LONI Projects at the University of Louisiana at Lafayette

Ramesh Kolluru, Raju Gottumukkala

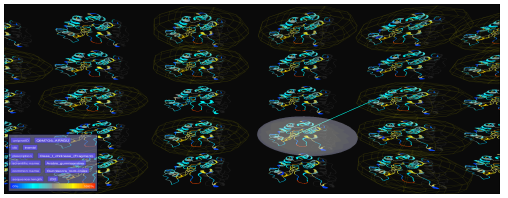
Outline

- **HPC for Computational Biology: Phylogenomics**
- **HPC for Homeland Security & Emergency Management: NIMSAT**
  - **Why HPC for HSEM**
  - **Proposed CI Architecture for HSEM**
  - **CI projects for HSEM**
    - **POD Tool**
    - **GRASS: Parallel GIS**
- **Administration**
  - **Hirings**
  - **Proposals**
    - **NIMSAT Center of Excellence**
    - **CiCURE (Cyberinfrastructure for Urgent Response to Emergencies)**
- **Collaborations**

HPC for Computational Biology: Phylogenomics

- **Members**
  - **Joe Neigel (PI), Dirk Reiners, Caryl Chlan, Christian Odom, Kevin Purcell**

- **The Protein Annotation Problem: Phylogenomics approach**
  - **Protein function drives and constrains evolution of protein structure (Phylogenomics)**
  - **Develop parameter-rich models that characterize**
    - **how proteins in different function-families evolve**
    - **ask which families unknown proteins are most likely to have evolved from**



- **HPC & Visualization**
  - **Parameter estimation for each protein evolution model is CPU intensive (Monte-carlo)**
    - **10,340 protein families in Pfam database**
  - **Computer-aided visual recognition of misclassified proteins and evolutionary signatures of altered function**

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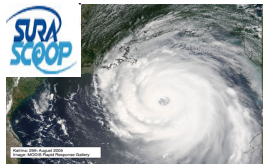
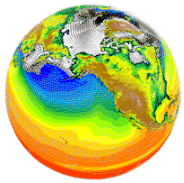
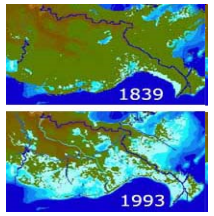
Louisiana Immersive Technologies Enterprise

HPC for HSEM: NIMSAT

- **Nation Facing Emerging Threats**
  - Natural, manmade
  - Resilient societies build on effective HSEM

- **Existing CI Applications for Disasters**
  - Tracking and forecasting Hazards
    - Eg: LEAD, SCOOP
  - Impact of hazards on environment
    - Climate change, Coastal Erosion

- **CI for Disaster management**
  - CI based tools and techniques would have a major impact for disaster response and recovery
  - Disaster managers and first responders need actionable information through decision support tools with the ability to collect, manage and analyze data

- **NIMSAT Institute's response to Hurricanes Gustav and Ike**

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AND ADVANCED TECHNOLOGIES
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HPC for HSEM: NIMSAT

- **Assessing On-the-ground Scenarios: Pre- and Post-disaster**
  - **Effect on people, supply chains and critical infrastructures**
  - **Understanding cascading effects**
    - **Power, communications**
    - **Pipelines, Economic impact**

- **Decision Making**
  - **CI and analytical tools for effective real-time response**

- **Data, Computing and Visualization Intensive**
  - **Data**
    - **Imagery (Satellite, areal), Sensor networks**
  - **Computing**
    - **data analysis/simulations/decision making**
  - **Visualization**
    - **Situational awareness with immersive 3D space**
    - **Planning, training first responders**

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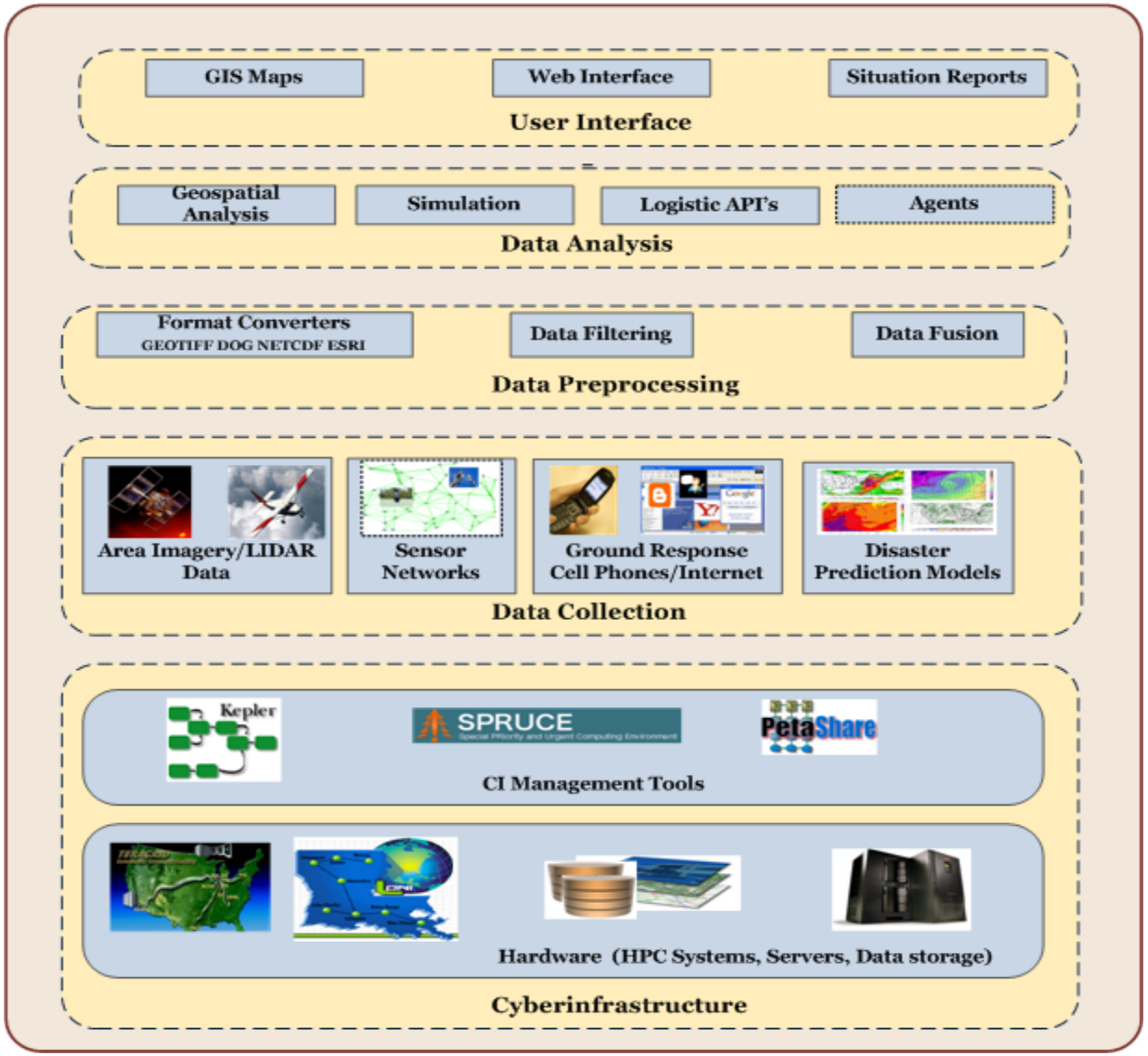
University of Louisiana at Lafayette

NIMSAT Institute
Cyberinfrastructure for Disaster Management



NIMSAT CI Projects:
A POD Tool for Emergency Managers

- **POD (Points of Distribution)**
  - **Enables emergency managers to effectively plan the distribution of basic commodities (food, water, ice, tarps, etc) during a disaster**
- **A Complex Problem**
  - **Technical/political/social issues**
- **Technical Issues/factors**
  - **Selecting feasible POD locations**
  - **Tracking evacuation data, distance people have to travel**
  - **CPU Intensive to run optimizations at a fine granular level**

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Point-of-Distribution (POD) Tool

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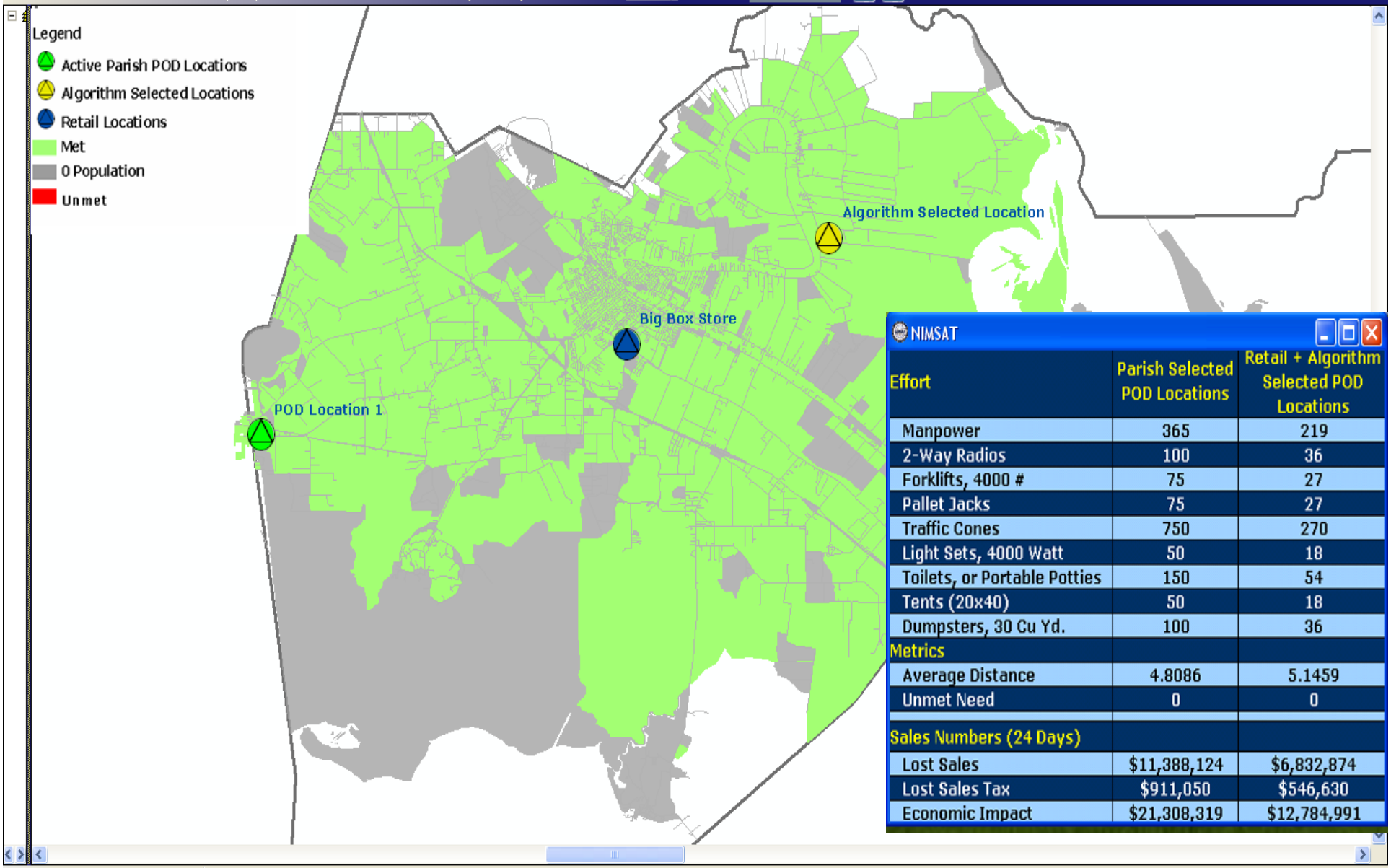
Network Analyst | Target: | Import/Export



NIMSAT

Effort	Parish Selected POD Locations	Retail + Algorithm Selected POD Locations
Manpower	365	219
2-Way Radios	100	36
Forklifts, 4000 #	75	27
Pallet Jacks	75	27
Traffic Cones	750	270
Light Sets, 4000 Watt	50	18
Toilets, or Portable Potties	150	54
Tents (20x40)	50	18
Dumpsters, 30 Cu Yd.	100	36
Metrics		
Average Distance	4.8086	5.1459
Unmet Need	0	0
Sales Numbers (24 Days)		
Lost Sales	$11,388,124	$6,832,874
Lost Sales Tax	$911,050	$546,630
Economic Impact	$21,308,319	$12,784,991

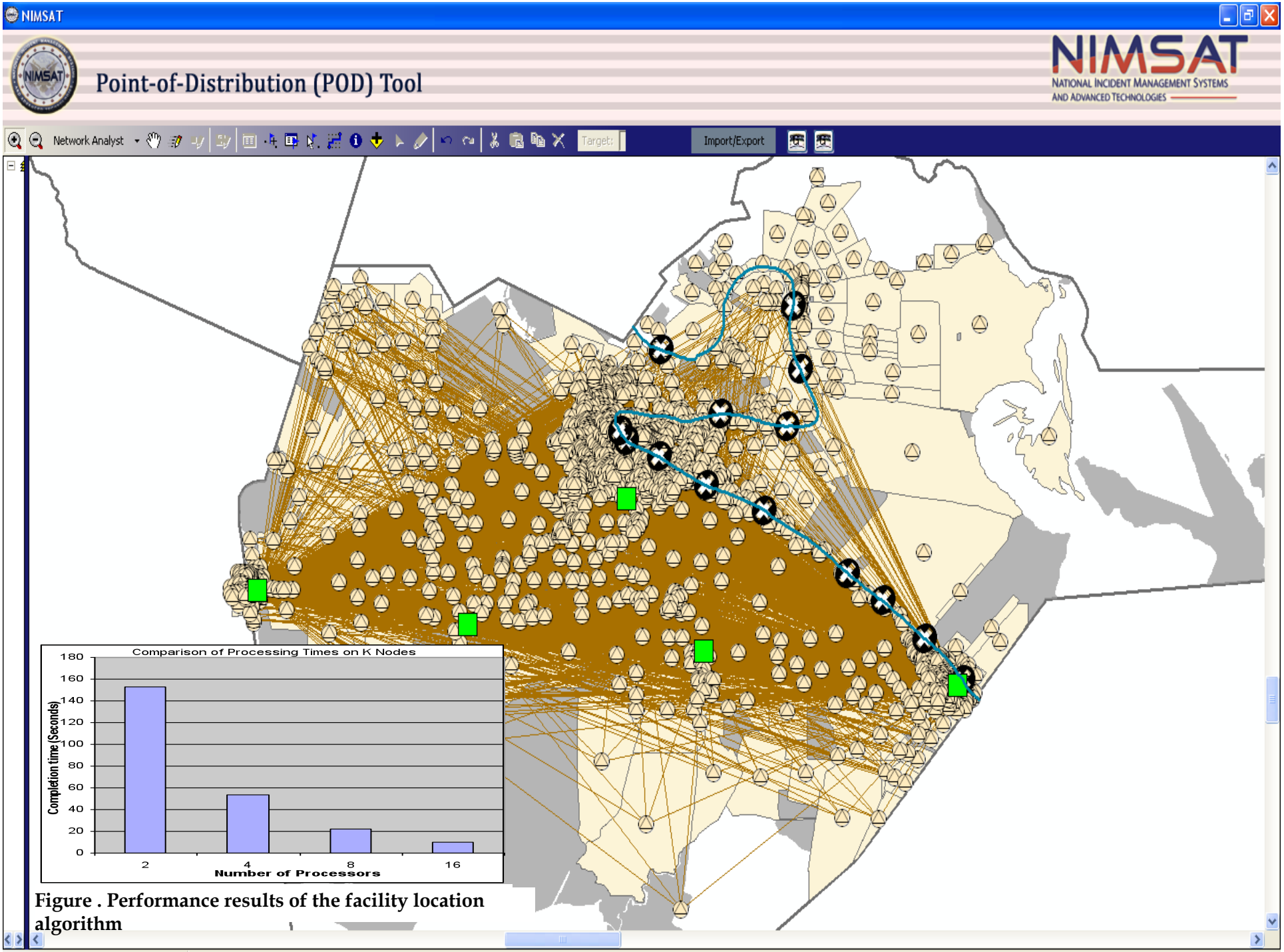


Figure . Performance results of the facility location algorithm

CI Projects: Parallel GIS (GRASS)

- **Geographic Resource Analysis Support System (GRASS)**
  - Multipurpose open source GIS software for geospatial data analysis, modeling, management and visualization
  - Applied for multiple areas such as Geography, Sociology, Ecology, Remote Sensing, Urban-Planning, Geostatistics, Geophysics and Hydrology
  - GRASS would be a versatile tool to better understand the impact of disasters on the community, assets and regions

- **Parallel GIS for Disaster Management**
  - Logistics modules for planning
  - Post disaster imagery analysis

Administration

- **Hirings**
  - **LI Faculty**
  - **Computational Scientist**

- **Proposals**
  - **DHS Center of Excellence ($18M/6 year)**
    - **NIMSAT Center of Excellence for Command, Control and Interoperability**
  - **NSF Science and Technology Center (pre-proposal)**
    - **CiCURE (with UCSD)**

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NATIONAL INCIDENT MANAGEMENT SYSTEMS AND ADVANCED TECHNOLOGIES

Collaborations

Private

James Lee Witt Associates, Part of GlobalOptions Group
Wal-Mart
sgi Innovation for Results
Rextag Strategies
Cisco
Sprint
Global eSolutions Group
Business Executives for National Security
IntraPoint
Lockheed Martin
Priority

Government


FEMA
NCAR
NOAA
United States Air Force Auxiliary Civil Air Patrol

LITE Louisiana Immersive Technologies Enterprise
USGS science for a changing world
NASA
INL Idaho National Laboratory

Academic

San Diego State University
Mississippi State University
NPS Praestantia per Scientiam
New York University
Alabama
UCSB
UCSD
LSU
Tulane University
A&M
Arkansas Tech University