# ONSET Use Cases for novice ontology developers

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ONSET, the foundational ontology selection tool, assists the domain ontology developer in selecting the most appropriate foundational ontology. The domain ontology developer provides the requirements/answers one or more questions, and ONSET computes the selection of the appropriate foundational ontology and explains why. The current version (v1.2) includes DOLCE, BFO, GFO and SUMO. To download ONSET and access supplementary information go to `http://www.meteck.org/files/onset/`. The ONSET application was developed by Zubeida Khan as part of her BSc(honours) thesis in Computer Science at the University of KwaZulu-Natal, supervised by Maria Keet. It was further refined afterward to include other foundational ontologies and more data.

## 1 Use Cases

The total time allocated to this section is 2 hours or less.

1. You are to develop an ontology of heart diseases. The ontology must capture the intrinsic nature of the real world only. As such, entities that are not extended in space and time must not be found in the ontology. Possible future conditions that are predicted and previous conditions of the heart must be modelled in the ontology. Since it is a biological ontology, you wish to register it with the OBO foundry to allow reuse and integration with other ontologies. This ontology must be modelled OWL 2 EL.

   (a) Which foundational ontology would you use to develop this ontology?

   (b) What are the possible reasons as to why you chose that particular foundational ontology? List and explain every possible reason for your choice.

2. Your company has acquired several candy manufacturing factories, and their databases have to be integrated. You wish to develop an ontology for this. The ontological assumptions that are made by the ontology must be based on human common-sense. You will need to include all the machinery, products and staff involved in the factory. It will be helpful to model the properties of the machinery found e.g., mass and dimensions. Production and other factory processes are to be modelled. The start and end times as well as production times of these operations must be captured. Take note that throughout the production process, the candy found in the factory will not always be of the same form. In order to predict and represent future trends in manufacturing, it must be possible to capture possibilia in the ontology. There will be some entities in the factory such as computer programs which may not be extended in space and time. In order to represent such an ontology, you are required to represent it in OWL DL.

   (a) Which foundational ontology would you use to develop this ontology?

   (b) What are the possible reasons as to why you chose that particular foundational ontology? List and explain every possible reason for your choice.

3. You are required to create an ontology of economic systems, and also incorporate the economic system of South Africa in the ontology for a consulting project, although you do not know much about economics in general. Due to time constraints, you are not able to perform extensive research on the economy. You would like to reuse economic components of existing foundational

ontologies, if possible. You will have to model some things that may not be extended in space-time e.g., the JSE. For this to be possible, the ontological assumptions that are made by the ontology must be based on human common-sense. It is important to note that many entities in this ontology will be quantified over time. Future events affecting the economy must be included as well. You may use any ontology language you think fits the ontology for representation.

   (a) Which foundational ontology would you use to develop this ontology?

   (b) What are the possible reasons as to why you chose that particular foundational ontology? List and explain every possible reason for your choice.

4. An assignment given to you by your lecturer is to create an ontology of banks. In such an ontology there will be concrete entities e.g., Bank manager and ATM, and abstract entities e.g., Loans. For this to be possible, the ontological assumptions that are made by the ontology must be based on human common-sense. Processes, such as withdrawals and deposits must also be modelled. It must be possible to capture dates and times for operations that occur between entities and processes. Past and present transactions must be allowed in the ontology. Entities of the ontology may have properties and values associated with them e.g., an individual has a credit rating. You are required to provide your lecturer with the axioms found in your ontology therefore it will be useful refer to or possibly use components of an ontology that implements a particular mereology theory such as classical extensional mereology (CEM) or any other. This ontology must be represented in OWL 2 DL.

   (a) Which foundational ontology would you use to develop this ontology?

   (b) What are the possible reasons as to why you chose that particular foundational ontology? List and explain every possible reason for your choice.

5. You have been assigned a project which requires you to represent the Unified Modelling Language (UML) in an ontology. Naturally, you will be required to represent abstract entities in the ontology. For this to be possible, the ontological assumptions that are made by the ontology must be based on human common-sense. Higher categories such as 'metaclass' which are found in UML must be represented in the ontology as well.

   (a) Which foundational ontology would you use to develop this ontology?

   (b) What are the possible reasons as to why you chose that particular foundational ontology? List and explain every possible reason for your choice.

## 2 Optimal Answers

The optimal answers for each use case as computed by ONSET are provided here.

1. (a) BFO
   (b) The following criteria corresponds to BFO:
      i. BFO is a realist ontology.
      ii. Concrete entities may be represented in BFO.
      iii. BFO may be represented in OWL 2 EL.
      iv. BFO ontologies may be registered with OBO.
      v. BFO has been applied in biomedical ontologies.
      vi. BFO is an actualist ontology.
      vii. BFO is an eternalist ontology.

2. (a) DOLCE
   (b) The following criteria corresponds to DOLCE:
      i. DOLCE is a descriptive ontology.

ii. Concrete and abstract entities may be represented in DOLCE.
iii. DOLCE is a possibilist ontology.
iv. Quality and qualia may be represented in DOLCE.
v. DOLCE is based on Endurantism and Perdurantism.
vi. Temporal Aspects may be modelled in DOLCE.
vii. DOLCE is sensitive to different levels of granularity.
viii. DOLCE may be represented in OWL DL.
ix. DOLCE has been used in Manufacturing ontologies.
x. DOLCE has been used in database integration.
xi. DOLCE has been used in ontology driven information systems.

3. (a) DOLCE or SUMO
   (b) The following corresponds to both DOLCE and SUMO:
      i. DOLCE and SUMO are both descriptive ontologies.
      ii. Concrete and abstract entities may be represented in both DOLCE and SUMO.
      iii. Temporal aspects may be represented in both DOLCE and SUMO.
      iv. Both DOLCE and SUMO have modularity (in-built domain ontologies) to support reusing components of the ontology.

4. (a) DOLCE
   (b) The following corresponds to DOLCE:
      i. DOLCE is a descriptive ontology.
      ii. DOLCE is based on Endurantism and Perdurantism.
      iii. Concrete and abstract entities may be represented in DOLCE.
      iv. DOLCE is an eternalist ontology.
      v. Quality and qualia may be represented in DOLCE.
      vi. DOLCE includes GEM mereology theory.
      vii. Temporal aspects may be modelled in DOLCE.
      viii. DOLCE may be represented in OWL 2 DL.

5. (a) GFO
   (b) The following corresponds to GFO:
      i. Abstract entities may be represented in GFO.
      ii. GFO has a three-layered architecture which allows for the representation of higher categories.
      iii. GFO has been applied in ontological foundation of conceptual modelling.