

KDDI Initiatives after the Great East Japan Earthquake

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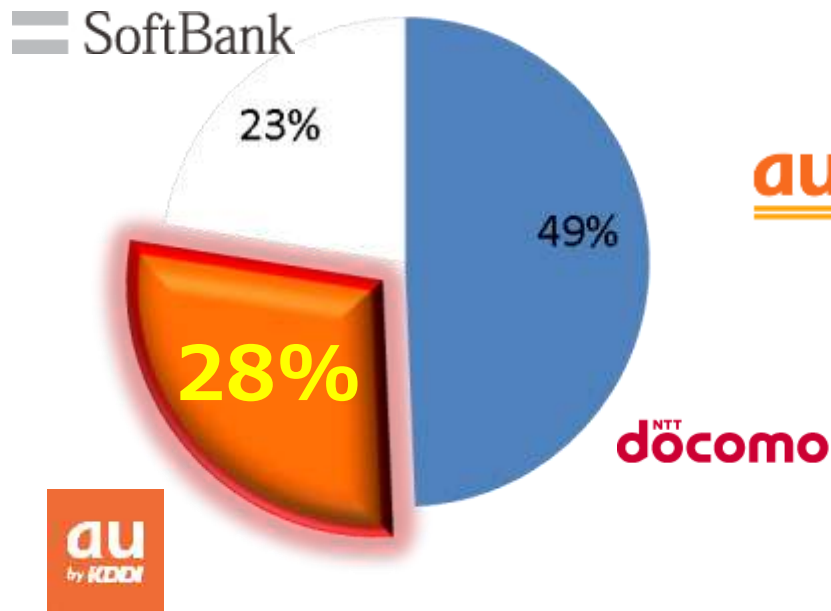
KDDI Corporation

16 March 2012

About KDDI

Mobile & Fixed line Business

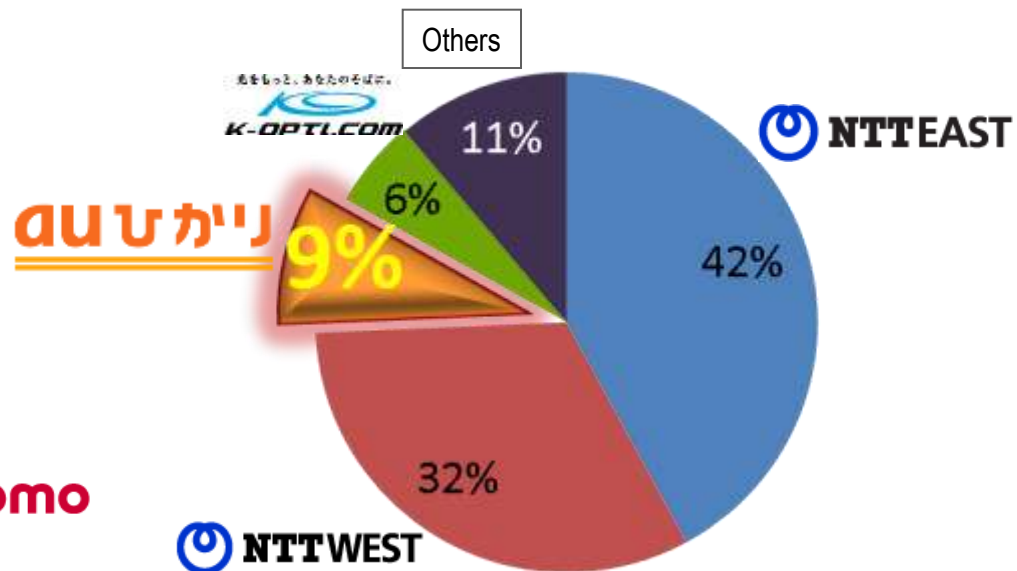
Mobile Market Share Note1



Subs: **35M** Note 1

Revenue: **US \$31,157M** Note 2

FTTH Market Share Note2



Subs: **2M** Note 2

Revenue: **US \$1,202M** Note 2

Note 1: As of **March 2012** Note 2: As of March 31, 2011

The U.S. dollar is the value converted from the Japanese yen., for convenience only, at the rate of ¥83.15 = U.S. \$1 on March 31, 2011.

Today's Presentation

- 1. The extent of the damage**
- 2. Recovery/Reconstruction Activities**
- 3. Traffic conditions**
- 4. The gap between planning and reality**
- 5. Lessons from the Great East Japan Earthquake and future measures**

11 March 14:46

**An earthquake strikes off the coast
of Northeastern Japan**

The Extent of the Damage

- Submarine cable landing stations damaged by the tsunami
- Highways were destroyed and fiber optic cables were cut along a 15 km stretch



Sendai East Submarine Cable Landing Station



Transmission line: Tohoku Expressway

Transmission line: Joban Expressway

The Extent of the Damage

- au base stations were caught in the tsunami and completely annihilated.
- au shops were also destroyed, the hubs for helping customers in the area were lost.



au Kamaishi Ryogoku BS



au Yamada-Orikasa BS

**No. of downed
base stations
1,933
(6 Pref. of
Tohoku)**



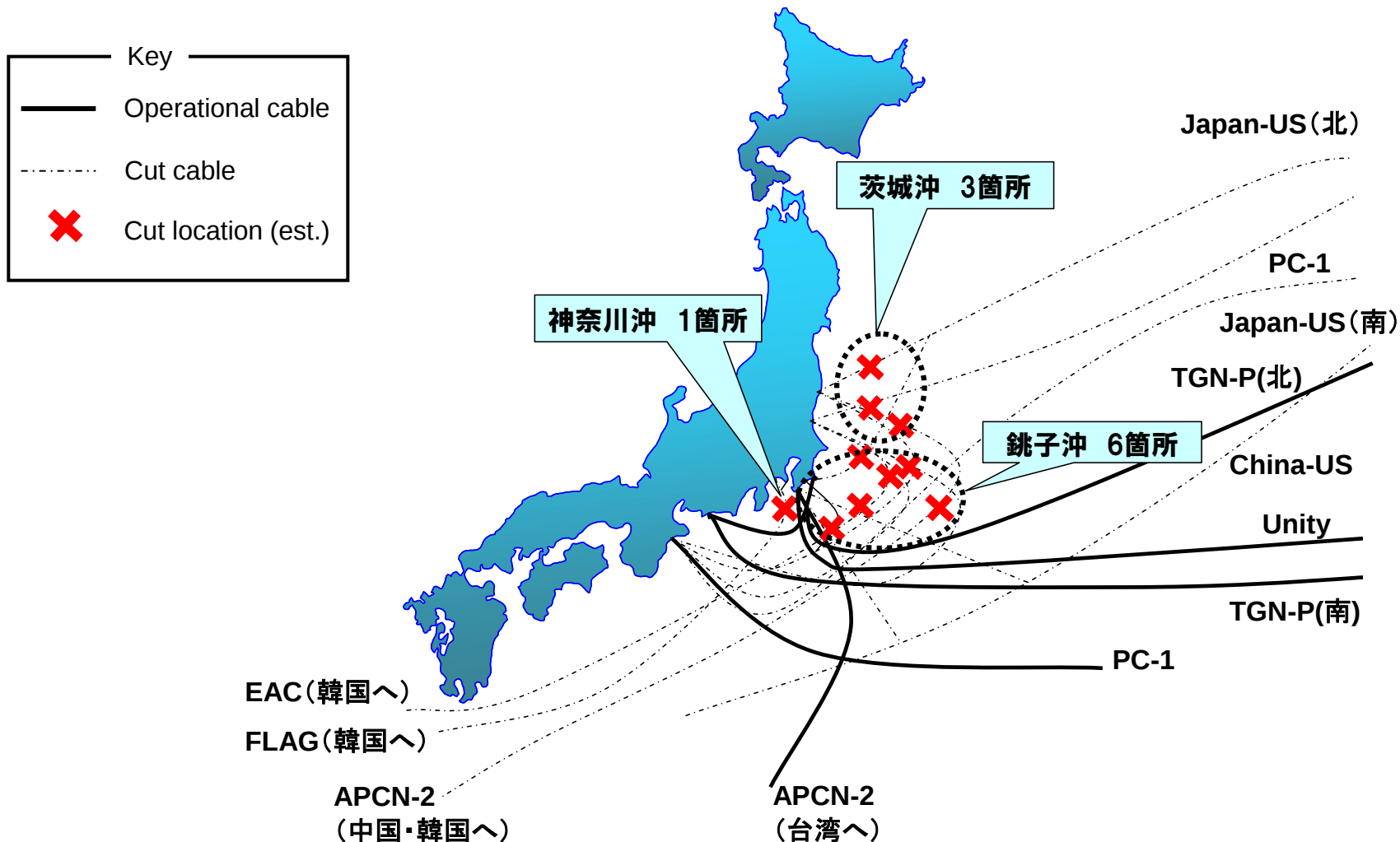
au Naruse Ohama BS



au shop in Kamaishi

The Extent of the Damage

- Damage to submarine cables affected international dedicated lines, international IP-VPN, international subscriber services.



Effects on Service

- Up to 390,000 subscriber lines were affected by the earthquake
- Up to 14,000 corporate customer lines were affected

Individual customers

	No. of affected lines (max figure)
au Hikari (FTTH)	119,000
Metal-plus	141,000
au one net (ADSL)	130,000
Total	390,000

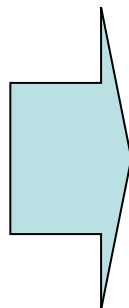
Corporate customers

	No. of affected lines (max figure)
Dedicated VPN lines	13,642
Internet	315

Recovery/Reconstruction Activities

Recovery and Reconstruction of Optical Cables

- Cut optical cables along highways were found and repaired non-stop for two straight days (about 20 km worth) to hasten the recovery.
- Submarine cable traffic was rerouted on Mar. 15 in order to restore international service.



Transmission lines embedded in the highway were damaged (*)

* From NEXCO East website

Transmission lines being repaired

Deploying Mobile Base Stations

Within 36 hours **after** the earthquake, the first mobile base station was deployed. All mobile base stations from around the country were set up in 70 locations in the disaster area.



Mobile base station

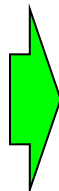
Restoring Base Stations

Restoration of a base station: Naruse Ohama Base Station

The damaged base station and debris were removed, and new equipment was installed



Damaged base station



Removing debris



Installing radio and power equipment



Satellite antenna installed -> service restored

Mobile Phone Lending Service

Mobile phone lending and free charging services were provided in the evacuation areas.

- au mobile phones: 1,290
- Satellite phones (Iridium/Inmarsat): 48



**Mobile phone lending service
(Kessenuma City, Miyagi Pref.)**



**Free charging service
(Onagawa, Miyagi Pref.)**

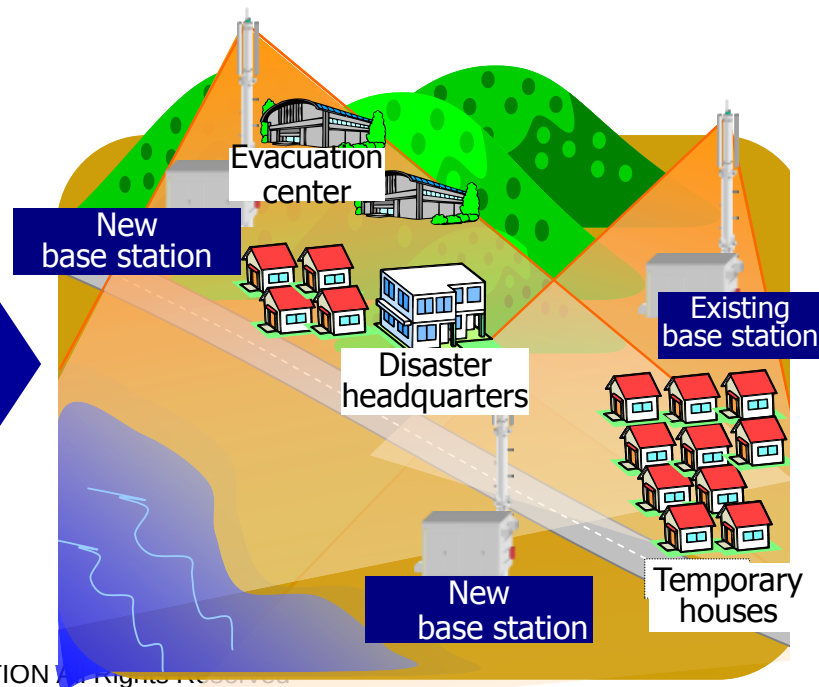
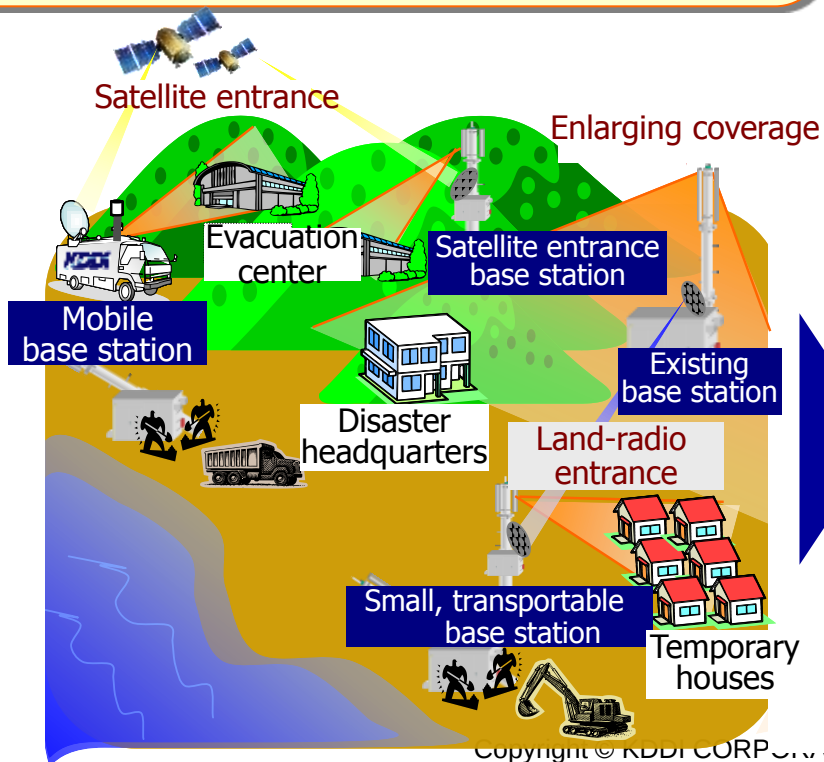
Recovery of au Coverage of Mobile Base Stations

Temporary Measures

- Enlarging the coverage area utilizing existing base stations
- Setting up base stations with satellite radio entrance line equipment
- Installation of mobile base stations equipped with satellite radio entrance
- Installation of small, transportable base stations equipped with land radio entrance

Final Measures

Recovery of the coverage areas with new base stations

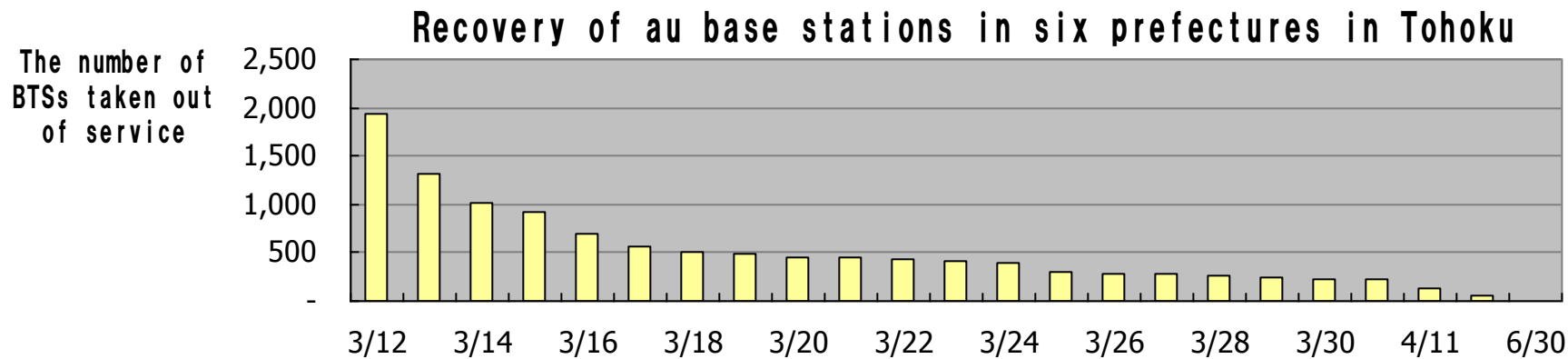


Damaged Base Stations of Mobile Service

The mobile service coverage had almost fully recovered by the end of June, with the exception of the restricted area around the Fukushima I Nuclear Power Plant, utilizing satellite radio and land radio entrance line equipment.

	As of March 12 (maximum impact)	As of June 30
The number of BTSs taken out of service (*)	1,933 (Amongst 3,004 stations)	0

(*) In six prefectures in Tohoku.



New Base Stations (evacuation zone, temporary housing areas)

- After the quake life in temporary housing or evacuation sites became inevitable, and the distribution of the population changed. We changed the coverage area based on information from local governments.

Progress as of end of March 2012

Area		New base stations (target)
Temp housing	Conducted signal survey on 1,891 locations (600 require intervention)	89 new stations (92)
Evacuation sites		26 new stations (27)
Life line	Iwate Pref. area (National road 106, 107)	18 new stations (21)
	Fukushima area (National road 115, 49, 289, etc.)	13 new stations (27)



Improvements at temp housing area

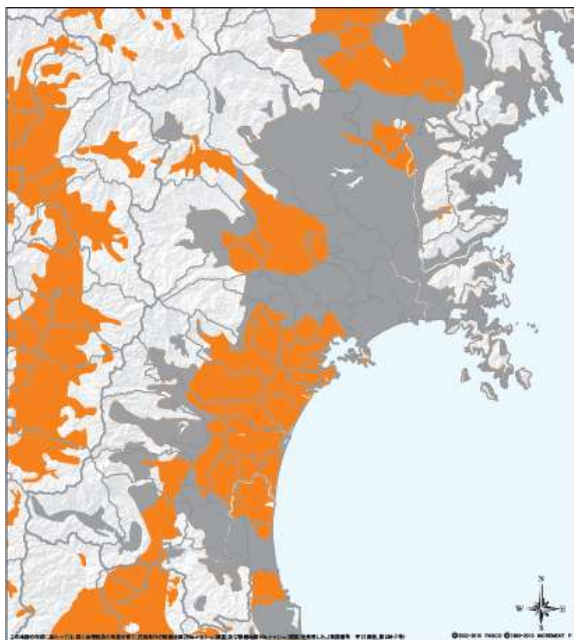
* Shimoyahagi Elementary School, Rikuzentakata City



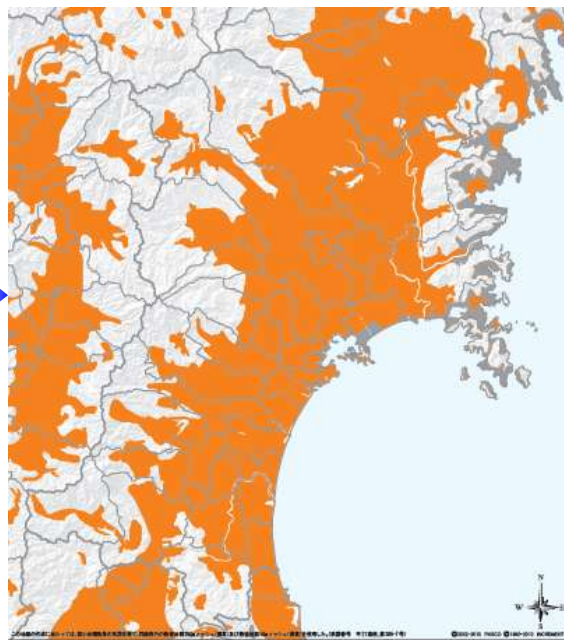
Improving reception using raised platform near evacuation site

* Juvenile housing Yamada Cho, Iwate Pref.

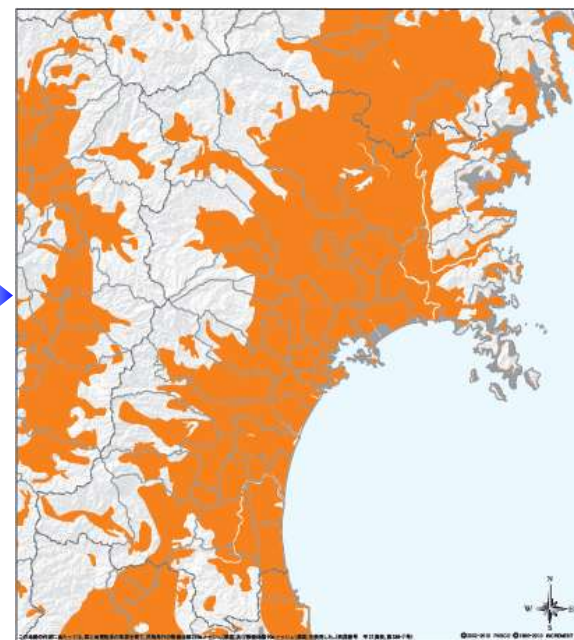
Coverage Area **Recovery** (Miyagi Prefecture)



Immediately after
the earthquake
(Mar. 14)



On April 5



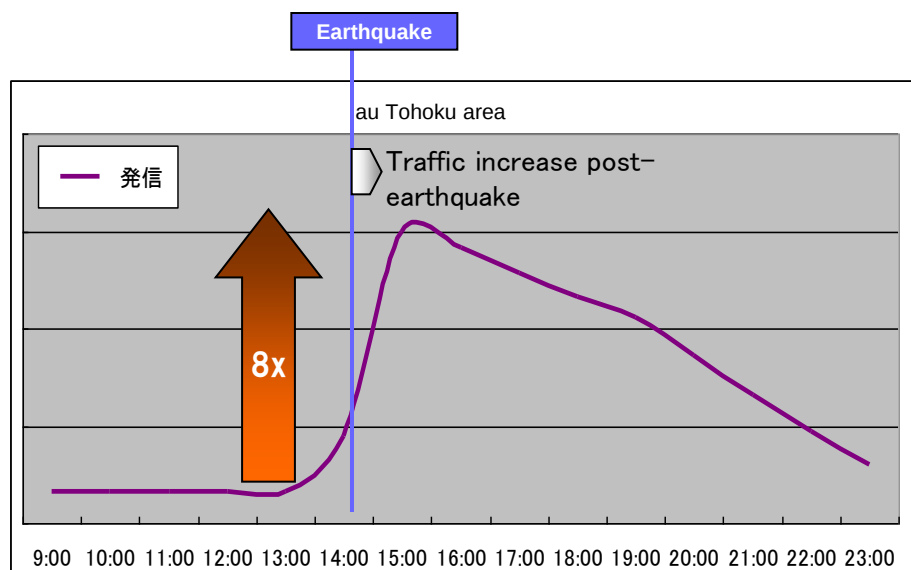
After recovery phase
(end of Apr.)

Traffic Conditions

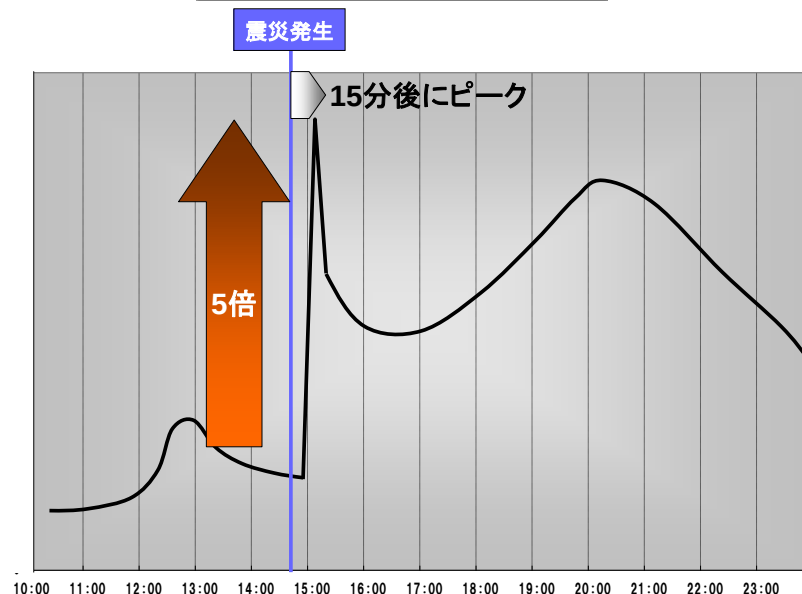
Post-earthquake Traffic Conditions

- There was a concentration of traffic immediately after the earthquake as people sought to call and confirm their safety, and voice traffic increased to about 8 times the normal levels. **(This could have been an assumed 40 to 50 times higher originations occurred.)**
- Base stations and switches had a maximum of 95% restriction on outgoing calls (50% on incoming calls)
- Because of the restrictions on voice communications, people used email instead. Email traffic was 5 times the normal level.

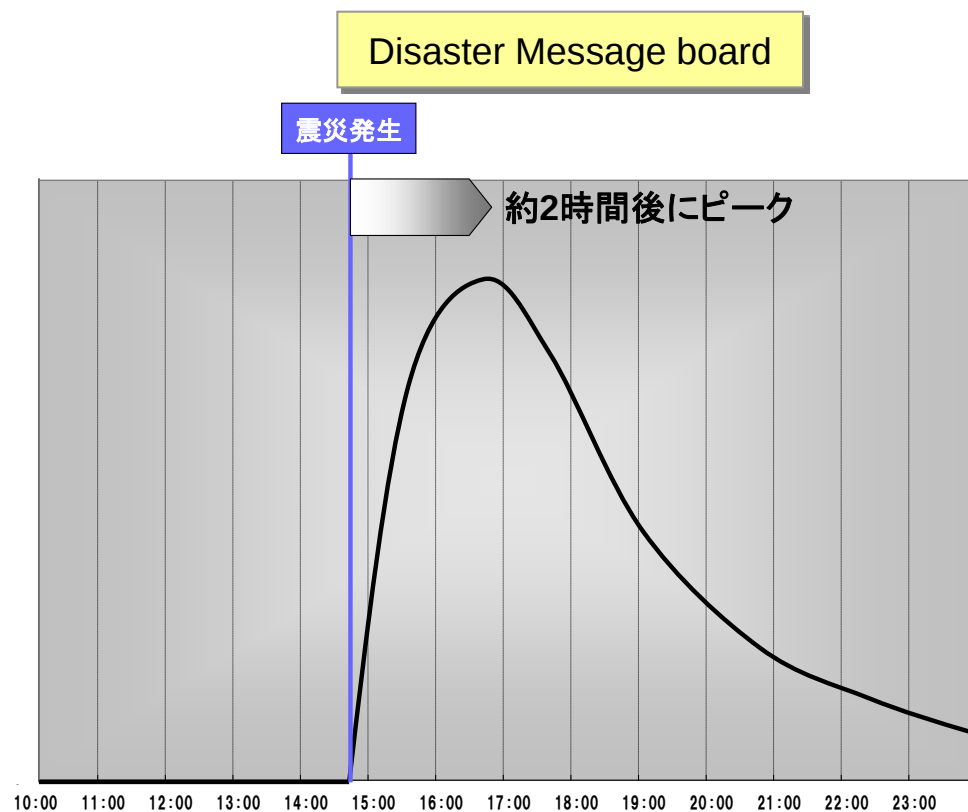
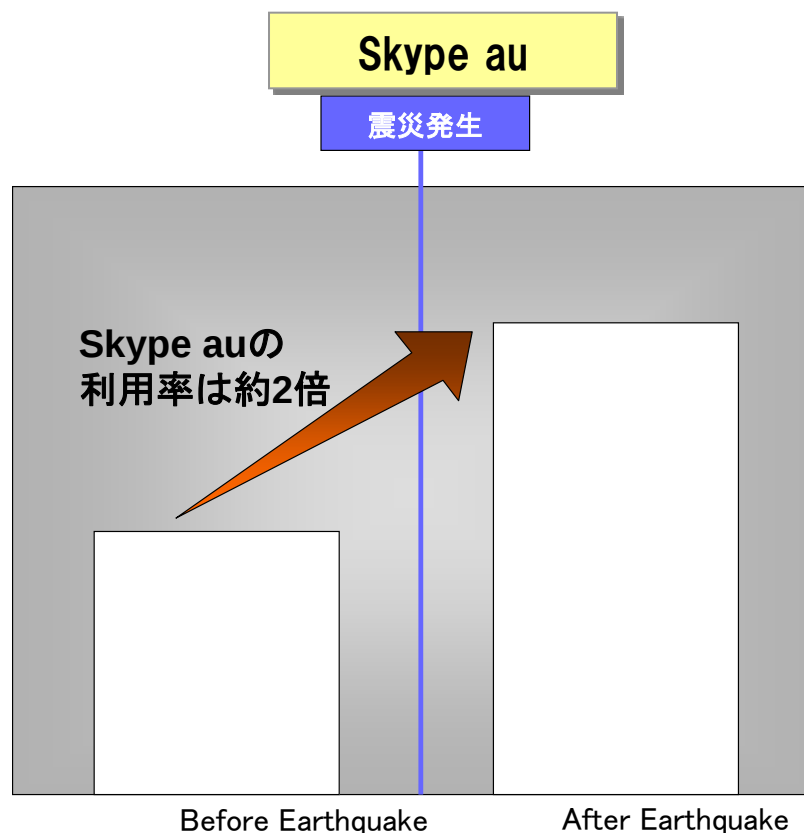
Voice (Tohoku area)



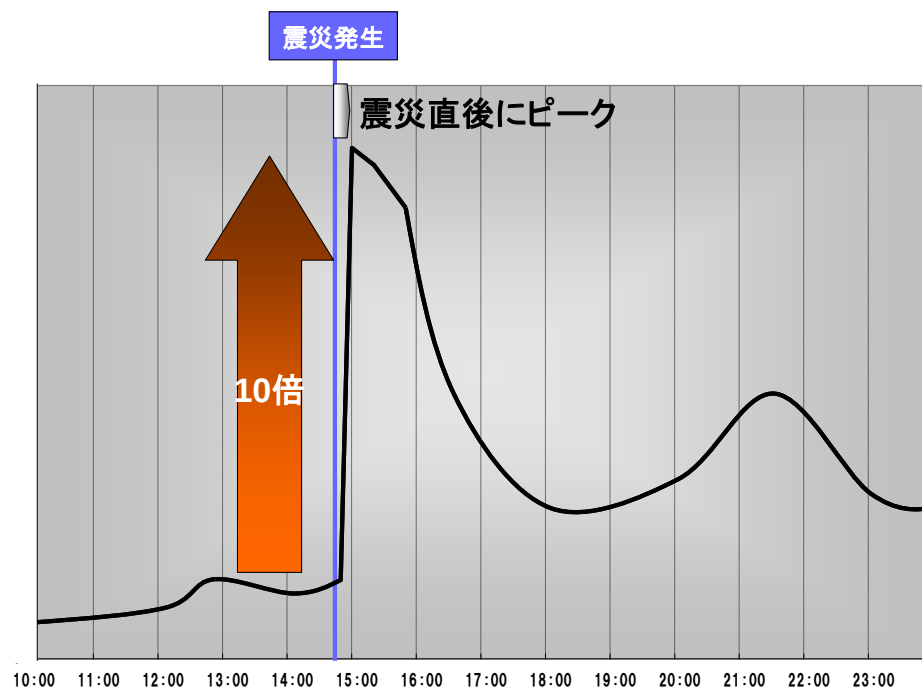
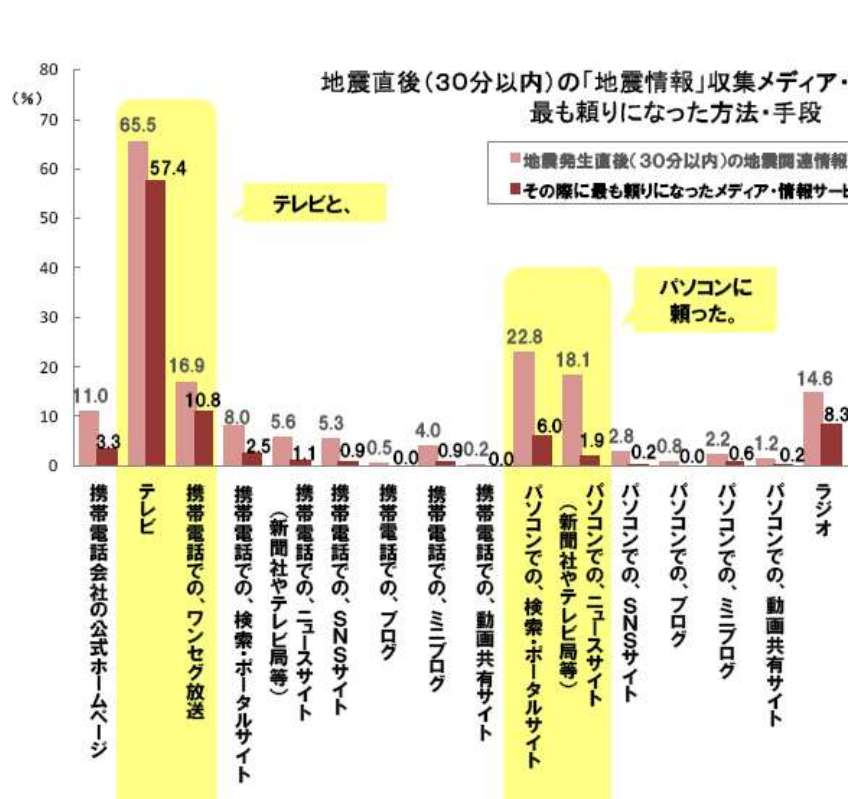
Email (nationwide)



- Because of restrictions on voice calls and **congestion on** email, there was an increased use of Internet voice services, such as Skype, and disaster message boards.
- Skype au calls were double their normal levels.
- SNS (mixi, Twitter) use was also about double normal levels.
- Disaster message board activity peaked about two hours after the earthquake.



- Information **gathered** immediately after the earthquake primarily from “1seg”
- KDDI also saw a 10 fold increase in 1seg traffic



The gap between planning and reality

Assumptions

Actual damage

Network Station facilities

- Earthquake preparedness:
Based on a 7 on the
Seismic Intensity Scale
- Tsunami preparedness:
Flood walls installed, floor
height raised, etc.

- The vibrations from the earthquake had no effect on stations
- The tsunami was larger than our assumptions and had wide spread impact.

Switches and transmission equipment

- Redundancy:
Redundant switches and
transmission equipment,
and n+1 redundancy
architecture should be
used.

- There were no problems switching to the redundant switches and transmission equipment
- The earthquake affected a much wider area than expected, and line equipment was damaged in many places.

Assumptions

Backup power

- The necessary backup power equipment was based on the different needs of each station.

Example

- Central office:
 - Backup power supply for more than 24 hours
- Base station:
 - Battery At least 3 hours, in principle

Traffic Control

- The manual for imposing and releasing restrictions was created for a level 5+ earthquake.

Actual damage

- Batteries and backup power generation specifications were sufficient in terms of duration of power generation, etc.
- The effects on equipment operation were as follows:
 - Central office: No effect on equipment operation
 - Base stations etc. Black out conditions lasted longer than expected, and a great number of stations were affected.

- We did not expect the continuously high traffic levels seen in the greater East Japan area.

Lessons learned from the Great East Japan Earthquake

The importance of “connecting”

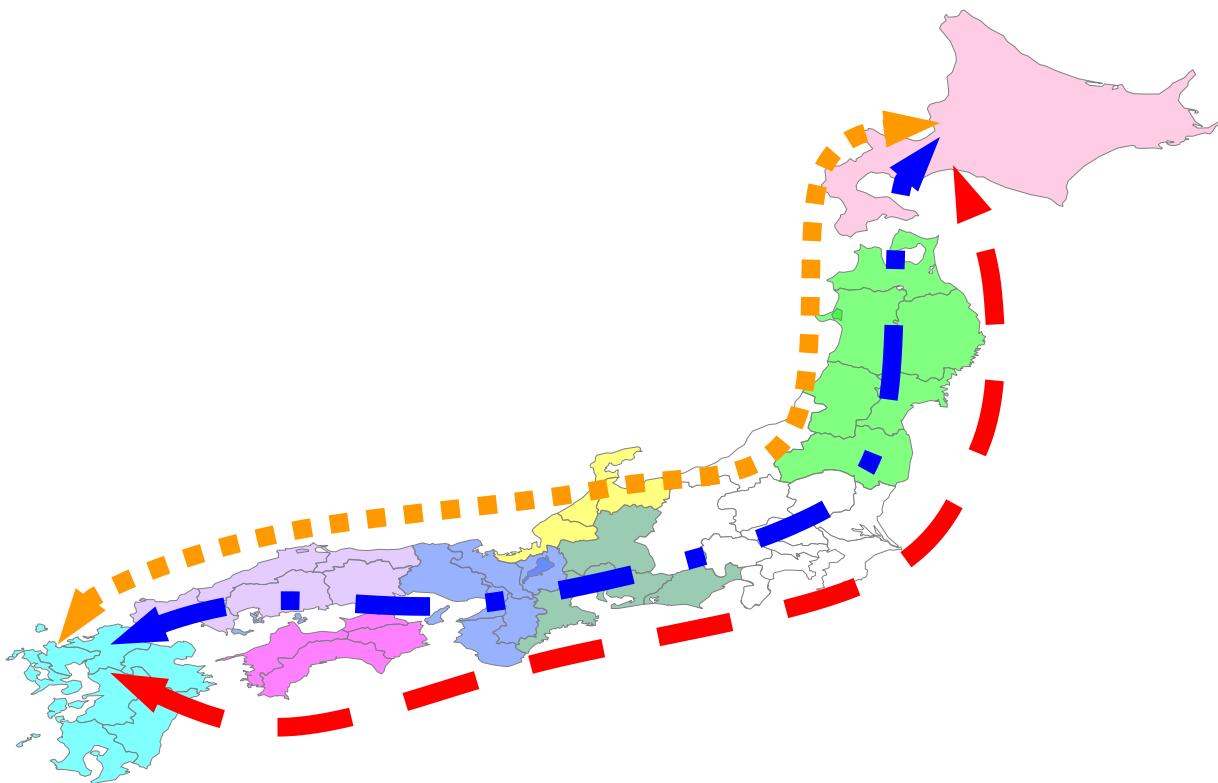
The necessity of a speedy response

Amend disaster assumptions

Respond to customer needs

Improving the Reliability of Network Infrastructure

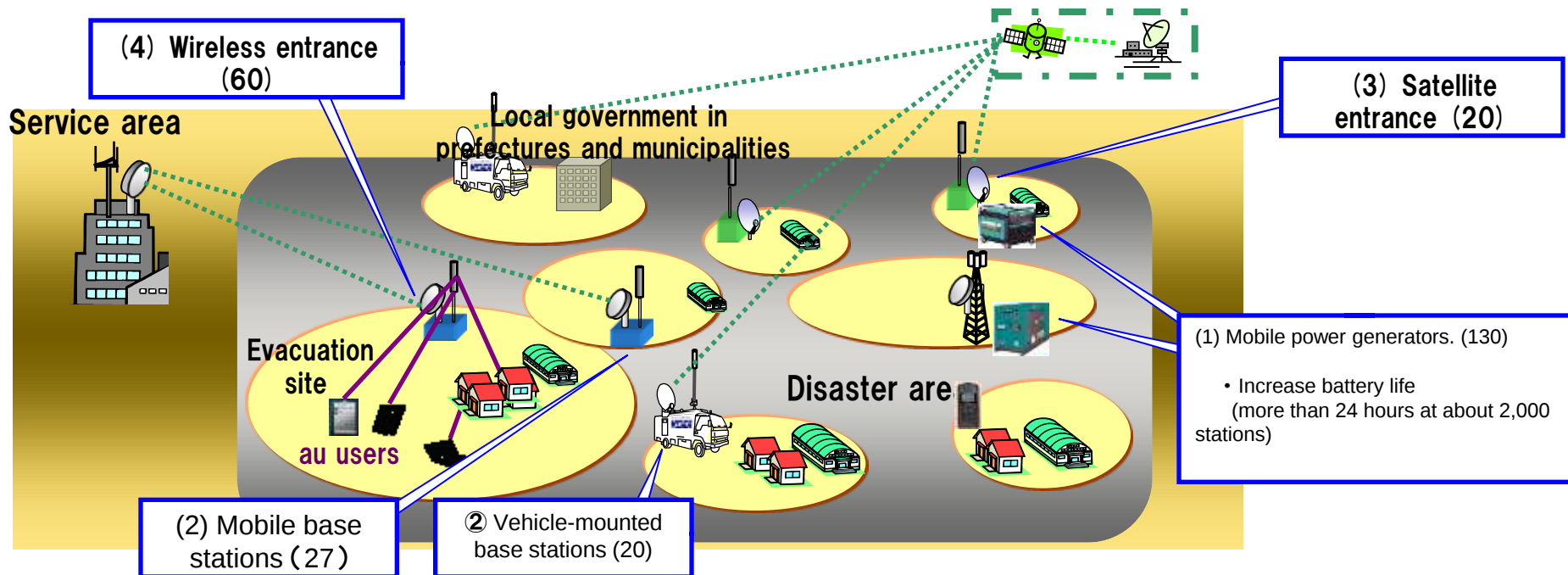
- Multiplied trunk transmission routes (more than 3 routes) in the event of a disaster
- Having redundancy of important stations
- Establish two **control** stations (Tokyo, Osaka) for continuity of operations



Base Station Measures

• To secure communications in important areas in the event of a disaster and to effect a speedy recovery in disaster stricken areas, we will implement the following measures for base stations.

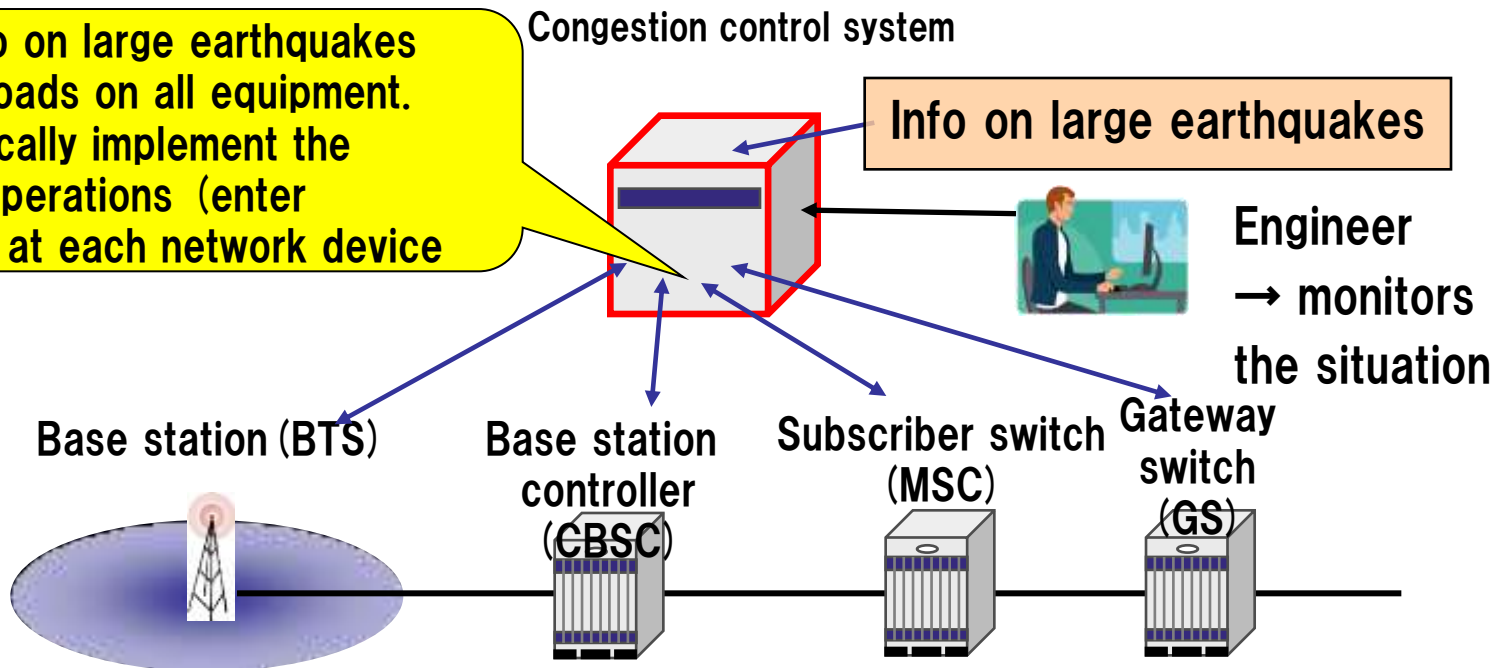
- (1) Strengthen base-station power supplies (Increase number of mobile power supplies, increase battery life, use solar batteries, etc.)
- (2) Increase number of vehicle-mounted base stations, distribute mobile base stations to each region
- (3) Secure the lines necessary for a base station with a satellite entrance (IP-based satellite lines)
- (4) Distribute equipment for wireless entrance



Automated **Congestion** Control Systems

- Currently considering the introduction of an automated **Congestion** control system, to confirm the status of all network systems
- In the short term, make it possible to implement and release restrictions in a short time to speed network recovery.

• Collect info on large earthquakes and traffic loads on all equipment.
→ Automatically implement the necessary operations (enter commands) at each network device

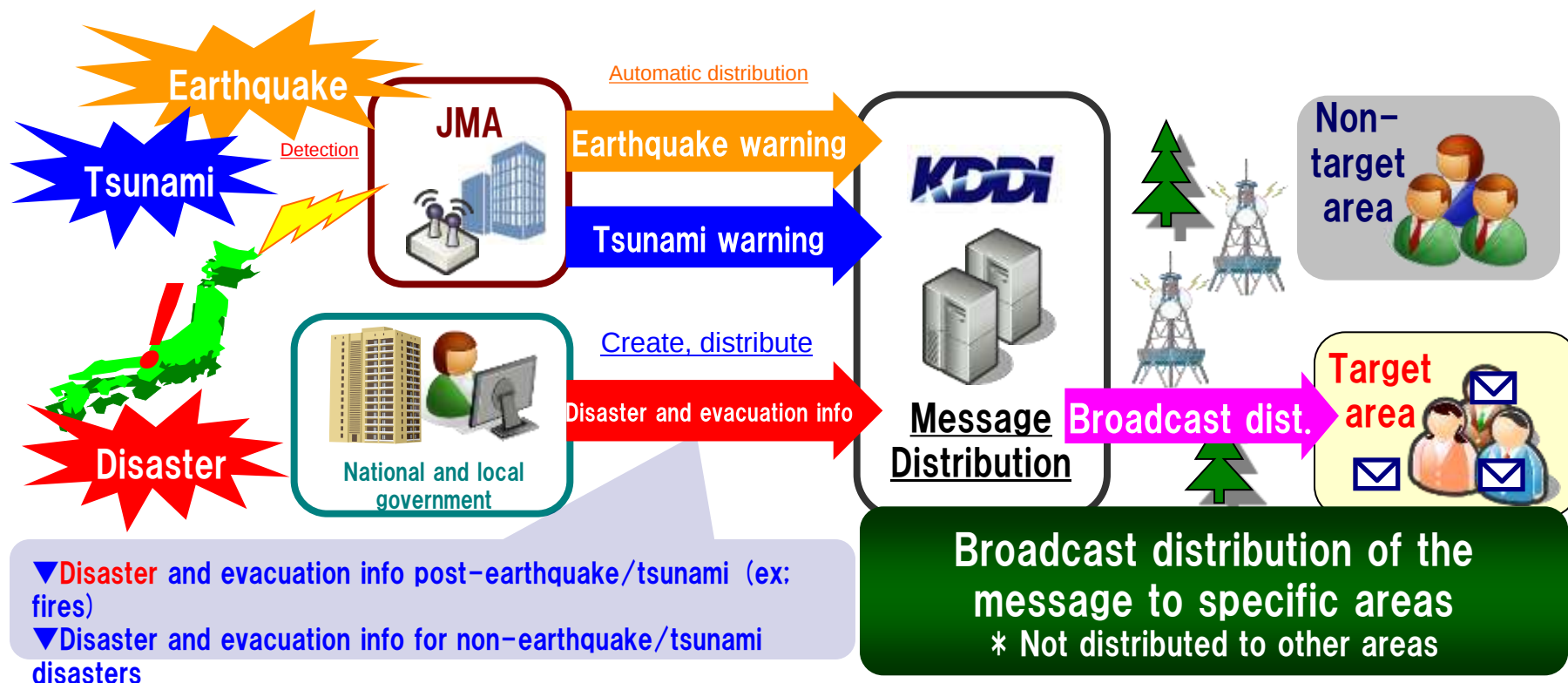


Responding to customer needs

Emergency **Rapid** Mail

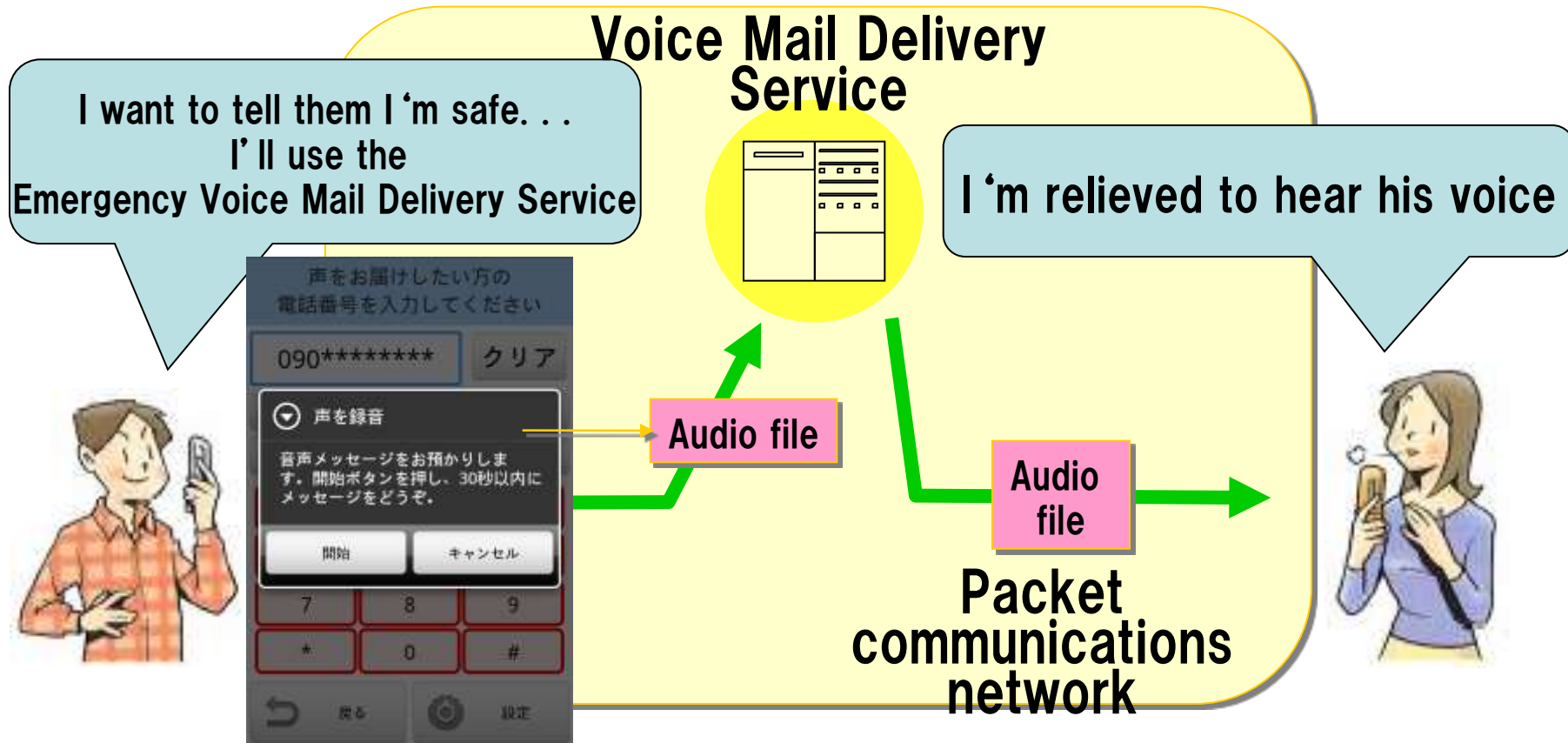
A service that broadcasts messages to a specific area

- Distributes emergency earthquake warning and tsunami warning messages from the Japan Meteorological Agency (JMA) (planned for release at the end of March 2012)
- Distribution of disaster/evacuation information from national and local government agencies (service began on January 31, 2012)



Emergency Voice Mail Delivery Service

To allow people to contact family and friends via voice mail, we are planning to release in the spring of 2012 the Emergency Voice Mail Delivery Service, which uses packet communications that are relatively easy to transmit.



Record your voice on a smartphone and send it via packet communications

■ The au Disaster Control app for Android au smartphones

New au Disaster Control app released to integrate Disaster Message Board, Emergency Warning Mail, and other services that enable quick evacuation and confirmation of safety in the event of a large-scale disaster

Service launched on December 23, 2011

* for phones produced in winter 2011/spring 2012, other models will be upgraded separately



■ Other

Disaster Message Board	In the event of a large-scale disaster, residents of the disaster area can record information about their situation, and this can be confirmed via Ezweb or on the Internet from anywhere in the country. (Smartphone compatible since March 16, 2011)
LISMO WAVE	Users can listen to FM radio broadcasts in the disaster area using Internet radio. (Useful for learning about the disaster situation) * Free since March 15, 2011, right after the Great East Japan Earthquake
Disaster Navi	Contains presets for evacuation sites nationwide. The users location is known even if phone calls do not go through. (for FP)
Mi-Look	A pedometer for outside use, and a safety sensor for inside use, regularly notifies a pre-registered person about daily activity levels and movements. In a medical emergency, a simple tug on the strap activates an emergency buzzer. When activated, the pre-registered person is sent a notification that includes the owner's current location. It has location and step count features, and is compatible with Emergency Earthquake Warnings and is water proof.
mamorino2	When an emergency earthquake warning is received, a recorded voice message says "earthquake," so that children can immediately understand, and an alarm sounds. The Disaster Message Board and disaster message dialing are also supported. A child's location can be identified, and children can leave a message for their family. Location notifications can also be sent at specified times.

Business Continuity Planning Service

緊急連絡／安否確認システム
エマージェンシーコール

After a disaster, use the public telephone network and the Internet to continue calling until the call goes through, for contacting employees in an emergency and confirming their safety.



KDDI 電話会議サービス

Using KDDI's conference call service, users can participate in conference calls even from disaster areas using a satellite phone. Inmarsat's BGAN can connect to a PC, to share PC screen shots and document via the Web while considering emergency measures, making it possible to keep the business running.



Emergency Satellite Communications Set

- 1: For first responders in a disaster or accident or for BCP contingency plans, the KDDI Satellite Communications Set fits the bill!
- 2: Comes with a solar panel. Recharge through solar power where there is no power or power has suddenly been lost.
- 3: Compatible with both the Iridium and Inmarsat systems to provide a strong, sure means of communication.



Support for Disaster Areas

■ Education support in the Ishinomaki Disaster Area

Through support of the Ishinomaki Board of Education, we have been providing support as a part of the Ishinomaki Senshu University initiative, “Reconstruction Cooperative Project,” from November 29, 2011, to March 2012.

Host: Tree of Hope Project Planning Committee

KDDI: Providing tablet computers for viewing video content, and a Wi-Fi environment to support online education for student's preparing to take entrance exams

Junior High School Students: about 100; High School Students: About 50

■ Establishment of the au Sendai Contract Center

The new Contract Center was established to accommodate the growing number of subscribers and to increase customer satisfaction. We selected Sendai as the location for the new center with the aim of promoting employment in the aftermath of the Great East Japan Earthquake.

Center capacity: about 700 people

Opening: February 14, 2012



Site Selection Certificate presented to the Mayor of Sendai Okuyama (right) by KDDI Chairman Onodera (center) and KDD Evolva President Mr. Ito, Dec. 22, Sendai City Hall, Main Building (Sendai Aoba-ku)

In conclusion . . .

KDDI believes in its mission as a communications carrier to provide reliable services to all its customers, no matter what. We will use the lessons of the Great East Japan Earthquake to deal with future emergencies.

