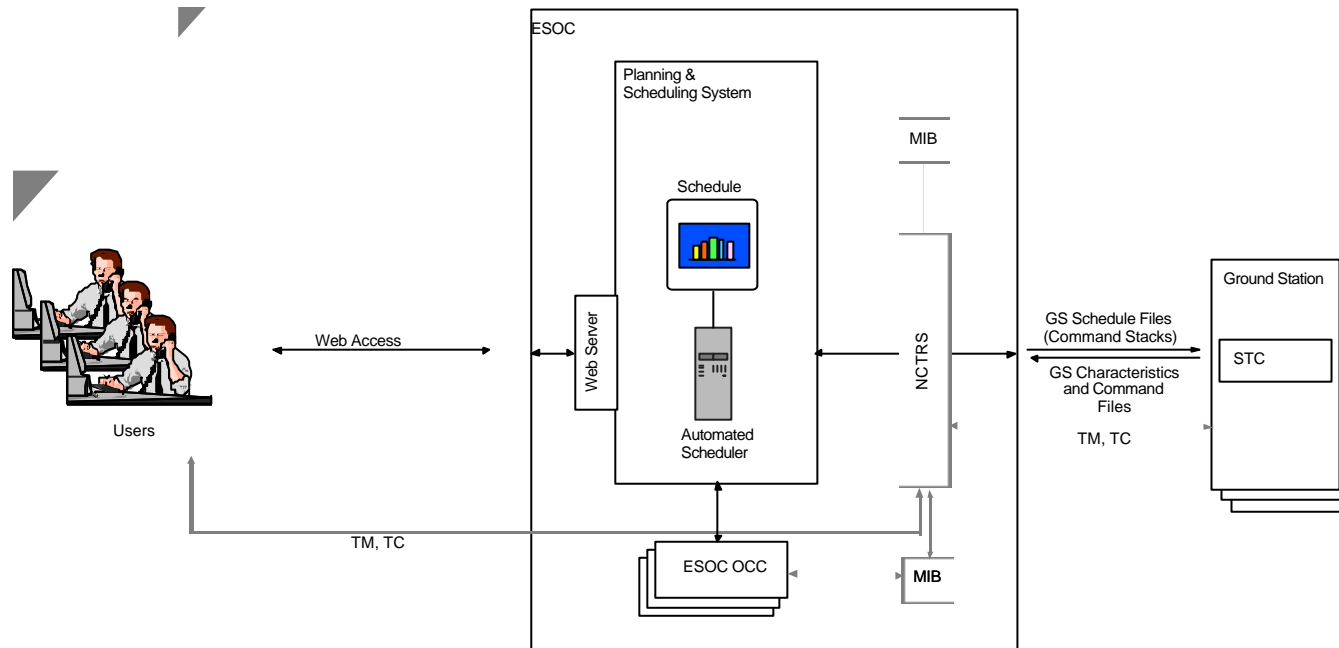# Commercial Access to ESOC Infrastructure

Summary

Space Applications Services

Purpose

- Identify ESOC Service Enhancement Candidates:
  - Web Access to the Ground Station Planning & Scheduling System
  - Ground Station Automated Planning & Scheduling System (+ support services)
  - Enhancement Services for additional Ground Stations

- Propose Architecture Concept for Implementation

Overall Functional Concept for ESOC Service Improvements

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ESOC

Planning & Scheduling System

Schedule

MIB

Web Server

Automated Scheduler

NCTRS

Web Access

Users

GS Schedule Files (Command Stacks)

GS Characteristics and Command Files
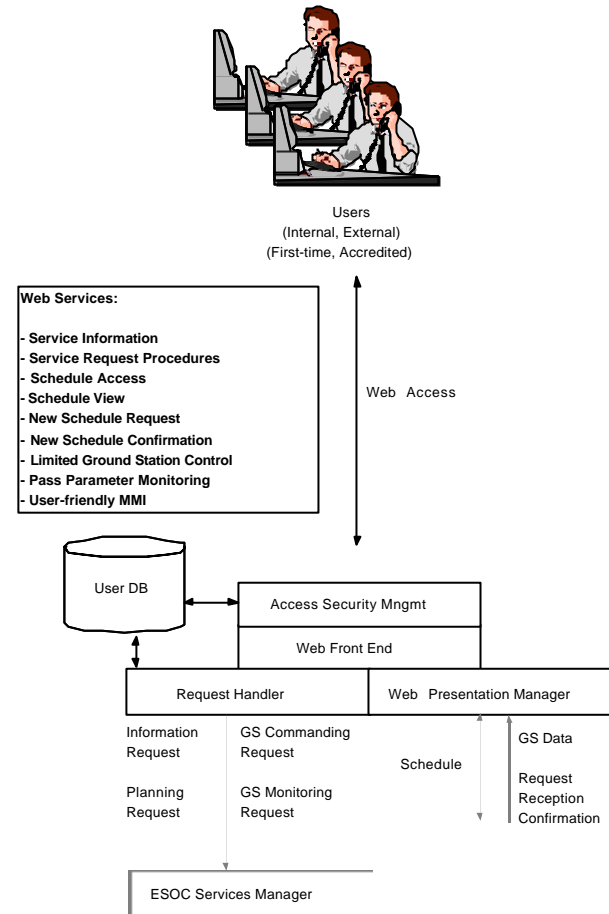
TM, TC

Ground Station

STC

TM, TC

ESOC OCC

MIB

Web Services:

- Schedule Access
- Schedule View
- New Schedule Request
- New Schedule Confirmation
- Limited Ground Station Control
- Pass Parameter Monitoring
- User-friendly MMI

Planning/Scheduling Services:

- Automated Processing of User Requests
- Automated Processing of GS Availabilities
- Automated Replanning
- Provision of B/U solutions for the Current Schedule
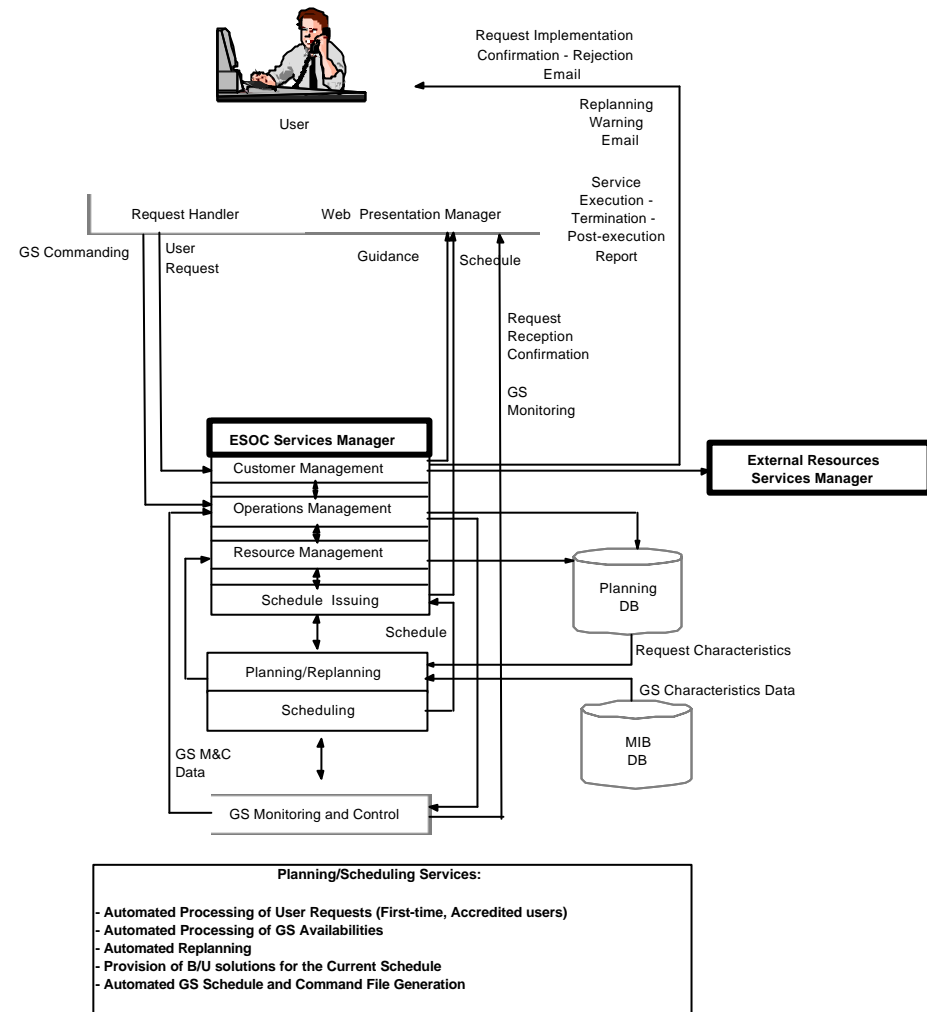- Automated GS Schedule and Command File Generation

Ground Station Services:

- Availability Declaration
- Automated Forwarding of GS Characteristics & Command File (new or updated)

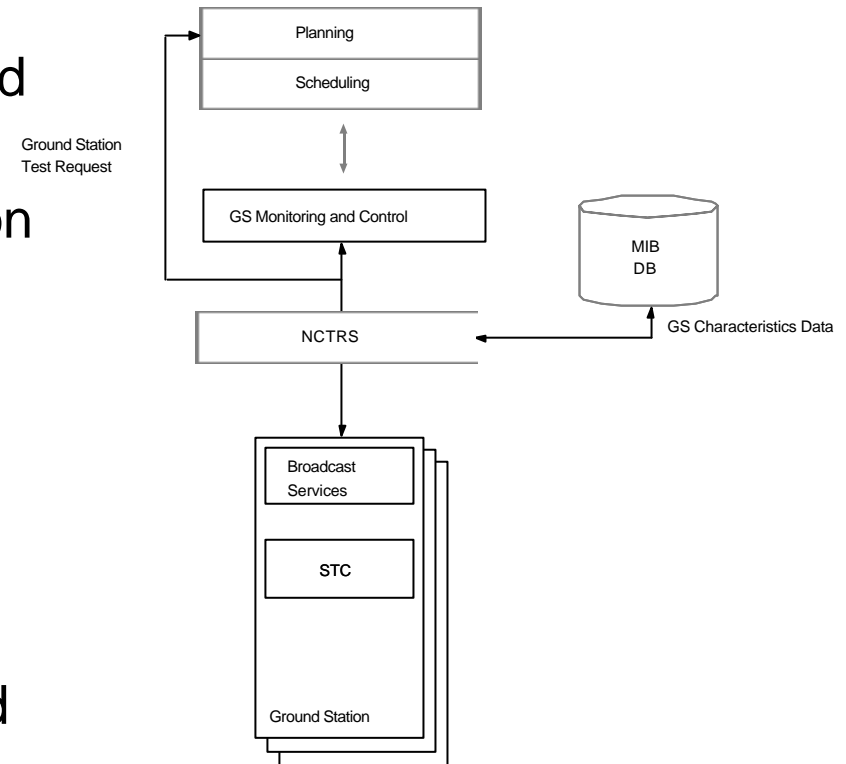- Web Access to the Ground Station Planning & Scheduling System
  - User Types: First Time User, Accredited User
  - Schedule Views: Long, Medium and Short Term Schedules
  - On-line user request acceptance, guidance, reply, processing and confirmation

Users
(Internal, External)
(First-time, Accredited)

Web Services:

- **Service Information**
- **Service Request Procedures**
- **Schedule Access**
- **Schedule View**
- **New Schedule Request**
- **New Schedule Confirmation**
- **Limited Ground Station Control**
- **Pass Parameter Monitoring**
- **User-friendly MMI**

Web Access

User DB

Access Security Mngmt

Web Front End

Request Handler   Web Presentation Manager

Information Request   GS Commanding Request   Schedule   GS Data

Planning Request   GS Monitoring Request   Request Reception Confirmation

ESOC Services Manager

- **Ground Station Automated Planning & Scheduling System (+ support services)**
  - real-time planning and replanning, scheduling
  - automated customer management
  - automated ground station command schedule generation and issuing

User

Request Implementation
Confirmation - Rejection
Email

Replanning
Warning
Email

Request Handler   Web Presentation Manager

Service
Execution -
Termination -
Post-execution
Report

GS Commanding

User
Request

Guidance

Schedule

Request
Reception
Confirmation

GS
Monitoring

ESOC Services Manager

Customer Management

Operations Management

Resource Management

Schedule Issuing

Schedule

Planning/Replanning

Scheduling

GS M&C
Data

GS Monitoring and Control

External Resources
Services Manager

Planning
DB

Request Characteristics

GS Characteristics Data

MIB
DB

Planning/Scheduling Services:

- Automated Processing of User Requests (First-time, Accredited users)
- Automated Processing of GS Availabilities
- Automated Replanning
- Provision of B/U solutions for the Current Schedule
- Automated GS Schedule and Command File Generation

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- Enhancement Services for additional Ground Stations

  - interfaces to additional ESA and non-ESA ground stations

  - automatic availability declaration to planning and scheduling

  - automatic planning and scheduling of non-ESA ground stations

  - automatic command schedule generation and issuing

  - automatic processing of ground station characteristics modifications

Planning

Scheduling

Ground Station
Test Request

GS Monitoring and Control

MIB
DB

NCTRS

GS Characteristics Data

Broadcast
Services

STC

Ground Station

- Enables the exploitation of new technology Ground Stations, that support multiple spacecraft missions (e.g. Steerable or multi-beam planar antennae)

- Tools Assessed:
  - AMPI (based on ILOG)
  - STK/GREAS
  - JPL Artificial Intelligence Tool Set
- Results:
  - ILOG is generic; a lot can be implemented, but requires implementation effort
  - AMPI proven application (ISO Planning prototype); some additions (concepts: 'request', 'event') w.r.t. ILOG
  - GREAS & STK have 'WebCast Application' available
  - JPL Applications cover a large part of the applications required for the ESOC enhancements

- User friendly, efficient, web accessible Front End for ground station service requests
- Reduced human intervention in the end-to-end ground station service planning and scheduling process:
  - quicker response to changes,
  - schedule optimized to selected criteria,
  - immediate use of free resources possible,
  - more services can be offered by an automated system (e.g. 'overbooking', no service gaps)
  - greater income
  - enables rapid cross-agency support
- Increased competitivity w.r.t. other ground station networks
- Automated performance evalution becomes possible