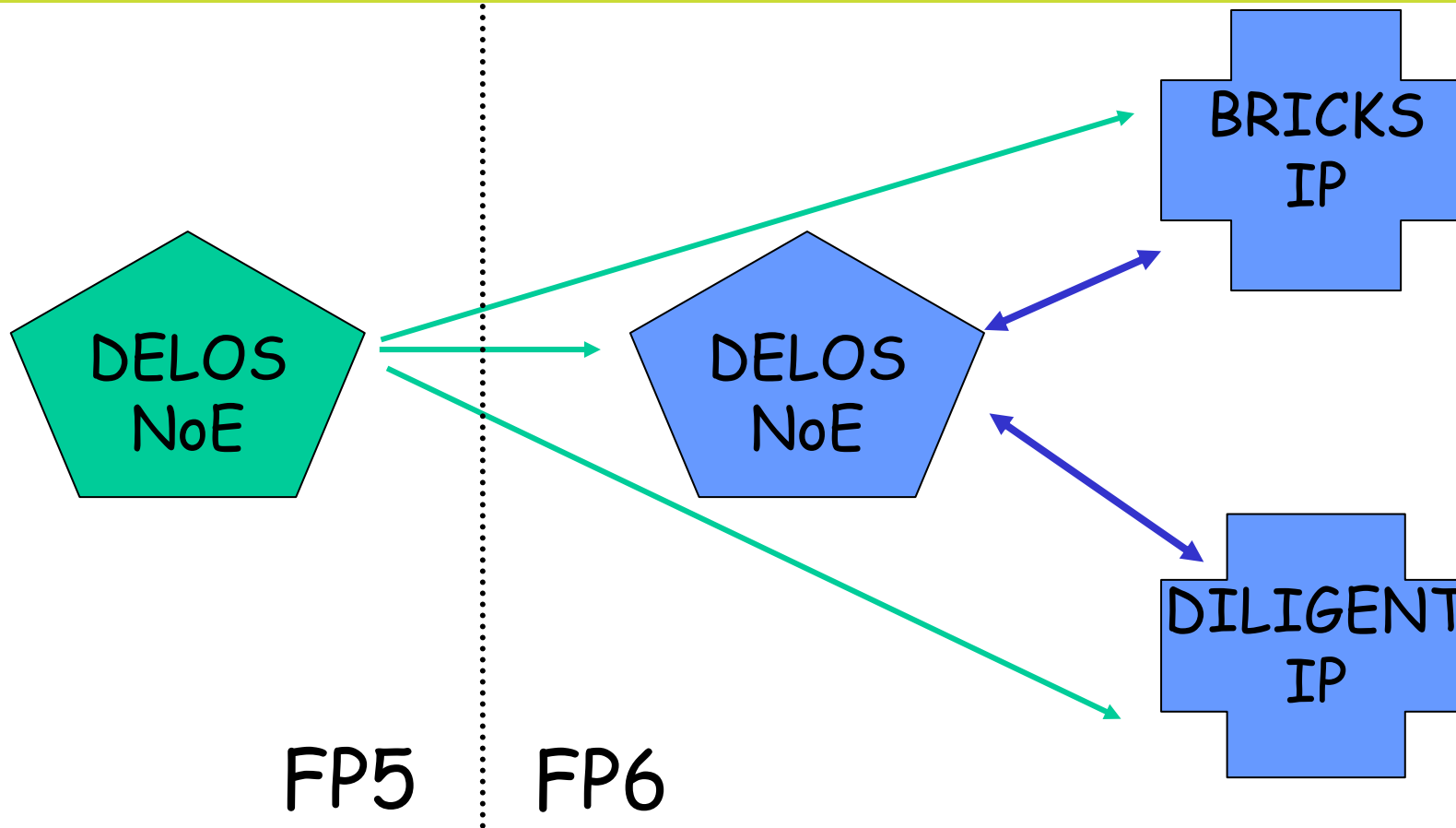


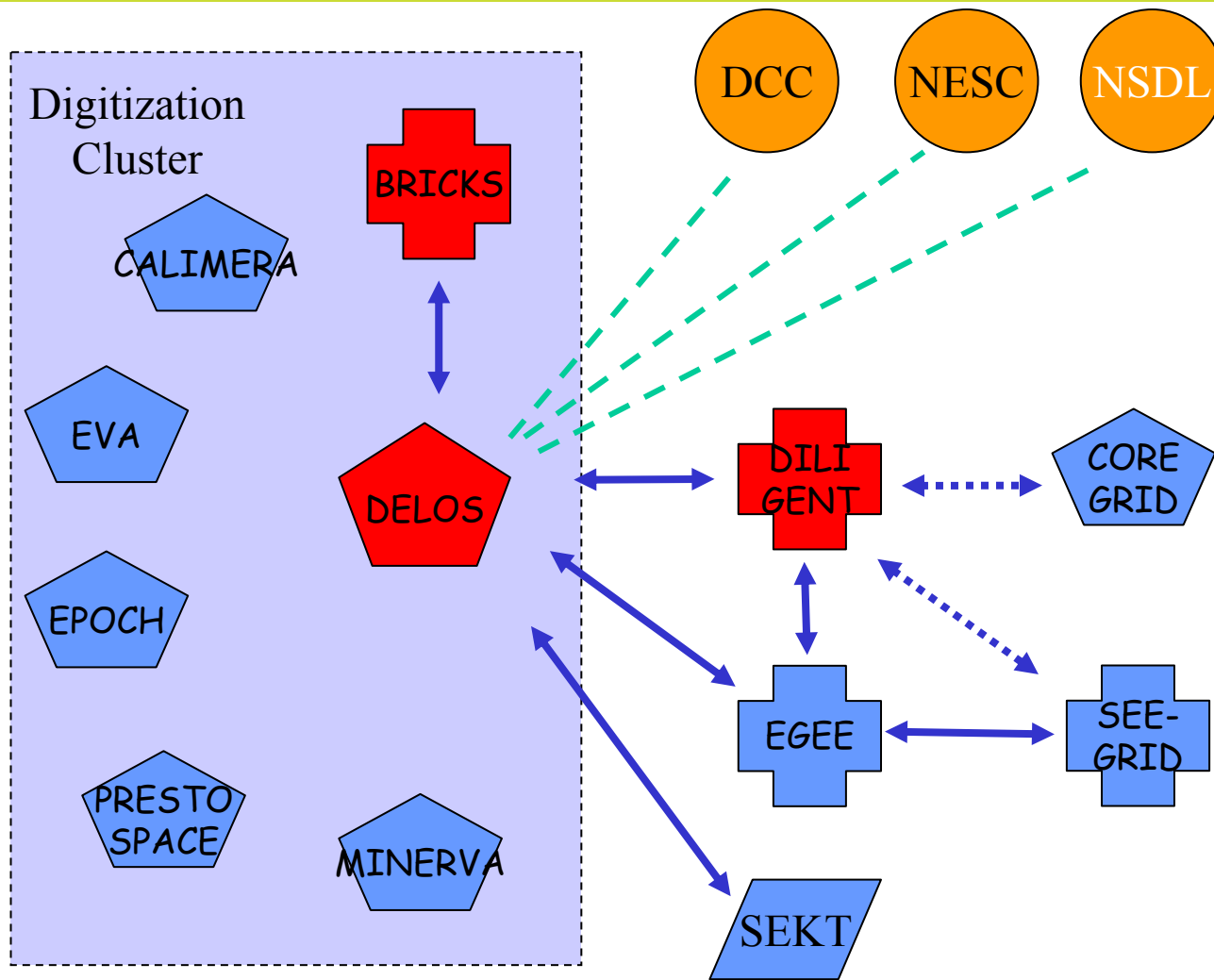
Towards a Long Term Research Agenda for Digital Library Research

Yannis Ioannidis
University of Athens
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DELOS Project Family Tree



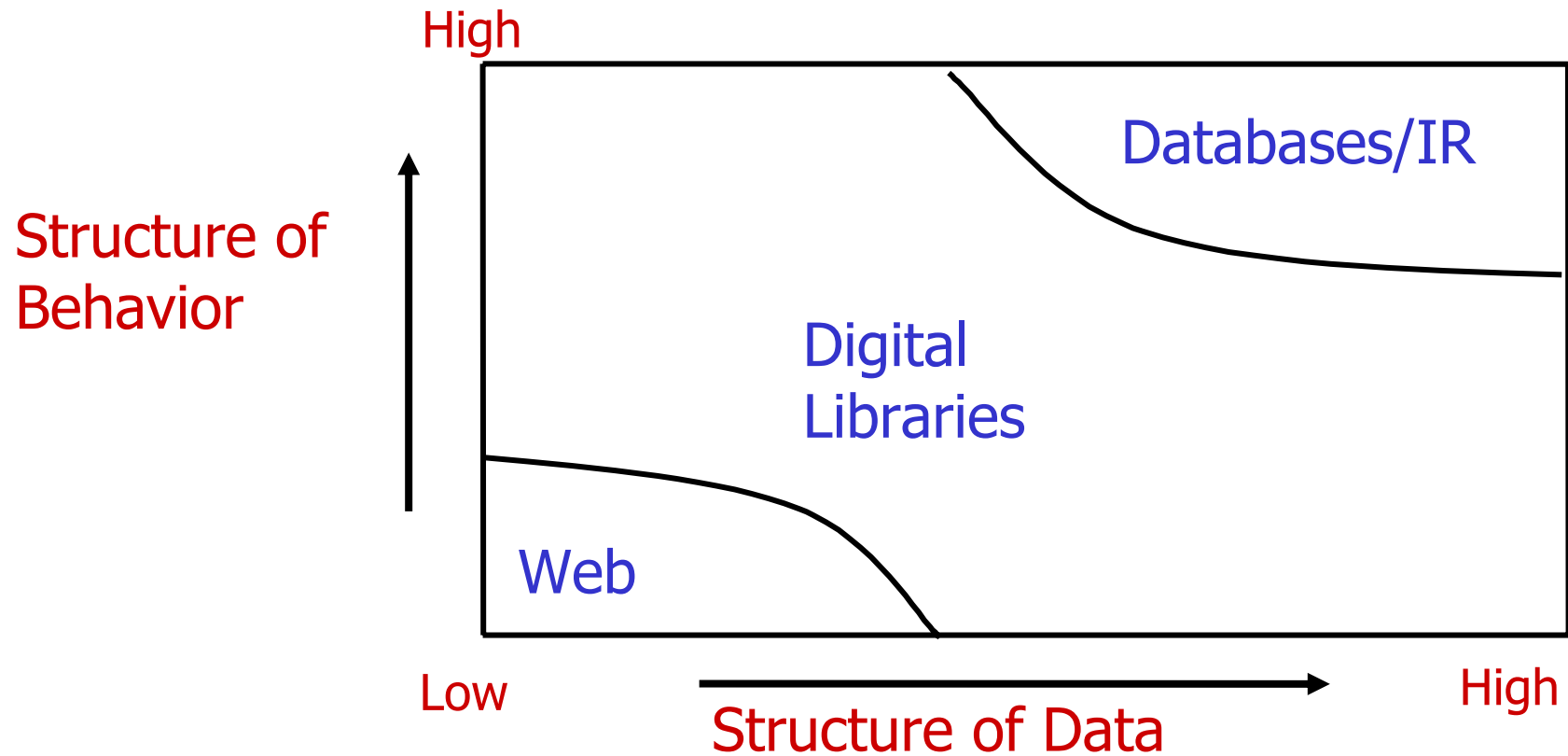
Project Interactions



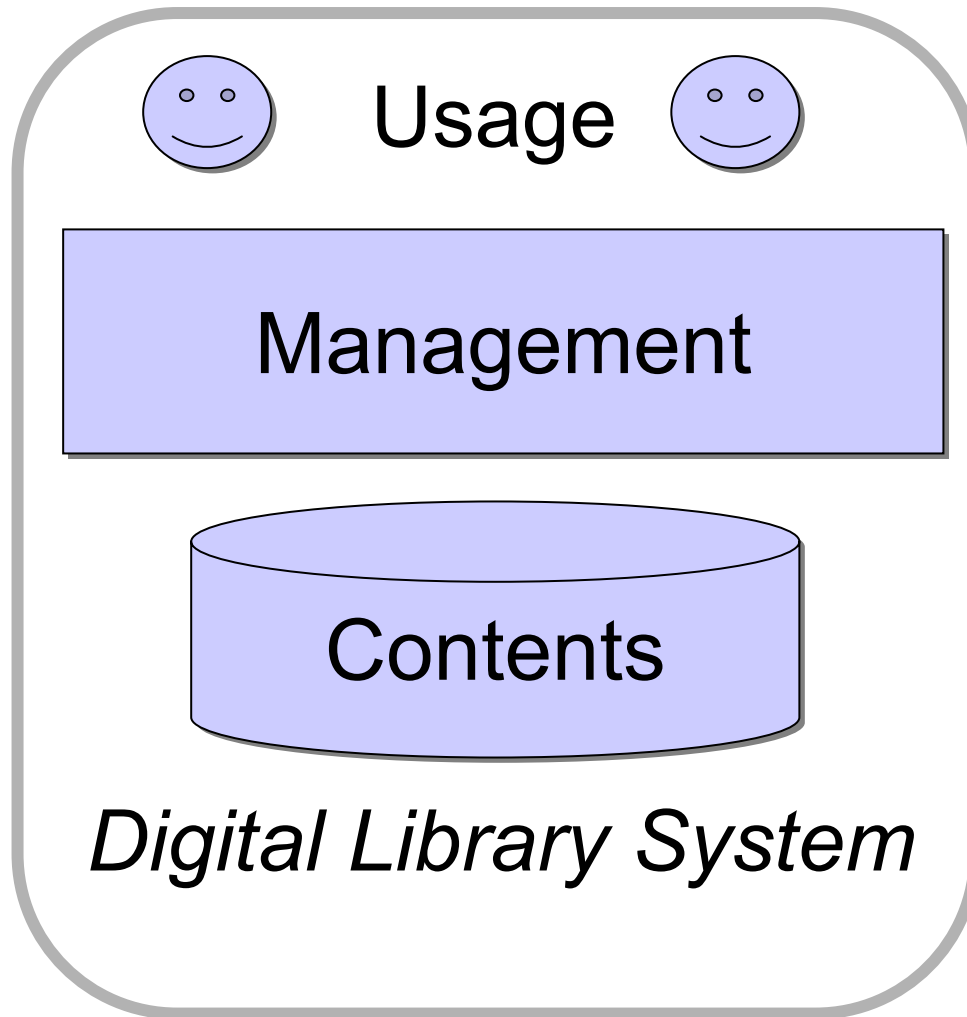
DL Definition

- **What:** information and services
 - comprehensive
 - rich forms and kinds
 - read-and-expand-only
- **Why:** learning and research
- **When:** value at depth of time

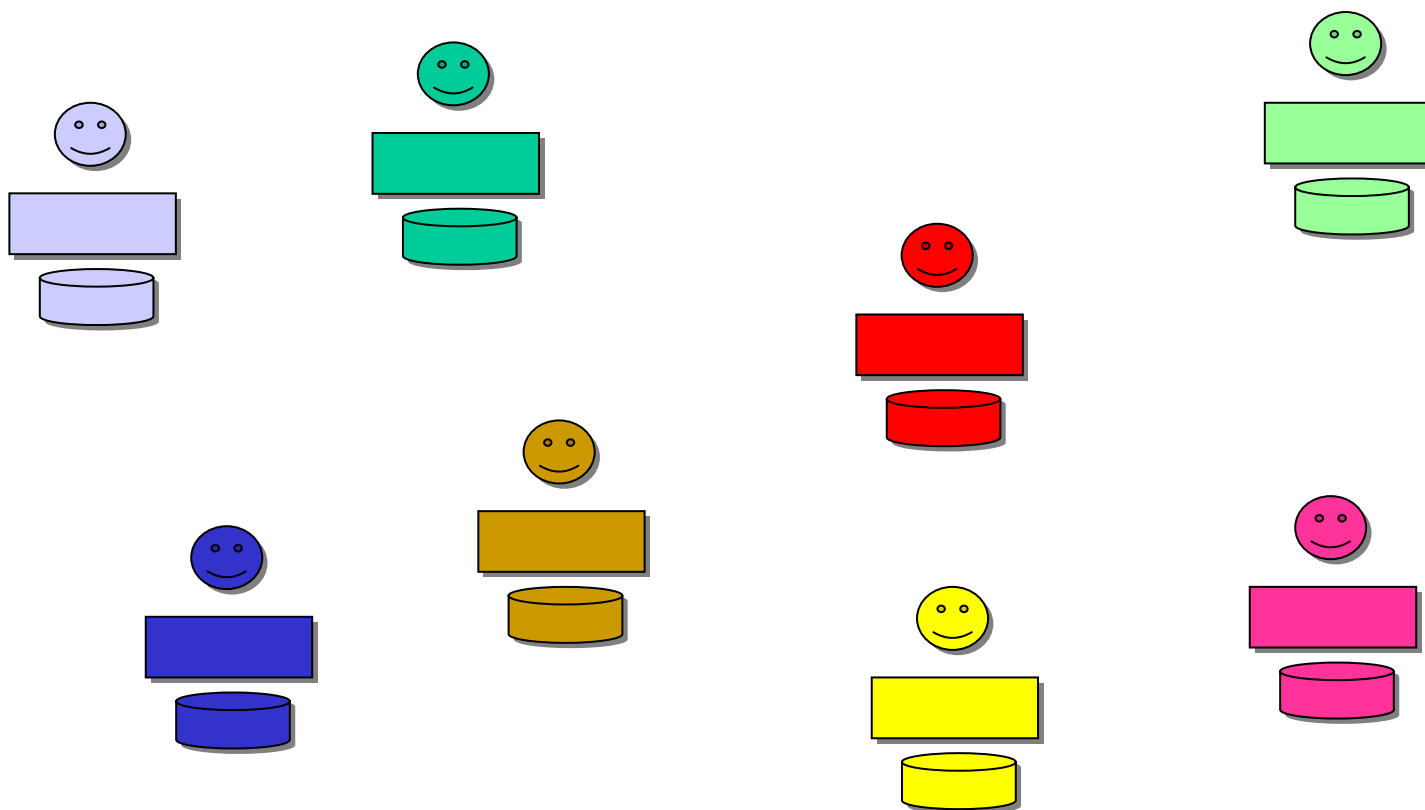
Information Space for DLs



Conceptual Framework



Current Methodology



Current Methodology

Content-centric

Targeted for static storage

Environment-specific

Isolated and repeated efforts

Isolated systems

Current Myths

Digital Libraries are for things in Libraries only

Digital Libraries are for Cultural Heritage only

Grand 10-Year Vision #1

Digital libraries should enable **any citizen** to access **all** human knowledge **anytime** and **anywhere**, in a **friendly, multi-modal, efficient,** and **effective** way, by overcoming barriers of **distance, language, and culture** and by using multiple **Internet-connected** devices

Grand 10-Year Vision #2

The potential exists for digital libraries to become the **universal** knowledge repositories and **communication conduits** for the future, a common vehicle by which **everyone** will access, **discuss, evaluate, and enhance** information of **all** forms

Future Digital Libraries

Content-centric

Person-centric

Targeted for static storage

Targeted for active communication/collaboration

Environment-specific

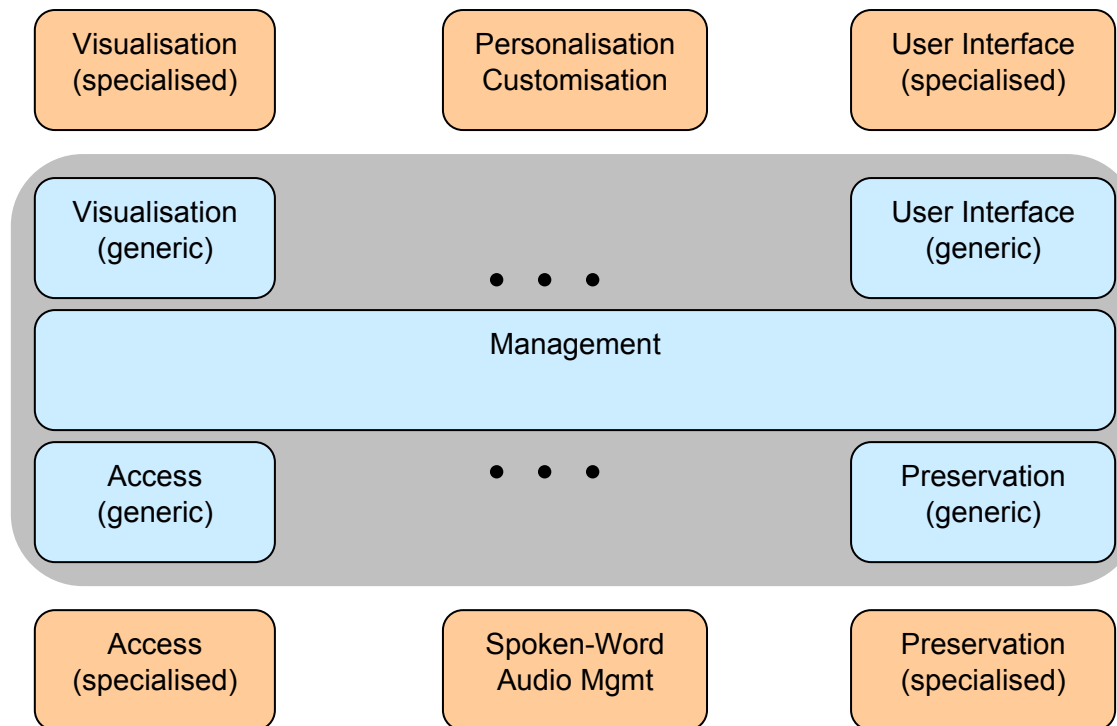
Isolated and repeated efforts

Isolated systems

Global distributed interacting systems

“All” applications

Digital Library Management Systems



Future Digital Libraries

Person-centric

Targeted for active communication/collaboration

Generic technology for DLMS

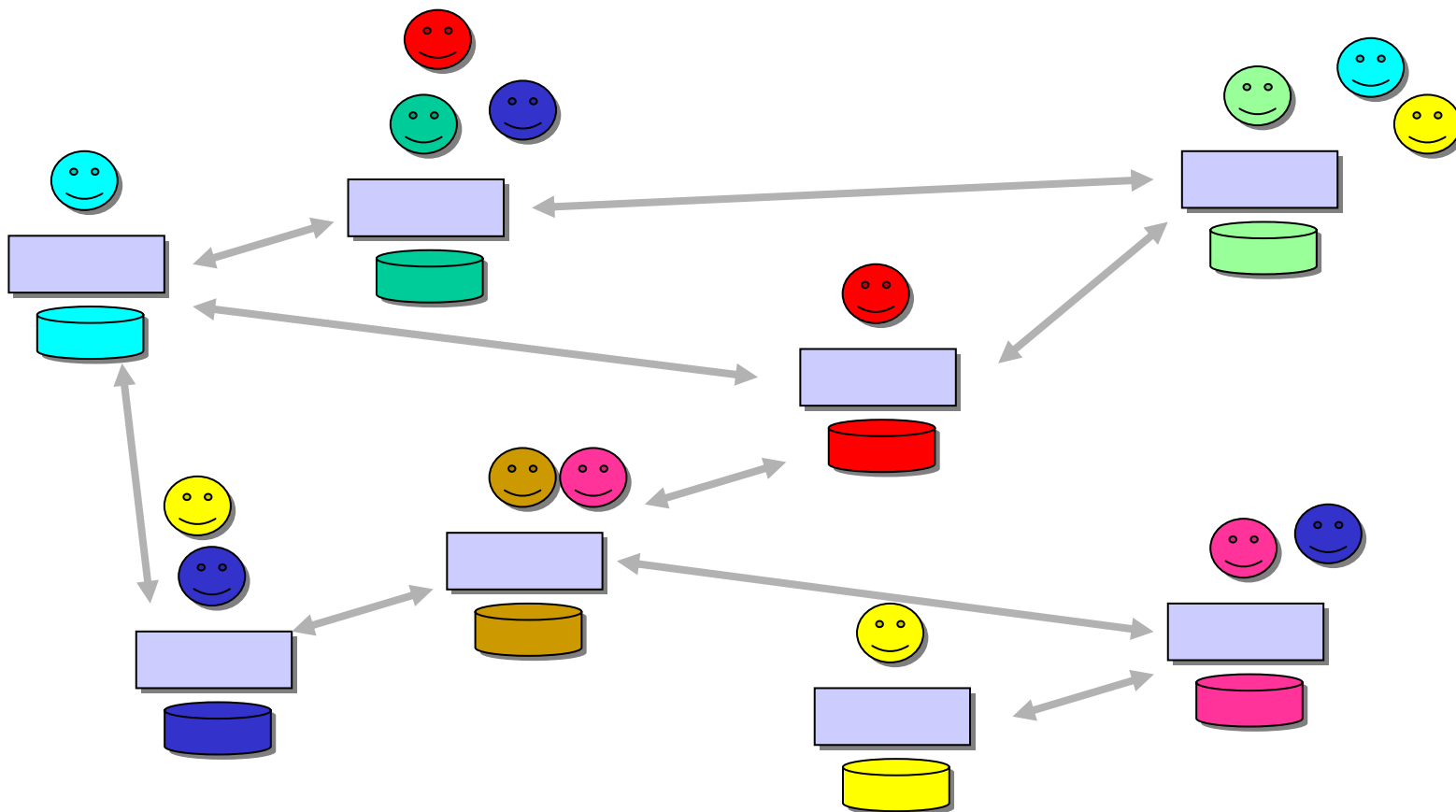
Environment-specific needs on top of them

Maximum reuse

Global distributed interacting systems

“All” applications

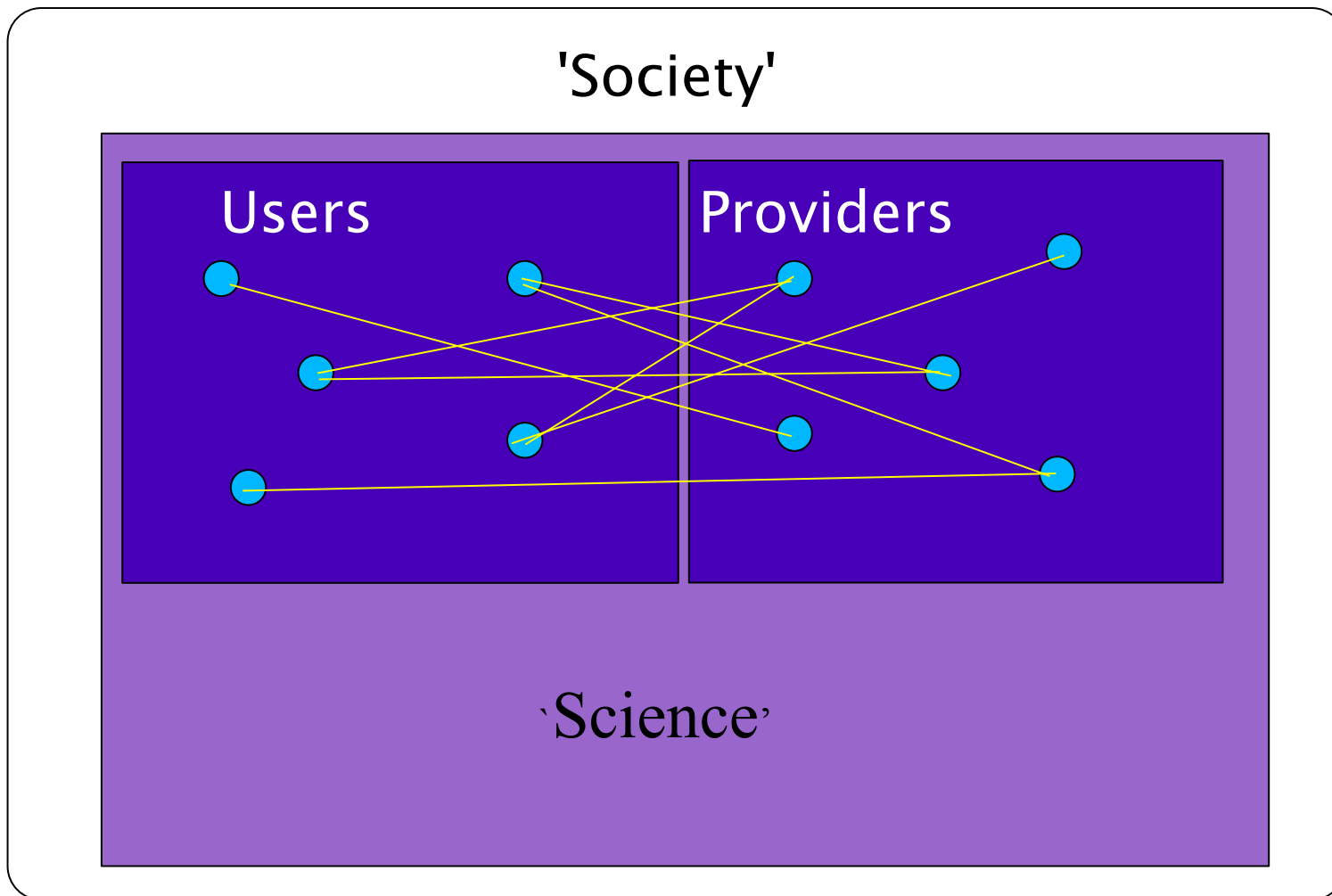
Future Digital Library Development



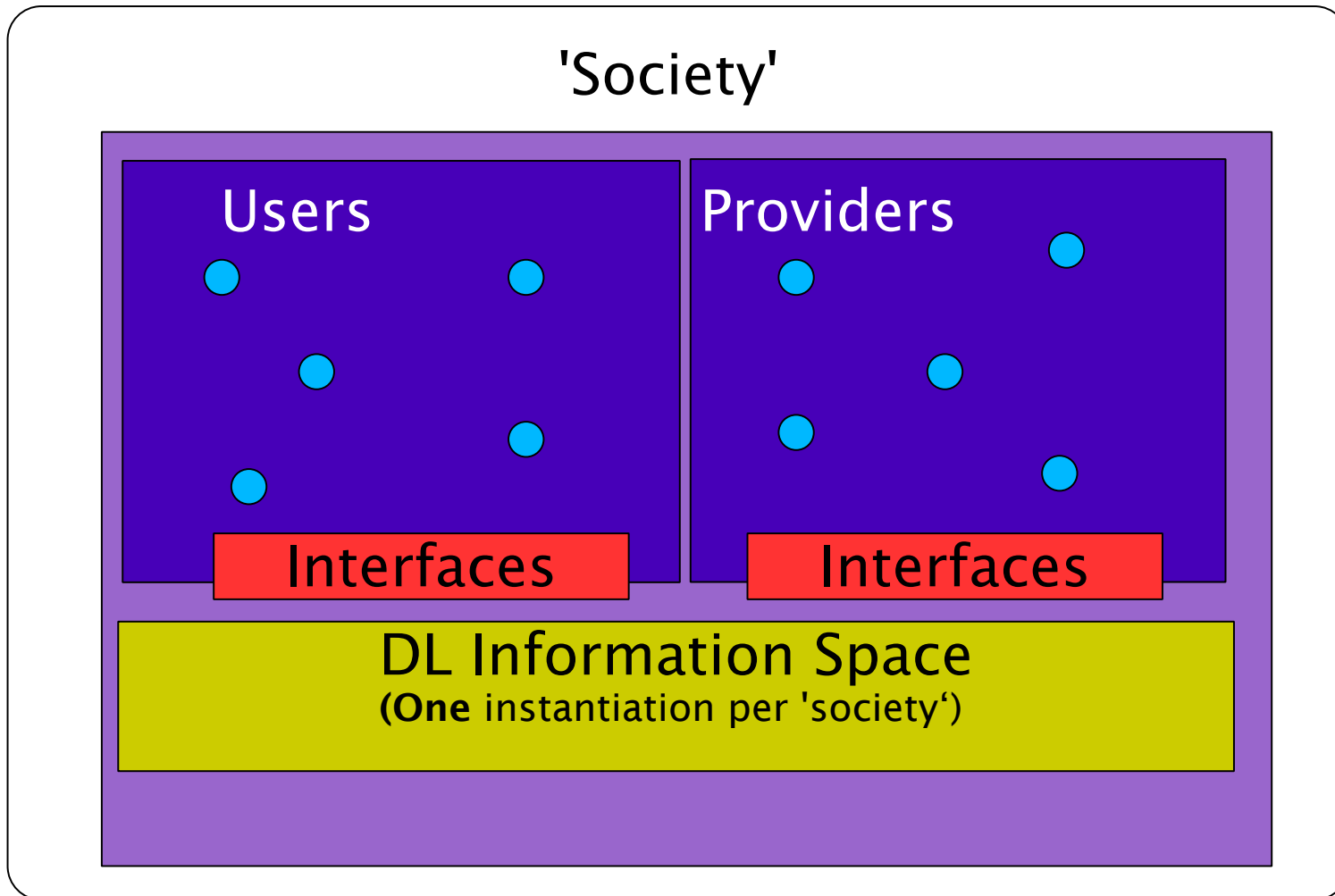
Conceptual Frameworks

- Operational Context
- Stakeholders
- Architectural Environment
- Information Object Abstractions
- Functional Power and Workflow Environment

Operational Context



Operational Context



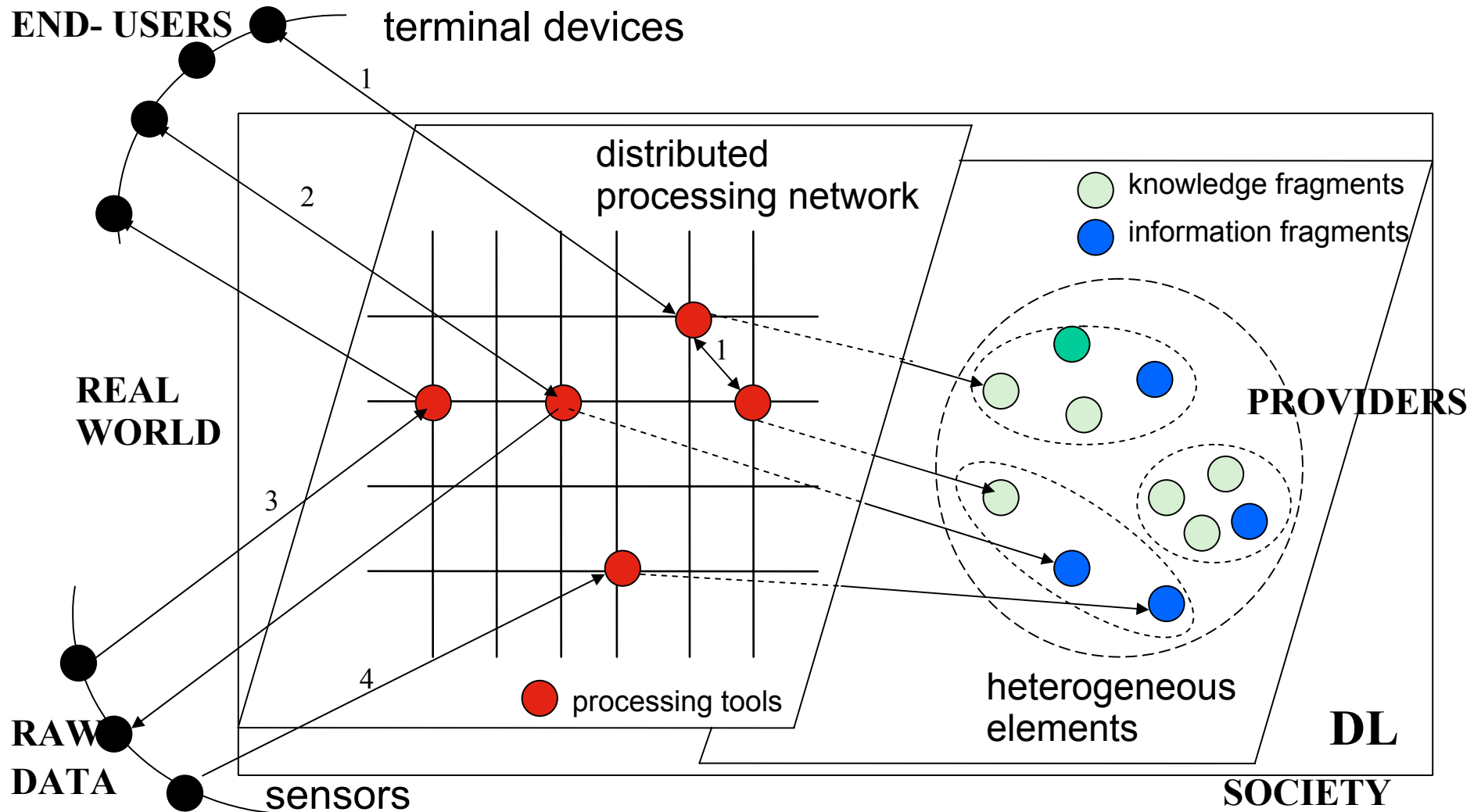
Stakeholders

- Past-Present: users and providers are mutually exclusive sets
- Future: `user' and `provider' are **roles**
 - Same actor may play both roles at different times
 - DLs at the center of scientific activity (collaboration & communication tool)
 - Increases set of actors and set of applications

Stakeholders - Applications

- DLs as parts of larger organizations and application contexts:
 - Health
 - Inclusion
 - Science
 - Government
 - Culture
 - Learning ...
 - Libraries, Museums, Archives, Hospitals, ...

Architectural Environment



Architectural Environment

- Raw data
- Information fragments
- Knowledge fragments

- User terminal devices
- Sensors

- Network of processing units

Information Object Abstractions

Pragmatic
Semantics

Vocabulary (Domain specific)

Formal
Semantics

Generic Semantics

Syntax

Middleware

Binary
Objects

Bits & bytes

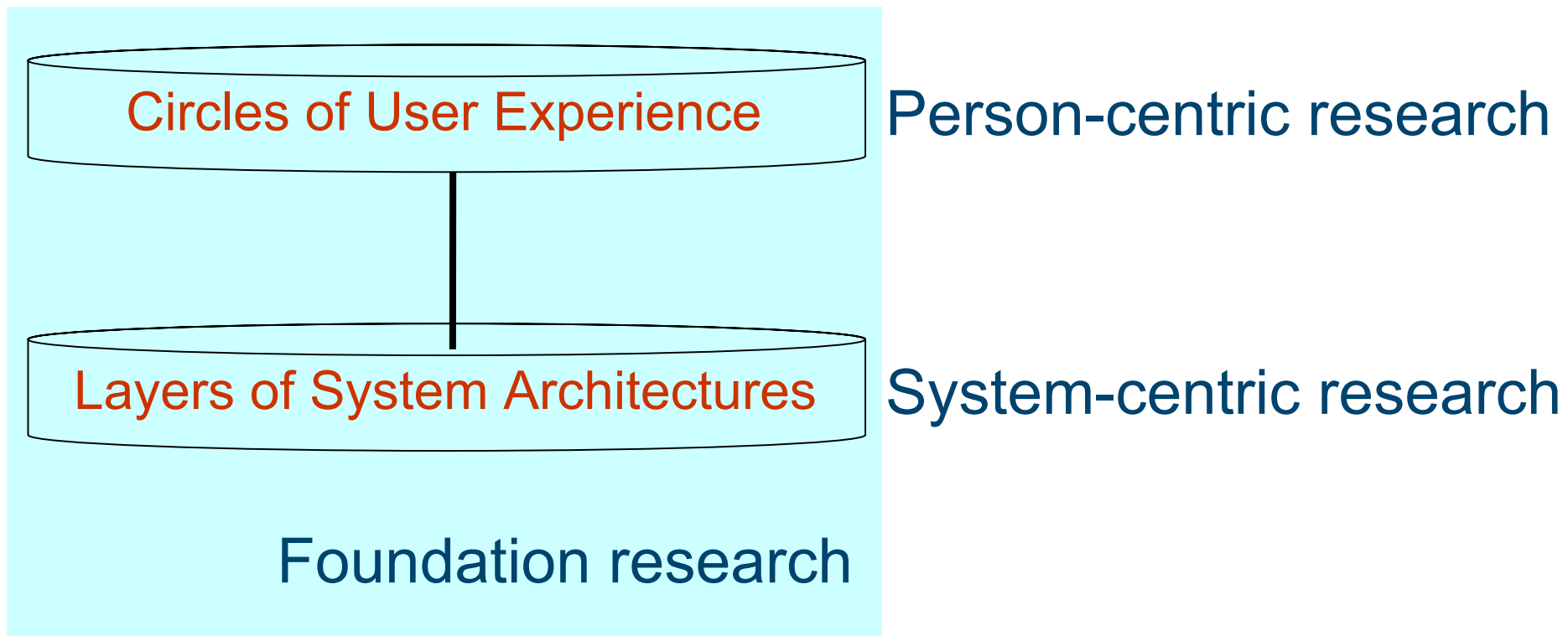
DL

'Society'

Functional Power & Wflow Environment

- Acquisition
- Modeling
- Management
- Mediation
- Access
- Distribution
- Interpretation and translation
- User-defined task-specific activities

Future Research Directions



Foundations

- Functionality specification for new objects
- Multi-perspective object access and tagging
- Integrated/unified access to digital repositories
- Lifecycle management
- Multi-modal functionality combination
- On-line availability and transcoding
- DLMS specification, design, development
- Application interfaces
- Evaluation (metrics, benchmarks....)

- Architectures
 - Grid?
 - Peer-to-Peer?
 - Service-oriented?
 - All of the above?
- Theories
- Unifying paradigms
- DL models

Digital Library Reference Model

Person-Centric Research

- Balancing cognitive load between user and information environment
- Collaboration, social context
- Personalized, customized, context-dependent, task-specific, knowledge-based, goal-oriented user/information interaction
- Harvest info across linguistic boundaries

Person-Centric Research

- Adding personal memory to global memory, originator notification
- Distributed (peer-to-peer) data creation/publication
- Communication via annotations
- Tools for building communities
- Accessibility, usability

System-Centric Research

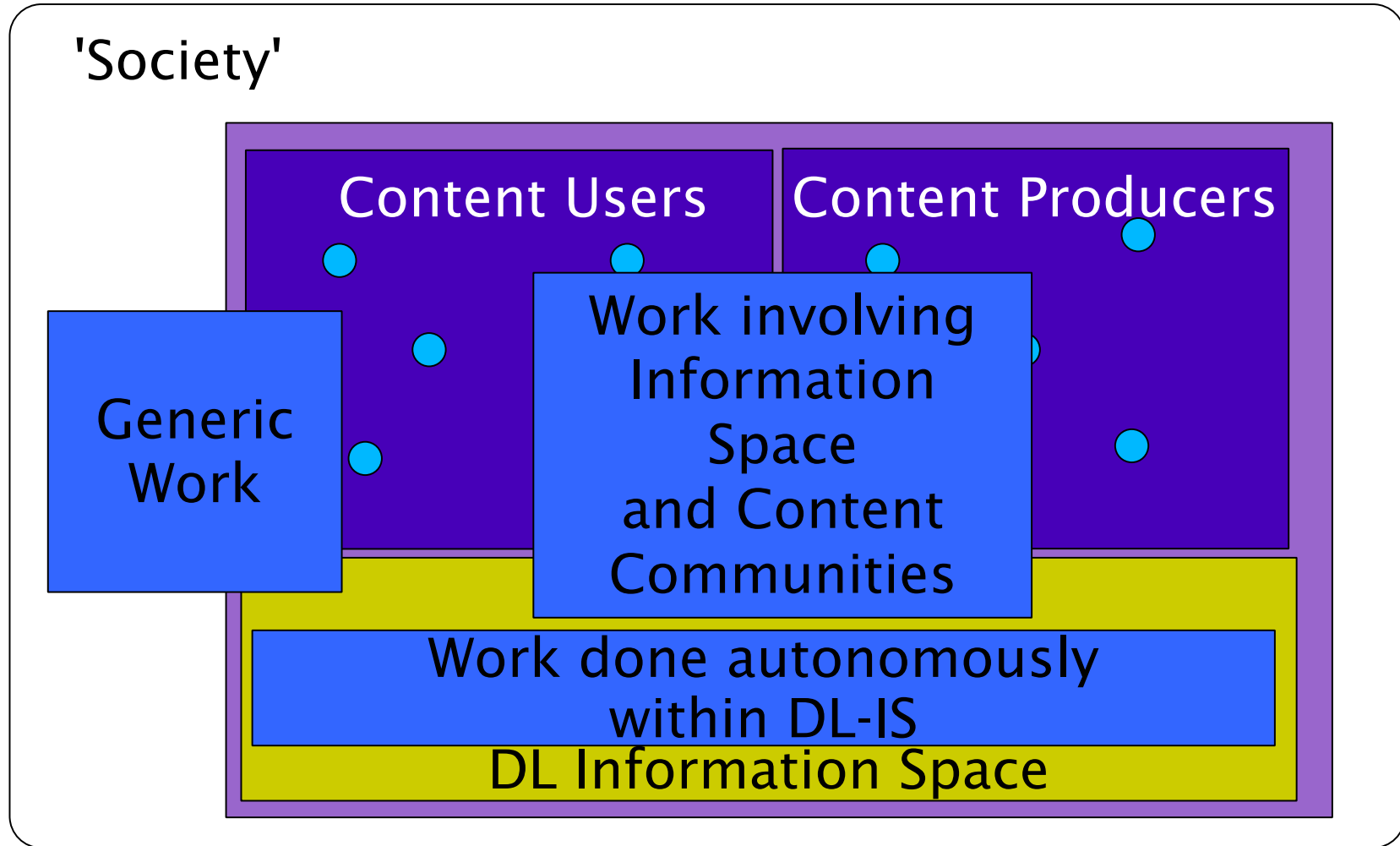
- Interoperability, system integration
- Security, privacy, authorization
- Mobile environments
- Lossless workflow management
- Information transformations across media types
- Multi-perspective functionality (multi-level features)

System-Centric Research

- Optimization of search processes (distributed, multi-feature, multi-object optimization)
- Transactional processes, service composition, process verification/check
- Perceptual object manipulation and transformation, doc recombination
- Information trading in DL federations

Vision Danger Antidotes

- Dealing with the avalanche of information available
- Protection of individuals' privacy from sensors
- Balance between privacy and personalization



DELOS Brainstorming Workshop Corvara, 7/2004

- About 25 participants
 - Most from Europe, two from the US
- Initial plenary session
 - Results of DELOS FP5 activities (brainstorming workshops, working groups, etc.)
 - Participants' visions of future
- Parallel sessions of three “competing” groups
- Plenary session of groups' results
- Plenary session of **integrated outcome**

Name

- (Adjective) (bit abstraction) (created entity)
- Digital Libraries
 - Adjective = digital
 - Bit abstraction = <>
 - Created entity = library

Name

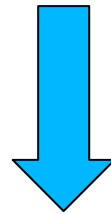
Digital
Pervasive
Dynamic
Universal
Ambient
Collaborative

Data
Information
Knowledge

Libraries
Environments
Spaces
Gardens
Architectures
Forums
Factories
Worlds
Realms
Agoras

Rebirth of the Field

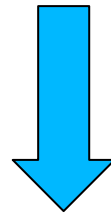
DIGITAL LIBRARIES



DYNAMIC
UNIVERSAL
KNOWLEDGE
ENVIRONMENTS

Rebirth of the Field

DIGITAL LIBRARIES



DYNAMIC
UNIVERSAL
COMMONS of
KNOWLEDGE