ABSTRACT

Routing is the method of selecting appropriate paths in a network along which to send data over network traffic. Due to rapidly increasing demand of data consumption and network resources required to introduce new approaches of network configurations and architecture is proposed and implemented. Mobile ad hoc network is very popular domain of research due to their ad hoc nature and this nature produces some disadvantages over performance and security, to understand network gaps and their properties in proper manner. In this paper we include the MANET supported routing protocols and perform their performance analysis over different performance parameters i.e. PDR, throughput.

KEYWORDS: MANET, Routing Protocols DSDV, AODV, OLSR, Performance Metrics

INTRODUCTION

A network is a collection of computers, similar communication devices and other hardware interconnected by communication channels that allow sharing of resources and information. According to their work and uses these networks are categorized and classified. Now in these days a new kind of network known as MANET, according to definition of MANET is a self-organizing, infrastructure less network, where each participating device is able to send and receive data, additionally this network contains property of mobility. A MANET is a type of ad hoc network that can change locations and configure itself on the fly. Because MANETS are mobile, they use wireless connections to connect to various networks. This can be a standard Wi-Fi connection, or another medium, such as a cellular or satellite transmission. Some MANETs are restricted to a local area of wireless devices (such as a group of laptop computers), while others may be connected to the Internet. For example, A VANET (Vehicular Ad Hoc Network), is a type of MANET that allows vehicles to communicate with roadside equipment. While the vehicles may not have a direct Internet connection, the wireless roadside equipment may be connected to the Internet, allowing data from the vehicles to be sent over the Internet. The vehicle data may be used to measure traffic conditions or keep track of trucking fleets. Because of the dynamic nature of MANETs, they are typically not very secure, so it is important to be cautious what data is sent over a MANET.

MANETs have several characteristics and properties that given below:

Dynamic Topologies

Nodes (Devices) are free to move arbitrarily; thus, the network topology—which is typically multi hop—may change randomly and rapidly at unpredictable times, and may consist of both bidirectional and unidirectional links.

Bandwidth-Constrained, Variable Capacity Links

Wireless links will continue to have significantly lower capacity than their hardwired counterparts. In addition, the realized throughput of wireless communications—after accounting for the effects of multiple access, fading, noise, and interference conditions, etc.—is often much less than a radio's maximum transmission rate. One effect of the relatively low to moderate link capacities is that congestion is typically the norm rather than the exception, i.e. aggregate application demand will likely approach or exceed network capacity frequently. As the mobile network is often simply an extension of
the fixed network infrastructure, mobile ad hoc users will demand similar services. These demands will continue to increase as multimedia computing and collaborative networking applications rise.

**Energy-Constrained Operation**

Some or all of the nodes in a MANET may rely on batteries or other exhaustible means for their energy. For these nodes, the most important system design criteria for optimization may be energy conservation.

**Limited Physical Security**

Mobile wireless networks are generally more prone to physical security threats than are fixed-cable nets. The increased possibility of eavesdropping, spoofing, and denial-of-service attacks should be carefully considered. Existing link security techniques are often applied within wireless networks to reduce security threats. As a benefit, the decentralized nature of network control in MANETs provides additional robustness against the single points of failure of more centralized approaches. In this section we provide general introduction about network and MANET introduction. In the next section we provide the different routing algorithm and their properties.

**BACKGROUND**

In any network routing protocols are plays important key roll. In this paper we study about different routing protocols, for that purpose we include some most frequently used routing protocols.

**AODV**

AODV is known as an on-demand reactive routing protocol. In this Routing approach routes are created when required, at time of connection establishment and routes are maintained for the duration of the communication session. During route discovery process source node that required sending packets, broadcasts a route request (RREQ) message for a given destination node. Nodes that have a route to the destination respond to the RREQ by sending a route reply (RREP) message to the source node and record the route back to the source node. Nodes that do not have a route to the destination node broadcast the RREQ packets after recording the return path to the source node. At the time of link breakage a route error RERR packets is sent to the list of nodes that rely on the broken link. Over receipt of a RERR packet, the corresponding route is invalidated and a new RREQ may be initiated by the source node to establish the route. The time-to-live field is used in RREQs for an expanding ring search to control flooding. Sequential RREQs use larger TTLs to increase the search for destination node.

**DSDV**

Unlike AODV, DSDV is a table-driven or proactive routing protocol. It is fundamentally based on the basic distributed Bellman-Ford routing algorithm. Each node in the network keeps a routing table residing of the next hop address, to guarantee loop free operation, routing updates from a given node are tagged with a simply increasing sequence number to distinguish between old and new route update messages. Nodes occasionally broadcast their routing tables to neighbouring nodes. Given sufficient time, all nodes will converge on common routing tables that list reachable nodes information to each destination in the network.

Route updates are generated and broadcast throughout the network when nodes discover broken network links. Nodes that receive a route update check to see if the sequence number specified in the route update message is higher than the sequence number recorded in their own routing table before accepting the update. DSDV reduces routing messages overheads by supporting both full and incremental updates of routing tables.
Main property of table-driven protocols is that, a route to every node in the network is always available. This results in considerable signalling overhead and power consumption. That degrades the network performance. Additionally, table driven routing transmit route updates of network load, size of routing table, bandwidth and number of nodes in the network.

**OLSR**

Optimized Link State Routing (OLSR) protocol is an optimization of the classical link state algorithm. Because of their quick merging ability, link state algorithms are somewhat less lying to routing loops, but they require more CPU power and memory. They can be more expensive to implement and support and are generally more accessible. OLSR operates in a hierarchical way minimizing the organization and supporting high traffic rates. MPRs are selected nodes which forward messages during the route discovery process. This method considerably reduces the message overhead as compared to a general flooding mechanism. By which reduces battery consumption in communicating nodes.

Link state information is created only by nodes selected as MPRs. MPR node may select to report only links between itself and its MPR selectors. Thus in the classical link state algorithm, partial link state information is distributed in the network. This information is then used for route calculation. OLSR promises to provide optimal routes in terms of number of hops. The protocol is particularly suitable for large and dense networks.

**IMPLEMENTATION**

To simulate our desired work we use the network simulator 3. NS3 is a discrete event simulator and for simulation python and C++ scripts are supported. NS3 contains rich classes and library for network simulation; additionally netAnim works as animator for the system. For simulation we setting up the following network parameters listed using table 1.

<table>
<thead>
<tr>
<th>Number of node</th>
<th>20, 40, 60, 80, 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobility model</td>
<td>RandomWalk2dMobilityModel</td>
</tr>
<tr>
<td>Simulation time</td>
<td>50 sec</td>
</tr>
<tr>
<td>Simulation size</td>
<td>300 X 500</td>
</tr>
<tr>
<td>Routing protocol</td>
<td>AODV, OLSR, DSDV</td>
</tr>
<tr>
<td>FixedRssLossModel</td>
<td>FixedRssLossModel</td>
</tr>
<tr>
<td>DataRate</td>
<td>500kb/s</td>
</tr>
<tr>
<td>energy model</td>
<td>WifiRadioEnergyModelHelper</td>
</tr>
</tbody>
</table>

**RESULTS**

After implementation of desired network we analyse the following performance parameters and evaluate their results.

**PDR**

Packet delivery ratio can be calculated as the ratio between the number of data packets that are sent by the source and the number of data packets that are received by the sink. Here the provided graphical results provide the packet delivery ratio over different and increasing traffic over mobile ad hoc network. From the below given results we can say that the PDR of the AODV, OLSR protocol is much similar or about near but as the network load increases the performance of DSDV routing is degraded and difference between AODV, OLSR in increases.
For the large and dense network the DSDV is not much suitable protocol because of their PDR ratio, but as the number of network nodes are increases AODV and OLSR reflects a constant performance and DSDV lose their performance considerably.

Figure 1: Shows PDR Ratio of 20 Nodes

Figure 2: Shows PDR Ratio of 40 Nodes

Figure 3: Shows PDR Ratio of 60 Nodes
Performance Analysis of Different Routing Protocols Using NS-3

Figure 4: Shows PDR Ratio of 80 Nodes

Figure 5: Shows PDR Ratio of 100 Nodes

End-to-end delay: That is overall time to find the shortest path as solution is defined as processing time. In MS

Figure 6: Shows End to End Delay for 20 Nodes
from the all results we can see clearly with 20 nodes the end to end delay is highest in DSDV and AODV and OLSR is much similar. From the increasing size of network nodes the highest performance of AODV found than OLSR and finally the DSDV.

Figure 7: Shows End to End Delay for 40 Nodes

Figure 8: Shows End to End Delay for 60 Nodes

Figure 9: Shows End to End Delay for 80 Nodes
Jitter

Jitter is the unwanted deviance from true periodicity of an assumed periodic signal in electronics and telecommunications, often in relation to a reference clock source. Jitter may be observed in characteristics such as the frequency of successive pulses, the signal amplitude, or phase of periodic signals. Jitter is a significant, and usually undesired, factor in the design of almost all communications links. In clock recovery applications it is called timing jitter.

From the results and its evaluation we found that the jitter for DSDV routing algorithm is higher than AODV and OLSR. Additionally due to the increasing size of network and node density jitter is increases for OLSR routing protocol. during the simulation we found that the highest jitter is evaluated for DSDV than OLSR and finally for AODV routing.
Throughput

Throughput of a network can be measured using various tools available on different platforms. That is the measurement of efficiency achieved by the system.
Figure 17: Shows the Throughput of 40 Nodes

Figure 18: Shows the Throughput of 60 Nodes

Figure 19: Shows the Throughput of 80 Nodes

Figure 20: Shows the Throughput of 100 Nodes
Network performance due to the low network traffic in terms of throughput DSDV is better with the 20 nodes and as the number of nodes increases OLSR provides highest throughput, than DSDV and in addition of AODV simulate similar behaviour all the time. In normal conditions the throughput of DSDV provide high throughput and as the number of nodes increases the throughput of OLSR is increases and for 100 nodes it is increases continuously.

**Packet Drop Ratio**

During communication total number of packets drop for different reasons is known as packet drop ratio.

![Figure 21: Shows the Packet Drop with 20 Nodes](image1)

![Figure 22: Shows the Packet Drop with 40 Nodes](image2)

![Figure 23 Shows the Packet Drop with 60 Nodes](image3)
CONCLUSIONS

In this paper we work with three most frequently used algorithms for routing. During results evaluation we found the below given facts.

<table>
<thead>
<tr>
<th>Property</th>
<th>OLSR</th>
<th>DSDV</th>
<th>AODV</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDR</td>
<td>High</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Throughput</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Packet drop</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Jitter</td>
<td>Avg</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>End to end delay</td>
<td>Avg</td>
<td>High</td>
<td>Low</td>
</tr>
</tbody>
</table>

The performance of the network due to increasing density of nodes are evaluated and compared using the graphical results and table summary. In future we find the performance of the network under the attacks.

REFERENCES


