Uncertainty … ?

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Karsten Tolle and David Wigg-Wolf

Archaeologists of the ancient world try to reconstruct what happened over 1500 or more years ago. Therefore, uncertainty plays an important role. Many artefacts may not be well preserved but still be highly relevant for the overall puzzle. However, uncertain information must be identified as such in order to prevent conclusions that are based on uncertain information, and then taken as certain. Uncertain information is of great importance for building hypotheses. But to prove a hypothesis you need to ensure that the data is certain.

In our presentation we show how we enter and store uncertain information within our system AFE (Antike Fundmünzen Europa). We concentrate on the attribute “Issuer” for a coin, where we allow different uncertainty levels. This includes the front-end view as well as the relational representation we use for these levels.

The more important, second part of the presentation deals with the representation of uncertainty within ontologies or other structures for exchanging data (which in the end is the overall goal of ECFN – to be able to exchange the numismatic data of different systems without losing important information, such as how certain it is). Surprisingly, many existing approaches in our domain do not handle uncertainty at all. The presentation provides and discusses different approaches as to how uncertainty could be modelled for our needs.

Real World

Entering „Real World“ into
AFE Front-End Form by
Expert (Numismatist)

Real World

System

AFE Front-End Form

mapping into
Backend-System

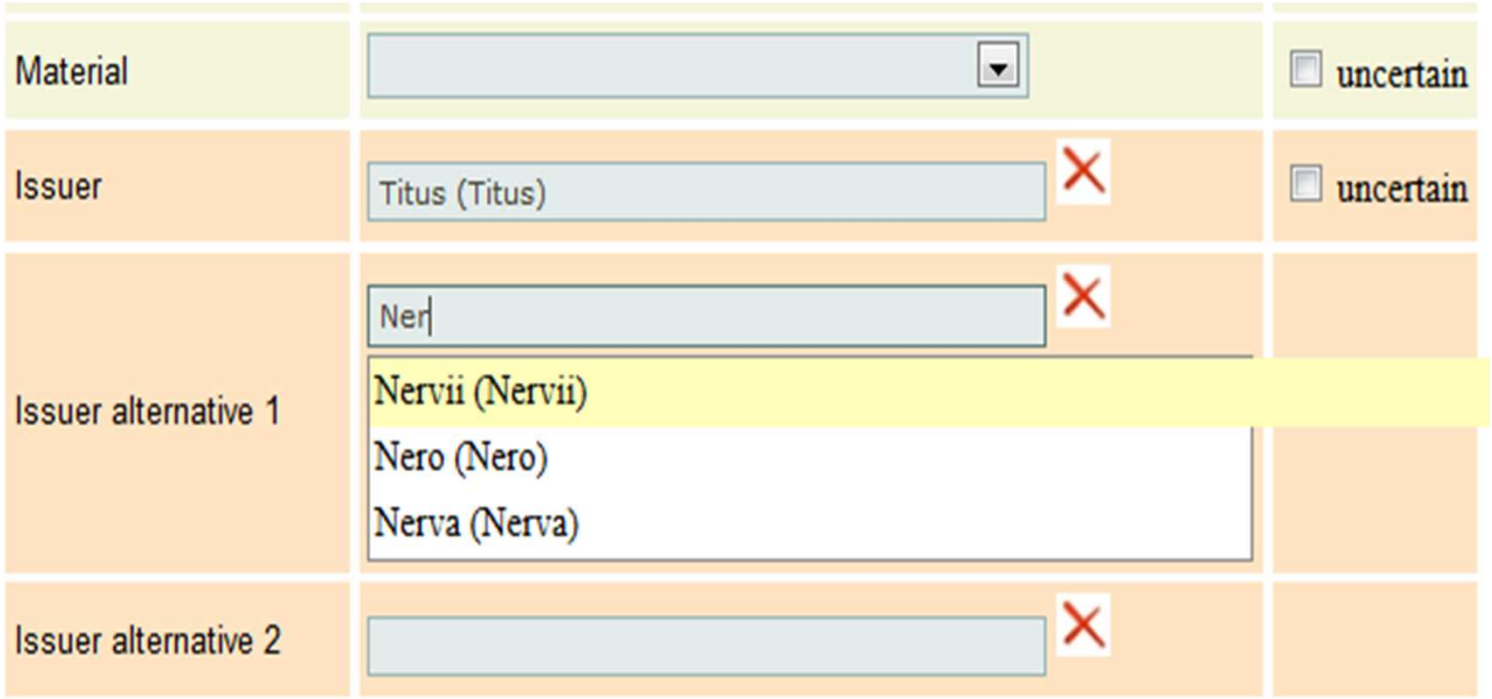
AFE-DB

Backend-System
(in our case a relational DB)

Important to agree on!

Model
(for exchange)

mapping into
Exchange Model


Material
uncertain
Issuer
Titus (Titus)
uncertain
Issuer alternative 1
Ner
Nervii (Nervii)
Nero (Nero)
Nerva (Nerva)
Issuer alternative 2

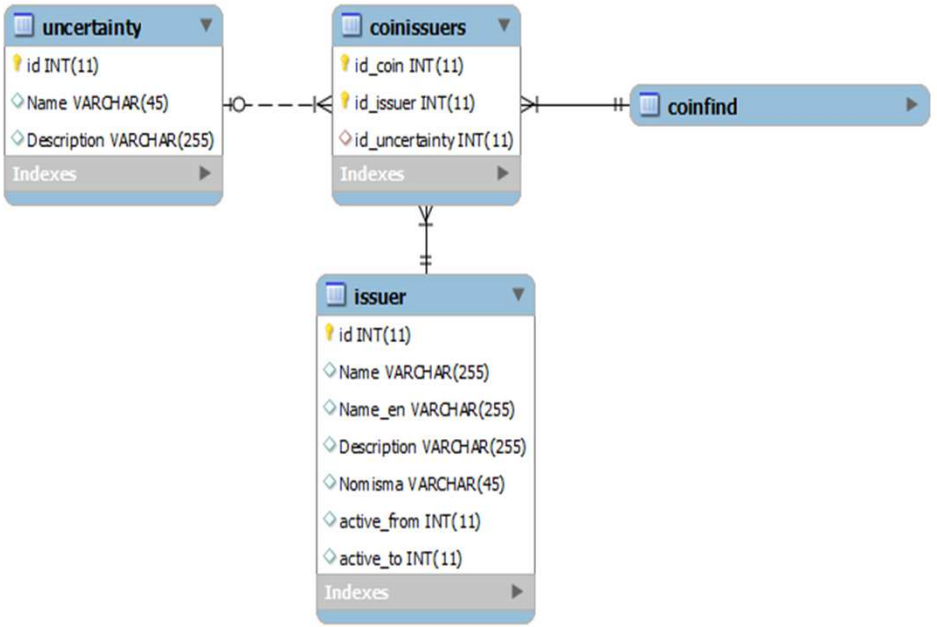
Uncertainty Cases in AFE

Case Name	Description
Certain	The portrayed person on the coin is clearly identifiable.
One Uncertain	The portrayed person on the coin is NOT clearly identifiable. The expert has one candidate he favors.
Alternative	The portrayed person on the coin is NOT clearly identifiable. The expert can name more than one candidate for the portrayed person (and nobody else).
Alternative Uncertain	The portrayed person on the coin is NOT clearly identifiable. The expert can name more than one candidate for the portrayed person, but it could also be somebody else.
Uncertain	The portrayed person on the coin is NOT clearly identifiable and the expert is not capable to reduce the possibilities in a solid way.

```
1  SELECT ci.id_coin,
2  ci.id_issuer,
3  u.Name as "Uncertainty Case"
4  FROM afe.coinissuers ci, afe.uncertainty u
5  where ci.id_uncertainty = u.id;
```

Set Filter: Export: Wrap Cell Con

id_coin	id_issuer	Uncertainty Case
1670	131	alternative
1670	154	alternative
1672	131	alternative
1672	154	alternative
1674	131	alternative
1674	154	alternative
177	6	uncertain and alternative
177	14	uncertain and alternative
210	6	uncertain and alternative



Existing Ontologies/Models …

CIDOC-CRM: Does not deal with uncertainty!

EDM and ESE: Do not deal with uncertainty!

Nomisma.org:

Nomisma.org: [home] [sparql] [apis] [flickr machine tags] [all ids] "Common currency for digital numismatics."

uncertain_value (nomisma_id)
- skos:prefLabel: Uncertain value (en)
- skos:definition: A value that is poorly known. Such as the location of a mint that is not known with confidence. (en)
- skos:prefLabel: Unsicherer Wert (de)
- skos:prefLabel: Valeur incertaine (fr)
- skos:prefLabel: Valoare necunoscută (ro)
- skos:prefLabel: Неопределенное достоинство (ru)
- skos:prefLabel: Onzekere waarde (nl)
- skos:prefLabel: Valore incerto (it)
- skos:prefLabel: Αβέβαιη αξία (el)
- skos:prefLabel: несигурна стойност (bg)

SKOS: For mapping – has some uncertain levels included!
skos:broadMatch, skos:closeMatch, skos:exactMatch

Existing Ontologies/Models …

W3C Incubator Group Report

Uncertainty Reasoning for the World Wide Web

W3C Incubator Group Report 31 March 2008

This version:
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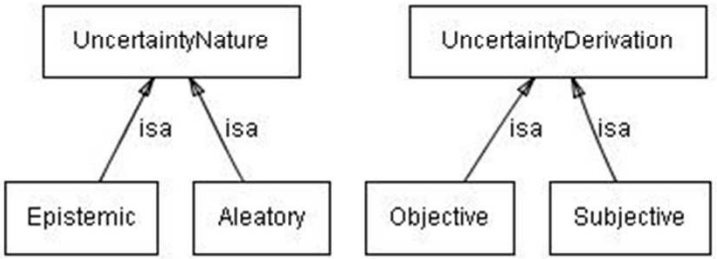
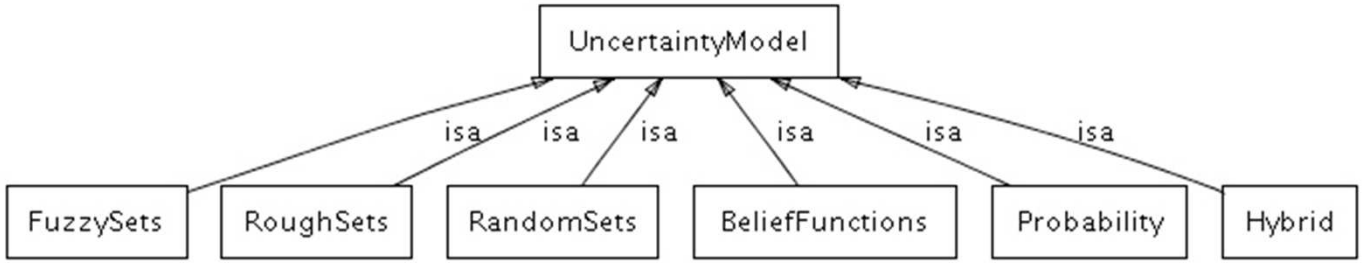
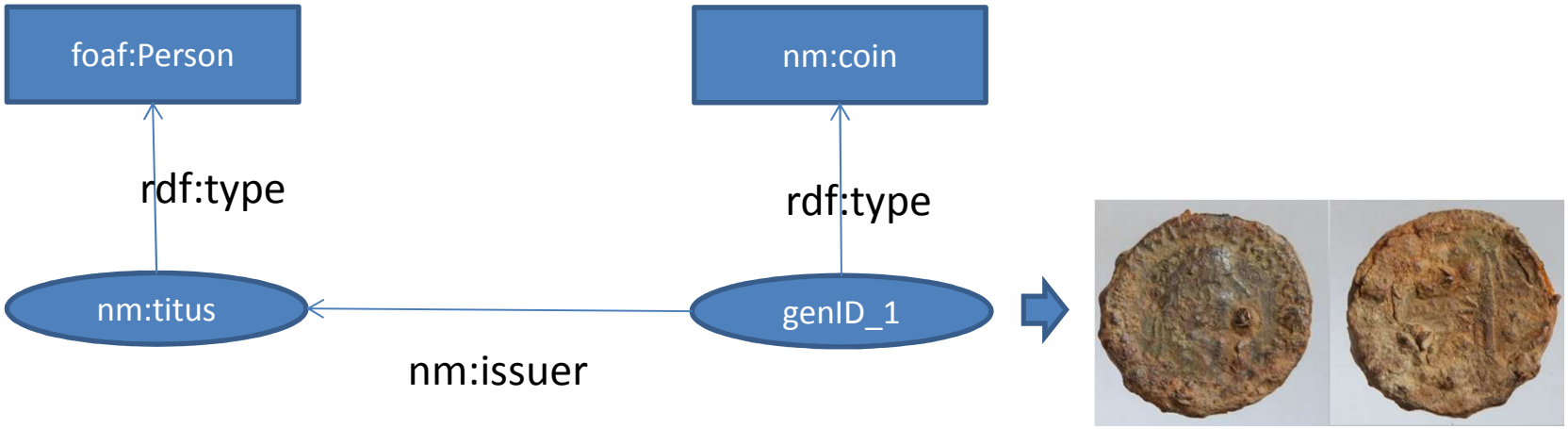




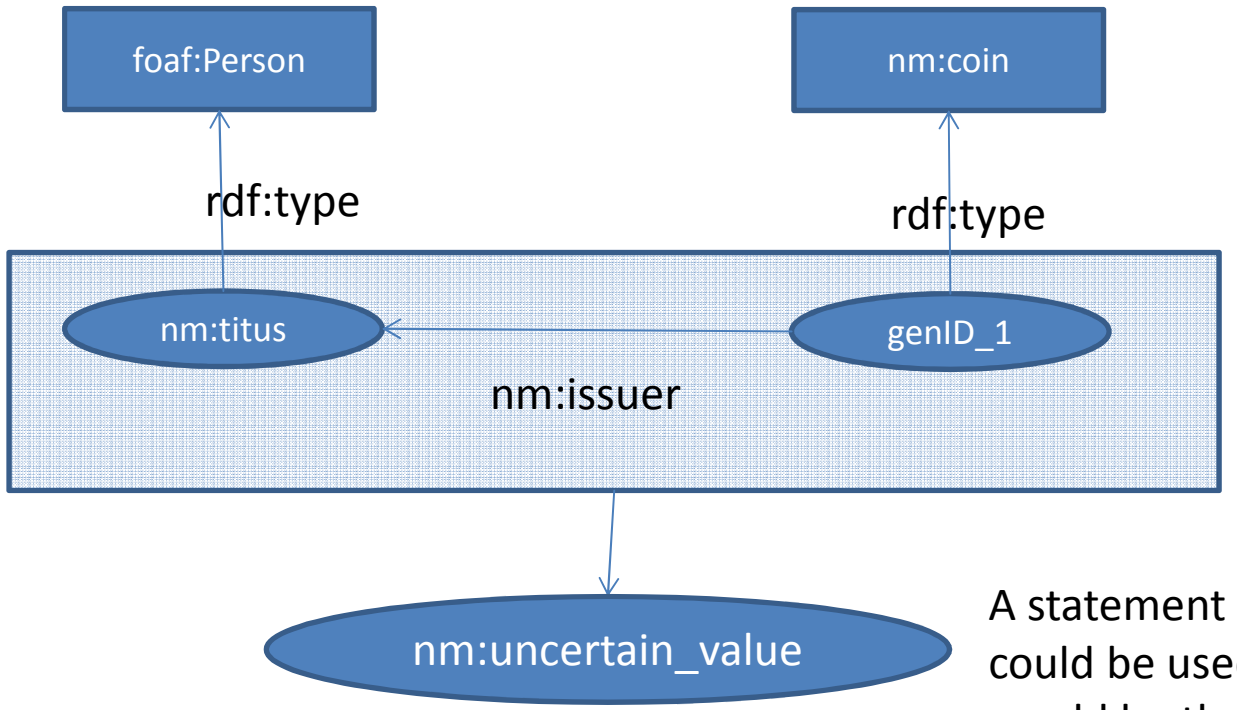
In a graph: The issuer of a coin is Titus!



Tasks:

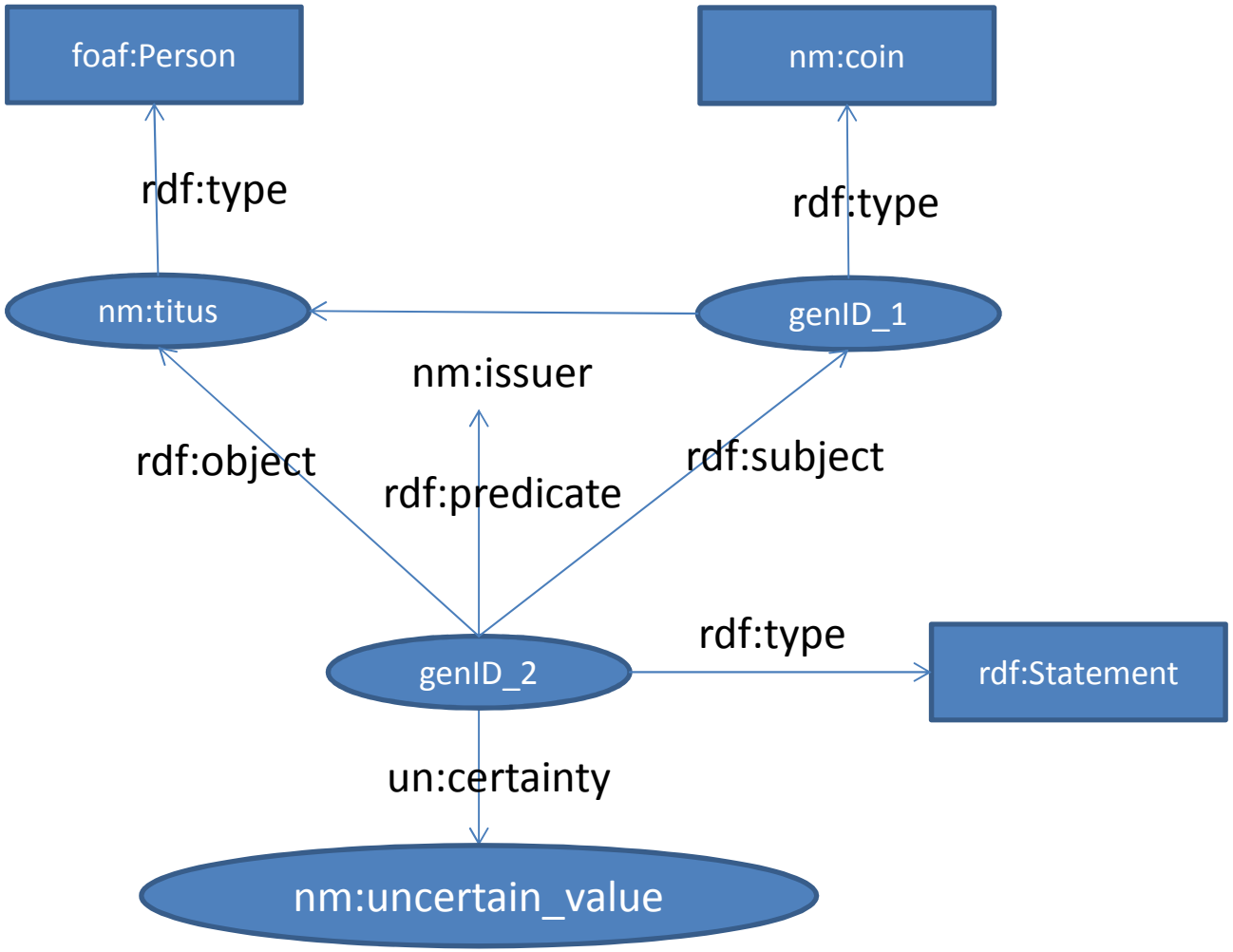
- We need to define:
  - Which level of uncertainty should be supported in the exchange model?
  - How should this be modelled?
  - … Note: Some attributes have additional characteristics: geo positioning has precision!

In a graph: The issuer of a coin is Titus! … but I am uncertain!
Version 1: reified statement



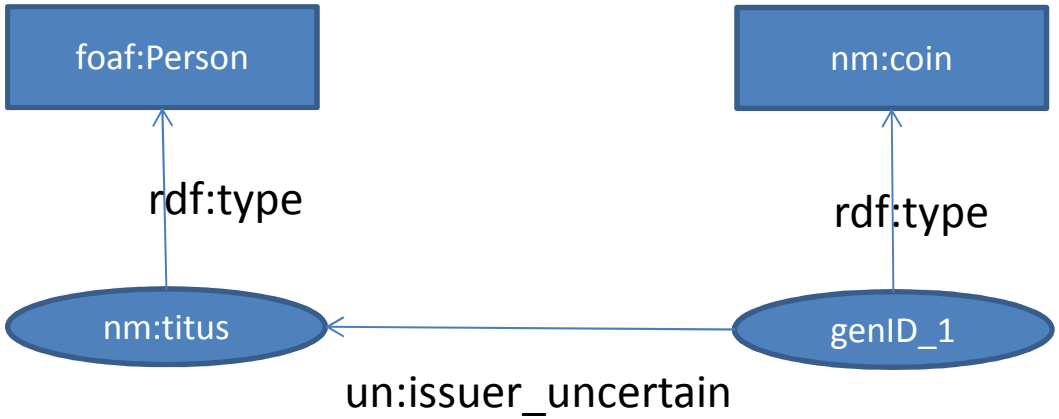
A statement about a statement could be used. The drawback here would be the explosion of triples. In fact it would look like in the following figure!

How I would model: The issuer of a coin is Titus! … but I am uncertain!
Version 1:



Triple Explosion!

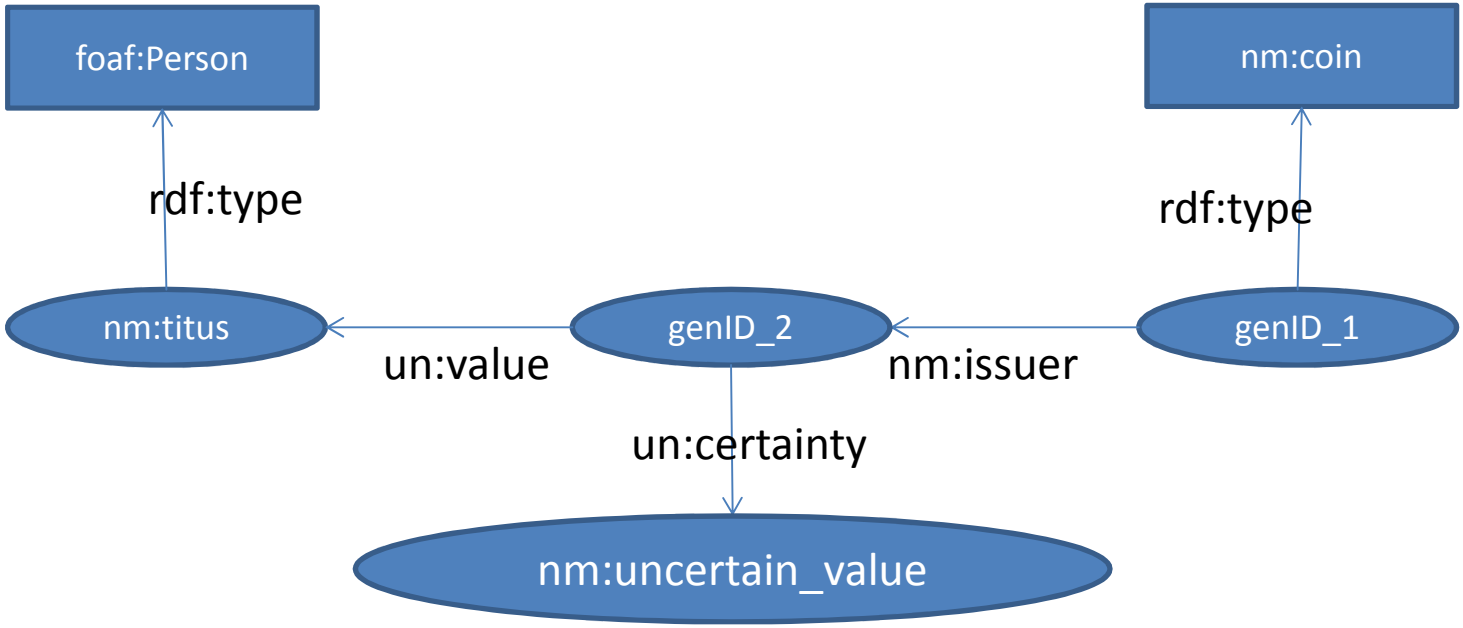
How I would model: The issuer of a coin is Titus! … but I am uncertain!
Version 2: … in order to avoid triple explosion special properties could be used!



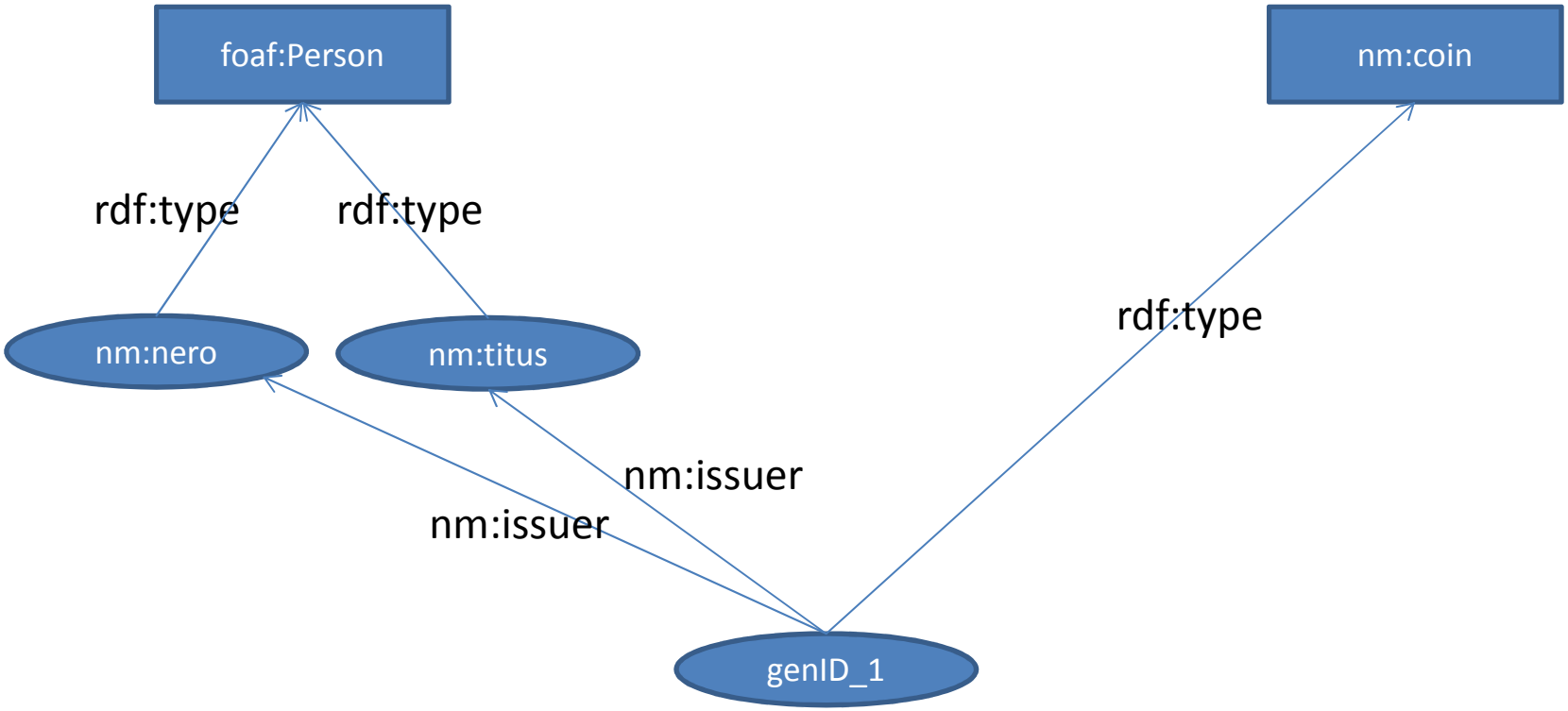
Defining un:issuer_uncertain as subproperty of nm:issuer!

Properties Explosion!

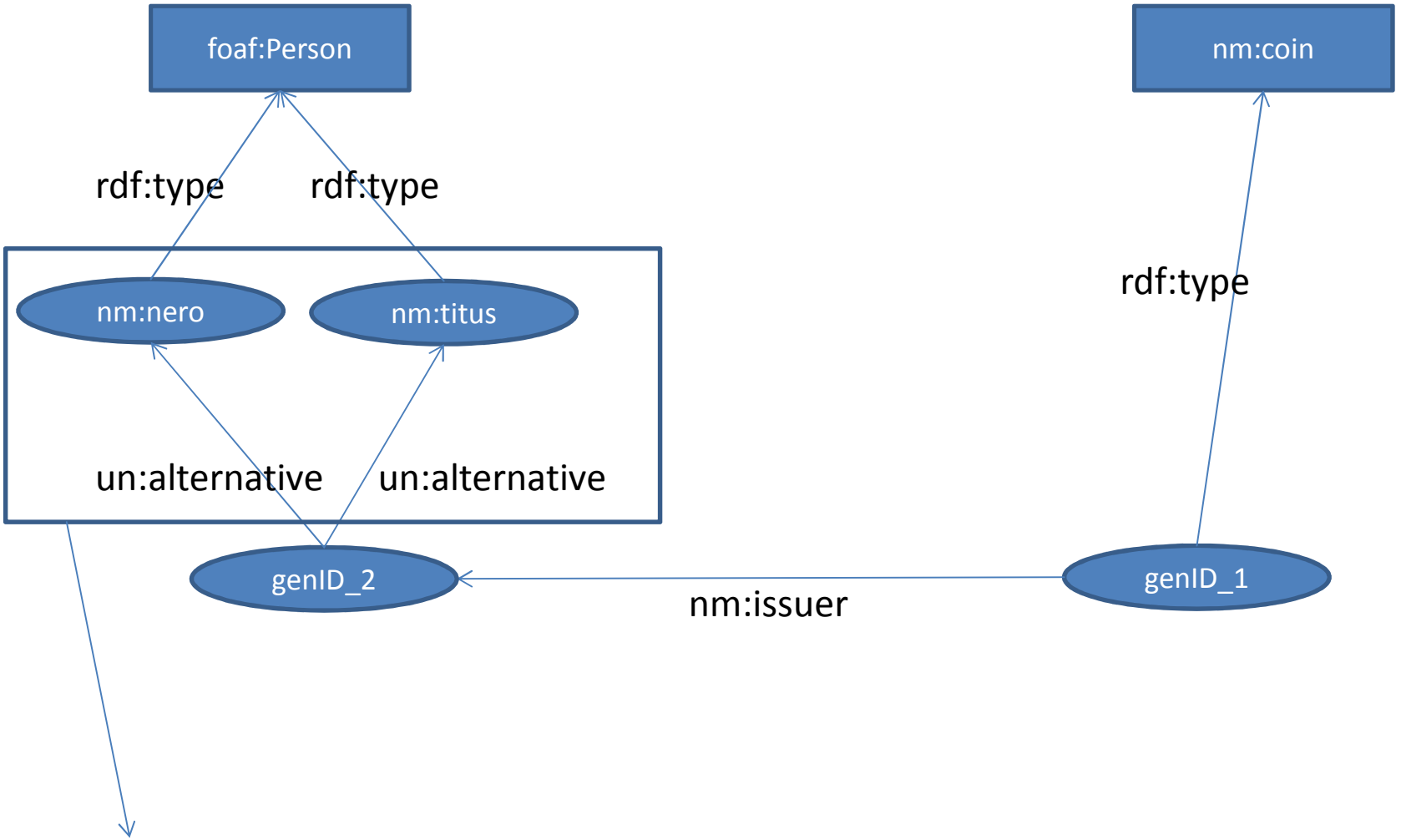
How I would model: The issuer of a coin is Titus! … but I am uncertain!
Version 3: … to avoid additional properties!



How I would model: The issuer of a coin is either Titus or Nero!
Version 1:



How I would model: The issuer of a coin is either Titus or Nero!
Version 2:



Could also be done with a List, Bag or Alternative that are defined in RDF!

Thank you for listening!