

Event Notification and Messaging Architectures for Real-Time Science Coordination

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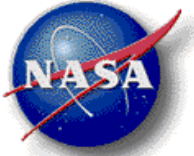
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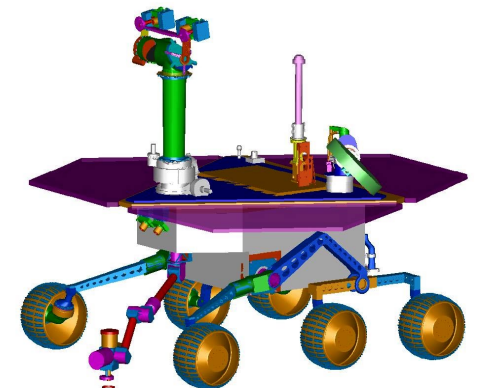
Terms and Definitions

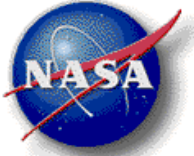
- **Collaboration vs. Coordination**
 - Related, but useful to distinguish between the two
 - Collaboration is when people work together on a given task
 - Coordination implies that multiple, interdependent tasks exist
- **Real-time science**
 - Hard deadlines
 - Closed control or feedback loop
 - Example: Remote operation of a science platform such as a satellite, space probe or robot



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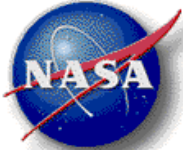
Some of the Challenges

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



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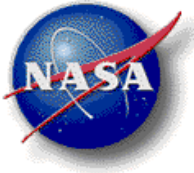
Requirements and Proposed Solutions

- 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
 - Mission scorecards
 - Data navigation tools
 - News broadcasts



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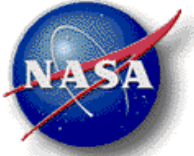
Event Notification / Messaging

- **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**



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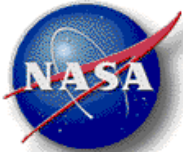
Event Notification / Messaging

- **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**

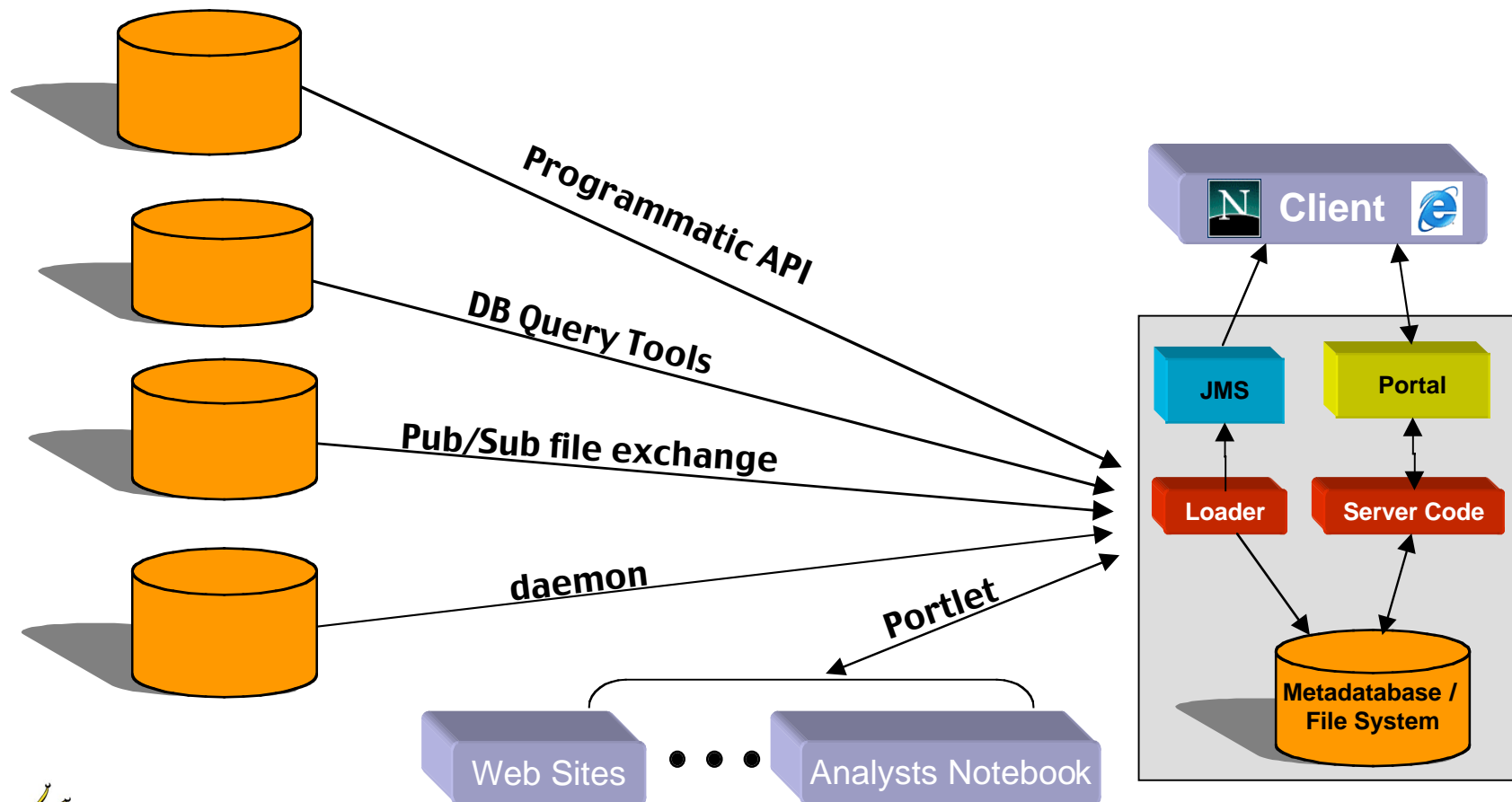


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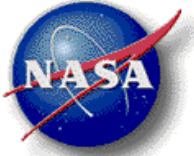


A Simple (?) Example



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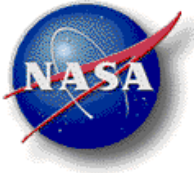
Change Awareness Dashboard

- 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



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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**



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