



**Simulation Interoperability
Standards Organization**

"Simulation Interoperability & Reuse through Standards"

SISO-STD-020-2020

Standard for Land Operations Extension to Command and Control Systems - Simulation Systems Interoperation

Version 1.0

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**Prepared by:
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Introduction

Military operations in today's world are increasingly driven towards coalition participation and as such are dependent on effective interoperation between participating coalition systems. The growth of digitized C2 systems and the need for coalition interoperation has created a need for standards to represent and exchange digitized C2 information and for these systems to interoperate.

The Simulation Interoperability Standards Organization (SISO) supports the identification and creation of standards and guidelines to help in the interoperability of simulation and more broadly to tackle issues related to M&S. Two main types of documents exist: guidelines and standards, the first mostly related to processes definition and the second mostly related to data structuration, with or without a reference model associated.

Command and Control Systems to Simulation Systems Interoperation (C2SIM) is a standard for expressing and exchanging Command and Control (C2) information among C2 systems, simulation systems, and robotic and autonomous (RAS) systems in a coalition context. The C2SIM Core is designed to provide a method to exchange information needed across multiple domains. The C2SIM Core is unencumbered by domain specific information, which is instead provided through specific extensions. This permits user to implement the smallest possible logical data model (LDM) consisting of the C2SIM Core and necessary extensions.

The Land Operations Extension (LOX) augments the Core and Standard Military Extension (SMX), adding the components necessary to exchange data concerning plans and orders in scenarios with land-focused operations. The LOX requires the C2SIM core and SMX; in the ontology, LOX imports SMX, which imports the C2SIM core.

As an extension of the C2SIM, this LOX documentation supplements the C2SIM main document. Users should reference the C2SIM main documentation to fully understand C2SIM concepts, as they are not restated in extension documentation.

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1 Overview

Command and Control Systems to Simulation Systems Interoperation is being developed as a standard to support interoperation between C2 systems, simulation systems, and robotics and autonomous systems (RAS) in a coalition context. The SISO C2SIM Product Development Group (PDG) replaced the Coalition Battle Management Language (C-BML) and Military Scenario Definition Language (MSDL) PDGs and Product Support Groups (PSGs). The C2SIM Core provides the minimum necessary information as a foundation for extension operations. The Land Operations Extension (LOX) builds on the C2SIM Core and C2SIM Standard Military Extension (SMX).

This document standardizes the LOX extension for C2SIM. The document is purposely quite brief because the mechanics of C2SIM, including its extensions, are defined in the basic C2SIM Standard. Most of the additional value in LOX is contained in the ontology that is established by this document. Like the Core and SMX ontologies established by the C2SIM standard, the LOX ontology will be maintained by the SISO C2SIM Product Support Group.

1.1 Scope

The Land Operations Extension (LOX) for C2SIM covers the behaviors of entities engaged in surface operations against surface threats. The LOX builds on and is dependent on the C2SIM Core standard.

1.2 Purpose

This document describes the methods used to extend the C2SIM to include land operations and provides a normative description of the scope and use of the extension. Additionally, as the initial extension to the C2SIM standard, this document is an exemplar for other extensions.

1.3 Objectives

The primary objective of this standard is to provide C2 systems, simulation systems, and RAS the ability to use the C2SIM LDM to generate an XML schema suitable to their needs to represent and exchange digitized C2 information. Using the LDM, systems can generate data needed for scenario execution in the land operations domain. This objective does not preclude direct use of the core and extension ontologies; for example, in systems directly implementing the Web Ontology Language (OWL) representations.

1.4 Intended Audience

The primary intended audience of this extension standard is aligned with the C2SIM Core standard. It is however specialized to those who seek to interoperate C2 systems, simulations, and Robotic and Autonomous Systems (RAS) with regard to land warfare.

2 References

2.1 SISO Documents

The following SISO documents were used in generating the policies and procedures defined herein. When the following documents are superseded by an approved revision and that causes a conflict with this document, the revision of the below-referenced documents shall supersede this document. These documents are available by through the SISO web site at <https://www.sisostds.org/>.

| Ref: | Document Number | Title | Date |
|------|-------------------------------|--|---------------------------|
| [1] | SISO-PN-010-2014 revision 1.1 | C2SIM Product Nomination | 14 Sep 2017 |
| [2] | SISO-STD-011-2014 Version 1.0 | Standard for Coalition Battle Management Language | 14 Apr 2014 |
| [3] | SISO-STD-007-2008 | Standard for Military Scenario Definition Language | Reaffirmed 11 May 2015 |
| [4] | SISO-STD-010-2020 | Standard for Command and Control Systems – Simulation Systems Interoperation | 25 April 2020 |

2.2 Other Documents

| Ref: | Document Number | Title | Date |
|------|---|---|-------------------|
| [5] | MIL-STD-2525B, 30 January 1999, w/Change 1, 1 July 2005 | Defense Information Systems Agency, Department of Defense. MIL-STD-2525B, Common Warfighting Symbolology. | 1 July 2005 |
| [6] | NATO APP-6 | MILITARY SYMBOLS FOR LAND BASED SYSTEMS | May 2011 |
| [7] | MIP JC3IEDM | JC3IEDM, Annexes, and .xsd Domain Values; www.mip-interop.org | 2020 |
| [8] | NIMA TM 8358.1 | Datums, Ellipsoids, Grids, and Grid Reference Systems. Edition 1. US National Imagery and Mapping Agency (NIMA) | 20 September 1990 |
| [9] | NIEM | USA National Information Exchange Model | |
| [10] | | ANSI SPARC Architecture | |
| [11] | LOX OWL v3.1 | | Dec 2018 |
| [12] | Webster | Webster's New World College Dictionary | 2018 |

2.3 Bibliography

| Document Number | | Title |
|-----------------|--|--|
| 1. | SISO-ADM-002-2008 | SISO Policies and Procedures (P&P) |
| 2. | SISO-ADM-003-2008 | SISO Balloted Products Development Process (BPDP) |
| 3. | SISO-ADM-005-2004 | Policy for: The Style and Format of SISO documents |
| 4. | SISO-PDG-PN-MSDL-2005-002-15 | MSDL Product Nomination |
| 5. | XML World Wide Web Consortium (W3C) web site | XML Schema http://www.w3.org/2001/XMLSchema http://www.w3.org/TR/xmlschema-1/ . |
| 6. | UN/CEFACT XML Naming and Design Rules | United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) XML Naming and Design Rules Version 2.0 of 17 February 2006 |

3 Definitions, Acronyms, and Abbreviations

English words are used in accordance with their definitions in the latest edition of Webster's New Collegiate Dictionary [12] except where special SISO product-related technical terms are required.

3.1 Definitions

All necessary definitions are provided in the main C2SIM standard.

3.2 Acronyms and Abbreviations

| Acronym/Abbr | Definition |
|----------------|--|
| BMNT | Begin Morning Nautical Twilight |
| BSO | Battle Space Object |
| CBRN | Chemical, Biological, Radiological, Nuclear |
| COA | Course of Action |
| COP | Common Operational Picture |
| DIS | Distributed Interactive Simulation |
| EENT | End Evening Nautical Twilight |
| EXCOM | Executive Committee |
| GCC | Geocentric Coordinate |
| GDC | Geodetic Coordinate |
| IFF | Identification, Friend or Foe |
| JC3IEDM | Joint Consultation, Command, and Control Information Exchange Data Model |
| METOC | Meteorology and Oceanography |
| MOOTW | Military Operations Other Than War |
| NBC | Nuclear, Biological, Chemical |
| RAS | Robotic and Autonomous System |

4 Structure of the Land Operations Extension LDM (Informative)

Note: The C2SIM LOX Ontology is a reference C2SIM domain extension ontology. It imports the C2SIM core ontology and the SMX extension. Both of those are required to support the LOX ontology.

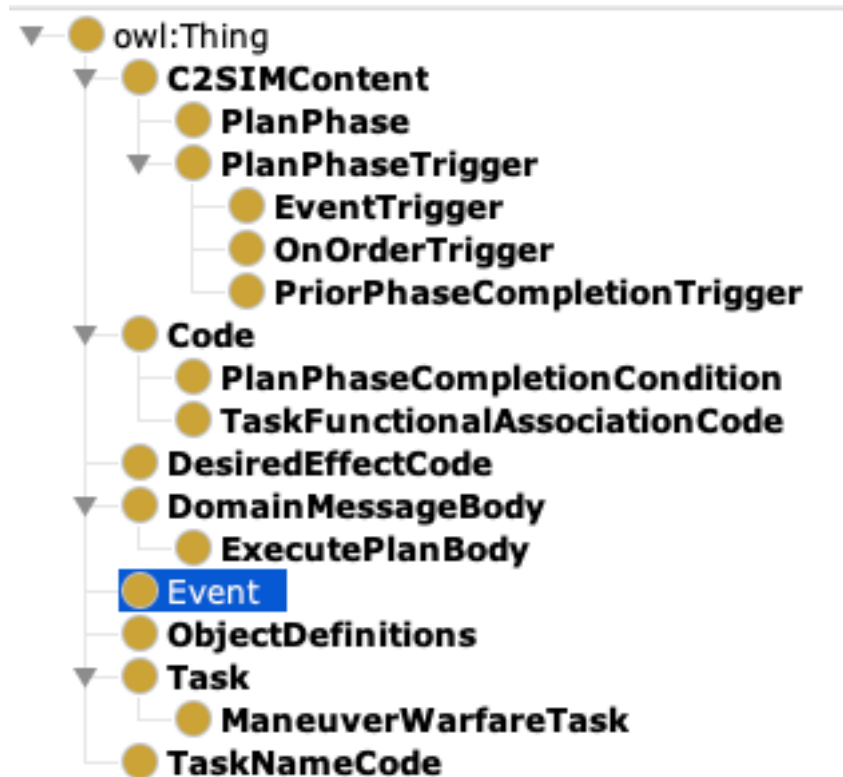


Figure 1: LDM LOX Ontology Hierarchy