NDIA 11th Annual Systems Engineering Conference

ESTABLISHNG A SYSTEM OF SYSTEMS SYSTEMS ENGINEERING ORGANIZATION IN THE ARMY

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Challenges for the Army

- No System of Systems (SoS) Systems Engineering capability at the Enterprise level

    - Stove-pipe product development

    - Many interdependencies

    - Path from Current to Future?

    - SE critical to LandWarNet Battle Command and operational GWOT rotations

- No "Integrator" for Brigade Combat Teams (BCTs) and support Brigades

- Institutionalizing Reliability Programs

Army systems are becoming more interdependent and required operational capability is not provided by a single system, but rather a combination of systems

ASA(ALT) SoS SE Organization

MISSION

Provide Systems Engineering capability at System of Systems level across the Army enterprise to deliver integrated and interoperable weapon systems that provide optimized and affordable capability

FUNCTIONS

- Develop, evolve, and maintain a detailed, interoperable SoS design baseline - <u>Enterprise Systems Architecture</u>

- Address technical, operational and cost aspects to <u>frame issues for decision making</u>

- <u>Leverage experimentation and M&S tools</u> as part of engineering analysis/operational assessment

- Establish and <u>evolve an SoS vision</u> over time, and translate into capability attributes

- Translate emerging requirements into implied system attributes for <u>technology insertion solutions</u>

- Lead <u>targeted technical assessments</u> to enable cost/capability trades within and across system boundaries

- <u>Maintain visibility</u> into individual system architectures, specifications & performance

- <u>Coordinate</u> technically with SEs in related programs (Army, Joint)

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SoS SE and PEO Relationship

ASAALT SoS SE Organization

COORDINATION/SUPPORT:
TRADOC
ARSTAFF
OSD/Joint Programs
RDECs

Ground Combat Portfolio
Lead – PEO GCS

Ammo Portfolio
Lead – PEO Ammo

ISR Portfolio
Lead – PEO IEW&S

Soldier Portfolio
Lead – PEO Soldier

Current BC Portfolio
Lead – PEO C3T

Simulation Portfolio
Lead – PEO STRI

Enterprise Systems Portfolio
Lead – PEO EIS

Aviation Portfolio
Lead – PEO Aviation

Future Combat System
Lead – PM FCS

Missile Portfolio
Lead – PEO M&S

Tactical Mobility Portfolio
Lead – PEO CS/CSS

Chem Bio Portfolio
Lead – JPEO CBD
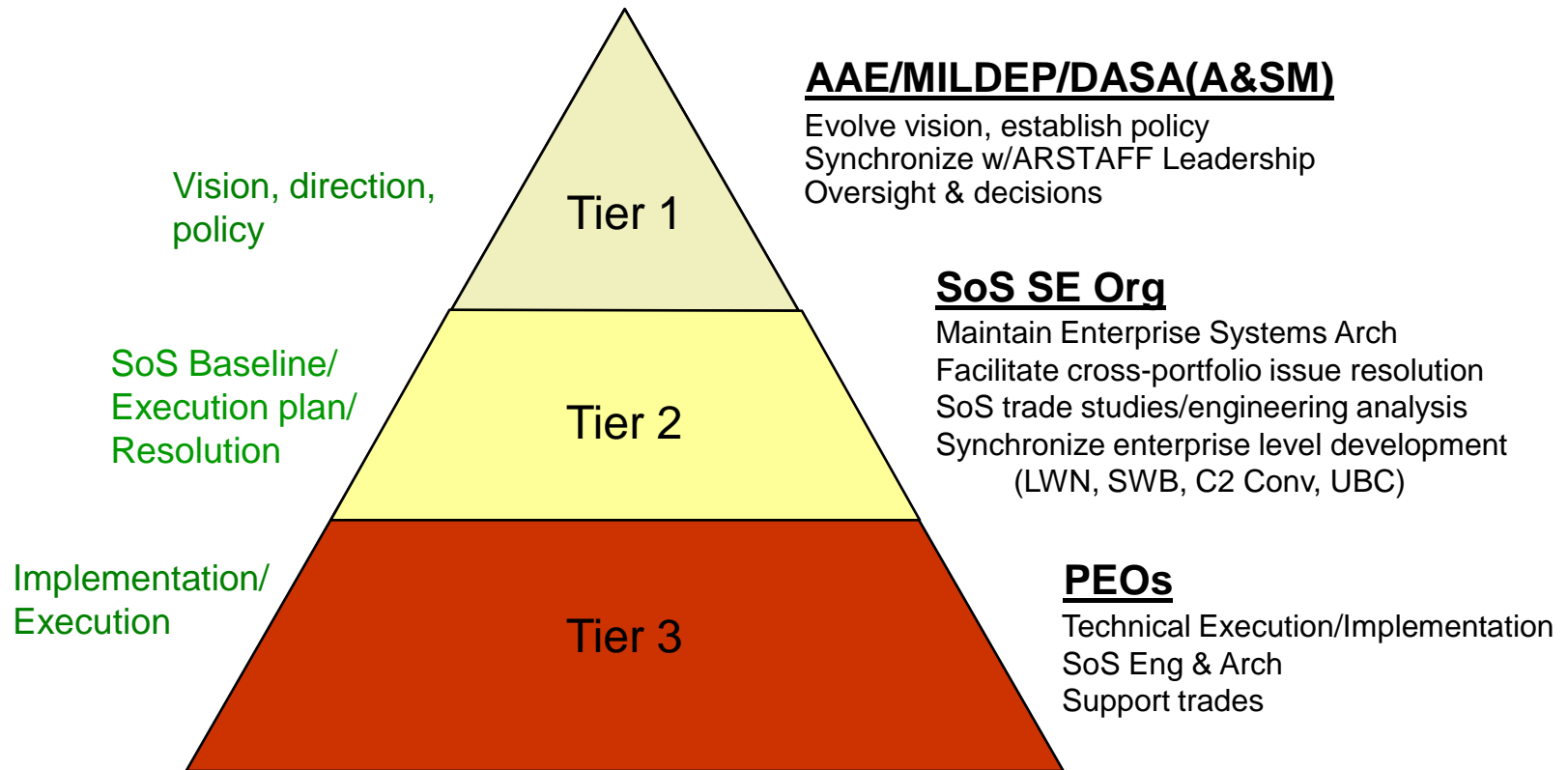
ASA (AL&T) SoS Systems Engineering
- **Policy**
- **Oversight**
- **Enterprise level system architectures**
- **Enterprise level analysis, evaluations, trade studies – End-to-end performance**
- **Synchronize enterprise level development**
- **Identify and resolve cross-portfolio issues**

PEO Portfolio SoS Engineering
- **Oversight of POR**
- **Portfolio level architecture (to include cross-portfolio requirements)**
- **Portfolio level analysis, evaluations, and trade studies**
- **SoS responsibilities - Works to resolve cross-domain issues**
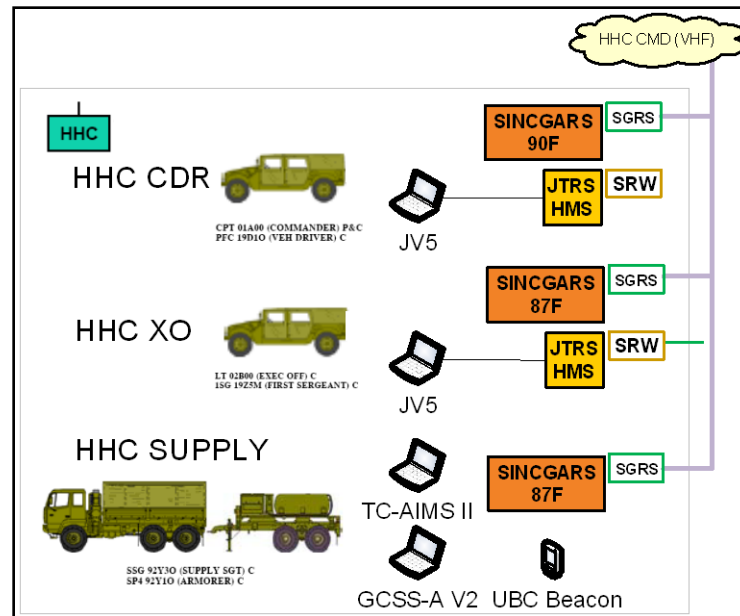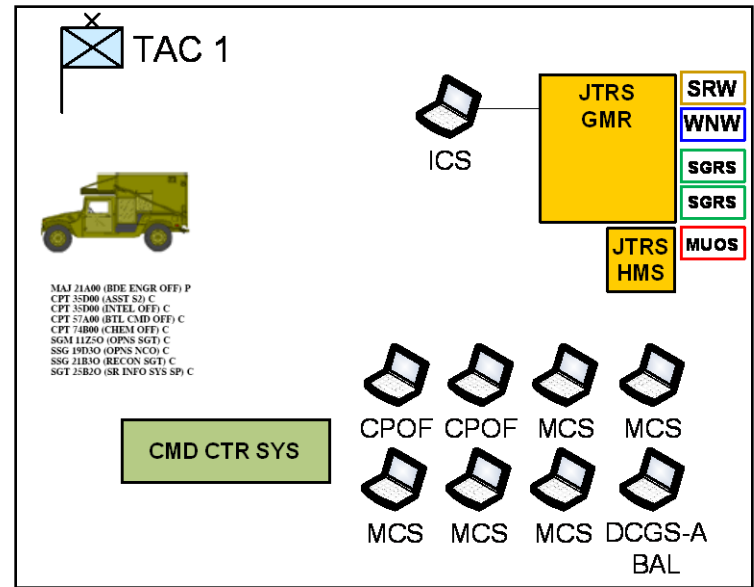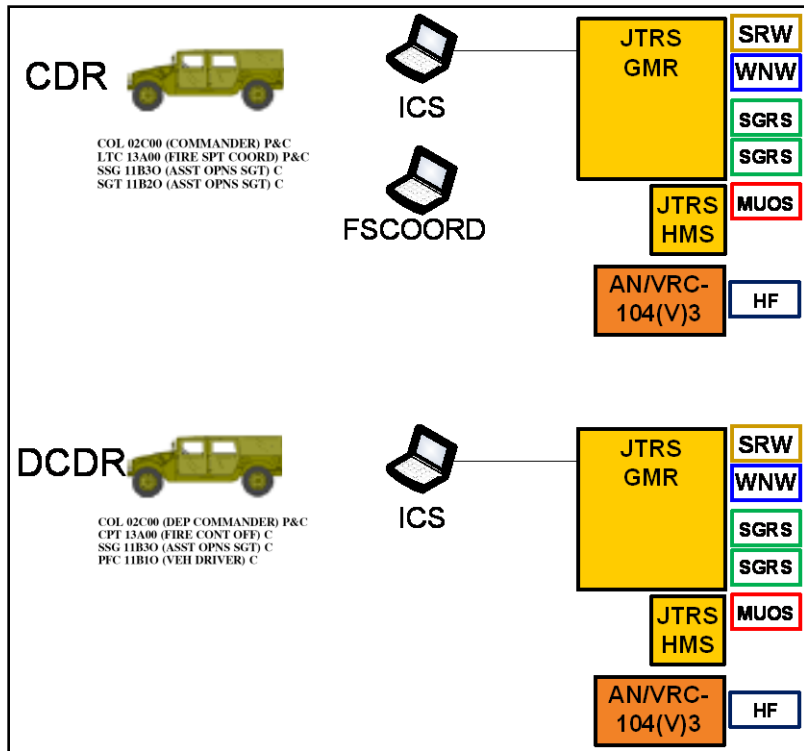- **PEO - Lead**
- **RDEC, FFRDC, SETA - Support**

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SoS SE Governance

Vision, direction, policy

SoS Baseline/
Execution plan/
Resolution

Implementation/
Execution

Tier 1

Tier 2

Tier 3

AAE/MILDEP/DASA(A&SM)
Evolve vision, establish policy
Synchronize w/ARSTAFF Leadership
Oversight & decisions

SoS SE Org
Maintain Enterprise Systems Arch
Facilitate cross-portfolio issue resolution
SoS trade studies/engineering analysis
Synchronize enterprise level development
(LWN, SWB, C2 Conv, UBC)

PEOs
Technical Execution/Implementation
SoS Eng & Arch
Support trades

Example: IBCT Snapshots

ASA (AL&T)

Synchronization with LandWarNet

ASA (AL&T)
LWN/BC Capability Set Management Process

"Capability Set Life-Cycle"

DEFINE & DEVELOP

★★★ *G3*   ★★★ *G3*

What can be provided when at affordable price?
- SoS Engineering Analysis/Trades
- SoS Synchronization
- Technical Feasibility
- Inform decisions
- "Bang for the Buck"

STEP 1
CABILITY NEEDS ANALYSIS

PRIORITIZE CAPABILITY NEEDS

ESTABLISH CAPABILITY SET PARAMETERS (OPN, TECH, FISCAL)

STEP 4
FOCUS ON CAPABILITY SEGMENTS

STEP 2 **INTEGRATE ARCHITECTURES**

STEP3 **Fiscal Analysis**

SCREEN & ID SOLUTION SET

Does Capability Set stand up to Oper Analysis?
- Exercise Cap Set through Oper Analysis - leverage analytic tool suite
- Adjust to changes (funding, rqmt, force changes, etc.)
- Assess changes on SoS perf & synchronization
- Re-assess "Bang for the Buck"

R-7 Years

REFINE

APPROVE

STEP5 **Develop "BASELINE" INTEGRATED CAPABILITY SET**

...NT FOR CHANGE ENVIRONMENT
...EW TECHNOLOGY, ONS/JUONS, FORCE SIZING)

★★★★
SELECT CAPABILITY SET COA

LWN GOSC
R-36 months

PRODUCE / PRIORITIZE COAS

SOSE ANALYSIS OF CAPABILITY SETS

★★★★
Approve "Baseline" CAP. SET 15-16 FOR REFINEMENT

LWN GOSC
R-6 Years

Understood Operational Effects Through Operational Analysis (M&S)

BOIP Lock
"80% Solution"

SYNCH

FIELD

Near Term Trades

★★★★
APPROVE Final CAPABILITY SET Synched w ARFORGEN

LWN GOSC
R-18 Months

MTOE Lock

ONS/JUONS

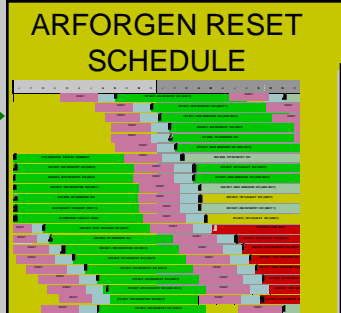STEP7 **SYNCH CAPABILITY SET** Testing & Certification

Force Validation Conference
Army Sourcing Conferences
Army Equipping Conferences

Begin Reset

SWB Go / No Go

Issue MTOE

ARFORGEN RESET SCHEDULE

"Good Idea" Cut-Off

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ASA (AL&T)

Army Reliability Initiatives

Army Reliability Policy

- Mandates development and demonstration of a mid-SDD reliability test threshold for all pre-Milestone B programs with a JPD of JROC Interest[1]:

    - Default value is 70% of CDD reliability requirement
    - Must be demonstrated with at least 50% statistical confidence by end of the first full-up, system-level developmental test event of SDD
    - Threshold value must be approved as a part of the TEMP, and recorded in the SDD contract and APB at Milestone B
    - Requires review of material developer's reliability case documentation
        - AMSAA and AEC to apply Reliability Scorecard

- ATEC to perform threshold assessment, and lead IPR in event of a breach:

    - PEO/PM develops corrective action plan
    - AEC performs assessment of PM's plan and projected reliability
    - AMSAA/AEC estimates ownership cost impacts
    - TRADOC assesses utility of system given current reliability maturity level
    - ATEC CG provides recommendation to ASA(ALT) thru Army T&E Executive, with PEO coordination in advance

> ### *ASA(ALT) policy expands the Army's current T&E mission*

1.   Per CJCSI 3170.01F, JROC "Interest" refers to programs that have a potentially significant impact on joint warfighting.

Army RAM Improvement Initiatives
(AAE Memo, 4 Sep 08)

- Army PM Charters to explicitly include RAM focus

- APB to include an increased RAM scope and hold PEOs & PMs accountable

- ASARC (& other reviews) to be modified to focus on RAM

- Reliability expertise & POCs within ASA(ALT) SOS Engineering Organization

- RAM emphasis in future capabilities documents & acquisition contracts

- Improve RAM training provided to Army acquisition & logistics workforces

- Sponsor RAM workshops & conferences, including latest RAM improvement initiatives

- Encourage use of GEIA-STD-0009 (Reliability Stnd for Design, Devel. & Manufac.)

- Apply Reliability Scorecard early to evaluate progress in the development process

ASA (AL&T)
5-Step Army Policy Implementation Plan

← Technology Development Phase → | ← System Development & Demonstration Phase →

MS A | **MS B** | **MS C**

1. Establish

Establish test threshold value[1,2]

Default value is 70% of requirement, and must be demonstrated with at least 50% statistical confidence.

2. Document

CDD[6]

RFP[1,2,4] → SDD Contract[1,2,4]

TEMP[1,2]

APB[1]

Threshold to be approved as part of TEMP and incorporated in SDD contract, TEMP, and APB.

RIWG sample RFP language (DAU Website), GEIA-STD-0009

3. Plan

Develop RG Planning Curve[1,2]

Source Selection Support[1,4]

Breach Contingency Planning[1,2,3,5]

AMSAA Reliability Growth (RG) Methodology

4. Evaluate

Evaluate RG Plan[1,2,4]

Early Engineering Evaluation[1,2,4]

Threshold Assessment[2]

Identify LCC Impacts[1,3,5]

RIWG Reliability Engineering Scorecard (DAU Website)

5. Report

ESR / CIPR[2]

SEP[2] | Sys Eng. Plan[1,2]

Milestone B OAR Risk Assessment[2]

Only done if threshold breached.

Threshold Breach Report[2,3,5]

OTA Assessment Report[2]

- **Key players**: 1 PEO/PM, 2 AEC-RAM, 3 AEC-ILS, 4 AMSAA - Reliability Branch, 5 AMSAA - Resource Studies Branch, and 6 TRADOC.
- **Documentation**: Currently developing an ATEC guide on this implementation plan and associated reliability growth planning processes.
- **Reference**: ASA(ALT) Memorandum, Dated 6 December 2007, Subject: Reliability of U.S. Army Materiel Systems.
- **GEIA**: Government Electronics and Information Technology Association.

Summary

- **The Army is modernizing & transforming**

- **The Army must organize for success**

- **SoS Systems Engineering plays a pivotal role**

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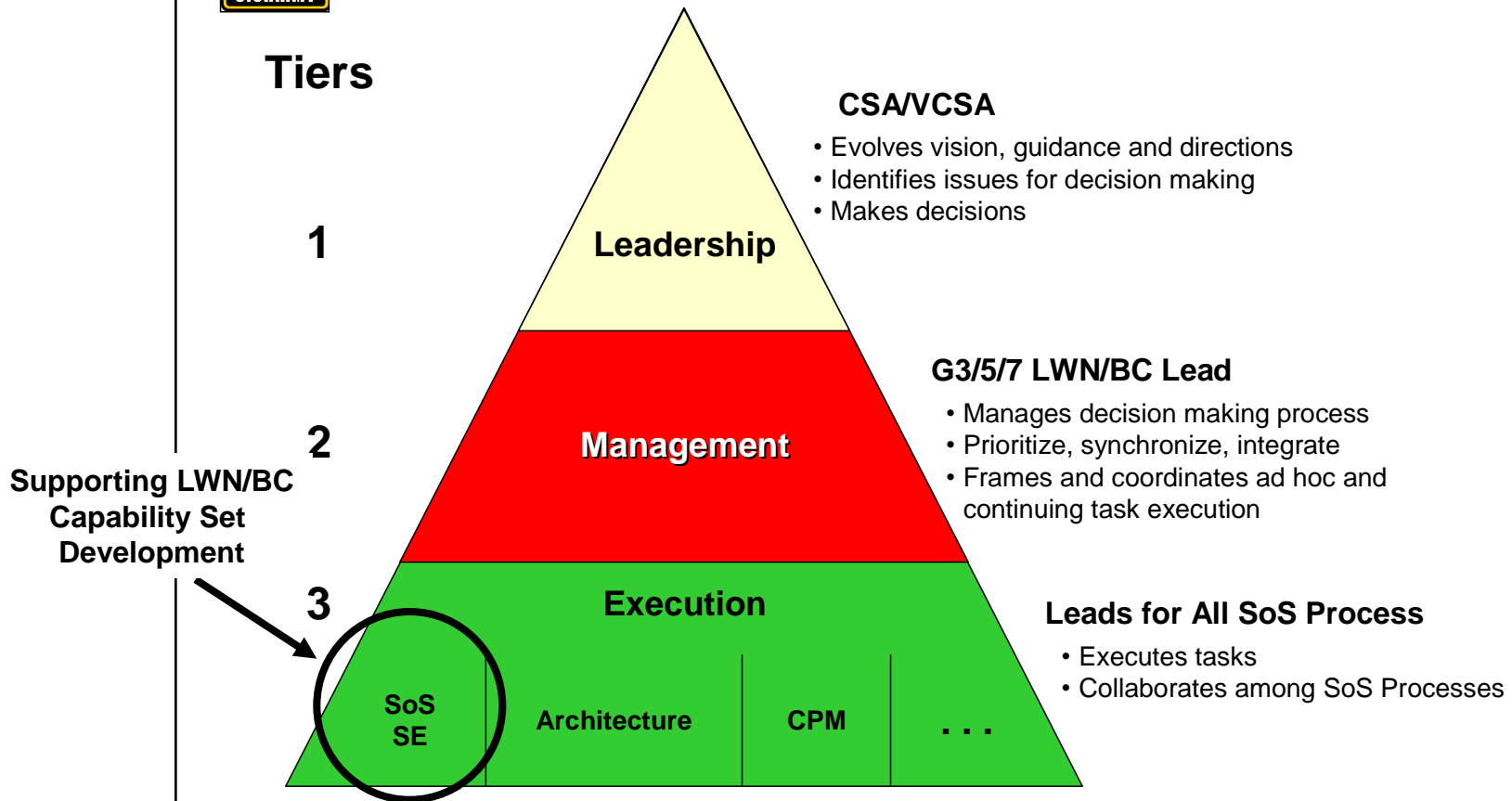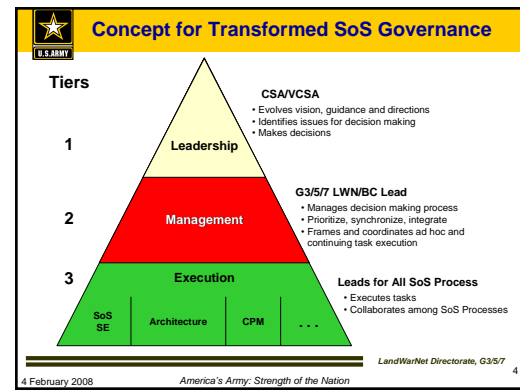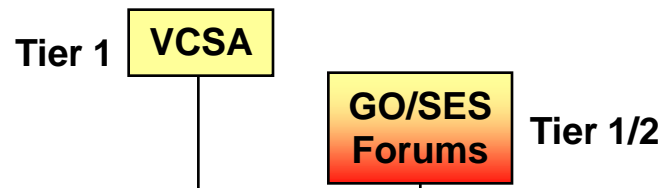
Questions?

ASA (AL&T)

Back-Up

LWN/BC Governance

Concept for Transformed SoS Governance

Tiers

1 Leadership

CSA/VCSA
- Evolves vision, guidance and directions
- Identifies issues for decision making
- Makes decisions

2 **Management**

G3/5/7 LWN/BC Lead
- Manages decision making process
- Prioritize, synchronize, integrate
- Frames and coordinates ad hoc and continuing task execution

Supporting LWN/BC Capability Set Development

3 **Execution**

SoS SE | Architecture | CPM | . . .

Leads for All SoS Process
- Executes tasks
- Collaborates among SoS Processes

LandWarNet Directorate, G3/5/7

4 February 2008 — *America's Army: Strength of the Nation*

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ASA (AL&T)
LWN/BC & SoS SE Synchronization

Tier 1 — **VCSA**

GO/SES Forums — Tier 1/2

ASAALT/ AAE

Program Oversight

PEOs
PEOs
PEOs

Acq & Sys Mgt

LWN/BC Director — Tier 2

ARSTAF

etc.
G-8
G-6
G-4
G-3
G-2

Decision Making

SoS SE

Operational Analysis

TRADOC

SoS SE Full-Time Team

RDECs

Enterprise Arch, Baseline SoS

Partners ←→

Authority ←→

Support ←→

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SoS SE | Architecture | CPM | . . .

LandWarNet Directorate, G3/5/7

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Generating Force Process Transformation

- **The success of the LandWarNet strategy is reliant on the transformation of current Generating Force processes, policies and procedures.**

- **The adoption of a System of Systems Engineering Approach is the first critical step in the transformation process.**

- **Concurrently, other processes must adapt to enable the System of System approach. The Generating Force processes identified for transformation include:**

ASA(ALT) SoS SE

- Engineering
- Architectures
- Configuration Management
- Portfolio Management
- Capabilities / Requirement Validation
- Force Integration & Documentation (TO&E, BOIP)

- Operational Analysis (M&S)
- Programming
- Testing & Certification
- Information Assurance
- Fielding Capability Sets
- Acquisition
- *Prioritization (DARPL/ARFORGEN)

To achieve synchronization:
Must determine critical deliverables
ID organizational Interdependence
Target key decision points (strategic and operational)

Overview of SoS SE Activities - FY09

PRIORITIES	FY08		FY09			
	4Q		1Q	2Q	3Q	4Q
UBC Design			UBC 120 Day Study Complete; Initial Systems Views for APOM 11-15 (Capability Sets FY11-12 & FY13-14); ▲ Army Decision		Update Enterprise Arch , plan for POM 12-17	
LWN/BC Capability Set Development			Process Recommendations from UBC 120 Day Study Lessons Learned; Candidate Systems for Capability Packages	Capability Set COA Evaluations	Baseline Cap Set Arch; Capability Set BOI and Cost Analysis	▲ Army Decision
Army-USMC C2 SA Convergence			Implementation Plan; APOM 11-15 Impact Analysis; Manage Implementation	C2 SA Convergence Architecture		
Wideband Interoperbility Study	UAS Interoperability Task; Review of CIO/G-6 AWIP		Assessment/selection of COA; HASC CDL Report; ▲ Army Decision	Enterprise Architecture Update		
Tactical CDS			Current Implementations/Capability Needs	Eval Candidates & COA Arch	COA Assessment /Selection	
Data Strategy	TODAY		Assess Stakeholder Positions	Recommend COAs; Review Implementation	Assess Impact on PORs	

TORs Being Developed for Each Activity

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