

# IEEE Recommended Practice for Distributed Interactive Simulation— Exercise Management and Feedback

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**Abstract:** Guidelines are established for exercise management and feedback in Distributed Interactive Simulation (DIS) exercises. Guidance is provided to sponsors, providers, and supporters of DIS compliant systems and exercises as well as to developers of DIS exercise management and feedback stations. The activities of the organizations involved in a DIS exercise and the top-level processes used to accomplish those activities are addressed. The functional requirements of the exercise management and feedback process are also addressed. This standard is one of a series of standards developed for DIS to assure interoperability between dissimilar simulations for currently installed and future simulations developed by different organizations.

**Keywords:** automated simulation, computer-generated force (CGF), dead-reckoning algorithms, simulation, simulation management, simulator networking, validation, verification, warfare simulation, wargames

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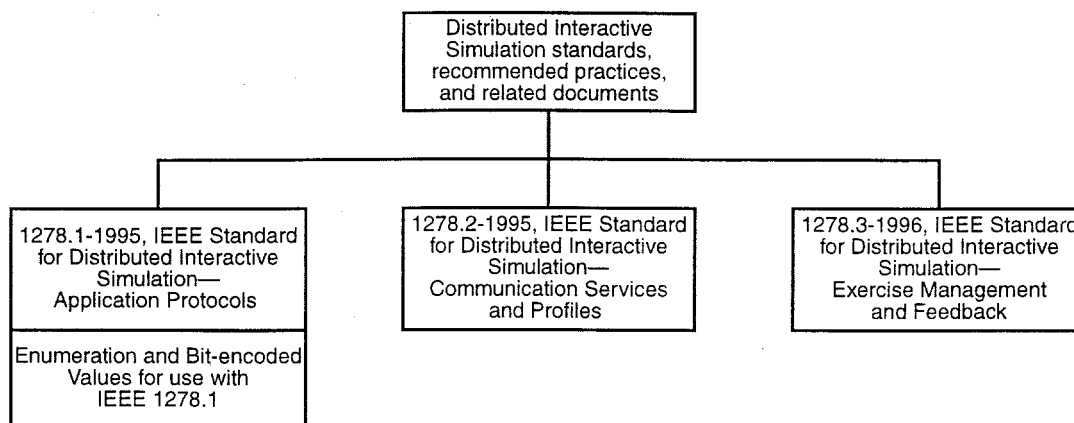
## Introduction

(This introduction is not part of IEEE Std 1278.3-1996, IEEE Recommended Practice for Distributed Interactive Simulation—Exercise Management and Feedback.)

Distributed Interactive Simulation (DIS) is a government/industry initiative to define an infrastructure for linking simulations of various types at multiple locations to create realistic, complex, virtual "worlds" for the simulation of highly interactive activities. This infrastructure brings together systems built for separate purposes, technologies from different eras, products from various vendors, and platforms from various services and permits them to interoperate. DIS exercises are intended to support a mixture of virtual entities with computer-controlled behavior (computer-generated forces), virtual entities with live operators (human in-the-loop simulators), live entities (operational platforms and test and evaluation systems), and constructive entities (wargames and other automated simulations). DIS draws heavily on experience derived from the Simulator Networking (SIMNET) program developed by the Advanced Research Projects Agency (ARPA), adopting many of SIMNET's basic concepts and heeding lessons learned.

In order for DIS to take advantage of currently installed and future simulations developed by different organizations, a means had to be found for assuring interoperability between dissimilar simulations. These means were developed in the form of industry consensus standards. The open forum (including government, industry, and academia) chosen for developing these standards was a series of semi-annual workshops on standards for the interoperability of distributed simulations, which began in 1989. The results of the workshops have been several IEEE Standards along with supporting documentation. These standards provide application protocol and communication services and profile standards to support DIS interoperability. In addition, an IEEE recommended practice for exercise management and feedback provides user guidelines for setting up and conducting a DIS exercise.

The relationship between the component documents comprising the set of IEEE DIS documents is shown in the figure below. Used together, these standards and recommended practices will help to ensure an interoperable simulated environment.



**Documentation relationships**

The interoperability components addressed by these standards and recommended practices are as follows:

- a) Application protocols
- b) Communication services and profiles
- c) Exercise management and feedback

IEEE Std 1278.1-1995, IEEE Standard for Distributed Interactive Simulation—Applications Protocols, defines the format and semantics of data messages, also known as Protocol Data Units (PDUs), that are exchanged between simulation applications and simulation management. The PDUs provide information concerning simulated entity states, the type of entity interactions that take place in a DIS exercise, and data for management and control of a DIS exercise. This standard also specifies the communication services to be used with each of the PDUs. These services are defined in IEEE Std 1278.2-1995, IEEE Standard for Distributed Interactive Simulation—Communication Services and Profiles.

An additional, non IEEE document is required for use with IEEE Std 1278.1-1995. This document is entitled *Enumeration and Bit-encoded Values for use with IEEE 1278.1* and is available from the Tactical Warfare Simulation and Technology Information Analysis Center at the Institute for Simulation and Training of the University of Central Florida.<sup>1</sup>

IEEE Std 1278.2-1995 defines the communication services required to support the message exchange described in IEEE Std 1278.1-1995. In addition, IEEE Std 1278.2-1995 provides several communication profiles that meet the specified communications requirements.

Taken together, IEEE Std 1278.1-1995 and IEEE Std 1278.2-1995 provide the necessary information exchange for the communications element of DIS.

This recommended practice provides guidelines for establishing a DIS exercise, managing the exercise, and providing proper feedback. This recommended practice is to be used in conjunction with IEEE Std 1278.1-1995 and IEEE Std 1278.2-1995.

Revisions are anticipated to each of these standards and recommended practice within the next few years to clarify existing material, to correct possible errors, and to incorporate new related material. Future versions of these documents will contain information concerning additional interoperability components that are currently in the process of being defined.

The Exercise Management and Feedback Working Group that developed this recommended practice had the following membership during the development cycle:

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<sup>1</sup>For information on projects underway at the Institute for Simulation and Training at the University of Central Florida, check their web site at <http://www.ist.ucf.edu>.

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# IEEE Recommended Practice for Distributed Interactive Simulation—Exercise Management and Feedback

## 1. Overview

### 1.1 Scope

This recommended practice establishes guidelines for exercise management and feedback in Distributed Interactive Simulation (DIS) exercises. It provides recommended procedures to plan, set up, execute, manage, and assess a DIS exercise. It is one in a series of standards that addresses the interoperability among interconnected simulation applications.

### 1.2 Application

This recommended practice provides guidance to sponsors, providers, and supporters of DIS compliant systems and exercises. It also provides guidance to developers of DIS exercise management and feedback stations. This document does not specify who may or may not participate in a DIS exercise. Depending upon the exercise objectives and the allocated time and assets, the degree that any of these practices can and will be followed can vary significantly.

### 1.3 Functions

This recommended practice addresses the activities of the organizations involved in a DIS exercise and the top-level processes used to accomplish those activities. It also addresses in some detail the functional requirements of the exercise management and feedback process. Broadly, these functional requirements characterize three points of view related to the formulation and conduct of a DIS exercise.

#### 1.3.1 User/Sponsor view

The Users/Sponsor view focuses on describing the simulation exercise context, objectives, organization, and constraints from the perspective of the results expected from the exercise. This view does not require an in-depth understanding of the technical means needed to provide the simulation environment used for conducting the simulation exercise.

### 1.3.2 Exercise Manager View

The Exercise Manager view focuses on the planning, coordination, integration, and execution of the DIS exercise defined by the User. This role is detailed in the requirements clause. The Exercise Manager coordinates and integrates the detailed functions described in 4.1.3 through 4.1.10. These functions may require support from outside of the Exercise Manager's organization.

### 1.3.3 Exercise Architect view

The Exercise Architect point of view concentrates on the development of a verified, validated, and accredited "simulation exercise" environment that can support a common group of class of "scenarios" or "vignettes." Execution of individual scenarios or vignettes are conducted as "sessions" of the DIS exercise.

## 2. References

This recommended practice should be used in conjunction with the following publications. When the following standards are superseded by an approved revision, the revision shall apply.

IEEE Std 1278.1-1995, IEEE Standard for Distributed Interactive Simulation—Application Protocols (ANSI).<sup>1</sup>

IEEE Std 1278.2-1995, IEEE Standard for Distributed Interactive Simulation—Communication Services and Profiles (ANSI).

## 3. Definitions and list of abbreviations and acronyms

### 3.1 Definitions

**3.1.1 accreditation:** (1) Distributed simulation accreditation is the official certification that a distributed simulation is acceptable for use for a specific purpose. (2) Model/simulation accreditation is the official certification that a model or simulation is acceptable for use for a specific purpose.

**3.1.2 computer generated force (CGF):** simulation of entities on the virtual battlefield. CGF entities may be fully autonomous (needing no human direction) or semi-autonomous (requiring some direction by a human controller who is not a participant in the virtual events). CGF entities represent friendly, opposing forces (OPFOR), and neutral battlefield participants not portrayed by manned simulators.

**3.1.3 control station:** Facility that provides the individual responsible for controlling the simulation and that provides the capability to implement simulation control as PDUs on the DIS network.

**3.1.4 data certification:** (1) The determination that data have been verified and validated. (2) Data producer certification is the determination by the data producer that data have been verified and validated against documented standards of criteria. (3) Data user certification is the determination by the application sponsor or designated agent that data have been verified and validated as appropriate for the specific Modeling and Simulation (M&S) usage.

**3.1.5 data logger:** Device that accepts PDUs from the network and stores them for later replay according to either the time sequence in which they were originally received or the time sequence as indicated by their time stamps.

**3.1.6 DIS compliant:** A simulation that can send or receive PDUs in accordance with IEEE Std 1278.1-1995<sup>2</sup> and IEEE Std 1278.2-1995. A specific statement must be made regarding the qualifications of each PDU.

<sup>1</sup>IEEE publications are available from the Institute of Electrical and Electronics Engineers, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, USA.

<sup>2</sup>Information on references can be found in Clause 2.