



ASA(ALT) Common Operating Environment Implementation

12 JUL 2011

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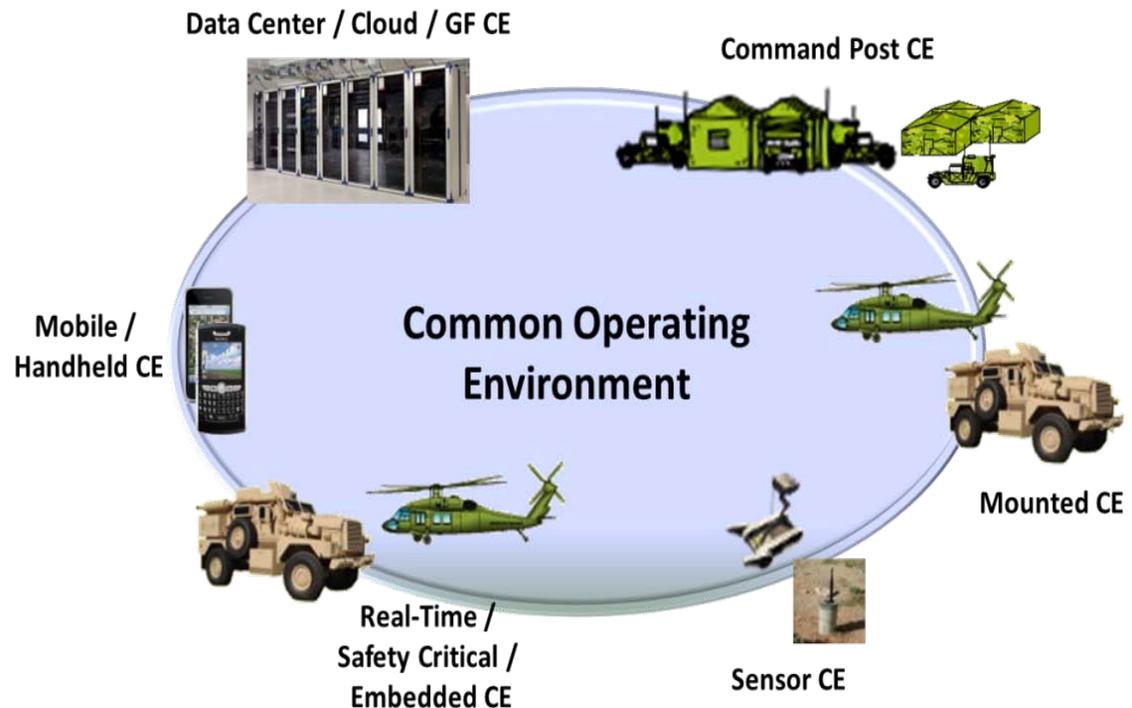
COE and Computing Environments (CE)



*COE Definition : **The Common Operating Environment** is an approved set of **computing technologies and standards** that enable secure and interoperable applications to be rapidly developed and executed across a variety of Computing Environments (i.e., Server(s), Client, Mobile, Sensors, and Platform).

COE Imp Plan Computing Environments

- Data Center/ Cloud/ Generating Force (Not in current App C)
- Command Post
- Mounted
- Mobile/Hand Held
- Sensor
- RT/Safety Critical /Embedded (Not in current APP C)



* Source: Army CIO G6 App C





Implementation Plan Initiative



 **DEPARTMENT OF THE ARMY**
WASHINGTON DC 20310

OCT 20 2010

SAIS-AEA

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Common Operating Environment Architecture Guidance

1. References:

a. Memorandum, Vice Chief of Staff of the Army (VCSA), subject: Achieving Army Network and Battle Command Modernization Objectives, dated 28 December 2009

b. Document, CIO/G-6, titled: Common Operating Environment Architecture. (Appendix C to Guidance for 'End State' Army Enterprise Network Architecture), dated 1 October 2010

2. The CIO/G-6, in close coordination with ASA(ALT) Systems of Systems Engineering (SOSE), has developed the Common Operating Environment (COE) Architecture concept, framework and standards for the Army Enterprise Network. In addition, in order to inform Program Objective Memorandum 13-17 investment decisions, ASA(ALT) will publish a complementary Implementation Plan that describes the steps and schedule for bringing Army systems into compliance with the COE Architecture guidance. Henceforth, compliance with the COE Architecture and Implementation Plan will be mandatory for all programs under the purview of the Army Acquisition Executive.

3. The CIO/G-6 and ASA(ALT) are committed to enabling the Army to produce high-quality applications rapidly while reducing the complexities embedded in the design, development, testing and deployment cycle. The COE Architecture and Implementation Plan will provide direction to our industry partners regarding our framework standards. Both documents are considered to be living instruments and will continue to evolve in a coordinated manner in order to keep up with the rapid changes in technology.

4. Our points of contact for this memorandum are: COL Anthony Howard, Sr., (703) 604-2068 or anthony.howardr@us.army.mil; and Mr. Phillip Minor, (703) 604-7133 or philip.minor@us.army.mil.


JEFFREY A. SORENSON
Lieutenant General, GS
Chief Information Officer/G-6

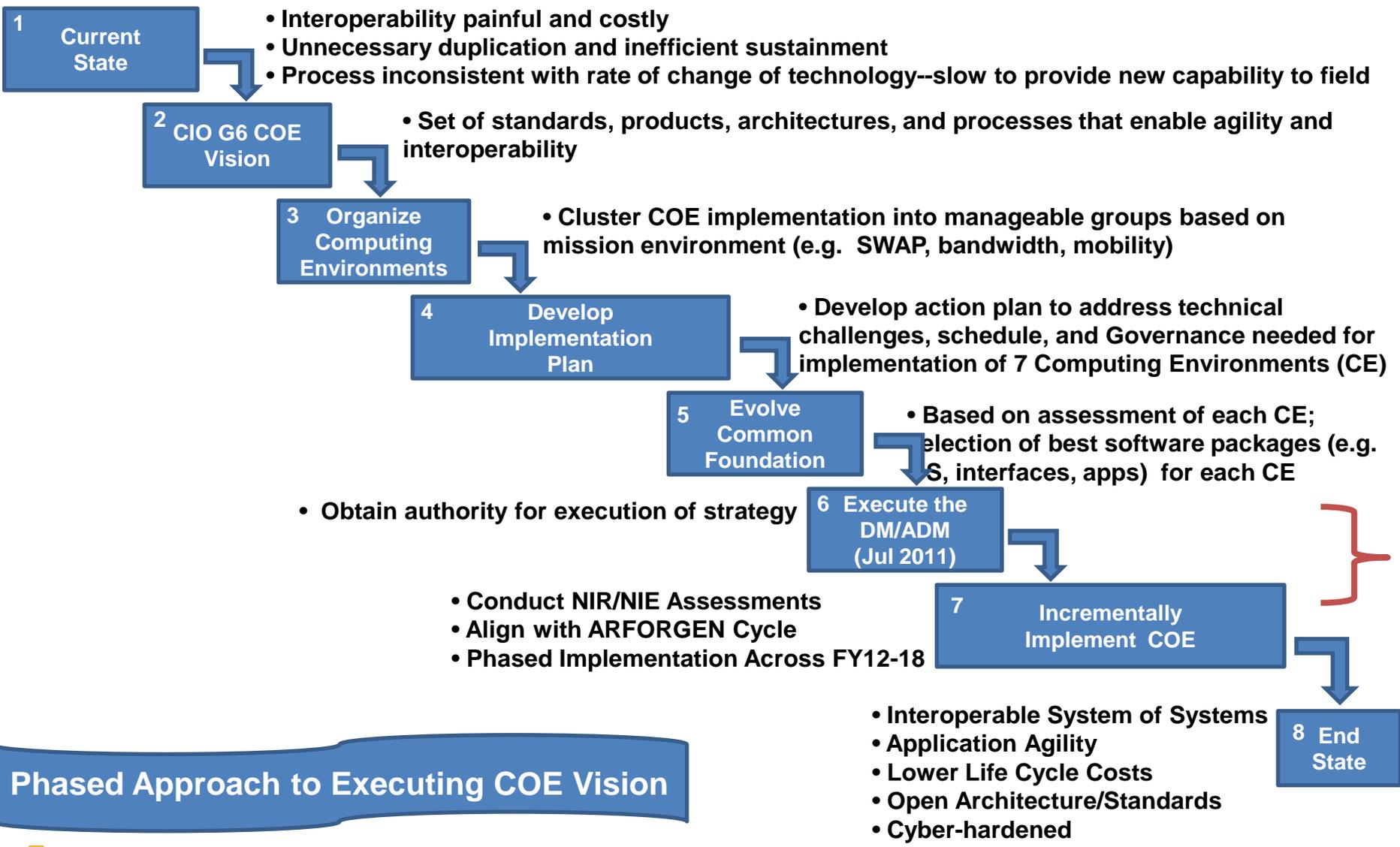

Malcolm R. O'Neill
Assistant Secretary of the Army
(Acquisition, Logistics and Technology)

- CIO/G-6 in close coordination with ASA(ALT) Systems of Systems Engineering (SOSE) has developed COE Architecture Guidance
- COE Architecture Guidance:
 - Defines the COE and Computing Environments
 - Describes the CEs architecture and services
 - Specifies COE principles and technical architecture standards
 - Details a maturity model for cost-benefit analysis trades and to evaluate programs' alignments with COE
- ASA(ALT) will develop COE Implementation Plan:
 - Inform Program Objective Memorandum (POM) 13-17 investment decisions
 - Identify the implementation strategy, time lines, effective dates and key milestones for moving Army systems to the COE





Overview: COE Implementation Building Blocks



Phased Approach to Executing COE Vision



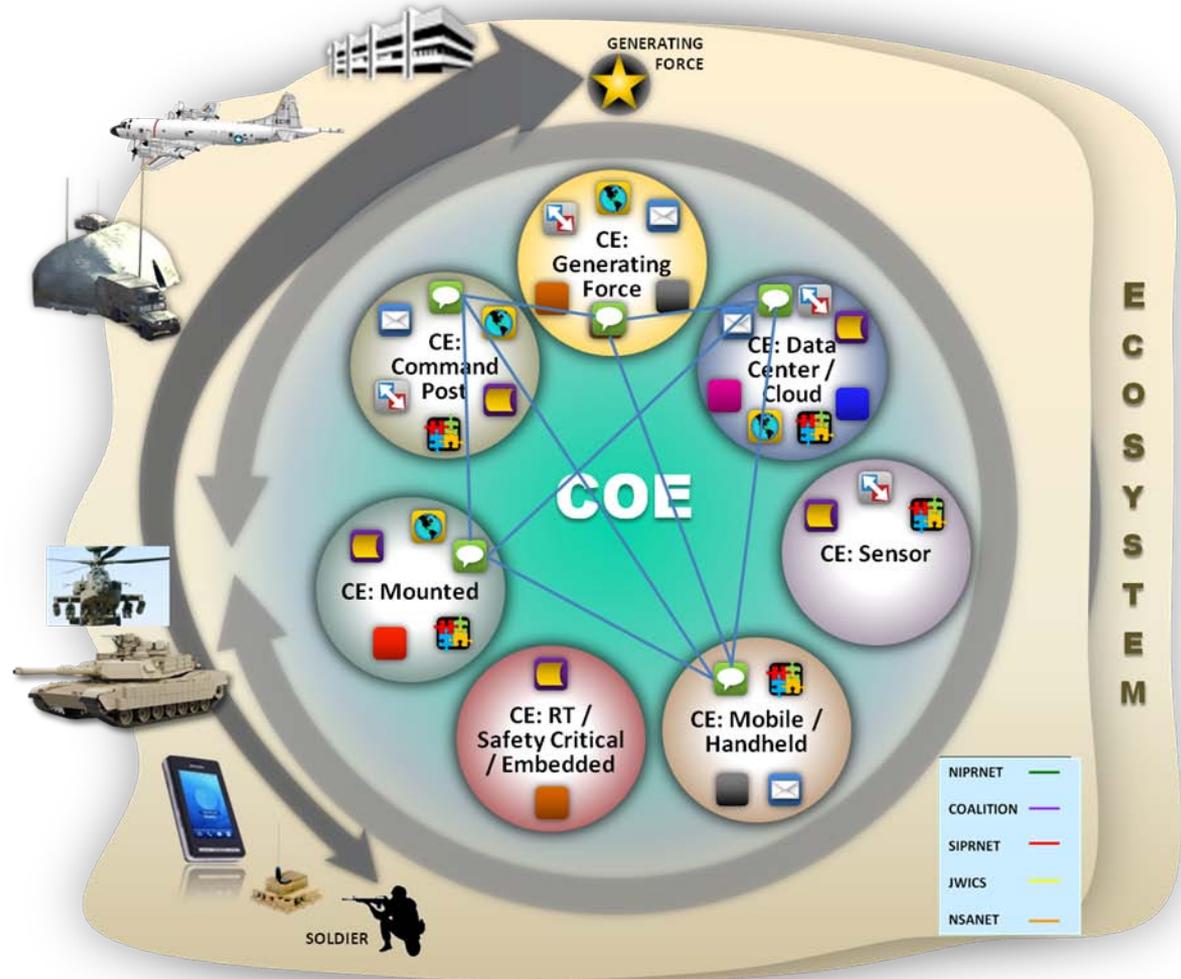
COE Building Blocks: Vision and Computing Environments

2 CIO G6 COE Vision

- CIO G6 Vision: Set of standards, products, architectures, and processes that enable agility and interoperability

3 Organize Computing Environments

- Scope of COE implementation requires systematic and manageable approach
- Clustering similar systems based on mission environments to facilitate implementation

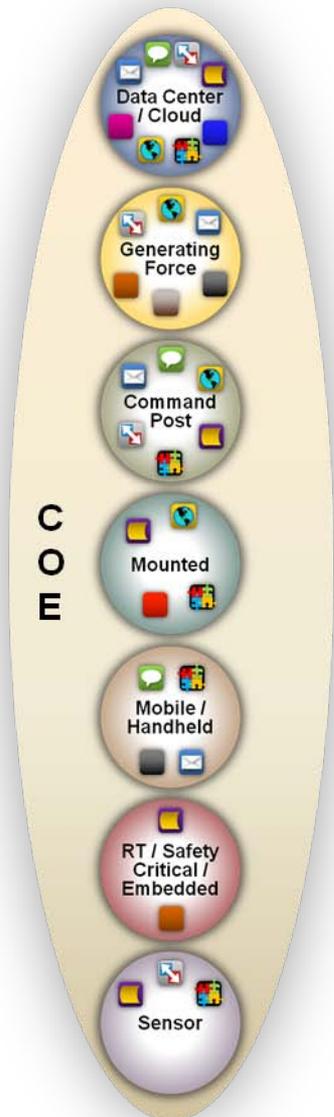


**ASA(ALT) Organized COE Space Into
Manageable Pieces: Computing Environments**

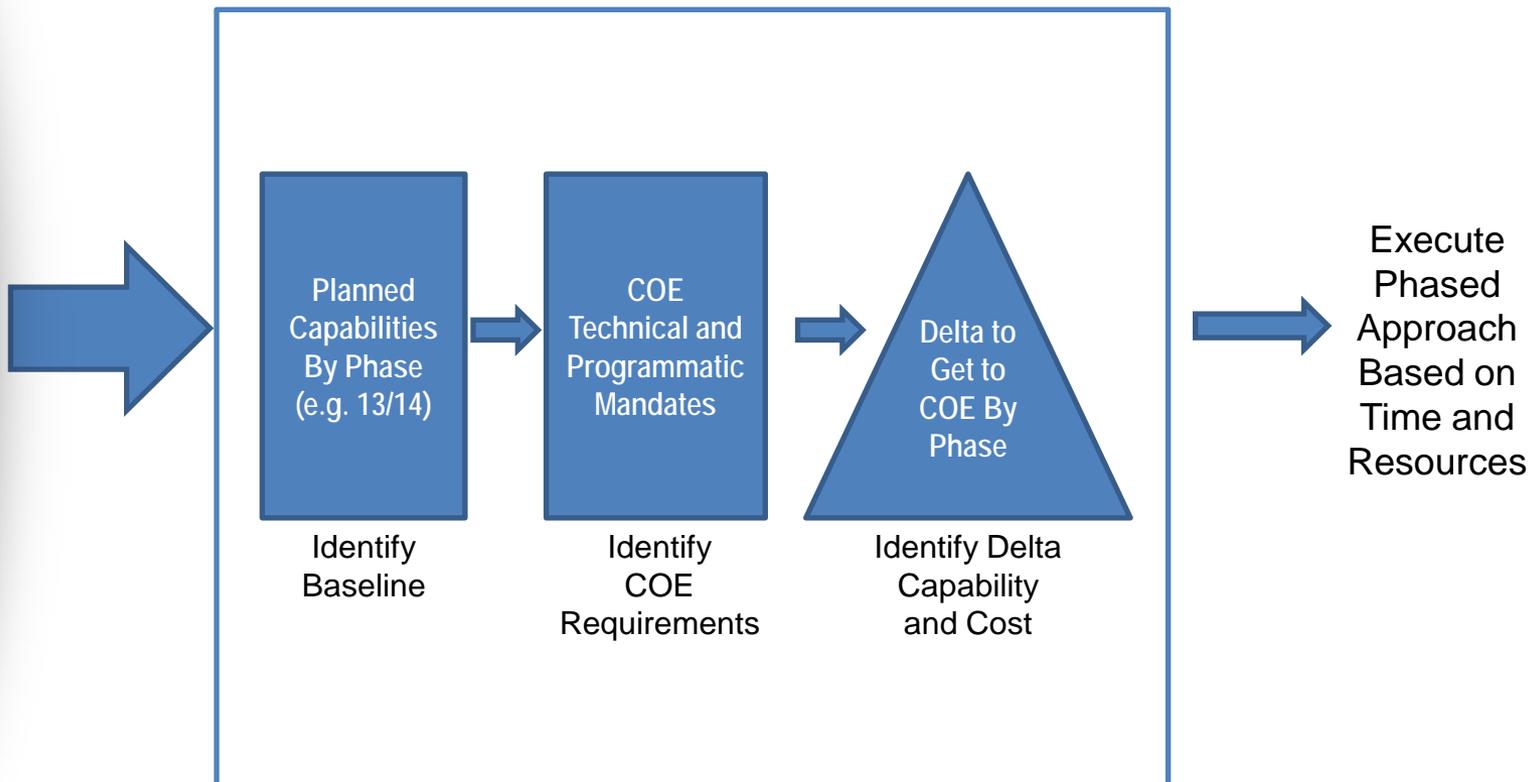
* COE Architecture – Appendix C to Guidance for 'End State' Army Enterprise Network Architecture, 1 October 2010



COE Building Blocks: Develop Implementation Plan



4 Develop Implementation Plan



Successful Implementation: Governance, Orchestration, and V&V

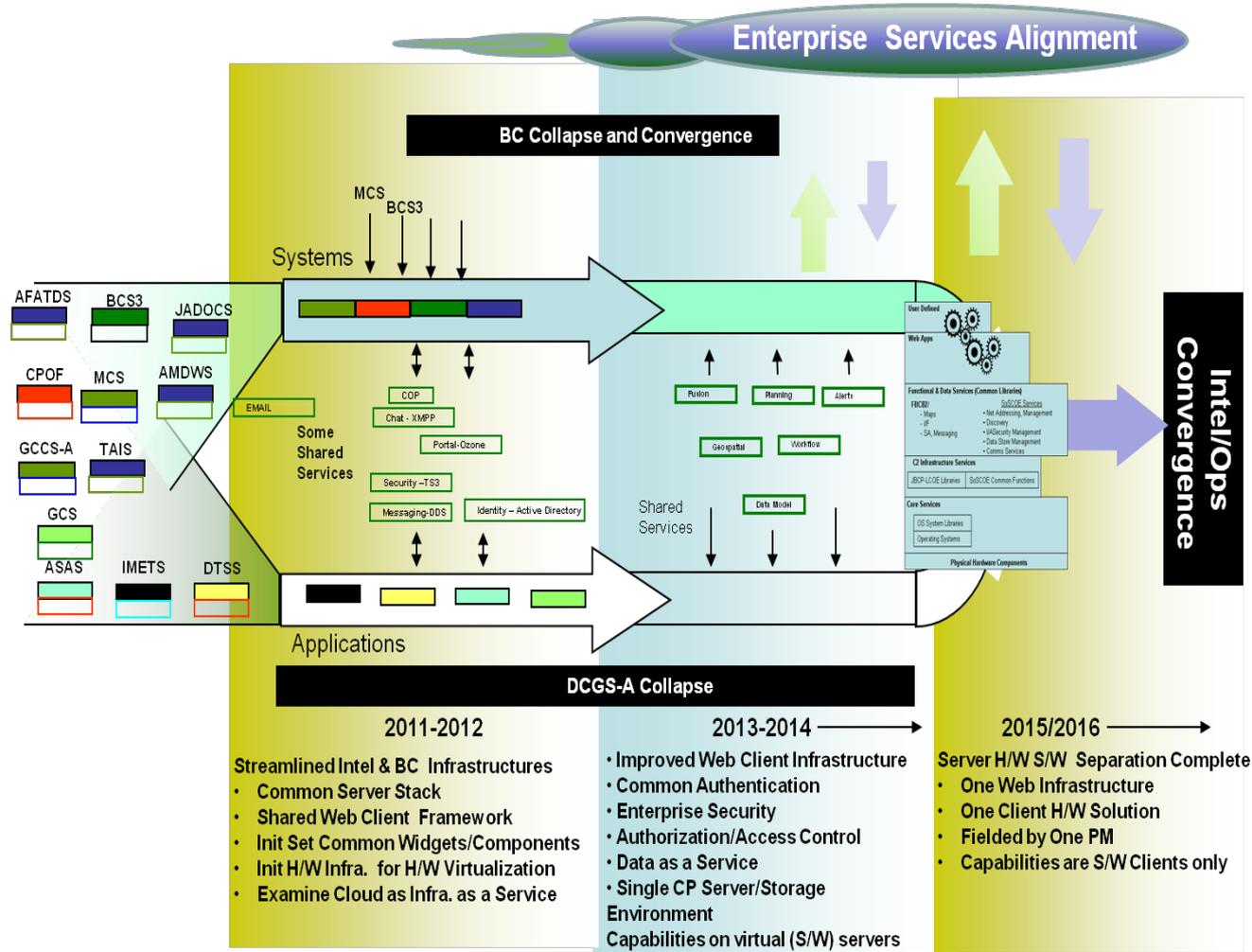




COE Building Blocks: Evolving Computing Environment Foundations

5 Evolve Common Foundation

- Analyze existing systems within CE clusters
- Select best of breed based on COE objectives
- Evolve each software system to meet Army needs
- Migrate existing apps across each cluster



Converge on Existing Foundations and Evolve, i.e. Intel/Ops Convergence

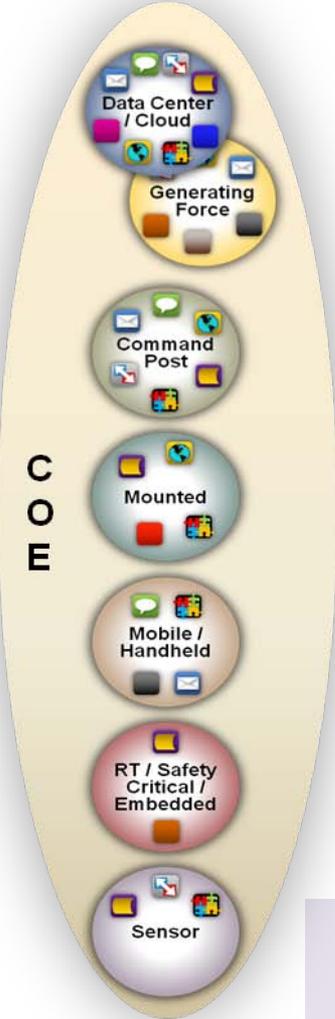


COE Building Blocks: Directive Memo

Content : Background, Roles & Responsibilities, Objectives, Tasks



Execute the DM (Jul 2011)



- 1) Data Center/Cloud and Generating Force
 - Common extensible architecture; Keep ERPs separate for now
- 2) Command Post:
 - Ops/Intel Convergence; Re-alignment of PMs (PM Ops/Intel)
 - Abstract HW from SW – designate infrastructure PM
- 3) Mounted
 - Leverage relevant design elements/systems; Leverage components from M/HH and CP CEs
- 4) Mobile/Hand Held
 - Ecosystem/ “App Store”; Emerging offerings from DARPA, Industry, DoD
- 5) Real time/Safety Critical/Embedded
 - Leverage FACE and VICTORY Architectures; Leverage IBCS foundation for RT BC systems
- 6) Sensor
 - Do not specify sensor hardware/software, focus on interfaces

Draft completed 30 Jun 2011 -- Informed by Implementation Plan -- Finalized Plans Due 45 Days after Signature -- ADMs Follow Analysis of Plans





COE Building Blocks: COE Implementation, 13-16 Example



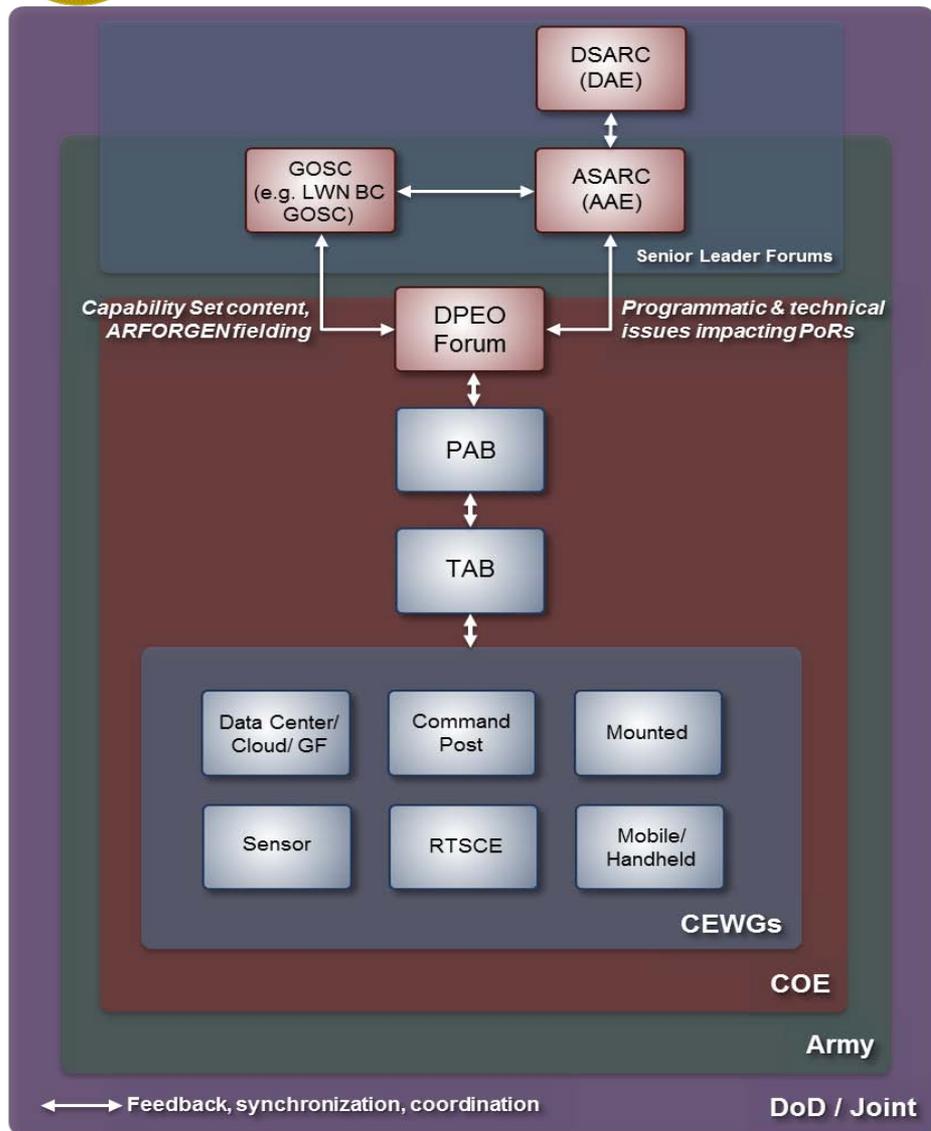
7 Incrementally Implement COE

| Capability | COE Principle Supported | Capability Description | Operational impact | FY 13/14 | FY 15/16 |
|--|---|---|---|---|---|
| Cloud Computing | Default to COTS | Service-based cloud infrastructure for hosting and accessing enterprise-wide software applications, services, and data. | Providing operational capability from the cloud infrastructure to include storage, data forwarding application and service provisioning . In addition the cloud will enable COOP /DR for CPs in the event of a disabled or down CP. | <p>Software as a Service PM's begin use SaaS. Email, Portal, Directory employed in CS 11/12</p> <p>Platform as a Service Applications begin to use common application and web servers</p> <p>Data as a Service Data middleware services</p> <p>Infrastructure as a Service Applications begin migration</p> <p>Enterprise Collaboration Social Networking, Application Sharing, Presence</p> | <p>Software as a Service PM's begin to Outsource using SaaS, office automations</p> <p>Platform as a Service Additional capabilities added</p> <p>Data as a Service Shared databases and data stores</p> <p>Infrastructure as a Service CIO/G-6 completes Data Center Consolidation</p> <p>Enterprise Collaboration Workflow</p> |
| Vehicular modular architecture to support easy integration of C2, IT and transport on the platform | Faster integration , testing and development of C2 systems for mounted platforms. | Provides the interface protocols, standards, data formats and architectures that are the means to achieve Interoperability and integration for ground platforms | Enable agility for the Warfighter by enabling an architecture that supports rapid integration and upgrades in the platform | <p>Standard Specification</p> <p>Victory Architecture</p> <p>Architecture / standards validation</p> <p>Interoperability experiments Alignment with Face</p> | |





Governance Structure: COE



• Governance Structure

- CE Working Groups and IPTs
- Technical Approval Board
- Programmatic Approval Board
- Deputy PEO Forum
- ASA(AL&T) SoS Engineering Team
- LandWarNet/Battle Command Steering Group
- DoD and Joint, Interagency, Intergovernmental, and Multinational (JIIM)

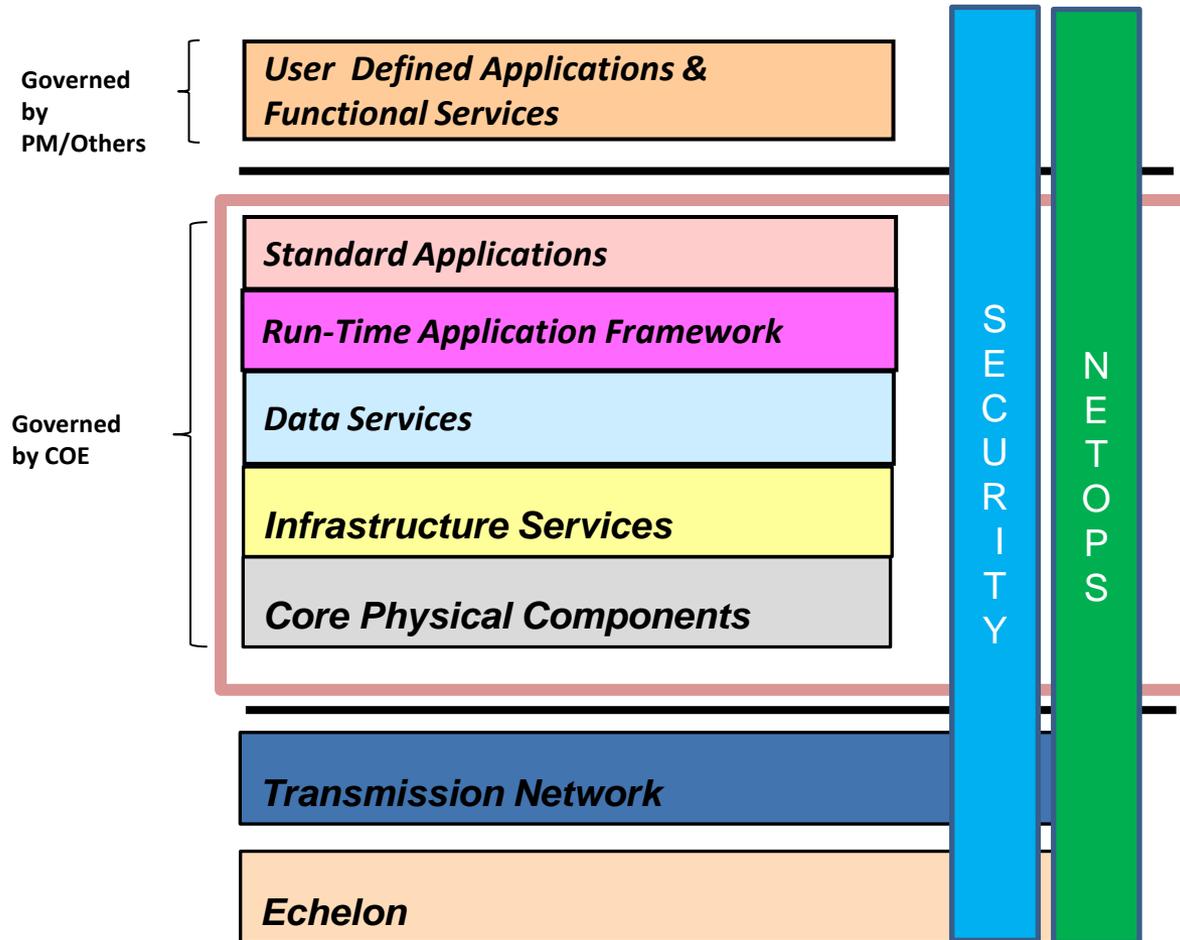
• Other Enforcement Mechanisms

- Directive Memo/ADM
- Integrated WSRs
- Maturity Model





* Technical Reference Model (TRM)



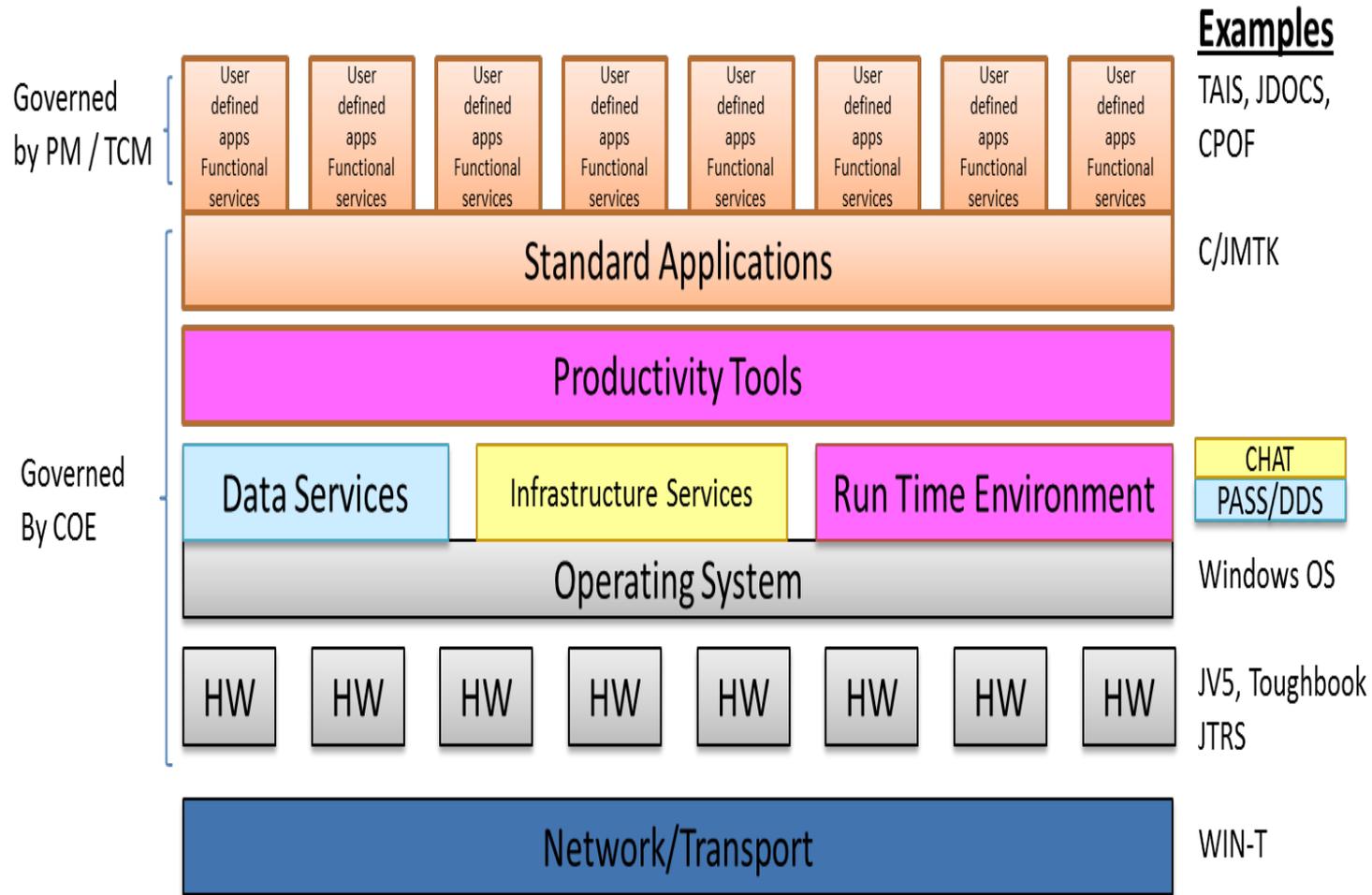
* Source: ASA(ALT) COE Implementation Plan

DESIGN • DEVELOP • DELIVER • DOMINATE

SOLDIERS AS THE DECISIVE EDGE



TRM: Some Examples

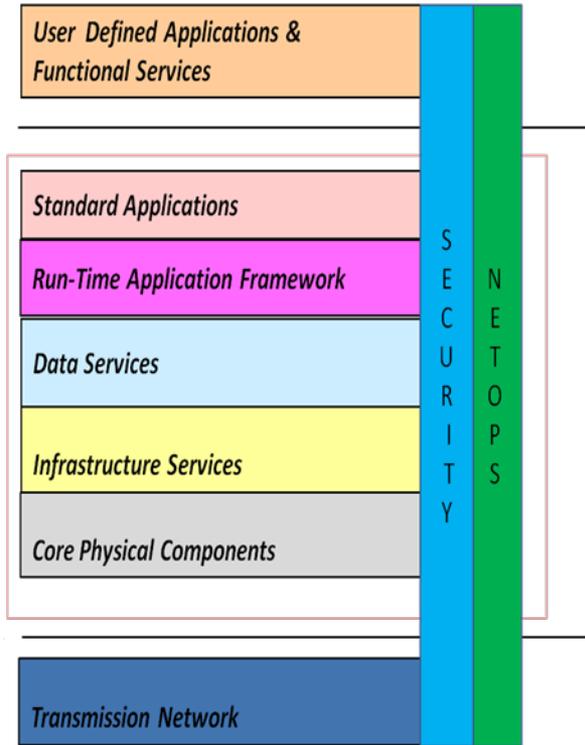




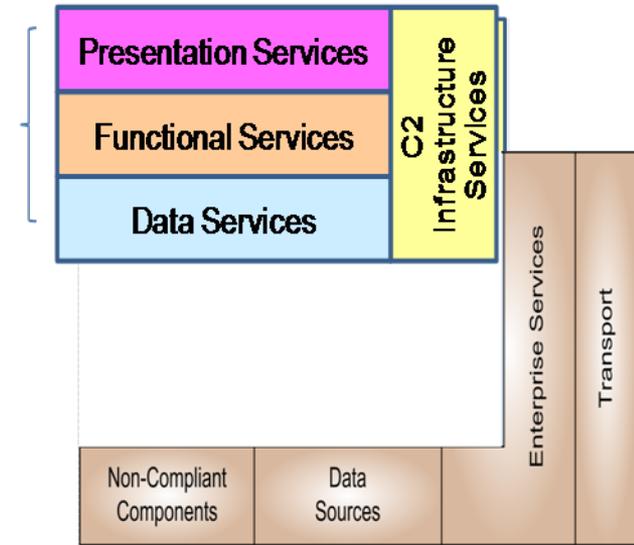
TRM and JC2



Domain neutral infrastructure

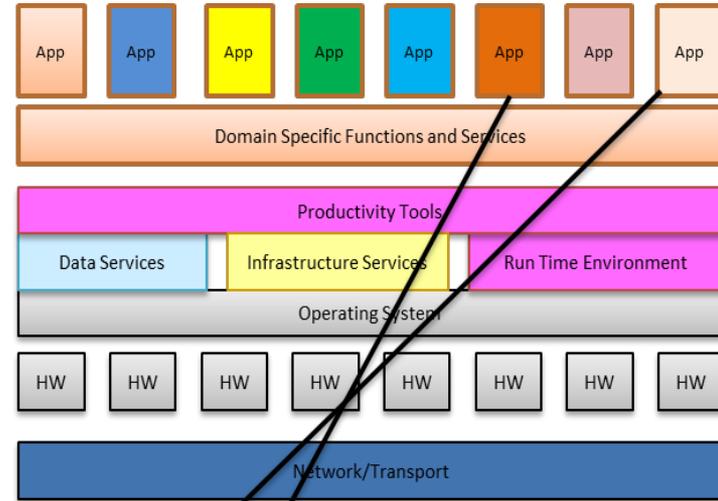
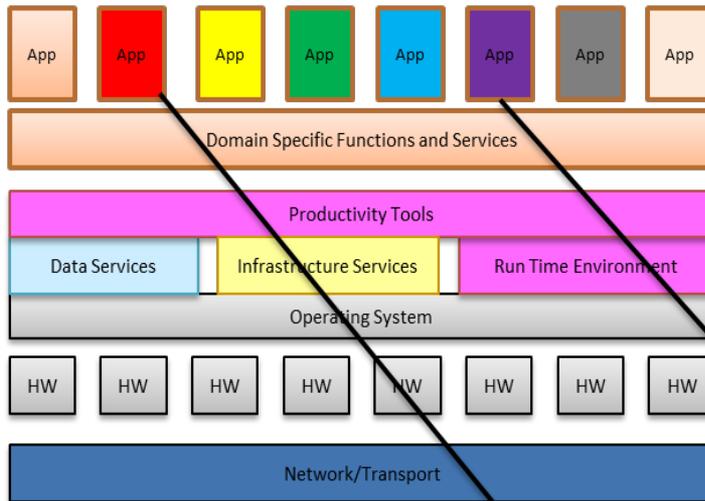


Domain specific infrastructure



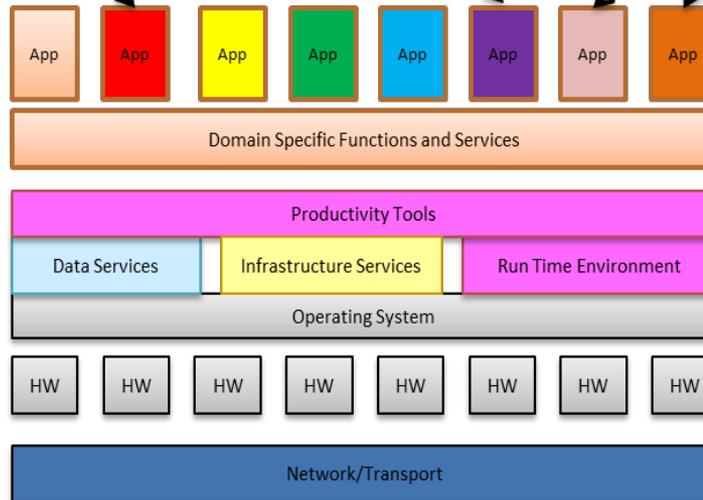


TRM: What Will We Use It For



Steps:

- Assess Current State
- Map to COE ref. Arch.
- Design / Architect core infrastructure components
- Select / migrate / develop required Apps
- Integrate
- Certify
- Test
- Field



Expected Outcome:

- Single foundation
- Common user experience
- Go multiple interfaces to a single warfighter interface
- Reduced number of PORs
- Faster integration of new services
- Reduced cost for new capabilities
- Simplified training





Challenges and Risks To Implementation



Challenges:

- Orchestration and V&V of COE is not resourced
- Aligning user requirements and resources to execute COE implementation consistent with the Agile process
- Cultural change

Risks:

- Hundreds of programs affected across the Army
- Transition costs expected to be high; up front costs are high and are expected to decrease over time
- Transition will begin immediately; funding consistency is required to ensure full compliance of all Army programs in 5 years
- Need on-going sustainment for systems pending transition to COE
- Requirements and acquisition processes are not currently aligned to respond to this challenge
- Current testing methodologies will not facilitate the desired pace of technological change
- Alignment has potential for disruption to schedule and cost of Army acquisition programs





Status: First Steps



- ✓ Define Principles, Tenets and Value Proposition
- ✓ Organize the Space for Implementation
 - Define Roles and Responsibilities and Lead Organizations
 - Ensure Collaboration across Army Components, DoD, and OSD
 - Identify Management Controls—accountability, traceability, transparency
 - Standards-based Implementation
 - Programmatic and Technical Governance from working group level to Army to Army AAE/DAE to DoD /Joint
 - Establish Charters
 - Define Roadmap / Schedule—Execute to one plan
- ✓ Develop COE Implementation Plan and associated Computing Environment Execution Plans
- ✓ Align Complementary Efforts
- ✓ Develop Cost Estimate Profile in support of POM/WSR Deliberations
- ✓ Establish Orchestration and V&V Strategy





Near Term Next Steps

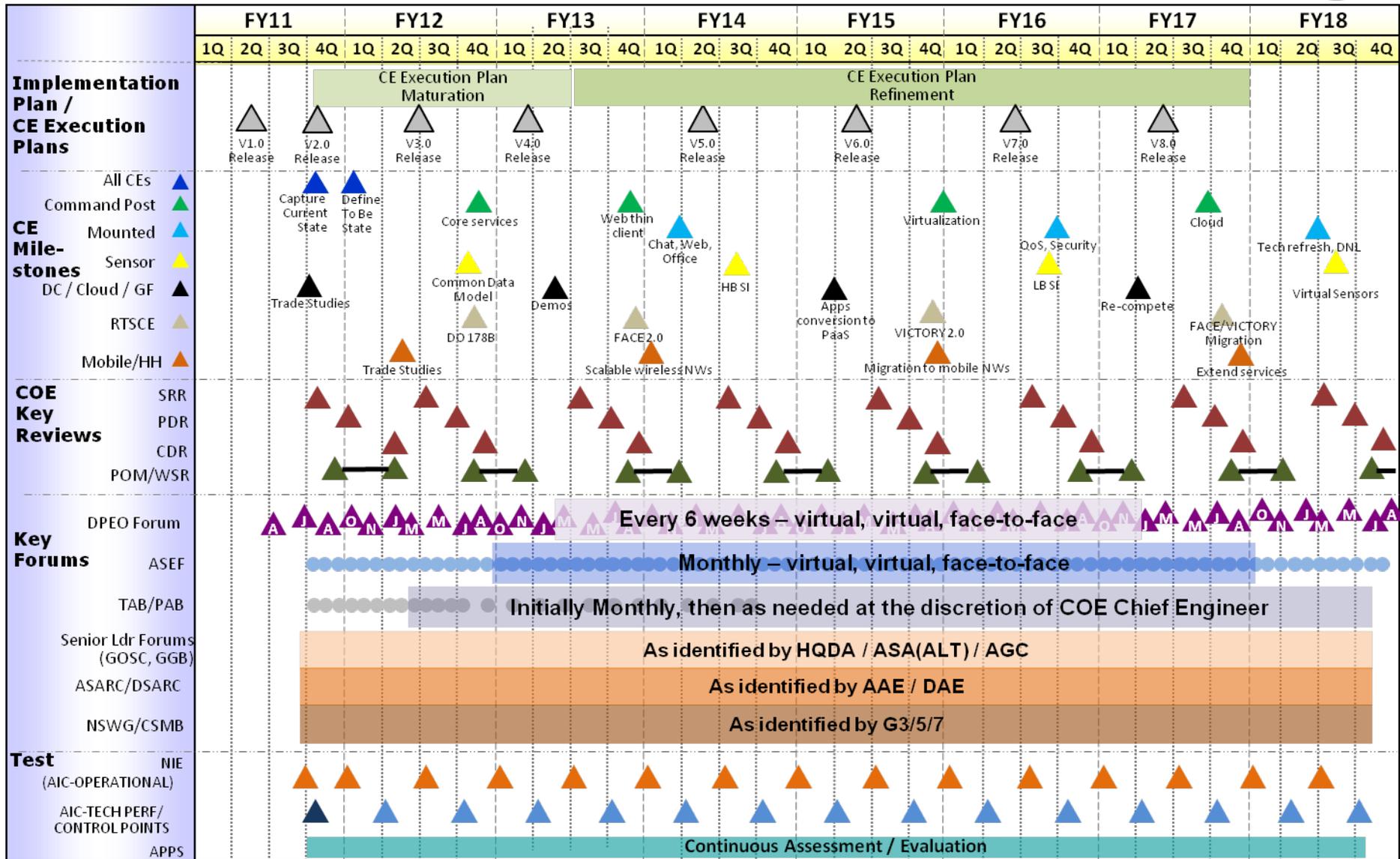


- AAE and DAE to agree on COE Implementation applicability to ACAT1-3 programs
- Implementation Plan v2 Released 30 Jun
- Draft AAE COE Directive Memo
 - Released 30 Jun
 - Went through preliminary OGC review
 - Plan and AAE Directive Memo go hand-in-hand
 - Comments from formal review due 15 Jul
 - 45 days to update/complete Execution Plans, from date of signature of memo
 - Upon review by OGC, will be provided to Ms. Shyu for signature o/a 25 Jul
- Receive and review CE execution plan updated strategies
- Analyze updated plans
- Issue ADMs as required





COE Top-level Roadmap





Anchored in Principles



- The COE must be standards-based.
- The COE must be scalable across the enterprise.
- The COE will default to commercial off-the-shelf solutions.
- The COE must be compliant with overarching DoD directives.
- The COE will require that software applications are abstracted from the hardware and software infrastructure supporting them.
- The COE will implement a Service-based Architecture approach.
- The COE will serve as a reference architecture that will aid the S&T community and industry in developing applications that are relevant and readily usable.
- The COE must remain relevant.
- The COE will be enabled by appropriate security solutions to protect against cyber threat at the outset.
- The COE will enable unity of effort across all deployment phases.
- COE successful implementation will depend on the time-phased introduction





Discussion





Please Share Your Thoughts



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2011 System of Systems Engineering Collaborators Information Exchange Webinars

- ✓ April 12th – **A Game Loop Architecture for the Modeling and Simulation of Mission Threats**, Thomas Tanner, SAIC
- ✓ May 3rd – **Mission Engineering for Warfighting Integration of Net-Centric Systems**, Eileen Bjorkman and Timothy Menke, USAF
- ✓ May 10th – **The Role of Enterprise Architecture Updates in Guiding Decentralized Organizations**, John Schatz, SPEC Innovations
- ✓ May 24th – **Test and Evaluation Issues for Systems of Systems: Sleepless Nights to Sominex**, Dr. Beth Wilson, Raytheon & Dr. Judith Dahmann, MITRE
- ✓ June 14th – **Establishing Confidence in Federations-of-Models**, Bryan Herdlick, JPU/APL, Thomas Mazzuchi, D.Sc. and Shahram Sarkani, Ph.D., PE, George Washington University
- ✓ July 12th – **ASA(ALT) Common Operating Environment Implementation**, Ms. Monica Farah-Stapleton, ASA(ALT)
- July 19th – **Systems Engineering Management and the Relationship of Systems Engineering to Project Management and Software Engineering**, Dr. Raymond Madachy, Naval Postgraduate School
- August 23rd – **SoS Management Strategy Impacts on SoS Engineering Effort**, Dr. Jo Ann Lane, University of Southern California

For information, email dasd-se@osd.mil or visit our website:
<http://www.acq.osd.mil/se/outreach/sosecollab.html>



BACK UP





Complementary Efforts



- TRADOC
 - Mission Command Information Services Working Group
 - Command Post Requirements Traceability
 - Architecture Executive Views
- Army Marine Corps Board
- G3/5/7
 - Network Synchronization Working Group
 - Army Operational Guidance on the COE and Development
 - LB GOSC
- CIO/G6
 - Army Software Transformation / Tabletop Exercises
 - Software Blocking Transformation
- G8
 - Army Marine Corps Board
 - POM/WSR Guidance
- SoSCOE Demonstrations and Analyses

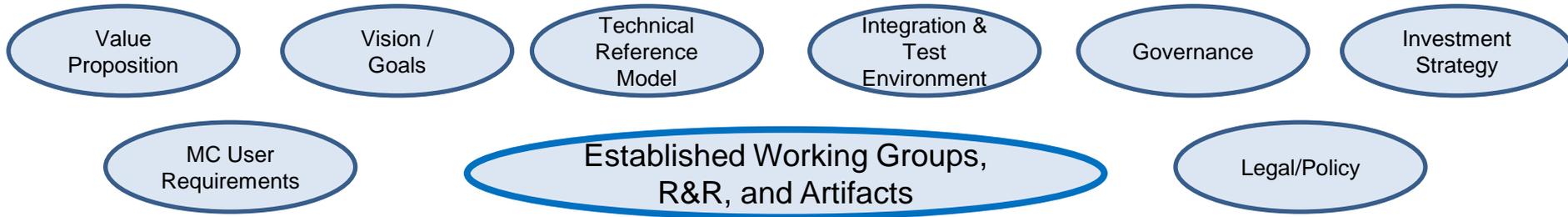




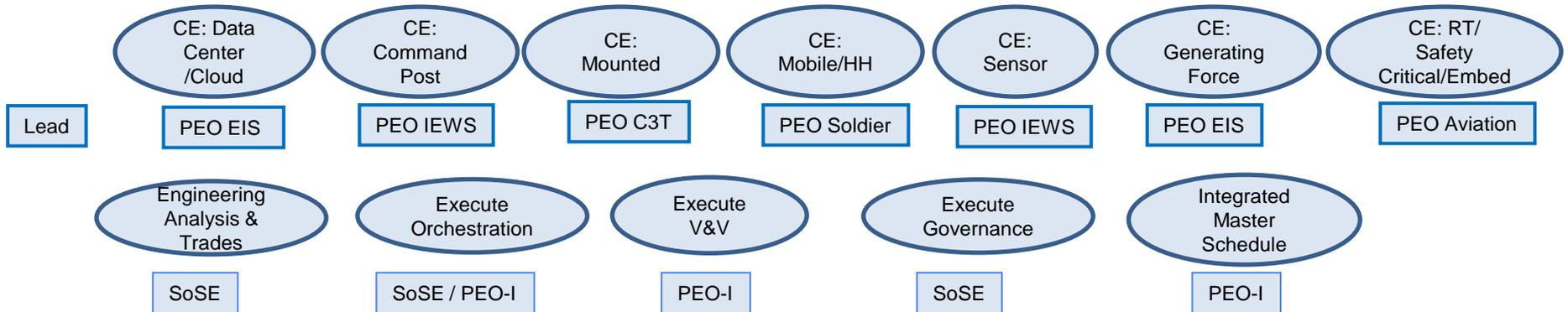
Roles and Responsibilities To Be Codified in ADM



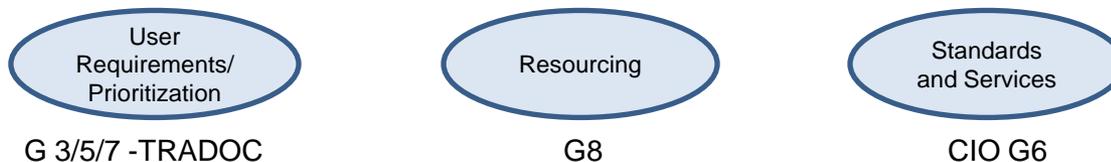
Implementation Plan: Main Body Effort



Implementation Plan: Appendices and Supporting Information Effort (Internal)



Implementation Plan: Appendices and Supporting Information Effort (External)





COE Investment Strategy



- Examine the total economic impact and expected ROI to the Enterprise
- Start with three broad Investment Areas for FY13-17 POM Deliberations
 - Individual PM Implementation costs for key PMs that are initially affected
 - Software Ecosystem Investments
 - **Orchestration and V&V**
- Develop total cost of ownership for Status Quo (As-Is) and To-Be state
- Consider challenges in realizable savings
 - Distributed ownership of service components
 - Cost elements funded from several accounts
 - Total cost of ownership vs. budgeted costs
 - Buy-in
 - Labor that is multi-tasked





Orchestration and V&V



Orchestration Activities

- Integrated Capability Portfolio Alignment
- COE/CE Architecture and Design Baseline Development
- Funding requirements and (re)prioritization Review and Recommendations
- Requirements Traceability / Alignment
- Capability Set Alignment
- COE/CE Synchronization with G2, G3/5/7, G6, G8, TRADOC, ...
 - Continuous Stakeholder Engagement
 - Effort Alignment (i.e., AST, NSWG, NIE/NIR)
- Control Point / Interface Agreements
- Systems Engineering Rock Drills
- Instantiation and Conduct of EcoSystem Processes
 - Governance
 - Cost Profile
 - Integrated Test Environment
- WG Charters and Synchronization
- S&T Community Alignment and Capability Prioritization
- Programmatic Synchronization

V&V Activities

- COE/CE Architecture and Design Baseline Validation
- COE Reference Architecture Compliance
 - Technical Reference Model
 - Performance Reference Model
 - Data Reference Model
- COE Maturity Model Compliance
- Metrics Collection and Analysis
- Modeling and Simulation Analyses
- COE Critical Enabler Implementation
- Technical Reviews / Forums across the engineering life cycle
 - Entrance and Exit Criteria
 - Engineering Artifacts Validation
- Integration and Test Events
 - Use Cases
 - End-to-end operational “threads”
- S&T Capability / Product Assessments
- Risk Assessment / Mitigation
- Cross-cutting Trades and Technical Analyses
- Accreditation and Certification Process Refinement

