

Open Archives Initiative Object Reuse & Exchange

Abstract Data Model and Serialization

Carl Lagoze ⁽¹⁾

Pete Johnston, Michael Nelson, Robert Sanderson, Herbert Van de Sompel,
Simeon Warner

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Cornell University

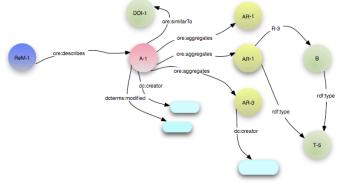
lagoze@cs.cornell.edu

<http://www.cs.cornell.edu/lagoze>



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April 4, 2008





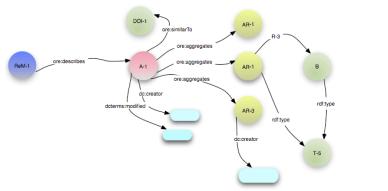
This Presentation

- OAI-ORE for the most of us
 - Abstract Data Model Basics
 - Aggregations
 - Resource Maps
 - Metadata
 - Aggregated Resource
 - Associating with similar resources
 - Relationships to other Resources
 - Using Atom to describe Aggregations

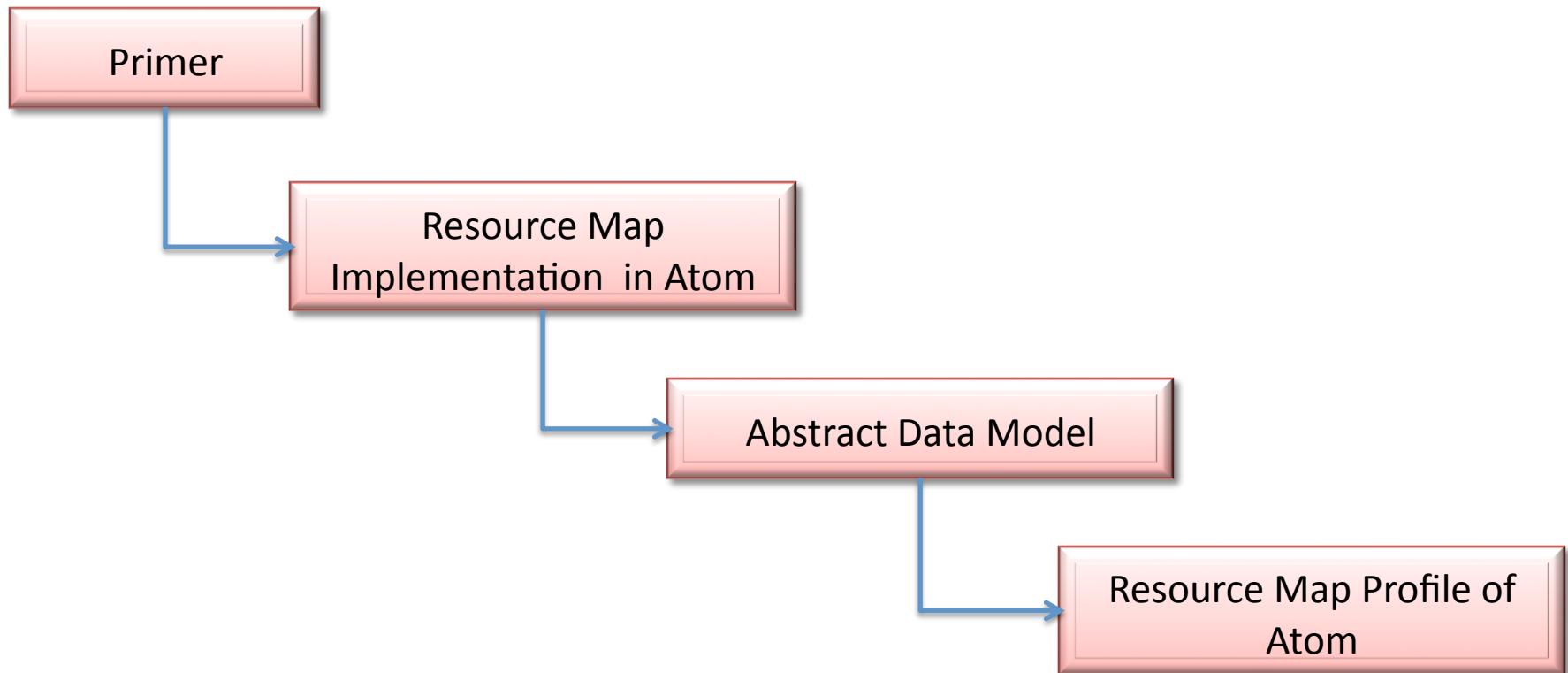


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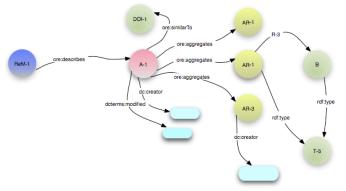


Document Chain



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Abstract Data Model

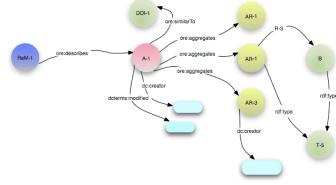
Why and What?

- Separation of concerns
 - Design
 - Implementation
- Provide basis for future implementations
 - Technology of the web (e.g. HTTP) will change over time
 - Other implementations are possible



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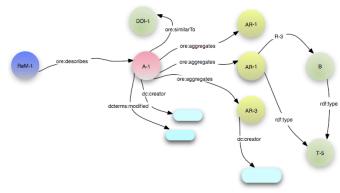
Requirements of the Model

- Aggregations
 - Both simple hierarchical and inter/intra related
 - Identification via URI
 - Metadata
- Resource Maps
 - Description of aggregations via a set of assertions
 - Identification via URI – independent of aggregation
 - Metadata
- Conformance to web architecture and RDF Semantics

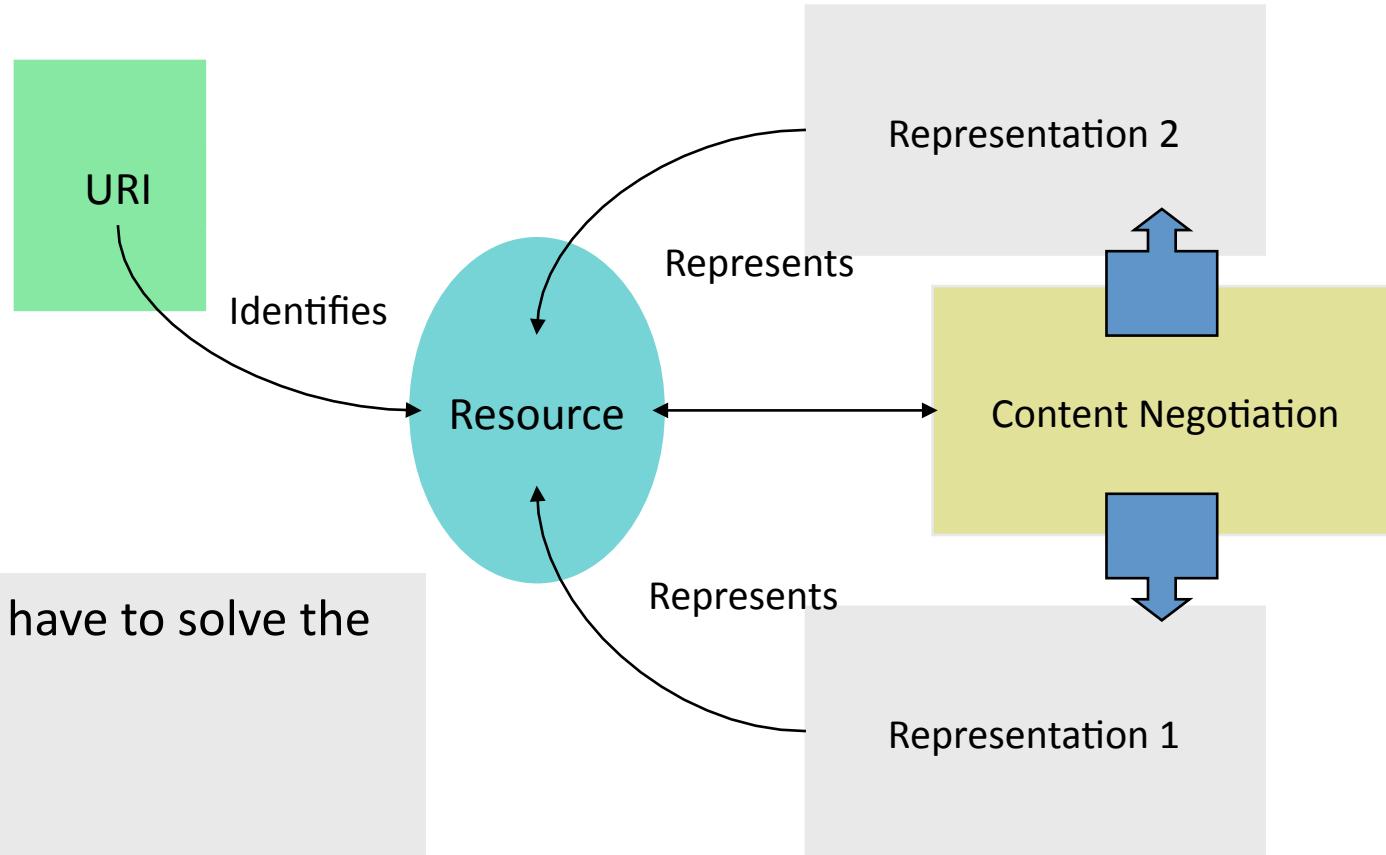


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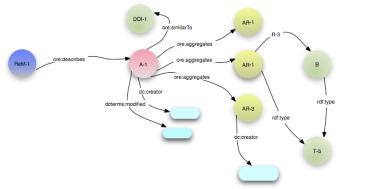
W3C Web Architecture



So, the tools we have to solve the problem are:

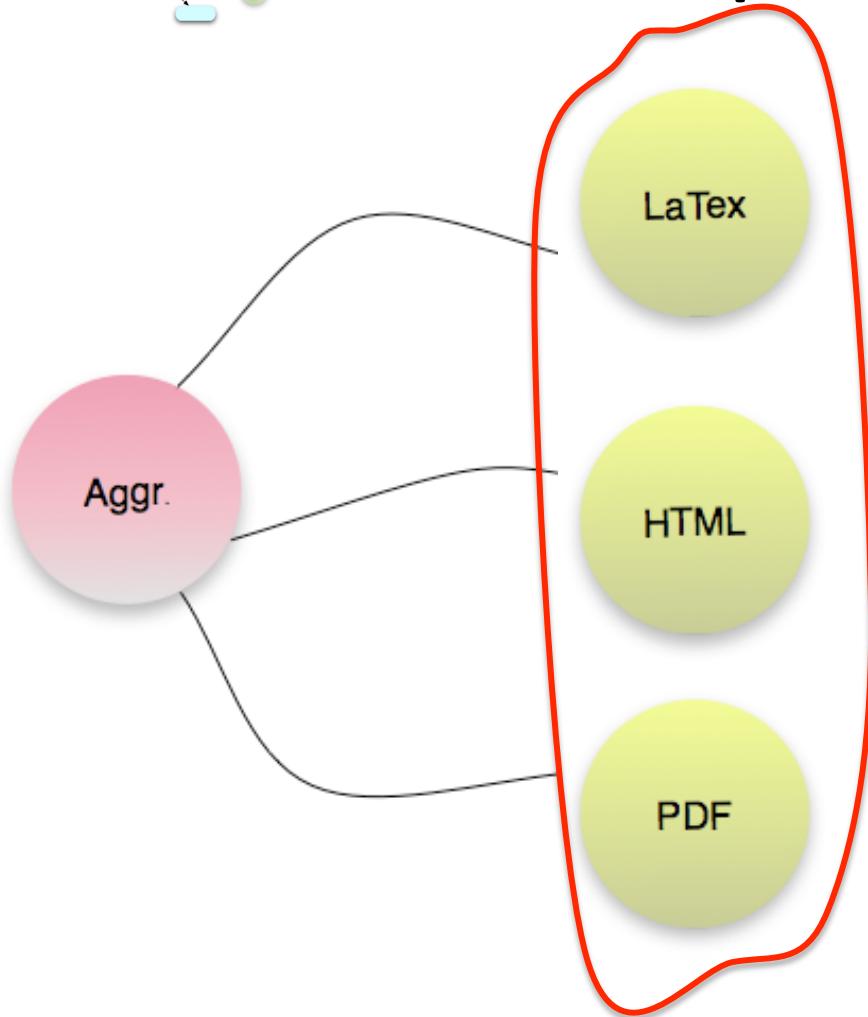
- Resource
- URI
- Representation





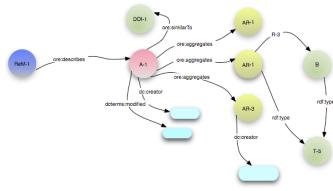
Simple Aggregation

Describe an HTML page, PDF, and Latex as an aggregation



Hierarchical or *Tree* Structure





Hierarchical Models and XML

```

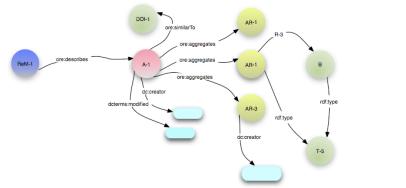
1  <?xml version="1.0" encoding="UTF-8"?>
2  <Memo xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
3  xsi:schemaLocation="http://mynames.com/mine memo.xsd"
4  xmlns="http://mynames.com/mine"
5  language="en">
6  <to>George Bush</to>
7  <from>Carl Lagoze</from>
8  <date>2005-02-21</date>
9  <keywords>Greetings</keywords>
10 <body length="8">Hi There</body>
11 </Memo>
12

```

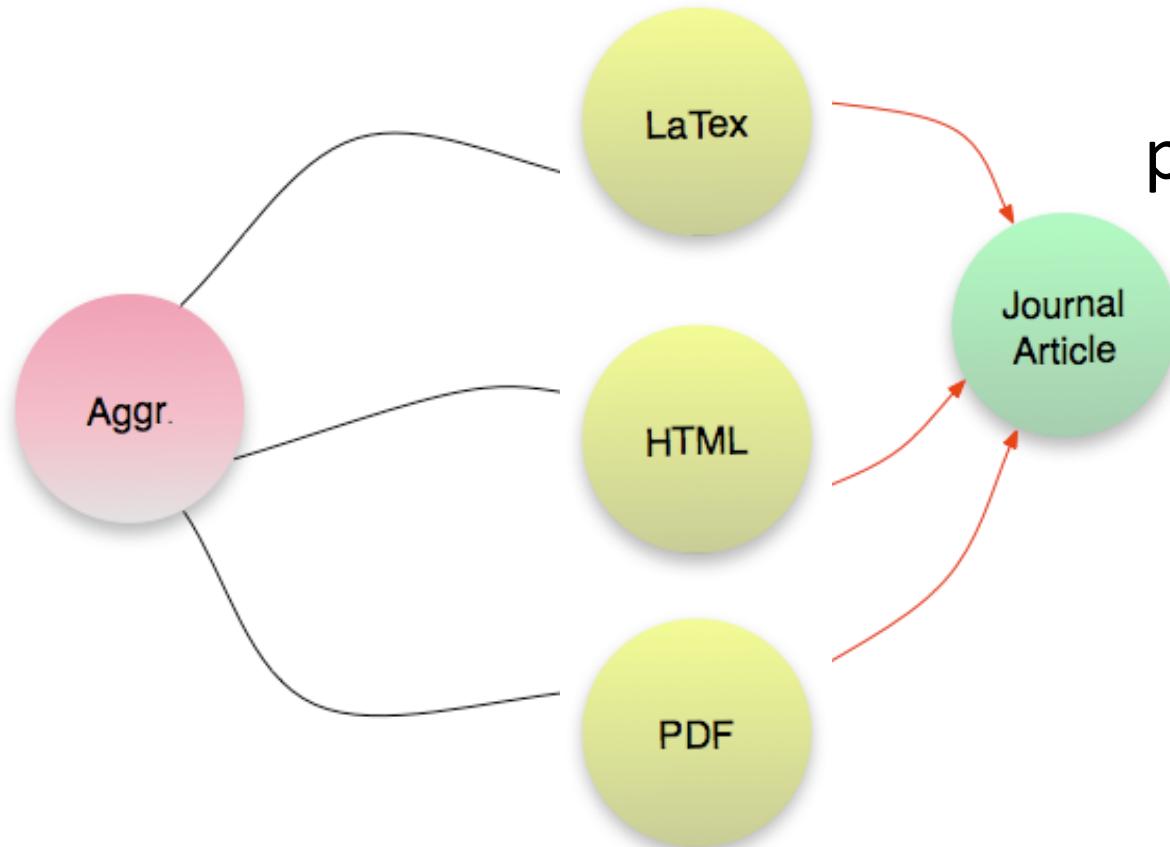
Document - memo.xml

- ▼ Memo
 - language en
 - xmlns http://mynames.com/mine
 - xmlns:xsi http://www.w3.org/2001/XMLSchema-instance
 - xsi:schemaLocation http://mynames.com/mine memo.xsd
 - ▼ to
 - George Bush
 - ▼ from
 - Carl Lagoze
 - ▼ date
 - 2005-02-21
 - ▼ keywords
 - Greetings
 - ▼ body
 - length 8
 - Hi There





More Complexity



Describe an HTML page, PDF, and Latex as an aggregation.

Assert that the PDF
and LateX are journal
articles

Graph Structure, Typed Relationships

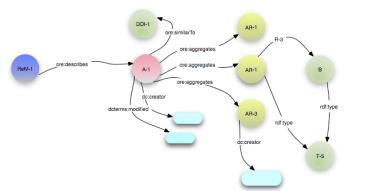


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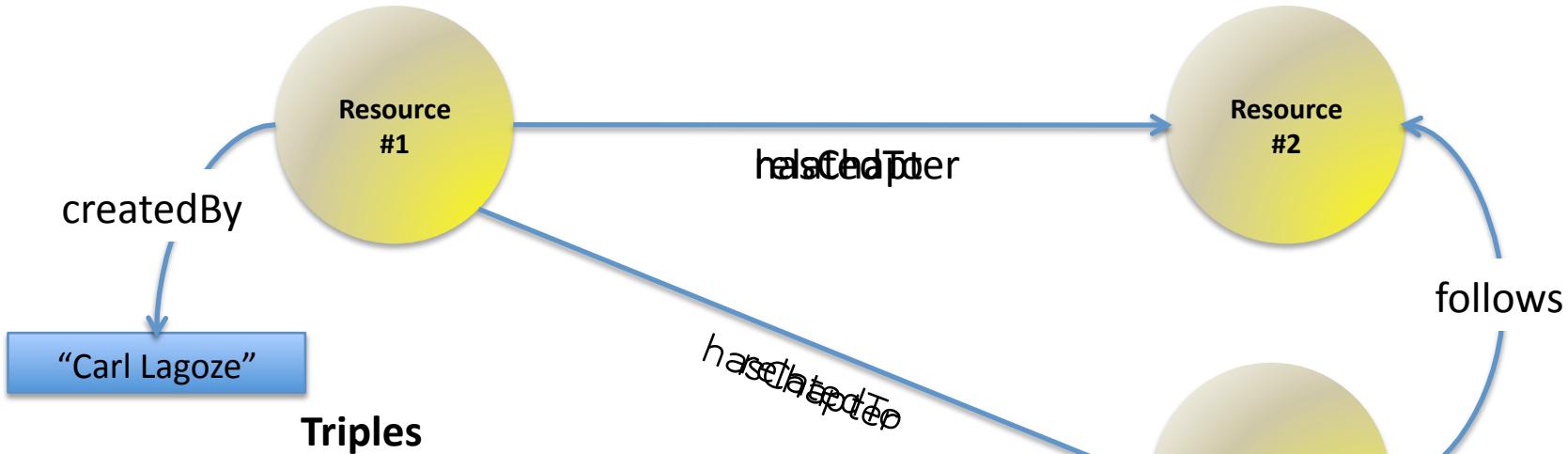
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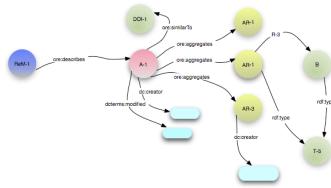


Resource Description Framework (RDF)

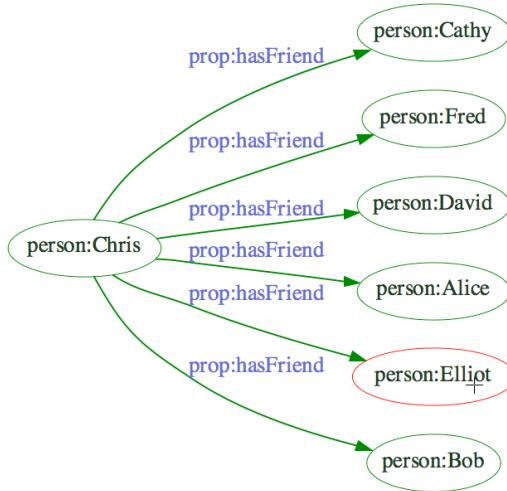


Subject	Predicate	Object
R1	hasChapter	R2
R1	hasChapter	R3
R3	follows	R2
R1	createdBy	"Carl Lagoze"





Multiple serializations



```

<rdf:RDF
  xmlns:j="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#" >
  <rdf:Description rdf:about="person:Chris">
    <j:asFriend rdf:resource="person:Cathy"/>
    <j:asFriend rdf:resource="person:Fred"/>
    <j:asFriend rdf:resource="person:David"/>
    <j:asFriend rdf:resource="person:Alice"/>
    <j:asFriend rdf:resource="person:Elliot"/>
    <j:asFriend rdf:resource="person:Bob"/>
  </rdf:Description>
</rdf:RDF>
  
```

```

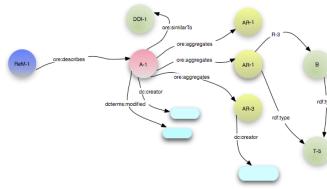
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix : <#> .

<person:Chris>
  <prop:hasFriend> <person:David> , <person:Elliot> , <person:Bob> , <
  
```

```

<person:Chris> <prop:hasFriend> <person:Cathy> .
<person:Chris> <prop:hasFriend> <person:Fred> .
<person:Chris> <prop:hasFriend> <person:David> .
<person:Chris> <prop:hasFriend> <person:Alice> .
<person:Chris> <prop:hasFriend> <person:Elliot> .
<person:Chris> <prop:hasFriend> <person:Bob> . 
```





Open Archives Initiative Object Reuse and Exchange



ORE Specification - Abstract Data Model

28 March 2008

Note: This document is alpha and subject to change at any time. It is being made available to the public for review and comment. Any implementation of the specifications or recommendations within should be undertaken with recognition of this alpha status. Please comment via the [OAI-ORE Google Group](#).

This version:

<http://www.openarchives.org/ore/0.3/datamodel>

Latest version:

<http://www.openarchives.org/ore/datamodel>

Previous version:

<http://www.openarchives.org/ore/0.2/datamodel>

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Pete Johnston, Eduserv Foundation
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Robert Sanderson, University of Liverpool
Simeon Warner, Cornell University Information Science

Abstract

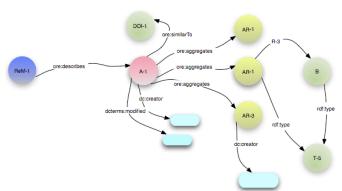
Open Archives Initiative Object Reuse and Exchange (OAI-ORE) defines standards for the description and exchange of aggregations of Web resources. This document describes the abstract data model that is the foundation for these standards. This model is conformant with the Architecture of the World Wide Web [[Web Architecture](#)] and leverages Named Graphs



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The starting point: bringing some resources together



These resources have URIs

AR-1

HTTP.GET



AR-2

HTTP.GET



AR-3

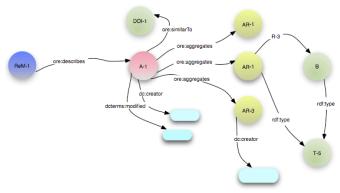
HTTP.GET



This has no URI

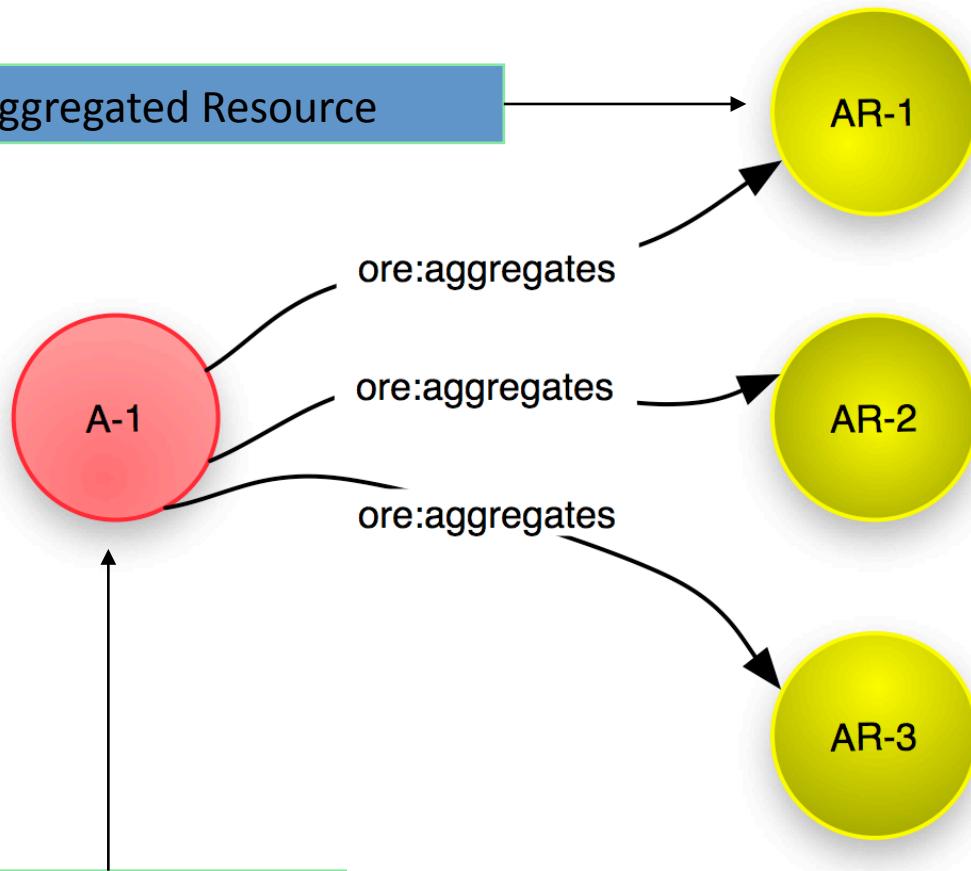
The resource have representations





Aggregation: Resource that is a set of resources

This resource is an Aggregated Resource

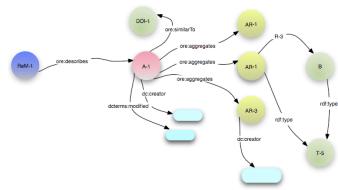


This resource is an Aggregation

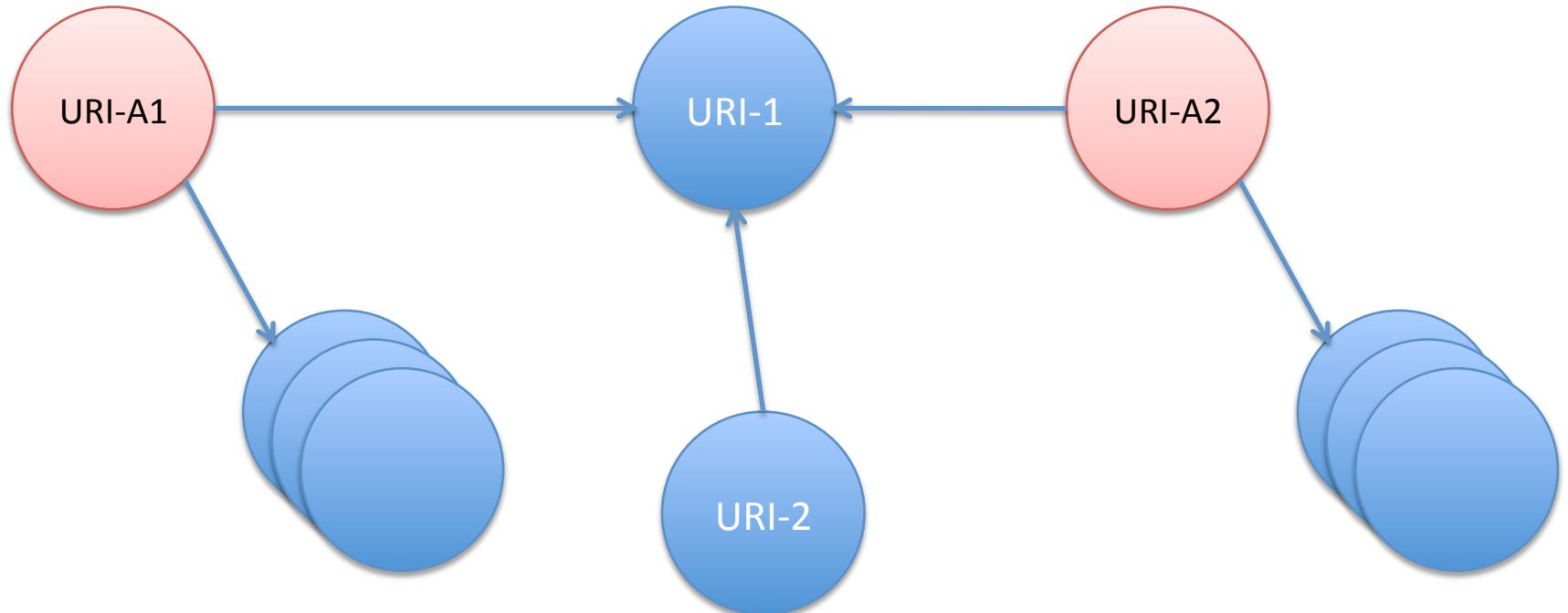


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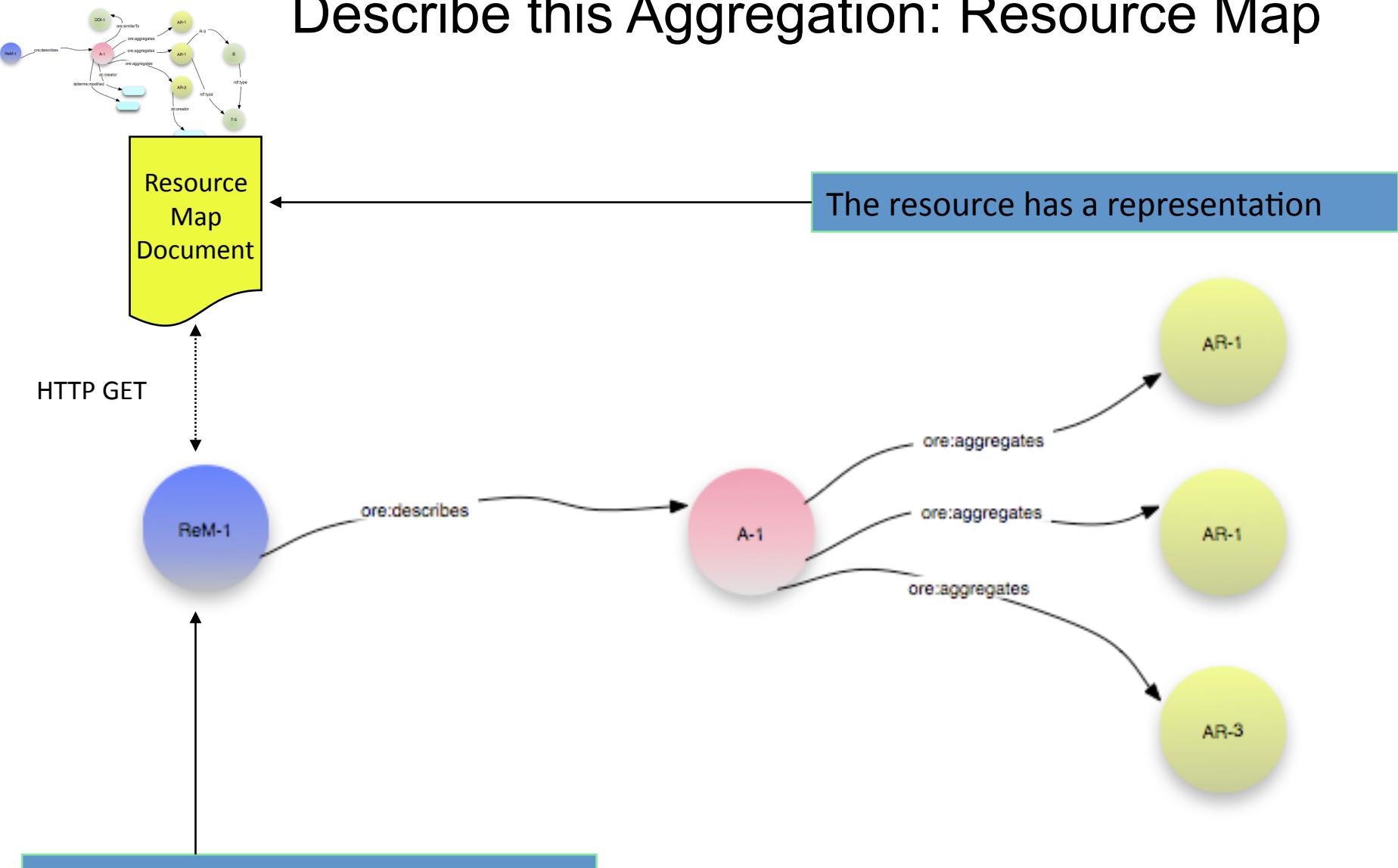
An Aggregated Resource is just a Resource



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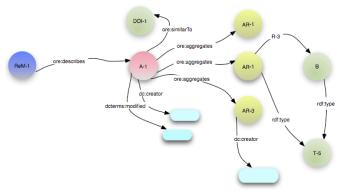


Describe this Aggregation: Resource Map



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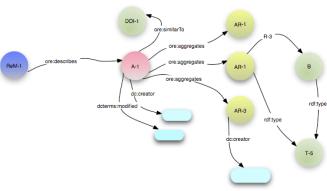
Relationship between Aggregation and Resource Map

- An Aggregation is a Resource with a URI
 - A Resource Map is a Resource with a URI
 - Each Resource Map asserts (identifies) and describes one Aggregation
 - Each Aggregation MAY be asserted and described by multiple Resource Maps
 - Each Resource MUST have one serialization (representation)

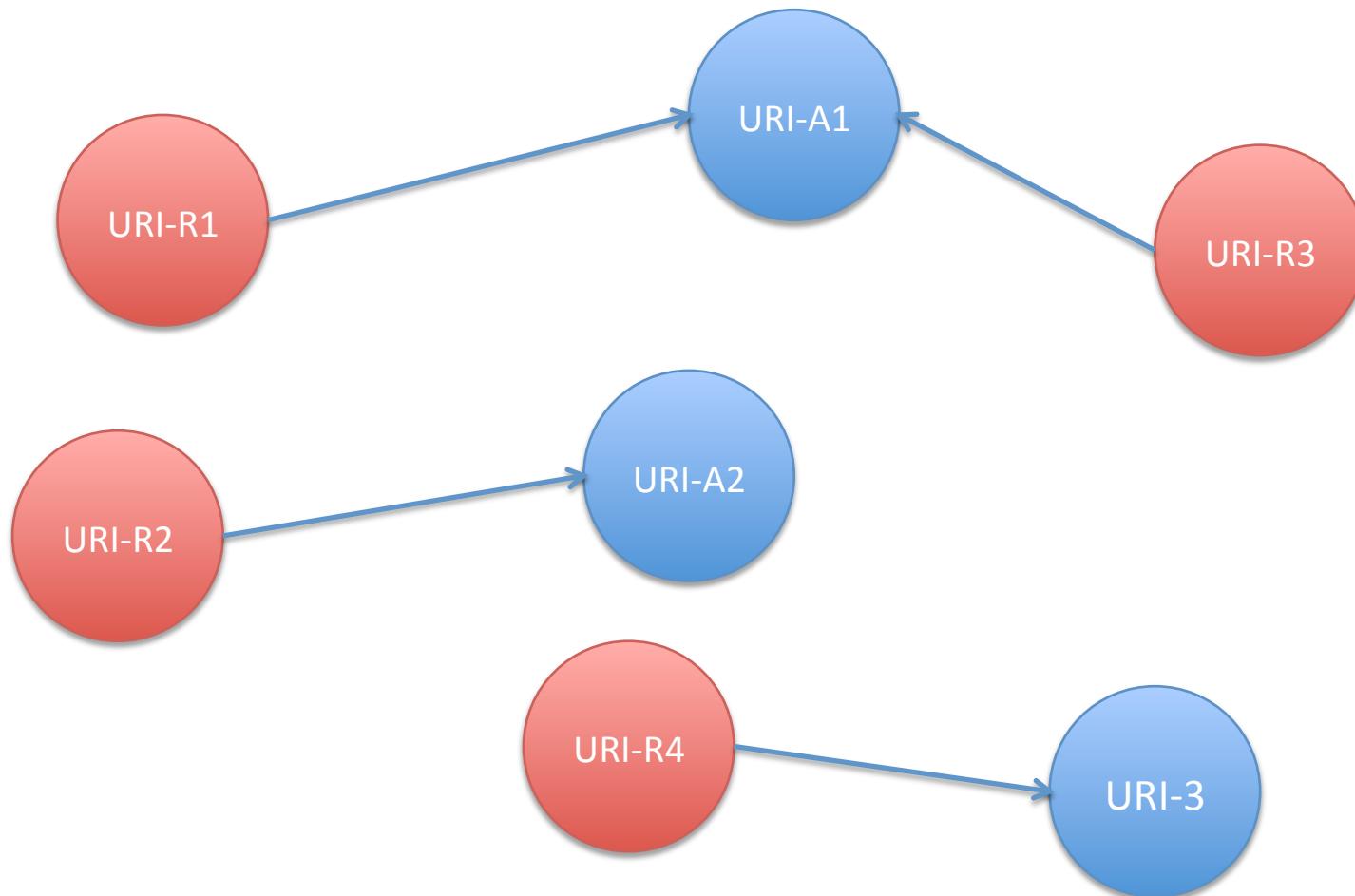


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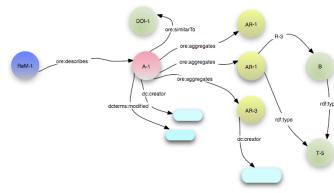


Relationship between Aggregation and Resource Map

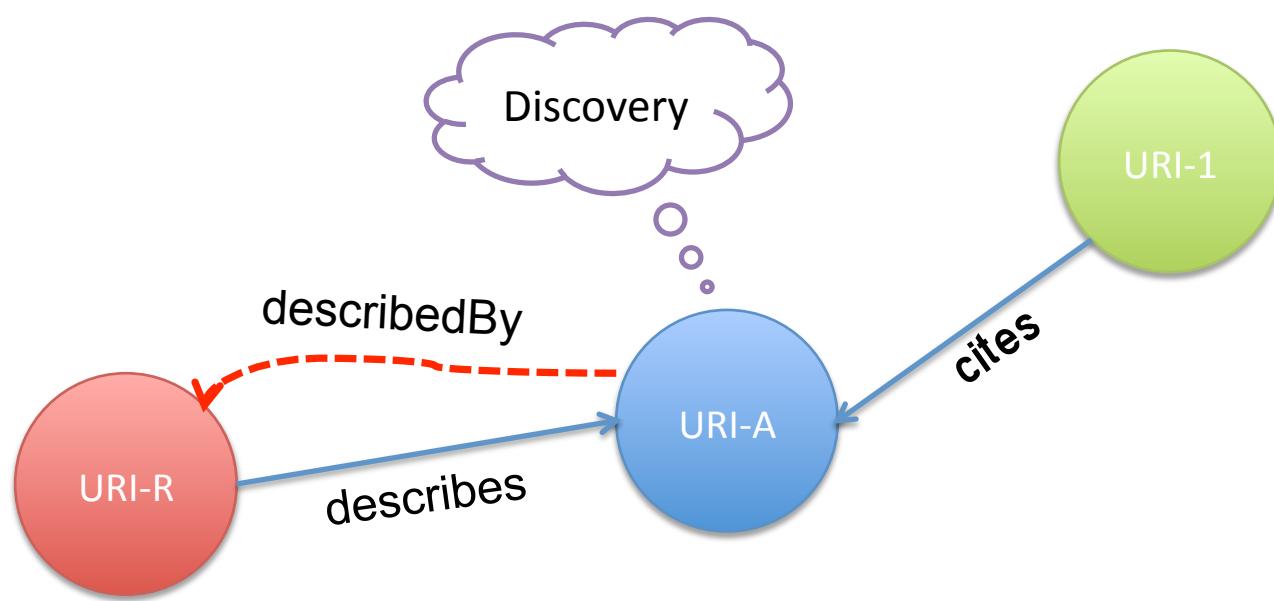


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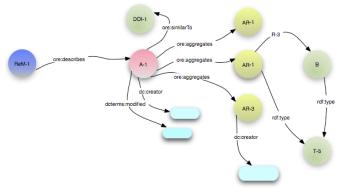


Relationship between Aggregation and Resource Map

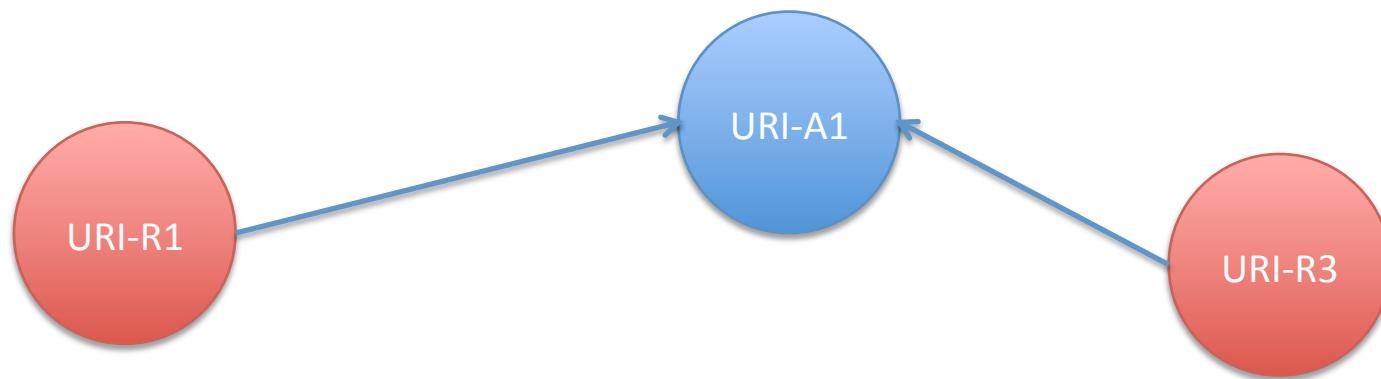


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Trust and Authority



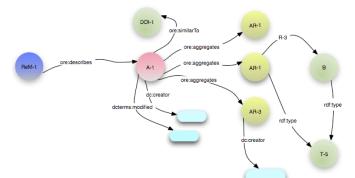
- Same as any metadata on the Web
- Addressed somewhat by discovery mechanisms (Aggregation can lead client to “authoritative” Resource Map)



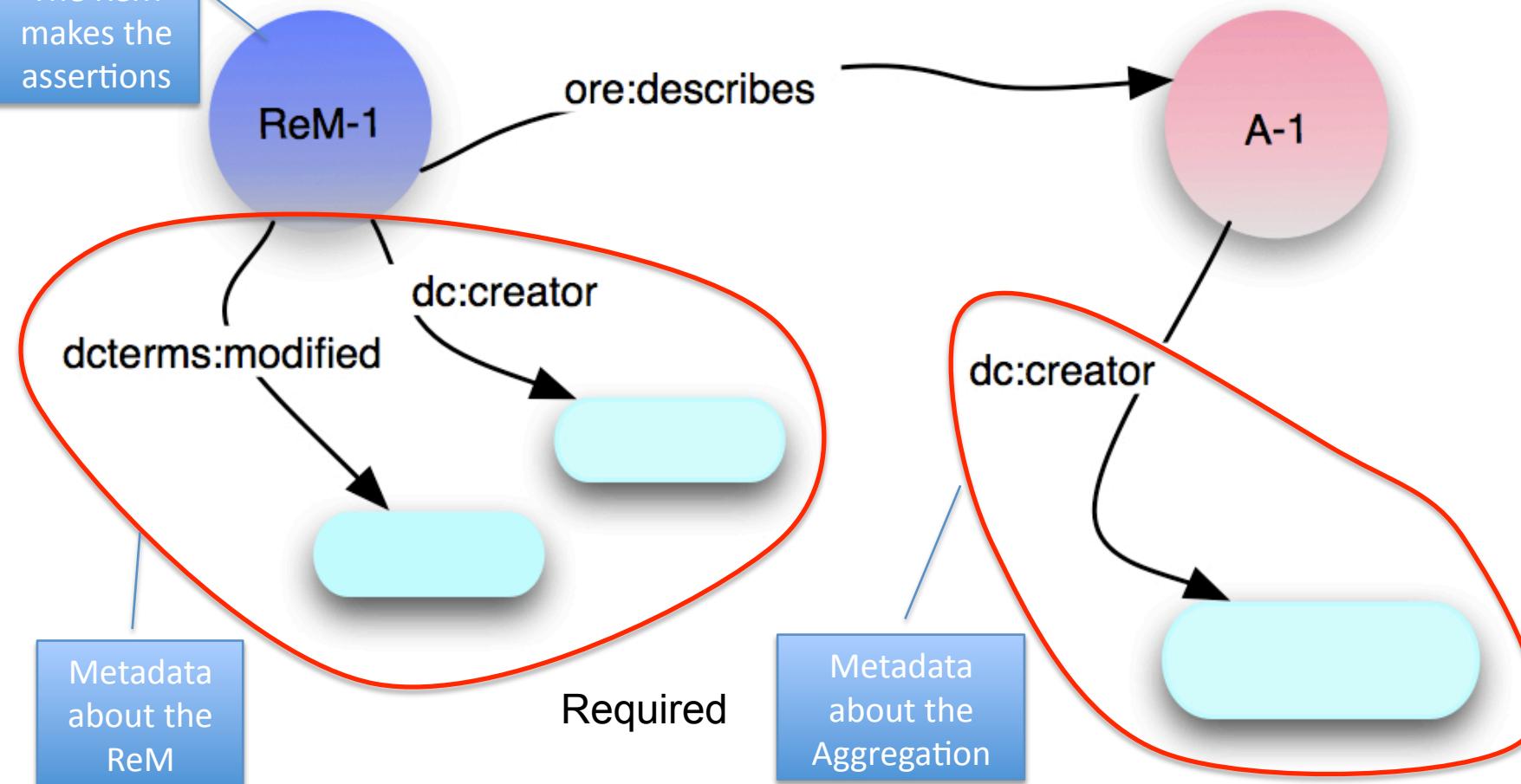
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Metadata about the Resource Map & Aggregation

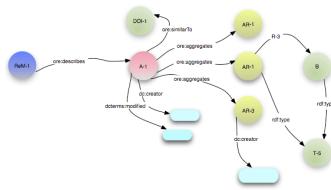


The ReM makes the assertions

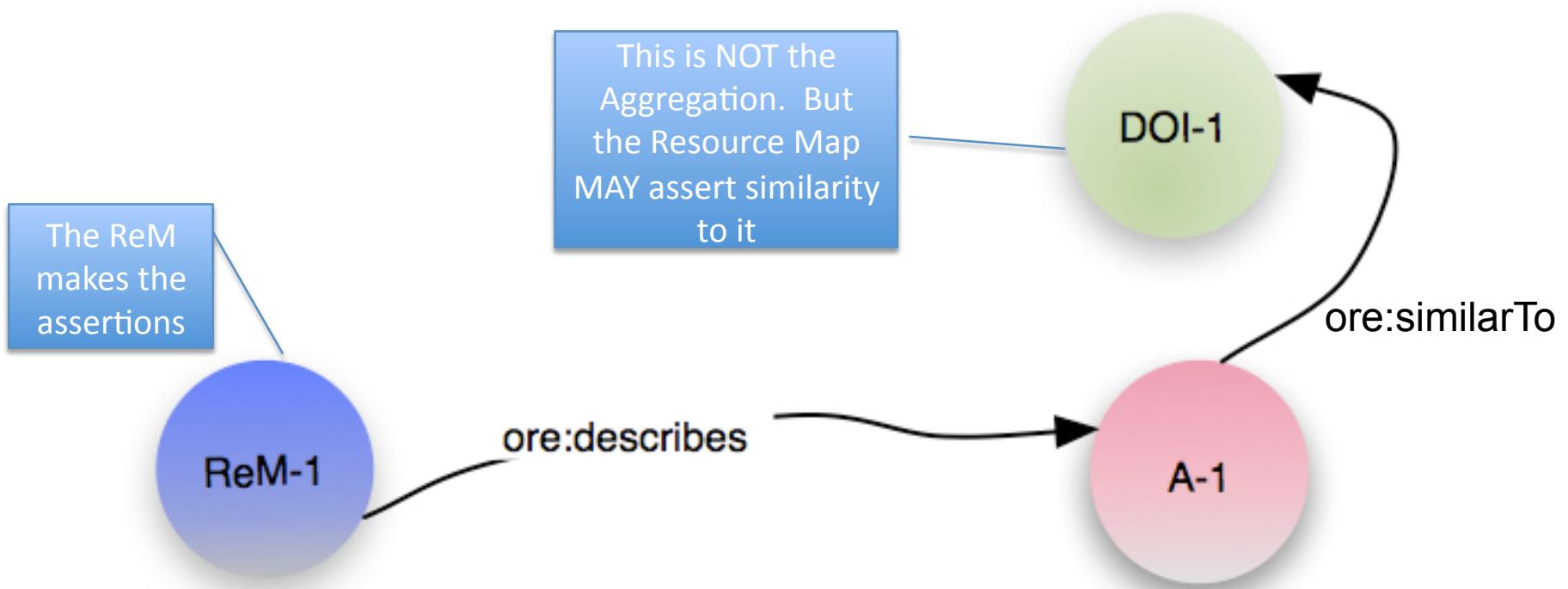


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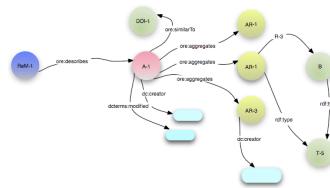


Asserting Similarity to other Resources



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Asserting other Relationships

Assertions about Aggregated Resources.

The ReM makes the assertions

Assertions about the Aggregation.

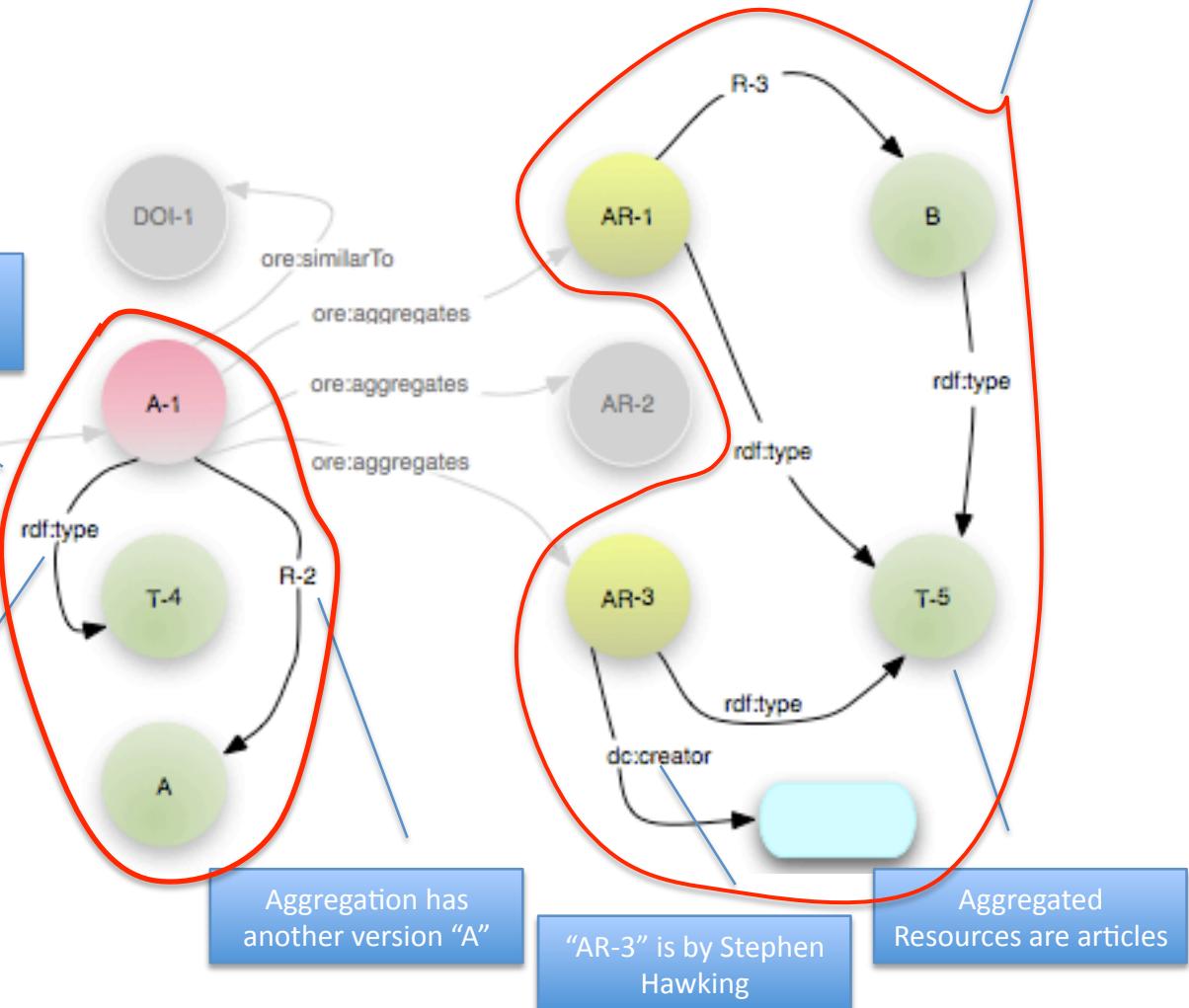
ReM-1

ore:describes

dc:creator

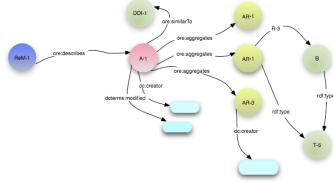
dcterms:modified

Aggregation is a journal



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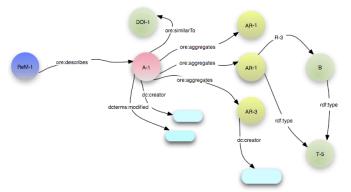




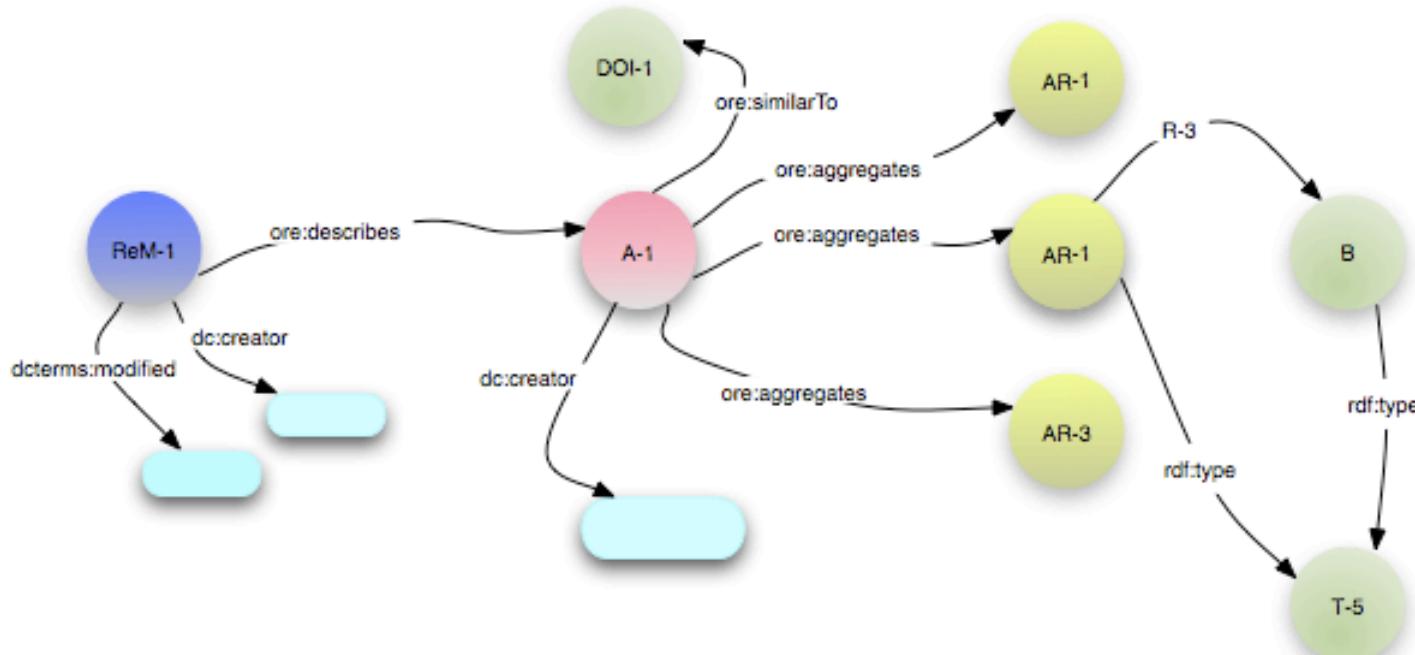
Limits of Assertions thus Far

- The meaning of an RDF triple is independent of the context in which it is stated
- Think of the difference:
 - Carl is a man
 - Carl is staying at Jury's
- All the triples described thus far are context independent
 - Therefore they can have the URI of an aggregated resource as subject or object
 - But remember that is just the URI of the Resource and is not exclusive of it being an Aggregated Resource
- Stay tuned for more

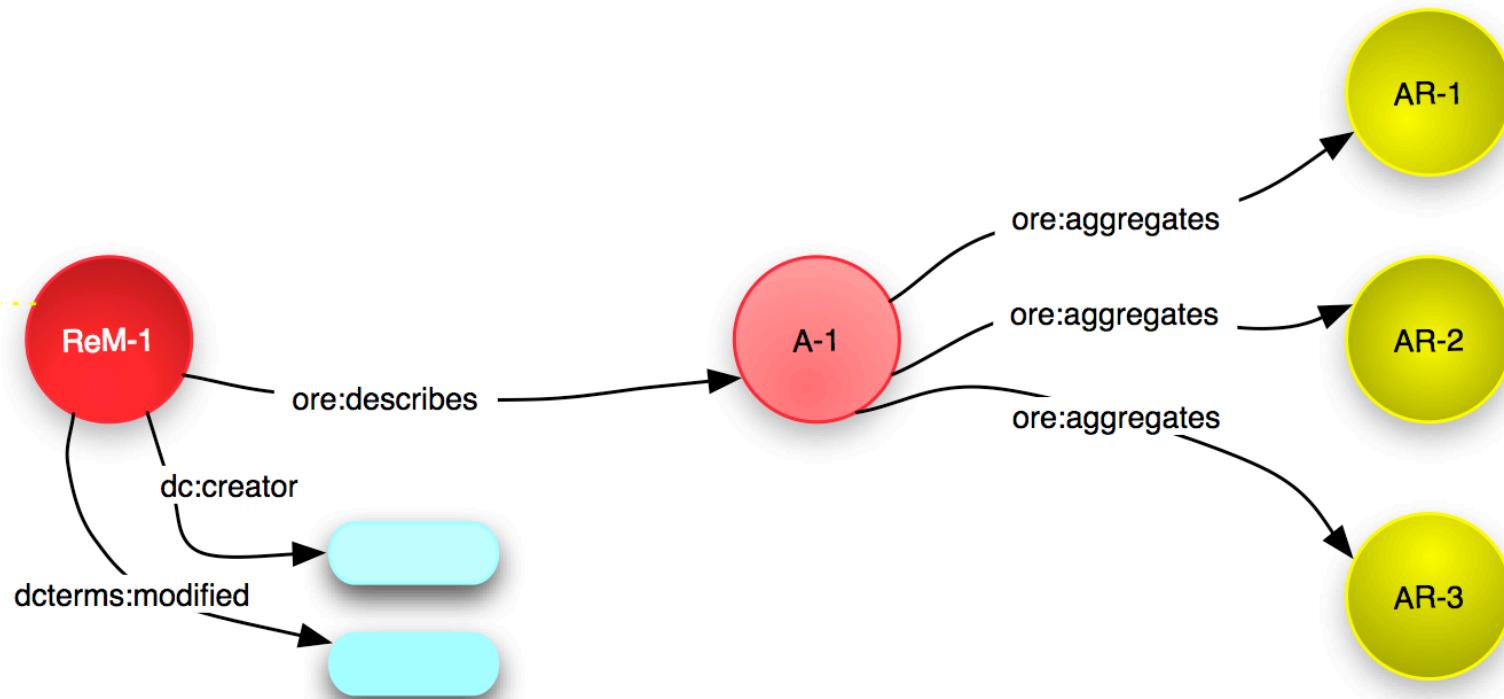
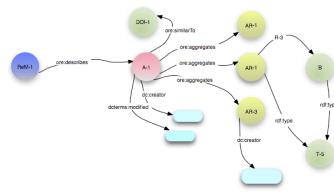




Aggregations can be Complex

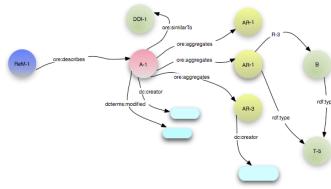


But most of the time they look like this....



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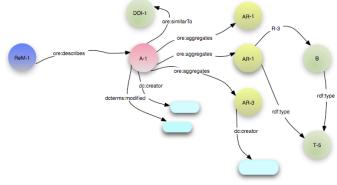


Serializing ORE Instances



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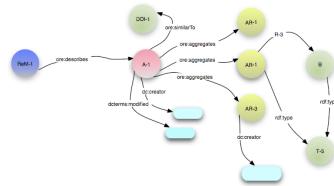
General Serialization Goals

- Express as much of the model as possible
- Ability to round-trip
 - serialization -> model triples -> serialization
- Use well-known standardized technologies
 - Leverage tools and knowledge

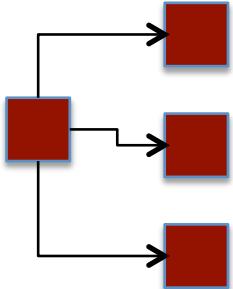


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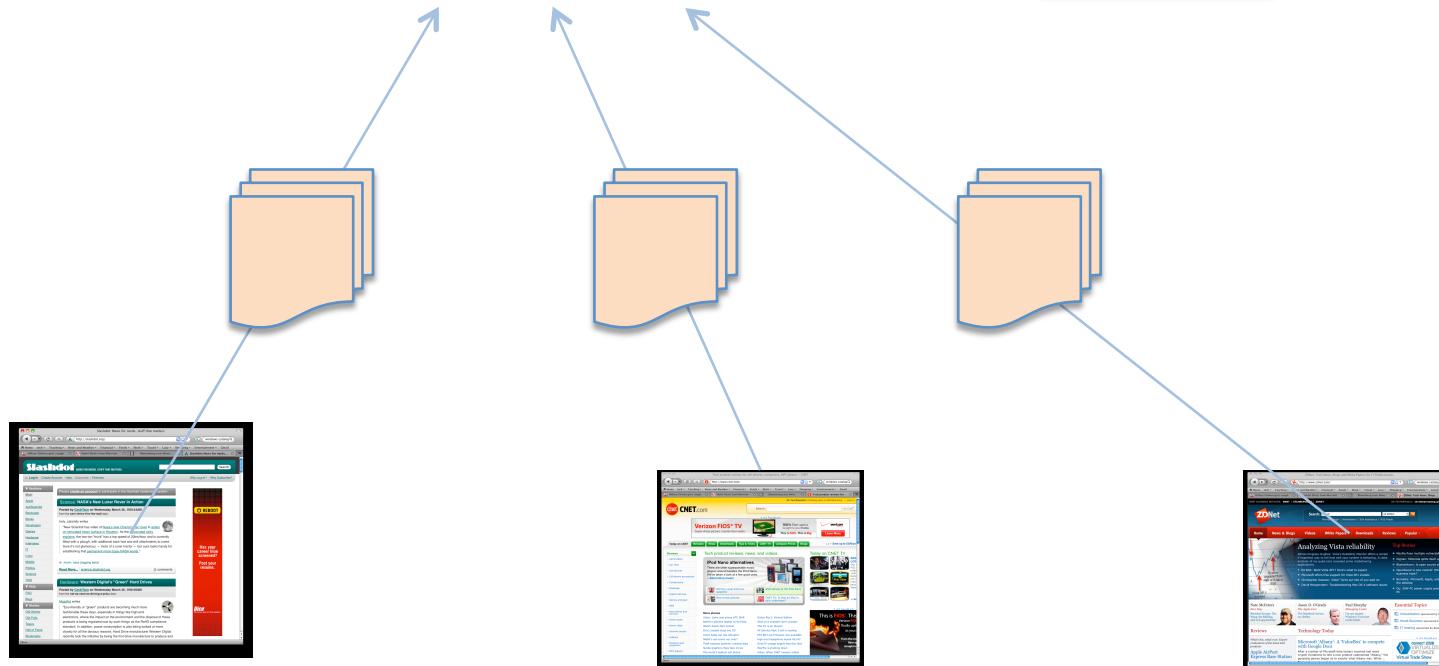
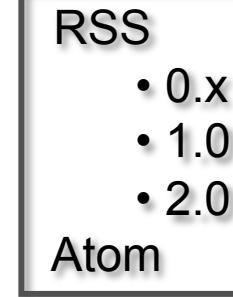




Syndication

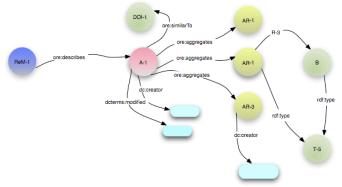


Simple
Compound
Document



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Atom

- Attempt to rationalize RSS 1.x, 2.x divergence
 - Encoding is up-to-date with current XML standards
 - namespaces
 - Schema
 - Robust content model
 - Distinguishes between metadata and content (plain text, HTML, base-64 binary)
 - Well-defined extensibility model
 - IETF FRC 4287
 - <http://www.ietf.org/rfc/rfc4287>

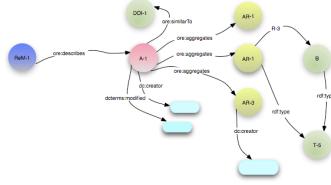


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Structure of Feed

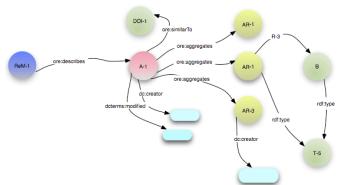
- **Feed**
 - ID
 - Author
 - Link
 - Title
 - Updated
 - *

- **Entry**
 - ID
 - Updated
 - Link
 - Summary
 - Content
 - *



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Simple Atom Feed

```
<?xml version="1.0" encoding="utf-8"?>
<feed xmlns="http://www.w3.org/2005/Atom"
```

Feed

```
<title>Dan's Blog</title>
<link href="http://netzoooid.com/blog/" />
<updated>2007-11-07T18:30:02Z</updated>
<author>
    <name>Dan Diephouse</name>
</author>
<id>urn:uuid:60a76c80-d399-11d9-b91c-000
```

Feed Metadata

```
<entry>
  <title>Building services with AtomPub</title>
  <link href="http://netzoooid.com/blog/atompub_services"/>
  <id>urn:uuid:1225c695-cfb8-4ebb-aaaa-80da344efa6a</id>
  <updated>2007-11-07T18:30:02Z</updated>
  <content>
    Entry [you must have content or a summary)
    Metadata <content>
  </entry>
</feed>
```

Entry

Entry id

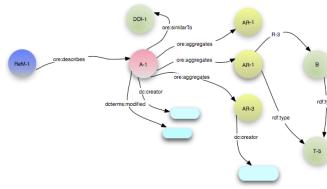


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ORE Specification - Resource Map Profile of Atom 26 February 2008

Note: This document is alpha and subject to change at any time. It is being made available to the public for review and comment. Any implementation of the specifications or recommendations within should be undertaken with recognition of this alpha status. Please comment via the [OAI-ORE Google Group](#).

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<http://www.openarchives.org/ore/atom>

Previous version:

<http://www.openarchives.org/ore/0.2/atom>

Editors (OAI Executive)

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Robert Sanderson, University of Liverpool

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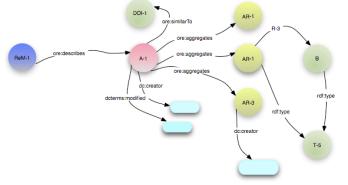
Abstract

Open Archives Initiative Object Reuse and Exchange (OAI-ORE) defines standards for the description and exchange of aggregations of Web resources, named Aggregations. OAI-ORE introduces the notion of Resource Maps that describe an Aggregation. A Resource Map is resource that is a specialization of a named graph. A Resource Map identifies an Aggregation, it asserts the finite set of constituent resources that make up the aggregation, and it asserts their relationships.



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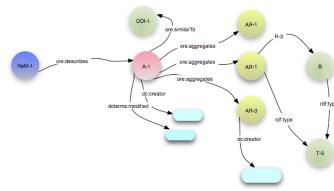
Atom Serialization Goals

- Result should be valid Atom
- Use as many Atom constructs as possible
 - Don't rely on extensions
 - Don't distort semantics
- Rely on RDF/XML when necessary



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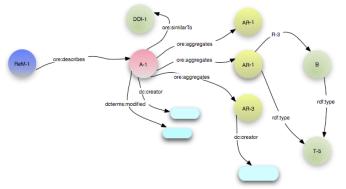
Mapping ORE Model to Atom

anoORE	Atom
<i>Aggregation</i>	<i>Feed</i>
URI-A	Feed <id>
URI-R	<link href="URI" rel="self"
ore:similarTo	<link href="URI" rel="related"
Aggregation Properties/Metadata	Feed metadata
<i>Aggregated Resource</i>	<i>Entry</i>
URI-AR	<link href="URI" rel="alternate"
Aggregated Resource Properties/Metadata	Entry metadata



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Atom/ORE Skeleton

```

<?xml version="1.0" encoding="UTF-8"?>
<feed xmlns="http://www.w3.org/2005/Atom">
  <id>http://arxiv.org/rem/astro-ph/0601007/aggregation</id>
  <link href="http://arxiv.org/rem/astro-ph/0601007/rem.xml"
    rel="self" type="application/atom+xml"/>
  <generator uri="http://arXiv.org/">arXiv.org e-Print Repository</generator>
  <updated>2007-10-10T18:30:02Z</updated>
  <category scheme="http://www.openarchives.org/ore/terms/"
    term="http://www.openarchives.org/ore/terms/Aggregation" label="Aggregation" />
</feed>

```

URI-A

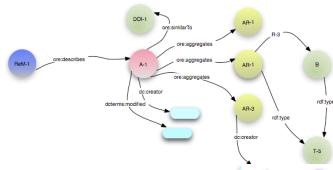
URI-R

This is an
aggregation



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URI-AR

```

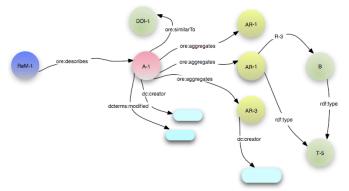
<?xml version="1.0" encoding="UTF-8"?>
<feed xmlns="http://www.w3.org/2005/Atom">
  <id>http://arxiv.org/rem/astro-ph/0601007/aggregation</id>
  <link href="http://arxiv.org/rem/astro-ph/0601007/rem.xml" rel="self" [1 line]
  <generator uri="http://arXiv.org/">arXiv.org e-Print Repository</generator>
  <updated>2007-10-10T18:30:02Z</updated>
  <category scheme="http://www.openarchives.org/ore/terms/" [1 line]>
    <entry>
      <id>tag:arxiv.org,2007:astro-ph/0601007v2:ps</id>
      <link href="http://arxiv.org/ps/astro-ph/0601007" rel="alternate"
            type="application/postscript"/>
    </entry>
    <entry>
      <id>tag:arxiv.org,2007:astro-ph/0601007v2:pdf</id>
      <link href="http://arxiv.org/pdf/astro-ph/0601007" rel="alternate"
            type="application/pdf"/>
    </entry>
    <entry>
      <id>tag:arxiv.org,2007:astro-ph/0601007v2:e-print</id>
      <link href="http://arxiv.org/e-print/astro-ph/0601007" rel="alternate"/>
    </entry>
  </feed>

```

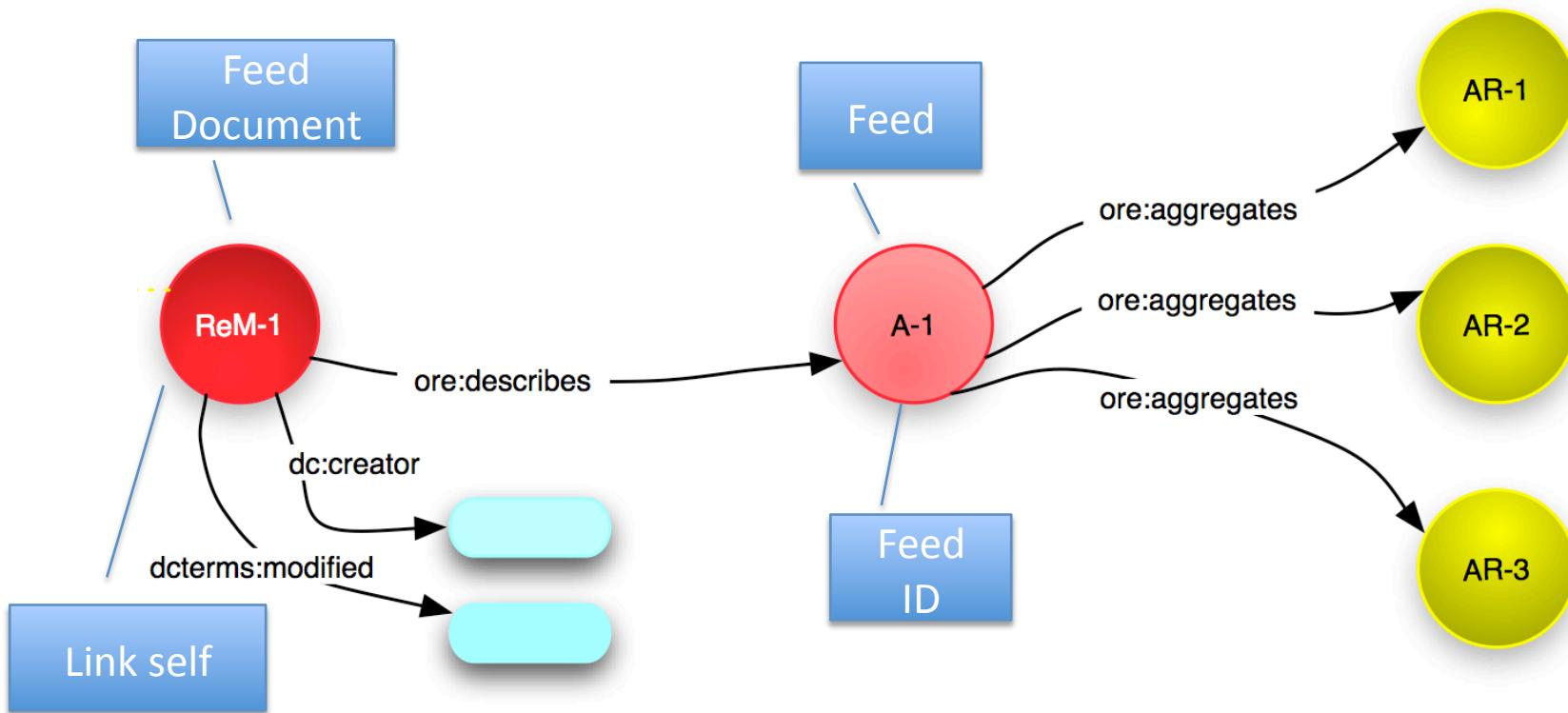


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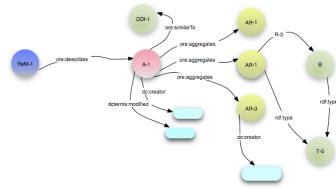


Data Model <-> Atom



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Looking to the future with Atom

- Atom Publishing Protocol
- SWORD
- Microsoft/Google APIs



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