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Performance Analysis of Broadcast Based Mobile Adhoc Routing Protocols AODV and DSDV

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Abstract

An ad-hoc network is the cooperative engagement of a collection of mobile nodes without the required intervention of any centralized access point or existing infrastructure. Wireless mobile ad-hoc networks are characterized as networks without any physical connections. In these networks there is no fixed topology due to the mobility of nodes, interference, multipath propagation and path loss. Hence a dynamic routing protocol is needed for these networks to function properly. Many Routing protocols have been developed for accomplishing this task. This paper provides an overview of two different protocols DSDV and AODV by presenting their characteristics and functionality and then provides a comparison and discussion of their respective merits and drawbacks.

Keywords: ad-hoc; mobility; DSDV; AODV

1. Introduction

Ad hoc is a decentralized wireless network which forms spontaneously.ad hoc networks are self organizing, self healing, and distributed networks. Computer network traditionally viewed as infrastructure of a fixed evolved into of wired and wireless networks to suit today's need f mobile Communication. Ad hoc network is a multi-hop wireless network, which consists of number of mobile nodes. These nodes generate traffic to be forwarded to some other nodes or a group of nodes. Due to a dynamic nature of ad hoc networks, traditional fixed network routing protocols are not viable. Based on that reason several proposals for routing protocols has been presented. MANETs are also characterized by a dynamic, random and rapidly changing topology. This makes the classical routing algorithms fail to perform correctly, since they are not robust enough to accommodate such a changing environment. Consequently, more and more research is being conducted to find optimal routing algorithms that would be able to accommodate for such networks. In mobile ad hoc network, nodes do not rely of any existing infrastructure. Instead, the nodes themselves form the network and communicate through means of wireless communications. Mobility causes frequent topology changes and may break existing paths. routing protocols for ad hoc networks can be classified into two major types: proactive and on-demand**.** Proactive protocols attempt to maintain up-to-date routing information to all nodes by periodically disseminating topology updates throughout the network. On demand protocols attempt to discover a route only when a route is needed.
Destination-Sequenced Distance Vector routing protocol (DSDV) [1] is a typical routing protocol for MANETs, which is based on the Distributed Bellman-Ford algorithm. In DSDV, each route is tagged with a sequence number which is originated by the destination, indicating how old the route is. Each node manages its own sequence number by assigning it two greater than the old one (call an even sequence number) every time. When a route update with a higher sequence number is received, the old route is replaced.

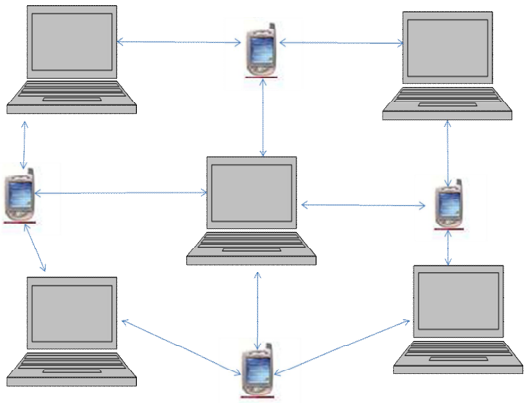

Figure1: Ad-Hoc Network

In case of different routes with the same sequence number, the route with better metric is used. Updates are transmitted periodically or immediately when any significant topology change is detected. There are two ways of performing routing update: “full dump”, in which a node transmits the complete routing table, and “incremental update”, in which a node sends only those entries that have changed since last update. To avoid fluctuations in route updates, DSDV employs a "settling time" data, which is used to predict the time when route becomes stable. In DSDV, broken link may be detected by the layer-protocol [2], or it may instead be inferred if no broadcasts have been received for a while from a former neighbouring node. In this paper the performance comparison Between three routing protocols, namely AODV (Ad hoc On Demand Distance Vector), DSDV (Destination Sequenced Distance Vector).While all routing protocols use sequence numbers to prevent routing loops and to ensure the freshness of routing information, AODV and DSDV differ drastically in the fact that they belong to two different routing families [3]. Namely, AODV is a reactive protocol
(routes are only generated on demand, in order to reduce routing loads), and DSDV is a proactive protocol (with frequent updates of routing tables regardless of need). Mobile ad hoc network is a collection of independent mobile nodes that can communicate to each other via radio waves. The mobile nodes can directly communicate to those nodes that are in radio range of each other, whereas others nodes need the help of intermediate nodes to route their packets.

2. Existing Ad-hoc Routing Protocols

Routing protocols may generally categorised as :

1. Table driven
2. Source Initiated(Demand Driven)

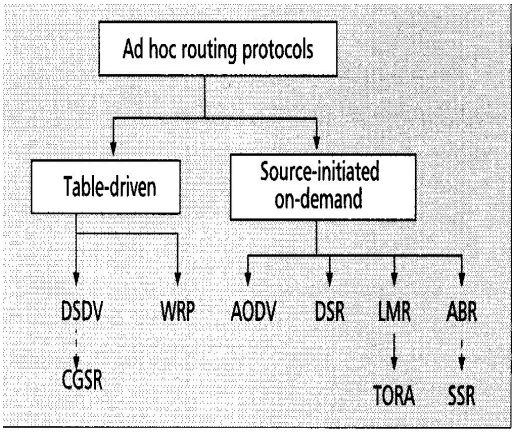

Figure2: Classification of Routing Protocols

Table driven routing protocols attempt to maintain consistent, up-to-date routing information from each node to every other node in the network. These protocols require each node to maintain one or more tables to store routing information and they respond to changes in network topology by propagating updates throughout the network in order to maintain a consistent network view.

A different approach from table driven is source initiated on demand routing. This type of routing creates routes only when desired by the source node. When a node requires a route to a destination, it initiates a route discovery process within the network. This process is complete once a route is found or all possible route permutations have been examined. Once a root has been established, it is maintained by a route maintenance procedure until either the destination becomes inaccessible along every path from the source or until the route is no longer desired.

DSDV

Destination – Sequenced Distance – Vector Routing- The Destination sequenced Distance vector Routing protocol (DSDV) described in [1] is a table driven algorithm based on the classical Bellman-Ford routing mechanism [4]. The improvements made to the Bellman-Ford algorithm include freedom from loops in routing tables. Every mobile node in the network maintains a routing table in which all the possible destination within the network and the number of hops to each destination are recorded. Each entry is marked with a sequence number assigned by the destination node. The sequence numbers are enabling the mobile nodes to distinguish stale routes from new ones, thereby avoiding the formation of routing loops. When a node detects a link failure, it sets the distance to each destination routed via the failed link to infinity and increments the sequence numbers associated with these entries. Because the sequence number for each of these destinations has increased, the change will be propagated through the network. Each of these destinations is thus effectively disconnected from the network, until it generates for itself a new routing message, containing a new sequence number.

AODV

Ad hoc On Demand Distance vector (AODV) [5,6] is a uniform, destination- based reactive protocol. It incorporates the destination sequence number techniques used in the DSDV into an on demand protocol. The Ad_hoc On Demand Distance Vector Routing, AODV [7,8] protocol is capable of unicast, broadcast and multicast communication. Unicast and multicast routes are discovered on demand and use a broadcast route discovery mechanism. Broadcast data delivery is provided by AODV by using the Source IP Address and Identification fields of the IP header as a unique identifier of the packet.

3. Simulation Overview

The NS-2 simulation environment offers great flexibility in investigating the characteristics of sensor networks because it already contains flexible models for energy-constrained wireless ad hoc networks. In this environment a sensor network can be built with many of the same set of protocols and characteristics as those available in the real world. NS-2 has many and expanding uses including:

1. To evaluate the performance of existing network protocols.
2. To evaluate new network protocols before use.
3. To run large scale experiments not possible in real experiments.

NS is an object-oriented, discrete event driven network simulator that simulates a variety of IP networks, written in C++ and OTcl. It is primarily useful for simulating local and wide area networks. It implements network protocols such as TCP and UDP, traffic behaviour such as FTP, Telnet, Web, CBR and VBR.

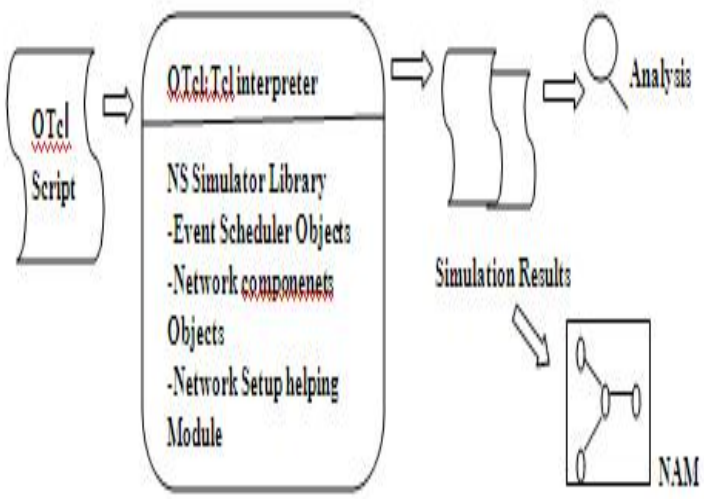

Figure3: Simplified Users View of NS-2

As shown in figure 3, in a simplified user's view NS is object-oriented Tcl [9] (OTcl) script interpreter that has a simulation event scheduler and network component object libraries, and network setup module libraries. To use NS we program in OTcl script language.

Installation Steps of NS2 in Fedora10

Following steps discuss about the installation of NS2-2.35 on fedora platform.
1.Download
(http://sourceforge.net/projects/nsnam/files/allinone/ns-allinone-2.35/ns-allinone-2.35.tar.gz/download)
2.Unzip or untar it to any folder that contains it using the command from GUI terminal $tar-xzvf ns-allinone-2.35.tar.gz
After unrar it will create ns-allinone-2.35 folder go into the folder by using command
3. $ cd ns-allinone-2.35
4. Run this command $sudo apt-get install build-essential autoconf automake libxmu-dev
5.Run this command to start ns-2 installation wait until installation is over $./install
6. Once installed the PATH information will have to be provided. Copy the PATH and LD_LIBRARY__PATH variable to .bashrc
Input the path information in .bashrc file like this export PATH=$PATH:<Place your path here>export LD_LIBRARY_PATH=$LD_LIBRARY PATH:<place the LD_LIBRARY_PATHS> here.
7. Once done, save the file and close
Execute the command and run /validate
8. Restart the system open the terminal and type ns If % sign appears it means ns-2 is installed in system. [10]

4. Conclusion

In this paper we provide description of routing schemes proposed for ad-hoc mobile networks also provide a classification of these schemes according to the routing strategy i.e. table driven and on-demand . The study reveals that, DSDV routing protocol consumes more bandwidth, because of the frequent broadcasting of routing updates. While the AODV is better than DSDV as it doesn't maintain any routing tables at nodes which results in less overhead and more bandwidth. It can be assumed that DSDV routing protocols works better for smaller networks but not for larger networks. So, my conclusion is that, AODV routing protocol is best suited for general mobile ad-hoc networks as it consumes less bandwidth and lower overhead when compared with DSDV routing protocol.

We have presented a comparison of these two categories of routing protocols, highlighting their features, differences, and characteristics.. The field of ad hoc mobile networks is rapidly growing and changing, and while there are still many challenges that need to be met.

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