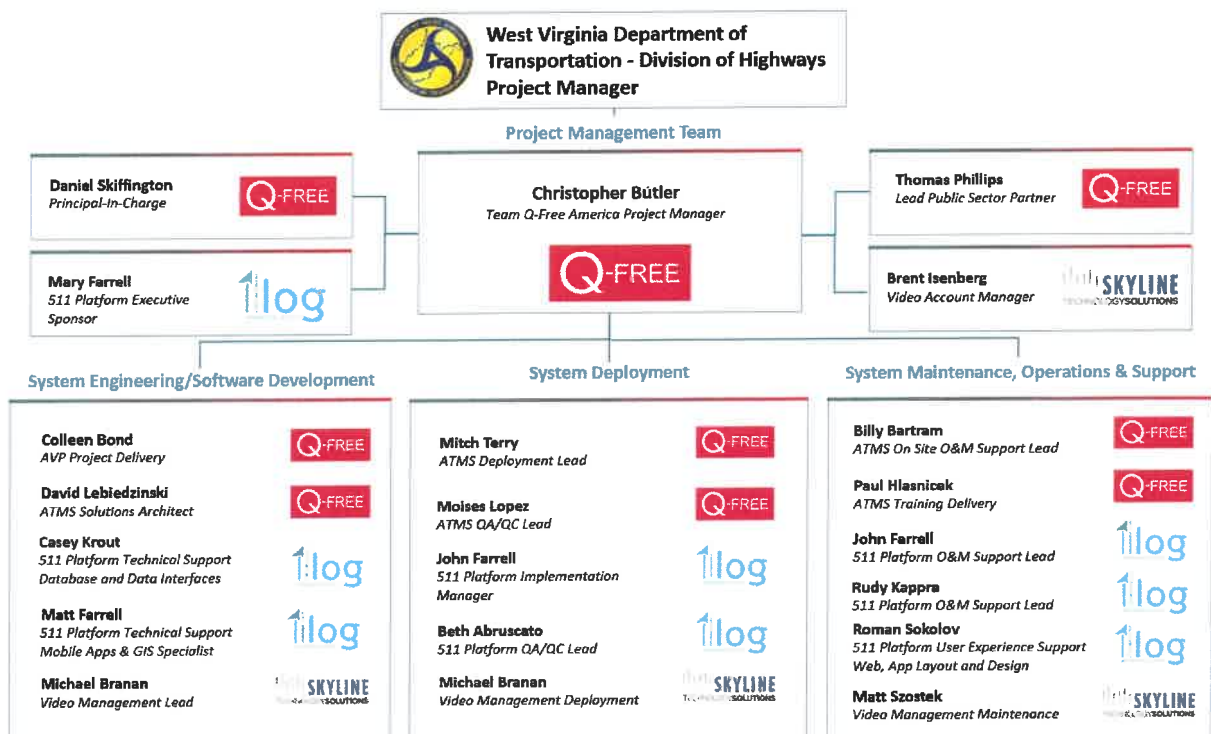


**TEAM Q-FREE WILL
PROVIDE TRAINING DURING
EACH AND EVERY O&M
YEAR.**

Additional information and how Team Q-Free will be fully compliant with all operations and support requirements are included in Q-Free’s response to sections 4.2.2.4 and 4.3.1.6 of this proposal.


4.3.1.4 Proposed Staffing Plan and Organizational Chart





Team Q-Free is comprised of staff from Q-Free America together with our partners ILOG, and Skyline. The Project Manager (Christopher Butler) will be assisted by a team of professionals who will lead the project tasks and ensure on-time delivery of the ATMS and 511 platform, while meeting and exceeding WVDOH specifications.













The details of the staff qualifications and high-level description in the table in the pages to follow provides the basics of the structure and the roles and responsibilities of the team.






Table 3 – Staffing Qualifications

Name/Company	Project Role	Responsibility
Project Management Team		
Christopher Butler 	Team Q-Free Project Manager	<ul style="list-style-type: none"> Take the responsibility for the overall success of the project and serve as the main Point of Contact (POC) between Team Q-Free and the WVDOH; Manage day-to-day activities and communication on the project. Support the task leads by providing clear guidance on project objectives, resource allocation, project scheduling, and setting client expectations; Coordinate project resources, activities, and subcontractors, so that schedule milestones are met in an efficient manner; Develop and maintain project schedule and issue/risk log and provide regular updates on project performance to the WVDOH PM. Collaborate with the WVDOH PM on changes to the work plan and schedule; Submit monthly project status reports detailing progress toward fulfilling objectives in the Work Plan and its project schedule and highlighting items on the critical path; Participate in person progress meetings and conference calls with project stakeholders and as requested by the WVDOH Project Manager; and Maintain a high standard of professionalism on the project, with competent and skillful employees doing the work and meeting WVDOH's requirements.
Daniel Skiffington 	Principal-In-Charge	<ul style="list-style-type: none"> Executive at Q-Free, responsible for project oversight.

Name/Company	Project Role	Responsibility
Mary Farrell 	511 Platform Executive Sponsor	<ul style="list-style-type: none"> Responsible for executive oversight for all aspects of the project with regards to the 511 platform system.
Thomas Phillips 	Lead Public Sector Partner	<ul style="list-style-type: none"> Responsible to ensure project success by developing solutions to complex contractual and project management issues. With over 20 years of experience at Virginia Department of Transportation, he serves as a key point of escalation within Q-Free and works directly with the North American President of Q-Free to allocate resources and communicate with senior customer leadership.
Brent Isenberg 	Video Account Manager	<ul style="list-style-type: none"> Responsible for executive oversight for all video management aspects of the project.
System Engineering (SE)/Software Development Team		
Colleen Bond 	AVP Project Delivery	<ul style="list-style-type: none"> Manage the integration of OpenTMS with external applications and third-party data provider services; Manage OpenTMS software release process including feature/release management; Provide the oversight for the overall ATMS delivery; Direct the transition and deployment of activities; and Technical lead who will direct all transition activities for ATMS.

Name/Company	Project Role	Responsibility
David Lebieczinski 	ATMS Solutions Architect	<ul style="list-style-type: none"> Develop and own the technical solution for the ATMS project including IT infrastructure and interfaces with external systems and data sources; Direct the detailed design of the ATMS solution and oversee the progress of the implementation team; Will work closely with WVDOH to understand the business needs, interpret the requirements, and develop the functional design of the ATMS solution; and During implementation and validation, will work with the implementation team to ensure the delivered system satisfies the requirements and meets WVDOH's needs.
Casey Krout 	511 Platform Technical Support Database and Data Interfaces	<ul style="list-style-type: none"> Senior Software Developer, and Database and Data Interfaces.
Matt Farrell 	511 Platform Technical Support Mobile Apps & GIS Specialist	<ul style="list-style-type: none"> Senior Software Developer, Mobile Apps & GIS Specialist.
Roman Sokolov 	511 Platform User Experience Support Web, App Layout and Design	<ul style="list-style-type: none"> Manages user experience through design; Coordinates project requirements, customer preferences, cross platform capabilities and best design practices; and Provides design oversight for all 511 Platform components.
Michael Brannan 	Video Management Lead	<ul style="list-style-type: none"> Skyline Solutions Architect responsible for designing the video network to delivery of video to the ATMS system and all partner agencies, public 511 and media partners as necessary; Primary architect for Skyline's video network and video wall products; and Oversees all integration requirements.

Name/Company	Project Role	Responsibility
System Deployment Team		
Mitchell Terry 	ATMS Deployment Lead	<ul style="list-style-type: none"> Execute procurement planning, hardware environment setup, and deployments of the ATMS; Works with WVDOH to capture all network and topology information and represents in appropriate diagrams and specifications; Direct all activities to test and integrate WVDOH ITS field devices into the ATMS solution; Responsible for software configuration management; and Direct software deployment and deployment planning activities.
Moises Lopez 	ATMS QA/QC Lead	<ul style="list-style-type: none"> Provide and direct all testing, system validation, and QA audits; and Oversee the development of test cases, execution of manual and automated tests and preparation of testing results reports.
John Farrell 	511 Platform Implementation Manager	<ul style="list-style-type: none"> Assists in oversight of all phases the project; Serves as the ILOG project manager; Responsible for making sure that all aspects of the system meet WVDOH requirements and work together seamlessly; and Responsible for handling of all administrative/paperwork items, including billing.
Beth Abruscato 	511 Platform QA/QC Lead	<ul style="list-style-type: none"> Oversees ILOG QA/QC program and will manage the team that does internal testing of each 511 Platform component for ILOG.
Michael Branan 	Video Management Deployment	<ul style="list-style-type: none"> Skyline Solutions Architect responsible for designing the video network to delivery of video to the ATMS system and all partner agencies, public 511 and media partners as necessary; Primary architect for Skyline's video network and video wall products; and Oversees all integration requirements.

Name/Company	Project Role	Responsibility
System Maintenance, Operations & Support		
Billy Bartram 	ATMS On Site O&M Support Lead	<ul style="list-style-type: none"> Will manage the team that does internal testing of each ATMS component for Q-Free.
Paul Hlasnicek 	ATMS Training Delivery	<ul style="list-style-type: none"> Prepare and manage the training program; and Will collaborate with WVDOH to define the training needs, create the training plan, oversee preparation of all training materials, and deliver on-site training.
John Farrell 	511 Platform O&M Support Lead	<ul style="list-style-type: none"> Assists in oversight of all phases the project; Serves as the ILOG project manager; Responsible for making sure that all aspects of the system meet WVDOH requirements and work together seamlessly; and Responsible for handling of all administrative/paperwork items, including billing.
Rudy Kappra 	511 Platform O&M Support Lead	<ul style="list-style-type: none"> Oversees ongoing maintenance and support for underlying systems, network and software for 511 Platform components.
Matt Szostek 	Video Management & Maintenance Lead	<ul style="list-style-type: none"> Oversees the scheduling of equipment procurement and installation, start-up and testing for the Skyline video group; and Manages the regular maintenance and upgrades and ticket response for the video delivery system.

4.3.1.5 Proposed Project Schedule

Team Q-Free is ready to begin work on the next generation ATMS and 511 Platform for West Virginia. The project schedule will be closely tracked across the project duration. The Team Q-Free Project Manager will update the project schedule weekly and realign all project tasks, milestones, timelines, dependencies, and resources. The most-up-to-date schedule will be delivered with the monthly progress report and reviewed at the progress meeting.

The below figure is a high-level schedule overview of the year 1 software development period. Upon Notice to Proceed (NTP) the team will work with the WVDOH to schedule a project kick off, followed by the requirements workshop. During the requirements workshop, Team Q-Free along with the WVDOH will validate that all teams have a clear understanding as to the vision WVDOH. Once the requirements workshop is complete Team Q-Free will enter into the iterative development cycle, meeting on a 3-week agile cycle to ensure the team is developing in line with WVDOH feedback.

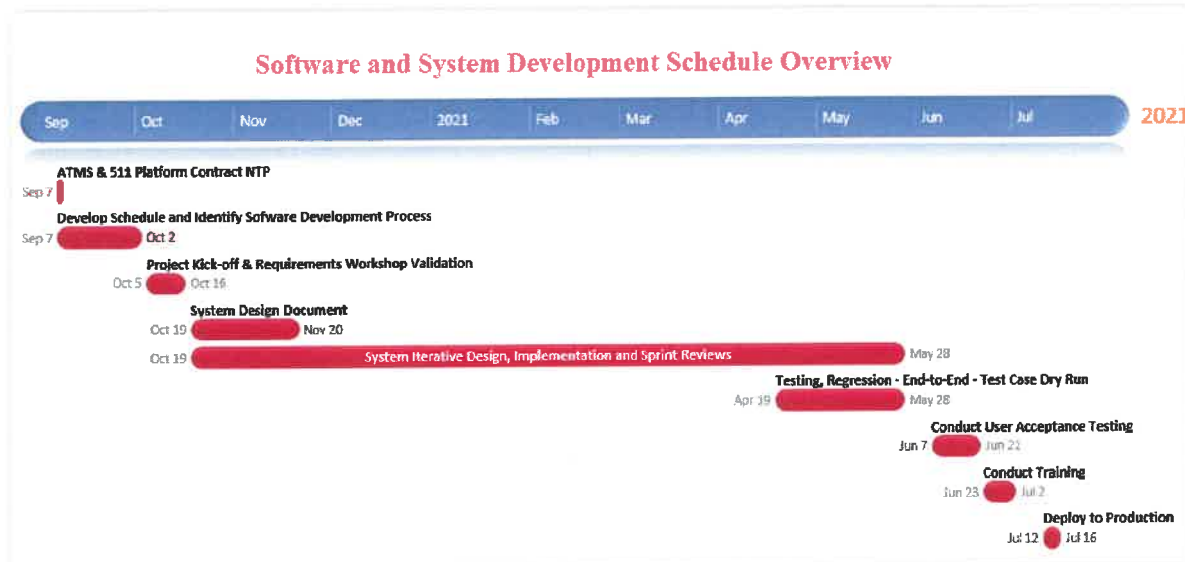


Figure 8 – Software and System Development Schedule

The detailed project schedule is included below.

Task Name	Start	Finish
WVDOT ATMS and 511 Platform Contract NTP	Mon 9/7/20	Mon 9/7/20
• Project Mgmt & Monthly Progress Meetings & Reports	Mon 9/7/20	Thu 7/18/24
Monthly Progress Meeting & Report	Mon 9/7/20	Thu 7/18/24
• Software and System Requirements and Design	Mon 9/7/20	Fri 1/29/21
Develop & Submit Detailed Schedule	Mon 9/7/20	Fri 10/2/20
Project Management Plan (QA/ Chg Mgmt/ Risk/ ...)	Mon 9/7/20	Fri 10/2/20
Identify & Submit Software Development Process - Iterative	Mon 9/7/20	Fri 10/2/20
WVDOT Review and Approve Schedule & Dev Process - Post Kick-off Meeting	Tue 10/6/20	Mon 10/12/20
• Project Kickoff Meeting & Requirements Verification Workshop	Mon 10/5/20	Fri 10/16/20
Kick Off Meeting	Mon 10/5/20	Mon 10/5/20
Requirements Workshop	Tue 10/6/20	Fri 10/9/20
WVDOT Review and Approve Requirements Clarifications & Updates	Mon 10/12/20	Fri 10/16/20
• System Design Document	Mon 10/19/20	Fri 11/20/20
• Security Document Deliverables	Mon 11/30/20	Fri 1/29/21
• Software and System Development	Mon 10/5/20	Fri 7/16/21
Deliver HW and COTS list	Mon 10/5/20	Fri 10/16/20
• Software System Deployment Transition Plan & Updates	Mon 10/5/20	Fri 5/14/21
• System (ATMS, 511, Video) Iterative Design, Implementation and Sprint Reviews	Mon 10/19/20	Fri 5/28/21
Sprint Preparation , User Story Creation and Acceptance Criteria	Mon 10/19/20	Fri 10/30/20
Sprint 1 (Incidents) (Planned Events) (GUI)	Mon 11/2/20	Fri 11/20/20
Sprint 2 (Incidents) (Planned Events) (GUI) (Video)(511)	Mon 11/23/20	Fri 12/11/20
Sprint 3 (Incidents) (Planned Events) (Other) (Video)(511)	Mon 12/14/20	Fri 1/1/21
Sprint 4 (Incidents) (Planned Events) (Notifications)(511)	Mon 1/4/21	Fri 1/22/21
Sprint 5 (Incidents / Planned Events) (Notifications) (Traveler Info)(511)	Mon 1/25/21	Fri 2/12/21
Sprint 6 (Data Collection) (Notifications)(RWIS)	Mon 2/15/21	Fri 3/5/21
Sprint 7 (DMS) (Integrations) (Reports)	Mon 3/8/21	Fri 3/26/21
Sprint 8 (End to End Testing Web Site) (Regression Testing & Bug Fix)	Mon 3/29/21	Fri 4/16/21
Sprint 9 (Regression Testing & Bug Fix) (FAT -Test Case Dry Run)	Mon 4/19/21	Fri 5/7/21
Sprint 10 (Regression Testing & Bug Fix) (FAT -Test Case Dry Run)	Mon 5/10/21	Fri 5/28/21
Deploy and Configure Release to WV Environment & System Checkout	Mon 5/31/21	Fri 6/4/21
• Operations & Maintenance Plan	Mon 2/1/21	Fri 3/5/21
• User Acceptance Test Plan, Procedures	Mon 11/23/20	Fri 3/12/21
• Conduct User Acceptance Testing	Mon 6/7/21	Mon 6/21/21
System Acceptance	Tue 6/22/21	Tue 6/22/21
• System Documentation, Training Plan & Materials	Mon 3/8/21	Fri 6/4/21
• Conduct Training	Wed 6/23/21	Fri 7/2/21
System Cutover to Production	Mon 7/12/21	Fri 7/16/21
O&M Years 1 to 3 - Maintenance, Support, Training Refresh	Mon 7/19/21	Thu 7/18/24

Figure 9 – Proposed Project Schedule

4.3.1.6 Software Development Process and how it will be employed on this project (e.g. functional requirement development, requirement traceability, software/system development and client review process, test procedure development, acceptance testing, etc.)

Our proposed Work Plan for the ATMS and 511 Platform deployment lays out a path for a low risk transition that keeps WVDOH engaged throughout the software and system development period. We propose to take an iterative approach to the software development process. This approach is proven to lower the risk of the project and better meets the users' expectations.

The Agile diagram here is an overview of the proposed software development process.

Project Kick-Off: Team Q-Free proposes to start the project by holding an on-site kick-off meeting that will include key WVDOH stakeholders and Q-Free's project leadership. Upon NTP, the Team Q-Free PM will work with the WVDOH PM to coordinate the time and location of the meeting.

At the kick-off meeting, Team Q-Free will engage the WVDOH in discussions related to the project software development process approach, scope of work, schedule, deliverable review processes, and approach to communication. The goal of the meeting is to ensure all project leaders and key stakeholders agree on the project goals, objectives, scope, and roles and responsibilities from day one.

Meeting "in person" will allow the key personnel from WVDOH and Team Q-Free to get acquainted from which working relationships and trust can be built. If in person meetings are unable to be held, Q-Free has experience using web-based conferencing tools that offer features such as "on-line whiteboards", meeting recording and shared display capabilities.

Requirements Workshop: During the first two to three months of the project, Team Q-Free will review project requirements and begin preparing for a series of requirement working sessions, we will illustrate key functions and concepts of our system, while simultaneously reviewing and clarifying the requirements. This approach allows WVDOH to become familiar with our ATMS and 511 Platform and lets our technical team to quickly identify the required configurations and customizations based on user feedback. The WVDOH PM shall review and approve the Requirements Document prior to proceeding to the other Preliminary Engineering and Design

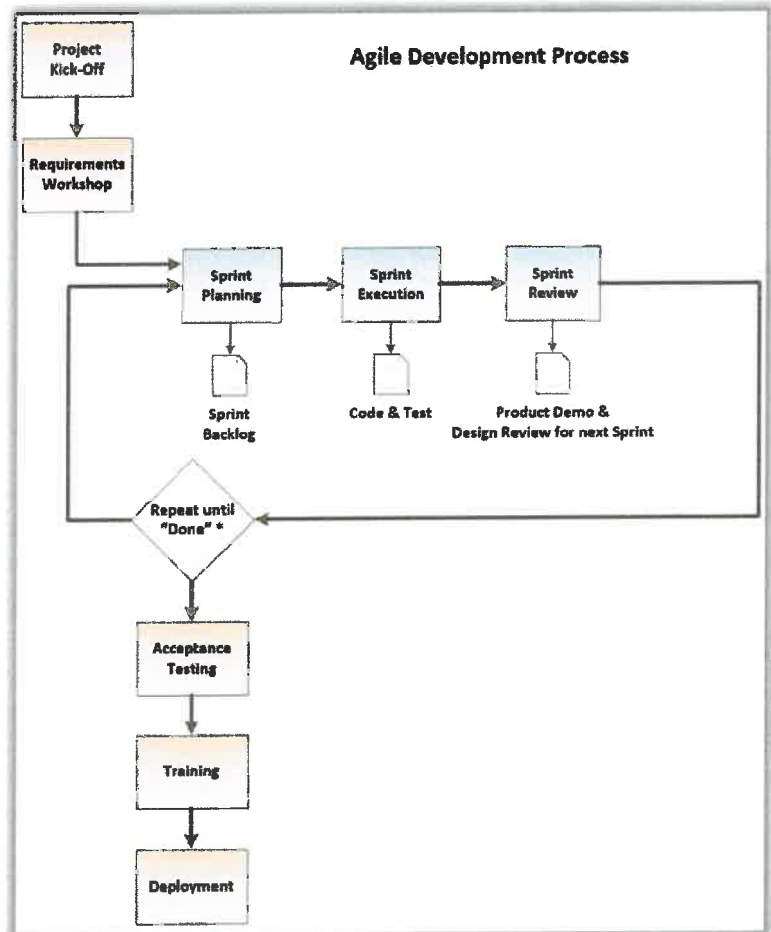


Figure 10 – Proposed Software Development Process

tasks. At the end of this phase Q-Free will deliver a Requirement document which the WVDOH shall review and approve.

Iterative Design and Implementation: Upon Requirements document sign-off, Team Q-Free will begin breaking down the requirements into user stories and assigning to sprints. As the sprints kick-off, the WVDOH will be engaged in reviewing and providing feedback for GUI mock-ups. We will start implementing customizations, configurations and enhancements for the WVDOH review and feedback in small iterations. This incremental design- implement approach provides for an efficient mechanism to solicit end-user feedback early and often. Sprints run-in three-week cycles ending with a Spring review that the WVDOH will be invited to. At this review the team demonstrates the functionality implemented during the sprint and discuss the features being implemented for the next sprint. This Agile development approach has proven to be very beneficial for large projects, as it substantially reduces the risk and complexity on the project, and results in a higher customer satisfaction.

Agile is an iterative and incremental development methodology that is used to manage software development. It provides a structure of roles and responsibilities, meetings, processes, and artifacts. Agile uses fixed-length iterations, called Sprints, which generally last from one to four weeks. Each Sprint consists of four types of meetings: (1) Sprint Planning, (2) Daily Scrums, (3) Sprint Review, and (4) Sprint Retrospective. Each meeting happens at a specific time and has a set purpose. Each Sprint incrementally builds on the functionality already completed in the last product increment. The following figure shows the Sprint workflow:

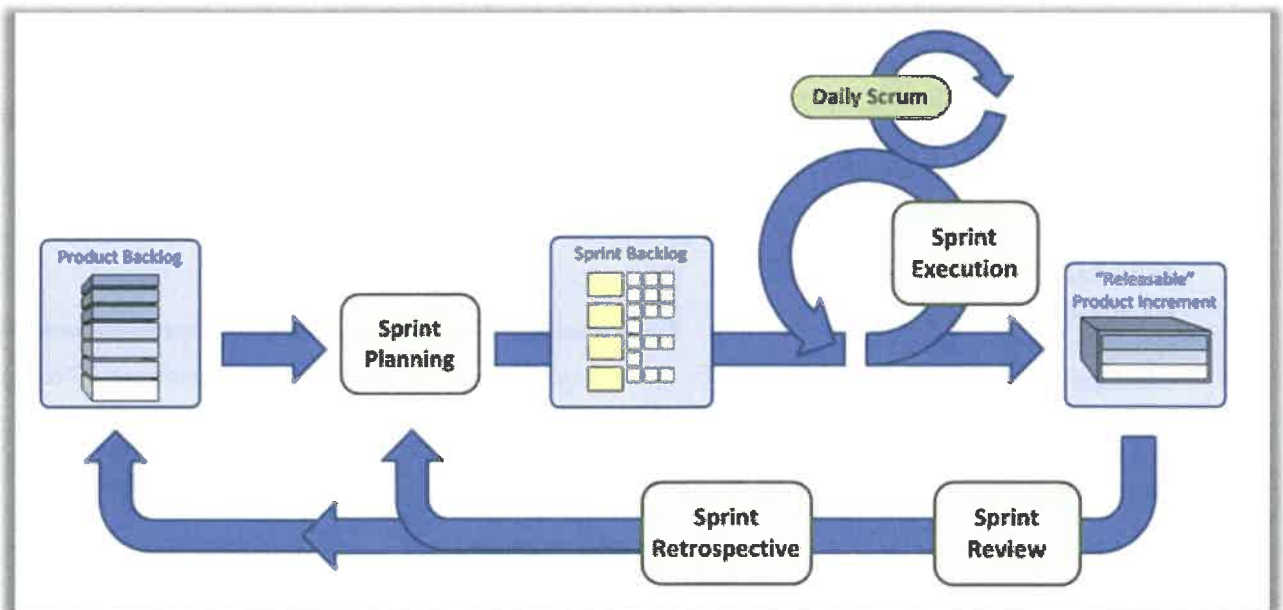


Figure 11 – Sprint Workflow

Acceptance Testing: Q-Free will develop test cases and once the sprints are complete Q-Free QA/QC team will be on-site to work with the WVDOH representatives to conduct User Acceptance Testing (UAT) and requirements verification. During the testing period the ATMS staging and 511 Platform preview environments will be utilized.



SpiraTest is an on-line requirements and test management tool. During implementation, QA writes test cases in SpiraTest per a documented standard. The standard is designed to create consistent test cases with accurate sample data. Using SpiraTest provides the traceability from functional requirements to requirements to test cases. During the testing period, we provide our clients access to SpiraTest to execute the test cases during the acceptance testing process. Testing results will be provided.

Training: Our Trainer will work with the WVDOH and WV Parkway Authority to develop and execute the training plan. Our Trainer will be on-site for a week to conduct 4 training sessions between the two sites for the initial deployment. Training materials will be supplied.

Deployment: Once the system has been accepted and training completed the software will be deployed to Production as outlined in the Software and System Deployment Transition Plan. A detailed work plan will be submitted at the project kick-off.

511 Platform Development: In deploying the 511 Platform components of the system, ILOG will adhere to the principles outlined below for customizing the 511 Platform to WVDOH requirements.

The process will begin with clarification of the requirements for each component of the 511 Platform and how they will be modified to meet each preference or requirement and will have a foundation based in the user experience. This initial process will specifically include establishing access to various external (non-ATMS provided) data sources that will be used to populate the 511 system. The final list of functional requirements for each 511 Platform component (IVR, website, travel alerts, mobile apps) will then be revised and presented to WVDOH for approval.

- The initial IVR structure can be based on the existing WV 511 dial plan, or can use ILOG's new artificial intelligence engine, SAM; and
- The subscriber services for travel alerts will be based on current subscription services and will retain the current subscriber base, if one is available. The user experience however, may be redesigned and simplified according to WVDOH preferences and best practices.

Once the requirements clarifications are approved, ILOG's networking team will create the network infrastructure necessary to support all the environments (development, preview and production), and will begin establishing connections to external data sources.

With this infrastructure in place, the design and development team can begin to work on initial drafts of the graphical user interface (GUI) for the web site, subscriber services and mobile app. A GUI design will be provided as a standard version of the ILOG 511 Platform. Utilizing Agile methods, ILOG will work proactively with WVDOH to customize the user experience for the web and mobile applications.

After the design is finalized, work will begin on the back-end system processes, meaning the web services that support the functions will be wired up to the UI elements. Bi-weekly updates or demonstrations of new features will be presented on a preview system as they become available. This preview system will be IP-restricted for testing by WVDOH. Similarly, the IVR will be demonstrated through a preview system, which will be assigned a test phone number. Through the bi-weekly demonstrations, each of the items on the final list of functional requirements will be fulfilled, which should facilitate UAT by WVDOH.

When the system nears the go-live date, the WV 511 line will be ported to the new IVR system, the current WV 511 web site URL DNS will be changed to point to the new website, and the mobile apps will be released to their respective stores so that all live systems become available to the public.

4.3.1.7 Quality Management/Change Management Plan details and how it will be employed on this project

Team Q-Free is committed to providing the highest quality service to our clients and we are extremely proud of our record of successfully deploying, operating, and maintaining ATMS and 511 Platform. We are committed to continuous quality improvement through involvement of all personnel in a systematic, logical process to continually improve work practices and procedures. The overall continuous quality improvement process is managed by the Q-Free QA/QC Director working with the ILOG Product Management Director and Skyline Product Management Director.

Quality Management / Test Plan

Q-Free will provide a Quality Management, Test Plan, describing our approach for testing the proposed solution. The plan will describe the testing that takes place during each phase of the project, approach to Factory Acceptance Testing (FAT), approach to User Acceptance Testing (UAT), schedule and resource requirements and acceptance criteria. Test cases will be created verify the requirements and these will be executed with the WVDOT on-site as part of acceptance testing. The following describes our approach to testing.



Figure 12 – Sprint Testing

Sprint Testing is conducted during the implementation phase by QA and the development team. This includes peer review, unit testing, integration testing, automated testing, and performance testing. QA utilizes Selenium and Apache JMeter for automated testing and performance related testing. Automated testing has proven to be a valuable investment in our product. Tests are run nightly to ensure no new bugs are introduced and any issues found are addressed immediately. Following the agile model, QA has an integral role throughout the entire sprint testing process/lifecycle;

- **FAT** is conducted in the WV Staging environment. Testing is conducted by Team Q-Free QA leads. Staging environment will mimic production. During this test phase the team will verify the ATMS and 511 Platform software components and modules, public websites, IVR and mobile applications, and functionality of the elements contained.

- **ITS Device Testing** is a critical aspect of testing. Team Q-Free will work with the WVDOT on any field device testing necessary. OpenTMS currently communicates with the existing devices so this should be minimal impact.
- **UAT** is conducted in the WV Staging environment with the WVDOT designated representatives. Team Q-Free QA will be on-site to execute the test cases verify that the requirements have been met. The DOT will also have the opportunity to do ad-hoc testing as well. UAT will test all aspects of the software being deployed; ATMS, 511, and Video. Q-Free will provide test results that will be reviewed with the WVDOT and if they meet the acceptance criteria identified in the test plan the software will be scheduled for deployment.

Q-Free uses SpiraTest an on-line requirements and test management tool throughout this process. During the testing period, we provide our clients access to SpiraTest to execute the test cases. This on-line tool provides the WVDOT visibility into the entire testing process.

Our approach to testing throughout the project lifecycle incorporates the following best practices and key strategies:



Figure 13 – SpiraTest

- Test Plan provides a well-documented process to that will be followed. The WVDOT reviews and approves the plan so they are part of the process. The QA Director is responsible for ensuring that this plan is followed.
- Availability of ATMS device simulators provide the QA team the ability to test the applications without actual field devices. We have a National Transportation Communications for Intelligent Transportation System Protocol (NTCIP) Simulator (DMS / Detectors / RWIS / VSL / LCS).
- All programming is performed using the operating system and database being deployed.
- QA Team leverages automated testing to ensure new development isn't introducing new issues and bugs introduced are caught quickly. These automated tests can be used for end to end testing as well.

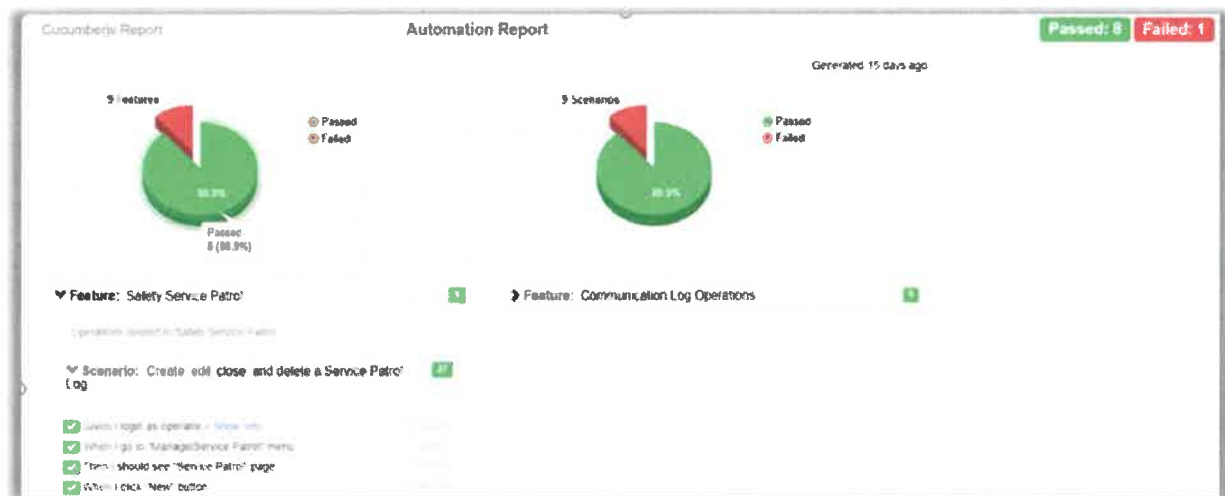


Figure 14 – Automation Report

Change Management

Based on lessons learned, Team Q-Free recommends that the WVDOT consider forming a Change Management Board of key ATMS and 511 Platform stakeholders that are responsible for managing changes to the platform.

All changes to production will be coordinated with the on-site SE and recorded in our JIRA Service Desk. JIRA Service Desk is available via the web and is used to report and track reported system issues.

The Operations Support and Maintenance Plan will contain configuration management details.

4.3.1.8 Issue Resolution Process

Team Q-Free's Ticket Resolution Process is shown in the figure below. The on-site SE typically takes ownership of investigating and works with the WVDOT prioritizing reported issues.

- If the issue can be resolved without technical support, the SE acts to resolve the ticket, logs the action in the JIRA Service Desk, and verifies that it is resolved with the reporter;
- If further technical support is needed;

- For ATMS issue, Team Q-Free's SE staff investigates the issue, reports findings, and schedules the fix with an upcoming maintenance release, depending on the defect priority;
- For VDS or 511 application issues, the on-site or on-call SE reached out to the appropriate vendor for support; and
- The SE closes the loop, reports the findings to the reporter and documents the actions in the JIRA Service Desk. Recurring issues are linked together for tracking and information gathering.

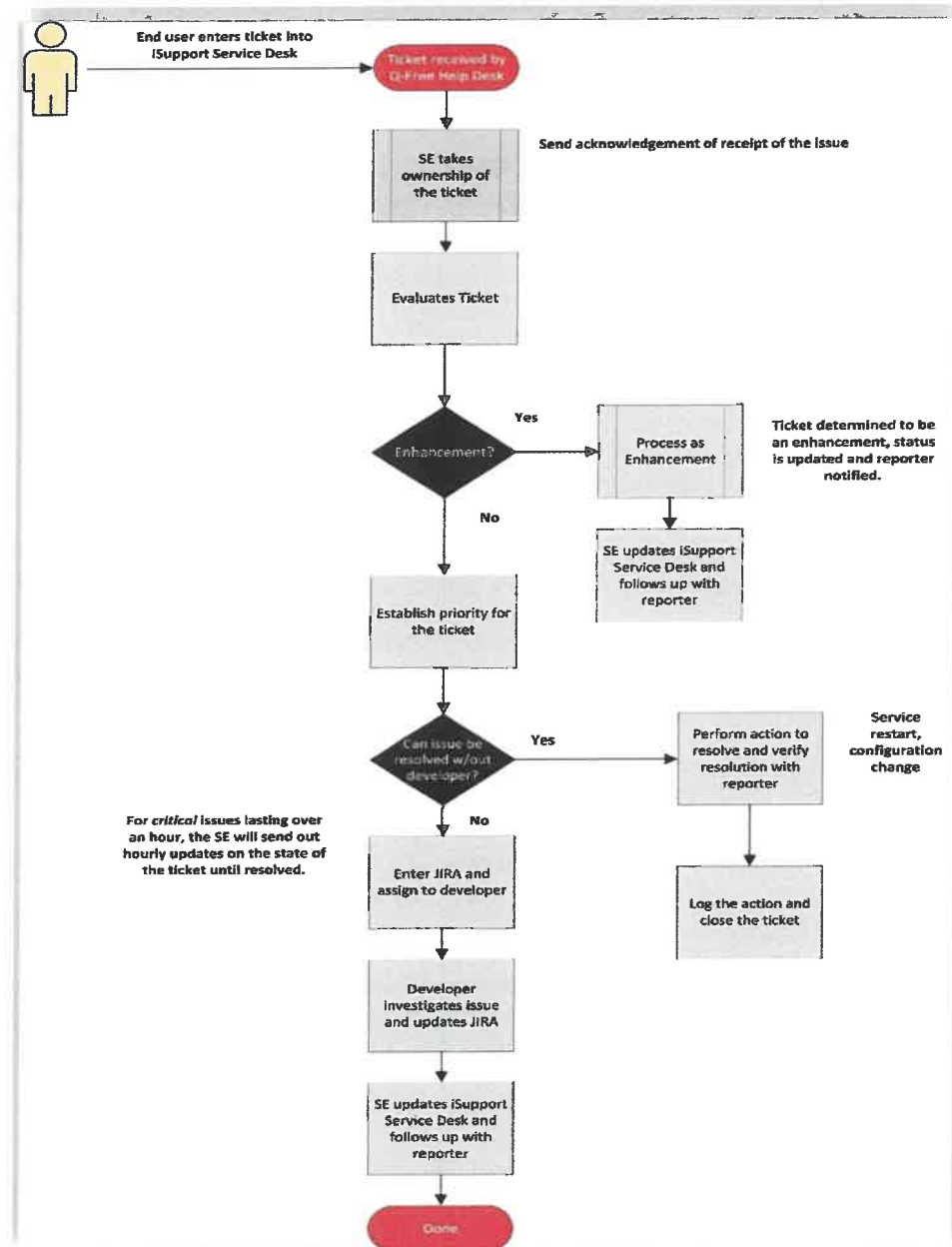


Figure 15 – Team Q-Free's Ticket Resolution Process

PRO-ACTIVE SYSTEM MONITORING

Team Q-Free proactively monitors the system state, health and performance of the platform.

ATMS/VDS Monitoring

ATMS/VDS uses Logic Monitor to monitor the system health 24x7. A collector will be deployed at the site. The collector watches the configured parameters on the servers and forwards the alert to Logic Monitor using SSL. Logic Monitor maintains a database that includes a history of alerts. Logic Monitor supports a reporting module that provides the admin the ability to create reports to monitor alerts over the past week or past month. Logic Monitor applies filtering rules to alerts as they arrive. A rule can trigger a notification, such as an e-mail, to notify an administrator of a problem that can be corrected before causing downtime in production

511 Platform Monitoring

ILOG has 24x7 systems monitoring and response protocol. On-call systems support staff are notified when performance thresholds are crossed. The reported problem is triaged, and customer-impacting issues are immediately addressed by appropriate support staff. ILOG provides the Q-Free support team with a toll-free number, answered by systems support staff that can be called to make a service request.

The cloud-hosted system is monitored by two sources; AWS and ILOG systems support center. AWS utilizes a wide variety of automated monitoring tools to detect unusual or unauthorized intrusion attempts at ingress and egress communications points. Alarms are configured to alert AWS systems staff when early warning thresholds are crossed, and on-call staff rapidly respond. AWS monitors for a number of threats including denial of service, man in the middle, packet sniffing, etc.

ILOG also monitors the network and systems using Nagios monitoring tools. ILOG staff are paged when a performance threshold is crossed, and corrective action is taken.

Systems are scanned monthly by a third-party provider for detection of vulnerabilities. Patches and updates are made regularly and generally without any service interruption. Reported critical vulnerabilities are corrected as soon as they are identified. Support staff are available 24x7 and will escalate issues to additional staff as needed for problem resolution

4.3.1.9 Risk Identification process

The Key Team Members and managers who have experience and insight are primarily responsible for risk identification. The Q-Free project manager along with the ILOG and Skyline project managers to identify and track risks in a Risk Register. The Risk Register will be provided with the monthly project progress report.

The impact of realized risks on dependent processes are also identified and are mitigated to the degree possible. Where applicable, additional resources may be needed. At these junctures, the project manager will draft an impact statement showing the effect of the risk on schedule, costs, etc. for the project.

4.3.1.10 Bios/Resumes of key personnel (PM, Tasks Leads, On-Site Staff) (2-page maximum for each)

Team Q-Free staff resumes can be found in the pages to follow.

Christopher Butler

Team Q-Free America Project Manager

Education	PL High School
Certifications	OCC – Communications and com. tech.; Electronics Tech Training and Certifications; CAPM certificate of completion; Currently pursuing PMP
Years of Experience	20+ years



Professional Experience

(2018 – Present)

Team Q-Free America Project Manager

- Initiated the Iowa DOT statewide ATMS project. Establishing the project baseline requirements understanding, coordinating subcontractors, and establishing schedules;
- Plan the Iowa DOT statewide ATMS project delivery and establish development schedules to meet the Iowa delivery schedule;
- Currently executing the Iowa Statewide ATMS project plan, meeting bi-weekly with the client to discuss project progress;
- Perform document control functions for all project files that adhere to the Q-Free America PMO standards. Schedule and coordinate activities associated with West Virginia/OHIO to produce an integrated critical path schedule, Project Management Plans as necessary, update as required, and identify and report potential problems/problem areas before they become an escalated customer issue;
- Responsible to assist with monthly resource forecasts, allocations, and work with other Project Managers to resolve resource and delivery issues/conflicts. Work closely with development, testing, portfolio management, and accounting to ensure that all divisions/groups have full project awareness for the appropriate Q-Free America protocols to be supported. Assist with entering and maintaining project budgets/estimates;
- Maintain/communicate overall and individual project status forms to communicate to portfolio management, customer, and third-party consultants. Responsible to maintain visibility into the West Virginia project for portfolio management;
- Support the PMO process for task order development. Responsible to recognize and follow up on opportunities for potential new tasks/functionality that the customer could benefit from. Assist in requirements gathering, documenting and tracking;
- Responsible to maintain project schedules, traceability matrix, project documentation, resource allocation, and delivery deadlines. Maintain requirements traceability matrix for ongoing projects to ensure testing and development are properly linked;
- Ensure Requirements documents, design documents, and training documents are all coordinated before customer delivery. Maintain a high level of project status form for management reporting. Assist with monthly projections, customer status reports, and



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customer invoicing. Assist with review of monthly account budgets to ensure the maintenance of profitability; recognize over budget potential before it occurs. Provide input to determine and implement solutions to deal with projects that run over budget; and

- Create, and maintain regular project status updates.

Prior Professional Experience

Customer Support Manager (2018-2019)

- Responsible for supervising SE/SAM Staff. Worked with HR and Client PM interview and hired field staff as the contract requires;
- Responsible for and executing the Maintenance / Help Desk Plans. Managed the ticketing system. Responsible for monthly Client Reporting on Tickets and SLA's for ATMS and Tolling delivered to PM. Monitored and acknowledged tickets, route tickets to Support Staff (SE, SAM), and/or Development as needed. Monitored routed tickets and ensured they are responded to within the SLA period. Managed and monitored tickets to closure. Ran ticket reports every Friday and sent it to PM and Portfolio Directors. Facilitation of RCA delivered to PM;
- Responsible for JIRA Service Desk Management, documented Support Processes and maintained support documentation repository for the team; and
- Ran the Support Meeting for clients, ran the support team meetings every other week. Met with management and other staff teams as necessary; worked to improve support processes across all portfolios as needed. Facilitated the SE/SAM training. Worked with clients and client support centers to ensure client needs are met. Managed the On-Call Program for the support staff.

Systems Engineer I, Systems Engineer II (2007 – 2018)

- Technical Lead Designer and implementation coordinator for the WVDOH ITS program. Managed the West Virginia DOH ITS infrastructure to facilitate application, device, and information sharing. Designed and implemented the WVDOH ITS Mesh network, incorporating four remote facilities across the state utilizing a single centralized redundant system. Designed the network portion of the state 511 system for deployment in the fall of 2012.

Network/Systems Administrator

- Responsible for setup and maintenance of workstations on multiplatform windows 2k-2k16 environments. Performed the day-to-day maintaining and managing of Exchange 2000, file servers, print servers, SQL and SQL 2005, LAN, and WAN network with mixed hardware Cisco pix 515E, 501, 506 and Watch-guard X500 solutions, configured point to point VPN's, IPSEC Configuration, ATM, and GRE configuration; and
- Supported VDOT Central Region TOC day to day operations. Setup, configured new field devices, maintained OpenTMS platform, and supported the On-Call Rotation. Worked with field staff and operations to ensure maximum system uptime and device usage.



Daniel Skiffington

Principal-In-Charge



Education	B.S., in Computer Science, Virginia Tech
Certifications	Executive Management, Strategic Planning, Risk Management, Product Marketing and Management, Global Operations, Program Management, Project Management, Software Engineering, System Architecture and Design, Integration, Agile Methodologies, Web Services (SOAP, REST), Messaging(JMS), Java, JavaScript, HTML, CSS, AngularJS, React.js, SQL, Oracle, PostgreSQL, GIS, Application Security
Years of Experience	17+ years

Overview

Mr. Skiffington leads the Inter-Urban division of Q-Free America with over 17 years of ITS experience. He provides leadership and guidance to all aspects of the ITS business at Q-Free America. His background in full lifecycle ITS program management including evaluating, designing, delivering, and maintaining ATMS solutions gives him a unique understanding of how to achieve success and provide customers with the best overall experience.

Professional Experience

Executive Vice President/Principal-In-Charge, Inter-Urban Division

- As Executive Vice President/ Principal-In-Charge of the Inter-Urban Division in America, Mr. Skiffington is responsible for all the ITS business including sales, operations, technology and services. Mr. Skiffington has full authority over all the workings of the division.

Portfolio Director, ITS and Tolling

- As Portfolio Director, Mr. Skiffington was responsible for running operations, leading technology and maintaining services related to all ITS and tolling programs.

Associate Vice President, ITS Technology

- As Associate Vice President of ITS technology, Mr. Skiffington managed all technical aspects of the ITS business in Q-Free America, including overseeing all engineering and IT programs and processes. Mr. Skiffington was also responsible for strategically planning all the ITS product roadmaps including the ATMS and coordinating development with all ITS project deliveries.

Director or Product Development

- As Director of Product Development, Mr. Skiffington managed the product roadmaps and project architecture solution for all Open Road's products. He led the design and development of the next generation of the enterprise ATMS product that is a completely web-based, scalable, high availability solution that



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can support centralized statewide deployments with many Traffic Operations Centers.

Lead Software Engineer; VDOT Transportation Operations Technology System Services

- Mr. Skiffington led the implementation task to virtualize the existing ATMS hardware platforms and upgrade the ATMS software to OpenTMS Version 7 for four Traffic Operations Centers operating in Virginia. The effort included establishing consistency of hardware and software between the operations centers and configuring and deploying onto a virtual environment that utilizes VMware Infrastructure.

Software Engineer; WVDOT Statewide ATMS Implementation

- Mr. Skiffington was responsible for the implementation and deployment of the statewide OpenTMS Enterprise System. Deployment was an off the shelf system integrating numerous legacy and new field devices well as a desktop video management system. Project was completed in seven months.

Technical Maintenance Liaison; Q-Free Open Road Transportation Division

- Mr. Skiffington provides technical software supported for Q-Free Open Roads products operating within the Transportation Operations Centers nationally. Mr. Skiffington is responsible for reviewing and responding to technical maintenance support requests related to any supported software product deployed in any of the Transportation Operations Centers. Currently this includes deployments in nine locations which reside in four different states. This responsibility includes facilitating communication between project managers, system administrators, developers and the end users as well as addressing the resolution of the submitted requests.

Product Manager; OpenTMS Enterprise

- Mr. Skiffington is responsible for managing the OpenTMS product. This includes prioritizing, scheduling, and assessing the risk of all software changes including future research and development. Mr. Skiffington reviews requirements and design for all major functionality changes or additions to OpenTMS in order to access their feasibility and impact to the system. Mr. Skiffington also oversees release preparation for OpenTMS to ensure quality assurance procedures are executed.

Software Engineer; VDOT I-81 Corridor Systems Integrator

- Mr. Skiffington was part of the development team that provided field device protocol integration, field device communication protocols, software and database support, client interaction, usability improvements for the user interface, GIS implementations, and reporting using Crystal Reports. This effort was completed using iterative deployments in both the VDOT NW and SW regional TOCs and was delivered on-time and within budget.



Thomas Phillips, PMP

Lead Public Sector Partner



Education	AS, University of Houston
Certifications	Project Management Professional
Expertise	ATMS and ATIS Project Management, TSMO Expertise, Connected Vehicle Technology Deployment, ITS Field Equipment Deployment, and ITS Systems Engineering
Years of Experience	20+ years

Overview

Mr. Phillips has over 20 years of experience managing technology projects for transportation. Mr. Phillips has a strong background in development, deployment, and operations and maintenance of ATMS and 511 Traveler Information Systems. He also has extensive experience managing cross-functional teams delivering Intelligent Transportation Systems, mission-critical software, connected vehicle technology and Transportation Systems Management and Operations (TSMO) related projects. His long background within a State DOT environment (20 years at Virginia Department of Transportation – VDOT) and lengthy working history with FHWA allows him to be effective as a project manager with a full understanding of system engineering requirements.

Professional Experience

(2006 – Present)

Project Delivery Manager/Client Account Manager

- Mr. Phillips leads overall program delivery and client management for major system deployments. In this role he works closely with state DOTs to help ensure project success by helping develop solutions to complex contractual and project management issues. He serves as a key point of escalation within Q-Free and works directly with the North American President of Q-Free to allocate resources, communicate with senior customer leadership and has a lead role in providing strategic direction on Q-Free's ATMS product. Outside of ATMS related activities, he also works serves as North American subject management expert on Connected Vehicle Technologies and V2I related activities.

Prior Professional Experience

Portfolio Manager Operations and Intelligent Transportation Systems

- Lead Leidos' surface transportation portfolio with a major focus on Advanced Traveler Information Systems (ATIS), Intelligent Transportation Systems, connected vehicle technology, smart cities and IoT. Work with Leidos leadership firm-wide in support of surface transportation initiatives. Manage transportation



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portfolio. Perform project management on multiple ATIS projects including New England ATMS/ATIS. Portfolio manager of Leidos, Metropolitan Transportation Commission (MTC) traveler information system for San Francisco Bay Area, including first U.S. based full Amazon Web Services (AWS) deployment of Integrated Voice Response (IVR) and mobile application. Project Manager of Leidos' Turner Fairbank Highway Research Center, Saxton Transportation Operations Laboratory contract to develop cloud-based "Clarix" program for FHWA (Road Weather Group), and many other projects including connected vehicle test bed deployments, FHWA website development and manage cross-functional team in revisions and new chapters of FHWA's Highway Capacity Manual.

Virginia Department of Transportation (VDOT) Experience (Multiple Positions)

- Held multiple positions involved in transportation technology deployment and Traffic Operations with progressive more responsibility including:
- 3/2011 - 6/2012 Director Operations and Security Division:
 - Provide oversight and management of statewide planning, design, and implementation of Intelligent Transportation Systems (ITS), Traffic Management Center Operations, back-end systems management, critical infrastructure (i.e. bridge and tunnel security), field operations, field maintenance, traveler information systems and emergency response programs. Manage system development of multiple mission-critical software systems for 911 integrations, mobile application development, and traveler information.
- 2/2006 - 3/2011 Transportation Systems Technology Manager:
 - Manage large scale Intelligent Transportation System technology upgrade for VDOT's Northern Regional Operations including managing the transition of VDOT's most complex Transportation Management Center to VDOT's McConnell Public Safety Transportation Operations Center (MPSTOC); defining, procuring, implementing and managing VDOT's Statewide Advanced Transportation Management System (ATMS) while adhering to FHWA system engineering requirements; managing traffic signal systems; Road Weather Information Systems; ITS telecommunications networks; technology related to Critical Infrastructure; managing the Center to Center integration with the I-495 Express lanes contractor, and managing VDOT's technology integration with the Metropolitan Area Transportation Operations Coordination group (MATOC) including leading the Change Control Board for regional transportation systems. Manage statewide system development and ITS deployment in a matrix organization utilizing cross-functional teams. manage design and deployment and operations of VDOT's statewide systems. Develop statewide Concept of Operations.



Colleen Bond

AVP Project Delivery



Education	BS, Computer Science/Scientific Concentration, Utica College of Syracuse University, Utica, New York
Training	Quality Improvement through Defect Prevention Software Engineering Training Program; Six Components of the Bullet Proof Manager Series; Agile Estimating and Planning; The Agile Product Owner; and Communication Fundamentals
Expertise	Software engineering and system integration including the Software Engineering Institute Capability Maturity Model (SEI CMM); System design, development, deployment, and maintenance for numerous types of systems including ATMS, Archive Data Management Systems (ADMS), Traveler Information, and Data Sharing Systems.
Years of Experience	30+ years

Colleen Bond is the Associate Vice President (AVP) of Project Delivery at Q-Free Open Roads. Ms. Bond works across departments in the Project Delivery department to maximize the value delivered across IT investments and oversees the day-to-day delivery of IT and project delivery services. Ms. Bond provides direction related to project management, product deployment, configuration management and customer support. She routinely works with project managers and engineering on requirements validation, design, and delivery.

Ms. Bond is currently serving as Project Manager and Technical resource for several major Advanced Transportation Management Systems (ATMS) deployments. She also provides high level oversight on all Q-Free ATMS projects. Ms. Bond has over 18 years' experience in ITS.

Ms. Bond is results-oriented with comprehensive expertise, in-depth experience, and a broad knowledge of software engineering and system integration. She has a strong background in system design, development, deployment, and maintenance for numerous types of systems including ATMS, Archive Data Management Systems (ADMS), Traveler Information, and Data Sharing Systems.

Ms. Bond is an excellent manager and is gifted at team mentorship, as well as implementing quality control (QC) procedures. She is self-motivated, decisive, and committed to the highest standards of performance and excellence.

Q-Free Experience

(June 2002 – Present)

Project Delivery - Iowa Department of Transportation (IowaDOT), ATMS

In July of 2019, Q-Free Open Roads kicked off the ATMS Project for IowaDOT. The project is nearing the completion of the planning phase and is moving into implementation. This project leverages an agile process where the client is an active participant. Ms. Bond works with the project manager and engineering to support requirements validation and design of the IowaDOT ATMS.

Project Manager, Technical Manager - Pennsylvania Department of Transportation (PennDOT), Next Generation Advance Transportation Management System

In September 2012 Q-Free Open Roads kicked off the Next Gen ATMS Project for PennDOT. As the Technical Manager on this project, Ms. Bond is responsible for the requirements, design, and development of our state of the art web based ATMS. As part of the effort she is managing project risks and tasking to include integration with new legacy ITS devices as well as upgrading the incident module to include automated incident response recommendations, signal integration and queue warning/detection. She managed the software rollout and transition planning for the project including the existing conditions discovery, third party integrations and deployment of software supporting the ATMS. Transition planning included the migration from a legacy ATMS and disparate systems. The Statewide

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ATMS rollout has been complete and now the focus is on maintenance and enhancements. Ms. Bond leads a weekly maintenance meeting to discuss current maintenance activities.

Later transitioning to project manager her responsibilities include facilitating a weekly stakeholder meeting, weekly and monthly status reporting, monthly SLA reports, management of subcontractor tasking, budgeting and coordinating internal resources to provide support and new initiatives.

Project Manager – Port Authority of New York and New Jersey, Deployment of Q-Free Lane Closure Management Tool, LaneAware

In 2019, Q-Free kicked off a project with the Port Authority to enhance our Lane Closure Management software to support construction on the George Washington Bridge in NYC. LaneAware simplifies the organization and management of construction projects by validating request against business rules and identifying potential conflicts. In addition to managing the customization, configuration, and deployment of the system in Azure, Ms. Bond is responsible for schedule development, management, and project reporting. Her team is preparing for the go live of Phase 1 of a 5 phase project.

Project Manager – Delaware Department of Transportation (DelDOT), ATMS Deployment

Ms. Bond oversees the maintenance and support for DelDOT ATMS. Currently managing the configuring and deployment of our Travel Time and Queue Detection (QD)/Queue Warning (QW) modules as part of the ATMS solution. Our QD/QW solution processes data from travel time segments and detectors continually watching for the formation of traffic queues. Once a queue is detected operations is alerted and messaging is posting along the monitored corridor warning travelers of congestion.

Technical Manager - Virginia Department of Transportation (VDOT), ATMS Deployment at McConnell Public Safety and Transportation Operations Center in Northern Virginia

In 2008 Q-Free Open Roads deployed its premiere ATMS solution, OpenTMS, at the McConnell Public Safety and Transportation Operations Center (MPSTOC) in Fairfax, VA. OpenTMS was selected by VDOT to replace an aging, legacy Traffic Management System with a modern, Commercial Off-the-Shelf (COTS) solution that would easily integrate its extensive set of Intelligent Transportation Systems (ITS) field devices and provide a scalable and extensible architecture to support future system expansion and integration with other stakeholder systems within Virginia, Maryland and Washington D.C. As the Technical Manager on this project, Ms. Bond was responsible for procurement, requirements, design, and development of the OpenTMS deployment. She managed risks and tasking to include integration with new legacy ITS devices as well as upgrading functionality deployed in their new Transportation Operations Center (TOC). She managed the software rollout and transition planning for the project including the deployment of hardware and software supporting the ATMS. Transition planning included the migration from a legacy ATMS as well as moving operations to a new location. Ms. Bond provided oversight for the integration of Lane Control, Ramp Meters, and Gate Control modules into OpenTMS, as well as managing tasking to include integration of travel time and device upgrades.

Technical Manager - Virginia Department of Transportation (VDOT), I-81 Corridor ATMS

Q-Free Open Roads deployed OpenTMS at two regional transportation operation centers on the I-81 Corridor in Virginia and have subsequently staffed, operated, and maintained these facilities since 2004. Ms. Bond was the Technical Manager on this project and responsible for the requirements definition, design, and development of the next generation OpenTMS Enterprise System. She managed the \$750,000 investment to upgrade numerous capabilities including adding new modules, integrating with new and legacy ITS devices, and upgrading functionality within all existing modules. This effort was completed using iterative deployments in both the VDOT Northwest and Southwest regional TOCs and was delivered on-time and within budget.

Director of Engineering, Project Delivery - West Virginia Division of Highways (WVDOH), Statewide Advanced Transportation Management System Deployment

Q-Free Open Roads provided a statewide ATMS solution as the backbone of the WVDOH statewide ITS program. Ms. Bond was responsible for overseeing the OpenTMS customization and configuration for the initial West Virginia Deployment in 2008. She worked with the project manager to coordinate technical resources and manage the development and integration of the ATMS. She provided programmatic Quality Assurance/Quality Control to ensure that OpenTMS was delivered as specified.



David Lebiedzinski

ATMS Solutions Architect



Education	B.S Computer Science, Christopher Newport University
Certifications	Oracle Certified Associate, Java SE 7 Programmer
Expertise	Development Team Management, Specification Development, Product Ownership, Java, React, Restful Web Services, GWT, Android
Years of Experience	8+ years

Skilled in software development lifecycle management, from design to implementation. Experienced in managing developmental efforts including remote development teams. Well-developed cross functional team leadership skills. Knowledge in foundational leadership theory. Proven ability to manage teams to successful completion and fulfillment of product specifications.

Q-Free Experience

(2012 – Present)

Technical Lead / Product Owner — Automated Corridor Response

- Simultaneously managed and lead efforts to provide an integrated corridor management solution for multiple clients including the Interstate 76 Speed Limit Corridor in Philadelphia and the Interstate 670 Lane Control Corridor in Columbus, Ohio;
- Designed and participated in development efforts to dynamically set speed limits based on measured speed and weather input data, as well as recommending lane control schemes based on lane obstructions;
- Managed a full stack development system, with multiple interfaces between system components, including third-party data feeds, and managing internal development systems during testing phase; and
- Worked with team members to identify and scrub product backlog to ensure project completion.

Technical Lead — Truck Parking Management

- Managed a remote development team to provide traveler information regarding truck parking areas along interstate highways;
- Integrated with a number of third-party vendors to complete integrations to gather data and report status updates and respond to public information systems in real time;
- Managing sprint tasks and providing estimates for completion of project on time; and
- Demonstrated product progress to project stakeholders on a sprint basis and involved in deployment support.



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Software Engineer I – Safety Service Patrol Mobile Application

- Individually tasked with updating an existing android mobile application to assist service patrol drivers to enter incidents and feed them into our core product;
- Worked to develop a rest feed to provide an API for the mobile app to interface; and
- Eventually took over development of client application to complete project on schedule.

Programmer I — West Virginia DOH and Virginia DOT Regional 911 Integrations

- Implementing software to fetch regional cad 911 feeds from numerous vendors and consolidate alerts into our common product for faster response times;
- Worked with various vendors to parse feeds and send updates to the core OpenTMS system;
- Responsible for regional deployments and communication with clients for project status and updates; and
- Involved with maintenance issues after deployment phase, and upgrade efforts to resolve issues.



Mitchell Terry, Jr.

ATMS Deployment Lead

Education	Associate of Applied Science: Information Systems Technology
Expertise	System Administration, Network Administration, Software Management
Years of Experience	10+ years in Architecting, Configuration, and IT Systems Administration



Professional Experience

(March 2016– Present)

Systems Analyst / Configuration Management & Deployment Coordinator (CM&D) – VDOT Statewide

- Collaborates on requirements clarification and verification with client;
- Responsible for security, deployment, configuration management, workflow and monitoring of VDOT Statewide ATMS platform;
- Collaborate with multiple parties and vendors to support the statewide effort;
- Works with VDOT's local TOC's to perform device integration and testing;
- Participates in Agile Sprint reviews providing feedback on requirements implementation, design, deployment considerations; and
- Works with Trainer to facilitate training.

Systems Engineer / CM&D Coordinator – PennDOT

- Worked with PennDOT operations, Network Administrators for Western Region field device testing and deployment; and
- Provides oversight for deployment configuration management performed by PennDOT.

Systems Engineer / CM&D Coordinator – IDOT - Peoria, IL

- Deployed and configured ATMS in local DOT environment.

Systems Engineer / CM&D Coordinator – ODOT I-90/I-670 Pilot

- Deployed and configured ATMS on hosting platform; and
- Monitoring environment.
- Migration to AWS Cloud environment Mar 2020.



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Prior Professional Experience

Systems Engineer; General Dynamics NASSCO-Norfolk | (2013 – Mar 2015)

- Analyze, resolve, and document issues in a 800+ user LAN environment Consolidated two separate domains to a single integrated domain while implementing security measures to ensure cyber security meets CIS standards;
- Continuous monitoring of systems and LAN to ensure operation and security compliance;
- Implementation and administration of SCCM 2012 to manage enterprise assets;
- Knowledge and experience with Cisco, Juniper, Aerohive, Solarwinds, Symantec, SQL, Powershell, VMWare, SCCM, Linux, windows, and various other IT specific software solutions; and
- Supported various Audits including Sarbanes-Oxley and Cyber Security based on CIS standards.

Technical Support Analyst; Metro Machine Corp. DBA. NASSCO-Norfolk | (2010 – 2013)

- Analyze, resolve, and document issues in a 300+ user LAN environment;
- Integration from a primarily Linux based infrastructure to a Windows Active Directory;
- Provide support to End Users from a Help Desk environment;
- Assist and backup current network administrator on Windows and Linux Servers; and
- Assist and support as needed with Sarbanes-Oxley audits.

PC Technician; Best Buy - Geek Squad | (2010 – 2011)

- Responsible for diagnosing hardware and software issues on Mac and Windows systems;
- Interact with consumers in a professional and courteous manner while working to resolve issues; and
- Ensure efficient and timely resolutions/repairs in accordance with company standards.

Tech Support Representative; Liberty Tax Technical Support via Headway Staffing | (2009 – 2010)

- Troubleshoot OS, Hardware, Networking, Printers, Software, etc.;
- Help create KB articles for re-occurring issues; and
- Provide remote support to franchise owners across the United States.



Moises H. Lopez Jr.

ATMS QA/QC Lead



Education	B.S., Computer Studies, Christopher Newport University
Expertise	OOP, Design Patterns; Java, TypeScript; Visual Studio Code, Eclipse; SQL (Oracle and Postgres); HTML, XML, JSON; Selenium Web Driver, Protractor, Cucumber, Chai, TestNG; and Git, SVN, Bitbucket, Maven.
Years of Experience	20+years

Overview

Moises Lopez is an accomplished and driven information technology professional specializing in all aspects of the software development life cycle, including quality assurance (QA)/quality control (QC) methodologies, policies and procedures and network administration. Mr. Lopez has proven strengths in meeting project requirements and producing high quality software applications through excellent analytical, leadership, and communication skills. He has experience hiring and developing individual team members. He is committed to thoroughly assessing product quality to ensure excellent results and customer satisfaction. Mr. Lopez is strong in automating testing using Java, Selenium, TestNG, Protractor, Typescript, and Chai.

Professional Experience

(August 2018 – Present)

Director of Quality Assurance

- Direct and mentor a team of quality assurance engineers in an agile driven environment focused on all aspects of testing;
- Perform training of products to new hires in all departments due to being resident product expert;
- Perform walkthroughs of software deployment and architecture of system to new hires in all departments;
- Researched and finalized tools used for automation, integration, and performance testing;
- Troubleshoot technical defects with engineering;
- Provide level of efforts for QA efforts to stakeholders;
- Deploy software to production environments;
- Advise agile teams on best software development cycle practices;
- Present product demos in face-to-face client meetings;



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- Headed on-site and remote user acceptance testing with operators to facilitate acceptance of software;
- Attend weekly meetings with customers to discuss project status;
- Collaborate daily with project/product managers, engineering, and system engineering; and
- Testing proof of concept applications in new AWS, Kubernetes, Docker initiatives.

Senior SQA Engineer/SQA Manager (August 2012 – March 2018)

- Implemented new transition from email based QA process tracking to QA portal and SpiraTeam for test case, requirement, and traceability management;
- Developed Java and TestNG Page Object Framework for automation suite used by QA engineers;
- Created manual test cases used in user acceptance testing using requirements and design specifications as guides;
- Performed performance tests against applications using JMeter;
- Deployed daily builds to QA environments and inform team of build readiness; and
- Conducted training of products at customer sites.

Web Application Tester (March 2009 – August 2012)

- Supported quality assurance effort of product change requests, product trouble requests, and new development of Navy Supply Information Systems Activity (NAVSISA)/ Financial and Air Clearance Transportation System (FACTS) web application.

SQA Specialist (Telecommute) (August 2008 – March 2009)

- Analyzed design documents and functional specifications to create test plans for assigned features; and
- Participated in weekly calls with out of state/country senior management to discuss test results and status.

QA Lead ((December 2007 – August 2008)

- Supported quality assurance effort for meeting planning web applications for pharmaceutical clients; and
- Created test plans without the assistance of detailed requirements or functional specifications.

SQA Specialist (2000 – 2007)

- Served as an SQA expert within the department by mentoring new hires and interns about all aspects of the software test cycle; and
- Served as the QA project lead for new pcAnywhere Access Server product.



Billy Bartram

ATMS On Site O&M Support Lead

Education

Marshall Community and Technical College - Computer and information sciences, Web Programming (Two years' university level)

Years of Experience

13+ years



Professional Experience

(2017 – Present)

SE Level 1

- Customer liaison;
- Respond to operational questions and issues;
- Troubleshoot and resolve hardware, software, and communications issues by identifying options for the most expedient resolution of the problem. This may include contacting the vendor for support, ordering parts, installing parts, and verifying the system is operational;
- Participate in client mandated meetings and change control processes;
- Document network/system architecture, configuration settings, and troubleshooting;
- Procedures;
- Design, install, configure and maintain a Windows Server environment including Active Directory, DNS, DHCP, and IIS;
- Install, configure, and troubleshoot the company's application software and associated databases;
- Perform hardware and software upgrades as needed on the network, server, and workstations to ensure 24/7 business continuity;
- I am responsible for the configuration, monitoring, and security of clients' data network;
- Provide immediate response to monitored events that indicate a failure in a mission-critical system;
- Perform system backups and recovery using applicable backup software;
- Provide on-call support during off-hours;
- Provide resolution of critical issues by determining and implementing the best course of action to restore the system to operational status;
- Responsible for all server and workstation functionality, security, and analysis as it relates to support of the Traffic Management System application. Ensuring that the system is available 24/7;
- Work with customer's IT staff to comply with all related regulations and duties;
- Install, configure, and maintain the organization's file servers and PC platforms;
- Act as primary liaison with vendors;
- Analyze current operations for opportunities to improve operational efficiency;



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- Design and recommend hardware, software, or process improvements;
- Manage the performance of multiple hardware and software platforms;
- Recommends upgrades or improvements and supports development of technical standards and applications;
- Resolve server/PC problems and offers technical assistance to users;
- Manage the acquisition, installation and maintenance of the organization's file servers, database servers, and desktop computers;
- Perform primary Help Desk function;
- Work jointly with Database Administrator(s) and Software Engineers(s) to define needs and requirements for continued operation, upgrade, and security of clients' systems; and
- Document all work as server and PC system components are modified, updated or installed.

Prior Professional Experience

CDI Corporation, NOC supervisor

- I supervised the Network Operations Center at my last position. I had 2 locations that I supervised. The clients that I had were Higher Education, Secure Research Environment, Corporate technology Enterprise Level, and Level 1 and 2 Helpdesk. I had started as an analyst on the L2 helpdesk and moved into different roles. I once supervised the contract for a helpdesk of about 100 employees and 4 team leads.



Paul Hlasnicek

ATMS Training Delivery



Education	The Pennsylvania State University, B.S., Applied Mathematics
Certifications	Dale Carnegie High Impact Presentations
Expertise	Software engineering, managing OpenTMS training, providing customer support.
Years of Experience	30+ years

Overview

Paul Hlasnicek is Q-Free America's ATMS Training Delivery with over thirty years' experience in software engineering. Mr. Hlasnicek works closely with the Agile teams to examine the requirements and create user stories and acceptance criteria for the development team to follow. Mr. Hlasnicek has a high level of understanding of the OpenTMS application and is very knowledgeable in how it pertains to the customer and control room operations. Mr. Hlasnicek delivers his training program to stakeholders from the operations level to the management level. This is done through closely analyzing and evaluating the personnel that he will be training and creating the curriculum, agenda, and delivery process. In addition to delivering the training sessions, he works closely with Q-Free America's Business Development and Technical Development teams to ensure that the training curriculum, materials, and programs will be developed to include the most recent deployment status.

Mr. Hlasnicek develops training plans that are customized for each customer. This includes a full curriculum, agenda, and training schedule. Mr. Hlasnicek works directly with the customer to create a training schedule that accommodates the operations staff and satisfies the contract requirements.

Mr. Hlasnicek has developed comprehensive training programs for Q-Free America's 511/Traveler Information Systems and ATMS clients. He has provided on-site and remote web-based training for clients in Pennsylvania, Virginia, West Virginia, Delaware, and Alaska.

Professional Experience

(July 2004 – Present)

ATMS Training Delivery

- VDOT ATMS Deployment
 - Mr. Hlasnicek managed and delivered the training program for the VDOT Traffic Operations Centers. He worked with VDOT management in implementing the training plan for the traffic center supervisors and operators. He works with operators and encourages an open dialog to identify enhancements and process improvements in transportation



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operations centers. He provides onsite support during the application deployment to insure a high level of customer support.

- PennDOT ATMS Deployment
 - Mr. Hlasnicek managed the overall training program for the PennDOT Traffic Operations Centers. He worked closely with the trainer and insured that all training materials were up to date and relevant for the customer. He works directly with the customer during and after the application deployment to insure the highest level of customer support. Mr. Hlasnicek creates and maintains an open dialog with the customer and encourages them to share feedback. He works with the project manager and the development staff to identify areas of improvement.



Mary Farrell

511 Platform Executive Sponsor

Education

Bachelor of Science, Mathematics; St. Peters University, Jersey City, NJ;
Graduate Studies in Operations Research; Steven's Institute of Technology,
New Jersey; and
Graduate Studies in Mathematics; Courant Institute of NYU, New York.

Years of Experience

41+ years



Ms. Farrell has worked in technology since 1977 when she started her career with Bell Laboratories as a researcher, supporting new telecom developments and customer interface analysis. She moved to working for ISSS, a custom software development firm serving the insurance industry. From there, Mary moved to the U.S. Navy Exchange System where she developed and programmed their first Executive Information System followed by automating the annual \$2B budget planning process. Mary moved into the technology consulting field where she designed and programmed custom software. She has served as project manager for literally hundreds of projects. She focuses now on managing customer and business relationships, making sure client expectations are met or exceeded. Of her 35+ years working in technology, she has been involved specifically with technology for the transportation industry since 2004.

Professional Experience

Account Executive – Pennsylvania Turnpike Commission (PTC)

Mary serves as the Account Executive for the Pennsylvania Turnpike Commission (PTC). Information Logistics developed and hosts the PTC's Emergency Notification System, adaptive website, toll free Interactive Voice Response (IVR) system, traveler email subscription services, TripTalk hands-free, eyes-free mobile app as well as other applications integrated with internal PTC programs. Mary listens to the needs of agency staff, and brings these insights back to the Information Logistics team, where they have devised new/innovative methods and technologies to solve the problems. By leveraging the traveler information IVR system to be used in reverse, the PTC was able to have roving maintenance crews automatically called by the IVR. This allows crews to report actual roadway conditions safely via voice recognition services. By leveraging an operator console, a mobile app was developed that could dispatch technicians to repair roadway facilities, and track their progress until repair completion.

Account Executive – GeoTalker™ Mobile Apps

Understanding that drivers need information about their route and also understanding that access to information must be mobile-focused has been apparent industry wide. However, delivering that information to travelers in a fashion that minimized distraction was a challenge. In 2011, under Mary's direction, Information Logistics invented GeoTalker, a platform that supports hands-free, eyes-free traffic alerts via mobile apps and is interoperable across agencies and across geographic boundaries. Current



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deployments include Trip Talk for the PTC, 511PA for PennDOT, Drive Safe West Virginia for WVDOT, Safe Trip NJ for NJ Turnpike Authority/NJ DOT, and Traffic Talker England for Highways England. The app has evolved to accommodate smart work zones, truck parking, speed limit changes, beacon messaging and other V2I initiatives.

Account Executive – Pennsylvania Department of Transportation, 511PA

Mary plays a key role in the 511PA ATIS program which has been twice awarded to Information Logistics (2013 and 2018). The project included design and implementation of the mobile-focused 511PA website, traveler email subscriber services, a phone system supporting interactive voice response (IVR) and a hands-free, eyes-free mobile app with accompanying agency management console. The 511PA system continues to advance into new functions and features to facilitate traveler information services including plow-tracker capabilities, special event planning sites, and custom event-driven IVR. The mobile app is in an evolution toward more rapid delivery of micro-localized conditions, with advancements working to bridge the gap as we move toward connected vehicles.

Senior Project Manager – HELP/511PAConnect

511PAConnect is Pennsylvania's implementation of revolutionary development for ATIS. In a cooperative effort with PTC, PennDOT, the Pennsylvania Emergency Management Agency and the PA State Police, Mary worked to very rapidly design and implement this new, two way communications tool for travelers trapped in long-duration queues on the highway. This FEMA tested and approved product has been in use since 2016 in Pennsylvania, and is currently being launched with NJDOT, GDOT, and MDSHA.

Leadership for Innovations

In addition to the new technologies devised by Information Logistics, Mary encourages the team to think innovatively. Under her leadership, the company has developed:

- A highway emergency alerting platform; an automated internet radio station product;
- A tolling app that can be used by drivers with no transponder and which can be used by cash-paying customers (those who are underbanked or who choose not to use credit cards); and
- A new AI program that will soon have initial testing at one or more agencies.



Casey Krout

511 Platform Technical Support - Database and Data Interfaces

Years of
Experience

20+years



Casey Krout has been a database designer and programmer since 1998. The base to any interactive program or app often involves a database and related programs, and Casey has designed more than 100 web-based interactive programs/sites. His first work in transportation was in 2004 when he began working on the Pennsylvania Turnpike Emergency Notification System. His ideas to link an operations center interface with a master database that could then disseminate a consistent public message helped win two international awards for the Pennsylvania Turnpike. Casey develops using virtually all mainstream languages, databases, frameworks, platforms and operating systems in both bricks and mortar and cloud facilities. On a personal note, Casey is a Scoutmaster who is a merit badge counselor for computers, digital technology, and programming.

Professional Experience

- **511PAConnect** – Casey created the GIS interfaces for the 511PAConnect program so that operations staff could easily draw a designated impact area for a trapped queue situation, and have the system automatically generate the corresponding shape file that is used by PEMA to issue an IPAWS alert to impacted travelers and residents. He was responsible for building the interface with PEMA;
- **GeoTalker™** – Casey developed the manual alert interface for GeoTalker mobile applications, including DriveSafe WV. With this interface, alerts pertinent to static geo-located events can be entered and then announced to travelers when they get near the specified geolocation. He has adapted this interface to accommodate speed limit changes, runaway truck ramps, truck parking data, and moving work zone announcements;
- **Pennsylvania Turnpike Commission (PTC)** – The ability for the Pennsylvania Turnpike Commission to enter traffic event information into the ENS system was programmed by, and has been enhanced with multiple upgrades by Casey. Casey has been the primary programmer for interfacing this system with a number of third party data feeds including NOAA, INRIX and WAZE. He has also created portals for construction managers to enter lane closures, and then to pass this information to other systems that red-flag conflicting planned and unplanned closures. Casey develops APIs for accepting data and for delivering data. He has written the databases and programs that generate data feeds for the PTC to provide to the public. Casey also developed and maintains the toll calculator and the over dimensional truck permitting programs for the PTC;



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- **Pennsylvania 511 System** – Casey was responsible for creating the web map and all the web map layers for the 511PA system. A key challenge for the system was to accept single video streams from each camera and securely reflect these streams to the public, and Casey developed the programming that made the video reliably delivered to PCs and mobile devices. As additional enhancements were requested, Casey designed and built the plow-truck tracker data interface and GIS layers. His final product is a dynamic, interactive plow truck layer that changes views at different zoom levels. Casey's ability to manage and display GIS data was instrumental in this implementation.



Matt Farrell

511 Platform Technical Support - Mobile Apps & GIS Specialist

Education

Master of Computer Science; University of Illinois (Urbana-Champaign), Champaign, Illinois; and
Bachelor of Science in Information Systems, Minor in Management; New Jersey Institute of Technology, Newark, NJ.



Matthew Farrell has previously worked as a developer for the financial institutions Dow Jones and Vanguard, but during his past 8+ years he has been responsible for developing many innovative programs for the transportation sector. While he is responsible for the creation of the GeoTalker apps, he has also created a series of private apps which are used primarily by agency/business staff to help the organization achieve greater efficiencies and expense reductions. Matt has studied and actually developed cloud technologies. He works adeptly with systems and cloud provisioning technicians, offering guidance and devising new ways of leveraging cloud capabilities to achieve greater levels of automated provisioning making apps respond more rapidly to spiked demand.

Matt is the key person who develops geocentric advisory alert applications for both iPhone and Android that are utilized by domestic and international traffic agencies (Drive Safe WV, 511PA, SafeTrip NJ, etc.). He also provides entirely new modules and maintains major Pennsylvania Turnpike advisory-related programs. He developed traffic data processing systems for use on the back-end of the map, IVR, and mobile services which have been used for the PTC, PennDOT, VDOT and for the 511-in-a-Box product. Matt has also leveraged GeoTalker features for a connected corridor app with SUNY Avail and NJDOT.

Professional Experience

- **IVR** – Matt is the senior programmer responsible for IVR systems. Matt works closely with ILOG's Chief Innovation Officer to develop the practical implementation and integration of new technologies for IVR. Matt has developed IVR systems for traveler information, for toll calculations, for weather, and for surveys during emergencies. He has been a strong advocate of cost reduction methods for IVR systems, including SIP to SIP communications.
- **GeoTalker™** – Matt is the key person who develops geocentric advisory alert applications for both iPhone and Android that are utilized by domestic and international traffic agencies (DriveSafe WV, TRIP Talk, 511PA, SafeTrip NJ, etc.). He also provides entirely new modules and maintains major Pennsylvania Turnpike advisory-related programs. He developed traffic data processing systems for use on the back-end of the map, IVR, and mobile services which have been used for the PTC, PennDOT, and for the 511-in-a-Box® product.
- **Pennsylvania Turnpike Commission (PTC)** – Matt developed several systems for various aspects of central management, including an integration of website credit



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card payment processing, modules of the emergency notification system, human resources management system, SCORE commissioner secure document sharing, and others. His work to date has given him a clear understanding of what it takes to integrate tolled and non-tolled agencies into a single, cohesive ATIS;

- **Virginia DOT** – Matt developed the mobile apps for the I66 and I64 dynamic, congestion based tolling;
- **Distributed Systems** – Developed a distributed storage cloud system with socket programming, hash-based indexing for storage selection and rudimentary bloom filters for retrieval;
- **Advanced CS Research** – Conducted a usability and enhancement analysis on the Julia programming language to offer insight into current usage patterns of popular functions and syntax in Julia;
- **Advanced Data Management** – Created a new index type for MongoDB (an R-Tree for n-dimensional polygons) and partially integrated it with the MongoDB source for research analysis.



John L. Farrell, MPA, PMP**511 Platform Implementation Manager - 511 Platform O&M Support Lead****Education**

Master of Arts in Criminal Justice; Temple University, Philadelphia, PA;
Master of Arts in Security Studies (Homeland Defense & Security); Naval Postgraduate School, Monterey, CA;
Master of Public Administration; Villanova University, Villanova, PA; and
Bachelor of Arts in Political Science; Villanova University, Villanova, PA,

Certifications

Project Management Professional; Project Management Institute; and
PMP Number: [REDACTED] Project Management Institute.

John's tenure in the US Marine Corps (2000-2007) and local government (2005-2014) comes with an unrivaled knowledge of management practices for the public sector and how to apply them for an efficient implementation. Having served as a Deputy Managing Director for the City of Philadelphia, John is an expert at developing and executing cross-agency and cross-departmental projects. At the City, John helped coordinate the delivery of city services in high-crime communities, managed a budget in excess of \$20 million, oversaw the administrative functions for the Managing Director's Office, and was frequently assigned to integrate new programs in city operations. John's passion for technology, coupled with his in-depth knowledge of Information Logistics products makes him an ideal project manager for this assignment. He has overseen the implementation of mobile applications for the New Jersey DOT (CV pilot project), Illinois Tollway (pilot program), the North Texas Tollway Authority (TrafficMate), as well as managed traveler information systems like 511PA and HELP/511PAConnect. John brings a wealth of organizational government project management experience, as well as a passion to use technology to facilitate emergency preparedness and generally communicate with the local community.

Professional Experience**Project Manager – HELP / 511PAConnect**

John is the lead for implementations of the Highway Emergency Linked Platform (HELP), an innovative system for establishing two-way communications during trapped queue events. John was heavily involved in the initial requirements gathering, overseeing development, and training agency staff. He has overseen implementations in Pennsylvania, New Jersey, and Georgia, and is currently working with Maryland and other states to improve their emergency communications capabilities.

Project Manager – Pennsylvania Department of Transportation, 511PA

John is the project manager for 511PA, and during his time he has overseen the system's expansion. John has managed a host of upgrades, including: a major update of the 511PA mobile application; an expansion of winter service information that includes tracking individual plow trucks via the 511PA website; the development of project-specific, adaptive websites with real-time traffic data; the creation of custom sites for special events including the 2015 Papal visit to Philadelphia and the 2016 Democratic



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National Convention; and a host of commercial vehicle related services. John is currently overseeing the 511PA's IVR transition from a traditional system into an artificial intelligence-based system that responds to natural language requests.

Project Manager – NJDOT/SUNY, Connected Corridor Mobile Application

John was the lead for ILOG in the development of a pilot connected corridor mobile application for NJDOT. In conjunction with researchers from the State University of New York (SUNY) at Albany, John led the ILOG build of a mobile app that collected data to assist commuters in determining whether they should drive or take mass transit to a busy area of central New Jersey. The app successfully incorporated data for traffic/travel times, and compared them with real-time information for trains and busses. The app also introduced the concept of a virtual DMS, which allowed travel times for custom routes to be played at any point in the state, based on the DOT's preferences.

Project Manager – Pennsylvania Turnpike Commission, via AECOM

As part of a larger contract with AECOM, Information Logistics was hired to build a custom project management tracking site for traffic operations projects. John served as the project manager for this complex build. The site incorporates user-friendly interfaces with a robust back-end system to manage and report progress on large, multi-year projects.

Military Experience

United States Marine Corps Reserve (2000 – 2007)

- E-6 / Staff Sergeant; and
- Combat tour in Operation Iraqi Freedom.



Beth Abruscato, MBA, PMP

511 Platform QA/QC Lead

Education

Master of Business Administration, with a concentration in MIS; Temple University, Philadelphia, PA; and
Bachelor of Science, Chemistry; University of Delaware, Newark, DE.

Certifications

Project Management Professional; Project Management Institute; and
PMP Number: [REDACTED] Project Management Institute.



Since 2000, Beth has helped assure that quality products are accompanied by quality business and administrative management. Beth is also responsible for testing and documentation. Under her guidance and direction, implementation testing for the 511PA project was thorough and smooth, helping the short time-frame launch to happen with confidence that the deployment would work as expected. Beth also serves as project manager for the many ad-hoc custom programming projects that are requested by both PennDOT and the PTC, and assures correct functionality through her testing procedures.

Professional Experience

Project Manager – Pennsylvania Turnpike Commission (PTC)

Since 2012, Beth has been the lead project manager for Information Logistics on most work for the PTC. Her scope of projects includes the development of websites, management consoles, emergency notification systems, procurement administration, human resources systems, secure communications channels for commissioner planning, and managed performance metrics. She has overseen the technological implementation of many high-visibility projects, including the original Trip Talk implementation, the redesign of www.paturnpike.com, several cashless tolling initiatives, Operation Orange Squeeze, internal safety initiatives, PTC University, All Ideas Matter, and a host of others. Beth's experience with the PTC gives her a unique knowledge and perspective of transportation operations.

Project Manager – Pennsylvania DOT (PennDOT)

Information Logistics has sub-contracted to other vendors on projects for PennDOT. On several of these, Beth has been the project manager. She has managed web and mobile app development projects, including work for the State Transportation Innovation Council, and the implementation of a survey tool that was used to assist in garnering feedback on capital project plans for the Commonwealth. Her projects were known for delivering high degrees of quality, with intuitive, user-friendly interfaces.

Manager – Admin and QC Management

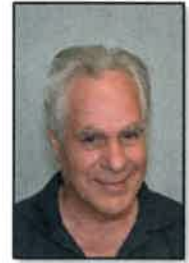
Beth and her QC team make sure that testing is done before passing the initial product for customer review and oversees test plan completion. She works closely with the project manager so that administrative and billing tasks are completed, documented and billed appropriately.



Rudy Kappra

511 Platform O&M Support Lead

Education	Ongoing certifications for Microsoft and Security programs; Control Data Institute, Philadelphia, PA, - Associates Degree in Computer Science; and Temple University, Philadelphia, PA - Studies in Communications and Rhetoric.
Years of Experience	30+ years



Rudy Kappra is the key to our systems administration section. Whether he is provisioning additional servers or managing our 24X7 support, Rudy is always ready to support our network, our systems, and our clients. His 30+ years of experience in technology (specifically in the transportation industry since 2004) make him one of the most effective system engineers in the industry.

Professional Experience

- **Cloud Computing - Manager** – Extensive experience with cloud computing on both VMware and Amazon AWS including capacity planning, server builds, acquisitions, and network infrastructure to deploy and manage 200+ servers on a global scale. Capacity planning and implementing VOIP/SIP protocols for provisioning 511PA IVR.
- **Secure Systems** – Responsible for provisioning Linux (Debian/Ubuntu/Centos, Qmail, Nagios, database, DNS) - Windows (Server 2008, 2012, exchange, AD, Web Database) on both AWS and VMware infrastructures. Design, implementation, configuration, management and backup initiatives for MS SQL Database Mirror as well as distributed MySQL clusters for both 511PA and Information Logistics GeoTalker™ applications.
- **Performance Guarantee** – Configuration, writing plugins for monitoring software for integration with NAGIOS and provisioning and monitoring streaming camera servers (WOWZA) to maintain multiple SLA requirements across diverse platforms and applications.
- **Clients** – Rudy and his team play an important role in every deployment, including all GeoTalker™ mobile applications. Rudy is responsible for setting up the infrastructure, communications, security and monitoring for each implementation.

Roman Sokolov

511 Platform User Experience Support - Web, App Layout and Design

Education

Associates Degree in Multimedia Design and Animation; Camden County College, Blackwood, NJ; and
Studies in Programming – Visual Basic, SQL, Oracle, HTML; CSC Institute.

Years of Experience

18+ years



Roman has more than 18 years of experience in web design, graphics, and animations. From web page to mobile applications, Roman produces creative and intuitive user interface designs, including those seen on the 511PA website and GeoTalker™ mobile apps.

Professional Experience

- **Pennsylvania Turnpike Commission (PTC)** – Roman has done extensive design work for the PTC on a variety of projects. His design style and influence can be seen throughout www.paturnpike.com, including the main style sheet. He has also done project-specific work, ranging from iterations of Turnpike Mike, to animated videos for cashless tolling communications, to providing the web design to some of the Operation Orange Squeeze websites. He's also the force behind several of the PTC website's holiday and promotional animations.
- **GeoTalker™** – Roman was the driving force behind the re-design of the GeoTalker mobile apps. DriveSafe WV, Trip Talk, 511PA, and the others have received extensive modifications, and their user-friendly interface is there thanks to Roman's ingenuity. While each of the apps have similar layouts, Roman ensured that each had a look and feel that matched each agency's style and preferences.
- **Pennsylvania DOT** – Roman has also been responsible for high visibility projects with PennDOT, including: the evolving layout of www.511pa.com, the presentation of new features (like plow truck tracking) on the web map, and the implementation of an interactive survey tool that was used to assist in garnering feedback on capital project plans for the Commonwealth.
- Roman designs using a wide variety of tools, including: HTML5, JavaScript, Flash, Action Script, jQuery, AJAX/XML/JSON, CreateJS, HTML5 Canvas, Bootstrap, Adobe Suite (Photoshop, Illustrator, Premier, InDesign, After Effects, and Dreamweaver), Quark, Autodesk 3DS Max, and Microsoft Visual Studio.



Brent Isenberg

Video Account Manager

Education	Masters Business Administration – University of Maryland; and B.S. Mechanical Engineering – Valparaiso University.
Years of Experience	30+ years



Overview

Mr. Isenberg has over 30 years of experience in engineering, business development and client management in the Power, IT and ITS industries. As a Senior Relationship Manager at Skyline, Brent is responsible for maintaining and growing relationships with key DOT accounts around the country. His job is to fully understand the customer's stakeholders, operational environment, technical architecture and business goals. Brent is the main point of contact for DOT customers and is aware of all maintenances, upgrades, system utilization data and other important factors for each of his client. He has been directly involved with the development of Skyline's video sharing market since 2013 and has been responsible for six regional/statewide video sharing network deployments as well as the sale and development of other key products such as Skyline's mobile video units and the video wall product.

Professional Experience

(August 2013 – Present)

Business Development

- Mr. Isenberg has been responsible for business development, relationship management and thought leadership for the Skyline video product group at Skyline. Brent has been involved in the sale and deployment of statewide video sharing networks for the states of South Carolina, Tennessee, Michigan and most recently Iowa. He has a thorough understanding of the technical architecture and operational use cases that DOT's utilize for Skyline's video products. As relationship manager, Brent is responsible for being the main contact for customers to discuss system status updates, upgrades and reporting as well as helping customers achieve their business and operational goals with all of Skyline's products and services.

Prior Professional Experience

Director Marketing and Business Development (December 2011 – August 2013)

- ITS America is a 501(c)3 non-profit organization and is the leading advocate for deployment of Intelligent Transportation System (ITS) technologies that improve the safety, security and efficiency of the nation's surface transportation system.

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My position focused on bringing sound private sector business principals to the marketing and meetings group, resulting in the following accomplishments:

- Managed \$1.8M annual meeting budget, including internal resources and external contracts. Managed the logistics and meeting planning and the marketing and sales activities.
 - Led the effort to revamp multiple programmatic and financial elements of the meeting resulting in a 50% increase in bottom line revenue from 2012.
- Led the marketing and sales outreach to ITS community, including state and local governments and private companies to support industry events through sponsorship and participation.
 - Sponsorship revenue increased 35% due to right-sizing price to benefits and product mix.
 - Public sector attendance increased 75% due to restructured registration model, program and significantly increased marketing and outreach plan; and
 - 11% increase in exhibiting companies.
- Development of new regional meetings model focused on topical based meetings. The new model demonstrates large public and private demand and 10-1 increased ROI for ITS America when compared to larger national meetings;
- Developed collateral supporting annual and regional meetings and general association services; and
- Leading efforts to implement document and project management software that will lead to significantly streamlined communications and task delivery.

LogicTree Corporation, National & Regional ITS Sales Director, (March 2004 – December 2011)

- Led sales of ITS Traveler Information Systems for 511 (Traffic) and Transit Information Services for state and local governments on a national and regional basis;
- Managed multi-company project proposal teams, determining project approach, messaging and strategy. Primary proposal writer for all major opportunities in the company, ranging from \$.5M to \$18M in contract value, leading to a recognized market leadership in traveler information services;
- Managed product/service development and positioning for automated services based upon market research and a thorough technical understanding of system design;
- Authored and conducted frequent industry presentations and webinars to national and regional organizations, expanding the market knowledge and name recognition for LogicTree and driving sales pipeline; and
- Main contributor and author for company collateral, email and mailing campaigns and website content.



Michael Branan

Video Management Lead and Video Management Deployment



Education	Bachelor of Science in Information Systems (BS) with a concentration in Security, Johns Hopkins University Associates of Science in Information System Security (AS), Anne Arundel Community College, Magna Cum Laude
Certifications	AWS Certified Solutions Architect – Associate; SAFe 4.0 Program Consultant (SPC4); Juniper Networks Certified Specialist, Security (JNCIS-SEC); Juniper Networks Certified Associate, Junos (JNCIA-Junos); JNCIA-ER; JNCIA-SSL; Juniper Networks Certified Associate, WX (JNCIA-WX); and Cisco Certified Network Associate (CCNA).
Years of Experience	15+ years

Mr. Branan has over 15 years of experience in network engineering and software development. He is responsible for leading the software design, implementation, and testing of the Skyline product line and custom software development provided by Skyline.

Mr. Branan has experience designing large scale video distribution systems for multiple state departments of transportation across the country providing access to live traffic cameras to millions of public users. In addition, he has designed several video interoperability solutions that allow separate agencies to securely share video with one another without requiring them to change their existing video management systems.

His work in the video interoperability field has ranged from consulting for a statewide video sharing solution to creating focused products that serve state agencies and first-responders, allowing them to more effectively carry out their duties and more effectively serve the public.

Professional Experience

April 2007 – Present)

Skyline Network Engineering, LLC d/b/a Skyline Technology Solutions, Network Engineer

Mr. Branan is responsible for supporting network and systems related requirements for Skyline customers. He performs security vulnerability assessments and develops detailed analysis and reports of findings. He also provides network and systems support for a large ISP / datacenter in Baltimore city.

Mr. Branan leads a team of developers and testers who are responsible for the continuous evolution of the Skyline products and services and will ensure the implementation for MDOT follows the latest revision and design criteria.



RESUME

Prior Professional Experience

Layer8 Consulting, Network Engineer

As a Network Engineer Mr. Branan provided various security and network consulting services to companies in the Baltimore Washington area. He provided cross-vender testing, analysis, and recommendations for custom WAN Accelerator solutions. Tested WAN accelerator equipment from Juniper, Cisco, BlueCoat and RiverBed. Assisted in the deployment of WAN accelerators across a global network which include Data Centers in both the US and Europe. Solution enabled server consolidation, which resulted in a significant reduction of IT support costs. Performed security vulnerability assessments and provided detailed analysis and reports of findings. He worked with the customers IT staff to design a new global IP scheme; set forth a migration plan to new MPLS based backbone. In addition, he also designed, implemented, and documented a node configuration and IP management solution.

DataPoint, Network Engineer

As a Network Engineer Mr. Branan maintained the WAN network which included multiple upstream and downstream BGP peers and used IBGP and OSPF within the autonomous system. He monitored DataPoint's network using SNIPS, Syslog, and SNMP. Designed, tested, documented and deployed custom managed firewalls, VPNs, servers, routers, and SAN backup solutions. He developed product training material to be used by the Network Operations Center (NOC). Mr. Branan developed and implemented security policies for the internal office network. He maintained Honeywell Closed Circuit Video (CCTV) monitoring system. He maintained HID ProxCard system and access lists. Mr. Branan also maintained DataPoint's Email Servers and shared web hosting servers (both UNIX and Windows). He generated custom security, billing, and PBX reports as needed and provided Tier 3 support to the Network Operation Center.

Mr. Branan was also awarded as Employee of the Month for September 2005. In addition, he was recognized for consistently going "Above and Beyond" normal duties.



Matt Szostek

Video Management Maintenance



Education	Towson University – Computer Information Systems / Minor, Economics
Certifications	<p>Production software deployments (Java, WebLogic, WebSphere, etc);</p> <p>SDLC models of Agile/Scrum, Waterfall, CI/CD, and RAD;</p> <p>Apache configurations;</p> <p>Monitoring and reacting to system alerts;</p> <p>Systems architecture and potential failure points;</p> <p>Familiarity with Cloud systems; AWS, AOL, Google Drive, etc;</p> <p>Educated/experienced in fundamentals of OOP using Java, C++, C#, .NET, PERL, PL/SQL, and VB; Source code editors (emacs, eclipse, VI);</p> <p>Development through HTML & XML as well as DOS/UNIX shell scripting; and JavaScript for ad tags and ServiceNow system deployments.</p>
Expertise	<p>Operational Duties: Production software deployments (Java, WebLogic, WebSphere, etc), SDLC models of Agile/Scrum, Waterfall, CI/CD, and RAD, Apache configurations, Monitoring and reacting to system alerts, Systems architecture and potential failure points, Familiarity with Cloud systems; AWS, AOL, Google Drive, etc.</p> <p>Operating Systems: Effective with Windows, Mac OSX, and UNIX/LINUX, Windows – 3.x, 95/98/2000/ME NT, XP, Vista, 7/8, 2003/2008 Server, UNIX/LINUX – Solaris SPARC, Redhat, Cent OS.</p> <p>Tools & Applications: Database management & tools: Oracle 9i/10g/11g, IBM's DB2, MS Access, & MySQL, Productivity: Google Docs (Drive), MS Office, MS Visio, Acrobat, Ticketing systems: JIRA, ServiceNow, ZenDesk and Remedy Web debugging tools: Fiddler, Wireshark, and Firebug.</p> <p>Engineering: Educated/experienced in fundamentals of OOP using Java, C++, C#, .NET, PERL, PL/SQL, and VB, Source code editors (emacs, eclipse, VI), Development through HTML & XML as well as DOS/UNIX shell scripting, JavaScript for ad tags and ServiceNow system deployments.</p> <p>Hardware Support: Windows PC/Server & SUN maintenance, upgrades, repair, and troubleshooting, Basic network troubleshooting, analysis, and component/topology knowledge, Management of devices at remote data centers.</p>
Years of Experience	10+ years

Mr. Szostek is a dedicated technology professional with 10 years of experience in Operations, Tech Support, and QA practiced in all SDLC aspects of production applications from design to post-release, including product sunset. He has a Passion for continuous improvement and operational excellence through the creation of technology efficiencies allowing proactive enhancements.

Mr. Szostek is resourceful and organized multi-tasker adaptable to the rapid introduction of new technologies and cited by executive management for excellent oral and written communication ability. He also practiced in core management disciplines of ITIL including Incident, Change, Request, Reporting, and Problem.

Professional Experience

(November 2014 – Present)



RESUME

Skyline Technology Solutions, Operations Manager

Mr. Szostek is Skyline's Product Operations Manager with his responsibilities including, managing a team of 6, building and maintaining relationships across Skyline's external DOT clients, oversees support of external clients on Skyline software/hardware in North America. He also is involved in recruitment and training of new employee team members. He applies ITIL policies in relation to Incident, Service, Knowledge, RCA, and Post Mortem management and serves as the steward in the role of Video Service Owner.

He composes weekly status and staffing reports regarding the state of operational wellness across Skyline product customers, review, edits, and enhancements of existing SLAs and writes Executive level (CEO, CTO, EVP's, etc..) communications regarding high visibility issues. He also authors customer documentation including infrastructure/network diagrams, operating procedures, and systems and provides reporting and analysis of incidents and service work.

He also maintains relationships with Skyline's local and nationwide clients, procures new hardware and stewardship of hardware installed at remote data center(s) for both internally hosted and external clients and reviews Change Management requests, defines policy, and participate in CCB review meetings. Mr. Szostek also is responsible for maintaining and tracking available data center space and represents Skyline as a Senior representative at Summit Team meetings. Mr. Szostek has supplemented his knowledge through coursework, on/off site training seminars, and self-improvement books.

Prior Professional Experience

Advertising.com/Aol, Sr. Tech Manager

Mr. Szostek was the Sr. Tech Manager, for the Advertising Technical Support division. As the Sr. Technical Manager, he built and maintain relationships across AOL's internal advertising leadership stretching company verticals and international boundaries and oversee support of external/internal clients on Advertising products in North America, Europe, & Asia. His responsibilities included adherence to requirements for legal, regulatory, information security, and compliance.

He formed and managed an international team of 13 employees across 5 offices, 4 time zones, and 3 continents and was responsible for shepherding the safe and accurate flow of Billions transactions/day through the various ad systems utilizing a Hadoop/Big Data apparatus.

Advertising Technical Support, Associate Manager

Mr. Szostek was promoted to management after six months and granted supervision of three direct reports. His duties included, managing daily operations, providing expertise to external/internal clients on all products internationally. He also provided Tier 2 escalation support to internal customers, as well as members of Technical Support and guided members of Technical Support with business communications as operational issues arise.





4.3.1.11 *Copies of any staff certifications or degrees applicable to this project*

Team Q-Free staff certifications can be found in the page to follow.

Project Management Academy

has granted

CHRISTOPHER BUTLER

with this

Certificate of Completion

*In recognition of the successful course completion
on this tenth day of August, [REDACTED]*

in Norfolk, VA

and earned 35 PDU/Contact Hours for

PMP® Exam Preparation Course



John Smith, PMP, SCPM
Chairman of the Board

PMI REP #: [REDACTED]

Course ID: [REDACTED]

Syracuse University

Atica College

To all who read these presents, Greeting

Whereas

Colleen J. Cleary

*has honorably completed the studies and duties prescribed by the Faculty,
therefore, the Trustees of the University by the authority vested in them
have conferred the degree of*

Bachelor of Science



*upon the candidate together with all the rights, privileges, honors, and marks
of distinction which everywhere pertain thereto.*

Whereof let this Diploma with the seal of the University bear witness.

Given at Syracuse, in the State of New York, this twentieth
day of May, [REDACTED]



Loring B. Baker
President, Atica College of Syracuse University

William A. Eggen
Chancellor

THE · PENNSYLVANIA · STATE · UNIVERSITY

COLLEGE · OF · SCIENCE

BY · AUTHORITY · OF · THE · BOARD · OF · TRUSTEES · AND · UPON
THE · RECOMMENDATION · OF · THE · FACULTY · AND · OF · THE · SENATE
HEREBY · CONFERS · UPON

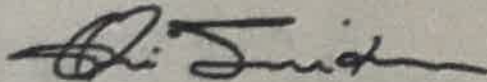
PAUL ANTHONY HLASNICEK

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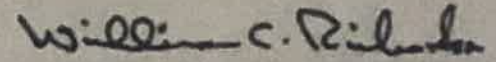
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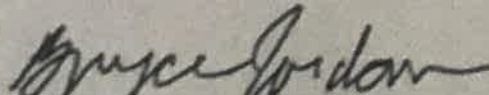
IN · RECOGNITION · OF · THE · COMPLETION · OF · THE · MAJOR · IN
MATHEMATICS

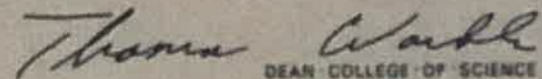
IN · TESTIMONY · WHEREOF · THE · UNDERSIGNED · HAVE · SUBSCRIBED
THEIR · NAMES · AND · AFFIXED · THE · SEAL · OF · THE · UNIVERSITY · THIS
MONTH · OF · [REDACTED]


PRESIDENT OF THE BOARD OF TRUSTEES




EXECUTIVE VICE PRESIDENT
AND PROVOST OF THE UNIVERSITY


PRESIDENT OF THE UNIVERSITY


DEAN COLLEGE OF SCIENCE



Certificate of Achievement

This certifies that

Paul Hlasnicek

has met the required standards for completion of the

Dale Carnegie® High Impact Presentations

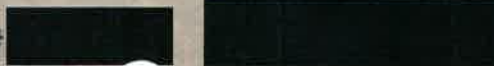
and is hereby awarded 1.6 Continuing Education Units (CEU's)

as set forth by Dale Carnegie & Associates, Inc.



DALE CARNEGIE®
TRAINING

Class #



A handwritten signature in black ink, appearing to read "Rt. Handel".

Chairman of the Board
Chief Executive Officer



The Johns Hopkins University

*Upon the recommendation of the Faculty of
The Carey Business School
has conferred upon*

Michael Robert Branan

the degree of
Bachelor of Science
Information Systems

*with all the rights, honors and privileges appertaining thereto.
Given under the seal of the University at Baltimore, Maryland*

on



James H. ...

Ronald D. ...

David P. ...

The Johns Hopkins University

[Candidate Login](#)

Michael Branan

AWS Certified Solutions Architect - Associate

Active



Towson University

*Upon the recommendation of the Faculty
and by the Authority of the Board of Regents
of the University System of Maryland*

Matthew Martin Szostek

is hereby granted the degree of

**Bachelor of Science
Computer Information Systems**

*with all rights, honors and privileges thereunto appertaining.
Given under the seal of Towson University in Maryland
this nineteenth day of [REDACTED]*




Clifford M. Kendall
*Chairperson of the Board of Regents
of the University System of Maryland*
WE Kivwan
Chancellor



Richard A. Cant
President of the University

James T. Brennan
*Provost and
Vice President of Academic Affairs*

Towson University
The Alex and Mildred Fisher College of Science and Mathematics

 ITIL PRINCE2 VSP M2R P3M3 PSO MoP MoV

This is to certify that

Matthew M. Szostek

Has achieved the

**ITIL® Foundation certificate in IT Service
Management**

Effective from

■■■■■

Certificate number

■■■■■

Registration number

■■■■■



Project Management Institute

THIS IS TO CERTIFY THAT

John L. Farrell

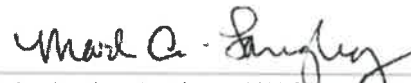
HAS BEEN FORMALLY EVALUATED FOR DEMONSTRATED EXPERIENCE, KNOWLEDGE AND PERFORMANCE
IN ACHIEVING AN ORGANIZATIONAL OBJECTIVE THROUGH DEFINING AND OVERSEEING PROJECTS AND
RESOURCES AND IS HEREBY BESTOWED THE GLOBAL CREDENTIAL

Project Management Professional (PMP)®

IN TESTIMONY WHEREOF, WE HAVE SUBSCRIBED OUR SIGNATURES UNDER THE SEAL OF THE INSTITUTE



Caterina La Tona • Chair, Board of Directors



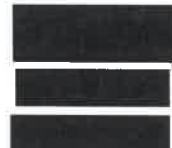
Mark A. Langley • President and Chief Executive Officer



PMP® Number:

PMP® Original Grant Date:

PMP® Expiration Date:





4.3.2. Mandatory Qualification/Experience Requirements

The following mandatory qualification/experience requirements must be met by the Vendor as a part of its submitted proposal. Vendor should describe how it meets the mandatory requirements and include any areas where it exceeds the mandatory requirements. Failure to comply with mandatory requirements will lead to disqualification, but areas where the mandatory requirements are exceeded will be included in technical scores where appropriate. The mandatory qualifications/experience requirements are listed below.

4.3.2.1 References (minimum 3, maximum 5 references) (no WVDOH references permitted), including name, agency, address, phone and email.

Q-FREE REFERENCES

Pennsylvania Department of Transportation (PennDOT) ATMS and 511 Platform Deployment

Ryan McNary
Manager
Bureau of Maintenance & Operations
1310 Elmerton Ave
Harrisburg, PA 17110
T: 717-346-4404
Email: rymcnary@pa.gov

Scott Benedict
Functional Architect – Consultant
Bureau of Maintenance and Operations
400 North Street 6th Floor, Harrisburg, PA 17120
T: 717-783-1903
Email: c-sbenedic@pa.gov

Virginia Department of Transportation (VDOT) Northern Virginia ATMS/VDS and Data Gateway Deployment / Statewide ATMS Implementation

Ken Earnest, P.E.
Assistant Division Administrator
Virginia Department of Transportation
1401 East Broad Street,
Richmond, VA 23219
T: 804-786-9743 / 804-263-4867 (cell)
Email: Ken.Earnest@vdot.virginia.gov

John Shaw, Transportation Technology Manager
VDOT Central Office
1401 E. Broad St.
Richmond, VA 23219
T: 804-786-2839
Email: John.shaw@vdot.virginia.gov



Iowa Department of Transportation (IowaDOT)

S. Sinclair Stolle, P.E.
Traffic Management Systems Engineer
Iowa Department of Transportation
800 Lincoln Way, Ames, IA 50010
T: 515-239-1933
Email: sinclair.stolle@iowadot.us

ILOG REFERENCES

Pennsylvania Turnpike Commission

Lorie Gray
700 S. Eisenhower Blvd.
Middletown, PA 17057
T: 717-831-7720
Email: lgray@paturndpike.com

SKYLINE REFERENCES

Maryland State Highway Administration (SHA)

Name: Rick Dye, CHART Systems Administrator
707 North Calvert Street
Baltimore, Maryland 21202
T: 410-582-5619
Email: rdye@sha.state.md.us

4.3.2.2 Descriptions of past projects completed entailing the location of the project, project manager name and contact information, type of project, and what the project goals and objectives were and how they were met. (minimum 3 projects completed/in operation in the past 5 years)

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION (PENNDOT) ATMS DEPLOYMENT

Dates:

September 2012 - Present

Project Manager:

Colleen Bond

Description of Project:

In 2012, Q-Free was selected to design and implement the ATMS and 511 Platform for PennDOT around OpenTMS. The project began in September 2012 and over the course of three deployment phases, Q-Free transitioned all 11 districts over to the new statewide ATMS.

The ATMS platform project includes services to design, develop, implement, test, maintain, and support a single statewide platform to promote coordinated traffic management and operations across the Commonwealth. The project has deployed to all the Pennsylvania regions achieving their goal of a statewide

system. The initial contract completed on time and on budget at the end of August 2017. We are currently in a maintenance period. The system supports intelligent responses to incidents and planned events, shared control of all existing and future ITS field devices, data fusion and travel time computation, and integration with existing PennDOT systems, business partners, and adjacent state systems. In addition to managing the ATMS deployment, the project has also included various task orders, such as an ICM module, Signal module with MAXVIEW integration and other scheduled enhancements.

The PennDOT ATMS platform is a fully centralized web-based solution accessible by PennDOT staff across the state. The system is hosted at the PennDOT Server Farm in Harrisburg and maintained by PennDOT IT Staff who are responsible for providing the hosting platform, handle all installations, and provide tier 1 support. OpenTMS controls over 1600 ITS field devices with modules deployed for DMS, highway advisory radio, traffic detector stations, and CCTV. OpenTMS is integrated with the statewide condition reporting system (RCRS) to coordinate planned event and incident management. Events are managed within RCRS, but operators use functionality in OpenTMS for resource planning (device scheduling) and rules-based automated incident response. The OpenTMS travel time engine generates statewide travel times that are displayed on message boards.

Enhancements to the system include a freeway service patrol log, data fusion hub for EZPass tag readers, and an ICM module that will be used by District 6 to better manage congestion associated with major construction projects along I-95 and I-76. Along I-76 the system monitors traffic and provides automatic queue detection and response alerting driver of congestion ahead. With the addition of the new Signal module, configured timing plans can be activated in response to incidents or work zones for a more efficient flow of traffic.

VIRGINIA DEPARTMENT OF TRANSPORTATION (VDOT) NORTHERN VIRGINIA ATMS AND DATA GATEWAY DEPLOYMENT / STATEWIDE ATMS IMPLEMENTATION

Dates:

2002-Present

Project Manager:

Dan Skiffington

Description of Project:

In September 2016, Q-Free was awarded a sole-source contract by VDOT to develop their statewide ATMS platform around OpenTMS after a significant contract default by one of VDOT's service providers. This ATMS project has a very aggressive schedule and highly complex business requirements. The Statewide ATMS project includes services to design, develop, implement, test, maintain, and support the statewide platform. The VDOT Statewide ATMS is a fully centralized web-based solution accessible across the state (5 TMCs operating off a centralized database structure). The system is implemented on a high-availability, fully redundant architecture, including a secondary hosting site (in Atlanta, GA), designed for 99.99% annual uptime. Q-Free is the process of transitioning VDOT's ATMS solution from disparate regional systems to a fully integrated statewide system and decommissioning several legacy systems (Parsons, I-66 corridor system and Kapsch's, Hampton Roads System, Dynac) and migrating other external applications previously built by Q-Free (including statewide Condition Reporting System and Lane Closure Management System) by integrating their functionality into OpenTMS. In 2017, Q-Free has transitioned 3 out of 5 TMCs onto the statewide platform

and is on track to transition the remaining 2 regional centers in 2018. Q-Free provides on-site service assurance managers at each regional center, as well as the 24/7 Tier 2/Tier 3 on-call support. Several of VDOT's Statewide ATMS enhancements will be included in I-66 OTB's ATMS solution.

Q-Free has been providing ATMS services to VDOT since 2002 having deployed OpenTMS at the Richmond TMC in 2002, Staunton in 2004, Salem in 2005, and Northern Virginia (Fairfax McConnell Public Safety and Transportation Operations Center) in 2009. Q-Free has provided numerous system integrations and deployed additional statewide systems including the Lane Closure Advisory Management System (LCAMS) and statewide condition reporting system (VaTraffic) and 511 integration working with Iteris.

- DMS (Fixed and portable);
- Closed Circuit Television (CCTV);
- Video Wall Control;
- Traffic Sensors;
- Truck Parking;
- Work Zone Management;
- Congestion Pricing Interface;
- Incident Management and Response;
- Roadway Weather Information System (RWIS);
- 911/ Computer Aided Dispatch (CAD) Integration – Virginia State Police;
- Integration with RITIS (Maryland); and
- Data Warehousing and Reporting.

Table 4 – Northern Virginia Enhancement Projects

VDOT Enhancements Work	Description
Gate Control System	Q-Free designed and implemented a gate module to control and manage gate groups along I-495, I-95, and I-395 in northern Virginia.
Lane Control System	Q-Free designed and implemented a lane control module to control and manage lane control signs along I-66 to support hard shoulder running.
Ramp Meter Module	Q-Free designed and implemented a ramp meter module.
I-495 Express Lanes TMC Data Integration	Q-Free created a bi-directional integration between the I-495 Express Lanes TMC data and the Northern Virginia TMC. This integration enables real-time data sharing between VDOT and TransUrban, the operator of the Express Lanes.
911/CAD Integrations	Q-Free has integrated 16 separate CAD systems from VA State Police and 911 centers across the state into our Virginia OpenTMS deployments to support statewide operations. The integration included new CAD systems in Northern Virginia over the past three years.

VDOT Enhancements Work	Description
Transportation Video Distribution (TVD) Enhancements	TVD is a statewide, integrated data warehouse. It collects and normalizes a wide range of traffic data in near real-time. Q-Free, as a subcontractor to the project, provides the backbone of the TVD system. As the integrators and managers of all TVD data, Q-Free supports all aspects of the project including the ATMS and 511 Platform (IVR/Web/Mobile), statewide data and video sharing, and revenue generation. Q-Free's role on the TVD project included deployment of a statewide data hub and travel time engine.

ILLINOIS DEPARTMENT OF TRANSPORTATION (IDOT) DISTRICT 4 OPENTMS DEPLOYMENT

Dates:

July 2009-Present

Project Manager:

Colleen Bond

Description of Project:

The 12-mile reconstruction of I-74 through Peoria and East Peoria was the largest road construction project outside the Chicago area undertaken by the Illinois Department of Transportation (IDOT). ITS technologies and strategies were planned, designed, and implemented to enhance the operations and management efficiency of the corridor, both during and after construction. In 2008, IDOT sought to integrate all field components of the Peoria area ITS, including DMS, surveillance cameras, highway/rail interface, and detector stations into a central Advanced Transportation Management System (ATMS) software package. The requirements for the ATMS solution included:

- Video and data consolidation and distribution to ITS operators and stakeholders;
- ITS data consolidation and distribution to the traveling public using DMS, an external web page with congestion maps and video images, and the media; and
- A mechanism to export incident data from the Peoria and East Peoria CAD systems for use with the ATMS software.

IDOT undertook a procurement process with extremely aggressive milestones for deploying and testing the new ATMS. Within 120 days of contract award, the contractor was expected to install the ATMS with a minimum 50% functionality for initial testing and verification. The full system was expected to be operational within ten months of contract award.

Q-Free submitted the winning solution by developing an aggressive project plan around the installation and configuration of OpenTMS Enterprise, the industry leading off-the-shelf ATMS. OpenTMS provides out-of-the-box support for all major ITS device protocols and is designed to quickly integrate with ITS field-devices including video cameras, DMS, traffic detectors, and weather stations.

Q-Free deployed a fully functional and secure system that enables DOT operators as well as system users from East Peoria Public Works, East Peoria Emergency Services, Peoria Public Works, and Peoria Emergency Services full access to system functions. The solution was built around OpenTMS Enterprise and includes a public traffic web page, incident and work zone management, and device command and control.

System Elements:

- OpenTMS Enterprise Rapid Deployment;
- 911 Integration;
- Regional ITS Systems Integration;
- Interface with Existing Video Wall;
- Traveler Information Web Site; and
- Remote Workstations Deployed at Partner Agencies.

Cost-Effective, Scalable Architecture:

- Hosted solution; and
- Fully maintained.

Support and Maintenance:

- 24x7x365 Support; and
- System Maintenance.

We are currently under Task to upgrade their OpenTMS version 7 system to our latest web-enabled version of OpenTMS. This wraps up late Spring of 2018.

ILOG EXPERIENCE

PennDOT – 511PA

The company's most comprehensive traveler information integration to date is the statewide 511PA website, IVR, subscriber services and mobile app suite, provided as Software-as-a-Service (SaaS). The 511PA system launched for the PennDOT in February of 2014 in just 76 calendar days from the NTP. Each component of the PA511 suite of services scales-on-demand to handle large increases in traffic, ranging from weather events (such as the blizzard in January 2016) to special events (such as the visit of Pope Francis to Philadelphia).

Prior to the ILOG relaunch of the 511PA site, there had been a maximum annual unique visitor count of fewer than 200,000. In the next full year after the ILOG relaunch (2015), the site had approximately 700,000 unique visitors. In 2018, the website had more than two million unique visitors. The increased usage can be attributed to making the site mobile responsive and adding new features that were useful to the public. Details of these new functions that are part of the 511PA program will be outlined in further detail in this response.

Of greater significance for the relaunched 511PA system is the impact of a major state-wide weather event and the ability of the system to respond to the increased demand. On just one day of the January 2016 blizzard (Saturday the 23rd), the website recorded more than 173,000 sessions, with almost 70% coming from mobile devices. That morning, the site was supporting nearly 1,800 simultaneous users. The following day, IVR usage

spiked to 5,433 calls - a 578% increase over the average daily call volume for 2015. The ILOG systems scaled appropriately and remained responsive throughout. The single day session record has been broken each successive year, peaking in November 2018 with a single day of over 266,000 sessions, which included 4,000 simultaneous users.

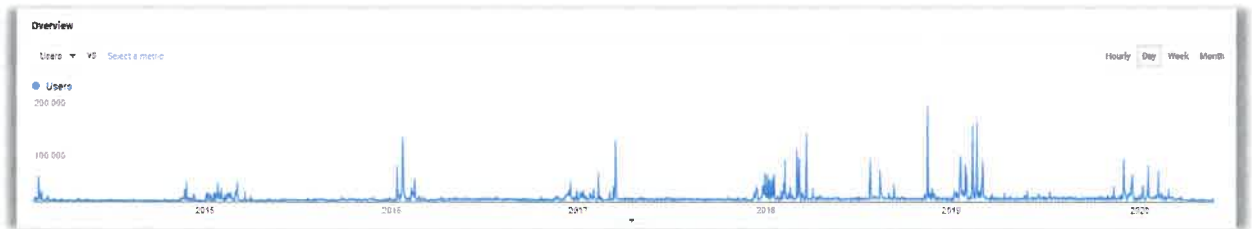


Figure 16 – 511PA Website Sessions, Feb. 2014 – May 2020

In 2018 ILOG was again awarded the 511PA contract and has been working closely with PennDOT to incorporate a multitude of new features to the system, including a traffic report approach to IVR, new tools for communicating commercial vehicle restrictions, and is currently working on integrating new data types and distribution methods for special categories of events.

The mobile app component of the 511PA Program is another hands-free, eyes-free mobile app, which uses the same GeoTalker platform used by the Pennsylvania Turnpike TripTalk app, and by all other agency GeoTalker mobile apps, including WV511 Drive Safe. Since initiation, the 511PA program has been enhanced to include features such as the ability to track plow trucks on the 511PA web map and being able to check a driving route for traffic events, including last plow truck visit through trip segments.

In 2016, the 511PAConnect program was developed by Information Logistics as part of a joint initiative with PennDOT, the Pennsylvania Turnpike, PEMA and PSP. The objective of 511PAConnect was to establish two-way emergency communications to assist travelers impacted by a trapped queue/closure, without the need for a mobile app, but using a mobile device. This program has also been adopted by New Jersey DOT, Georgia DOT and Maryland DOT.

Pennsylvania Turnpike Commission

Information Logistics is responsible for many aspects of the PTC's traveler information infrastructure, including www.paturnpike.com. While ILOG has held the contract since 2012, a major overhaul of the site's design and UI happened in 2015. The current version is user-friendly and has many of the same features that requested in the PennDOT 511 Request for Proposal (RFP). ILOG also designed and maintains the PTC intranet, which included an integration with the traveler alert ticker from the PTC traveler information web site.

ILOG has also created both public and private mobile apps for the PTC: public mobile apps for interagency/interoperable 511/Traveler Information Services (TIS) delivery, and private mobile apps to support internal maintenance functions and roadway reporting. The TripTalk mobile app was developed for the Pennsylvania Turnpike to deliver real-time travel alerts to drivers as they approach the affected area by using the device's geo-location capabilities to determine which roadway events are relevant to each driver, as the drivers move across the highway. The mobile app system includes a manual entry web application, which can be used for everyday travel alerts, or for "fast track" alerts, which are information delivered to drivers when they are very close to a specific geography, regardless of the settings that the driver has selected on the app.



These fast track alerts are currently being used to announce curve warnings and speed limit changes and reflect the system's ability to identify and act accordingly on the user's geographic location.

The ILOG team also developed and hosts other services and applications for the PTC, including; a web portal for incident/event management (Emergency Notification System) including WAZE data feeds; adaptive websites for special projects (e.g. cashless tolling, major construction projects); a bi-directional IVR telephone system including an IVR toll calculator module; an automated traveler subscription services (with automatic Twitter postings); an authenticated portal for sharing information among agencies and vendors; commercial over-dimensional vehicle permitting; online payments; employment application and management; CRFP/Bid posting automation; contract administration for Right-to-Know compliance; and a web-based project management tool to organize/track/report on traffic engineering and operations initiatives. ILOG has also integrated a contact management program with most of these applications.

New Jersey Turnpike Authority

While Information Logistics' resume contains a variety of projects for transportation agencies, the team may be best known for mobile applications that comply with anti-distracted driving regulations by supporting hands-free, eyes-free information delivery. One unified geo-centric platform (called the GeoTalker™ platform) supports apps such as Trip Talk for the Pennsylvania Turnpike Commission (PTC), 511PA for PennDOT, Drive Safe West Virginia for WVDOH, and Safe Trip NJ for NJ Turnpike Authority/NJ DOT. Each implementation of these mobile apps brought with it unique challenges to integrate the data for each agency, and unique opportunities for providing specialized traveler information services. The New Jersey Turnpike Authority has added expanded features to their mobile app including streaming cameras, integration with Google and Waze, and cross jurisdictional alerting.

State University of New York (SUNY)

ILOG is also involved in a connected corridor project with the State University of New York and NJDOT. The project involves gathering information from multiple sources along the New Brunswick Rt. 1 and Rt. 18 corridors and providing a comprehensive travel experience and decision support package. ILOG's GeoTalker platform is being used as the consumer distribution mechanism for this pilot program. This app, based off the Safe Trip NJ app, has features for parking, transit locations and schedules geocentric to the user, and virtual DMS. All of these projects were implemented by the ILOG staff who will also design and maintain the WVDOH 511 Platform services required in this CRFP.

SKYLINE VIDEO SHARING EXPERIENCE

Skyline provides the most qualified, experienced video expertise in the ITS market to deliver video sharing infrastructures. Skyline has delivered statewide video sharing systems for ten (10) states and many cities and counties within those states and a regional emergency management video network for the Mid-Atlantic region. Our experience includes:

- **New York** – 1,100+ cameras (MGEG2, MPEG4, H.264), 20 source agencies, 70+ consumer agencies;
- **Maryland** - 1,000+ cameras (MGEG2, MPEG4, H.264), 20 source agencies, 70+ consumer agencies;
- **Virginia** - 1,000+ cameras (MGEG2, MPEG4, H.264), 10+ source agencies, 50+ consumer agencies, hosted solution;

- **Tennessee** - 525 Cameras (MPEG2, MPEG4, H.264), 4 regions, 20+ consumer agencies, hosted solution;
- **Pennsylvania** - 900+ cameras (MPEG2, MPEG4, H.264), 12 regions, 50+ consumer agencies;
- **Missouri** - 391 cameras (MPEG2, MPEG4, H.264), 2 regions, on-premise, locally hosted;
- **Washington D.C.** - 140+ cameras, (MPEG2, MPEG4, H.264);
- **West Virginia** - 50+ cameras;
- **South Carolina** - 333 cameras, 4 regions, hosted solution;
- **Michigan** - 500+ cameras, 4 regions, 30+ consumer agencies;
- **Maryland Coordination and Analysis Center (MCAC)** - 12,000+ cameras, 1,700 agency users across Virginia, District of Columbia and Maryland; 30 state, local and federal agency partners, including local school districts;
- **Iowa DOT** - (Under contract) - 7 regions, 500 cameras; and
- **Dallas Region Pilot Project** - 100 cameras, source cameras from 2 TxDOT district TMC's and Cities of Arlington and Grand Prairie. Hosted and on-premise solution.

SKYLINE - DESCRIPTIONS OF PAST PROJECTS

Virginia Department of Transportation (VDOT)

VDOT is a leader in providing ITS information to the traveling public. In an effort to consolidate this information into one contract, VDOT issued a competitive RFP to select a new team to provide Video, Data, and other information to the public. The goal was to select a team that could provide cutting edge technology for IVR, Website, Mobile Video and data distribution. Since completion, additional cities and agencies throughout Virginia have continued to share cameras on the state platform and also benefit from viewing cameras from other agencies, resulting in a system that has grown to over 1,100 cameras.



Figure 17 – VDOT Skyline Project

Challenge:

- Initially Ingest 700+ Traffic Management Cameras from five (5) Traffic Operations Centers dispersed through the State of Virginia. Total now over 1,000 cameras;
- Distribute Live Video to the Public via a 511 Website and Mobile Application;
- Distribute Live Video to the Media Partners, via a secure web portal and provide a viewing platform and access to a Dynamic API; and

- Distribute Live Video to the Media, agency Partners and first responders, within the State of Virginia and bordering States via a secure portal.

Solution:

Skyline was able to navigate and address all these challenges utilizing our background in Network Engineering and our video sharing appliances. Skyline established private MPLS network to each Traffic operations center in the state, installed network and video appliance equipment outside the firewalls in partnership with the local VDOT staff, and established a distribution point in Tier-1 Data Center. Skyline monitors and maintains the entire solution from end to end utilizing our 24/7/365 staffed Network Operations Center.

Results:

- Transitioned from a picture every 2-4 seconds to Live Streaming video at 15 Frames per second for all 700+ cameras
- Video is available on a VDOT 511 website and Mobile App
- Live Video is now in a standard format that can be ingested by any partner agency, media, law enforcement or first responders, free of charge
- Skyline One View provides virtual video wall access to all networked cameras via PC, tablet or smart phone and management of user groups
- Access for new partners can now be granted in a matter of minutes, not weeks or months
- First Responders have access to the video via an SSL Portal that is free of charge and can be accessed with the proper login information from any internet connection
- Live Streaming video integrated into the Iteris 511 website and mobile app.
- No pending legal actions related to this project.

Maryland SHA CHART

CHART (Coordinated Highways Action Response Team) is a joint effort of the Maryland DOT, Maryland Transportation Authority and the Maryland State Police, in cooperation with other federal, state and local agencies. Since 2010, the State of Maryland has been engaged with Skyline in creating a Statewide Interoperability Architecture to support video sharing around the state. Since completion, additional cities and agencies throughout Maryland have continued to share cameras on the state platform and also benefit from viewing cameras from other agencies, resulting in a system that has grown to over 1,200 cameras and 20+ agencies.



Figure 18 – Maryland SHA CHART

Challenge:

- Ingest 800+ Traffic Management Cameras from over 20 State, County and Local Agencies dispersed throughout the State of Maryland
- Integrate live video from various source hardware and software platforms
- Distribute Live Video to the Public via a Website and Mobile Application
- Distribute Live Video to the Media, agency Partners and first responders, within the State of Maryland and bordering States via a secure portal

Solution:

Skyline interconnected local counties, cities, law enforcement and trusted partners utilizing Maryland's Statewide Government Intranet. Once the connections were made, Skyline installed network and video appliance equipment to efficiently share live video between trusted partners and CHART and stream live video to the public and media.

Results:

- Transitioned from a picture every 2-4 seconds to Live Streaming video at 15 frames per second for over 800 State, County and local cameras
- Live Video is now in a standard format that can be ingested by any partner agency, media, law enforcement or first responders, free of charge
- Skyline One View administrative portal provides virtual video wall access to all networked cameras via PC, tablet or smart phone, and management of user groups
- Access for new partners can now be granted in a matter of minutes, not weeks or months
- Video content now available from mobile cameras mounted on first responder units
- No pending legal actions related to this project.

Tennessee DOT

Tennessee DOT needed video sharing solution that could easily share video between regions in the state and provide decision makers at all levels of government insight into what was happening on the roads anywhere in the state. The DOT previously had no way of sharing video between its four (4) regions, each with their own TMC's and partners. Further, leaders in the state government and the DOT wanted to be able to see a live view into all of the trouble areas throughout the state without having to go to a TMC or relay information through third parties or media. The goal was to provide a scalable architecture that would significantly increase the use and sharing of video throughout the DOT and highest levels of government in Tennessee.

Challenge:

- Integrate over 500 cameras being fed into four (4) regional TMC's throughout the state. These cameras are a mix of analog and digital formats with multiple manufacturers.
- Provide a live video dashboard of 24 simultaneous live feeds that represent the six (6) cameras in each of the four (4) regions that are focused on the main areas of congestion and incidents. The dashboard needs to be viewable in the Commissioner's and Governor's office 24 x 7.

- Provide a live video dashboard of the video wall in each TMC, consisting of 18 simultaneous camera views, to be viewable in the Commissioner's and Governor's office 24 x 7.
- Provide a web-based interface so that managers and operators can remotely see video from any camera in the state on any web-enabled device.
- Deliver live video to agency partners including other government departments, first responders, media outlets and the 511 website.

Solution:

Skyline designed a video sharing network that utilized a combination of locally hosted and remotely hosted equipment and services. Because many of the camera feeds provide analog output, the video streams had to be normalized locally at each TMC. Skyline installed transcoding appliances at each TMC that normalized the video into a common format for distribution. Skyline then distributes the normalized streams from a cloud hosting center. These streams are available in two groups: publicly available streams and partner streams, giving the DOT the ability to red-button any camera(s) to the public while maintaining feeds partners.

Results:

- Over 500 cameras are available for viewing by internal stakeholders and external partners (State police, fire departments, 911 centers, federal agencies.) securely through Skyline's video sharing platform.
- The Governor and DOT Commissioner can see what is going on in each region first hand without having to travel to a TMC or even their office.
- Skyline OneView allows TDOT to manage user access rights for sets and subsets of cameras throughout the state, allowing access to selected content in a matter of minutes.
- The DOT no longer has to provide direct access to their network for media outlets to receive live streaming video. Now, the media can access video of their choice using standard definition feeds or have the option for higher definition content.
- The Skyline video platform for Tennessee allows the DOT to grant access to the platform such that other public safety cameras from agencies, such as schools, local police and emergency management, can be cost effectively added to the platform and use a common user interface for all.

4.4 Oral Presentations (CRFP Section 4.4)

4.4. Oral Presentations (Agency Option)

4.4. The Agency has the option of requiring oral presentations of all Vendors participating in the RFP process. If this option is exercised, it would be listed in the Schedule of Events (Section 1.2) of this RFP. During oral presentations, Vendors may not alter or add to their submitted proposal, but only clarify information. A description of the materials and information to be presented is provided below.

Materials and Information Requested at Oral Presentation:

4.4.1 Introduction of Project Team Personnel: Vendor's representatives at the oral presentation should include the Principal-in-Charge, Project Manager, and key System Integration Leads. At the Vendor's option, they may add other team members as deemed necessary, but the oral presentation team shall consist of no more than 6 people.

4.4.2 Proposed Script:

1. Present examples of:

- a. Public Interface*
- b. Administrator interface*
- c. 511 Website*
- d. 511 App*
- e. CAD integration and operator interface*
- f. Weather interface*
- g. Map interface*
- h. Travel times (both display and how they calculate with or without state-owned speed detection hardware)*
- i. CCTV control*

2. Provide and present system highlights and how it differs from others

3. Provide samples and/or discussion of:

- a. How an event is entered into A TMS from beginning to end by the operator*
- b. Control concept plan for a fully wireless ITS field device system and plan for handling a backhaul during an event or incident.*
- c. System security rolls and protocols*

4.4.3 Questions & Answers: The WVDOH evaluation committee and key support staff may ask questions throughout the oral presentation.

Team Q-Free will gladly visit West Virginia and give an oral presentation and demonstration of our ATMS and 511 Platform and their capabilities if shortlisted to do so.

4.5 General System Requirements (CRFP Section 4.5)

4.5 General System Requirements

4.5.1. Mandatory System Requirements

4.5.1.1. The ATMS solution shall be compatible with State of West Virginia software standards and security policies. The ATMS Solution shall be compatible with Microsoft products and State of West Virginia's acceptable user policy. Here's the link for those policies: West Virginia IT Policies: <https://technology.wv.gov/security/Pages/policies-issued-by-the-cto.aspx> Security Policy: https://technology.wv.gov/SiteCollectionDocuments/Policies%20Issued%20by%20the%20CTO/2017/PO1001_Security_Sept2017.pdf

Team Q-Free will fully comply with the State of West Virginia software standards and security policies.

4.5.1.2. Functionality of the proposed ATMS and 511 software and systems must be equivalent to or exceed the current functionality as described in the Background and Current Operating Environment Document and in any specific answers to questions submitted to WVDOH through this RFP process.

Team Q-Free offers the best value for a fully integrated ATMS and 511 Platform that meets and exceeds the functionality currently deployed.

OpenTMS is the most fully featured, highly productized, and easy-to-use ATMS solution on the market. Q-Frees' off-the-shelf, cloud capable ATMS is an independent solution built around open, modular architecture. The intuitive interface combines a feature-rich interact map with both list views and data entry screens. Through the interface, it is easy to monitor the operational status of the network, control ITS devices, and manage both planned and unplanned events. Being web-based, OpenTMS will operate on any desktop or laptop using standard (not modified browsers like many other ATMS providers) browsers. This scalable and extensible architecture ensures long-term viability.

In addition to the base system that provides the GIS and mapping functions, the base system includes a host of traffic management modules as well as ITS device modules to choose from based on the responsibility of the DOT and the deployed devices in the field. The diagram below identifies the modules that will be licensed to the WVDOH. OpenTMS version 9 will be deployed to the WVDOH as part of this proposal. This version provides all the modules deployed in WVDOH today plus several additions:

- **Detectors** – Detector module collects and distributes traffic condition data (volume-occupancy-speed) and vehicle classification data gathered from detectors and provides the collected data to the Incident Detection (ID) module and the user for monitoring traffic conditions.
- **Travel Time** – Using input from travel time data sources, the ATMS Travel Time (TT) Module collects current travel information in monitored areas. Travel Time reports the time it takes to travel from one point to another (the start node to the end node), commonly referred to as a travel time segment.
- **Lane Control Signals** – Lane Control module provides the capability to view, manage and control lane control signal devices being used within the operational environment. Consisting of overhead lane signals denoting a red "X" if travel in the lane is prohibited, and a green arrow if travel is

permitted, these signals symbolically display the status of each freeway lane to inform motorists of the condition of the lanes downstream so that they may take appropriate action.

- **Variable Speed Limits** – Variable Speed Limits module allows the user to update speed limits along the roadway.
- **Corridor Management** – The ICM module, referred to as the Corridors module, provides the operator the ability to assess and respond to travel conditions across a designated area of interest, also known as a corridor.
- **Weather Responsive Corridor** – A weather response corridor monitors weather conditions and based on threshold settings provides automated DMS and VSL messaging to inform the traveling public of the upcoming hazardous road conditions. This corridor is deployed in Ohio along the I-90 corridor.
- **Queue Detection/Warning Corridor** – Based on detector and/or travel time thresholds users are alerted if a traffic queue is forming and in response the system recommends DMS and VSL messaging to inform the traveling public of congestion and potentially stopped vehicles.
- **Vehicle Tracking & Dispatch** – Vehicle Tracking and Dispatch module provides an interface to dispatch, log and track motorist assistance vehicles. For vehicles equipped with GPS, there movement can be tracked.
- **Center-2-Center** – An NTCIP Center-to-Center interface is available for integration with third party systems.
- **Maintenance Ticketing** – Version 9 integrates osTicket for maintenance ticket support. Users will be able to generate maintenance tickets from the devices maintenance tab and view the device's open tickets.
- **Analytics Package** – An Analytics Package will be available that will allow the slicing and dicing of data. Version 9 also includes a new Event module that consolidates Incidents, Weather Incidents and Planned Events into a single management module with consistent functionality.
- **Road Conditions** – OpenTMS has a Road Conditions module where users can manage road conditions. This information is distributed to the 511.

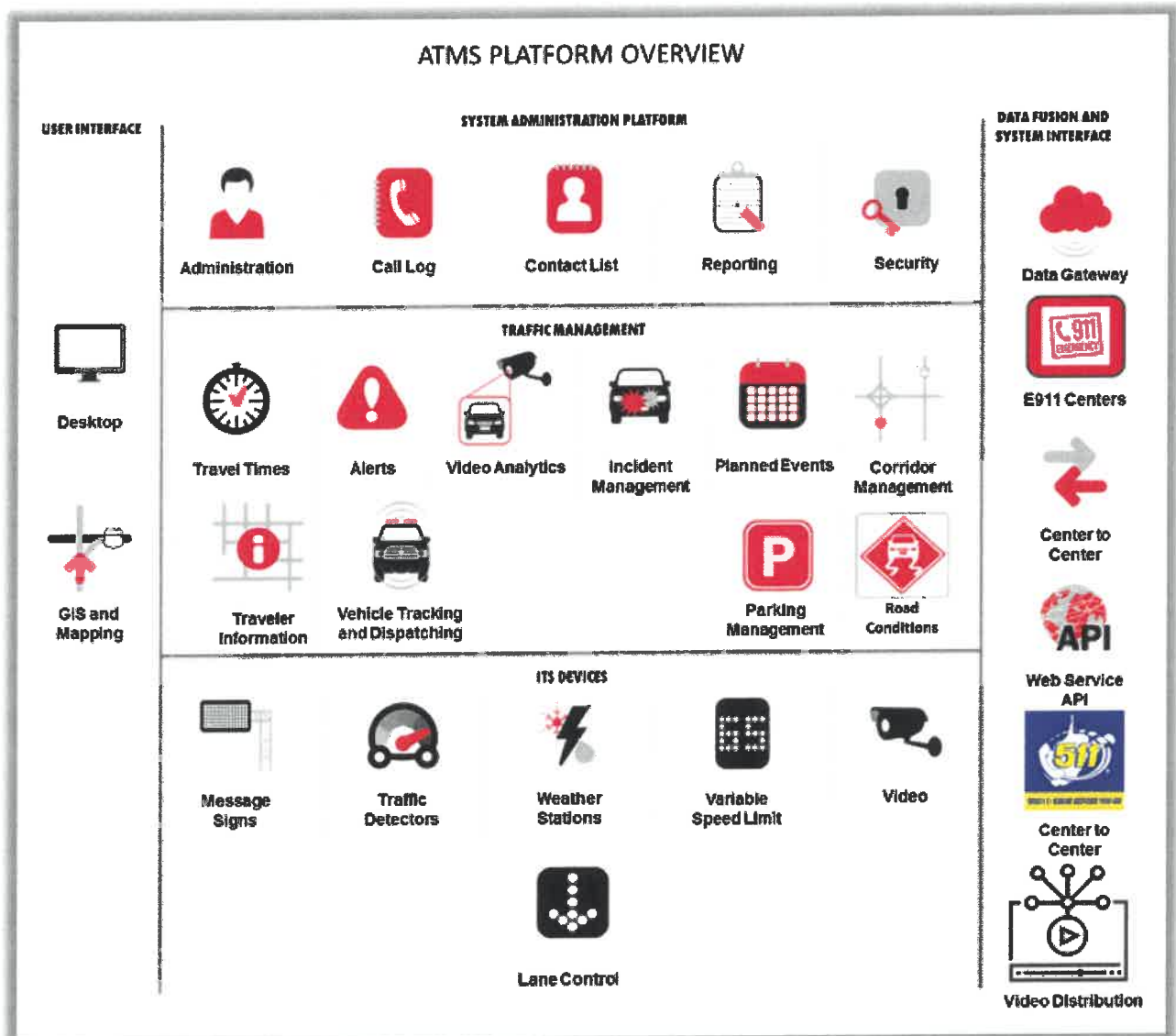


Figure 19 – ATMS Platform Overview

Access will be available to the West Virginia Turnpike (WVTPA) using a standard web browser, via a metro ring connection. This will allow the WVTPA to directly connect to the ATMS environment. With this dual routed network, downtimes should be limited to facility maintenance events.

Q-Free has been a leader in CAD integration for over the last 10+ years. Q-Free has integrated over 12 separate CAD systems from State Police and 911 centers. Q-Free has three clients actively using CAD alerts as a primary component of incident detection. We've integrated over 40+ centers between these clients. Traffic CAD events are integrated into OpenTMS Alerts module. When an event is received, the user receives a notification and can create an incident from the alert tracking the two together. As updates come in the users have the most update to date information within minutes of being entered by the 911 center.

The proposed 511 Platform will meet and exceed the current functionality that is described in this CRFP. Details of how the proposed 511 Platform will meet or exceed the current functionalities is described in the section for each functional requirement.

4.5.1.3. The ATMS Vendor is required to maintain connectivity and key data transfer functionality, during any new or upgraded ATMS software and 511 system installations, between the WVDOH TMC located in Charleston, WV and the remote users and offices that provide information to and/or receive information from the TMC and associated ATMS and 511 software and systems. This includes the current E-911 centers located across the state the provide incident data directly to the ATMS platform and the event/incident window.

Q-Free will maintain connectivity and key functionality during the transition.

Migrating legacy systems to the new ATMS and 511 Platform can be a challenging effort without a detailed plan. There are several key components critical to the success of an ATMS and 511 Platform migration. These key components include business processes, impacted systems, system data, and system users. Team Q-Free has successfully transitioned four of five VDOT TMCs from legacy ATMS to OpenTMS and all regions of Pennsylvania DOT from legacy ATMS and vendor applications to a statewide version of OpenTMS. This capability ensures an easy and worry-free transition for WVDOH to a new WVDOH ATMS and 511 Platform with continuity and confidence in maintaining or exceeding the performance of current elements.

During any new upgrades or installations of the ATMS and 511 Platform, connectivity and data transfer functionalities will be maintained. By having a test/preview environment that mirrors the production environment, a migration path can be fully tested in the preview system before cutting over to the production system. Similarly, the redundancy built into the production system can make migrations and upgrades seamless to end users.

Q-Free will prepare a Software and System Deployment Transition Plan documenting the transition and steps leading up to the transition. The document is described in more detail in Requirement [4.2.2.13](#).

4.5.1.4. The Vendor must provide a non-revocable and perpetual license to the WVDOH and its current in-state partner agencies for the use of the ATMS software and its associated systems.

WVDOH will receive an Enterprise license. Licensor grants to Licensee, and Licensees accepts, a non-revocable, perpetual license for Licensee to use the licensed software within the scope of the project.

The 511 platform of the proposed solution is offered as SaaS and will grant WVDOH and its current in state partners unlimited usage of the system for the duration of the contract.

4.5.1.5. The ATMS Vendor will be required to develop agreements with third party data providers, software providers, or other system providers required to make the ATMS functional.

Q-Free is the prime and will manage our subcontractors. We will develop and execute any necessary agreements with our subcontractors to deliver the ATMS and 511 Platform. The Q-Free proposed Project Manager (PM) and Project Management Team has experience in managing multiple subcontractors today. Many of our contracts today have subcontractors that we have initiated agreements with and managed throughout the project lifespan. The proposed PM has coordinated their activities so that schedule milestones



and support are met in an efficient manner. Q-Free is working with both Skyline and ILOG on our current contracts.

ILOG has entered into third party agreements with providers such as Google and Amazon, to provide the services in the 511 platform.

4.5.1.6. A copy of all manuals, diagrams, design documents, requirements documents, testing documentation, training materials, change configuration documentation, upgrades and other material associated with the ATMS software and all associated connections shall be provided to the WVDOH at Final Acceptance and as necessary through the term of the contract.

Q-Free will provide an electronic copy of all documentation associated with the ATMS and 511 Platform to the WVDOH throughout the term of the contract.

4.6 Traffic Display Maps/GUI (CRFP Section 4.6)

4.6. Traffic Display Maps/GUI

4.6.1. Mandatory Traffic Display Map/GUI Requirements

4.6.1.1. The ATMS shall display responder information tied to appropriate highway segment on the TMC operator GUI/traffic conditions map.

OpenTMS meets this requirement. Suspected incidents are displayed on the map at the location of the potential incident. Users can interact with the incident by hovering over and viewing a tool tip and selecting the incident to display its detailed view. Closures are displayed on the map at the location specified. Users can interact with the closure by hovering over and viewing a tool tip and selecting from the map to view its detail view.

4.6.1.2. The ATMS shall support an interactive base map for displaying the ITS devices statewide.

OpenTMS meets this requirement. Q-Free can leverage existing maps such as Google Maps to provide a base map that includes adjoining states and local roadways. Other base maps are available for inclusion if desired.

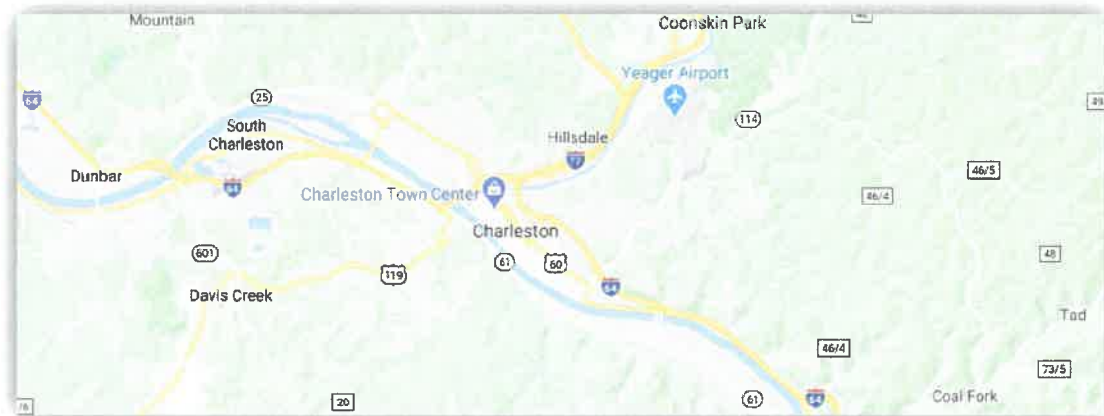


Figure 20 – Google Roadmap of the Charleston Area



Figure 21 – Google Satellite of the Charleston Area

In addition to the two layers above, OpenTMS can bring in any layer available through an ArcGIS Rest query.

For underlying GIS data used for incident/event management and device location, Q-Free will utilize the West Virginia Transportation Roads and Highway Linear Reference data and linear referencing services hosted by ArcGIS server. Integration of the web services into the OpenTMS location services will provide for automatic updates once the data is available in the base dataset.

The OpenTMS Map Interface optimizes the user experience and operational process. It consists of several integrated components that provide a feature-rich, easy-to-use interface. Users can monitor the operational status of the transportation network, control ITS devices, and manage events. OpenTMS web-based GUI runs on standard web browsers including Chrome, Firefox, Internet Explorer, and Safari. The controls to manipulate the map are consistent with most commercial mapping interfaces:

- Pan and Zoom can be accomplished with the control widgets on the left side of the map or by using the mouse. Navigation is supported by dragging the map with the mouse while clicking the mouse.
- A Layers Widget in the upper right corner, enables users to toggle the view of specific layers, and configured map overlays.
- Hovering over an icon brings up information about that icon in a Toaster Popup at the bottom of the map; Clicking on a device icon opens the command and control view for that device.

The map GUI consists of a base map. Q-Free will customize the map layers to meet the WVDOH's requirements. Aerial images and/or orthophotography are easily incorporated into the map interface. The display map is updated at least every 5 seconds to reflect real-time changes.

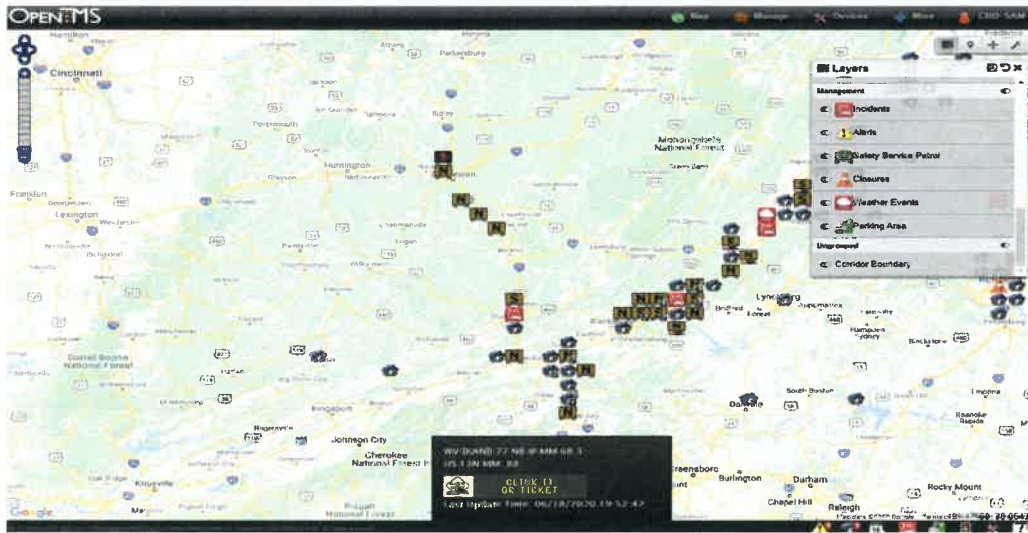


Figure 22 – OpenTMS Map Interface

The map interface can integrate a variety of spatial information organized by layers that can be toggled on and off by the operator. Specialized icons are used to distinguish between various map elements, including ITS devices. For this proposal Q-Free will be utilizing Google as the base map provider on both the ATMS and the 511 system to ensure operations and the public are interacting with the same mapping information.

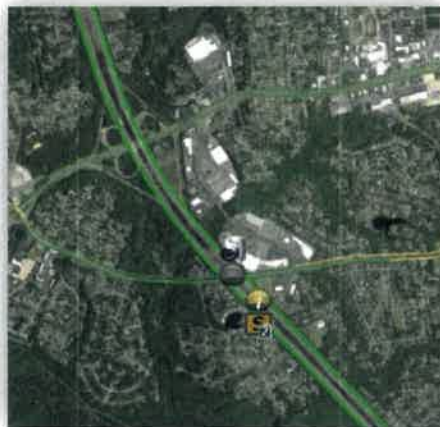


Figure 23 – WMS Map Layers

Support for rendering multiple WMS layers:

- Interactive display of roadway network and current status of ITS devices, incidents, and planned events;

- Map tools that allow users to display or hide map layers and change the map view via zoom and pan controls. A summary window provides additional information about a specific device or event;
- Many layers including state and local routes, road conditions, events, and other layers of interest to WVDOH;
- Configurable color overlays for real-time travel times/traffic flow conditions, winter road conditions;
- Icons to represent unique features static features including bridges, mile markers, exit numbers, and landmarks;
- Real-time updates of incidents, closures, and ITS device status;
- Third party data; and
- Maintenance Mode map tool that filters the map to only show devices that are not in normal condition. Devices are considered not normal if they have communications that are suspect or failed and/or the device is reporting an error such as a pixel error.

4.6.1.3. The ATMS map shall support pan and zoom capabilities throughout the State of West Virginia and into adjoining states.


OpenTMS meets this requirement. ATMS map will support pan and zoom capabilities throughout the West Virginia map and including adjoining states. The proposed base map includes adjoining states.

4.6.1.4. The ATMS shall display real-time traffic conditions using a standard color coding of green for uncongested conditions through yellow and amber for moderate congestion to red for high congestion on freeways and roadways shown on the map. Real-time latency shall be no more than 5 minutes.

OpenTMS meets this requirement. The ATMS speed layer will be integrated from a third-party, including the Google Traffic Layer. This speed map uses green to indicate free flow then as congestion builds yellow, orange and finally red for stop and go traffic.

4.6.1.5. The ATMS shall provide an icon for each type of ITS device identified as part of WVDOH ITS.

OpenTMS meets this requirement. OpenTMS provides an icon for each ITS device type listed in CRFP Attachment B – List of ITS devices. OpenTMS icons also reflect communication status.



Devices in communications failure have an '!' point ().

	Cameras		Truck Parking		Detectors
	Permanent Signs		Variable Speed Limit Signs		Weather
	Portable Signs				

Note: Portable device icons sit on a trailer.

4.6.1.6. The ATMS shall provide a layer for each type of ITS device identified as part of the WVDOH ITS.

OpenTMS meets this requirement. Each ITS device type has its own map layer that can be enabled or disabled. In addition to ITS devices, many other layers can be managed here such as overlays, incidents, alerts, and planned events.

OpenTMS also supports a Maintenance tool () that displays only devices in an error state. The Move tool () allows the user to move a portable device.

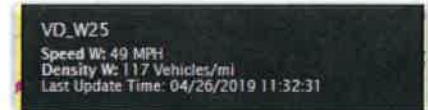


Figure 24 – Detector Tooltip Details

4.6.1.7. The ATMS map shall provide declutter features to provide appropriate number or size of icons as maps are zoomed in or out consistent with layer selection.



Figure 25 – Smart Grouping Features

OpenTMS meets this requirement. The OpenTMS map includes a smart icon grouping feature. When multiple devices are in close proximity, OpenTMS automatically clusters the icons and indicates the number of devices with a number indicator on the icon. When a user hovers over a clustered icon, the map interface will provide a popup of all devices included in that cluster. To select one the user can click on the device name.

The system can also be configured to display layers at different zoom levels. For example, the active signs at a higher zoom level than blank signs. As the user zooms in the blank signs will appear at the configured zoom level. This is done in the Admin Portal Map module.

4.6.2. Traffic Display Map GUI Desirables

4.6.2.1. The ATMS should have the ability to integrate and share data with neighboring states including CCTV video.

OpenTMS will have the ability to integrate and share data with neighboring states, including video. The video architecture is designed specifically to support easy and secure sharing with any trusted partner. Surrounding states Virginia, Maryland and Pennsylvania use the same video architecture to support their sharing efforts.

4.6.2.2. The ATMS map should display all major freeways and streets with graphical representation for each roadway classification.

OpenTMS meets this requirement. As part of the map display the Google base map provides differentiate between roadway classifications by styling the segments accordingly. Interstate, US Route and State routes are all displayed in an easy to recognize format that clearly indicates the level of classification. As the map is zoomed, more classification features will be made visible to the operator.



Figure 26 – Google Roadway Classifications

4.6.2.3. The ATMS should allow user selection of type of traffic measurement for near real-time traffic condition display including speeds, volume, occupancy, and (optionally) a combined traffic metric.

In order to display volume, occupancy, and speed the ATMS needs a source of data. Our OpenTMS Detector module continuously monitors and ingests real-time traffic data from detectors. Data for individual detectors can be accessed through the detector view.

On the map view, the detector icon looks like a speedometer and provides visual cues for the data being returned. The color coding of the detector icons is configurable in the administration portal and enables users to quickly see which detectors are reporting free flow or congested conditions. Congestion levels can be set to color based on speed or occupancy. Hovering over a detector displays a tool tip with additional traffic metrics.

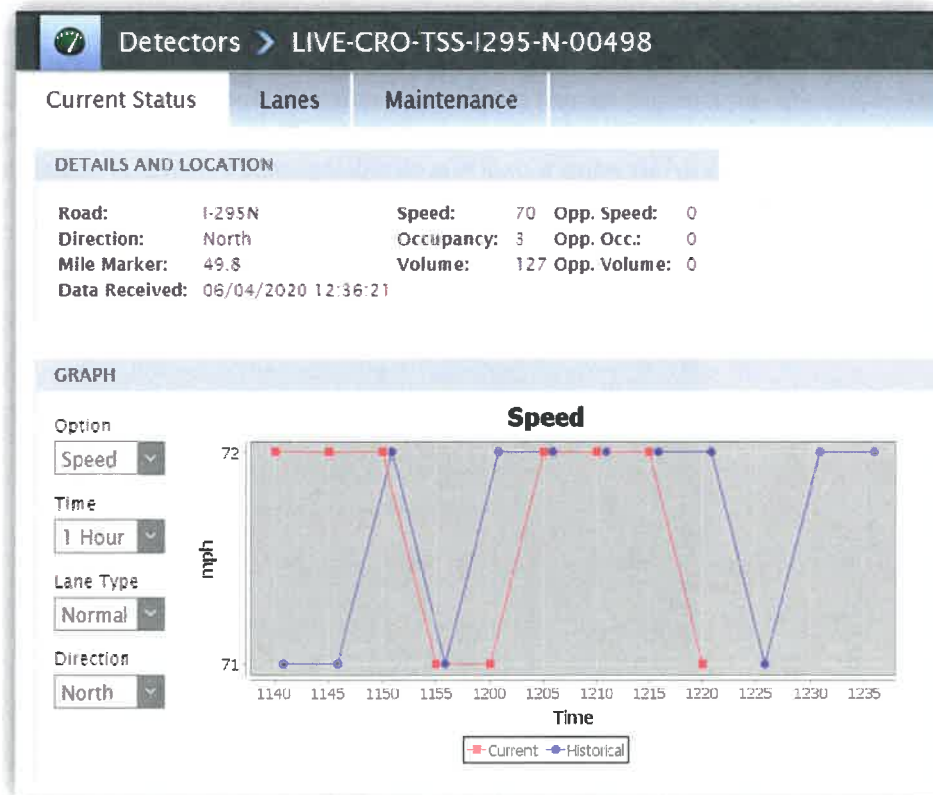


Figure 27 – Detector Details View

The Detector Lanes tab displays lane by lane data. For detectors that report classification data that will be displayed as well. The Current Status tab displays the detector average speed, volume, and occupancy by direction:

4.6.2.4. The ATMS should allow selection of numerical limits associated with each display color for each type of traffic measurement by a user with sufficient authorization. These parameters should be applied to all traffic condition map/GUI displays.




Figure 28 – Configurable Detector Icons

OpenTMS meets this requirement. The color-coding thresholds of the detector icons on the map are configurable in the administration portal by the administrator.

4.6.2.5. The ATMS should depict summary device status using coloration of appropriate ITS device icon with the corresponding ITS field device.

OpenTMS meets this requirement. OpenTMS icons are colored to represent the communication status of a field device and provide an indication as to whether the device is reporting an error. Icons are shown below.

	Normal Communications
	Normal Communications, but device is reporting errors
	Suspect Communications
	Failed Communications
	Disabled Communications

4.6.2.6. The ATMS should be able to display detailed device information appropriate to the individual type of device upon selection of an icon from the map/GUI.

OpenTMS meets this requirement. On the map interface, selecting an icon from the map displays the device detail view. The detail view contains up to date information on data readings, poll data, allows the user to execute other commands such as posting messages for signs, accessing logs and maintenance functions.



Figure 29 – Google Base Map

4.6.2.7. The ATMS base map should display neighboring states a minimum of 25 miles outside of state border or have the ability to pan to adjacent states.

OpenTMS meets this requirement. By utilizing the Google Maps Base Map layers, adjacent states can be displayed on the ATMS map with the same level of detail as West Virginia.

4.6.2.8. The user interface map display should display icons representing locations of traffic data sensors connected to the ATMS.

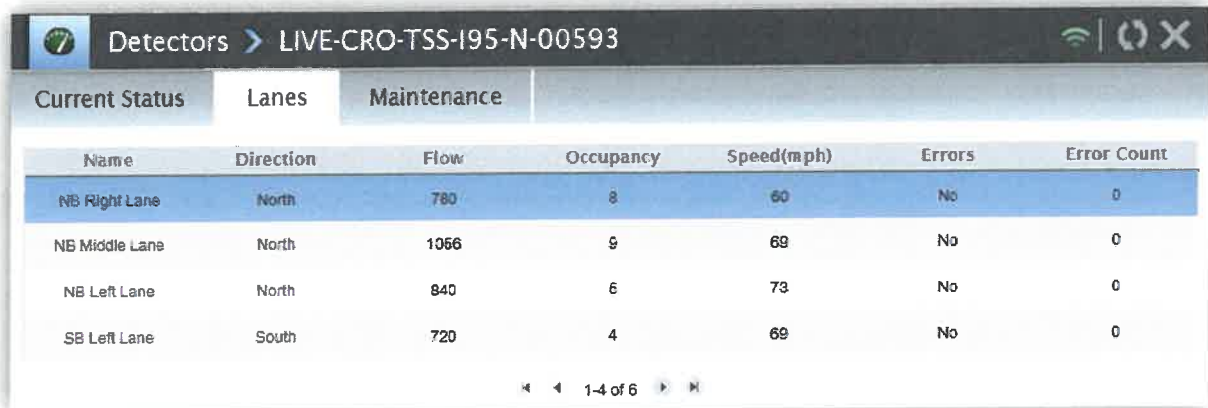
OpenTMS meets this requirement. Traffic data sensors are displayed on the map at their location as entered through the Administration Portal.

4.6.2.9. The user interface map should enable operators to select traffic data sensors to view the most recent data recorded from the sensor.

OpenTMS meets this requirement. All real-time data collected by OpenTMS is accessible via the map, list view or a graphical representation of historical data. The detector view is the same regardless of the type of detector or manufacturer. Clicking on a detector from the map or list view displays its detailed view.

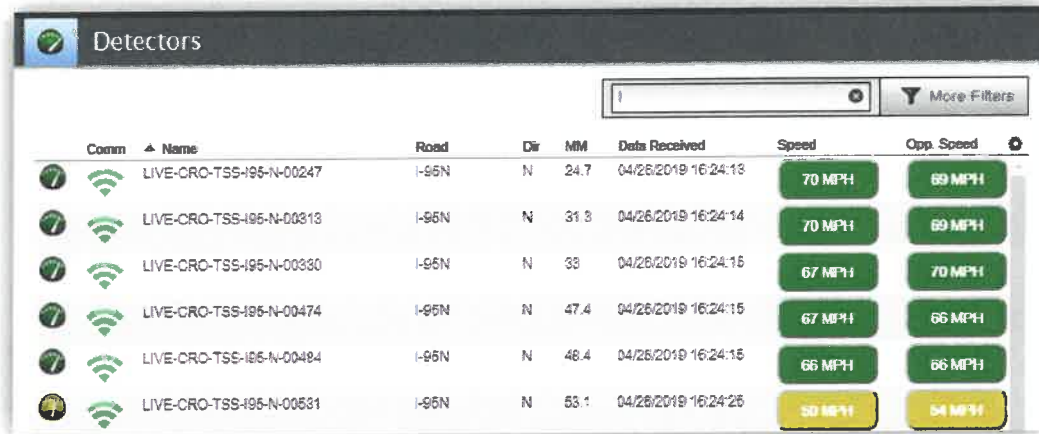
The Detailed View:

- Displays most recent data recorded from the sensor;
- Real-time vs. historical graphic display of speed, volume, occupancy, and volume looking back over past one to six hours; and
- Clicking on the Lanes tab, displays data by lane.



Detectors > LIVE-CRO-TSS-I95-N-00593						
Current Status		Lanes	Maintenance			
Name	Direction	Flow	Occupancy	Speed(mph)	Errors	Error Count
NB Right Lane	North	780	8	60	No	0
NB Middle Lane	North	1066	9	69	No	0
NB Left Lane	North	840	6	73	No	0
SB Left Lane	South	720	4	69	No	0

Figure 30 – Detector Lanes Tab



Comm	Name	Road	Dir	MM	Data Received	Speed	Opp. Speed
	LIVE-CRO-TSS-I95-N-00247	I-95N	N	24.7	04/26/2019 16:24:13	70 MPH	69 MPH
	LIVE-CRO-TSS-I95-N-00313	I-95N	N	31.3	04/26/2019 16:24:14	70 MPH	69 MPH
	LIVE-CRO-TSS-I95-N-00330	I-95N	N	33	04/26/2019 16:24:16	67 MPH	70 MPH
	LIVE-CRO-TSS-I95-N-00474	I-95N	N	47.4	04/26/2019 16:24:15	67 MPH	66 MPH
	LIVE-CRO-TSS-I95-N-00484	I-95N	N	48.4	04/26/2019 16:24:16	66 MPH	66 MPH
	LIVE-CRO-TSS-I95-N-00531	I-95N	N	53.1	04/26/2019 16:24:26	50 MPH	54 MPH

Figure 31 – Detector List View

Accessing the Detectors module from the Devices menu displays the list view. This view provides a summary of the most recent data recorded colored by congestion level. Speeds and/or occupancy readings can be displayed based on operator preference.

4.6.2.10. *The user interface map should enable operators to select traffic data sensors to view archived data recorded from the sensor within user defined parameters.*

OpenTMS meets this requirement. The detector's detailed view provides access to historical data from a graph. The user can select to view from one to hours in the past. Jasper reports can also access historical data for selected detectors over a selected time period.

4.6.2.11. *The ATMS base map should show traffic speeds by lane or as an average across all lanes in each direction (station) at user option.*

OpenTMS meets this requirement. Sensor speed values are shown as an average across all lanes in each direction when displayed on main map tooltips.

4.6.2.12. The ATMS base map should show traffic volume by lane or as a total across all lanes in each direction (station) at user option.

OpenTMS meets this requirement. Sensor volume values are shown as a total across all lanes in each direction when displayed on main map tooltips.

4.6.2.13. The ATMS base map should show traffic occupancy by lane or as an average across all lanes in each direction (station) at user option.

OpenTMS meets this requirement. Sensor occupancy values are shown as an average across all lanes in each direction when displayed on main map tooltips.

4.7 Device Control - Dynamic Message Sign (CRFP Section 4.7)

4.7. Device Controls-Dynamic Message Sign

4.7.1. Mandatory Requirements

4.7.1.1. The ATMS shall include and interface for Dynamic Message Sign (DMS) control and management.

OpenTMS meets this requirement. The OpenTMS Sign module provides operators with a common interface to control all their fixed and portable signs, regardless of manufacturer. All fixed and portable signs are managed through the sign module that contains both a list view and a device view.

4.7.1.2. The ATMS shall communicate with each DMS connected to the ATMS to receive all parameters describing the DMS, as contained in NTCIP messages (as defined by NTCIP Object Definitions).

OpenTMS meets this requirement. OpenTMS supports the NTCIP protocol.

4.7.1.3. The ATMS shall display the parameters for each DMS as received from the standardized NTCIP message. The ATMS will adapt entered text and message library text to fit the specific DMS configuration, unless restricted by size.

OpenTMS meets this requirement. OpenTMS displays the parameters received for each DMS in the Sign module. Examples of parameters displayed include:

- Posted messages are confirmed by reading the current message from the controller and displayed back to the user in the font selected
- Firmware is read and displayed to the user on the current status tab
- For portables, voltage readings are displayed
- Reports on Power, Pixel, Fan, Lamp, Controller, Attached device, Photocell, Temperature, Door Open, RAM, Program, PROM, Message and Power errors.
- OpenTMS maintains a message library for each sign type, this ensures messages are properly formatted to the sign dimensions. Any attempt to define a message which does not fit on the sign type will generate an error notice.

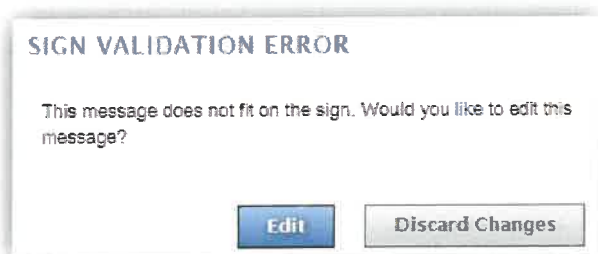


Figure 32 – Sign Message Validation Error Popup

4.7.1.4. The ATMS shall include the capability for operators to control the messages that are displayed on fixed and portable DMS connected to the ATMS.

OpenTMS meets this requirement. OpenTMS supports both fixed and portable signs through a common user interface. To the end user there is no difference between fixed and portable message postings.

4.7.1.5. The ATMS shall include logic to manage multiple agencies and users who might simultaneously attempt to control a common DMS.



OpenTMS meets this requirement. Q-Free will meet this requirement by implementing a priority scheme where the owning agency will have priority in posting messages. Message priority processing will give the device owning agency priority. Non-owning agency requests will be put in the message queue, order by message priority.

4.7.1.6. DMS control shall be dependent on appropriate user permissions.

OpenTMS meets this requirement. Control access is available to those users with the correct permissions. Permissions are configured by the administrator in the Admin portal.

4.7.1.7. If a conflict between requested messages arise, the owning agency will have priority.

OpenTMS meets this requirement. Q-Free will meet this requirement by implementing a priority scheme where the owning agency will have priority in posting messages. Message priority processing will give the device owning agency priority. Non-owning agency requests will be put in the queue. Priority will be evaluated as follows:

Select the highest priority message of the device owning agency if none are available then select the highest priority message of the non-owning agency.

4.7.1.8. If a conflict between requested messages arise and all conflicting requests are from the same agency, the system will grant the request of the user with the highest priority.

OpenTMS meets this requirement. OpenTMS maintains a message priority queue. All messages are assigned a priority level, for example, 1 – Most Critical to 10 – Least Critical. OpenTMS does not limit the number of priorities. When a message with higher priority is posted, any lower-priority messages are pushed down the queue. When a message times out, the next highest-level priority message on the queue will be automatically posted. The priorities of the device owning agency are evaluated first. Message priority levels are configurable through the Administration Portal.

Within the same agency message priority, the user with the highest priority message will post and other messages are pushed to the message queue.

4.7.1.9. The ATMS shall have the capability to alert an operator with an agency that owns a DMS if another agency posts a message to the DMS.

OpenTMS meets this requirement. OpenTMS will generate a notification when a message is posted from a device non-owning agency to the owning agency.

4.7.1.10. The ATMS shall have the capability to alert an operator who has posted a DMS message if another operator has overridden the message by posting another message.

OpenTMS meets this requirement. OpenTMS will generate a notification to the device's owning agency when a message is posted from a non-owning agency overriding a message from the owning agency.

4.7.1.11. The ATMS shall provide a mechanism for authorized users to control the messages displayed on DMS from remote locations.

OpenTMS meets this requirement. OpenTMS is a web application any user with a standard web browser can access the application. Application can be accessed from any user on the network or through Virtual Private Network (VPN) connection. Further, OpenTMS can be made available through the ATMS network utilizing 2-factor authentication allowing for non-VPN access managed through the firewall.

4.7.1.12. The ATMS shall include the capability for automated message creation.

OpenTMS meets this requirement. OpenTMS provides the ability for the system to recommend DMS messages in response to an event based on a set of configurable business rules. OpenTMS further allows for the operator to modify the recommendation before accepting the message for posting.

4.7.1.13. The ATMS shall include logic to manage conflicts between automatically generated messages (e.g. travel time displays etc.) and manually generated messages.

OpenTMS meets this requirement. OpenTMS maintains a message priority queue. All messages are assigned a priority level, for example, 1 – Most Critical to 10 – Least Critical. OpenTMS does not limit the number of priorities. When a message with higher priority is posted, any lower-priority messages are pushed down the queue. When a message times out, the next highest-level priority message on the queue will be automatically posted. The priorities of the device owning agency are evaluated first then non-owning.

If a system event kicks off such as a resource plan or incident response and a message is in conflict the user is presented with a Resource Plan Conflict Notification and given the opportunity to resolve the conflict.

4.7.1.14. The ATMS shall include the capability to automatically generate messages for DMS to display Travel Times, as collected/calculated by the ATMS.

OpenTMS meets this requirement. Travel time messages are configured with a specially formatted travel time template configured through the sign module devices' travel time message tab. Creating a travel time message is similar to creating a standard message with the exception of a double hashtag (##) that represents the travel time to be automatically pulled and updated from an assigned segment. If the message is active it will be reposted.

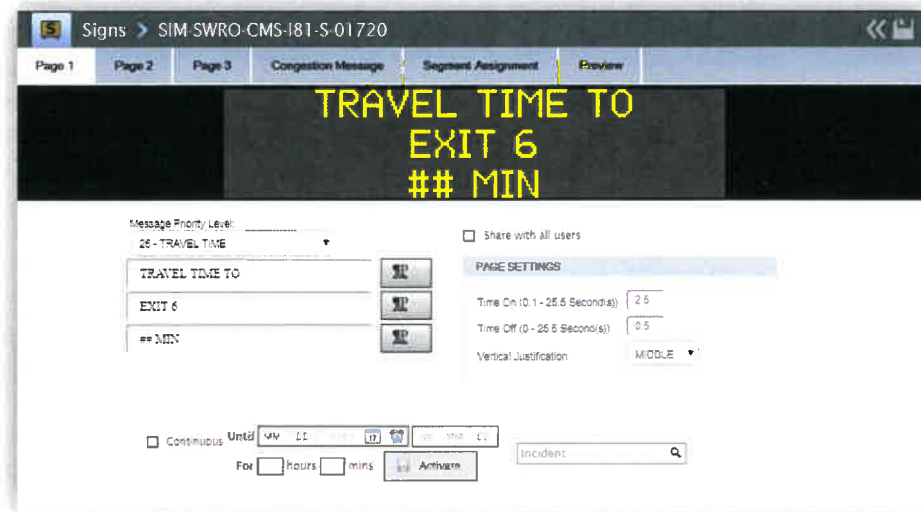


Figure 33 – Travel Time Message Editor

As part of creating a travel time message there is also a congestion message tab which allows the user to configure a generic congestion message to replace the travel time message when the travel time exceeds a configured threshold. When the travel time falls below the threshold the travel time message resumes.

Segments are created in the admin portal and linked to a sign and associated to the message at the time the message is created from the Segment Assignment Tab.

Once the message is activated, travel times will automatically update on the sign as the travel time changes.

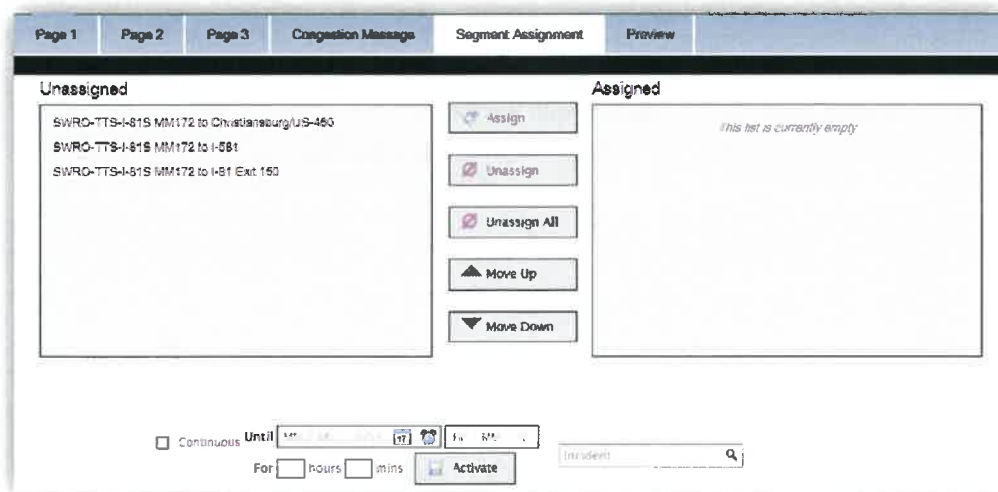
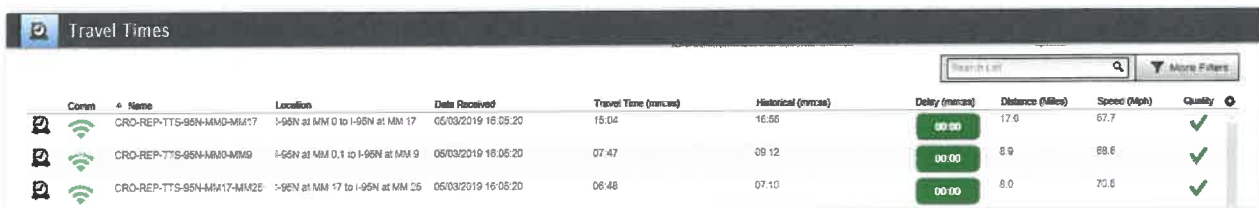


Figure 34 – Travel Time Message Segment Assignment

OpenTMS provides a Travel Time module that collects the travel time for configured segments. These travel times are visible from the Travel Time list view.

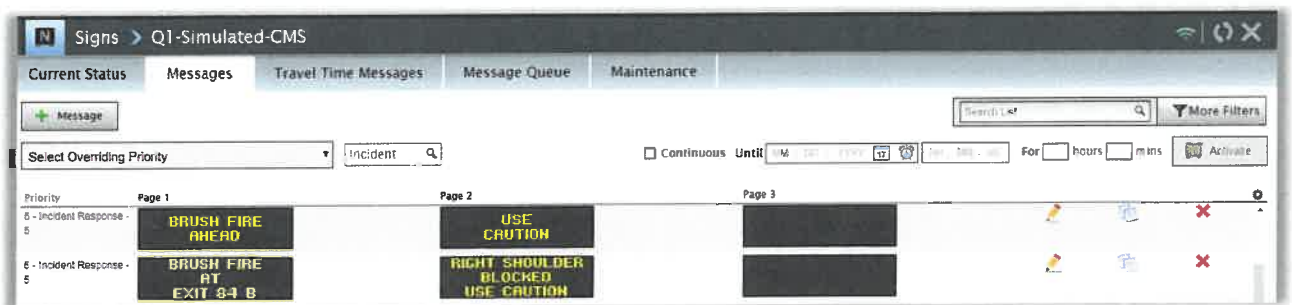


Comm	Name	Location	Date Received	Travel Time (min:sec)	Historical (min:sec)	Delay (min:sec)	Distance (Miles)	Speed (Mph)	Quality
CRO-REP-TTS-95N-MM0-MM17		I-95N at MM 0 to I-95N at MM 17	05/03/2019 16:05:20	15:04	16:55	00:00	17.0	67.7	✓
CRO-REP-TTS-95N-MM0-MM9		I-95N at MM 0.1 to I-95N at MM 9	05/03/2019 16:05:20	07:47	09:12	00:00	8.9	68.6	✓
CRO-REP-TTS-95N-MM17-MM25		I-95N at MM 17 to I-95N at MM 25	05/03/2019 16:05:20	06:48	07:10	00:00	8.0	70.6	✓

Figure 35 – Travel Time List View

4.7.1.15. The ATMS shall include DMS message libraries.

OpenTMS meets this requirement. OpenTMS maintains a message library for each sign type, this ensures messages are properly formatted to the sign dimensions. Authorized users can create, edit, and save messages to the library. All messages can be copied. The message editor uses fonts downloaded from the sign to provide the what you see is what you get (WYSIWYG) view, and operators can select from among the available fonts. Messages selected from the library can be quickly posted by clicking on the message and indicating whether to post continuously or for a specified duration.



Priority	Page 1	Page 2	Page 3
5 - Incident Response -	BRUSH FIRE AHEAD	USE CAUTION	
5 - Incident Response -	BRUSH FIRE AT EXIT 34 B	RIGHT SHOULDER BLOCKED USE CAUTION	

Figure 36 – Sign Message Library

Selecting the message tab from a sign's detailed view shows a list of the messages in the library as shown below. List shows the default priority and text of the message. The user can search the library to narrow down the list. From this list the user can post the message using the default priority or overriding for a selected duration or continuous and associated to an incident as part of the posting process.

If an existing message doesn't work, the user can create a new message, copy an existing or edit a message using the message editor shown below.

The message editor is a full featured editor providing the user the ability to customize the justification, font, and page settings. The editor provides the ability to preview the message before posting directly from the editor, saving the user time

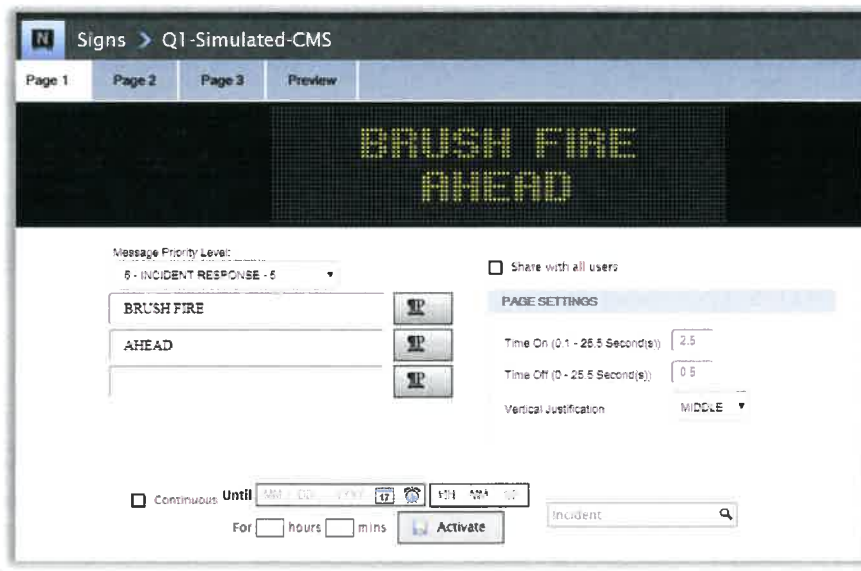


Figure 37 – Sign Message Editor

4.7.1.16. The ATMS shall allow authorized users to select a message from any of the DMS message libraries.

OpenTMS meets this requirement. Control access is available to those users with the correct permissions. Permissions are configured by the administrator in the Admin portal.

4.7.1.17. The ATMS shall allow authorized users to generate a message from free text.

OpenTMS meets this requirement. From the sign's detailed view, the user can post a free text message without saving to the library. The basic view uses the default settings for the sign, but if a different font or justification is required then clicking on the Advanced button will bring up the full featured message editor.

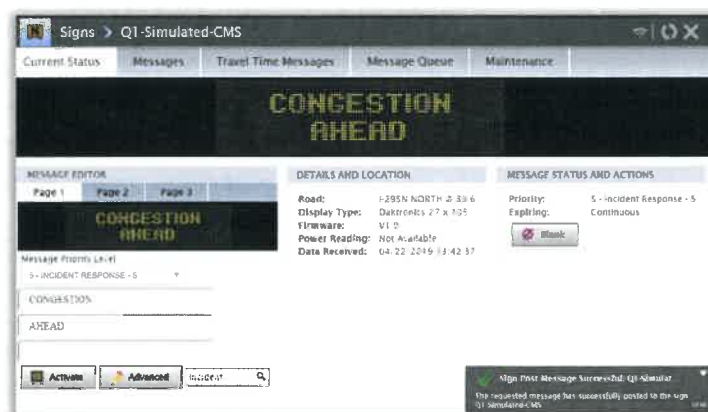
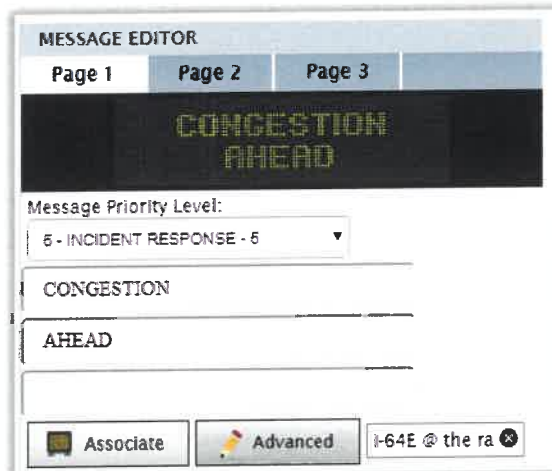


Figure 38 – Sign Details view with Quick Editor

From this view, you can associate an incident to the posted message by selecting the incident and clicking Associate as shown below.



The screenshot shows a 'MESSAGE EDITOR' window with three tabs: 'Page 1', 'Page 2', and 'Page 3'. The 'Page 2' tab is active, displaying a message configuration for 'CONGESTION AHEAD'. The message text is shown in a large, bold, yellow font on a black background. Below the message text, there is a 'Message Priority Level' dropdown menu set to '5 - INCIDENT RESPONSE - 5'. The message content is split into two lines: 'CONGESTION' and 'AHEAD'. At the bottom of the window, there are two buttons: 'Associate' and 'Advanced', and a status bar showing 'I-64E @ the ra'.

Figure 39 – Associating a Sign Message to an Incident

4.7.1.18. The ATMS shall allow for additional DMS message libraries to be generated by authorized users or edits to be made to the DMS message libraries.

OpenTMS meets this requirement. Ability to add, edit, and delete a message is available to those users with the correct permissions. Permissions are configured by the administrator in the Admin portal.

4.7.1.19. All messages from all the DMS message libraries shall be accessible from a master DMS message library.

OpenTMS meets this requirement. Authorized users will be able to access a master DMS library report. The report will be available through the Jasper Reporting Module.

4.7.1.20. The ATMS shall allow authorized users to select that a DMS message be displayed on multiple selected DMS without needing to re-enter the message for each sign selected.

OpenTMS meets this requirement. The sign list view enables users to perform the same action on multiple signs. An authorized user clicks on the checkboxes to select one or more signs. Controls on the list view enable users to simultaneously post messages (standard or travel time) or blank multiple signs. When posting to multiple signs of different size, OpenTMS automatically groups the sign by sign type, enabling users to select the right message configuration for each sign type. In the figure below, the selected signs are grouped into 3 sign-type families. OpenTMS notifies the operator if there is any error when posting a message.



Figure 40 – Sign Message Library

4.7.1.21. The ATMS shall allow authorized users to select a DMS message, either standard or custom, for display on all signs controlled by the ATMS.

OpenTMS meets this requirement. The sign list view enables users to perform the same action on multiple signs. An authorized user clicks on the checkboxes to select one or more signs. Controls on the list view enable users to simultaneously post messages (standard or travel time) or blank multiple signs. When posting to multiple signs of different size, OpenTMS automatically groups the sign by sign type, enabling users to select the right message configuration for each sign type. In the figure below, the selected signs are grouped into 3 sign type families. OpenTMS notifies the operator if there is any error when posting a message.

OpenTMS also provides the ability to select permanent and portable DMS from the map and post standard or travel time messages as well as blank or poll the selected signs. Devices are selected by holding down the Ctrl button on the keyboard and using your mouse to click on signs. The device manager is shown below.

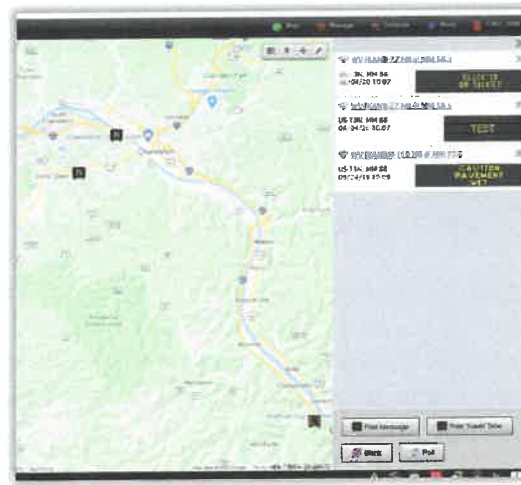


Figure 41 – Sign Multi-Post from Map View

4.7.1.22. The ATMS shall communicate with all legacy field devices currently used by WVDOH and future DMS procurements.

OpenTMS meets this requirement. OpenTMS currently supports all protocols in use by the WVDOH and will support future DMS procurements.

4.7.1.23. The ATMS shall be able to display a predefined travel time message to a selected set of DMS and update the travel time estimate dynamically without user interaction.

OpenTMS meets this requirement. The sign list view enables users to perform the same action on multiple signs. An authorized user clicks on the checkboxes to select one or more signs. Controls on the list view enable users to simultaneously post travel time to multiple signs. OpenTMS displays each sign enabling users to select the right travel time message for each selected sign. OpenTMS notifies the operator if there is any error when posting a message.

4.7.1.24. The ATMS user shall be able to save a new message in a message library.

OpenTMS meets this requirement. Authorized users can create a new message and save to the message library.

4.7.1.25. The ATMS user shall be able to choose a predefined message from message library, edit, and resave the message.

OpenTMS meets this requirement. Authorized users can select a predefined message from the library, edit and resave, copy to create a new message. Controls for message editing are shown below.



Figure 42 – Sign Message Library Controls

4.7.1.26. *The ATMS shall provide assistance in selecting standard DMS messages from the message library.*

OpenTMS meets this requirement. When adding a sign to an active incident, the Incident Response Plan will determine the best message. This is accomplished by utilizing a rules engine to select the best message based on select criteria such as incident type, location and severity. These rules can be tailored to WVDOH's specific use cases.

4.7.1.27. *The ATMS shall be able to send a message to one or more signs simultaneously.*

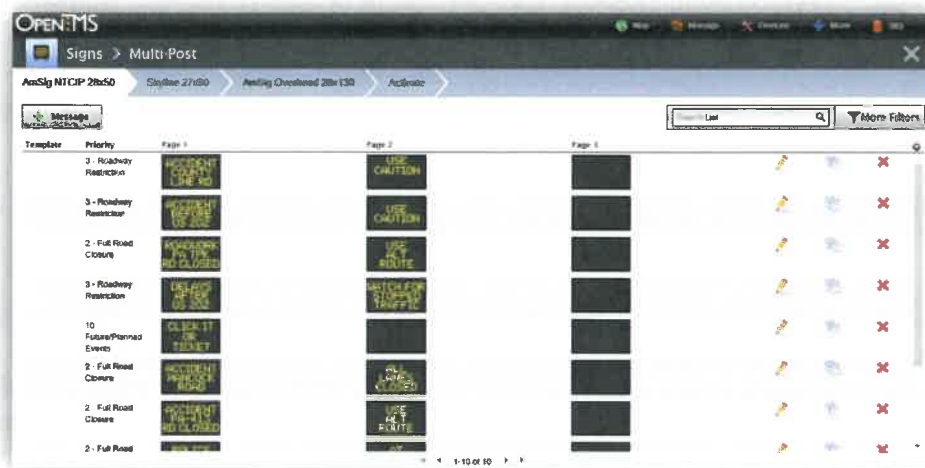



Figure 43 – Sign Multi-Post View

OpenTMS meets this requirement. The sign list view enables users to perform the same action on multiple signs. An authorized user clicks on the checkboxes to select one or more signs. Controls on the list view enable users to simultaneously post messages (plain or travel time) or blank multiple signs. When posting to multiple signs of different size, OpenTMS automatically groups the sign by sign type, enabling users to select the right message configuration for each sign type. In the figure below, the selected signs are grouped into 3 sign type families. OpenTMS notifies the operator if there is any error when posting a message.

OpenTMS also provides the ability to select permanent and portable DMS from the map and post standard or travel time messages as well as blank or poll the selected signs. Devices are selected by holding down the Ctrl button on the keyboard and using your mouse to click on signs.

4.7.1.28. *ATMS users shall be able to delete a message from the message library.*

OpenTMS meets this requirement. Authorized users can select a predefined message from the library and delete  a message. The user is prompted to confirm the delete action and the action is logged in the audit log. Control for message deletion is shown below.

4.7.1.29. *The ATMS shall be able to terminate messages.*

OpenTMS meets this requirement. Messages can be blanked from a signs detailed view or from the sign list. From the sign list the user can select one or multiple signs to blank.



Figure 44 – Blanking Signs from Main List View

OpenTMS also provides the ability to select permanent and portable DMS from the map to blank. Devices are selected by holding down the Ctrl button on the keyboard and using your mouse to click on signs. The device manager is shown to the right. Active messages are automatically removed when they expire by the system.

4.7.1.30. *The ATMS shall support daily automated diagnostic of DMS, including alarm generation based on diagnostic results, results logging, and results archival.*

OpenTMS meets this requirement. OpenTMS will provide the ability for a user to schedule diagnostic tests such as pixel and fan tests. When the tests are run, the results will be logged in the event log accessible from the maintenance tab. If errors are found a notification will be generated.

Actions	Test	Status Logs	Message Logs	Event Logs	Fonts
Event Time	Event Name	User Name	Event Additional Information		
04/25/2019 20:25:54	Test	System	Fan Test finished. Fans 1, 2, 3, and 4 failed.		

Figure 45 – Sign Event Log

4.7.1.31. *The ATMS shall provide the ability to control and retrieve information from a DMS via NTCIP 1203v1.*

OpenTMS meets this requirement. OpenTMS support NTCIP 1203v1 protocol. The DMS module also supports NTCIP 1203v2 graphics capabilities.

4.7.1.32. *The ATMS shall provide the ability to control and retrieve information from a DMS using permanent DMS protocol(s).*

OpenTMS meets this requirement. OpenTMS supports control and polling of permanent DMS message sign protocols. In OpenTMS capabilities are enabled on a sign by sign basis to allow for the reporting different controller conditions as well as enabling any standard or enhanced functionality the DMS is capable of such as Full Color Graphics. OpenTMS supports many permanent NTCIP DMS vendors such as Daktronics, SWARCO, WANCO, Ledstar, and SES America.

4.7.1.33. The ATMS shall provide the ability to control and retrieve information from a DMS using portable DMS protocol(s).

OpenTMS meets this requirement. OpenTMS supports control and polling of portable DMS message signs. In OpenTMS with NTCIP the signs share the same protocol, but capabilities are enabled on a sign by sign basis. OpenTMS supports many NTCIP portable DMS vendors such as Vermac, Daktronics, Precision Solar and SolarTech.

4.7.1.34. The ATMS shall support storage and display of messages including uppercase alphanumeric characters and at minimum the following special characters: #@&8+< >!?./- and arrows.

OpenTMS meets this requirement. OpenTMS will supports special characters (#@&8+< >!?./- and arrows) included in the font.

4.7.1.35. The DMS Interface shall provide an interface for sequencing up to three-line message panels as well as full matrix DMS, including graphics.

OpenTMS meets this requirement. OpenTMS supports both line matrix and full matrix DMS. This is a configurable option per sign. Messages for line matrix are displayed as shown below in row1 and full matrix on row 2.

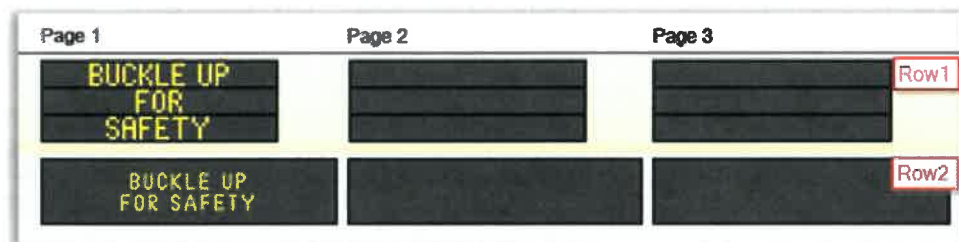


Figure 46 – Three Line Message Panels

4.7.1.36. The ATMS shall support the use of full color DMS and graphics.

OpenTMS meets this requirement. OpenTMS supports NTCIP 1203v2 along with graphics and symbols. If a sign is configured with the graphics capability the Message Editor includes additional graphic options as shown below. As with standard messages the user can associate an incident and activate from this view.

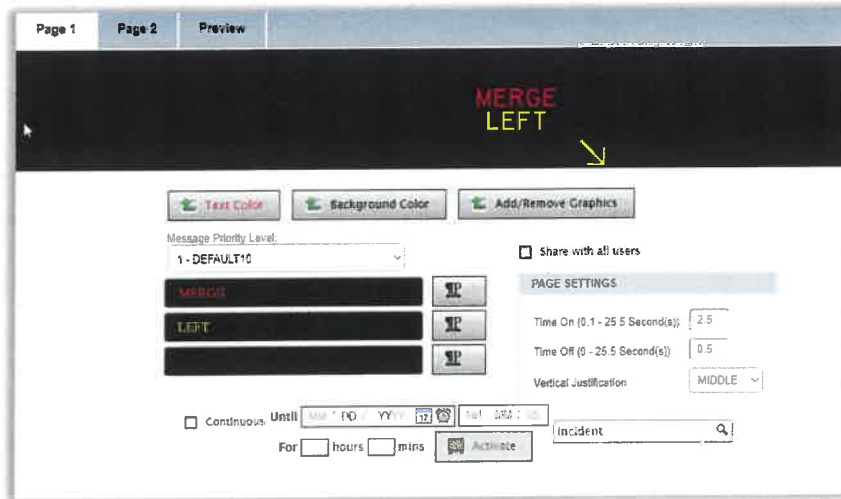


Figure 47 – Sign Message Graphic Editor

Images are uploaded through the Admin portal, signs module. When creating messages, the user can specify the location of the graphic image as shown below

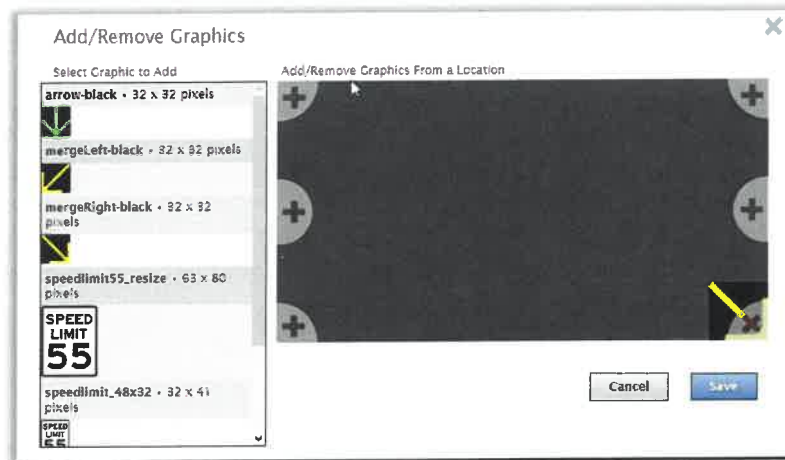


Figure 48 – Sign Message Graphic Placement

In addition to graphics the user can enter text with the graphic. The text color can also be changed as shown below. The sign background color can also be updated as shown below.

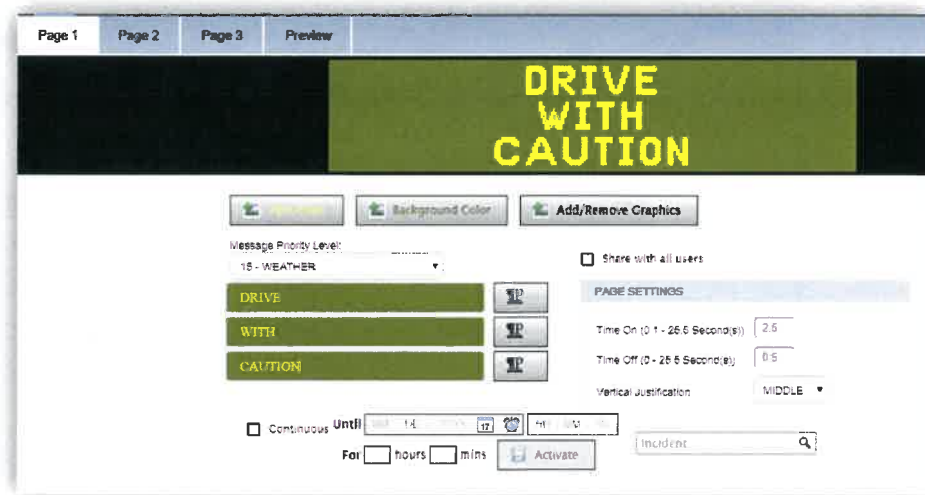


Figure 49 – Sign Message Editor with Foreground/Background Colors

Device Control – DMS Desirables

4.7.1.37. *The ATMS may have a master library of DMS messages that may be sorted by the capability of DMS that an operator is placing a message on. When the operator selects a certain DMS, the message library available to that DMS may be restricted by the size and capability of that DMS.*

OpenTMS provides an alternative approach detailed in this section. The OpenTMS library can be searched by free text. Entering Brush Fire in the Search box will narrow down the list to all messages with Brush and Fire in the message.

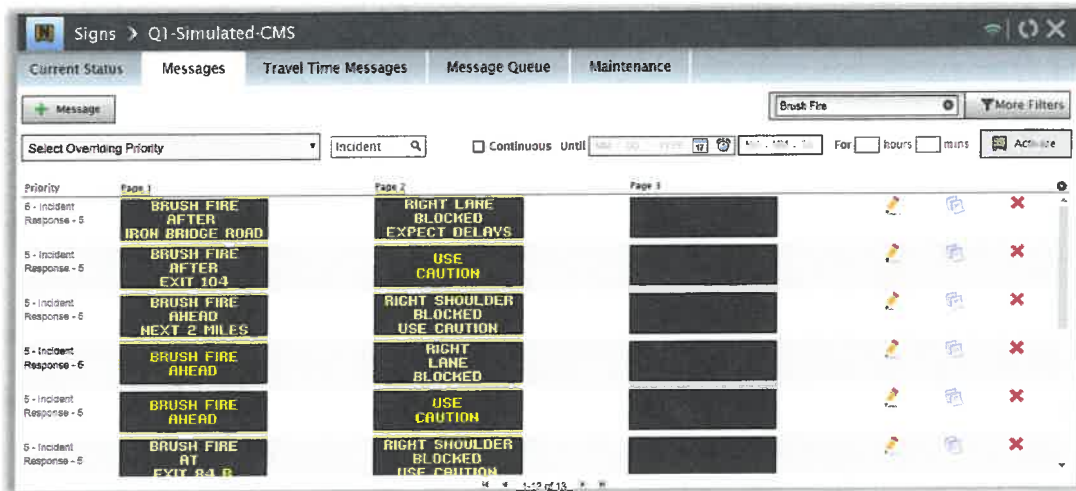


Figure 50 – Sign Message Library Search

4.7.1.38. *The ATMS should support retrieval and display DMS status reports including at a minimum sign display content, illumination, pixel failures, power status communication status, and temperature. Fan error and humidity are highly desired, if available from field hardware.*

OpenTMS meets this requirement. The application supports the retrieval of DMS status on sign display content, illumination, pixel failures, power status communication status, fan and temperature. Status is visible from the Maintenance Tab. The system polls in the background and generates a notification when and error is found as well as logs the state in the status log.

OpenTMS, through the reporting module, has a Field Device and Health Report that can be scheduled to run nightly and emailed to the maintenance staff. The Health report identifies the failed devices and those with errors. The Field Device report provides device counts, communication state information. Below is a snippet of the Field Device report.

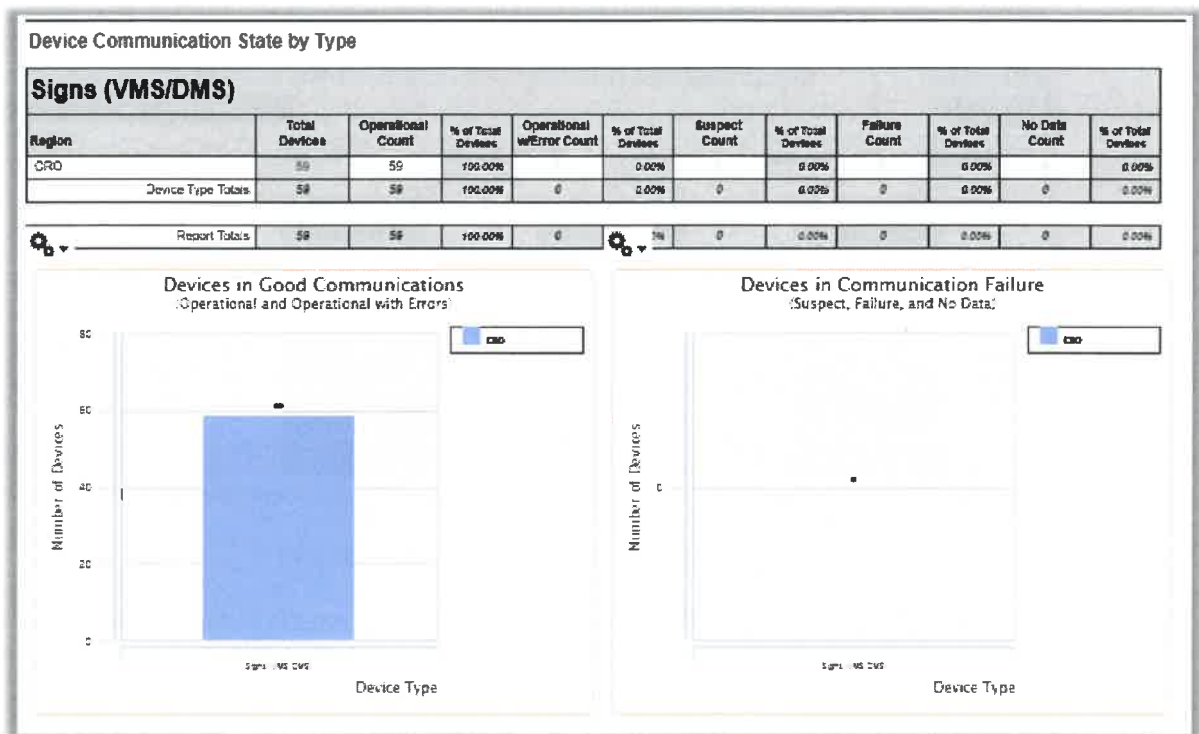
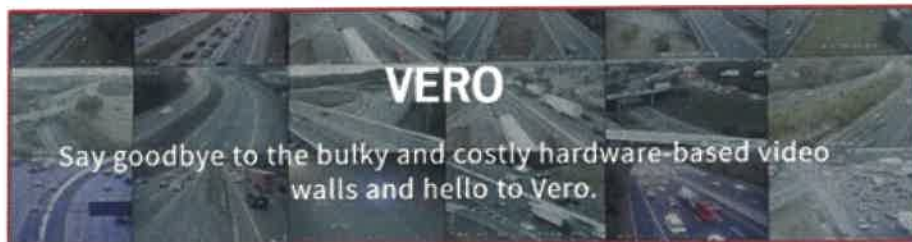


Figure 51 – Device Communication Report

4.8 Device Control - CCTV/Camera (CRFP Section 4.8)

4.8. DEVICE CONTROL-CCTV/CAMERA

In June 2018 Skyline and Q-Free made a strategic decision to share technologies natively and integrate Skyline's Vero video solution into OpenTMS. Vero provides operators a powerful, highly configurable web platform for getting the most out of the DOTs video content. Vero allows operators to effectively and efficiently view video content in a way that helps them best manage an incident.



Vero is tightly integrated and is accessed through the OpenTMS menu bar which will open the Camera module for a seamless user experience.

4.8.1. MANDATORY REQUIREMENTS

4.8.1.1. *The ATMS shall provide a mechanism for operators to view real-time video from CCTV cameras.*

Camera Module

The Camera module provides a listing of all available cameras organized by operational area as well as a dynamic display to enable the viewing of multiple video streams (See figure below). Individual cameras or predefined tours can be selected and displayed on the interface. Viewing slots can also be used for external websites or other media sources. Clicking on the camera's control button will open the control view and provide pan-tilt-zoom (PTZ) control.



Figure 52 – OpenTMS/Vero Video Module

Customizable Personal Video Wall Configurations

Operators can configure one or multiple operator workstation monitors as their own personal video walls that they use to monitor/manage accidents and congested areas. They can configure and save many different video walls based upon user and use case. Personal video walls are also configurable to up to 16 simultaneous camera views.

Added content: Information displayed on and operators personal video wall includes one or more of the following at any given time:

- Video streams from any camera;
- Map-based applications (ex. 511);;
- Web applications;
- Twitter Feeds;
- Weather;
- Cable TV feeds (if available); and
- Map-based and list-based selection of cameras.



Figure 53 – Personal Video Walls

OpenTMS will provide multiple ways to display video in the web interface. The Video will be provided in CLSP video protocol which is HTML5 Compliant and provide sub-second latency performance. Views will include video in incident management use cases and in a virtual video wall.

4.8.1.2. The ATMS shall provide a mechanism for operators to control CCTV cameras (pan, tilt, zoom).

OpenTMS will provide a mechanism for operators to control the CCTV (pan, tilt, zoom).

4.8.1.3. The ATMS shall include capability to set camera pre-sets.

OpenTMS will provide the capability to set camera pre-sets.

4.8.1.4. The ATMS will allow an operator to develop camera tours made up of views and presets from operator configurable cameras.

OpenTMS will allow an operator to develop camera tours made up of views and presets from operator configurable cameras.

4.8.1.5. The ATM shall include fine control of pan, tilt and zoom for CCTV cameras.

OpenTMS shall include fine control of pan, tilt and zoom for CCTV cameras.

4.8.1.6. The ATMS shall enable all users and TMC partner agencies with an ATMS client or workstation to view and control CCTV, according to their assigned user permissions.

OpenTMS shall enable all users and TMC partner agencies with an ATMS client or workstation to view and control CCTV, according to their assigned user permissions.

4.8.1.7. The ATMS shall determine rights and privileges of camera control based on permission and priority assigned to users by an administrator.

OpenTMS shall determine rights and privileges of camera control based on permission and priority assigned to users by an administrator.

4.8.1.8. The ATMS shall provide video recording capabilities.

Team Q-Free meets this requirement by utilizing the Video Analytics solution provided by CitiLOG. The system is setup to record at a minimum 72 hours of footage on a rotating loop. The recording system, timestamps alarm periods for easy retrieval. The system is designed to record 60 camera feeds. Team Q-Free, working with WVDOH will ensure that the system is recording those feeds the WVDOH determines are most critical.

4.8.1.9. The ATMS shall control and allow viewing from both digital and analog cameras.

OpenTMS shall control and allow viewing from both digital and analog cameras, assuming that the analog cameras are connected to an IP encoder that allows commands to be passed to the camera.

4.8.1.10. The ATMS shall interface with the workstation and video wall controller for the TMC video wall for viewing capability by operators. (Note: The current manufacture protocol in the existing ATMS system is VI CADS version 4.1)

OpenTMS is designed to allow any operator, with permission, to interface with any display wall and control the layout and content that is displayed. The TMC Video all will be driven by dedicated PC's that will display the WVDOT TMC Video Wall layout shown below in the image. Operators will select the wall and will then choose the content for each panel

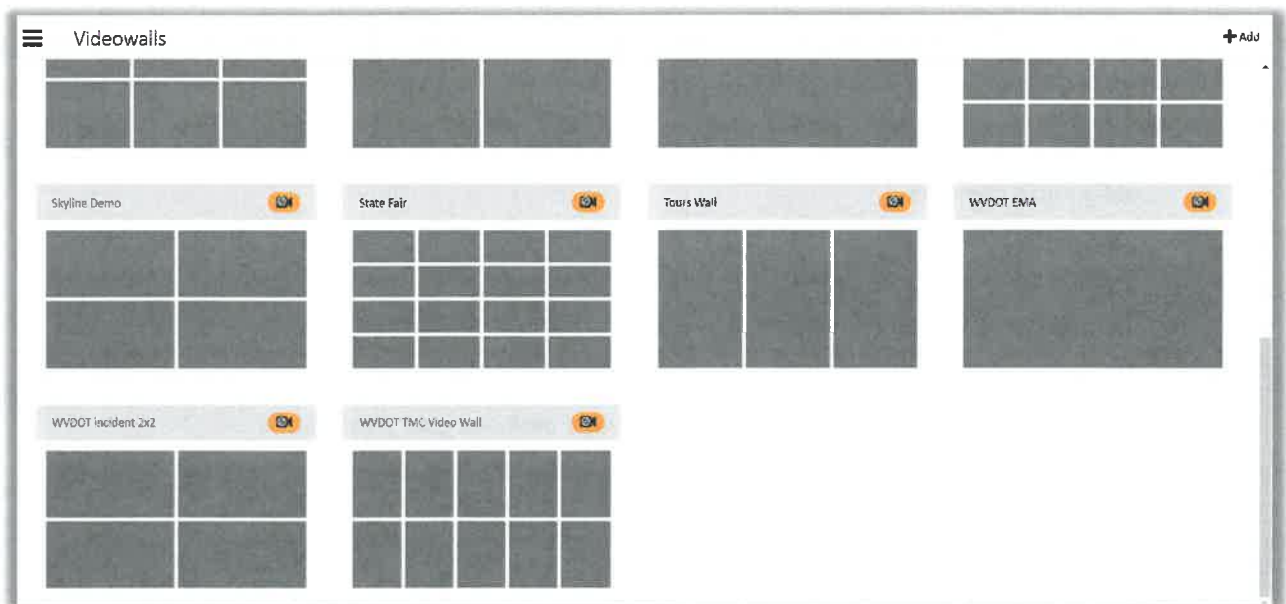


Figure 54 – Video Wall Layouts



Figure 55 – Video Wall

4.8.1.11. The ATMS shall enable operators to select the configuration of the video wall.

OpenTMS will allow operators to select the overall configuration of multiple video walls, as shown below. Once the layout of the overall wall is selected the operator can then select the layout within each section of the video wall.

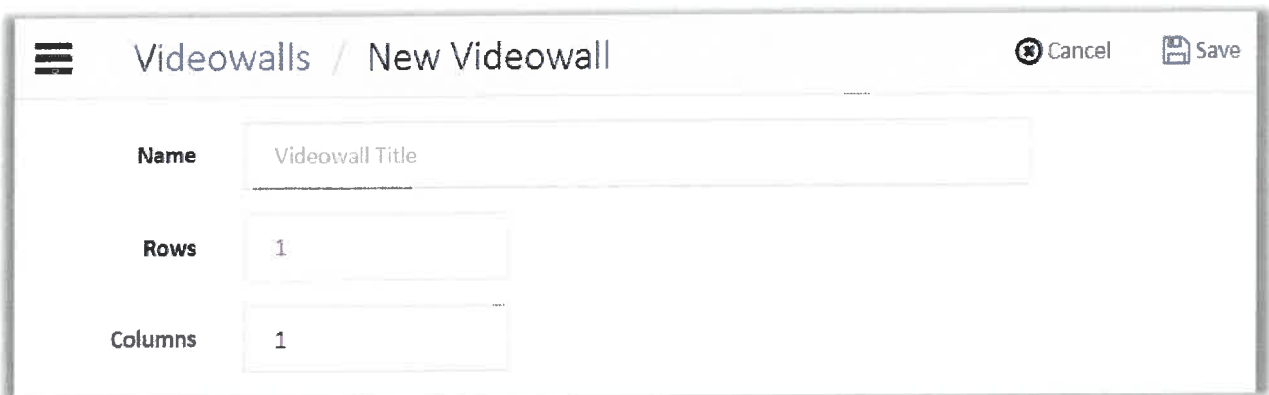


Figure 56 – New Video Wall Creation

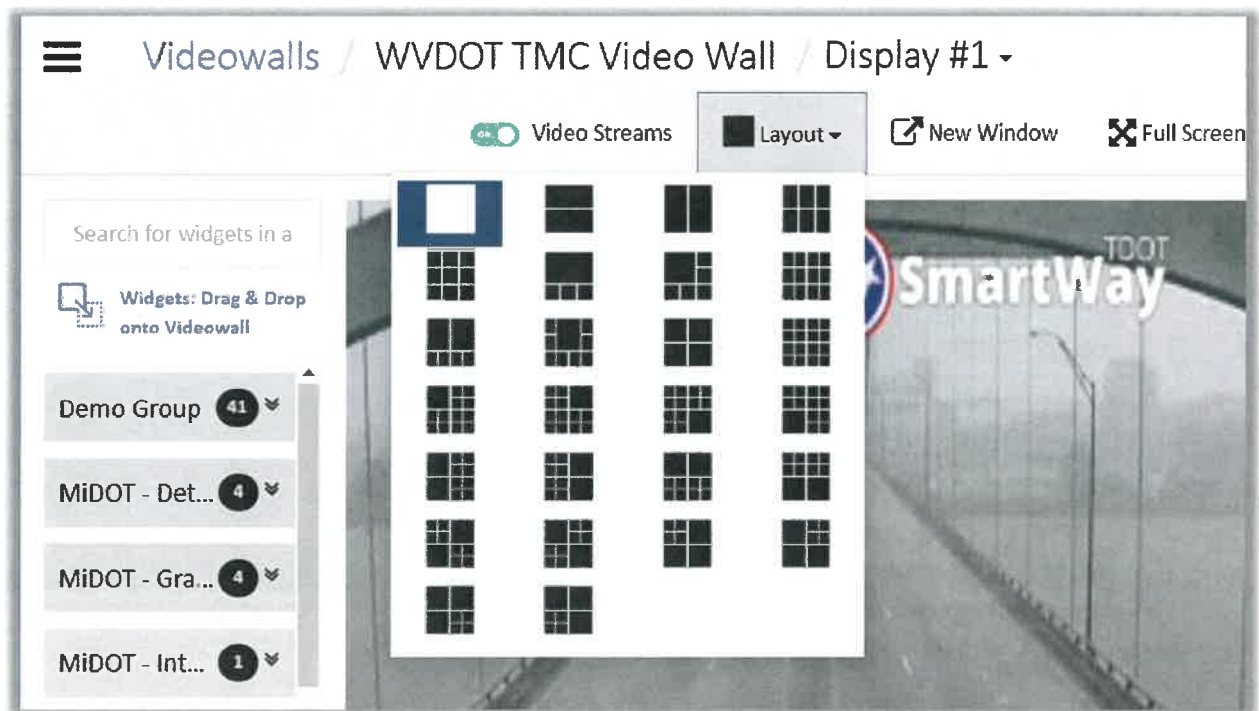


Figure 57 – Video Wall Layouts

4.8.1.12. *The ATMS shall enable operators to select what camera feeds are displayed on specific portions of the video wall.*

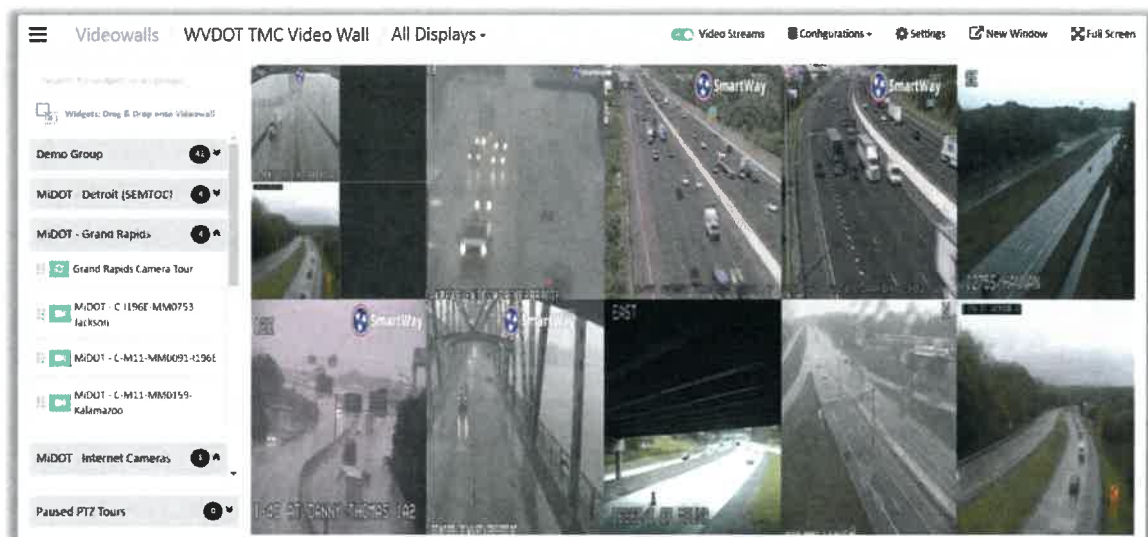


Figure 58 – Control Camera Feeds

OpenTMS will allow operators the ability to select the camera feeds that are displayed on specific portions of the video wall. This can be done by clicking on a camera feed on the left menu or by dragging a dropping a camera or widget into a specific cube on the wall.

4.8.1.13. The ATMS shall include capability to block selected cameras from selected viewers, while enabling other viewers to continue to view the camera video.

OpenTMS will provide the ability to block any camera stream from selected viewers while allowing other, usually trusted partners, to view the video streams. this feature will be available to any operator with permissions.

4.8.1.14. The ATMS shall communicate with all legacy field devices currently used WVDOH. (Note: All field devices are 2008 or newer and are on the WVDOH APL.)

OpenTMS shall communicate with all legacy IP cameras or encoders currently used by WVDOH.

4.8.1.15. The ATMS solution shall control the distribution of all traffic images for internal and external use on the public website and 511 app.

OpenTMS solution will control the distribution of all traffic images for internal and external use on the public website and 511 app.

4.8.1.16. The ATMS solution shall collect and report current camera status, e.g. communication, image status, and PTZ status.

OpenTMS will collect and report the current camera status, communication, image and PTZ status.

4.8.1.17. The operator shall be able to select a camera from the CCTV menu or GUI map.

OpenTMS will allow the operator to select a camera from the CCTV menu or GUI map.

4.8.1.18. The ATMS shall provide a demand indicator on the user's screen that will display when another authorized user requires control of the camera PTZ.

OpenTMS will provide a demand indicator on the user's screen that will display when another authorized user requires control of the camera PTZ. If a user has a PTZ camera locked and another user with a higher priority level takes control, then the original user receives a message indicating that the camera control was taken over by the other user.

4.8.1.19. The ATMS shall provide preset positions and the capability of programming a minimum of four (4) PTZ preset positions. The presets shall not be deleted/lost if the ATMS or camera software loses connection to the device.

OpenTMS will exceed the ability to provide preset positions and the capability of programming a minimum of four (4) PTZ preset positions. The presets shall not be deleted/lost if the ATMS or camera software loses connection to the device. The number of presets will only be limited by the capacity of the camera.

4.8.1.20. The ATMS shall display camera ID within the video image consisting of the name of the camera location at administrator option.

OpenTMS shall display camera ID within the video image consisting of the name of the camera location at administrator option.

4.8.1.21. The ATMS shall provide for the display of a camera control ID of the party controlling the camera control ID of the party controlling the camera when not in a preset position at administrator option.

OpenTMS shall provide for the display of a camera control ID of the party controlling the camera control ID of the party controlling the camera when not in a preset position at administrator option. If a camera's PTZ controls are locked, you can see which user has locked the camera by hovering your mouse over the lock symbol.

4.8.1.22. The ATMS shall provide a selectable time-out feature which is a programmable interval (range of 2 to 30 minutes) or event identification in which the camera must automatically return to a preset default position after the last camera control commands is received or the event is terminated.

OpenTMS shall provide a selectable time-out feature which is a programmable interval (range of 2 to 30 minutes) or event identification in which the camera must automatically return to a preset default position after the last camera control commands is received or the event is terminated.

4.8.1.23. The ATMS shall be capable of at least four independent camera tours consisting of display to a user-selected video monitor consisting of a user-selected camera and (optional) preset for display of a user-selected duration. (Note: The current ATMS system utilizes additional screens connects to the operator's workstation)

OpenTMS shall exceed this requirement allowing an unlimited number of independent camera tours consisting of display to a user-selected video monitor consisting of a user-selected camera and allows the operator to select the preset for display of a user-selected duration.

4.8.1.24. The ATMS shall allow pan-tilt-zoom (PTZ) and focus and iris control by any authorized user.

OpenTMS shall allow pan-tilt-zoom (PTZ) and focus and iris control by any authorized user.

4.8.1.25. The ATMS shall validate that users have authorized access and priority for full camera control.

OpenTMS shall validate that users have authorized access and priority for full camera control.

4.8.1.26. The ATMS interface shall provide a mechanism for capturing still and moving video images from CCTV video streams in standard format such as JPEG and publishing them to the traffic web page.

OpenTMS solution will allow the DOT the ability to capture still images (JPEG) at a selected interval and display those images on any location given permission. The Solution will also allow live streaming video to be distributed in multiple video protocols without impact to the DOT's internal operations. Mobile phone users will receive HLS protocol which can be seen on the native viewer on the devices. PC users will receive either HLS or CLSP protocol depending on the requirements of the DOT. HLS has inherent latency of 20-30 seconds and is typically use for general public and media distribution. CLSP or Claris Live Streaming Protocol, was

developed by Skyline to be a Flash/RTMP replacement. Offering agencies, the ability to distribute low latency video to users that is HTML5 compliant and does not require security permissions to view the video on modern browsers.

4.8.1.27. The ATMS shall allow for camera view access by television media with appropriate rights and restrictions.

OpenTMS solution will allow for camera view access by television media with appropriate rights and restrictions

4.8.2. Device Control – CCTV/Camera Desirables

4.8.2.1. The ATMS should include capability to set camera pre-sets by time of day / day of week, season of the year, and by independent user.

OpenTMS should include capability to set camera pre-sets by time of day / day of week, season of the year, and by independent user.

4.8.2.2. The ATMS should manage conflicts between pre-sets selected by multiple users.

OpenTMS will manage conflicts between pre-sets selected by multiple users.

4.8.2.3. CCTV control from users accessing the ATMS from within the TMC should have a latency of no more than 0.5 second as defined by the time an operator executes a control command and when an operator is able to visually verify the command was completed on a workstation or video wall.

OpenTMS CCTV control from users accessing the ATMS from within the TMC will have a latency of no more than 0.5 second as defined by the time an operator executes a control command and when an operator is able to visually verify the command was completed on a workstation or video wall.

4.8.2.4. CCTV control from users accessing the ATMS from remote access should have a latency of no more than 0.5 second as defined by the time an operator executes a control command and when an operator is able to visually verify the command was completed on a workstation or video wall.

OpenTMS CCTV control from users accessing the ATMS from remote access will have a latency of no more than 0.5 second as defined by the time an operator executes a control command and when an operator is able to visually verify the command was completed on a workstation or video wall. Note that issues with the users connection to the ATMS or the network will not be included in the time requirement.

4.8.2.5. The ATMS should interface to cameras operated by TMC partners on arterial roadways.

OpenTMS will interface to cameras operated by TMC partners on arterial roadways if provided with the correct access rights to those devices and their network.

4.8.2.6. The ATMS should incorporate view restriction protocols (blackout zones).

Currently, OpenTMS doesn't support the blackout zone capability, but the design does allow for us to expand in the future.

4.8.2.7. The ATMS should provide an interface that allows operators to manage, control, and display multiple closed-circuit television cameras including pan-tilt-zoom functions and manual camera functions available from the camera vendors where applicable. Camera image display must include simultaneous display of all cameras up to the number of monitors in the TMC.

OpenTMS will provide an interface that allows operators to manage, control, and display multiple closed-circuit television cameras including pan-tilt-zoom functions and manual camera functions available from the camera vendors where applicable. Camera image display must include simultaneous display of all cameras up to the number of monitors in the TMC.

4.8.2.8. The ATMS should allow reclamation of control of a camera being demanded by other users based on user privilege levels.

OpenTMS will allow reclamation of control of a camera being demanded by other users based on user privilege levels.

4.8.2.9. The ATMS should display the name of camera preset selected within the video image when pointed using the preset capability at administrator option.

OpenTMS will display the name of the camera preset selected within the video image when pointed using the preset capability at the administrator option.

4.9 Device Control - RWIS (CRFP Section 4.9)

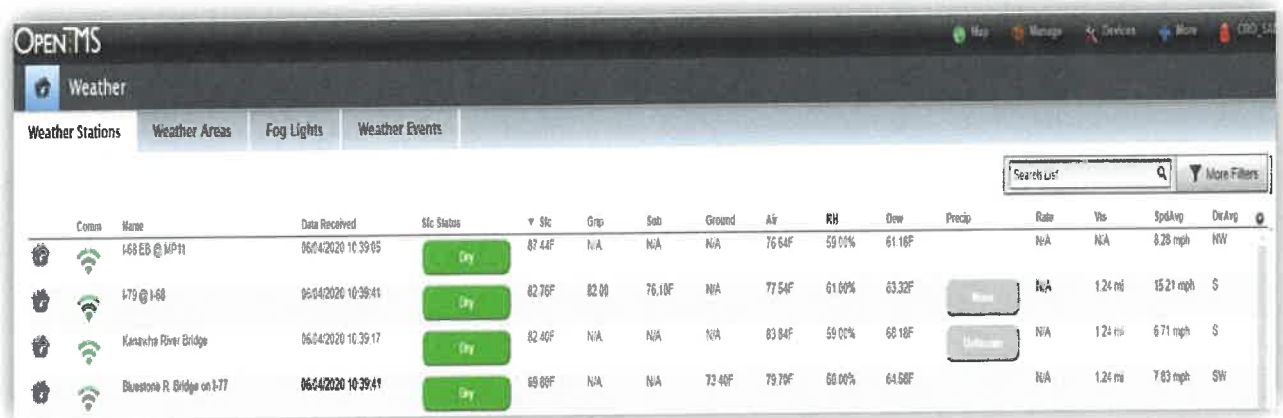
4.9. Device Control - RWIS

4.9.1. Mandatory Requirements

4.9.1.1. *The ATMS shall monitor weather data from the field devices and set threshold levels for conditions that must be posted on the GUI and integrated with the notification system.*

OpenTMS meets this requirement. The OpenTMS Weather module provides operators with a common interface to control all their weather stations, regardless of manufacturer. The weather module that contains both a list view and a device view. The list view shown below provides a summary of the communication status and key data provided by the RWIS devices.

The various detail views, as shown below provides real time information on the current device status and data readings, images from cameras mounted on the RWIS, and maintenance information. OpenTMS can ingest and display data from any sensor on the RWIS that is transmitting data.



Comm	Name	Data Received	Sfc Status	▼ Sfc	Grp	Sat	Ground	Air	RH	Dew	Precip	Rate	Vis	SpdAvg	DirAvg
	I-68 EB @ MP11	06/04/2020 10:39:05	Dry	87.44F	N/A	N/A	N/A	76.64F	59.0%	61.16F		N/A	N/A	8.28 mph	NW
	I-79 @ I-68	06/04/2020 10:39:41	Dry	82.76F	82.00	76.10F	N/A	77.54F	61.60%	63.32F		N/A	1.24 mi	15.21 mph	S
	Kanawha River Bridge	06/04/2020 10:39:17	Dry	82.40F	N/A	N/A	N/A	83.84F	59.0%	66.18F		N/A	1.24 mi	6.71 mph	S
	Bluestone R. Bridge on I-77	06/04/2020 10:39:41	Dry	69.86F	N/A	N/A	73.46F	79.70F	60.0%	64.58F		N/A	1.24 mi	7.83 mph	SW

Figure 59 – Weather Module List View

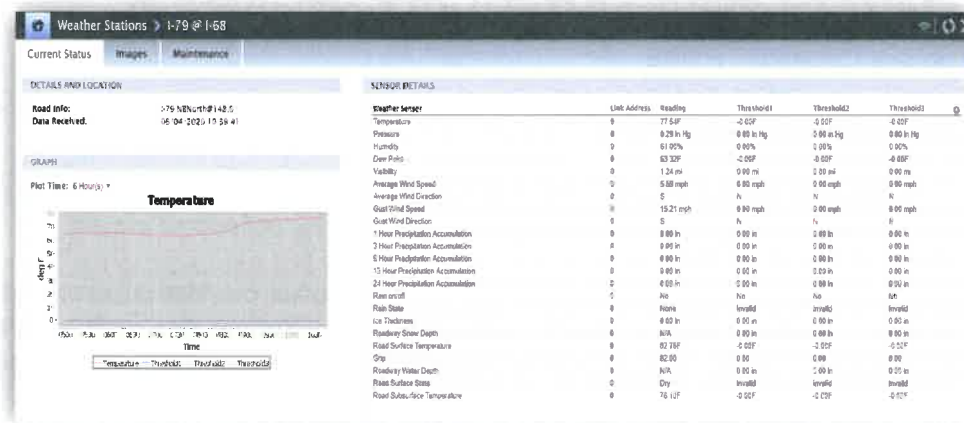


Figure 60 – Weather Sensor Detail View

When setting up the RWIS, administrators can configure thresholds on each sensor for triggering system alarms. Configured thresholds are displayed in the detailed view. In the figure below thresholds are set for temperature. As the temperature drops and a threshold is crossed an Alert in the Alert Management system will be created. Below is an example of an Alert Notification. To view details on the alert, access through the Alerts module.

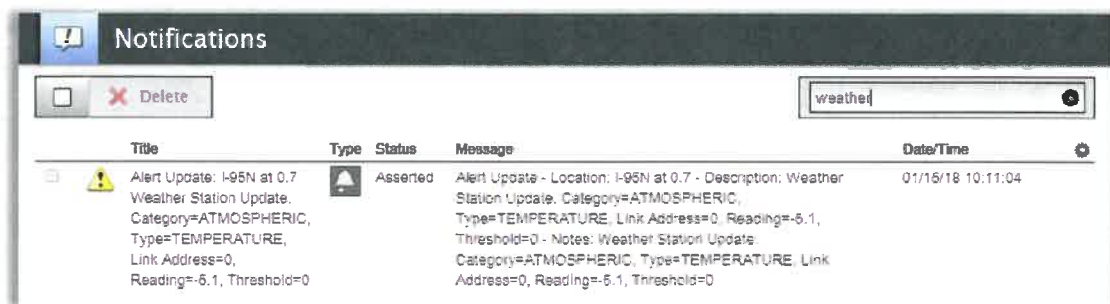


Figure 61 – Weather Alert List View

4.9.1.2. The ATMS shall accept weather sensor data coming from existing and future environmental sensors and systems. (Note: Current system is Vaisala; however, may have different options in the future)

OpenTMS meets this requirement. OpenTMS support the existing RWIS deployed in WV today. OpenTMS supports the following RWIS protocols: Vaisala 3, Vaisala FTP, Vaisala 2, Vaisala ROSA, Vaisala PWD, NTCIP, SSI, DTN v1 & v2, HSE IceSight, and HSE StormLink. Additional vendors and procurements can be supported by OpenTMS in the future.

4.9.1.3. The ATMS shall log RWIS data for operational retrieval and reporting purposes.



Timestamp	Air	Press	RH	Dew	Vis	Avg Wind Dir	Avg Wind Spd	Gust Wind Dir	Gust Wind Spd	Rate	24 Hour Precip	Rain On/Off	Solar	Sen	WB Temp
04/05/2019 21:28:45	26.24F	0.00 in Hg	18.00%	64.76F	2899.50 ft	N	0.00 mph	N	1.34 mph	0.60 mph	0.38 in	No	665.00W/m ²	427.00W/m ²	75.40F
04/05/2019 21:28:46	27.28F	0.00 in Hg	87.00%	60.96F	12871.00 ft	N	0.00 mph	SE	2.24 mph	1.11 mph	0.09 in	No	488.00W/m ²	576.00W/m ²	48.22F

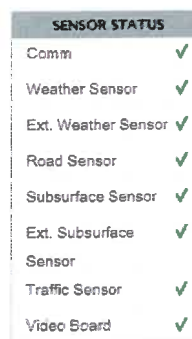
Figure 62 – Weather Atmospheric Log

OpenTMS meets this requirement. OpenTMS logs all RWIS data in the database. From the GUI, the data is accessible from one of the Atmospheric, Pavement, and Subsurface Logs in the device detailed view's Maintenance tab. The user can enter a start and end time to look at historical data. Reporting module supports access to the data for reports or download.

4.9.1.4. The ATMS shall support daily automated diagnostics for field RWIS device, including alarm generation based on diagnostic results and results logging.

OpenTMS will provide the ability for a user to schedule diagnostic tests. When the tests are run, the results will be logged in the event log accessible from the maintenance tab. If errors are found a notification will be generated. Tests available are dependent on the integration and protocol implemented.

The system polls in the background and generates a notification when an error is found as well as logs the state in the status log. Status to the right changes to a red **X** when an error is reporting. Diagnostic data available may vary based on protocol.



SENSOR STATUS	
Comm	✓
Weather Sensor	✓
Ext. Weather Sensor	✓
Road Sensor	✓
Subsurface Sensor	✓
Ext. Subsurface	✓
Sensor	✓
Traffic Sensor	✓
Video Board	✓

Figure 63 – Weather Sensor Status Panel

4.9.2. Device Control – RWIS Desirables

4.9.2.1. The ATMS should enable viewing of RWIS cameras.



Figure 64 – Weather Station Camera Snapshots

OpenTMS meets this requirement. OpenTMS supports pulling RWIS images from Vaisala 3 and Vaisala FTP protocols. WV uses Vaisala 3 today.

4.9.2.2. The ATMS should provide an alert to operators when user defined thresholds are met. e.g. The pavement temperature drops below 32 degrees F.



Figure 65 – Weather Alert Details View

OpenTMS meets this requirement. OpenTMS supports configurable thresholds. To set a pavement temperature threshold the user would configure the thresholds in the admin portal. A threshold could be set to trigger when the temperature drops below 32. When the threshold drops below 32 an Alert will be created. The user will receive a notification. Clicking on the Notification will bring up the Alert in the Alerts module. The user can review the notes for the update to view the reading that triggered the alert. From the Alerts module, a user can create a weather event from the threshold crossing.

4.9.3. Device Control Data Sensors – Desirables

4.9.3.1. *Although WVDOH does not currently have any data collection sensors in use, they desire this functionality in the future. A detector device control application should be available if and when WVDOH installs detectors.*

OpenTMS exceeds this requirement. OpenTMS has a Detectors module with a full set of protocols available; NTCIP, EIS-RTMS, Wavetronix, Peek, SSI to name a few. This module is deployed at multiple client sites today. In addition to these protocols, OpenTMS will be updated to support any available procurement or vendor the DOH desires.

4.9.3.2. *The ATMS should have the ability to integrate with and accept data from 3rd party data providers such as Waze, HERE, Inrix, etc. or approved equal.*



Icon	Name	Location	Date Received	Travel Time (minutes)	Historical (minutes)	Delay (minutes)	Distance (Miles)	Speed (Mph)	Quality
	SWRO-TTS-I-81N MM08 to I-81N MM180	I-81N at MM 4.5 to I-81N at MM 150	05/02/2019 08:52:19	08:46	08:44	00:02	8.0	80.6	✓
	SWRO-TTS-I-81N MM113 to I-81 Exit 150	I-81N at MM 113 to I-81N at MM 150	05/02/2019 08:52:18	34:19	34:15	00:04	37.0	64.7	✓

Figure 66 – Travel Time List View

The OpenTMS open modular architecture provides us the ability to integrate additional travel time and incident detection data sources. OpenTMS currently integrates with INRIX today in two of our client sites to provide travel times. The ATMS solution has a travel time engine that pulls statewide XD Segments from INRIX and makes the data available to the Travel Time module for posting travel times on DMS. Waze integration is on the road map for additional clients.


4.9.3.3. *The ATMS should provide an interface that allows operators to manage and view a summary of information from roadway sensors to the present status of the entire roadway network including a summary of individual traffic variables (speed, volume, occupancy, or a combined congestion metric) and the status (functional or nonfunctional) of all traffic sensors.*



Comm	Name	Road	Dir	MM	Data Received	Speed	Occ. Speed	Occupancy	Occ. Occ.
	LIVE-CRD-TSS-95-N-00247	I-95N	N	24.7	05/02/2019 08:29:15	73 MPH	74 MPH	4%	2%
	LIVE-CRD-TSS-95-N-00818	I-95N	N	31.3	05/02/2019 08:29:15	73 MPH	68 MPH	2%	3%
	LIVE-CRD-TSS-95-N-00330	I-95N	N	35	05/02/2019 08:29:04	68 MPH	68 MPH	2%	2%
	LIVE-CRD-TSS-95-N-00478	I-95N	N	47.4	05/02/2019 08:29:15	69 MPH	66 MPH	2%	1%
	LIVE-CRD-TSS-95-N-00484	I-95N	N	48.4	05/02/2019 08:29:15	69 MPH	67 MPH	2%	2%
	LIVE-CRD-TSS-95-N-00591	I-95N	N	58.1	05/02/2019 08:29:26	64 MPH	61 MPH	8%	7%
	LIVE-CRD-TSS-95-N-00553	I-95N	N	58.3	05/02/2019 08:31:03	67 MPH	65 MPH	8%	7%
	LIVE-CRD-TSS-95-N-00620	I-95N	N	62	05/02/2019 08:30:51	66 MPH	60 MPH	8%	5%
	LIVE-CRD-TSS-95-N-00751	I-95N	N	75.1	05/02/2019 08:29:28	68 MPH	0 MPH	13%	0%
	LIVE-CRD-TSS-95-N-00769	I-95N	N	76.3	05/02/2019 08:29:15	64 MPH	37 MPH	10%	10%

Figure 67 – Detector List View

OpenTMS exceeds this requirement. The detectors list view provides an immediate summary of all detectors with the most recent data recorded colored by congestion level. Speed is displayed by default, but Occupancy columns can be enabled. The current communication status is also displayed. From the figure below we see

that all detectors are in good communications, but one of the detectors is reporting an error () that needs to be investigated.

4.9.3.4. The ATMS should display an alarm notification when traffic speeds drop, volume rises, or occupancy increases beyond configurable thresholds.

OpenTMS meets this requirement. OpenTMS supports configurable confidence level threshold for detectors. Traffic data is used to generate alerts based on a configurable confidence level threshold that compares real-time to historical data to determine when to automatically trigger an alert. Historical data is calculated over the previous 60 days in 5-minute increments by day of the week. The threshold settings are configurable in the Admin Portal.

4.9.3.5. The ATMS should update the 511-website interface with information including a summary of individual traffic variables (speed, volume, occupancy, or a combined congestion metric).

OpenTMS meets this requirement. Through the Data Prism module, the ATMS provides a Detector Feed that third parties can pull. Feed contains speed, volume, and occupancy. The ATMS will provide the 511-website interface with the traffic variables requested, and these will become part of the 511 platform master database. WVDOT will discuss how they would like this information displayed during the design phase of the implementation.

4.9.3.6. The ATMS should update the ATMS traffic conditions map/GUI with measurements from traffic sensors and derived traffic variables on a frequency of once per minute or more frequent with data that have been collected two minutes or less prior.

OpenTMS meets this requirement. Detector data throughout the application is updated on a real time basis in places such as the list views, and map tooltips.

4.9.3.7. *The ATMS should automatically measure or calculate volume, traffic speeds, and occupancy.*

OpenTMS meets this requirement. The OpenTMS detector module continuously polls and ingests real-time traffic data from detectors. This data is made available to the user interface and is used in the background to provide incident detection.

4.9.3.8. *The ATMS should calculate and be able to display vehicle classification information.*

OpenTMS meets this requirement. Select detector protocols support the reading of classification data and is displayed on the lanes tab as shown below:

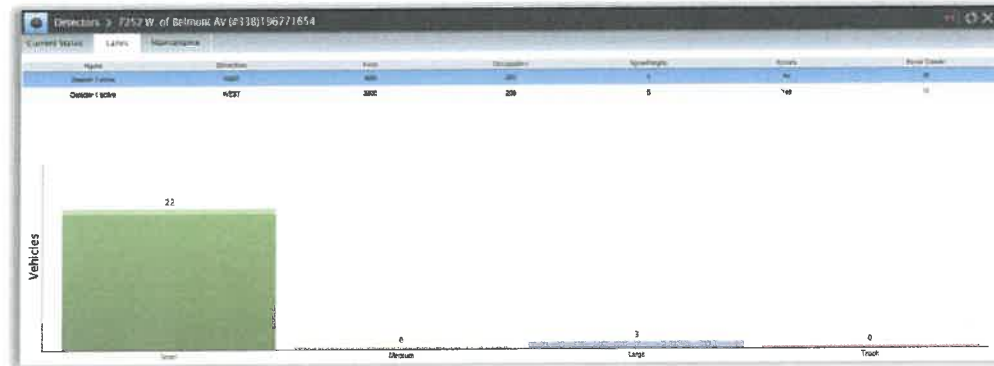


Figure 68 – Detector Lanes Tab with Classification Data

4.10 Event/Incident Management & Reporting (CRFP Section 4.10)

4.10. Event/Incident Management & Reporting

4.10.1. Mandatory Requirements

4.10.1.1. *The ATMS shall provide a mechanism for operators to manage incidents and events through a dialog box or user interface.*

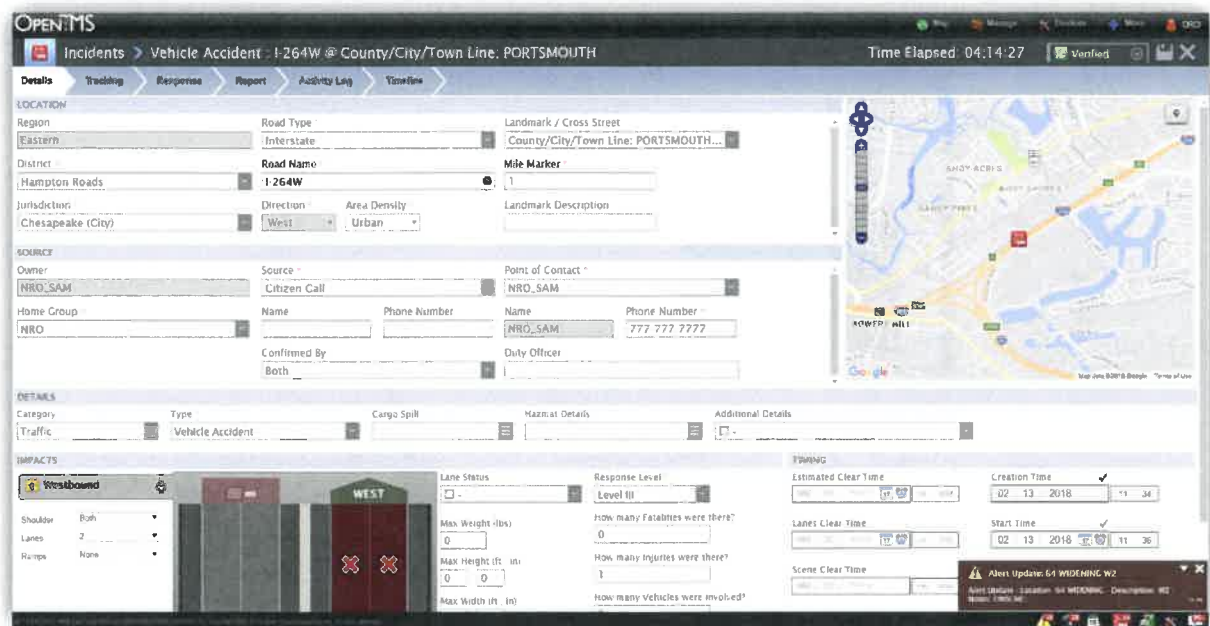


Figure 69 – Incident Details View

MANAGING INCIDENT DATA

OpenTMS greatly exceeds this requirement. OpenTMS provides a rich user interface for managing incidents. The GUI leads the operator through a workflow to log critical information about the incident and agency/stakeholder activities. The rules-based decision support automatically generates an incident response based on the incident attributes such as incident duration, road or lane closure. The incident response recommends ITS devices, 511 messaging, and email notifications. OpenTMS provides comprehensive logging of all events and provides an interactive graphical timeline. Fields are available for users to comment on the incident status and track relevant information regarding the incident.

The interface is structured to allow operators to quickly enter the minimum required fields so that the initial response and notices to the public can happen rapidly. It also provides a larger palette for more detailed information as needed. Data validation processes are context dependent such that, for example, some incident types may have different required fields from other types.

The Incident View is broken down into several tabs:

- **Details** – This tab the user enters all the information to verify an incident, send to 511 and initiate a response plan
- **Tracking** – This tab is where the user enters all the information for agency notifications, writes free text internal notes, associate alerts and communication logs
- **Response** – This tab provides the tools for managing field devices, notifications, and recommended responses
- **Report** – This tab provides a report of all the events that have occurred during this incident. It is a textual report that can be copied and pasted
- **Activity Log** – This tab provides access to the activity log which records every change made and response to the incident; and
- **Timeline** – This tab provides a graphical view of the incident over its lifespan.

One element that has been a big success with clients is the configurability of the Incident Management module. An authorized user, via the Administration page, can configure various data elements for selection by operators while managing incidents. A few of these examples are:

- Incident Types;
- Entities Impacted (e.g. School Bus Involved, Hazmat, DOT Employee, etc.);
- Response Agencies (e.g. Highway Helper, Tow Trucks, Law Enforcement, etc.);
- Severity / Response Level; and
- Incident Sources (e.g. CAD, Waze, Citizen Call, etc.).

OpenTMS uses a natural language processing algorithm to create the base 511 message for an incident based on the incident attributes including severity, impacts, and details. Controls on the user interface allow system users to customize the message in several ways:

- Indicate whether to send the message to IVR;
- Add internal information not to be disseminated;
- Add additional text to be displayed on website or social media; and
- Add additional predefined responses such as: Alternating Lane impacts, watch for stopped vehicles, etc.

Example 511 response form is shown below:

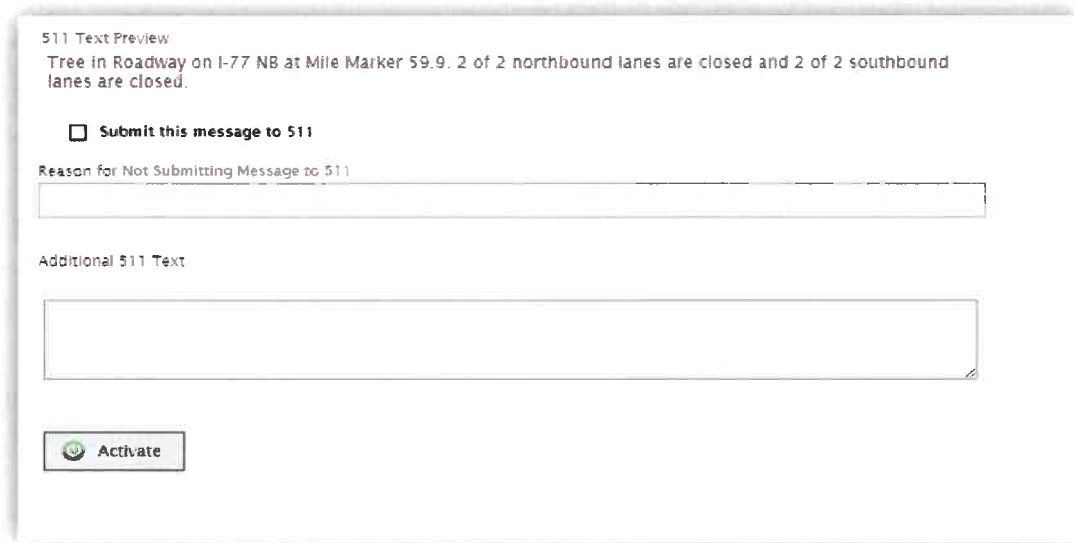


Figure 70 – Incident Response 511 View

Incident Timeline

The Incident Management module features a built-in tool known as the Incident Timeline to represent lifecycle changes in an intuitive and easy to understand format. The image below showcases the timeline for a sample incident, that includes the start of the incident, the impacted lanes, when signs were posted, and when the 511 messages were activated. Each element can be selected, and a popup will be displayed with more pertinent information to be reviewed.

The Incident Timeline features the following graphical elements:

- **Device Activation** – Information about when signs were activated in the field based on changes to the incident. Displays the message and time for each activation;
- **Incident Status** – Display status information of the incident, including when the suspect incident was created and when verification took place;
- **Lane Closures** – Display the changes in lane status over the lifetime of the incident, for when closures have escalated and deescalated. This is helpful to see how the lane closures affect the sign messages and the built-in decision support;
- **511 Activations** – Show when 511 messages were sent to public outlets. This keeps the public informed of changing conditions with the incident; and
- **Service Patrol Events** – If a service patrol truck was dispatched, keep track of notified, on-scene and departed times for support staff and agencies.



Figure 71 – Incident Timeline

4.10.1.2. *The ATMS shall store and provide operators with access to event information (incidents, construction/maintenance, parking, etc.) as entered by users.*

OpenTMS meets this requirement. OpenTMS stores all event information in the database. Access to this information is provided through a list view where the user can view a summary of the information for the event. Selecting an event from the list view or map displays the detailed view with additional information.

4.10.1.3. *The ATMS shall provide a mechanism for operators to enter/create new incidents or events. Data to be entered may include, but not be limited to: type, location (jurisdiction, route, milepost, direction, lat-long, exit number), source, details, impacts, agencies to notify, response, narrative/comments, activity log, lane configuration, lane impacts, and severity.*

OpenTMS meets this requirement. The user can create new incidents or events in a few different ways. An incident can be created from the map by dragging a Pin to the location on the map. An incident can also be created by clicking the **New** button from the Incidents list view. Incidents can be created from an incoming CAD, CitiLOG video analytics or RWIS alert as well. When creating an incident from an alert, information is populated for the incident from the alert to the extent possible, therefore allowing quicker response times when managing these incidents.



Figure 72 – Main Map Pin Drop Dialog

4.10.1.4. Users shall have the option to select from pre-defined phrase to describe the incident or event.

OpenTMS meets this requirement. The user can select a Type of Incident to describe the event. Incident Types are configurable by the administrator in the Administration Portal.

4.10.1.5. Users shall have the option to enter free text to describe the incident or event.

OpenTMS meets this requirement. The user has a few options with entering free text. As part of the Location there is a free text Landmark Description, tracking tab there is a free text internal notes area. If these options are not optimal, Q-Free will work with the WVDOH on a solution to meet their requirement.

4.10.1.6. Users shall have the option to enter free text to describe the incident or event for descriptions posted to 511.

OpenTMS meets this requirement. The user shall have the ability to review and enter additional free text for incidents or events posted to 511.

4.10.1.7. Users shall be required to specify the location of the incident either through data entry or pin-dropping on a map such that the ATMS can capture the location of the incident relative to the route, direction and location (milepost and/or lat-long).

OpenTMS meets this requirement. The user has the option of entering the location in the Location section of the form or to use the map to drop a pin on the roadway. The location panel will automatically update based on the pin drop.




Figure 73 – Incident Location Fields

4.10.1.8. Users shall be required to enter the start and end time of the incident or event.

OpenTMS meets this requirement. The Incident details tab contains a Timing section where the user can enter start and end time of the incident. Some of these fields are defaulted base on certain actions but can be updated by the user before saving. For scheduled events the start and end times are recorded when the schedule kicks off and terminates in the activity log.

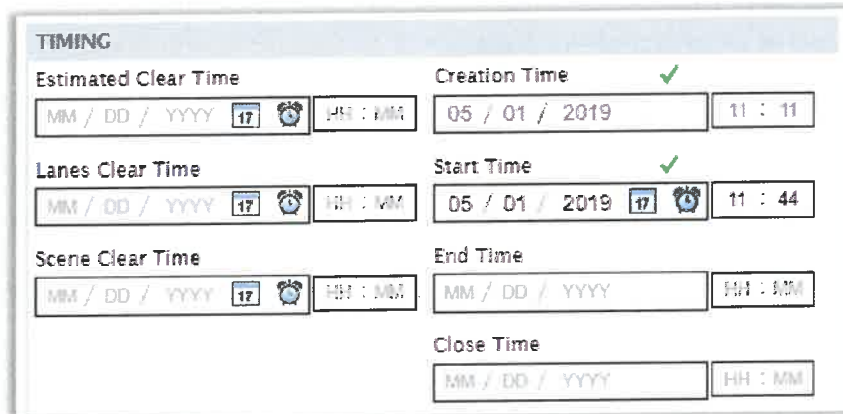


Figure 74 – Incident Timing Fields

4.10.1.9. The ATMS shall allow incident or event start times in the future to be entered and pre-defined actions to take place (e.g. construction events are often entered before the start time).

OpenTMS meets this requirement. Using the Planned Event module, WVDOH will have the ability to create custom schedules for special events, routine maintenance, emergency Work zones, or long-term projects. The interface allows the users to associate field devices, track the POC or responsible parties, and assign the event to a specific home group. This allows multiple agencies using the same platform, to filter out what is only important to that agency or home group.

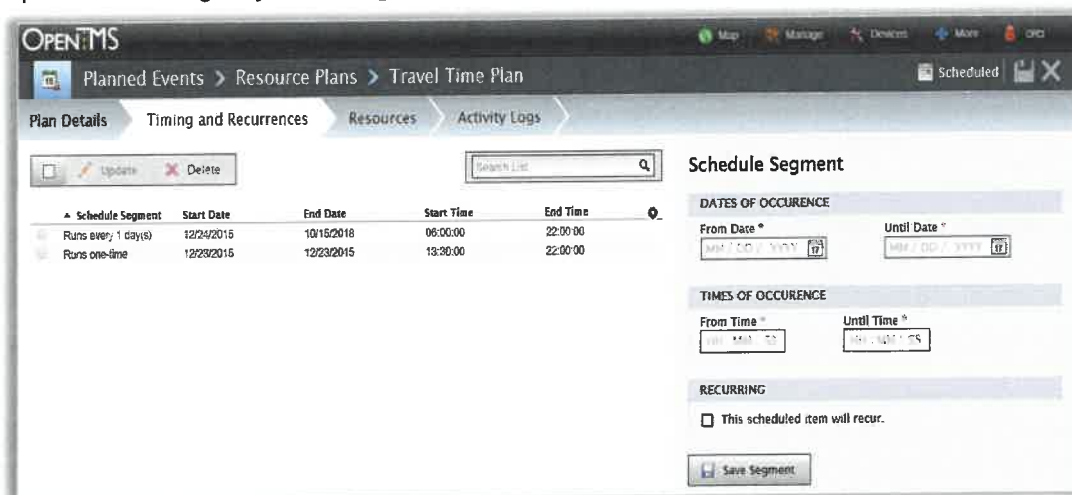


Figure 75 – Resource Plan Timing and Recurrences

4.10.1.10. Authorized users shall be able to edit incident reports.

OpenTMS meets this requirement. Privileges are configurable and only those users with the correct permissions will be allowed to edit incidents. In addition, some privileges can be restricted by home group.

4.10.1.11. Authorized users shall be able to edit incident reports created by any user in the system.

OpenTMS meets this requirement. Privileges are configurable and only those users with the correct permissions will be allowed to edit incidents.

4.10.1.12. Authorized users shall be able to edit incident reports received by the ATMS from external systems.

OpenTMS meets this requirement. Privileges are configurable and only those users with the correct permissions will be allowed to edit incidents.

4.10.1.13. The ATMS shall provide a mechanism for entry and edit of construction information as a specific type of incident/event.

OpenTMS will meet this requirement. The user can select a Type of incident/event to describe the event. Incident/Event Types will be configurable by the administrator in the Admin Portal.

4.10.1.14. Authorized users shall be able to create construction/maintenance event reports in the ATMS.

OpenTMS meets this requirement. Privileges are configurable and only those users with the correct permissions will be allowed to edit construction/maintenance events. In addition, some privilege can be restricted by home group.

4.10.1.15. Authorized users shall be able to edit construction/maintenance event reports, including changing the status from active to inactive.

OpenTMS meets this requirement. Privileges are configurable and only those users with the correct permissions will be allowed to edit construction/maintenance events.

4.10.1.16. The ATMS shall include capability for operators to enter and update construction and maintenance activities for private utilities that will impact travel on public roads.

OpenTMS meets this requirement. Users can enter and update construction and maintenance events for any third party. These events can be sent to 511 or schedule the posting of DMS.

4.10.1.17. The ATMS event management system shall include capability to generate and send alerts to WVDOH partner agencies and personnel.

The Q-Free team exceeds this requirement. Included in our decision support system is the capability to generate notifications and recommend recipients consistent with the WVDOH contact notification structure. Contacts will be recommended for incidents based on parameters such as location/jurisdiction and severity. See below for an example recommended contact list (Note: Contact numbers will be displayed for recommended recipients):

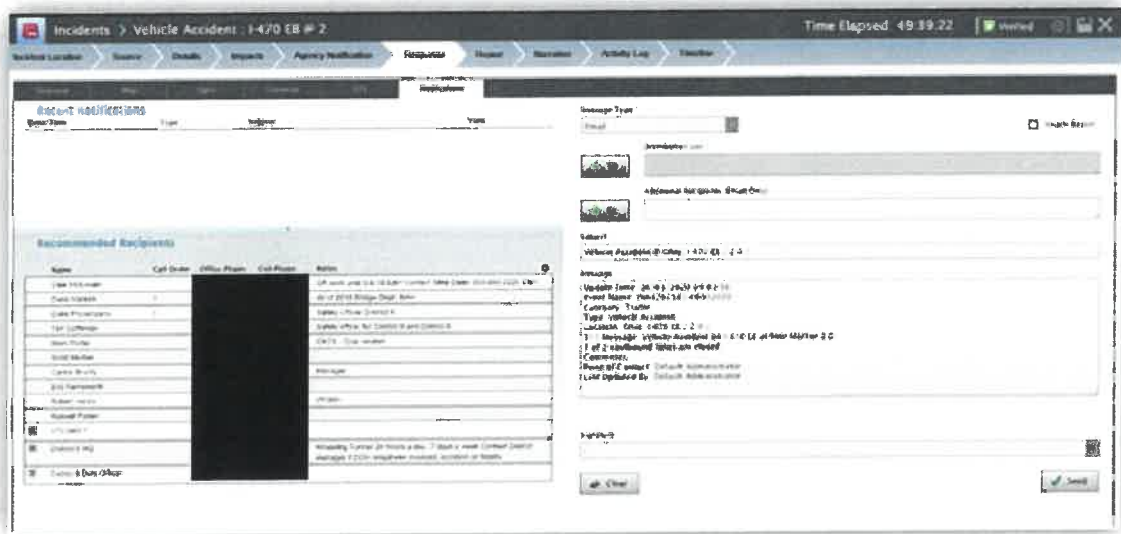


Figure 76 – WVDOH Contact Recommendation for Incident Response

4.10.1.18. The ATMS shall provide a mechanism for operators to edit incidents, regardless of the source of the incident.

OpenTMS meets this requirement. All incidents can be edited by authorized users regardless of the source of the incident.

4.10.1.19. The ATMS shall display the location of fixed ITS devices that are integrated in to the ATMS.

OpenTMS meets this requirement. All ITS devices are shown on the map at the configured location. ITS devices when presented in a list include the location.

4.10.1.20. The ATMS shall display the location of portable devices that are either reporting data to the ATMS (including location) or have been entered/configured in the ATMS by operator.

OpenTMS meets this requirement. All ITS devices are shown on the map at the configured location. ITS devices when presented in a list include the location. ATMS has integrated with the NTCIP location commands for DMS and can automatically move a DMS as it is moved in the field if the device is equipped with a GPS.

4.10.1.21. The ATMS shall maintain an incident log that records the date/time stamps of operator's actions and data entry.

OpenTMS meets this requirement. All incident activity and responses are logged. A sample log is shown below:



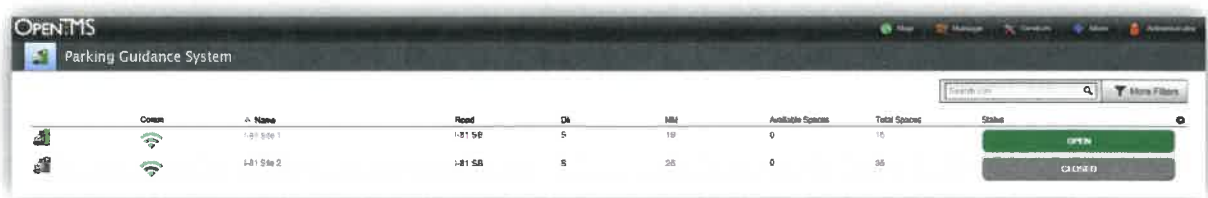
Incident Location	Source	Details	Agency Notification	Response	Report	Narrative	Activity Log	Timeline
05/22/2020 14:54:35	Administrator	511 Message					Old Value Removed > New Value Added: Tree in Roadway on I-77 NB at Mile Marker 59.9: 2 of 2 northbound lanes are closed and 2 of 2 southbound lanes are closed. Comments: test test	
05/22/2020 14:54:36	Administrator	Incident submitted to 511					Old Value Removed > New Value Added: Successful	
05/22/2020 14:54:36	Administrator	Successfully sent incident to 511					Old Value Removed > New Value Added: Tree in Roadway on I-77 NB at Mile Marker 59.9: 2 of 2 northbound lanes are closed and 2 of 2 southbound lanes are closed. Comments: test test	
05/22/2020 14:54:37	Administrator	Incident Saved					Old Value Removed > New Value Added:	
05/22/2020 14:54:37	Administrator	511 Message					Old Value Removed > New Value Added: Tree in Roadway on I-77 NB at Mile Marker 59.9: 2 of 2 northbound lanes are closed and 2 of 2 southbound lanes are closed	
05/22/2020 14:54:37	Administrator	Incident submitted to 511					Old Value Removed > New Value Added: Successful	
05/22/2020 14:54:37	Administrator	Successfully sent incident to 511					Old Value Removed > New Value Added: Tree in Roadway on I-77 NB at Mile Marker 59.9: 2 of 2 northbound lanes are closed and 2 of 2 southbound lanes are closed	
05/22/2020 14:54:38	Administrator	New Detection Source					Old Value Removed > New Value Added: Local Photo/Sheet	
05/22/2020 14:54:38	Administrator	New Time Verified					Old Value Removed > New Value Added: 05/22/2020 14:54:37	
05/22/2020 14:54:38	Administrator	New Time Started					Old Value Removed > New Value Added: 05/22/2020 14:54:37	
05/22/2020 14:54:38	Administrator	Updated State					Old Value Removed > New Value Added: Verified	
05/22/2020 14:54:38	Administrator	New Lane Status Change					NB Lane 0 CLOSED	
05/22/2020 14:54:38	Administrator	New Lane Status Change					NB Lane 1 CLOSED	
05/22/2020 14:54:38	Administrator	New Lane Status Change					SB Lane 1 CLOSED	
05/22/2020 14:54:38	Administrator	New Lane Status Change					SB Lane 0 CLOSED	

Figure 77 – Incident Activity Log

4.10.1.22. The ATMS shall provide a mechanism for entry and edit of truck parking information from existing truck parking systems on I-81 and future systems. (Note: Currently the entry and edit of truck parking information is a function used in the existing ATMS system.)

OpenTMS meets this requirement. OpenTMS has a Parking Guidance module that provides the ability to monitor and report the availability of parking from parking areas that are instrumented with vehicle counting devices. Parking availability data is disseminated to the traveling public via a roadway sign indication if the truck parking area is "Open", "Full" or "Closed" as well as delivering the status of the truck parking lots to 3rd party public notification systems, such as the 511 Travelers Information System, alerting drivers of the state of the parking area. The Parking Guidance Admin module provides an administrator with the ability to administer existing parking sites as well as configure new sites as they are brought on-line.

The parking guidance module contains both a list view, and a detailed view, which are shown below:





Icon	Name	Road	DA	Mile	Available Spaces	Total Spaces	Status
	I-81 Site 1	I-81 SB	5	19	0	10	OPEN
	I-81 Site 2	I-81 SB	5	25	0	35	CLOSED

Figure 78 – Parking List View

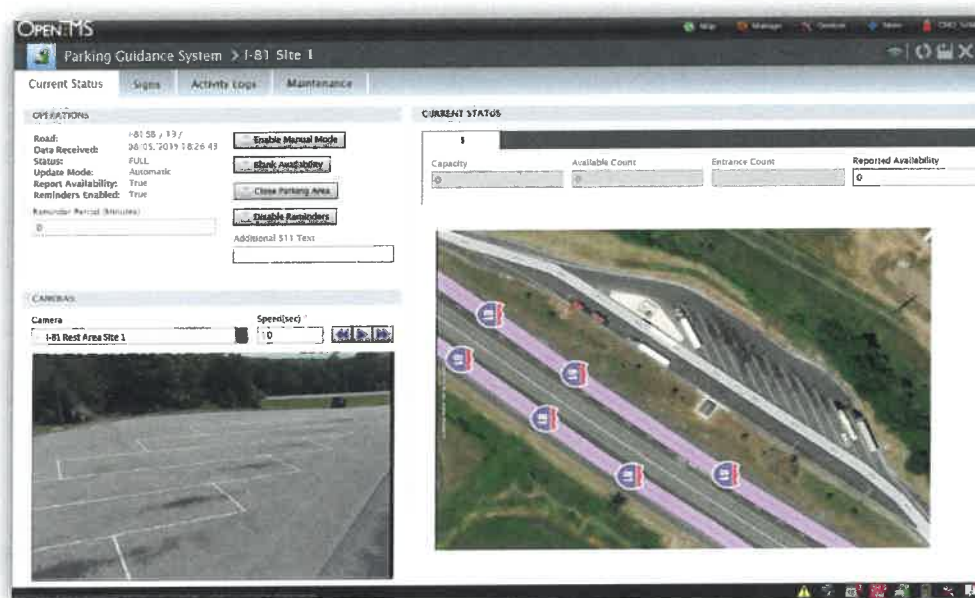


Figure 79 – Parking Details View

4.10.1.23. The ATMS shall include capability of accepting truck parking occupancy data for parking lots.

OpenTMS meets this requirement. The Parking Guidance module polls for occupancy data at regular intervals.

4.10.1.24. The ATMS shall accept and handle truck parking occupancy data for multiple lots and distinguish the lots in display to operators.

OpenTMS meets this requirement. The Parking Guidance module provides for the system to configure multiple parking sites. Each parking site has its own icon on the map and is distinctly identified in the module's list view.

4.10.1.25. The ATMS shall include capability to receive incident reports from external systems.

OpenTMS meets this requirement. OpenTMS supports the ability to detect incidents from external systems such as State Police, 911 centers, Citilog video analytics, and through monitoring RWIS and Detector threshold crossings. Notification of potential incidents are integrated into the OpenTMS Alerts module. When an event is received, the user receives a notification and can create an incident from the alert.

4.10.1.26. The ATMS shall include functionality to receive incidents from various 911 centers and law enforcement CAD systems and software.

OpenTMS exceeds this requirement, Q-Free has been a leader in CAD integration for over the last 20 + years. Q-Free has integrated over 15 separate CAD systems from State Police and e911 centers.

Q-Free has clients actively using CAD alerts as the primary component for incident detection in production today. Q-Free has integrated over 40+ e911 and State Police centers between our clients. Q-Free not only supports all the CAD systems identified in this RFP, including the new State Police integration but as the incumbent, Q-Free is providing real-time incident notifications to West Virginia operations for all current e911

partners. Additionally, Q-Free has successful integrations and a great relationship with Motorola and the software platform the WV State police procured.

Current integrated CAD vendors:

- Motorola
- Interact
- Caliber
- Tiberon
- VisionAIR
- Zuercher
- Emergitech
- Spilman
- New World
- PTS
- Intrado
- Sungard
- Intergraph
- DaPro
- EnRoute

CAD events are integrated into OpenTMS Alerts module and include an e911 center health status indicator reporting the state of the connection and the last update the ATMS received. When an event is received from an e911 center, the ATMS users receives a notification and can create an incident from the alert, associating the alert and the event together. Alternately the ATMS user can create an incident independent of the alert, ignore the alert if no action is required, or monitor the alert until action is required and then associate/create an event in the ATMS. A key feature of the Alert system beyond the initial notification, as event information is updated by the e911 center operators, the ATMS users have the most update to date information within minutes of being entered.

4.10.1.27. The ATMS shall include functionally to detect incidents using incident detection algorithms and available data.

OpenTMS meets this requirement. OpenTMS offers automated incident detection to help notify users about changing traffic conditions that warrant further inspection. Possible sources of incident detection include:

- Incidents reported by 911/CAD
- Incidents reported through video analytics – presence of wrong way driver, stopped vehicle
- Incidents / congestion reported through detector threshold crossing; and
- Potential for incidents reported through RWIS threshold crossings such as low visibility.
- Events reported through weather threshold and traffic flow thresholds as part of the Integrated Corridor Module

4.10.1.28. The ATMS shall include capability to process active incidents against internal logic to determine action plans to be performed.



OpenTMS meets this requirement. OpenTMS provides a rich user interface for managing incidents and response to incidents. The GUI leads the operator through a workflow to log critical information about the incident and agency/stakeholder activities. The rules based decision support automatically generates an incident response based on the incident attributes. The DSS is triggered when specific fields in the

incident/event that would trigger business rules are modified such as severity or lanes closed. At this point OpenTMS invokes the decision support to create an updated response plan. The incident response recommends ITS devices, 511 messaging, and email notifications. Q-Free will work with the WVDOH to customize the rules to meet their standard operating procedures.

4.10.1.29. The ATMS shall provide a mechanism for operators or administrators to create and edit action plans to include recommended activities to be performed for a variety of types of incidents and other events (special events, weather events, construction activities, maintenance activities).

OpenTMS meets this requirement. The first generation OpenTMS DSS is constructed around DROOLS (www.drools.org), the open source Business Rules Management System (BRMS). This DSS is currently in use for our clients in Pennsylvania (incident response planning, ICM), Virginia (incident response planning, West Virginia (incident response planning and contacts integration), and Ohio (ntegrated corridor management).

The Q-Free Business Rules Engine (BRE) enables us to generate response plans that were previously managed with table driven rules with fewer than 30 business rules. The beauty of the DSS is that our clients can focus on managing their business policies for incident management to ensure a consistent approach for selecting ITS devices and formatting consistent messages across the state. Q-Free will work with the WVDOH to customize the rules to meet their standard operating procedures.

Once a response is recommended users can edit the response. Note the blue stars  in the figure below. These indicate devices recommended in the response. Clicking on the star removes the device from the response and clicking on a devices adds it to the response. This provides the user the ability to quick edit recommended action plans by adding or removing devices. When a DMS is activated a blue check  is displayed.

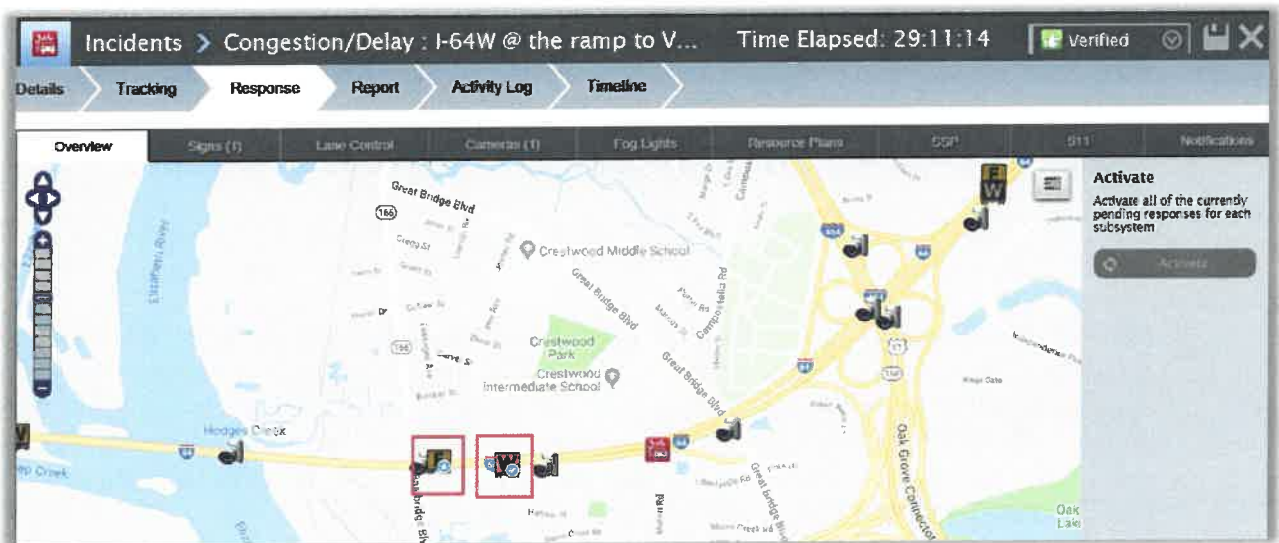


Figure 80 – Incident Response Map View

4.10.1.30. The ATMS event management plans shall include both automated and manual activities (manual are displayed to operators for them to perform).

OpenTMS meets this requirement. The OpenTMS rules-based DSS automatically generates an incident response based on the incident attributes. The DSS is triggered when specific fields in the incident/event that would trigger business rules are modified such as severity or lanes closed. At this point OpenTMS invokes the DSS to create an updated response plan. The incident response recommends ITS devices, 511 messaging, and email notifications. All generated responses are presented to the user for review. Users can remove or add DMS from a response before activating.

4.10.1.31. The event management plans shall evaluate current incident/event reports against thresholds and recommended one or more activities to operators.

OpenTMS meets this requirement. The OpenTMS rules-based DSS automatically generates an incident response based on the incident attributes. The DSS is triggered when specific fields in the incident/event that would trigger business rules are modified such as severity or lanes closed. At this point OpenTMS invokes the DSS to create an updated response plan. The incident response recommends ITS devices, 511 messaging, and email notifications.

4.10.1.32. When activities are recommended to operators, operators shall have a mechanism to accept, decline, or edit and accept the recommendations.

OpenTMS meets this requirement. Users can modify the recommended plan by adding/removing signs from the plan and altering any messaging or editing email recipients and the email message. Once the user has reviewed the recommendation the response can be activated or not.

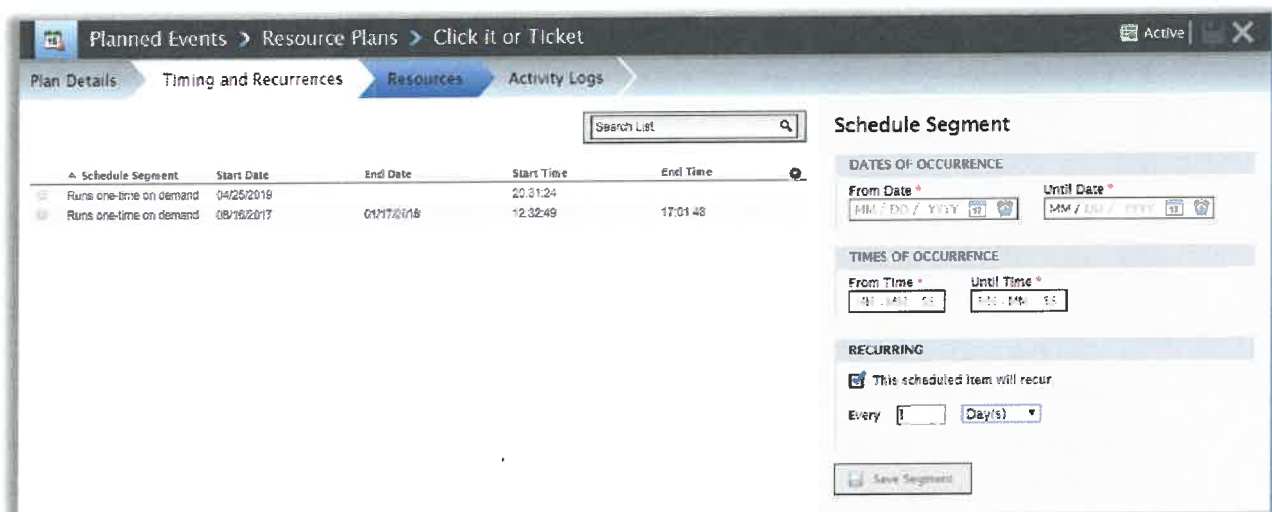
4.10.1.33. The ATMS shall perform the activities that are recommended and accepted (with or without editing) by operators.

OpenTMS meets this requirement. The rules-based DSS automatically generates an incident response based on the incident attributes. The DSS is triggered when specific fields in the incident/event that would trigger business rules are modified such as severity or lanes closed. Users can modify the recommended plan by adding/removing signs from the plan and altering any messaging or editing email recipients and the email message. Once the user has reviewed the recommendation the response can be activated.

4.10.1.34. The thresholds controlling the ATMS event management plans shall be adjustable by operators or administrators.

OpenTMS meets this requirement. The OpenTMS rules-based decision support system automatically generates an incident response based on the incident attributes. The DSS is triggered when specific fields in the incident/event that would trigger business rules are modified such as severity or lanes closed. At this point OpenTMS invokes the DSS to create an updated response plan. The incident response recommends ITS devices, 511 messaging, and email notifications. Based on current roadway conditions or special event in progress the user can modify the response or choose not to activate.

4.10.1.35. The thresholds controlling the ATMS event management plans shall allow for time of day, day of week, time of year settings.



△ Schedule Segment	Start Date	End Date	Start Time	End Time
Runs one-time on demand	04/25/2019		20:31:24	
Runs one-time on demand	08/16/2017	01/17/2018	12:32:49	17:01:48

Schedule Segment

DATES OF OCCURRENCE

From Date * MM / DD / YYYY

Until Date * MM / DD / YYYY

TIMES OF OCCURRENCE

From Time * HH : MM : SS

Until Time * HH : MM : SS

RECURRING

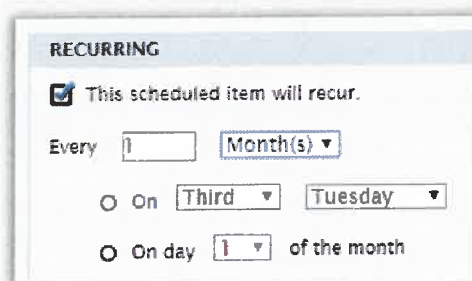
☒ This scheduled item will recur

Every Day(s)

Figure 81 – Resource Plan Timing and Recurrences

OpenTMS meets this requirement. The Planned Event module, shown below, will enable WVDOH users to schedule upcoming events for posting traveler information via roadside devices or 511. Events will activate at the scheduled time and perform the scheduled actions such as posting messages.

Events can be scheduled by time of day, every X day, every X week, or every X month. Refer to the figures below for recurring segments.



RECURRING

☒ This scheduled item will recur.

Every Month(s)

☐ On Third Tuesday

☐ On day 1 of the month

Figure 82 – Resource Plan Recurrence Detail

4.10.1.36. ATMS events can be programmed for future events and associate DMS devices and messages to be used with that future event.

OpenTMS meets this requirement. The Planned Event Module Resources tab, shown below, will enable WVDOH users to schedule future events and associate DMS message to be posted when the schedule activates.



Figure 83 – Resource Plan Resources Tab

4.10.1.37. The ATMS event management plans shall include control of DMS.

OpenTMS meets this requirement. The Planned Event Module Resources tab, shown below, will enable WVDOH users to schedule future events and associate DMS message to be posted when the schedule activates.

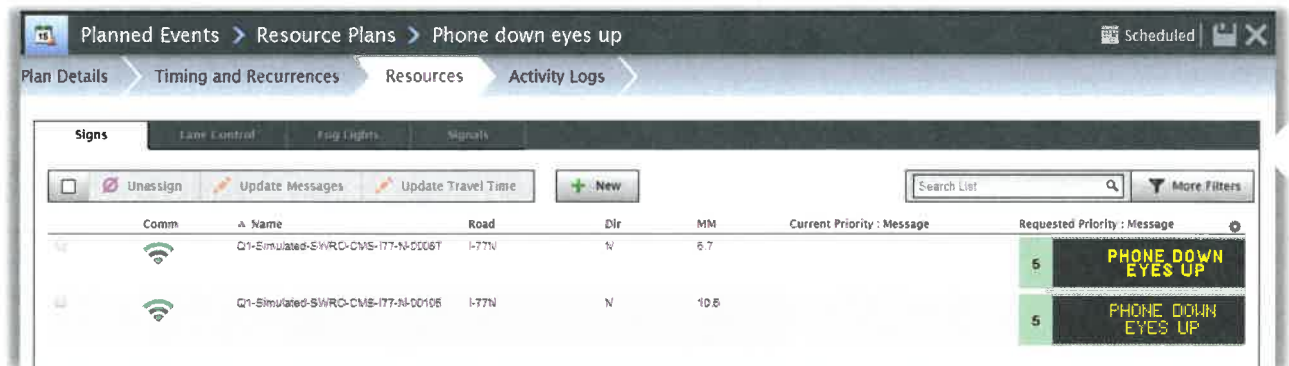


Figure 84 – Resource Plan Resources Tab

4.10.1.38. The DMS event management plans shall automatically recommend messages to be displayed on signs based on incident and event attributes.

OpenTMS meets this requirement. The rules-based DSS automatically generates an incident response based on the incident/event attributes. The DSS is triggered when specific fields in the incident/event that would trigger business rules are modified such as severity or lanes closed. At this point OpenTMS invokes the DSS to create a response plan automatically recommending DMS messages.

4.10.1.39. The ATMS event management plans shall allow authorized users to program messages for DMS and 511 to be presented by time of day.

OpenTMS will meet this requirement. The rules-based DSS automatically generates an incident response based on the incident/event attributes. The DSS is triggered when specific fields in the incident/event that would trigger business rules are modified such as severity or lanes closed. At this point OpenTMS invokes the

DSS to create an updated response plan. The incident response recommends ITS devices, 511 messaging, and email notifications. OpenTMS further allows for the operator to modify the recommendation before accepting the suggested ITS devices. ITS devices can be added or removed from the response and DMS messages used as recommended or updated. As mentioned in the introduction to this section our new Events module will support automated response plans. Response would activate when the schedule kicks off.

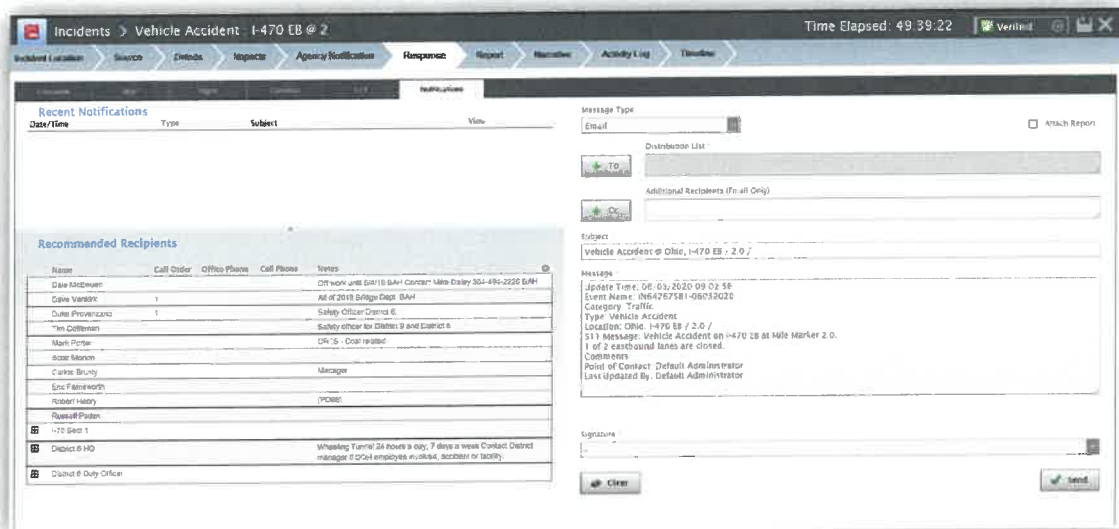
4.10.1.40. The time of day messages in event management plans shall be able to be overridden by authorized users.

OpenTMS will meet this requirement. Users with the correct privileges will be able to edit the event plan.

4.10.1.41. The ATMS event management plans shall include standard operating procedures to operators to follow, based on the type and location of the event.

OpenTMS will meet this requirement. Leveraging the automated incident response recommendations will help to standardize responses, Q-Free will work with the WVDOH to customize rules to meet their standard operating procedures. As mentioned in the introduction to this section our new Events module will support automated response plans.

4.10.1.42. The ATMS shall have the ability to automatically send an event alert message to selected recipients upon incident confirmation via automated event notification.



Date/Time	Type	Subject	View

Name	Call Order	Office Phone	Cell Phone	Status
Case Middleton				Off work until 5/11/18 BAH/Concord Mills Drivay 304-494-2250 BAH
Case Vanden	1			Aid at 2018 Bridge Dept. BAH
Duke Provenzano	1			Safety Officer District 6
Tim Coffman				Safety Officer for District 9 and District 6
Mark Porter				CR-15 - Coordinator
Scott Johnson				
Carrie Brundy				Message
Eric Farnsworth				
Robert Hasty				(NOBS)
Russell Paden				
I-70 Sect 1				
District 6 HD				Whisking Tunnel 24 hours a day; 7 days a week Contact District manager if O'Call employees are unavailable, accident or incident
District 6 Duty Officer				

Message Type:

Override List:

Additional Recipients (If any Only):

Subject:

Message:

Update Time: 06/03/2020 09:02:58
Event Name: 0664267581-06032020
Category: Traffic
Type: Vehicle Accident
Location: CR-15 I-70 EB / 2.0 /
511 Message: Vehicle Accident on I-70 EB at Mile Marker 2.0.
1 of 2 east-bound lanes are closed.
Comments:
Point of Contact: Default Administrator
Last updated By: Default Administrator

Signature:

Figure 85 – Incident Response Notifications Tab

OpenTMS meets this requirement. The rules-based DSS automatically generates an incident response based on the incident/event attributes. The DSS is triggered when specific fields in the incident/event that would trigger business rules are modified such as severity or lanes closed. At this point OpenTMS invokes the DSS to create an updated response plan. The incident response recommends email notifications. The response notifications tab is shown below. Messages sent are logged on the left and the recommended email is shown on the right. The user can modify the email and add or remove recipients.

4.10.1.43. The ATMS shall display active events as symbols (icons) located next to the associated link on the traffic Conditions map/GUI.

OpenTMS meets this requirement. The event icon is placed at the starting location of the event.

4.10.1.44. The ATMS shall provide users the ability to initiate the editing, confirmation, and termination of events by selecting the graphic object from the traffic conditions map/GUI.

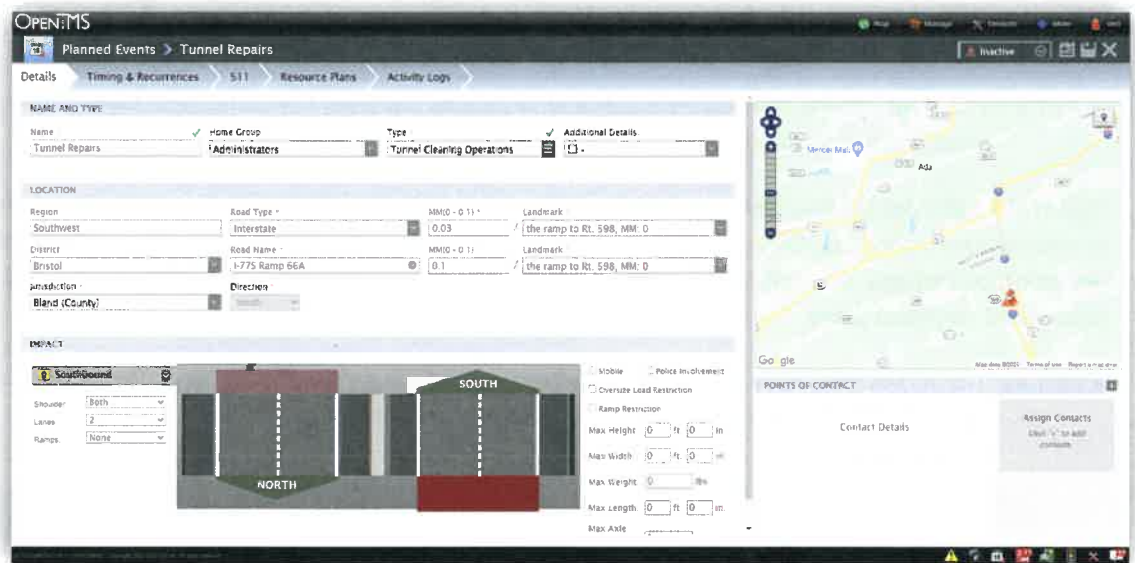


Figure 86 – Event Details View

OpenTMS meets this requirement. The user can select the planned event icon (🚧) from the map to display the Event's detailed view. The user can edit the event information and update the status to Active, Scheduled, Approved, Conflicted, Inactive, and Unapproved. The Event's detailed view is shown below.

4.10.1.45. The ATMS shall provide the ability to view an active event report containing a listing of all events active at the time of the report request including summary information about each event.

OpenTMS meets this requirement. Accessing the Planned Events module from the Manage menu displays the list view. This view provides a summary of all the resource plans their current status and description. Q-Free will provide a Jasper Report that provides a summary of the active resource plans. Team Q-Free will work with the WVDOH on the contents of that report.

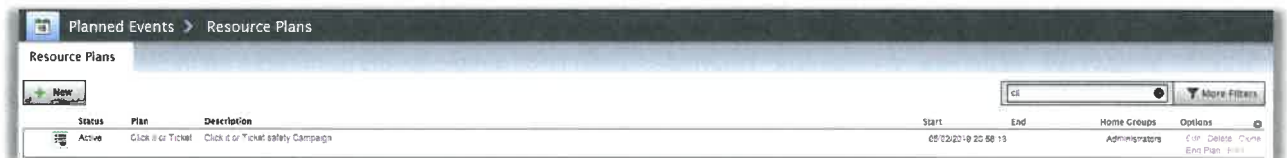


Figure 87 – Resource Plan List View

4.10.1.46. The ATMS shall provide users the ability to assign (add/remove) field devices to an event. The field device shall remain assigned to that event until the event is terminated, the device is removed, or the device is added to another event.

OpenTMS meets this requirement. The user can click the *Unassign* button to remove a DMS from an event and click *New* to add a DMS to an event. The DMS will remain assigned to the event until it is removed.

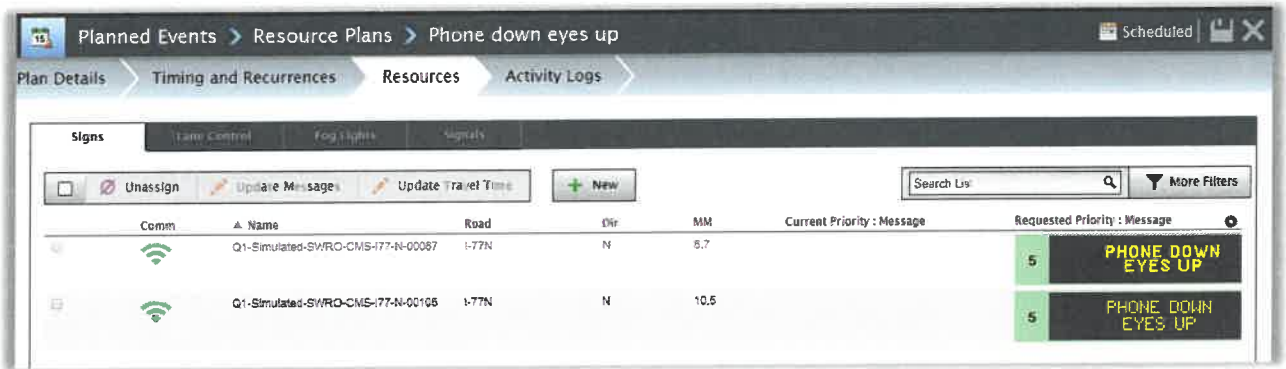


Figure 88 – Resource Plan Resources Signs Tab

4.10.1.47. The ATMS shall provide users the ability to reactivate a terminated event.

OpenTMS meets this requirement. To reactivate a terminated event the user can *Run Plan* on demand or *Edit* the plan and create or update the schedule timing.

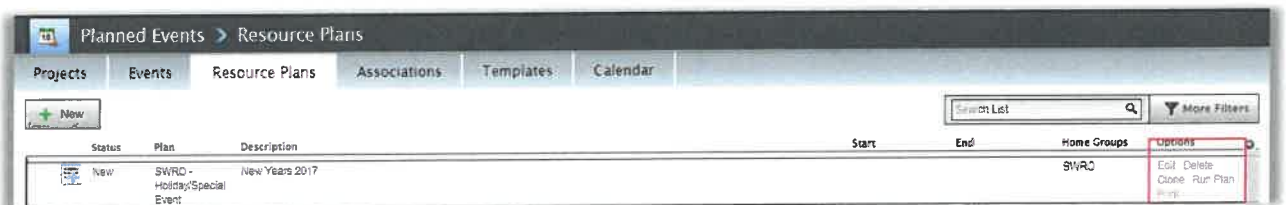


Figure 89 – Resource Plan List Options

4.10.1.48. The ATMS shall distribute all event data to WVDOH authorized users.

OpenTMS meets this requirement. All authorized users will have access to the event.

4.10.1.49. The ATMS shall provide the user with a request to confirm before an event is terminated.

OpenTMS meets this requirement. When a schedule is about to terminate, the user receives a resource Plan Expiration Reminder. Clicking on the reminder provides the user the ability to extend the plan. An example reminder is shown below.

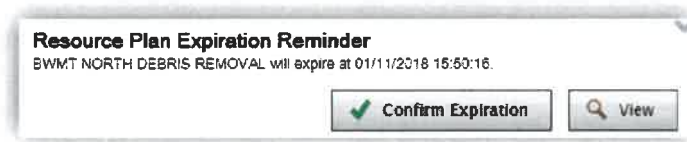


Figure 90 – Resource Plan Expiration Reminder Dialog

4.10.1.50. The ATMS shall record date and time of device access, system user, action taken, messages posted to device and error logs by event or by operator.

OpenTMS meets this requirement. The event activity log records every change and action taken by users, system actions, messages posted and any errors posting those messages or activating the schedule. Below is an example of an event activity log.



The screenshot shows the 'Activity Logs' tab for the 'Nightly Re-Paving - Bowers Hill' resource plan. The table lists various activities performed by the user 'daniels' on 04/11/2019 at 01:41:14.

Created	Username	Activity	Event Info	Options
04/11/2019 01:41:16	daniels	Added Event Association	Nightly Ramp Re-Paving	
04/11/2019 01:41:14	daniels	Added Sign	64-119 (762077340), Priority: [18 Planned Events - 3], Message: [ROAD WORK AHEAD USE CAUTION]	
04/11/2019 01:41:14	daniels	Added Sign	64-119 (762077364), Priority: [18 Planned Events - 3], Message: [ROAD WORK AHEAD USE CAUTION]	
04/11/2019 01:41:14	daniels	New Status	UNSCHEDULED	
04/11/2019 01:41:14	daniels	New Confirmation Required	true	
04/11/2019 01:41:14	daniels	New Home Group	Administrators	
04/11/2019 01:41:14	daniels	New Name	Nightly Re-Paving - Bowers Hill	

Figure 91 – Resource Plan Activity Log View

4.10.1.51. The ATMS shall identify DMS devices for use in display of specific message set(s) in response to an event.

OpenTMS will meet this requirement. The rules-based DSS automatically generates an incident response based on the incident/event attributes. The DSS is triggered when specific fields in the incident/event that would trigger business rules are modified such as severity or lanes closed. At this point OpenTMS invokes the DSS to create an updated response plan. The incident response recommends DMS messaging.

4.10.1.52. The ATMS shall provide a user interface to accept, modify or decline the identified ITS devices suggested by the system in response to an event.

OpenTMS will meet this requirement. The rules-based DSS automatically generates an incident response based on the incident/event attributes. The DSS is triggered when specific fields in the incident/event that would trigger business rules are modified such as severity or lanes closed. At this point OpenTMS invokes the DSS to create an updated response plan. The incident response recommends ITS devices, 511 messaging,

and email notifications. OpenTMS further allows for the operator to modify the recommendation before accepting the suggested ITS devices. ITS devices can be added or removed from the response and DMS messages used as recommended or updated. As mentioned in the introduction to this section our new Events module will support automated response plans.

4.10.1.53. The ATMS shall provide a user interface to initiate or inhibit display of DMS messages with and allow user modification of DMS messages in response to an event.

OpenTMS meets this requirement. The user can unassign DMS, update both standard and travel time messages when managing an event. If additional DMS are needed later, the user can add new DMS and save.



Figure 92 – Resource Plan Resources Signs Tab

4.10.1.54. The ATMS shall provide the ability to create test events that are not transmitted outside of the TMC or to devices for the purpose of training of operators.

OpenTMS will meet this requirement. The Incident Types are configurable in the Admin Portal. As far as configuring Incident/Event type there is a default Public Mode that can be set to Never.

As part of this deploying, Q-Free will be deploying a Staging environment that the WVDOH can access for training new users.

4.10.2. Event/Incident Management Reporting Desirables

4.10.2.1. The ATMS should provide a mechanism for automated interface with RWIS and entry and edit of weather reports as a specific type of incident/event.

OpenTMS meets this requirement. The RWIS module will automatically poll RWIS for sensor data. Using the Admin Portal administrators can configure thresholds on each sensor for triggering RWIS alerts. For example, if you have a visibility threshold, as the visibility drops, and a threshold is crossed an alert in the Alert Management system will be created. This alert can be used to create a weather incident that users can manage by posting DMS, for example.

4.10.2.2. The ATMS should provide a mechanism for entry and edit of holiday-based restrictions as a specific type of incident/event.

OpenTMS meets this requirement. Incident types are configurable by the administrator in the Admin Portal.

4.10.2.3. The ATMS should allow multiple authorized users to edit event data at the same time and save dynamically. A conflict resolution scheme is to be proposed.

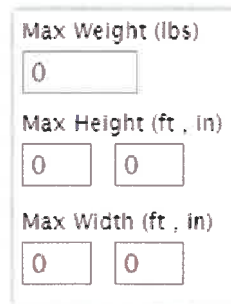
OpenTMS will meet this requirement. A conflict resolution scheme will be provided to operators when the same incident is being edited at the same time. A notification will be displayed on the screen indicating that the incident has been updated by another user. A conflict screen will be displayed that allows the operator to see what was updated and what was entered and decide how to consolidate and move forward with the incident.

4.10.2.4. The ATMS should provide a mechanism for entry and edit of permanent freight specific information related to height, width, and load rating as it pertains to specified routes, locations and/or direction of travel.

OpenTMS meets this requirement. The ATMS provides the ability for users to enter weight, width, and height restrictions that are associated with single incidents or construction events. This information is provided to the 511 website through a data feed. The ATMS does not have a permanent method for entering the restriction information by route, this is currently handled on an incident by incident basis.

4.10.2.5. The ATMS should include capability for operators to enter temporary weight, width, and height restrictions for commercial vehicles.

OpenTMS meets this requirement. The ATMS provides the ability for users to enter weight, width, and height restrictions that are associated with single incidents or construction events. These restrictions are configured when entering an incident/event and are included in the data feed. Entry form is shown below:



Max Weight (lbs)

Max Height (ft , in)

Max Width (ft , in)

Figure 93 – Incident Restriction Entry Form

This information will appear on the 511 website as shown below.

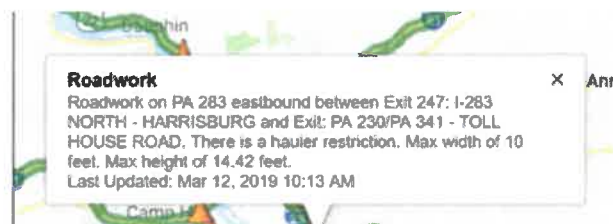


Figure 94 – 511 Construction Tooltip

4.10.2.6. The ATMS event management plans should include user creation of detour routes.

OpenTMS will meet this requirement. If pre-planned detour routes are available in a supported map layer the layer can be added. The OpenTMS map interface supports the display of WMS and ArcGIS Rest end points. As part of the roads and highways integration, detour routes can be consumed, and basic ad-hoc detour routes can be created as well. These detour routes can also be pulled into our decision support rules if desired and can be incorporated into DMS messaging as part of a response plan.

4.10.2.7. The ATMS should allow users to drag and drop event icons within the traffic conditions map/GUI and associate the event with the nearest roadway and/or cross street.

OpenTMS meets this requirement. The user can use the Pin map tool to create a new incident or event. To create the new incident, drag the Pin to the location on the map. A pop-up will be presented for the user to confirm the roadway selection. Once confirmed, an incident will be created and the location including the roadway and cross street of the incident populated.

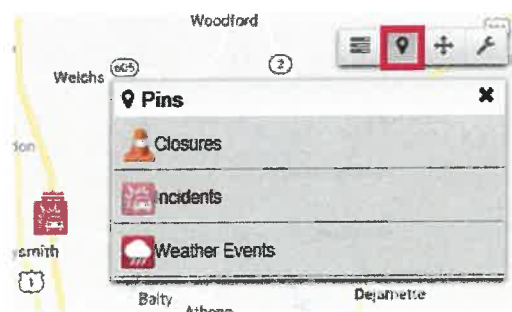


Figure 95 – Map Pin Control

LOOKING TOWARDS THE FUTURE

On the Q-Free Product Road Map for the next version of OpenTMS is a consolidation of our Incidents, Planned Events and Weather Incidents into a single Events module. This consolidated module will focus users on consistent look and feel for event management with consistent features like Incident Response. Based on feedback from our clients they want to take our current event management and extend functionality to include many of the features available in the incident module today such as – business rules for message posting and notifications, timeline views, consolidated incident/event reporting and management from a single view. As this module is developed the WVDOH will participate in the design process by providing input at the sprint review meetings.

All the mandatory requirements will be incorporated into the module. Below is a mockup of the Events Dashboard.

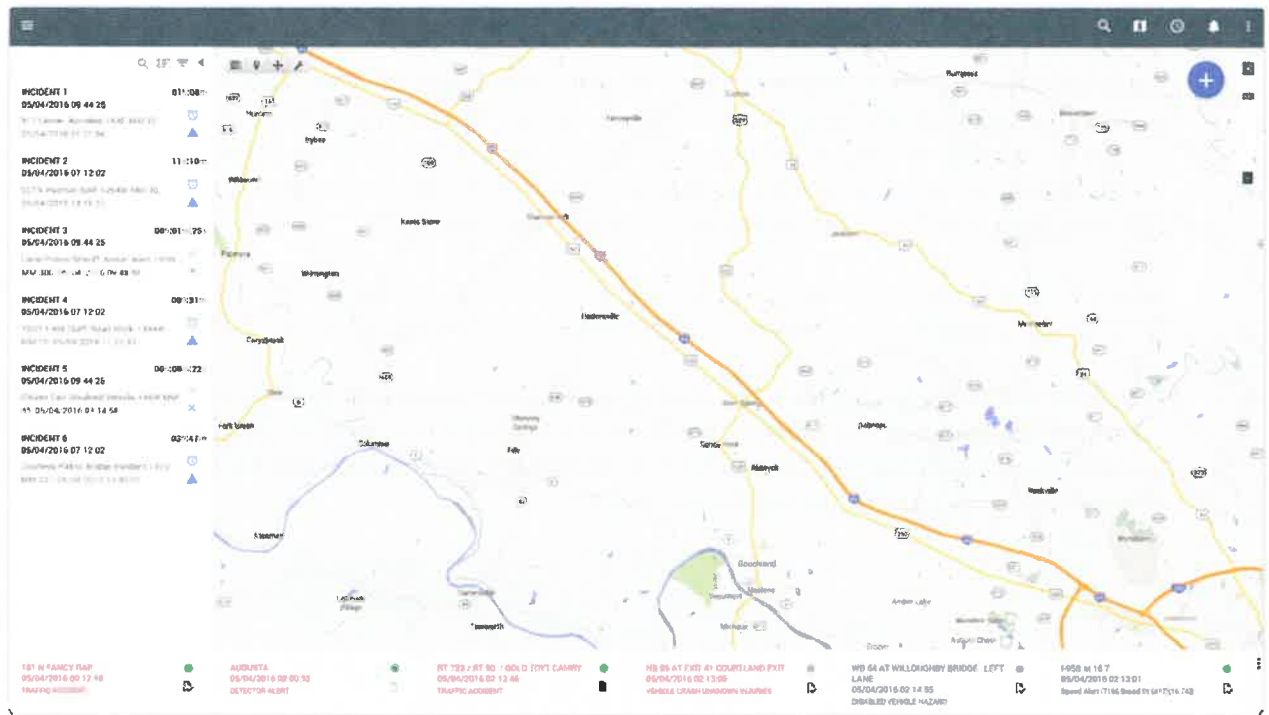


Figure 96 – Events Dashboard Mockup

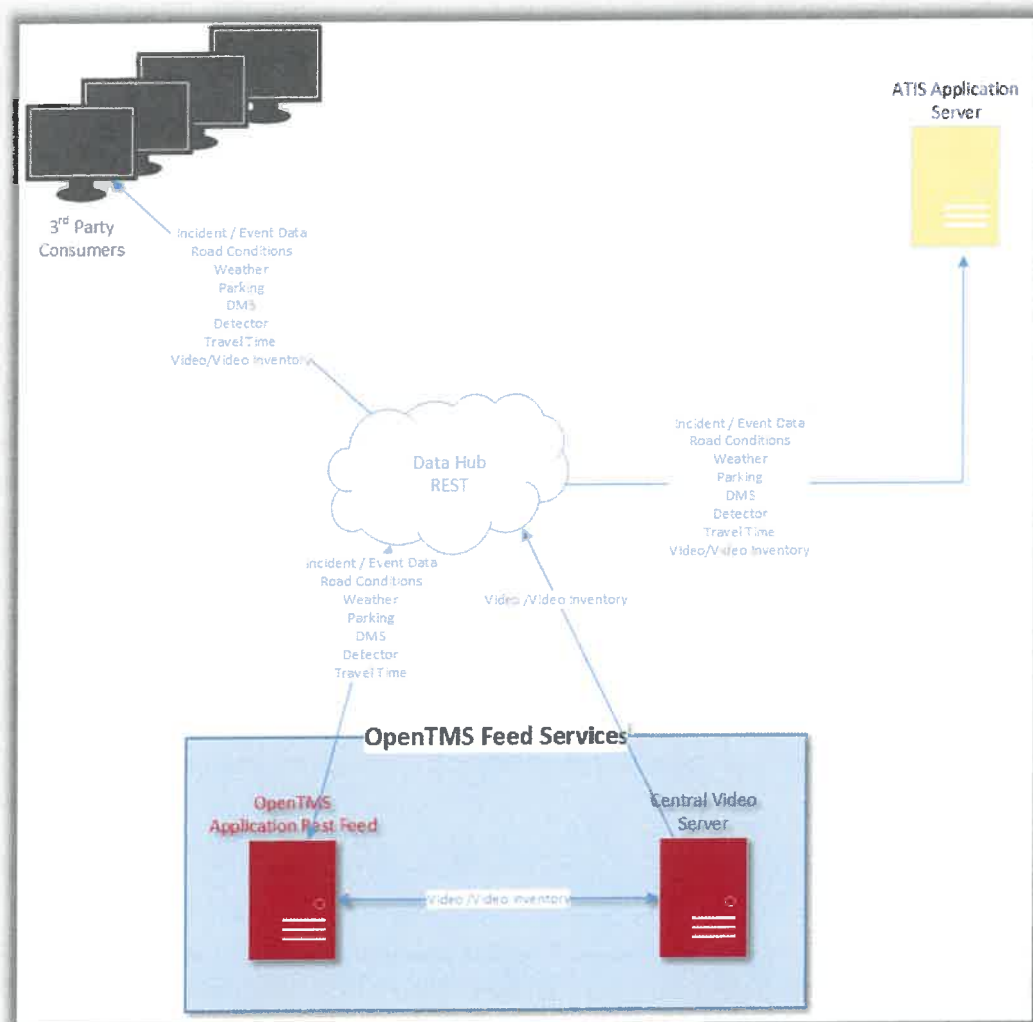
4.11 Traveler Information (CRFP Section 4.11)

4.11. Traveler Information

4.11.1. Mandatory Requirements

4.11.1.1. *The ATMS shall provide a data stream to be accessed by the 511 websites to share data for display on the 511 website and 511 app.*

OpenTMS exceeds this requirement. The modular architecture of OpenTMS supports standards-based integrations with external systems. The system includes a data integration platform which will facilitate exchange of data with the 511 through a REST API. An Interface Control Document (ICD) is available to third parties that consume our feeds. The ICD details the contents of the feeds. OpenTMS provides a data export feed in VDOT and PennDOT today. We have integrated with 511 systems in Alaska, VDOT and West Virginia. The figure below is a high-level architecture of the data feed distribution system.



The ILOG 511 platform collects data in a variety of ways with periodic pushes and/or pulls of information and can include a virtually unlimited number of data sources. The system accommodates a wide variety of data formats and uses many different programming languages/techniques to interface with data providers. Some agency data is collected over secure VPNs, some through public feeds, and some through secure, authenticated sites. The system also collects information from 3rd party providers (e.g. INRIX, National Weather Service, WAZE), 3rd party AVL feeds, 3rd party speed sensor feeds, 3rd party parking feeds, agency data pumps, and can ingest or share data from the system's own mobile app.

The centralized 511 platform will accept, filter, and distribute data from the ATMS for distribution to the 511 components including the website, IVR, and the mobile app. During the processing of the data, WV business rules will be applied that can de-duplicate repetitive information, triage/prioritize information, and assign distribution channels, depending on WVDOH preferences. As part of the processing, each piece of data is tagged with its required geo-specific characteristics. For example, the latitude and longitude in the raw data can be used to assign the data with other geospatial reference information such as a rest area, milepost, parking area, etc. The stored data is converted into all formats needed by the specifics required in the 511 platform: e.g. formatted for text display, formatted for audio output, formatted for distribution to publicly available data feeds, etc. By converting processed data to all formats, the information is immediately available for all components of the 511 platform. This way, regardless of how the traveler receives the information, and regardless of how other parties use the public data feeds, WVDOH can be sure that all distribution channels contain the same information – updated simultaneously.

4.11.1.2. The data sharable with the 511 website and 511 app shall include all traveler information reports (Incidents, construction, events, freight, parking) entered, received, or edited in the ATMS.

OpenTMS meets this requirement. The data feeds are available through a REST API and can be accessed by 511 systems. Feeds will be available for incidents, construction events, freight and parking.

The 511 platform exceeds this requirement. The centralized 511 platform system will accept, filter, and distribute data from the ATMS for distribution to the 511 components including the website, IVR, and the mobile app. During the processing, business rules can be applied that can de-duplicate repetitive information, triage/prioritize information, and assign distribution channels, depending on WVDOH preferences. As part of the processing, each piece of data is tagged with its required geo-specific characteristics. For example, the latitude and longitude in the raw data can be used to assign the data with information such as a rest area, milepost, parking area, etc. The stored data is converted into all formats needed by the solution: formatted for text display, formatted for audio output, and formatted for distribution to publicly available data feeds. By converting processed data to all formats, the information is immediately available for all components of the 511 platform. Regardless of how the traveler receives the information, and regardless of how other parties use the public data feeds, WVDOH can be sure that all distribution channels contain the same information – updated simultaneously.

4.11.1.3. The data sharable with the 511 website and 511 app shall include CCTV video images captured by cameras connected to the ATMS.

The 511 platform exceeds this requirement. The data sharable with the 511 website and 511 app will include live streaming video captured by cameras connected to the ATMS. The private source data stream locations provided by Skyline will be accessed by ILOG via URLs. These streams will be provided to the public through the website and mobile application.

The 511 website and mobile app can display both streaming camera video and static camera images. Camera images will be brought into the 511 platform and processed to add a watermark. Simultaneously the database will mark the timestamp of the image. Monitoring systems can detect if an updated still image is not received after a preset period of time, and a message stating that the image is not available can be displayed, and/or the camera icon can be disabled and turned gray.

A challenge for web map visuals is the inequitable distribution of ITS devices, such as cameras, across the state geography. Cameras generally are not distributed uniformly, which means some areas have dense pockets with many cameras, while other areas do not have any. To create map views that are convenient for end-users, two methods are used. The first method is related to the mobile-adaptive nature of the website, which makes certain map features are only available at particular zoom levels. The second method is icon clustering to indicate where zooming in will provide greater granularity. An example can be seen in the figure below, with the camera icons clustered and expanded on a web map. Notice that each cluster icon indicates the number of cameras that are available in that cluster. When a user clicks on a clustered camera icon, the web map zooms to that area at a level where individual cameras may be selected.

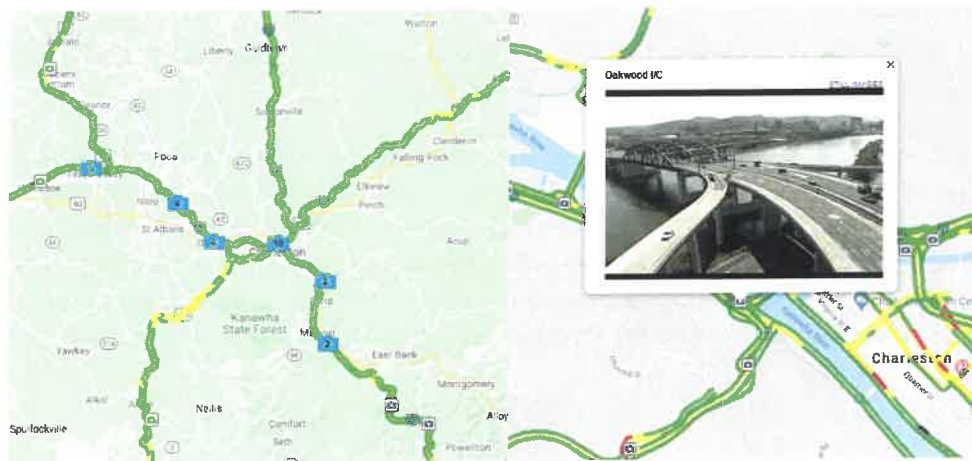


Figure 97 – Example Map Clustering based on Zoom level

Additionally, the 511 platform provides a “text” view of cameras so that users can select a region, road or camera (depending on the preferences of WVDOH), and quickly scan through a list of the series of cameras that can be streamed or viewed in current snapshot mode. This list view can be saved for later quick access by the user.

The ILOG 511 platform administrative portal provides a simple interface where admin users can disable specific WVDOH cameras from being displayed on the website and mobile app, but still have the cameras available for internal agency viewing. This feature has been particularly useful when departments of transportation have needed to disable public viewing of selected cameras during accident responses, and during high profile events, such as the Pope’s visit to Philadelphia.

LATITUDE	LONGITUDE	STREAMING CAM	STREAM OK	SNAPSHOT CAM	SNAPSHOTS OK	ENABLED
41.87982	-80.17874	Yes	No	Yes	Yes	Yes
42.13439	-80.08849	Yes	Yes	Yes	Yes	Yes
42.1108	-80.12017	Yes	Yes	Yes	Yes	Yes
41.14321	-80.15544	Yes	Yes	Yes	Yes	Yes
42.06994	-80.04003	Yes	Yes	Yes	Yes	Yes
41.94312	-80.50145	Yes	No	Yes	Yes	Yes
42.2499	-79.7852	Yes	No	Yes	Yes	Yes
42.0951	-80.11052	Yes	No	Yes	Yes	Yes
42.06525	-80.10563	Yes	Yes	Yes	Yes	Yes
42.06542	-80.09341	Yes	Yes	Yes	Yes	Yes
42.11916	-79.96365	Yes	Yes	Yes	Yes	Yes

Figure 98 – Camera List View

4.11.1.4. The data sharable with the 511 website and 511 app shall include DMS messages posted to DMS connected to the ATMS.

OpenTMS meets this requirement. The data feeds are available through a REST API and can be accessed by 511 systems. A feed is available for DMS message activity.

The 511 platform exceeds this requirement. The web map will contain the consolidated list of categories of information (map layers, text, links, etc.) requested by WVDOH, including DMS messages. The figure to the right shows a DMS message as seen when looking at the website from a mobile device. Notice how there are two different color icons for DMS boards – one for those that are active, and another for those that are inactive. By applying business rules developed cooperatively with WVDOH, critical messages on DMS signs can be escalated to being available as audio on the mobile app and IVR, expanding distribution to geographically relevant travelers.



Figure 99 – Mobile View of Active DMS

4.11.1.5. The ATMS shall provide a data stream to be accessed by third party traveler information dissemination entities.

OpenTMS meets this requirement. The data feeds are available through a REST API and can be accessed by third party traveler information entities. An Interface Control Document (ICD) is available to third parties that consume our feeds. The ICD details the contents of the feeds. OpenTMS provides a data export feed in VDOT and PennDOT today.

The ILOG 511 platform is also capable of providing data feeds to third parties. Team Q-Free has extensive experience with customizing data exports for a wide variety of sources, including Waze. Providing data from the 511 platform allows for the flexibility of customizing a data feed, along with the added security buffer of not having third parties directly access the ATMS, consuming local WVDOH resources.

If desired by WVDOH, the 511 website can contain a page with a list of all publicly-available data feeds. In some cases, ILOG has seen agencies provide a data access agreement that must be completed and approved before full access to the feeds is granted. However, it is also possible to simply list the feeds, links, and documentation, so that they may be accessed without any DOT action.

4.11.1.6. The data sharable with the 3rd Party Information Dissemination entities shall include all traveler information reports (incidents, construction, events, freight, parking) entered, received, or edited in the ATMS.

OpenTMS meets this requirement. The data feeds are available through a REST API and can be accessed by third party traveler information entities. Feeds will be available for incidents, construction events, freight and parking.

The 511 platform can provide feeds for all reports that are passed to the system. In the case of the Pennsylvania Turnpike, ILOG provides over a dozen feeds. Many of these feeds contain very similar information, but are formatted in different ways, and with different combinations of data, to adjust for various use cases. These uses cases range from Waze distribution, to third-party data integration, to dashboards used internally for reporting on performance metrics.

4.11.1.7. The data sharable with the 3rd Party Information Dissemination entities shall include CCTV camera images captured by cameras connected to the ATMS.

The DOT will determine the 3rd Party Information Dissemination entities that will receive live streaming video captured by cameras connected to the ATMS. Each CCTV image will be access on the 511 website via a link provided for each camera by Skyline. Skyline will also provide envelope information to the 511 platform for each camera. The envelope information and corresponding link will be stored in the 511 platform master database and will be used to present CCTV images and streams. In addition, the envelope information and camera link can be provided to third party users in a data feed hosted by the ILOG 511 platform.

4.11.1.8. The data shareable with the 3rd Party Information Dissemination entities shall include DMS messages posted to DMS connected to the ATMS.

OpenTMS meets this requirement. The data feeds are available through a REST API and can be accessed by third party traveler information entities. A feed is available for DMS message activity. DMS messages, along with the locations of the DMS showing those messages, are available as a data feed that can also be provided by the 511 platform.

4.11.1.9. The ATMS shall be upward expandable to cover increased coverage areas.

The ILOG 511 platform exceeds this requirement, as the solution is scalable/expandable in several ways. It is scalable to handle increased demand during storms, and other times of high usage. It is also scalable in terms of being able to add increasing amounts of data and road coverage. In the case of 511PA, both types of scalability have been exercised.

- During large storms, the 511PA system has seen its usage spike to 4,000 simultaneous users on the website; and
- From a data perspective, ILOG's time supporting 511PA has seen the addition of large numbers of traffic cameras, plow trucks, and expanded roadway coverage to go beyond a core network and be able to show traffic flow and incidents on roadways throughout the state.

While both usage and expanded data and roadway coverage added a considerable amount of ITS data to the 511PA system (particularly the plow trucks, for which the site displays both historical and current data), the system handled the expansion with ease. This is partially due to the architecture used to design the site, and partly due to the expandable nature of the cloud-computing backbone that supports the 511 platform.

Expandability is also true of the IVR portion of the 511 platform. Many traditional IVR systems are constrained by the provisioning of physical trunks and access to available ports on provider switches. The ILOG traditional IVR and SAM are both virtual, natively VoIP, and provisioned based on licensing and bandwidth, rather than physical trunks. These systems are scalable within minutes, not weeks. The system can also accommodate the inclusion of additional roads in a variety of ways, based on the type of IVR deployed.

4.11.1.10. The ATMS shall provide for a highway conditions, including trend data, reporting system that can be accessed by authorized users with ATMS software or application access.

OpenTMS meets this requirement. Authorized user can access the Road Condition module to enter road conditions. The Analytics package will provide the user the ability to slice and dice road condition data to look at trends. Q-Free will work with the WVDOH to customize a report template for the Jasper Reports module.

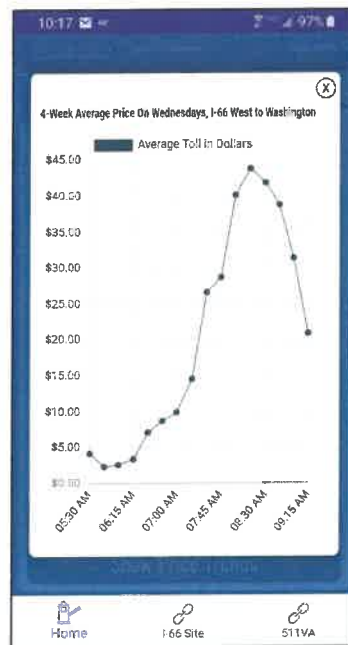


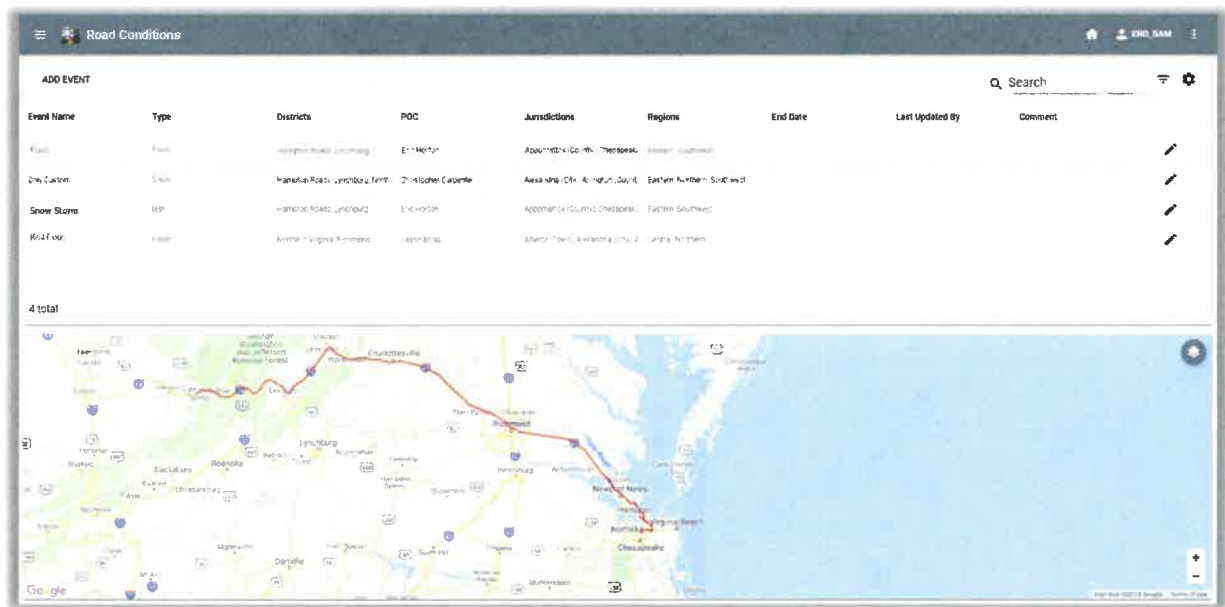
Figure 100 – Mobile Display of Analytic Data

ILOG also has extensive experience presenting road conditions and reports in a variety of formats. For various current clients, we present this data as map layers, text listings, and charts. ILOG will work with WVDOH to determine which information should be available via the 511 platform, and then together decide the most appropriate method for distributing this information to the proper stakeholders. As one example of distributing trend data reports to the public, the image to the right shows the average tolls over the last several weeks on a stretch of I-66 in Virginia, as it displays on the mobile app. The report was customized based on several options chosen by the user, but the parameters and methods of calculation were determined by Virginia DOT. This allowed VDOT to present information that was helpful to travelers, but still control the method by which the information was attained. The 511 platform also has an associated administrative portal which provides usage reports and other metrics/trends.

4.11.1.11. The ATMS highway conditions reporting system shall have the ability to enter road conditions for multiple locations or the entire state or an entire district all at once versus having to enter conditions for each segment of road one by one.

OpenTMS meets this requirement. The OpenTMS Road Condition module provides the user the ability to respond to a weather event quickly by providing an easy to user interface for creating and editing road conditions. Users can create localized conditions on road or create conditions over an area.

The list view shown below allows the user to quickly and efficiently assess the current status and location for entered road conditions.

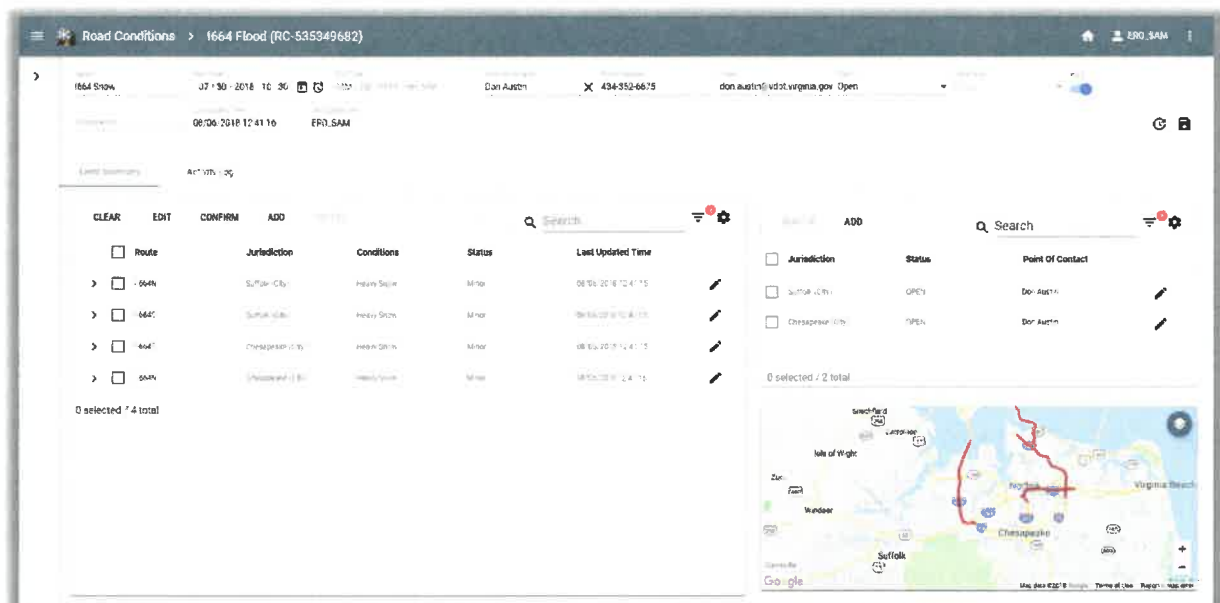


Event Name	Type	Districts	POC	Jurisdiction	Regions	End Date	Last Updated By	Comment
Road	Road	Hampton Roads (unlabeled)	Eric Horton	Appomattox County, Chesapeake	Eastern, Southwest			
One Closure	Closure	Hampton Roads (unlabeled)	Christopher Carpenter	Area One City, Arlington County	Eastern, Northern, Southwest			
Snow Storm	Event	Hampton Roads (unlabeled)	Eric Horton	Appomattox County, Chesapeake	Eastern, Southwest			
Leaf Off	Event	Hampton Roads (unlabeled)	Eric Horton	Appomattox County, Chesapeake	Eastern, Southwest			

4 total

Figure 101 – Road Conditions List View

Clicking on a road condition opens its detailed view shown below. A road condition feed will be available for the 511 system.



Route	Jurisdiction	Conditions	Status	Last Updated Time
664N	Suffolk City	Heavy Snow	Minor	08/06/2018 12:41:15
664E	Suffolk City	Heavy Snow	Minor	08/06/2018 12:41:15
664W	Chesapeake City	Heavy Snow	Minor	08/06/2018 12:41:15
664S	Chesapeake City	Heavy Snow	Minor	08/06/2018 12:41:15

0 selected / 4 total

Figure 102 – Road Conditions Detail View

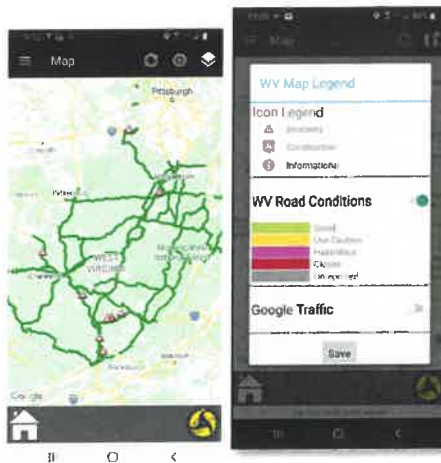


Figure 103 – Mobile Display of Road Conditions

The ILOG 511 platform can display roadway conditions to the public in a variety of ways. The most common method is through roadway coloring. Based on the information entered about the condition of a roadway (or portion of a roadway), the 511 platform can color-code the appropriate stretch of roadway. On the 511PA website, a roadway conditions layer is available on the web map during winter months. As seen in the image below, different colors indicate different conditions. A legend is present to decipher the condition of each roadway. This is also currently done in the Drive Safe mobile app. Although they use different keys for what the conditions mean, the layer is valuable on each because it draws the user's eye to locations where the roadways are not dry and/or clear. Text listings of roadway conditions can be included on the website and mobile app if desired by WVDOH.

4.11.1.12. The ATMS shall have the ability to create warnings of commercial vehicle and oversize/overweight restrictions due to closures, width restrictions/height restrictions, construction and maintenance.

The ILOG 511 platform exceeds this requirement. The 511 platform excels at displaying roadway restrictions of all types. The 511PA implementation of the system alerts drivers to restrictions using different methods, depending on the nature of the restriction. Each of these methods may be used interchangeably by WVDOH, depending on how they think they information will be clearest to their travelers.

The first type of restrictions discussed here are those that apply to long stretches of roadway, typically caused by bad weather. These sometimes involve all types of vehicles, but almost always at least apply to commercial vehicles. To display these types of restrictions, PennDOT opted to have them shown as a layer on the web map, much like the winter road conditions, but as a separate layer. In the image below, you will notice that the legend item for this layer is highlighted. This is because PennDOT wants to draw significant attention to this layer when it is active, as it often indicates a travel ban of some nature. Note that, as shown in the second image, that any portion of the roadway that is clicked will reveal more details about the restriction.

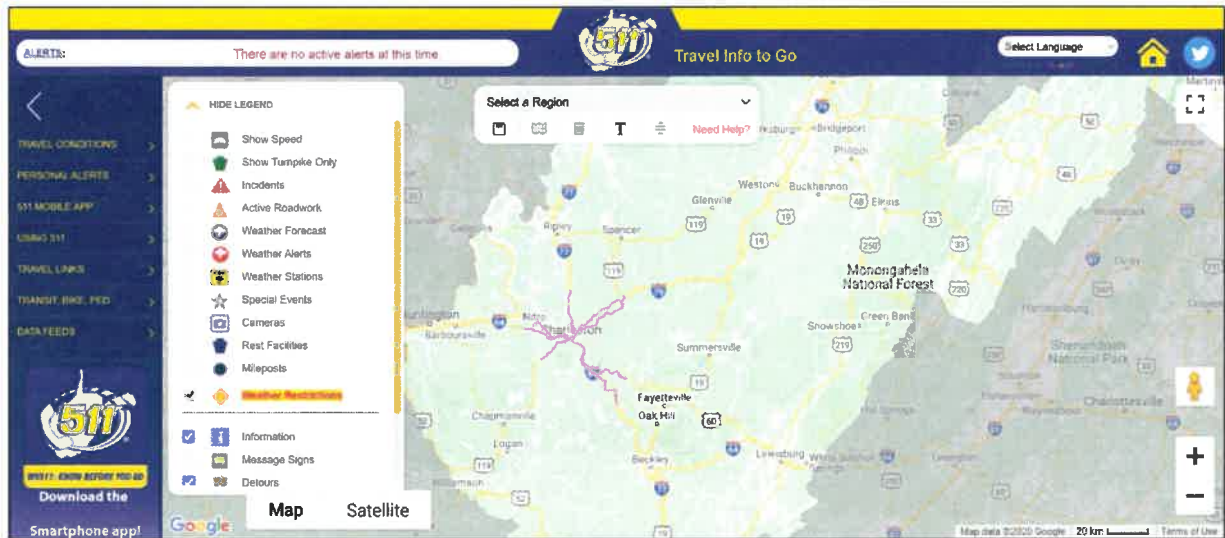


Figure 104 – 511 Map and Legend Display

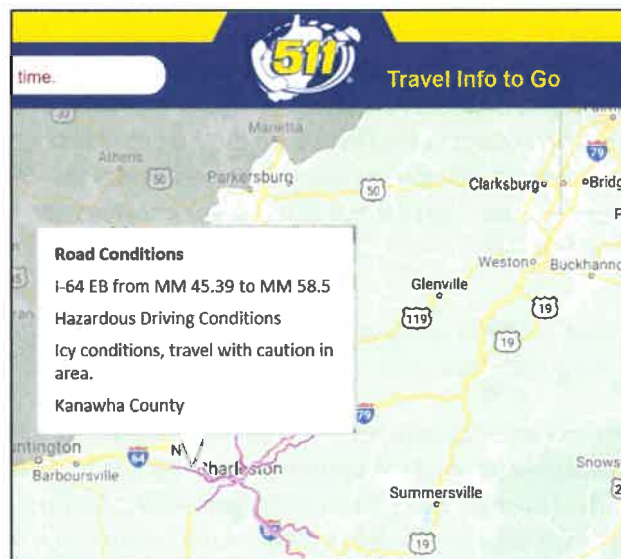


Figure 105 – 511 Road Condition Tooltip

The second type of restrictions are those that are associated with single incidents or construction events. These tend to be related to vehicle size restrictions, or lane restrictions through emergency or construction patterns. This information is contained in the details of each incident or construction icon that appears on the map. To provide more detail, their map offers options to choose whether the user wants to see events that simply have a restriction/disruption, or a full closure of all lanes.

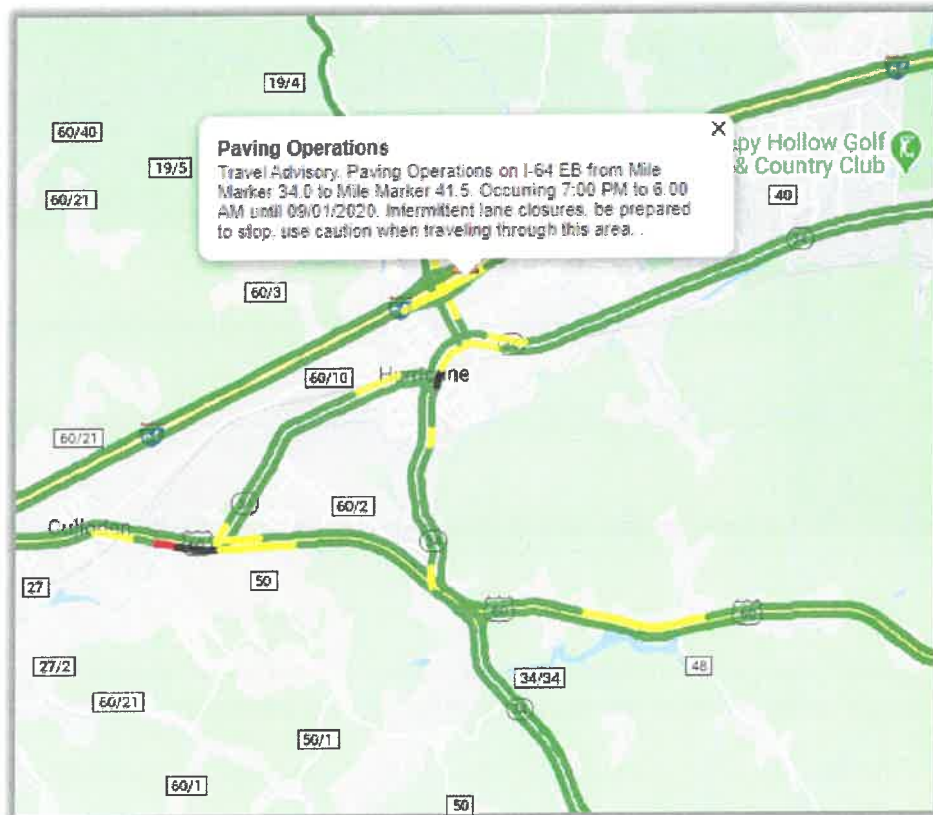


Figure 106 – 511 Construction Event Tooltip

For both types of restrictions, text listings of the data are available through the 511 platform. Additionally, the information for restrictions can also automatically trigger an alert on the scrolling banner of the website. The business rules for which types of alerts trigger an entry on the banner will be determined with WVDOH during setup.

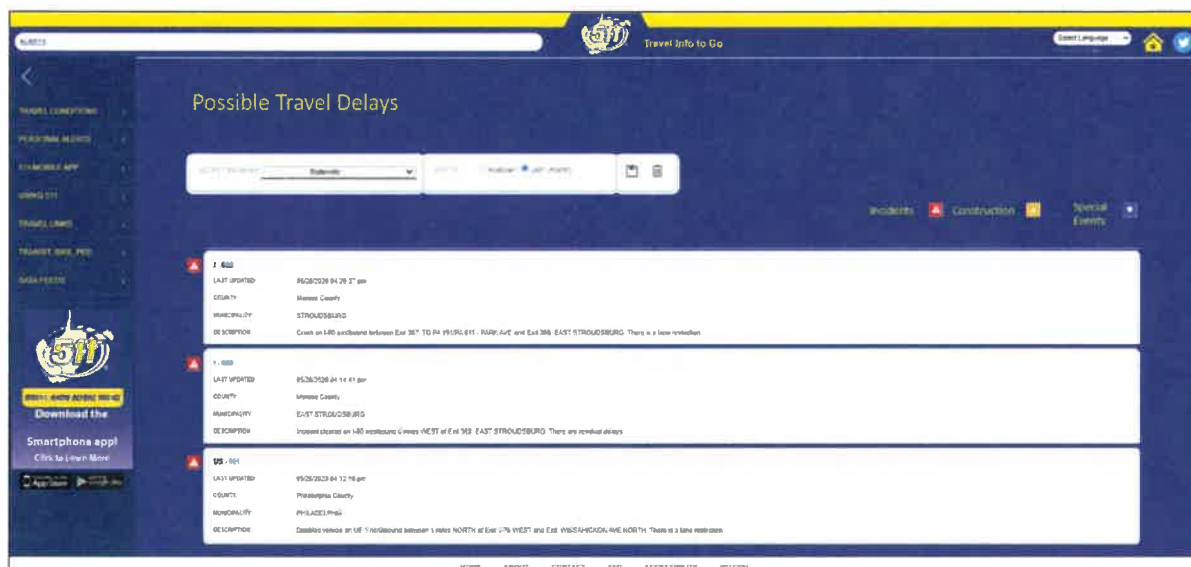


Figure 107 – 511 Restriction List View

ATMS provides those restrictions that are associated with single incidents or construction events. These restrictions are configured when entering an incident/event and are included in the data feed.

4.11.1.13. The ATMS Vendor shall provide a telephony and web-based 511 system to meet or exceed the capabilities of the current 511 system used by WVDOH.

This 511 platform system will meet or exceed the capabilities of the existing 511 system used by WVDOH. ILOG's approach to 511 platform is a single source, data-driven system that natively contains the core functionalities of the 511 services. This means all components, including the IVR, are virtual and united by a single master data store. By taking this virtual environment to the cloud, ILOG was able to provide the cost savings of a usage-based model – meaning that no portion of the system needs to be provisioned to the maximum anticipated usage year-round. Instead, the platform expands, and contracts based on demand, and performance remains optimal.

For the web-based components of this CRFP, we propose the ILOG 511 platform, which is a proven solution that has delivered extremely large amounts of data to the traveling public during times of incredible demand. The details of this system are described throughout the various requirements outlined in this proposal.

The telephony portion of this proposal offers two approaches IVR; a traditional IVR or SAM – a digital assistant IVR. WVDOH can select either approach with no change to data requirements or pricing. Either system will meet and exceed all WVDOH requirements.

What is SAM? SAM was created after years of listening to travelers getting frustrated with IVR systems. Despite new efficiencies in systems underlying traditional IVRs, they still can suffer from poor voice recognition due to background noise in the vehicle, regional accents, inadequate synonyms for popular “hot spots” requested by travelers. Furthermore, hotspot or point of interest (POI) lists provided by agencies can exclude new POI locations. The drill-down, menu-based approach for information can frustrate drivers. It is generally accepted that 511 IVR usage is dropping, and some agencies have omitted IVR as part of their traveler information offerings or have radically changed the information offered.

On the other side, the voice assistant market is becoming more popular – people are now accustomed to talking with Alexa and Google Home without using structured menu systems. Team Q-Free thought that adopting a personal assistant approach for IVR would be a convenient and safe way for drivers to request travel information hands free. ILOG has been developing what we believe to be the first digital voice assistant IVR, which leverages Google and Amazon voice recognition and speech generation, to create a state of the art IVR platform, which we call SAM. For the user, it is a simple, effective and familiar way of communicating with the IVR using natural speech (e.g. “What’s the traffic like in Morgantown?”) versus a series of very specific command set (e.g. “Press or say one for Morgantown traffic”).

Sam has several interesting features that we would like WVDOH to explore:

- Instead of plodding through old-fashioned menus, users can make a request in plain English. SAM, using our own artificial intelligence engine, as well as that from some APIs, will glean the caller’s intent; and
- SAM uses geo-coding to identify roadways – so there is no need to pre-define a list of POIs, acceptable selections or locations.

Traffic can be requested in three ways:

- Users can ask for traffic near any location or landmark;
- Users can ask for traffic with or without directionality on any road, near a location, or statewide;
- Users can ask for traffic on a roadway between two locations – again, with or without directionality;
- SAM will figure out the geography surrounding your request and give the user relevant information as provided from the agency approved data feeds;
- SAM incorporates floodgates, just like a traditional IVR system. Floodgates may be marked as “interruptible,” or “not interruptible”;
- SAM is customizable – users can set a default location; which SAM will translate into the appropriate WVDOH region. When the user calls back, he can opt to have the traffic and/or weather alert automatically read for the customized area;
- SAM also knows when a caller is using profanity and will warn the user to be careful about their language. If the caller persists, the call may be terminated. If a caller repeatedly uses profanity at different times, SAM can automatically block their phone number; and
- Finally, SAM retains transaction records for everything that callers do when they are using the system. This can provide helpful analytics.

SAM can provide the speech recognition and text to speech announcements that are now experienced in services like Alexa and Google. SAM can offer traveler information in a safe fashion that is no more dangerous than a hands-free phone call. SAM eliminates the need for agencies to maintain lists of hotspots and POI. SAM can give information on any road that is in the approved data feeds and does not restrict users to any preset list of roadways.

SAM also can make connection via an icon on a web page, to announce relevant traffic for an area. With a single click, Sam’s voice will announce traffic conditions, which can help with visually impaired site visitors.

4.11.1.14. The 511 system shall the ability to provide public safety alerts and announcements at the beginning of a call based on the location entered or statewide on all calls.

In both the traditional and SAM IVR models, floodgate announcements (for public safety or other DOT-approved messages) can be announced at the beginning of a call.

Floodgate messages can be entered in two different ways – they can be automatically triggered by certain conditions presented in the data feed, or through manual entry in the administrative portal. Business rules that can be determined for automated floodgate messages include whether or not they are interruptible, whether they should be played for a certain region or statewide, and many other details.

When using the manual entry system, the administrative panel gives the user several abilities with regard to floodgates:

- To preview the message before it is made live;
- To schedule messages in advance;
- To prioritize messages;
- To edit active messages; and
- To assign a message to multiple regions.

For the most serious messages, floodgates can also be flagged so that the system will terminate a call immediately after the floodgate is heard.

4.11.1.15. The ATMS shall transfer data useful for traveler information into WVDOH's 511 system for access by the general public. Data shall include at a minimum event-related data provided by the highway condition reporting system, relevant data obtained from ITS field devices, NWS weather alerts, weather forecast, and estimated travels times.

The 511 platform exceeds this requirement. All data layers and information provided from the ATMS will be displayed on the ILOG 511 platform. This will include events, road conditions, travel restrictions, ITS devices, alerts and forecasts from the National Weather Service, and estimated travel times. This information will be provided, as possible, to the various components of the 511 system (website, IVR, mobile app). Where practical, the information will be provided visually (e.g. NWS shape files for weather alerts will be displayed as a translucent overlay on the web map), as an audio advisory through text-to-speech translation, and as a text listing.

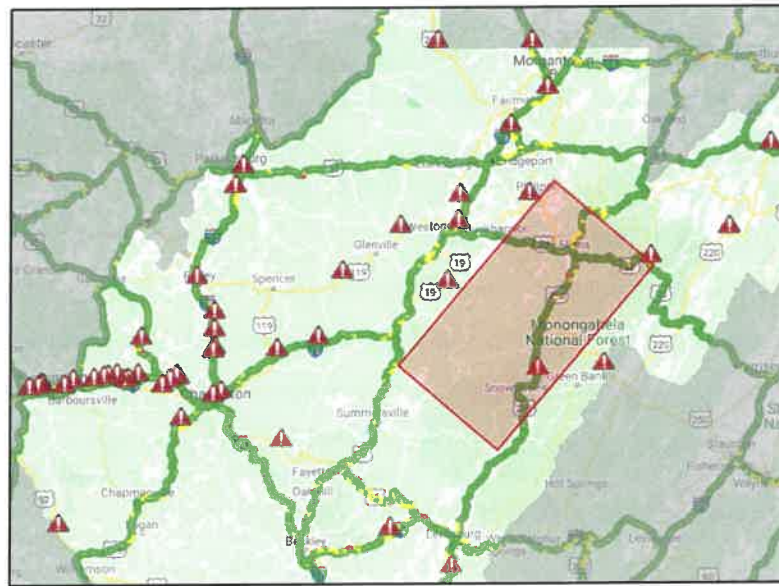


Figure 108 – 511 National Weather Service Alerts Display

4.11.1.16. The ATMS shall provide a mobile application with a hands-free option for the 511 system in order to maintain adherence to restrictions on use of phones while driving in West Virginia.

The ILOG 511 platform exceeds this requirement. This proposal includes the continuation of the hands-free, eyes-free, interoperable Drive Safe mobile app based on the GeoTalker™ platform. The app will continue to be available on both Android and iOS platforms, with ILOG handling all of the logistics for ensuring that the latest version is available to users through the app stores.

As with the other traveler information components, the app receives consistent traveler information from the common data platform. This means that all the apps will receive and publish all WVDOH incidents, events, and detours from the ATMS. Data from New Jersey and Pennsylvania will continue to be integrated in the app, and additional states may be added, as long as WVDOH is able to secure access to the data.

The GeoTalker™ platform was designed to support mobile apps that could provide a safe method for hearing nearby traffic alerts while driving. To accomplish this, the app obtains the user's current position, and audibly announces advisories that are located within a user-defined range and direction of travel, without requiring additional interaction from the user. This format works well for a wide variety of alerts, including floodgates/tickers, NWS weather alerts/advisories, winter road conditions, Waze alerts, incidents, roadwork, slowdowns, DMS messages, rest area locations, commercial vehicle information, and detour information. It should also be noted that the GeoTalker platform allows audio alerts to be paused when a phone call is active.

Other types of information, however, are best heard when the alert location is imminent – such as when a runaway truck ramp, or dangerous curve is approaching – and ILOG has addressed these with Fast Track Alerts. The app has the ability to announce Fast Track alerts within a few yards of a geographic point. This feature is currently being explored as a component “next step” in connected vehicle pilots, and as a feature in the PTC’s Trip Talk.

GeoTalker is a flexible, geocentric platform. It was used as a TIS for a pilot connected corridor. The project was undertaken by ILOG as a subcontractor to the University at Albany Visualization and Informatics Lab (AVAIL) for New Jersey DOT. The connected area is focused on the Route 1 and 18 corridors near New

Brunswick, NJ. The app integrated multi-modal travel info, including real-time information about train and bus arrivals, as well as parking availability. Customized virtual DMS messages, and corridor-specific travel times were also integrated to provide a comprehensive overview of travel in the region.

While the Drive Safe app offers a host of features in the hands-free, eyes-free “Drive Mode,” users have the ability to configure several of these parameters. Users can determine:

- The range for which alerts are read;
- The time interval between when the app will check for new or updated alerts;
- Whether or not a user wants to have alerts repeated at set intervals, or only read once;
- The types (categories) of alerts that the user wants to hear, as determined by WVDOH; and
- The Drive Safe mobile app will contain a link to the adaptive web map, where travelers can see all the features and functions offered by the website. The map is automatically centered on the user’s position, based on the GPS reading from the user’s device.

Team Q-Free is currently completing a new method for integrating detours into GeoTalker™ mobile apps. For pre-defined detour routes, the mobile app can now give the user turn-by-turn directions along the prescribed route. This is particularly valuable to the commercial vehicle sector, who needs to be mindful of size and weight limits when detouring from major highways. This is currently being done for Trip Talk and can be incorporated into the next Drive Safe build if underlying preset detour data is available from WVDOH.

The layout design to GeoTalker apps (as seen in 511PA, TripTalk, DriveSafe, and SafeTrip NJ) has evolved to create blended apps, meaning that some functions of the app are native app components, and other functions are links to the responsive web site – all seamlessly presented to the user. This is an efficient format which eliminates the need to “triple program” functions for both web and apps. The blended approach accommodates a wide variety of functions, including context-sensitive help and the ability to use the same map functions (like Check My Route and snow plow tracking) that are available on the 511PA website.

The mobile app and its functions respect traveler privacy and does require login or other personal information.

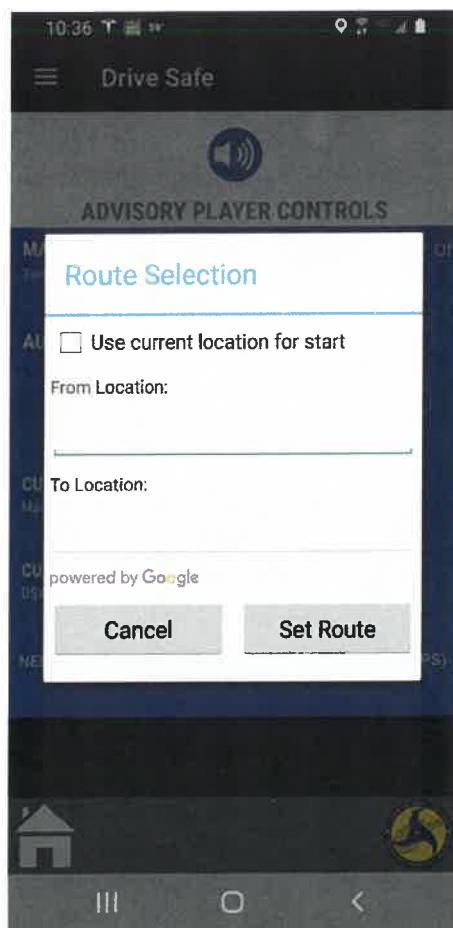


Figure 109 – Route Navigation Via Mobile Application

The mobile app is also now integrated with Google Maps so that travelers can simultaneously hear navigation instructions and agency travel alerts. As an alternative, Waze can be offered as an integrated feature. In either case, users activate the Drive Mode function of the app, and then select the Google Maps/Waze button that appears on the screen. This cross-launches the third-party app, but allows WVDOH alerts to continue to be heard interspersed with the navigation directions from the Google/Waze app. As seen in the Safe Trip NJ mobile app, when the route planning (directions) function is selected, the system will have available all the features of Google Maps directions, which includes multi-modal planning (including train, bus, plane, hailing services - Uber, Lyft -cycling and walking directions) as available. These features include the ability to enter starting/ending and waypoints and information about selected routes, including travel times and schedule information. The Waze interface offers a more direct link to the Waze app.

While all the functionality of the current app will be retained, ILOG also recommends that, in conjunction with the design discussion about the website (discussed as part of 4.11.1.20 below), the WVDOH team consider a refresh to the design of the mobile app to align with the new 511 site. The refresh may include both design elements, as well as the inclusion of additional data on the mobile app. Minimally, ILOG recommends adding access to the traffic cameras, as this feature is frequently requested by mobile app users. Other data layers or text listings from the website that may be added will also provide additional value.

The refresh will also get the benefit of GeoTalker features that were improved for the 511PA deployment, including the announcement of National Weather Service weather notifications when the user

approaches the alert area.

4.11.1.17. The ATMS shall provide a mechanism for automatically publishing data and video images from multiple sources to the WVDOH 511 as well as various traveler information web sites at specific intervals.

The ILOG 511 platform will ingest the feed from the ATMS at prescribed intervals. Due to the centralized nature of the 511 platform processing (described further in 4.11.1.1), each pull will refresh the data in the various 511 platform components, keeping data consistent across delivery methods. Simultaneously, data feeds to other 3rd party providers will also refresh with the new data.

4.11.1.18. The ATMS shall transmit highway conditions reporting data to the 511 system.

OpenTMS meets this requirement. The data feeds are available through a REST API and can be accessed by the 511 system. A feed is available for highway road conditions.

The 511 platform will display all highway conditions sent by the ATMS, as described in the response to requirement 4.11.1.1.

4.11.1.19. The ATMS shall display condition and device data for 511 website distribution with maximum of 5 minutes of data latency.

OpenTMS meets this requirement. The data feeds are available through a REST API and can be accessed by the 511 system. The feeds are updated in real time within 5 minutes of receiving the data from the device or upon saving a road condition.

The 511 platform will request a refresh of the data from the 511 platform at least every 5 minutes. This information will then be processed and published to the various components as soon as it is available.

4.11.1.20. The ATMS shall provide a graphical map of the state or selected region for displaying the WVDOH's ITS devices and select summary and status information suitable for 511 website display compatible with common web browsers.

The focus of the web site is an interactive web map – it serves as the main landing page for the 511 platform. This main page can be superseded by a landing page, and the layout may be modified. As part of this proposal, ILOG includes a design period, where WVDOH, Q-Free, and ILOG personnel will discuss design preferences. ILOG envisions this to be an Agile-type process:

- Meet to discuss WVDOH initial thoughts on design, and inspiration for style preferences.
- ILOG drafts several examples of what the design changes could look like, from a user experience perspective.
- WVDOH provides feedback, likely mixing elements of several proposed designs.
- ILOG then combines these preferences into a final design, subject to tweaks from WVDOH.

This will allow the WVDOH team to take the functionality of the ILOG 511 platform system and customize the layout so that it will optimally meet the needs of West Virginia travelers.



Figure 110 – Landing Page for www.paturnpike.com



4.11.1.21. The 511 map shall display for internet distribution all major freeways and streets within the state's boundaries with distinct graphical representation for each roadway classification.

The 511 platform exceeds this requirement. The interactive web map will use Google as a base map. By using Google, major roadways and arterials will be seen, as will most smaller streets. This also means that WVDOH gets the benefit of the pre-existing Google roadway coloring configurations, which differ according to roadway classification.

The 511PA system also uses a thick border to denote the boundaries of Pennsylvania on the web map. This layout may also be used by WVDOH, or other options, such as shading the areas outside West Virginia, may also be incorporated. This will be part of the design discussion referenced in the response to requirement

~~4.11.1.20.~~

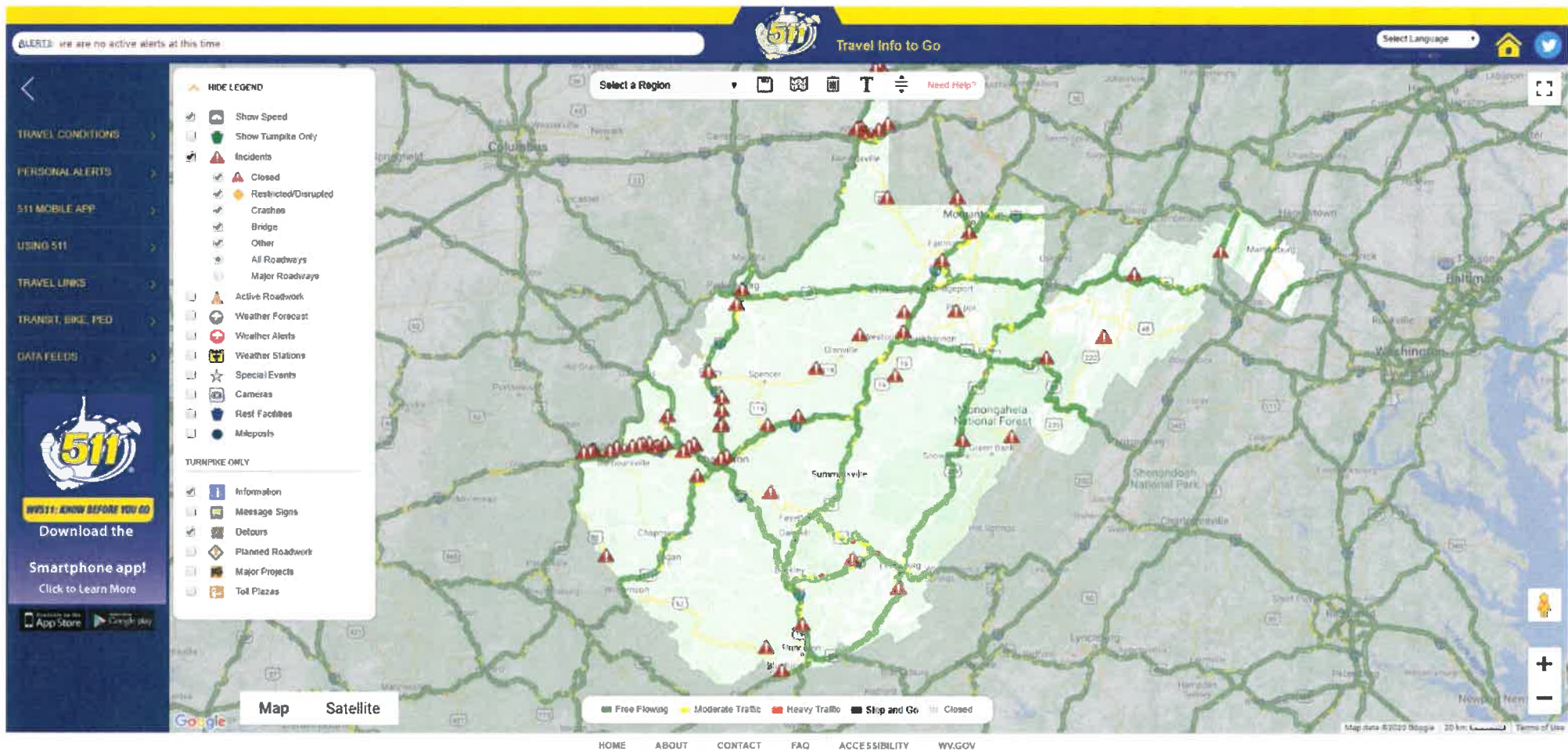


Figure 1 – West Virginia 511 Map Display

4.11.1.22. The 511 map shall display near real-time traffic speeds using a standard color coding of green for uncongested conditions through yellow and amber for moderate congestion to orange and reds for high congestion on freeways located within the state. This data can come from 3rd party providers.

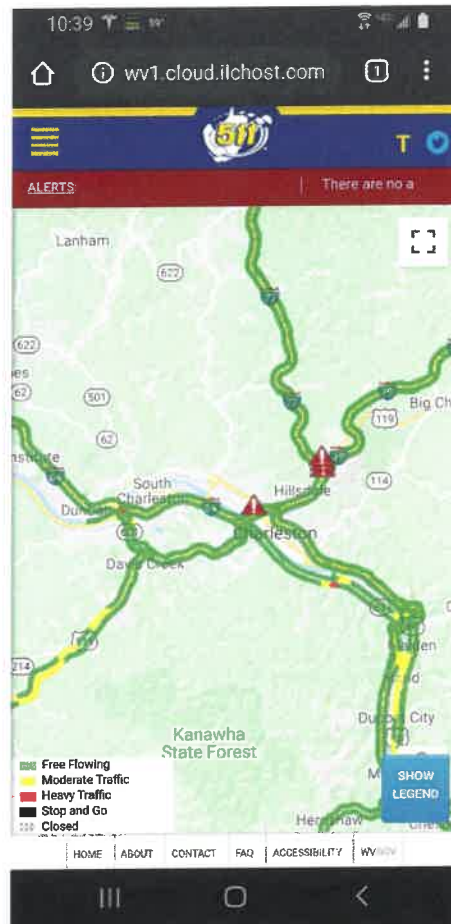


Figure 112 – Mobile Application Map Display

The centerpiece of the web site is an interactive web map, which will include the Google Traffic data as a layer. This is intended to allow users to see traffic “at-a-glance” with no interaction required. However, as discussed in 4.11.1.20, the default experience for users visiting the site will ultimately be determined through the design process during the setup phase of the project.

4.11.1.23. The 511-map display shall provide map navigation tools (zoom in/out icons, window box, layer control toggles, status of equipment).



Figure 113 – Mobile Application Tooltip Display

The 511 platform exceeds this requirement. Adaptive in nature, the interactive 511 map includes several standard functionalities, such as panning, zooming (with in/out icons), auto-scaling based on the user's zoom level, and an interactive legend. The interactive legend allows user to zoom to preset regions of the state, select map layers, and save their customized map view, including their selections of various data layers. The legend indicates which layers are currently active, and different icons may be used to indicate equipment status, such as active/inactive ITS devices (e.g. DMS).

To save web map views and layers or save text listing travelers use simple controls above the web map and text listing of alerts. To save a map view, for instance, a user might zoom to a particular city or town and select several map layers that they would like to see (e.g. incidents, cameras, DMS). The user then presses the "Save Map View" button, and the map can default to the same view when the user returns again from that device. These basic controls allow users to customize their view of the web map without the need to log in.



Figure 114 – 511 Toolbar Control

Of particular note is the recent refresh/renewal of the 511PA system. A new requirement was to blend the existing 511PA map features with the data/features from the Pennsylvania Turnpike. The challenge was to address the needs of both agencies, without overwhelming the public with layers of menus and legend selections. The result was a good compromise. The legend automatically changes the data filters once a user selects “PA Turnpike only”. ILOG can work with the WVDOH to make sure critical items for both agencies are represented clearly on the 511 system.

4.11.1.24. The 511 map shall display for internet distribution the appropriate information being supplied by corresponding ITS devices including at minimum full motion video images from cameras, sign display for DMS, and data from RWIS.



Figure 115 – 511 Video Display Dialog

The ILOG 511 platform has full capabilities for displaying a number of different types of data within map layers, including full motion video images from cameras, sign information from DMS, and RWIS data. The following images demonstrate how these layers appear on the 511PA and Pennsylvania Turnpike websites. The way the information is displayed, as well as associated icons and graphics, may all be modified during the setup phase if desired by WVDOH.

4.11.1.25. The 511 website shall provide a menu to select which ITS devices to display (layer controls).

The 511 platform exceeds this requirement. All layers displayed on the 511 platform website are controlled through a simple legend. The legend lists both the titles of each layer and the symbol that represents the data or devices. As part of the initial design process, several options for how the legend may be formatted will be presented. Some options will include the coloring, placement, shape, whether or not the legend may be hidden by the user, and any controls associated with how the legend appears or is hidden. In the case of 511PA, the legend may be hidden, so that more of the map may be seen on the screen. The PA Turnpike website, however, uses a fixed legend at the bottom of the screen, which is always visible. ILOG will also guide the WVDOH through requirements related to the need for the legend to work well on mobile devices. This may

mean a slightly different appearance, or minimally the ability to hide the legend when the site is viewed from a mobile device.

4.11.1.26. The 511 website shall provide a legend to explain which ITS devices are being displayed.

The legend will include information about each icon that is available on the web map, defining what the icon represents. This will be true for ITS devices, as well as for data such as incidents, construction areas, etc.

4.11.1.27. The 511 map shall provide a legend to explain the near real-time traffic speed colors being displayed.

The 511 platform exceeds this requirement. While the legend will always contain the type of information described in 4.11.1.24 and 4.11.1.25 related to layers and icons, additional information may also be present depending on which layers are active. For example, when the speed layer is active, a legend will be visible that explains the colors being displayed. Similarly, when road conditions are displayed, a legend will be visible to define the roadway coloring pertinent to that layer. Below are some examples of layer definitions on 511PA that only appear when particular layers are active.

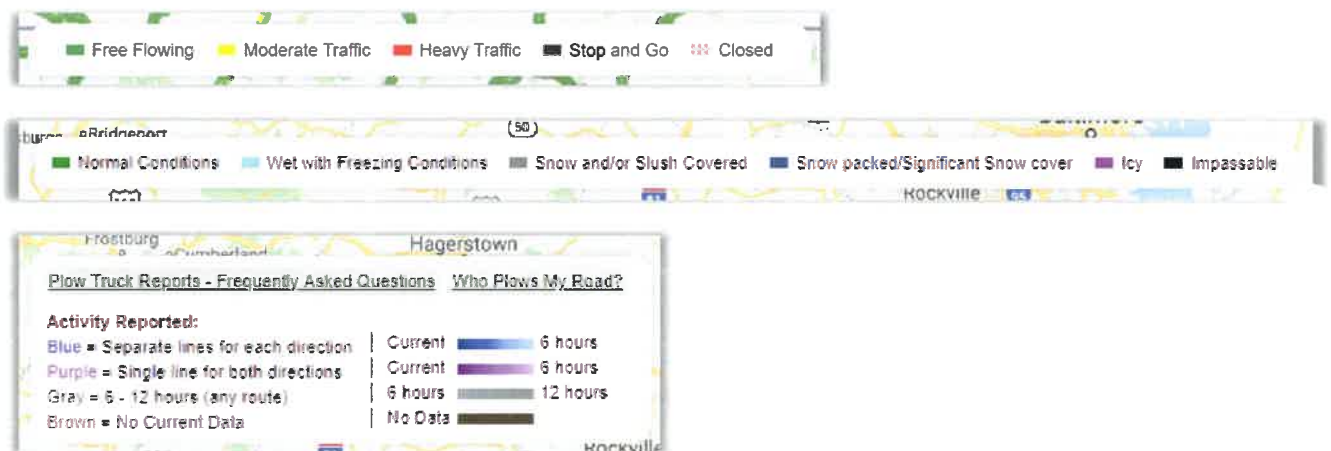


Figure 116 – 511 Legend Displays

To make this information clearer, Team Q-Free recommends not allowing users to view more than one roadway coloring layer at a time on the web map. This means that users could either view real time traffic speed data, or roadway conditions, but not both at the same time.

4.11.1.28. The ATMS shall automatically refresh the real-time traffic speed display on 511 at a minimum frequency of 30 seconds.

The 511 platform maps on the website and the mobile app can automatically refresh the real-time traffic speed display at least every thirty seconds.

4.11.1.29. The ATMS shall be capable of distributing color and black and white video images to WVDOH's 511 website.

The ILOG 511 platform can display both color and black and white images, as well as streaming video. For a more robust description of the 511 platform camera display capabilities, please see the response to requirement [4.11.1.3](#).

The OpenTMS video solution provides the ability to stream the camera feed in day mode and night mode, as long as it's supported by the camera manufacturer.

4.11.1.30. The 511-telephony system, including the 511 system as well as the communication capability, shall have the ability to handle an average of 200 to 300 calls per day and allow for a peak usage of 5,000 to 6,000 calls per day. Vendor is to propose how they would meet this requirement or provide an alternate solution.

The IVR component of the ILOG 511 platform (both the traditional and SAM versions) will easily handle 200-300 calls per day, accommodating spikes to 6,000 calls per day. To accomplish this, ILOG has abandoned the old IVR model, in which systems are constrained by the provisioning of physical trunks and access to available ports on provider switches.

The ILOG IVR is virtual, natively VoIP, provisioned based on licensing and bandwidth, rather than physical trunks, and scalable within minutes, not weeks. When ILOG's system technicians receive system monitor alerts letting them know that system usage has exceeded pre-defined notification levels, they are able to quickly log in to the system and increase the capacity for as long as necessary. ILOG proactively increases capacity before large storms, or other events when there is an expected surge in usage.

The ILOG IVR complies with national standards and guidance, including that published by the 511 Deployment Coalition. The system has been tested with TTY operators to be sure that it complies with Section 255 of the Telecommunications Act of 1996 and Title II of the ADA.

4.11.1.31. The 511 shall graphically provide the location of each camera and a representation to show the user what direction the camera is facing.

The 511 platform web map and mobile app will provide icons for the location of each camera, and different icons when many cameras are densely clustered at a particular location on the map, as described in the response to requirement [4.11.1.3](#) in section. ILOG can provide the DOT with several options to indicate how the direction of the camera may be indicated. The most straightforward way is to include a description of the direction the camera is facing once the user clicks on the icon, as seen in the image below. However, the icons for cameras may be modified to indicate the direction they are pointing, as long as that information is available in a feed, spreadsheet, or database. For instance, the camera icons might be facing different directions, or colored differently, if they are pointing eastbound versus westbound. This is a decision that would be discussed with WVDOH during system setup.



Figure 117 – Camera Dialog with Location

4.11.1.32. The 511 system shall have the ability to add additional routes in the future beyond what is covered by current 511 system now.

The 511 platform exceeds this requirement. There are virtually no limits to the route capacity of the 511 platform system; any number of additional routes may be added to what is currently covered in the WV 511 system.

4.11.1.33. The 511 website shall provide a linked text-based list of primary website content for selection by users.

The ILOG 511 platform is configured to provide text listings of information whenever possible. This alternative to map-based data is beneficial both to users who have low bandwidth, as well as those with visual impairments. ILOG has experience providing the following types of data as text listings, and the system is capable of handling more:

- Travel alerts for incidents, construction, special events, and other dynamic information. In the case of construction and special events, this is done for both active and planned work;
- Travel restrictions;
- Weather alerts & forecasts;
- Listings of RWIS stations/cameras;
- Listings of traffic cameras;
- Rest facilities and service plazas; and

- Selection options for toll calculators.

In each of the text listings, agencies have provided preferences for how the information is organized. Typically, the data is categorized by roadway, county, and/or region. For example, in the 511PA text listing of cameras, the user can first select a region of Pennsylvania, and then the roadway for which they would like the cameras. The traffic camera names/locations are then listed as links, in the order in which they appear on the roadway.

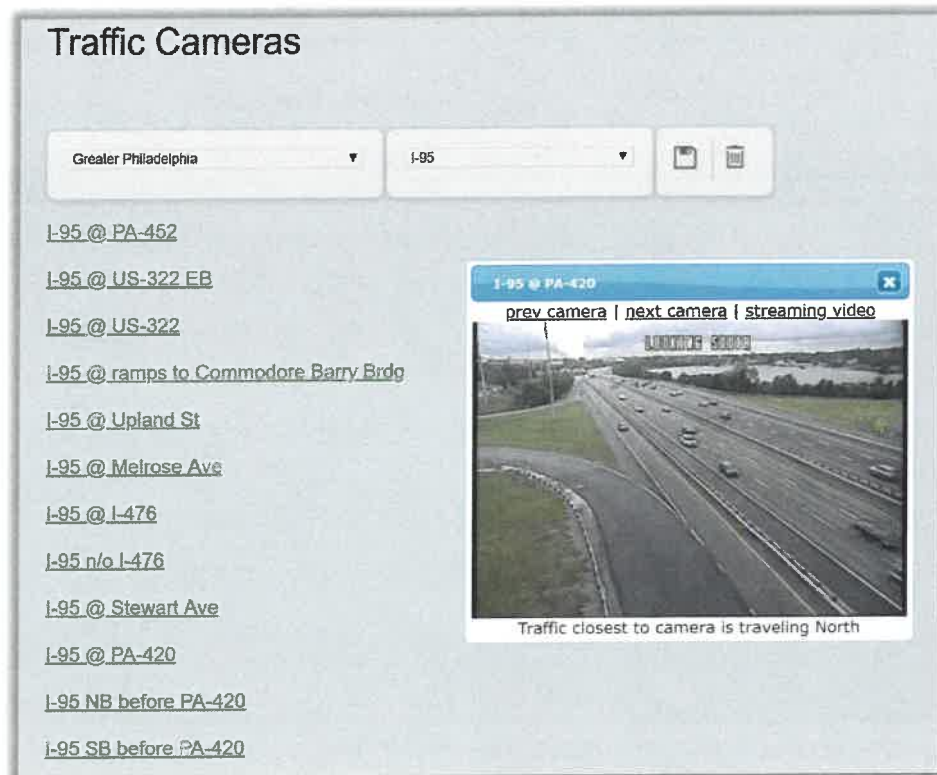


Figure 118 – Camera List by Route

4.11.1.34. The 511 website shall allow users to select cameras and DMS for a specified region of the state or by major roadway and accident or construction/work zone information for a specified region of the state or by major roadway.

All data in the ILOG 511 platform may be selected by first filtering by a criterion, such as a region or roadway. This is true for both the text listing and map pages of the website.

As seen in the response to requirement **4.11.1.32**, the text listing of traffic cameras has first been filtered by region, and then by roadway, before producing the list of options available for the user to choose from. This same methodology applies to text listings for other types of information, such as DMS, incidents, and construction/work zones. Text listings can also be provided with combinations of ITS devices. The specifics for the text listing of the site can be determined during design.

The web map portion of the website can be used in a similar fashion. Using 511PA as an example, the top of the web map has an option available for selecting a particular region of Pennsylvania. When a region is chosen, the map zooms to a pre-defined center point and zoom level, which helps to filter the information for all layers available on the web map. Additional boundary lines may also be drawn, by whichever level of

organization is chosen by WVDOH (e.g. county, region, etc.). In the image below, the grayed-out area represents the WV state line, with everything in gray being outside of WV. Mixing these clear boundary lines with pre-defined regional zooms help to focus the perspective of the user on the map, and may be saved for later viewing.



Figure 119 – 511 Toolbar Control

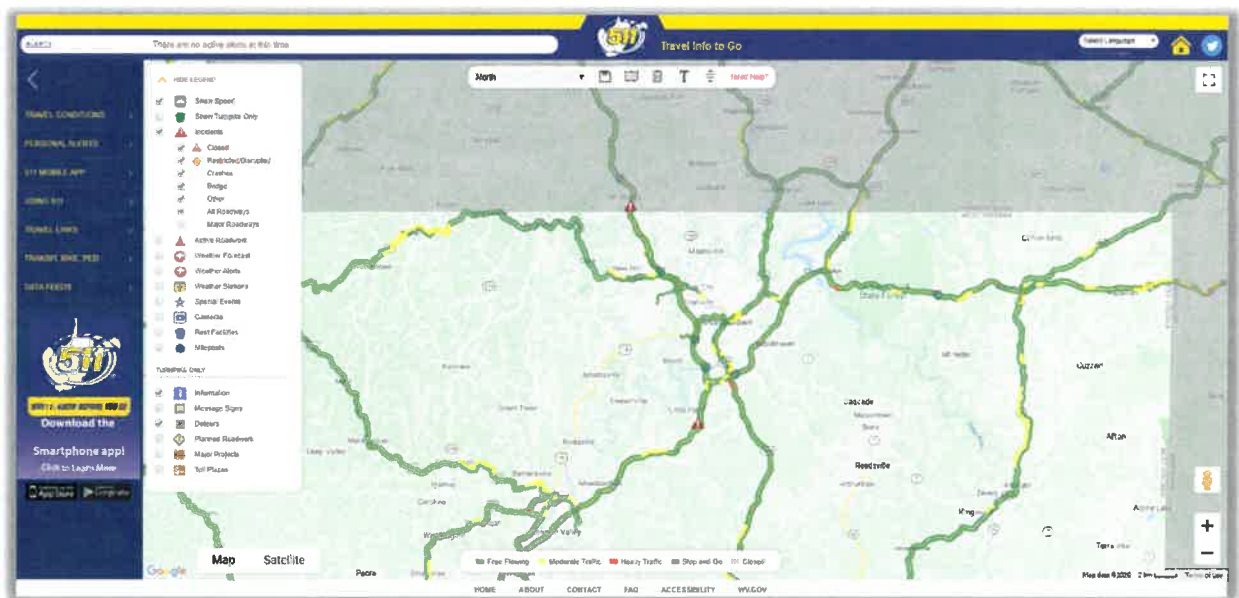


Figure 120 – 511 Map Display

4.11.1.35.No Adobe flash content is to be used on the 511 website, 511 mobile website or 511 application.

The ILOG 511 platform does not use Adobe flash content in any component.

4.11.1.36. The 511 website shall provide a link to specific WVDOH construction projects/special projects/studies information sites.

The website portion of the ILOG 511 platform can handle any number of links to specific WVDOH projects.

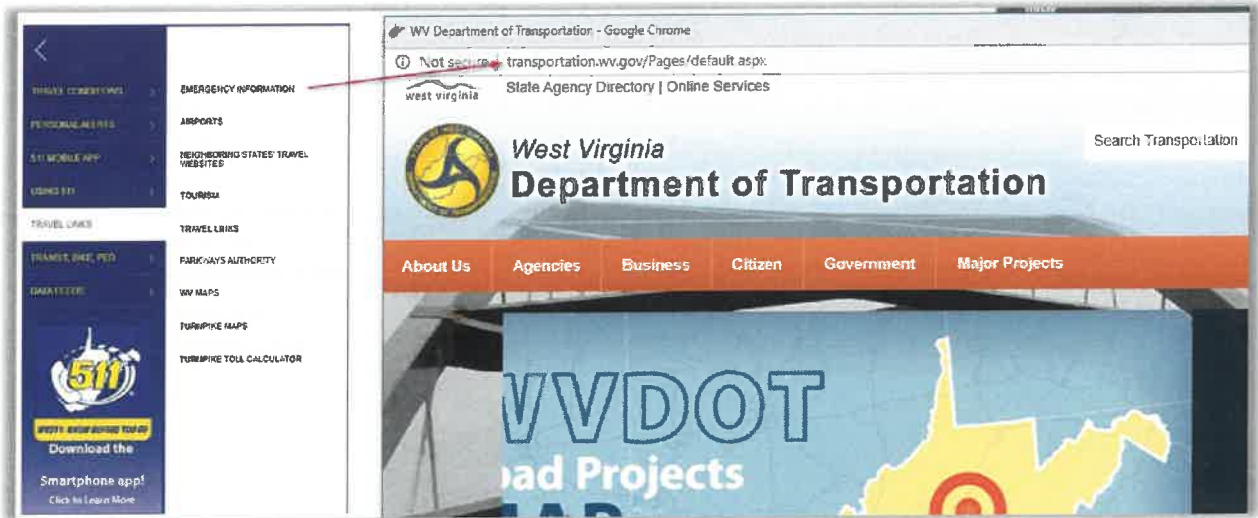


Figure 121 – Sample WVDOH External Links

The system currently provides this for the Pennsylvania Turnpike, the site for which can be accessed at https://www.paturnpike.com/travel/major_design_construction_projects.aspx.



Figure 122 – Sample External Links from 511 Application

Other links can also be accommodated for special events or projects. Team Q-Free typically sets up and links multiple special event pages each year for 511PA, including sites for the Little League World Series, Pennsylvania Farm Show, and historical traffic videos for major travel holidays.

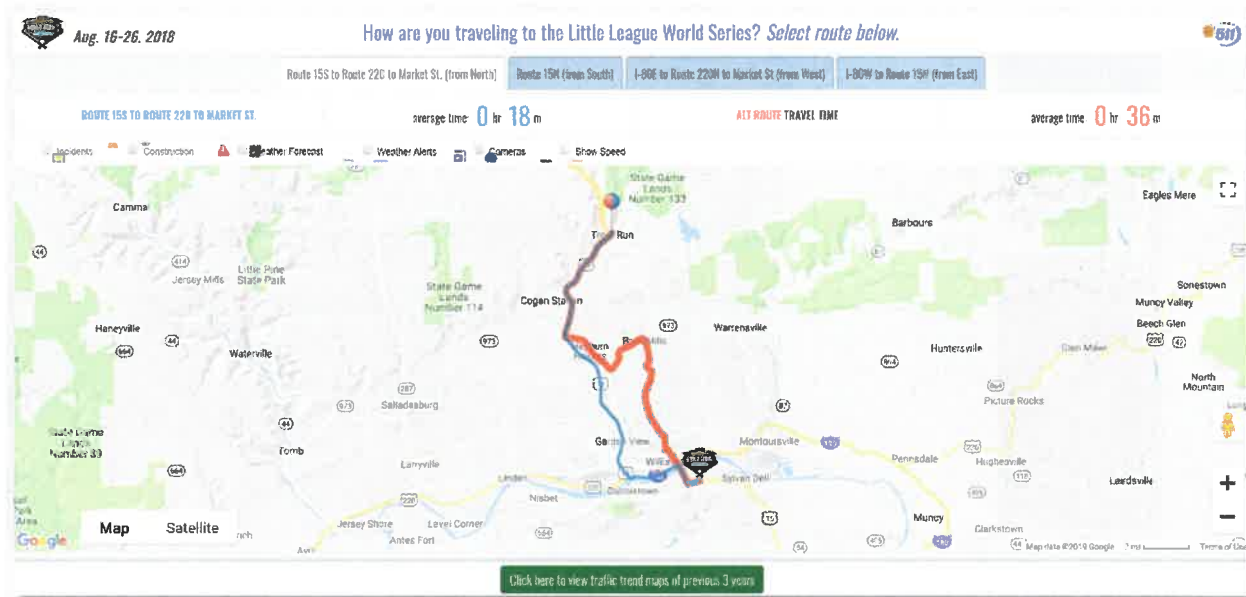


Figure 123 – Special Event Link from 511 Application

4.11.1.37. The 511 website shall be smart-phone/mobile phone accessible and shall be adapted to work in both a desktop and mobile format with all content that is available on desktop version available on mobile version.

The ILOG 511 platform website was specifically created with an adaptive design, meaning that the site automatically adjusts to accommodate the size limitations of the device being used. With adaptive design, only one site is maintained, but the appearance of the site on a desktop PC will be different from the appearance on a mobile device. This gives users the ease of learning a single feature navigation that is available on both desktop and mobile devices and gives the agency the assurance that consistency is maintained as one update applies to all devices that access the site.

4.11.1.38. The 511 mobile website and the 511 app shall have a warning banner regarding use while driving and disclaimer similar to one used on the current WV511 app.

The Drive Safe mobile application will continue to have a warning banner regarding use while driving, as well as a disclaimer. The look and precise text of the warning and disclaimer may be changed by WVDOH if desired during the design portion of the system setup.

4.11.1.39. The 511 website and 511 app shall be updated as necessary as operating systems used by mobile phone providers are updated. Vendor is to verify impacts to functionality if new OS releases are anticipated and maintain functionality through updates to software as required with new OS updates or versions.

The mobile application will continue to be maintained, tested, and updated as new operating systems are released for iOS and Android, or if a symptom indicating a programming bug is reported by users. ILOG proactively monitors customer feedback and crash reports and will address issues with app updates as needed. Due to the redundancy built into the 511 platform network structure, most maintenance activities (for both the mobile app and other components) can be performed without service interruption.

4.11.1.40. The 511 website shall be capable of being imbedded into other HTML documents, or mirrored by other websites, with 511 logos intact as an Inline Frame (Iframe) or similar.

The ILOG 511 platform website is capable of being embedded into other HTML documents/mirrored with 511 logos intact as an iframe. ILOG would work cooperatively to provide code to a third party that is interested in integrating the website in this manner, to assure a smooth implementation. ILOG has helped third party vendors in Pennsylvania who wished to incorporate key components of the traveler information site into their web sites or distribution devices, such as the Travel Boards displays in rest areas.

4.11.1.41. The camera image displayed on the 511 website and exported to external users shall have a customizable graphic overlay that will identify the source of the images.

The ILOG 511 platform is capable of handling this requirement in two different ways. If the image has a customized graphic overlay (is watermarked) before coming to the 511 platform, then the image with the watermark will be displayed as-is. The system is also capable of adding a watermark to images that are received without one. ILOG currently adds watermarks to camera images for the PA Turnpike.



Figure 124 – Camera Video with watermarked graphic

Traveler Information – Desirables

4.11.1.42. The data sharable with the 511 website and 511 app should include freeway traffic speed indicators.

Q-Free exceeds this requirement. Data feeds are available through a REST API and can be accessed by the 511 system. A feed is available for detector data. The feed includes volume, occupancy, and speed.

The ILOG 511 platform website and mobile app are capable of displaying freeway traffic speed indicators, as provided by the ATMS. The method by which these indicators are displayed will be discussed during the design period of the system setup.

4.11.1.43. The data sharable with the 511 website and 511 app should include arterial traffic speed information gathered by the ATMS or 3rd party provider.

OpenTMS meets this requirement. Data feeds are available through a REST API and can be accessed by the 511 system. A feed is available for detector data. The feed includes volume, occupancy, and speed.

The ILOG 511 platform website and mobile app are capable of displaying arterial traffic speed information, as provided by the ATMS. If speed data from the ATMS is desired in addition to Google Traffic, then the method by which these indicators are displayed will be discussed during the design period of the system setup.

4.11.1.44. The data sharable with the 3rd Party Information Dissemination entities should include freeway occupancy. (if available)

OpenTMS meets this requirement. Data feeds are available through a REST API and can be accessed by 3rd parties. A feed is available for detector data. The feed includes volume, occupancy, and speed.

The ILOG 511 platform is capable of distributing this data to third-party entities, if WVDOH does not want it to be accessed directly from the ATMS.

4.11.1.45. The data sharable with the 3rd Party Information Dissemination entities should include arterial traffic speed information gathered by the ATMS. (if available)

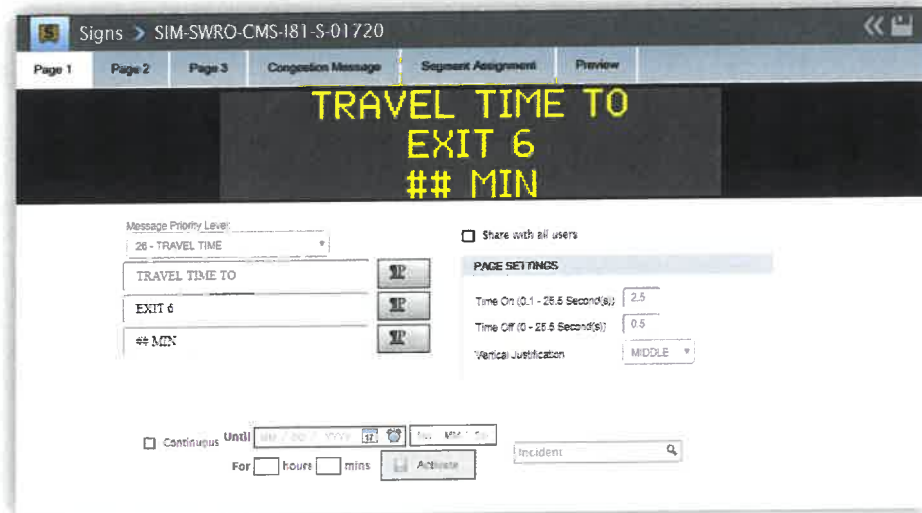
OpenTMS meets this requirement. Data feeds are available through a REST API and can be accessed by 3rd parties. A feed is available for detector data. The feed includes volume, occupancy, and speed.

The ILOG 511 platform is capable of distributing this data to third-party entities, if WVDOH does not want it to be accessed directly from the ATMS.

4.11.1.46. The ATMS should include capability of generating the messages to display travel time estimates for DMS locations in the network.

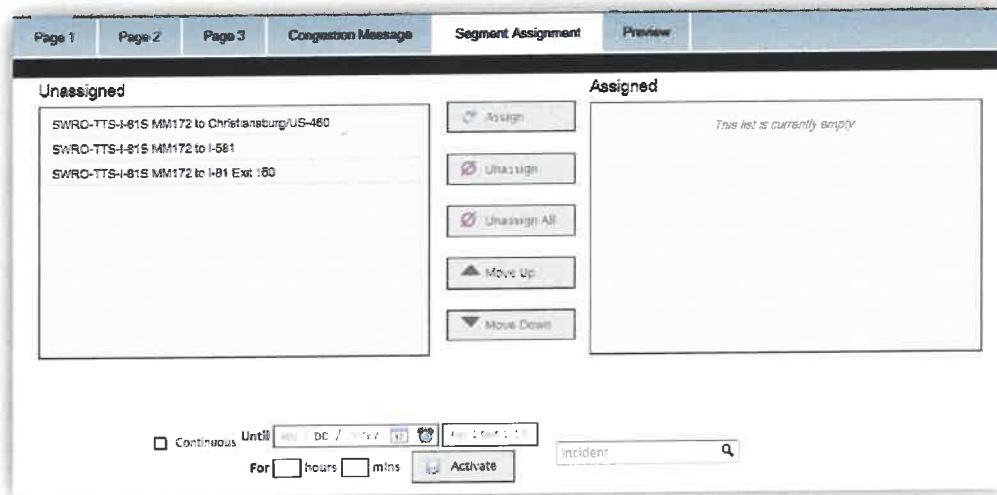
OpenTMS meets this requirement. OpenTMS has the ability to display travel times on DMS. Travel time messages are configured with a specially formatted travel time template configured through the sign module devices' travel time message tab. Creating a travel time message is similar to creating a standard message with the exception of a double hashtag (##) that represents the travel time to be automatically pulled and updated from an assigned segment. If the message is active it will be reposted.

Segments are created in the admin portal and linked to a sign and associated to the message at the time the message is created from the Segment Assignment Tab.



The screenshot shows the 'Signs' application interface. At the top, there's a breadcrumb trail: 'Signs > SIM-SWRO-CMS-181-S-01720'. Below this are tabs for 'Page 1', 'Page 2', 'Page 3', 'Congestion Message' (active), 'Segment Assignment', and 'Preview'. The main display area shows a large black sign with yellow text: 'TRAVEL TIME TO EXIT 6 ## MIN'. Below the sign, there are input fields for 'Message Priority Level' (set to '26 - TRAVEL TIME'), 'TRAVEL TIME TO', 'EXIT 6', and '## MIN'. There are also buttons for 'MP' and 'Share with all users'. To the right, there's a 'PAGE SETTINGS' section with 'Time On (0.1 - 25.5 Second(s))' set to 2.5, 'Time Off (0 - 25.5 Second(s))' set to 0.5, and 'Vertical Justification' set to 'MIDDLE'. At the bottom, there's a 'Continuous' checkbox, 'Until' and 'For' time fields, an 'Activate' button, and an 'Incident' search field.

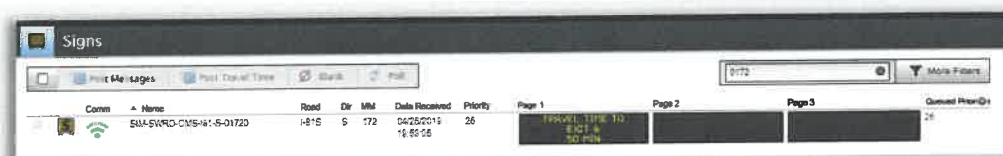
Figure 125 – Travel Time Message Creation



The screenshot shows the 'Signs' application interface with the 'Segment Assignment' tab active. It displays two columns: 'Unassigned' and 'Assigned'. The 'Unassigned' column lists three items: 'SWRO-TTS-I-81S MM172 to Christiansburg/US-460', 'SWRO-TTS-I-81S MM172 to I-581', and 'SWRO-TTS-I-81S MM172 to I-81 Ext 180'. Between the columns are buttons for 'Assign', 'Unassign', 'Unassign All', 'Move Up', and 'Move Down'. The 'Assigned' column is currently empty, with the text 'This list is currently empty'. At the bottom, there are 'Continuous', 'Until', 'For' time fields, an 'Activate' button, and an 'Incident' search field.

Figure 126 – Travel Time Segment Association

Once the message is activated, travel times will automatically update on the sign as the travel time changes.



The screenshot shows the 'Signs' application interface with a table displaying message details. The table has columns for 'Comm', 'Name', 'Road', 'Dir', 'MM', 'Date Received', 'Priority', 'Page 1', 'Page 2', 'Page 3', and 'Current Page'. The data row shows a message for 'SWRO-CMS-181-S-01720' on 'I-81S' road, direction 'S', MM '172', received on '06/25/2019' at '16:50:06' with a priority of '26'. The 'Page 1' column shows the message text: 'TRAVEL TIME TO EXIT 6 25 MIN'. The 'Current Page' is '26'.

Comm	Name	Road	Dir	MM	Date Received	Priority	Page 1	Page 2	Page 3	Current Page
SWRO-CMS-181-S-01720		I-81S	S	172	06/25/2019 16:50:06	26	TRAVEL TIME TO EXIT 6 25 MIN			26

Figure 127 – Travel Time Message Display

The ILOG 511 platform exceeds this requirement. The system is capable of displaying any active message on DMS icons. This is true regardless of whether this is a safety message, travel time, or information relevant to a specific incident. As noted in the response to requirement 4.11.1.23, different icons will be used on the web map to indicate active versus inactive DMS.

4.11.1.47. The ATMS should provide a mechanism to automatically post travel time estimates to DMS.

OpenTMS meets this requirement. Travel times can be posted manually through the sign module or a resource plan. With a resource plan the WVDOH can activate travel times from 6 AM to 11 PM for example Monday through Friday and 9 AM to 10 PM on Saturday and Sunday if desired. DMS displaying travel times are automatically updated with the latest travel times at a configurable interval. All DMS messages available in the 511 platform feed will be automatically posted to the 511 platform components.

4.11.1.48. The ATMS should have the ability to push commercial vehicle and OS/OW restrictions to subscribers.


Team Q-Free's proposal for WVDOH exceeds this requirement. The proposal includes a subscriber services portion in the ILOG 511 platform. Behind a credentialed login, this portion of the system has an integrated personalized alert component so that users can provide areas/roadways and days/times of day during which they wish to receive email alerts about particular portions of the state. This feature can be expanded to providing commercial vehicle and OS/OW restrictions as well as all other alerts in the 511 platform. Alerts received from the ATMS are automatically translated into email alerts and distributed to travelers who have subscribed to receive notifications for alerts matching their user profile.

Users are able to manage the various features of their accounts from the website. After logging in,

- Users may edit their personal info/user profile;
- Users may subscribe/unsubscribe from alerts or change the types of alerts they wish to receive;
- Alerts may be configured so they are only sent during particular days and times. Furthermore, these configurations may be different for each route entered by a user; and
- As a new feature, users can select the area of their focus by drawing a shape on a map, rather than clicking through roadway dropdown options. This gives great flexibility when a user wants alerts near a specific region, or along a commute that involves multiple roadways. It also gives the user the opportunity to incorporate roads near their primary route, which may have a secondary impact on their commute.

Traffic Profile Area

Select by route



Check the days you wish to be notified

☐ Entire Week
☐ Weekend
☒ Week Days

☐ Mon ☐ Tue ☐ Wed ☐ Thu ☐ Fri ☐ Sat ☐ Sun

Profile Details - Last Updated

Choose the time periods for which you want to receive traffic reports

* Beginning Time

* Ending Time

Other Details

* Where would you like alerts to be sent?

* Please enter a name to associate with this profile

Add Profile

Figure 128 – User Route Selection

Incorporation of the notification function into the mobile app can also be done by linking the app to the subscriber services and providing app notifications.

For users who have subscribed to email alerts, the ILOG 511 platform administrative portal allows authorized agency users to search for subscribers, and to modify subscriber information, routes and other parameters

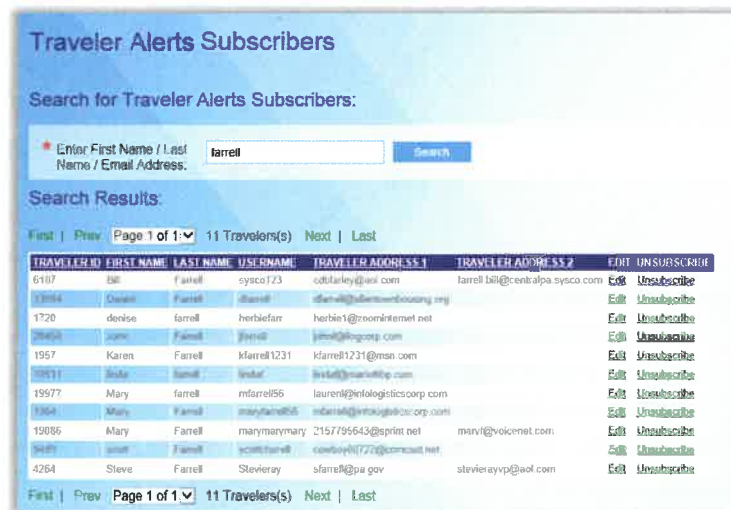


Figure 129 – Subscription Services Management

4.11.1.49. The ATMS highway conditions reporting system should be able to provide roadway condition reporting to local roads in addition to major US and state routes.

As outlined in the response to requirement 4.11.1.11, the ILOG 511 platform is capable of displaying any roadway conditions provided by the ATMS. This is not restricted to major US and state routes; local roads may also be accommodated.

4.11.1.50. The 511 website should provide for individual public users to create user accounts and customize travel route alerts to notify them of incident, events or unusual congestion along their designated travel route(s) and display specified camera images related to that route.

The ILOG 511 platform proposal includes a traveler subscription service (i.e. user accounts) and is outlined in detail in requirement 4.11.1.27. The system will provide email alerts related to any events provided through the ATMS along their route. The user may then login to the website where they would be presented with their personal routes list, and when one is selected, the map would zoom into the subscriber's pre-defined route and display events and camera layers for the route.

4.11.1.51. The ATMS should allow selection of numerical limits associated with each display color for each type of traffic measurement by an ATMS user with sufficient authorization. These parameters should be applied to display generation for the 511 website.

All business rules related to 511 platform display, including numerical limits associated with display colors and types of traffic measurements, will be carried to the 511 platform so that only approved information will be distributed to the public in a way that is compatible with the metric to be presented.

4.11.1.52. The 511 website should incorporate a banner scrolling along the bottom of the WV511.org page that will allow ATMS operators to enter text for unique events and emergency notifications.

The ILOG 511 platform exceeds this requirement. The system incorporates a scrolling banner on the website as part of the basic system. This banner may be populated through a manual input process, or with automatic triggers from the ATMS data feed, or both. The manual banner announcements are created and edited through an administrative interface. The text in the ticker can be edited to display boldface and italicized text, and hyperlinks can be included. Alerts may be instantly activated or scheduled for activation in the future.

The banner can also be automatically populated from the ATMS data, according to pre-defined business rules such as when events hit a particular severity level. For automated banner alerts, hyperlinks may be connected to a specific closure on the map, so that when they are clicked, details are displayed on the map.

4.11.1.53. The 511-phone system to have a comprehensive vocabulary for text to voice system or more intuitive interpretation of what the operator types in to the system. (e.g. if the operator types "SB", 511 system should know that means southbound versus having to type the words out.)

The ILOG 511 platform IVR and mobile app share a common text-to-speech translation process. This means that when an audio version is created for an alert, it will sound the same on the mobile app as it does on the IVR. To ensure that common abbreviations are read correctly (such as SB meaning southbound), and to account for local accents and pronunciations, the system also has a translation database. This database allows for custom pronunciations which correct the pronunciation of words that may not sound quite right from the initial text-to-speech conversion. This database already has many common conversions, as it benefits from both the experiences of other states, as well as ILOG's existing relationship working with WVDOH's roadway names. The image below shows a handful of the pronunciation adjustments that have already been made for the Drive Safe mobile app, which will be carried to the IVR. To further aid WVDOH, the system has several areas where an audio preview button may be clicked, so that an administrator entering an alert can hear a message before it is sent to the public.

Apoor	Approach:	WVDOH	VW Julie	Pronun	No
Carado	Slee duh	WVDOH	VW Julie	Pronun	No
Cheyan	shill yane	WVDOH	VW Julie	Pronun	No
Ghent	geent	WVDOH	VW Julie	Pronun	No
Kanawha	kahnahwah	WVDOH	VW Julie	Pronun	No
Kenova	kenn no va	WVDOH	VW Julie	Pronun	No
Mahan	may hame	WVDOH	VW Julie	Pronun	No
Medina	muh dye na	WVDOH	VW Julie	Pronun	No
Oolebay	ogg el bee	WVDOH	VW Julie	Pronun	No
Poca	puck uh	WVDOH	VW Julie	Pronun	No
Poca Talica	puck uh tay'licko	WVDOH	VW Julie	Pronun	No
Robert C. Byrd	Robert C Bird	WVDOH	VW Julie	Pronun	No
Sebraton	say bray lun	WVDOH	VW Julie	Pronun	No
Stanton	Stunton	WVDOH	VW Julie	Pronun	No
Sun	Sunday	WVDOH	VW Julie	Pronun	Yes
Sun	Sunday	WVDOH	VW Julie	Pronun	Yes
Teays Valley	teays valley	WVDOH	VW Julie	Pronun	No
Thurs	Thursday	WVDOH	VW Julie	Pronun	No
Tues	Tuesday	WVDOH	VW Julie	Pronun	No
WV	west virginia	WVDOH	VW Julie	Pronun	No

Figure 130 – 511 Pronunciation Adjustments

4.11.1.54. The ATMS should require varying levels of administration rights on the 511 website from view only to super user.

The ILOG 511 platform can provide for varying levels of access to administrative website functions, ranging from super users to read-only access. The levels of access to this admin portal for either/both agencies will be discussed and determined during the implementation phase.

4.11.1.55. The data sharable with the third-Party Information Dissemination entities should include freeway traffic speed. (if available)

OpenTMS meets this requirement. Data feeds are available through a REST API and can be accessed by 3rd parties. A feed is available for detector data. The feed includes volume, occupancy, and speed.

The ILOG 511 platform is capable of distributing this data to third-party entities, if WVDOH does not want it to be accessed directly from the ATMS.

4.12 Integration with Other Systems (CRFP Section 4.12)

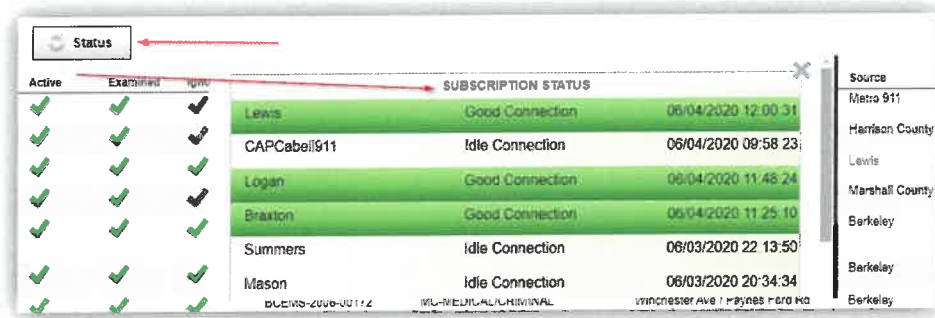
4.12. Integration with Other Systems

4.12.1. Mandatory Requirements

4.12.1.1. *The ATMS shall establish and maintain connections with existing external systems.*

OpenTMS meets this requirement. The modular architecture of OpenTMS supports standards-based integrations with external systems. ATMS will establish and maintain connections with all existing external systems; CCTV, DMS, RWIS, 22 County E-911, truck parking sites, and 511 systems.

4.12.1.2. *The ATMS shall operate and report system diagnostics to enable operators to confirm that communications to external systems are functioning properly.*





Active	Examined	Ignored	SUBSCRIPTION STATUS		
✓	✓	✓	Lewis	Good Connection	06/04/2020 12:00:31
✓	✓	✓	CAPCabello	Idle Connection	06/04/2020 09:58:23
✓	✓	✓	Logan	Good Connection	06/04/2020 11:48:24
✓	✓	✓	Braxton	Good Connection	06/04/2020 11:25:10
✓	✓	✓	Summers	Idle Connection	06/03/2020 22:13:50
✓	✓	✓	Mason	Idle Connection	06/03/2020 20:34:34

Figure 131 – Alert Subscription Status Panel

OpenTMS meets this requirement. For external systems connected to the Alerts module, a Status button is available on the Alerts list view that opens a dialog that shows the state of the connection.

4.12.1.3. *The ATMS shall operate and report system diagnostics to enable operators to confirm that communications to external field devices are functioning properly.*

OpenTMS meets this requirement. The system continuously polls in the background. When a poll fails, the communication status is changed to Suspect. The system retries polling and after a set number of attempts, the device is marked as Failed. The number of polls until the device is marked as Failed is configurable. Communication status icons shown below and are visible from the map and list view. The Device reporting errors icon is visible on the list view only, but from the map the user can click on the Maintenance Mode map tool that filters the map to only show devices that are not in normal condition. Devices are considered not normal if they have communications that are suspect or failed and/or the device is reporting an error such as a pixel error.

	• Normal Communications
	• Normal Communications, but device is reporting errors



- Suspect Communications
- Failed Communications
- Disabled Communications

Reports are available to be run on-demand or scheduled to automatically run that report on ITS device health.

4.12.1.4. *The ATMS shall incorporate center to center standards enabling standardized data exchange with other systems and agencies.*

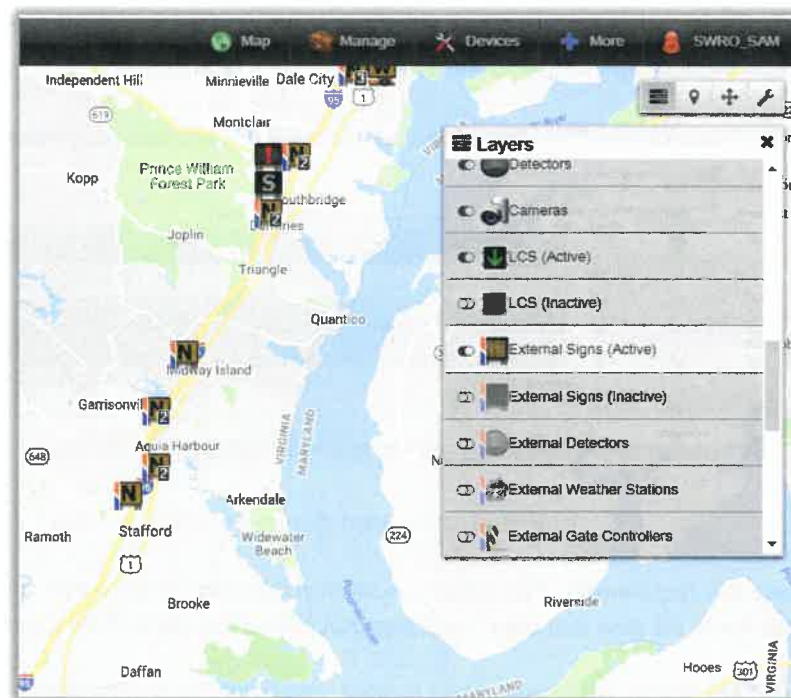


Figure 132 – Center-To-Center Map Icons

OpenTMS meets this requirement. ATMS supports NTCIP center-to-center (C2C) communications with other systems and agencies. Q-Free has implemented C2C with our VDOT client to integrate two other ATMS vendors managing Toll Roads in Northern Virginia. This integration pulls in the other center's devices and displays in the list views and on the map. In the figure below, external devices have a different icon and the map layer can be toggled off. This list view shown below, has external devices enabled.

OPEN.TMS

Signs

Open

More Filters

Category

▲ Name

Road

Dir

MM

Data Received

Priority



Page 1

Page 2

Page 3

Queue Priorities

External Devices



DMS-966-S-6.8-OP

I-394S

HOV



S

6.8

04/30/2019 14:48:32

50

OPEN TO ALL TRAFFIC



DMS-966-S-6.8-OP

I-394N

HOV



N

6.2

04/30/2019 14:48:33

50

OPEN TO ALL TRAFFIC



DMS-465-N-67.0

I-96S



S

172.2

04/30/2019 14:48:32

50

HOV 3+ ONLY



DMS-5EM-H-0.6

VA-420E



E

0.2

04/30/2019 14:48:32

50

OPEN TO HOV 3+ ONLY



DMS-5EM-S-0.6

VA-420E



E

0.1

04/30/2019 14:48:32

50

OPEN TO HOV 3+ ONLY



DMS-WAS-S-0.5

VA-27W



W

1.7

04/30/2019 14:48:32

50

OPEN TO ALL TRAFFIC



DMS-WAS-S-0.7

VA-27W



W

2.2

04/30/2019 14:48:32

50

OPEN TO ALL TRAFFIC



NRC-CMS-86-E-004874-R

I-86E

E



46.7

04/30/2019 14:58:21

27

OPEN TO TRAFFIC

27



NRC-CMS-86-E-004814-R

I-86E

E

46.1

04/30/2019 14:57:45

27

OPEN TO TRAFFIC

27

Figure 133 – Sign List View with External Devices

4.12.1.5. The ATMS shall provide traffic data to West Virginia 511 system, website and 511 app.

OpenTMS meets this requirement. ATMS provides traffic data to multiple 511 systems in our current production deployments. The modular architecture of OpenTMS supports standards-based integrations with external systems. The system includes a data integration platform which supports multiple data standards and exchange models; REST API, and Java Message Service. 511 platform vendor will pull data from the ATMS REST API.

The ILOG 511 platform currently accepts traffic data from the Q-Free ATMS in West Virginia, and uses that data to populate the Drive Safe mobile app. While the amounts and types of data may expand in the new setup, the ability to receive and processing data will not. ILOG is capable and experienced accepting data using VPNs, secure web services, secure FTP transmissions, and most other transmission methods and supporting multiple data standards and exchange models.

As it does today, the centralized 511 platform system will accept, filter, and distribute data from the ATMS. Instead of preparing the data for the mobile app alone, it will also prepare the data for distribution to the website and IVR. During the processing, business rules can be applied that can de-duplicate repetitive information, triage/prioritize information, and assign distribution channels, depending on WVDOT preferences. As part of the processing, each piece of data is tagged with its required geo-specific characteristics. For example, the latitude and longitude in the raw data can be used to assign the data with a mile marker, rest area, city tag, a roadway tag, point-of-interest tag, etc. The stored data is converted into all formats needed by the solution: formatted for text display, formatted for audio output, and formatted for distribution to publicly available data feeds. By converting processed data to all formats, the information is immediately available for all components of the 511 platform. Regardless of how the traveler receives the information, and regardless of how other parties use the public data feeds, WVDOT can be sure that all distribution channels contain the same information – updated simultaneously.

4.12.1.6. The ATMS shall have the ability to establish, maintain, and exchange data with CAD systems operated by 911 centers and law enforcement agencies within the State of West Virginia.

OpenTMS exceeds this requirement, Q-Free has been a leader in CAD integration for over the last 20 + years. Q-Free has integrated over 15 separate CAD systems from State Police and e911 centers.

Q-Free has clients actively using CAD alerts as the primary component for incident detection in production today. Q-Free has integrated over 40+ e911 and State Police centers between our clients. Q-Free not only supports all the CAD systems identified in this RFP, including the new State Police integration but as the incumbent, Q-Free is providing real-time incident notifications to West Virginia operations for all current e911 partners. Additionally, Q-Free has successful integrations and a great relationship with Motorola and the software platform the WV State police procured.

4.12.1.7. The ATMS shall receive CAD incident reports and make them available to authorized users through the ATMS user interface.

OpenTMS meets this requirement. Traffic CAD events are integrated into OpenTMS Alerts module. When an event is received, the user receives a notification and can create an incident from the alert tracking the two together. As updates come in the users have the most update to date information within minutes of being entered by the 911 center. Access is available to users with the correct privileges.

4.12.1.8. The ATMS shall be able to share ATMS functionality with the WVPA (West Virginia Parkway Authority) offices.

OpenTMS meets this requirement. OpenTMS is deployed as a Statewide solution in Virginia and Pennsylvania where there are multi-Transportation Management Centers (TMC) in operation. OpenTMS has a feature called "Home Groups" which can be used to define different operational areas within the agency, state, or province. This allows clients control data accessibility across groups of users. For example, in Pennsylvania, each TMC is defined as its own operational area and users assigned to that group can only see those events or devices within their jurisdiction. Notifications can be customized to home group as well. If access to the other TMC's devices are needed their home group can be enable in a user's preferences.

4.12.1.9. The ATMS shall integrate with the current Citilog video analytics system in order to provide data related to wrong-way driver, incident and stopped vehicle detection.

OpenTMS meets this requirement. Q-Free integrates with Citilog video analytics system to provide data related to wrong-way driver, incidents and stopped vehicles. Events are integrated into OpenTMS Alerts module. When an event is received, the user receives a notification and can create an incident from the alert tracking the two together. Below is an example of an alert received due to a stopped vehicle.



Figure 134 – CitiLOG Video Alert

4.12.2. Integration with Other Systems – Desirables

4.12.2.1. *The ATMS should integrate with external agencies' systems using standardized Center to Center communication protocols.*

OpenTMS meets this requirement. The ATMS supports NTCIP center-to-center (C2C) communications with other systems and agencies. Q-Free has implemented C2C with our VDOT client to integrate two other ATMS vendors managing Toll Roads in Northern Virginia.

4.12.2.2. *The ATMS should have the ability to integrate the fog warning/conditions system to activate a DMS.*



Figure 135 – Integrated Corridor Management Details View

OpenTMS has a Corridor Management module which provides rule-based traffic management in corridors of interest to the client. A corridor is configured to respond to traffic data from several sources (RWIS, traffic sensors, travel times, etc.) and automatically activate control mechanisms (DMS, VSL) based on agency specific business rules. The module is highly flexible and can be configured to consume multiple data sources and drive multiple traffic control devices. The response can be configured to be fully or semi-automated. Fully automated corridors update traffic controls with no actions from the operators whatsoever. Semi-automated corridors require operator approval before executing the system-generated response plan.

Q-Free has implemented and deployed a weather corridor along the Ohio I-90 Corridor. The Corridor uses weather station data to identify when a corridor is experiencing low visibility. When visibility drops below the threshold a DMS and VSL response is recommended to slow down drivers in advance of fog conditions. The system updates on regular cycles based on changing visibility conditions providing a level of responsiveness which would be virtually impossible without automation.

Q-Free is currently working on a Queue Detection / Warning Corridor for Pennsylvania where the system monitors detector or travel time data and when a slowdown is detected DMS and VSL response is recommended to slow down drivers in advance of the slowed or stopped traffic.

Other weather sensors could be integrated in lieu of RWIS visibility monitoring.

*4.12.2.3. The ATMS should have the ability to access to OES flood gauge monitoring system. (!FLOWS)
(Note: This desirable is for monitoring only.)*

OpenTMS will meet this requirement. The ATMS will integrate with the !FLOWS sensor to provide real time alerts to operations when alarms are triggered by field devices.

4.12.2.4. For optional interfaces not incorporated into the ATMS, the ATMS should provide a means to initiate the external software from within the ATMS and must log the initiation and termination of the external software.

Skyline's VERO will be accessible from the OpenTMS Devices Camera option. VERO will implement single sign on capability.

4.12.2.5. The ATMS should be able to share ATMS functionality with the West Virginia State Police Troop locations and dispatch centers.

West Virginia State Police Troop and dispatch center staff can be provided 'Guest' access to OpenTMS. Using the Guest Role, the WVDOH can assign view only privileges to those modules that they want the third-party to view. If not on the TMC network, access would be through a secure Virtual Private Network (VPN).

4.12.2.6. The ATMS should have the ability to integrate West Virginia weigh station offices through on-site video monitoring and providing access to the ATMS software application.

While OpenTMS does not integrate weight stations in our latest version, our open modular architecture provides us the ability to do so in the future. Third parties can be provided 'Guest' access to OpenTMS. Using the Guest Role, the WVDOH can assign view only privileges to those modules that they want the third-party to view. If not on the TMC network, access would be through a secure Virtual Private Network (VPN).

Video from on-site cameras can be brought back to the VDS and made available to the TMC.

4.13 Operator and User Features (CRFP Section 4.13)

4.13. Operator and User Features

4.13.1. Mandatory Requirements

4.13.1.1. The ATMS shall enable multiple users to be logged in simultaneously.

OpenTMS meets this requirement. ATMS does not limit the number of simultaneous users. Current PennDOT requirements require 100 simultaneous user users and 20 simultaneous administrators. As the number of users increase the number of multiple webserver sitting behind a load balancer can be scaled provide the ability to distribute load. VDOT requirements require 500 simultaneous users. Our system load tests are done utilizing these numbers as a minimum.

4.13.1.2. The ATMS shall enable users to access the system from locations remote from the TMC.

OpenTMS meets this requirement. OpenTMS is a fully web-enabled ATMS. The architecture is designed to run on a desktop/laptop through a conventional browser. As a web application, users can access the ATMS inside or external to the client's TMC if they have network access.

Several of our clients support a secure Virtual Private Network (VPN) to remotely access the DOT hosted hardware platform and/or ATMS application from outside the TMC.

4.13.1.3. The ATMS user interface shall display alerts and notifications to users.

OpenTMS meets this requirement.

Alert-based – The Alerts module provides notifications of events detected internally by OpenTMS or externally through integrations with partner systems. Alerts can be viewed from the Alerts module list view or by clicking on the Alerts icon in the notification toolbar for new notifications.



Figure 136 – Urgent Notification Display

Notification-based – The ATMS contains a built-in notification system that alerts users to urgent and ongoing events concerning devices, services, and requests. Notifications are organized into urgent notifications and new notifications. *Urgent Notifications* indicate that events should be confirmed or acknowledged and will appear in the lower right-hand corner of the screen. *New Notifications* simply let the user know about action results or events. These notifications are generated by the client (rather than the service itself) and they will only appear to the user rather than everyone.

The Notification Tray provide a current list of recent notifications. This quick view is located a in the lower right corner of the OpenTMS window.



Figure 137 – Notifications Tray

Clicking on a notification tray opens the notification tray. In the figure below, the user clicked on the Planned Events tray.

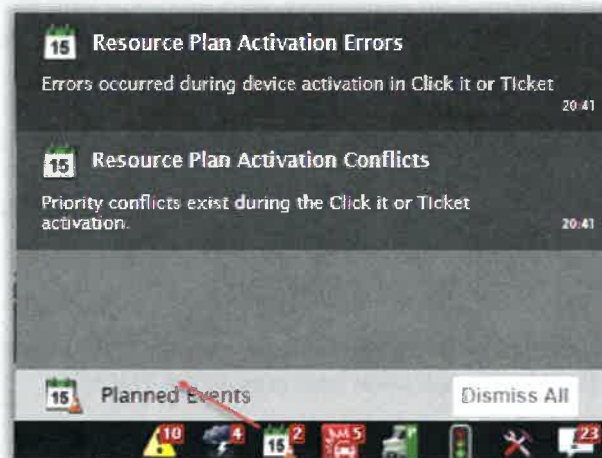


Figure 138 – Planned Events Notification Tray

Immediate feedback, such as the success of a user posting a message is displayed in the bottom right.

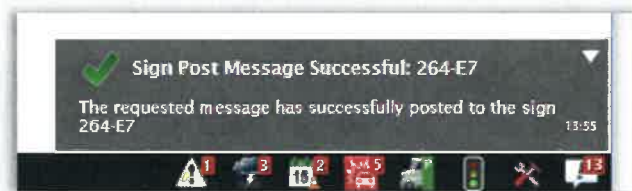


Figure 139 – Sign Post Message Successful Notification

In addition to the toolbar, the user can access notifications through the Notifications module.

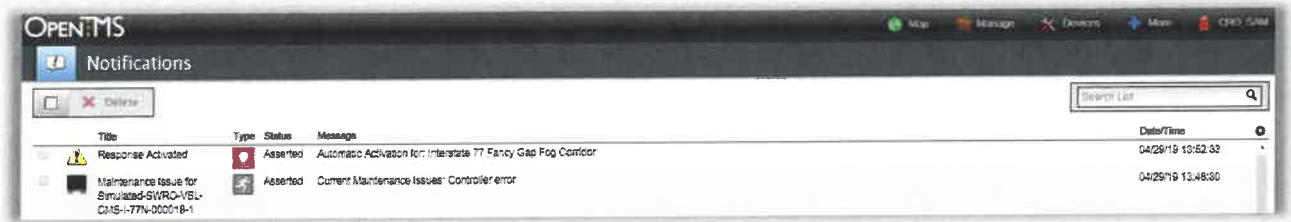


Figure 140 – Notifications List View

4.13.1.4. The ATMS user interface shall enable users to view the identification of other users that are logged in to the system.

OpenTMS meets this requirement. OpenTMS will provide a view of the users currently logged into the system from the main More menu.

4.13.1.5. The ATMS shall alert operators when users log in or log off the system.

OpenTMS meets this requirement. OpenTMS will provide a notification when users log in or log off the system.

4.13.1.6. The activities performed in the ATMS by other users shall be visible to all other users with the appropriate authority.

OpenTMS meets this requirement. The system updates in real time to provide the most recent status. For example, if a user posts a message on a sign, all users with privileges to view signs will see the change in real time.

4.13.1.7. The ATMS user interface shall include map display for both local and remote work stations.

OpenTMS meets this requirement. The same map is provided for both local and remote work stations.

4.13.1.8. User interface maps shall be GIS based to enable smooth and continuous scrolling and zooming.

OpenTMS meets this requirement. The OpenTMS Map Interface optimizes the user experience and operational process. It consists of several integrated components that provide a feature-rich, easy-to-use interface. The system provides responsive maps with a target update rate within 1 second.

4.13.1.9. User interface maps shall include functionality to hide layers or attributes at wide zoom levels to avoid map clutter.

OpenTMS meets this requirement. The OpenTMS map includes a smart icon grouping feature. When multiple devices are in close proximity, OpenTMS automatically clusters the icons and indicates the number of devices with a number indicator on the icon. When a user hovers over a clustered icon, the map interface will provide a popup of all devices included in that cluster. To select one the user can click on the device name.



Figure 141 – Icon Clustering Features

The system can also be configured to display layers at different zoom levels. For example, active DMS can be configured to display at a higher zoom level for a broader operational view while inactive signs can be enabled at a different zoom layer to help reduce cognitive load. As the user zooms in the blank signs will appear at the configured zoom level. This is done in the Admin Portal Map module.

4.13.1.10. The ATMS shall provide a mechanism for operators and users to select what is displayed on the map (e.g. make DMS visible or not visible on the map, make CCTV visible or not visible on the map).

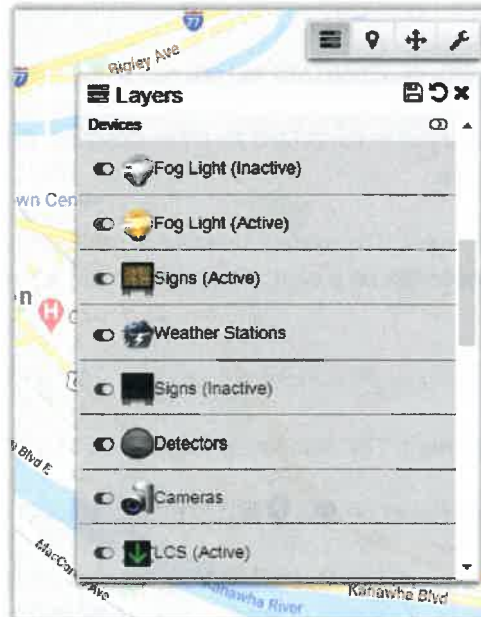


Figure 142 – Map Layer Control

OpenTMS meets this requirement. A Layers Widget in the upper right corner, enables users to toggle the view of specific layers on the map.

4.13.1.11. The ATMS user interface maps shall display active incidents (construction, incidents, etc.).

OpenTMS meets requirement. OpenTMS displays all active incidents and closures on the map.



Figure 143 – Active Incident Map Icons

4.13.1.12. The ATMS user interface maps shall enable operators to select an incident icon to open and view information describing the incident.

OpenTMS meets requirement. Clicking on an incident icon from the map opens the Incidents detailed view. The detailed view provided more in-depth information on the incident.

4.13.1.13. The ATMS user interface maps shall display icons representing both fixed and portable device locations.

OpenTMS meets this requirement. Portable devices use the same icon as the device type but sit on a trailer as shown below. This icon displays on the map as well as the list views.



Figure 144 – Portable Device Icons

4.13.1.14. The user interface map display of DMS shall distinguish DMS that are not currently connected or operational from those that are operational and connected to the ATMS and ready to receive a message from the ATMS.



OpenTMS meets this requirement. OpenTMS icons also reflect communication status. Devices in

communications failure have an '!' point (). This is standard among all field devices.

4.13.1.15. The on-screen map shall distinguish between fixed and portable DMS.

OpenTMS meets this requirement. Portable devices use the same icon as the device type but sit on a trailer as shown below. This icon displays on the map as well as the list views.



Figure 145 – Portable Device Icons

4.13.1.16. The user interface maps shall enable operators to select DMS to view current messages displayed on the signs.

OpenTMS meets this requirement. The map provides a visual, gold background, that a message is posted on a sign. If you hover over the icon, the tooltip will display the current message.

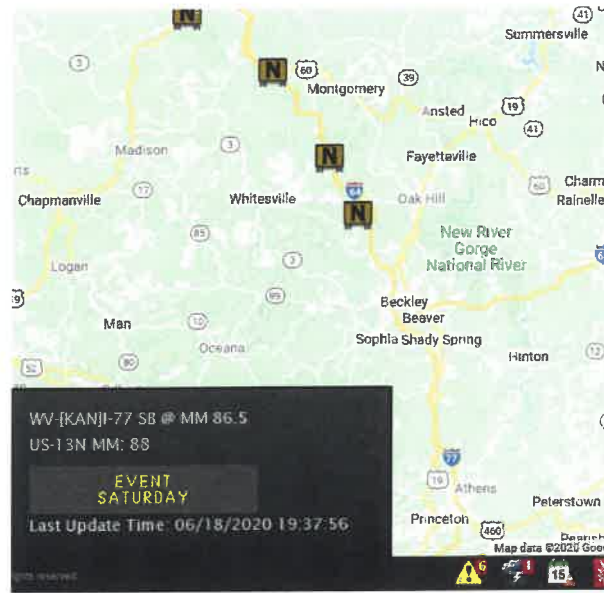


Figure 146 – Sign Current Status Tooltip

Clicking on the icon will display the sign's detailed view. The current message is displayed on the detailed view.

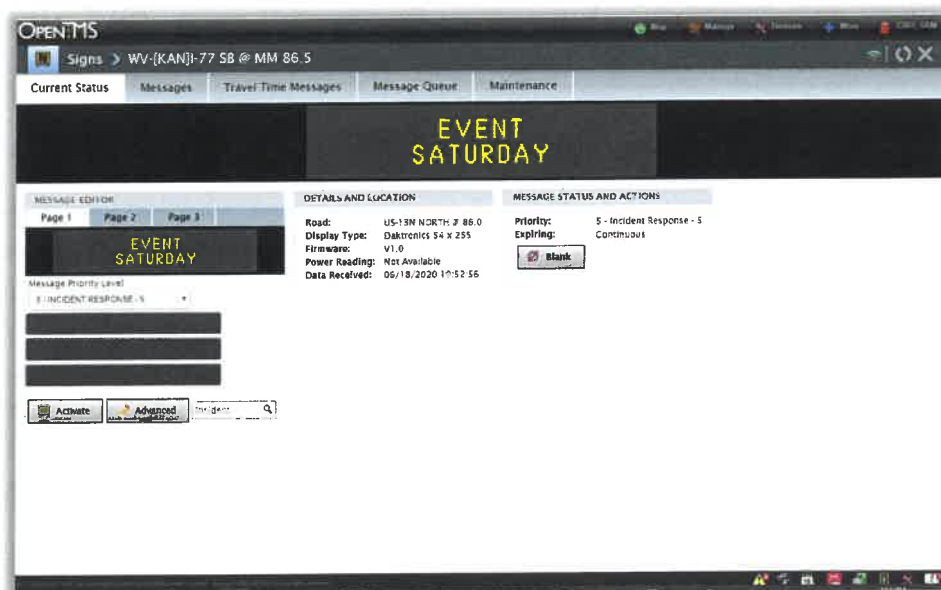


Figure 147 – Sign Current Status View

4.13.1.17. The user interface maps shall enable authorized users to select DMS to control the current messages displayed on the signs.

OpenTMS meets this requirement. OpenTMS also provides the ability to select permanent and portable DMS from the map and post standard or travel time messages as well as blank or poll the selected signs. Devices are selected by holding down the Ctrl button on the keyboard and using your mouse to click on signs. The device manager is shown below. Users with the Sign control privilege can control message posting.

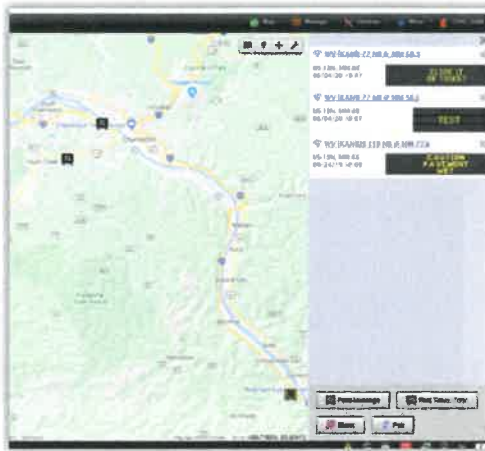


Figure 148 – Device Manager Detail View

4.13.1.18. The user interface map display shall display icons representing locations of all CCTV connected to the ATMS.

OpenTMS meets this requirement. OpenTMS displays all CCTV on the map at the configured location.

4.13.1.19. The user interface shall enable authorized users to select CCTV to pan, tilt, and zoom the CCTV cameras.

OpenTMS meets this requirement. The OpenTMS/Vero interface will enable authorized users to select CCTV to pan, tilt, and zoom the CCTV cameras.

4.13.1.20. The user interface shall enable operators to select CCTV cameras to view real-time video from the cameras.



Figure 149 – Pan, Tilt, and Zoom CCTV Cameras



Figure 150 – CCTV Cameras Allow Real-Time Video

OpenTMS meets this requirement. The OpenTMS interface will enable operators to select CCTV cameras to view real-time video from the cameras.

4.13.1.21. The user interface shall enable operators to open multiple cameras simultaneously, viewing real-time video from each camera.

The OpenTMS interface will enable operators to open multiple cameras simultaneously, viewing real-time video from each camera.



Figure 151 – Video Wall Display

4.13.1.22. The user interface shall allow operators to turn map layers on and off.

OpenTMS meets this requirement. A Layers Widget in the upper right corner, enables users to toggle the view of specific layers on the map.

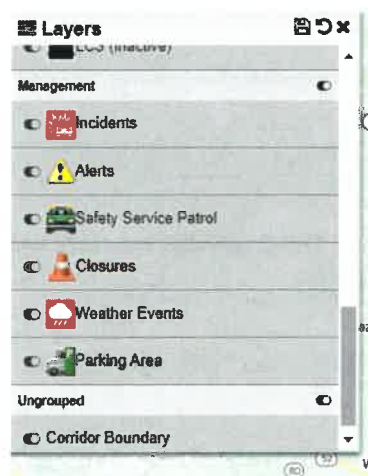


Figure 152 – Map Layer Toggle

4.13.1.23. The user interface map display shall display icons representing locations of weather stations supplying information to the ATMS.

OpenTMS meets this requirement. OpenTMS displays all weather stations on the map at the configured location.



Figure 153 – Weather Station Icon Display

4.13.1.24. The user interface shall enable operators to select weather stations to view the current status of the weather station.

OpenTMS meets this requirement. Hovering over the icon will display a tool tip with a summary of important readings. Clicking on the icon will display the weather station's detailed view. The current sensor readings are displayed on the detailed view.

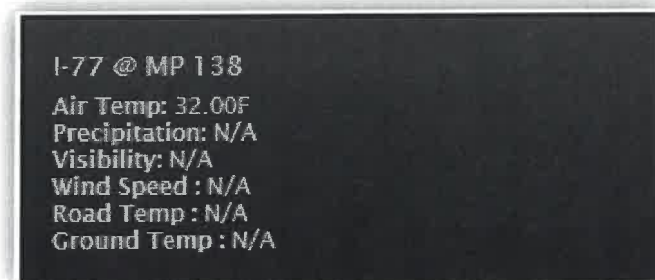



Figure 154 – Weather Station Tooltip Display

4.13.1.25. The user interface shall enable operators to view the locations and status of portable ITS devices.

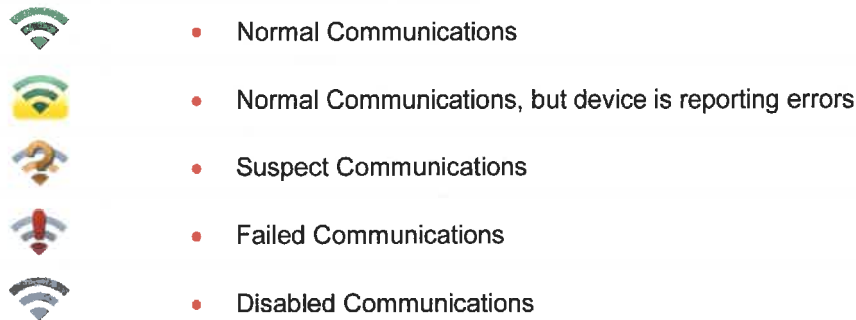
OpenTMS meets this requirement. How a user views the location and status of portable ITS devices is the same as fixed with the following exceptions:

- On the map the user can access a Move tool () that allows the user to move portable devices as they are moved in the field;

- ATMS has integrated with the NTCIP location commands for DMS and can automatically move a DMS as it is moved in the field if the device is equipped with a GPS; and
- User have the ability to update the location of the portable device from the Maintenance tab in the device's detailed view.

4.13.1.26. The ATMS shall display device status data on the map display.

OpenTMS meets this requirement. OpenTMS icons are colored to represent the communication status of a field device and provide an indication as to whether the device is reporting an error. Icons are shown below.



4.13.1.27. The ATMS shall have the capability of displaying real-time data that is collected by field devices and made available to the ATMS.

OpenTMS meets this requirement. OpenTMS continuously polls field devices for real-time data that is made available to the ATMS. In most cases data, can be viewed on the list view of the device type, device's detailed view or by hovering over and icon to display its tool tip.

4.13.1.28. The ATMS user interface shall provide a mechanism for operators to manage multiple events simultaneously (e.g. toggling back and forth between).

OpenTMS meets this requirement. The application is launched in a browser and users can open multiple tabs or peel off additional windows to have multiple views concurrently running on multiple monitors. Below are two events each open its their own tab.

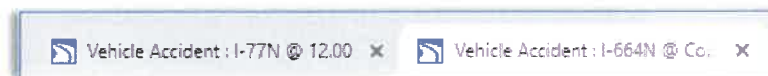



Figure 155 – Multiple Application Tabs Open at Same Time

*4.13.1.29. The ATMS user interface shall enable operators to request and view diagnostics of the System.
(Note: The user should receive the following diagnostic information: status display IE, temp, power, pixels, out, door open, fan on, etc.)*

OpenTMS meets this requirement. Available diagnostics can be requested from the Maintenance tab on a device's detailed view. DMS supports diagnostics such as temperature, power, pixel errors, door open, and fan errors. Reports are available for users to view the current state of a device. OpenTMS has a Field Device and Health Report that can be scheduled to run nightly and emailed to the maintenance staff. The Health report

identifies the failed devices and those with errors. The Field Device report provides device counts, communication state information.

4.13.1.30. The ATMS user interface shall enable users to view the operational status of field devices and other systems connected to the ATMS.

OpenTMS meets this requirement. Users can view the operational status of field devices from a map. Devices in communications failure have an '!' point (). The operational status is also shown on the list view.

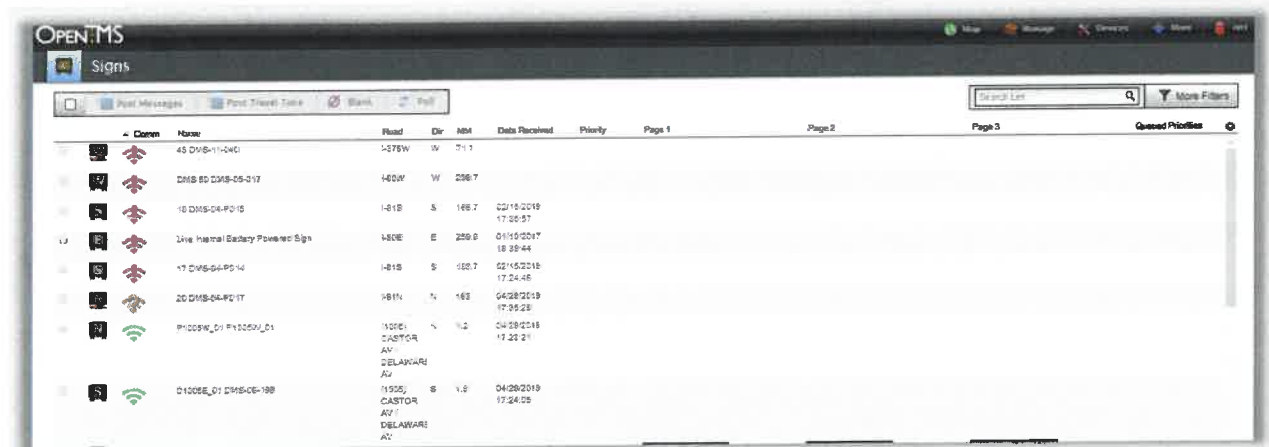


Figure 156 – Sign List View with Communication Status

For external systems connected to the Alerts module, a Status button is available on the Alerts list view that opens a dialog that shows the state of the connection.



Figure 157 – Alert Subscription Status View

4.13.1.31. Operators shall have a mechanism to initiate the ATMS to ping field devices to detect if communications and field devices are responding properly.

OpenTMS meets this requirement. The messages for polling and posting failures in the Event log will more clearly indicate if there is a connection error which indicates that the system cannot connect to the field devices versus a timeout where the system can connect, but no response is received to the message sent.

Event Time	Event Name	User Name	Event Additional Information
06/05/2019 08:55:00	Message Displayed	CRC_SAM	Sign post failed: java.net.ConnectException: Connection refused: no further information

It will be documented in the troubleshooting guides on how to respond to each of these errors.

Figure 158 – Sign Event Log

4.13.1.32. The ATMS administrators shall be able to set minimum thresholds, such that operators cannot set their thresholds below the value.

OpenTMS meets this requirement. OpenTMS supports the setting of thresholds for RWIS sensors, detectors and travel time. For RWIS if a threshold is set for RWIS visibility, as visibility drops and a threshold is crossed an Alert is in the Alert Management system will be created.

The ATMS supports tailoring of notifications by home group and device.

4.13.1.33. The ATMS user interface shall enable administrators to assign permissions to users.

OpenTMS meets this requirement. Through the Admin Portal Security module user interface, administrators can quickly manage the set of privileges assigned to a Role. Users are typically assigned a role such as Guest, Operator, Supervisor or Administrator and privileges are assigned to that Role. There is no limit in the number of Roles defined. Users are assigned to a Role.

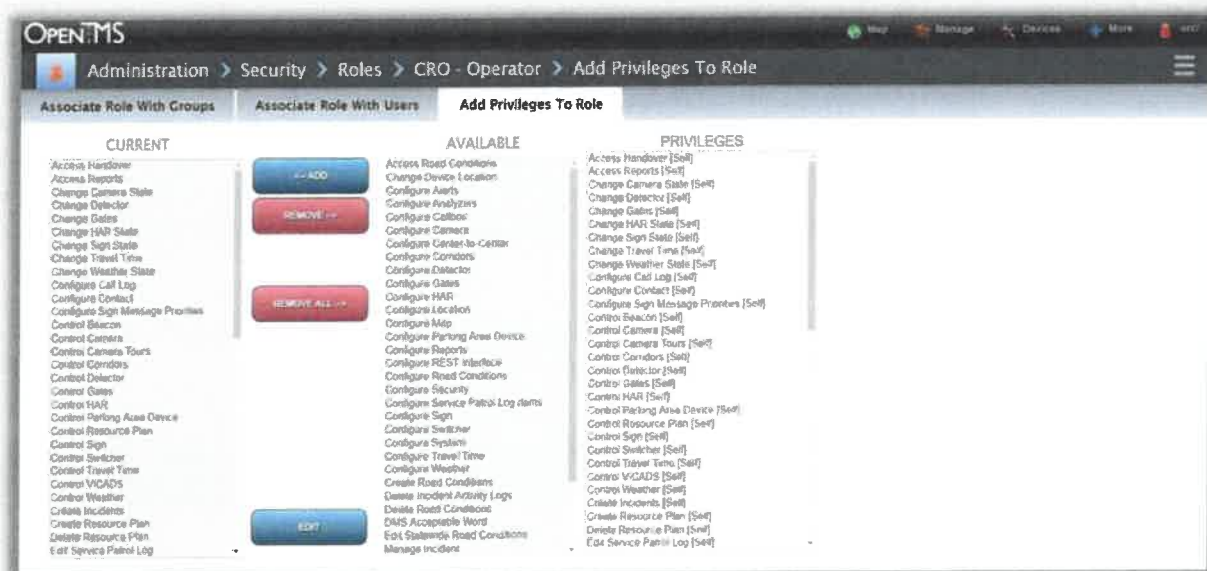


Figure 159 – Privilege Role Assignment View

4.13.1.34. The ATMS shall import specific traffic operations related CAD data so that it can be made available to the ATMS user and used to create events within the ATMS.

OpenTMS meets this requirement. Q-Free has integrated over 40+ centers throughout 3 states. Those OpenTMS deployments all feature CAD integration as a primary source of incident detection. ATMS users see CAD alert information directly in the ATMS and relevant data is imported into the incident management system automatically. When an CAD alert comes into the system the user receives a notification in the bottom right corner and clicks on it displaying the Alerts detailed view. The user reviews the alert and creates an incident from the alert. Once associated alert updates will be fed into the incident so the user has the most recent updates.

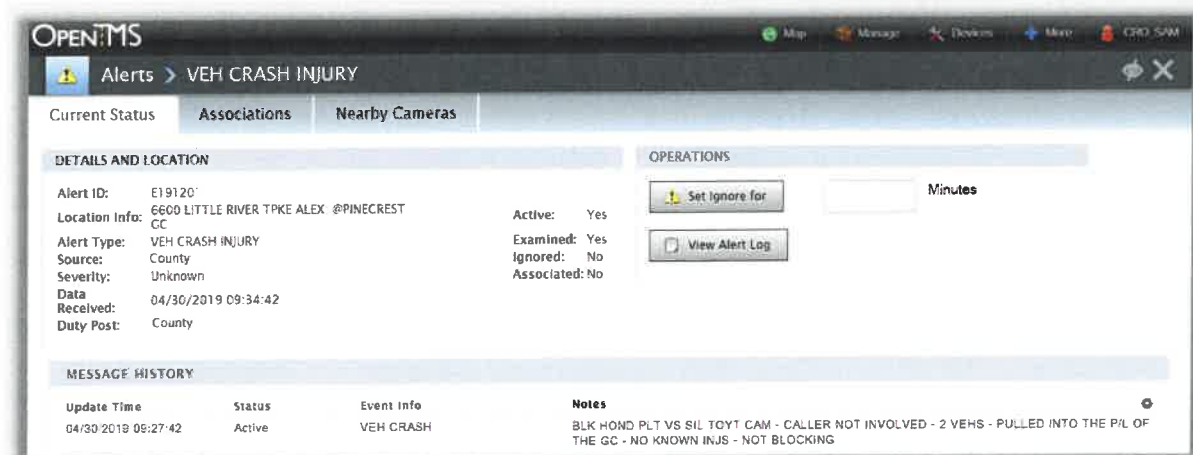
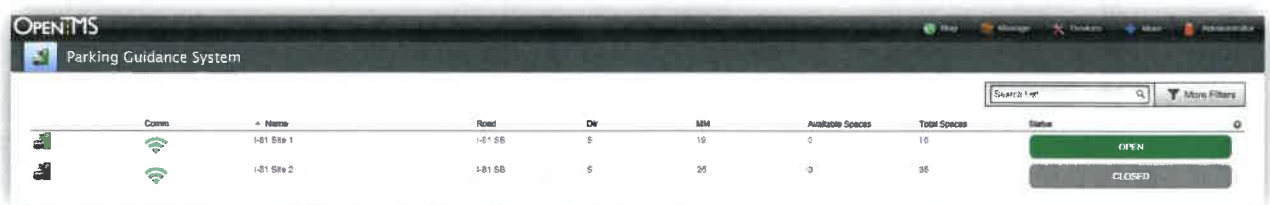


Figure 160 – CAD Alert Detail View

4.13.1.35. The user interface shall enable operators to view parking information made available to the ATMS.

OpenTMS meets this requirement. The OpenTMS Parking Guidance module provides the ability to monitor and report the availability of parking from parking areas that are instrumented with vehicle counting devices. Parking availability data is disseminated to the traveling public via a roadway sign indication if the truck parking area is "Open", "Full" or "Closed" as well as delivering the status of the truck parking lots to 3rd party public notification systems, such as the 511 Travelers Information System, alerting drivers of the state of the parking area.

The parking guidance module contains both a list view and a detailed view. The list view shown below provides a summary of the communication status and parking area state at a glance.





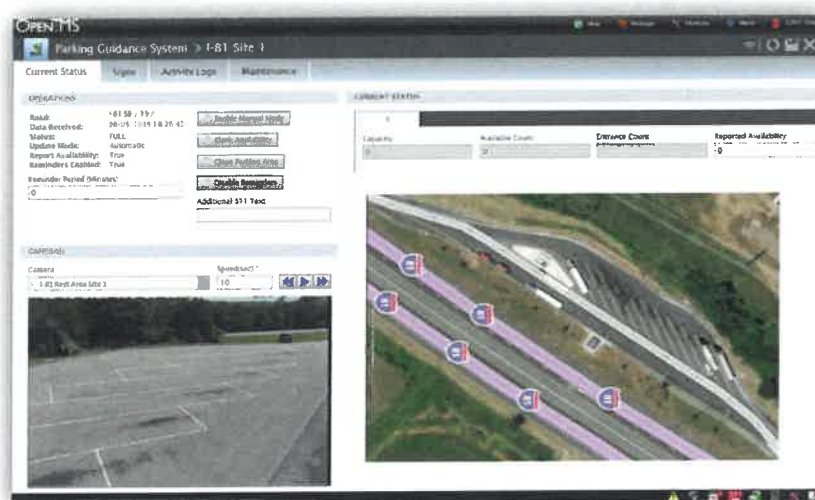
Comm	Name	Road	Dir	MM	Available Spaces	Total Spaces	Status
	I-81 Site 1	I-81 SB	S	10	0	10	OPEN
	I-81 Site 2	I-81 SB	S	25	0	25	CLOSED

Figure 161 – Parking Area List View

The detailed view, as shown below provides real time information on the parking area. Key features include:

- Ability to run in Automatic or Manual mode;
- In Automatic mode, automatically post open/closed and/or parking spaces available;
- View status of associated signs and manually post if in manual mode;
- Close the parking area;
- Review activity logs for the selected parking area; and
- Review status logs which shows historical data on parking spaces.

Figure 162 – Parking Area Details View



Map display includes icons and hovering over the icon displays a tool tip with the parking area status and spaces available.

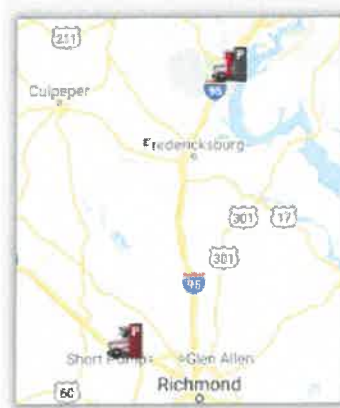


Figure 163 – Truck Parking Module Icon Display

4.13.1.36. The ATMS user interface shall provide a mechanism for operators to view standard operational procedures to be used while responding to events or incidents.

OpenTMS meets this requirement. A help button will be added to the event/incident view that is linked to a PDF. Clicking on the button will display a PDF of the standard operating procedure. The PDF can be updated as needed.

4.13.1.37. The ATMS shall provide prescribed response scenarios or automation tools to assist users in controlling multiple devices quickly, consistently, and with limited manual input.

OpenTMS meets this requirement. OpenTMS provides a rich user interface for managing incidents. The GUI leads the operator through a workflow to log critical information about the incident and agency/stakeholder activities. The rules-based DSS automatically generates an incident response based on the incident attributes.

The DSS is triggered when specific fields in the incident/event that would trigger business rules are modified such as severity or lanes closed. At this point OpenTMS invokes the DSS to create an updated response plan. The incident response recommends ITS devices, 511 messaging, and email notifications. Q-Free will work with the WVDOH to customize the rules to meet their standard operating procedures.

The figure below provides an overview of the incident response:

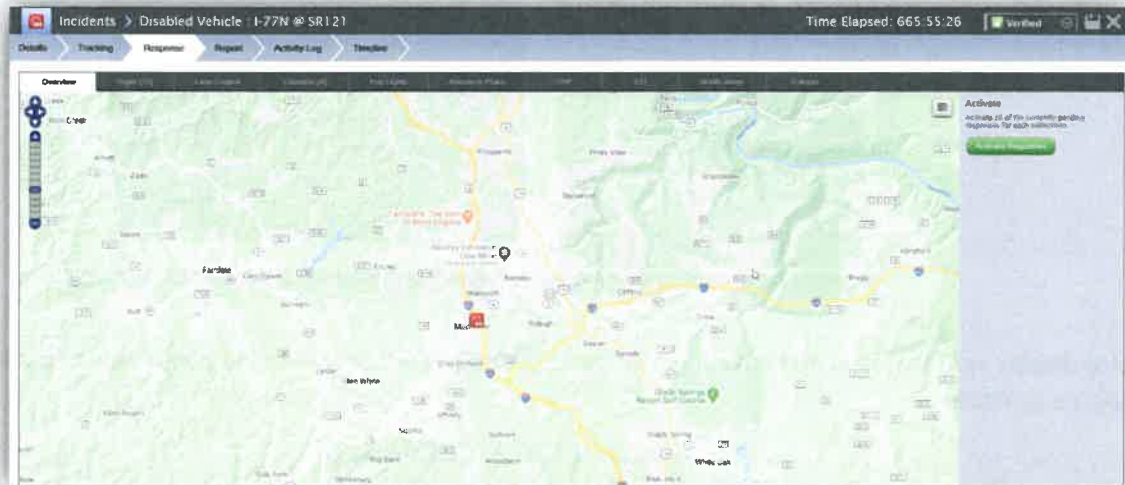


Figure 164 – Incident Response Overview Map View

The figure below provides a view of the DMS posting recommended based on business rules.

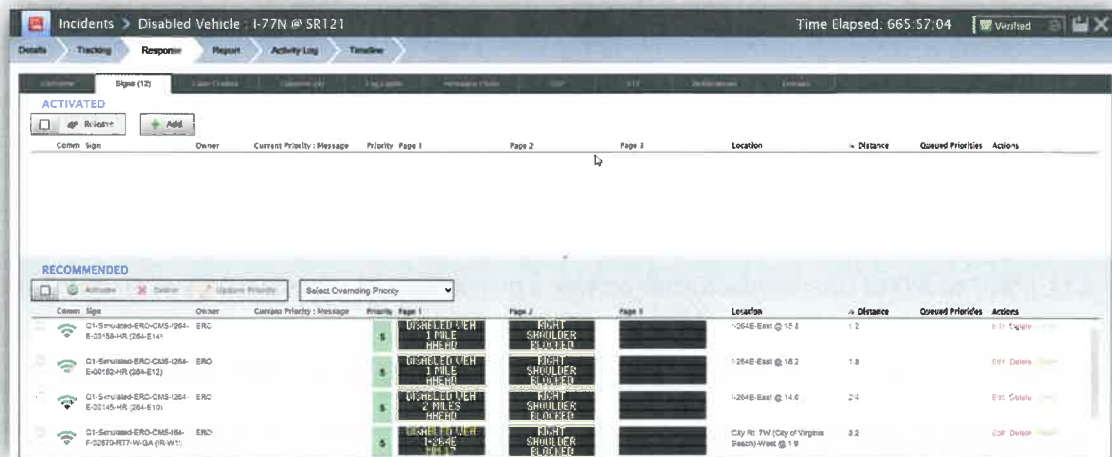


Figure 165 – Incident Response Sign Detail View

4.13.1.38. The ATMS shall provide a means of organizing devices into logical groupings or zones.

OpenTMS meets this requirement. Devices are assigned a home group when they are configured. End users by default view devices in their home group but can enable the view of other home groups. For example, the WVDOH and Turnpike would have device assigned to their own home groups. DMS will further support another level of grouping that can be configured through the Admin portal. Available sign groups can be further filtered down by selecting the sign groups filter in the operational sign list view.

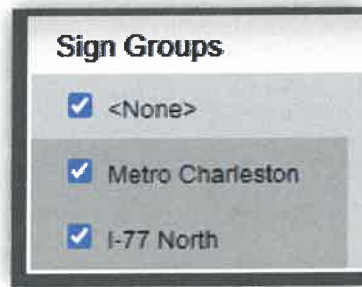



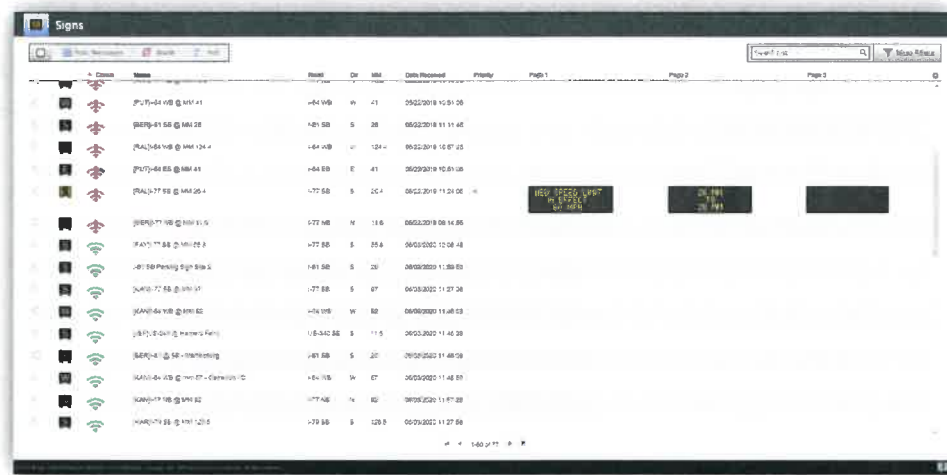
Figure 166 – Sign Groups Filter Selection

4.13.1.39. The ATMS shall provide spell check, text wrapping, and copy/cut/paste capabilities for all operator typed entry.

OpenTMS meets this requirement. Typed entry fields support copy/cut/paste capabilities. Spell check is supported through the browser and DMS has its own spell-checking capability. Free text note fields wrap.

4.13.1.40. The ATMS user interface shall enable users to view the status of communication with field devices and other system connected to the ATMS.

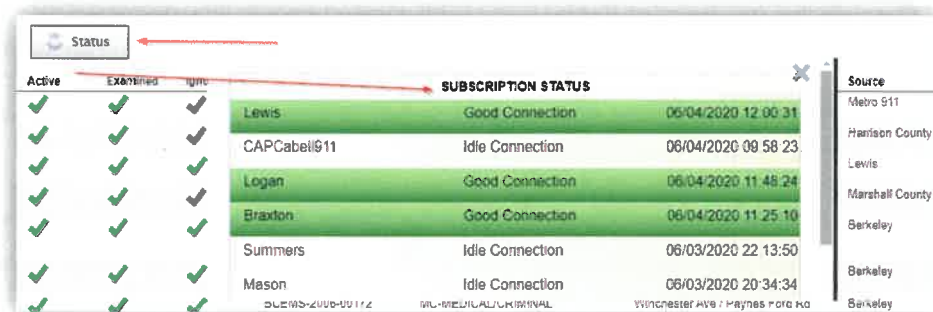
OpenTMS meets this requirement. Users can view the communication status of field devices from a map. Devices in communications failure have an '!' point (). The communication status is also shown on the list view.



Name	Model	Dr	Mile	Date Received	Priority	Page 1	Page 2	Page 3
PLA2-04-08 @ M41 A1	-04-08	W	41	05/22/2018 15:51:26				
PLA2-01-08 @ M41 B	-01-08	S	38	05/22/2018 11:11:42				
PLA2-04-08 @ M41 C4	-04-08	W	124	05/22/2018 15:57:25				
PLA2-04-08 @ M41 A1	-04-08	E	41	05/22/2018 15:51:26				
PLA2-77-08 @ M41 B4	-77-08	S	25.4	06/23/2018 11:21:06		NEW TRUCK STOP	NEW TRUCK STOP	
PLA2-77-08 @ M41 B1	-77-08	N	18.6	06/23/2018 08:14:36				
PLA2-77-08 @ M41 B2	-77-08	S	25.6	06/23/2018 12:08:48				
PLA2-77-08 @ M41 B3	-77-08	S	26	06/23/2018 11:58:03				
PLA2-77-08 @ M41 B4	-77-08	S	27	06/23/2018 11:27:26				
PLA2-04-08 @ M41 B2	-04-08	W	82	06/08/2020 15:48:03				
PLA2-04-08 @ M41 B3	-04-08	S	11.5	06/03/2020 11:48:28				
PLA2-04-08 @ M41 B4	-04-08	S	20	06/03/2020 11:48:08				
PLA2-04-08 @ M41 B5	-04-08	W	87	06/03/2020 11:48:07				
PLA2-04-08 @ M41 B6	-04-08	N	82	06/03/2020 11:47:28				
PLA2-04-08 @ M41 B7	-04-08	S	128.5	06/03/2020 11:27:06				

Figure 167 – Sign List View with Devices in Failed Communication

For external systems connected to the Alerts module, a Status button is available on the Alerts list view that opens a dialog that shows the state of the connection.



Active	Examined	Ignored	Subscription Status	Source
✓	✓	✓	Lewis Good Connection 06/04/2020 12:00:31	Metro 511
✓	✓	✓	CAPCabel\$11 Idle Connection 06/04/2020 09:58:23	Harrison County
✓	✓	✓	Logan Good Connection 06/04/2020 11:48:24	Levitt
✓	✓	✓	Braxton Good Connection 06/04/2020 11:25:10	Marshall County
✓	✓	✓	Summers Idle Connection 06/03/2020 22:13:50	Berkeley
✓	✓	✓	Mason Idle Connection 06/03/2020 20:34:34	Berkeley
✓	✓	✓	PLA2-04-08 @ M41 B2	Berkeley

Figure 168 – Alert Subscription Status Panel

4.13.2. Operator and User Features – Desirables

4.13.2.1. The ATMS user interface should include tailored windows for each user, based on login.

OpenTMS meets this requirement. Users can generate map extents for heavily monitored areas and can set them as their default location when logging into the application.

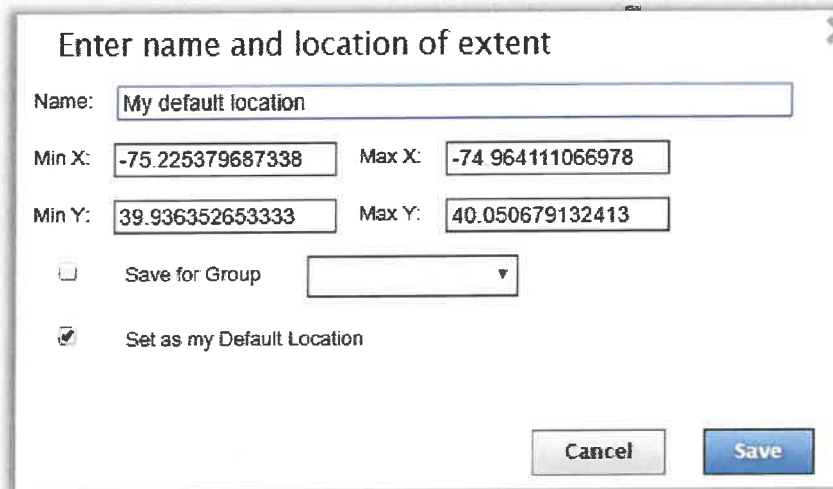


Figure 169 – Map Extent Creation Panel

4.13.2.2. The user preferences to determine the interface presented should be set by users.

OpenTMS meets this requirement. The map is adjusted to the user's default extent and the views default to the user's selected home group(s).

4.13.2.3. Alerts and notifications should be tailored to each user based on preferences established by each user.

OpenTMS meets this requirement. The ATMS supports tailoring of notifications by home group and device. During a user's login session filters are saved within the session. Users will be allowed to filter notifications based on device type, geographical area, and other available selections.

4.13.2.4. The ATMS should provide a mechanism for authorized users to send and receive instant messages with other users while logged into the system. These messages should be capable of allowing attachments.

The ATMS does not have an integrated instant message module. Q-Free is proposing an alternative solution to use Slack (<https://slack.com/>), a fully functional messaging application. Users will be able to communicate with each other, create specific groups, and share files and screenshots. See below for a screenshot of the Slack interface:

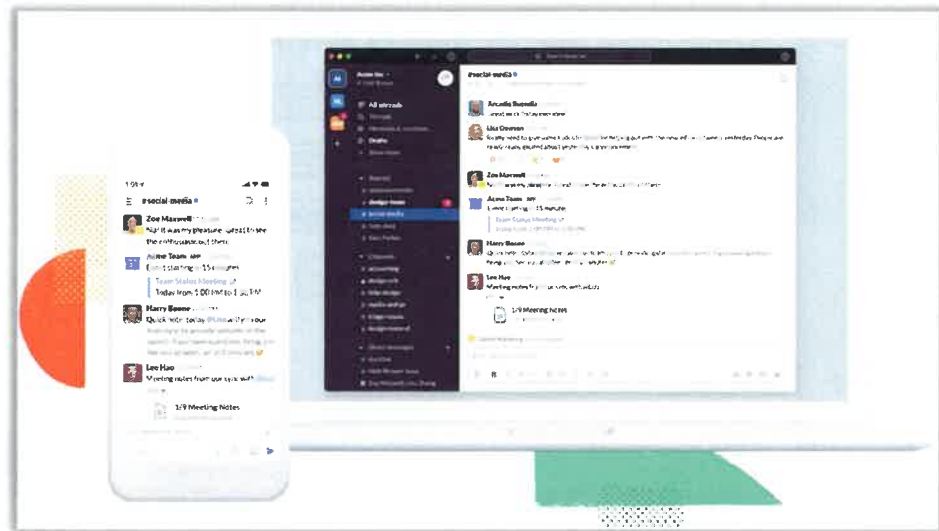


Figure 170 – Slack Instant Messaging Interface

4.13.2.5. The ATMS user interface maps should display traffic flow maps.

OpenTMS meets this requirement. As part of the map interface's ability to pull in additional map layers, traffic flow maps can be displayed on the map. This includes the Google Traffic layer.

4.13.2.6. Flow maps displayed on the ATMS user interface should integrate freeway and arterial conditions on one common map display.

OpenTMS supports a speed layer. The ATMS speed layer will be integrated from a third-party provider and displayed as a map overlay that can be toggled.

4.13.2.7. Flow maps should have the capability to display speed data.

OpenTMS meets this requirement. On the map view, the detector icons look like a speedometer and provides visual cues for the data being returned. The color coding of the detector icons is configurable in the administration portal and enables users to quickly see which detectors are reporting free flow or congested conditions. Congestion levels can be set to color based on *speed* or *occupancy*.

4.13.2.8. Flow maps should have the capability to display freeway occupancy data.

OpenTMS meets this requirement. On the map view, the detector icons look like a speedometer and provides visual cues for the data being returned. The color coding of the detector icons is configurable in the administration portal and enables users to quickly see which detectors are reporting free flow or congested conditions. Congestion levels can be set to color based on *speed* or *occupancy*.

4.13.2.9. The ATMS should integrate information between incident reports and construction maintenance reports.

OpenTMS will meet this requirement by adding the ability to associate incidents to an event to track this information and make it available in a report for administrators.

4.13.2.10. The ATMS user interface map display should provide a mechanism for operators to view the location of systems and field devices monitored but not controlled by the ATMS.

OpenTMS meets this requirement. In addition to displaying devices controlled by the owning agency, it can also display devices controlled by external agencies by adding a blue/orange column on the left side of the icons. All icons will be the same with this added element. Separate layers will be available to toggle the view of these devices.

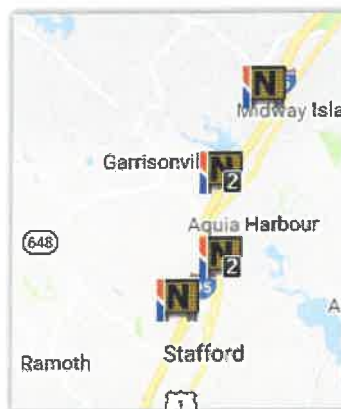


Figure 171 – Center-to-Center Device Map Display

4.13.2.11. Real-time display should include volume data.

OpenTMS meets this requirement. The Detector module pulls lane by lane volume data and displays lane by lane or aggregated by station direction.

4.13.2.12. Real-time volume data display should be able to be displayed by individual lane.

OpenTMS meets this requirement. The Detector module pulls lane by lane volume data and displays lane by lane or aggregated by station direction.

4.13.2.13. The ATMS should display aggregated real-time volume data by direction at a station's location.

OpenTMS meets this requirement. The Detector module pulls lane by lane volume data and displays lane by lane or aggregated by station direction. The detailed view shown below in the details and location section shows aggregated traffic data.

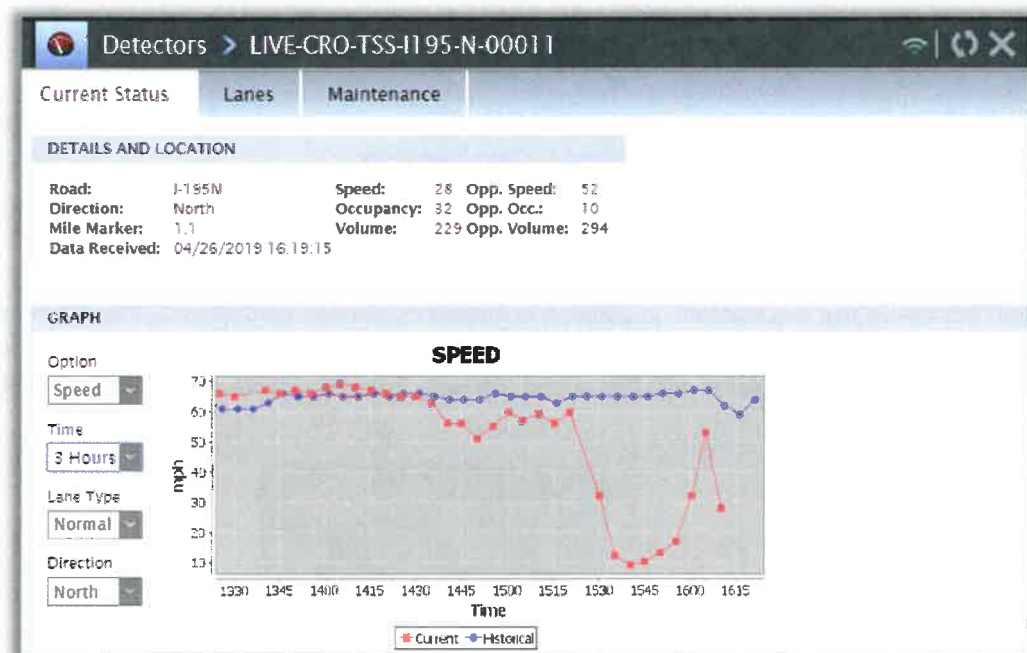
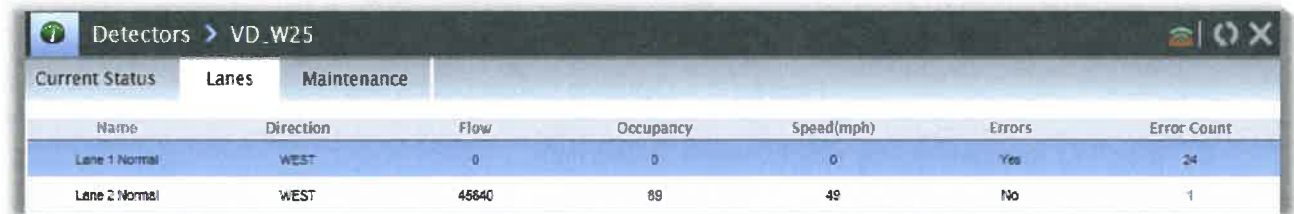


Figure 172 – Detector Detail View with Aggregated Traffic Data

Clicking on the Lanes tab shows lane by lane traffic data.



Name	Direction	Flow	Occupancy	Speed(mph)	Errors	Error Count
Lane 1 Normal	WEST	0	0	0	Yes	24
Lane 2 Normal	WEST	45640	89	49	No	1

Figure 173 – Detector Lanes Tab

4.13.2.14. Real-time display should include occupancy data.

OpenTMS meets this requirement. The Detector module pulls lane by lane occupancy data and displays lane by lane or aggregated by station direction.

4.13.2.15. Real-time occupancy data display should be able to be displayed by individual lane.

OpenTMS meets this requirement. The Detector module pulls lane by lane occupancy data and displays lane by lane or aggregated by station direction.

4.13.2.16. The ATMS should be able to display average real-time occupancy data for all lanes by direction at a station's location.

OpenTMS meets this requirement. The Detector module pulls lane by lane occupancy data and displays lane by lane or aggregated by station direction.

4.13.2.17. The ATMS should be able to display average real-time speed data for all lanes by direction at a detector's location.

OpenTMS meets this requirement. The Detector module pulls lane by lane speed data and displays lane by lane or aggregated by station direction.

4.13.2.18. Operators should be able to adjust threshold values for when to receive notices and alerts.

OpenTMS meets this requirement. The ATMS supports tailoring of notifications by home group and device. For example, the system can be configured so users at the WVDOH TMC do not receive notifications for WVPA field devices. Threshold settings for RWIS, Detector and Travel Time thresholds are configurable in the Admin Portal.

4.13.2.19. Operators / users should use thresholds to control what types of alerts they receive. For example, operators may decide not to receive alerts of technical failures while technical support may opt to receive technical failure alerts.

OpenTMS meets this requirement by allowing operators to only have access to notifications based on their privilege level. In addition, operators will can select which alerts they wish to receive based on their current assignments for a period of time.

4.13.2.20. The ATMS user interface maps should display pre-planned detour routes.

OpenTMS meets this requirement. The OpenTMS map interface supports the display of WMS and ArcGIS Rest end points. If pre-planned detour routes are available in a supported map layer the layer can be added. Additional clients use this to display their detour routes on the main map. With the ESRI detour integration, these routes can also be displayed on the main map if configured and available.

4.13.2.21. The user interface map display should display icons representing locations of all variable speed displays connected to the ATMS.

OpenTMS meets this requirement. The Variable Speed Limit (VSL) Sign module is part of the OpenTMS offering and is currently deployed for at least three of our clients. The VSL module enables operators to control a single variable speed sign or a group of signs. The list view provides access to the signs and sign groups to quickly update speed limits. Selecting an individual sign from the map or list provides a more detailed view to view historical data, conduct diagnostics, and view logs.

The map displays the VSL as icons with the speed limit displayed. Hovering over the icon provides the user with a tool tip.

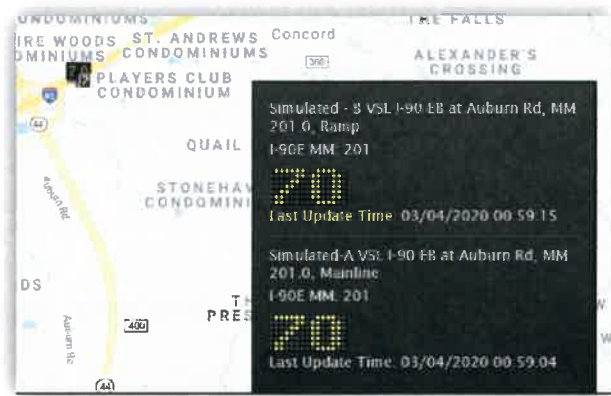
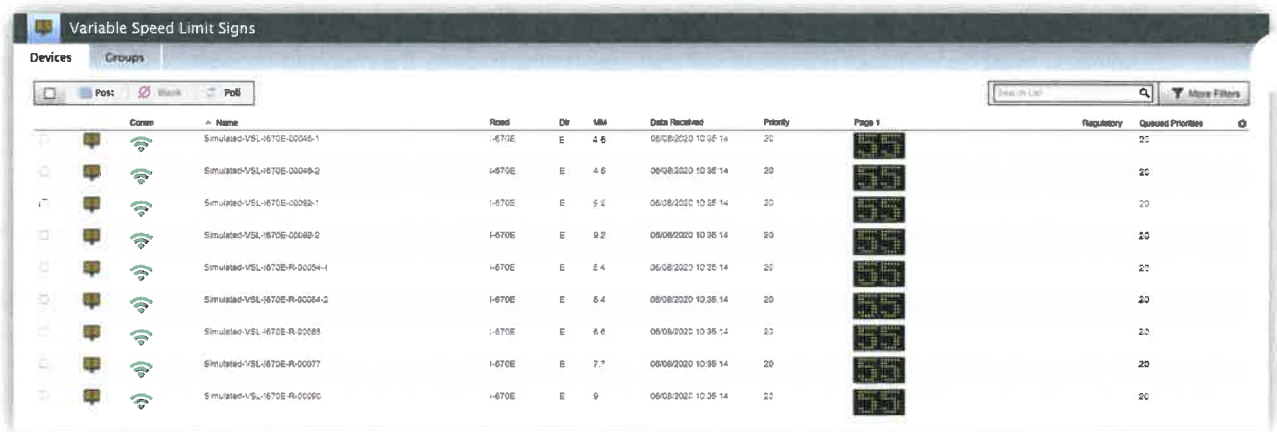


Figure 174 – Variable Speed Limit Icon/Tooltip Display

4.13.2.22. The user interface should enable operators to select variable speed displays and view the current status of the sign.

The list view provides an overview of the current status for each device at a glance. The user can filter the list by roadway, display state, or free text filter.



Name	Road	Dir	Mile	Data Received	Priority	Page 1	Regulatory	Queued Priorities
Simulated-VSL-I-670E-00045-1	I-670E	E	4.6	06/08/2020 10:05:14	20		20	
Simulated-VSL-I-670E-00045-2	I-670E	E	4.6	06/08/2020 10:05:14	20		20	
Simulated-VSL-I-670E-00052-1	I-670E	E	5.4	06/08/2020 10:05:14	20		20	
Simulated-VSL-I-670E-00052-2	I-670E	E	5.4	06/08/2020 10:05:14	20		20	
Simulated-VSL-I-670E-R-00054-1	I-670E	E	5.4	06/08/2020 10:05:14	20		20	
Simulated-VSL-I-670E-R-00054-2	I-670E	E	5.4	06/08/2020 10:05:14	20		20	
Simulated-VSL-I-670E-R-00055	I-670E	E	6.6	06/08/2020 10:05:14	20		20	
Simulated-VSL-I-670E-R-00077	I-670E	E	7.7	06/08/2020 10:05:14	20		20	
Simulated-VSL-I-670E-R-00090	I-670E	E	9	06/08/2020 10:05:14	20		20	

Figure 175 – Variable Speed Limit List View

The VSL sign can be selected from the map or list view to view a more detailed current status. Selecting an individual sign allows the user to view additional details on the current status tab.

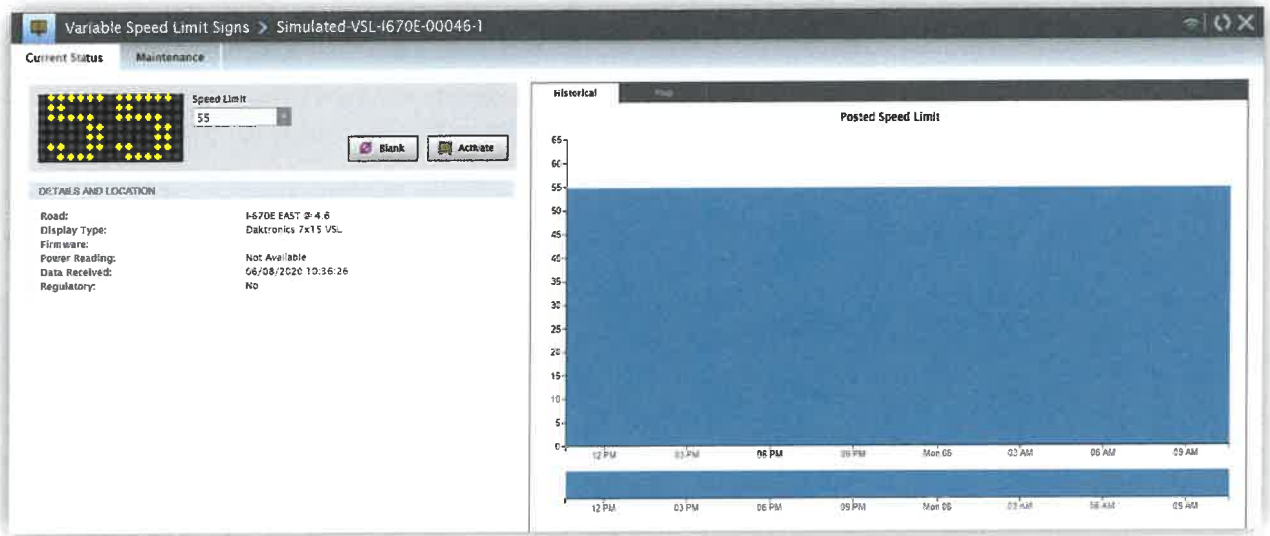



Figure 176 – Variable Speed Limit Detail View

The Maintenance tab provides access to status logs, message history logs, event logs, and sign errors.



The screenshot shows the 'Variable Speed Limit Signs' interface for 'Simulated-VSL-I670E-00046-1' with the 'Maintenance' tab selected. It displays a 'Message Log' table with columns for Time On, Time Off, Speed Limit, Username, Blanked By, and Priority. The table shows a history of speed limit changes and blanking events.

Time On	Time Off	Speed Limit	Username	Blanked By	Priority
06/06/2020 10:18:09		55	orc		20
06/06/2020 15:07:43	06/06/2020 06:11:16	55	System	System	20
06/06/2020 14:08:56	06/06/2020 18:27:43	45	orc	System	20
06/06/2020 14:48:29	06/06/2020 14:08:56	50	orc	orc	20
06/06/2020 14:43:18	06/06/2020 14:48:29	40	orc	orc	20
06/06/2020 14:43:10	06/06/2020 14:43:18	45	orc	orc	20
06/06/2020 14:26:17	06/06/2020 14:40:10	55	System	orc	20

Figure 177 – Variable Speed Limit Message Log

4.13.2.23. The user interface should enable authorized users to select variable speed display sign icons and change the status of the variable speed display.

OpenTMS meets this requirement. Control access is available to those users with the correct permissions. Permissions are configured by the administrator in the Admin portal.

4.13.2.24. The ATMS should provide the ability for the operator to display snap shot images from RWIS camera or other digital still image sources on any combination of workstation or video display monitors within the TMC.

The OpenTMS will provide the ability for the operator to display snap shot images from RWIS camera or other digital still image sources on any combination of workstation or video display monitors within the TMC.

OpenTMS meets this requirement. T OpenTMS supports pulling RWIS images from Vaisala 3 and Vaisala FTP protocols in our latest version. WVDOH uses Vaisala 3 today.



Figure 178 – Weather Station Snapshot View

The ILOG 511 platform has full capabilities for displaying a snap shot images from RWIS cameras and other digital still image sources. ILOG is specifically experienced in displaying data and images from Vaisala RWIS stations, as their information is currently displayed on the 511PA webmap, an example of which can be seen in the image below. The type of data, as well as way the information is displayed to the public (including associated icons and graphics), may all be customized during the setup phase if desired by WVDOH.



Figure 179 – 511 Weather Station Snapshot Display

4.14 Data Collection & Archiving (CRFP Section 4.14)

4.14. Data Collection & Archiving

4.14.1. Mandatory Requirements

4.14.1.1. The ATMS shall have a data archiving capability that stores and provides access to historical data. Data is to be collected from ITS field devices and from system users both in normal operation and during the management of planned and unplanned events. WVDOH has a 5 year data retention requirement.

The OpenTMS will have a data archiving capability that stores and provides access to historical data. Data is to be collected from ITS field devices and from system users both in normal operation and during the management of planned and unplanned events. WVDOH has a 5-year data retention requirement.

OpenTMS meets this requirement. Q-Free will stand up an archival database and archive from production at regular intervals. The archived data will be retained for at least a period of 5 years as requested by the WVDOH. The data can be accessed by users through Jasper Reports. Jasper Reports provides the ability to run pre-defined reports or create ad-hoc reports. It also allows for data to be exported in multiple formats such as CSV. The Analytics Package, described below, will be able to access the archived data. Q-Free will remove archived data from production at an agreed upon period.

4.14.1.2. The ATMS shall provide operational data to calculate performance measures for both system utilization (including such items as number of events managed, amount of public access, and amount of staff access) and system performance (including such items as server up time, field device up time, communication reliability, and field device command responsiveness).

OpenTMS meets this requirement. OpenTMS stores all data in a database. OpenTMS is bundled with a license for Jasper Reports Server Professional. Jasper Reports is a leading enterprise reporting system. It is fully integrated with OpenTMS so that users can create new reports, run existing reports, or view past reports

from within the OpenTMS GUI. In addition, the Jasper server can also be accessed from outside OpenTMS if so configured. Numerous pre-defined reports are included with the installation of Jasper. A few reports are described below.

Incident Type Report – This report provides information on incidents by type over a selected time. Sample sections on the report are shown below.

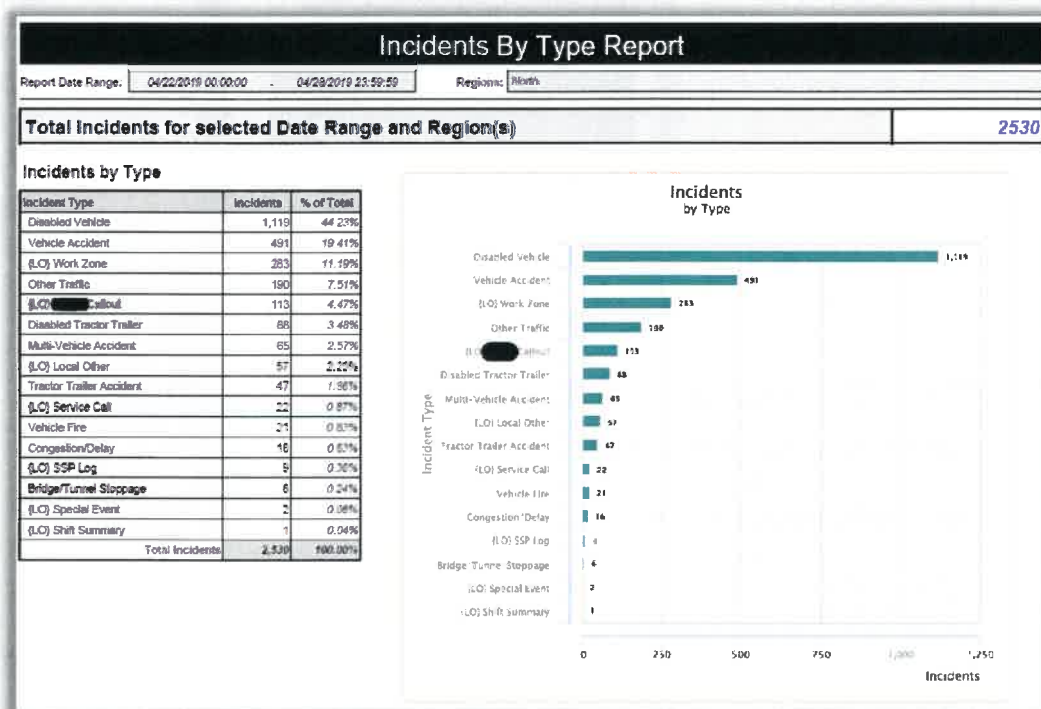


Figure 180 – Incident Type Report

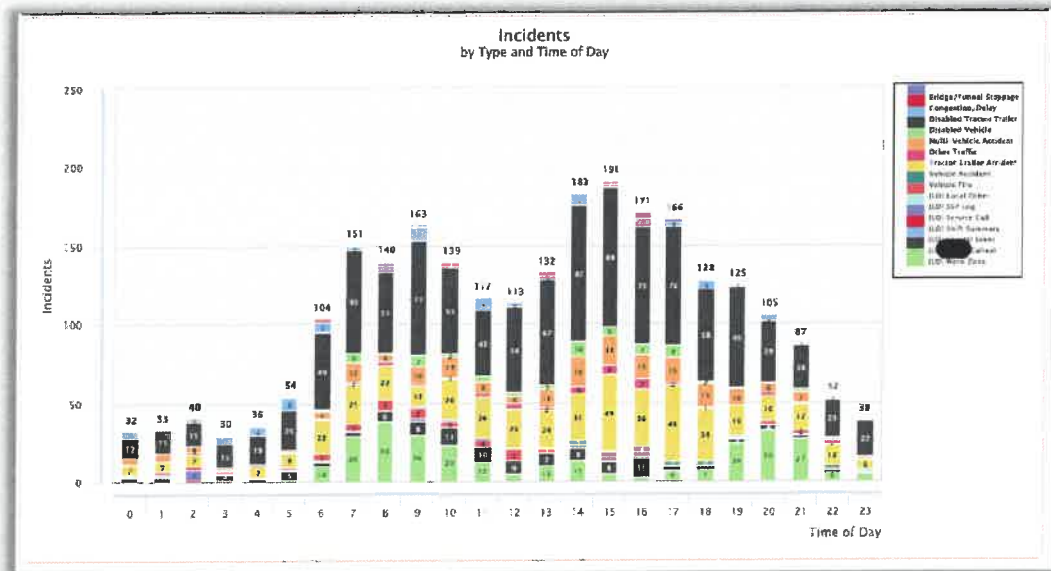


Figure 181 – Incidents by Type and Time of Day

Incident Location Report – This report provides incident breakdown by roadway type, roadway name and region. Sample section of the report is shown below.

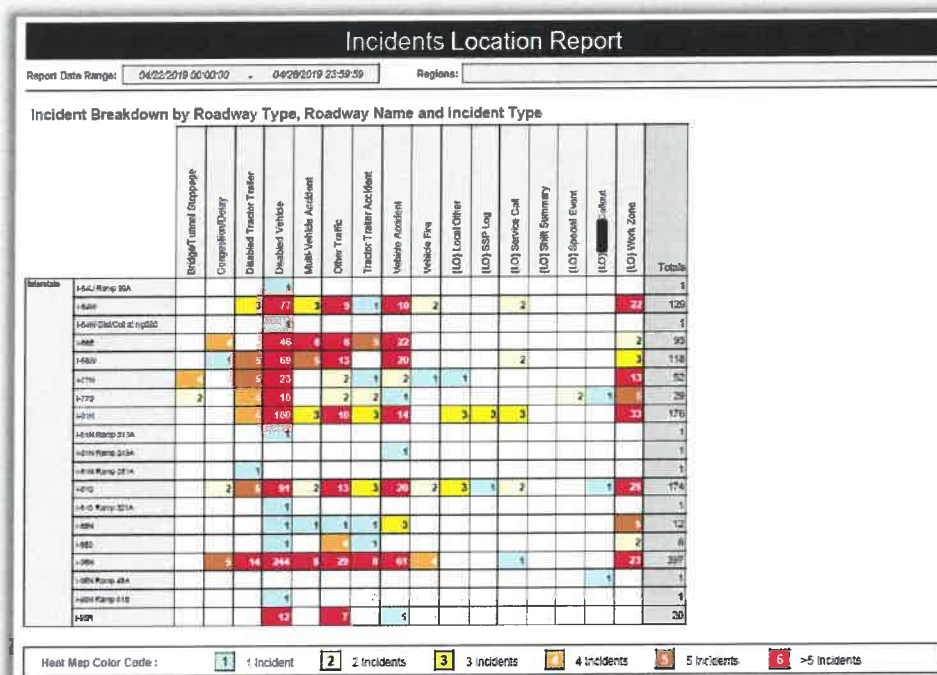


Figure 182 – Incident Location Report

Field Device Report - The Field Device report provides device counts, communication state information, and uptime. Sample section of the report is shown below.

Field Device Report

Report Date Range: 04/22/2019 00:00:00 - 04/28/2019 23:59:59

Groups: /

Signs (VMS/DMS) Device Polling Details

Device Name	Successful Polls	% of Total Polls	Failed Polls	% of Total Polls	Suspect Polls	% of Total Polls	Total Polls
NRO-BOS-I66-E-00046-CFR-5996	673	100.00%		0.00%		0.00%	673
NRO-BOS-I66-F-00667-AD-VA7-E-53117	1,963	87.23%	50	2.48%	6	0.30%	2,019
NRO-BOS-I66-F-00667-AD-VA7-W-53211	1,992	88.81%	19	0.94%	5	0.25%	2,016
NRO-BOS-I66-F-00667-CF-VA7-E-5432	672	100.00%		0.00%		0.00%	672
NRO-BOS-I66-FE-00667-CF-VA7-E-51117	562	88.23%	73	10.88%	6	0.90%	641
NRO-BOS-I66-FE-00667-CF-VA7-W-51210	362	58.25%	278	41.46%	2	0.30%	642
NRO-BOS-I66-FE-00667-S-AD-VA267-E-5338	672	100.00%		0.00%		0.00%	672
NRO-BOS-I66-E-00638-AD-5314	672	100.00%		0.00%		0.00%	672

Figure 183 – Field Device Report

Planned Events Report – This report provides information on planned event by event type. Sample section of the report is shown below.

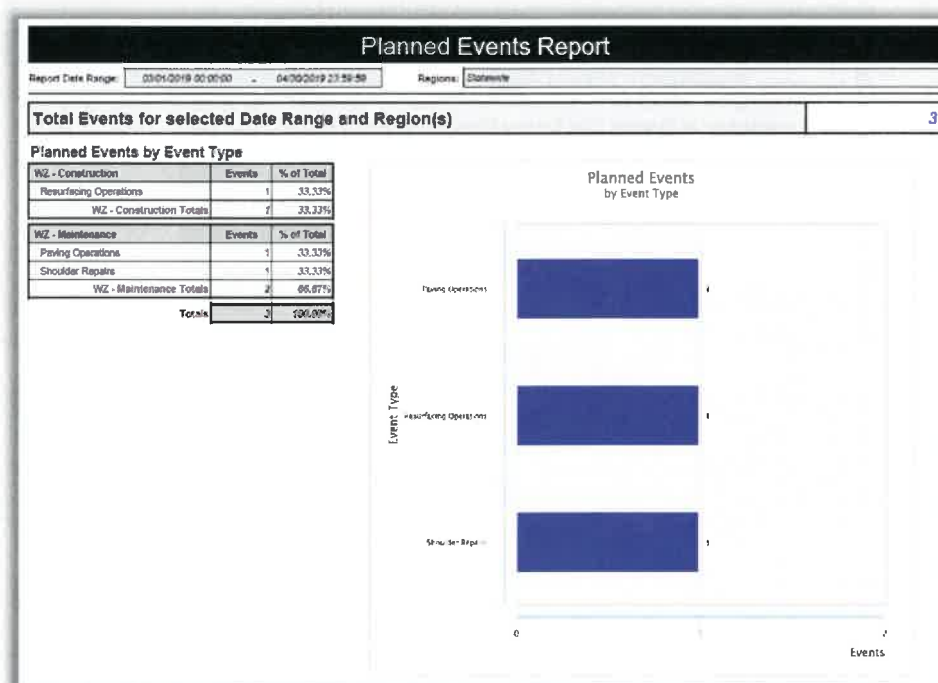


Figure 184 – Planned Events Report

4.14.1.3. The ATMS shall have the ability to import data from third party providers.

OpenTMS meets this requirement. The ATMS is designed to be flexible enough to support any third-party integration. The integration will be based on available interfaces using an Interface Control Document (ICD). Additional providers can be integrated into OpenTMS as operations evolve.

4.14.1.4. The ATMS shall have the ability to display and use real-time third-party data similar to data collected from field devices.

OpenTMS meets this requirement. The ATMS is designed to support real time operations, independent of the source of the data. This will appear transparent to the end users, whether data is being consumed by public feeds, or collected from field devices.

4.14.1.5. The ATMS data archive shall have an analytics package.

OpenTMS meets this requirement. Q-Free will deploy Tableau, <https://www.tableau.com/>, as the analytics package. Tableau is one of the fastest evolving data visualization tools. It is very fast to deploy, easy to learn and very intuitive to use. Team Q-Free will deploy and train the WVDOT on using this analytics package. Q-Free will provide two Creator and three Explorer subscriptions. Explorers will be able to interact with visualizations. Creator will administer the analytics package.

Leveraging Tableau will allow the DOT to generate powerful tools to assist in planning and response to further enhance and optimize operations by using real-time and historical data collected by OpenTMS.

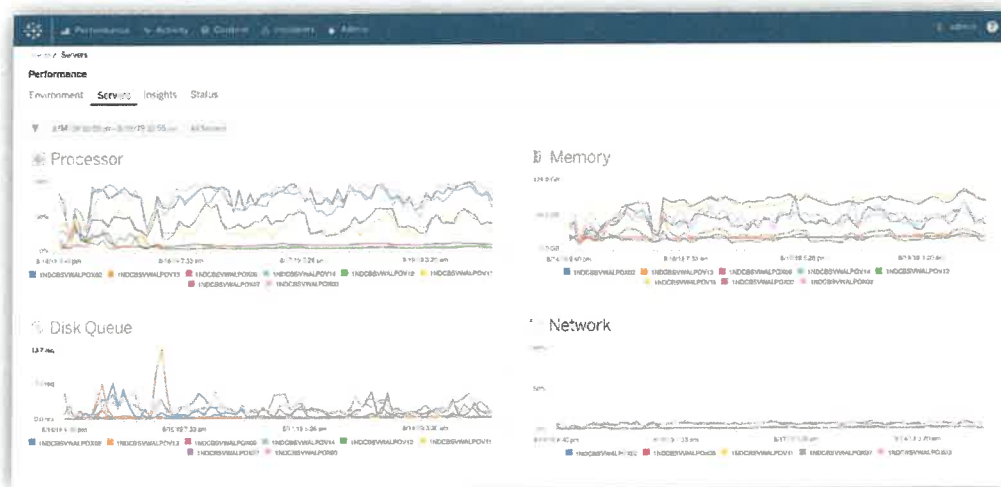


Figure 185 – Example Tableau Dashboard

4.14.1.6. The Analytic Package shall enable users to access and view the archived data.

OpenTMS meets this requirement. The Analytics Package can be configured to connect to any database.

4.14.1.7. The Analytics Package shall enable users to request and view data analyses and specify a time-slice over an operator defined time period.

OpenTMS meets this requirement. The Analytics package will allow users to visualize data

4.14.1.8. Data analytics shall include functionality to compute and display 24 hours traffic volumes.

OpenTMS meets the requirement. All of the data will be accessible through the Analytics Package.

4.14.1.9. The ATMS shall enable portions of data to be excluded from public access.

OpenTMS meets this requirement. A public data feed option can be available. Team Q-Free will work with the WVDOH on what fields need to be restricted from third party data recipients identified as public.

4.14.1.10. The ATMS shall enable manual loading of collected data through an operator entry mechanism.

OpenTMS meets this requirement. Some data like events can be entered after the fact via the event data entry form. For field device data, the on-site SE can develop scripts to enter data as needed.

4.14.2. Data Collection and Archiving – Desirables

4.14.2.1. The historical data in the archive should include traffic volume data, whether from sensors or third-party data sources.

OpenTMS meets this requirement. Historical traffic volume data is made available by viewing the speed graphs for each traffic sensor over a specified period. Historical traffic volume data will also be available for consumption by third parties as part of our data sharing component.

4.14.2.2. Traffic volume data should be stored by individual lane.

OpenTMS meets this requirement. Traffic data such as volume is available on the sensor lanes tab. This data is used in the calculation of speed alerts and incident detection where configured. This data is also made available as part of the data sharing component for consumption by third party entities.

4.14.2.3. The historical data in the archive should include traffic occupancy data.

OpenTMS meets this requirement. Historical traffic occupancy data is made available by viewing the speed graphs for each traffic sensor over a specified period. Historical traffic occupancy data will also be available for consumption by third parties as part of our data sharing component.

4.14.2.4. Traffic occupancy data should be stored by individual lane.

OpenTMS meets this requirement. Traffic data including occupancy is available on the sensor lanes tab. This data is used in the calculation of speed alerts and incident detection where configured. This data is also made available as part of the data sharing component for consumption by third party entities.

4.14.2.5. The historical data in the archive should include traffic speed data

OpenTMS meets this requirement. Historical traffic speed data is made available by viewing the speed graphs for each traffic sensor over a specified period. Historical traffic speed data will also be available for consumption by third parties as part of our data sharing component.

4.14.2.6. Traffic speed data should be stored by individual lane.

OpenTMS meets this requirement. Traffic data including speed is available on the sensor lanes tab. This data is used in the calculation of speed alerts and incident detection where configured. This data is also made available as part of the data sharing component for consumption by third party entities.

4.14.2.7. The historical data in the archive should include traffic travel time data.

OpenTMS meets this requirement. Historical travel time data is kept for alerting and reporting purposes. Travel Time alerts are generated from a combination of historical and real time data. This data can be used to generate historical patterns for predictive analytics.

4.14.2.8. The historical data in the archive should include traffic data that is collected and made available by any roadway within the TMC partner jurisdictions.

OpenTMS meets this requirement. By virtue of collecting data on a sensor by sensor basis, reports can be generated by filtering out sensors by roadway, or any other filter desired.

4.14.2.9. The historical data in the archive should include location and status of portable ITS devices for times when the devices are providing data to or being controlled by the ATMS.

OpenTMS meets this requirement. The Field Device report summaries device status by type and will be updated to include location information for portable devices.

4.14.2.10. Archive ATMS data should be available to partner agencies for download from an on-line access location.

The Analytics Package supports download of data used for the visualization. Jasper Reports provides the ability to create an ad-hoc report and download the data. Jasper Reports can also be accessed from outside OpenTMS if so configured. The WVDOH can provide access to these tools as needed.

4.14.2.11. The ATMS should calculate and store travel times based on available speed data.

OpenTMS meets this requirement. The ATMS calculates and stores travel times based on several data sources: INRIX, detectors, tag reader and Traffax blue tooth readers. The ATMS travel time solution has a travel time engine that pulls data from multiple sources and makes the data available to the OpenTMS Travel Time module for posting travel times on DMS based on data a source priority.

4.14.2.12. The ATMS should calculate and store Travel Time Index, based on available speed data and free flow data. WVDOH has a 5-year data retention requirement.

OpenTMS meets this requirement. The Travel Time module will calculate and store the Travel Time index based on available data gathered from the Travel Time Engine.

4.14.2.13. The ATMS should have a parameter for each third-party provider that can be set to use or not use the third-party data as if it was collected from field detectors.

OpenTMS meets this requirement. The travel time engine provides the ability to prioritize source data. For example, the Travel Time Engine could be configured to use data gathered from INRIX, and then use traffic sensors as a backup.

4.14.2.14. *Data analytics should include functionality to compute and display Travel Time Reliability information.*

The Analytics Package will be available to access and visualize travel time data.

4.14.2.15. *Travel Time Reliability displays should include reliability by different vehicle classifications, as they are reported to the ATMS.*

The Analytics Package will be available to access and visualize travel time data. Association with vehicle classifications is not available in our latest release.

4.14.2.16. *Data analytics should be automated to the extent possible to support established performance measure reporting needs of the TMC and/or partner agencies. (Note: This should include incident and clearance times, lanes closed, all applicable incident date, monthly and yearly reports)*

OpenTMS meets this requirement. As part of the analytics and reporting functions, users will be able to generate custom reports to handle high value performance items. OpenTMS comes prepackaged with several incident reports, such as Incident Duration and Incident Location. These reports can also be scheduled to run automatically. Q-Free can work with the DOH to define additional reports not already established. Below are report snippets that show how the data can be leveraged with Analytics.

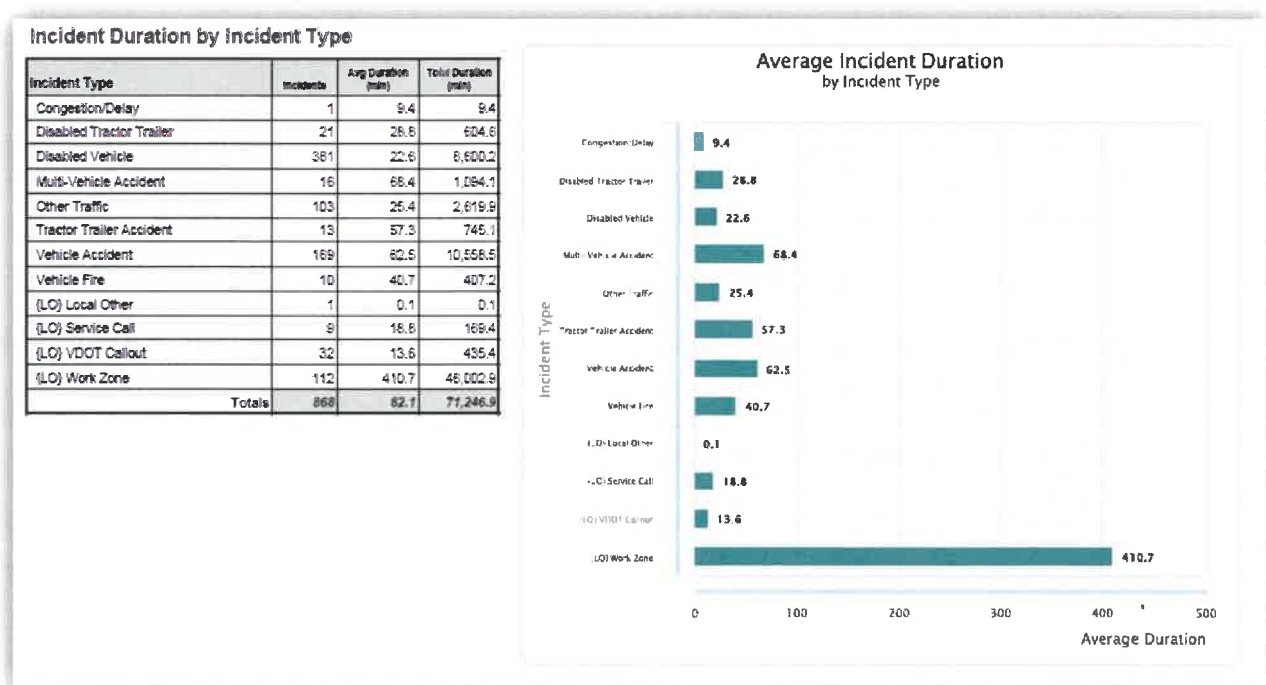


Figure 186 – Sample Incident Duration Report

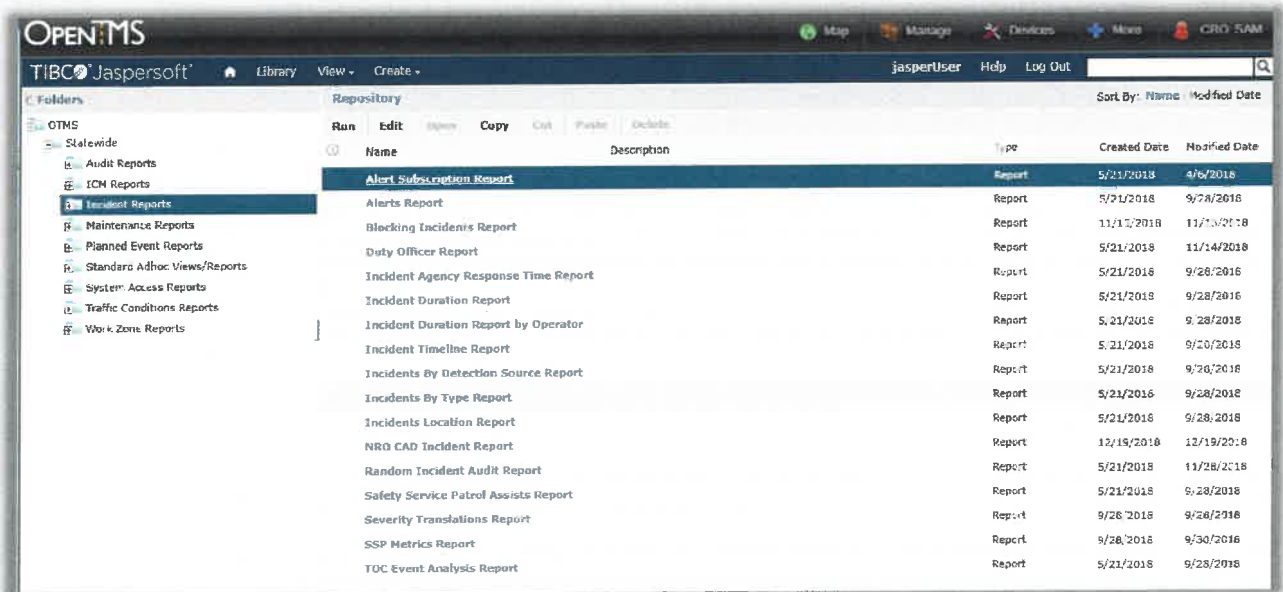
Incident Duration Counts by Year

Year	< 15 Mins	15 - 30 Mins	30 - 45 Mins	45 - 60 Mins	60 - 75 Mins	75 - 90 Mins	90 - 105 Mins	105 - 120 Mins	2 - 3 Hrs	3 - 4 Hrs	4 Hrs +	Totals
2019	5,332	2,110	1,368	1,130	800	520	308	198	314	167	1,317	13,584
Totals	5,332	2,110	1,368	1,130	800	520	308	198	314	167	1,317	13,584

Figure 187 – Sample Incident Duration Count Report

4.14.2.17. The ATMS should include multiple data reporting formats/templates.

OpenTMS is bundled with a license for Jasper Reports Server Professional. Jasper Reports is a leading enterprise reporting system. It is fully integrated with OpenTMS so that users can create new reports, run existing reports, or view past reports from within the OpenTMS GUI. Reports are available to export using standard formats, including excel and csv. The Reporting module comes bundled with a large set of reporting templates available for use.



Repository	Name	Type	Created Date	Modified Date
Alert Subscription Report	Alert Subscription Report	Report	5/21/2018	4/6/2018
Alerts Report	Alerts Report	Report	5/21/2018	9/28/2018
Blocking Incidents Report	Blocking Incidents Report	Report	11/12/2018	11/14/2018
Duty Officer Report	Duty Officer Report	Report	5/21/2018	11/14/2018
Incident Agency Response Time Report	Incident Agency Response Time Report	Report	5/21/2018	9/28/2018
Incident Duration Report	Incident Duration Report	Report	5/21/2018	9/28/2018
Incident Duration Report by Operator	Incident Duration Report by Operator	Report	5/21/2018	9/28/2018
Incident Timeline Report	Incident Timeline Report	Report	5/21/2018	9/28/2018
Incidents By Detection Source Report	Incidents By Detection Source Report	Report	5/21/2018	9/28/2018
Incidents By Type Report	Incidents By Type Report	Report	5/21/2018	9/28/2018
Incidents Location Report	Incidents Location Report	Report	5/21/2018	9/28/2018
NRG CAD Incident Report	NRG CAD Incident Report	Report	12/18/2018	12/19/2018
Random Incident Audit Report	Random Incident Audit Report	Report	5/21/2018	11/28/2018
Safety Service Patrol Assists Report	Safety Service Patrol Assists Report	Report	5/21/2018	9/28/2018
Severity Translations Report	Severity Translations Report	Report	9/28/2018	9/28/2018
SSP Metrics Report	SSP Metrics Report	Report	9/28/2018	9/30/2018
TOC Event Analysis Report	TOC Event Analysis Report	Report	5/21/2018	9/28/2018

Figure 188 – Bundled Jasper Reports

4.14.2.18. The ATMS should accept data for long term storage on a continuous basis without operation action.

OpenTMS stores all data in a database. Q-Free will archive from production at regular intervals. This process will be done in the background without operator action. The archived data will be retained for at least a period of 5 years as requested by the WVDOH.

4.14.2.19. The ATMS should make archived data available in an online database for a user definable period.

The archival database will be accessible through Jasper Reports Server or the Analytics Package.

4.14.2.20. Data analytics should include functionality to compute and display mobile source emissions information if data is collected and provided to the ATMS.

All data integrated will be saved to the database and can be access through Jasper Reports Server or the Analytics Package. Mobile source emissions information is not available in the current release.

4.14.3. Notifications & Alarms

4.14.3.1. Mandatory Requirements

4.14.3.1.1. The ATMS shall have and notification built into the system.

OpenTMS meets this requirement. The ATMS contains a built-in notification system that alerts users to urgent and ongoing events concerning devices, services, and requests. Notifications are organized into urgent notifications and new notifications. *Urgent Notifications* indicate that events should be confirmed or acknowledged and will appear in the lower right-hand corner of the screen. *New Notifications* simply let the user know about action results or events. These notifications are generated by the client (rather than the service itself) and they will only appear to the user rather than everyone.

The Notification Tray provide a current list of recent notifications. This quick view is located in the lower right corner of the OpenTMS window.

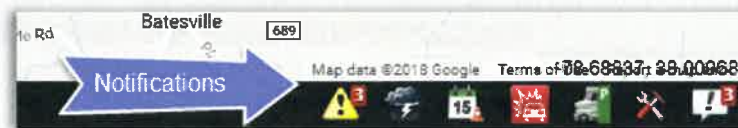


Figure 189 – Notification Tray

Clicking on a notification tray opens the notification tray. In the figure below, the user clicked on the Incidents tray. This will filter out all non-incident notifications from the master tray. Other device trays are available for selection.



Figure 190 – Incident Notification Tray

Immediate feedback, such as the success of a user posting a message is displayed in the lower right corner.



Figure 191 – Sign Post Success Notification

In addition to the toolbar, the user can access notifications through the Notifications module as shown below.

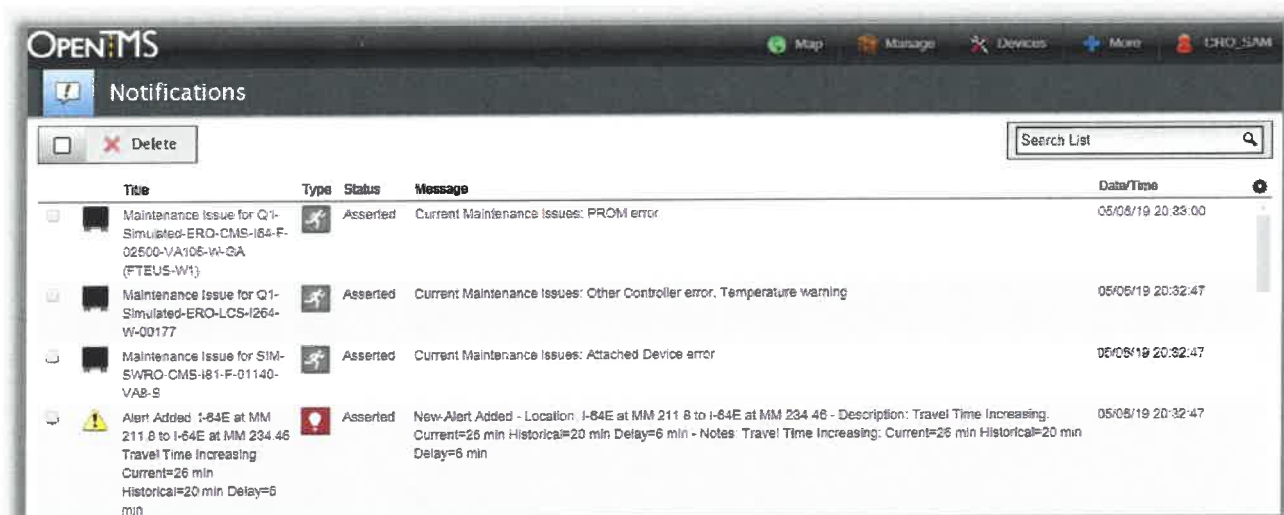


Figure 192 – Notifications List View

4.14.3.1.2. The ATMS shall provide a single integrated interface, available from any TMC workstation, that allows operators to set threshold conditions for various devices or other user definable conditions such that when threshold conditions are met or exceeded, alarms will be generated notifying the operator of the presence of such condition. At a minimum, data elements available for alarm

generation will include traffic measurements, detected incidents, weather measurements, and device status.

OpenTMS meets this requirement. Thresholds for alarms can be set from OpenTMS which is a web browser-based application accessible from any TMC workstation. All incoming alerts notifying the user of a potential incident come in through the Alerts module. In the figure below, we have a travel time threshold crossing and a CAD alert.

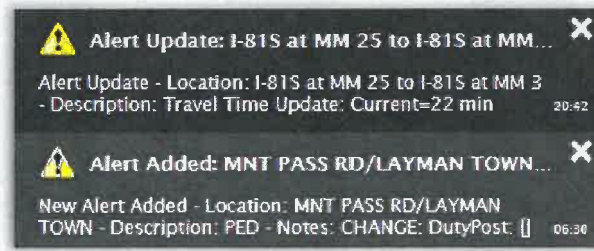


Figure 193 – Stacked Notification View

Thresholds can be set for detector traffic measurements, detected incidents, weather measurements and device status. Thresholds are set in the Admin Portal. Thresholds can be set for devices for a set number of retries before putting a device in communications failure. In the figure below the administrator enters weather threshold settings and enables.

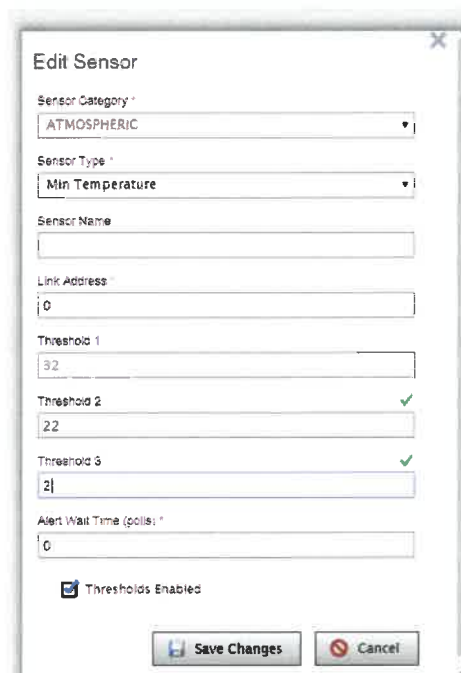


Figure 194 – Weather Station Sensor Edit View

4.14.3.1.3. The ATMS shall provide the mechanism for users to select filters for alerts and notifications.

OpenTMS meets this requirement. By default, alerts and notifications are filtered to a user's access level, but additional filters will be made available to users to minimize interruptions while performing critical operations.

4.14.3.1.4. The alert and notification filters shall be based on type of filter, device, type of device, time of day, and jurisdiction.

OpenTMS meets this requirement. OpenTMS will provide the user the ability to set their user preferences to filter alerts and notifications. The filters will include type of device and jurisdiction.

4.14.3.1.5. Users shall be able to set alert and notification filters based on geographic area as an option.

OpenTMS meets this requirement. OpenTMS will provide the user the ability to set their user preferences to filter alerts and notifications by geographic area.

4.14.3.1.6. The ATMS shall allow authorized users to set alert and notification thresholds by time of day.

OpenTMS meets this requirement. OpenTMS will provide the user the ability to set their user preferences to filter alerts and notifications by time of day.

4.14.3.1.7. The system shall be able to generate alerts and notification based on traffic conditions (traffic speeds, volume levels, congestion levels) and event triggers (incidents, construction and maintenance activities, special event activities, etc.)

OpenTMS meets this requirement. OpenTMS supports speed thresholds for detectors. Traffic data is used to generate alerts based on a configurable speed threshold that compares real-time to historical data to determine when to automatically trigger an alert. Historical data is calculated over the previous 60 days in 5-minute increments by day of the week. The threshold settings are configurable in the Admin Portal.

- Scheduled events such as special event activities or construction generate an activation alert and can be set to require user confirmation to activate or not;
- Maintenance activities such as pixel errors create notifications; and
- Alerts are generated from multiple detection sources (RWIS, Detectors, Travel Time, CAD). Notification are generated when an alert is created or updated.

4.14.3.1.8. The ATMS shall be able to send out internal notifications regarding an event to up to 100 recipients. Notification to include select information captured in the event log. Notifications shall be completed within 5 minutes of initiation of procedure (process only, not inclusive of conveyance method and receiver's email system delays).

OpenTMS meets this requirement. Our Incident Response Notification supports notifications to partners. The rules-based DSS automatically generates an incident response based on the incident/event attributes. The DSS is triggered when specific fields in the incident/event that would trigger business rules are modified such as severity or lanes closed. At this point OpenTMS invokes the DSS to create an updated response plan. The incident response recommends email notifications. The response notifications tab is shown below. Messages sent are logged on the left and the recommended email is shown on the right. The user can modify the email to add 100 recipients or remove recipients. Notifications are sent within 5 minutes.

Figure 195 – Incident Response Notification View

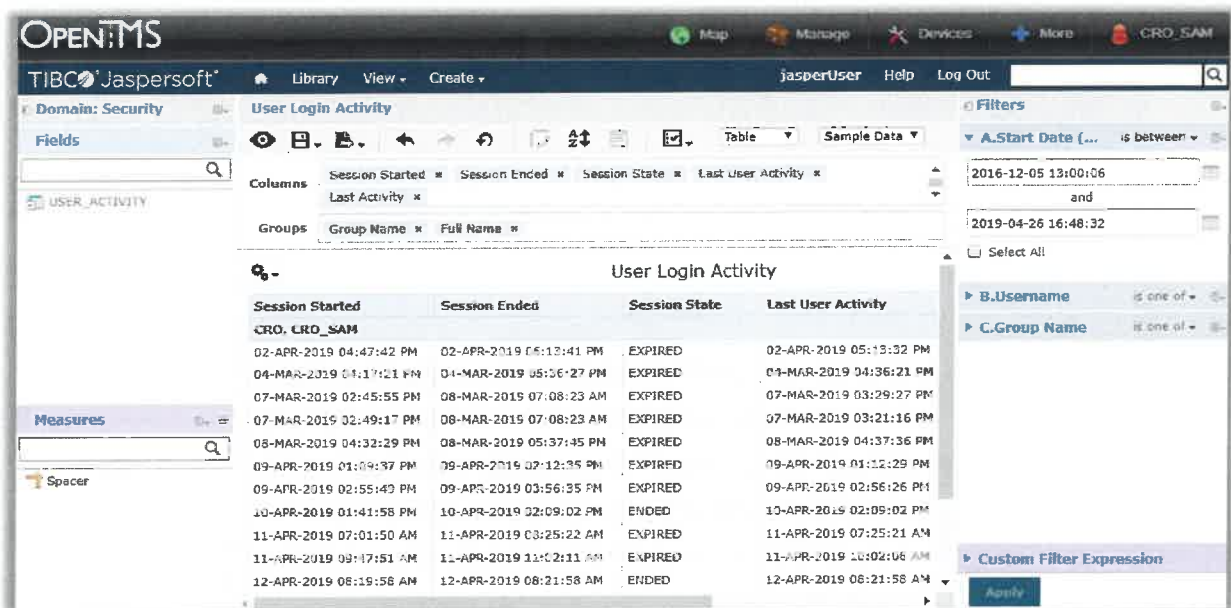
4.15 Log Reports System Reports (CRFP Section 4.15)

4.15. Log Reports System Reports

4.15.1. Mandatory Requirements

4.15.1.1.1. The ATMS shall be capable of generating reports from ATMS generated data.

OpenTMS meets this requirement. OpenTMS is bundled with a license for Jasper Reports Server Professional. Jasper Reports is a leading enterprise reporting system. It is fully integrated with OpenTMS so that users can create new reports, run existing reports, or view past reports from within the OpenTMS GUI. In addition, the Jasper server can also be accessed from outside OpenTMS if so configured. This approach allows access to reports by users without OpenTMS credentials, regularly scheduled automatic execution and delivery of standard reports and other enterprise reporting features.



The screenshot displays the Jasper Reports Server Professional interface. The main report area shows a table titled 'User Login Activity' with the following columns: Session Started, Session Ended, Session State, and Last User Activity. The data is filtered for the group 'CRO. CRO_SAM' and shows a list of sessions from April 2, 2019, to April 12, 2019. The sessions are marked as 'EXPIRED' or 'ENDED'. The interface also includes a sidebar with 'Fields' and 'Measures' sections, and a top navigation bar with options like 'Library', 'View', 'Create', and 'Log Out'.

Session Started	Session Ended	Session State	Last User Activity
02-APR-2019 04:47:42 PM	02-APR-2019 05:12:41 PM	EXPIRED	02-APR-2019 05:13:32 PM
04-MAR-2019 04:17:21 PM	04-MAR-2019 05:06:27 PM	EXPIRED	04-MAR-2019 04:36:21 PM
07-MAR-2019 02:45:55 PM	08-MAR-2019 07:08:23 AM	EXPIRED	07-MAR-2019 03:29:27 PM
07-MAR-2019 02:49:17 PM	08-MAR-2019 07:08:23 AM	EXPIRED	07-MAR-2019 03:21:16 PM
08-MAR-2019 04:32:29 PM	08-MAR-2019 05:37:45 PM	EXPIRED	08-MAR-2019 04:37:36 PM
09-APR-2019 01:09:37 PM	09-APR-2019 02:12:35 PM	EXPIRED	09-APR-2019 01:12:29 PM
09-APR-2019 02:55:49 PM	09-APR-2019 03:56:35 PM	EXPIRED	09-APR-2019 02:56:26 PM
10-APR-2019 01:41:58 PM	10-APR-2019 02:09:02 PM	ENDED	10-APR-2019 02:09:02 PM
11-APR-2019 07:01:50 AM	11-APR-2019 03:25:22 AM	EXPIRED	11-APR-2019 07:25:21 AM
11-APR-2019 09:17:51 AM	11-APR-2019 11:02:11 AM	EXPIRED	11-APR-2019 10:02:06 AM
12-APR-2019 08:19:58 AM	12-APR-2019 08:21:58 AM	ENDED	12-APR-2019 08:21:58 AM

Figure 196 – Jasper Reports Server Professional

The reporting interface includes a simple graphic interface for building ad-hoc reports. Jasper Reports enables users to set up simple tables and charts by dragging and dropping pre-defined fields. Reports created in the ad-hoc viewer can be saved and reused as needed. Once a report has run it can be exported in a variety of formats including PDF, Excel, and Word formats. OpenTMS has a large library of predefined reports that can be edited to suit WVDOH's needs. Q-Free will work with the WVDOH on tweaking any reports to meet your needs.

4.15.1.1.2. *Pre-selected, pre-formatted, reports shall be included in the system, e.g. daily/weekly/monthly/annual reports reporting devices in operation, work orders/trouble tickets tracking, incidents, events, etc. These shall be provided in list and graphical formats.*

OpenTMS meets this requirement. OpenTMS has a large library of predefined reports that can be edited to suit WVDOH's needs. Q-Free will work with the WVDOH on tweaking any reports to meet your needs and creating new ones to meet the needs of any new requirements that will be implemented. Reports can use tables or graphical elements. In the Incidents by Type Report shown below data is presented in a list and graphically.

The osTicket integration being proposed will provide access to work order/trouble ticket reports.

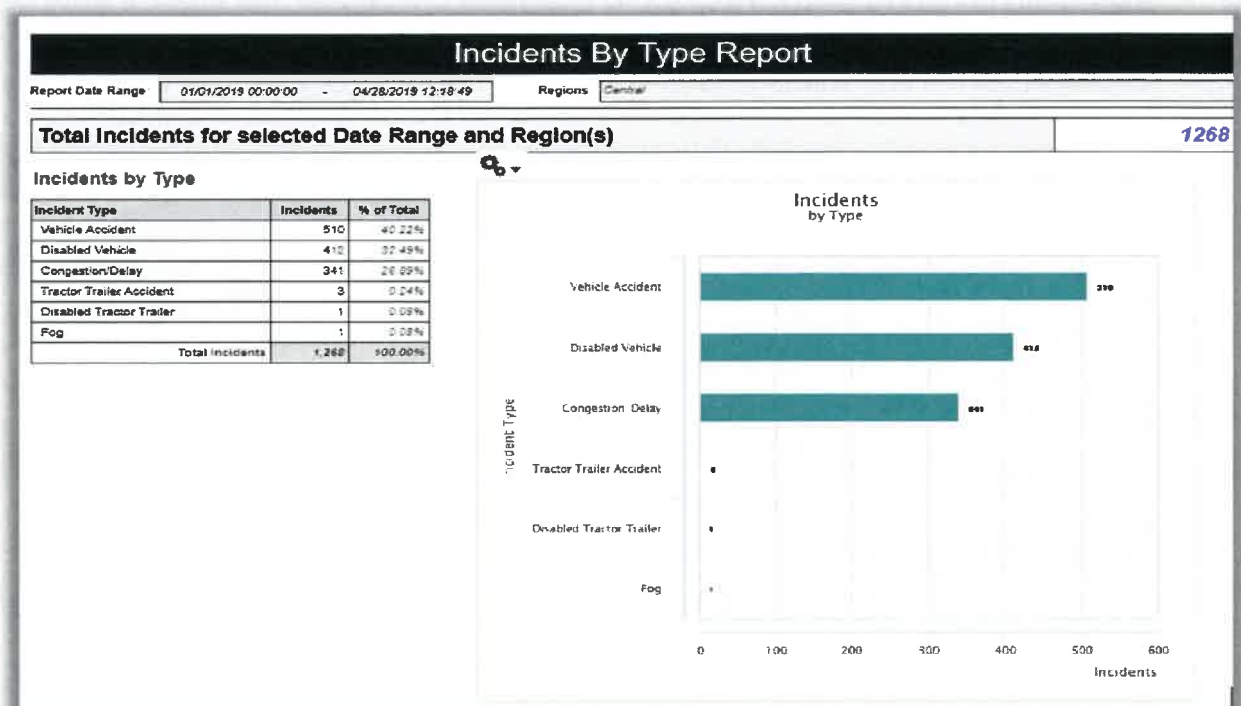


Figure 197 – Incidents by Type Report

4.15.1.1.3. *Users shall be able to generate ad hoc reports, specified by the user, viewable using off the shelf software.*

OpenTMS meets this requirement. The reporting interface includes a graphic interface for building ad-hoc reports. Jasper Reports enables users to set up simple tables and charts by dragging and dropping pre-defined fields.

4.15.1.1.4. *Users shall be able to save the ad hoc report to become a permanent report.*

OpenTMS meets this requirement. Users can save ad-hoc reports as shown below. Save as an 'ad-hoc view and create report' allows the user can go back and edit the view as requirements change as opposed to a report which is a permanent report that can be run as needed. In this option you get both.

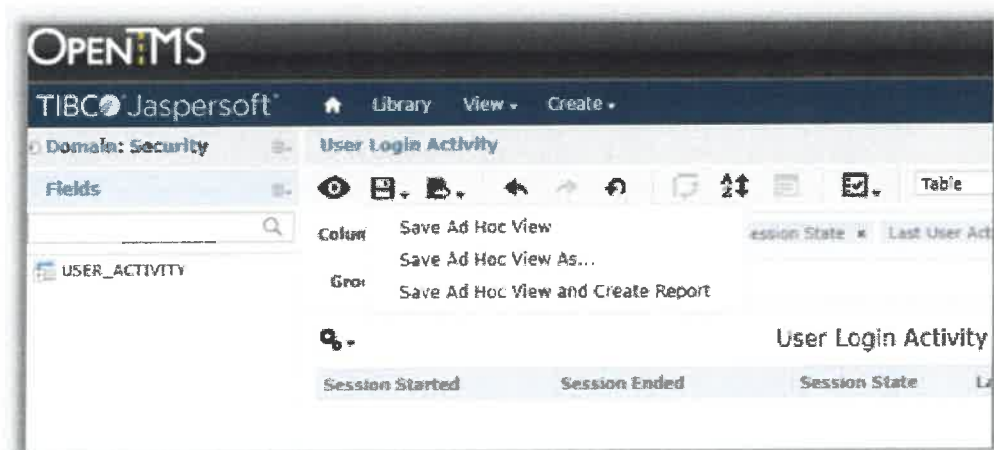


Figure 198 – Jasper Reports Ad-Hoc Report View

4.15.1.1.5. *The ATMS shall be capable of automatically generating reports via time of day scheduling.*

OpenTMS meets this requirement. Jasper Reports provides the ability for a user to schedule a report at specific time of day to execute one time or recurring and email the report or save to a pre-determined location.

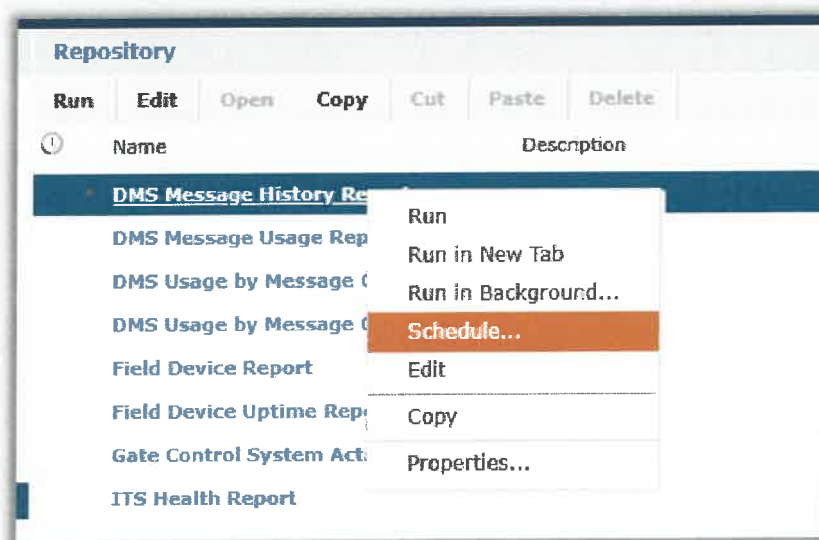


Figure 199 – Scheduling a Jasper Report

4.15.1.1.6. *The ATMS shall be able to export reports or data base information with comma, space and/or tab between fields to allow import into other programs such as Excel.*

OpenTMS meets this requirement. Once a report has run it can be exported in a variety of formats including PDF, Excel, and Word formats as shown below.

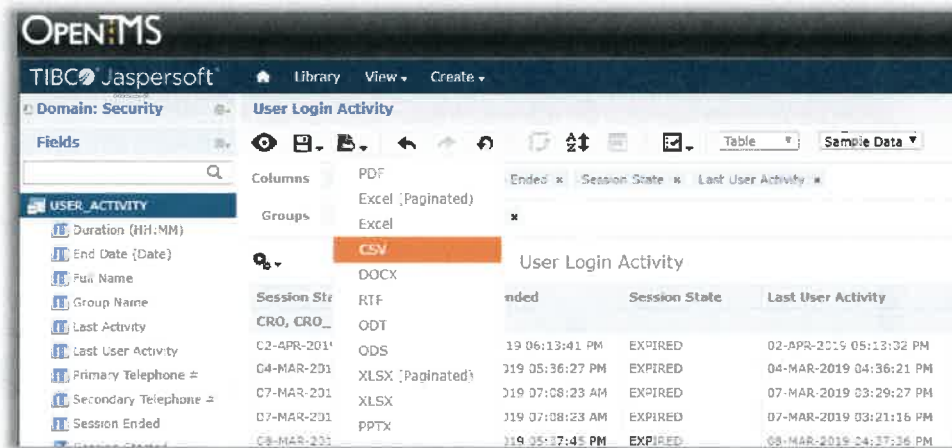


Figure 200 – Report Exporting Formats

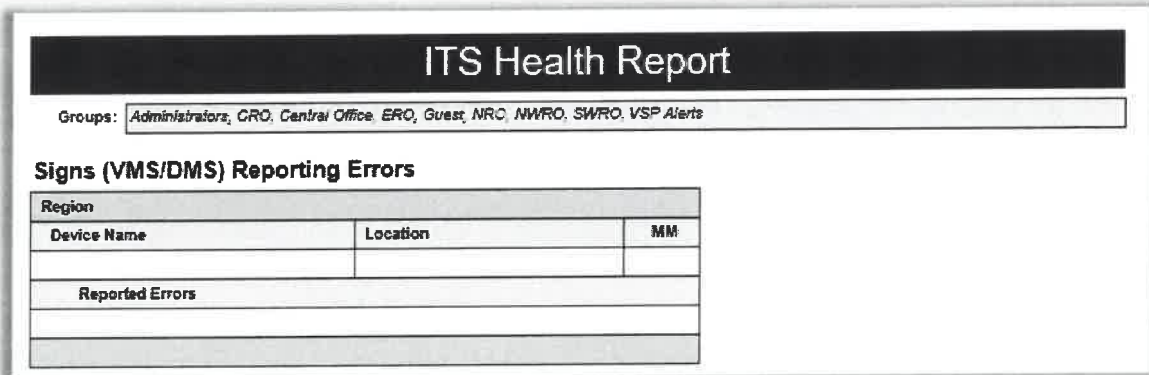
4.15.1.1.7. *The ATMS shall generate information every 24-hours indicating device/system failures. A maintenance report suitable for staff shall be generated.*

OpenTMS meets this requirement. OpenTMS has a Field Device and Health Report that can be scheduled to run nightly and emailed to the maintenance staff. The Health report identifies the failed devices and those with errors. The Field Device report provides device counts, communication state information. Below is a snippet of the Health Report.

ITS Health Report				
Groups: Administrators, CRO, Central Office, ERO, Guest, NRO, NWRO, SWRO, VSP Alerts				
Signs (VMS/DMS)				
Administrators				
Device Name	Location	MM	Communication State	Last Good Poll
TEST-CHES-MCCAIN	I-64E	290.00	FAILED	4/22/19 6:36 PM
SWRO				
Device Name	Location	MM	Communication State	Last Good Poll
Test Sign 3570721	I-95N	80.00	SUSPECT	4/28/19 11:23 AM

Figure 201 – Sample ITS Health Report

Additional errors, such as pixel or fan for signs, are presented in the format below:



ITS Health Report

Groups:

Signs (VMS/DMS) Reporting Errors

Region	Device Name	Location	MM
Reported Errors			

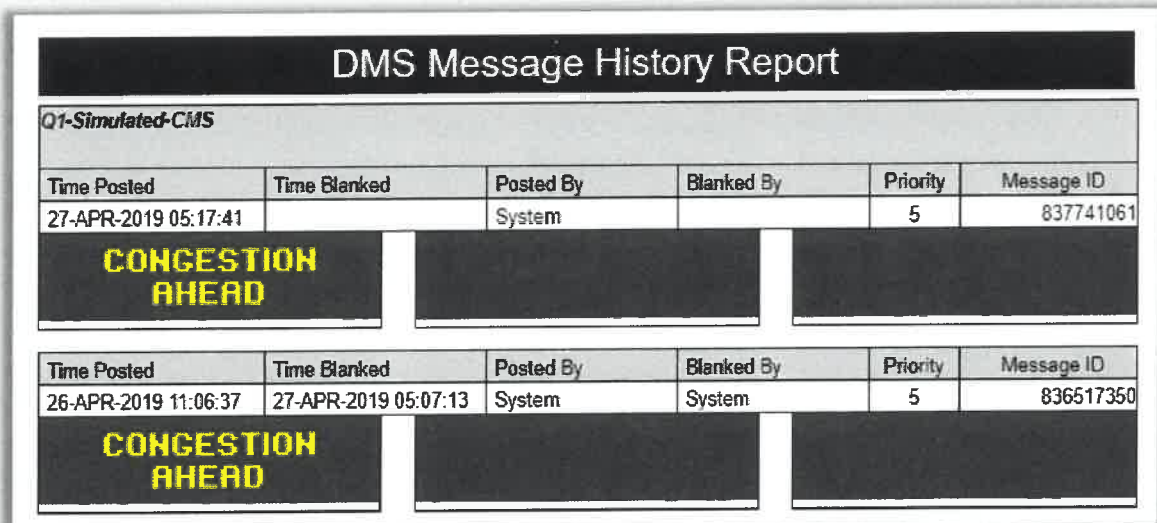
Figure 202 – ITS Health Report Sign Reporting Errors

4.15.1.1.8. *The maintenance report shall indicate type of device, device ID, and jurisdictional responsibility for maintenance.*

OpenTMS meets this requirement. The Field Device and Health Reports are broken down by owning group, device type, device name, and location. Q-Free can work with the WVDOH on customizing this report to meet any additional requirements.

4.15.1.1.9. *The ATMS shall maintain a log of all users' activities relating to field device control, system administration, and user access.*

OpenTMS meets this requirement. User access is logged, and System Access Reports are available to view invalid login attempts and user login activity. Audit reports are available to view changes to user accounts, field devices, sign message library, properties, and groups/roles. For field device control for DMS there is a message activity log and an event log. Below is a snippet from the DMS Message History Report.



DMS Message History Report					
Q1-Simulated-CMS					
Time Posted	Time Blanked	Posted By	Blanked By	Priority	Message ID
27-APR-2019 05:17:41		System		5	837741061
CONGESTION AHEAD					
Time Posted	Time Blanked	Posted By	Blanked By	Priority	Message ID
26-APR-2019 11:06:37	27-APR-2019 05:07:13	System	System	5	836517350
CONGESTION AHEAD					

Figure 203 – Sample DMS Message History Report

Below is a snippet from a DMS event log which provides a log of significant sign events.

Event Time	Event Name	User Name	Event Additional Information
04/28/2019 11:20:45	Test	CRO_SAM	Pixel Test Started Successfully
04/27/2019 05:17:41	Message Displayed	System	Displayed Message: 5 - CONGESTION AHEAD

Figure 204 – Sign Event Log

4.15.1.1.10. The ATMS shall provide event logging such that events can be searched on any unique field or combination of fields.

OpenTMS meets this requirement. Reports can be filtered by any or a combination of the fields. For example, the DMS Message History Report today is filtered by a date range, owning group, and sign. For adhoc report views, the user can drag a field to the filter area to add additional field filters. In the User Telephone List Report below the user can filter by Group Name or Status. If desired, they can drag the Username field to the filter area and further filter by a user or users. Jasper is a very flexible tool.

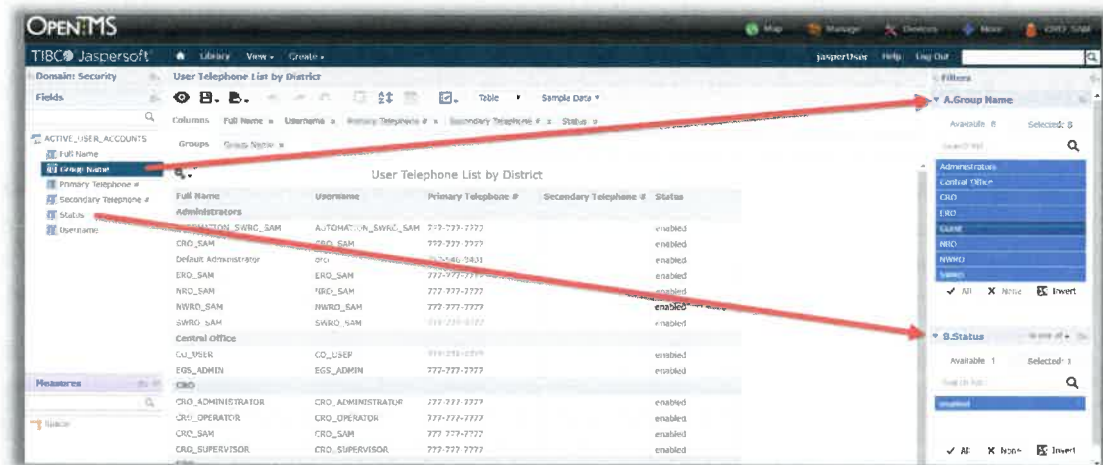


Figure 205 – Report Filter Fields

4.15.1.1.11. The ATMS shall be capable of generating reports of logs covering user-define time periods and including user-selected event types at the direction of the TMC authorized users.

OpenTMS meets this requirement. Reports can be filtered by any or a combination of the fields. Access to the Reports module is controlled by permissions so only authorized users can access. In the DMS Device Event Log adhoc report below, the user can drag the Event Type field to the filters area and then select SIGN_MESSAGE_DISPLAYED to filter the log to display only this event as shown below.

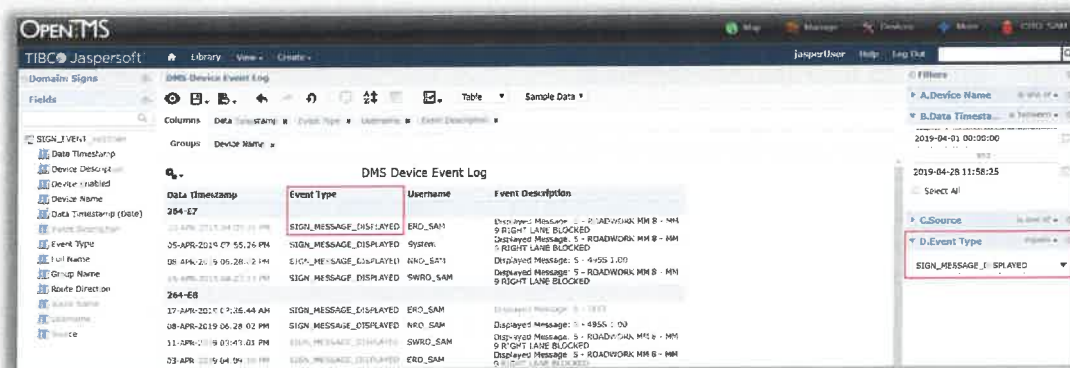


Figure 206 – Filter Reports by Event Type

4.15.2. Log Reports/System Reports – Desirable Requirements

4.15.2.1. *The ATMS data should have a GUI to configure collection and storage of user activity log data and to generate and display activity reports.*

OpenTMS meets this requirement. The system automatically collects and stores user activity log data and access to these tables is available in the Reporting module through a report template.

4.15.2.2. *The ATMS should be able to archive all data from the activity log to the data archive subsystem.*

OpenTMS meets this requirement. OpenTMS stores all data in a database. Q-Free will stand up an archival database and archive from production at regular intervals.

4.15.2.3. *The ATMS should be able to archive log data in the data archiving system at predefined times to generate a continuous archival record.*

OpenTMS meets this requirement. OpenTMS stores all data in a database. Q-Free will stand up an archival database and archive from production at regular intervals in the background.

4.16 Security and Administration (CRFP Section 4.16)

4.16. Security and Administration

4.16.1. Mandatory Requirements

4.16.1.1. The ATMS shall provide security and administration functions.

OpenTMS meets this requirement. OpenTMS has a full featured Administration Portal that enables administrators to manage the system configuration and user profiles. The administration portal front-end is a series of boxes representing each of the modules within OpenTMS as well as system-level and user-level configuration options.



Figure 207 – OpenTMS Administration Portal

4.16.1.2. The ATMS shall provide a log-in, log-out, and exit function.

OpenTMS meets this requirement. OpenTMS uses Keycloak as its authentication provider. The benefits of using an external authentication provider include the ability for single-sign on, meaning multiple applications within the ATMS suite will leverage the same user accounts and security policies, and allowing users to navigate between applications without entering their credentials every time. It also supports standard OAuth protocols, and features a full administration portal to configure user and realm settings.



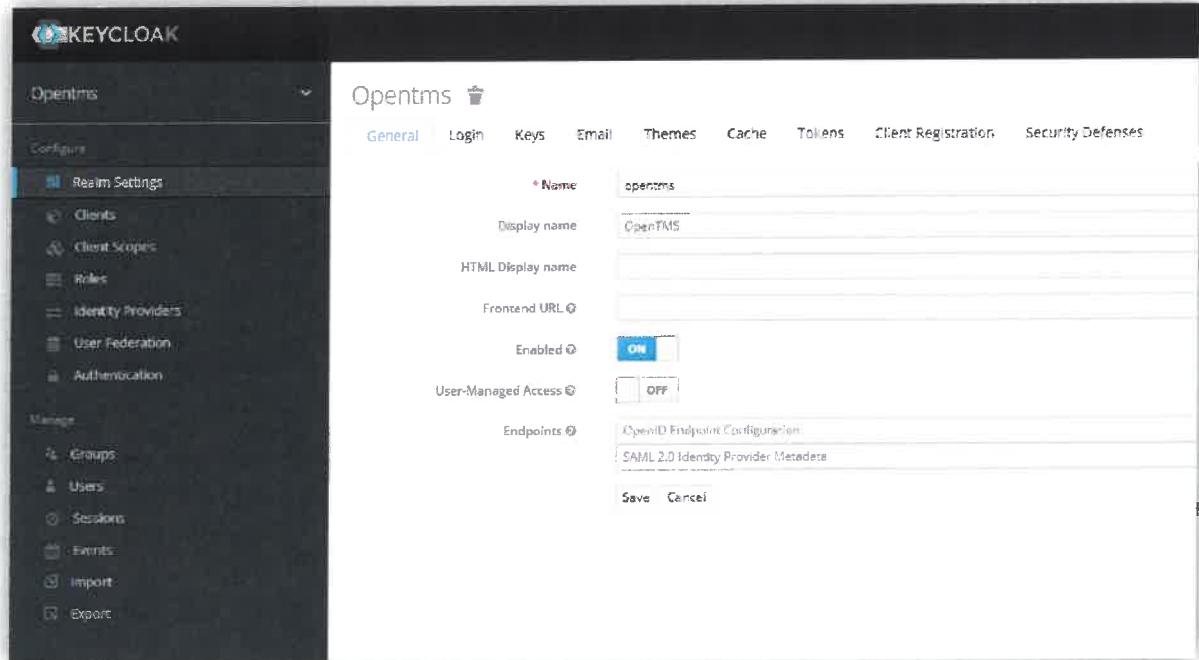


Figure 208 – Keycloak Realm Configuration

User login and logout functions are now handled by Keycloak, and a login screen will be presented to the user when accessing the OpenTMS application. After entering their credentials, the user will be redirected to OpenTMS. A logout function will also be available within OpenTMS on the main menu.

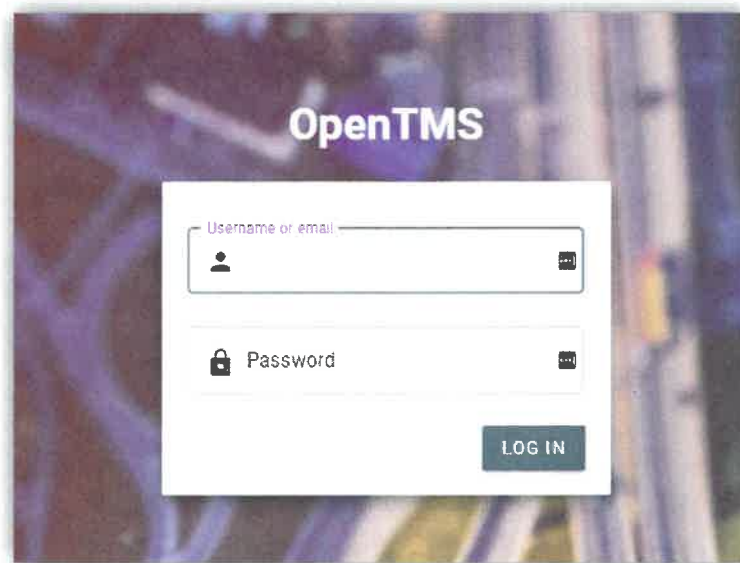


Figure 209 – OpenTMS Login Dialog

4.16.1.3. The ATMS shall provide a security (ID/password or approved equivalent) function.

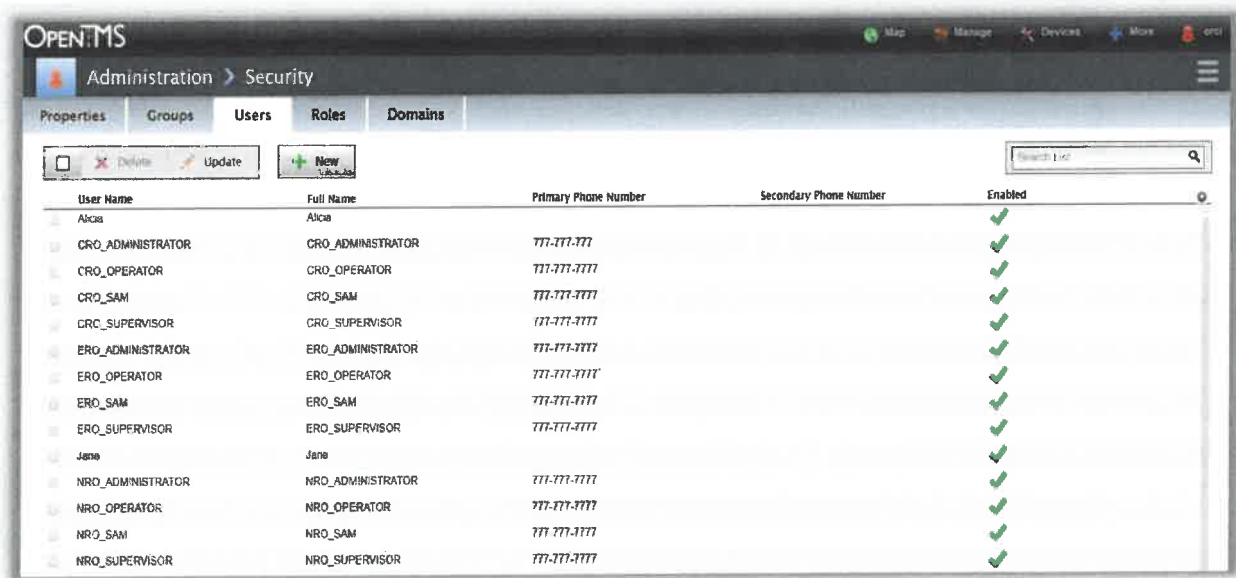
OpenTMS meets this requirement. Users will be required to have an account configured in both Keycloak and OpenTMS. Through the Keycloak administration panel, two types of accounts are available:

- Local user accounts. These local accounts are managed within the ATMS/Keycloak; and
- Active Directory accounts. Keycloak is configured to take the entered username and authenticate against the active directory server. The advantage here is that all the access and password security is controlled by the WVDOH. Single sign on can be implemented so when a user logs into their workstation they are automatically logged into the application.

Users can be disabled locally and in active directory when access to the ATMS is no longer required. The same authentication provider will be used to access the VERO application within OpenTMS.

4.16.1.4. The ATMS shall provide a capability to add or delete users by an administrator.

OpenTMS meets this requirement. The Admin Portal Security module enables administrators to add, edit, or delete users consistent with Keycloak and manage groups, roles, profiles, and privileges. The ATMS comes pre-configured with a series of privileges and basic roles that can be expanded upon to create a wide range of user profiles. The Users Tab as shown below presents a list of registered users.

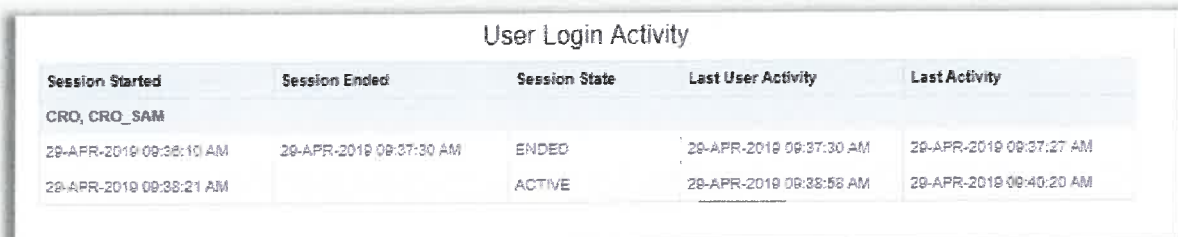


User Name	Full Name	Primary Phone Number	Secondary Phone Number	Enabled
Alice	Alice			✓
CRO_ADMINISTRATOR	CRO_ADMINISTRATOR	777-777-7777		✓
CRO_OPERATOR	CRO_OPERATOR	777-777-7777		✓
CRO_SAM	CRO_SAM	777-777-7777		✓
CRO_SUPERVISOR	CRO_SUPERVISOR	777-777-7777		✓
ERO_ADMINISTRATOR	ERO_ADMINISTRATOR	777-777-7777		✓
ERO_OPERATOR	ERO_OPERATOR	777-777-7777		✓
ERO_SAM	ERO_SAM	777-777-7777		✓
ERO_SUPERVISOR	ERO_SUPERVISOR	777-777-7777		✓
Jane	Jane			✓
NRO_ADMINISTRATOR	NRO_ADMINISTRATOR	777-777-7777		✓
NRO_OPERATOR	NRO_OPERATOR	777-777-7777		✓
NRO_SAM	NRO_SAM	777-777-7777		✓
NRO_SUPERVISOR	NRO_SUPERVISOR	777-777-7777		✓

Figure 210 – OpenTMS User List View

4.16.1.5. *The ATMS shall maintain log and be able to generate reports of administrative actions and all log-in/log-out activity.*

OpenTMS meets this requirement. User access is logged, and System Access Reports are available to view invalid login attempts and user login activity. Below is an example of the User Login Activity Report.



Session Started	Session Ended	Session State	Last User Activity	Last Activity
CRO, CRO_SAM				
28-APR-2019 09:38:10 AM	28-APR-2019 09:37:30 AM	ENDED	28-APR-2019 09:37:30 AM	28-APR-2019 09:37:27 AM
28-APR-2019 09:38:21 AM		ACTIVE	28-APR-2019 09:38:58 AM	28-APR-2019 09:40:20 AM

Figure 211 – User Activity Report

4.16.1.6. *The ATMS shall allow for the specification of user's rights by an administrator.*

OpenTMS meets this requirement. Through the Admin Portal Security module user interface, administrators can quickly manage the set of privileges assigned to a Role. Users are typically assigned a role such as Guest, Operator, Supervisor or Administrator and privileges are assigned to that Role. There is no limit in the number of Roles defined. Users are assigned to a Role.

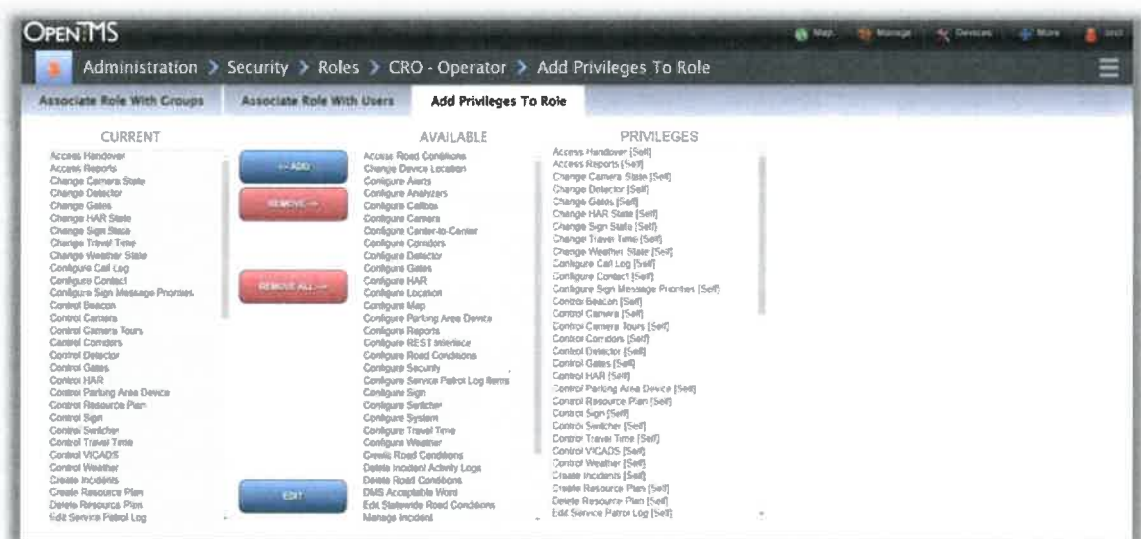


Figure 212 – Privilege Role Assignment View

4.16.1.7. User's rights shall be designated by function and specific equipment.

OpenTMS meets this requirement. Privileges are available for functionality within each module. Privileges like Control provide the administrator the ability to assign control by individual device or home group. The administrator is presented with a create restriction view and can either select individual devices from a list or select the groups that can control this device. The create restriction view is shown below.

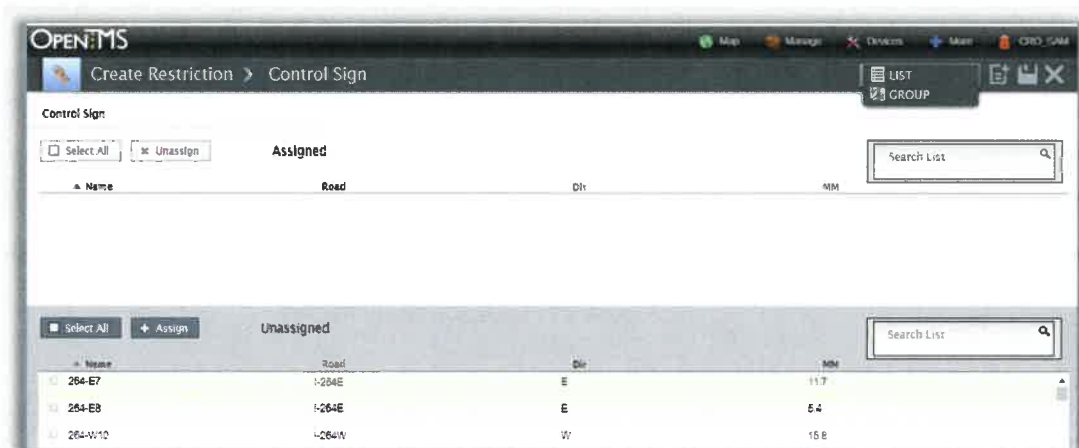


Figure 213 – Control Sign Privilege Restriction View

4.16.1.8. The ATMS shall allow a system administrator to change a user's password.

OpenTMS meets this requirement through the Keycloak administration panel. For local accounts the administrator can update their password and optionally require them to change on login. For active directory integration, the passwords would need to be updated in the domain controller.

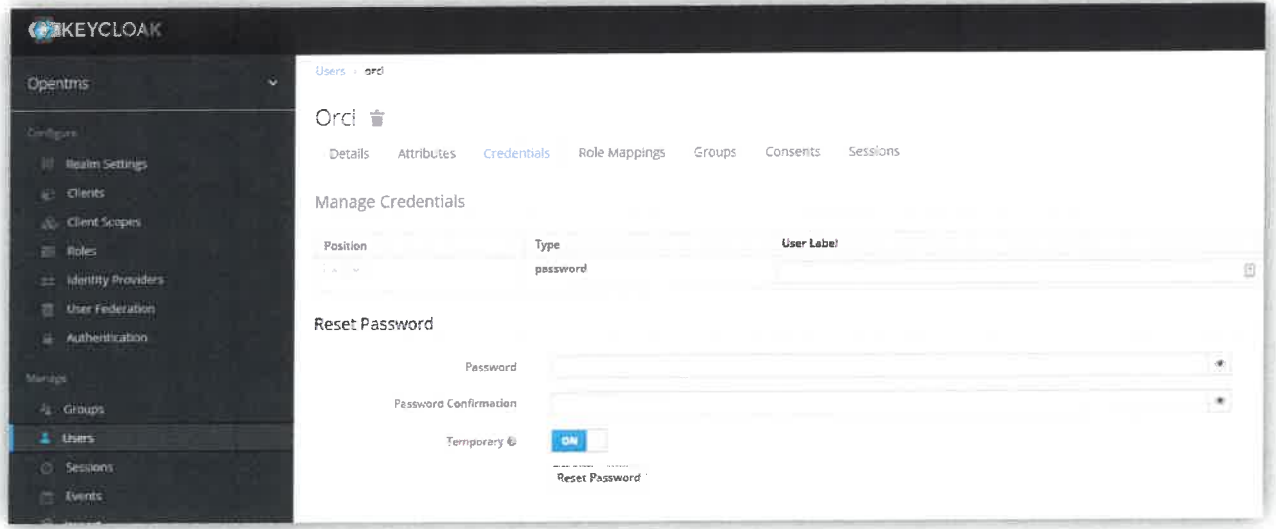
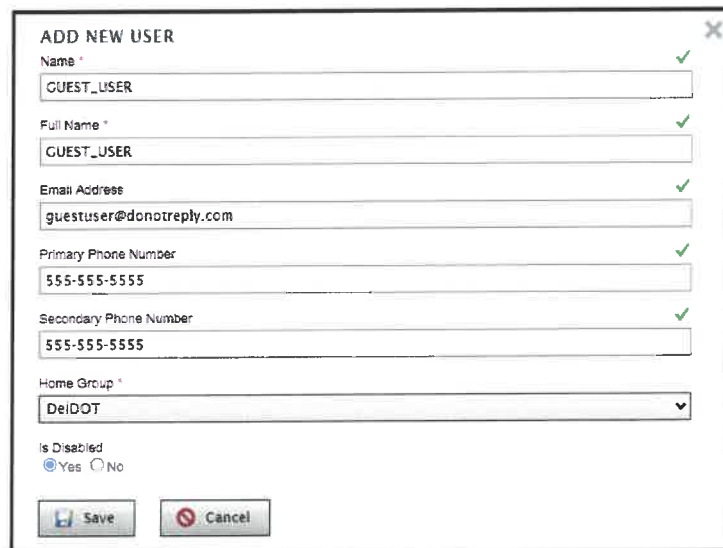


Figure 214 – Keycloak User Password View

4.16.1.9. *The ATMS shall allow a system administrator to disable a user.*

OpenTMS meets this requirement. The administrator can disable a user's account by setting Is Disabled to Yes. For active directory integration, the administrator can disable their account which prevents them from access the ATMS regardless of their account status in the software.



The 'ADD NEW USER' dialog box contains the following fields and controls:

- Name ***: Text field with value 'GUEST_USER' and a green checkmark.
- Full Name ***: Text field with value 'GUEST_USER' and a green checkmark.
- Email Address ***: Text field with value 'guestuser@donotreply.com' and a green checkmark.
- Primary Phone Number ***: Text field with value '555-555-5555' and a green checkmark.
- Secondary Phone Number ***: Text field with value '555-555-5555' and a green checkmark.
- Home Group ***: Dropdown menu with value 'DeiDOT' and a green checkmark.
- Is Disabled**: Radio buttons for 'Yes' (selected) and 'No'.
- Buttons**: 'Save' and 'Cancel' buttons at the bottom.

Figure 215 – OpenTMS Edit New User Dialog

4.16.1.10. The ATMS shall allow a system administrator to change the status of a user to "expired".

OpenTMS meets this requirement. For active directory integration, the administrator can set their account to expire at a set time in the future.

4.16.1.11. The ATMS shall allow a user to change their own password.

OpenTMS meets this requirement. For active directory users, the user would change their password from their desktop. From the desktop, press Ctrl+Alt+Del and select Change a password. For local accounts, Keycloak administrators can set users to change their password on their next login.

4.16.1.12. The ATMS shall allow a user access to the ATMS from any workstation on the system.

OpenTMS meets this requirement. OpenTMS is a fully web enabled ATMS. The architecture is designed to run on a desktop/laptop through a conventional browser. As a web application, users can access the ATMS inside or external to the client's TMC if they have network access. The application is launched in a browser and users can open multiple tabs or peel off additional windows to have multiple views concurrently running on multiple monitors.

4.16.1.13. The ATMS workstation / server communications shall be able to function over VPN or firewall traversal.

OpenTMS meets this requirement. Several of our clients support a secure Virtual Private Network (VPN) to remotely access WVDOH hosted hardware platform and/or ATMS application from outside the TMC. OpenTMS is a fully web enabled ATMS. The architecture is designed to run on a desktop/laptop through a conventional browser.

4.16.1.14. The ATMS shall provide a method to manage users and groups of users within the software such that only ATMS authorized users are allowed to access the system. A minimum of four (4) levels of security are required (external agency, TMC operator, supervisor, and administrator).

OpenTMS meets this requirement. Through the Admin Portal Security module user interface, administrators can create, update and delete Roles and quickly manage the set of privileges assigned to a Role. There is no limit in the number of Roles defined. Users are assigned to a Role. Team Q-Free will work with WVDOH on setting up the roles that are needed.

4.16.1.15. The ATMS shall support appropriate security and firewalls necessary to safeguard internal operational information from unauthorized access.

OpenTMS meets this requirement. The ATMS platform utilizes state of the art technology to monitor for 'zero day' attacks and updates the firewall security definitions several times a day. The ATMS further secures the environment using and domain infrastructure that requires users to routinely change their passwords, enforcing industry standard enforcement policies and practices.

4.16.1.16. The ATMS shall provide an audit trail capturing the user's ID, date and time stamp, transaction type, and before/after values whenever changes are posted to system database.

OpenTMS meets this requirement. The audit trail captures the timestamp, username, activity, and detail information on changes. Below is an example of the incident activity log.



Date/Time	Username	Activity	Event Info
04/29/2019 10:40:51	System	Owner of Incident has changed.	Old Value Removed: None > New Value Added: CRD_SAM
04/29/2019 16:23:25	System	Owner of Incident has changed.	Old Value Removed: Colleen Bond > New Value Added: None
04/29/2019 16:23:19	System	Owner of Incident has changed.	Old Value Removed: Daniel Skiffington > New Value Added: Colleen Bond
04/11/2019 00:35:43	DanielS	Additional 511 Text	
04/11/2019 00:35:43	DanielS	511 Message	On I-77 at mile marker 12 in the County of Carroll, motorists can expect delays due to a vehicle accident. The North left lane, left center lane, right center lane, and right lane are closed. Traffic backups are approximately 6.0 miles
04/11/2019 00:35:43	DanielS	Suppressed	no
04/11/2019 00:35:43	DanielS	Incident submitted	Successful
04/11/2019 00:35:35	DanielS	New Primary Delay Length	5.0
04/11/2019 00:35:35	DanielS	Incident Saved	
04/11/2019 00:35:05	DanielS	Additional 511 Text	
04/11/2019 00:35:05	DanielS	511 Message	On I-77 at mile marker 12 in the County of Carroll, motorists can expect delays due to a vehicle accident. The North left lane, left center lane, right center lane, and right lane are closed.
04/11/2019 00:35:05	DanielS	Suppressed	no
04/11/2019 00:35:05	DanielS	Incident submitted	Successful
04/11/2019 00:34:58	DanielS	New Lane Status Change	North General Purpose Lane 2 CLOSED
04/11/2019 00:34:58	DanielS	New Lane Status Change	North General Purpose Lane 1 CLOSED
04/11/2019 00:34:58	DanielS	Updated Lane Status Change	Old Value Removed: North General Purpose Lane 4 OPEN > New Value Added: North General Purpose Lane 4 CLOSED
04/11/2019 00:34:58	DanielS	Updated Lane Status Change	Old Value Removed: North General Purpose Lane 3 OPEN > New Value Added: North General Purpose Lane 3 CLOSED
04/11/2019 00:34:58	DanielS	New Lane Status Change	North General Purpose Lane 2 CLOSED
04/11/2019 00:34:58	DanielS	New Lane Status Change	North General Purpose Lane 1 CLOSED
04/11/2019 00:34:58	DanielS	Updated Lane Status Change	Old Value Removed: North General Purpose Lane 4 OPEN > New Value Added: North General Purpose Lane 4 CLOSED
04/11/2019 00:34:58	DanielS	Updated Lane Status Change	Old Value Removed: North General Purpose Lane 3 OPEN > New Value Added: North General Purpose Lane 3 CLOSED
04/11/2019 00:34:58	DanielS	Incident Saved	

Figure 216 – Incident Activity Log

4.16.1.17. The ATMS shall support full system backups while maintaining 24/7 operational status.

OpenTMS meets this requirement. Using industry best practices, the ATMS platform is incrementally backed up daily with full backups occurring once a week. The backups are then tested to ensure as part of the 'System Recovery Process' testing.

4.16.2. Security and Administration – Desirables

4.16.2.1. The ATMS should provide rules-based administration for access and security at all levels of use.

OpenTMS meets this requirement. The Admin Portal Security module enables administrators to add, edit, or delete users and manage groups, roles, profiles, and privileges. The ATMS comes pre-configured with a series of privileges and basic roles that can be expanded upon to create a wide range of user profiles. Privileges are available for functionality within each module. Privileges can typically be assigned to a group or individual device.

Team Q-Free recommends active directory integration for system access. In this case all users are authenticated against the client's active directory.

Team Q-Free will work with WVDOH on setting up access and the roles that are needed.

4.16.2.2. The ATMS should provide data locking or buffering routines in a multi-user environment.

The ATMS is updated in real-time ensuring each user has the most up to date data. OpenTMS does not have conflict resolution for multiple users editing the same event.

4.17 Performance (CRFP Section 4.17)

4.17. Performance

4.17.1. Mandatory Requirements

4.17.1.1. The ATMS shall not require system restarts or reboots except for major system upgrades.

OpenTMS meets this requirement. Q-Free will provide a high-availability and fully redundant platform to provide 24x7 operations. High availability is discussed in requirement 4.17.1.2 in more detail. A summary is provided to the right.

4.17.1.2. The ATMS shall be available 24 hours a day, 7 days a week, except during scheduled maintenance.

OpenTMS meets this requirement. Q-Free will provide a high-availability and fully redundant platform to provide 24x7 operations. Key Features of our high availability solution include:

Taking Advantage of Built-In High Availability and Redundancy Features of Virtualization

The ATMS applications will run on a virtualized environment spread across multiple host servers. A virtualized platform allows us to take advantage of built in high availability and redundancy features without additional cost. Virtualized servers

look and act like real servers but are not constrained to a single piece of hardware. A virtualized server can run on any number of physical servers (hosts) and multiple virtualized servers can run on a single hardware server. This virtualized environment also provides for the automatic moving of virtual machines (VM) from one host to another, should a host machine fail or need to be taken "off-line for maintenance, without shutting down the application. Virtualization allows for the quick provisioning of new machines to support the standing up production or test servers.

Key Features Of Our High Availability Solution Include:

- Taking advantage of built in high availability and redundancy features of virtualization
- Database Redundancy – best practices for backup/recovery, hot standby
- Hardware Architecture – RAID configuration, Load Balancers, redundancy
- Technology – keeping current with technology
- Redundant Services
- Proactive Monitoring

Database

Database redundancy can be achieved by using the following configuration and processes:

- Best practices for backup and recovery; and
- Deploying a hot standby for redundancy.

Hardware Architecture

Deploying best practices in hardware achieved through RAID configuration, load balancers, and redundancy. Multiple web servers sitting behind a load balancer provide the ability to distribute load in addition to allowing for running on a single instance of a web server if one goes down.

Technology

Q-Free continually invests in technology to keep the platform current with latest versions of COTS products and technology changes. Keeping with the latest versions allows us to take advantage of the latest application Security improvements in an ever-changing time, moving our products forward, and new more efficient features that result in better performance. Our module design and service-oriented architecture allows us to easily add new modules to meet the needs of the future.

Redundant Services

With redundant services a single service can be restarted in the background without bringing the system down.

Kubernetes & Containers

Team Q-Free proposes deploying the ATMS software using Kubernetes containers/nodes. Kubernetes is an open source deployment platform that aims to automate much of the manual processes involved in deploying a large scale application.

Proactive Monitoring

ATMS system is proactively monitored including application metrics through a monitoring platform, LogicMonitor.

4.17.1.3. The ATMS shall not let its performance and operation be impacted adversely by the malfunction, removal, or addition of interfaces.

OpenTMS meets this requirement. Performance and operation are not impacted by interface operation. In our production systems today, interfaces experience period issues and do not impact the overall ATMS.

4.17.1.4. The ATMS system up time goal shall be 99.9%.

OpenTMS will meet the 99.9% uptime goal. Q-Free currently runs in Highly Available Architecture configurations in 3 major states including VDOT which has an uptime requirement of 99.99%.

4.17.1.5. The ATMS refresh rate for the largest map shall be a maximum of 1 second.

OpenTMS meets this requirement. The system provides responsive maps with a target update rate within 1 second. Number of themes/layers will impact map response time.

4.17.1.6. The ATMS refresh rate for all other displays shall be a maximum of 1 second.

OpenTMS meets this requirement. The system provides responsive views with a target update rate within 1 second.

4.17.1.7. The ATMS vendor response shall define how many devices and type the ATMS is capable of supporting. (Minimum: 500 CCTV, 250 DMS, 1000 Detectors).

OpenTMS meets this requirement. OpenTMS does not limit the number of field devices configured into the system. The table below shows the production load for two of our clients.

Device Type	Site 1 Production Count	Site 2 Production Count
CCTV	451	994
DMS	575 996* including external C2C devices	691
Detectors	483 1149* including external C2C devices	530
RWIS	92	69

Our system load tests are done utilizing client maximum requirements. For example, PennDOT has requirements for 2,000 CCTV, DMS and Detectors to be supported so those are the values that will be load tested. For West Virginia we plan on testing with the max device requirements for our product.

4.17.1.8. The ATMS vendor shall indicate if all components necessary to make the ATMS functional will be installed on-premise or off-site and the reason/benefit to WVDOH.

OPENTMS AND VIDEO DISTRIBUTION

OpenTMS and the Skyline VDS will be deployed on premises at the Data Center located at Building 6000 at the Tech Park located in south Charleston. The reason for this choice is due to the high uptime requirement and the State capitol network instabilities. The benefits of hosting in this location include:

- The Data Center is a central junction for several internet service providers. Using this network node allows for redundant paths to the TMC internet, field devices and e911 centers around the state. This is to ensure that the system has multiple core network providers to route traffic through to ensure maximum uptime for the ATMS, Partner Connections and Video systems. The Data center currently load balances across the following networks:
 - Frontier;
 - Lumos (Segra);
 - AT&T;
 - Sprint;
 - Suddenlink;
 - Zayo; and
 - Windstream.
- Connectivity to the TMC and TPA will be provided utilizing the Charleston 'Metro Ring' for redundant highspeed connectivity. Though a complete outage may still occur at the TMC or TPA end of the network, the underlying ATMS platform will still remain functional allowing for remote access from a non-impacted network to manage the states ATMS infrastructure and continue to serve the traveling public with real time traveler information.

ILOG 511 Platform

The use of cloud computing has redefined business continuity, disaster recovery and backup testing. The ILOG 511 platform will be housed in the Amazon cloud, load-balanced across multiple servers in multiple locations, each location supported by RDS databases. ILOG builds redundancy in each of its technology solutions.

There are many benefits to WVDOH in virtual, cloud-hosted systems:

- There is no hardware procurement and installation required to add computing resources for the system (web servers, database capacity, data ingestion/processing power, etc.). Additional resources can generally be provisioned and available for use within minutes – a great benefit when natural disasters or other emergencies bring sudden surges in usage;
- Having the entire 511 system replicated and accessed across multiple Amazon data centers means that if one system or node fails, the event does not cause an interruption in service – other nodes simply take on the extra traffic until the errant node is placed back in service. This is also a feature that enables ILOG to update and patch servers without interruptions in service;
- Virtual cloud-based systems can be easily backed up with server snapshots created and stored at inexpensive and easily accessed Amazon storage. Backups can also be kept in a standby mode and turned up almost instantly;
- All servers and services are remotely accessible so that weather, road conditions, congestion or other impediments to travel are immaterial in accessing servers for maintenance, upgrade or expansion. This ability to access cloud servers from multiple remote points renders business continuity issues virtually irrelevant; and
- Hardware updates have no impact to users in this context. Amazon cloud services notify you when underlying hardware needs to be changed. Virtual systems mean that the supporting host can be changed with no end-user impact. By having multiple systems in service at all times, the hardware underlying the virtual system can be changed - all while end-user requests are still fulfilled by other servers in the network.

Below is an overview of the proposed architecture.

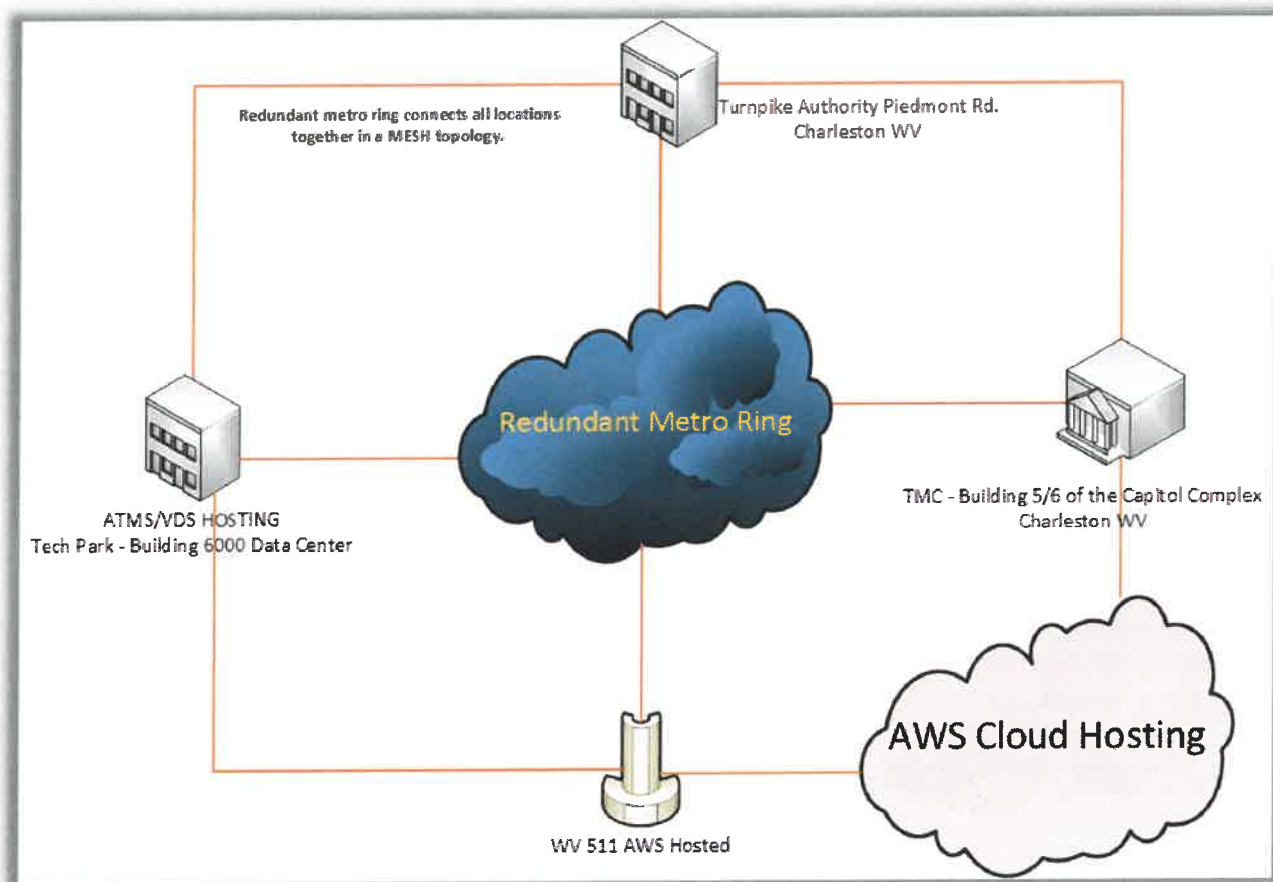


Figure 217 – Proposed Network Architecture

4.17.2. Performance - Desirables

4.17.2.1. *The ATMS should provide for "operator-free" operation so that the system performs all minimally necessary control and monitoring processes unattended.*

OpenTMS meets this requirement. OpenTMS provides automated incident response based on a set of business rules. The rules based DSS automatically generates an incident response based on the incident attributes such as incident duration, road or lane closure. The incident response recommends ITS devices, 511 messaging, and email notifications. All generated responses are presented to the user for review, modification if required and activation.

Travel times can be scheduled through schedules and activate daily for a defined period without user intervention. Travel times posted on DMS continuously update in the background.

Detection algorithms such as detector, travel time and RWIS are automatically monitored in the background and alerts are automatically created as thresholds are crossed. CAD alerts automatically come in as roadway issues occur.

In summary, in OpenTMS the “operator-free” operation comes from alerts users as congestion/weather monitoring occurs in the back ground and the automatic recommendation of responses to incidents/events.

4.17.3. Other ATMS Operations

4.17.3.1. Mandatory Requirements

4.17.3.1.1. *The ATMS shall include capability to generate real-time travel times for defined roadway segments on Interstate and Expressway routes.*

OpenTMS meets this requirement. OpenTMS system contains two distinct components to manage travel times. The Travel Time Engine (TTE) is a server-side data fusion engine to collect data from multiple sources and intelligently fuse those values to produce composite travel times. The Travel Time Module (TTM) is an operational management module within the OpenTMS that gives operators status information, notifications for deviations from historical norms, and controls for managing travel times automatically posted to DMS. Decoupling these two functions facilitate integration with other systems and maximizes flexibility for deployment and configuration. Taken together, these two components provide a full featured system for travel time calculation, management, and dissemination.

Travel Time Engine

The TTE fuses data from multiple sources. Existing deployments gather data from fixed detectors, third-party probe data such as INRIX, Bluetooth systems, and toll tag readers. The fusion algorithm is configurable and can be tuned to suit particular needs. If contributing data sources provide historical data, then the TTE can provide that information when nothing else is available. Local knowledge is always critical to understand the relative strengths and weaknesses of rival data sources. Empirical validation of individual data sources, if possible, will provide a better foundation for the fusion algorithm.

One of the biggest advantages to separating the TTE from the ATMS is that travel times may be accessed from approved and authenticated third party systems. Secure web services are available which provide travel times upon request. The requesting system specifies the route and end points, and the TTE returns travel time information. For example, the state of Virginia uses a statewide TTE to provide travel times to traveler information websites and to operational systems other than OpenTMS.

Travel Time Module

The TTM within OpenTMS is the operator’s management tool for travel times. It includes a list view (see figure below) which shows current and historical speed, delay, communication, and data quality among other values. The detail view for travel time segments includes graphs showing how travel times are trending over time.

OPEN:TMS

Map

Manage

Devices

More

ORCI

Travel Times

Search List

More Filters

Comm	Name	Location	Data Received	Travel Time (mm:ss)	Historical (mm:ss)	Delay (mm:ss)	Speed (Mph)	Quality
	D001N_64 New Jersey via I-95	US-1N at 68.5 to I-95N at 50.9	01/29/2016 15:56:28	14:57	15:28	00:00	62.6	✓
	D001N_64 to I-95	US-1N at 68.5 to US-1N at 75.1	01/29/2016 15:56:28	06:32	06:42	00:00	60.6	✓
	D001N_64 to PA 413	US-1N at 68.5 to US-1N at 73.6	01/29/2016 15:57:28	05:08	05:02	00:06	59.6	✓
	D001N_68 to Academy via I-95S	US-1N at 73.7 to I-95S at 32.2	01/29/2016 15:48:09	12:59	13:04	00:00	65.2	✓
	D001N_68 to New Jersey via I-95N	US-1N at 73.2 to I-95N at 50.9	01/29/2016 15:48:18	06:29	06:43	00:00	64.8	✓
	D001N_68 to New Jersey via I-95N	US-1N at 73.2 to I-95N at 50.9	01/29/2016 15:48:18	06:29	06:43	00:00	64.8	✓

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Figure 218 – Travel Time List View

Travel Time Administration

Travel time segments are created and maintained in the Administration Portal. The administrator specifies the route for the desired travel time segment. The system automatically queries the TTE using the information supplied when the segment was created. The administrator can also identify one or more DMS associated with the travel time segment. Those DMS can be set to automatically post travel times for the given segment.

4.17.3.1.2. *The ATMS shall provide a mechanism for operators to select and implement pre-defined operations response plans for incidents.*

OpenTMS meets this requirement. OpenTMS provides automated incident response based on a set of business rules. Utilizing a Business Rules Engine enables us to generate response plans to promote consistent response and provides for selection of new field devices automatically. Q-Free will work with the WVDOH to customize their business rules. The figure below shows the business logic for posting a DMS message for a road closure.

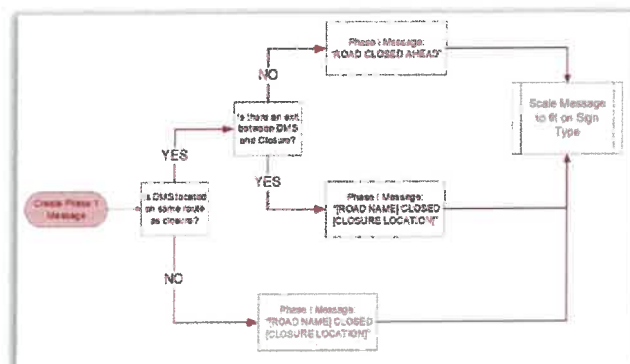


Figure 219 – Business Logic for Posting a DMS Message for a Road Closure

4.17.3.1.3. *The ATMS shall maintain a local emergency response agency contact list.*

OpenTMS meets this requirement. OpenTMS provides a Contact module which provides the ability to store and use contact information throughout of the application. The contacts can be associated to organizations, which then are returned with the incident response plan system when the contact/origination falls within the zone of control. The figure below is the entry form for managing contacts. OpenTMS also maintains a list of Organizations that contacts can be grouped by.

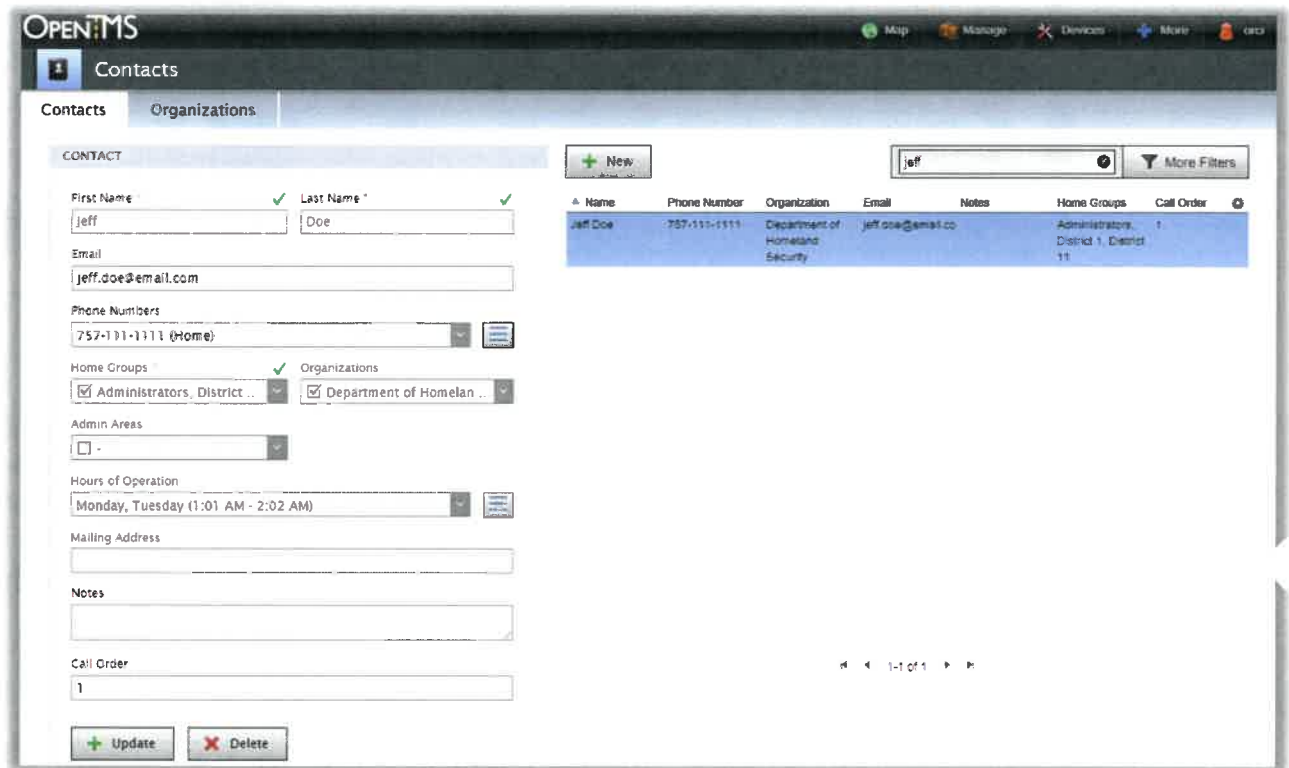


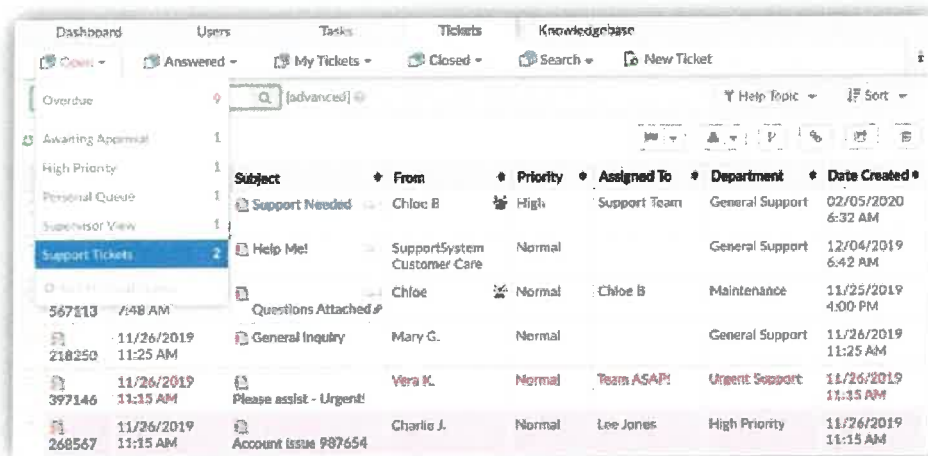
Figure 220 – Contact Module

4.17.3.1.4. *The ATMS shall provide access to the contact lists to authorized users.*

OpenTMS meets this requirement. Contact list access is available to those users with the correct permissions. Permissions are configured by the administrator in the Admin portal.

4.17.3.1.5. *Trouble ticket generation capability for system and device service and maintenance needs.*

OpenTMS meets this requirement. OpenTMS will integrate with cloud-hosted osTicket software, <https://osticket.com/>, to provide support ticketing. Ten agent licenses will be provided. osTicket provides ticket management including email and dashboard to track tickets. From the OpenTMS user interface a list view will be available to show active tickets. Tickets can be created from OpenTMS. A link from the More menu will open osTicket in the web browser.



Subject	From	Priority	Assigned To	Department	Date Created
Support Needed	Chloe B	High	Support Team	General Support	02/05/2020 6:32 AM
Help Me!	SupportSystem Customer Care	Normal		General Support	12/04/2019 6:42 AM
Questions Attached #	Chloe	Normal	Chloe B	Maintenance	11/25/2019 4:00 PM
General Inquiry	Mary G.	Normal		General Support	11/26/2019 11:25 AM
Please assist - Urgent!	Vera K.	Normal	Team ASAP!	Urgent Support	11/26/2019 11:35 AM
Account issue 987654	Charlie J.	Normal	Lee Jones	High Priority	11/26/2019 11:15 AM

Figure 221 – Ticket Queue

4.17.3.2. Other ATMS Operations - Desirables

4.17.3.2.1. *The ATMS should include capability to use archived data and real-time data together with predictive algorithms to generate travel forecasts for display to operators.*

OpenTMS meets this requirement. For the Detectors Module, alerts are generated when current measured values drift from historical values based on a configurable confidence level.

OpenTMS will have decision support in the Integrated Corridor Management module. The current module produces real-time response based upon real-time data from RWIS sensors, Detection and data such as INRIX and Wavetronix. The current decision support does not predict future conditions.

4.17.3.2.2. *The ATMS should maintain a call-out list of private industry contractors of equipment resources.*

OpenTMS meets this requirement. The Contact list can be used to maintain a list of contractors of equipment resources. Further OpenTMS allows for organization(s) to be associated with the contacts.

4.17.3.2.3. *The ATMS should provide a commuter route app so users can enter a frequent route and receive a specific update for their route including incidents, construction, congestion, events, etc.*

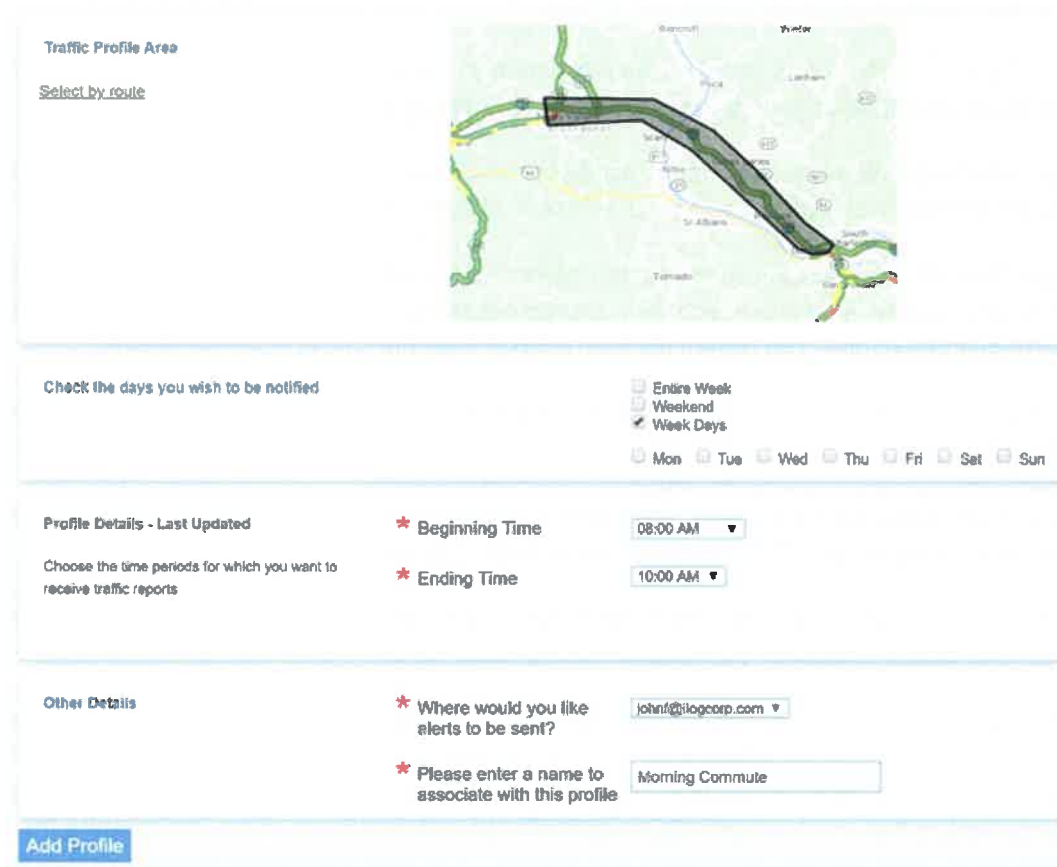
The ILOG 511 platform exceeds this requirement. As described in the responses to requirements 4.11.1.27 and 4.11.1.29, the Q-Free proposal for WVDOH includes a subscriber services portion in the ILOG 511 platform. Behind a credentialed login, this portion of the system has an integrated personalized alert component so that users can provide areas/roadways and days/times of day during which they wish to receive email alerts about portions of the state. The system will provide email alerts related to any events provided through the ATMS along their route.

In existing deployments of the system, alerts received from the ATMS are automatically translated into email alerts and distributed to travelers with the appropriate settings. The system may also incorporate advisories such as Amber Alerts and detour information.

Users can manage the various features of their accounts from the website. After logging in,

- Users may edit their personal info/user profile.
- Users may subscribe/unsubscribe from alerts.
- Alerts may be configured so they are only sent during days and times. Furthermore, these configurations may be different for each route entered by a user.
- As a new feature, users can select the area of their focus by drawing a shape on a map, rather than clicking through roadway dropdown options. This gives great flexibility when a user wants alerts near a specific region, or along a commute that involves multiple roadways. It also gives the user the opportunity to incorporate roads near their primary route, which may have a secondary impact on their commute.

Incorporation of this feature into the mobile app can also be done by linking the app to the subscriber services and providing relevant app notifications. The 511 system will relay this information to both the website and the traveler information mobile application.



The screenshot shows a web form for creating a traffic profile. It includes a map for selecting a route, checkboxes for notification days, time selection for alerts, and a section for email and profile name. An 'Add Profile' button is at the bottom.

Traffic Profile Area
[Select by route](#)

Check the days you wish to be notified

☐ Entire Week
☐ Weekend
☒ Week Days

☐ Mon ☐ Tue ☐ Wed ☐ Thu ☐ Fri ☐ Sat ☐ Sun

Profile Details - Last Updated

* Beginning Time: 08:00 AM ▼

* Ending Time: 10:00 AM ▼

Choose the time periods for which you want to receive traffic reports

Other Details

* Where would you like alerts to be sent? johnf@ilogcorp.com ▼

* Please enter a name to associate with this profile: Morning Commute

Add Profile

Figure 222 – Commuter App Route Selection

4.17.3.2.4. The ATMS should populate social media mechanisms with event data automatically.

OpenTMS meets this requirement. The ATMS provides a data feed to the 511 which populates social media.

The ILOG 511 platform automatically posts advisories to agency-specified Twitter accounts, including regional or subject-specific accounts. Different Twitter accounts are linked to the preview and production systems so that new Twitter functions can be tested before being pushed to the general public.

Sometimes agencies find that their tweets are blocked by Twitter because they are too similar to prior tweets. For example, tweets for an initial alert, an update and a cleared event may look very similar. To prevent agency tweets from being blocked from Twitter due to their similarity to a previous tweet, ILOG uses oauth1.0 for authentication. We use a consumer key/consumer secret to build a token and token secret for each tweet. Each tweet is signed with HMAC-SHA1.

ILOG also follows each agency's Twitter accounts so that our QA staff can confirm that tweets have not been blocked.

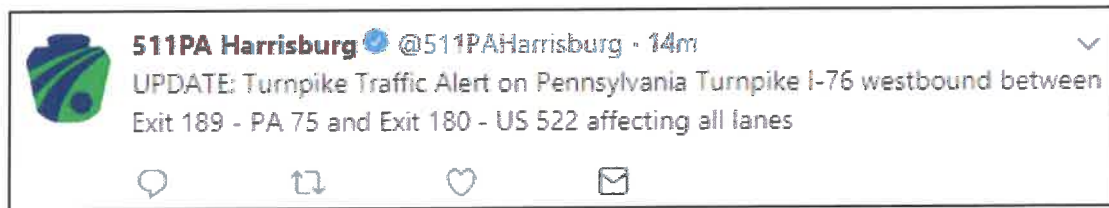


Figure 223 – Automatically-Generated Tweet

4.17.3.2.5. The ATMS should provide for enhanced social media capabilities to allow for easier use of Twitter, Facebook, etc. for events or emergencies.

OpenTMS meets this requirement. The ATMS provides a data feed to the 511 system which populates social media.

The ILOG 511 platform administrative portal will provide a feature that will allow authorized staff to enter customized and free-form messages that will post to WVDOH Twitter account(s). ILOG currently provides this service for the PA Turnpike, where we developed a portal page that could post to any of their development or production Twitter accounts. Since the PA Turnpike has separate accounts for travel alerts and more social aspects of the agency, there are times when ad-hoc tweets are sent to one or both accounts.

4.17.3.2.6. Operator manuals should be intuitive and key operations should be on flip cards that are easy to access and understand during an emergency.

Team Q-Free will develop a set of flip cards for key ATMS and 511 platform operations.

4.17.4. Traffic Signal Control Systems – Desirables

4.17.4.1. *Although not required at this time, the ATMS should have the capability of adding a traffic signal control module or third-party application for the centralized control of WVDOH traffic signal systems across the state with communication capabilities.*



Q-Free has the capability of adding a traffic signal control module. The OpenTMS Signals module integrates with INTELIGHT's MAXVIEW Central Software to provide operators with the ability to incorporate pre-defined action sets (timing plans) in their incident response. MAXVIEW organizes incident responses using pre-configured objects called action sets. MAXVIEW operators can create and configure action sets, within MAXVIEW, to temporarily implement a variety of signal control objects from a single command.

OpenTMS fetches the action sets from MAXVIEW and displays them in the signals module. Signals interface provides the operator the following features:

- Visualize the controllers in the action set in a list or map;
- Interactive Map;
- Notes field, entered in MAXVIEW, provide operators the intended impact of the action set;
- Provides the ability to run and stop one or more action sets from a single view;
- Action set deconflicting; and
- List Searching and Filtering.

Figure below shows the Signal Module Action Set List View.

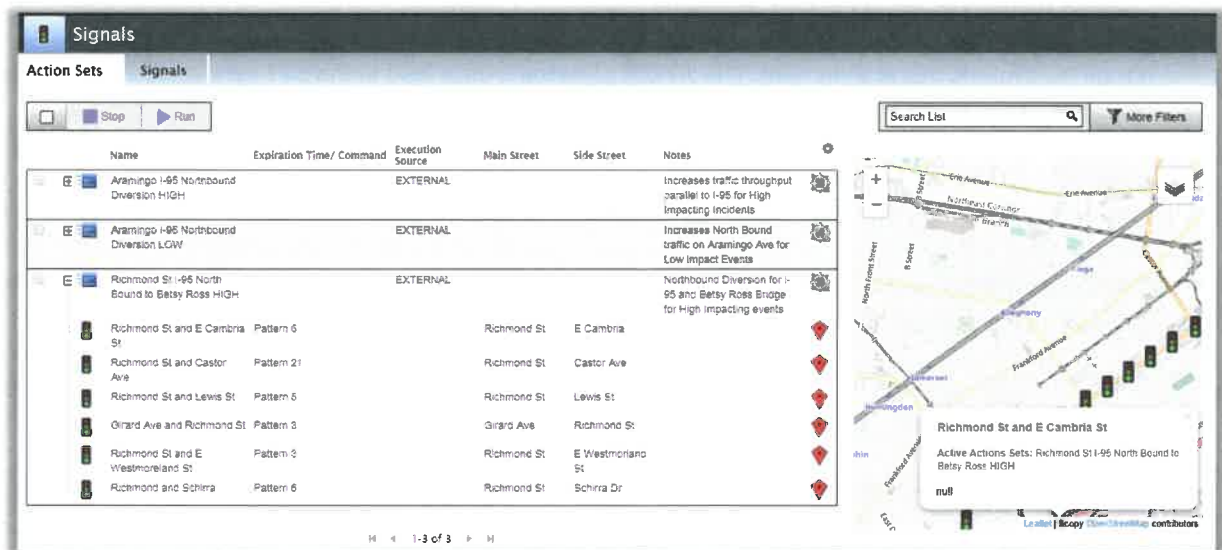


Figure 224 – Signal Module Action Set List View

Clicking on an action set opens a more detailed view of the action set. From this view the operator has a more detailed look at signal controllers within the action set. The detailed view is shown below.

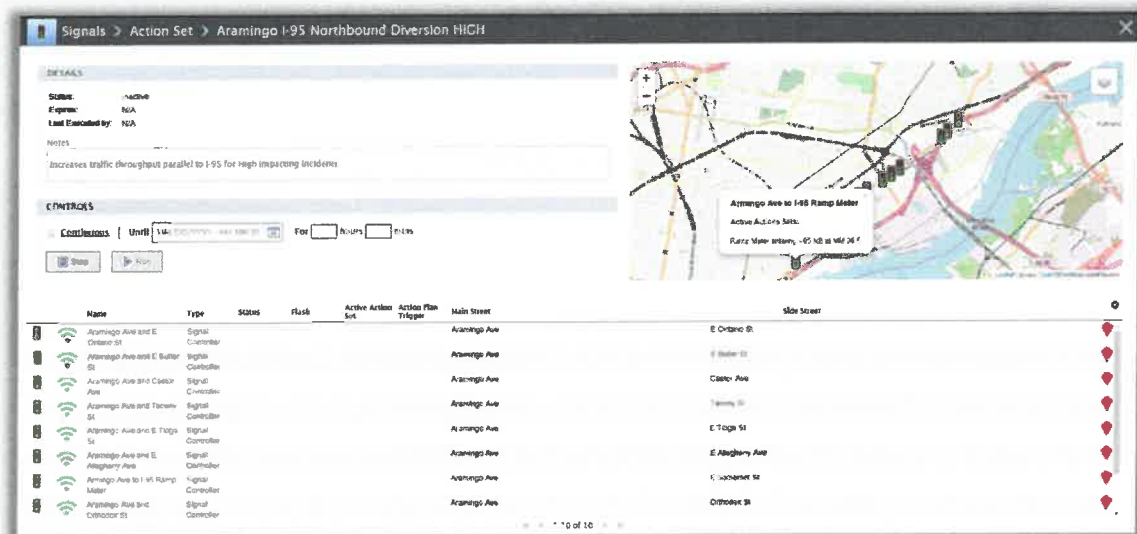


Figure 225 – Traffic Signal Action Set Detail View

To respond to an incident, OpenTMS will fetch the list of available action sets according to business rules and make them available in the Incident Response module. Once the action sets are returned, the operator will be able to select or de-select recommended action sets. To the OpenTMS operator, the action sets will appear as just another part of a response plan. When the operator invokes a response, which includes a MAXVIEW action set, the system will send the command back to MAXVIEW for execution. OpenTMS operators can run pre-defined plans on the signal system without having access to or knowledge of MAXVIEW. As part of activation, Operators are alerted to action set conflicts that require deconfliction within the ATMS.

Signal action sets are also integrated with the Corridor module and Response Plans. The image below shows the activation of an action set.

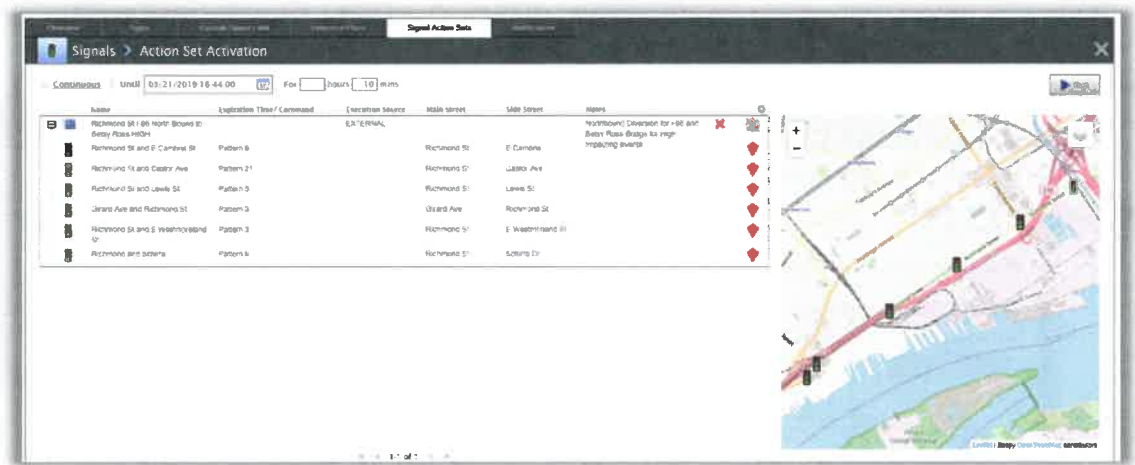


Figure 226 – Traffic Signal Action Set Activation View

5.0 Additional Information Required (CRFP Section 5.3.10)

- *Prime and subconsultant firm profiles*

See Team Q-Free's response to CRFP Section 4.3.1.1 above.

- *Company and staff qualifications and experience in completing similar projects*

See Team Q-Free's response to CRFP Section 4.3.1.2 above.

- *Project understanding and approach/methodology to achieving project objectives*

See Team Q-Free's response to CRFP Section 4.3.1.3 above.

- *Proposed staffing plan and/or organizational chart*

See Team Q-Free's response to CRFP Section 4.3.1.4 above.

- *Proposed project schedule*

See Team Q-Free's response to CRFP Section 4.3.1.5 above.

- *References (minimum 3, maximum 5 references) (no WVDOT references permitted), including name, agency, address, phone and email.*

See Team Q-Free's response to CRFP Section 4.3.2.1 above.

- *Descriptions of past projects completed entailing the location of the project, project manager name and contact information, type of project, and what the project goals and objectives were and how they were met. (minimum 3 projects completed/in operation in the past 5 years)*

See Team Q-Free's response to CRFP Section 4.3.2.2 above.

- *Quality Management/Change Management Plan details and how it will be employed on this project*

See Team Q-Free's response to CRFP Section 4.3.1.7 above.

- *Issue Resolution process*

See Team Q-Free's response to CRFP Section 4.3.1.8 above.

- *Risk Identification process*

See Team Q-Free's response to CRFP Section 4.3.1.9 above.



- *Bios/Resumes of key personnel (PM, Tasks Leads, On-Site Staff) (2 page maximum for each)*

See Team Q-Free's response to CRFP Section 4.3.1.10 above.

- *Copies of any staff certifications or degrees applicable to this project*

See Team Q-Free's response to CRFP Section 4.3.1.11 above.

6.0 Appendices

6.1 Appendix I – WVDOH Official CRFP Cover Page

See the pages to follow.



Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Request for Proposal
21 — Info Technology

Proc Folder: 708650

Doc Description: ADDENDUM 6 ADVANCED TRAFFIC MANAGEMENT SYSTEM (6319C0040)

Proc Type: Central Master Agreement

Date Issued	Solicitation Closes	Solicitation No	Version
2020-06-12	2020-06-24 13:30:00	CRFP 0803 DOT2000000001	7

BID RECEIVING LOCATION

BID CLERK
DEPARTMENT OF ADMINISTRATION
PURCHASING DIVISION
2019 WASHINGTON ST E
CHARLESTON WV 25305
US

VENDOR

Vendor Name, Address and Telephone Number:

Q-Free America, Inc.
4660 La Jolla Village Dr., Suite 500
San Diego, CA 92122
+1 (855) 737-3387

FOR INFORMATION CONTACT THE BUYER

Crystal G Hustead
(304) 558-2402
crystal.g.hustead@wv.gov

Signature X

FEIN # 454337530

DATE 6/24/2020

All offers subject to all terms and conditions contained in this solicitation

ADDITIONAL INFORMATION:

THE STATE OF WEST VIRGINIA PURCHASING DIVISION FOR THE AGENCY, WEST VIRGINIA DIVISION OF HIGHWAYS, IS SOLICITING PROPOSALS FOR ADVANCED TRAFFIC MANAGEMENT SOFTWARE, A 511-TRAVELER INFORMATION SYSTEM, AND SOFTWARE SUPPORT SERVICES PER THE ATTACHED DOCUMENTS.

QUESTIONS REGARDING THE SOLICITATION MUST BE SUBMITTED IN WRITING TO CRYSTAL.G.HUSTEAD@WV.GOV PRIOR TO THE QUESTION PERIOD DEADLINE CONTAINED IN THE INSTRUCTIONS TO VENDORS SUBMITTING BIDS

ONLINE RESPONSES FOR THIS SOLICITATION ARE PROHIBITED

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
1	SYSTEM DEVELOPMENT, MIGRATION, SOFTWARE				

Comm Code	Manufacturer	Specification	Model #
81111504			

Extended Description :

SYSTEM DEVELOPMENT, MIGRATION SERVICES, MAINTENANCE, SUPPORT FOR ADVANCED TRANSPORTATION MANAGMENT SYSTEM

SCHEDULE OF EVENTS

Line	Event	Event Date
1	VENDOR QUESTION DEADLINE	2020-06-12



6.2 Appendix II – Designated Contact Page, Certification & Signature Page

See the page to follow.

DESIGNATED CONTACT: Vendor appoints the individual identified in this Section as the Contract Administrator and the initial point of contact for matters relating to this Contract.

Thomas Phillips, Executive Vice President, Inter-Urban Solutions

(Name, Title)

Thomas Phillips, Executive Vice President, Inter-Urban Solutions

(Printed Name and Title)

4660 La Jolla Village Dr. Suite 100, San Diego, CA 92122

(Address)

703-973-8711 / 757-546-1832

(Phone Number) / (Fax Number)

tom.phillips@q-free.com

(email address)

CERTIFICATION AND SIGNATURE: By signing below, or submitting documentation through wvOASIS, I certify that I have reviewed this Solicitation in its entirety; that I understand the requirements, terms and conditions, and other information contained herein; that this bid, offer or proposal constitutes an offer to the State that cannot be unilaterally withdrawn; that the product or service proposed meets the mandatory requirements contained in the Solicitation for that product or service, unless otherwise stated herein; that the Vendor accepts the terms and conditions contained in the Solicitation, unless otherwise stated herein; that I am submitting this bid, offer or proposal for review and consideration; that I am authorized by the vendor to execute and submit this bid, offer, or proposal, or any documents related thereto on vendor's behalf; that I am authorized to bind the vendor in a contractual relationship; and that to the best of my knowledge, the vendor has properly registered with any State agency that may require registration.

Q-Free America, Inc.

(Company)



Thomas Phillips, Executive Vice President, Inter-Urban Solutions

(Authorized Signature) (Representative Name, Title)

Thomas Phillips, Executive Vice President, Inter-Urban Solutions

(Printed Name and Title of Authorized Representative)

6/24/2020

(Date)

703-973-8711 / 757-546-1832

(Phone Number) (Fax Number)



6.3 Appendix III – Addenda Acknowledgment

See the page to follow.

ADDENDUM ACKNOWLEDGEMENT FORM
SOLICITATION NO.: DOT2000000001

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:

(Check the box next to each addendum received)

<input checked="" type="checkbox"/> Addendum No. 1	<input checked="" type="checkbox"/> Addendum No. 6
<input checked="" type="checkbox"/> Addendum No. 2	<input type="checkbox"/> Addendum No. 7
<input checked="" type="checkbox"/> Addendum No. 3	<input type="checkbox"/> Addendum No. 8
<input checked="" type="checkbox"/> Addendum No. 4	<input type="checkbox"/> Addendum No. 9
<input checked="" type="checkbox"/> Addendum No. 5	<input type="checkbox"/> Addendum No. 10

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

Q-Free America, Inc.

Company



Authorized Signature

6/24/2020

Date

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing.

Revised 6/8/2012

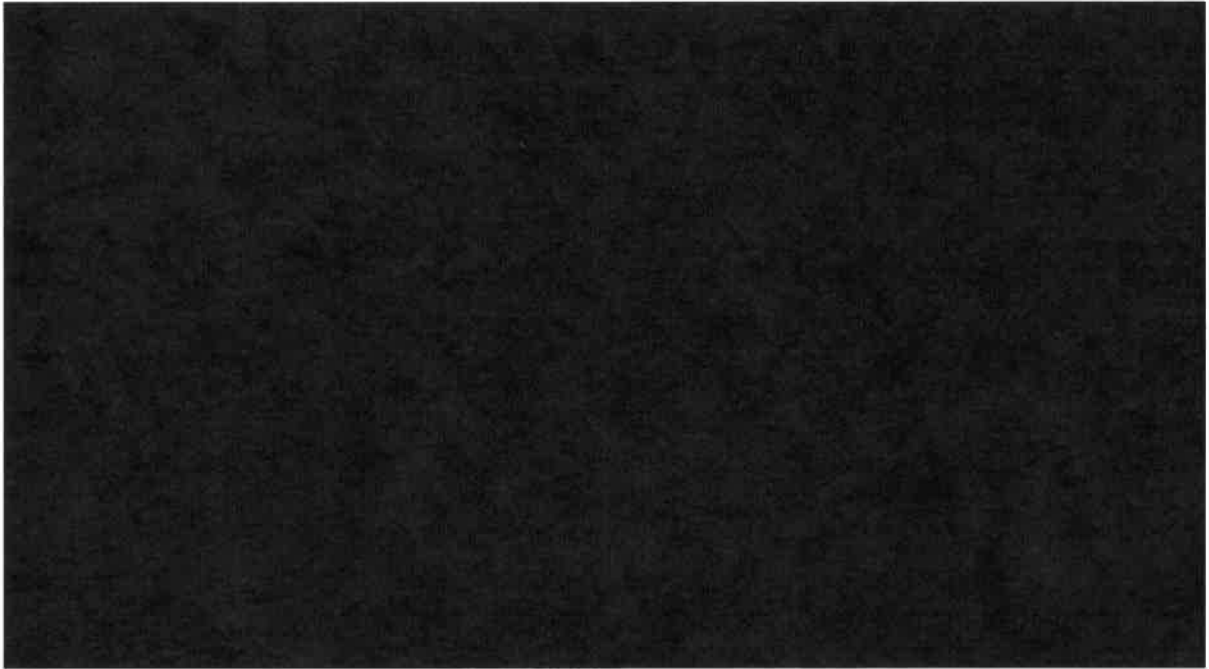


6.4 Appendix IV – Availability of Information Form (CRFP Section 6.8)

See the page to follow.

REQUEST FOR PROPOSAL

West Virginia Department of Transportation– ATMS and 511 Platform



- 6.8. Availability of Information:** Proposal submissions become public and are available for review immediately after opening pursuant to West Virginia Code §5A-3-11(h). All other information associated with the RFP, including but not limited to, technical scores and reasons for disqualification, will not be available until after the contract has been awarded pursuant to West Virginia Code of State Rules §148-1-6.3.d.

By signing below, I certify that I have reviewed this Request for Proposal in its entirety; understand the requirements, terms and conditions, and other information contained herein; that I am submitting this proposal for review and consideration; that I am authorized by the bidder to execute this bid or any documents related thereto on bidder's behalf; that I am authorized to bind the bidder in a contractual relationship; and that, to the best of my knowledge, the bidder has properly registered with any State agency that may require registration.

Q-Free America, Inc.

(Company)

Thomas Phillips, Executive Vice President, Inter-Urban Solutions

(Representative Name, Title)

703-973-8711 / 757-546-1832

(Contact Phone/Fax Number)

6/24/2020

(Date)



6.5 Appendix V – Disclosure of Interested Parties to Contracts

See the page to follow.

West Virginia Ethics Commission
Disclosure of Interested Parties to Contracts

(Required by W. Va. Code § 6D-1-2)

Name of Contracting Business Entity: Q-Free America, Inc. Address: 4660 La Jolla Village Dr., Suite 500
San Diego, CA 92122

Name of Authorized Agent: Thomas Phillips Address: 4660 La Jolla Village Dr., Suite 500, San Diego, CA 92122

Contract Number: CRFP No. DOT2000000001 Contract Description: ATMS and 511 Platform

Governmental agency awarding contract: West Virginia Department of Transportation - Division of Highways

☐ Check here if this is a Supplemental Disclosure

List the Names of Interested Parties to the contract which are known or reasonably anticipated by the contracting business entity for each category below (attach additional pages if necessary):

1. Subcontractors or other entities performing work or service under the Contract

☐ Check here if none, otherwise list entity/individual names below.

2. Any person or entity who owns 25% or more of contracting entity (not applicable to publicly traded entities)

☐ Check here if none, otherwise list entity/individual names below.

3. Any person or entity that facilitated, or negotiated the terms of, the applicable contract (excluding legal services related to the negotiation or drafting of the applicable contract)

☐ Check here if none, otherwise list entity/individual names below.


Signature:  Date Signed: 6/24/2020

Notary Verification

State of Virginia, County of Chesapeake:

I, Dimitris H. Hadnett, the authorized agent of the contracting business entity listed above, being duly sworn, acknowledge that the Disclosure herein is being made under oath and under the penalty of perjury.

Taken, sworn to and subscribed before me this 24th day of June, 2020


Notary Public's Signature

To be completed by State Agency:

Date Received by State Agency: _____

Date submitted to Ethics Commission: _____

Governmental agency submitting Disclosure: _____

Revised June 8, 2018



6.6 Appendix VI – Purchasing Affidavit

See the page to follow.

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

CONSTRUCTION CONTRACTS: Under W. Va. Code § 5-22-1(i), the contracting public entity shall not award a construction contract to any bidder that is known to be in default on any monetary obligation owed to the state or a political subdivision of the state, including, but not limited to, obligations related to payroll taxes, property taxes, sales and use taxes, fire service fees, or other fines or fees.

ALL CONTRACTS: Under W. Va. Code §5A-3-10a, no contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and: (1) the debt owed is an amount greater than one thousand dollars in the aggregate; or (2) the debtor is in employer default.

EXCEPTION: The prohibition listed above does not apply where a vendor has contested any tax administered pursuant to chapter eleven of the W. Va. Code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

DEFINITIONS:

"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Employer default" means having an outstanding balance or liability to the old fund or to the uninsured employers' fund or being in policy default, as defined in W. Va. Code § 23-2c-2, failure to maintain mandatory workers' compensation coverage, or failure to fully meet its obligations as a workers' compensation self-insured employer. An employer is not in employer default if it has entered into a repayment agreement with the Insurance Commissioner and remains in compliance with the obligations under the repayment agreement.

"Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceeds five percent of the total contract amount.

AFFIRMATION: By signing this form, the vendor's authorized signer affirms and acknowledges under penalty of law for false swearing (W. Va. Code §61-5-3) that: (1) for construction contracts, the vendor is not in default on any monetary obligation owed to the state or a political subdivision of the state, and (2) for all other contracts, that neither vendor nor any related party owe a debt as defined above and that neither vendor nor any related party are in employer default as defined above, unless the debt or employer default is permitted under the exception above.

WITNESS THE FOLLOWING SIGNATURE:

Vendor's Name: Q-Free America, Inc.

Authorized Signature: [Signature] Date: 6/24/2020

State of Virginia

County of Chesapeake, to-wit:

Taken, subscribed, and sworn to before me this 24th day of June, 2020

My Commission expires June 30, 2021.

AFFIX SEAL HERE

NOTARY PUBLIC [Signature]



6.7 Appendix VII – Commercial Liability Insurance Documentation

See the page to follow.

ACORD™

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

4/16/2020

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer any rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Marsh & McLennan Agency LLC Marsh & McLennan Ins. Agency LLC PO Box 85638 San Diego, CA 92186	CONTACT NAME: Steve Soriano	
	PHONE (A/C, No, Ext): 858-750-4537	FAX (A/C, No): 858-452-7530
	E-MAIL ADDRESS: Steve.Soriano@MarshMMA.com	
INSURED Q Free America 4660 La Jolla Village Dr San Diego, CA 92122	INSURER(S) AFFORDING COVERAGE	
	INSURER A : Zurich American Insurance Company	NAIC # 16535
	INSURER B : American Guarantee and Liability Ins Co	26247
	INSURER C : Hartford Casualty Insurance Company	29424
	INSURER D : Steadfast Insurance Company	
	INSURER E :	
INSURER F :		

COVERAGES

CERTIFICATE NUMBER:

REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL SUBR INSR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
A	<input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR X BI Ded:12,099 GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input type="checkbox"/> PROJECT <input type="checkbox"/> LOC OTHER:	X	GLO020604002	06/01/2019	06/01/2020	EACH OCCURRENCE \$2,000,000 DAMAGE TO RENTED PREMISES (Ea occurrence) \$300,000 MED EXP (Any one person) \$10,000 PERSONAL & ADV INJURY \$1,000,000 GENERAL AGGREGATE \$3,000,000 PRODUCTS - COMP/OP AGG \$3,000,000 \$
A	AUTOMOBILE LIABILITY <input type="checkbox"/> ANY AUTO OWNED AUTOS ONLY <input checked="" type="checkbox"/> HIRED AUTOS ONLY <input type="checkbox"/> SCHEDULED AUTOS NON-OWNED AUTOS ONLY		BAP038337802	06/01/2019	06/01/2020	COMBINED SINGLE LIMIT (Ea accident) \$1,000,000 BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$ \$
B	<input checked="" type="checkbox"/> UMBRELLA LIAB <input checked="" type="checkbox"/> OCCUR <input type="checkbox"/> EXCESS LIAB <input type="checkbox"/> CLAIMS-MADE DED <input checked="" type="checkbox"/> RETENTION \$10000		AUC038455302	06/01/2019	06/01/2020	EACH OCCURRENCE \$5,000,000 AGGREGATE \$5,000,000 \$
C	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? <input checked="" type="checkbox"/> Y/N <input checked="" type="checkbox"/> N/A (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below		72WECAD8YE2	09/05/2019	06/01/2020	<input checked="" type="checkbox"/> PER STATUTE <input type="checkbox"/> OTHER E.L. EACH ACCIDENT \$1,000,000 E.L. DISEASE - EA EMPLOYEE \$1,000,000 E.L. DISEASE - POLICY LIMIT \$1,000,000
D	Cyber Liability		SPR848110900	08/23/2019	06/01/2020	1,000,000


DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

Professional Liability is under global program, please see attached certificate.

Additional Cyber Liability is covered under global program, please see attached certificate

CERTIFICATE HOLDER

CANCELLATION

Evidence of Coverage	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.
	AUTHORIZED REPRESENTATIVE 

6.8 Appendix VIII – Acronyms

Acronym	Definition
ATMS	Advanced Traffic Management System
AVL	Automatic Vehicle Location
AWS	Amazon Web Services
CAD	Computer Aided Dispatch
COTS	Commercial off-the-shelf
CRFP	Centralized Request for Proposal
DMS	Dynamic Message Sign
DOT	Department of Transportation
DSS	Decision Support System
FAT	Factory Acceptance Test
FHWA	Federal Highway Administration
ICM	Integrated Corridor Management
ILOG	Information Logistics
IP	Internet Protocol
ITS	Intelligent Transportation System
IVR	Interactive Voice Response/Responsive
NTCIP	National Transportation Communications for Intelligent Transportation System Protocol
NTP	Notice to Proceed
PennDOT	Pennsylvania Department of Transportation
POC	Point of Contact
QA	Quality Assurance
QC	Quality Control
RDS	Relational Database Service
RFP	Request for Proposal
RTM	Requirements Traceability Matrix
SaaS	Software as a Service
SE	System Engineer
Skyline	Skyline Technology Solutions
TIS	Traveler Information System
TMC	Traffic Management Center
VDS	Video Distribution System
WVDOH	West Virginia Department of Transportation - Division of Highways



7.0 Appendix IX – Reference Letters

See Q-Free's letters of references in the pages that follow.

June 12, 2020

To whom it may concern:

I have been managing the Iowa DOT's ATMS Program for the past 3.5 years and in May 2019 we selected Q-Free Open Roads as our new statewide ATMS provider. Q-Free is currently in development of version 8 of their OpenTMS ATMS solution, to be launched in Iowa in November of this year. They are currently on schedule to meet this delivery date.

I have had the pleasure of working with Q-Free for the last year on the IowaDOT statewide ATMS program as they work to deliver Iowa's innovative ATMS solution. They have a team of knowledgeable professionals providing a high level of customer support and technical ability.

If you have any questions or would like more information, please feel free to reach out.

Email: sinclair.stolle@iowadot.us

Phone: 515-239-1933

Sincerely,



S. Sinclair Stolle, P.E.
Traffic Management Systems Engineer
Iowa DOT - Traffic Operations



Pennsylvania Turnpike Commission

PO Box 67676
Harrisburg PA 17106-7676
717.939.9551

May 26, 2020

To Whom It May Concern,

The Pennsylvania Turnpike Commission (PTC) has worked with the team at Information Logistics (ILOG) since 2004, and as a prime contractor since 2012. During that time, ILOG has provided a wide range of services, including our traveler information services. They have assisted with everything from updates to our strategic plan, to animations of Santa Claus on our website, to notifying travelers of operational changes to deal with COVID-19.

While our ATIS is at the heart of our service contract with ILOG, we have also called upon them to provide expert consulting and innovative solutions to build and deploy several systems, including our Emergency Notification System, ticketing systems, human resource systems, toll calculator, and many others including my personal favorite, 511PAConnect <https://www.paturndpike.com/travel/511PAConnect.aspx>. In each assignment we give to the ILOG team, they exceed our expectations in their performance, reliability, and in the quality of their products.

Working with ILOG, the PTC developed one of the first adaptive traveler information websites in the transportation industry. Their designers and programmers ensured that we were able to strike a balance between conveying the mission and message of the PTC, while making it easy for our constituents to access our services. Through their own project management acumen and customer service skills, they have helped the PTC reach new heights in the services and experience we are able to provide to our travelers.

The ILOG team has also played the role of a key business partner and a true advisor to the PTC, particularly my Communications Department. Working cooperatively to solve problems, the ILOG team has been key to numerous awards received for PTC projects, including:

- 2011 IBTTA Presidents Award
- 2012 IBTTA Technology & Presidents Awards
- ITE 2017 Transportation Achievement Award for Operations
- IBTTA 2017 Toll Excellence Award for Technology
- ITS NJ 2017 Outstanding ITS Project
- MASITE 2017 Project of the Year
- ITS Pennsylvania, 2017 Project of the Year
- ITS America 2018 Best of ITS (Finalist)
- National Operations Center of Excellence 2018 TSMO Awards – Major Incident or Special Event (Runner-up)

I am pleased to endorse the ILOG team for their work in the transportation area, especially for their innovations and insights in providing reliable, high-quality, and affordable traveler information systems. Their work truly helps to move our field forward to the future.

Please feel free to contact me at lgray@paturndpike.com with any questions.

Sincerely,

Lorie Gray
Manager of Customer Communications
Pennsylvania Turnpike Commission





Larry Hogan
Governor
Boyd K. Rutherford
Lt. Governor
Gregory Slater
Secretary
Tim Smith, DE

June 5, 2020

To Whom it May Concern:

As the Systems Administrator for the emergency transportation management systems of the Maryland Department of Transportation State Highway Administration (MDOT SHA), I am pleased to submit this Letter of Reference for Skyline Technology Solutions, LLC.

Just to provide a little background, the Coordinated Highways Action Response Team (CHART) systems have been developed to be statewide traffic management and emergency operations systems, not limited to one or two specific corridors of high traffic volumes, but expandable to cover the entire State as funds, resources, and roadside equipment become available to support traffic and emergency management. CHART systems have evolved into a coordination focal point, able to identify incidents, congestion, construction, road closures and other emergency conditions; and then able to share data and coordinate response with various agencies, as necessary, to respond to recurring and non-recurring congestion and emergencies both natural and man-made. It also manages traffic flow with traveler advisories, and coordinates or aids in the cleanup and clearance of obstructions. CHART systems have a high level of interactive communication that include coordinating between jurisdictions, first responders, and the traveling public. CHART systems operate 7 day per week, 24 hours per day with the Systems performing internal processing and status checks to detect failed system components and resetting or reconfiguring themselves where appropriate, or notifying operators and/or maintenance staff where necessary for service.

Skyline has been an integral part of the MDOT SHA CHART program since 2010 where Skyline has provided their family of video transcoding and streaming products now known as Claris to provide the video transcoding and streaming infrastructure for our interagency video sharing as well as sharing live video to the public on the CHART 511 site (www.md511.maryland.gov.) During this time the video shared has grown many fold and become the backbone of the statewide Maryland MView Video sharing system. As of December 2018, video available to share day-to-day and for incident support in MView has increased from 847 in 2013 to over 11,300 from 60 organizations and include Police, Fire, EM, Parks, Schools, Universities, Learning Institutions, Hospitals, Rail, Transit, Transportation & mobile, portable, aerial, and marine video.

The best thing I can tell you about Skyline is they will take your biggest problems and will passionately attack them until solutions are found. Please let me know if I can help in any other way.

Sincerely,

Richard R. Dye, CHART Systems Administrator
Office of CHART & ITS Development



8.0 Appendix X – Mandatory and Desired Requirements Matrix

See Team Q-Free's Requirements Matrix in the pages that follow.

Section	Requirement ID	Description	Mandatory / Desirable	Meets Requirement / No Development	Meets Requirement / Additional Development	Meets Requirement / Alternative Approach	Vendor Response
General System Requirements	4.5.1.1	The ATMS solution shall be compatible with State of West Virginia software standards and security policies. The ATMS Solution shall be compatible with Microsoft products and State of West Virginia's acceptable user policy. Here's the link for those policies: West Virginia IT Policies: https://technology.wv.gov/security/Pages/policies-issued-by-the-cio.aspx Security Policy: https://technology.wv.gov/StateCollectionDocuments/Policies%20Issued%20by%20the%20CISO/2017%20IOO%201_Security_Sep2017.pdf	Mandatory	X			See in proposal above.
General System Requirements	4.5.1.2	Functionality of the proposed A TMS and 511 software and systems must be equivalent to or exceed the current functionality as described in the Background and Current Operating Environment Document and in any specific answers to questions submitted to WVDOT through this RFP process.	Mandatory	X			See in proposal above.
General System Requirements	4.5.1.3	The ATMS Vendor is required to maintain connectivity and key data transfer functionality, during any new or upgraded A TMS software and 511 system installations, between the WVDOT TMC located in Charleston, WV and the remote users and offices that provide information to and/or receive information from the TMC and associated ATMS and 511 software and systems. This includes the current E-911 centers located across the state the provide incident data directly to the A TMS platform and the event/incident window.	Mandatory	X			See in proposal above.
General System Requirements	4.5.1.4	The Vendor must provide a non-revocable and perpetual license to the WVDOT and its current in state partner agencies for the use of the ATMS software and its associated systems.	Mandatory	X			See in proposal above.
General System Requirements	4.5.1.5	The ATMS Vendor will be required to develop agreements with third party data providers, software providers, or other system providers required to make the ATMS functional.	Mandatory	X			See in proposal above.
General System Requirements	4.5.1.6	A copy of all manuals, diagrams, design documents, requirements documents, testing documentation, training materials, change configuration documentation, upgrades and other material associated with the ATMS software and all associated connections shall be provided to the WVDOT at Final Acceptance and as necessary through the term of the contract.	Mandatory	X			See in proposal above.
Traffic Display Maps/GUI	4.6.1.1	The ATMS shall display responder information tied to appropriate highway segment on the TMC operator GUI/traffic conditions map.	Mandatory	X			See in proposal above.
Traffic Display Maps/GUI	4.6.1.2	The ATMS shall support an interactive base map for displaying the ITS devices statewide.	Mandatory	X			See in proposal above.
Traffic Display Maps/GUI	4.6.1.3	The ATMS map shall support pan and zoom capabilities throughout the State of West Virginia and into adjoining states.	Mandatory	X			See in proposal above.
Traffic Display Maps/GUI	4.6.1.4	The ATMS shall display real-time traffic conditions using a standard color coding of green for uncongested conditions through yellow and amber for moderate congestion to red for high congestion on freeways and roadways shown on the map. Real-time latency shall be no more than 5 minutes.	Mandatory	X			See in proposal above.
Traffic Display Maps/GUI	4.6.1.5	The ATMS shall provide an icon for each type of ITS device identified as part of WVDOTITS.	Mandatory	X			See in proposal above.
Traffic Display Maps/GUI	4.6.1.6	The ATMS shall provide a layer for each type of ITS device identified as part of the WVDOT ITS.	Mandatory	X			See in proposal above.
Traffic Display Maps/GUI	4.6.1.7	The ATMS map shall provide declutter features to provide appropriate number or size of icons as maps are zoomed in or out consistent with layer selection.	Mandatory	X			See in proposal above.
Traffic Display Maps/GUI	4.6.2.1	The ATMS should have the ability to integrate and share data with neighboring states including CCTV video.	Desirable	X			See in proposal above.
Traffic Display Maps/GUI	4.6.2.2	The A TMS map should display all major freeways and streets with graphical representation for each roadway classification	Desirable	X			See in proposal above.
Traffic Display Maps/GUI	4.6.2.3	The ATMS should allow user selection of type of traffic measurement for near real-time traffic condition display including speeds, volume, occupancy, and (optionally) a combined traffic metric.	Desirable	X			See in proposal above.
Traffic Display Maps/GUI	4.6.2.4	The ATMS should allow selection of numerical limits associated with each display color for each type of traffic measurement by a user with sufficient authorization. These parameters should be applied to all traffic condition map/GUI displays.	Desirable	X			See in proposal above.
Traffic Display Maps/GUI	4.6.2.5	The A TMS should depict summary device status using coloration of appropriate ITS device icon with the corresponding ITS field device.	Desirable	X			See in proposal above.
Traffic Display Maps/GUI	4.6.2.6	The ATMS should be able to display detailed device information appropriate to the individual type of device upon selection of an icon from the map/GUI.	Desirable	X			See in proposal above.

Section	Requirement ID	Description	Mandatory / Desirable	Meets Requirement / No Development	Meets Requirement / Additional Development	Meets Requirement / Alternative Approach	Vendor Response
Traffic Display Maps/GUI	4.6.2.7	The ATMS base map should display neighboring states a minimum of 25 miles outside of state border or have the ability to pan to adjacent states.	Desirable	X			See in proposal above.
Traffic Display Maps/GUI	4.6.2.8	The user interface map display should display icons representing locations of traffic data sensors connected to the ATMS.	Desirable	X			See in proposal above.
Traffic Display Maps/GUI	4.6.2.9	The user interface map should enable operators to select traffic data sensors to view the most recent data recorded from the sensor.	Desirable	X			See in proposal above.
Traffic Display Maps/GUI	4.6.2.10	The user interface map should enable operators to select traffic data sensors to view archived data recorded from the sensor within user defined parameters.	Desirable	X			See in proposal above.
Traffic Display Maps/GUI	4.6.2.11	The ATMS base map should show traffic speeds by lane or as an average across all lanes in each direction (station) at user option.	Desirable	X			See in proposal above.
Traffic Display Maps/GUI	4.6.2.12	The ATMS base map should show traffic volume by lane or as a total across all lanes in each direction (station) at user option.	Desirable	X			See in proposal above.
Traffic Display Maps/GUI	4.6.2.13	The ATMS base map should show traffic occupancy by lane or as an average across all lanes in each direction (station) at user option.	Desirable	X			See in proposal above.
Dynamic Message Sign	4.7.1.1	The ATMS shall include and interface for Dynamic Message Sign (DMS) control and management.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.2	The ATMS shall communicate with each DMS connected to the ATMS to receive all parameters describing the DMS, as contained in NTCIP messages (as defined by NTCIP Object Definitions).	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.3	The ATMS shall display the parameters for each DMS as received from the standardized NTCIP message. The ATMS will adapt entered text and message library text to fit the specific DMS configuration, unless restricted by size.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.4	The ATMS shall include the capability for operators to control the messages that are displayed on fixed and portable DMS connected to the ATMS.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.5	The ATMS shall include logic to manage multiple agencies and users who might simultaneously attempt to control a common DMS through field and remote access.	Mandatory		X		See in proposal above.
Dynamic Message Sign	4.7.1.6	DMS control shall be dependent on appropriate user permissions.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.7	If a conflict between requested messages arise, the owning agency will have priority.	Mandatory		X		See in proposal above.
Dynamic Message Sign	4.7.1.8	If a conflict between requested messages arise and all conflicting requests are from the same agency, the system will grant the request of the user with the highest priority.	Mandatory		X		See in proposal above.
Dynamic Message Sign	4.7.1.9	The ATMS shall have the capability to alert an operator with an agency that owns a DMS if another agency posts a message to the DMS.	Mandatory		X		See in proposal above.
Dynamic Message Sign	4.7.1.10	The ATMS shall have the capability to alert an operator who has posted a DMS message if another operator has overridden the message by posting another message.	Mandatory		X		See in proposal above.
Dynamic Message Sign	4.7.1.11	The ATMS shall provide a mechanism for authorized users to control the messages displayed on DMS from remote locations.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.12	The ATMS shall include the capability for automated message creation.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.13	The ATMS shall include logic to manage conflicts between automatically generated messages (e.g. travel time displays etc.) and manually generated messages.	Mandatory	X			See in proposal above.

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Dynamic Message Sign	4.7.1.14	The ATMS shall include the capability to automatically generate messages for DMS to display Travel Times, as collected/calculated by the ATMS.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.15	The ATMS shall include DMS message libraries.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.16	The ATMS shall allow authorized users to select a message from any of the DMS message libraries.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.17	The A TMS shall allow authorized users to generate a message from free text.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.18	The ATMS shall allow for additional DMS message libraries to be generated by authorized users or edits to be made to the DMS message libraries.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.19	All messages from all the DMS message libraries shall be accessible from a master DMS message library.	Mandatory		X		See in proposal above.
Dynamic Message Sign	4.7.1.20	The ATMS shall allow authorized users to select that a DMS message be displayed on multiple selected DMS without needing to re-enter the message for each sign selected.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.21	The ATMS shall allow authorized users to select a DMS message, either standard or custom, for display on all signs controlled by the A TMS.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.22	The ATMS shall communicate with all legacy field devices currently used by WVDOT and future DMS procurements.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.23	The A TMS shall be able to display a predefined travel time message to a selected set of DMS and update the travel time estimate dynamically without user interaction.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.24	The ATMS user shall be able to save a new message in a message library.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.25	The ATMS user shall be able to choose a predefined message from message library, edit, and resave the message.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.26	The ATMS shall provide assistance in selecting standard DMS messages from the message library.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.27	The ATMS shall be able to send a message to one or more signs simultaneously.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.28	ATMS users shall be able to delete a message from the message library.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.29	The A TMS shall be able to terminate messages.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.30	The ATMS shall support daily automated diagnostic of DMS, including alarm generation based on diagnostic results, results logging, and results archival.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.31	The ATMS shall provide the ability to control and retrieve information from a DMS via NTCIP 1203v1.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.32	The ATMS shall provide the ability to control and retrieve information from a DMS using permanent DMS protocol(s).	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.33	The ATMS shall provide the ability to control and retrieve information from a DMS using portable DMS protocol(s).	Mandatory	X			See in proposal above.

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Dynamic Message Sign	4.7.1.34	The ATMS shall support storage and display of messages including uppercase alphanumeric characters and at minimum the following special characters: #&'+<> ? ,/- and arrows.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.35	The DMS Interface shall provide an interface for sequencing up to three line message panels as well as full matrix DMS, including graphics.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.1.36	The ATMS shall support the use of full color DMS and graphics.	Mandatory	X			See in proposal above.
Dynamic Message Sign	4.7.2.1	The ATMS may have a master library of DMS messages that may be sorted by the capability of DMS that an operator is placing a message on. When the operator selects a certain DMS, the message library available to that DMS may be restricted by the size and capability of that DMS.	Desirable	X			See in proposal above.
Dynamic Message Sign	4.7.2.2	The ATMS should support retrieval and display DMS status reports including at a minimum sign display content, illumination, pixel failures, power status communication status, and temperature. Fan error and humidity are highly desired, if available from field hardware.	Desirable	X			See in proposal above.
CCTV/Camera	4.8.1.1	The ATMS shall provide a mechanism for operators to view real-time video from CCTV cameras.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.2	The ATMS shall provide a mechanism for operators to control CCTV cameras (pan, tilt, zoom).	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.3	The ATMS shall include capability to set camera pre-sets.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.4	The ATMS will allow an operator to develop camera tours made up of views and presets from operator configurable cameras.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.5	The ATM shall include fine control of pan, tilt and zoom for CCTV cameras.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.6	The ATMS shall enable all users and TMC partner agencies with an ATMS client or workstation to view and control CCTV, according to their assigned user permissions.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.7	The ATMS shall determine rights and privileges of camera control based on permission and priority assigned to users by an administrator.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.8	The ATMS shall provide video recording capabilities.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.9	The ATMS shall control and allow viewing from both digital and analog cameras.	Mandatory	X			See in proposal above.

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CCTV/Camera	4.8.1.10	The ATMS shall interface with the workstation and video wall controller for the TMC video wall for viewing capability by operators.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.11	The ATMS shall enable operators to select the configuration of the video wall.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.12	The ATMS shall enable operators to select what camera feeds are displayed on specific portions of the video wall.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.13	The ATMS shall include capability to block selected cameras from selected viewers, while enabling other viewers to continue to view the camera video.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.14	The ATMS shall communicate with all legacy field devices currently used WVDOT.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.15	The ATMS solution shall control the distribution of all traffic images for internal and external use on the public website and 511 app.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.16	The ATMS solution shall collect and report current camera status, e.g. communication, image status, and PTZ status.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.17	The operator shall be able to select a camera from the CCTV menu or GUI map.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.18	The ATMS shall provide a demand indicator on the user's screen that will display when another authorized user requires control of the camera PTZ.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.19	The ATMS shall provide preset positions and the capability of programming a minimum of four (4) PTZ preset positions. The presets shall not be deleted/lost if the ATMS or camera software loses connection to the device.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.20	The ATMS shall display camera ID within the video image consisting of the name of the camera location at administrator option.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.21	The ATMS shall provide for the display of a camera control ID of the party controlling the camera control ID of the party controlling the camera when not in a preset position at administrator option.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.22	The ATMS shall provide a selectable time-out feature which is a programmable interval (range of 2 to 30 minutes) or event identification in which the camera must automatically return to a preset default position after the last camera control commands is received or the event is terminated.	Mandatory	X			See in proposal above.

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CCTV/Camera	4.8.1.23	The ATMS shall be capable of at least four independent camera tours consisting of display to a user-selected video monitor consisting of a user-selected camera and (optional) preset for display of a user-selected duration.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.24	The ATMS shall allow pan-tilt-zoom (PTZ) and focus and iris control by any authorized user.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.25	The ATMS shall validate that users have authorized access and priority for full camera control.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.26	The ATMS interface shall provide a mechanism for capturing still and moving video images from CCTV video streams in standard format such as JPEG and publishing them to the traffic web page.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.1.27	The ATMS shall allow for camera view access by television media with appropriate rights and restrictions.	Mandatory	X			See in proposal above.
CCTV/Camera	4.8.2.1	The ATMS should include capability to set camera pre-sets by time of day / day of week, season of the year, and by independent user.	Desirable	X			See in proposal above.
CCTV/Camera	4.8.2.2	The ATMS should manage conflicts between pre-sets selected by multiple users.	Desirable	X			See in proposal above.
CCTV/Camera	4.8.2.3	CCTV control from users accessing the ATMS from within the TMC should have a latency of no more than 0.5 second as defined by the time an operator executes a control command and when an operator is able to visually verify the command was completed on a workstation or video wall.	Desirable	X			See in proposal above.
CCTV/Camera	4.8.2.4	CCTV control from users accessing the ATMS from remote access should have a latency of no more than 0.5 second as defined by the time an operator executes a control command and when an operator is able to visually verify the command was completed on a workstation or video wall.	Desirable	X			See in proposal above.

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CCTV/Camera	4.8.2.5	The ATMS should interface to cameras operated by TMC partners on arterial roadways.	Desirable	X			See in proposal above.
CCTV/Camera	4.8.2.6	The ATMS should incorporate view restriction protocols (blackout zones).	Desirable		X		See in proposal above.
CCTV/Camera	4.8.2.7	The ATMS should provide an interface that allows operators to manage, control, and display multiple closed circuit television cameras including pan-tilt-zoom functions and manual camera functions available from the camera vendors where applicable. Camera image display must include simultaneous display of all cameras up to the number of monitors in the TMC.	Desirable	X			See in proposal above.
CCTV/Camera	4.8.2.8	The ATMS should allow reclamation of control of a camera being demanded by other users based on user privilege levels.	Desirable	X			See in proposal above.
RWIS	4.9.1.1	The ATMS shall monitor weather data from the field devices and set threshold levels for conditions that must be posted on the GUI and integrated with the notification system.	Mandatory	X			See in proposal above.
RWIS	4.9.1.2	The ATMS shall accept weather sensor data coming from existing and future environmental sensors and systems. (Note: Current system is Vaisala; however, may have different options in the future)	Mandatory	X			See in proposal above.
RWIS	4.9.1.3	The ATMS shall log RWIS data for operational retrieval and reporting purposes.	Mandatory	X			See in proposal above.
RWIS	4.9.1.4	The ATMS shall support daily automated diagnostics for field RWIS device, including alert generation based on diagnostic results and results logging.	Mandatory		X		See in proposal above.
RWIS	4.9.2.1	The ATMS should enable viewing of RWIS cameras.	Desirable	X			See in proposal above.
RWIS	4.9.2.2	The ATMS should provide an alert to operators when user defined thresholds are met. e.g. The pavement temperature drops below 32 degrees F.	Desirable	X			See in proposal above.
Data Sensors	4.9.3.1	Although WVDOT does not currently have any data collection sensors in use, they desire this functionality in the future. A detector device control application should be available if and when WVDOT installs detectors.	Desirable	X			See in proposal above.
Data Sensors	4.9.3.2	The ATMS should have the ability to integrate with and accept data from 3rd party data providers such as Waze, HERE, Inrix, etc. or approved equal.	Desirable	X			See in proposal above.
Data Sensors	4.9.3.3	The ATMS should provide an interface that allows operators to manage and view a summary of information from roadway sensors to the present status of the entire roadway network including a summary of individual traffic variables (speed, volume, occupancy, or a combined congestion metric) and the status (functional or nonfunctional) of all traffic sensors.	Desirable	X			See in proposal above.
Data Sensors	4.9.3.4	The ATMS should display an alarm notification when traffic speeds drop, volume rises, or occupancy increases beyond configurable thresholds.	Desirable	X			See in proposal above.
Data Sensors	4.9.3.5	The ATMS should update the 511 website interface with information including a summary of individual traffic variables (speed, volume, occupancy, or a combined congestion metric).	Desirable	X			
Data Sensors	4.9.3.6	The ATMS should update the ATMS traffic conditions map/GUI with measurements from traffic sensors and derived traffic variables on a frequency of once per minute or more frequent with data that have been collected two minutes or less prior.	Desirable	X			See in proposal above.
Data Sensors	4.9.3.7	The ATMS should automatically measure or calculate volume, traffic speeds, and occupancy.	Desirable	X			See in proposal above.

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Data Sensors	4.9.3.8	The ATMS should calculate and be able to display vehicle classification information.	Desirable	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.1	The A TMS shall provide a mechanism for operators to manage incidents and events through a dialog box or user interface.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.2	The ATMS shall store and provide operators with access to event information (incidents, construction/maintenance, parking, etc.) as entered by users.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.3	The ATMS shall provide a mechanism for operators to enter/create new incidents or events. Data to be entered may include, but not be limited to: type, location (jurisdiction, route, milepost, direction, lat-long, exit number), source, details, impacts, agencies to notify, response, narrative/comments, activity log, lane configuration, lane impacts, and severity.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.4	Users shall have the option to select from pre-defined phrase to describe the incident or event.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.5	Users shall have the option to enter free text to describe the incident or event.	Mandatory		X		
Event/Incident Management & Reporting	4.10.1.6	Users shall have the option to enter free text to describe the incident or event for descriptions posted to 511.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.7	Users shall be required to specify the location of the incident either through data entry or pin-dropping on a map such that the A TMS can capture the location of the incident relative to the route, direction and location (milepost and/or lat-long).	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.8	Users shall be required to enter the start and end time of the incident or event.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.9	The ATMS shall allow incident or event start times in the future to be entered and pre-defined actions to take place (e.g. construction events are often entered before the start time).	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.10	Authorized users shall be able to edit incident reports.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.11	Authorized users shall be able to edit incident reports created by any user in the system.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.12	Authorized users shall be able to edit incident reports received by the ATMS from external systems.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.13	The ATMS shall provide a mechanism for entry and edit of construction information as a specific type of incident/event.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.14	Authorized users shall be able to create construction/maintenance event reports in the ATMS.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.15	Authorized users shall be able to edit construction/maintenance event reports, including changing the status from active to inactive.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.16	The ATMS shall include capability for operators to enter and update construction and maintenance activities for private utilities that will impact travel on public roads.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.17	The ATMS event management system shall include capability to generate and send alerts to WVDOT partner agencies and personnel.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.18	The A TMS shall provide a mechanism for operators to edit incidents, regardless of the source of the incident.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.19	The ATMS shall display the location of fixed ITS devices that are integrated in to the ATMS.	Mandatory	X			See in proposal above.

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Event/Incident Management & Reporting	4.10.1.20	The ATMS shall display the location of portable devices that are either reporting data to the ATMS (including location) or have been entered/configured in the ATMS by operator.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.21	The ATMS shall maintain an incident log that records the date/time stamps of operator's actions and data entry.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.22	The ATMS shall provide a mechanism for entry and edit of truck parking information from existing truck parking systems on 1-81 and future systems. (Note: Currently the entry and edit of truck parking information is a function used in the existing ATMS system.)	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.23	The ATMS shall include capability of accepting truck parking occupancy data for parking lots.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.24	The ATMS shall accept and handle truck parking occupancy data for multiple lots and distinguish the lots in display to operators.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.25	The ATMS shall include capability to receive incident reports from external systems.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.26	The ATMS shall include functionality to receive incidents from various 911 centers and law enforcement CAD systems and software.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.27	The ATMS shall include functionality to detect incidents using incident detection algorithms and available data.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.28	The ATMS shall include capability to process active incidents against internal logic to determine action plans to be performed.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.29	The ATMS shall provide a mechanism for operators or administrators to create and edit action plans to include recommended activities to be performed for a variety of types of incidents and other events (special events, weather events, construction activities, maintenance activities).	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.30	The ATMS event management plans shall include both automated and manual activities (manual are displayed to operators for them to perform).	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.31	The event management plans shall evaluate current incident/event reports against thresholds and recommended one or more activities to operators.	Mandatory		X		See in proposal above.
Event/Incident Management & Reporting	4.10.1.32	When activities are recommended to operators, operators shall have a mechanism to accept, decline, or edit and accept the recommendations.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.33	The ATMS shall perform the activities that are recommended and accepted (with or without editing) by operators.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.34	The thresholds controlling the ATMS event management plans shall be adjustable by operators or administrators.	Mandatory		X		See in proposal above.
Event/Incident Management & Reporting	4.10.1.35	The thresholds controlling the ATMS event management plans shall allow for time of day, day of week, time of year settings.	Mandatory		X		See in proposal above.
Event/Incident Management & Reporting	4.10.1.36	ATMS events can be programmed for future events and associate DMS devices and messages to be used with that future event.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.37	The ATMS event management plans shall include control of DMS.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.38	The DMS event management plans shall automatically recommend messages to be displayed on signs based on incident and event attributes.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.39	The ATMS event management plans shall allow authorized users to program messages for DMS and 511 to be presented by time of day.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.40	The time of day messages in event management plans shall be able to be overridden by authorized users.	Mandatory	X			See in proposal above.

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Event/Incident Management & Reporting	4.10.1.41	The ATMS event management plans shall include standard operating procedures to operators to follow, based on the type and location of the event.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.42	The ATMS shall have the ability to automatically send an event alert message to selected recipients upon incident confirmation via automated event notification.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.43	The ATMS shall display active events as symbols (icons) located next to the associated link on the traffic Conditions map/GUI.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.44	The ATMS shall provide users the ability to initiate the editing, confirmation, and termination of events by selecting the graphic object from the traffic conditions map/GUI.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.45	The ATMS shall provide the ability to view an active event report containing a listing of all events active at the time of the report request including summary information about each event.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.46	The ATMS shall provide users the ability to assign (add/remove) field devices to an event. The field device shall remain assigned to that event until the event is terminated, the device is removed, or the device is added to another event.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.47	The ATMS shall provide users the ability to reactivate a terminated event.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.48	The ATMS shall distribute all event data to WVDOT authorized users.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.49	The ATMS shall provide the user with a request to confirm before an event is terminated.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.50	The ATMS shall record date and time of device access, system user, action taken, messages posted to device and error logs by event or by operator.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.51	The ATMS shall identify DMS devices for use in display of specific message set(s) in response to an event.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.52	The ATMS shall provide a user interface to accept, modify or decline the identified ITS devices suggested by the system in response to an event.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.53	The ATMS shall provide a user interface to initiate or inhibit display of DMS messages with and allow user modification of DMS messages in response to an event.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.1.54	The ATMS shall provide the ability to create test events that are not transmitted outside of the TMC or to devices for the purpose of training of operators.	Mandatory	X			See in proposal above.
Event/Incident Management & Reporting	4.10.2.1	The ATMS should provide a mechanism for automated interface with RWIS and entry and edit of weather reports as a specific type of incident/event.	Desirable	X			See in proposal above.
Event/Incident Management & Reporting	4.10.2.2	The ATMS should provide a mechanism for entry and edit of holiday based restrictions as a specific type of incident/event.	Desirable	X			See in proposal above.
Event/Incident Management & Reporting	4.10.2.3	The ATMS should allow multiple authorized users to edit event data at the same time and save dynamically. A conflict resolution scheme is to be proposed.	Desirable		X		See in proposal above.
Event/Incident Management & Reporting	4.10.2.4	The ATMS should provide a mechanism for entry and edit of permanent freight specific information related to height, width, and load rating as it pertains to specified routes, locations and/or direction of travel.	Desirable	X			See in proposal above.
Event/Incident Management & Reporting	4.10.2.5	The ATMS should include capability for operators to enter temporary weight, width, and height restrictions for commercial vehicles.	Desirable	X			See in proposal above.
Event/Incident Management & Reporting	4.10.2.6	The ATMS event management plans should include user creation of detour routes.	Desirable	X			See in proposal above.

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Event/Incident Management & Reporting	4.10.2.7	The ATMS should allow users to drag and drop event icons within the traffic conditions map/GUI and associate the event with the nearest roadway and/or cross street.	Desirable	X			See in proposal above.
Traveler Information	4.11.1.1	The ATMS shall provide a data stream to be accessed by the 511 website to share data for display on the 511 website and 511 app.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.2	The data sharable with the 511 website and 511 app shall include all traveler information reports (incidents, construction, events, freight, parking) entered, received, or edited in the ATMS.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.3	The data sharable with the 511 website and 511 app shall include CCTV video images captured by cameras connected to the ATMS.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.4	The data sharable with the 511 website and 511 app shall include DMS messages posted to DMS connected to the ATMS.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.5	The ATMS shall provide a data stream to be accessed by third party traveler information dissemination entities.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.6	The data sharable with the 3rd Party Information Dissemination entities shall include all traveler information reports (incidents, construction, events, freight, parking) entered, received, or edited in the ATMS.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.7	The data sharable with the 3rd Party Information Dissemination entities shall include CCTV camera images captured by cameras connected to the ATMS.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.8	The data shareable with the 3rd Party Information Dissemination entities shall include DMS messages posted to DMS connected to the ATMS.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.9	The ATMS shall be upward expandable to cover increased coverage areas.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.10	The ATMS shall provide for a highway conditions, including trend data, reporting system that can be accessed by authorized users with ATMS software or application access.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.11	The ATMS highway conditions reporting system shall have the ability to enter road conditions for multiple locations or the entire state or an entire district all at once versus having to enter conditions for each segment of road one by one.	Mandatory		X		See in proposal above.
Traveler Information	4.11.1.12	The ATMS shall have the ability to create warnings of commercial vehicle and oversize/overweight restrictions due to closures, width restrictions/height restrictions, construction and maintenance.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.13	The ATMS Vendor shall provide a telephony and web-based 511 system to meet or exceed the capabilities of the current 511 system used by WV DOT.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.14	The 511 system shall have the ability to provide public safety alerts and announcements at the beginning of a call based on the location entered or statewide on all calls.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.15	The ATMS shall transfer data useful for traveler information into WV DOT's 511 system for access by the general public. Data shall include at a minimum event-related data provided by the highway condition reporting system, relevant data obtained from ITS field devices, NWS weather alerts, weather forecast, and estimated travel times.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.16	The ATMS shall provide a mobile application with a hands-free option for the 511 system in order to maintain adherence to restrictions on use of phones while driving in West Virginia.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.17	The ATMS shall provide a mechanism for automatically publishing data and video images from multiple sources to the WV DOT 511 as well as various traveler information web sites at specific intervals.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.18	The ATMS shall transmit highway conditions reporting data to the 511 system.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.19	The ATMS shall display condition and device data for 511 website distribution with maximum of 5 minutes of data latency.	Mandatory	X			See in proposal above.

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Traveler Information	4.11.1.20	The ATMS shall provide a graphical map of the state or selected region for displaying the WVDOT's ITS devices and select summary and status information suitable for 511 website display compatible with common web browsers.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.21	The 511 map shall display for internet distribution all major freeways and streets within the state's boundaries with distinct graphical representation for each roadway classification.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.22	The 511 map shall display near real-time traffic speeds using a standard color coding of green for uncongested conditions through yellow and amber for moderate congestion to orange and reds for high congestion on freeways located within the state. This data can come from 3 rd party providers.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.23	The 511 map display shall provide map navigation tools (zoom in/out icons, window box, layer control toggles, status of equipment).	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.24	The 511 map shall display for internet distribution the appropriate information being supplied by corresponding ITS devices including at minimum full motion video images from cameras, sign display for DMS, and data from RWIS.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.25	The 511 website shall provide a menu to select which ITS devices to display (layer controls).	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.26	The 511 website shall provide a legend to explain which ITS devices are being displayed.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.27	The 511 map shall provide a legend to explain the near real-time traffic speed colors being displayed.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.28	The ATMS shall automatically refresh the real-time traffic speed display on 511 at a minimum frequency of 30 seconds.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.29	The ATMS shall be capable of distributing color and black and white video images to WVDOT's 511 website.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.30	The 511 telephony system, including the 511 system as well as the communication capability, shall have the ability to handle an average of 200 to 300 calls per day and allow for a peak usage of 5,000 to 6,000 calls per day. Vendor is to propose how they would meet this requirement or provide an alternate solution.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.31	The 511 shall graphically provide the location of each camera and a representation to show the user what direction the camera is facing.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.32	The 511 system shall have the ability to add additional routes in the future beyond what is covered by current 511 system now.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.33	The 511 website shall provide a linked text-based list of primary website content for selection by users.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.34	The 511 website shall allow users to select cameras and DMS for a specified region of the state or by major roadway and accident or construction/work zone information for a specified region of the state or by major roadway.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.35	No Adobe flash content is to be used on the 511 website, 511 mobile website or 511 application.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.36	The 511 website shall provide a link to specific WVDOT construction projects/special projects/studies information sites.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.37	The 511 website shall be smart-phone/mobile phone accessible and shall be adapted to work in both a desktop and mobile format with all content that is available on desktop version available on mobile version.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.38	The 511 mobile website and the 511 app shall have a warning banner regarding use while driving and disclaimer similar to one used on the current WV511 app.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.39	The 511 website and 511 app shall be updated as necessary as operating systems used by mobile phone providers are updated. Vendor is to verify impacts to functionality if new OS releases are anticipated and maintain functionality through updates to software as required with new OS updates or versions.	Mandatory	X			See in proposal above.

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Traveler Information	4.11.1.40	The 511 website shall be capable of being imbedded into other HTML documents, or mirrored by other websites, with 511 logos intact as an inline Frame (iframe) or similar.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.41	The camera image displayed on the 511 website and exported to external users shall have a customizable graphic overlay that will identify the source of the images.	Mandatory	X			See in proposal above.
Traveler Information	4.11.1.42	The data sharable with the 511 website and 511 app should include freeway traffic speed indicators.	Desirable	X			See in proposal above.
Traveler Information	4.11.1.43	The data sharable with the 511 website and 511 app should include arterial traffic speed information gathered by the ATMS or 3rd party provider.	Desirable	X			See in proposal above.
Traveler Information	4.11.1.44	The data sharable with the 3rd Party Information Dissemination entities should include freeway occupancy. (if available)	Desirable	X			See in proposal above.
Traveler Information	4.11.1.45	The data sharable with the 3rd Party Information Dissemination entities should include arterial traffic speed information gathered by the ATMS. (if available)	Desirable	X			See in proposal above.
Traveler Information	4.11.1.46	The ATMS should include capability of generating the messages to display travel time estimates for DMS locations in the network.	Desirable	X			See in proposal above.
Traveler Information	4.11.1.47	The ATMS should provide a mechanism to automatically post travel time estimates to DMS.	Desirable	X			See in proposal above.
Traveler Information	4.11.1.48	The ATMS should have the ability to push commercial vehicle and OS/OW restrictions to subscribers.	Desirable	X			See in proposal above.
Traveler Information	4.11.1.49	The ATMS highway conditions reporting system should be able to provide roadway condition reporting to local roads in addition to major US and state routes.	Desirable	X			See in proposal above.
Traveler Information	4.11.1.50	The 511 website should provide for individual public users to create user accounts and customize travel route alerts to notify them of incident, events or unusual congestion along their designated travel route(s) and display specified camera images related to that route.	Desirable	X			See in proposal above.
Traveler Information	4.11.1.51	The ATMS should allow selection of numerical limits associated with each display color for each type of traffic measurement by an ATMS user with sufficient authorization. These parameters should be applied to display generation for the 511 website.	Desirable			X	See in proposal above.
Traveler Information	4.11.1.52	The 511 website should incorporate a banner scrolling along the bottom of the WV 511.org page that will allow ATMS operators to enter text for unique events and emergency notifications.	Desirable	X			See in proposal above.
Traveler Information	4.11.1.53	The 511 phone system to have a comprehensive vocabulary for text to voice system or more intuitive interpretation of what the operator types in to the system. (e.g. if the operator types "SB", 511 system should know that means southbound versus having to type the words out.)	Desirable	X			See in proposal above.
Traveler Information	4.11.1.54	The ATMS should require varying levels of administration rights on the 511 website from view only to super user.	Desirable	X			See in proposal above.
Traveler Information	4.11.1.55	The data sharable with the 3rd Party Information Dissemination entities should include freeway traffic speed. (if available)	Desirable	X			See in proposal above.
Integration with Other Systems	4.12.1.1	The ATMS shall establish and maintain connections with existing external systems.	Mandatory	X			See in proposal above.
Integration with Other Systems	4.12.1.2	The ATMS shall operate and report system diagnostics to enable operators to confirm that communications to external systems are functioning properly.	Mandatory	X			See in proposal above.
Integration with Other Systems	4.12.1.3	The ATMS shall operate and report system diagnostics to enable operators to confirm that communications to external field devices are functioning properly.	Mandatory	X			See in proposal above.
Integration with Other Systems	4.12.1.4	The ATMS shall incorporate center to center standards enabling standardized data exchange with other systems and agencies.	Mandatory	X			See in proposal above.

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Integration with Other Systems	4.12.1.5	The A TMS shall provide traffic data to West Virginia 511 system, website and 511 app.	Mandatory	X			See in proposal above.
Integration with Other Systems	4.12.1.6	The ATMS shall have the ability to establish, maintain, and exchange data with CAD systems operated by 911 centers and law enforcement agencies within the State of West Virginia.	Mandatory	X			See in proposal above.
Integration with Other Systems	4.12.1.7	The ATMS shall receive CAD incident reports and make them available to authorized users through the ATMS user interface.	Mandatory	X			See in proposal above.
Integration with Other Systems	4.12.1.8	The A TMS shall be able to share ATMS functionality with the WVPA (West Virginia Parkway Authority) offices.	Mandatory	X			See in proposal above.
Integration with Other Systems	4.12.1.9	The A TMS shall integrate with the current Citilog video analytics system in order to provide data related to wrong-way driver incident and stopped vehicle detection.	Mandatory	X			See in proposal above.
Integration with Other Systems	4.12.2.1	The A TMS should integrate with external agencies' systems using standardized Center to Center communication protocols.	Desirable	X			See in proposal above.
Integration with Other Systems	4.12.2.2	The A TMS should have the ability to integrate the fog warning/conditions system to activate a DMS.	Desirable	X			See in proposal above.
Integration with Other Systems	4.12.2.3	The A TMS should have the ability to access to OES flood gauge monitoring system. (IFLOWS) (Note: This desirable is for monitoring only.)	Desirable		X		See in proposal above.
Integration with Other Systems	4.12.2.4	For optional interfaces not incorporated into the ATMS the ATMS should provide a means to initiate the external software from within the ATMS and must log the initiation and termination of the external software.	Desirable	X			See in proposal above.
Integration with Other Systems	4.12.2.5	The ATMS should be able to share ATMS functionality with the West Virginia State Police Troop locations and dispatch centers.	Desirable	X			See in proposal above.
Integration with Other Systems	4.12.2.6	The ATMS should have the ability to integrate West Virginia weigh station offices through on-site video monitoring and providing access to the ATMS software application.	Desirable	X			See in proposal above.
Operator and User Features	4.13.1.1	The ATMS shall enable multiple users to be logged in simultaneously	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.2	The A TMS shall enable users to access the system from locations remote from theTMC.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.3	The ATMS user interface shall display alerts and notifications to users.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.4	The A TMS user interface shall enable users to view the identification of other users that are logged in to the system.	Mandatory		X		See in proposal above.
Operator and User Features	4.13.1.5	The A TMS shall alert operators when users log in or log off the system.	Mandatory		X		See in proposal above.
Operator and User Features	4.13.1.6	The activities performed in the ATMS by other users shall be visible to all other users with the appropriate authority.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.7	The ATMS user interface shall include map display for both local and remote work stations.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.8	User interface maps shall be GIS based to enable smooth and continuous scrolling and zooming.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.9	User interface maps shall include functionality to hide layers or attributes at wide zoom levels to avoid map clutter.	Mandatory	X			See in proposal above.

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Operator and User Features	4.13.1.10	The A TMS shall provide a mechanism for operators and users to select what is displayed on the map (e.g. make DMS visible or not visible on the map, make CCTV visible or not visible on the map).	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.11	The ATMS user interface maps shall display active incidents (construction, incidents, etc.).	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.12	The ATMS user interface maps shall enable operators to select an incident icon to open and view information describing the incident.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.13	The ATMS user interface maps shall display icons representing both fixed and portable device locations.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.14	The user interface map display of DMS shall distinguish DMS that are not currently connected or operational from those that are operational and connected to the ATMS and ready to receive a message from the ATMS.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.15	The on-screen map shall distinguish between fixed and portable DMS.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.16	The user interface maps shall enable operators to select DMS to view current messages displayed on the signs.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.17	The user interface maps shall enable authorized users to select DMS to control the current messages displayed on the signs.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.18	The user interface map display shall display icons representing locations of all CCTV connected to the A TMS	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.19	The user interface shall enable authorized users to select CCTV to pan, tilt, and zoom the CCTV cameras.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.20	The user interface shall enable operators to select CCTV cameras to view realtime video from the cameras.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.21	The user interface shall enable operators to open multiple cameras simultaneously, viewing real-time video from each camera.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.22	The user interface shall allow operators to turn map layers on and off.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.23	The user interface map display shall display icons representing locations of weather stations supplying information to the ATMS.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.24	The user interface shall enable operators to select weather stations to view the current status of the weather station.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.25	The user interface shall enable operators to view the locations and status of portable ITS devices.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.26	The ATMS shall display device status data on the map display.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.27	The A TMS shall have the capability of displaying real-time data that is collected by field devices and made available to the ATMS.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.28	The ATMS user interface shall provide a mechanism for operators to manage multiple events simultaneously (e.g. toggling back and forth between).	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.29	The ATMS user interface shall enable operators to request and view diagnostics of the System. (Note: The user should receive the following diagnostic information: status display IE, temp, power, pixels, out. door open, fan on, etc...)	Mandatory	X			See in proposal above.

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Operator and User Features	4.13.1.30	The A TMS user interface shall enable users to view the operational status of field devices and other systems connected to the A TMS.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.31	Operators shall have a mechanism to initiate the A TMS to ping field devices to detect if communications and field devices are responding properly.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.32	The ATMS administrators shall be able to set minimum thresholds, such that operators cannot set their thresholds below the value.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.33	The ATMS user interface shall enable administrators to assign permissions to users.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.34	The ATMS shall import specific traffic operations related CAD data so that it can be made available to the ATMS user and used to create events within the ATMS.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.35	The user interface shall enable operators to view parking information made available to the ATMS.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.36	The ATMS user interface shall provide a mechanism for operators to view standard operational procedures to be used while responding to events or incidents.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.37	The ATMS shall provide prescribed response scenarios or automation tools to assist users in controlling multiple devices quickly, consistently, and with limited manual input.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.38	The ATMS shall provide a means of organizing devices into logical groupings or zones.	Mandatory			X	See in proposal above.
Operator and User Features	4.13.1.39	The ATMS shall provide spell check, text wrapping, and copy/out/paste capabilities for all operator typed entry.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.1.40	The ATMS user interface shall enable users to view the status of communication with field devices and other system connected to the A TMS.	Mandatory	X			See in proposal above.
Operator and User Features	4.13.2.1	The A TMS user interface should include tailored windows for each user, based on login.	Desirable	X			See in proposal above.
Operator and User Features	4.13.2.2	The user preferences to determine the interface presented should be set by users.	Desirable	X			See in proposal above.
Operator and User Features	4.13.2.3	Alerts and notifications should be tailored to each user based on preferences established by each user.	Desirable		X		See in proposal above.
Operator and User Features	4.13.2.4	The ATMS should provide a mechanism for authorized users to send and receive instant messages with other users while logged into the system. These messages should be capable of allowing attachments.	Desirable			X	See in proposal above.
Operator and User Features	4.13.2.5	The A TMS user interface maps should display traffic flow maps.	Desirable	X			See in proposal above.
Operator and User Features	4.13.2.6	Flow maps displayed on the ATMS user interface should integrate freeway and arterial conditions on one common map display.	Desirable	X			See in proposal above.
Operator and User Features	4.13.2.7	Flow maps should have the capability to display speed data.	Desirable	X			See in proposal above.
Operator and User Features	4.13.2.8	Flow maps should have the capability to display freeway occupancy data.	Desirable	X			See in proposal above.
Operator and User Features	4.13.2.9	The ATMS should integrate information between incident reports and construction maintenance reports.	Desirable		X		See in proposal above.

Section	Requirement ID	Description	Mandatory / Desirable	Meets Requirement / No Development	Meets Requirement / Additional Development	Meets Requirement / Alternative Approach	Vendor Response
Operator and User Features	4.13.2.10	The ATMS user interface map display should provide a mechanism for operators to view the location of systems and field devices monitored but not controlled by the ATMS.	Desirable	X			See in proposal above.
Operator and User Features	4.13.2.11	Real-time display should include volume data.	Desirable	X			See in proposal above.
Operator and User Features	4.13.2.12	Real-time volume data display should be able to be displayed by individual lane.	Desirable	X			See in proposal above.
Operator and User Features	4.13.2.13	The ATMS should display aggregated real-time volume data by direction at a station's location.	Desirable	X			See in proposal above.
Operator and User Features	4.13.2.14	Real-time display should include occupancy data.	Desirable	X			See in proposal above.
Operator and User Features	4.13.2.15	Real-time occupancy data display should be able to be displayed by individual lane.	Desirable	X			See in proposal above.
Operator and User Features	4.13.2.16	The ATMS should be able to display average real-time occupancy data for all lanes by direction at a station's location.	Desirable	X			See in proposal above.
Operator and User Features	4.13.2.17	The ATMS should be able to display average real-time speed data for all lanes by direction at a detector's location.	Desirable	X			See in proposal above.
Operator and User Features	4.13.2.18	Operators should be able to adjust threshold values for when to receive notices and alerts.	Desirable		X		See in proposal above.
Operator and User Features	4.13.2.19	Operators/ users should use thresholds to control what types of alerts they receive. For example, operators may decide not to receive alerts of technical failures while technical support may opt to receive technical failure alerts.	Desirable		X		See in proposal above.
Operator and User Features	4.13.2.20	The ATMS user interface maps should display pre-planned detour routes.	Desirable	X			See in proposal above.
Operator and User Features	4.13.2.21	The user interface map display should display icons representing locations of all variable speed displays connected to the ATMS.	Desirable	X			See in proposal above.
Operator and User Features	4.13.2.22	The user interface should enable operators to select variable speed displays and view the current status of the sign.	Desirable	X			See in proposal above.
Operator and User Features	4.13.2.23	The user interface should enable authorized users to select variable speed display sign icons and change the status of the variable speed display.	Desirable	X			See in proposal above.
Operator and User Features	4.13.2.24	The ATMS should provide the ability for the operator to display snap shot images from RWIS camera or other digital still image sources on any combination of workstation or video display monitors within the TMC.	Desirable	X			See in proposal above.
Data Collection & Archiving	4.14.1.1	The ATMS shall have a data archiving capability that stores and provides access to historical data. Data is to be collected from ITS field devices and from system users both in normal operation and during the management of planned and unplanned events. WVDOT has a 5 year data retention requirement.	Mandatory	X			See in proposal above.
Data Collection & Archiving	4.14.1.2	The ATMS shall provide operational data to calculate performance measures for both system utilization (including such items as number of events managed, amount of public access, and amount of staff access) and system performance (including such items as server up time, field device up time, communication reliability, and field device command responsiveness).	Mandatory	X			See in proposal above.
Data Collection & Archiving	4.14.1.3	The ATMS shall have the ability to import data from third party providers.	Mandatory	X			See in proposal above.
Data Collection & Archiving	4.14.1.4	The ATMS shall have the ability to display and use real-time third-party data similar to data collected from field devices.	Mandatory	X			See in proposal above.
Data Collection & Archiving	4.14.1.5	The ATMS data archive shall have an analytics package.	Mandatory		X		See in proposal above.

Section	Requirement ID	Description	Mandatory / Desirable	Meets Requirement / No Development	Meets Requirement / Additional Development	Meets Requirement / Alternative Approach	Vendor Response
Data Collection & Archiving	4.14.1.6	The Analytic Package shall enable users to access and view the archived data.	Mandatory		X		See in proposal above.
Data Collection & Archiving	4.14.1.7	The Analytics Package shall enable users to request and view data analyses and specify a time-slice over an operator defined time period.	Mandatory		X		See in proposal above.
Data Collection & Archiving	4.14.1.8	Data analytics shall include functionality to compute and display 24 hours traffic volumes.	Mandatory		X		See in proposal above.
Data Collection & Archiving	4.14.1.9	The ATMS shall enable portions of data to be excluded from public access.	Mandatory	X			See in proposal above.
Data Collection & Archiving	4.14.1.10	The A TMS shall enable manual loading of collected data through an operator entry mechanism.	Mandatory		X		See in proposal above.
Data Collection & Archiving	4.14.2.1	The historical data in the archive should include traffic volume data, whether from sensors or third party data sources.	Desirable	X			See in proposal above.
Data Collection & Archiving	4.14.2.2	Traffic volume data should be stored by individual lane.	Desirable	X			See in proposal above.
Data Collection & Archiving	4.14.2.3	The historical data in the archive should include traffic occupancy data.	Desirable	X			See in proposal above.
Data Collection & Archiving	4.14.2.4	Traffic occupancy data should be stored by individual lane.	Desirable	X			See in proposal above.
Data Collection & Archiving	4.14.2.5	The historical data in the archive should include traffic speed data	Desirable	X			See in proposal above.
Data Collection & Archiving	4.14.2.6	Traffic speed data should be stored by individual lane.	Desirable	X			See in proposal above.
Data Collection & Archiving	4.14.2.7	The historical data in the archive should include traffic travel time data.	Desirable	X			See in proposal above.
Data Collection & Archiving	4.14.2.8	The historical data in the archive should include traffic data that is collected and made available by any roadway within the TMC partner jurisdictions.	Desirable	X			See in proposal above.
Data Collection & Archiving	4.14.2.9	The historical data in the archive should include location and status of portable ITS devices for times when the devices are providing data to or being controlled by the ATMS.	Desirable	X			See in proposal above.
Data Collection & Archiving	4.14.2.10	Archive ATMS data should be available to partner agencies for download from an on-line access location.	Desirable		X		See in proposal above.
Data Collection & Archiving	4.14.2.11	Tot: ATMS should calculate and store travel times based on available speed data.	Desirable	X			See in proposal above.
Data Collection & Archiving	4.14.2.12	The ATMS should calculate and store Travel Time Index, based on available speed data and free flow data. *WVVDOT has a 5-year data retention requirement.	Desirable		X		See in proposal above.
Data Collection & Archiving	4.14.2.13	The ATMS should have a parameter for each third-party provider that can be set to use or not use the third party data as if it was collected from field detectors.	Desirable	X			See in proposal above.
Data Collection & Archiving	4.14.2.14	Data analytics should include functionality to compute and display Travel Time Reliability information.	Desirable		X		See in proposal above.
Data Collection & Archiving	4.14.2.15	Travel Time Reliability displays should include reliability by different vehicle classifications, as they are reported to the ATMS.	Desirable		X		See in proposal above.

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Data Collection & Archiving	4.14.2.16	Data analytics should be automated to the extent possible to support established performance measure reporting needs of the TMC and/or partner agencies. (Note: This should include incident and clearance times, lanes closed, all applicable incident date, monthly and yearly reports)	Desirable		X		See in proposal above.
Data Collection & Archiving	4.14.2.17	The ATMS should include multiple data reporting formats/templates.	Desirable	X			See in proposal above.
Data Collection & Archiving	4.14.2.18	The ATMS should accept data for long term storage on a continuous basis without operation action.	Desirable	X			See in proposal above.
Data Collection & Archiving	4.14.2.19	The ATMS should make archived data available in an online database for a user definable period.	Desirable		X		See in proposal above.
Data Collection & Archiving	4.14.2.20	Data analytics should include functionality to compute and display mobile source emissions information if data is collected and provided to the ATMS.	Desirable		X		See in proposal above.
Notifications & Alarms	4.14.3.1.1	The ATMS shall have and notification built into the system.	Mandatory	X			See in proposal above.
Notifications & Alarms	4.14.3.1.2	The ATMS shall provide a single integrated interface, available from any TMC workstation, that allows operators to set threshold conditions for various devices or other user definable conditions such that when threshold conditions are met or exceeded, alarms will be generated notifying the operator of the presence of such condition. At a minimum, data elements available for alarm generation will include traffic measurements, detected incidents, weather measurements, and device status.	Mandatory	X			See in proposal above.
Notifications & Alarms	4.14.3.1.3	The ATMS shall provide the mechanism for users to select filters for alerts and notifications.	Mandatory		X		See in proposal above.
Notifications & Alarms	4.14.3.1.4	The alert and notification filters shall be based on type of filter, device, type of device, time of day, and jurisdiction.	Mandatory		X		See in proposal above.
Notifications & Alarms	4.14.3.1.5	Users shall be able to set alert and notification filters based on geographic area as an option.	Mandatory		X		See in proposal above.
Notifications & Alarms	4.14.3.1.6	The ATMS shall allow authorized users to set alert and notification thresholds by time of day.	Mandatory		X		See in proposal above.
Notifications & Alarms	4.14.3.1.7	The system shall be able to generate alerts and notification based on traffic conditions (traffic speeds, volume levels, congestion levels) and event triggers (incidents, construction and maintenance activities, special event activities, etc.)	Mandatory	X			See in proposal above.
Notifications & Alarms	4.14.3.1.8	The ATMS shall be able to send out internal notifications regarding an event to up to 100 recipients. Notification to include select information captured in the event log. Notifications shall be completed within 5 minutes of initiation of procedure (process only, not inclusive of conveyance method and receiver's email system delays).	Mandatory	X			See in proposal above.
Log Reports System Reports	4.15.1.1	The ATMS shall be capable of generating reports from ATMS generated data.	Mandatory	X			See in proposal above.
Log Reports System Reports	4.15.1.2	Pre-selected, pre-formatted, reports shall be included in the system, e.g. daily/weekly/monthly/annual reports reporting devices in operation, work orders/trouble tickets tracking, incidents, events, etc. These shall be provided in list and graphical formats.	Mandatory		X		See in proposal above.
Log Reports System Reports	4.15.1.3	Users shall be able to generate ad hoc reports, specified by the user, viewable using off the shelf software.	Mandatory	X			See in proposal above.
Log Reports System Reports	4.15.1.4	Users shall be able to save the ad hoc report to become a permanent report.	Mandatory	X			See in proposal above.
Log Reports System Reports	4.15.1.5	The ATMS shall be capable of automatically generating reports via time of day scheduling.	Mandatory	X			See in proposal above.
Log Reports System Reports	4.15.1.6	The ATMS shall be able to export reports or data base information with comma, space and/or tab between fields to allow import into other programs such as Excel.	Mandatory	X			See in proposal above.
Log Reports System Reports	4.15.1.7	The ATMS shall generate information every 24-hours indicating device/system failures. A maintenance report suitable for staff shall be generated.	Mandatory	X			See in proposal above.

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Log Reports System Reports	4.15.1.8	The maintenance report shall indicate type of device, device ID, and jurisdictional responsibility for maintenance.	Mandatory	X			See in proposal above.
Log Reports System Reports	4.15.1.9	The ATMS shall maintain a log of all users' activities relating to field device control, system administration, and user access.	Mandatory	X			See in proposal above.
Log Reports System Reports	4.15.1.10	The ATMS shall provide event logging such that events can be searched on any unique field or combination of fields.	Mandatory	X			See in proposal above.
Log Reports System Reports	4.15.1.11	The ATMS shall be capable of generating reports of logs covering user-defined time periods and including user-selected event types at the direction of the TMC authorized users.	Mandatory	X			See in proposal above.
Log Reports System Reports	4.15.2.1	The ATMS data should have a GUI to configure collection and storage of user activity log data and to generate and display activity reports.	Desirable	X			See in proposal above.
Log Reports System Reports	4.15.2.2	The ATMS should be able to archive all data from the activity log to the data archive subsystem.	Desirable		X		See in proposal above.
Log Reports System Reports	4.15.2.3	The ATMS should be able to archive log data in the data archiving system at predefined times to generate a continuous archival record.	Desirable		X		See in proposal above.
Security & Administration	4.16.1.1	The ATMS shall provide security and administration functions.	Mandatory	X			See in proposal above.
Security & Administration	4.16.1.2	The ATMS shall provide a log-in, log-out, and exit function.	Mandatory	X			See in proposal above.
Security & Administration	4.16.1.3	The ATMS shall provide a security (ID/password or approved equivalent) function.	Mandatory	X			See in proposal above.
Security & Administration	4.16.1.4	The ATMS shall provide a capability to add or delete users by an administrator.	Mandatory	X			See in proposal above.
Security & Administration	4.16.1.5	The ATMS shall maintain log and be able to generate reports of administrative actions and all log-in/log-out activity.	Mandatory	X			See in proposal above.
Security & Administration	4.16.1.6	The ATMS shall allow for the specification of user's rights by an administrator.	Mandatory	X			See in proposal above.
Security & Administration	4.16.1.7	User's rights shall be designated by function and specific equipment.	Mandatory	X			See in proposal above.
Security & Administration	4.16.1.8	The ATMS shall allow a system administrator to change a user's password.	Mandatory	X			See in proposal above.
Security & Administration	4.16.1.9	The ATMS shall allow a system administrator to disable a user.	Mandatory	X			See in proposal above.
Security & Administration	4.16.1.10	The ATMS shall allow a system administrator to change the status of a user to "expired".	Mandatory	X			See in proposal above.
Security & Administration	4.16.1.11	The ATMS shall allow a user to change their own password.	Mandatory	X			See in proposal above.
Security & Administration	4.16.1.12	The ATMS shall allow a user access to the ATMS from any workstation on the system.	Mandatory	X			See in proposal above.
Security & Administration	4.16.1.13	The ATMS workstation/ server communications shall be able to function over VPN or firewall traversal.	Mandatory	X			See in proposal above.

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Security & Administration	4.16.1.14	The ATMS shall provide a method to manage users and groups of users within the software such that only A TMS authorized users are allowed to access the system. A minimum of four (4) levels of security are required (external agency, TMC operator, supervisor, and administrator).	Mandatory	X			See in proposal above.
Security & Administration	4.16.1.15	The ATMS shall support appropriate security and firewalls necessary to safeguard internal operational information from unauthorized access.	Mandatory	X			See in proposal above.
Security & Administration	4.16.1.16	The ATMS shall provide an audit trail capturing the user's ID, date and time stamp, transaction type, and before/after values whenever changes are posted to system database.	Mandatory	X			See in proposal above.
Security & Administration	4.16.1.17	The ATMS shall support full system backups while maintaining 24/7 operational status.	Mandatory	X			See in proposal above.
Security & Administration	4.16.2.1	The ATMS should provide rules-based administration for access and security at all levels of use.	Desirable	X			See in proposal above.
Security & Administration	4.16.2.2	The ATMS should provide data locking or buffering routines in a multi-user environment.	Desirable	X			See in proposal above.
Performance	4.17.1.1	The ATMS shall not require system restarts or reboots except for major system upgrades.	Mandatory	X			See in proposal above.
Performance	4.17.1.2	The ATMS shall be available 24 hours a day, 7 days a week, except during scheduled maintenance.	Mandatory	X			See in proposal above.
Performance	4.17.1.3	The ATMS shall not let its performance and operation be impacted adversely by the malfunction, removal, or addition of interfaces.	Mandatory	X			See in proposal above.
Performance	4.17.1.4	The ATMS system up time goal shall be 99.9%.	Mandatory	X			See in proposal above.
Performance	4.17.1.5	The ATMS refresh rate for the largest map shall be a maximum of 1 second.	Mandatory	X			See in proposal above.
Performance	4.17.1.6	The ATMS refresh rate for all other displays shall be a maximum of 1 second.	Mandatory	X			See in proposal above.
Performance	4.17.1.7	The ATMS vendor response shall define how many devices and type the ATMS is capable of supporting. (Minimum: 500 CCTV, 250 DMS, 1000 Detectors).	Mandatory	X			See in proposal above.
Performance	4.17.1.8	The ATMS vendor shall indicate if all components necessary to make the ATMS functional will be installed on-premise or off-site and the reason/benefit to WVDOT.	Mandatory	X			See in proposal above.
Performance	4.17.2.1	The ATMS should provide for "operator-free" operation so that the system performs all minimally necessary control and monitoring processes unattended.	Desirable	X			See in proposal above.
Other ATMS Operations	4.17.3.1.1	The ATMS shall include capability to generate real-time travel times for defined roadway segments on Interstate and Expressway routes.	Mandatory	X			See in proposal above.
Other ATMS Operations	4.17.3.1.2	The ATMS shall provide a mechanism for operators to select and implement predefined operations response plans for incidents.	Mandatory	X			See in proposal above.
Other ATMS Operations	4.17.3.1.3	The ATMS shall maintain a local emergency response agency contact list.	Mandatory	X			See in proposal above.
Other ATMS Operations	4.17.3.1.4	The ATMS shall provide access to the contact lists to authorized users.	Mandatory	X			See in proposal above.
Other ATMS Operations	4.17.3.1.5	Trouble ticket generation capability for system and device service and maintenance needs.	Mandatory		X		See in proposal above.

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Other ATMS Operations	4.17.3.2.1	The ATMS should include capability to use archived data and real-time data together with predictive algorithms to generate travel forecasts for display to operators.	Desirable	X			See in proposal above.
Other ATMS Operations	4.17.3.2.2	The ATMS should maintain a call-out list of private industry contractors of equipment resources.	Desirable	X			See in proposal above.
Other ATMS Operations	4.17.3.2.3	The ATMS should provide a commuter route app so users can enter a frequent route and receive a specific update for their route including incidents, construction, congestion, events, etc.	Desirable	X			See in proposal above.
Other ATMS Operations	4.17.3.2.4	The ATMS should populate social media mechanisms with event data automatically.	Desirable	X			See in proposal above.
Other ATMS Operations	4.17.3.2.5	The ATMS should provide for enhanced social media capabilities to allow for easier use of Twitter, Facebook, etc. for events or emergencies.	Desirable	X			See in proposal above.
Other ATMS Operations	4.17.3.2.6	Operator manuals should be intuitive and key operations should be on flip cards that are easy to access and understand during an emergency.	Desirable		X		See in proposal above.
Traffic Signal Control Systems	4.17.4.1	Although not required at this time, the ATMS should have the capability of adding a traffic signal control module or third party application for the centralized control of WVDOT traffic signal systems across the state with communication capabilities.	Desirable	X			See in proposal above.