



Comparison: Introduction to Mobile Ad-Hoc Network and Routing Implementation

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Abstract: in this paper we will discuss about basic of mobile ad hoc network (MANET) mobile Ad Hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration, in which individual nodes cooperate by forwarding packets to each other to allow nodes to communicate beyond direct wireless transmission range. Routing is a process of exchanging information from one station to other stations of the network. Routing protocols of mobile ad-hoc network tend to need different approaches from existing Internet protocols because of dynamic topology, mobile host, distributed environment, less bandwidth, less battery power.

Keywords: routing, topology, dynamic, bandwidth, exchange, transmission

I. Introduction

Wireless communication between mobile users is becoming more popular than ever before. This is due to recent technological advances in laptop computers and wireless data communication devices, such as wireless modems and wireless LANs. This has led to lower prices and higher data rates, which are the two main reasons why mobile computing continues to enjoy rapid growth.

There are two distinct approaches for enabling wireless communication between two hosts. The first approach is to let the existing cellular network infrastructure carry data as well as voice. The major problems include the problem of handoff, which tries to handle the situation when a connection should be smoothly handed over from one base station to another base station without noticeable delay or packet loss. Another problem is that networks based on the cellular infrastructure are limited to places where there exists such a cellular network infrastructure.

The second approach is to form an Ad hoc network among all users wanting to communicate with each other. This means that all users participating in the Ad hoc network must be willing to forward data packets to make sure that the packets are delivered from source to destination. This form of networking is limited in range by the individual nodes transmission ranges and is typically smaller compared to traditional cellular system. Ad hoc networks have several advantages compared to traditional cellular systems.

These advantages include:

- On demand setup
- Fault tolerance
- Unconstrained connectivity
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II. Application of Mobile Ad hoc Networks

Because Ad hoc network are flexible network that can be set up anywhere at any time, without infrastructure including reconfiguration and administration, Mobile Ad hoc Networks is widely used. The main application areas of Mobile Ad hoc Networks are:

- Tactical network related application to improve the battle field communication and survivability.
- Sensor network services e.g. remote sensors for weather, earth activities, sensor for manufacturing equipment.
- Emergency services, search and rescue operation as well as disaster recovery e.g. early retrieval and transmission of patient data.
- Application in the field of e-commerce (electronic payment for any where). In vehicular services for transmission of news, road condition and weather.
- Educational application, in a classroom, students and instructors can set up an Ad hoc wireless network to share data using laptops.
- Set up virtual classrooms or conference rooms.
- Location aware services, automatic call forwarding, transmission of actual workspace to the current location.

III. General Issues in Mobile Ad hoc Networks

In mobile ad hoc networks, all the nodes co-operate amongst each other to forward the packets in the network and hence, each node is effectively a router. Thus one of the most important issues is routing. This Dissertation focuses mainly on routing issues in ad hoc networks. In this section, some of the other issues in ad hoc networks are described.

- (a) **Distributed network:** A MANETs can be considered as a distributed wireless network without any fixed infrastructure. By distributed, it is meant that there is no centralized server to maintain the state of the clients, similar to peer-to-peer (P2P) networks.
- (b) **Dynamic topology:** The nodes are mobile and hence the network is self-organizing. Due to this, the topology of the network keeps changing with time. Hence the routing protocols designed for such networks must also be adaptive to the changes in the topology.
- (c) **Power awareness:** Since the nodes in ad hoc networks typically run on batteries and deployed in hostile terrains, they have stringent power requirements. This implies that the underlying protocols must be designed to conserve battery life, or in other words, they must be power aware.
- (d) **Addressing scheme:** The network topology keeps changing dynamically and hence the addressing scheme used is quite significant. A dynamic network topology entails a ubiquitous addressing scheme, which avoids any duplicate addresses. Mobile IP is currently being used in cellular networks where a base station handles all the node addressing. However, such a scheme doesn't apply to ad hoc networks due to their decentralized nature.
- (e) **Network size:** Commercial applications of ad hoc networks such as data sharing in conference halls, meetings, etc. are an attractive feature of ad hoc networks. However, the delay involved in the underlying protocols places a strict upper bound on the size of the network.
- (f) **Security:** Security in ad hoc networks is of prime importance in scenarios of deployment such as battlefield. The three goals of security confidentiality, integrity and authenticity are very difficult to achieve since every node in the network participates equally in the network.

IV. Advantages of Mobile Ad hoc Networks

Low cost of deployment: As the name suggests, ad hoc networks can be deployed on the fly, thus requiring no expensive infrastructure such as copper wires, data cables, etc.

- (a) **Fast deployment:** When compared to WLANs, ad hoc networks are very convenient and easy to deploy requiring less manual intervention since there are no cables involved.
- (b) **Dynamic Configuration:** Ad hoc networks configuration can change dynamically with time. For the many scenarios such as data sharing in classrooms, etc., this is a useful feature. When compared to configurability of LANs, it is very easy to change the network topology.

V. Ad-hoc On Demand Distance Vector Routing Algorithm (AODV)

The Ad Hoc On-Demand Distance-Vector Protocol (AODV) is a distance vector routing for mobile ad-hoc networks. AODV is an on-demand routing approach, i.e. there are no periodical exchanges of routing information.

- (c) The protocol consists of two phases:
- (d) i) Route Discovery
- (e) ii) Route Maintenance.

Algorithm for the Calculation of TTL in Normal AODV

I. Initialization

Set $TTL_START = 5$
 Set $TTL_THRESHOLD = 7$
 Set $TTL_INCREMENT = 2$
 Set $NETWORK_DIAMETER = 30$

II. Calculation of TTL Time

$rt \rightarrow rt_req_last_ttl = \max(rt \rightarrow rt_req_last_ttl, rt \rightarrow rt_last_hop_count);$

III. Check Whether TTL is zero or not

```
if (0 == rt->rt_req_last_ttl) {
    // first time query broadcast
    ih->ttl = TTL_START; }
else {
```

IV. Expanding ring search

```
if (rt->rt_req_last_ttl < TTL_THRESHOLD)
    ih->ttl = rt->rt_req_last_ttl + TTL_INCREMENT;
```

```
else {
```

V. Network-wide broadcast

```
ih->ttl_ = NETWORK_DIAMETER;
rt->rt_req_cnt += 1;
}
}
```

VI. Remember the TTL used for the next time

```
rt->rt_req_last_ttl = ih->ttl_;
```

VI. Result

Packet Analysis for Normal AODV

Packet Analysis for Normal AODV			
Packet Analysis for Updated AODV			
Sender Node	Total Packet Sent	Receiver Node	Total Packet Recvd.
2	249	7	330
6	911	11	247
9	548	12	909
22	352	14	57
25	21	19	462
31	6	21	1
35	1222	24	18
39	61	32	1144
40	463	36	489
42	960	41	1210
48	1155	44	884
Total Packet Sent	5948	Total Pkt Recvd.	5751

VII. Conclusion

AODV is one of the most popular ad-hoc on-demand routing protocols. In the AODV routing protocol, local repair operation done by broadcasting RREQ packet with TTL equal to Eq. (1). This process produces high routing message overhead which consumes high portions from the bandwidth of the connected nodes. Whereas the new adaptive MAODV routing protocol, local repair done on one or more trials with TTL in the first trial initialized to a small value equal to LR_TTL_START. This will reduce the routing message overhead resulted from local repair operation in the AODV routing protocol.

From the obtained results it could be concluded that in small ad-hoc networks, MAODV is suitable for the applications that need low routing message overhead.

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