

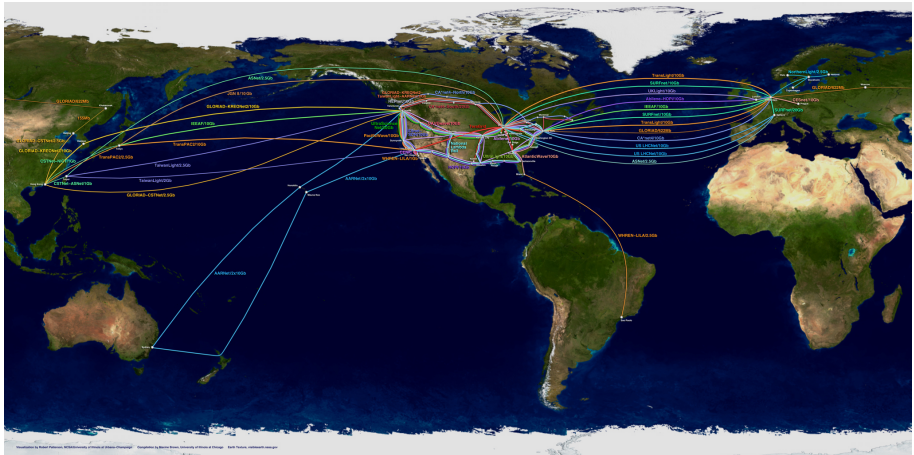
# Using RDF to Describe Networks

Jeroen van der Ham  
vdham@science.uva.nl

Advanced Internet Research Group  
Universiteit van Amsterdam

September 30, 2005

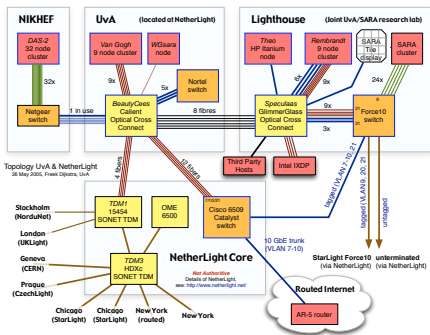
# Global Lambda Integrated Facility



# What is GLIF?

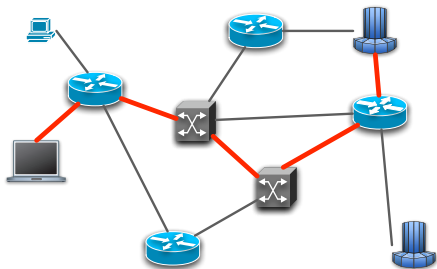
- A group of cooperating NRENs, consortia and institutions
- Make lambdas available as integrated global facility
- Sharing their research and knowledge
- Each with different policies

# Why Do We Need Network Descriptions?



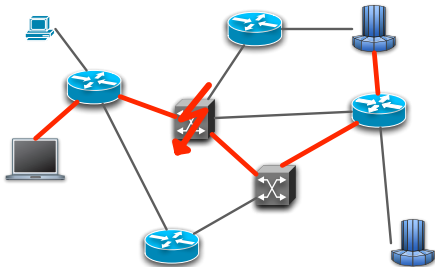
- To provide an overview of resources
- Make path discovery easier
- Do simple problem detection

# Why Do We Need Network Descriptions?



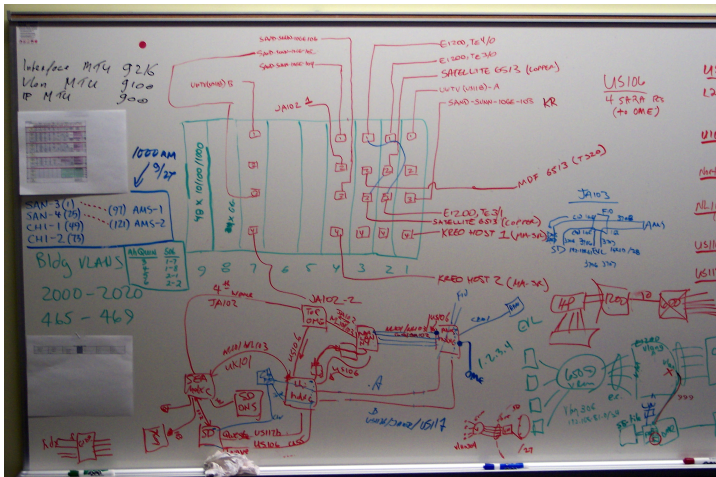
- To provide an overview of resources
- Make path discovery easier
- Do simple problem detection

# Why Do We Need Network Descriptions?



- To provide an overview of resources
- Make path discovery easier
- Do simple problem detection

# Why Do We Need Network Descriptions **NOW?**



# Problem With Descriptions

- We need a description readable by both **humans** and **computers**.
- **Problem:** Computers still have no common sense.

## Example

- 'A is connected to B.'
- 'There is a connection between A and B.'



# Problem With Descriptions

- We need a description readable by both **humans** and **computers**.
- **Problem**: Computers still have no common sense.

## Example

- 'A is connected to B.'
- 'There is a connection between A and B.'

# Semantic Web

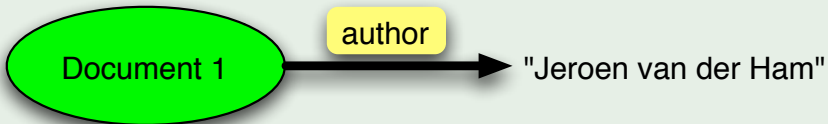
Solution: Use Semantic Web techniques:

*“**The Semantic Web** is an extension of the current web in which information is given well-defined **meaning**, better enabling **computers** and **people** to work in cooperation.”*  
(Tim Berners-Lee)

# Resource Description Format

- Resource Description Format (RDF) is a Semantic Web technique.
- RDF is a lightweight ontology system
- it describes things using triplets:

## Example



# Subject, Property, Object

- Triplets consist of three elements:

## Definition

**Subject** The thing it describes.

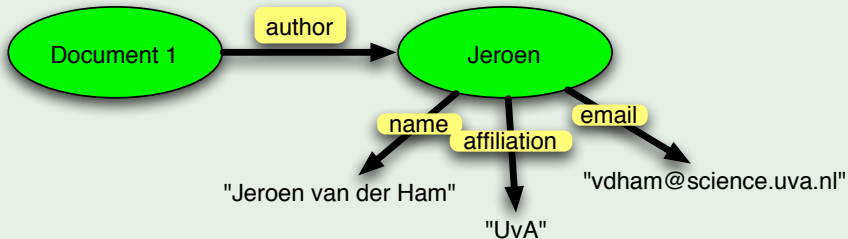
**Predicate** A property the statement describes.

**Object** The value of the property.

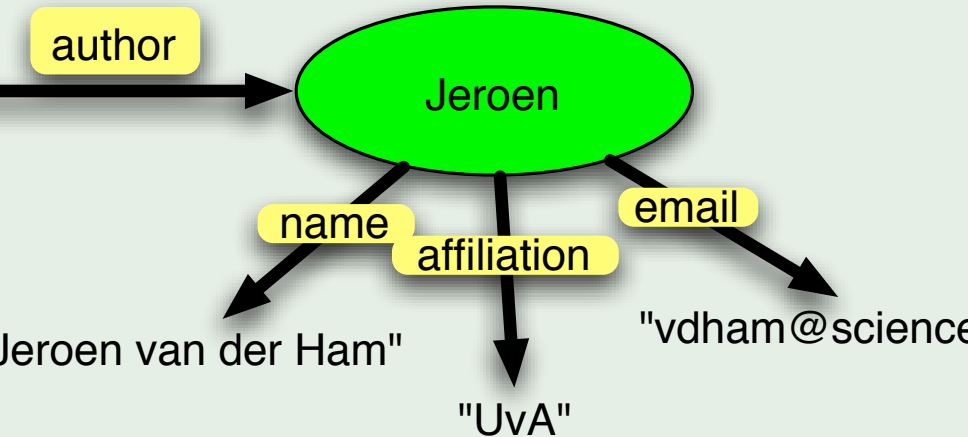
# RDF Data Model

- RDF describes things using triplets:

## Example



# RDF Data Model



Jeroen van der Ham"

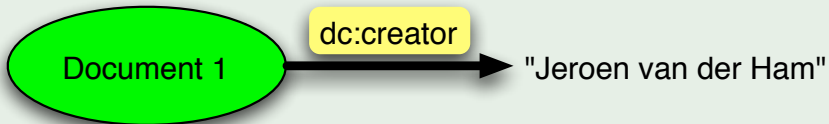
"UvA"

"vdham@science"

# RDF Namespaces

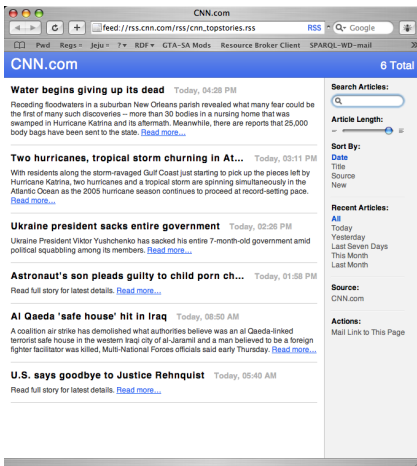
- Unique terminology is achieved using namespaces
- Readable for both computers and people

## Example



- Uses Dublin Core Namespace.

# Real-World RDF Examples



The screenshot shows a web browser window displaying an RSS feed from CNN.com. The browser's address bar shows the URL `feed://rss.cnn.com/rss/cnn_topstories.rss`. The page header includes the CNN.com logo and a count of '6 Total' items. The main content area lists several news articles with their titles, timestamps, and brief summaries. A sidebar on the right contains search and sorting options.

**Water begins giving up its dead** Today, 04:28 PM  
Receding floodwaters in a suburban New Orleans parish revealed what many fear could be the first of many such discoveries – more than 30 bodies in a nursing home that was swamped in Hurricane Katrina and its aftermath. Meanwhile, there are reports that 25,000 body bags have been sent to the state. [Read more...](#)

**Two hurricanes, tropical storm churning in At...** Today, 03:11 PM  
With residents along the storm-ravaged Gulf Coast just starting to pick up the pieces left by Hurricane Katrina, two hurricanes and a tropical storm are spinning simultaneously in the Atlantic Ocean as the 2005 hurricane season continues to proceed at record-setting pace. [Read more...](#)

**Ukraine president sacks entire government** Today, 02:26 PM  
Ukraine President Viktor Yushchenko has sacked his entire 7-month-old government amid political squabbling among its members. [Read more...](#)

**Astronaut's son pleads guilty to child porn ch...** Today, 01:58 PM  
Read full story for latest details. [Read more...](#)

**Al Qaeda 'safe house' hit in Iraq** Today, 08:50 AM  
A coalition air strike has demolished what authorities believe was an al Qaeda-linked terrorist safe house in the western Iraqi city of al-Jaramil and a man believed to be a foreign fighter facilitator was killed, Multi-National Forces officials said early Thursday. [Read more...](#)

**U.S. says goodbye to Justice Rehnquist** Today, 05:40 AM  
Read full story for latest details. [Read more...](#)

**Search Articles:**

**Article Length:**  
--

**Sort By:**  
**Date**  
Title  
Source  
New

**Recent Articles:**  
**All**  
Today  
Yesterday  
Last Seven Days  
This Month  
Last Month

**Source:**  
CNN.com

**Actions:**  
Mail Link to This Page

RSS RDF Site  
Summary (v1.0)  
DOAP Description of a  
Project  
FOAF Friend of a Friend



# Real-World RDF Examples

O'Reilly CodeZoo: SimpleParse  
http://python.codezoo.com/pub/component/+RSS

O'REILLY®  
**codeZoo** Find *good* code. Use it *quickly*.

Home Log In Suggest a Component Feedback My Library Search for

Python > Data Formats >

ADD TO MY LIBRARY What's This? SpikeSource supports Python

**SimpleParse**

Version: 2.0.1a3  
By: Mike C. Fletcher  
Release Date: Dec 25, 2003  
User Tips: None [Add a Tip](#)  
Average Rating: Not Rated [Rate It](#)  
Downloads: 10  
License: BSD License  
Homepage: <http://simpleparse.sourceforge.net>  
Other Files: [SimpleParse-2.0.1a3.win32.exe](#)

[Download Now](#)  
zip file (313 Kb)

DOAP? What's This? XML What's This?

Are you a developer of this component? Help keep CodeZoo up to date with new information about your project.

**Description**

SimpleParse is a BSD-licensed Python package providing a simple parser generator for use with the mxTextTools text-tagging engine. SimpleParse allows you to generate tagging tables for use with the text-tagging engine directly from your EBNF grammar. Unlike most parser generators, SimpleParse generates single-pass parsers (there is no distinct tokenization stage), an approach taken from the predecessor project (mcf.pars) which attempted to create "autonomously parsing regex objects". The resulting parsers are not as generalized as those created by, for instance, the Earley algorithm, but they do tend to be useful for the parsing of computer file formats and the like (as distinct from natural language and similar "hard" parsing problems). In addition to the parser generator, the SimpleParse project includes a sub-project to create a modified version of the mxTextTools engine which reorganizes the code to allow for certain common EBNF constructs.

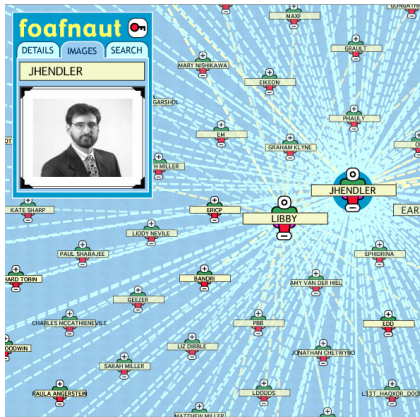
Cancelled opening the page

RSS RDF Site  
Summary (v1.0)

DOAP Description of a  
Project

FOAF Friend of a Friend

# Real-World RDF Examples



- RSS Site Summary (v1.0)
- DOAP Description of a Project
- FOAF Friend of a Friend

# Network Description Language

We started on a set of properties and classes to describe networks:



Location



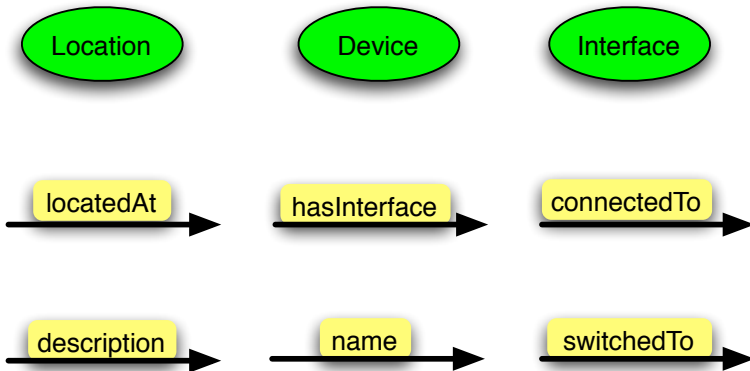
Device



Interface

# Network Description Language

We started on a set of properties and classes to describe networks:



# Example of NDL

```
<ndl:Device rdf:about="#Rembrandt3">  
  <ndl:name>Rembrandt3</ndl:name>  
  <ndl:locatedAt rdf:resource="#Lighthouse"/>  
  <ndl:hasInterface rdf:resource="#Rembrandt3:eth0"/>  
</ndl:Device>
```

# Example of NDL

```
<ndl:Device rdf:about="#Rembrandt3">
  <ndl:name>Rembrandt3</ndl:name>
  <ndl:locatedAt rdf:resource="#Lighthouse"/>
  <ndl:hasInterface rdf:resource="#Rembrandt3:eth0"/>
</ndl:Device>
```

```
<ndl:Interface rdf:about="#Rembrandt3:eth0">
  <ndl:name>Rembrandt3:eth0</ndl:name>
  <ndl:connectedTo rdf:resource="#Glimmerglass:port3"/>
</ndl:Interface>
```

# Example of NDL

```
<ndl:Device rdf:about="#Rembrandt3">
  <ndl:name>Rembrandt3</ndl:name>
  <ndl:locatedAt rdf:resource="#Lighthouse"/>
  <ndl:hasInterface rdf:resource="#Rembrandt3:eth0"/>
</ndl:Device>
```

```
<ndl:Interface rdf:about="#Rembrandt3:eth0">
  <ndl:name>Rembrandt3:eth0</ndl:name>
  <ndl:connectedTo rdf:resource="#Glimmerglass:port3"/>
</ndl:Interface>
```

```
<ndl:Interface rdf:about="#Glimmerglass:port3">
  <ndl:name>Glimmerglass:port3</ndl:name>
  <ndl:connectedTo rdf:resource="#Rembrandt3:eth0"/>
</ndl:Interface>
```

# Querying RDF Repositories

**SPARQL**<sup>1</sup> is a SQL-like query language for RDF:

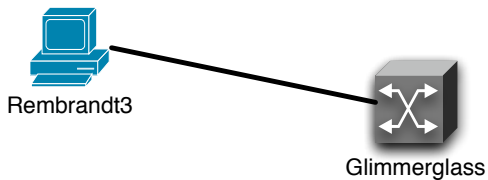
## Example

```
SELECT  ?host1 ?host2
WHERE   { ?if1  ndl:connectedTo ?if2 .
          ?if2  ndl:connectedTo ?if1 .
          ?host1 ndl:hasInterface ?if1 .
          ?host2 ndl:hasInterface ?if2 }
```

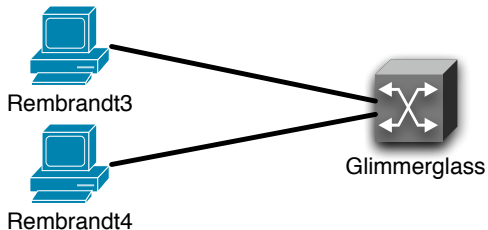
<sup>1</sup>SPARQL Protocol And RDF Query Language



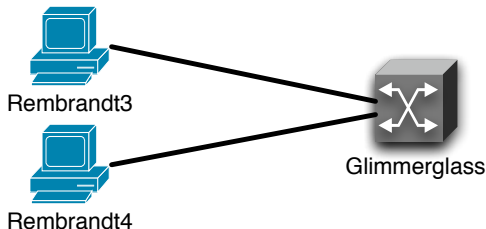
# Query Result



# Query Result



# Query Result



```
<ndl:Interface rdf:about="#Glimmerglass:port3">  
  <ndl:name>Glimmerglass:port3</ndl:name>  
  <ndl:switchedTo rdf:resource="#Glimmerglass:port4"/>  
</ndl:Interface>
```

# Distributed Repositories

NDL descriptions can point to other network descriptions:

```
<ndl:Interface rdf:about="#Rembrandt3:eth0">  
  <ndl:name>Rembrandt3:eth0</ndl:name>  
  <ndl:connectedTo rdf:resource="nl:C6509:port7"/>  
</ndl:Interface>
```

```
<ndl:Interface rdf:about="nl:C6509:port7">  
  <rdfs:seeAlso  
    rdf:resource="http://www.netherlight.nl/ndl.rdf"/>  
</ndl:Interface>
```

# SPARQL & Distributed Repositories

Querying remote information can be done in two ways:

- 1 Fetch each description, parse it and then query it.
- 2 Issue SPARQL queries over HTTP or SOAP (WSDL Interface).

Both approaches allow for filtering.

# Applying Network Descriptions in GLIF

- 1 Each institute creates a description of their network
- 2 Validate and publish using the portal
- 3 Description must be automatically updated with each change
- 4 Users use the portal or tools to find paths and resources

# Extending NDL

RDF allows for easy extensibility:

- Include geographical information (geo) and use with Google Earth
- Link to FOAF descriptions of administrators
- Include policy information
- etc. . .

# Future Research

- Publish a portal with links to participants
- Tools for automatic generation and updating of descriptions
- Extend NDL to include higher layers
- Security & filtering possibilities



# Related Work

- Using RDF for Home Network Configuration  
*G. Klyne*
- Using the Semantic Web to Automate the Operation of a Hybrid Internetnetwork  
*Franco Travostino* (to be published, GridNets '05)

# Questions?

# Questions?

More information:

<http://www.science.uva.nl/~vdham/research/ndl/>