Visual Analytics and Collaborative Decision Making of Regional Security Communities

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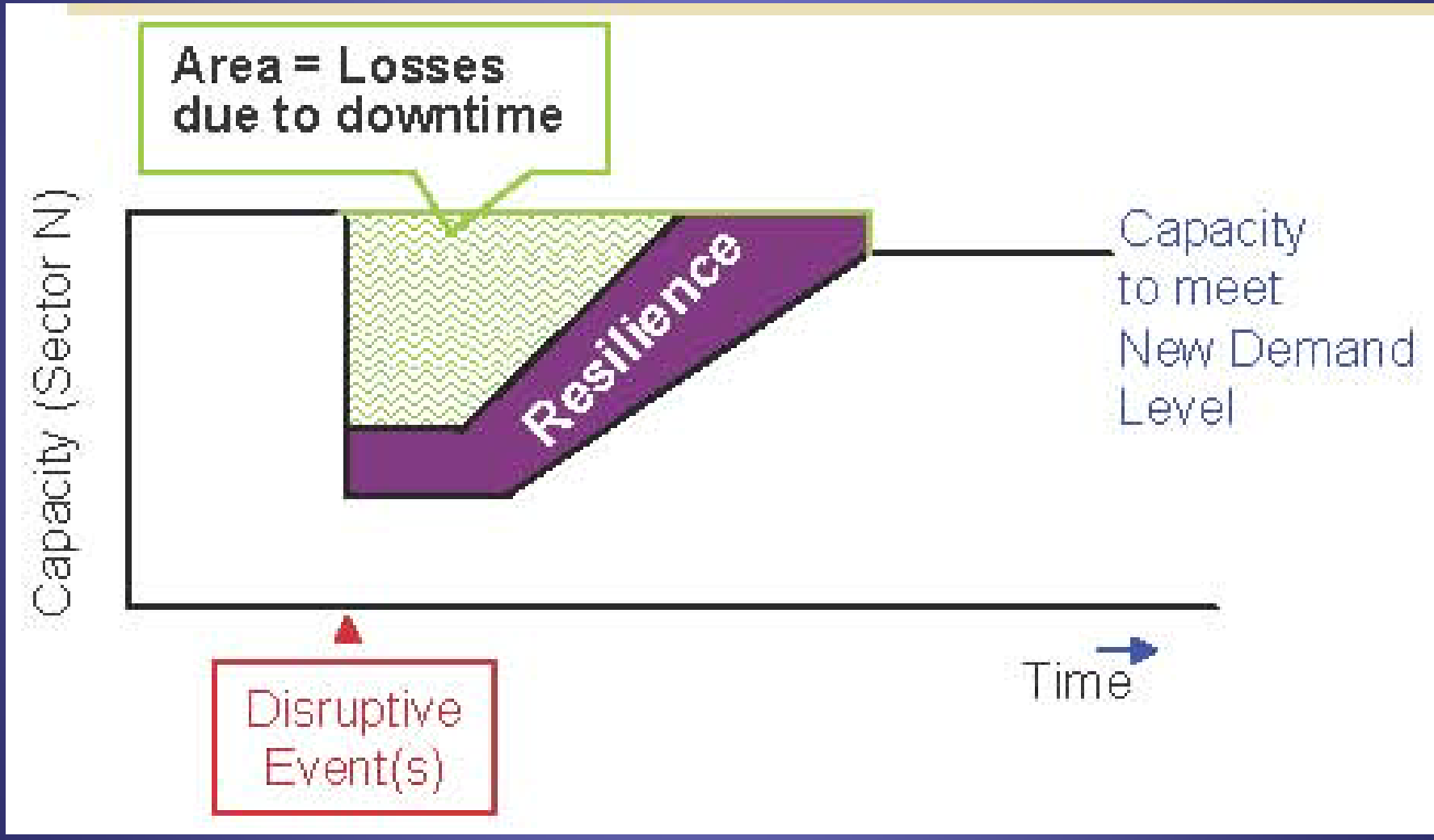
Puget Sound Port-Wide Risk Management/Mitigation and Trade Resumption/Resiliency Plan

- **Resiliency-Building Strategy: *Develop "visual analytics" tools to facilitate and optimize decision-making during and after an incident*.**
  - **Goals and Objectives include:**

    Help public and private stakeholder make timely, defensible, and justifiable assessments, and thereby optimize decision-making, when confronted with massive amounts of confusing, dynamic, conflicting data during and after an incident.
  - **Recommended Initiatives include:**

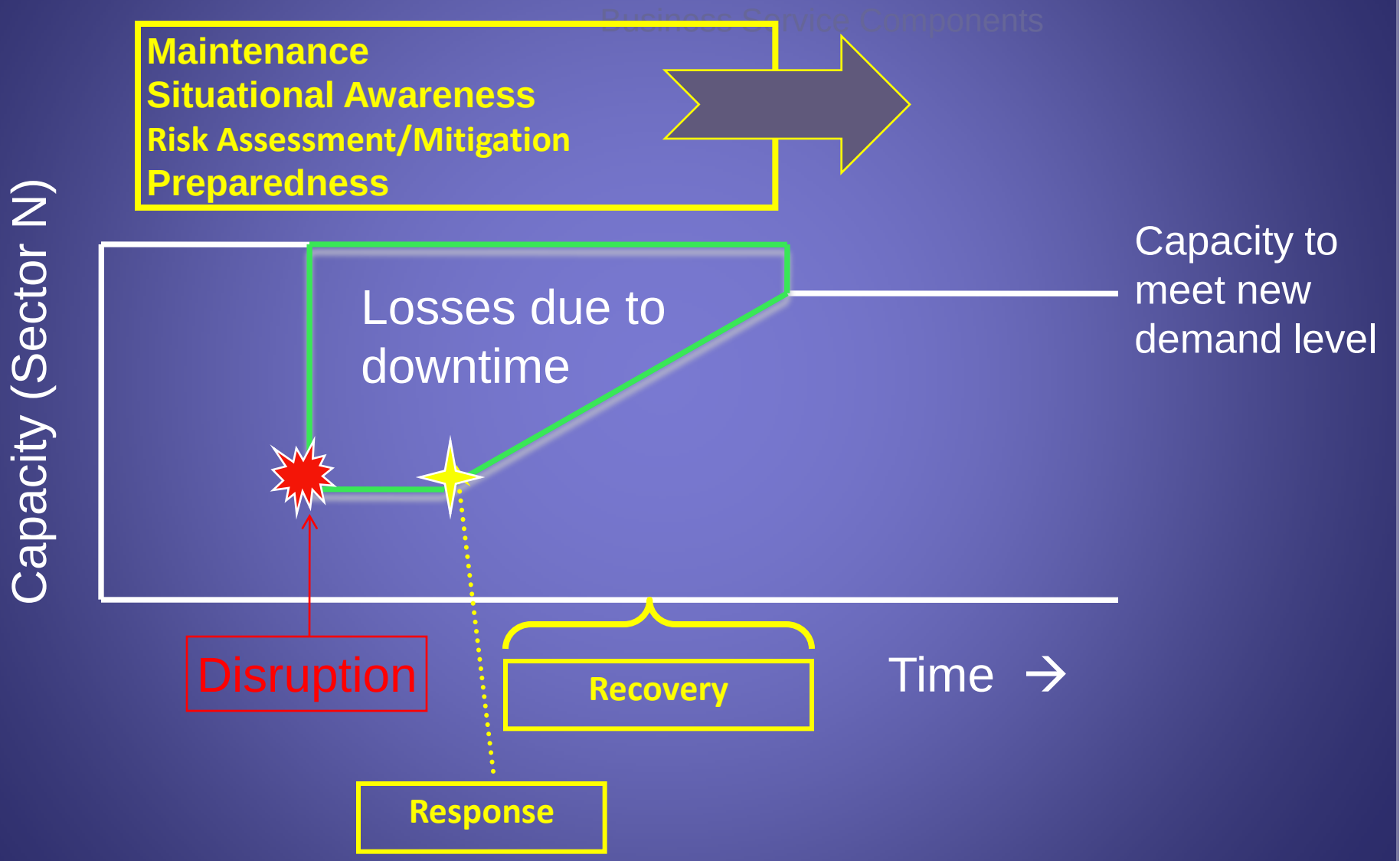
    Define the comprehensive range of assessments and decisions necessary in responding to and recovering from terrorist and all-hazards incidents, and develop visual analytics tools to aid in making those assessments and decisions.

Resilience



Adapted from a DHS presentation by Chris Doyle

The Role of Visual Analytics



PARVAC, Haselkorn, 2008

Service Science: the Study of Service Systems

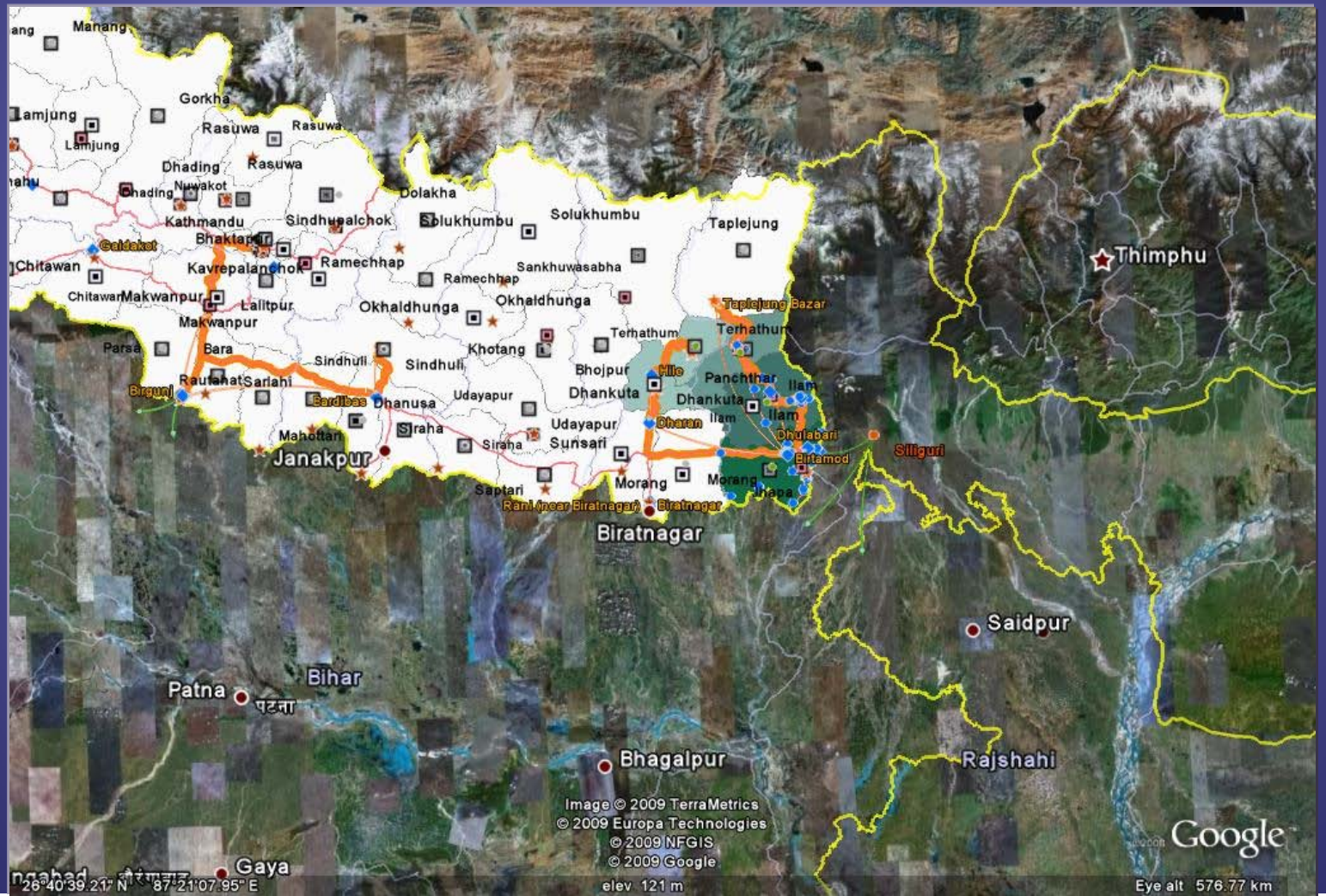
- ***Discover the underlying principles and processes of complex service systems***
- ***Systematically create, scale and improve systems***
- ***Adopt and apply foundations laid by existing disciplines***
- ***Progress in academic studies and practical tools***
- ***Fill gaps in knowledge and skills***

Adapted from "Succeeding through Service Innovation" Whitepaper: A Framework for Progress
(http://www.ifm.eng.cam.ac.uk/ssme/)

How Disaster Management Systems Research Differs from Traditional, Market-based Service Systems Research

- Concept of ***value*** is not negotiated between a provider and customer
- Metrics for ***success*** are not provided by the market place
- Infrastructure assumptions (e.g. predictability of power, transportation and communications) are not valid

There are great tools for visualizing complex interdependencies in support of collaborative decision making, but we need to start with content and how it will be used by the community of practice



Complex Service Communities

- Multiple Stakeholders
- Multiple Missions
- Multiple Jurisdictions
- Multiple Business Processes
- Multiple Systems
- Multiple Terminologies
- Multiple Cultures

It is difficult to fully understand the processes that a community of stakeholders employs to create and deliver service, but mapping and analyzing these processes is a prerequisite to improving them.

PARVAC, Haselkorn, 2008

Some Issues in Service Process Improvement

- Transparency
  - Operational Analysis
  - Mapping of how decisions are made
  - Leadership tools
- Awareness, Analysis, Decision Making, Coordination
  - Visual Analytics
  - Collaborative Decision Making
  - Operational tools
- Economic interdependencies/Business Continuity
  - Analysis of economic value chains
  - Tools for analyzing impacts on environments

Transparency

Information transparency breeds self-correcting behavior.

-- Admiral Thad W. Allen

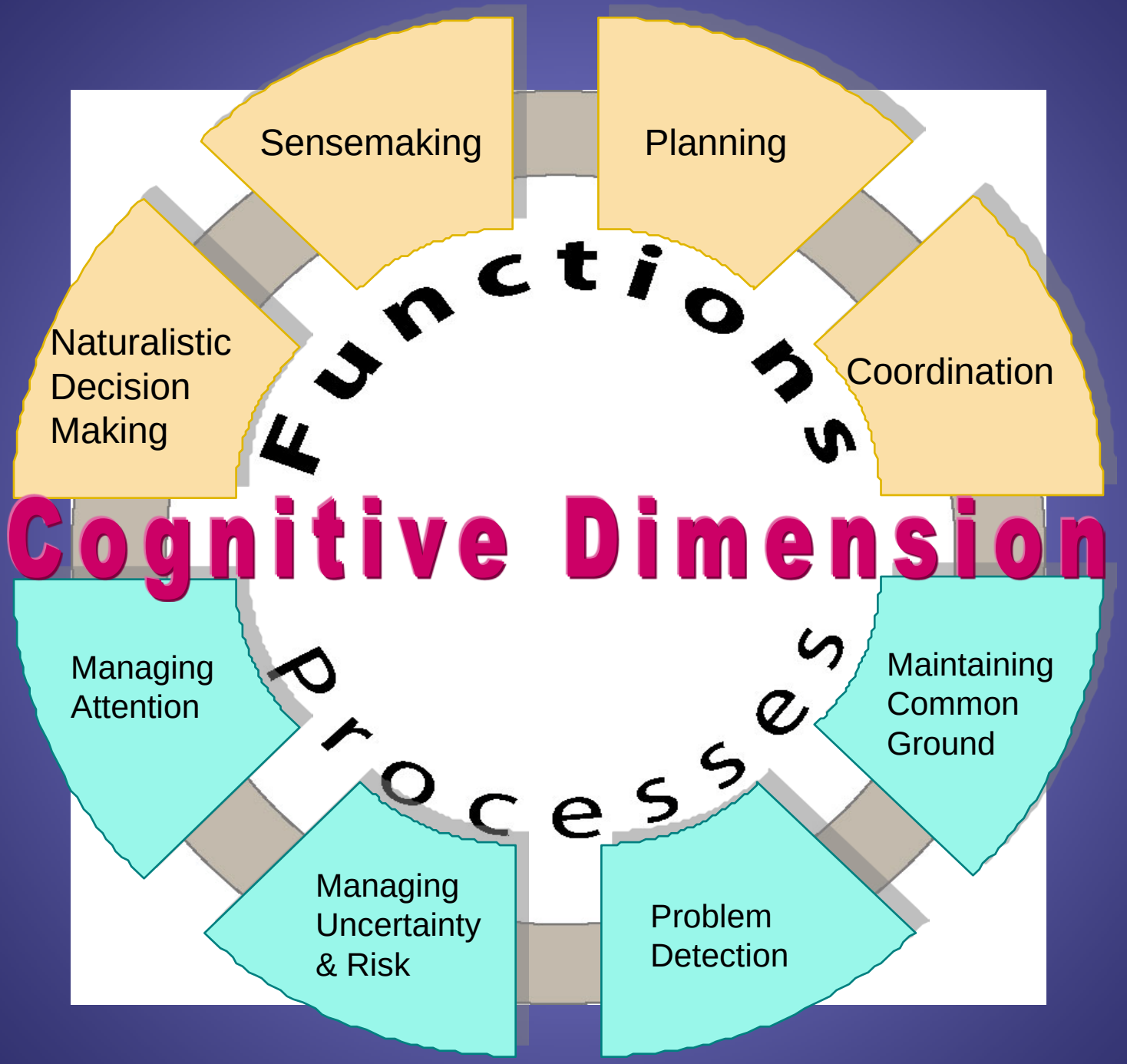
External/Intentional versus Internal/Systemic

Intentional		**Unintentional**
Originates outside system	⟷	Systemic
Generally understood	⟷	Lack basic understanding
Responsibility clear	⟷	Responsibility part of the problem
Adversarial	⟷	Interdependent
Goal to deter	⟷	Goal to coordinate
Outside threat to functionality	⟷	An aspect (price) of functionality

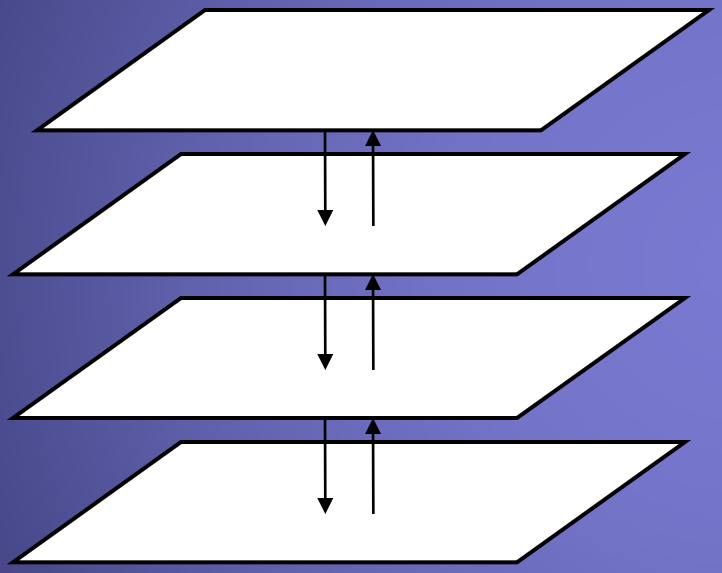
PARVAC, Haselkorn, 2008

Visual Analytics, Collaborative Decision Making and Communication

- identify critical information
- analyze it
- decide on a course of action
- act in a coordinated fashion.


Sensemaking
Planning
Naturalistic Decision Making
Coordination
Functions
Cognitive Dimension
Processes
Managing Attention
Maintaining Common Ground
Managing Uncertainty & Risk
Problem Detection

Layered Model of Agency Processes



Organizational Infrastructure

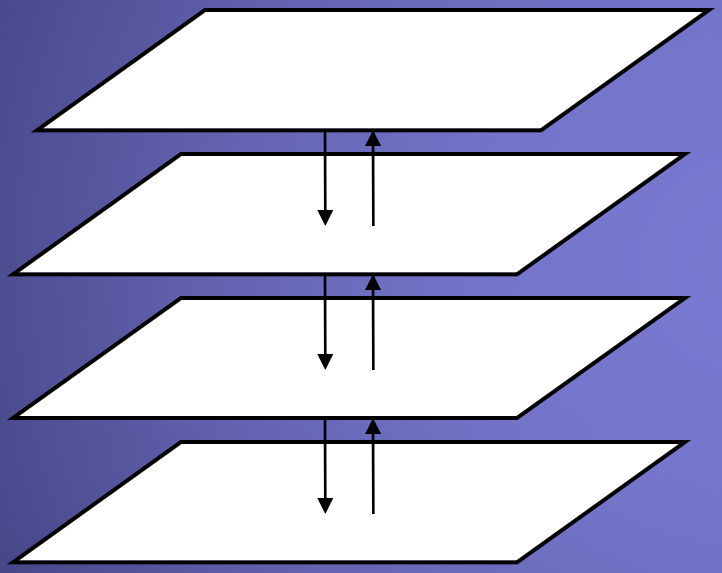
Business Processes

Data

Technology Infrastructure
- Service Oriented Architecture

Layered Model of Regional Processes

Focus on Key Decisions with Regional Economic and Service Impacts



Organizational Decision Makers

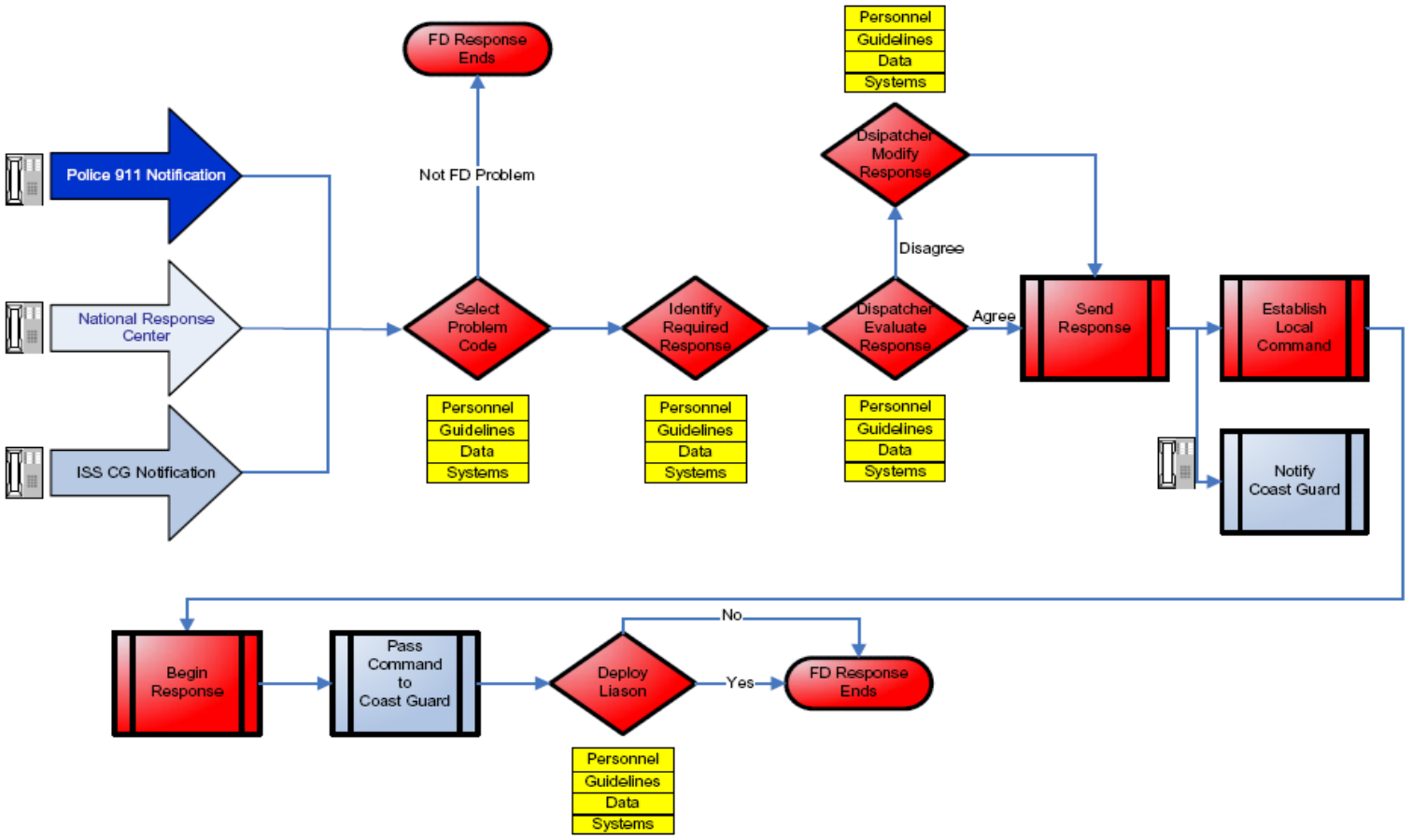
Business Processes

Data

Technology Infrastructure
- Service Oriented Architecture

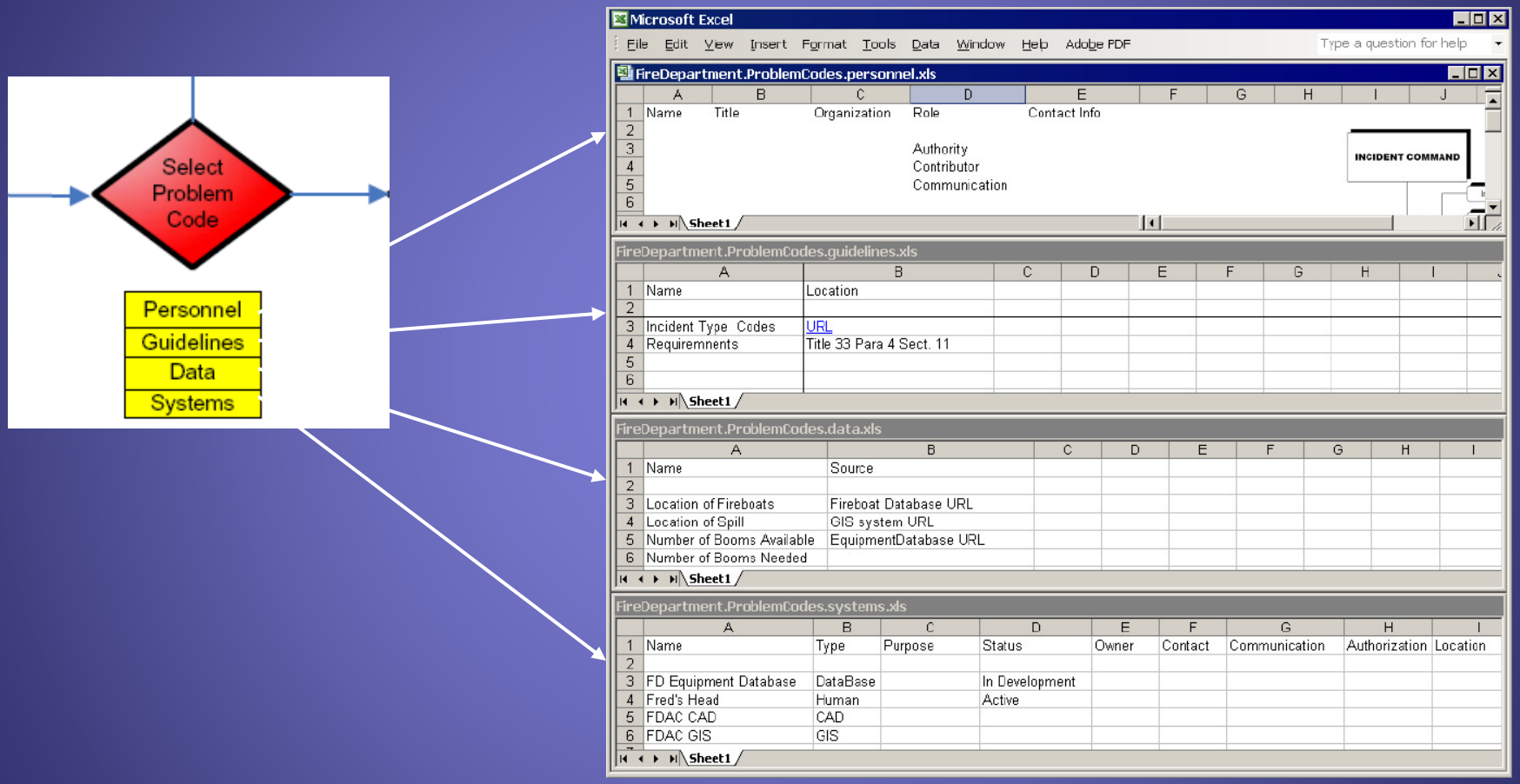
Add Economic Interdependencies Layer

Service System: One View
Processes that describe service delivery

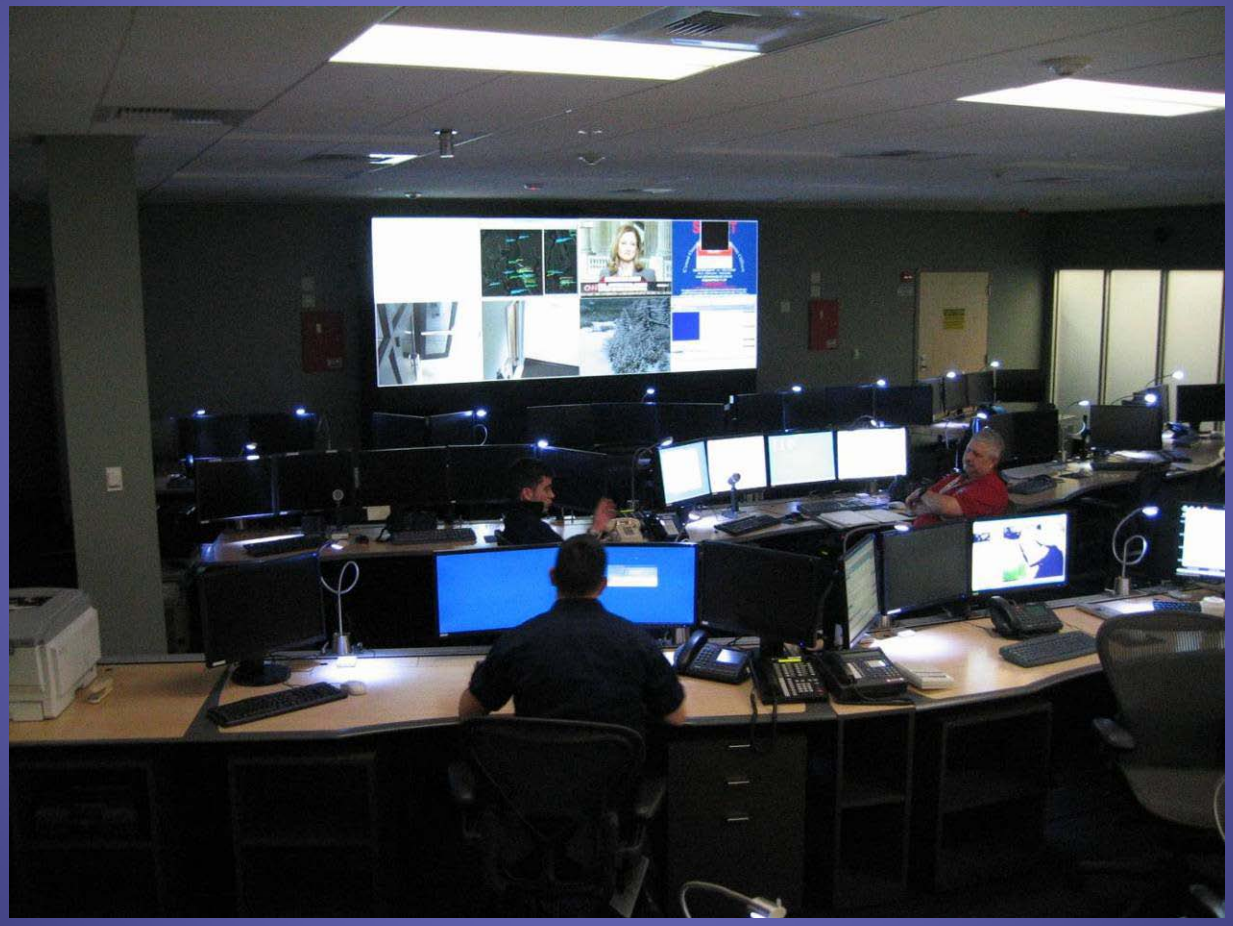


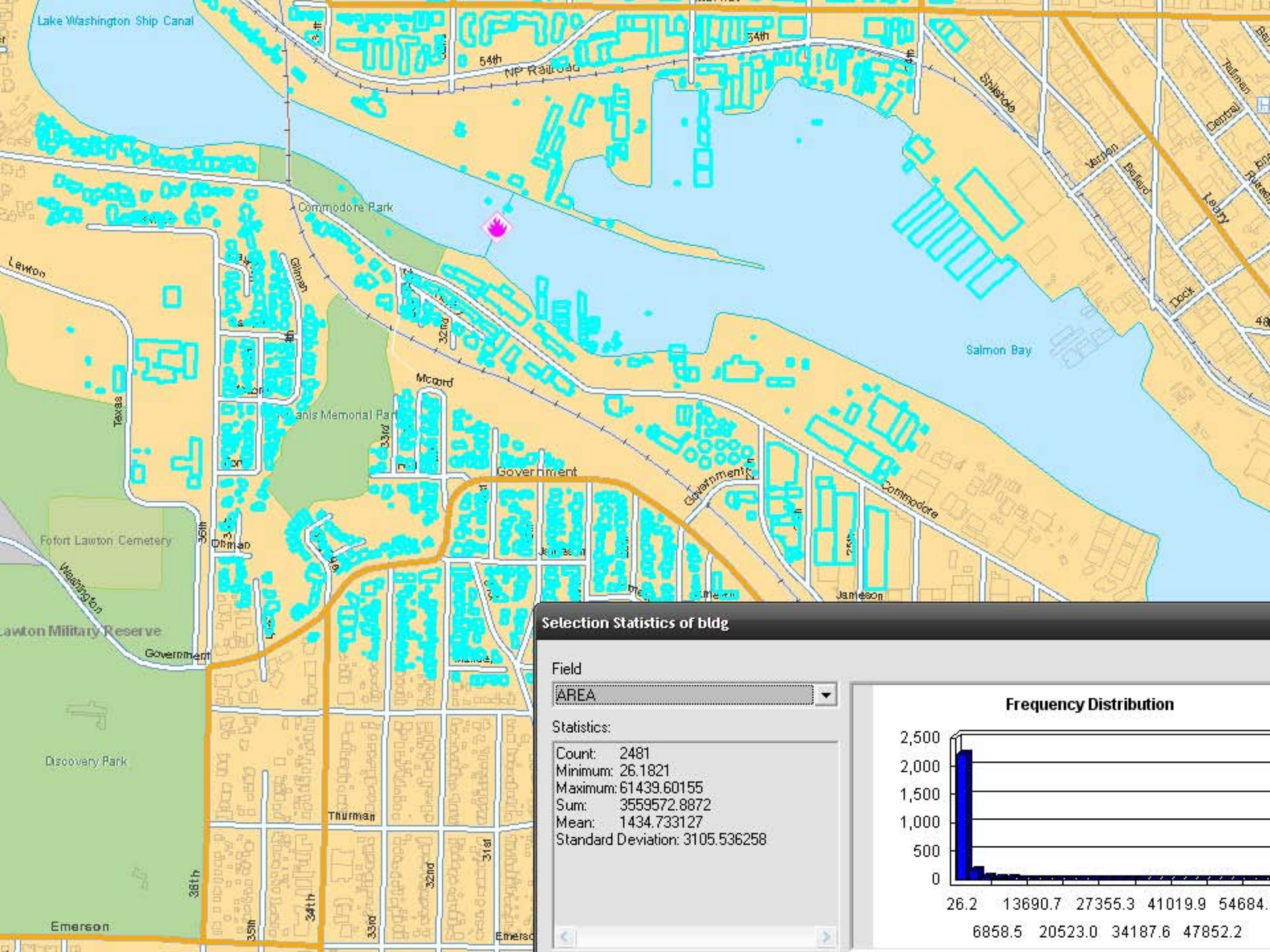
Seattle Fire Alarm Center Oil Spill Decision Process

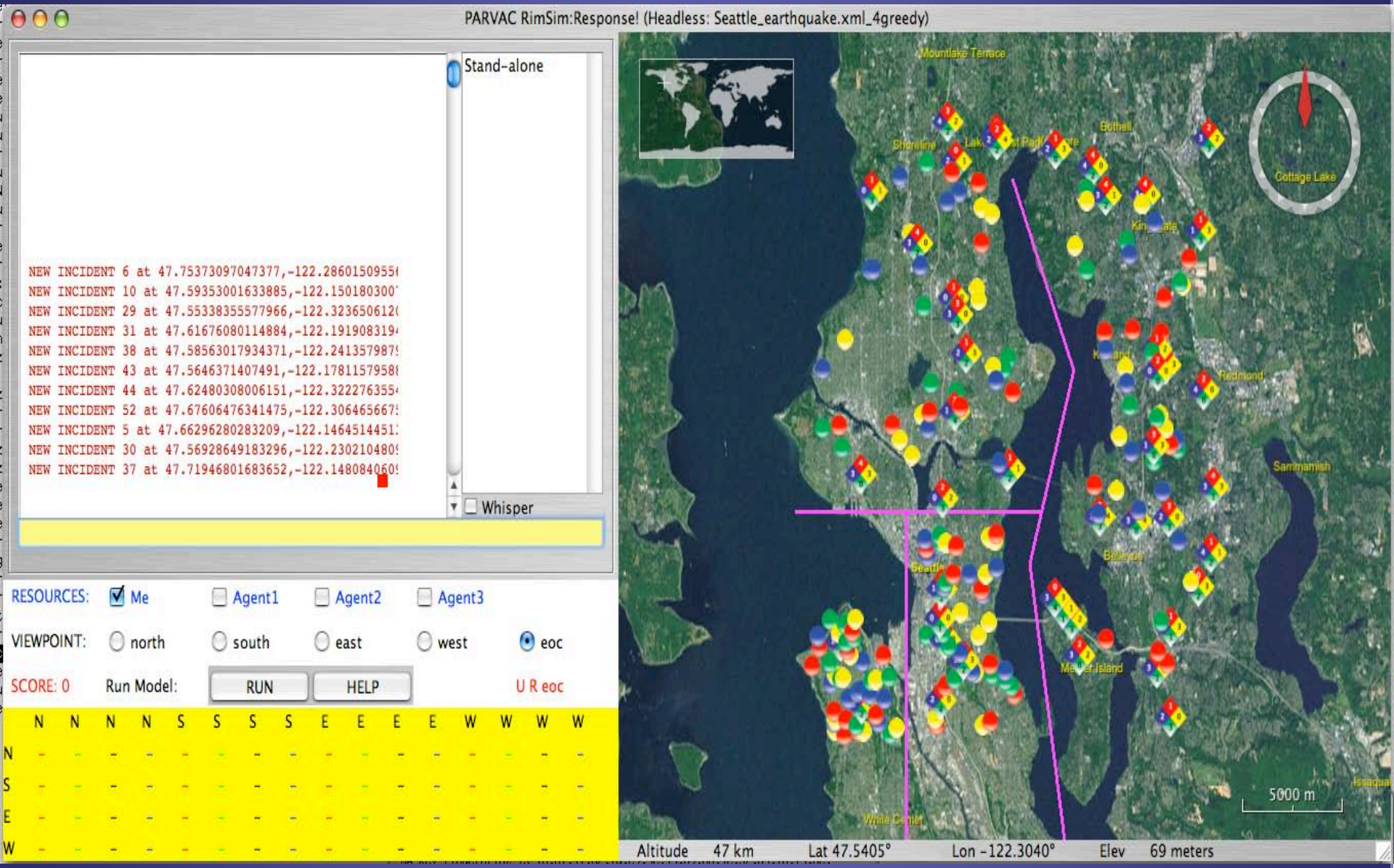
Decision Drilldown



Information and Communication




Lake Washington Ship Canal
54th
NP Railroad
Commodore Park
Salmon Bay
Government
Fort Lawton Cemetery
Lawton Military Reserve
Discovery Park
Thurman
Emerson
Selection Statistics of bldg
Field
AREA
Statistics:
Count: 2481
Minimum: 26.1821
Maximum: 61439.60155
Sum: 3559572.8872
Mean: 1434.733127
Standard Deviation: 3105.536258
Frequency Distribution
2,500
2,000
1,500
1,000
500
0
26.2
6858.5
13690.7
20523.0
27355.3
34187.6
41019.9
47852.2
54684.


PARVAC RimSim:Response! (Headless: Seattle_earthquake.xml_4greedy)
Stand-alone
NEW INCIDENT 6 at 47.75373097047377,-122.2860150955
NEW INCIDENT 10 at 47.59353001633885,-122.150180300
NEW INCIDENT 29 at 47.55338355577966,-122.323650612
NEW INCIDENT 31 at 47.61676080114884,-122.191908319
NEW INCIDENT 38 at 47.58563017934371,-122.241357987
NEW INCIDENT 43 at 47.5646371407491,-122.1781157958
NEW INCIDENT 44 at 47.62480308006151,-122.322276355
NEW INCIDENT 52 at 47.67606476341475,-122.306465667
NEW INCIDENT 5 at 47.66296280283209,-122.1464514451
NEW INCIDENT 30 at 47.56928649183296,-122.230210480
NEW INCIDENT 37 at 47.71946801683652,-122.148084060
Whisper
RESOURCES: Me Agent1 Agent2 Agent3
VIEWPOINT: north south east west eoc
SCORE: 0 Run Model: RUN HELP U R eoc
N N N N S S S S E E E E W W W W
N
S
E
W
Mountlake Terrace
Bothell
Cottage Lake
Redmond
Sammamish
Seattle
Bellevue
Mercer Island
White Center
5000 m
Altitude 47 km Lat 47.5405° Lon -122.3040° Elev 69 meters