Event Notification and Messaging Architectures for Real-Time Science Coordination

Elias Sinderson
elias@cse.ucsc.edu
elias@email.arc.nasa.gov
UC Santa Cruz / NASA Ames

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Terms and Definitions

• Collaboration vs. Coordination
  - Related, but useful to distinguish between the two
  - Collaboration is when people work together on a given task
  - Coordination implies that multiple, interdependent tasks exist

• Real-time science
  - Hard deadlines
  - Closed control or feedback loop
  - Example: Remote operation of a science platform such as a satellite, space probe or robot
Some of the Challenges

- High communication overhead
- Shifting/rotating schedules
- Data navigation and assimilation
- Maintaining situational awareness
- Time sensitive nature of mission operations
- Heterogeneous computing environment
- Security!
Requirements and Proposed Solutions

• Provide ‘one stop’ access to multiple repositories and data analysis tools under a common, Web-based interface
• Notification of ‘active’ resources...
• Increase overall awareness of mission personnel:
  - Scheduling tools  
  - Data navigation tools  
  - Mission scorecards  
  - News broadcasts
Event Notification / Messaging

- Tradeoffs between expressiveness and scalability need to be reconciled
- Heterogeneous nature of data repositories and legacy systems makes instrumenting them difficult
- Need for a complete and robust domain model
Event Notification / Messaging

- Remote file systems can be monitored and logged with utilities such as nfslogd, auditd, etc.
- Some databases support stored procedures
- Push rather than pull information wherever possible to minimize load on system and network
A Simple (?) Example

- Metadatabase / File System
- Client
- Portal
- DB Query Tools
- Pub/Sub file exchange
- Loader
- Server Code
- JMS
- Metadatabase / File System
- Web Sites
- Analysts Notebook
- Daemon
- Portlet
- Programmatic API
Change Awareness Dashboard

- Active resources are the primary objects of interest
- Easy access to resources
- Minimally invasive
- Peripheral awareness
- User preferences

- Subscription persistence
  - Reestablishes sessions when users start their shift
- Notification persistence
  - Keeps users up to date with any changes since they last logged on
Future Activities

- Finish the implementation over the next year
- Collect user feedback on system
  - Validation of GUI design
  - Comparisons with other missions
- Workflow analysis of Ops environment
- Develop web services for mobile and handheld devices
- Extend system to support multiple sites