Ontology Engineering Tradecraft

John Beverley

Assistant Professor, *University at Buffalo*
Vice President, *National Center for Ontological Research*
Affiliate Faculty, *Institute of Artificial Intelligence and Data Science*

Outline

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- The New Era
- Pillars of Ontology Engineering
- Systematic Disambiguation
- Ontology Engineering as Discipline

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Philosophy is at heart the **study of methods**; philosophers seek out methods for answering important questions

Once consensus has been reached over methods, they **form the basis of a scientific discipline**

Garden of Forking Paths

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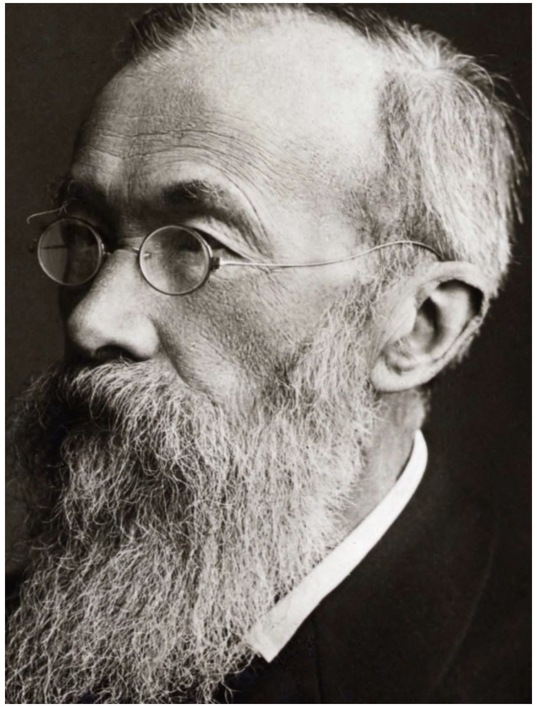
- Philosophy is a garden in which scientific disciplines are grown


Garden of Forking Paths

- Philosophy is a garden in which scientific disciplines are grown
- Ontology engineering – despite existing as a field for over 20 years – has yet to fully emerge as a scientific discipline

Garden of Forking Paths

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- Philosophy is a garden in which scientific disciplines are grown
- Ontology engineering – despite existing as a field for over 20 years – has yet to fully emerge as a scientific discipline
- Philosophers turned engineers and engineers turned philosophers **do not** a discipline make
- We need **consensus on methods**

WHAT DISTINGUISHES ONTOLOGY ENGINEERING FROM NEARBY DISCIPLINES?

It Bears Repeating...

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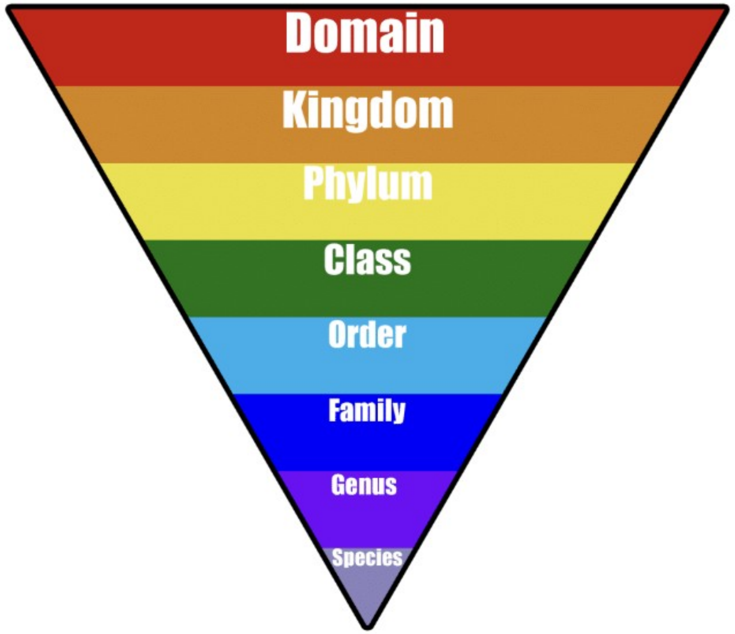
- You should seriously ask yourself, what distinguishes ontology engineering from:

Taxonomies



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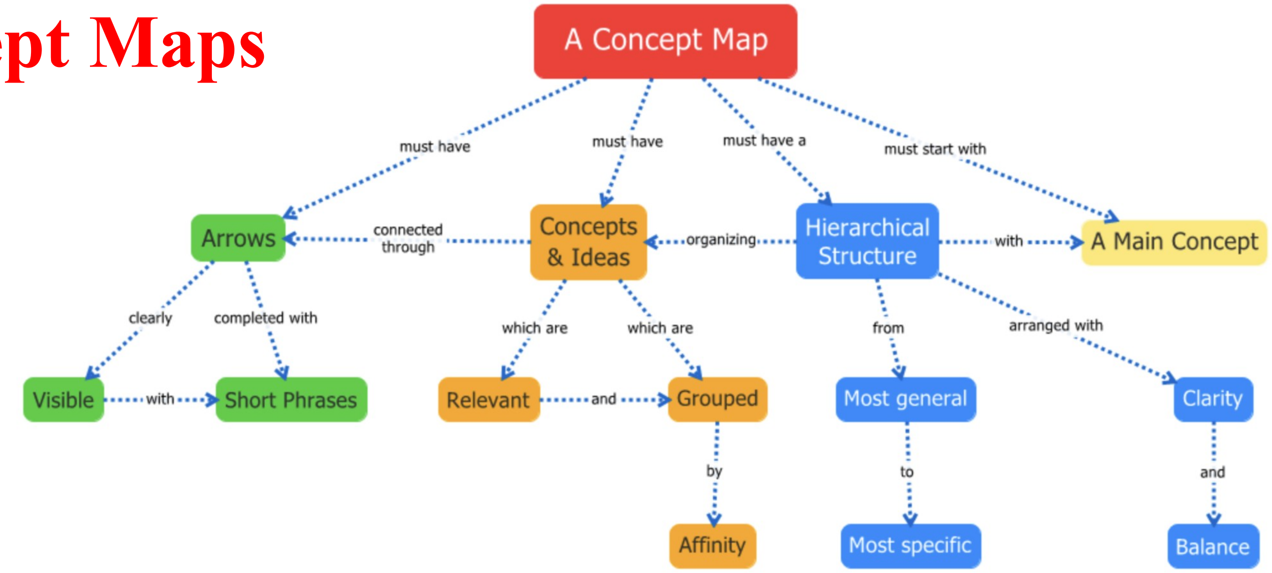
Concept Maps



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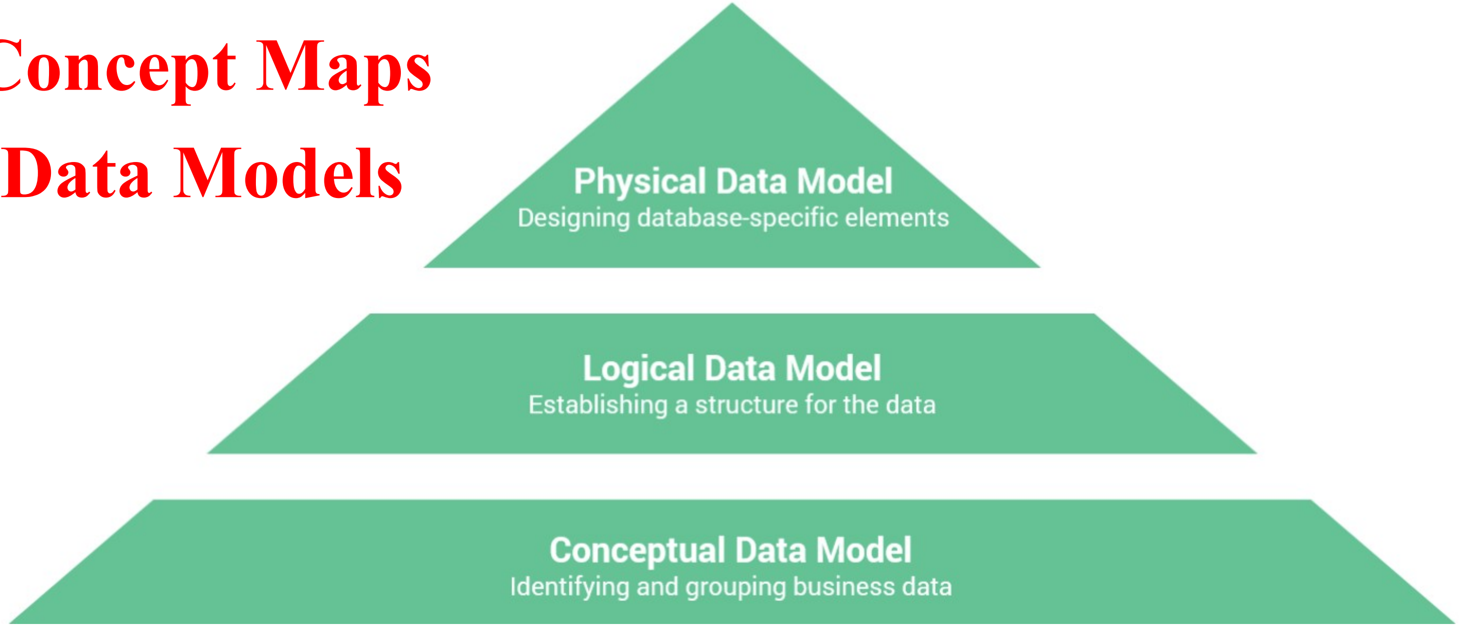

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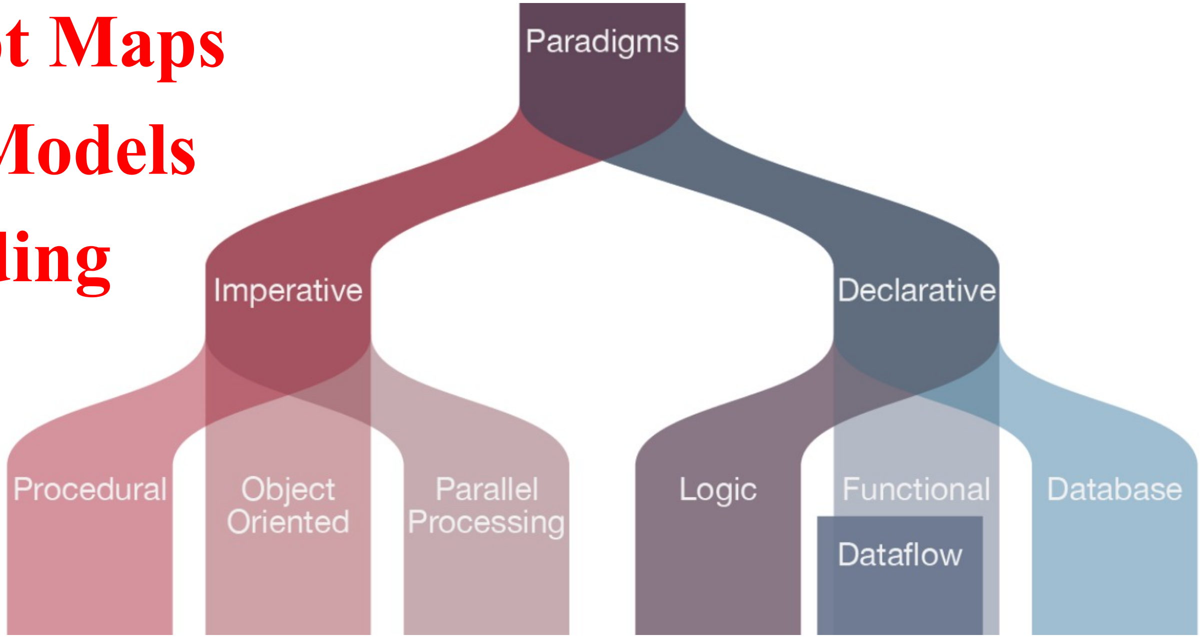

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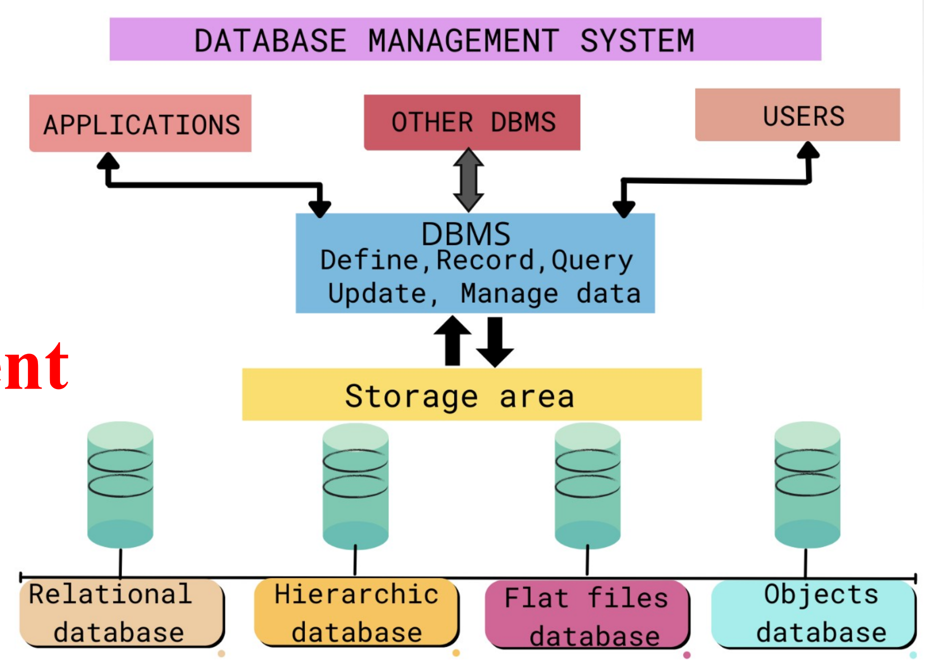
Database Management



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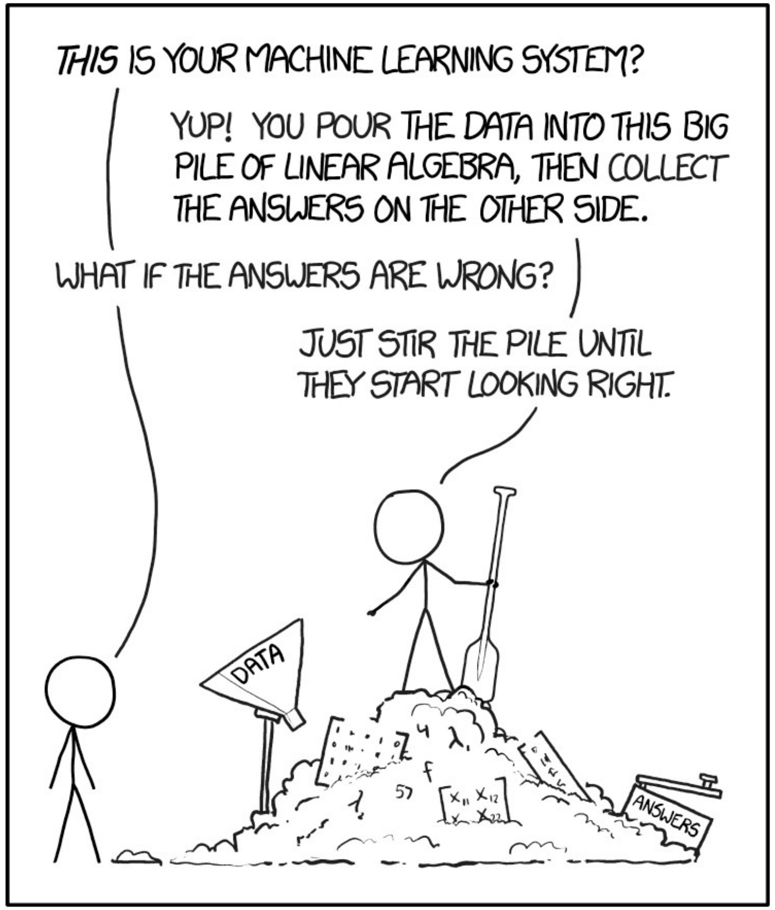
Machine Learning



Non-Starters

- Ontologists use the **semantic web stack**!
- Ontologists specifically use the **Web Ontology Language (OWL)**!
- Ontologists build **ontologies**!
- Ontologists are concerned with **universals (or something akin)**!

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INSUFFICIENT

I COME BEARING GIFTS

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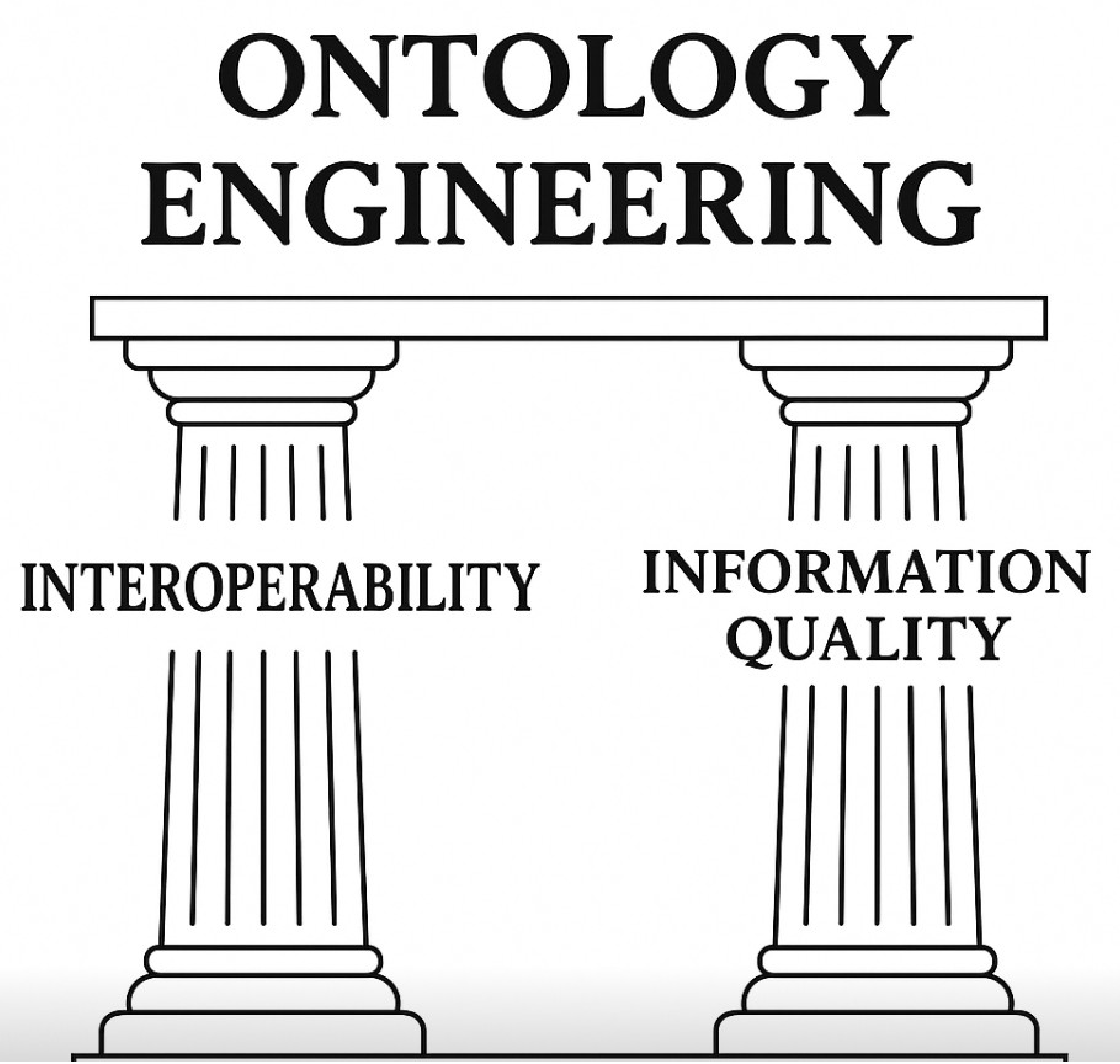
ONTOLOGY
ENGINEERING
INTEROPERABILITY
INFORMATION
QUALITY

Promise of Ontology Engineering

- Ontologies are formally well-defined machine-interpretable controlled vocabularies designed to represent entities and logical relationships among them

- Ontologies make **explicit** the **implicit** meanings buried in datasets, by using basic principles of formal logic

- Ontologies provide a **semantic layer** to connect information silos

Interoperability Strategies

- For the sake of argument, let us call "interoperability strategies" those strategies that mitigate or eliminate information silos

- Interoperability strategies may be divided along at least three axes

Human-Human
Human-Machine
Machine-Machine

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Human-Human Interoperability

- Concerns the alignment of understanding between **human agents**

- Often pursued through the **creation of** shared vocabularies, definitions, standards, and practices

- Perhaps facilitated by education, legislation, consensus-building, or social conventions

FOR HUMANS

acceptability — The joint operation plan review criterion for assessing whether the contemplated course of action is proportional, worth the cost, consistent with the law of war; and is militarily and politically supportable. See also **adequacy; feasibility.** (JP 5-0)

access — In counterintelligence and intelligence use, a. a way or means of approach to identify a target; or b. exploitable proximity to or ability to approach an individual, facility, or information that enables target to carry out the intended mission. (JP 2-01.2)

access to classified information — The ability and opportunity to obtain knowledge of classified information by persons with the proper security clearance and a need to know of specified classified information. (JP 2-01)

accompanying supplies — Unit supplies that deploy with forces. (JP 4-01.5)

accountability — The obligation imposed by law or lawful order or regulation on an officer or other person for keeping accurate record of property, documents, or funds. (JP 1)

acoustic intelligence — Intelligence derived from the collection and processing of acoustic phenomena. Also called **ACINT.** (JP 2-0)

DOD Dictionary of Military and Associated Terms

Central Conceit

- Concerns the alignment of understanding between **human agents**

- Often pursued through the **creation of** shared vocabularies, definitions, standards, and practices, perhaps facilitated by education, legislation, consensus-building, or social conventions

Any two speakers of a given natural language share some underlying formal structure

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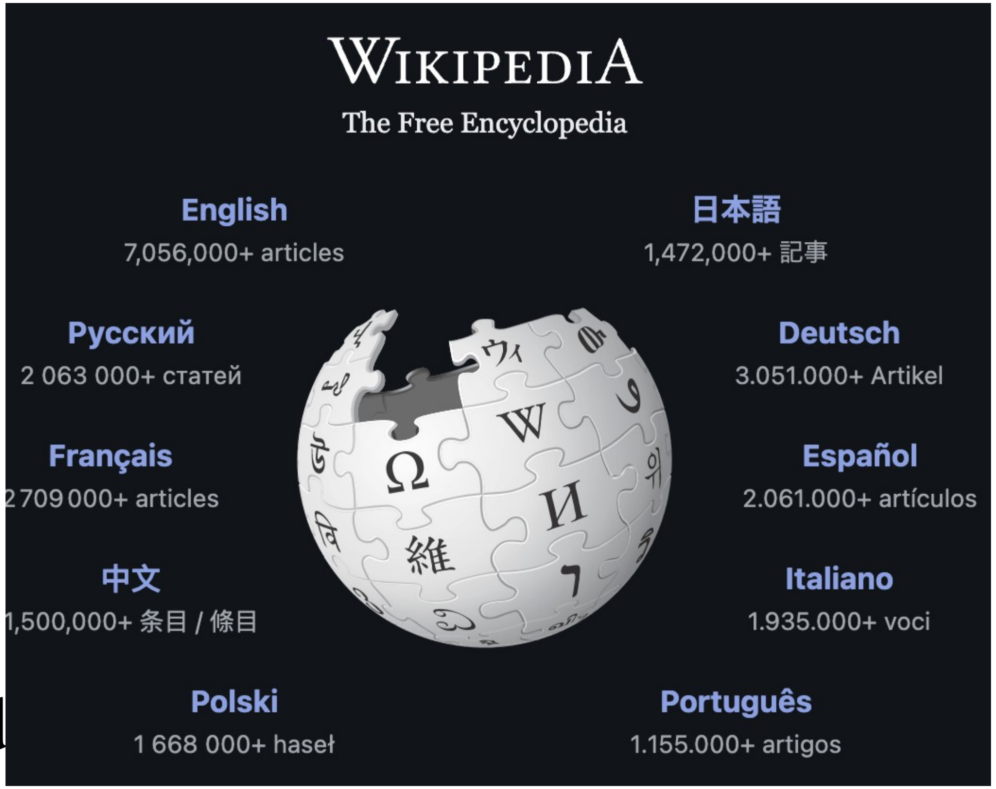
Human-Human Interoperability

- Ontology engineers operate on this axis when **eliciting knowledge from domain experts**

- This may involve extracting key terms, formulating competency questions, or evaluating domain-specific generated by those experts

- They are not alone along this axis, e.g. dictionaries, thesauri, taxonomies, wikiped



Human-Human Success Conditions

- Success **can be measured** by the clarity achieved among and across stakeholders, the resolution of verbal ambiguities
- As well as extent to which **consensus is reached** on meanings
- Ask three economists to define "GDP" and you may receive three different answers, e.g. Keynsian, classical, developmental, etc.

Interoperability Strategies

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- Interoperability strategies may be divided along at least three axes

Human-Human
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Human-Machine Interoperability

- Concerns the **capability of computational systems** to interpret and act upon human-understandable descriptions of the world

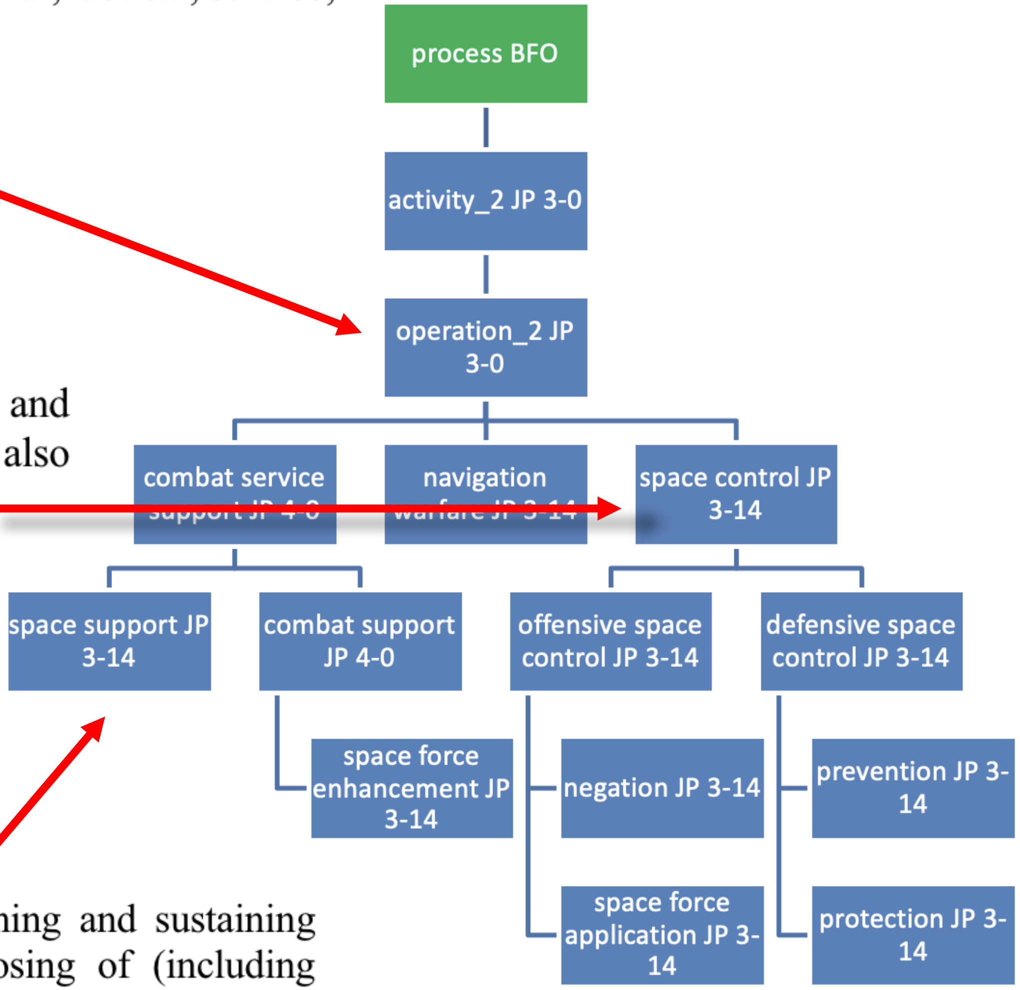
- Promoting human-machine interoperability requires translating domain knowledge into formal representations that machines can reason over

- For example, in **implementations** of ontologies, logical models, data models, and so on

FOR MACHINES

operation — 1. A sequence of tactical actions with a common purpose or unifying theme. (JP 1) 2. A military action or the carrying out of a strategic, operational, tactical, service, training, or administrative military mission. (JP 3-0).

space control — Operations to ensure freedom of action in space for the United States and its allies and, when directed, deny an adversary freedom of action in space. See also **combat service support; combat support; negation; space systems.** (JP 3-14)



space support — Launching and deploying space vehicles, maintaining and sustaining spacecraft on-orbit, rendezvous and proximity operations, disposing of (including deorbiting and recovering) space capabilities, and reconstitution of space forces, if required. See also **combat service support.** (JP 3-14)

Central Conceit

- Concerns the **capability of computational systems** to interpret and act upon human-understandable descriptions of the world
- Promoting human-machine interoperability requires translating domain knowledge into formal representations that machines can reason over

Any two heterogeneous information systems share some underlying formal structure

Human-Machine Interoperability

- Ontology engineers operate along this axis when formalizing expert knowledge into machine-readable languages

- Languages such as the **Web Ontology Language (OWL)** for reasoning engines like HermiT and Pellet, **variations of First-Order Logic**

- Or indeed **RDFlib**, **SPARQL**, **SHACL**, and so on

Human-Machine Success Conditions

- Progress **evaluated** based on faithfulness of representation and **human-machine integration**

- As well as the **extent to which** machines can extract useful explicit and implicit information from human-defined structures

Interoperability Strategies

- For the sake of argument, let us call "interoperability strategies" those strategies that mitigate or eliminate information silos

- Interoperability strategies may be divided along at least three axes

Human-Human
Human-Machine
Machine-Machine

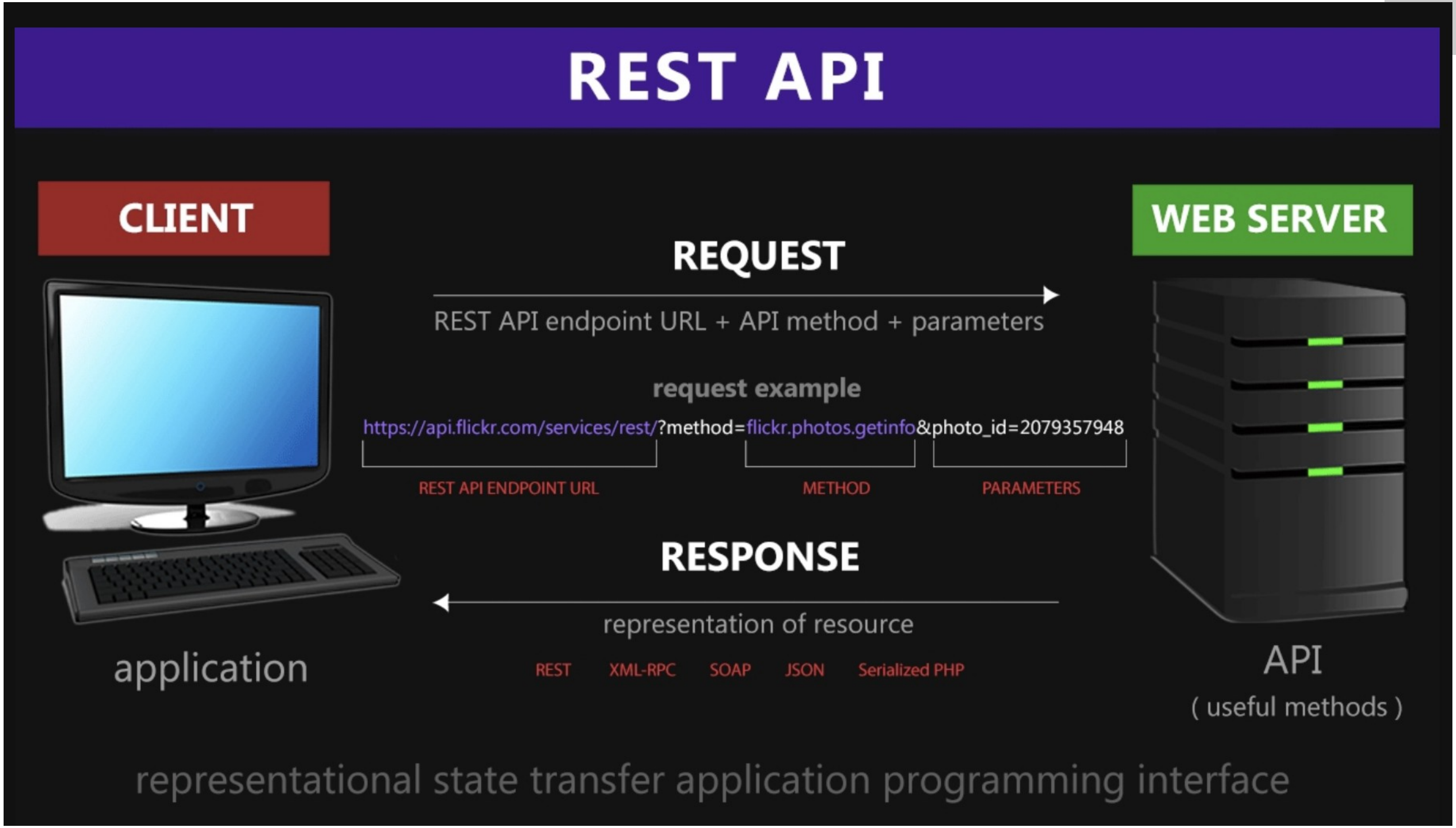
Machine-Machine Interoperability

- Concerns the extent to which **independent computing systems can exchange, interpret, and process data** without human intervention

- Requires robust data structuring, shared semantics, exchange protocols

- At a syntactic level, interoperability can be facilitated through **standards** like JSON-LD, RDF, or OWL, and interfaces such as REST APIs or SPARQL endpoints

GET SOME REST



Central Conceit

- Concerns the extent to which **independent computing systems can exchange, interpret, and process data** without human intervention

- Requires robust data structuring, shared semantics, exchange protocols

Any two heterogeneous information encodings share some underlying formal structure

Success Conditions

- Contributions along this axis are evaluated in various ways

- Such as:
  - **Syntactic Coherence** - Data format or structure compatible
  - **Semantic Alignment** - Extent to which systems share semantics
  - **Computationally Feasibility** - Automated reasoning and querying across distinct datasets locally or over web protocols
  - ....

ONTOLOGY ENGINEERS CONFLATE THESE AXES AND SUCCESS CONDITIONS OFTEN

Costs of Conflating Axes

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- It is common to hear of ontology engineers both eliciting knowledge from domain experts and trying **to teach experts** to build ontologies
- Conflating **human-human** and **human-machine axes**
- This is analogous to having a product manager hire a JavaScript expert to build a user interface for a new product, only for the JavaScript developer to try to teach the product manager how to code in JavaScript

WHO WOULD MAKE SUCH A MISTAKE?

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Connection between Pillars

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- Information Quality: Fitness of information for its intended use

- Interoperability is often pursued without reflection on how information quality will or may be impacted in applications

- Information quality is often pursued without reflection on how interoperability will be obtained

Connection between Pillars

- Too much **emphasis on interoperability** leads to ontology artifacts that lack the the rich axiomatization needed to leverage tools to support information quality improvement

- Too much **emphasis on the information quality** results in information silos, unable to leverage common semantics in computing systems to promote interoperability

Patchwork Quilt

- Having stitched together databases, if we then aim to ensure consistency, completeness, and reliability across such loosely connected data sources, we will find ourselves needing to stitch together more datasets

- Re-checking and updating our previous stitching, and praying the patchwork quilt we have built stays together long enough to support our applications

Best Practices

- Pursuing **interoperability** and **information quality** simultaneously can be pursued by adopting common best practices in our community

- Many of which are shared with the software development community, such as having a **top-level ontology**, adopting **modularization**, and so on

(OG) Foundry Efforts

Overview
Open (principle 1)
Common Format (principle 2)
URI/Identifier Space (principle 3)
Versioning (principle 4)
Scope (principle 5)
Textual Definitions (principle 6)
Relations (principle 7)
Documentation (principle 8)
Documented Plurality of Users (principle 9)
Commitment To Collaboration (principle 10)
Locus of Authority (principle 11)
Naming Conventions (principle 12)
Notification of Changes (principle 13)
Maintenance (principle 16)
Responsiveness (principle 20)

Open Biological and Biomedical Foundry

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1 Introduction
2 IOF Ontology Architecture
3 Common Representations
4 Open Availability and Copyright
5 Scope and Context
6 Modularity
7 Ontological Considerations
8 Foundational Ontology – Use
9 Documentation
10 Textual Definitions
11 Identifiers and Naming Conventions
12 IRI and Identifier Space
13 Versioning
14 Maintenance
15 Contributed Ontologies: – Use
16 Collaboration

Industrial Ontologies Foundry

P1 – OPENNESS
Summary
Purpose
Recommendations and Requirements
Examples
P2 – MODIFICATION
Summary
Purpose
P3 – COMMON FORMAT
Summary
Recommendations and Requirements
Implementation
P4 – IRI/IDENTIFIER SPACE
Summary
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P6 – SCOPE
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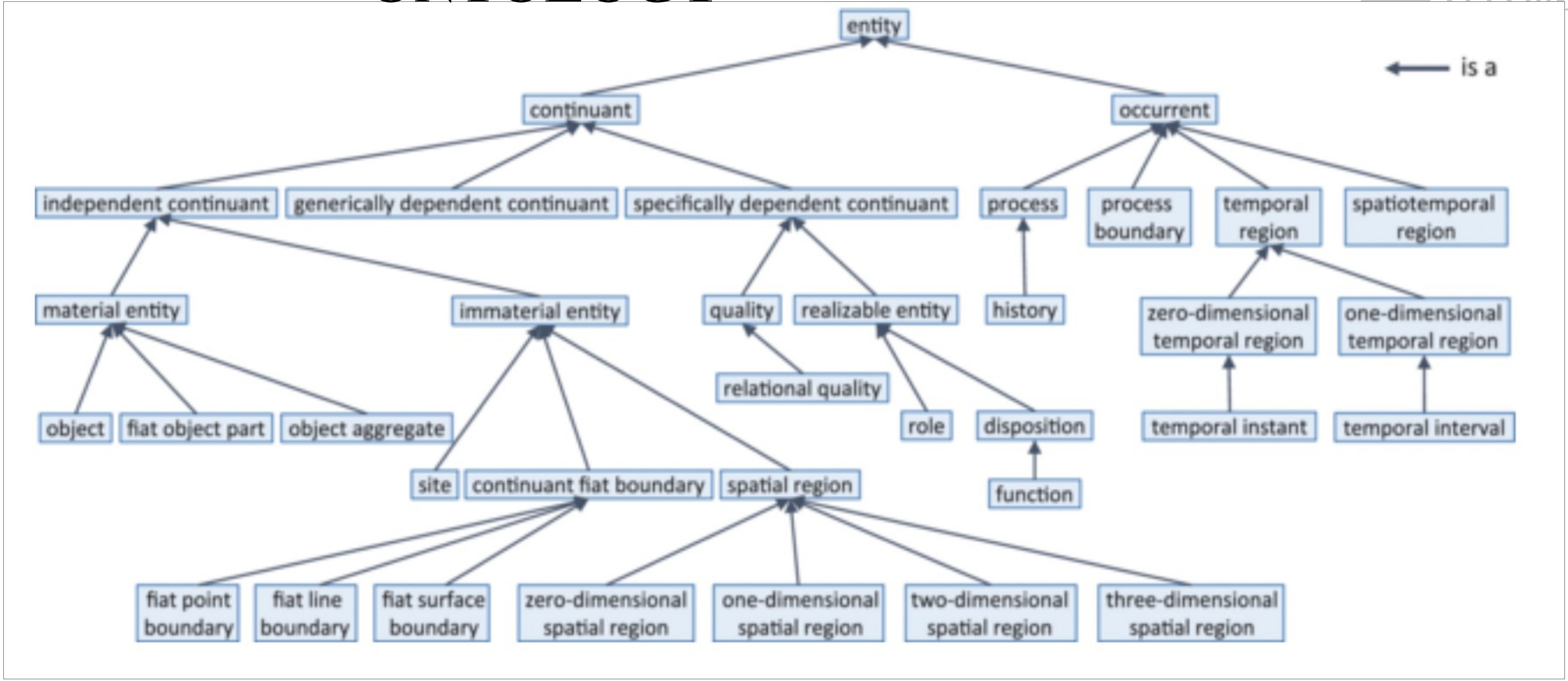
Recommendations and Requirements
Example
P7 – TEXTUAL DEFINITIONS
Summary
Purpose
Recommendations and Requirements
P8 – RELATIONS
Summary
Purpose
P9 – DOCUMENTATION

DOD-IC Foundry

BASIC FORMAL ONTOLOGY



Standards About us News Taking part Store EN MENU

ICS › 35 › 35.060

ISO/IEC 21838-2

Information technology — Top-level ontologies (TLO) — Part 2: Basic Formal Ontology (BFO)

GENERAL INFORMATION

Status : Under development **Publication date :** 2020-03

Edition : 1

Technical Committee : ISO/IEC JTC 1/SC 32 Data management and interchange

ICS : 35.060 Languages used in information technology | 01.040.35 Information technology (Vocabularies)

MEMORANDUM FOR CHIEF DIGITAL AND ARTIFICIAL INTELLIGENCE OFFICER COUNCIL MEMBERS
INTELLIGENCE COMMUNITY CHIEF DATA OFFICER COUNCIL MEMBERS

SUBJECT: Baseline Standards for Formal Ontology within the Department of Defense and the Intelligence Community

In April 2023, the Chief Digital and Artificial Intelligence Officer Council and the Intelligence Community Chief Data Officer Council chartered the joint Department of Defense (DoD) and Intelligence Community (IC) Ontology Working Group (DIOWG). It was tasked with developing coordinated ontologies to set the agreed definitions and standard necessary to make data machine understandable. Based on the DIOWG's recommendations, both Councils direct the use of three baselines: Top-Level Ontology, Basic Formal Ontology, and Common Core Ontology. These will set the baseline standards for formal DoD and IC ontology.

By aligning the DoD and IC ontologies to a common set of top and mid-level standards, the combined enterprise will realize significant gains in data interoperability, federated search and discovery, decreased analytic timelines, and better cost efficiency. This common approach to data ontology is key to deriving value from shared data assets at speed and scale. The DIOWG has provided additional background information on these international ontological standards in Attachment A.

The nation's warfighters and intelligence professionals will need to have a decisional advantage in the immediate future and that can only be unlocked through the sharing of interoperable data. The next steps for the DIOWG are to codify recommended principles and governance processes to manage the DoD-IC Ontology Foundry. The DIOWG collaboration site can be accessed by visiting https://www.trmc.osd.mil/wiki/display/DIOWG/.

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Lori Wade
Intelligence Community Chief Data Officer
Office of the Director of National Intelligence

Dr. Craig H. Martell
Chief Digital and Artificial Intelligence Officer
Department of Defense

DoD-IC Enterprise Standards Baseline

Standards Citations for ISO 21838: Parts 1 and 2

Joint Enterprise Standards Committee (JESC) Plenary was held 23 Oct 2024. DoD IT Standards Registry (DISR) 24-2.0 (i.e., the DoD-IC joint enterprise standards baseline) was published 07 Nov 2024. The baseline includes the two Change Requests (CRs) for TLO and BFO. Congratulations all and thank you!

DISR 24-2 Baseline (published on 7 Nov 2024) Includes Entries for ISO/IEC 21838 Parts 1 and 2. Their citations are below:		
Standard Reference Number	303330	303321
Standard Identifier	ISO/IEC 21838-1:2021	ISO/IEC 21838-2:2021
Standard Title	Information Technology – Top Level Ontologies (TLO) – Part 1: Requirements	Information Technology – Top Level Ontologies (TLO
Standard Class	Standard	Standard
DoD Status	Mandated	Mandated
DoD Sunset Date		
DoD Sunset Event		
Date Introduced to Registry	07-Nov-2024	07-Nov-2024
Date DoD Emerging		
Date DoD Mandated	07-Nov-2024	07-Nov-2024

Joint Enterprise Standards Committee (JESC) Applications Technical Working Group

About JESC

The JESC serves as the governance body for DoD information technology (IT) standards, and for Intelligence Community (IC) enterprise standards. These include data standards critical to the ADL Initiative's development of a Total Learning Architecture (TLA) for DoD education and training.

The JESC, which includes subordinate committees, working groups, and ad-hoc enterprise standards activities, recommends common enterprise standards, profiles, and specifications for DoD and IC information environments. Standards approved by this committee are mandated by DoD's Chief Information Officer for Department-wide use and acquisitions.

BFO Ecosystem

700+ Projects

national center for ontological research
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BFO Basic Formal Ontology

Home GitHub Guidebook Publications FOL Users Tutorials

Users

Below you will find an alphabetical list of ontologies and institutions/groups usin

Ontologies

- ACGT Master Ontology (ACGT MO)
- Actionable Intelligence Retrieval System (AIRS)
- Addiction Ontology (Addict-O)
- Additive Manufacturing Ontology (AMO)
- Adolescent Depression Ontology (ADO)
- Adverse Event Reporting Ontology (AERO)
- AFO Foundational Ontology
- African Wildlife Ontology (AWO)
- Agronomic Linked Data (AgroLD)
- Agronomy Ontology (AGRO)
- Aircraft System Ontology
- Algorithm-Implementation-Execution Ontology Design Pattern
- Alzheimer Disease Ontology (ADO)
- Alzheimer's Disease Diagnosis Ontology (ADDO)
- Anatomy of the Insect Skeleto-Muscular system ontology (AISM)
- Animals in Context Ontology (ACO)
- Anthropological Notation Ontology (ANNO)
- Antimicrobial-Microorganism Ontology
- Apollo Structured Vocabulary (Apollo-SV)
- Argument Ontology (ARGO)
- ARIES (Arkansas Imaging Enterprise System) Knowledge Graph
- Asset Management Ontology (AMODO)
- Autism-DSM-ADI-R Ontology (ADAR)
- Bacterial Clinical Infectious Diseases Ontology (BCIDO)
- Baden Württemberg Materials Digital Domain Ontology (BWMD)
- Bank Ontology
- Battle Management Ontology (BMO)
- Behavior Change Intervention Ontology (BCIO)
- Behaviour Change Technique Ontology
- Behavior Perspective Model (BPM)
- Beta Cell Genomics Application Ontology (BCGO)
- Bio-Knowledge Network Ontology (BioKNO)
- BioAssay Ontology
- Bioinformatics Web Service Ontology (OBIWS)
- Biological Collections Ontology (BCO)
- Biomedical Ethics Ontology
- Biomedical Grid Terminology (BiomedGT, retired)
- Biomedical Study - Lifecycle Management (BMS-LM) core ontology
- Biomimetic Ontology
- BioTop: a biomedical top-domain ontology

- OntoAlign++: A Combined Strategy for Improving Ontologies Alignment
- OntoBuildableSpace Ontology
- OntoDM Core
- OntoForInfoScience
- Ontologies for Representing Surgical Procedure Models (OntoSPM)
- Ontologized Minimum Information About Blobank data Sharing (OMIAB
- Ontology Based Clinical Decision Support System for Geriatrics
- Ontology Based Decision Support System for Tuberculosis Manageme
- Ontology for Adverse Events (OAE)
- Ontology for Autism Spectrum Disorder
- Ontology for Biobanking (OBIB)
- Ontology for Biofilms (BIFO)
- Ontology for Biomedical Investigations (OBI)
- Ontology for Cancer research variables (OCRV)
- Ontology for Computable Eligibility Criteria - Hepatitis C Virus (OCEC-I
- Ontology for Dengue Fever (IDODEN)
- Ontology for Documentation of Variable/Data Source Selection (ODVD
- Ontology for Drug Discovery Investigations (DDI)
- Ontology for Energy Investigations (OEI)
- Ontology for Functionally Graded Materials (OFGM)
- Ontology for General Medical Science (OGMS)
- Ontology for Genes and Genomes - Mouse (OGG-MM)
- Ontology for Genetic Interval (OGI)
- Ontology for Guiding Appropriate Antibiotic Prescribing
- Ontology for Information Science (OntoforInforScience)
- Ontology for Laparoscopic Surgeries (LapOntoSPM)
- Ontology for MIcroRNA Target Prediction (OMIT) (here)
- Ontology for Newborn Screening and Translational Research (ONSTR
- Ontology for Next Generation Sequencing Experiments (NGS Ontology
- Ontology for Nutritional Epidemiology (ONE)
- Ontology for Nutritional Studies (ONS)
- Ontology for Pain and Related Disability, Mental Health and Quality of
- Ontology for Parasite LifeCycle (OPL)
- Ontology for Periodontitis (PERIO)
- Ontology for Petroleum Production
- Ontology for Prognostic Health Management (PHM) in Spacecraft Avio
- Ontology for Stem Cell Investigations (OSCI)
- Ontology for the Documentation of Variable Selection and Data source
- Ontology for Thoracentesis
- Ontology of Autonomous Driving Based on the SAE J3016 Standard
- Ontology of Arthropod Circulatory Systems (OArCS)
- Ontology of Biological and Clinical Statistics (OBCS)
- Ontology of Cancer Related Social-Ecological Variables (OCRSEV)
- Ontology of Card Sleights
- Ontology of Cardiovascular Drug Adverse Events (OCVDAE)
- Ontology of Chinese Medicine for Rheumatism (OCMR)
- Ontology of Clinical Research (OCRe)
- Ontology of Commercial Exchange (OCE)
- Ontology of Data Mining (OntoDM)

- Shop-Floor Digital Twin (DT) ontology
- Situated and Interactive Multimodal Conversations
- Situation Awareness Ontology (SAO)
- Sketch Map Ontology
- Skin Physiology Ontology (SPO)
- Sleep Domain Ontology (SDO)
- SMART Protocols: SeMAntic RepresenTation for Experimental Protocols
- Smart Ultrasound in Obstetrics and Gynecology (SUOG) Ontology
- SNOMED CT (SCT) Standard Ontology
- Social Determinants of Health Ontology (SDoHO)
- Social Psychology Ontology (SPO)
- Socialog Ontology for Social Simulation
- Software Ontology (SWO)
- Software, Disabilities and Competences Ontology (SODIC)
- Soil Food Web Ontology
- Space Domain Ontologies (SDO)
- Space Object Ontology (SOO)
- Spatial Graph Adapter (SGA) Ontology Design Pattern
- Spatial Relation Ontology
- Spatiotemporal Ontology for the Administrative Units of Switzerland (SONADUS
- Special Nuclear Materials Detection Ontology (SNM-DO)
- Statistics Ontology (STATO)
- STATO-LMM Linear Mixed Model Ontology
- Style of Delivery Ontology
- Subcellular Anatomy Ontology (SAO)
- Suggested Ontology for Pharmacogenomics (SO-Pharm)
- Supply Chain Traceability Ontology
- Surface Water Ontology (SWO)
- Survey Ontology
- Sustainable Development and Climate (SDC) Ontology
- Symptomatic Treatment of Multiple Sclerosis Ontology (STMSO)
- Taxonomy for Rehabilitation of Knee Conditions (TRAK)
- The Common Rule Ontology (CRO)
- The Trope Ontology
- Time Event Ontology (TEO)
- Toxic Process Ontology (TXPO)
- Trade-Space Analysis Tool for Constellations (TAT-C) ontology
- Traditional Chinese Drugs Ontology (TCDO)
- Translational Medicine Ontology (TMO)

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THIS IS NOT A POPULARITY CONTEST

BFO IS SO WIDELY USED FOR GOOD REASONS

Outline

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- The New Era
- Pillars of Ontology Engineering
- Systematic Disambiguation
- Ontology Engineering as Discipline

Disambiguation

- **Type** vs an **instance** of that type, e.g. the instance Algeria vs country

- **Information** vs what that information **is about**, e.g. occupation code vs a holder of an occupation

- **Material** vs **immaterial** things, e.g. a given river vs the site where the river used to flow

- **Processes** vs **product**, e.g. ontology engineering vs ontology produced

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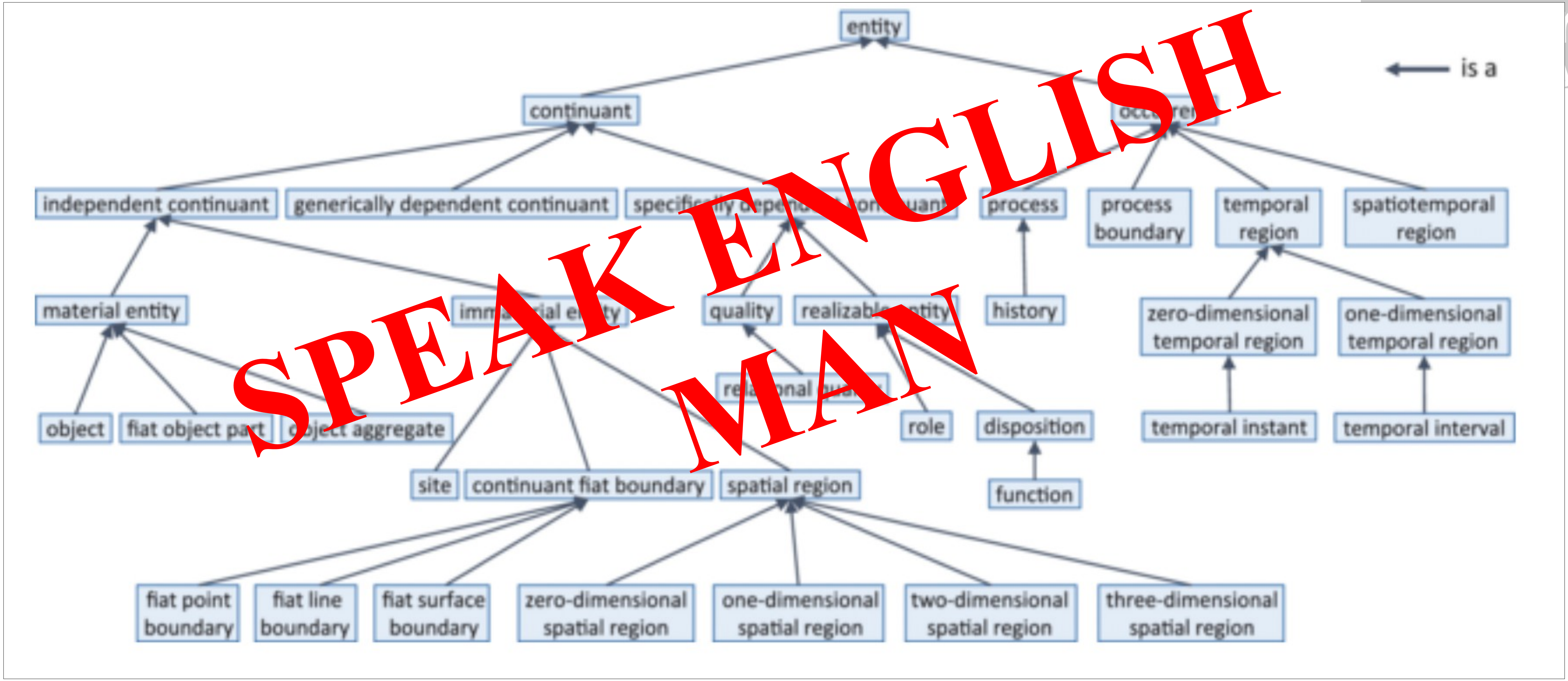

Rules of Thumb

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- When identifying classes, describe:

    1. Material entities within scope, i.e. **Material Entity**
    2. Qualities these material entities have, i.e. **Quality**
    3. What these material entities could do, i.e. **Realizable Entity**
    4. What these material entities actually do, i.e. **Process**
    5. Where these entities and boundaries are located, i.e. **Immaterial Entity**
    6. When these entities exist, i.e. **Temporal Region**
    7. Information about 1-6, i.e. **Generically Depedent Continuant**

https://github.com/BFO-ontology/BFO-2020

Rules of Thumb

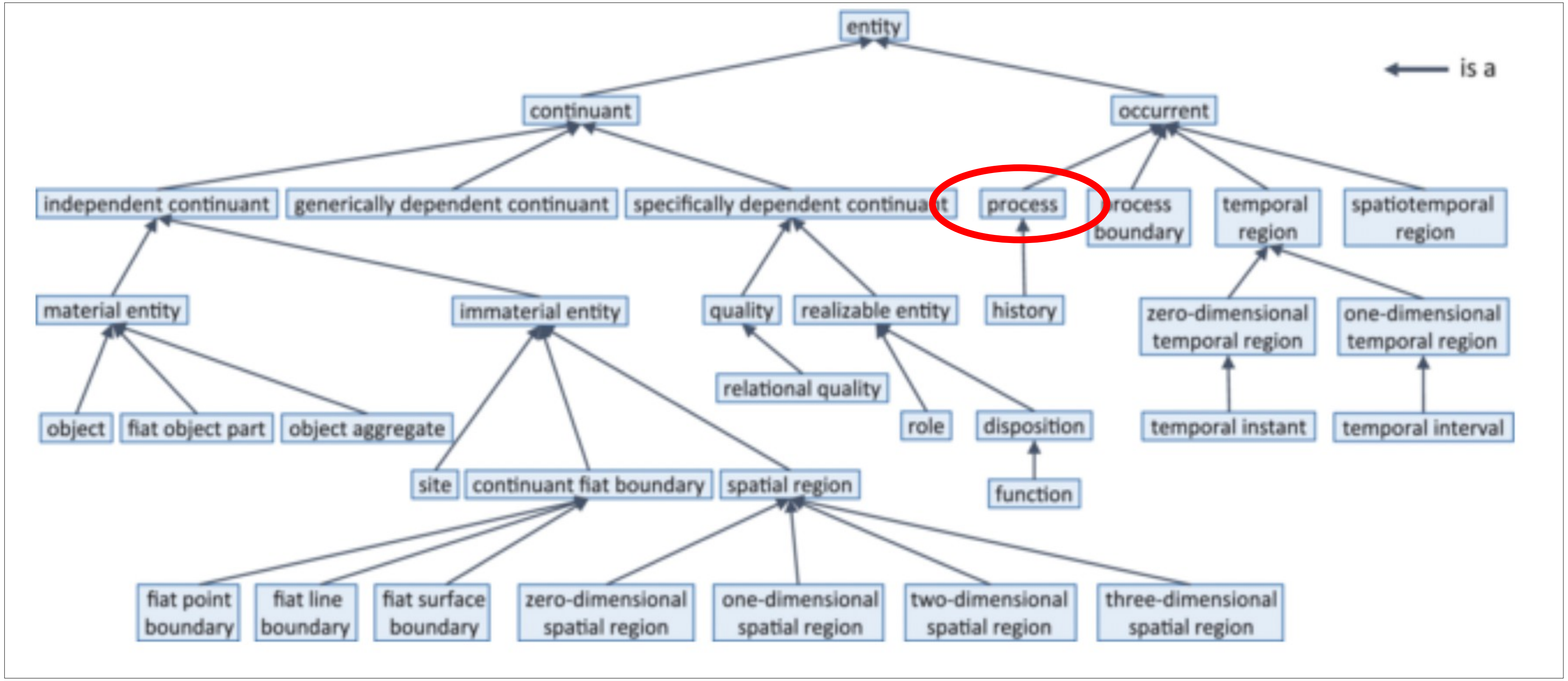
- When identifying relations, describe:

1. Qualities to material entities, i.e. **inheres in**
2. Realizables to material entities, i.e. **inheres in**, **has material basis**
3. Processes to material entities, i.e **participates in**
4. Realizables to processes, i.e. **has realization**
5. Immaterial location of material entity, i.e. **located in**
6. When any such entities exist, i.e. **exists at**, **datatype property**
7. When any such entities carry information, e.g. **generically depends on**

https://github.com/BFO-ontology/BFO-2020

Dependency Chain

- A given **process** may have realization some realizable entity, which inheres in some material entity



Dependency Chain

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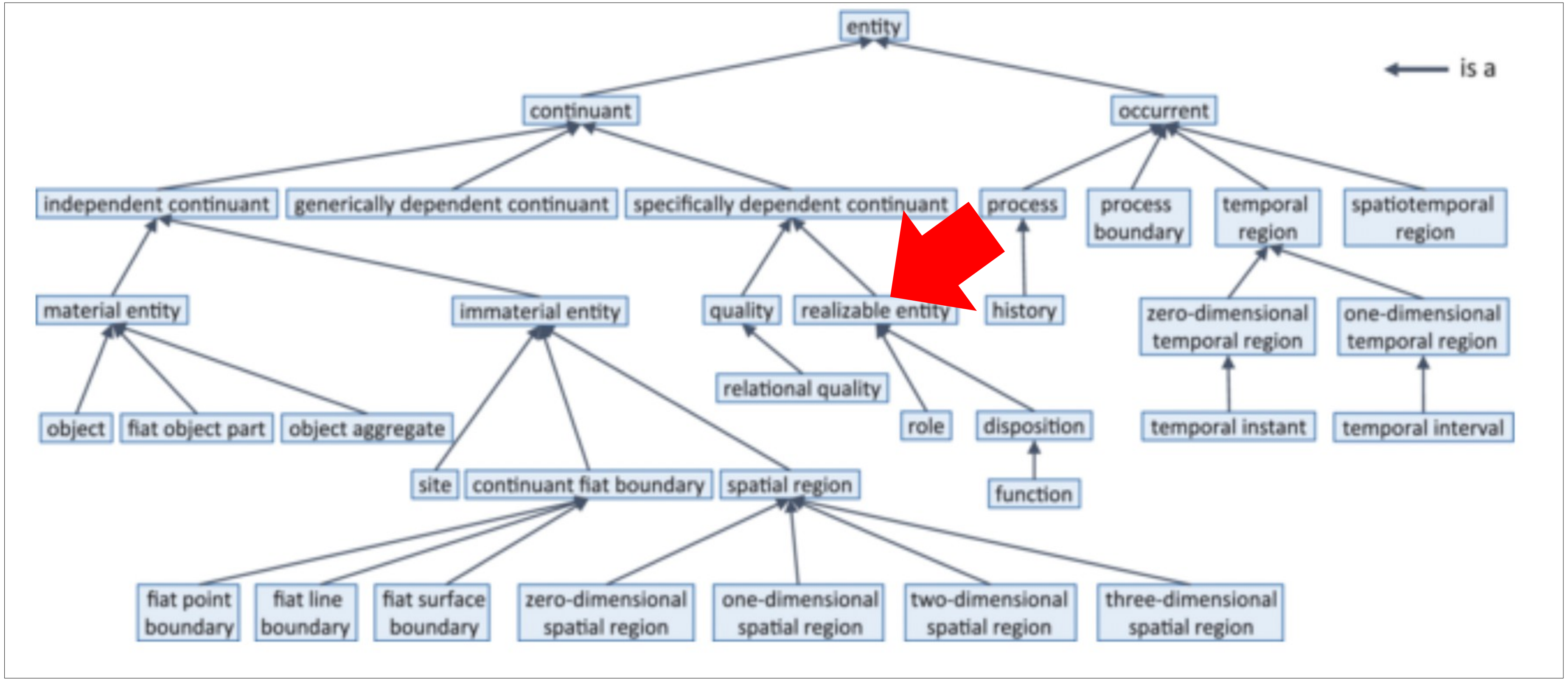

Dependency Chain

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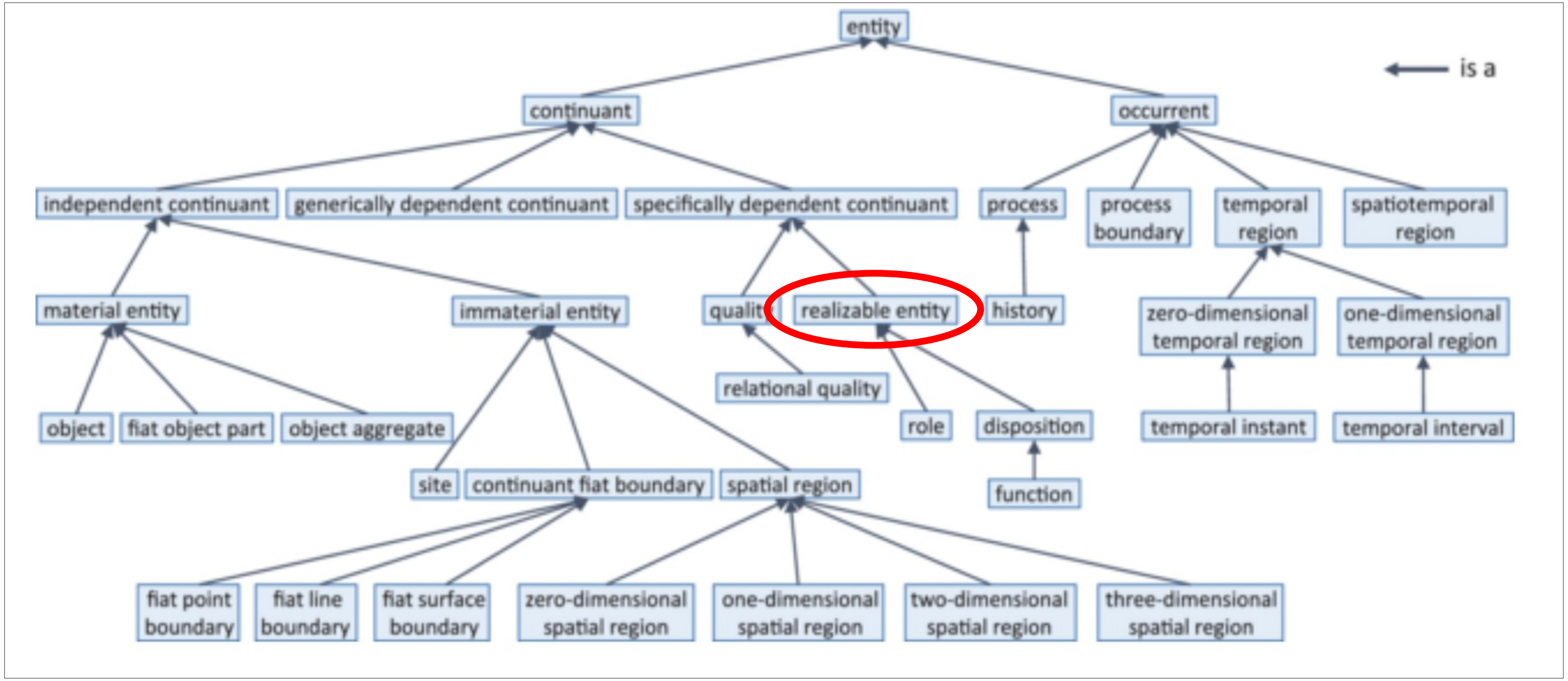

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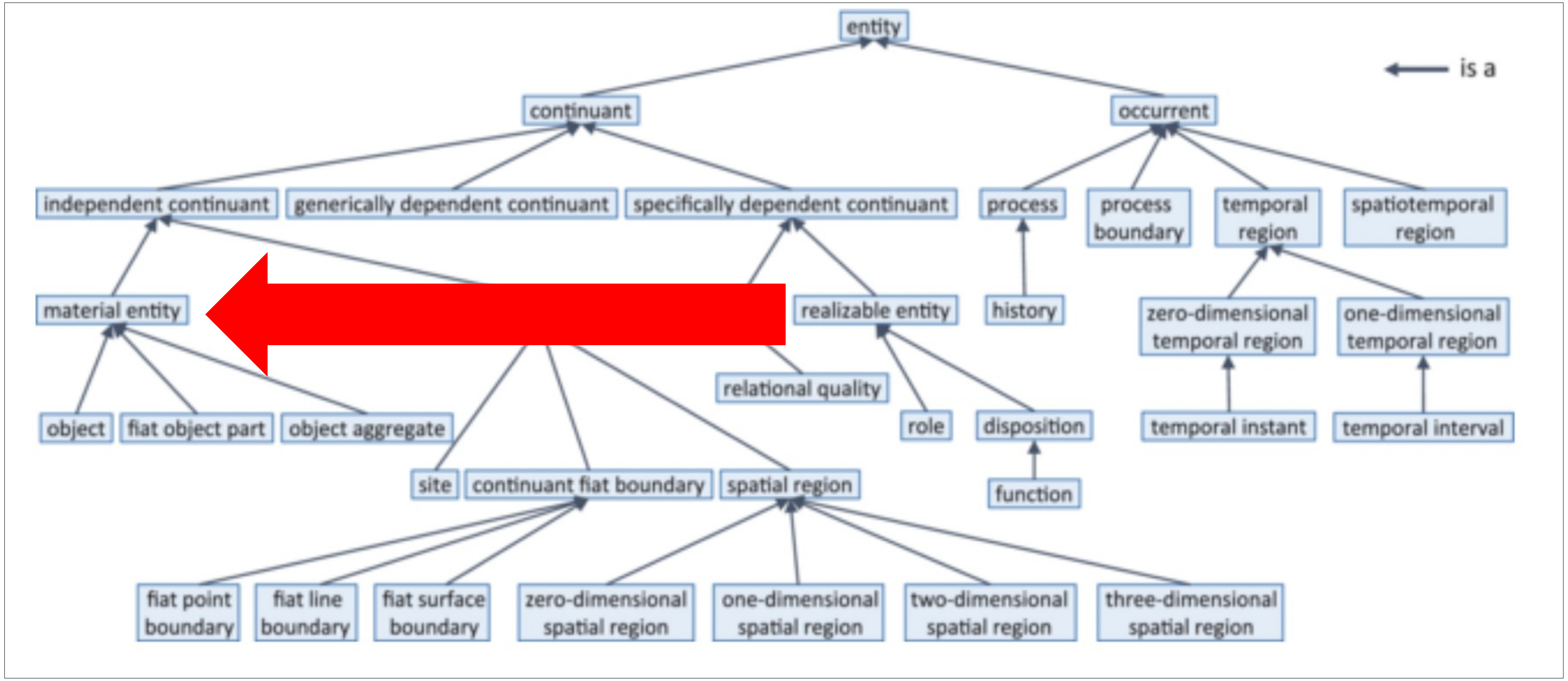

Dependency Chain

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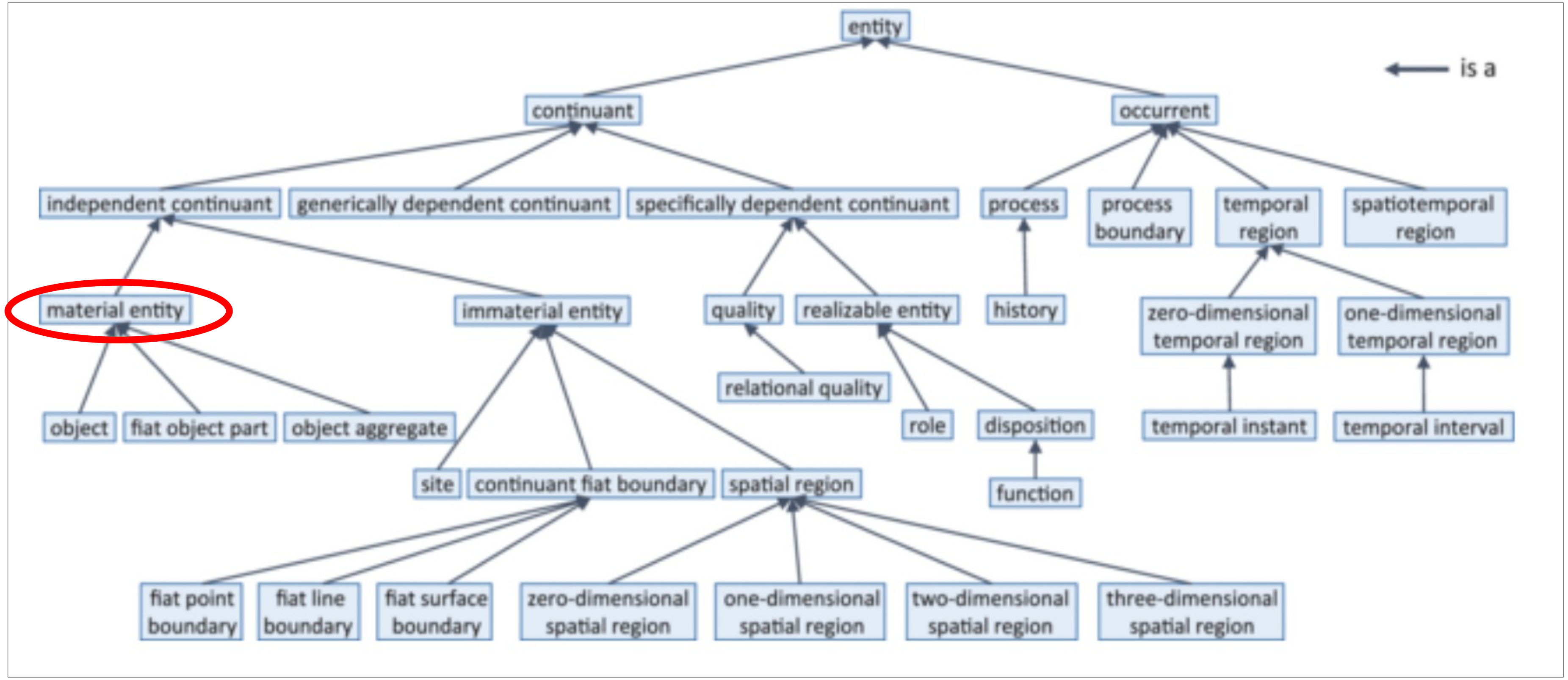
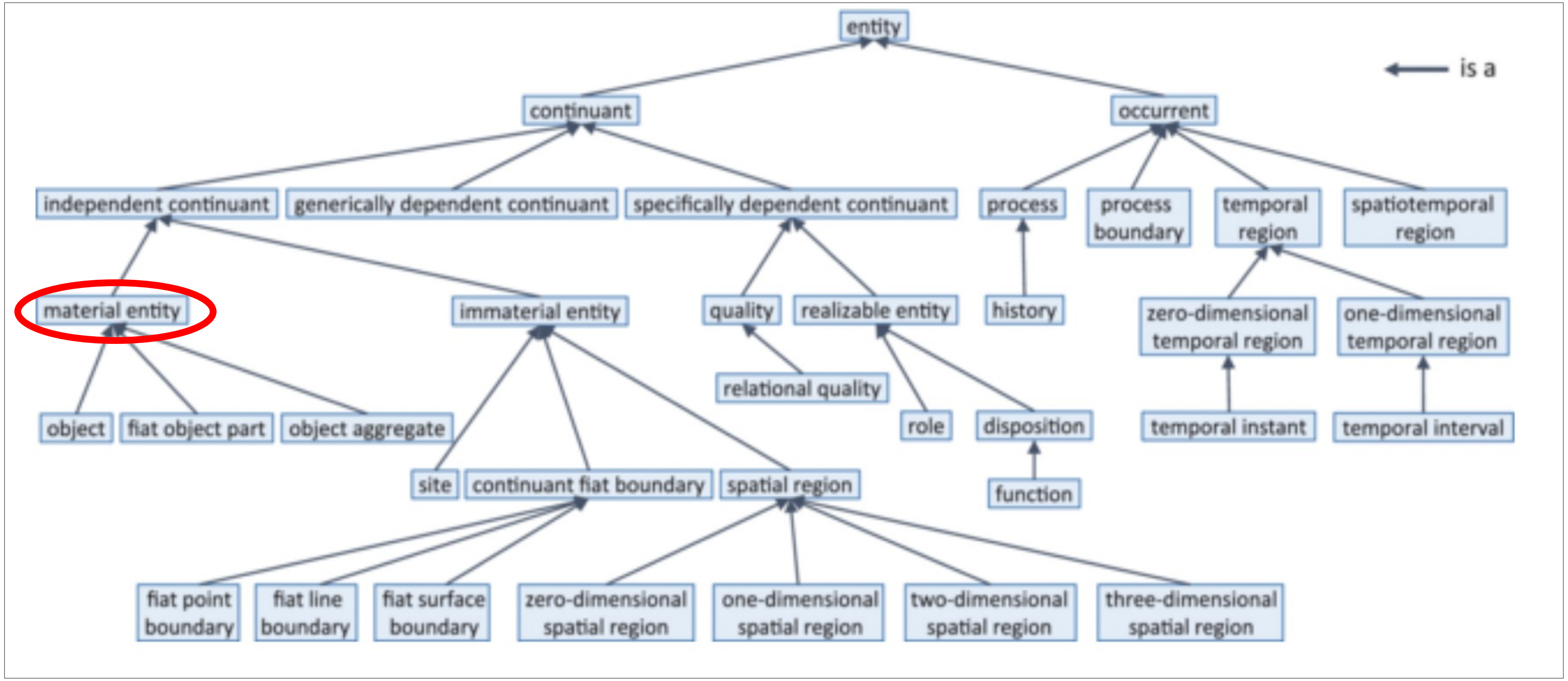


Dependency Chain

- A given **material entity** is located at some site at some time all of which is described by some information



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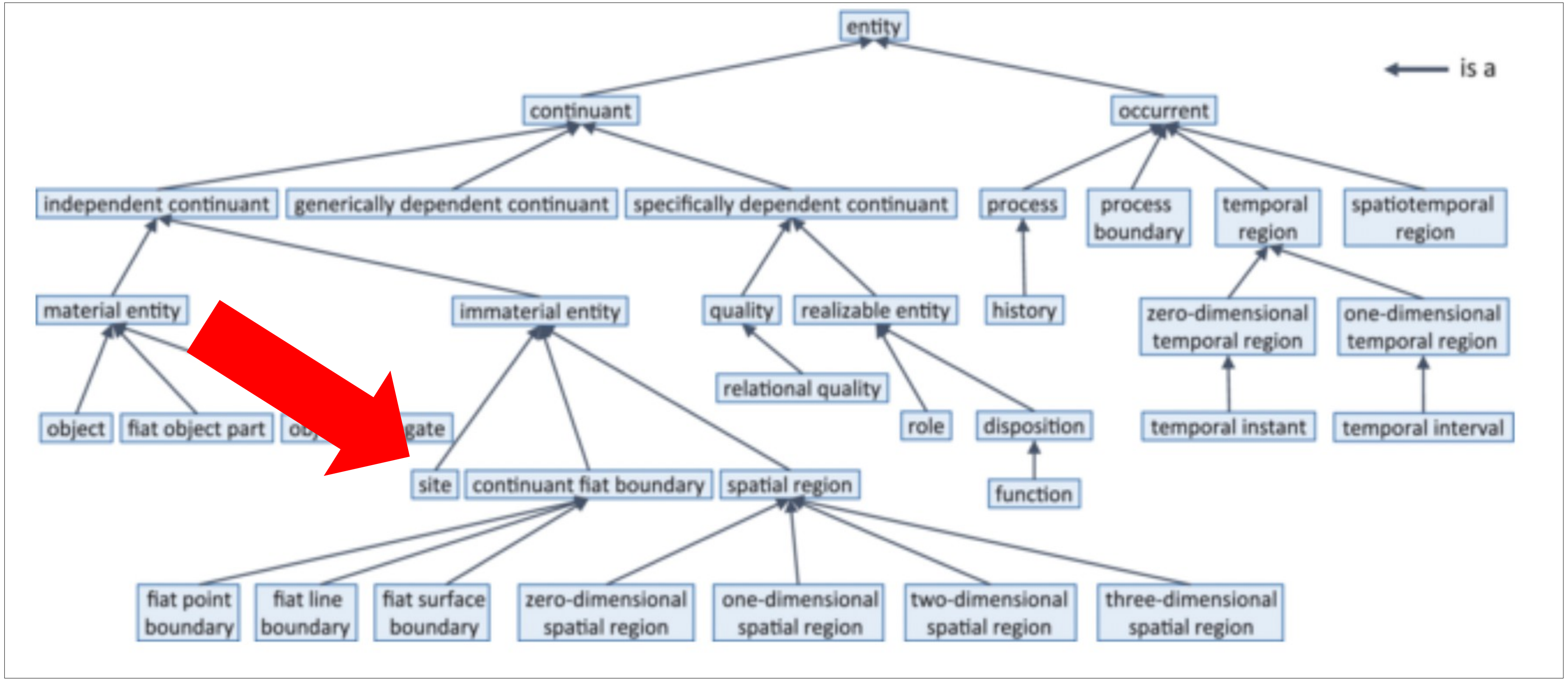

Dependency Chain

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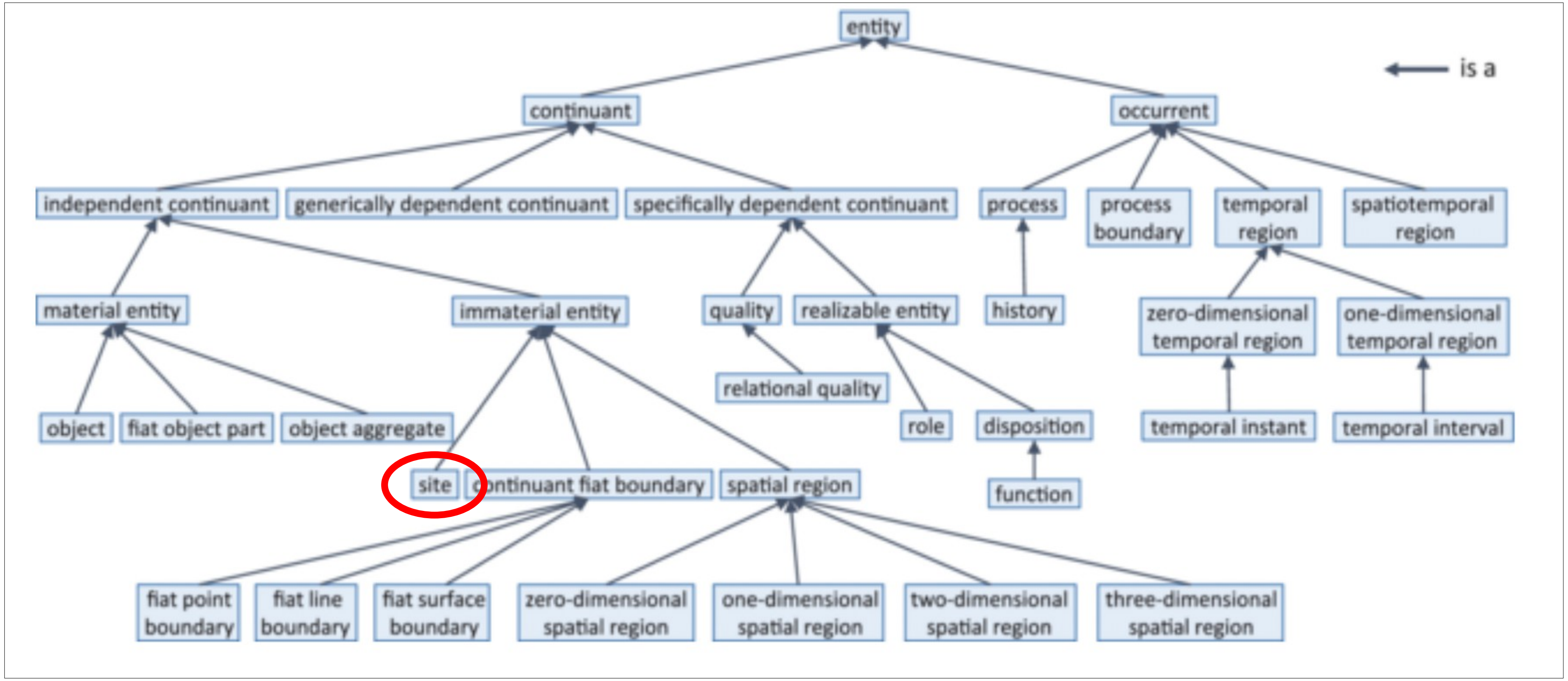

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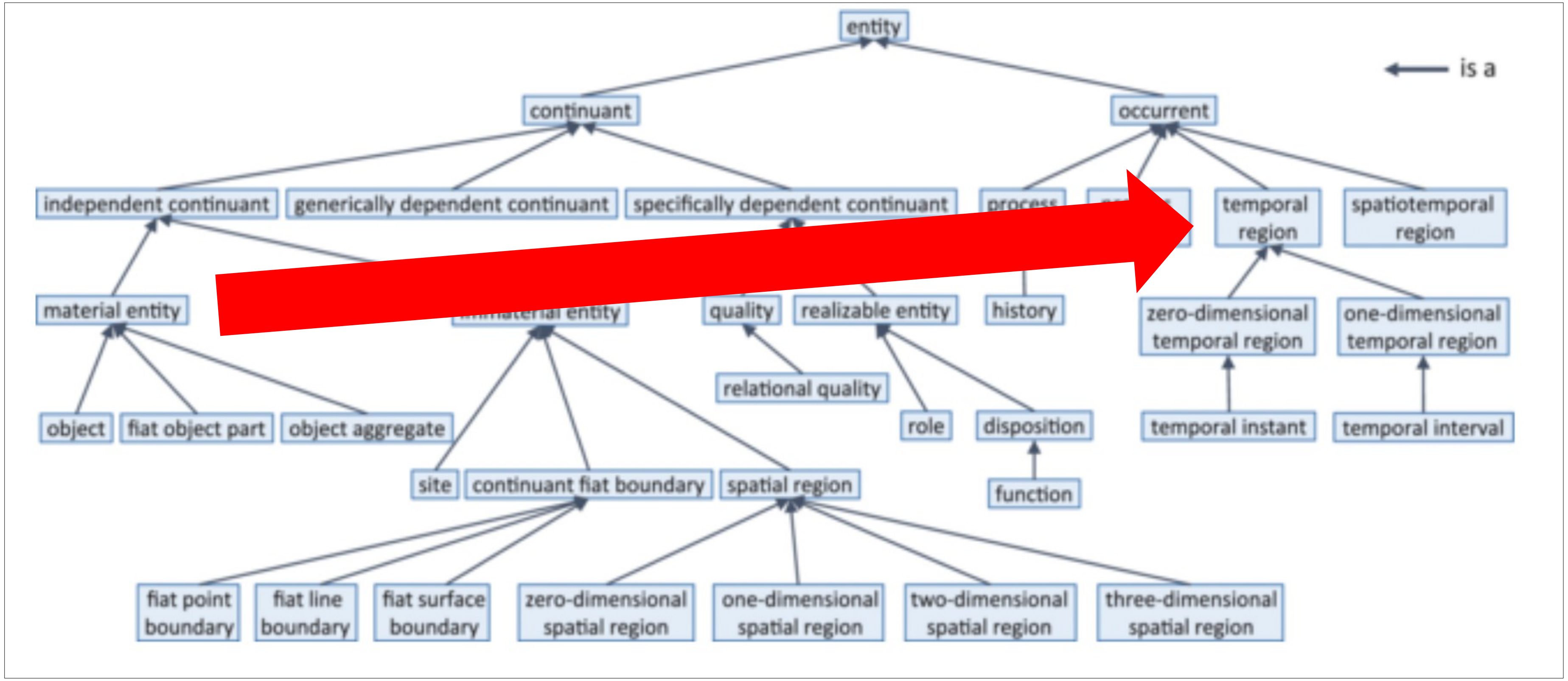

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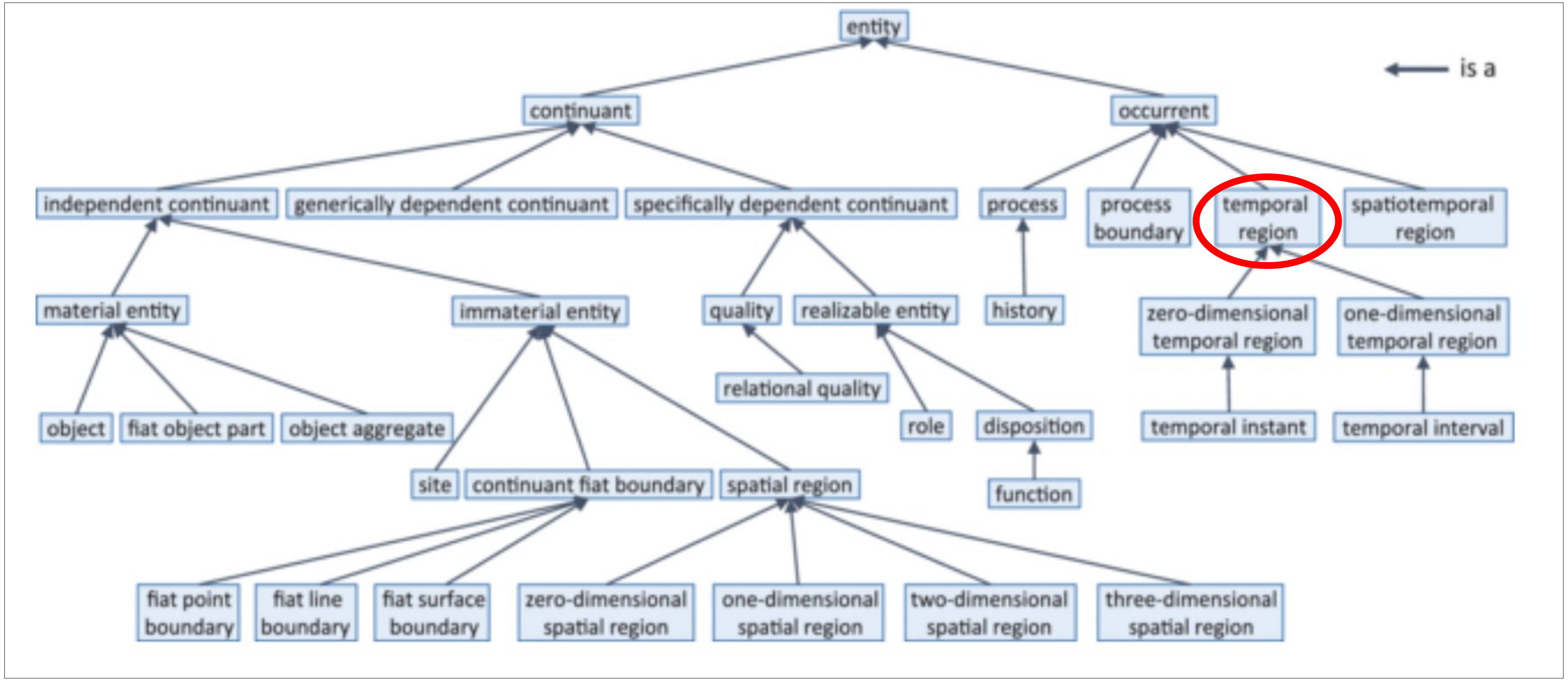

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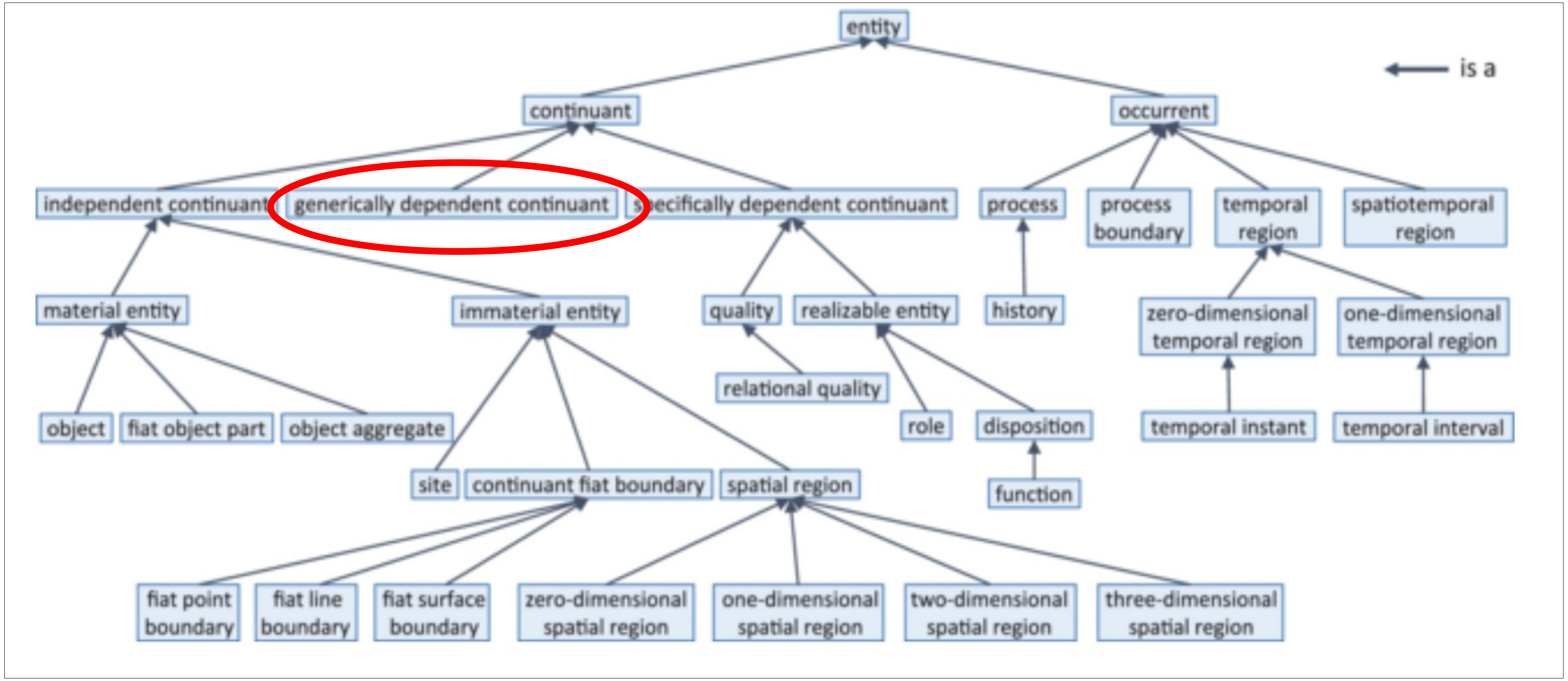

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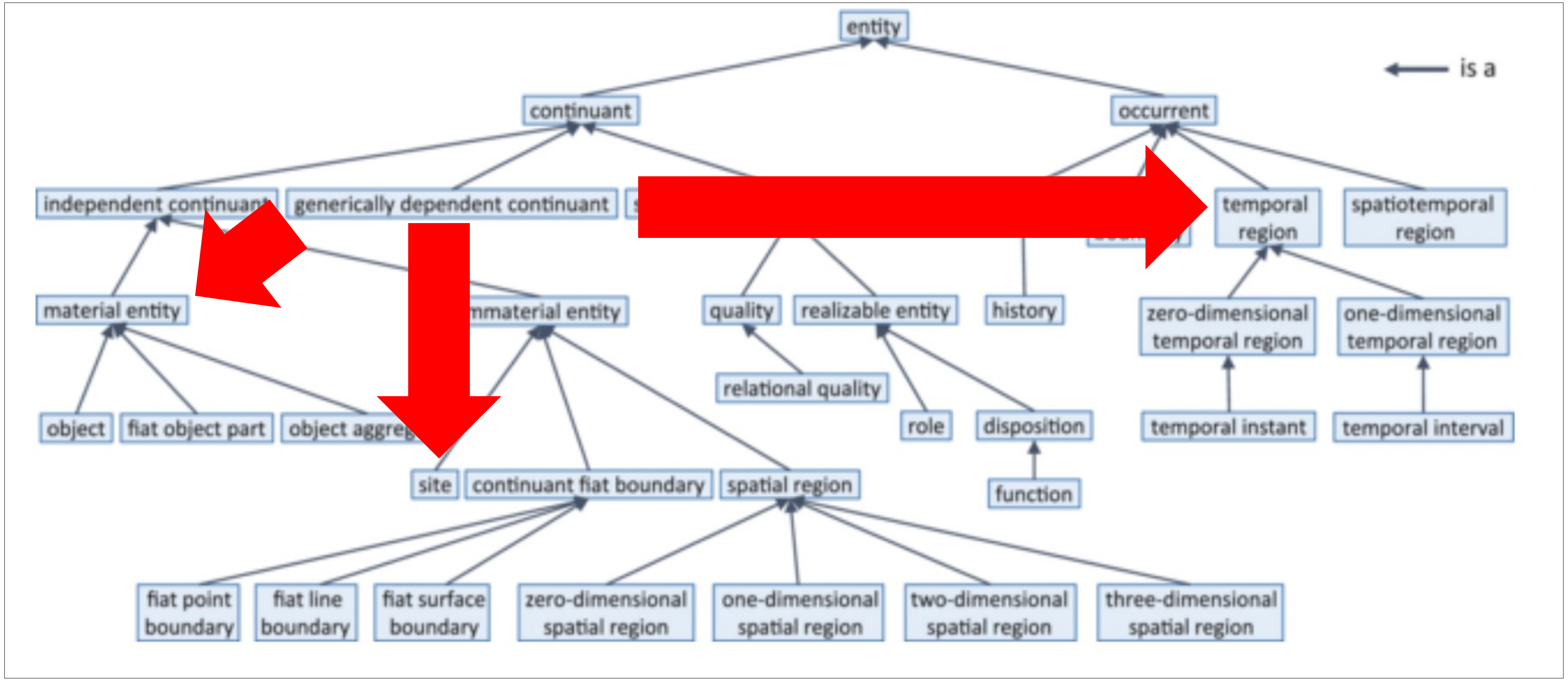

BECAUSE THESE POINTS ARE SO OBVIOUS, THEY ARE SO OFTEN OVERLOOKED

KNOWN KNOWNS

“things that we’re aware that we know”

KNOWN UNKNOWNS

“things that we’re aware that we **don’t** know”

UNKNOWN KNOWNS

“things that we’re **unaware** that we know”

UNKNOWN UNKNOWNS

“things that we’re **unaware** of and **don’t** know”

INTEROPERABILITY

KNOWN KNOWNS

“things that we’re aware that we know”

KNOWN UNKNOWNS

“things that we’re aware that we **don’t** know”

UNKNOWN KNOWNS

“things that we’re **unaware** that we know”

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INFORMATION QUALITY

KNOWN KNOWNS

"things that we're aware that we know"

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"things that we're **unaware** that we know"

UNKNOWN UNKNOWNS

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INFORMATION QUALITY

Systematic Disambiguation

- Ontology engineering is a discipline concerned with **systematic disambiguation**
- "Disambiguate" does not mean find and represent a **privileged** interpretation of some phenomenon
- It means find and represent the **logical space of interpretations** of some or some related phenomena

THERE IS NO OTHER DISCIPLINE THAT FOCUSES ON SYSTEMATICALLY DISAMBIGUATING DATA IN THE MANNER PRESCRIBED HERE

THIS IS OURS, OWN IT

Non-Trivial Consequences

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- A complete representation of any use case, scenario, etc. **will use every class and relationship** in BFO

- You won't address interoperability challenges without building the complete representation

- Systematic disambiguation is how we build that complete representation

- But this does not mean you have the full graph

Semantic vs Operational Layer

- This **does not mean** you must use the full graph in every or any application
- Operational layers will only need subsets of the full graph; this concerns release strategies

YOU SHOULD CUT YOUR RELEASE IN OPERATION FROM THE WHOLE SEMANTIC CLOTH

Outline

- The New Era
- Pillars of Ontology Engineering
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Finer Point

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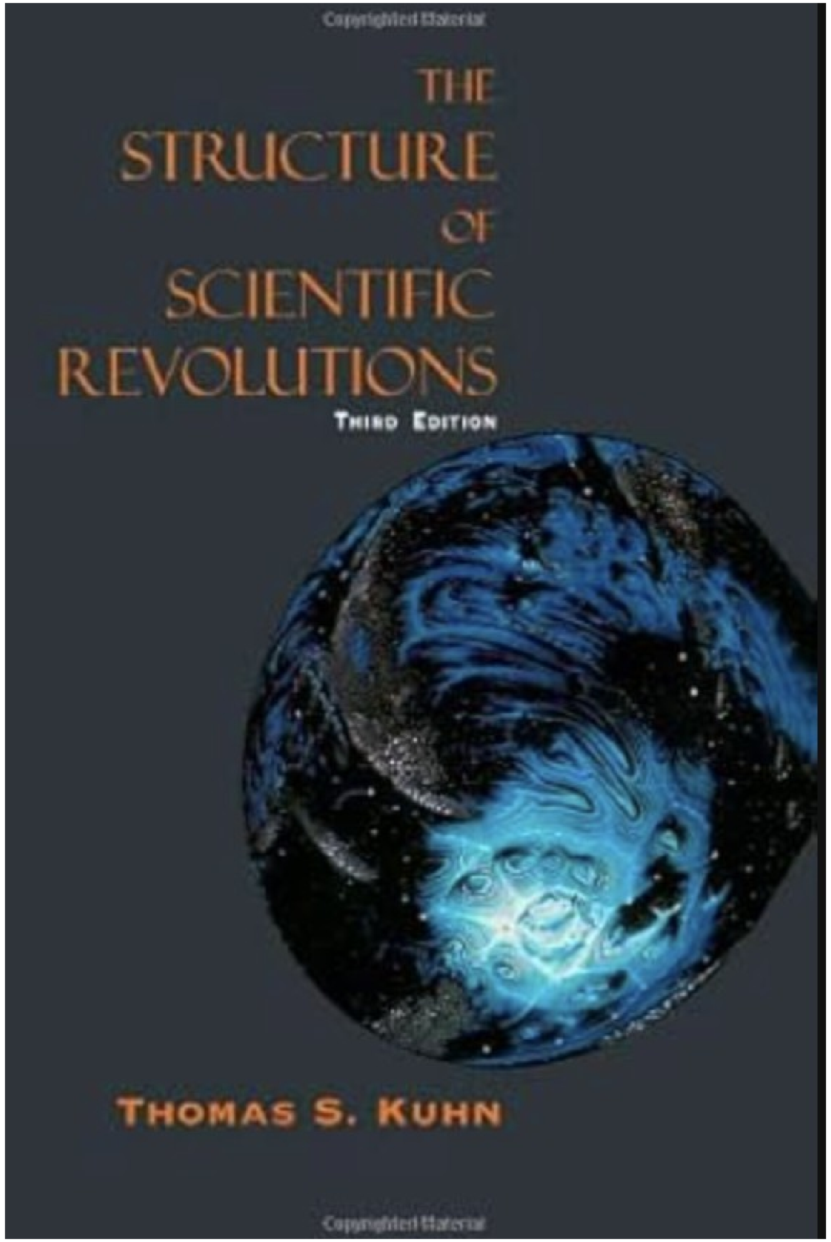
- I began with the question "what distinguishes ontology engineering from nearby disciplines"

- The answer is our north star, it will guide our consensus, it is the rallying cry of the new era:

Ontology engineering is focused on constructing machine-interpretable artifacts designed to systematically disambiguate information, improve information quality, and facilitate information interoperability

OF COURSE, WE ALSO NEED MORE THAN JUST CONSENSUS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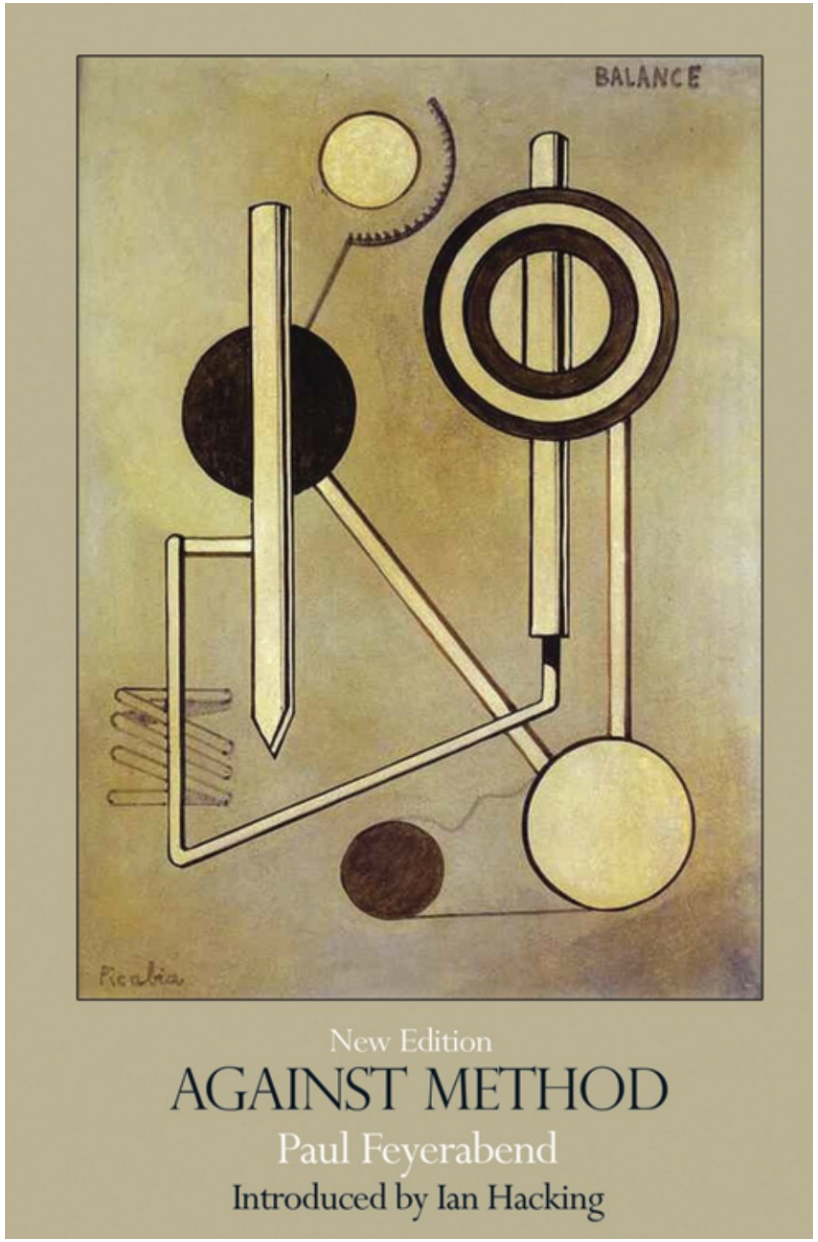
BALANCE
Picabia
New Edition
AGAINST METHOD
Paul Feyerabend
Introduced by Ian Hacking

Dissemination

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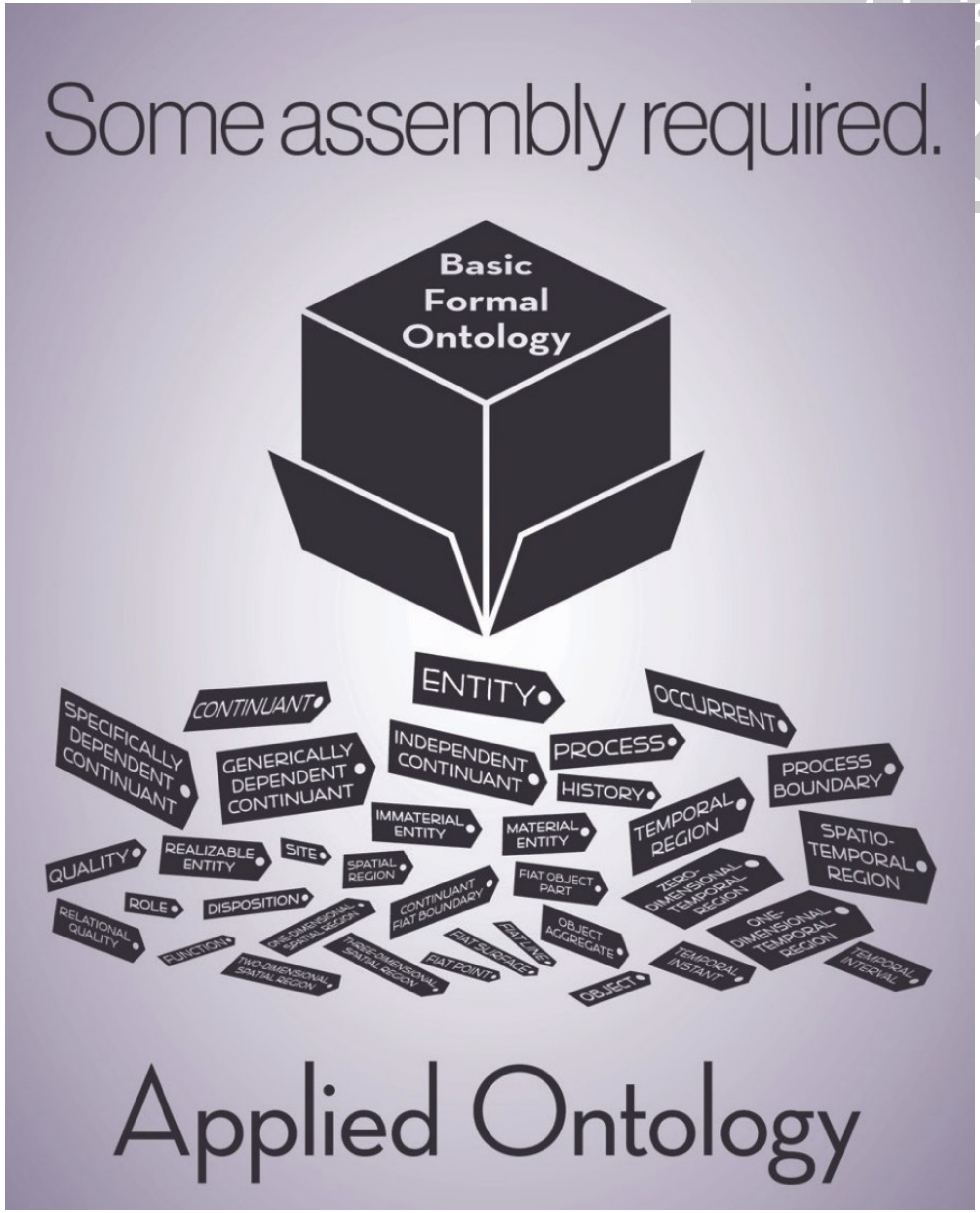
- This is not a **mere intellectual or academic exercise**; the position has and will continue to impact **training**, **research**, and **application**
- E.g. Barry and I have (re)trained **numerous ontology engineers** across government, academic, and commercial spaces in **the last three years**
- If you disagree, or think the proposal should be amended, speak up sooner rather than later **because**...

UB Applied Ontology

- In Fall 2026, UB will enroll the first class of applied ontology PhD students in the US, and perhaps the world
- At present count, we have a class of ~50 students across MS/PhD
- The program is **entirely remote** and **asynchronous**



Overview Repositories 9 Projects Packages Teams People 1 Insights Settings

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Applied Ontology Education

Organization for applied ontology education

32 followers United States of America https://ncor-organization.github.io/... https://www.youtube.com/c/BarryS... @johnbeve https://ontology.buffalo.edu/smith/ https://johnbeverley.com/ johnbeve@buffalo.edu

Unfollow

README.md

Applied Ontology Education GitHub Organization

Welcome to the official NCOR GitHub organization for ontology engineering educational materials. The resources contained here are designed to guide you through the evolving fields of semantic web technologies, AI-powered systems, and advanced data modeling.

Our Mission Our goal is to empower learners, developers, and researchers in their journey towards mastering ontology engineering, knowledge graph development, and artificial intelligence. By providing curated resources and hands-on repositories, we hope to facilitate knowledge sharing and skill-building within these important domains.

View as: Public

You are viewing the README and pinned repositories as a public user.

You can pin repositories visible to anyone.

Get started with tasks that most successful organizations complete.

Discussions

Set up discussions to engage with your community!

Turn on discussions

MIT Model

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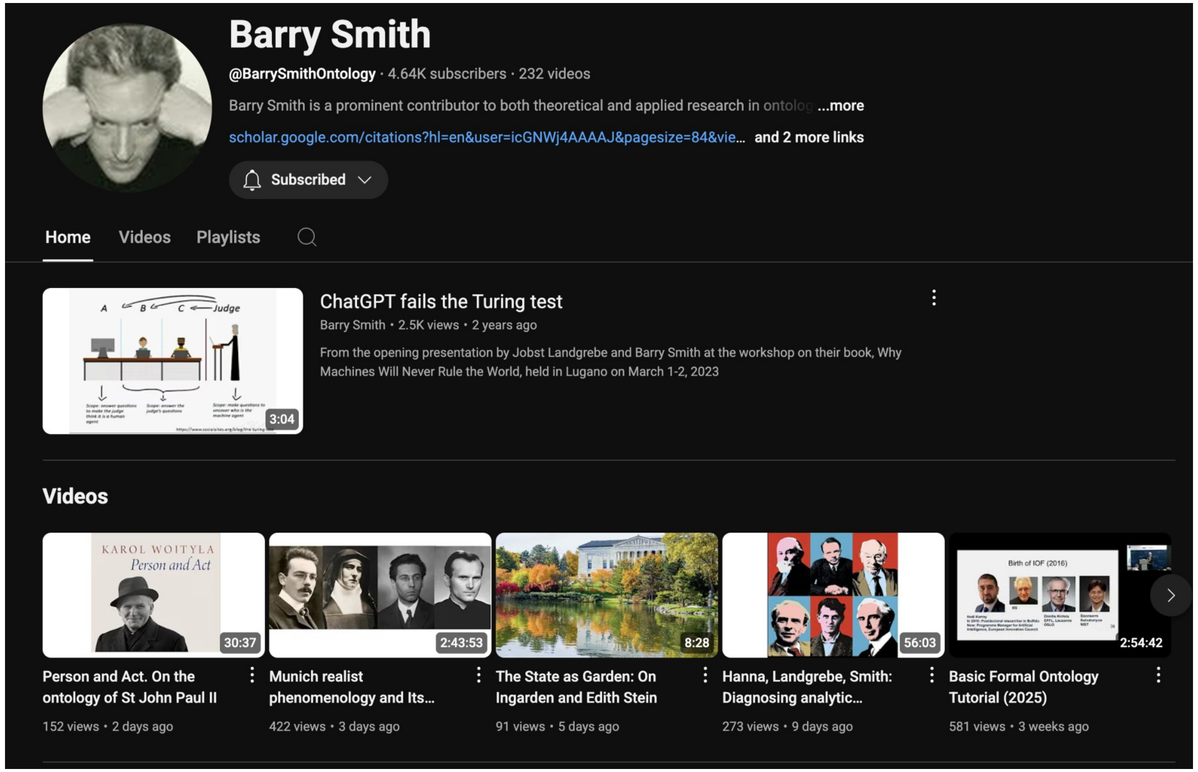
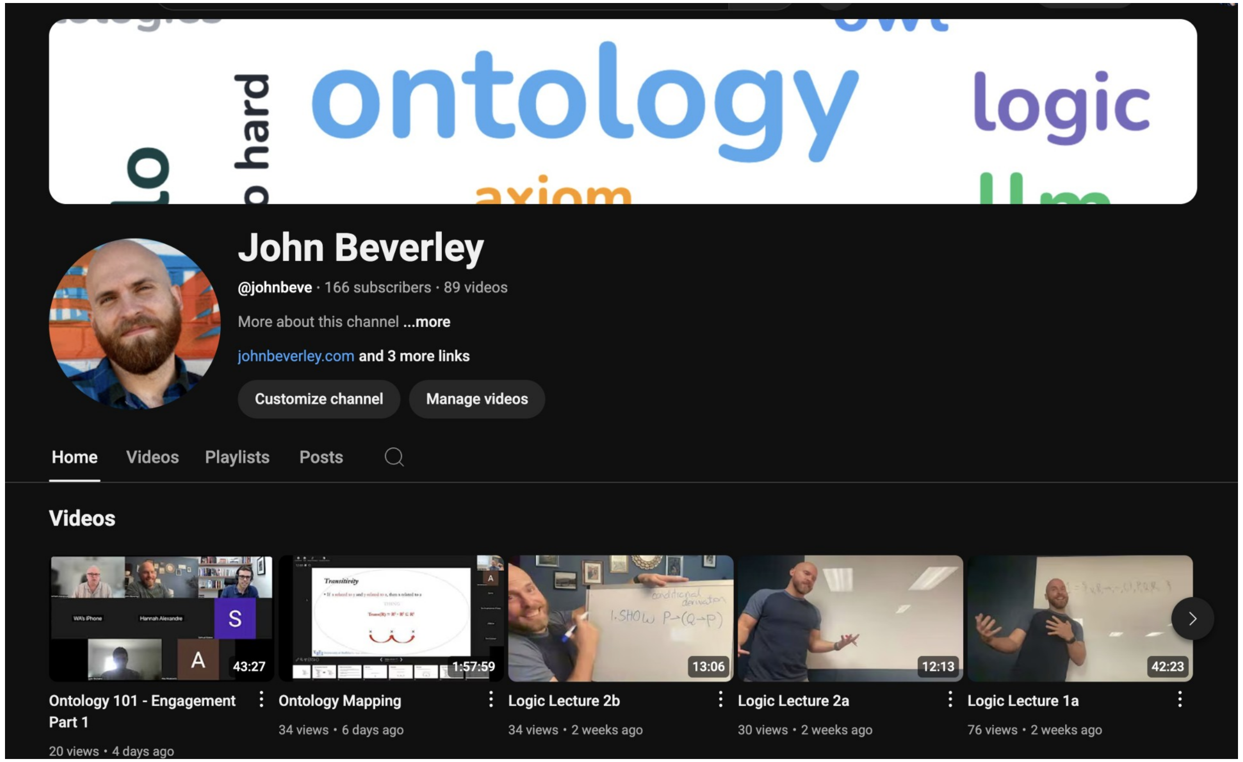
- All of our education material will remain accessible online: https://github.com/Applied-Ontology-Education





CLOSING REMARKS