Overview of

**Named Graphs**

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Named Graphs are a simple extension of the RDF data model for representing meta-information about RDF data.

2004: Invented by Jeremy Carroll, Christian Bizer, Pat Hayes, and Patrick Stickler

2005: First release of NG4J – Named Graphs for Jena toolkit

2008: Named Graphs part of W3C SPARQL specification

2008: Named Graphs implemented widely by SPARQL stores

2009: Named Graphs used by many Linked Data applications

2011: Named Graphs likely to be part of upcoming RDF 2.0
A Named Graph is an entity which consists of
- A name, which is an URIref
- A graph, which is an RDF Graph

Blank nodes not shared between different graphs

A Named Graph is a resource, which can be described within the graph itself or in another graph.

Pragmatic alternative to RDF reification, which avoids
- triple bloat (3 times more triples)
- problems with querying reified triples
- problem of meta-data redundancy
Syntaxes for Named Graphs

- **TriX**
  - XML based syntax for exchanging a set of Named Graphs in a single document

- **TriG**
  - Plain text syntax for better readability

- **RDF/XML**
  - A set of RDF documents on the Web can be seen as a set of Named Graphs
  - Using the first `xml:base` or the URL of a RDF file as graph name
  - This is the usual approach used by Linked Data applications for provenance tracking.
TriX

- Straight forward XML serialization of the abstract syntax

```xml
<TriX xmlns="http://www.w3.org/2004/03/trix/trix-1/"
     <graph>
       <uri>http://www.bizer.de/InformationAboutRichard</uri>
        <triple>
          <uri>http://richard.cyganiak.de/foaf.rdf#RichardCyganiak</uri>
          <uri>http://xmlns.com/foaf/0.1/mbox</uri>
          <uri>mailto:richard@cyganiak.de</uri>
        </triple>
      </graph>
      <graph>
        <uri>http://www.bizer.de/ProvenanceInformation</uri>
        <triple>
          <uri>http://www.bizer.de/InformationAboutRichard</uri>
          <uri>http://purl.org/dc/elements/1.1/author</uri>
          <plainLiteral>Chris Bizer</plainLiteral>
        </triple>
      </graph>
</TriX>
```

- allows the usage of generic XML tools like XSLT or XQuery
TriG

- based on the Turtle subset of N3, extended with graph naming

```trig
@prefix dc: <http://purl.org/dc/elements/1.1/> .
@prefix ex: <http://www.example.org/vocabulary/> .
@prefix : <http://www.example.org/exampleDocument/> .

:G1 { _:Monica ex:name "Monica Murphy" .
   _:Monica ex:email <mailto:monica@murphy.org>.
   :G1 ex:disallowedUsage ex:Marketing }

:G2 { :G1 dc:author :Chris .
   :G1 dc:date "2009-09-03"^^xsd:date }
```
@prefix swp: <http://www.w3.org/2004/03/trix/swp-1/> .
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix : <http://www.example.org/exampleDocument/> .

:G1 { :Monica foaf:name "Monica Murphy" .
    :G1 swp:assertedBy :w1 .
    :w1 swp:authority :cb .
    :cb foaf:mbox <mailto:chris@bizer.de> } 

:G2 { :G1 swp:quotedBy :w2 
    :w2 swp:authority :ps .
    :ps foaf:mbox <mailto:patrick.stickler@nokia.com> }
Expressing a trust policy within a SPARQL query.

"Give me all information about Siemens. Use only information from data sources that I trust."

```sparql
SELECT ?company ?predicate ?object
WHERE {
  GRAPH ?graph {
    ?company ?predicate ?object
    ?company rdfs:label "Siemens AG" . }
  GRAPH db:ProvenanceGraph {
    ?graph swp:assertedBy ?warrant .
    ?warrant swp:authority ?dataSource }
  GRAPH db:userInformationChrisBizer {
    db:ChrisBizer iqv:trusts ?dataSource . } }
```
Named Graphs Tools

- **NG4J – Named Graphs API for Jena**
  - Extension to the Jena semantic web toolkit
  - API for manipulating sets of Named Graphs
  - Support for the TriX, TriG and RDF/XML syntax
  - Provenance-enabled Jena statements

- **All current SPARQL stores**
  - For instance Virtuoso, Sesame, Jena TDB, …
  - Benchmark comparing the query performance
  - BSBM – Berlin SPARQL benchmark
Thanks :-)

- Overview paper

- SPARQL Specification
  - http://www.w3.org/TR/rdf-sparql-query/#rdfDataset

- NG4J - Named Graphs API for Jena (BSD License)
  - http://www4.wiwiss.fu-berlin.de/bizer/ng4j/

- Berlin SPARQL Benchmark
  - http://www4.wiwiss.fu-berlin.de/bizer/BerlinSPARQLBenchmark/