

RSP-QL*: ENABLING STATEMENT-LEVEL ANNOTATIONS IN RDF STREAMS

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E-CARE@HOME

- Distributed research environment
- Technology-supported independent living
- Patient safety, system reliability, and transparency
- Semantic interoperability

<http://ecareathome.se/>



USE-CASE SCENARIO



Provenance?

Noise?

Errors?

Confidence?

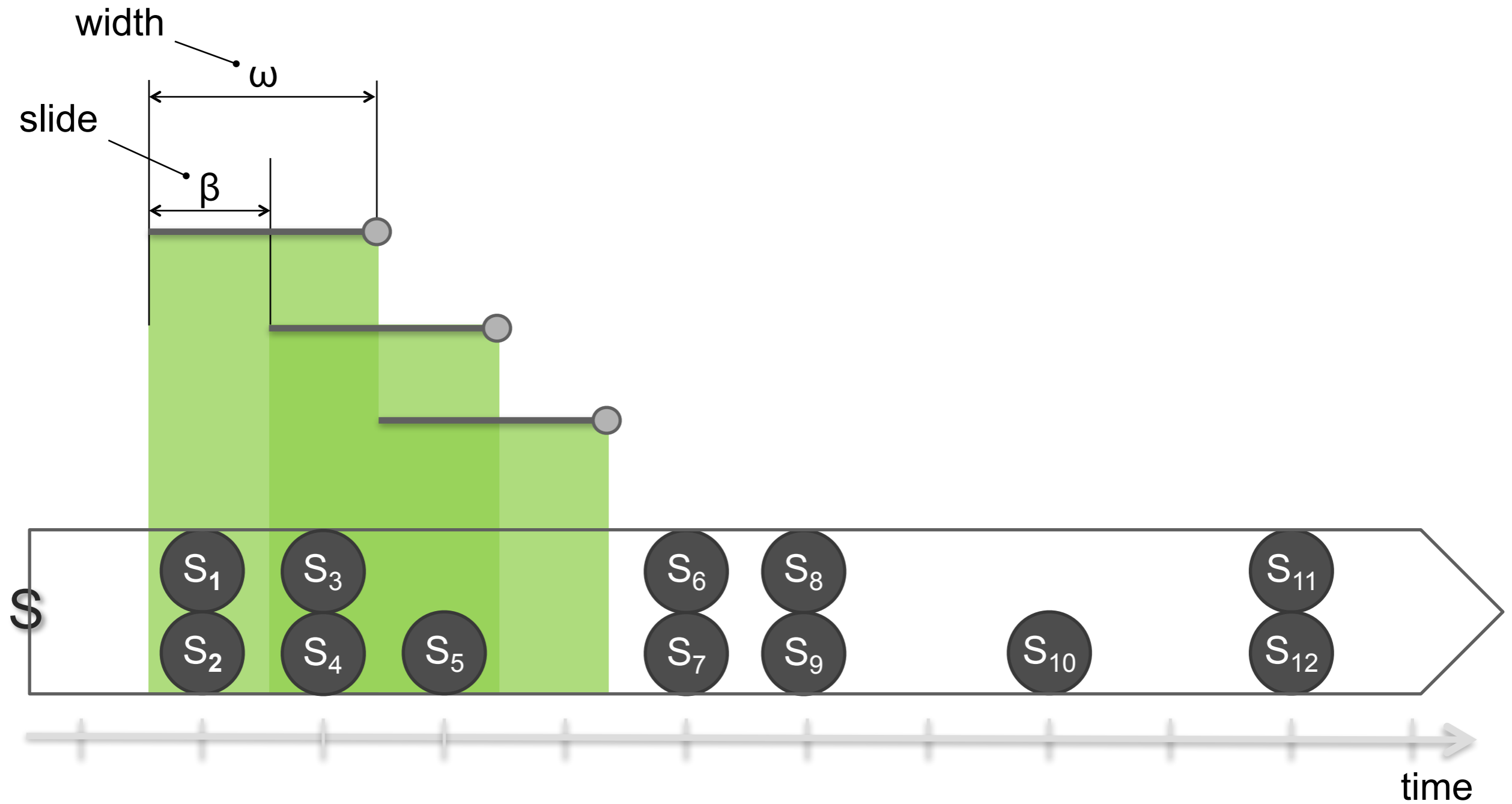
Justifications?

Certainty?

Probabilities?

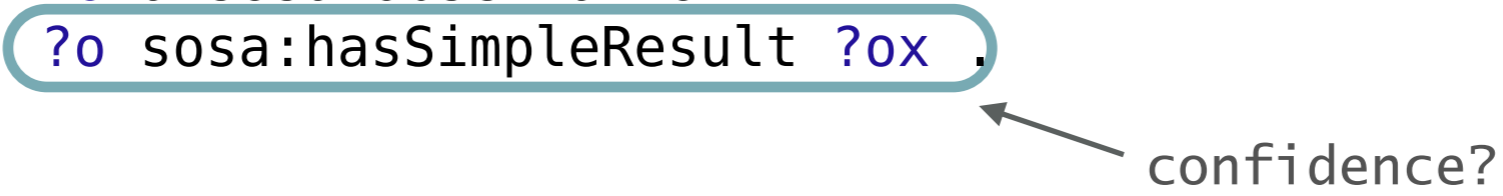
SEMANTIC WEB TECHNOLOGIES

RDF STREAM PROCESSING



RSP-QL

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX sosa: <http://www.w3.org/ns/sosa/>
REGISTER STREAM <alerts/ox> COMPUTED EVERY PT10S AS
SELECT ?ox
FROM NAMED WINDOW <win> ON <sensor/ox> [RANGE PT1M STEP PT10S]
WHERE {
  WINDOW <win> { # Oxygen saturation
    GRAPH ?g {
      ?o a sosa:Observation .
      ?o sosa:hasSimpleResult ?ox .
    }
  }
  FILTER(?ox < 0.95)
}
```



RDF REIFICATION

```
<obs/0> sosa:hasSimpleResult 0.97 .
```


RDF REIFICATION

```
PREFIX ex: <http://www.example.org/ontology#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX sosa: <http://www.w3.org/ns/sosa/>
REGISTER STREAM <alerts/ox> COMPUTED EVERY PT10S AS
SELECT ?ox
FROM NAMED WINDOW <win> ON <sensor/ox> [RANGE PT1M STEP PT10S]
WHERE {
  WINDOW <win> { # Oxygen saturation
    GRAPH ?g {
      ?o a sosa:Observation ;
        sosa:hasSimpleResult ?ox .
      _:b a rdf:Statement ;
        rdf:subject ?o ;
        rdf:predicate sosa:hasSimpleResult ;
        rdf:object ?ox .
      _:b ex:confidence ?c .
      FILTER(?c > 0.90)
    }
  }
  FILTER(?ox < 0.95)
}
```

RDF*

```
<< :bob foaf:age 23 >> ex:certainty 0.9 .
```



SPARQL*

```
SELECT ?age ?certainty
WHERE {
  <<:bob foaf:age ?age>> ex:certainty ?certainty .
}
```



RSP-QL*

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX sosa: <http://www.w3.org/ns/sosa/>
REGISTER STREAM <alerts/ox> COMPUTED EVERY PT10S AS
SELECT ?ox
FROM NAMED WINDOW <win> ON <sensor/ox> [RANGE PT1M STEP PT10S]
WHERE {
    WINDOW <win> { # Oxygen saturation
        GRAPH ?g {
            ?o a sosa:Observation .
            << ?o sosa:hasSimpleResult ?ox >> ex:confidence ?c .
            FILTER(?c > 0.90)
        }
    }
    FILTER(?ox < 0.95)
}
```

EVALUATION

APPLICATION-BASED EVALUATION

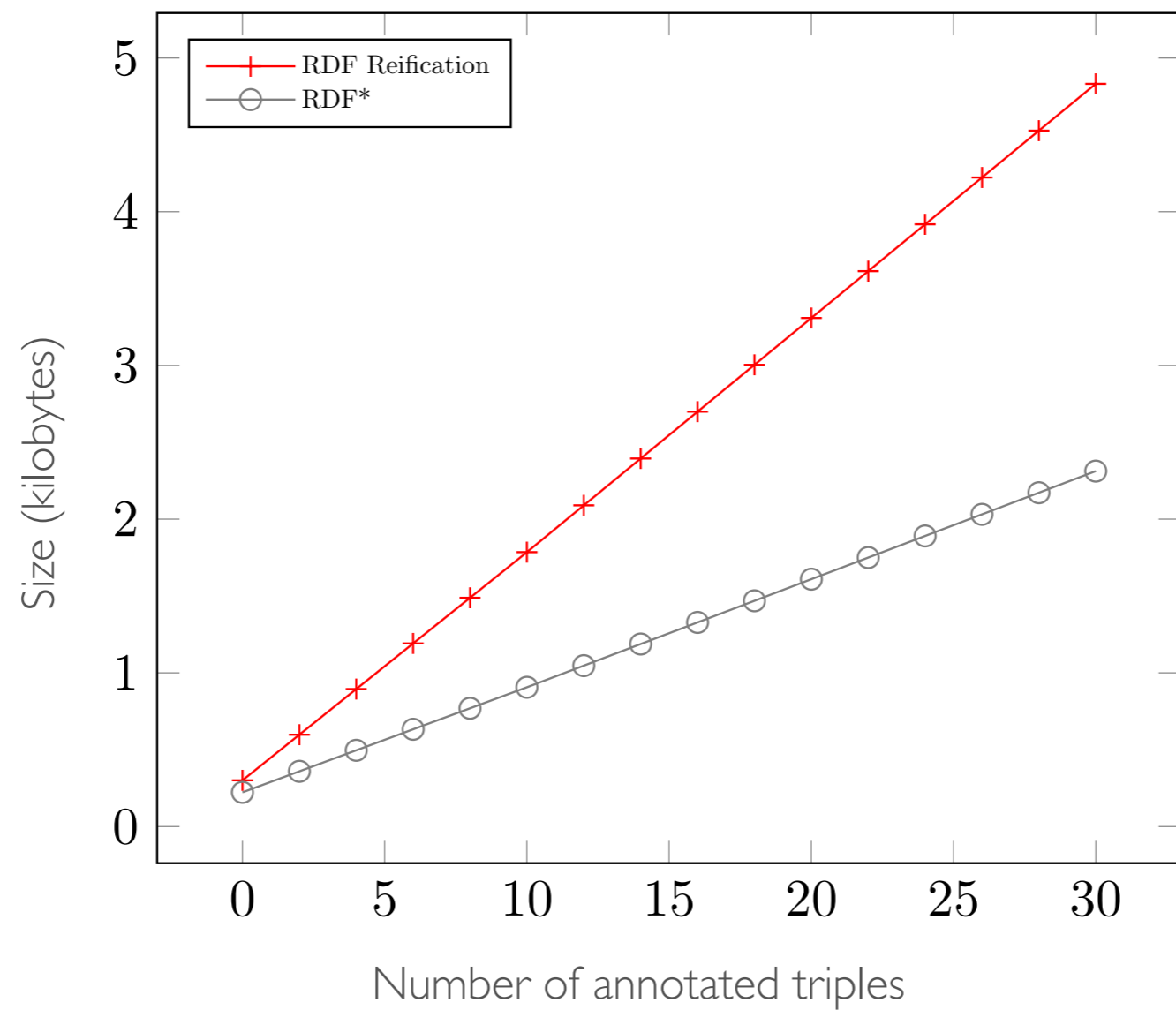


SERIALIZATION

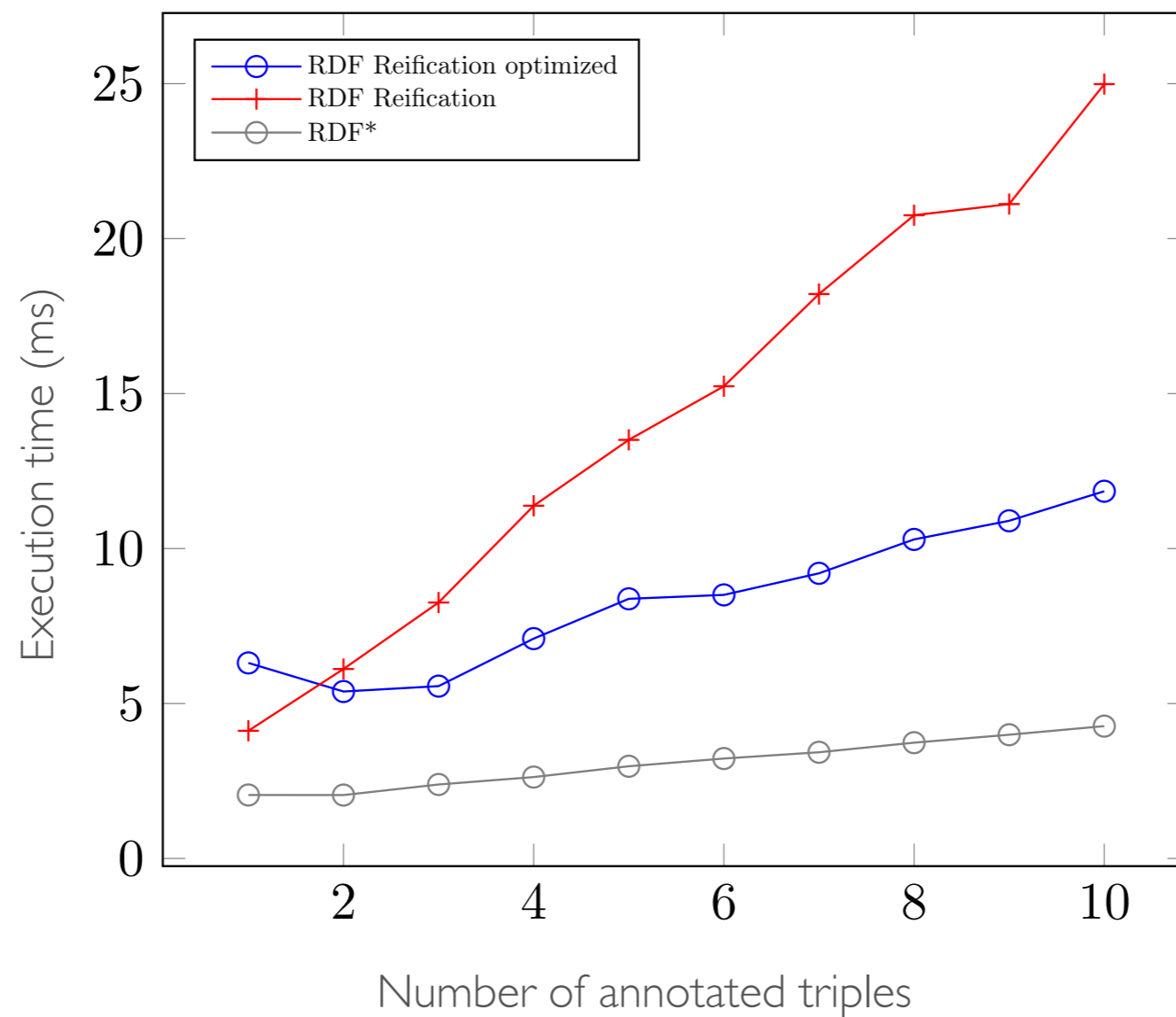
```
# Trig*
_:g0 {
  << <observation/0> <value> <value/0> >> <confidence> "0.84"^^xsd:float .
}

# Trig reification
_:g0 {
  <observation/0> <value> 0 .
  [] a rdf:Statement ;
  rdf:subject <observation/0> ;
  rdf:predicate <value> ;
  rdf:object 0 ;
  <confidence> "0.84"^^xsd:float .
}
```

SERIALIZATION OVERHEAD



QUERY EXECUTION PERFORMANCE



CONTRIBUTIONS

- Conceptual extension of RSP-QL
- Formal definitions of the proposed approach
- Prototype implementation
- Evaluation
- Foundation for future research

EXTRA

RDF*

An *RDF** triple is defined recursively as:

- any RDF triple is an *RDF** triple, and;
- any *RDF** triple with an *RDF** triple in the subject or object position is an *RDF** triple

TRIPLE* PATTERN

A *triple** pattern is defined recursively as:

- any triple pattern is a *triple** pattern, and;
- any *triple** pattern with a *triple** pattern in the subject or object position is a *triple** pattern

(SINGLE-STATEMENT) NAMED GRAPHS

```
:g1 { :bob foaf:age 23 } .  
:g1 ex:certainty 0.9 .
```

SINGLETON PROPERTIES

```
:bob foaf:age#1 23 .  
foaf:age#1 rdf:singletonPropertyOf foaf:age .  
foaf:age#1 ex:certainty 0.9 .
```