STE
Industry Day Briefs

18 Sep 2017

Further dissemination only as directed by TCM ITE, 410 Kearney Ave., Fort Leavenworth, KS 66027 or higher authority. This dissemination was made on 7 SEP 17.
STE Industry Day
Opening Remarks
CG, Combined Arms Center

18 Sep 2017
STE Industry Day
Opening Remarks
DCG, Combined Arms Center-Training

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STE Video

Video Link:
https://m.youtube.com/watch?feature=youtu.be&v=yQETJEBRNWM
**Mission:** The Army must fight and win wars against adversaries...

**Principles:** The Army’s Synthetic Training Environment must enable:

- Prepare/Train for War. Execute realistic, expeditionary, multi-echelon, cross war fighter function, Joint combined arms multi-domain battle training in various complex operational environments.
- Conduct of War. Provide trained and ready units prepared for the execution of expeditionary, world-wide, Unified Land Operations (ULO) to shape, prevent, and win as a part of Unified Action in all domains and all environments.
One World Terrain
- Open source Global 3D runtime game/sim engines
- Terrain & Integration w/ Mission Command Information Systems
- Megacities & Dense Urban terrain features
- Automated creation of 3D building interiors

Common Synthetic Environment
- Interactive, high fidelity 3D moving models for vehicle & equipment simulation
- Integrated User Interface Devices
- High Resolution Graphics (HD – 4K quality)

Reconfigurable and Transportable Virtual Trainers
- Immersive ground and air platform trainers
- Provide acceptable form, fit, and function that allows formations to conduct collective, combined arms maneuver training
- Scalable from the squad through battalion task force
- Software centric capability

Point of Need
- Cloud-Based streaming & processing

Big Data
- Large entity counts (2-million entities)/ Thousands of users Math & Realism that Constructive simulations provide

Artificial Intelligence / Intelligent Tutors
- AI virtual role-players and virtual humans (VH)

Training Effectiveness
- Evaluation tools and methodologies that assess effectiveness of training conducted and of the system to conduct the training

User Interfaces
- 60hz minimum update rates. 120hz for VR
- Virtual Reality – Higher resolution, Expand FOV, Wireless
- Finger-level tracking with haptic feedback for Virtual Reality
- Mixed-Reality; Augmented Virtuality and Augmented Reality
- Easy Exercise design tools from authoritative data sources
STE Vision and Framework
TCM ITE

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The Army’s current training devices do not allow units and Soldiers to conduct realistic, multi-echelon, collective training, seamlessly from squad to ASCC echelons, anywhere in the world, and require significant training overhead (time, money, people).

**Success Looks Like:**
- An architecture and set of standards that converges Constructive, Virtual, and Gaming environments
- Scalable capability from squad to ASCC
- Allows units to train with their mission command information systems and platforms.
- Available at the PoN
- Reduces the training support overhead (Time, Money, People)

**Success Does Not Looks Like:**
- Proprietary software or systems
- Requirements for bridging capabilities between environments
- Requires fixed facilities
- Lacks common global terrain
- Inability to train with current mission command information systems
- Does not reduce the current training support overhead (Time, Money, People)
Issues with today’s, multi-echelon, collective training capabilities:

1. Complex systems require significant overhead
2. Lacks platform concurrency
3. Expensive to maintain
4. Requires large technical support staff
5. Facilities based
6. Not available where Soldiers train
7. Use fixed, custom, training networks
8. Long lead time for scenario generation
9. Does not allow iterative training
10. Does not represent the Operational Environment
11. Uses 1980/90 technologies
12. Stove piped systems requiring integration
13. Do not provide necessary tools/methodology to assess the training
This framework only helps to visualize the requirement, it is NOT meant as a solution or intended to constrain development concepts.
Key Capabilities:
- Collective combined arms virtual training thru BN level
- Reconfigurable and transportable Virtual Trainers; platform agnostic
- Dynamic One-World Terrain - global Data accessible on your device/platform
- Cloud Based
- Represent the complex Operational Environment including Dense Urban terrain
- Accessible anytime, anywhere
- Sustainable, easy-to-use, & intuitive training capability
- Intelligent Tutors - Artificial Intelligence enabled training management and exercise design
- Adapt to advances in technology
Problem Statement: The current collective training capability uses separate Constructive, Virtual, and Gaming environments. This requires a complex and expensive bridging solution and provides multiple Operational Environment views that cause training inconsistencies. The facility based capabilities require a custom network for training.

Vision:
- Convergence of the Virtual, Gaming, and Constructive environments
- Integrates with the Live environment
- Provides training in the Operational, Institutional, and Self-Development training domains
- Supports training with JIM and Unified Action Partners
- Streams training content from the cloud to the PoN
- Stimulates and communicates with mission command information systems

Success Looks Like:
An architecture and set of standards that converges Constructive, Virtual, and Gaming environments and integrates with the Live environment. Provides a capability for the other Services to access the synthetic environment. Available at the PoN.

Success Does Not Looks Like:
- Use of Proprietary systems
- Requirements for a bridging capability between environments
- Requires fixed facilities
- Does not use global terrain
ITE LIMITATIONS

- Cross Domain Effects
- Integrated Direct Fire
- Lowest Common Denominator
- Common Data/Modeling
- Distribution

LVC Integrated Architecture

Requires robust hardware footprint at FWD locations

VIRTUAL LIMITATIONS
- Primarily training Direct Action Tasks, limited types of BLUFOR/OPF
- Equipment that can be used for training

GAMING LIMITATIONS
- Small Unit Level Trainer.
- Primarily training Direct Action Tasks.
- Conducting operations/training in a small Area of Operations.

LIMITATIONS
- No Direct Fire interactions across domains.
- Only In-Direct Fire Systems, creating incomplete environment.

LIMITATIONS
- Insufficient in training Individual Soldier Warrior Tasks and Battle Drills

LIMITATIONS

CONSTRUCTIVE

- Cross Domain Effects
- Integrated Direct Fire
- Lowest Common Denominator
- Common Data/Modeling
- Distribution

JLCCTC

HITS

Integrated Training Environment
Problem Statement: The current stove piped collective training capabilities do not provide a common representation of the Operational Environment. Different data sources, data formats, algorithms, and timing create inconsistencies. Current training capabilities have different scale limitations, use closed architectures, require dedicated support staff, and require duplicative updates of the similar capability in each stove pipe.

Success Looks Like: A single capability that provides authoritative adjudication of all interactions in the Live and virtual environments. Provides realistic effects in the Operational Environment. Supports all user interfaces and uses global terrain.

Success Does Not Looks Like:
- Proprietary
- Does not support all user interfaces
- Does not use global terrain
- Does not scale from squad to ASCC

Vision:
- Centralized capability that represents / adjudicates all entity and user inputs
- Consistent representation of the Operational Environment
- Uses artificial intelligence to streamline exercise design, reduce exercise support, and facilitate ease of use
- Uses an open architecture
- Scales from squad to ASCC allowing control of entities and/or formations
- Streams training content from the cloud to the PoN
- Provides intelligent tutor capabilities
Today's Integration Challenge

Mission Training Complex (MTC)

DoDIN

Translation Tool

LVC-IA

Translation Tool

Mission Command Information Systems (MCIS)

LVC-IA: Live, Virtual, Constructive Integrating Architecture
Problem Statement: Current terrain products lack the capability to represent the Operational Environment to include Dense Urban Terrain, requires long lead time for development, is expensive, and does not allow Soldiers to train as they would fight.

Vision:
- A fully accessible “virtual globe”
- Cloud-based service
- Represents the complexities of the Operational Environment including air, land (incudes subterranean), sea (includes undersea), space (up to geosynchronous), and cyber domains
- Allows units to train with their mission command information systems and platforms
- Enables integration with the Live Environment

Success Looks Like: An unconstrained representation of the globe that represents the Operational Environment allowing Soldiers to train as they fight.

Success Does Not Looks Like:
- Proprietary formats
- Long development timelines
- Postage stamp terrain boxes
- Multiple formats
SE Core Databases and Coverage
Current Limitations

Terrain Generation:
Lengthy and expensive process

Terrain Distribution:
Large Database Sizes 1TB - 2TB

Terrain Formats:
47 different formats for Virtual, Constructive, and Gaming environments

Postage stamp coverage
One World Terrain Desired Capabilities

- Cloud-based service that delivers a common synthetic representation of the whole Earth
- Includes air, land (subterranean), sea (undersea), space (up to geosynchronous), and cyber domains
- The ability to export 3D mesh-based terrain to 2D vector- and raster-based terrain systems
- Includes dynamic terrain capabilities
**Problem Statement:** Current collective trainers do not represent the Operational Environment to include Dense Urban Terrain, are proprietary, do not maintain concurrency with platforms, are expensive to maintain, are facilities based, require significant contractor overhead, requires integration to operate with other training devices, and does not allow Soldiers to train as they would fight.

**Vision:**
- Reconfigurable, transportable and Immersive ground and air platform trainers
- Acceptable form, fit, and function that allows formations to conduct collective, combined arms maneuver training
- Provides training at the Point of Need
- Scalable from the squad through battalion task force
- Software centric capability
- Provides intelligent tutor capabilities
- Intuitive end device capability that reduces training time for Soldiers
- Interface with other virtual, constructive and live training systems

**Success Looks Like:** Intuitive Immersive trainers that provide functional and physical fidelity allowing Soldiers to train as they fight using digital representations of the weapons system and mission command information system interfaces. Uses common global terrain.

**Success Does Not Looks Like:**
- Proprietary
- Hardware intensive
- Fixed facility based modules
- Lack of concurrency with platforms
- Does not use global terrain
**Future Virtual Interfaces**

- Software-centric
- Capitalize on Commercial Technology
- Reconfigurable
- Low Sustainment $$
- One World Terrain
- Common Synthetic Environment
- Scalable Interfaces – Point of Need
- Responsive to Updates – Most will take place with software changes
- Transportable
- OFP for AVN Platforms

**Current Virtual Systems**

- Hardware-centric
- Technology >15 years old
- High annual sustainment costs
- Separate Terrain Databases
- Connects through LVC-IA
- Fixed Sites or Large Mobile Platforms
- Perpetual Concurrency Gaps
Problem Statement: Current collective trainers do not represent the Operational Environment to include Dense Urban Terrain, are proprietary, require contractor overhead, largely facilities based, require integration to operate with other training devices, and does not allow Soldiers to train as they would fight. Only supports training at company and below.

Vision:
- Transportable
- Semi-immersive trainers that allow training of all warfighting functions
- Scalable from squad through ASCC
- Provides training at the Point of Need
- Software centric capability.
- Provides a dismounted training capability
- Provides intelligent tutor capabilities
- Intuitive end device capability that reduces training time for Soldiers
- Interface with other virtual, constructive and live training systems

Success Looks Like: Semi-Immersive trainers that provide a low overhead, intuitive, reconfigurable and transportable training capability allowing Soldiers to train as they fight using digital representations of the weapons system and mission command information system interfaces.

Success Does Not Looks Like:
- Proprietary software
- Requires Fixed facility
- Does not scale to ASCC echelon
- Does not train all warfighting functions
- Does not use global terrain
Current Semi-immersive limitations:

- Significant HW and software support that requires a large contractor support team footprint
- Facilities to support training
- Bridging solution to work with other Virtual, Live and Constructive trainers
- Only supports company and below trainings not scalable above company level
- Limited interoperability with all mission command information systems
- Limited Logistical training capability
Problem Statement: Current Brigade and Above staff trainers require long lead times to design, prepare, and execute training. They require significant contractor overhead, are facilities based, and require integration to operate with other training devices. Database and federation of different capabilities drives the long exercise timelines.

Vision:
• Staff trainers that allow training of all warfighting functions
• Scalable from Battalion through ASCC
• Provides intuitive interfaces allowing a few personnel to control large formations
• Reduces the requirement for constant technical support
• Provides intelligent tutor capabilities
• Interface with other virtual, constructive and live training systems

Success Looks Like: Staff trainers with a reduced support footprint and reduced exercise design timelines that allow Soldiers to realistically control forces and train as they fight using mission command information system interfaces. Uses common global terrain.

Success Does Not Looks Like:
• Proprietary software
• Does not scale to the ASCC echelon
• Does not train all warfighting functions
• Requires a federation of capabilities
• Does not use global terrain
Current JLCCTC Limitations

Current JLCCTC capabilities require:

• Single, dual or three enclave configurations based on Echelon of the Training audience
• Large HW footprint
• Federated Capability with multiple tools for specific roles
• Multiple cross domain solution requirements
• Large contractor and government footprint to plan, prepare, execute & assess training
• Long lead time for database construct and synchronization
• Long lead time for architecture development
• Facilities based
## Training Management Tool (TM)

### Problem Statement:
Current collective trainers use unique training management tools that require long lead times to plan, prepare, and assess exercises. Insufficient automation to efficiently develop training support package and initialize the training environment. Lacks automated capability for commanders to assess effectiveness of training in real time. Unable to efficiently process authoritative data into a useable format.

### Vision:
- An intuitive easy to use capability that allows Commanders and Exercises Developers to efficiently plan, prepare, execute, and assess training
- A tool that automatically retrieves and transforms authoritative data
- Automatically generate and populate simulation inputs (databases)
- Provides intelligent tutor capabilities
- Provides methodologies to assess training effectiveness
- Interface with all virtual, constructive and live training systems

### Success Looks Like:
An intuitive and easy to use tool, that allows efficient training management, exercise design and assessment of training. Accessible to the Commander anywhere, anytime with an automatic initialization process of the training event that uses available training support packages.

### Success Does Not Looks Like:
- Proprietary software
- Limited accessibility at the training site
- Requires significant contractor support
- Does not automatically generate and populate simulation inputs (databases)
- Does not provide tools for assessing the effectiveness of training
Interoperability

**Problem Statement:** The current stove piped collective training capabilities require a bridging strategy (LVC-IA) to represent a common training environment. The current terrain bridging strategy (SE CORE) is inefficient and expensive. Current capabilities do not fully stimulate and communicate with mission command information systems. Inefficient access of multiple authoritative data sources. Soldiers in the Live Environment cannot physically see virtual or constructive objects and effects.

**Vision:** A capability that is interoperable with:
- Authoritative data sources
- Mission command information systems
- Compliant with the current Common Operating Environment concepts
- Live instrumentation systems
- Current legacy collective training systems
- Joint service models

**Success Looks Like:** An environment that allows execution of realistic, Joint, expeditionary, multi-national, multi-echelon, cross warfighter function, combined arms multi-domain battle training.

**Success Does Not Looks Like:**
- Proprietary software
- Requirements for a bridging capability between environments
- Not interoperable with all mission command information systems
- Not compliant with risk management framework
### Scope of the Synthetic Training Environment

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<tr>
<th>Training Framework</th>
<th>Scalable from Squad to ASCC</th>
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<tr>
<td>Training audiences: Squad to ASCC</td>
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<tr>
<td>Staff training audiences: Battalion to ASCC</td>
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<td>HICON capability: Company to ASCC</td>
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<tr>
<td>Immersive virtual capabilities from platform through Battalion for Armor, Infantry, Stryker, Aviation, and Combat and Combat Support formations</td>
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<td>Semi-immersive capabilities from dismounted Soldier through ASCC</td>
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<td>Integrates with Live training through the current live Instrumentation systems</td>
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<td>Enables “fair fight” across training environments</td>
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| Simultaneous Exercises | 50 simultaneous independent exercises using virtual capabilities; Expanded to 70+ simultaneous exercises using all Virtual and Live instrumentation capabilities; at the Point of Need to include, Homestation, Armory, CTC and deployed |

| Scalability & Entity Count | Common Synthetic Environment scalable capability from 40,000 entities to 2.6M entities (including virtual, current constructive and live instrumented entities) |

| Operational Variables | Represent all Operational Variables (Physical Environment, Military, Economic, Social, Infrastructure, Information, Political, and Time) |

| Interoperability | Interoperable with Mission Command Information Systems, Common Operating Environment, Authoritative Data Sources, Legacy Training Devices, Army Enterprise Networks, Emerging Army data consolidation policies, Joint and Multi-national systems |
Demonstration Capabilities:

- User assessment of Industry delivered prototype
- An immersive virtual collective reconfigurable and transportable training capability (both mounted and dismounted)
- Delivered to the Point of Need
- Use a Global Terrain standard shareable geospatial foundation
- Use a single Training Simulation Software
- Risk Management Framework compliance (information assurance / cyber-security) and analysis of network (bandwidth and latency) constraints

**One World Terrain**

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**Virtual Immersive Trainers**

Reconfigurable and Transportable Company of Virtual air platforms and Virtual unmanned air system

**Virtual Semi-Immersive Trainers**

Reconfigurable and transportable company Bradley and Abrams Virtual ground platforms

**Virtual Semi-Immersive Trainer**

Train dismounted soldiers in a gaming environment

**Virtual Immersive Trainers**

Doctrinal set of Battalion assets For Combat Support / Combat Service Support formations

Virtual Immersive Trainers and Virtual Semi-Immersive Trainers
Questions?