



ICT Infrastructure of University Campuses in Disaster-Resistant City Plans

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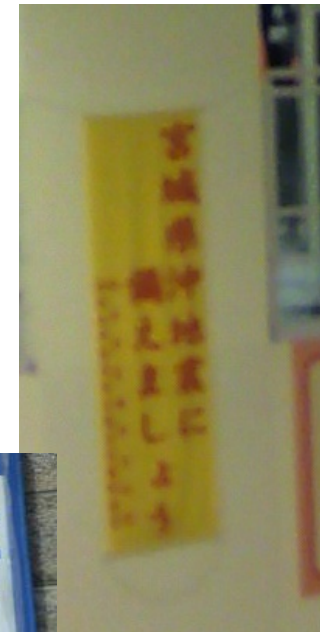
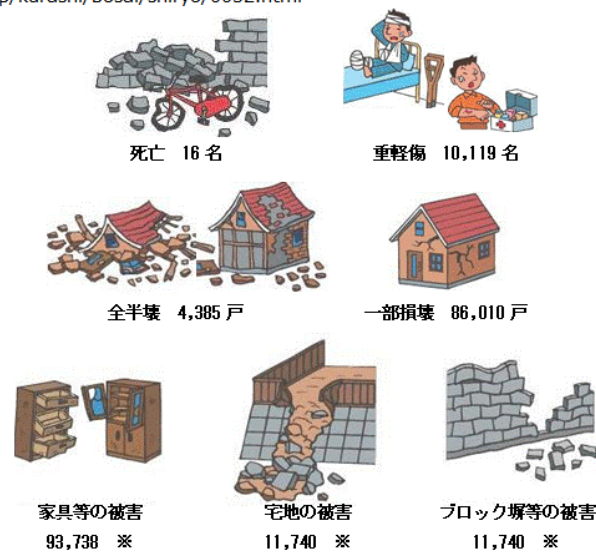
The 2011 Earthquake and its Damage on Campus ICT Infrastructure

■ 37 years period Earthquakes

■ 1978 Earthquake in Miyagi

1978年宮城県沖地震による各種被害状況

<http://www.city.sendai.jp/kurashi/bosai/shiryo/0052.html>



■ Disaster-Resistant City Plans

- Earthquake-resistant buildings, Anchored furniture, Fire,
- Civil infrastructure (gas, water, ...), Evacuation, Storage,

2011 Earthquake

■ The Earthquake on March 11, 2011

■ Very widespread suffered area

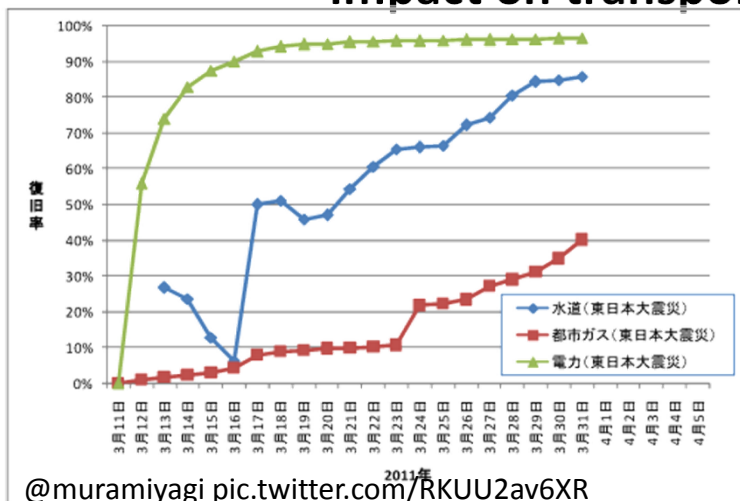
- Completely destructive damage by huge tsunami
- Widespread rescue, aid, restoration, ...

■ Recovery in emergency stage

- Power, water, and gas came back soon in downtown Sendai
 - Sufficient quantities of foods and other supplies
- Damage on oil distribution

復旧率推移

Impact on transportation, distribution, generators, machines, ...



2011	1978
M9.0 quake	M7.4
743 fatal victims	16
102,433 evacuee	1,574
44,515 destroyed houses	4,385

Overview of Damage at Tohoku University

- **Damage to buildings: Safe – 521 (90%)**
Severely destroyed – 13 in main campuses
Washed-out coastal facilities



- **Lifeline utilities : disconnected for a long period**
Electricity: April 4,
Water: April 13,
Gas: April 26,
Bus: March 14, Subway: March 13,
Shinkansen: April 25, Airport: April 13

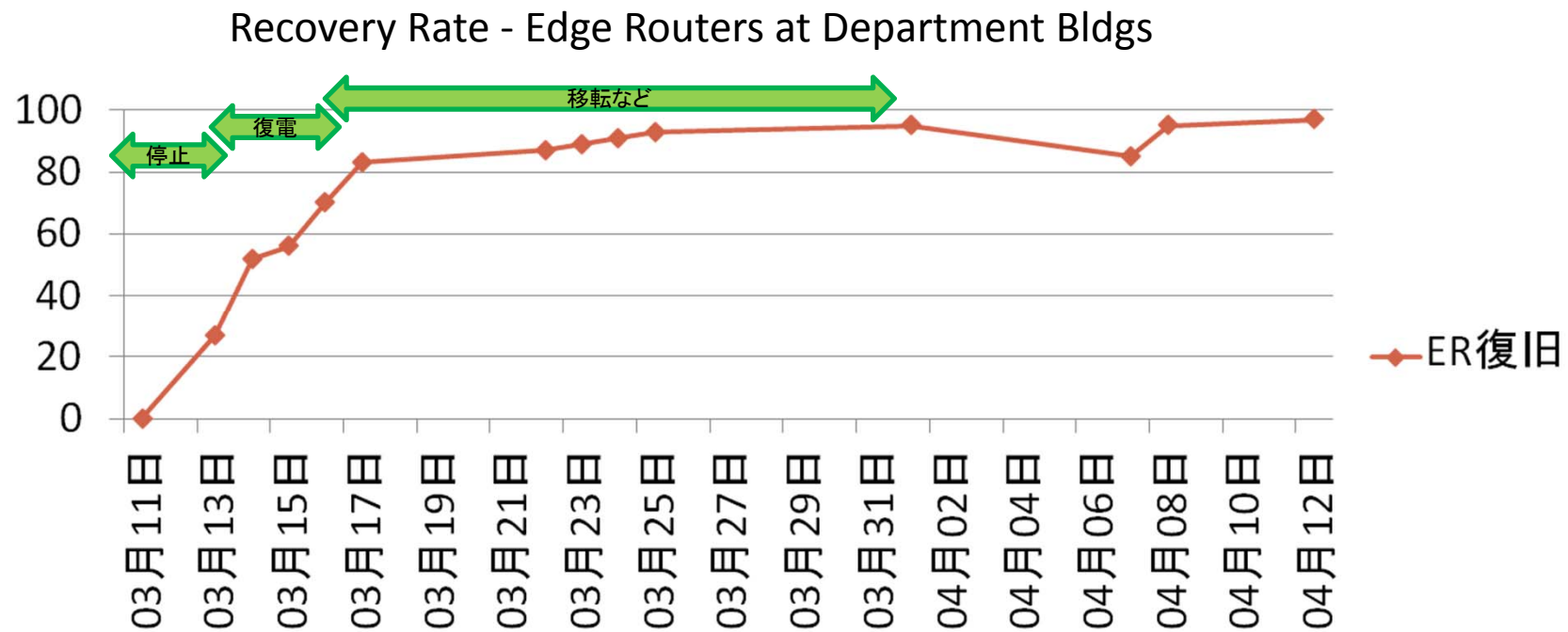


Recovery of Campus ICT Infrastructure

- Buildings: Safe
 - Cyberscience Center (Network and servers)
 - Information Department (Bureau systems)
- Servers, networks and other equipment
 - No damage of central and backbone equipment
 - No damage of inter-campus optical cables
- Power failure for 46 hours
 - March 11 (Fri) Quake at 14:46-52, Power failure at 14:48
 - 10 mins later: TAINS mail and remote access server shutdown
 - 2:50 later: TAINS backbone stopped (UPS exhausted, no generator)
 - March 12 (Sat) Damage survey, report to HQ, preparation
 - March 13 (Sun) 13:48 Power recovery

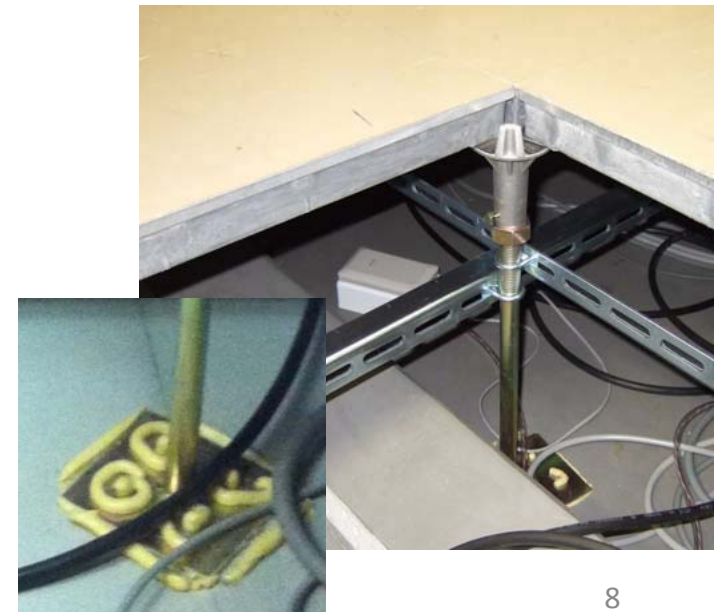
Recovery of department networks

- March 11 (Fri) Earthquake, and power failure
- March 13 (Sun) Backbone network recovered
- March 13 (Sun) 27% of Edge-Routers (13/48) came back
- March 17 (Thu) 83%, April 1 (Fri) 95%, April 12 (Tue) 97%



Disaster Prevention on Campus ICT Infrastructure

- Earthquake-resistant raised floor and rack
 - Lesson from Hanshin-Awaji Earthquake
 - Domino catastrophe if support columns fall
 - Earthquake-resistant raised floor
 - Anchored rack or safety against falling
- Earthquake prevention in office
 - Shelves anchored to wall, prevention for fall from shelves
- Survival stocks
 - Foods, water, lights



Disaster-Resistance and University Campus ICT?



Disaster-Resistance and University Campus ICT?

- Disaster prevention and disaster risk reduction
 - Preparation, and strengthening
 - Rescue equipment, aid stocks, skills, ...
- Universities can be emergency shelters
 - Broad area and premises
 - Spacious classrooms, complete (ICT) infrastructure
 - Many people (specialists, young students)
 - Medical hospital
- Question: Use of ICT infrastructure in disasters



What by University Campus ICT?

- Three stages of DRR for disaster victims:
Self Help > Mutual Help > Public Help
 - University in a (local) mutual community
 - To help victims, supporters, and public services
 - Emergency shelter
- By the aid of ICT
 - Communication (Network)
 - Safety confirmation, rescue activities, ...
 - Information systems (Computers)
 - Information collection, documentation, publication, ...
 - University may offer its ICT equipment in emergency

Preparation of University ICT

- ICT equipment to be offered in emergency
 - Electricity and emergency supplies: prerequisite
- Communication
 - Internet connection, in-room Wi-Fi service
 - For information collection, rescue activities, ...
 - Mobile phone service may not work (Power, congestion)
 - Tough information network system in university!
- Information systems (Computers)
 - Smart phones for private communications
 - PC and printer for operation of emergency shelter
 - Name lists, documentation, publication,
 - Rescue team may carry its own equipment
 - Training for information literacy
- Information security issues

Information security issues

- Possible problems
 - Illegal/inappropriate use of Internet services
 - Transmission of false information, crimes
 - Network congestion
 - Many victims and managers in an emergency shelter
 - Common problem with public/private shelters
- Each user should be identified -- Difficulties
 - User identity: moderate operation -> Open connection?
 - ID authorization by each Internet service
- Privileged ID for network bandwidth control
 - Better connection for managers and public services
- Continued to Demo Session
 - (Hideaki Goto) "Wireless LAN Access Points guaranteeing communications even during large-scale disasters"

My Proposal

- Focus: Universities can be emergency shelters
- Campus ICT infrastructure will help victims and rescue activity in time of emergency
 - Communication network (Internet + Wi-Fi)
 - Information systems (PC + printer)
- Preparation of ICT infrastructure
 - Standard shelter requirements (water, food, bed, ...)
 - Disaster-resistant ICT facilities
 - A part of emergency plan (BCP) for ICT service operation
 - EQ-resistance, electricity (UPS) and internet connection
 - Wi-Fi service in shelters (classrooms, gym)
 - ID (Auth'n/Auth'z) based network connection service
 - Any standard on ICT for emergency shelters???

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 - Disaster-Resistant City Plans
 - 2011 Earthquake
 - Overview of Damage at Tohoku University
 - Recovery of Campus ICT Infrastructure
 - Recovery of department networks
 - Disaster Prevention on Campus ICT Infrastructure
- Disaster-Resistance and University Campus ICT?
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 - What by University Campus ICT?
 - Preparation of University ICT
 - Information security issues
 - My Proposal