Integrated Information Management

Science Data Processing Session

Jason J. Hyon
Jet Propulsion Laboratory
California Institute of Technology
Earth Science Data Systems Section

4th Quality Mission Software Workshop
Dana Point, CA, May 7-9 2002
IIM
Object Oriented Data Technology Framework

- End-to-end integrated data system environment
- Reusable object components for ground and flight systems
- Interoperability between highly distributed data systems and archives
- Extensible architecture for building new visualization and analysis tools
IIM Deliverables

- Client Tools
- CORBA
- Oracle

- API
- Polyhedra DB
- GAM

- January
- April
- August
Integrated Information Manager Framework
IIM Details

- Onboard Data Management
  - Polyhedra Database Implementation
    - Implement a fault tolerant DB server (replication server)
    - Download history files
  - Publish APIs for goal and data manager, and IIM service modules
    - Disk I/O, RAM I/O, DBI
    - CL
  - Integrate IIM services
    - Image Compression, Buffer Management, CFDP
- Define GAM (Goal Achieving Module) and integrate it to DB
  - Develop criteria for resource management, command processing, data transfer, and fault tolerance.
  - Implement Elaborator and time control.
IIM Details (Continued)

- Ground Data Management
  - Implement Oracle database for managing data
    - Design tables for storing data
  - Implement Polyhedra for replicating onboard database
  - Implement middleware for publishing interfaces to clients and database
    - Develop interfaces with CORBA and JDBC
    - Define services for tools and database
    - Develop Profile services and XML metadata
  - Publish APIs
    - Java and C++
  - Integrate Client tools
    - JADE
    - Planning tool
    - IIM Services - decompression and reshuffle buffer managed data. (CT)
IIM Software Architecture

- On board system
  - VX Works on PPC 603
  - Polyhedra and ACE
  - C++ , C, CL
  - TCP/IP, FTP, NFS, Telnet
- Ground system
  - Solaris, Linux, and MS Windows
  - Oracle DB, Orbacus, Apache, Polyhedra, MS Office
  - C++, C, Java, CL
  - TCP/IP, FTP, NFS, Telnet, IIOP, HTTP, JDBC, ODBC
Data Flow Scenario

- Plan a goal
- Register the goal in the ground data management
- Process the goal in the ground and issue a goal for the onboard
- Upload the goal to the onboard data management
- Process the goal onboard
- Download data to the ground data management
- Update the goal status
- Notify the user
- Replan a goal
IIM “Goal” Example

- After a user plans a new goal using a planning tool, the goal gets issued to the ground goal manager.
- Ultimate goal: “Data in ground DB”
  - Achieve goals in ground:
    - Ground DB running, Services running, Check coordinate, check spacecraft availability, check telecomm ready, check spacecraft ready
  - Achieve goals onboard.
    - Goal uploaded, Instrument ready, IIM onboard services running, FEI running.
  - Instrument ready
    - Navigation, Power on, Boresight outside of Sun
  - Data in RAM
    - Compression, buffer management, RAM management
      - C1,C2,C3, and B1,B2,B3
  - Data in Disk
    - Onboard DB update, generate Metadata, downlink
Conclusions

- Science Data Processing and management only
  - Completely isolated from Spacecraft operation
  - Easier to convince missions
  - Still need to prove that there will be equal or more amount of science data return to scientists
  - Use separate hardware resource
  - Cheap redundant chips with enough fault tolerance is a possibility (e.g. REE)

- COTS solution vs. home-grown solution
  - Maintainability
  - Cost effectiveness
  - Development of framework architecture
    - ACE/TAO