



Cyberinfrastructure and Observations Breakout Group

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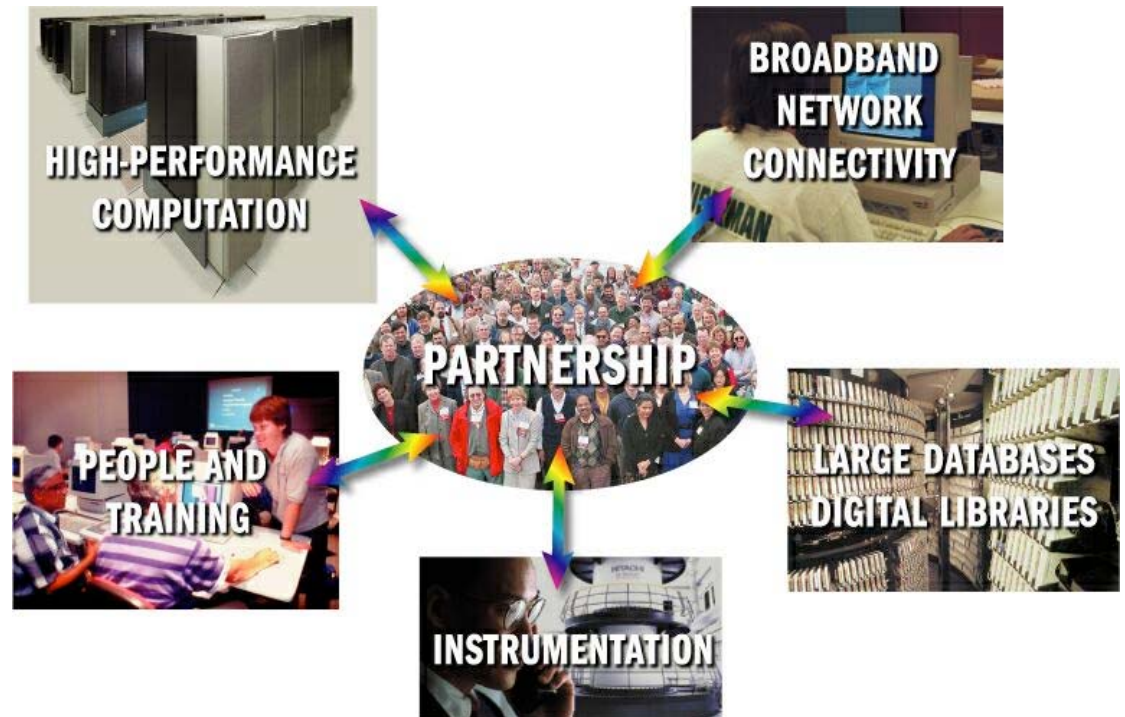
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Cyberinfrastructure – A Unifying Concept



- **Cyberinfrastructure** is the development of “infrastructure based upon distributed computer, information and communication technologies”
- **Software provides the Glue to enable “end-to-end” applications**



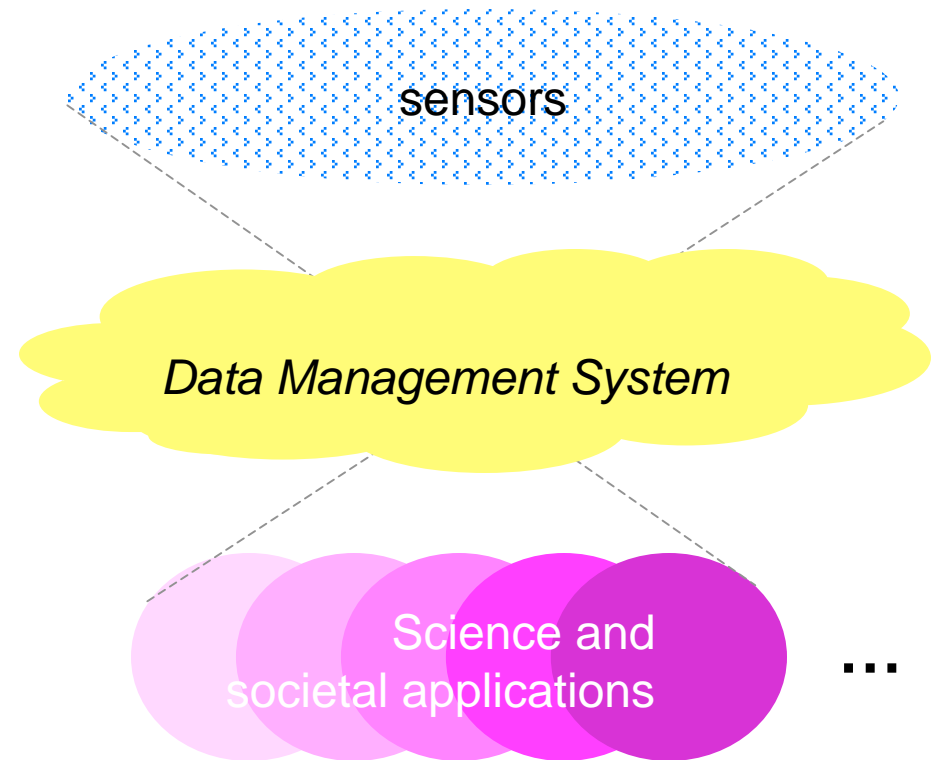
*National Science Foundation's
Cyberinfrastructure*

Breakout Questions

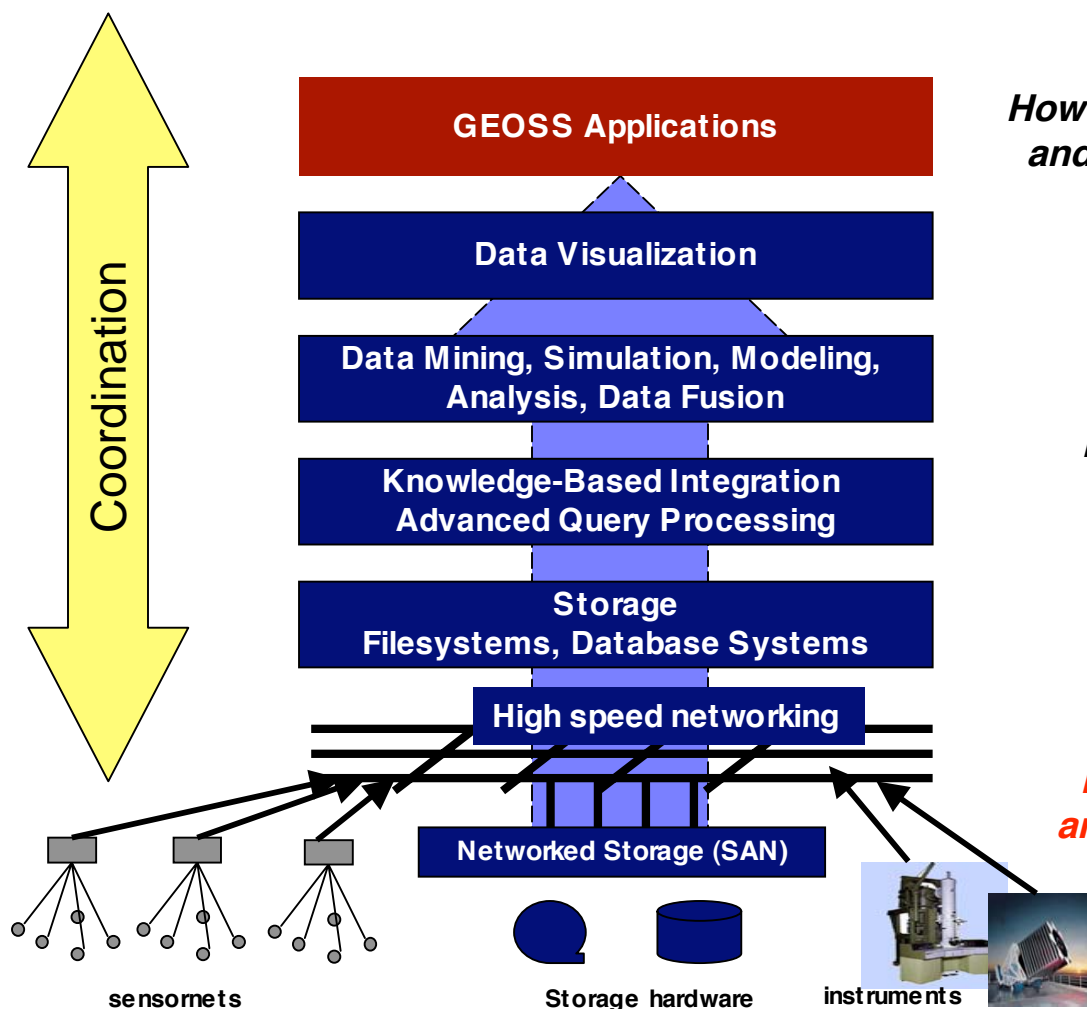
- **Data**
 - How can cyberinfrastructure help in integrating heterogeneous data with variable latencies into GEOSS?
 - What cyberinfrastructure is needed to manage data in near-real-time?
 - How do you define “real-time” and “near-real-time” data?
 - Will data systems comprise central archives or data grids in GEOSS?
- **Compute**
 - How can expanding computational capability, storage capacity and visualization be integrated into observations planning?
 - Do you anticipate that enough computational capability will be available for assimilating a growing body of environmental data into predictive models?
- **Networking, Visualization**
 - How can growing network capability be effectively integrated into observations planning?
 - What role will visualization play in GEOSS?
- **Interoperability**
 - How can system interoperability be achieved?
 - Is it possible to develop interoperability based on non-proprietary standards? How are “non-proprietary standards” defined?
- **Business/Policy Model**
 - If data and metadata are available through the Internet, should there be charges for use or copying?
 - What’s the role of “open source” software?

The “Hourglass Model”

- **GEOSS data management system must be**
 - Interoperable
 - Usable
 - Scalable
 - Robust
 - Cost-effective
 - Able to incorporate evolutionary underlying infrastructure
 - Able to support end-to-end applications



End-to-end Data Management



Key Challenges:

How do we combine data, knowledge and information management with simulation and modeling?

How do we represent data, information and knowledge to the user?

How do we detect trends and relationships in data?

How do we obtain usable information from data?

How do we collect, access and organize data?

How do we configure computer architectures to optimally support data simulation, analysis and modeling?

GEOSS Cyberinfrastructure can benefit from a Regional Approach

- **Regional approach**

- Leverages trust relationships
- Promotes targeted expertise
- Allows experimentation at near-scale

- **“Common usage model” approach**

- Helps target software and hardware solutions
- Promotes focused expertise
- Allows experimentation at near-scale

Wide Spectrum of University Constituents Can Participate

- **Geosciences**
- **Life Sciences**
- **Information Technology/ Computer Scientists**
- **Business/Management Schools**
- **Economists**
- **Communications**
- **NSF, DOE, NASA, NOAA centers**



Cyberinfrastructure is not just a technical problem

- **Business and Policy Models**
 - **How should efforts be funded and for how long?**
 - What is the role of academia, federal, state, private industry in the development and use of GEOSS?
 - How does this change in an open source scenario?
 - **What are the real costs of data infrastructure?**
 - Quality assurance and usability engineering
 - Linkage with compute, visualization, network resources for analysis
 - Long-term preservation and data stewardship
 - Usable portals, documentation, tools and interfaces

Cyberinfrastructure is not just a technical problem

- **Social Dynamics**

- How should participants be coordinated?
- How should systems be coordinated? How should we incentivize the development of a coordinated pipeline from sensors to data to knowledge to information to policy and actuation?
- How should standards be developed and who should develop them?

- **Measuring Success**

- What does it mean for GEOSS Cyberinfrastructure to be successful?
- What are adequate evaluation metrics?
- What is adequate return on investment?