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Analyzing the QoS metrics of destination sequenced distance vector protocol

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ABSTRACT

A mobile ad-hoc network (MANET) is a self-configuring infrastructure-less network of mobile devices connected by wireless. MANETs are restricted to a local area of wireless devices (such as a group of laptops/computers), so the determination of which nodes forward data is made dynamically on the basis of network connectivity and the routing algorithm in use. In this paper, an attempt has been made to study the DSDV protocol using the NS2 simulator.

Keywords— Sensor Network, DSDV, Mobile Ad-hoc Network (MANET), Network Simulator, routing Protocols, End-to-End delay, Throughput

1. INTRODUCTION

“A network is a collection of computers, servers, mainframes, network devices, peripherals, or other devices connected to one another to allow the sharing of data.” [1] Destination Sequenced Distance Vector (DSDV) is a hop-by-hop vector routing protocol requiring each node to periodically broadcast routing updates. This is a table-driven algorithm based on modifications made to the Bellman-Ford routing mechanism. It is a pro-active, table-driven routing protocol for MANETs developed by Charles E. Perkins and Pravin Bhagwat in 1994. In this routing protocol, each node uses a routing table with next-hop address, destination node, the sequence number, and install Time. In this paper, an attempt has been made to study the DSDV protocol using the following laptop configurations.

2. LITERATURE REVIEW

This paper presents the research papers required to implement this project

2.1. Literature review of Network Simulator (NS2)

Kalpana Pandey, et al, in their paper, “Performance Evaluation & Simulation of Network Parameters for NOC Architecture Using NS2” [2], stated that NS-2 is an open-source simulation tool that runs on Linux or windows. NS-2 also implements multicasting and some of the MAC layer protocols for LAN simulations.

2.2. Literature review of Network Animator (NAM)

Deborah Estrin, et al, in their paper, “Network Visualization with Nam, the VINT Network Animator” [3], provided that Nam interprets a trace file containing time-indexed network events to animate network traffic in several ways. Nam usually runs offline using traces stored on disk, but it can also play traces from a running program through a Unix pipe. We can start NAM with the command

‘nam <nam-file>’

Where ‘<nam-file>’ is the name of a NAM trace file.

2.3. Literature review of Destination-Sequenced Distance-Vector (DSDV)

Charles E. Perkins, et al, in their paper “Highly Dynamic Destination Sequenced Distance Vector for mobile computers” [4], stated that ad-hoc network is a collection of mobile nodes forming an instant network without fixed topology. DSDV is a modification of the conventional Bellman-Ford routing algorithm.

2.4. Literature review of Mobile Ad Hoc Network (MANET)

S.-J. Lee, et al, in their paper, “A simulation study of table-driven and on-demand routing protocols for mobile ad hoc networks” [5], have analysed the two on-demand routing protocols (dynamic source routing and associativity-based

routing) with distinctive route selection algorithms which are simulated in a common environment to quantitatively measure and contrast their performance.

2.5. Literature review of Quality of Service (QoS) metrics:

M. Mirhakkak, et al, in their paper, “A new approach for providing quality-of-service in a dynamic network environment” [6], focused on an approach to expand the semantics of the reservation so that instead of being a single value indicating the level of service needed by an application.

2.6. Literature review of propagation Model

SM Itoua, et al, in their paper “Effect of propagation models on ad hoc networks routing protocols” [7] stated that a mobile ad hoc network is (MANET) suffers from the performance limitations of wireless channels, like the obstacle between the transmitter and the receiver.

3. METHODOLOGY

This chapter presents the methodology used to do this paper.

3.1. Network Simulator

A network simulator uses mathematical formulas to create a theoretical and entirely virtual model of a network. They act as a crucial testing tool in the design and development of a network.

3.2. NS2 Manual

NS2 uses Tcl language for creating a simulation scenario file (for example, sample.tcl). Network topology, transmission time, using a protocol, etc., are defined in the scenario file. If this scenario is executed, the simulation result will be output to out.tr and out.nam file. The **out.tr** all the information about communication is written in this file. It tells how the packet was forwarded. This file is called a trace file. The **out.nam** contains the data for the animation of the experiment result. This file can be executed by Nam, an animation software.

3.3. Installing NS2, Ubuntu 18.04 LTS, and Xming server Requirements

- (a) Internet Connection Wired or Wireless Internet Connection is recommended.
- (b) A Ubuntu18.04LTS
- (c) Enable Developer mode and turn on Windows Subsystem for Linux
- (d) NS2.
- (e) Xming server

Procedure

- (a) Open ‘Settings’ in Windows 10. Select ‘Update and Security’ and click on the option called ‘For Developers’. Enable the ‘Developer mode’ in order to access the advanced development features.
- (b) Open ‘Control Panel’ in Windows 10. Select ‘Programs’ and then select ‘Programs and Features’. Now click on ‘Turn Windows features on or off’ and choose the option Windows Subsystem for Linux.
- (c) Install Ubuntu 18.04 LTS from the Microsoft Store. Run the ‘bash’ file as administrator and open the ‘Ubuntu 18.04 LTS’ application. And set the username and password for the ubuntu.
- (d) Download NS2 (NS-2.35) from here. It gets downloaded into your ‘/home/ your_username/ Downloads’ directory. Copy and Extract it to the ‘Windows/Program Files’ directory.
- (e) Download Xming from the internet. Open and Launch the Xming Server as a local server.

- (f) Click on the “Ubuntu” application and an ubuntu terminal is opened. Type “sudo apt-get install ns2” and hit enter. Type “sudo apt-get install nam” and hit enter in order to invoke the nam package. Hence ns2 and nam are installed.
- (g) The first ns2 run: Open the Ubuntu terminal and type “ns t.tcl” and hit enter. The nam windows should appear as shown below. If not, make sure that you have done all the steps correctly. Click on the ‘play’ icon and watch the packets moving from one node to another node.

4. RESULTS AND ANALYSIS

The DSDV protocol is implemented using the following laptop configurations:

Processor	i3
Ram	4GB
Hard disk capacity	1TB

4.1. Simulation Parameters

The following simulation parameters used in this work are given below:

Routing protocol	DSDV
Number of nodes	10,20,30,40,50,60,70,80,90,100
Simulation time	2 minutes
Simulation area	500x400 m
Propagation model	Two-way ground reflection model
Traffic model	TCP
Application protocol	FTP
MAC protocol	802.11
Antenna direction	Omni

4.2. QoS metrics

The following simulation metrics are considered to estimate the performance of DSDV under different network sizes.

4.2.1. Throughput (bits/sec): The amount of data actually received by the receiver from the sender divided by the time taken by the receiver to get the last packet.[8]

4.2.2. Delay (sec): The time taken for a packet to travel from a source to destination.[8]

4.3. Results and analysis of DSDV protocol

The QoS metrics considered for simulation parameters are given below.

4.3.1. Throughput (bits/sec): The variation of throughput with different numbers of nodes is shown in figure 1. From the graph, it is found that the throughput is maximum for 20 nodes and is minimum for 100 nodes. The overall results of the throughput are tabulated in figure 2.

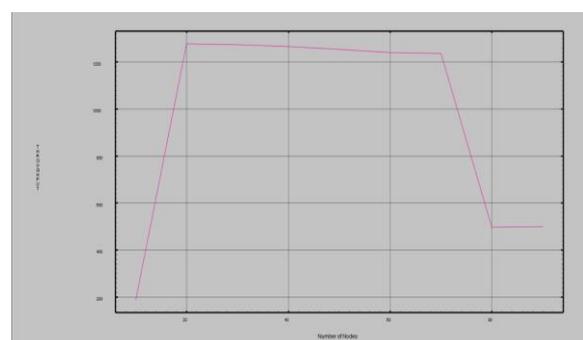


Fig. 1: Variations of Throughput with different number of nodes in X-Graph

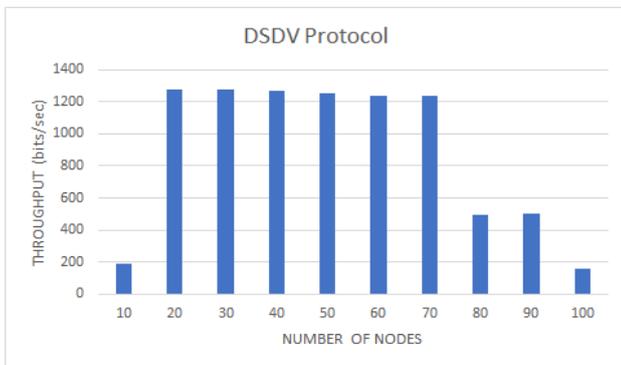


Fig. 2: Variations of Throughput with different number of nodes in MS-Excel

4.3.2. Delay (sec): The variation of delay with different numbers of nodes is shown in figure 3. From the graph, it is found that the delay is maximum for 10 nodes and is minimum for 30,40, and 60 nodes. The overall results of the delay are tabulated in figure 4.

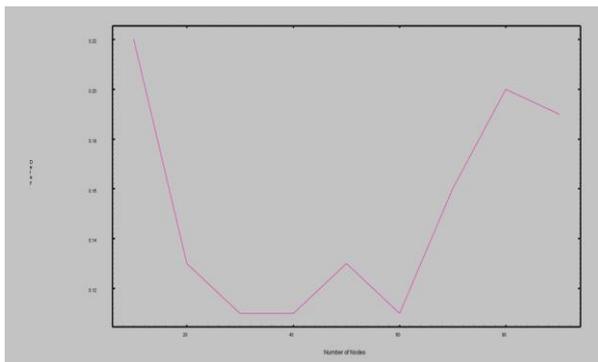


Fig. 3: Variations of Delay with different number of nodes in X-Graph

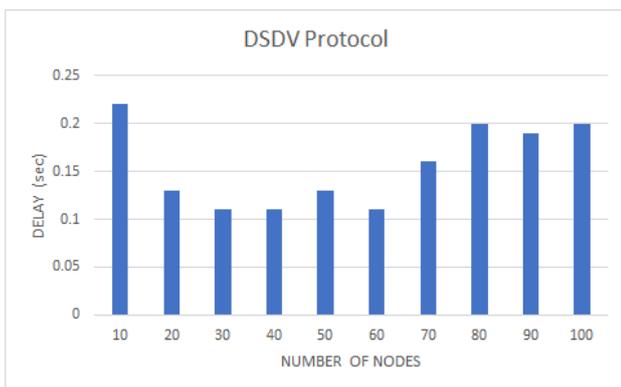


Fig. 4: Variations of Delay with different number of nodes in MS-Excel

5. CONCLUSION

This paper provides the simulation of different network nodes namely 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100. All the nodes are equipped with speeds ranging from 1 to 10 m/s. The simulator area is considered to be 500x400m. From the result, it observed that the throughput is maximum for 20 nodes and minimum for 100 nodes. The delay is maximum for 10 nodes and is minimum for 30,40,60 nodes. For any network, the throughput should be more and delay should below. It is concluded that this protocol lacks scalability from the results.

6. REFERENCES

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