Satellite data distribution experiment using IP/DVB

Taku Urabe[1], Hiroshi Tsuruoka[2], Naoshi Hirata[1], Kenji Uehira[3], Shiro Ohmi[4]

[1] ERI, Univ. Tokyo, [2] ERI, [3] SEVO, Kyushu Univ., [4] D.P.R.I., Kyoto Univ.

An experiment of distributing realtime earthquake data/information to a public level as well as scientists using a communications satellite and a digital video broadcasting standard has been started. Adding an inexpensive PC card and connecting to a small satellite dish enable a PC to receive the data.

BACKGROUND   The satellite seismic telemetry system of the Japanese universites, which is in operation since 1996, is delivering at the reserarchers more than 4000 channels of real-time waveform data from seismometry sites of the universities, JMA, Hi-net etc. in the Japanese Islands.   The system drastically promoted the circulation of the waveform data and enabled the studies which are not restricted by a local network.   On the other hand, an expensive price of the receiver system has been preventing the number of receiving stations from increasing.   Since the present system transmits data in a special form, a receiver system is also required to be special and therefore expensive as several million yen per set.   By introducing a data transmission system which is based on a digital video broadcasting standard, inexpensive receivers on the market becomes available for data reception.

DVB STANDARD   A data transmission experiment based on the DVB (Digital Video Broadcasting), which is the digital video broadcasting standard of the European Telecommunications Standards Institute (ETSI), started in the autumn of 2002 using a satellite space segment provided by JSAT, a satellite communication company.

TRANSMISSION SYSTEM   The transmission system, which consisted of an IP/MPEG-2 gateway (Thomcast OPAL) and a DVB modulator (Newtec NTC/2080/Z), has been installed to each of the two hubs (at Gunma and Tokyo) of the satellite system.   UDP/IP packets sent from a workstation to the gateway are converted into an MPEG-2 Transport Stream, and then sent to the modulator which outputs an IF (intermediate frequency) signal in a DVB format.   The modulation scheme is QPSK, 3/4 FEC with a data rate of 6 Mbps.   The resultant IF signal is up-converted to Ku band and sent to the satellite, N-STARb.

RECEIVER   Three kinds of IP/DVB receivers by PentaMedia have been tested so far;(1) PCI card, (2) USB box, and (3) IP router.   Both (1) and (2) are recognized on Windows as a network interface by installing a driver software.   A device driver on Linux is also provided for (1).   UDP/IP packets (normally destined to a multicast address) sent out from the hub are received by the receivers as they are.   A small size (45cm) satellite dish is enough to receive the signal from the satellite.

OPERATION   The band width of 6 Mbps can be shared by mutually independent streams of IP packets which are identified by PID (Packet IDentifier). Each PID may be assigned   a maximum and/or reserved bit rate.   Presently, 98-99% of the band width is allocated to the waveform data and the rest can be used to send various realtime earthquake-related information such as hypocenters and CMT solutions.   The experiment is scheduled to continue until the spring of 2006. Schools or public offices as well as researchers are included in the probable monitoring users in the experiment.   From the spring of 2003, additional two contents (PIDs) which are related to early warning system will be distributed through the satellite system; NOWCAST as a joint research with JMA, and REIS as a joint research with NIED.