PME Institutional Simulation Requirement

Use Case:

Student Battalion-Brigade Staff Educational Simulation
Stability Operations

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Overview: This document outlines required functional capabilities and training effects for a Stability Operations simulation enabling student staff exercises at echelons from battalion through brigade. There is no requirement to interface with the Live, Virtual, Constructive - Integrating Architecture (LVC-IA). At this time, the only Mission Command System that needs to be populated is Command Post of the Future (CPoF). There is no requirement to federate with other simulations. Stimulating additional Mission Command systems, federating with other simulations, and working with LVC-IA is acceptable if and only if there is no additional workload or cost associated with the capability and those systems are not required for fully capable operation. This document will assist the Material Developer to better understand the required functional capabilities and training effects to be included in the Simulation.

Description: The purpose of this Use Case is to provide requirements for a simulation to support competitive-play low-overhead educational staff-centric stability operations exercises conducted at battalion through brigade level by Professional Military Education (PME) students acting as commanders and key staff officers. This simulation is focused on Stability Operations and enables experiential educational environments. It adjudicates the results of student staff planning and decisions, requiring students to adapt their plans to an evolving situation.

This is not a predictive simulation. It is intended to produce generally plausible outcomes whose dilemmas will drive student learning.

Program of Instruction: The purpose of this Use Case is to support exercises in which PME students at CGSC conduct staff exercises focused on the MDMP, RDSP, Targeting Meeting, and Mission Command processes in a stability operations environment. It is not a predictive simulation; the simulation acts as a military chess game, providing appropriate responses to student inputs for the various sides, and these resulting situations in turn pose new problems for students to analyze and make decisions about.

This Use Case is expected to be used in the classroom with the simulation run on classroom computers as a competitive fight between Blue and Red. Blue includes US forces and other friendly factions; Red may comprise a variety of independent factions; and some of the factions initially friendly to a given side can be induced to change allegiance. Most students are in the staff of the echelon that is the target of the current instruction, acting as the commander and primary staff officers. The exercise includes the six FM 3-24 Lines of Effort (Establish Civil Security, Establish Civil Control, Support Host Nation Security Forces, Support Governance, Restore Essential Services, Support Economic and Infrastructure Development, and Conduct Information Engagement), with a focus on the synchronization and prioritization of forces and effects for a Stability Operation. Student operators, who are also expected to be commanders or staff officers in the exercise, control the major immediately subordinate elements and some smaller specialist units or assets; the simulation must take in decisions about these elements of military forces, without requiring any student to manage them in detail. A given student class cannot be assumed to have a student who is expert in any given area; therefore, the simulation must be designed to enable non-specialist students to rapidly learn to operate any given function to standard without
acquiring specialized knowledge. (For example, an infantry officer must be able to
manage contracts, while a finance officer must be able to direct units to patrol, without
the other’s specialized expertise.)

Projected scenarios include situations based on Afghanistan, Iraq, relatively well-
developed regions (such as the Pushkino Rayon in the GAAT scenario used at CGSC),
and completely undeveloped regions (such as the Horn of Africa in the Cerasia scenario
used with British exchange officers at CGSC). The simulation must not be limited to one
class or example of stability operation.

There are three primary exercise types expected; opposing forces will often, but
not always, have students in charge:

1) Brigade and battalion multi-echelon staff exercise with 16 to 32 students, of
whom 2 to 5 are in each major command, and 1 to 12 are student operators
and White Cell controllers.

2) Brigade Staff exercise with 16 to 32 students, of whom 2 or 3 are student
operators and White Cell controllers.

3) Small group exercises at either echelon, each involving 4-16 students, of
whom 1 is the simulation operator. These exercises involve a reduced unit
set. OPFOR is controlled by a combination of scripting and AI.

Required Capability: The student staff operates at one or two echelons of
decision. The simulation controls all elements and assets below student planned
elements; all elements and assets perform tasks to standard. The simulation must
produce and adjudicate lethal and non-lethal effects, and both lethal and non-lethal
injects. The simulation must be able to compress time (turn-based preferred, but not a
hard requirement; if not turn-based then it must be pauseable and must be able to issue
orders in the simulation while paused). Enclosure 1, Detailed Specifications, provides
additional details on specific necessary functionality.

Time: During a student exercise lasting 2-4 days of real time (each day of 6-8
hours of class time), the simulation must be able to cover 12-18 months’ worth of
activity while providing the students ample time to conduct repeated planning cycles.
Therefore the simulation must proceed through time extremely quickly. The simplest
means of achieving this is by using turns, which should be of 1 to 4 week’s duration, the
duration of each turn being selected by the host computer prior to running the turn.

The threshold capability is 1 week in 5 minutes. This rate of movement through
time, in turn, implies that the operators must not be required to control forces and assets
in detail as events unfold; given missions, the forces and assets must perform to
standard without operator intervention until the turn is complete.

The second implication of this rate of play is that, because the focus of the
exercise is on the planning and targeting processes, not interacting with the simulation,
it must enable operators and students to input orders, and gain situational
understanding, very rapidly. This in turn places a great weight on the user interface, to
streamline issuing orders and provide reports in formats that are immediately useful to
the student training audience.

**Factions:** The simulation must include multiple sides with varying relationships
and the ability to change their allegiances based on student actions and the actions of
other factions. Expected scenarios are complex multilateral environments composed of
multiple types of friendly and opposing forces whose attitudes towards each other and
the US forces is dependent on the students' actions and the various other factions’
actions.

**Area Maps:** The basic geographical division on the map is areas, which can be
arbitrarily defined by the scenario author. Units, assets, and populations operate in
these areas. Movement is conducted only from one area to another area; locations
inside areas are not defined for forces. For cosmetic reasons, the specific location of
static assets' or populations' icons can be fixed to a given point by the scenario author.
The baseline characteristics of an area should be the type (such as urban, forest,
farmland), mobility, size in square kilometers, and SWEAT-MS (Sewage, Water,
Electricity, Academics, Trash, Medical, Security), but the scenario author must be able
to define other variables and to define the impact of each variable in a given scenario.

Movement of Units is from area to area. Movement capabilities are defined in
terms points; Areas can be defined as costing more than one point to traverse for
certain types of units. This permits, for example, airmobile units to move rapidly over
terrain that is functionally impassable to mechanized units, or differing movement costs
for US or insurgent forces.

**Units:** Units are the set of mobile entities in the simulation composed primarily of
people, such as military forces, NGO aid teams, or individual leaders. Different units
may have widely varied properties which can be used to introduce effects in an area.
For example, a battle-ready US combat unit would have high training, morale, combat
power, and current effectiveness, while an NGO team’s combat power would be
minimal, but might have the capability to improve the medical situation in its area.

Student planned elements are normally two echelons down from the highest
student echelon, plus smaller specialist units, individual leaders, and/or associated
forces depending on the scenario. A brigade exercise would track companies in most
cases, but also include civil affairs or engineer platoons that could be independently
tasked depending on the students’ plan. In all cases, the unit should perform to
standard without student intervention once a task is assigned.

In some cases, notably insurgent or criminal groups, it may be convenient to
create one icon for a relatively large force in a given area, so that the forces’ strength,
capabilities, and taskings are centralized to assist in rapid assessment and assignment.
In this instance, it is still useful for such icons to be able to lend strength to other icons
on the same side in different areas. Thus, the insurgents in Area 1 could primarily
conduct recruiting while sending fighters to assist in attacks in Area 2, and the specialist
bomb-making unit in Area 3 could send its product to support the Area 2 fight as well.
Such icons should be tasked in terms of aggressiveness in pursuing the task, and the
type of task.
Units have relationships with other units, factions, and populations which change in response to events; the state of these relationships impacts how units act and react to other units, factions, assets, and populations.

Key leaders are an important class of unit; see Leader Interactions below.

**Assets:** Assets are fixed capabilities, usually infrastructure such as schools or water treatment plants. These have a fixed location on the map, a specified owner (which can change) and capabilities that are enabled or reduced in proportion to their state of repair. Assets' effective capability can also be capped by the state of repair of other assets; these effects will be defined by the scenario author. For example, a water pumping station's effectiveness might be dependent on the effectiveness of an electrical substation, whose effectiveness is in turn dependent on the state of repair of a power plant; thus, the water plant and the substation could be in perfect condition, yet delivering no benefit because the power plant was not functional.

Assets should report not only owners, capabilities, and dependencies, but also state of repair, and the time/cost to repair.

**Populations:** Populations are large groups of people sharing most general characteristics. Populations are the recruiting sources for all local sides; their attitude towards the side determines the level of success at recruiting. More than one population may be present in an area. Populations have scenario-author defined needs and desires, such as the need for water, or the desire to have no US troops in their area; meeting or failing to deliver these outcomes impacts their attitude to various sides.

Populations can be influenced directly, and may have relationships with sides and units through whom they can be influenced; for example, a population may have a leader through whom it can be influenced, in addition to influencing it through its needs and local events.

**Money:** Each faction must be able to have a budget it can spend in order to conduct projects that repair or create assets, and/or to influence leaders, units and populations. The US side, at least, must be able to have separate budgets for scenario-author-defined portions of the force: for example, a different budget for each battalion in a brigade, plus a brigade budget.

**Combat:** The combat model should be focused on outcomes, not process. Units must interact plausibly in accordance with their missions. For example, Units come into contact when their missions clash and they have detected each other; patrolling units in an area interfere with units attempting covert missions if their presence is sufficient compared to the size of the populations the covert force is attempting to hide among.

A unit set to patrol a given area should have a probability of intercepting enemy forces attempting to transit the area in accordance with the area's characteristics and size, and the presence or absence of other interfering enemy units in the region.

**Reports:**

All reports must be sortable by at least area, selected areas, unit, selected units, side, selected sides, and/or turn(s). Players must be able to save specific report
sorting schemes and run those user-defined reports for the current turn with very few mouse clicks. For example, students may configure a report for specific types of events that occur in several areas that correspond to a BN AO. They must be able to save this report format, and get a new report of that type at a later time merely by selecting that saved report format.

Reports of the previous turn’s insurgent activity should reflect a battalion or brigade S2’s weekly assessment, to include number of attacks by target, type/method, area, and time; current estimated insurgent composition, disposition, strength, and enemy leader locations (if known). The minimum useful time scale for an assessment report is one game turn.

Any messages about specific insurgent activity must be plausible indicators of specific insurgent activity (e.g. local tips or discovered weapons caches) using standard SALUTE report format. These messages will be supporting detail for the S2 assessment of insurgent activity, not the simulation’s primary indicators of insurgent activity.

Blue unit status reports should include location, mission, and relevant status information.

Financial status views should show the current status in a tabular report format. This report must separate the expenditures and dollars by organization responsible (BDE/BN/PRT). Objective: Include estimates of fraud and contractor efficiency.

The simulation must provide and export trend graphs. These graphs will include at least support to government/government legitimacy numbers, each type of area variable modeled by the simulation, US forces present, host nation forces present, insurgent strength present, and SIGACTs per turn. These graphs must be generated per area, for the entire AO, and averages for user specified groups of simulation areas. The force strength graphs should only be available to the appropriate side and the instructor. Export all trend graphs to standard graphical formats (such as jpg, png, or PowerPoint files). The raw data used to create these trend graphs should be exported to a documented comma separated value (csv) and/or XML format file.

Provide an interface allowing instructors to configure which categories of information and levels of detail are available to students in the reports the sim generates.

Provide a report that delivers all information for white cell use, labeled as such, and only accessible on a workstation with instructor/host privileges.

**Leader Interactions:**

Leader meetings must be assigned a purpose and an asset (player controlled leader) to meet with the leader of any group or area. All player controlled leaders available for meetings should appear on a single user interface page, along with a means to select the person to meet with and purpose of the meeting. These purposes must include: influence (attempting to increase that leader’s organization’s friendliness or support, but any effects will be delayed); reconcile (attempt to stop a trend of decreasing support by the leader’s organization); evaluate (attempting to determine if the leader supports insurgents or the host nation government, and how influential that leader is); gain info (attempt to find out what the leader and his people want); and leader training (which may improve some leader attributes, but risks alienating the leader).
All leader interactions must generate reports including the topics raised during the meeting, an estimate of the leader’s support to the government and to anti-government factions, the estimated status of the local leader’s trust/relationship with the leader assigned to meet with him, and any changes that resulted from the meeting. Faction leaders asked for information should provide a report of at least one of their factions’ important needs or desires in the event of a successful meeting. The leader meeting results must be editable so that instructors can insert more detailed meeting reports to drive specific plots or training objectives. Each leader must have a scenario author specified level of effectiveness in meeting with other leaders. Insurgent leaders must be able to meet with other faction leaders to influence, coerce, or threaten them. All leaders must display a short block of descriptive text (provided by the scenario author) when selected. The simulation must display and export (as with trend graphs) a social relationship graph displaying the relationships between different leaders, sides, and populations, and whether each relationship is friendly or hostile. Each organization with a leader must have a line of succession in case that leader is captured or assassinated. The sim should randomly generate leaders at the bottom of this list of succession after each capture or assassination. The randomly generated leaders should average somewhat less competent than the leaders they are replacing.

The minimum simulation capability must provide information and input capabilities to the training audience/student sufficient to perform MDMP, RDSP, Targeting Meetings, and Mission Command activities along all seven Lines of Effort. Enclosure 1, Detailed Specifications, provides a detailed description list of tasks required to replicate WFF and conduct scenario development and exercise control capabilities for this Use Case.

The system must be low overhead. Overhead manifests in three primary areas: operator training, hardware requirements, and ease of use. [For a detailed discussion of the sources of overhead in an educational context, refer to Live/Virtual/Constructive (LVC) capability in the Institutional Environment (Jeff Leser, 2006) or “A Battle in Every Classroom” (Jeff Leser & James Sterrett), Chapter 8 of Huntemann & Payne, Joystick Soldiers, (Routledge, 2010). Further references available on request.]

Hardware requirements are driven by typical classroom computers. The standard would be an ‘ever present’ persistent capability of these simulations in all classrooms. There are an estimated 40,000 computers in “CRXXI” classrooms, typically older low-end machines such as a Dell Optiplex 760 running Windows Vista or Windows 7; see Enclosure 2, Hardware Specifications, for detailed discussion and specifications. Ideally, all such classrooms would be equipped to the current Classroom XXI standard; but this is not reality. In times of large budgets, these computers were on a 5-year replacement at best; smaller budgets put even this in doubt.

Operator training for any given classroom event must not take more than 10% of the time intended for the classroom event and ideally will take far less. As a metric,
operator training for the most detailed classroom simulation must require no more than 4 hours; host/white cell operator training will require no more than 12 hours. Ideal times are 2 and 6 hours or less, respectively.

Ease of use differs from training time in that it addresses the ability of trained operators to rapidly understand the situation in the simulation and input new orders into the simulation. Part of this stems from the user interface, whose design must minimize the number of mouseclicks and keypresses to perform tasks, organize workflows in logical and consistent ways, and use automation such as typedown searches to streamline selections and access to information. Equally, however, the simulation design must control the level of detail, which must be set to that which is necessary to drive the desired training dilemmas, and no more. This is achieved through using a design for effect approach instead of a design for cause approach. Thus, abstraction of events outside the scope of the training audience is necessary and desired. For example: Units can be assigned to areas to interact with friendly and enemy units, assets, and groups, instead of detailed tracking of subunits’ missions and their locations. Design for effect is easiest to perform when a simulation is designed for a specific echelon and student audience.

There is no need for a detailed combat model, let alone a ranged direct fire model. The terrain model should be area-based and does not need elevation data or line of sight. Terrain types should be defined by the scenario author in terms of mobility, concealment, and a short descriptive text (~25 characters).

This is not a predictive simulation. It is intended to produce generally plausible outcomes whose dilemmas will drive student learning.

**Standalone and Networked Operation:** Students must be able to operate simulation from one stand-alone computer; or simulation can be networked on NIPR classroom computers to include at least intra- and inter-classroom, and ideally inter-installation, configurations. The simulation will require a Certificate of Networthiness (CoN), or equivalent security accreditation acceptable to all NECs to permit unrestricted networked operation on NIPRNet computers. Simulation system must be able to operate in various classroom configurations. Simulation must provide CPOF with a common operating picture; other mission command systems are acceptable.

Training site may be a classroom or an external site, using computers on a closed exercise network or on the NIPRNet in multiplayer mode. See Enclosure 4, Network Diagrams.

Routing Schema
**AAR:** The capability must incorporate a playback AAR function: able to move at will to any gameturn or pause point, and, at that point in time, show Red and Blue orders, units states, and active injects; the Blue picture, the Red picture, or a see-all picture; the reports that were generated in the block of time prior to the turn or pause point. The AAR will represent all Warfighting Functions, units, and assets at the simulation’s level of fidelity. Objective: The simulation can restart active play with new student orders from the AAR.

**Classification:** The simulation itself must be useable by foreign students at Army institutions and thus must not contain any NOFORN or above data. When required by educational goals and with appropriate external safeguards, individual scenarios may be created that contain classified (US Secret) data, but this must not contaminate or preclude other uses of the simulation. The simulation is not expected to operate in a mixed-classification mode. Objective: The simulation can be issued to all students at Army institutions, including other service, other agency, and international students, for unrestricted home use.

**MCS Feed:** The minimum MCS systems requirement is to provide a direct-feed COP to Command Post of the Future; feeding other systems is acceptable but must not be required for the system to function – for example, neither FBCB2 for a lower feed nor GCCS-A for a higher feed nor a PASS can be required. It is perfectly acceptable to send simulation battle results to CPoF via databridge as XML overlays. Ideally, the simulation will import overlays from these systems as well; in a perfect world, the MCS system is the interface to the simulation. See Enclosure 3, Sample Reports, and attached CD for sample XML and report files. *(Need sample SASO reports from faculty)*

Data communications requirements do not specify an identical data model for the simulation and current MCS systems. The capability’s internal communications are immaterial; though at a minimum the simulation must be capable of exporting an XML document capable for use in Command Post of the Future systems.

**Training Audience:** Training Audience (TA) comprised of students at Army schools and Centers of Excellence, Captain’s Career Course Core, Command and General Staff College (CAC LD&E). In this environment the students may represent the Commander,
Assistant Commander/Executive Officer, Chief of Staff, Command Sergeant Major, and Coordinating Staff (such as Intelligence Officer, Operations Officer, Logistics Officer, Civil-Military Operations Officer, and Communications-Electronics Officer) and Special Staff (such as Fires Coordination, Engineer Coordination, Aviation Coordination, Air Liaison), Allied staff, or Other Agency personnel as directed by the instructor.

Simulation use may be multiplayer and multifaction, with widely varying ratios of students on each side; in addition, use may be multiplayer US with other factions under computer control, or single-player US with other factions under computer control. In all cases, competitive play between factions is required. Computer control of factions can be largely driven by setting parameters for goals, with dynamic allocation of assets to react to unpredictable student plans.

Note that the number of sides in the simulation must be flexible, and the affiliation of units and assets must likewise be flexible, in order to enable scenarios in which students are faced with multiple competing hostile groups which can be neutralized or co-opted short of their destruction, and multiple friendly groups who can be alienated.

If MCS system(s) are used, operators will be designated as directed by instructor/POI.

The simulation operator may be a student, an instructor, or a member of the institutional staff.

Simulation networking inside a given classroom, if any, will be serviced by a separate individual (may be same individual identified above).

Simulation networking outside a given classroom, if any, will be serviced by a member of the institutional staff as applicable.

MCS systems networking, if any, will be serviced by a member of the institutional staff as applicable.

Pre-conditions:

Training site is identified and established.

Host hardware (Simulation and MCS as applicable) networked to enable information delivery to the students.

Simulation application software installed to a single hardware platform (server).

A server is defined as a classroom computer used for the purpose, with the capabilities as defined above.

Communications established: simulation internal, simulation to MCS, and MCS internal.

Student operators trained to execute their tasks in the exercise in 4 hours or less.

The scenario is built and STARTEX conditions set.

Event Execution: Students use simulation user interfaces to interact with the scenario. Effects/outcomes of modeled interactions or POI/tutorial messages are returned to the students via simulation.

Role-players are normally not employed.
**Post-conditions:** Training objectives met or available training time elapses.

As applicable simulation software check-pointed, paused, reset, shut down, uninstalled or otherwise managed.

Proper handling of all classified data, documentation, and storage media.

Training site returned to pre-training condition.

**Non-functional Requirements:**

Simulation application operates on a single computer as defined above, managed by a single individual with no simulation, gaming, or IMI software technical skills other than that provided by the simulation-specific training.

Simulation system set up will take no more than one (1) hour (minus communication network setup) to install and configure the software, and load scenario data, in a classroom of 20 computers. Installation must not require reimaging the classroom computers: must not make core changes to the operating system, and must be able to install, uninstall, and reinstall in accordance with the requirements of the local DOIM.

The simulation will take no more than 10 minutes to start, configure, and link into a networked exercise for a classroom of 20 computers.

Post training recovery (all systems and networks) to take no longer than two (2) hours for an unclassified event or four (4) hours for a classified event.

**Other Requirements:**

Simulation scenario build times (including creating the terrain, environment, and assets; creating combatant & noncombatant groups and sides and their relationships, initial deployments, input of planned injects, creation or import of operational graphics, and configuring the simulation for MCS feed):

Brigade/battalion scenarios to be built in not more than ten (10) man days, including creation of the map from baseline NGA products. Due to the complexity of defining asset capabilities and relationships, a scenario editor carefully designed to be powerful, flexible, and easy to use is necessary. Due to the shifting complexities needed in scenarios, the simulation should hard-code as few parameters as possible in order to expose them to the scenario author for alteration, and must completely and thoroughly document all such exposed parameters and their use/impact in the simulation.

Map creation includes georeferencing all map data, and defining geographical areas.

Scenarios and AAR products must be savable for reuse.

The simulation must ship with complete standalone tutorials that will train a person new to the simulation into an operator capable of effective operation as a brigade-level puckster in a Stability Operations exercise – ready for the exercise rehearsal - inside of 4 hours; and a user manual with complete description of all simulation capabilities. The tutorials must require the student to perform the actions being taught: thus both read-and-puck-along or a fully interactive overlay are acceptable, but movies and other forms of hands-off demonstrations are not. The
simulation should include embedded help along the lines of standard Microsoft Office embedded help systems.

**Measure of Performance: Threshold**

**Low-Overhead:**
- Able to train simulations operators in under 4 hours
- Able to train "White Cell" (simulation administrators) personnel in under 12 hours
- Pace of exercise driven by instructor not the simulation; capable of faster than real time (1 week of simulation time in 10 minutes of real time)
- Each specialist simulation support person able to support at least 8 simultaneous, independent exercises each run primarily by student operators and student Host/White Cell
- All actions are adjudicated by the Simulation capability; no "White Cell" is required to create results; White Cell retains ability to alter simulation at any pause point

**Student-Centered:**
- Student's plan is the primary input to the simulation
- Units execute tasks to standard: success/failure determined by student planning

**Training Relevance and Ease:**
- Instructor can alter course of the exercise
- Runs on computers as defined above
- Outputs easily presented as reports relevant to training audience

**Measure of Performance: Objective** (As stated above, except as follows:)

**Low-Overhead:**
- Able to train operators in under 2 hours
- Able to training "White Cell" personnel in under 6 hours
- Each specialist simulation support person able to support at least 16 simultaneous, independent exercises each run primarily by student operators and student Host/White Cell