Title: Common Synthetic Environment (CSE) Statement of Need

Background

The Army's future training capability is the Synthetic Training Environment (STE). The STE enables tough, iterative, dynamic, and realistic multi-echelon / combined arms maneuver, mission rehearsal, and mission command collective training in support of multi-domain operations. The STE will provide units the repetitions necessary to accelerate individual through Unit skill and collective task proficiency resulting in achieving and sustaining training readiness. The STE provides complex operational environment representations anytime and anywhere in the world. The STE will deliver collective training, accessible at the Point of Need (PoN) in the operational, self-development and institutional training domains.

The focus of this Statement of Need (SoN) is a single, interconnected training capability that provides a Common Synthetic Environment (CSE) that delivers a comprehensive, collective training and mission rehearsal capability. The CSE is comprised of three foundational capabilities: One World Terrain (OWT), Training Management Tool (TMT), and Training Simulation Software (TSS). The CSE enables the convergence of the live, virtual, constructive, and gaming environments into the Synthetic Training Environment. The CSE delivers software, application(s) and services that will enable the Reconfigurable Virtual Collective Trainer (RVCT), Soldier Squad Virtual Trainer (S/SVT) which includes the embedded Integrated Visual Augmentation System (IVAS) S/SVT training capability. The CSE architecture and design will enable and support interoperability with the future Next Generation Constructive (NGC), Live Training Environment, and other STE and operation capabilities (eg. Mission Command Systems, air and ground platforms) The CSE vendor will need to monitor, collaborate, and support integration with RVCT, S/SVT, OWT, and IVAS solution sets

The STE will achieve Initial Operational Capability (IOC) by September 2021 and Full Operational Capability (FOC) by September 2023. The CSE will be delivered with the STE IOC capability. All capabilities described in this SoN will be achieved by IOC. The FOC is outside the scope of this SoN, however, is identified throughout this document as a "*design consideration*" in order to provide a holistic STE vision. This SoN addresses scalability from Soldier/Squad through Brigade; with *design considerations* scaling up to Army Service Component Command (ASCC).

The CSE vendor will support continuous collaboration, cooperation, and information exchanges to ensure a complete, integrated system-of-systems architecture. The CSE vendor and other STE vendor(s), as part of the STE Development Operations (DEVOPS), will collaborate to develop Application Programming Interfaces (APIs) as required.

Architecture

The architecture is a critical and fundamental capability of the STE. The vision is for an architecture that supports real-time situational awareness across all modules / components, modularity, scalability, cybersecurity, accessibility, interoperability, and extensibility. The CSE is built on a modular open systems approach (MOSA). The MOSA design includes highly cohesive, loosely coupled, and severable modules that can be competed separately, acquired from independent vendors, and allows the STE to evolve with future technologies and capabilities. The CSE's open architecture will seamlessly integrate and maintain concurrency with the Common Operating Environment (COE), Mission Command Information Systems, and Operational Platforms. The architecture provides flexible, extensible data models and application programming interfaces (API) / Software Development Kits (SDK) that foster interoperability among internal native components and external services. The architecture will support the integration / interface of external components of the STE, while maintaining synchronization of data across all components of the

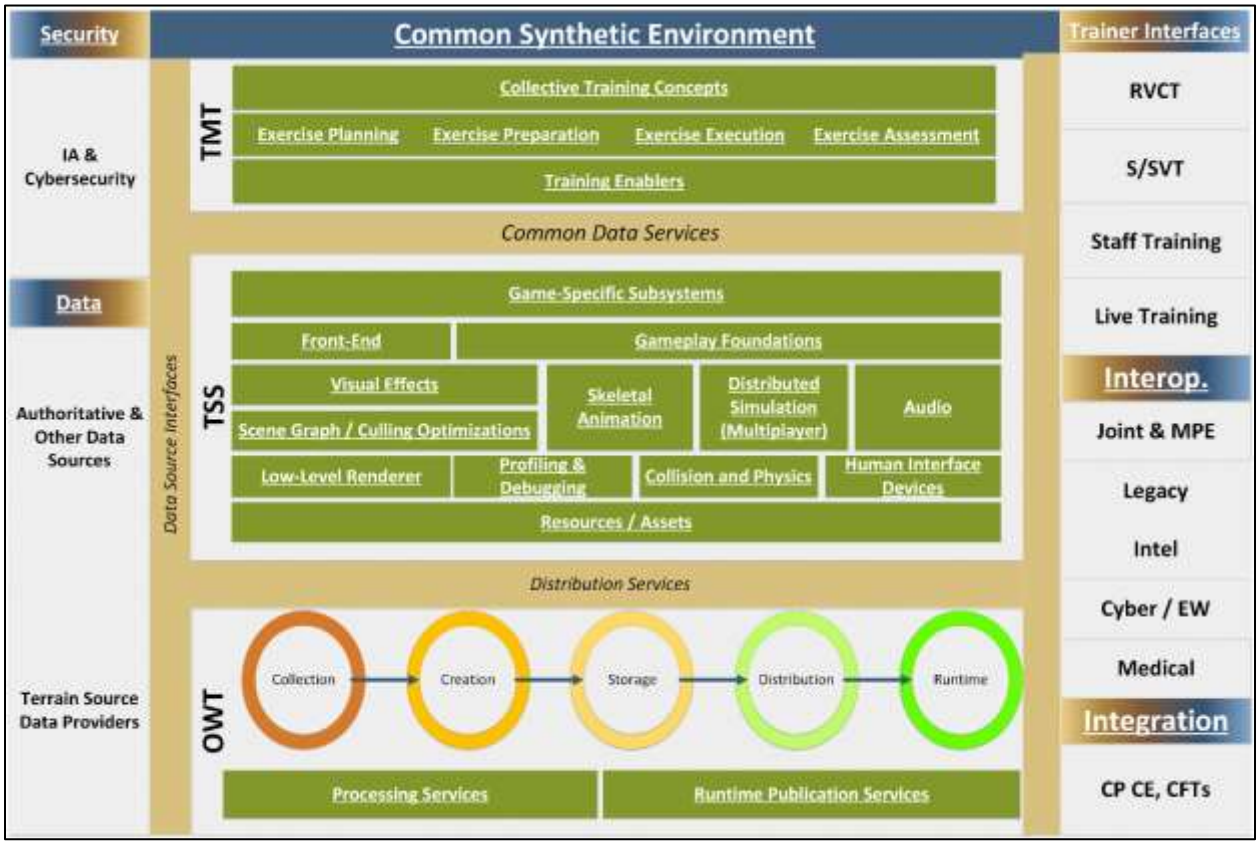
STE. The architecture is loosely-coupled to support the upgrade and, when necessary, the replacement of STE modules.

Desired CSE prototype characteristics will:

1. Operate within existing Army and DoD regulatory, architecture, and training methodology constraints. Current DoD/Army policies should not limit technology innovation as it applies to the architecture. Army leadership has encouraged innovation and will conduct a case-by-case risk assessment to determine if any current policies can be modified to fit a particularly unique approach.
2. Operate in both standalone and distributed manner to provide training from the cloud to the PoN. For IOC:
    a. Ft. Hood, TX
    b. Ft. Drum, NY
    c. Ft. Benning, GA
    d. Joint Base Lewis-McChord (JBLM), WA
    e. Ft. Leonard Wood, MO
3. Support the development and integration of the CSE consistent with Risk Management Framework (RMF) practices and guidelines to achieve an Interim Authorization to Test (IATT) and an Authority to Operate (ATO).
4. Support training events unclassified through Secret classification. Provide a cross domain solution that enables multi-level classification training events with current capabilities. The CSE will not produce, consume or process actual intelligence data. *Design considerations* include: all classification levels (e.g. Unclassified, Secret, Top Secret, and Secret releasable to coalition partners), and multi-classification enclaves (e.g. three enclave architecture with Unclassified, Secret, Top Secret); the cross-domain solution needs to facilitate future objective interfaces and future Army Modernization capabilities.
5. Interoperate with Live and Constructive capabilities via the Live, Virtual, Constructive, Integrating Architecture (LVC-IA) to support current Live and Constructive collective training; *design considerations* for native communication with future Constructive and Live instrumentation systems.
6. Implement only industry standards, protocols, data models, and interfaces that provides the Government the appropriate data rights to enable CSE full control without reliance on the CSE vendor.
7. Provide a hardware abstraction layer to facilitate physical and virtual platform interfaces.
8. Separate / abstract the User Interface Layer from the underlying code.
9. Use existing authoritative data sources, other data sources, and models (e.g. Army Geospatial Center, National Geospatial-Intelligence Agency [NGA], Mission Command Information Systems [MCIS], Army Training Information System [ATIS], Global Force Management, Joint / Mission Partner Environment / Combatant Command, Medical Simulation Enterprise, etc.); provide the ability to seamlessly incorporate new sources/models as they become available.
10. Interface with external system standards and specifications.

11. Communicate bi-directionally with the COE standards and specifications; and MCIS. *Design considerations* include support Joint Training Enterprise Architecture (JTEA), Joint Information Environment (JIE); Joint, Interagency, Multi-National (JIM) collective training.
12. Implement a Development Operations (DEVOPS) / Agile development approach that involves the Government in all areas. Support continuous integration with other efforts (e.g., RVCT, S/SVT, IVAS, OWT, Live, Network, MCIS, and COE) to ensure a complete solution, to include the integration of externally developed code, models and applicable ongoing and future Science and Technology (S&T) efforts. Includes collaboration with the Government and other OTA vendors for architecture, integration, and other development risk management. Includes providing sustainment projections for the life-cycle management and affordability of the STE solution.
13. The CSE Vendor will also need to monitor the SSVT/IVAS solution set and will have the requirement to integrate to the Adaptive Soldier Architecture. As a "design consideration" the CSE vendor will need to integrate to the IVAS prototype (expected to be delivered Nov 20) to meet STE requirements for S/SVT to include TSS, TMT and OWT.
14. Support Unit training and the use of established Army collective training models (e.g., Sustainable Readiness Model, Objective-T).
15. Support the delivery of training content to the PoN at Home Stations (e.g., administrative buildings, motor pools, training buildings, local training areas, combat training centers, armories, reserve centers, Regional Collective Training Centers, Maneuver Combat Training Centers, Armories), deployed locations, and training and educational institutions.
16. Support the established warfighting symbology (i.e., MIL-STD 2525C).
17. Support all Warfighting Functions, with IOC providing Mission Command, Movement and Maneuver, and Fires collective training; and *design considerations* for Protection, Sustainment, Intelligence collective training, in accordance with ADP 3-0.
18. Support an automated, digital, Training Support Package (TSP) (i.e. TRADOC Publication 350-70-1, TRADOC Circular 7-101).
19. Reduce the training support overhead in terms of people, time, and money required to plan, prepare, execute, and assess training exercises.
20. Use Artificial Intelligence (AI) to automate / eliminate or reduce manual, human touch labor; provide fully and semi-automated forces.
21. Provide adaptive/machine learning for both human and machine behaviors, adjusts the AI difficulty to meeting training audience proficiency.
22. Use Intelligent Tutoring to increase the rate of exercise development.
23. Use Intelligent Tutoring to provide the training audience informal training objective feedback.
24. Use Big Data techniques to analyze and search large data sets (e.g., data collection) to inform training effectiveness, inform AI/machine learning, and to identify themes.
25. Automatically provision cloud and other resources when requested by the training scenario to enable Soldiers to train in a realistic environment with different Unit formations that scales from Soldier/Squad up to Brigade. Supports cloud deployment, as well as standalone or edge computing deployment.

26. Provide accessibility over Department of Defense Information Networks (DoDIN). Supports all PoN network conditions (e.g., Connected, Denied, Disrupted, Interrupted, Intermittent, and Limited [D-DIL]).
27. Provide all required IT resources (e.g., hardware, software, infrastructure) at the PoN, except for RVCT (including thick clients), and local network infrastructure.
28. Support seamless handoffs between semi-automated and automated entities, and live users (e.g., platforms, dismounts, Live).
29. Support seamless aggregation and disaggregation to and from higher echelons (e.g., from Platoon to Company and vice-versa).
30. The following figure provides a high-level, conceptual CSE architecture overview. The figure depicts the three main components (OWT, TSS, TMT) and notional external interfaces.



Cloud Services

The STE will use elastic and scalable shared computing resources to scale the capability without excessive, idle overhead capacity. The CSE vendor provides Defense Information Systems Agency [DISA] approved Cloud services. The CSE vendor provides network access from the Cloud provider to the DoDIN access point. The design is cloud agnostic that enables capability transition between cloud service providers and supports all emerging STE capabilities. Note: The Government will provide network accessibility to the PoN.

Critical Technology Elements

Throughout the performance of the CSE effort, the vendor will identify and support continuous evaluation of critical technology elements that are needed for the STE IOC. These critical technology elements will be risk areas for the STE. The CSE vendors, as the main software component of the STE, will also support the integration, evaluation, documentation of other critical technology elements during user assessments, or integration events at the STE CFT Technical Innovation Facility (TIF) Lab or at the vendors CSE integration lab. This will help enable the STE CFT to track and document (e.g., Technology Readiness Assessments [TRA], Technology Readiness Levels [TRL], Integration Readiness Levels [IRL]) the maturation of the critical technology elements across the STE.

One World Terrain

OWT will be a well-formed (defined as structured 3D data [e.g., polygons, textures, attributes] that are editable and consumable by standard commercial tools and technologies), virtual, 3D global terrain, World Geodetic System 84 (WGS-84) whole-earth representation that reflects complexities of the operational environment. All STE components will only use OWT products for terrain representation. OWT includes a base globe at a default resolution, and supports higher-resolution insets. OWT Geographic Information System (GIS) layers include elevation (e.g., subterranean), imagery, hydrology, vegetation, transportation networks, buildings, clutter, and simulation attribution. OWT needs to deliver and update terrain data from the cloud, over the network, to the PoN. OWT provides tools to modify the environment to support training objectives (e.g., remove trees, modify buildings, add ditches, add sensor collected data). OWT includes an end-to-end process to collect raw source terrain data, automatically process and conflate/fuse/process multiple terrain sources, store raw and intermediate terrain data, and generate and distribute runtime formats. The OWT will:

1. Provide synthetic/virtual WGS-84 whole-Earth representation that supports land (incudes subterranean), air, maritime (includes undersea/bathymetry in littoral/costal/tidal areas), and space (intel collection, up to geosynchronous orbit) unit operations for operations and collective training. Design considerations should include the cyber/information (e.g., multi-spectral attribution) operations.
2. Supports multiple coordinates systems to include Military Grid Reference System (MGRS).
3. Automatically process raw terrain data into intermediate terrain data to support training objectives at a rate not less than 1km^2 per hour, with fluctuations depending on resolution and data complexity. *Design considerations include* the need to produce terrain necessary to support a warfighter exercise (e.g., 600,000 km^2) within seven days upon request.
4. Smoothly zoom from space to ground level.
5. Use of open or common commercial industry standards (e.g. fbx, obj, gltf) and common industry 3D software modeling tools, which provide full access to gaming assets (e.g., lifeforms, vehicles, systems, equipment, etc.): static and dynamic models, skins, animations, sound effects, sound, skeletons, rigging, colliders, shaders, damage states (e.g., building rubble, road degradation, collapsed bridges and tunnels, etc.), motion captures, etc.
6. Provide terrain configuration management capability to incorporate approved geospatial information updates and local terrain surveys back into the OWT master database.

7. Represent dense urban terrain/megacities.

8. Represent Presidential Policy Directive 21 critical infrastructure.

9. Support terrain updates (e.g., higher resolution terrain insets, newer imagery, etc.) on-demand to the local OWT dataset, and propose updates to the master OWT dataset through the configuration management process.

10. Provide the STE IOC baseline in an OWT base globe, with high-resolution insets for the IOC Home Station training locations.

11. Enable all STE components to use the well-formed, common OWT formats.

12. Enable user to edit/create all OWT raw, intermediate, and runtime formats (e.g., terrain, three-dimensional [3D] models) using existing commercial tools.

Collection – Automatically (e.g., system-to-system interfaces without manual, human touch labor) collect terrain data from Government and non-Governmental sources, traditional and non-traditional sources, and from on-demand terrain surveys. This includes traditional GIS products (e.g., vector, raster, imagery, elevation) and 3D models. Collected terrain is considered raw source data until it is processed/conflated into an intermediate, well-formed format. The intermediate format will be an open standard, not locked into proprietary format and tools, easy to maintain or repurpose data, considers secondary impacts (e.g., scaling data storage to a global level [managing and storing petabytes of data], minimizing CPU processing and time) further down the OWT pipeline. A *design consideration* is automated collection (e.g., system-to-system interfaces without manual, human touch labor). The OWT solution will:

1. Collect source terrain data from Government (e.g., Synthetic Environment Core [SE Core], NGA) and non-Governmental sources, traditional and non-traditional sources, and on-demand terrain surveys (e.g., drone-captured photogrammetry, Simultaneous Localization and Mapping [SLAM], Light Detection and Ranging [LIDAR]).
2. Provide resolution necessary to support Soldier-level fidelity / micro-terrain (e.g., convex and concave features that support tactical military routing) to enable realistic movement and maneuver, and cover and concealment. Resolution should range from sub 1cm to no greater than 30m.
3. Provide a 3D Earth, base globe representation that includes default imagery (30cm or less), elevation (30m or less), features / vectors (e.g., roads 1m or less), clutter / vegetation, simulation attribution, bathymetry at as high a resolution as possible. The objective is to provide sub-centimeter resolution and accuracy to support full live-synthetic integration.
4. Provide geo-specific building exteriors.
5. Provide geo-specific and accurate airport representations.
6. Provide geo-specific building interiors, when available. Provide procedurally generated, geo-typical building interiors, when actual building interiors (e.g., blueprints, surveys) are not available.
7. Provide subterranean features (e.g., complex underground structures, caves, tunnels, subways, sewers).

Creation (Process/Conflate) – Automatically process and conflate/fuse raw terrain source data from multiple sources into an intermediate, well-formed (e.g., required geometry, no polygon defects, no melted corners, without extra surface polygons, distortion free, syntactically correct, proper textures, proper lighting/shadows, proper transportation connectivity, feature overlap deconfliction, proper integration between elevation and features) terrain data format. The OWT solution will:

1. Include attribution that supports simulation reasoning at scale (e.g., AI, navigation/routing mesh, automated after action review, Intelligent Tutors, fully and semi-automated behaviors, environment attribution, collision meshes, navigation meshes, munition behaviors, cratering, civil engineering practices). Events (e.g., flooding) will impact simulation reasoning (e.g., navigation).

2. Represent operational (Political, Military, Economic, Social, Information, Infrastructure, Physical Environment, and Time [PMESII-PT]) and mission (Mission Enemy Terrain Time Troops and Civilians [METT-TC]) variables, and their interrelated effects, to replicate the complexities of the operational environment, and support simulation reasoning.

3. Evaluate, correct, and enhance raw source data to correct defects and prepare data from processing.

Storage - The processed/conflated/fused raw terrain data will be stored in a well-formed, intermediate format. OWT stores only the raw source data (e.g., Soldier as a sensor, UAV surveys) that isn't provided by other terrain service providers (e.g., NGA, SE Core). OWT maintains historic raw source data to determine environment updates over time. OWT will cache generated runtime formats. OWT provides an automated terrain administration capability. The OWT solution will:

1. Provide a cloud-based, configuration management and administration capability that enables GIS users to modify a branch of the base globe.
2. Isolate classified layers from unclassified layers for separate storage.

Generate Runtime and Other Formats – OWT generates simulation ready, runtime formats; correlated products (e.g., maps); and other export formats on demand. The generated formats will be stored. The generated formats contain layers the separate the information (e.g., elevation, imagery, vegetation/vectors, buildings, obstacles, etc.). The OWT solution will:

1. Export to the TSS optimized runtime format.
2. Export a correlated, COE Computing Environment compliant format (e.g., Standard Shareable Geospatial Foundation [SSGF]).
3. Export to the Warfighter Simulation (WARSIM) and constructive simulation ready terrain formats.
4. Support technical and data interchanges with Integrated Visual Augmentation System (IVAS).

Distribution – Users will request OWT runtime formats that include the entire base globe and high-resolution insets for a user defined area of interest. Delivers terrain data from the cloud, over the network, to a requesting user. The OWT solution will deliver runtimes to training audiences at the PoN. Note: Runtime versions will support minimum latency to achieve training objectives. Provides an optimized, runtime format for a TSS that minimizes impacts to performance (e.g., frame rate). Optimization includes

balancing OWT features to support the performance limitations of the requesting end device's hardware capabilities and network limitations.

Training Simulation Software

The TSS is the core simulation of the CSE that acts as the source of, and provides synthetic representations to, the military capabilities and operational environment. It provides a global representation of warfare delivered in the form necessary for the user to perform the collective training tasks supported by STE. The TSS is the single simulation engine utilized by RVCT, S/SVT, IVAS, OWT, Future Live, Next Generation Constructive and future STE capabilities. The TSS consumes data from, and utilizes resources provisioned by, the TMT to initialize the environment. The TSS provides the TMT the data required to conduct after action reviews, and manage/control the exercise. The TSS leverages local and distributed resources to provide the operational environment at the PoN. The TSS adjudicates future live and synthetic interactions and effects – current systems will continue to adjudicate their own interactions.

The STE TSS will include the following critical operational attributes and functionality consistent with the desired training objectives:

Models and Behaviors

The STE TSS Will:

1. Represent dynamic multi-domain operations (i.e., for IOC: land, air, maritime, space). *Design considerations* include the cyber domain (e.g., jamming and jamming countermeasures, cyber-kinetic effect integration, electromagnetic spectrum, tactical network, dynamic sensor representation, commercial networks). *Design considerations* will allow multi-echelon training from Squad to Brigade operational environment modeling.
2. Instantiates models (two and three dimensional) of lifeforms (e.g., persons, animals), vehicles, systems, equipment, and objects with associated dynamics, behaviors.
    a. Represents Friendly, Opposing, Joint, and Multi-National/Coalition Force structure representation.
    b. Represents PMESII-PT variables (Military, Information, Infrastructure, Physical Environment, and Time) and METT-TC variables, and their interrelated effects, to represent the complexities of the operational environment, and support simulation reasoning. *Design Considerations:* Full representation of PMESII-PT, to include Political, Economic and Social variables.
    c. Represents civilian and animal entities in the battlefield.
    d. Provides semi-autonomous decision-making capabilities with a configurable level of fidelity (e.g. ability to turn automation on/off, weapons on/off) informed by command structure and available doctrine. *Design considerations*: Provides fully automated human behaviors for autonomous, Friendly Forces, Opposing Forces, Neutral Forces, entities on the battlefield, electronic warfare.
    e. Simulates crowd behaviors and resulting "patterns of life". "Patterns of life" pertains to societal norms and behaviors of the indigenous population, (e.g. traffic flow during rush hour, religious activity on days of worship, going to market, demonstrations [peaceful or violent], mass migration, refugee activity, rioting, looting).

f. Represents kinetic (e.g. direct/indirect fire) and non-kinetic (e.g., civilian satisfaction) effects on simulated entities.

g. Imports data from TMT (e.g., operational environment, force management, collective training tasks, parametric data).

3. Represent current behaviors and physics-based effects (guided and unguided) of direct and indirect kinetic munitions from the point of launch through impact. Atmospheric, weapon/sensor, and terrain influences must affect munition behaviors and provide the 2nd and 3rd order effects of those influences (e.g., drift, smoke dispersion, and cratering). Utilize appropriate probability of Hit / probability of Kill (pH/pK) values of munitions.

4. At IOC, represent three of the Army's six Warfighting Functions (Mission Command, Movement and Maneuver, and Fires) as executed by the applicable Unit/force types. *Design considerations* should include all six Warfighting Functions (Movement and Maneuver, Intelligence, Fires, Sustainment, Protection, and Mission Command). To include:

a. Mission Command: Command and control live and simulated entities to accomplish a specific goal or outcome.

b. Movement and maneuver: Mounted (ground and air) and dismounted forces.

c. Fires: Engagements with direct and indirect fire/weapon systems and their coordination.

External Interoperability & Integration

The STE TSS will:

1. Provide seamless interaction between simulated and human participants.

2. Provide the core simulation and 3D virtual environment for RVCT-Air and RVCT-Ground, S/SVT and live reflecting appropriate platform and all simulated entity dynamics, behaviors, and functional characteristics. Provide software, application(s) and services that will enable the RVCT and S/SVT. Adjudicate all interactions in the CSE, to include RVCT and S/SVT.

a. The RVCT interface will:

i. Exchange radio and intercom communications traffic with the CSE. Intercommunications system (aka intercom) traffic is internal platform communications. Radio traffic is external to the platform, and can be impacted by the environment (e.g., interference, jamming). The CSE TSS will route messages and apply environmental impacts. The CSE TMT will collect radio and intercom traffic for replay during AAR.

ii. Enables the user to operate using MCIS (e.g., digital messages) within the Common Operating Environment (COE) Command Post Computing Environment (CP CE).

iii. Integrate through a hardware abstraction layer (collaboratively developed by RVCT and CSE vendors). RVCT will consume TSS provided simulation services such as: Behavior / AI Models, Cyber Management, Communications Management, Physics, Path Planning, Rendering, Weather, and Embedded Mission Command.

iv. Provide simulation wrap around forces to stimulate and be stimulated by the

Operational Flight Programs (OFP), Abrams Common Software Library (ACSL), Bradley Common Software Library (BCSL), and other platform / tactical software.

v. Provide 3D models, AI / behaviors, animations, and sounds necessary to represent platform interiors, cyber management, communications management, physics, path planning, rendering, weather, and embedded mission command.

vi. Provide a digital representation and simulate the primary weapon systems, secondary weapon systems (e.g., coaxial and pintle-mounted), sensors (e.g., radar, multi-spectral [e.g., infrared], acoustic, Night Vision Image Generator [NVIG]), smoke grenade launchers, munitions, unmanned capabilities, and weapon system effects specific to each rotary wing and ground track and wheeled vehicle variant. Provide Soldiers a natural field-of-view and allow Soldiers to see from first person perspective. The visuals should provide the visual acuity and fidelity to enable responses to visual events (e.g., maneuver, observe weapon effects, employ weapons and targeting sensors separately from vehicle direction, observe and react to environmental changes [e.g., weather, day, night]).

vii. Allow Soldiers to hear and provide voice input.

viii. Receive RVCT hardware control inputs and represent the proper platform handling/control characteristics that allow Soldiers input via the use of physical and tactile controls of systems, subsystems, components, weapons, and MCIS to interface / interact with TSS.

ix. Provide Computer Generated Forces (CGF) / Semi and Fully Automated Forces / Artificial Intelligent force capability with variable difficulty, to simulate friendly, civilian, neutral, enemy, irregular, and hybrid threat forces in replicating tasks, processes, functionality, and behaviors.

x. Permit the user to transition between CGF controlled to human controlled.

xi. Provide automated simulation of crew station functions for the RVCT when stations are not occupied by a Soldier.

b. The TSS RVCT-Air services will:

i. Provide the aircrew with the capability to generate the input (voice and digital messages) that will be used to support flight and digital mission management operations in a digital cockpit.

ii. Provide access to a simulation-ready aircraft specific OFP.

iii. Maintain 100% concurrency with currently employed aviation Operational Flight Programs (OFP) software versions for all aircraft platform variants (e.g., UH-60, CH-47, UH-72, AH-64, See Platform List Annex) and achieve 100% concurrency within 90 days of new/updated OFP and Aviation Mission Planning System (AMPS) fielding (*Exception*: UH-72 is a commercial aircraft and reuse of Government owned simulated OFP from Aviation Combined Arms Tactical Trainer (AVCATT) is

acceptable).

iv. Simulate pilot functions and non-rated crew member (NRCM) station functions for the UH-60, CH-47, UH-72, when Air RVCT roles (e.g., NRCM, Pilot) are not occupied by a human participant.

v. Provide the Shadow and Grey Eagle Ground Control Station (GCS) unique mission software; and ensure interoperability with AH-64 D & E platforms to prescribed Levels of Interoperability as part of manned-unmanned teaming.
    1. Provide video, voice, and data transfer capabilities from/to the RVCT-Air.
    2. Provide the GCS the Unmanned Aerial System (UAS) sensor feed visuals.
    3. Provide the UAS visuals at appropriate level of visual fidelity (i.e., fixed displays) to allow and enable appropriate responses to visual events (e.g., fly the aircraft, observe weapon effects, employ weapon and targeting sensors separately from the direction of aircraft flight, observe and react to environmental changes [weather, day, night]) in the synthetic environment.
    4. *Design considerations* include providing the UH-72 and CH-47 aircraft cockpit Multi-Function Display (MFD) / Multi-Purpose Display (MPD) UAS video.

vi. Enable the transfer of aircraft unique (e.g., communications plan, weapons load, navigation) OFP and AMPS inputs after the aircrew has completed planning.

vii. Provide accurate platform flight models and visuals for each respective aircraft based upon environmental conditions (e.g., day, night, Forward Looking Infraed [FLIR] systems).

viii. Provide Multi-Function Display (MFD)/Multi-Purpose Display (MPD) functionality.

c. The TSS RVCT-Ground services will:

i. Provide crewmembers with a display with the required visual acuity and fidelity to enable responses to visual events (e.g., maneuver, observe weapon effects, employ weapons and targeting sensors separately from vehicle direction, observe and react to environmental changes [e.g., Provide crewmembers with a display with the required visual acuity and fidelity to enable responses to visual events (e.g., maneuver, observe weapon effects, employ weapons and targeting sensors separately from vehicle direction, observe and react to environmental changes [e.g., weather, day, night]).

ii. Utilize MCIS (e.g., digital messages), physical platform controls, virtual platform controls, and radio/intercom to influence/control the synthetic environment and conduct mission operations. The TSS will render the models, animations, behaviors, and provide audio.

iii. Interface with the CSE to interact with the ACSL, BCSL and other platform / tactical software.

iv. Provide collective gunnery training (e.g., Gunnery Table, Support by Fire, Attack by Fire). Collective gunnery events are planned through TMT using proponent gunnery information and dynamically tracked during tactical mission execution.
    1. Record and play back gunnery events, depicting enemy/friendly casualties and equipment damage.
    2. Provide the capability to capture round accuracy given set of aircraft/vehicle, environmental, and meteorological conditions.
    3. Provide scoring of rounds hitting targets and quantify the effectiveness of the crewmembers firing at different targets (e.g., boats, trucks, personnel) during weapon firing training.
    4. Provide sight and audio recording of target acquisition, tracking and firing skills, and crew audio during gunnery training or tactical engagement exercises.

d. The TSS S/SVT- services will:

i. Provide a semi-immersive training capability for dismounted Soldiers.

ii. Facilitate individual Soldier and squad training capabilities provided by S/SVT: STE Squad Capability (SSC), Weapon Skill Development (WSD), Joint Fires Training (JFT), and Use of Force (UoF).

iii. Enable training of different skills concurrently (i.e., a squad is firing their weapons and conducting call for fire tasks simultaneously).

iv. Provide inter-squad and full squad collective training enabling small units to shoot, move and communicate while reacting to a threat.

v. Enable coordination and distribution of fires.

vi. Replicate all squad organic weapons.

3. Interface with Live and Constructive capabilities via LVC-IA, providing interoperability between the STE and current Live and Constructive capabilities.

4. *Design Consideration:* TSS capability will integrate the Live Training Environment (LTE), embedded training with operational platforms, Cyber Electromagnetic Activities (CEMA), training devices to represent military capabilities such as operations in the cyber domain, the use of directed energy weapons, and non-lethal weapons effects (e.g. Supervisory Control and Data Acquisition [SCADA]).

5. Updates the common operating picture will:

a. Integrates with MCIS / COE.

b. Provides models with correct MCIS information exchange between live and simulated entities

c. Represent Army voice, data, and tactical network to enable communication between

virtual units (both air and ground) (adequate for collective training). *Design considerations* include Simulate the effects of cyber-attacks and electronic warfare on communications.

d. Accounts for a simulation in an operational environment different than the live environment, e.g. simulating a battle in California while physically located in Washington.
    i. Accounts for GPS location data in mission command systems whereby TSS reflects position in simulation vice location in physical environment

e. Integrates with Integrated Sensor Architecture (ISA)

    i. Ensures ISA enables sensors within an area of operation to "talk" without requiring physical integration. ISA dynamically locates other sensors on the network and accesses their information to improve situational awareness for Soldiers.

Simulation Services (TSS & TMT Hand-Off)

The STE TSS will:

1. Provide perceived and ground truth in real-time to TMT for event control. Perceived truth refers to the perspective of the user who may not have a complete or even accurate picture of what is transpiring in the operational environment. Ground truth is the complete and accurate picture.
2. Support TMT data requests (e.g., real-time recording and review, recording and playback).
3. Initialize simulation by utilizing TMT-provided digital TSP and initialization data.
4. Facilitate Exercise Control will:
    a. Maintain the current simulation state for the purpose of reverting to prior saved simulation states (e.g., checkpoint and restore in the event of a system crash). Account for behaviors that TSS is executing during checkpoint such that when the simulation is restored, these behaviors continue without interruption. *Design consideration:* include modifying the simulation time (i.e. adjusting the rate to faster than, slower than, or equivalent to real time).
    b. Consume prescribed events that move the scenario forward without depending upon preceding events to occur in the simulation (Master Scenario Event List [MSEL] injections) (e.g. the injection of an event that forces a downed aircraft to prompt users to implement the appropriate response).
5. Reflect TMT adjustments to operational and mission variables.
6. Incorporate run-time edits from TMT (e.g., ability to add additional simulated entities during the execution of the simulation, scenario difficulty adjustment, terrain edits).
7. Consume mission planning data generated by mission planning systems (e.g., AMPS).

Synthetic Environment Visualization:

The STE TSS will:

1. Enable immersive and semi-immersive visualization (e.g., virtual, augmented reality, augmented reality, and live-mixed reality).
2. Import and dynamically renders the OWT runtime format, containing simulation attribution, impacting operations (e.g., Soldier movements, behaviors, and equipment).

3. Provide near, mid, and far views incorporating sensors where applicable of current fielded capabilities. Provides transition between the three views with respect to the user's focal point. Table below provides examples of near, mid and far views.

	Near	Mid	Far
Dismounted	- Weapon sights - Night Vision	- Immediate surroundings - Mobile devices	- Horizon
Mounted	- Head mounted Display	- Instrument Panel	- Out the window

Scalability (Soldier/Squad to BDE):

The STE TSS will:

1. Support aggregation of simulated entities (i.e., from Soldier/Squad through Brigade) and enables the commanding/controlling of such aggregated formations. Supports the reverse – the disaggregation of aggregated entities (i.e. from Brigade through Soldier/Squad).
    a. Support aggregation and disaggregation with the flexibility of selecting the desired echelon (i.e. any echelon between soldier and brigade).
    b. Ensure behaviors are doctrinally correct and realistic, regardless of echelon, such that it promotes the immersion of the training audience as it interacts with the simulated entities. *Design considerations:* Incorporates artificial intelligence (AI) and machine learning in simulated entities to optimize the operations process.
    c. Provide models at the entity level.

Operational Environment Representation

The STE TSS will:

1. Represent atmospheric effects will include:
    a. Light levels, air pressure and turbulence, and their impact to munitions, platforms, and aircraft flight dynamics, navigational systems, communications and visibility.
    b. Seasonal and weather effects on soldier performance and equipment (e.g., snow impacting operations, fog impacting visibility, mud resulting from rain impacting soldier movement).
2. Represent dynamic terrain that evolves based on effects on the battlefield to include:
    a. Terrain affects line of sight, communication, navigation, munitions, sensors, and weapons.
    b. Runtime deformation from weapons effects and traffic (e.g., building rubble, road degradation, collapsed bridges and tunnels).
    c. Lighting effects on the terrain to include global time zone effects to account for varying light levels based upon ephemeris effects, (e.g. natural light [moon phase, position of the sun, starlight]) and artificial light (e.g., city lights, airfield, and vehicles).
    d. Seasonal and weather effects on terrain, infrastructure, and vegetation. Dynamic terrain attribution based on seasons affecting behaviors and models.

562 e. Terrain affects sounds from the battlespace, (e.g. explosions, echoes, movement on
563 varying surfaces, geographical/directional accuracy).

564 f. Terrain includes heat signatures (e.g., platform heat signature, platform thermal tracks).

565 g. *Design considerations* should include dense urban terrain/megacities, political, economic
566 and social impacts to the operational environment.

567 3. Representation of dynamic weather (e.g., snow, seasons, floods), climate, biomes to include
568 natural disasters (i.e., hurricane, floods, earthquakes, drought, forest fires).

569 Training Management Tool

570 The CSE provides a TMT that represents the Army Operations Process (ADRP 5-0, ADP 5-0), and consistent
571 with FM 7-0 (Train to Fight in a Complex World). The TMT provides users the capability to plan, prepare,
572 execute, and assess collective training from Soldier/Squad through Brigade for IOC (Soldier/Squad through
573 ASCC is FOC and is mentioned for *design considerations*). The TMT supports Operational Force readiness
574 before, during, and after missions and supports Joint, Combatant Commander and multi-national partners.
575 The TMT provides automation, data services, data processing, analysis, biometric / physiological systems,
576 and AI in a user environment that is intuitive to the TMT operator. Current and future Army/Joint
577 capabilities will be required to interface with TMT. Smart defaults based on user role, procedural
578 generation of scenario content, and a business process execution engine shall enable the training process.
579 TMT provides a single Army/ Joint exercise design, execution, and assessment tool used at all echelons and
580 forces for collective training. TMT enables greater visibility of training metrics that support Objective-T and
581 the Sustainable Readiness Model.

582 TMT capabilities will:

583 1. Provide a single, intuitive, holistic tool that integrates all TMT capabilities, and is accessible at the
584 PoN using Unit organic equipment.

585 2. Provide an Intelligent Tutor that assist users. The Intelligent Tutor will:

586 a. Guide users (including those with limited simulation experience) through the entire plan,
587 prepare, execute, and assess process.

588 b. Provide prompts during the exercise design process and checks for errors prior to
589 execution.

590 c. Monitor progression and reports status to assigned users.

591 d. Provide recommendations and smart defaults through the process based on best practices
592 and lessons learned (for example, derived from prior exercises by trained units, units of
593 similar type, exercises of similar tasks, soldiers of similar experience).

594 e. Provide informal After-Action Review (AAR) to training audiences based on training
595 objective performance.

596 3. Provide AI with machine learning utilizing Big Data techniques. The AI will be utilized to inform and
597 improve the Intelligent Tutor, increase exercise realism and recommend real-time modifications,
598 create more intelligent OPFOR, assist in all aspects of the plan, prepare, execute, and assess
599 process.

4. Provide access to a repository of all previously created exercise content for reuse (TSPs, data, storylines, roles, performance measures).
5. Provide a configuration management and administration capability to manage repository data.
6. Archive all data with unique identifiers and a change log.
7. Provide a prioritization and governance process to request 3D asset development when an asset does not exist in the repository.
8. Provide a capability for performance and parametric data from authoritative (e.g., Combat Capabilities Development Command Data and Analysis Center [CCDC DAC] – formerly known as Army Materiel Systems Analysis Activity [AMSAA]) and other data sources or all required characteristics of each model (e.g., weapon systems, behaviors, sensors, platforms, entities, munitions, etc.). All required characteristics include those to provide realistic training including pH/PK, weapons effects, health states, and 3D visualizations. This data is provided to TSS during execution. This data can be edited by users (with appropriate privileges) as needed during planning and execution.
9. Provide a capability to modify doctrinal and other behaviors models to satisfy future Tactics, Techniques, and Procedures (TTPs).
10. Provide an interface to develop and export/distribute a WARNO for Troop Leading Procedures.
11. Support multiple instances of each phase (plan, prepare, execute, and assess) at the PoN. For example, the TMT can provision and execute multiple exercises simultaneously.

TMT Plan. Units need to plan training events without external contractor support. Commanders and Training Developers will use TMT Plan capabilities to establish training objectives, design a scenario that will meet the training objectives, and schedule training resources for the training event. This capability will exchange information with Army Training Management Capability (ATMC) to schedule resources and to access Unit and Soldier training records. This capability will also retrieve authoritative and other data needed to create the digital TSP. TMT Plan capabilities will:

1. Use ATMC to identify, request, and reserve TADSS, network, and cloud resources for the training event per TC 7-101 (e.g. ranges, facilities, training aids).
2. Identify, access and request data from authoritative and other sources including Army Training Information System (ATIS), Worldwide Equipment Guide (WWEG), SAS Database, Spectral Library, Operators Manuals, Exercise Design Tool, Army Model Exchange, Training / Technical Manuals, Logistics Information Warehouse, Common Access Card, Army Org Server, Field Manuals, USGS, Synthetic Environment (SE) Core, TAMIS, MEPED.
3. Allow simultaneous exercise and scenario design collaboration between users from different locations.
4. Allow the capability to set permissions/privilege levels for specific roles and users.
5. Provide a capability to search, access, export, reuse, clone, modify, and create new TP 350-70-1 compliant digital TSP and Exercise Support Packages (ESPs; non-standard TSPs).
6. Guide (through use of Intelligent Tutor and AI) and provide the ability for the user to develop the digital TSP through the 4 Phases of the Exercise Design Guide (EDG) TC 7-101:
    a. Phase I Initial Planning. Select exercise parameters include:

- Time
- Exercise Location (Terrain)
- Physical Training Location
- Weather
- Commanders intent including Training Objectives
- Operation
- Echelon
- Type of exercise (e.g. MRX, CPX)
- Classification

b. Phase II Task and Counter Task Development. Select BLUFOR using authoritative Force Management unit data and:

- Identify Host Nation
- Identify Coalition partners based on authoritative Force Structure
- Assign tasks to units from authoritative data sources (CATS, CAR, UTJL, AUTL)
- Assign live, virtual player, non-player character control to units
- Select 3D models from model repository or have automated based on AO and other force considerations.
- Select OPFOR using authoritative data.
- Assign OPFOR counter tasks from authoritative data sources (e.g. OPFOR manuals).

c. Phase III PMESII-PT Operational Environment Development:

- Search, access, select, and tailor terrain.
- Provide a MSEL development tool to search, access, import, export, reuse, clone, modify, and create new MSEL events from planning to assessment.
- Provide a MSEL execution tool to layout an exercise storyboard.
- Provide a capability to correlate METL and subtasks.
- Provide a MSEL synchronization tool and decision support matrix that Commanders, Exercise/Training directors and Support Staff (EXCON) can use to manage the training event.

d. Phase IV Orders, Plans, and Instructions. Design an exercise scenario including:

- Search, access, export, import, reuse, clone, modify, and create new OPORD.
- Search, access, export, import, reuse, clone, modify, and create new OPFOR OPORD.
- Search, access, export, import, reuse, clone, modify, and create new Storylines, role-players, and threads. Include ability to thread storylines together and assign role-player and unit tasks.
- Identify, access, and modify (ability to modify data in time, space, and by keyword) operational environment wrap data (intelligence data, PowerPoints, etc.) to facilitate reuse.

- Build Road to War from scratch, generic authorities template based on operational environment designated by the user, or reuse Road to War built by another unit.
- Search, access, export, import, reuse, clone, modify, and create new Operational Graphics (exportable for use in the STE, other simulations, and MCIS) with multiple phases and unit specific views and overlays.

7. Provide capability to create mission plan in AMPS in the absence of an aircrew.
8. Provide AMPS for the aircrew to plan mission.
9. Provide a checklist with cross reference to echelon Objective-T requirements. Provide at a minimum:
    a. Automated Checklist to show objectives side by side with user selections.
    b. Compare orders to capabilities check list
    c. Capability to review all built materials:
        - Export to common office formats (e.g. Word, PowerPoint, Excel)
        - Export training and evaluation outlines (T&EO).
    d. Archive everything for reuse with unique identifier.
10. Provide a dataset that initializes the TSS and other user interfaces (e.g., RVCT, S/SVT, IVAS, OWT).
11. Provide digital TSP planning data for use by external systems.

Prepare. Commanders and Developers will use TMT Prepare to manage training preparation activities, manage Army training resources, and develop the event assessment plan. TMT Prepare capabilities provide Commanders and training developers a roadmap to ensure the collective training event is ready for execution. Prepare capabilities will:

1. Provide a pre-execution checklist management tool.
2. Provide AMPS for the aircrew to plan mission.
3. Generate the training event assessment plan for the Commanders, Exercise/Training directors and Support Staff which make up the exercise control (EXCON).
4. Provision the cloud resources and TSS.
5. Automatically initialize MCIS.
6. Initialize the training scenario.
7. Load AMPS aircraft data into TSS Operational Flight Program.
8. Provide training, including the Intelligent Tutor, to exercise participants.
9. Provide an automated capability to test the training environment (including MCIS) to ensure it is ready to execute the collective training event.

Execute. Exercise Control (EXCON) uses TMT Execute capabilities to begin the training event, manage event execution activities, make on-demand modifications, conduct a checkpoint/restore, MSEL injects, and manage and collect data. While the EXCON monitors and controls execution with the TMT, the training audience interacts with the TSS using immersive trainers (e.g., RVCT, S/SVT, IVAS), semi-immersive

712 trainers, live training capabilities and MCIS. TMT Execute capabilities will:

713 1. Allow AI to cue the EXCON to adjust event parameters (including OPFOR) challenging the Training
714 Unit and maximize training outcomes.
715 2. Provide EXCON a capability to make dynamic scenario adjustments including:
716 a. Modification of operational PMESII-PT and mission variables METT-TC and their interrelated
717 effects, to represent the complexities of the operational environment
718 b. The ability to inject MSELs into the training event automatically or manually.
719 c. Adjust event parameters to challenge the training Unit and maximize training outcomes.
720 d. Adjust MSEL/scenario time and location to provide retrain opportunities.
721 e. Adjust the scenario to train sequel and branches as defined in Army Doctrine (FM 5-0, ADP 3-
722 0).
723 f. Search, select, and modify runtime terrain.
724 3. Provide EXCON a MSEL synchronization board showing major scenario events in selectable
725 timeframes.
726 4. Provide an EXCON capability to initiate, monitor, control, pause, control time (e.g. pause,
727 compress, rewind, fast-forward), complete restart, checkpoint/restore, and make on demand
728 modifications to the ongoing training event.
729 5. The Intelligent Tutor provides checklists for actions that need to occur to perform a checkpoint
730 restore, complete restart, tactical pause, or any other modification to the exercise timeline. For
731 example, intelligence reporting that was released into the MCIS may need to be manually
732 removed.
733 6. Provide EXCON the ability to control simulated, immersive, and semi-immersive entities to include
734 resupply, reconstitute, change health state, magic move, aggregate, disaggregate, and transfer
735 entity control between AI and training audience control.
736 7. Provide an observer-only view and controls that are accessible remotely that is configured by EXCON.
737 8. Provide a geographically distributed EXCON.
738 9. Provide EXCON access to a semi-immersive TSS interface to monitor the ongoing training event.
739 10. Provide EXCON the ability to monitor any video and audio source in the training environment. This
740 includes any player's or entity's viewpoint.
741 11. Provide EXCON the ability to select and view the entire exercise including all virtual, simulated, and
742 instrumented entities/units and entity/unit positions and states.
743 12. Provide EXCON the ability to select and view all exercise terrain and features.
744 13. Provide EXCON an ability to facilitate participant communication (e.g. chat room, Voice Over
745 Internet Protocol [VOIP]).
746 14. Provide EXCON an ability to capture participant communication.
747 15. Provide visual cues to EXCON that display system status (e.g. network connectivity, TSS
748 communication, MCIS, Quality of Service [QoS] measures).

16. Provide EXCON data management capabilities that collect, tag, and store training data to support post-training event analysis and AAR activities. Facilitate data management with AI to correlate data.
17. Allow observer controllers to collect, tag, and store training data to support post-training event analysis and AAR activities. Facilitate data management with AI to correlate data.
18. Collect, tag, analyze, and store human performance data including biometric, observer data, and human mounted sensors. Facilitate data management with AI to correlate data.
19. Provide EXCON replay capability of collected data during execution.
20. Provide EXCON the ability to capture exercise products developed by the training audience in a common format for reuse (e.g. ISR packages).
21. Provide capability to track STE utilization data that identifies how often each end device is used and the duration.

Assess. EXCON uses TMT Assess capabilities to provide feedback throughout the process, conduct the AAR, and update Unit training records. TMT will provide feedback on two levels: the performance of the training audience during the exercise and the performance of the EXCON on exercise development and execution. Automated AAR capabilities will recommend future training needs and remediation events. TMT Assess capabilities will:

1. Provide AAR package following event completion. Provide an initial automated AAR product, which aligns assigned individual and collective tasks from the Plan phase.
2. Provide replay, data analytics, and data visualization for the AAR. Replay provides the ability to fast forward, compress, pause, rewind, zoom, and pan.
3. Provide a summarized replay of the training event (event highlights). Highlights include automated and manual bookmarks of events key to the success or failure of training objectives.
4. Use simulation data to create AAR products (e.g., execution parameters such as Named Areas of Interest (NAIs) or Target Areas of Interest (TAIs) nominated and executed).
5. Provide automated performance assessment of the training audience.
6. Identify a task breakdown of the exercise that shows unit, conducted tasks, and performance on those tasks.
7. Identify tasks that may require additional training (e.g., not completed, not to standard). Facilitate with AI.
8. Identify scenario adjustments for retraining. Facilitate with AI.
9. Provide training record updates to ATMC.
10. Provide non-intrusive recording capabilities to enable timestamped audio/video synchronized with scenario data for playback/analysis.
11. Provide Human Dimension lessons learned (TP 525-3-1, TP 525-3-7, FM 22-100).
12. Allow observer controllers to provide T&EO feedback for automated recommendations of Unit assessment (Trained, Proficient, Untrained [TPU]).
13. Allow the Intelligent Tutor to guide observer controllers during the assessment preparation.

14. Collect, organize, publish, and archive all exercise materials and data to the repository, consistent with classification (including multi-national classifications). AI facilitates and correlates data. Including:
    a. TSP materials
    b. Simulation data
    c. Intel message data
    d. Captured voice and video
    e. Communications log
    f. Exercise participant generated products
    g. AAR products
15. Provide AAR reports in standard formats (e.g. fratricide report, munitions expended, OPFOR attrition, battle damage assessment).
16. Allow users to create customized AAR reports.
17. Allow unit to upload AAR products created outside TMT.
18. Allow AI to assist identifying classification of all materials to be uploaded into the repository, this includes instances where aggregation of data may result in elevated classification.
19. Provide naming convention for products and data collected during exercise for data tagging and rapid retrieval.
20. Provide access to data repository of all data in native format (e.g. PowerPoints are accessed as PowerPoint files).
21. Support an informal AAR with data, metrics, and measures
22. Support a formal AAR with analysis, recommendations, and comparisons.

Cybersecurity

The CSE requires a secure design to directly connect to DoD infrastructure and systems. The CSE needs to comply with RMF (DoDI 8510.01) to achieve authorization for secure operations. To do this the vendor will follow the guidance as outlined by Network Enterprise Technology Command (NETCOM) and Defense Information Systems Agency (DISA).

Risk Management Framework

The vendor will need to plan and resource RMF support from the beginning of contract award. The vendor will need to work with the Government to develop the RMF Implementation Plan (RIP) to determine applicability of security controls in support of the Government Cybersecurity Strategy. The vendor needs to develop the Systems Security Plan (SSP) that details how controls will be met. As part of the SSP the vendor will need to use National Information Assurance Partnership (NIAP) validated components and to develop a patch management plan that includes Information Assurance Vulnerability Alert (IAVA) and DISA Security Technical Implementation Guides (STIGs). The vendor needs to document all security control non-compliance or mitigations in the Plan of Action and Milestones (POA&M).

IATT / ATO Documentation

Prior to connecting the system to any DoD network, the system will need to have an Interim Authorization to Test (IATT) or Authority to Operate (ATO). Due to the aggressive timeline, the vendor needs to plan, resource, and document the Assessment and Authorization from the onset of this award. The vendor is expected to team with the Government to create all documentation, process, and assessments to achieve the IATT and ATO. It is expected that this work will align with and position the CSE to achieve and maintain the ATO at IOC. The vendor will support:

1. Categorization and security control selection
2. Enterprise Mission Assurance Support Service (eMASS) Registration
3. Multi-phased, test timeline development
4. Test purpose development
5. Test scope (locations, networks, environments) documentation
6. Hardware and software list creation and maintenance
7. Document configuration and operational details
8. Functional architecture/topology diagram(s) development
9. STIGs implementation, compliance scans with all category 1 (CAT1) items fixed or mitigated (within 30 days of submission to Package Approval Chain)
10. Conduct vulnerability scans with all CAT I items fixed or mitigated (within 30 days of submission to Package Approval Chain)
11. Conduct a scan analysis and report findings to Government
12. Plan of Action and Milestone (POA&M) coordinated submitted to program office.

Development Environment

The development environment will also need to comply with certification requirements for development, management, and storage of CSE related data. This will include Self Assessments as well as RMF certification. Refer to latest NETCOM Tactics, techniques and procedures (TTPs) for the current certification requirements.

Cybersecurity Incident Reporting

For response and reporting of any cybersecurity related incidents the contractor will comply with the program's Incident Response Plan.

Cybersecurity Training

The contractor needs to ensure that personnel to be assigned as Cybersecurity, System Administrators or Network Administrators meet the minimum requirements for technical category Level II and workforce

management category Level I with minimum certification as defined by DOD 8570.01-M, Information Assurance Workforce Improvement Program including:

- DoD-approved information assurance workforce certifications appropriate for each category and level as listed in the current version of DoD 8570.01-M; and
- Appropriate operating system certification or training for information assurance technical positions as required by DoD 8570.01-M.

Upon request by the Government, the contractor shall provide documentation supporting the information assurance certification status of personnel performing information assurance functions. Contractor personnel who do not have proper and current certifications shall be denied access to DoD information systems for the purpose of performing information assurance functions.

Hardware Considerations

Vendors will identify the hardware configuration that satisfies the CSE SoN requirements. Configurations will consider the performance trade space between:

- Visual realism (e.g., polygons, lighting, shaders) and simulation fidelity (e.g., sensors, high-entity counts, interaction adjudication)
- Infrastructure scalability needed to support scenarios ranging from Soldier/Squad to Brigade. *Design consideration* to scale the infrastructure needed to support Army Service Component Command scenarios)
- Network, cloud, storage, and end-device (e.g., zero/thin client, thick client, RVCT, S/SVT) capabilities and location

ANNEXES.

Annex A: Glossary
Annex B: Documents/References
Annex C: OWT Use Case
Annex D: TMT Use Case
Annex E: Test Strategy
Annex F: Platform List
Annex G: Product Support
Annex H: Terrain Challenges