Real-Time Data Acquisition, Analysis and Display

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***Abstract*— In this paper, we discuss about data obtained from the satellite has to be converted to digital signals. The client requests the data from the satellite through TTC processor; and the obtained data from the satellite is transmitted to the ground station on a real time basis and is usually in the form of radio frequency. The data obtained in the form of radio frequency through the TTC processor and it is converted into Binary Coded Decimal (BCD) format data, which is converted into a readable format. Furthermore, the data in readable format is logged, stored and the data bit rate is calculated.**

Keywords— ***Digital signals; Binary coded decimal; logging.***

I. INTRODUCTION

A computer network or data network is a telecommunications network which allows computers to exchange data. In computer networks, networked computing devi

ces pass data to each other along data connections (network links). Data is transferred in the form of packets. The connections between nodes are established using either cable media or wireless media. The best-known computer network is the Internet.

Remote sensing satellites controlled and monitored by a set of telemetry, tracking and command operations. These control operations are carried out from Satellite Control Center (SCC) through any of the Ground Station, which has the visibility of the satellite. There are

many Ground Stations in the network for the control at the time of visibility. The visibility time is said to be the pass time. During the pass time, the Ground Station receives data from

the satellite. Control operations are carried out depending upon the correct status of the satellite and the operation requirements for the TTC support. Since the modernization program at ISTRAC, has brought in many new technology

equipments like the TTC processor, which transmits the satellite data over LAN using TCP/IP protocol. Whereas the existing data handling system (STC) in the ground station cannot support telemetry and payload data acquisition from LAN. Hence to support the TTC operations in a modernized ground station, STC must be able to support data acquisition over LAN.

"Telemetry and Payload Data Support" module of the STC is aimed at the above requirement. It is intended to acquire two streams of telemetry data and one stream of payload data from the TTCP over LAN. Further, STC formats the data and transmits the data blocks to SCC.

II. SYSTEM ARCHITECTURE

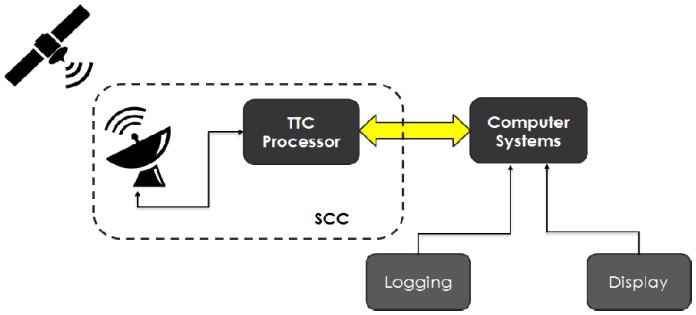

Figure 1:System Architecture

From the above figure we can notice that the data or the signal (radio frequency) which is sent from the Remote sensing satellite is received in the antennas. The antennas further sends the data to the TTC processor which is in the Spacecraft control centre. In this centre the control operations of the data which was sent from the satellite is carried out using the TTC processor. The TTC processor performs data handling and sends it to the computer systems through LAN. In the computer system logging of the data is done and the data is displayed using the user interface.

Modules:

- SCC: The spacecraft controllers at SCC interact through voice links with the TTC station to obtain telemetry & tracking support and uplink the scheduled commands during the radio visible segment of an orbit. SSC IS EQUIPPED WITH THE REQUISITE mission software and display terminals to ensure error-free operations. These operations are carried out

on a routine basis to keep the spacecraft in good health, intended orbit and orientation.

 Computer systems (STC): The station computer (STC) at ground station is a single entity to collect and store all ground station data relevant to satellite operations. STC system acts as an interface between Spacecraft control centre (SCC) and Telemetry tracking and Command (TTC) networks. STC will have interface with Monitor and Control System (MCS) for remote operations and also interface with other TTC elements like TTC processor, Antenna Control Unit (ACU) and Time Server.

o Logging: Any data received from the TTC processor is logged into a file.

o Display: Data received from the TTC processor is also simultaneously displayed in real-time through LAN throughout the network.

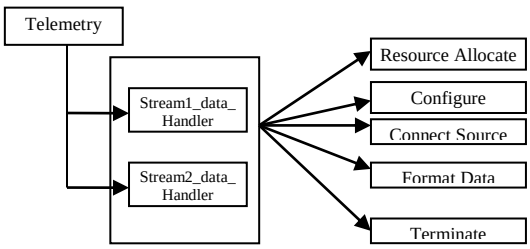

Figure2: Functional decomposition

III. FUNCTIONAL DECOMPOSITION

The purpose of creating this module is to satisfy the following requirements from software requirements specifications:.

Accept user inputs like satellite id, data type and TTC processor id and validate.

 It shall establish TCP/IP connects to the configured TTCP, and update the connect status in shared memory for GUI to refer.

 It shall not have any constraints on length of the data packet.

 It shall extract the required data from the frame received from TTC processor and by appending the header telemetry data frame shall be formatted to compatible format.

 The data rates within the specified limits shall not cause any constraints on the performance of the system.

 Formatting of the acquired data shall not cause any loss or modification of the original data.

 All the acquired data shall be handled carefully to do formatting and shall not cause any conflict between the different types of block

 It shall not lose any blocks in the process of formatting

 The module shall format the data as and when available without any delay

 Any new data format shall be added in reference database and supported without modifying the main software.

 At the end of the session (terminate support command from user) all file shall be closed properly and it shall be ensured that data is logged in the system.

Function

The above three modules are functionally identical modules. Hence, any module can support any data type. There is no constraint in supporting a particular data type in a specific module only. Hence the function decomposition shown and explained below, applies to each module individually. Each str1, str2 and str3 modules is functionally decomposed further as following

1. Resource allocate. Allocate Variables, flags And file parameters ,Waits for signal to EOP, terminate, Waits for signal to change configuration

2. Configure. Open reference files,Accept input from user ,Get the new set of parameters from reference file, for the changed configuration, Update shared memory after performing successful configuration change

3. Connect data. Keep pausing until connect request ,Get connected to input source ,Wait for data and acquire data.

4. Format_data. Validate data Data frame length, FSP from Strip real time parameter from data and update in status shared memory, Format the data w.r.t input format information and construct a block.

5. Dispatch_data. Send formatted data blocks to logger queue, If data transmission requested for real time send formatted data blocks to MPS queue

6. Terminate. Handle EOP request from GUI, Handle entity termination.

IV. EVALUATION OF THE SYSTEM

Scalability

The system is can handle multiple requests at a time and also highly scalable.

Reliability

The LAN cables and the SCC subsystem is tested before the deployment. Hence it provides reliability.

Maintainability

Easy to maintain as the devices are installed just once and the availability of log files also ease this procedure.

Extensibility

The system can be extended for further analytical functions by the developers..

Performance

The performance is increased

Usability

The application interface is very user friendly and also the availability of the customer information on the GUI enhances the usability

Operating Systems Support

It works on LINUX PLATFOEM (REDHAT), GRUB Bootloader- Redhat,Kernel- LINUX/2.6.32-71.

I. CONCLUSION AND FUTURE WORK

We were able to successfully satisfy all the requirements. We established a connection with the TTCP server. After successful connection, we then created a shared memory and encrypted data was obtained from the server and decrypted at the client (STC). A GUI is created which will display the data obtained from the server. Another GUI is created which will display both the encrypted and decrypted data. The data is then logged for analysis, we also display a customer information tab in the GUI to show system activities. We can ascertain that, expert users will be easily able to use the system and system will conform to all requirements.

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