IEEE Standard for Modeling and Simulation (M&S) High Level Architecture (HLA)—Framework and Rules

IEEE Computer Society

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Simulation Interoperability Standards Organization/
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Abstract: This standard, describing the framework and rules of the High Level Architecture (HLA), is the capstone document for a family of related HLA standards. It defines the HLA, its components, and the rules that outline the responsibilities of HLA federates and federations to ensure a consistent implementation. Simulations are abstractions of the real world, and no one simulation can solve all of the functional needs for the modeling and simulation community. It is anticipated that technology advances will allow for new and different modeling and simulation (M&S) implementations within the framework of the HLA. The standards contained in this architecture are interrelated and need to be considred as a product set, as a change in one is likely to have an impact on the others. As such, the HLA is an integrated approach that has been developed to provide a common architecture for simulation.
Keywords: architecture, class attribute, federate, federation, federation execution, federation object model, framework, High Level Architecture, instance attribute, interaction class, joined federate, object class, object model template, rules, runtime infrastructure, simulation object model

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Introduction

This introduction is not part of IEEE Std 1516-2010, IEEE Standard for Modeling and Simulation (M&S) High Level Architecture (HLA)—Framework and Rules.

This standard is the capstone document for a family of related standards that together describe a unified approach to constructing interoperable simulation systems.

The High Level Architecture (HLA) provides a general framework within which simulation developers can structure and describe their simulation applications. Flexibility is the aim of the HLA. In particular, the HLA addresses two key issues: promoting interoperability between simulations and aiding the reuse of models in different contexts. Three main components are described within the set of products forming the HLA. The first component, the HLA Framework and Rules Specification (i.e., this standard), provides a set of ten rules that together ensure the proper interaction of federates in a federation and define the responsibilities of federates and federations. The second component, the object model template (OMT), is a necessary basis for reuse and forms a documentation standard describing the data used by a particular model. The third component, the federate interface specification, addresses interoperability and describes a generic communications interface that allows simulation models to be connected and coordinated. Although the HLA is an architecture, not software, use of runtime infrastructure (RTI) software is required to support operations of a federation execution. The RTI software provides a set of services, as defined by the federate interface specification, used by federates to coordinate operations and data exchange during a runtime execution.

Simulations are necessarily abstractions of the real world, and no one simulation design can meet the functional needs of the entire modeling and simulation community. However, in defining an overriding architecture, generic issues can be addressed. When doing so, it is essential that such an architecture encompass both differing computing environments and differing classes of simulations.

This standard, describing the framework and rules, is intended to provide some of the general philosophy behind the HLA, including guidance about how to design, use, and adhere to the HLA vision.

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Contents

IEEE Standard for Modeling and Simulation (M&S) High Level Architecture (HLA)—Framework and Rules

1. Overview

1.1 Scope

This document provides an overview of the High Level Architecture (HLA), defines a family of related HLA documents, and defines the principles of HLA in terms of responsibilities that federates (simulations, supporting utilities, or interfaces to live systems) and federations (sets of federates working together) must uphold.

1.2 Purpose

This document describes the general principles defining the HLA and delineates the set of rules that apply to HLA federations and federates. Each rule is then described, and the rationale for its inclusion is provided.

Many different classes of simulations exist. Each class has changing application characteristics and needs to be flexibly supported to allow for interoperability and reuse across classes and to limit the need to maintain multiple interoperability approaches. The HLA is a common integrated architecture, which has been