Capabilities Composition

Software Systems Technology Conference

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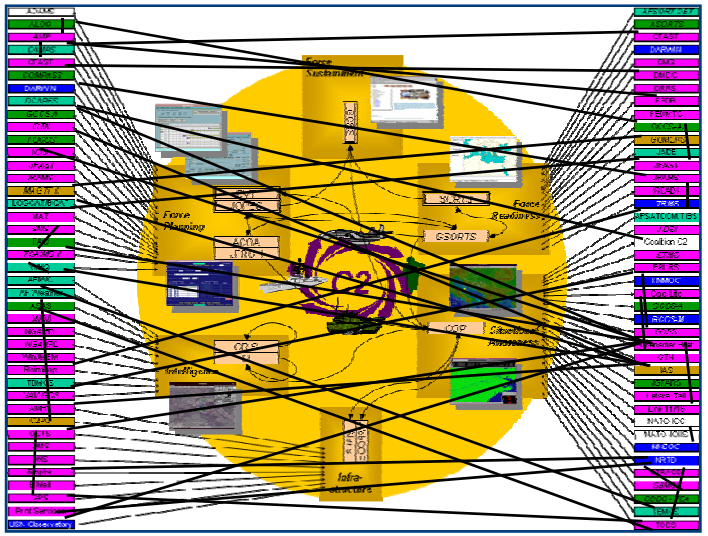
Agenda

- ***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**

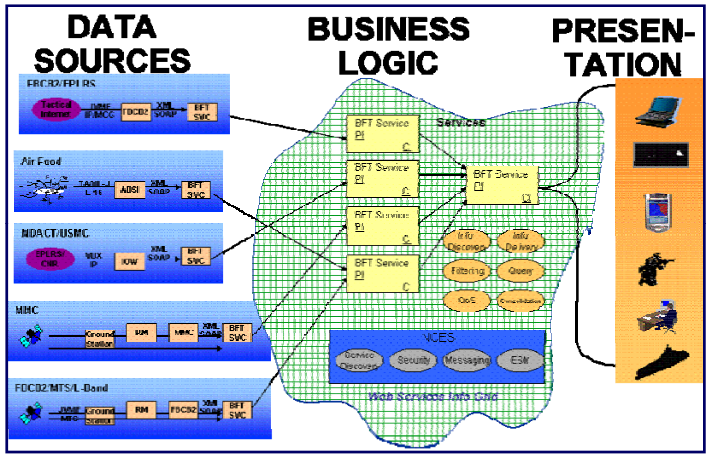


Business logic (and data) is still largely buried in stove-pipe systems …

Where We're Heading…

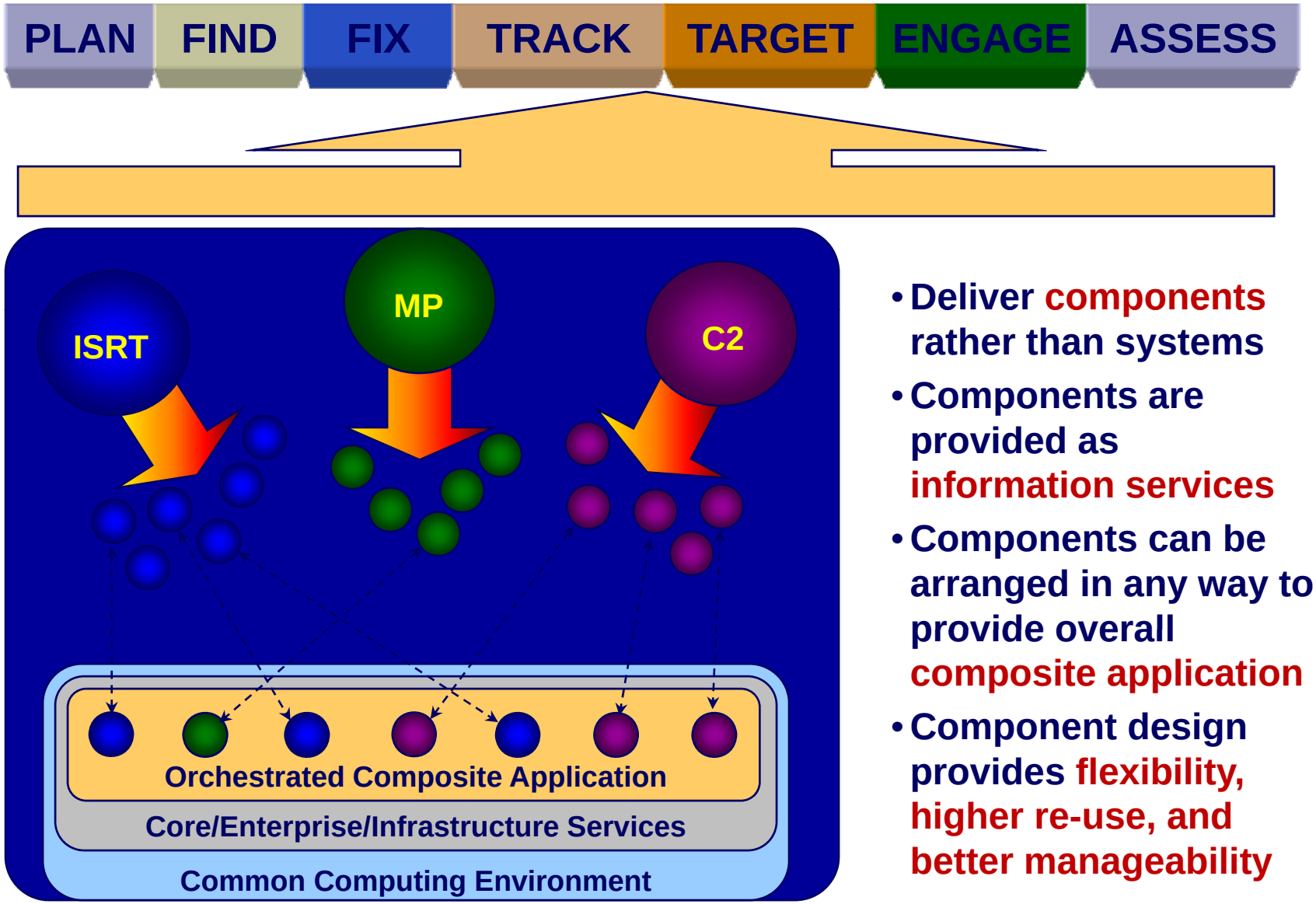
A Mission Focus….

- **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

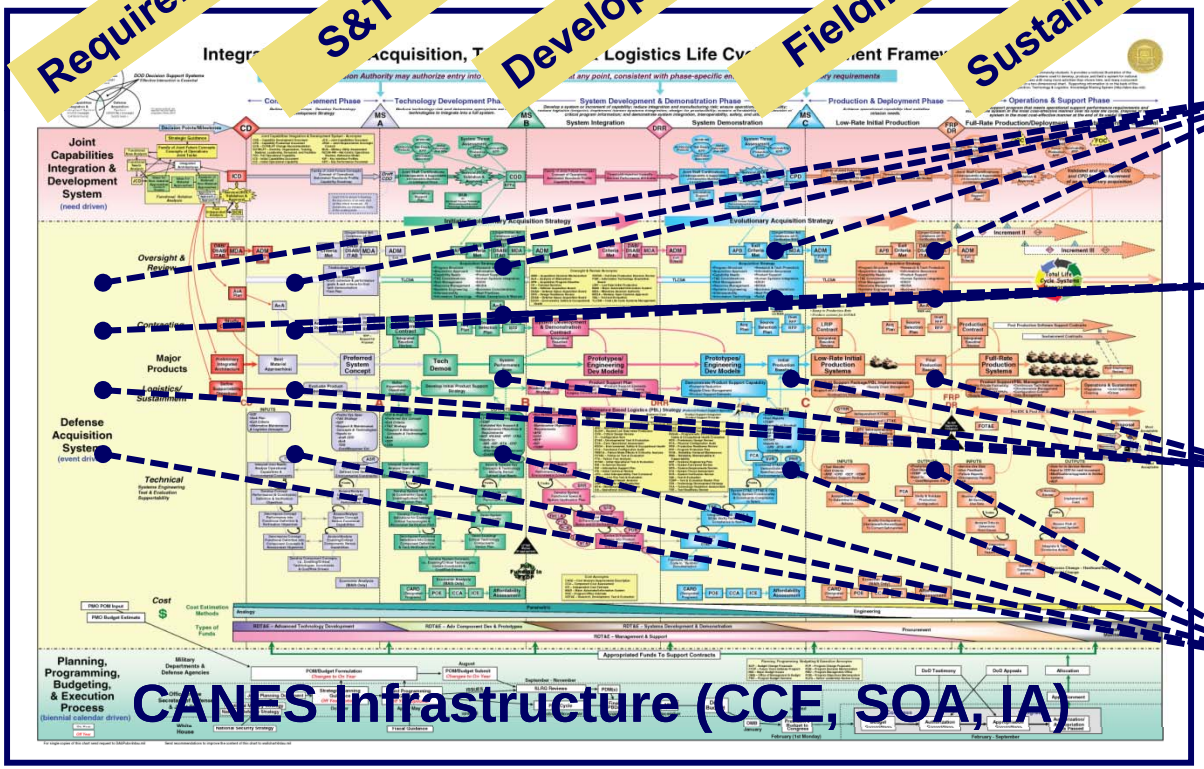
<u>Capability Composition</u> focuses Data, Applications and Infrastructure on Warfighter needs

The Challenge…

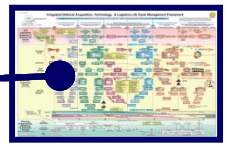
…using CANES as an example

Governance (Operational, Acquisition, Engineering, Enterprise)

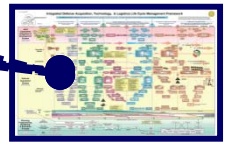
Requirements **S&T** **Development** **Fielding** **Sustainment**



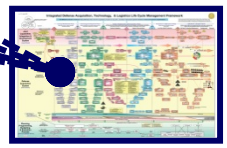
C2 Applications
PMW 150



IO/ISR Applications
PMW 120



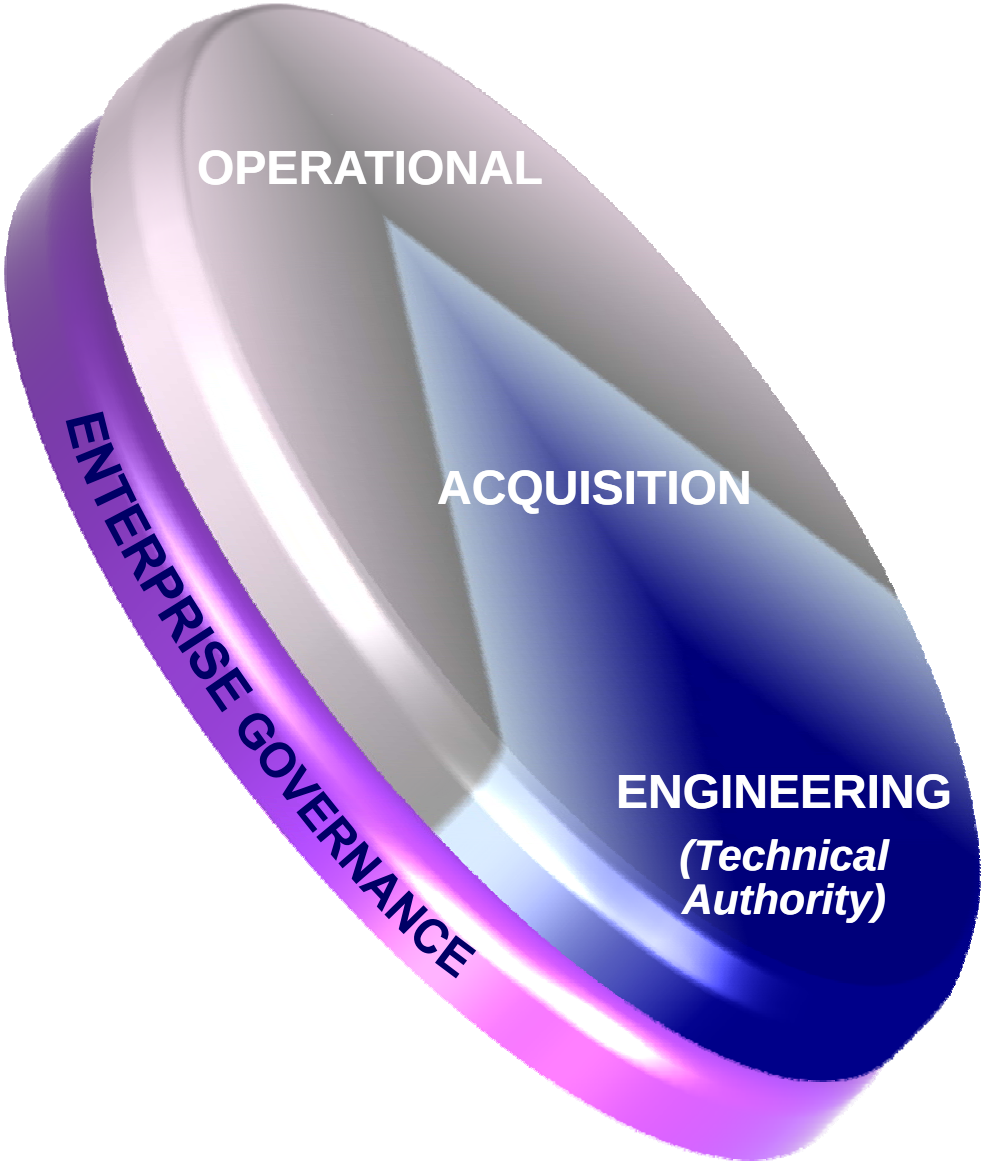
Business Applications
various providers (Naval, Joint)



Other COI Applications
various Providers (Naval, Joint)

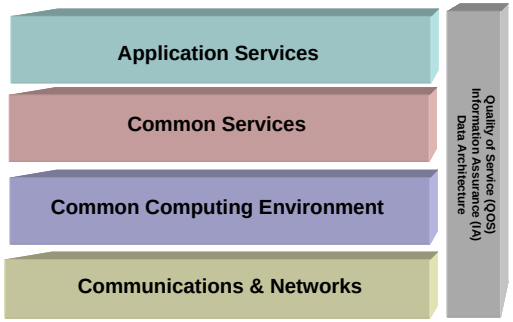
Align & synchronize capabilities and processes to enable development…

Dimensions of Governance

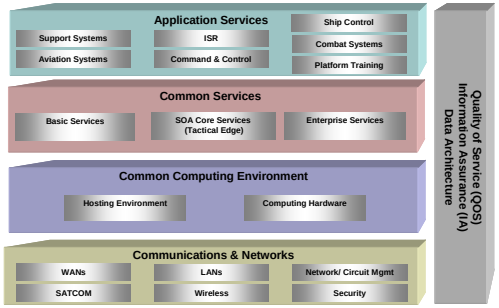


- *Portfolio Management* of :
  - Operational requirements
  - Acquisition priorities and funding
  - Engineering solutions
- Scale and align with the larger Service / Joint enterprise environment
- Leverage intersections between key elements of Joint and Service specific efforts

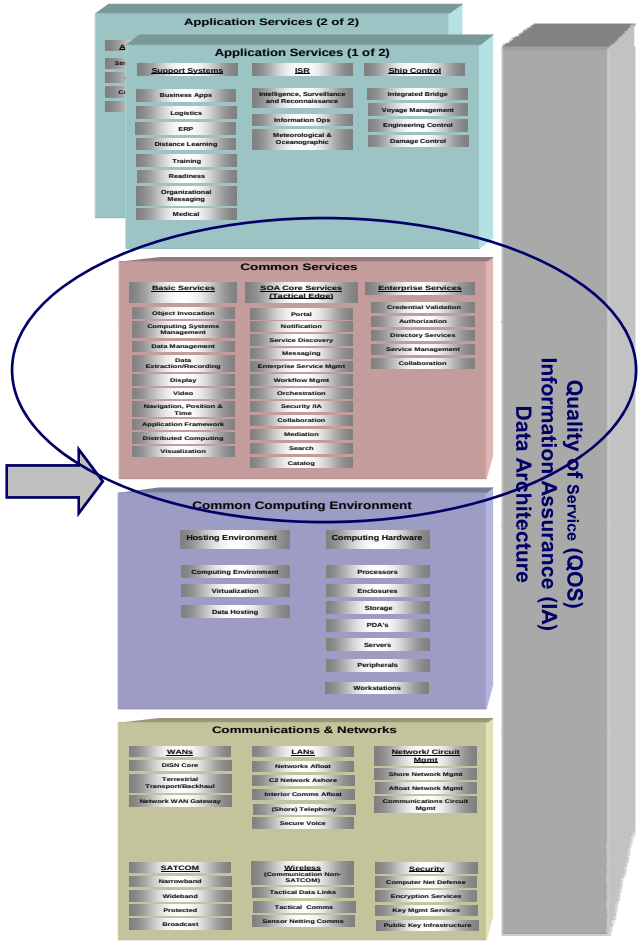
Navy Technical Reference Model (NTRM)
Overview



Navy Technical Reference Model Level 0

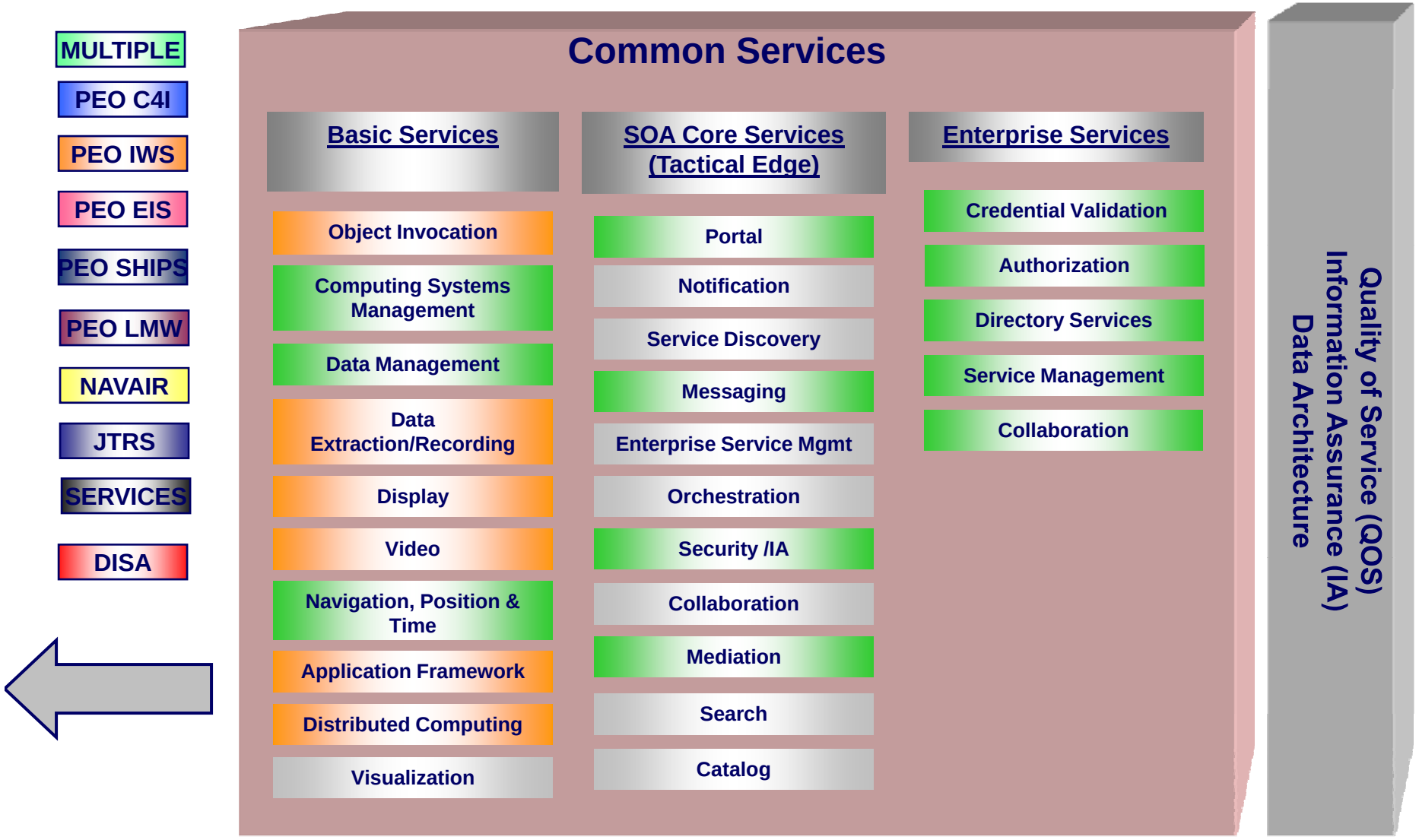


Navy Technical Reference Model Level 1



Navy Technical Reference Model Level 2

NTRM Level 2
(With R&R Based on Existing Acquisition Efforts)

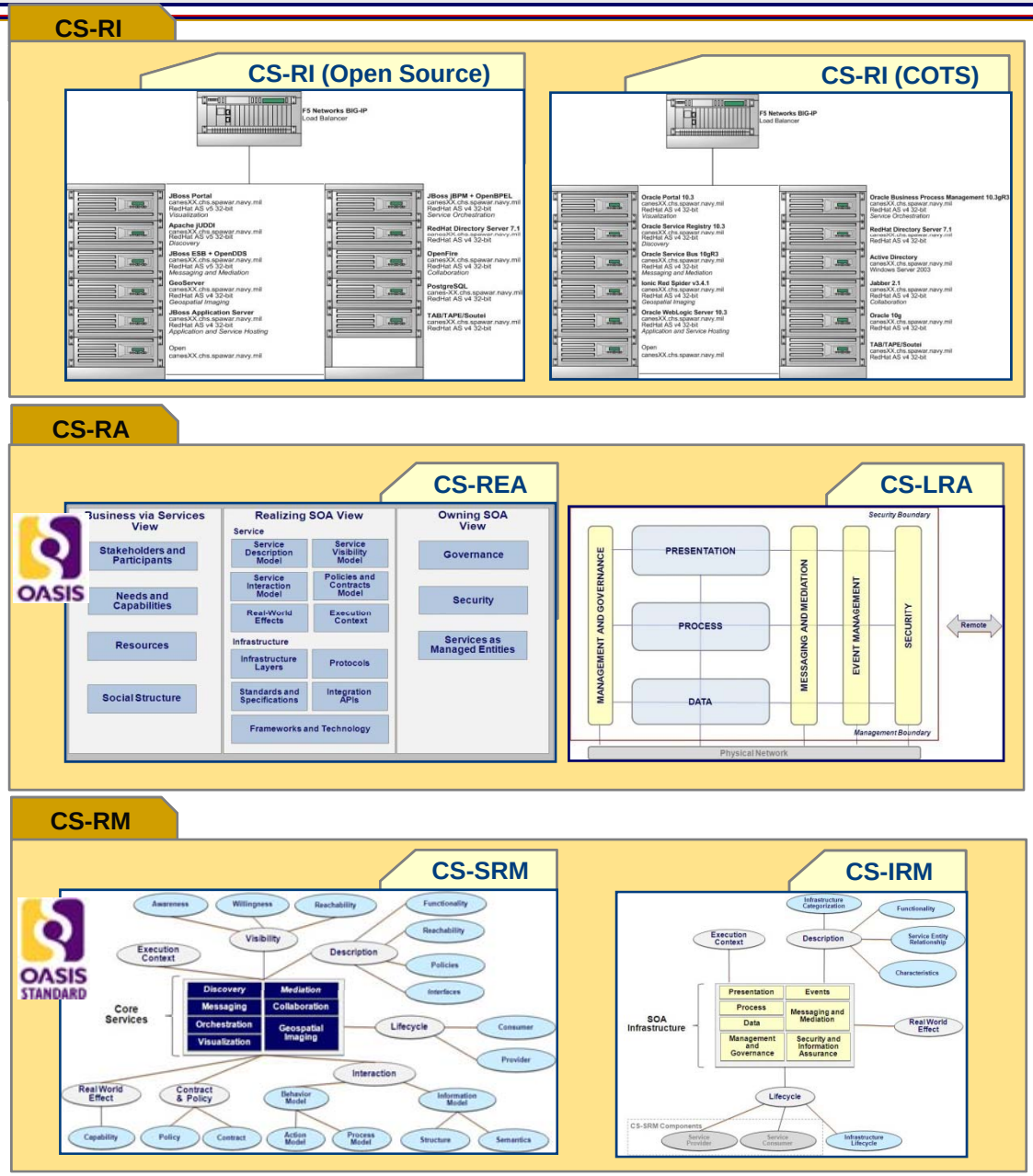


ONR Core Services Architecture Evolution
Reference Framework

Core Services Reference
Implementation
(CS-RI)

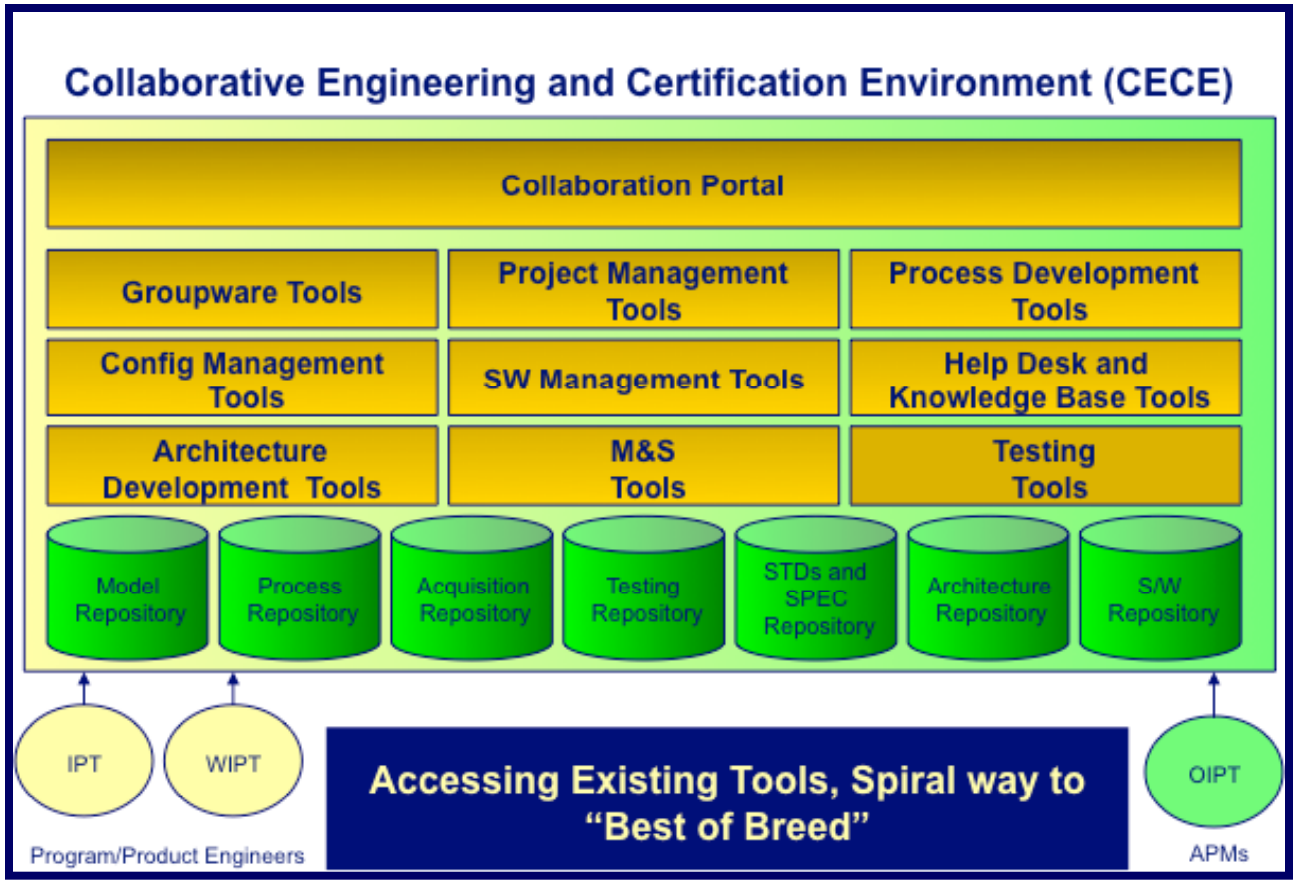
Core Services Reference
Architecture
(CS-RA)
CS-Reference Element Architecture
CS-Layered Reference Architecture

Core Services Reference
Model
(CS-RM)
CS-Service Reference Model
CS-Infrastructure Reference Model

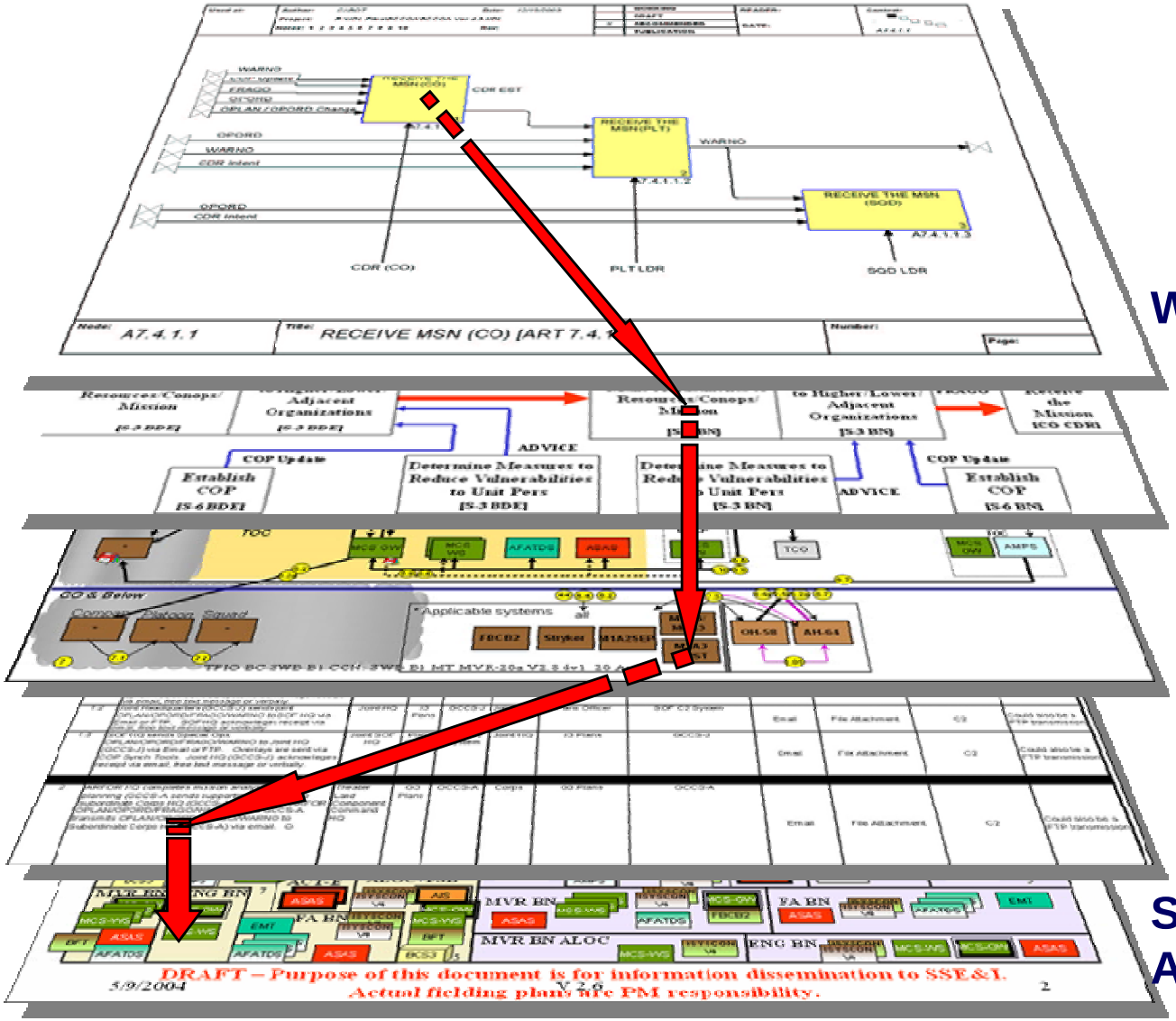


Engineering Governance Enabler

- **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**



Guiding Composition

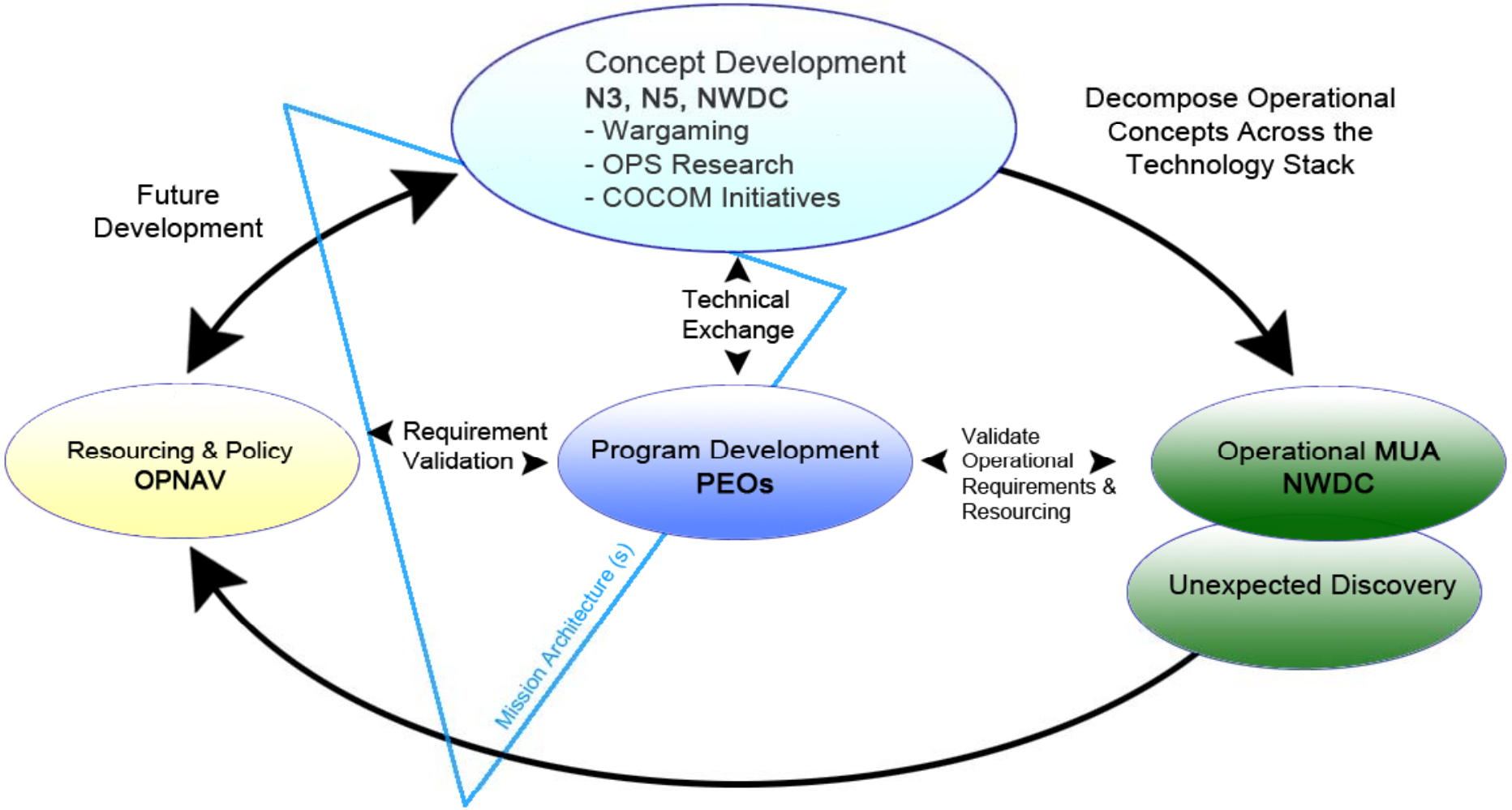


Warfighter Req

Collaborative Test Thread Architecture

System Architecture

Linking Innovation to Acquisition



[1] OPNAV N6F, 2008, *Enterprise Engineering Implementation White Paper (Draft)*

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"

List of Acronyms

- 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

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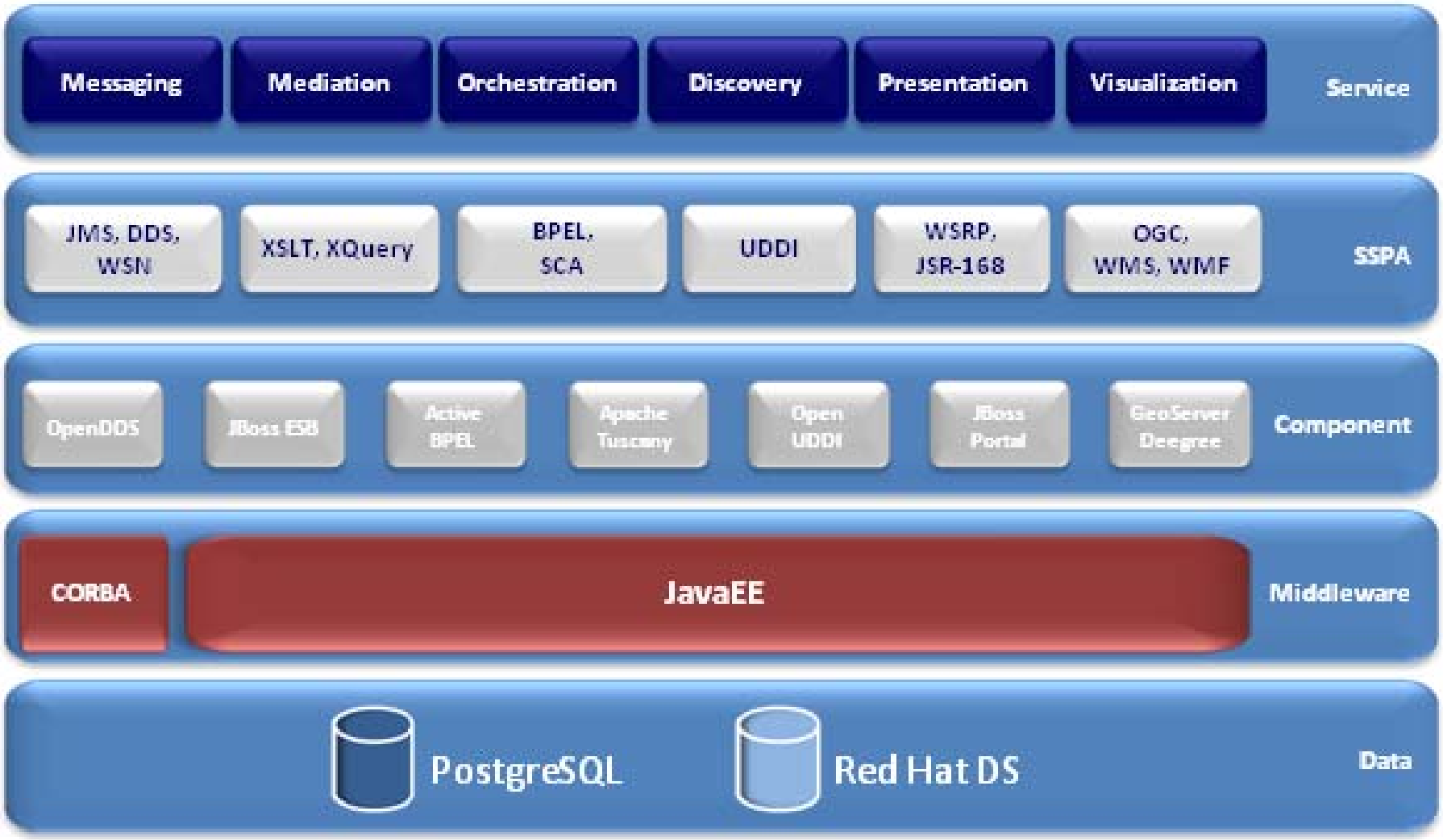
Navy SOA Reference Implementation



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