Digital Libraries, Data Grids, and Persistent Archives

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Accessing Data

- How do you access storage systems at remote sites in someone else's administration domain?
- How do you organize distributed data into a cohesive collection with global, persistent identifiers?

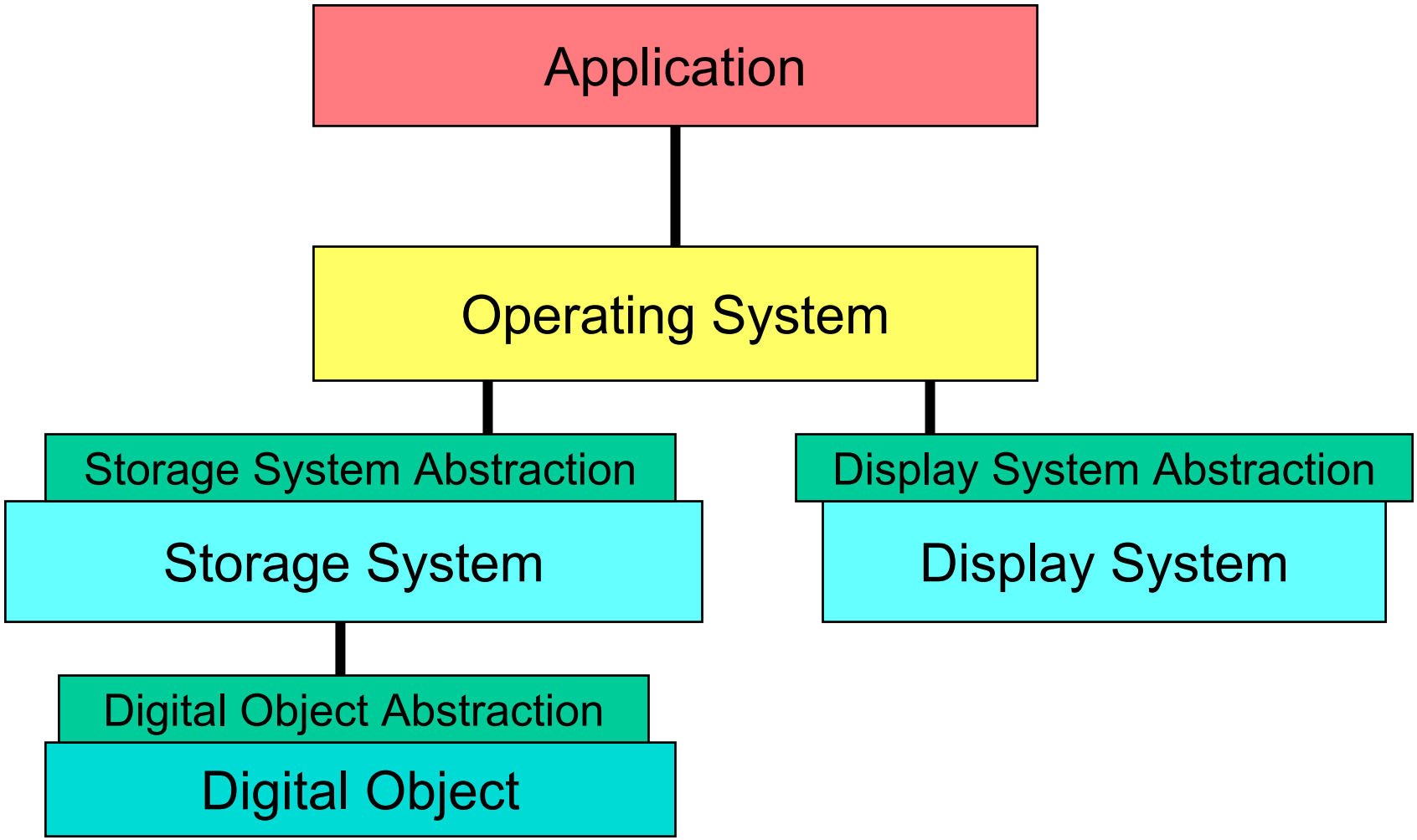
Information Management Projects

- **Digital Libraries**
  - CDL - AMICO
  - DARPA/USPTO - patent digital library
  - NLM Visible Embryo digital library - GMU
  - NSF Digital Library Initiative, Phase II - UCSB, Stanford
  - NSF NPACI Digital Sky - Caltech 2MASS sky survey
  - NSF NSDL - UCAR / Columbia / Cornell / UCSB
- **Data Grid Environments**
  - DOE Data Visualization Corridor - LLNL
  - DOE Particle Physics Data Grid - Stanford, Caltech
  - NASA Information Power Grid - NASA Ames
  - NIH Biomedical Informatics Research Network
  - NSF Grid Physics Network - U Florida
  - NSF National Virtual Observatory - Johns Hopkins University / Caltech
  - NSF Southern California Earthquake Center - ISI
- **Persistent Archives**
  - NARA Persistent Archive
  - NHPRC - Archivist workbench

Specifying levels of Abstraction

- Technology management becomes simpler if the persistent archive infrastructure operates on abstractions, rather than an explicit physical implementation of a resource
- Can we abstract
  - Digital objects
  - Storage

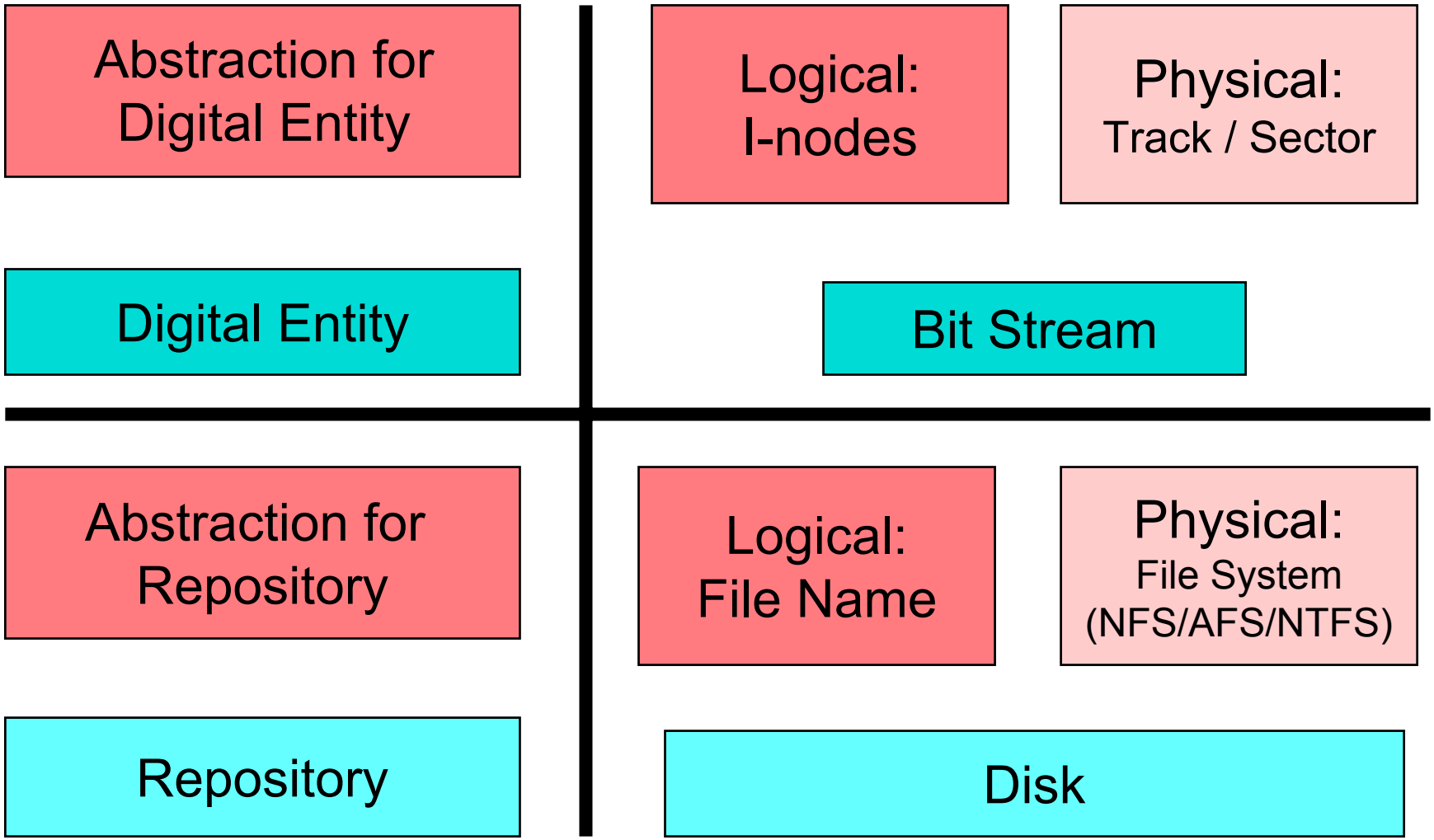
Technology Management



Types of Digital Entity Abstractions

- Logical representation
  - What does the digital entity represent?
  - What is the associated meaning?
- Physical representation
  - What is the physical structure of the digital entity?

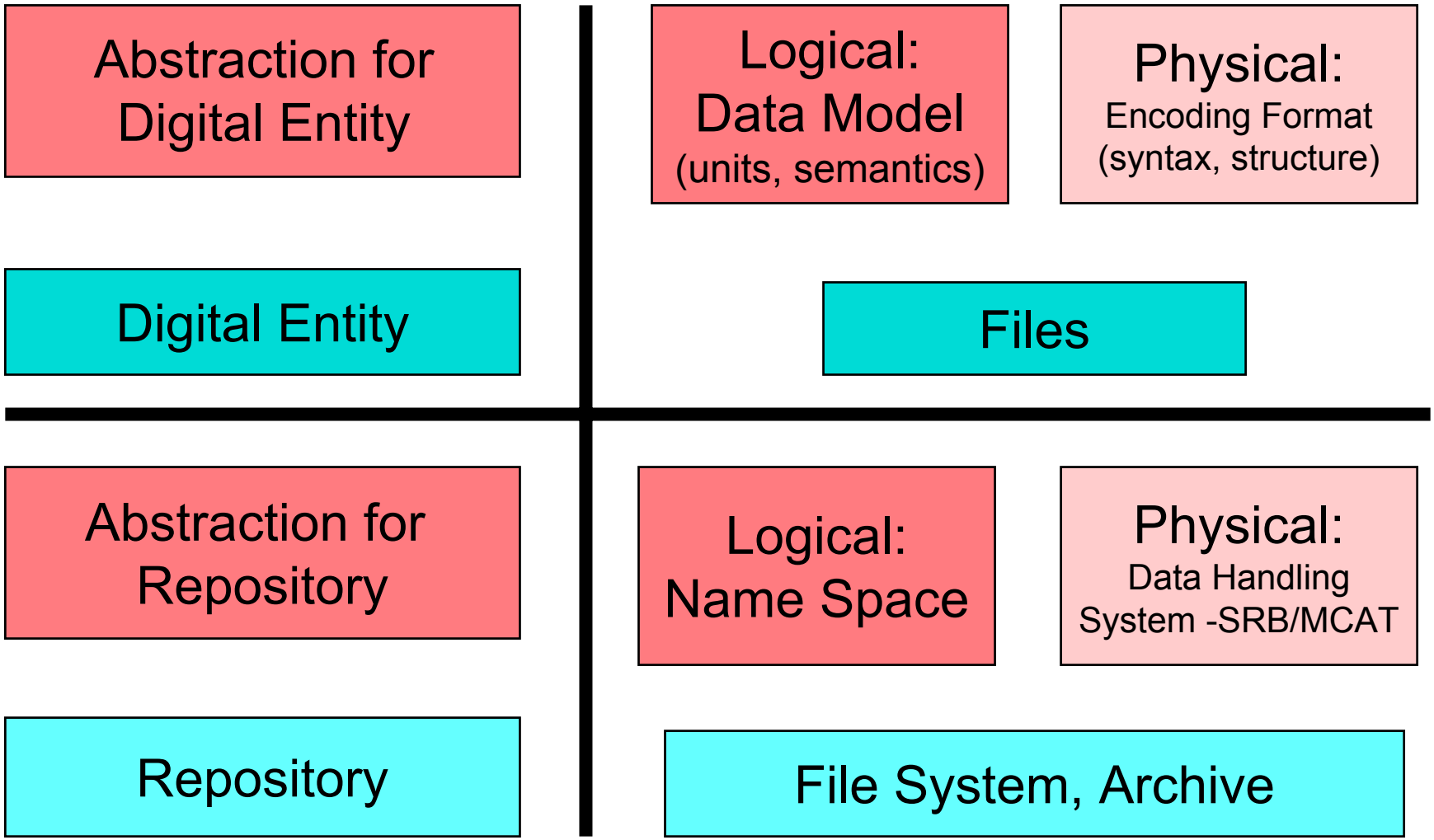
Levels of Abstraction for Bits



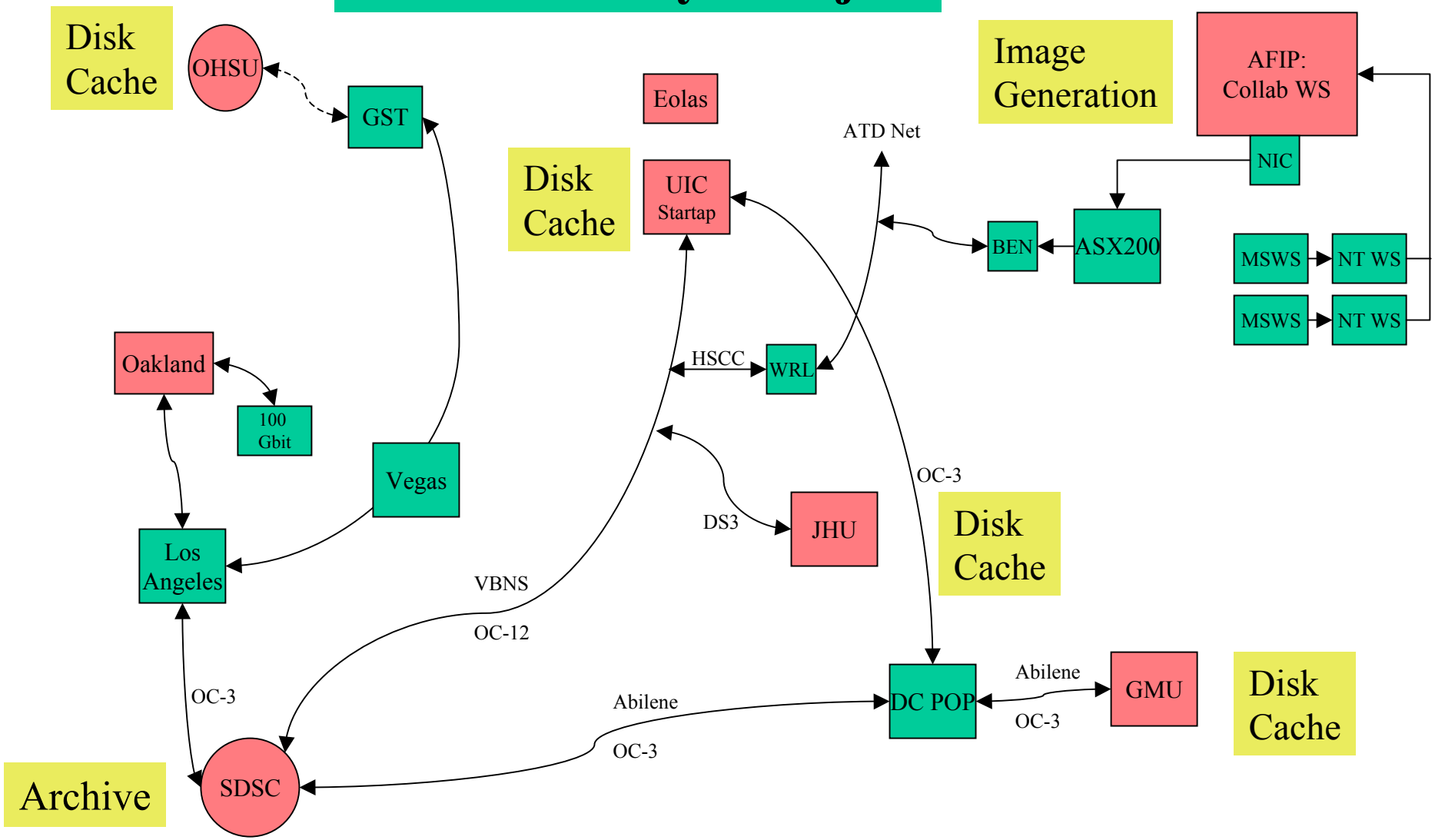
Managing Distributed Storage

- Separate the organization of digital objects from their physical storage
  - Logical Name Space to manage attributes about the digital objects
  - Data handling system to manage interactions with remote storage systems
- Create storage abstraction layer
- Storage Resource Broker (SRB) provides data management system

Levels of Abstraction for Data



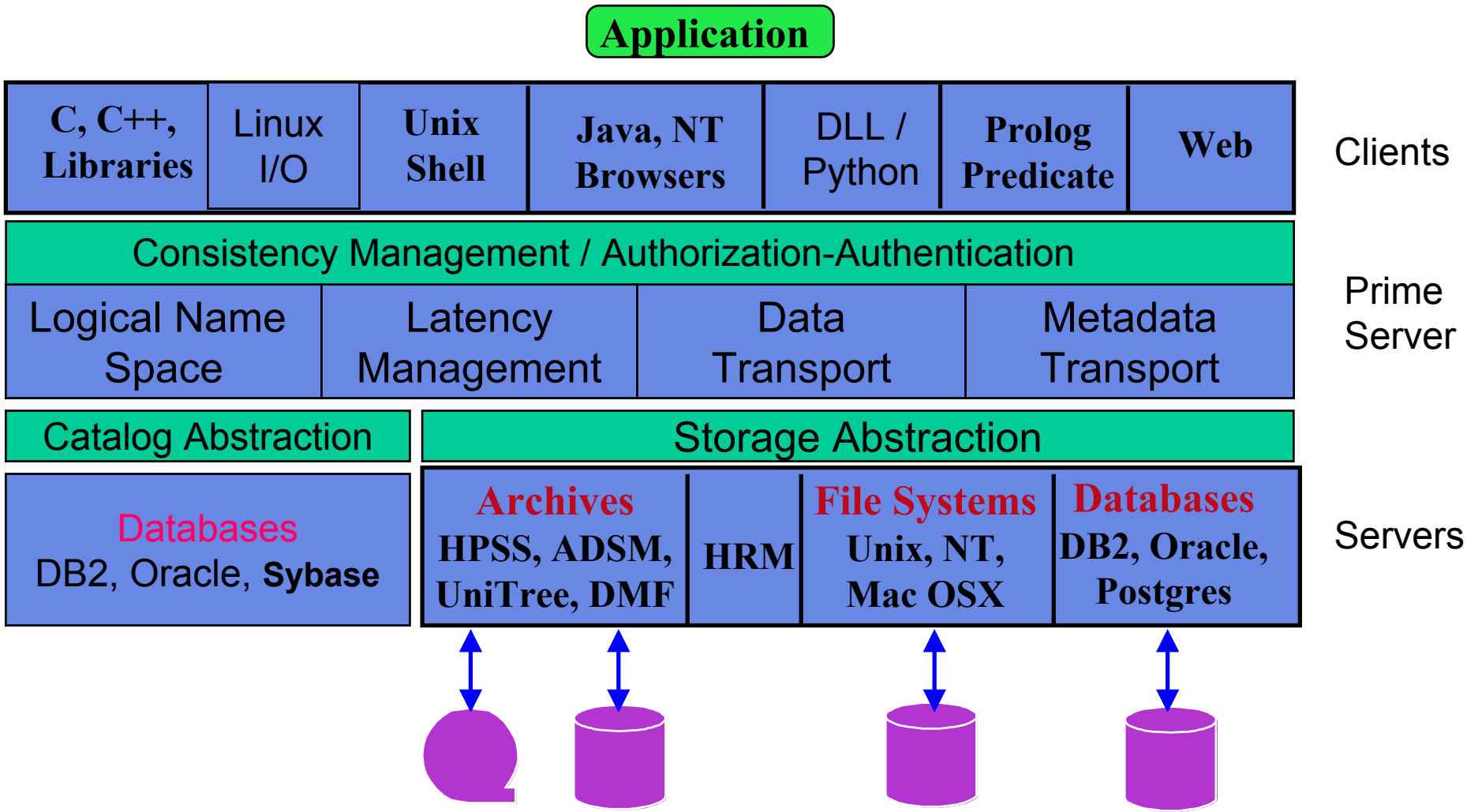
Visible Embryo Project



Disaster Response

- Support replicas - provide multiple copies of a data set stored at multiple sites, but accessed by the same logical file name
- On access, map from logical file name to the physical file name. If the file is not accessible, automatically fail over to a replica.

SDSC Storage Resource Broker & Meta-data Catalog



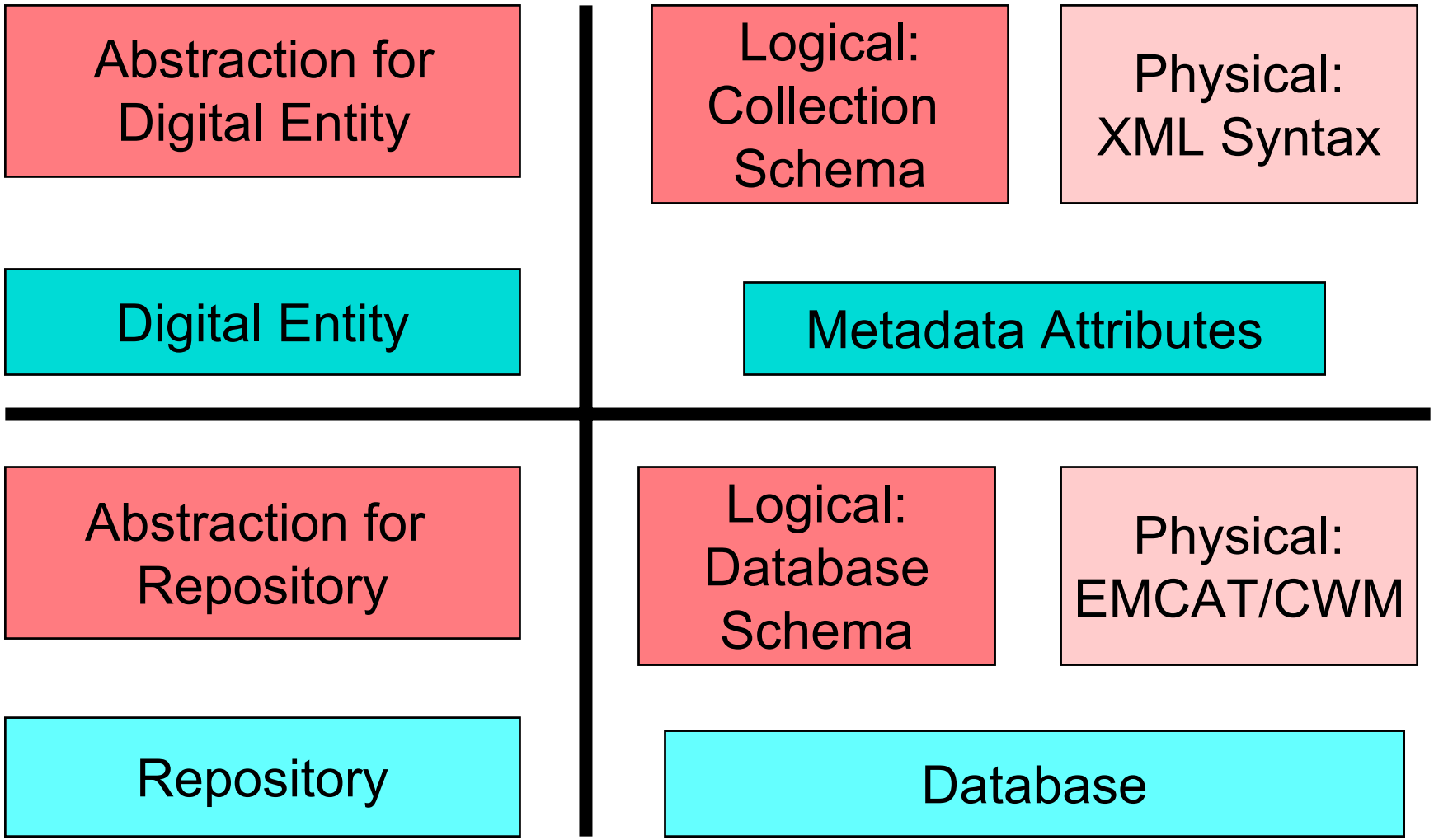
Information Management- Logical Name Space

- Set of attributes to describe digital entities that are registered into the logical name space
  - SRB metadata - Unix file system semantics
  - Provenance metadata - Dublin Core
  - Resource metadata - User access control lists
  - Discipline metadata - User defined attributes
- Each digital entity may have unique attributes

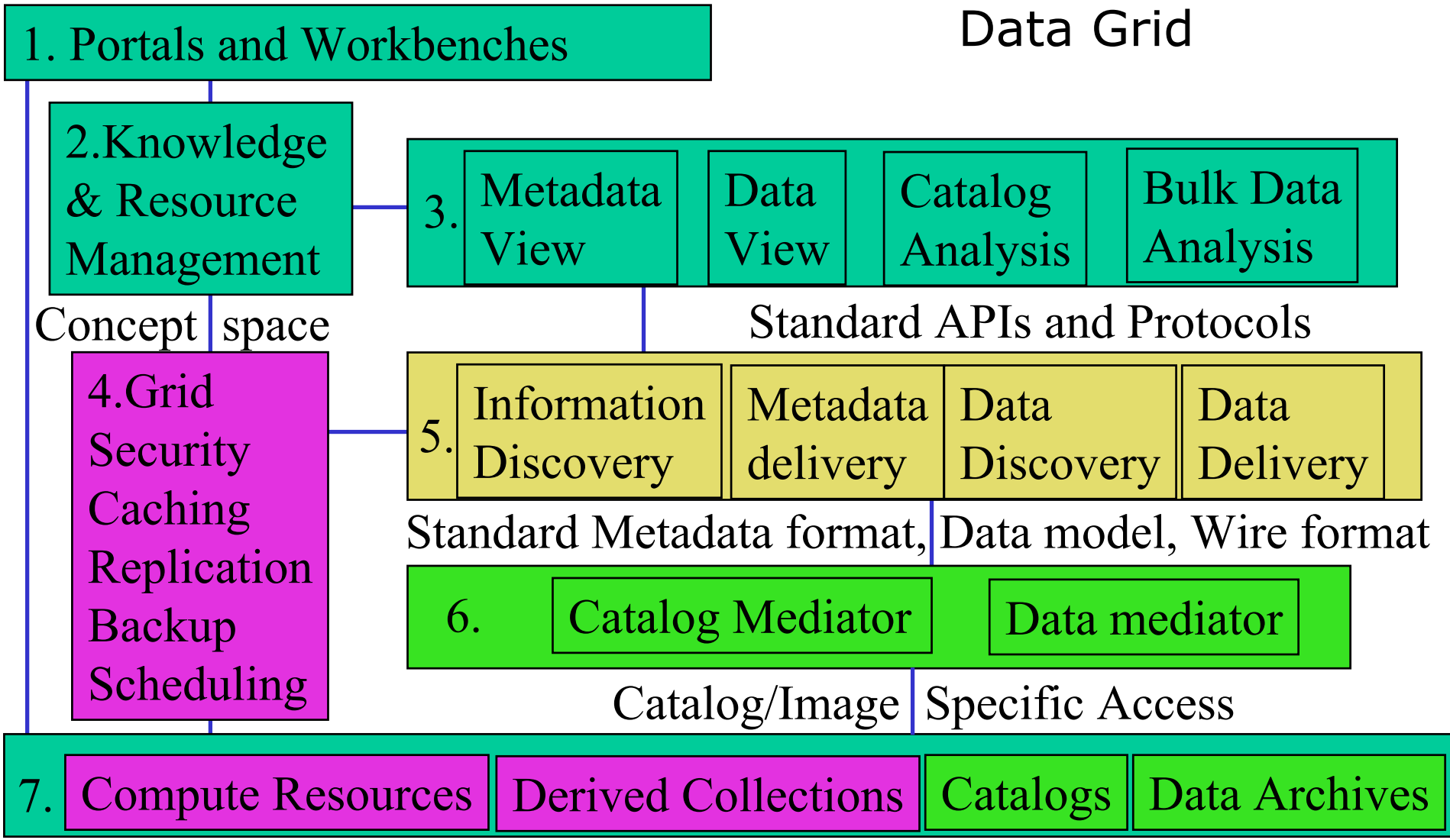
Information Management

- Abstraction layer for interacting with information repositories
  - Manage the schema and physical table structures of a database
  - Extensible schema
  - User defined attributes
- Extensible Metadata CATalog (EMCAT) manages collections
- mySRB.html interface supports dynamic collection creation

Levels of Abstraction for Information



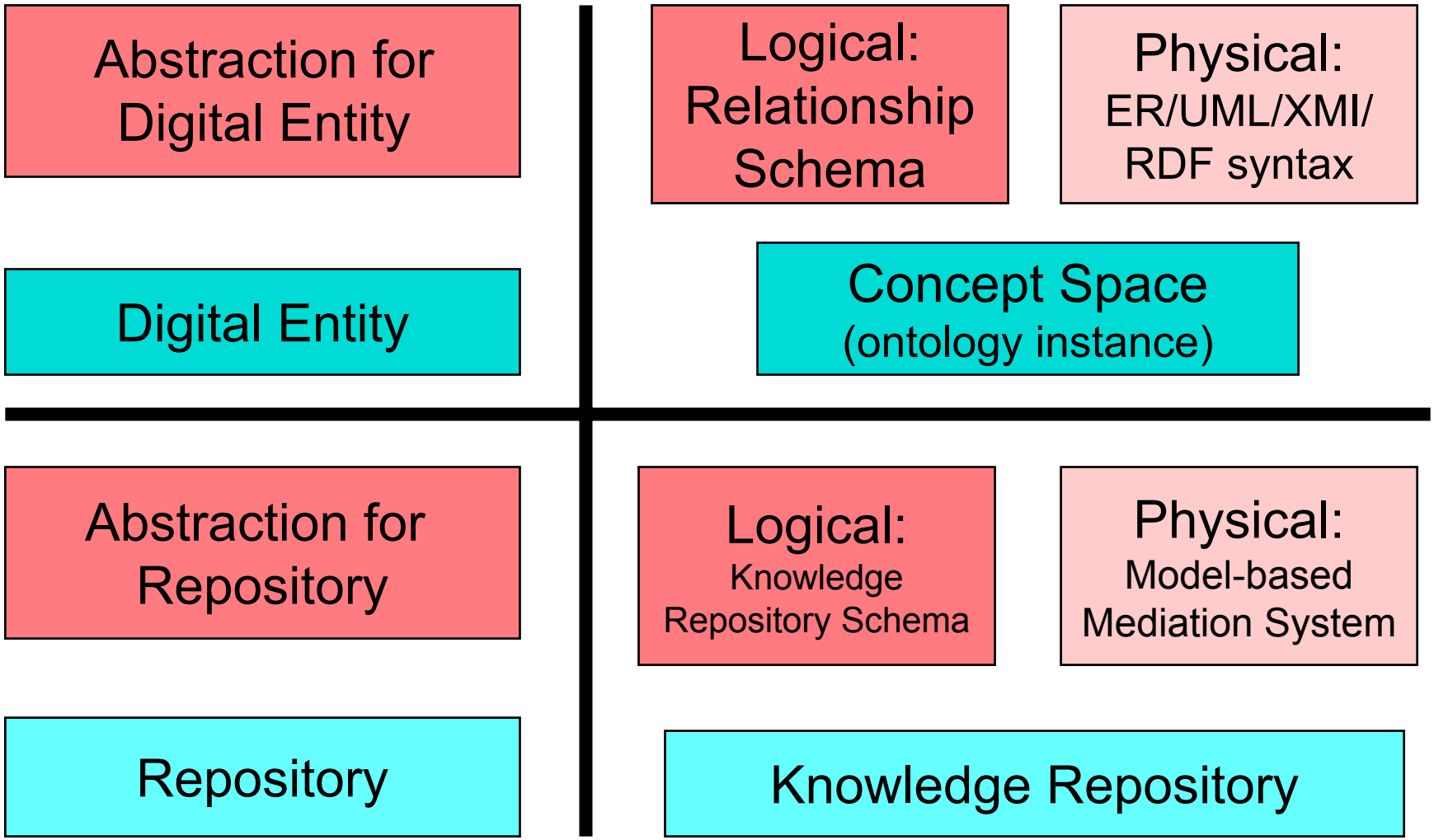
National Virtual Observatory Data Grid

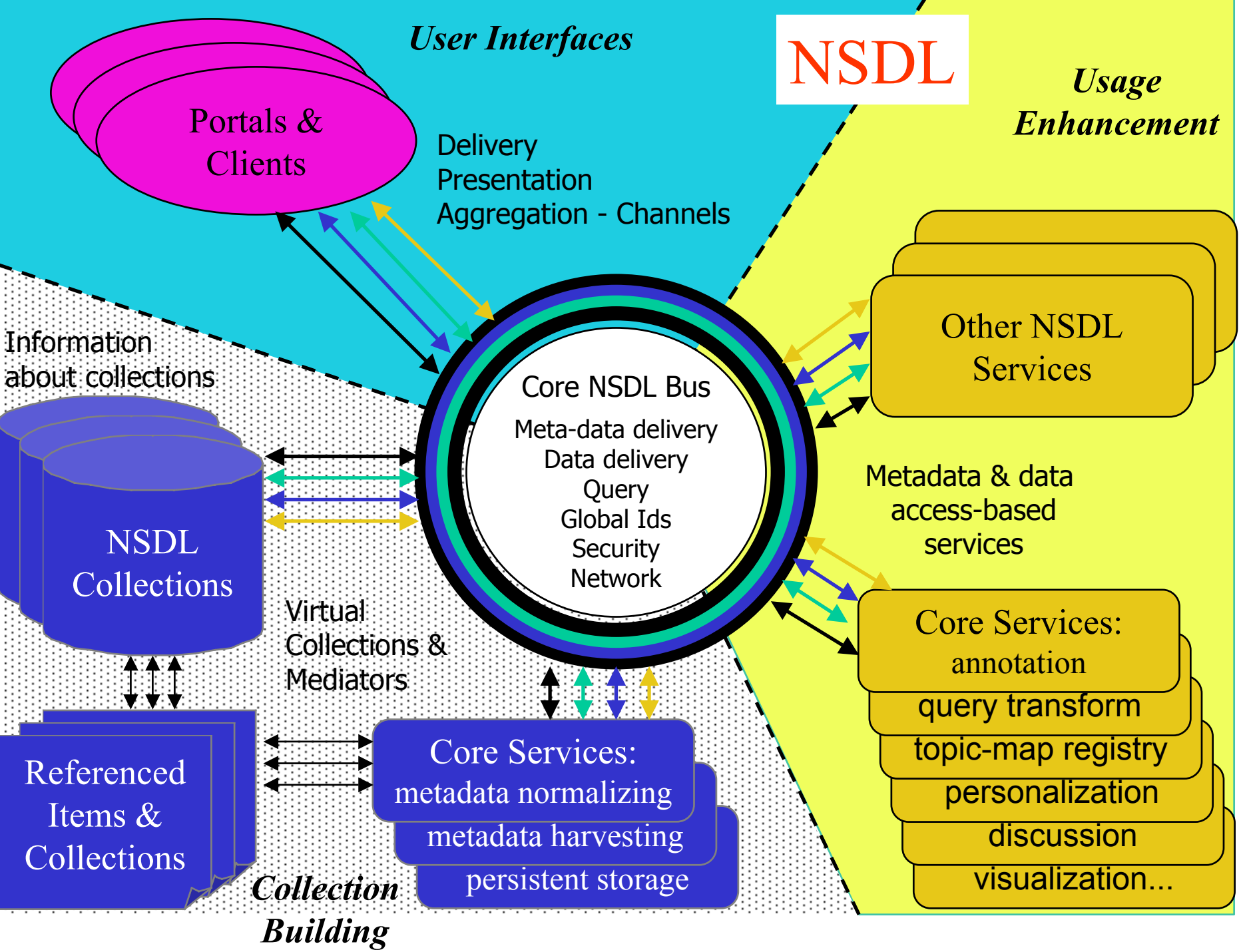


Knowledge Management - Discovery across Collections

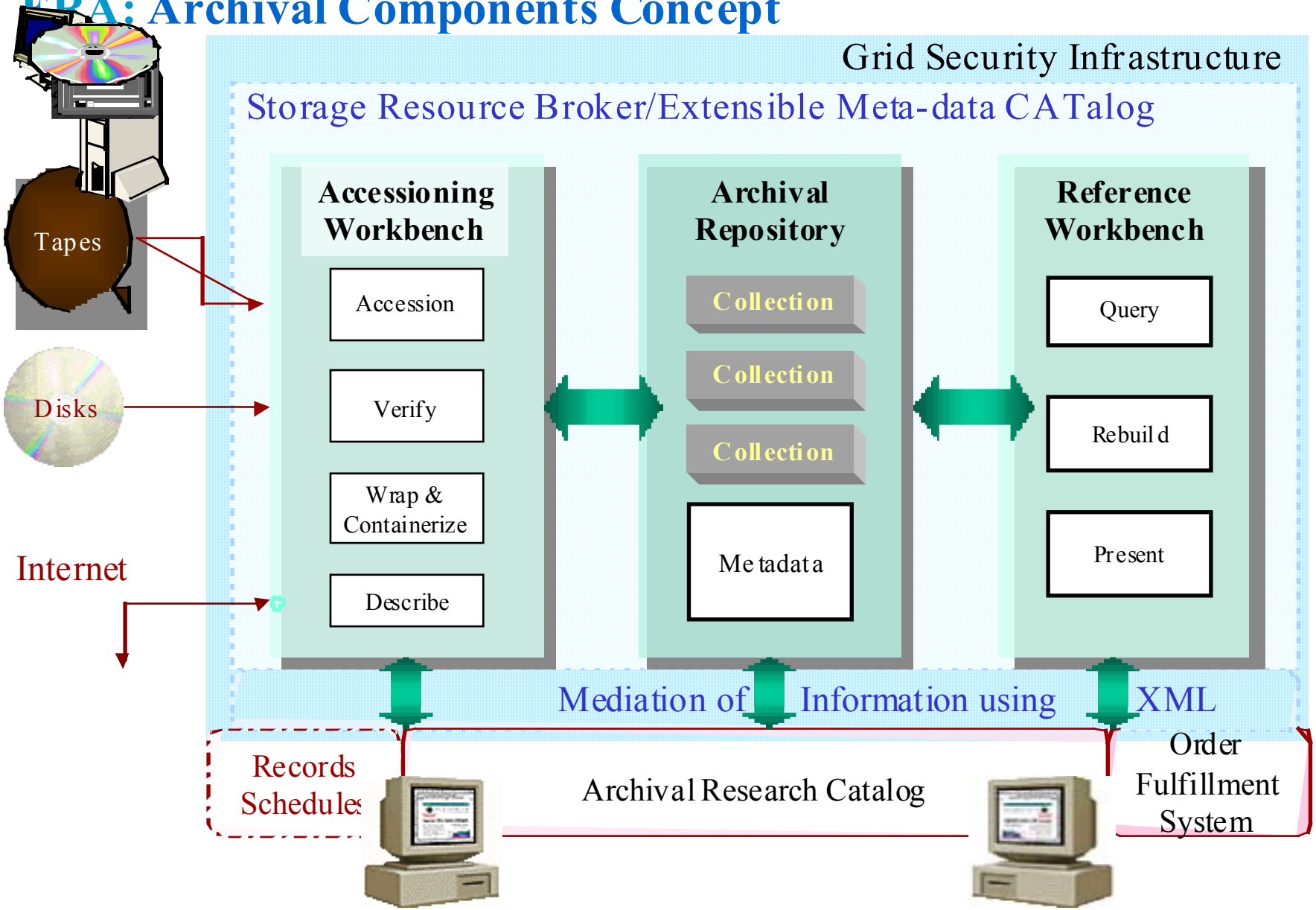
- Characterization of relationships between attributes
  - Semantic / logical - cross-walks
  - Procedural / temporal - records management
  - Structural / spatial - GIS
- Abstraction layer for knowledge repositories
- Mapping from collection attributes to discipline concepts
- Model-based Mediation supports mapping from knowledge relationships to rule-based inference engines

Levels of Abstraction for Knowledge




User Interfaces
NSDL
Usage Enhancement
Portals & Clients
Delivery
Presentation
Aggregation - Channels
Other NSDL Services
Information about collections
Core NSDL Bus
Meta-data delivery
Data delivery
Query
Global Ids
Security
Network
Metadata & data access-based services
NSDL Collections
Virtual Collections & Mediators
Core Services:
annotation
query transform
topic-map registry
personalization
discussion
visualization...
Referenced Items & Collections
Core Services:
metadata normalizing
metadata harvesting
persistent storage
Collection Building

ERA: Archival Components Concept



Further Information

- Academic

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- Commercial - Storage Resource Broker

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