Realtime Information Systems for Tokyo Metro Company and Others

Tsutomu Sato[1], Masami Watanabe[2], Shutaro Abe[3], Jun Saita[1] and Yutaka Nakamura[1,4]

1. System and Data Research Co., Ltd., Tokyo, Japan
2. Tokyo Metro Co., Ltd., Tokyo, Japan
3. Tohoku Electric Co., Inc., Miyagi, Japan
4. Tokyo Institute of Technology, Tokyo, Japan

The essentials for emergency response right after a big earthquake are the earthquake early warning, EEW, and the information to grasp the exact shaking situation of the event. The EEW and the information are desired useful not only for a big plate boundary earthquake causing widespread seismic damage but also for an epicentral earthquake causing seismic damage locally. In particular, it would be possible to take a quick and certain response after the earthquake with “the EEW system” and “the system for exact and quickly shaking information in the relative area”.

This presentation reports the importance of the EEW system and the shaking information with the example of the earthquake warning system for subway network of Tokyo Metro (Fig.1 and Fig.2). And the result of the comparison between the early earthquake alarm system “FREQL” and EEW system of Japan Metrological Agency (JMA) at Onagawa nuclear power station of Tohoku Electric Co., Inc. in test operation (Fig.3) is also reported.

Based on the experiences at the time of 2005 Chiba north-west earthquake (35.5N, 140.2E, M6.0, Depth: about 73km, Maximum seismic intensity: Jma5+ corresponding to MMI8 in Adachi-ku, Tokyo), Tokyo Metro has constructed a new seismometer system that consists of 6 sets of the FREQL for the train control and 33 sets of the portable digital seismometers “AcCo” for the quick restart of train service based on the shaking information after train stopped. The system has aimed to make the train operation immediately by 6 early earthquake alarm systems and to restart the train operation rationally by 33 portable seismometers choosing the checking area after the event.

On the other hand, Onagawa nuclear power station of Tohoku Electric Co., Inc. has introduced the earthquake warning by the function of earthquake parameters estimation (magnitude, location and azimuth etc.) of FREQL for the staffs. The FREQL information has been compared with the EEW information of JMA. FREQL had issued the earthquake information earlier than EEW information of JMA because the time to estimate of FREQL is one second after the P wave detection and that of EEW by JMA is several seconds depending on the system algorism and the complex system.

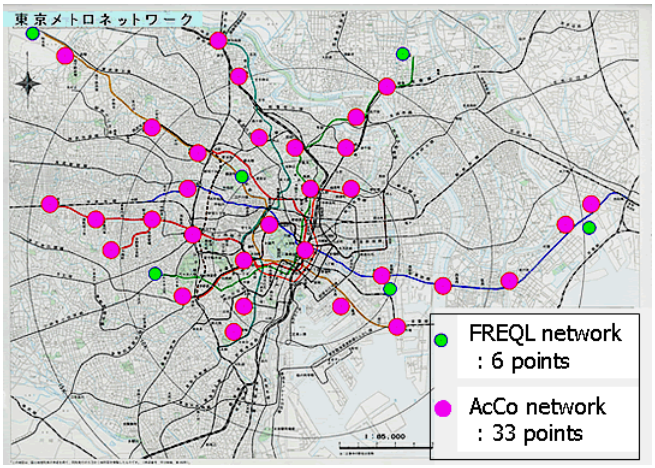

Fig.1 The seismometer system of Tokyo Metro

The system consists of 6 sets of “FREQL” and 33 sets of “AcCo”.

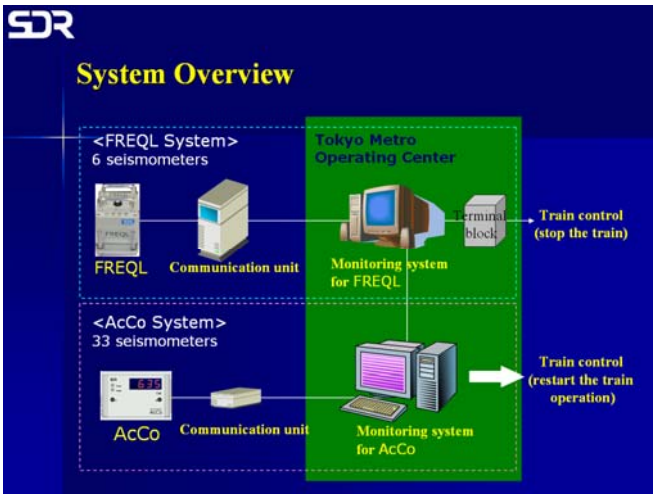

Fig.2 The system overview of Tokyo Metro

“FREQL” is to make the train operation immediately and “AcCo” is to restart the train operation rationally by 33 after the event.

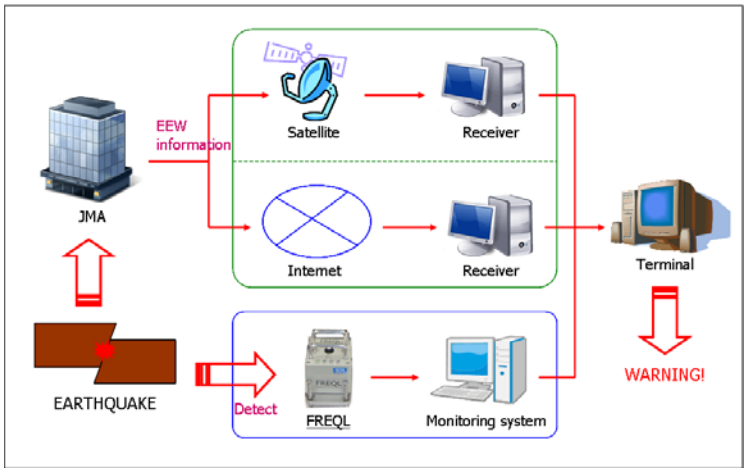

Fig.3 The system overview of Onagawa nuclear power station