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Information technology — Top level ontologies (TLO) —

Part 5: Unified Foundational Ontology (UFO)

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Foreword

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This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 32, *Data management and interchange*.

A list of all parts in the ISO/IEC 21838 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

The Unified Foundational Ontology (UFO) [1] is a top-level ontology (TLO) conforming to ISO/IEC 21838-1:2021. It contains definitions of its terms and relational expressions, and formal representations in both the Web Ontology Language (OWL 2) [2] and Common Logic (CL).

The purpose of UFO is to provide foundations for domain analysis in conceptual modeling, as well as for designing concrete models and grammar. In this sense, it is designed to support tasks of ontological analysis, conceptual clarification, and semantic explicitation of the content embedded in representation artifacts.

UFO has been successfully employed in a variety of domains in industry, academia, and education, including but not limited to agriculture, business process, bioinformatics, data processing, decision-making, emergency disaster management, e-government, geology, legal domains, services, smart contracts, software engineering, telecommunications, trust, and value.

The UFO ontology is specified here in three complementary formats: as a natural language specification, as an OWL 2 ontology, and as CL axiomatization.

The natural language specification offers human agents a more readable way of consuming the ontology, describing the semantics carried by the symbols of the ontology (e.g. the predicates in the CL axiomatization).

The OWL 2 ontology of UFO offers an implementation-ready format for Semantic Web applications. It conforms with the W3C specification of the Web Ontology Language (OWL 2), and it can be integrated or aligned with other RDF and OWL ontologies in the development of applications.

The CL axiomatization of UFO provides a translation of the description logic axioms of the OWL 2 ontology, allowing for consistency and satisfiability checks through automated first-order logic provers. All axioms included in this implementation are organized into modules as presented in Figure 1. Each module includes several concepts, with dashed arrows representing dependencies of concepts defined in target modules.

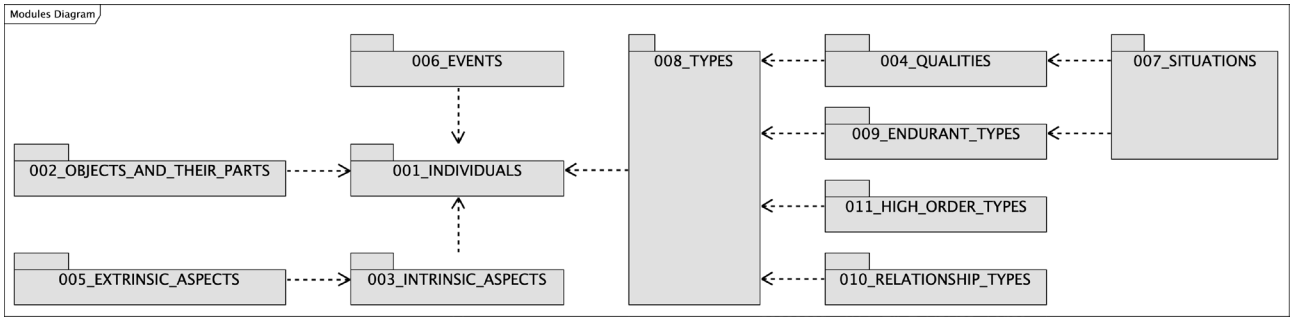


Figure 1 — UFO Modules

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Information technology — Top-level ontologies (TLO) — Part 5: Unified Foundational Ontology (UFO)

1 Scope

This document describes UFO as an ontology that is conformant to the requirements specified for top-level ontologies in ISO/IEC 21838-1:2021.

This document describes UFO as a resource designed to support ontology design, ontology integration, and semantic integration of heterogeneous information systems. The following are within the scope of this document:

— definitions of classes and relations in the signature of UFO;

— axiomatizations of UFO in OWL 2 and CL;

— documentation of the conformity of UFO to the requirements specified for top-level ontologies in ISO/IEC 21838-1:2021;

— documentation of the methodology for specifying domain ontologies that conform to UFO;

The following are outside the scope of this document:

— specification of ontology languages, including the languages RDF, OWL, and CL standardly used in ontology development;

— specification of methods for reasoning with ontologies;

— specification of translators between the notations of ontologies developed in different ontology languages.

2 Normative references

The following documents are referred to in the text in such a way that their content constitutes the requirements of this document. The latest edition of the referenced documents (including any amendments) applies.

ISO/IEC 21838-1:2021, *Information technology — Top-level ontologies (TLO) — Part 1: Requirements*

ISO/IEC 24707, *Information technology — Common Logic (CL) — A framework for a family of logic-based language*

3 Terms and definitions

For the purposes of this document, the terms and definitions in ISO/IEC 21838-1:2021 and the following apply.

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ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
conservative extension
superset of axioms from which no new theorems in the signature of the original logical theory are provable

3.2
consistent extension
supserset of axioms which is a consistent logical theory

3.3
logically synonymous
theories whose sets of models are in a one-to-one correspondence

3.4
module
subset of the axioms in a formal theory that is conservatively extended by the logical theory

3.5
reduction, ajd.
set of logical theories whose union is logically synonymous with the ontology

4. Conformance of UFO to ISO/IEC 21838-1:2021

4.1 Overview

This standard is comprised of three elements:

a) natural language representation of the terms in this UFO axiomatization

b) axiomatization in Web Ontology Language (OWL 2)

c) axiomatization in Common Logic (CL)

The resources reflecting each of these elements are available at https://standards.iso.org/iso/21838/-5/ed-1/en.

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