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# Philosophical foundations of intelligence collection and analysis: a defense of ontological realism

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## Introduction to the problem

There is a common misconception across the Intelligence Community (IC) that information trapped within multiple heterogeneous data silos[1] can be semantically integrated by the sorts of meaning-blind statistical methods employed in much of artificial intelligence (AI)[2] and natural language processing (NLP). The misconception about AI and NLP leads to a false belief on the part of many analysts and technology developers that incoming data can be analysed coherently without any shared framework for classifying what these data are about. The idea is that when we have huge amounts of heterogeneous data that need to be weaved into a common intelligence picture this can be achieved by using statistical algorithms. Unfortunately, such approaches do not yield the sorts of results which are sustainable where we are dealing with widely distributed, highly heterogeneous and often changing bodies of data. We argue here that such integration requires the use of what we call an Integrating Semantic Framework (ISF), which provides a consistent set of categories and relationships that can be reused over and over again to tag successive bodies of data in ways which foster more coherent integration and reasoning.

Yet intelligence analysts still spend an inordinate amount of time searching for and organizing relevant data prior to conducting any meaningful analysis. Because this is so difficult, analysts must typically focus on just the small subset of data repositories which they know well. The results of such analyses then become stored in different information systems that still need to be collated in a way that would enable the production of a common intelligence picture across the whole space of relevant data by assembling disparate data points into complete narratives.

Where data that may be relevant to the analytic process are trapped in data silos that are easily accessed by the analysts that produced them but not by the analysts who need to use them, all sorts of synoptic connections between data are missed. Data repositories and information systems used by different analysts fail to be semantically integrated even where the data in them refers to the very same portions of reality – for example to the same specific site or to the same specific material object moving through space and time. Several analysts may make assertions about the same entity in different systems, but the assertions are trapped beyond each other's reach.

## A proposed solution

We argue here that the needed integration can be reached through the use of a consistent set of categories and relationships that are represented in a suite of ontology modules within an Integrating Semantic Framework (ISF). The proposed ISF will provide a consistent set of terms and relational expressions that emulate the ways analysts make assertions about portions of reality. Because these terms have logical definitions, the results of attaching them to data can be used by computers to bring those assertions together in meaningful ways. The ontology modules in the ISF are all built on the basis of a shared Top-Level Ontology (TLO), consisting of terms representing the

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most general classes (such as: material object, process, site, spatial region, and so on), which provides the structure for more specific domain-level ontologies. Extending directly from the TLO are the Common Core Ontologies (CCO) that are intended to represent and integrate taxonomies of generic classes and relations across all domains of interest – they are the semantic layer between the TLO and more specific domain-level ontologies that are closest to the actual data.[3] The result is a suite of semantically integrated and modular ontologies intended to represent reality in ways that analysts use to support cross-domain reasoning and computers can exploit for automated data analysis.

In what follows we will explain the construction of an ISF that builds upon BFO's highly general categories and relations and show how it can be extended into any domain of interest to the IC. This chapter will provide the analyst, system architect, and aspiring Ontologist with some of the primary tools needed to understand the structure of an ISF and to participate in the construction of BFO-compliant ontologies that will benefit the IC.

## Semantic integration through ontological realism

> "As we perceive the world around us, we recognize various individual phenomena as being equal for purposes of interaction in spite of the fact that no two of them are ever exactly the same … In this way the world is not perceived and experienced as a huge (and chaotic) array of individual phenomena but as a relatively stable and ordered set."[4]

From a very young age children learn and communicate through basic-level categories. They categorize the objects around them (e.g., dog, doll, chair, child, etc.) and then group them according to similarities to other objects. This basic-level categorization is the result of processing sense data pertaining to the general shape, natural discontinuities, and movements of individual objects as they present themselves in nature. More specialized categorization is based upon enhanced knowledge of an object's function or its further decomposition from wholes into constituent parts. Gábor Győri states that:

> … there is a level of categorization of reality – the basic level – at which we make categorizations on the basis of natural discontinuities found in nature. In other words, we distinguish the entities that show maximal category resemblance with each other and minimal with others based on gestalt perception, as well as motor movements and behavioural functions connected to them.[5]

The ability to categorize and relate objects as they present themselves in reality serves as the foundation for both cognition and the encoding of language. Similarly, computing information systems must emulate human categorization and the processes related thereto in order to become semantically integrated. This requires a consistent way of categorizing and relating objects that matches the ways humans encode categories into language. Just as children learn and communicate through the use of categories, computing information systems emulate such processes. Győri states that, 'recognition, and also differentiation, happens on the basis of categories because they function as pattern recognition devices by specifying relevant properties and thus providing schemas for finding similarities'.[6]

Categories and interrelationships encoded in a consistent schema are prerequisites for semantic integration across disparate information systems. Semantic integration is the process of connecting information from disparate resources and multiple locations in such a way that meaning is preserved. Achieving semantic integration across disparate information system requires methods for consistently representing the objects being referenced. We here propose methods for semantic integration based on ontological realism (OR), the view that ontologies should represent the inherent structure of reality in terms of universal classes, individual instances, and various relations between them. As we have stated elsewhere, 'The realist methodology is based on the idea that the most effective way to ensure mutual consistency of ontologies over time … is to view ontologies as representations of the reality that is described by science. This is the fundamental principle of ontological realism'.[7]

In contrast to OR, idealism is the view according to which 'the term "reality" signifies nothing more than a construction built out of concepts, so that every concept-system would in principle have an equal claim to constituting its own "reality" or "possible world"'.[8] Ontologies built around concepts (mental constructions), rather than the objects themselves, result in vague and often inconsistent classifications, whose integration often leads to untenable assertions. Semantic integration becomes impossible when one starts out with information sources based on incompatible sets of concepts, or if not impossible then at least so difficult as to require considerable manual effort. And if no benchmark set of ontology terms is selected in advance, this investment of manual effort will have to be repeated over and over again with each new integration task. OR is, to our knowledge, the only strategy which has proven itself in defining the needed sort of benchmark ontology in a way which has been adopted, now, by 100s of different ontology developer groups.

## Object Based Production (OBP) and Ontological Realism (OR)

While serving as the Director for Analysis at the Defense Intelligence Agency (DIA), Catherine Johnston stated that:

> Historically, information in the Intelligence Community (IC) was disseminated through a set of single intelligence-discipline stovepipes according to the specific sensor (human or machine) that detected it. This method of receiving data forced the all-source analyst to hunt for and gather information in these stovepipes—basically finding all of the disparate pieces of information and acting as the manual fusion engine for single-source reporting.[9]

Over the last four decades sensing and computing devices have flooded the Operating Environment, resulting in torrents of data that become immediately trapped in data silos. The result is that intelligence analysts still spend most of their time working out how to search for, retrieve, and collate data from what may be hundreds of disparate sources before they can conduct any sort of meaningful analysis. Semantic interoperability across information processing systems will result in computer-assisted fusion where each system can carry out the tasks for which it was designed using data and information taken from another system as seamlessly as it can when using its own data and information. So far, AI and NLP have not provided a solution to semantic integration. Johnston et al. describe the problem at the Defense Intelligence Agency (DIA) as follows:

> As automated data expand, analysts are overwhelmed, with no reasonable chance to find all the relevant information, much less analyze it. Instead, analysts spot-check roughly 1,400 data sources for information they believe will be most relevant.[10]

Making stored data discoverable for analysts requires an enterprise-level data strategy that describes the vision, goals, guiding principles, and capabilities needed to integrate the disparate data and convert it into usable information. The goals of such a data strategy will include some form of semantic integration that makes data discoverable, and interoperable, across multiple data resources. Semantic integration results when multiple data sources are connected through a common annotation and interrelation framework of the sort provided by the BFO and by a consistent set of specific domain ontologies such as those provided by ontology developers who follow BFO principles.

The U.S. Department of Defense Data Strategy describes several goals that require semantic integration:

(1) Make Data Visible – Consumers can locate the needed data.
(2) Make Data Accessible – Consumers can retrieve the data.
(3) Make Data Understandable – Consumers can recognize the content, context and applicability.
(4) Make Data Linked – Consumers can exploit data elements through innate relationships.
(5) Make Data Interoperable – Consumers have a common representation/comprehension of data.[11]

From this list, requirements 1, 3, 4, and 5 will all fail to be satisfied if data are collected and annotated using different terminologies without shared meaning or relational expressions. Furthermore, these strategies require AI and NLP tools that leverage consistently developed categories and relationships.

The set of processes for managing an organization's information resources as they are acquired from numerous individuals and sub-organizations working on disparate information systems is called Information Management (IM),[12] which is designed to ensure the timely flow of accurate information to the correct node within the networked organization, to support planning, decision-making, and mission execution. Joint Publication 3.0 Joint Operations defines IM as, 'the function of managing an organization's information resources for the handling of data and information acquired by one or many different systems, individuals, and organizations in a way that optimizes access by all who have a share in that data or a right to that information'.[13] IM is greatly enhanced through semantic interoperability, where AI and NLP performs many of the tedious collation and fusion tasks that are currently performed by the analyst.

The U.S. Department of Defense (US DoD) formulated a series of interrelated strategies (directives) to break down these data-stovepipes and increase IM efficiencies. As early as 2001 the DoD Net-Centric Data Strategy outlined the Department's vision for realizing a networked information environment (including infrastructure, systems, processes, and people) that would integrate data resources across disparate systems and enable computationally assisted reasoning.[14] Starting in 2015, Consolidated Intelligence Guidance directed the adoption of Object Based Production (OBP) as a core intelligence business process, implemented as a whole-of-community initiative to change fundamentally the way the IC organizes information and intelligence.[15] OBP is an analytic business process that organizes intelligence reporting to known objects (person, place, or thing) that can be visualized and analyzed:

> Reduced to its simplest terms, OBP creates a conceptual "object" for people, places, and things and then uses that object as a "bucket" to store all information and intelligence produced about those people, places, and things. The object becomes the single point of convergence for all information and intelligence produced about a topic of interest to intelligence professionals. By extension, the objects also become the launching point to discover information and intelligence. Hence, OBP is not a tool or a technology, but a deliberate way of doing business.[16]

The idea of organizing data around real-world objects and their interrelationships has also been adopted by the systems engineering, acquisitions, and maintenance communities within the DoD, who are beginning to organize their data around what they refer to as a digital twin – for vehicles, aircraft, weapons, and so on. A digital twin is defined as:

> a virtual representation of an object or system that spans its lifecycle, is updated from real-time data, and uses simulation, machine learning and reasoning to help decision-making.[17]

Just like the objects (people, places, facilities, and equipment items) in OBP, so each digital twin serves as the single point of convergence for information about its real-world counterpart. Here again, however, achieving semantic integration within a digital twin that is maintained in conformity with its target by using information that is stored in disparate information systems requires a set of standardized ontology classes that are used to tag the information in these sources. The classes used to tag digital twin-relevant information would then be identical to those used to label the corresponding real-world material objects and their components.[18]

The realist framework provides not only the top-level classes needed to organize classes of these sorts, but also a set of consistent domain ontologies – such as the Common Core ecosystem of Space Domain Ontologies[19] – which provide the means for representing the relationships between the digital twin and the material objects whose behaviors in space and time it is intended to mirror. The digital twin is an information artifact, like a document, but unlike a document it is designed to change as the item it mirrors changes in the world. This helps to resolve the dichotomy between the analyst's focus on objects as they are in the world on the one hand and the information artifacts that represent them on the other. Smith describes the BFO compliant Information Artifact Ontology for Intelligence (IAO-Intel) as providing:

> common resources for the consistent description of information artifacts of relevance to the intelligence community in a way that will allow discovery, integration and analysis of intelligence data from both official and non-official sources.[20]

Similarly, Bone and colleagues describe an Interoperability and Integration Framework (IoIF) for a digital thread[21] as 'a high-level Semantic Web Technology-Enabled architecture solution for the interoperability and integration of data in the development and management of engineered systems with multiple digital artifacts'.[22]

## Object Based Production (OBP) and semantic integration

OBP has as its goal an integrated system of information systems (a system of systems) where every individual object salient to intelligence analysis is accounted for, and data are accurately and systematically mapped to their respective objects. In this way, for example, all the data accessible to a given analyst about a given person, place, facility, or equipment item are immediately available. The measurement results, images, analyses, assessments, and so forth, that make up intelligence products become aligned with the individual object or process in the Operating Environment to which they refer, and the Web Ontology Language (OWL) enables information integration and computer-assisted reasoning across disparate information systems.[23]

Each individual object in the resultant enterprise-level information system can have numerous data associated with it. For example, an individual 'Vehicle' object will have identifying information such as a tail, wing, or hull-number, images, and capability assessments, as well as spatial and temporal data that is continuously updated in near-real time. And we can imagine a very powerful information system that integrates all data sources across an enterprise and accurately aligns each datum to its appropriate object, so that everything that has been asserted about that object is accurately aligned to it in complete data-to-object alignment.

Yet achieving this state of complete data-to-object alignment does not in and of itself provide any solution to the problem of silo formation. Put another way, organizing intelligence information around known objects does not by itself result in semantic integration and the ability to achieve computationally assisted analysis encompassing all available data. This is because the organizing principle of OBP applies only to the relationship between data (information) and the objects that the data is about. What it does not take account of is the fact that these objects themselves have common general properties – a *person* is an *organism*, a *commander* is a person who is capable of giving *commands*, a *hospital* is a *complex of buildings*, a *wedding* is an *event*, et. al. All of the mentioned entities form a common, general organization resting on common, general relationships that hold between them. Genuine semantic integration across the IC requires that the known objects are organized by type and subtype within a well-formed synoptic taxonomical framework in which the interrelationships between objects are made explicit in a computable format such as OWL.

## The taxonomy of Basic Formal Ontology (BFO)

A taxonomy is a classification schema consisting of entities organized in a genus-species format. All classes, in other words, are positioned hierarchically in the taxonomy, with child classes standing to their respective parent classes in what is called an *is_a* or subclass relationship. Sibling classes are children of the same parent and are positioned on the same level in the hierarchy. A common taxonomical categorization of this sort should form the backbone of any well-structured ontology, and the ultimate parent classes at and near the top of the hierarchy derive from a formal top-level ontology (TLO). These will serve as the most general classes in terms of which more specific domain content will defined through specialization, as in

### *Human being is_a rational animal*

Where *human being* is the species (child class), *animal* the genus (parent class) and *rational* is the specific difference, which specifies the way in which humans differ from other animals.[24]

BFO is a top-level (or upper-level) ontology consisting of only 35 classes that was developed to support the integration of data across scientific disciplines (see Figure 1 below). Arp and colleagues state that:

> BFO is deliberately designed to be very small, in order to represent in consistent fashion those top-level categories common to domain ontologies developed by scientists in different fields. BFO assists domain ontologists by providing a common top-level structure to support the interoperability of the multiple domain ontologies created in its terms.[25]

## How Basic Formal Ontology (BFO) serves as the basis for an integrating semantic framework

> " . . . where a domain ontology assists in organizing the data of a particular domain to make that data understandable, accessible, and computer analyzable, a top-level ontology assists in organizing the data of multiple domain ontologies in a way that promotes the degree to which the information systems using these ontologies will be semantically interoperable." [26]

The goal of the DoD Net-Centric Data strategy goes beyond the mere integration of data resources. The underlying goal is the semantic interoperability of all DoD data and information systems, so that intelligence collected in one system becomes usable within the framework of each other system, ideally without further intervention by human beings. This is what is meant by semantic interoperability and computer-assisted intelligence analysis. Digital data and information become interoperable, shareable, discoverable, and reusable so that an intelligence analyst focused on a particular

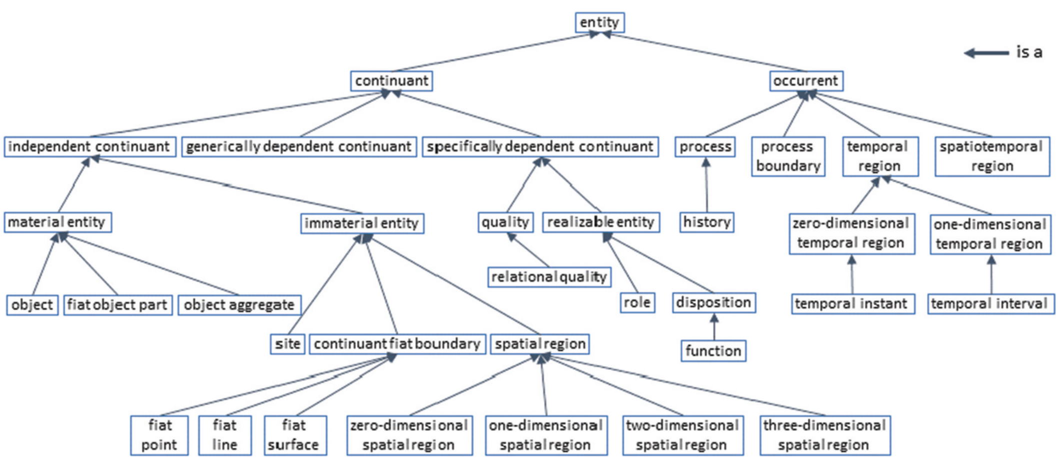


**Figure 1.** The Basic Formal Ontology (BFO) class hierarchy (only subclass relations are shown). BFO provides the classes, taxonomical structure, and interrelationships required for creating consistent and interoperable domain-level ontologies. It provides a set of classes and relationships that are designed to facilitate semantic interoperability across disparate information systems by providing a common starting point for defining classes at lower (domain-specific) levels which can then be used to annotate corresponding instance-level data.

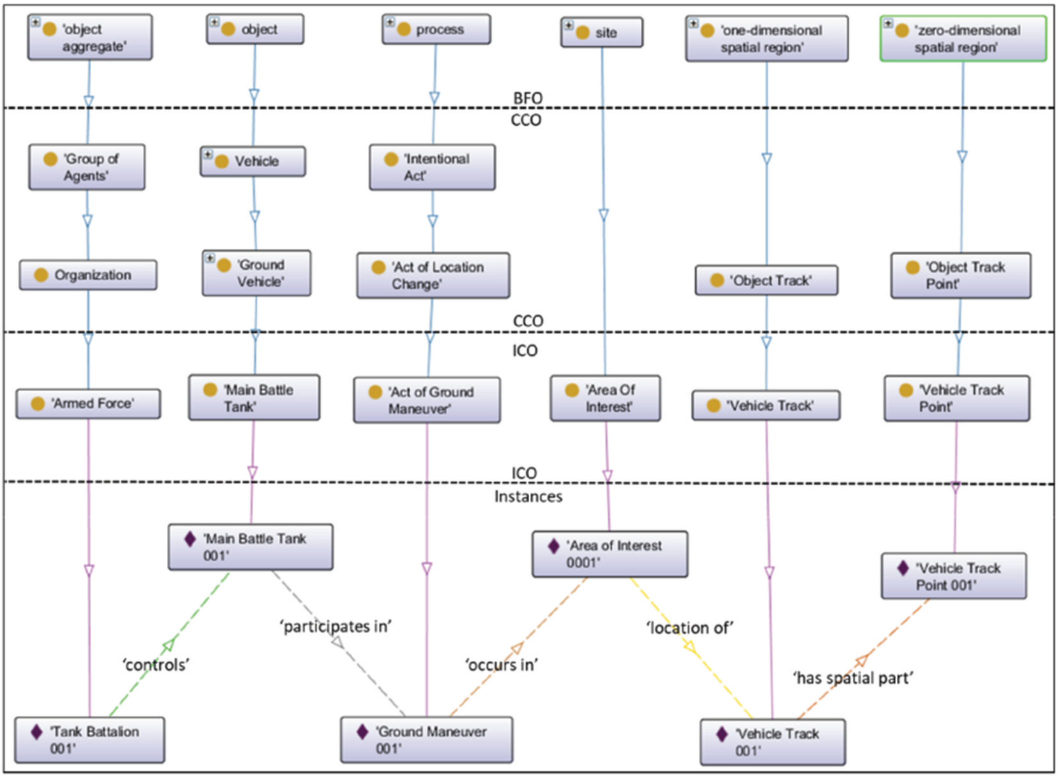


**Figure 2.** Categorization of types and subtypes in compliance with BFO and CCO facilitates computationally-assisted reasoning with instances (individuals) using OWL-RDF. These knowledge graphs become more valuable as data regarding new instances are added and linked to existing data creating a growing enterprise knowledge graph.

object or region will have immediate access to relevant intelligence created by analysts working on these or related objects data about which are captured in other information systems. Arp and colleagues define semantic interoperability corresponding as:

> … the ability of two or more such systems to exchange information in such a way that the meaning of the information generated by any one system can be automatically interpreted by each receiving system accurately enough to produce results useful to its end users.[27]

BFO provides the upper-level structure needed to properly organize the classes in more specific domain ontologies. Extending directly from BFO, the Common Core Ontologies (CCO) comprise eleven mid-level ontologies that aim to represent and integrate taxonomies of generic classes and relations across all domains of interest.[28] From the BFO and CCO layer, developers within the Intelligence Community (IC) can create semantically integrated ontology modules with the specific classes and relationships needed for reasoning in an Object Management System (OMS). Figure 2 depicts how specific content is dealt with in a notional BFO-CCO compliant Intelligence Core Ontology (ICO) in a way that conforms to the sort of common, more general, upper-level structure that is used for other types of specific content.

## Ontology-Enhanced Object Management Systems (OMS) for semantic integration across disparate information systems

> "Net centricity is a robust, globally interconnected network environment (including infrastructure, systems, processes, and people) in which data is shared timely and seamlessly among users, applications, and platforms." [29]

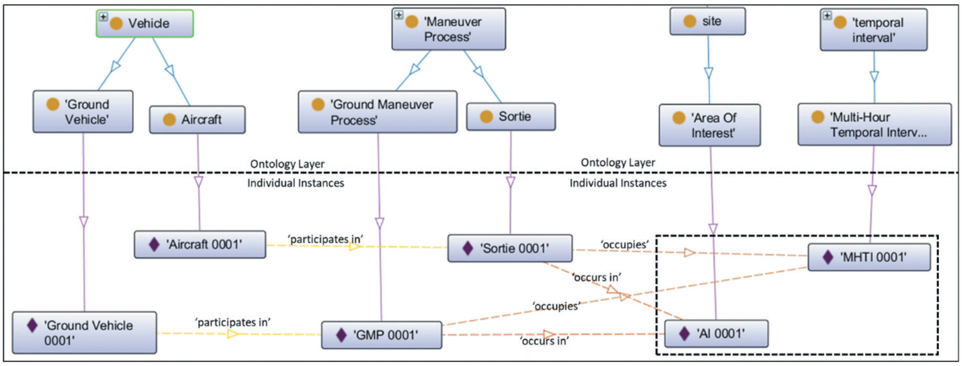


**Figure 3.** Objects that are tracked in disparate IS's are semantically integrated in a common Object Management System (OMS). As depicted above, the OMS uses the instances 'AI 0001' and 'MHTI 0001' to semantically integrate the movements of 'Aircraft 0001' and 'Ground Vehicle 0001'. Additional assertions made by other analysts may lead to the inference that the maneuvers of 'Ground Vehicle 0001' and 'Aircraft 0001' are part of a coordinated operation.

Object Management Systems (OMSs) are 'object-oriented software systems for simulating, evaluating, and controlling large-scale physical environments'.[30] An ontology-enhanced OMS creates a semantically integrated information system (IIS) that combines different databases from various sources across the IC. BFO-CCO compliant ontologies provide the logical structure that is required for the semantic integration (i.e., tagging and relating) of content residing in the disparate Information Systems (IS's). Semantic integration is attained through the use of consistently developed classes, individual instances, relationships, and uniform resource identifiers (URIs).

To understand how these elements support semantic integration across disparate information systems consider data that resides in two distinct IS's designed to track different objects. The first IS tracks the movement of aircraft through space and time. The second IS tracks the movement of ground vehicles through space and time. Each of the individual entities (i.e., referents) in the two IS's have an assigned URI that makes semantic integration possible. Semantic integration occurs every time the different systems refer to a common object with a shared URI.

Figure 3 below shows how semantic integration occurs when the Aircraft Tracking System and the Ground Vehicle Tracking System both refer to the same Area of Operations and Multi-Hour Temporal Interval. In this example, 'Sortie 0001' and 'Ground Maneuver Process 0001' are both logically related to 'Area of Interest 0001' and 'Multi-Hour Temporal Interval 0001' which links the assertions in two different IS. Because the two vehicles are maneuvering in the same area of interest, during the same temporal interval, an analyst may infer from this simple graph that they are somehow related. Additional assertions made by analysts using different, but integrated, systems will make reference to the same instances (with the same URI) in the OMS. This may lead to the inference that the maneuvers of 'Ground Vehicle 0001' and 'Aircraft 0001' are part of a coordinated operation. Furthermore, as new assertions become semantically integrated (linked) into the ever-expanding knowledge-graph, the analyst's confidence in their inferences increases.

## Conclusion

Semantic interoperability across multiple information systems cannot be realized through AI and NLP working alone, which is to say, without the aid of some kind of integrating framework. The ISF proposed above consists of a suite of BFO-ISO compliant ontologies, which are controlled structured vocabularies designed to foster interoperability in the collection and curation of data and thereby to prevent the sorts of siloing of information which arise where there is inconsistency in the use of terms. In this article we described how Basic Formal Ontology (BFO), recently approved as international standard ISO/IEC 21838–2, serves as an integrating semantic framework for human analysis and computer reasoning through the provision of clearly defined classes in a well-formed taxonomical hierarchy. BFO principles rest on ontological realism, which is the view according to which, to be useful in discoverability, integration and analysis, ontologies should be developed on the basis of general truths about reality of the sort discovered by science. We showed how the adoption and implementation of BFO facilitates the sort of consistent modeling across multiple heterogeneous domains at different levels of granularity that is a prerequisite for the integration of intelligence data and information.

The resultant realist approach to ontology addresses an enduring core problem for the Intelligence Community, namely the establishment of a semantically integrated information environment that will support semantic interoperability between disparate information systems and computationally-assisted intelligence analysis. Consistently defined classes (types) and subclasses and their real-world counterparts can be related to each other in a computable format (OWL-RDF) so that human reasoning can be enhanced by computers and integrated across information systems – prerequisites for semantic integration across the 'Five Eyes' (FVEY) Intelligence Alliance.[31]

## Notes

1. A data silo is a collection of data held by one group that is not easily or fully accessible by other groups in the same organization ("What are Data Silos?", https://www.talend.com/resources/what-are-data-silos Accessed February 21, 2022).
2. The Oxford English Dictionary defines Artificial Intelligence as the development of computer systems able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.
3. The Common Core Ontologies (CCO) comprise eleven ontologies that aim to represent and integrate taxonomies of generic classes and relations across all domains of interest. Accompanying these ontologies is a rule-based method for representing the content of any data source whatsoever through constructing domain ontologies as extensions of CCO. See National Institute of Standards and Technology (NIST) "Document: An Overview of the Common Core Ontologies".
4. Győri, "Basic Level Categories," 149.
5. Ibid., 154.
6. Ibid., 149.
7. Smith and Ceusters, "Ontological Realism," 139–188.
8. Smith, "Beyond Concepts," 1.
9. Johnston et. al., "Transforming Defense Analysis," 13.
10. Ibid., 13.
11. Deputy Secretary of Defense, "Defense Data Strategy", Executive Summary.
12. Information Management (IM) is defined *in Joint Publication 3–0, Joint Operations* and *Joint Publication 3–33* Joint Task Force Headquarters.
13. Chairman of the Joint Chiefs of Staff, *Joint Operations*, GL-10.
14. Chief Information Officer, *DoD Net-Centric Data Strategy*, 2003.
15. Referent Tracking, the counterpart of OBP developed in the field of biomedicine, attempts to organize medical and other data around the real-world entities – such as patients, doctors, images, tumors, clinical notes, etc. This is achieved by providing unique identifiers for such entities along the lines described in Ceusters and Smith "Ontological Realism". Implications for intelligence analysis are outlined in Limbaugh et al. "Warranted diagnosis".
16. Johnston, Catherine, "Transforming Defense Analysis," 13.
17. Armstrong, "What is Digital Twin?" Derived from IBM Definition.
18. Digital twins work well for isolated items, say factories; but not where the twinned items get involved with each other. If we create say an instance digital twin for each Main Battle Tank instance, and then the tanks get involved in different virtual environments (e.g., virtual battles), each digital twin will have to be maintained separately, which will be very hard to do.
19. Cox et. al., "The Space Object Ontology".

20. Smith et. al., “Information Artifact Ontology,” 33.
21. The digital thread refers to the communication framework that allows a connected data flow and integrated view of the asset’s data throughout its lifecycle across traditionally siloed functional perspectives. See: Leiva, “Demystifying the Digital Thread and Digital Twin Concepts” https://www.industryweek.com/technology-and-iiot/systems-integration/article/22007865/demystifying-the-digital-thread-and-digital-twin-concepts Accessed February 21, 2022.
22. Boone et. al., “Interoperability and Integration,” 2.
23. The W3C Web Ontology Language (OWL) is a Semantic Web language designed to represent rich and complex knowledge about things, groups of things, and relations between things. OWL is a computational logic-based language such that knowledge expressed in OWL can be exploited by computer programs, e.g., to verify the consistency of that knowledge or to make implicit knowledge explicit. See: https://www.w3.org/OWL.
24. On best practices for the formulation of definitions in ontologies see Seppälä and Smith, “Guidelines for writing definitions in ontologies.”
25. Arp et. al., *Building Ontologies*, glossary.
26. Ibid., 38.
27. Ibid.
28. The Common Core Ontologies are described in Rudnicki, Ron, “An Overview of the Common Core Ontologies”, https://www.nist.gov/system/files/documents/2019/05/30/nist-ai-rfi-cubrc_inc_004.pdf.
29. Deputy Secretary of Defense, Data Sharing, E1.1.17.
30. Gollu and Deshpande, *Object Management Systems*, 5494.
31. The Five Eyes brings the UK, the United States, Canada, Australia and New Zealand into the world’s most complete and comprehensive intelligence alliance. See: The Five Eyes – The Intelligence Alliance of the Anglosphere (ukdefencejournal.org.uk).

## Disclosure statement

No potential conflict of interest was reported by the author(s).

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