

Disaster Management Using D2D Communication

Senan Ali Abd¹, Dr. Manjunath S.S², Dr. Sayed Abdulhayan³

PhD Scholar, Dayananda Sagar College of Engineering, Bengaluru, Karnataka, India¹

Professor, Dayananda Sagar College of Engineering, Bengaluru, Karnataka, India²

Associate Professor, Dayananda Sagar College of Engineering, Bengaluru, Karnataka, India³

Abstract: At the time of Disaster, the towers get collapse leading to loss of Network. Hence we need to communicate with people lying in Debris becomes essentially important to save them. Hence we want to use D2D Technology for our device to device communication where network availability is absent. This Region without Network is made to interoperate with the Region Having Network connectivity with the existing Protocol by developing Gateway at the interface of the two regions one with Network availability and other with Network absent.

Keywords: D2D(Device-to-Device),5G(5thGeneration Technology), TCP/IP Model, AODV Routing Protocol, MANETs (Mobile Adhoc Networks).

I. INTRODUCTION

At the time of disaster we are will lose the connectivity with one another. The basic need at that time is to know the conditions and whereabouts of people lying under debris by relief team. The way to communicate with the relief team is through D2D communication where network is not available. When these people want attention by Rescue team a special gateway needed to be developed for communicating these people with the Mobiles of people lying under network to acquire their attention. Since we assume that People came for rescue will be operating with Devices having Network availability of some sort by satellite etc.

We are organizing our Papers into 6 sections. Section-I is Introduction, Section-II is MANETs Explanation, Section-III is Principle of Operation, Section-IV is need for Gateway Technology, Section-V Proposed Model for Disaster Rescue, Section-VI is Issues and Challenges in MANET-INTERNET integration, Section-VII is Future Enhancement, Section-VIII–Conclusion

II. MANETS

MANETs are the scenario for the Mobiles when its struck by Natural Disaster and the infrastructure (eNodeB, BTS, MMSC Towers) had collapsed due to Natural Calamality where in the Mobiles are left without network service.

A MANET is an autonomous collection of mobile users that move arbitrarily and communicate over multi-hop relays. The topology of the network may change unpredictably and dynamically. There is no pre-established infrastructure or backbone and centralized administration in the MANET. The MANETs are generally envisioned to operate as stand-alone networks, which mean that the traffic will be restricted within the MANET. All members in the MANET equally participate in the routing information distribution and route

maintenance, by running the same routing protocol. Efficient ad hoc routing protocols must be adaptive to topological changes and traffic demands [1].

To connect the MANET to the internet first it might discover internet gateway through which it can communicate. The discovered gateway may be the mobile node within the MANET or it may be any fixed external node outside the MANET. The gateway works as the default router for all the nodes of the MANET through which all the incoming/outgoing packets are routed between the MANET and the internet. Discovery of the efficient internet gateway is very challenging task.

To establish the connection between the nodes within the MANET and INTERNET, a gateway is required to be discovered to route the information between the MANET nodes and Internet. There are different approaches for internet gateway discovery, such as proactive, reactive and hybrid [2].

Internet gateway may be a mobile node within the MANET or it may be any external fixed node outside the MANET. Different Protocol architecture is required for connectivity of MANET with Internet. TCP/IP suite and MANET Protocol Architecture use different languages. The Mobile devices in MANET share limited storage and less computational capabilities. They heavily depend on other hosts and resources for data access and information processing [3]. A Gateway, that must be able to translate between these “two languages”, must understand both [4]. These networks are autonomous where a number of mobile nodes equipped with wireless interfaces.

A scenario under calamities is defined with the following assumptions:

- i. There might be multiple gateways to the Internet.
- ii. Nodes are mobile, at both micro and macro scales.

- iii. The routing protocol is reactive and hop-by-hop, i.e., each node has a limited horizon in the view of the network and only knows the next hop towards a destination.
- iv. Nodes do not share a common IP-prefix [15].
- v. Hand over between Gateways.

III. PRINCIPLE OF OPERATION

We want the infrastructure less Devices i.e. Devices with no network availability (e.g. Mobile etc in disaster hit area) to communicate with the Devices with Network availability using the proposed Model of interoperability between them. We know that for communication between the Devices is through TCP/IP or OSI Model when Network is available. Here The Routing Protocols are invariable OSPF,BGP etc as according to IP Protocol in Network Layer. But whenever the network gets collapsed, we are left the scenario more preferably mentioned as MANETs where the Mobiles are been reduce to a state of Nodes in MANETs. Here the Network Layer Protocol for communication is AODV routing Protocol not IP Protocol. Hence we need to develop a Layer of Interoperability for the Networks which interface these Mobiles for Communication between the above mentioned Regions.

IV. NEED OF GATEWAY

Since the change in the protocol Stack will be observed only at network layer between the set of Devices operation at the regions with and without Network availability. The Gateway should Process the Data from the mobile Nodes available by AODV Routing Protocol to the IP- Network Mobiles wherein Data is available by OSPF,BGP etc Protocols. The gate way should also do a Vice-Versa i.e. from IP Routing Protocol based Mobiles to AODV routing based Mobile in Disaster Hit area. The Gate way should act as Interface between IP Network Layer and AODV Network layer.

V. PROPOSED MODEL FOR DISASTER MANAGEMENT

The figure 1 shows the depiction of Protocol at various Layers in Both Regions having Network and without Network. The Routing at the level of MANETs Reduced Mobile after Destruction is AODV protocol i.e Adhoc On demand distance Vector Routing

Ad hoc On-Demand Distance Vector (**AODV Routing**) is a **routing protocol** for mobile ad hoc networks (MANETs) and other wireless ad hoc networks. It was jointly developed on July 2003 in Nokia Research Center, University of California, Santa Barbara and University of Cincinnati by C. Perkins, E. Belding-Royer and S. Das.

IP Routing is an umbrella term for the set of protocols that determine the path that data follows in order to travel across multiple networks from its source to its destination. Data is **routed** from its source to its destination through a series of **routers**, and across multiple networks. IP Routing is used in Region-1 whereas AODV Routing Protocol is used in Region-2.

- Region-1-Region with Network Availability
- Region-2-Region with no Network availability
- Region-1-IP Protocol at Network Layer
- Region-2-AODV Protocol at Network Layer

Device Under Network Availability	Gateway Interface between 2 Regions under Network Availability		Device Under No Network Availability
Application Layer			Application Layer
Transport Layer-UDP			Transport Layer-UDP
Network Layer-IP Protocol	Network Layer-IP Protocol	Network Layer-AODV Protocol	Network Layer-AODV Protocol
Datalink Layer	Datalink Layer	Datalink Layer	Datalink Layer
Physical Layer	Physical Layer	Physical Layer	Physical Layer

Figure.1. Protocol Suite for Interoperable Gateway

VI. ISSUES AND CHALLENGES IN MANET-INTERNET INTEGRATION

MANET-INTERNET integration may be defined as-

- i) Determining the node's location
- ii) Discovering gateways and
- iii) Establishing and maintaining consistent forwarding states to the gateways.

The Gateway Server will:

- a. Generate IDs for the Mobile based on Mobile IP for UE with no IP address due to collapse of Network..
- b. Stores a list of authorized MIP IDs for UE discovery
- c. Will register the user Mobile IP for UEs which were been assigned by different Gateway.

VII. FUTURE ENHANCEMENT

As of now we are thinking of only voice Communication but it may be extended to the Image Transport and also video stream since this is D2D communication within 5G which works on the principle Bandwidth of 2G Hertz. We are in process of Building the device and testing it with Image and video streaming.

VIII. CONCLUSION

Here we want to conclude with the opinion that this approach to contact people lying under debris is excellent Method of Rescue to trace and provide relief to the disaster affected people. We can say that this approach is Novel as it can use the latest technology available in upcoming years to come i.e. D2D for MANET routing Protocol.

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