

Joint Staff J7 Joint Training Tools for Campaign Planning

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ABSTRACT

The Joint Staff (JS) Joint Training Directorate (J7) Environment Architecture Division (EAD) is developing modular simulation services known as the Joint Training Tools (JTT) to reside within the Joint Training Synthetic Environment (JTSE). JTT will be a cloud-based, web-enabled, enterprise environment that will provide scalable, modular simulation services on-demand, and operationally relevant training. Campaign planning is one of those modular simulation services. This iterative planning process incorporates situational analysis with respect to the enemy intent, enemy capability, and impacts of humanitarian assistance efforts for developing courses of action (COA)s that mitigate undesirable outcomes. This planning requires the integration of several standalone database services containing force structures and equipment information, geospatial databases and layers, and logistical supply consumption and movement databases. The Training Environment Manager (TEM) tool will support database integration by consuming, combining, and displaying data of interest. The Joint Exercise Design Tool (JEDT) will enable campaign plans creation by allowing users to review, adjudicate, or export user plans. Other JTT services will interoperate with TEM and JEDT according to Order of Battle (OOB), geospatial, or logistical needs. Simulation supported event designers will need less preparation time for making training situations more credible in terms of quality and realism, allowing for rapid integration of pre-existing data, and enabling dynamic access and update of data within real-time events. This paper will discuss how force structure, geospatial, and logistical information can help to achieve a Modeling and Simulation as a Service (MSaaS) environment.

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JOINT TRAINING TOOLS OVERVIEW

The Joint Training Tools (JTT) modular capability will replace monolithic simulation systems and support Joint force readiness to fulfill Combatant Commander (CCDR) (regional commands responsible for Joint Task Force (JTF) training) and Service (Army, Navy, Air Force, Marines) Joint Training requirements. The web-enabled, enterprise-based JTT will improve trainer access to capabilities; enhance ease of use through simplified user interfaces; and support discoverability and more rapid content delivery. It will provide scalable, modular simulation services supported by a cloud-based computing architecture providing on-demand, operationally relevant training. The JTT will leverage existing collaborative environments and provide planning services that can be used to foster increased training among Combatant Commands (CCMDs), Services, and Agencies (C/S/A), and their mission partners. JTT will provide planning and execution services that reduce the tedious, repetitive tasks inherent to data processing. These tasks will include manual processes such as database configuration and coordination.

CCMD, JTF, and Service/Agency commanders will use JTT services to meet high-interest training requirements to achieve Joint force readiness. Commanders at all echelons are the primary trainers responsible for preparing units to accomplish assigned missions. To assist Commanders in preparing for current and future conflicts, training, and exercises, mission rehearsal solutions must represent and adapt to rapidly changing operational environments. JTT services will provide trainers the ability to represent operational environments, while reducing the amount of time and labor necessary to design, plan, execute, and access Joint Training across the full range of military operations. JTT services will enable Joint forces to accomplish a diverse and complex set of missions that demand an ever-changing combination of military deterrence, security cooperation, and engagement.

JTT's authority stems directly from the Chairman of the Joint Chiefs of Staff (CJCS) Joint Training Guidance that dictates, "The joint community must sustain training with joint, interagency, intergovernmental, and multinational partners" (JP 1, 2013). This same collaborative focus is found in the Combatant Commanders Exercise Engagement and Training Transformation (CE2T2) Program Goals and Objectives (PGO) FY2017, which targets "a realistic training environment for CCDRs to maintain trained and ready forces, exercise their Theater Campaign Plans (TCP), and achieve joint and multinational training". TCP's include the CCDRs strategic and operational objectives accomplished through Joint Strategic Planning, which incorporates planning for security cooperation, joint operation, and forces. Joint operation includes campaign planning for both deliberate operations and crisis action planning.

Joint Campaign Planning

Joint campaign planning consists of planning for a series of related major Joint operations aimed at achieving strategic and operational objectives within a given time and space. Campaign Planning is appropriate when contemplated military operations exceed the scope of a single major operation (JP 5-0, 2011). Joint Publication 5 (JP 5-0) describes a general six-phase model for use as a template for conducting Joint campaign planning. This general phasing construct, or some modification of it, may be used by Commanders and applied to various campaigns and operations. Geographic CCDRs generally use the phasing model to link the pertinent TCPs and Operation Plans (OPLANs)¹

¹ Operation plan (also called OPLAN). 1. Any plan for the conduct of military operations prepared in response to actual and potential contingencies. 2. A complete and detailed joint plan containing a full description of the concept of operations, all annexes applicable to the plan, and a time-phased force and deployment data.

operations and activities. Operations and activities in the *Shape Phase (Phase 0)* normally are outlined in TCPs and those in the remaining phases are outlined in contingency plans. The following brief description of these phases is drawn from JP 5-0, Chapter III Section 10.

- (1) **Shape (Phase 0)**. Includes normal and routine military activities of Joint and multinational operations to dissuade or deter potential adversaries to assure or solidify relationships with allies.
- (2) **Deter (Phase I)**. Demonstrate the capabilities and resolve of the joint force to deter undesirable adversary actions.
- (3) **Seize Initiative (Phase II)**. Seize the initiative through the application of appropriate joint force capabilities.
- (4) **Dominate (Phase III)**. Break the enemy's will for organized resistance or, in noncombat situations control the operational environment.
- (5) **Stabilize (Phase IV)**. Perform limited local governance, integrate efforts of other supporting/contributing multinational, government, non-government, or agency participants until legitimate local entities are functioning.
- (6) **Enable Civil Authority (Phase V)**. Enable the viability of the civil authority and its provision of essential services to the largest number of people in the region.

Joint Operational Planning Process (JOPP)

JOPP provides a methodical approach to planning at any of the organizational levels to address a specific problem or situation. The JOPP includes developing, analyzing, and comparing Courses of Action (COA) to produce a best COA for a given situation. JOPP is an iterative process that enables a COA to evolve as data is gathered that increases situational understanding. JOPP enables “defining the military mission and development and synchronization of detailed plans to accomplish the mission” (JP 5-0). Figure 1 is a depiction of campaign plan phases (across the bottom) applied for a notional OPLAN with relative levels of anticipated military effort (increasing from bottom to top).

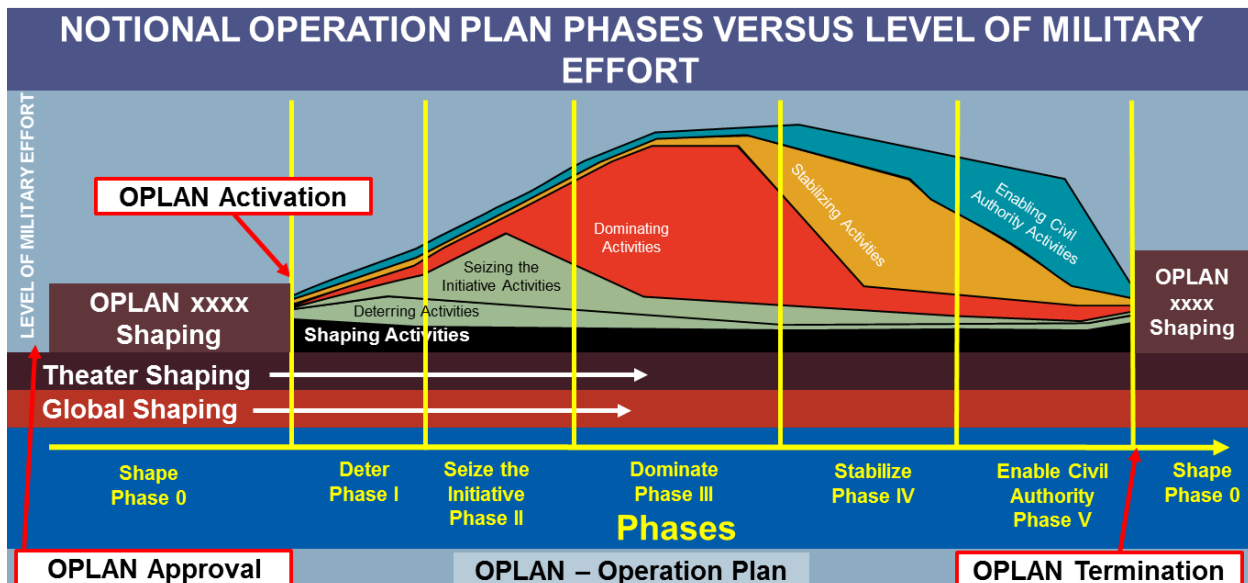


Figure 1. Campaign Planning Phases

Joint Training System Execution Phase

Joint Training exercises are usually executed within time windows of short duration. Campaign plans set the stage and drive the scenario and events needed to accomplish the Commander’s desired training objectives. The CJCSM 3500.03E defines a multi-stage Joint Event Life Cycle (JELC), which is used to produce the training by-products that enable the desired level of training. Thus, campaign plans serve as an input to the exercise execution. In turn, CCMDs may use existing real-world campaign plans or derive fictional plans for their respective exercise. The traditional simulation supported exercise, Command Post Exercise (CPX), tends to mostly focus on the active *Seize the Initiative* (Phase II) and *Dominate* (Phase III) phases of the campaign plan as depicted in Figure 2.

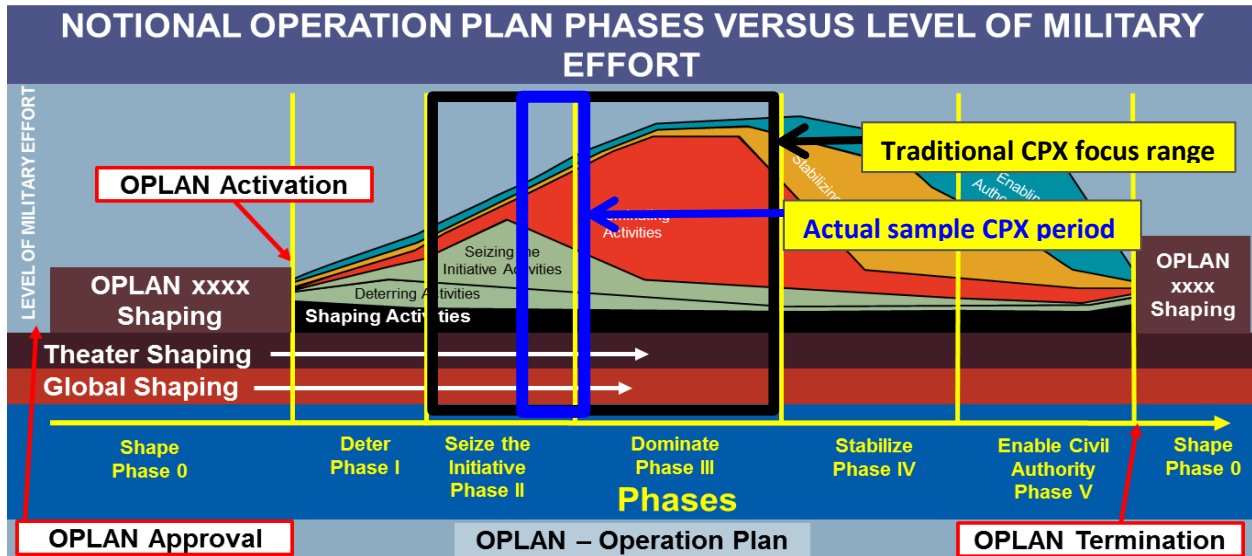


Figure 2. Limited CPX Focus and Execution Windows

Since a CPX execution window is typically five to 10 days in duration, limited time exists for training audience campaign or operational planning to be performed. Generally, it must be done early in the JELC at home station, in JELC planning conferences, or in separate CCMD directed activities. If existing plans cannot be adequately used to meet the desired training objectives, then additional plans must be created. Usually these plans are needed by event planners early in the JELC to make timely exercise design and preparation decisions, such as scenario creation and simulation database building. Exercise preparation decisions and work sometimes get delayed while awaiting efficient campaign and operational plans for the exercise. JTT has the potential to enhance exercise preparation and training value by supporting a broader range of campaign planning phases as depicted by the red box in the Figure 3.

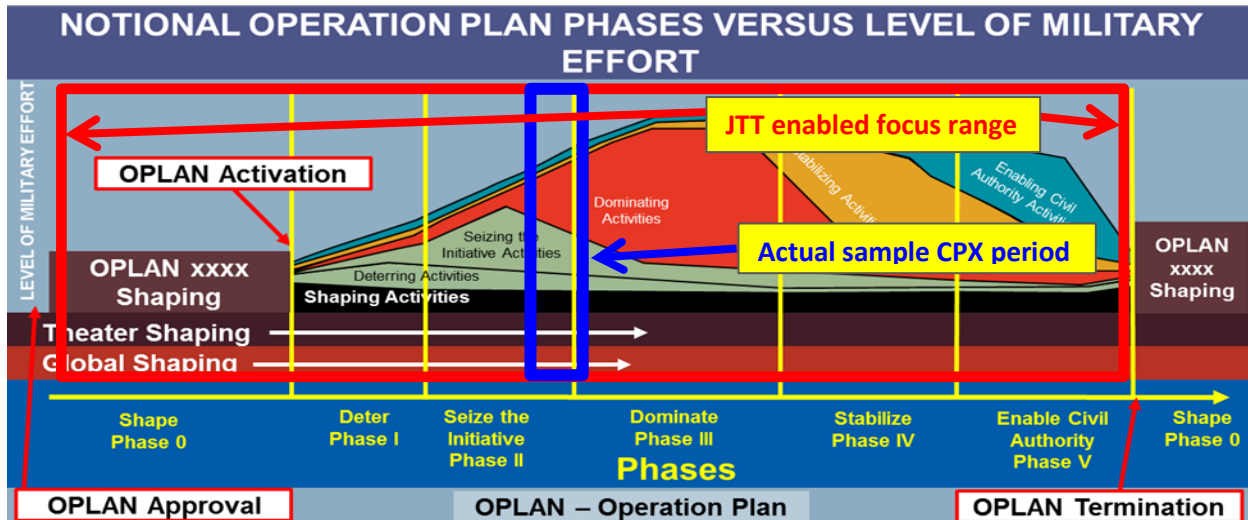


Figure 3. JTT Enables Expanded Planning Focus Window

JOINT TRAINING TOOLS (JTT)

JTT will allow for a distributed and seamless web-enabled Joint Training System (JTS), which can be articulated as Modeling and Simulation as a Service (MSaaS). The MSaaS concept will support scalable, modular simulation on-demand services paired with Graphical User Interfaces (GUI) within a service based architecture. JTT will provide the ability to replicate combatant, non-combatant Situational Forces (SITFOR), Opposing Forces (OPFOR) Command and Control (C2), and the presence of appropriate threat systems along with the capacity of OPFOR/SITFOR to sustain operations throughout exercises² (CJCSM 3500.03E, 2015). JTT will have logistic support elements that will include credible equipment, systems, and facilities representations in the training environments. These tools will enable JOPP at all three levels of war, and support the iterative process of campaign planning by allowing the ability to change, add, remove, update, and adjudicate warfighting constructs such as Forces, Campaigns³, Lines of Effort (LOEs)⁴, and Lines of Operation (LOOs)⁵. These warfighting constructs assist in defining the fluid nature, and ever-changing intelligence, assumptions, force availability, and force requirements associated with military operations. The user will enter the JTT Landing Page via a web browser, appropriate Uniform Resource Locator (URL), common access card (CAC) and required PIN. The Joint Exercise Design Tool (JEDT) will guide the user through an event planning menu that generates the necessary products and processes. The Training Environment Manager (TEM) will be the execution tool used during an exercise/ event that interfaces with the JEDT and the user. Ancillary services/tools that operate behind the JEDT and TEM are designed to assist the user in campaign and operational planning. Brief descriptions of selected ancillary services/ tools are provided below. These ancillary tools include: Force Management Service (FMS), Terrain Generation Services (TGS), Logistics Planning Services (LPS), and the aggregate Combat Adjudication Services (CAS).

Joint Exercise Design Tool (JEDT)

JEDT will be user-friendly and a key user interface for exercise planning (execution phase of the JTS). JEDT will provide the ability to plan, coordinate, and synchronize exercise by-products / timelines collaboratively in a distributed manner. Users will use it to evolve operational plans into exercise design by-products as depicted in Figure 4. On the left side of this figure will be JELC stages implemented in the JEDT as well as key input information necessary for

² **Exercise.** A military maneuver or simulated wartime operation involving planning, preparation, and execution carried out for the purpose of training and evaluation.

³ **Campaign.** A series of related major operations aimed at achieving strategic and operational objectives within a given time and space.

⁴ **Line of effort.** In the context of joint operation planning, using the purpose (cause and effect) to focus efforts toward establishing operational and strategic conditions by linking multiple tasks and missions. Also called **LOE**.

⁵ **Line of operation.** A line that defines the interior or exterior orientation of the force in relation to the enemy or that connects actions on nodes and/or decisive points related in time and space to an objective(s). Also called **LOO**.

understanding the scenario. In the center, the figure illustrates a typical troop list. Finally, the far right arrays the units on an electronic map to enhance the user's battlespace geometry.

The user will also be able to plan an event at home station with a reduced reliance on previously knowing the planning and design activities and nuances associated with the JELC. The tool will support development or "re-use" of scenario products. JEDT will also provide the ability to create training objectives, create storylines / Master Scenario Events Lists (MSELs) and track event planning progress. JEDT provides web access to terrain and force flow data. JEDT will provide the ability to build force structure, startex locations, and operational graphics that can be exported to the simulations/C2 systems for initialization and more efficient use. The tool will be web-accessible to increase distributed collaboration on event by-products (e.g., Road to Crisis, MSELs for all phases of the campaign plan, training objectives, etc.); and these will be linked to order of battle data via an Application Programming Interface (API).

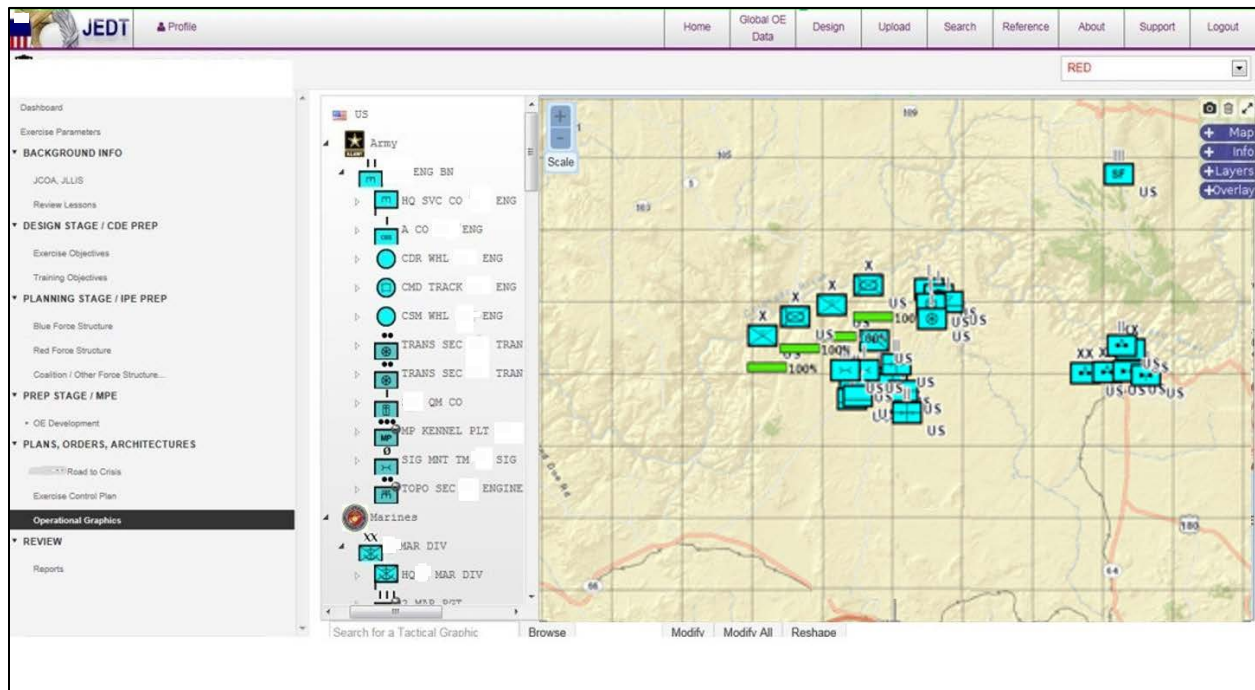


Figure 4. JEDT User Interface for Operational Planning

Training Environment Manager (TEM)

During exercise execution, TEM will provide a unified scenario Common Operational Picture (COP) that will synchronize storylines, MSELs, and an ability to shift between current time and future time (projected), as well as an on-going depiction of military operations (i.e., exercise ground truth). TEM will allow users to define and visualize campaign/contingency plans and overlay them on the map and timeline to enhance event manager situational awareness. TEM will reflect JEDT-derived planning elements (such as campaign LOOs and LOEs), component decision points and decisive points, and the progress towards them. TEM users will be able to display force lists (linked to authoritative data) and the force flow/ deployment schedule for generating Time Phased Force Deployment

Data-Like (TPFDDL) information. The TEM user interface depicted in Figure 5 contains four quadrants that are interactive with one another. These four areas are; The Map (Red), the Order of Battle (OOB) and Graphics Tree (Yellow), The Storyline Editor (Green), and the Timeline (Blue).

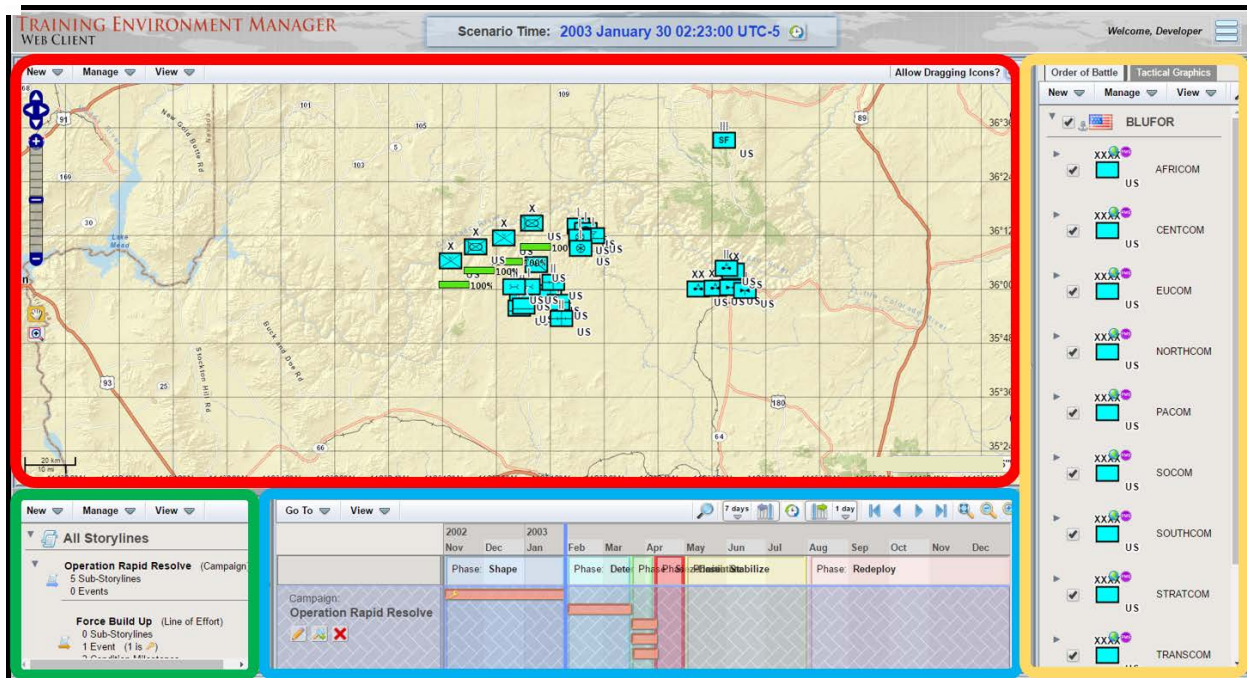


Figure 5. Training Environment Manager Display

Description of the Ancillary Tools/Services:

Force Management Service (FMS)

FMS will provide an unclassified capability to initiate a Request for Forces (RFF) via TEM and other web-based tools. Subsequently, force data at sufficient levels of fidelity and quality will be available via FMS to drive campaign and operations planning and will be based on authoritative Blue Forces and unclassified coalition and threat country databases. Specifically, FMS will provide the capability to bridge force generation into force flow data environments, and will be an estimator for Global Force Management (GFM) process.

Terrain Generation Services (TGS)

TGS provides authoritative, automated correlated Modeling and Simulation (M&S) terrain creation via the web, with limited 3D terrain editing capability for planning and execution. TGS also provides visualization and Geographic Information Systems (GIS) Map Layers for planning and role-player services. It publishes to Open Geospatial Consortium (OGC) web specification standards and utilizes the Common Database (CDB) format.

Logistics Planning Service (LPS)

LPS will allow the user to select maneuver units for a LOO and will estimate logistics consumption and suggest the support unit structure (i.e., troop list). LPS will include a Force Flow Estimator (FFE) module that will provide a gross estimate of the force flow schedule accounting for strategic lift capabilities using Air, Sea, and Land. LPS will provide the ability to perform a gross strategic lift assessment to estimate the number of weeks and days required to ship the apportioned force. Once LPS is integrated with TEM, it will run behind the scenes without its own dedicated GUI.

Combat Adjudication Service (CAS)

CAS will enable an estimation of combat results at an aggregate level. Combat adjudication will employ combat powers based on equipment used by the units and the domain of the unit (e.g., ground, air, etc.). CAS deterministic calculations will be based upon combat factor work by COL Trevor N. Dupuy. Combat powers for units are initially generated in FMS and retrieved and organized by the TEM according to how the planner task organizes the units. Units for each LOO, unit characteristics, and environmental characteristics will be sent from the TEM to the CAS, which then utilizes the combat powers to calculate a likely potential outcome.

JTT User Experience with JEDT/ TEM

JEDT and TEM comprise the user interfaces capable of consuming, combining, and displaying information from other web-based tools within JTT. These user interfaces will allow trainers to plan and design training events⁶ based on CJCSM 3500.03E, execution planning⁷ (JP 5-0), and evolving OPLANs (JP 5-0). JTT can be used to develop plans for combat and humanitarian situations. Components of the JTT repository will provide data such as friendly and opposition force structures, combat strength and health, maps and overlays, logistics and movement data, graphics and symbols, and the ability to organize the data in a manner that allows for real time and faster than real time execution. This information will be available for use by multiple simulation systems and services. However, the intended use for JEDT/ TEM is to combine data via a user-friendly interface.

Planners will create map layers in TGS that can be imported into the JEDT and TEM. In the user interface users toggle the map layers on/off to focus on specific parts of the Area of Operations (AO). Force information will import from FMS and the user places forces in appropriate locations. Force information may also include equipment and combat powers to be used when combat adjudication is requested from CAS. Normally TEM will then interface with the LPS to execute the Request for Forces (RFF) to select the necessary logistical support units required to sustain the force (prior to execution this could be done by JEDT for COA analysis /wargaming in the planning process). The user may dictate other factors such as desired unit arrival times.

Once the RFF is executed, the LPS will add the support unit types to the list of planned unit types and return estimated fuel, supplies, and ammo calculations. The user will then interface with FMS to request desired units, which places the allocated units into the OOB. TEM will interface with FFE to provide the user information, which could support high fidelity TPFDDL information. These steps will support the mobility, deployment, and sustainment components of the JOPP by allowing one to identify the necessary set of units, their availability, and the force flow timeline to support a specific campaign or operation.

The web-enabled JTT, using the JEDT planning user interface and the TEM execution user interface and supporting FMS, TGS, CAS, and LPS ancillary services (depicted in Figure 6), will allow a one-stop shop to plan, prepare, execute, and assess. JTT will provide access to systems and services, both legacy and evolving, that provide machine-readable data that is easily coupled to provide a faster than real time simulated view of planned operations. The user interfaces will support detailed analysis of critical information for decision makers regardless if they are conducting an exercise, operational planning, or training event.

⁶ **Training event.** Training events are distinguished from exercises. A training event focuses primarily on improving individual or collective ability to perform. An exercise focuses primarily on evaluating capability, or an element of capability (such as a plan or policy).

⁷ **Execution planning.** The Adaptive Planning and Execution System translation of an approved course of action into an executable plan of action through the preparation of a complete operation plan or operation order. Also called APEX.

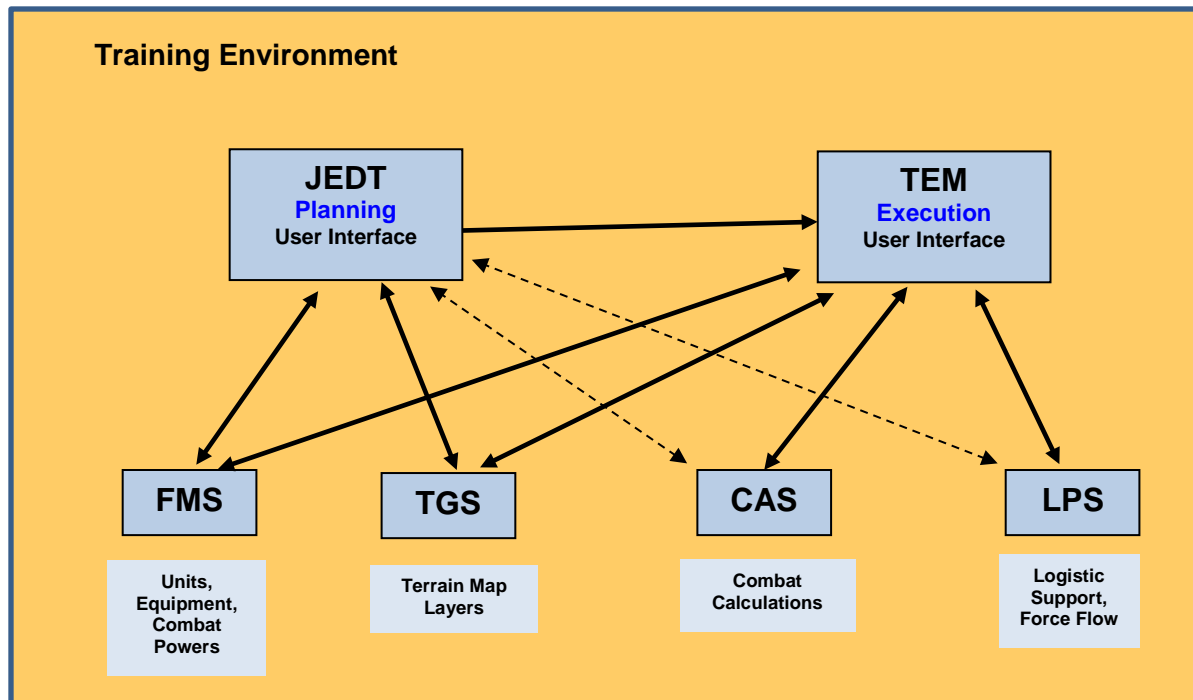


Figure 6. Key JTT Services Interactions

JTT Technical Details

JTT components or services communicate via Representational State Transfer (REST)ful web services. REST is stateless, which enables service calls to be retried independently and aids in scalability. JavaScript Object Notation (JSON) is used as the primary transfer data format. While based upon a subset of JavaScript, JSON is an open standard format that uses human readable text to transmit data objects consisting of attribute-value pairs.⁸ JSON is language independent and supported by all of the technology stacks used by the developers. A style guide was created to aide developers in standardizing their design practices. The guide includes standards regarding browser support, client side software, server side technology and architecture, and API standards. Elements considered when designing APIs included data versioning, Uniform Resource Identifier (URI) structure, pagination of request responses, object identifier fields, and error codes. As a standard practice, each of the JTT services provides an API reference describing available calls, input, response, and other service-specific information to aid other developers. The data model and names used within the services are standardized so that variables used across the APIs have the same semantic meaning for the same name. If different data names are used, then the semantic components of the data are also different.

Identity and Access Management (IdAM) is the combination of technical systems, policies, and processes that create, define, govern, and synchronize the ownership, utilization, and safeguarding of identity information. It will be essential for accessing services in JTT through authentication, authorization user management, and central user repository. Using IdAM, we will achieve Single Sign On (SSO), which allows a user to enter their login credentials a single time to access multiple system and services without re-authenticating. IdAM is one of many Department of Defense (DoD) Cyber security requirements that have to be addressed during development of code, instantiation of servers, and overall design of JTT.

Conclusion/Future Vision

JTT capabilities show promise for facilitating Joint Training and supporting CCMD and exercise campaign and operations planning. These capabilities will provide additional support to the broader spectrum of campaign planning

⁸ <http://ahex.co/json/> Introduction to JSON

phases rather than the traditional CPX focus. In the JTT cloud construct, these tools will be used anywhere and anytime that exercise planners or training audience analysts might need them. Development of these tools and services within cloud-enabled standards will continue to advance the MSaaS concept, and explore the feasibility of Joint training simulations as a Service in a cloud environment.

DISCLAIMER

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