

INTERNET[®]

Health Sciences

Michael McGill

Internet2

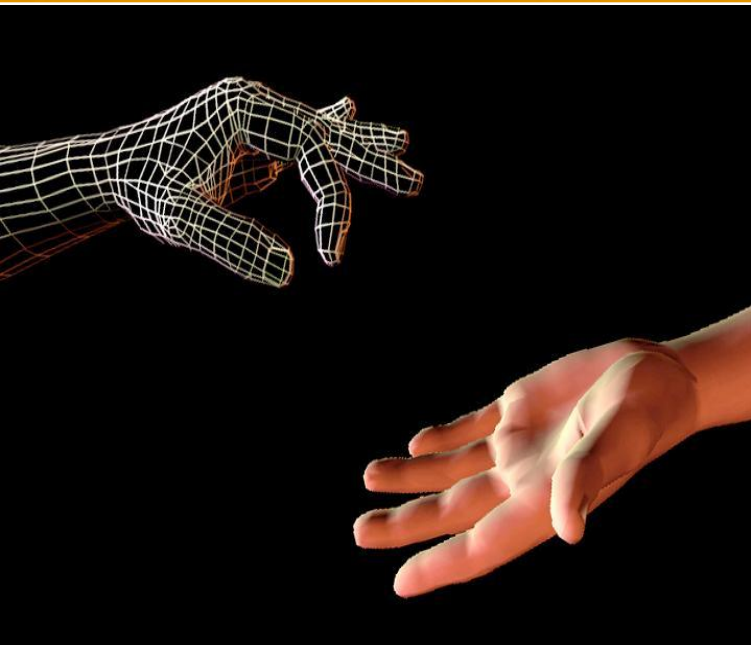
Health Sciences



Healthcare Expectations



The scope of the Internet2 Health Science Initiative includes medical and related biological research, education, and advances in clinical practice.



- 111 Academic Medical Colleges (AAMC) and their medical centers
- 130 Health Science related colleges
 - Public Health, Nursing, Dentistry, Pharmacy
- Affiliate Members
 - NIH, NSF, NASA, NOAA
 - Howard Hughes Medical Institute
- Pharmaceutical Companies
 - Johnson&Johnson, Pfizer, Eli Lilly
- Industry
 - Prouis Science, Cisco, IBM, Microsoft, SUN₄, Polycom, Ford Motor Company

- Distributed data sharing
 - Electronic Health Record
 - National Health Initiatives (ONCHIT)
 - Remote and Assisted Surgery
 - Remote Instrumentation
 - Real time access to remote images
- Collaboration independent of boundaries
 - Geography: Second Opinion Networks
 - Time: Learning Technology (Distance Education)
 - Computation: Knowledge Management
- New techniques and procedures
 - Surgical Planning
 - Digital Anatomy



Educators: Why Faculty Participate in Internet2

- Increasingly specialized information
- Access to expertise at remote locations
- Multiple learning modalities
- Access to resources not otherwise available



**Dynamic
charts**

**Second
screen**

lecture

**Communal
note taking**

messaging

*Slide courtesy:
Parvati Dev, Stanford University*

- Need for continually increasing bandwidth to support the increasingly finer resolution of data resources.
- To address policy issues such as the security and privacy requirements that must be met for the use of information that originates with or about a patient.
- To remove roadblocks as they confront the increasing need to collaborate across political (including state and federal government), academic, defense and security, and commercial

Biotech data's BIG BANG

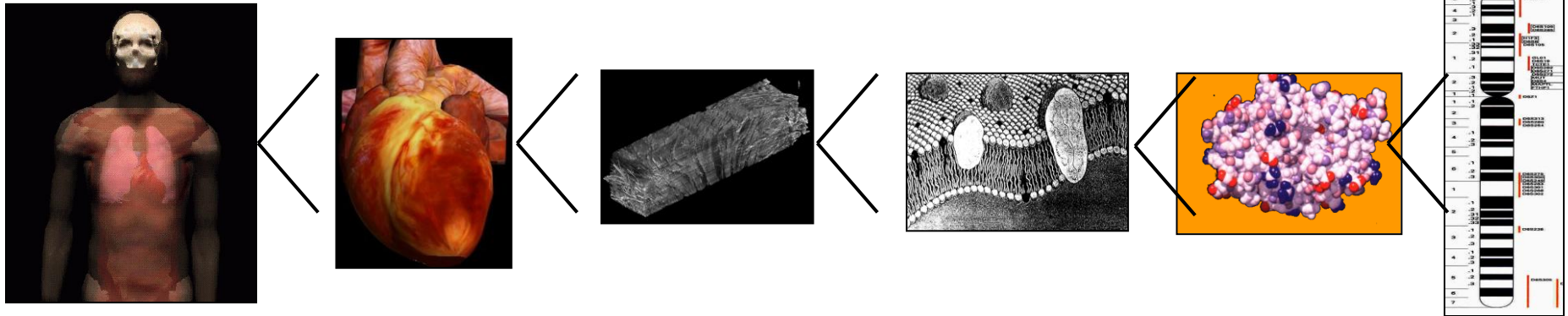
It's like Moore's Law on steroids:

The total volume of biological data worldwide, having doubled every 18 months in recent years, is now doubling every half a year to three months.

And this isn't a momentary spike, but a long-term trend that may require new ways to measure, analyze and mine biological databases.

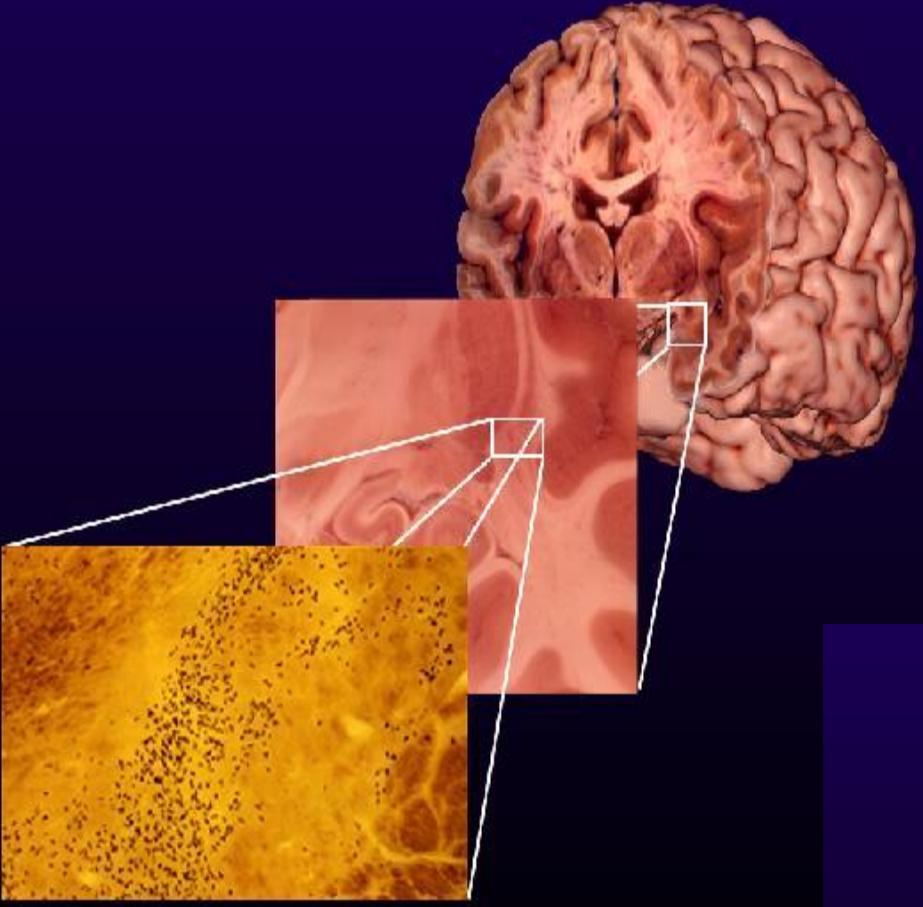
INTERNET² Health Science Grand Challenge

<Person-----Organ-----Tissue-----Cell-----Protein-----Atom>



Courtesy: Peter Hunter, University of Auckland

EACH BRAIN REPRESENTS A LOT OF DATA



Volume sizes by resolution -
brain = 1500 cm³

GB = Gigabyte = 10⁹

TB = Terabyte = 10¹²

PB = Petabyte = 10¹⁵

**Comparisons must be made
across several image sets**

Slide courtesy of Arthur Toga (UCLA)

Voxel size	B&W (1 B/p)	High res (2 B/p)	Color (3 B/p)
cm	1.5 KB	3 KB	4.5 KB
mm	1.5 MB	3 MB	4.5 MB
10 μ m	1.5 TB	3 TB	4.5 TB
μ m	1.5 PB	3 PB	4.5 PB

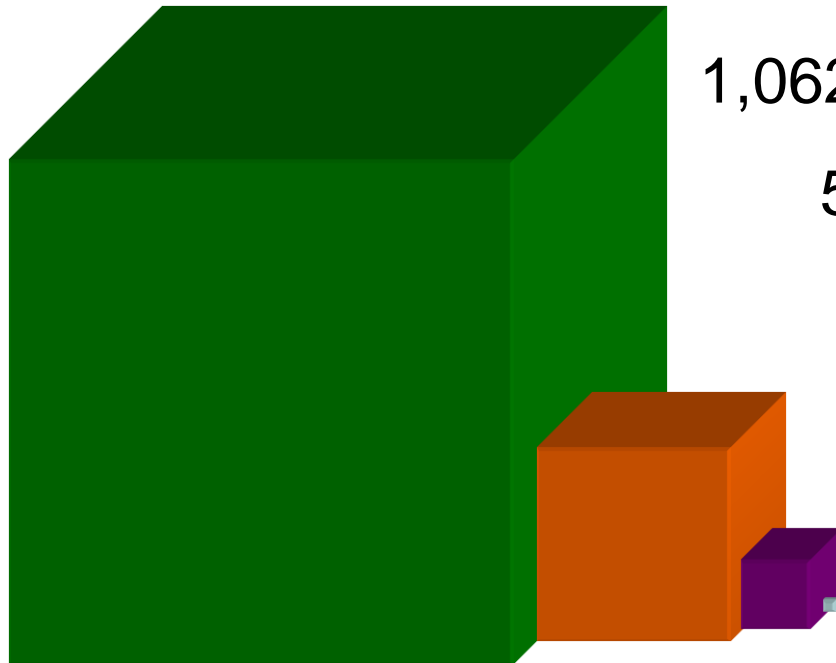
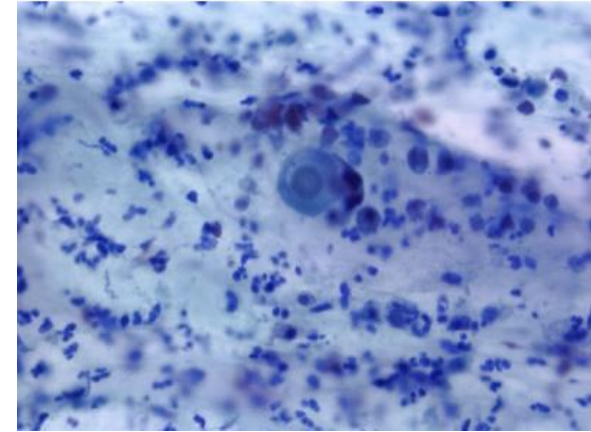


Time Needed to Move Brain Images Across the Internet

Voxel size: 1 μm

Imaging Technology: Color MRI

Data generated: 4.5 Petabytes



1,062,925.17 weeks

56 Kbps Modem

59,523.8 weeks

Broadband Internet

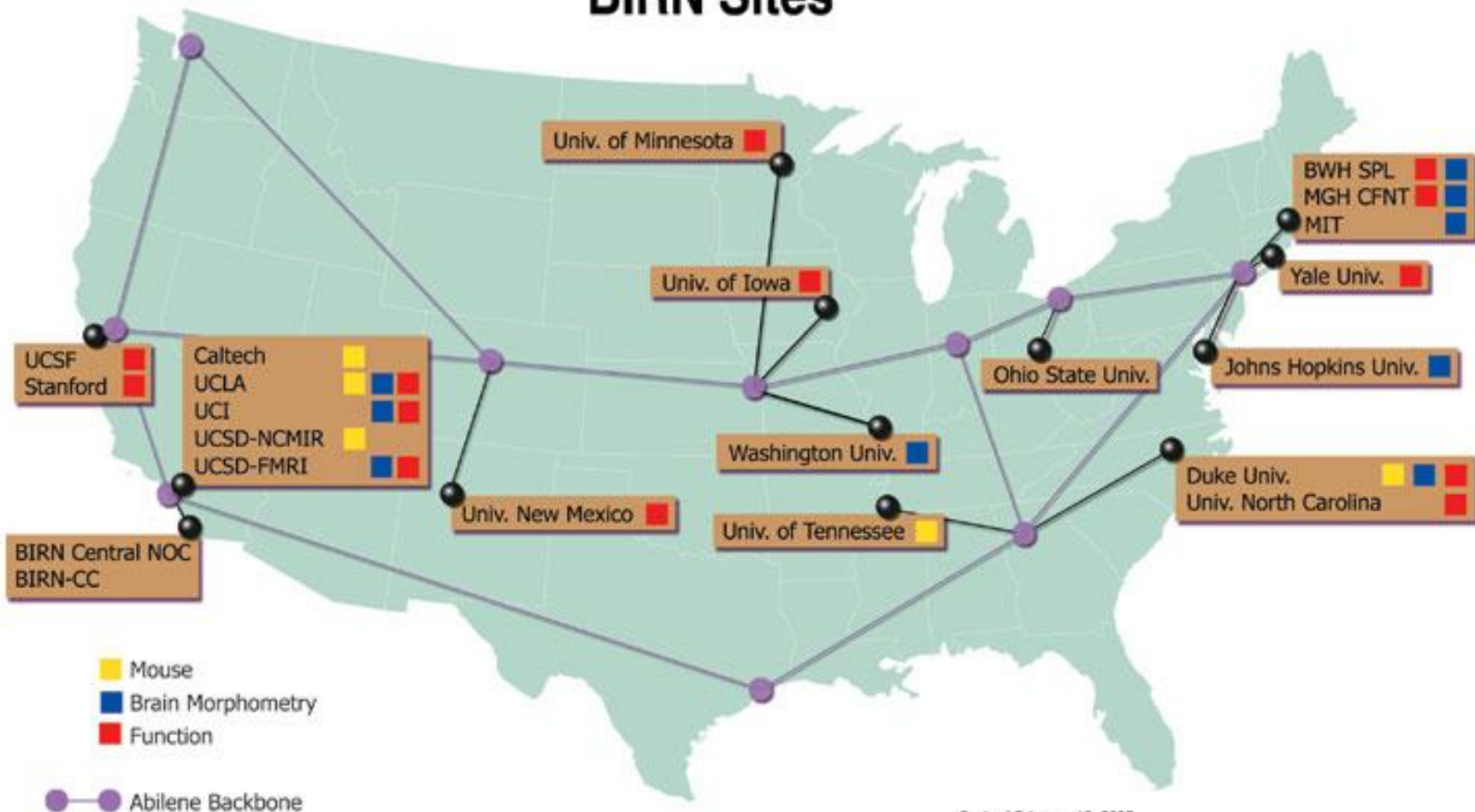
181.7 weeks

Typical LAN

10.6 weeks

Current Internet2
Record (5.6 Gbps)

BIRN Sites

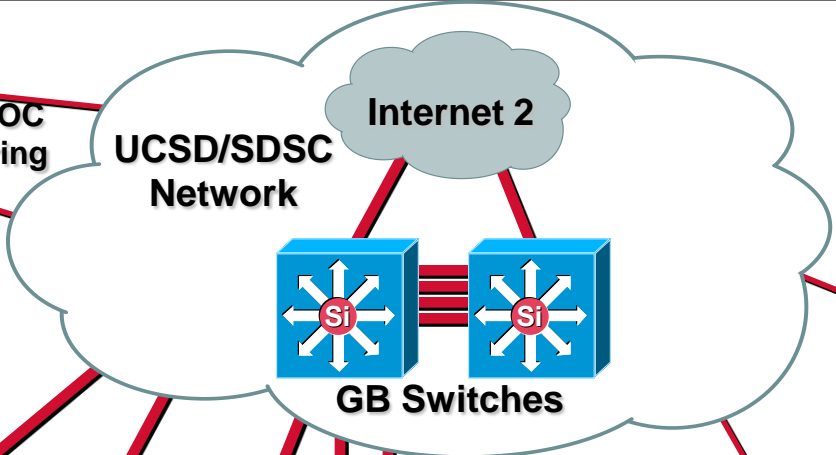
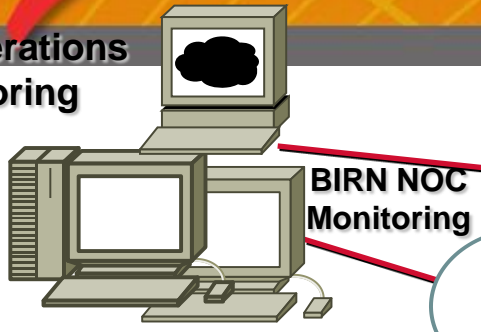


Revised February 10, 2005

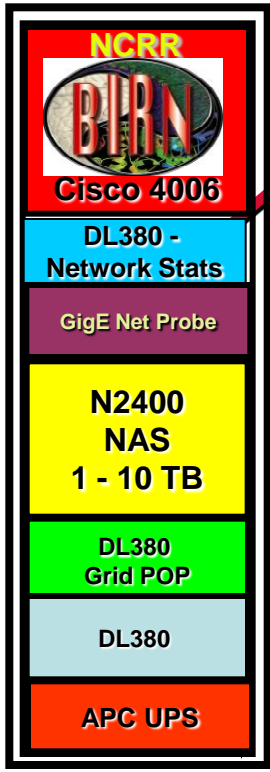
Funded by: NCRR/NIH
 Mark Ellisman, PhD, Univ. California San Diego, SDSC
www.nbirn.net

BIRN Network Operations Center Standardized Site Rack

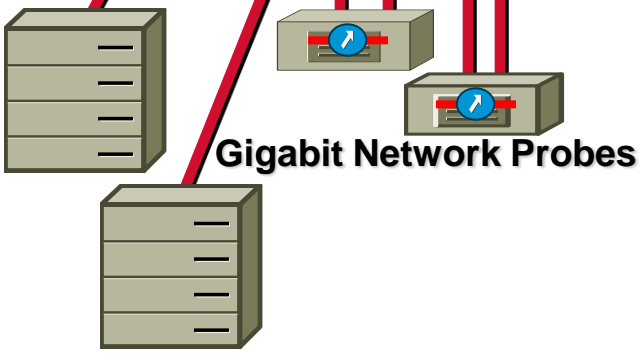
24x7 Operations Monitoring



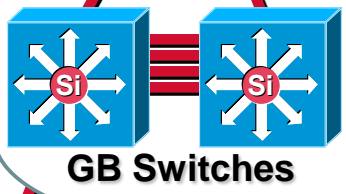
- Network Switch
- BIRN Statistics
- BIRN Network Probe
- Network Attached Storage –
- Grid POP/ SRB, Globus
- General purpose (e.g., encryption)
- UPS for Rack



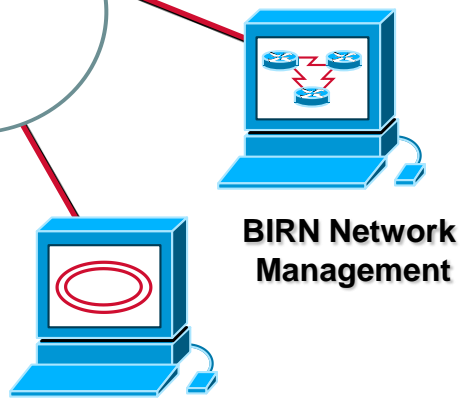
BIRN Site Rack



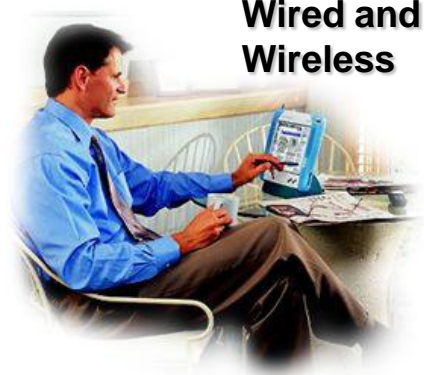
NOC Servers and Testers/Analyzers



Gigabit Network Probes



BIRN Network Management



Wired and Wireless

Ultimately, Access from Anywhere to BIRN DATA Everywhere



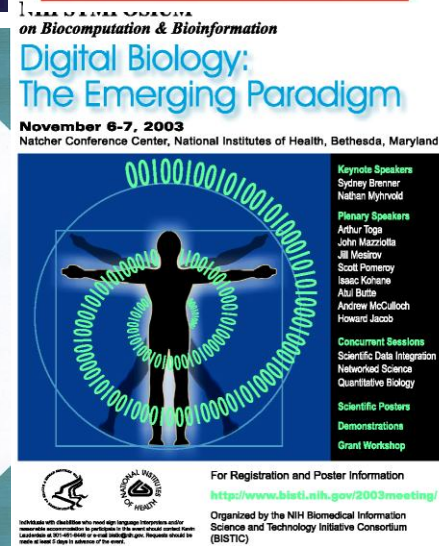
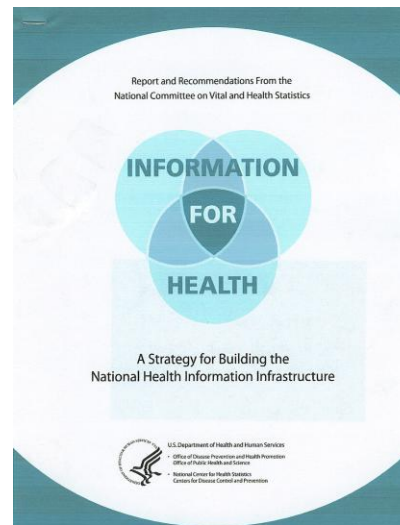
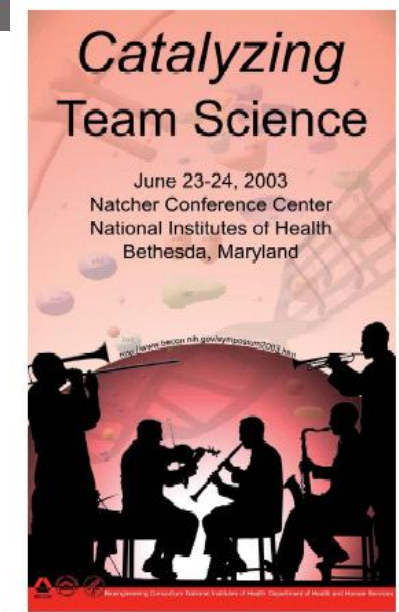
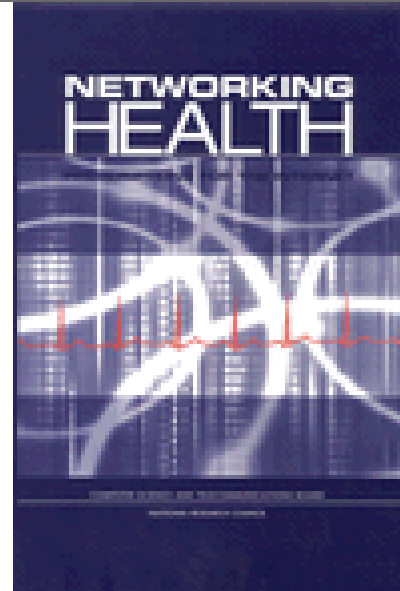
- What are today's most pressing scientific challenges?
- What are the roadblocks to progress and what must be done to overcome them?
- Which efforts are beyond the mandate of one or a few...but are the responsibility of (NIH as) a whole?

E. Zerhouni, M.D.
Director, National Institutes of Health

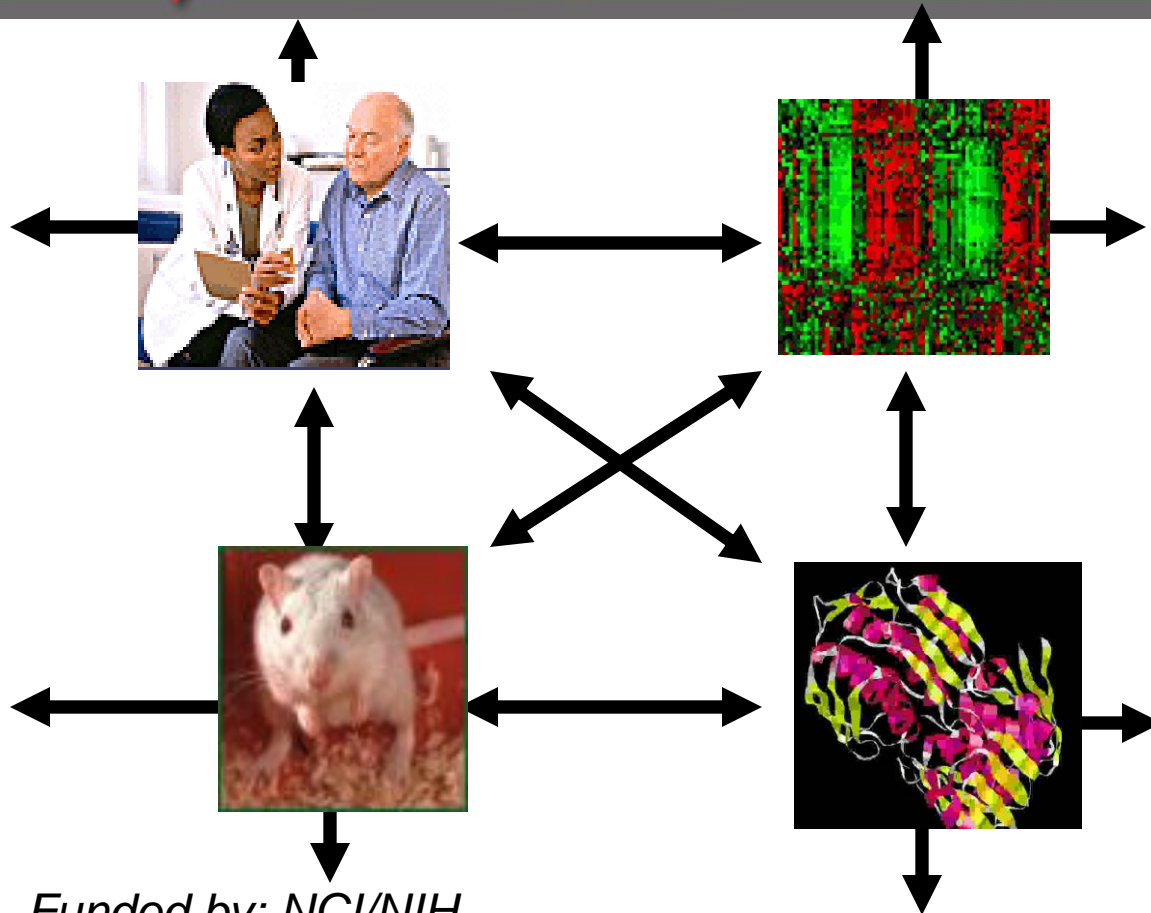


NIH Roadmap: Implementation Themes

- New Pathways to Discovery
- Research Teams of the Future
- Reengineering Clinical Research Enterprise
 - National Electronic Clinical Trials and Research Network (NECTAR)



Research Team of the Future: Cancer Biomedical Informatics Grid

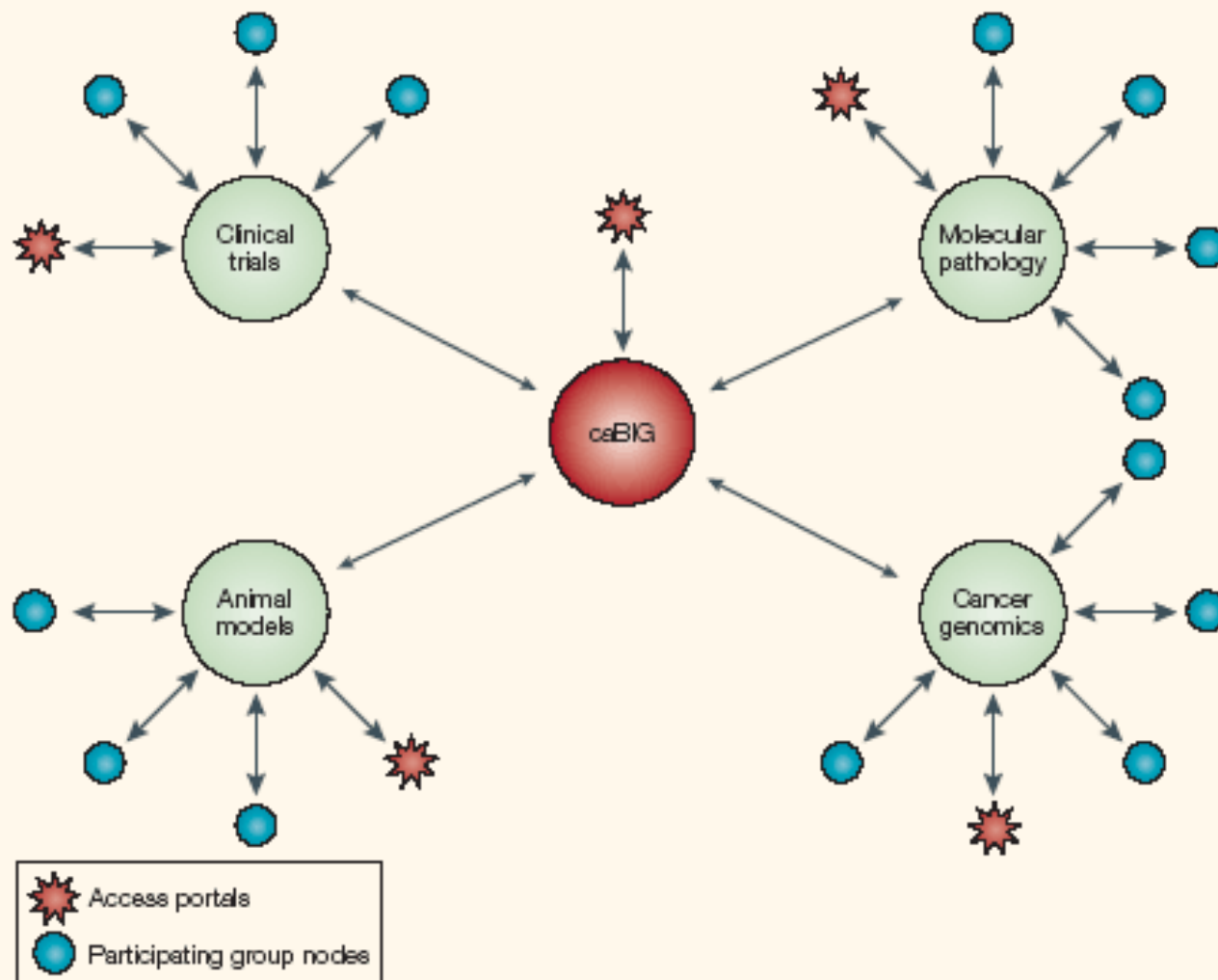


Funded by: NCI/NIH

<http://cabig.nci.nih.gov/>

David States, MD, PhD

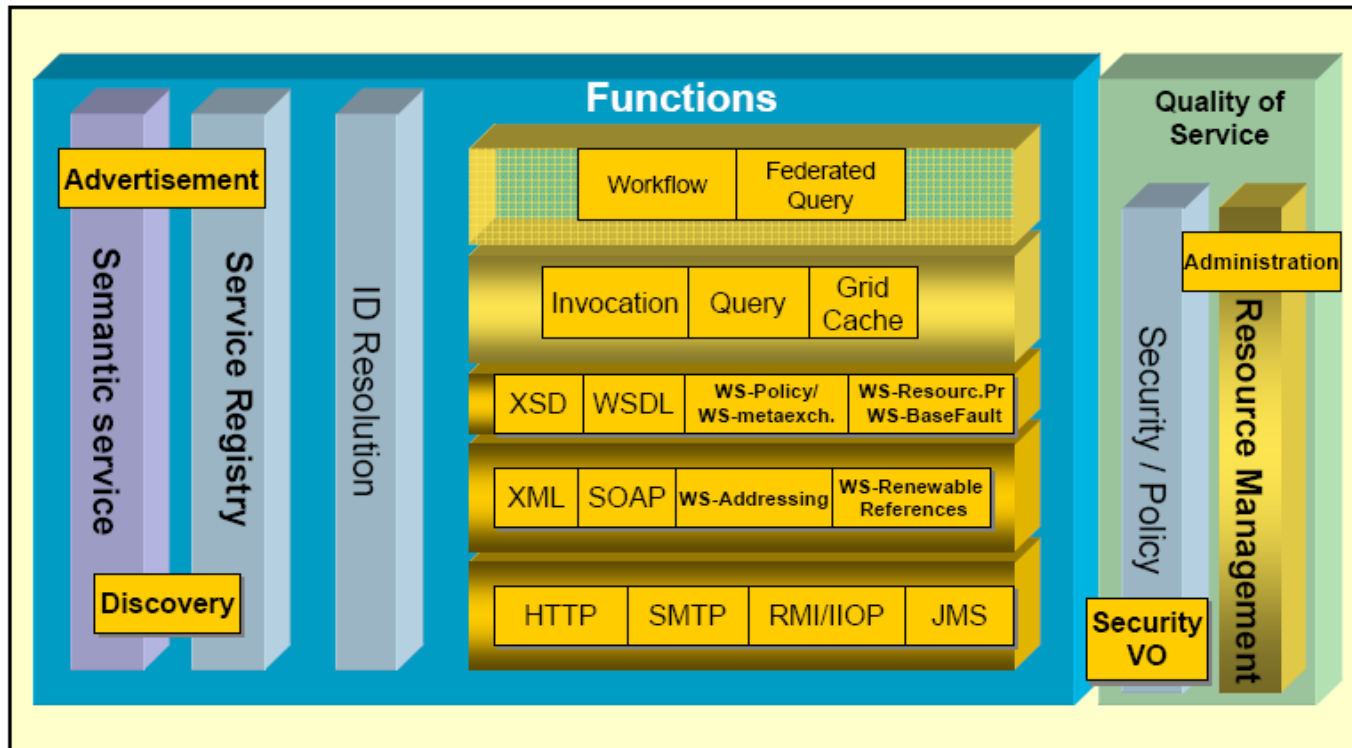
- Global Cancer Research Community
- Grid deployment to Cancer Centers
- Bioinformatics infrastructure
- Public data sources





caBIG pilot status - participation

Group (participants)	Funded Centers	Volunteer/Affiliated Organizations
Trials (152)	17	21
Integrated research (157)	24	15
Tissue Banks (83)	17	7
Data standards (85)	7	20
Architecture (61)	10	9
Data sharing (68)	15	1
Planning (66)	16	5
Training (50)	9	2

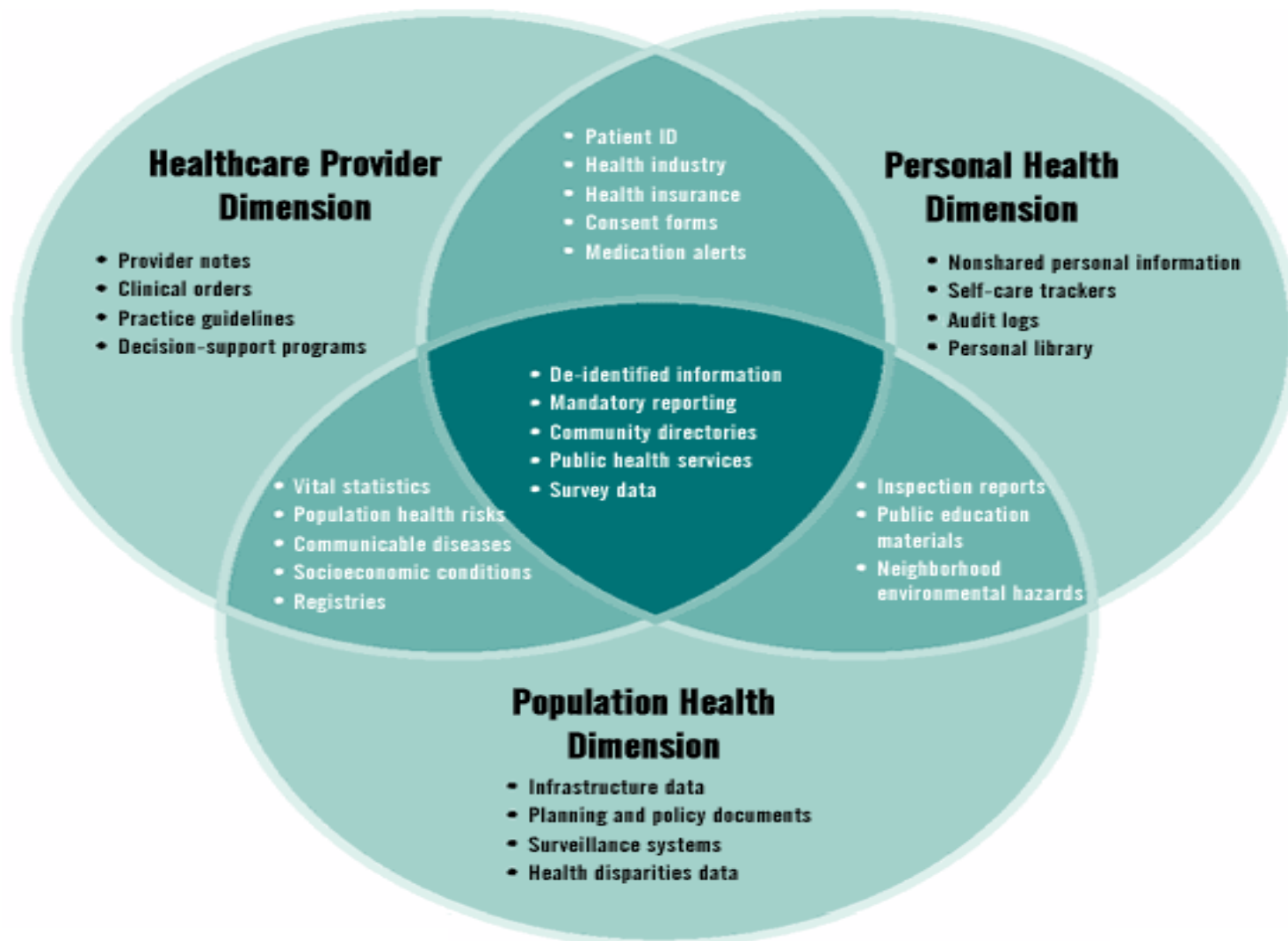


OGSA Compliant Service Oriented Architecture

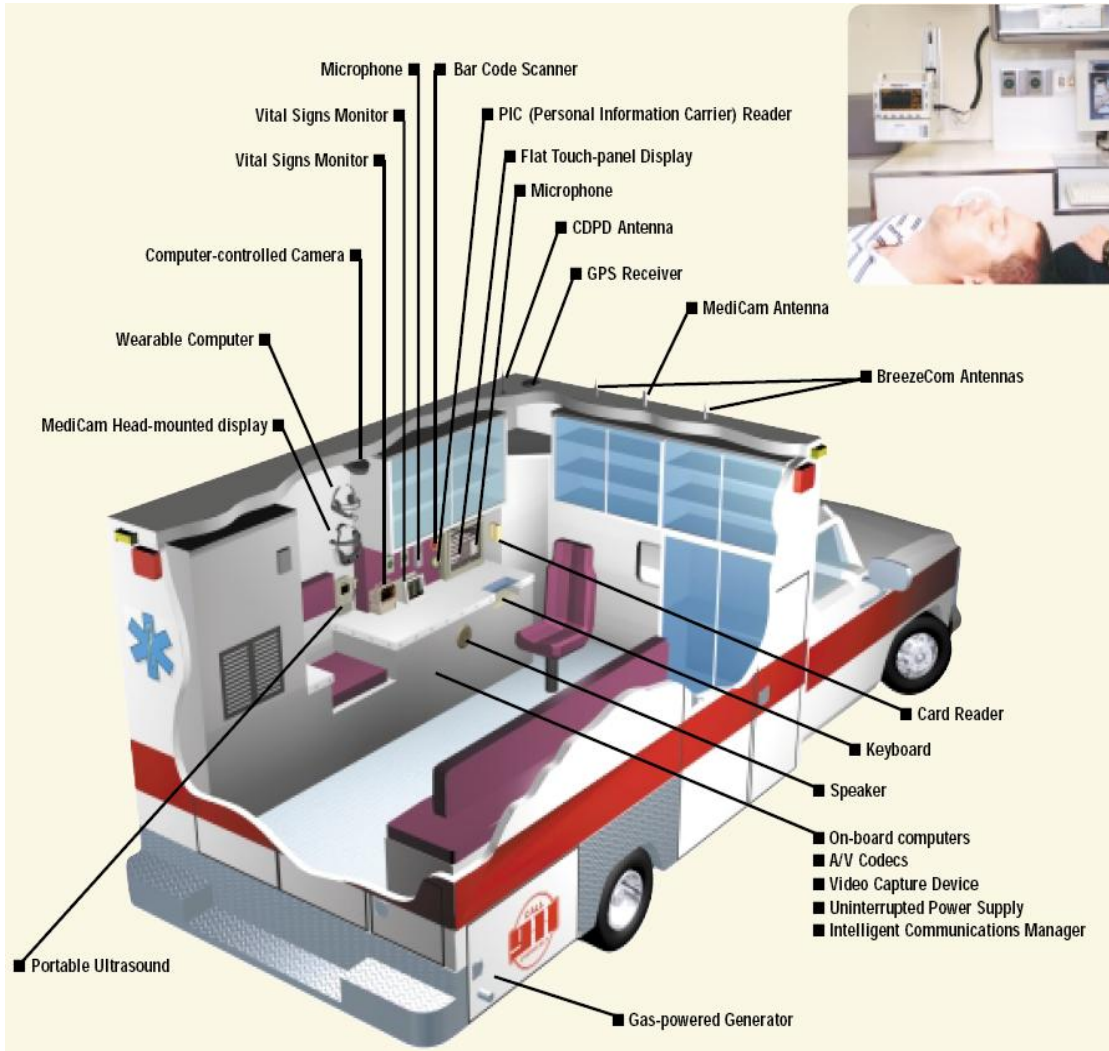


NHII Vision

Examples of content for the three dimensions and their overlap



Dreams Project





www.internet2.edu