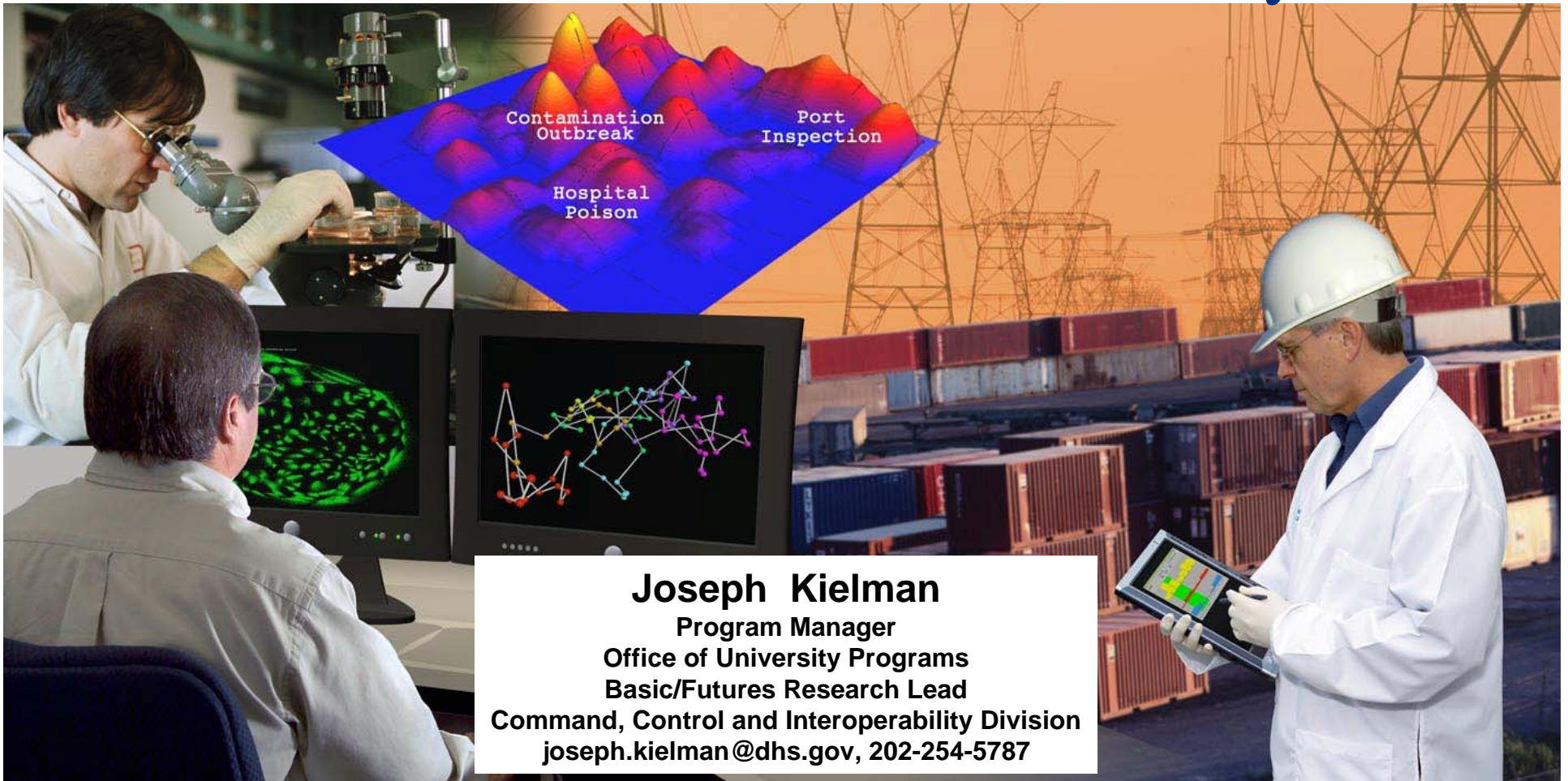


The Visual Analytics Complex: A Collaboration Among National Laboratories, Universities, and Industry



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**Homeland
Security**



National Visualization
And Analytics Center

Basic/Futures Research – The Mission

Division Mission: Through a practitioner-driven approach, CCI creates and deploys information resources to enable seamless and secure interactions among homeland security stakeholders

- A practitioner-driven approach is defined as a process where the needs of end-users drive the creation of information resources
- Information resources include standards, frameworks, tools, and technologies
- Enabling seamless and secure interactions means enhancing the ability to communicate, share, visualize, analyze, and protect information
- Stakeholders include all local, tribal, state, Federal, international and private entities engaged in homeland security

DHS Drivers: OI&A, OIP, FEMA, ICE, CBP, USCG, S&T; federal, state, and local public safety, health, law enforcement, and emergency response organizations; NSF, ODNI, CIA, and NSA; DRDC, BMBF

End-Users: OI&A, OIP, FEMA, ICE, CBP, USCG, S&T; federal, state, and local public safety, health, law enforcement, and emergency response organizations



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Basic/Futures Research - Description

Basic/Futures Research Application

- The capability supports CID efforts in threat assessment, data communications and sharing, interoperability, knowledge management and analysis, surveillance and investigative support, cyber security, and disaster management

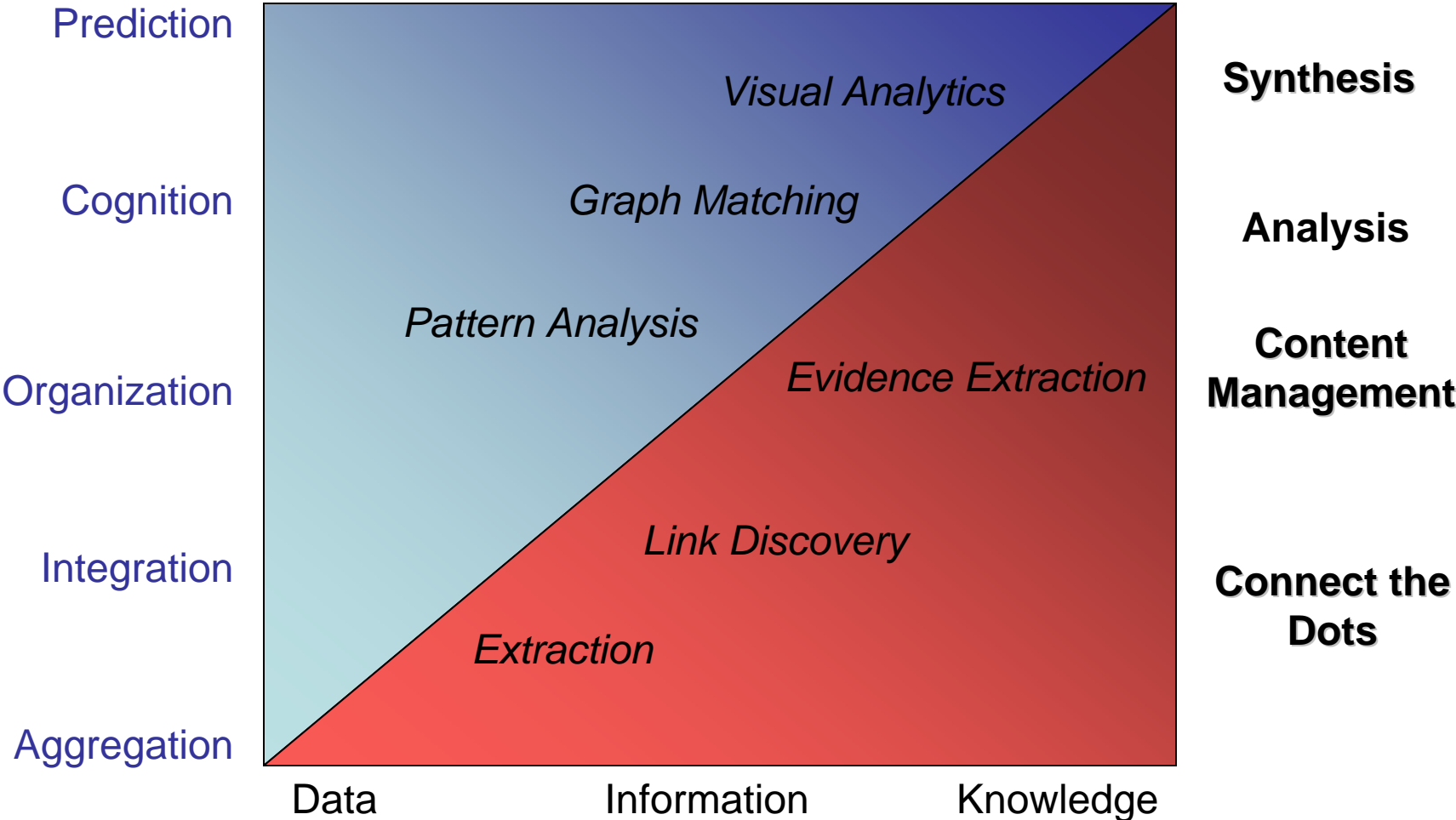
Basic/Futures Research Metrics

- Search for novel algorithms, computing architectures, and methods that will fundamentally advance the theory and practice of transforming data into new, scalable representations suitable for computer visualization, visualizations that faithfully represent the content of the underlying data, and physically realistic and accurate simulations
- Creation of a single, common analytical framework for all data types, namely, structured and unstructured text, video, imagery, audio, and sensor and other data, and all computer and network architectures
- Development of a truly scalable knowledge discovery, understanding, and dissemination capability, which maintains its real-time nature as the amount, variety, and diffusion of the data increase
- Development of application-specific interfaces and combined analytical-synthesis capabilities for systems ranging from handheld, mobile devices to single analyst stations to command center installations suitable for wide-area, multi-threat, and inter-agency operations



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Multiple Techniques Contribute to Threat Assessment

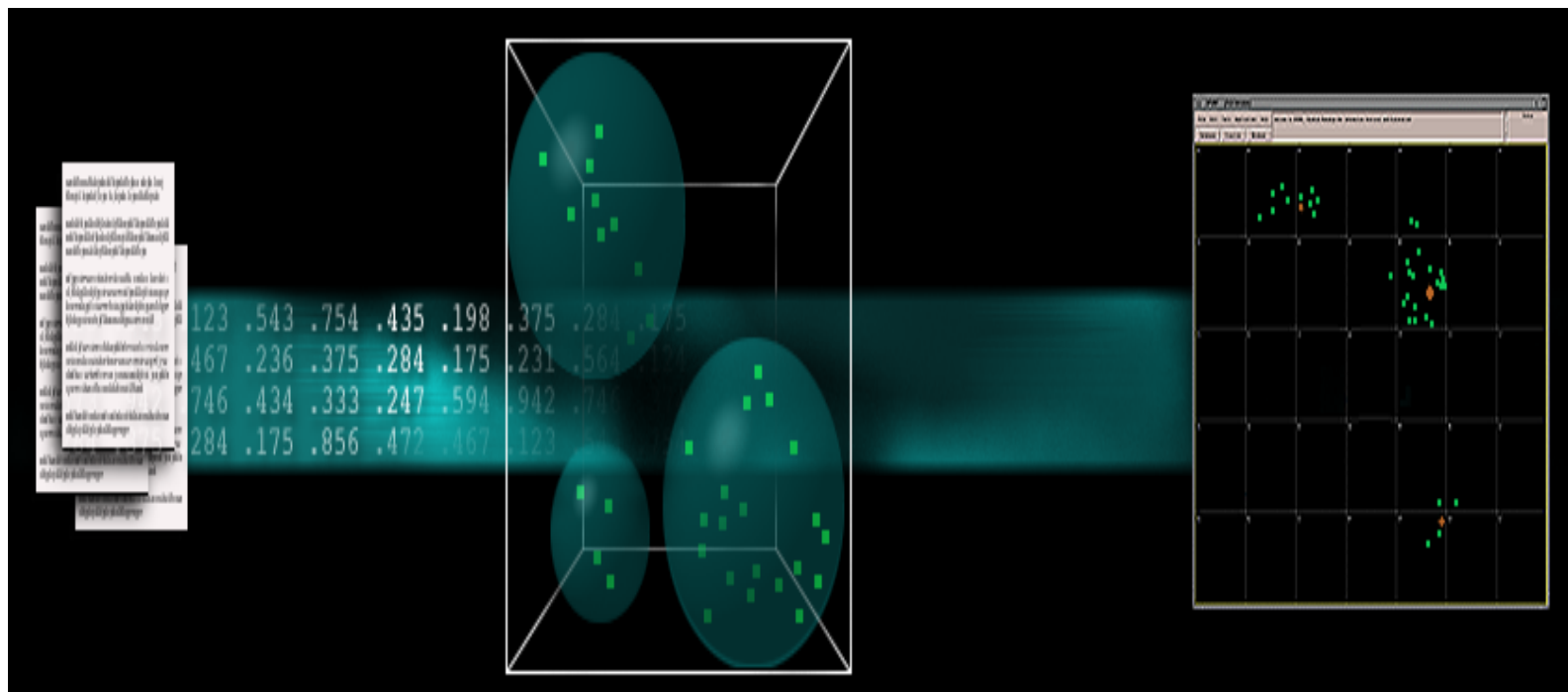


One Core Concept

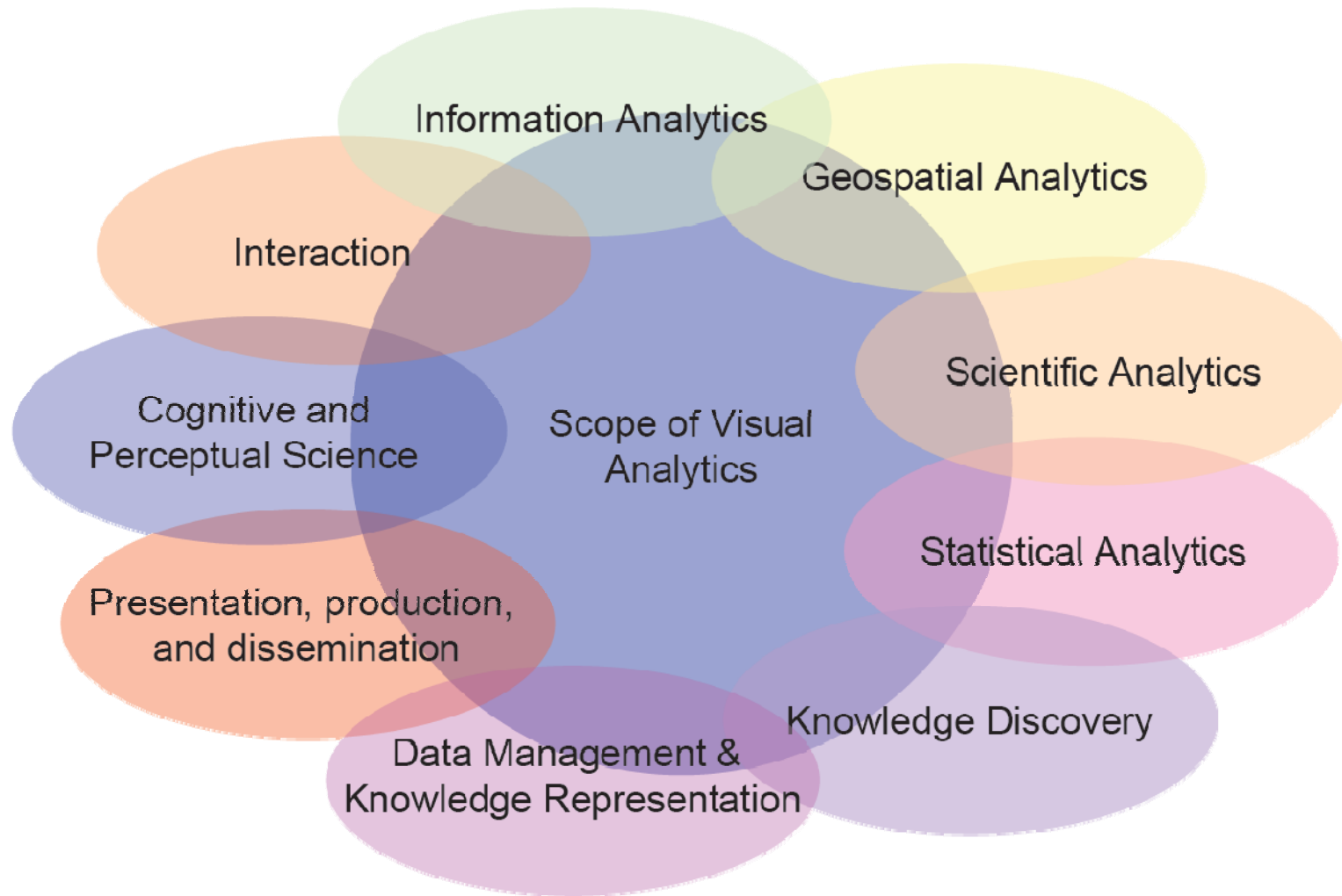
Create data signature

Synthesize into high-dimensional discovery space

Visual discourse for discovery



Scope of Visual Analytics



Visual Analytics Capabilities

The collage illustrates various visual analytics capabilities:

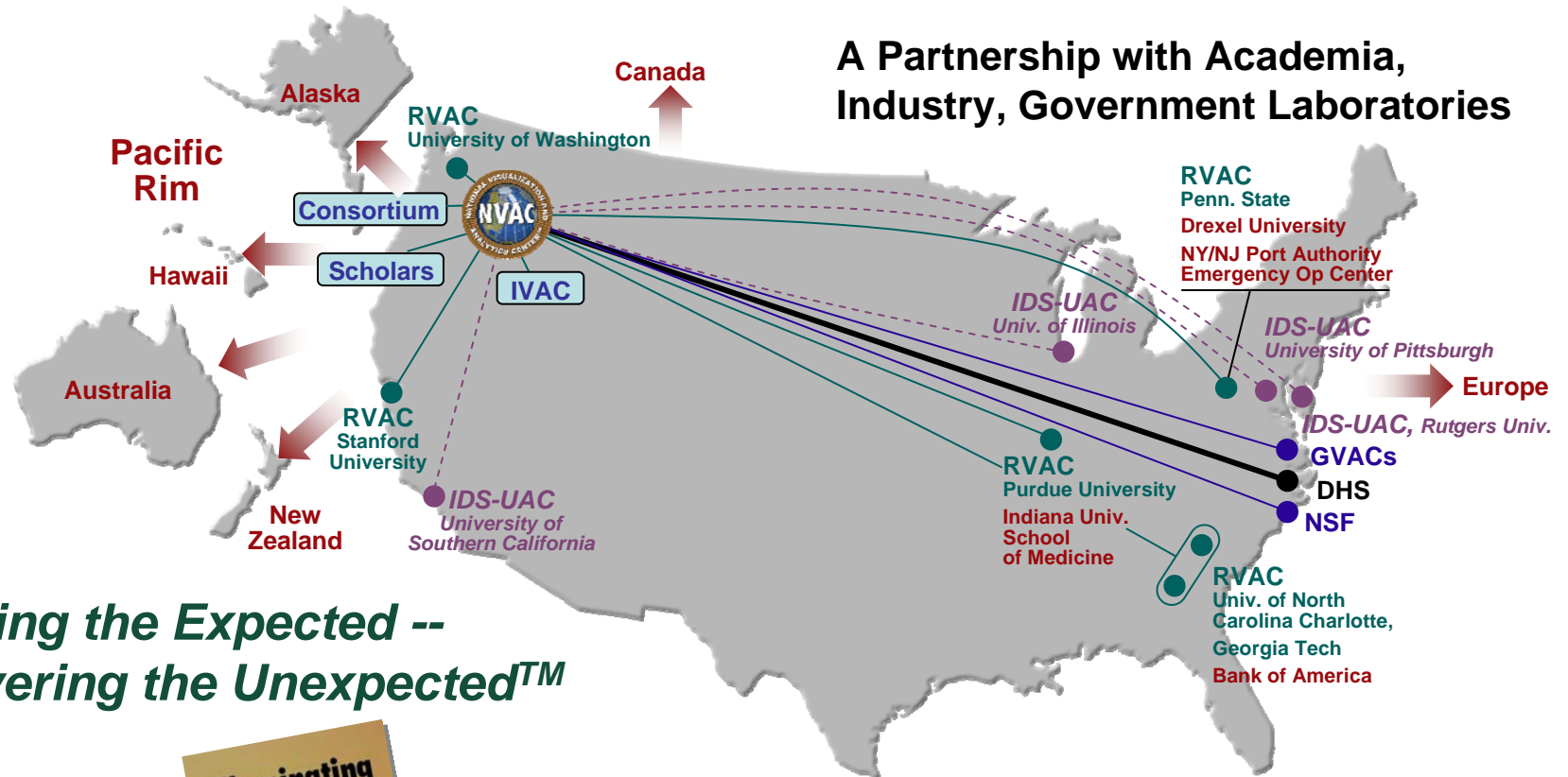
- WMD Threat Analysis:** A 3D heatmap showing vectors for WMD threats, categorized by Biological, Chemical, Nuclear, and Cyber. Includes newspaper clippings like "WMD Threat Analysis" and "Internet provides battling new virus".
- Shipping and Border Crossings:** A network diagram showing connections between nodes like "Shipping", "Border Crossings", "Sarin", "Anthrax", "WMD Reports", "Bio warfare", and "Immigration".
- Energy Data:** A bar chart showing energy-related metrics such as q-nuclear (2351), q-atomic (1435), q-plutonium (80), q-reactor (16), q-energy (2056), q-wm.d (434), q-uranium, q-enrich (696), q-uranium/enrich, and q-plutonium/enrich.
- Country A Bank:** A map of "Country A" with a central pink circle and surrounding green circles representing bank locations.
- Word Cloud:** A word cloud containing terms like "min, bank, qa", "mailes, words, sy", "announcer, mailes, pa", "words, mailes, productio", "afp, production, plant", "putin, ivanov, ukraine", "afp, world, ivanov, plant", "plant, putin, ivanov", and "georgia, kazakhstan, ukraine".
- 3D City/Terrain Model:** A 3D visualization of a city or terrain with a green and blue color scheme.
- Software Interface:** A screenshot of a software interface showing a concept map, a data table, and a map. The data table includes columns for "Count", "Age", "Gender", and "Date".



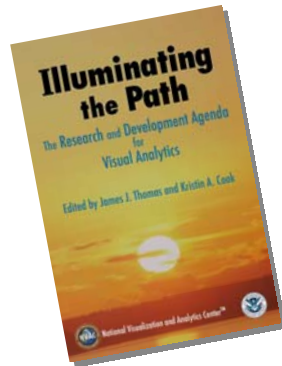
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Visualization and Analytics Centers

A Partnership with Academia, Industry, Government Laboratories



*Detecting the Expected --
Discovering the Unexpected™*

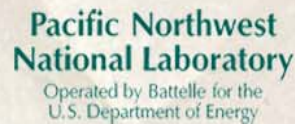


Fall 2007 VAC Consortium

Welcome! You're in good company.
Let's learn, respect, and form partnerships to deliver.



Collaborating on Land & Sea



VAC Consortium Meeting
November 14-15, 2007
Richland, WA



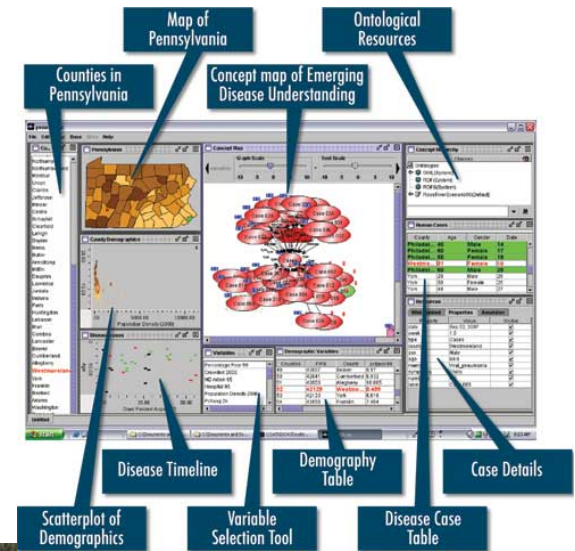
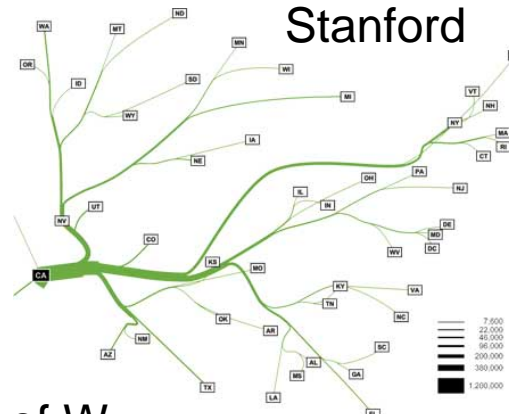
Drawing on the VAC Partners

- Regional Centers
- DHS Centers of Excellence

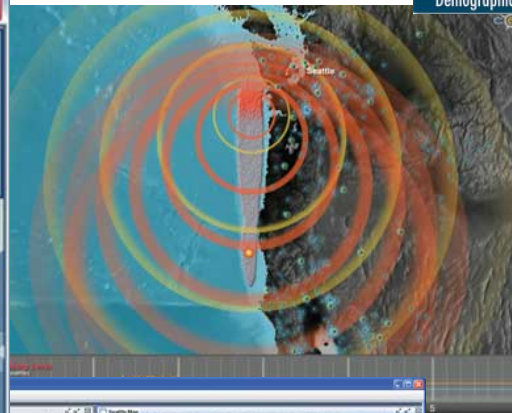
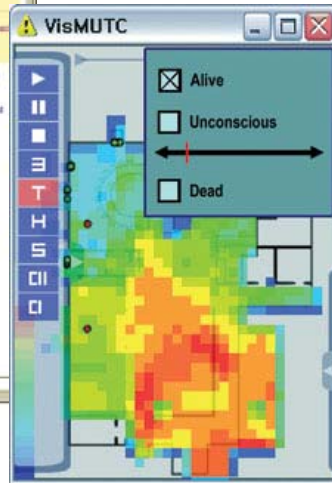
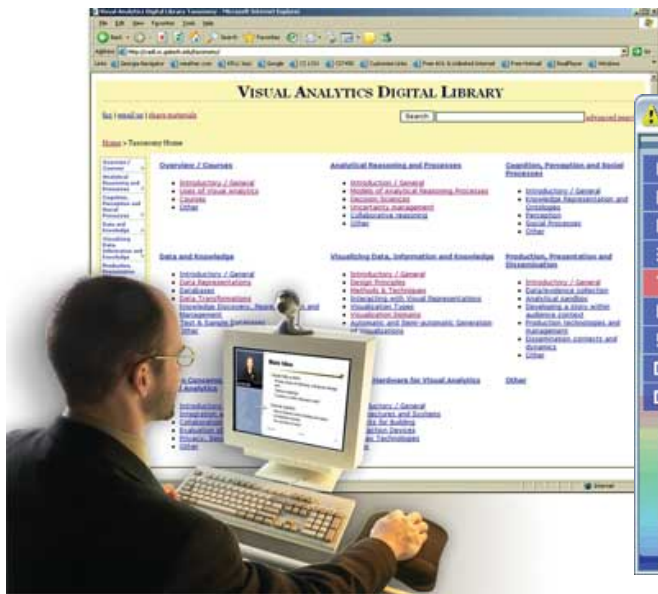
Georgia Tech

U. of W.

Penn State



UNCC



Homeland Security



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SouthEastern RVAC:UNC Charlotte

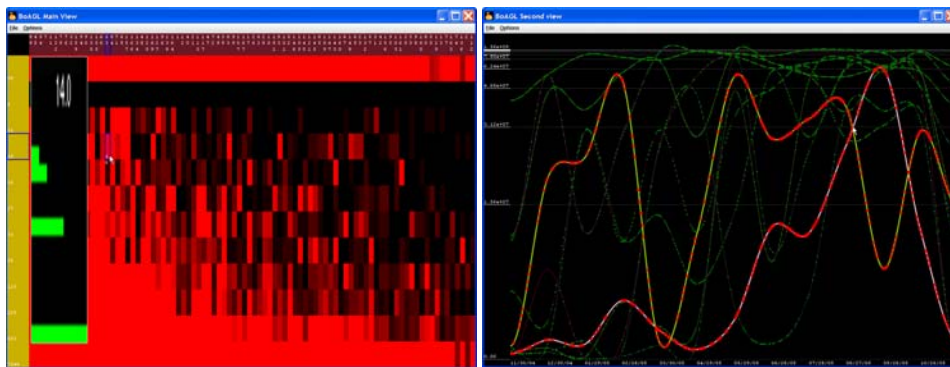


Visual Image Content Browser
 Analyzes any number of images of unknown content. Provides a highly interactive visual interface for exploration. NVAC is evaluating and will use. Available to all RVACs and partners.



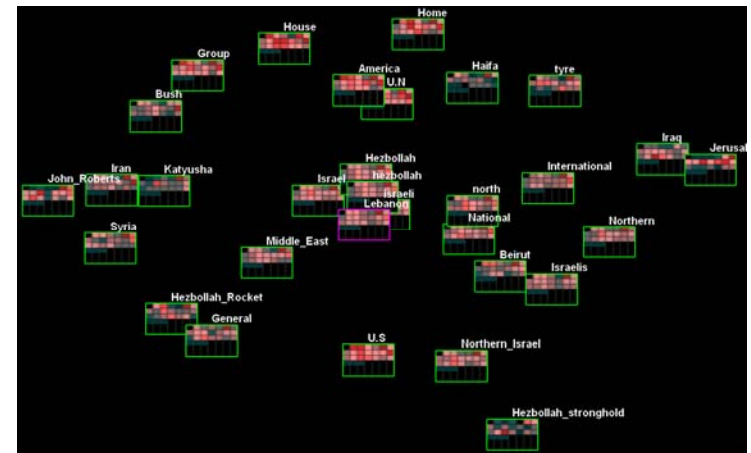
Video Exploration Visual Interface

Explores hundreds or more broadcast channels over time to automatically analyze news.



Transaction Visual Interface

Used to explore wireless bank transactions to find money laundering. Able to do complex investigations over time. Work with Bank of America and NVAC.



Homeland Security





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SouthEastern RVAC: Georgia Tech

Main Idea

- Visuals help us think
 - Provide a frame of reference, a temporary storage area
 - "Seeing is believing"
 - "A picture is worth a thousand words"
- External cognition
 - Role of external world in thinking and reason
 - An illustrative example
 - Can you think of more?

Visual Analytics Digital Library

A central repository for educational materials about visual analytics. Organized along a visual analytics taxonomy.

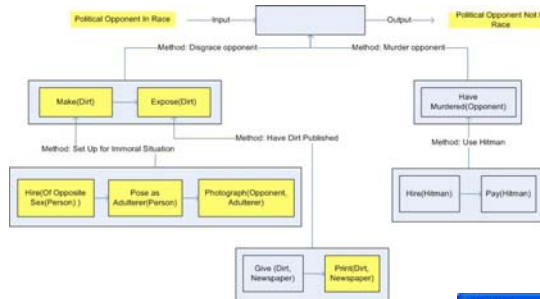
URL: <http://vad1.cc.gatech.edu>



The Team

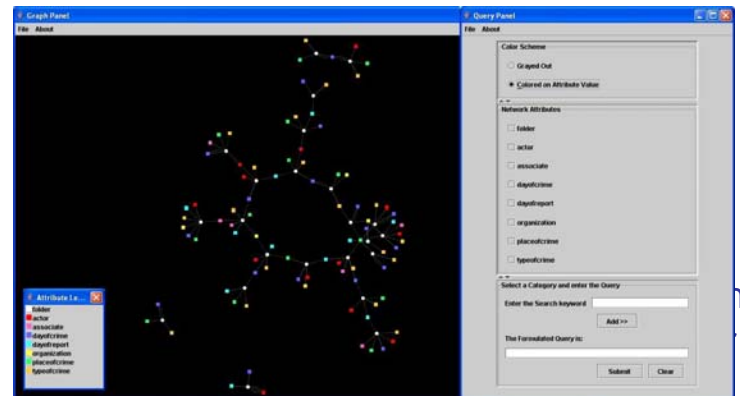
STAB System

Making predictive hypotheses about future events based on past situations.



Intelligence Report Visualizer

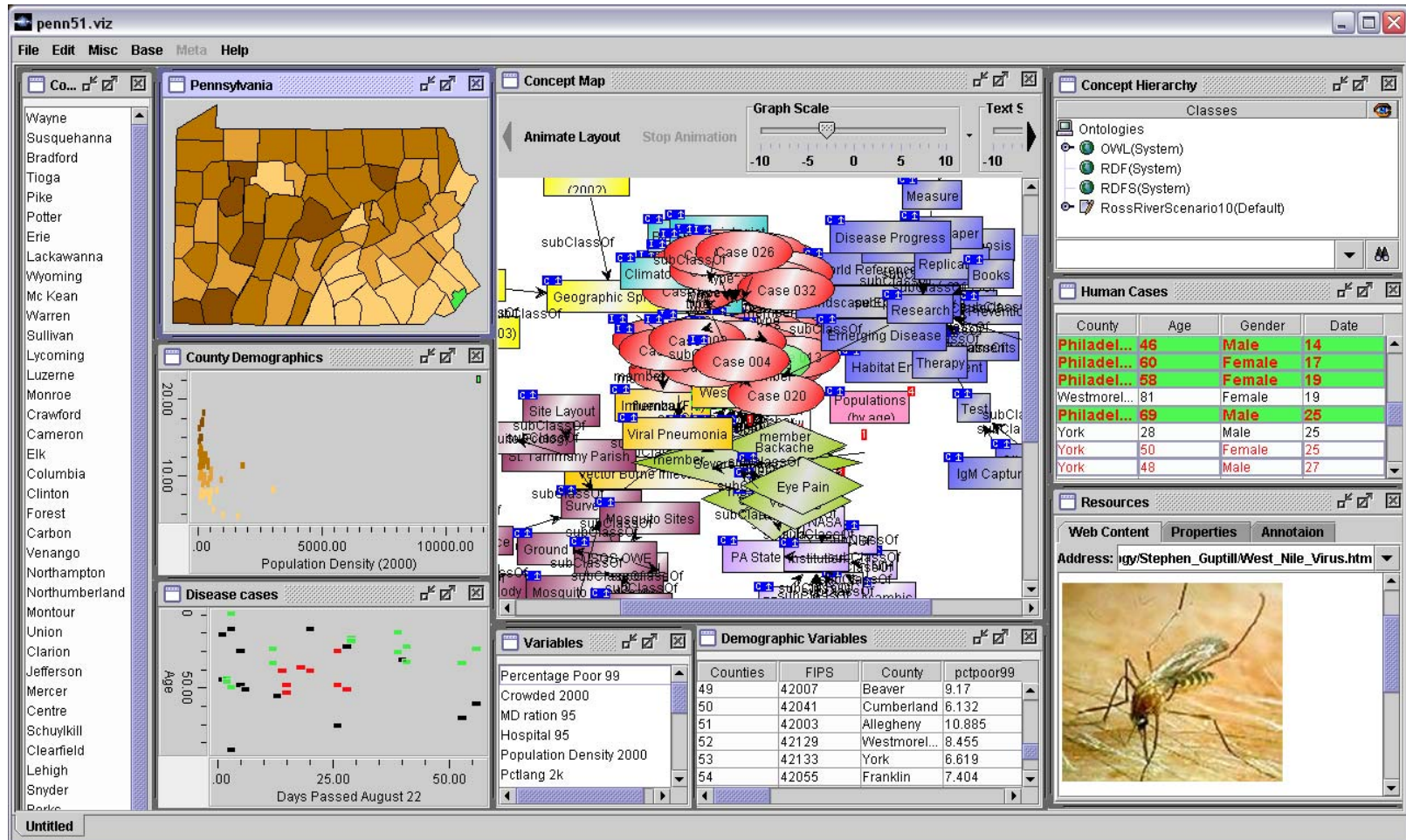
Visualizing intelligence reports and their important constituents in order to help analysts explore the reports more flexibly.



NorthEastern RVAC:

Exploring connections between conceptual knowledge, geography, and disease cases

Investigating new outbreaks of vector-borne disease (highly coordinated visual representations, existing knowledge is used to find new resources)



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PARVAC: Pacific Rim Visualization and Analytics Center



JITC3

(Just-In-Time C3)



Purpose - To develop a flexible, portable command post for deployment with emergency response personnel which optimizes situational awareness and responder flow during an emerging event.

Approach - Develop a cohesive geo-spatial representation of an urban environment that can be navigated and manipulated using Augmented Reality. The ARToolkit's intuitive, tangible interface is used to create location-specific perspectives, including both exocentric and egocentric viewpoints.

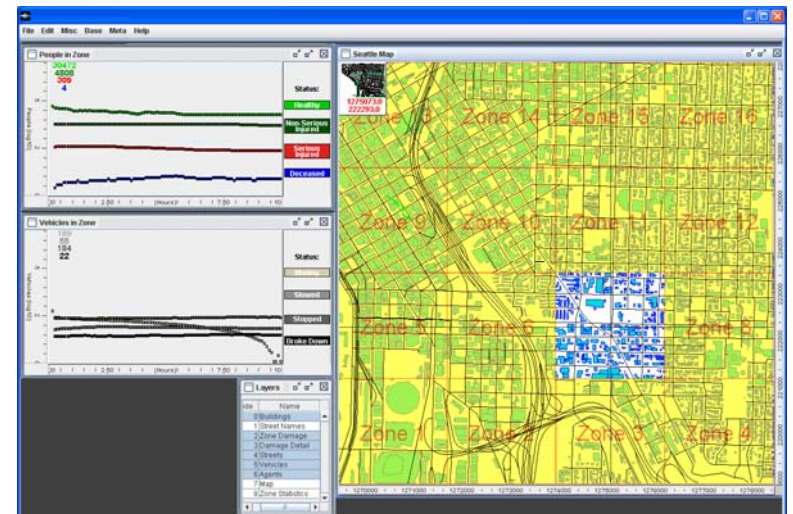


An international R&D collaboration involving researchers in the Washington, Hawaii, Alaska, Canada, New Zealand and Australia, led by the University of Washington HIT Lab (Tom Furness, PI)

RimSim

Purpose - To develop a reality-based simulation game as a platform for studying distributed cognition and collaborative analysis of geospatial events typical of cities around the Pacific Rim.

Approach - In parallel to requirements gathering and game development, a focus on assessing the quality of a game session through a visual analytics support tool helps RimSim developers verify game data needs, interface needs, and game objectives. The assessment tool builds upon the Improvise platform developed by researchers at the Penn State RVAC.



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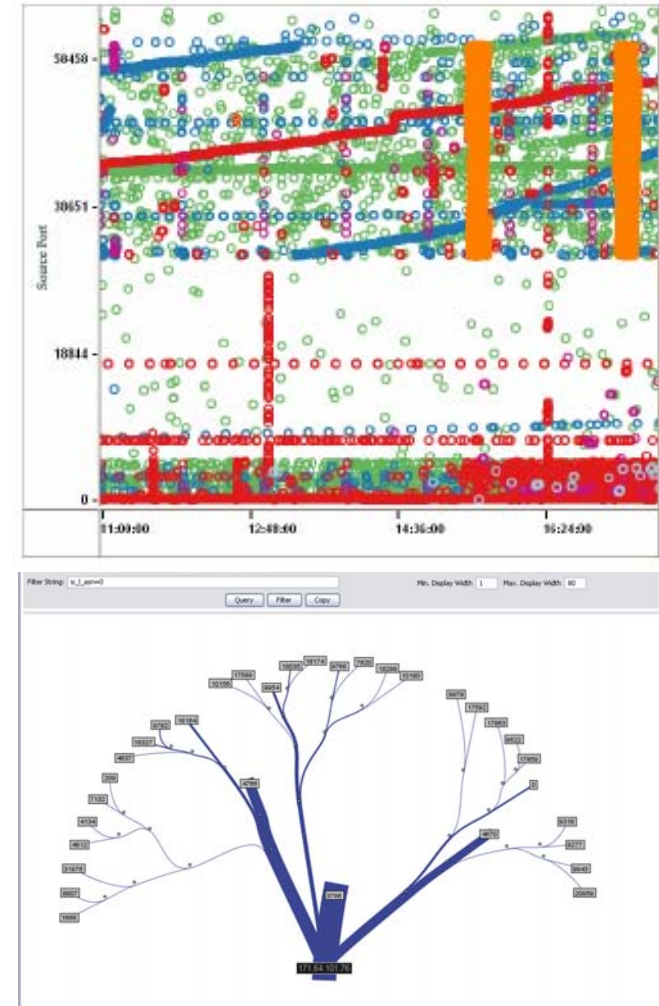
Stanford: Transactional Analytics

Goals:

- *Transforming* events into transactions
- *Linking* transactions into behaviors
- *Modeling* participant behavior patterns
- *Identifying* unusual patterns
- *Searching* for their agents

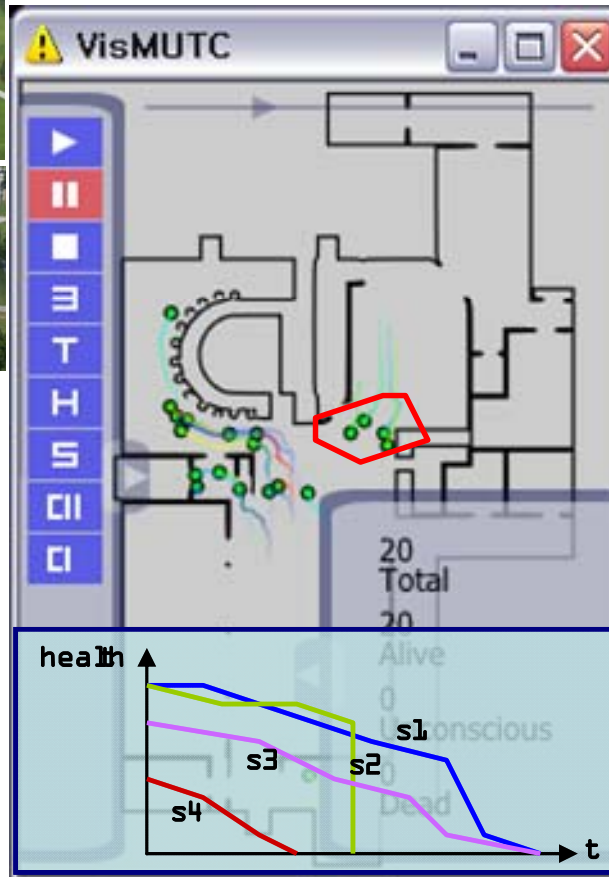
Challenges:

- Massive amounts of streaming data
- Couple classification and visualization



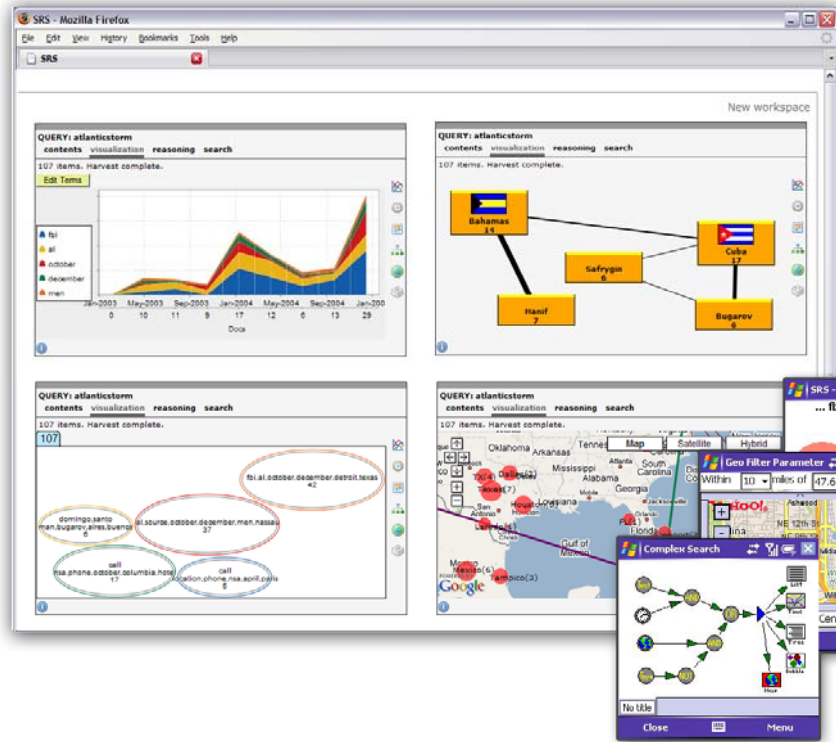
PurVAC: First Responder Command and Control

Muscatatuck Urban Training Center Mobile and EOC Visual Analytics



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Law Enforcement and Counter-Terrorism



Desktop to Handheld: Enabling cross-jurisdictional situational awareness for rapid decision making and resource deployment

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