



Securing Access to ICTs in Natural Disasters

- Experiences in Japan -

FEB 22 2005

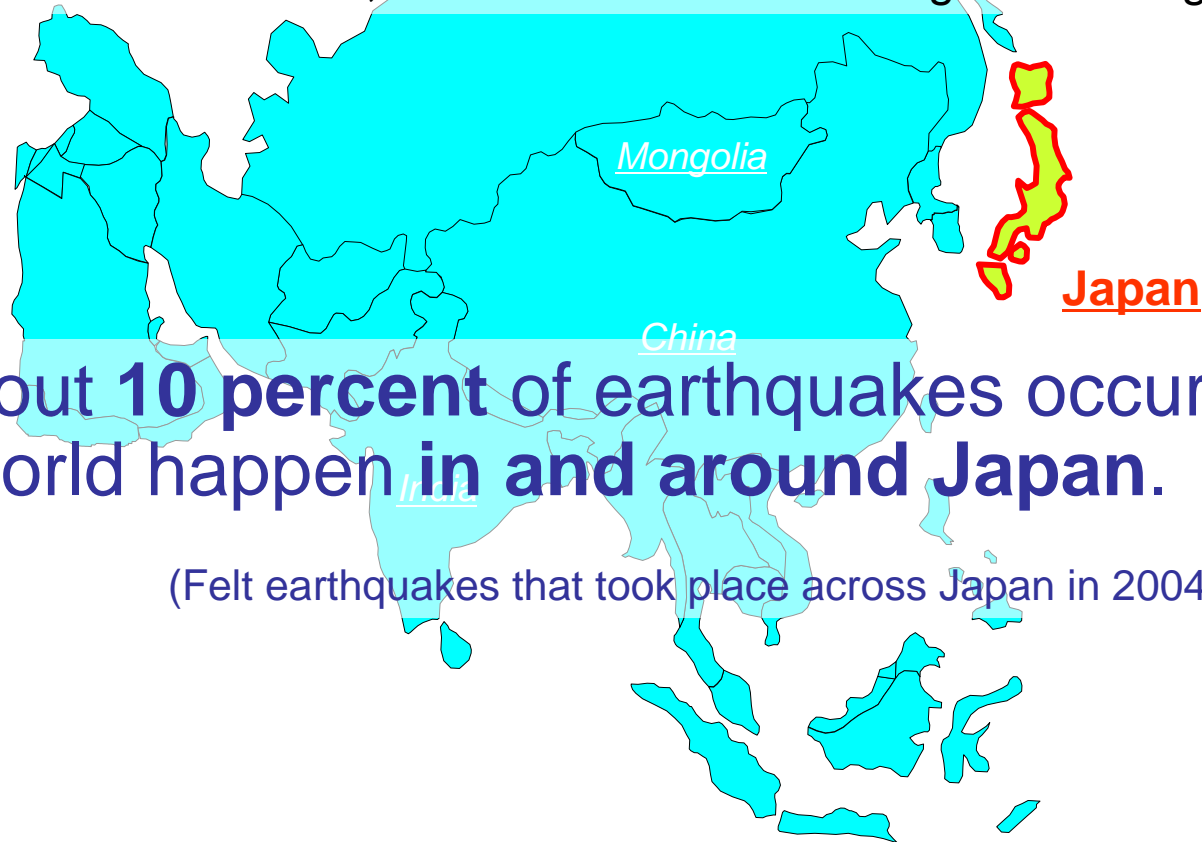
Manabu Kanaya

**Director of Telecommunication Systems Division, Telecommunications Bureau,
Ministry of Internal Affairs and Communications (MIC), Japan**

Natural Disaster-prone Japan

Japan is one of the world's most quake-prone countries, where earthquakes and tsunami cause great suffering and damage.

The Japanese archipelago has many active volcanoes, another source of disasters. Recently, worldwide weather changes bring about typhoons, severe rainstorms, violent heat and cold waves, which also cause suffering and damage.



◆ About **10 percent** of earthquakes occurring in the world happen **in and around Japan**.

(Felt earthquakes that took place across Japan in 2004 totaled 2,234.)

Japan's Major Earthquakes and Tsunami Disasters

Earthquake name (Magnitude on the Richter scale)	Date	Dead and missing persons
Nobi Earthquake (M8.0)	1891.10.28	7,273
Meiji Sanriku Earthquake Tsunami (M8.5)	1896. 6.15	26,360
Great Kanto Earthquake (M7.9)	1923. 9. 1	142,807
Kita-tango Earthquake (M7.3)	1927. 3. 7	2,925
Tottori Earthquake (M7.2)	1943. 9.10	1,083
Tonankai Earthquake (M7.9)	1944.12. 7	1,251
Mikawa Earthquake (M6.8)	1945. 1. 3	2,306
Nankai Earthquake (M8.0)	1946.12.21	1,443
Fukui Earthquake (M7.1)	1948. 6.28	3,769
Chile Earthquake Tsunami (M9.5)	1960. 5.23	139
Central Sea of Japan Earthquake (M7.7)	1983. 5.26	104
Southwest Hokkaido Offshore Earthquake (M7.8)	1993. 7.12	230
Southern Hyogo Prefecture Earthquake (M7.3)	1995. 1.17	6,435

Notes: The earthquakes before 1950 are those which left more than 1,000 dead and missing people.

The earthquakes after 1951 are those which left more than 100 dead and missing persons.

The meshing parts indicate an earthquake involving tsunami.

Japan's Major Volcanic Disasters

Place	Date	Description
Sakurajima Island	1779.11.8 ~ 9	Lava flow and volcanic cinders killed 153 people.
Mt. Asama	1783.8.4	Pyroclastic flow, lava flow and volcanic mud flow. The Azuma River and the Tone River flooded. 1,151 people were killed.
Aogashima Island	1785.4.18	The number of deaths was between 130 people and 140 people. The islanders took refuge in Hachijojima Island, leaving Aogashima Island deserted for 50 years or so.
Mt. Unzen	1972.5.21	Mt. Bi collapsed, which caused tsunami leaving about 15,000 people dead.
Mt. Usu	1822.3.23	A glowing cloud destroyed former Abuta hamlet completely. 50 people dead.
Mt. Bandai	1888.7.15	Great mud flow buried villages at the base of the mountain, leaving 461 people dead.
Izu-Torishima Island	1902.8.7	The central volcanic cone erupted, killing all islanders, 125 persons.
Sakurajima Island	1914.1.12	Lava outflow, villages were immersed, destruction by fire. Earthquake roaring. 58 deaths.
Mt. Tokachi	1926.5.24	Great mud flow burying 2 villages and killed 144 people.
Miyakejima Island	1940.7.12	Volcanic cinders and lava flow killed 11 people.
Mt. Asama	1947.8.14	Volcanic cinders killed 11 people.
Mt. Aso	1958.6.24	Volcanic cinders killed 12 persons.
Mt. Tokachi	1962.6.29	4 deaths and 1 missing persons
Sakurajima Island	1974.6.17, and 8.9	The avalanche of rocks, volcanic ash and mud killed 8 people.
Mt. Usu	1977.8 ~ 10	Mud flow, ash fall sand and ground movement. 3 dead persons. New Usu mountain was formed.
Miyakejima Island	1983.10.3	Lava flowed down. 394 houses were destroyed by fire or buried in the Ako district.
Izu-Oshima Island	1986.11 ~ 12	The eruption occurred for the first time in 12 years. About 10,000 people including all islanders evacuated the island.
Mt. Unzen	1990.11.17	Pyroclastic flow left 41 people dead and 3 missing.

Japan's Major Flood Disasters

Name	Date	Dead and missing persons
Great Kanto flood	1910.8.11	1,349
Tohoku and Kinki regions' damage by wind and flood	1917.9.30	1,300
Muroto typhoon	1934.9.21	3,036
Makurazaki typhoon	1945.9.17	3,756
Kathleen typhoon	1947. 9.15	11,930
Kyushu and Chugoku regions' heavy rain (front)	1953.6.25	758
Nanki torrential rains	1953.7.16	1,125
Toyamaru typhoon	1954.9.26	1,761
Isahaya flood	1957.7.25	992
Karino River typhoon	1958.9.26	1,269
Isewan typhoon	1959.9.26	5,697
The torrential rain (front) of 1972	1972.7.9	557
Niigata torrential rains	2004.7.12	16
Fukui torrential rains	2004.7.17	5
Typhoon No. 23	2004.10.20	68

Notes: The floods before 1950 are those which left more than 1,000 dead and missing persons.
The floods after 1951 are those which left more than 500 dead and missing people.
The meshing parts indicate floods which caused great damage within 2004.

Ocean-floor Plates around the Japanese Archipelago

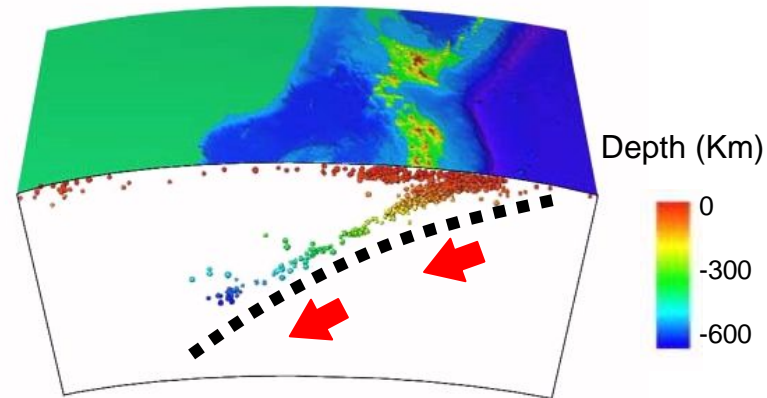
North American Plate

◆ In Japan's Pacific sea, ocean plates are squeezed in under continental plates, which causes trench-type earthquakes registering 8-class magnitudes when the edge of a plate pops up.

Eurasian Plate

Pacific Plate

Philippines Sea Plate



(Distribution of the epicenters of earthquakes occurring in and around the Japanese archipelago (Source: The Headquarters for Earthquake Research Promotion))

Outline of the United Nations World Conference on Disaster Reduction (1/2)

The United Nations World Conference on Disaster Reduction (18-22 Jan. 2005, Kobe, Hyogo, Japan)

◆ Objectives:

In order to develop the 21st century's new disaster reduction guidelines for reducing worldwide damage caused by disasters, the following key items were considered:

- Declaration: to enhance the momentum toward pushing forward with the efforts to reducing vulnerabilities to natural hazards in 2005 to 2015.
- Review of the Yokohama Strategy
- Action plan: guidelines for disaster reduction measures which countries and organizations should tackle based on the conclusions the above-mentioned review in 2005 to 2015.

◆ Participants:

- U.N. member countries (191 countries), United Nations organizations (ISDR, OCHA, UNDP, WMO, UNESCO, UNEP, etc.), international and regional organizations (International Federation Red Cross and Red Crescent Societies, Asian Disaster Reduction Center), NGO (Japan Association for Earthquake Engineering, etc.)

◆ Results:

- Adoption of the Hyogo Declaration and the Hyogo Framework for Action as disaster reduction guidelines in the next ten years (see the next page).
- Review of the “Yokohama Strategy and Action Plan for a safer world.”
- Common statement in the special session concerning the Indian Ocean disaster

Outline of the Hyogo Declaration and the Hyogo Framework for Action (2/2)

◆ Hyogo Declaration

Stating that the Conference announced the “Common Statement of the Special Session on Indian Ocean Disaster: Risk Reduction for a Safer Future” as its outcome.

(Excerpt from the Common Statement)

“Early warning systems consist of:

- (a) prior knowledge of the risks faced by communities;
- (b) technical monitoring and warning service for these risks;
- (c) dissemination of understandable warnings to those at risk; and,
- (iv) knowledge, public awareness and preparedness to act.

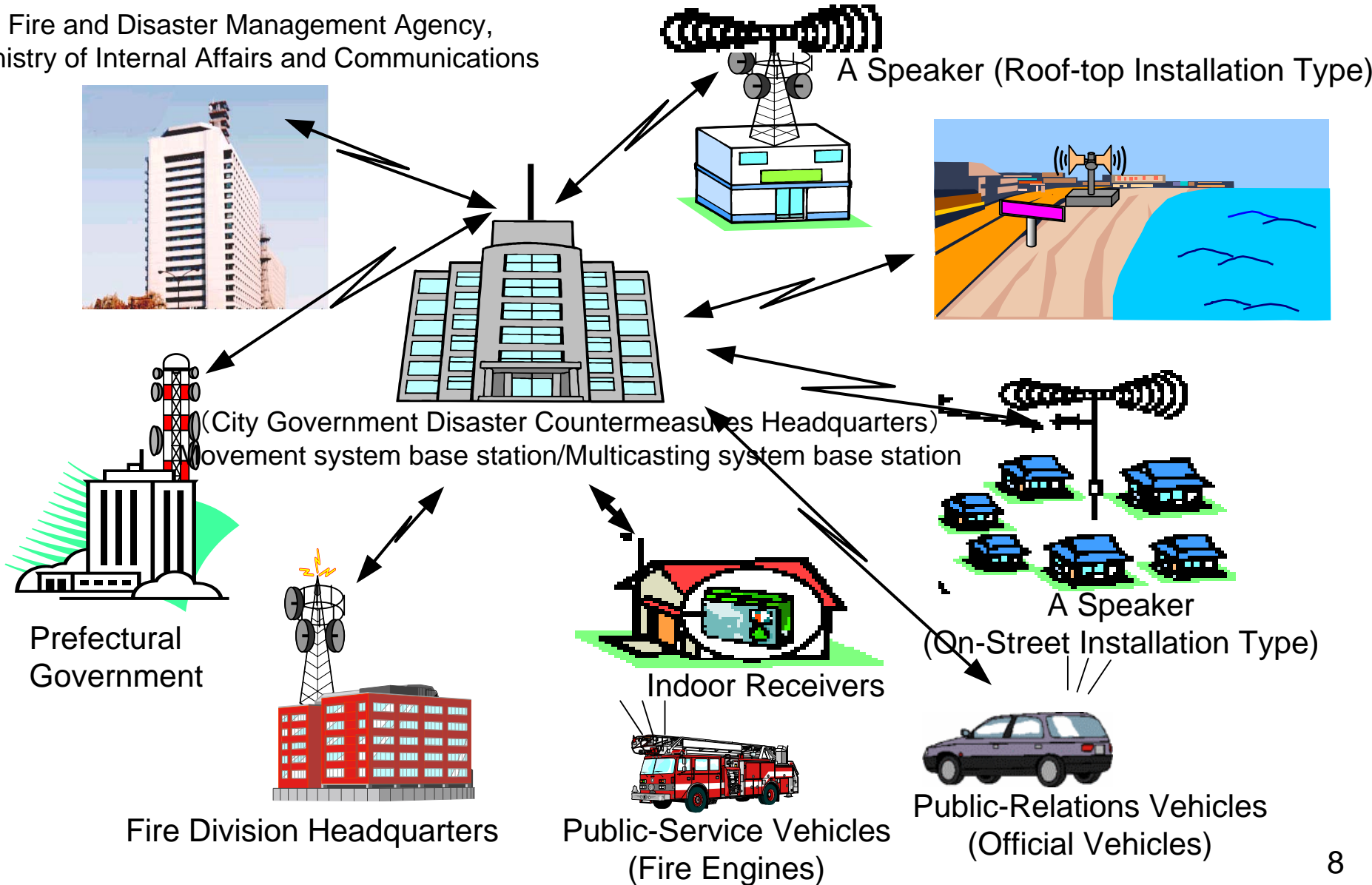
◆ Hyogo Framework for Action (excerpts in terms of information and communications)

- Identify, assess and monitor disaster risks and enhance early warning
(Developing early warning systems of which warnings are timely and understandable to those at risk, etc.)
- Use knowledge, innovation and education to build a culture of safety and disaster resilience
(Promote the use of recent information, --- communications technologies, particularly for training and for sharing and dissemination of information among different categories of users.)
- Reduce the underlying risk factors
(Protect and strengthen critical public facilities and physical infrastructure, particularly --- communications through proper design, retrofitting and re-building, in order to render them adequately resilient to hazards.)
- Strengthen disaster preparedness for effective response
(Strengthen and when necessary develop coordinated regional approaches, and create or upgrade --- communications systems to prepare for and ensure rapid and effective disaster response in situations that exceed national coping capabilities.)

Tsunami Warning System in Japan

(1) Disaster Management Radio

Fire and Disaster Management Agency,
Ministry of Internal Affairs and Communications

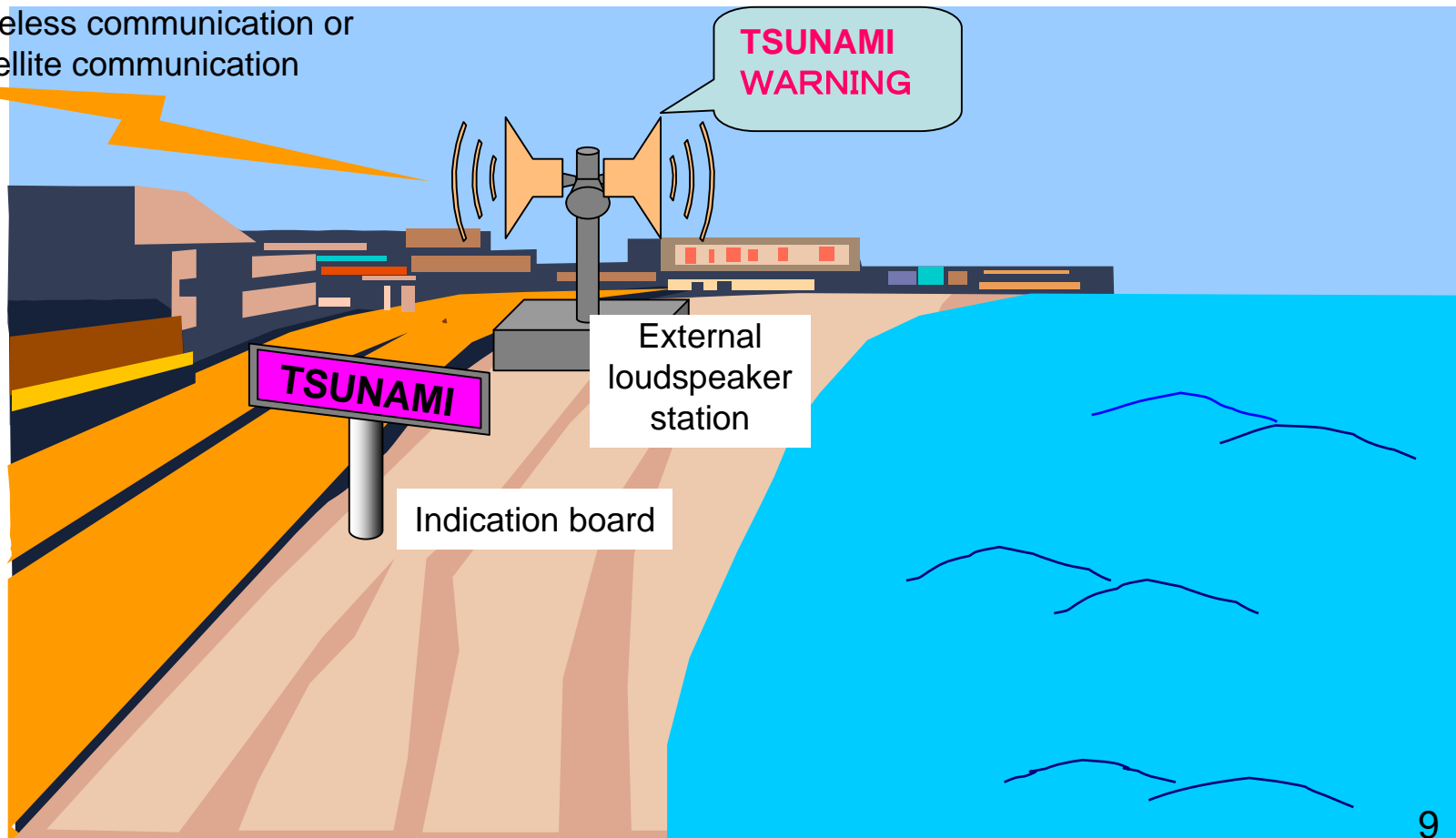
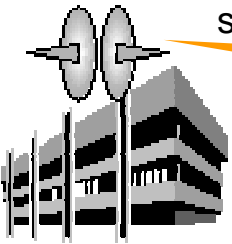


Tsunami Warning System in Japan

(2) Reporting and Notification by Loudspeakers and Sirens

- ◆ Using loudspeakers is an effective measure to catch the attention of people in a specific area.
- ◆ Announcement using loudspeakers can transmit information from 2 to 300 m; using a siren, it can be transmitted from 1 to 2 km.

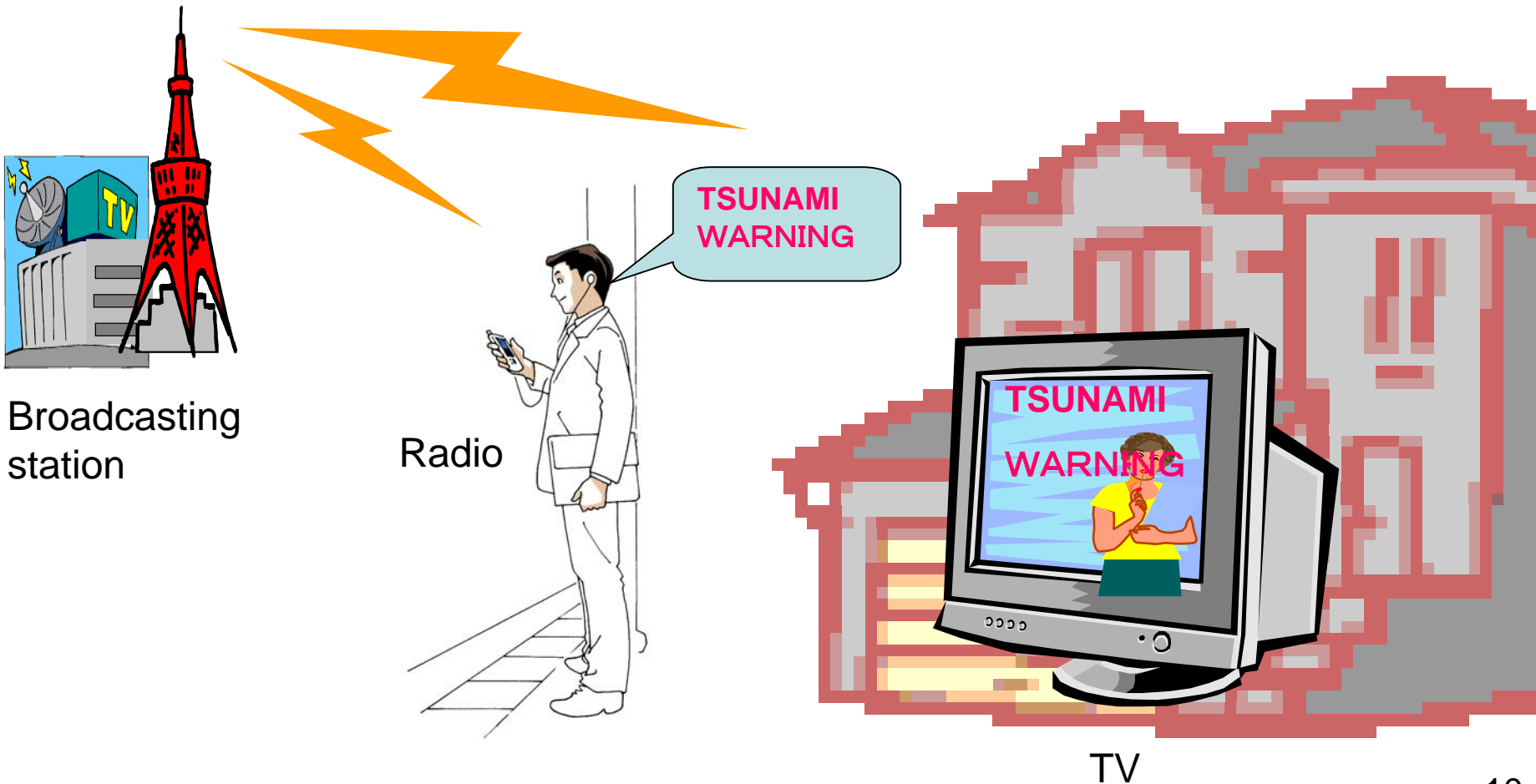
Wireless communication or satellite communication



Tsunami Warning System in Japan

(3) Broadcasting

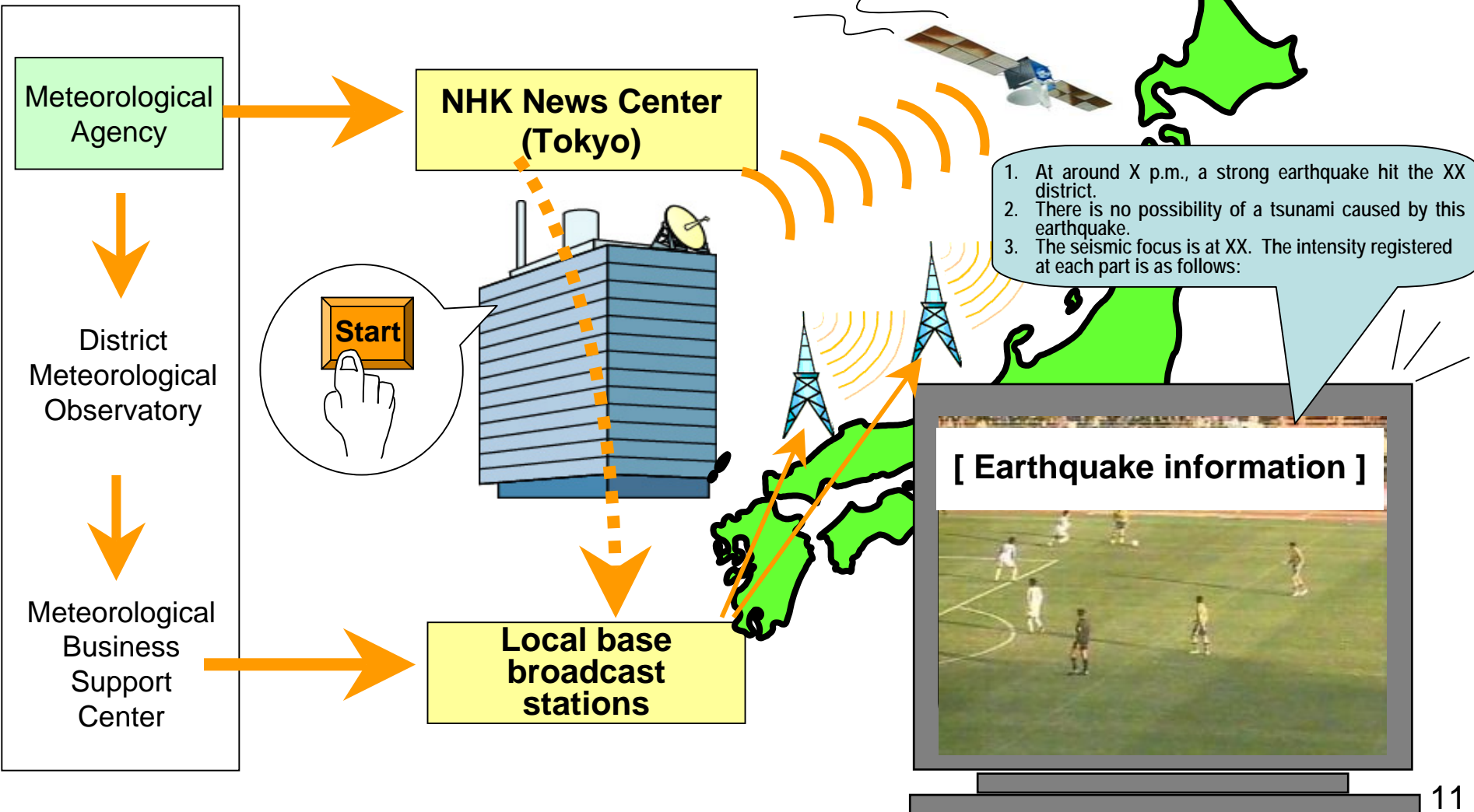
- ◆ Broadcasting is the most effective method to transmit information over a wide area
- ◆ It is important to prepare a system that can report disasters and provide notification by disaster warnings on TV or by a news bulletin on TV/radio.



Outline of Early Earthquake and Tsunami Warning Systems by NHK*

* Broadcasting Culture Research Institute in Japan

- ◆ When an earthquake occurs, the Meteorological Agency communicates the information to the NHK News Center. At the same time, the information is communicated to local base broadcast stations via the district meteorological observatory, etc.



Example of the Latest Earthquake which Occurred in Japan

◆ The Mid Niigata Prefecture Earthquake of 2004 (Saturday, October 23, 2004)

➤ Dates and times, and seismic intensities:

- 10.23 {
17:56 7 on the Japanese intensity scale (M6.8)
18:11 6plus on the Japanese intensity scale (M6.0)
18:34 6plus on the Japanese intensity scale (M6.5)
19:45 6-minus on the Japanese intensity scale (M5.7)
- 10.27 10:40 6minus on the Japanese intensity scale (M6.1)

➤ Epicenter: Chuetsu district in Niigata Prefecture

(All foci of those quakes were located 12 Km to 14 Km deep.)

Center of Earthquake

➤ Characteristics:

- There were a main shocks registering 7 on the 7-point Japanese intensity scale and many other aftershocks registering 6minus to 6plus on the Japanese intensity scale
- Devastating damage in the mountain areas and other places → Severed roads and isolated areas were brought about.
- Heavy snowfall area (as much as 1m to 2m fall of snow during the winter months)

➤ Damage:

- Human toll : 40 deaths and 4,574 injuries
- Damaged houses : 2,867 destroyed houses, 11,122 half destroyed houses and 92,609 partially destroyed houses
- Fires : 9 buildings

Status of the Provision of Communication Service in the Mid Niigata Prefecture Earthquake of 2004

◆ Immediately after the earthquake, a massive number of phone calls inquiring after people's safety, etc. were made to the quake-hit area from all over Japan (45 to 50 times the normal rate.) As a result, there was traffic congestion for about six hours shortly after the quake, which made connection through fixed-line phone and cell phone calls difficult.

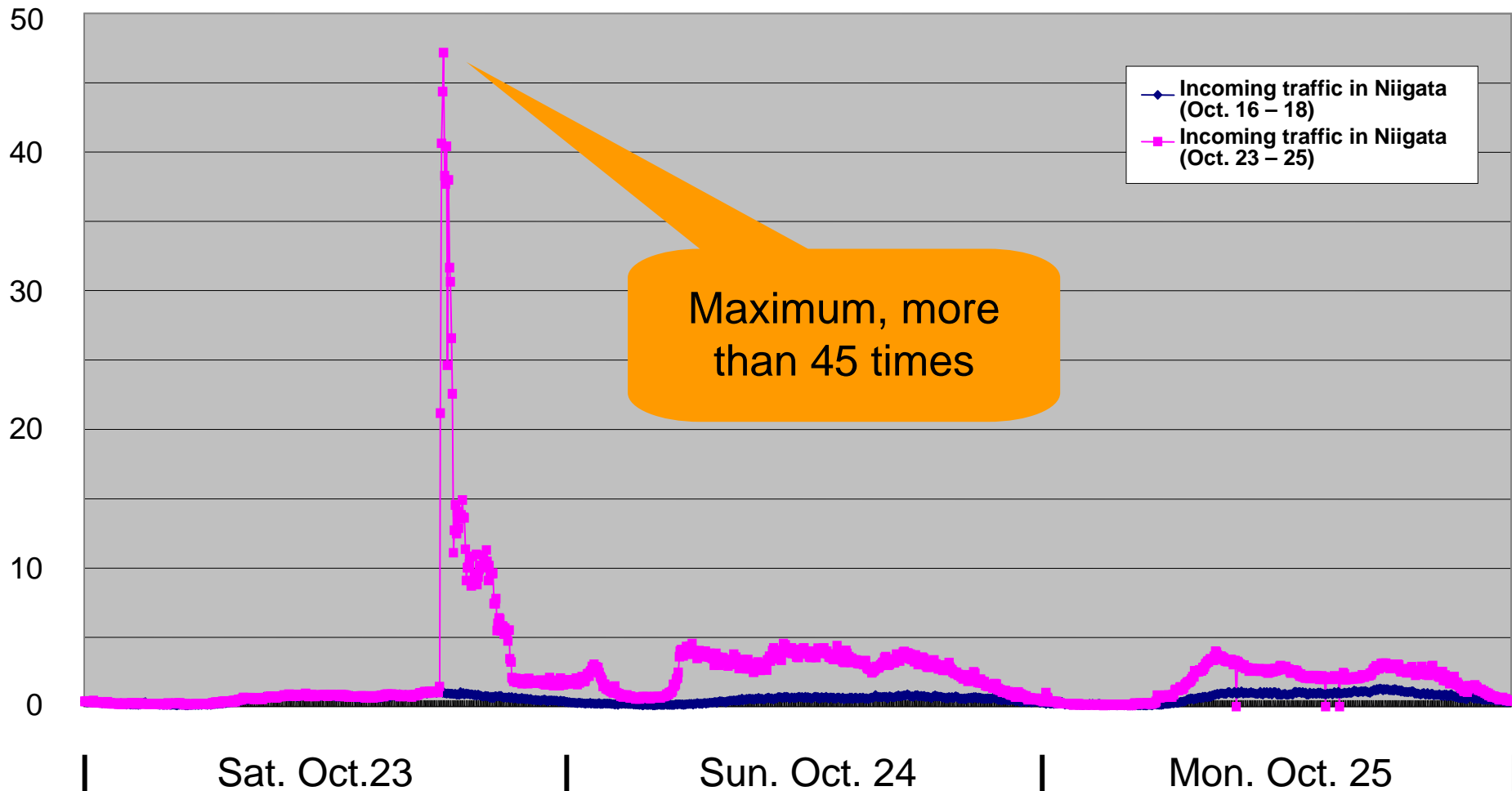


In order to maintain a network switch function as well as to ensure emergency messages (emergency number 110, etc.),

implemented communication control on transit switches nationwide and subscribers' switches in the disaster areas.

Changes in Incoming Traffic Volume in the Disaster Area from All Over Japan

Unit: times



Lessons of the Mid Niigata Prefecture Earthquake of 2004

It is possible for cellular phone base stations to operate for a certain number of hours on emergency batteries even when the supply of commercial electricity has stopped.

Normally, a mobile power source car or a motor power generating machine will be sent to a troubled base station within its operating hours for temporary recovery.

◆ However, at the time of this earthquake,

many roads become impassable due to landslides and caving, preventing this countermeasure from being taken.



(Example of the site of a soil landslide)

Problems and Measures in Telecommunications Services in Cases of Disaster (Technologically 1/2)

1

Extending the duration of emergency power supply in cellular phone base stations, etc.

- Countercheck power resource taking the time to dash off to a base station into account.
- Prolong the duration of battery life according to the degrees of importance in terms of service aspects including coverage of government agencies including a headquarters of disaster countermeasures
- Deploy and enhance portable motor power generating machines in branch establishments or branch offices

2

Measures for building and sharing disaster message dials and boards, etc.

- Build disaster message boards via portable Internet
- Develop, in collaboration with telecommunications carriers, the environment in which the people can have freely access to registered messages on disaster message boards for confirmation, regardless of telecommunications carriers, with just a single touch of a button.
- Establish days for use of disaster message dials or boards for experience and continue to make an effort to let more people know of such dial or boards.

Problems and Measures in Telecommunications Services in Cases of Disaster (Technically 2/2)

- 3** Review, etc. the methods for communications controls on voice and packet on a separate basis.
 - Introduce functions for enabling independent communications control on voice and packet on a separate basis.
 - Check and review the methods for controlling communications including the control rate of voice calls.
- 4** Extend services for charging cellular phone terminals and the durations of battery life of those terminals.
 - Provide services for charging batteries of cellular phone terminals through visiting by charging service cars and loans of chargers.
 - Widely disseminate uses of charging batteries or manual chargers which are dedicated for cellular phone terminals and various charging methods to the general public.
 - Application of solar batteries, fuel batteries, etc. used to prolong the duration of battery life of cellular phone terminals per se.
- 5** Future problems with IP telephony
 - Comparison between IP telephony and circuit switching telephones and technological consideration of measures, etc. for traffic congestion in connection with IP telephony in the event of a disaster.

Problems and Measures in Telecommunications Services in Cases of Disaster (In terms of systems and frameworks 1/2)

1 Establish a system for communicating with related organizations and bodies

- Establish a system, under normal circumstances, for sharing information and communicating with municipalities, road administrators and lifeline-related organizations (electric companies, etc.)
- Check and review internal regulations on responses to disasters, etc. in connection with the system for communicating with related organizations in a company.

2 Ensure and widely disseminate various means of communications (installation of satellite-based cellular phones, special pay phones, etc. and use of e-mail) in a disaster.

- Ensure various communications means including satellite-based cellular phones, etc. for disasters, make efforts to let the residents widely know of those communications means, and consider publicity in relation to communication tools (places of pay phones, etc.) available to the residents.
- Utilize e-mail as a communication tool for inquiring after someone's safety, etc. when communication traffic is congested (voice calls) in a time of disaster.

Problems and Measures in Telecommunications Services in Cases of Disaster (In terms of systems and frameworks 2/2)

3

Temporary recovery by mobile base stations or installation of alternative entrance lines

- Ensure installation sites and installation facilities, etc. necessary for maintenance work (refueling of mobile power source cars, etc.)
- Structure for cooperate with the municipality of a disaster area, etc. in connection with the provision of installation sites, supply of electricity, etc.

4

Building a system relating to a framework for sharing disaster information and promptly communicating with governmental bodies.

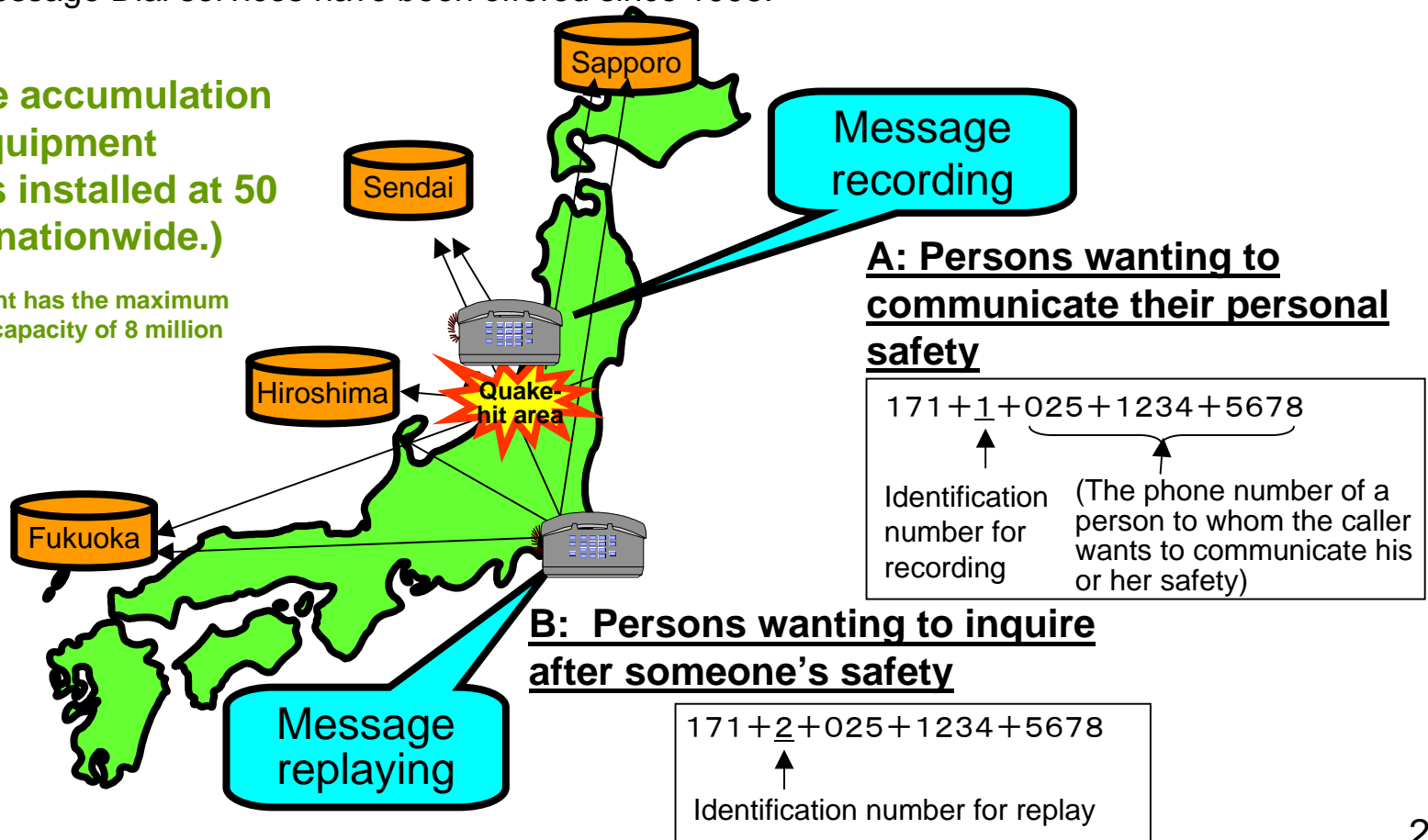
- Build a system for enabling to share all information about landslide or flood and recovery situation of roads, electrical power, etc. which are necessary for prompt work for temporary recovery.
- Build a system for utilizing the Internet in connection with report on damage and repair situations of telecommunications facilities, status of communication traffic congestion, etc. to governmental organizations.

Use of Disaster Message Dial (Voice Message) In the Mid Niigata Prefecture Earthquake of 2004

- ◆ Disaster Message Dial service was started (at 18:15) nineteen minutes after the earthquake occurred at 17:56 on October 23, 2004. There were approximately 354,600 accesses by 15:00 on December 20, at which the service was closed. (About 112,700 messages were recorded and about 241,900 messages were replayed.)
- ◆ Disaster Message Dial services have been offered since 1998.

Message accumulation equipment
(which is installed at 50 sites nationwide.)

* The equipment has the maximum accumulation capacity of 8 million messages.



High Diffusion Rate of Portable Internet

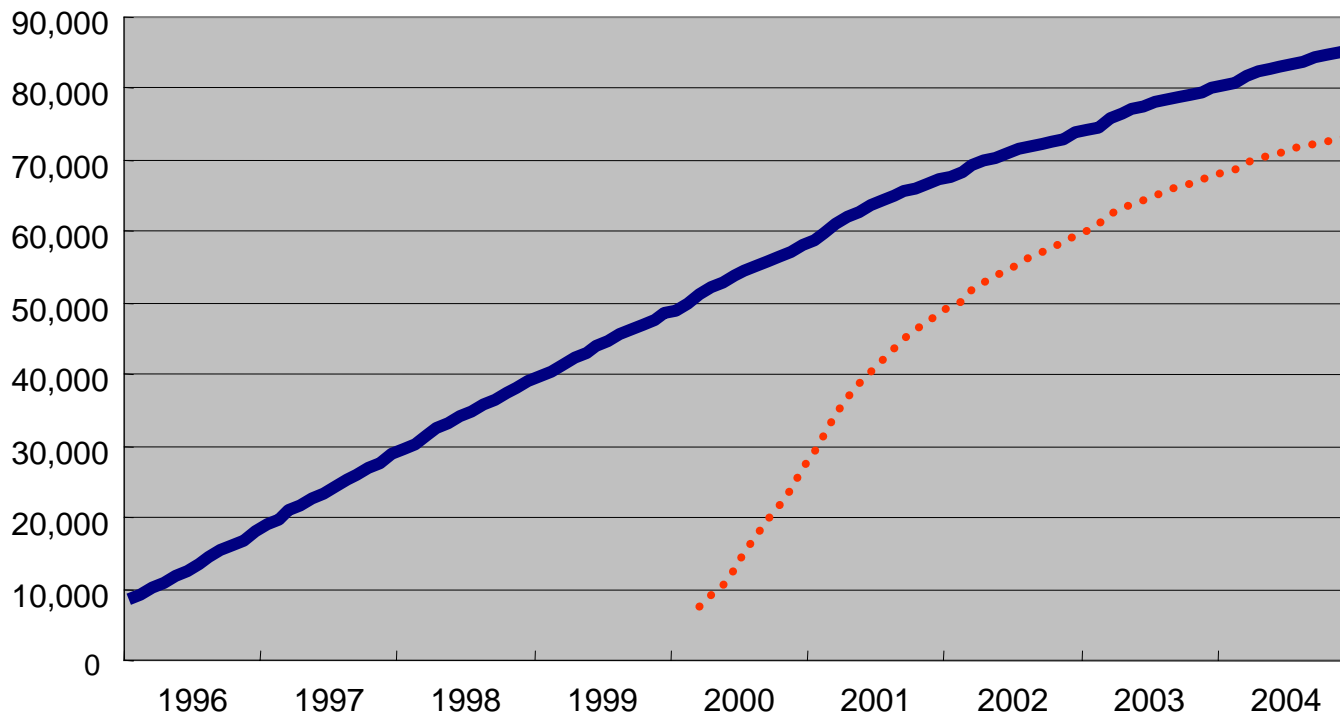
◆ Japan's cellular phone subscribers totaled 85,483,800 as of the end of December 2004, of which 73,554,600 persons (86%) used portable Internet.

◆ The diffusion rate of cellular phones to Japan's total population, approximately 127.61 million, is 67%

(Reference) The number of fixed phone contracts is 60,218,496.

Note: The figures are as of the end of December, 2004, except that for contracts for fixed phone subscription which is as of the end of March 2004.

Unit: 1,000 persons



Cellular phones
85,483,800 persons
(as of the end of Dec.
2004)

Portable Internet
73,554,600 persons
(as of the end of
Dec. 2004)

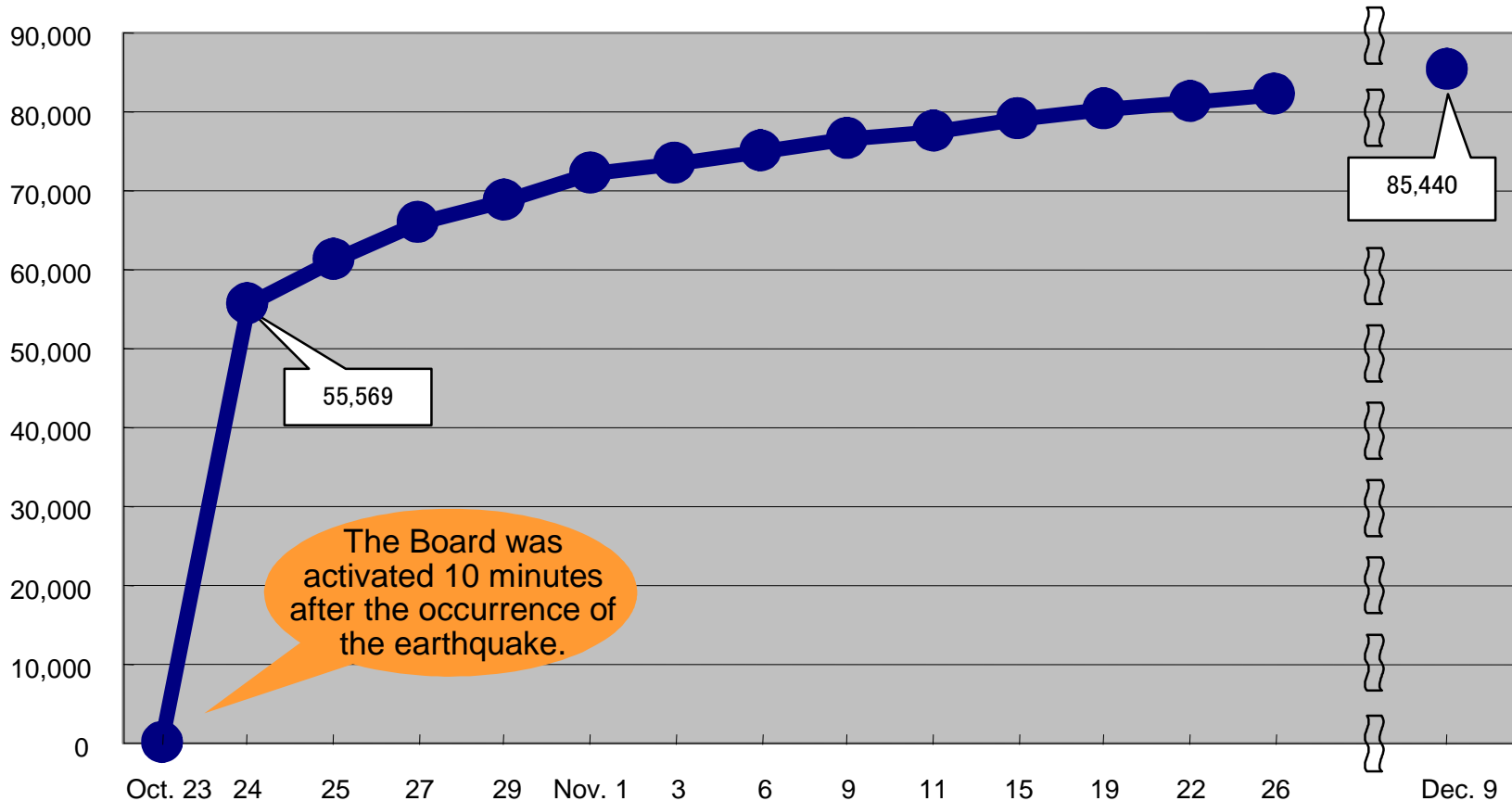
Number of cellular phone
subscribers

Number of portable
Internet subscribers

Use of Disaster Message Board through Portable Internet In the Mid Niigata Prefecture Earthquake of 2004

- ◆ The Disaster Message Board (electronic bulletin board) service is to be activated in the event of a major calamity such as a high-magnitude earthquake. The Disaster Message board will enable portable internet subscribers within the disaster area to post messages in order to notify family and friends of their personal safety and whereabouts.
- ◆ Disaster Message Board services have been launched since 2004. (At present, two carriers provide the service.)
- ◆ In the case of Mid Niigata Prefecture Earthquake, Disaster Message Board service was started (at 18:06) ten minutes after the earthquake occurred at 17:56 on October 23, 2004. Approximately 85,400 persons registered their messages by 15:00, on December 9, when the service was closed.

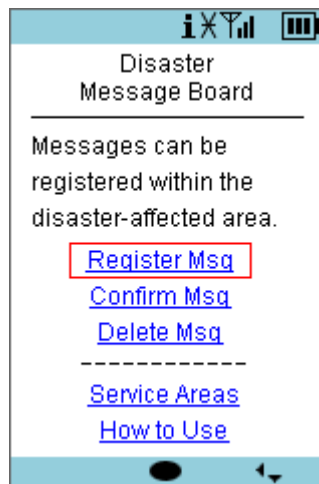
Unit: Persons



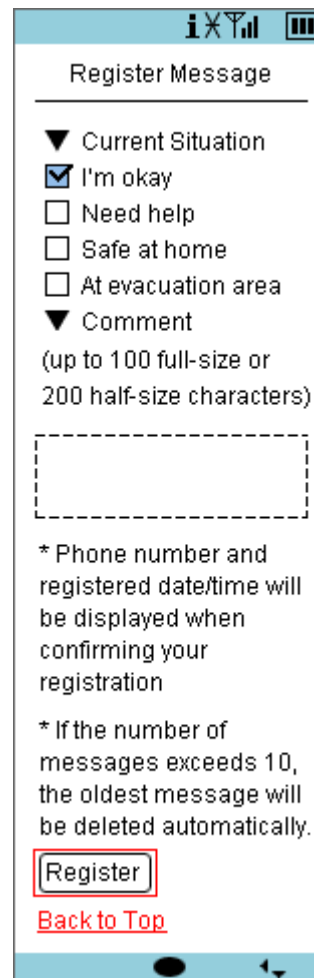
Disaster Message Board: Registration (Posting)



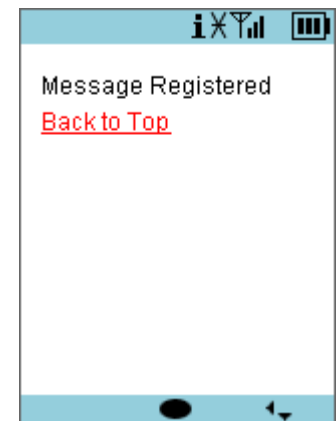
1. Disaster Message Board Select "Register Message"



2. Select or type in message and press register



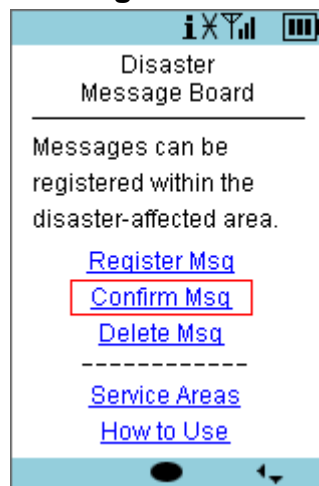
3. Message registration confirmed



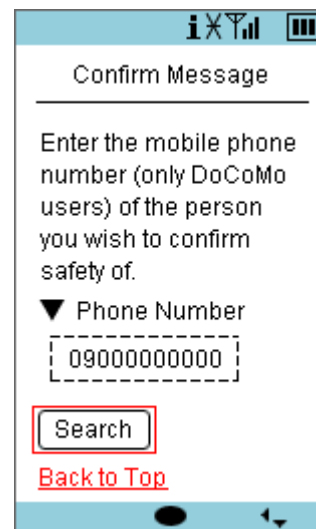
Disaster Message Board: Confirmation (Read Messages)



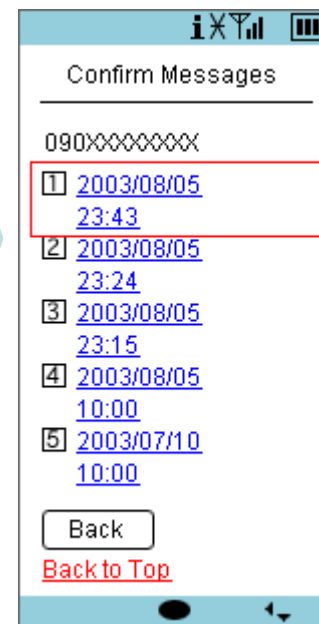
1. Disaster Message Board
Select "Confirm Messages"



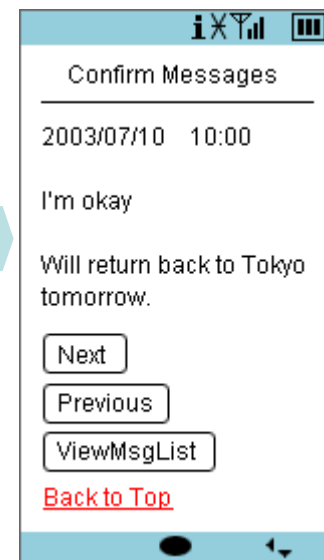
2. Type in phone number and press search



3. Search results appear



4. Message shown on screen



Summary

For “Securing means of communication ” and
“Quick recovery of damaged telecommunications facilities”
in disasters including earthquake....

- ◆ Establish and ensure viability of various, widely disseminated means of communication. (fixed, mobile, satellite, broadcast, etc)
- ◆ Importance of Disaster Message Boards for checking on family or friends.
(promotion of building and sharing the system, necessity of PR)
- ◆ Necessity of close cooperation, in disaster situations and otherwise, among government and infrastructure bodies including telecommunications companies.



Thank you