

Wireless Balloon Network for Disaster Information System

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Abstract. In this paper, in order to quickly recover communication network where the communication facility was seriously damaged and to collect the information with evacuated residents and disaster areas, we propose a balloon wireless network which is realized by combining balloons and wireless LANs and organizing into an adhoc network in the air. Using this balloon network, the damaged communication line can be quickly recovered. By combining with balloon wireless network and wired Internet overlay network, more robust, flexible and large scale disaster information network system can be realized even though some of the network lines and nodes are damaged and destroyed. In order to verify the usefulness of the suggested balloon network, a prototype system was constructed and made performance evaluation.

Keywords: Disaster Information, Wireless Network, Reliability.

1 Introduction

Recently, large scale sizes of natural disasters, such as earth quake, mountain explosion, seismic sea wave, frequently happened in addition to ordinal disasters, such as typhoon, hurricane, rain flooding and snow-slide are occurring in many countries in the world. Many residents by those disasters are losing their lives. However, in many cases of disaster occurrences, the resident lives can be saved if the disaster information network system could effectively work just after disaster happened. In order to save our lives from those disasters, more reliable and robust information network for disaster prevention purpose than the conventional information network.

As for the safety confirmation with the residents in the stricken area, it is very important to quickly process the frequent inquiries from the people outside of the disaster area whether the residents could be safely evacuated or injured. Furthermore, in order to quickly manage and distribute foods and life supplies to evacuated residents, and register and assign volunteers, information and communication network system in the evacuation places is also important. However, When a disaster happened, various wire-based communication networks around the disaster area seriously damaged and disconnected and cannot perform their functions as communication means. Therefore, more reliable and usable communication network is required even just after the disaster happened.

As advent of Internet and high-speed wireless LAN technologies, various information and communication networks have been used as disaster information

transmission means without any restriction for individuals in bi-directional ways. Moreover, most of the people using mobile terminal such as VoIP and PDAs can interactively communicate each other even though the public communication lines are out of order.

So far, we have developed Disaster Prevention Information Network based on wireless LANs and various application systems for disaster including Resident safety information system”, Resource management system and Bi-directional video communication system[1][2][3].

However, due to failure of communication devices and disconnection of communication lines there are many cases where the communication means cannot function and the evacuated residents are isolated. Therefore, it is required to quickly establish the communication means effective on emergency.

In this paper, in order to quickly recover communication network where the communication facility was seriously damaged and to collect the information with evacuated residents and disaster areas, we propose a balloon wireless network which is realized by combining balloons and wireless LANs and organizing into an adhoc network in the air. Using this balloon network, the damaged communication line can be quickly recovered. By combining with balloon wireless network and wired Internet overlay network, more robust and flexible, and large scale disaster information network system can be realized provide even some of network lines and nodes are damaged and destroyed when the disaster happened.

2 System Configuration

Fig. 1 shows our proposed large scale disaster information network based on a combination of overlay network such as Internet and Mobile Adhoc Networks (MANET). In this paper, we newly propose a balloon wireless network as one of MANET.

As shown in Fig. 2, a balloon wireless network is organized by multiple balloons with wireless LANs. Since the wireless LAN has auto-configuration function, which

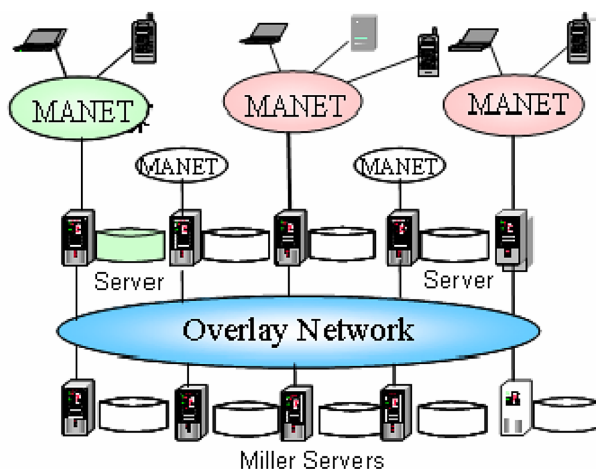


Fig. 1. System Configuration