

Cyberinfrastructure- enabled Radiology Informatics

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These bridges made Iowa attractive.



“We are building another Iowa-based bridge more spectacular.”

-- H. RI --

Cyberinfrastructure



- Initiated by NSF
- National evolving vision of computing for 21th century of scientific discovery
- Paradigm and Envision
 - To develop a cultural community that supports large-scale peer-to-peer collaboration and new modes of research and education

Cyberinfrastructure



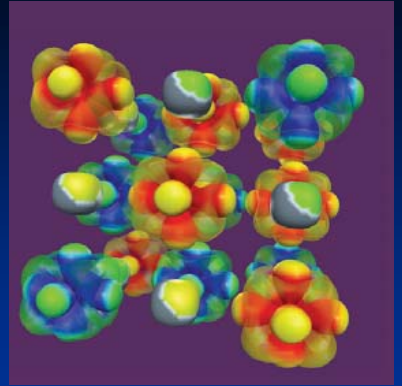
■ Functions

- Leadership computing;
- Data and information resources;
- Online instruments and observatories
- Visualization and collaboration services

■ Enabling Features

- Enables distributed knowledge communities that collaborate and communicate across disciplines, distances and cultures.
- Extend beyond traditional brick-and-mortar facilities, becoming virtual organizations that transcend geographic and institutional boundaries.

Cyberinfrastructure



- Complementary domains
 - Cutting-edge computing systems
 - Data, information resources, networking and communication, digital media and devices, instruments, observatories, along with an interoperable suite of software services and tools
 - Virtual organizations for integration collaboration, and cooperation at system levels
 - Educational and workforce initiatives

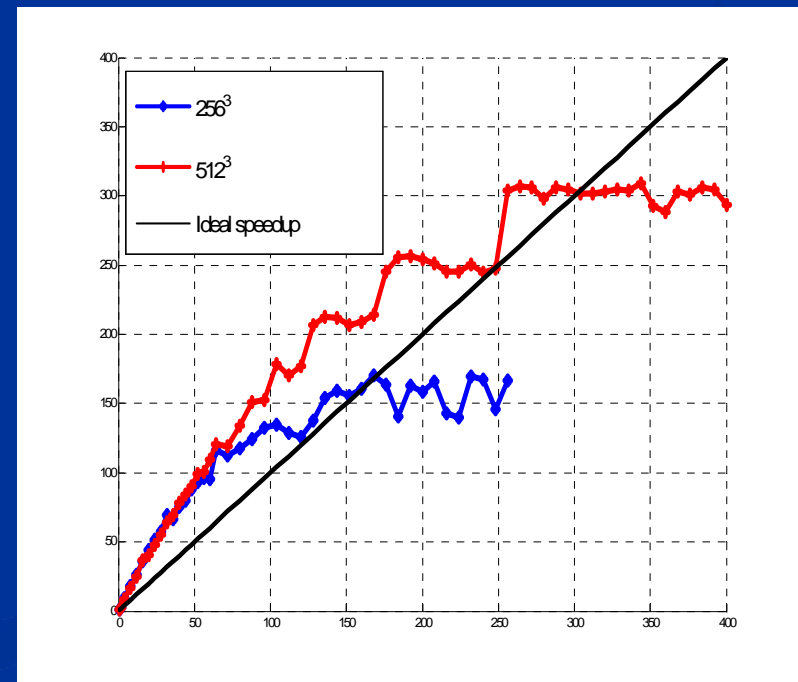
State Mission

- National strategic taskforces
 - World-level petascale computing system
 - In support of modeling, simulation, and extraction of knowledge from huge data collections is increasingly essential to a broad range of multi-disciplines (e.g. physics, biology, medicine, chemistry, cosmology, computer science, mathematics), as well as multi-scalar in spatial and temporal dimensions and complexity.
 - 1 \$200 millions (0.1-1.0 petascale), NCSA proposal with Great Lake Computing Consortium
 - 1-5 \$ 50 millions (10-100 terascale), TeraGrid facility

“Micro CT medical image reconstruction remains a major topic of interest for medical researchers. Although medical image reconstructions have become more mature, particular challenges have persisted over the decades, for example, the solution to instantly obtainable high-resolution image reconstruction. Dr. Jun Ni’s research group (www.uiowa.edu/mihpclub/), **Department of Radiology, at the University of Iowa, sponsored by NIH and Intel**, developed a scalable parallel reconstruction algorithm and with very successful high performance results of up to 1000 processors at NCSA. Although it is the state-of-the-art of large-scale HPC based medical image reconstruction, it can only handle four gigabyte data (512^3 voxel) every couple of minutes. Even a teraflops-based computing facility is not efficient enough to handle much higher resolution of CT data. Dr. Ni’s group has been searching for a petascale computing system to reconstruct microscopic CT images (terabyte) within a minute’s time.”

TeraGrid Sites

- University of Chicago/Argonne National Laboratory
- Indiana University
- Oak Ridge National Laboratory
- National Center for Supercomputing Applications
- Pittsburgh Supercomputing Center
- Purdue University
- San Diego Supercomputer Center
- Texas Advanced Computing Center
- National Center for Atmospheric Research.
- www.teragrid.org

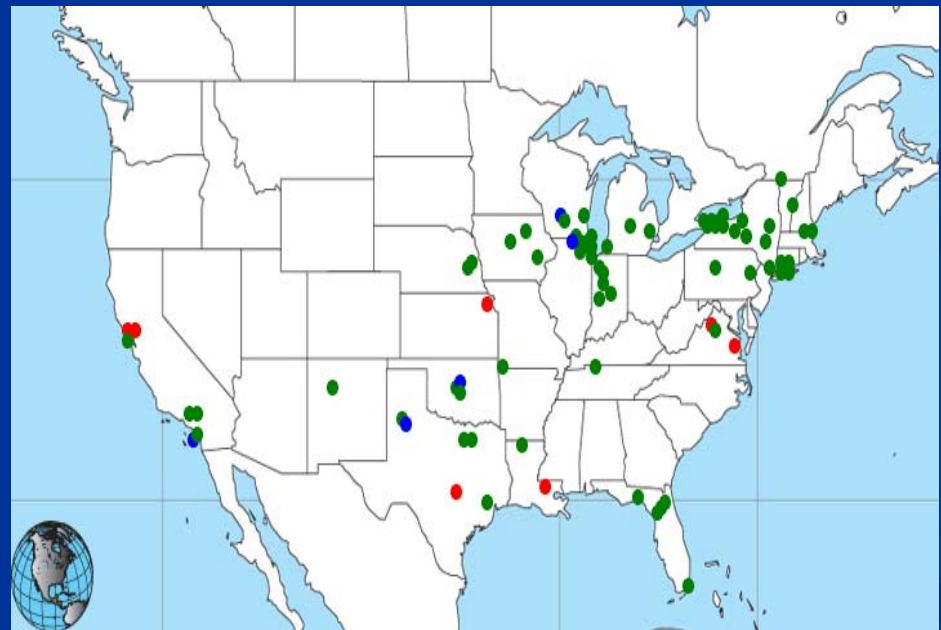


Open Science Grid (DOE, NSF)



Open Science Grid

- UI OSG Activities
 - OSG Consortium Member
 - Grow Project
 - HawkGrid – Campus Grid
 - Active Technical Development Site
 - www.osg.org



Medical Imaging Grid and UI- Radiology Involvement

- **Global Grid Forum (GGF), Chicago, 2003**
 - Ni and Wang, called and chaired GGF Life Science Grid (LSG) -Medical Imaging and gave a talk “Grid Computing Scenario for Medical Imaging in Radiology”
 - He and Ni, “OSGA-DAI for Medical Imaging”
 - Ni and Wang, “NSF: Grid-based Digital Libraries for Medical Imaging” (did not awarded)
- **NIH-BISTI Center for Grid-Enabled Medical Image Analysis (GEMIAC) at OSU**
- **NIH-BISTI GEMIAC - NIH P20 EB000591-02 (7/03-7/06)**
\$2,084k for applications, NSF 400k, middleware
 - (<http://medimage.bmi.ohio-state.edu/>) (NIH)
 - <http://amp.osu.edu/hims/article.cfm?id=1533> (NIH and NSF)
 - Presented at RSNA05

Medical Imaging Grid and UI-Radiology Involvement

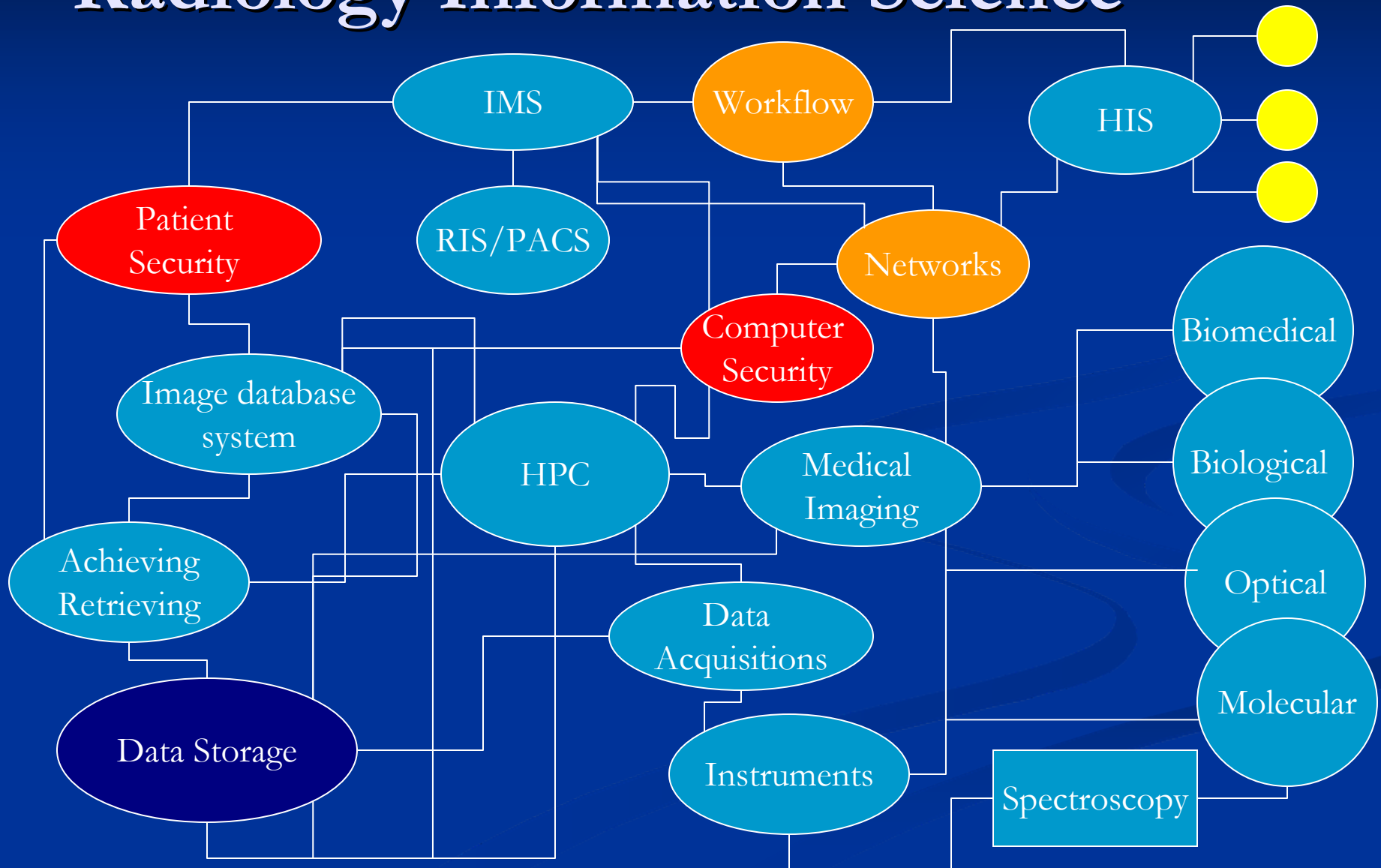
- **Medicus Project (NIH, NSF)**
 - Grid Middleware for Medical Imaging Informatics (DICOM data storage) (NIH grant UO1-BA97452)
 - University of Chicago (radiology and computer science), USC (Functional Imaging and Biomedical Informatics at Children Hospital Los Angeles)
 - FUJI FILM provided Synapse PACS and Workstation software
 - Presented at RSNA06
 - UI-Radiology has been invited to participate future collaborations
- **CCT, LSU Collaboration**
 - Invited talk about UI-HPC in Medical Imaging
 - (<http://www.cct.lsu.edu/events/talks/164>)
 - Data storage resources discovery (NSF awarded)
 - UI-radiology proposal with CCT

Medical Imaging Grid and UI-Radiology Involvement

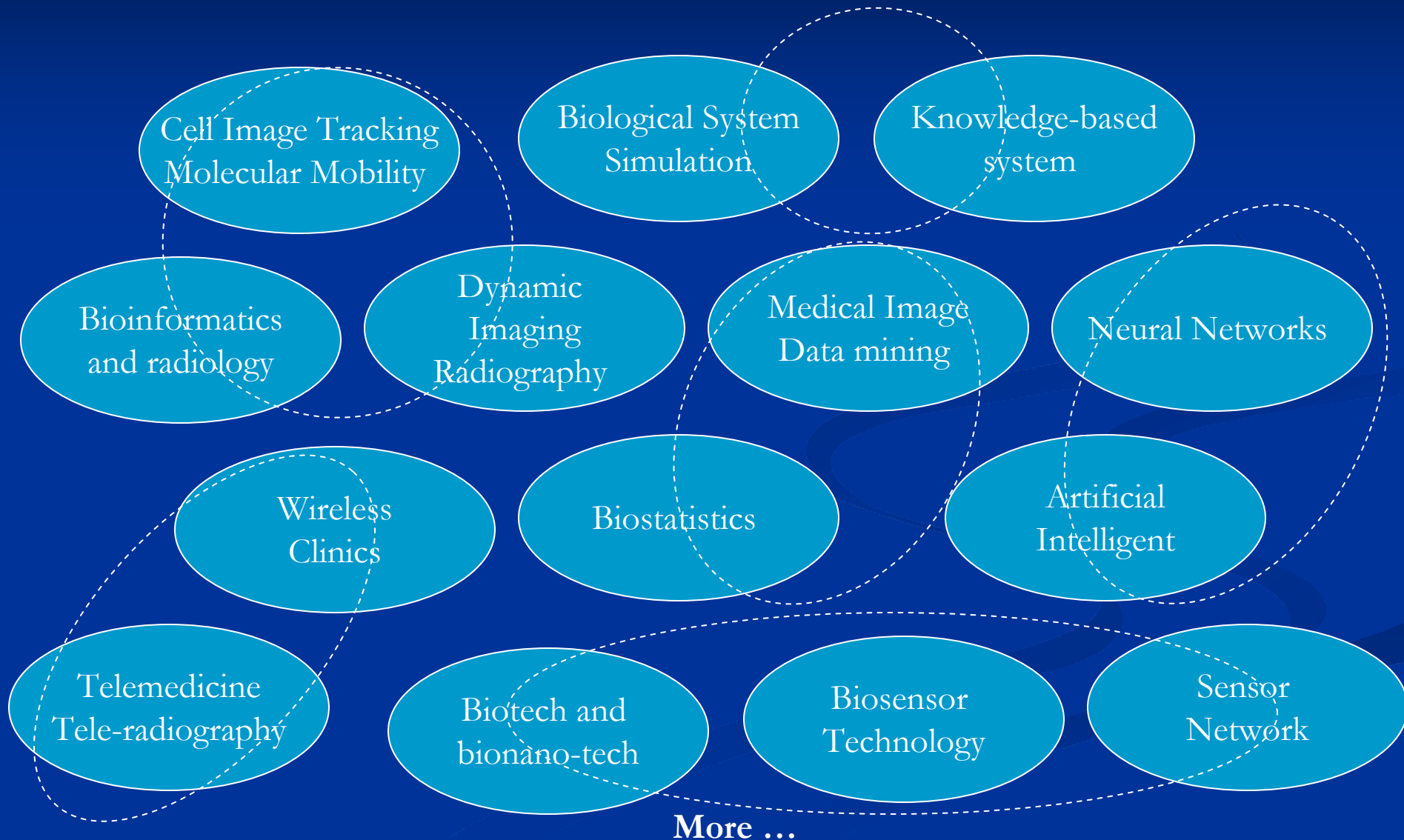
■ Our next step

- Continue to collaborate U. of Chicago, USC in experimenting Medicus
- Develop Medical data storage resources system with CCT, LSU
- Form a UI led global-scaled cyberinfrastructure-enabled medical imaging informatics network, called **Radiology Informatics Hub (RIB)** and **Medical Imaging Informatics Consortium (MIIC)**
 - UI, VT, LSU, LTech, Fudan University (China), Shanghai Jiao University (China), Yousen University (Korea), Oxford University (UK), National Singapore University (Singapore), Cornell University, Intel, Microsoft, ...

Spectrum of Medical Imaging & Radiology Information Science



Spectrum of Radiology Informatics



Conclusion

System Radiology

Hawk Radiology Informatics (H. RI)

www.uiowa.edu/~hri/

Thanks

Q&A?