Data Management in the STaRBURSTT CDC – Remote Data Collection

2007 Crystal Grid Workshop

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STaRBURSTT
CyberDiffraction Consortium

- Science Teaching and Research Bring Undergraduate Research Strength Through Technology
- http://www.STaRBURSTT.org
STaRBURSTT@YSU & the STaRBURSTT CyberDiffraction Consortium
Current Focus: Remote Diffractometer Control

- Sample Submission
- Initial Visit
- Mail/FEDEX
- Manual Mounting
- Robotic Soon!
Current Focus: Remote Diffractometer Control

- Web Cameras & Sound
- User Experience \( \approx \) Local
- Video Conferencing
- Remote Monitoring
- Remote Whiteboard
Current Focus: Remote Diffractometer Control

- PC Anywhere, Etc.
- Security
- Control ≈ Local
- Data Transfer & Archiving
A Primary Challenge: IT Overhead & Data Management
Proposed Solution: CyberLabNet
Design Goals

- Highly distributed, central organization, peer data exchange
- Loosely coupled – easily plug-in new resources, new users, new core services
- Web based collaboration tool
- Rich client tools using for user-resource interaction
- Start with symbiotic instrument control
- Start with symbiotic data archiving
- Start with Authentication and Administration
- Start with simple Collaboration
The elements depict the organization of services but not the distributed, loosely coupled nature of the system. Nodes, whether symbiotes or computers running the service software are monitored by the core but can come and go without disrupting the core. Data and control channels are authorized by the core but established between peers.
This layer overview shows how the elements work together yet remain loosely coupled to provide a powerful and extensible system.
Multipoint, distributed collaboration uses central organization to authorize and schedule activity while not forcing a one-to-one connection with nodes.

Multipoint, distributed collaboration uses central organization but allows more direct and flexible peer data channels.
One important aspect of peer data channels is that intra-lab data storage can take advantage of high speed and more direct connections. In this case if data is archived locally then it will be moved over a gigabit wire.
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Proposed Solution: CyberLabNet Symbiotic Behavior

- The system will employ simple symbiotic computing appliances to create mutually beneficial interfaces between CyberLabNet and existing external systems and devices.
- The concept of symbiosis permits us to control the CyberLabNet appliance with little or no impact on the existing device.
- Symbiotic devices work as additional non-disruptive layers in existing infrastructure.
Proposed Solution: CyberLabNet
Symbiotic Behavior: Benefits

- Easy install, little or no management
- Inexpensive
- Scalable
- Use commercial grade hardware and networks
- We control and ensure security
- Low to zero impact or change in existing devices
Proposed Solution: CyberLabNet

Symbiotic Behavior: Principals

- Simple plug-and-play devices (software + hardware)
- Highly distributed, loosely organized
- Service Oriented Architecture (machine-to-machine automation) – highly interfaced for extensible, collaborative development and maintenance
Proposed Solution: CyberLabNet
Symbiotic Behavior: Principals

- Modular, decoupled functionality
- Scalable – grows without extensive systemic alteration
- Extensible – can be altered without systemic alteration
- Pipeline – flexible, content agnostic
- Web launched rich client tools
Proposed Solution: CyberLabNet Collaboration Environment

- A fluid collaboration environment can greatly enhance the use and benefit of remote access and control of resources.
Proposed Solution: CyberLabNet
Collaboration Environment: Benefits

- Ease-of-Use
- Ease-of-Administration
- Improved sharing and use of resources
- Security and accountability
- Improved research and science Service Oriented Architecture (machine-to-machine automation) – highly interfaced for extensible, collaborative development and maintenance
Proposed Solution: CyberLabNet
Collaboration Environment: Principals

- Fluid resource definition, scheduling and sharing
- Multi-person control and auditing
- Community
- Administration
- Security and Authorization
- Web based tools