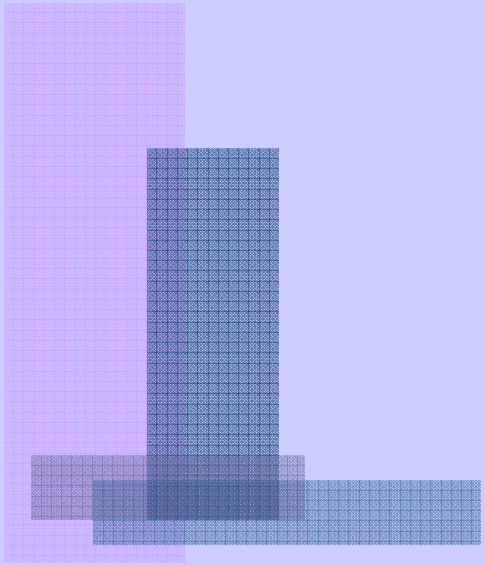
Working with Grid Services and Resource Metadata using Existing Specifications and Tools



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Outline

- The Grid
- Service Orientation
- Resources and the need for Metadata
- Grid Resource Metadata
- Conclusions

- "What is the Grid?"
  - ***"Neo, the Grid is everything you would like it to be"***
- Just few…
  - Virtual organisations
  - Integration of distributed resources
  - Universal computer
  - Interconnection technologies for supercomputers
- Or… if you are a technologist
  - An application domain for the Web Services ideas and technologies
- Or… if you are a researcher/academic
  - A new set of interesting problems in distributed computing applied at a global scale
- A world-wide virtual computer (http://www.ibm.com/grid)
  - Computational resources
  - Data resources
  - Network bandwidth
  - Etc.

Service Orientation

- Built around the concepts of service and message
- A service may be defined as *a logical manifestation of some physical resources (like databases, programs, devices, or humans) that an organization exposes to the network*
- A service is an entity that can send and receive messages
- A service adheres to a contract
  - Describes the format of the messages exchanged
  - Defines the message exchange patterns in which a service is prepared to participate

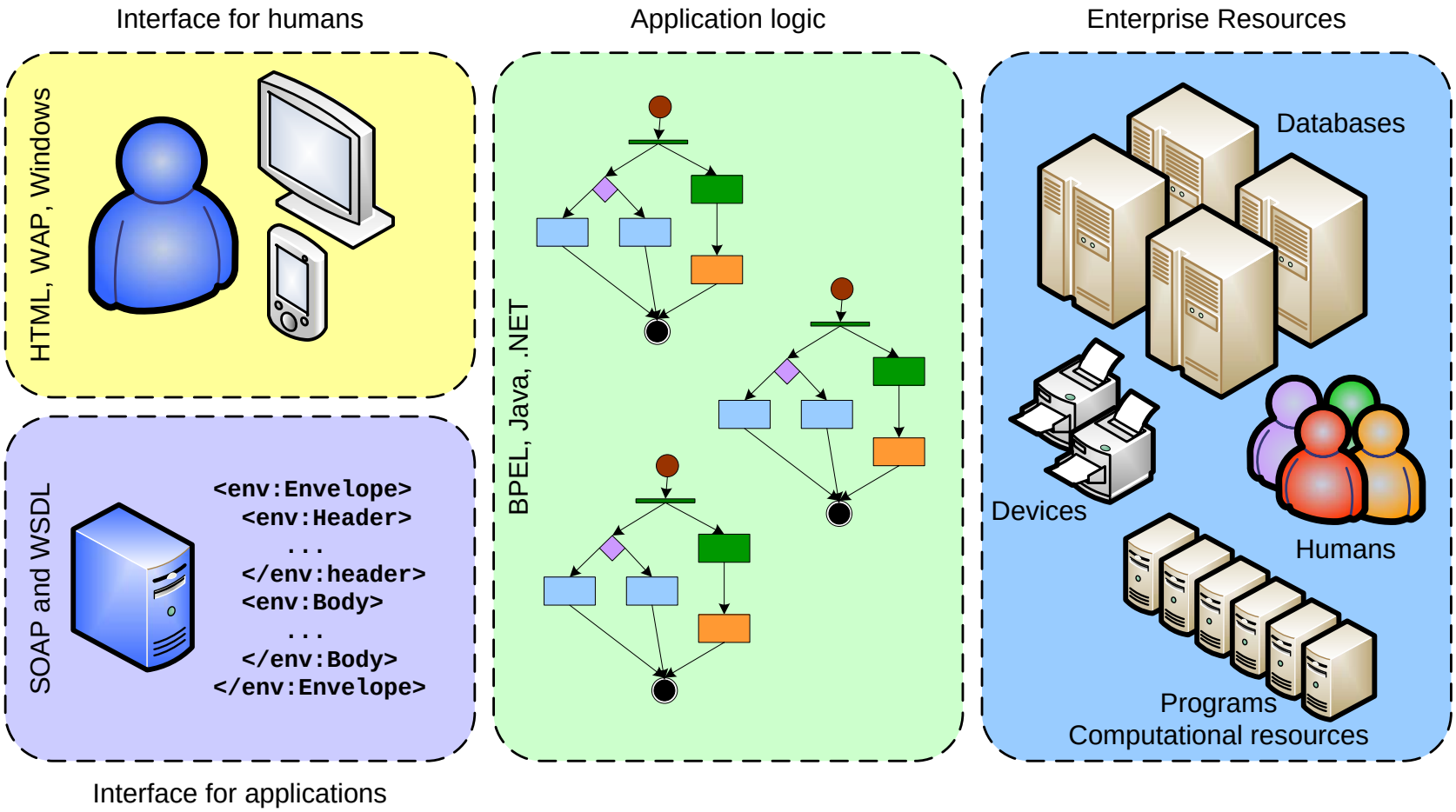
Service Orientation

- Don Box's four tenets about Service Orientation
  - Boundaries are explicit
  - Services are autonomous
  - Services share schema and contract, not class (abstractions)
  - Service compatibility is determined based on policy

Source: "A Guide to Developing and Running Connected Systems with Indigo"
http://msdn.microsoft.com/Longhorn/understanding/mag/default.aspx?pull=/msdnmag/issues/04/01/Indigo/default.aspx
and various talks

The Anatomy of a Web Service

- Large grained, loosely coupled
  - Performance, scalability, maintenance, re-use, etc.



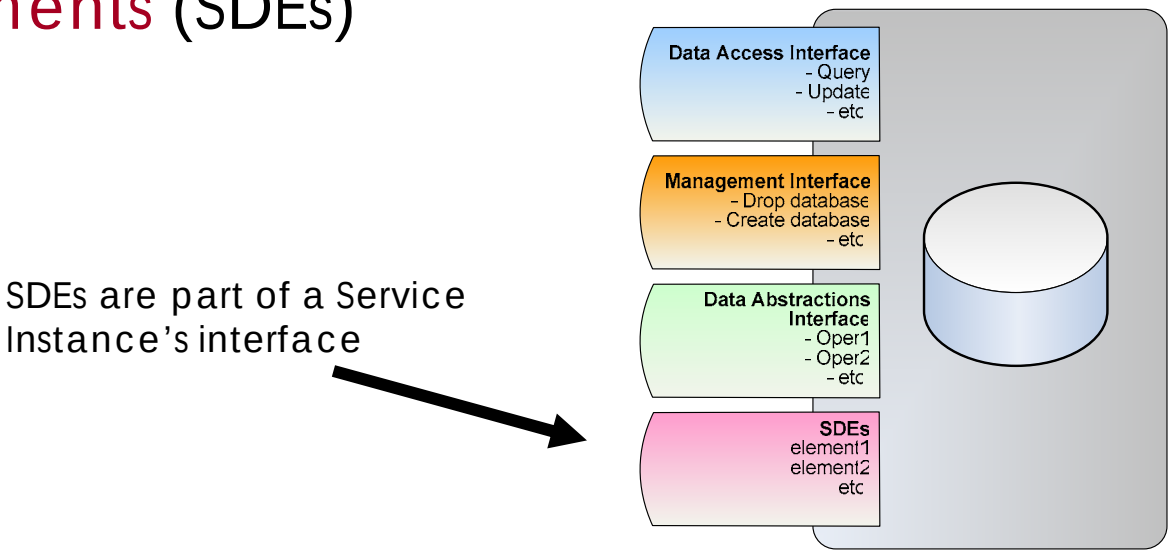
Resources

- There is a many-to-many relationship between resources and services
- If resources are exposed outside an organisation's boundaries there is need for
  - Ontologies
  - Relationships
  - Location information
  - Lifetime information
  - Ownership/access restrictions information
  - Provenance
  - etc.

- **Metadata**

Resources in OGSI

- OGSI: Open Grid Services Infrastructure
- Built around the concept of a Grid Service Instance
- A conceptual one-to-one association between a Service Instance and a Resource
  - Although not a restriction imposed by the specification
- Metadata about resource exposed through Service Data Elements (SDEs)

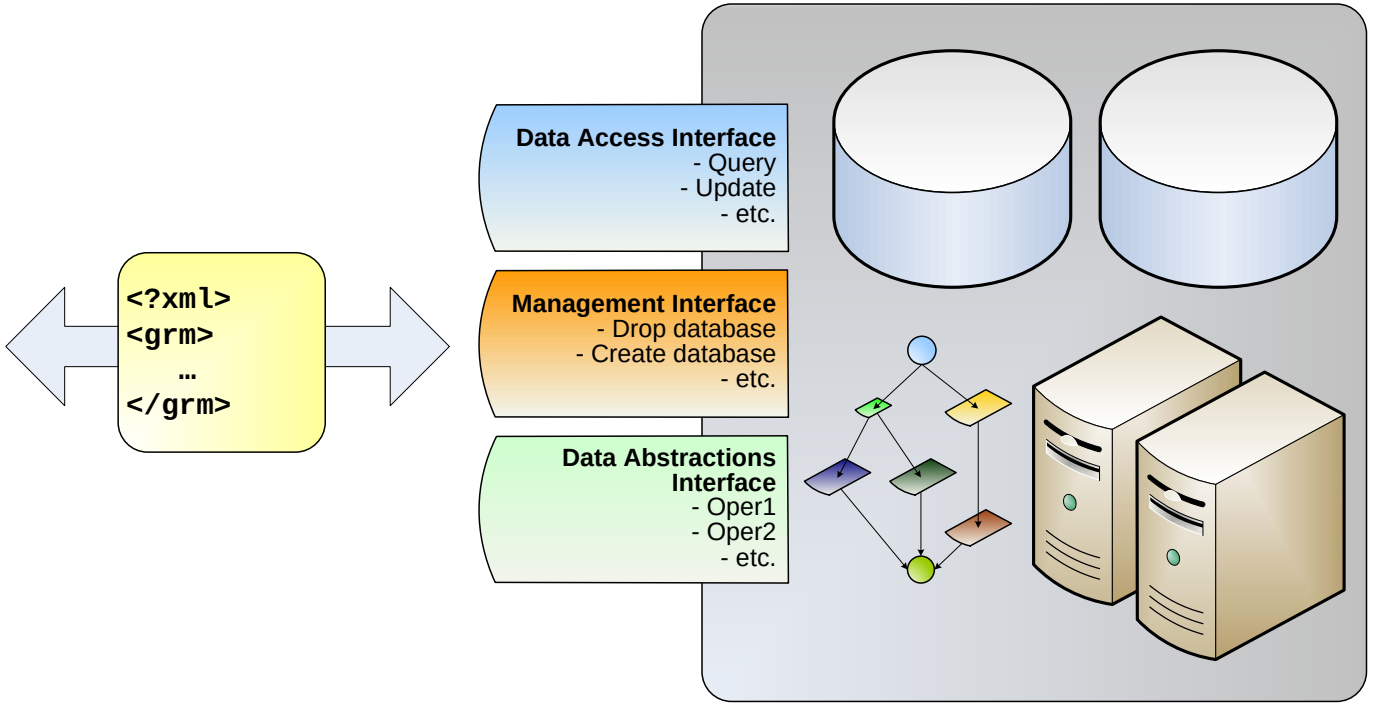


Service Data Elements

- A “requirement” due to the additional semantics introduced to services
  - 1-1 association with a resource
    - Coupling of interface and state
    - Coupling of interface and identity
  - “Publicly visible state” of a Grid Service Instance
- Why mandatory?
  - Better as an optional specification at the Open Grid Services Architecture level
- “Will be introduced in WSDL 2.0”, “The Web Services community needs them”
  - WS-Attributes will be considered as a separate specification now

The Grid Resource Metadata Document

- Functionality equivalent to Service Data Elements
- Everything implemented using existing technologies and tooling
- Not Grid-specific (it's just an XML Schema document)



Possible Uses

- Infrastructure does not need to be aware of the differences in metadata documents
  - Generic metadata Web services
  - Generic tools for Peer-to-Peer metadata propagation
  - Generic metadata registries
  - Databases

Structure

- **gri (mandatory)**
- type
- grm-lifetime
  - Lifetime of the document
- resource-lifetime
  - Lifetime of the resource
- set of endpoints
  - Each endpoint has lifetime related info
  - e.g., WS-Address
- Metadata entries
  - **Name (mandatory)**
  - Lifetime
  - More through extensibility
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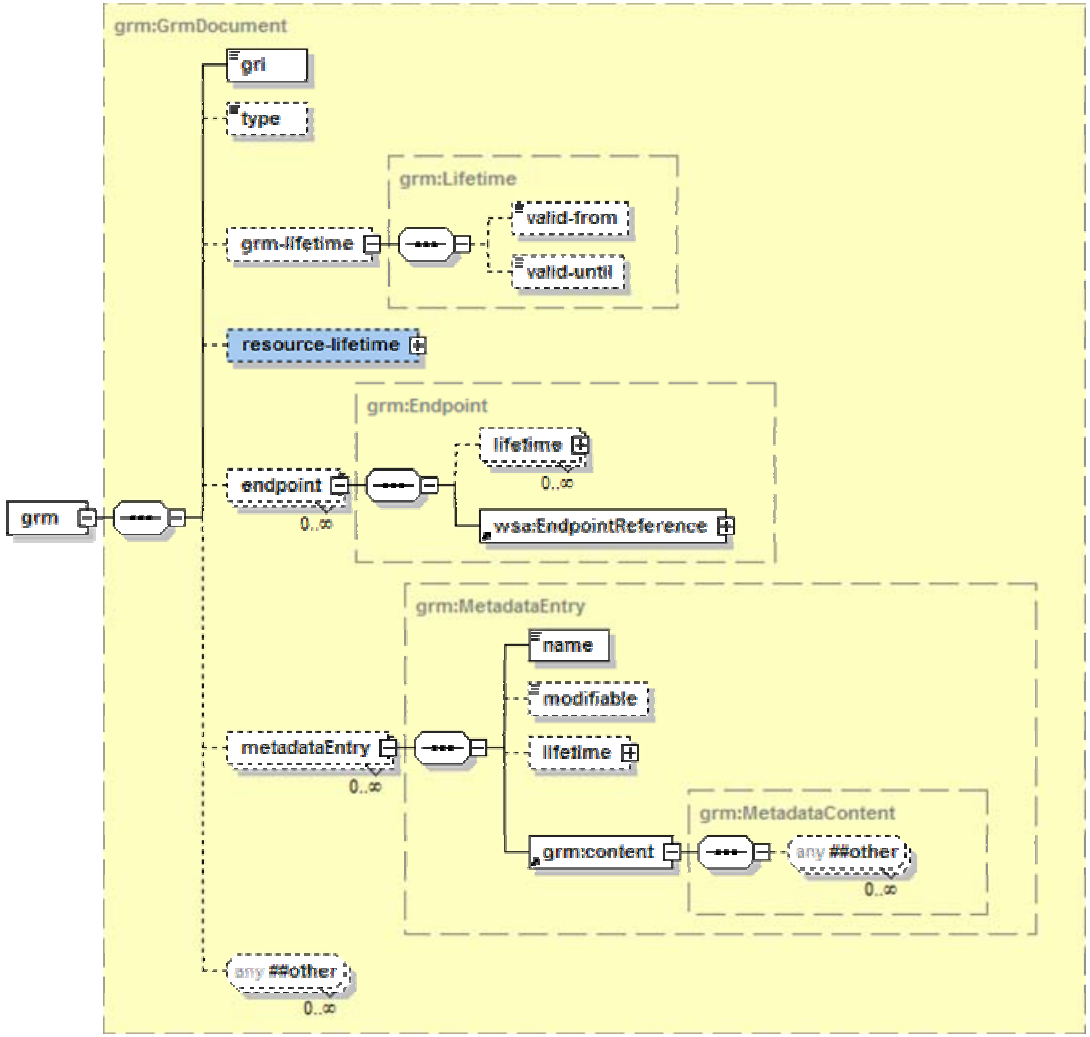
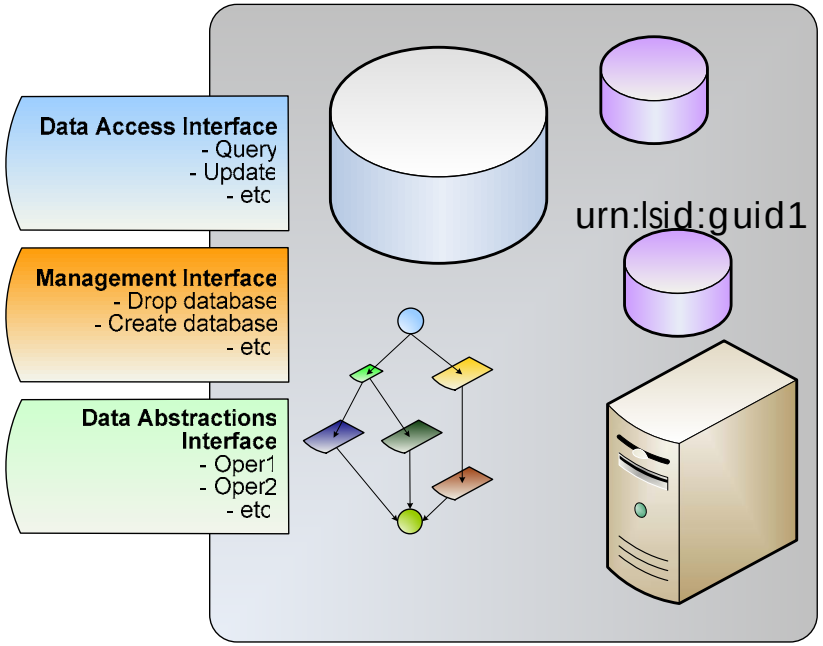


Identity

- Grid Resource Identifier (GRI) (like an LSID)
  - Everlasting, unique resource identifier (Uniform Resource Name, URN)
  - Can be stored in a database or printed in a journal
  - Decoupling of identity from interface

It's the resource that is identified and not a service instance

A service could be seen as a resource



Demo

- A generic browser
- Few Web Services (in Java and .NET)

SDEs vs GRM

- SDEs
  - Require additions to WSDL
  - New SDE-aware tools
  - Add semantics to a Web service
  - Requires a particular Web service interface (SDE-specific)
- Grid Resource Metadata document
  - Based on XML-Schema
  - No additions to WSDL or another specification
  - Existing tools work
  - Does not add semantics to a Web service, it's just a document
  - Could be published into a registry
  - Requires a particular Web service interface (Management interface or another interface) but other solutions can be built around it (e.g., P2P, registries, etc.)

Conclusions

- SDEs were invented to support a perceived requirement due to the semantics associated with Grid Service Instances
- The Grid Resource Metadata document is a functionally equivalent alternative to SDEs
  - Without requiring changes to the semantics of the underlying infrastructure or the tooling
  - Existing technologies to describe metadata does not have to change
  - Reuse all existing work
- Proposed as an “envelope” for metadata information
- Very simple solution

People and Links

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Web Services Grid Application Framework (WS-GAF)

http://www.neresc.ac.uk/ws-gaf