

CMSC 714
Lecture 12
Grids

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Notes

- Group project proposal questions?
 - proposals due Monday
- Swati working on grading OpenMP project

Computational Grids

- Infrastructure for dependable, consistent, pervasive access to high-end compute resources
- Why?
 - Increased compute power to users
 - Demand-driven access to compute power
 - Utilize idle capacity (desktop grids)
 - Sharing of computational results (data grids)
- Application areas
 - Distributed supercomputing – to aggregate compute power
 - High throughput – desktop grids, volunteer computing
 - On-demand computing – remote servers, instruments, etc.
 - Data intensive computing – LHC, SDSS, remote sensing
- Grid users
 - Infrastructure developers
 - Tool developers
 - Application developers – various programming models
 - End users of grid-enabled applications
 - System administrators – across admin domains

Grids (cont.)

- Grid architecture

- End systems – individual components
- Clusters – mostly homogeneous, larger scale
- Intranet – distributed, heterogeneous, limited centralized control
- Internet – heterogeneous, no centralized control, security and trust issues, more geographic distribution

- Current status is that grids are now everywhere, for high performance computing applications, for large-scale volunteer computing projects

- but the infrastructure is still somewhat brittle, and has not had as widespread impact on science and other areas as was expected 15-20 years ago
- A lot of it has morphed into cloud computing (one big difference is virtualization)

Data Grids

- Key issue is accessing, managing, and computing on large, distributed data collections
 - geographic distribution
 - high performance demands
- Key design principles
 - Mechanism neutrality – independence from how data is stored, metadata is stored, data transferred, etc.
 - Policy neutrality – expose performance-related decisions to users if they want to make them
 - Grid infrastructure compatibility – use existing Grid infrastructure (they mean Globus toolkit) for basic services
 - authentication, resource management, resource discovery
 - Information infrastructure uniformity – easy access to resource structure and state
 - to enable applications to adapt to current system conditions

Data Grids (cont.)

- Core services
 - Storage system abstraction – create, destroy, read, write, manipulate *file instances*
 - could be data in a DBMS, or a mass-storage system, or data accessed via an http server
 - Data access – including 3rd party transfers
 - Metadata service – to publish and access info about file instances in a uniform way – stored in a *metadata catalog*
 - structured as a hierarchical, distributed system (LDAP)
 - Authentication/authorization via Grid Security Infrastructure (GSI)
 - Resource reservation and co-allocation for storage systems and networks
 - Performance measurement and instrumentation
- Replica management as a higher level service
 - to create and manage file instance copies
 - problems addressed include replica selection and data filtering