The Mirror – CI Reference Architecture for Operational Traceability and Intelligence

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Partnership for Performance

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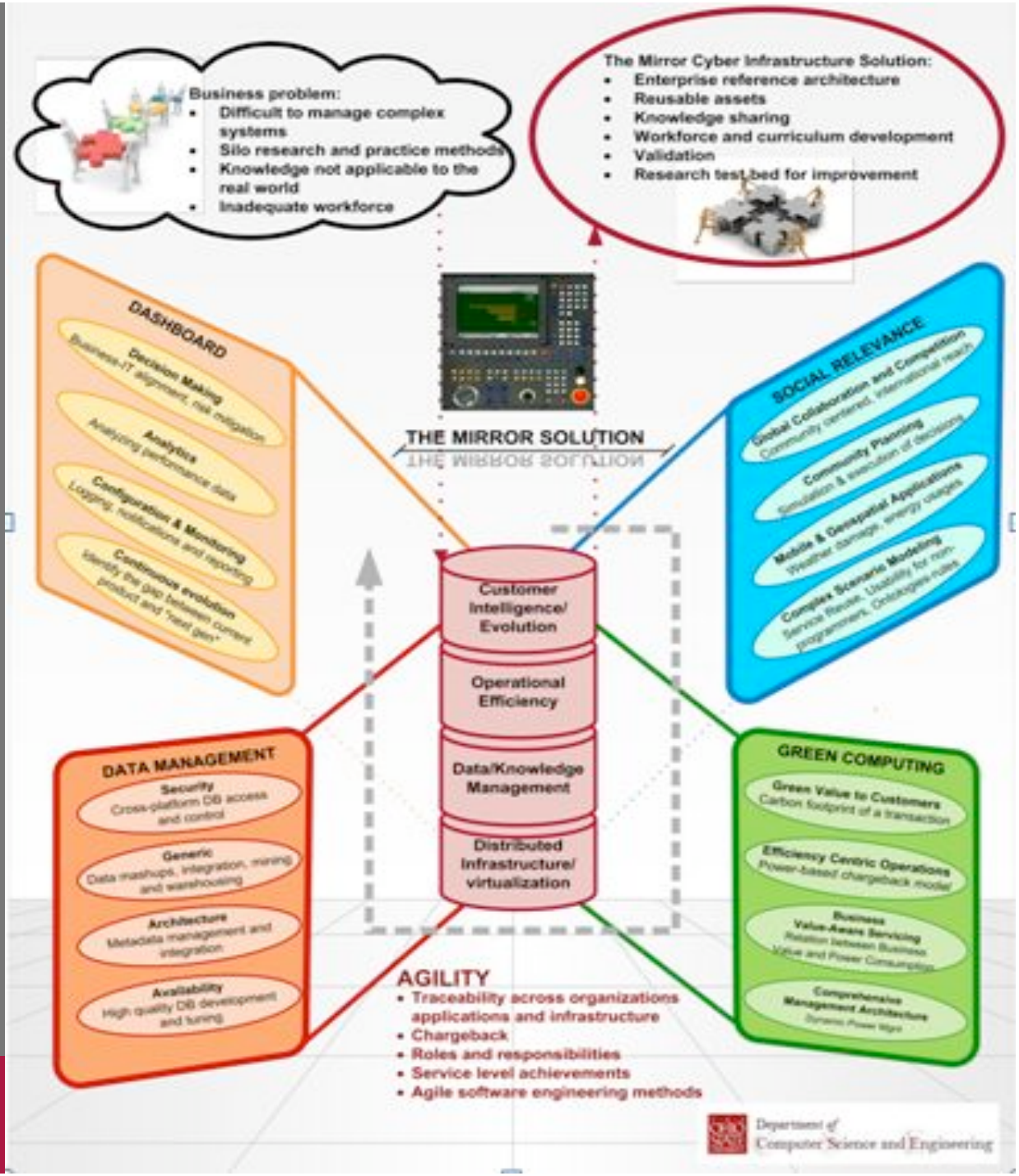
Research Overview

- **Program of Research, The Mirror Cyber Infrastructure and Reference Architecture**
- **A major industry challenge**
  - Service variation
  - Associating Performance across Service layers
- **Adaptive Complex Enterprise (ACE)**
- **Interaction modeling**
  - A conceptual view for analysis
- **Complexity thinking, uniqueness**
  - Applications, Benefits to Industry

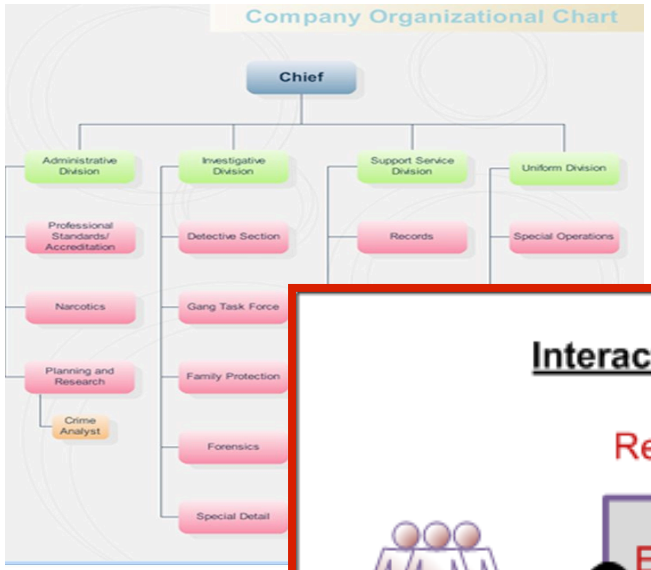
The Mirror:

CI Reference Architecture

- *Dashboards*
- *Federate Data Management*
- *Green Computing*
- *Social Relevance*

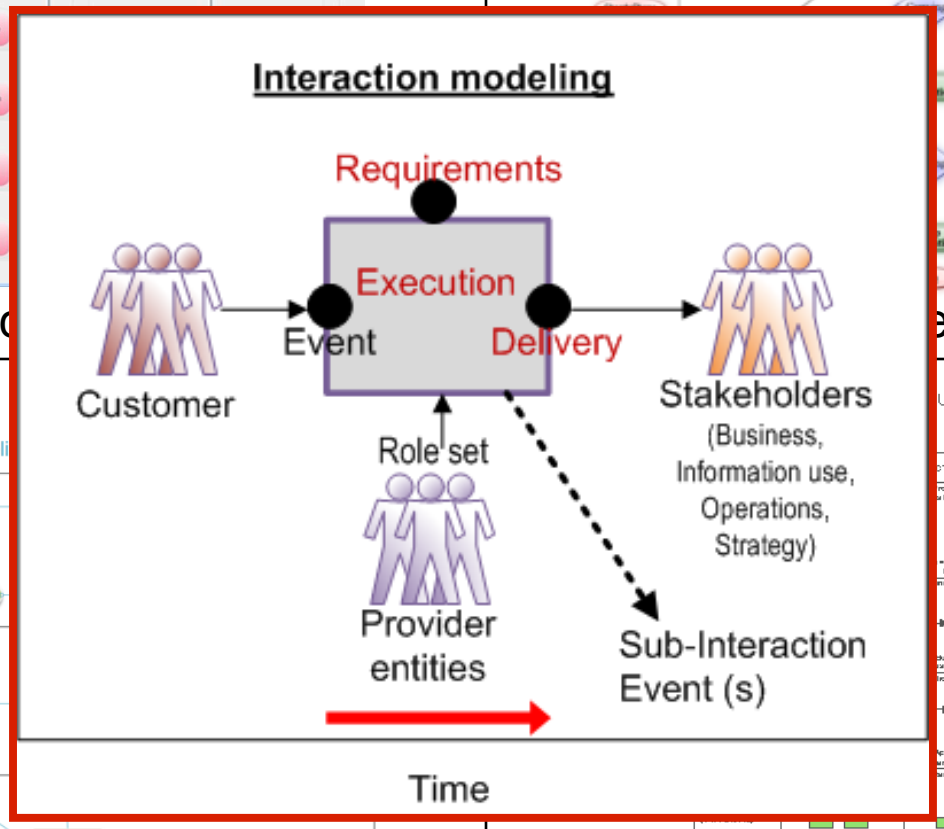


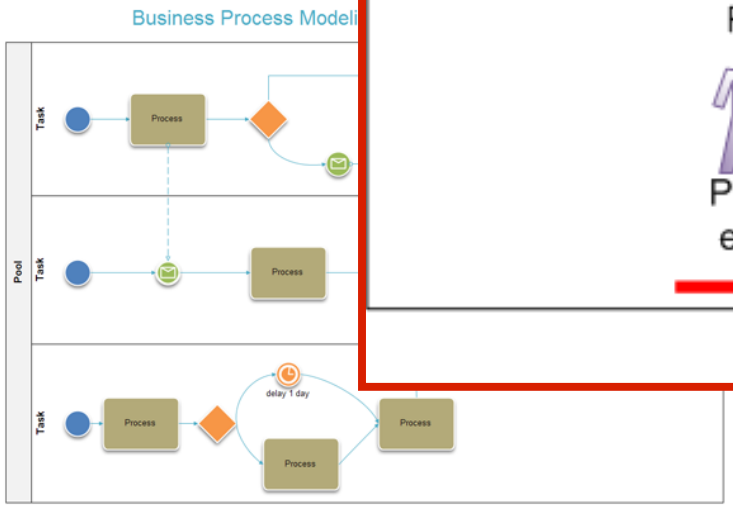
IBM Equipment and Faculty Grants



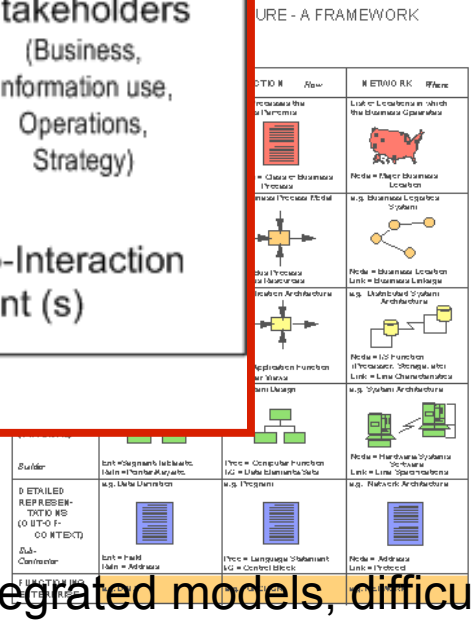
Shared resourc

erent meanings?





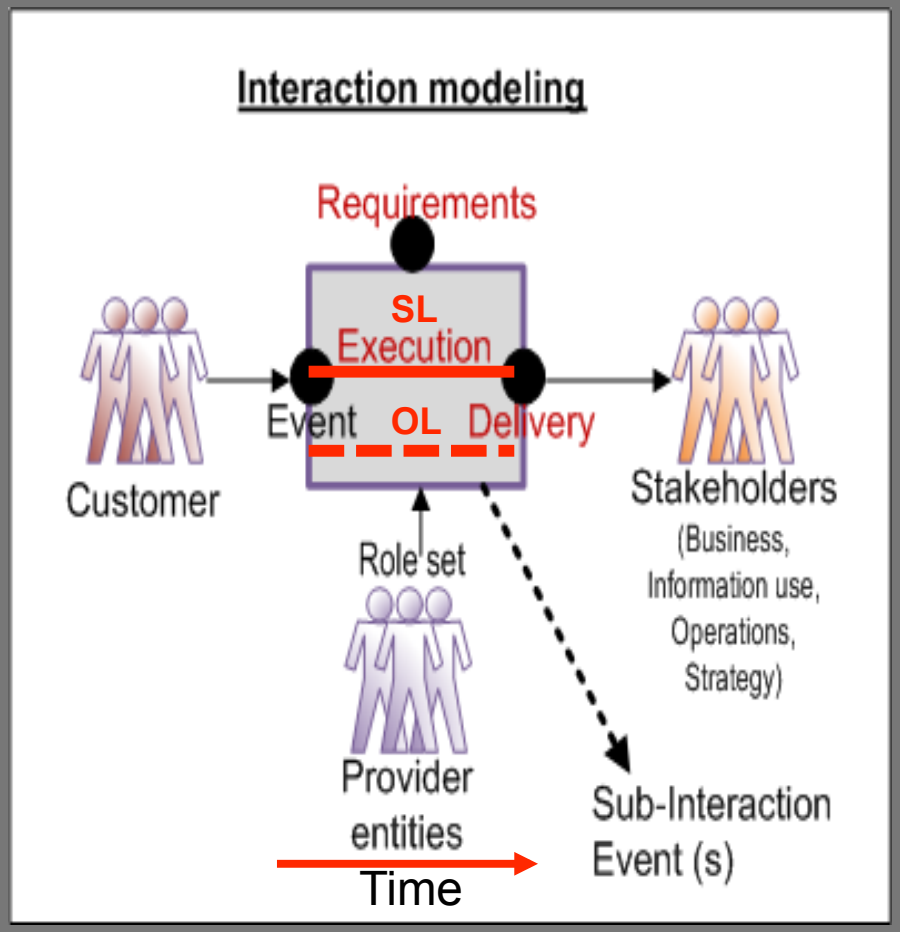
Static processes, dealing with variation?



Un-integrated models, difficult for decision making?

Interaction modeling - Closer Look

Interaction

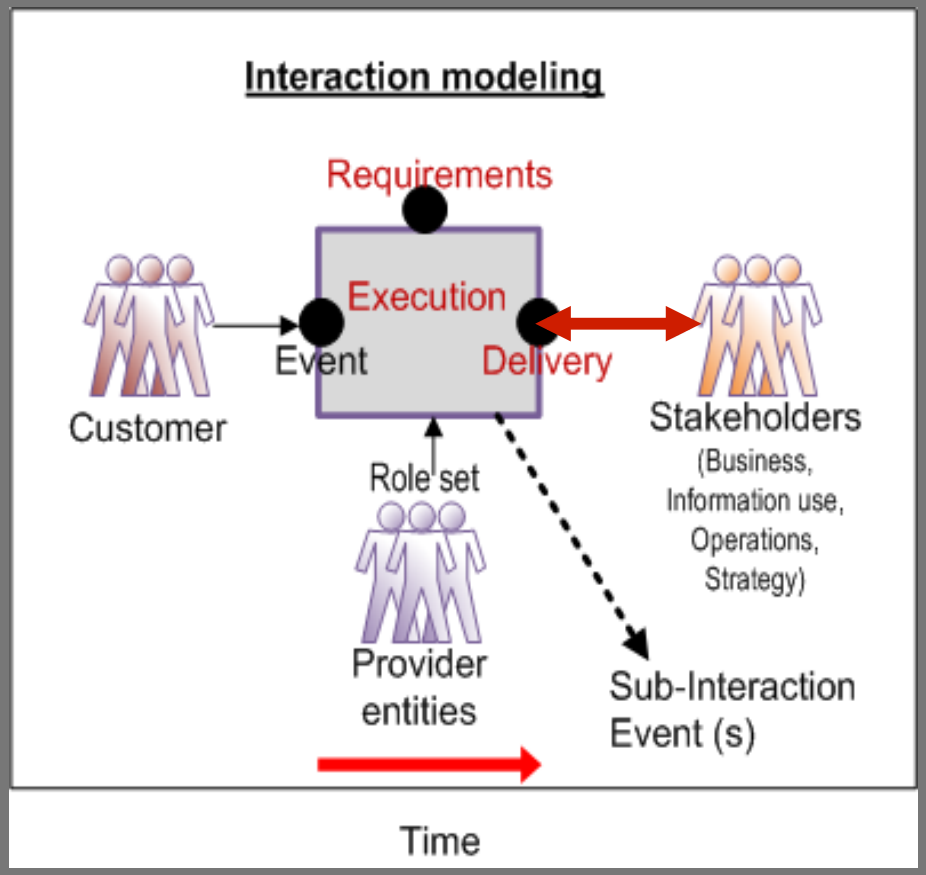


Concepts

- **Micro-economic transactions, value created**
- **Event – incident, purchase request, patient arrival, failure, etc.**
- **Service level (SL)**
  - Customer's view - RED milestones
  - Response time – event arrival to delivery
- **Operating level (OL)**
  - Provider's view
  - Resource/ entities availability for execution
- **Facets: Why, Who, When, Where (GIS, GPS), How, What.**
- **Some details**
  - Entities (assets, agents, humans) provide services, resources,
    - Ignore entity details (processes, data, reporting hierarchies)
  - Role set can be assigned entities dynamically,
  - Different associations between interactions and sub-interactions,

Interaction and Operational Performance

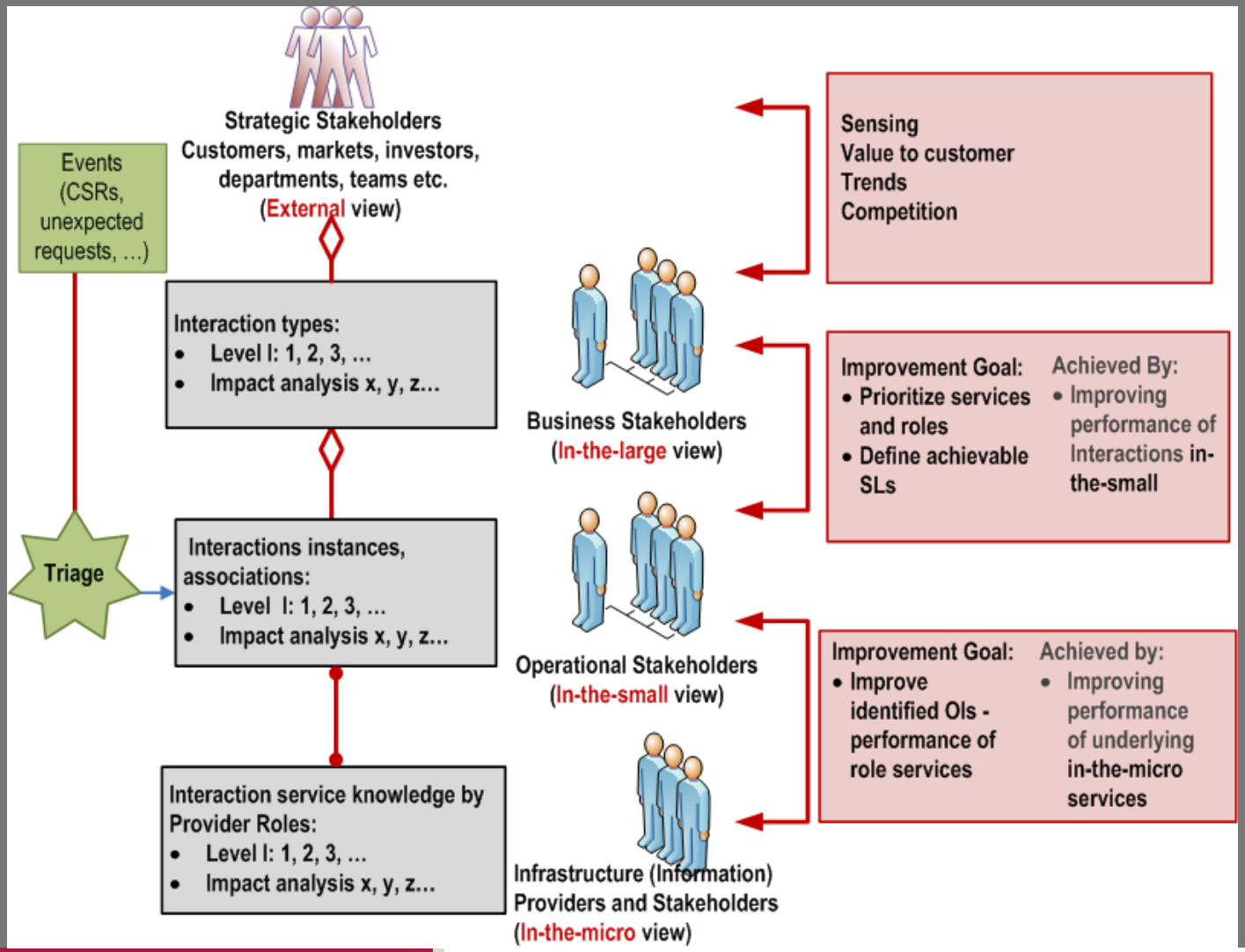
Interaction



…and Operational Traceability for Stakeholders

- ⇔Business: investment ($), priority, roi
- ⇔IT/ infrastructure: entities capacity used for each non-routine type (time)
- ⇔Operational: throughput (shared resources), quality
- ⇔Strategy: value/ requirements met, growth

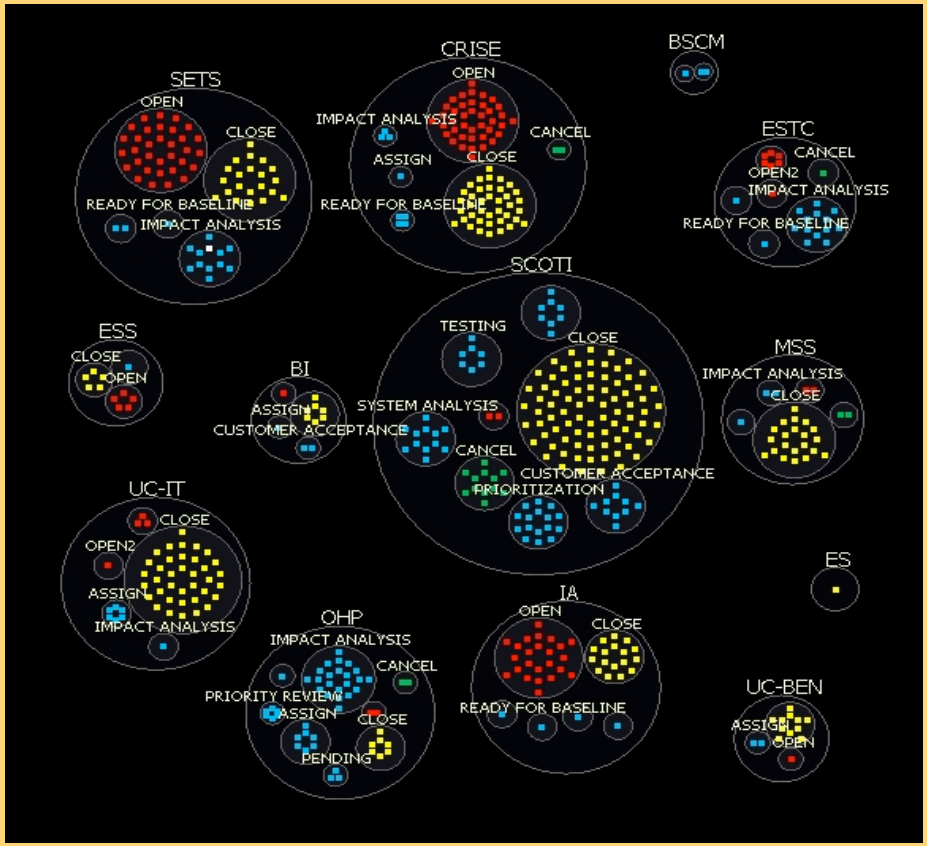
Adaptive Complex Enterprise (ACE) – Operational Traceability for Stakeholders

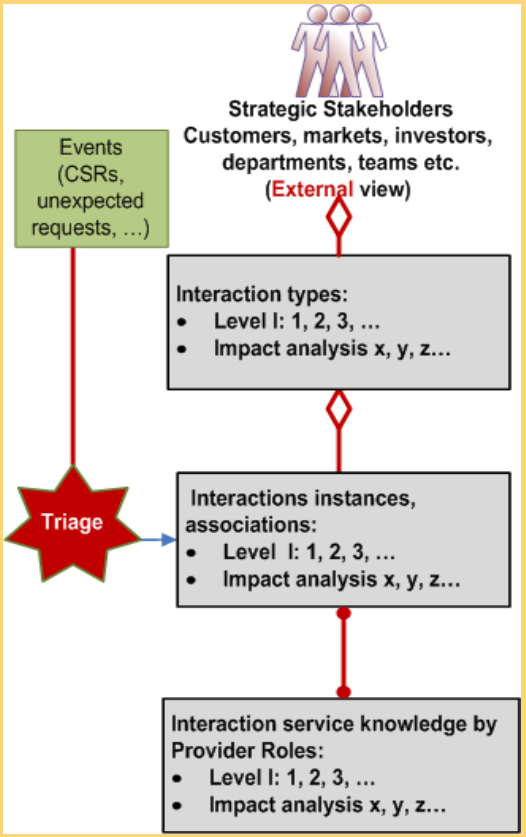


Note Triage is the ‘broker’ pattern

ACE In-the-large : What has the maximum potential for SL improvement?

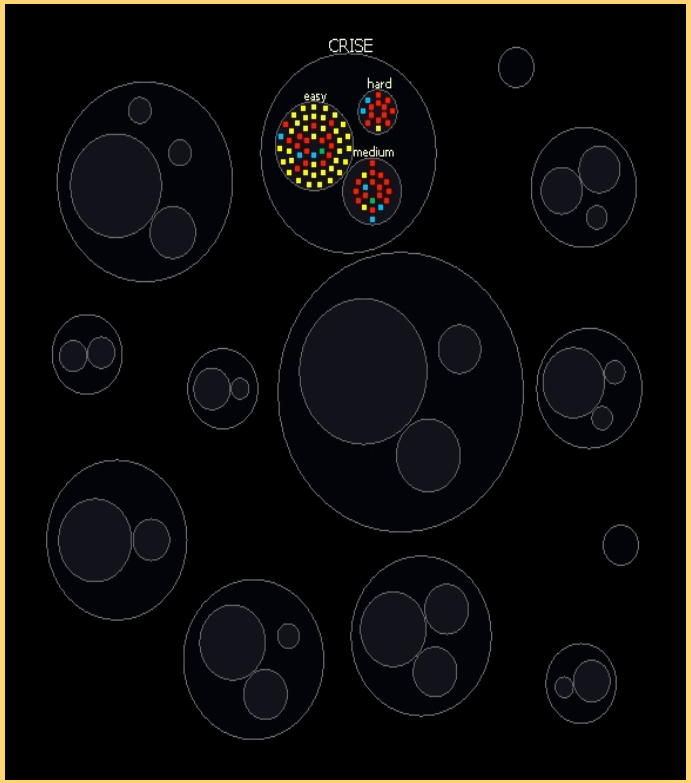
In-the-large comparison with peers

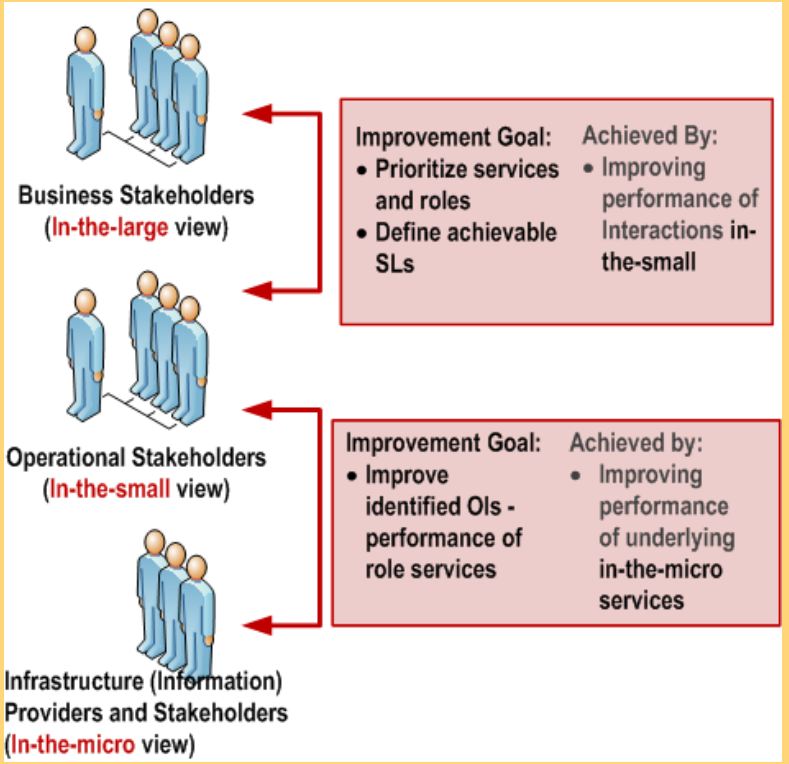


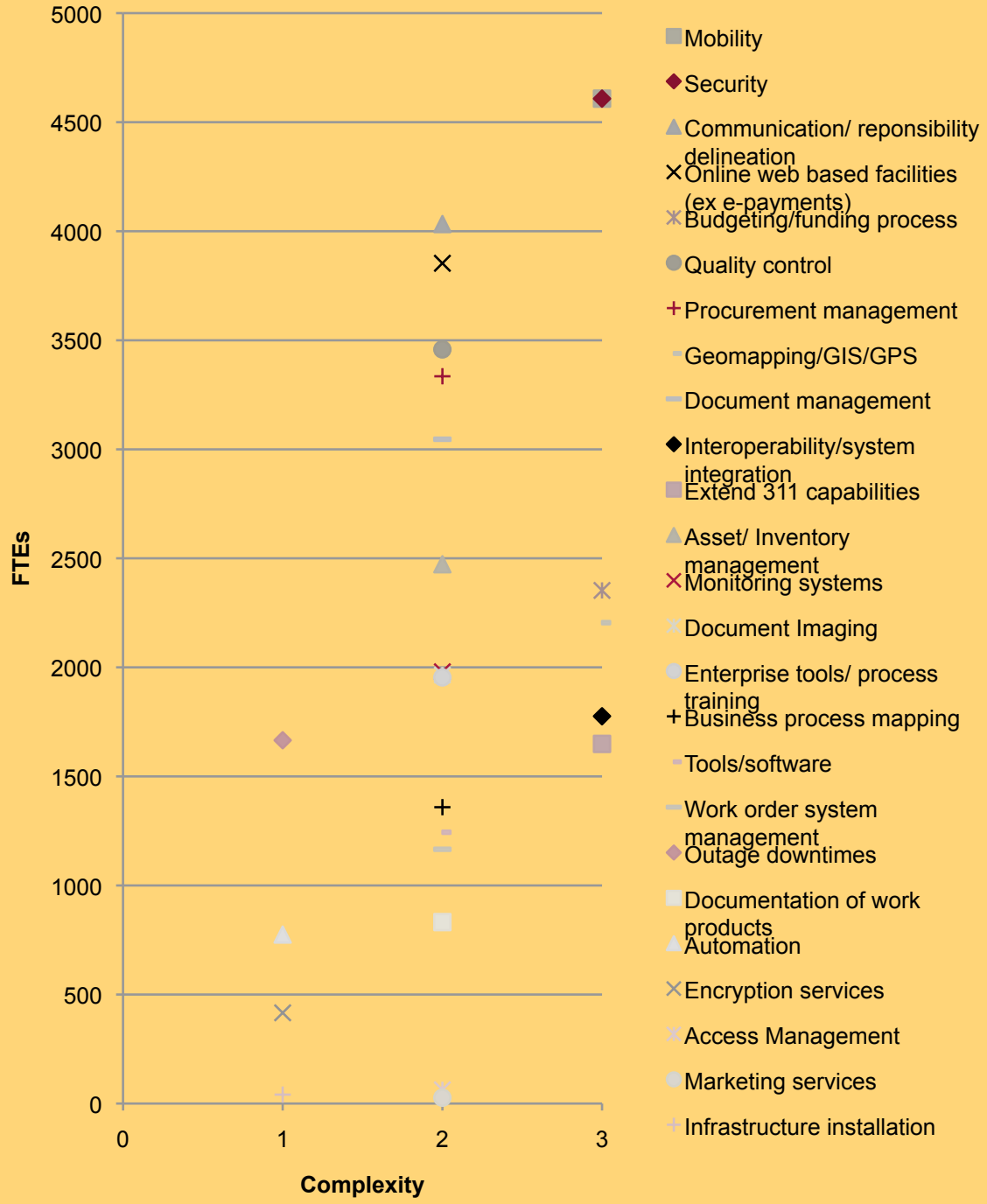


ACE In-the-micro – What do the resources think?

Many hard ones are open! Re-assign skilled resources?
Bargaining power of competing strategic needs?






5000
4500
4000
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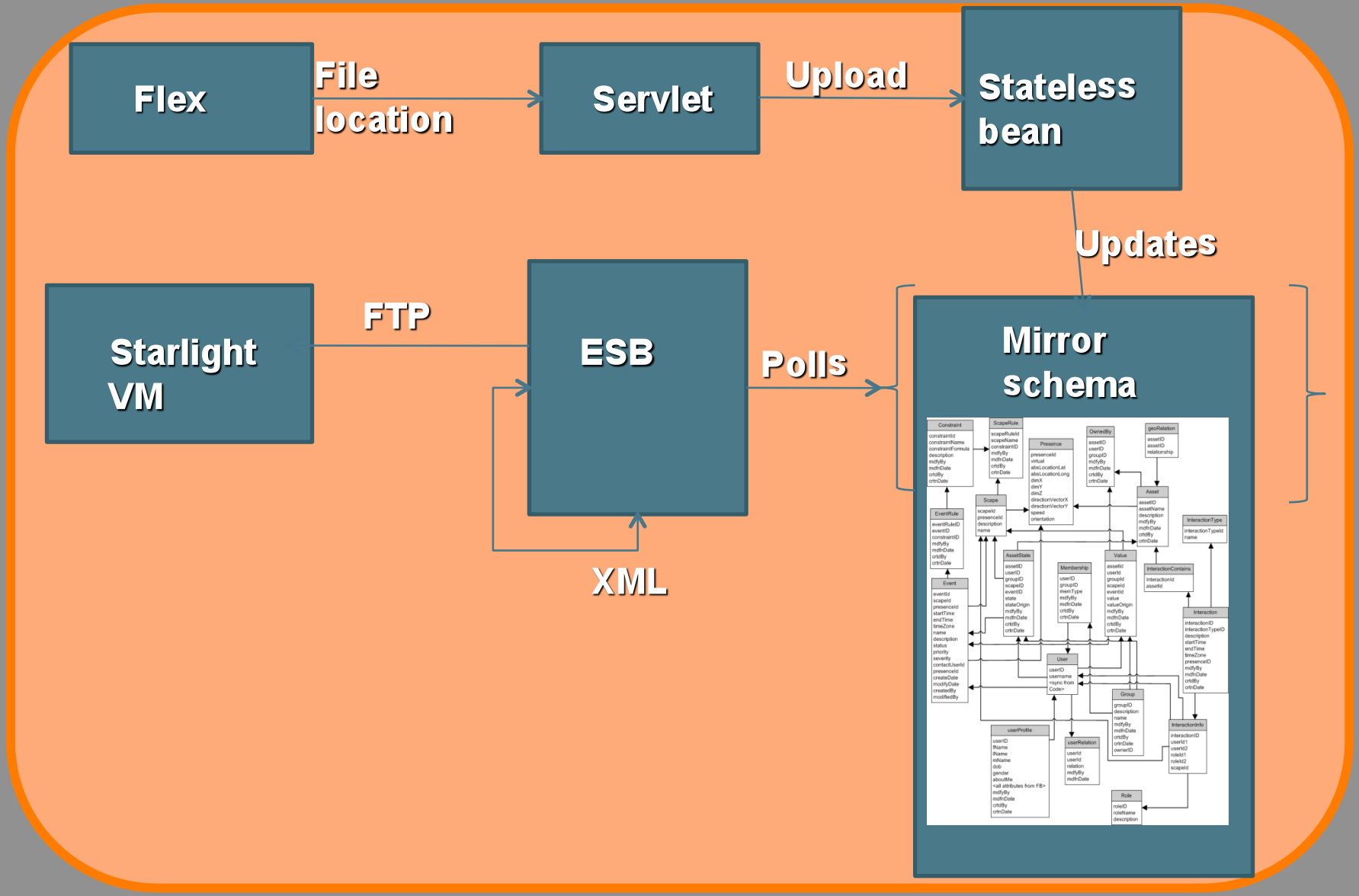
2500
2000
1500
1000
500
0
FTEs
0
1
2
3
Complexity
Mobility
Security
Communication/ reponsibility delineation
Online web based facilities (ex e-payments)
Budgeting/funding process
Quality control
Procurement management
Geomapping/GIS/GPS
Document management
Interoperability/system integration
Extend 311 capabilities
Asset/ Inventory management
Monitoring systems
Document Imaging
Enterprise tools/ process training
Business process mapping
Tools/software
Work order system management
Outage downtimes
Documentation of work products
Automation
Encryption services
Access Management
Marketing services
Infrastructure installation

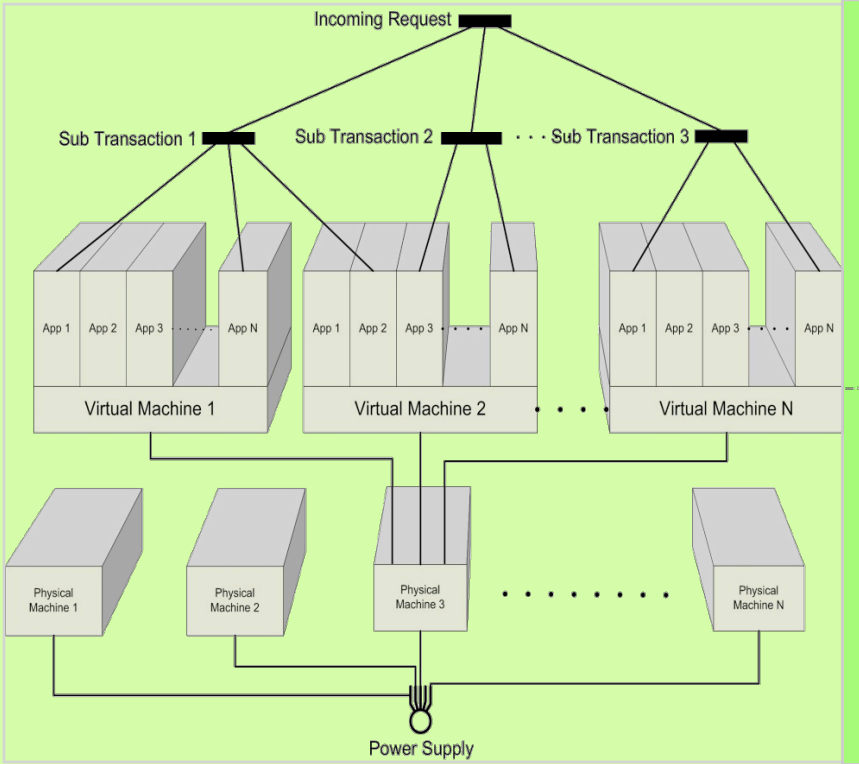
Mirror Example: Dashboard Architecture

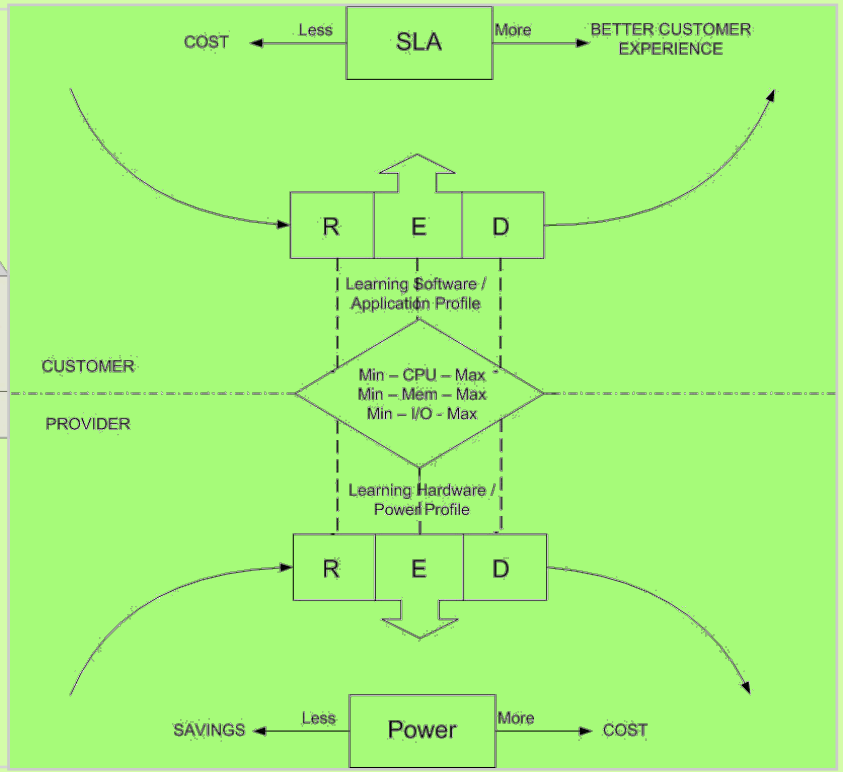


Framework for Green Computing

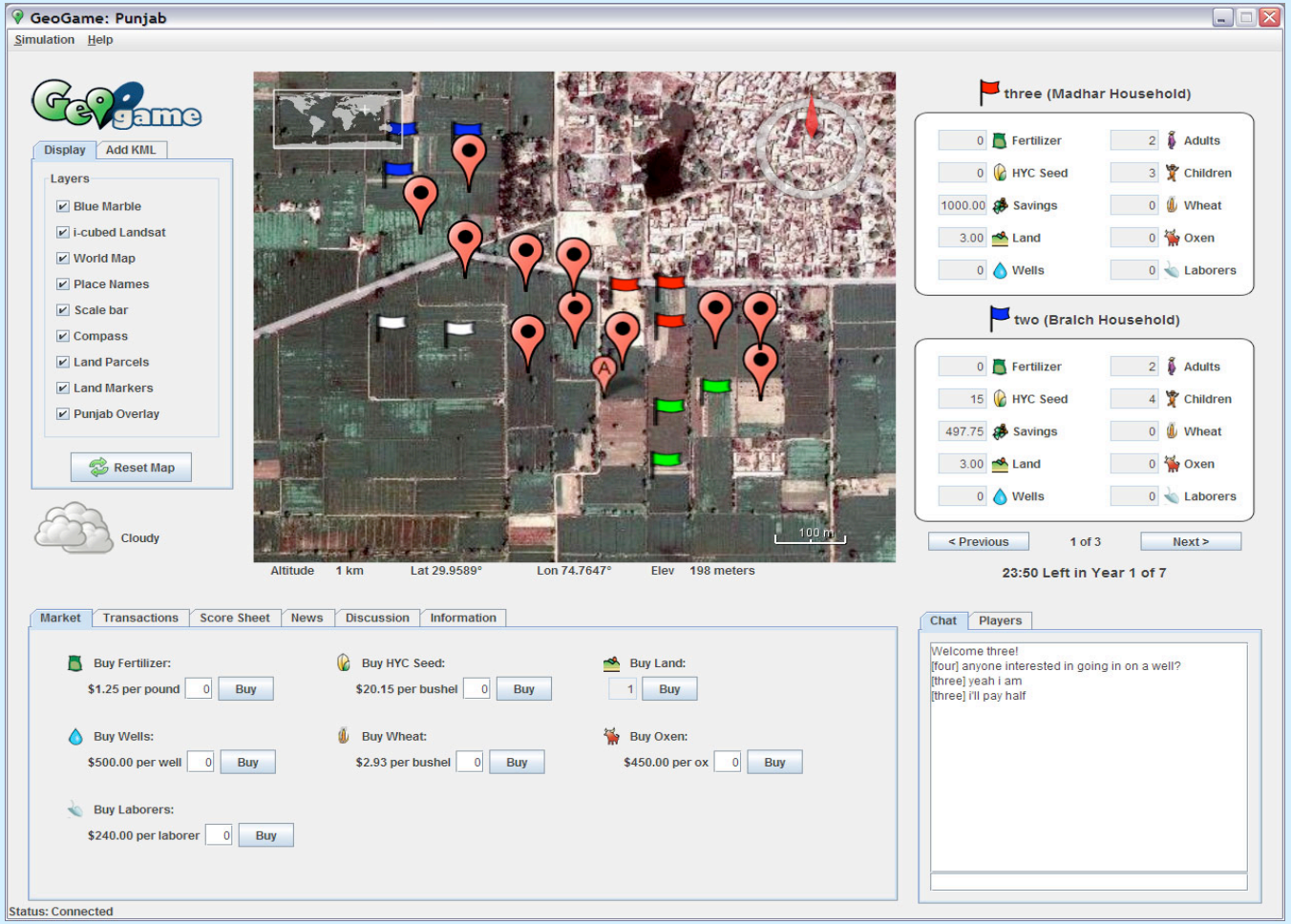
Nationwide
On Your Side

Stakeholders
(Business, Information use, Operations, Strategy)





Serious Gaming Interactions

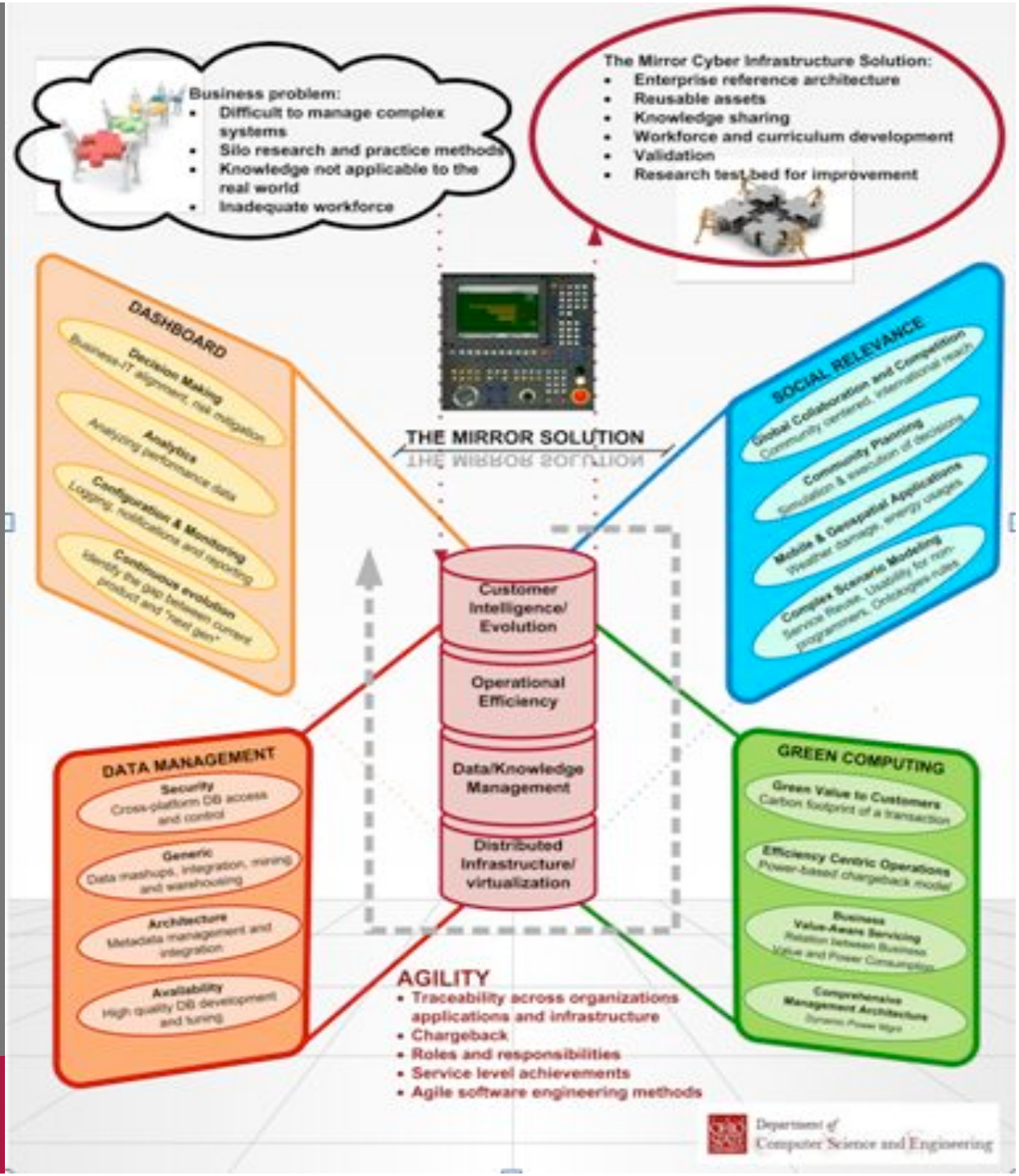


OSU Department of Geography

The Mirror : CI
Reference Architecture

Community collaboration to identify sustainable actions:

- ***Gaming: explores different scenarios in-the-small interactions***
- ***Simulation focuses on the rules, consequences due to interactions***
- ***Planning looks at the impact of policy, often reflected as a change that govern future executions, and finally,***
- ***Execution of policy influences the real-world entities leading to new data integrated with existing data***



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What's new? Complexity Thinking!

Complexity Thinking in EA

- **Systems that exhibit complex behaviors are made of simple 'patterns'**
- **Dynamic, evolution based on context**
  - e.g. social media and participatory context
  - Life cycle modeling – creation, execution, evolution
- **Distributed execution**
  - Autonomous
  - Mobile devices, Sensors, Enterprise systems, …
- **Layers of virtualization (highly nested)**
  - shared resources and roles
- **Traceability information**
  - Continuous improvement
  - Software as a service implies chargeback

Contrast to Traditional Thinking

- **Software requirements fairly static and definable**
- **Known relationships between processes, roles, and data**
- **Software engineering methods focus on programming (creational) complexity**
- **Not as much on creational/ operational/ evolution**
- **Belief that evolution is predictable**

Questions?

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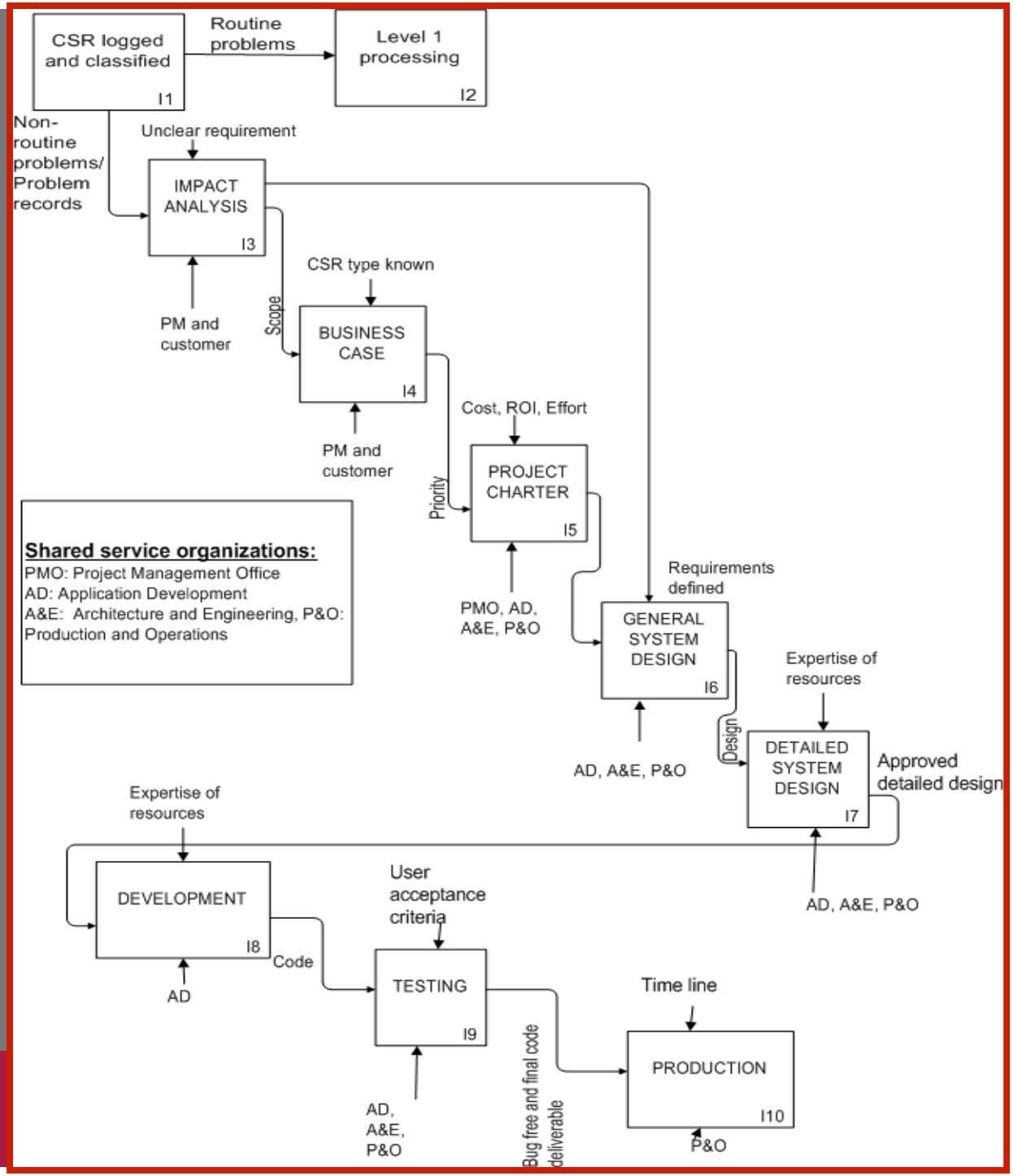
Interactions

- **Request events into routine and non routine**
- **Identify**
  - possible transactions
  - services and
  - events only
- **The models can be recursive**



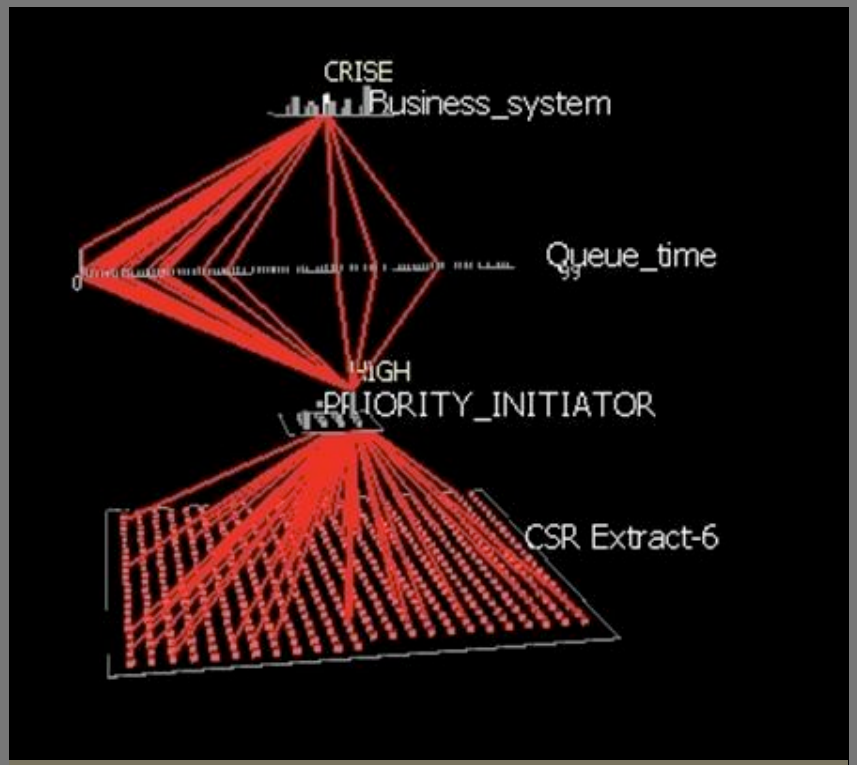
Customer Service Request (CSR)

- CUSTOMER OFFICE: ABC
- CREATE_DATE: 1/15/2009 10:48
- DOC_ID: CRISE_CSR_4530
- PRIORITY_INITIATOR: HIGH
- STATUS: CLOSE
- BUSINESS SYSTEM: CRISE
- TYPE: code change
- ACTION_DATE: 1/31/2009 16:50
- TITLE: Remove Obsolete COBOL Run Time Libraries From Procs
- SERVICE NEEDED: Remove dataset SDC.VS31.COB2LIB from the load library concatenations in procs.

- 300 employees,
- Initially 1600 processes
- Dynamic sub Interactions
- Shared IT resources can play many Roles
- Resources services implemented by humans, automated, ….
- Resources empowered to apply their own processes
- Distributed, off-line
- Many on-going executions of interactions
- TRIAGE to staple resources to meet requirements
- CSR Data Records - about 600

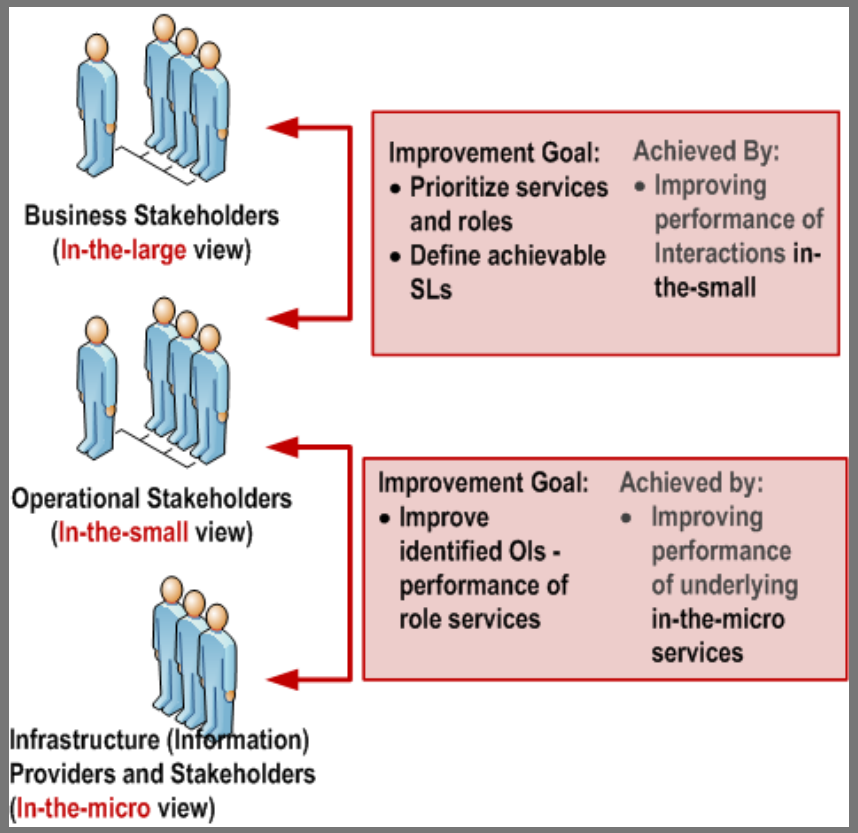
Example: Ohio Department of Health and Family Services

In-the-small : Achievable Response Times for CRISE?



In-the-small comparison with

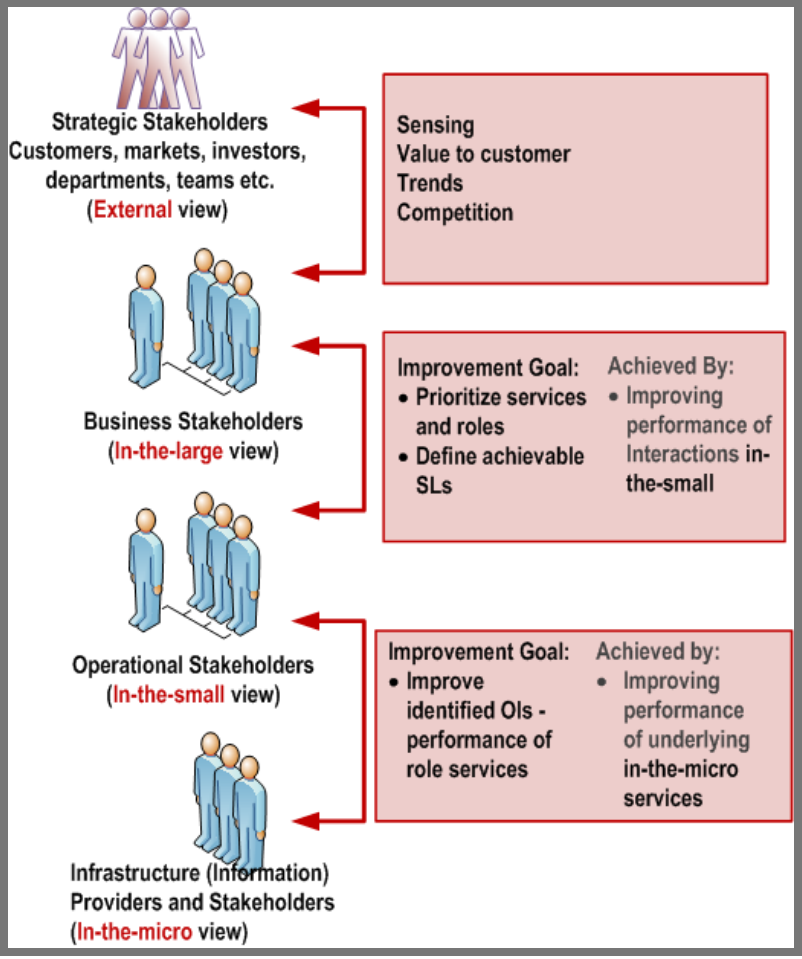
pe Deviation from norm



Managing the Adaptive Complex Enterprise

Sense-and-Respond, Continuous Improvement, Predictive using Operational Traceability…

- **Strategic value**
  - Emerging sensing mechanisms – social media, face book, opinion mining, etc.
- **In-the-large comparison with peers**
- **In-the-small performance monitoring**
- **In-the-micro feedback**
  - local empowerment,
  - Sensing, mobility, …
  - Information for bargaining power
    - what can we trade-off
    - who can we partner with



Strategic Planning of City DOT Services

- City – a most complex service organization
- We estimate sixteen city departments handle about two million requests annually with over 30% of them non-routine. It is also estimated, based on the most recent data, that overall, there are over 360 different types of requests with different needs for business process execution.
- Economic / revenue constraints
- How do we decide what Interactions to invest in?