

# HarmonISA

## Harmonisation of ontology based descriptions of landcover types

Peter Mandl und Mark M. Hall

Institute of Geography and Regional Studies

University Klagenfurt

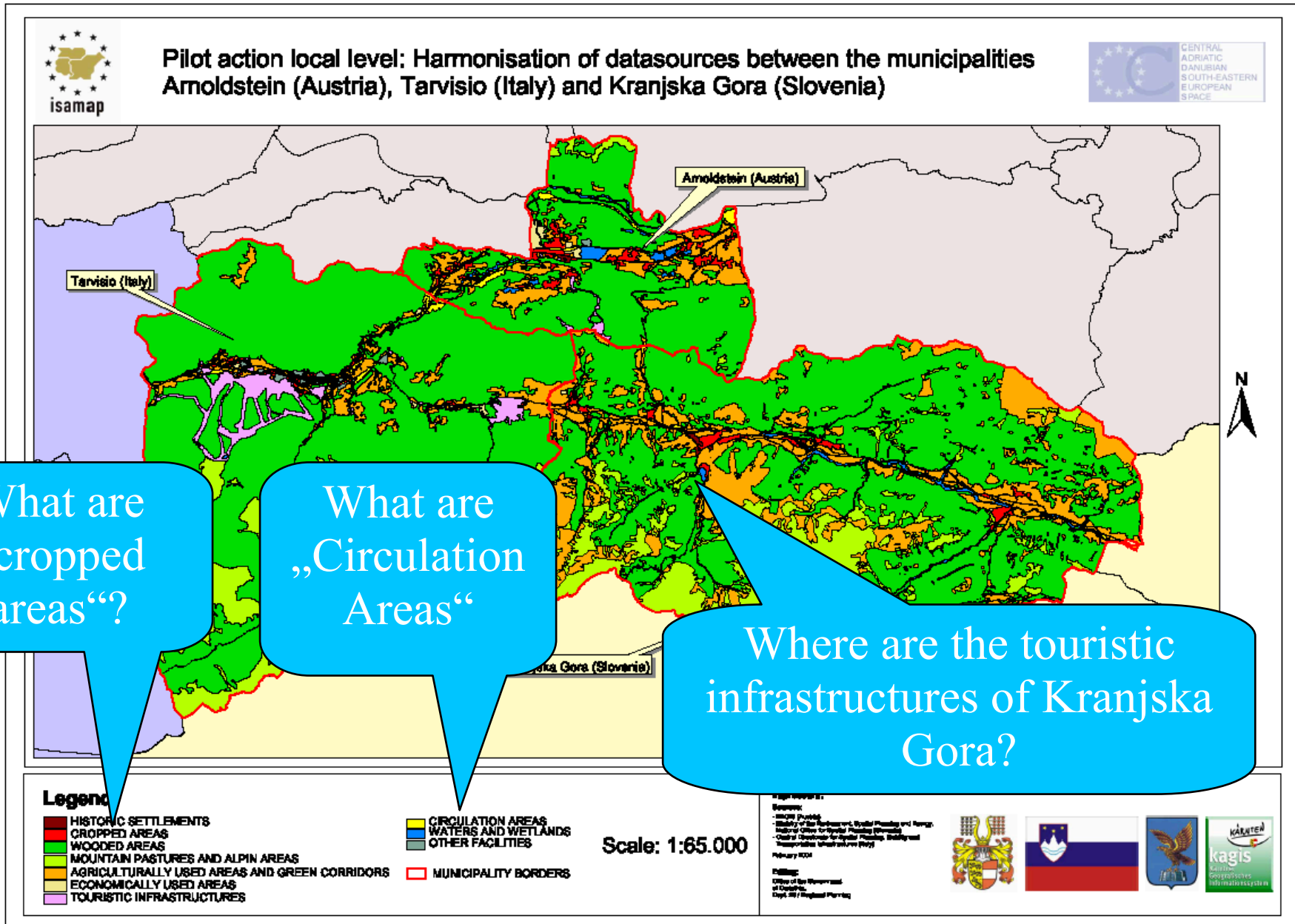
[peter.mandl@uni-klu.ac.at](mailto:peter.mandl@uni-klu.ac.at) / [mhall@edu.uni-klu.ac.at](mailto:mhall@edu.uni-klu.ac.at)

MUSIL Brown Bag Presentations, IfGI Münster, 14.1.2005

# Overview

- **Introduction to the HarmonISA Project**
  - Motivation
  - Conceptual Framework for Semantic Studies
  - Project Title and expected Results
  - Quality Criteria of the Project
  - Data to be Harmonized in the Project
  - Project Concept
  - Project Workflow
- **Ontologies**
- **Application**
- **Conclusions**

# Motivation



What are „cropped areas“?

What are „Circulation Areas“

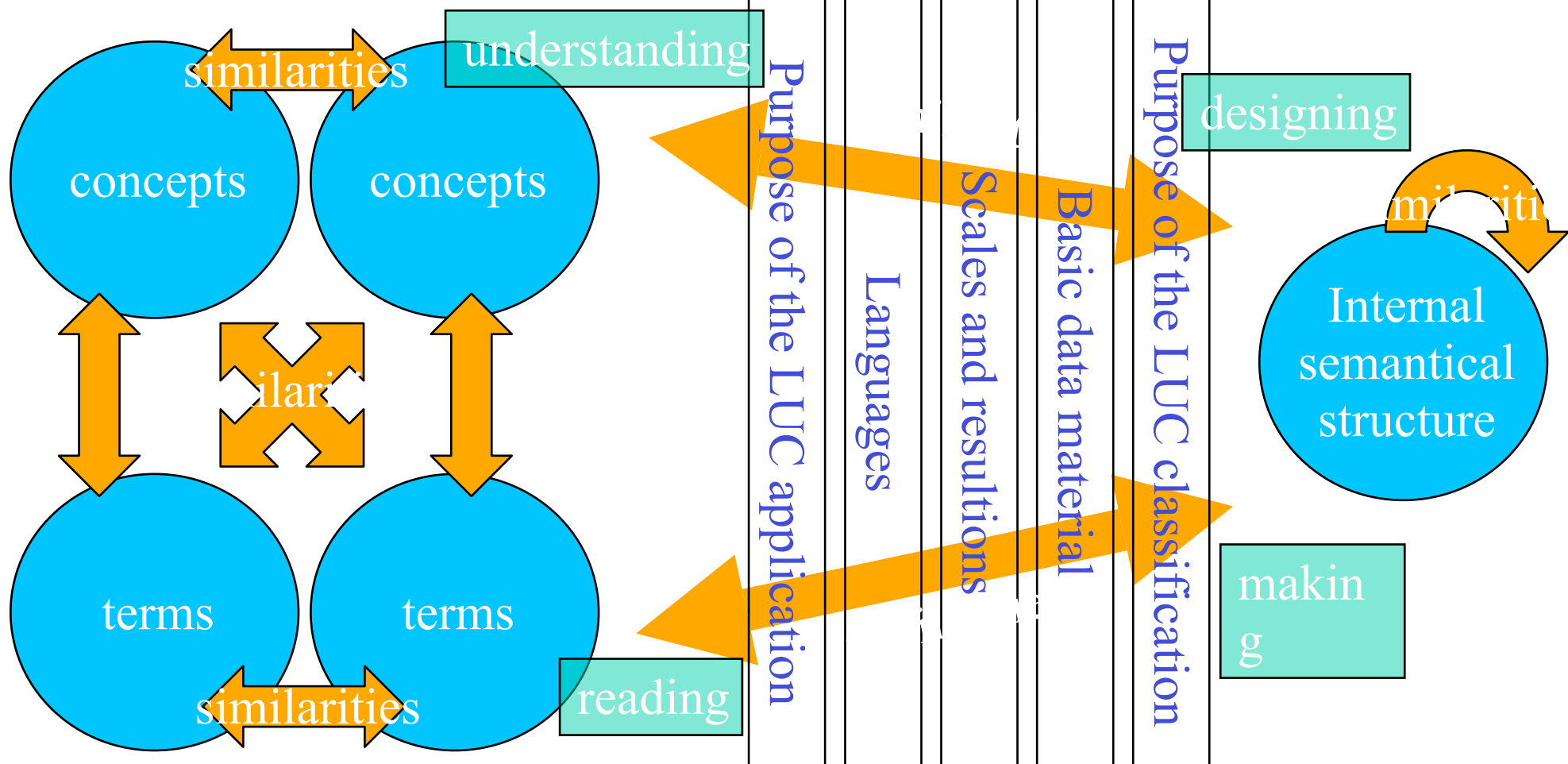
Where are the touristic infrastructures of Kranjska Gora?

# Conceptual Framework for Semantic Studies

People:

Filters:

Representation:





Project Titel

---



**HarmonISA**

# Project Results

1. A **computer based query tool for ontology based and harmonised land cover / land use type catalogues**, which consist of data for each of the three countries. These catalogues hold existing but not identical land use data sets having different spatial and thematic resolution. **The query tool can be handled in a web browser in intranet or internet** (<http://www.isamap.info>)

## **Functions of the HarmonISA tool are:**

- (a) **Query** of the land use catalogues
  - (b) **Query of the translation** of land use class names in the different project languages
  - (c) **Selection** of a subset of the types in one catalogue and **suggestion** of the aggregation of types in another catalogue **by the program**, to get a harmonized land use class
  - (d) **Output** of the results (a to c) as table or graph
  - (e) **Output** of the final map legend
  - (f) **Output** of a harmonized land use map or the instructions to draw it, if the data are not available
2. The **ontologies** of the land use classifications used in the project **written in OWL** (Web Ontology Language) (<http://www.w3.org/TR/owl-features/>)
  3. A comprehensive project report including a **user manual of the tool**

# Quality Criteria of the Project

- Compatibility with ontology-standards, Open-GIS-standards and other W3C-standard for **interoperability of the results**
- **Workshops with project presentations** at the „Münster Semantik Interoperability Lab“ (MUSIL, <http://musil.uni-muenster.de>) headed by Prof. Dr. Werner KUHN at the Institute of Geoinformatics at the University Münster in Germany
- The user interface of the **HarmonISA Tool will be tested on „Usability“** by the working group on „Interactive Systems““ headed by Prof. Dr. Martin Hitz at the Institute of Informatics at the University of Klagenfurt

# Data to be Harmonized in the Project

## 1. Land use data in European scale (< 1:50.000):

- **CORINE Land Cover (CLC90) 100 m - version 12/2000 (A, I und SLO)**  
(<http://dataservice.eea.eu.int/dataservice/metadetails.asp?id=309>)

## 2. Land use data in medium scale (1:10.000 to 1:50.000):

- **Realraumanalyse Österreich (A)** (<http://www.uni-klu.ac.at/geo/projekte/realraum/realraum.htm>)
- Landschaftsräumliche Gliederung Kärnten (Kärnten) ([http://213.47.127.15/corp/archiv/papers/2000/CORP2000\\_blechl\\_piechl.pdf](http://213.47.127.15/corp/archiv/papers/2000/CORP2000_blechl_piechl.pdf))
- Flächendeckendes Landnutzungsmodell von Österreich aus Fernerkundungsdaten (A)  
([http://www.ipf.tuwien.ac.at/publications/re\\_as\\_ks\\_p\\_agit95.html](http://www.ipf.tuwien.ac.at/publications/re_as_ks_p_agit95.html))
- **MOLAND (Monitoring Land Use/Cover Dynamics) FVG Project Data Base (Friuli – Venezia Giulia)** (<http://moland.jrc.it/fvg/fvg.htm>)
- **Land Use Database / Ministry of Agriculture and Forestry (SLO)**

## 3. Diverse regional plans (A, I und SLO)

## 4. Zoning plans (1:5.000 to 1:10.000) (A, I und SLO)

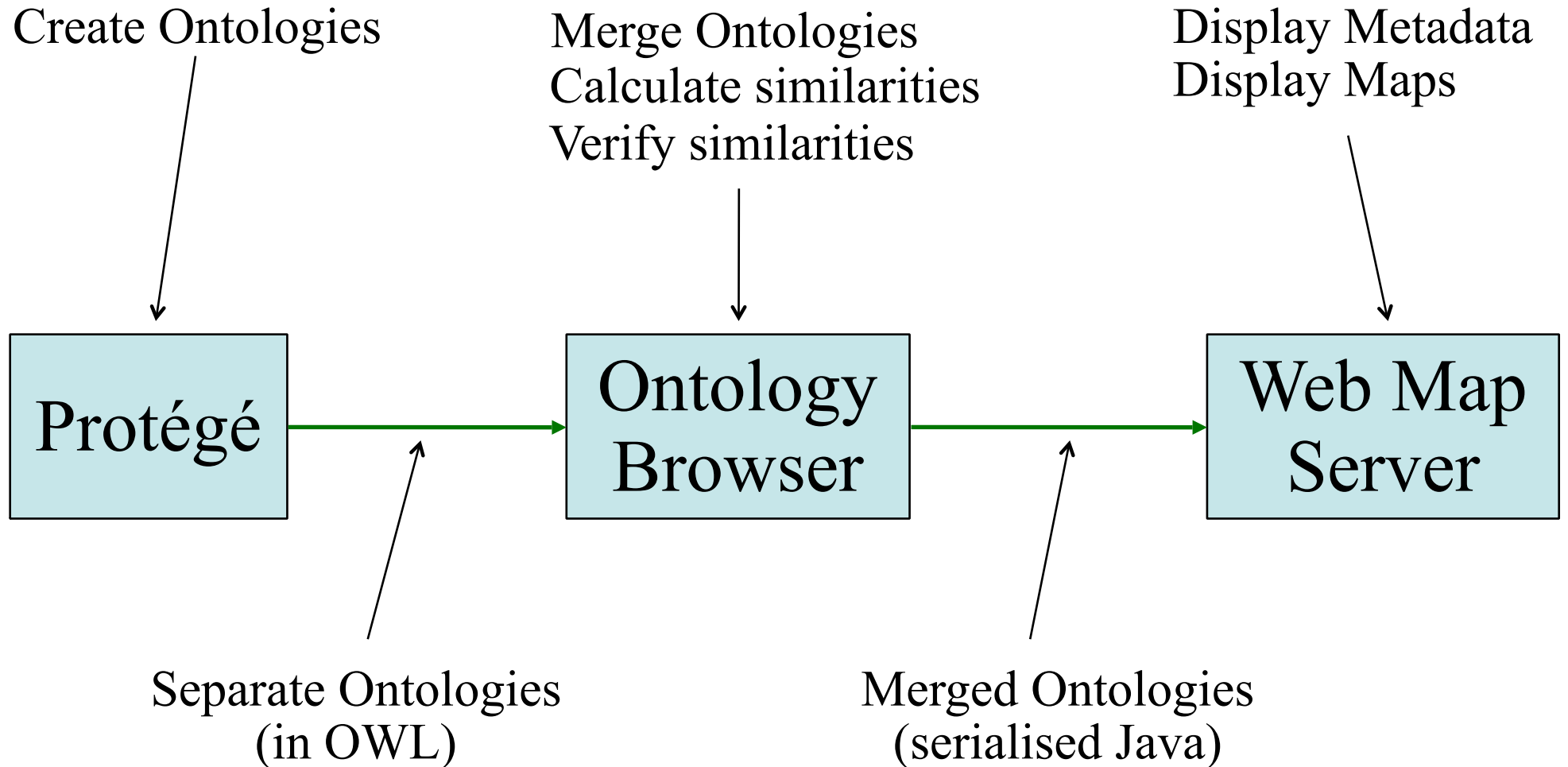
## 5. Cadastral plans (1:1.000 to 1:5.000) (A, I und SLO)



# Project Concept

- Create ontological descriptions of land-use categories
  - Use a normalised approach
  - Use necessary and sufficient conditions for definitions
- Calculate similarity of land-use categories based on their ontological definitions
  - Similarity of definitions = Similarity of categories

# Project Workflow



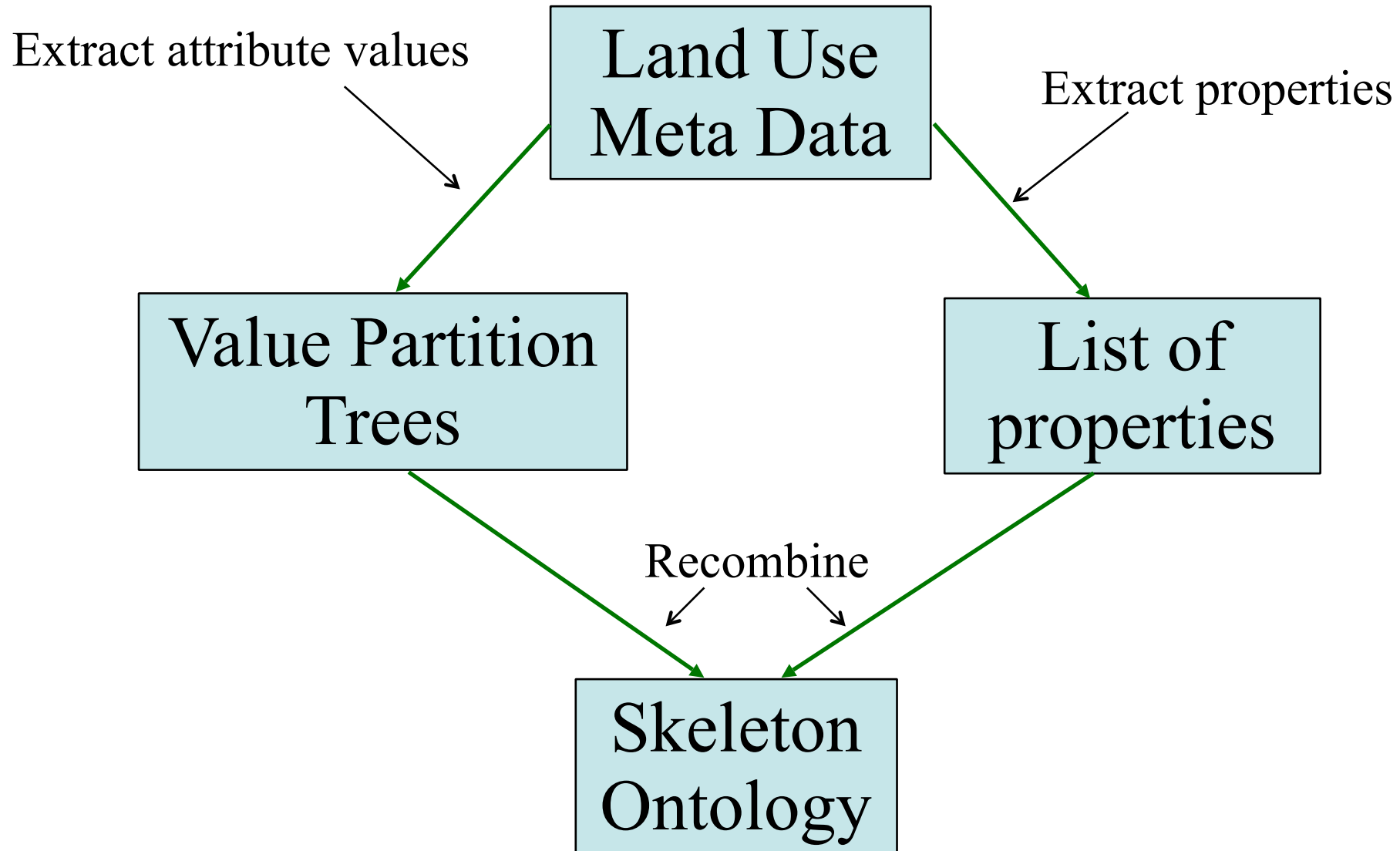
# Overview

- Introduction to the HarmonISA Project
- **Ontologies**
  - Ontology structure
  - Ontology creation
  - Ontology example
- Application
- Conclusions

# Ontology Structure

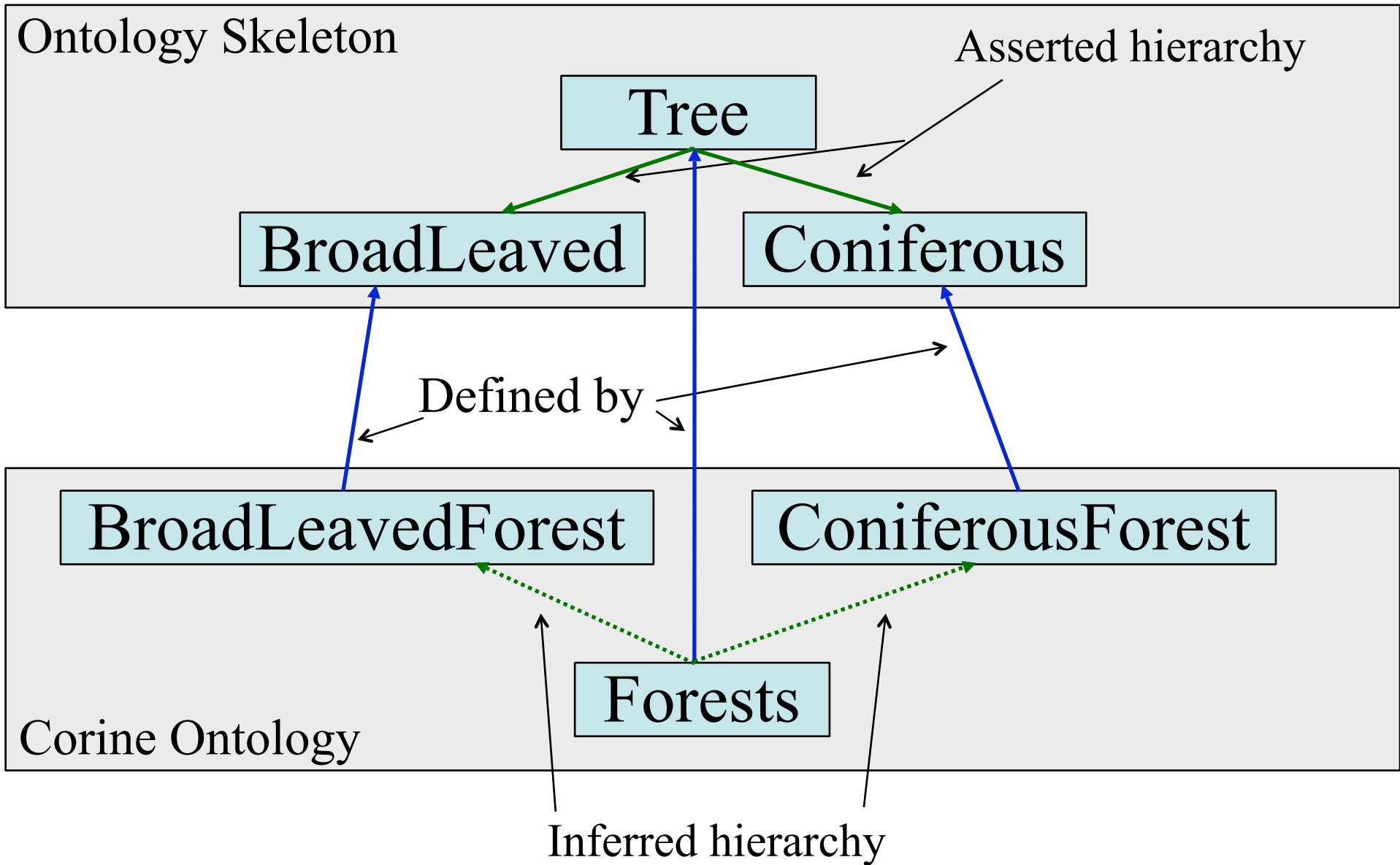
- Fully modularised
- One ontology for properties and property values
  - Contains the value partitions (ontology skeleton)
- One ontology per land-use classification
  - Imports the ontology skeleton
  - Contains the classes representing the land-use categories
- Ontologies stored in OWL

# Ontology Creation I





# Ontology Example

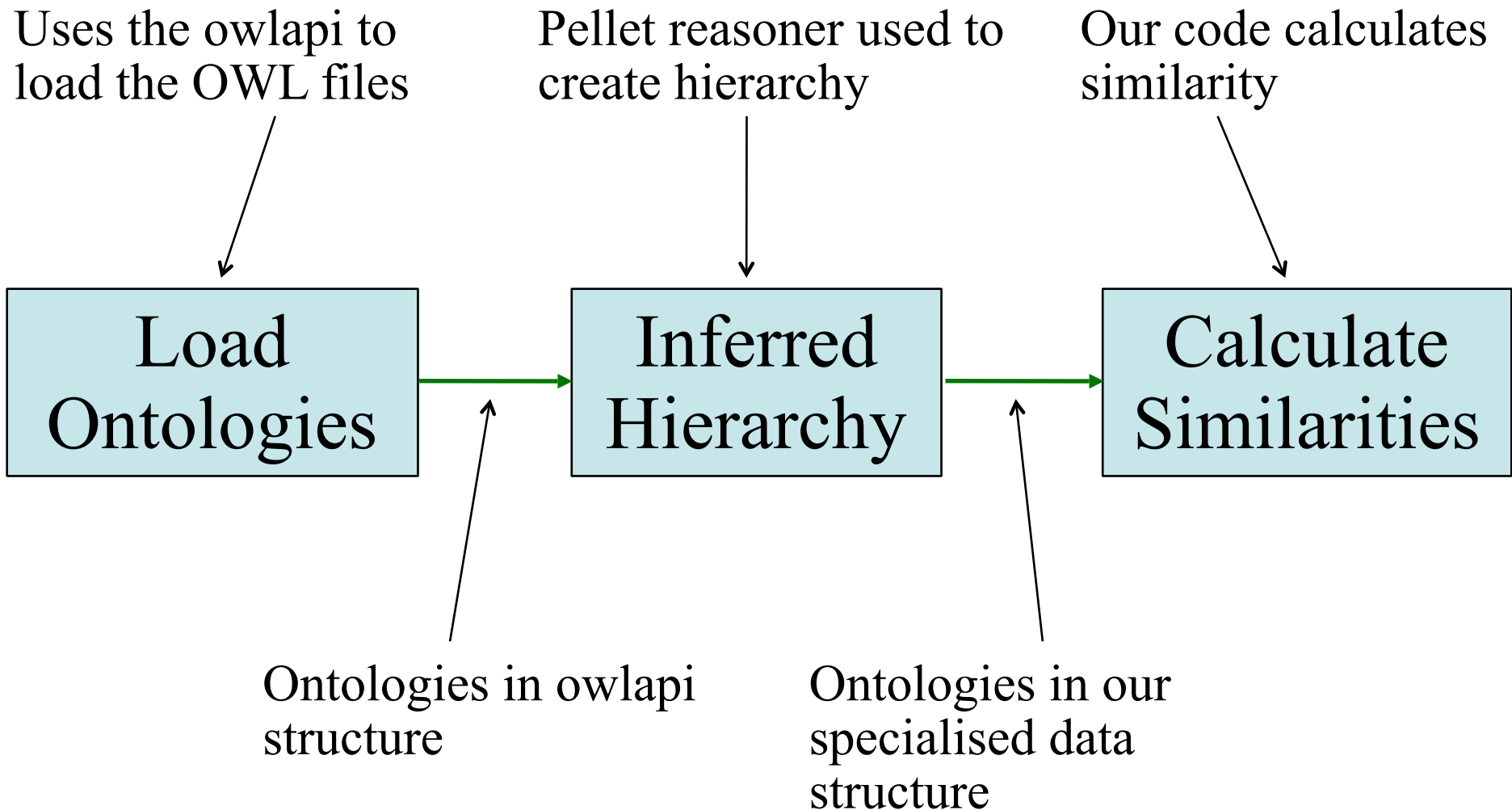


# Overview

- Introduction to the HarmonISA Project
- Ontologies
- **Application**
  - Program Structure
  - Ontology Data Structure
  - Similarity reasoning
  - Screenshots
- Conclusions



# Program Structure

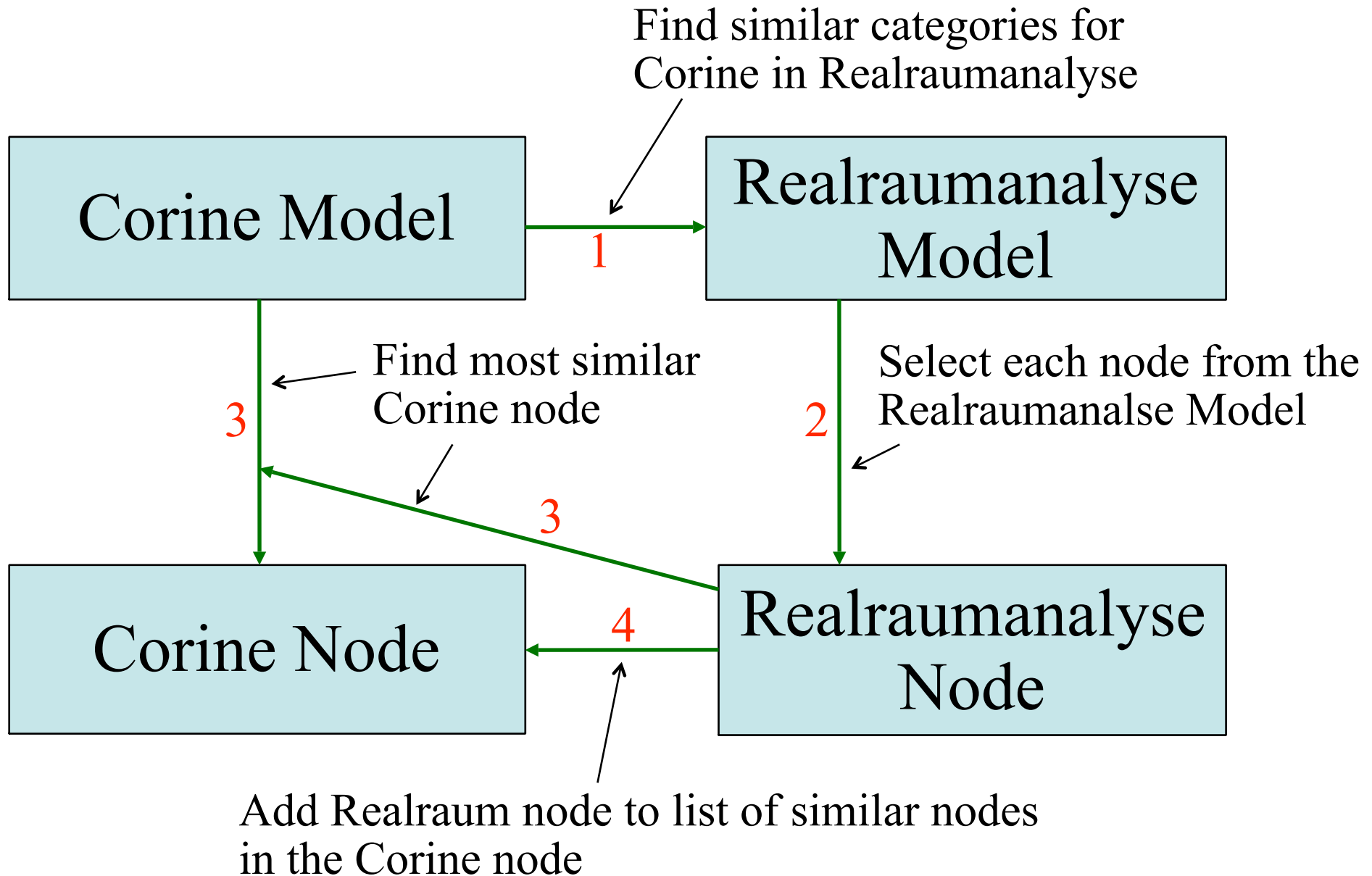




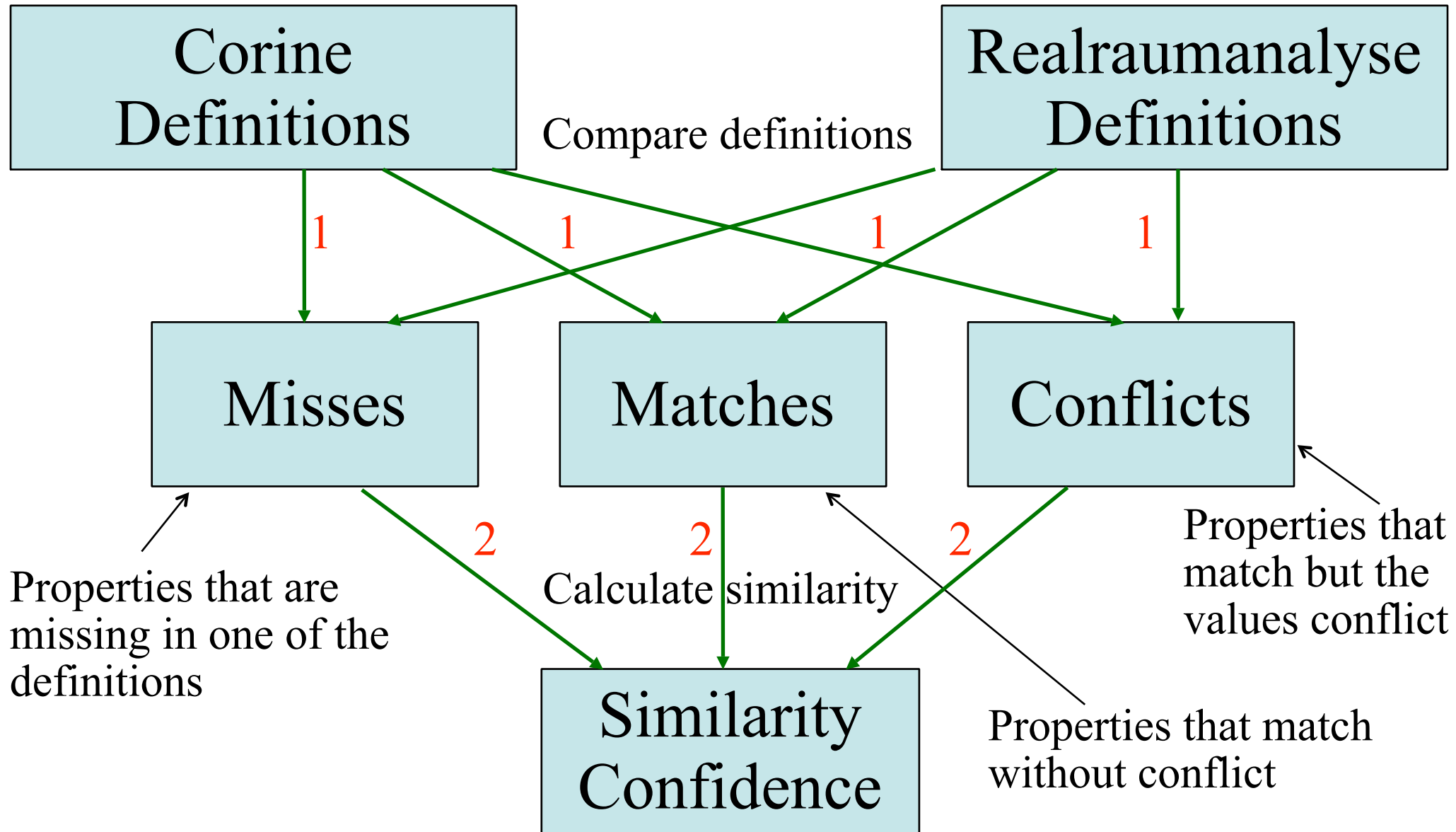
# Similarity Reasoning I

- Calculates the similarities between all land-use categories
  - Calculates the similarity based on the similarity of the necessary and sufficient conditions that define each class
- Works with similarity confidence values

# Similarity Reasoning II



# Similarity Reasoning II



# Ontology Browser

Trees \ Details \

When displaying the selected category, data from the following categories is also displayed:

Source	Category	Confidence
Italy - Moland	Forests and semi-natural ar...	100 / 100
Austria - Realraumanalyse	Natural vegetation	99 / 140
Austria - Realraumanalyse	Pasture outside of the contin...	99 / 240

Differences \

Differences between "Forests and semi-natural areas" and "Natural vegetation":

	Property	Definition Euro...	Definition Austr...	
Some	Primary vegetat...	Missing	Vegetation	0 / 40
Some	Surface	Vegetation or O...	Vegetation	99 / 100

# Overview

---

- Introduction to the HarmonISA Project
- Ontologies
- Application
- **Conclusions**
  - Outlook
  - Conclusions

# Outlook

- Create a Web Service to provide similarity data
- Create a Web Map Service
  - Using the UMN Mapserver
  - Custom handling of the colouration and legend



# Conclusions

- Ontologies have stable structure
- Guaranteed mapping of complete study area
- Some other spatial attributes included
- Extensions:
  - consider more application areas
  - consider the specialities of the used languages
  - Consider the different spatial resolutions
  - Consider topological relations between the classes to fill missing areas

**Thank you very much for your  
attention!**

**Questions and suggestions please send to:  
[peter.mandl@uni-klu.ac.at](mailto:peter.mandl@uni-klu.ac.at) / [mhall@edu.uni-klu.ac.at](mailto:mhall@edu.uni-klu.ac.at)**

**For watching the project progress, keep an eye at:  
<http://www.isamap.info/html/harmonisa.html>  
<http://www.edu.uni-klu.ac.at/~mhall/harmonisa/>**