

# Aftermath of the Great East Japan Earthquake and KDDI's Efforts



At 2:46 p.m. Japan Standard Time on March 11, 2011, a massive earthquake of magnitude 9.0, which is the most powerful recorded earthquake in the history of Japan, struck the north-east coast of Japan. The quake and the tsunamis generated by it caused tremendous and extensive damage to Eastern Japan. KDDI also suffered significant damage to telecommunications facilities, such as cellular base stations. This caused an interruption in our provision of service to our customers. Here, we report on KDDI's efforts from the time when the earthquake hit to the recovery of service.

KDDI will take the experience from the Great East Japan Earthquake as a lesson to identify the issues in our disaster preparedness, as well as to develop more robust telecommunications networks and stronger framework that enables us to provide stable information and communications service under all conditions and adversities.

## KDDI's Efforts from the time when the Great East Japan Earthquake Hit to the Recovery of Service

Events and Actions		
Disaster Countermeasures Office launch phase	<p><b>11th</b></p> <p><b>2:46 PM</b> ● "2011 earthquake off the Pacific coast of Tohoku" occurs</p> <p>● Disaster Message Board service operation begins</p> <p><b>3:10 PM</b> ● Operation Task Force is established</p> <p><b>3:43 PM</b> ● Disaster Countermeasures Office and Local Disaster Countermeasures Office (Sendai, Miyagi Prefecture) are established</p> <p><b>3:56 PM</b> ● Communication cable along the backbone route is partially cut off, disrupting communication to the Tohoku region</p>	
	<div style="text-align: center;"> <p><b>Organizational Structure of Disaster Countermeasures Office</b></p> <pre> graph TD     A[General Manager of Disaster Countermeasures Office] --&gt; B[Operations Task Force]     A --&gt; C[Information Systems Task Force]     A --&gt; D[Local Disaster Countermeasures Office]                     </pre> </div>	
Information collection phase	<p><b>4:00 PM</b> ● Information on the damage is gathered; Dispatch order for vehicle base station and mobile power supply car is released</p> <p><b>4:50 PM</b> ● Vehicle base station and mobile power supply car leave for the disaster-struck area</p>	
Recovery phase	<p><b>March 2011</b></p> <p><b>12th</b> ● Traffic<sup>*1</sup>-bypassing route for domestic services is completed, achieving partial recovery</p> <p><b>13th</b> ● Lending out of au mobile phones, satellite telephones, data communication devices to disaster task force organizations starts</p> <p>● First vehicle base station set up in front of the Iwanuma Elementary School (evacuation center) in Iwanuma, Miyagi Prefecture</p> <p>● Disconnection of communication cables in the backbone route is repaired</p> <p><b>14th</b> ● Traffic flow is returned to the original backbone route (normal operating state is restored)</p> <p>● Vehicle base stations are set up in front of Kamaishi joint government building, Miyako joint government building, Kesenuma city hall, Tagajo city hall, and Iwanuma Elementary School (evacuation center)</p> <p>● Fuel and relief goods are transported to the sites</p> <p><b>15th</b> ● Vehicle base stations are set up at the Ōfunato city hall, Tagajo city hall, and Ishinomaki Haguro Base Station</p> <p>● The implementation of the traffic flow bypass for international services to another submarine communications cable is completed</p> <p><b>16th</b> ● 120 au mobile phones and 44 satellite phones (Iridium/Inmarsat) are lent out to disaster task force organizations</p>	
	April	<p><b>7th</b> ● Approximately 91% of cellular base stations restored; Approximately 99% fixed-line networks are restored</p> <p><b>8th</b> ● Press release announces the status of disaster response and future prospects</p> <p><b>30th</b> ● Coverage for au mobile phones are mostly back to their pre-earthquake state</p>
		<p><b>June</b></p> <p><b>30th</b> ● Service quality for au mobile phones are mostly back to their pre-earthquake state (PR as of July 1st)</p>

\*1 Traffic: Flow of calls and data communications (e-mails, etc.)

# KDDI's Actions in Response to the Earthquake

On March 11, 2011, immediately after the earthquake occurred, the Disaster Countermeasures Office headed by the president was set up at our head office along with the Operations Task Force, Information Systems Task Force, and Local Disaster Countermeasures Office (Sendai, Miyagi Prefecture), to lay down chains of command in order to facilitate early recovery (See p.5 "Organizational Structure of Disaster Countermeasures Office").

About an hour after the earthquake occurred, part of the backbone routes to the Tohoku area (Northern region of Japan) were cut off, disrupting communications temporarily. We worked through this problem with a concerted effort toward recovery, and by the next day (March 12th), we managed to recover from the communication traffic congestion\*<sup>2</sup> by bypassing traffic. On March 13th, we repaired the damaged cables and returned to our normal operating state.

On another note, the traffic increased to 40 times the usual volume right after the earthquake. In order to prevent network failure\*<sup>3</sup>, we restricted communications up to 95%. Thereafter, the traffic gradually calmed down and we lifted the restriction on the 16th.

\*<sup>2</sup> Communication traffic congestion: A state in which calls and e-mails concentrate and thus create an obstruction that makes connections difficult

\*<sup>3</sup> Network failure: A state in which telecommunications facilities receive traffic that exceeds their processing capability and stops



Communication cable recovery work on backbone routes

## Telecommunications Service Recovery Status

### • Mobile communication service

	At the time of earthquake occurrence (Max. rate/number)	As of April 7th
Communication restriction	95%	0%
Base stations out of service (6 Tohoku prefectures)	1,933	176

Recovered the same quality of service provided before the earthquake by the end of June

### • Fixed-line communication service

		At the time of earthquake occurrence (Max. number)	As of April 7th
Personal	au Hikari	119,000	2,027
	Metal-plus	141,000	1,711
	au one net (ADSL)	130,000	359
	Total	390,000	4,097
Corporate	VPN/PLC	13,642	433
	Internet	315	6

\* The number of affected lines with regards to Metal-plus and au one net does not include the cases of line break between customer homes and connected building(s).



Disaster-struck facilities  
(Top left) au shop (Top right) au Kamaishi Ryōishi Base Station  
(Bottom) JIH Sendai Station building

## VOICE

### "We couldn't help letting out a cry of joy when we got the connection"



**Toshiyuki Okada**

General Manager,  
Operations & Service Quality  
Management Department  
Operations Division,  
Technology Sector



**Hiroshi Yokoi**

General Manager,  
Oyama Technical Center  
(Then General Manager,  
Sendai Technical Center)  
Operations & Service Quality  
Management Department  
Operations Division,  
Technology Sector

In Sendai, we just experienced a magnitude-7.2 earthquake two days before the Great East Japan Earthquake, so we had the feeling that we might have an earthquake again soon. However, the actual earthquake was of a scale that we had never experienced before. The work to recover from the damage caused by the unprecedented earthquake was an extreme challenge.

Only one hour after the earthquake hit, part of the Tohoku route was cut off, which created a state where it was difficult for calls and e-mails to connect. Under such conditions, we decided to use the connected route as a bypass route for the disconnected part. The network route design and the route configuration change at the unmanned station building took the whole night. In the early morning of the 12th, we were finally ready to activate the completed bypass implementation. The moment the bypass route connected with the Tohoku network, we all let out cries of joy.

Although the provision of enriched services, content and such is important, we could not but realize, more than anything, the importance of "being connected" with this earthquake experience. This, we believe, is the foremost role and responsibility of a telecommunications business.

# Recovering Coverage through the Establishment of Local Site Restoration System

KDDI set up the “Local Disaster Countermeasures Office” at the Sendai Technical Center (TC). Early on, we were able to organize a restoration system at the disaster site, where we collected information on the damage to our infrastructure, ordered the dispatch of vehicle base stations and mobile power supply cars, and procured personnel, fuel, and relief goods for the local site support team.

In cooperation with the Engineering Division as well as KDDI Group companies and partners, we set out on the early restoration of communications services, including the repair of base station facilities and access lines to cellular base stations. To restore the cellular base stations, we introduced the large-zone base station\* scheme and used satellite links and terrestrial micro-power radio to connect to the base stations. By the end of April, we were able to restore coverage to the same level as before the earthquake (excluding the restricted area in which the Fukushima Nuclear Power Plants are situated).

\* Large-zone base station: Cellular base station that has an increased signal output to expand service area

## Messages from Our Customers

### Message of Gratitude

“Thank You”

The mobile phone company’s vehicle came to the municipal athletic ground. I got in line for charging my phone. They said it would take 15 minutes per person. I asked for charging, and it was completed. I turned it on and waited. Then suddenly it rings. I was startled and, I didn’t need to rush, but somehow I felt the urge to hurry and opened up the phone, to look at the display. It was just one phrase “Are you all right?” from a friend in Yamoto. Tears swelled up in my eyes from the joy of knowing that I could communicate. This was followed by a series of calls from Higashi-matsushima, Ishinomaki, Shiogama, Akita Prefecture and Tokyo, all calling to check whether I’m all right. I am filled with emotions that I have never felt before in the 73 years of my life. How so important it is to be able to talk with and be in contact with each other! I thank the people of the phone company so much.

\* Above is a translation of the original letter as it was written.

### “Could be Better”

“Took a while to come. Don’t lag behind the other carriers!”  
“au can’t be used around here. But other phones can be.”



Vehicle base stations (Rikuzentakata, Iwate Prefecture)

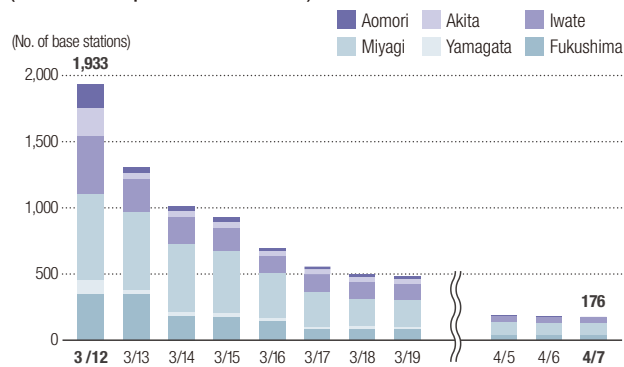


au femtocell antenna using satellite communications (Ishinomaki, Miyagi Prefecture)



au mobile phone free rental and battery charging service (Onagawa, Oshika, Miyagi Prefecture)

## Cellular Base Station Restoration Status in Six Tohoku Prefectures (Number of Suspended Base Stations)



As of the end of June, achieved the same service quality level as before the earthquake

## VOICE Acutely Aware of the Social Function of Infrastructure Business



### Seiji Yamamori

Associate General Manager  
(Then General Manager,  
Network Operations Division,  
Operations Sector)  
Engineering Division,  
Technology Sector

From this disaster, I felt keenly the importance of people involved combining efforts for early recovery at the disaster site.

Cellular base stations suffered extensive damage in the Great East Japan Earthquake, so we gathered vehicle base stations and mobile power supply cars from all over Japan for dispatch to the disaster-struck areas. On March 11th, the day the earthquake hit, everyone arrived at the office by 4 p.m. to head for the disaster area. However, due to the Tohoku Expressway and Ban-etsu Expressway being unavailable, we had to take the roads on the west coast (Sea of Japan coast). More than twenty vehicles were gathered from Sapporo, Kanazawa, Nagoya, Osaka, Takamatsu, Hiroshima, and Fukuoka and met up in Niigata. It was in the evening of the 12th that we all arrived in Sendai via local roads. Among us were vehicles that had come spontaneously before the call-out. We were exhausted from driving all day, but immediately got to setting up the base stations, which took the whole night. At this time, we were driven by a strong sense of mission to get the “signals going at the disaster area.” I was proud of my associates that rushed to the scene from different parts of Japan.

In the gray of the morning of the 13th—that was 36 hours after the earthquake hit—we managed to set up the first vehicle base station, which had come from Kanazawa, on the school grounds of Iwanuma Elementary School in Miyagi Prefecture. When we set up a vehicle base station at the Shizugawa Junior High School in Minami-sanriku, Miyagi Prefecture, I heard about a teenage girl talking tearfully on the mobile phone that finally got connected, informing her family that she is alive. It was a moment when I acutely realized the social function of our task of dealing with communication infrastructure.

• Number of vehicles dispatched to disaster area

Vehicle base stations	Mobile power supply cars
11	35

# Stable Provision of Information and Communications Services in the Future

Through our recovery and restoration efforts over three months since the occurrence of the earthquake, as of the end of June 2011, our mobile phone service is provided with the same communications service quality as before the earthquake except for the periphery of the Fukushima Nuclear Power Plants. We will continue to work toward the complete restoration of our fixed-line communication network as well as the expansion of coverage into the temporary housing and shelter areas. Furthermore, we will deliberate on and implement the following actions in preparation for future large-scale disasters.

## 1. KDDI will reinforce facilities so that early recovery of coverage can be attained in the event of a large-scale disaster.

- (1) The deployment of mobile power supply cars and emergency power generators will be increased from the current 55 units to 130 units in order to enable a swift supply of power to customers and KDDI communications facilities, including cellular base stations, in disaster-struck areas.
- (2) KDDI will increase the deployment of emergency radio entrance facilities\* from the current 40 sections to 60 sections in order to ensure communication between the cellular base stations and the telephone exchange stations at all times, including when fixed lines suffer damage in the event of a disaster.
- (3) KDDI will, in addition to increasing the number of vehicle base stations equipped with satellite entrance systems\* from the current 15 units to 20 units, deploy 27 transportable kit-type base stations that can equip both satellite and radio entrance systems in order to recover our customers' use of communications service in the disaster-struck areas.
- (4) By the end of FY2012, KDDI will provide for batteries that enable our near-2,000 cellular base stations to operate for more than 24 hours.

\* Radio/Satellite entrance facilities: Facilities that connect using radio networks or satellite links in the case of a break in line between a cellular base station and telephone exchange station in the event of a disaster

## 2. KDDI will review the introduction of the following projects in view of further improvement of convenience of our customers' use of communications service at the time of disaster.

- (1) Improve the usability of the Disaster Message Board on a smartphone
- (2) Reinforce e-mail communications in the post-disaster period
- (3) Introduce voice file message service
- (4) Expand the range of models that support "disaster/evacuation information" conveyed in emergency warning e-mails

## KDDI's Support of the Disaster-struck Areas

The KDDI Group donated JPY 1 billion, which includes contributions from our associates, through the Japanese Red Cross Society. We also supported customers affected by the earthquake and the tsunamis via extensions to charge payment due dates, reductions of or exemption from payment, and reduced repair fees.

Our support efforts for the affected areas are an ongoing pursuit in various forms other than those mentioned above.

### Our Disaster Area Support Efforts

- Reduction in monthly basic charges for Metal-plus phone, au Hikari, Cable-plus phone, etc.
- Extension of payment due dates for au mobile phone service and fixed-line communications service charges
- Reduced repair fees for au mobile phones damaged due to the disaster
- Free rental of au mobile phones and Iridium satellite mobile phones
- Support of the Disaster Message Board service for smartphones
- Opening of the Great East Japan Earthquake support site "LISMO WAVE"
- One month of free Skype™\* calling
- Free provision of "KDDI Web Hosting Service (G120, S10)" and "KDDI Paperless FAX Service"
- Recovery support for bases in the affected areas for customers using intranet services
- Opening of the "Disaster Area Support Donation Site"
- Opening of the Tohoku region disaster area reconstruction support site "live earth"
- Support for mass transmission of community information to evacuated people
- Support for the disaster area volunteer activities of our associates
- Provision of disaster relief goods
- Donation of monetary contributions through "au Smart Sports"



Free rental of au mobile phones (Kesenuma, Miyagi Prefecture)



Free rental of Iridium satellite mobile phones (Onagawa, Oshika, Miyagi Prefecture)

\* Skype, its related trademarks and logos, and the "S" symbol are trademarks of Skype Limited.

## VOICE

### Creating Disaster-tolerant Communications Infrastructure for Reliable Delivery of Information



**Hiroshi Kobayashi**

Vice President Associate General Manager, Technical Sector  
(Then General Manager of Operations Sector)

KDDI has gone through the process of telecommunications network recovery from damage caused by natural disasters a number of times, but this one was on a whole different scale. In common cases, all we had to do was restore the damaged base stations, but this time around the base stations themselves were washed away by the tsunamis. The restoration project proceeded under the conditions where the whole "town" or "community" had disappeared—a situation we had never experienced before. However, today at the disaster-affected sites, new communities are already being built. KDDI will pursue wider service areas in order to cover the new areas with temporary housings.

On another note, we are reviewing and revising our disaster actions in preparation for earthquakes of this magnitude in all parts of Japan. Using this incident as a lesson, we have constructed a new backbone route on the Sea of Japan side in order to bolster the reliability of our telecommunications network. We now have 4 routes on the western coast. KDDI also intends to utilize satellite-based infrastructure. In collaboration with local governments, we will strive to create the telecommunications infrastructure—a lifeline as proven in this disaster—that not only "connects," but also securely delivers information to those in need.