NDIA System Engineering Conference
29 October 2013

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Executive Director
System of Systems Engineering & Integration Directorate (SOSE&I)
Army ASA(ALT)

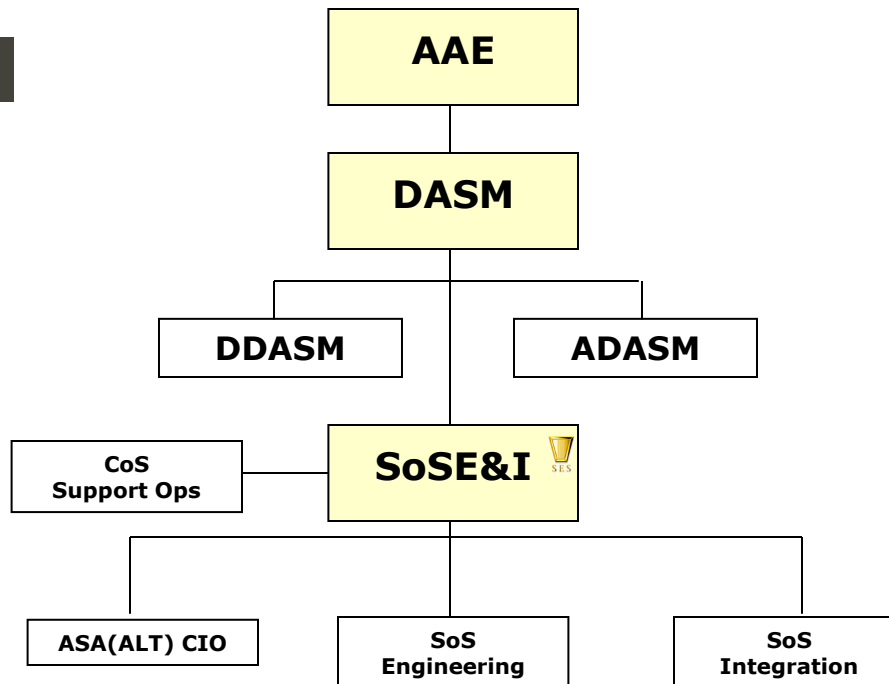DESIGN / DEVELOP / DELIVER / DOMINATE   *SOLDIERS AS THE DECISIVE EDGE*

System of Systems Engineering & Integration (SoSE&I)

Vision

To be the focal point for System of Systems Engineering and Integration across the Army's materiel development community

Mission Statement

Provide coordinated system of systems analysis, engineering, architectural and integration products to facilitate how the Army efficiently shapes, manages, validates and synchronizes the fielding of integrated materiel capabilities

Organizational Chart

- **AAE**
  - **DASM**
    - **DDASM**
    - **ADASM**
    - **SoSE&I** (SES)
      - **CoS Support Ops**
      - **ASA(ALT) CIO**
      - **SoS Engineering**
      - **SoS Integration**

Goals

- Develop Army SoS Integrated Architectures to deliver current and future Capability Sets.
- Provide SoS engineering expertise to support current Army decisions.
- Support Program Objective Memorandum (POM) process to implement SoS architecture decisions and fund integrated capability sets.
- Ensure acquisition programs comply with SoS architecture through integrated testing.
- Lead the ASAALT implementation of the Agile Process.
- Lead technology integration efforts for the Army.
- Ensure the coordinated fielding of integrated capability sets.

SoSE&I Key Activities

1. **Army SoS and Systems Engineering Standards**
   a. Common Operating Environment (COE)
   b. Vehicular Integration for C4ISR/EW Interoperability (VICTORY)
   c. Future Airborne Capability Environment (FACE)
   d. Advanced Systems Engineering Capability (ASEC)

2. **SoS Engineering Management Plan (SOSEMP)**
   a. Engineering and Architecture Artifacts
   b. Capability and Gap Analysis, 'Good Enough' POM drills

3. **Program Engineering Support**
   a. Army Systems Engineering Forum (ASEF)
      • System Engineering Best Practices and Common Processes
      • OSD and Army policy discussions
   b. Program Documentation (SEP, PPP, TEMP, Life Cycle Sustainment Plan)
   c. Workforce Development
   d. Persistent M&S and Emulation Environment "Always ON"

4. **Network Evaluation Environment (NIE)**

5. **Capability Set Fielding Synchronization**

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Systems Capability Development Reference Framework

Network Infrastructure Components

TRANSPORT
- NETOPS
- Cyberspace
- Spectrum
- Waveforms
- Terrestrial
- Wireless (Cellular, WiFi/WiMax/Mesh)
- Satellite

Transport & Services

Applications & Services

Sensors & Services

APPLICATIONS
- Data Center/Cloud/Generating Force CE
- Command Post CE
- Mounted CE
- Mobile/Handheld CE
- Real-Time/Safety Critical/Embedded CE

SENSORS
- Aerial/Ground/Space
- Manned/Unmanned
- Sensor CE

Platforms
- Building
- Command Post
- Tactical Wheeled Vehicles/Ground Combat Vehicles
- Aviation
- Soldier
- Robotics
- Munitions

Formations
- Installations   FOB
- XXX CORPS Corps
- XX DIV Divisions
- X HVY BCT
- X INF BCT
- BCTs
  - Heavy
  - Stryker
  - Light Infantry
  - Support, Aviation, Fires

Missions

Spectrum of Military Operations

Invincible in War

Persuasive in Peace

Soldiers on Point for the Nation

ASA(ALT)
V5.02 11/02/12

Inter-Agency Coalition Joint Army

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Shaping the Army's COE

GENERATING FORCE

Standards Based Open Architecture

TRANSPORT & SERVICES
- NETOPS
- Cyberspace
- Spectrum
- Waveforms
- Satellite
- Terrestrial
- Wireless (Cellular, WiFi/WiMax/Mesh)

- Data Center/Cloud/Generating Force CE
- Command Post CE
- Mounted CE
- Mobile/Handheld CE
- Real-Time/Safety Critical/Embedded CE

PLATFORMS
- Facilities
- Command Posts
- Soldiers
- Ground
- Aerial
- Robotics

- Aerial / Ground / Space
- Manned / Unmanned
- Sensor CE

APPLICATIONS & SERVICES

SENSORS & SERVICES

COE

TACTICAL EDGE

Common Operating Environment Architecture

Appendix C to Guidance for 'End State' Army Enterprise Network Architecture

U.S. Army CIO/G-6

The COE is *an approved set of Computing Technologies & Standards that enable secure and interoperable applications to be developed and executed rapidly across a variety of computing environments or CEs.*
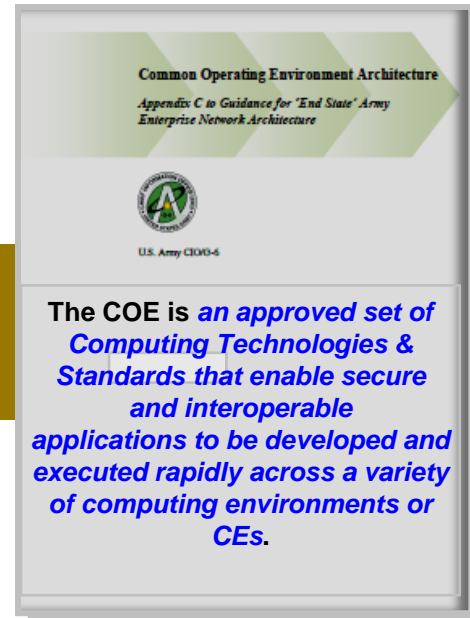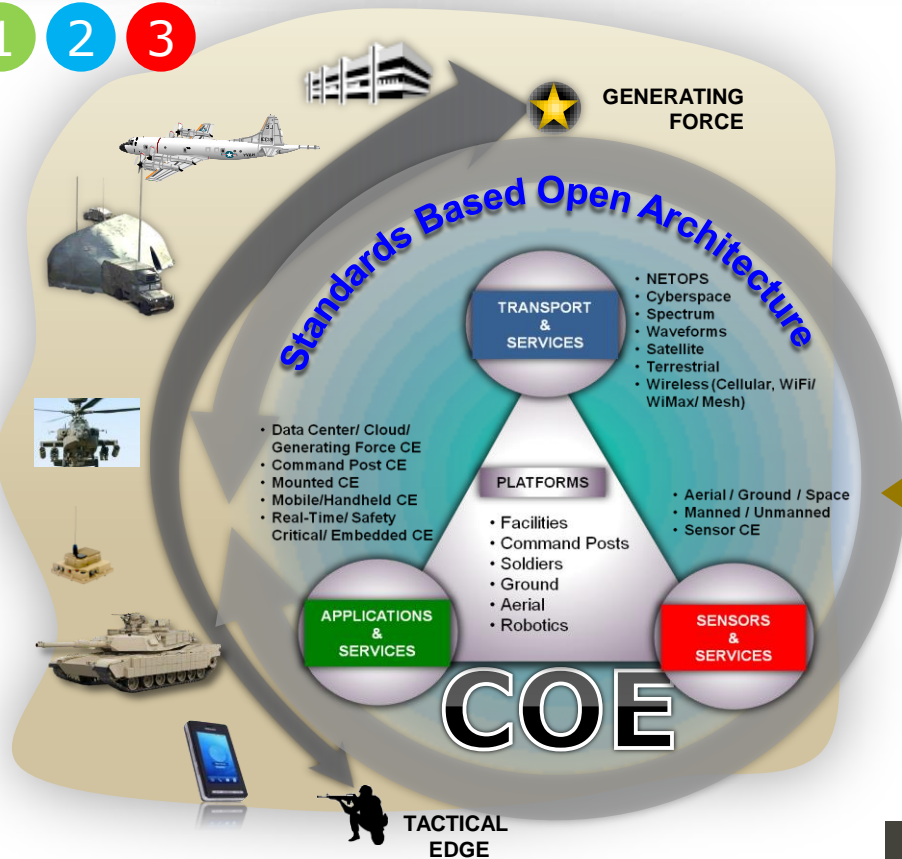
CE LEADS:

- **Mobile/Handheld CE-PEO Soldier**
- **Mounted CE - PEO C3T**
- **Command Post CE - PEO IEW&S & C3T**
- **Data Center/Cloud/Generating Force CE - PEO EIS**
- **Sensor CE - PEO IEW&S**
- **Real Time /Safety Critical/Embedded CE - PEO Aviation**

Organized into Six Computing Environments (CEs)

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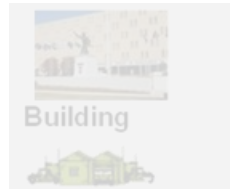
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COE Framework - Platforms
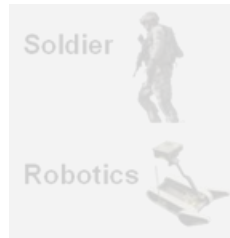
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Building

Command Post

Tactical Wheeled Vehicles/Ground Combat Vehicles

Aviation

Soldier

Robotics

Munitions

Platforms

***Vehicular Integration for C4ISR/EW Interoperability (VICTORY) Objective*** - *Define a network-based data bus architecture for integrating the electronics systems, enabling C4ISR/EW systems to share information, computational resources, and user interfaces (displays, controls, etc.) as a means of reducing overall vehicle size, weight, and power (SWaP) requirements.*

Future Airborne Capability Environments (FACE) Objective - *Publish a set of standards that define a Department of Defense - (DoD) wide COE for real time, safety critical embedded applications for avionics. Strategy is to create a hardware-agnostic software environment in war-fighting platforms that enables conformant applications to be deployed on multiple platforms without impact to the application.*
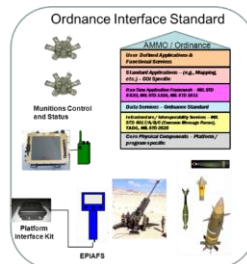
Ordnance Interface Standard (OIS) Objective - *Provide standardization and definition of ordnance interfaces, quality attributes, engineering artifacts, and architecture framework to enable control of Ordnance Systems by any PoR/system that has the required ordnance certifications. Provides efficiencies in development through reusable artifacts for existing systems.*

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Network Capability Set

5

Institutional CS (notional)

Enterprise Component Capabilities

Network Capacity Domain Capabilities (Connect and Operate)
- Global (Computing and Storage)
- Long Haul
- Core (Computing and Storage)

Enterprise Services Domain Capabilities (Share)
- Collaboration
- User Access Portal
- Content Delivery
- Content Management
- Enterprise Application Software
- Business Process Management
- Content Discovery
- Records Management
- Respond (Common Core)
- Service Strategy

Network Operations and Security Domain Capabilities (Access and Defend)
- Workforce Training
- Standards and Business Rules
- Call Centers
- Recruit and Retain
- Protect the Network
- Secure Access
- Respond (Secure Network)
- Network Utility
- Network Management

Multi-Protocol Label Switching Installation Gateway

Regional Hub Node

Operational CS (notional)

Base Camps

WIN-T
- Respond (Secure Network)
- Respond (Common Core)
- Service Strategy

TDC — Tactical Data Center
- Content Discovery
- Content Delivery
- Collaboration
- Secure Access
- Protect the Network

SNAP — SNAP Terminal

LAN: NIPRNET, SIPRNET, MPE

BOC

Base Camp Communications

Unit Organic Communications

- Extra Small Base Camp
- Small Base Camp
- Medium Base Camp

Operational Capability Set – Brigade Combat Team

- **WIN-T Inc II**
- **FBCB2-BFT II JCR**
- **AN/PRC-117G (v4)**
- **HMS ManPack Radio Rifleman's Radio**
- **NETT Warrior**
- **Software Block 11-12**

BFT-2, CDS, WIN-T/Trojan/CSS VSAT/DVB/GBS, GIG, Hub(s), BDE, ANW2 (PRC-117G), BN, SINCGARS, CO Net, SRW (PRC-152A), Unclass TIGR Server, SRW (PRC-117G), Plt Net, SRW (RR)

Installation as a Docking Station

SRW – Soldier Radio Waveform

Installation Component Capabilities

Network Capacity Domain Capabilities
- Long Haul
- Short Haul
- Mobility (end user devices)
- Local Computing and Storage
- End User Computing at Post/Camp/Station

Enterprise Services Domain Capabilities
- Collaboration
- Content Discovery
- Respond (Common Core)
- Service Strategy
- User Access Portal
- Content Delivery

Network Operations and Security Domain Capabilities
- Workforce Training
- Recruit and Retain
- Secure Access
- Protect the Network
- Network Enterprise Center (NEC)
- Respond (Secure Network)

Plus Tailored Mission Packages for Power Projection Platforms, Industrial Bases, Training Bases, and Mobilization Stations and Armories

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Aim: One unified, modernized Army network that improves effectiveness, security and efficiency
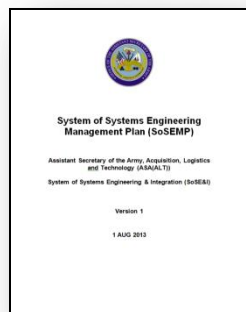
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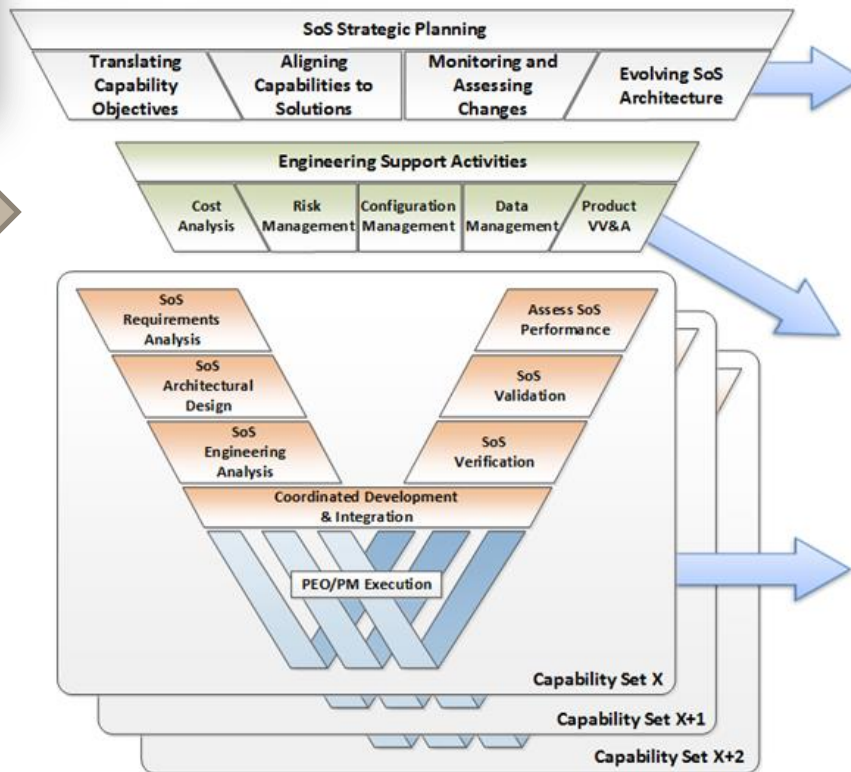*SOLDIERS AS THE DECISIVE EDGE*

SoS Engineering Process
SoS Management Plan SoS(EMP)

The SoSEMP serves as the guiding document for Army System of Systems (SoS) engineering, acquisition planning, portfolio management, and decision making

Strategic Planning Guidance to shape SoS Architectures

Engineering Support activities applied to achieve strategic and technical goals using common SE processes, data, and analysis

SoS Engineering processes undertaken with PEO operations to ensure SoS capabilities are developed, integrated and tested while maintaining alignment with Program Cost, Schedule and Performance strategies

Provides the SoS Engineering component of the overall Army Enterprise development effort
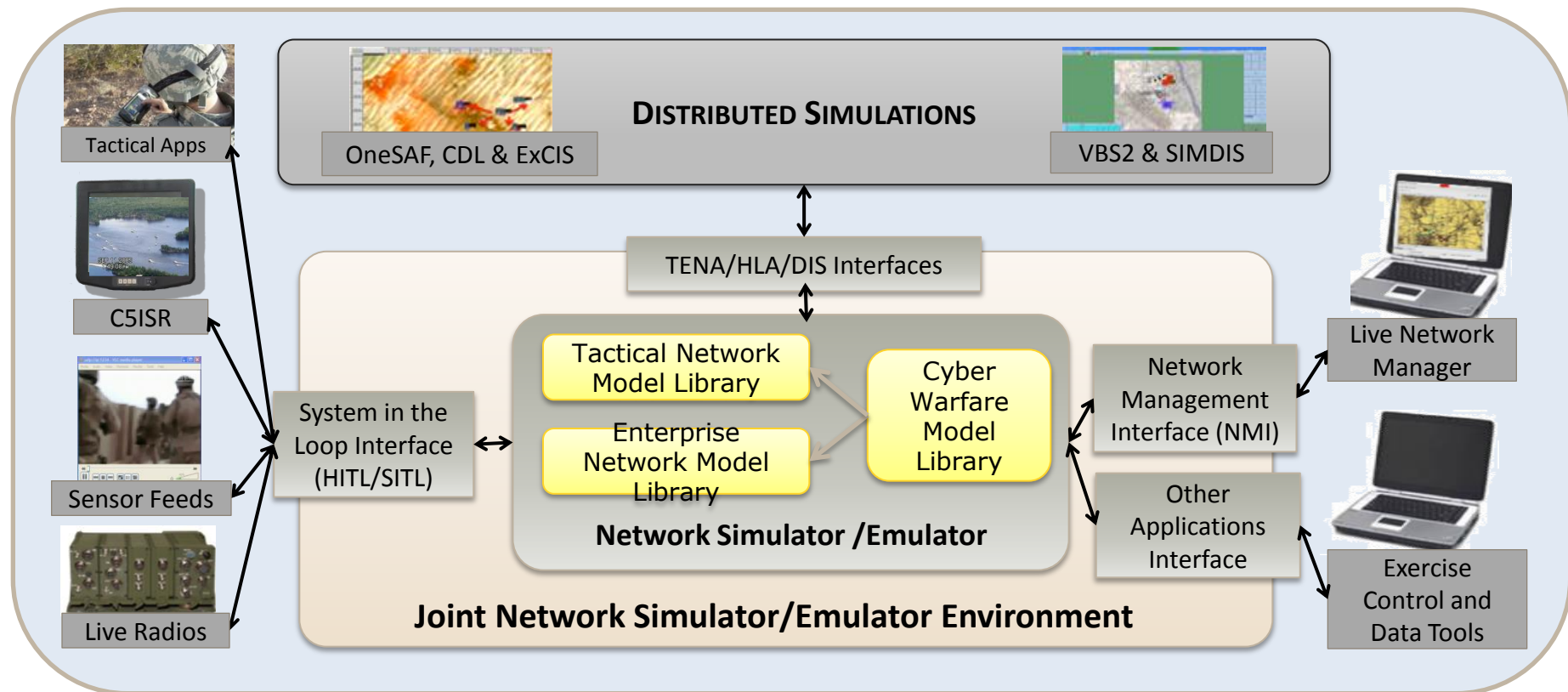
"ON DEMAND"
Live-Virtual-Constructive Architecture

DISTRIBUTED SIMULATIONS

OneSAF, CDL & ExCIS

VBS2 & SIMDIS

Tactical Apps

C5ISR

Sensor Feeds

Live Radios

TENA/HLA/DIS Interfaces

System in the Loop Interface (HITL/SITL)

Tactical Network Model Library

Enterprise Network Model Library

Cyber Warfare Model Library

Network Simulator /Emulator

Network Management Interface (NMI)

Other Applications Interface

Live Network Manager

Exercise Control and Data Tools

Joint Network Simulator/Emulator Environment

Providing A Network Modernization "Integration/Test Harness" Capability Which Can Support Multiple Use Cases Across The Acquisition Life Cycle

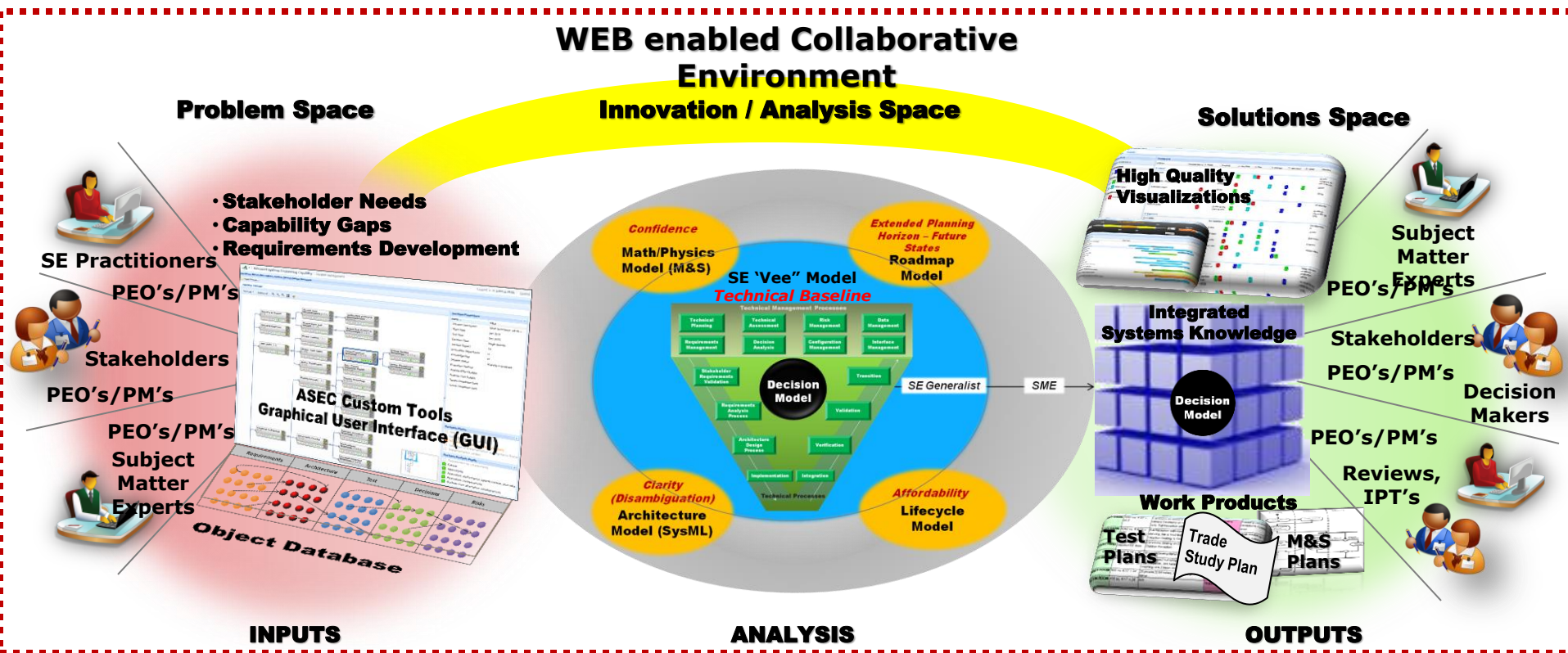**DESIGN / DEVELOP / DELIVER / DOMINATE**

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Systems Engineering Data Collaboration
Framework to Improve SE Effectiveness

WEB enabled Collaborative Environment

Problem Space

Innovation / Analysis Space

Solutions Space

- Stakeholder Needs
- Capability Gaps
- Requirements Development

SE Practitioners
PEO's/PM's
Stakeholders
PEO's/PM's
PEO's/PM's
Subject Matter Experts

ASEC Custom Tools Graphical User Interface (GUI)

Object Database

Confidence Math/Physics Model (M&S)

Extended Planning Horizon – Future States Roadmap Model

SE 'Vee" Model *Technical Baseline*

SE Generalist — SME

Clarity (Disambiguation) Architecture Model (SysML)

Affordability Lifecycle Model

High Quality Visualizations

Subject Matter Experts
PEO's/PM's

Integrated Systems Knowledge

Stakeholders
PEO's/PM's
Decision Makers
PEO's/PM's

Reviews, IPT's

Work Products

Test Plans — Trade Study Plan — M&S Plans

INPUTS   **ANALYSIS**   **OUTPUTS**

Establishing an integrated Systems Engineering knowledge creation and capture framework built on a decision centric method, high quality data visualizations, intuitive navigation that enables continuous data traceability, real time collaboration and knowledge pattern leverage supporting the entire system lifecycle
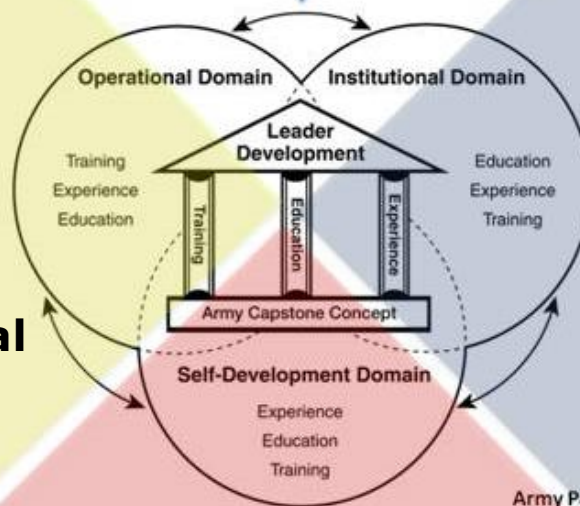
Workforce Development Model

System of Systems/ System Engineering
Workforce Development Governance Board

Operational Domain

- Mentoring
- Identify and groom future leaders
- Multiple organizational assignments

Institutional Domain

- Standardized Practices
- Promote Education (Defense Acquisition University, Civilian Education System, Naval Postgraduate School, etc.)

Army Pamphlet 350-58

Self-Development Domain

- Establish Career Paths
- Publish Competencies
- Reward Behavior

The Army's Network Integration Evaluation (NIE)

What the NIE does for the Army:
The NIE brings Soldiers, materiel developers, engineers and testers together in a realistic operational environment.
VCSA – 9 May 2012

Intended benefits for the Army ....
✓ *Eliminates network integration burdens on deployed forces*
✓ *Conduct DOTML-PF assessments of the network, <u>capability sets </u>and other capabilities*
✓ *Establishes and refines TTPs, SOPs and training for the baseline capability sets*
✓ *Infrastructure and configuration to conduct DT & OT for POR in an operational environment*
✓ *Serves as an environment to identify operational and technical gaps*
✓ *Serves as a test-bed to evaluate mature industry and Gov technologies to fill identified gaps*

Executing the NIE....
✓ *Part of a the Army's six-phase Agile Process for Capabilities Integration*
✓ *Semi-annual evaluation and testing of networked and non-networked capabilities using an operational BCT in a realistic environment*
    ✓ *Consolidating Network evaluations at Ft. Bliss/WSMR enables testing and evaluating the Army Network as a whole vice individual programs*
    ✓ *Includes lab assessment and risk reduction at Aberdeen Proving Grounds*
✓ *Leverages industry innovation and RDT&E funding to close the IT "Gap"*

Set conditions for continued success by implementing Lessons Learned

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Direction for Future Integration Evaluations

ARMY 2020

Strategic Domains

- Air
- Land
- Sea
- Space
- Cyber
- **Human**

Warfighting Functions

- ✓ Mission Command
- ✓ Movement & Maneuver
- ✓ Fires
- ✓ Intelligence
- ✓ Sustain
- ✓ Protection

NIE 15.2
- CS 16 Validation / Joint fires
- Expanded JIIM

NIE 15.1
- CS 16 Bridge / Joint Fires
- Expanded JIIM

NIE 14.2
- CS 15 Validation / Doctrinal Concept Assessments / CYBER
- Expanded JIIM NIE/ BCT Design (3rd BN) /LVC-IA

NIE14.1
- CS 15 Bridge / Intelligence, Surveillance & Reconnaissance
- Joint Participation / LVC-IA

NIE 13.2
- CS 14 Validation / Intelligence, Surveillance & Reconnaissance
- Training & Leader Development / Emerging LVC Initiatives / Instrumented HST w/ network

NIE 13.1
- CS 14 Bridge / Intelligence Surveillance and Reconnaissance Baseline,
- Battle Command Transport Convergence – Intel and Log; Operational Energy

NIE is more than a field evaluation ... it is the integration, training and validation leading to DOTMLPF recommendations for the Army

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Network Capability Set
"Building a Blueprint"

Program Executive Offices /Acquisition Programs

Threat

Science & Technology
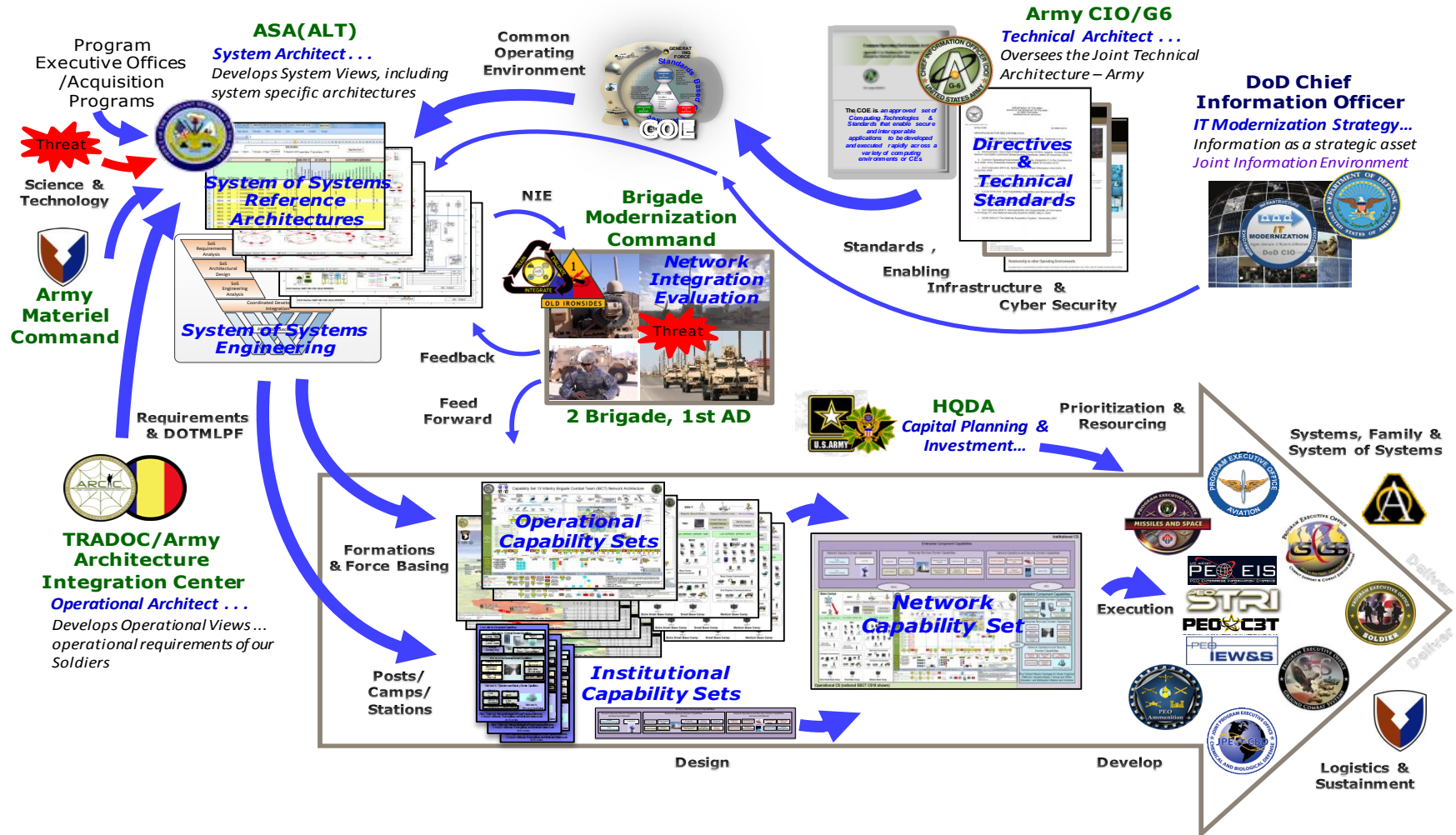
Army Materiel Command

ASA(ALT)
System Architect . . .
Develops System Views, including system specific architectures

Common Operating Environment

COE

System of Systems Reference Architectures

System of Systems Engineering

NIE

Brigade Modernization Command

Network Integration Evaluation

Threat

2 Brigade, 1st AD

Feedback

Feed Forward

Army CIO/G6
Technical Architect . . .
Oversees the Joint Technical Architecture – Army

The COE is *an approved set of Computing Technologies & Standards that enable secure and interoperable applications to be developed and executed rapidly across a variety of computing environments or CEs*

Directives & Technical Standards

DoD Chief Information Officer
IT Modernization Strategy…
Information as a strategic asset
Joint Information Environment

Standards, Enabling Infrastructure & Cyber Security

HQDA
Capital Planning & Investment…

Prioritization & Resourcing

Systems, Family & System of Systems

Requirements & DOTMLPF

TRADOC/Army Architecture Integration Center
Operational Architect . . .
Develops Operational Views … operational requirements of our Soldiers

Formations & Force Basing

Posts/ Camps/ Stations

Operational Capability Sets

Institutional Capability Sets

Network Capability Set

Execution

PEO EIS
STRI
PEO C3T
PEO IEW&S
PEO Ammunition
JPEO CBRD

Design

Develop

Logistics & Sustainment

Aim: One unified, modernized Army network that improves effectiveness, security and efficiency

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Questions

ASA(ALT) SOSE&I SharePoint Knowledge Center:
https://sp3.kc.army.mil/sosei/kmportal/default.aspx

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