Building scientific Virtual Research Environments in D4Science

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Interoperability & VRE Definition

Interoperability:"*The capability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units*", ISO/IEC 2382-01, Information Technology Vocabulary, Fundamental Terms

VRE: a digital environment that supports researchers across disciplines in the process of creation, validation and exploitation of data, information and knowledge as individuals and as groups, supporting collaboration and fulfilling their needs in ICT resources.

Resource

Software

Data

Policies

Resources & Software

Resources (Virtualisation & resource model (representation and use))

- Resource Virtualization
- Common Resource Management Facilities
  - Lifecycle
  - Publication/Registration
  - Monitoring
  - Discovery
  - Employing / Querying

Software (empowering resources)

- Interface-based architecture
  - “Cooperate on interfaces, compete on implementations”
- Loosely coupled components
- Message exchange and handling
- Management
- Compliance with Open Standards

Data & Policy interoperability

Data interoperability

- Schema agnostic data handling
  - Tolerant for structured, semi-structured and “unstructured” data
- (Meta) Data / Content interoperability
  - Brokerage
  - Data Transformation

Policy interoperability

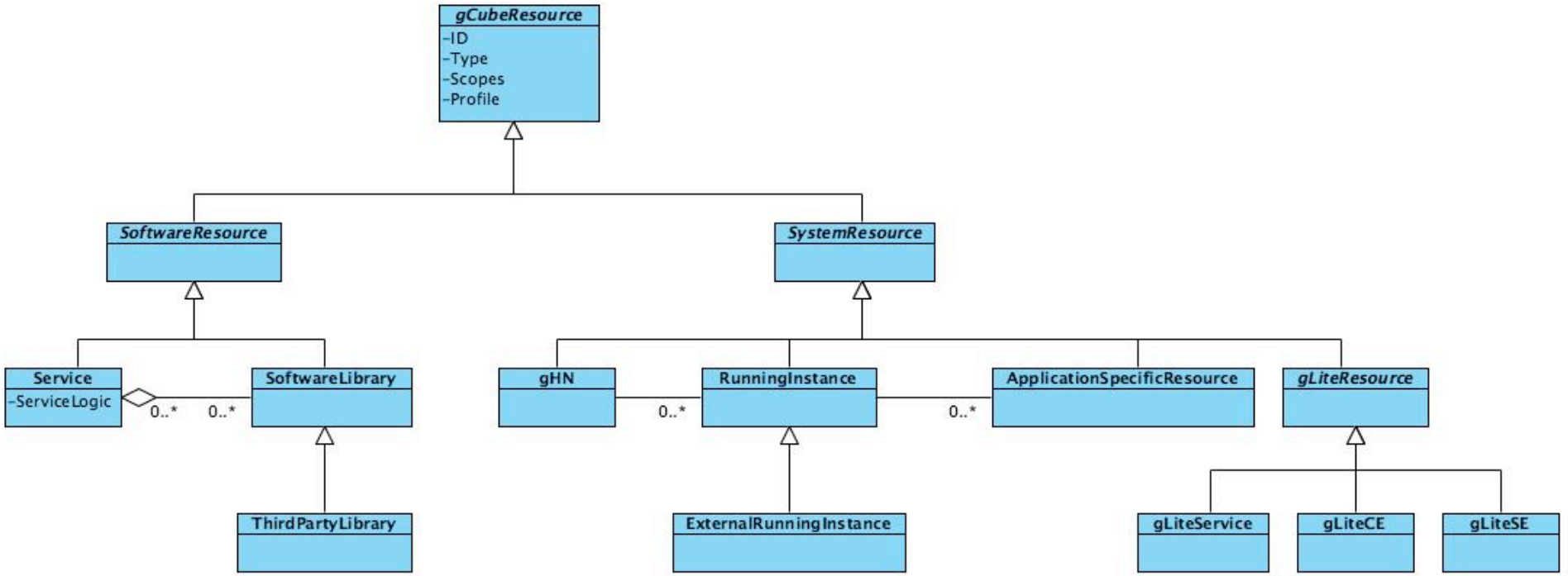
- Conceptualization
- Interoperating policy enforcement mechanisms

Resource Model

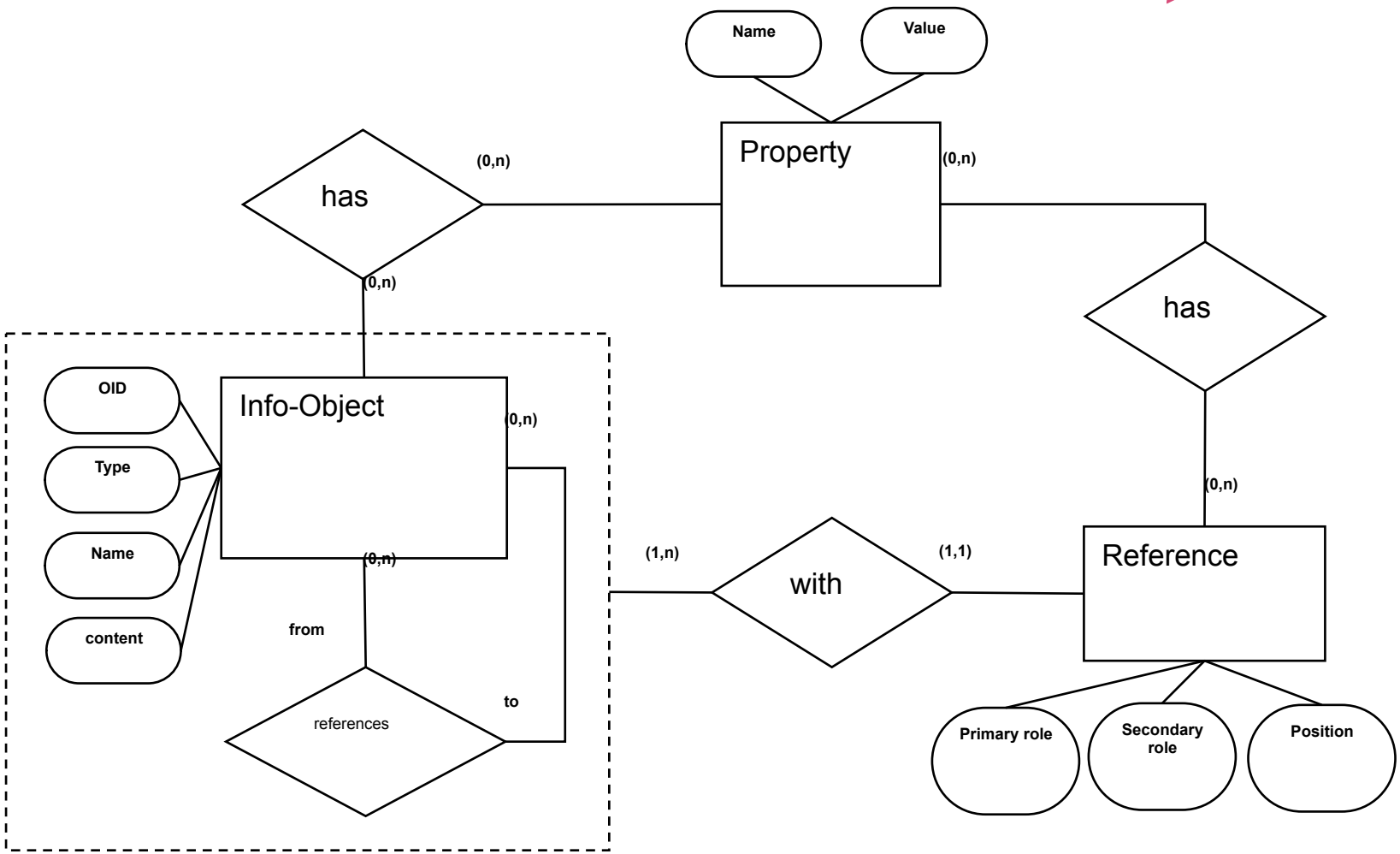
Information Model

Policy Model

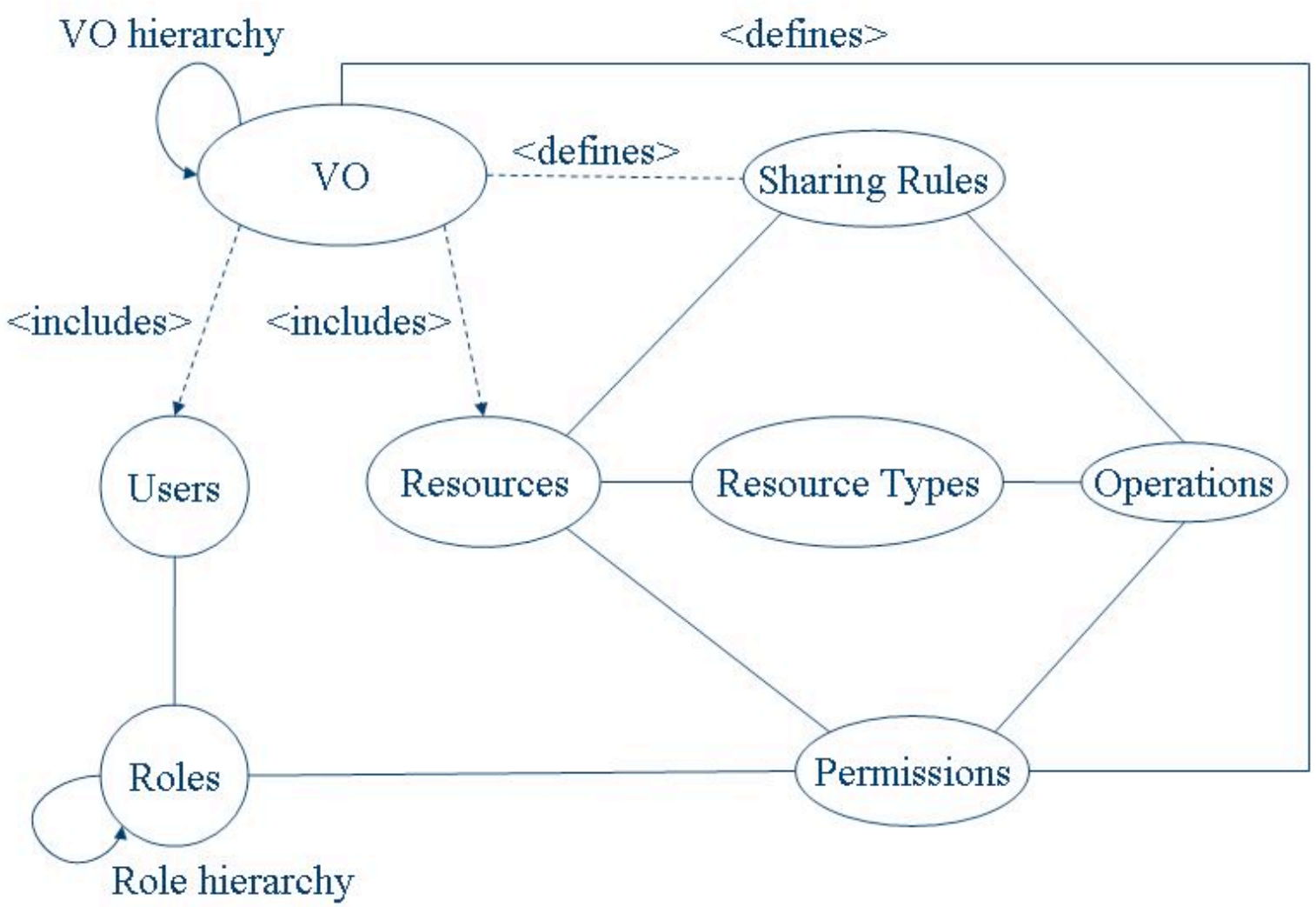
Resource Model



Information Model



VO Model


VO hierarchy
<defines>
VO
<defines>
Sharing Rules
<includes>
<includes>
Users
Resources
Resource Types
Operations
Roles
Permissions
Role hierarchy

Focus on Data Interoperability in gCube

Makes excessive use of XML data

Provides dynamically constructed highly distributed data processing pipe-line

- "Players" are all service resources

Provides the mechanisms for interoperable services exchanging data

- Data transfer not effectively captured by WS-*
- ResultSets

Is data agnostic in the core:

- Metadata Management, Indexing, storage do not pose restrictions on payload.
- Exposes excessive configurability for handling domain-specific requirements

Offers services for converting data and content among interoperating parties:

- The Metadata Broker
- The gCube Data Transformation Service

Focus on Data Interoperability in gCube : On the road

Supports multiple protocols for importing / exporting data

- Soon OAI-PMH compliant

WS-DAI compliance

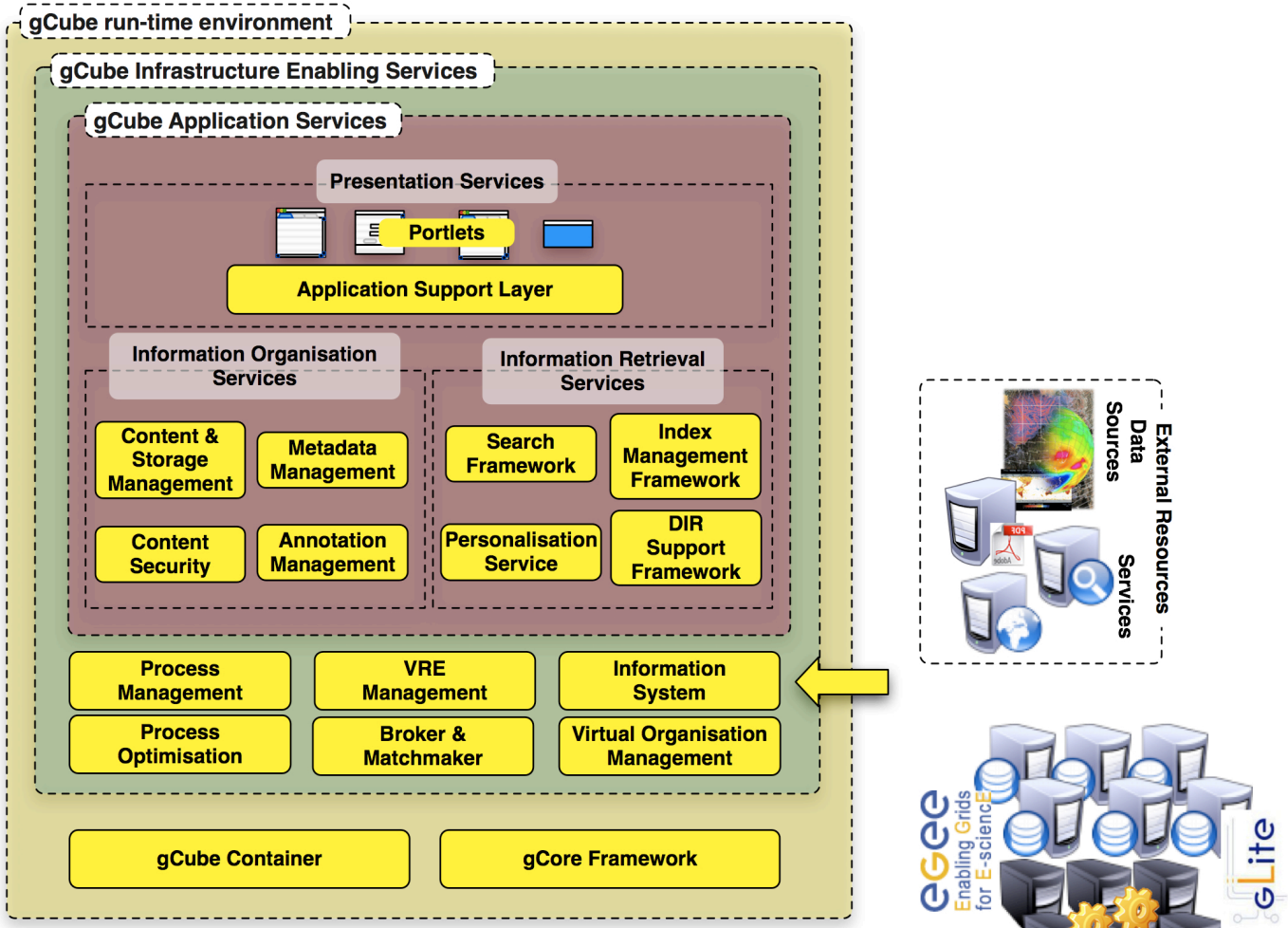
- gCube concepts directly map to WS-DAI ones

OAI-ORE compliance

- gCube Information model directly matches the ORE model

Advanced data interoperability techniques, based on ontologies and inference

D4Science System Reference Architecture



Sum up

D4Science/gCube provides machinery for:

- Operating an e-Infrastructure that supports Resource Sharing
- Design, Creation, Management for Virtual Research Environments

Its targeted execution environment / scope dictates an inherent interoperable philosophy / architecture

Every aspect (both model-based and systemic) is designed to be interoperable in principle

Thank you!