



October 8, 2002

NTT Has Developed a Satellite Communication System that Provides Multicast contents gathering and distribution service Nationwide

Compact and Economical Satellite Communication System That Enables Simultaneous Communication at Any Speed with Multiple Access Points

Nippon Telegraph and Telephone Corporation (referred to as NTT henceforth: Head Office: Chiyoda-ku, Tokyo, CEO: Norio Wada) has developed a "direct multicasting satellite communications system" that provides an economical multicast^{*1} contents gathering and distribution service nationwide.

This system enables direct distribution of high-definition video signal and IP data from multiple access points simultaneously, thereby enabling the nationwide information transmission freely without restriction of time and location. While minimizing the system's initial installation cost, NTT achieved compact and economical satellite communication equipment that can reduce the total cost. Consequently, the system can be used in various fields regardless of the local or overseas markets for contents (live image and streaming image) gathering and distribution services, intra-corporation Intranet, remote medical support, remote electrical learning services, electronic government, and municipality disaster handling systems. In the domestic market, the system is expected to be used as a Digital Divide^{*2} solution tool for isolated islands and mountain areas, in relation to the e-Japan plan.

<Background of the development>

Satellite communication, which can connect any points on the Earth, has been used as a system for areas that are difficult to prepare for a terrestrial communication network or a disaster handling communication system. Recently, satellite communication is often used for multicast satellite communication systems for its broadcast feature that can distribute information to multiple information receiver points simultaneously. The multicast satellite communication systems, which are currently available commercially, are mainly star type systems and are configured by one center HUB^{*3} and Very small aperture terminals (VSAT^{*4}). VSAT units are installed in various locations and distribution is only initiated from the center HUB. In this configuration, individual dedicated terrestrial lines connecting to the center HUB are required for contents gathering, adding to the user's cost burden. In the configuration utilizing satellites that use VSAT as the contents gathering channels, the bandwidth from VSAT to HUB is limited, preventing the achievement of adequate data rate. And also efficient sharing of transponder bandwidth by multiple transmitting earth stations is

required because the transponder^{*5} bandwidth is limited in a multiple access satellite communication system.

<Features of the system>

The NTT Service Integration Laboratories has been engaged in development of a system for achieving large capacity multicast contents distribution economically directly from VSAT at each location to all the information access points without intervention of the center HUB. The "direct multicasting satellite communications system" overcame such issues as those indicated above. ([Figure 1](#))

This system is configured by "group modem equipment" that was developed based on the "multi-carrier/multi-rate modem technology"^{*6} designed by the NTT Network Innovation Laboratories and a "high-efficiency satellite line control program." The group modem equipment enables contents gathering and distribution from multiple access points and the high-efficiency satellite channel control program automatically allocates the necessary line capacity by sharing the satellite transponder^{*5} band in VAST at multiple access points. As a multicast application, NTT has also developed a "high-reliability multicast program" that realizes satellite multicast contents distribution efficiently and reliably.

Being able to directly distribute information from multiple VSAT transmission stations to nationwide areas, this system does not require dedicated lines for gathering contents to a center HUB. Since a receiving earth station can receive multiple contents that were distributed from multiple transmitting earth stations, the station can achieve the same function as that of receiving multiplexing signals from the center HUB. To receive signals from multiple transmitting earth stations using conventional modem equipment, as many modem equipment units as the number of communication channels are required. The group modem equipment can handle multiple channels, enabling construction of a compact and economical satellite multicast network of advanced functions.

<New technologies that were developed>

1. Group modem equipment

This equipment, which is regarded as the key to this system, enables communication of video signal, IP data, and audio data with multiple access points at any data rate respectively and simultaneously. This equipment can receive IP data from up to 32 transmission points simultaneously and can modulate/demodulate up to 256 carriers simultaneously. ([Figure 2](#)). The modem equipment is also featuring the "Dispersed assignment of discontinuous spectrum" that integrates discontinuous bandwidth of the transponder into one communication channel, achieving effective use of a transponder band for the first time in the world.

2. High-efficiency satellite channel control program

This channel control program realizes efficient sharing of a transponder band by multiple transmitting earth stations at multiple locations. The program enables the securing of scalability and optimization of cost performance through hierarchical control over three levels, achieving direct multicast by multiple transmitting earth stations at multiple locations, utilizing the features of the group modem equipment ([Figure 3](#)).

3. High-reliability multicast program

This program suppresses response concentration during rain through the "user station distribution algorithm and response suppression algorithm" for reliable and efficient satellite multicast distribution to several tens thousands of users. ([Figure 4](#))

<Future plan>

NTT will contribute to the creation of new business by pioneering new satellite communication markets through the economical direct multicasting satellite communications system using VSAT.

NTT will also continuously provide systems and new technologies according to the market demands in a timely and speedy fashion, by scrutinizing the trends of the entire satellite communications business.

- [Figure 1 : Configuration of the direct multicasting satellite communications system](#)
- [Figure 2 : Group modem equipment](#)
- [Figure 3 : High-efficiency satellite channel control program](#)
- [Figure 4 : High-reliability multicast program](#)

<Glossary>

- *1 Multicast
Communication method that distributes the same data to multiple specific receiving points simultaneously.
- *2 Digital Divide
Social division created by spread of information technology (so called IT) between those who are capable of using the technology and those who are not. This is being recognized as a social problem and the problem is simply referred to as the "Digital Divide."
- *3 Center HUB
Satellite transmitting earth station that is installed in the center as an information distribution station.
- *4 VSAT (Very small aperture terminal)
Small satellite earth station that is installed in each base as an information transmitting/receiving earth station.
- *5 Transponder
Radio wave relay unit that is installed in a satellite for amplifying weak radio waves captured by a satellite antenna
- *6 Multi-carrier/Multi-rate modem technology
Technology of filter bank and modem for modulating/demodulating multiple signals at a specified speed simultaneously

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