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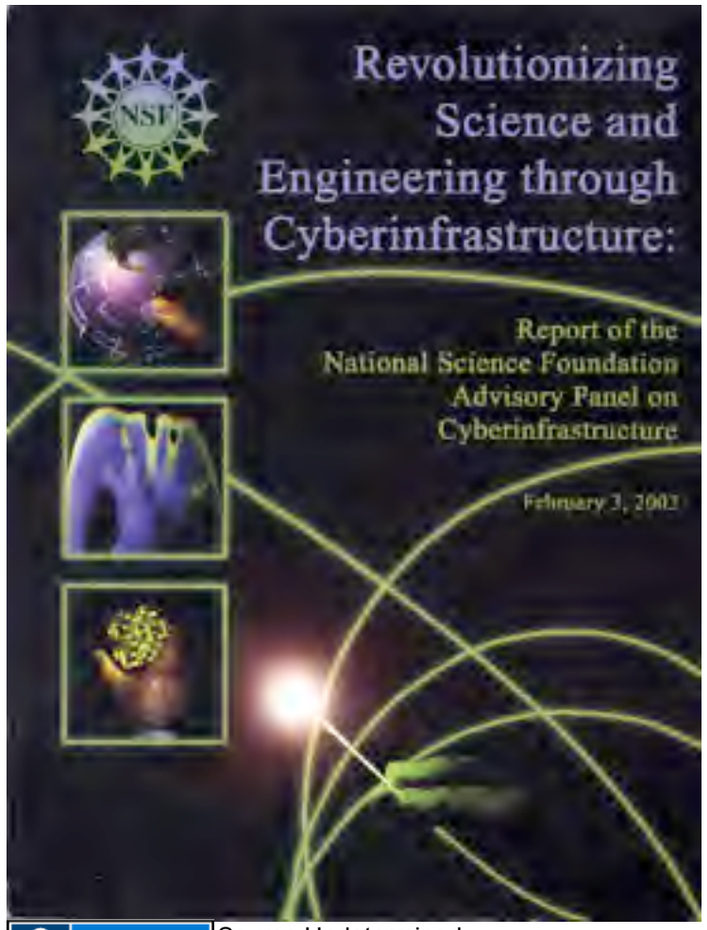
SI 640 DIGITAL LIBRARIES AND ARCHIVES

2010 Week 3: Cyberinfrastructure

[Dan Atkins & Paul Conway, contributors]

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."



PD-GOV Source Undetermined

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

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Terms

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

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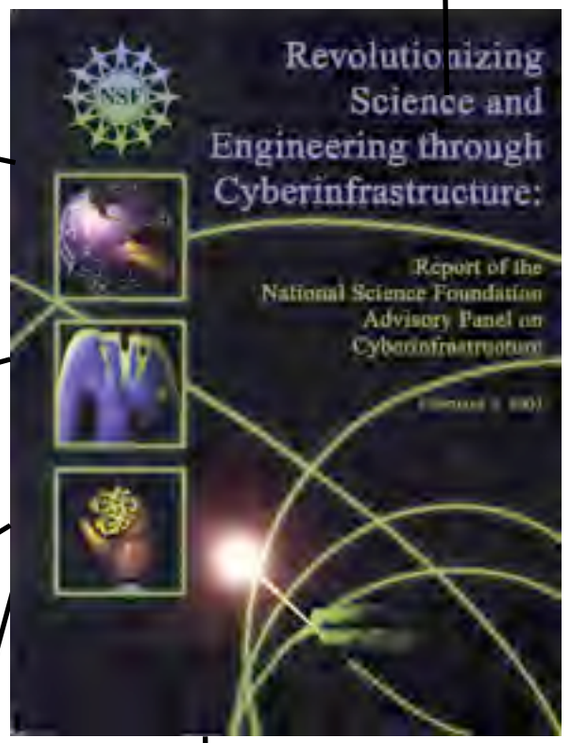
Converging Streams of Activity

Collaboratories

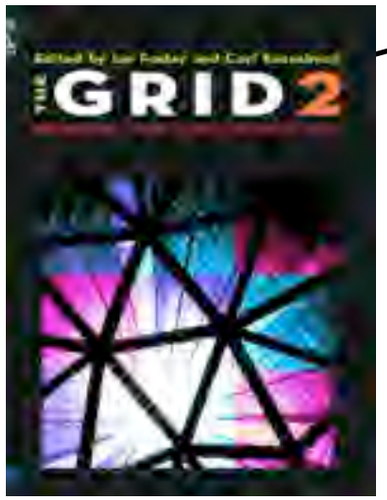
Home Land Security
http://web.calit2.net/RiskReduction/index.html



Cyberscience

ACLS Panel

GRIDS (broadly defined)



2nd Edition
www.mkp.com/grid2

E-science

IT & Future of Higher Education

Science-driven pilots (not using above labels)

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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

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Networked Information
(Knowledge) Society

Cyberinfrastructure-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 & Communication Technology
(electro-optical-magnetic)

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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

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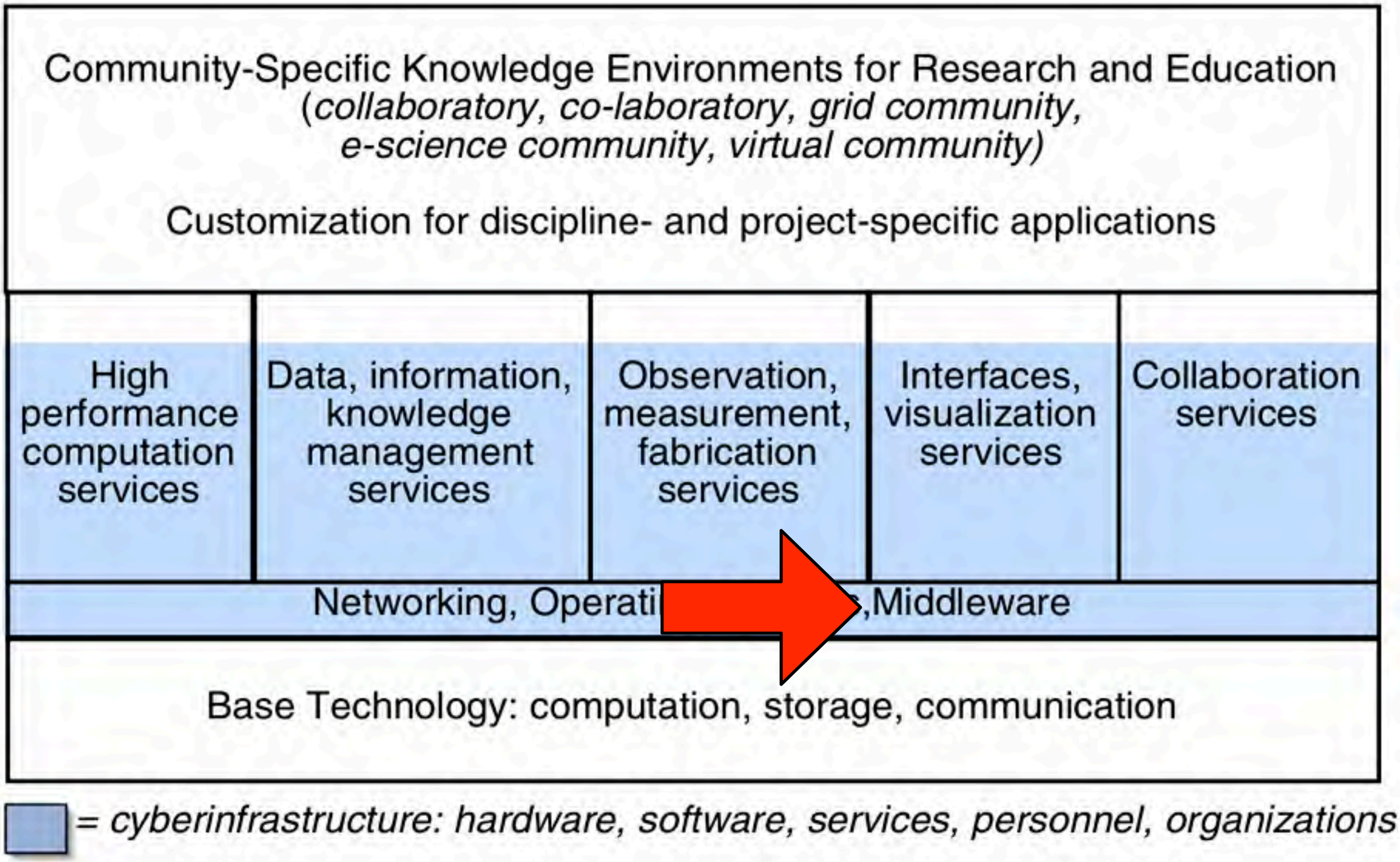
Cyberinfrastructure



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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

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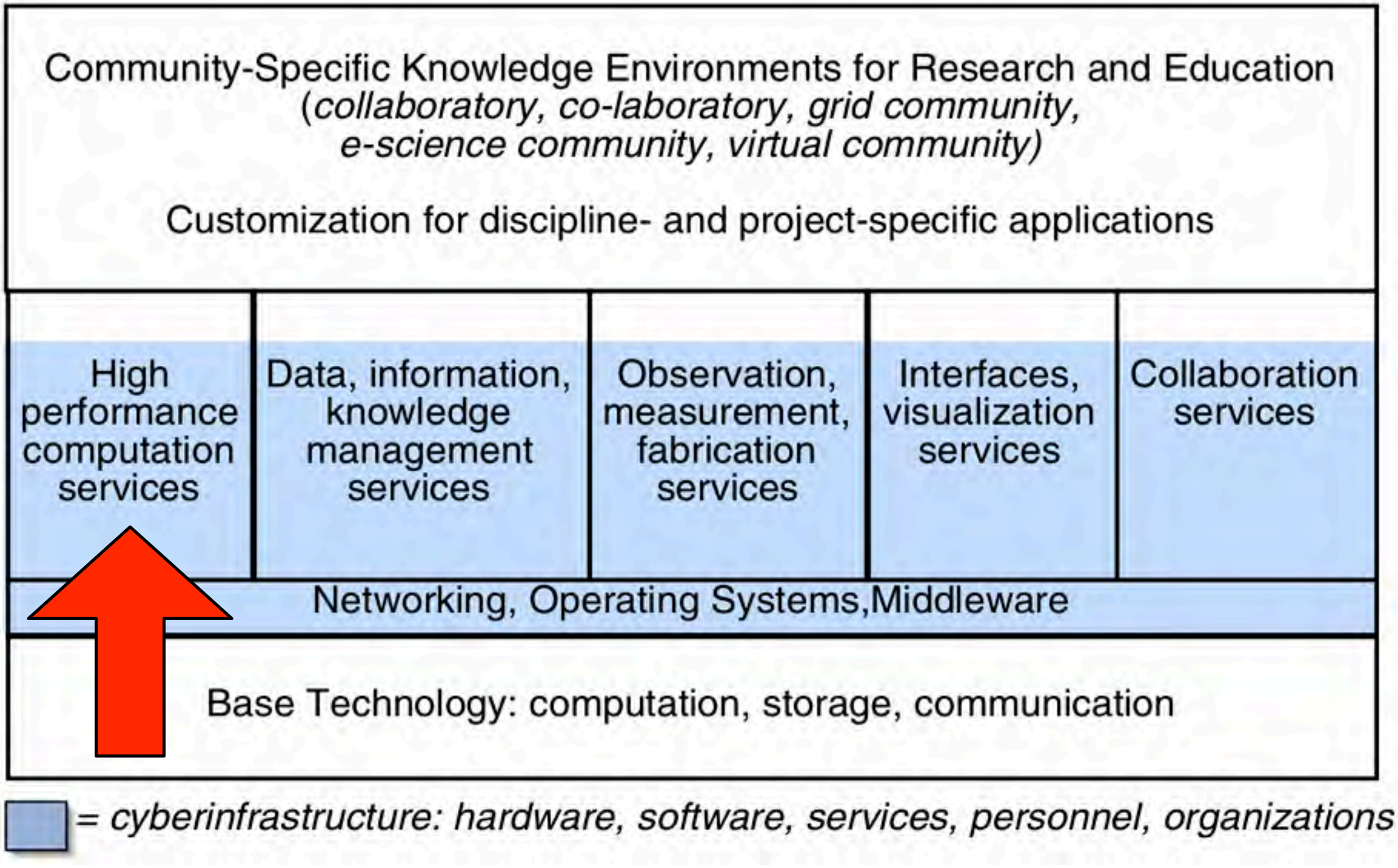
Cyberinfrastructure



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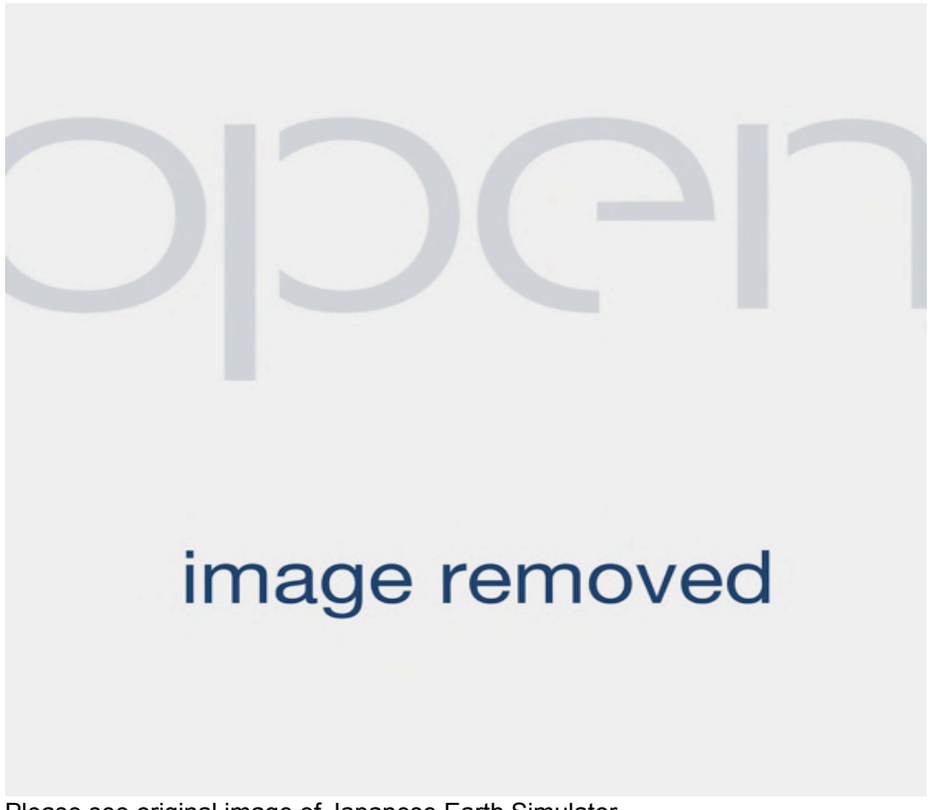
Japanese Earth Simulation Center

PD-SELF JAMSTEC, Earth Simulator,

Please see original image of Japanese Earth Simulator

Please see original image of Japanese Earth Simulator



Please see original image of Japanese Earth Simulator

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Virginia Tech Terascale Cluster
(1,100 Mac G5s)

Please see original image of Virginia Tech Terascale Cluster

Please see original image of Virginia Tech Terascale Cluster

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

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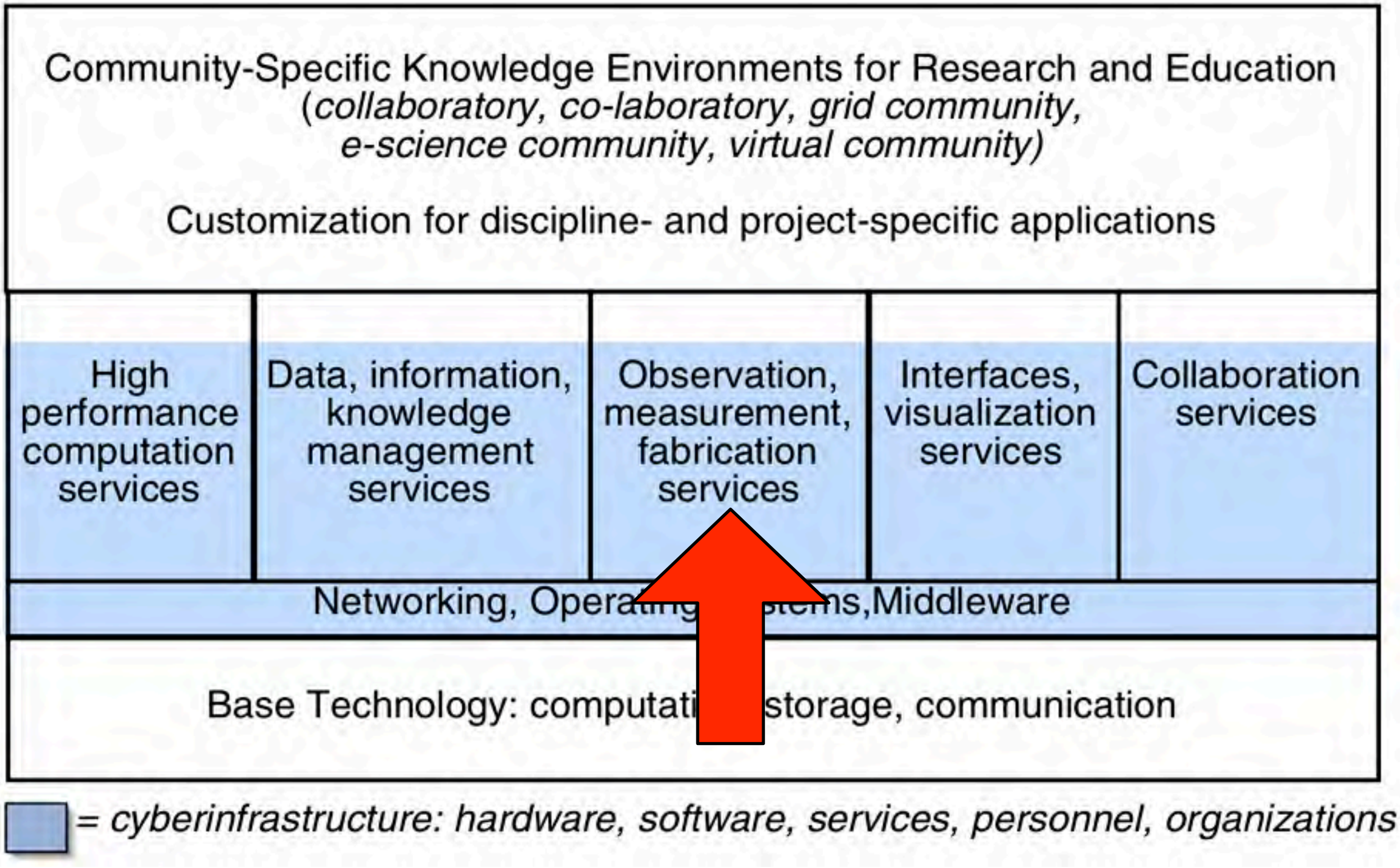
Cyberinfrastructure



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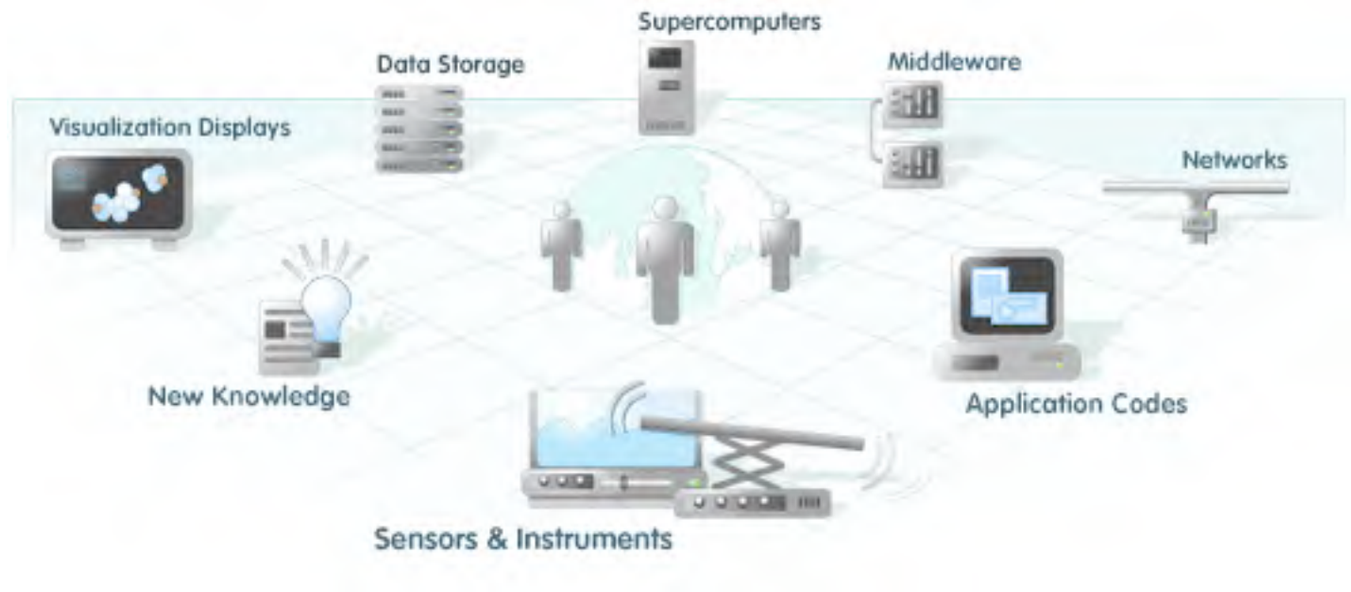
NEESgrid
Earthquake Engineering Collaboratory



© FAIR USE NEESgrid

U.Nevada Reno

www.neesgrid.org

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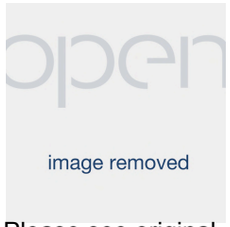
Please see original image of [brief description] at [URL of original, if available]

Embedded Sensors: R&D and Use



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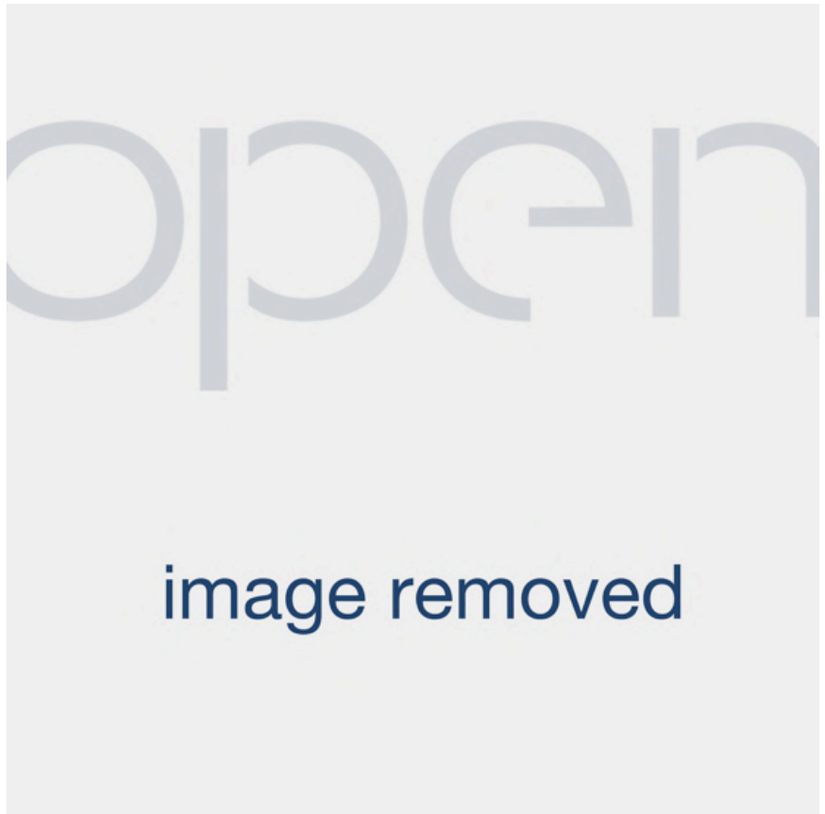
National Ecological Observatory Network (NEON)



Please see original image of embedded sensors.

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

Ocean Research Interactive Observatory Networks

Please see original image of Ocean Research Interactive Observatory Networks.

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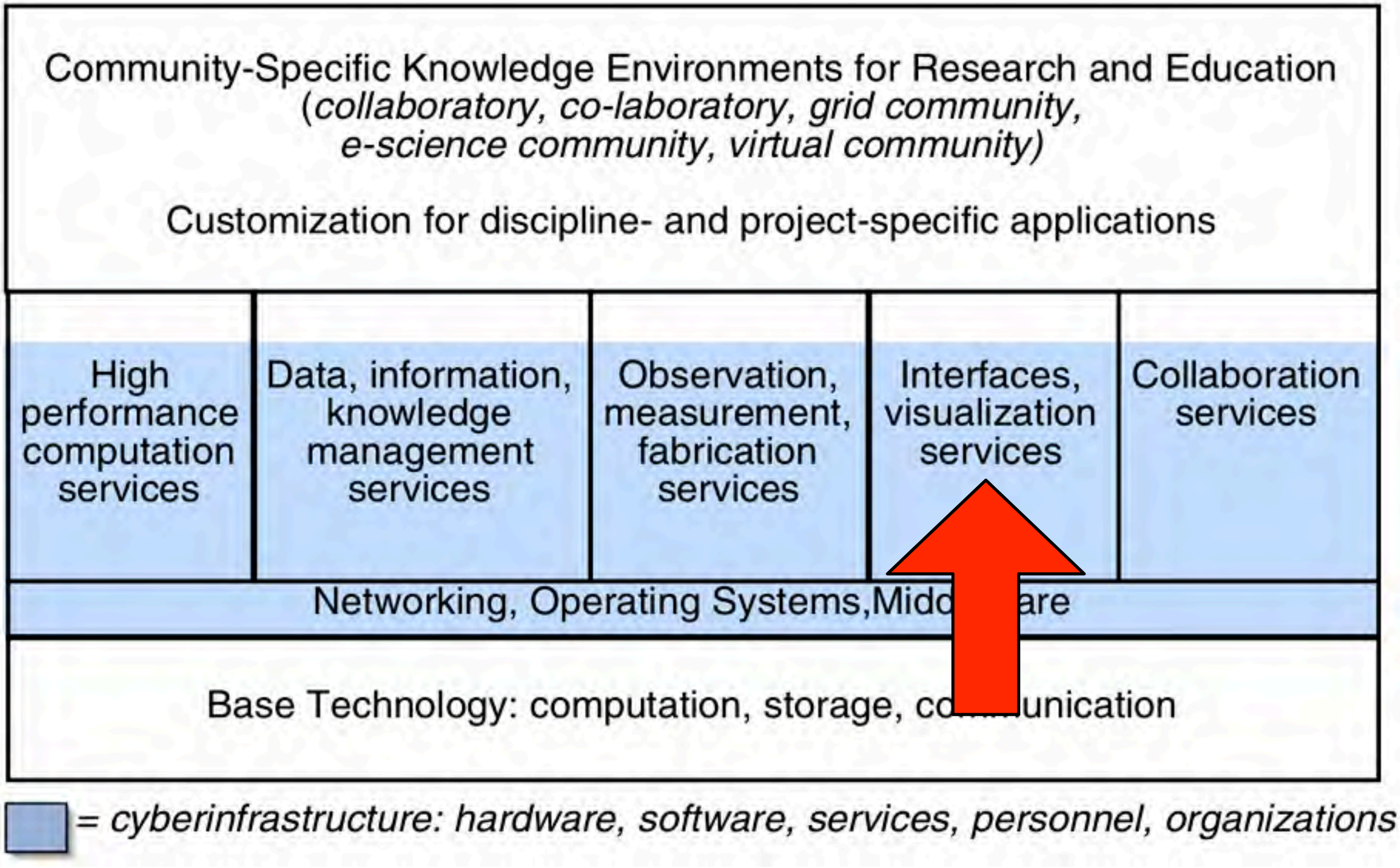
Cyberinfrastructure



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Electronic Visualization Lab

http://www.evl.uic.edu

Tele-Immersive Collaboration in the CAVE Research Network

Please see original images of Electronic Visualization Lab.

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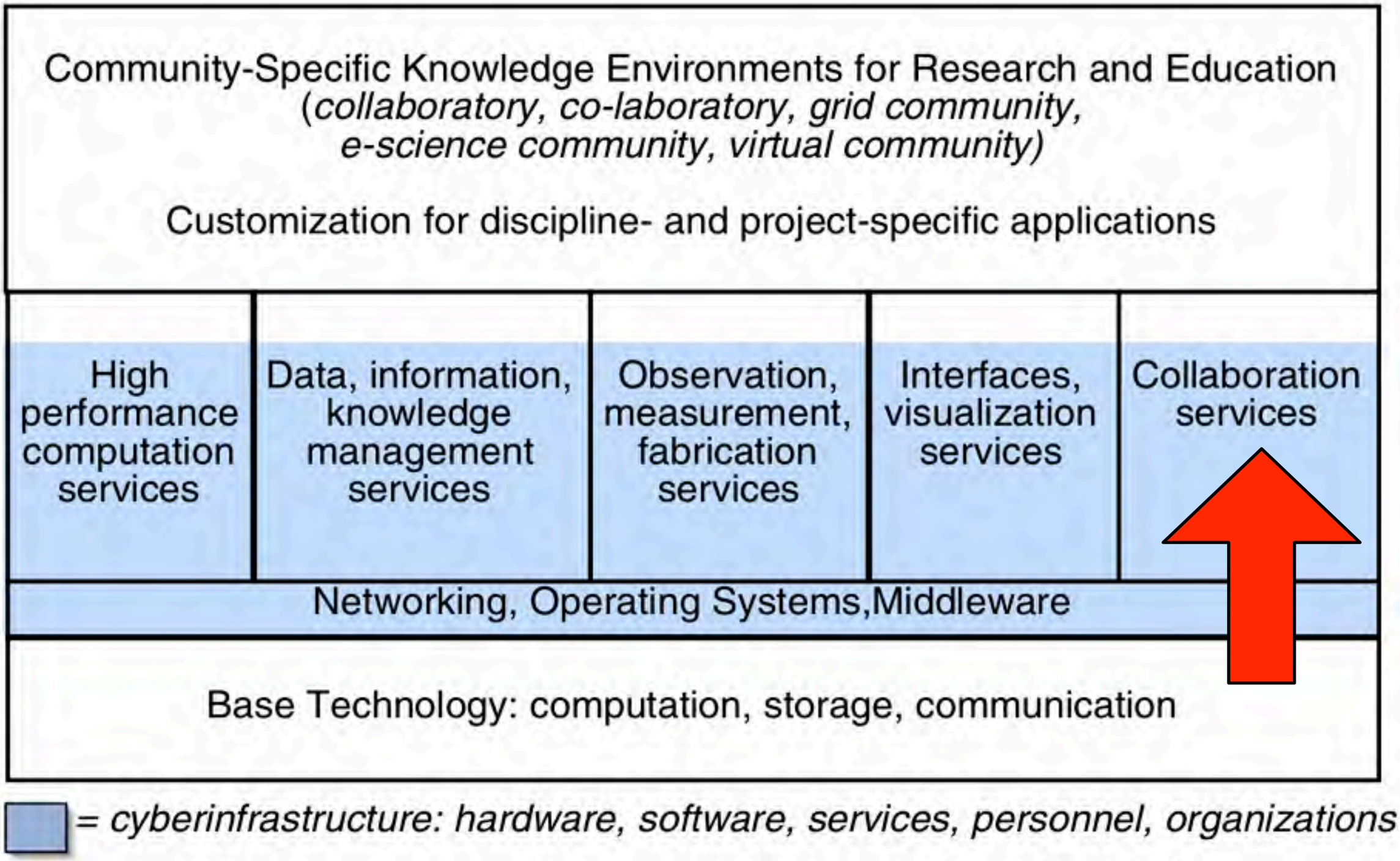
Cyberinfrastructure



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Time-Space Collaboration

Place \ *Time*	Same	Different
Same	Physically together...	Drop in lab, physical library, museum
Different	Audio, chat, video conference, group applications	Email, threaded-discussions, shared files...

distance matters ——— *beyond being there*

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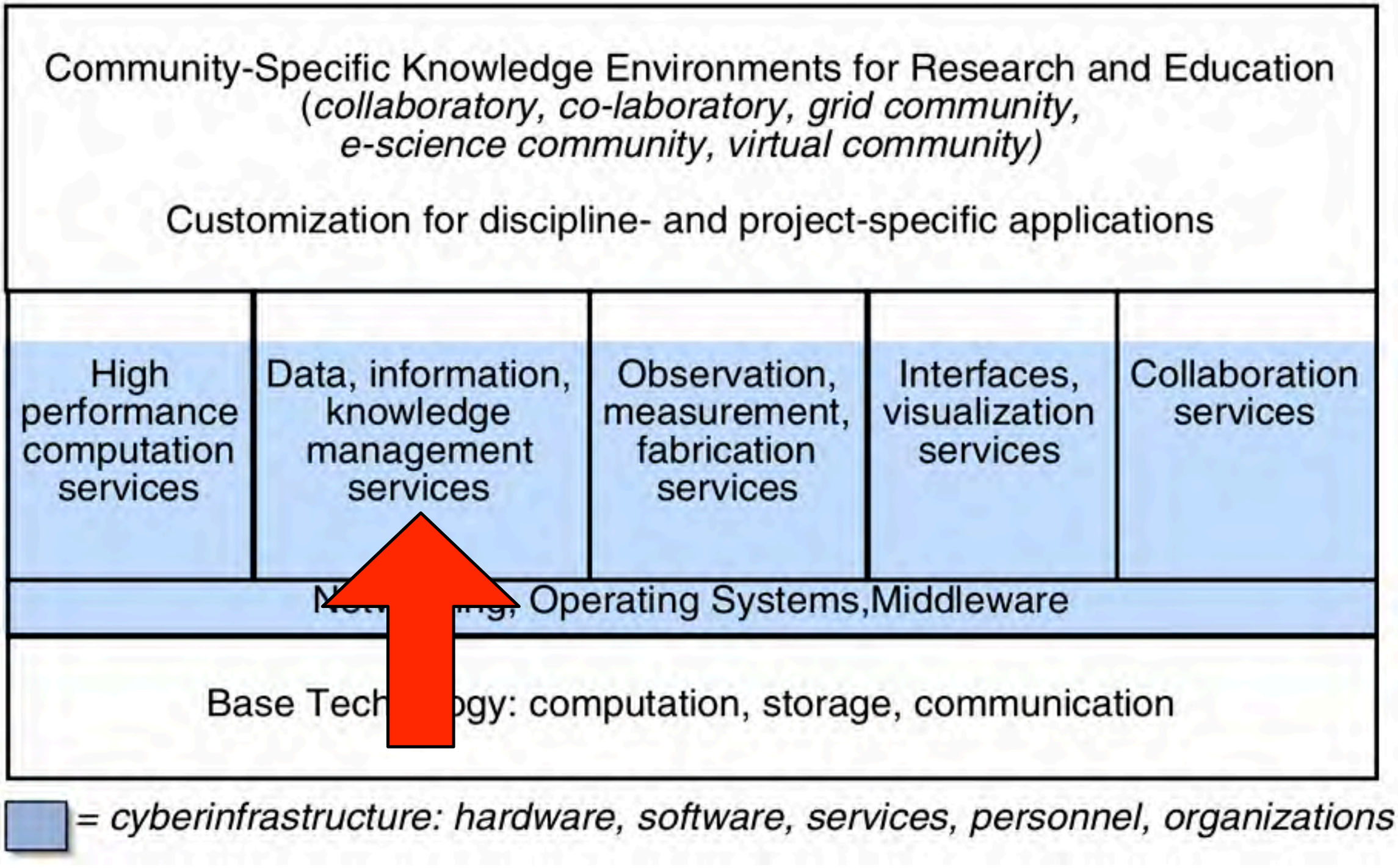
Cyberinfrastructure



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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.

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Cyberinfrastructure is a First-Class Tool for Science

Please see original image of cyberinfrastructure examples.

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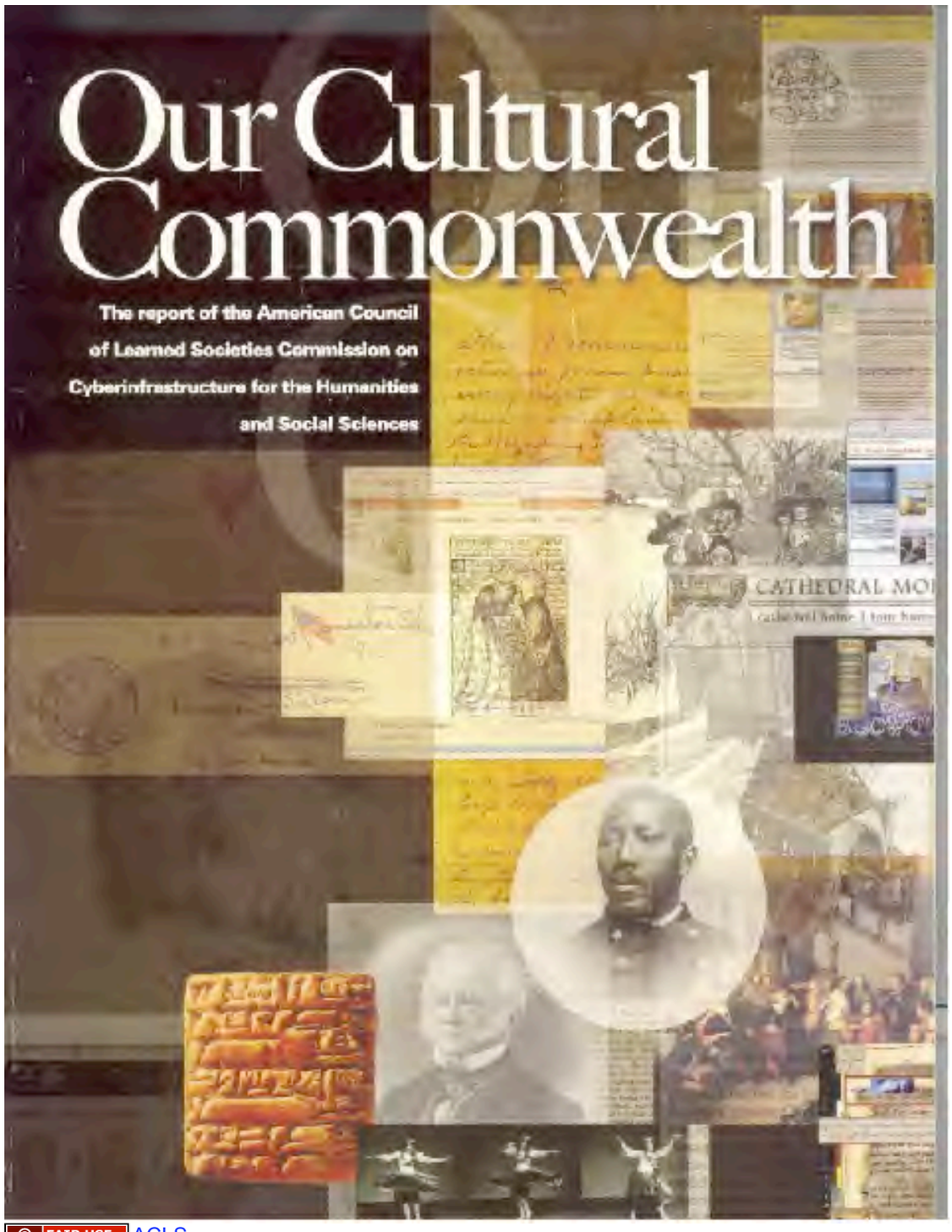
Our Cultural Commonwealth, 2006



Problems of Scholarly Publishing, 1959

On Research Libraries, 1967

 ACLS

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
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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.

Thank you!

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www.si.umich.edu

Additional Source Information

for more information see: http://open.umich.edu/wiki/CitationPolicy

Slide 4: Source Undetermined

Slide 6: Clockwise From Top Right: Amazon, http://ecx.images-amazon.com/images/I/41KQJX1STHL._SL500_AA300_.jpg; Source Undetermined; Amazon, http://ecx.images-amazon.com/images/I/517M5A325HL._SL500_AA300_.jpg; Alibris, http://www4.alibris-static.com/isbn/9781573565202.gif; Nap.edu, http://images.nap.edu/images/minicov/0309074177.gif; Amazon, http://ecx.images-amazon.com/images/I/518GJND9A0L._SL500_AA300_.jpg; GRIP, http://www.grid-interoperability.eu/grip-links.htm; Tower.co, http://i43.tower.com/images/mm101831317/grid-2-second-edition-blueprint-for-new-computing-ian-foster-hardcover-cover-art.jpg

Slide 8: Paul Conway

Slide 10: Paul Conway

Slide 12: Paul Conway

Slide 13: JAMSTEC, Earth Simulator, http://www.jamstec.go.jp/esc/gallery/index.en.html

Slide 14: Please see original image of Virginia Tech Terascale Cluster, http://obamapacman.com/2009/08/high-performance-low-cost-super-computer-virginia-tech-mac-cluster/

Slide 15: Paul Conway

Slide 16: NEESgrid, http://www.neesgrid.org/about/index.html

Slide 17: Please see original image of Ocean Research Interactive Observatory Networks, http://www.coreocean.org/Dev2Go.web?Anchor=orion_home_page&rnd=17953

Slide 18: Paul Conway

Slide 19: Please see original images of Electronic Visualization Lab, http://www.evl.uic.edu

Slide 20: Paul Conway

Slide 21: Paul Conway

Slide 22: Paul Conway

Slide 25: ACLS, http://www.acls.org/cyberinfrastructure/ourculturalcommonwealth.pdf

Slide 26: ACLS

Slide 27: ACLS

Slide 28: ACLS

Slide 29: ACLS, http://www.acls.org/cyberinfrastructure/ourculturalcommonwealth.pdf