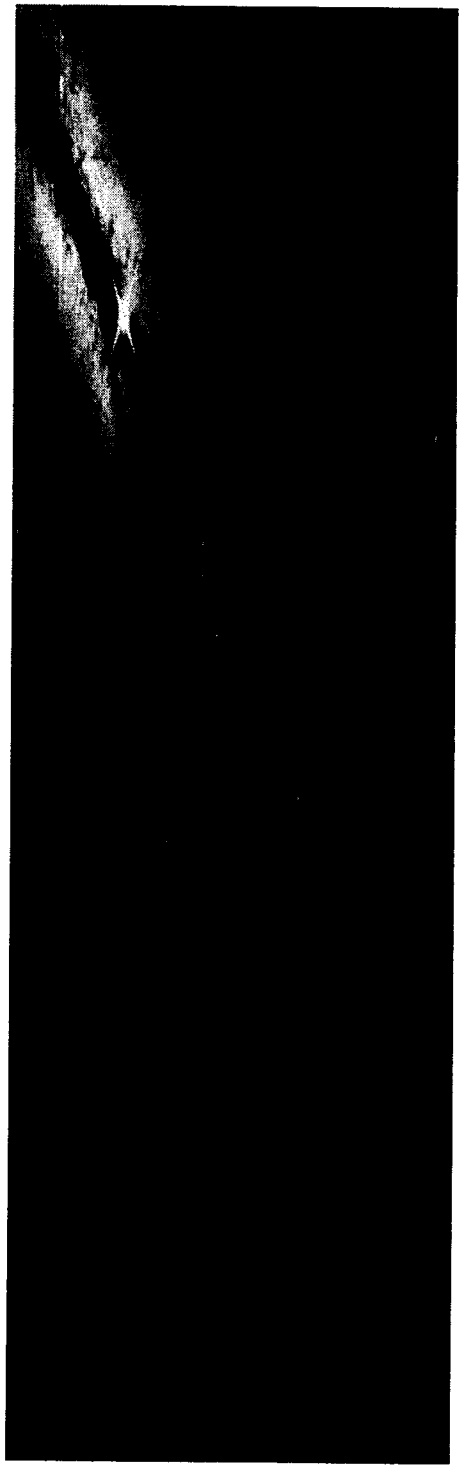

JPL Goddard Space Flight Center NASA CSMISS

Integrated Information Management

Science Data Processing Session

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California Institute of Technology
Earth Science Data Systems Section

4th Quality Mission Software Workshop
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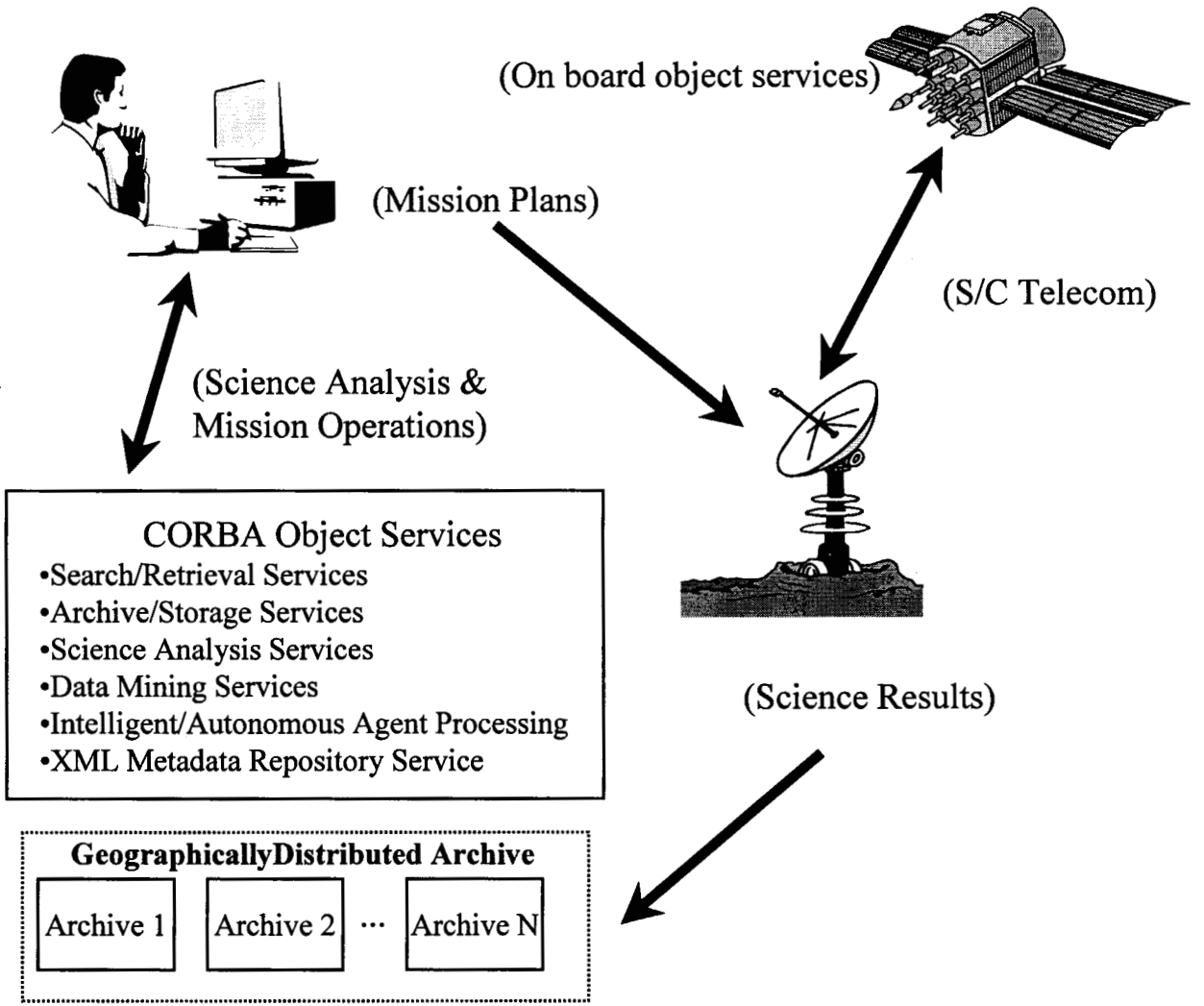
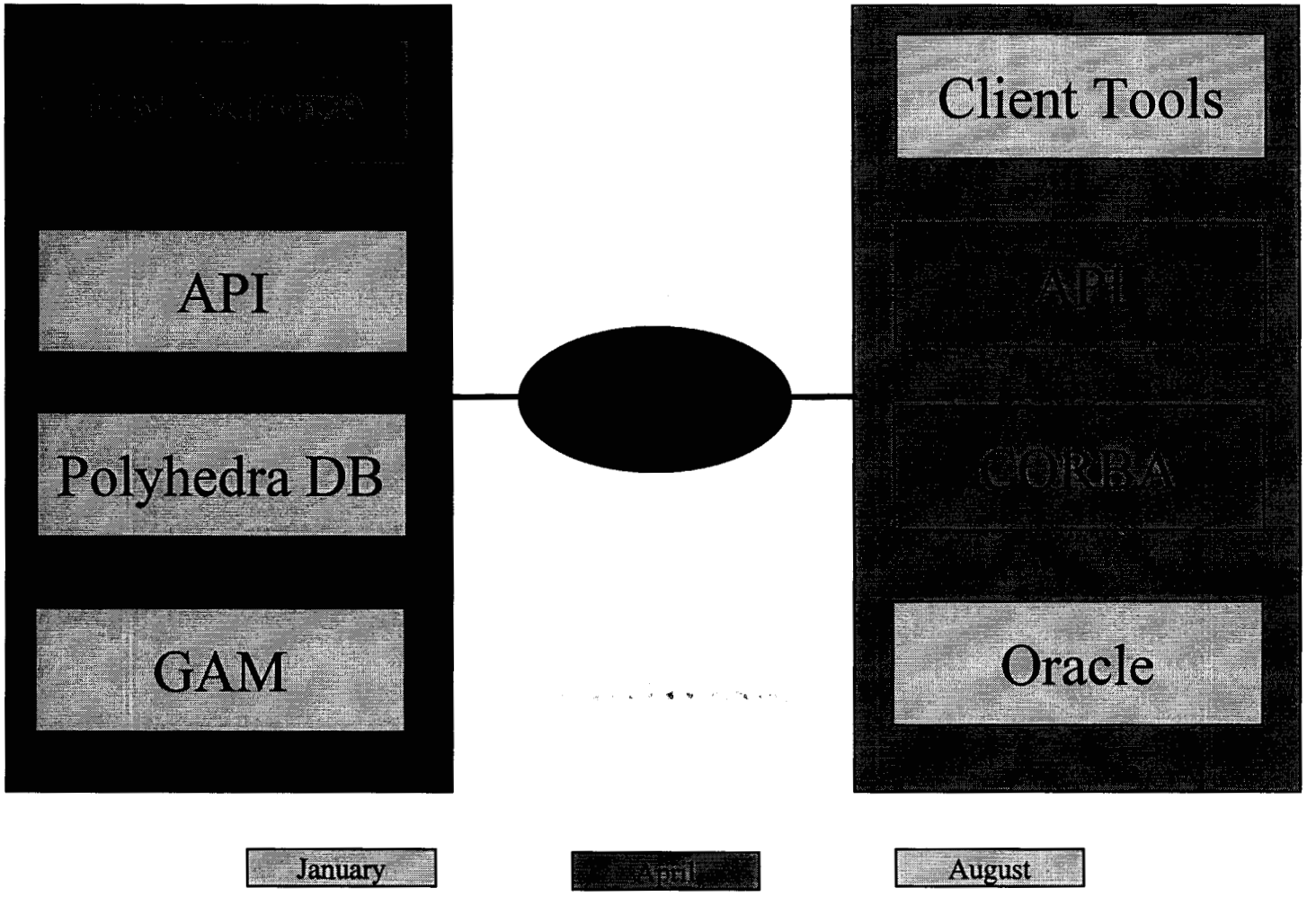
IIM
Object Oriented Data Technology Framework

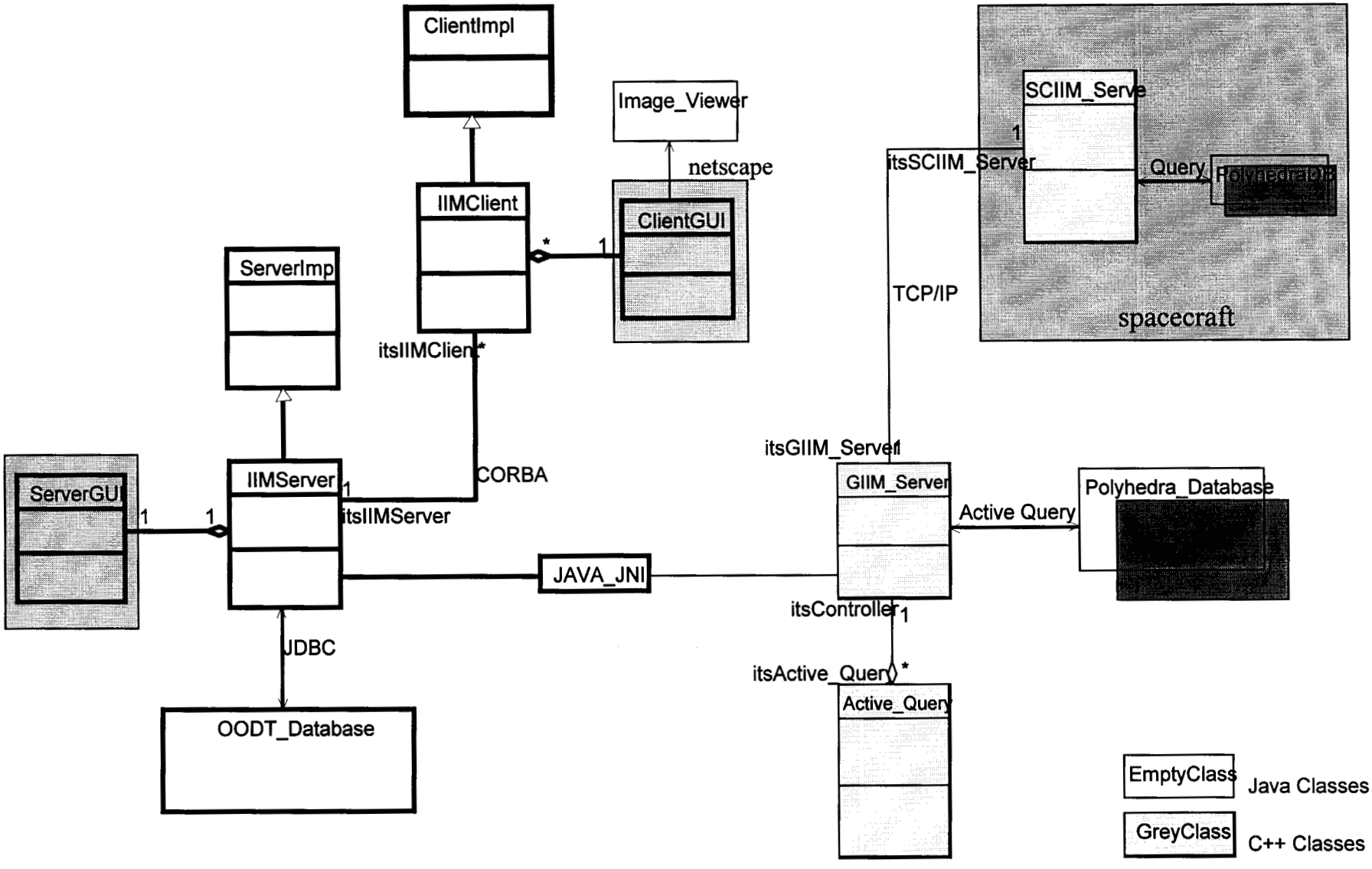
- End-to-end integrated data system environment
- Reusable object components for ground and flight systems
- Interoperability between highly distributed data systems and archives
- Extensible architecture for building new visualization and analysis tools



IIM Deliverables



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