



Federal Aviation  
Administration

# **SWIM Prototype Project:** **EDX Operational Evaluation: NAS Enterprise Domain Data Exchange for SWIM & Implications Net-Centric Operations on Data Exchange**

Presented to:

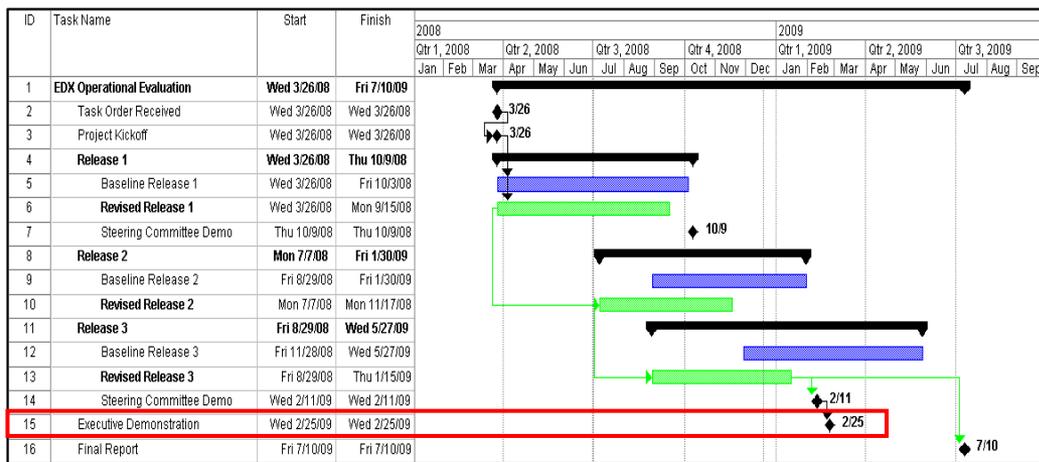
Demonstration and Prototyping  
Information Exchange Briefing

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Date: November 4, 2009

# Description, Major Players & Milestones

- **Background:** Team proposed NAS Enterprise Domain Tier for SWIM Core Services, integrated with the existing NAS IT infrastructure.
- **Scope:** Operational Eval demonstrating Net-Centric Core Services for SWIM delivered as a shared NAS service
  - For example: FTI currently provides the shared NAS Enterprise Security Gateway service (ED8) which enables non-NAS users to interoperate
- **Stakeholders:** FTI, SWIM, WARP, ITWS (WJHTC) & Ops Planning Services



- **Deliverables: Information Exchange**
  - Rel 1: Basic Net-centric Core Services & Weather product distribution via pub/sub services (Oct 08)
  - Rel 2: Extended Core Services & NEXRAD weather product distribution to **ITWS**, message transformation to **web services** (Nov 08)
  - Rel 3+: Advanced Core Services & WARP's federated ESB, ERAM/weather overlay (Jan 09)

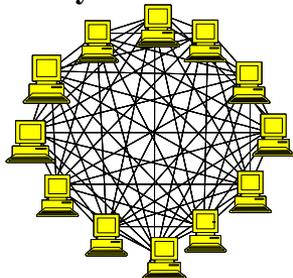
*FTI EDX Op Eval demonstrates a NAS Enterprise Domain tier for establishing a shared services model for SWIM.*



# Building on The Solution: Scaling the DEX for increased capability

## Problem

Today's "Cylinders of Excellence"



- Lack of Information Sharing
- Lack of Agility to Adapt to Dynamic Situations
- Costs to Deploy New Interfaces and Applications is too High
- Timely Access to Common Data is Lacking
- Lacks Tools to Support Performance Based Operation

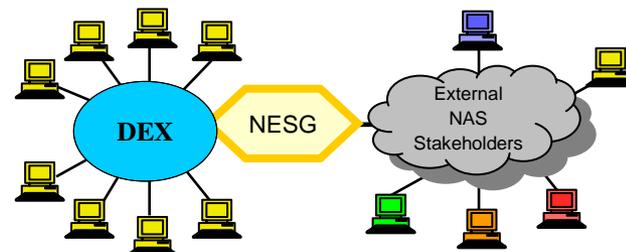
## Solution

Net-centric SOA-based data exchange



- Network Enabled Information Access
  - Scalable architecture, incremental investment & low risk transition to NG
  - EDX Op Eval demonstrates Core Services as shared, net-centric services
  - Increased awareness of NAS ops status through consolidated service management
  - Net-centric core services enable rapid on-ramping of new NAS users
- Weather Assimilated into Decision Making
- Layered Adaptive Security
- Performance Based Operations & Services

Net-centric Infrastructure for  
Secure SOA-based Data Exchange

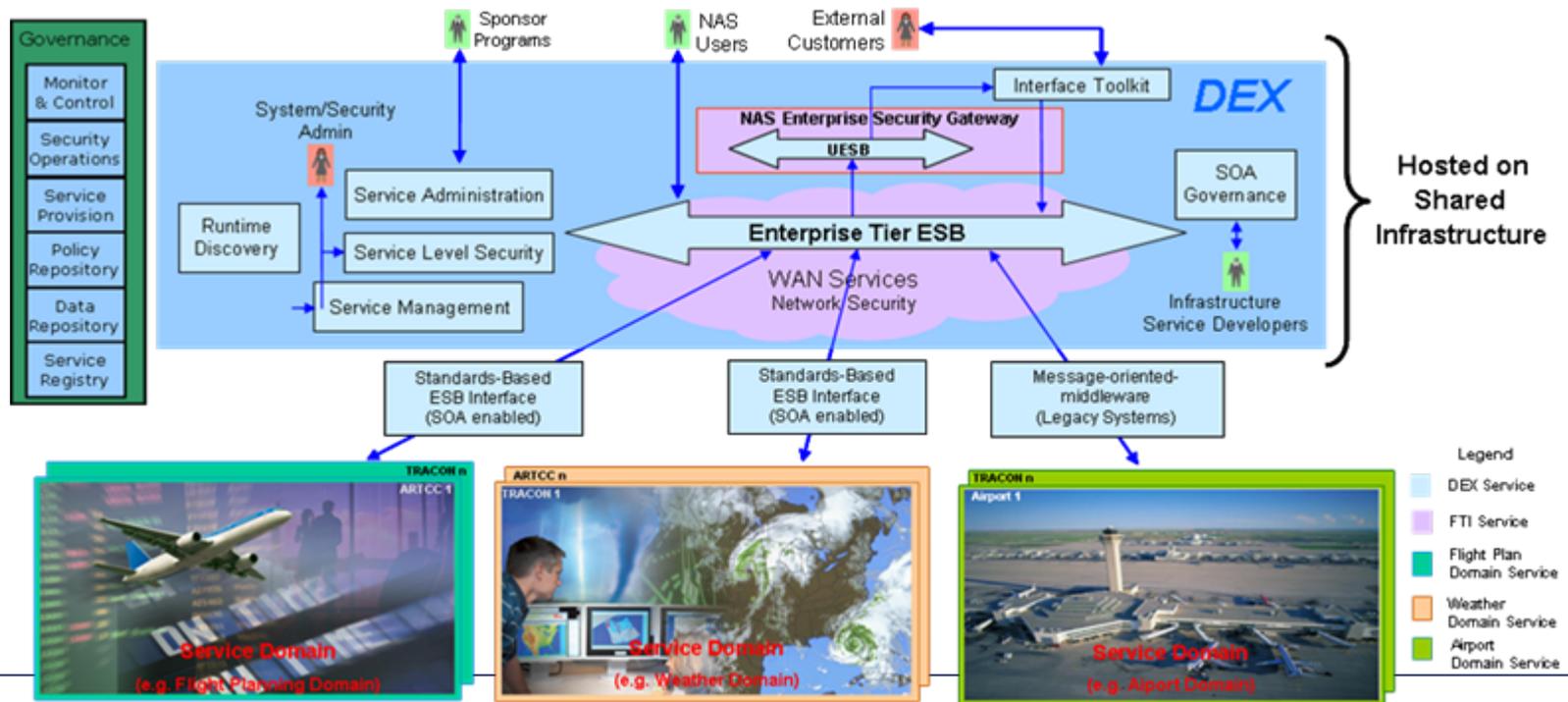


- Securing data exchange between NAS Stakeholders: Location-independence, trusted content delivered over a NAS "portal"
- Network-centric: IT infrastructure layer enhances service delivery & security
- Network Awareness: Product/Service registration & Service Administration process enables "SmartRouting", enhances network to deliver the "right data, right user"
- Building Consumer-centric information sharing model: Content producers "provide-to-cloud" & users "consume-from-cloud", enabling content re-use with no code modifications at source

*Satisfying External Stakeholders: Net-centric Core Services enables more content, available to more users!*

# Layered, Two-tier Architecture: Enterprise Domain & Service Domain

- Layered architecture used for re-usability of information/content assets
  - Service Domain Tier: Application programs able to provide/consumer available data
  - Enterprise Tier: hosts “Enterprise Services” accessible by all authorized users
- Interface management layer abstracts Enterprise Domain to service domains
  - Alleviates requirements on Application Programs to expose services to enterprise
  - Enables simple, standardized mechanism for App Pgms to discover, acquire & ingest enterprise services rapidly improving information re-usability across the NAS

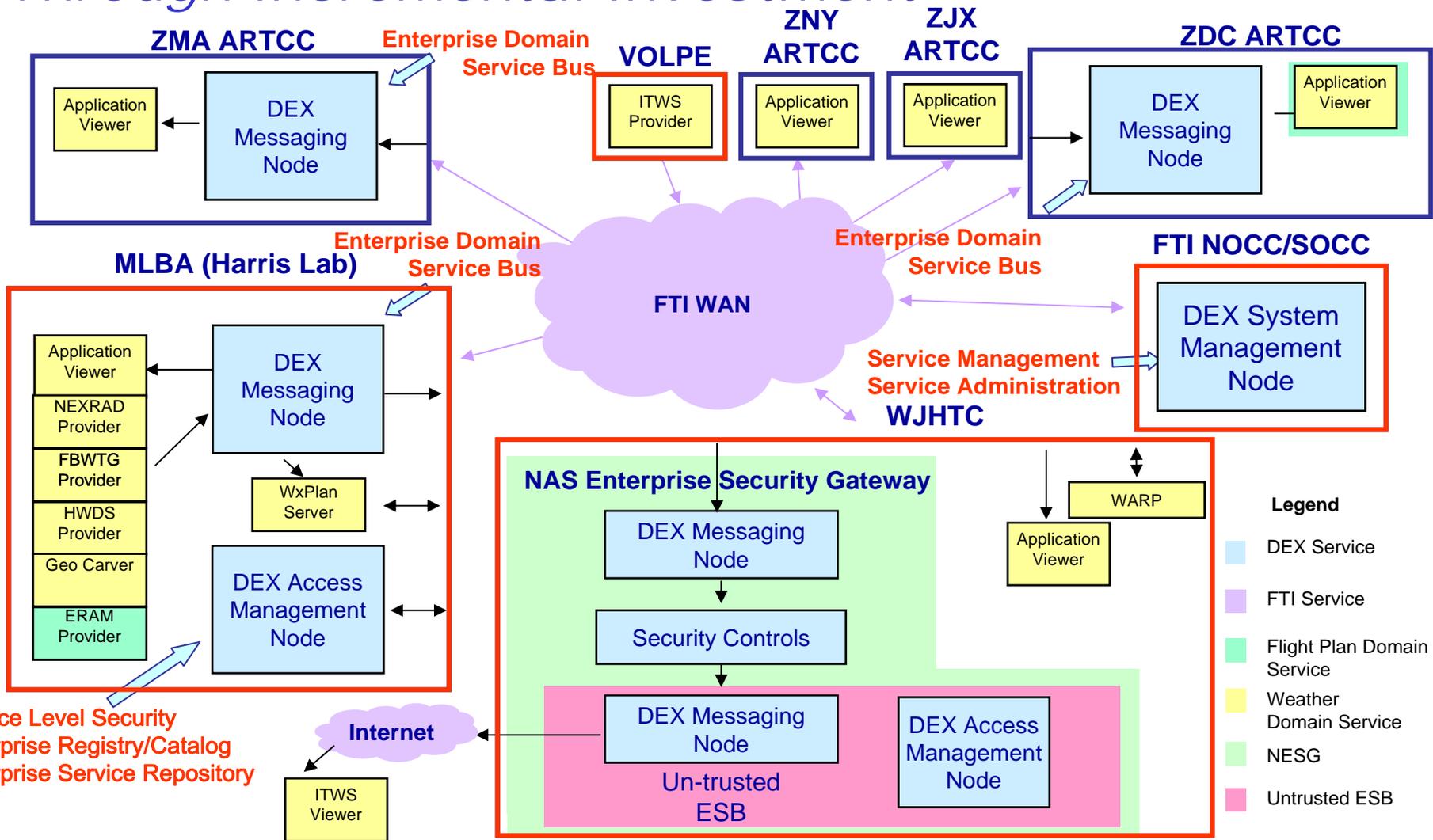


## *Release 4: Scope*

- **EDX R4 continues to validate shared, Net-centric Core Service as a NAS-tier capability for data exchange**
  - R4 integrates the DEX with NAS boundary protection security policy
    - Integration of DEX in the NAS Enterprise Security Gateway
    - Leverages information sharing with external NAS users, cost effectively
  - Interoperability with Segment 1 Service Container into a NAS-Tier
    - ITWS Segment 1 integration demonstrates a Segment 1 to Segment 2 transition
  - EDX R4 demonstrates FAA enterprise governance across the NAS
    - Enforcing a NAS governance to prevent content from being disseminated within NAS
  - Geo-Carving RUC to demonstrate advanced subscriber capabilities
  - Further integration with Operational Management systems
    - Integration of IT infrastructure & service level monitoring & control in existing Ops Center
- **Got Data? Content on-ramped & available in the DEX:**
  - All operational weather (WARP & ITWS), SUA, PIREPs, METARs, ERAM, NOTAMS, FBWTG, satellite imagery and more.



# EDX Rel 4: Expanding Infrastructure Through Incremental Investment



Service Level Security  
Enterprise Registry/Catalog  
Enterprise Service Repository

*Rapid deployment with EDX R4 under FTI CM control.*



# *Leveraging Net-Centric Infrastructure: Building on a Solid Foundation*

## • **Release 1: Basic Core Services**

- On-ramp weather products & more:
  - SUA, PIREPs, METARs, NOTAMS, FBWTG, satellite imagery, etc.

## • **Release 2: Expanded Core Services Capability**

- On-ramp Nexrad information with ESB based mediation

## • **Release 3: Advanced Core Services**

- On-ramp WARP products from ECP, ERAM (ERAM/Wx Integration)

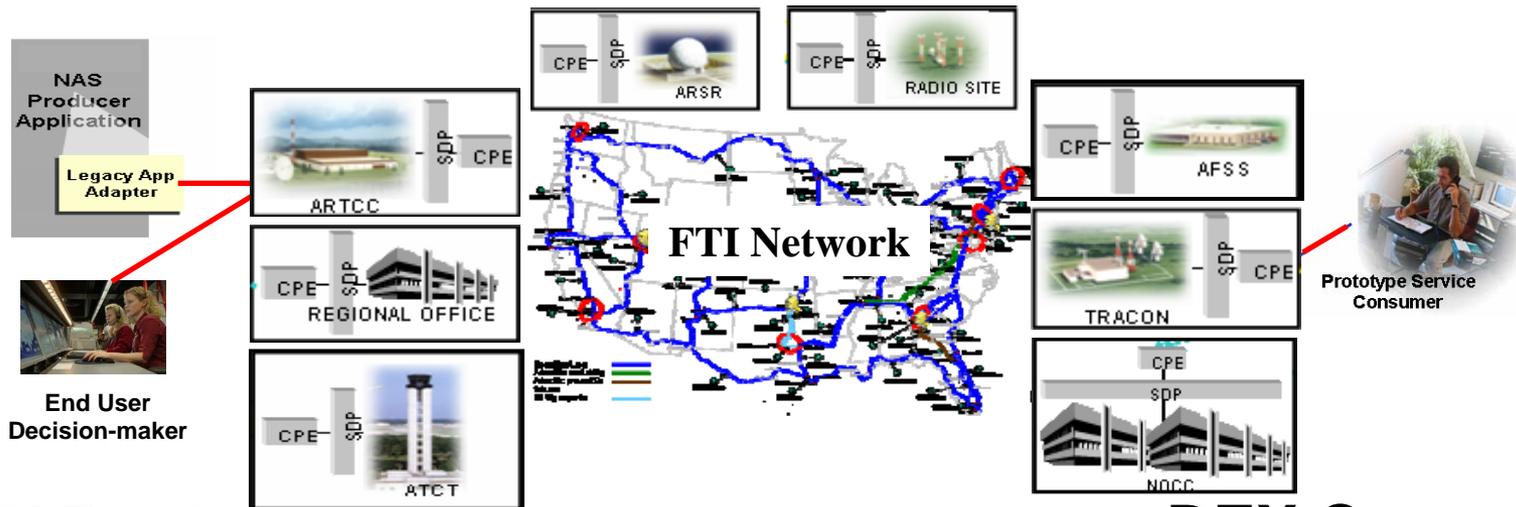
## • **Release 4 build on existing capability, adding:**

- On-ramp ITWS & new weather subscription capability
- Increased **interoperability**: Added Service Container & Geo-carver
- Increased **scalability**: Continued to optimize ESB router performance
- Increased **flexibility**: Mediation for WS-to-JMS conversions
- Increased **availability**: Auto-migration for catastrophic failure modes
- Increased **usability**: Tools added for policy & system management

*Incremental expansion & scalability supports  
incremental migration to NextGen.*



# DEX On-Ramping: Flexible "Service Domain" Integration



## • DEX Producers

## • DEX Consumers

System	System Provider	Service Domain	Products Provided	Publisher Software Technology	On-Ramping Solution	System	Subscriptions	Service Domain	Subscription Setup	On-Ramping Solution
WARP	Harris	Weather	FBWTF products	IBM MQ	Websphere JMS (MQ to Oracle Service Bus)	WxPlan	HWDS, FDO	Weather	Static (DEX Navigator)	Oracle JMS (DJK Consumer)
ERAM	LM	Automation	Canned Flight Data Objects	Oracle Weblogic	Oracle JMS (DJK Producer)	WARP Lite	HWDS, FBWTF	Weather	Static (DEX Navigator)	Oracle JMS (DJK Consumer)
SWIM-ITWS	FAA	Weather		Iona FUSE	Oracle JMS (DJK based adaptor to convert Active MQ JMS to Oracle JMS and convert from "pull to push" paradigm)	METAR Reformatter	HWDS	Weather	Static (DEX Navigator)	Oracle JMS (DJK Consumer)
NEXRAD	NWS	Weather		Java POJO		Geo Carver	FBWTF	Weather	Static (DEX Navigator)	Oracle JMS (DJK Consumer)
HWDS	Harris	Weather		Java POJO	Oracle JMS (DJK Producer)	DEX ITWS Consumer	NEXRAD	Weather	Static (DEX Navigator)	1) Oracle JMS (DJK Consumer), 2) Service Domain hosted web service
FBWTF	Hemdon	Weather	Gridded Data Products	Java POJO	Oracle JMS (DJK Producer)	SWIM-ITWS Consumer				
Geo Carver	Harris	Weather	RUC Model user specified regions	Glassfish	Web Service in combination with Oracle JMS (DJK Producer)	Weather Impact Tool	Geo Carver	Weather	Dynamic (Web Service)	Web service subscription requestor, Oracle JMS (DJK Consumer)

# DEX Compliance to SWIM Standards

DEX NODE TYPE	COTS PRODUCT	SERVICE PROVIDED	DEX PRODUCT MATURITY	STANDARDS	COMPLIANT To SWIM STANDARDS
DEX Messaging Node:	Oracle Service Bus	Messaging, Mediation	High	JMS 1.1; SOAP 1.1, 1.2; WSDL 1.1; HTTP 1.0,1.1; MTOM; WS-Security 1.0; WS-SecurityPolicy 1.2; WS-Policy Attachment 1.0; SAML 1.1, XQuery 1.0 and XPath 2.0	Yes
	WebLogic Server	Application Server, JMS, Security Policy Enforcement	High	JMS 1.1; SOAP 1.1, 1.2; WSDL 1.1; Java EE 5/ EJB 3.0; JAX-RPC 1.1; JAX-WS 2.1; JAXB 2.1; MTOM; WS-Security 1.0, 1.1; WS-Policy 1.2, 1.5; WS-Security Policy 1.1, 1.2; JAAS; XACML 2.0; SAML 1.1, XML 1.0	Yes except Active-MQ (not a standard)
DEX Access Management Node	Oracle Service Registry	Run-time Service Registry	High	WSDL 1.1; UDDI 3.0.1	One minor revision behind UDDI Version 3.0.2
	Oracle Enterprise Repository	Governance - Design-time Service Repository	Medium		No compliancy specified
	WebLogic Server	Product Catalog Service, DEX Navigator	High	JMS 1.1; SOAP 1.1, 1.2; WSDL 1.1; Java EE 5/ EJB 3.0; JAX-RPC 1.1; JAX-WS 2.1; JAXB 2.1; MTOM; WS-Security 1.0, 1.1; WS-Policy 1.2, 1.5; WS-Security Policy 1.1, 1.2; JAAS; XACML 2.0; SAML 1.1, XML 1.0	Yes
	Oracle DB	Database Services	High	JDBC; SQL, XQuery, XPath, XSLT, SOAP 1.1	Yes
	Oracle VPD	Database Role Based Access Control	High		No compliancy specified
	Oracle Identity Manager	Identity Management	High	SPML 2.0; WS-Security 1.1	Yes
	Oracle Internet Directory	LDAP	High	LDAP v2 and v3; SSL v3; TLS 1.0; SASL, X.509 V3	Yes
	Oracle Enterprise Security	Security Policy Management	High	SAML 1.1; XACML 2.0; JAAS	Yes
DEX System Management Node	Oracle Enterprise Manager	SOA Service Management	Medium	SNMP	Yes

*DEX is compliant with SWIM open standards, except proprietary ActiveMQ JMS messaging protocol.*



# *Net-Centric Information Exchange*

*Applying Net-centric Concepts:  
Establishing Infrastructure for an Agile NAS*

# Today's Point-to-Point: Where does the future start?



- **NAS was built as:**

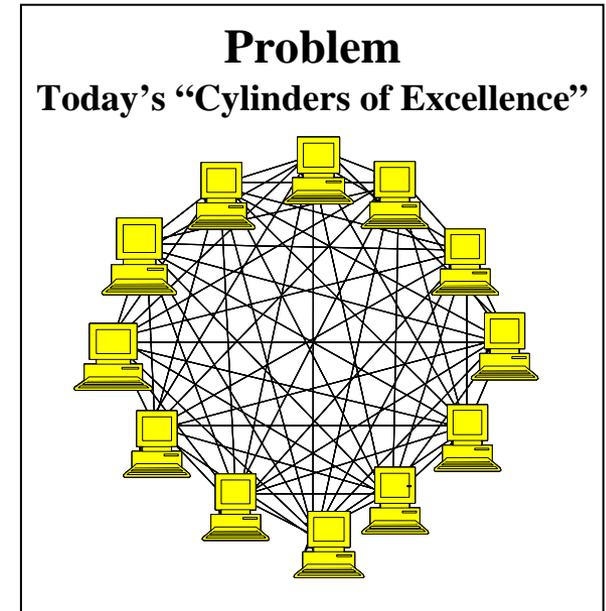
- Point-to-point network & system architectures, developed on prevailing technologies & mired in proprietary protocols

- **Net result:**

- Lack of data sharing, adaptability & re-usability
- Cost/Schedule constraints prevent flexibility of new interfaces & applications
- Lacks ability for dynamic airspace management

- **What's needed?**

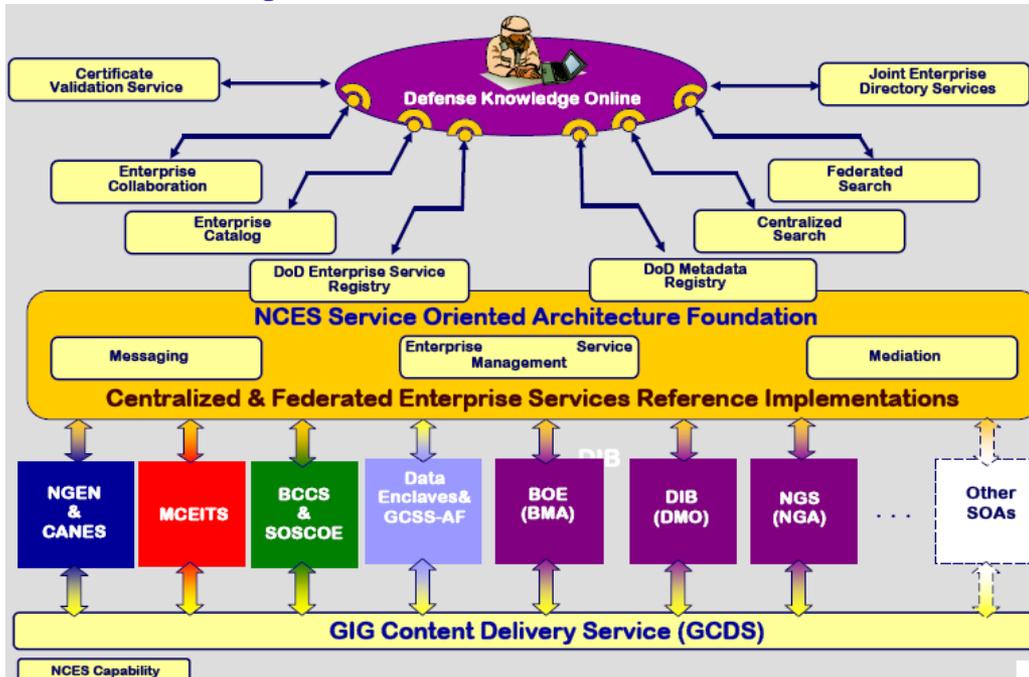
- Network-centric approach to information exchange within the NAS can accelerate the FAA's migration to NextGen
  - **Net-centric Infrastructure & Net-centric Information Services**
    - Net-centric infrastructure provides enterprise framework for reliable communications & data connectivity
    - Net-centric information services provides information through the net-centric infrastructure to users, in a timely & secure manner



# Net-centricity: DoD Concept of Operations



## Joint System Architecture View



### Cloud Computing:

- Spectrum of services that enable users to access infrastructure resources

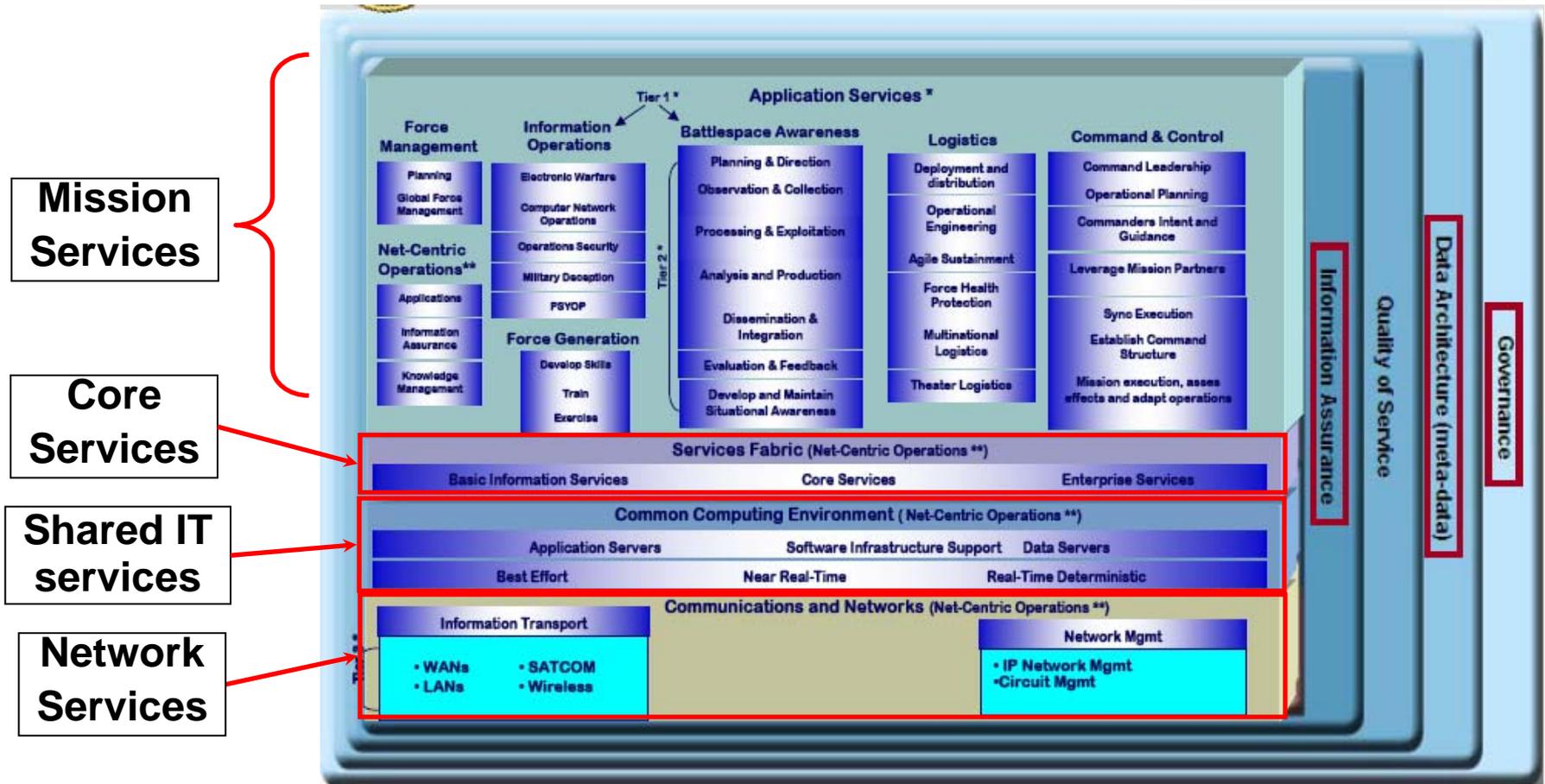
### Intent of "cloud computing" model:

- Abstract underlying infrastructure to the end user community
- Provision of dynamically scalable & often virtualized resources as services

### Spectrum of services:

- Simple shared infrastructure services
- Infrastructure & Platform "as a service"

- A robust, globally interconnected network environment (including infrastructure, systems, processes, and people) in which data is shared timely & seamlessly among users, applications & platforms.
- Characteristics:
  - **Securely interconnecting people and systems**
  - **Independent of time or location,**
  - **Supports a substantially improved military situational awareness,**
  - **Better access to information to dramatically shorten decisions cycles**



## Support Services:

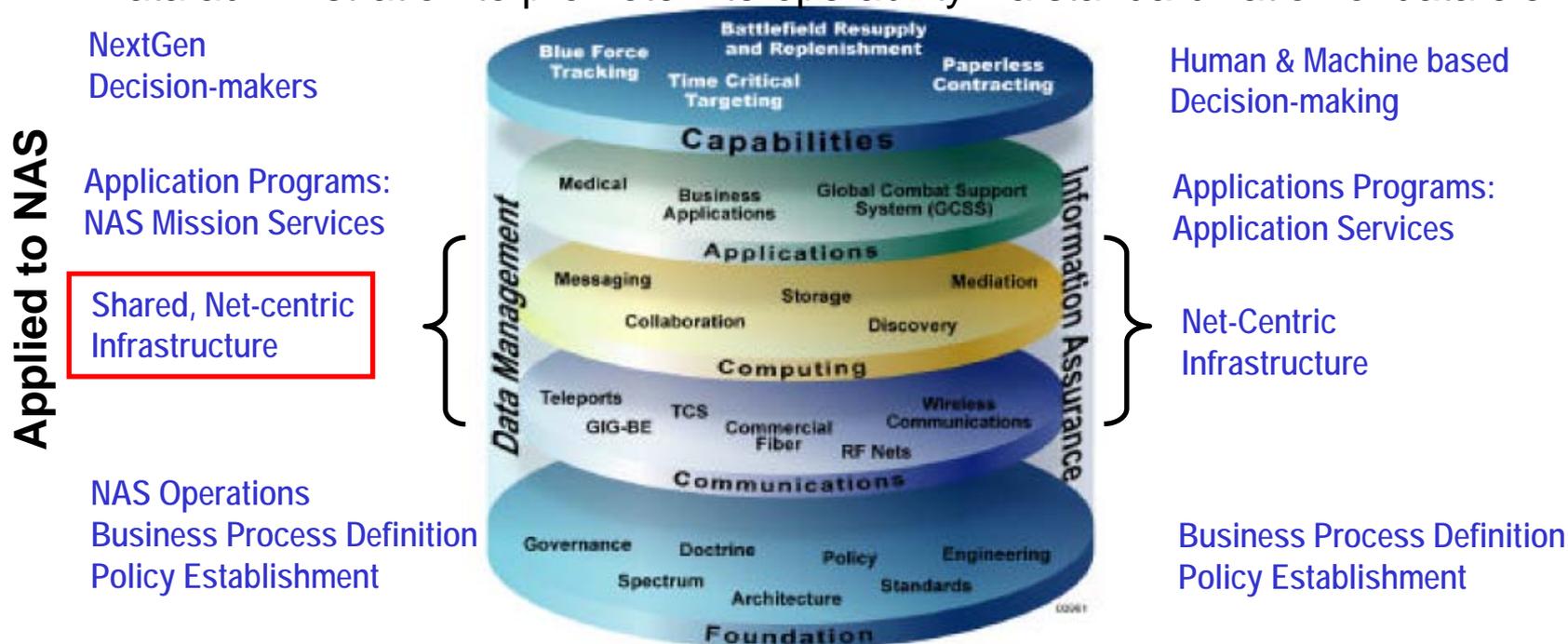
- Data, or information architecture
- Governance, Information Assurance (Security)
- Quality of Service (Service Mgmt)

# Net-centric Operations: Addressing the Enterprise Services



- DoD Lesson learned:

- Traditional approach to data has been data administration.
- Data administration to promote interoperability via standardization of data elements



- Net-Centric Data Strategy

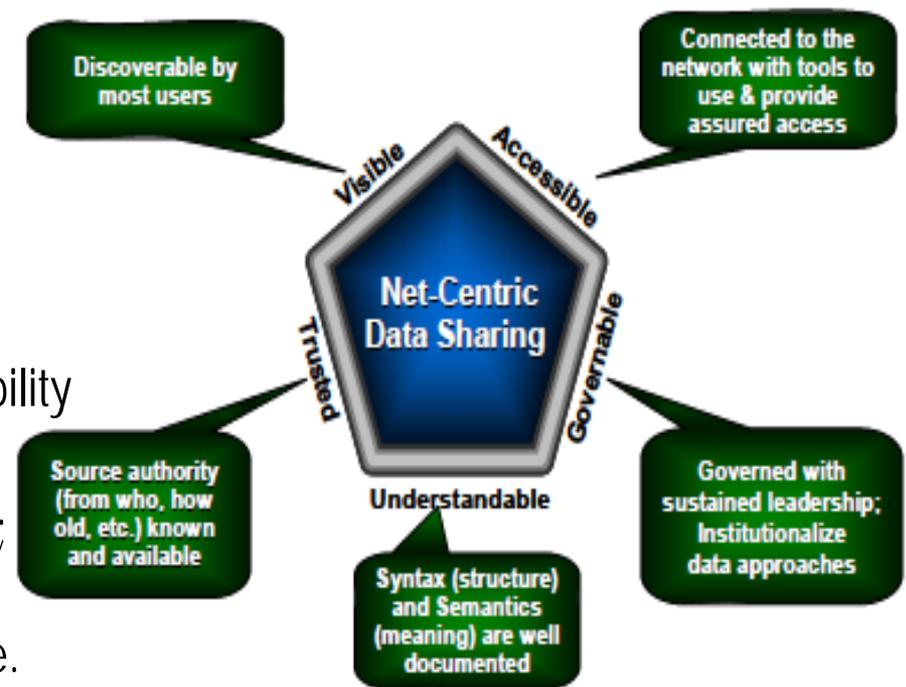
- Vision of net-centric data requires greater availability of data to the enterprise
- Expands focus to visibility & accessibility of data rather than standardization
- Recognizes need for data usability for anticipated & unanticipated users/apps

# SOA is an enabler for Net-centric Operations



- Service Orientated Architecture is...
  - A business transformational technology, not an application
  - Infrastructure that accelerates the rate of innovation
  - A catalyst for operational efficiencies
  - Capability enabling enterprise to leverage power of information

- Net-centric Data Strategy
- Core Enterprise Services will allow users & information systems to:
  - Find & access relevant information;
  - Expose information for others to discover;
  - Increase performance & data access reliability
  - Collaborate in a more effective manner;
  - Distribute data to forward deployed areas;
  - Enterprise infrastructure for evolving DoD systems to a Service-Oriented Architecture.

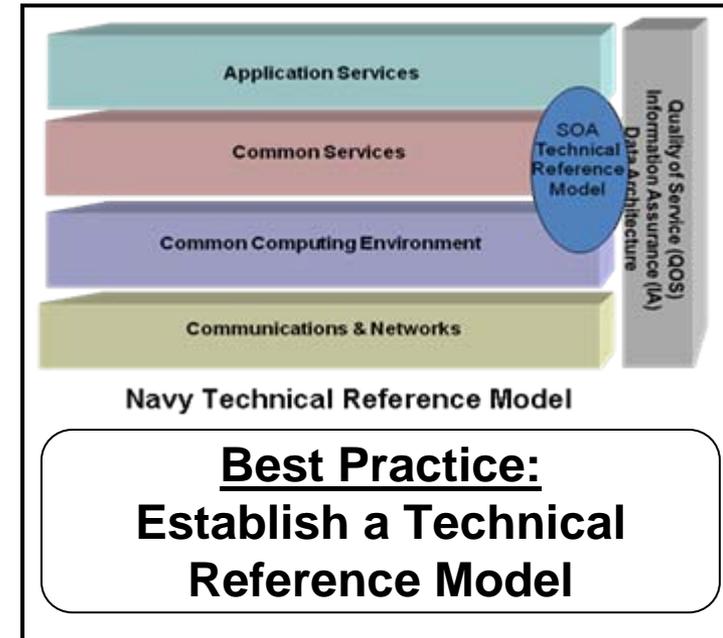


# Case Study: Navy

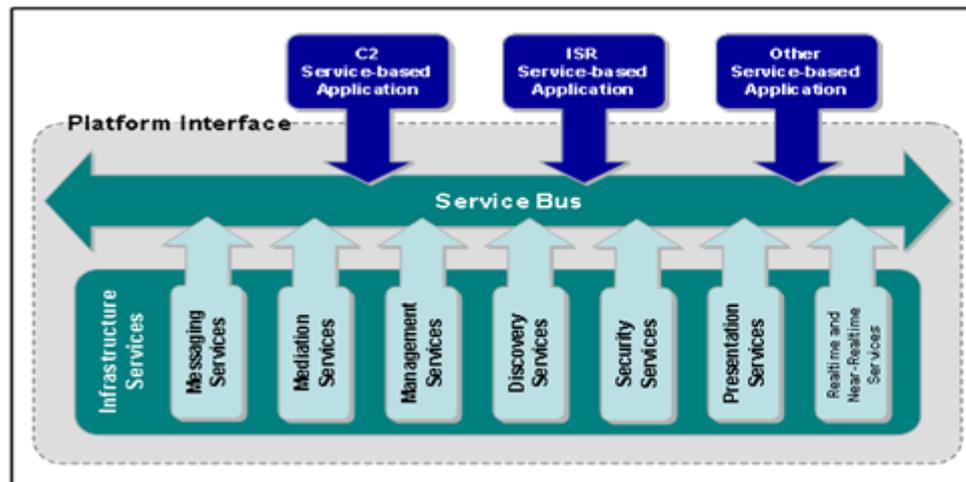
## Establish a model & implement



- **Established conops/use for Service Bus:**
  - Must support any type of communications style
    - One-way messaging, hub/spoke, request/response, brokered delivery, peer-to-peer & orchestrated workflow
- **Lessons Learned:**
  - SOA & net-centricity require major culture change
  - Rigorous Configuration Management
  - Leadership support (Governance)
  - Policy enforcement is important to build in



**CANES SOA Runtime Infrastructure Architecture**



- Application Programs interact with shared infrastructure
- Supports communication & various services from "Infrastructure Services" layer
- Shared infrastructure: Policy enforcement point

# NextGen Case Study: Telecommunications Industry

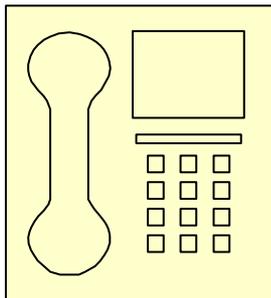
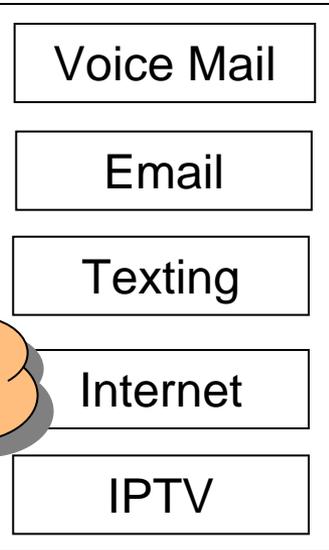


## • Traditional Networks Services

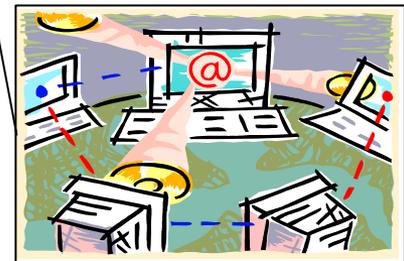
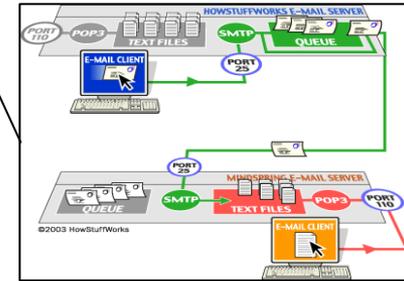
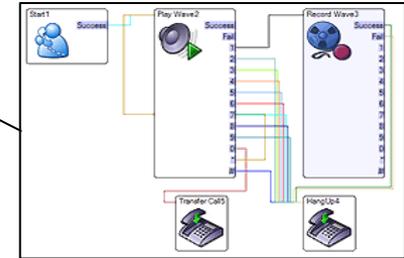
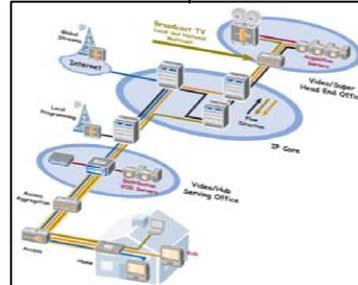
- Provide basic services
- Technology evolved & started offering value added services

- Voice & Data
- Add TV

- More capabilities delivered to users as enhanced services



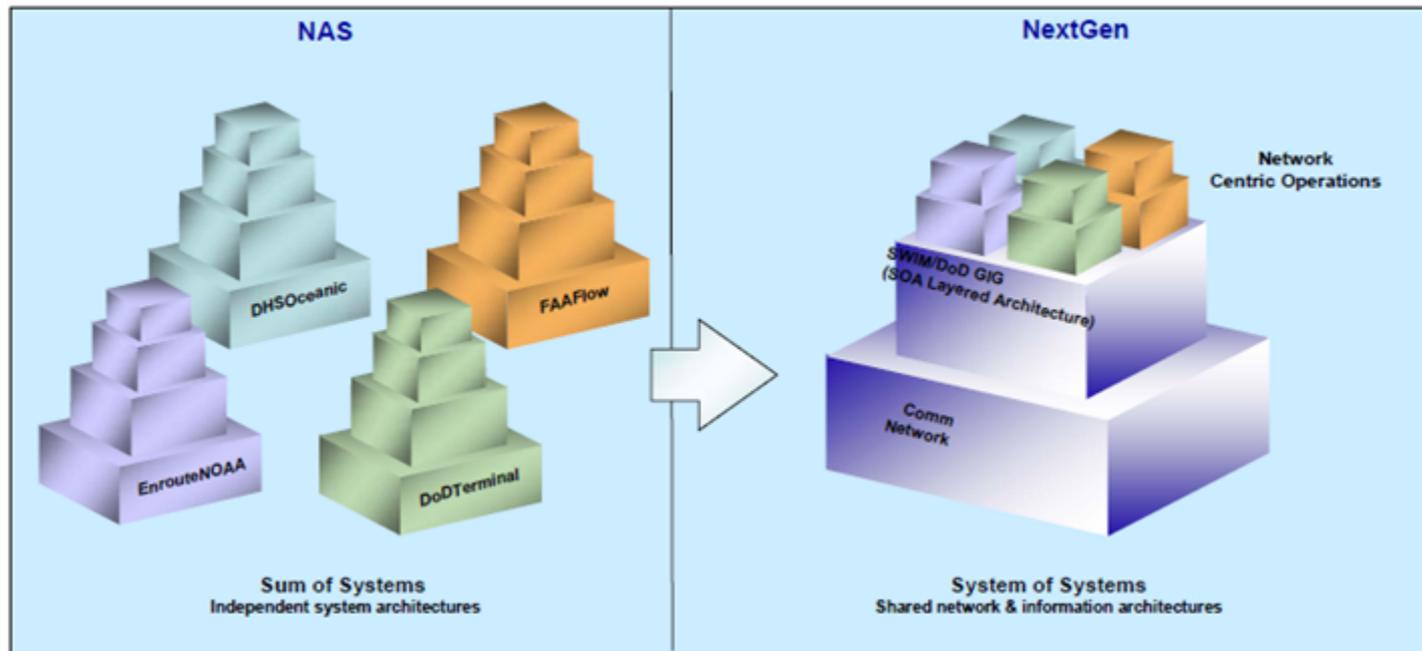
- Call Waiting
- Call Forward
- 3-way Call



## JPDO:

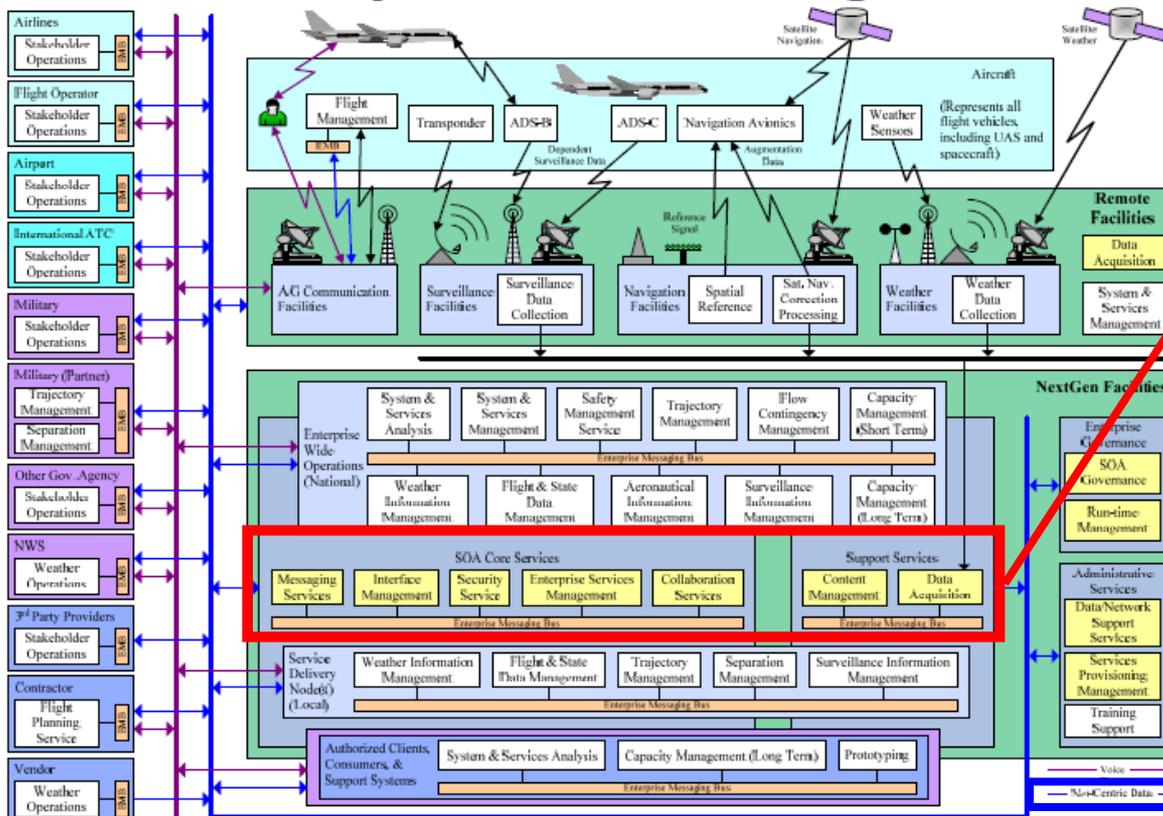
**Net-centricity: information sharing components  
known as net-centric infrastructure services**

## The Legacy System Challenge



*"Hey architects, a little help here, too!"*  
- Col. Doug Wreath, June 23, 2009

## SV-1p - Context Diagram



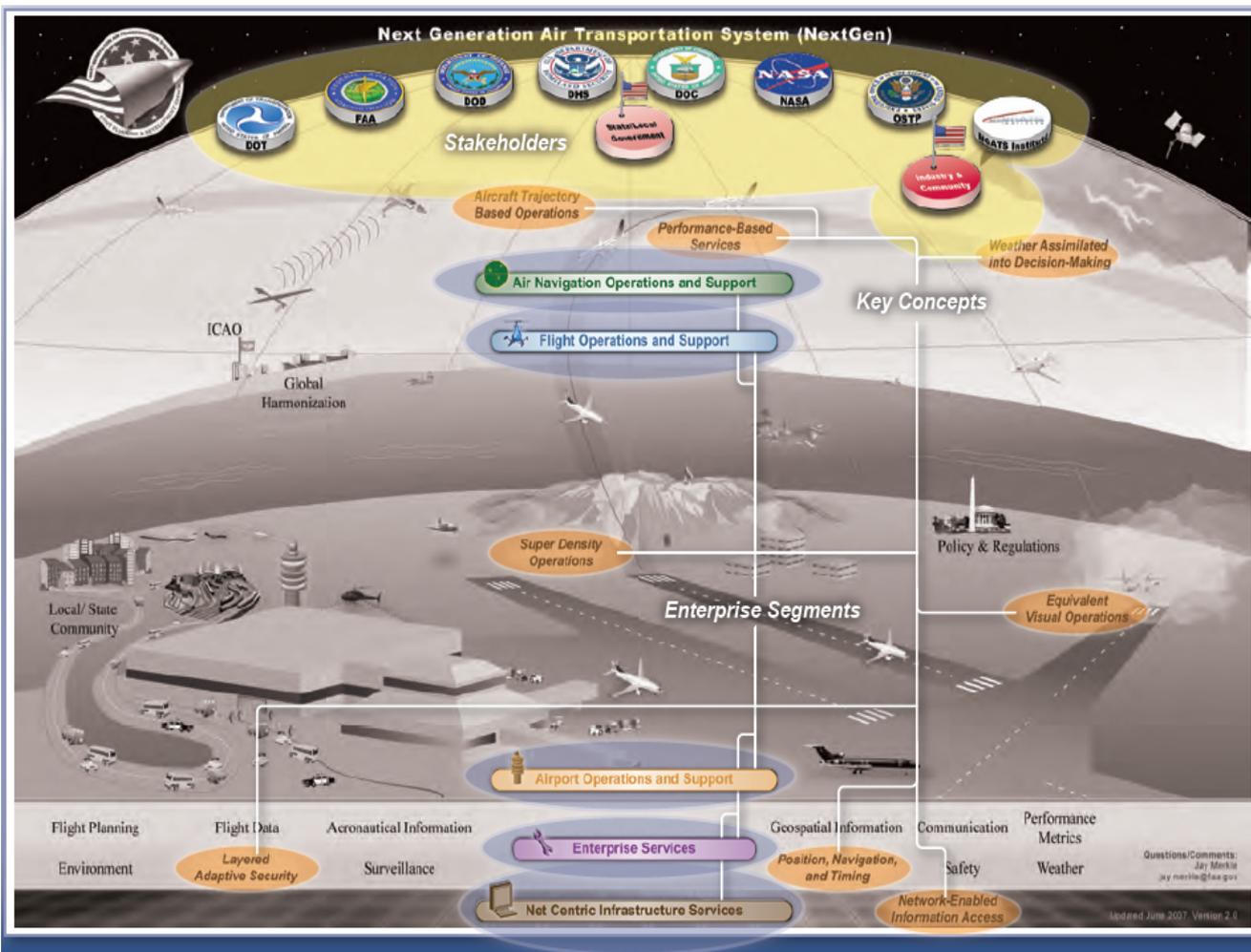
**Enterprise Core Services:**  
Shared Services across all NAS users

**Net-centric Data:**

- “Enterprise Services”
- Services discoverable & accessible within the NAS
- Exposed & made available via Core Services

- NAS Enterprise Architecture:
  - Recognition of net-centric operations
    - Net-centric Data: content exchanged between systems across the NAS
  - SOA Services (yellow boxes) are those required to create a net-centric environment

# How do we use that to advance NG? Accelerate NG Key Capabilities



## NextGen Objectives:

- Increase Safety
- Expand Capacity
- Improved Efficiency
- Increase Productivity
- Secure the Nation
- Ensure our Defense

Who will do the work?  
Application Programs:  
Develop Mission Services

What do App Pgms need?  
Shared, Net-centric  
Infrastructure Services

**Enterprise Data Access**

**Rapid App Innovation**

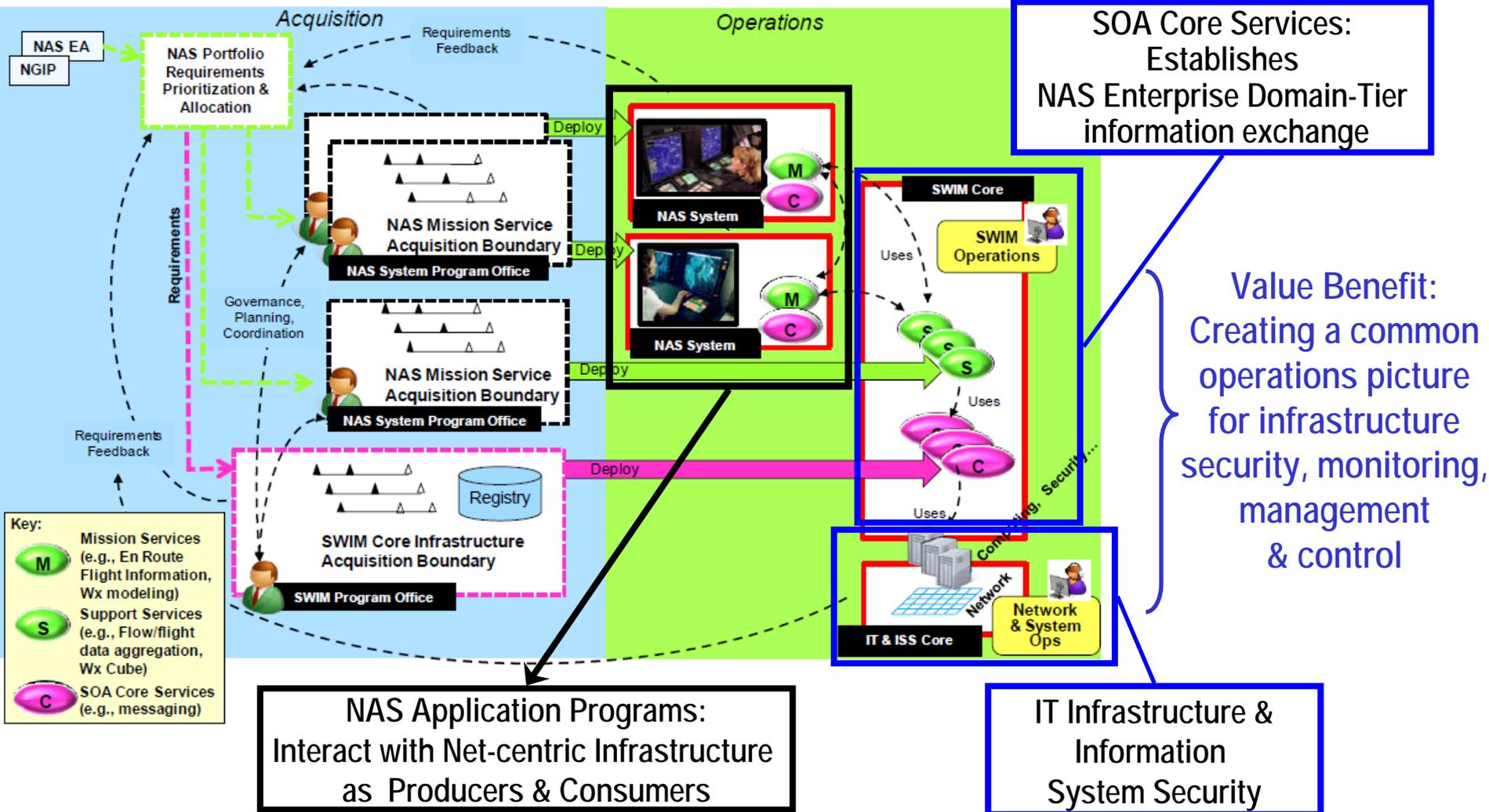
**Lower Cost Integration**

**Common Ops Picture**

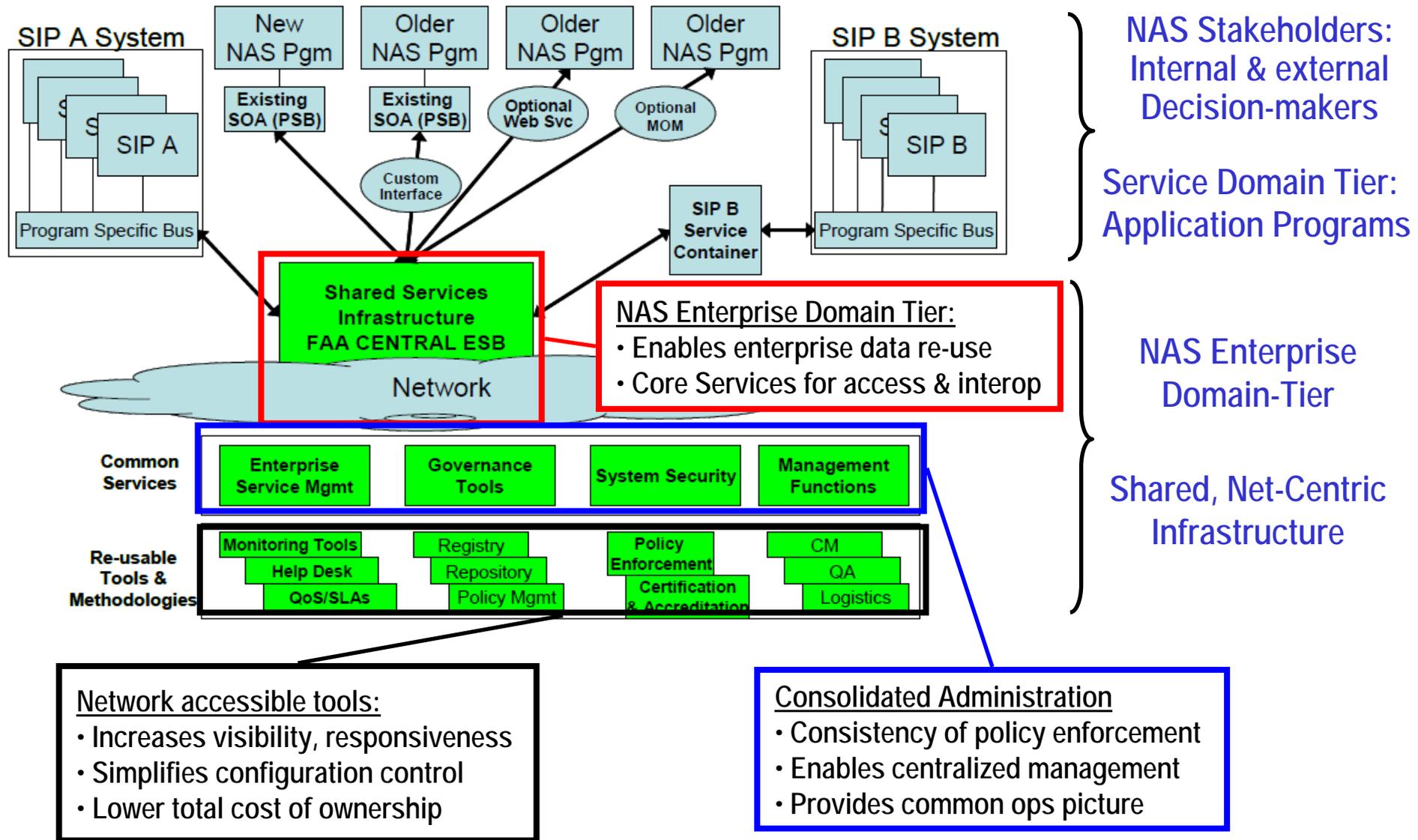
**Cultural Incentives**

Technology  
Management

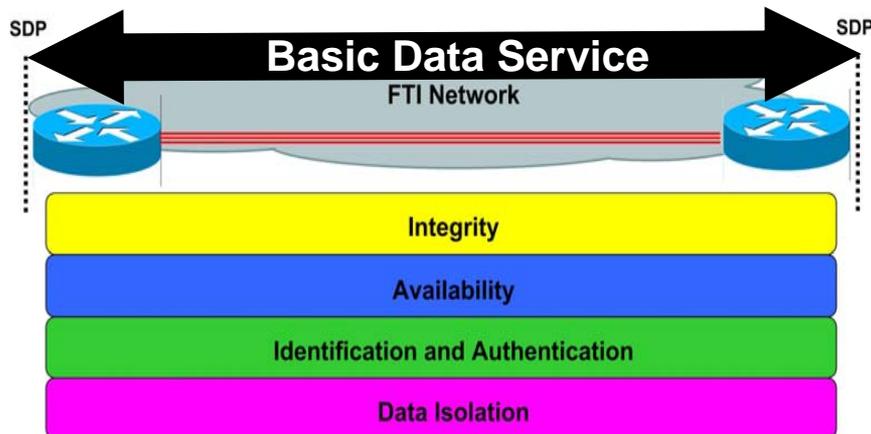
# Mitre's SWIM Evolution Concept: "NAS Net-centric Infrastructure"



# GEIA/ITAA (TechAmerica): Shared Services Infrastructure



# Security Enterprise: Shared Security Services



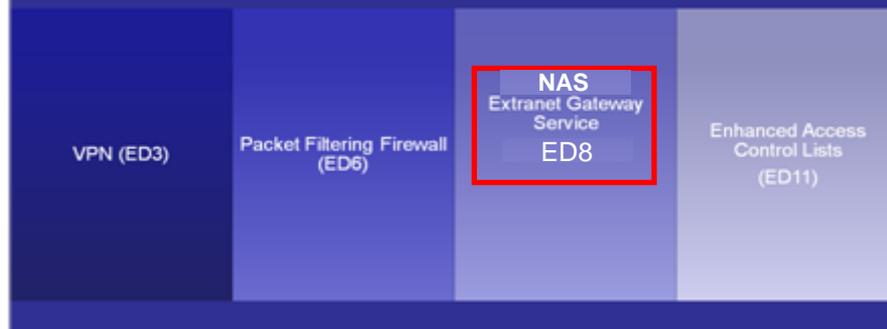
## • Basic Data Service (BD-1)

- Provides common, basic security solution
- FAA Policy dictates all users inherit
  - BD-1 level service are trusted network services & do not communicate with external un-trusted users
  - Security policy enforced to all NAS users consistently via net-centric approach

## • Enhanced Data Services (ED)

- Enhanced data service are net-centric, shared services that leverage infrastructure across all NAS users
- NAS Enterprise Security Gateway:
  - ED8 enables NAS users to interoperate with the non-NAS (ie, AOC's, etc.)
  - Hosted security architecture & applications offered to NAS users as a service

Enhanced security services are optional security features and must be explicitly ordered by programs wishing to utilize them. Options include:

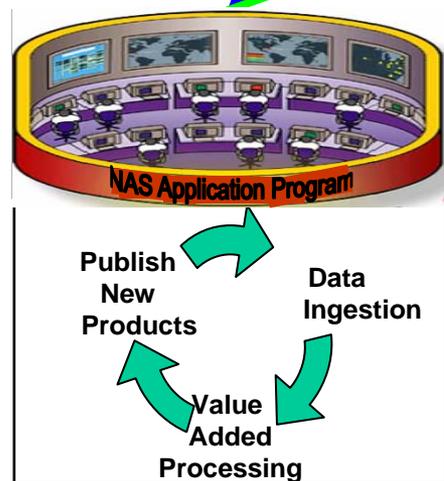
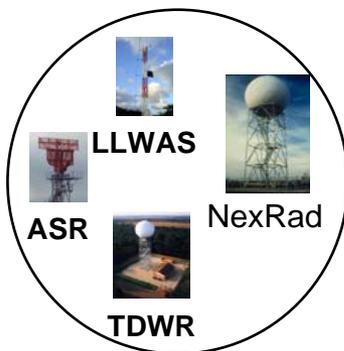


*Security: Delivered as an enhanced network service providing enterprise governance & policy enforcement.*

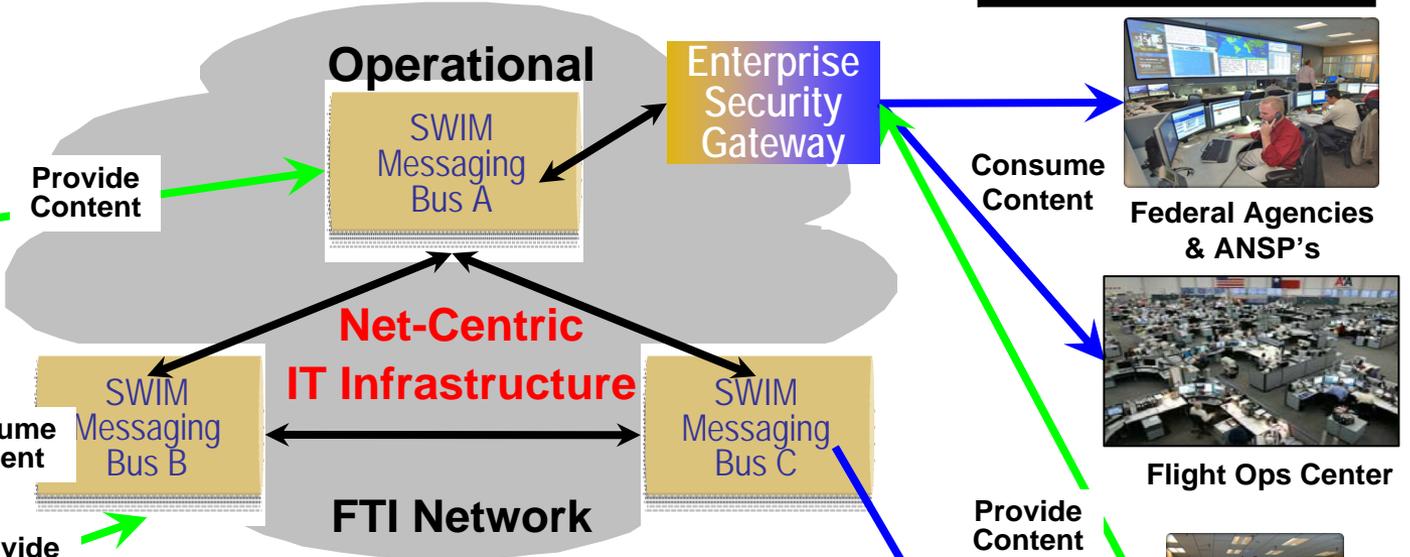
# Achieving Net-cent Ops in NAS: Net-centric Information Exchange



## The Source



## Service Factory



- New data distribution paradigm
  - **Consumer-centric:** Model where content producers “provide-to-cloud” & users “consume-from-cloud”, enabling content re-use w/ no code modifications at source
  - **Network-centric:** Product/Service registration, provisions IT infrastructure & enhances network to delivering the “right data, right user, right location”

# *Accelerating NextGen through Net-centric Information Exchange*



- NextGen can benefit through adoption of a net-centric operational model
- NextGen key capabilities require:
  - SWIM as the net-centric-enabling infrastructure leveraging SOA technology
  - These shared infrastructure services establish NAS Enterprise Domain-Tier for SWIM, accelerates NextGen with a lower total cost of ownership
    - Exposes location independent NAS information as “Enterprise Services”
    - Empowering application programs to accelerate rate of innovation
    - Net-centric model enables content re-use with no code modifications at source
    - Leverages investments across all NAS application programs
  - NAS-wide enterprise awareness & operational flexibility
    - Content Producers “provide-to-cloud” & Users: “Consume-from-cloud” model
  - NAS-wide policy based management & governance
    - Improved interoperability, re-usability & standardization
    - Delivers the right data, right decision-maker, right location

*Net-centric approach will accelerate formation of:  
Net-centric Information Exchange,  
Enabling NextGen, Now!*

*backup*

# *EDX Operational Evaluation: Release 4 Demo*

## • **Scenarios**

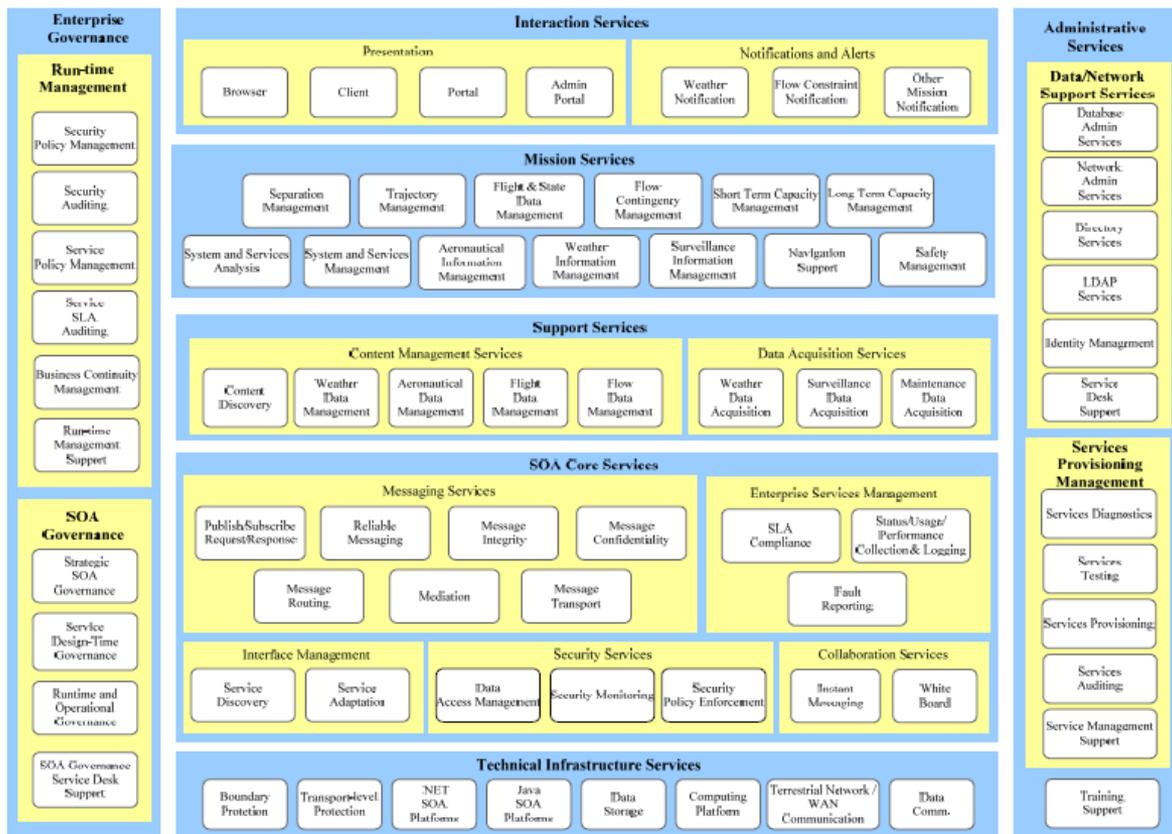
- **System Security – centralized service level policy management**
  - *Demonstrates role based access control and the value of the consolidated administrative interface for net-centric infrastructure*
- **ITWS Product Distribution via DEX**
  - *Illustrates “provide-once, consume-many” benefit of Net-centric Core Services*
    - *On-ramp content once and distribute internal & external NAS stakeholders*
  - *Demonstrates a Segment 1-to-Segment 2 Transition Strategy*
- **Enterprise Service Management**
  - *Establishes a demarcation point between Providers & Consumers, using SAP’s*
  - *Demonstrate policy based management for net-centric infrastructure*
- **GEO-Carving the RUC Model**
  - *Demonstrates that once a NAS-Tier is in place, NextGen programs will have the content needed to innovate, accelerating NextGen objectives*
- **Run-time Service Discovery and Governance**
  - *Demonstrates the DEX environment has integrated registry, repository & ESB*



# Tracking Best Practices: Have a framework



## NextGen NAS SV-4 Framework



**Mission Services:**  
Operational app services supporting air traffic ops

**Support Services:**  
Content discovery, management

**SOA Core Services:**  
Run time services & infrastructure for messaging, interface management, enterprise service & security management

- Constructs are all similar

# NAS Enterprise Architecture: Recognizing NAS at Enterprise Level



## • Automation:

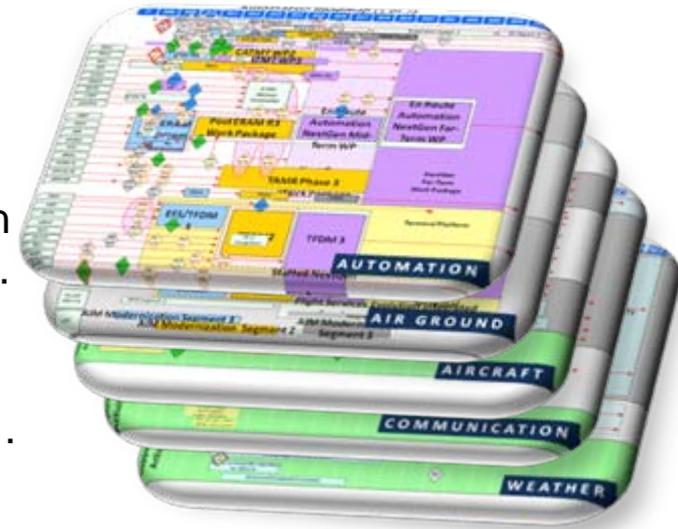
- 01: **Net-centric Enterprise Services** will replace existing point-to-point interfaces...based on SOA
- 08: **Consistent security management** across...

## • Enterprise Services:

- 01: **FAA Net-centric Programs** will exchange information
- 02: ...provide **policies...existing systems & networks...**

## • Facilities:

- 04: NextGen...use new **goe-independent model...**
- 07: ...capabilities include...**network addressable voice...**



## • Information System security

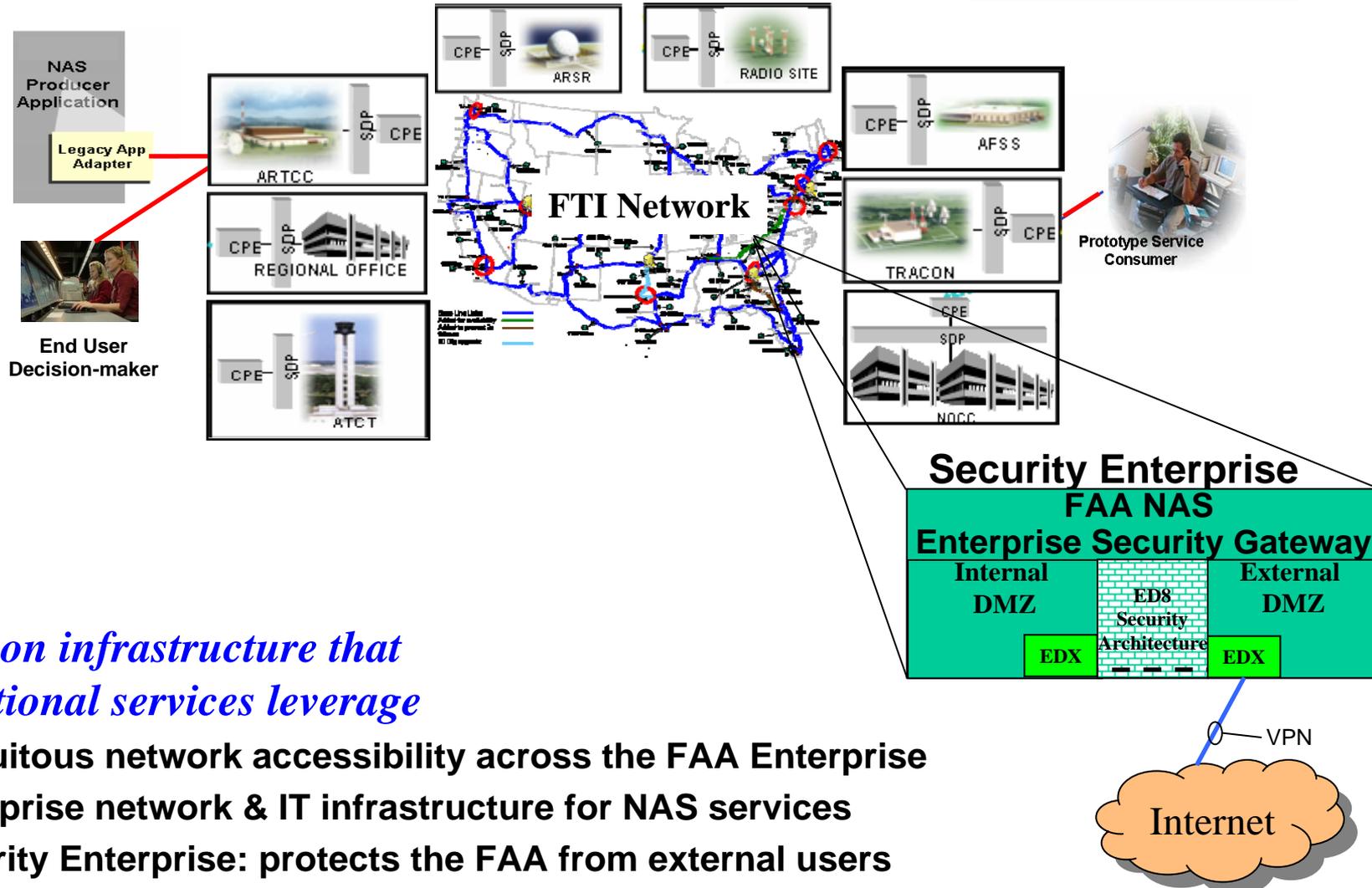
- 01: **Enterprise security policy and governance** structure will exist...
- 05:[perimeter protection] domain level must be expanded to **enterprise administration**
- 06: **Enterprise security...technology:** leverage **common enterprise security services**

## • Communications:

- 01: NAS must transition...[from] sector based facility operations to **networked based ops**
- 12: **Relationship between SWIM & Communications:** **SWIM** requires **FTI IP service**

*"At the heart of NextGen is... net-centric infrastructure services,  
or net-centricity" - JPDO ConOps for NGATS*

# Secure Network Connectivity: Foundation for Secure Data Exchange



## Common infrastructure that Operational services leverage

- ✓ Ubiquitous network accessibility across the FAA Enterprise
- ✓ Enterprise network & IT infrastructure for NAS services
- ✓ Security Enterprise: protects the FAA from external users

	<b>Commoditized (Basic) Service</b>	<b>Premium Service</b>
Interface Management	Service administration of on-ramping providers and consumers	DEX JumpStart Kit. Provider/consumer deployment service
Security	Service level access control	Inter-domain credential interoperability
Messaging	Pub/sub best effort delivery, Request/Response best effort delivery, Near real-time latency Low message frequency	Pub/sub guaranteed delivery, Pub/sub durable subscriptions, Dynamic subscriptions, Real-time latency High message frequency
Message Routing	Header based routing	Payload based routing
Service Management	Availability status monitoring of SAPs (percentage availability), Performance monitoring ( latency, message rates) SAP to SAP	Producer and Consumer Service Monitoring beyond SAPs
Mediation	Provider protocol transformation	XML-XML message format transformation, Custom message format transformation, Message information insertion, Consumer protocol transformation
Governance	Basic service metadata management, Lifecycle service management	Extended service metadata management, Impact analysis

# *Blueprint for the Agile NAS: Constructing the ATS of the Future*



- NextGen benefits of the future ATS are waiting:
  - NAS-wide enterprise awareness & operational flexibility
    - Content Producers “provide-to-cloud” & Users: “Consume-from-cloud” model
    - Enterprise view eliminates “virtual point-to-point” message exchange
  - Lower total cost of ownership
    - Net-centric model enables content re-use with no code modifications at source
    - Leverages investments across all NAS application programs
  - NAS-wide policy based management & governance
    - Improved interoperability, re-usability & standardization
    - Delivers the right products, right decision-maker, right time

*Net-centricity establishes the infrastructure services, leverages investment & accelerates constructing the ATS of the Future.*

- **Background:** Team proposed NAS Enterprise Domain SWIM services integrated with the existing NAS IT infrastructure.
- **Scope:** Operational Eval demonstrating Net-Centric Core Services for SWIM delivered as a shared NAS service
  - For example: FTI currently provides the shared NAS Enterprise Security Gateway service (ED8) which enables non-NAS users to interoperate

• **Stakeholders:** FTI SWIM WARP ITWS (WJHTC) & Ops Planning

ID	Task Name	Start	Finish	2008												2009											
				Qtr 1, 2008			Qtr 2, 2008			Qtr 3, 2008			Qtr 4, 2008			Qtr 1, 2009			Qtr 2, 2009			Qtr 3, 2009					
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep			
1	EDX Operational Evaluation	Wed 3/26/08	Fri 7/10/09	[Gantt chart bar]																							
2	Task Order Received	Wed 3/26/08	Wed 3/26/08	[Gantt chart bar]																							
3	Project Kickoff	Wed 3/26/08	Wed 3/26/08	[Gantt chart bar]																							
4	Release 1	Wed 3/26/08	Thu 10/9/08	[Gantt chart bar]																							
5	Baseline Release 1	Wed 3/26/08	Fri 10/3/08	[Gantt chart bar]																							
6	Revised Release 1	Wed 3/26/08	Mon 9/15/08	[Gantt chart bar]																							
7	Steering Committee Demo	Thu 10/9/08	Thu 10/9/08	[Gantt chart bar]																							
8	Release 2	Mon 7/7/08	Fri 1/30/09	[Gantt chart bar]																							
9	Baseline Release 2	Fri 8/29/08	Fri 1/30/09	[Gantt chart bar]																							
10	Revised Release 2	Mon 7/7/08	Mon 11/17/08	[Gantt chart bar]																							
11	Release 3	Fri 8/29/08	Wed 5/27/09	[Gantt chart bar]																							
12	Baseline Release 3	Fri 11/28/08	Wed 5/27/09	[Gantt chart bar]																							
13	Revised Release 3	Fri 8/29/08	Thu 1/15/09	[Gantt chart bar]																							
14	Steering Committee Demo	Wed 2/11/09	Wed 2/11/09	[Gantt chart bar]																							
15	Executive Demonstration	Wed 2/25/09	Wed 2/25/09	[Gantt chart bar]																							
16	Final Report	Fri 7/10/09	Fri 7/10/09	[Gantt chart bar]																							

- **Deliverables: Information Exchange**
  - Rel 1: Basic Net-centric Core Services & Weather product distribution via pub/sub services (Oct 08)
  - Rel 2: Extended Core Services & NEXRAD weather product distribution to ITWS, message transformation to **web services** (Nov 08)
  - Rel 3+: Advanced Core Services & WARP's federated ESB, ERAM/weather overlay (Jan 09)

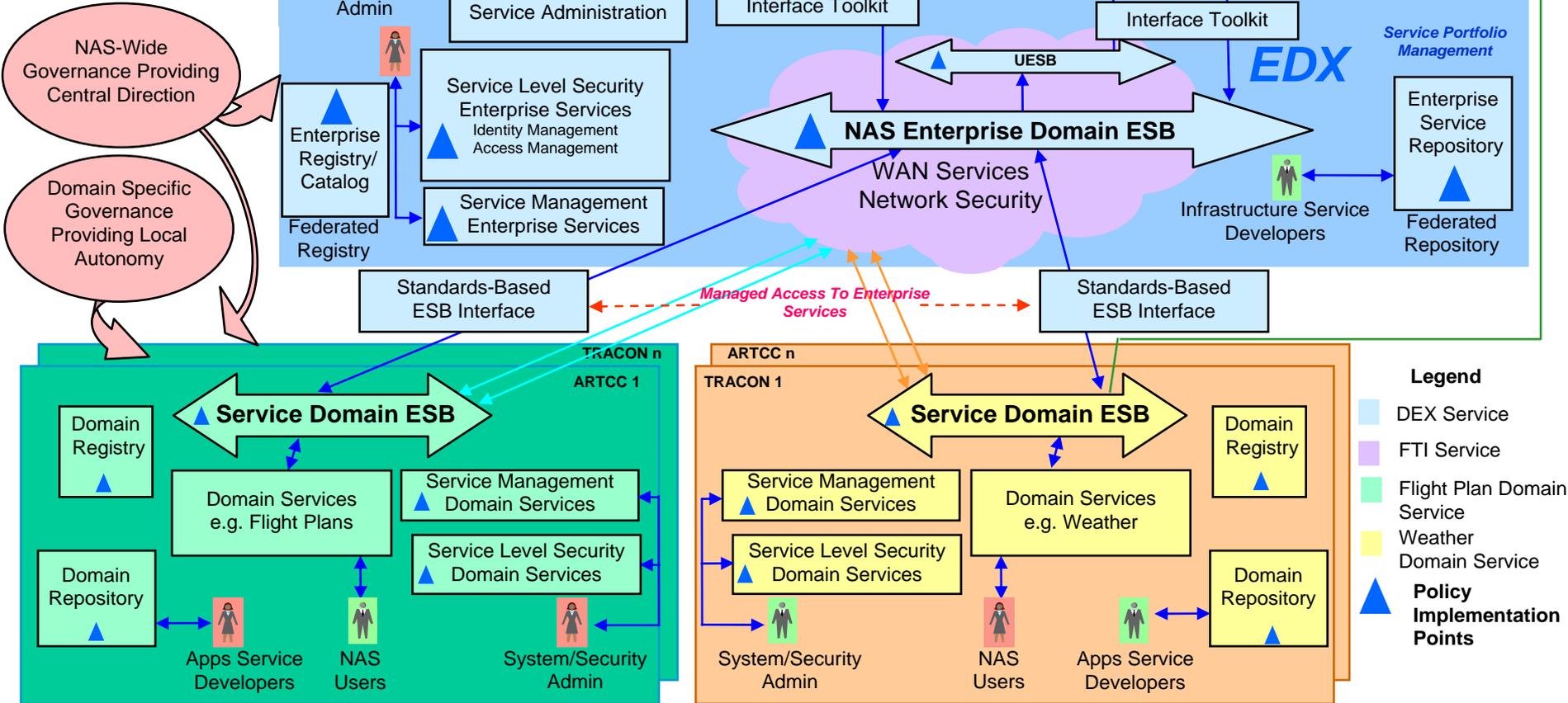
*FTI EDX Op Eval demonstrates a NAS Enterprise Domain tier for establishing a shared services model for SWIM.*

# EDX Notional Architecture



Current Segment 1  
ITWS Field Trial

Stakeholders – Make Decisions  
Process – Procedures, Metrics,  
Control Mechanisms  
Policies – Decisions Made



*Flexible two-tier architecture enables Service Domains to make services available across the FAA enterprise through Shared Services. Architecture scales with migration to NextGen.*

# Milestones Achieved

- **Delivered 4 Releases in 10 months (Plan: Rel 1, 2 & 3+ in 14 months)**
  - Releases supported weather content distribution, changing authoritative sources, ESB transformation & collaboration with LM on-ramping FDO
- **Demonstration scenarios to FAA Executives completed: 4/8 & 4/9/09**
  - R1-R3 Evaluated alternative SOA integration concepts with IT infrastructure
  - Weather Products via Pub/sub and Web Service Delivery Mechanisms
    - Interoperability, network awareness & minimize risk
  - Supporting Common Operations Picture:
    - Leverage existing investment in Security & Operations management capabilities
  - Continuity of NAS Operations: BCP Scenario: ARTCC Failure/WJHTC becomes ARTCC
  - Rapid On-ramping of Providers and Consumers
    - Demonstrated how once an existing service domain publishes content (LM ERAM) & exposes to NAS Enterprise Domain tier, other service domains can acquire, ingest & integrate new services
  - SOA Design-time Governance: Applying FAA defined NAS-wide policy enforcement
- **Gathering lessons learned:**
  - EDX Environment is CM controlled & uses FTI deployment processes
    - Can build any node from scratch within hours & used HSV Lab for interoperability analysis & test
  - Vendor independent implementation: Release 1: IBM, Release 3: Oracle
- **EDX Release 4: Currently under development – July deployment**
  - Integrate ITWS prototype w/ NAS Enterprise Domain through boundary protection



# EDX Roadmap - Release 4

- NAS Enterprise Security Gateway – Provides un-trusted ESB for simplified access to NAS products by external consumers
- ITWS Interoperability – Ease of bringing SWIM Segment 1 Service Container based providers into the DEX
  - Provides a Service Container adapter to Interface to DEX.
  - Provider does not have to be modified.
- Geo-carving: Provide subset of RUC model to consumers
  - Weather IRAD
  - User creates request, ESB send request to Geo-carving Service, ESB routes data to destination
- Expansion of Core Service capabilities
  - High Availability persistent messaging support via ESB – pre-requisite for guaranteed message delivery
    - Clustering capability using WLS & Messaging service migration
  - Service Monitoring & Metrics: NOCC integration and consolidated service monitoring, highly available monitoring
    - NOCC Integration: provides consolidated monitoring of all distributed DEX nodes



# EDX Roadmap - Release 4 (cont.)

- Expansion of Core Service capabilities (cont.)
  - Service Level Security – Policy driven consolidated DEX Security management
    - Provide access control at the service level using consolidated policy manager
  - High Availability Database – Provides highly available message routing engine & product catalog access
    - Clustered product catalog and message routing databases
  - Performance Improvements – Reduced message latencies
    - Database tuning & Server side caching of message routing tables
  - DEX Navigator Enhancements
    - Manage web service endpoints for pub/sub consumers
    - Select subscriptions from web service
    - View summary of all current consumer subscriptions
  - Enhanced DEX JumpStart Kit – Flexible adaptor pattern for Providers & Consumers
    - Allows for rapid deployment of new provider and consumers for the DEX platform
  - Registry – Increased service maintainability
    - Runtime usage strategy utilizing proxies for flexible service management
    - Supports virtual service endpoints
  - Repository – Increase service governance
    - Publish services and endpoints from design-time repository to the run-time registry
    - Discovery of run-time proxy services and endpoints on the ESB and ingest to the repository so that they can be governed



# Benefits

- **EDX is demonstrates:**

- A shared services capability where Service Domain content is made visible, accessible and interoperable with COI's across the NAS
- Value of NAS Enterprise Domain tier for data exchange
  - The flexibility to have Service Domains control their own operations
  - Sharing assets (IT infrastructure & information) across FAA Enterprise
  - Rapid integration from available content
- How FAA can leverage existing operations and management assets, as well as monitoring/maintenance assets

- **EDX Release 4 continues to validate shared data exchange concept of operations, known as the DEX**

- Cost effective solution for sharing information with external NAS stakeholders, within the context of NAS boundary protection & FAA security policies
- Re-usability: Once on-ramped, ITWS content will be available (internal & external) to all authorized NAS users
- EDX R4 demonstrates FAA enterprise governance of content across the NAS

- **Environment & capability that can be leveraged for other research & development activities**

# Net-centric Shared Core Services: Demonstrations – Benefits Summary

<i>Net-Centric Core Services</i>	<i>FAA Benefits</i>
<i>Net-centric Architecture &amp; Operations</i>	<ul style="list-style-type: none"> <li>• <b>NAS Agility:</b> operational flexibility in enterprise data sharing &amp; interoperability</li> <li>• <b>WAN &amp; infrastructure optimization:</b> supports multiple failure modes (lower cost)</li> <li>• <b>Enterprise view eliminates “virtual point-to-point” message exchange</b></li> </ul>
<i>Centralized Administration &amp; Management</i>	<ul style="list-style-type: none"> <li>• <b>Increased enterprise-wide awareness, consistent application of NAS-wide policy management &amp; re-use existing “defense-in-depth” security architecture investment</b></li> <li>• <b>IT/WAN Scalability:</b> supports incremental expansion, NG transition risk reduction</li> </ul>
<i>Lowest Total Cost of Ownership (TCO)</i>	<ul style="list-style-type: none"> <li>• <b>Deployment:</b> IT infrastructure used as shared services, ensures NextGen migration through incremental investment &amp; eliminates underutilized infrastructure</li> <li>• <b>Maintainability:</b> Leverages investment in existing enterprise-wide operational shared services, maintenance &amp; avoids costly mass system-wide upgrades</li> </ul>
<i>Demonstration Scenarios</i>	<i>Benefits Demonstrated &amp; Relevance to NextGen (NG)</i>
<i>Weather Products via Pub/sub &amp; Web Service Delivery Mechanisms</i>	<ul style="list-style-type: none"> <li>• <b>Interoperability:</b> Pervasive data availability supports evolving NG requirements</li> <li>• <b>Network Awareness:</b> right products, to the right people at right time</li> <li>• <b>Shared services maximizes IT re-use, investment &amp; minimizes NG transition risk</b></li> </ul>
<i>Supporting Information Assurance</i>	<ul style="list-style-type: none"> <li>• <b>Enterprise awareness:</b> Net-centricity leverages multi-layer FAA certified</li> </ul>

*Net-centric Shared Services demonstrated through  
The DEX Accelerates Evolution to NextGen*



