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Perpetual Enterprise Management Service (PEMS) for C2 SOA Deployments

Presented by:

***Erik King, C4IT Business Unit
kinge@saic.com***

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Objectives

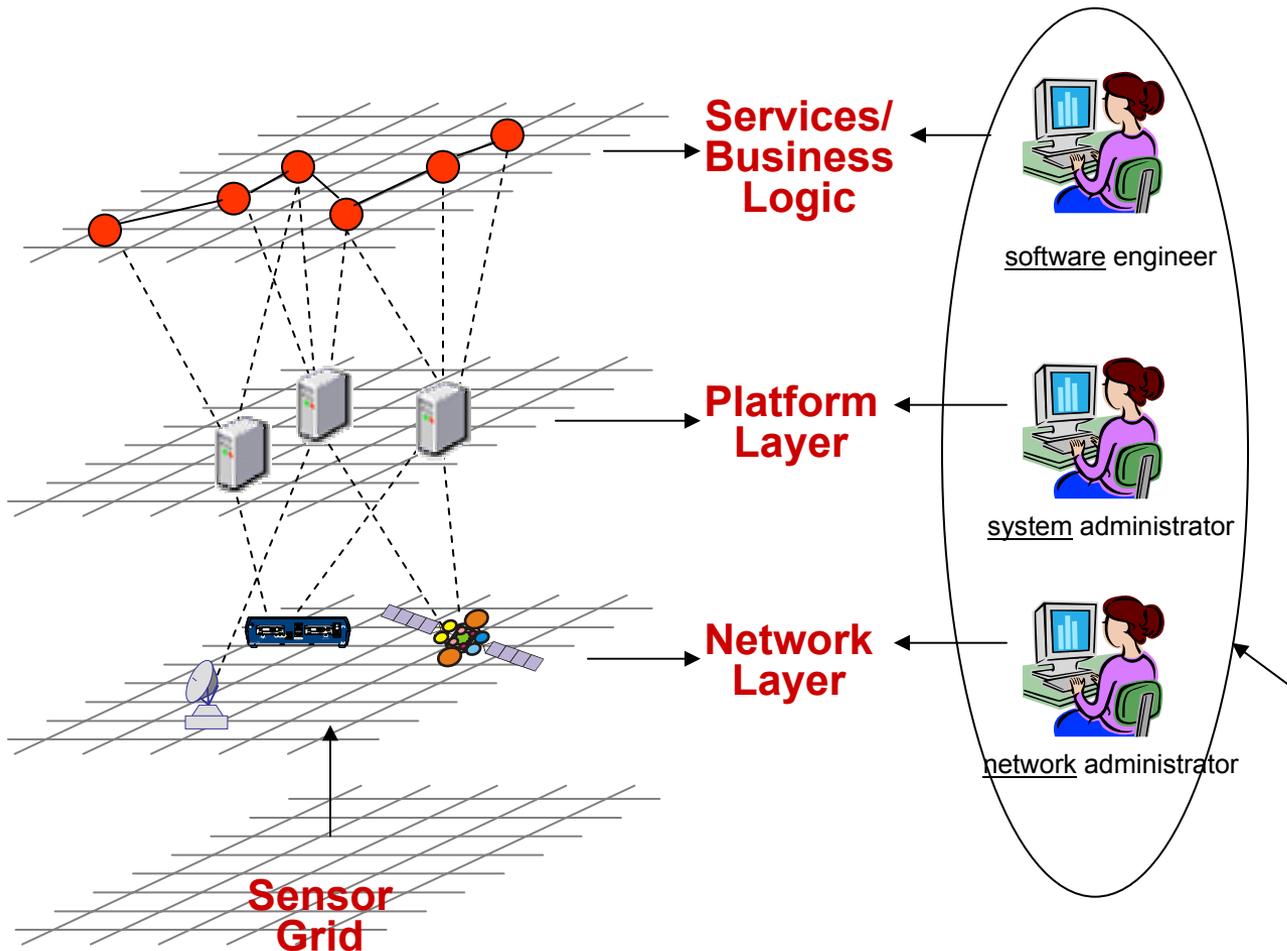
- Discussion of the DoD Problem Domain
- Perpetual Enterprise Management Service (PEMS) as a Potential Solution
 - Technical Solution (approach)
 - Anticipated Capability (output)
- IR&D Partners
- PEMS Applicability to NCES
- Additional Resources

DoD Problem Domain: Enterprise Management of SOA Systems

- **Current systems are transitioning to Service Oriented Architectures (SOA) and as a result are becoming far more distributed**
 - Applications are distributed via web services
 - Hardware platforms are being distributed via “grid” technologies
 - Operating systems can span multiple hardware configurations
 - Networks are becoming more diverse as IP traffic is possible over radio, ground, and satellite based infrastructures
 - Sensor numbers are increasing as cost of collecting sensory data is reduced (ex. RFID)
- **Understanding “Where”, “What”, and “How” a full system, and mission threads within that system reside, are comprised of, and operate is extremely complex in an SOA environment**
 - With at least 3 dimensions of distribution (App, HW/OS, Network) it is **difficult to pin down where the active logic of a user experience exists** at any given time
 - Defining a “mission thread” beyond just its application components is critical if we are to have any hope of managing these enterprise systems
- **New methods of managing these distributed systems is required if true Service Level Objectives and Agreements are to be defined and measured.**

Enterprise Management of SOA Systems

Where does the management need to take place

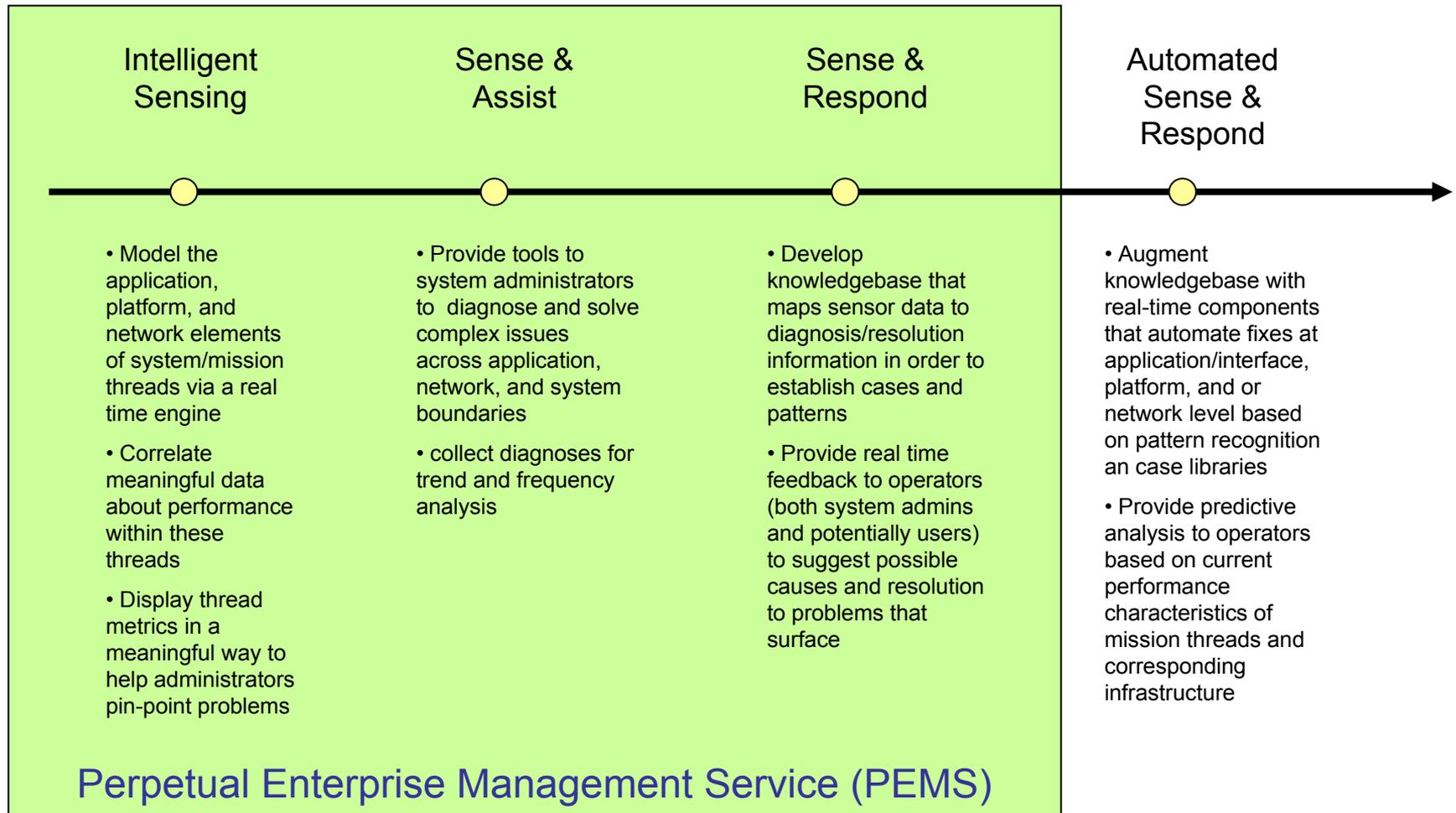


- Mission thread or “user experience” of a given capability will occur across assets at all three layers
- Each has its own potential distributed (and complex) architecture
- Each traditionally has its own management tools and personnel who monitor health independent of one another

Need to provide tools and capability to combine these activities into one in order to manage end-to-end mission thread quality & performance

Enterprise Management of SOA Systems

How do we tackle the problem?



SAIC Research Effort: Perpetual Enterprise Management Service (PEMS)

■ Area of Focus:

- Web Service Management (WSM) & Enterprise Systems Management (ESM) as it applies to the Net-Centric Command and Control domain.

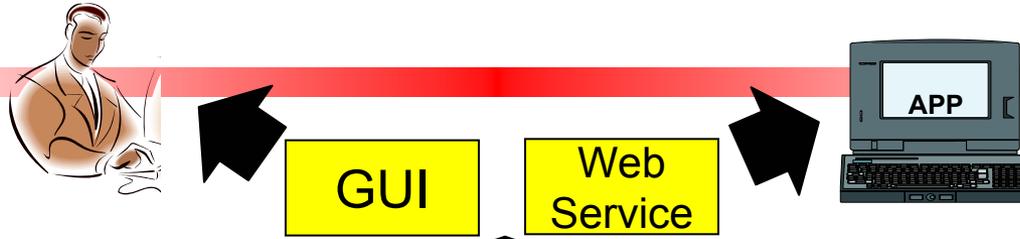
■ Current State of the Market:

- COTS products exist in 3 distinct spaces: 1) Application or Business Logic Layer, 2) Platform/OS Layer, and 3) Network Layer. Vendors in each space are beginning to provide web service and API hooks into their respective products. No single product exists that bridges these three areas to provide real time analysis and event management to promote self-healing of distributed SOA-based applications to improve the user experience.

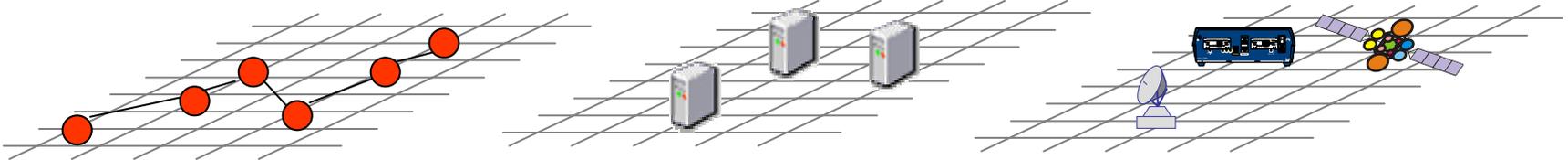
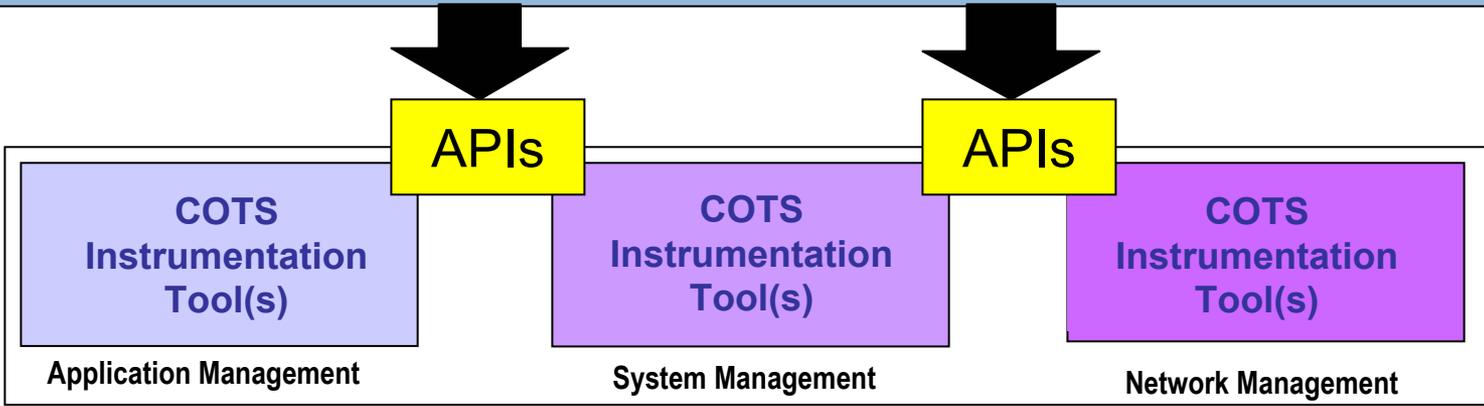
■ PEMS Objective:

- Develop an integrated set of Web Services & UI capability that bridge commercial products that serve the Business Logic Layer (ex. Amberpoint), Platform Layer (ex. IBM Tivoli) and Network Layer (ex. HP OpenView). This capability would be extended to allow applications to conduct perpetual analytics and subsequent system to system events to resolve application problems (self heal) and improve user experience.

PEMS End-State Vision

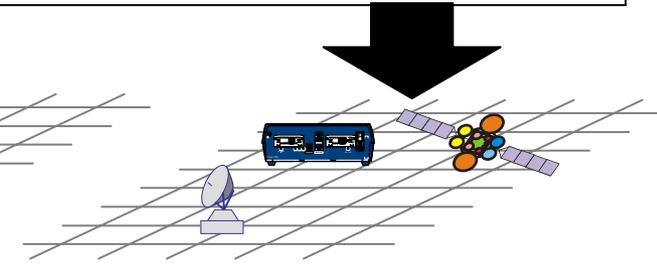
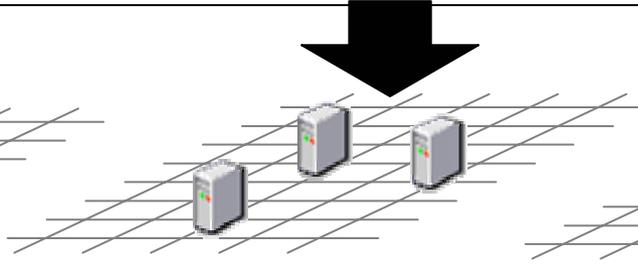
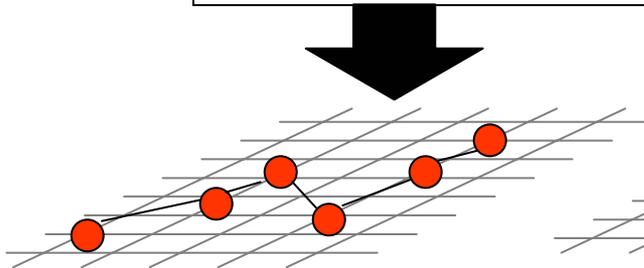


Perpetual Enterprise Management Service (PEMS)
(correlates, fuses, aggregates in context to user experience)



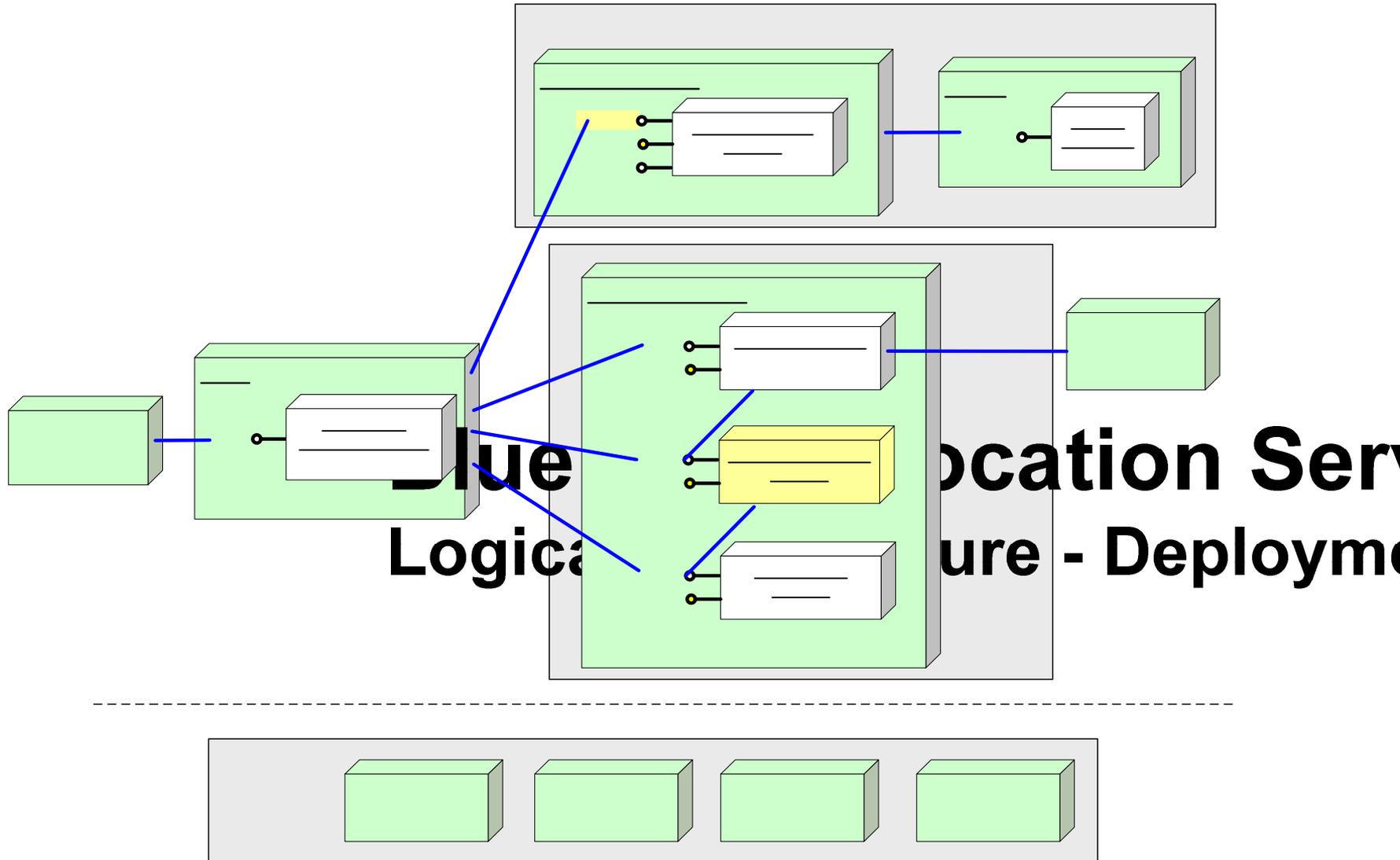
Technical Solution (1)

COTS Product Classification (select some to help capture metrics)



Technical Solution (2)

Identify business logic threads ("mission threads") that define end-to-end functionality that needs to be monitored



Technical Solution (3)

Understand how that design is implemented from the users perspective

The screenshot displays a web browser window titled "Net Centric Capabilities Pilot Portal Desktop - Microsoft Internet Explorer". The address bar shows the URL: https://portal.netcentriclab.com/NCCP.portal?_nfpb=true&OperationalContext_Manager_1_actionOverride=%2Fportlet%2FOperationalContextPortlet%2FOAction&_windowLabel=OperationalCor. The page features a green header with "UNCLASSIFIED" and the NCCP logo, and a black navigation bar with "NCES | Contact Us | Feedback".

The main content area is titled "Manage Operational Context" and contains a sub-section "Operational Context Configuration". This section includes a "Back" link and a form with the following fields:

- Name *: DSide
- Description: Dside
- Active:
- Created By: Joe Rice
- Authorized By: Joe Rice

Below the form are "Done" and "Update" buttons. A table below the form lists configured data sources:

Configured	Active	Name	Description	Actions
Yes	<input checked="" type="checkbox"/>	BlueForceReadines...	The bridge service for Blue Force Readiness d...	Edit Delete
Yes	<input checked="" type="checkbox"/>	TMSFilterBridge	The TMS filter bridge	Edit Delete

Below the table is an "Alert Notification" section with a "Send Alert" and "Acknowledge" link, and a timestamp "191848:14Z MAY 2005". The alert message reads: "Not Joined to Op Context Currently".

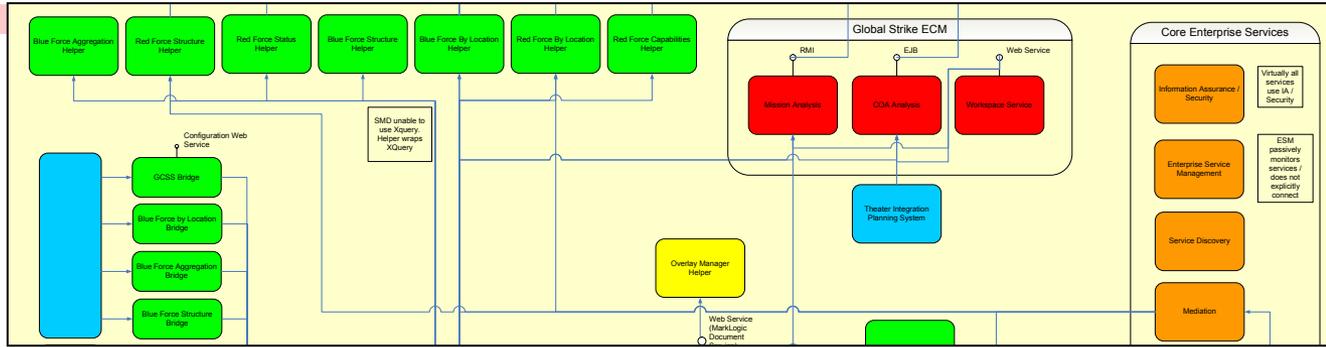
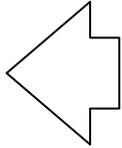
Technical Solution (3)

Map out how business logic threads map to underlying Platform and Network Layer elements; identify appropriate metrics to collect



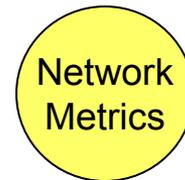
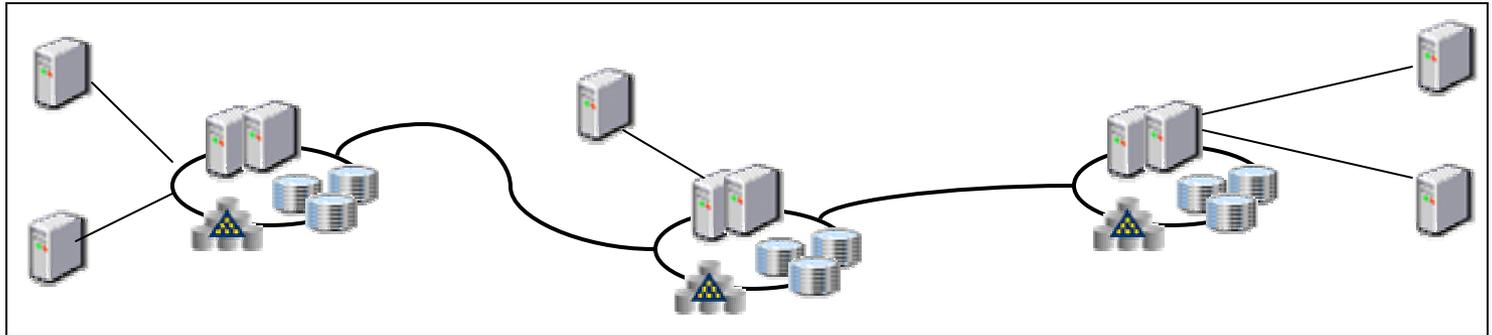
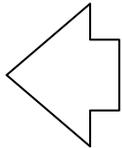
App Metrics

Ex. (Database access, web service availability)



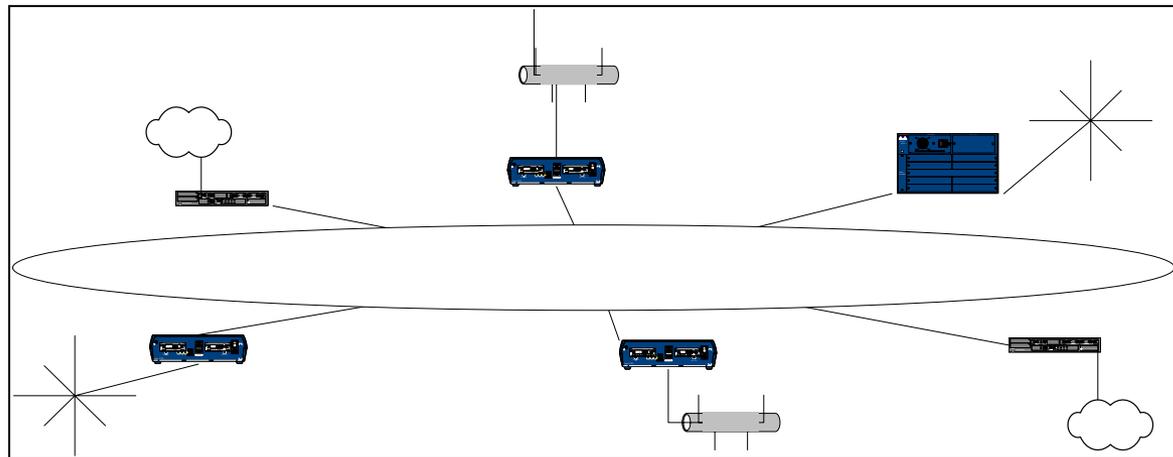
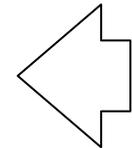
Platform Metrics

Ex. (CPU utilization, system availability, memory, HD space)



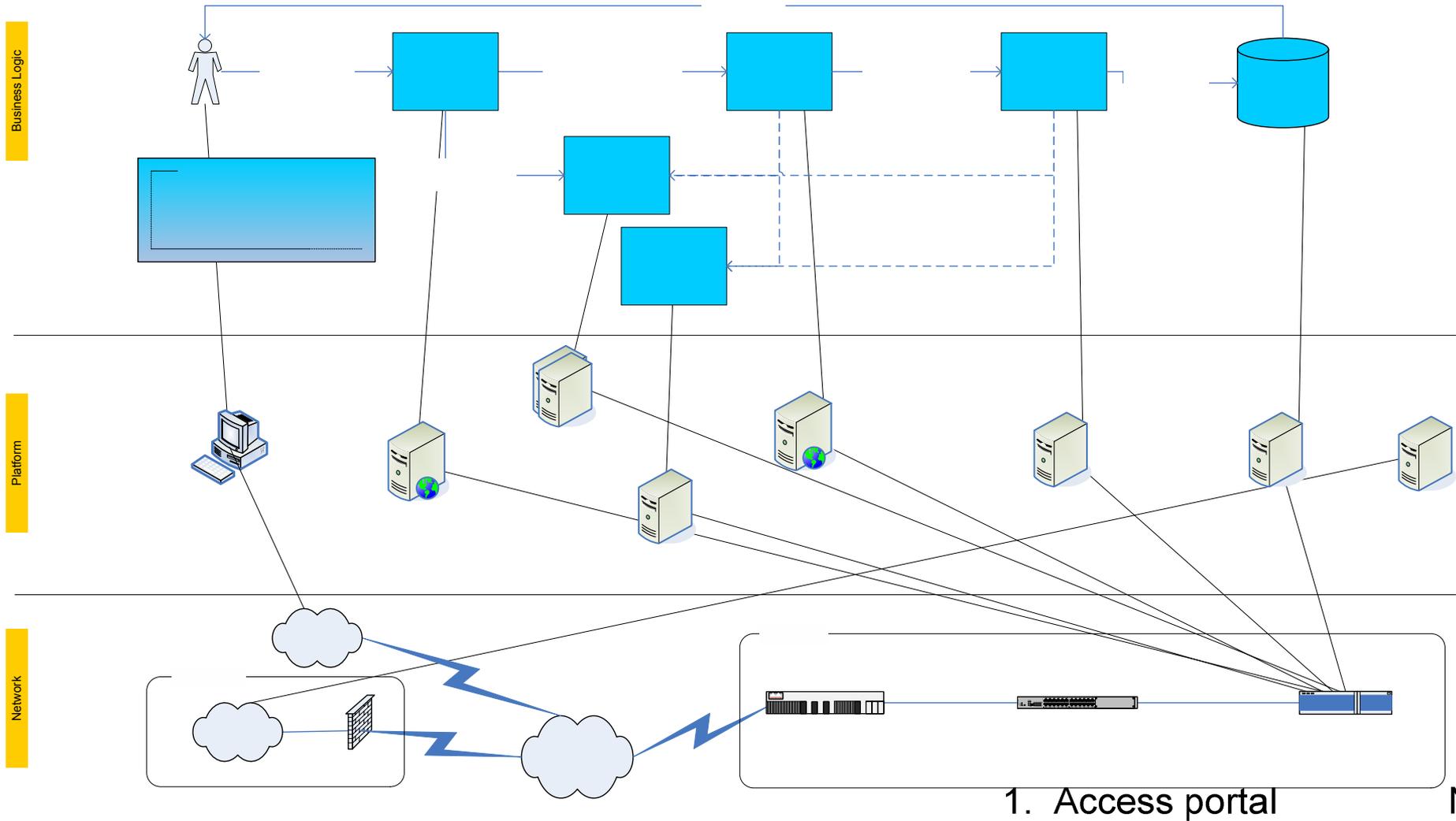
Network Metrics

Ex. (bandwidth latency, LAN/WAN availability)



Technical Solution (4)

Model key threads using tools to identify underlying physical entities

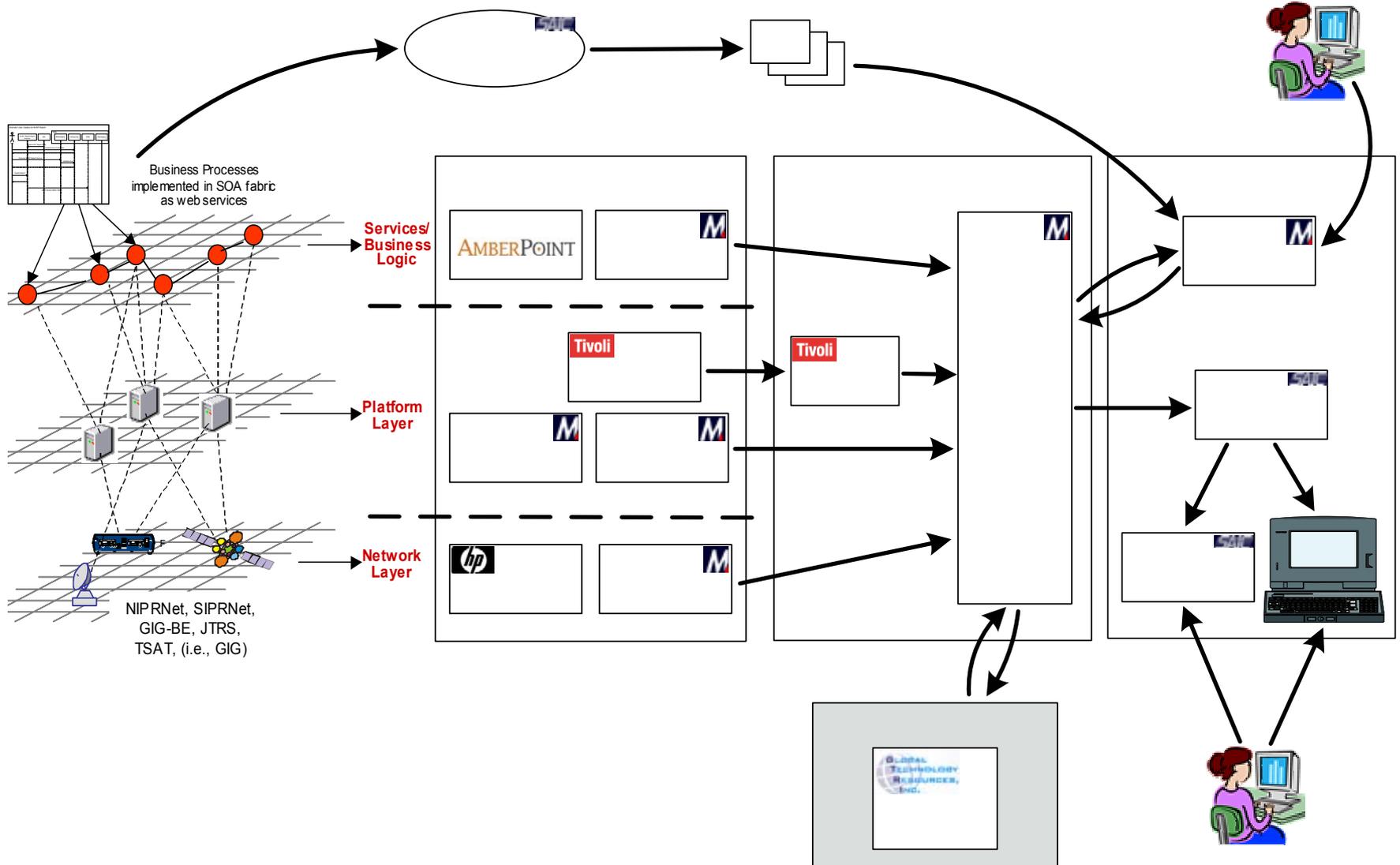


1. Access portal

NO

Technical Solution (5)

Create an COTS-Integrated architecture for correlation, fusing, and reporting of instrumented data in a form that is useful to monitoring the 'user experience'



Technical Solution (6)

Implement the logical models into the commercial toolset and configure for management of a Common Picture

Micromuse - Netcool/RAD 2.0 - Microsoft Internet Explorer

File Edit View Favorites Tools Help

NCES
Perpetual Enterprise Management Service

logged in as: root [Manage Users](#) [Logout](#)

Service Navigation

Services Templates Views Data

Service Name	State	Time	Events
66.251.110.101	●	●	●
ABA2WK	●	●	●
BF Bridge Conf	●	●	●
BlueForce by Loc Bridge	●	●	●
Document Service	●	●	●
NCES Web Portal	●	●	●
Security CES	●	●	●
Database Servers	●	●	●
NCES Network	●	●	●
NCESVRS	●	●	●
Service Discovery	●	●	●
VitalNet	●	●	●

Service Viewer & Editor

View Service 'BlueForceBridgeConf' Edit Service 'BlueForceBridgeConf'

Layout Relationships Levels Down 3 Levels Up 1 Apply

Event Summary

Event Summary

Severity: Clear (Green), Major (Orange), Critical (Red)

Number Of Events

Node

Service Details

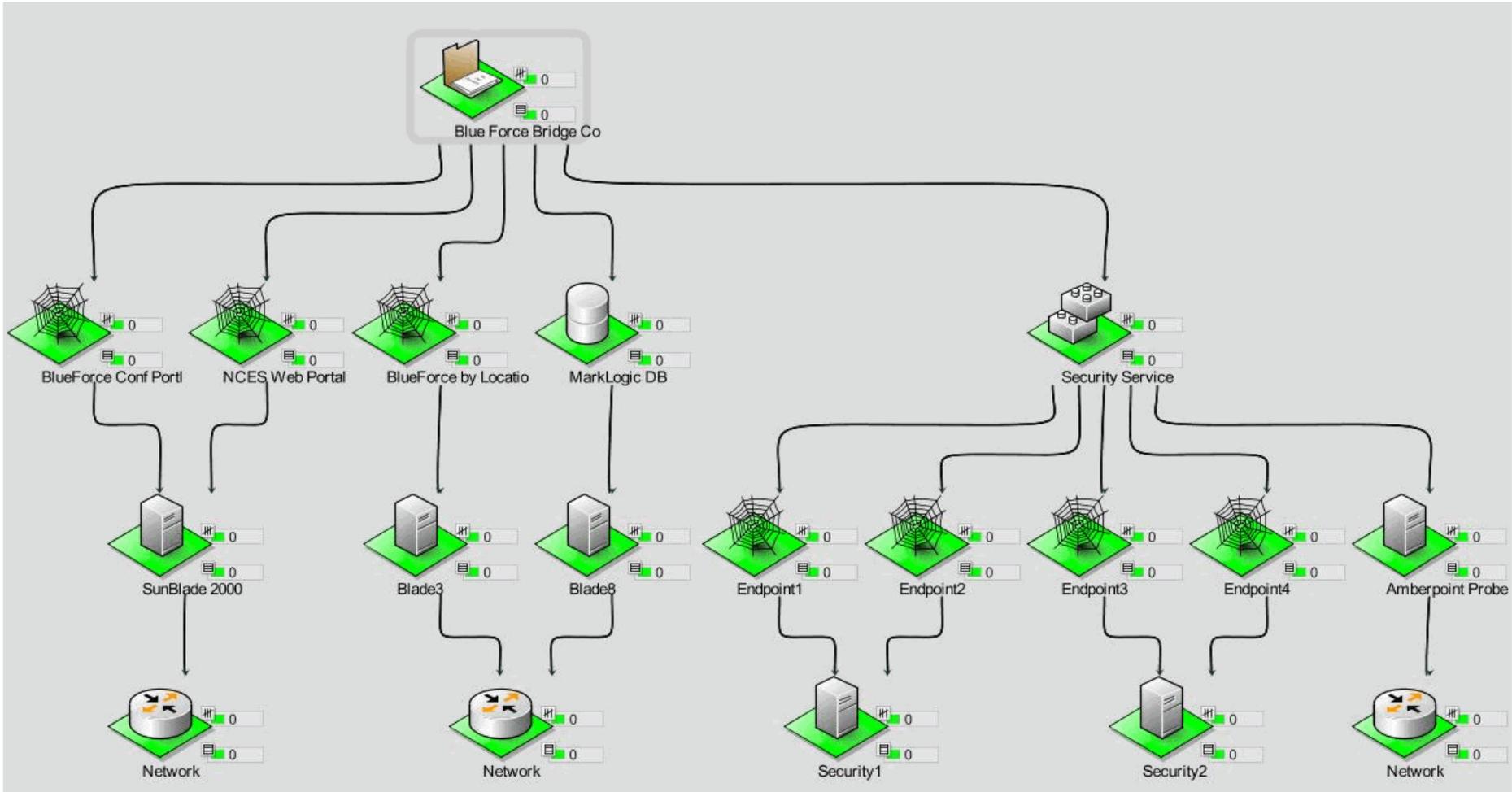
SLA Events Rules

Entity: RawEvents_34 View: RawEvents DataSource: NCOMS

Node	Summary	AlertKey	Class	Manager	Serial	Tally
10.0.0.2	Echo reply 100% out of 3 (Average RTT = 0.00997)		ICMP ISM	ICMP ISM	2837	5608
66.251.2.129	Echo reply 100% out of 3 (Average RTT = 0.00999)		ICMP ISM	ICMP ISM	2845	13605
66.251.2.151	Echo reply 100% out of 3 (Average RTT = 0.00999)		ICMP ISM	ICMP ISM	2853	8338

A Closer Look

The "Physical Model" of a key user thread





Demonstration

Anticipated PEMS Capability / Output

- 1. Real-time monitoring of 'end-to-end' mission threads / user experience (example: Blue Force Tracking by Location) that correlates the application (web service), platform, and network events that comprise the thread.**
 - *Micromuse NetCool Suite* is currently being used to visualize this correlated data.
 - Web-based/portal-based interface will provide a network or systems engineer with a dashboard which he/she can use to monitor important business processes (threads)
 - When a problem occurs, the tool would help the operator pinpoint the root cause of the failure for remediation
- 2. ESM (Health/Quality) Web Services that are available via a UDDI registry that allows developers (and potential users of a service) to see how well BPEL or SOA workflows (threads) are performing.**
 - Service would be discoverable like any other entity in the SOA fabric offering up throughput, latency, and failure rate metrics (among others) for core and composite services that are being advertised in the UDDI registry
 - Agencies being required to use NCES and other C2 services built on top of NCES (or other infrastructure) can understand the impact these services will have from a performance perspective to their overall system design

Anticipated PEMS Capability / Output

3. Knowledgebase / Decision Support Aide that helps operators improve their ability to recognize, predict, and automate resolutions to problems that are identified and remediated via #1 above.
- Leverages Case-base reasoning tools that *Georgia Tech Research Institute (GTRI)* has built to capture the state of monitored events when a problem occurs and the corresponding solution that is put in place to solve these problems
 - Over time, the knowledgebase will be able to provide predictive analysis on 'what might occur' given a network/platform/application correlated state
 - Will provide the system administrator or operator with a tool that would aide them in the remediation activity over time
 - System would collect problem parameters and corresponding remediation steps, but over time it would provide suggestions as real-time events are compared against its pattern engine
 - Ultimately, certain remediation activities would be able to be automated.

IRAD Proposed Partners

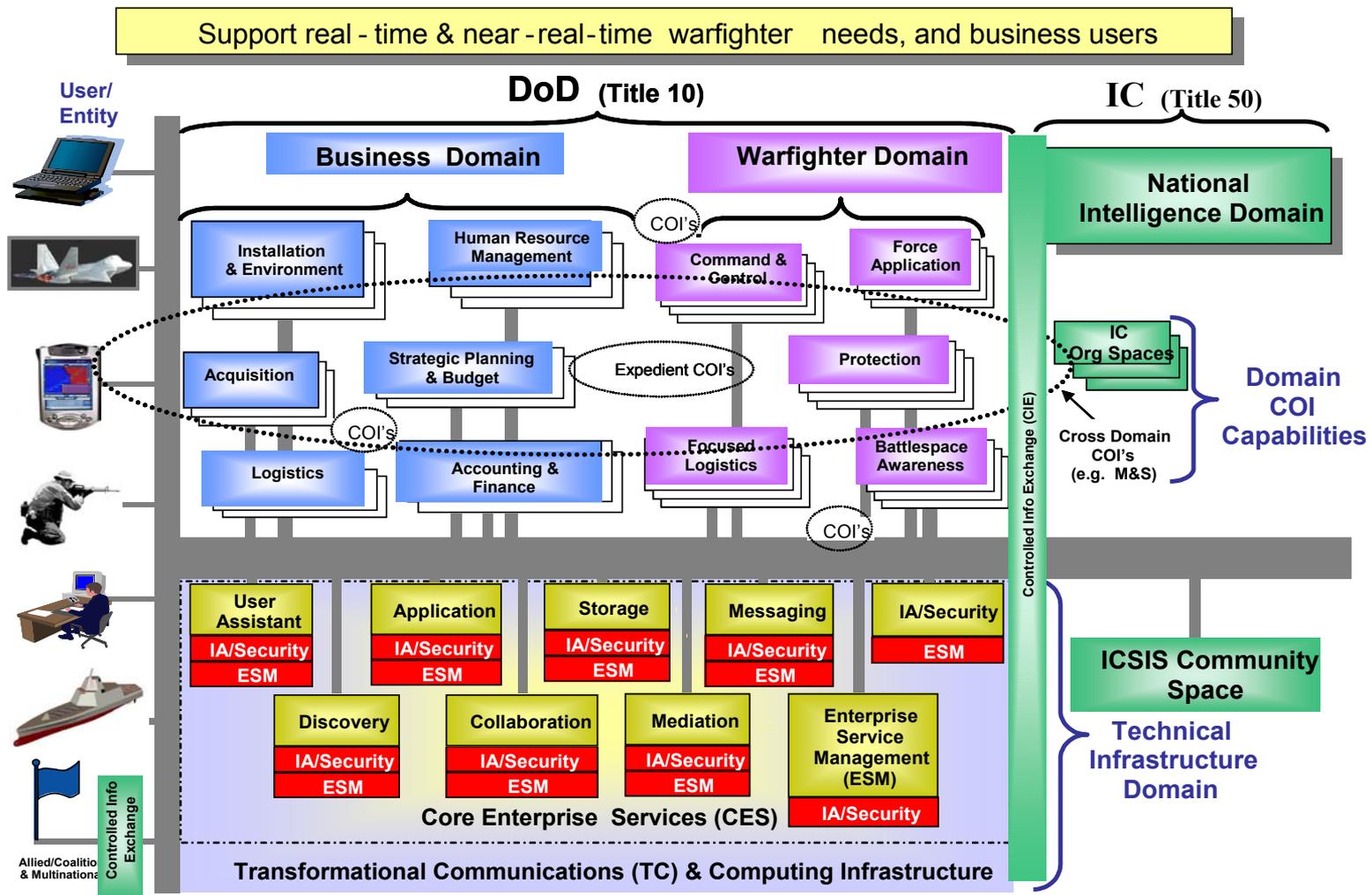
■ Identified Partners:

- **Micromuse**
- **Lucent**
- **Georgia Tech Research Institute (GTRI)**
- **Amberpoint**
- **IBM (Hardware and Tivoli support)**
- **Hewlett Packard (HP OpenView)**

■ Other Potential Partners:

- **Actional**
- **BMC (Patrol)**

PEMS is directly relevant to NCES ESM block



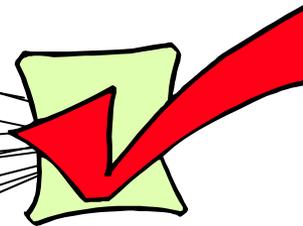
NCES ESM Capabilities (*per NCES CDD*)

■ Enterprise Systems Management (ESM Definition for NCES)

- Provides end-to-end GIG performance monitoring, configuration management, and problem detection/resolution as well as enterprise IT resource accounting and addressing (e.g., for users, systems, devices)

■ NCES Enterprise Systems Management (Services)

- Automated Service Status
- Configuration Management
- Management Information Exchange
- End-to-End Performance Monitoring and Analysis
- Automated Service Desk
- Enterprise Software Distribution
- Service Life-Cycle Management
- Integrated Service Management
- Integrated Service Status
- Remote Management
- Service Element Status
- Service Level Management
- NETOPS Situational Awareness
- Quality of Service (Qos) Management



PEMS addresses these ESM Requirements

- As Web services become pervasive and critical to business operations, the task of managing Web services and implementations of the Web services architecture will be imperative to the success of business operations. Management of Web services in this case is defined as a set of capabilities for discovering the existence, availability, performance health, usage, control and configuration of resources within the Web services architecture.

Additional Resources

■ Web Services Management:

- <http://www.w3.org/TR/2004/NOTE-wslc-20040211/>

■ Service Assurance & Performance Management:

- **Micromuse NetCool**
 - http://www.micromuse.com/products_sols/index.html
- **Amberpoint**
 - <http://www.amberpoint.com/solutions/manager.shtml>
- **Lucent VitalSuite**
 - <http://www.lucent.com/products/solution/0,,CTID+2020-STID+10439-SOID+1455-LOCL+1,00.html>
- **Lucent Vital SQM**
 - <http://www.lucent.com/products/solution/0,,CTID+2020-STID+10439-SOID+1518-LOCL+1,00.html>

Thanks !