SATellite DATA reception system at
MULTImission GROUND station

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ABSTRACT

The data reception of earth observation satellites and small satellites as well as the processing, archiving and distribution of the received data are the main activities of the National Ground Segment in Neustrelitz.

There are two 7.3m antennas available for data reception at S- and X-band frequencies and additionally one 4m antenna for L- and S-Band. The ground station enables a daily and operational data reception of the missions ERS-2, LANDSAT-7, IRS-1C, IRS-1D, IRS-P3 and CHAMP. The data reception of the satellites ENVISAT, GRACE, BIRD and CORONAS-F will start in 2001.

Therefore it was proceeded a continuous improvement of the station under aspects of automation, flexibility and redundancy. Quality information from all components is collected and stored during the satellite pass. The internal procedures are unified for all mission projects. A software system was realized for station control and management, which integrates the antennas and its RF components, all demodulators and bitsynchronizers and partly the data recording components in a unified system.

1. INTRODUCTION

The system integration was realized under the following aspects. All devices and subsystems are integrated as shared components if it was possible from the technical point of view. The most of them are used for several missions.

The multimission data reception has to realize receiving activities in parallel at the same time. This has to be done by one operator. Therefore an unique graphical operator interface was realized, which enables the access to all devices and doesn’t gain an information overload. Furthermore the system provides efficient measurement procedures to check the functionality of the equipment in a simple manner by the operator.

The ground station will be automated and unified also to prepare a planned certification (ISO 9000). The automated survey of detailed information about procedures and from devices is an important precondition for an quality management system. A hierarchical structure was created to reduce the number of consoles for the operator. The system should be able to realize interfaces to the data management system (DIMS) which is used as a standard tool for automatic data processing, archiving and distribution /1/. An
important additional requirement for a modern ground station is the (near) realtime data distribution (e.g., house-keeping data to the mission operation center).

2. THE GROUNDSTATION EQUIPMENT

The equipment of the ground station consists of the following classes of devices: antennas and its RF components, demodulator’s and bitsynchronizers as well as the direct archive systems and magnetic tape machines. All of these devices and subsystems realize different levels of functionality and types of interfaces. The RF signals are transmitted by fiber links into the control room. All devices and subsystems are connected by matrixes as shown in figure 1. This gives the important advantage that all reception components and their interconnections can be configured in a flexible manner.

There are some tested standard configurations for each satellite mission, which can be changed (e.g., Bitsync 2 instead of Bitsync 3) in an easy manner by the operator in case of conflicts through other reception activities at the same time or in case of technical problems.

3. THE NETWORK-INFRASTRUCTURE

Two central servers and a number of WinNT and UNIX clients are the basis of the reception system network. The PrePass server realizes the external interfaces to the
mission control centers. The **PostPass server** interacts with the data management system to provide the received satellite data and metadata. At these servers LINUX is used because of its reliability and because a lot of middle ware and communication tools are available, e.g. the Object Request Broker (CORBA) is used to handle most of the needed interfaces.

4. THE STATION CONTROL SOFTWARE

The different subsystems of the station control software (SCS) are autonom operable within here base functionality and are able to execute once transmitted requests. All subsystems are connected with middle ware or client/server relations. The devices are connected with serial, socket or GPIB interfaces. All devices and subsystems are integrated by specialized device drivers of the software system. These device drivers have an unified interface and a standardized design themselves. This interface permits the control system to control and monitor the devices and subsystems from one graphical front end and with similar procedures. The specific functionality are hidden for the Control_Host. Even the device driver can fulfill the needed control functionality of each device and each subsystem.

4.2. The Control_Host

The Control_Host represents the monitoring and control component of the station control software. It executes the central schedule of the ground station. The central schedule will be available from the **PrePass server** and its schedule manager tool. The Control_Host provides the actual schedule information to all subsystems dynamically. The Control_Host can handle missions, devices and configurations as much as necessary. Of course the specialized device driver is required, but for very low level of integration a polymorph device driver is available. The Control_Host is able to execute the schedule very efficiently and in parallel.
Due the loose coupling between the software components the whole system is more robust in case of short term problems on some devices or subsystems. Nevertheless the Control_Host has to fulfill a high level of operability and reliability.

5. THE QUALITY ASSESSMENT

The station control software keeps and supervises the once fixed procedures. Even the station control software is flexible enough to enable the operator to solve problems in a fast and reliable manner. The reception system determines and collects metadata of all devices and subsystems. Furthermore it makes a survey of events and interactions initiated by programs and operators. The metadata are used to create reports and have an important advantage to find out and solve technical problems at the station. They can also used to forward looking investigations of critical parameters of the system and device health.

6. CONCLUSION

By the station control software we got a robust and scaleable system. All interfaces to the several mission control centers are realized comfortably. The station control software is a first important step to certify the ground station.

7. REFERENCES