Live-Synthetic Enterprise Architecture for US Army Training and Test & Evaluation

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Topics

• Motivation and Relationship to Other Initiatives
• Project Overview and Organizations Involved
• Enterprise Architecture Framework
• Governance
• Business Architecture
• Initial Implementation of the Reference Architecture
• Near, Mid- and Long Term Plans
• Summary
Motivation

• Live and Synthetic (gaming, virtual and constructive) tools and architectures are essential capabilities in T&E and Training
  – Significant commonality in needs, yet each community has historically taken its own path in designing, and producing the capabilities

• The maturation of information technologies
  – Enable a fundamentally different approach for developing, delivering, and evolving Live and Synthetic capabilities

• Budget realities demand the development of more affordable and collaborative solutions
  – Enable the agile leveraging of each other's investments in scale and realism (training) and tactical systems integration and simulation (testing).

• Cross-community approach will reduce the risk
  – Risk of accepting warfighting systems that should have failed during testing
  – Risk of not having mature Live and Synthetic tools to train the force when those systems are fielded
Relationship to Other Initiatives

Army Training M&S Community

LS TTE EA Provides Common Architectural Structures and Risk Reduction for the Army’s Live-Synthetic Enterprise

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Project Overview and Organizations Involved

• Research & Development project to explore common Live-Synthetic solutions technical and governance approaches for Training and Operational T&E

• Sponsors:
  – US Army PEO STRI, PM ConSim, PM ITTS and PM TRADE
  – US Army OTC
  – Army Modeling & Simulation Office

• R&D organizations
  – JHU/APL
  – MITRE

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1. **Taxonomy**

**Vision:**
Contains the doctrine-based objectives that drive technical and engineering decisions

**Business Architecture:**
Contains the engineering trade-offs needed to meet the economic, quality, and schedule requirements of LS TTE EA

**Governance:**
Contains the human- and automated-driven policy activities

**Reference Architecture:**
Defines a architectural template for managing, developing, and executing on-going to future programs

**Solution Architecture:**
Contains the programs and architectures that will fulfill the Vision and Business Architecture goals

2. **Layered**

**Vision**
drives

**Business Architecture**
drives

**Governance & Reference Architecture**
drives

**Solution Architecture**

3. **Consolidation of Components Evolves a Solution Architecture**

The Vision layer, the Business Architecture, the Governance, & the Reference Architecture guide the evolution from the Foundational systems, through the Transitional systems, and finally to the Future systems; while consolidating the common components

4. **The Future of the Solution Architecture**

While utilizing the Live-Synthetic components of Next Gen, a layered architecture will support the Common Operating Environment and each of the program specific components

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Supporting Detail In DoDAF Views

CV-1
CV-2
CV-3
CV-4
CV-5
CV-6
CV-7

OV-1
OV-2
OV-4
OV-5a
OV-5b

StdV-1
StdV-2

PV-1
PV-2
PV-3

Supporting Detail In DoDAF Views

Vision
- In Support of the Nation's Mission
- Do More with No More
- At Home and Abroad
- Technology + Human Element = Realistic Training
- Agile Test & Evaluation
- LS TTE EA Campaign Plan

Business Strategy
- Reduce Operational Complexity
- Reduce Operations & Sustainment Costs
- Enable a Training and Test & Evaluation SOA Ecosystem

Business Goals & Objectives
- Increase Agility
- Reduce Development Costs
- Improve Soldier and Unit Readiness
- Streamline IA Recertifications
- Leverage Other Army Systems
- Provide More Realistic Test Environments

Capabilities & Drivers

Stakeholders

Governance
- Leadership
- Scope & Delivery Management
- Informing & Monitoring
- Solution & Development Guidance

Reference Architecture
- Presentation / Consumer Layer
- Orchestration Business Processes
- Composite Services
- Low Level Services
- Authoritative & Correlated Data
- Frameworks, APIs, SOKs, Libraries
- Operating Systems and Virtualized Platforms
- Hardware Level Device Drivers
- Data Services & Services Broker Infrastructure

Solution Architecture – Integrated Testing and Training Environment

Foundation
- Mission Command Systems
- Live (LVC-IA)
- Virtual (CCTC/ALCAT/NSF)
- Constructive (LVC/ALCAT/NSF)

Transitional
- Synthetic Training Environment (STE) + Integrated LVC Test Environment (ILTE)
- Common Operating Environment (COE)
- Computing Environments (CIs)
- Synthetic (Next Gen)

Future
- Future Holistic Training Environment + Integrated LVC Test Environment (ILTE)
- Common Operating Environment (COE)
- Computing Environments (CIs)
- Live-Synthetic (Next Gen)

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Governance (1 of 2)

• Provides a formalized alignment of organizations and services that create a useful and sustainable SOA through agreed upon policies of interaction
  – Includes how these policies can evolve over time, keeping the policies relevant to the SOA and the needs of the stakeholders

• Focus areas:
  – Updating current services and developing new services
  – Service lifecycle management and change management
  – Policies and standards
  – Implementing and supporting service security
  – Software rights, data rights, and distribution mechanisms
  – Ensuring the quality of services
  – Managing how the services are used and who uses them
  – Managing how the services are deployed and who pays for them
Governance (2 of 2)

- Reviewed existing governance approaches:
  - Army COE governance
  - FAA’s System Wide Information Management (SWIM)
- Performing initial process steps to support execution of initial Governance approach in FY15 prototyping efforts
  - Initial draft under review
Business Architecture Decomposition (1 of 2)
Cost Benefit Analysis

1. Define the Problem/Opportunity; Describe the Background
2. Define the Scope; Formulate Facts and Assumptions
3. Define Alternatives
4. Develop Cost Estimate for Each Alternative
5. Identify Quantifiable and Non-Quantifiable Benefits
6. Define Alternative Selection Criteria
7. Compare Alternatives
8. Report Results and Recommendations

Cost Estimate
Benefit Estimate

#1 - Status Quo
#2 - Common Architecture, SOA Delivery
#3 - Common Architecture, Product Line Delivery

### Cost-Benefit Index (CBI)

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Notional example

Initial Implementation of the Reference Architecture

**Presentation Layer**
- HTLMS

**Orchestrated Business Processes**
- Mission Command Services

**Composite Services**
- Service Monitor

**Low Level Services**
- Mission Command Services

**External Services**
- VMWare vSphere API
- LDAP

**Core Infrastructure**
- Business Rules Engine
- Business Process Modeling
- Enterprise Decision Management
- Messaging & Routing
- Complex Event Processing
- Identity Server
- OWF Server
- Governance Registry
- IT Automation
- Version Control
- IDE

**Existing Systems**
- HLA (WARSIM)
- DIS (OneSAF)
- CTIA (Live)

**Authoritative & Correlated Data**
- Configuration Service
- Runtime Database
- Runtime Logger
- Authoritative Source Data
- Event Archive
- Parametrics

**System Monitoring**
- System Monitoring
- Service Management

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Near and Long Term Plans

• Near Term Plans (1-2 Years)
  – Artifacts support development of the STE CDD
  – Exercise initial Governance approach in developing FY15 prototype
  – EA provides key building blocks for future LVC-IA architecture technology insertions

• Long Term Plans (Beyond 2 Years)
  – EA supports ILTE Increments 1 and 2
  – EA and Governance approach provide:
    • Architecture framework basis for ILTE, STE and FHTE-LS
    • Enterprise convergence of Training and OT&E
Summary

• Project focuses the needs and funding of AMSO, Army OTC, and PEO STRI to research technical and governance approaches for common Live-Synthetic solutions

• Intent is to leverage project results and artifacts to support an evolutionary path to a common solution

• Will build upon initial results in an FY15 R&D project to gain further insights