

Military Intelligence Part 2

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Outline

- Definitions Revisited
- Coordination by Standardization
- Coordination by Ontologies as Standardization

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- Coordination by Standardization
- Coordination by Ontologies as Standardization

Definitions 101

- For any definition there is a term defined – T – and the expression or expressions – E – defining that term
- A definition is a pair $\langle T, E \rangle$
- For any definition and any domain, T is true of that domain just in case E is true of that domain

Triangle =_{def} A polygon with three edges and three vertices

Evaluating Definitions

- Evaluating a definition then involves at least two steps:
 - Assume T is true of a domain, attempt to find a scenario in which E is not
 - Assume E is true of a domain, attempt to find a scenario in which T is not

Triangle =_{def} A polygon with three edges and three vertices

- The preceding is a good definition; any triangle is a polygon with three edges and vertices; any polygon with three edges and vertices is a triangle

Evaluating Definitions

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Human Being =_{def} A featherless biped

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Human Being =_{def} A featherless biped

- The preceding is an infamous definition attributed to Plato; Diogenes the Cynic famously plucked a chicken and proclaimed “Behold, a man!”

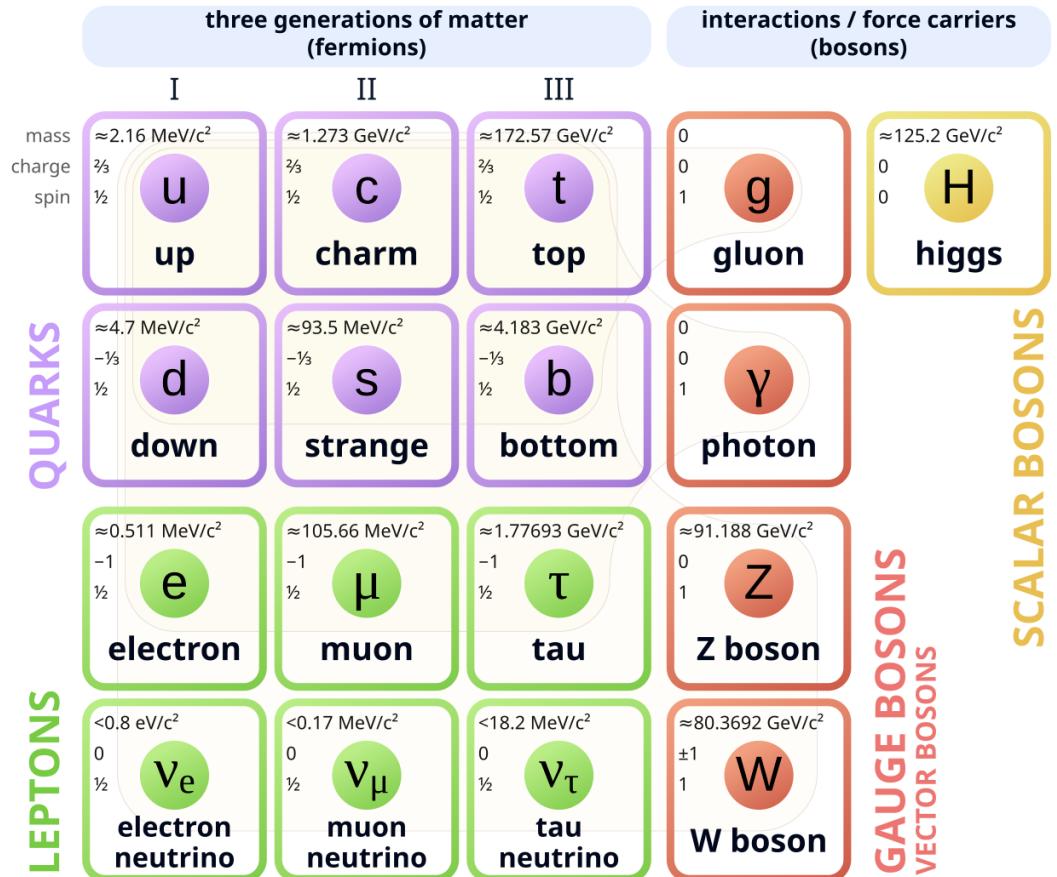
Primitive Definitions

- One often has a need to introduce **primitive definitions**, which are so basic as to not be reducible to other class terms and relational expressions
- For example, **continuant part of** is a relation so basic that any attempt to define it in terms other terms will invariably require circularity
- **Entity** in BFO is, additionally, so basic as to resist defining in terms of other...entities

Primitive Definitions

- This is not peculiar to BFO
- **All** theories have their primitives

Standard Model of Elementary Particles



Non-Circularity

- Definitions should not be circular

Non-Circularity

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 - ✗ training objective: *A **training objective** which is fulfilled by the provision of some training* (OBI_0000962)
 - ✓ ctraining objective: *An **objective** which is fulfilled by the provision of some training.*

Non-Circularity

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- ✗ training objective: *A **training objective** which is fulfilled by the provision of some training* (OBI_0000962)
- ✓ ctraining objective: *An **objective** which is fulfilled by the provision of some training.*
- ✗ large: *The attribute of something that is **big**.* (KELLEY, 1998)
- ✓ large: *The attribute something **has when it has a measurable quality that is above average**.* (adapted from the definition of *large* in WordNet 3.1)

Non-Circularity

- Definitions should not be circular

- ✗ training objective: *A **training objective** which is fulfilled by the provision of some training* (OBI_0000962)
 - ✓ training objective: *An **objective** which is fulfilled by the provision of some training.*
 - ✗ fear: *The state of being **fearful**.* (LANDAU, 2001)
 - ✓ fear: *an **emotion experienced in anticipation of some specific pain or danger*** (WordNet 3.1)

Definition Loops

- Definitions should not form **definition loops**
- A definitional loop arises, for example, when the textual definition for a term refers to another term which has a textual definition referring to the first
 - ✗ **training objective:** *A training objective which is fulfilled by the provision of some **training** (OBI_0000962)*
 - training process:** *A process that achieves a **training objective** (OBI_0000962)*

Redundancy

- Definitions should not include **redundant** or **irrelevant expressions**
- Examples of redundant expressions include repetitions or paraphrases of expressions in the definition, such as lists of examples, explanations of use, etc.
- Examples and lists are better treated usign annotations for examples, comments, etc.

Redundancy

- Definitions should not include **redundant** or **irrelevant expressions**

- ✗ cellular_organism: *An organism of microscopic or submicroscopic size, especially a **bacterium** or **protozoan*** (NCRO_0000483)
- ✓ cellular organism: *An organism of microscopic or submicroscopic size.*
Examples: a **bacterium**; a **protozoan**
- ✗ patient questionnaire: *A questionnaire that comprises a set of **questions about a patient**, such as **height, weight, race, biological sex, clinical history, etc.**, which will be filled by the human subject.* (OBIB_0000020)
- ✓ patient questionnaire: *A questionnaire that comprises a set of **demographic and medical questions**, which will be filled by the human subject.*

Avoid Evaluative Language

- Definitions should not include **subjective** or **evaluative** language, as it adds nothing to the descriptive content of the definition

Avoid Evaluative Language

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 - ✗ cranberry bean: *Also called shell bean or shellout, and known as borlotti bean in Italy, the cranberry bean has a large, knobby beige pod splotched with red. The beans inside are cream-colored with red streaks and have a delicious nutlike flavor. Cranberry beans must be shelled before cooking. Heat diminishes their beautiful red color. They're available fresh in the summer and dried throughout the year.* (FOODON_03411186)
 - ✓ cranberry bean: *A bean that has a large, knobby beige pod splotched with red, that is cream-colored with red streaks, and has a nutlike flavor.*

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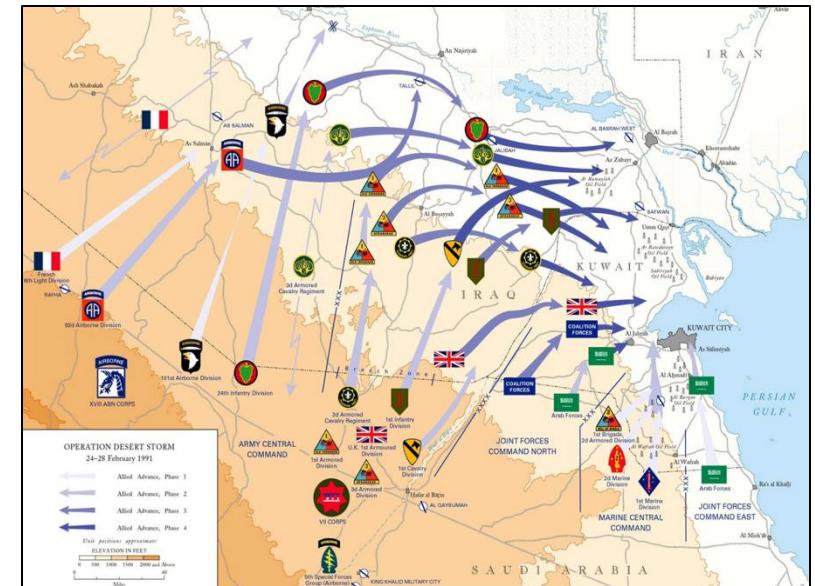
Early Modern Warfare

- Characterized by widespread use of gun powder, explosives, and professional armies
- Greater reliance on strategy and intelligence
- Massive increase in number of deaths



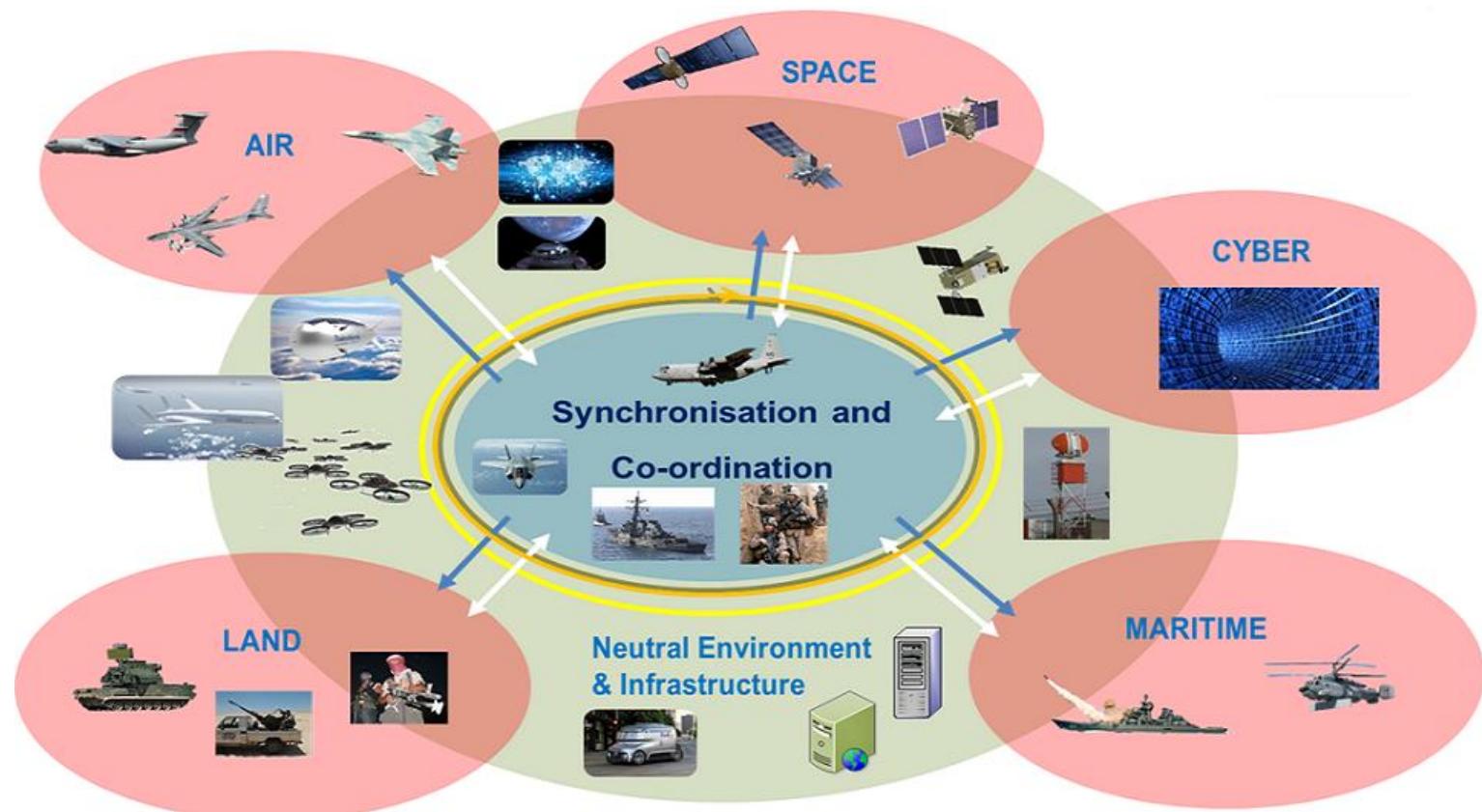
Modern Warfare

- Characterized by weapons of mass destruction, stealth, and massive coordination of resources
- Expansion of routine operational environments to include land, sea, and air, as well as digital domains that stretched across participating nations



Modern Warfare

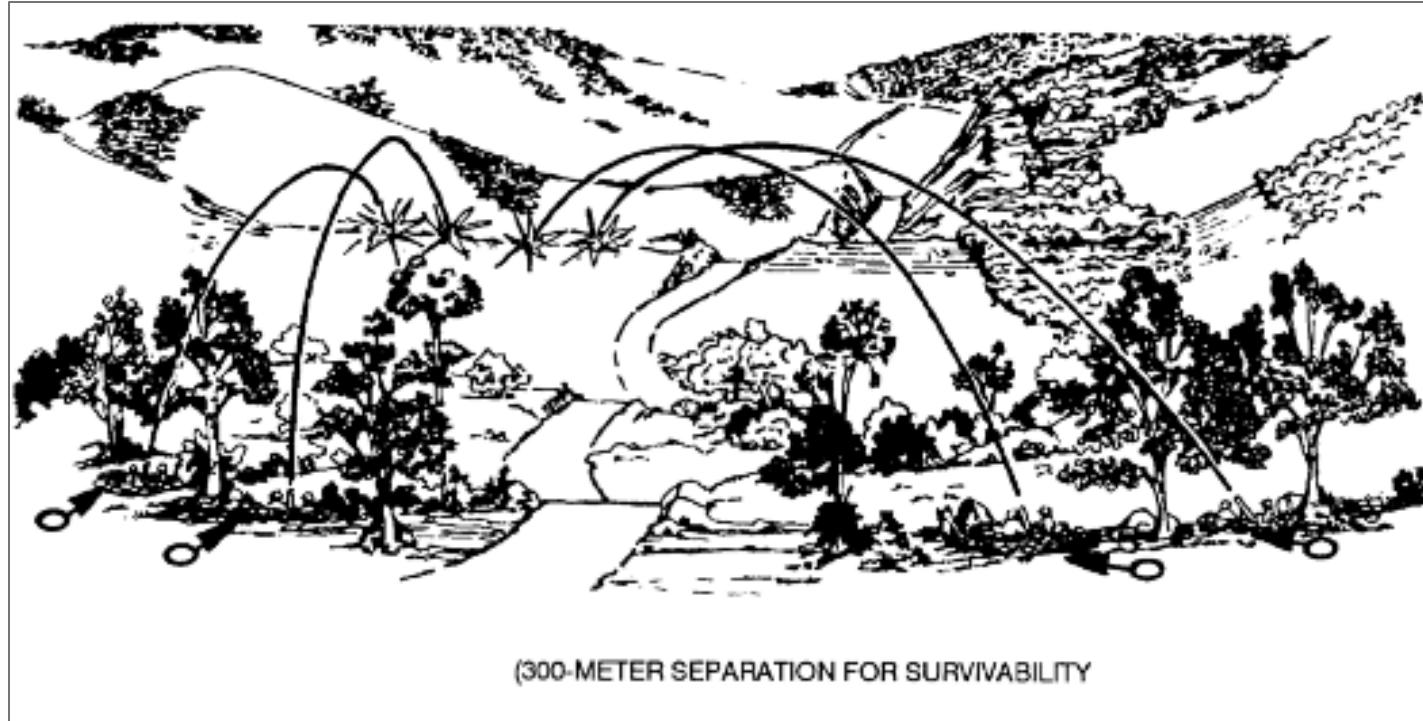
- Illustration of the electromagnetic warfare domain and required coordination during engagements
- Traditional warfare has focused on kinetic attack and defense, i.e. physical damage to people and infrastructure



How do we coordinate such massive efforts across so many disparate domains?

Doctrine of Massing Fires

- Coordinated dispersed artillery on single target
- Required:
 - Real-time coordination
 - Common operational view
 - Interoperable artillery
- Achieved by:
 - New information support strategies and governance
 - New training



Importance of Standardization

- Massing fires was a strategy that could be realized by militaries long before Steuben outlined it in 1779
- The actual doctrine for massing fires was approved *only in 1939*
- The codification of massing fires enabled progressive refinement of this military capability over time

Aided by professionalization of armed forces, including signals indicating who can be trusted in battle, training, etc.

Historical Lessons

- Standardization around which training is conducted is key to coordinated efforts
- Massing artillery is one thing, but this is **modern warfare**
- We also need to coordinate intelligence offense and defense, to **predict and avoid** adversarial efforts

Anticipating Massing Intelligence Fires

- 9-11 illustrated challenges of predicting massing fires from intelligence failures
- Prediction requires:
 - Real-time information sharing and revising
 - Common operational perspective
 - Interoperability across activities
- Which will require:
 - New information support strategies
 - Semantic interoperability across data
 - New governance and training for both humans and machines



Anticipating Massing Intelligence Fires

- Agencies too need signals to understand who can be trusted
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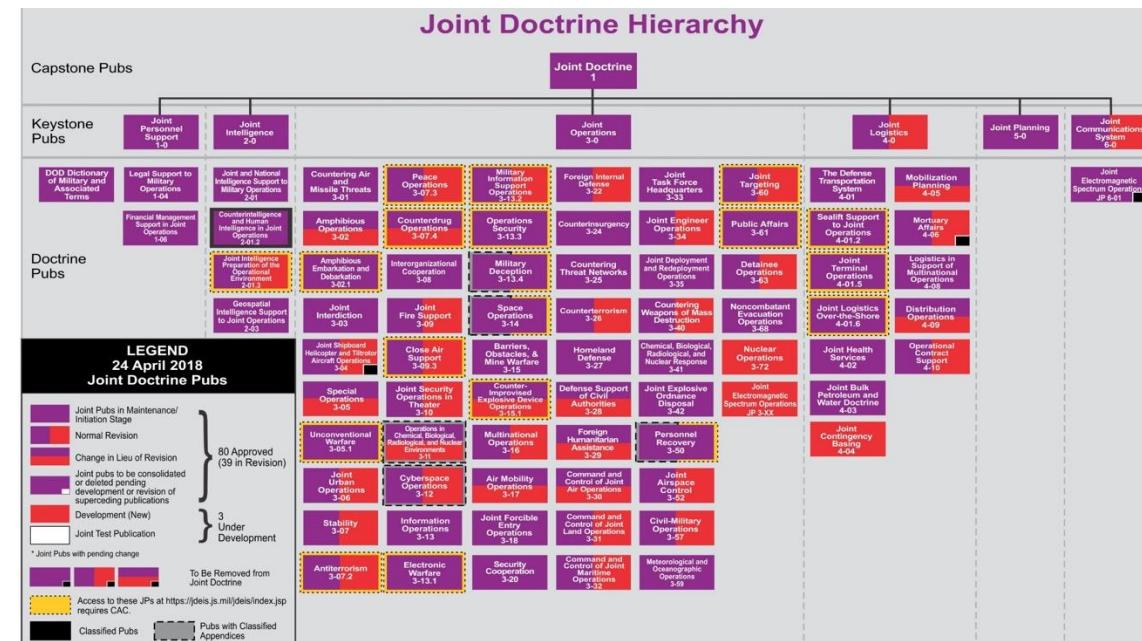
The diagram illustrates the Joint Doctrine Hierarchy, organized into three main levels: Capstone Pubs, Keystone Pubs, and Doctrine Pubs.

 - Capstone Pubs:** Includes Joint Doctrine 1 (covering Joint Operations 3-0) and Joint Doctrine 2 (covering Joint Personnel Support 1-0 and Joint Intelligence 2-0).
 - Keystone Pubs:** Includes DOD Dictionary of Military and Associated Terms, Legal Support to Military Operations 1-0, Financial Management Support in Joint Operations 1-0, Joint and National Intelligence Support to Military Operations 2-01, Counterintelligence and Human Intelligence Operations 2-12, Preparation of the Operational Environment 3-01, Amphibious Operations 3-02, Counterdrug Operations 3-07, Peace Operations 3-07.3, Amphibious Operations 3-02, Counterdrug Operations 3-07.4, Military Information Systems Operations 3-08, Operations 3-13, Counterintelligence and Human Intelligence Operations 2-12, Counterinsurgency 3-24, Foreign Internal Defense 3-22, Joint Force Headquarters 3-33, Joint Engineers Operations 3-34, Joint Deployment and Redeployment Operations 3-35, and Joint Warfare and Mass Destruction 3-40.
 - Doctrine Pubs:** Includes Geospatial Intelligence Support to Joint Operations 2-03, Joint Interactions 3-04, Amphibious Embarkation and Debarkation 3-04, Joint Fire Support 3-05, Space Operations 3-14, Counterterrorism 3-25, Counterintelligence and Human Intelligence Operations 2-12, Counterinsurgency 3-26, Counter Threat Networks 3-27, Homeland Defense 3-27, Counterterrorism 3-28, Chemical, Biological, Radiological, and Nuclear Response 3-41, and Electronic Warfare 3-42.

LEGEND (24 April 2018)

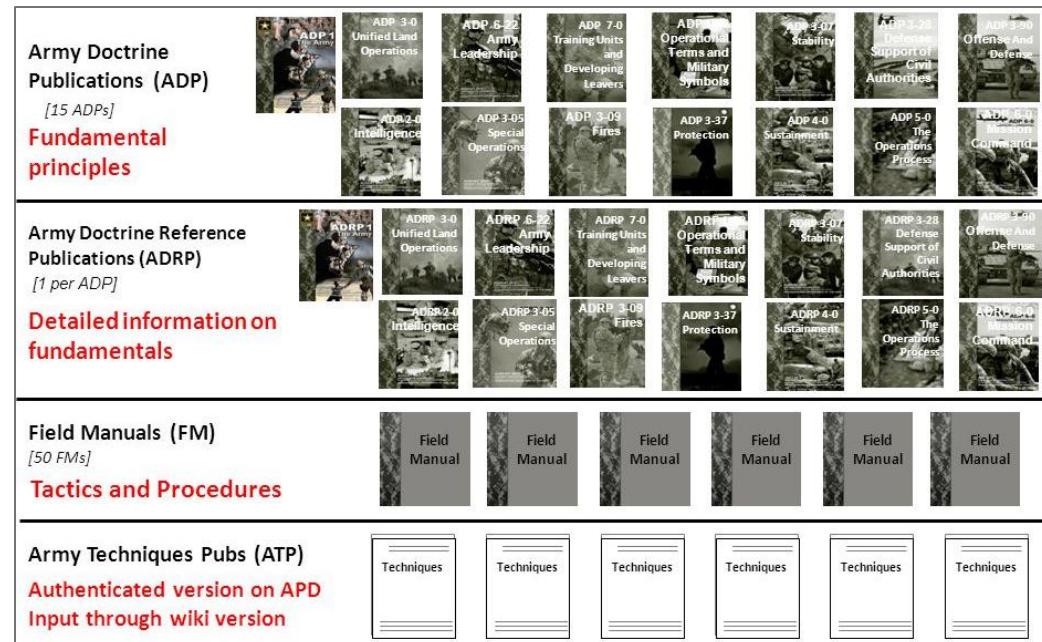
 - Joint Pub in Maintenance/Initiation Stage
 - Normal Revision
 - Change in Lieu of Revision
 - Joint pub to be consolidated or deleted per requirement of developing or revision of superceding publications
 - Development (New)
 - Joint Test Publication
 - * Joint Pubs with pending change
 - To Be Removed from Joint Doctrine
 - Access to these JPs at <https://jdes.js.mil/jdes/index.jsp> requires CAC.
 - Classified Pubs
 - Pubs with Classified Appendices

80 Approved (39 in Revision)
3 Under Development



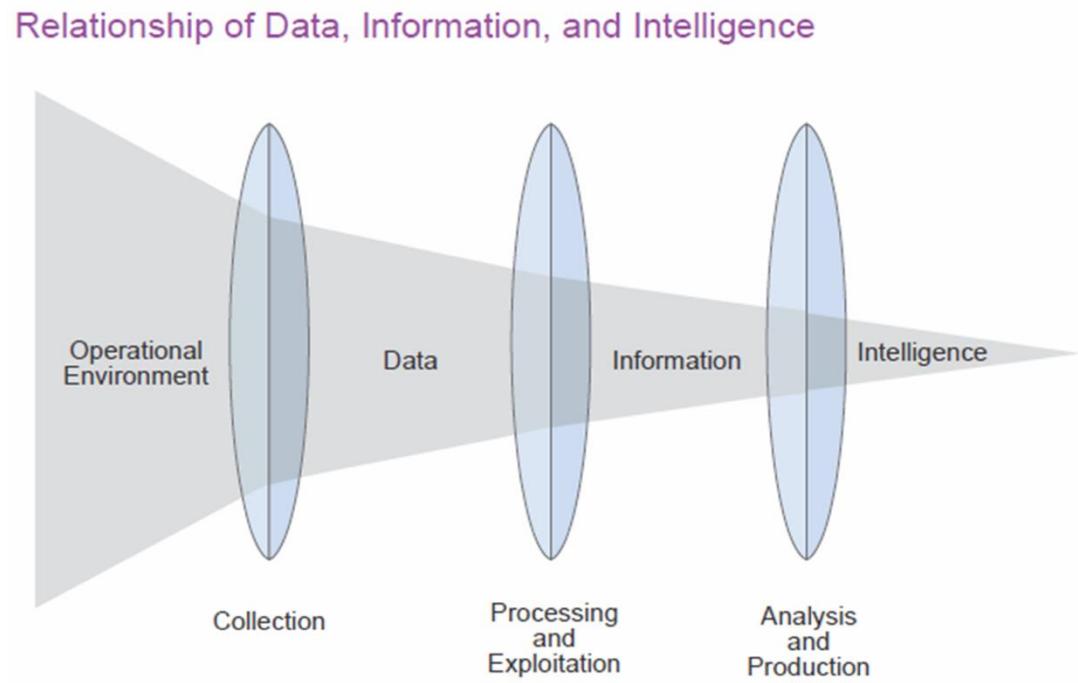
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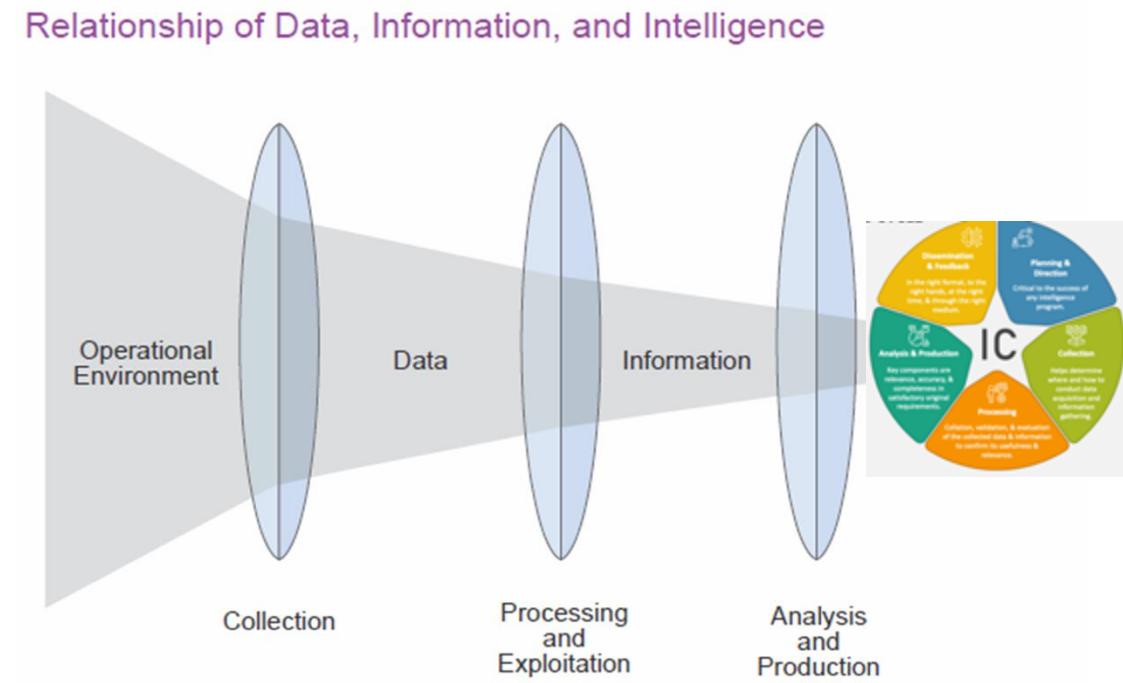
Anticipating Massing Intelligence Fires

- Integrating data from operational perspective requires automation
- Prediction requires:
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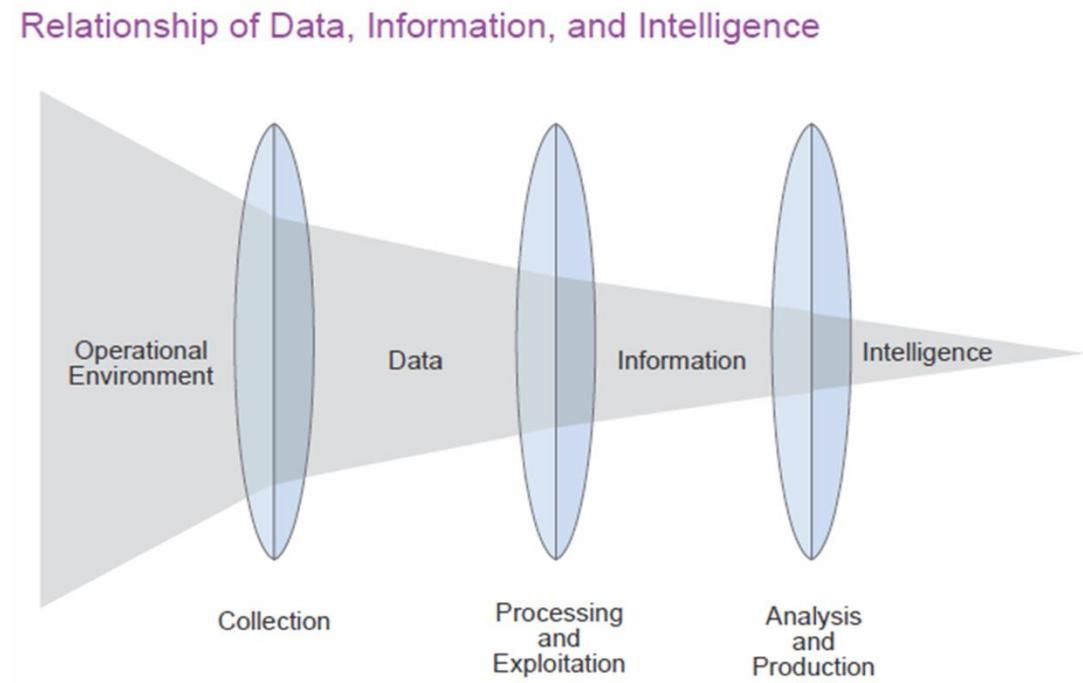
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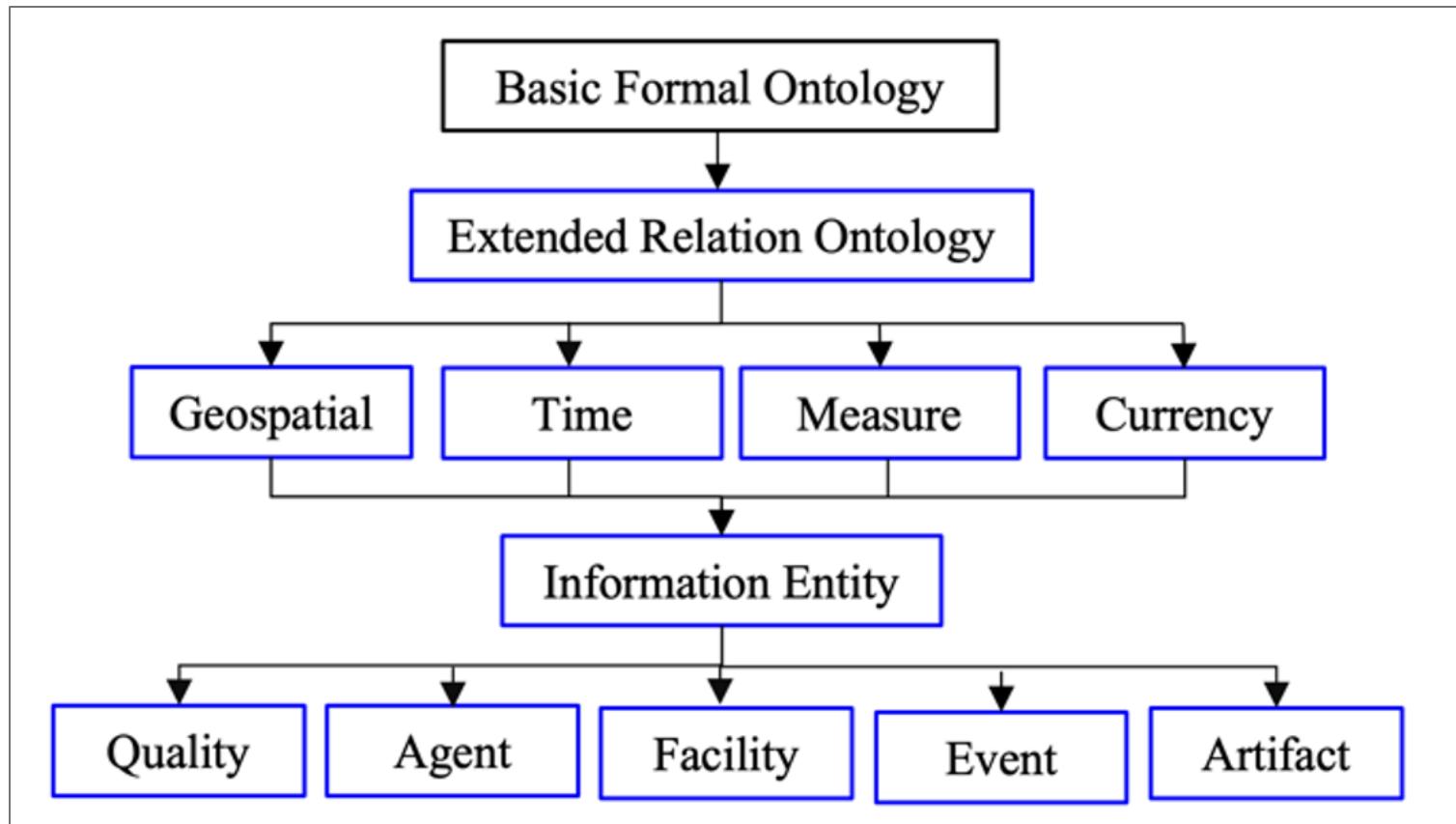
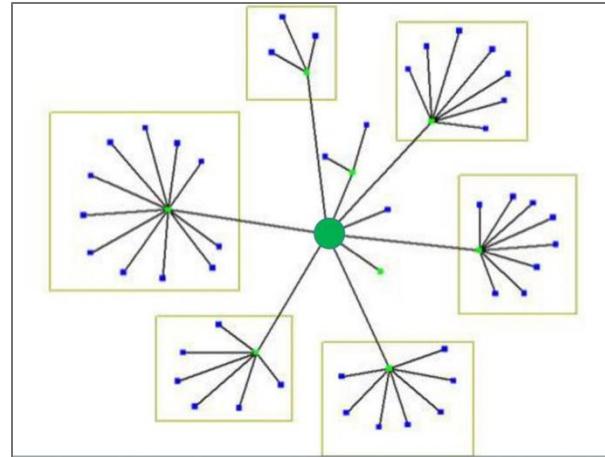
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BFO and CCO

- Leverage vetted, widely-used open-source standards
- Leverage downward population strategy starting with the Basic Formal Ontology down into the Common Core Ontologies mid-level suite



BFO Ecosystem

700+ Projects

BFO Basic Formal Ontology

Home GitHub Guidebook Publications FOL Users Tutorials

Users

Below you will find an alphabetical list of ontologies and institutions/groups using BFO.

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 (OMIAE)
- Ontology Based Clinical Decision Support System for Geriatrics
- Ontology Based Decision Support System for Tuberculosis Management
- 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-HCV)
- 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 (OntoforInfoScience)
- 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 Life
- Ontology for Parasite LifeCycle (OPL)
- Ontology for Periodontitis (PERIO)
- Ontology for Petroleum Production
- Ontology for Prognostic Health Management (PHM) in Spacecraft Avionics
- 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 (OBGS)
- 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)



Standards About us News Taking part

Store



EN

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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

Joint Doctrine Ontology Project

- Create a computational counterpart of the *DOD Dictionary of Military and Associated Terms*
- Test in Air Force Research Lab (AFRL) to support joint operations
- To promote Joint Doctrine terminology across DOD to advance interoperability

DOD Dictionary of
Military and Associated Terms

As of November 2021



DOD Dictionary of Military Terms

The DOD Dictionary is managed by the Joint Education and Doctrine Division, J-7, Joint Staff. All approved joint definitions, acronyms, and abbreviations are contained in Joint Publication 1-02, *DOD Dictionary of Military and Associated Terms* 08 November 2010, as amended through 15 June 2015. The Dictionary is available for browsing, searching, or can be downloaded in the formats below.

[PDF](#) [Excel - Terms and Definitions](#) [Excel - Acronyms and Definitions](#) [XML](#)

Search

Browse

Joint Electronic Library (JEL)

Universal Joint Task List (UJTL)

Capstone Concept for Joint Operations (CCJO)

JEL+

DOCNET

Motivation

- Enable the identification of logical issues in the DOD Dictionary and Joint Doctrine Publications
- Facilitate coordination of training and operations
- Increase automation of plans, ops assessment, BlueForce Status, etc.
- Allow novel assessment processes based on measures of adherence to doctrine, which may give rise to new ways of computationally identifying areas where changes in doctrine may be needed

Joint Doctrine Ontology

- To create a computational counterpart of the *DOD Dictionary of Military and Associated Terms*

intratheater airlift — Airlift conducted within a the combatant commander or attached to a subord intertheater airlift. (JP 3-17)

intratheater patient movement — Moving pati command or in the continental United States. intertheater patient movement. (JP 4-02)

inventory control — That phase of military logis requirements determinations, procurement, c materiel. Also called **inventory manag management; supply management**. (JP 4-09)

inventory control point — An organizational unit o supply system that is assigned the primary n management of a group of items either for : Department as a whole. Also called **ICP**. (JP 4-

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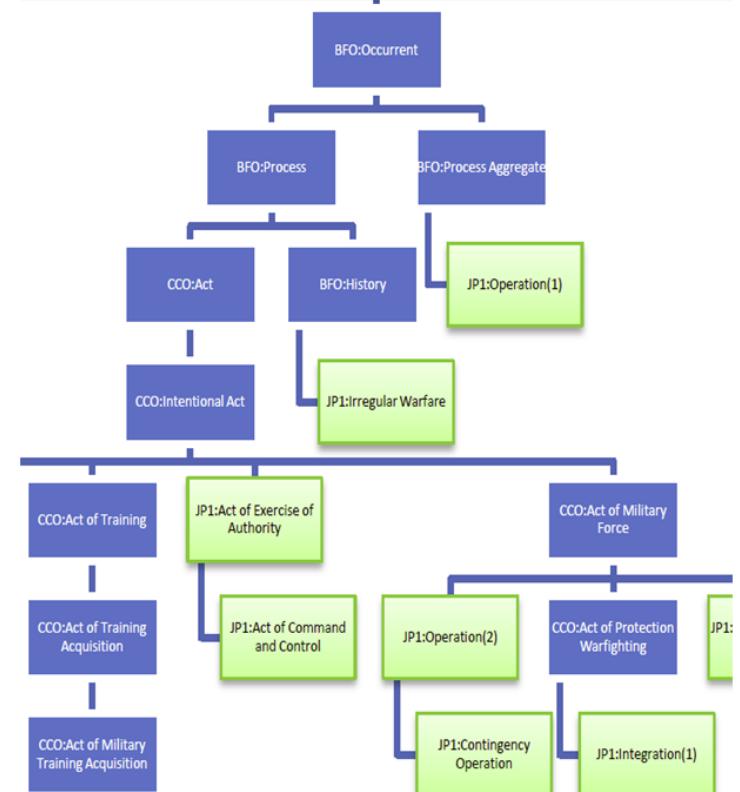
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DOD Dictionary Issues

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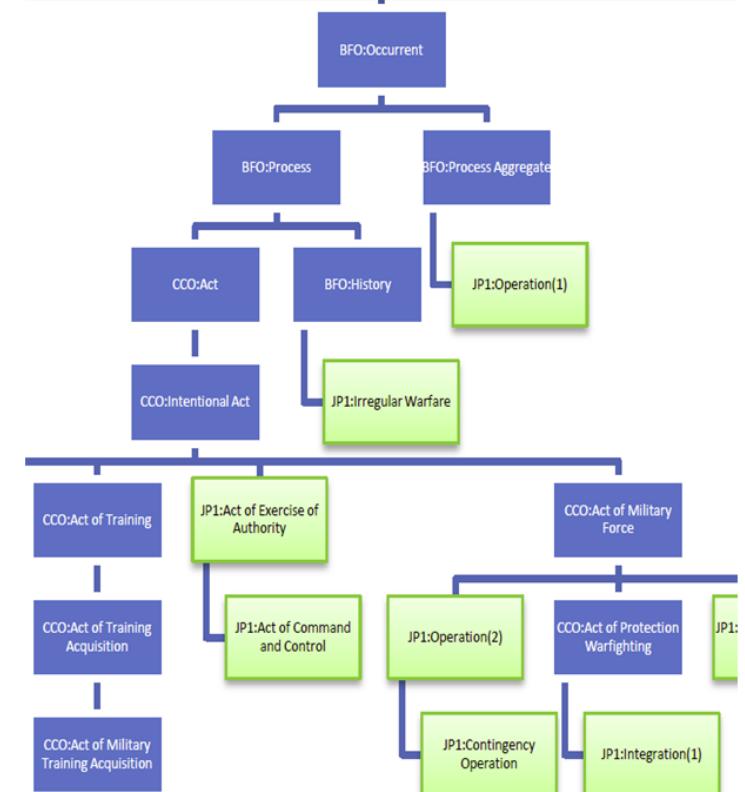
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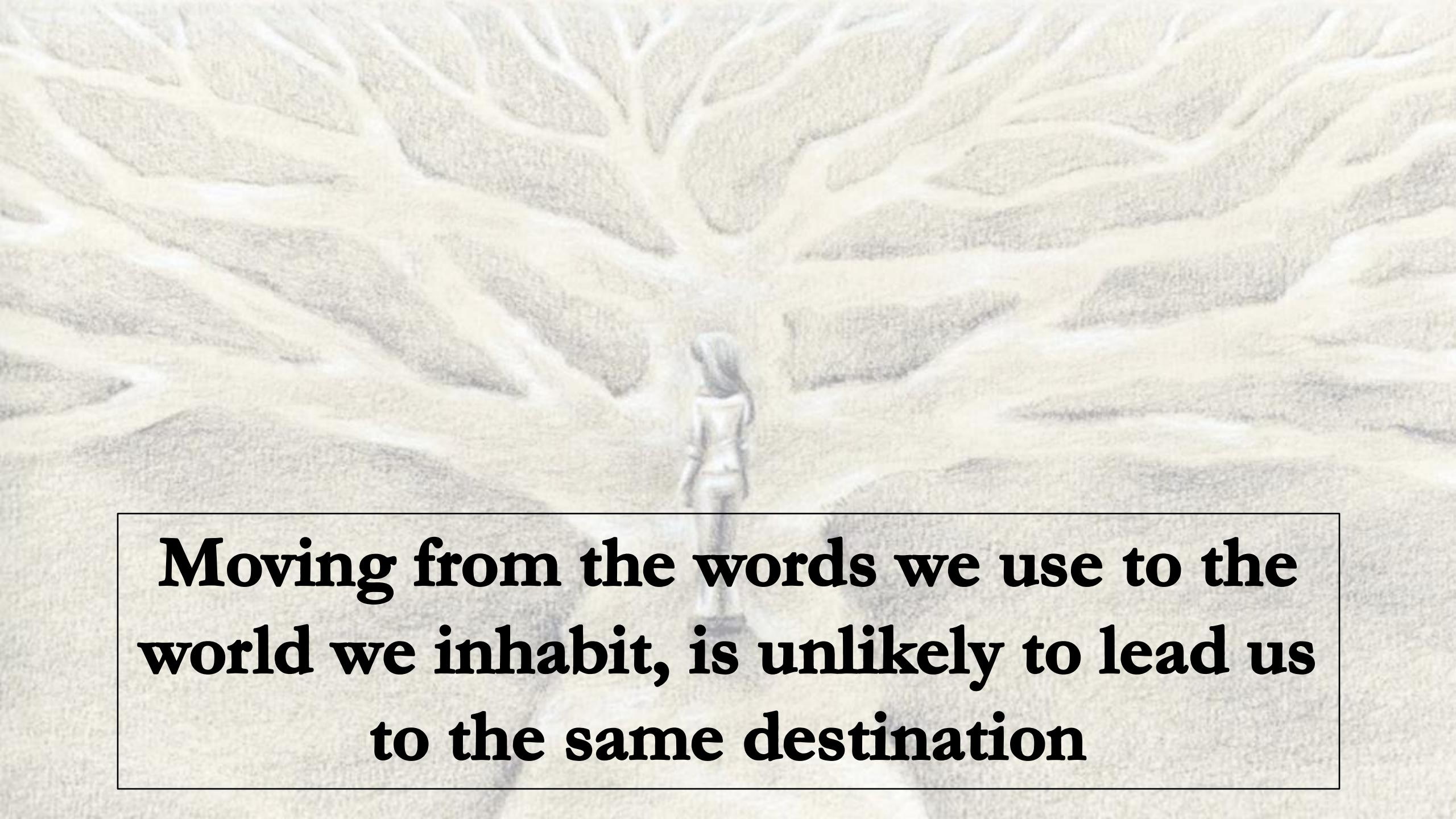
- Despite the breadth of coverage, the DOD Dictionary does not provide definitions for common military terms:
 - Commander
 - Geographic Area
 - Geopolitical Entity
 - Nation
 - National Organization
 - Organization
 - Territory
 - Training

**DOD Dictionary of
Military and Associated Terms**

Group Exercise

- Gather into groups and reflect on the definitions provided from the DOD Dictionary
- Keep the lesson I've been pressing in mind regarding the purpose of crafting definitions

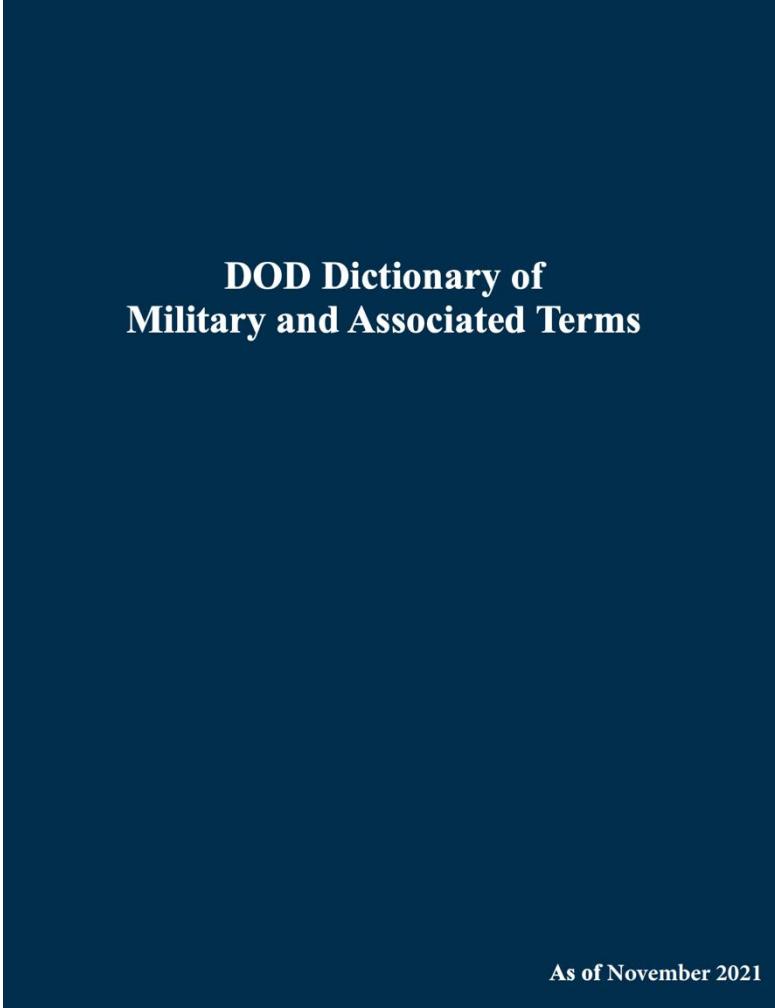
Be prepared to defend and revise your definitions

A black and white photograph showing a person from behind, walking away on a narrow path. The path is surrounded by tall, textured grass or crops that reach up to the person's waist. The perspective is from a low angle, looking up at the person.

**Moving from the words we use to the
world we inhabit, is unlikely to lead us
to the same destination**

Joint Doctrine Ontology Issues

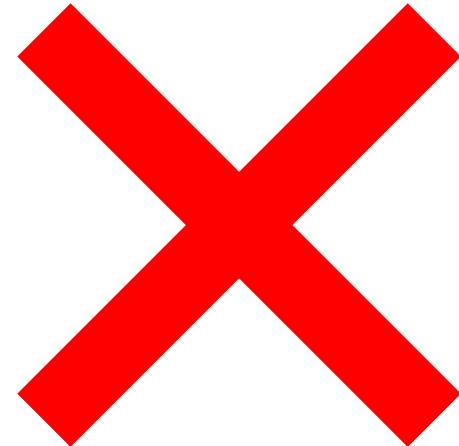
- Current guidelines for supplementing missing definitions is to check Webster's Dictionary...
- Questions immediately arise:
 - Which edition?
 - Which of the multiple definitions typically provided for each term?
 - How should address inconsistency between Webster's and existing DOD definitions?



**DOD Dictionary of
Military and Associated Terms**

Missing from Both DOD & Webster's

- Level of War
- Situational awareness
- Mission Assurance from Situational Awareness
- Cyber Situational Awareness Explorer
- Network Command and Control Integrated Situation Awareness Capability



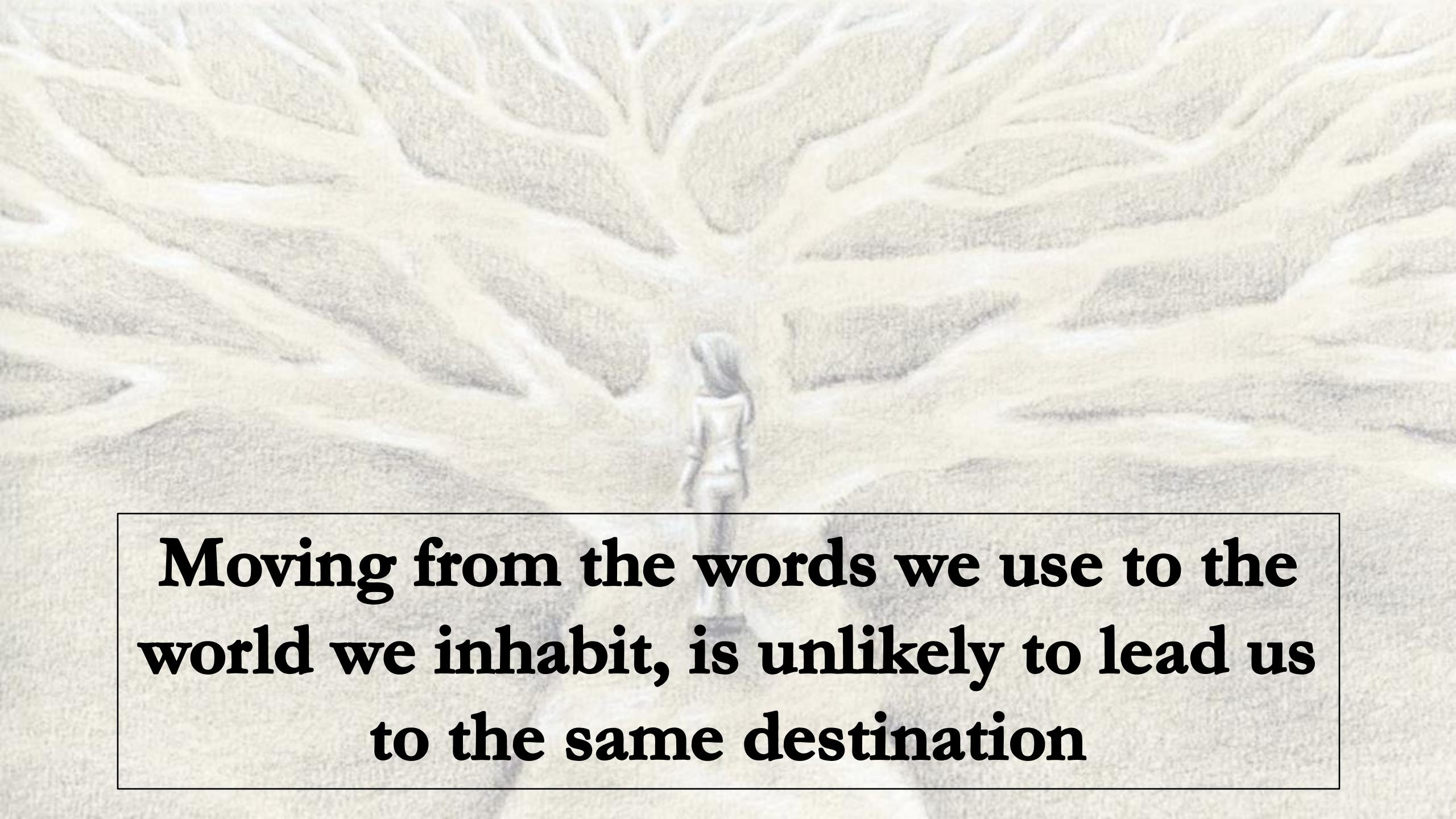
Group Exercise

- Gather into groups and attempt to provide a single definition for each of these missing terms; you are welcome to use online resources

Level of War

Situational awareness

If you find multiple definitions online, be sure to report that information to the class



**Moving from the words we use to the
world we inhabit, is unlikely to lead us
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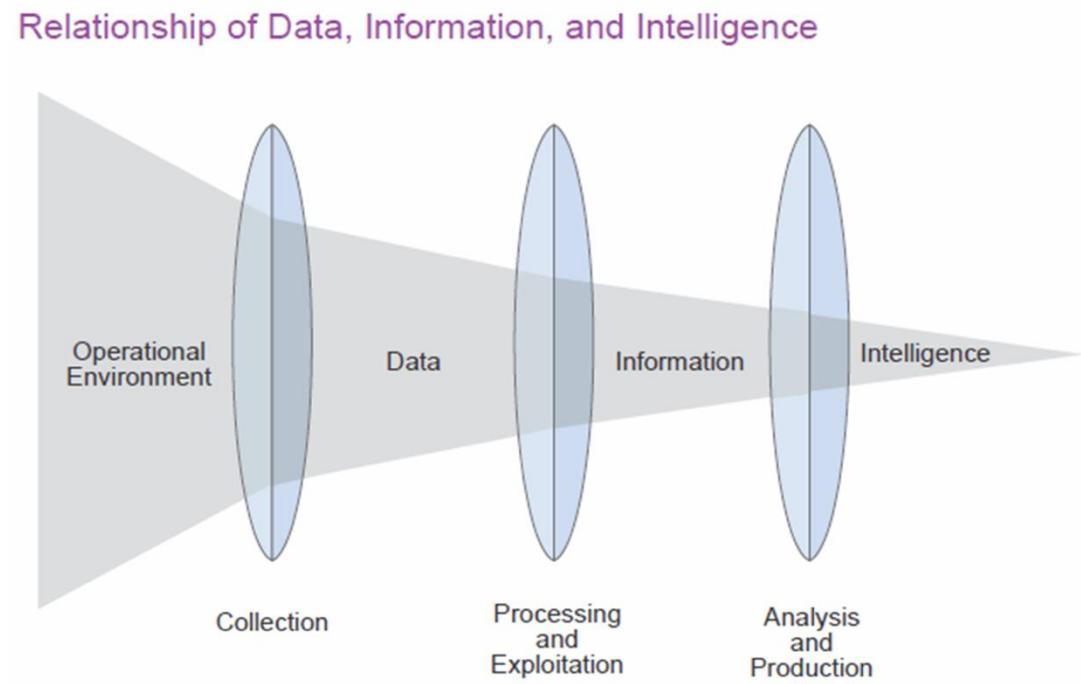
Ontology Solutions

- You should be able to see – and indeed have been able to demonstrate - how ontological strategies can address definitional issues
- Leveraging top- and mid-level standards should support optimism about such a project
- There are, however, deeper challenges ahead

Anticipating Massing Intelligence Fires

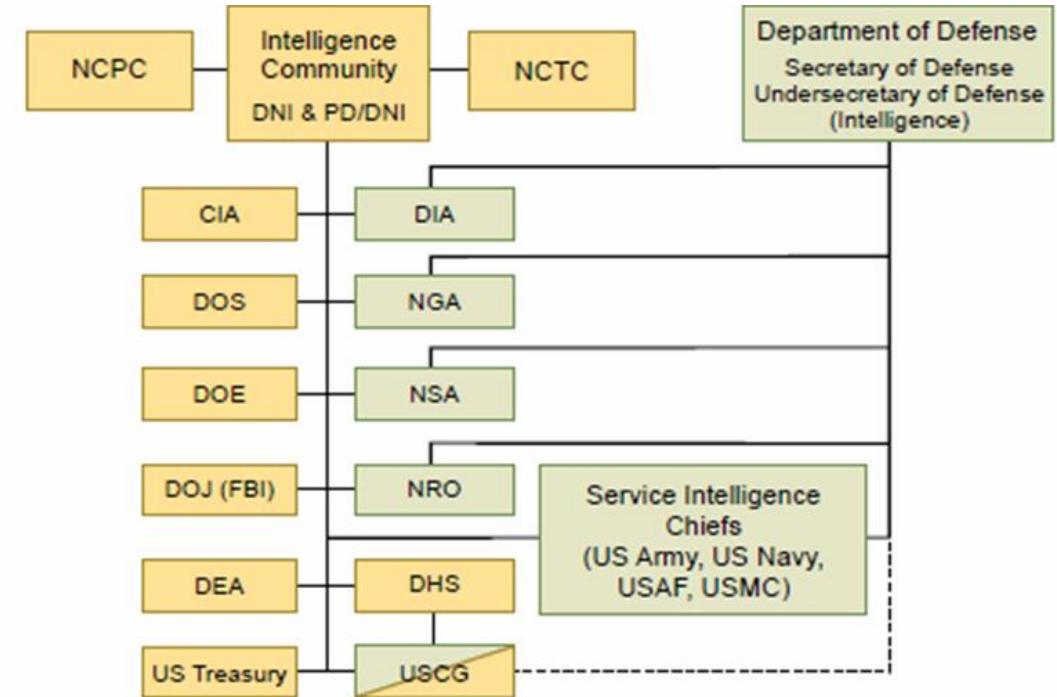
- Integrating data from operational perspective requires automation
- Prediction requires:
 - Real-time information sharing and revising
 - Common operational perspective
 - Interoperability across activities
- Which will require:
 - New information support strategies
 - Semantic interoperability across data
 - New governance and training for both humans and machines

CHALLENGES



Challenge: “Three-Letter Suite”

- Various agencies will create controlled vocabulary of the terms commonly used in its domain; various ontologies will then be created
- Just as the Gene Ontology spurred a proliferation of uncoordinated ontologies, we should expect success to bring similar fruits
- Every agency wants to have its own “three-letter ontology suite”



Challenge: Coordinated Development

- An adequate account of *military entities* will require at a minimum ontological characterizations of:
 - Social dispositions, e.g. military customs, jargon, conventions, etc.
 - Speech acts, e.g. imperatives, interrogatives, credence, etc.
 - Mental functioning, e.g. beliefs, knowledge, intentionality, etc.
 - Social acts, e.g. intelligence gathering, coordinated tactics, etc.
 - Documents, e.g. rankings, intelligence reports, drill manuals, etc.
 - Authorities, e.g. agencies, squad leads, subject-matter experts, etc.
 - Digital, e.g. encryption, sensor communication, etc.
 - Hardware, e.g. weapons, facilities, towers, etc.

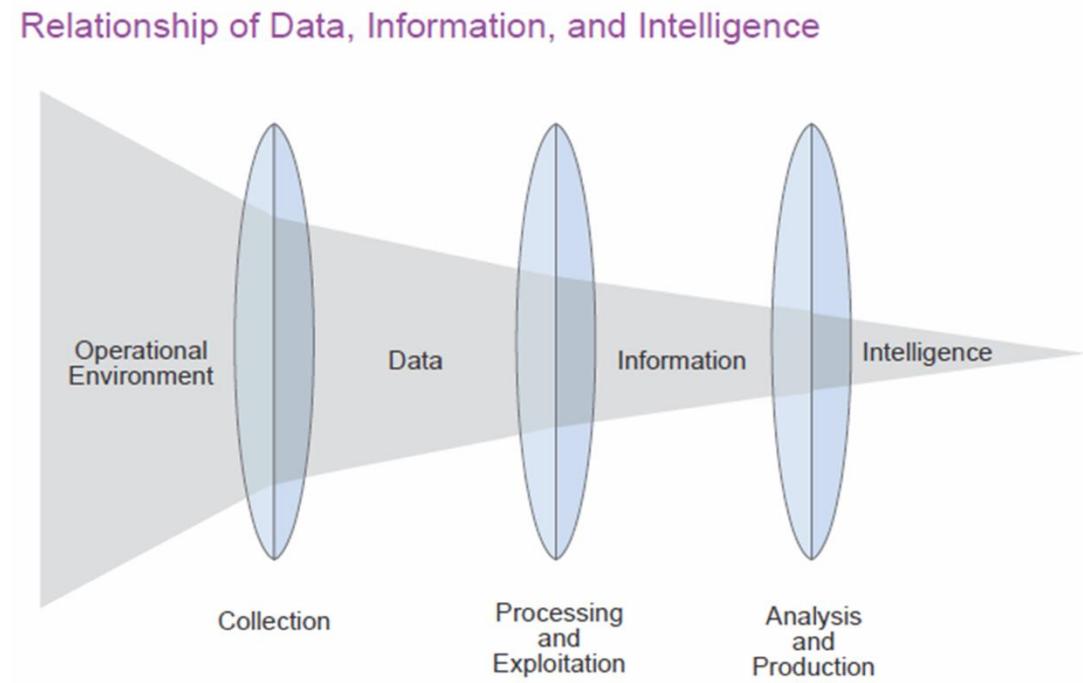
Challenge: Coordinated Development

- An adequate account of *military entities* will require at a minimum ontological characterizations of:
 - Social dispositions, e.g. military customs, jargon, conventions, etc.
 - Speech acts, e.g. imperatives, interrogatives, credence, etc. (ARGO)
 - Mental functioning, e.g. beliefs, knowledge, intentionality, etc. (MFO)
 - Social acts, e.g. intelligence gathering, coordinated tactics, etc.
 - Documents, e.g. rankings, intelligence reports, drill manuals, etc. (D-ACTS/RANKS)
 - Authorities, e.g. agencies, squad leads, subject-matter experts, etc. (CCO)
 - Digital, e.g. encryption, sensor communication, etc. (C3O)
 - Hardware, e.g. weapons, facilities, towers, etc. (CCO)

green indicates developed work; *blue* indicates first steps; *red* indicates gap

Anticipating Massing Intelligence Fires

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Applied Ontology Education GitHub Organization

Welcome to the official NCOR GitHub organization for ontology engineering educational materials. The resources are designed to guide you through the evolving fields of semantic web technologies, AI-powered systems, and advanced 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 projects, we hope to facilitate knowledge sharing and skill-building within these important domains.

Featured Repositories

Intelligence Analysis and Ontology Engineering

Stars 11

An introductory course concerned with building, maintaining, and applying ontologies in the domain of intelligence analysis.

Topics: OWL, Intelligence Cycle, Arguments Ontology, Conformation Bias, Analytic Methods.

Applied-Ontology-Education/Ontology...

No description provided

11 stars

6 forks

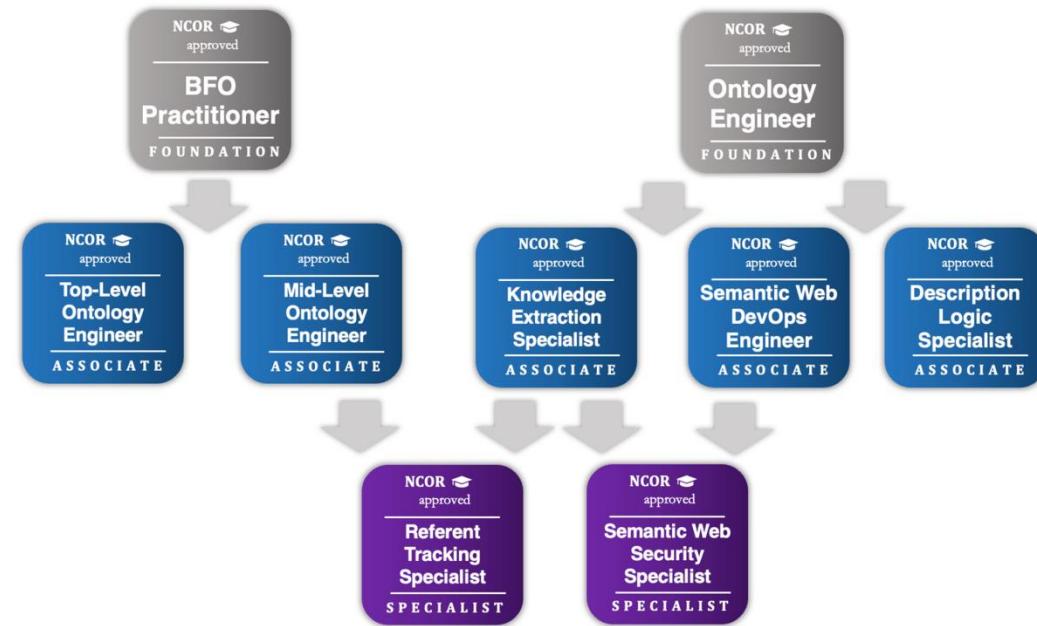
Logic for Ontologists

Stars 8

Learn how to construct and query knowledge graphs using RDF, OWL, SPARQL, and other tools/standards from the semantic web stack.

Topics: RDF, SPARQL, SHACL, Knowledge Graph Construction.

Overview



Open-Access Resources

Open-Access Ontology Engineering Resources

Planned

- [Ontology for Data Science](#)

2024

- [Ontology of Economics](#), Department of Philosophy, University at Buffalo, Fall 2024
- [Philosophy and Artificial Intelligence](#), Università della Svizzera italiana, Lugano, Switzerland, Spring 2024

2023

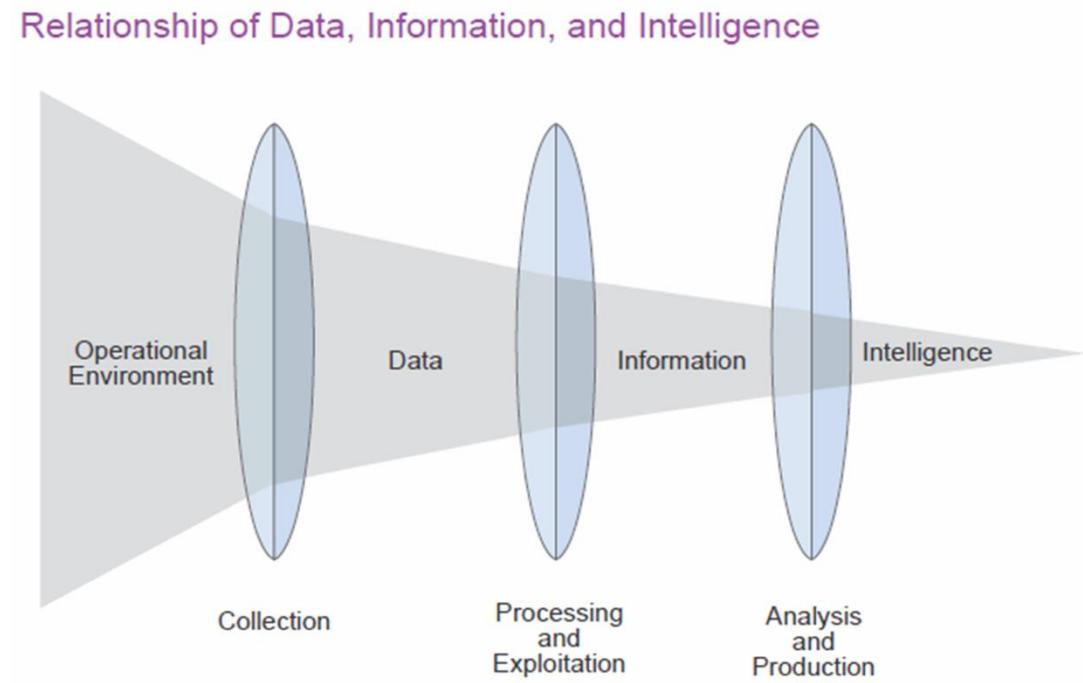
- [Nature and Culture](#), Department of Philosophy, University at Buffalo, Fall 2023
- [Philosophy and Artificial Intelligence](#), Università della Svizzera italiana, Lugano, Switzerland, Spring 2023

2022

- [Applied Ontology 2022](#), Spring Semester, Department of Philosophy, University at Buffalo, Spring 2022
- [Philosophy and Artificial Intelligence](#), Università della Svizzera italiana, Lugano, Switzerland, March and May 2022
- [Philosophy of Science](#), University at Buffalo, Department of Philosophy, Fall Semester

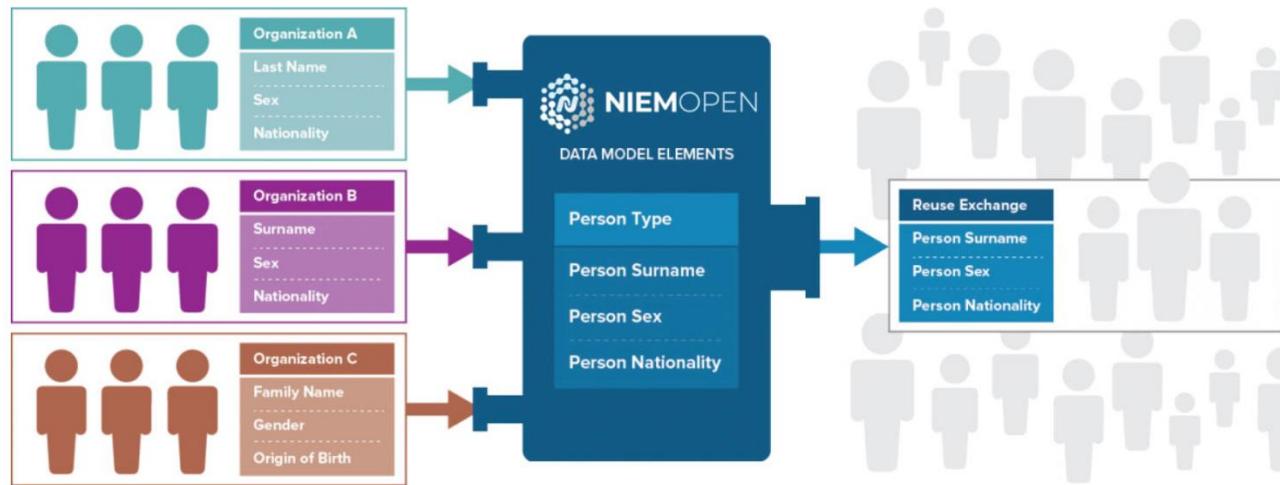
Anticipating Massing Intelligence Fires

- Integrating data from operational perspective requires automation
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- Which will require: **CHALLENGES**
 - New information support strategies
 - Semantic interoperability across data
 - New governance and training for both humans and machines



Challenge: Swim Lanes

NIEM Enables a Common Understanding



If I say "vessel" and you say "boat", and he says "ship" and she says "conveyance", we may mean the same thing, but we have no way to tell our computer systems to treat the words as having the same meaning. Until we do, we'll all have separate facts about the same world—pieces of the big puzzle—but no common understanding or way to connect them.

This is the idea behind NIEM. It lets your system and my system speak—even if they've never spoken before—by ensuring that information carries the same consistent meaning across various communities.

Rather than starting from scratch, NIEM can save organizations time and money by providing consistent, reusable, and repeatable data terms, definitions, and processes.

Challenge: Swim Lanes

John lost his car registration documents and was required to report to the DMV within 7 days.

```
<niem:Message xmlns:niem="http://niem.gov/niem/niem-core/2.0">
  <niem:EntityReference>
    <niem:EntityIdentification>
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      <niem:IdentificationCategoryText>Car Registration Document
    </niem:IdentificationCategoryText></niem:EntityIdentification>
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      <niem:MetadataIdentifier>
        <niem:IdentifierType>Internal</niem:IdentifierType>
        <niem:IdentifierText>ABC789</niem:IdentifierText>
      </niem:MetadataIdentifier>
      <niem:MetadataDate>
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      </niem:MetadataDate>
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    </niem:EntityMetadata>
  </niem:EntityReference>
</niem:Message>
```

<niem:SecurityCategory>Unclassified</niem:SecurityCategory>
 </niem:MetadataSecurity>
</niem:EntityMetadata>
<niem:EntityDetails>
 <niem:DetailsCategory>
 <niem:CategoryText>Lost Document</niem:CategoryText>
 <niem:CategoryCode>LOST</niem:CategoryCode>
 </niem:DetailsCategory>
 <niem:DetailsInformation>
 <niem:InformationText>John lost his car registration documents and was required to report to the DMV within 7 days.</niem:InformationText>
 </niem:DetailsInformation>
</niem:EntityDetails>
</niem:EntityReference>
</niem:Message>

Challenge: Swim Lanes

**An information exchange
data model exhibiting at best
minimal semantics**

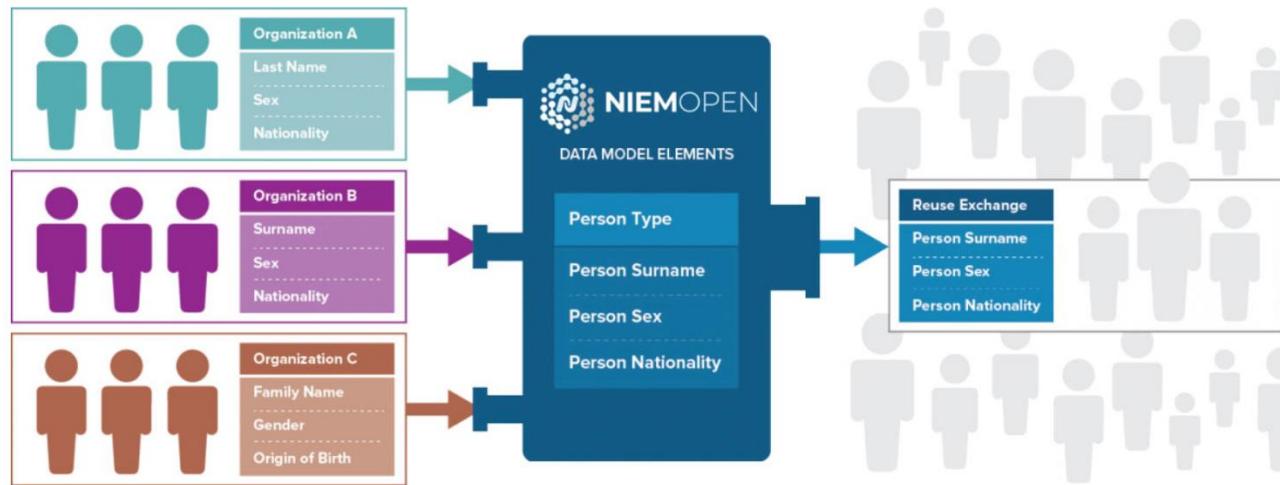
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  </niem:EntityReference>
</niem:Message>
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Challenge: Swim Lanes



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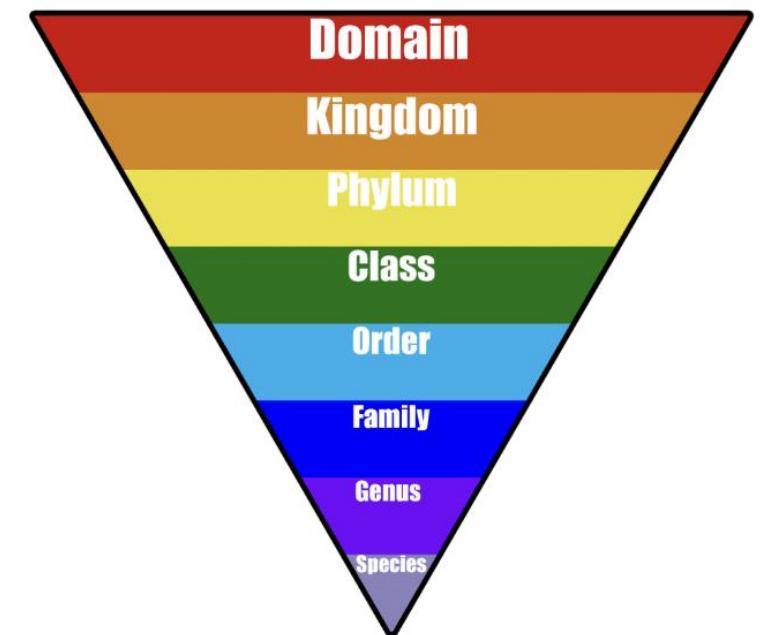
- The NIEM team regularly attempts to leverage interesting ontologies to generate interest in NIEM
- NIEM is not an ontology; indeed, it's inconsistent
- And that is okay as **long as it stays in its swim lanes**

```
---  
title: "More and better NIEM Tools"  
description: 01-19-2022  
short: 01-19-2022  
---  
  
✓ ### More and better NIEM Tools  
  
*Wednesday, January 19, 2022*  
  
- Release 5.2 of NIEM is in final release stages, with new data components in many domain  
- The new metamodel of NIEM that allows the creation of an ontology using OWL and RDF, ma  
- A new on-line, interactive training program will be rolled out in 2022 to support techn  
  
From the NIEM SLTT Tiger Team, an instrument of the NIEM Business Architecture Committee
```

Science of Ontology Engineering

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

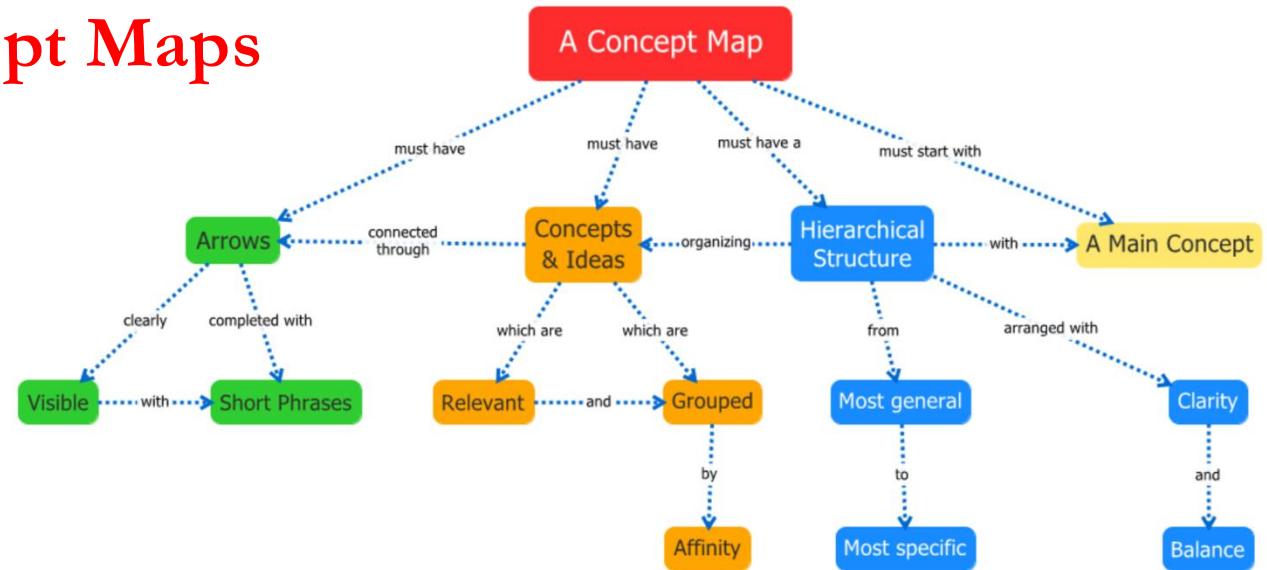
Taxonomies



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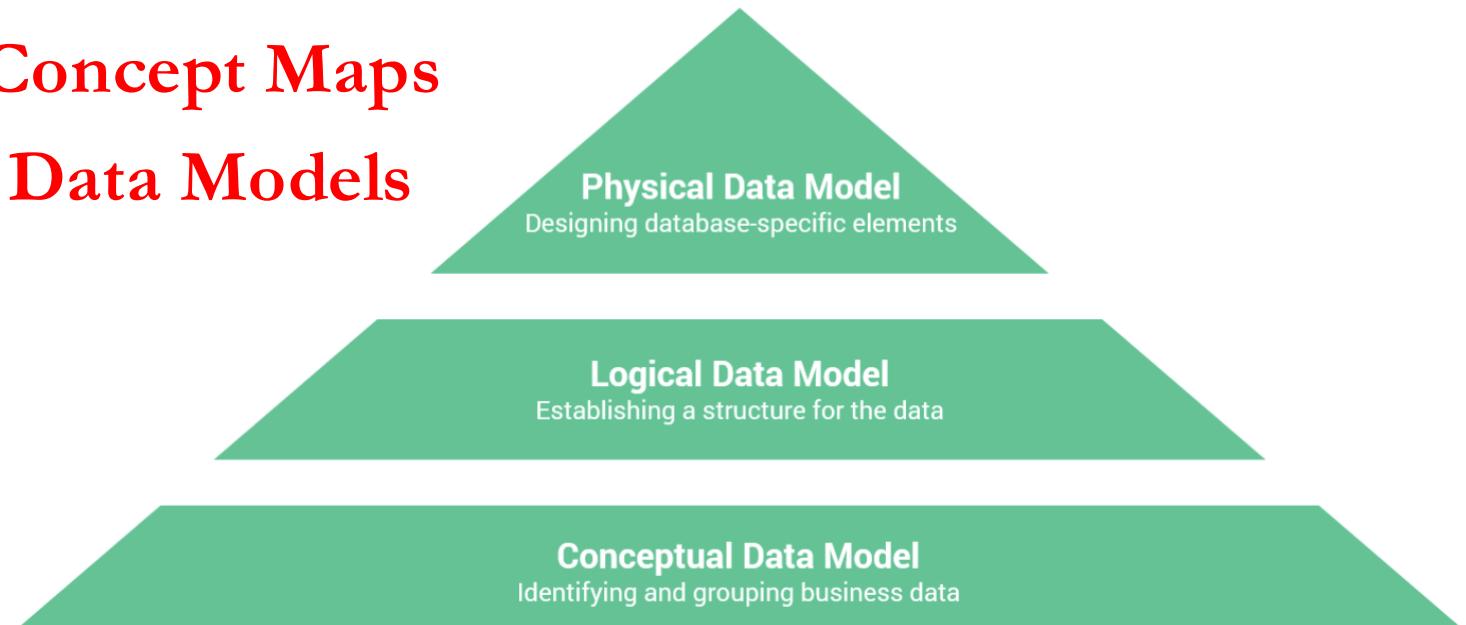
Taxonomies Concept Maps



Science of Ontology Engineering

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

Taxonomies
Concept Maps
Data Models

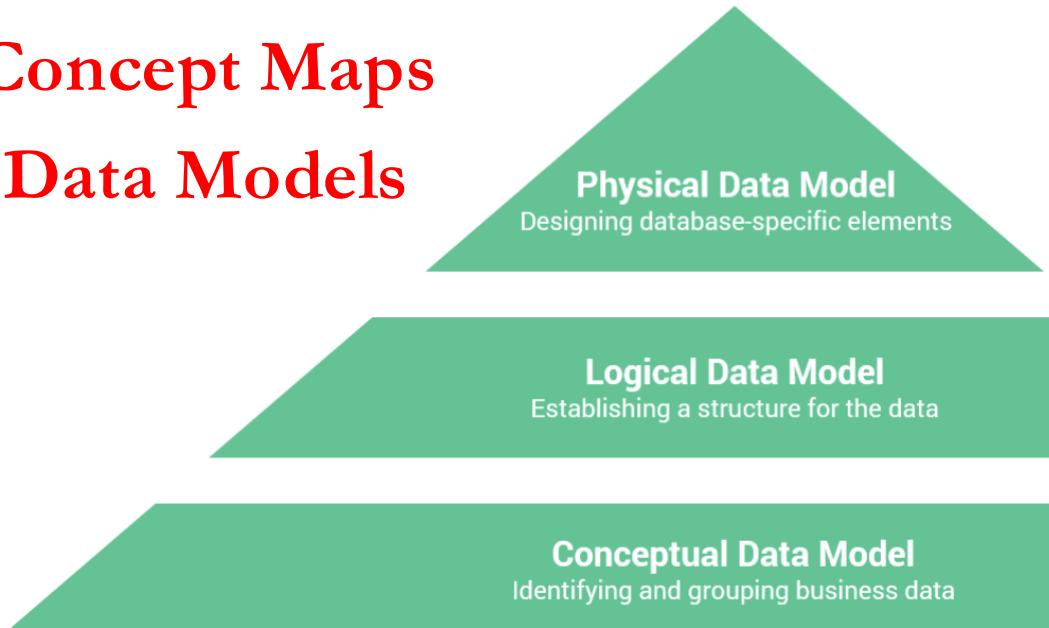


Pop Quiz

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

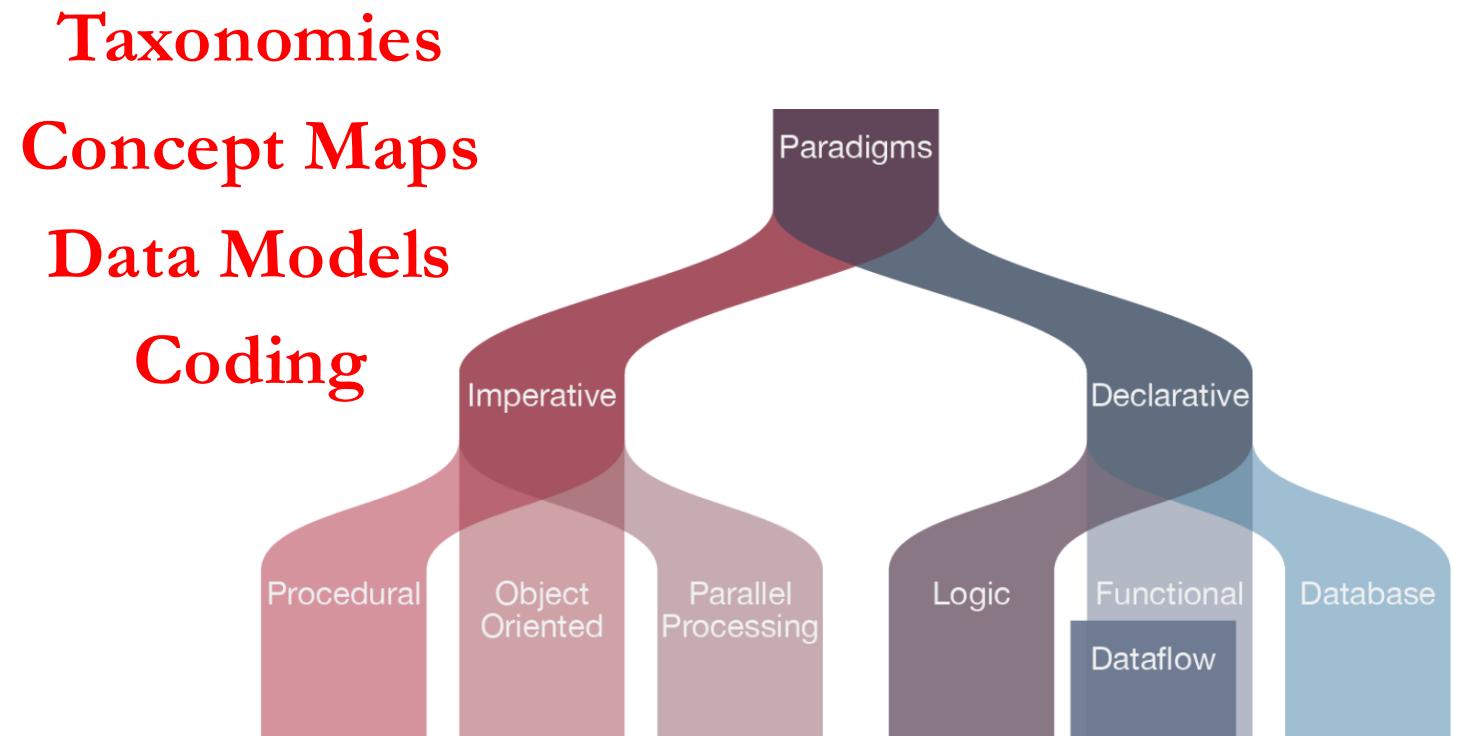
What distinguishes
ontology engineering
from data model
development?

Taxonomies
Concept Maps
Data Models



Science of Ontology Engineering

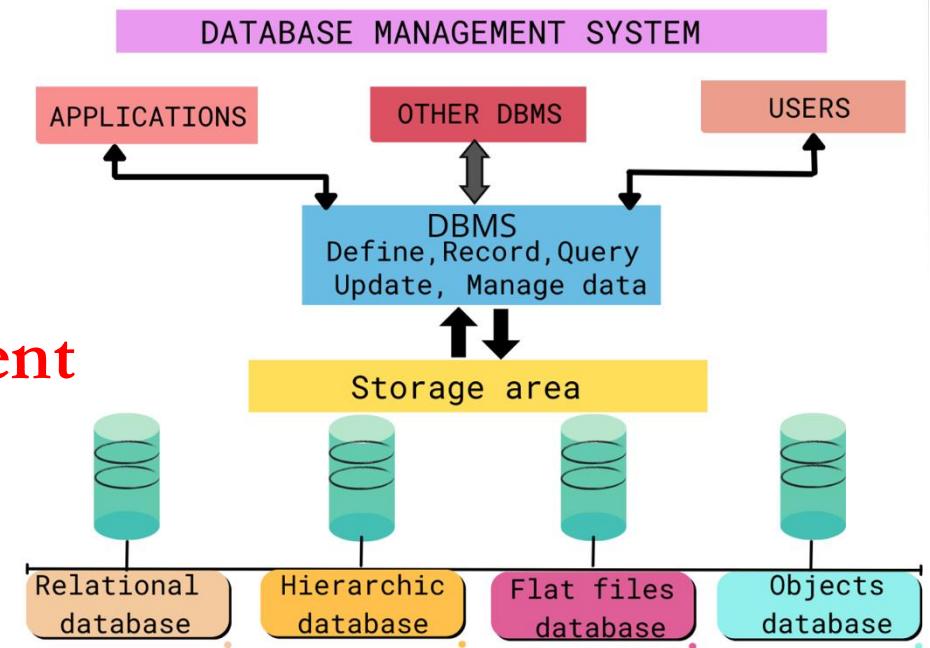
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Science of Ontology Engineering

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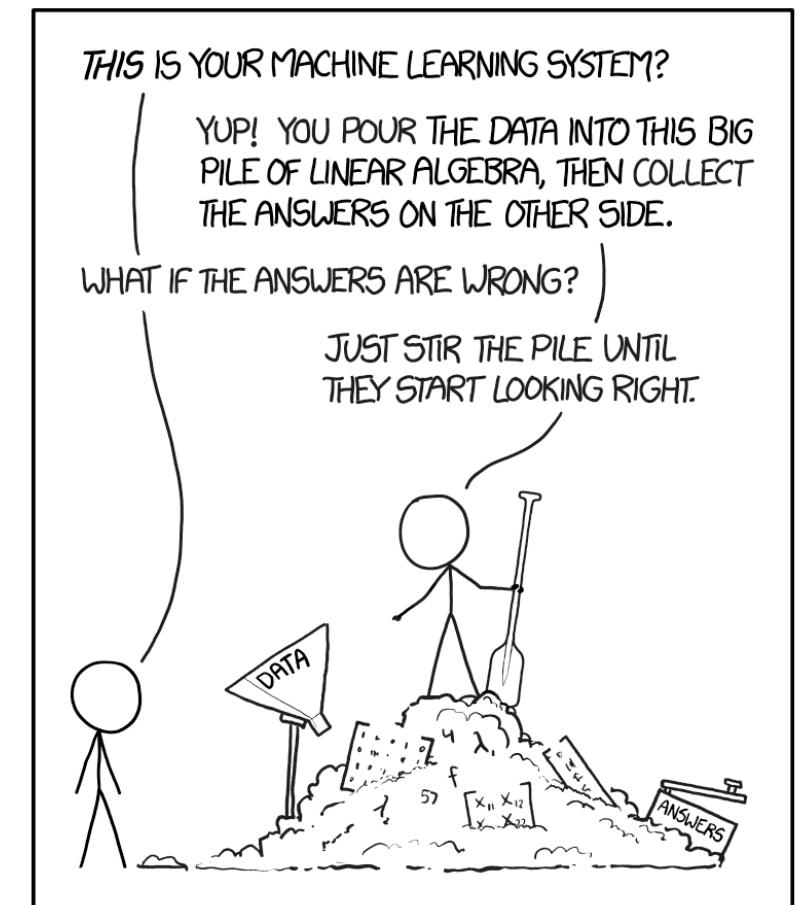
Taxonomies
Concept Maps
Data Models
Coding
Database Management



Science of Ontology Engineering

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

Taxonomies
Concept Maps
Data Models
Coding
Database Management
Machine Learning



Readings

- Joint Doctrine Ontology
- Complexity in Military Intelligence