



3741 Morgantown Industrial Park
Morgantown, West Virginia 26501-2347
(304) 292-3700
FAX: (304) 292-0873

23 February 2010

State of West Virginia
Department of Administration
Purchasing Division
ATTN: Mr. John Abbott
Building 15
Charleston, WV 25305-0130

RECEIVED

2010 FEB 23 A 8:19

PURCHASING DIVISION
STATE OF WV

Subject: Business Proposal

Dear Mr. Abbott:

Azimuth, Incorporated (**Azimuth**) is pleased to submit our Business Proposal for the following Request for Quotation (RFQ):

- RFQ Number: HSE000101 – Modeling and Simulation (M&S) Capability for Consequence Management (CM) in support of the West Virginia Department of Military Affairs and Public Safety (WV DMAPS)

Azimuth offers the WV Department of Administration Purchasing Division and DMAPS outstanding program management and analytical support, proven experience, and reduced contractual risk. We welcome this contracting opportunity to provide our services and are fully prepared to commence work immediately upon issuance of a contract.

If you have any questions regarding this information, please contact the undersigned at (304) 292-3700.

Sincerely,

A handwritten signature in cursive script that reads "Tina M. Hartzell".

Tina M. Hartzell
VP/CFO

Encl

With Offices in:

Fairmont, WV

Frederick, MD

**GENERAL TERMS & CONDITIONS
REQUEST FOR QUOTATION (RFQ) AND REQUEST FOR PROPOSAL (RFP)**

1. Awards will be made in the best interest of the State of West Virginia.
2. The State may accept or reject in part, or in whole, any bid.
3. Prior to any award, the apparent successful vendor must be properly registered with the Purchasing Division and have paid the required \$125 fee.
4. All services performed or goods delivered under State Purchase Order/Contracts are to be continued for the term of the Purchase Order/Contracts, contingent upon funds being appropriated by the Legislature or otherwise being made available. In the event funds are not appropriated or otherwise available for these services or goods this Purchase Order/Contract becomes void and of no effect after June 30
5. Payment may only be made after the delivery and acceptance of goods or services
6. Interest may be paid for late payment in accordance with the *West Virginia Code*
7. Vendor preference will be granted upon written request in accordance with the *West Virginia Code*.
8. The State of West Virginia is exempt from federal and state taxes and will not pay or reimburse such taxes.
9. The Director of Purchasing may cancel any Purchase Order/Contract upon 30 days written notice to the seller.
10. The laws of the State of West Virginia and the *Legislative Rules* of the Purchasing Division shall govern the purchasing process.
11. Any reference to automatic renewal is hereby deleted. The Contract may be renewed only upon mutual written agreement of the parties.
12. **BANKRUPTCY:** In the event the vendor/contractor files for bankruptcy protection, the State may deem this contract null and void, and terminate such contract without further order.
13. **HIPAA BUSINESS ASSOCIATE ADDENDUM:** The West Virginia State Government HIPAA Business Associate Addendum (BAA), approved by the Attorney General, is available online at www.state.wv.us/admin/purchase/vrc/hipaa.htm and is hereby made part of the agreement. Provided that the Agency meets the definition of a Cover Entity (45 CFR §160.103) and will be disclosing Protected Health Information (45 CFR §160.103) to the vendor.
14. **CONFIDENTIALITY:** The vendor agrees that he or she will not disclose to anyone, directly or indirectly, any such personally identifiable information or other confidential information gained from the agency, unless the individual who is the subject of the information consents to the disclosure in writing or the disclosure is made pursuant to the agency's policies, procedures, and rules. Vendor further agrees to comply with the Confidentiality Policies and Information Security Accountability Requirements, set forth in <http://www.state.wv.us/admin/purchase/privacy/noticeConfidentiality.pdf>
15. **LICENSING:** Vendors must be licensed and in good standing in accordance with any and all state and local laws and requirements by any state or local agency of West Virginia, including, but not limited to, the West Virginia Secretary of State's Office, the West Virginia Tax Department, and the West Virginia Insurance Commission. The vendor must provide all necessary releases to obtain information to enable the director or spending unit to verify that the vendor is licensed and in good standing with the above entities.
16. **ANTITRUST:** In submitting a bid to any agency for the State of West Virginia, the bidder offers and agrees that if the bid is accepted the bidder will convey, sell, assign or transfer to the State of West Virginia all rights, title and interest in and to all causes of action it may now or hereafter acquire under the antitrust laws of the United States and the State of West Virginia for price fixing and/or unreasonable restraints of trade relating to the particular commodities or services purchased or acquired by the State of West Virginia. Such assignment shall be made and become effective at the time the purchasing agency tenders the initial payment to the bidder

I certify that this bid is made without prior understanding, agreement, or connection with any corporation, firm, limited liability company, partnership, or person or entity submitting a bid for the same material, supplies, equipment or services and is in all respects fair and without collusion or Fraud. I further certify that I am authorized to sign the certification on behalf of the bidder or this bid.

INSTRUCTIONS TO BIDDERS

1. Use the quotation forms provided by the Purchasing Division. Complete all sections of the quotation form.
2. Items offered must be in compliance with the specifications. Any deviation from the specifications must be clearly indicated by the bidder. Alternates offered by the bidder as **EQUAL** to the specifications must be clearly defined. A bidder offering an alternate should attach complete specifications and literature to the bid. The Purchasing Division may waive minor deviations to specifications
3. Unit prices shall prevail in case of discrepancy. All quotations are considered F.O.B. destination unless alternate shipping terms are clearly identified in the quotation.
4. All quotations must be delivered by the bidder to the office listed below prior to the date and time of the bid opening. Failure of the bidder to deliver the quotations on time will result in bid disqualifications: Department of Administration, Purchasing Division, 2019 Washington Street East, P.O. Box 50130, Charleston, WV 25305-0130
5. Communication during the solicitation, bid, evaluation or award periods, except through the Purchasing Division, is strictly prohibited (W.Va. C.S.R. §148-1-6.6).



State of West Virginia
 Department of Administration
 Purchasing Division
 2019 Washington Street East
 Post Office Box 50130
 Charleston, WV 25305-0130

**Request for
 Quotation**

RFQ NUMBER
HSE000101

PAGE
1

ADDRESS CORRESPONDENCE TO ATTENTION OF:
JOHN ABBOTT 304-558-2544

RFQ COPY
 TYPE NAME/ADDRESS HERE

AZIMUTH, INCORPORATED
 3741 MORGANTOWN INDUSTRIAL PARK
 MORGANTOWN, WV 26501

HOMELAND SECURITY & EMERGENCY
 MANAGEMENT, DIVISION OF
 BUILDING 1, ROOM EB80
 1900 KANAWHA BOULEVARD, EAST
 CHARLESTON, WV
 25305-0360 304-558-5380

DATE PRINTED	TERMS OF SALE	SHIP VIA	F.O.B	FREIGHT TERMS
01/12/2010				

BID OPENING DATE: 02/23/2010 BID OPENING TIME 01:30PM

LINE	QUANTITY	UOP	CAT NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
0001	1	LS		961-20		
MODELLING & SIMULATION CAPABILITY REQUEST FOR PROPOSAL (RFP) CONTRACT TO PROVIDE MODELLING AND SIMULATION CAPABILITY FOR CONSEQUENCE MANAGEMENT SERVICES FOR THE WEST VIRGINIA DEPARTMENT OF MILITARY AFFAIRS AND PUBLIC SAFETY, HOMELAND SECURITY DIVISION, PER THE ATTACHED REQUEST FOR PORPOSAL (RFP). MANDATORY PRE-BID A MANDATORY PRE-BID WILL BE HELD ON 2/03/10; 10:30 AM - LOCATION LISTED IN THE ATTACHED DOCUMENTATION. ALL INTERESTED PARTIES ARE REQUIRED TO ATTEND THIS MEETING FAILURE TO ATTEND THE MANDATORY PRE-BID SHALL RESULT IN DISQUALIFICATION OF THE BID. NO ONE PERSON MAY REPRESENT MORE THAN ONE BIDDER. AN ATTENDANCE SHEET WILL BE MADE AVAILABLE FOR ALL POTENTIAL BIDDERS TO COMPLETE. THIS WILL SERVE AS THE OFFICIAL DOCUMENT VERIFYING ATTENDANCE AT THE MANDATORY PRE-BID. FAILURE TO PROVIDE YOUR COMPANY AND REPRESENTATIVE NAME ON THE ATTENDANCE SHEET WILL RESULT IN DISQUALIFICATION OF THE BID. THE STATE WILL NOT ACCEPT ANY OTHER DOCUMENTATION TO VERIFY ATTENDANCE. THE BIDDER IS RESPONSIBLE FOR ENSURING THEY HAVE COMPLETED THE INFORMATION REQUIRED ON THE ATTENDANCE SHEET. THE PURCHASING DIVISION AND THE STATE AGENCY WILL NOT ASSUME ANY RESPONSIBILITY FOR A BIDDER-S FAILURE TO COMPLETE THE PRE-BID ATTENDANCE SHEET. IN ADDITION, WE REQUEST THAT ALL POTENTIAL BIDDERS INCLUDE THEIR E-MAIL ADDRESS AND FAX NUMBER.						

SEE REVERSE SIDE FOR TERMS AND CONDITIONS

SIGNATURE <i>Shirley M. Hartzell</i>	TELEPHONE 304-292-3700	DATE 23 February 2010
TITLE VP/CFO	FAX 55-0686327	ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'



State of West Virginia
 Department of Administration
 Purchasing Division
 2019 Washington Street East
 Post Office Box 50130
 Charleston, WV 25305-0130

**Request for
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PAGE
2

ADDRESS CORRESPONDENCE TO ATTENTION OF
JOHN ABBOTT 304-558-2544

RFQ COPY
 TYPE NAME/ADDRESS HERE

AZIMUTH, INCORPORATED
 3741 MORGANTOWN INDUSTRIAL PARK
 MORGANTOWN, WV 26501

HOMELAND SECURITY & EMERGENCY
 MANAGEMENT, DIVISION OF
 BUILDING 1, ROOM EB80
 1900 KANAWHA BOULEVARD, EAST
 CHARLESTON, WV
 25305-0360 304-558-5380

DATE PRINTED	TERMS OF SALE	SHIP VIA	FOB	FREIGHT TERMS
01/12/2010				

BID OPENING DATE: 02/23/2010 BID OPENING TIME 01:30PM

LINE	QUANTITY	UOP	CAT NO	ITEM NUMBER	UNIT PRICE	AMOUNT
<p>ALL POTENTIAL BIDDERS ARE REQUESTED TO ARRIVE PRIOR TO THE STARTING TIME FOR THE PRE-BID. BIDDERS WHO ARRIVE LATE, BUT PRIOR TO THE DISMISSAL OF THE TECHNICAL PORTION OF THE PRE-BID WILL BE PERMITTED TO SIGN IN. BIDDERS WHO ARRIVE AFTER CONCLUSION OF THE TECHNICAL PORTION OF THE PRE-BID, BUT DURING ANY SUBSEQUENT PART OF THE PRE-BID WILL NOT BE PERMITTED TO SIGN THE ATTENDANCE SHEET.</p> <p style="text-align: center;">NOTICE</p> <p>A SIGNED BID MUST BE SUBMITTED TO:</p> <p style="text-align: center;">DEPARTMENT OF ADMINISTRATION PURCHASING DIVISION BUILDING 15 2019 WASHINGTON STREET, EAST CHARLESTON, WV 25305-0130</p> <p>THE BID SHOULD CONTAIN THIS INFORMATION ON THE FACE OF THE ENVELOPE OR THE BID MAY NOT BE CONSIDERED:</p> <p>SEALED BID</p> <p>BUYER: JOHN ABBOTT (32)-----</p> <p>RFQ. NO.: HSE000101-----</p> <p>BID OPENING DATE: 2/23/2010-----</p> <p>BID OPENING TIME: 1:30 PM-----</p>						

SEE REVERSE SIDE FOR TERMS AND CONDITIONS

SIGNATURE <i>Jana M. Hartzell</i>	TELEPHONE 304-292-3700	DATE 23 February 2010
TITLE VP/CFO	FERN 55-0686327	ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'



State of West Virginia
 Department of Administration
 Purchasing Division
 2019 Washington Street East
 Post Office Box 50130
 Charleston, WV 25305-0130

Request for Quotation

RFQ NUMBER
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PAGE
3

ADDRESS CORRESPONDENCE TO ATTENTION OF
JOHN ABBOTT
304-558-2544

RFQ COPY
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AZIMUTH, INCORPORATED
3741 MORGANTOWN INDUSTRIAL PARK
MORGANTOWN, WV 26501

HOMELAND SECURITY & EMERGENCY
MANAGEMENT, DIVISION OF
BUILDING 1, ROOM EB80
1900 KANAWHA BOULEVARD, EAST
CHARLESTON, WV
25305-0360 304-558-5380

DATE PRINTED 01/12/2010	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS
BID OPENING DATE: 02/23/2010 BID OPENING TIME 01:30PM				

LINE	QUANTITY	UOP	CAT NO	ITEM NUMBER	UNIT PRICE	AMOUNT
PLEASE PROVIDE A FAX NUMBER IN CASE IT IS NECESSARY TO CONTACT YOU REGARDING YOUR BID: ----- CONTACT PERSON (PLEASE PRINT CLEARLY): ----- FINA M. HARTZELL FAX NUMBER 304-292-0873 ----- ***** THIS IS THE END OF RFQ HSE000101 ***** TOTAL:						

SEE REVERSE SIDE FOR TERMS AND CONDITIONS

SIGNATURE <i>FINA M. Hartzell</i>	TELEPHONE 304-292-3700	DATE 23 February 2010
TITLE VP/CFO	FEIN 55-0686327	ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'



State of West Virginia
 Department of Administration
 Purchasing Division
 2019 Washington Street East
 Post Office Box 50130
 Charleston, WV 25305-0130

**Request for
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RFQ NUMBER
HSE000101

NV 1700 1/10

PAGE
1

ADDRESS CORRESPONDENCE TO ATTENTION OF
JOHN ABBOTT 304-558-2544

RFQ COPY
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AZIMUTH, INCORPORATED
 3741 MORGANTOWN INDUSTRIAL PARK
 MORGANTOWN, WV 26501

HOMELAND SECURITY & EMERGENCY
 MANAGEMENT, DIVISION OF
 BUILDING 1, ROOM EB80
 1900 KANAWHA BOULEVARD, EAST
 CHARLESTON, WV
 25305-0360 304-558-5380

DATE PRINTED	TERMS OF SALE	SHIP VIA	FOB	FREIGHT TERMS
02/11/2010				

BID OPENING DATE: 02/23/2010 BID OPENING TIME 01:30PM

LINE	QUANTITY	UOP	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
				ADDENDUM #01		
				THIS ADDENDUM IS ISSUED TO ANSWER QUESTIONS AND CLARIFY THE ORIGINAL REQUEST FOR PROPOSAL SPECIFICATIONS, PER THE ATTACHED DOCUMENTATION.		
				NO ADDITIONAL QUESTIONS WILL BE ACCEPTED.		
0001	1	LS		961-20 MODELLING & SIMULATION CAPABILITY		
***** THIS IS THE END OF RFQ HSE000101 ***** TOTAL: _____						

SEE REVERSE SIDE FOR TERMS AND CONDITIONS

SIGNATURE <i>John M. Hartzell</i>	TELEPHONE 304-292-3700	DATE 23 February 2010
TITLE VP/CFO	FIRM 55-0686327	ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'



State of West Virginia
 Department of Administration
 Purchasing Division
 2019 Washington Street East
 Post Office Box 50130
 Charleston, WV 25305-0130

Request for
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RFQ NUMBER
 HSE000101

PAGE
 1

ADDRESS CORRESPONDENCE TO ATTENTION OF:
 JOHN ABBOTT
 304-558-2544

VENDOR

RFQ COPY
 TYPE NAME/ADDRESS HERE

AZIMUTH, INCORPORATED
 3741 MORGANTOWN INDUSTRIAL PARK
 MORGANTOWN, WV 26501

SHIP TO

HOMELAND SECURITY & EMERGENCY
 MANAGEMENT, DIVISION OF
 BUILDING 1, ROOM EB80
 1900 KANAWHA BOULEVARD, EAST
 CHARLESTON, WV
 25305-0360 304-558-5380

DATE PRINTED 02/17/2010	TERMS OF SALE	SHIP VIA	FOB	FREIGHT TERMS
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BID OPENING DATE: 02/24/2010 BID OPENING TIME 01:30PM

LINE	QUANTITY	UOP	CAT NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
				ADDENDUM #02		
				THIS ADDENDUM IS ISSUED TO CLARIFY SECTION 2.2, BACKGROUND OF THE ORIGINAL REQUEST FOR PROPOSAL SPECIFICATIONS, PER THE ATTACHED DOCUMENT, AND EXTEND THE BID OPENING TO 2/24/2010; 1:30 PM		
				REVISED BID OPENING: 2/24/2010; 1:30 PM		
				NO ADDITIONAL QUESTIONS, INQUIRIES, OR COMMENTS WILL BE ACCEPTED OR ACKNOWLEDGED DUE TO THE TIME CONSTRAINTS OF THIS PROJECT.		
0001	1	LS		961-20 MODELLING & SIMULATION CAPABILITY		
***** THIS IS THE END OF RFQ HSE000101 ***** TOTAL:						

SEE REVERSE SIDE FOR TERMS AND CONDITIONS

SIGNATURE <i>Jana M. Hartill</i>	TELEPHONE 304-292-3700	DATE 23 February 2010
TITLE VP/CFO	FAX 55-0686327	ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

RFQ No HSE000101

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

West Virginia Code §5A-3-10a states: No contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and the debt owned is an amount greater than one thousand dollars in the aggregate

DEFINITIONS:

"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Debtor" means any individual, corporation, partnership, association, Limited Liability Company or any other form or business association owing a debt to the state or any of its political subdivisions. "Political subdivision" means any county commission; municipality; county board of education; any instrumentality established by a county or municipality; any separate corporation or instrumentality established by one or more counties or municipalities, as permitted by law; or any public body charged by law with the performance of a government function or whose jurisdiction is coextensive with one or more counties or municipalities. "Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceeds five percent of the total contract amount.

EXCEPTION: The prohibition of this section does not apply where a vendor has contested any tax administered pursuant to chapter eleven of this code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

Under penalty of law for false swearing (*West Virginia Code §61-5-3*), it is hereby certified that the vendor affirms and acknowledges the information in this affidavit and is in compliance with the requirements as stated.

WITNESS THE FOLLOWING SIGNATURE

Vendor's Name: Azimuth Incorporated

Authorized Signature: *Uma M. Hartzell* Date: 23 February 2010

State of West Virginia

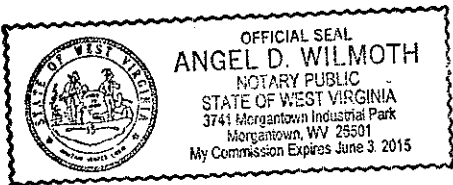
County of Monongalia, to-wit:

Taken, subscribed, and sworn to before me this 23 day of February, 2010

My Commission expired June 3, 2015

AFFIX SEAL HERE

NOTARY PUBLIC *Angel D. Wilmoth*



State of West Virginia

VENDOR PREFERENCE CERTIFICATE

Certification and application* is hereby made for Preference in accordance with West Virginia Code, §5A-3-37. (Does not apply to construction contracts) West Virginia Code, §5A-3-37, provides an opportunity for qualifying vendors to request (at the time of bid) preference for their residency status. Such preference is an evaluation method only and will be applied only to the cost bid in accordance with the West Virginia Code. This certificate for application is to be used to request such preference. The Purchasing Division will make the determination of the Resident Vendor Preference, if applicable.

1. Application is made for 2.5% resident vendor preference for the reason checked:

- X Bidder is an individual resident vendor and has resided continuously in West Virginia for four (4) years immediately preceding the date of this certification; or,
Bidder is a partnership, association or corporation resident vendor and has maintained its headquarters or principal place of business continuously in West Virginia for four (4) years immediately preceding the date of this certification; or 80% of the ownership interest of Bidder is held by another individual, partnership, association or corporation resident vendor who has maintained its headquarters or principal place of business continuously in West Virginia for four (4) years immediately preceding the date of this certification; or,
Bidder is a nonresident vendor which has an affiliate or subsidiary which employs a minimum of one hundred state residents and which has maintained its headquarters or principal place of business within West Virginia continuously for the four (4) years immediately preceding the date of this certification; or,

2. Application is made for 2.5% resident vendor preference for the reason checked:

- X Bidder is a resident vendor who certifies that, during the life of the contract, on average at least 75% of the employees working on the project being bid are residents of West Virginia who have resided in the state continuously for the two years immediately preceding submission of this bid; or,

3. Application is made for 2.5% resident vendor preference for the reason checked:

- _____ Bidder is a nonresident vendor employing a minimum of one hundred state residents or is a nonresident vendor with an affiliate or subsidiary which maintains its headquarters or principal place of business within West Virginia employing a minimum of one hundred state residents who certifies that, during the life of the contract, on average at least 75% of the employees or Bidder's affiliate's or subsidiary's employees are residents of West Virginia who have resided in the state continuously for the two years immediately preceding submission of this bid; or,

4. Application is made for 5% resident vendor preference for the reason checked:

- X Bidder meets either the requirement of both subdivisions (1) and (2) or subdivision (1) and (3) as stated above; or,

5. Application is made for 3.5% resident vendor preference who is a veteran for the reason checked:

- _____ Bidder is an individual resident vendor who is a veteran of the United States armed forces, the reserves or the National Guard and has resided in West Virginia continuously for the four years immediately preceding the date on which the bid is submitted; or,

6. Application is made for 3.5% resident vendor preference who is a veteran for the reason checked:

- X Bidder is a resident vendor who is a veteran of the United States armed forces, the reserves or the National Guard, if, for purposes of producing or distributing the commodities or completing the project which is the subject of the vendor's bid and continuously over the entire term of the project, on average at least seventy-five percent of the vendor's employees are residents of West Virginia who have resided in the state continuously for the two immediately preceding years.

Bidder understands if the Secretary of Revenue determines that a Bidder receiving preference has failed to continue to meet the requirements for such preference, the Secretary may order the Director of Purchasing to: (a) reject the bid; or (b) assess a penalty against such Bidder in an amount not to exceed 5% of the bid amount and that such penalty will be paid to the contracting agency or deducted from any unpaid balance on the contract or purchase order.

By submission of this certificate, Bidder agrees to disclose any reasonably requested information to the Purchasing Division and authorizes the Department of Revenue to disclose to the Director of Purchasing appropriate information verifying that Bidder has paid the required business taxes, provided that such information does not contain the amounts of taxes paid nor any other information deemed by the Tax Commissioner to be confidential.

Under penalty of law for false swearing (West Virginia Code, §61-5-3), Bidder hereby certifies that this certificate is true and accurate in all respects; and that if a contract is issued to Bidder and if anything contained within this certificate changes during the term of the contract, Bidder will notify the Purchasing Division in writing immediately.

Bidder: Azimuth Incorporated Signed: Gina M. Hartzell

Date: 23 February 2010 Title: VP/CFO

*Check any combination of preference consideration(s) indicated above which you are entitled to receive



CERTIFICATE OF LIABILITY INSURANCE

OP ID AN
AZIMU-2

DATE (MM/DD/YYYY)

02/17/10

PRODUCER

Insurance Agency
 1. Oakland Street
 Morgantown WV 26505
 Phone: 304-599-3445

INSURED

Azimuth, Inc
 3741 Morgantown Industrial Prk
 Morgantown WV 26501-2347

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

INSURERS AFFORDING COVERAGE

NAIC #

INSURER A: Chubb Group of Insurance Co's
 INSURER B:
 INSURER C:
 INSURER D:
 INSURER E:

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS

TR ADD'L TR INSRD	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YYYY)	POLICY EXPIRATION DATE (MM/DD/YYYY)	LIMITS
	GENERAL LIABILITY <input type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS MADE <input type="checkbox"/> OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC				EACH OCCURRENCE \$ DAMAGE TO RENTED PREMISES (Ea occurrence) \$ MED EXP (Any one person) \$ PERSONAL & ADV INJURY \$ GENERAL AGGREGATE \$ PRODUCTS - COMP/OP AGG \$
	AUTOMOBILE LIABILITY <input type="checkbox"/> ANY AUTO <input type="checkbox"/> ALL OWNED AUTOS <input type="checkbox"/> SCHEDULED AUTOS <input type="checkbox"/> HIRED AUTOS <input type="checkbox"/> NON-OWNED AUTOS				COMBINED SINGLE LIMIT (Ea accident) \$ BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$
	GARAGE LIABILITY <input type="checkbox"/> ANY AUTO				AUTO ONLY - EA ACCIDENT \$ OTHER THAN EA ACC \$ AUTO ONLY: AGG \$
	EXCESS / UMBRELLA LIABILITY <input type="checkbox"/> OCCUR <input type="checkbox"/> CLAIMS MADE DEDUCTIBLE RETENTION \$				EACH OCCURRENCE \$ AGGREGATE \$ \$ \$
A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under SPECIAL PROVISIONS below Y/N <input type="checkbox"/>	7172-73-24	11/10/09	11/10/10	<input checked="" type="checkbox"/> WC STATU-TORY LIMITS <input type="checkbox"/> OTH-ER E.L. EACH ACCIDENT \$ 1000000 E.L. DISEASE - EA EMPLOYEE \$ 1000000 E.L. DISEASE - POLICY LIMIT \$ 1000000
	OTHER				

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES / EXCLUSIONS ADDED BY ENDORSEMENT / SPECIAL PROVISIONS
 Evidence of Insurance for Workers Compensation for State of West Virginia

CERTIFICATE HOLDER

Azimuth Inc
 3741 Morgantown Industrial Park
 Morgantown WV 26501-2347

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE
Ana Woolbach

TITLE PAGE

**Request for Quotation (RFQ) Number: HSE000101
Modeling and Simulation (M&S) Capability for
Consequence Management (CM)**

**In support of:
West Virginia Department of Military Affairs and Public Safety**

**Submitted to:
WV Department of Administration
Purchasing Division
2019 Washington Street, East
P.O. Box 50130
Charleston, WV 25305-0130**

Submitted by:



**3741 Morgantown Industrial Park
Morgantown, WV 26501-2347**

Azimuth offers and agrees that if our bid is accepted we will convey, sell, assign or transfer to the State of West Virginia all rights, title, and interest in and to all causes of action it may now or hereafter acquire under the antitrust laws of the United States and the State of West Virginia for price fixing and/or unreasonable restraints of trade relating to the particular commodities or services purchased or acquired by the State of West Virginia. Such assignment shall be made and become effective at the time the purchasing agency tenders the initial payment to Azimuth.

I certify that this bid is made without prior understanding, agreement, or connection with any corporation, firm, limited liability company, partnership, or person or entity submitting a bid for the same material, supplies, equipment or services and is in all respects fair and without collusion or fraud. I further certify that I am authorized to sign the certification on behalf of Azimuth on this bid.

Authorized Signature:

A handwritten signature in cursive script that reads "Jina M. Hartzell".

Vice President/CFO

23 February 2010

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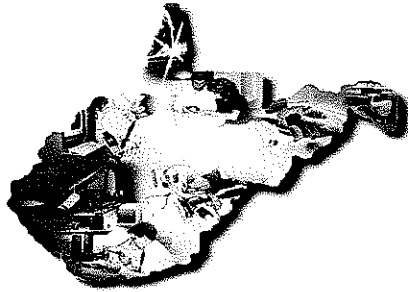
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EXECUTIVE SUMMARY



Azimuth Incorporated (**Azimuth**) is a Service-connected Disabled Veteran Owned Small Business headquartered in Morgantown, West Virginia. We are submitting this proposal in response to the State of West Virginia, Department of Administration Purchasing Division Modeling and Simulation (M&S) Capability solicitation. Azimuth has been registered as a "Registered Vendor" for the State of West Virginia for several years, and is currently the Prime Contractor for designing, testing, producing, and integrating Vehicle Control and Communication Systems (VCCSs) in all Personal Rapid Transit (PRT) vehicles for West Virginia University (WVU) and Department of Transportation (DOT).

As a successful technology-based system solutions company, Azimuth has been providing support for both state and federal government agencies as well as commercial customers for over 20-years. Azimuth provides solutions tailored to our customer's requirements. Additionally, we enjoy an excellent reputation as a developer of hybrid software solutions that combine Government and Commercial-off-the-Shelf hardware/software applications to meet specific integration needs. All of these skills have been effectively brought into play supporting several programs similar to the WV DMAPS M&S Capability project.

Azimuth will leverage the invaluable experience and data sets we have designed and developed in support of *critical pre-assessment* information packages for the WVNG Joint Interagency Training and Education Center (JITEC) Infrastructure Assessment Teams, and the Network Engineer Sandbox Project (NeS) that focuses on *Deliberate and Adaptive Planning* of telecommunications and information systems, networks, critical nodes, and facilities associated with selected areas of interest.

Azimuth's GIS Research & Analysis Team possesses the skills, experience and resources necessary to perform detailed "open source" research for CIP-MAA (Critical Information Protection – Mission Assurance Assessments) via public and private database sources. We have performed extensive "open source" research for several government agencies via various search engines and a sundry number of resources. Azimuth's Infrastructure Analysts have been very involved with "open source" research and training assignments for several years.

Azimuth has gained invaluable corporate experience and derived numerous benefits from important strategic corporate partnerships with other West Virginia-based corporations, organizations and academic institutions.

Mid-Atlantic Technology,
Research & Innovation Center

 MATRIC

One such relationship is our partnership with **MATRIC** for this effort. MATRIC develops and improves software solutions for some of the most complex systems in the world. They have a key corporate focus in developing M&S capabilities and their engineers are well respected experts in the fields of GIS, artificial intelligence, data mining and data fusion. MATRIC engineers have multiple M&S focused patents, have an excellent relationship with ESRI through the ESRI Business Partnership program, and develop systems for customers such as the medical and energy industries, NASA and the Department of Defense.



Another resource the Azimuth Team has is our partnership with the West Virginia University Resource Corporation (**WVURC**) Office of Technology Transfer (**OTT**). WVURC is committed to the transfer of research results to the public, bringing researchers and the business community together in a relationship of mutual advantage. The WVURC OTT has designed and developed computer-based methods of providing clustering related data that represents objects of interest and information with levels of relatedness between those objects.

SECTION I - General Overview

The Azimuth Team will provide the WV Department of Military Affairs and Public Safety (WV DMAPS) and stakeholder partners a fully functional Modeling and Simulation (M&S) Consequence Management (CM) prototype system that allows decision makers to plan and run simulations of large-scale catastrophic events within the National Capitol Region (NCR). Our multi-layered prototype M&S capability system will be designed and developed leveraging our team's vast experience designing and developing sophisticated M&S capability systems for our government and commercial customers. We will incorporate data that we have collected, verified and input into a comprehensive database system through our in-house "open source" research, and from numerous other government activities and commercial organizations provided by our customers in various formats, including real-time data feeds and existing databases.

The Azimuth Team also consists of Subject Matter Experts (SMEs) experienced in CM measures taken to protect public health and safety, and providing emergency relief to government (local, state, and federal), businesses and individuals affected by the consequences of a chemical, biological, nuclear, and/or high-yield explosive (CBRNE) situations. Azimuth is the Prime Contractor supporting the West Virginia National Guard (WVNG) at the Center for National Response (CNR) Memorial Tunnel for weapons of mass destruction (WMD), CM, and counterterrorism (CT) training in support of the WVNG Joint Interagency Training and Education Center (JITEC). Azimuth is responsible for performing all missions related to the CNR Memorial Tunnel in Gallagher, WV. These include maintaining current operational levels, facilities and continually enhancing capabilities for WMD, CM, and CT training activities for Federal, State and Local WMD/CM/CT response elements.

Our proposed M&S capability will be structured to simulate the impacts of road closures on surrounding infrastructures, initially concentrating on data sets for the four (4) selected WV counties (Jefferson, Berkley, Morgan and Hampshire). However, our proposed M&S capability solution design and development efforts will be extensible to encompass all state-wide counties, neighboring states and geographical regions/districts once the appropriate data is collected and/or provided by the appropriate government agencies and commercial entities.

As stipulated in the Request for Quotation (RFQ), (reference pages 12 & 13 of 30), the Azimuth Team is assuming that the agency (WV DMAPS) will support our M&S Capability prototype development effort by providing all information/data listed. This information will be critical for providing the research for the integration of our M&S capability so local, state and federal evacuation managers can model their resource capabilities.

As illustrated in Figure 1, the Azimuth Team's CM solution will be designed and developed utilizing the presentation, consequence management and data set layer approach, and include inter-dependency algorithms that allow users at the local, state, and federal levels to quickly access the system at the appropriate and accredited level in order to input assumptions and review results of their decisions on the relevant infrastructure(s), including roadways and other resources.

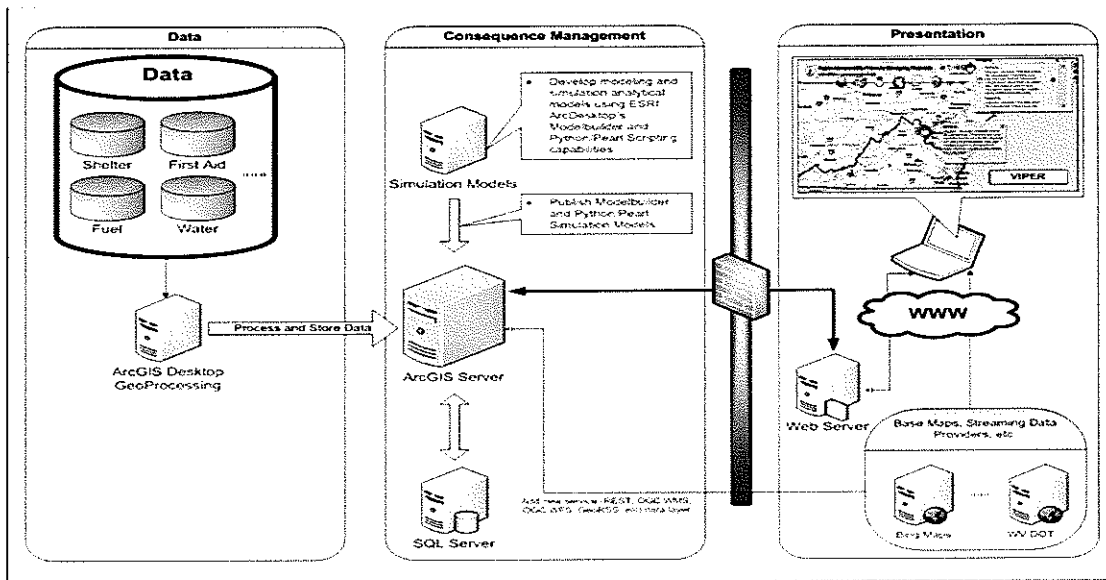


Figure 1, System Design

SECTION II - Scope of Work Requirements

Presentation Layer

The CM capability being developed will provide emergency planners with the ability to explore the consequences of their decisions in regards to the allocation of resources. The simulation capability coupled with data provided by the funding agency will enable emergency planners to run an exercise and receive reports on resource consumption and availability. The CM capability described in this proposal provides a cost effective way to re-run scenarios and examine different plans or procedures for handling the event.

The CM capability proposed by the Azimuth Team will address the emergency planner's need to view data on available resources on hand, convey resource changes as a simulated scenario unfolds, enable changes to resource allocation in real time and display the effect of these changes, and enable running of multiple iterations of the CM simulation capability for the same scenario with different resource allocations.

To meet the requirements of the RFQ, the Azimuth Team will utilize the Adobe Flex based VIPER application developed by ESRI and the Virginia Department of Emergency Management (VDEM).

The Adobe Flex framework is a client-side, web-enabled technology and is rendered by Adobe Flash Player (Version 9 and above) or by Adobe AIR. According to Adobe, 99% of all internet enabled desktops have Adobe Flash Player installed. ESRI has developed and made freely available an ArcGIS API for Flex, which allows for the creation of rich internet applications on top of ArcGIS Server. Coupling the capabilities of the Adobe Flex application framework and the ESRI ArcGIS API enables users to develop rich internet applications with ArcGIS services using the Flex framework. The API enables creation of applications with intuitive, visually rich and responsive user interfaces. Furthermore, coupling the Adobe Flex framework with ESRI ArcGIS API enables advanced functionality for users to interact with the application to perform tasks such as adding and removing data layers, modifying simulation parameters, and displaying GIS data such as raster grids, vector layers, or even streaming data, or simulation results.

ArcGIS API for Flex takes full advantage of the powerful mapping, geo-coding, and geo-processing capabilities of ArcGIS services

Reference Figure 2, an Adobe FLEX example showing a law enforcement VIPER-like application with a widget (shown in the upper right hand side) enabling the user to show/hide various data layers.

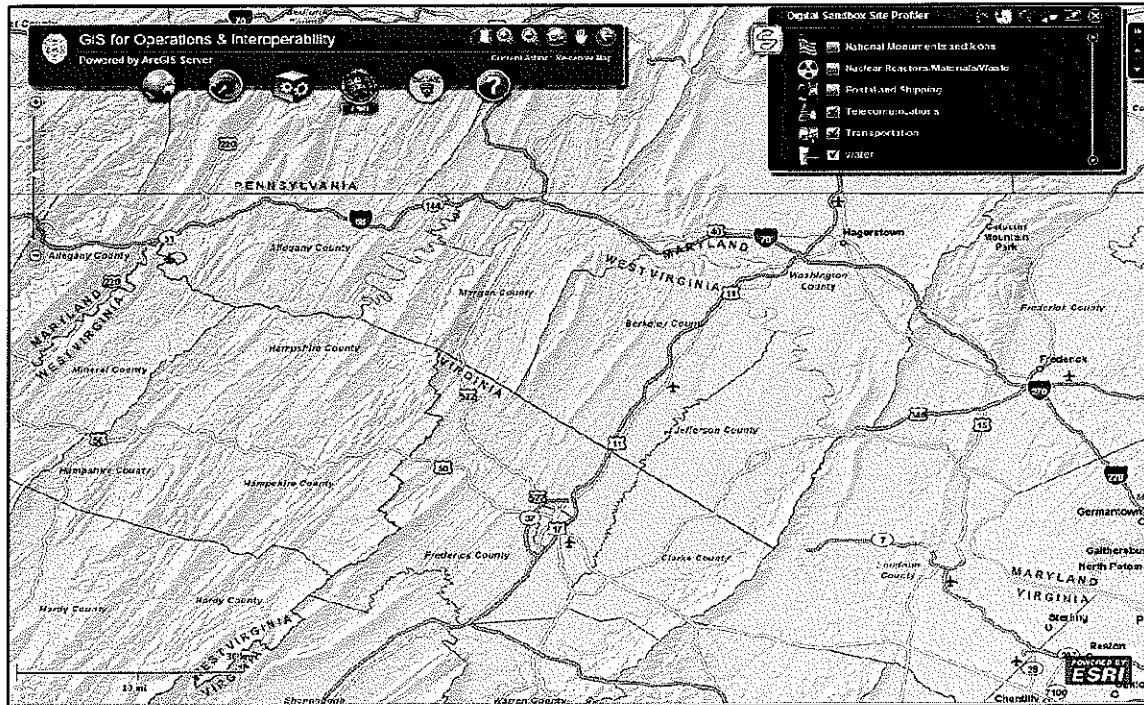


Figure 2, Adobe FLEX Example

The Azimuth Team will develop and publish a Consequence Management (CM) widget using the Adobe Flex & ESRI ArcGIS API for Flex framework for inclusion into a VIPER-like Flex application. The widget will encapsulate the GUIs and linkages to simulation models residing on an ArcGIS Server. The widget can be incorporated into an existing VIPER-like Flex application via modification of the XML configuration file contained within the VIPER-like application that has been published to a web server. The rationale of encapsulating the user interface and business logic for all simulation interdependencies within a single widget is directly related to the design of the Adobe Flex framework. An application such as VIPER is based on an underlying Flex framework and is a collection of widgets that are not dependent upon each other or have any knowledge of each other. To clarify, menus and widgets are added to the Flex based application via XML configuration files contained within the source code of the Flex application residing on the web server. This design consideration means that there is no inherent cross communication capability between widgets within the Flex application. For example, a drive time computation widget has no inherent knowledge of what another widget such as a live maps weather layer is displaying, even though the user may be visualizing both within the same Flex application. Any interdependencies must be explicitly developed within a custom widget. This is the focus of the development task for the CM simulation widget.

To meet the requirements of interdependencies between layer selection, simulation parameters, and functionality, the Azimuth Team will develop a CM widget that encapsulates all necessary functionality. The widget will serve as the user interface between the web enabled computer and the simulation infrastructure. The simulation infrastructure is defined as the data and geo-processing simulation models and scripts published to and stored on an ArcGIS Server.

The widget will have a graphical user interface enabling intuitive addition or removal of feature layers, event simulation parameters such as time of day, weather conditions, an estimation on percentage of evacuees traveling to their home or home of friends and/or family, and type of event for overriding real-time data feeds.

We will design and implement simulation management functionality to save simulation parameters and to allow playback functionality of previous simulations as well as start/stop/reset capabilities for the simulations.

Consequence Management Layer

Based on guidance from WV DMAPS, the Azimuth Team will design and implement event simulation and analytical models using ESRI ArcGIS ModelBuilder. ModelBuilder is a flexible technology for constructing geo-processing and simulation models that are published to an ESRI ArcGIS Server. The published models can then be accessed via a web enabled computer running an Adobe Flex based application to run the simulations. We will extend ModelBuilder's functionality through Python and Pearl scripting to provide advanced artificial intelligence and simulation logic capabilities, which will be required to meet the goals of this M&S capability requirement.

An event will require many simulation models that will work together and contain logical interdependencies of both the model's input and output parameters. Each model is a logical component responsible for a specific portion of the overall simulation. We will utilize concepts from Object Oriented Programming to design the component models, taking into account interdependencies into the model design. As illustrated in Figure 3, Object Oriented Simulation design principles are ideal for breaking a large problem into manageable, testable modules and we will fully utilize these approaches in the design and implementation of the event simulation system. For example, a routing computational model can be designed to accept a logical set of inputs (road closures or accident locations) and outputs (fastest drive time or shortest distance). Thereafter, any simulation model that requires the routing functionality does not need to replicate the routing logic, but rather can call the existing routing model.

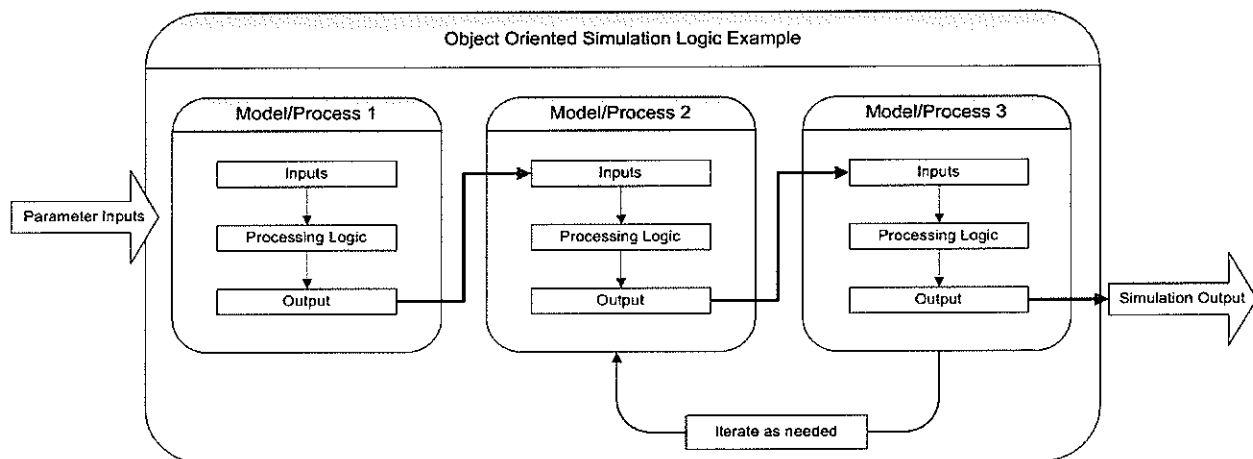


Figure 3, Object Oriented Simulation Logic Example

In a dynamic process model, the process explicitly changes in time and space. In a dynamic process model, the model iterates multiple times with the output of one step being the input to the subsequent step. The results of time step two are input into time step three. This process continues for the desired number of time steps.

Dynamic modeling is an approach in which pieces of a model, or the entire model, are rerun with the output of the model becoming the input for the next iteration of the model. Usually, in dynamic GIS models, time and space are explicitly modeled. The dynamic approach can be either deterministic or stochastic.

Time-based dynamic modeling can be accomplished by incorporating time through looping that is either implied or explicit in the dynamic process (simulation) models. To do so, generally, the same set of rules needs to be run multiple times. For example, to calculate effects of varying rainfall rates for a flood event simulation, the absorption and runoff rules for the varying quantities of rainfall for a time step must be specified. The output of the first run of the model is input to the second time step, and the model is rerun. This process continues through a specified number of steps. To achieve this capability, the modeling environment must have the ability to iterate a model, in this case the absorption and runoff rules, as many times as desired.

The simulation logic contained with the models will be designed to account for data interdependencies. The models can receive input from GIS data servers and via the GUI contained within the Flex-based CM widget described in the Presentation Layer above.

A simulation model of mass evacuation as a result of a catastrophic event is an example of multiple interdependent dynamic process models. Uncertainty is inevitable in all models. Uncertainty derived from error in the input data or the model parameters and its effects on the output can be explored through error analysis. Additionally, through sensitivity analysis, users can explore the influence of each simulation parameter on the output.

Our software development team consisting of computer scientists and GIS experts, will work with Subject Matter Experts (SMEs) to create logical process models for the event simulation. These process models will then be implemented using ModelBuilder and custom scripting as needed. We will then utilize an iterative approach to ensure model reliability by having SMEs test the simulation models for anticipated results. Simulation logic refinements will be made to the models and the process repeated until the model meets the expected outcomes.

Utilizing ModelBuilder will enable us to:

- Develop workflow processes and models.
- Run consistent, repeatable models to ensure the integrity of our analysis.
- Rerun processes or models with different data or conditions for what-if scenarios

The Azimuth Team will develop event simulation models that automate workflows through the use of the ESRI ArcGIS Desktop ModelBuilder and scripting capability. The resulting event simulation models will incorporate static, dynamic, and streaming data, and utilize statistical models and artificial intelligence logic developed in coordination with SMEs and the funding agency. We will seek to maximize previous and ongoing investments by DHS, FEMA, States, Universities, and commercial entities where possible by using available capabilities such as plume modeling via ALOHA, geo-processing functionality via ESRI tools, and with WV DMAPS sponsorship and FEMA authorization we will incorporate infrastructure data via HSIP Gold. The resulting capability will simulate the effects of road closures on surrounding infrastructure in support of a study on the impact of mass ingress on state infrastructure and resources taking into account current policies, plans, and procedures in coordination with the funding agency. The developed simulations will allow users such as emergency planners to explore the myriad of "what ifs" via user defined input parameters for the logical processes that drive the event and see the results of the simulation within the Flex based application.

The complex logic for the resulting capability will reside within the simulation models and will not require the end user to be an expert in GIS

Modeling using ArcGIS Desktop's ModelBuilder

The Azimuth Team will use ESRI ArcGIS's ModelBuilder to create process models for the CM simulations. ModelBuilder is a tool that enables us to build, manage and automate spatial models. A spatial model is a set of one or more processes and each process includes input data, a spatial function (tool) that operates on the input data, and output data. The spatial model does not actually contain spatial data; it has placeholders, called nodes, which represent the data that is processed and created when the model is run. The nodes are connected by arrows that show the sequence of processing in the model. The actual data is managed and displayed in ArcGIS Server; ModelBuilder just gives processing instructions to ArcGIS Server when the model is run.

ModelBuilder will create intuitive, powerful, scalable simulation models that do the heavy lifting so that the emergency planner can focus on saving and protecting lives.

Processes can be connected so that the output of one process becomes the input to another process, as illustrated in the object oriented design shown in Figure 4.

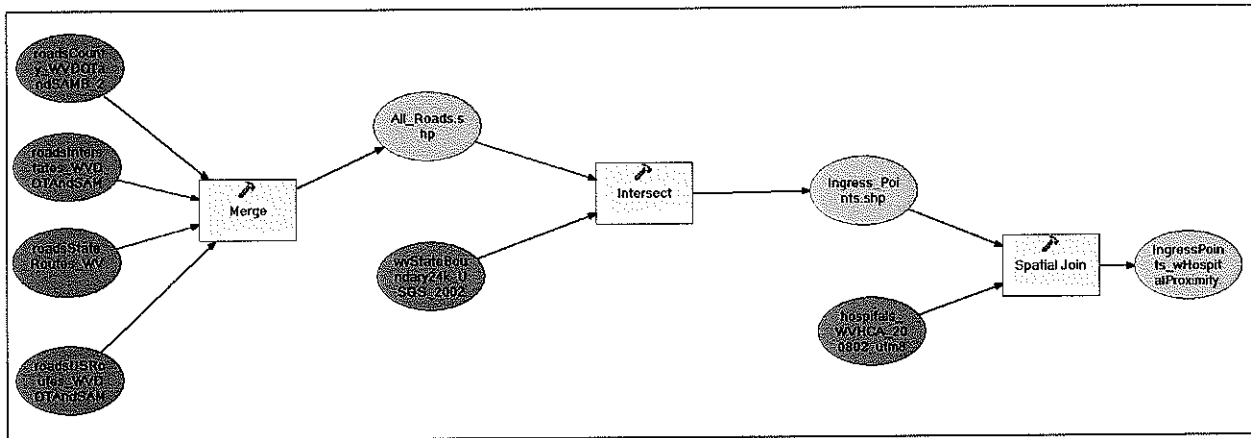


Figure 4, A Spatial Model Represented in ModelBuilder

Scripts using Python/Pearl

For automation purposes or to create advanced process or artificial intelligence logic, or when existing functionality within ModelBuilder does not suffice or becomes cumbersome for CM simulations, the Azimuth Team will utilize existing or develop custom Python/Pearl scripts. Python is the preferred text-based programming language for ArcGIS Server and it is embedded with ArcGIS. We can also build tools for use within ModelBuilder via Python. These Python based tools can be added into the ModelBuilder model to accomplish tasks that ModelBuilder does not inherently have.

Publishing models and scripts in ArcGIS Server

Once a CM model or simulation is created using ModelBuilder, we will use ArcCatalog to publish it into ArcGIS Server. Most models will have a resulting map service as output. The model will be published as a new geo-processing Web service on ArcGIS Server. The execution type will be asynchronous, so the VIPER application would not wait for the ArcGIS Server to finish the processing.

Similarly, the Python/Pearl scripts will be added from the ArcGIS Desktop to the ArcGIS Server. The published model that represents the geo-processing service will be added to the Presentation Layer (VIPER application), and will be utilized by the application.

The models created to support the program requirements will include process models with stochastic events that perform error and sensitivity analysis.

Data Layer

The Azimuth Team's prototype M&S capability system will utilize ESRI GIS applications, and the Data Layer will be designed to receive OGC conformant data. ESRI is a principal member of the Open Geospatial Consortium, Inc. (OGC) and actively participates in the development of many specifications. ESRI supports and complies with virtually all commonly accepted Information Technology (IT) standards. This means compatibility and interoperability support with major enterprise systems such as enterprise resource planning (ERP), customer relationship management (CRM), enterprise application integration (EAI), work management systems, and others. Some of the supported standards include:

- *Operating Systems* including Windows, UNIX, and Linux
- *DBMSs* such as IBM DB2 Universal Database and Informix Dynamic Server, Oracle, and Microsoft SQL Server (*including support for all spatial types*) and PostgreSQL
- *Spatial Data Formats* including translators; direct read and data access via SQL, OLE COM, XML, KML, and GML; published APIs; CAD data; and other GIS formats
- *Network Protocols* such as TCP/IP, HTTP, and HTTPS
- *Developer Environments* including Visual Basic, C#, C++, Visual Studio .NET, and Java
- *Mobile Devices and Operating Systems* such as Windows Mobile 2003, 5.0, and 6.0 for various Pocket PCs, smart-phones, and PDAs; Windows CE for Tablet PCs and laptops; and Windows 2000 or XP for laptops
- *Enterprise Applications* such as SAS, IBM DB2, Oracle, SAP, IBI, and FileNet
- *Web Services* such as XML, SOAP, UDDI, and WSDL; OGC specifications such as WFS, WMS, and GML; and application servers such as Oracle and WebSphere

ArcGIS Server 9.3 also allows users to publish any raster data type as an OGC WCS 1.0, 1.1, or 1.1.1 service. Using the WCS specification, clients can get subsets of the data and request server-side re-sampling of the data. ArcGIS Server also supports publishing geo-processing models that consume WCS services. For example, an OGC WCS service with precipitation data can be used as input to a geo-processing model for calculating near real-time flood delineation.

OGC (Open Geospatial Consortium) conformant data will be stored at the Data Layer and geo-processed by ArcGIS Desktop software and published to the ArcGIS Server residing in the CM Layer.

The Data Layer for the M&S capability shall be Unified Incident Command and Decision Support (UICDS) compliant. To support any developmental effort, the "Agency" will provide the Vendor with:

- Sample code for the integration of the individual components of the M&S capability
- Source code for the Virginia Interoperability Picture for Emergency Response (VIPER) that can serve as the Presentation and/or Data Layer components
- Contact information to obtain the UICDS Software Development Kit (SDK) in order to formulate this "middleware foundation" that enables National Response Framework (NRF), National Information System (NIMS) and Incident Command Structure (ICS) information sharing and decision support among commercial and government incident management technologies used across the country to prevent, protect, respond, and recover from natural, technological, and terrorist events.

The goal of UICDS Architecture is:

- To eliminate new user interfaces, no additional training, and no new applications to purchase
- Royalty-free architecture and software availability
- Users get role-based information targeted to their skills, qualifications, location, and role in the emergency.
- Open Standards encourage technology innovation and motivate developers such as Azimuth and MATRIC to accelerate putting tools into the hands of state and local users.

Real-Time Data Ingestion

The Azimuth Team M&S capability will ingest real-time data, when available. Should real-time data not be available for one (1) of the required resources, we will simulate incoming real-time data based on assumptions supplied by the WV DMAPS. Simulated data could take the form of static, dynamic, or streaming, but is not limited to these forms.

Extensibility of Application

Our proposed M&S capability will be structured to simulate the impacts of road closures on surrounding infrastructures, initially concentrating on data sets for the four (4) selected WV counties (Jefferson, Berkley, Morgan and Hampshire). However, our proposed M&S capability solution design and development efforts will be extensible to encompass all state-wide counties, neighboring states and geographical regions/districts once the appropriate data is collected and/or provided by the appropriate government agencies and commercial entities. Even though the M&S capability will be designed to service the entire state of West Virginia, it is ultimately dependent on compliant data availability. The initial mandatory counties shall be:

- Jefferson
- Berkley
- Morgan
- Hampshire

The data for these counties must be OGC conformant; and published using a Service Oriented Architecture (SOA) in order to be passed to the CM layer for analysis; and it shall be UICDS compliant. Eventually, if all these compliance conditions are met for the other counties within the State, the M&S will be extended to use those data sources for the other counties.

Effect of a Mass Ingress of People and Vehicles

The M&S capability designed and developed by the Azimuth Team will focus on the effect that a mass ingress of people and vehicles will have on a minimum of four (4) dynamic resources, and provide algorithms to calculate the interdependencies of each. The initial four (4) mandatory resources we will focus on are fuel, water, first aid locations and shelter beds. However, our delivered tool will be extensible to add additional resources as required.

Addition of Current and Proposed Construction Projects

The Azimuth Team's M&S capability system approach will utilize Adobe Flex and ESRI ArcGIS Desktop API capabilities in conjunction with ArcGIS Server(s) to ingest data streams from network accessible services as well as from data files that the user may need to upload during a crisis for use in simulation computations. For example, the WV DOT publishes a service for Snow Removal and Ice Control (SRIC) road conditions, as well as a list of construction projects that include information such as start date, estimated completion date, location, detour information and more. For more immediate disruptions that are not published by sites like WV DOT, our team will provide a capability to upload an Excel or CSV data file into our routing logic model.

Continuing with our example, roadwork projects within District 5, which include Berkeley, Grant, Hampshire, Hardy, Jefferson, Mineral, and Morgan Counties that are expected to affect traffic, are listed as Interstate, US Routes and County Work Zone Areas. Listed below is an example:

I-81 - Tabler Station Connector

Construction
02/16/2009
06/20/2011

Alternate Route: US 11

Notes: Construction of a new Tabler Station Road bridge over I-81 and a new roadway from I-81 to US Route 11. The current work involves erosion control, grading, stone placement, paving and bridge construction. Motorists should be alert for flaggers stopping traffic on Tabler Station Road (CR 32) and/or US Route 11 for trucks entering and exiting the roadway. Shoulder closures are in place on I-81 for

Analogous to the layout depicted above, we could assume that the routing logic model is similar to the Model 1 process (Reference Figure 3, Object Oriented Simulation Logic Example) and the input parameters into our routing logic model could accept a user supplied Excel or CSV file in addition to already identified data providers such as that provided by the DOT.

Adding and Removing Layers

Our CM widget within the VIPER-like application will contain a GUI for a user to select, add, and remove data layers. Users can add data layers such as REST, OGC WMS, OGC WFS, and others via the CM widget's GUI. The user's selection can then be shown via the map as a data layer. Furthermore, since the selection process occurs within the CM widget, we can use this information for conducting any relevant simulation event processing. For example in Figure 2, Adobe Flex Example the widget in the upper right hand corner can add and remove layers for the map display as well as specify which layers to pass to any background geo-processing tasks being called by the widget. Since the management of the layer selection occurs within the widget's GUI, the widget has knowledge of what was selected. If the layers were selected from another widget's GUI, this knowledge is not known by default and would require custom development for the information sharing to occur between the widgets. For example, if a user selects a Live Map layer from the Flex application toolbar, there is no information of this selection passed to any of the widgets accessible by the Flex application.

Remote Login, Credentials Requirement and Role-Based Permissions

The Azimuth Team's M&S capability will allow for remote login via the Internet, require specific usernames and passwords, and allow permission and grant priority based on individual user name and password. This will be accomplished via an Active Directory technology to provide role-based credentialing for access to specific datasets. We will implement a security module to store the user's access information and to enforce role-based access. The Active Directory technology allows the implementation of an LDAP-based single sign-on login that is then used to enforce the role-based permissions mentioned above. The role-based permissions control access to each individual widget within the Flex-based VIPER-like application. This approach offers each user with a list of accessible layers and simulation capabilities for the role he or she is assigned to. Furthermore, standards such as the OGC WFS and WMS specifications have a challenge/response credentialing capability that enables specific users access to specific data layers based on their privilege level.

Leverage Previous Investments

The Azimuth Team will seek to maximize previous and ongoing investments by DHS, FEMA, States, Universities, and commercial entities where possible by using available capabilities such as plume modeling via ALOHA, geo-processing functionality via ESRI tools, and with WV DMAPS sponsorship and FEMA authorization we will incorporate infrastructure data via HSIP Gold.

M&S Capability Framework

The Azimuth Team will incorporate the following standards/methodologies into our M&S capability framework:

Department of Defense Architecture Framework (DoDAF) which provides a standard description of what architecture artifacts will be required to provide a complete description of a system prior to implementation. Depending on the type of project - e.g. a software system - the architecture framework defines that certain types of drawings and architecture artifacts must be provided to define the architecture at each stage in the design.

There are three versions of the DoDAF: v1.0, v1.5 and v2.0. The Azimuth Team will implement the following DODAF products as stipulated in the requirements illustrated in Table 1:

Table 1, DoDAF V1.5 Architecture Products

Applicable View	Framework Product	Framework Product Name	General Description
All View	AV-1	Overview and Summary Information	Scope, purpose, intended users environment depicted analytical findings
All View	AV-2	Integrated Dictionary	Architecture data repository with definitions of all terms used in all products
Operational	OV-1	High-Level Operational Concept Graphic	High-level graphical/textual description of operational concept
Operational	OV-2	Operational Node Connectivity Description	Operational nodes, connectivity, and information exchange need lines between nodes
Operational	OV-3	Operational Information Exchange Matrix	Information exchanged between nodes and the relevant attributes of that exchange
Operational	OV-5	Operational Activity Model	Capabilities, operational activities, relationships among activities, inputs, and outputs; overlays can show cost, performing nodes, or other pertinent information
Systems and Services	SV-1	Systems Interface Description Services Interface Description	Identification of systems nodes, systems, system items, services, and service items and their interconnections, within and between nodes
	TV-1	Technical Standards Profile	Listing of standards that apply to Systems and Services View elements in a given architecture

In an effort to distinguish what version is being specified, the Azimuth Team reviewed requirements for v2.0 and identified a change that was made with OV-5. In version 2.0, OV-5 is now replaced with OV-5a and OV-5b. In lieu of the fact that OV-5 does not exist in the newest version, v2.0, it precludes that a previous version of DoDAF is being considered, most likely, v1.5, as it seems to have the most Internet influence prior to v2.0.

The Azimuth Team will obtain the necessary DoDAF products to produce various views of the new system prior to the Preliminary Design Review (PDR) currently scheduled for 7/20/2010. Figure 5 illustrates a typical All-View document created with DoDAF tools

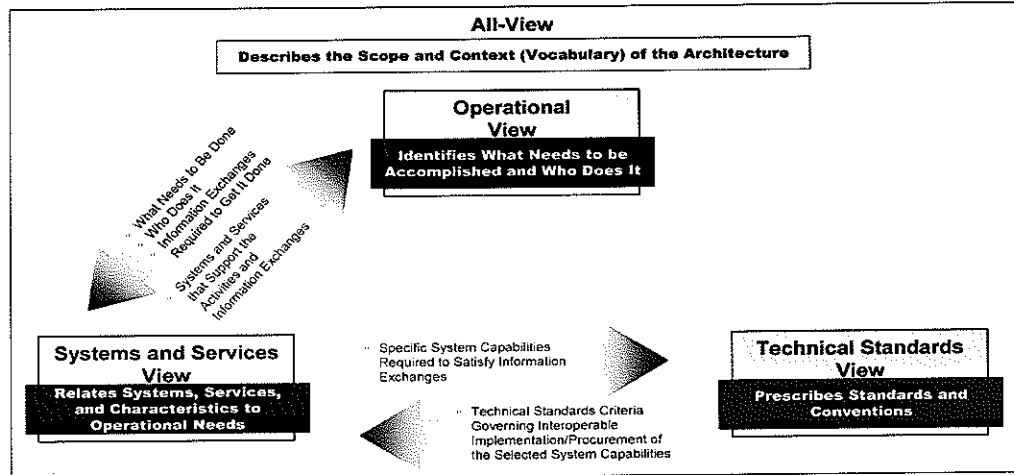


Figure 5, Linkages Among Views

Azimuth's M&S capability will be created within ESRI's ArcGIS Desktop 9.3.1 and will utilize *Open Geospatial Consortium (OGC)* conformant data. As the GIS industry leader and principal member of the Open Geospatial Consortium, ESRI fully supports OGC interoperability. ESRI's Data Interoperability Extension allows users to convert and transform data to and from more than 80 GIS, CAD, BIM/3D and database formats. This extension will allow the Azimuth Team to convert any non-conformant data to fit within the OGC interoperability standards.

ESRI's ArcGIS products support leading OGC Web standards, such as Web Map Service (WMS), Web Feature Service (WFS), Web Coverage Service (WCS), metadata and catalog services, and Keyhole Markup Language (KML). This wide range of support will allow any M&S capability developed by our team to work with a variety of systems and data types, ultimately making a reliable and interoperable system to show the effect of a mass ingress of people and resources into the target area.

One of the primary functions of the *National Incident Management System (NIMS)* is to identify and classify resources that can serve as key resources after an incident. By providing a single standard for responders, it lays the foundation for interoperability when several jurisdictions are involved in a response. The Azimuth Team's M&S capability will be developed in coordination with the NIMS framework in order to maintain a compliant database of key incident resources that could be used in simulating a mass ingress into the target area. The Azimuth Team currently implements a NIMS compliant training program at our Center for National Response (CNR) program in support of the West Virginia National Guard (WVNG). All of our instructors at the CNR are trained in the NIMS - Incident Command System (NIMS-ICS).

The *National Information Exchange Model (NIEM)* is a partnership of the U.S. Department of Justice and the Department of Homeland Security. It is designed to develop, disseminate and support enterprise-wide information exchange standards and processes that can enable jurisdictions to effectively share critical information in emergency situations, as well as support the day-to-day operations of agencies throughout the nation.

NIEM enables information sharing, focusing on information exchanged among organizations as part of their current or intended business practices. The NIEM exchange development methodology results in a common semantic understanding among participating organizations and data formatted in a consistent manner. NIEM will standardize content (actual data exchange standards), provide tools, and managed processes.

NIEM is essentially a data model providing the reference vocabulary for consistent and repeatable interagency and inter-domain exchanges of information. The model is represented in a number of forms, including a data dictionary, and a reference schema, and includes the body of concepts and rules that underlie its structure, maintain its consistency, and govern its use. NIEM uses extensible markup language (XML) as its rendering language. XML allows the structure and meaning of data to be defined through simple but carefully defined syntax rules, thereby providing a common framework for information exchange. The models unique architecture enables data components to be constrained, extended, and augmented as necessary to formulate XML exchange schemas, and XML instance documents defining the information payloads (content) for data exchange.

The Azimuth Team's developed M&S capability will conform to the *Unified Network Transportation (UNETRANS)* data model for transportation using ESRI ArcGIS Desktop 9.3.1 software. The UNETRANS data model has developed a generic data model for transportation applications. This recommended data organization allows sharing of data and greater interoperability between different users and systems.

UNETRANS works much like a document template in a word processor. It is a starting point, not an imposed standard; and users can modify the template as needed to suit particular purposes (e.g. transit, aviation). UNETRANS was developed in consultation with a consortium of users: highway agencies and DOTs, transit and rail organizations, city streets departments and airport authorities, planning consultants, software developers and university faculty in North America, Europe and the Pacific Rim.

Detailed Development and Integration Schedule

The Azimuth Team will manage the M&S capability program using an Integrated Program Management (IPM) approach. IPM establishes four groups of processes for effective management, control and reporting of the following program tasks:

- 1) Planning
- 2) Initiation
- 3) Monitoring and Control
- 4) Closure

Following the guidelines and procedures established in these process groups will ensure standardized and repeatable management practices for cost, schedule, performance measurement, development, program planning, and status review activities. Metrics gathered during process group execution permits regular quantitative assessments of status, progress, and quality. Data derived from the metrics, when combined with lessons learned and post mortem analysis, allows for the IPM approach to be continuously improved to enhance performance, improve efficiencies, and increase quality.

Utilizing Microsoft Office Project for Windows or FastTrack Schedule Project Management for MAC, the Azimuth Team Program Manager will finalize a detailed Development and Integration "Schedule of Events" and "Table of Milestones and Deliverables" for the Modeling & Simulation capability.

The IPM approach will include the key action items, their expected completion dates and the resources associated with them. Azimuth and MATRIC will jointly prepare the Integration and Development Schedule for inclusion in a Program Management Plan (PMP) and provide digital and hard copies to WV DMAPS and the Lead Project Planner. Dates for weekly reports and monthly reports will be included in the PMP. The PMP will also include contact information for Azimuth and MATRIC "key" personnel.

Preliminary Design Review (PDR) and Critical Design Review (CDR)

The Azimuth Team will participate in a Critical Design Review (CDR) at a location determined by WV DMAPS, following a "State" approved (PDR) Preliminary Design Review and a scheduled interval for any required modifications. At the CDR the Azimuth Team will formally report the results of developmental tests, address design changes made during the development process, recommend design changes and discuss trade-off impacts.

Simulations Playback

Within the CM widget the Azimuth Team will implement a mechanism for starting, stopping, reset, and saving of simulation playback. Two approaches can be taken for this:

1. A Deterministic Approach
2. A Video Capture Approach

For the deterministic approach we can save all simulation parameters to provide reproducible results for a given set of simulation parameter inputs. For simulation computations involving a random number generator, we can either save the generated number for later or save the seed for later use to generate the same random number between runs. These values can be stored on a server for later playback or be made available as a downloadable configuration file stored on the client machine. For a video capture option, we can save the contents of the user's Flex application display to a video file for later playback. By using a deterministic approach instead of a video capture approach, users would be free to explore the simulation model events at any geographic location of interest during the playback, where a video capture approach, while useful, would provide only information that was observed by the user during the simulation run.

Hardware/Software Requirements for the M&S Capability

Collectively, Azimuth and MATRIC have already established an in-house server infrastructure similar to the Office of Technology (OT) infrastructure. We have extensive experience configuring databases and applications on a VMWare-based infrastructure, and have created multiple virtual servers that are running Windows Server 2008 R2. Upon these virtual servers we have installed and configured an MS SQL Server for storage and an ESRI ArcGIS Server for data services. This architecture allows for fast cloning of the data stored in the MS SQL Server and rapid installation and publishing of the services stored in the ArcGIS Server onto the State's servers. The Azimuth Team will provide an executable installation package that will enable WV DMAPS to use additional servers or laptops at their discretion to execute the prototype M&S System for their unique purpose.

The Azimuth Team will procure two (2) high-end laptops that contain Adobe Flash and any additional software necessary to run remote demonstrations of our M&S capability. The laptops will be delivered to WV DMAPS as an "Action" item outlined in the Project Management Plan. These two laptop computers will contain the necessary software and processing power to run remote demonstrations of the prototype M&S System. The Adobe Flex-based, VIPER-like client application that will be developed will be provided to WV DMAPS as an installation package enabling the Requestor to install it on additional servers and laptops at their discretion.

Technology Demonstrations

Upon finalizing the design and development requirements for our prototype M&S capability system, the Azimuth Team will support three (3) technology demonstrations to allow agency "Key" personnel involved in CM requirements to evaluate, provide comments and provide final acceptance of our M&S Capability. The Azimuth Team will be glad to assist with the logistics of setting up these technology demonstrations.

The Azimuth Team will utilize all our presentation resources such as DoDAF tools, large format GIS Maps, large format Imagery and PowerPoint slides for the technology demonstrations.

- 1 Evaluation Board – Project Planner and Evaluation Board evaluate the M&S System prior to showing it to WV DMAPS
- 2 WV DMAPS – WV DMAPS will be agency to provide “final acceptance” of the M&S System.
3. FEMA Technology Showcase – this technology demonstration will be used to share the prototype M&S System with VIPs to be determined later.

SECTION III - System Requirements

Graphic Information Systems

The Azimuth Team will create a viable GIS base-map solution within ESRI ArcGIS Desktop 9.3.1. Base-map layers will be acquired from applicable data owners and secured in accordance with the proper Role Based Access Control (ANSI INCITS 359-2004). The base-map will conform to OGC specifications in order to achieve interoperability. Base-map layers will be geo-referenced with horizontal spatial reference guidance from the State and other stakeholders. The unit of measure for this spatial reference will be in meters with a maximum allowable geospatial error of 10 meters, providing the absolute spatial data accuracy of the data given fits this requirement. The base-map will allow the user to switch between various raster and vector based data to include Satellite Imagery, Ortho-rectified Aerial Photographs, Topographic Maps (7.5-minute / 1:24,000 scale), and an Extensive Transportation Layer. The base-map for the M&S capability will include the following:

- major county, state and federal transportation routes
- state and all encompassing fuel locations and depots
- mass care facilities including shelters, feeding sites, comfort stations and points of distribution
- k-12 schools
- responder headquarters and areas of operation
- border states Ingress points
- communications assets
- potable water locations
- public utilities locations

Other M&S capability base maps will include the location of the following detailed response infrastructure data by population center:

- hospitals and triage sites with expansion capacity
- first responder organizations and their capacity and capabilities
- potable water storage and reservoirs
- National Guard armories and other state government facilities
- federal facilities
- motels, hotels and camp grounds
- Red Cross chapters and their capabilities
- grocery stores
- hardware stores
- clothing stores
- trucking and construction companies and their capabilities
- automobile and truck dealerships
- gas stations

Figures 6 & 7 illustrate examples of Base Maps that illustrate some of the resources available within the Areas of Interest.

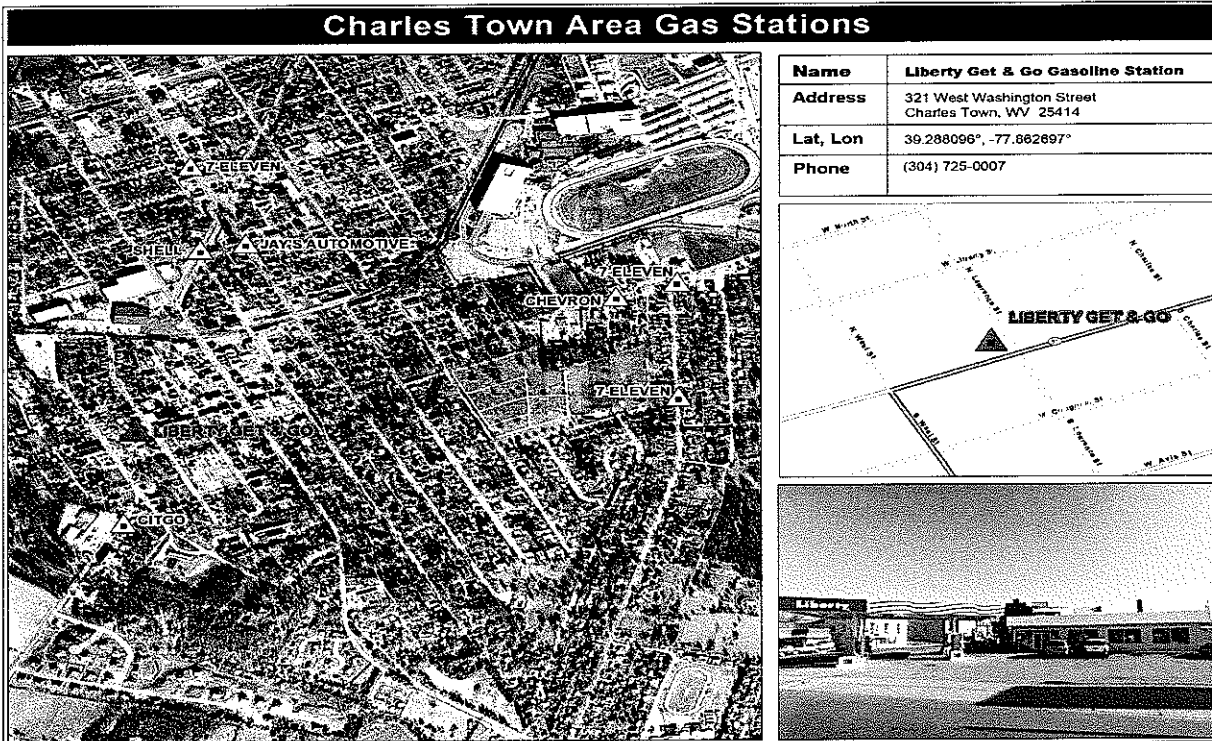


Figure 6, Base Map Example (Charles Town, WV)

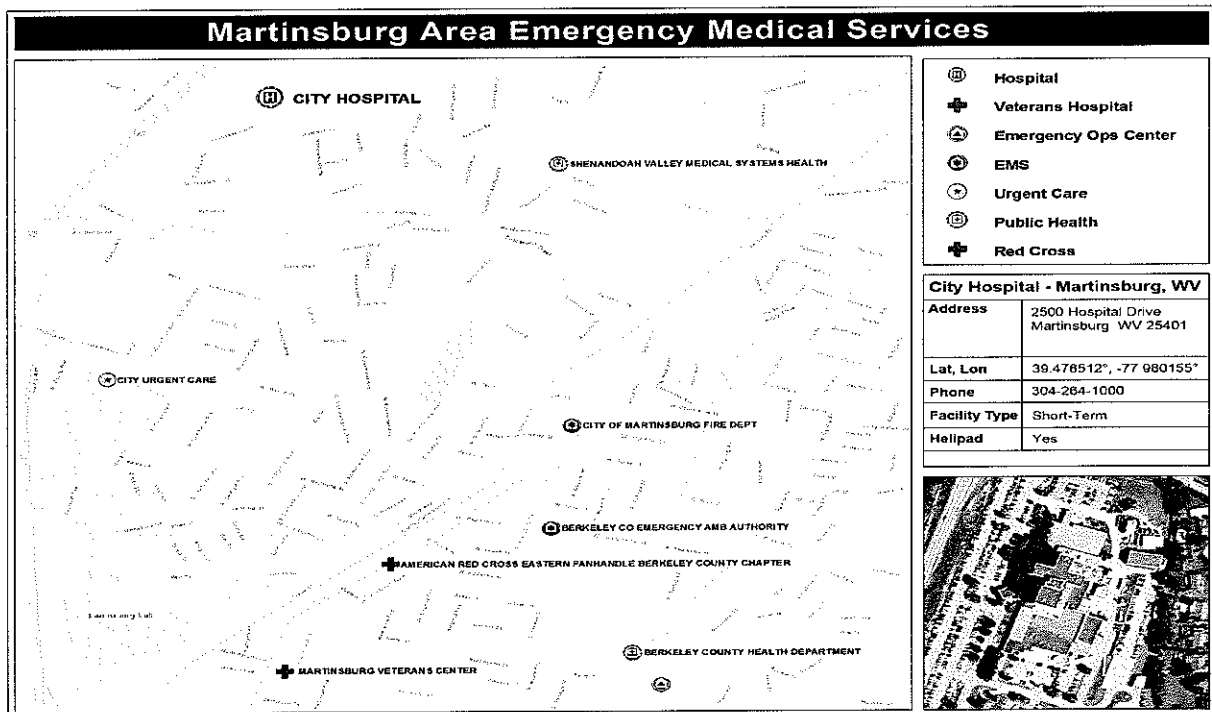


Figure 7, Base Map Example (Martinsburg, WV)

Utilizing data from governmental data repositories, the base-map can be structured to include additional demographic conveyance per population centers, to include infrastructure resources such as:

- vehicle ownership figures
- carpooling figures
- numbers of mass transportation vehicles available
- private and public waterborne assets
- typical airline scheduling, average availability and delay history
- typical airline loading at regional airports

User-Resource Capabilities Assessment

The foundation of VIPER-like applications enables easy ingestion of data services such as REST, GeorSS and OGC WFS. The data being consumed by the VIPER-like application will include user resources, inventories, and locations to provide basic analysis of the current situation.

VIPER-like applications are ideal for adding, displaying, and interacting with "dots on a map" to provide the user with the ability to click on a feature and access metadata associated with the feature provided by the service provider.

Resource data that will be provided by the funding agency will have metadata fields. We will develop models that will utilize these fields to build event simulation capabilities. We will utilize existing ESRI Flex packages to aggregate data according to a chosen scale through a VIPER-like application.

The Azimuth Team will develop a statewide NIMS compliant database of key incident resources. Geospatial data will be held to consistent NIMS compliant standards, with the understanding that the geospatial information could be used in remote field locations or devastated areas where telecommunications may not be capable of handling large images or may be limited in terms of computing hardware. The M&S capability that we develop will abide by the NIMS compliance standards by focusing on:

- Interoperability
- Reliability
- Scalability
- Portability

The overall system devised by the Azimuth Team will ensure the resiliency and redundancy of the M&S capability and associated data. We will implement a security module to store the users and to enforce role-based access. The Active Directory technology allows the implementation of an LDAP-based single sign-on login that is used to enforce the role-based permissions. The role-based permissions will enforce data access privileges within the Flex-based VIPER-like application. This approach will offer each user with a list of accessible layers and simulation capabilities for the role he or she is assigned to. Furthermore, standards such as the OGC WFS and WMS specifications have a challenge/response credentialing capability that enables specific users access to specific data layers based on their privilege level.

The Azimuth Team will assure secure access to the NIMS compliant database detailing key publicly or privately controlled resources essential to the minimal operations of the economy and government. Key incident resources will include fuel, water, first aid locations, and shelter beds. The Azimuth Team will also determine the database owner, the update mechanisms, and the validation process for the database for once the M&S capability is turned over to the State of West Virginia.

Key incident resource information provided in the database will be input according to NIMS typing standards. To facilitate the deployment and use of resources following an incident, NIMS has developed and issued national standards for resource typing.

NIMS types resources into three levels:

1. Category refers to the function for which a resource would be most useful.
2. Kind refers to broad classes that characterize like resources, such as teams, personnel, equipment, supplies, vehicles, and aircraft.
 - a. Components are the elements that make up a resource. For example, an engine company may be listed as having the eight components shown in Table 2:

**Table 2, Example of a Resource with Multiple Components
(Firefighting Engine Company)**

(1) Pump	(5) Water tank
(2) Hose 2 ^{1/2} "	(6) Ladder
(3) Hose 1 ^{3/4} "	(7) Master stream
(4) Hand tools	(8) Personnel

- b. Measures are standards that identify capability and/or capacity. For example, an appropriate measure for a firefighting hose might be the number of gallons of water per hour that can flow through it.
3. Type refers to the level of resource capability. Assigning the Type 1 label to a resource implies that it has a greater level of capacity than a Type 2 of the same resource (for example, due to its power, size, or capacity).

Based upon data availability, simulation models can be built based on supply and demand. For instance, if the user enters a value for the number of anticipated evacuees that will be seeking hotels for shelter and we have access to the current number of available hotel rooms within a user specified distance from the evacuation point, we can compare the supply vs. the demand for that particular resource. If adequate hotel resources are not available for the demand, the model can prompt the user to increase the distance parameter, or iteratively run the computation by increasing the distance parameter until the demand is met and display the resulting information on the map.

In addition to graphically displaying available information in a VIPER-like application, the Azimuth Team will implement the capability to export data to Excel spreadsheet or CSV formats for external analysis

User Feedback & Reaction to On-Going Situation

The Azimuth Team will develop a web portal capability which will leverage technologies such as RSS feeds, instant messaging, email, etc. to enable users to provide feedback and to receive updates, such as where additional resources can be found

Based upon data availability, guidance from the funding agency, and expertise provided by our team SMEs, we will develop our model logic to incorporate key resource decision points. It is assumed that the data provided will already provide ownership and contact information within the metadata for each resource. To assist in information dissemination and resource gathering during an event, the capability will export this information as Excel spreadsheet or CSV formats.

Based on guidance from the funding agency to identify key alert parameters, we will incorporate this information as input parameters for the simulation models we create. The models we create will alert the user to resource issues within the VIPER-like application. The alert thresholds are input parameters that can be defined by the user. The resulting alerts for resource shortages and stockpiles can be conveyed visually and displayed as an alert icon on the map. As a resource depletes, an automated network analysis can identify alternative nearby resource locations based on parameters such as drive time or distance. Additional forms of notification can be utilized such as e-mail.

Simulation

The Azimuth Team's delivered solution will contain an event simulation parameter interface contained and displayed within the developed Consequence Management (CM) widget in the VIPER-like Flex application. Users will be able to assign event simulation parameter values and manage and select data layers for display via the widget's graphical user interface. Data input parameter values will then be utilized by the geo-processing models stored on ArcGIS Server to compute simulation results.

Based on data availability we will construct the necessary models to support the inclusion of population and traffic during specific time intervals. The critical component for meeting this requirement is accurate and reliable data and correct modeling assumptions. The funding agency will provide the data. Modeling logic will be provided via a combination of guidance from the funding agency and the Azimuth Team SMEs. The logic will be implemented via ESRI products.

The Azimuth Team will utilize existing plume models for floods, chemical releases and fires. One such example is ALOHA (Areal Locations of Hazardous Atmospheres) which is a freely available computer program designed especially for people planning for or responding to chemical releases. The ALOHA air dispersion model was originally developed to estimate how a toxic cloud might disperse after an accidental chemical release. ALOHA can also model threats from chemical releases that could result in fires or explosions. Plugins already exist that allow ALOHA to be integrated within ESRI's ArcToolbox as a geo-processing tool. Utilizing ALOHA via ArcToolbox enables seamless integration with the CM models we will build via ModelBuilder.

The Azimuth Team's delivered solution will include live weather layer from the National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service (NWS), who publish OGC WFS services that provide vector layers containing "at the moment" attribute information. This data feed can be consumed by models such as ALOHA or others or simply viewed as a live weather map layer.

The Azimuth Team's delivered solution will use a computer mouse for scrolling and zooming functions. We will follow existing human computer interface practices currently in use by applications such as VIPER.

The CM simulations will provide the Confidence interval for each of the simulations being run based upon the sample size and quality of the data used in the simulation. Guidance from the SMEs referenced in the General Overview Section, as well as toolsets such as the ESRI Geo-statistical Analyst can be incorporated into the calculation of the Confidence interval.

The event simulation capability we are developing will output actionable data in spreadsheet and CSV file formats. We will seek guidance from the funding agency to identify whether this capability should be automated or manual (user initiated). Outputs of the actionable data delivered in spreadsheet or CSV formats may include time dependent data such as resource availability information, or transportation data such as ingress points or construction areas. We

will seek the guidance of SME's, WV DMAPS, and the funding agency to further understand what actionable data will be desired

Based upon data availability and/or model assumptions input from the funding agency, the Azimuth Team M&S capability system will display population center densities by square mile areas at specified time intervals in order to develop a simulation model, if adequate inputs are known. Data interpolation techniques such as Inverse Distance Weighting can be utilized to view where population centers are located and their density by square mile at certain moments in time. This provides the capability to view the population center data at a micro and macro level.

The Azimuth Team will integrate and enhance existing tools such as ESRI's Population Summary Tool as illustrated in Figure 8 to display age demographics of these population centers. We can easily utilize these tools to differentiate between driving and non-driving ages.

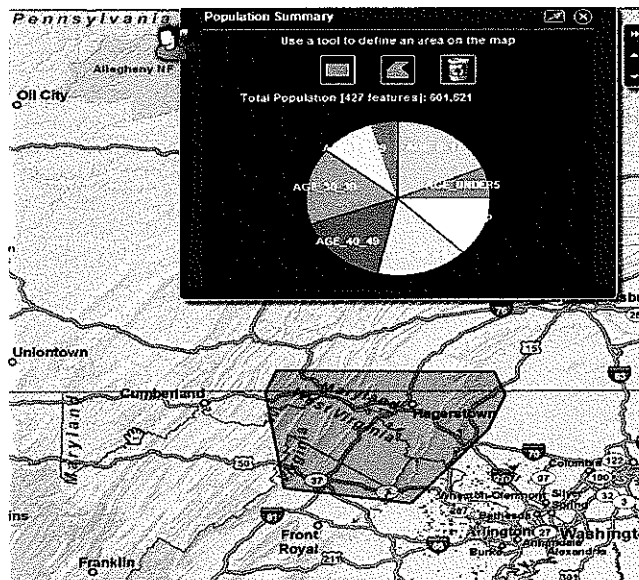


Figure 8, ESRI Population Summary Tool

According to the U.S. Department of Justice Fusion Center Guideline document, the required demographic information of the population centers should already exist. Assuming the Azimuth Team has access to this information via the funding agency, we can develop a tool within the CM widget to display this information.

Based on data availability and assumptions (age based and/or physical impairment) provided by the funding agency and/or SME's, we can develop a tool to display the special needs demographic for selected population centers.

Based on data availability such as bus and mass transit schedules, temporal traffic signal data and traffic signal location as well as assumptions provided by the funding agency and/or SME's, we can develop a tool to calculate and display normal flow and density of varying transportation means during non-rush hour and rush hour timeframes.

Based upon data availability and/or model assumptions provided by the funding agency, we can develop a simulation model to display this data if adequate inputs are known. For example, we could integrate traffic signal pattern data, temporal population center data, and guidance from the funding agency and SME's to develop a tool to compute and display normal pedestrian loading at various time intervals.

The Azimuth team will provide the ability to display the primary motor vehicle commuting routes, secondary motor vehicle commuting routes, maintenance status (lanes closed or blocked) of all commuting routes, signaling of commuting routes, and pedestrian and bicycle routing data with access control in accordance with ANSI INCITS 359-2004 by utilizing the data and assumptions provided by SME's and the funding agency

Transportation

The National ITS Architecture is the definitive framework that will guide deployment of intelligent transportation systems in the U.S. for the next 20 years or more. The Azimuth Team's M&S capability will employ the use of the National ITS Architecture and any subsystems or user services available from the ITS community. ITS data will be geo-referenced with horizontal spatial reference guidance from the WV DMAPS.

The integrated ITS system will include the following technologies or static data if supported by the current data holdings and capability of the State/Agency:

1. An Automated Crash Notification Systems (ACNS) will detect and report the location and severity of incidents to agencies and services responsible for coordinating appropriate emergency response actions. As illustrated in Figure 9, more advanced ACN systems use in-vehicle crash sensors, global positioning system (GPS) technology, and wireless communications systems to automatically determine the severity, location, condition, and orientation of vehicles in a crash, and communicate this information to emergency responders. The Azimuth Team's M&S capability will integrate these types of real time vehicle-borne data feeds.

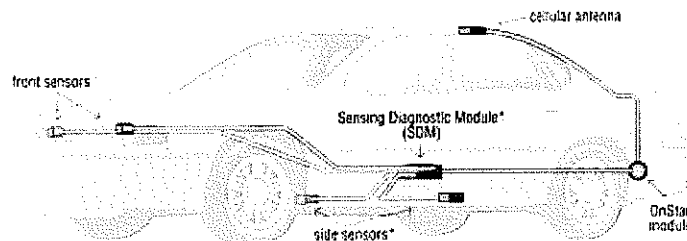


Figure 9, Advance Vehicle Sensors

2. Advanced Traveler Information Systems (ATIS), as illustrated in Figure 10, can deliver data directly to travelers, empowering them to make better choices about alternate routes or modes of transportation.



Figure 10, Advanced Traveler Information Systems (ATIS)

- 3 Advanced Traffic Management Systems (ATMS), as illustrated in Figure 11, employ detectors, cameras, and communication systems to monitor traffic and toll plaza data feeds, optimize signal timings on major arterials, and improve the flow of traffic.

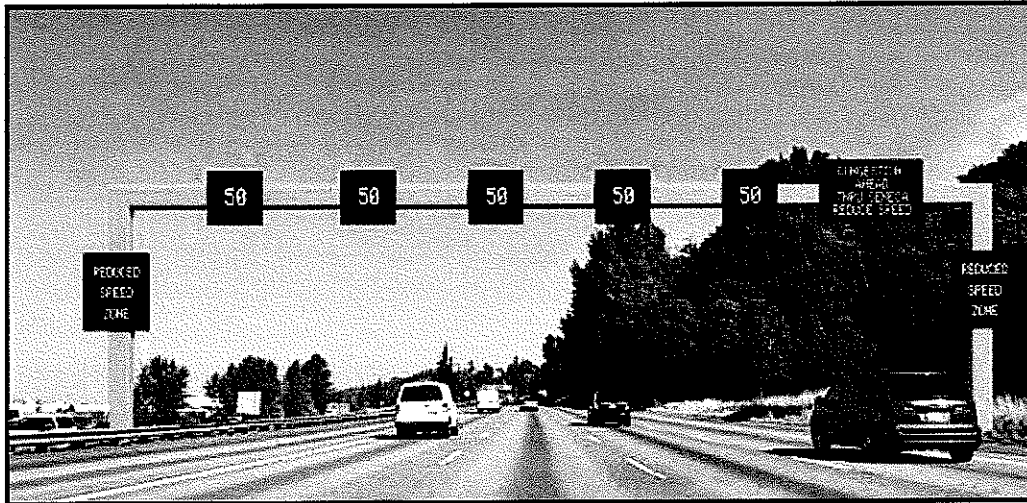


Figure 11, Advanced Traffic Management Systems (ATMS)

All transportation related data will be secured in accordance with the proper Role Based Access Control (ANSI INCITS 359-2004) and conform to the Unified Network-Transportation (UNETRANS) data model for transportation using ESRI ArcGIS Desktop 9.3.1 software. UNETRANS will support the need for a common data model to facilitate application development and data exchange as illustrated in Figure 12

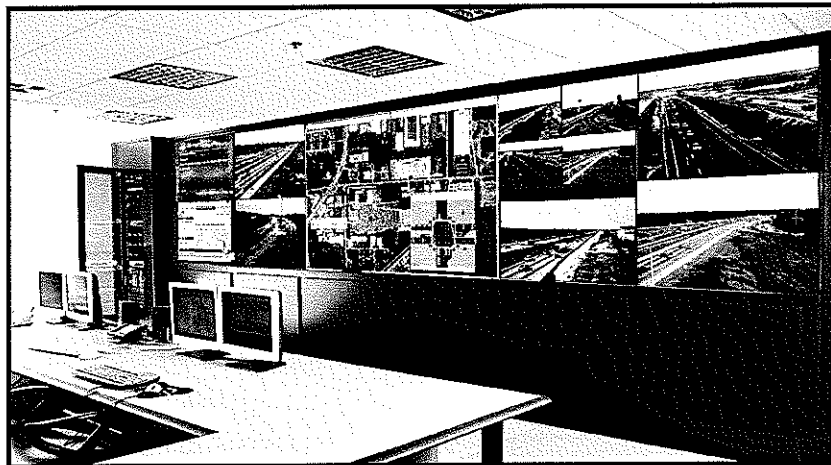


Figure 12, Unified Network-Transportation Data Model

When integrated into the transportation system's infrastructure, and into vehicles themselves, these technologies relieve congestion, improve safety, and enhance American productivity.

User Administration

The following user administration requirements for the Azimuth Team's M&S capability will include the following:

- Application will contain a user sign-on and password that can differentiate over 100 different user types within the system

- There will not be any limits on the amount of users that can access the system
- Access will be web-enabled
- Access control will be implemented in accordance with ANSI INCITS 359-2004

The Azimuth Team's approach for remote login, user credentials requirements and role-based permissions for access to the M&S capability are defined in Section II of this proposal.

The Azimuth Team's M&S capability will be structured to allow for remote login via the Internet. Each user will be required to have a valid username and password, and permission will be granted on a priority-based system by recognition of the user name and password. This will be accomplished via an Active Directory to provide role based credentialing for access to specific datasets. For example, the OGC WFS and WMS specifications have a challenge/response credentialing capability that enables specific user's access to specific data layers based on their privilege level.

Milestones and Deliverables

The Azimuth Team will conform to the timeframes specified in the solicitation for all milestones, and submittal of deliverables as stipulated in Table 3.

Table 3, Milestones and Deliverables

Description	Date
Detailed Development and Integration Schedule	10 Days after Contract Award
Software Requirement Specification	On or Before 7/20/2010
Software Design Document	On or Before 7/20/2010
Processing hardware with required software	11/30/2010
Demonstration hardware with required software	11/30/2010
Executable for installation on a server (if required)	11/30/2010
Executable for installation on a demonstration laptop	11/30/2010
Source Code final M&S capability	11/30/2010
DODAF Products	On or Before 7/20/2010
Preliminary Design Review (PDR)	On or Before 7/20/2010
Critical Design Review 9CDR)	On or Before 8/17/2010
EB Demonstration	9/28/2010
WV DMAPS Demonstration	10/26/2010
FEMA Technology Showcase	11/30/2010
Monthly Integrated Product Team Meetings	2 nd Wednesday of each month
Weekly Activity Reports	By COB Fridays
M&S Capability	11/30/2010
Other deliverables as required	TBD

Intellectual Property Disclaimer

Ownership of all data systems, programs, materials, documentation, and reports originated and prepared for the State pursuant to the work performed under this contract will belong exclusively to the State unless the agency agrees to release ownership prior to beginning the project.

Workers Compensation Certificate

As the prime Contractor, Azimuth Incorporated (Azimuth) has provided a copy of our Workers Compensation Certificate with our proposal.

Available Azimuth Team Resources

The following is an overview of the Azimuth Team resources for satisfying grant requirements for the 25% soft-matching of non-Federal funds in accordance with the guidance in the Catalog of Federal Domestic Assistance program number 97.111, titled *Regional Catastrophic Preparedness Grant Program*. An itemized list is available upon request.

Hardware

- Desktop and Laptop Computers
- Desktop Scanners
- Digital Storage Media
- High Volume Printers
- Large Format Displays
- Large Format Printer
- Large Format Scanner
- Media Production Equipment
- Network Hardware
- Peripheral Hardware
- Power Management Equipment
- Video Conferencing Equipment

Software

- ArcGIS 3D Analyst
- ArcGIS Maplex
- Cartographica GIS
- CoordTrans Pro
- ESRI ArcGIS Desktop 9.3.1
- ESRI SDE
- Google Earth Pro
- MAP2PDF for Acrobat
- MAP2PDF for ArcGIS
- MapTech Terrain Navigator Pro
- Telcordia Network Engineer
- Oracle Database Standard Edition
- Multimedia & Productivity Software
- RemoteView Pro
- Urban Analyst

Maintenance

- GIS Software Maintenance
- Network Hardware Maintenance
- Productivity Software Maintenance

SECTION IV - Cost

NOTE: All cost information is provided in the Sealed Package provided with this proposal.

Azimuth Incorporated (**Azimuth**) is a Service-Connected Disabled Veteran Owned, Small Business (**SDVOSB**) specializing in high-technology services. Azimuth is incorporated in and under the laws of the State of West Virginia and the corporation's primary focus is to support the Department of Defense (DOD). As a diverse engineering firm, Azimuth provides specialized services in:

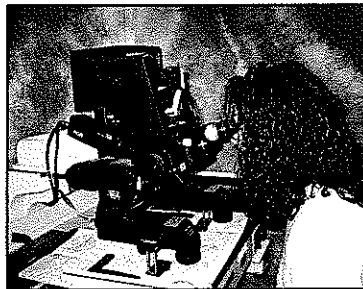


- Electronic Engineering and Design
- Software Engineering
- Graphical Information Systems
- Imagery Exploitation and Mapping
- Rapid Prototyping
- Biometrics Engineering
- Systems Design and Integration
- Integrated Logistical Support
- Information Systems Technology
- Computer Aided Design (CAD)

Since the creation of Azimuth in 1989, our client base has grown to include a wide variety of customers in both government and commercial sectors. To properly perform and excel in today's dynamic and competitive environment, we have concentrated substantial efforts toward the development of strategic policies and control systems, effectively managing growth, and performing complex contractual efforts. Azimuth's corporate facility is located in Morgantown, West Virginia, where we currently occupy 9,000 square feet of secure office and laboratory space. Our secure corporate facility consists of a state-of-the-art secure network system that is accredited in accordance with the DOD requirements and an approved Automated Information System Security Plan. Azimuth's Infrastructure Analysis Group is located adjacent to our Corporate Office. Our Engineering Group is located in Fairmont, West Virginia at the Alan B. Mollohan Innovation Center, where we occupy approximately 6,500 square feet of engineering laboratory and 6,000 square feet of manufacturing and integration space. Azimuth also has a light manufacturing facility located in Morgantown, WV and a Systems Integration and Light Manufacturing Facility in Fairmont, WV which together provide an additional 20,000 square feet of engineering, fabrication, integration, testing, and component storage/packaging areas.

Azimuth provides industry-best commercial practices and standards that are in line with our accredited ISO 9001:2008 Quality Management System (QMS) tailored to meet the needs of our customers. Azimuth recognizes that the single dominant factor affecting any corporation's ability to meet the specifications of the WV DMAPS Modeling and Simulation (M&S) capability will be the quality of the personnel assigned to the project and their ability to identify and implement required analytical and engineering solutions. We place great emphasis on maintaining a dedicated WV-based workforce that consists of reliable, experienced, and highly productive long term employees.

Azimuth's collective experience is the result of formal education, practical "hands-on" experience, and years of service to the U.S. Department of Defense, other Government agencies, major prime Federal contractors, and private industries. Our skilled professionals currently work in aerospace, defense, law enforcement, manufacturing, medical, telecommunications, intelligence and various other sectors.



Mid-Atlantic Technology, Research & Innovation Center

MATRIC

The Mid-Atlantic Technology, Research and Innovation Center (MATRIC) is a nonprofit, 501(c)(3) corporation headquartered in Charleston, West Virginia with satellite locations in Morgantown, West Virginia; Oakridge, Tennessee; and Milan, Italy. MATRIC serves customers world-wide and has completed over \$22M in successful projects in the past three years.

Our **mission** is to develop a globally significant innovation enterprise that focuses on supporting market-driven demands for science, technology and engineering. Our **vision** is to create life-changing innovations that impact the daily life of individuals and businesses around the world.

MATRIC has world-class scientists and engineers in the areas of advance engineering systems, chemical and environmental technologies and health and life sciences who conduct life-changing research and development and commercialize resulting products and services. Our capabilities in these areas include:

- Advance Engineering Systems - Key technical capabilities in GIS, data mining, data fusion, modeling and simulation, pattern recognition, visualization, statistical inference, independent verification and validation, guidance and navigation, robotics control and virtual reality
- Chemical and Environmental Technologies - Key technical capabilities include catalysis, process chemistry, advanced separations, reaction engineering, computational/quantum chemistry, analytical science, polymer science, process safety, statistical analysis, experimental design, transport phenomena, materials of construction, and process economics.
- Health and Life Sciences - Key technical capabilities encompass three primary investigational areas: cancer, autoimmunity, and infectious disease.

As a nonprofit organization, MATRIC does not have stockholders or investors. All retained earnings are used to fund R&D projects that investigate new concepts and growth areas for the organization. As research projects are performed, we develop intellectual property that is commercialized, either through licensing arrangements, outright sale, or spinning-off of a new company.

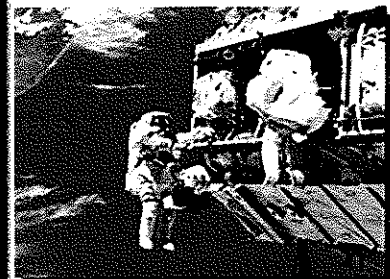
MATRIC also offers commercial R&D and technical services through its wholly owned for-profit subsidiary, Mid-Atlantic Commercial Research (MCR). Through this arrangement, MATRIC capabilities are made available to meet a wide variety of industrial customer needs



**Chemical and Environmental
Technologies**



Health and Life Sciences



**Advanced Engineering
Systems**

The logo for West Virginia University is a stylized, blocky letter "W" composed of several horizontal bars of varying lengths, creating a sense of depth and movement.

West Virginia University[®]

Research Corporation

West Virginia University Research Corporation is a private company categorized under Education Centers and is located in Morgantown, WV

The WVURC is a valuable resource as a partner on the M&S endeavor. WVURC and Federal Emergency Management Agency (FEMA) were technical partners in mapping of the nation's floodplains to create a broad-based awareness of flood hazards and to provide the data necessary for community floodplain management programs and to actuarially rate flood insurance.

WVURC worked with FEMA to identify and develop a scope of study to produce updated, digital flood maps. WVURC has sufficient technical capability and resources to assist the "State" with research of critical infrastructure data crucial to the M&S database structure.

Azimuth Incorporated - WV GIS Project: (WV NGB JITEC)

Contract Number: GS-35F-5694H
 Award Date: 17 July 2009 - 1st year with options for additional years
 Order Number: W912L8-09-F-0063
 Initial Funding: \$250K
 Contact: Major Patrick Reese WVNG
 304-550-3467
patrick.reese@us.army.mil

Detailed Description of Work Performed by Azimuth:

The West Virginia National Guard (WVNG) Joint Interagency Training and Education Center (JITEC) utilizes two vulnerability assessment methodologies to complete their Critical Infrastructure Protection – Mission Assurance Assessment (CIP-MAA) mission. These methodologies are the Defense Critical Infrastructure Protection (DCIP) methodology and the Homeland Defense Comprehensive Assessment Model (HLD-ECAM). To support these assessments, there is a requirement for “pre-assessment” packages.

As of January 2010, Azimuth has completed thirteen pre-assessment packages for the following sites that were reviewed by the WV National Guard Critical Infrastructure Team located at Camp Dawson in Preston County, WV.

Pre-Assessment & Analysis Packages Prepared for WVNG by Azimuth:

Site	Date	Comment
Philadelphia 30 th Street Amtrak Station	12/12/08	Team Effort
Wilmington Amtrak Station	4/3/09	Team Effort
NY Penn Station (Amtrak)	5/1/09	Team Effort
Chicago Union Station (Amtrak)	6/12/09	Team Effort
Bluegrass Station, KY, SOCOM Facility	7/17/09	Special Request
Albany-Rensselaer Amtrak Station	7/30/09	Team Effort
Seattle King Street Amtrak Station	8/21/09	Team Effort
San Diego Santa Fe Amtrak Station	9/4/09	Team Effort
Pittsburgh G20 Summit Meeting	9/8/09	Special Request
Oakland California Amtrak Station	10/2/09	Team Effort
Sacramento California Amtrak Station	10/9/09	Team Effort
Los Angeles Union Station Amtrak	11/13/09	Team Effort
Amtrak Auto Train (Virginia to Florida)	1/8/10	Special Request

Azimuth's GIS and Infrastructure Analysts coordinated pre-assessment briefings at our Department of Defense accredited secure facilities. Azimuth's conference rooms are equipped with multimedia equipment for classified and unclassified briefings, and for displaying satellite imagery and GIS maps for the team's review and assessments.

A binder containing pertinent hard copy open source information, analysis white papers prepared by Azimuth Analysts, and detailed reviews of associated and surrounding infrastructure, along with GIS data such as maps and site imagery are provided to the WVNG Critical Infrastructure Assessment Team

The pre-assessment package also includes a DVD with detailed GIS maps, satellite imagery, digital copies of all open source documents, and any other relevant information. All infrastructure entities researched are georeferenced and included on the detailed GIS data DVD.

Azimuth collects detailed open source data for each pre-assessment package. This data includes, but is not limited to, a history of each site and record of any security incidents, any known terrorist activity or group presence in the area, and the geographical location of key infrastructure and organizations associated with law enforcement and emergency management, such as:

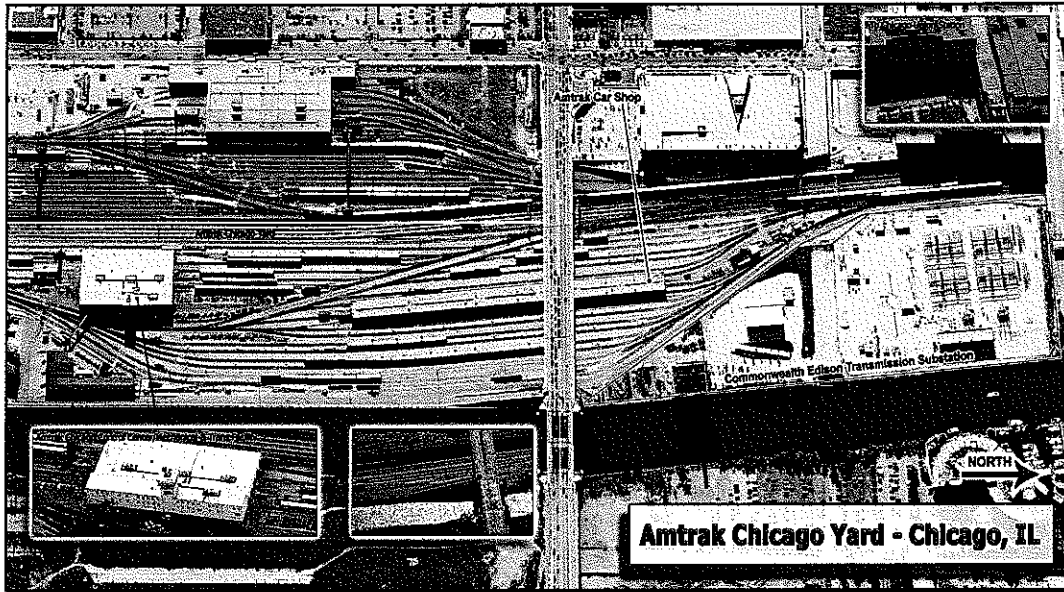
- Hospitals
- Airports
- Bridges
- Dams
- Communications Backbones
- Telephone Switching Centers (Central Offices)
- Cellular Switching Centers (MSC/MTSO)
- Cellular Antenna Sites
- AM/FM Radio Stations
- Natural Gas Networks
- Water & Waste Treatment Plants
-
- Power Generation Plants
- Power Substations
- Power Transmission Lines
- Transmission Switchyards
- Local Law Enforcement Agencies
- Microwave Tower Sites
- Local Road Network
- Tunnels
- Rail Yards
- Ports
- Water Utilities and Sources of Water
- Water Transmission Pipelines
- Hazmat Team Staging Areas
- Red Cross Offices
- Fire Stations
- EMS Units
- County and City Police Departments
- Bomb Squads
- SWAT Teams
- Highway Patrol
- FBI Offices
- Stadiums
- School
- POL Infrastructure

Azimuth's GIS Analysis team has visited nearby sites slotted for review and made independent assessments of security, in addition to photographing and videoing site infrastructure for inclusion in the pre-assessment package. For the G20 Summit in Pittsburgh, PA, a professional aerial photographer was employed to photograph the critical site locations and make a video recording to enhance visual analysis. The Department of Homeland Security and the U.S. Secret Service agencies also used Azimuth's G20 Summit assessment package for analytical purposes.

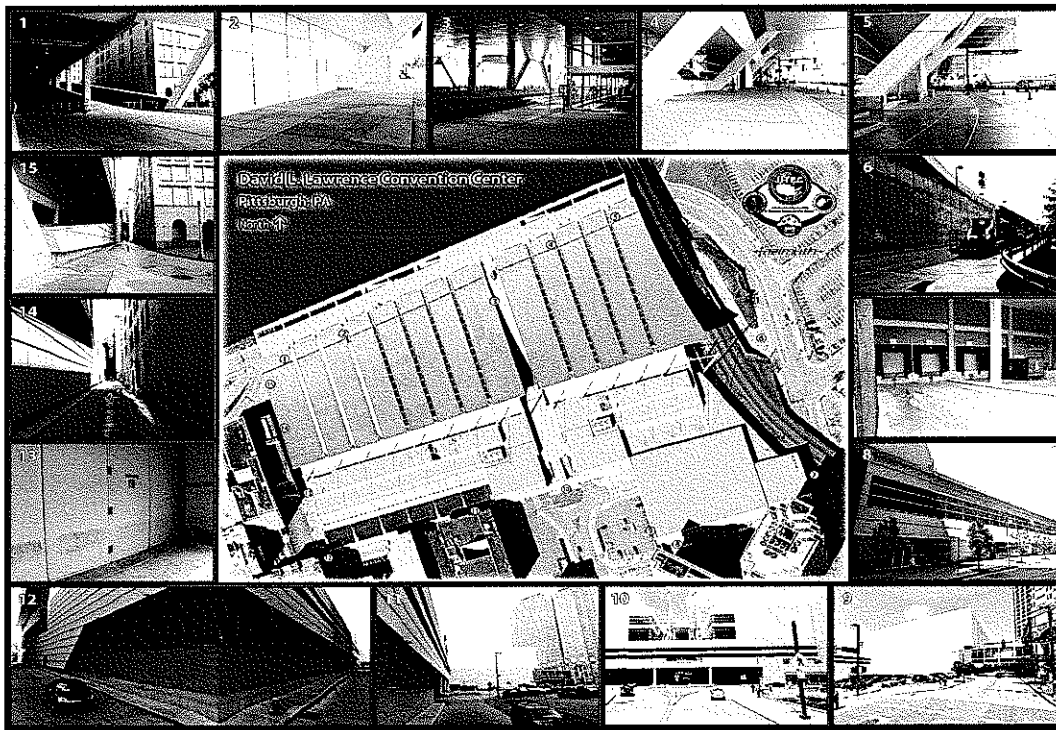
Azimuth has the capability to identify sniper locations using line-of-sight analysis prior to summit meetings, inaugurations, special events, etc. Azimuth is moving towards GIS-based IED simulation using the Urban Analyst software package.

As illustrated in on the following page, Azimuth provides the team with large format (up to 44") annotated satellite imagery with the geographic location of key infrastructure elements. These maps are used for planning purposes and consultations with local management at the site location.

Each pre-assessment package contains Open Source and Geospatial (GIS) data in the following formats:



Large format annotated imagery of Amtrak's Chicago Yard



*Large format imagery of the David L. Lawrence Convention Center-
Provided by Azimuth for the G20 Summit (Pittsburgh, PA) Pre-Assessment*

Azimuth Incorporated - Network Engineer Sandbox Project (NeS)

Contract Number: HHM402-05-F-0301
Period of Performance: 5/1/05- 11/30/08
Initial Funding: \$1,994,111.72
Contact: Mr. Louis M. Werdebach
202-231-8285
SigVoice@Verizon.net

Detailed Description of Work Performed by Azimuth:

Azimuth was tasked by the Department of Defense (DOD) Intelligence Community to provide the DOD with detailed data for *Deliberate and Adaptive Planning* on the telecommunications and information systems, networks, critical nodes, and associated facilities through which national leaders exercise control over key functions within a specific country. By applying general knowledge of telecommunications analysis to *Telcordia™ Network Engineer* software, Azimuth produces comprehensive, technically sound, and coherent models of telecommunications infrastructures for countries of operational priority. *Telcordia™ Network Engineer* is the next generation geospatial network management system that provides an environment for the comprehensive design, documentation, and management of GIS information. *Telcordia™ Network Engineer* is the world's leading GIS-based system for planning, designing, engineering, and documenting complex communications networks. Built on the ESRI® ArcGIS® platform, it provides a centralized geospatial environment for managing all networks - wireless, optical, mobile, all types of cable, and converged IP.

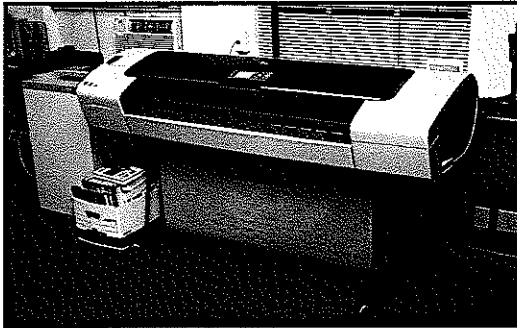
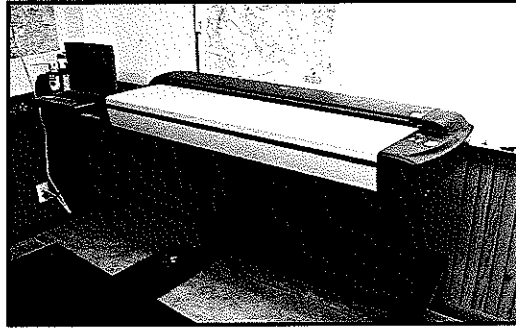
Engineers and Analysts can configure transitions, status, and workflow and conduct "what-if" scenarios displaying the overall effects of compromised communications infrastructure.

Government agencies can perform "what if" analysis to see the effect of natural catastrophes, terrorism, and design changes. In addition, complex version management allows multiple users to display and edit geographical data simultaneously. Azimuth has plotted and analyzed substantial amounts of data obtained from the customer and made use of our telecommunications engineering capability to fill in the blanks when intelligence data is unavailable or incomplete. Azimuth has the telecommunications engineering capability to illustrate and document the capability of communications structure of any type, including virtual systems such as Wave Division Multiplexing. Azimuth has developed, and integrated, proprietary software tools in Network Engineer to attain our customers' unique goals due to our background in telecommunications and software design.

Azimuth conducts detailed research and analysis associated with the specific sites and surrounding geographical areas scheduled for an infrastructure review. The tools Azimuth employs to prepare a detailed review and analysis package for each site include:

- Commercial chips of Satellite Imagery and/or Aerial Photography that depict the specified site and surrounding geographical area;
- Digital Topographical Maps for each site that show local utility lines and other public infrastructure; and
- City Street Maps are reproduced as geo-referenced maps and integrated with ESRI GIS software and PDF geo-referenced documents.

Azimuth's large format scanner and printer, as depicted in the following figures, are used to create large annotated maps and satellite imagery for team planning meetings

**HP Designjet T1100ps (44")****Contex HD 4250 Plus Scanner**

Azimuth's GIS Research & Analysis Team has full access to incorporate assets necessary to support this effort. The following geospatial software is employed to organize, display and consolidate the data obtained through Azimuth's research effort:

- ESRI Arc Editor GIS Applications
- Remote View Pro 3D Satellite Imagery Application
- Terrain Navigator Pro
- Urban Analyst Software Bundle:
 - Advanced 3D Visualization & Analysis Capabilities
 - Visualization and Analysis of Chemical, Biological and Radiological Plume Dispersion Models
 - LIDAR Capabilities (LIDAR Analyst)
 - Measurement Tools
 - Blast Radius Effects Tool (as illustrated in the figure below)
 - The Blast Zone Impact feature is an efficient way to visualize and analyze the potential effects of an explosive device such as an IED in proximity to a Federal Building as shown in the above figure.
 - Buffer Analysis
 - Point-to-Point line-of-sight analysis

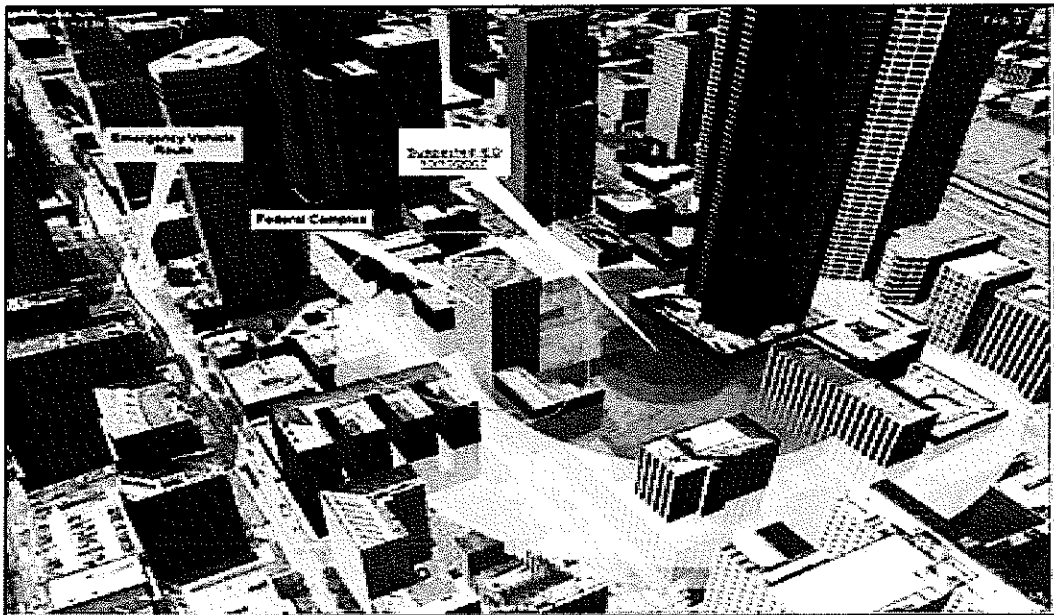
Azimuth conducts detailed research for scheduled infrastructure site visits via public and private database sources. We perform extensive "open source" research of other government agencies via various search engines and a sundry number of resources. Our Infrastructure Analysts have been very involved with open source research assignments for several years. Azimuth specialized experience include:

- GIS-based Telecommunications Analytical Tool for planning, designing, engineering and documenting complex communication networks.
- Complex version management, which allows multiple users to display and edit geographical data simultaneously.
- A centralized geospatial environment for managing all infrastructure components.
- Configure transitions, status, workflow and "what-if" scenarios displaying the overall effects of compromised infrastructures.

Azimuth's support to the DOD Intelligence Community has included multi-year programs to enhance the Intelligence Community database holdings including GIS data on the national electric power infrastructures of selected countries. Efforts encompass electric power system assessments necessary for meeting Command and policymaker requirements for current and correct infrastructure data. Our efforts included designing and building a Sybase Database Management System (DBMS) that supports database templates used on the Modernized Integrated Database (MIDB), which serves as the foundation of the defense intelligence all-

source analysis and production and is used to support a broad range of modern military operations. In addition, our in-house DBMS and other applications, such as the Infrastructure Reference Guide (IRG) program, have been specifically designed to export directly to GEMINI, which is the Defense Intelligence Community Infrastructure's General Military Intelligence (GMI) shared information space resident on INTELINK. GEMINI hosts a variety of analytical tools, infrastructure-related encyclopedia information, country and/or discipline Points of Contact (POC), and of utmost importance, direct interface (read/write) with the MIDB through the preparation, introduction and maintenance (update) of Infrastructure Facility Sheets.

The National Geospatial Intelligence Agency (NGA) and the Defense Intelligence Agency (DIA) have entered into a collaborative partnership for Azimuth to develop soft copy interactive Compact Disks (CDs) for Information Operations, Planning and Targeting Folders in support of our Warfighters at all echelons. The product was required to contain essential information needed to achieve the goals and objectives of the decision makers and include a large volume of information and an opportunity for a wider diversified audience to use the information.



Example Blast Radius Effect - Urban Analyst Software Package

MATRIC – Project National Shield Integration Center (PNSIC)

Contract Number: W15QKN-09-9-0004, P00002, Item # 0001AB
Period of Performance: 10/16/09 – 12/16/10
Initial Funding: \$1.6 Million
Contact: Mr. David Yam
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david.yam@us.army.mil

Detailed Description of Work Performed by Azimuth:

The Project National Shield Integration Center (PNSIC) project is part of the Project National Shield (PNS) System of Systems Security (SOSSEC) integration program. PNS is managed by the U.S. Army Armament Research, Development and Engineering Center (ARDEC) at Picatinny Arsenal and is focused on shielding the United States from potential disasters, man-made or natural, by providing an integrated surveillance, warning, response and recovery capability.

The events of the Oklahoma City bombing and 911 are illustrations of our national vulnerability to the threats of terrorist attack directed against civilian populations and critical infrastructure. In a similar manner, our recent experiences in the aftermath of natural disasters such as hurricanes Katrina and Rita have indicated our need to adequately prepare for and recover from the devastation inflicted by the ravages of nature. Effective protection of our Homeland demands timely coordination of "sensing, warning and reacting" to events. The ARDEC Project National Shield (PNS) initiative requires the sharing of information and will rely on an evolving enterprise architecture approach with full recognition that early applications of the system are dependent on the effective interoperability of disparate systems.

The purpose of PNSIC is to provide a single source of state-of-the-art intelligence integration by providing data coordination and analysis capabilities for disaster "early warning" and recovery needs. The PNSIC effort simplifies and accelerates the warfighter's communication and coordination with state and local entities upon arrival to a region needing Homeland Defense crisis support. Putting these capabilities in place prior to an incident rather than waiting for an incident to occur greatly increases the warfighter's effectiveness. **The initial focus of the PNSIC project is to create a common operating picture capability that can be utilized by the Army and the State of West Virginia.**

Until recently, defense, intelligence, and law enforcement organizations struggled with manual processes and a lack of qualified analysts to translate data into actionable knowledge content. The result has been reduced efficiency and increased risk of missing key data. PNSIC combines expertise and industry knowledge to introduce integrated technology solutions and business process solutions that automate the intelligence lifecycle, streamline processes, and dramatically speeds the analysis of information in the Homeland Defense intelligence domains.

The ability to manage and integrate spatial data is an important capability in support of intelligence-led policing, intelligence analysis and emergency management operations. This capability must enable data fusion, visualization, modeling and analysis of resources maintained and available from Federal, state, regional and local levels and private partners.

PNSIC utilizes Geographic Information Systems (GIS) to provide the platform and framework to collect, integrate, analyze, and disseminate data—**turning data into actionable knowledge** (Reference Figure 1).

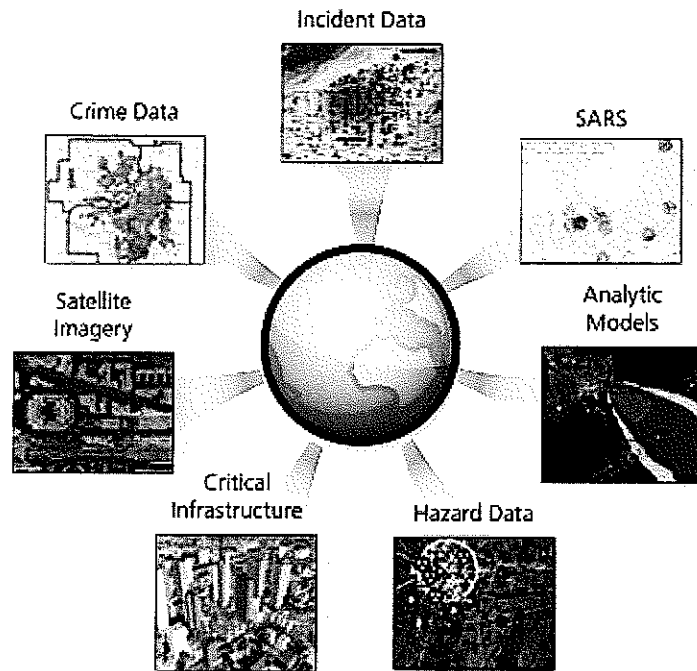


Figure 1: Geospatial Data Fusion

GIS provides the following benefits:

- Standards based interoperability with existing systems and technology
- Integrated spatial and tabular data across multiple data providers
- Improved collaboration and communication across intelligence, command, control, and response teams
- Increased ability to analyze and respond to events as they unfold by using a single, common view of operations
- Improved situational awareness for intelligence analysts and decision makers

The PNSIC project utilizes the appropriate data analysis tools for “connecting the dots” to include gathering, modeling, and transforming data with the goal of highlighting useful information, suggesting conclusions, and supporting decision making. Data analytic applications utilized include; Data Fusion, Data Mining and Link Analysis.

- Data Fusion is defined as the use of techniques that combine data from multiple sources and gather that information in order to achieve inferences, which will be more efficient and potentially more accurate than if they were achieved by means of a single source.
- Data Mining is the identification of useful data patterns from large sets of structured data. Data Mining tools use discovery rules, Bayesian learning, and clustering algorithms to sort through data and identify data relevancy.
- Link Analysis is the construction of networks of interconnected data to explore patterns and trends.

This data can come from many different sources and be in many different forms; nominal, ordinal, interval, ratio, parametric, continuous, discrete. Being able to fuse together and overlay many different types of data: pictorial (facial recognition), historical (past relationships), static (DMV), and real-time (social networks); with a GIS platform, greatly increases the actionable knowledge available to an end user (Reference Figure 2).

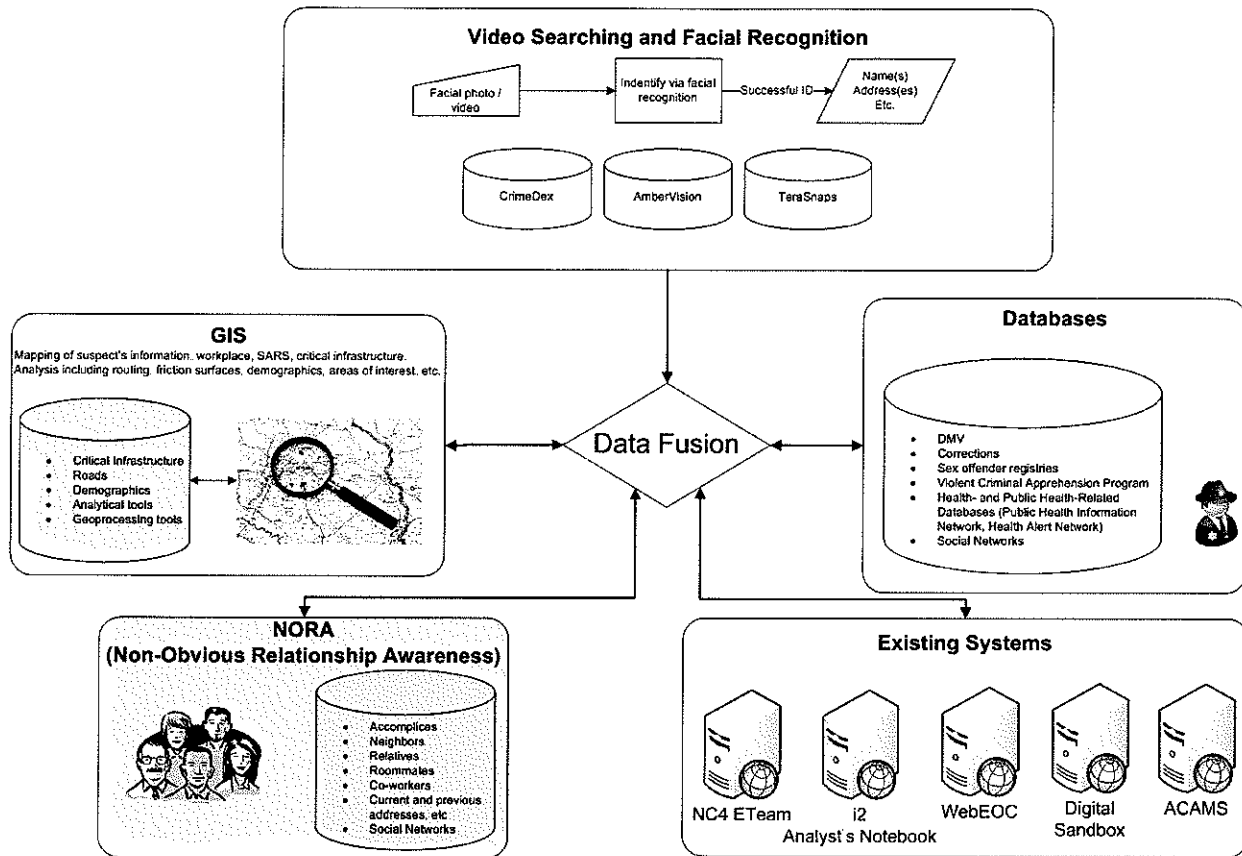


Figure 2. Multi-Stream Data Fusion

Through the PNSIC project, MATRIC is already working with many of the same state entities that will need to be interfaced with for a West Virginia Department of Military Affairs and Public Safety (WV DMAPS) Modeling and Simulation Consequence Management prototype. These entities include the National Guard, Division of Homeland Security and Emergency Management, Fusion Center, State Police, Department of Transportation, and many others. As part of the PNSIC effort, we are already familiar with many of the state data sources applicable to this effort as well.