Secured Information Service Platforms Effective in Case of Disasters

- using multilayered communications network-

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***Abstract*— In case of a large scale disaster such as the Great East Japan Earthquake, many people may not be able to get disaster and emergency information because of heavy traffic congestion, serious damage and/or power cable cutoff of base stations, backhaul cable cutoff, etc. In many cases, private information needs to be sent through secured communication channels to designated recipients and people who evacuated to remote areas. In this paper, the development of secured information service platforms is presented. This development is one of R&D subjects of "the disaster-resilient multilayered communications network" proposed by Tohoku University, KDDI Corporation, KDDI R&D Laboratories, and OKI Electric Industry. The development will be carried out in collaboration with NICT (National Institute of Information and Communications Technology) and YRP (Yokosuka Research Park).**

Keywords-Disaster communications, secured communications, service platform

I. INTRODUCTION

After the Great East Japan Earthquake [1] on 11 March 2011, communications networks were disabled in very wide areas along the Pacific coastline due to serious damage and/or power cable cutoff of base stations, backhaul cable cutoff, etc. Furthermore, serious traffic congestion occurred as a fairly large volume of communication traffic which requires urgent transfer was generated for safety confirmation of relatives or colleagues, etc. To cope with this kind of situation, we started an R&D project to develop a disaster-resilient multilayered communications network [2].

In disaster cases, we notice the following.

(1) For speedy rescue operations in disaster stricken areas, operational and emergency information needs to be shared among rescue teams.
(2) For transmission of private information to designated person and people who evacuated to remote areas, secured communication channels are necessary.

The information mentioned above is highly private and sensitive. However, the traffic is detoured thorough different networks in the disaster-resilient multilayered communications network [2]. Thus, the communication links may probably be unstable and unsecured. Therefore, we are developing two secured information service platforms in our R&D project "disaster-resilient multilayered communications network". The first is "secured group communication" and the second is "push-type personalized transmission".

II. SECURED GROUP COMMUNICATION

Figure 1 shows an image of "secured group and simultaneous communications". In case of disasters, secured group and simultaneous calls communication among secured groups is considered to be very effective especially for rescue activities. The order needs to be simultaneously provided to all the rescue team members by an emergency dispatcher. In response to the dispatched direction order, rescue team members need to quickly exchange emergency information and make discussions among team members. Such information needed is very private such as life and death and hence, should be exchanged through secured channels.

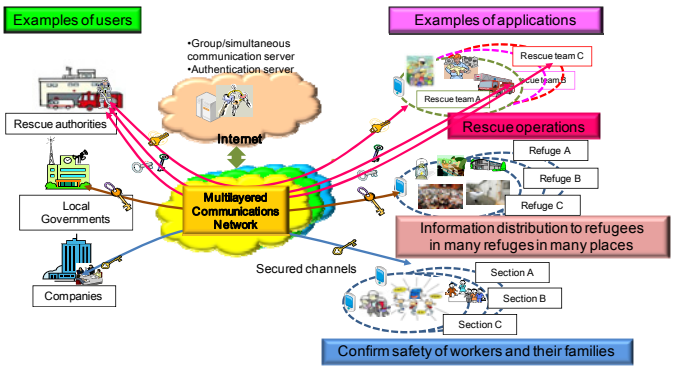

Figure 1. Secured group communication.

In order to guarantee highly secured communications, the channels must be protected by encrypted codes. All the users served by the secured group communication system must be registered on the server. Registered users can be grouped according to users' requirements. When a user makes a call, an authentication server identifies the user and issues an encrypted code to the user and the counterpart. Then, registered users in the same group can communicate with each other in either the direct communication mode or the simultaneous one.

In Fig.1, two other application examples are shown. One is for a local government and the other is for a private company. Even after the disaster, administrative agencies have to distribute disaster-related information including safety, food supply, etc. to refugees who evacuated from disaster stricken areas. This system can connect residents and help them to

share the same information as if they lived in their previous residential area even after they evacuated to different places after the disaster.

III. PUSH-TYPE PERSONALIZED TRANSMISSION

In case of disasters, everyone wants to confirm safety of family, relatives and friends. This information is highly private and has to be limited to the designated persons. Such information is specific to designated persons. People living in a disaster stricken area has to evacuate as soon as possible. However, person who has a chronic disease may need medical care by a private medical doctor. A handicapped person will face a very serious situation. However, if a local government, for example, has data of personal profiles, specified (tailor-made) information can be transmitted to the designated person. Figure 2 shows an image of "Push-type personalized transmission", where three scenarios are considered. If a local government has personal profile data of a handicapped who needs special cares and medicines, it can send such personalized information as "Please evacuate using suggested barrier-free ways to your family hospital. Please identify yourself to make a doctor prepare your medicines in advance". Personal identification is essential for the above application.

The key of this service is a service platform consisting of user and device management function, service contents, and user profile data. The personal identification function is one of the most important in this service. In our experiment, fingerprint data will be used. Since the communication links of the disaster-resilient multilayered communications network may probably be unstable and unsecured, quality of person identification through unstable communication links will be evaluated.

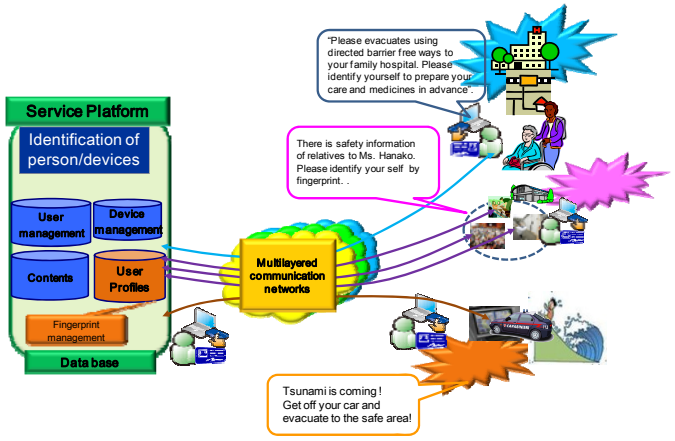

Figure 2. Push-type personalized transmission.

The push-type services are expected to contribute greatly to save many lives in case of disasters. However, these services have many non-technical issues to be solved before real operations. Typical one is how to collect personal profile data such as gender, age, and residential area, etc. If people understand that the system will save their lives in case of disasters and it provides many interesting applications in normal situations, people would join the system under the strict personal data protection.

IV. CONCLUSION

In this paper, two communication services which are effective in case of disasters were introduced. The first one is "secured group communication" and the second is "push-type personalized transmission". The effectiveness of proposed communication services will be demonstrated and confirmed using a test-bed of the disaster-resilient multilayered communications network.

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