

TOWARDS AN INTERACTIVE APPROACH FOR ONTOLOGY RECOMMENDATION AND REUSE



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OUTLINE

- Introduction
- Ontology Reuse Process
- Proposed Interactive Ontology Recommendation and Reuse Approach
- Example
- Conclusion

INTRODUCTION

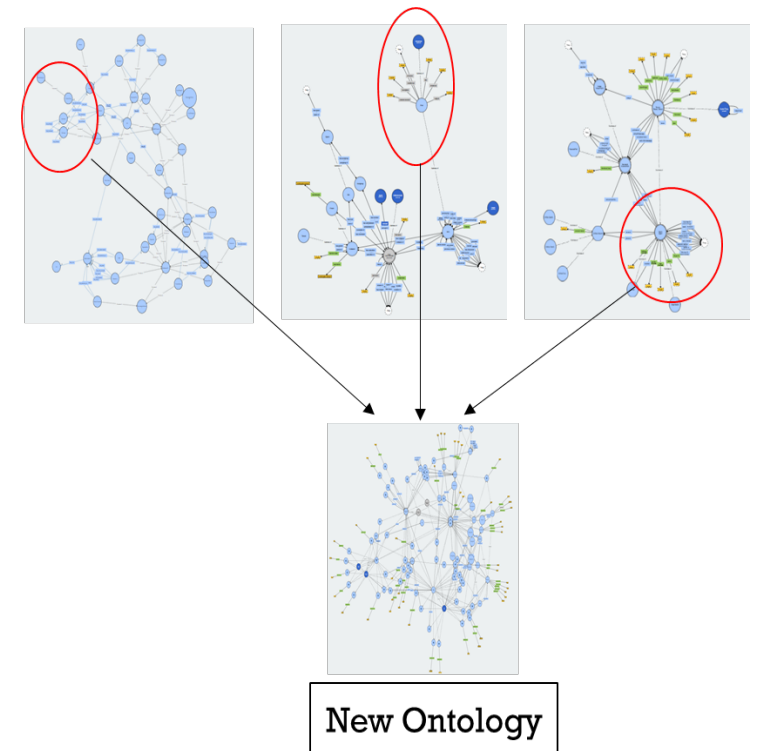
- Ontology is a formal representation of knowledge.
- Ontology explicitly defines the semantics of an application domain.
- It consists of a set of concepts, properties that relate concepts to each other, and a set of individuals.
- Ontologies help to share common understanding of domain knowledge.

INTRODUCTION

- Ontologies are widely used in a variety of domains.
- To develop an ontology for a new application domain, ontology engineers either:
 - build a new ontology from scratch
 - or, reuse existing ontologies
- Building an ontology from scratch particularly in conceptually diverse domains, such as biodiversity:
 - expensive and time-consuming process
 - needs concrete efforts
 - not straight forward process, but an iterative one
- It is a better choice to reuse existing ontologies or parts of them.

ONTOLOGY REUSE PROCESS

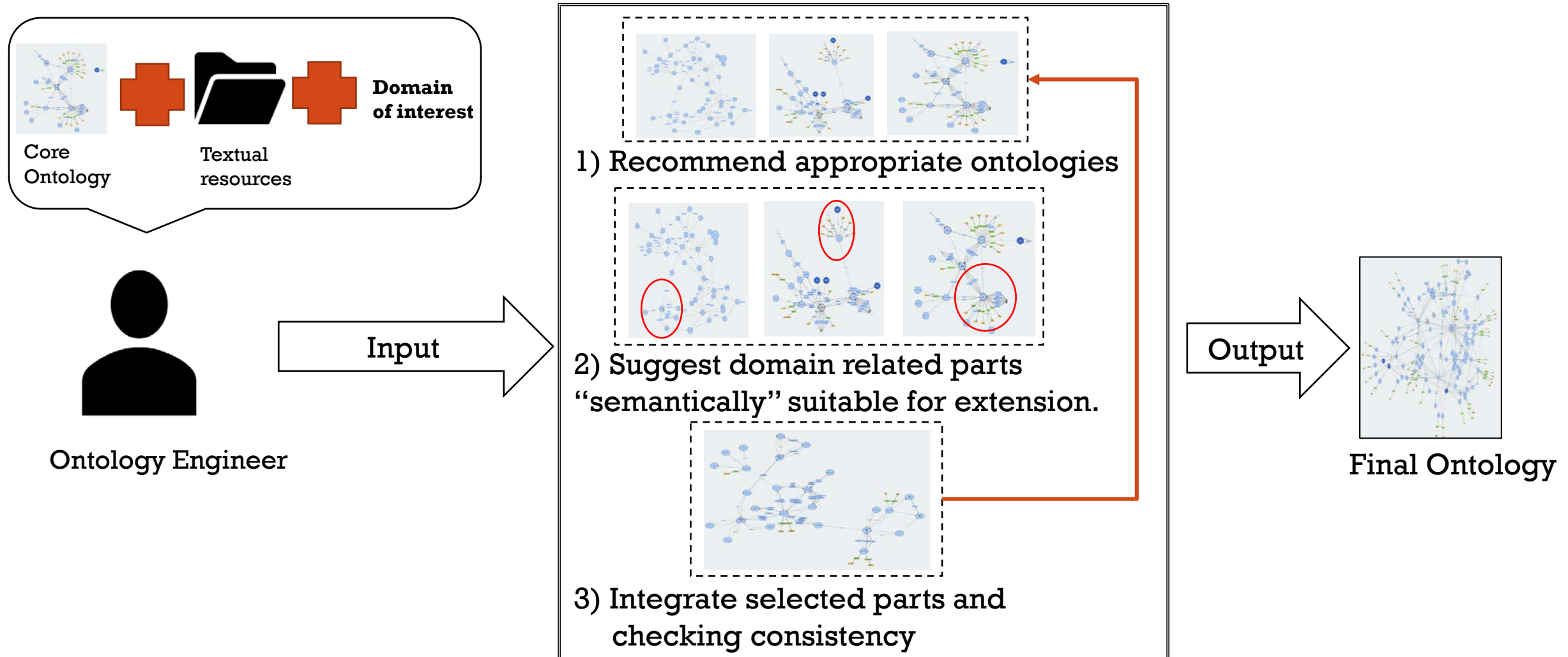
- The process where existing ontologies or parts of them, are determined and reused for building new integrated ontologies.
- Manual ontology reuse is a complex process.
- Existing ontology reuse tools
 - E.g. Bioportal recommender to select relevant ontologies,
 - Protégé to integrate and merge different ontologies, etc.



LIMITATIONS OF EXISTING SEMI-AUTOMATIC ONTOLOGY REUSE TOOLS

- Existing ontology reuse tools do not fit well:
 - Typically make one-shot recommendations
 - Ontology recommendations in based on textual input only
 - Ontology Recommendation tools are not interactive
 - No possibility to provide feedback on the recommended ontologies
 - No possibility to reuse parts of existing ontologies to incrementally develop new ontology

PROPOSED INTERACTIVE ONTOLOGY RECOMMENDATION AND REUSE APPROACH



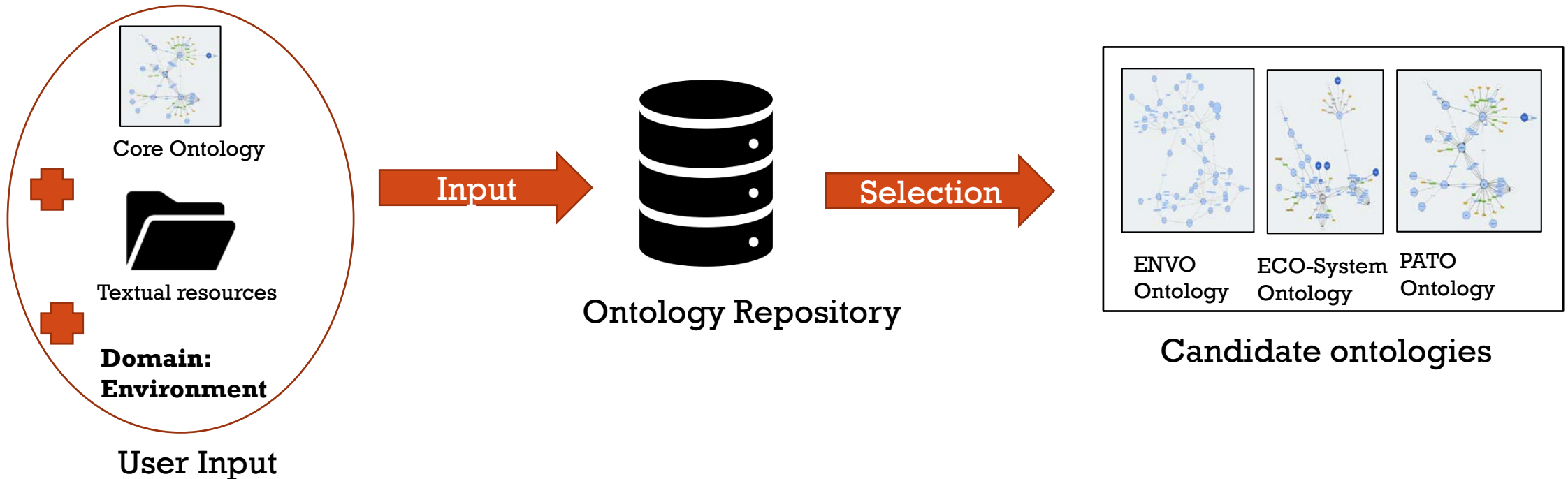
EXAMPLE

Ontology engineer may want to start with core ontology containing classes **Units** and **Characteristics**, and he wants to expand it from existing environmental ontologies.

NEW ONTOLOGY REUSE APPROACH

1. Recommendation

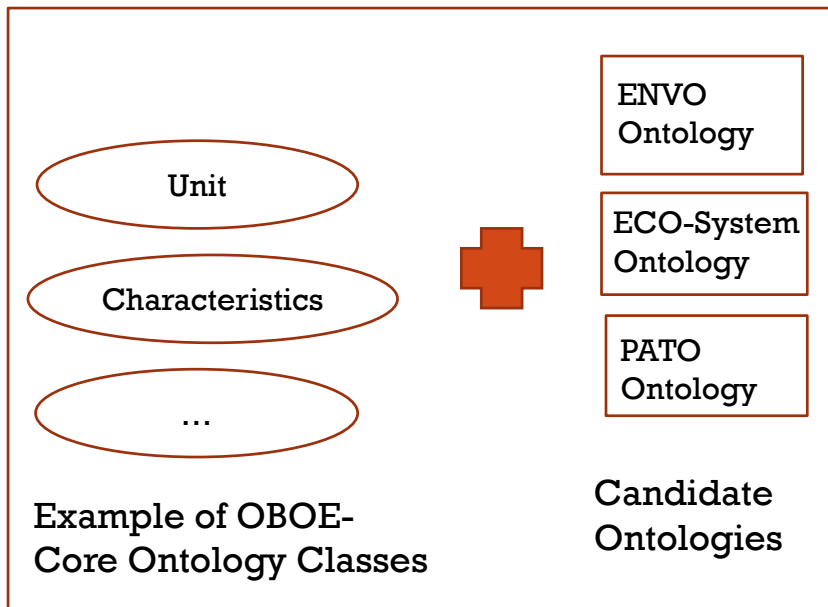
- Select candidate ontologies, using the following criteria:
 - Domain related (Environment)
 - Input coverage (textual input and Core ontology classes)



NEW ONTOLOGY REUSE APPROACH

2. Matching

- For each class in the input ontology, find the set of matched classes in the candidate ontologies and their similarity scores



Class/ Ontology	Class/ Ontology	Similar -ity Score
Unit/Core ontology	Unit/Eco-System	98.97%
Characteristics /Core ontology	Characteristics/ Eco-system	98.97%
Entity/Core ontology	Entity/ENVO	98.4%
...

Matcher Output

NEW ONTOLOGY REUSE APPROACH

3. For each Matched pair of classes: recommend additional semantics given in the candidate ontology to be added in the input/core ontology (e.g. equivalent/disjoint classes, object/data properties, or super/sub-classes).

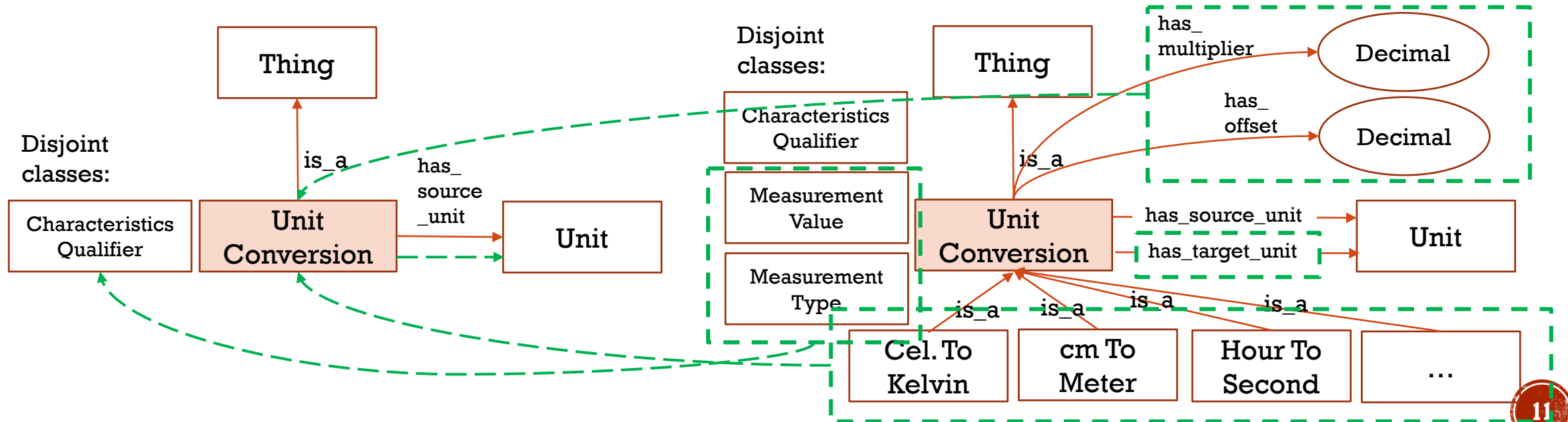
Example:

Unit conversion/core ontology

&

Unit conversion/Eco-system

98.97%

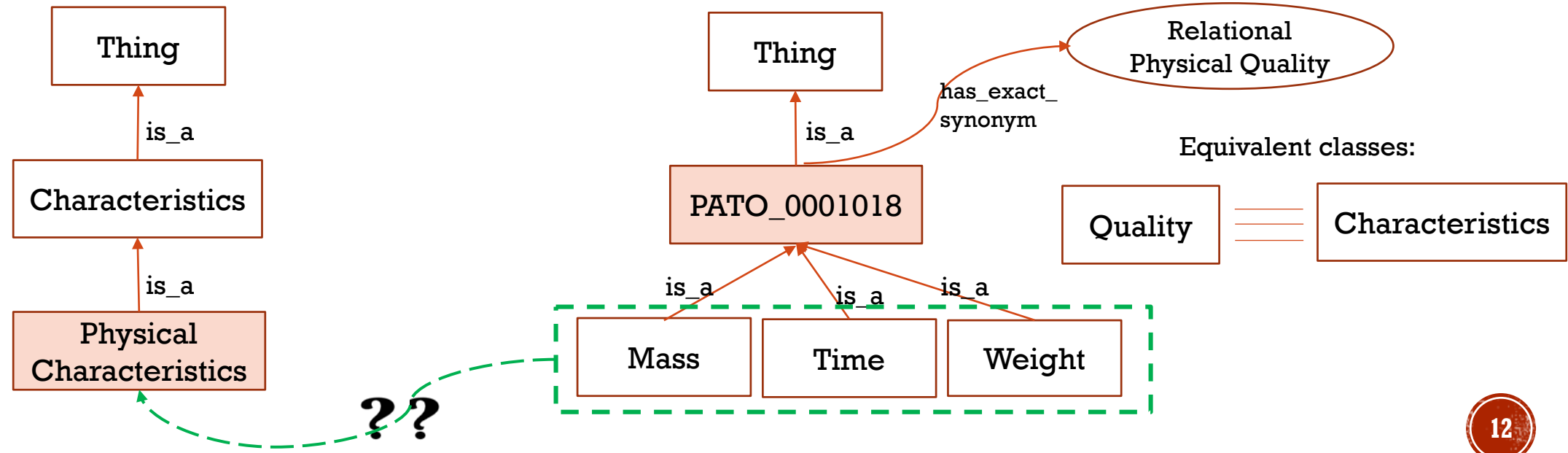


NEW ONTOLOGY REUSE APPROACH

3. For each Matched pair of classes: recommend additional semantics given in the candidate ontology to be added in the input/core ontology (e.g. equivalent/disjoint classes, object/data properties, or super/sub-classes).

Example:

Physical Characteristics/core ontology & PATO_0001018/Eco-system 80.69%



NEW ONTOLOGY REUSE APPROACH

4. Suggest a list of extending elements for each class to the user (After checking consistency)

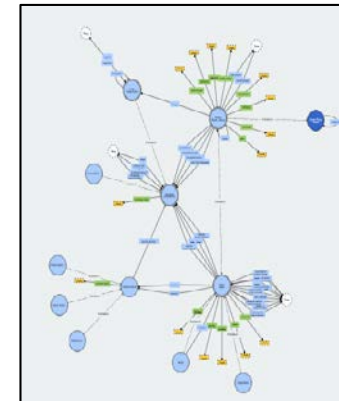
- “Centimeter to Meter” Sub-class** of “Unit conversion” class
- “Standard” Super-class** of “Unit” class
- “has_target_unit” object_property.**
Domain: “Unit conversion” class,
Range: “Unit” class
- “has_offset” data_property.**
Domain: “Unit conversion” class,
Range: decimal
-

List of recommended elements

NEW ONTOLOGY REUSE APPROACH

5. Extend the Input Ontology with selected elements after checking consistency.

- “Prefixed Unit” Sub-class of “Unit” class
- “Standard” Super-class of “Unit” class
- “has_target_unit” object_property.
Domain: “Unit conversion” class,
Range: “Unit” class
- “has_offset” data_property.
Domain: “Unit conversion” class,
Range: decimal
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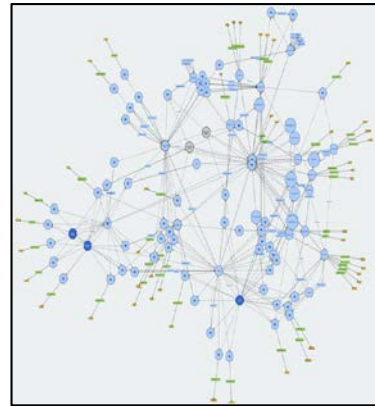


Extended version of the core Ontology

User selects some of the recommended elements

NEW ONTOLOGY REUSE APPROACH

6. Iteratively refine the ontology to reach the desired result.



New Environment ontology

CONCLUSION

- Ontology development is an incremental and iterative process.
- It is a better choice to reuse existing ontologies.
- Existing ontology reuse tools are not supporting the process well.
- Introduction to a new tool that supports interactive ontology reuse and incremental ontology development.

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THANK YOU 😊

Any Questions??



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