GIS Projects at the National Incident Management Systems and Advanced Technologies (NIMSAT) Institute

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Presentation Outline

• About NIMSAT
• GIS Projects at NIMSAT
  – Community Education and Outreach
  – Critical Infrastructures and Key Resources
  – Parallel GIS: Computationally Intensive Geospatial Analysis
  – Disaster Resistant University
  – GIS Training
• NIMSAT’s response during Gustav and Ike
  – Government Industry Partnerships
  – Critical Infrastructures
  – GIS based decision support
• Conclusion
To enhance national resiliency to a full range of disasters:

– Conduct **research** leading to cutting edge **technologies**

– Provide **education, training, and operational support**

– Empower the homeland security and emergency management (HSEM) community
National Partners

AidMatrix/American Logistics Aid Network
Arkansas Tech University, Baron Services
CISCO, Inc., Civil Aviation Patrol, US Air Force CommandNet Technologies
Cyber Innovation Center, Fritz Institute
Genesys, Georgia Tech Research Institute
IntraPoint, James Lee Witt Associates
Lockheed Martin
Los Alamos National Laboratory
Louisiana OCHSEP
Louisiana Immersive Technologies Enterprise
Louisiana Optical Networking Initiative
Louisiana State University, Louisiana YOAD
MIEMAR Institute, Mississippi State University
NASA Regional Application Center
National Center for Atmospheric Research
Naval Postgraduate School, New York University
Rextag Strategies, San Diego State University
Sandia National Labs, Savannah State University
SGI, Inc., Spirit, TeraGrid
Texas A&M University System, TEEX
Tulane University, University of Alabama
University of California, San Diego
University of California, Santa Barbara
University of Louisiana at Lafayette
US Geological Service (USGS)
Walmart Corporation
GIS based Research and Development Efforts
Community Education and Outreach (CEO)

• **Background**
  - Devastation left by Hurricanes Katrina and Rita affirmed the need for an innovative approach to risk education
  - Need to provide information about:
    - risks that businesses and citizens face
    - what can be done to reduce risks
    - Effectiveness and cost-effectiveness of mitigation
  - Funded by GOHSEP

• **Project Overview**
  - Risk and Vulnerability assessment based on historical hazards and proximity to hazards
  - Communicate comprehensive and individual risk to stakeholders and communities through a web based portal
CEO Portal

Risk to various hazards

Historical Impact

Explain predicted risk
Critical Infrastructures and Key Resources

• Critical Infrastructures drive the necessary functions of our daily life

• We realize the interdependency and criticality of an asset only after the effect
  – E.g. Shutdown of a gas compressing plant in the gulf shore affects the natural gas price in NY

• GIS for CIKR Analysis
  – Mapping the critical infrastructures that are in the path of the hurricane
  – Analyze the physical and logical interdependencies between various critical assets in the gulf coast to prioritize mitigation and recovery efforts
Example 1: Interdependency of the price of corn oil in the Midwest on natural gas supply in the Gulf coast
Example 1: How does the price of corn oil in the Midwest get affected due to natural gas supply in the Gulf coast.

Single pipeline supplies the plant.
The plant produces 39% of US fertilizer.

Connecting for a Resilient America
Example 2: Earthquake in New Madrid and Electricity in NE
<table>
<thead>
<tr>
<th>% Consumption Capacity provided by GOM</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Electricity generated from Natural Gas</td>
<td>96.9%</td>
</tr>
<tr>
<td>% Electricity generation affected by disturbance in GOM pipelines</td>
<td>96.9%</td>
</tr>
</tbody>
</table>

**Rhode Island**

<table>
<thead>
<tr>
<th>% Consumption Capacity provided by GOM</th>
<th>76.46%</th>
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<tbody>
<tr>
<td>% Electricity generated from Natural Gas</td>
<td>51%</td>
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<tr>
<td>% Electricity generation affected by disturbance in GOM pipelines</td>
<td>38.99%</td>
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**Massachusetts**

**Example 2: Natural Gas Flow Diagram for NE**

TGP: Tennessee Gas Pipeline
AGT: Algonquin Gas Transmission
GS: Granite State
PN: Portland Natural Gas
I: Iroquois
MC: Maritime CA

IN: Total nat. gas going in State
OUT: Total nat. gas going out of State
• What is Parallel GIS
  – Developing computational approaches to run multi scale, computationally intensive geospatial analysis on supercomputers

• Parallel GIS
  – Empower individual users with supercomputing resources
  – Hundreds of users can simultaneously perform spatial analysis where the throughput can reach thousands of hours
  – Visualization of GIS data on massive displays
Disaster Resistant University

- An “All Hazards” Hazard Mitigation Plan for UL Lafayette
- High-Resolution 3-D Virtual campus
  - Google Sketch up & Google Earth
GIS Training

- Authorized ESRI Instructor
- FEMA Certified HAZUS-MH Instructor
- Customized GIS/Emergency Management courses with future continuing education opportunities
Response Activities during Gustav and Ike
Government Industry Partnerships

- Worked with executives from the Governor’s office and state agencies

- Facilitated mobilization of approximately $23.8 million dollars of cash, goods and services, of which approximately $8 million were contracts

- Included over 30 private sector partners
  - Wal-Mart, Shell, Target, Office Depot, Home Depot, Anheuser-Busch, etc.
With DHS & GOHSEP: compiled a list of **8000 CIKR assets**
- Selected a subset of **150 CIKR assets** operated by private sector
- Analyzed the list of these CIKR assets, determining pre-event the most likely facilities that were at risk

- Reviewed operating capacity of **120 petroleum, natural gas, chemical and electricity facilities** along LA coast
  - CITGO Refinery, Conoco-Phillips Alliance Refinery, Entergy (multiple stations), Exxon Garden City Gas Plant, LOOP, Port Fourchon, etc.

- Estimated direct economic impact of the storms on O&G: **$7.6B - $8.3B** as of October 1, 2008
Site Selection Tools

- POD Closures
- POD Planning
- Gas stations

Connecting for a Resilient America
Conclusions

• GIS based development
  – Server, desktop based applications

• GIS based research
  – Geospatial analysis & Decision support
    • E.g. : Points of Distribution (POD) model, Risk estimation
  – Addressing data, computational and visualization challenges
    • E.g. Debris analysis, flood loss estimation
Thank you!
Questions?

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