Sides and Forces in the OneSAF Objective System

Susan A. Gugel
SAIC
Orlando, FL
Susan.A.Gugel@saic.com

Gregory S. Miller
Alion
Fort Monroe, VA
millerg2@monroe.army.mil

ABSTRACT

Over the past few decades the world has changed, no longer is it dominated by two world powers. Today's conflicts and wars involve many different sides and forces, where several sides and their affiliated forces may agree on the enemy but cannot agree on how they view other sides. Regularly, new events occur and new information is available, that cause relationships between these sides to change. Our experience in Afghanistan shows how quickly these views can change. These changes impact the soldier; he must learn to determine who is the enemy and who is a friend by more than the type of tank that he or she sees through their sensors. To support training and analysis, simulations such as the OneSAF Objective System (OOS) must support multiple-sided engagements with changing relationships across the full range of military operations. This paper outlines the OOS approach starting with definitions for sides, forces, and relationships. The sides and forces are used by models as well as presented to the user both for viewing and modification through tools. The OOS approach utilizes MIL-STD-2525B (DISA, 1999), which is designed to display tactical symbols and graphics to US soldiers, to display the symbols and graphics to trainees and roleplayers on the US side, showing who is hostile, friendly, etc. To provide a user-friendly display for non-US side roleplayers, the presentation may need to reflect the view of the "enemy" roleplayer's side. In addition, different presentations are needed to support observers evaluating the training exercise or human-in-the-loop experiments. To this end, this paper outlines how OOS utilizes and enhances MIL-STD-2525B to provide the presentation of sides and forces necessary to support training and experimentation.

ABOUT THE AUTHORS

SUSAN A. GUGEL has over nine years of experience in virtual entity simulations utilizing Computer Generated Forces as a Senior Software Engineer at SAIC. Over this period, Ms. Gugel has supported modeling and simulation projects such as the Close Combat Tactical Trainer (CCTT) program, the United Kingdom Combined Arms Tactical Trainer (UKCATT) program, and the OneSAF Objective System (OOS) program. In addition, Ms. Gugel has supported research programs such as Semi-Automated Behavior Generation System (SBGS) and Non-traditional Human Behavior Models (NHBM). Throughout these programs, Ms. Gugel has specialized in various areas including behavior models, tools, and architectures. Ms. Gugel received her Master of Science in Computer Science from the University of Central Florida in 1993.

GREGORY S. MILLER is a Senior Engineer with Alion and provides engineering and technical support to the Training and Doctrine Command Program Office OneSAF since 1998. His experiences in each Military and Simulation Domain include leading the Early Entry Battle Lab's study efforts "Early Entry Brigade Study (2K Study)" that won the 1994 Wilber B. Payne Award for Best Analysis in the Army and the "10K Study" which both served as the analytical foundation for the development of the Interim Brigade Combat Team (Stryker Brigade Combat Team) (Advanced Concepts and Requirements Domain), developing the System Evaluation Planning for the Land Warrior Program (Research, Development, and Acquisition Domain), and as a planner and participant in battalion and brigade level command and staff training simulation exercises and as a leader of cells for division and corps Warfighter (Training, Exercise and Military Operations Domain). He holds a B.S. from the United States Military Academy, West Point, NY and a M.S. in Operation Research System Analysis from the Air Force Institute of Technology, Wright-Patterson Air Force Base.

Sides and Forces in the OneSAF Objective System

Susan A. Gugel
SAIC
Orlando, FL
Susan.A.Gugel@saic.com

Gregory S. Miller
Alion
Fort Monroe, VA
millerg2@monroe.army.mil

PURPOSE

Recent experiences show that relationship between sides, membership to a side, and view of other sides can and do change as operations move through the pre-, during and post-operation phases. For example, urban residence (pre-operation) may become refugees and/or vigilante forces (during or post operations) and may view Coalition Forces as friendly/neutral/hostile depending on how they are treated during those phases of the operation. For example in the Balkan Area of Responsibility, there are eleven sides:

- Side 1: Coalition Forces (including US and Allies, Conventional and Special Operation Forces)
- Side 2: Urban residence
- Side 3: Refugees
- Side 4: Conventional Units (comprised of professional soldiers from the State), State Sponsored Terrorists, Militia Units (led by professional officers and non-commissioned officers), and State Special Operation Forces
- Side 5: Para-Military (including criminal, nationalistic, and urban residence that fear them)
- Side 6: Criminal forces (who are true survivors that are always hostile and self-serving)
- Side 7: External Forces
- Side 8: Interior Special Police Units
- Side 9: Territorial Border Guard Units
- Side 10: Non-Governmental Organizations
- Side 11: Vigilante Forces (that protect their urban turf and whose hostility is based on how they are treated)

The complexity of sides and forces and a need for disciplined approach to handle it can be seen in the above example. In order to train today's soldier, simulations such as OneSAF Objective System (OOS) must be able to model the ever-changing battlefield.

This paper outlines the OOS approach to multiple sides and forces. First, the paper utilizes real world terms such as affiliations and allegiance to reinforce the definition of sides and forces and then uses these definitions to describe the OOS design and presentation approaches. The interpretation and use of MIL-STD-2525B symbology is utilized to ensure consistency and usability of the OneSAF tools.

DEFINITIONS

In the real world, sides are defined in the pre-operation phase. All members of the force understand who the opposing forces, friendly forces, and neutral forces are as well as those that are undecided. In the real world, a side contains "*states*" or "*organizations*" where a "*state*" could be the United States or United Kingdom and an "*organization*" could be the Red Cross. Each "*state*" or "*organization*" has an affiliation with a "*side*". When you "*affiliate*", you commit to join a "*side*" and accept and abide by the view or relationship that side has of the other sides. A *force*, on the other hand, has an allegiance to a "*state*" or "*organization*" and fights or acts on its behalf. An example of a force is the US Army. As a result, the *force* is an *affiliate* to a *side*. Again, in real life, the "*politicians*" control the affiliation of their "*state*" or "*organization*".
Although these statements are clear, there is often confusion with the term affiliation and what a faction is in the real world model. Webster's Dictionary defines affiliation as "to connect or associate oneself". This can then be interpreted in the following two ways:

- Affiliation defines who I fight with (what side I belong to)
- Affiliation defines who I fight against (how I view others)

Webster's Dictionary defines *faction* as "a party or group (as within a government) that is often contentious or self-seeking". This can be interpreted to mean elements of a force, a force itself, or set of forces. To clarify the OOS approach, side, force, relationship, structure, unknown, suspect, affiliation, and faction are defined in the following paragraphs. In several cases, examples of the definition are provided to help relay the definition.

Sides: A side can contain other sides, forces, and/or units and entities that share the same view (such as hostile, neutral or friendly) of other sides not on their side and force structure; the members of a side all interact with other sides with respect to this view (i.e. all members of the side will not fire at sides denoted as friendly).

Forces: A force can consist of units, entities, and forces. The units and entities have specific equipment and doctrine. However, neither the equipment nor the doctrine must be unique to the force.

A force belongs to one and only one side at a particular moment and inherits the side's view of other sides.

Structure: A structure is defined as a view of what side units and forces belong. Structure is used to refer to the interpretation of affiliation that is the view of what side a unit belongs to. An example of a side and force structure is shown in Figure 1 where one side is defined, NATO. This side has two forces reporting directly to it. One of these forces, Force 1, has subordinate forces beneath it, Force 3 and Force 4. Forces 2, 3, and 4 all have subordinate units. These units in turn have subordinate units and entities not shown in the figure.

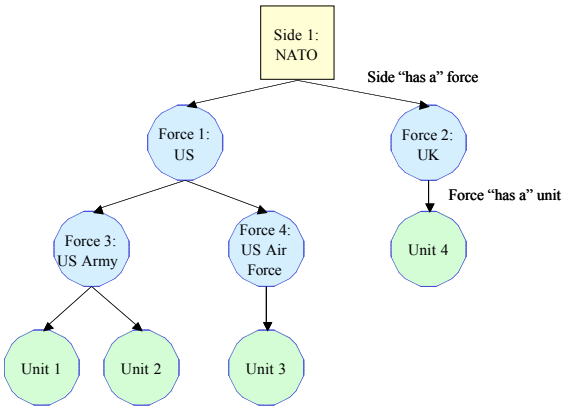

Figure 1: Side and Force Structure Example

Relationship: A relationship is defined as how one-side views another side. A side can view another side in one of four ways: hostile, friendly, neutral, or suspect. Relationship is used to refer to the interpretation of affiliation that is applied to the forces of that side. An example of how one side views other sides is shown in
Figure 2. This shows that Side 1 views Side 2 and 4 as friendly while it views Side 3 as hostile and Side 5 as Neutral.

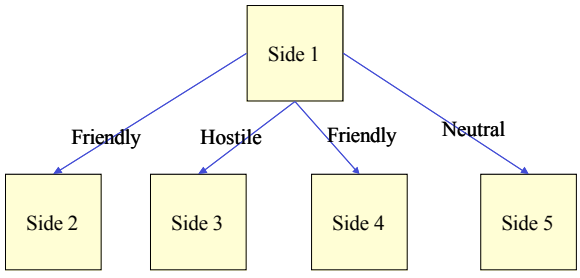

Figure 2: One Side Relationships Example

Each and every side has a corresponding relationship with every other side. A complete example of this can be seen in Table 1. Note that two sides can view each other differently. For example, in Table 1, Side 4 views Side 3 as Hostile while Side 3 views Side 4 as Neutral.

Table 1: All Sides Relationships Example

From /To	Side 1	Side 2	Side 3	Side 4
Side 1	Friendly	Friendly	Hostile	Friendly
Side 2	Friendly	Friendly	Neutral	Friendly
Side 3	Hostile	Hostile	Friendly	Neutral
Side 4	Friendly	Hostile	Hostile	Friendly

Suspect: From MIL-STD-2525B, "a track which is potentially hostile because of its characteristics, behavior, origin, or nationality (MIL-STD-6016)".

Track: From MIL-STD-2525B, "a battlespace entity on the battlefield."

Unknown: From MIL-STD-2525B, "an evaluated track which has not been identified (MIL-STD-6016)."

Affiliation: From MIL-STD-2525B, "affiliation refers to the threat posed by the warfighter object being represented. (MIL-STD-2525B)." Where possible, the terms structure and relationship should be used instead for clarity.

Faction: A faction often refers to a force/partial force that is loyal to the overall objectives of a side but does not necessarily share its doctrine, execution methods, or all the side's views on affiliations. The terms force and side will be used instead of faction for clarity.

OOS SIDES AND FORCES APPROACH

The sides and forces approach includes the sides and forces software services and its presentation in the OOS tools. During both planning and execution, the OOS system provides the capability to:

- Create and remove sides
- Modify the relationships between sides
- Create and remove forces under sides
- Create units under sides or forces
- Change the side a unit or force belongs
- Create at least 25 sides

Details of both the implementation and presentation approaches are contained in the sections.

OOS Implementation Approach

The OOS underlying services provide objects, sides, forces, unit, and entities. These objects include the attributes associated with each as well as the overall side and force structure. The objects provide the ability for the operator and other underlying services the ability to modify both the side and force structure and relationships. The services provide no restrictions

on the number of sides and forces that can be created. The services also provide notification when the structure or relationships change to allow underlying models and user interface to be updated.

OOS Presentation Approach

To support the underlying sides and forces services, OOS tools provide the capability to create, delete, modify and view the forces, sides, relationships and structure. In addition, the tools support the ability for the user to assign units and entities to forces and sides. Sides and forces are modified both during planning where the sides, forces, structure, and relationships are defined within a military or simulation scenario and also during simulation execution where modifications are injected directly into the ongoing run-time simulation database. The following sections detail the actions that the user performs to configure the sides and forces information through the OOS lifecycle phases. For more information on the OOS lifecycle phases refer to A Product Line Approach for a New Generation CGF (Courtemanche, 2002).

Event Planning Phase
During the Event Planning phase, the user can define the entities, units, behaviors, terrain, sides, forces, structure and relationships through the Military Scenario Development Environment (MSDE) OOS tool. To develop the sides and force information, the user can create, delete, modify and view both sides and forces. This includes modifying the relationship between sides and the force and side structure itself. The resulting information is stored within the saved military scenario

Once the forces and sides are defined for the scenario, the user can create instances of units and entities by selecting a unit or entity from the available MSDE list and placing the entity or unit on the Plan View Display (PVD). Each unit and entity will be associated with one of the sides already defined along with other instance attributes such as name, location, and orientation. Once all the entities, units, and control measures are created, they will appear on the PVD.

The actual sides, forces, units, entities, and control measures to which the scenario developer has access depend on the current privileges and settings for the user. The privileges and settings restrict the view of the battlefield to only those symbols that the scenario developer should have knowledge. In addition, to support the needs of different scenario development requirements (e.g., training and experimentation); the scenario developers will have the ability to place icons for units and entities that have no associated models. These icons can be used to show expected enemy locations.

Model Composition Phase
During the Model Composition Phase, the Model Composer creates new entities, units, and behavior compositions using the OOS Entity Composer, Unit Composer, and Behavior Composer tools. Entity compositions include information about the physical models that are used to simulate the entity such as a M1A1 tank. Unit compositions define units and include information about the subordinate units and/or entities and their role within the unit. Behavior compositions include the subtasks that a unit or entity can perform to accomplish a task. In Modeling in OneSAF (Henderson, 2002), the details about modeling in OOS are described. When creating an entity, unit, or behavior composition the user will have the ability to optionally provide side and force information.

When other compositions are developed that use existing compositions, the force information for a composition can be used to aid the user through the use of *composition rules*. Composition rules allow the Model Composer to enter the criteria that the composition building blocks and referenced compositions need to have before these elements are added to the entity, unit or behavior composition. Example composition rules settings include:

- Selecting a specific fidelity level such as low or high (*Fidelity Level*),
- Selecting whether to use only validated compositions and building blocks (*Validated Models Only*),
- Selecting a specific version of the composition (*Specified Version*), and/or
- Selecting whether to use only compositions and building blocks of the same or generic sides and forces (*Use Only Own Forces*)

These rules help provide guidance to the Model Composer. The user is notified when they select to add a composition or building block to the current composition that does not meet these rules. As part of this notification, the user is given the option to cancel the addition or to continue. For example, a user is developing a new unit. The user wants the unit to contain only BLUFOR entities and also only entities whose physical models have a medium fidelity. The user starts the OOS Unit Composer and sets the composition rules so that the *Fidelity Level* is medium and the *Use Only Own Forces* is true. The user now starts building the unit. The first attribute to edit is to set the force of the unit to BLUFOR. Then the user starts building the unit by dragging a high fidelity BLUFOR entity to the unit tree. The Unit Composer will display a warning message notifying the user that

the select building block, the entity, does not meet the current composition rules settings. The window will provide the user the ability to cancel the operation or to continue. The user cancels the operation and then selects a BLUFOR entity whose physical models are all of medium fidelity. The new entity will then appear within the unit tree. At any time, the user can change or disable the composition rules settings.

These rules allow the user to optionally filter lists of compositions and building blocks to reduce list sizes to only entries that they are looking for. The user can disable composition rules as desired so units with different fidelity levels, forces, version and validation levels can be built.

Scenario Generation Phase

During the Scenario Generation phase, the scenario developer can define the entities, units, behaviors, terrain, sides, forces, structure and relationships in one of two ways. First, the user can import the information from an existing military scenario created through the MSDE. If the user imports a military scenario, SSDE will add the side and force structure and relationship to the simulation scenario. Once complete, SSDE will also add the entity and unit information to the simulation scenario. This second step requires user intervention to ensure that the mapping between MSDE entities and units and OOS specific entity and unit compositions is accurate. In cases where no mapping can be found, SSDE will allow the user to invoke the Unit or Entity Composer and automatically populate the new unit or entity composition with the information provided by MSDE. The user will then need to complete the composition. Once the composition is completed, it will be automatically available to SSDE.

Second, the user can create a new simulation scenario or modify an existing simulation scenario directly through SSDE without importing a military scenario. Through SSDE, the user can create, delete, modify and view sides and forces. This includes modifying the relationship between sides and the force and side structure itself.

Once the forces and sides are defined for the scenario, the user can create instances of units and entities by selecting a unit or entity composition and placing the entity or unit on the PVD. Each unit and entity will be associated with one of the sides and forces already defined. If the force information within the unit or entity composition is not one of the forces defined for the scenario the user will be prompted to enter their force information along with other instance attributes such as name, location, and orientation. On the other hand, if the force of the unit or entity is being used within the scenario the user still has the ability to change the force of the unit or entity being added. The predefinition of force at the composition level is designed to help reduce user workload as much as possible. Once all the entities, units, and control measures are created, they will appear on the PVD.

The actual sides, forces, units, entities, and control measures that the scenario developer has access to depend on the current privileges and settings for the user. The privileges and settings restrict the view of the battlefield to only those symbols that the scenario developer should have knowledge of. In addition, to support the development of scenarios, the scenario developer will have the ability to place icons for units and entities that have no associated models. For example, to show expected enemy locations.

The next step involves entering information about the simulation setup including which System Composition and corresponding Software Application Compositions to use. This step-up includes entering the number of instances of each of the Software Application Compositions desired. (For Example, the user may specify the user of two Simulation Cores and two Simulation Controller applications.) Each Software Application Composition that contains a Management and Control Tool also has associated with it a subset of sides, forces, units, and entities that are to be controlled by that Management and Control Tool instance. Finally, the setup will include marking the side that contains the “US force”. This information will by used during the Simulation Execution phase by the Management and Control Tool to correctly display the entities and units on each workstation in accordance with the privileges provided to the user at the workstation.

Whether the user starts planning within the SSDE or imports a military scenario into the SSDE, all of the information can be further modified using SSDE. Once the planning is complete, the user saves the scenario and runs various tasks to check for consistency. During this activity, any required attributes that are not complete will be displayed so that the user can enter the data and ensure that the simulation scenario provides all of the information needed by the simulation to run successfully.

Simulation Execution Phase

During the Simulation Execution phase, simulation services reads the simulation scenario and simulation objects are created and distributed through the Simulation Object Runtime Database (SORD) including objects for the sides, forces, unit and entities as well as associations between them

The Management and Control Tool uses interest management to express interest in units based on their

side for display purposes. By using interest management, the workstation has access to every simulated entity and unit to check its side to determine if the information should be displayed. In addition, the tool will register for interest in any change to the sides, forces, relationships, and structure.

As the simulation progresses, the Simulation Controller has the capability to change the side and force information through the Management and Control Tool. The user will be able to change the side or force that a unit or entity is associated with. When a unit or entity changes force or side their superior unit or subordinates do not have to change to that force or side. In cases where the superior or subordinates do not change force or side then the superior/subordinate relationships will be set to none to reflect the change in task organization. In addition, the force and side attributes for the unit or entity will be updated to reflect the new force or side. The ability to change a unit or entity's force or side will also be available for behavior models to support specific behaviors/orders that support defection. These behaviors access the same services as Management and Control Tool to effect these changes.

OOS Sides and Forces Presentation Approach

The previous section described how the user entered and maintained the side, force, relationship and structure information. This section now describes how various OOS tools use the side and force information to display units and entities to the user.

Plan View Display (PVD) Presentation Approach

During several lifecycle phases, information about units and entities is displayed through a two dimensional map or PVD. Several tools utilize PVDs to relay information to the user including MSDE, SSDE, and Management and Control Tool. The PVD displays units, entities, and control measures using MIL-STD-2525B symbology in the form of icons. MIL-STD-2525B outlines not only an icon's picture but also the shape and color. The standard was designed for used by C4I devices to display battlefield information. As such, the standard is oriented around displaying items with respect to a US view of the battlefield. In this view, the color and shape of icons are based on the threat posed, to the US, by the entity or unit icon. In the standard, all icons that are hostile or suspect to the US are red, icons that are friendly are blue, icons that are unknown are yellow, and those that are neutral are green. For OOS, the actual colors used for each threat posed will default to the MIL-STD-2525B colors but based on user privilege, Presentation Side Control Privilege, the colors and presentation can be modified. The ability to change the presentation and colors allows observers to represent suspect and hostile as different colors to provide additional insight into the battlefield and interactions between entities.

For OOS, the PVD will support three options for the presentation of the icons as part of the Presentation Side Mode User Preference: US-centric, side-centric, or user-defined. The ability to change the default selection of the US-centric options will be controlled by the Presentation Side Control Privilege that is set for each user through the System Account Tool. The actual selection of the display option will be saved as part of a user's preferences. These options don't control which icons are visible only what color and shape the icons are displayed in. Using the US-centric option when the workstation's side is set to the US side (default mode), all icon shape and colors will be set in the following manner:

- If the US views a side as hostile then all icons associated with the side will be red
- If the US views a side as suspect then all icons associated with the side will be red
- If the US views a side as friendly then all icons associated with the side will be blue
- If the US views a side as neutral then all icons associated with the side will be green
- If the US does not know the side that the icons is associated with, then that icons will be will be yellow (for unknown)

By default, the PVD will display MIL-STD-2525B symbology using this option. The operator selects the side that represents the US force when the scenario is developed. Using this option, all workstations, even those whose users are role-playing a side or a force hostile to the US, will view the icons with respect to a US centric point of view. This is similar to the approach of many current simulations that always show the US forces as blue and opposing forces as red.

In the second option, the operator will have the ability to switch their view so that the icon shapes and colors are shown with respect to the workstation's side specified as part of the Presentation Side User Preference. This option is provided to allow the roleplayer to view the units and entities in accordance with the relationships that have been defined between their side and all other sides. The view provides more information to enable them to make quick decisions based on the map display. Using the side-centric option, all icon shapes and colors will be set in the following manner:

- If the selected workstation's side views a side as hostile then all icons associated with the side will be red
- If the selected workstation's side views a side as suspect then all icons associated with the side will be red

- If the selected workstation's side views a side as friendly then all icons associated with the side will be blue
- If the selected workstation's side views a side as neutral then all icons associated with the side will be green
- If the selected workstation's side does not know the side that the icons is associated with, then that icons will be will be yellow (for unknown)

In the third option, user-defined, the user will have the ability to assign a color to each side to be able to visually distinguish them by setting the Side Colors User Preference. This option is provided to allow role-players and observers more insight into the operations of separate forces of all sides. In this case, the shape of the icon will be presented using a US centric point of view.

Management and Control Tool Presentation Approach

Once a simulation scenario has been developed and the simulation configured using the Simulation Configuration Tool, the user can start the Management and Control Tool. Within this tool the user starts the simulation with the selected scenario. Once the simulation is started, the tool allows the user the ability to view entities, units, forces, and sides. The extent of the forces, sides, units and entities displayed is based on the user privileges and preference settings.

If the user has only the privilege (or has set their user preference) to see a *subset of own side* and to only view the sensed or *perceived world*, then only entities of their own side, "assigned" to their workstation will appear in the list of sides, forces, units, and entities that can be manipulated. These same units and entities will be visible on the PVD along with any entities and units that have been sensed including other entities and units of their own side. The sensed entities will appear as unknown until their side can be determined by the sensing entities. Once the side is determined then the icon will change to the appropriate color based on the relationship settings.

There are two user privileges (Side View Control Privilege and Perception View Control Privilege) and their accompanying user preferences (Side View User Preference and Perception View User Preference). If the user has the Side View Control Privilege then they can alter the Side View User Preference to modify which sides and forces can be viewed. If the user does not have the ability to set the Side View Control Privilege then the associated user preference is set to Subset of Own Side. The second user privilege, Perception View Privilege, allows the user to change the Perception View User Preference, which specifies the level of perception of the battlefield. If the user does not have the ability to set the Perception View User Preference then the preference is set to Perceived World. The actual sides, forces, units, and entities associated with the workstation that the tool is running on are set as part of the simulation scenario. The various options and settings result in different entities and units being visible. The combinations of the two preference settings are outlined in Table 2.

If the user has only the privilege (or has set their user preference) to see a *subset of own side* and to view the *game truth*, then only entities of their own side, "assigned" to the workstation will appear in the list of sides, forces, units, and entities that can be manipulated. These same units and entities will be visible on the PVD along with any entities and units that have been sensed including other entities and units of their own side. The main difference between this case and the previous case is that the relationship will always be known so icons will only appear as red, blue, or green according to the side's relationship to other sides.

If the user has the preferences set to see their *own side* and to only view the sensed or *perceived world*, then only entities of their own side will appear in the list of sides, forces, units, and entities that can be manipulated. These same units and entities will be visible on the PVD along with any entities and units that have been sensed. The sensed entities will appear as unknown until their side can be determined by the sensing entities. Once the side is determined, then the icon will change to the appropriate color based on the relationship settings.

If the user has the preference set to see their *own side* and to view the *game truth*, then only entities of their own side will appear in the list of sides, forces, units, and entities that can be manipulated. These same units and entities will be visible on the PVD along with any entities and units that have been sensed. The main difference between this case and the previous case is that the relationship will always be known so icons will only appear as red, blue, or green according to the side's relationship to other sides.

If the user has the preferences set to see *other sides* and to view the sensed or *perceived world*, the list of sides visible for manipulation will include those established for the workstation within the simulation scenario. This list may include some or all of the other sides as determined by the scenario developer. If the list of sides does not include all sides in the simulation then only entities of their own side and other sides in the access list will appear in the list of sides, forces, units, and entities that can be manipulated. These same units and entities will be visible on the PVD along with any

entities and units that have been sensed. The sensed entities will appear as unknown until their side can be determined by the sensing entities. Once the side is determined then the icon will change to the appropriate color.

If the user has the preference set to see *other sides* and to view the *game truth*, the list of sides visible for manipulation will include those established for the workstation within the simulation scenario. This list may include some or all of the other sides as determined by the scenario developer. If the list of sides does not include all sides in the simulation then only entities of their own side and other sides in the access list will appear in the list of sides, forces, units, and entities that can be manipulated. These same units and entities will be visible on the PVD along with any entities and units that have been sensed. The main difference between this case and the previous case is that the relationship will always be known so icons will only appear as red, blue, or green according to the side's relationship to other sides.

If the user has the preferences set to view all sides and to view either the *"real" world* or *perceived world*, the list of sides visible for manipulation will include all sides, forces, units, and entities from the simulation. In this case, the PVD will include all units and entities regardless of sensing capabilities and the relationship will always be known so icons will only appear as red, blue, or green. In this setting the Presentation Side User Preference will be used to determine the color and shape of each icon.

Summary of Privileges and Preferences for Presentation Approach

Throughout the various sections different privileges and preferences were outlined. This section provides a summary of those available. The Technical Manager can use the OOS System Account Tool to set the following privileges for a user (for sides and forces presentation):

- Presentation Side Control Privilege specifies if the user can change the Presentation Side Mode, Presentation Side, and Side Colors User Preferences.
- Side View Control Privilege specifies if the user can change the Side View User Preference.
- Perception View Control Privilege specifies if the user can change the Perception View User Preference.

Table 2: Presentation based on User Preference Settings

Side View User Preference	Perception View User Preference	Icons displayed	Unknown Categorization
Subset of Own Side	Perceived World	Units and Entities assigned to the specific workstation (a subset of a side) as well as any other entity or unit sensed by the assigned units and entities	Sensed entities and units will appear as "unknown" until their side (and thus the relationship) is determined
Subset of Own Side	Game Truth	Units and Entities assigned to the specific workstation (a subset of a side) as well as any other entity or unit sensed by the assigned units and entities	Sensed entities and units will appear according to the "own" side relationship to the side of the sensed entity or unit
Own Side	Perceived World	Units and Entities of the Own side as well as any entity or unit sensed by the Own side	Sensed entities and units will appear as "unknown" until their side (and thus the relationship) is determined
Own Side	Game Truth	Units and Entities of the Own side as well as any entity or unit sensed by the Own side	Sensed entities and units will appear according to the "own" side relationship to the side of the sensed entity or unit
Subset of All Sides	Perceived World	All units and entities that belong to one of the sides in the set of sides assigned to a workstation as well as any entity or unit sensed by the sides	Sensed entities and units will appear as "unknown" until their side (and thus the relationship) is determined
Subset of All Sides	Game Truth	All units and entities that belong to one of the sides in the set of sides assigned to a workstation as well as any entity or unit sensed by the sides	Sensed entities and units will appear according to the "own" side relationship to the side of the sensed entity or unit
All Sides	Perceived World	All units and entities	All units and entities will appear according to the relationship of the Presentation Side User Preference to the side of the entity or unit
All Sides	Game Truth	All units and entities	All units and entities will appear according to the relationship of the Presentation Side User Preference to the side of the entity or unit

Based on the privilege settings above, the user will have the ability to change the following preferences through the Preference Dialog:

- Presentation Side Mode can be set to US-Centric, Side-Centric, or User-Defined. This preference controls the display of the color and shape of MIL-STD-2525B symbols on the PVD.
- Presentation Side can be set to the name of the presentation side to use when the Side-Centric Mode is selected. The values will alter the color and shape of the MIL-STD-2525B icons displayed on the PVD.
- Side Colors allows the user to select colors to use for the display of each side when the User-Defined Presentation Side Mode is selected. The values will alter the color of the MIL-STD-2525B icons displayed on the PVD.
- Perception View can be set to Perceived World, or Game Truth. This value controls the display of the MIL-STD-2525B icons as unknown (which utilizes a specific shape and color).
- Side View can be set to Own Side, Subset of Own Side, Subset of All Sides, or All Sides.

The setting controls the sides, forces, units, and entities that can be controlled by the Management and Control Tool on this node. Note that the exact units and entities controlled and seen by a workstation in the Subset of Own Side node are set within the simulation scenario.

CONCLUSION

The modeling of sides, forces, structure, and relationships within OOS is strengthened by the various approaches to their presentation. The sides, forces, relationships, and structure approach allows for the modeling of complex, multi-sided environments such as Afghanistan. The presentation supports displaying sides and forces in a US centric, MIL-STD-2525B point of view for trainees but also provides the flexibility to change the display to support analyst, roleplayer, and observer/controller user tasks. In addition, the presentation is driven by both user privileges and user preferences to configure the OOS display to each individual user's needs. Together these features work to provide an adaptable, sides and forces approach to meet the simulation of today's conflicts.

REFERENCES

Defense Information Systems Agency (DISA) (1999). *Department of Defense Interface Standard: Common Warfighting Symbology* Retrieved August 28, 2003, from http://symbology.disa.mil/symbol/mil-std.htm

Henderson, C., & Rodriguez, A. (2002). Modeling in OneSAF. *Proceedings of the 11th Computer Generated Forces and Behavioral Representation Conference, Orlando, FL. May 7-9 2002*, pages 337-347.

Courtemanche, A., & Wittman, R. (2002). OneSAF: A Product Line Approach for a New Generation CGF. *Proceedings of the 11th Computer Generated Forces and Behavioral Representation Conference, Orlando, FL. May 7-9 2002*, pages 349-361.