

**Raytheon**

*Customer Success Is Our Mission*



# Federated Service Oriented Architecture for Effects-Based Operations

**Intelligence and Information Systems**

**Matt Brown**

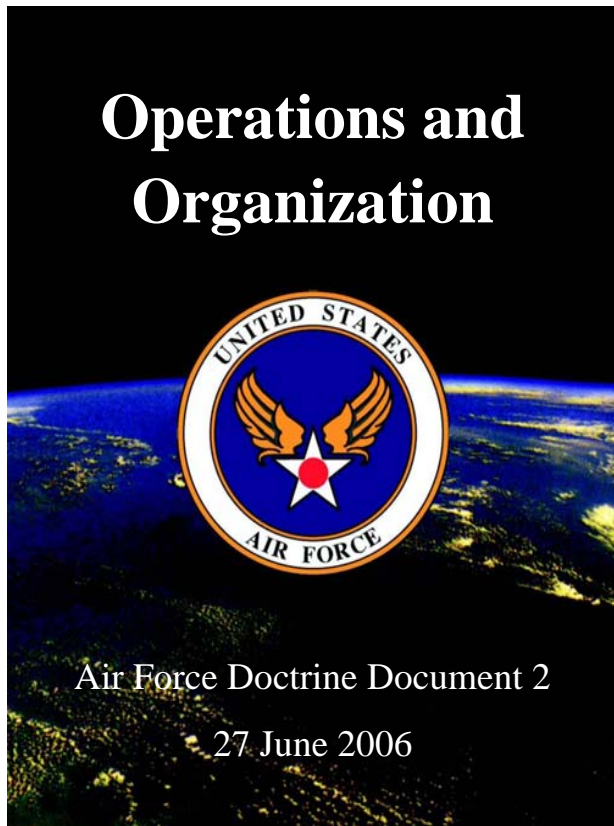
**(720) 858-4014**

**[mebrown@raytheon.com](mailto:mebrown@raytheon.com)**

# Topics

- Effects-Based Operations (EBO)
- Service Oriented Architectures (SOA)
- Federated SOA
- Characteristics of a Federated SOA that enable EBO
  - Shared data and services across Communities of Interest
  - Simplified Integration of legacy capabilities
  - Leverages existing standards and standards implementations
  - Maintains interoperability of Vendor tools
- Conclusions

# AFDD-2 Principles of EBO



- Effects-based operations:
  - seek to **integrate planning, execution, and assessment.**
  - should focus upon the **objectives and the end state.**
  - are about creating effects, **not about platforms, weapons, or methods.**
  - approach should consider **all possible types of effects.**
  - should seek to achieve objectives **most effectively**, then to the degree possible, most efficiently.
  - cut across **all dimensions, disciplines, and levels** of war.
  - **focus on behavior**, not just physical changes.
  - recognize that **comprehensive knowledge of all actors** and the operational environment are important to success, but come at a price.

# EBO Requires a Net-Centric Enterprise

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- Traditional siloed systems do not support EBO well
  - Need capability to easily share large amounts of data across organizational boundaries
  - Timeliness of data and decisions is critical to EBO
  - Need access to modeling and sim, and other service like capabilities across the Enterprise
  - Limited visibility across the Enterprise
  - Efficient asset usage to gain data for EBO decision making

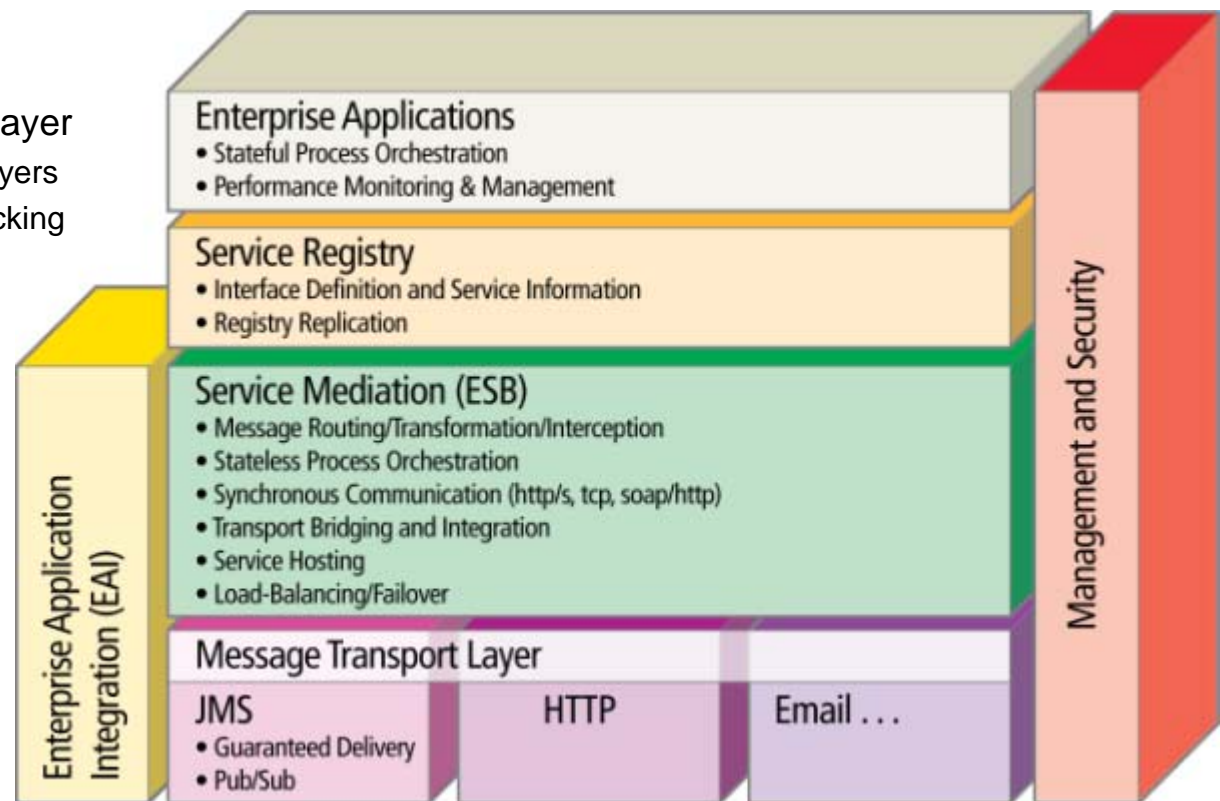
**Federated Service Oriented Architecture Provides a  
Net-Centric Infrastructure to Support EBO**

# Service Oriented Architectures

“Service oriented architecture is an IT strategy that organizes the discrete functions contained in enterprise applications into interoperable, standards-based services that can be combined and reused quickly to meet business needs.” – BEA

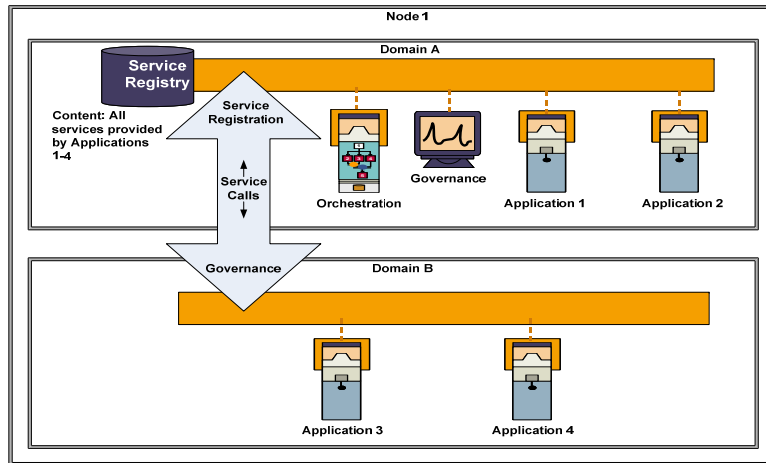
## ■ SOA COTS

- Multiple vendors provide each layer
  - Vendor products often blur the layers
  - Vendor standards compliance lacking

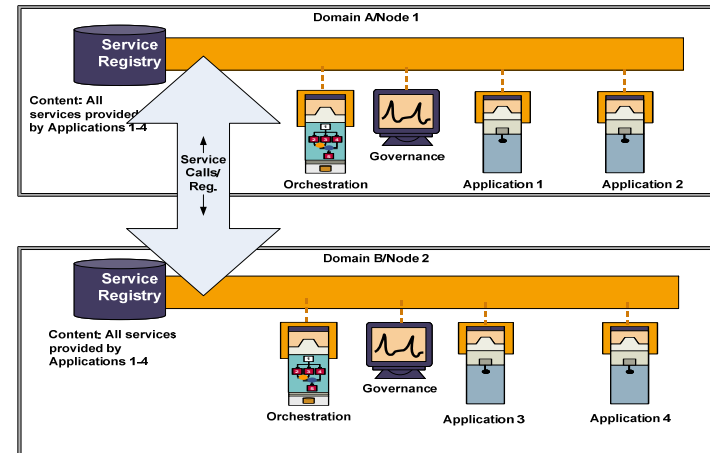


# SOA Topologies in a Net-centric Environment

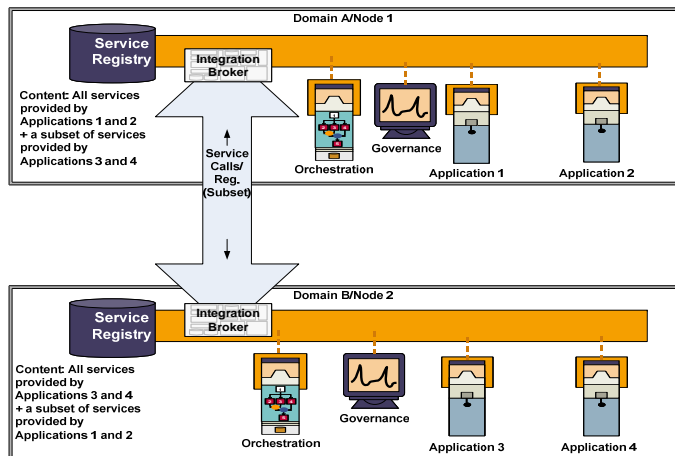
**Global: one shared SR (Service Registry)**



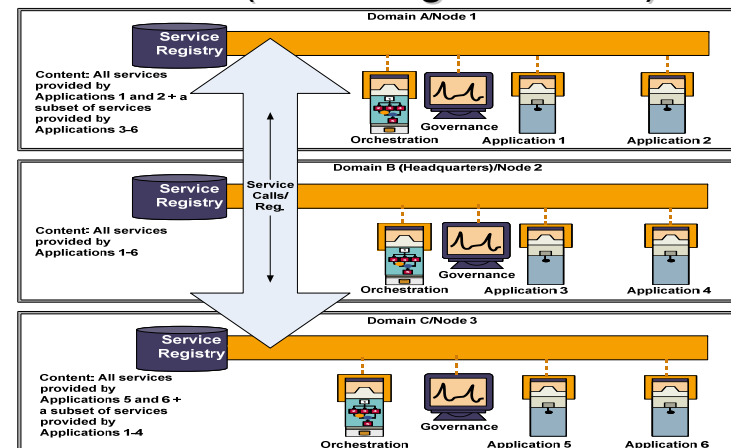
**Directly Connected: two+ completely synchronized SRs**



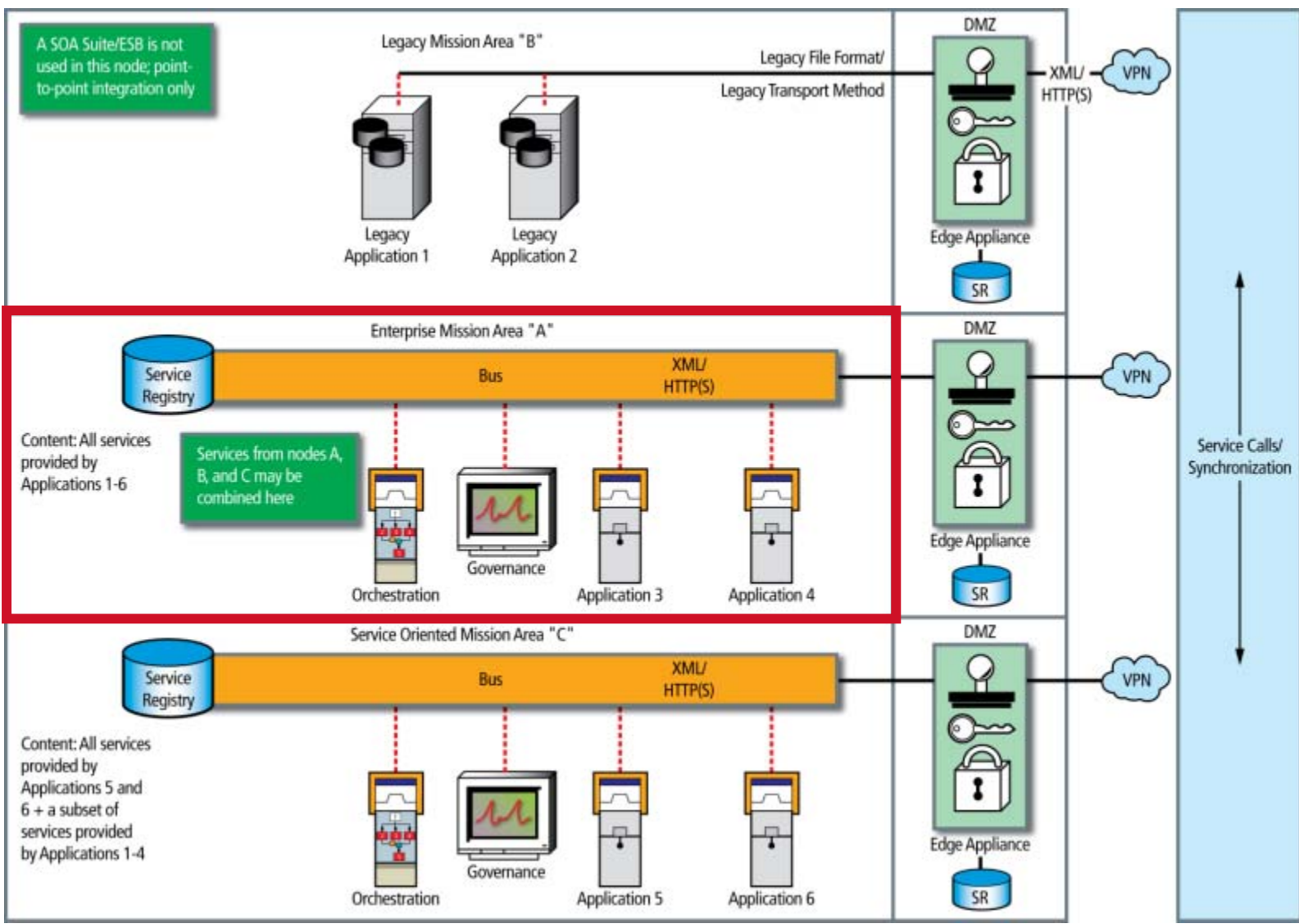
**Brokered: two+ SRs selectively synchronized**



**Federated: three+ SRs selectively synchronized (including 1 master)**



# Federated SOA



# Characteristics of a Federated SOA Infrastructure that enable EBO

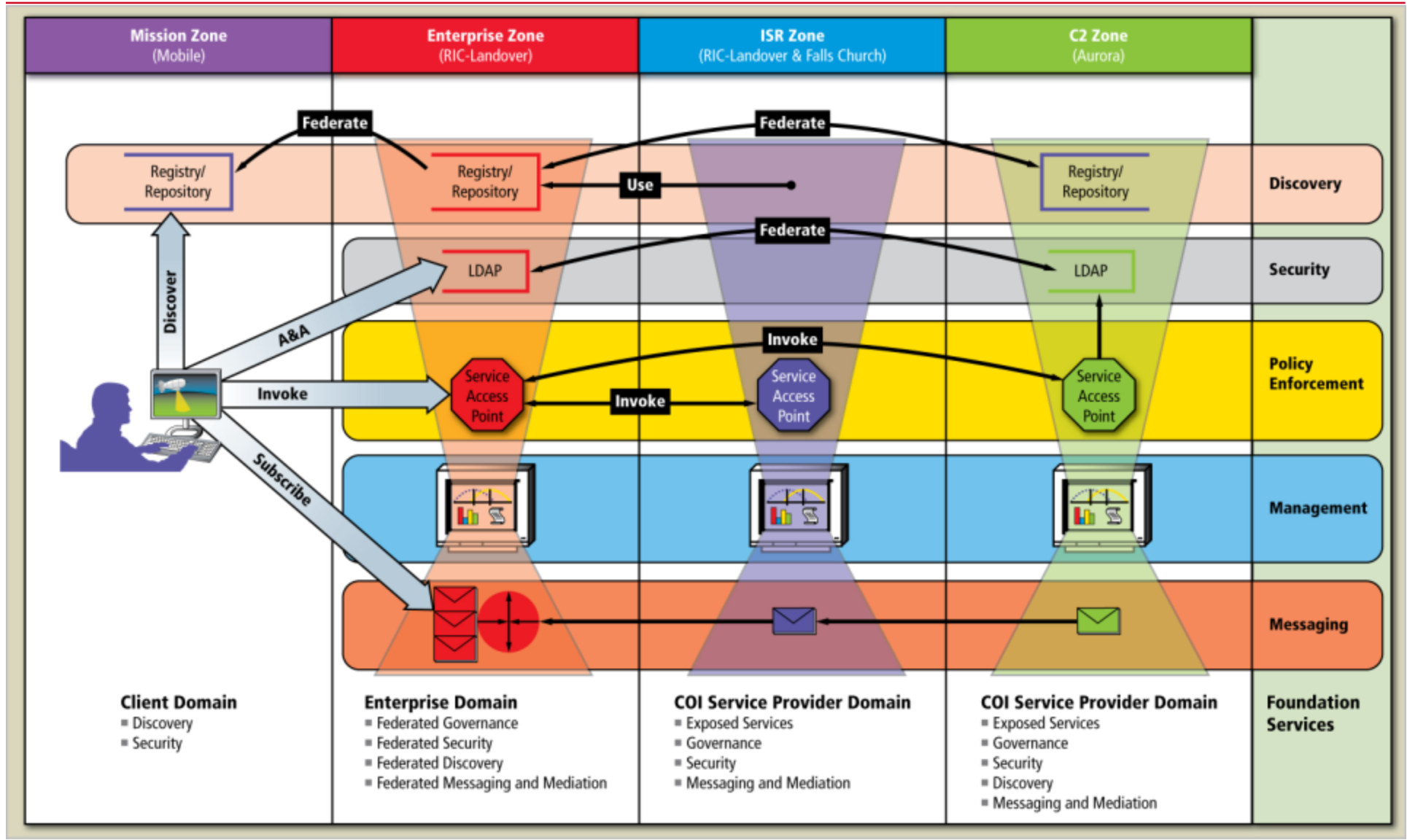
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- Shared data and services across Communities of Interest
- Simplified Integration of legacy capabilities
- Leverages existing standards and standards implementations
- Maintains interoperability of Vendor tools

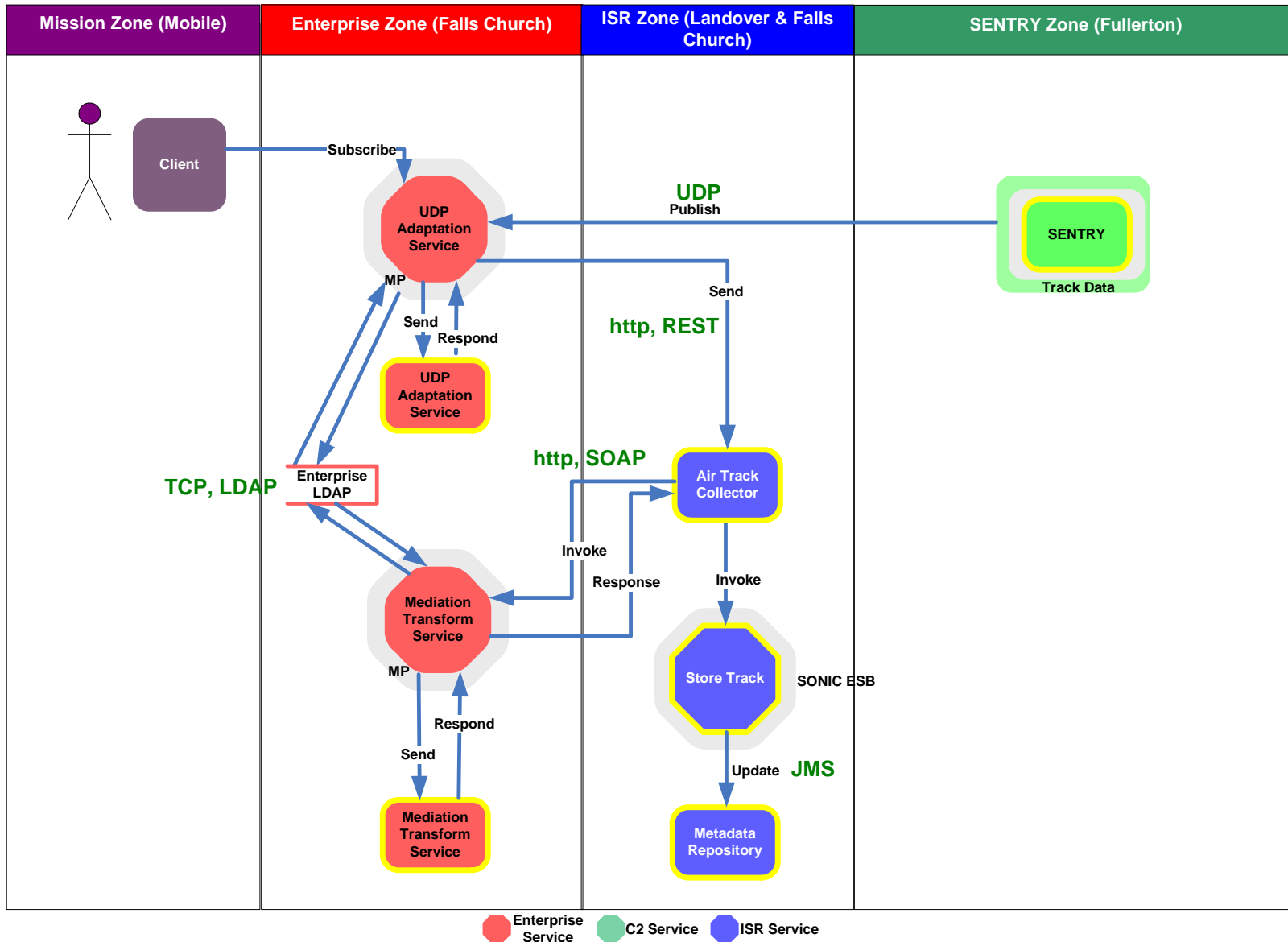
**Federated Service Oriented Architecture Design Pattern  
is a Key Architectural Decision**



# Federated SOA Test Bed



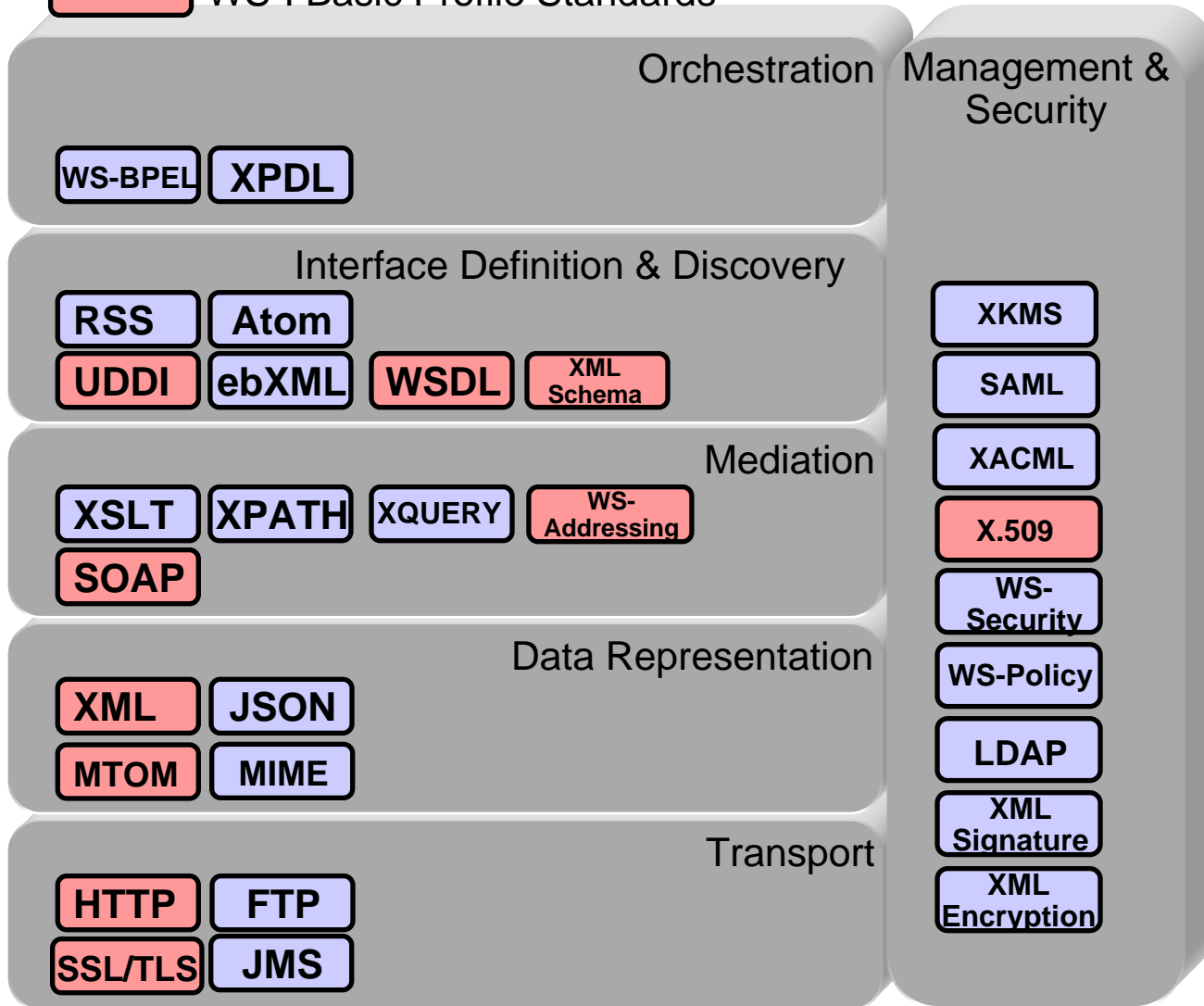
# Leveraging Core Services to Integrate Legacy Capabilities



# SOA Standards

## WS-I Basic Profile Standards

[http://www.ws-i.org/Profiles/BasicProfile-2\\_0\(WGD\).html#references](http://www.ws-i.org/Profiles/BasicProfile-2_0(WGD).html#references)



The WS-\* set of standards is overwhelming. Some of the standards are not implemented. So, for real interoperability, it's safest to stick to the WS-I Basic Profile:

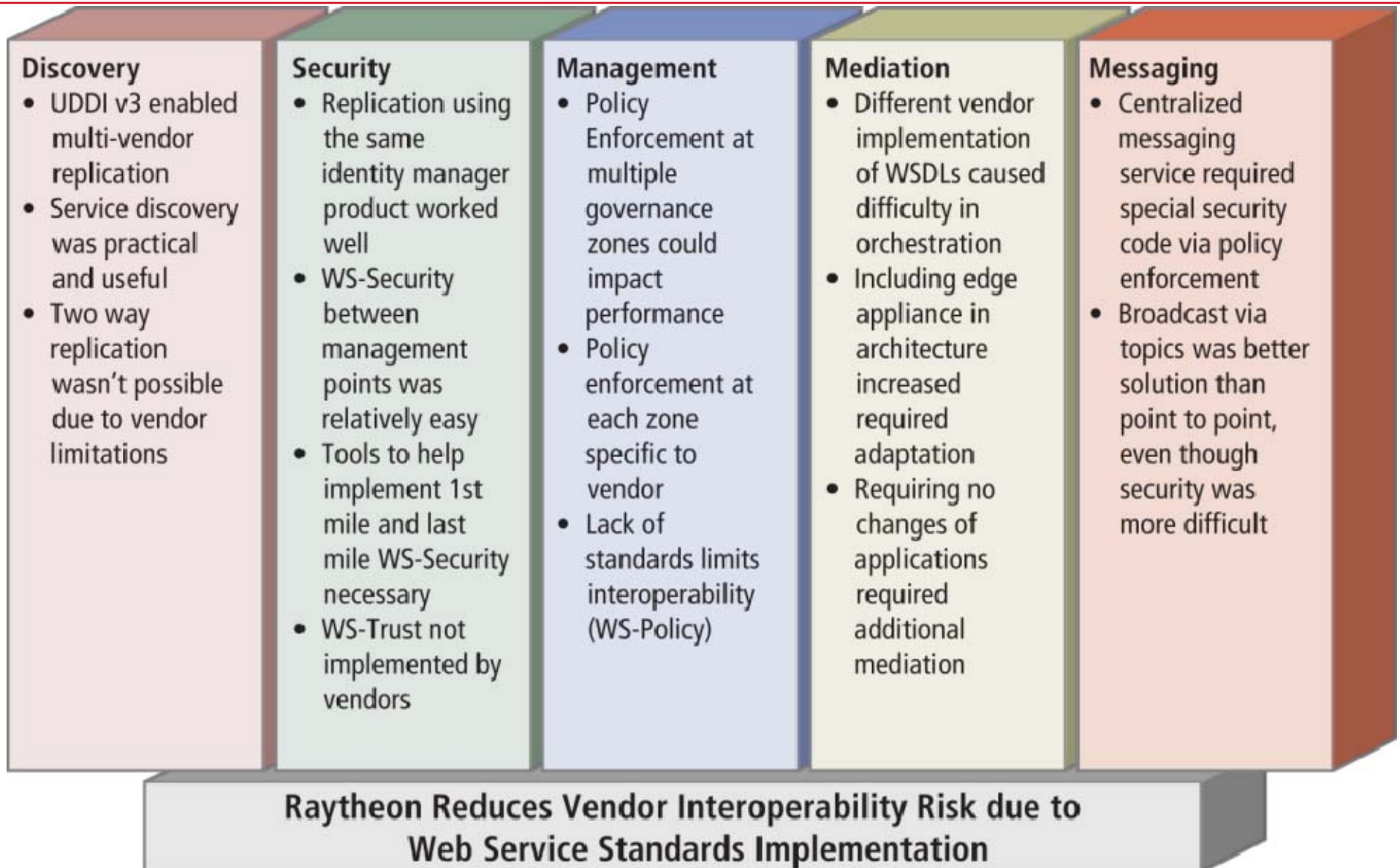
- SOAP 1.2
- MTOM
- HTTP 1.1
- WS-Addressing 1.0
- XML 1.0
- WSDL 1.1
- XML Schema
- UDDI 2.0
- TLS 1.0 / SSL 3.0
- X.509 v2/v3

# Vendor Agnosticism is Key to Success

		Services				
		Security	Mediation	Governance	Discovery	Workflow
Vendors	SOA software™	Service Manager		Service Manager	Registry	
	IBM			DataPower		
	hp				Systinet Registry	
	AMBERPOINT			SOA Management		
	bea		Aqualogic ESB			
	Program Sonic		Sonic ESB			
	ORACLE®					OraBPEL
	Sun microsystems	Sun One Identity Server				
	MuleSource		Mule ESB			
	JBoss a division of Red Hat		JBoss ESB			
	ServiceMix		ServiceMix ESB			
	Microsoft .net		.NET			
	TIBCO The Power of Now™		Tibco ESB			

CES Test Bed Incorporates The Best Industry COTS Software

# Vendor Interoperability Lessons Learned



# Conclusions

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- A Net-Centric environment is necessary to enable Effects-Based Operations.
- A Federated Service Oriented Architecture approach to providing federated interoperability, including federated modeling and simulation, can help achieve Effects-Based Operations.
- The federated governance design pattern that is used is a key architectural decision in the development process.
  - It is important to choose a design pattern that allows multiple vendor tools to be used across the enterprise while maintaining interoperability.
- Leveraging federated SOA and core service capabilities allows existing capabilities to be included in the Effects-Based Operations process.
- Understanding current standards and how vendors implement these standards is an important element in achieving success.

**Federated Service Oriented Architecture Enables EBO**