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A SURVEY ON SECURE COMMUNICATION IN PUBLIC NETWORK DURING DISASTER

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ABSTRACT

Secure communication is possible, when two entities are communicating and do not want/allowed a third party to listen in/enter in. A Disaster is a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts which exceeds the ability of the affected community or society to cope using its own resources.In disaster situations, such as search and rescue for victims of hurricanes, earthquakes, or tsunamis, network access to the outside world is critical for information dissemination, resource allocation, and rescue command and control. But relief crew operating on-site must have emergency communication system to evacuate people and provide assistance. So an Emergency communication system must be setup in fast time without much configuration and relief worker must be able to use this system. This kind of system must also be secure, because any attacker can spread rumours and affect the entire relief operations. In this project, we provide a solution for this problem.

KEYWORDS: Public Network, Private Network, Hybrid-Cellular Network, MANET, Disaster, QoS, Emergency Communication, Earthquake, Biometric.

INTRODUCTION

Almost every year natural disaster like flood, tsunami, earthquake, landslide, and hurricane of varying intensity hit many areas of the world. Because of these accidental hits/events many people life is trapped in disastrous area. Rescue operation in these disastrous areas become extremely difficult because of the loss of communication system. As a result, many trapped victims died because they did not get any chance to be rescued. The affected victims in disastrous area need a technical communication system for various reasons like reunion of family, allocation of relief resources. There is a huge need to have a Emergency Communication System.

Emergency Communication System (ECS):
An Emergency communication system (ECS) is any system (typically, computer-based) that is organized for the primary purpose of supporting one-way and two-way communication of emergency messages between both individuals and groups of individuals. These systems are commonly designed to integrate the cross-communication of messages between varieties of communication technologies, forming a unified communication system intended to optimize communications during emergencies. When an emergency occurs, the need for communication will be immediate.

During a crisis or emergency period, the people who decided to use an Emergency Communication Systems must be facilitated with quick and easy launch of their notifications and they need to be able to do so in a confidence way and also an intuitive, familiar and easy-to-use interface that can be accessed from any location must be design and facilitated for effective communication. An emergency communication system that's designed for non-technical users must ensure successful administration and usage especially security.

Mbile Ad Hoc Network:
- ❖ A mobile ad hoc network (MANET) is a continuously self-configuring, infrastructure-less network of mobile devices connected without wires.
- ❖ A MANET is a type of ad hoc network that can change locations and configure itself on the fly.
- ❖ MANETS are mobile; they use wireless connections to connect to various networks.
- ❖ MANET connections can be a standard Wi-Fi connection, or another medium, such as a cellular or satellite transmission.
- ❖ The purpose of the MANET working group is to standardize IP routing protocol functionality suitable for wireless routing application within either static and dynamic topologies with increased dynamics due to node motion or other factors. Two Standards track routing protocol used are Reactive MANET Protocol (RMP) and Proactive MANET Protocol (PMP).

We required to understand the related research works, which are all addressing the issues mentioned above, especially secure communication in public network during disaster/emergency period. The following chapter will discusses about the related research works.

Related Research Works:
- ❖ Himanshu Verma et.al, 2015 MANET Based Emergency Communication System for Natural Disasters [1]. It proposes a routing protocol which is aware of energy and mobility of nodes, and have self-organizing feature. This proposed model is able to provide an emergency communication to establish communication between trapped victims and rescue volunteers.

- ❖ Chenyu Zheng et.al, (2014) Hybrid Cellular-MANETs: An Energy-Aware Routing Design [2]. It has presented a self-organizing communication framework for mobile devices in disaster areas to form a hybrid cellular-MANET to extend wireless coverage, without requiring the modification of the existing wireless infrastructure. In this they had designed a low-complexity, energy-aware, multi-path routing protocol for this framework.

- ❖ S.H.M. Fakhruddin (2007) Emergency Communications for Disaster Management [3]. It improves its compatibility with the Common Alerting Protocol. The feasibility to implement voice mail as an alternative to the call back facility is being studied. In this all disaster emergencies and crisis events are highly dynamic, creating physical, emotional, and social disorder. In such crisis events and emergencies, communications is critical at all phases of disaster management. It specifies to offer communications during emergencies incorporates a wide range of measures to manage risks to communities and the environment. Various sources that include telecommunication satellites, radar, telemetry, meteorology and remote sensing, early warning is made possible.

- ❖ Young Bail et.al, (2010). Emergency Communication System by Heterogeneous Wireless Networking [4]. It proposes an integrated communication system by composing heterogeneous wireless networks. Wireless Sensor Network (WSN) and mobile adhoc network (MANET) are deployed on the disaster site for local communication and information collection. It specifies to communicate with the remote disaster-safe areas; satellite gateway is used for the local networks to interconnect with the satellite mobile network. This proposed system can help to reduce the network deployment time, support more terminal types, and provide emergency management services. In this it offers organization of heterogeneous communication networks inside and outside of disaster site as an integrated overall architecture. Emergency end users can select appropriate communication path according to their locations and wireless network coverage conditions.

- ❖ Oksana Denysyuk et.al, (2009) Group Communication in Mobile Ad Hoc Networks [5]. It aims to solve the problem of supporting multicast in mobile ad hoc networks (MANETs).Multicast is an important building block for many applications in MANETs, including data dissemination, service discovery, publish-subscribe, among others. The basis of a multicast protocol in a mobile ad hoc network with heterogeneous mobility

patterns will combine the most robust and the most efficient features of the existing solutions. It will infer local network stability and employ a structured solution in more static environments; when significant mobility is observed, a flooding technique will be applied locally.

❖ Chenyu Zheng et.al, (2014) Hybrid Cellular-MANETs in Practice: A Micro blogging System for Smart Devices in Disaster Areas [6]. The local wireless infrastructure may be damaged, which causes serious communication issues for mobile devices in the disaster area. A hybrid cellular mobile ad hoc network (hybrid cellular- MANET) is used to address the above coverage problem, in which wireless devices can connect to each other through Wi-Fi interfaces without the dependence on the wireless infrastructure, e.g., Wi-Fi Access Points (APs) or base stations, and the participating devices that have strong access to wireless infrastructure and sufficient battery charge level can rely on data of other devices to destinations of the MANET. This paper provides the solution for issues of networking layer data forwarding solutions. People can install the corresponding Android application on smart phones and tablets, use it to form a hybrid cellular-MANET, and perform micro blogging activities in areas with inadequate wireless coverage.

❖ Srividya and Ramesh, (2015) Design of Biometric Authentication Technique for MANET Based Emergency Response System [7]. There are many methods used to protect any of the confidential and sensitive information or files and systems from unauthorized access. The easy to adopt and fast catching authentication techniques is by using one's own physiological or behavioural traits or combination of both can be made use for authentication purpose. This paper offers effective design of biometric systems for the emergency management system.

❖ Krishna Gorantala, (2010) Routing Protocols in Mobile Ad-hoc Networks [8]. It proposes networks in which there is no fixed topology due to the mobility of nodes, interference, multipath propagation and path loss. Destination Sequenced Distance Vector (DSDV) is best suited for only smaller networks and Adhoc On-Demand Vector (AODV) is suited for general Ad-hoc networks. DSDV routing protocol consumes more bandwidth, because of the frequent broadcasting of routing updates. AODV is better than DSDV as it doesn't maintain any routing tables at nodes which results in less overhead and more bandwidth. AODV routing protocol is best suited for general mobile ad-hoc networks as it consumes less bandwidth and lower overhead when compared with DSDV routing protocol.

❖ Panu Avakul et.al, (2012) Benefit of Selecting Number of Active Mesh Routers in Disaster Oriented Wireless Mesh Network [9]. After a major disaster, existing communications infrastructures will be heavily damaged or even completely unusable. It is necessary that communications are to be promptly restored to the disaster area. The project aims to build three tiers wireless mesh network from remaining wireless access points in order to provide communication services to the disaster area. Wireless Mesh Networks (WMN) is low-cost and rapid deployment, which are suitable properties for an emergency network role. Optimize the performance of the project by choosing the right number or combination of active Multi Routers (MR's).

❖ Stephen Muler et.al, (2014) Multipath Routing in Mobile Ad Hoc Networks: Issues and Challenges [10]. It has presented a multipath routing in ad hoc networks mostly in terms of the network layer. Using multipath routing to support Quality of Support (QoS), most of the protocols proposed only provide QoS in terms of specific metrics, such as bandwidth, delay, or reliability. Due to the limited transmission range of wireless network nodes, multiple hops are usually needed for a node to exchange information with any other node in the network. Thus routing is a crucial issue to the design of a MANET. Multipath routing allows the establishment of multiple paths between a single source and single destination node. Multipath routing is used in order to increase the reliability of data transmission. Routing in MANET is a challenge due to dynamic topology in network as mobile nodes can move in any direction in the MANET.

❖ Douglas S. J. De Couto et.al, (2003) A High Throughput Path Metric for Multi-Hop Wireless Routing [11]. It presents the expected transmission count metric (ETX), which finds high-throughput paths on multi-hop wireless networks. The design and implementation of ETX as a metric for the Destination Sequence Distance Vector (DSDV) and Dynamic Source Routing (DSR) routing protocols, as well as modifications to DSDV

and DSR which allow them to use ETX. It measures the link loss characteristics. Route selection using ETX accounts for link loss ratios, the asymmetry of the loss ratios in the two directions of each link, and the reduction of throughput due to interference among the successive hops of a route. Packet loss and retransmission that is due to channel error and incorporates the effect of loss rate asymmetry between both directions of a link.

❖ Pauline ML Chan et.al, (2006) Hybrid satellite/terrestrial networks: State of the art and future perspectives [12]. It proposes a number of possible roles of the satellite component in hybrid satellite/terrestrial networks had been discussed, as well as the core functions which should be performed to optimize the performance of the hybrid networks. The inter-working of QoS mechanisms is a critical issue in hybrid systems so that end-to-end QoS support can be efficiently provided. Recent work in the European Telecommunication Standards Institute (ETSI) has addressed in the Broadband Satellite Multimedia (BSM) group the issue of enabling QoS for IP-based multimedia satellite systems.

OBSERVATION

Reviewing the above mention papers in point of fact observed that, at the time of disastrous situations, emergency communication systems and establishment of secure system is essential and also very difficult to frame. There are many techniques and methods utilized to implement the communication systems. But still we must try to design an effective communication system with completeness, adaptability, easy-to-use and also technologically sound.

CONCLUSION

In the disastrous situations, Emergency communication system is considered as life saving support system which provides emergency facilities to victims, support rescue teams to help victims and as a communication infrastructure in disastrous area. In existing emergency communication solutions, there is a need of extra equipments such as satellite phone and user should be aware of operation of those devices.

- A hybrid cellular mobile ad hoc network (hybrid cellular MANET) can provide a solution for emergency communication system in disaster hit areas.
- In this kind of network, mobile nodes (devices) connected through Wi-Fi interface to each other and they can also connect directly to the access points which are dropped in disastrous area.
- This emergency network uses the features of cellular communication if any of base station is alive.
- We must propose a system, where trapped victims can use their smart phones or similar devices for communication purpose. There should not be any need of new devices or new technology.
- A proposed system must be adaptable to the changes in topology of the network. The network must efficiently utilize the energy resource of devices and available communication system.

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