

THE IMPLEMENTATION METHOD AND TEST OF TELEMETRY TREND ANALYSIS IN KOMPSAT-2

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ABSTRACT

In this paper, we will present the implementation method of telemetry trend analysis in KOMPSAT-2 (Korea Multi Purpose SATellite II), and then we will show the test result of trend analysis with telemetry data. Trend Analysis function is one of the module of Satellite Operations Subsystem and that analyzes the telemetry data of satellite state of health and telemetry trend for operation support. With this system many clients can analyze telemetry data simultaneously.

Keywords: satellite operation, KOMPSAT-2, , telemetry trend, mission control element

1. INTRODUCTION

The Korea Ground Station of KOMPSAT-2 consists of MCE (Mission Control Element) and IRPE (Image Reception and Processing Element). The MCE consists of four subsystems (Jung et al. 2002) such as TTC (Tracking, Telemetry and Command) subsystem, SOS (Satellite Operations Subsystem)(Mo et al. 2000), MAPS (Mission Analysis and Planning Subsystem), and satellite SIM (SIMulator subsystem). The telemetry Trend Analyzer is a part of SOS functions. The SOS must monitor and control the KOMPSAT-2 for normal operation, control and monitor operation system of MCE, and it has the capacity to process data of satellite operation on real-time. Figure 1 shows the structure of KOMPSAT-2 MCE.

The telemetry Trend Analyzer is a part of SOS functions. The SOS is composed of 5 modules. Telemetry Processing function monitors the state of health of satellite. Telecommand Processing function controls the satellite. System Management function manages SOS. Database Management function manages the operating data and special data of satellite. Trend Analysis function analyzes the off-line data of satellite state of health and telemetry trend for operation support.

2. THE IMPLEMENTATION METHOD OF TELEMETRY TREND ANALYSIS

The SOS for KOMPSAT-2 is composed of 3 workstations which process and control satellite data. They communicate with CORBA. PC server which located between SOS server and PC clients stores and broadcasts satellite telemetry data frame, and many PC clients display telemetry data and trend analysis. When we developed KOMPSAT-1, there is no PC Server, thus all PC clients

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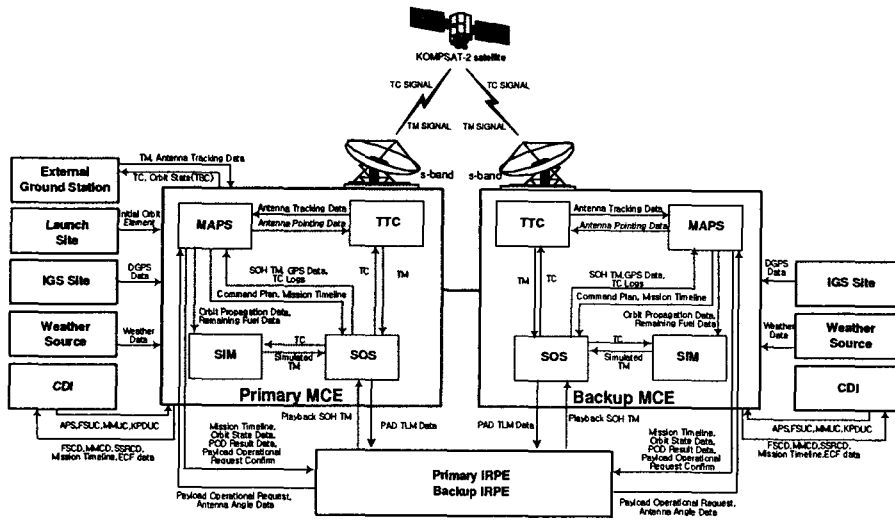


Figure 1. The Structure of KOMPSAT-2 MCE.

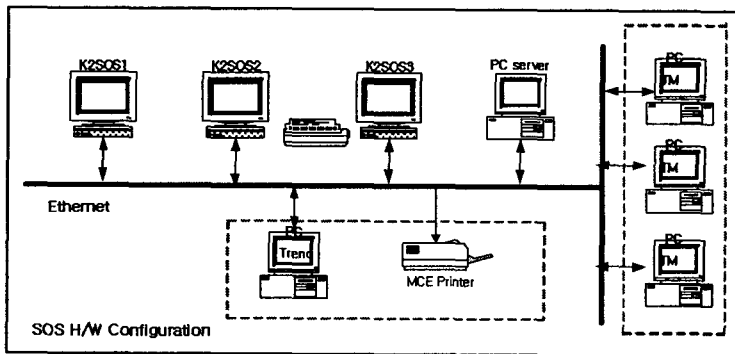


Figure 2. The Configuration of SOS Hardware.

must access SOS server directly. But because that mechanism made the SOS server load too much, sometimes the SOS server was shut down. Thus when we develop KOMPSAT-2 we include PC server between SOS server and PC Client and this mechanism reduces the load of SOS server. Figure 2 shows the configuration of SOS hardware.

SOS server send the data to PC server periodically and real-time telemetry Trend Analyzer receives the telemetry data that was broadcasted by PC server. When clients want to analyze telemetry trend analysis they must input the period of time to analyze. In case data do not exist in local PC, the Trend Analyzer provides the “Synchronize” function. Using “Synchronize” function the client can get the telemetry data by downloading telemetry data from PC Server by FTP.

The Trend Analyzer provides enlargement of graph so we can enlarge some area in graph, and then we can analyze more easily. Trend Analyzer has a function to change the unit of Y axis to “log” unit, the operator can analyze the trend of telemetry data more easily.

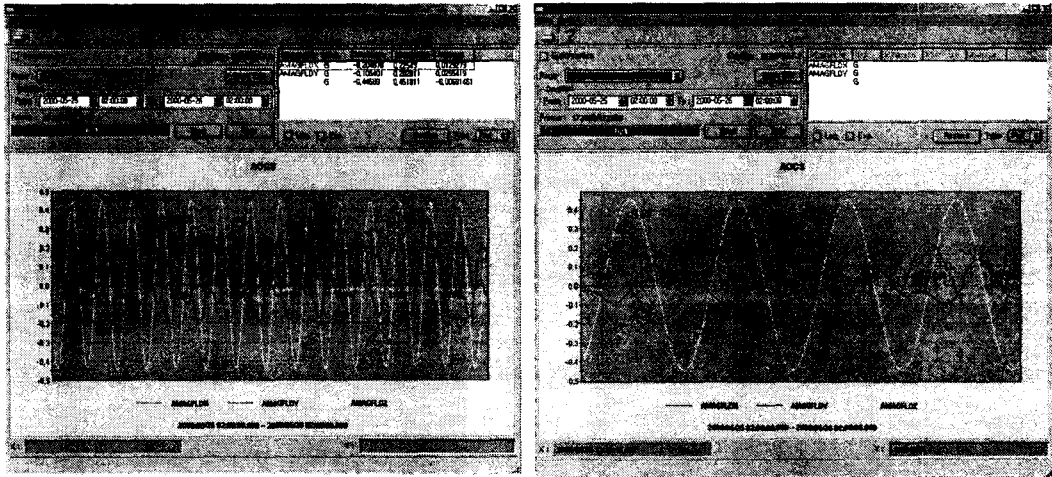
Table 1. The description of earth magnetic field telemetry of AOCS.

TM	Description	Size	Calibration Curve(Unit Scale)
AMAGFLDX	Earth's Magnetic Field Body X	4Bytes	1(G)*
AMAGFLDY	Earth's Magnetic Field Body Y	4Bytes	1(G)*
AMAGFLDZ	Earth's Magnetic Field Body Z	4Bytes	1(G)*

*: 'G' for 'Gauss'

Table 2. est result of AOCS telemetry trend analysis.

TM	Minimum Value	Maximum Value	Average
AMAGFLDX	-0.204878	0.22543	0.0129273
AMAGFLDY	-0.106401	0.202011	0.0255419
AMAGFLDZ	-0.4468	0.45181	-0.0069146



(a) Original Graph

(b) Enlarged Graph

Figure 3. Trend Analysis of AOCS Telemetry Data.

3. THE TEST OF TELEMETRY TREND ANALYSIS

For the test we generated the simulated telemetry data, and then we used this simulated telemetry data for the test. Of course the format of simulated telemetry data are the same of real data, and the values of them are as close as real data (Jung & Kim 2004). We analyze AOCS (Attitude and Orbit Control Subsystem) telemetry data. Table 1 describes the example of AOCS telemetry data, AMAGFLDX, AMAGFLDY and AMAGFLDZ. For the test, at first we make "AOCS" page using "Display Page Editor" which includes the mnemonic of AMAGFLDX, AMAGFLDY and AMAGFLDZ telemetry data. And then we input the start time and end time. If we click "Start" button, the trend analyzer processes the telemetry data and then displays the result of AOCS telemetry trend analysis like Figure 3. Figure 3a shows the original graph of AOCS trend analysis and Figure 3b shows the enlarged graph of AOCS trend analysis. The Trend Analyzer displays the minimum value, maximum value and average value of telemetry trend for one day in Table 2.

4. CONCLUSIONS

In this paper, we presented the implementation method of telemetry trend analysis in KOMPSAT-2. And we also showed the test result of trend analysis with AOCS telemetry data. When we developed KOMPSAT-1, there is no PC Server, so that makes SOS server load too much, sometimes the SOS server was shut down. Thus when we developed a KOMPSAT-2 we included a PC server between the SOS server and a PC Client and this mechanism reduced the load of SOS server. Thus when clients want to analyze telemetry data in real-time, the Trend Analyzer receives telemetry data that are broadcasted by PC server. And also when a client requests telemetry data for non-real time trend analysis, the Trend Analyzer in PC downloads requested telemetry data from PC server.

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