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WV PURCHASING DIVISION

West Virginia Lottery

**Technical Proposal**

**RFP# LOT2100000001 – Scalable Infrastructure Storage Solution**

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TECHNOLOGIES



West Virginia Lottery

Scalable Infrastructure Storage Solution

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## SUMMARY

This document outlines the immediate ways Alpha Technologies can provide WV Lottery with the needed compute, storage and network infrastructure to properly stabilize, secure, maintain and propel the IT environment into the future. Upon acceptance of the proposed solutions, a detailed project plan will be completed and reviewed with WV Lottery.

## PROPOSED SOLUTION

Alpha Technologies is pleased to present this response to WV Lottery's bid request for a new hyperconverged infrastructure solution. We have engineered a modern and affordable solution for the environment. This document outlines the proposed changes.

## HYPER CONVERGED INFRASTRUCTURE

Hyperconvergence is a software-defined approach to your entire infrastructure. HCI provides many advantages including flexibility and scaling options that far exceed the conventional systems approach. The HCI method consolidates compute, storage and networking components into a unified system. This one integrated system also consolidates the entire infrastructure management into a single, unified interface as well, further increasing operational efficiency. All aspects of the compute, storage and network resources can be configured and monitored from this single pane of glass. Consolidating these resources also decreases data center complexity and footprint, as well as provides the pinnacle of private cloud flexibility.

The benefits of a hyperconverged system include:

- Lower Cost
- Greater Scalability and Flexibility
- Simplified Management
- Automation Capabilities

## CISCO HYPERFLEX HCI

Alpha's proposed HCI solution is powered by Cisco Hyperflex hyperconverged technologies. Cisco HyperFlex next-generation systems eliminate the compromises that hindered the previous generation of solutions. Engineered on Cisco Unified Computing Systems (Cisco UCS) technology, Cisco HyperFlex systems include Intel Xeon processors, built-in networking, integrated management, and a high-performance and highly available data platform, with preinstalled software. Cisco networking

interconnects the system from a single point. Integrated management makes the system self-aware and self-integrating, automatically detecting changes to the hardware and incorporating new components automatically. The Cisco HyperFlex HX Data Platform makes your data instantly accessible and highly

available, with always-on deduplication and compression that reduces your storage needs. In addition, the preinstalled VMware ESXi hypervisor accelerates both provisioning and scaling.

With Cisco HyperFlex systems, you have flexible pools of computing, network, and storage resources that are easy to deploy and maintain. The system offers one-click integration with VMware vSphere, allowing IT staff to extend their virtualization skills to storage and management to get better visibility into and control over your computing, network, and storage resources from a single console, improving productivity and infrastructure operation. With systems designed to be upgraded as new technologies become available, you have infrastructure that is easy to deploy, scale, and manage, while providing investment protection.

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## WHY CISCO HYPERFLEX

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### INTELLIGENT END-TO-END AUTOMATION—INCLUDING NETWORKING AUTOMATION

Cisco considers networking to be an integral and essential part of hyperconvergence. Cisco HyperFlex systems provide comprehensive end-to-end automation across computing, storage, and networking resources. Using a simple and intuitive wizard, the entire deployment process takes minutes to complete. The process uses Cisco UCS Manager service profile templates optimized for hyperconverged environments to help ensure rapid deployment and expansion. Cisco fabric interconnects create a redundant dual network fabric that connects to Cisco UCS virtual interface cards (VICs) in server nodes. These cards establish a programmable I/O infrastructure. You can configure the number and type of I/O interfaces on demand with a zero-touch model that increases staff efficiency and accelerates operations. We preconfigure Cisco UCS service profiles to automatically create the appropriate devices to support your cluster with no guesswork required. The programmable I/O infrastructure dramatically reduces the number of network adapters, cables, and switches you need. Cisco VICs support up to 256 PCI Express (PCIe) devices with a high rate of I/O operations per second (IOPS), lossless Ethernet, and 20-Gbps connectivity to each server. Network interface card (NIC) teaming with automated fabric failover increases reliability and availability. Cisco simplifies deployment by preconfiguring the network with automated workflows. Cisco network fabric gives you:

- Traffic segmentation and security through dedicated virtual links connecting each server to the fabric interconnect: Cisco automatically creates the multiple interfaces used by VMware networking in accordance with VMware best practices.
- Storage and management traffic shared on the network fabric: This approach enables optimal performance.
- Quality of service (QoS) policies enabled for well-defined and predictable service: Policies include no-drop and jumbo frames policies for optimal performance.
- Multicast policy for Cisco HyperFlex system clusters: This feature is a part of Cisco's automated configuration process that other vendors do not even consider.
- No need to configure IPv6 or IPv4 multicasting or Internet Group Management Protocol (IGMP) snooping on your upstream switches as a network prerequisite:

The included fabric interconnects give you a single point of connectivity and management for your Cisco HyperFlex systems and other Cisco servers. All traffic reaches any node in the cluster through a single network hop. This approach delivers high-bandwidth and low-latency networking for fast application response. As your cluster scales, the network scales with it to easily handle storage and production IP networking traffic.

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#### UNIFIED MANAGEMENT FOR ALL WORKLOADS

If your data center supports virtualized environments, you already use VMware vCenter to manage your virtual infrastructure. With Cisco HyperFlex systems, you can continue to do so without creating yet another management silo. With a single vCenter plug-in, you can manage your physical and virtual hyperconverged infrastructure through a single, intuitive interface. If you have already started to manage your data center infrastructure with workflow-based Cisco UCS Director, you can use it to manage and automate your hyperconverged environment as well. The reason for this flexibility is that each of these management approaches use a unified API provided by Cisco UCS Manager. This integrated, model-based management software is built into all your Cisco server and storage infrastructure.

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#### INDEPENDENT RESOURCE SCALING

Cisco HyperFlex Systems include a purpose-built, high-performance distributed file system that expands the boundaries of hyperconverged infrastructure. You can scale your environment simply by adding nodes to the configuration. Unlike with any other hyperconverged product, you can choose to independently scale computing or storage capacity to meet the specific needs of your applications. Cisco's predefined networking resources expand to incorporate the new nodes. All this is accomplished without the need for you to change or adjust your software or networking configuration or interrupt your cluster operations. The new node is efficiently and automatically added to your environment with no downtime.

With Cisco HyperFlex systems, you can scale your storage by adding a Cisco UCS rack server-based storage node to the cluster. You can scale your computing performance by adding Cisco UCS blade server-based computing nodes. You can scale with a graphics-processing-intensive computing node by adding Cisco UCS C240 Rack Servers to the cluster.

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#### SINGLE DATA CENTER ARCHITECTURE BASED ON CISCO UCS

By basing Cisco HyperFlex systems on Cisco UCS, we allow you to extend the popular Cisco UCS Manager policy automation capabilities to your Cisco HyperFlex clusters. Deployment and expansion processes both use service profiles, simplifying daily operations and increasing overall infrastructure consistency and reliability across the data center. We offer the only hyperconverged infrastructure platform in the industry that can logically create virtual host bus adapters (vHBAs), supporting the presentation of external storage, including Fibre Channel storage, to the Cisco HyperFlex nodes. With Cisco HyperFlex

systems, you can easily bring outside resources and data into your new systems, allowing you to move data and applications from existing environments to Cisco HyperFlex systems. This capability also supports virtual machine mobility, allowing you to move virtual machines through VMware Storage vMotion without having to take applications offline. You also can simply and quickly back up and archive your data to traditional Fibre Channel–based storage systems. With just a change to the Cisco UCS service profile, you can easily add Fibre Channel. You manage Cisco HyperFlex nodes just like other Cisco UCS resources in your data center. As a result, you can shift these resources across hyperconverged infrastructure (HCI), converged infrastructure, and traditional infrastructure. You can use the computing-only nodes to support a hyperconverged cluster, and then, according to seasonal or daily application demands, you can shift them to support traditional infrastructure, providing true cloud-like agility across your data center.

#### GREATER VIRTUAL MACHINE DENSITY AND LOWER AND MORE CONSISTENT LATENCY

The Cisco HyperFlex HX Data Platform is a file system that is specifically built for hyperconverged systems. It uses dynamic data distribution, in which data is striped and distributed across the cluster, using all available resources for optimal I/O performance. As a result, Cisco HyperFlex systems achieve significantly greater performance than competing solutions, allowing you to run up to three times more virtual machines, dramatically lowering your overall total cost of ownership (TCO), and providing more flexibility for your environment.

By using intelligent and dynamic data distribution across all nodes in the cluster, the HX Data Platform avoids performance bottlenecks and provides consistent latency and performance. When running a heavy load, you can expect up to three times lower latency with Cisco HyperFlex systems than with competing solutions. And the HX Data Platform provides lower latency while maintaining consistent virtual machine performance across the cluster for long periods of time. Cisco HyperFlex Systems deliver more than low latency—they deliver more consistent latency between virtual machines. If your latency for traffic between virtual machines varies, so will your application performance and your user experience.

#### CISCO INTERSIGHT

Intersight Infrastructure Service delivers value from day one all the way through daily lifecycle operations. Whether deploying, managing, or upgrading infrastructure, Intersight Infrastructure Service can transform your IT operations. It provides a single point of connection from anywhere you have Internet connectivity, allowing you to manage Cisco HyperFlex Hyperconverged Infrastructure (HCI), Cisco UCS, and Cisco converged infrastructure through an intuitive UI, virtual appliance or mobile app. Intersight Infrastructure Service is a secure, unified way to manage distributed computing environments from the core to the edge.

Intersight Infrastructure Service provides advisories and notifications about any of your endpoint devices which may be impacted by supported security advisories or field notices. Cisco Security

Advisories enable you to ensure compliance and stay on top of important hardware and software information. The Cisco Security Advisory feature identifies, monitors, and updates the status of advisories to provide the latest information on the severity of the advisory, impacted products, and any available workarounds. If there are no known workarounds, you can open a support case with the Cisco Technical Assistance Center (TAC) directly from Intersight for quick assistance in resolution. A select list of the security advisories is shown in Intersight under the resources section on our help center.

## DOMAIN CONTROLLERS

### CISCO UCS SERVERS

The Cisco Unified Computing System is the first integrated data center platform that combines industry-standard, x86-architecture servers with networking and storage access into a single unified system. The system is intelligent infrastructure that uses integrated, model-based management to simplify and accelerate deployment of applications and services running in bare-metal, virtualized, and cloud-computing environments. Employing Cisco's innovative SingleConnect technology, the system's unified I/O infrastructure uses a unified fabric to support both network and storage I/O. The Cisco fabric extender architecture extends the fabric directly to servers and virtual machines for increased performance, security, and manageability.

Cisco UCS helps change the way that IT organizations do business, with benefits including the following:

- Increased IT staff productivity and business agility through just-in-time provisioning and equal support for both virtualized and bare-metal environments.
- Reduced TCO at the platform, site, and organization levels through infrastructure consolidation.
- A unified, integrated system that is managed, serviced, and tested as a whole.
- A comprehensive management ecosystem that supports complete infrastructure provisioning and management that can make your Cisco UCS instance anything from a bare-metal enterprise application engine to a multcloud containerized environment. Locally hosted tools give you a range of options and Intersight software as a service is emerging as the solution to help you manage all your assets worldwide.
- Scalability with the Intersight software-as-a-service platform that can manage all of your infrastructure wherever it resides. Many of the most tedious administration tasks, such as setting up clusters in edge locations, can be automated completely so that new locations can be rolled out quickly, easily, and accurately.
- Open industry standards supported by a partner ecosystem of industry leaders.
- A system that scales to meet future data center needs for computing power, memory footprint, and I/O bandwidth; it has hosted five generations of servers and three generations of network fabric in its highly simplified blade server chassis—and is poised to continue to support future generations of servers and networks.



### HPE COHESITY

Cohesity ushers in a new era in data management that solves a critical challenge facing businesses today: mass data fragmentation. The vast majority of enterprise data — backups, archives, file shares, object stores, and data used for test/dev and analytics — sits in fragmented infrastructure silos that makes it hard to protect, expensive to manage, and difficult to analyze. Cohesity consolidates silos onto one web-scale platform, spanning on-premises, cloud, and the edge, and uniquely empowers organizations to run apps on that platform — making it easier than ever to back up and extract insights from data.

**An Intelligent NAS Solution Designed for Web Scale, Cohesity SmartFiles Software Dramatically Simplifies Management and Significantly Reduces Operational Costs.**

SmartFiles is a software-defined solution for files and objects that goes beyond traditional scale-out NAS (network attached storage) capabilities. SmartFiles empowers organizations to utilize integrated applications to bring exceptional intelligence to file-related IT infrastructure. SmartFiles also reduces storage costs with unique capacity efficiency and multi-tier data management capabilities. Unlike competitive products, SmartFiles integrates multi-layer cybersecurity to defend valuable business data against cyber threats.

SmartFiles is ideal for a variety of workloads including collaboration and productivity apps, large-scale document management, life sciences and medical research, digital archives, and video and surveillance. SmartFiles offers benefits to customers that are unlike any NAS solution on the market today.

- **Integrated apps provide intelligence and simplify management:** One of the breakthroughs with SmartFiles is that applications built to support the NAS ecosystem are integrated within Cohesity DataPlatform. Available through the Cohesity MarketPlace, apps such as antivirus, file audit with anomalous access detection, and content search can all be run directly on the platform. Traditional NAS implementations often require organizations to purchase and run separate infrastructure to accomplish these same tasks. This approach of bringing compute to the data reduces costs and complexity and makes it easy to extract value from data. It also means that as the storage cluster scales, so does the scale of the integrated applications.
- **Integrated cybersecurity improves security posture:** The SmartFiles solution provides layers of cybersecurity through Cohesity DataPlatform to guard against ever-increasing security threats: This includes end-to-end software encryption, multi-factor authentication, an immutable file system, data-lock, and other security benefits. The integrated apps also protect data against a wide range of cyber threats including the detection and blocking of malicious files, detection of anomalous file accesses, and identification of high-risk information with actionable results.
- **“Google-like” enterprise search makes it a snap to find data:** As part of the Cohesity DataPlatform, SmartFiles provides nearly unprecedented enterprise search capabilities —

allowing users to search for and within files across an entire site. Using optional Cohesity Helios, searches can extend to multiple sites as well as across Cohesity instances running in public clouds such as Amazon Web Services (AWS), Microsoft Azure, and Google Cloud. The solution makes it easy to find files regardless of where data resides. Customers no longer need to commence a lengthy, multi-step, complicated process to find data, one silo at a time. Instead, this capability makes eDiscovery and business research much easier and can play a key role in compliance readiness.

- Capacity efficiency reduces costs: SmartFiles delivers substantially greater storage capacity than legacy solutions for the same raw storage space by leveraging advanced deduplication, compression, and small file capacity optimization. Additional dedupe benefits are achieved by eliminating duplicate files across siloed data center volumes. This can translate into immediate total cost of ownership (TCO) savings.
- Automated policy control enhances multi-tiered data management: SmartFiles delivers transparent data tiering both on-premises and to the cloud. Many traditional NAS solutions frequently store between 70-90 percent inactive data – data that no longer requires low-latency performance. With SmartFiles, it's easy to create an automated policy to tier select data from an existing NetApp, Isilon, or Pure Storage device to SmartFiles, as well as to archive even “colder” data to the cloud. And, with SmartFiles, the need for third-party tiering software is eliminated. Effortless policy-based movement of data to the Cohesity DataPlatform is transparent to applications and can result in Tier 1 storage cost savings and improved backup performance.

SmartFiles also provides value to customers as their needs change and expand:

- Multiprotocol support with unified permissions accelerates application development: Native multiprotocol (NFS, SMB and S3) support for files and objects with simultaneous access and unified permissions enables developers to easily move applications and data to the cloud now or in the future without disrupting workflows.
- Web-scale architecture removes scalability challenges: There is no fear of hitting scalability “brick walls” due to hard limits of a given solution. SmartFiles overcomes common limitations for file and object solutions including capacity, file size/name/path, and performance degradation from frequent snapshots. Built atop a web-scale architecture based on a shared-nothing, fully distributed file system, SmartFiles scales as required for data consolidation, large archives, media repositories, and large-scale file or object storage pools – all on an easy-to-manage platform.
- Software-defined flexibility: SmartFiles supports a variety of hardware platforms and can run in the cloud with the same functionality as on-premises, providing choice and flexibility.
- Heterogeneous support makes forklift upgrades a thing of the past: SmartFiles ensures seamless horizontal scaling as well as support for heterogeneous older and newer nodes working together in a single scale-out cluster.

## DATA PROTECTION SERVICES

HPE StoreOnce, combined with HPE StoreOnce Catalyst and Veeam, addresses the challenges facing backup administrators who need to consolidate and improve storage efficiencies while addressing these common problems.

### **Data is Isolated and Protected**

The HPE StoreOnce purpose-built backup appliance and HPE StoreOnce Catalyst bring a wealth of benefits to an organization in the way of space-efficient backup, deduplication, data lifecycle management, and information assurance. However, the single most important feature of HPE StoreOnce Catalyst is its ability to completely isolate data from being tampered with unintentionally. Data is isolated and protected HPE StoreOnce is a purpose-built backup appliance (or virtual machine) that includes HPE StoreOnce Catalyst stores to effectively isolate critical data where attackers cannot have impact on it without resorting to direct physical interactions that ultimately would result in the destruction of some or all of the hardware itself. Even when physical destruction is achieved at a single location, whether from malware or a natural disaster, the more advanced implementation of HPE StoreOnce Catalyst stores (distributed implementation) would effectively protect mission-critical data by effectively isolating it from traditional lines of communication and command sets leveraged by ransomware attackers. HPE has hidden the Catalyst store from attackers in plain sight but behind an application programming interface (API) that both enhances and simplifies the process of backing up and deduplicating data while making it practically impossible for ransomware to attack it directly.

HPE StoreOnce Catalyst stores do not prevent the rest of the enterprise from being compromised by malware, but they will protect the mission-critical data stored from being either targeted or affected. Ransomware cannot encrypt what it cannot see, and because the Catalyst store does not use standard operating system command instructions for its operations, malware cannot become active while inside. HPE StoreOnce Catalyst efficiently backs up and restores data using a tamperproof method. HPE StoreOnce Catalyst, initially designed for use as a disk-based solution and now extended to the cloud, is capable of leveraging deduplication, compression, encryption, and data isolation for backup and archiving processes. HPE StoreOnce Catalyst prevents ransomware from accessing data on the HPE StoreOnce appliance ensuring data integrity.

### **Command and data sessions**

The Catalyst architecture is accessed through an API command set that is directly integrated into a backup application media agent, which includes the HPE StoreOnce Catalyst client library. This library is effectively an API that uses a proprietary set of commands to send and retrieve data from the Catalyst store using command and data sessions.

These command and data sessions are comparable to the SMB (or Samba) connections in a traditional datastore using NAS and similar technologies. The key difference with the HPE StoreOnce Catalyst store is that it does not rely on the same authentication methodology or most importantly the same set of

instructions stemming from the operating system that these other technologies do. HPE StoreOnce Catalyst can be considered a kind of demilitarized zone where malware is concerned.

It is this separation from the operating system instruction set that isolates and protects the HPE StoreOnce Catalyst store and its items from a ransomware attack. The systems that the Catalyst media agent reside upon are still vulnerable to attack without further hardening, and the malware itself could be potentially sent across the network to the Catalyst store; however, the Catalyst store itself is completely protected from being encrypted by the malware due to the separation of it from any usable command sets (targeted operating systems such as Windows and Linux). All communication to and from the HPE StoreOnce Catalyst store is sent through the Catalyst client library (API) and its associated command and data sessions that create the pipes between systems using HPE technology specific to this task.

The command and data sessions run over standard TCP/IP Ethernet or Fibre Channel connections depending on the HPE StoreOnce model. These sessions use remote procedure call (RPC) through the API, which causes subroutines to run in different memory address spaces on each system associated with the solution. The memory segregation further isolates the process by adding additional protective layers between the data and the malware before it gets to the Catalyst store, taking the layered security methodology all the way to the end point.

### **Interprocess communication**

The item of importance where ransomware is concerned is that all communication between the backup server and the HPE StoreOnce Catalyst store is handled using interprocess communication (IPC), which is a mechanism within the context of RPC used to enable communication between a client and a server regardless of where the parts are physically located (remotely, same system, and so on). This communication is not dependent on the local operating system command set to perform its duties. This secures the data, not the device, and enables data mobility in a way that brings the data closer to the systems where compute happens, increasing efficiency and potentially decreasing costs while eliminating risk.

Data protection has slowly morphed into a never-ending series of disk-based replications and snapshots, which serve to recover specific files quickly. However, the move away from more redundant and secure methods such as tape and off-site archives has left a large security gap for cybercriminals to distribute ransomware. Many organizations can now unfortunately attest that simply backing up data by making copies is not sufficient. If an operating system can see your data, so can ransomware. In traditional backups, knowing what data has been affected and when plays a crucial role in determining which backup repositories can be used to recover post-attack. The 3-2-1-1 rule that data protection specialists have relied on must always be remembered: Preserve three copies of your data on at least two different media types with one stored offline, and one stored offsite at another physical location or in the cloud.

The best method for protecting enterprise data is a combination of well documented and communicated policies, effective implementation of critical security controls (particularly access

controls), and HPE StoreOnce Catalyst, which is the critical data protection component in safeguarding data from ransomware in a backup or data archiving solution. HPE StoreOnce Catalyst deployed as the backup target for mission-critical data ensures the ability to recover data from either a specific RTO or a configuration RPO. Most importantly, it shields data from ransomware and other forms of malware that target specific operating systems. HPE StoreOnce Catalyst stores effectively isolate data and protect it from unintended manipulation and, in the case of ransomware specifically, encryption.

Some companies have tried to hide ransomware incidents, only to have the media report the data breaches later for customers, shareholders, and board members to see. You can find the right hardware and software solution by combining the fully integrated, industry-leading disk technology of HPE Primera and HPE Recovery Manager Central with the HPE StoreOnce Catalyst store technology. The procedures and policies of the US-CERT recommended backup methodology of 3-2-1 ensure true enterprise-level information assurance. Remember that ransomware cannot infect what it cannot see. Be sure your data is securely isolated from cybercriminals with HPE StoreOnce Catalyst stores, and shift from data protection to information assurance.

## TRAINING

Alpha Technologies has decades of experience with all facets of public and private cloud configurations. Our team has been focused on understanding and implementing the technologies that our clients, like the WV Lottery, need since we opened our doors. In order to stay ahead of this incredibly face paced technology landscape our teams are continually sharpening their existing skillsets and adding to their toolbelts when new solutions are introduced to the market. We strive to stay ahead of the curve in order to anticipate and respond to our clients ever demanding needs.

We have knowledgeable staff that will work with key employees at the WV Lottery to ensure full understanding and confidence in learning the new systems. We understand the need to have quality training time with confident and knowledgeable staff. We will work side-by-side with the WV Lottery until there are no questions whether the WVL Infrastructure team can confidently and correctly own their new technology environment.

## MANAGEMENT/QUALITY CONTROL APPROACH

### MANAGEMENT AND QUALITY CONTROL

The delivery of Quality Services to customers is the utmost priority at Alpha Technologies. Our internal Quality Management System (QMS) is designed to combine human, technical and material resources in a manner that results in optimum production, consistent with the highest possible quality standards. To maintain these quality standards, we adhere to Quality Assurance (QA) and Quality Control (QC) procedures to identify and mitigate risk before service levels are impacted, as follows:

**Quality Assurance:** Our quality assurance process allows us to collect, monitor, and report on performance metrics and deliverables for each task. Performance metrics are constructed to provide

performance improvement, effectiveness, efficiency and the required levels of internal controls, including cost/risk/benefit analysis, where appropriate. Our internal review process is designed to monitor all workload, performance, and quality objectives while meeting urgent customer requirements, as follows:

- Weekly team meetings provide necessary reviews and add value to the process and action plans to monitor and improve the quality on constant basis.
- Monthly progress meetings
- Monthly formal review meetings between the Project Manager and the subcontractors
- Action item logs maintained by the project manager.
- Internal Quality Assurance audits and reviews

**Quality Control:** In the ITIL lifecycle, Alpha's quality control processes are executed during the Service Transition phase and Service Operation phase, deploying ITIL Service Asset and Configuration Management (SACM) methodology, to manage all service assets or components that need consideration in order to deliver a service. Alpha's quality control process includes Change Management, Event Management, Incident Management, and Problem Management.

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## MANAGEMENT APPROACH

**Management Organization:** Our Chief Operating Officer is responsible for assembling resources for the project who then report to an assigned Project Manager; Project Managers monitor all resources dedicated to the project, including timesheet review and verification, and ensure resources remain within the agreed-upon budget. We monitor budgets for professional time and out-of-pocket reimbursement based on contractual agreements with each client and monitored through established policies and procedures in compliance with applicable laws and regulatory requirements.

**Staffing Plan:** Alpha's proven and successful staffing approach is based on a combination of re-allocating available existing staff from resource pool to active projects/programs; hiring key incumbents currently supporting. As a small business, we maintain a low overhead structure, but we believe in investing in our employees through a highly competitive compensation package, training, and other incentives which enable us to retain a highly qualified staff.

## OUR STORY

Alpha Technologies is a service-disabled veteran-owned small business headquartered in Hurricane, WV with a global datacenter located in South Charleston, WV. We are a business technology focused company. Guided by integrity, Alpha's team of experts craft reliable and secure IT solutions with the same goal every time: to provide invaluable results and forge long-term relationships with our clients. Our comprehensive offerings allow clients to focus on growing their business while we manage their technology.

Douglas Tate, a West Virginia native, is the founder and CEO of Alpha Technologies. His military background includes a special operations command-grade assignment with the United Nations. Since retiring from the military, Doug has earned his bachelor's degree in computer science, a master's degree in applied computer science and an MBA.

A strong work ethic and determination are characteristics Doug portrays in everything he does. Alpha Technologies reflects Doug's entrepreneurial spirit by pairing ingenuity and security with business technology systems and communication solutions.

To stay ahead of the ever-changing market, Alpha has aligned its core business model with what our clients desperately need: fast, less expensive and more secure ways of handling business communications, data storage, data security, and fail-safe backup systems.

Letter from the President

Hello,

As the President/CEO of Alpha Technologies, I want to extend the gratitude of myself and our entire Alpha Technologies Staff in your selection of our company to provide, assist and consult with you and your organization in this complicated world of information technology.

Our job is to provide your company with the hardware, software, protection & security, best practices and partnership to ensure your company operates in a well-designed and secure environment. Additionally, we are focused on providing these items at the most competitive and affordable value possible. This philosophy has worked for Alpha and our highly regarded clients for many years and we are thrilled to walk side-by-side along this path with you and your organization today.

I am duty bound and pledge continued investment in Alpha Technologies to make certain your organization's functionality and security are met and your expectations exceeded in this ever-changing world of information technologies.

I personally wish to thank you for extending your faith and trust in Alpha Technologies, not just a company, but a growing family of well qualified and handpicked staff.

Best regards,

Doug Tate

President/CEO





How to Buy

# Cisco HyperFlex HX220c Edge M5



## Hyperconvergence engineered on the fifth-generation Cisco UCS platform

Rich digital experiences need always-on, local, high-performance computing that is close to users. Retail, finance, education, healthcare, transportation, and manufacturing organizations, and remote and branch offices in general, are all pushing computing to the network edge. Cisco HyperFlex™ Edge brings the robust feature set of Cisco HyperFlex systems to your edge environments with a low-cost, easy-to-deploy, centrally managed solution.

### Designed for the edge

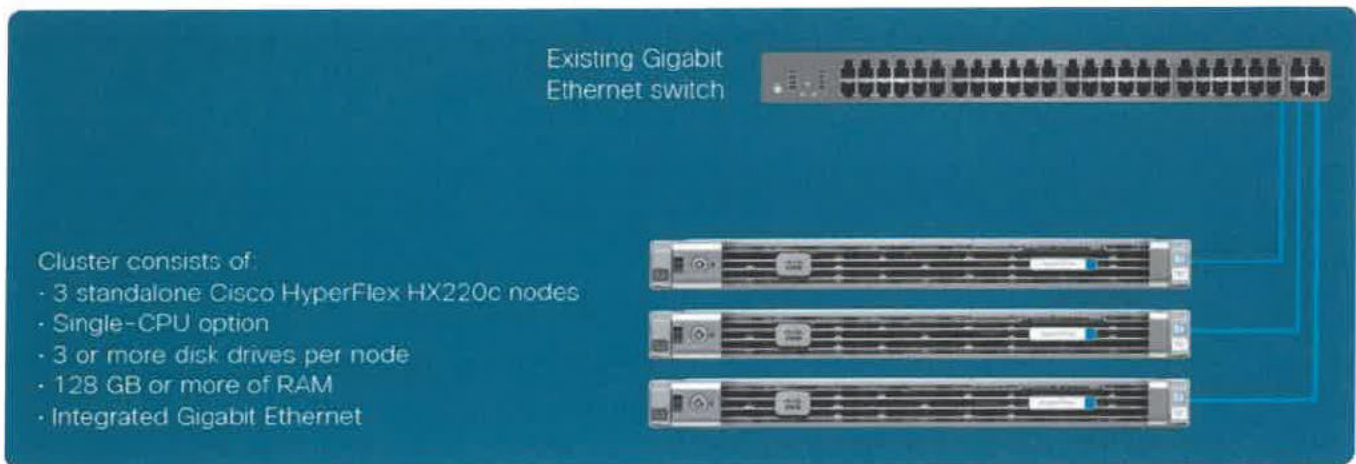
While enterprise applications have been migrating to centralized data centers and to the cloud, the Internet edge has been moving to branch and remote locations closer to user devices and organizational touchpoints. Cisco HyperFlex Edge can help your organization extend its reach and service customers and employees at their touchpoints.

Built on the full power of Cisco HyperFlex systems, our entry-level Cisco HyperFlex Edge configurations can be deployed in existing edge locations and can even use existing networks for cluster communication. These features enable you to easily and affordably deploy Cisco HyperFlex Edge as a hyperconverged solution in a multitude of edge locations, or even as the sole cluster supporting a small or medium-size business.

## Cisco HyperFlex Edge

Cisco HyperFlex Edge is deployed as a preintegrated cluster with a unified pool of resources that you can quickly provision, adapt, scale, and manage to efficiently power your remote-office and branch-office (ROBO) locations (Figure 1). Physically, the system is delivered as a cluster of three hybrid or all-flash nodes that are integrated using your existing Gigabit Ethernet switch. All nodes use Intel® Xeon® Scalable CPUs and next-generation DDR4 memory and offer 12-Gbps SAS throughput. As a result, these fifth-generation servers offer faster processing, more cores, and a faster, larger memory capacity than previous-generation nodes.

Figure 1. Cisco HyperFlex Edge



## Main features and benefits

Table 1 summarizes the features and benefits of the Cisco HyperFlex Edge system.

Table 1. Features and benefits

Feature	Benefit
<b>Memory</b>	128 GB or more of memory per node Capability to use 16-, 32-, 64-, or 128-GB DIMMs
<b>1 or 2 Intel Xeon Scalable CPUs</b>	Built on 14-nanometer (nm) processor technology, Intel Xeon Scalable processors are designed to deliver highly robust capabilities with outstanding performance, security, and agility. Up to 28 cores in 2-socket configurations Top-of-the-line memory-channel performance Three Intel Ultra Path Interconnect (UPI) links across sockets for improved scalability and intercore data flow Hardware-assisted security advancements Low-power, high-speed DDR4 memory technology Increased performance with Intel Automated Vector Extensions 2 (AVX2) Increased virtual machine density Automated energy efficiency that reduces energy costs by automatically putting the processor and memory in the lowest available power state while still delivering the performance required Flexible virtualization technology that optimizes performance for virtualized environments, including processor support for migration and direct I/O Innovation with the latest processors, which increase processor frequency and improve security
<b>Network</b>	Deployment in existing edge locations Use of existing Gigabit Ethernet networks for cluster communication
<b>Expansion</b>	Support for up to 2 PCI Express (PCIe) 3.0 slots Flexibility, increased performance, and compatibility with industry standards High I/O bandwidth, increased flexibility, and backward compatibility with support for PCIe 2.0
<b>Virtualization optimization</b>	I/O virtualization and Intel Xeon Scalable processor features, extending the network directly to virtual machines Consistent and scalable operational model Increased security and efficiency with reduced complexity Capability to move virtual machine security features and policies from rack to rack or rack to blade
<b>Choice of management tools</b>	Installation wizard for automated configuration Capability to manage centralized and remote locations through the VMware vSphere plug-in Access through the Cisco HyperFlex Connect interface with an HTML 5 presentation layer accessible on desktop and laptop computers and mobile devices

<b>Storage</b>	<p>Built-in role- and policy-based management through service profiles and templates, enabling more effective use of skilled server, network, and storage administrators</p> <p>Automated provisioning and increased business agility, allowing data center managers to provision applications in minutes rather than days by associating a service profile with a new, added, or repurposed Cisco HyperFlex HX220c M5 Node or HX220c All Flash Node</p> <p>All-flash-memory or hybrid (hard-disk drive [HDD] and solid-state-disk [SSD] memory) storage configurations</p> <p>High-capacity configurations for the Cisco HyperFlex HX Data Platform capacity layer:</p> <ul style="list-style-type: none"><li>HX220c M5 Node: 3 to 8 x 1.2-TB SAS HDDs</li><li>HX220c M5 All Flash Node: 3 to 8 x 3.8-TB or 960-GB SSD drives</li></ul> <p>1 x 240-GB SSD log drive</p> <p>Caching or write log drive:</p> <ul style="list-style-type: none"><li>HX220c M5 Node: SSD caching drive</li><li>HX220c M5 All Flash Node: SAS SSD write-logging drive</li></ul> <p>Cisco 12-Gbps Modular SAS host bus adapter (HBA) with internal SAS connectivity</p> <p>M.2 SATA SSD drive for boot</p>
<b>Enterprise data protection</b>	<p>Pointer-based snapshot capabilities</p> <p>Near-instant cloning</p> <p>Inline deduplication and compression</p>
<b>Cisco® Integrated Management Controller (IMC)</b>	<p>Connection to Cisco UCS management or the Cisco HyperFlex dashboard for automated configuration through a unified interface</p>
<b>Advanced reliability, availability, and serviceability (RAS) features</b>	<p>Highly available and self-healing architecture</p> <p>Robust reporting and analytics</p> <p>Hot-swappable, front-accessible drives</p> <p>Dual-redundant fans and hot-swappable, redundant power supplies for enterprise-class reliability and uptime</p> <p>Convenient latching lid for easy access to internal server</p> <p>Tool-free CPU insertion, enabling processor upgrades and replacements with less risk of damage</p> <p>Tool-free access to all serviceable items, and color-coded indicators to guide users to hot-pluggable and serviceable items</p> <p>Nondisruptive rolling upgrades</p> <p>Cisco Call Home and onsite 24-hours-a-day, 7-days-a-week (24 x 7) support options</p>
<b>Security features</b>	<p>Locking bezel option to protect against unauthorized access to disk drives</p>
<b>Software</b>	<p>Cisco HyperFlex HX Data Platform Software (software subscription)</p>

## Product specifications

Table 2 lists specifications for Cisco HyperFlex Edge systems.

**Table 2.** Product specifications

Item	Specification
<b>Chassis</b>	3RU of rack space for the cluster
<b>Nodes</b>	3 Cisco HyperFlex HX220c M5SX Nodes or HX220c-M5SX All Flash Nodes
<b>Processors</b>	1 or 2 Intel Xeon Scalable CPUs per node
<b>Interconnect</b>	3 Intel UPI channels per processor, each capable of 10.4 gigatransfers per second (GTPS)
<b>Chip set</b>	Intel C620 series
<b>Memory</b>	24 DDR4 DIMM slots per node Support for DDR4 registered DIMMs (RDIMMs) Advanced error-correcting code (ECC) Independent channel mode Lockstep channel mode
<b>PCIe slots</b>	6 PCIe 3.0 slots per cluster (2 PCIe slots per node)
<b>Embedded network interface card (NIC)</b>	Dual 10-Gbps Intel x550 Ethernet ports per node (1-Gbps connection usable for Cisco HyperFlex Edge) Support for the wake-on-LAN (WoL) standard
<b>Power supplies</b>	Up to 2 hot-pluggable, redundant 1050-watt (W) or 1600W power supplies per node
<b>IMC</b>	Integrated baseboard management controller (BMC) IPMI 2.0 compliant for management and control One 10/100/1000 Ethernet out-of-band management interface Command-line interface (CLI) and web GUI management tool for automated, lights-out management Keyboard, video, and mouse (KVM) console
<b>Front-panel connector</b>	One KVM console connector (supplies 2 USB connectors, 1 VGA connector, and 1 serial connector) per node
<b>Front-panel locator LED</b>	Indicator to help direct administrators to specific servers in large data center environments
<b>Additional rear connectors</b>	Additional interfaces including a Video Graphics Array (VGA) video port, 2 USB 3.0 ports, an RJ45 serial port, a 1 Gigabit Ethernet management port, and dual 10 Gigabit Ethernet ports per node
<b>Rail-kit options</b>	Cisco ball-bearing rail kit with optional reversible cable-management arm Cisco friction rail kit with optional reversible cable-management arm
<b>Software support</b>	ESX 6.5 ESX 6.0 Cisco IMC Supervisor

## Ordering information

For a complete list of part numbers, refer to the Cisco HyperFlex Edge specification sheet.

## Cisco Unified Computing Services

Cisco and our industry-leading partners deliver services that accelerate your transition to Cisco HyperFlex systems. Cisco Unified Computing Services can help you create an agile infrastructure, accelerate time-to-value, reduce costs and risks, and maintain availability during deployment and migration. After you have deployed your system, our services can help you improve performance, availability, and resiliency as your business needs evolve and help you further mitigate risk.

## Cisco Capital financing to help you achieve your objectives

Cisco Capital® financing can help you acquire the technology you need to achieve your objectives and stay competitive. We can help you reduce capital expenditures (CapEx), accelerate your growth, and optimize your investment dollars and ROI. Cisco Capital financing gives you flexibility in acquiring hardware, software, services, and complementary third-party equipment. And there's just one predictable payment. Cisco Capital financing is available in more than 100 countries. [Learn more.](#)

## How to buy

To view buying options and speak with a Cisco sales representative, [www.cisco.com/c/en/us/buy](http://www.cisco.com/c/en/us/buy).

## For more information

For more information about Cisco HyperFlex systems, refer to <http://www.cisco.com/go/hyperflex>.

Cisco HyperFlex™ systems with Intel® Xeon® processors



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Asia Pacific Headquarters  
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# VMware vSphere

The Industry-Leading Virtualization Platform

## AT A GLANCE

VMware vSphere®, the industry-leading virtualization platform, empowers users to virtualize scale-up and scale-out applications with confidence, redefines availability and simplifies the virtual data center. The result is a highly available, resilient, on-demand infrastructure that is the ideal foundation of any cloud environment.

## KEY BENEFITS

- **Efficiency through utilization and automation** – Achieve consolidation ratios of 15:1 or more and improve hardware utilization from 5-15 percent to as much as 80 percent or more—without sacrificing performance.
- **Maximize uptime across your cloud infrastructure** – Reduce unplanned downtime and eliminate planned downtime for server and storage maintenance.
- **Dramatically lower IT costs** – Reduce capital expenditures by up to 70 percent and operational expenditures by up to 30 percent to achieve 20-30 percent lower IT infrastructure costs for each application running on vSphere.
- **Agility with control** – Respond quickly to changing business needs without sacrificing security or control, and deliver zero-touch infrastructure with built-in availability, scalability and performance guarantees for all business-critical applications running on vSphere.
- **Freedom of choice** – Use a common, standards based platform to leverage existing IT assets alongside next-generation IT services, and enhance vSphere through open APIs with solutions from a global ecosystem of leading technology providers.

## What is vSphere?

VMware vSphere, the industry-leading virtualization platform, empowers users to virtualize scale-up and scale-out applications with confidence, redefines availability and simplifies the virtual data center. The result is a highly available, resilient, on-demand infrastructure that is the ideal foundation of any cloud environment. This can drive down data center cost, increase system and application uptime, and drastically simplify the way IT runs the data center. vSphere is purpose-built for the next generation of applications and serves as the core foundational building block for the Software-Defined Data Center.

vSphere accelerates the shift to cloud computing for existing data centers and also underpins compatible public cloud offerings, forming the foundation for the industry's only hybrid cloud model. With the support of more than 3,000 applications from more than 2,000 ISV partners, vSphere is the trusted platform for any application.

## How Is vSphere Used?

- **Virtualize Applications with Confidence** – Deliver enhanced scale, performance and availability that enables users to virtualize applications with confidence.
- **Simplify Management of the Virtual Data Center** – Manage the creation, sharing, deployment, and migration of virtual machines with powerful yet simple and intuitive tools.
- **Data Center Migration and Maintenance** – Perform live workload migrations and data center maintenance with zero application downtime.
- **Transform Storage for Virtual Machines** – Enable your external storage arrays to operate in a more VM-centric manner that increases performance and efficiency for your virtual machine operations.
- **Enable Choice in How to Build and Operate Cloud Environments** – Build and operate cloud environments that fit your needs using vSphere and the VMware stack or open-source frameworks such as OpenStack and the VMware Integrated OpenStack add-on.

## Key Features and Components of vSphere

### Virtualization Platform

- **VMware vSphere Hypervisor Architecture** provides a robust, production-proven, high-performance virtualization layer. It enables multiple virtual machines to share hardware resources with performance that can match (and in some cases exceed) native throughput.
- **VMware vSphere Virtual Symmetric Multiprocessing** enables the use of ultra-powerful virtual machines that possess up to 128 virtual CPUs.
- **VMware vSphere Virtual Machine File System (VMFS)** allows virtual machines to access shared storage devices (Fibre Channel, iSCSI, etc.) and is a key enabling technology for other vSphere components such as VMware vSphere Storage vMotion®.
- **VMware vSphere Storage APIs** provide integration with supported third-party data protection, multipathing and disk array solutions.



VMware vSphere provides a complete virtualization platform with a comprehensive set of application and infrastructure services.

- **VMware vSphere Thin Provisioning** provides dynamic allocation of shared storage capacity, enabling IT organizations to implement a tiered storage strategy while reducing storage spending by up to 50 percent.
- **VMware vSphere vMotion®** enables live migration of virtual machines between servers and across virtual switches with no disruption to users or loss of service, eliminating the need to schedule application downtime for planned server maintenance.

- **VMware vSphere Storage vMotion** enables live migration of virtual-machine disks with no disruption to users, eliminating the need to schedule application downtime for planned storage maintenance or storage migrations.
- **VMware vSphere High Availability (HA)** provides cost-effective, automated restart within minutes for all applications if a hardware or operating system failure occurs.
- **VMware vSphere Fault Tolerance (FT)** provides continuous availability of any application in the event of a hardware failure - with no data loss or downtime. For workloads up to 2-vCPU.
- **VMware vSphere Data Protection™** is VMware's backup and replication solution, powered by EMC Avamar. It delivers storage-efficient backups through patented variable-length deduplication, rapid recovery and WAN-optimized replication for DR. Its vSphere-integration and simple user interface makes it an easy and effective backup tool for vSphere. It provides agent-less, image-level VM backups to disk and application-aware protection for business-critical applications (e.g., Exchange, SQL Server) along with WAN-efficient, encrypted backup replication across sites.

- **VMware vShield Endpoint™** secures virtual machines with offloaded antivirus and antimalware solutions without the need for agents inside the virtual machine.
- **VMware vSphere Virtual Volumes** enables abstraction for external storage (SAN and NAS) devices making them VM-aware.
- **VMware vSphere Storage Policy-Based Management** allows common management across storage tiers and dynamic storage class of service automation via a policy-driven control plane.

### Additional Components Available in Enterprise Edition

- **VMware vSphere Distributed Resource Scheduler™** provides dynamic, hardware-independent load balancing and resource allocation for virtual machines in a cluster, using policy-driven automation to reduce management complexity while meeting SLAs.
- **VMware vSphere Distributed Power Management™** automates energy efficiency in vSphere Distributed Resource Scheduler clusters by continuously optimizing server power consumption within each cluster.
- **VMware vSphere Reliable Memory** places critical vSphere components (such as the hypervisor) into memory regions identified as "reliable" on supported hardware. This further protects components from an uncorrectable memory error.
- **VMware vSphere Big Data Extensions** run Hadoop on vSphere to achieve higher utilization, reliability and agility. vSphere Big Data Extensions support multiple Hadoop distributions and make it seamless for IT to deploy, run and manage Hadoop workloads on one common platform.

### Additional Components Available in Enterprise Plus Edition

(also inclusive of Enterprise Edition Components listed earlier)

- **VMware vSphere Distributed Switch** simplifies and enhances virtual-machine networking in vSphere environments and enables those environments to use third-party distributed virtual switches.
- **VMware vSphere Storage I/O Control and VMware vSphere Network I/O Control** set storage and network quality-of-service priorities for guaranteed access to resources.
- **VMware vSphere Auto Deploy™** performs quick, as-needed deployment of additional vSphere hosts. When vSphere Auto Deploy is running, it pushes out update images, eliminating patching and the need to schedule patch windows.
- **VMware vSphere Host Profiles** help IT administrators simplify host deployment and compliance.
- **VMware vSphere Storage DRS™** automates load balancing by using storage characteristics to determine the best place for a virtual machine's data to reside, both when it is created and when it is used over time.
- **VMware vSphere Flash Read Cache** virtualizes server-side flash providing a high performance read cache layer that dramatically lowers application latency.
- **VMware vSphere Fault Tolerance** provides continuous availability of any application in the event of a hardware failure – with no data loss or downtime. For workloads up to 4-vCPU.
- **VMware vSphere vMotion** enables live migration of virtual machines between servers, across vCenter Servers, and over long distances (up to 100 milliseconds round trip time) with no disruption to users or loss of service, eliminating the need to schedule application downtime for planned server maintenance.
- **VMware vSphere Content Library** provides simple and effective centralized management for VM templates, virtual appliances, ISO images, and scripts.
- **NVIDIA GRID™ vGPU™** delivers the full benefits of NVIDIA hardware-accelerated graphics to virtualized solutions.

### Customer Success Stories

**Marshall University**, the oldest public institution of higher learning in West Virginia, has leveraged vSphere to extend the life of an overcrowded data center while reducing IT expenditures and accelerating server provisioning time.

Read the Marshall University success story: [http://www.vmware.com/go/customer\\_success/marshall\\_u](http://www.vmware.com/go/customer_success/marshall_u).

**EGIS Nyrt.**, one of the leading pharmaceutical manufacturers in the Central Eastern European region, has used vSphere to consolidate the number of servers managed and has virtualized its business-critical applications to help improve performance and uptime.

Read the EGIS success story: [http://www.vmware.com/go/customer\\_success/EGIS\\_Nyrt](http://www.vmware.com/go/customer_success/EGIS_Nyrt).



**QIC**, one of Australia's largest institutional investment managers, has used vSphere to virtualize 80 percent of its Microsoft Windows Server production servers. The company not only has streamlined its infrastructure; it also has leveraged the backup and recovery capabilities of vSphere to further its disaster recovery and business-continuity planning.

Read the QIC success story: [http://www.vmware.com/go/customer\\_success/QIC](http://www.vmware.com/go/customer_success/QIC).

### Additional vSphere Products and Add-Ons

VMware vCenter Server™ provides unified management for the entire virtual infrastructure and enables many key vSphere capabilities, such as live migration. vCenter Server can manage thousands of virtual machines across multiple locations and streamlines administration with features such as rapid provisioning and automated policy enforcement.

Note: vCenter Server is a required element of a complete vSphere implementation and is licensed separately on a per instance basis.

### Support and Professional Services

VMware offers global support and subscription (SnS) services to all vSphere customers. For customers requiring additional services, VMware also offers professional services engagements on best practices and getting started with your vSphere deployment, both directly and through an extensive network of certified professionals: <http://www.vmware.com/services/>.

### How to Buy

VMware vSphere is available standalone and as part of VMware vSphere\* with Operations Management™ or VMware vCloud Suite. Use the online VMware Partner Locator to find an authorized reseller in your area: <http://partnerlocator.vmware.com/>.

You can also visit the online VMware store to determine which kit or edition of vSphere is right for your organization: <http://www.vmware.com/vmwarestore/datacenter-products/>.

If you are an existing vSphere or VMware Infrastructure™ customer, visit the vSphere Upgrade Center to determine the appropriate upgrade path for your organization: <http://www.vmware.com/products/vsphere/upgrade-center/>.

### Find Out More

For information or to purchase VMware products, call 877-4-VMWARE (outside North America, +1-650-427-5000), visit <http://www.vmware.com/products> or search online for an authorized reseller. For detailed product specifications and system requirements, refer to the vSphere documentation.





# Simplify Your Data Management with Cohesity and HPE

## Key Benefits

- Eliminate data silos
- Simplified procurement and management
- Faster backup and instant restore
- Enterprise-class data security
- Industry-leading data consolidation
- Seamless hybrid and multicloud environments
- Reduced TCO
- Flexible consumption models

Exponential data and application growth make it increasingly challenging to protect, manage, and gain insights from your data for competitive advantage. The complex patchwork of specialized point products and infrastructure silos that your teams must now manage across data centers and clouds contributes to **mass data fragmentation**—creating unnecessary costs, risks, and operational burdens while preventing your organization from realizing business value from data.

Cohesity and Hewlett Packard Enterprise (HPE) deliver integrated all-flash and disk-based data management solutions that eliminate silos so you can easily back up, access, and extract insights from all of your data and apps. Best-of-breed solutions, spanning on-premises, cloud, and the edge, combine the simplicity and efficiency of web-scale Cohesity data management software with the power and density of industry-leading, certified HPE Apollo and HPE ProLiant Gen 10 servers with HPE Pointnext services. The joint solutions redefine data management for the vast majority of enterprise data—backup and recovery, archives, file shares, object stores, and data used for dev/test and analytics.

## Trusted Partners, Proven Solutions

Continued HPE and Cohesity partnership and solution innovation accelerates enterprise data center modernization and multicloud adoption initiatives. Cohesity's native snapshot integration with HPE Nimble Storage provides more efficient backup and improved application performance. Using Cohesity data management software on Apollo 4200 and 4510 Gen 10 servers with its density-optimized storage and compute capabilities, purpose-built scale-out architecture, and comprehensive server security simplifies long-term retention and archival. Deploy Cohesity at remote and branch locations either as a software only running on existing hypervisors or as a plug-and-play appliance on HPE ProLiant DL 360. The joint solution is easily procured via a single order directly from HPE or via HPE certified partners and backed by world-class support and services provided by trusted HPE and Cohesity professionals.

“Leveraging data assets is not optional anymore. Organizations need a cutting-edge platform to eliminate mass data fragmentation, simplify backup and recovery, and do more with their backups and unstructured data. The Cohesity and HPE solution delivers just that—a unique combination of capabilities for intelligent data reuse. Any organization interested in being more AI-driven, more compliant/secure, and more hybrid/multicloud capable should consider this joint solution.”

Christophe Bertrand, Sr. Analyst, Enterprise Strategy Group

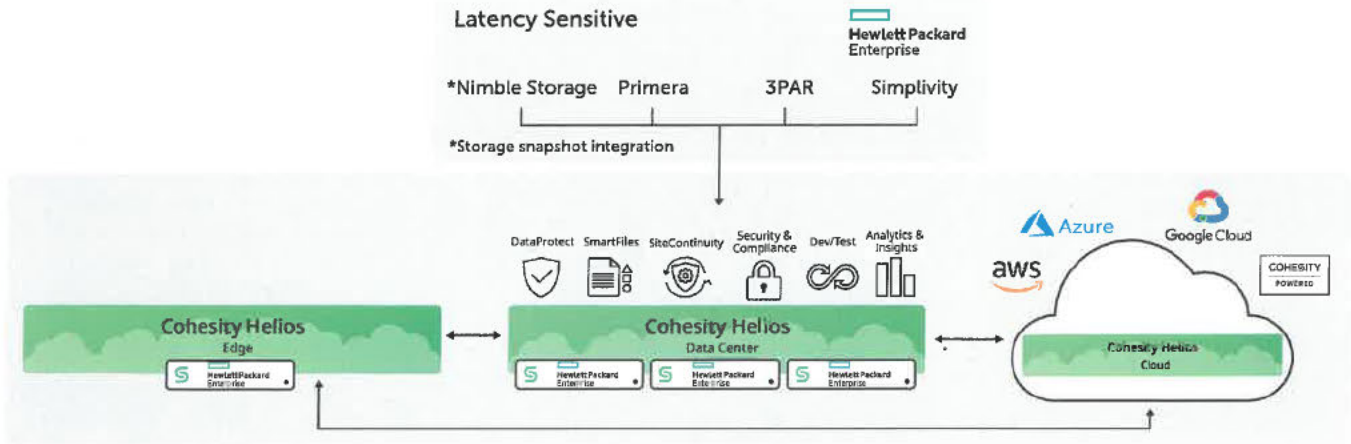


Figure 1: Simplified end-to-end data management with Cohesity software on HPE servers

## Why Cohesity and HPE?

### One Simple, Secure, and Flexible Data Management Platform Maximizing Efficiency

- Hyperscale and integrated to support diverse workloads—from virtual and physical servers to relational and NoSQL databases to traditional and containerized apps—non-disruptively.
- Built-in, enterprise-grade security from combining 'Silicon Root of Trust' HPE servers with immutable snapshots, secure multi-tenancy, and instant ransomware recovery of Cohesity software.
- End-to-end data protection with HPE Nimble snapshot integration and without separate backup software, target storage, dedupe appliances, and cloud gateways.

### Built for Seamless Hybrid/Multicloud to Optimize Investments

- Native cloud integration with Amazon Web Services, Microsoft Azure, Google Cloud, and Cohesity service provider partner clouds for maximum ROI.
- Resource shifting to meet business needs such as cloud tiering, DR in the cloud/cloud archiving, rapid dev/test environment provisioning, cloud-native/SaaS workload protection.
- Unified, intelligent data management across edge, core, and cloud through one Cohesity Helios UI.

- Cloud28+ community access to cloud data management experts and best practices.

### Empowering Your Enterprise to Do More With Your Data

- Faster app development with zero-cost clones for dev/test on-premises or in hybrid/multicloud.
- Predictive and business insights from smart, self-monitoring HPE storage infrastructure and unified visibility from Cohesity data management software, respectively.
- Strengthened security and streamlined compliance using automated global indexing, Google-like search, and Cohesity Marketplace apps for vulnerability assessment, anti-ransomware, and in-place analytics.

## HPE Servers Certified for Cohesity Software

Both rack-optimized HPE ProLiant and rack-scale HPE Apollo servers with Cohesity software simplify data management. Choose the configuration that best meets your organization's needs and then scale capacity non-disruptively as needed, starting with as few as three nodes and scaling-out linearly by adding individual node(s) to the cluster. Deploy certified enterprise-class all-flash or disk-based data management solutions to modernize your data center and simplify your data management onsite and in hybrid/multicloud with Cohesity and HPE.

Learn more at [www.cohesity.com/products/hpe](http://www.cohesity.com/products/hpe)

**COHESITY**

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# Cohesity SmartFiles: Beyond Scale-Out NAS



## Key Benefits

- Freedom of choice
- Broad compatibility
- Stress-free operation
- Eliminate security risks
- Lower storage cost
- “Google-like” search

## Unstructured Data Growth Challenges

According to Gartner, data will grow by 800% over the next five years, of which 80% will be unstructured in the form of file shares, backups, archives, logs, media files, dev/test and analytics. Traditional network attached storage (NAS) was designed over a decade ago for traditional use cases, and without serious architectural consideration for cloud and hybrid IT environments. The reality today is that there are multiple data silos resulting in mass data fragmentation across the data center and cloud.

Challenges are not limited to the cost and management of multiple silos, or delivering hybrid cloud seamlessly. Storage costs often destroy storage budgets. Addressing compliance, regulatory, and governance requirements adds to complexity and cost. That’s why we created Cohesity SmartFiles: to go beyond traditional file and object platforms and address real data management pain with real on-premises, hybrid, and multicloud solutions.

## What is Cohesity SmartFiles

Cohesity SmartFiles is the industry’s first software-defined, data-centric, multiprotocol file and object solution for the enterprise. SmartFiles is part of the Cohesity Helios data platform and goes beyond traditional scale-out NAS in terms of manageability, scale, storage efficiency, integrated applications, cybersecurity, and multi-tiered data management.

## Why Is SmartFiles Smart?

Unlike traditional NAS, the Cohesity Helios data platform with SmartFiles is data-centric, not storage or infrastructure centric. This means there is no need to move data to apps as apps and data are integrated in the same platform. This removes the complexity and cost of running file ecosystem apps for file environments. Cohesity Marketplace apps and machine-learning assisted management provide intelligence and ease-of management that separates SmartFiles from traditional scale-out NAS appliances. It’s smart and with virtually effortless management, regardless of scale.



“We provide the back end for leading companies all over the world, and as an example, just one of our customers has more than 2.5 billion files, so it was imperative to enable a scale-out, software-defined file and object solution across our environment.”

JOHN WHITE, chief innovation officer, Expedient

SmartFiles uniquely provides freedom of choice, broad compatibility, stress-free management, integrated security, search of the entire geographic enterprise, and lower storage cost.

## Freedom of Choice

Software-defined means customers have the freedom to choose the most appropriate hardware for any workload. It's the freedom to match capacity, performance, and cost with workload requirements. But this is not just about today, it's about tomorrow. SmartFiles future-proofs unstructured data workloads on the assurance that workloads are not bound to proprietary hardware—or even the data center. SmartFiles runs in the cloud with all the functionality available on-premises. And it's an easy on-ramp to the cloud through its native S3 protocol—along with unified NFS and SMB protocols for on-premises and the cloud.

## Broad Compatibility

SmartFiles has you covered if you have a mixed OS environment or hybrid cloud environment. File permissions across NFS and SMB environments are mapped for transparent file access from either protocol. Files and objects can be accessed simultaneously, and all data is always available as S3. Hybrid environments are easier as SmartFiles speaks the language of Windows/Linux/Unix and the cloud. Seamless data interoperability helps make complex hybrid environments easy.

## Stress-Free Operation

It begins with an intuitive UI and “click-and-go” ease. It ends with a bit more time to focus on strategic matters—or just extra time to relax. Machine-learning driven management acts as a hidden smart assistant to remove complexity and save time. Data migrations are easy using Cohesity's backup solution—which removes the complexity of other migration tools. Automate operations through rich APIs. Cold data on costly Tier 1 storage automatically moves itself to a cost-optimized tier or the cloud. Utilize policies to ensure consistent management. Manage across multiple clusters and locations from a single management pane. Cloud or on-premises. Core or edge. Physical or virtual. Data movement is always easy and transparent to applications. Cohesity SmartFiles alleviates the stress and complexity of traditional scale-out NAS.

## Integrated Apps

Integrate an entire NAS ecosystem on a single platform. That means anti-virus protection, file audit, and content search all run on the Cohesity Helios data platform with no additional infrastructure required. Detect anomalous file accesses from file logs. Index and

search contents inside of files for compliance and security reasons. The SmartFiles solution eliminates the cost of infrastructure for a NAS ecosystem while removing the management effort required to manage NAS ecosystem hardware.

## Eliminate Security Risks

Cybersecurity is not an option for unsecured data. It's not a want—it's a need. SmartFiles integrated cybersecurity makes security easy to deploy and manage. It's a multi-layered security approach to prevent, detect, and analyze threats:

- **Prevent** – Immutable file system, software encryption, over the wire encryption, multi-factor authentication, DataLock (WORM), and adherence to FIPS 140-1 and 140-2 standards.
- **Detect** – Anti-virus: Detect infected files and prevent files from being compromised
- **Analyze** – Observe user and behavior analytics for security and compliance reasons

## “Google-like” Enterprise Search

It's not just simple, it's deep and data-centric. Get fast search results across file metadata and file content as both are indexed. Unlike traditional NAS, use results to drive data-driven services and make decisions on actual data contents, and not just data about the data. Data is no longer dark. Rather, it's an asset you need for smart operations. Conduct a single simple search across the entire enterprise. Search any data—anywhere. Across silos, VMs, backups, data centers, remote sites, and multiple clouds.

## Low storage cost

Being software-defined, SmartFiles customers have a variety of hardware price points to choose from. SmartFiles reduces hardware storage requirements through data deduplication, compression, small file optimization, and dedupe across data center volumes. Storage costs can be reduced even further through tiering from Tier 1 storage to a cost-optimized Cohesity tier. Let's explore this technology.

- **Data deduplication** – Based on advanced sliding window variable dedupe technology. This means that duplicate data that has been slightly changed is still deduped—which is beyond traditional dedupe capabilities.
- **Compression** – Zstandard compression algorithm for high compression ratios.
- **Small file optimization** – Eliminated the small file amplification penalty common to traditional NAS file systems. Small files are stored efficiently and without the need for triple-mirroring inefficiency. Put simply, 50TB of small files under SmartFiles consumes about 50TB of capacity.

- **Cross-volume dedupe** – Unlike many traditional NAS appliances, data is deduped across storage volumes and application silos across the data center. Duplicate data that can't be reduced by traditional silo-by-silo dedupe is eliminated by the Cohesity SmartFiles.

SmartFiles supports the migration of older inactive data from Netapp, Dell/EMC Isilon, or Pure Storage transparently and seamlessly to Cohesity or to a cloud tier. Apps won't know the difference and storage costs are instantly and drastically reduced.

There are dozens of workloads and use cases in which SmartFiles provides benefit. Amongst these use cases are:

 <p><b>Content Management</b></p> <ul style="list-style-type: none"> <li>• Document management</li> <li>• Scalable libraries</li> <li>• Files and objects</li> </ul>	 <p><b>Splunk Cold Buckets</b></p> <ul style="list-style-type: none"> <li>• Cost-effective cold archiving</li> <li>• on-premises, cloud or both</li> <li>• Frozen data to cloud</li> </ul>	 <p><b>Corporate Video</b></p> <ul style="list-style-type: none"> <li>• Corporate communication</li> <li>• In-house productions</li> <li>• Education and training</li> </ul>	 <p><b>Digital Archives</b></p> <ul style="list-style-type: none"> <li>• Digital documents</li> <li>• Audio and video files</li> <li>• Active archives</li> <li>• Passive archives</li> </ul>	 <p><b>Video Surveillance</b></p> <ul style="list-style-type: none"> <li>• Security cameras</li> <li>• Body and mobile cams</li> <li>• Rapid retrieval from large amounts of data</li> </ul>
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There are many industries that depend on Cohesity for file and object services. These industries include:

 <p><b>Financial Services</b></p> <ul style="list-style-type: none"> <li>• Images and documents</li> <li>• Call logs and correspondence</li> </ul>	 <p><b>Law Firms</b></p> <ul style="list-style-type: none"> <li>• Documents and research</li> <li>• Collaboration</li> <li>• eDiscovery and legal hold</li> </ul>	 <p><b>State, Local and Education</b></p> <ul style="list-style-type: none"> <li>• Collaboration and research</li> <li>• Safety and security</li> <li>• Innovation and technology</li> </ul>	 <p><b>Healthcare</b></p> <ul style="list-style-type: none"> <li>• PACS archives</li> <li>• VNA archives</li> </ul>	 <p><b>Life Sciences and Medical Research</b></p> <ul style="list-style-type: none"> <li>• Next generation sequencing</li> <li>• Genomics analysis</li> </ul>
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Feature	Description
NFSv3, CIFS, SMB 2.x, SMB 3.0, S3, and Openstack Swift APIs	Simultaneous multiprotocol access to the same data with unified permissions. Supports NFS, SMB, and S3 API
Strict consistency	Guaranteed consistent data regardless of scale
SnapTree® snapshots and clones	Limitless and fully-hydrated snapshots for granular Cohesity Views (file systems) as well as writable snapshot clones that provide instant creation, testing, and development of View-based data sets
Fully distributed shared-nothing file system	Limitless scalability, always-on availability, non-disruptive upgrades, pay-as-you-grow model

Feature	Description
API-first design	Architecture built with an API-first design for maximum flexibility and ease of automation
Data management platform	Single platform for data protection, files, objects, dev/test, analytics, and cloud integration
Global deduplication and compression	Unparalleled storage efficiency with global deduplication, compression, and small file capacity optimization across all cluster nodes to significantly reduce data center cost and footprint
Erasure coding and replication factor	Data is protected against any individual node failure with erasure coding or replication across nodes
Global indexing and search	File and object metadata is indexed upon ingest, enabling Google-like search across all files in a cluster. Indexed search of file contents through Insight integrated app. Search across geographic locations and clouds through Cohesity Helios.
Windows Active Directory and Kerberos Integration with Role-Based Access Control (RBAC)	Simplify user and group access to data utilizing credentials and permissions with Windows AD and Kerberos mechanisms. Create and manage custom Cohesity cluster administration roles for domain users and groups
MMC Integration	Snap-in for the Microsoft management console, which allows Cohesity file shares to be managed by the MMC
Quotas	Easily establish user and file system quotas with audit logs
Policy-based backup protection	Integrated data protection software and SnapTree technology is available to allow simplified data protection of objects with fully-hydrated snapshots
Quality of service (QoS)	QoS policies are provided that optimize performance for different types of workloads
Encryption	Support for data-at-rest as well as data-in-flight encryption using the industry standard 256-bit Advanced Encryption Standard (AES) algorithm. The platform is also FIPS 140-1 and 140-2 compliant.
Write Once Read Many (WORM)	Enables long-term retention of data that has compliance controls mandating a policy that objects cannot be modified during the lock time
Replication for disaster recovery	Built-in, granular, and secure replication services for geo redundancy
Cloud integration (CloudArchive, CloudTier, CloudReplicate)	Archive into public cloud services for long-term retention. Utilize cloud tiering for transparent capacity expansion into the cloud. Replicate into the cloud for disaster recovery and dev/test. Also, SmartFiles runs in the cloud of major cloud service providers with all of the functionality of on-premises deployments.

Learn more at [Cohesity.com/products/smartfiles](https://cohesity.com/products/smartfiles)

**COHESITY**

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**Hewlett Packard  
Enterprise**

**VEEAM**

Brochure

# **Better data availability for the Always-On Enterprise**

HPE StoreOnce Systems with Veeam

### Take a fresh approach

The consumerization of IT—and business competition—have forced the need for Always-On computing and instant access to applications. Data centers are increasingly adopting technologies such as flash memory to improve application performance, reduce latency, and so on. Backup windows are shrinking and recovery point objective (RPO)/recovery time objective (RTO) parameters are shifting toward application recovery criteria. Data protection must evolve. As a result, we see large portions of IT budgets getting directed toward improving overall application availability, which requires modernizing data protection.

In the Always-On Enterprise, more and more workloads are mission-critical and are being deployed on virtualized infrastructure, leading to virtual machine (VM) sprawl. Unfortunately, this has created a staggering increase in the amount of backup storage space required, which ultimately results in storage inefficiencies. Virtual machine sprawl and increased data storage size requirements have also caused legacy backup tools to become impractical due to shrinking backup windows, cost, manageability, and poor performance.

Data backup and availability are critical business requirements that have to be planned and deployed correctly. HPE StoreOnce, combined with HPE StoreOnce Catalyst and Veeam, addresses the challenges facing backup administrators who need to consolidate and improve storage efficiencies while addressing these common problems.

- **Backup sprawl**—As you add VMs, hosts, and storage to keep pace with demands, you may need to add more backup infrastructure in order to maintain your backup window. This increases the overhead needed to run multiple backup processes and manage additional devices.
- **Backup overspill**—If your overnight backup solution can't complete the backup in time, it may spill over into the working day. This means slower system performance for your users, or application inaccessibility. You may have to terminate the process in mid-backup—resulting in incomplete protection.
- **Unreliable backup and recovery**—Managing virtual machines, snapshots, backup agents, and planning appropriate backup schedules, is a complex task. Add to that the potential for unforeseen circumstances leading to backup failures, and you may find your backup—and more importantly, the recovery—isn't as reliable as it needs to be, increasing your exposure to data loss and downtime.

## IT departments need a data protection solution to address evolving needs

IT departments need a solution that can:

- **Deliver industry-leading performance to meet growing data volumes and shrinking backup windows**—Reduce impact on VM workloads without the need for backup agents, and store multiple simultaneous backup streams—or full synthetic backups—to a single device at breakneck speeds with HPE StoreOnce Catalyst. This shortens backup windows and accelerates recovery, so you can regain access to data when you need it the most.
- **Keep pace with data and VM growth to enable future-proofing with easy scale-out**—With HPE's StoreOnce pay-as-you-grow architecture, you can start small and scale up to 2240 TB (raw) or 1728 TB (usable) capacity, without any disruption to service. Simply add expansion shelves or couplets. Plus, Veeam's simple per-socket licensing structure scales easily to protect all your VMs as your environment grows.
- **Lower ongoing backup costs**—The HPE StoreOnce federated deduplication solution provides highly-efficient backup storage that reduces the size of data stored on disk. Instead of storing duplicate data, deduplication lets you store only unique data blocks, and places pointers to them when other instances of the same data blocks are needed—without having to store them more than once. With HPE StoreOnce, you can achieve up to a 95% reduction in your backup footprint, reducing your cost per gigabyte of storage while also increasing the number of recovery points.
- **Deliver reliability**—With the combination of HPE StoreOnce and Veeam, you can be confident your data was backed up reliably and that applications are available. HPE solutions are uniquely designed to offer high availability with full redundancy and autonomic restart to reduce single point hardware failures.<sup>1</sup>
- **Provide restore flexibility**—Veeam image-level backup allows for fast, efficient, and flexible VM recovery. It also includes granular file or item-level recovery for applications including Microsoft® Active Directory, SQL Server, Exchange, SharePoint, and Oracle, without use of any agents.

<sup>1</sup> Dependent upon the HPE StoreOnce System selected.

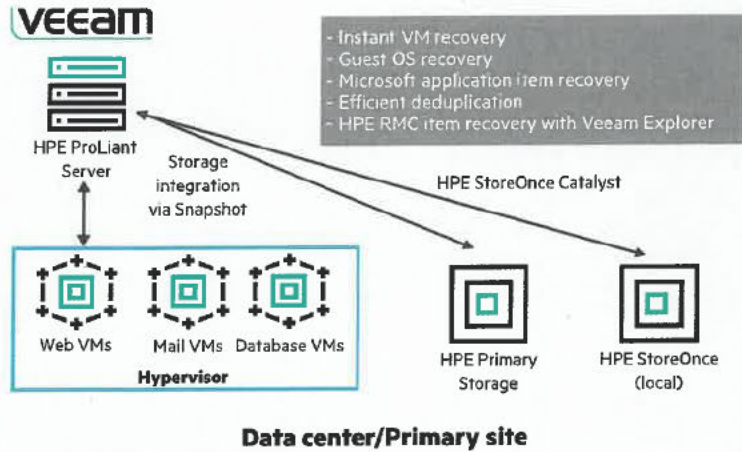


Leverage HPE primary storage with Veeam Backup and Replication and HPE StoreOnce. Add 6-nines reliability with Veeam Instant VM recovery (IVMR) from storage snapshots and achieve higher application availability. With Veeam's integration of Veeam Explorer for storage snapshots and Veeam Backup from storage snapshots with HPE storage, customers are able to implement comprehensive data protection with enterprise capabilities and maximize their investment.

HPE StoreOnce Catalyst for the Veeam backup repository enables fast restore of Veeam IVMR and the other vPower NFS features combining benefits such as space saving and backup efficiency of an in-line deduplication appliance.

Veeam Explorer for Storage Snapshots provides advanced recovery capabilities of VMs and Guest OS, as well as item recovery for Exchange, SharePoint, SQL Server, Active Directory, and Oracle. Application owners can easily recover items and provide maintenance/software upgrades anytime, without disrupting service.

Veeam Explorer integrates with HPE RMC for VMware® (RMC-V). By extending the functionality of Veeam Backup & Replication, application items can be viewed and recovered from within the application VM backup or replica. Combining the speed and affordability of RMC with the granularity of Veeam Explorer, Active Directory, SQL Server, SharePoint, Exchange, and Oracle items can be recovered directly from RMC-V Express Protect backups in addition to the file, VMDK and Datastore level recovery already provided by RMC-V.



**Figure 1. HPE StoreOnce** is an industry-leading disk-based deduplication and backup appliance. HPE StoreOnce Catalyst is a backup and recovery optimized device type that uses a more efficient protocol than NAS or VTL for faster performance. Another significant advantage of Catalyst is that it controls where the backup data deduplication processing takes place (i.e., application server, backup server, or the target device) to optimize the use of available server resources and network bandwidth

### Benefits beyond backup

- **Reduces the cost of replication, both on and off-site**—Veeam’s built-in, VM-centric replication provides highly available off-site disaster recovery of Tier 1 applications, and HPE StoreOnce replication enables you to send deduplicated backup data over lower bandwidth links for a more network and cost-efficient off-site disaster protection. You can now enjoy the complementary benefits of disaster recovery (DR) resiliency for Tier 1 applications, as well as for backup data.
- **Instant recovery and better application uptime for HPE StoreVirtual and 3PAR StoreServ customers**—Leverage your existing or new purchase of HPE primary storage for even greater benefits with Veeam’s integration of Veeam Explorer, Backup, and On-Demand-Sandbox for Storage Snapshots. Deliver the shortest RPOs and RTOs, fastest backups in the industry, and deployment testing that leverages existing backup data as the test environment. Now you can recover all your data in the exact form you need it, to bring applications back online in minutes—significantly reducing downtime and avoiding wasted hours or days in recovery.
- **Immunize the backup repository against virus/malware**—Catalyst based repositories are not directly accessible by the OS and thus a virus or malware cannot access or even see backup objects.
- **Benefit**—The backup repository is protected against virus or malware.

“Veeam proved its value a second time when one of our critical VMs became inoperable after a change. The issue hadn’t been identified during testing, and it was initially unclear why the change had caused an outage. Had this situation persisted, it could have caused an airport disruption and a reputational knock. However, Veeam restored the VM quickly, and we placed it back in service.”

– Sherif Darwish, Head of IT Infrastructure, Gatwick Airport



# PROTECTING DATA FROM RANSOMWARE WITH HPE STOREONCE CATALYST

Ransomware cannot affect what it cannot see

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## EXECUTIVE SUMMARY

Ransomware has been on the rise. Although it has existed since 1989, criminal organizations started developing and distributing ransomware as an attack vector since 2013. Over the years, these attacks have been perfected to target a very vulnerable set of systems and protocols. Any company that has been impacted by malware should seriously consider the possibility that ransomware is also hidden within their environments.

In 2020, the threat landscape evolved to use COVID-19 for successfully depositing ransomware in networks. Changes in preventive and detective controls to accommodate flexible working practices as well as constraints on IT security teams during lockdowns have contributed to the vulnerability of the workplace.

When it comes to ransomware, the primary weakness in any [storage system](#) is within the user authentication process. This white paper covers common authentication methods and how they are compromised. Impacts to the data stored within various types of storage are summarized, including file-sharing technology, along with object and block devices as related to the issue of ransomware. This paper also provides technical detail on how ransomware impacts the traditional storage mechanisms employed by most businesses, as well as how [Hewlett Packard Enterprise \(HPE\) StoreOnce Catalyst](#) can help protect your enterprise data from ransomware and other forms of malware.

## Audience

This paper is intended for information assurance and data protection technologists who are executive staff or IT operations staff responsible for the protection of enterprise data. It is assumed that subjects such as [networking](#), storage area networks, data shares, encryption, malware, and backup are understood, as are the protocols they use. For those not already familiar with ransomware and the associated risks, refer to the HPE technical white paper [Ransomware: Ensuring Protection from a Growing Threat](#).

## BACKGROUND

The use of ransomware attacks is more prevalent today simply because it is a relatively low-touch attack method for criminals, and it works. Criminal groups are pivoting to COVID-19-themed lures in order to exploit end users' concerns over the pandemic and the safety of their loved ones. Remote working significantly increases the risk of a successful ransomware attack due to a combination of weaker controls on home IT and a higher likelihood of users clicking on COVID-19-themed ransomware lure emails. Ransomware has real consequences for victims who, if affected, will find themselves requiring data recovery, paying the ransom due to a lack of preparedness (or lack of secure backups), or accepting the loss of their data altogether. Some sources estimate the revenue generated from ransomware attacks in 2020 alone at \$20 billion.<sup>1</sup> The cost for victims is obviously much greater than the ransom itself. There are significant costs associated with downtime, loss of productivity, and a potentially permanent loss of customers when they are not served appropriately. Furthermore, making significant changes to the enterprise infrastructure and processes to prevent future compromises can be costly considering the time, resources, and money required.

Traditionally, organizations are leveraging a variety of methods to retain and make redundant copies of data. For example, snapshots and replication of network attached storage (NAS), Network File System (NFS) data shares, and Common Internet File System (CIFS) data shares are used to connect, map, and provide data services, all of which are susceptible to ransomware encryption malware.

Online and nearline file-based storage commonly leverages the cross-platform Server Message Block (SMB) protocol to map network drives and read/write remote files in Windows environments (Samba for Linux®/UNIX®). The longevity and backward compatibility of SMB make it widely adopted for general-purpose file storage; although it functions very well for this purpose, it also carries inherent risk in the case of ransomware and should not be relied upon as a mission-critical data repository. SMB can be utilized as a cost-effective and efficient means of temporarily storing data for small businesses or work groups in an enterprise, but eventually all critical data needs to be stored securely.

The primary weakness in securing SMB is in the authentication process. Commonly NT LAN Manager (NTLM) is used in smaller shops and work groups, and Kerberos is used in larger enterprises where a separate authentication server is deployed for this purpose. SMB authentication is the process of confirming a valid user and system combination (system logon credentials) for which rigorous policies should be in place. Different machines on a network then exchange authentication information using NTLM or Kerberos in a challenge-and-response process as needed.

SMB can be made vulnerable in either authentication scenario using pass-the-hash attacks. Authentication using a hash of the user's system password or a Kerberos ticket during the SMB connect exchange with the server is stored in the memory of every system accessed until powered down (assuming volatile memory) in Single Sign-On (SSO) environments. Attackers can grab this hash by playing man in the middle through packet captures or after compromising either the client or server where the hash resides in memory from a memory dump. After the NTLM hash is captured, it is easily used by an attacker. NTLMv1 should not be used at all per Microsoft because it uses an MD4 hash with 56-bit encryption chunks that almost any computer can easily crack. NTLMv2 is better because it has MD5 encryption that should prevent cracking the hash, but this still does not protect a connection from the man-in-the-middle approach where a hostile server intercepts and forwards the uncracked but still valid credentials during the authentication process. This is why strict data classification and authentication policies are so vital for helping to protect an organization and minimize the number of users with access to critical data.

<sup>1</sup> PurpleSec: 2021 Ransomware Statistics, Data, & Trends



The same is true for object and block storage devices that do not incorporate immutable data technologies. Applications and block devices that use immutable data storage technologies might prevent ransomware from affecting some portion of your data, but there are too many variations to detail here. The integration of immutable block technologies with other common enterprise systems and software should be completely investigated before relying on them as a preventative measure against ransomware. Block devices with or without immutable technologies are susceptible to the same authentication issues described here for SMB and Samba. The immutable technology might be able to provide access to unaffected original block data even when the majority of revised data is affected; however, how much and how efficiently data can be recovered can present a challenge especially for large enterprises.

After a storage system integrated with Active Directory has been compromised, it is wide open to an attack that is difficult to identify because legitimate processes and credentials are used to take advantage of the compromised systems. Usually the only way to recognize this means of attack is when things start to go wrong. Obviously, this is far too late.

### HPE STOREONCE CATALYST FEATURES AND BENEFITS

The HPE StoreOnce purpose-built backup appliance and HPE StoreOnce Catalyst bring a wealth of benefits to an organization in the way of space-efficient backup, deduplication, data lifecycle management, and information assurance. However, the single most important feature of HPE StoreOnce Catalyst is its ability to completely isolate data from being tampered with unintentionally.

#### Data is isolated and protected

HPE StoreOnce is a purpose-built backup appliance (or virtual machine) that includes HPE StoreOnce Catalyst stores to effectively isolate critical data where attackers cannot have impact on it without resorting to direct physical interactions that ultimately would result in the destruction of some or all of the hardware itself. Even when physical destruction is achieved at a single location, whether from malware or a natural disaster, the more advanced implementation of HPE StoreOnce Catalyst stores (distributed implementation) would effectively protect mission-critical data by effectively isolating it from traditional lines of communication and command sets leveraged by ransomware attackers. HPE has hidden the Catalyst store from attackers in plain sight but behind an application programming interface (API) that both enhances and simplifies the process of backing up and deduplicating data while making it practically impossible for ransomware to attack it directly.

HPE StoreOnce Catalyst stores do not prevent the rest of the enterprise from being compromised by malware, but they will protect the mission-critical data stored from being either targeted or affected. Ransomware cannot encrypt what it cannot see, and because the Catalyst store does not use standard operating system command instructions for its operations, malware cannot become active while inside. HPE StoreOnce Catalyst efficiently backs up and restores data using a tamperproof method. HPE StoreOnce Catalyst, initially designed for use as a disk-based solution and now extended to the cloud, is capable of leveraging deduplication, compression, encryption, and data isolation for backup and archiving processes. HPE StoreOnce Catalyst prevents ransomware from accessing data on the HPE StoreOnce appliance ensuring data integrity.

#### Command and data sessions

The Catalyst architecture is accessed through an API command set that is directly integrated into a backup application media agent, which includes the HPE StoreOnce Catalyst client library. This library is effectively an API that uses a proprietary set of commands to send and retrieve data from the Catalyst store using command and data sessions, as shown in Figure 1.

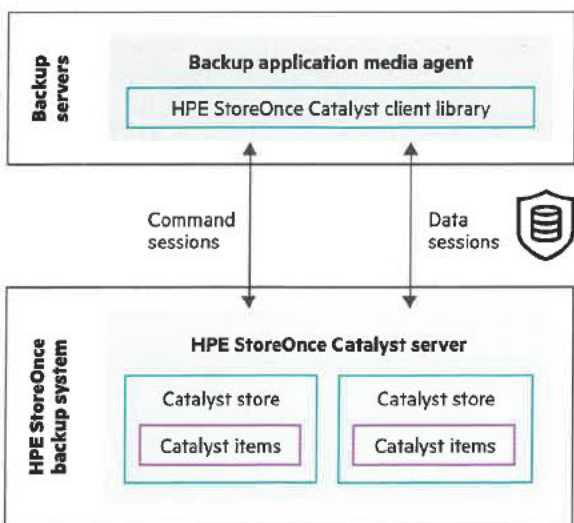


FIGURE 1. Command and data session communication



These command and data sessions are comparable to the SMB (or Samba) connections in a traditional datastore using NAS and similar technologies. The key difference with the HPE StoreOnce Catalyst store is that it does not rely on the same authentication methodology or most importantly the same set of instructions stemming from the operating system that these other technologies do. HPE StoreOnce Catalyst can be considered a kind of demilitarized zone where malware is concerned.

It is this separation from the operating system instruction set that isolates and protects the HPE StoreOnce Catalyst store and its items from a ransomware attack. The systems that the Catalyst media agent reside upon are still vulnerable to attack without further hardening, and the malware itself could be potentially sent across the network to the Catalyst store; however, the Catalyst store itself is completely protected from being encrypted by the malware due to the separation of it from any usable command sets (targeted operating systems such as Windows and Linux). All communication to and from the HPE StoreOnce Catalyst store is sent through the Catalyst client library (API) and its associated command and data sessions that create the pipes between systems using HPE technology specific to this task.

The command and data sessions run over standard TCP/IP Ethernet or Fibre Channel connections depending on the HPE StoreOnce model. These sessions use remote procedure call (RPC) through the API, which causes subroutines to run in different memory address spaces on each system associated with the solution. The memory segregation further isolates the process by adding additional protective layers between the data and the malware before it gets to the Catalyst store, taking the layered security methodology all the way to the end point. This is also conducive to cross-platform data movements where instruction sets are likely not the same (for example, Windows to Linux).

### **Interprocess communication**

The item of importance where ransomware is concerned is that all communication between the backup server and the HPE StoreOnce Catalyst store is handled using interprocess communication (IPC), which is a mechanism within the context of RPC used to enable communication between a client and a server regardless of where the parts are physically located (remotely, same system, and so on). This communication is not dependent on the local operating system command set to perform its duties. This secures the data, not the device, and enables data mobility in a way that brings the data closer to the systems where compute happens, increasing efficiency and potentially decreasing costs while eliminating risk. How HPE implements deduplication on HPE StoreOnce appliances is not directly relevant to the security aspect of the Catalyst solution aside from employing encryption algorithms to reduce the data set size, but additional information can be found in other documentation referenced in the [Resources](#) section of this white paper.

## **BACKUP METHODOLOGIES**

Data isolation effectively protects the data, but efficient data management requires the use of one or more technologies depending on the services and efficiency requirements of an organization. One consideration should be the implementation of solid backup methodologies as indicated by the United States Computer Emergency Readiness Team (US-CERT) in its report [Data Backup Options](#). The 3-2-1-1 rule refers to the practice of creating at least three copies of data (one primary copy and two backups). Two copies are stored on at least two different types of media (for example, disk and tape) with at least one copy stored off-site and one copy offline.

## **BACKUP APPLICATIONS**

Several software vendors have integrated HPE StoreOnce Catalyst technology into their data protection applications, providing advanced backup, data management, and automation capabilities. Using the 3-2-1-1 backup methodology as recommended by US-CERT is still very applicable as a process control even when HPE StoreOnce Catalyst isolates the data. The 3-2-1-1 method helps to ensure data is protected from a variety of potential problems, including human error and natural disasters. One unique and very useful third-party capability is Veeam Mount Server, which enables the ability to immediately mount backed up virtual machine files for instant VM recovery and unparalleled RTO efficiency when combined with HPE StoreOnce Catalyst. VMs recovered in this fashion are mounted Read-Only by default, further protecting the environment should any malicious software remain within the backup data.

### **Immunize backup repositories against viruses**

The best backup solution is useless if ransomware can access your backup repositories. Figure 2 illustrates how HPE StoreOnce Catalyst provides protection for backup repositories. Backup applications integrated with HPE StoreOnce Catalyst stores primarily enhance the ability to manage the lifecycle of backup data through policies and scheduling.



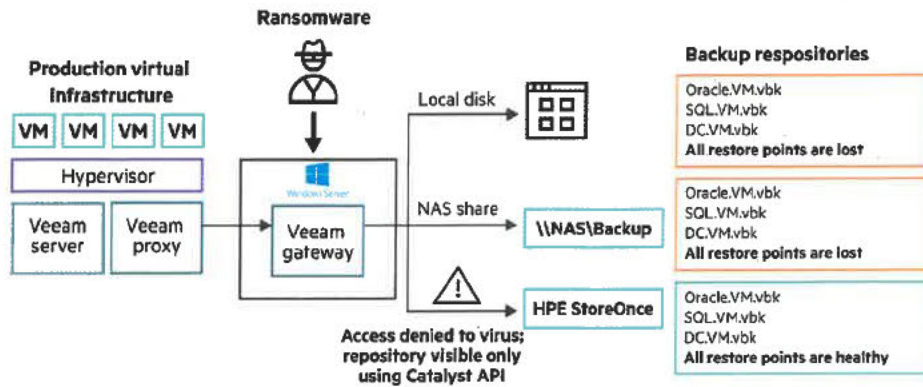


FIGURE 2. HPE StoreOnce Catalyst protects data because the repository is only visible through the Catalyst API

## HPE STOREONCE CATALYST ARRAY INTEGRATION WITH HPE RECOVERY MANAGER CENTRAL AND BACKUP APPLICATIONS

### HPE Recovery Manager Central

HPE Recovery Manager Central (RMC) is tailored to many enterprise software applications to enable the ability to create snapshots, replicate volumes, and back up storage while providing stringent recovery point objective (RPO) and recovery time objective (RTO) service-level agreements (SLAs) in conjunction with HPE Primera and HPE Nimble Storage<sup>2</sup> arrays. All-flash-enabled applications running on HPE 3PAR StoreServ or HPE Primera arrays can take advantage of crash consistent backups and snapshots to ensure that the right data is available for recovery at the right time. The HPE StoreOnce Catalyst store serves as an ideal final destination for any information on the array that is considered mission-critical enough to protect from ransomware. When used in conjunction with HPE RMC, the HPE StoreOnce Catalyst store is fully integrated for a seamless and efficient data protection experience. Additional information about these products can be found in the [Resources](#) section or through speaking with an HPE Presales professional.

### Backup Applications

Many backup software products such as Commvault CommServe and Veeam Backup & Replication are integrated with HPE StoreOnce Catalyst leading to faster backups and recovery. A greater number of backup images can be stored on disk, providing more recovery points and faster restores from backups. HPE StoreOnce variable-length deduplication provides a fine-grained deduplication capability that increases the overall storage efficiency of backups and reduces costs. HPE StoreOnce allows you to deduplicate across the backup jobs, further improving deduplication efficiency. Commvault CommServe and Veeam Backup & Replication software integration includes reliable security and ransomware protection that fends off increasing risks of cyberthreats now and into the future, delivering unprecedented resiliency for companies of any size. HPE StoreOnce Catalyst effectively isolates critical data so attackers cannot access it without resorting to direct physical interactions. Even in instances a single location is physically compromised, HPE StoreOnce Catalyst stores continue to protect mission-critical data by effectively isolating the data from traditional lines of communication and command sets leveraged by ransomware attackers.

## RANSOMWARE PROTECTION IN THE CLOUD WITH HPE CLOUD VOLUMES BACKUP

A modern data protection plan should extend to the cloud for scalability. The cloud offers flexible capacity and supreme agility without requiring additional capital investment. Cloud services scale up or down to meet unpredictable demands, and because data is managed off-site, your IT staff is freed up from additional data center tasks.

HPE Cloud Volumes Backup delivers a simple, efficient, and flexible way for users to backup data in the cloud. This enterprise backup service enables the customer to backup seamlessly to the cloud—directly from any storage using any backup ISV—without changing existing data protection workflows. Start backing up to the cloud in less than 5 minutes with automated backup policies in just a few clicks and recover with ease. HPE Cloud Volumes Backup is secure by design and safeguards against any threat with encrypted backups that are invisible to ransomware attacks. Using the proven HPE Catalyst API, it makes backup images invisible and inaccessible to ransomware, ensuring data integrity and enabling restores in the event of an attack. You can restore workloads on-premises or easily leverage public cloud for multiple use cases, such as test/dev, reporting, and analytics, helping you to transform your backup data into a business asset.

<sup>2</sup> HPE Nimble Storage RMC integration is planned.



## CONCLUSION

Data protection has slowly morphed into a never-ending series of disk-based replications and snapshots, which serve to recover specific files quickly. However, the move away from more redundant and secure methods such as tape and off-site archives has left a large security gap for cybercriminals to distribute ransomware. Many organizations can now unfortunately attest that simply backing up data by making copies is not sufficient. If an operating system can see your data, so can ransomware. In traditional backups, knowing what data has been affected and when plays a crucial role in determining which backup repositories can be used to recover post-attack. The 3-2-1-1 rule that data protection specialists have relied on must always be remembered: Preserve three copies of your data on at least two different media types with one stored offline, and one stored offsite at another physical location or in the cloud.

The best method for protecting enterprise data is a combination of well documented and communicated policies, effective implementation of critical security controls (particularly access controls), and HPE StoreOnce Catalyst, which is the critical data protection component in safeguarding data from ransomware in a backup or data archiving solution. HPE StoreOnce Catalyst deployed as the backup target for mission-critical data ensures the ability to recover data from either a specific RTO or a configuration RPO. Most importantly, it shields data from ransomware and other forms of malware that target specific operating systems. HPE StoreOnce Catalyst stores effectively isolate data and protect it from unintended manipulation and, in the case of ransomware specifically, encryption.

Some companies have tried to hide ransomware incidents, only to have the media report the data breaches later for customers, shareholders, and board members to see. You can find the right hardware and software solution by combining the fully integrated, industry-leading disk technology of HPE Primera and HPE Recovery Manager Central with the HPE StoreOnce Catalyst store technology. The procedures and policies of the US-CERT recommended backup methodology of 3-2-1 ensure true enterprise-level information assurance. Remember that ransomware cannot infect what it cannot see. Be sure your data is securely isolated from cybercriminals with HPE StoreOnce Catalyst stores, and shift from data protection to information assurance.

## CALL TO ACTION

Download the 60-day free trial of HPE StoreOnce VSA and try Catalyst stores in your own test and development environment. There are virtual machine versions for VMware ESXi™, Microsoft Hyper-V, and Kernel-based Virtual Machine (KVM).

### Resources

HPE Recovery Manager Central  
[hpe.com/us/en/storage/rmc-backup.html](https://hpe.com/us/en/storage/rmc-backup.html)

US-CERT Data Backup Options  
[us-cert.gov/sites/default/files/publications/data\\_backup\\_options.pdf](https://us-cert.gov/sites/default/files/publications/data_backup_options.pdf)

HPE StoreOnce 3100, 3520, 3540, 5100, and 5500 User Guide  
[support.hpe.com/hpsc/public/docDisplay?docId=a00062048en\\_us&docLocale=en\\_US](https://support.hpe.com/hpsc/public/docDisplay?docId=a00062048en_us&docLocale=en_US)

Veeam and HPE StoreOnce Catalyst  
[psnow.ext.hpe.com/doc/4aa6-4336enw](https://psnow.ext.hpe.com/doc/4aa6-4336enw)

Veritas NetBackup and HPE StoreOnce Catalyst  
[support.hpe.com/hpsc/doc/public/display?sp4ts.oid=5196525&docId=emr\\_na-c03616587&docLocale=en\\_US](https://support.hpe.com/hpsc/doc/public/display?sp4ts.oid=5196525&docId=emr_na-c03616587&docLocale=en_US)

Center for Internet Security Critical Security Controls  
[cisecurity.org/controls/](https://cisecurity.org/controls/)

NIST Special Publication 1800-11A  
Data Integrity—Recovering from Ransomware and Other Destructive Events  
[nccoe.nist.gov/sites/default/files/library/sp1800/di-nist-sp1800-11a-draft.pdf](https://nccoe.nist.gov/sites/default/files/library/sp1800/di-nist-sp1800-11a-draft.pdf)

SANS Critical Security Controls poster  
[sans.org/media/critical-security-controls/critical-controls-poster-2016.pdf](https://sans.org/media/critical-security-controls/critical-controls-poster-2016.pdf)

Managing HPE Nimble Storage snapshots, replication, and backup to HPE StoreOnce with Veeam  
[psnow.ext.hpe.com/doc/a00030378enw](https://psnow.ext.hpe.com/doc/a00030378enw)



## LEARN MORE AT

[hpe.com/us/en/storage/storeonce](https://hpe.com/us/en/storage/storeonce)

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a00042003ENW, April 2021, Rev. 2



# HPE AND QUMULO FILE DATA PLATFORM

High-performance scalable storage for healthcare and medical  
imaging data with Qumulo for PACS and VNA

**Qumulo leverages HPE Apollo 4200 best-in-class storage servers** to provide cost-effective, high-performance imaging data collection and management. This solution meets leading imaging vendors' single and multi-tier storage requirements and is ideal for healthcare customers' long-term imaging data archive needs. This solution delivers:

- **Enterprise performance at archive prices.** Flash-first architecture and machine learning, read-ahead cache provides the performance benefits of flash with the cost benefits of spinning disks.
- **Greater true usable capacity; get what you pay for.** Qumulo clusters can be filled to 100% of usable capacity without performance degradation. The clusters are optimized for mixed I/O environments so high efficiency is maintained across all files large and small.
- **Real-time analytics for visibility and control.** Qumulo analytics provides users with real-time insight into what's driving the growth of the storage footprint. It also shows which clients and IP addresses are dominating IOPS and network bandwidth. Reporting is immediate without the traditional delay.
- **Best-in-class cross-protocol support.** This solution automatically manages NTFS and POSIX permissions, preserving ACL inheritance and allowing true collaboration without compromise. Qumulo software supports SMB, NFS, and FTP standard protocols and includes a comprehensive REST API that enables you to easily automate your storage management.
- **Enterprise-grade features.** Qumulo capacity licensing covers all software features presently available—snapshots, replication, reporting, and more—as well as any future enhancements that are released as long as the cluster has an active subscription. Additionally, users can move to newer hardware generations or to the cloud using the value of the existing subscription.

## Hybrid cloud infrastructure as a service on an industry-leading storage server



### MEDICAL IMAGING IS A POWERFUL TOOL FOR CLINICAL DIAGNOSIS AND PATIENT TREATMENT

However, the growing use of imaging technologies combined with ever-larger file or study sizes are driving greater demand for storage. Increasingly, healthcare IT departments are facing an imaging data storage and management challenge.

Consolidation of providers can also result in a collection of multiple disparate Picture Archiving and Communication Systems (PACS), each with their associated storage requirements, further exacerbating the storage capacity and performance.

Over time, management, maintenance, and scalability of these siloed systems can become increasingly complex and costly.

### PERFORMANCE AT SCALE

Healthcare providers are increasingly leveraging modalities such as MRI, CT, PET scans, and more recently digital pathology in diagnosis and care provision. The large size of these files/studies places greater stress on the underlying storage infrastructure. The storage component of a medical imaging system faces the dual challenge of absorbing the data growth while maintaining user performance. Limited clinician access to data slows processes and impacts patient care and organizational profitability.

## Solution brief

Proprietary storage can also result in vendor lock-in, migration costs, and challenges, further preventing healthcare organizations from harnessing more recent cost-effective performant storage solutions. Vendor-neutral archive implementation demands storage capable of similar seamless, cost-effective, and open-ended scale, without the pain and disruption of platform/data migration. The storage infrastructure also needs to offer the necessary performance to support storage, management, and rapid retrieval of studies potentially gigabytes in size.

Capacity demand combined with the regulatory patient privacy concerns and the requirement for personal health records mean increased pressure on the demand for compliant, secure, consolidated storage.

## SINGLE-TIER STORAGE

Healthcare providers are challenged to give their imaging departments sufficient capacity (potentially petabytes) of cost-effective storage that also meets technical, regulatory, and fiscal requirements. Some imaging vendors are moving their storage requirements toward a single-tier architecture with the potential for large-scale seamless growth.

Imaging data storage systems should meet imaging vendor requirements and provide:

- Predictable large file-size performance
- Seamless ability to scale
- Options to leverage the cloud

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## WHY QUMULO STORAGE FOR MEDICAL IMAGING

Qumulo is a high-performance cloud-native file data platform that meets the performance and capacity demands of medical imaging data.

Qumulo is easy to manage with real-time IT operational analytic that gives you instant visibility of every file and user and cost-efficient capacity to serve your performance peaks while meeting your budget constraints, all from one namespace.

Qumulo stores your data securely on-prem and in the public cloud with dynamic scaling in a single namespace for active, archived, and backed-up data without the need for third-party data management applications.

The Qumulo file data platform running on HPE Apollo 4200 series storage servers allows healthcare organizations to symmetrically scale capacity and performance in real-time without disruption. With industry-leading file system efficiency, Qumulo offers the best raw-to-usable capacity, allowing customers to leverage 100% of usable storage.

## QUMULO STORAGE AND HPE APOLLO

Healthcare providers require modern, flexible storage systems to manage the consolidated imaging output from higher-resolution diagnostic imaging systems. Qumulo scale-out NAS software running on HPE Apollo 4200 storage servers provides a cost-effective, reliable, scalable, high-performance, storage solution that meets both providers' and leading imaging vendors' needs.

### Built for the hybrid cloud

Qumulo provides a single file solution for cloud or on-premises environments. Customers can burst compute in Amazon Web Services (AWS) or Google™ Cloud Platform (GCP) and shift primary workloads to the cloud without application changes.

### Real-time analytics for data transparency

Qumulo software assigns the aggregation of real-time metadata to all data as it is ingested, providing real-time insight into crucial information without performance degradation or long-file system scans.

### Greater storage utilization

Erasure coding provides data protection at the block level and is more configurable and space-efficient than mirroring and RAID. The efficient Qumulo software architecture enables 100% usable storage, unlike legacy systems, so customers use what they pay for.

### Reliable medical imaging and data assurance and security

This solution provides built-in data protection through local and remote snapshots and continuous replication to ensure data is preserved and remains highly available. In addition, always-on software based encryption at-rest and over-the-wire encryption ensure confidential records are secure.

## HPE APOLLO 4200 STORAGE SERVERS

Density-optimized HPE Apollo 4200 systems are designed specifically for highly scalable storage. They provide an optimal platform for Qumulo scale-out NAS software and can scale from terabytes to petabytes while meeting single or multisite requirements.

### Custom configurations

An HPE Apollo 4200 for Qumulo solution can be configured as follows:

- Custom memory and SSD sizing for large file size imaging applications
- Customizable capacity points with specific SSD/HDD sizes to maximize bulk data capacity
- From a 36 TB node to 100s of petabytes in larger-capacity server nodes
- 2U and 4U form factors
- HPE GreenLake IaaS capable

**LEARN MORE AT**  
[HPE Solutions for Qumulo](#)

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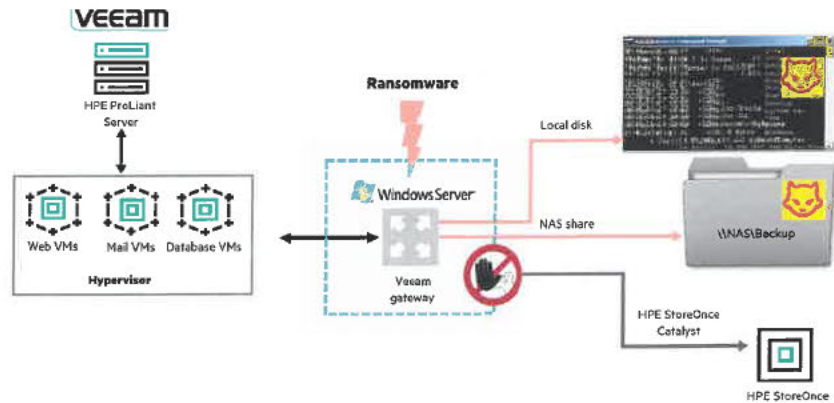
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a00096828ENW, February 2021, Rev. 2

With HPE StoreOnce you can achieve up to

95%

reduction in your backup footprint<sup>2</sup>



Access denied to Virus. Repository visible only using Catalyst API

Figure 2. Protection against virus or malware with HPE StoreOnce and Veeam

## Ready to overcome the virtualization backup challenge?

You wouldn't choose to operate your company without property liability and other key insurance. Why put your valuable data assets at risk? You never know when or where a disaster will strike, so let us evaluate your environment and propose a solution that improves data protection and availability across your organization, while reducing complexity and lowering costs. A free backup assessment can be obtained with **HPE's Ninja Protected+ Backup Assessment** to provide insights into how healthy your backup environment is and to uncover opportunities for you to reduce cost, risk and complexities involved in protecting your data and application.

Insuring your data with HPE StoreOnce and Veeam means you can be confident that it is protected, recoverable, and readily available. This allows you to meet stringent backup windows, while reducing your management overhead, complexity, and cost. It seamlessly integrates into your virtual environment allowing simple, agentless deployment, along with reduction and consolidation of storage.

To learn more, contact your certified HPE or Veeam partner.

Learn more at

[hpe.com/storage/burasolutions](http://hpe.com/storage/burasolutions)

[hpe.com/partners/technology](http://hpe.com/partners/technology)

[veeam.com/hpe-availability-solution.html](http://veeam.com/hpe-availability-solution.html)

<sup>2</sup> StoreOnce deduplication ratio from HPE internal lab tests has shown 20:1 reduction in data. The results are not typical and the number could vary based on number of factors including data change rate, backup retention, etc.

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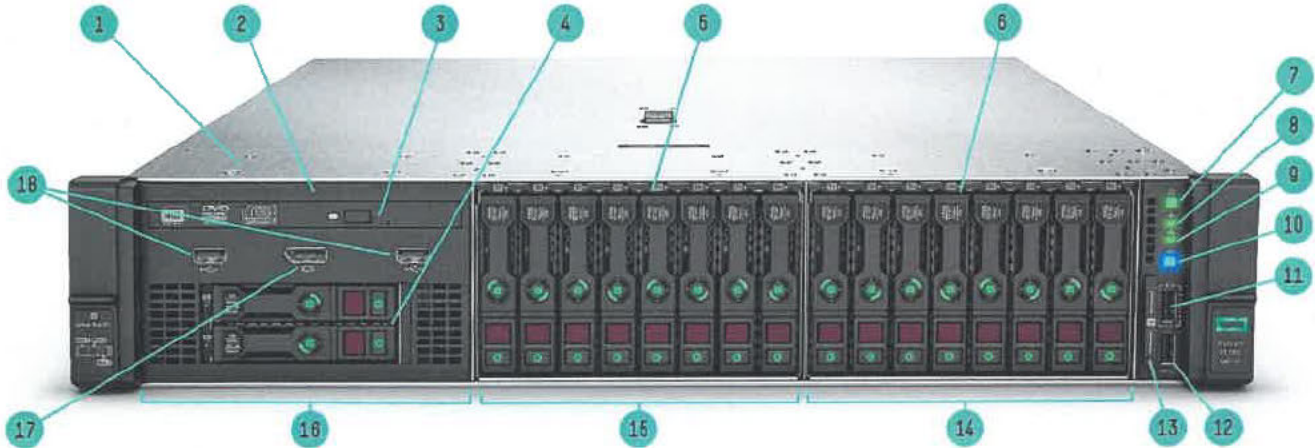
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4AA5-5279ENN, May 2017, Rev. 4

### Overview

### HPE ProLiant DL380 Gen10 Server

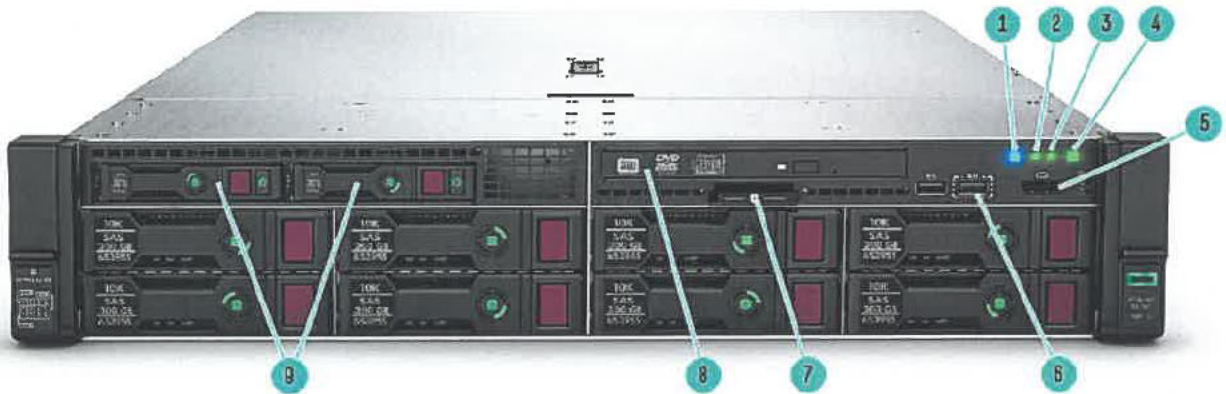
Adaptable for diverse workloads and environments, the secure 2P 2U HPE ProLiant DL380 Gen10 delivers world-class performance with the right balance of expandability and scalability. Designed for supreme versatility and resiliency while being backed by a comprehensive warranty make it ideal for multiple environments from Containers to Cloud to Big Data. Standardize on the industry's most trusted compute platform.



**Front View – SFF chassis with optional Universal Media bay with optical and 2 NVMe plus 16 NVMe shown**

- |   |   |
|---|---|
| 1. Quick removal access panel   | 10. UID button  |
| 2. Optional Universal Media bay. 2 USB 2.0 and Display port standard (8 SFF bay or 6 SFF+2NVMe or 8NVMe optional) | 11. iLO Front Service Port                                |
| 3. Optional Optical drive. Requires Universal Media bay   | 12. USB 3.0   |
| 4. Optional 2 SFF HDD, requires optional Universal Media bay  | 13. Serial label pull tag                                 |
| 5. Drive Bay 2. NVMe shown (8 SFF, 6SFF+2NVMe or 8 NVMe PCIe SSD optional)  | 14. Box 3   |
| 6. 8 SFF Drive Cage Bay   | 15. Box 2   |
| 7. Power On/Standby button and system power LED button  | 16. Box 1   |
| 8. Health LED   | 17. Optional front display port (Via Universal Media Bay) |
| 9. NIC status   | 18. Optional USB 2.0 (via Universal Media Bay)            |

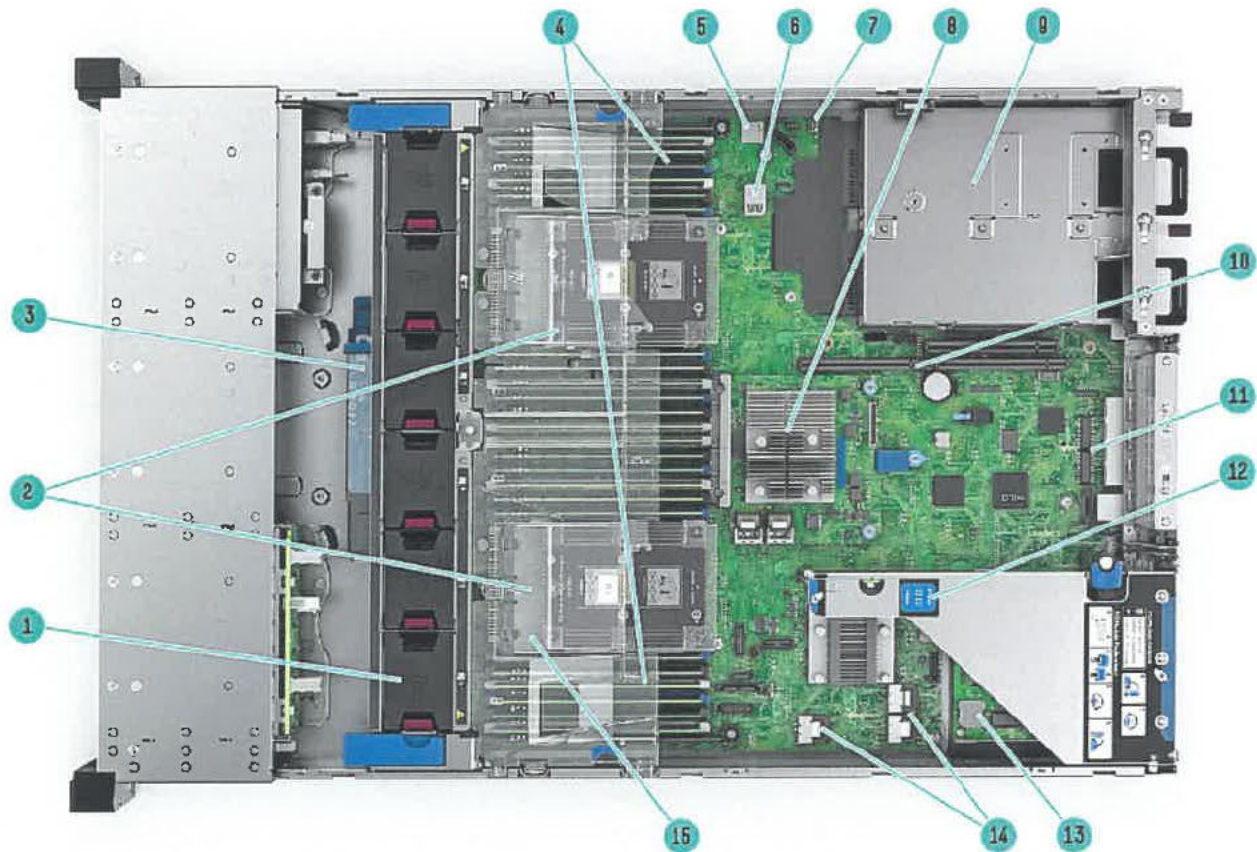
## Overview



**Front View – 8LFF chassis with Universal media bay and optional 2SFF and optical drive shown**

- |  |   |
|--|---|
| 1. UID button  | 6. iLO Front Service Port                           |
| 2. Health LED  | 7. Serial label pull tag                            |
| 3. NIC status  | 8. Optional optical drive shown (blank as standard) |
| 4. Power On/Standby button and system power LED button | 9. Optional 2 SFF Drive bay, 2 NVMe shown           |
| 5. Front display port                                  |   |

## Overview

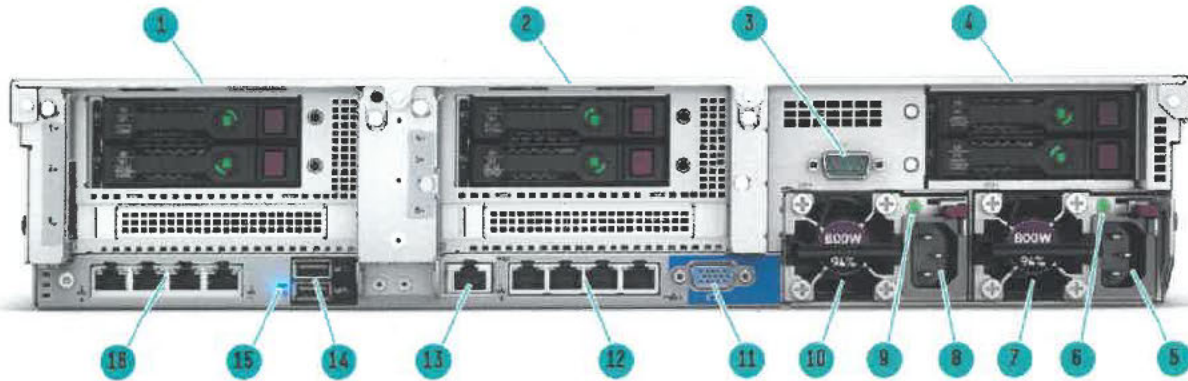


### Internal View 8SFF chassis – with optional 2<sup>nd</sup> CPU, FlexLOM, Smart array shown

1. Fan cage shown with 6 standard Hot-plug fans (High Performance temperature fans optional)
2. 2 Processors, heatsink showing
3. Optional HPE Smart Hybrid Capacitor or HPE Smart Storage Battery
4. DDR4 DIMM slots. Shown fully populated in 24 slots (12 per processor)
5. MicroSD card slot (Optional Dual Micro-SD option)
6. Internal USB 3.0 connector
7. Chassis intrusion detection connector
8. Optional HPE Smart Array (P408i-a shown) Clear air baffle
9. (Under) Hot Plug redundant HPE Flexible Slot Power supplies
10. Connection for second (optional) riser (Requires second CPU)
11. Embedded 4x1Gbe NIC (if equipped)<sup>1</sup>
12. Primary PCIe riser, standard (Optional double wide GPU riser)
13. FlexibleLOM slot (Optional, depending on model selected)
14. X4 SATA ports (1, 2 and 3)
15. Clear air baffle

**Notes:** <sup>1</sup> Networking Choice (NC) models do not include an embedded NIC and have a FlexibleLOM pre-selected for Build-to-Order (BTO) models; Configure-to-Order (CTO) models require a primary networking choice of FlexibleLOM or select networking adapters NIC adapters. See "FlexibleLOM Adapters" and/or "HPE Networking" sections for available options.

## Overview



**Rear View – With optional FlexLOM, Rear drives and Serial port shown.**

- |   |  |
|---|--|
| 1. Primary Riser. PCI Slots (Slots 1-3 top to bottom, riser shipped standard, not shown), optional 2SFF rear drives                               | 9. Power supply Power LED  |
| 2. Secondary Riser. PCI Slots (Slots 4-6 top to bottom, not shown, requires second riser card, and second processor). Showing optional 2 SFF rear | 10. HPE Flexible Slot Power Supply bay 2 (800W shown)                |
| 3. Optional serial port   | 11. VGA connector  |
| 4. Tertiary Riser (Slots 7-8). Optional rear 2 SFF HDD (supported in 24 SFF or 12 LFF front end)  | 12. Embedded 4 x 1GbE Network Adapter (if equipped) <sup>1</sup>     |
| 5. Power supply Power connection  | 13. Dedicated iLO management port                                    |
| 6. Power supply Power LED   | 14. USB connectors 3.0 (2)   |
| 7. HPE Flexible Slot Power Supply bay 1 (800W shown)  | 15. Unit ID LED  |
| 8. Power supply Power connection  | 16. FlexibleLOM ports (4 x 1GbE shown); optional, depending on model |

**Notes:** <sup>1</sup> Networking Choice (NC) models do not include an embedded NIC and have a FlexibleLOM pre-selected for Build-to-Order (BTO) models; Configure-to-Order (CTO) models require a primary networking choice of FlexibleLOM or select networking adapters NIC adapters. See “FlexibleLOM Adapters” and/or “HPE Networking” sections for available options.

### What's New

- New Read-Intensive SFF Value SAS SSD (960GB/1.92TB/3.84TB/7.68TB)
- New Mixed-Use SFF Value SAS SSD (960GB/1.92TB/3.84TB)
- New Mixed-Use LFF Value SAS SSD (1.92TB)
- New HPE 32GB 1Rx4 DDR4-2933 Registered Memory Kit (P38466-B21)
- New HPE Trusted Supply Chain/HPE ProLiant DL380T Gen10 option (P36394-B21)

## Overview

### Platform Information

#### Form Factor

- 2U rack

#### Chassis Types

- 8 SFF with optional Universal Media Bay, and optional SFF or NVMe drive bay options
- 24 SFF bay with additional 6SFF rear drive bay option to total 30 SFF drives
- 8 LFF with Universal Media Bay
- 12 LFF with optional 4 LFF mid-plane and optional 3LFF + 2 SFF rear drive bay to total 19 LFF drives + 2 SFF drives

#### Notes:

- The 3 LFF rear drive box will consume space for the secondary and tertiary riser.
- The 8 and 12 LFF chassis also supports the 2 SFF rear drive box which allows for the user to attach a secondary or tertiary riser.
- The 8 NVMe drive option (826689-B21) can only be leveraged in the SFF chassis and replaces Box 1, 2 or 3, however there is a maximum of 20 NVMe drives supported with Partial population of Box 1.
- The Premium cage (826690-B21, 6 SAS/SATA+2 NVMe) can only be leveraged in the SFF chassis and replaces Box 1, 2 or 3.
- The Universal Media Bay (826708-B21) not available with the LFF chassis or the 24 SFF front end, and can only be populated in Box 1.
- The 8 SFF can be upgraded with additional 8SFF drive box to total 16 or 24 SFF drives. For optimal upgrade Box 2 should be populated second, with Box 1 the last to be populated for a field upgrade to 24 SFF. For CTO builds requiring 24 SFF please use the 24 SFF chassis (868704-B21). Note a field upgrade to 24 SFF will require a High Performance fan kit (867810-B21).
- The 8 LFF chassis cannot be upgraded to 12 LFF front in the field; however the 4-LFF Mid plane (826686-B21) is supported, but will also require a performance fan kit (867810-B21).
- The 8LFF chassis ships with 6-standard fans.
- All models come with the S100i Smart Array Controller with embedded software RAID support for 12 drives. The S100i uses 14 embedded SATA ports, but only 12 ports are accessible as 2 are leveraged to support the 2 M.2 options on the primary riser.

#### System Fans

- Standard – fan types included

#### Notes:

- 1P models typically ship with 4 standard fans. The second processor option kit contains 2 additional fans. 1P Models have (4) (N+1 redundancy standard).
- 2P models typically ship with 6 standard fans. 2P Models have (6) (N+1 redundancy standard).
- The 12 LFF and 24 SFF chassis ship with 6 High performance fans as standard.
- The 8LFF chassis ships with 6 standard fans as standard.
- High performance fan kit is available to meet ambient temperature environments.
- High performance fan kits are required for rear drives, Graphics (GPU) card or NVMe configurations.



## Standard Features

**Processors** – Up to 2 of the following depending on model.

The 2nd digit of the processor model number “x1xx” and “x2xx” is used to denote the processor generation (i.e. 1=1st generation and 2=2nd generation)

**Notes:** Field upgrades from 1<sup>st</sup> generation processors (x1xx) to 2<sup>nd</sup> generation processors (x2xx) not supported.

“U” processors (i.e. 6212U) only supported in single socket configurations

For more information regarding Intel Xeon processors, please see the following <http://www.intel.com/xeon>.

This table covers the public Intel offering only.

Intel Xeon processors		
Processor Suffix	Description	Offering
<b>L</b>	Large memory tier	Up to 4.5 TB addressable memory per socket
<b>M</b>	Medium memory tier	Up to 2.0 TB addressable memory per socket (up to 1.5TB for 1st generation Intel Xeon Scalable Processors denoted with the “M” suffix)
<b>N</b>	NFV Optimized	Targeted at Network Function Virtualization (NFV) workloads. Intel® SST-BF improves performance by directing base frequency to high priority/bottleneck cores. Other workloads may see throttling, more details to be provided in upcoming documentation.
<b>S</b>	Search Optimized	Optimized base frequency to address ‘search’ workloads. Other workloads may see throttling, more details to be provided in upcoming documentation.
<b>U</b>	1 Socket Optimized	Focused on single socket (1P) configurations, delivering performance at competitive price points. Does not support two socket (2P) arrangements.
<b>V</b>	VM Optimized	Fosters enhanced VM density, allowing to support more/largervirtual machines per host.
<b>Y</b>	Speed Select	Intel® SST-PP increases base frequency when fewer cores are enabled. Allows greater flexibility, deployment options and platform longevity.

**Notes:** More than 1.5 TB memory per socket requires memory higher than 128 GB capacity

2nd Generation Intel® Xeon® Scalable Processor Family							
Intel Xeon Models	CPU Frequency	Cores	L3 Cache (MB)	Power	UPI	DDR4	Memory per socket
Platinum 8280M Processor	2.7GHz	28	38.5	205W	3 @ 10.4 GT/s	2933 MT/s	2TB
Platinum 8280L Processor	2.7GHz	28	38.5	205W	3 @ 10.4 GT/s	2933 MT/s	4.5TB
Platinum 8280 Processor	2.7GHz	28	38.5	205W	3 @ 10.4 GT/s	2933 MT/s	1TB
Platinum 8276M Processor	2.2GHz	28	38.5	165W	3 @ 10.4 GT/s	2933 MT/s	2TB
Platinum 8276L Processor	2.2GHz	28	38.5	165W	3 @ 10.4 GT/s	2933 MT/s	4.5TB
Platinum 8276 Processor	2.2GHz	28	38.5	165W	3 @ 10.4 GT/s	2933 MT/s	1TB
Platinum 8270 Processor	2.7GHz	26	35.75	205W	3 @ 10.4 GT/s	2933 MT/s	1TB
Platinum 8268 Processor	2.9GHz	24	35.75	205W	3 @ 10.4 GT/s	2933 MT/s	1TB
Platinum 8260Y Processor	2.4/2.5 /2.7GHz	24/20/16	35.75	165W	3 @ 10.4 GT/s	2933 MT/s	1TB
Platinum 8260M Processor	2.4GHz	24	35.75	165W	3 @ 10.4 GT/s	2933 MT/s	2TB
Platinum 8260L Processor	2.4GHz	24	35.75	165W	3 @ 10.4 GT/s	2933 MT/s	4.5TB
Platinum 8260 Processor	2.4GHz	24	35.75	165W	3 @ 10.4 GT/s	2933 MT/s	1TB
Platinum 8256 Processor	3.8 GHz	4	16.5	105W	3 @ 10.4 GT/s	2933 MT/s	1TB
Platinum 8253 Processor	2.2GHz	16	22	125W	3 @ 10.4 GT/s	2933 MT/s	1TB

## Standard Features

### Notes:

- Platinum – 8200 Series – 2 Socket supports supports 6-Channel DDR4 @ 2933 MT/s providing up to 1TB memory capacity per socket (up to 2TB/socket on M series and up to 4.5TB/socket on L series); Intel Optane Persistent Memory for HPE (select skus), Vector Neural Network Instructions (VNNI) for inference acceleration, Intel Turbo Boost Technology, Intel Hyper-Threading Technology Intel AVX-512 (2x 512-bit FMA), 48 lanes PCIe 3.0, advanced RAS
- Processors with 130W TDP or higher and the 8256, 8156, 6128, 5222, and 5122 will ship with the High Performance heatsink. All other will processors will ship with the Standard heatsink.

### 1st Generation Intel® Xeon® Scalable Processor Family

Intel Xeon Models	CPU Frequency	Cores	L3 Cache (MB)	Power	UPI	DDR4	Memory per socket
Platinum 8180M Processor	2.5 GHz	28	38.5	205W	3 @ 10.4 GT/s	2666 MT/s	1.5TB
Platinum 8180 Processor	2.5 GHz	28	38.5	205W	3 @ 10.4 GT/s	2666 MT/s	768GB
Platinum 8176 Processor	2.1 GHz	28	38.5	165W	3 @ 10.4 GT/s	2666 MT/s	768GB
Platinum 8170 Processor	2.1 GHz	26	35.75	165W	3 @ 10.4 GT/s	2666 MT/s	768GB
Platinum 8168 Processor	2.7 GHz	24	33	205W	3 @ 10.4 GT/s	2666 MT/s	768GB
Platinum 8165 Processor	2.3 GHz	24	33	205W	3 @ 10.4 GT/s	2666 MT/s	768GB
Platinum 8164 Processor	2.0 GHz	26	35.75	150W	3 @ 10.4 GT/s	2666 MT/s	768GB
Platinum 8160 Processor	2.1 GHz	24	33	150W	3 @ 10.4 GT/s	2666 MT/s	768GB
Platinum 8158 Processor	3.0 GHz	12	24.75	150W	3 @ 10.4 GT/s	2666 MT/s	768GB
Platinum 8156 Processor	3.6 GHz	4	16.5	105W	3 @ 10.4 GT/s	2666 MT/s	768GB
Platinum 8153 Processor	2.0 GHz	16	22	125W	3 @ 10.4 GT/s	2666 MT/s	768GB

### Notes:

- Platinum – 8100 Series – 2 Socket supports 2UPI, supports 6-Channel DDR4 @ 2666 MT/s providing up to 768GB memory capacity (1.5 TB on select processor skus). Intel Turbo Boost Technology, Intel Hyper-Threading Technology supported. Intel AVX-512 (2x 512-bit FMA), 48 lanes PCIe 3.0, advanced RAS.
- Processors with 130W TDP or higher and the 8256, 8156, 6128, 5222, and 5122 will ship with the High Performance heatsink. All other will processors will ship with the Standard heatsink.

### 2nd Generation Intel® Xeon® Scalable Processor Family

Intel Xeon Models	CPU Frequency	Cores	L3 Cache (MB)	Power (TDP)	UPI	DDR4	Memory per socket
Gold 6262V Processor	1.9GHz	24	33	135W	3 @ 10.4 GT/s	2933MT/s	1TB
Gold 6258R Processor	2.7GHz	28	38.5	205W	2 @ 10.4 GT/s	2933MT/s	1TB
Gold 6256 Processor <sup>4</sup>	3.6GHz	12	33	205W	3 @ 10.4 GT/s	2933MT/s	1TB
Gold 6254 Processor	3.1GHz	18	24.75	200W	3 @ 10.4 GT/s	2933MT/s	1TB
Gold 6252N Processor	2.3GHz	24	35.75	150W	3 @ 10.4 GT/s	2933MT/s	1TB
Gold 6252 Processor	2.1GHz	24	35.75	150W	3 @ 10.4 GT/s	2933MT/s	1TB
Gold 6250L Processor	3.9GHz	8	35.75	185W	3 @ 10.4 GT/s	2933MT/s	4.5TB
Gold 6250 Processor <sup>4</sup>	3.9GHz	8	35.75	185W	3 @ 10.4 GT/s	2933MT/s	1TB
Gold 6248R Processor	3.0GHz	24	35.75	205W	2 @ 10.4 GT/s	2933MT/s	1TB
Gold 6248 Processor	2.5GHz	20	27.5	150W	3 @ 10.4 GT/s	2933MT/s	1TB
Gold 6246R Processor	3.4GHz	16	35.75	205W	2 @ 10.4 GT/s	2933MT/s	1TB
Gold 6246 Processor	3.3GHz	12	24.75	165W	3 @ 10.4 GT/s	2933MT/s	1TB
Gold 6244 Processor	3.6GHz	8	24.75	150W	3 @ 10.4 GT/s	2933MT/s	1TB
Gold 6242R Processor	3.1GHz	20	35.75	205W	2 @ 10.4 GT/s	2933MT/s	1TB
Gold 6242 Processor	2.8GHz	16	22	150W	3 @ 10.4 GT/s	2933MT/s	1TB
Gold 6240Y Processor	2.6/2.8/ 3.1 GHz	18/14/8	24.75	150W	3 @ 10.4 GT/s	2933MT/s	1TB
Gold 6240M Processor	2.6GHz	18	24.75	150W	3 @ 10.4 GT/s	2933MT/s	2TB
Gold 6240L Processor	2.6GHz	18	24.75	150W	3 @ 10.4 GT/s	2933MT/s	4.5TB

## Standard Features

Gold 6240R Processor	2.4GHz	24	35.75	165W	2 @ 10.4 GT/s	2933MT/s	1TB
Gold 6240 Processor	2.6GHz	18	24.75	150W	3 @ 10.4 GT/s	2933MT/s	1TB
Gold 6238R Processor	2.2GHz	28	38.5	165W	2 @ 10.4 GT/s	2933MT/s	1TB
Gold 6238M Processor	2.1GHz	22	30.25	140W	3 @ 10.4 GT/s	2933MT/s	2TB
Gold 6238L Processor	2.1GHz	22	30.25	140W	3 @ 10.4 GT/s	2933MT/s	4.5TB
Gold 6238 Processor	2.1GHz	22	30.25	140W	3 @ 10.4 GT/s	2933MT/s	1TB
Gold 6234 Processor	3.3GHz	8	24.75	130W	3 @ 10.4 GT/s	2933MT/s	1TB
Gold 6230R Processor	2.1GHz	26	35.75	150W	2 @ 10.4 GT/s	2933MT/s	1TB
Gold 6230N Processor	2.3GHz	20	27.5	125W	3 @ 10.4 GT/s	2933MT/s	1TB
Gold 6230 Processor	2.1GHz	20	27.5	125W	3 @ 10.4 GT/s	2933MT/s	1TB
Gold 6226R Processor	2.9GHz	16	22	150W	2 @ 10.4 GT/s	2933MT/s	1TB
Gold 6226 Processor	2.7GHz	12	19.25	125W	3 @ 10.4 GT/s	2933MT/s	1TB
Gold 6222V Processor	1.8GHz	20	27.5	115W	3 @ 10.4 GT/s	2933MT/s	1TB
Gold 6212U Processor	2.4GHz	24	35.75	165W	0	2933MT/s	1TB
Gold 6210U Processor	2.5GHz	20	27.5	150W	0	2933MT/s	1TB
Gold 6209U Processor	2.1GHz	20	27.5	125W	0	2933MT/s	1TB
Gold 6208U Processor	2.9GHz	16	22	150W	0	2933MT/s	1TB
Gold 5222 Processor <sup>1</sup>	3.8GHz	4	16.5	105W	2 @ 10.4 GT/s	2933MT/s	1TB
Gold 5220S Processor	2.7GHz	18	24.75	125W	2 @ 10.4 GT/s	2666MT/s	1TB
Gold 5220R Processor	2.2GHz	24	35.75	150W	2 @ 10.4 GT/s	2666MT/s	1TB
Gold 5220 Processor	2.2GHz	18	24.75	125W	2 @ 10.4 GT/s	2666MT/s	1TB
Gold 5218R Processor	2.1GHz	20	27.5	125W	2 @ 10.4 GT/s	2666MT/s	1TB
Gold 5218N Processor <sup>3</sup>	2.3GHz	16	22	110W	2 @ 10.4 GT/s	2666MT/s	1TB
Gold 5218B Processor <sup>2</sup>	2.3GHz	16	22	125W	2 @ 10.4 GT/s	2666MT/s	1TB
Gold 5218 Processor	2.3GHz	16	22	125W	2 @ 10.4 GT/s	2666MT/s	1TB
Gold 5217 Processor	3.0GHz	8	11	115W	2 @ 10.4 GT/s	2666MT/s	1TB
Gold 5215M Processor	2.5GHz	10	13.75	85W	2 @ 10.4 GT/s	2666MT/s	2TB
Gold 5215L Processor	2.5GHz	10	13.75	85W	2 @ 10.4 GT/s	2666MT/s	4.5TB
Gold 5215 Processor	2.5GHz	10	13.75	85W	2 @ 10.4 GT/s	2666MT/s	1TB

## Notes:

- <sup>1</sup> Gold Processor 5222 supports 2933 DDR4 and 2 512-bit FMA units
- <sup>2</sup> Gold Processor 5218B has consistent features with the 5218 processor but is from a different die. Mixing both 5218B & 5218 in a system is not supported
- <sup>3</sup> Gold Processor 5218N processor available April 2019, Intel® Speed Select Technology-Base Frequency enablement via System ROM upgrade targeting June 2019
- Processors with 130W TDP or higher and the 8256, 8156, 6128, 5222, and 5122 will ship with the High Performance heatsink. All other processors will ship with the Standard heatsink.
- <sup>4</sup> Configuration support and facilities-requirements matrix for Gold Processor 6256 and Gold Processor 6250 listed below:

## Standard Features

## Intel Xeon Scalable Series 6250, 6250L, and 6256 Configuration and Facilities Requirements Matrix

DL380 Gen10	6250 & 6250L		6256	
Max inlet temp.	Without DIMM blanks	With DIMM blanks kit <sup>1</sup>	Without DIMM blanks	With DIMM blanks kit <sup>1</sup>
8SFF	Up to 30°C / 86°F	Up to 35°C / 95°F <sup>1</sup>	Up to 30°C / 86°F	Up to 35°C / 95°F <sup>1</sup>
16SFF + front 2SFF	Up to 25°C / 77°F	Up to 30°C / 86°F <sup>1</sup>	Up to 30°C / 86°F	Up to 35°C / 95°F <sup>1</sup>
16SFF + 8NVMe	Not Supported	Not Supported	Not Supported	Not Supported
24SFF	Up to 25°C / 77°F	Up to 30°C / 86°F <sup>1</sup>	Up to 30°C / 86°F	Up to 35°C / 95°F <sup>1</sup>
24SFF + rear SFF	Not Supported	Not Supported	Not Supported	Not Supported
8LFF	Up to 25°C / 77°F	Up to 30°C / 86°F <sup>1</sup>	Up to 30°C / 86°F	Up to 35°C / 95°F <sup>1</sup>
12LFF	Up to 20°C / 68°F	Up to 25°C / 77°F <sup>1</sup>	Up to 20°C / 68°F	Up to 25°C / 77°F <sup>1</sup>
12LFF + rear 2SFF	Not Supported	Not Supported	Not Supported	Not Supported
High Perf. fans	Mandatory	Mandatory	Mandatory	Mandatory
NVMe SSDs	Not supported	Not supported	Not supported	Not supported
Rear 2SFF	Not supported	Not supported	Not supported	Not supported
GPUs	Not supported	Not supported	Not supported	Not supported
4LFF mid-tray	Not supported	Not supported	Not supported	Not supported

Notes: <sup>1</sup>Must install DDR4 DIMM blanks (P07818-B21) on all empty DIMM slots

## 1st Generation Intel® Xeon® Scalable Processor Family

Intel Xeon Models	CPU Frequency	Cores	L3 Cache (MB)	Power	UPI	DDR4	Memory per socket
Gold 6154 Processor	3.0 GHz	18	24.75	200W	3 @ 10.4 GT/s	2666 MT/s	768GB
Gold 6152 Processor	2.1 GHz	22	30.25	140W	3 @ 10.4 GT/s	2666 MT/s	768GB
Gold 6150 Processor	2.7 GHz	18	24.75	165W	3 @ 10.4 GT/s	2666 MT/s	768GB
Gold 6148 Processor	2.4 GHz	20	27.5	150W	3 @ 10.4 GT/s	2666 MT/s	768GB
Gold 6146 Processor	3.2 GHz	12	24.75	165W	3 @ 10.4 GT/s	2666 MT/s	768GB
Gold 6144 Processor	3.5 GHz	8	24.75	150W	3 @ 10.4 GT/s	2666 MT/s	768GB
Gold 6143 Processor	2.8 GHz	16	22	205W	3 @ 10.4 GT/s	2666 MT/s	768GB
Gold 6142 Processor	2.6 GHz	16	22	150W	3 @ 10.4 GT/s	2666 MT/s	768GB
Gold 6140 Processor	2.3 GHz	18	24.75	140W	3 @ 10.4 GT/s	2666 MT/s	768GB
Gold 6138 Processor	2.0 GHz	20	27.5	125W	3 @ 10.4 GT/s	2666 MT/s	768GB
Gold 6137 Processor	3.9 GHz	8	24.75	205W	3 @ 10.4 GT/s	2666 MT/s	768GB
Gold 6136 Processor	3.0 GHz	12	24.75	150W	3 @ 10.4 GT/s	2666 MT/s	768GB
Gold 6134M Processor	3.2 GHz	8	24.75	130W	3 @ 10.4 GT/s	2666 MT/s	1.5TB
Gold 6134 Processor	3.2 GHz	8	24.75	130W	3 @ 10.4 GT/s	2666 MT/s	768GB
Gold 6132 Processor	2.6 GHz	14	19.25	140W	3 @ 10.4 GT/s	2666 MT/s	768GB
Gold 6130 Processor	2.1 GHz	16	22	125W	3 @ 10.4 GT/s	2666 MT/s	768GB
Gold 6128 Processor	3.4 GHz	6	19.25	115W	3 @ 10.4 GT/s	2666 MT/s	768GB
Gold 6126 Processor	2.6 GHz	12	19.25	125W	3 @ 10.4 GT/s	2666 MT/s	768GB
Gold 5122 Processor	3.6 GHz	4	16.5	105W	2 @ 10.4 GT/s	2666 MT/s	768GB
Gold 5120 Processor	2.2 GHz	14	19.25	105W	2 @ 10.4 GT/s	2400 MT/s	768GB
Gold 5118 Processor	2.3 GHz	12	16.5	105W	2 @ 10.4 GT/s	2400 MT/s	768GB
Gold 5117 processor	2.0 GHz	14	19.25	105W	2 @ 10.4 GT/s	2400 MT/s	768GB
Gold 5115 Processor	2.4 GHz	10	13.75	85W	2 @ 10.4 GT/s	2400 MT/s	768GB

## Notes:

- Gold - 6200 & 5200 Series - 6-Channel DDR4 @ 2933 MT/s (6200 & 5222 skus only) or 2666 MT/s (all Gold 5200 skus except 5222 @ 2933 MT/s); providing up to 1TB memory capacity per socket (up to 2TB/socket on M series and up to 4.5TB/socket on L series); Support for Intel Optane Persistent Memory for HPE (select skus), Vector Neural Network Instructions (VNNI) for inference acceleration.

## Standard Features

- Intel Turbo Boost Technology, Intel Hyper-Threading Technology Intel AVX-512 (2x 512-bit FMA for 6200 series and 5222; 1 x 512-bit FMA for 5200 series, except for 5222) 48 lanes PCIe 3.0, advanced RAS
- Gold – 5100, 6100 Series - 2 Socket supports 2UPI, supports 6-Channel DDR4 @ 2400 MHz (SKU 5122=supports 2666) providing up to 768GB memory capacity (1.5 TB on select skus). Intel Turbo Boost Technology, Intel Hyper-Threading Technology, Intel AVX-512(1x 512-bit FMA) (SKU 5122 supports 2x 512 bit FMA), 48 lanes PCIe 3.0, advanced RAS supported.
- Processors with 130W TDP or higher and the 8256, 8156, 6128, 5222, and 5122 will ship with the High Performance heatsink. All other will processors will ship with the Standard heatsink.

### 2nd Generation Intel® Xeon® Scalable Processor Family

Intel Xeon Models	CPU Frequency	Cores	L3 Cache (MB)	Power	UPI	DDR4	Memory per socket
Silver 4216 Processor	2.1GHz	16	22	100W	2 @ 9.6 GT/s	2400 MT/s	1TB
Silver 4215R Processor*	3.2GHz	8	11	130W	2 @ 9.6 GT/s	2400 MT/s	1TB
Silver 4215 Processor*	2.5GHz	8	11	85W	2 @ 9.6 GT/s	2400 MT/s	1TB
Silver 4214R Processor	2.4GHz	12	16.5	100W	2 @ 9.6 GT/s	2400 MT/s	1TB
Silver 4214Y Processor	2.2/2.3/ 2.4GHz	12/10/8	16.5	85W	2 @ 9.6 GT/s	2400 MT/s	1TB
Silver 4214 Processor	2.2GHz	12	16.5	85W	2 @ 9.6 GT/s	2400 MT/s	1TB
Silver 4210R Processor	2.4GHz	10-core	13.75	100W	2 @ 9.6 GT/s	2400 MT/s	1TB
Silver 4210 Processor	2.2GHz	10	13.75	85W	2 @ 9.6 GT/s	2400 MT/s	1TB
Silver 4208 Processor	2.1GHz	8	11	85W	2 @ 9.6 GT/s	2400 MT/s	1TB

**Notes:** \* Silver Processors 4215R and 4215 support Intel Optane Persistent Memory for HPE

### 1st Generation Intel® Xeon® Scalable Processor Family

Intel Xeon Models	CPU Frequency	Cores	L3 Cache (MB)	Power	UPI	DDR4	Memory per socket
Silver 4116 Processor	2.1 GHz	12	16.50 MB	85W	2 @ 9.6 GT/s	2400 MT/s	768GB
Silver 4114 Processor	2.2 GHz	10	13.75 MB	85W	2 @ 9.6 GT/s	2400 MT/s	768GB
Silver 4112 Processor	2.6 GHz	4	8.25 MB	85W	2 @ 9.6 GT/s	2400 MT/s	768GB
Silver 4110 Processor	2.1 GHz	8	11.00 MB	85W	2 @ 9.6 GT/s	2400 MT/s	768GB
Silver 4108 Processor	1.8 GHz	8	11.00 MB	85W	2 @ 9.6 GT/s	2400 MT/s	768GB

#### Notes:

- Silver – 4200 Series - 6-Channel DDR4 @ 2400 MT/s, providing up to 1TB memory capacity per socket; Support for: Intel® Vector Neural Network Instructions (VNNI) for inference acceleration; Intel Turbo Boost Technology, Intel Hyper-Threading Technology Intel AVX-512 (1x 512-bit FMA).48 lanes PCIe 3.0, standard RAS
- Silver – 4100 Series - 2 Socket supports 2UPI @ 9.6 GT/s, 6-Channel DDR4 @ 2400 MHz providing up to 768 GB memory capacity. Intel Turbo Boost Technology, Intel Hyper-Threading Technology, Intel AVX-512(1x 512-bit FMA), 48 lanes PCIe 3.0, standard RAS supported.

### 2nd Generation Intel® Xeon® Scalable Processor Family

Intel Xeon Models	CPU Frequency	Cores	L3 Cache (MB)	Power	UPI	DDR4	Memory per socket
Bronze 3206R Processor	1.9GHz	8	11	85W	2 @ 9.6 GT/s	2133MT/s	1TB
Bronze 3204 Processor	1.9GHz	6	8.25	85W	2 @ 9.6 GT/s	2133MT/s	1TB

**Notes:** Bronze – 3200 Series - 6-Channel DDR4 @ 2133 MT/s, providing up to 1TB memory capacity per socket; Support for: Intel® Vector Neural Network Instructions (VNNI) for inference acceleration; Intel AVX-512 (1x 512-bit FMA); 48 lanes PCIe 3.0, standard RAS

## Standard Features

### 1st Generation Intel® Xeon® Scalable Processor Family

Intel Xeon Models	CPU Frequency	Cores	L3 Cache (MB)	Power	UPI	DDR4	Memory per socket
Bronze 3106 Processor	1.7 GHz	8	11.00 MB	85W	2 @ 9.6 GT/s	2133 MT/s	768GB
Bronze 3104 Processor	1.7 GHz	6	8.25 MB	85W	2 @ 9.6 GT/s	2133 MT/s	768GB

**Notes:** Bronze – 3100 Series – 2 Socket supports 2UPI @ 9.6 GT/s, supports 6-Channel DDR4 @ 2133 MHz providing up to 768GB memory capacity. Intel AVX-512(1x 512-bit FMA), 48 lanes PCIe 3.0, standard RAS supported.

### Chipset

Intel C621 Chipset

For more information regarding Intel® chipsets, please see the following URL: <http://www.intel.com/products/server/chipsets/>

### On System Management Chipset

HPE iLO 5 ASIC

Read and learn more in the [iLO QuickSpecs](#).

### Memory

One of the following depending on model.

<b>Type</b>	HPE DDR4 SmartMemory, Registered (RDIMM), Load Reduced (LRDIMM)
<b>DIMM Slots Available</b>	24 12 DIMM slots per processor, 6 channels per processor, 2 DIMMs per channel
<b>Maximum capacity (LRDIMM)</b>	3.0 TB 24 x 128 GB LRDIMM @ 2933 MT/s
<b>Maximum capacity (RDIMM)</b>	1.54 TB 24 x 64 GB RDIMM @ 2933 MT/s
<b>Maximum capacity (Intel Optane Persistent Memory for HPE)</b>	6.0 TB 12 X 512 GB Memory Modules @ 2666 MT/s
<b>Maximum capacity (HPE NVDIMMs)</b>	192 GB 12 x 16 GB NVDIMM @ 2666 MT/s

#### Notes:

- Intel Optane Persistent Memory for HPE only supported with select 2nd generation Intel Xeon Scalable Series Processors ONLY (82xx/62xx/52xx/4215R/4215) and can only be mixed with either RDIMMs or LRDIMMs.
- HPE NVDIMMs are only supported on 1st generation Intel Xeon Scalable Series Processors and can only be mixed with RDIMMs.
- Maximum memory per socket is dependent on processor selection. 2<sup>nd</sup> generation processors supporting 2 TB or 4.5 TB per CPU are indicated by the “M” and “L” in the processor model names (i.e. 8276M and 8276L). 1<sup>st</sup> generation processors supporting 1.5 TB per CPU are indicated by the “M” in the processor model names (ie 8160M)
- Maximum memory per socket is dependent on processor selection. Processors supporting 1.5 TB per CPU is indicated by the “M” in the processor model names (i.e. 8160M).
- Mixing of RDIMM and LRDIMM memory is not supported.
- For General Server Memory and HPE NVDIMM Population Rules and Guidelines for Gen10 see details here: <http://www.hpe.com/docs/memory-population-rules>
- For details on the HPE Server Memory speed, visit: <https://www.hpe.com/docs/memory-speed-table>
- To realize the performance memory capabilities listed in this document, HPE DDR4 SmartMemory is required.
- For additional information, please see the [HPE DDR4 SmartMemory QuickSpecs](#).

### Memory Protection

For details on the HPE Server Memory Options RAS feature, visit: <http://www.hpe.com/docs/memory-ras-feature>

## Standard Features

### Expansion Slots

#### Primary Riser

Slots #	Technology	Bus Width	Connector Width	Slot Form Factor	Notes
1	PCIe 3.0	X8	X8	Full-height, full-length slot	Proc 1
2	PCIe 3.0	X16	X16	Full-height, full-length slot	Proc 1
3	PCIe 3.0	X8	X8	Full-height, half-length slot	Proc 1

#### Notes:

- Bus Width Indicates the number of physical electrical lanes running to the connector.
- The specifications above correspond with the default primary riser which also supports dual m.2 cards. Additional Primary Riser options and specifications noted in the “Riser Information” table within this document.

#### Secondary Riser

Slots #	Technology	Bus Width	Connector Width	Slot Form Factor	Notes
1	PCIe 3.0	X8	X8	Full-height, full-length slot	Proc 2
2	PCIe 3.0	X16	X16	Full-height, full-length slot	Proc 2
3	PCIe 3.0	X8	X8	Full-height, half-length slot	Proc 2

#### Notes:

- Bus Width Indicates the number of physical electrical lanes running to the connector.
- The Secondary Riser requires Processor 2 to be populated 870548-B21
- The specifications above correspond with the x8/x16/x8 Secondary Riser Kit (870548-B21). Additional Secondary Riser options and specifications noted in the “Riser Information” table within this document.

#### Tertiary Riser

Slots #	Technology	Bus Width	Connector Width	Slot Form Factor	Notes
1	PCIe 3.0	X8	X8	Full-height, full-length slot	Proc 2
2	PCIe 3.0	X8	X8	Full-height, full-length slot	Proc 2

#### Notes:

- Bus Width Indicates the number of physical electrical lanes running to the connector.
- The Tertiary Riser requires Processor 2 to be populated
- The specifications above correspond with the 2x8 Tertiary Riser Kit (875780-B21). Additional Tertiary Riser options and specifications noted in the “Riser Information” table within this document

## Graphics

### Integrated Video Standard

- Video modes up to 1920 x 1200@60Hz (32 bpp)
- 16MB Video Memory

### HPE iLO 5 on system management memory

- 32 MB Flash
- 4 Gbit DDR 3 with ECC protection

## Standard Features

### Maximum Internal Storage

Drive	Capacity	Configuration
Hot Plug SFF SAS HDD	72.0 TB	24+6 x 2.4 TB* (with optional rear SFF drive cage)
Hot Plug SFF SATA HDD	60.0 TB	24+6 x 2 TB (with optional SFF drive cage)
Hot Plug LFF SAS HDD	311.68 TB	12+4+3 x 16 TB + 2 x 3.84 TB (with optional mid-tray and rear LFF drive cage, plus 2 SFF SSD rear)
Hot Plug LFF SATA HDD	311.68 TB	12+4+3 x 16 TB + 2 x 3.84 TB (with optional mid-tray and rear LFF drive cage, plus 2 SFF SSD rear)
Hot Plug SFF SAS SSD	459 TB	24+6 x 15.3 TB (with optional rear SFF drive cage)
Hot Plug SFF SATA SSD	230.4 TB	24+6 x 7.68 TB (with optional rear SFF drive cage)
Hot Plug LFF SATA SSD	44.16 TB	12+4+3 x 1.92 TB + 2 x 3.84 TB (with optional mid-tray and rear LFF drive cage, plus 2 SFF SSD rear)
Hot Plug LFF SAS SSD	44.16 TB	12+4+3 x 1.92 TB + 2 x 3.84 TB (with optional mid-tray and rear LFF drive cage, plus 2 SFF SSD rear)
Hot Plug SFF NVMe PCIe SSD	307.2 TB	20 x 15.36 TB NVMe

#### Notes:

- 2x m.2 drives are supported on the Primary Riser.
- UFF drives are also supported.

### Internal Storage Devices

One of the following depending on model

- **Optical Drive**  
Ships standard in Performance Models  
Optional: DVD-ROM, DVD-RW
- **Hard Drives**  
None ship standard

### Power Supply

- HPE 500W Flex Slot Platinum Hot Plug Low Halogen Power Supply Kit  
**Notes:** Available in 94% efficiency.
- HPE 800W Flex Slot Platinum Hot Plug Low Halogen Power Supply Kit  
**Notes:**
  - Available in 94% and 96% efficiency.
  - Also available in -48VDC and 227VAC/380VDC power inputs.
- HPE 1600W Flex Slot Platinum Hot Plug Low Halogen Power Supply Kit  
**Notes:**
  - Available in 94% efficiency.
  - Also available in -48VDC

HPE Flexible Slot (Flex Slot) Power Supplies share a common electrical and physical design that allows for hot plug, tool-less installation into HPE ProLiant Gen10 Performance Servers. Flex Slot power supplies are certified for high-efficiency operation and offer multiple power output options, allowing users to "right-size" a power supply for specific server configurations. This flexibility helps to reduce power waste, lower overall energy costs, and avoid "trapped" power capacity in the data center.

All pre-configured servers ship with a standard 6-foot IEC C-13/C-14 jumper cord (A0K02A). This jumper cord is also included with each standard AC power supply option kit. If a different power cord is required, please check the **ProLiant Power Cables** web page. To review the power requirements for your selected system, please use the **HPE Power Advisor Tool**.

For information on power specifications and technical content visit **HPE Server power supplies**



## Standard Features

### Storage Controllers

The Gen10 controller naming framework has been updated to simplify identification as depicted below. For a more detailed breakout of the available Gen10 Smart Array controllers visit the [HPE Smart Array Gen10 Controllers Data Sheet](#).

One of the following depending on model

#### Software RAID

- HPE Smart Array S100i SR Gen10 SW RAID

##### Notes:

- HPE Smart Array S100i SR Gen10 SW RAID will operate in UEFI mode only. For legacy support an additional controller will be needed, and for CTO orders please also select the Legacy mode settings part, 758959-B22.
- HPE Smart Array S100i SR Gen10 SW RAID is off by default and must be enabled.
- The S100i uses 14 embedded SATA ports, but only 12 ports are accessible as 2 are leveraged to support the 2 M.2 options on the primary riser. If more than 8 SATA devices are being supported on this controller, then a Qty=1 of the SAS 3POS Cable Kit (826709-B21) is required.
- The S100i supports Windows only
- For Linux users, HPE offers a solution that uses in-distro open-source software to create a two-disk RAID 1 boot volume. For more information visit: <https://downloads.linux.hpe.com/SDR/project/lssrb/>

#### Essential RAID Controller

- HPE Smart Array E208i-a SR Gen10 Controller
- HPE Smart Array E208i-p SR Gen10 Controller
- HPE Smart Array E208e-p SR Gen10 Controller

#### Performance RAID Controller

- HPE Smart Array P408i-a SR Gen10 Controller
- HPE Smart Array P408i-p SR Gen10 Controller
- HPE Smart Array P408e-p SR Gen10 Controller
- HPE Smart Array P816i-a SR Gen10 Controller

##### Notes:

- Performance RAID Controllers require the HPE Smart Hybrid Capacitor (P02377-B21) or the HPE Smart Storage Battery (P01366-B21) which are sold separately.
- For additional details, please see [HPE Smart Array Gen10 Controllers Data Sheet](#).

## Interfaces

<b>Serial</b>	Optional, rear
<b>Display Port</b>	1 (SFF 1 front, optional via Universal Media Bay, 826708-B21), 8 LFF chassis standard
<b>Network Ports</b>	4 x 1GbE embedded (if equipped/depending on model) One (1) FlexibleLOM slot available on all chassis types (supporting various NIC adapters)
<b>HPE iLO Remote Management Network Port</b>	1 Gb Dedicated
<b>Front iLO Service Port</b>	1 standard (Not available on 12 LFF chassis or when SID is ordered, note iLO dongle required, 880123-B21)
<b>Micro SD Slot</b>	1 Micro SD <b>Notes:</b> The Micro SD slot is not a hot-pluggable device. Customers should not attempt to plug an SD card into the SD slot while the server is powered.
<b>USB 3.0</b>	Up to 5 total: 1 front, 2 rear, 2 internal (secure), 2 optional USB 2.0 front via Universal Media Bay, or standard on 8LFF chassis
<b>SID (Systems Insight Display)</b>	Optional <b>Notes:</b> Not shipping as standard. Available as a CTO option or as a field upgrade (826703-B21).

## Standard Features

### Operating Systems and Virtualization Software Support for ProLiant Servers

#### 2<sup>nd</sup> Generation Intel® Xeon® Scalable Processor Family

- Windows Server 2019: Essentials, Standard, Datacenter
- **Windows Server 2016**: Essentials, Standard, Datacenter
- **Windows Server 2012 R2**: Essentials, Standard, Datacenter
- Microsoft Hyper-V Server: 2012 R2, 2016 & 2019
- **VMware vSphere 6.0 U3**, 6.5 U2 through U.3 & 6.7 U1 through U3, 7.0  
**Notes:** 6.5 U3, 6.7 U3 & 7.0 minimums for Xeon "R", Gold 6256, Gold 6250L & Gold 6250 processors.
- ClearOS: 7.6; ClearVM: 2.0
- **Red Hat Enterprise Linux (RHEL)** 7.6 w/ Kbase\*\*, 8.0
- **SUSE Linux Enterprise Server (SLES)** 12 SP3, 15 (includes Xen) \*\*

#### Notes:

- SLES12 SP4 is the minimum for servers featuring Intel® Optane™ DC Persistent Memory.
- Ubuntu: 18.04 LTS (4.15.0)
- Oracle Linux: Oracle Linux 7.6 UEK Release 5 Update 2; Oracle VM 3.4.6 (UEK Release 4 Update 7)
- Citrix: Hypervisor: 8.0, 8.1, 8.2; XenServer 7.1, 7.4, 7.5, 7.6

#### 1<sup>st</sup> Generation Intel® Xeon® Scalable Processor Family

- Windows Server 2019: Essentials, Standard & Datacenter
- **Windows Server 2016** : Essentials, Standard & Datacenter
- **Windows Server 2012 R2**: Essentials, Standard & Datacenter
- Microsoft Hyper-V Server: 2012 R2, 2016 & 2019
- VMware vSphere 6.0 U3, 6.5 through U.3 & 6.7 through U3, 7.0
- **ClearOS**: 7.6; ClearVM: 2.0
- **Red Hat Enterprise Linux (RHEL)** 6.9, 7.3 \*\*
- **SUSE Linux Enterprise Server (SLES)** 11 SP4, 12 SP2 & 15 (includes Xen) \*\*
- Ubuntu: 16.04.3 HWE (4.10), 18.04 LTS (4.15.0)
- Oracle Linux: Oracle Linux/UEK 6.9, 7.4; Oracle VM 3.4.4
- Citrix: Hypervisor: 8.0, 8.1, 8.2; XenServer 7.1, 7.4, 7.5, 7.6

#### Notes:

- For more information on Hewlett Packard Enterprise Certified and Supported ProLiant Servers for OS and Virtualization Software and latest listing of software drivers available for your server <http://www.hpe.com/info/ossupport>
- \*\* 64-bit only; includes KVM

### HPE Server UEFI/Legacy ROM

Unified Extensible Firmware Interface (UEFI) is an industry standard that provides better manageability and more secured configuration than the legacy ROM while interacting with your server at boot time. HPE ProLiant Gen10 servers have a UEFI Class 2 implementation and support both UEFI Mode (default) and Legacy BIOS Mode.

**Notes:** The UEFI System Utilities tool is analogous to the HPE ROM-Based Setup Utility (RBSU) of legacy BIOS. For more information, please visit <http://www.hpe.com/servers/uefi>.

#### UEFI enables numerous new capabilities specific to HPE ProLiant servers such as:

- Secure Boot and Secure Start enable for enhanced security
- Embedded UEFI Shell
- Operating system specific functionality
- Mass Configuration Deployment Tool using iLO RESTful API that is Redfish API Conformant
- Support for > 2.2 TB (using GPT) boot drives
- PXE boot support for IPv6 networks
- USB 3.0 Stack

## Standard Features

- Workload Profiles for simple performance optimization

### UEFI Boot Mode only:

- TPM 2.0 Support
- iSCSI Software Initiator Support.
- NVMe Boot Support
- HTTP/HTTPs Boot support as a PXE alternative.
- Platform Trust Technology (PTT) can be enabled.
- Boot support for option cards that only support a UEFI option ROM

### Notes:

- For UEFI Boot Mode, boot environment and OS image installations should be configured properly to support UEFI.
- UEFI FIO Setting (758959-B22) can be selected to configure the system in Legacy mode in the factory for your HPE ProLiant Gen10 Server.

## Industry Standard Compliance

- ACPI 6.1 Compliant
- PCIe 3.0 Compliant
- WOL Support
- Microsoft® Logo certifications
- PXE Support
- VGA/Display Port

**Notes:** This support is on the optional Universal Media Bay.

- USB 3.0 Compliant (internal)
- USB 2.0 Compliant (external ports via SUV)

**Notes:** This support is on the optional Universal Media Bay.

- Energy Star
- SMBIOS 3.1
- Redfish API
- IPMI 2.0
- Secure Digital 4.0
- TPM 1.20 and 2.0 Support
- Advanced Encryption Standard (AES)
- Triple Data Encryption Standard (3DES)
- SNMP v3
- TLS 1.2
- DMTF Systems Management Architecture for Server Hardware Command Line Protocol (SMASH CLP)
- Active Directory v1.0
- ASHRAE A3/A4

**Notes:** For additional technical, thermal details regarding ambient temperature, humidity, and feature support, please visit <http://www.hpe.com/servers/ashrae>

- EU Lot9
- Notes:** European Union (EU) eco-design regulations for server and storage products, known as Lot 9, go into effect on March 1st, 2020. Among other requirements, for servers this directive establishes power thresholds for idle state, as well as efficiency and performance in active state which vary among configurations. HPE ProLiant Gen10 servers are compliant with Lot9 requirements. Please visit: <https://www.hpe.com/us/en/about/environment/msds-specs-more.html> for more information regarding HPE Lot 9 conformance.- UEFI (Unified Extensible Firmware Interface Forum) 2.6

**Notes:** UEFI is the default for the DL380 Gen10. Legacy mode can be selected in the field or as a CTO option (758959-B22); some configuration restrictions apply.

## Standard Features

### Embedded Management

#### HPE Integrated Lights-Out (HPE iLO)

Monitor your servers for ongoing management, service alerting, reporting and remote management with HPE iLO. Learn more at <http://www.hpe.com/info/ilo>.

#### UEFI

Configure and boot your servers securely with industry standard Unified Extensible Firmware Interface (UEFI). Learn more at <http://www.hpe.com/servers/uefi>.

#### Intelligent Provisioning

Hassle free server and OS provisioning for 1 or more servers with Intelligent Provisioning. Learn more at <http://www.hpe.com/servers/intelligentprovisioning>.

#### iLO RESTful API

iLO RESTful API is Redfish API conformance and offers simplified server management automation such as configuration and maintenance tasks based on modern industry standards. Learn more at <http://www.hpe.com/info/restfulapi>

### Server Utilities

#### Active Health System

The HPE Active Health System (AHS) is an essential component of the iLO management portfolio that provides continuous, proactive health monitoring of HPE servers. Learn more at <http://www.hpe.com/servers/ahs>.

#### Active Health System Viewer

Use the Active Health System Viewer, a web-based portal, to easily read AHS logs and speed problem resolution with HPE self-repair recommendations, to learn more visit: <http://www.hpe.com/servers/ahsv>.

#### Smart Update

Keep your servers up to date with the HPE Smart Update solution by using Smart Update Manager (SUM) to optimize the firmware and driver updates of the Service Pack for ProLiant (SPP).

#### iLO Amplifier Pack

Designed for large enterprise and service provider environments with hundreds of HPE servers, the iLO Amplifier Pack is a free, downloadable open virtual application (OVA) that delivers the power to discover, inventory and update Gen8, Gen9 and Gen10 HPE servers at unmatched speed and scale. Use with an iLO Advanced License to unlock full capabilities. Learn more at <http://www.hpe.com/servers/iLOamplifierpack>.

#### HPE iLO Mobile Application

Enables the ability to access, deploy, and manage your server anytime from anywhere from select smartphones and mobile devices. For additional information please visit: <http://www.hpe.com/info/ilo/mobileapp>

#### RESTful Interface Tool

RESTful Interface tool (iLOREST) is a single scripting tool to provision using iLO RESTful API to discover and deploy servers at scale. Learn more at <http://www.hpe.com/info/resttool>.

#### Scripting Tools

Provision one to many servers using your own scripts to discover and deploy with Scripting Tool (STK) for Windows and Linux or Scripting Tools for Windows PowerShell. Learn more at <http://www.hpe.com/servers/powershell>.

#### HPE OneView Standard

HPE OneView Standard can be used for inventory, health monitoring, alerting, and reporting without additional fees. It can monitor multiple HPE server generations. The user interface is similar to the HPE OneView Advanced version, but the software-defined functionality is not available. Learn more at <http://www.hpe.com/info/oneview>.

## Standard Features

### HPE Systems Insight Manager (HPE SIM)

Ideal for environments already using HPE SIM, it allows you to monitor the health of your HPE ProLiant Servers and HPE Integrity Servers. Also provides you with basic support for non-HPE servers. HPE SIM also integrates with Smart Update Manager to provide quick and seamless firmware updates. Learn more at <http://www.hpe.com/info/hpesim>.

### Security

- UEFI Secure Boot and Secure Start support
- Tamper-free updates – components digitally signed and verified
- Immutable Silicon Root of Trust
- Ability to rollback firmware
- FIPS 140-2 validation
- Secure erase of NAND/User data
- Common Criteria certification
- TPM (Trusted Platform Module) 1.2 option
- Configurable for PCI DSS compliance
- TPM (Trusted Platform Module) 2.0 option
- Advanced Encryption Standard (AES) and Triple Data Encryption Standard (3DES) on browser
- Bezel Locking Kit option
- Support for Commercial National Security Algorithms (CNSA)
- Chassis Intrusion detection option
- Secure Recovery – recover critical firmware to known good state on detection of compromised firmware

### Warranty

This product is covered by a global limited warranty and supported by HPE Services and a worldwide network of Hewlett Packard Enterprise Authorized Channel Partners resellers. Hardware diagnostic support and repair is available for three years from date of purchase. Support for software and initial setup is available for 90 days from date of purchase. Enhancements to warranty services are available through HPE Pointnext operational services or customized service agreements. Hard drives have either a one year or three year warranty; refer to the specific hard drive QuickSpecs for details.

**Notes:** Server Warranty includes 3-Year Parts, 3-Year Labor, 3-Year Onsite support with next business day response. Warranty repairs may be accomplished through the use of Customer Self Repair (CSR) parts. These parts fall into two categories: 1) Mandatory CSR parts are designed for easy replacement. A travel and labor charge will result when customers decline to replace a Mandatory CSR part; 2) Optional CSR parts are also designed for easy replacement but may involve added complexity. Customers may choose to have Hewlett Packard Enterprise replace Optional CSR parts at no charge. Additional information regarding worldwide limited warranty and technical support is available at:

<http://h17007.www1.hpe.com/us/en/enterprise/servers/warranty/>.



# Adam C. Holland

aholland@alpha-tech.us

## Certifications

- Certified Wireless Technical Specialist (CWTS) (<http://www.cwnp.com/>)
- Microsoft Certified Professional (MCP)
- Microsoft Certified S

## Qualifications

### x86 Servers

- Installation, Configuration and Troubleshooting
- Dell Poweredge
- Cisco UCS
- HPE
- Lenovo

### SAN and Storage

- EMC VNX/VNXe Storage Arrays
- EMC DataDomain Dedup Appliance
- Nimble Storage Arrays
- Tintri Storage Arrays

### PC Administration

- Installation/Maintenance of Windows Server 2008-2016
- Maintenance/Installation of Active Directory
- Troubleshooting Server 2008-2016
- Debian/Ubuntu Linux Installation and Troubleshooting

### PC Hardware and Software

- PC Hardware Troubleshooting and Installation/Maintenance
- PC Software/Operating System Installation and Troubleshooting
  - Broad Experience with Windows XP/7/8.1/10
  - Windows Server 2003-2019
  - Linux (Ubuntu 12.04-18.04, Debian Linux)
- Extensive experience working with Dell Hardware and Software
- Printer Installation and Maintenance

### Network Administration/Design

- Network Design and Implementation
- Installation of Network Hardware (Switches/Routers)
- Installation of Cable Runs/Punchdowns/Cat 5e/6 Cabling

- Troubleshooting Cisco Network Devices
- 802.11a/b/g/n/ac WiFi Network Installation/Troubleshooting

## Experience

**Lead Helpdesk Engineer** (06/15 - Present)  
Alpha Technologies (Hurricane, WV)

- Tier 1/2/3 Helpdesk Troubleshooting and Remote/Onsite Support
- Windows Server Administration/Troubleshooting
- VMWare/Hyper-V Administration/Troubleshooting
- Cisco Routing/Switching/ASA Troubleshooting/Configuration
- Storage, including EMC VNX/VNXe/DataDomain and Nimble Administration
- Dell/HP/Lenovo Server Hardware Installation/Configuration/Troubleshooting
- Cisco UCS Chassis and Fabric Interconnect Installation/troubleshooting
- Sales Engineering and Design
- Systems Engineering/Architect

**IT Desktop Support Technician** (08/13 - 06/15)  
Mountwest Community and Technical College

- Desktop/Laptop Troubleshooting and Repair
- Network Management
- Reimaging Desktops and Laptops
- Replying to and Servicing User Requests in Ticket System
- Projector Maintenance
- Assisting end users in person or via phone
- Assisting with other tasks as needed
- Printer Installation and Maintenance

## Education

**Mountwest Community and Technical College**

- Working on Associate in Applied Science - Network Systems Security
- Cisco Networking Academy (CCENT/CCNA course)
- Microsoft Windows XP/7/Server 2008/2012 (Microsoft MCSA/MCSE course)
- Security+ Course
- General Virtualization (Windows Server Hyper-V and VMWare ESXi)
- Certified Wireless Technical Specialist (CWNP Course)



# Johnny Clonch

jconch@alpha-tech.us

## Certifications

- VMware Certified Professional 5 (VCP 5)
- VCP-DCV 2019
- XtremIO Implementation
- VNX Solutions Specialist Version 8.0 (EMCIE)
- EMCTA , VNX Solutions
- EMCISA (Information Storage Management)
- Cisco DCUCI
- MCITP: Server Administrator
- MCTS
- MCSA 2012
- MCSA 2008
- Microsoft Certified Professional (MCP)

## Qualifications

Experience in designing, implementing, and maintaining a wide range of physical and virtual systems. Currently responsible for designing and implementing systems from the ground up, including aspects such as: storage, server hardware, software and licensing, back up solutions, disaster recovery and business continuity.

Specialties: Windows server , Microsoft Exchange , PKI, Office 365, Active Directory, Storage technologies (Nimble / EMC), VMWare, Hyper V, System Design, Cisco UCS

## Experience

**Lead System Engineer** (01/08 – Present)  
Alpha Technologies (Hurricane, WV)

- Responsible for designing, implementing, and maintaining systems for clients as well as internal company infrastructure.
- Specialization in several distinct fields such as: exchange server, virtualization, storage, backup and disaster recovery, hosted solutions.



**Technician** (08/07 – 09/07)  
Geek Squad

**Firedog** (01/05 – 02/07)  
Circuit City

## **Education**

**Associate Degree of Science in Information Technology** (2002-2004)  
National Institute of Technology

# MICHAEL R. BELCHER

[wvmntneer@gmail.com](mailto:wvmntneer@gmail.com) / [mbelcher@alpha-tech.us](mailto:mbelcher@alpha-tech.us)

*Professional network engineer with 21+ years of experience in IT LAN, WAN network and Collaborative design, analysis, development and implementation* □ *Server Implementation* □ *Superior customer service skills* □ *Creative problem solver* □ *Excellent organizational and prioritizing capabilities*

## SKILLS

Extensive experience in the implementation and support of major network systems. Experience is ranging from Public Sector to throughout West Virginia State Government. Highly effective management of customer implementation and projects. Capable at overseeing multiple projects while balancing the needs of the customer and the organization. Technically skilled at installing and troubleshooting routers, firewalls, switches, VPN solutions, wireless and voice systems. Primary experience pertains to Cisco. Also familiar with Avaya, Extreme, Meraki and Enterasys equipment. Cisco Convergence / Cisco VoIP (4.x – 12.x), Cisco Unity & Unity Connection and related equipment. Singlewire/InformaCast Implementation and Support. Advanced Data Center Implementation and Support. Advanced knowledge of ATM, Frame Relay, SMDS, ISDN, Sonet, IP, SNA, MPLS, SIP, Voice over IP and Video over IP technologies. Technically skilled at diagnosing and resolving PC hardware and software related issues. Advanced knowledge of Linux, Windows NT 3.5, 4.0, 2000, XP, Windows 8 and 2003 & 2008 Server platforms. Experience with Windows Server 2008 and 2012 platforms. Familiar with Novell 4.11 & 5.0 platforms. Experienced with COBOL, Visual Basic, Fortran and Visual C programming languages. Skilled in the development, design and implementation of technical documentation.

## EXPERIENCE

### **Alpha Technologies, 4003 Outlook Drive, Scott Depot, WV 25560** **Lead Systems Engineer, July 2019 - Present**

- Provide advanced professional and technical consulting in designing, selecting, implementing, and maintaining various network hardware, software and communications equipment for customers
- Install, configure, and maintain Cisco LAN/WAN and Collaborative equipment for customers, which includes various routers, Catalyst switches, PIX / ASA firewalls, Meraki Security and Wireless solutions, SDWAN and VPN solutions, remote access and Radius Servers, Wireless solutions/devices and Security solutions/devices. Cisco Call Manager 4.x-12.x platforms, Unity & Unity Connection implementations. Voice Gateway Implementations (MGCP & H323).
- Install, configure and maintain Avaya / Extreme series switching equipment.
- Provide video conferencing installation and support for Polycom and Tandberg equipment.
- Perform advanced technical tasks including optimization of communications equipment, identification and resolutions of networking abnormalities, initiation of security audits, preventive measures and traffic management
- Serve in a technical role on projects involving interconnectivity between Federal, State, local and other systems
- Maintain network documentation, including network diagrams, addressing schemes, and server, router, switch, firewall, and security configurations
- Project Management for customer "Turn-key" solutions, upgrades, implementations
- Implement new and emerging technologies that best fit the needs of the customer
- Address connectivity issues between multi-platform and protocol environments
- Provide timely and effective support to customers in accordance with established Service Level Agreements

### **Getronics (formerly) Pomeroy IT Solutions, 135 Corporate Centre Drive, Scott Depot, WV 25560** **Senior Systems Engineer, Sept. 2012 – July 2019**

- Provide advanced professional and technical consulting in designing, selecting, implementing, and maintaining various network hardware, software and communications equipment for customers
- Install, configure, and maintain Cisco LAN/WAN equipment for customers, which includes various routers, Catalyst switches, PIX / ASA firewalls, VPN solutions, remote access and Radius Servers, Wireless solutions/devices and Security solutions/devices. Cisco Call Manager 4.x-12.x platforms, Unity & Unity Connection implementations. Voice Gateway Implementations (MGCP & H323).
- Install, configure and maintain Avaya / Extreme series switching equipment.
- Provide video conferencing installation and support for Polycom and Tandberg equipment.
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resolutions of networking abnormalities, initiation of security audits, preventive measures and traffic management

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- Provide timely and effective support to customers in accordance with established Service Level Agreements

**2008 – Aug. 2012 VERIZON, Network Integration, 4700 MacCorkle Ave SE, Charleston, WV  
Field Engineer, 2008 – 2012**

Provide advanced professional and technical consulting in designing, selecting, implementing, and maintaining various network hardware, software and communications equipment for customers

Install, configure, and maintain Cisco LAN/WAN equipment for customers, which includes various routers, Catalyst switches, PIX / ASA firewalls, VPN solutions, remote access and Radius Servers, Wireless solutions/devices and Security solutions/devices. Cisco Call Manager 4.x, 6.x – 11.x platforms, Unity & Unity Connection implementations. Voice Gateway Implementations.

Provide video conferencing installation and support for Polycom and Tandberg equipment.

Perform advanced technical tasks including optimization of communications equipment, identification and resolutions of networking abnormalities, initiation of security audits, preventive measures and traffic management

Serve in a technical role on projects involving interconnectivity between Federal, State, local and other systems

Maintain network documentation, including network diagrams, addressing schemes, and server, router, switch, firewall, and security configurations

Project Management for customer "Turn-key" solutions, upgrades, implementations

Implement new and emerging technologies that best fit the needs of the customer

Address connectivity issues between multi-platform and protocol environments

Provide timely and effective support to customers in accordance with established Service Level Agreements

**1999 - 2008 WEST VIRGINIA DEPARTMENT OF ADMINISTRATION, WV Office of Technology,  
Charleston, WV**

**Information Systems Specialist IV, Network Unit Supervisor, Engineer - 2007 – 2008(July)  
Information Services & Communications Division (WVOT)**

Serving as the Network Unit Supervisor and support engineer for the WV Office of Technology, Infrastructure and Telecommunications Sections

Provides primary support of the West Virginia State Infrastructure, including the Unified State Network, 10-Gig Backbone and Gig-E Backbones. Approximately 2200 state locations.

Provides support for the Centralized Cisco IPT Infrastructure and Rollout

Provide advanced professional and technical consulting in designing, selecting, implementing, and maintaining various network hardware, software and communications equipment for customers

Install, configure, and maintain Cisco equipment for customers, which includes various routers, Catalyst switches, PIX / ASA firewalls, VPN solutions, remote access and Radius Servers and Wireless solutions/devices

Perform advanced technical tasks including optimization of communications equipment, identification and resolutions of networking abnormalities, initiation of security audits, preventive measures and traffic management

Serve in a technical role on projects involving interconnectivity between Federal, State, local and other systems

Maintain network documentation, including network diagrams, addressing schemes, and server, router, switch, firewall, and security configurations

Design, specify and procure network equipment following State purchasing guidelines

Provide hardware/software technical support for servers and workstations to end users when required

Project Management for customer "Turn-key" solutions, upgrades, implementations

Implement new and emerging technologies that best fit the needs of the customer as well as the needs of the State of WV

Provide the primary support of the State of West Virginia's DNS Infrastructure.

Maintain and provide administrative support for the Imail POP3 mail server.

Address connectivity issues between multi-platform and protocol environments

Provide timely and effective support to customers in accordance with established Service Level Agreements

### **Information Systems Specialist III, Network Unit Supervisor, 2003-2007** Information Services & Communications Division

- Provides primary support of the West Virginia State Infrastructure, including the Unified State Network, 10-Gig Backbone and Gig-E Backbones
- Provides support for the Centralized Cisco IPT Infrastructure and Rollout
- Performs advanced professional and technical consulting tasks in designing, selecting, implementing, and maintaining various network hardware, software and communications equipment for all customers
- Install, configure, and maintain Cisco equipment for customers, which includes various routers, Catalyst switches, PIX firewalls, VPN Concentrators, remote access and Radius Servers and Wireless devices
- Performs ongoing advanced technical tasks, optimization of communications equipment, identification and resolutions of networking abnormalities, initiation of security audits, preventive measures and traffic management
- Maintains network documentation, including network diagrams, addressing schemes, and server, router, switch, firewall, and security configurations
- Design, specify and procure network equipment following State purchasing guidelines
- Primary Server support
- Active Directory Design, Implementation (WV2000)
- Provide hardware/software technical support for Servers and workstations to end users when required
- Project Management for customers ("Turn-key" solutions, upgrades, implementations)
- Implement new and emerging technologies that best fit customer requests as well as the State of WV
- Provide server support and installation solutions customers.
- Initial point of contact between technical staff and end-user; performed first level problem determination.
- Set-up workstations and installed operating system and appropriate software.
- Primary Support of State DNS Infrastructure. POP3 Mail system support.
- Troubleshoot automation problems in computer systems.
- Address connectivity issues between multi-platform and protocol environments.

### **Information Systems Specialist II, 2000-2003** Information Services & Communications Division

- State of WV (WV2000) Active Directory Rollout, Support and Implementation
- Provides primary support of the West Virginia State Infrastructure, and Gig-E Backbone
- Provide server support and installation solutions for State Agencies as well as IS&C.
- Provided primary support and installation of all Server systems
- Installed, configured and managed the TSM Tivoli Backup Storage Solution, IBM Mainframe
- LAN Design and Installation services
- Turn-Key solutions to customers
- Initial point of contact between technical staff and end-user; performed first level problem determination.
- Set-up workstations and installed operating system and appropriate software.
- Secondary Support of State DNS Infrastructure. POP3 Mail system support.

### **Information Systems Specialist I, 1999 – 2000** Information Services & Communications Division

- State of WV (WV2000) Active Directory Rollout, Support and Implementation
- Provides primary support of the West Virginia State Infrastructure, and Gig-E Backbone Provide server support and installation solutions for customers.
- Provided primary support and installation of all Server systems, NT4.0, Windows 2000
- Installed, configured and managed the TSM Tivoli Backup Storage Solution, IBM Mainframe
- LAN Design and Installation services
- Turn-Key solutions to customers
- Initial point of contact between technical staff and end-user; performed first level problem determination.
- Set-up workstations and installed operating system and appropriate software.

1990-1999 **BERWIND LAND COMPANY, Natural Resources Division, Charleston, WV**

## **IT Support Specialist, CAD Operator**

- Served as the IT support specialist for Charleston and Pikeville, KY office locations
- Support and implementation of the GIS system and database to coordinate and file Unmined Minerals Taxes
- Provide advanced professional and technical consulting in designing, selecting, implementing, and maintaining various network hardware, software and communications equipment
- Install, configure, and maintain all Server and network equipment
- Serve in a technical role on projects involving interconnectivity between Federal, State, local and other systems
- Maintain network documentation, including network diagrams, addressing schemes, and server, router, switch, firewall, and security configurations
- Provide hardware/software technical support for servers and workstations to end users when required
- Address connectivity issues between multi-platform and protocol environments
- Provide GIS database support and design work
- Provide support for AutoCad, AutoCad Map and SurvCadd systems
- Provide support and calculations for Reserve trending and cost models

### **CERTIFICATIONS**

2016: CCNP-Collaboration (Current)  
2015: CCDA - (Current)  
2013: CCNP – Voice (Updated) (CCNP Collaboration)  
2011: CCNA-Wireless (Current)  
2010: CCNA-Voice (Current)  
2009: CCNA (Current)  
2007: Microsoft Certified Systems Engineer (MCSE - Windows 2003), MCSA 2003  
2002: Net+  
2002: Server +  
1998: Microsoft Certified Systems Engineer (MCSE – Windows NT 4.0)  
1992: A+

### **EDUCATION**

**West Virginia State College, Institute, WV**  
Associate Applied Science, 1990  
**West Virginia State College, Institute, WV**  
Completed 50 additional Credit Hours, (Computer Science) 1996 – 1998

### **PROFESSIONAL Installations / References**

**Mountwest Community & Technical College**  
**Our Lady of Bellefonte Hospital (BonSecours)**  
**Cabell County 911 / EMS**  
**Cabell County Commission**  
**United Mine Workers**  
**Cammack Childrens Center**  
**City of Wheeling**  
**City of Clarksburg**  
**Shuman Center, PA**  
**Heinz / Del Monte**  
**Eastern Community & Technical College**  
**Kanawha County Commission**  
**Kanawha County Sheriff**  
**Kanawha County Prosecuting Attorney**  
**Kentucky Community Action Council**  
**Loop Pharmacy**  
**WV Homeland Security**  
**WV Lottery**  
**WV Legislature**  
**WV Treasury**  
**WV Conservation**  
**WV Auditor's Office**  
**WV Secretary of State**  
**WV Department of Tax & Revenue**  
**WV DHHR**  
**WV Office of Technology**  
**WV OIEP**  
**WV Department of Highways**  
**WV Department of Administration**  
**WV Department of Education – Statewide School Implementations (55 Counties)**

OH Department of Education – Ashland School District

# DOUGLAS TATE

[dtate@alpha-tech.us](mailto:dtate@alpha-tech.us)

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Goal is to use my experience, knowledge and leadership skills to make a difference in the lives of those around me.

## EXPERIENCE

**MAY 1987 – SEPTEMBER 1996**

**SFC/E-7, U.S. ARMY**

Various jobs ranging from Infantry Soldier to Platoon Sergeant over a communications group.

**SEPTEMBER 1996 – JULY 1999**

**NETWORK ENGINEER, INTERNATIONAL NETWORK SERVICES**

Consultant providing design, troubleshooting and staffing support for IT related issues within the New York, New Jersey and Philadelphia areas.

**AUGUST 1999 – APRIL 2001**

**DIRECTOR NETWORK SERVICES, COLUMBIA GAS SOLUTIONS**

Responsible for oversight and management of IT Staff including budget, technical and support for all pipeline activities within the United States.

**APRIL 2001 – MAY 2005**

**VP ENGINEERING, CHARTER BUSINESS NETWORKS**

Over all aspects of technical and technical support for a subsidiary of Charter Communications. Developed technical solutions, market offerings, support models and managed deployment of services.

**MAY 2005 – PRESENT**

**CEO, ALPHA TECHNOLOGIES INC.**

Started Alpha Technologies Inc., in 2001 as a part time endeavor, taking it full time May 2005. Responsible for all aspects of the business. I have grown the company to average 18 million in yearly average gross revenue, employing over 70 full time staff members out of 4 offices. Currently supporting services in 32 states and 23 countries.

## EDUCATION

**MAY 2001**

**INFORMATION SYSTEMS MANAGEMENT, UNIVERSITY OF MARYLAND**

**DECEMBER 2012**

**MASTER OF BUSINESS ADMINISTRATION, UNIVERSITY OF CHARLESTON**

It's okay to brag about your GPA, awards, and honors. Feel free to summarize your coursework too.

## **AWARDS**

- US Army Leadership Award
- West Virginia Veteran Owned Businessperson of the Year
- West Virginia Exporter of the Year.
- WV SBA Businessperson of the Year
- SBA Businessperson of the Year (runner-up)
- Putnam County Businessperson of the Year

## **CERTIFICATIONS**

Cisco Systems Certified Network Professional

- Security
- Telephony
- Data Center
- Route/Switch

Cisco Systems Certified Design Professional

VMWare Certified Network Engineer

Microsoft Certified Systems Engineer

A+ Certified

Network + Certified

Security + Certified

Various other technical certifications.

## **INTERESTS**

Family

Scuba Diving (Dive Master)

Motorcycles