

INTERNATIONAL
STANDARD

ISO/IEC
21838-3

First edition
2023-09

**Information technology — Top-level
ontologies (TLO) —**

Part 3:

**Descriptive ontology for linguistic and
cognitive engineering (DOLCE)**



Reference number
ISO/IEC 21838-3:2023(E)

© ISO/IEC 2023



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2023

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Conformance of DOLCE to ISO/IEC 21838-1	2
4.1 Overview.....	2
4.2 Natural language representation of DOLCE.....	2
4.3 OWL 2 formalization of DOLCE.....	2
4.4 Common Logic axiomatization of DOLCE.....	2
4.4.1 General.....	2
4.4.2 Modularity.....	2
4.5 Specification of the purpose of DOLCE (in conformance to ISO/IEC 21838-1:2021, 4.4.2).....	3
4.6 Description of how conformance of a domain ontology to DOLCE is established (in conformance to ISO/IEC 21838-1:2021, 4.4.3).....	3
4.7 Demonstration of the consistency of the CL axiomatization of DOLCE (in conformance to ISO/IEC 21838-1:2021, 4.4.4).....	3
4.8 Interpretability of the OWL 2 axiomatization of DOLCE in CL (in conformance to ISO/IEC 21838-1:2021, 4.4.5).....	3
4.9 Demonstration of breadth of coverage of DOLCE (in conformance to ISO/IEC 21838-1:2021, 4.4.6).....	3
4.9.1 General.....	3
4.9.2 Space and time.....	3
4.9.3 Actuality and possibility.....	4
4.9.4 Classes and types.....	4
4.9.5 Change over time.....	4
4.9.6 Parts, wholes, unity and boundaries.....	4
4.9.7 Space and place.....	4
4.9.8 Scale and granularity.....	5
4.9.9 Qualities and other attributes.....	5
4.9.10 Quantities and mathematical entities.....	5
4.9.11 Processes and events.....	5
4.9.12 Constitution.....	6
4.9.13 Causality.....	6
4.9.14 Information and reference.....	6
4.9.15 Artefacts and socially constructed entities.....	6
4.9.16 Mental entities, imagined entities, fiction, mythology, religion.....	6
4.10 Documentation of ontology management principles (in conformance to ISO/IEC 21838-1:2021, 4.4.8).....	6
Bibliography	7

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives or www.iec.ch/members_experts/refdocs).

ISO and IEC draw attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO and IEC take no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO and IEC had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents and <https://patents.iec.ch>. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html. In the IEC, see www.iec.ch/understanding-standards.

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 and IEC websites.

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 and www.iec.ch/national-committees.

Introduction

The descriptive ontology for linguistic and cognitive engineering (DOLCE) (see References [1] and [3]) 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 OWL 2 and in Common Logic (CL).

DOLCE is a top-level ontology aimed at making people’s assumptions about the nature and structure of the world explicit, as reflected by natural language, cognition and human common sense (see its backbone taxonomy in Figure 1). DOLCE is widely used by a diverse array of domain ontologies in areas like enterprise and process modeling, engineering, robotics, geographical information systems, socio-technical systems and digital humanities.

The natural language specification of the DOLCE signature supports human maintenance and use of the ontology, including use in development of conformant domain ontologies.

The adoption of the Web Ontology Language (OWL) as a W3C standard was motivated by the need to have a decidable ontology representation language as the basis for the Semantic Web. The OWL 2 formalization of DOLCE supports use of the ontology in computing, including enabling DOLCE to be used in tandem with other ontologies expressed in OWL and in related languages, and in allowing ontology quality control through use of OWL reasoners.

The CL formalization of DOLCE provides the expressivity needed to provide an axiomatization whose models are the intended models of DOLCE. This axiomatization has a modular structure (see Figure 2 where the arrows represent the relation of extension of theories).

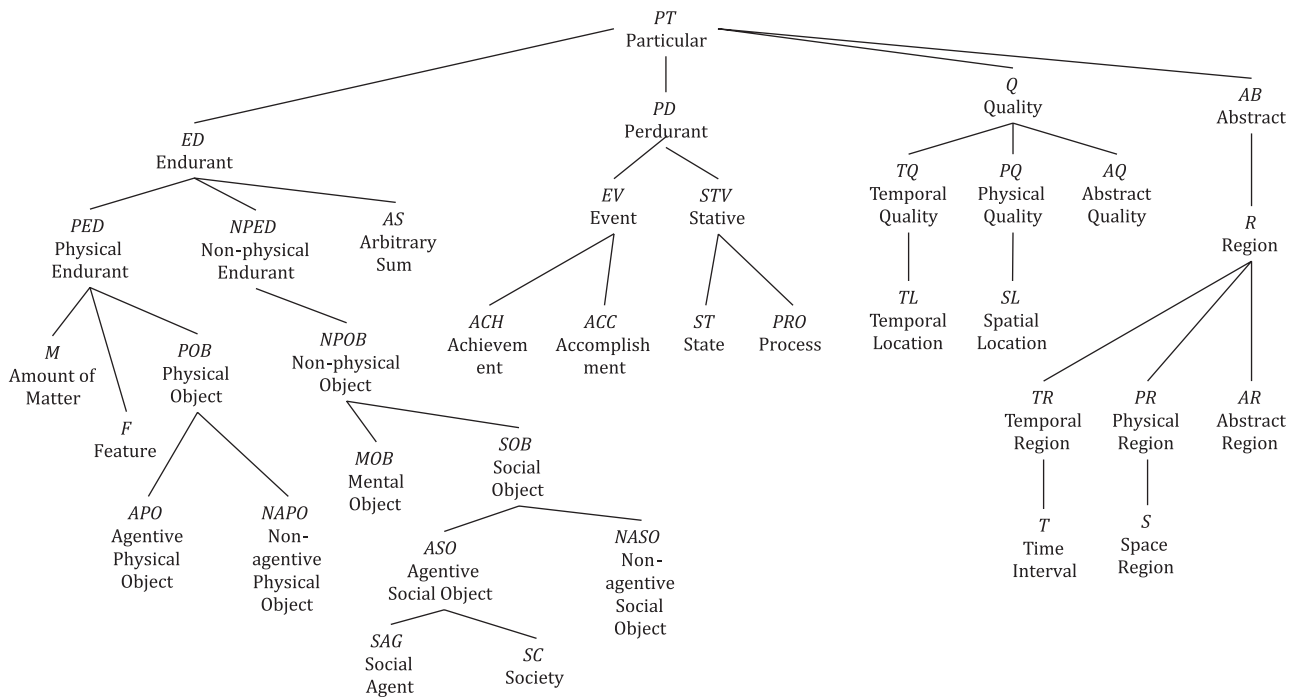


Figure 1 — DOLCE taxonomy

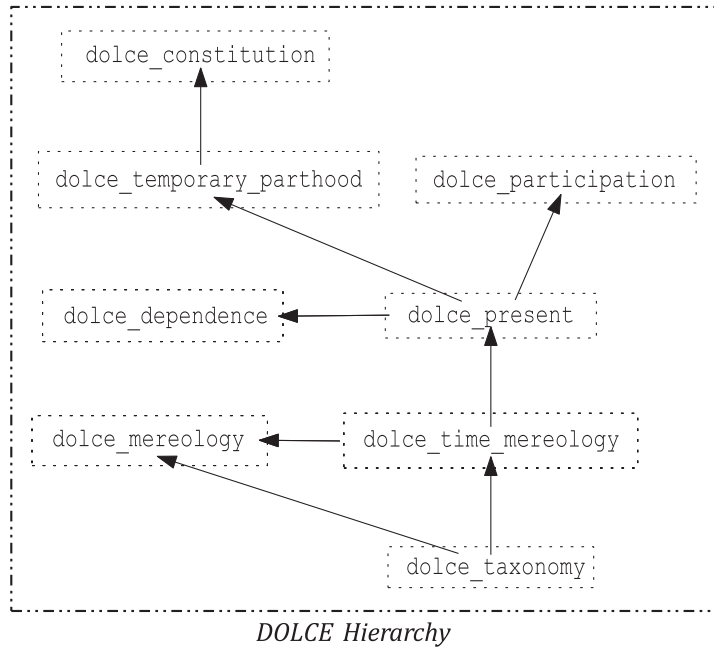


Figure 2 — DOLCE modules

Information technology — Top-level ontologies (TLO) —

Part 3:

Descriptive ontology for linguistic and cognitive engineering (DOLCE)

1 Scope

This document describes descriptive ontology for linguistic and cognitive engineering (DOLCE) as an ontology that is conformant to the requirements specified for top-level ontologies in ISO/IEC 21838-1.

This document describes DOLCE 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 DOLCE;
- axiomatizations of DOLCE in OWL 2 and CL;
- documentation of the conformity of DOLCE to the requirements specified for top-level ontologies in ISO/IEC 21838-1;
- documentation of the methodology for specifying domain ontologies that conform to DOLCE.

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 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 languages*