

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Fixed and Broadcast Communications (2)

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SURVIVABILITY APPLICATION DEMONSTRATIONS VIA WIDEBAND INTERNETWORKING
ENGINEERING TEST AND DEMONSTRATION SATELLITE “KIZUNA” (WINDS)

Abstract

The “KIZUNA” (WINDS) was developed by NICT and JAXA, and was launched on 23 Feb. 2008. WINDS was designed as an extension of the internet connections via satellite using two operation modes. One is the bent-pipe relay mode. In this mode, two channels of 622 Mbps transmission or a 1.2 Gbps transmission capability can be realized by using Ka-band 1.1 GHz bandwidth transponders. The other is the Ka-band regenerative repeater mode. In this mode, ultra/small aperture terminals (USAT/VSAT) having 45 cm/120 cm diameter dish are connected by using three channels of 155 Mbps on-board ATM based baseband switch developed by NICT. The ATM based baseband switch works as a TDMA connection controller which uses 2 ms cells as a TDMA burst signals. Then, the USAT/VSAT mesh network connections are realized without any use of the hub stations. There are many types of application and demonstration experiments have been carried out by using both satellite and terrestrial optical fiber network to evaluate the internet connection capabilities. One of the important applications is disaster communication. Then NICT started to evaluate the utility of WINDS satellite for disaster rescue, and carried out integrated demonstration of WINDS and terrestrial wireless network technologies. One of the scenarios of the disaster is earth quake. After the heavy earth quake, the wireless ad-hoc mesh networks with satellite communication functions are deployed in the stricken area. By using the femto-cell unit connected to the wireless ad-hoc nodes, a resident in the stricken area can communicate through the conventional cell phones. By using the transmission capability of the WINDS, the high definition images can be transmitted to the disaster management office to support the disaster relief. Demonstration experiment was carried out using WINDS with a wireless LAN mesh network which uses ad-hoc mode of IEEE802.11a, b, g. The wireless IP phones were used instead of mobile phones for this demonstration. And also the high definition video images were sent to the disaster relief office, and the damage evaluation information was sent back to the place of refuge. By using new control software developed by ATR, the throughput of the wireless mesh network was kept around 25 Mbps. The data rate of the WINDS-VSAT can be selected from 1.5 Mbps to 51 Mbps in case of the single carrier transmission. Then overall throughput of the demonstration system was the same as the wireless mesh network.