COMPARISON OF ROUTING PROTOCOLS IN MANET FOR FUTURE IN DISASTER MANAGEMENT

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Abstract

This study focused on the routing and maintenance process of MANET which consists of dynamic changes in topology and nodes so that data can be distributed faster. The driving component of MANET for research is the discovery of pathways, and a number of techniques have been proposed for this. Each has higher expectations than the other. This comparative analysis reveals the issues of route finding and maintenance of MANET communications, such as whether one is better than the other in different network conditions. This study examines the literature on MANET pathway discovery and maintenance strategies. As a result, several routing protocol techniques are compared. These methods include some suggestions of performance improvement using routing protocols, especially in disaster management, to achieve improvements. This study presents guidelines for future experimentation, which will be adopted to identify the most advantageous collection of strategies to meet the needs of various applications.

Keywords: MANET, Pathway, Discovery and Maintenance etc.

1.1 Introduction

A wireless ad hoc network [1] (WANET) or mobile ad hoc network (MANET) is a decentralized type of wireless network. [2] [3] [4] [5] [6] The network is ad hoc because it does not rely on pre-existing infrastructure, such as routers in wired networks or access points in managed (infrastructure) wireless networks. [7] Instead, each node participates in routing by forwarding data to other nodes, so determining which nodes to forward data to is made dynamically, based on network connectivity and the routing algorithm in use. [8] In Windows operating systems, ad hoc is a communication mode (setting) that allows computers to communicate with each other directly without a router. Wireless mobile ad hoc networks are self-configuring, dynamic networks in which nodes are free to move. Such wireless networks lack the complexities of infrastructure installation and administration, enabling devices to create and join networks "on the fly". [9] By definition a true MANET requires multicast routing, not just unicast or broadcast. [10] Each device in the MANET is free to move independently in any direction, and will therefore frequently change its links to other devices. Each must forward traffic unrelated to its own use, and therefore must be a router. The primary challenge in building a MANET is equipping each device to consistently maintain the information needed to properly route traffic. [11] This becomes difficult as the scale of a MANET increases due to 1) the desire to route packets to/through every other node, 2) the percentage of overhead traffic required to maintain real-time routing status , 3) each node has its own goodput for routing independent and unaware of the others' needs, and 4) all must share limited communications bandwidth, such as a piece of radio spectrum. Such networks may be self-powered or may be connected to the larger Internet. They may have one or multiple and different transceivers between nodes. This results in a highly dynamic, autonomous topology. [1 1] MANETs typically consist of a routable networking environment on top of a link layer ad hoc network. MANET consists of a peer-to-peer, self-forming, self-healing network. MANETs circa 2000–2015 typically communicate over radio frequencies (30 MHz - 5 GHz).

1.2 Preparatory work on MANET

The development of laptops and 802.11/Wi-Fi wireless networking has made MANETs a popular research topic since the mid-1990s. Many academic papers evaluate protocols and their capabilities, assuming varying degrees of mobility within a confined space, typically with all nodes within a few hops of each other. Various protocols are evaluated based on measures such as packet drop rate, overhead introduced by the routing protocol, end-to-end packet delay, network throughput, ability to scale, etc. In the early 1990s, Charles Perkins of Sun Microsystems USA and Chai Keong Toh of Cambridge University began work on a separate Internet, that of wireless ad hoc

networks. Perkins was working on dynamic addressing issues. Toh worked on a new routing protocol, which was known as ABR - Associative-Based Routing. [16] Perkins eventually proposed DSDV - Destination Sequence Distance Vector Routing, which was based on Distributed Distance Vector Routing. Toh's proposal was an on-demand based routing, i.e. on-the-fly routes are discovered in real-time when needed. The ABR [17] was submitted to the IETF as an RFC. ABR was successfully implemented in Linux OS on Lucent WaveLAN 802.11a capable laptops and hence a practical ad hoc mobile network proved possible in 1999 [2] [18] [19] . Another routing protocol known as AODV was introduced later and later perfected and implemented in 2005. [20] In 2007, David Johnson and Dave Maltz proposed DSR - Dynamic Source Routing. [21]

1.3 Application

The decentralized nature of wireless ad-hoc networks makes them suitable for a wide variety of applications where central nodes cannot be trusted and can improve the scalability of the network compared to wireless managed networks, although the overall capacity of such networks is limited. Theoretical and practical limitations have been identified. Minimal configuration and quick deployment make ad hoc networks suitable for emergency situations such as natural disasters or military conflicts. The presence of dynamic and adaptive routing protocols enables ad hoc networks to be formed quickly. Wireless ad hoc networks can be further classified by their applications:

Mobile Ad Hoc Network (MANET)

A mobile ad hoc network (MANET) is a continuous self-configuring, self-managed, infrastructure-less [22] network of wirelessly connected mobile devices. This is sometimes referred to as an "on-the-fly" network or a "spontaneous network". [23]

Vehicle Ad Hoc Networks (VANETs)

VANET is used for communication between vehicles and roadside equipment. [24] Intelligent Vehicle Ad Hoc Network (InvaNet) is a type of artificial intelligence that helps vehicles behave intelligently during vehicle-to-vehicle collisions, accidents. Vehicles are using radio waves to communicate with each other, creating instant communication networks while vehicles move on the roads. VANET needs to be secured with lightweight protocols.

Smartphone Ad Hoc Network (SPAN)

A SPAN takes advantage of existing hardware (primarily Wi-Fi and Bluetooth) and software (protocols) in commercially available smartphones to enable peer-to-peer communication without relying on cellular carrier networks, wireless access points, or traditional network infrastructure. network can be created.

IMANETS

Internet based mobile ad hoc network (IMANET) is a type of wireless ad hoc network that supports Internet protocols such as TCP/UDP and IP. The network uses network-layer routing protocols to connect mobile nodes and to establish routes distributed and automatically.

Wireless Mesh Network

Mesh networks take their name from the topology of the resulting network. In a fully connected mesh, every node is connected to every other node, forming a "mesh". A partial mesh, in contrast, is a topology in which some nodes are not connected to others, although the term is rarely in use. Wireless ad hoc networks may take the form of a mesh network or others.

1.3 Link State/Table Driven Routing Protocol (Proactive)

In these routing protocols, we use routing algorithms that continuously transfer related information to its neighboring nodes. In PRP, each node has a table that manages continuous change [6]. The main examples of PRP are DSDV and WRP. Destination sequence distance vector routing (DSDV) is a proactive vector routing protocol that uses hop by hop technology [6]. Wireless Routing Protocol (WRP) maintains four tables for each node which are a distance table, routing table, link-cost table and, message retransmission list for routing. In WRP, the updating of messages is done through the neighbors of a node.

TABLE 1.1: PROACTIVE ROUTING PROTOCOL COMPARISON[10]

Challenges	DSDV	OLSR
Balance of Load Issue	Negative	Negative
Reliability and validity issue	Positive	Positive
Throughput issue	Reduced with mobility	Better result as compared to DSDV
Scale controlling issue	Negative	Negative
Control Management Issue	Positive	Negative

1.4 On Demand/Distance Vector Routing Protocol (Reactive)

In RRP, the design of a route to achieve the main goal is possible only when it is needed. The distance-vector routing algorithm manages the route to a particular destination station only when a node needs and demands it. The main idea behind these protocols is to reduce the routing overhead of traffic, which is the main challenge of PRP [5]. Each node in TORA uses a parameter height that measures the distance from the source to the destination in hops. The source node uses the altitude parameter to assist the source node in selecting the best path parameter to reach the desired destination. This communication is without iterative multipath routing to the destinations to reduce overhead. A qualitative comparison of reactive routing protocols is presented in Table 1.2.

TABLE 1.2: REACTIVE ROUTING PROTOCOL COMPARISON[10]

Challenges	AODV	DSR
Complexity Issues	Moderate	Moderate
Balance of Load Issue	Negative	Negative
Reliability and validity issue	Positive	Positive
Configuration of routes	After use delete the route give information to source	After use delete the route give information to source
Throughput issue	For above 20 nodes it is low	Reduction on increment in mobility
Scale controlling issue	Negative	Negative
Control Management Issue	Negative	Negative
Management of routes	Through Table	Through cache
Loop issues	Free	free
Delete Route Information timing	Positive	Negative
Multi Routing System support	Negative	Positive
Types of protocol	Distance base routing	Source base routing
Burden on Route	Low	Moderate

1.5 Comparison on Routing Protocols

Table 1.3 on a comparative analysis of different types of routing protocols such as PRP, RRP, and HRP on the types of protocols, approaches used in routing, scalability, energy efficiency, network overhead and throughput, latency issues, power requirement, storage The issue has been discussed with regard to requirement and bandwidth requirement.

TABLE 1.3: COMPARISON BETWEEN DIFFERENT ROUTING PROTOCOLS[10]

Main Features	Proactive Protocol	Reactive protocol	Hybrid Protocol
Routing issues for Acquis ion	Table Driven base	On demand base	Both combine
Scalability Issues	Less Level	Not accurate for large network	Have best design for large network
Latency issues	Less due to use of table for routing	Its High Peak due flooding environment	Less inside Zone High outside zone
Bandwidth Requirement Issues	High	Less	Medium
Periodically updating	Needed when change occur in network topology	Not needed	Needed
Routing Overhead Issues	High	Less	Medium
Power Requirement Issues	High	Less	Medium
Storage requirement issues	High	Less	Medium
Mobile nature of nodes	Updating perform periodically	Maintain Route on demand basis	Combine both together
Routing Information issues	High level Availability	Availability on requirement	Combine both together

The main performance parameters used in MANET are message overhead, average end-to-end delay, and routing throughput. Tables compare different routing protocols used in disaster management with their weaknesses and strengths respectively.

Based on the comparison made in the tables, the following conclusions can be drawn.

1. MANET is an active and urgent area of research in disaster management, which needs more emphasis.
2. Efficiency was the key factor required which was mainly based on protocol complexity or overhead (light/heavy) and end-to-end delay.
3. The main issues observed were the security and integrity of the data.

1.6 Conclusion

A major problem in wireless ad hoc networks is to predict the various possible situations that may occur. As a result, modeling and simulation (M&S) using comprehensive parameter comprehensive and what-if analysis becomes an extremely important paradigm for use in ad hoc networks. One solution is to use a simulation tool like OPNET, NetSim or ns3. A comparative study of various simulators for VANET shows that constrained road topologies, multi-path fading and roadside obstacles, traffic flow models, travel models, speed and maneuverability of individual vehicles, traffic lights, traffic Factors like crowd, behavior of drivers etc. , to be taken into account in the simulation process to reflect realistic conditions. This study explores and describes different types of routing protocols and their difficulties associated with security attacks on security, power, routing, and data and physical structure of the layers to address the issue of e-security. did. The various routing protocols mentioned above are very valuable and efficient for new research efforts aimed at identifying current problems for future research. Many new approaches, rules, algorithms and protocols are now being introduced to implement routing solutions. However, despite this progress, there are still many research challenges. B. Which protocol, technique, method, algorithm, or process works best in your particular environment? Much has been done in this area so far, but there are still many challenges and problems to be resolved. MANET networking is one of the most important and essential approaches to future computing plans. MANET currently collects a large number of engaging research papers, research projects and issues used by universities and companies around the world. As such, it covers fog and cloud computing paradigms and includes multi-objective and heuristic-based algorithms for smart city environments. This study explores various routing protocol strategies and discusses the problems caused by these techniques. This helps

researchers better understand routing performance. In the future, we want to compare routing algorithms based on network overhead.

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