Capabilities Composition
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Mr. Terry Simpson
Space & Naval Warfare Systems Center Atlantic
✉️ terry.simpson@navy.mil
📞 (843) 218-5630
📞 DSN 312-588-5630
• **Background**
  – Today
  – Tomorrow

• **Getting There**
  – Stakeholders
  – The Challenge
  – Governance (alignment of the pieces)
  – Example: Navy Technical Reference Model (NTRM)
  – Collaboration Environments
  – Innovation & Composition

• **Summary & Discussion**
Where We Are Today…

A Systems focus….

- Inflexible systems cannot be easily reconfigured to meet changing mission needs
- Systems are the centers of gravity, and all data is stored within them
- Multiple systems are often required to execute a mission thread
- Every link and interface must be tested/accredited
- Capabilities delivery & upgrades are expensive and time consuming

Business logic (and data) is still largely buried in stove-pipe systems …
A Mission Focus....

- Far fewer connections, much more agile development cycle
- Data Sources are centers of gravity - data is stored within data enclaves
- Compose capabilities to meet warfighter / mission needs
- Expose and tailor business logic to meet mission needs
- Deliver component capabilities incrementally to meet dynamic mission needs

Business logic (and data) is delivered through components rather than systems...
Service Orientation of a Mission Thread

- Deliver components rather than systems
- Components are provided as information services
- Components can be arranged in any way to provide overall composite application
- Component design provides flexibility, higher re-use, and better manageability
Getting from Today to Tomorrow…

- **Warfighter Needs** define the goal

- **Operational Architectures** define deployable approaches to deliver mission capabilities

- **Capability Portfolio Managers** guide and drive capabilities developed and delivered for C2, BA, L, NC….

- **Resource Sponsors** use CONOPS, Scenarios, Mission Threads and wargames to determine appropriate investment areas

- **Operational Test Authorities** test systems and capabilities against mission thread, interoperability, and technical guidelines

- **OSD NII and Service Directives** guide NetCentric Data Sharing and Data Exchange

- **Programs of Record** direct and manage capabilities Fielding and life-cycle management

**Capability Composition** focuses Data, Applications and Infrastructure on Warfighter needs
The Challenge...

...using CANES as an example

Governance (Operational, Acquisition, Engineering, Enterprise)

CANES Infrastructure (CCE, SOA, IA)

Align & synchronize capabilities and processes to enable development...

C2
Applications
PMW 150

IO/ISR
Applications
PMW 120

Business
Applications
various providers
(Naval, Joint)

Other COI
Applications
various Providers
(Naval, Joint)
Dimensions of Governance

• Portfolio Management of:
  – Operational requirements
  – Acquisition priorities and funding
  – Engineering solutions

• Scale and align with the larger Service / Joint enterprise environment

• Leverage intersections between key elements of Joint and Service specific efforts
NTRM Level 2
(With R&R Based on Existing Acquisition Efforts)

Common Services

Basic Services
- Object Invocation
- Computing Systems Management
- Data Management
- Data Extraction/Recording
- Display
- Video
- Navigation, Position & Time
- Application Framework
- Distributed Computing
- Visualization

SOA Core Services (Tactical Edge)
- Portal
- Notification
- Service Discovery
- Messaging
- Enterprise Service Mgmt
- Orchestration
- Security /IA
- Collaboration
- Mediation
- Search
- Catalog

Enterprise Services
- Credential Validation
- Authorization
- Directory Services
- Service Management
- Collaboration

Quality of Service (QOS)
Information Assurance (IA)
Data Architecture
ONR Core Services Architecture Evolution

Reference Framework

Core Services Reference Implementation (CS-RI)

Core Services Reference Architecture (CS-RA)

CS-Reference Element Architecture
CS-Layered Reference Architecture

Core Services Reference Model (CS-RM)

CS-Service Reference Model
CS-Infrastructure Reference Model
Engineering Governance Enabler

• Engineering Governance is enabled by collaboration and the co-evolution of tools and engineering processes to support interoperability

• Co-evolution requires a flexible Collaborative Engineering and Certification Environment (CECE)

• A CECE is a key collaboration & re-use enabler
  • Discovery
  • Context
  • Service Descriptions
  • Unintended Consumer ($$$$
  • Scalability and Extensibility
  • Interfaces
Linking Innovation to Acquisition

Summary - the challenge continues…

• Service Orientation is still evolving
  – Design patterns, technologies, and implementation and support processes (including ITIL v3)

• Understanding of Governance is still evolving
  – *Engineering, Acquisition and Operational Governance* enables interoperability via flexible, transparent, collaborative processes
  – Re-use goes beyond just code and applies to knowledge, processes, artifacts, approaches, and testing (*there is no single answer – apply a full spectrum of SSPPs*)

• CECE provides the foundation for development agility
  – Persistent engineering and test facility – transparency and collaboration
  – Alignment and traceability of Capability Modules and Mission Threads
  – Rapid assessment via experimentation and MUAs

“SOA is not the answer to everything; one SOA is not the answer to anything”
• SOA – Service Oriented Architecture
• C2 – Command & Control
• ISRT – Intelligence, Surveillance, Reconnaissance & Targeting
• MP – Mission Planning
• L – Logistics
• NC – Net-Centric
• ONR – Office of Naval Research
• OPNAV – Navy Echelon 1 resource organization
• NWDC – Naval Warfare Development Command
• PEO – Program Executive Officer
• CECE – Collaborative Engineering & Certification Environment
• CES – Core Enterprise Services
• CCE – Common Computing Environment
• CPM – Capability Portfolio Management
• ITIL v3 – Information Technology Infrastructure Library version 3
• MUA – Military Utility Assessment
• SSPP – Standards, Specifications, Patterns and Practices
• CM – Configuration Management
Questions & Answers
Navy SOA Reference Implementation

* See ONRRI-SSPA.doc for supported Standards, Specifications, Protocols and API versions.
* See ONRRI-Blueprints.doc for guidelines, patterns and code examples.