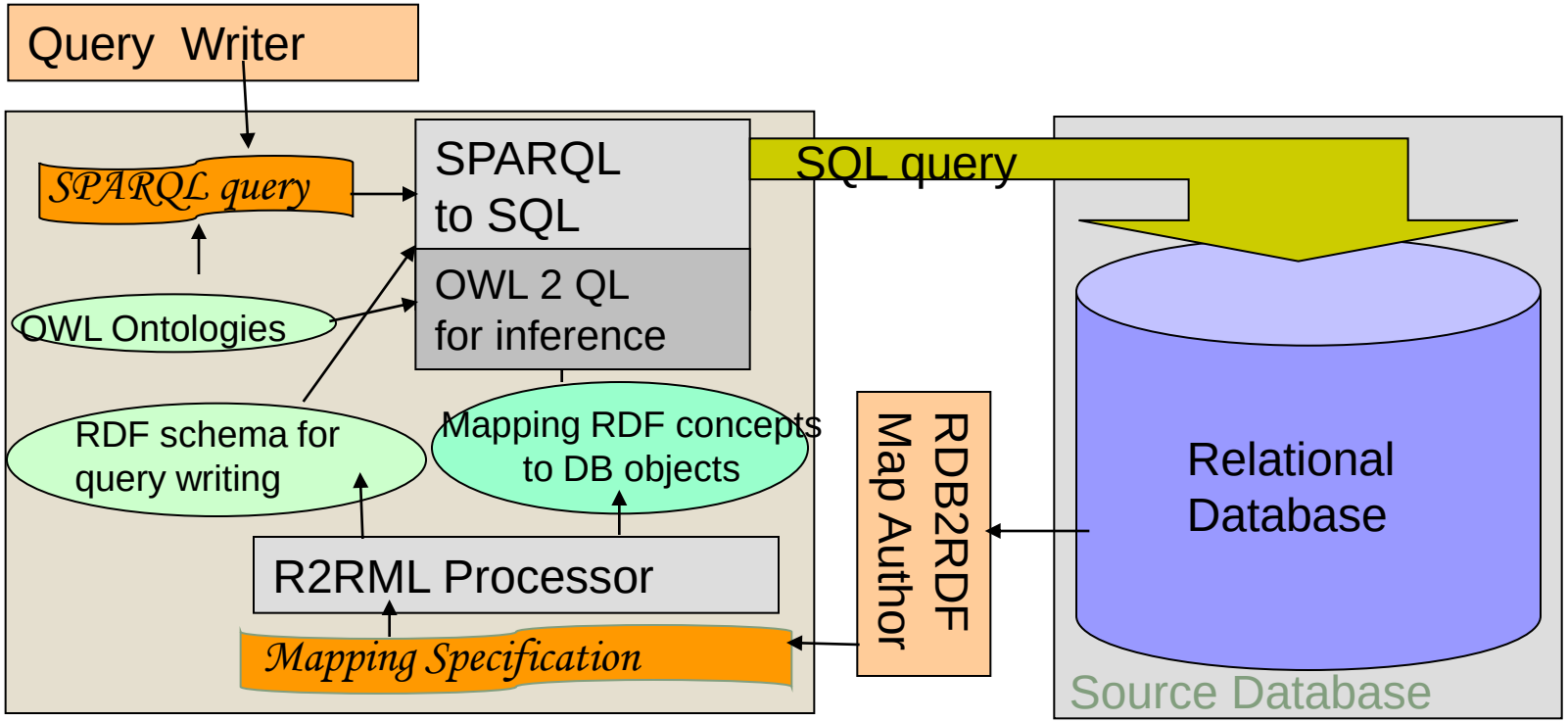
Augmenting Linked (RDF) Data with Relational Data

Souripriya Das, Seema Sundara, Jagannathan Srinivasan
Oracle

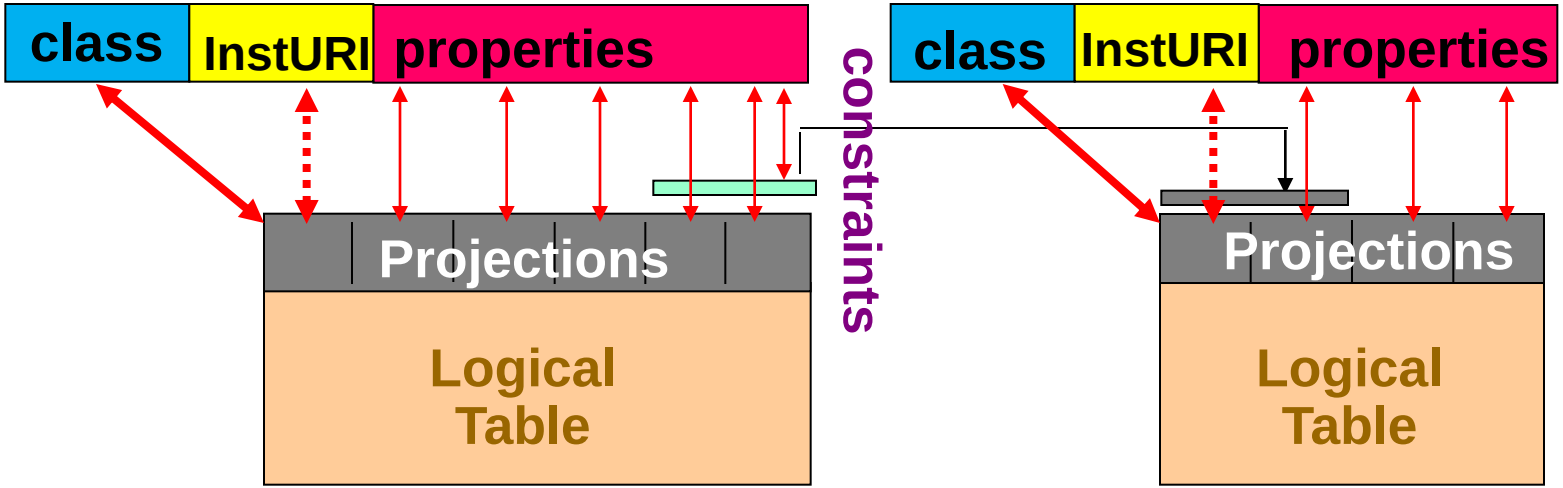
Outline

- Publishing local relational data as RDF
  - Direct Mapping
- Publishing local relational data by linking it with well-known external data
  - R2RML mapping
- Pre-entail the Tbox
  - OWL 2 QL

Architecture Diagram for RDB2RDF processing

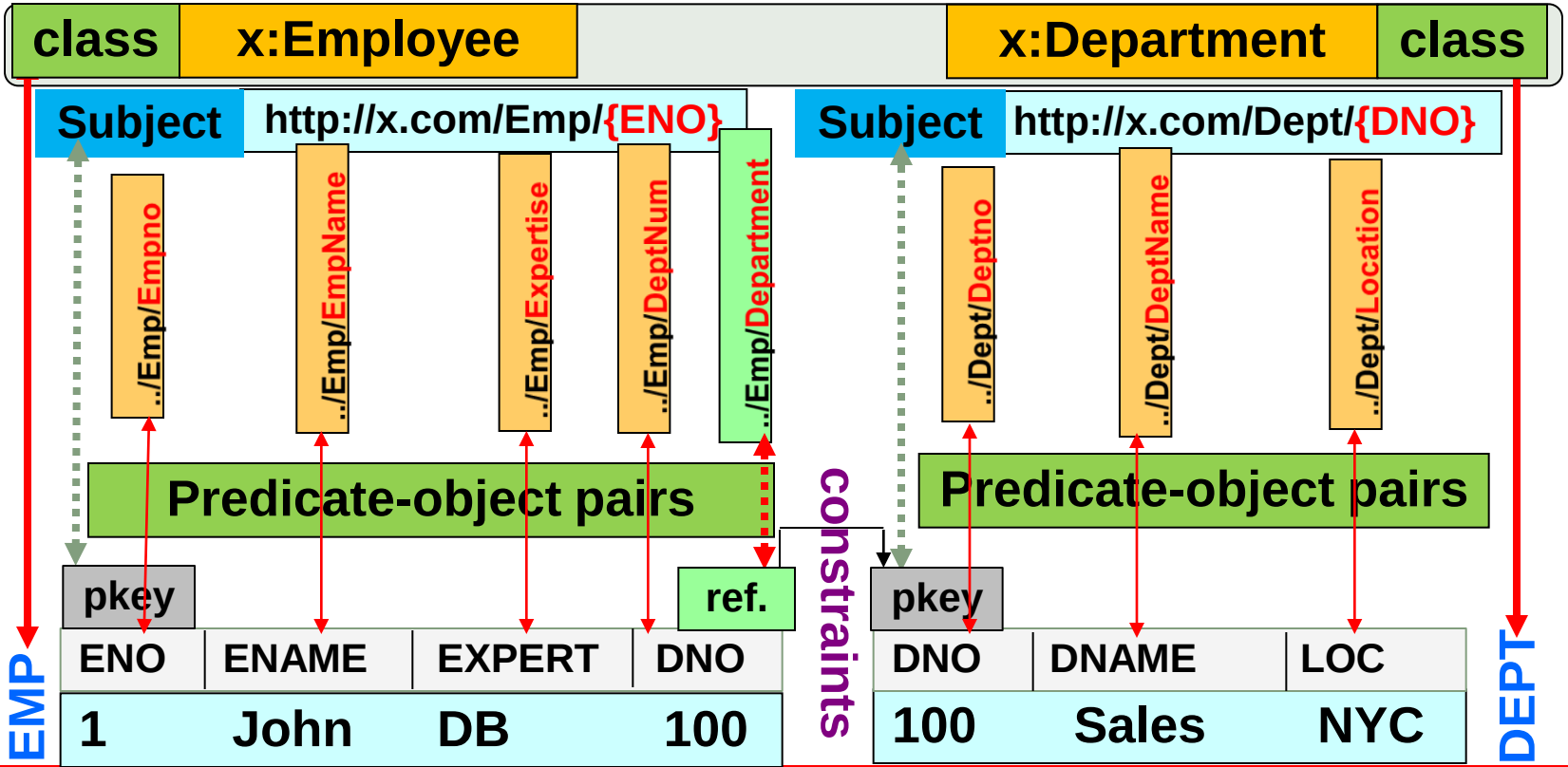


SQL-based mapping

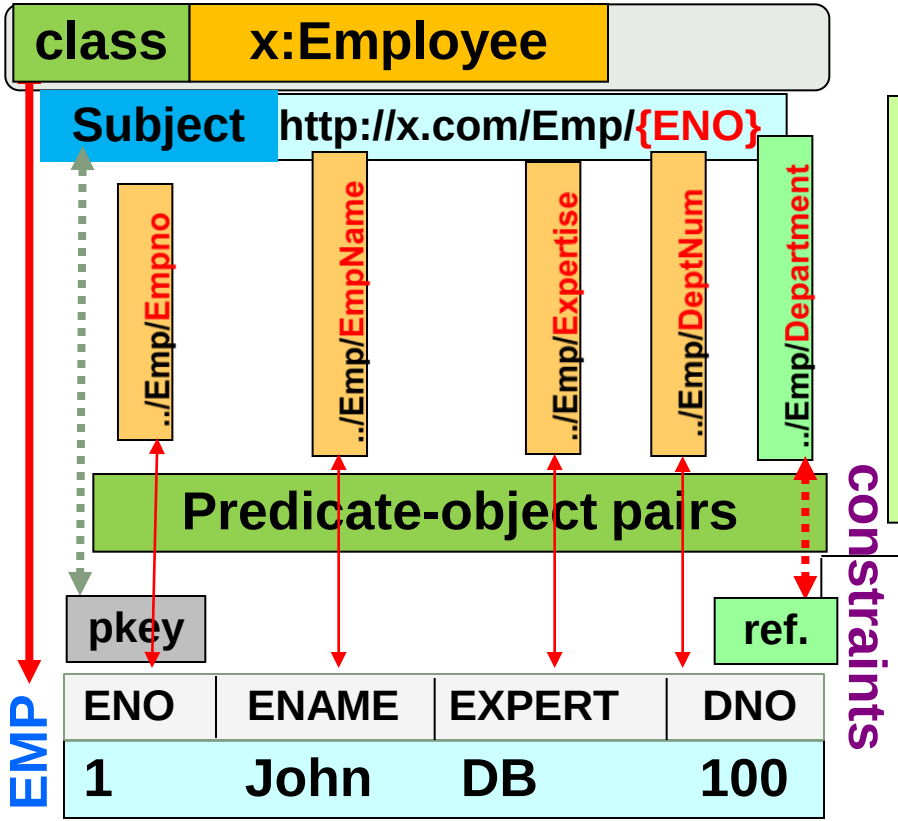


Simple mapping language to specify mapping between RDF classes, properties and SQL queries, query projections, constraints.

Mapping EMP/DEPT Tables to RDF



EMP table: Generated RDF triples



•<http://x.com/Emp/1>
rdf:type x:Employee ;

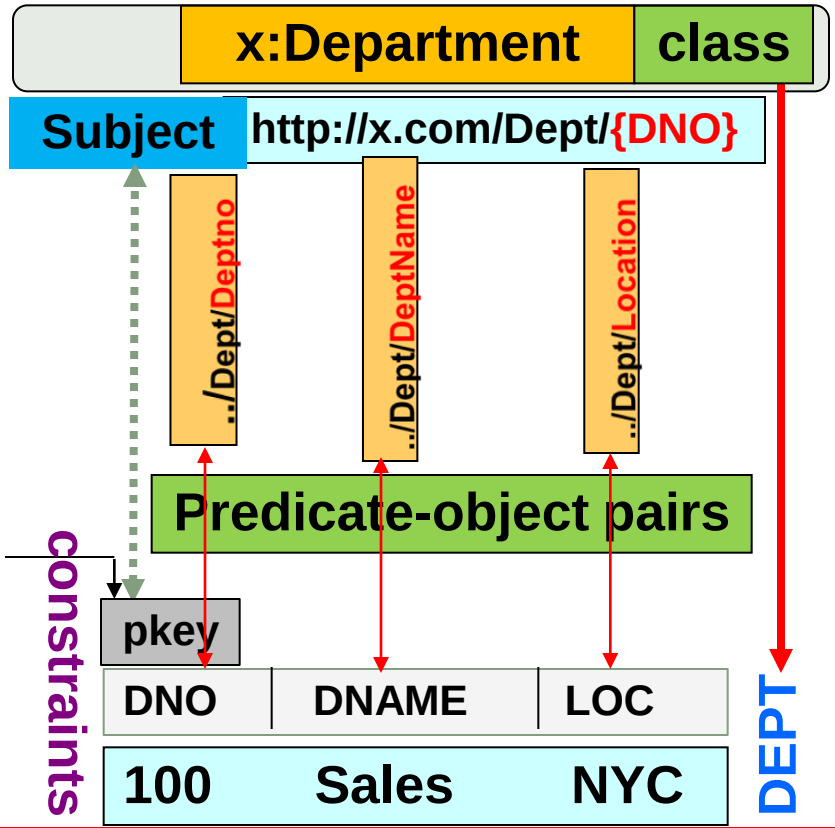
<../Emp/Empno> 1 ;
<../Emp/EmpName> “John” ;
<../Emp/Expertise> “DB” ;
<../Emp/DeptNum> 100 ;

<../Emp/Department> <http://x.com/Dept/100> .

DEPT table: Generated RDF triples

•<http://x.com/Dept/100>
rdf:type x:Department ;

<../Dept/Deptno> 1 ;
<../Dept/DeptName> “Sales” ;
<../Dept/Location> “NYC” ;



Example: DEPT table and its Tmap

Deptno NUMBER	Dname Varchar	Contact_Us Varchar	Troubleshooting NUMBER	Location Varchar

Tmap

<DeptTM> rdf:type rr:TriplesMap

Smap

rr:template
"http://ex.org/D/{DEPTNO}"

rr:class ex:Department

POmaps

rr:predicate dp:phone

rr:objectMap
[rr:column "CONTACT_US"]
, [rr:column "TROUBLESHOOTING"].

POmap

rr:predicate dp:deptNum

rr:objectMap
[rr:column "DEPTNO"].

POmap

rr:predicate dp:name

rr:objectMap
[rr:column "DNAME"].

Example: EMP table and its Tmap

Empno NUMBER	Ename Varchar	W_phone NUMBER	C_phone Varchar	H_phone Varchar	W_addr Varchar	H_addr Varchar	DeptNo NUMBER

Tmap

```
<EmpTM>
  rdf:type rr:TriplesMap
```

Smap

```
rr:template
  “http://ex.org/E/{EMPNO}”
rr:class ex:Employee
```

POmaps

```
rr:predicate em:phone
rr:objectMap
  [ rr:column “W_PHONE” ]
, [ rr:column “C_PHONE” ]
, [ rr:column “H_PHONE” ] .
```

POmap

```
rr:predicate em:dept
rr:objectMap [ rr:parentTriplesMap <#DeptTM> ;
                 rr:joinCondition [ rr:child “DEPTNO” ;
                                    rr:parent “DEPTNO” ]].
```

Family Data and Inference

	Name		Father	Mother	Sister	Brother
Children	sn:Cathy		sn:Sammy	sn:Suzie		
	sn:Jack		sn:Sammy	sn:Suzie	sn:Cathy	
	sn:Tom		sn:Matt	sn:Martha		
	sn:Cindy		sn:Matt	sn:Martha		sn:Tom
Parents	sn:Sammy					
	sn:Suzie		sn:John	sn:Janice		
	sn:Matt		sn:John	sn:Janice		
	sn:Martha					
Grand Parents	sn:John					
	sn:Janice					

Family Ontology

Domain and Range of properties

- :hasFather rdfs:domain :Person ; rdfs:range :Man .
- :hasMother rdfs:domain :Person ; rdfs:range :Woman .
- :hasBrother rdfs:domain :Person ; rdfs:range :Man .
- :hasSister rdfs:domain :Person ; rdfs:range :Woman .

Subclass hierarchy

- :Man rdfs:subClassOf :Person .
- :Woman rdfs:subClassOf :Person .

SPARQL to SQL Translation

- SPARQL:
  SELECT ?x
  WHERE { ?x rdf:type :Man }
- SQL:
  SELECT father FROM family_data
  WHERE father is not null
  UNION
  SELECT brother FROM family_data
  WHERE brother is not null