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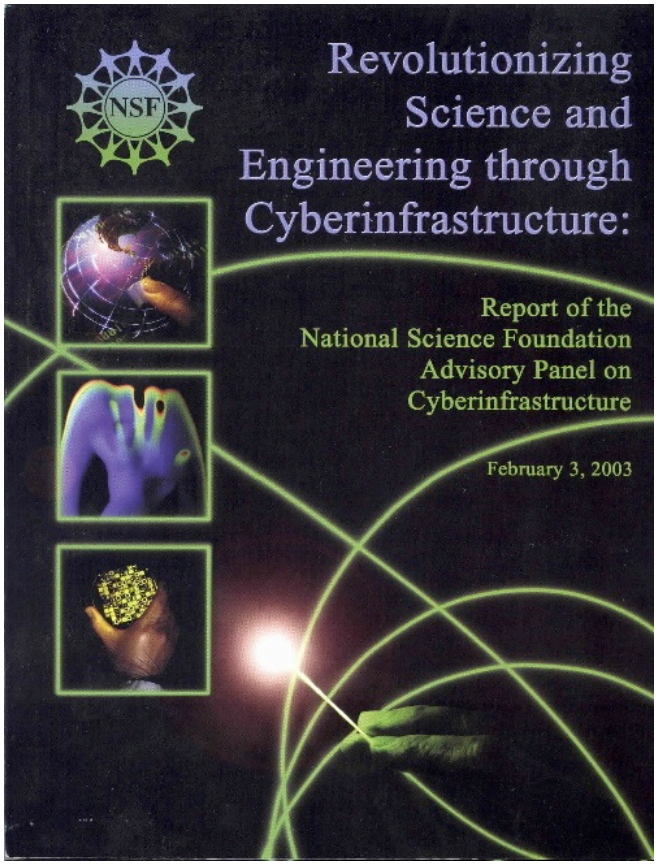
UNIVERSITY OF MICHIGAN

SI 615 Digital Libraries Seminar

Week 8 – Cyberinfrastructure

NSF Blue Ribbon Advisory Panel on Cyberinfrastructure

"a new age has dawned in scientific and engineering research, pushed by continuing progress in computing, information, and communication technology, and pulled by the expanding complexity, scope, and scale of today's challenges. The capacity of this technology has crossed thresholds that now make possible a comprehensive "cyberinfrastructure" on which to build new types of scientific and engineering knowledge environments and organizations and to pursue research in new ways and with increased efficacy."

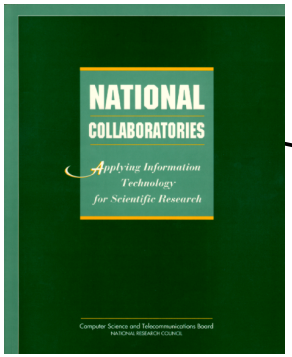


- http://www.cise.nsf.gov/sci/reports/toc.cfm

Terms

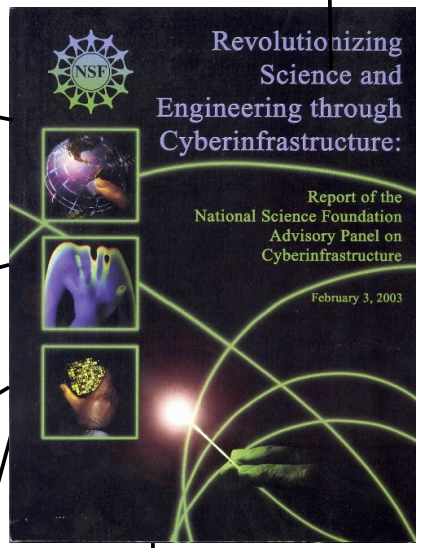
- *Cyberinfrastructure*
  - *infrastructure*
  - *cyber*
- *Cyberinfrastructure-enabled*
  - *knowledge communities* (CKCs)
  - *learning, research, engagement*

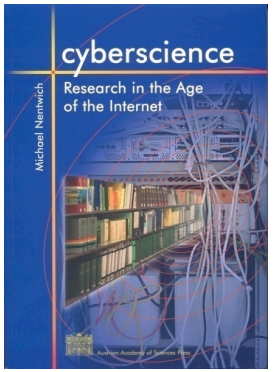
Converging Streams of Activity



Collaboratories

Home Land Security
http://web.calit2.net/RiskReduction/index.html

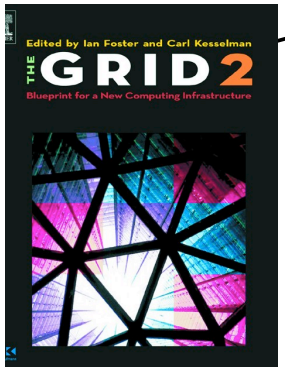




Cyberscience

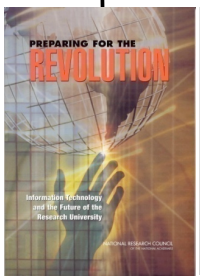
ACLS Panel

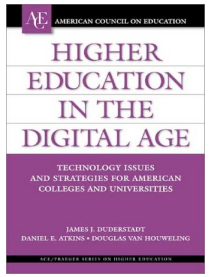
GRIDS (broadly defined)



2nd Edition
www.mkp.com/grid2

Removed logo of
e-Science
http://
www.nesc.ac.uk/



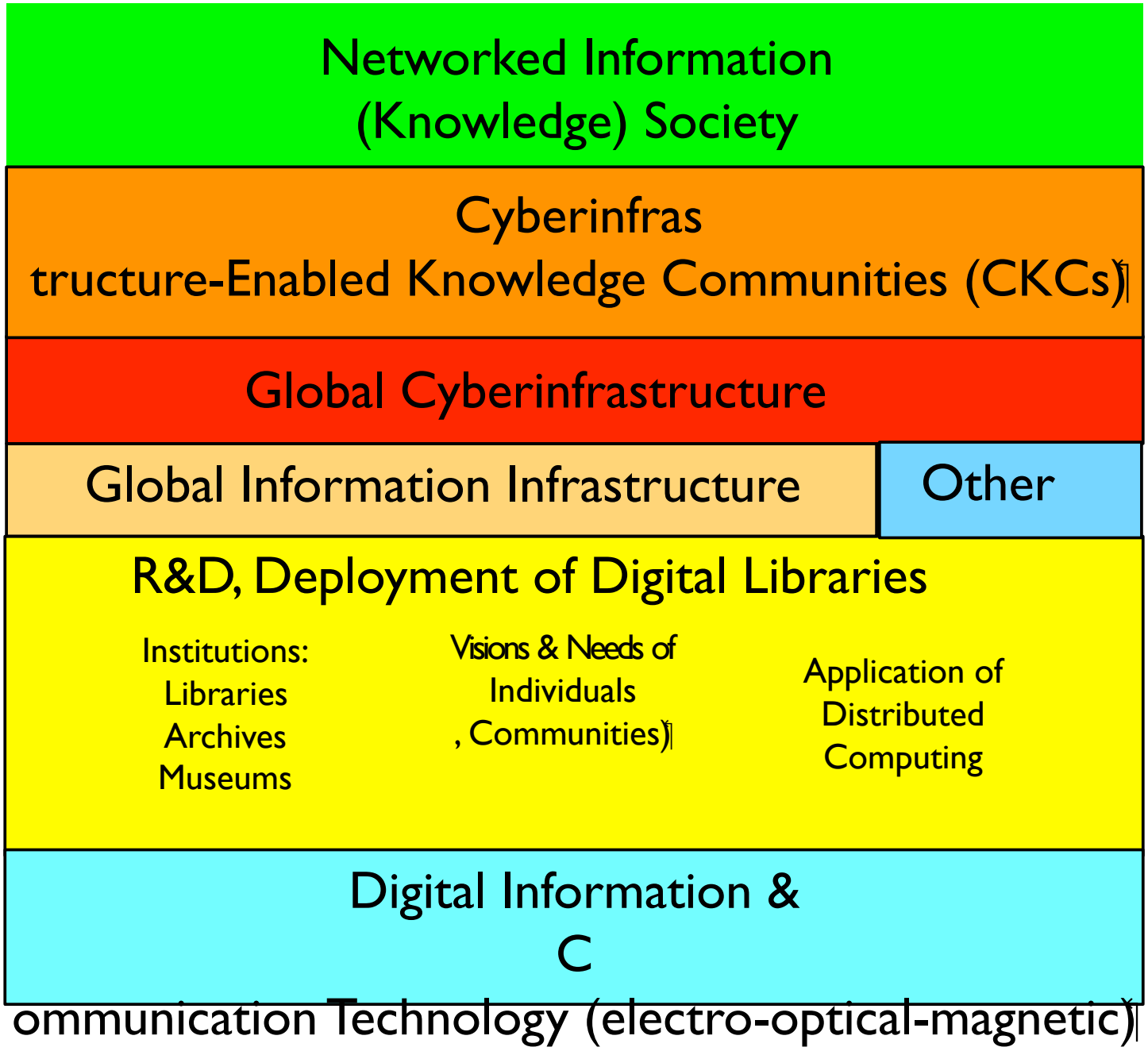


IT & Future of Higher Education

Science-driven pilots (not using above labels)

Cyberinfrastructure Goals

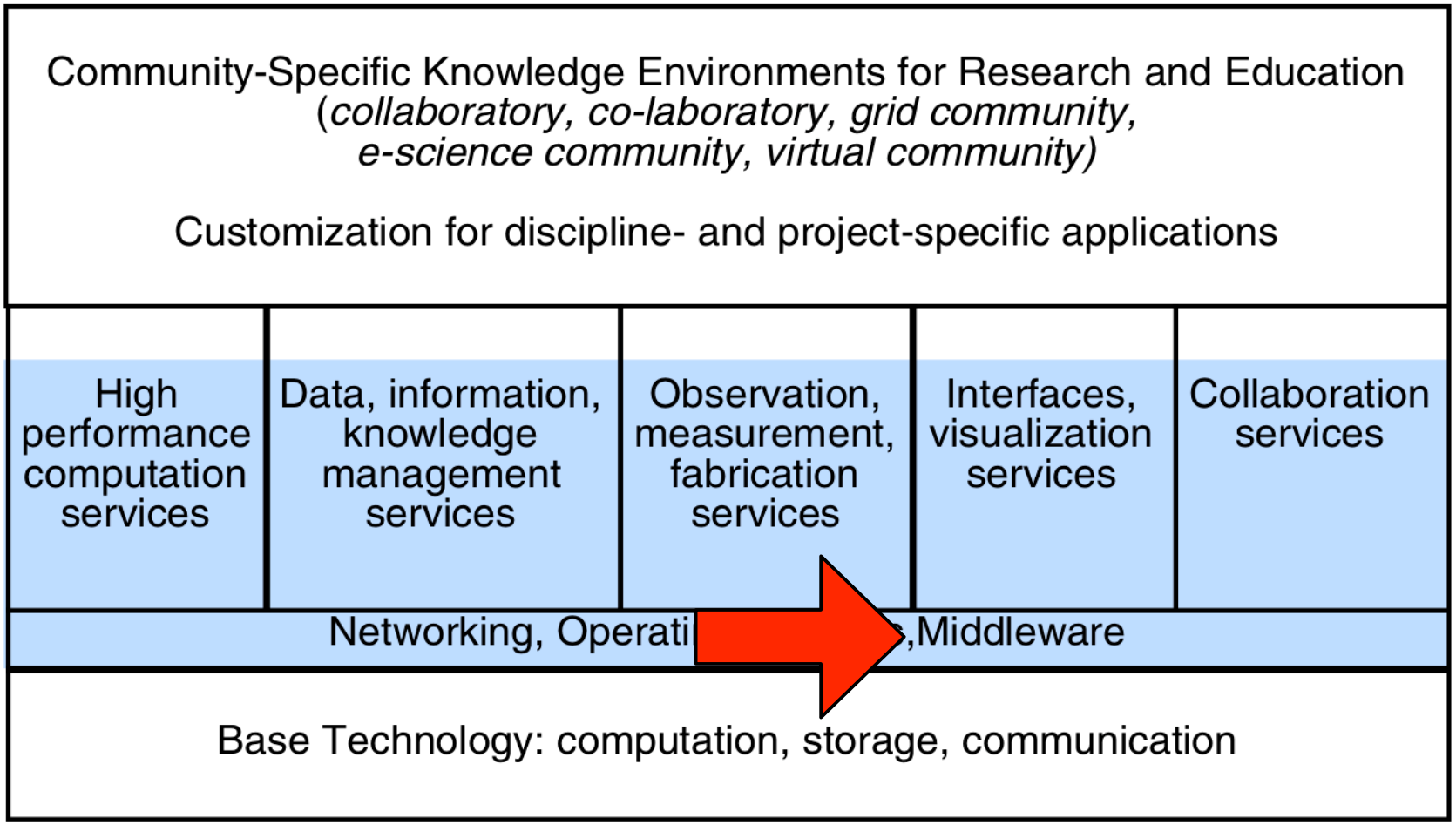
- More applications, capabilities, efficiency
- Reuse and multiple-use of designs; capture of commonality
- Spread of best practice
- Achieving interoperability
- Provision of tools and services
- Shared facilities
- Assistance and expertise


Networked Information
(Knowledge) Society
Cyberinfras
tructure-Enabled Knowledge Communities (CKCs)
Global Cyberinfrastructure
Global Information Infrastructure
Other
R&D, Deployment of Digital Libraries
Institutions:
Libraries
Archives
Museums
Visions & Needs of
Individuals
, Communities)
Application of
Distributed
Computing
Digital Information &
C
ommunication Technology (electro-optical-magnetic)

Some Names for CKCs

- Co-laboratory, Collaboratory
- Grid Community
- e-X Community (as in e-science)
- Cyber-X Community (as in cyberscience)
- Community Gateways or Portals
- Virtual Community, Virtual Organizations, e.g. (Inter) National Virtual Observatory

Cyberinfrastructure

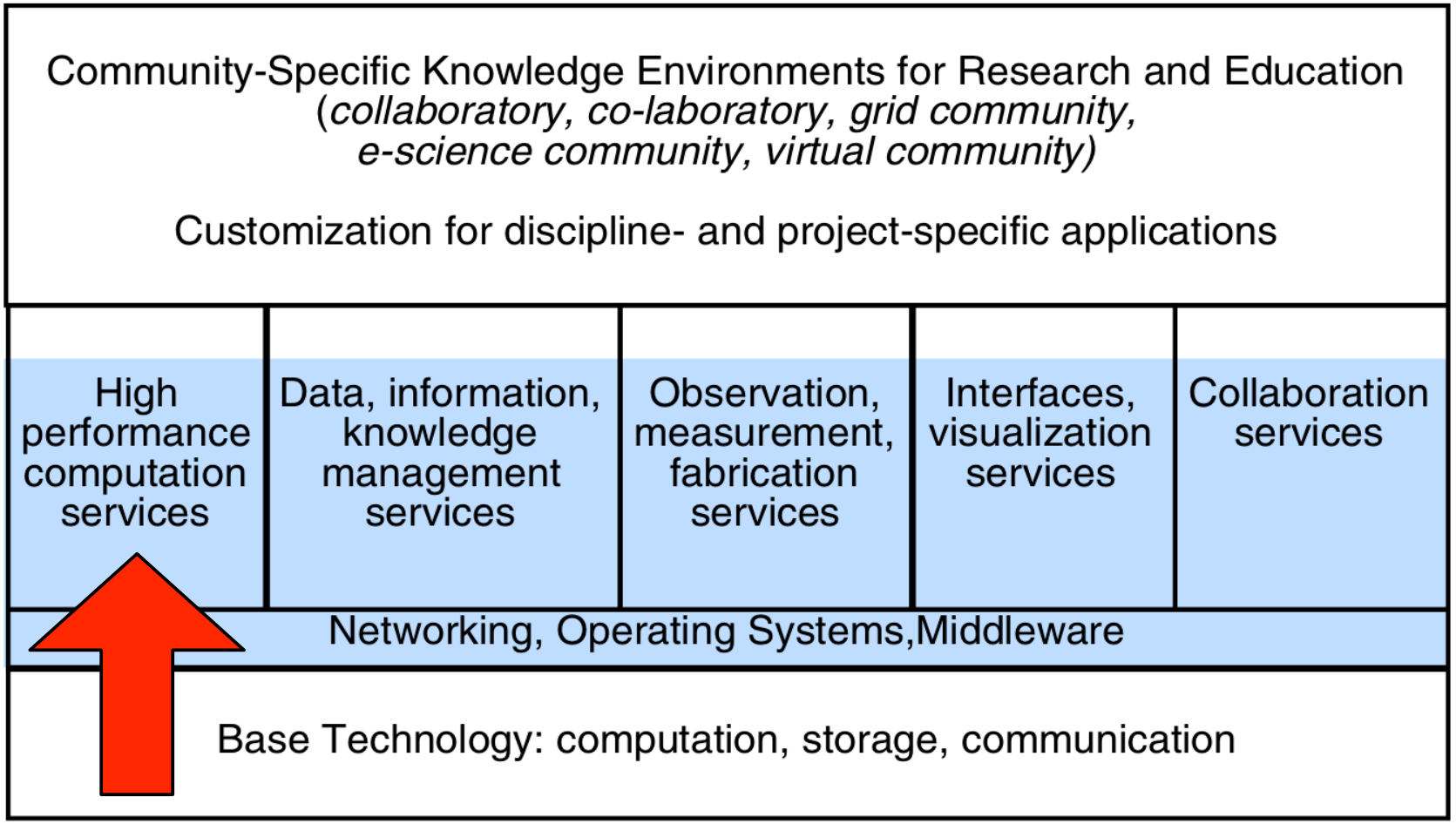


= *cyberinfrastructure: hardware, software, services, personnel, organizations*

Core Middleware

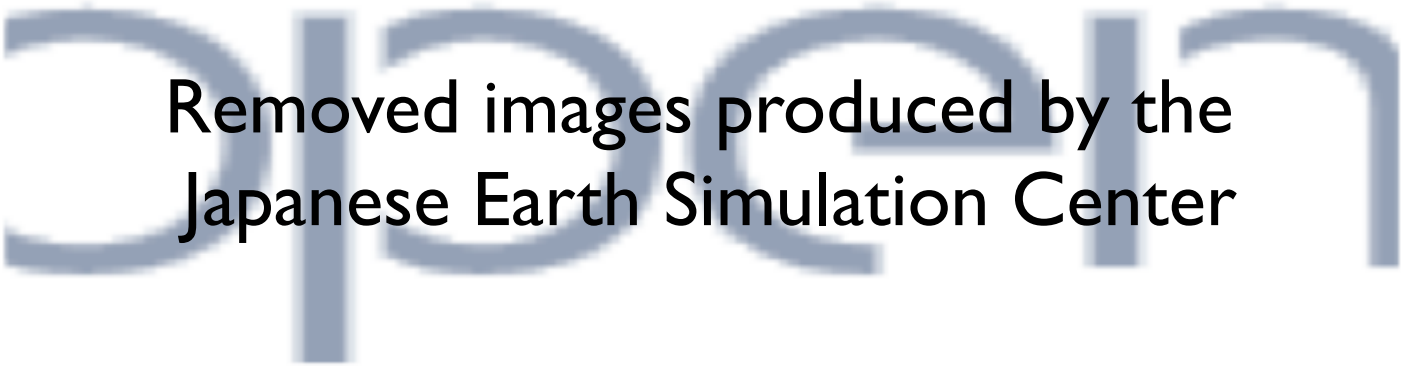
- **Identity and Identifiers** – namespaces, identifier crosswalks, real world levels of assurance, etc.
- **Authentication** – campus technologies and policies, interrealm interoperability via PKI, Kerberos, etc.
- **Directories** – enterprise directory services architectures and tools, standard objectclasses, interrealm and registry services
- **Authorization** – permissions and access controls, delegation, privacy management, etc.
- **Integration Activities** – open management tools, application of virtual, federated and hierarchical trust, enabling common applications with core middleware

Cyberinfrastructure



= *cyberinfrastructure: hardware, software, services, personnel, organizations*

Japanese Earth Simulation Center

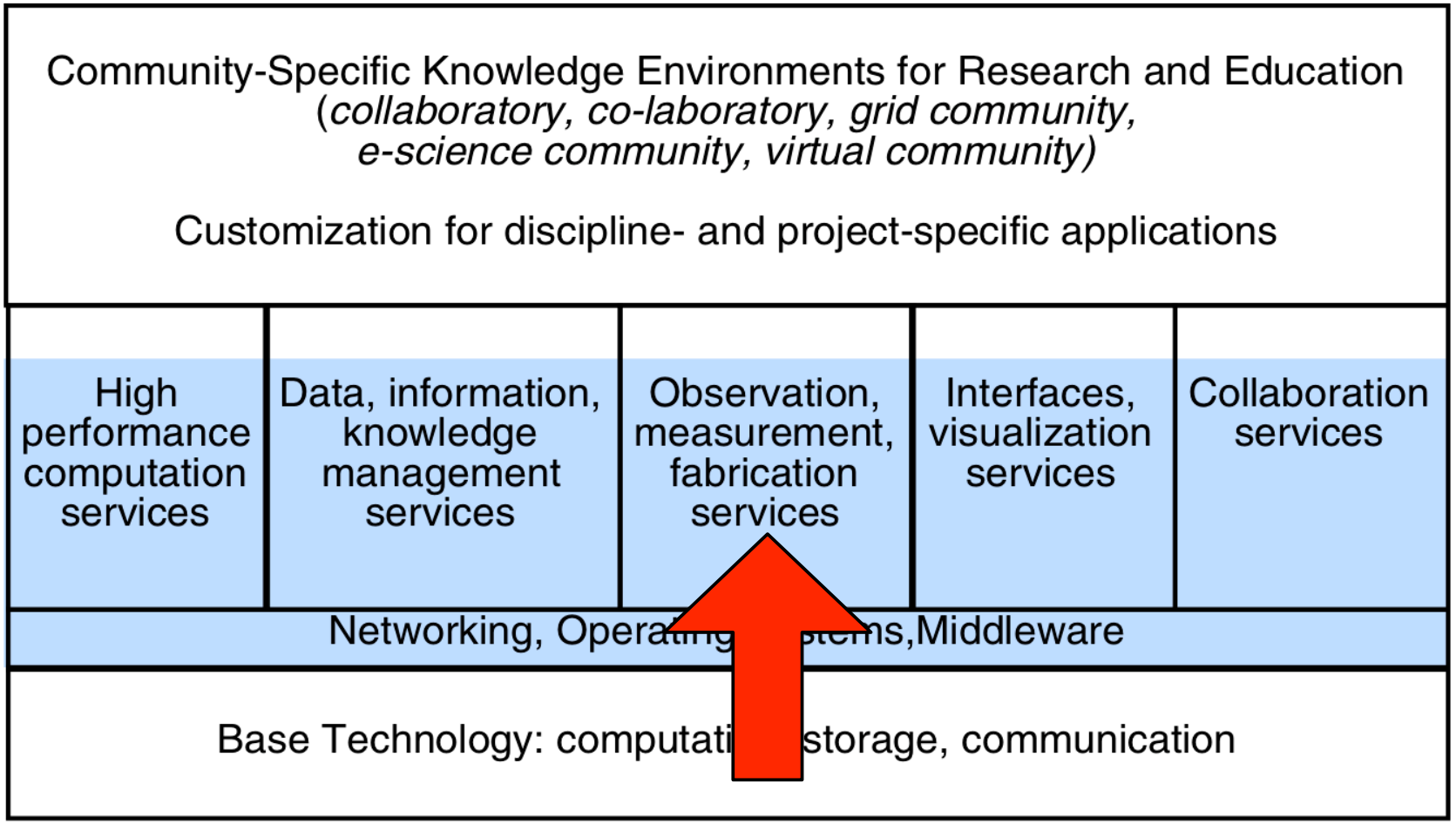


Virginia Tech Terascale Cluster
(1,100 Mac G5s)

Removed images of the
computer cluster at Virginia Tech

http://computing.vt.edu/research_computing/terascale/

Cyberinfrastructure



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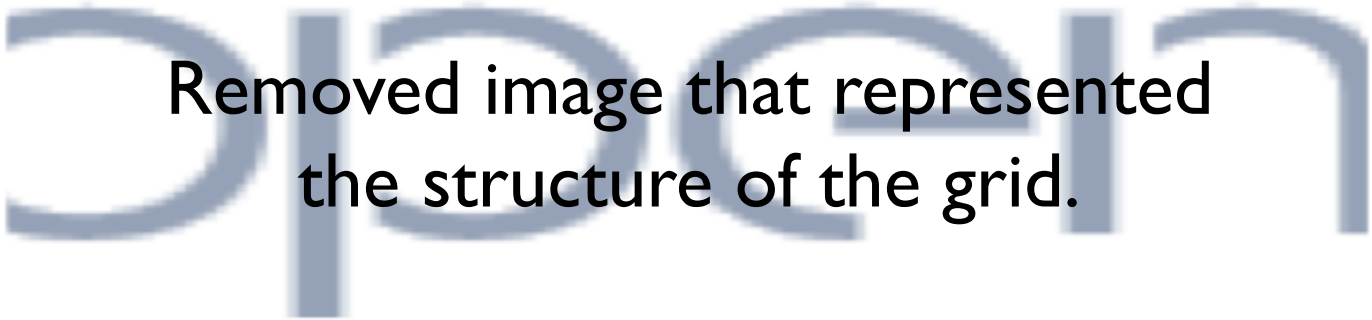
NEESgrid
Earthquake Engineering Collaboratory



Embedded Sensors: R&D and Use

http://www.cens.ucla.edu/index.html

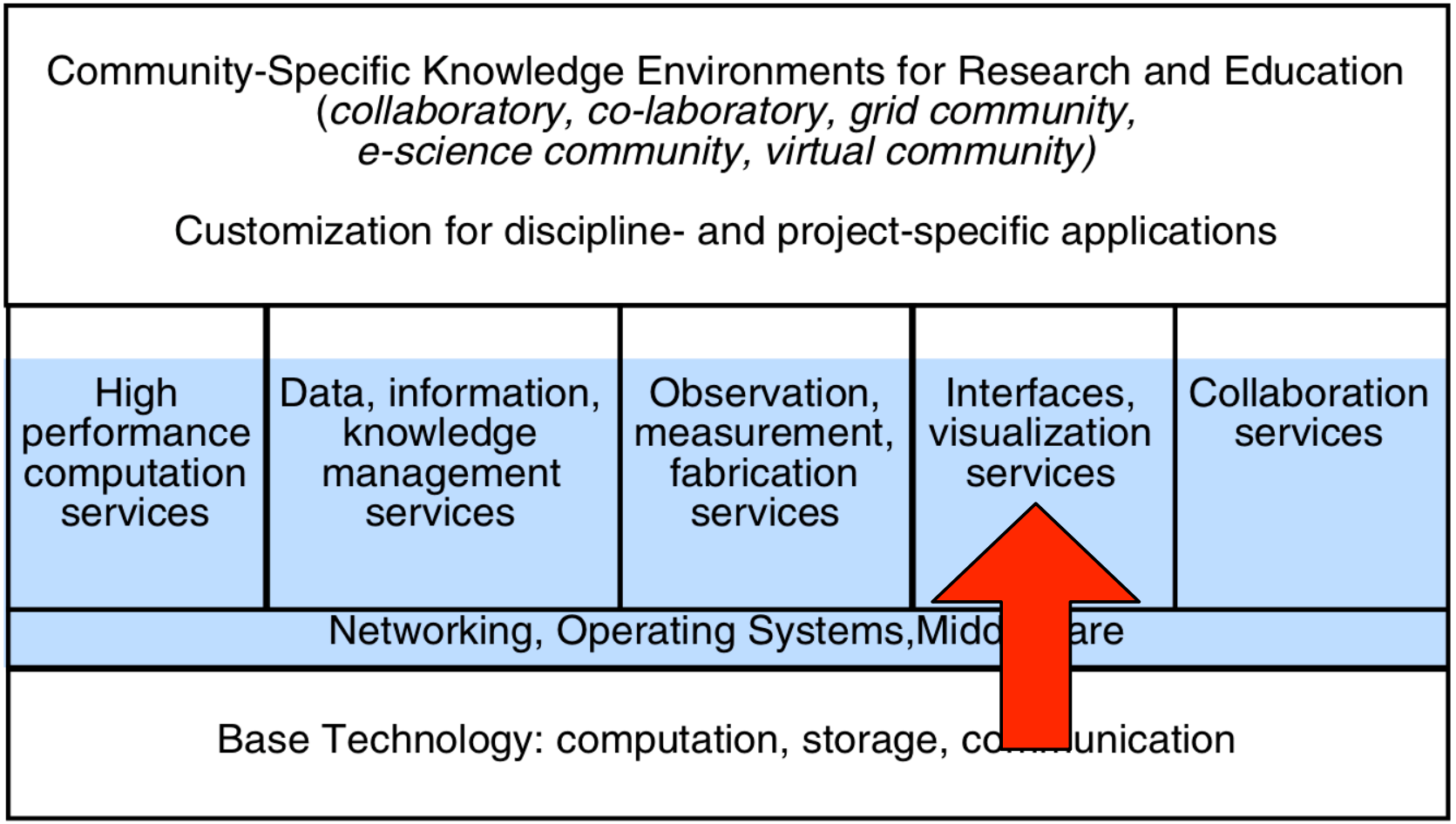
Ocean Research Interactive Observatory Networks

National Ecological Observatory Network (NEON)

http://www.coreocean.org/Dev2Go.web?Anchor=orion_home_page&rnd=17953

http://www.nsf.gov/bio/neon/start.htm

Cyberinfrastructure



= *cyberinfrastructure: hardware, software, services, personnel, organizations*

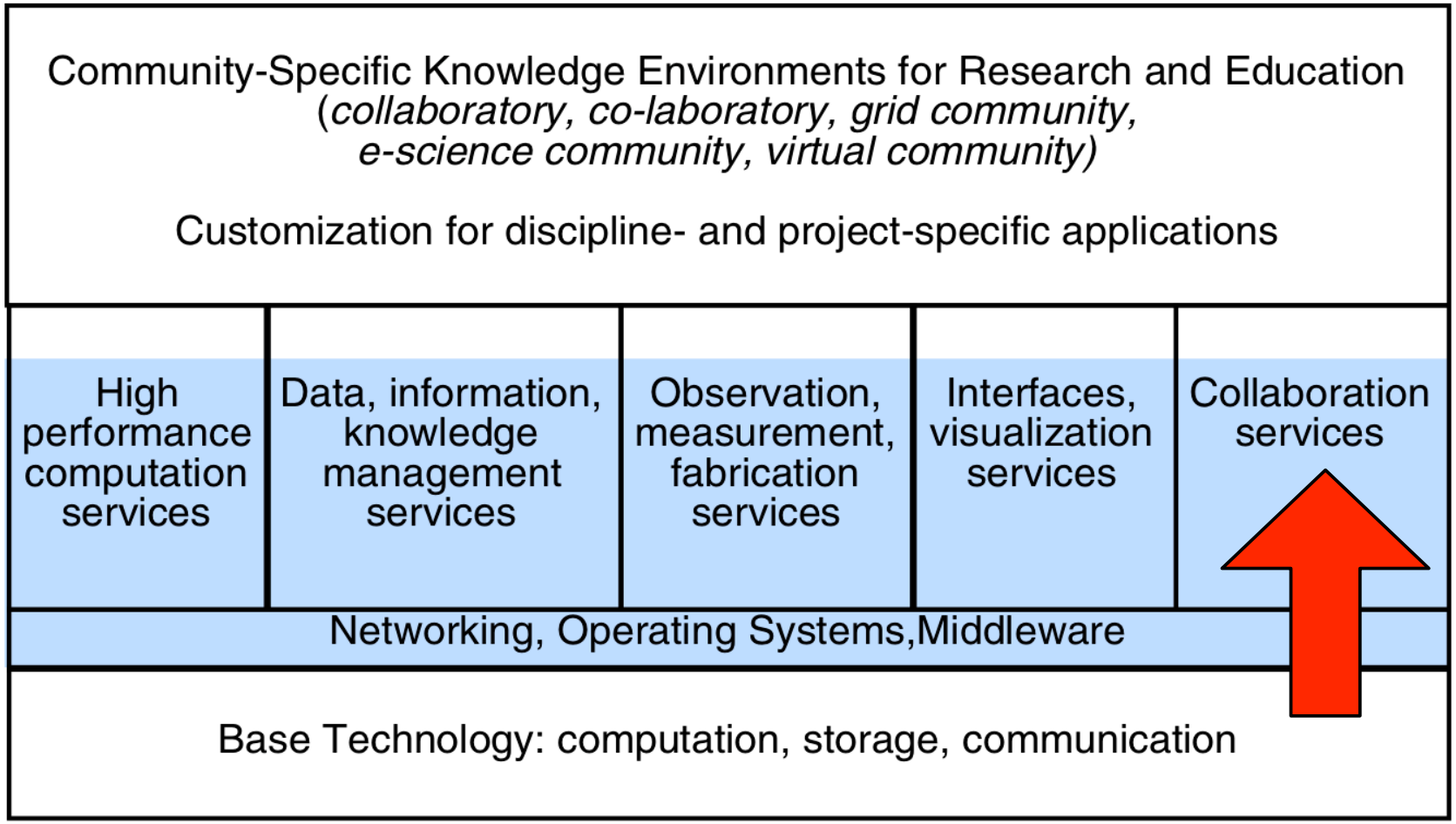
Electronic Visualization Lab

http://www.evl.uic.edu

Tele-Immersive Collaboration in the CAVE Research Network

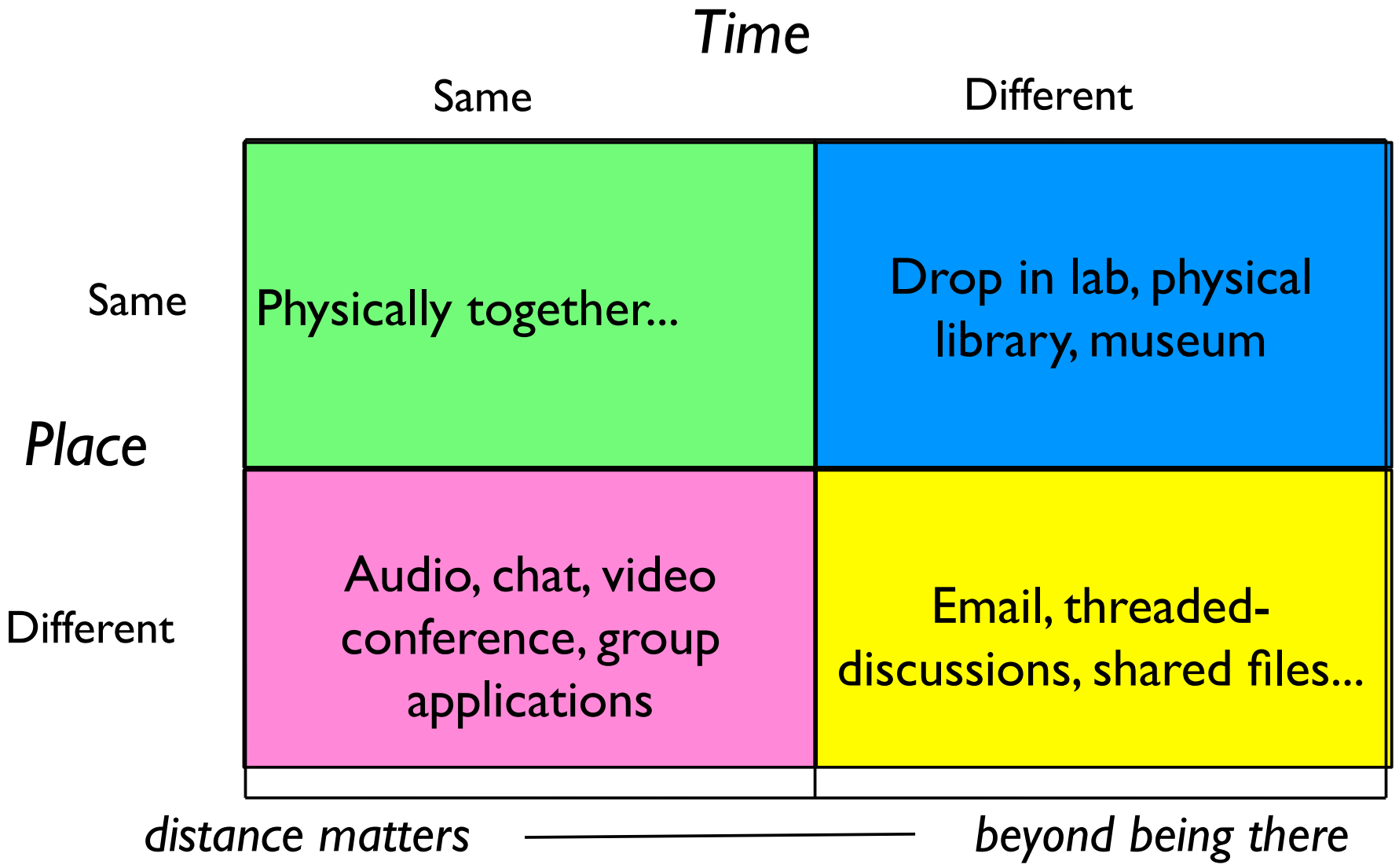
Removed photographs of the Lab.

Cyberinfrastructure

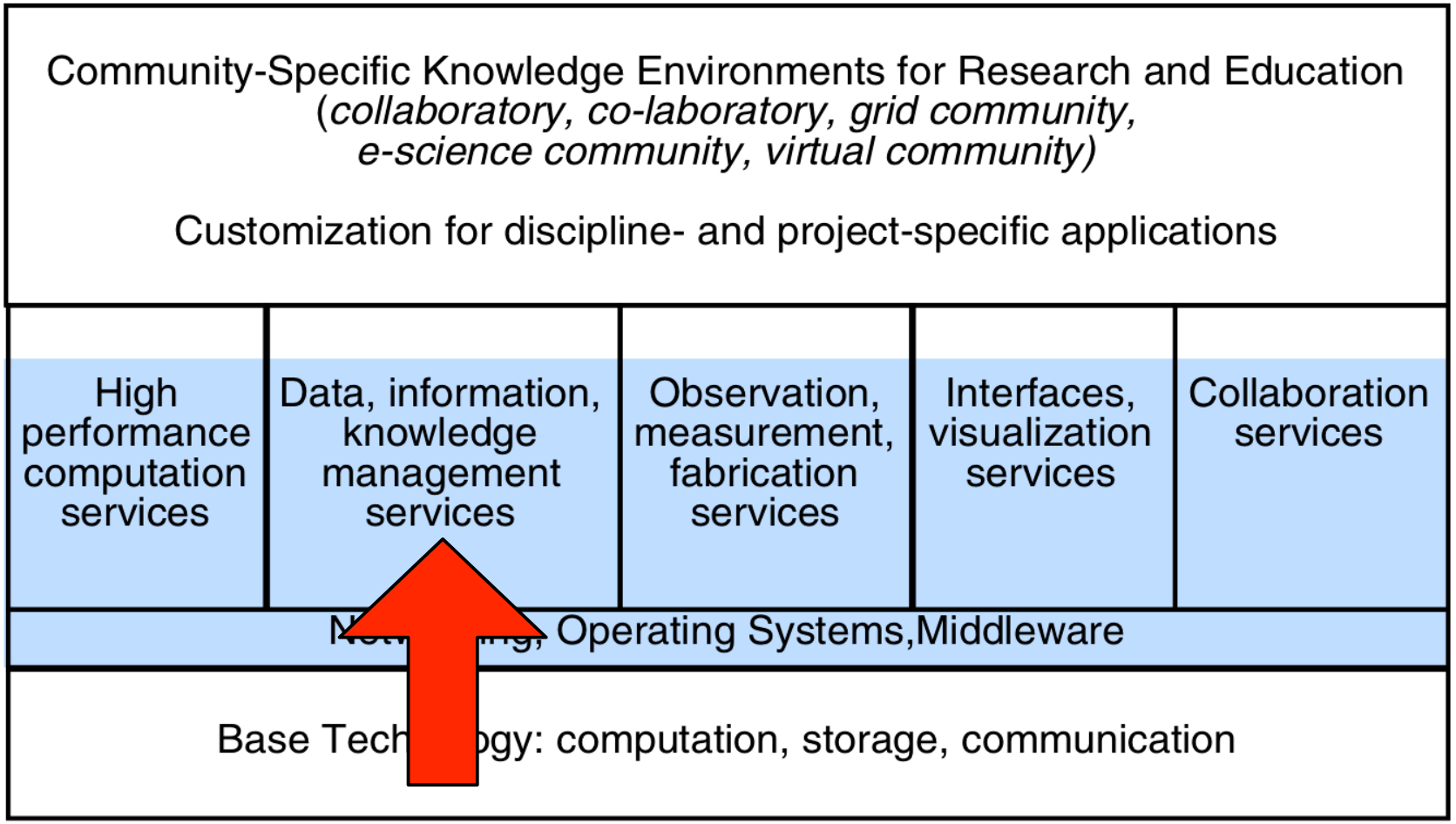


= *cyberinfrastructure: hardware, software, services, personnel, organizations*

Time-Space Collaboration



Cyberinfrastructure



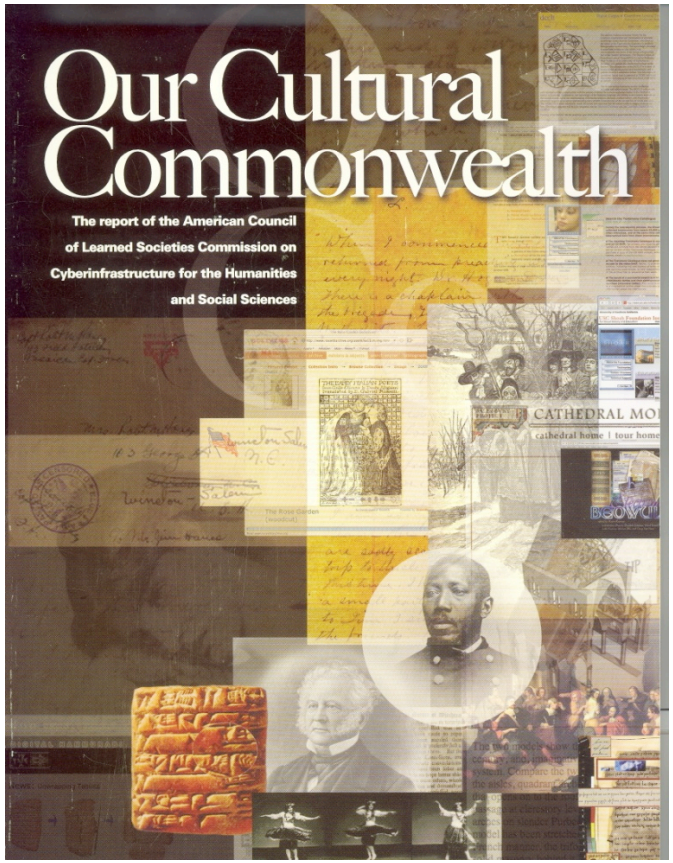
= *cyberinfrastructure: hardware, software, services, personnel, organizations*

Information Services for CKCs

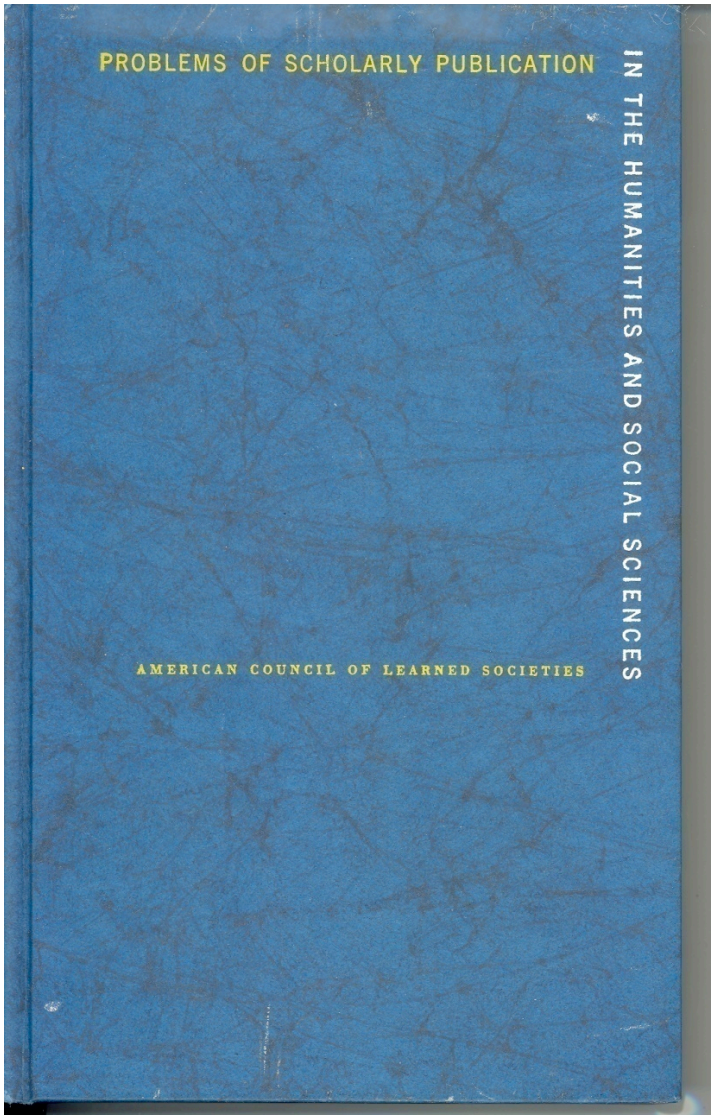
- Online access to complete credentialled, archival literature.
- Stewardship and curation services for enormous collections of scientific data.
- Digital repositories for diverse digital objects as instructional material and works in progress.
- Digitized special collections.
- More continuous (vs. batch) and open forms of scholarly communication.
- Individual and community customization information services.

Cyberinfrastructure is a First-Class Tool for Science

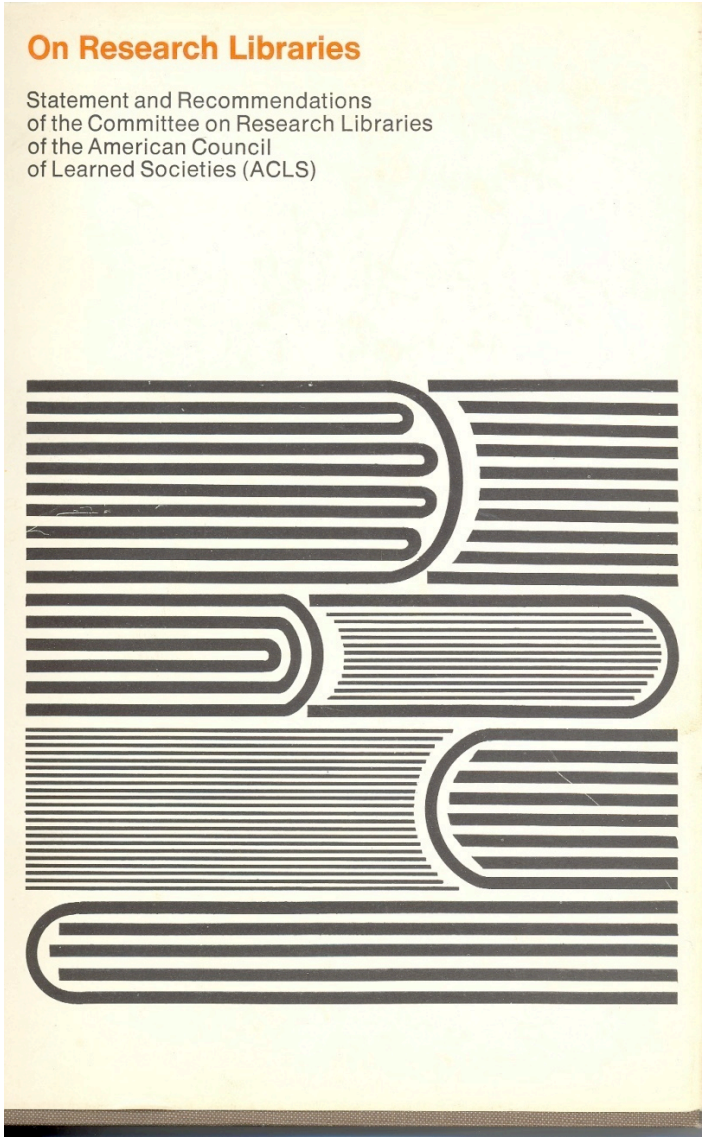
Our Cultural Commonwealth, 2006



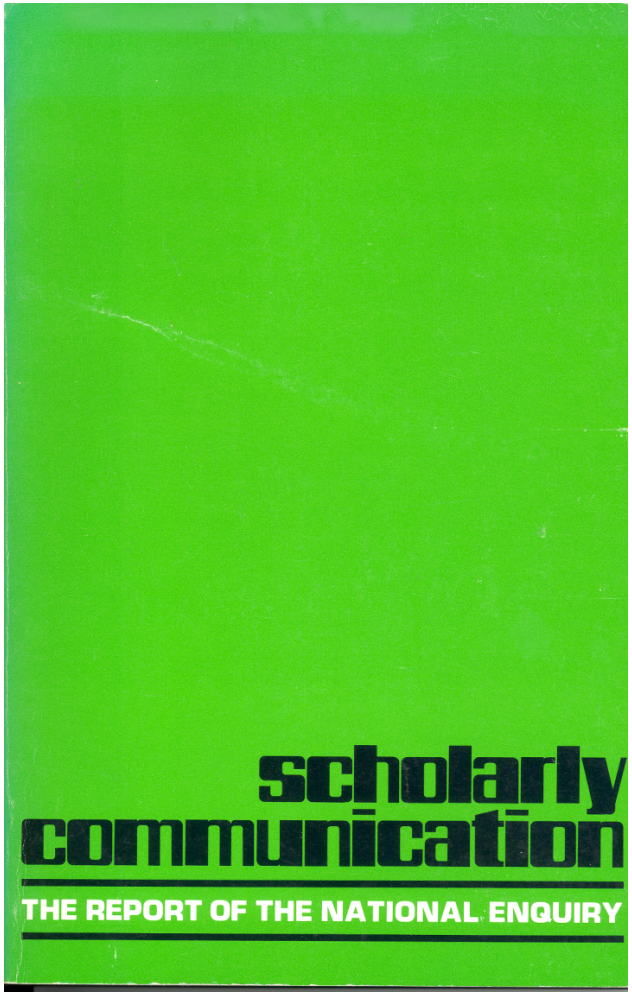
Problems of Scholarly Publishing, 1959



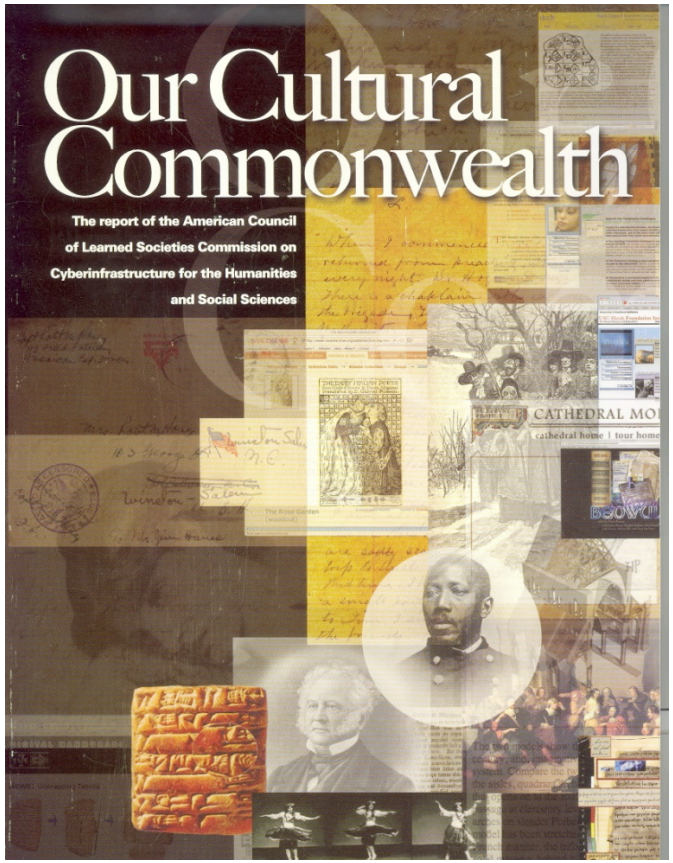
On Research Libraries, 1967



Scholarly Communication, 1979



www.acls.org/cyberinfrastructure



Commission Members

Paul Courant
Provost, Economics
University of Michigan

Sarah Fraser
Art History
Northwestern University

Mike Goodchild
Geography
UC Santa Barbara

Margaret Hedstrom
School of Information
University of Michigan

Charles Henry
VP & CIO
Rice University

Peter B. Kaufman
VP, Innodata-Isogen
President, Intelligent Television

Jerome McGann
English
University of Virginia

Roy Rosenzweig
History
George Mason University

John Unsworth (Chair)
Library and Information Science
University of Illinois, Urbana-Champaign

Bruce Zuckerman
Religion
University of Southern California

Potential of Cyberinfrastructure

"New information technologies empower research on traditional objects of study."

ACLS Report, p. ii

What is Cyberinfrastructure?

- Discipline-specific software
- Expertise
- Best Practices
- Tools
- Collections
- Policies
- Collaborative environments

ACLS Report, p. 6

Necessary Characteristics

- Accessible as a public good
- Sustainable
- Interoperable
- Facilitate collaboration
- Support experimentation

Recommendations

1. Invest in cyberinfrastructure as a strategic priority.

2. Develop public and institutional policies that foster openness and access.

3. Promote cooperation between the public and private sectors.

Recommendations (cont'd)

1. Cultivate leadership.

2. Encourage digital scholarship.

3. Establish national centers to support scholarship that contributes to and exploits cyberinfrastructure.

Recommendations (cont'd)

1. Develop and maintain open standards and robust tools.

2. Create extensive and reusable digital collections.