



SPEAR

***Semper Paratus* : Enterprise Architecture Realization**

Doctrine and Event-Drive, Asynchronous Message Based
Service Oriented Architecture
Supporting USCG **Mission Execution** –
“The Pointy End of the Spear”



Homeland
Security

U.S. Department of
Homeland Security
**United States
Coast Guard**





Discussion Topics

- Keys to Our Success
- SPEAR architecture validation framework
- URI's and Context/Content Based Message Routing
- REST-ful Services vs. SOAP
- Pilot Projects and Services Implemented
- Vendor Selection Methodology



Homeland
Security

U.S. Department of
Homeland Security
**United States
Coast Guard**





Keys to Success

- DEFINE what SOA means for your enterprise
 - For the USCG, we have widely distributed, poorly connected assets = cannot be network-centric
 - Local, mission-focused command decision structure = human intervention in business processes
- Build a little, validate architectural approach. Repeat.
- Use narrowly focused, rapid turn-around pilot projects.



Homeland
Security

U.S. Department of
Homeland Security
**United States
Coast Guard**





What is Service Oriented Architecture?

SOA for the CG means ...

*Doctrine and event-driven,
loosely coupled, asynchronous
message based, business services*

We used the
Authoritative Parts Service Pilot Project
to validate the conceptual SOA architecture for the CG.



Homeland
Security

U.S. Department of
Homeland Security
**United States
Coast Guard**





SPEAR Principles

- Coast Guard Doctrine
- Messages
- Documents
- Content Routing
- Human Meaningful



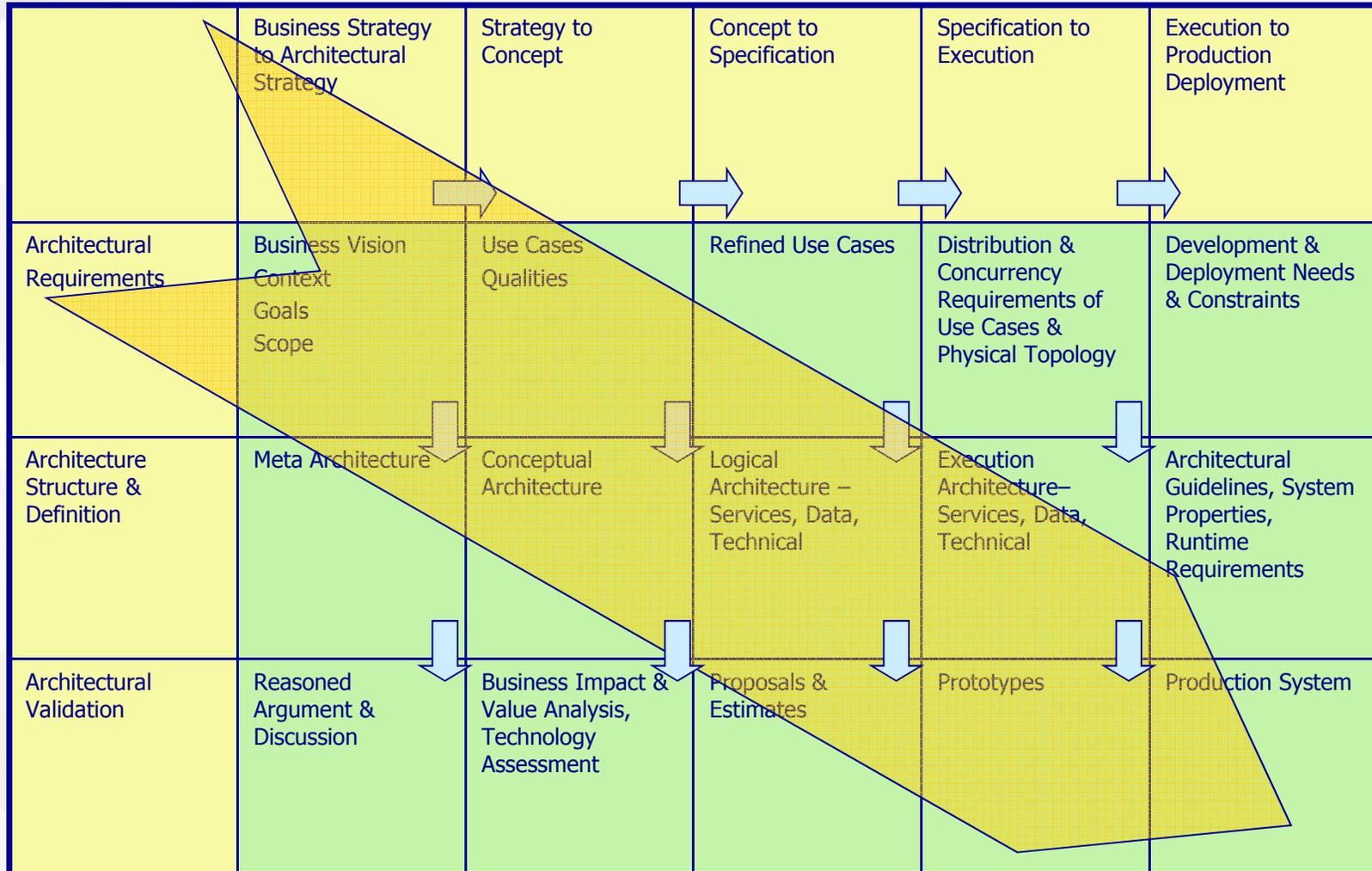
Homeland
Security

U.S. Department of
Homeland Security
**United States
Coast Guard**





Architecture Development & Validation Process Roadmap



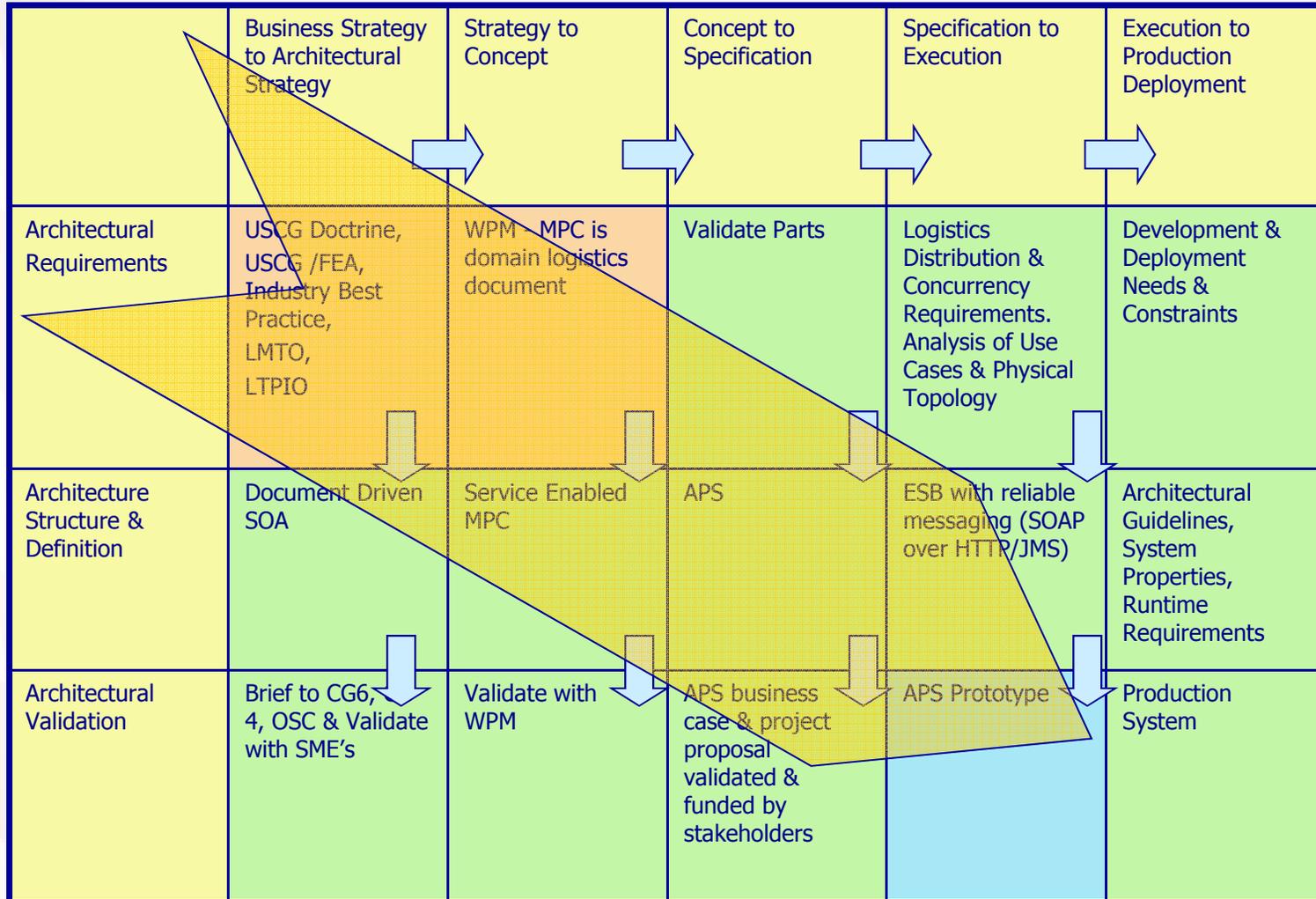
Homeland Security

U.S. Department of Homeland Security
United States Coast Guard





Architecture Development & Validation Process Roadmap Applied to APS





Why Messaging is Key

- Asynchronous
 - Very similar to event-driven
 - Messages are retained at their last stop
 - Your listener is like a handler
 - Sender is fire and forget
- Assured delivery
- Point to point
- Publish/Subscribe
- Routable
 - Implies runtime environment capable of routing - message bus
 - Messages are sent into the bus - not to the destination
 - Messages are retained at the routing event - assured delivery
- Late Binding





Late Binding

- No build time mapping to particular resources
- Messages can be routed to any resource
- Resources are loosely coupled to message contents
- Relies on dynamic typing
- Does not work well with SOAP
- Does not work well with NIEM or other strongly typed schemas
- Requires loose typing in the document



Homeland
Security

U.S. Department of
Homeland Security
**United States
Coast Guard**





Java Message Service

- Current SOA implementation uses JMS
- Specification, not a standard
- We only use basic features
 - Queues
 - Topics
 - Priority for QOS



Homeland
Security

U.S. Department of
Homeland Security
**United States
Coast Guard**





Fiorano MQ

- Fiorano MQ is our JMS provider
- Java client library & samples
- C# client library & samples
- C/C++ client library & samples

- Our Emerging Technology Team is developing a standard .NET assembly and Java project file in Eclipse for most applications



Homeland
Security

U.S. Department of
Homeland Security
**United States
Coast Guard**





SPEAR Documents

- The document = the interface
- Human and machine meaningful
- Self describing
- Have requirements based on type
- USCG owned
- Need not define the contract specifically



Homeland
Security

U.S. Department of
Homeland Security
**United States
Coast Guard**





Document Practices

- Make your documents first
- Don't use automated tools
- Avoid references
- Avoid includes and namespaces
- Run time simplicity > build time purity



Homeland
Security

U.S. Department of
Homeland Security
**United States
Coast Guard**





Logical Routing

- Everything is a resource
- Resources are addressed via URI
- URIs are used across domains
- The ESB routes, filters and enforces policy via URI



Homeland
Security

U.S. Department of
Homeland Security
**United States
Coast Guard**





SPEAR URIs

service://uscg.mda.vesselCrew:pii/sla

Domain: Taxonomy of resource types.
system:// organization:// geography://

Provider: Address to provider of resource

uscg.logistics.requisition uscg.infrastructure.routing

Context: Used for business contexts
such as PII, test, etc.

Resource: The address of the
resource on the service provider.



Homeland
Security

U.S. Department of
Homeland Security
**United States
Coast Guard**

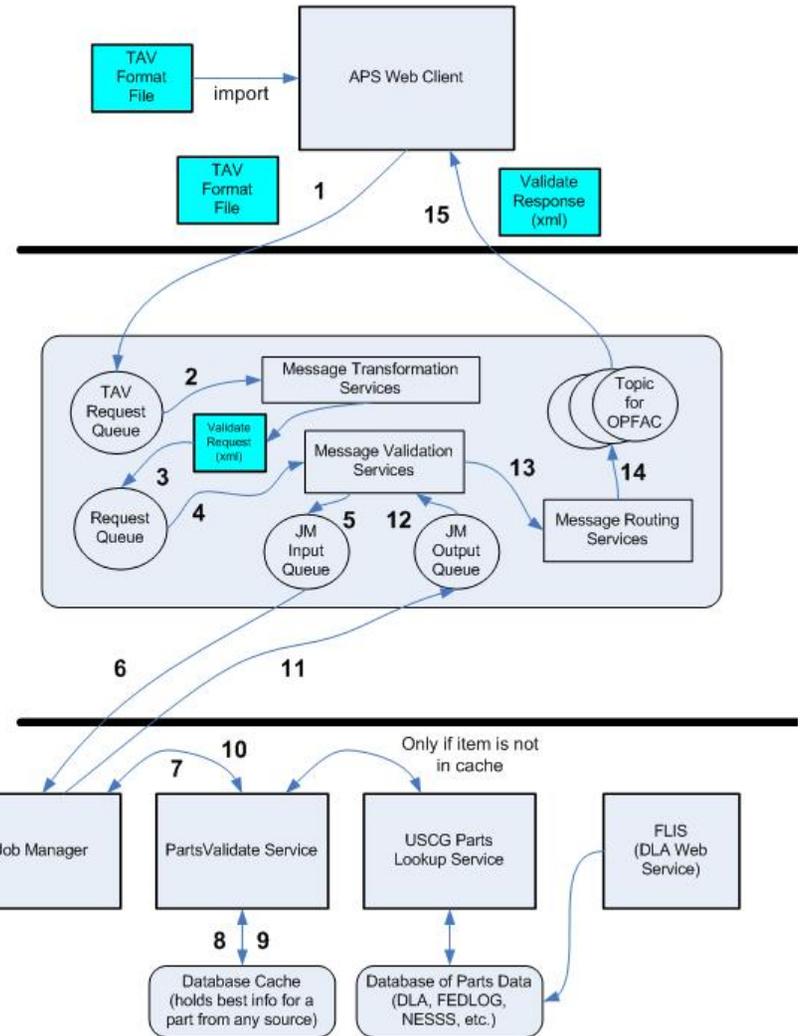




Authoritative Parts Service (APS)

- Document Managed State
- Standard Interfaces
- Asynchronous Messaging

Client



Services



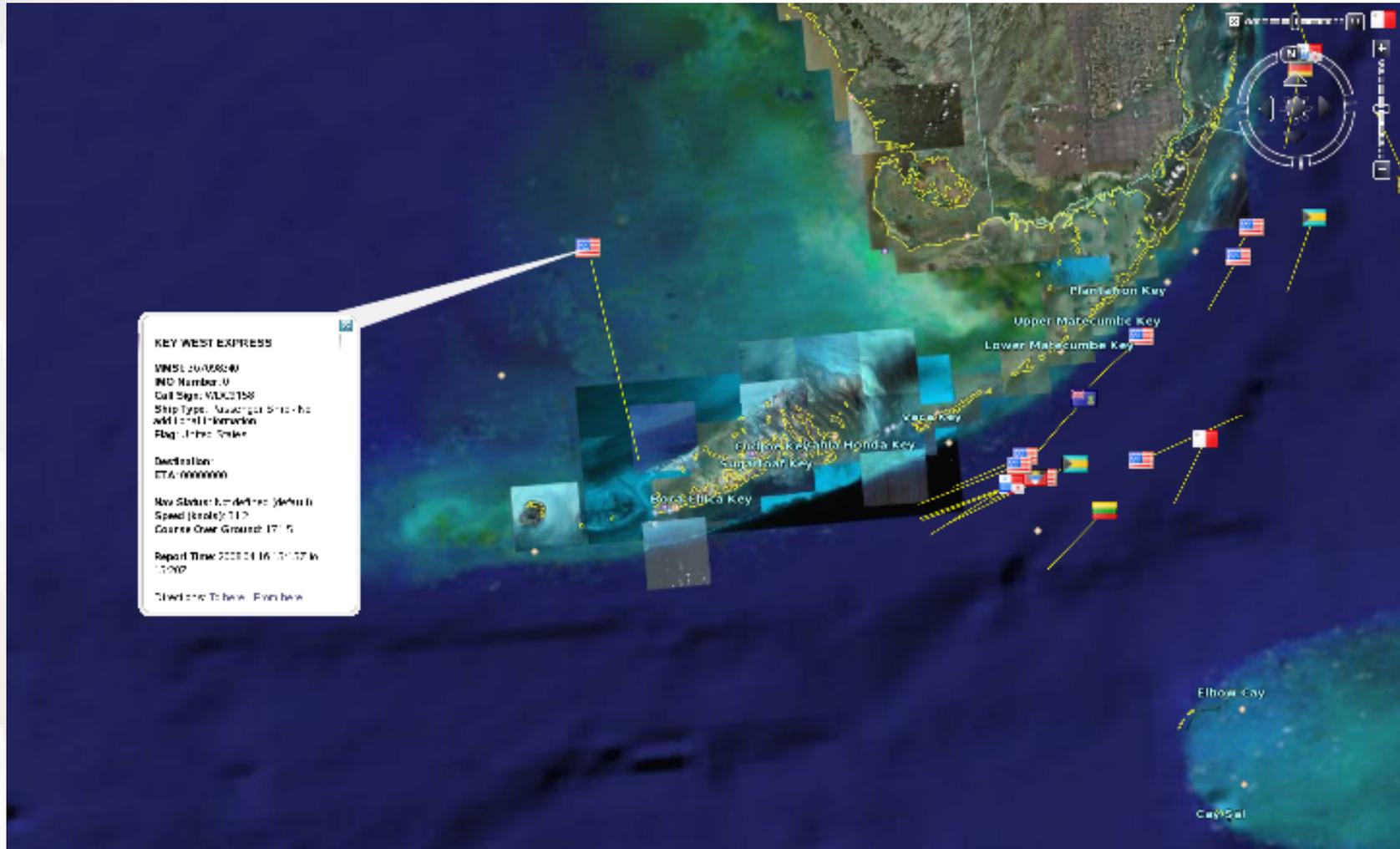
Homeland Security

U.S. Department of
Homeland Security
**United States
Coast Guard**





Enterprise AIS Data Services (EADS)



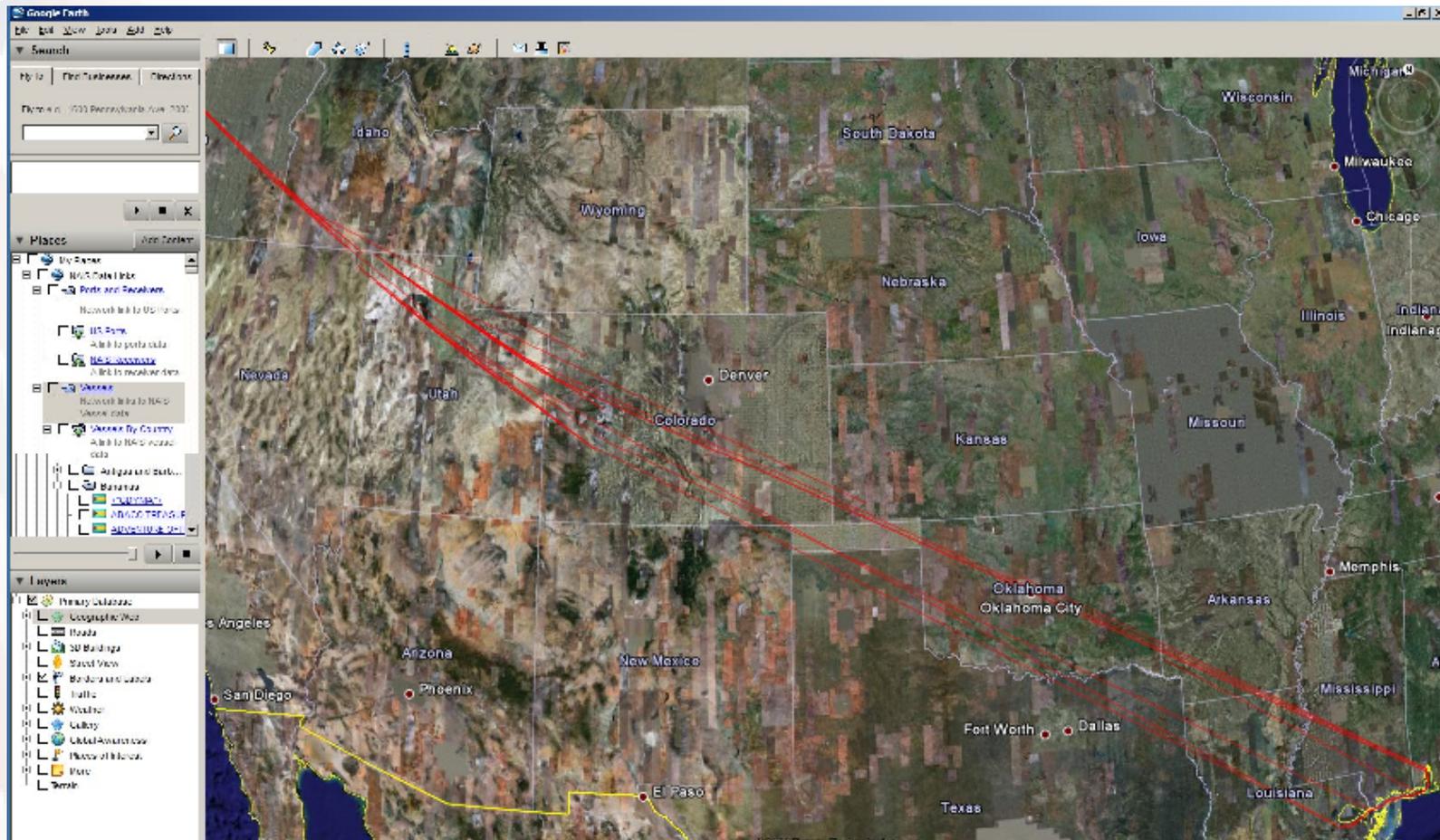
Homeland Security

U.S. Department of
Homeland Security
**United States
Coast Guard**





Enterprise AIS Data Services (EADS)



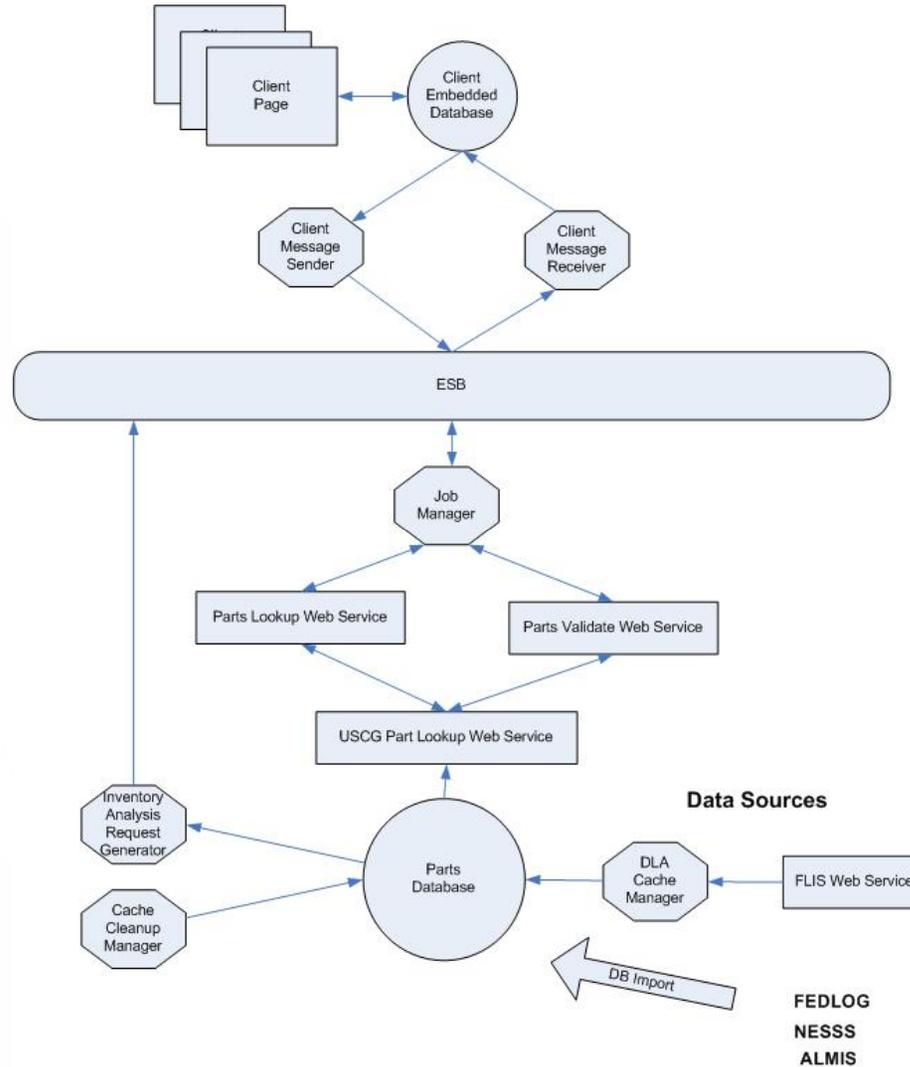
Homeland
Security

U.S. Department of
Homeland Security
**United States
Coast Guard**





A Word About Vendor Selection





USCG ESB Selection Criteria

- Ability to Support USCG Architecture
- Standards based focus
- Ease of development
- Ease of Administration, Configuration, Deployment & Maintenance
- Functionality
- Security
- Dependability
- Performance & Scalability
- Vendor Criteria (Reputation, Track Record, Market Share, Profitability & Financial Stability, Longevity, Vision, Commitment to R&D, Customer Support)



Homeland
Security

U.S. Department of
Homeland Security
**United States
Coast Guard**





Standard USCG ESB POC Gauntlet

- Implement APS Via 3-4 day proof of concept.
 - Standard Hardware, Network, OS
 - Standardized Web Services, Database
 - Standardized Re-usable JAVA & XML components
 - Optional "extra credit" work
- Follow-up statistically rigorous designed experiments.
- Publish results & recommendations in an ESB Whitepaper.



Homeland
Security

U.S. Department of
Homeland Security
**United States
Coast Guard**





ESB Proof of Concept Results

ESB SCORING MATRIX	ESB-1	ESB-2	Fiorano	ESB-4	ESB-5	ESB-6	ESB-7
POC Performance Metrics	0	10	8	4	10	0	8
Overall Cost Estimate	2	9	8	9	3	9	6
Architecture Compliance	6	10	8	6	7	8	6
Business Factors	9	1	4	7	9	6	7
Installation & Maintenance	2	5	9	6	7	7	4
Development Process/Methodology	5	1	9	5	8	6	5
Development Tools	7	1	10	3	9	4	7
Configuration Management	3	8	8	3	9	8	4
Debugging	2	5	9	2	8	9	2
Deployment	5	2	10	2	8	7	7
System & Application Administration	3	5	9	5	8	7	5
Support for Required Features	5	1	7	8	9	8	7
POC Success	2	10	10	9	10	2	10
Total Score (130 points possible.)	51	68	109	69	105	81	78
Average Score (10 max. possible)	3.92	5.23	8.38	5.31	8.08	6.23	6.00



Homeland Security

U.S. Department of
Homeland Security
**United States
Coast Guard**





XML Gateway Proof of Concept Results

XML Gateway/Appliance Scoring Matrix	A	B	C	Vordel VXG
Criteria				
Support for Protocol Mediation	7	9	4	7
Support for Transport Security	10	10	10	9
Support for XML Validation and Transformation	8	9	9	9
Support for WS-Security	6	7	10	10
Support for Authorization/Authentication/Access Control/Identity Federation	7	9	8	10
XML Threat Protection	7	8	9	10
Deployment Architecture	7	9	5	9
Quality of Tools	5	8	7	9
Performance	10	8	7	8
5 year cost of ownership	6.1	5.7	5.0	5.4
Architectural Compliance/Compatibility	6	10	5	8
Business Factors	10	6	10	3
Standards Conformance	9	9	9	9
Total Points (130 maximum)	98.1	107.7	98	106.4
Overall Score	7.55	8.28	7.54	8.18



Homeland Security

U.S. Department of
Homeland Security
**United States
Coast Guard**



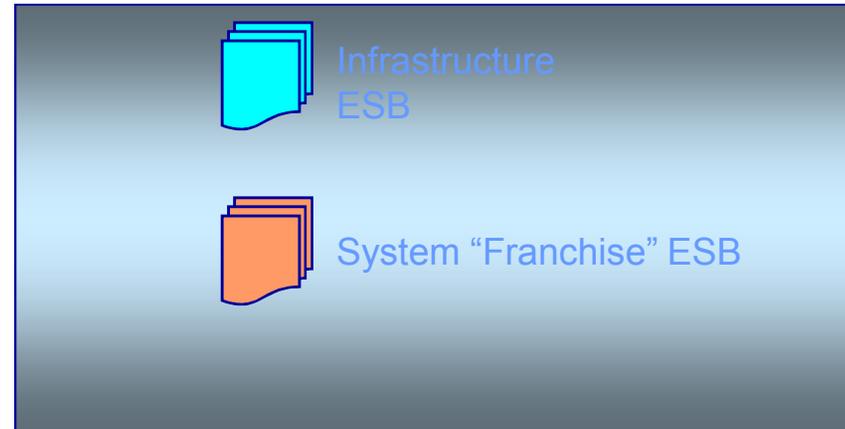
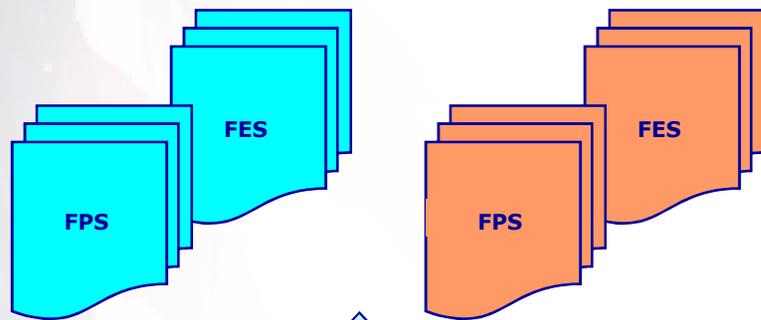


ESB Security Architecture

CGDN+

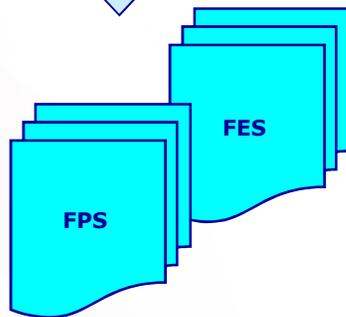
DMZ

Business Logic Services

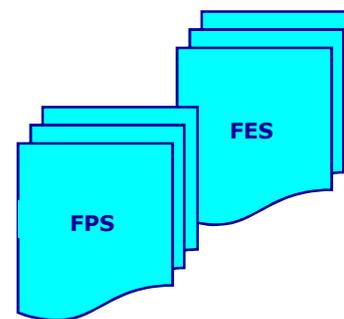


Infrastructure Services

DMZ Infrastructure Services



XML Gateway



Zone 2



Zone 1



Homeland Security

U.S. Department of Homeland Security
United States Coast Guard

