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An Advanced Query and Result Rewriting Mechanism for Information Retrieval Purposes from RDF Datasources

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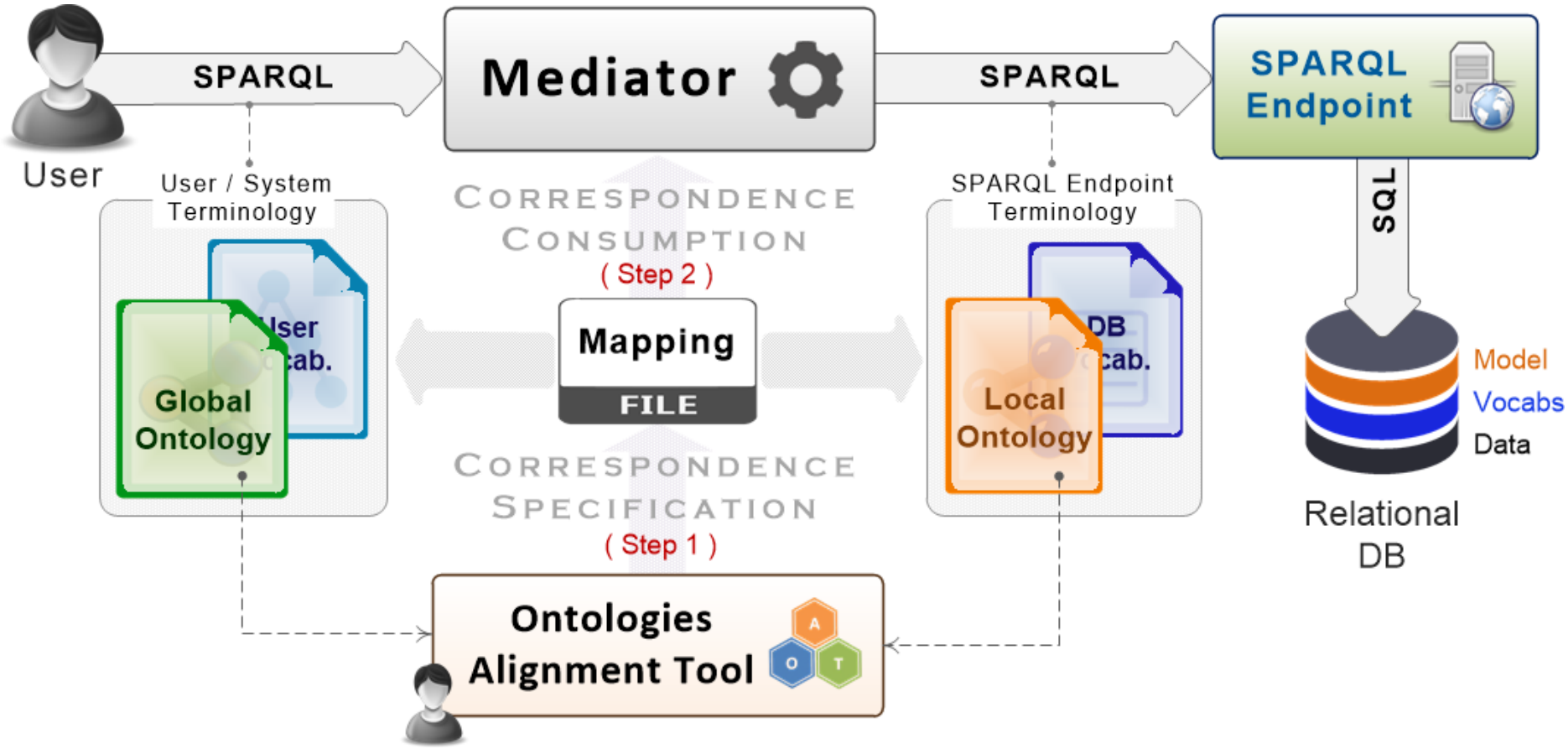
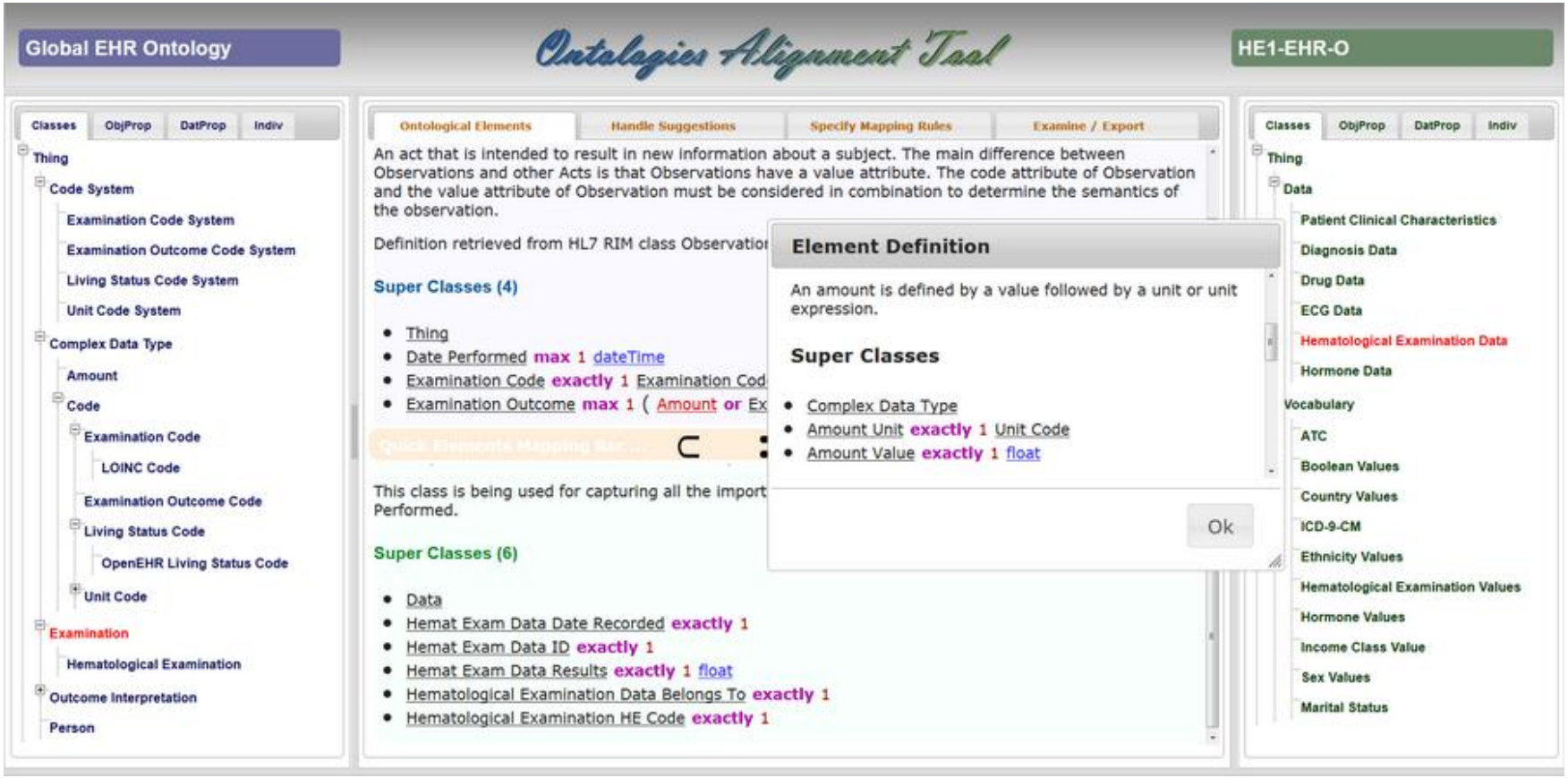
Introduction

- Relational Databases
  - Widely Used in Software Industry
  - Access via **SQL** queries
- SPARQL Endpoints (e.g., D2R server)
  - Enable users to treat a RDB as a Virtual RDF Graph
  - Access via **SPARQL** queries
    - Close to the data structure (DB schema) and
    - DB vocabularies (i.e., table-field values)
- Semantic Web Applications
  - Need access to existing (real or virtual) RDF datasources
  - Use different Model and Vocabularies

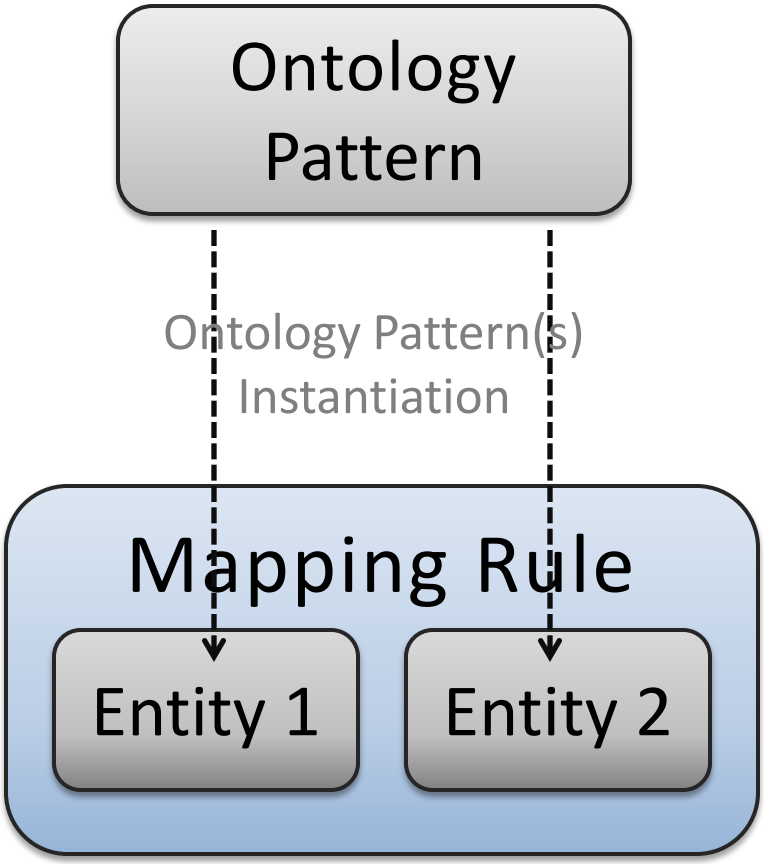
Approach Followed



Correspondence Specification – OAT



Ontology Patterns & Mapping Rules



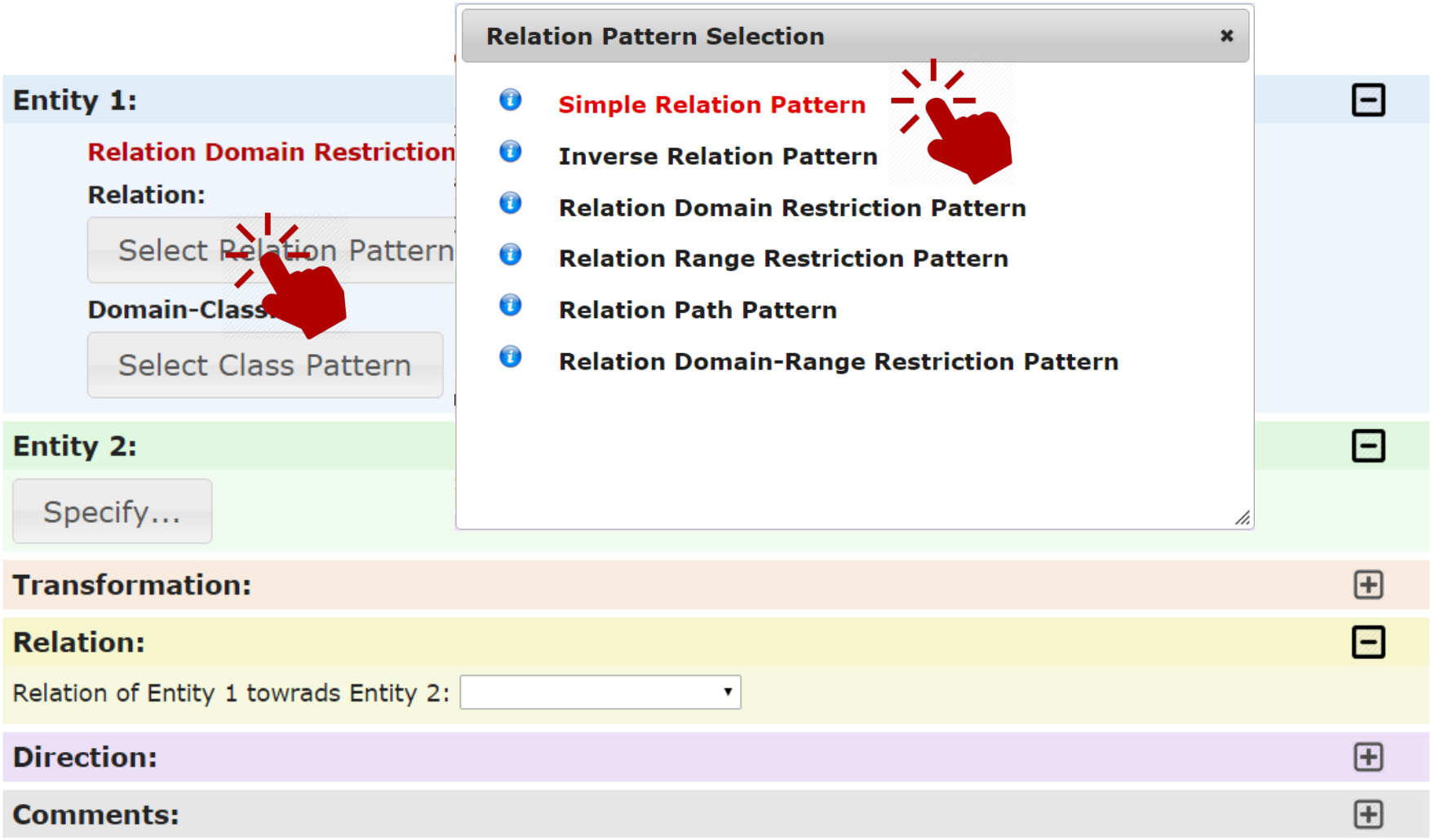
Ontology Pattern

- Uniquely determines an Entity of a Mapping Rule
- Specifies either an existing Ontological Element or a new one

Mapping Rule

- Specify the correspondence among the ontology terms along with the changes that should take place in their values (if necessary)

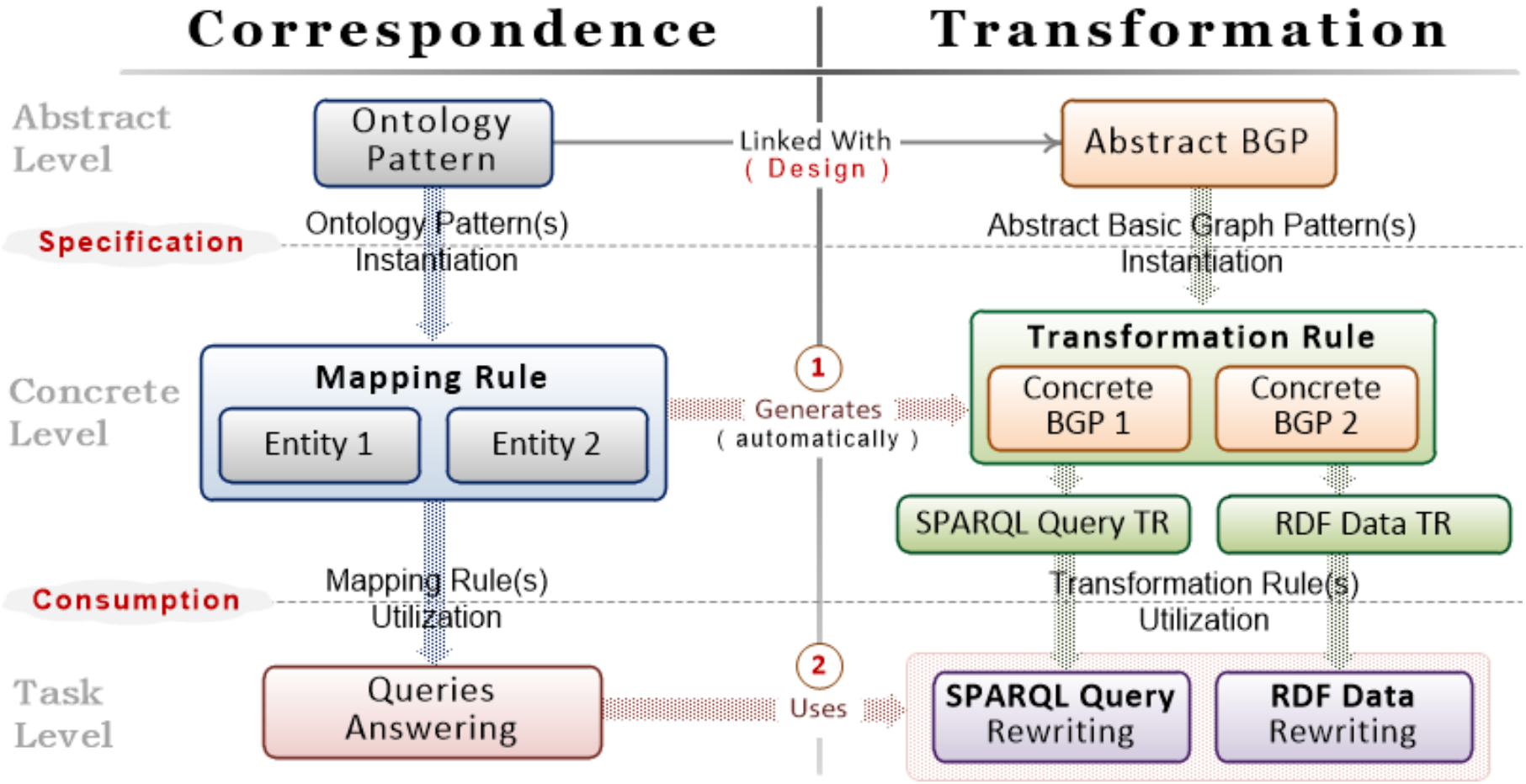
Ontology Pattern(s) Instantiation – Example



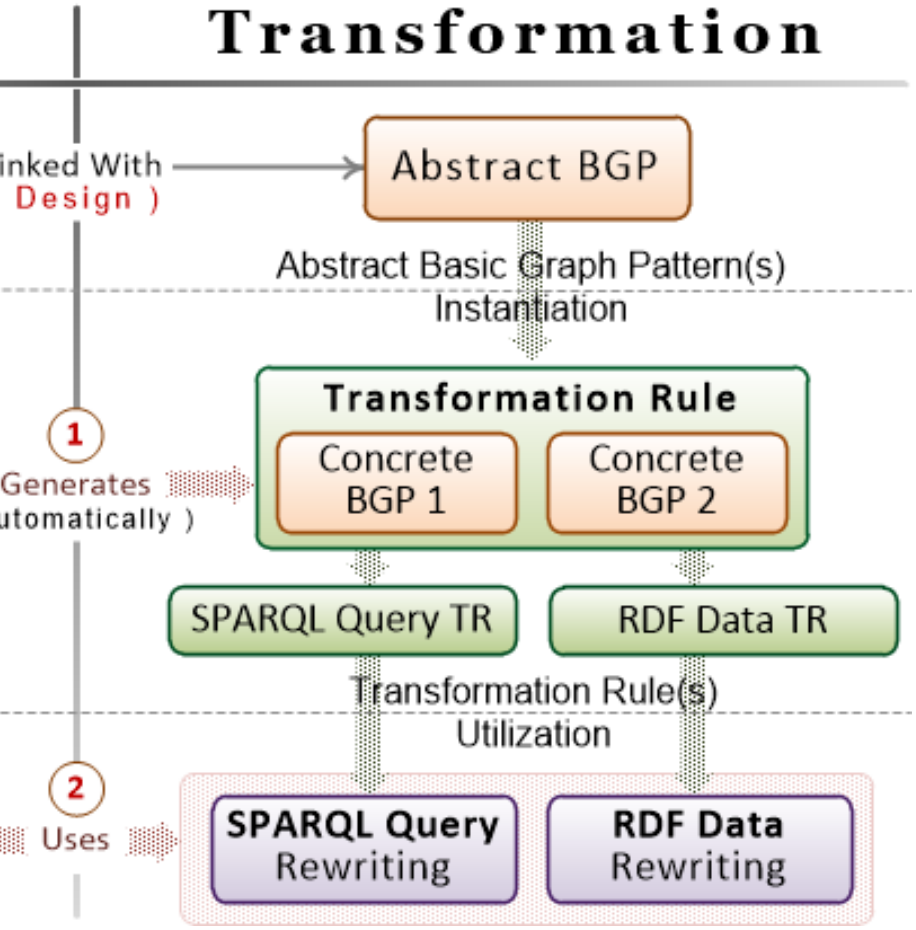
Correspondence Consumption – Mediator

- User
  - Forms the SPARQL query (i.e., SELECT or CONSTRUCT)
  - Terminology: User Model & Vocabularies
- **Mediator**
  - Rewrites both SPARQL query and RESULT (i.e., RDF data)
  - Based only on the Mapping Rules specified
- DB SPARQL Endpoint
  - Executes the SPARQL query provided
  - Terminology: Data Model & DB vocabularies

Query & Result Rewriting – Overview



Abstract BGP & Transformation Rules



Abstract BGP

- Provides a triple-based representation of an Ontology Pattern
- Example: for a Simple Property

  [sth1] {property-uri} [sth2]

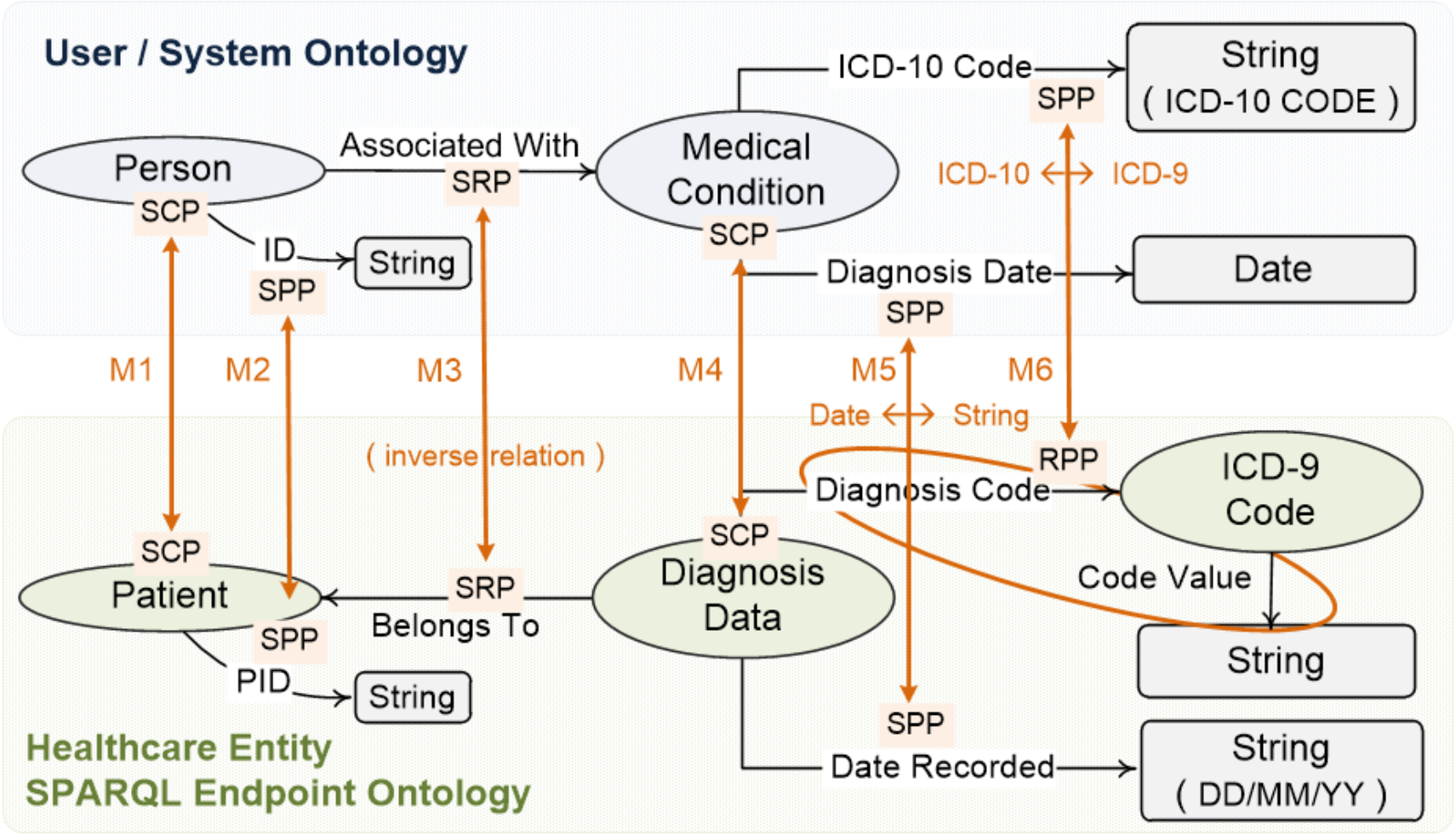
Transformation Rule

- Specifies the changes that should take place in a graph-based representation of the corresponding data
- Example:

  [s1] **PropA** [s2] ↔ [s1] **PropB** [s2]

  [s2] : Data Transformation ?

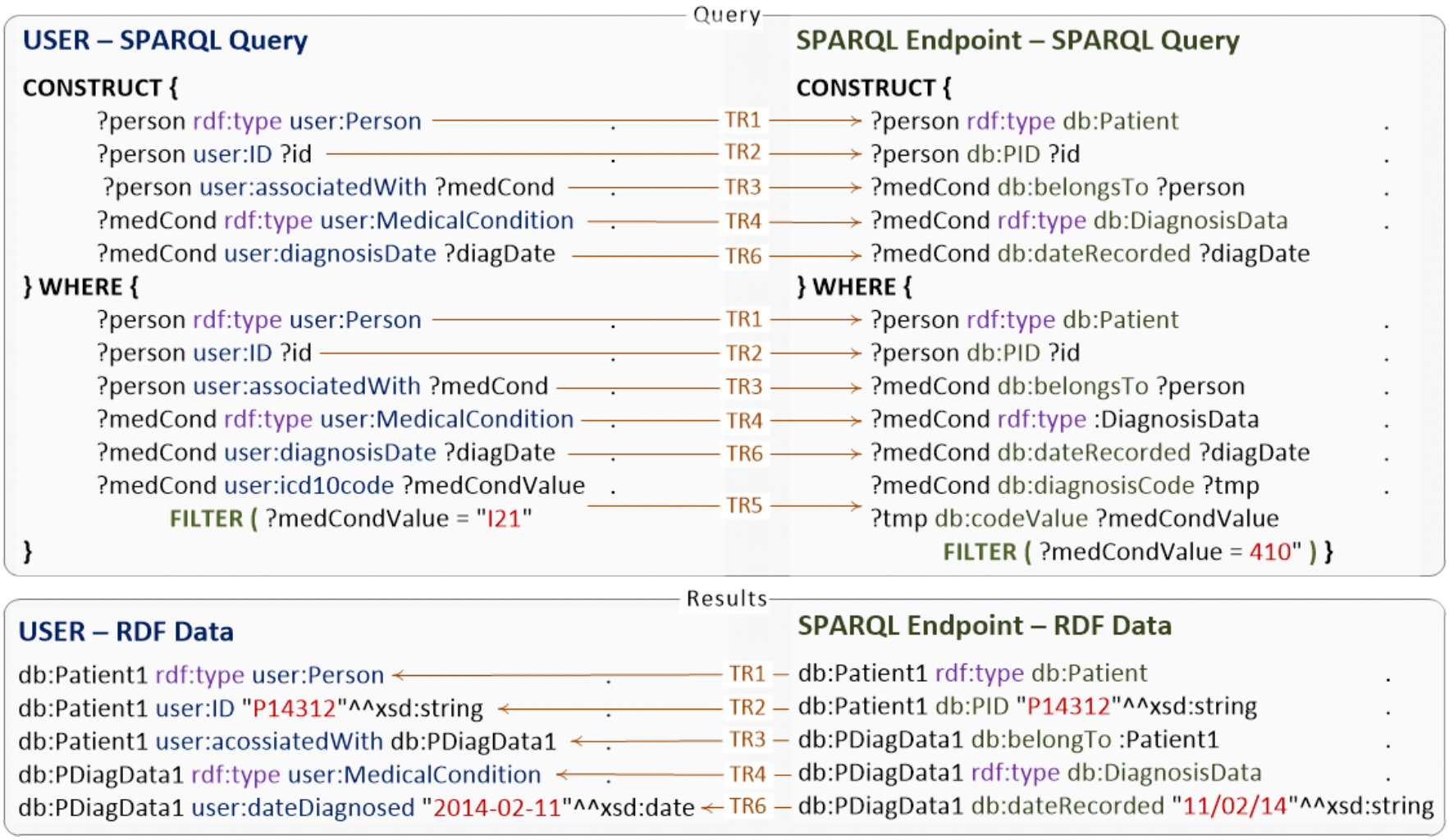
Example (1/3) – Mapping Rules



Example (2/3) – Transformation Rules

ID	MR	TR: Left Side	TR: Right Side
TR1	M1	[*sth*] rdf:type usr:**Person**	[*sth*] rdf:type db:**Patient**
TR2	M2	[*sth1*] usr:**ID** [*sth2*]	[*sth1*] db:**PID** [*sth2*]
TR3	M3	[*sth1*] usr:**associatedWith** [*sth2*]	[*sth2*] db:**belongsTo** [*sth1*]
TR4	M4	[*sth*] rdf:type usr:**MedicalCondition**	[*sth*] rdf:type db:**DiagnosisData**
TR5	M5	[*sth1*] usr:**icd10code** [*sth2*]	[*sth1*] db:**diagnosisCode** [*tmp*] . [*tmp*] db:**codeValue** [*sth2*]
		Data Transformation: [*sth2*]:ICD-10 to/from ICD-9	
TR6	M6	[sth1] usr:**diagnosisDate** [sth2]	[*sth1*] user:**dateRecorded** [*sth2*]
		Data Transformation: [*sth2*]:Date to/from String	

Example (3/3) – Query & Result Rewriting



Discussion

- Ontology Alignment and Query / Result Rewriting
  - Global Ontology may be partially linked with Local Ontology
  - Information Loss during both Query and Results Rewriting
    - Explicitly mention to the end users any modification (either change or omission) made during both SPARQL query and Result rewriting processes.
- Semantics
  - On condition that there is **a)**1:1 among vocabularies and **b)** all the Global Ontology terms have been mapped to the corresponding ones, the semantics of the rewritten SPARQL query (and hence data retrieved) do not change !
- Mapping Issues: Semantically Related Terms
  - e.g. age (including date recorded) and date/year of birth

Conclusion

- A novel approach for Query Answering purposes
  - Enable users to access a Relation DB or RDF graph using their own Models and Vocabularies
- Users specify correspondence through a semi-automatic process based on the OAT (step 1)
  - Enable users to instantiate one or more Ontology Patterns for specifying the entities of a Mapping Rule
- Mediator rewrites SPARQL queries formed and data retrieved to the appropriate ones (step 2)
  - Automatically produces the corresponding Transformation Rules for both SPARQL query and RDF data rewriting purposes

Thank You !

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Баярлалаа
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matondo
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