

MOBILE AD HOC NETWORKS: ROUTING PROTOCOLS, ISSUES IN ROUTING PROTOCOLS AND ITS APPLICATIONS

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ABSTRACT

Mobile Ad Hoc Network (MANET) consists of two or more nodes or terminals or devices with networking capability and wireless communications that communicate with each other without the assistance of any centralized administrator also the wireless nodes that can vigorously form a network to exchange information without using any existing fixed network path. MANET is a special kind of wireless Ad Hoc network which has special characteristics like dynamic topology, hop-by-hop communications and easy and quick setup. And it's an independent system in which mobile hosts connected by wireless relations are free to be dynamically and some time act as routers at the same time. The different characteristics of traditional wired networks, including network configuration may change at any time, there is no direction or limit the movement and so on, and thus needed a new optional path Agreement (Routing Protocol) to identify nodes for these actions communicate with each other path, An ideal choice way the agreement should not only be able to find the correct path, and the Ad Hoc Network must be able to adapt to changing network of this type at any time. MANET faced lots of challenges symbolically routing, security and clustering. The security challenges arise due to MANET's self configuration and self-maintenance capabilities.

Keywords: Wireless Ad Hoc Networks, Mobility, hop-by-hop, dynamic, routing, self configuration and self-maintenance.

I.INTRODUCTION

With the extensive rapid development of computers and the wireless communication, the mobile computing has already become the arena of computer communications in high-profile link. Mobile Ad Hoc Network (MANET) is a completely wireless through the nodes constructed by the actions of the network, which usually has a dynamic shape and a limited bandwidth and other features. Network address can be laptop, Personal Digital Assistant (PDA), mobile phones, MP3 players, and digital cameras and so on. On the Internet, the original Mobility (mobility) is the term used to denote actions hosts roaming in a different domain; they can retain their own fixed IP address, without the need to constantly changing, which is Mobile IP technology. Mobile IP nodes

in the main action is to deal with IP address management, by Home Agent and Foreign Agent to the Mobile Node to packet Tunneling, the Routing and fixed networks are no different from the original; however, Ad Hoc Network to be provided by Mobility is a fully wireless, can be any mobile network infrastructure, without a base station, all the nodes can be any link, each node at the same time take Router work with the Mobile IP completely different levels of Mobility.^[1] Early use of the military on the Mobile Packet Radio Networked in fact can be considered the predecessor of MANET, with the IC technology advances, when the high-tech communication equipment, the size, weight continuously decreases, power consumption is getting low, Personal Communication System (Personal Communication System, PCS) concept evolved, from the past few years the rapid popularization of mobile phones can be seen to communicate with others anytime, anywhere, get the latest information, or exchange the required information is no longer a dream, And we have gradually become an integral part of life. Military purposes, as is often considerable danger in field environment, some of the major basic communication facilities, such as base stations, may not be available, in this case, different units, or if you want to communicate between the forces, we must rely on This cannot MANET network infrastructure limitations. In emergency relief, the mountain search and rescue operations at sea, or even have any infrastructure can not be expected to comply with the topographical constraints and the pressure of time under the pressure, Ad Hoc Network completely wireless and can be any mobile feature is especially suited to disaster relief operations. When personal communication devices and more powerful, some assembly occasions, if you need to exchange large amounts of data, whether the transmission of computer files or applications that display. If we can link into a temporary network structure, then the data transmission will be more efficient without the need for large-scale projection equipment would not have point to point link equipment (such as network line or transmission line). The current wireless LAN technology, Bluetooth is has attracted considerable attention as a development plan. Bluetooth's goal is to enable wireless devices to contact with each other, if the adding the design of Ad Hoc Network (MANET).

II.MOBILE AD HOC NETWORKING (MANET):

Mobile Ad hoc Networking (MANET) is a collection of independent network mobile devices that are connected over various wireless links. It is comparatively working on a constrained bandwidth. The network topologies are dynamic and may differ from time to time. Each device must act as a router for transferring any traffic among each other. This network can operate by itself or incorporate into large area network (LAN).

There are three types of MANET. It includes:

- Vehicular Ad hoc Networks (VANETs)
- Intelligent Vehicular Ad hoc Networks (InVANETs)
- Internet Based Mobile Ad hoc Networks (iMANET).

The application for MANETs can be ranged from small, static networks that are limited by power sources, to large-scale, mobile, highly dynamic networks. On top of that, the design of network protocols for these types of networks is face with multilayered issue. Apart from of the application, MANETs need well-organized dispersed algorithms to determine network organization, link scheduling, and routing. Conventional routing will not work in distributed environment because this network topology can change at any point of time. Therefore,

we need some sophisticated routing algorithms that take into consideration this important issue (mobile network topology) into account. While the shortest path (based on a given cost function) from a source to a destination in a static network is usually the optimal route, this idea is not easily far-reaching to MANETs. Some of the factors that have become the core issues in routing include variable wireless link quality, propagation path loss, fading, interference; power consumed, and network topological changes.

2.1 The fundamentals for the Mobile Ad Hoc Networks:

MANET has characteristics can be divided into the following sections:

- ✓ Dynamic topologies: nodes can move freely, network topology may change rapidly, restructuring, but also may also have symmetric and asymmetric links.
- ✓ Bandwidth-constrained, variable capacity links: Compared with the wired network environment, the capacity of the wireless link itself is relatively small, but also susceptible to external noise, interference, and signal attenuation effects.
- ✓ Energy-constrained operation: A laptop or handheld computers are often used batteries to provide power, how to save electricity in the context of depletion of system design is also necessary to consider the point.
- ✓ Limited physical security: Network Security With the network deeply embedded in our daily lives and the benefits have become increasingly important in the wireless network to provide security support is also an important issue.^[i]

III.EXISTING AD HOC ROUTING PROTOCOLS

Some of the basic routing protocols are described here:

3.1 Destination-Sequenced Distance-Vector Routing (DSDV)- Each node in an operation must be stored a routing table, which records all the possible links with the nodes in the node and the distance like the number of hops, routing table within each record also contains a sequence number, which is used to determine are there any more old path in order to avoid routing table generation

3.2 Global State Routing (GSR)-Each node maintains a neighbor list, a topology table, a next hop table and a distance table.The neighbor list of a node includes the list of its neighbors. The link state information for each destination is maintained in the topology table together with the timestamp of the information. The next hop table includes the next hop to which the packets for each destination must be dispatched. The distance table contains the shortest distance to each destination node. The routing messages will be created on a link change as in all link state protocols.

3.3 Cluster head Gateway Switch Routing (CGSR)-Using a cluster head to manage a group of action nodes, that is, the action is divided into a group of a group of nodes, each elected by a head, the cluster head among through a gateway to connect to each other, into a hierarchical structure.

3.4 Wireless Routing Protocol (WRP)- Wireless Routing Protocol ^[iii] makes use of the routing table at each node in the record to complete the routing, and DSDV with CGSR difference is that, WRP require each node to

operate a record four tables, namely Distance table, Routing table, Link-cost table, Message retransmission list table.

3.5 Fisheye State Routing (FSR)- It swaps information about neighboring nodes regularly than it does about farther nodes, thus reducing the update message size. In this way, each node gets accurate information about the nearest neighbors and accuracy of information decreases as the distance from the node increases.

3.6 Ad Hoc On-Demand Distance Vector Routing (AODV)- When a node wants to send data to another node in the network, the first to broadcast a Route Request (RREQ) packet ^[iii] RREQ where the record that this is given by which a source is to be used to find which of a destination node. RREQ in the network is a kind of flooding of the transfer mode, destination until they were received, of course, a node can only be processed once on the same RREQ in order to avoid routing loop generation.

3.7 Dynamic Source Routing (DSR)- As the name suggests is the use of the concept of source routing, the routing information that is directly recorded in the inside of each packet, but to be in the MANET environment, the use of such a special, DSR is needed only when the path to find out the path, that is, on -demand.

3.8 Temporally Ordered Routing Algorithm (TORA)-Concept of link reversal will be used in MANETS become a kind of decentralized routing algorithms, from the beginning need to route the data sender to the destination number can be used to identify the direction of the path, suitable for highly dynamic environment. TORA is that when there is link the characteristics of the changes, produced by the adjacent node control message is confined to changes occurring at the vicinity of its process is divided into three steps: Route Creation, Route Maintenance, Route Erasure.

3.9 Cluster Based Routing protocol (CBRP)-A cluster head maintains information about the members of its cluster and also maintains a cluster adjacency table that contains information about the neighboring clusters. For each neighbor cluster, the table has entry that contains the gateway through which the cluster can be reached and the information about the cluster head.

IV. AD HOC NETWORK ROUTING PROTOCOL PERFORMANCE ISSUES

As the MANET with the traditional wired, fixed networks have many different characteristics, so to design a suitable routing protocol for MANET operating environment must also consider the different directions, the following sub-qualitative and quantitative aspects of the discussion:

4.1 On the qualitative aspects

It can be divided into

1. Distribution operation: due to the existence of MANET where there is no precondition for the construction of the underlying network, so routing can not rely on a particular node to operate.
2. Loop-freedom: all the routing protocol should be consistent with the characteristics; we must ensure the normal work in order to avoid waste of bandwidth.
3. Demand-based operation: In order to reduce the burden on each node, if the link is not so much the demand should be considered when using On-demand approach to the establishment of the path, and only when the need for a particular path query, the establishment of the path.

4. Proactive operation: with the On-demand concept of the contrary, if the network resources fairly adequate, proactive table-driven approach could speed up the path to the establishment of speed.

5. Security: Because it is the wireless environment, to how to ensure the security of the connection can not be ignored will be part of network security is also a MANET from theory to implementation of the key challenges

6. Sleep Period operation: As the MANET nodes are generally smaller wireless devices, using the battery as a power supply, how to save power consumption, or for no work, the node goes into sleep mode, can operate more smoothly so that MANET. Also the nodes of a Mobile Ad Hoc Networks may stop transmitting or receiving or both, also even receiving requires power for arbitrary time periods and the routing protocol should be able to accommodate such sleep periods without overly adverse consequences. This property may require close coupling with the link-layer protocol through a standardized interface.

7. Unidirectional link support: MANET nodes have heterogeneous characteristics, and some may be notebook computers, and some may be PDA, and some might be even smaller devices, in this environment, the transmission characteristics of asymmetric more significant than the wired environment.

4.2 On the quantity:

It can be divided into

1. End-to-end data throughput and delay: data transmission rate and delay in the case that every routing protocol must take into account the focus should be how to find the best path? Is the maximum bandwidth or minimum latency, or the link to the most stable? Considered more likely to make more complicated routing protocol, but it is possible to significantly improve the transmission quality.

2. Route Acquisition time: While the table-driven generally higher than on-demand performance good, but many of the former to pay the price, which, if properly designed, for example, there is more commonly used in the path cache, or a certain fixed path, can improve the path to the establishment of time.

3. Percentage Out-of-order delivery: real-time data for this part of the more stringent requirements, and general information will not affect how and upper TCP cooperation is also IP routing work.

4. Efficiency: the simplest method, the smallest control overhead

V.APPLICATION IN AD HOC NETWORKS

5.1 Tactical networks

- Military communication. • Military operations
- in the battlefields.

5.2 Emergency services

- Search and rescue operations in the desert and in the mountain and so on.
- Replacement of fixed infrastructure in case of environmental disasters
- Policing



- fire fighting
- Supporting doctors and nurses in hospitals

5.3 Coverage extension

- Extending cellular network access
- Linking up with the Internet, intranets, and so on.

5.4 Sensor networks

- Inside the home: smart sensors and actuators embedded in consumer electronics.
- Body area networks (BAN)
- Data tracking of environmental conditions, animal movements, chemical/biological detection

5.5 Education

- Universities and campus settings
- Classrooms
- Ad hoc Network when they make a meetings or lectures Education
- Multi-user games
- Wireless P2P networking
- Outdoor Internet access
- Robotic pets
- Theme parks

5.6 Home and enterprise

- Using the wireless networking in Home or office.
- Conferences, meeting rooms

5.7 networks

- Personal area networks
- Personal networks.

5.8 Context aware services

- Follow-on services: call-forwarding, mobile workspace
- Information services: location specific services, time dependent services
- Infotainment: touristic information

5.9 Commercial and civilian environments

- E-commerce: electronic payments anytime and anywhere
- Business: dynamic database access, mobile offices
- Vehicular services: road or accident guidance, transmission of road and weather conditions, taxi cab network, inter-vehicle networks
- Sports stadiums, trade fairs, shopping malls and so on.
- Networks of visitors inside the airports.

VI.CONCLUSION

In this paper, we have seen the routing techniques used popularly in mobile Ad Hoc network and also its performance issues. Mobile Ad Hoc network provides an independent network connected through wireless links. It has a constrained bandwidth and the time variation for each network devices. In this paper we have also seen some of the applications of mobile Ad hoc networks.

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