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Ontology-based Metadata of Thai Culture: Heet Sib Song (Twelve Months Festival)

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Outline

- **Background**
- **Problem statements**
- **Research methodology**
- **Preliminary result**
- **Conclusion and future work**

Background

- **Local Wisdom in Thailand**
- **Variety data sources**
- **Different academies**
- **Semantic search**

Problem statements

- **Information access system**
- **The metadata criteria in a research setting for Thai culture**
- **Mistakes cause contradictions and incompleteness**

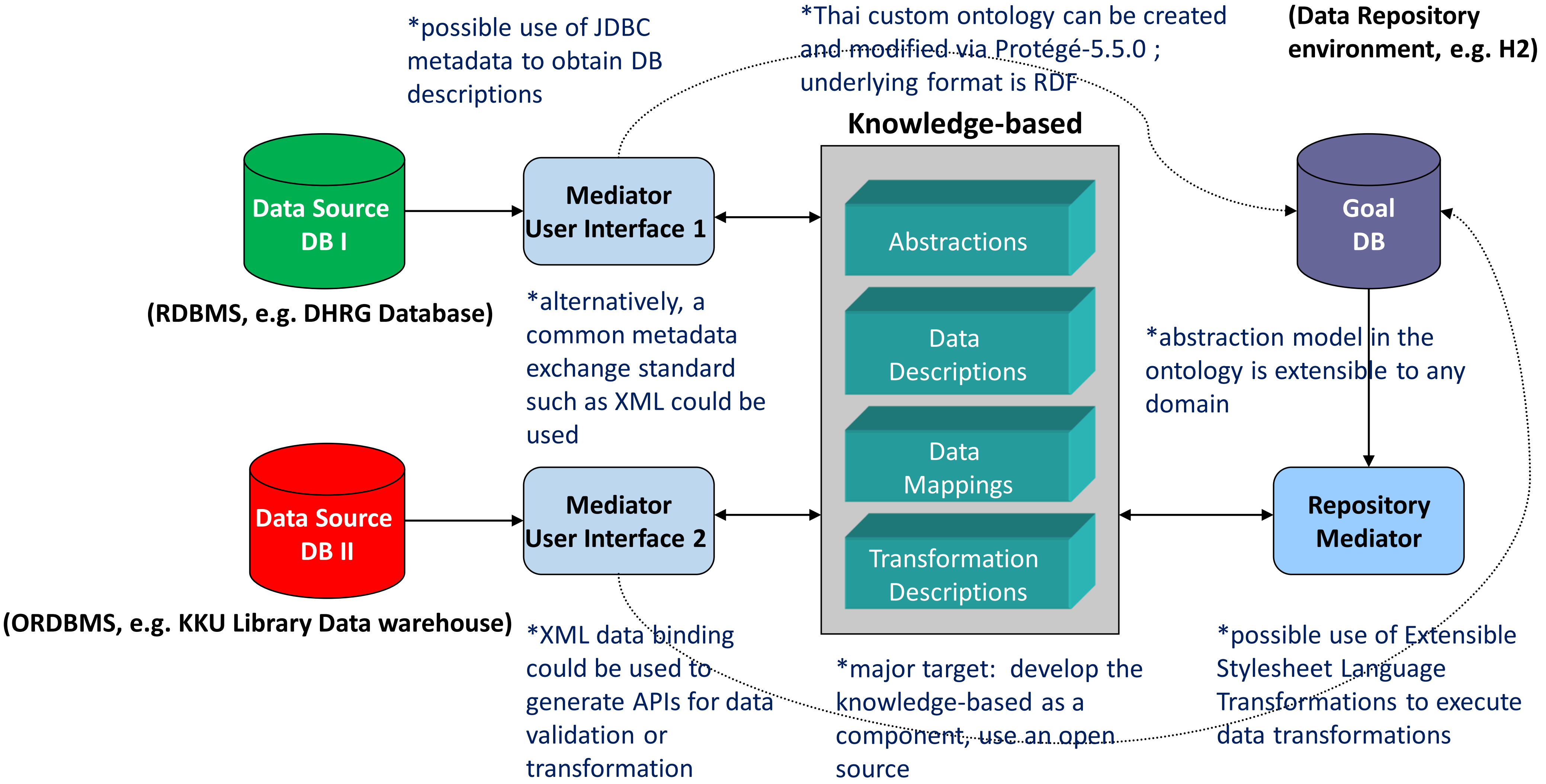
Integrating Various Data Sources

- **The main challenge in integrating data from various sources is in resolving schema and data conflicts**
- **Approaches to this problem include using a federated database architecture, or providing a multi-database interface. These approaches are geared more towards providing query access to the data sources than towards supporting analysis**
- **Types of data integration:**
  - **Physical integration – convert records from various data sources into a common format (e.g. 'XML')**
  - **Logical integration – relate all data to a common process model**
  - **Semantic integration – allow cross-reference and possibly inferencing of data with regards to a common metadata standard or ontology**

Research methodology

- In this study, we attempted to develop an extensible and adaptable architecture to perform the integration of various data sources into a data repository environment using an ontology-based data mediator approach
- The components of this architecture include:
  - Knowledge-based – stores the ontology; consists of:
    - The abstraction model – domain level concepts
    - The database description model – metadata record of data sources
    - The mappings model – how data elements relate to attributes in the abstraction model
    - The transformations model – metadata of available methods to transform data elements from one data source to another
  - Data mediators – provides each data source an interface to the repository and resolving data conflicts between any different representations; necessary classes generated from the Thai custom ontology
  - Data repository – provides access to integrated data for analysis and decision-making

A Thai Culture Prototype Architecture



*possible use of JDBC metadata to obtain DB descriptions

*Thai custom ontology can be created and modified via Protégé-5.5.0 ; underlying format is RDF

(Data Repository environment, e.g. H2)

Knowledge-based

Data Source DB I

(RDBMS, e.g. DHRG Database)

Mediator User Interface 1

Abstractions

Data Descriptions

Data Mappings

Transformation Descriptions

Goal DB

*alternatively, a common metadata exchange standard such as XML could be used

*abstraction model in the ontology is extensible to any domain

Data Source DB II

(ORDBMS, e.g. KKU Library Data warehouse)

Mediator User Interface 2

Repository Mediator

*XML data binding could be used to generate APIs for data validation or transformation

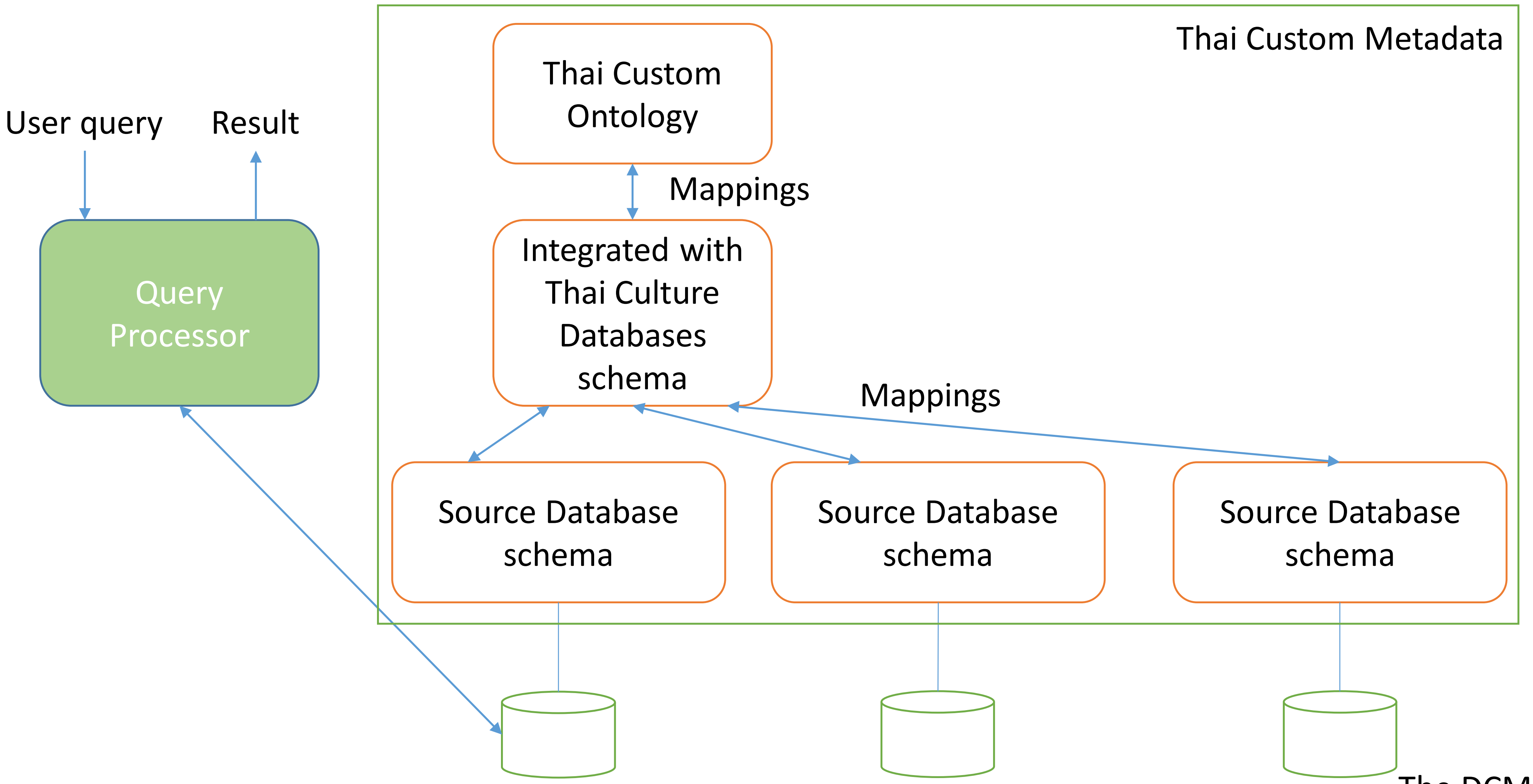
*major target: develop the knowledge-based as a component; use an open source

*possible use of Extensible Stylesheet Language Transformations to execute data transformations

Challenges of various data integration

- Increasingly large volumes of data are being made available
- Data sources are often developed by different people with differing requirements for differing purposes
- Data sources may therefore be various in terms of their:
    - Data model
    - Query interfaces
    - Query processing capabilities
    - Database schema or data exchange format
    - Data types used
    - Terminology adopted
- Integrating data sources to meet the needs of new users or new applications requires reconciliation of such heterogeneities

Thai Custom Ontology-based access to an Integrated Virtual Database Resources



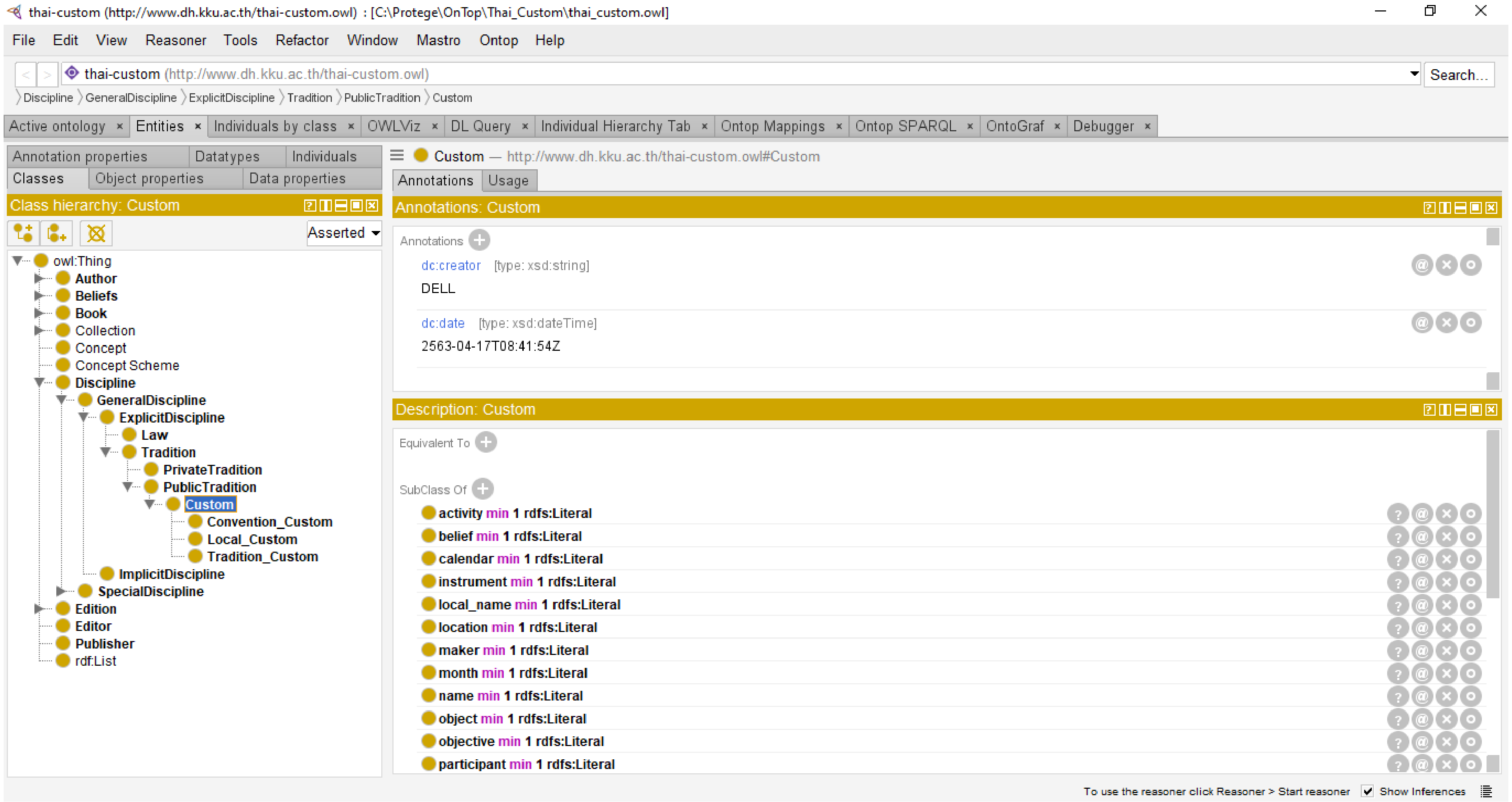
Preliminary result

- **Thai Custom Metadata**
- **Thai Custom Ontology**
  - **Classes and subclasses of Thai Custom Ontology**
  - **Object properties of Thai Custom Ontology**
  - **Data properties of Thai Custom Ontology**
  - **Instances (Individuals) of Thai Custom Ontology**

Thai Custom Metadata

No.	Elements	Description
1	Tradition name	The name used for the tradition
2	Local tradition name	Other names used to refer to that custom
3	Organized month	International calendar month names for tradition organizing
4	Time according to the lunar calendar	The time period specified according to the format in the Thai lunar calendar
5	Objective	What the organizers want to appear according to expectations in organizing traditions
6	Activity	The model of the method of performing expression the skits
7	Ritual	Model of practice patterns with objects things, words, and chants or text used in the performing
8	Literature	Stories, fairy tale, fables, jataka, allegory, books, prose works, poetry or writing
9	Belief	A strong faith in supernatural powers that control human destiny, comments that are consistent with what is involved in any subject
10	Place	An area or area used for holding a tradition
11	Ceremony	A person who performs the primary duty of a leader in the ceremony
12	Participant	People who take part in the ceremony
13	Equipment	Objects or things used to organize a tradition
14	Buildings	Something built for the tradition or that occurred after the tradition was held

Classes and subclasses of Thai Custom Ontology



thai-custom (http://www.dh.kku.ac.th/thai-custom.owl) : [C:\Protege\OnTop\Thai_Custom\thai_custom.owl]

thai-custom (http://www.dh.kku.ac.th/thai-custom.owl)

Discipline 〉 GeneralDiscipline 〉 ExplicitDiscipline 〉 Tradition 〉 PublicTradition 〉 Custom

Custom — http://www.dh.kku.ac.th/thai-custom.owl#Custom

Class hierarchy: Custom

```
owl:Thing
  Author
  Beliefs
  Book
  Collection
  Concept
  Concept Scheme
  Discipline
    GeneralDiscipline
      ExplicitDiscipline
        Law
        Tradition
          PrivateTradition
          PublicTradition
            Custom
              Convention_Custom
              Local_Custom
              Tradition_Custom
      ImplicitDiscipline
    SpecialDiscipline
  Edition
  Editor
  Publisher
  rdf:List
```

Annotations: Custom

Annotations

dc:creator [type: xsd:string]
DELL

dc:date [type: xsd:dateTime]
2563-04-17T08:41:54Z

Description: Custom

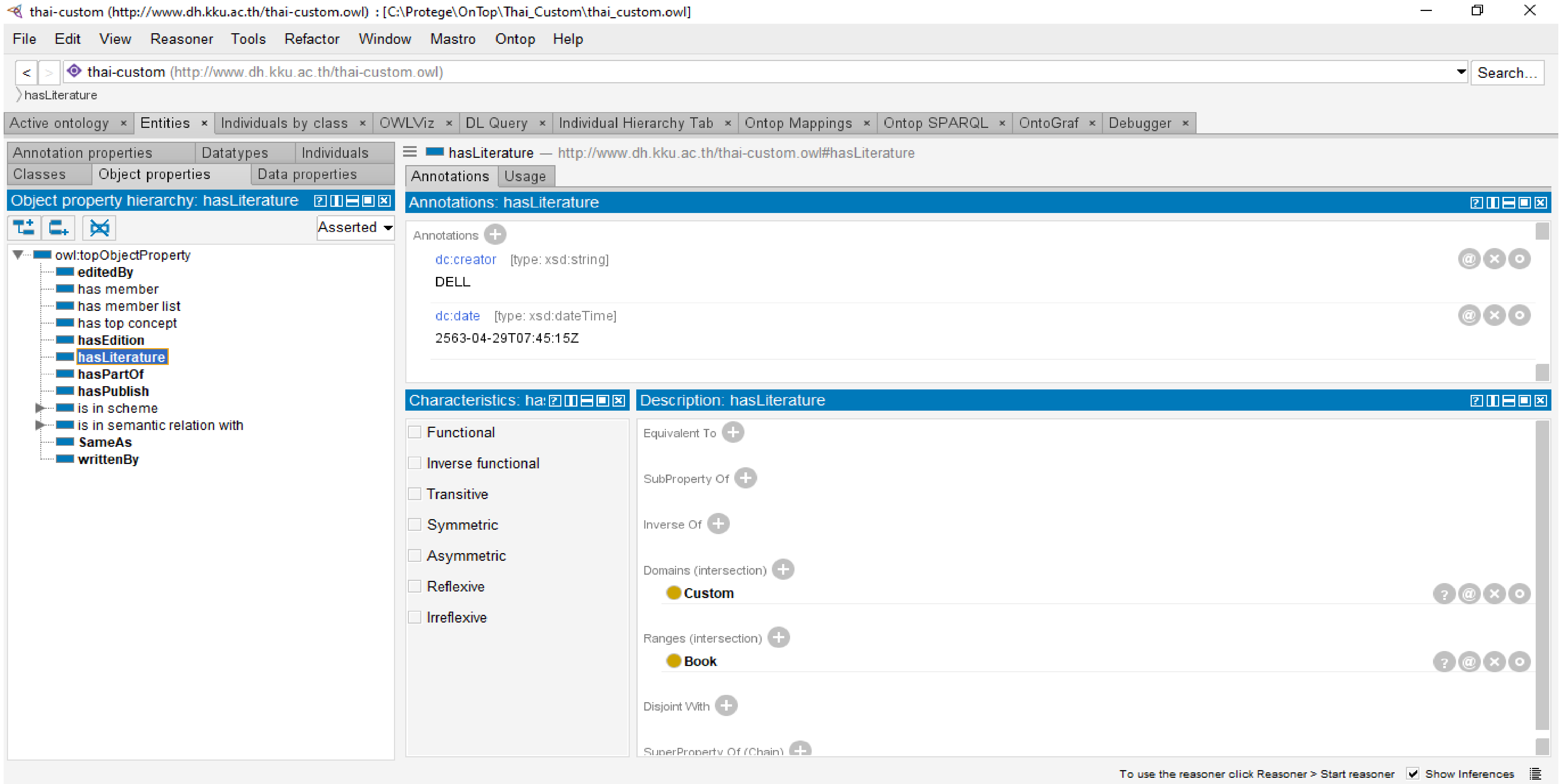
Equivalent To

SubClass Of

- activity min 1 rdfs:Literal
- belief min 1 rdfs:Literal
- calendar min 1 rdfs:Literal
- instrument min 1 rdfs:Literal
- local_name min 1 rdfs:Literal
- location min 1 rdfs:Literal
- maker min 1 rdfs:Literal
- month min 1 rdfs:Literal
- name min 1 rdfs:Literal
- object min 1 rdfs:Literal
- objective min 1 rdfs:Literal
- participant min 1 rdfs:Literal

To use the reasoner click Reasoner > Start reasoner ☑ Show Inferences

Object properties of Thai Custom Ontology



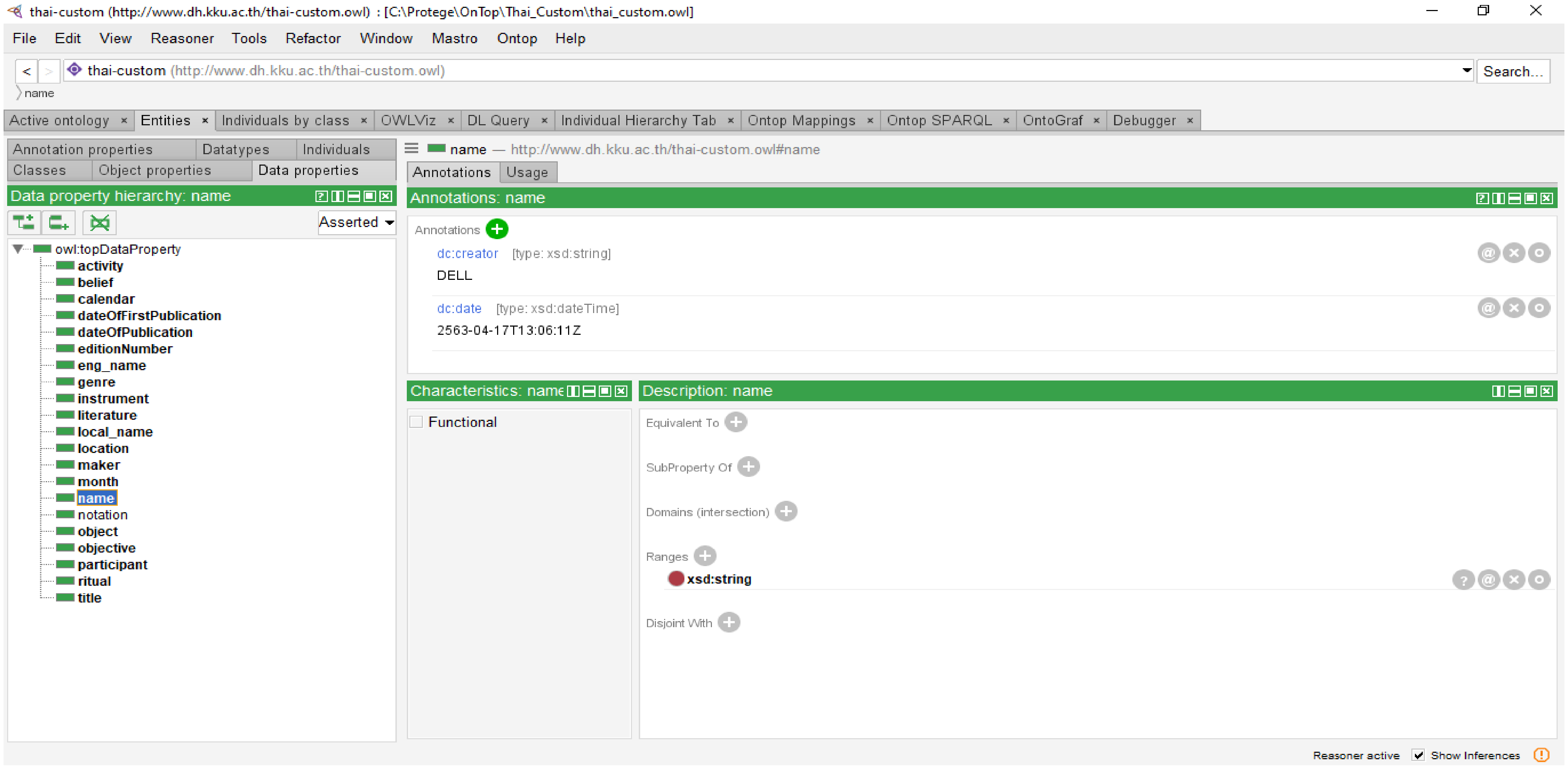
thai-custom (http://www.dh.kku.ac.th/thai-custom.owl) : [C:\Protege\OnTop\Thai_Custom\thai_custom.owl]
File Edit View Reasoner Tools Refactor Window Mastro Ontop Help
thai-custom (http://www.dh.kku.ac.th/thai-custom.owl)
Search...
hasLiterature
Active ontology × Entities × Individuals by class × OWLViz × DL Query × Individual Hierarchy Tab × Ontop Mappings × Ontop SPARQL × OntoGraf × Debugger ×
Annotation properties Datatypes Individuals
Classes Object properties Data properties
Object property hierarchy: hasLiterature
Asserted
owl:topObjectProperty
editedBy
has member
has member list
has top concept
hasEdition
hasLiterature
hasPartOf
hasPublish
is in scheme
is in semantic relation with
SameAs
writtenBy
hasLiterature — http://www.dh.kku.ac.th/thai-custom.owl#hasLiterature
Annotations Usage
Annotations: hasLiterature
Annotations

dc:creator [type: xsd:string]
DELL

dc:date [type: xsd:dateTime]
2563-04-29T07:45:15Z

Characteristics: ha:
□ Functional
□ Inverse functional
□ Transitive
□ Symmetric
□ Asymmetric
□ Reflexive
□ Irreflexive
Description: hasLiterature
Equivalent To
SubProperty Of
Inverse Of
Domains (intersection)
Custom
Ranges (intersection)
Book
Disjoint With
SuperProperty Of (Chain)
To use the reasoner click Reasoner > Start reasoner
☑ Show Inferences

Data properties of Thai Custom Ontology



thai-custom (http://www.dh.kku.ac.th/thai-custom.owl) : [C:\Protege\OnTop\Thai_Custom\thai_custom.owl]

thai-custom (http://www.dh.kku.ac.th/thai-custom.owl)

name

Data property hierarchy: name

- owl:topDataProperty
  - activity
  - belief
  - calendar
  - dateOfFirstPublication
  - dateOfPublication
  - editionNumber
  - eng_name
  - genre
  - instrument
  - literature
  - local_name
  - location
  - maker
  - month
  - name
  - notation
  - object
  - objective
  - participant
  - ritual
  - title

name — http://www.dh.kku.ac.th/thai-custom.owl#name

Annotations: name

Annotations

dc:creator [type: xsd:string]
DELL

dc:date [type: xsd:dateTime]
2563-04-17T13:06:11Z

Characteristics: name

□ Functional

Description: name

Equivalent To

SubProperty Of

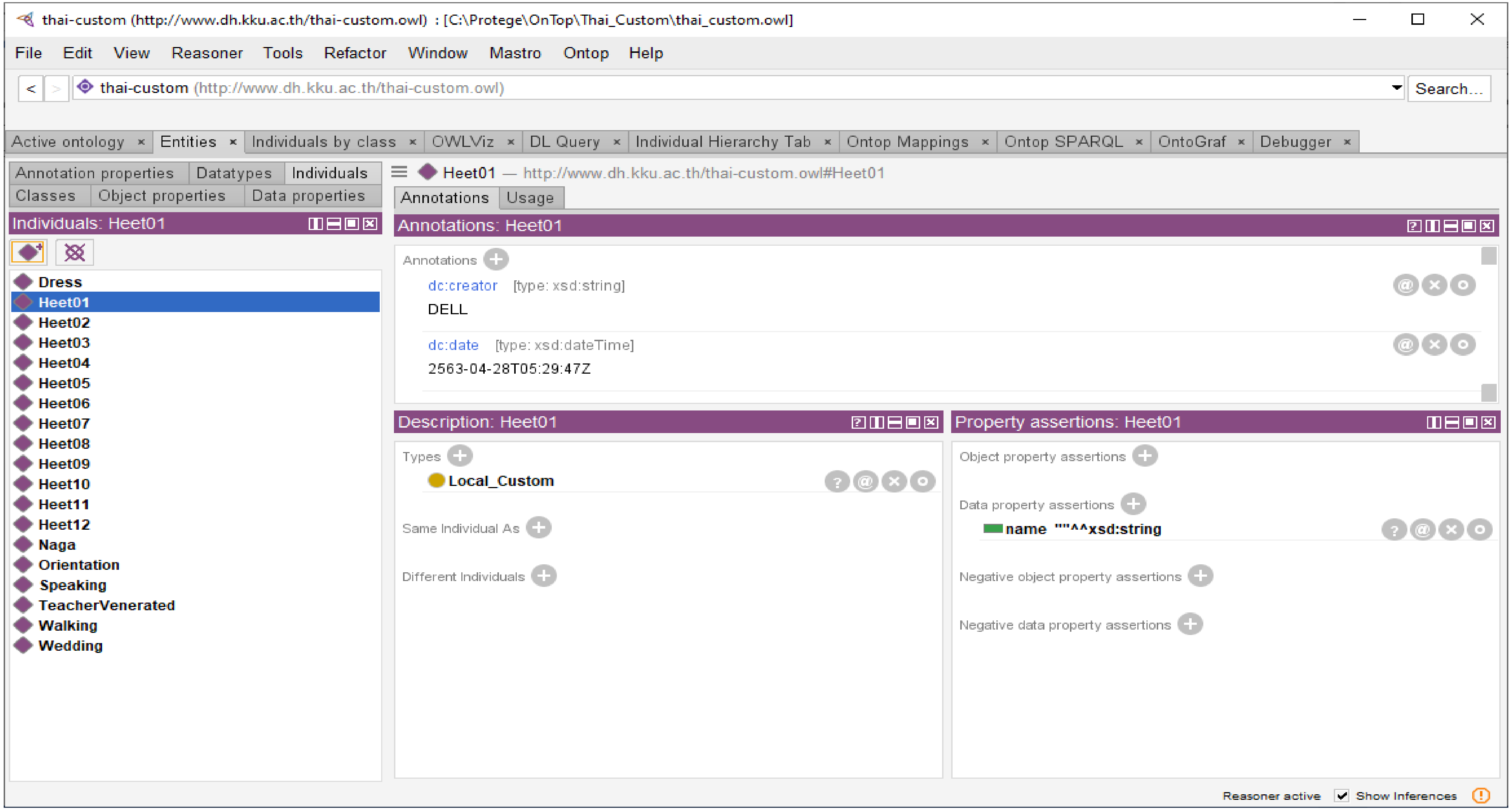
Domains (intersection)

Ranges
xsd:string

Disjoint With

Reasoner active ☑ Show Inferences

Instances (Individuals) of Thai Custom Ontology



Individuals: Heet01

- Dress
- Heet01
- Heet02
- Heet03
- Heet04
- Heet05
- Heet06
- Heet07
- Heet08
- Heet09
- Heet10
- Heet11
- Heet12
- Naga
- Orientation
- Speaking
- TeacherVenerated
- Walking
- Wedding

Heet01 — http://www.dh.kku.ac.th/thai-custom.owl#Heet01

Annotations: Heet01

Annotations

dc:creator [type: xsd:string]
DELL

dc:date [type: xsd:dateTime]
2563-04-28T05:29:47Z

Description: Heet01

Types
Local_Custom

Same Individual As

Different Individuals

Property assertions: Heet01

Object property assertions

Data property assertions
name ""^^xsd:string

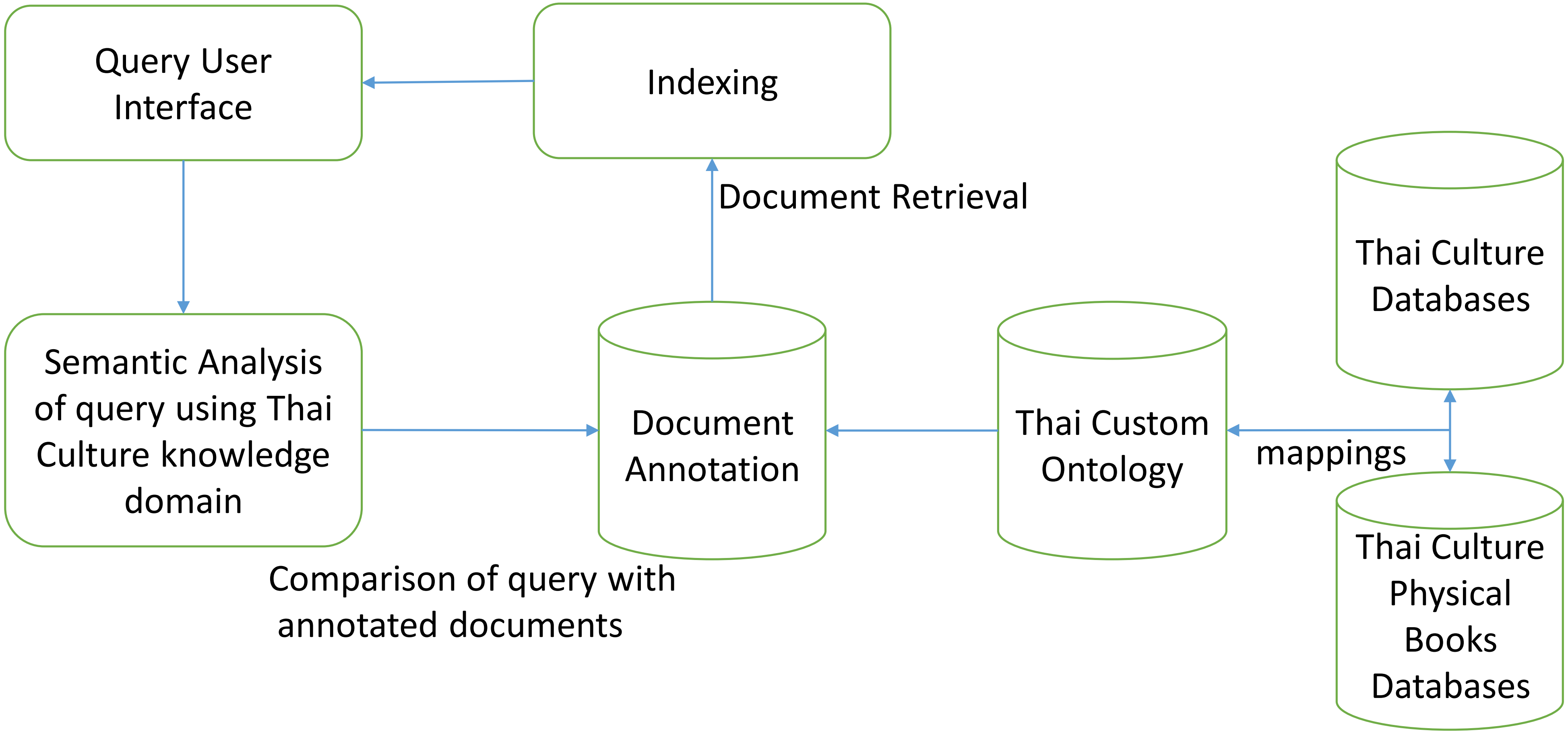
Negative object property assertions

Negative data property assertions

Conclusion: Metadata model for databases integration

- The metadata model here contains the information needed for the data integration process
- The database description model contains language independent class definitions that closely mirror the physical layout of a source database. In our prototype model, the database description is simply a class containing a set of database entries. A model is provided for two distinct entry-types: ***field-entries*** (from flat-file data sources) and ***column-entries*** (from relational data sources). Entries are essentially instances of the ***attribute*** class
- Modeling the database metadata as an ontology provides flexibility when trying to describe heterogeneous data sources. For instance, the model can be easily extended to describe Native XML databases
- How the models are used in data integration:
  - The source ***database*** attributes are mapped to the appropriate ***abstraction*** characteristic through ***mappings***. When an abstraction defines multiple representations for the same characteristic attribute, ***transformation*** functions are defined to convert between them

Future work: Thai Culture Information Retrieval on the Semantic Web


Query User Interface
Indexing
Document Retrieval
Thai Culture Databases
Semantic Analysis of query using Thai Culture knowledge domain
Document Annotation
Thai Custom Ontology
mappings
Thai Culture Physical Books Databases
Comparison of query with annotated documents

Thank you for your attention

Question & Answer