Special Report

Disaster-Prevention Administrative Satellite Communication System -Local Authorities Satellite Communications Network-

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1. What is the Local Authorities Satellite Communications Network?

The Local Authorities Satellite Communications Network is a system providing communications channel among all local governments in Japan and disaster prevention agencies such as fire defense headquarters. The network is constructed and operated as one of the world biggest satellite communications network for disaster-prevention and administrative communications which utilizes the feature of the satellite communications such as wide coverage in the service area, independence from disasters on earth, and flexibility of line setting. As of April 1st, 2008, total of 4533 earth stations are in operation and covering all the 47 prefectural governments, and almost 90% of municipality and 65% of fire defense headquarters in Japan.

In the past, for the prefectural disaster-prevention ministerial wireless system (terrestrial communication system), only one frequency channel was allocated for several municipalities and it was difficult to correspond advanced applications such as data transmissions. Therefore in late 1980s, some prefectures made a study on a disaster-prevention network using communication satellites. After that, the demands for sharing a network nationwide heightened and the Association of Prefectural Governors determined to build the satellite communications network for the local authorities. The Local Authorities Satellite Communications Organization (LASCOM) was established in February 1990 for the purpose of operating the network, and promoted and constructed the disaster-prevention information and administrative information network. The operation of the satellite communication network has been done by the LASCOM since December 1991.

2. Structure of the network

Figure 1 shows the concept of the Local Authorities Satellite Communications Network. The network consists of core stations with 4.5m diameter class antenna built by prefectural

governments, earth stations with 1 to 2m diameter class antenna (VSAT) mainly located at each municipals, mobile earth stations (vehicle mounted or transportable type), central earth stations which control all the earth stations and assign the communication links, and communication satellite.

The network is based on mesh type channel structure and direct bi-directional communication between all the stations (core station, VSAT, mobile station) can be possible. This is the main difference from the ordinary terrestrial network built as a unit for each prefecture or each municipal. Therefore the network is expected to be used as effective communication means among related organizations and local authorities in case of wide area disasters. It is possible to configure a star type channel structure and is used as a simultaneous command link which transmits the information from the prefecture (core station) to each municipal (VSAT) simultaneously.

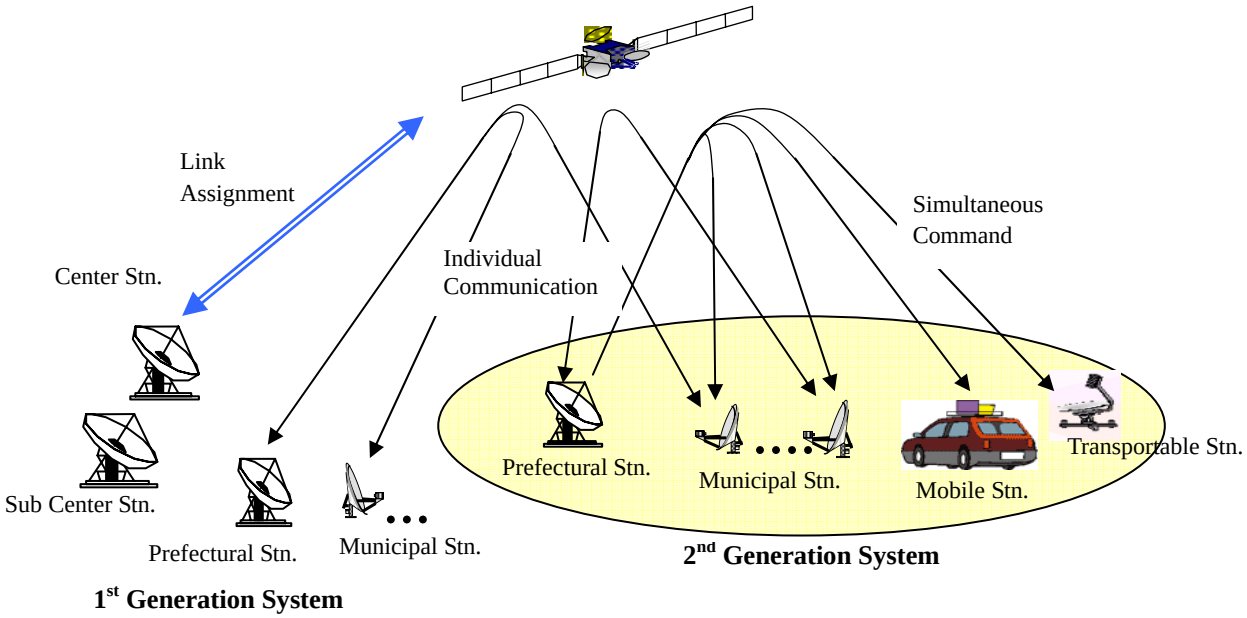

Fig. 1 Concept of the Local Authorities Satellite Communications Network

3. Types of communication services

Table 1 shows the typical communication services provided by the local authorities satellite communications network. The communication network provides Individual communication (voice, facsimile, data), Simultaneous command (voice, facsimile, data), and Analogue video transmission as basic services, and packet data transmission and quasi-video transmission services as the option. In the second generation system which operation began in 2003, IP data transmission was added and video transmission was updated to the MPEG-2 digital method.

Table 1 Principal services provided by the Local Authorities Satellite Communications Network

Service name	Service contents	Communication link
Individual Communications	Voice, facsimile or data transmission between two earth stations among the network	Earth Stn. ⇒ Earth Stn.
Simultaneous command	Simultaneous transmission of voice, facsimile and data from a hub station (prefectural governments or fire and disaster management agency) to related earth stations.	Fire and Disaster Management Agency ⇒ Local Governments ⇒ Fire Defense Headquarters Prefectural Governments ⇒ Municipals
IP data transmission	IP data communication from 32kbps to 8Mbps Point to Point or Point to Multipoint	Earth Stn. ⇒ Earth Stn.
Video transmission	7Mbps MPEG-2 video and audio distribution with a conditional access feature	Fire and Disaster Management Agency, Prefectural Governments ⇒Prefectural Government ⇒ Municipal

However the renewal of each earth station depends on the various situations of each local authority and both of the old and new generation stations will exists for a while. Therefore the network ensures the intergenerational interconnectivity in the basic communication services and enables gradual generation transitions.

4. Record of the network usages in the case of disasters

In recent years, an unprecedented number of natural disasters have occurred. Figure 2 shows the record of the usages of the individual communication in the period of September and October 2004. In this period, 4 typhoons have hit Japan's mainland and in October 23, the Mid Niigata Prefecture Earthquake occurred.

In normal weekdays, the number of communication usages was about 9,000 times per day. In normal weekend, it was about 4000 times per day. In the period when disasters occurred or expected, the number of communication usages increased. In the case of typhoon, it increased for a few days before and after typhoons passing. On the other hand, in the case of large earthquakes, the duration of communication increase was longer than the other cases because of the occurrence of after shocks. It is well understood from the figure that the Local Authorities Satellite Communications Network is practically utilized in the case of each disaster.

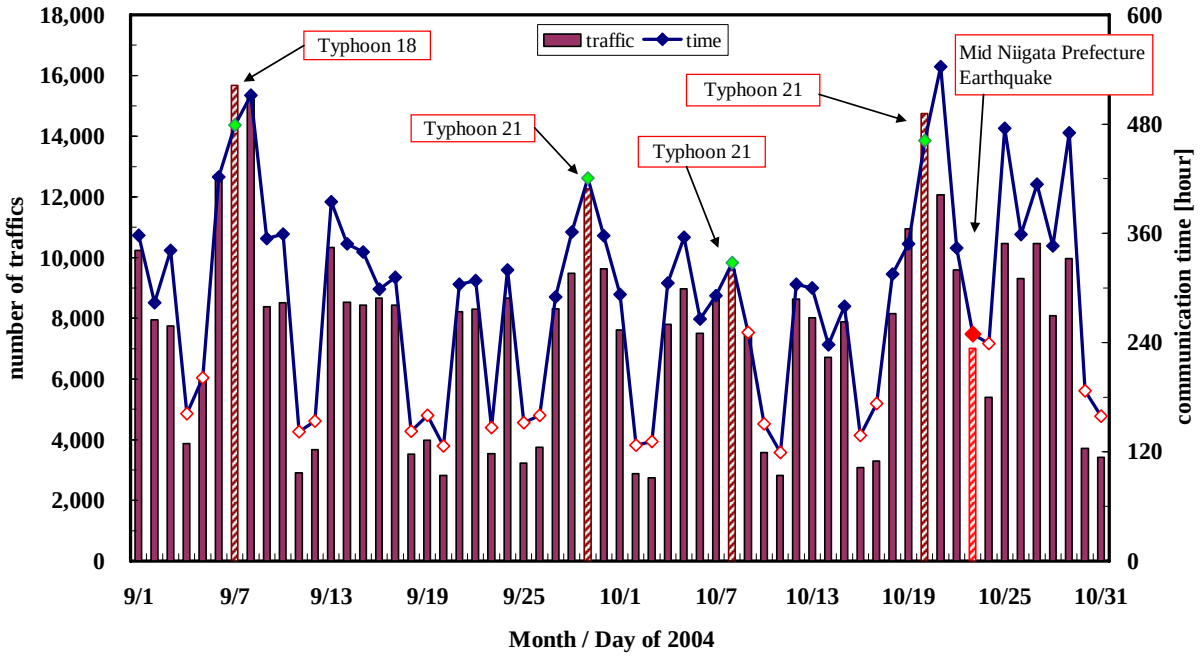

Fig. 2 Traffics of the Local Authorities Satellite Communications Network in case of disasters

Usages of video transmission by local government in the case of disaster are also increasing in numbers and in the duration of usages. The reasons of the rapid increase of the video usages are considered to be because of the recent frequent occurrence of disasters and the recognition of the importance to figure out the reality of the disasters by video information. Major utilization form is the transmissions of the video information of the disaster site acquired by cameras mounted on helicopters, by overhead cameras located on fire defense headquarter buildings, or by cameras mounted on mobile vehicles.

In 2007, three strong earth quakes: Noto hanto earthquake in March, Central Mie earthquake in April, and Niigataken Chuetsu-oki earthquake in July, have occurred in succession. Figure 3 and Figure 4 show the example of the usage of the satellite communications at Noto Hanto Earthquake and at Niigataken Chuetsu-oki earthquake, respectively.

In the case of the Noto hanto earthquake, particularly the communication between the prefectural government and its local branches increased in Ishikawa prefecture. And, in Niigata prefecture, the network is used for the collection and the delivery of the information of the earthquake intensity shortly after the earthquake occurrence.

When the Niigataken Chuetsu-oki earthquake, the network was used for the communication between the prefectural government and its local branch, and between municipal

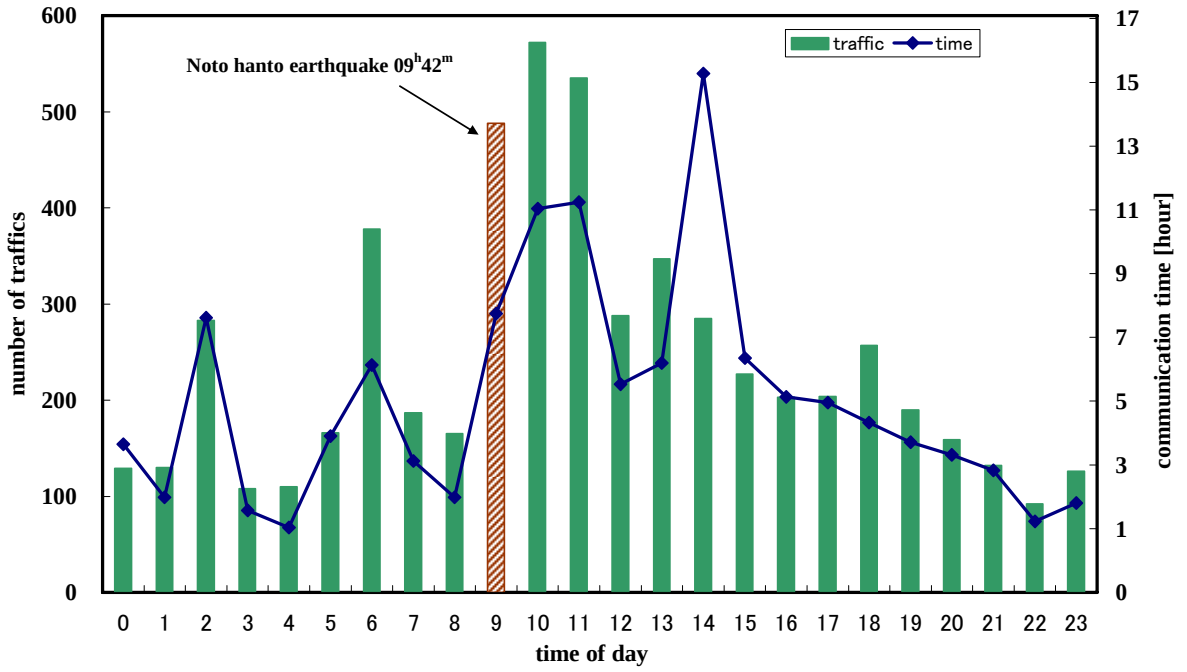

Fig. 3 Traffic of the network at the Noto Hanto Earthquake
March 25, 2007
(Usages of voice, fax and IP data communication in all prefectures)

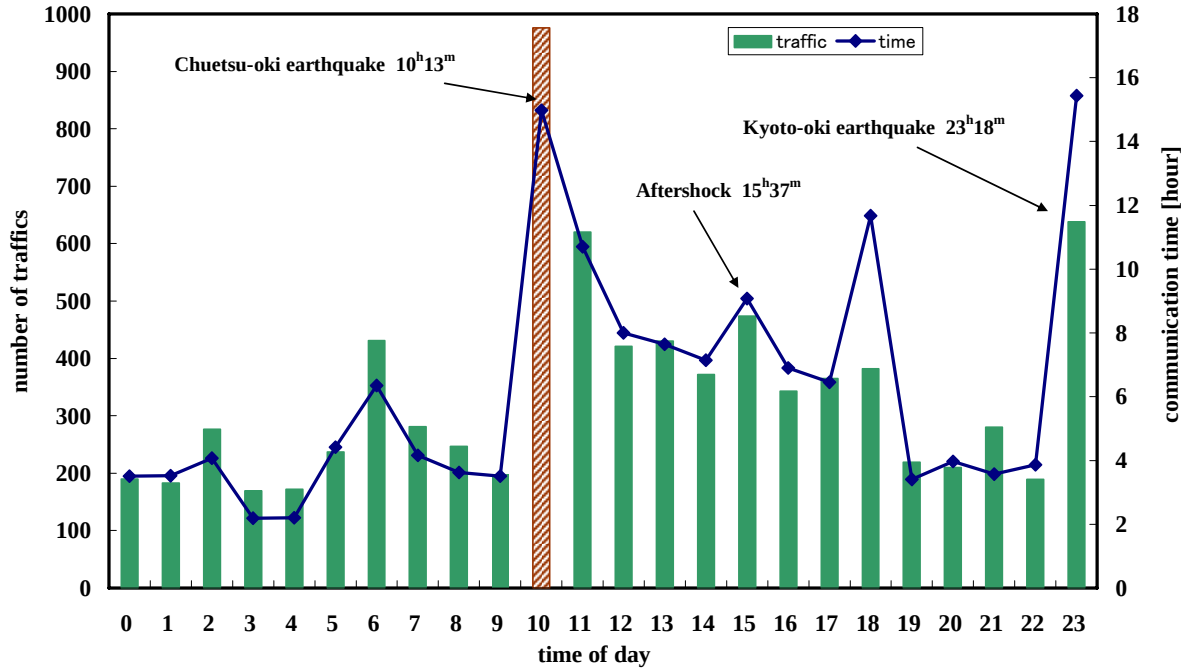

Fig. 4 Traffic of the network at the Niigataken Chuetsu-oki Earthquake
July 16, 2007
(Usages of voice, fax and IP data communication in all prefectures)

governments and its local branches or fire headquarters. As well as the case of the Noto hanto earthquake, the collection and the delivery of the information of the earthquake intensity were done through the network, showing the significant increase of the communication traffic.

5. Conclusion

The Local Authorities Satellite Communications Network is introduced. The network is an independently operated and owned by all the 47 prefectures in Japan and is used as a secure communication link that will not have the convergence problem even in the case of disasters.

In the Local Authorities Satellite Communication Network, the needs for the fast and precise information exchange with the disaster site are very high. The main trend of satellite communication service is the mobile communications using small and light-weighted terminals. The transportable and mobile terminal will become popular, and the cooperation with other satellite communication services such as WIDESTAR, IRIDIUM, and INMARSAT will be expected.