**Updated Dec 10, 2021**

**Ontology**

Much time and effort have gone into defining “what is an ontology?”[[1]](#footnote-1) But these definitions are much too complicated … An ontology can be defined as:

A partial, simplified description of the categories of things, attributes and relationships, in a topic area, created by a community of users for an explicit purpose, and specified in some formalism

Unpacking the concepts in the definition, it is important to highlight that:

* An important goal of an ontology is to communicate the concepts and knowledge (and increase the understanding) of the topic area within the “community of users”
  + Which also enables sharing and reuse of the knowledge encoded using the ontology
* A “topic area” may be broad or specific, focused or generic
* A “community of users” may be one or more users and may be non-human agents/actors
* A “partial, simplified description” requires understanding and describing the domain as *simply* as possible, while still addressing the “explicit purpose” of the ontology’s “community”
* As part of the description, the community of users’ assumptions need to be stated
* Defining an ontology “in some formalism” does NOT mean that it uses a complex logical form, a programming or standard language (such as RDF or JSON), or specific tooling
  + What is required is a mechanism to organize the descriptions and concepts
  + This can be accomplished with explicit statements and definitions written in natural language OR using a computational form or a logical form
  + Defining an ontology using a machine-processible language is necessary IF the ontology is to be consumed by both humans and machines
* All definitions and forms must be understandable to the community of users

**Competency Questions**

An ontology’s use cases can be made explicit by a set of *competency questions* that query/test the ontology’s concepts and data. These questions suggest the “explicit purpose” of the ontology, but are typically not sufficient to describe its complete scope.

**Graphs**

A graph is a set of “nodes” (vertices) that are connected by labeled or unlabeled “edges” (relationships or associations). In this set of definitions, the nodes are entities (instances of the categories of things in our ontology) or values (such as string or integer values), and the edges are the attributes and relationships that connect them.

**Knowledge Graphs**

A knowledge graph is a collection of nodes interconnected by named edges (identifying properties and relationships). The structure of the graph is defined by an ontology, which formally specifies and defines the semantics of the possible nodes and edges. The “knowledge” that is captured comes from the specific data that is rendered using the ontology and comes from multiple sources, in multiple formats, with multiple levels of specificity.

Knowledge graphs enable analysis of the data as an integrated whole. When implemented using graph database tooling, they combine features of standard, relational databases (such as structured query), with the flexibility and extensibility of graphs. In addition, graph analysis (such as centrality, clustering and associativity analyses) can be performed on the integrated data. Backing the graph by an ontology provides formal definition and structure, which provides for increased precision and accuracy when fusing and integrating data from various sources.

Other terminology that has been applied to knowledge graphs is to reference the statements in the backing ontology as a T-Box (“terminology”) and the encoded data as an A-Box (“assertions”).

**Ontological Commitment**

Since ontologies define the concepts and vocabulary for communication within a “community of users”, the members of the community must use it. This is the essence of *ontological* *commitment* – using an ontology correctly and consistently. Note that this does not mean that the ontology needs to be taken as a whole, or used in its entirety. It means that the concepts and information that are communicated conform to the definitions of the ontology.

1. There is a 371-page book by Effingham, a 23-page paper by Gruber, a 17-page paper by Guarino, a 10-page rebuttal of Guarino’s paper by Neuhaus, a 17-page paper by Neuhaus, the developing ontologies 101 web site from the creators of Protégé, and much more! [↑](#footnote-ref-1)