

# Special Article on Satellite Packet Communication Service

## Node System Equipment

A Satellite Packet Processing Module (S-PPM), which is a subscriber system node, has been newly developed for the Satellite Mobile Packet Communication System to connect to the existing PDC using the Satellite Mobile Communication System at subscriber links. Measures for satellite support in the existing packet networks have been implemented, taking into account the delay characteristic of satellite transmission.

This article overviews the S-PPM and introduces the node system equipment in the Satellite Mobile Packet Communication System.

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### 1. Introduction

The number of subscribers to the PDC Mobile Packet Data Communication System (PDC-P) [1] has been increasing, and the total area covered has been expanding rapidly, since the service was introduced in March 1997. In contrast the number of subscribers has been increasing steadily for the Satellite Mobile Communication System [2] since it was introduced to service in March 1996, and a wide spectrum of services are now provided by combinations of various applications.

The Satellite Mobile Packet Communication System recently has started its service, with the objectives of enlarging the PDC-P service areas and improving the serviceability of the Satellite Mobile Communication System.

This article first overviews the Satellite Packet Processing Module (S-PPM), newly developed to provide satellite support to subscriber links and to connect the Satellite Mobile Packet Communication System with the existing PDC-P system. It next introduces the node system equipment in the Satellite Mobile Packet Communication System, with explanation centered on the functions supported in the existing PDC-P system and designed to compensate for the delay that is characteristic of satellite transmission.

### 2. S-PPM Overview

#### 2.1 Hardware Overview

The hardware configuration of S-PPM is shown in Figure

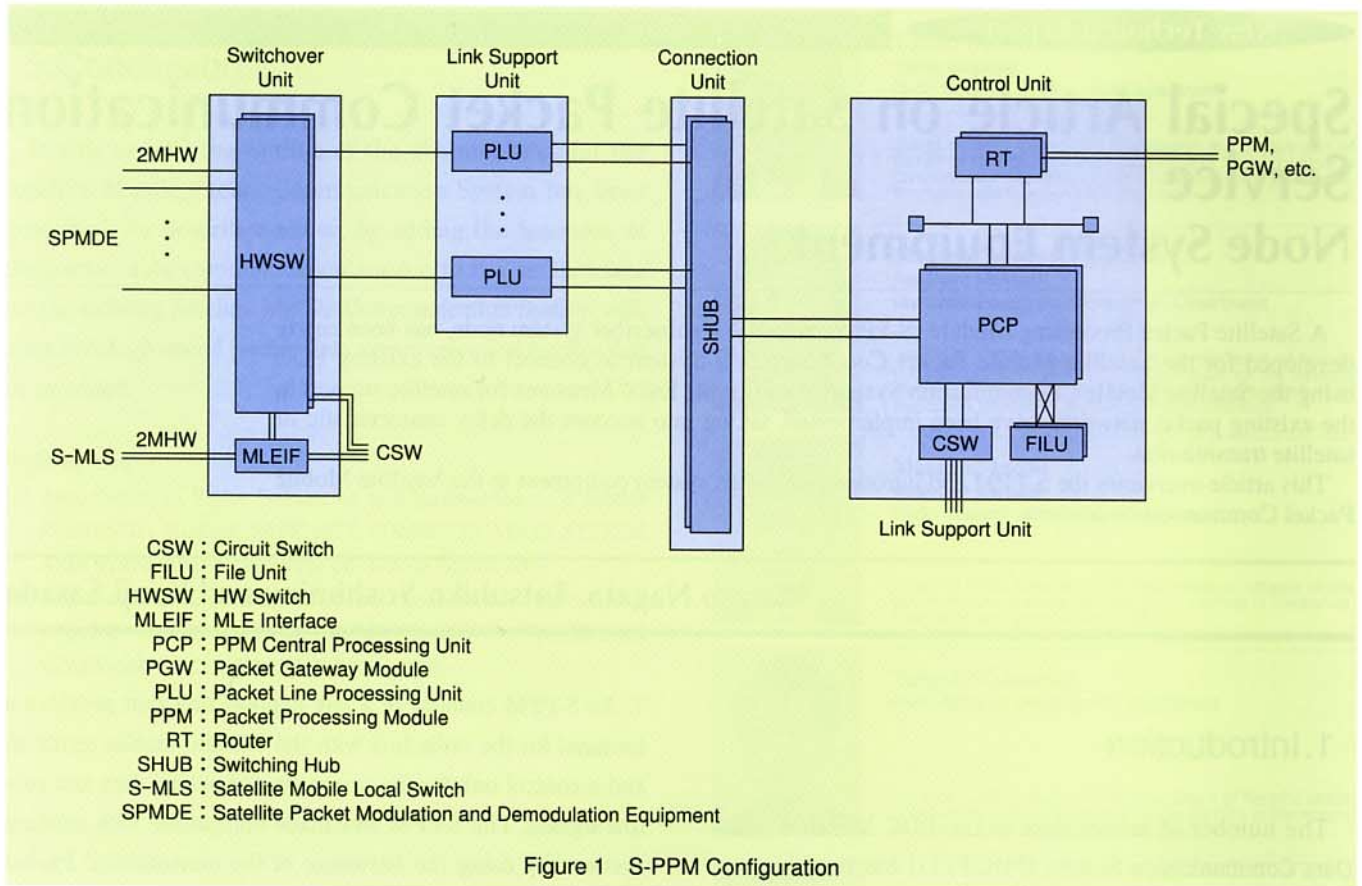
1. An S-PPM consists of a link support unit that provides a terminal for the radio link with the satellite mobile terminal, and a control unit for the processing of packet data and control signals. The S-PPM was made compatible with existing systems by using the hardware of the conventional Packet Processing Module (PPM) at the hardware interface of each node. It was made highly reliable by using a redundant configuration like that of the conventional PPM. The appearance of the S-PPM is shown in Photo 1.

#### (1) Link support unit equipment

The link support unit equipment has a switchover unit with a packet Highway Switch (HWSW) function to accommodate mainly the highway signal from the Satellite Packet Modulation and Demodulation Equipment (SPMDE) and to distribute the LAPB (Link Access Procedure Balanced) channel to the link support unit. It has a Packet Line Processing Unit (PLU) to terminate the LAPB channel from the SPMDE and to transmit/receive user data information and control signals from the PPM Central Processing Unit (PCP). And it has a Connection Unit with a Local Area Network (LAN) Interface Function (LANIF) to transmit/receive data between the PLU and PCP.

#### (2) Control unit equipment

The control unit equipment of S-PPM consists of PCP, a communication adapter for each channel, and peripheral equipment such as File Units (FILUs). It conducts radio-signal processing, intra-network control-signal processing, link support unit control, and communication with the Satellite Mobile Local Switch (S-MLS). In addition, the control unit equipment transmits/receives control signals from other



nodes, user data, and control signals from remote maintenance terminals via PDCP-LAN/WAN (Wide Area Network) links.

## 2.2 Software Overview

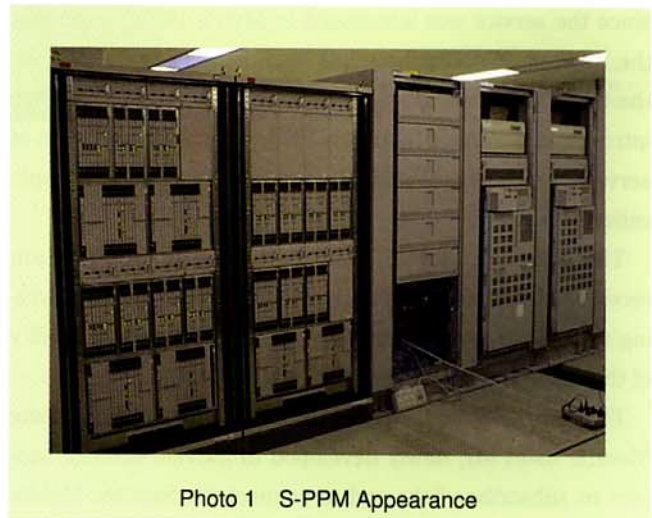
In the Access Satellite Mobile Packet Communication System, satellite communication is supported by changing the air interface terminated at the S-PPM. This enables the Satellite Mobile Communication System to be used for radio sections.

In addition, functions are included to support the monitoring and control characteristic to satellite systems and to support a channel configuration different from that of cellular systems.

## 3. Support in the Network

### 3.1 Connection Configuration

The Satellite Mobile Packet Communication System and the PDC-P system share the same network. Packaging all of the satellite-specific functions into the S-PPM enables us to provide packet services in the Satellite Mobile Communication System more economically. Additionally, because satellite method requires a highly reliable network configuration, while



two S-PPMs operate in both-working configuration, each one has working and standby radio system equipment (Figure 2). This enables the S-PPMs to back each other up; if one of them or the radio system equipment in one fails, another S-PPM takes over.

### 3.2 Support for Satellite Delay

Although the PDC-P system and the Satellite Mobile Packet Communication System share a Packet Gateway Module (PGW), the response wait timer in the module is not



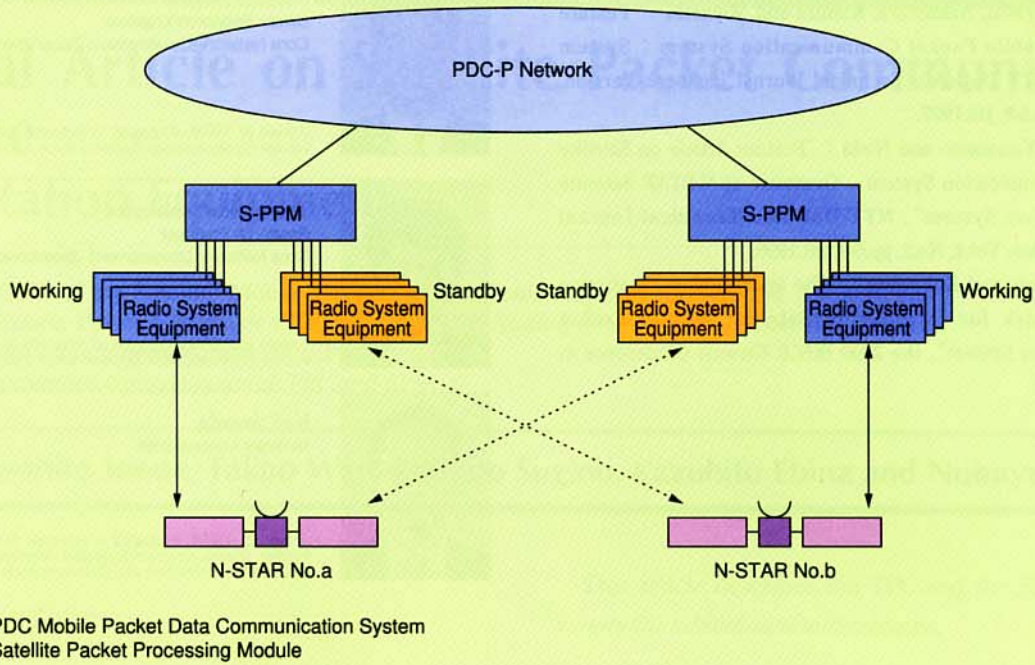


Figure 2 Working / Standby Configuration

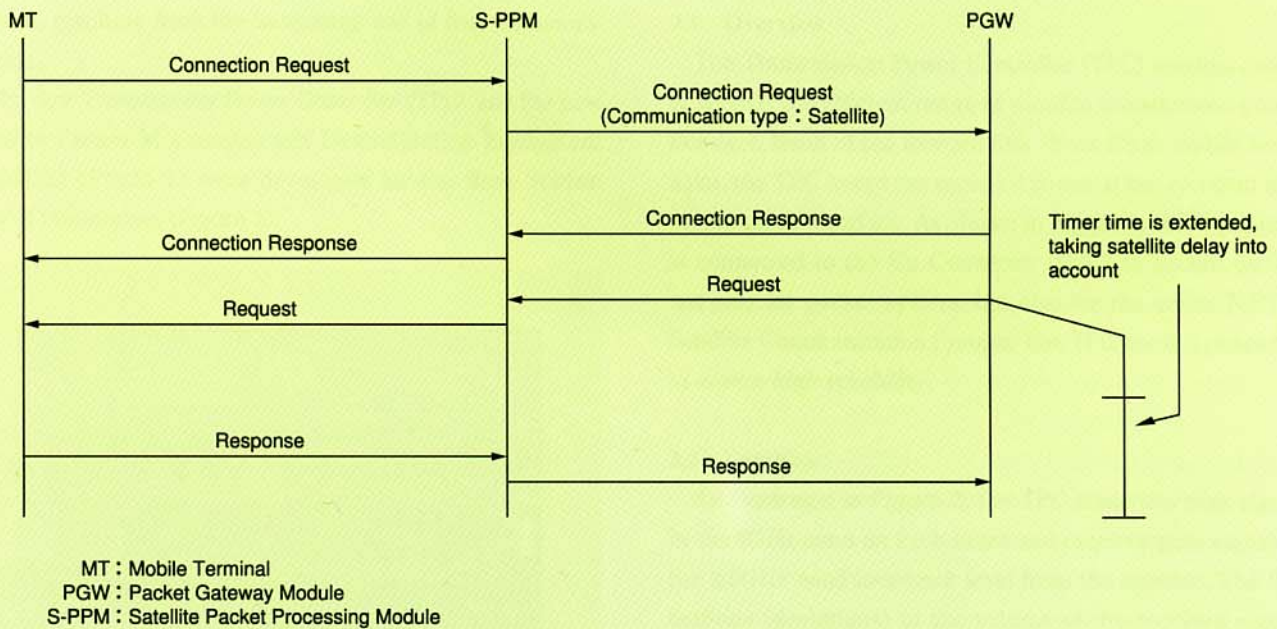


Figure 3 Timer Change Sequence

the same as that used in cellular systems due to the delay in satellite communications. A signal indicating connection from the Satellite Mobile Packet Communication System is transmitted from the S-PPM to the PGW at the start of communication. Then, a timer value suitable to the communication method is set at the PGW after identifying the communication method. Thus, PGW sharing by the two methods has been implemented [3].

Figure 3 shows an overview of the operation.

## 4. Conclusion

In this article, the overview of node system equipment in the Satellite Mobile Packet Communication System has been described.

## References

- [1] Ohnuki, Kobayashi, Nakamura, Kimura and Miyazaki : "Feature Article on Mobile Packet Communication System : System Overview", NTT DoCoMo Technical Journal Japanese Version, Vol.5, No.2, pp.6-9, Jul.1997.
- [2] Ueno, Utano, Yamamoto and Nishi : "Feature Article on Satellite Mobile Communication System : Overview of N-STAR Satellite Communication System", NTT DoCoMo Technical Journal Japanese Version, Vol.4, No.2, pp.6-9, Jul.1996.
- [3] Numajiri, Sasada and Kubosawa : "The improvement of existing PDC-P network for Introducing Satellite Mobile Packet Communication System", the 2000 IEICE General Conference in Spring, B-5-122.