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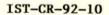
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#### MILITARY STANDARD (DRAFT)

EXERCISE CONTROL AND FEEDBACK REQUIREMENTS FOR DISTRIBUTED INTERACTIVE SIMULATION







Contract Number N61339-91-C-0091 STRICOM DMSO September 4, 1992

# Military Standard Draft

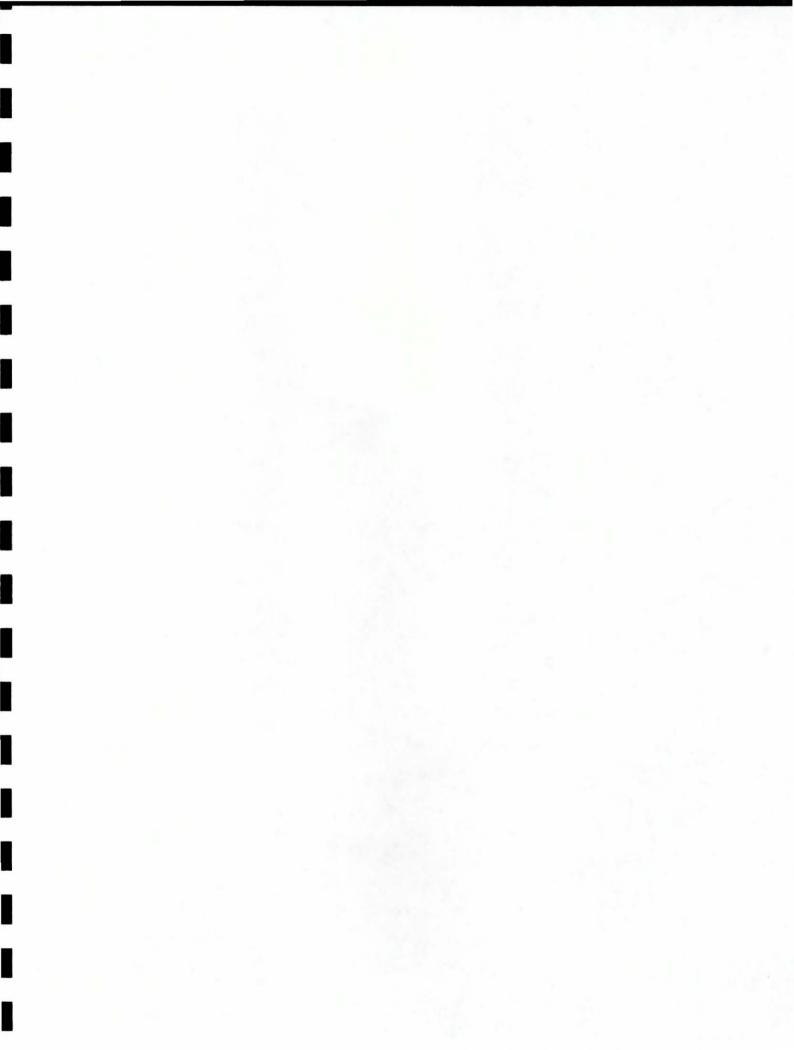
Exercise Control and Feedback Requirements for Distributed Interactive Simulation

iST

Institute for Simulation and Training 12424 Research Parkway, Suite 300 Orlando FL 32826

University of Central Florida Division of Sponsored Research

IST-CR-92-10



#### METRIC

WORKING DRAFT STANDARD 4 September 1992

#### **IEEE STANDARD**

#### EXERCISE CONTROL AND FEEDBACK REQUIREMENTS

### FOR DISTRIBUTED INTERACTIVE SIMULATION

"NOTE: This working draft, dated 4 September 1992, prepared by the Institute for Simulation and Training for STRICOM, has not been approved and is subject to modification. DO NOT USE PRIOR TO APPROVAL. (Project \_\_\_\_\_)"

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#### 1.0 SCOPE

1.1 <u>Scope</u>. This standard establishes the Exercise Control and Feedback requirements for simulators participating in a Distributed Interactive Simulation. It is the second in a series of standards being developed to address the problem of interoperability among interconnected simulators.

1.2 <u>Application</u>. When invoked in a specification or statement of work, these requirements will apply to simulation devices intended for participation in a Distributed Interactive Simulation (DIS). The contractor is responsible for invoking all the applicable requirements of this Standard on any and all subcontractors he may employ.

#### 2.0 APPLICABLE DOCUMENTS

- 2.1 Government documents
  - 2.1.1 Specifications, standards, and handbooks
- 2.2 Non-Government publications

#### GENERAL INFORMATION

Distributed Interactive Simulation: Operational Concept (Draft 2.0). Orlando, FL: Institute for Simulation and Training

#### INTEROPERABILITY MEETINGS

| IST-CF-89-1 - | Summary Report: The First Conference on<br>Standards for the Interoperability of Defense<br>Simulations  |
|---------------|----------------------------------------------------------------------------------------------------------|
| IST-CF-90-01- | Summary Report: The Second Conference on<br>Standards for the Interoperability of Defense<br>Simulations |
| IST-CR-90-13- | Summary Report: The Third Workshop on<br>Standards for the Interoperability of Defense<br>Simulations    |
| IST-CR-91-11- | Summary Report: The Fourth Workshop on<br>Standards for the Interoperability of Defense<br>Simulations   |
| IST-CR-91-13- | Summary Report: The Fifth Workshop on Standards<br>for the Interoperability of Defense Simulations       |
| IST-CR-92-2-  | Summary Report: The Sixth Workshop on Standards<br>for the Interoperability of Defense Simulations       |

#### DRAFT STANDARDS

| <b>IEEE P1278</b> | IEEE Standard for Inf                               | ormation Technology,    |  |  |  |  |  |
|-------------------|-----------------------------------------------------|-------------------------|--|--|--|--|--|
|                   | Application Protocol for                            | Distributed Interactive |  |  |  |  |  |
|                   | Simulation                                          |                         |  |  |  |  |  |
| IST-CR-92-6       | Draft Military Standard                             | d: Communication        |  |  |  |  |  |
|                   | Architecture for Distributed Interactive Simulation |                         |  |  |  |  |  |

IST-CR-92-8 Draft Military Standard: Fidelity Correlation

#### ACCOMPANYING DOCUMENTS

| IST-CR-92-11 | Rationale Document for Exercise Control       | and  |
|--------------|-----------------------------------------------|------|
|              | Feedback Requirements for Distributed Interac | tive |
|              | Simulation (DRAFT)                            |      |

#### 3.0 DEFINITIONS

| entity -            | Any vehicle, craft, weapon system, or physical object, manned or<br>computer-generated, that is part of a DIS exercise. This vehicle, craft,<br>weapon system, or physical object can assume either a passive or active<br>role in a given exercise. |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| simulation          |                                                                                                                                                                                                                                                      |
| fidelity -          | Refers to the degree of similarity between the training situation and the operational situation that is being simulated.                                                                                                                             |
| unit -              | An appropriate of antition                                                                                                                                                                                                                           |
| umi -               | An aggregation of entities.                                                                                                                                                                                                                          |
| central station -   | A computer connected to a local area network that transmits/receives<br>simulation management protocol data units at the direction of the<br>simulation manager.                                                                                     |
| simulation          |                                                                                                                                                                                                                                                      |
| manager -           | Test director or training officer who manages the setup, control, and feedback of a simulation exercise after the computer network is setup.                                                                                                         |
| network<br>manager- | Individual who sets up and manages a computer network. (These functions are not covered in this standard)                                                                                                                                            |
|                     |                                                                                                                                                                                                                                                      |

#### 4.0 GENERAL REQUIREMENTS

4.1 <u>Introduction</u>. This section contains Exercise Control and Feedback Requirements for DIS. Operational scenarios for DIS training and decision support exercises are contained in Section 6.4.

4.2 <u>Purpose</u>. This standard provides procedures and guidelines required to plan, execute, manage, and assess a DIS exercise.

4.3 <u>Use</u>. This standard does not dictate who can or cannot participate in a DIS exercise. This responsibility is in the hands of the activity organizing the DIS exercise, and will be based on the analyses of comparative data required or recommended by this standard.

4.4 <u>Functions</u>. The functions discussed in this document may be used to manage exercises at the same site as the control station over the local area network (LAN), or at other sites over the wide area network (WAN). Each DIS exercise site should have a control station with the capability of (1) transmitting the protocol data units (PDUs) described herein when requested by the simulation manager, and (2) receiving these same PDUs from other control stations and executing the required functions.

#### 5.0 DETAILED REQUIREMENTS

5.1 <u>Pre-Exercise Setup and Planning</u>. In order to select a proper DIS setup, network, and resources required, critical setup and planning tasks must be performed. These tasks are listed below:

- a. Define exercise objective(s)
- b. Identify simulated location
- c. Define environment
- d. Set timeframe
- e. Determine forces
- f. Determine simulations required
- g. Determine personnel required (e.g., participants, operators, support, etc.)
- h. Identify simulation resources needed
- i. Determine simulation resources available
- j. Develop scenario(s)
- k. Distribute databases
- 1. Perform interoperability tests
  - entity performance models (e.g., weapons, countermeasures)
  - environment models
  - line-of-sight intervisibility
  - target/background color contrast
- m. Assess tests (depending on test results, go back to j, or a, and continue the process until acceptable test results are achieved)
- n. Schedule exercise (includes resources, network, etc.)
- o. Provide schedule to participants

p. Develop initialization databases (e.g., DIS parameters, stores, fuel)

5.2 <u>Exercise Setup</u>. The functions listed below enable proper initialization and subsequent control of each entity in the exercise. Table 1 provides a matrix of exercise setup functions along with the exercise setup PDU which support it. Each DIS site should have a control station with the following exercise setup capabilities:

- a. Synchronize clocks provide a mechanism to allow each entity to synchronize their internal clock with a master clock.
- b. Position Forces provide a mechanism to position forces in the gaming area.
- c. Set Expendables provide a mechanism to set expendable items such as fuel, ammunition, etc.

- d. Set Initial Conditions provide a mechanism to set initial exercise conditions to include:
  - entities (types and amounts)

- environment (states and conditions for environment models)
- database (set 2851 database which will be used for a given exercise. Information will include terrain and features, ocean models, and atmosphere models, as appropriate.)
- e. Instantiate Entities provide mechanism to allow appearance of entities on the network
- f. Select Exercise Area provide mechanism to set an exercise area within a given database.
- g. Initialize Computer-Generated Forces (CGFs) provide a mechanism to initialize computer-generated forces to include rules of engagement and proficiency or intelligence level.
- h. Parameters Report Request provide a mechanism to allow entities to transmit exercise parameters to a master exercise controller.
- i. Network Health Monitor provide a mechanism for a master exercise controller to assess the technical status and health of the network (e.g., number players initialized, current number of players, average network delay, etc.).
- j. Entity Status Report provide a mechanism for each entity to report its status (i.e., damage, fuel, etc.) to a master exercise controller.

| Exercise Setup Functions  | Simulation Management PDUs                            |  |  |
|---------------------------|-------------------------------------------------------|--|--|
| Synchronize Clocks        | done by Network Time Protocol                         |  |  |
| Position Forces           | Set Data PDU                                          |  |  |
| Set Expandables           | Set Data PDU                                          |  |  |
| Set Initial Conditions    | Set Data PDU                                          |  |  |
| Instantiate Entities      | Create Entity PDU<br>Set Data PDU<br>Start/Resume PDU |  |  |
| Select Exercise Area      | Set Data PDU                                          |  |  |
| Initialize SAFOR          | Set Data PDU                                          |  |  |
| Parameter Report Request  | Data Query PDU                                        |  |  |
| Network Health Monitoring | done by Network Manager                               |  |  |
| Entity Status Report      | Data Query PDU or<br>Event PDU                        |  |  |

Table 1. Exercise Setup Functions and PDUs to Support Them.

5.3 <u>Exercise Management</u>. The functions listed below will allow the master exercise controller to manage the DIS exercise. Table 2 provides a matrix of exercise management functions along with the simulation management PDUs which supports it. These PDUs are defined in the IEEE P1278 Standard listed in Section 2.2. Each DIS site should have a control station with the following exercise management capabilities.

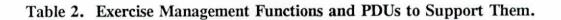
- a. Exercise Initiation provides a mechanism to initiate a previously saved exercise (see item f below)
- b. Freeze/Resume provides a mechanism to temporarily freeze and then resume a given exercise
- c. Exercise Termination provides a mechanism to terminate an exercise. It is envisioned that an exercise would be "frozen" before it is terminate in order to inform participants.
- d. Remove Entities provides a mechanism for selectively removing entities (by entity ID number) from an exercise.
- e. Regenerate Entities provides a mechanism for regenerating a given entity after it has been killed or, for some other reason, removed from the exercise.
- f. Save States provides a mechanism to save a given exercise state (i.e., entity locations and states, and environment conditions) for later use.
- g. Exercise Monitoring provides a mechanism for monitoring exercise progress via graphical and tabular display(s). Displays include:
  - Plan View

- Entity Status Table (this table provides a list of all exercise participants along with their current status)
  - 3D display with free-play eye point
- h. Observed Event Input provides a mechanism for the master exercise controllers at both the LANs and the WAN to input an observed event into a given exercise.
- i. Parameter Query provides a mechanism for the master exercise controller to request a parameters report from one or more entities (see item h, Section 5.2 (Exercise Setup).
- j. Instructor/Test Director Aids provides the master exercise controller with specific exercise information. These aids are envisioned to work with the exercise monitoring displays in item g above. These aids include:

- intervisibility (i.e., can two entities see each other?)
- range between two entities
- closure rate between two entities
- speed of a given entity

- bearing of a given entity

| Exercise Management Functions    | Simulation Management PDU(s)                        |
|----------------------------------|-----------------------------------------------------|
| Exercise Initiation              | Set Data PDU                                        |
| Freeze/Resume                    | Start/Resume PDU<br>Stop/Freeze PDU                 |
| Exercise Termination             | Stop/Freeze PDU                                     |
| Remove Entities                  | Remove Entity PDU                                   |
| Regenerate Entities              | Stop/Freeze PDU<br>Set Data PDU<br>Start/Resume PDU |
| Save States                      | Action Request PDU                                  |
| Exercise Monitoring              | Internal to Simulation Node                         |
| Observed Event Input             | Event PDU                                           |
| Parameter Query                  | Data Query PDU                                      |
| Instructor/Test<br>Director Aids | Data Query PDU                                      |



5.4 <u>Exercise Feedback</u>. The fifteen items below are functional specifications for a unit performance feedback system for use with networked simulators in a DIS exercise. These specifications are intended to provide a flexible set of tools that will apply to a wide variety of collective training objectives, at varying echelons, within and across branches of the military. These tools make use of various types of figures to integrate data collected from a network (entity status, location, firing event and tactical communications data) with terrain data and unit plans to provide a more complete picture of unit performance. Each DIS site should have a control station with the following exercise feedback capabilities.

a. Collect all PDUs specified by the user. Provide the user a means of specifying the required filtering of the PDUs. All collected PDUs shall be stored in compliance with

**Justification**: Occasions are likely to arise where PDUs are being broadcast over the network from a simulator or simulators not involved in a particular exercise. This feature allows for filtering of network data.

Replay exercise from a plan view, using changes in entity icons to indicate (1) firing events, (2) major changes in entity status where information is conveyed by PDUs (assessed as casualty, dismount), (3) evasive actions other than movement described by PDUs (e.g., smoke, flares), (4) movement of articulated parts and gun tubes (where meaningful from a plan-eye view), (5) C<sup>3</sup> Connectivity (Active, Passive, and broken), and (6) significant events in the electromagnetic spectrum.

**Justification:** This type of figure facilitates evaluation of performance in cases where it is important to look at the rate of continuity of movement over brief periods of time, such as examining the smoothness of the transition from one formation to another or evasive actions (including movement) in response to a threat situation.

c. Provide capability to display a trace of the movement of selected units or entities from a plan view perspective, and include capability for user to (1) specify interval at which trace positions are to be marked on the display and (2) limit trace to a specific period within the exercise.

**Justification**. The tool would provide a very quick method of examining the extent to which the execution of movement fit (1) the plan for each and every phase of the operation and (2) the terrain situation. The capability to change update intervals makes it possible to accommodate differences in the size of the unit performing the mission (a less frequent update interval for larger units to avoid data clutter) and the portion of the battle to be traced (a more frequent update interval for tracing smaller portions of a mission).

d. Provide capability to display a plan view of the exercise at a point in time selected by the user (snapshot) or at the specified occurrence of an event contained in a PDU, indicating entity status.

**Justification:** This tool would provide a quick method for examining relationships among unit plans for the operation, the status and location of vehicles, and the terrain situation at a specific point in time.

e. Provide replay, trace, and snapshot functions over a grid map showing user-selected terrain features and unit control measures.

Justification: This feature serves to integrate network data with two of the other data sources needed to provide a more complete picture of unit performance (terrain data and unit plans for the operation). Since many unit control measures are referenced to a time and required unit action (e.g., Company Team A will cross Phase Line Truck at 0700 hours, report, and switch to the bounding overwatch formation.) all of the displays (as well as the Exercise Timeline described below) might be used to decide how well a unit applied each control measure. Some displays might be more useful than others, depending on the unit actions to be performed.

f. Provide capability for user to change origin and level of magnification for replay, trace, and snapshot.

**Justification**: Magnification makes it possible to obtain more accurate information about the positions of vehicles relative to one another and relative to major terrain features. At lower levels of magnification, entities icons are expected to be oversized relative to terrain features in order for these icons to convey information about the identification and status of the entities represented.

g. Provide capability for user to specify the units or entities in a replay, trace, or snapshot.

Justification: This feature helps to tailor the displays for use in providing feedback to specific echelons (e.g., platoon rather than company team or battalion task for level), combined arms tasks, or joint tasks.

h. Identify specific entities or units in the replay, trace, and snapshots using a method of identification that is readily meaningful to exercise participants (such as vehicle bumper numbers, hull numbers and aircraft designations).

Justification: It is hard to use these displays if you do not know who is who.

i. Provide a quick search feature for the replay, trace, and snapshot that will allow the user to jump directly (forward or backward) from one point (time or event) in an exercise to another.

Justification: This feature will reduce the time required to make use of these tools.

j. Provide a timeline that indicates the temporal relationships among movement events, firing events, tactical communications, and significant events in the electromagnetic spectrum and logistical events in user-selected combinations. This timeline should be generated using the relational or hierarchical database described immediately below.

**Justification**: This tool could be used to quickly assess if critical events are being reported by integrating communications data with other data types, and it provides a very quick method for assessing rate of movement as a function of units plans and the changing tactical situation.

k. Automatically load data from collected PDUs into a Structured Query Language (SQL) hierarchical or relational database for subsequent analyses and reporting.

**Justification:** This feature provides the flexibility to organize and summarize data in a wide variety of ways to meet information needs using Structured Query Language (SQL) or another query language (depending on the specific database management system selected) rather than a more formal programming language. This feature makes it possible to provide data summaries that were not even envisioned until after a particular DIS application was developed without costly reprogramming.

1. Provide menus of data summary graph and table options for the user.

**Justification**: This feature makes it possible for the user to tap the power of the relational database without knowing SQL.

m. Provide capability for users (with a knowledge of SQL) to modify graph and table definitions, create new tables/graphs, and insert new tables/graphs into menus of options.

**Justification**: Provides the flexibility to improve and add to the menus, based upon actual experience in using the graphs and tables to support training.

n. Provide capability to print a hard copy of graphs, tables, replays (at specific times), traces, snapshots, and time lines.

**Justification:** This feature gives the user the capability to use multiple displays concurrently when providing feedback, such as using an overhead projector to display a graph or table that complements the information provided by a replay of the exercise.

o. Provide 3-D view of playback with free-play viewpoints.

**Justification**: This feature gives the user the capability of displaying a 3-D perspective from any desired viewpoint when replaying all or part of an exercise. This capability will enable the user to provide powerful and flexible visual feedback to trainees.

#### 6.0 NOTES

#### 6.1 Introduction

DIS will take advantage of currently installed and future simulations manufactured by different organizations. Consequently, a means must be found for assuring interoperability between dissimilar simulations. The first step in achieving this interoperability is to develop a set of standards to address:

- Protocol Data Units
- Communication Architecture
- Fidelity Correlation
- Exercise Control and Feedback

The current work on standards began in August 1989 with the first workshop on Standards for the Interoperability of Defense Simulations. Five subsequent workshops were held at six month intervals. As a result of these workshops and subsequent subgroup meetings, over 150 position papers containing recommendations for the standards were submitted to the Institute for Simulation and Training (IST). Using the work of SIMNET as a baseline and considering recommendations made in meetings and position papers, IST is developing draft standards which address the topic areas listed above.

#### 6.2 Description of Distributed Interactive Simulation

The basic concepts of Distributed Interactive Simulation (DIS) are an extension of the Simulation Networking (SIMNET) program developed by the Defense Advanced Research Projects Agency (DARPA). The purpose of DIS is to allow dissimilar simulators distributed over a large geographical area to interact in a team environment. These simulators communicate over local area networks and wide area networks. The basic DIS concepts are:

No central computer for event scheduling or conflict resolution

- Autonomous simulation nodes responsible for maintaining the state of one or more simulation entities
- There is a standard protocol for communicating "ground truth" data
- Receiving nodes are responsible for determining what is perceived
- Simulation nodes communicate only changes in their state
- Dead reckoning is used to reduce communications processing

#### 6.3 Intended Use

The primary mission of DIS is to create synthetic, virtual representations of warfare environments by systematically connecting separate elements or subcomponents of simulation which reside at distributed, multiple locations. DIS can be used as a substitute for some field training and testing, and can allow for practice of warfighting skills when cost, safety, environmental and political constraints will not permit the field training and testing required to maintain readiness.

The property of connecting separate sub-components or elements affords the capability to configure a wide range of simulated warfare representations patterned after the task force organization of actual units, both friendly and opposing, including joint and combined force operations to represent a wide range of warfighting missions facing U.S. forces today and in the future. Equally important is the property of interoperability which allows different simulation environments to efficiently and consistently interchange data elements essential to representing warfighting interactions and outcomes.

In effect, interoperable simulations will exchange data in a manner such that the differences in the representation of the simulated battlefield will be transparent or "seamless" as experienced by participants interacting with their particular representation of the warfighting environment. This property affords the opportunity for linking heterogeneous representations, each providing a locally consistent simulated environment, through use of buffers or translators to create a seamless interconnection. With these properties, it is possible to have simulation components which meet special purpose local uses and when required can link together to form larger scale warfighting environment representations.

In addition to DIS's primary mission of supporting training and testing needs, DIS can serve as a tool for mission planning and mission rehearsal.

#### 6.4.1 DIS Training Exercise Scenarios

The primary customers for DIS training exercises are commanders, from unit commanders to Commanders In Chief (CINCs). Unit commanders who wish to conduct a training exercise involving only their unit will coordinate with other unit commanders at that base, schedule time for their personnel on the simulators and conduct the exercise using the simulation resources attached to the Local Area Network (LAN) at the base. If the unit commander requires outside support in the form of an opposing force (OPFOR) or additional friendly forces, the commander will follow the procedure discussed below for CINCs.

CINCs will use the wide area network WAN services of DIS. The CINC will specify the mission objective (liberate country green) and the CINC's staff will plan the exercise in the same manner as an actual mission. Once the staff has determined which forces will be required to conduct the exercise, they will contact the commanders of these forces through normal channels. In addition, they will contact the DIS Administrative Unit to determine the availability of (1) simulators at those forces' bases, and (2) bandwidth on DIS. DIS is being designed such that a number of separate exercises can be conducted simultaneously on the WAN in a way that is transparent to the participants. The DIS administrative unit will assign a unique exercise number to differentiate it from other simultaneous exercises. It will also calculate the required bandwidth for the required simulators as well as that required for the exercises already scheduled during the desired time period. If the available bandwidth is exceeded, the administrative unit will resolve the conflicts with rescheduling acceptable to all participants. Once this scheduling is complete, all participants will complete their planning for the exercises.

As the planning continues, the CINC will hold video conferences (over the DIS WAN) with the unit commanders to simulate actual planning meetings. As the mission start day approaches, the Operations Officer will issue orders to the unit commanders for initial deployment of forces. These unit commanders will determine the deployment of their forces and give the initial locations to the local DIS exercise controllers to feed into the simulators.

As the day of exercise start arrives, the local commanders and their staffs will assemble in the DIS LAN controller's room to participate in a video conference final briefing with the CINC. At the mission start time, the DIS WAN will issue a start command to each location and the LAN controllers will issue start commands to the simulators. The other threats and friendlies will then begin to appear on each simulator's displays. Radio communications will be digitized and sent in packets over the DIS network to the appropriate simulators and replayed if the receiving simulator is in range and on the same frequency. As the battle proceeds and each side takes losses, the LAN controllers may be allowed to reconstitute forces to simulate replacements and to allow participants to continue training. During the battle, the debrief station at each location will store all forces location and status messages (protocol data units) for later replay.

When the CINC has achieved his goal, he will issue a Cease Fire command and the DIS LAN controllers will issue a freeze command to all simulators. After participants have gathered in each DIS LAN controller's room, the CINC will conduct a video conference debrief of the exercise. During this debrief, the WAN manager will issue commands to each LAN exercise feedback device to replay the exercise. The CINC will have the controller start, stop and reverse the playback as required to illustrate the lessons learned during the exercise. If desired, the debrief will be broken into segments such as maneuver, logistics, etc. and the LAN controller will enter a command for the debrief station to display only the desired forces.

Once the CINC's debrief is completed, the unit commanders will call in lower ranking personnel for a debriefing. During this debriefing, the LAN controllers will play back the exercise but will concentrate the debrief view on the area of responsibility for that unit. After completion of the exercise debriefs, the stored forces location and status messages will be permanently stored for use in future classroom demonstrations or analysis efforts.

#### 6.4.2 DIS Decision Support Scenarios

The primary customers for DIS decision support exercises are the Combat Development, System Acquisition, Test and Evaluation and Training communities. If the test organization has sufficient simulations of threat and friendly forces at the test facility, they will schedule time for their personnel on the simulators and conduct the exercise using the simulation resources attached to the LAN at the test facility. If the test organization requires outside support in the form of an OPFOR or additional friendly forces, the commander will follow the procedure discussed below.

Tests that require outside simulation resources will use the WAN services of DIS. The test organization will specify the test objectives (determine system improvement's effect on outcome of realistic battle engagement) and the test director's staff will plan the exercise. Once the staff has determined which forces will be required to conduct the exercise, they will contact the DIS administrative unit to determine (1) the availability of the simulated/actual equipment/personnel at other locations, and (2) bandwidth on DIS. DIS is being designed such that a number of separate exercises can be conducted simultaneously on the WAN in a way that is transparent to the participants. The administrative unit will assign a unique exercise number to differentiate it from other simultaneous exercises. It will also calculate the required bandwidth for the required simulators as well as that required for the exercises already scheduled during the desired time period. If the available bandwidth is exceeded, the administrative unit will resolve the conflicts with rescheduling acceptable to all participants.

Once this scheduling is complete, all participants will complete their planning for the exercises. As the planning continues, the test director may hold video conferences (over the DIS WAN) with the participants to iron out procedures.

As the day of exercise start arrives, the distributed participants will assemble in the DIS LAN controller's room to participate in a video conference final briefing with the Test Director. At the exercise start time, the DIS WAN will issue a start command to each location and the LAN controllers will issue start commands to the simulators/actual equipment. The other threats and friendlies will then begin to appear on each display of the simulator/actual equipment. Radio communications will be digitized and sent in packets over the DIS network to the appropriate simulators/actual equipment and replayed if the receiving entity is in range and on the same frequency. As the exercise proceeds and each side takes losses, the LAN controllers may be allowed to reconstitute forces to simulate replacements and to allow participants to continue provide additional threats and friendlies. During the exercise, the debrief station at each location will store all forces location and status messages (protocol data units) for later replay.

When the exercise is complete, the Test Director will issue a stop command and the DIS LAN controllers will issue a freeze command to all simulators/actual equipment. After participants have gathered in each DIS LAN controller's room, the Test Director will conduct a video conference debrief of the exercise. During this debrief, the WAN manager will issue commands to each LAN exercise feedback device to replay the exercise. The Test Director will have the controller start, stop and reverse the playback as required to illustrate the lessons learned during the test exercise. If desired, the debrief will be broken into segments such as maneuvers, electronic warfare, etc., and the LAN controller will enter a command for the debrief station to display only the desired forces. After completion of the exercise debriefs, the stored forces location and status messages will be permanently stored for use in future demonstrations or analysis efforts.

