Grid Architecture

William E. Johnston
Lawrence Berkeley National Lab and NASA Ames Research Center
wejohnston@lbl.gov
(These slides are available at grid.lbl.gov/~wej/Grids)
Grids: An Emerging, Common Computing and Data Infrastructure for Science and Engineering

- **Distributed Resources**
  - national supercomputer facilities
  - clusters
  - Condor pools of workstations
  - tertiary storage
  - scientific instruments

- **Portals**
  - Web Portal Access to Application and Grid Services
  - Specialized Portal Access (high performance displays, PDAs, etc.)

- **Services**
  - Data Management: replication and metadata
  - Resource Brokering
  - Fault Management
  - Workflow Management
  - Accounting
  - Applications

- **Basic Grid Functions**
  - Resource Discovery
  - Scheduling and Access to Computing
  - Uniform Data Access
  - Monitoring and Events
  - Grid Communication Functions: transport services, security services

- **Services Building Blocks**
  - Encapsulation as Web Services
  - Encapsulation for Script Based Services
  - Encapsulation as Java Based Services

- **Operational Support**
  - Portals
  - Resource Brokering
  - Fault Management
  - Accounting
  - Applications

- **Communications**
  - Internet
  - optical networks
  - space-based networks
Grids: A Common Computing and Data Infrastructure for Science and Engineering

Portals: Services Presented to the Users to Accomplish Tasks

Application Domain Independent Portals

Application Domain Specific Portals

Grid Web Services: Grid Functions and Application Functions Packaged for Building Portals

Domain Independent Grid Web Services

Domain Specific Web Services – Encapsulated Applications

Grid Common Services: Uniform Access, Security, and Management of Compute, Data, and Instrument Resources
Combining Grid and Web Services

Grid Protocols and Grid Security Infrastructure

### Clients
- Application Portals
  - Discipline / Application Specific Portals (e.g. SDSC TeleScience)
  - Problem Solving Environments (AVS, SciRun, Cactus)
  - Environment Management (LaunchPad, HotPage)
- XML / SOAP over Grid Security Infrastructure
  - composition frameworks (e.g. XCAT)
- Web Browser
  - http, https, etc.
- PDA

### Web Services
- Job Submission / Control
  - File Transfer
  - Data Management
  - Monitoring
  - Events
  - Credential Management
  - Workflow Management
- other services:
  - visualization
  - interface builders
  - collaboration tools
  - numerical grid generators
  - etc.

### Resources
- Compute (many)
- Storage (many)
- Communication

### Grid Services: Collective and Resource Access
- CORBA
- GRAM
- Condor-G
- SRB/ Metadata Catalogue
- Data Replica and Metadata Catalog
- GridFTP
- Grid Monitoring Architecture
- Grid X.509 Certification Authority
- Secure, Reliable Group Comm.
- Grid Information Service
- Grid Web Service Description (WSDL) & Discovery (UDDI)

### Grid Protocols and Grid Security Infrastructure
- Apache SOAP, .NET, etc.
- Grid ssh
- Apache Tomcat & WebSphere & Cold Fusion
- JVM + servlet instantiation + routing
- CoG Kits implementing Web Services in servelets, servers, etc.