COMP318

Ontologies and Semantic Web

RDF - Part 11

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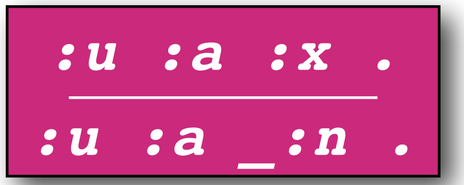
Where were we

- RDFS schema language
  - RDFS and entailment

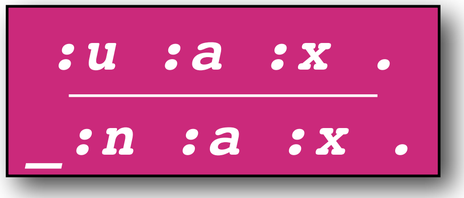
Simple entailment deduction rules

- If the triple `:u, :a, :x` is valid, then we can entail that the triple `:u, :a, _:n` is valid



se1

- If the triple :u, :a, :x is valid, then we can entail that the triple _:n, :a, :x is valid



se2

Formalism

:a, :b, refer to any arbitrary URI

:u, :v, refer to any arbitrary URI or blank node ID

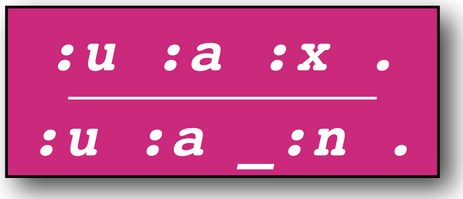
:x, :y, refer to any arbitrary URI, blank node ID or literal

_:n, refer to the ID of a blank node

:l, refers to a literal

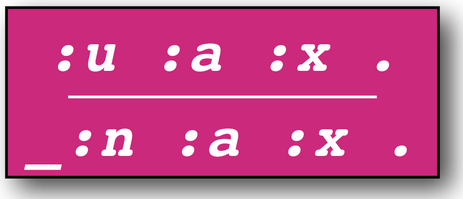
Simple entailment deduction rules

- URIs are all treated equally
  - we can decide whether a graph entails by applying the following rules se1 and se2 and adding the resulting triples to the original graph



se1

*I.e. if you have an **object**, you can derive a **blank node for that object**, as long as the **subject and predicate** stay the same.*



se2

*I.e. if you have a **subject**, you can derive a **blank node for that subject**, as long as the **object and predicate** stay the same.*

Simple entailment deduction rules

- A graph G1 simply entails a graph G2, if G1 can be extended to a graph G’1 by virtue of the rules se1 and se2 such that G2 is contained in G’1
  - G2 ⊆ G’1

Note

- se1 and se2 effectively “weaken” the subject and the object of the triples they are applied
  - by applying se2 to the triple

we derive that

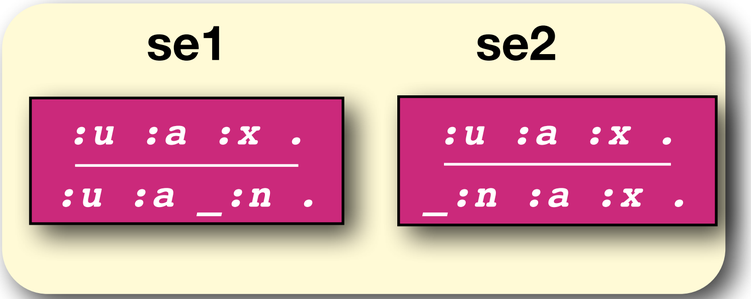
```
ex1:john   ex1:hasWife  ex1:mary
```

```
_:n   ex1:hasWife  ex1:mary
```

- “john hasWife mary” is weakened into the statement “someone hasWife mary” (i.e. mary is a wife)

- se1and se2 can be safely applied only if the blank node `_:n` that is being introduced was not already present in the graph. If `_:n` was already introduced, then the rules can be used only to assign `_:n` with the same resource that which it was originally assigned

Example



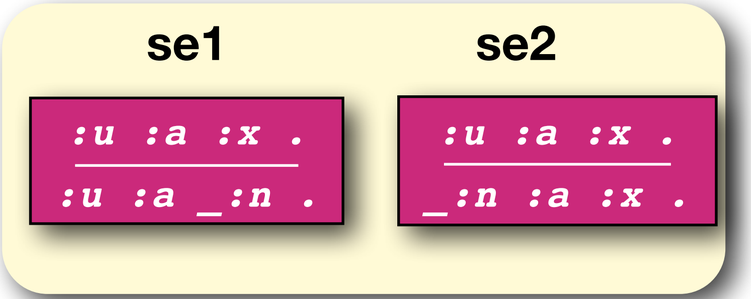
- Let's consider the graph G_1

```
book:uri  ex:publishedBy  crc:uri .
book:uri  ex:title        "SW Technologies" .
crc:uri   ex:name         "CRC Press" .
```

- Let's see if G_1 entails the graph G_2 below

```
book:uri  ex:publishedBy _:blank1 .
_:blank1     ex:name   _:blank2 .
_:blank1     ex:name   "CRC Press" .
```

Example



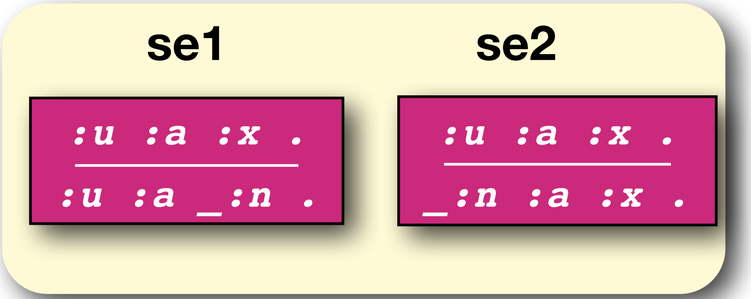
- Let's consider the graph G_1

```
book:uri  ex:publishedBy  crc:uri .
book:uri  ex:title        "SW Technologies" .
crc:uri   ex:name         "CRC Press" .
```

- We need to find out whether (and if so, how) the deduction rules se1 and se2 can be applied to G_1 to produce a graph G_1' that contains G_2

```
book:uri  ex:publishedBy _:blank1 .
_:blank1     ex:name   _:blank2 .
_:blank1     ex:name   "CRC Press" .
```

Example



- By applying se1 to the first triple in G_1 we add a triple with a blank node to the graph

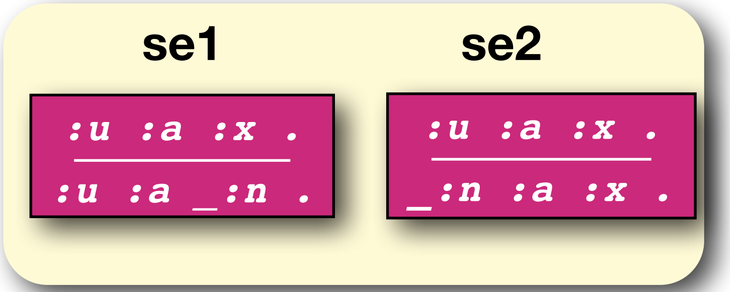
```
book:uri   ex:publishedBy   _:blank1 .
```

- By applying se2 to crc:uri ex:name “CRC Press” we can add the triple

```
_:blank1    ex:name  “CRC Press” .
```

  - note that the empty node referenced by _:blank1 has been introduced by rule se1 exactly for crc:uri (and no other URI)

Example



- Finally, by applying se1 to the triple just generated we obtain

```
_:blank1    ex:name   "CRC Press" .
_:blank1    ex:name   _:blank2 .
```

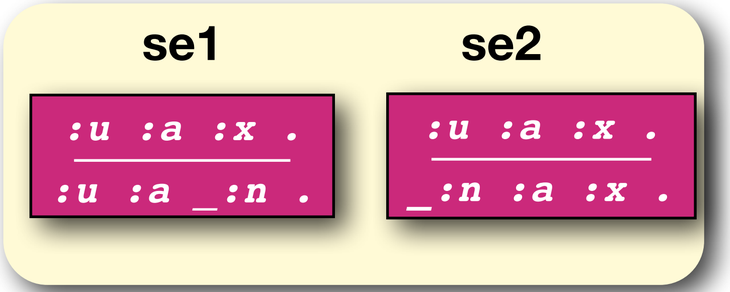
- so we now have

Original Triples

Derived Triples

```
book:uri  ex:publishedBy  crc:uri .
book:uri  ex:title        "SW Technologies" .
crc:uri   ex:name         "CRC Press" .
book:uri  ex:publishedBy  _:blank1 .
_:blank1  ex:name         _:blank2 .
_:blank1  ex:name         "CRC Press" .
```

Example



- G_2

```
book:uri  ex:publishedBy _:blank1 .
_:blank1     ex:name  _:blank2 .
_:blank1     ex:name  “CRC Press” .
```

- is contained in G'_1 and therefore G_1 entails G_2
-

Original Triples

Derived Triples

```
book:uri  ex:publishedBy  crc:uri .
book:uri  ex:title        “SW Technologies” .
crc:uri   ex:name         “CRC Press” .
book:uri  ex:publishedBy  _:blank1 .
_:blank1  ex:name         _:blank2 .
_:blank1  ex:name         “CRC Press” .
```

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End of RDF - Part 11

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