Proposed NDIA brief focusing on System of System Engineering using COE as Exemplar

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Purpose

To inform the audience of ASA(ALT) OCSE system-of-systems engineering initiatives focused on streamlining the acquisition of military C4ISR programs.

References

- Network enabled Mission Command Initial Capabilities Document 1 December 2011
- VCSA Army Enterprise Common Operating Environment Convergence Plan EXORD 24 May 2010
- Common Operating Environment Architecture Guidance 20 October 2010
- Army Operational Guidance on the Common Operating Environment and Application Development 4 October 2011
- Common Operating Environment Directive for Program Executive Offices (PEOs) 20 December 2011
- Directed Requirement for Operations-Intelligence (Ops-Intel) Convergence for the Common Operating Environment (COE) Computing Environments (CEs) 8 March 2012
- INCOSE Systems Engineering Handbook v. 3.2.1January 2011
- MITRE System Engineering guide
  - http://www.mitre.org/work/systems_engineering/guide/index.html

BLUF

- System-of-systems engineering is the key to streamlining the acquisition of C4ISR capabilities:
  - Efficiencies in performance of the material solution and how the material solution is applied by the user for mission success
  - Affordable solutions maximizing market leading products, processes, and standards
  - Rapidly responding and adjusting to new capabilities, technology improvements, and mission adjustments
- C4ISR systems need to maintain and gain in capability even in budget constrained environments

Protect the Warfighter, Protect the Network, Protect the Data

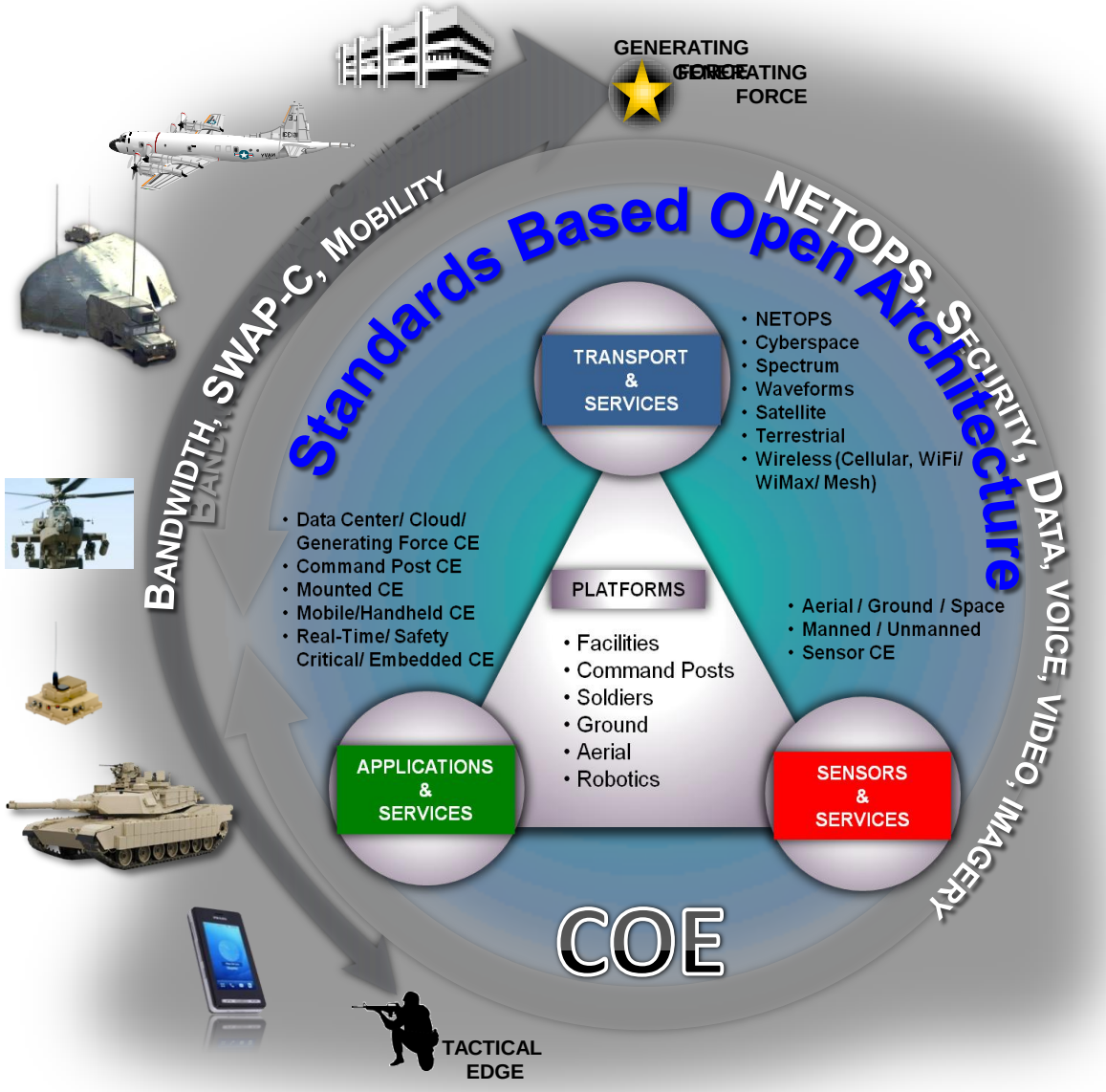
Today's Acquisition Challenges

- Lack of integrated warfighter capabilities across Programs
  - Not organized for a System of Systems solution
  - PEOs, PMs build end-to-end solutions against threats to requirements
- Systems in inventory that have not adapted to new warfighter needs
- No owner of SoS requirements
- Large tactical support footprint
  - Field Service Representatives, Field Service Engineers
- Agility across the JCIDS and PPBE process
- Organizational policy mandates driving technical solutions, adding to cost, and hurting performance

The SoS Approach to Integrated Capabilities

- **The Promise**:
  - A System of System approach offers a valuable set of techniques for developing large-scale, networked, agile, integrated systems that hold the promise of saving organizations time and money while speeding application development and increasing information technology functionality.
- **Challenges:**
  - Coordinating many moving parts, changing the procurement paradigm, scoping the effort and getting the requirements correct and as complete as possible, finding the right skill sets in the people who will execute.
- **Example Initiative:**
  - Army Common Operating Environment (COE)

ASA(ALT) Army COE Initiative

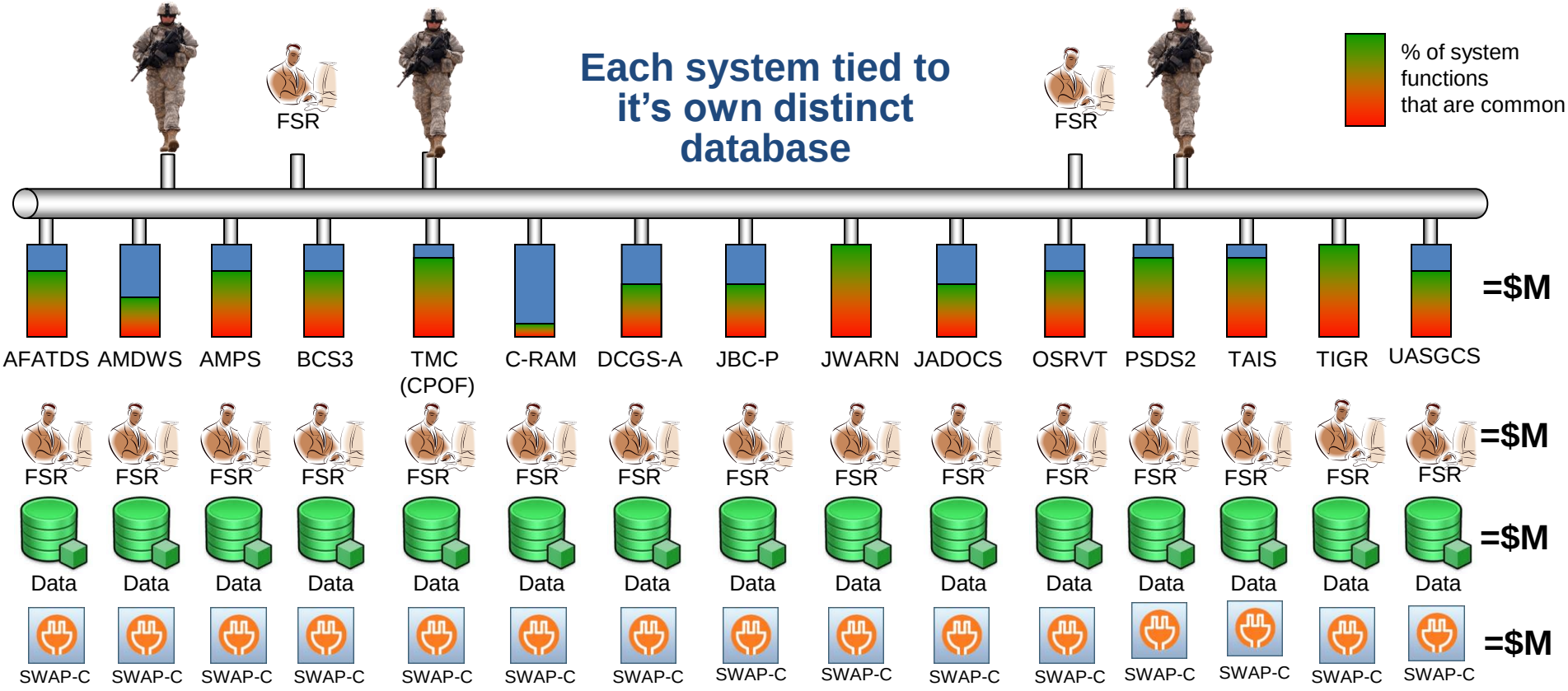


COE is an approved set of computing technologies and standards that enable secure and interoperable applications to be rapidly developed and executed across a variety of Computing Environments

Source: *Army CIO/G6 COE App C*

Today's TOC

Separate Environments Resulting in a Complex and Inefficient Enterprise



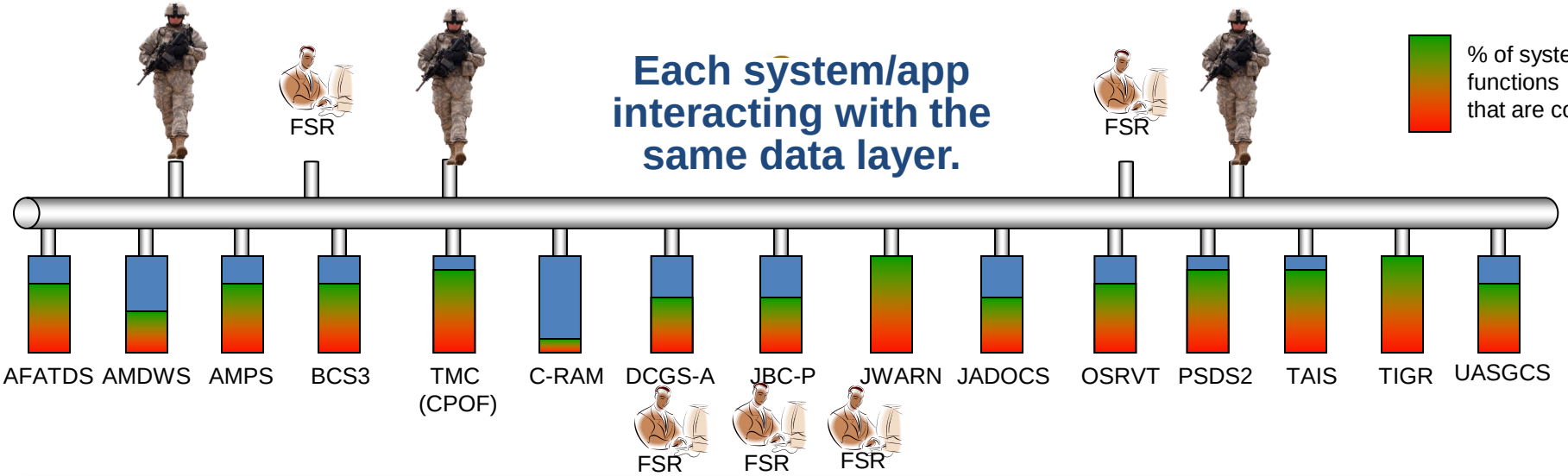
Inefficiencies of maintaining separate computing environments

- ↓Individual Production Lines
- ↓Geographically separated Hubs
- ↓Data Tied to tools/Limited reuse
- ↓Increase space requirements
- ↓Unmanageable Transport Needs
- ↓Increasing Power Needs
- ↓Multiple Accreditation Requirements
- ↓Limits mobility - "Jump TOC"
- ↓Increasing HVAC Needs
- ↓Unsustainable FSR
- ↓Multiple Nodes to Protect
- ↓Unused capacity

Total **$BB**

The COE Impact on Tomorrow's TOC

Efficiency through commonality



Common hardware and data layers Creates a coherence between users Reduces redundancy and cost

FSRs

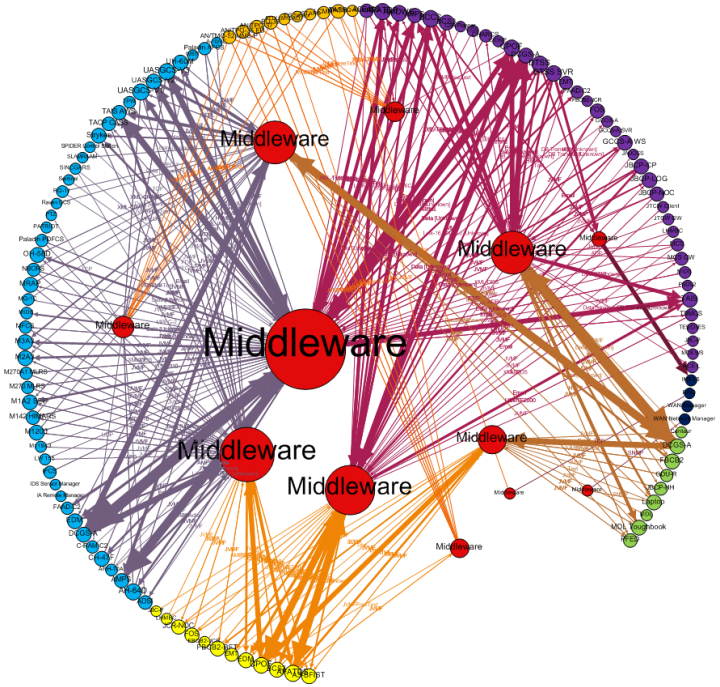
DATA COST

DATA AVAILABILITY

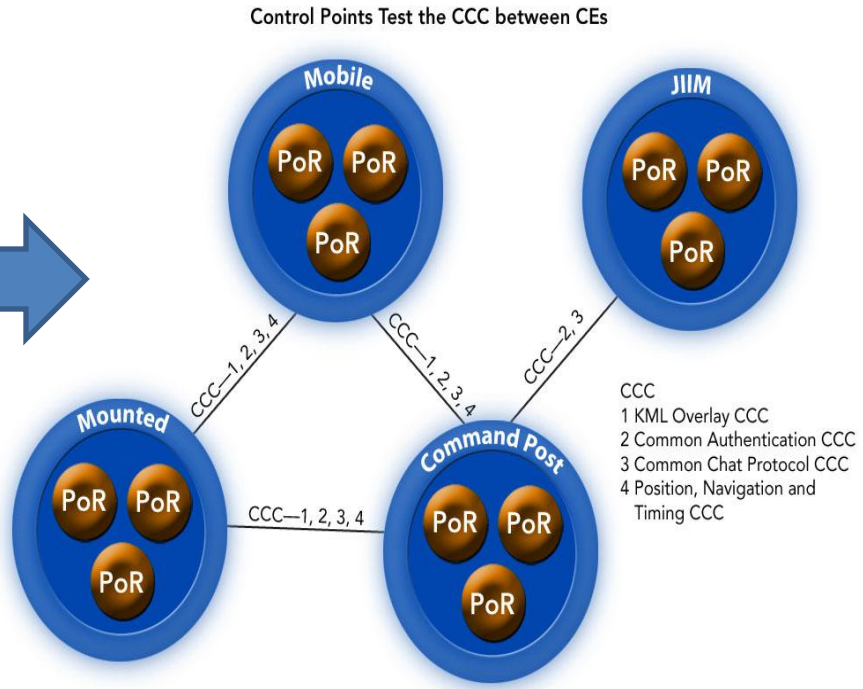
Common interface to apps and data

A new strategy to achieve systems interoperability : Control Points

- An Interface point between CEs
- Adherence will be mandated
- The control point (collection of interfaces) is what will be tested
- Speed up certification, via control point focused testing and continuous evaluation



Current - AIC



Future – Control Points

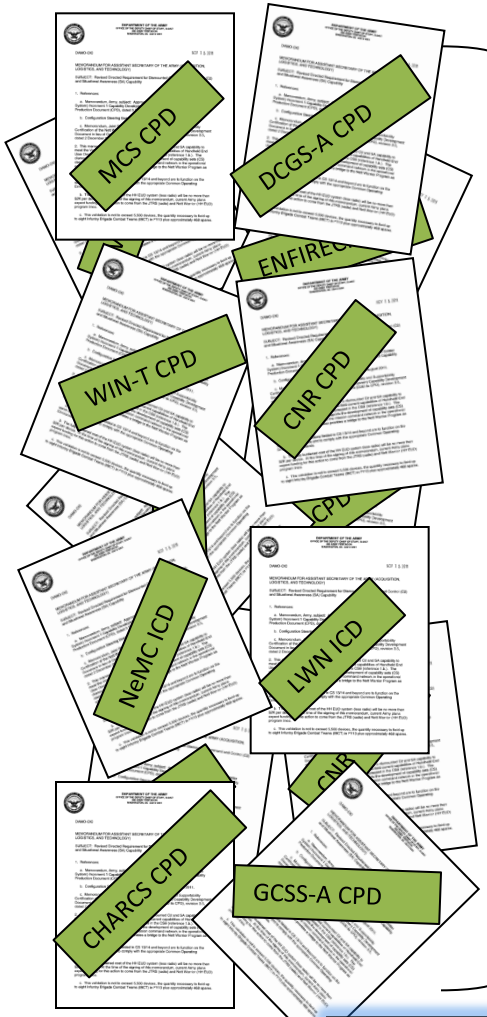
A new approach to requirements

Requirements documents are assigned to each category to support a specific function or capability

"Phonebook" concept

Select "best of breed" document(s) for each category or develop new overarching document

Plethora Of Documents



Organized Into Categories

Unique Systems

Specific to WfF

Common To All

Required Portions Identified

Selected Document(s) Per Category Over Time

Simplified Hierarchy Document

Foundational Documents (MCEC, NeMC, IEWS ICD, LWN ICD)

Basic process is adjusted to meet the needs and peculiarities of all six computing environments

COE Successes

- **Start with the Warfighter perspective**
  - What does this solution do for the warfighter and his/her mission success
- **A framework for cross-PEO collaboration**
  - Moving from vertical integration (a Program provides the full solution) to horizontal integration (Programs share common components)
- **Focused S&T investment in Software Development Infrastructures and disruptive Technologies**
  - Migrating the Army command post to a fully web-based, common, infrastructure
  - PNT anti-jam GPS capability built on services
- **Streamlined Integration Testing**
  - Interface based testing via Control Point mechanism
  - Feeder to the Network Integration Evaluation (NIE)

Key initiatives

- **TRADOC Mission Command Center of Excellence teaming with ASA(ALT) Office of the Chief System Engineer, U.S. Army Research, Development & Engineering Command (RDECOM), and MITRE, DoD FFRDC to establish an integrated requirements management system to support Army System of Systems (SoS) requirements analysis and acquisition decisions for the Army Common Operating Environment**
  - Focus on the Warfighter perspective
  - Identify Unique, Specific, and Common to all outcome focused measurable requirements for COE and CEs
  - Identify Future Cross Cutting Capabilities
  - Be mindful of the COE Technical Reference Model and the Computer Environment ecosystems

Challenges we still face

- Policy, directives, ruggedization requirements and Statutory Laws that dictate solutions, drive cost and inhibit innovation.
- Technology changes faster than Army acquisition and Security can adapt and deliver needed capabilities for mission success
- Title 10 Inhibits the Services to share common solutions, each is building to their own solution to their own need
- “That’s not how its done today” Culture
  - Command What You Control is less risky than Collaborate and Cooperate
- Ease of use for the end user, in the operational scenario, with the material solution

Summary

- System-of-systems engineering is the key to streamlining the acquisition of C4ISR capabilities:
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QUESTIONS

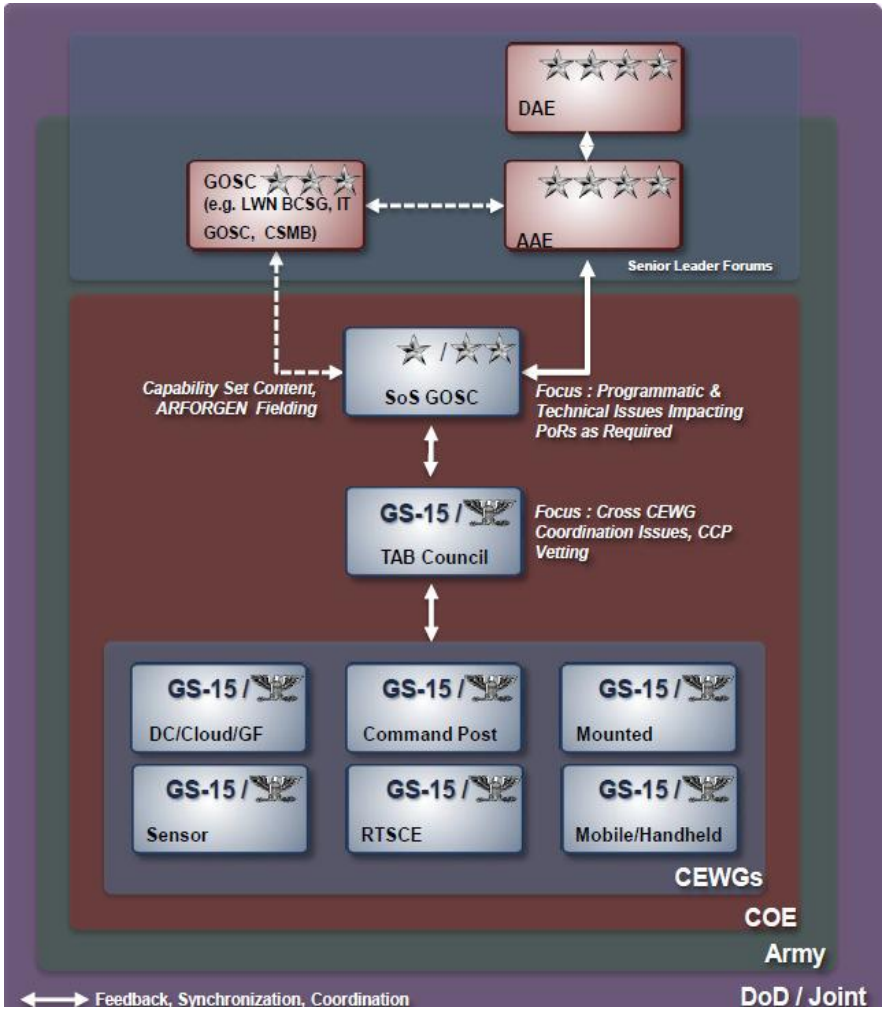
Way a Head

- Produce the COE Policy
  - Produce the Directive memo for COE implementation
- Provide COE Technical roadmap
  - COE Cross Cutting Capabilities roadmap
- Define how to resource COE
  - Business Rules
  - Program of Record System Binning to Computer Environments
  - Provide POM / Weapon System Review / Integrated WSR Template
- COE Process (how will we execute)
  - Finalizing CE SEPs
  - V&V Proposed Process for COE Tech Baseline
  - COE Knowledge Management & Configuration Management
  - Metrics review based on implementation plan updates
  - KM / Communications Management Strategy
  - Software Optimization tasker
- Focus on the Joint Fight
  - Joint Mission Threads (JMT) Analysis for PEOs/PMs. Currently engaged with JS J-6.

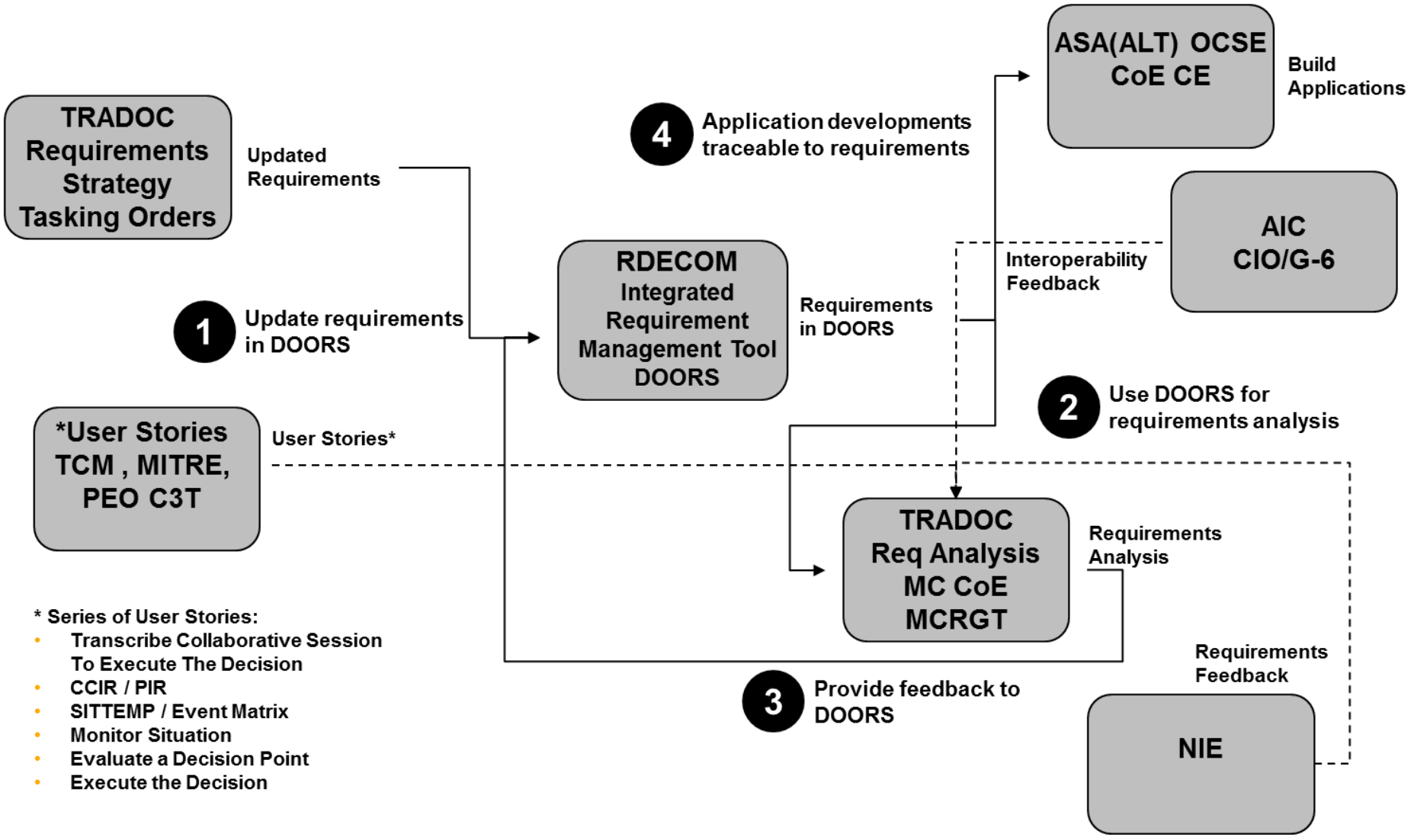
Achieving the COE

Action Plan for Success:

- COE CE WGs, TAB, & PAB Chartered, w/Leads Appointed
- COE Implementation & Execution Plans developed for CEs
- Control Point Specifications have been developed
- Platform IPTs
- System Engineering Plans for CEs
- Integrated Master Schedule for COE Baselines 1-3 Defined
  - ARFORGEN, POMs, NIE Planning/ Execution, I2E/AIC, COE Governance Activities & Reviews
- Army COE Policy
  - Replace the Army Software Blocking Policy to support agile development.



Collaboration & Information Flow & Players



* Series of User Stories:

- Transcribe Collaborative Session To Execute The Decision
- CCIR / PIR
- SITTEMP / Event Matrix
- Monitor Situation
- Evaluate a Decision Point
- Execute the Decision