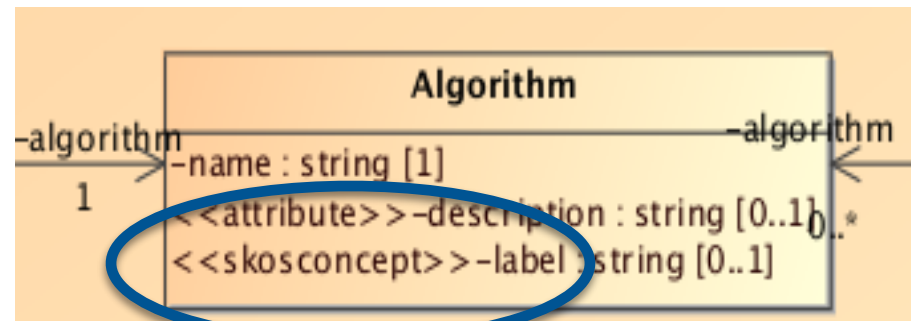# Theory Vocabularies

Franck Le Petit, Nicolas Moreau, David Languignon,
Zakaria Meliani, Emeric Bron, Hervé Wozniak

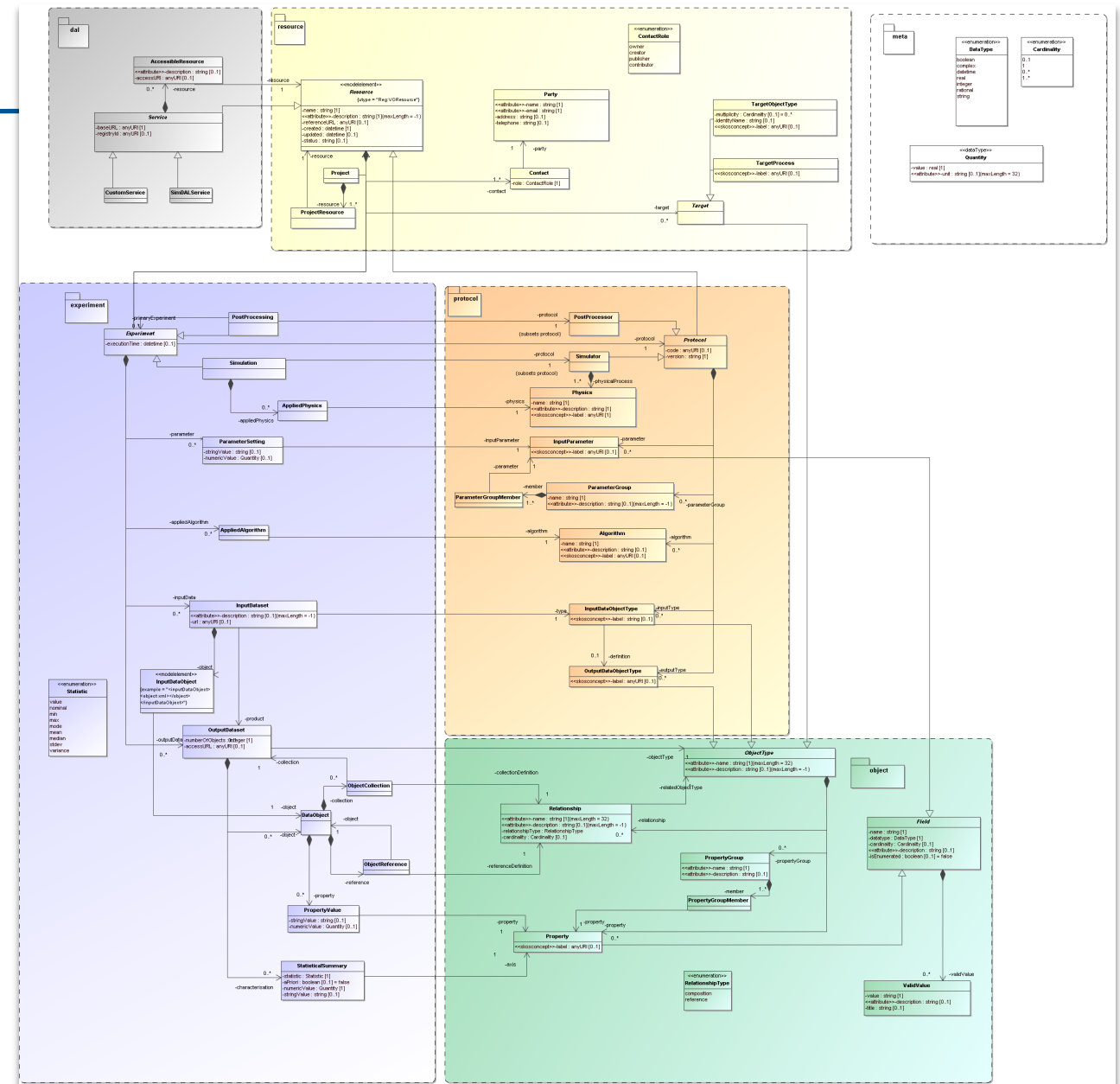# Simulation Data Model (SimDM)

Skos concept attribute

- **SKOS** (Simple Knowledge Organization System) is a W3C standard using the Resource Description Framework (RDF)

- Recommended by the semantic IVOA WG

- Used in the Simulation Data Model to tag concepts

Several vocabularies

- **Algorithms**
  Ex: Runge-Kutta, Burlish-Stoer, …

- **Physical processes**
  Ex: turbulence, gravitation, …

- **Physical quantities**
  Ex: Velocity, Mass, …

~ 700 concepts

- **Data Objects Types**
  Ex: mesh cell, …

- **Astronomical Objects**
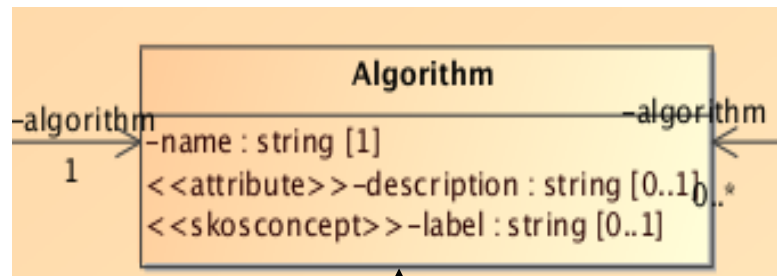 ➔ comes from the OWL thesaurus developed by Semantics W.G. (S. Derrière)

SKOS Concepts

Each concept is <u>identified</u> by a **persistent URI**

http://purl.obspm.fr/vocab/Algorithms/ForwardTimeCentralSpace

Pref: Forward-Time Central Space
ALT: FTCS
Broader: Finite Difference
Related: Lax-Friedrichs

Forward-Time Central-Space

Finite difference method used to solve parabolic partial differential equations. The method is first-order, explicit and conditionally stable ("Computational Fluid Mechanics and Heat Transfer 2nd ed.", John C. Tannehill, Dale A. Anderson, Richard H. Pletcher, 1997).

http://purl.obspm.fr/vocab/Algorithms/ForwardTimeCentralSpace

AltLabels
FTCS (en)

Broader concepts
Algorithm
Finite Difference

Broader Transitive concepts
Algorithm
Finite Difference

Related concepts
Lax-Friedrichs

Persistent URI

○ Until 2016, we used **purl.org**

○ We have created our own PURLS :
 – purl.obspm.fr

○ Naming pattern is :

 •http://purl.obspm.fr/ConceptName

○ ConceptName is prefLabel value

① Need to change: remove the *obspm* ⟶ IVOA
• Identify the **official** vocabularies with **IVOA domain**
• Independent of the place where vocabularies are developed

② Semantics W.G. wants to publish IVOA vocabularies on a web page

ivoa.net/vocabularies

Actions done

① All URIs of Theory vocabularies have been changed in:

ivoa.net/vocabularies/theory/Vocabulary/Concept

② Can provide vocabulary files to be published on Semantics dedicated page

Official vocabularies for Theory at: ivoa.net/rdf

Example of vocabularies:

```xml
<?xml version="1.0" encoding="UTF-8"?>
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  xmlns:skos="http://www.w3.org/2004/02/skos/core#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">
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  <skos:prefLabel xml:lang="en">Algorithm</skos:prefLabel>
  <skos:definition xml:lang="en">Vocabulary top concept</skos:definition>
  <skos:inScheme rdf:resource="http://ivoa.net/vocabularies/theory/Algorithms/Scheme"/>
  <skos:narrower rdf:resource="http://ivoa.net/vocabularies/theory/Algorithms/AlternatingDirectionImplicit"/>
  <skos:narrower rdf:resource="http://ivoa.net/vocabularies/theory/Algorithms/AdaptiveMeshRefinement"/>
  <skos:narrower rdf:resource="http://ivoa.net/vocabularies/theory/Algorithms/CrankNicolson"/>
  <skos:narrower rdf:resource="http://ivoa.net/vocabularies/theory/Algorithms/Euler"/>
  <skos:narrower rdf:resource="http://ivoa.net/vocabularies/theory/Algorithms/EscapeProbability"/>
  <skos:narrower rdf:resource="http://ivoa.net/vocabularies/theory/Algorithms/ExactRadiativeTransferMethod"/>
  <skos:narrower rdf:resource="http://ivoa.net/vocabularies/theory/Algorithms/FastMultipoleMethod"/>
  <skos:narrower rdf:resource="http://ivoa.net/vocabularies/theory/Algorithms/FiniteVolume"/>
  <skos:narrower rdf:resource="http://ivoa.net/vocabularies/theory/Algorithms/FokkerPlanckSolver"/>
  <skos:narrower rdf:resource="http://i...
```

```xml
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  <skos:prefLabel xml:lang="en">Fourier Technique</skos:prefLabel>
  <skos:inScheme rdf:resource="http://ivoa.net/vocabularies/theory/Algorithms/Scheme"/>
  <skos:narrower rdf:resource="http://ivoa.net/vocabularies/theory/Algorithms/ParticleMesh"/>
  <skos:narrowerTransitive rdf:resource="http://ivoa.net/vocabularies/theory/Algorithms/ParticleParticleParticleMes
  <skos:broader rdf:resource="http://ivoa.net/vocabularies/theory/Algorithms/Algorithm"/>
</skos:Concept>
<skos:Concept rdf:about="http://ivoa.net/vocabularies/theory/Algorithms/Godunov">
  <skos:prefLabel xml:lang="en">Godunov</skos:prefLabel>
  <skos:definition xml:lang="en">Finite volume method</skos:definition>
  <skos:inScheme rdf:resource="http://ivoa.net/vocabularies/theory/Algorithms/Scheme"/>
  <hasVersion xmlns="http://purl.org/dc/terms/" rdf:datatype="http://www.w3.org/2001/XMLSchema#int">1</hasVersion>
  <skos:broader rdf:resource="http://ivoa.net/vocabularies/theory/Algorithms/Algorithm"/>
  <skos:broader rdf:resource="http://ivoa.net/vocabularies/theory/Algorithms/FiniteVolume"/>
  <skos:broaderTransitive rdf:resource="http://ivoa.net/vocabularies/theory/Algorithms/Algorithm"/>
  <skos:broaderTransitive rdf:resource="http://ivoa.net/vocabularies/theory/Algorithms/FiniteVolume"/>
</skos:Concept>
```

```
  <skos:narrower rdf:resource="http://ivoa.net/vocabularies/theory/Algorithms/ParticleInCell"/>
  <skos:narrower rdf:resource="http://ivoa.net/vocabularies/theory/Algorithms/PiecewiseParabolicMethod"/>
  <skos:narrower rdf:resource="http://ivoa.net/vocabularies/theory/Algorithms/PiecewiseLinearMethod"/>
```

Website at Paris Observatory

Discover concepts and relations:

This service is dedicated to scientists and VO developers who wish to publish theoretical services described by the Simulation DataModel.

As described in the IVOA standard, Simulation Data Model, registrations of theoretical services, require to provide several URIs corresponding to semantics keywords describing services and simulations. VO-Theory concepts are based on SKOS description as recommended by the IVOA Semantic Working Group.

This website is dedicated to the discovery of these URIs. Navigate through the broader, narrower, related terms to discover the most precise concept you wish.

To suggest new concepts or corrections, contact : support.votheory@obspm.fr.

Search concepts

David Languignon [1], Franck Lepetit [1], Nicolas Moreau [1], Zakaria Meliani [2], Fabrice Roy [2], Norman Gray [3], Sebastien Derriere [4], Carlos Rodrigo [5],

[1]LERMA - Obs. Paris,[2]LUTH - Obs. Paris,[3]University of Glasgow,[4]Centre de Données astronomiques de Strasbourg,[5]CAB/INTA-CSIC/SVO

Website at Paris Observatory

Discover concepts and relations:

Website at Paris Observatory

Discover concepts and relations:

This XML file does not appear to have any style information associated with it. The document tree is shown below.

```xml
<rdf:RDF xmlns:skos="http://www.w3.org/2004/02/skos/core#" xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#" xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">
  <skos:Concept rdf:about="http://purl.obspm.fr/vocab/Algorithms/CoupledEscapedProbability">
    <skos:prefLabel xml:lang="en">Coupled Escaped Probability</skos:prefLabel>
    <skos:definition xml:lang="en">
      Exact method for line radiative transfer ("A new exact method for line radiative transfer", Elitzur, M., & Asensio Ramos, A. 2006, MNRAS, 365, 779).
    </skos:definition>
    <hasVersion xmlns="http://purl.obspm.fr/dc/terms/" rdf:datatype="http://www.w3.org/2001/XMLSchema#int">8</hasVersion>
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    <skos:altLabel xml:lang="en">CEP</skos:altLabel>
    <skos:broader rdf:resource="http://purl.obspm.fr/vocab/Algorithms/Algorithm"/>
    <skos:broader rdf:resource="http://purl.obspm.fr/vocab/Algorithms/EscapeProbability"/>
    <skos:broaderTransitive rdf:resource="http://purl.obspm.fr/vocab/Algorithms/Algorithm"/>
    <contributor xmlns="http://purl.obspm.fr/dc/terms/">roy</contributor>
    <creator xmlns="http://purl.obspm.fr/dc/terms/">roy</creator>
    <created xmlns="http://purl.obspm.fr/dc/terms/" rdf:datatype="http://www.w3.org/2001/XMLSchema#dateTime">2010-09-14T14:12:43Z</created>
  </skos:Concept>
</rdf:RDF>
```

Note: purl.obspm.fr will be replaced by ivoa.net/vocabularies on this page

Redirection

IVOA

ivoa.net/rdf/theory

List of vocabularies:
- Algorithms
- Data Object Types
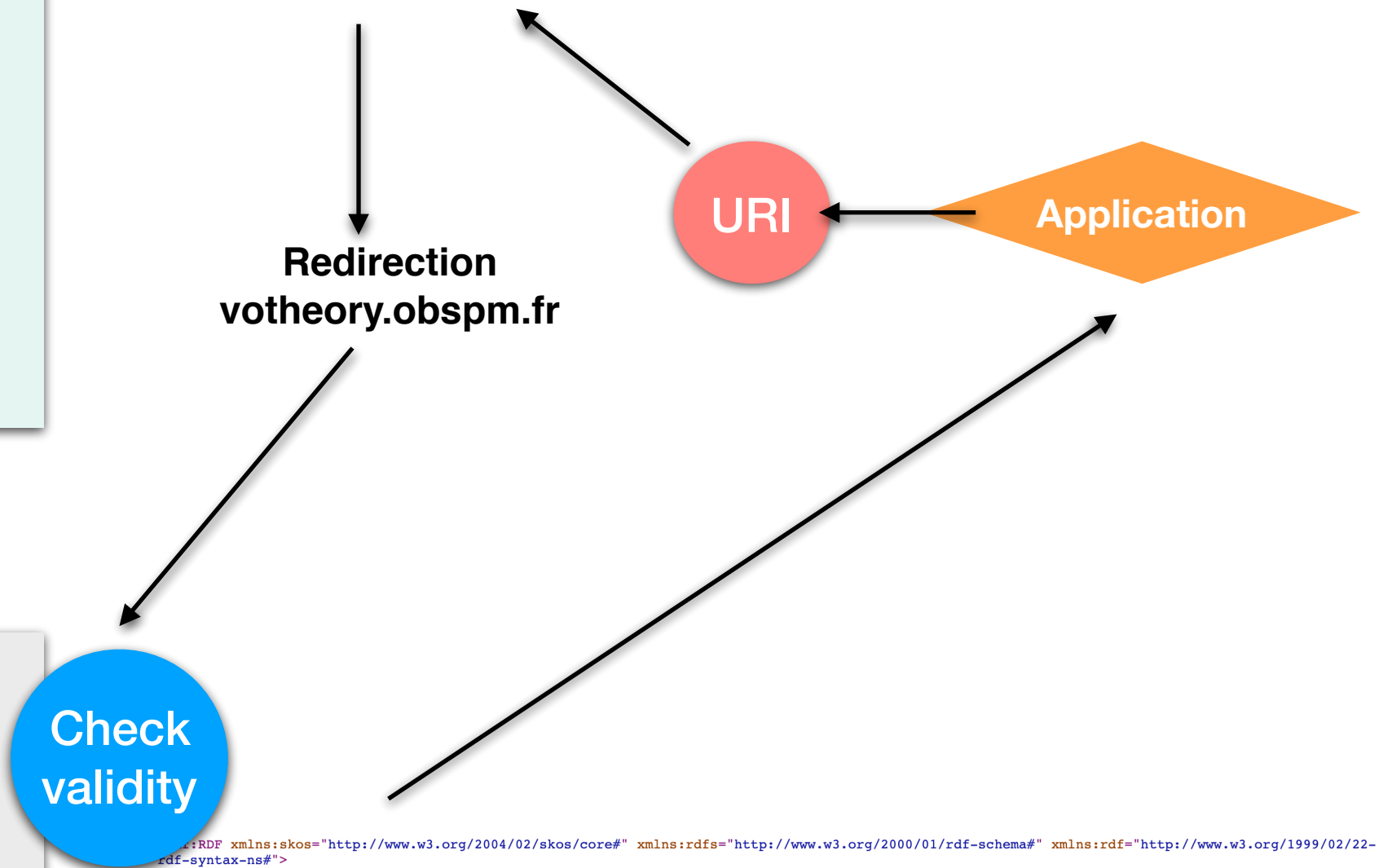- Physical processes
- Physical quantities
- Astronomical Objects

PARIS

http://votheory.obspm.fr

Copy of vocabularies
+ **application** to:
1 - discover concept
2 - navigation in relations
3 - check existence

Redirection

ivoa.net/rdf/theory

List of vocabularies:
• Algorithms
• Data Object Types
• Physical processes
• Physical quantities
• Astronomical Objects

ivoa.net/vocabularies/theory/Concept

Redirection
votheory.obspm.fr

URI

Application

http://votheory.obspm.fr

Copy of vocabularies
+ **application** to:
1 - discover concept
2 - navigation in relations
3 - check existence

Check validity

```
:RDF xmlns:skos="http://www.w3.org/2004/02/skos/core#" xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#" xmlns:rdf="http://www.w3.org/1999/02/22-
rdf-syntax-ns#">
▼<skos:Concept rdf:about="http://purl.obspm.fr/vocab/Algorithms/CoupledEscapedProbability">
    <skos:prefLabel xml:lang="en">Coupled Escaped Probability</skos:prefLabel>
  ▼<skos:definition xml:lang="en">
    Exact method for line radiative transfer ("A new exact method for line radiative transfer", Elitzur, M., & Asensio Ramos, A. 2006, MNRAS, 365,
    779).
  </skos:definition>
    <hasVersion xmlns="http://purl.obspm.fr/dc/terms/" rdf:datatype="http://www.w3.org/2001/XMLSchema#int">8</hasVersion>
    <modified xmlns="http://purl.obspm.fr/dc/terms/" rdf:datatype="http://www.w3.org/2001/XMLSchema#dateTime">2011-04-27T12:12:47Z</modified>
    <skos:altLabel xml:lang="en">CEP</skos:altLabel>
    <skos:broader rdf:resource="http://purl.obspm.fr/vocab/Algorithms/Algorithm"/>
    <skos:broader rdf:resource="http://purl.obspm.fr/vocab/Algorithms/EscapeProbability"/>
    <skos:broaderTransitive rdf:resource="http://purl.obspm.fr/vocab/Algorithms/Algorithm"/>
    <contributor xmlns="http://purl.obspm.fr/dc/terms/">roy</contributor>
    <creator xmlns="http://purl.obspm.fr/dc/terms/">roy</creator>
    <created xmlns="http://purl.obspm.fr/dc/terms/" rdf:datatype="http://www.w3.org/2001/XMLSchema#dateTime">2010-09-14T14:12:43Z</created>
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</rdf:RDF>
```