

**PERFORMANCE ANALYSIS OF AN AD HOC NETWORK
BASED ON PACKET LEVEL SIMULATION**

BY

TASNIMUL HASAN SHAON

ID: 151-19-1655

IRIN AKTER

ID: 151-19-1656

MD.JAHID HOSSEN

ID: 151-19-1716

This Report Presented in Partial Fulfillment of the Requirements of
the Degree of Bachelor of Science in Electronics and
Telecommunication Engineering

Supervised By

Professor Dr. A.K.M. Fazlul Haque

Professor, Department of ETE

&

Associate Dean, Faculty of Engineering

Daffodil International University



DAFFODIL INTERNATIONAL UNIVERSITY

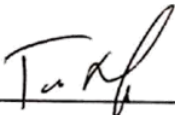
DHAKA-1207, BANGLADESH

DECEMBER 2018

APPROVAL

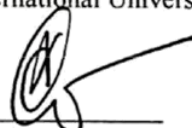
This Project titled “**Performance Analysis Of an Ad Hoc Network based on packet level Simulation**” submitted by Tasnimul Hasan Shaon, Irin akter, Md. Jahid Hossen and to the Department of Information and Communication Engineering (ICE), Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Information and Communication Engineering and approved as to its style and contents. The presentation was held on December, 2018.

BOARD OF EXAMINERS



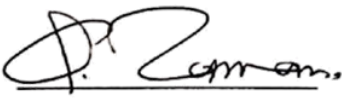
(Mr. Md. Taslim Arefin)
Associate Professor and Head
Department of ICE
Faculty of Engineering
Daffodil International University

Chairman



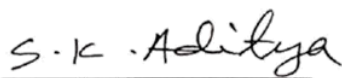
(Prof. Dr. A.K.M. Fazlul Haque)
Professor, Department of ICE
&
Associate Dean, Faculty of Engineering
Daffodil International University

Internal Examiner



(Prof. Engr. Dr. Quamruzzaman)
Professor
Department of ICE
Daffodil International University

Internal Examiner



(Dr. Subrata Kumar Aditya)
Professor
Department of EEE
University of Dhaka

External Examiner

DECLARATION

We here by declare that this project is our own work and effort under the supervision of **Prof. Dr. A.K.M. Fazlul Haque, Professor, Department of Electronics and Telecommunication Engineering and Associate Dean, Faculty of Engineering,** Daffodil International University, Dhaka. It has not been submitted anywhere for any award. Where other sources of information have been used, they have been acknowledged.

Supervised By:



Prof. Dr. A.K.M. Fazlul Haque
Professor, Department of ETE

&

Associate Dean, Faculty of Engineering
Daffodil International University

Submitted By:

Tasnimul Hasan Shaon

Tasnimul Hasan Shaon

ID: 151-19-1655

Department of ETE

Daffodil International University

Irin Akter

Irin Akter

ID: 151-19-1656

Department of ETE

Daffodil International University

MD. JAHID HOSSSEN

Md. Jahid Hossen

ID: 151-19-1716

Department of ETE

Daffodil International University

ACKNOWLEDGMENTS

First of all, we would like to convey our gratitude to the Almighty, for giving us the right direction while attempting the task.

The real spirit of achieving a goal is through the way of excellence and austere discipline. We would have never been succeeded in completing our task without the cooperation, encouragement and help provided to us by various personalities.

This work would not have been possible without the support and guidance of **Prof. Dr. A.K.M. Fazlul Haque, Professor**, Department of Electronics and Telecommunication Engineering and **Associate Dean**, Faculty of Engineering Daffodil International University, Dhaka, under whose supervision we choose this topic and developed the project. Deep Knowledge and keen interest of our supervisor in the field of Biomedical and Signal Processing influenced us to carry out of this project.

We would like to express our heartiest gratitude to **Mr. Md. Taslim Arefin, Associate Professor and head**, Department of Electronics and Telecommunication Engineering, for his kind help to finish our thesis and also to other faculty members, the staffs of the ETE Department of Daffodil International University.

We must acknowledge with due respect the constant support and patience of our family members for completing this project.

TASNIMUL HASAN SHAON

IRIN AKTER

&

MD. JAHID HOSSEN

ABSTRACT

This report represents performance analysis of different routing protocols of ad-hoc network using packet level simulation. This work has been done using Network Simulator 2. Four types of protocols-AODV, DSR, DSDV and TORA have been considered for evaluating the performance. The performance analysis of these routing protocols has been carried out considering five metrics: Throughput, End to End delay, Package Drop, Routing overhead and Bandwidth. With the simulated results, it is been found that DSR protocol provides the best performance among all mentioned protocols in routing.

TABLE OF CONTENT

Contents	Pages
Board of examiners	ii
Declaration	iii
Acknowledgements	iv
Chapter1: Introduction	1-4
1.1 General Introduction	1
1.2 Objective or Goal of this Thesis	2
1.3 Organization of the Thesis	2
1.4 Advantages of NS-2 for Simulation	3
1.5 Disadvantages of NS-2 for Simulation	3
Chapter 2: Background and Related Work	5-10
2.1 Writing Overview	5
2.2 Related Work	5
2.3 Ad hoc Networks	6
2.3.1 Mobile Ad hoc Networks	7
2.3.2 Wireless Mesh Network	8
2.3.3 Wireless Sensor Network	8
2.3.4 Application and Challenges of Ad-hoc Network	9
2.3.5 NS-2 as Ad-hoc Network Packet Level Simulation	10
Chapter 3: Ad hoc Networks Routing Protocols	11-22
3.1 Routing	11
3.2 Routing protocols	12
3.3 Reactive Routing Protocols	13
3.4 Proactive Routing Protocols	13
3.5 Advantages and Disadvantages of Proactive and Reactive routing Protocols	14
3.6 Overview of AODV, DSR, DSDV and TORA	14
3.6.1 Ad Hoc On-Demand Distance Vector Routing (AODV)	14
3.6.1.1 The Ad-hoc On-Demand Distance Vector Algorithm	15
3.6.1.1.1 Path Discovery Process	15
3.6.1.1.2 Maintaining Routes	16
3.6.2 Benefits and Limitation of AODV	16
3.6.3 Dynamic Source Routing (DSR)	17
3.6.3.1 Route Discovery	18
3.6.3.2 Route maintenance	19
	vi

3.6.4 Benefits and disadvantage of DSR	19
3.6.5 Dynamic Destination-Sequenced Distance-Vector Routing Protocol (DSDV)	20
3.6.6 Temporary Ordered Routing Algorithm (TORA)	20
3.6.7 Advantages and Disadvantages of TORA	22
Chapter 4: Performance Evolution of AODV, DSR, DSDV and TORA Routing protocols	23-25
4.1 Performance Parameters	23
4.2 Throughput	23
4.3 Average End-to-End delay in second	24
4.4 Packet Drop	24
4.5 Routing Overhead	25
4.6 Bandwidth	25
Chapter 5: Simulation and Result	26-44
5.1 Simulation Process in NS-2	27
5.2 Simulation Topology	28
5.3 Discovery process	29
5.4 Mobility of Wireless Node	30
5.5 Packet Sent	31
5.6 Result	32
5.6.1 Throughput	32
5.6.2 Packet Drop	37
5.6.3 End To End Delay	38
5.6.4 Routing Overhead	42
5.6.5 Bandwidth	43
Chapter 6: Conclusion	45
References	46-47
Chapter 7: Appendix	48-52
Appendix 1	48
Trace file	48-52

LIST OF FIGURES

Contents	Pages
Chapter 2	
Fig 2.3.1: Mobile Ad-hoc Network	7
Chapter 3	
Fig 3.1: Updates of Routers	11
Fig 3.2: Routing protocol of Ad-hoc network	12
Fig 3.6.3 Working of dynamic source routing	17
Fig 3.6.3.1: Route discovery in DSR	18
Fig 3.6.3.2: DSR Request and Reply	19
Fig 3.6.6: TORA Routing Protocol	21
Chapter 5	
Fig: 5.1 Simulation Process of NS-2	27
Fig: 5.2 Simulation topology of 11 nodes	28
Fig: 5.3 Discovery Process	29
Fig 5.4.1 Fixed position of node	30
Fig: 5.4.2 Shows the mobility of the nodes	30
Fig: 5.5 Packet Sent Process	31
Fig: 5.6.1.1 Throughput vs. Time for AODV protocol	32
Fig: 5.6.1.2 Throughput vs. Time for DSR protocol	33
Fig: 5.6.1.3 Throughput vs. Time for DSDV protocol	34
Fig: 5.6.1.4 Throughput vs. Time for TORA protocol	35
Fig: 5.6.1.5 Throughput vs. Time for Compression between four protocols	36
Fig: 5.6.2 Packet dropping ratio for four routing protocols	37
Fig: 5.6.3.1: End to End delay vs. Node (Sending, Receiving) for AODV	38
Fig: 5.6.3.2: End to End delay vs. Node (Sending, Receiving) for DSR	39
Fig: 5.6.3.3: End to End delay vs. Node (Sending, Receiving) for DSDV	40
Fig: 5.6.3.4: End to End delay vs. Node (Sending, Receiving) for TORA	41
Fig 5.6.4: Routing Overhead for four routing protocols	42
Fig 5.6.5 1: Bandwidth for AODV	43
Fig 5.6.5.2: Bandwidth for DSR	43
Fig 5.6.5.3: Bandwidth for DSDV	43
Fig 5.6.5.4: Bandwidth for TORA	43

LIST OF TABLES

Contents	Pages
Table 1.1: Comparison of Different Network Simulator in General	2
Table 1.5: NS-2 Trace file format and their specification	4
Table 5.1: Table of Simulation Parameter	26

Chapter 1

INTRODUCTION

1.1 General introduction

Now a days we know that NS-2 is a one kind of network simulator. NS-2 started as a correction of ns-1. This imitation is the emulation how an ideal of scheme is operates. It's allows us to explore the influence of research in a controlled beside real-time effectuation [1]. Now the use of wireless communication is more and more popular. An ad-hoc wireless system is a gathering of independent nodes that interconnect to each other by create a multi-hop system, sustaining connectivity in a regionalized scheme [2]. The greater part of the examination worried of the execution investigation of remote system is appeared through reenactment instruments. A portion of the reenactment apparatuses that are vigorously utilized is the remote research arrange network incorporate NS-2. A portion of the recreation devices that are intensely utilized in the remote research organize network incorporate NS-2, OPNET, GloMoSim, J-sim, MATLAB and OMNeT++. A correlation of various system test system is given in table 1.1 [1].

Despite the fact that these test systems are prominent for reenacting system, they have their own qualities and shortcomings in wording of conventions that they bolster, recreation strategies, assessment strategies, run-time execution and so forth. In spite of the fact that these test systems are well known for recreating system, they have their very own qualities and shortcomings in wording of conventions that they bolster, reenactment philosophies, assessment systems, and run-time execution and so on. Before the beginning a reproduction, one needs to choose the recreation criteria, parameter settings and setup. Be that as it may, these highlights change starting with one apparatus then onto the next. Henceforth this is greatly urgent to know about the highlights offered by recreation apparatuses utilized by the specialists [1].

In NS-2 simulator, there are four types of protocols. Many steering strategy have been suggested yet only couple of weight explore have been directed. All of the similar investigation utilizes the versatility that is the outright hurry and stopped period.

Anyway this kind of adaptability does not reliably demonstrate the topology change. In this undertaking have been introduced a few viewpoints and achievement that have given to ns2 and examination the changes results on the execution of four conventions, for example, (AODV, DSR, DSDV and TORA) [2].

1.2 Objective or Goal of this Thesis

The vast majority of the works concentrated on to investigation the execution of specially appointed utilizing a few directing convention dependent on throughput and end to end deferral and those examinations speak to the versatility either by the interruption time or by the hubs speed. Still the execution investigation of specially appointed utilizing distinctive steering convention inclination has been showed up in the current work. In this venture, the execution examination of impromptu utilizing AODV, DSR, DSDV, TORA conventions has been enhanced by similar investigation of specially appointed dependent on Throughput ,End to End delay, Bandwidth, Packet drop and Routing Overhead .To examination the Trace document for various circumstance and get the increasingly more better yield result[2].

Table: 1.1

COMPARISON OF DIFFERENT NETWORK SIMULATOR IN GENERAL [1]

Attributes	NS-2	J-Sim	Omnet++	Qualnet	OPnet
Coding Style	C++	Java	C++/JAVA	Parse C++	C++/Java
Simulation Time	Moderate	High	Average	High	High
User Interface	Minimal	Average	Average	High Quality	High Quality
Analysis Tools	Custom built	Custom Built	Built in	Built in	Built In
License	Freeware	Freeware	Freeware	Commercial	Commercial
User Adaptability	Long	Moderate	Moderate	Very Easy	Long
Documentation	Poor	Moderate	Moderate	Good	Excellent

1.3 Organization of the thesis

The theory has been for the most part partitioned into 5 Sections. Section 1 gives the theme the specific talk of bundle level reenactment of impromptu system alongside the issue explanation. Section 2 exhibits the foundation of our work and some piece of

related work with couple of models. Section 3 gives complete theoretical requirements and ideas of the ad hoc network routing protocols. Section 4 examines about the general productivity measurements: throughput, End-to-End delay, bundle drop, Bandwidth, Routing overhead. Section 5 present in the investigation alongside the reenactment aftereffects of all the engaged directing conventions and furthermore about the reproduction of Network Simulator (ns2), alongside the end.

1.4 Advantages of NS-2 for simulation

NS-2 offers various preferences. A portion of the main focal points obtainable by NS-2 are talked about beneath:

Constraints, for example, bundle measure, traffic designs (e.g. exponential, pare to, undeviating etc...), traffic rate, co-ordinates of the hubs) are clear and simple to keep up. The Size of the bundle can likewise be different in run-time which is in some cases vital for assessing the ideal parcel estimate. NS-2 can give broad data about bundle level reproduction investigation (see Tab. 1.2) [1].The blunder model of NS-2 can portray the busy bundle misfortune conduct of uproarious channel. It pursues the hypothetical conditions of the Bit Error Rate (BER) and Bundle Error Rate (PER). It has worked in Forward Error Correction (FEC) module that keeps up a recipe like that utilized in the hypothetical comprehension of blunder redress [1]. The inherent vitality ideal of NS-2 can be utilized to gauge the vitality utilization of specific hubs also whole mimicked arrange amid bundle transmission. NS-2 is a freeware, has extensive network and heaps of fabricated in instances of reenactment contents [1].

1.5 Disadvantages of NS-2 for Simulation

NS-2 additionally has a few drawbacks regarding a system test system. Following are a portion of the inconveniences of NS-2: To extricate the reproduction outcomes, the follow document should be analyzed with moreover other post handling devices or scripting dialects (exceed expectations and so on) or even physically. Establishment process is very intricate and tedious. In a perfect world, NS-2 should be introduced in UNIX conditions. In openings condition it tends to be introduced by introducing CYGWIN. Foundation code customization is intricate and tedious [1]. Looking at the

advantages and disadvantages, NS-2 is commonly acknowledged as a standout amongst the most advantageous apparatuses for doing reenactments for organize explore. A concise portrayal of NS-2 centering bundle level recreation is given in the accompanying areas [1].

Table 1.5: NS-2 trace file specification [1]

Event Information	Specifications	Tag
Event Type	Send, Receive, drop, forward	S, R, D, F
Time	Packet transmission time in milliseconds	t
Source and destination id	Source and Destination node Id	Hs, Hd
Current Node ID	Intermediate node Id	Ni
Nodes Position	X, Y, Z coordinate	Nx, Ny, Nz
Nodes Energy	Nodes Energy level	Ne
Trace Level	Router, Agent, or MAC trace	Nl
Reasons of packet drop	Queue full, TTL,MAC Error etc	Nw
Packet Information IP level	Packet type, size, TTL, flow Id etc	Is, It, If, Iv
Packet info MAC level	Ethernet address, type etc	Ma, Mt
Packet Info level	TCP, UDP, DSR, DSDV, AODV etc	Po, Ps, Pp, etc

Chapter 2

Background and Related work

2.1 Writing overview

Numerous specialists have projected the increases of new copies to NS2 .Investigation Copies in NS2 endeavors to catch the tracker impact of signs, in actuality, however that does incorrectly. NS2's investigation model does not think about connections: a genuine shadowing impact has solid relationships between two areas that are near one another. Shadow blurring ought to be demonstrated as a two dimensional log-ordinary irregular process with exponentially rotting spatial relationships [2]. The four specially appointed steering conventions that are at present upheld are Destination Sequence Distance Vector (DSDV), Dynamic Source Routing (DSR), temporally requested Routing Algorithm (TORA) and Ad-hoc On-request Distance Vector (AODV). These models has been led will have a solid connection with the hypothetical standards and furthermore with the anticipated proficiency in down to earth and ongoing usage. This investigation perform will give of extraordinary help with the future examination [2].

2.2 Related work

Numerous examinations have been embraced to dissect and assess the execution of various directing conventions for diverse sorts of systems and under different portability designs. This area studies the most relevant investigations exhibited as of late [10]. Broad research has been done in the situation of Ad-hoc directing conventions. Distinctive steering conventions were reproduced in various method for test systems. Here the diverse research papers have been examined about Ad-hoc steering conventions execution. In this undertaking the work has been finished by reproducing four steering conventions in the ns2 test system, for example, AODV, DSR, DSDV and TORA against five distinct parameters i.e. Throughput, End-to-End delay, Packet drop, Bandwidth and Routing overhead. Beneath the investigation of various test systems in various directing conventions and their execution assessment

has been talked about [2]. Iftekharul Mobin, Sifat Momen, and Nabeel Mohammed described a Packet Level Simulation Study of Adhoc network with Network Simulator-2 (NS-2) [1]. Naeem Raza, Muhammad Umar Aftab, Muhammad Qasim Akbar, Omair Ashraf, Muhammad Irfan are present Mobile Ad-Hoc Networks Applications and Its Challenges [4]. Anuj K. Gupta, Member, IACSIT, Dr. Harsh Sadawarti, Dr. Anil K. Verma are present Performance analysis of AODV, DSR & TORA Routing Protocols [6]. Another paper in reference gives end in versatile impromptu system that responsive convention i.e. DSR achieve glowing when the system stack is moderate. The creator composed that AODV indicates best execution in little and average hub thickness yet in high hub thickness both OLSR and DSR beats. The creator composed that DSR is chosen for record exchanges where conveyance and throughput are basic elements. OLSR performs well in both low and high hub thickness [2].

2.3 Ad-hoc network

An Ad hoc organize has been sent where remote system foundation has not accessible. This sort of specially appointed system is called foundation less system or impromptu system. In framework or specially appointed system every hub has been associated through remote connections. These hubs get associated with one another and furthermore go about as a switch, by sending information to different remote Nodules. There has no confinement on these hubs to join or leave the system. Along these lines the system has no fundamental framework. Impromptu systems have two structures; one is static specially appointed systems (SANET), alternate has been called portable impromptu system (MANET). Business execution of impromptu system winds up conceivable because of the advancement of new innovation, for example, 802.11 [2] specially appointed systems have their own favorable circumstances. These points of interest include:

- On interest setup.
- Fault resilience.
- Unconstrained availability.

Especially selected schemes don't be contingent on any pre-set up framework and can consequently be conveyed in adverts with no outline. This is cooperative in bad luck

recovery conditions and advertises with non-existing or hurt communication foundation where fast organization of a communication arrange is essential. Especially selected systems additionally permit the making of impermanent systems without drawing in the administrations of prior systems. Then hubs are distribution parcels for one additional, some kind of steering agreement is required to resolve on the directing selections. Prior to going into the directing conventions, we talk about the issues identified with directing in specially appointed systems [3]. The principle motivation to convey this sort of system is the adaptability and ease of arrangement. Be that as it may, with every one of these characteristics, specially appointed system activity is extremely hard to deal with. Every single hub is in charge of its activity to keep up its directing table and furthermore sending bundles to its neighbors as switches [2].

2.3.1 Mobile Ad-hoc Network

A portable impromptu system (MANET), now and then called a versatile work organize, is a self-designing scheme of cell phones related by remote connections. Every device in a MANET is permissible to transfer freely toward any path, and will in this way alteration it's connect to altered devices habitually. Each must frontward traffic irrelevant to its very personal utilization, and in this way be a switch. The necessary test in construction a MANET is formulating every device to ceaselessly have up the data vital to properly path traffic.

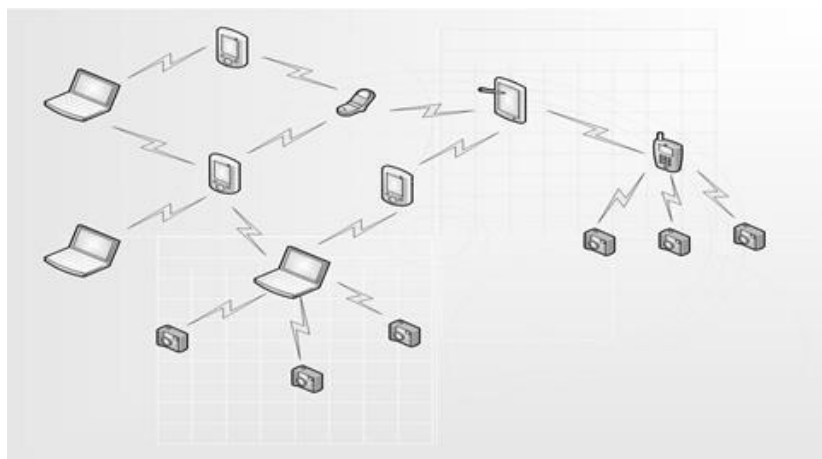


Fig 2.3.1 Mobile Ad-hoc Network [2]

Such structures may effort self-governing from anyone else or might be related with the better Internet. MANETs are a kind of isolated especially chosen schemes that

typically has a routable systems management state over a Link Layer unprepared scheme. They are likewise a sort of work establish, yet many work schemes are not transferrable or not remote. The development of PCs and 802.11/Wi-Fi remote systems administration have ready MANETs a well-known research subject since the mid-to late 1990s.

2.3.2 Wireless Mesh Network

A remote work arrange (WMN) is a correspondences arrange included of radio hubs arranged out in an effort topology. Remote work systematizes regularly include of work clients, work shifts and entries. The work clients are frequently workstations, PDAs and changed remote devices while the work shifts forward traffic to and from the entryways which may yet require not subordinate with the Internet. The inclusion territory of the radio centers operative as an unsociable scheme is here and there called a work haze. Admission to this work haze is reliant on the radio hubs employed in congruity with one alternative to make a radio system.

2.3.3 Wireless sensor Network

A remote sensor arrange (WSN) comprises of spatially disseminated self-ruling devices to helpfully shade fleshly or natural situations, for example, temperature, sound, vibration, weight, movement or toxins. The progression of isolated device schemes was propelled by military submissions, for example, front line remark. They are presently utilized in numerous mechanical and nonmilitary workers submission regions, counting modern procedure detecting and control, machine wellbeing checking, condition and natural environs detecting, social insurance applications, home computerization, and traffic control. Notwithstanding at least one devices, every hub in a sensor organize is commonly outfitted with a radio receiver or dissimilar isolated particular device, a slight microcontroller, and a vivacity source, more often than not a battery.

2.3.4 Applications and Challenges of Ad-hoc Network

Application:

Some unmistakable Ad-hoc applications contain:

Military field: Ad-Hoc systems administration can allow armed force to abuse advantage of regular system mastery for saving any data organize among vehicles, military, and central command of data.

Helpful work: To encourage the business settings, need for purposeful figuring is exceptionally noteworthy outer to office climate and surroundings when contrasted with inward condition. Individuals need getting outside gatherings for trading the data in addition to participating with one another in regards to any doled out errand.

Container and Bluetooth: A PAN is limited and little range organize whose gadgets are by and large have a place with a indicated person. Constrained range MANET, for example, Bluetooth can make less complex the trade among a few compact gadgets like a PC, and a phone [4].

Reinforcement Services: freedom activities, catastrophe recuperation, analysis or status or record submitting healing centers, substitution of stationary framework.

Instructive segment: course of action of interchanges offices for PC produced meeting rooms or classrooms or laboratories [4].

Challenges:

The consequent rundown of issues demonstrates the insufficiencies and confinements that must be overpowered in an Ad-hoc condition:

Confined remote transmission extend: The radio assembly will be incomplete in the remote arrangements and as a result material sums it can give a lot smaller than what a certain system can spring [4].

This contains steering methods of isolated systems must be use transmission speed in faultless way. This can be talented through securing the above as least as imaginable. The confined transmission run additionally authorizes restriction on steering methods

for continuing the land data. Particularly in MANETs in view of normal diversities in topology, protecting the topological information for each hub incorporates more controller above which outcomes in extra transfer speed exhaustion [4]. Portability actuated course changes: The framework geology in specially appointed remote system is to a great degree dynamic due to hub development; therefore, a steady assembly practices numerous pathway fractures. Such position frequently results in ordinary way regulations. So adaptability organization is huge investigation subject in impromptu systems [4].

2.3.5 NS-2 as Ad-hoc Network Packet Level simulation

System Simulator (variant 2), broadly known as NS-2, is a standout amongst the most well-known decisions for execution investigation of wired and remote systems. NS-2 test system, is printed in C++ which is the center motor and usages OTcl, and question arranged rendition of TCL dialect for order, arrangement and reproduction contents. The C++ code depicts the limitations and strategies that are to be ready accessible for OTcl scripting [1]. By utilizing OTcl contents, one can without much of a stretch set up arrange topology, design hubs, traffic design and so on [1]. The utilization of two dialects give two noteworthy points of interest:

- 1) C++ is ease back to alteration yet quick to route.
- 2) OTcl is ease back to route however simple to alteration inside the reproduction content.

In 2004, NS-2 presented the Wireless Local Area Network (WLAN) usefulness. Moreover, the versatility of hubs and sensible OSI layer are joined inside the NS-2 center motor. After this, the NS-2 test system rose as a understood test system for ad-hoc arrange for the bundle level reproduction. NS-2 has numerous points of interest contrasted with other test systems for parcel level reenactment owe to some one of a kind highlights that the test system offers. The greater part of the model of remote systems in NS-2 pursues hypothetical recipes which are settled in system execution estimations [1].

Chapter 3

Ad-hoc Network Routing Protocols

3.1 Routing

Routing cause to select a path. Steering wording is utilized in various types of systems, for example, in communication innovation, electronic information systems and in the web arrange. Here we are more worry about directing in portable impromptu systems. Steering conventions in versatile specially appointed system implies that the portable centers will look for a course or way to associate with one additional and segment the evidence bundles. Conventions are the arrangement of tenets through which at least two gadgets (portable hubs, PCs or electronic gadgets) can convey to one another. In portable impromptu systems the directing is for the most part finished with the assistance of steering tables [2]

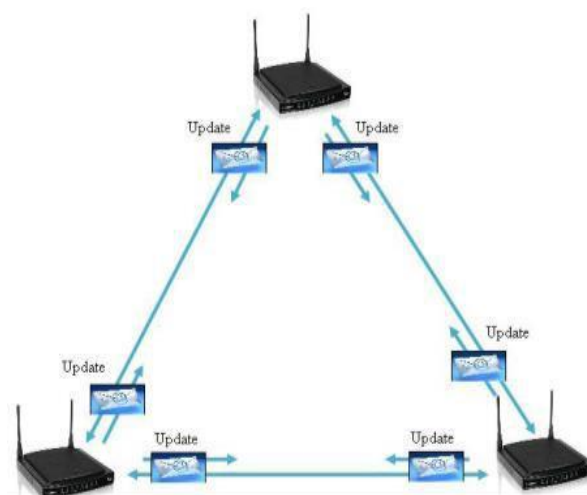


Fig: 3.1 Updates of Routers [2]

These tables are kept in the memory reserve of these portable hubs. While directing procedure is going on, it course the information bundles in various systems. The primary is unicast, in which the foundation specifically sends the information parcels to the goal. The second is multicast, in this the foundation hub directs information parcel to the predefined different hubs in the system. The third is communicated; it

implies the foundation hub sends communications to all the close and far hubs in the system [2].

Especially selected Networks are exceptionally respected in emergency hunt and safeguard events, congregations or societies in which people demand to hastily share data, and evidence procurement tasks in cold territory [5]. This specially appointed steering conventions can be separated into two classes: Table-Driven Routing Protocols: In table driven directing conventions, reliable and up-t o-date directing data to all hubs is kept up at every n tribute [5]. On-Demand Routing Protocols: In On-Demand directing conventions, the courses are made as and when essential. At the point when a foundation needs to send to a goal, it conjures the course revelation instruments to discover the way to the goal [5].

3.2 Routing protocol

A few directing conventions have been produced for specially appointed versatile systems. Fig 3.2 figures demonstrates the arrangement of these steering conventions.

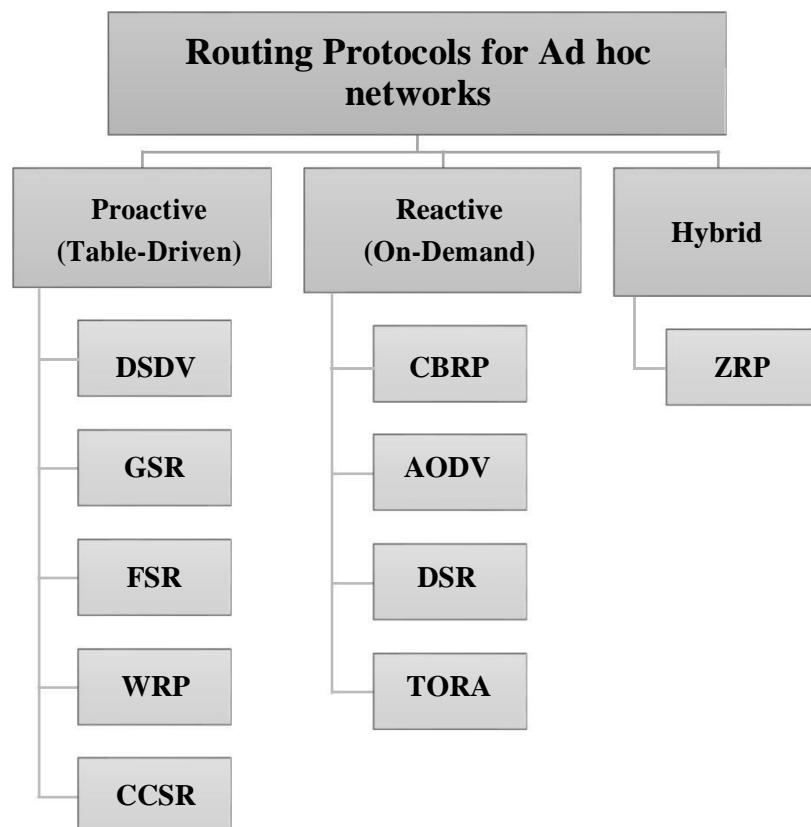


Fig: 3.2 routing protocol of Ad-hoc network [8]

Such conventions must manage average impediments of these systems which incorporate high power utilization, low data transfer capacity and high mistake rates [2].

3.3 Reactive Routing Protocols

As opposite to proactive methodology, in approachable or on application agreements, a hub starts a course expose all through the system, just when it needs to send bundles to its goal. For this reason, a hub starts a course revelation process through the system. This procedure is ended once a course is determined or all imaginable changes have been inspected. When a course has been built up, it is kept up by a course support process until either the goal ends up distant along each way from the source or until the point when the course is never again wanted. In responsive plans, hubs keep up the courses to dynamic goals. A course scan is required for each obscure goal [6].

3.4 Proactive Routing Protocols

In proactive or table-driven steering conventions, every hub persistently keeps up cutting-edge courses to each other hub in the system. Steering data has been intermittently transmitted all through the system so as to keep up directing table consistency. In this manner, if a course has just happened before traffic reaches, broadcast happens proximately. Something else, traffic bundles should hold up in line till the point when the hub gets directing data relating to its goal. In any case, for extraordinarily powerful scheme topology, the proactive plans want a lot of possessions to vacation up with the newest and rock-hard. Confident proactive steering conventions are Destination-Sequenced Distance Vector (DSDV), Wireless Routing Protocol (WRP), Global State Routing (GSR) and Cluster head Gateway Switch Routing (CGSR) [2]. Rather than proactive methodology, in receptive or on request conventions, a hub jumps a sequence revelation all through the system, just when it needs to refer parcels to its goal. For this cause, a hub jumps a course revelation process through the system [6].

3.5 Benefits and Disadvantages of Proactive and Reactive routing Protocols

Preferred standpoint of Proactive convention is that a course can be chosen quickly directly. Focal points of Reactive convention are bring down data transfer capacity for keeping up steering tables, more vitality productive and viable course upkeep.

Responsive (on-request) steering conventions discovers a course on interest by inundating the system with Route Demand parcels. The primary impediments of such calculations are high idleness time in course finding, over the top inundating can prompt system clogging. The significant downside of receptive steering is that a postponement is brought about while building up a course among source and goal hubs. Master dynamic (table-driven) directing agreements saves up crisp preparations of goals and their sequences by sporadically disseminating direction-finding tables all through the scheme. The fundamental drawbacks of such intentions are separate amount of evidence for support and reasonable reply on rebuilding and dissatisfactions [7].

3.6 Overview of AODV, DSR, DSDV and TORA

3.6.1 Ad-hoc On Demand Distance Vector Routing (AODV)

AODV is essentially an enhancement of Dynamic Destination-Sequenced Distance-Vector (DSDV) steering convention. In any case, AODV is a responsive directing convention as opposed to being proactive. It limits the quantity of communicates by making courses dependent on interest, which isn't the situation for DSDV. At the point when any source center needs to send a plot to a goal, it communicates a sequence ask for (RREQ) bundle [2].

The neighboring hubs thusly communicate the parcel to their neighbors and the procedure proceeds until the point when the bundle achieves the goal. Amid the way toward sending the course ask for, middle hub best ever the location of the fellow citizen from which the principal duplicate of the communicate parcel is gotten. This best ever is put away in their course benches, which benefits for setting up a turnaround way. In the event that extra duplicates of the equivalent RREQ are later gotten, these bundles are disposed of. The answer is sent applying the improvement way. For course support, when a source hub transfers, it can reinitiate a course revelation process. In the event that any transitional hub transfers inside a specific course, the fellow citizen of the

floated hub can recognize the connection disappointment and refers a connection disappointment warning to its upstream fellow citizen. This procedure proceeds until the disappointment sign realizes the basis hub. In light of the got data, the basis may choose to reinitiate the course revelation step [2].

3.6.1.1 The Ad-hoc On-Demand Distance Vector Algorithm

Our essential proposition can be identified as an unadulterated on demand sequence procurement system ; centers that don't lie on active ways neither keep up any leading data nor take an interest in any intermittent directing table trades. Further, a hub does not need to find and keep up a course to another hub until the point that the two need to convey, except if the previous hub is putting forth its administrations as a transitional sending station to keep up network between two different hubs [8]. At the point when the neighborhood availability of the versatile hub is of intrigue. Every versatile hub can wind up mindful of the different hubs in its neighborhood by the utilization of a few methods, including neighborhood (not framework wide) communicates recognized as hi mails. The directing benches of the hubs inside the area are composed to upgrade reaction time to nearby developments and give snappy reaction time to demands for foundation of new courses [8]. The calculation's essential targets are:

- To communicate disclosure bundles just when important.
- To recognize nearby availability the executives (neighborhood recognition) and over-all topology upkeep.
- To scatter data about deviations in nearby network to those adjacent portable hubs that are probably going to require the data [8].

3.6.1.1.1 Path Discovery Process

When attempting to make an impression on a goal hub without knowing a functioning course to it, the sending hub will start a way disclosure process. A course ask for dispatch (RREQ) is communicated to all nationals, which keep on communicating the memo to their nationals, etc. The sending procedure is proceeded until the goal hub is come to or until the point that a halfway hub recognizes a course to the goal that is sufficiently new. To guarantee circle free and latest course data, each hub keeps up two

counters: succession amount and transmission id. The transmission id and the location of the source hub interestingly distinguish a RREQ communication. Transmission id is increased for each RREQ the foundation hub starts [2]. When the course ask for communicate achieves the goalmouth or a central of the street hub with a crisp enough sequence, the hub reacts by transfer a unicast course answer bundle (RREP) vertebral to the hub from which it got the RREQ. So really the bundle is sent back invert the way worked amid communicate sending. A course is viewed as sufficiently new, if the middle of the road hub's course to the goal hub has a goal arrangement amount which is equivalent or more prominent than the one limited in the RREQ parcel [2].

As the RREP is directed back to the basis, each transitional hub sideways this way adds an onward course passage to its directing table [2].

The onward course is usual dynamic for quite a while demonstrated by a course clock passage [2].

3.6.1.1.2 Maintaining Routes

On the off chance that the source hub moves, it can send another RREQ parcel to locate another course to the goal. On the off chance that a halfway hub lengthways the onward way changes, its upstream national sees the change and directs a connection disappointment warning communication to every one of its active upstream nationals to advise them of the eradication of that piece of the course [2].

The connection disappointment warning is sent as long as the source hub isn't come to. In the wake of having found out about the disappointment, the source hub may reinitiate the course revelation convention. Alternatively a versatile hub may perform nearby availability upkeep by intermittently communicating hi messages [2].

3.6.2 Benefits and Limitations of AODV

The advantages of AODV convention are that it supports the minimum clogged course of the briefest course and it additionally underpins both unicast and multicast parcel transmissions notwithstanding for hubs in steady development. It likewise reacts rapidly to the topological changes that influences the dynamic courses. AODV does not

put any extra overheads on information parcels as it doesn't make utilization of source steering. The restriction of AODV convention is that it expects/necessitates that the hubs in the communicate medium can distinguish each other's communicates. It is too conceivable that a legitimate course is terminated and the assurance of a sensible expiry time is troublesome. The explanation for this is the hubs are portable and their sending rates may vary broadly and can change powerfully from hub to hub. What's more, as the extent of system develops, different execution measurements start diminishing. AODV is powerless to different sorts of assaults as it dependent on the supposition that all hubs must collaborate without their participation no course can be set up [9].

3.6.3 Dynamic Source Routing (DSR)

DSR is a responsive steering convention which enables hubs in the MANET to powerfully find a source course over different system bounces to any goal. In this convention, the versatile hubs are required to keep up course stores or the known courses. The course reserve is refreshed when any new course is known for a specific passage in the course store [2].

A hub forms the sequence ask for tract just in the occasion that it has not lately handled the package and its site is absent in the sequence record of the tract.

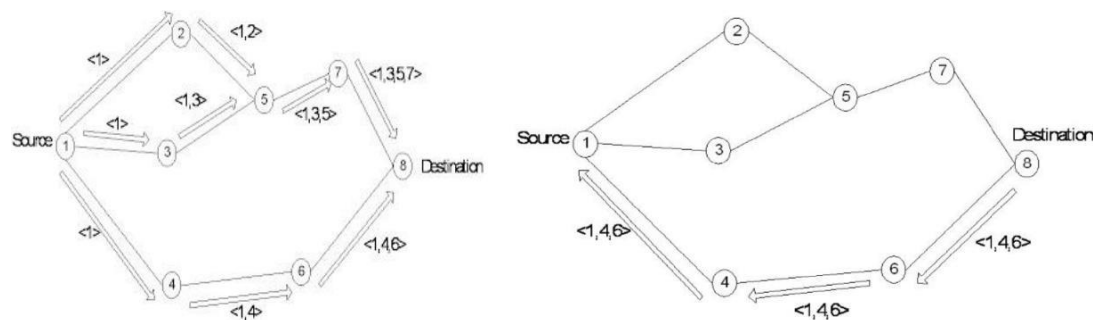


Fig 3.6.3: Working of Dynamic Source Routing

A course answer is shaped by the goal or by any of the central of the road hubs when it reasons about how to attain the journey's end [2].

DSR convention depends on source directing. Since in Ad hoc arrange, any connection may fall flat whenever. In this way, course upkeep process will always screens and will

likewise inform their tributaries if there is any disappointment in the way. Thus, the hubs will change the sections of their course store as gotten generally a similar will be sent utilizing the way joined on the information parcel [9].

3.6.3.1 Route Discovery

Course Discovery is utilized at whatever point a source hub wants a course to a goal hub. To begin with, the source hub looks into its course reserve to decide whether it as of now contains a course to the goal. In the event that the source finds a legitimate course to the goal, it uses this course to send its info packages [2].

On the off accidental that the hub does not have a considerable course to the goal, it starts the course disclosure process by interactive a course ask for message. The course ask for message comprises the location of the source and the goal, and a one of a kind ID number. A middle of the road hub that gets a course ask for message looks its course stand-in for a course to the goal. In the event that no course is open, it assigns its deliver to the course record of the communication and advances the message to its neighbors. The message proliferates through the system until the point that it comes to either the goal or a middle of the road hub with a course to the goal [2].

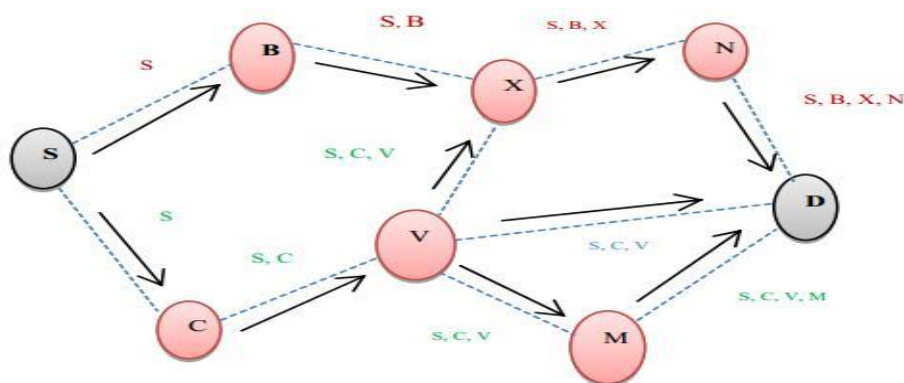


Fig 3.6.3.1: Route discovery in DSR [10].

At that point a course answer message, containing the correct jump succession for achieving the goal, is created and unicast back to the source hub [2].

3.6.3.2 Route Maintenance

Course Maintenance is utilized to deal with course breaks. At the point when a hub involvements a lethal broadcast subject at its material attach layer, it expels the course from its course standby and harvests a course mistake communication. The course mistake communication is sent to every hub that has sent a package absorbed over the broken assembly. At the point when a hub gets a course mistake message, it expels the bounce in mistake from its course standby. Confirmation messages are applied to sanction the right task of the course borders [2].

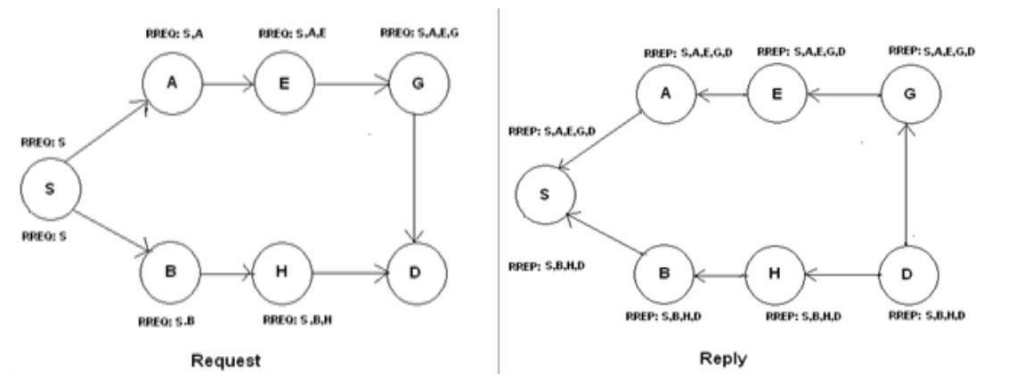


Fig 3.6.3.2: DSR Request and Reply [2]

In the event that an inherent confirmation device isn't available, the hub communicating the message can expressly ask for a DSR-explicit software design confirmation to be refunded by the following hub sideways the passage [2].

3.6.4 Benefits and Disadvantages of DSR

Solitary of the principle advantage of DSR convention is that here is no convincing reason to keep direction-finding table in order to highway a given information parcel as the whole course is measured in the parcel heading. The imprisonments of DSR agreement is this isn't multipurpose to expansive systems furthermore, even needs essentially all the more preparing assets than most different conventions. Fundamentally, In request to get the steering data, every hub must invest parcel of energy to process any control information it gets, regardless of whether it isn't the proposed beneficiary [9]

3.6.5 Dynamic Destination-sequenced Distance-vector Routing Protocol (DSDV)

DSDV is a practical steering convention which is produced based on Bellman-Ford directing calculation with a few alterations. In this convention, every versatile hub in the system keeps a direction-finding table. Every one of the direction-finding table contains the rundown of each single accessible goal and the quantity of bounces to each. Apiece table passage is labeled with a grouping amount which is begun by the goal hub. Intermittent broadcasts of updates of the steering tables help keeping up the topology data of the scheme. In the event that there is any new dangerous change for the direction-finding data, the updates are communicated promptly. In this way, the steering data updates may either be recurrent or occasion driven. DSDV resolution requires every versatile hub in the system to promote its own pointing table to its present neighbors [2]. Every hub holds up to certain time short-term to conduct the notice message to its nationals so the most current data with better sequence to a goal could be cultured to the nationals [2].

This will lead to a proceeding with burst of new course transmittal upon each new arrangement number from that goal [3].

3.6.6 Temporary Ordered Routing Algorithm (TORA)

The Temporally-Ordered Routing Algorithm (TORA) is a versatile directing convention for multi-jump systems that has the accompanying qualities:

- a. Dispersed execution
- b. Multipath steering

The convention can all the while bolster source started, on-request directing for a few goals and goal started, and proactive directing for different goals. Minimization of correspondence overhead by means of restriction of algorithmic response to topological changes. TORA is circulated, in that switches require just look after data about neighboring switches (i.e., one-bounce learning). Like a remove vector directing methodology, TORA keeps up state on a for every goal premise. TORA is intended to limit the correspondence overhead connected with adjusting to arrange topological

changes. The extent of TORA's control informing is regularly restricted to a little arrangement of hubs almost a topological change [9].

The convention responds just when all courses to the goal are lost. In case of system segments the convention can recognize the parcel and delete every single invalid course [2].

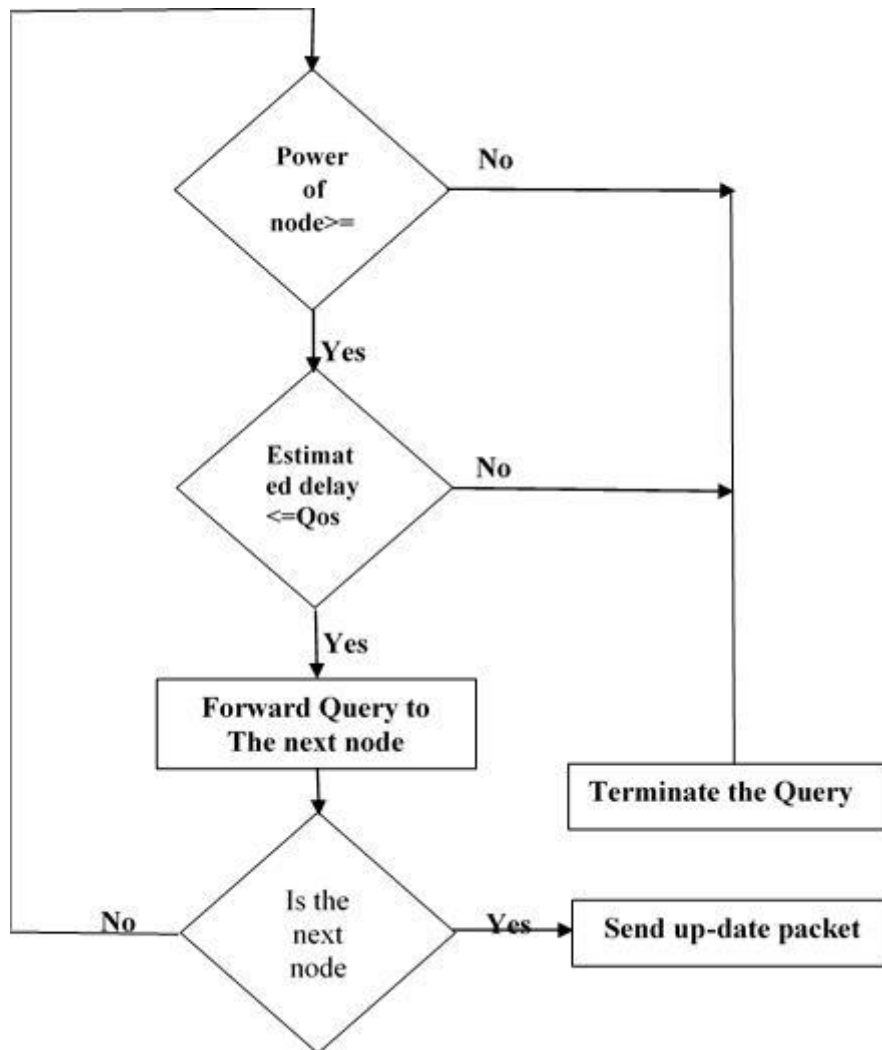


Fig 3.6.6: TORA Routing Protocol [11]

TORA have no restriction in the assembly time in most pessimistic scenario situations, they keep up different courses to the goal. With this, when a course change or course blunder happens it doesn't have any impact however just respond when the whole courses to the goal are lost. This type of steering convention identifies the segment and deletes all the invalid courses in term of system apportioning [11].

3.6.7 Advantages and Disadvantages of TORA

The goal arranged environment of the directing construction in TORA underpins a blend of responsive and practical steering on a for each goal premise. Amid receptive Task, sources start the foundation of courses to a given goal on-request. This method of activity may be worthwhile in powerful systems with generally inadequate traffic designs, since it may not be fundamental (or attractive) to keep up courses between each source/goal combine at all occasions. In the meantime, chose goals can start proactive activity, looking like conventional table-driven steering methods. This permits passages to be proactively kept up to goals for which course-plotting is reliably or then again recurrently compulsory. TORA is intended to limit the correspondence above associated with adjusting to arrange topological changes. The extent of TORA's control updating is regularly limited to a little arrangement of hubs almost a topological change [9].

Chapter-4

Performance evolution of AODV, DSR, DSDV and TORA routing protocols

In this part unique measurements have been considered in the execution assessment of AODV, DSR, DSDV and TORA Protocols. First the execution parameters considered in the correlation have been quickly examined. The reproduction configuration will likewise be examined [2].

4.1 Performance Parameters

There are various types of perspectives for the execution appraisal of the Routing conventions. These have diverse examples of the general program execution. This task has been evaluating five perspectives for the appraisal of our examination on the general program execution. These viewpoints are Throughput, End-to-End delay, Packet drop, Bandwidth and Routing overhead for strategies appraisal. These viewpoints are imperative in the thought of evaluation of the Routing conventions in an associations program. These procedures should be tried against specific perspectives on behalf of their execution. To check strategy execution in discover a way concerning area, we will aspect to the basis that how much control data it provides. A similar way a directing convention giving Lower Packet drop and lower steering overhead is called proficient Routing Protocol .Same way a directing convention which data transmission utilization is bring down is called effective Routing convention. These perspectives have extraordinary impact in the choice of a productive course-plotting system in any associations program [2].

4.2 Throughput

Throughput speaks to the normal rate of effective parcel conveyance per unit time over a correspondence channel [10]..Throughput's characterized as; the proportion of the aggregate information achieves a beneficiary since the sender. The period it receipts by the recipient to get the past message is named as throughput. Throughput's communicated as bytes or bits per sec (byte/sec or bit/sec). A few components influence

the amount as; if here are numerous topology variations in the system, questionable correspondence among hubs, constrained data transfer capacity accessible and restricted vitality. A high throughput is outright decision in each system. Throughput can be spoken to scientifically as in condition [2].

4.3 Average End-to-End delay in second

Normal bundle transmission time (delay) - which stays the contrast among when bundle is referred by the camera center and when the bundle arrives at vehicle hub. It incorporates a wide range of postpones like lining postpone engendering delay, and so forth [10].

The usual time it receipts an info bundle to achieve the aim. This measurement is determined by subtracting "time at which first parcel was transmitted by source" from "time at which first information bundle landed to goal". This incorporates all conceivable postponements caused by buffering within course expose idleness, facing at the interface line, retransmission intervals at the MAC, proliferation and exchange periods. This measurement is dangerous in understanding the adjournment offered by way confession [2].

4.4 Packet Drop

Packet drop happens when at least one bundles of information bridging a system neglect to achieve their goal [2]. The Transmission Control Protocol (TCP) distinguishes package misfortune and completes retransmissions to assurance solid notifying. Package misfortune in a TCP relationship is likewise used near maintain a strategic space from blockage and along these shapes creates a intentionally lessened throughput for the association.

4.5 Routing Overhead

Convention overhead - speaks to add up to number of bytes furthermore, parcels utilized for directing amid the reproduction [10]. Add up to number of directing parcels isolated by aggregate number of conveyed information bundles. Here, the normal number of directing bundles required to convey a solitary information parcel have been break down. This measurement gives a thought of the additional transmission capacity devoured by overhead to convey information traffic [2].

4.6 Bandwidth

Normal end-to-end postponement of information parcels: It's characterized as the normal end-to-end deferral of information bundles inside a system. The total ever contrasts among the parcel sent and gotten partitioned through the quantity of parcels, gives the normal end-to-end delay. The lesser the conclusion to-end postpone the better the application execution [2].

Chapter 5

Simulation and Result

The recreations has been performed operating Network Simulator 2 (Ns-2) especially famous in the impromptu systems management network. The source-goal sets have been spread arbitrarily over the system. Amid the recreation, every hub begins its voyage from an arbitrary spot to an irregular picked goal. When the goal has been achieved, the hub receipts a rest timeframe in second and extra irregular goal is picked after that stop time. This procedure rehashes all through the recreation, causing persistent changes in the topology of the basic system. Distinctive system situation for number of hubs and delay times has been produced. The model parameters that have been utilized in the accompanying trials have been abridged in Table 5.1 [2].

Table 5.1 Table of Simulation Parameter [2]

Simulation Parameter	Value
Channel Type	Wireless Channel
Radio-propagation model	Two Ray Ground Model
Network interface type	Wireless Physical
MAC type	802_11 b
Interface Queue Type	Drop Tail Primary Queue
Antenna model	Omni Direction
Number of Mobile nodes	11
Ad Hoc Routing Protocol	AODV,DSR,DSDV and TORA
Simulation Area	500m x 400m
Simulation Time	12s
Traffic Type	UDP
Nodal speed	1-3m/s
Packet size	1500 Byte (Data Packets)

5.1 Process of Simulation in NS-2

In this reenactment procedure at opening tcl document has been kept running as a system test system. System Simulator (ns2) has been delivered two diverse record one's NAM document and alternative is Trace document. Nam record equally a Network illustrator record which speaks to the graphical exemplary and Trace record speaks to the majority of the data of this reproduction. To investigation the follow record the diverse yield chart has been found [2].

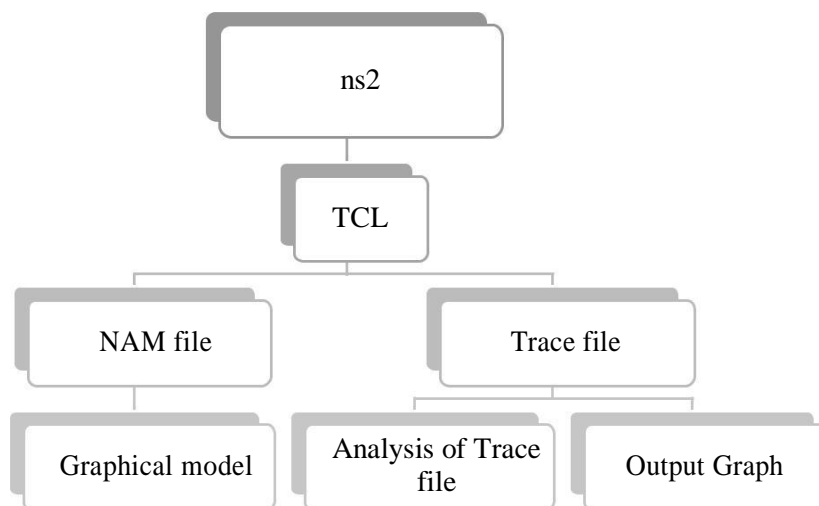


Fig 5.1 Simulation process of NS-2 [2]

As the reenactment is kept running for a specific situation, one follow record is made for each run. The follow records are prepared through an assortment of contents (e.g. Perl, awk, shell and so forth). More investigation can be done utilizing Mat lab or Microsoft Excel. They can remain used to create the charts, for example, that portrayed in the last mentioned segments of the paper [1].

5.2 Simulation Topology [2]

It's appeared in Fig.5.2 that from basis hub 0 the information is being referred to goal hub 10 [2].

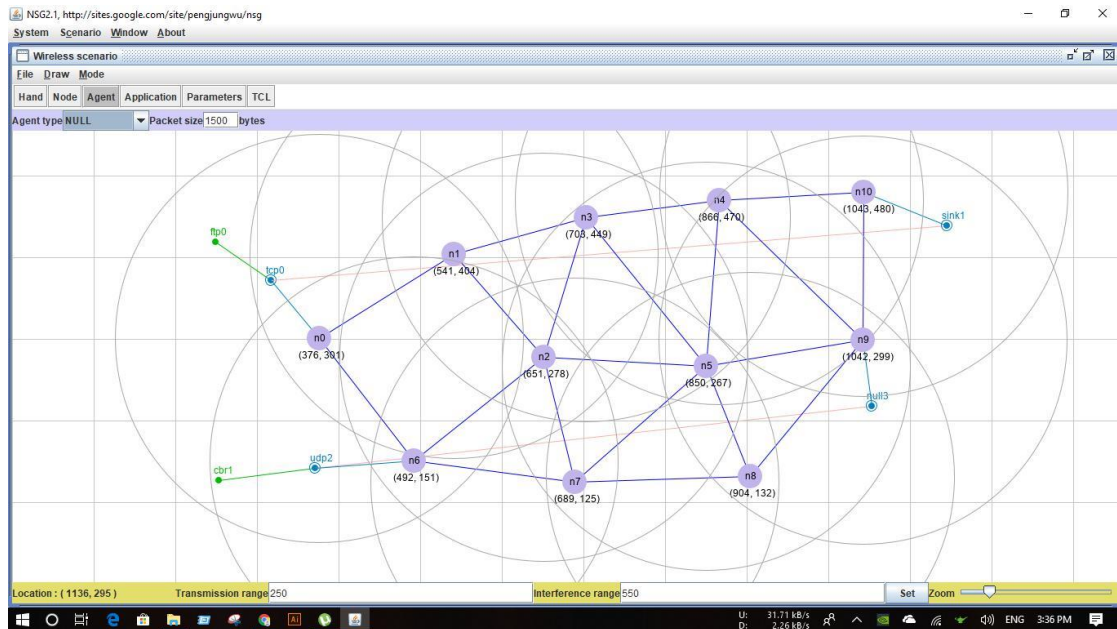


Fig 5.2 simulation topology of 11 nodes

And when the goal hub gets the bundle it sent back the replay back rub to source hub 0 [2].

5.3 Discovery Process [2]

At the point when a hub Sending Packet to the goal at first it checks its steering table or reserve [2].

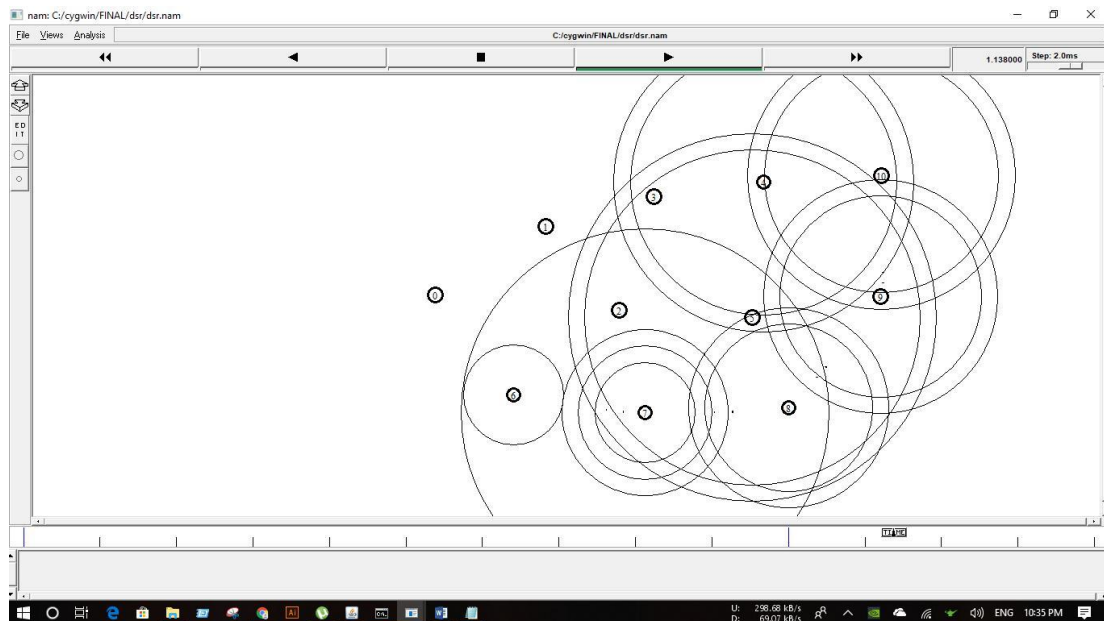


Fig 5.3 Discovery Process [2].

In the event that it doesn't discover the data of the goal hub, communicate message and finds the course of the goal. Fig 6.3 demonstrates the find procedure of those hubs [2]

5.4 Mobility of Wireless Node

This is the nam file of 11 nodes.

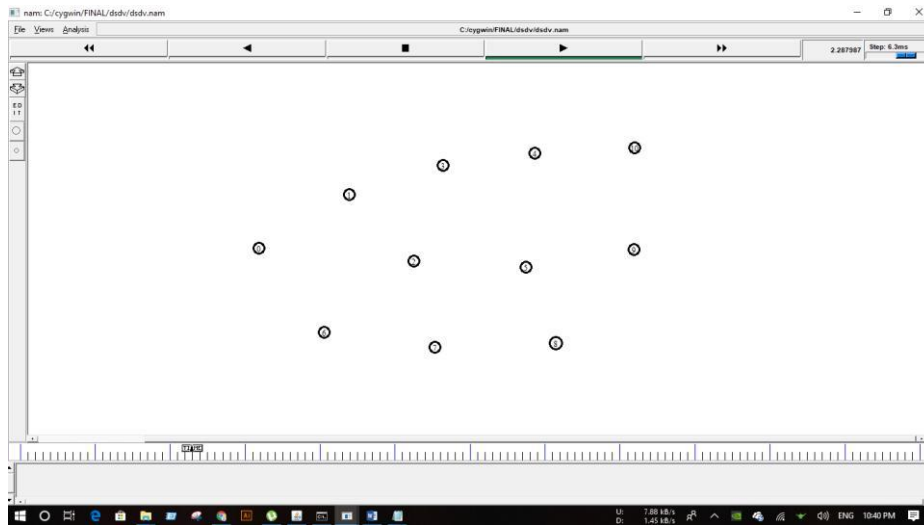


Fig 5.4.1 Fixed position of node

Mobility of 11 nodes

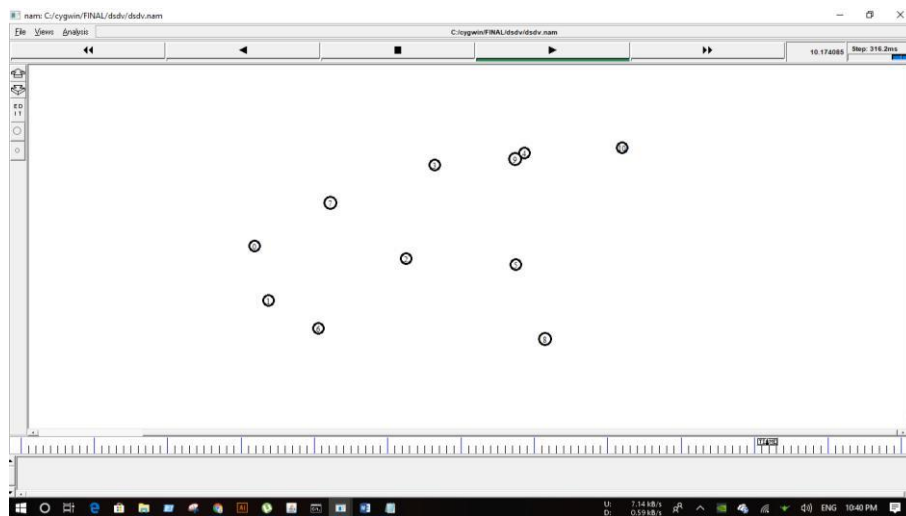


Fig 5.4.2 Shows the mobility of the nodes [2]

In this two fig we show the mobility of 11 nodes. This is from our nam file.

5.5 Packet Sent [2]

Packet sent process from our nam file.

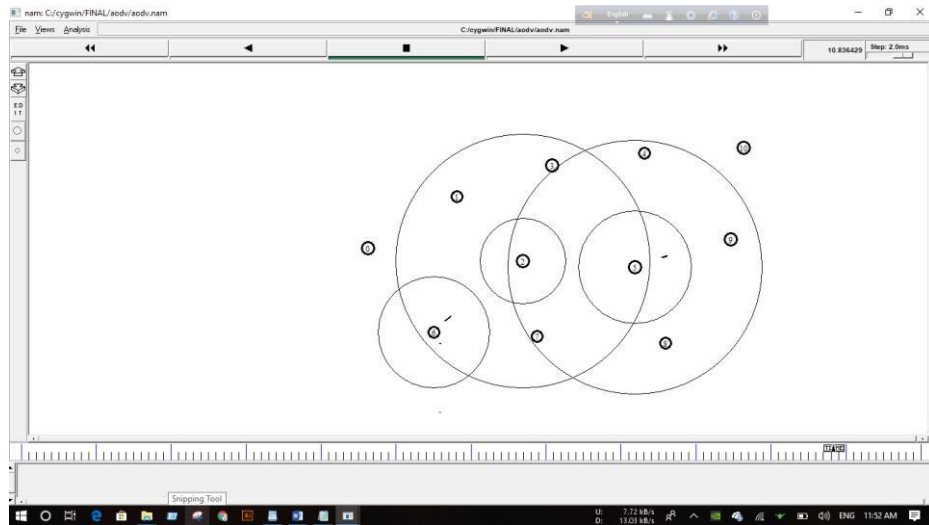


Fig 5.5 Packet Sent Process

When packet passes one node from another node this is the scenario of our topology.

5.6 Result

5.6.1 Throughput

AODV

In fig 5.6.1.1 we can see that it's a graph of Throughput vs Time of AODV protocol. In this graph when time was near to 10 second then the value of Throughput was 40 KB [2].

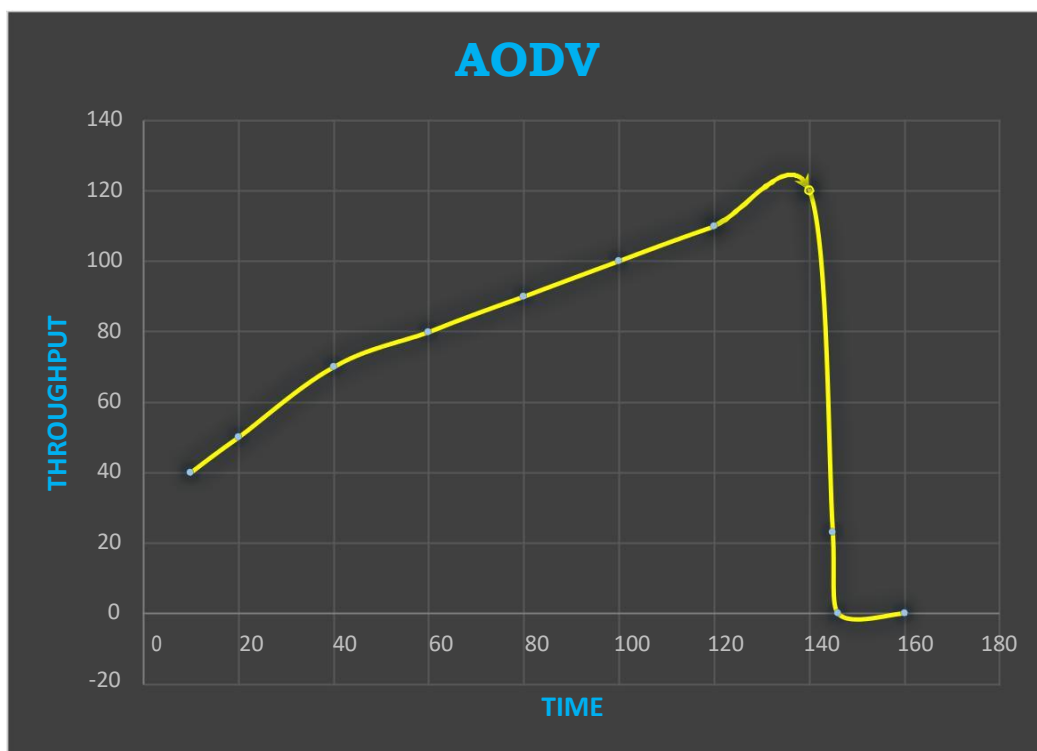


Fig 5.6.1.1 Throughput vs Time for AODV protocol [2]

At the point when period has been expanded the estimation of throughput additionally expanded .When the period was near about 150seconds the rate of the throughput was top [2].

DSR

In fig 5.6.1.2 we can see that it's a graph of Throughput vs Time of DSR protocol. In this graph when time was 20 second then the value of Throughput was up to 40 KB [2].

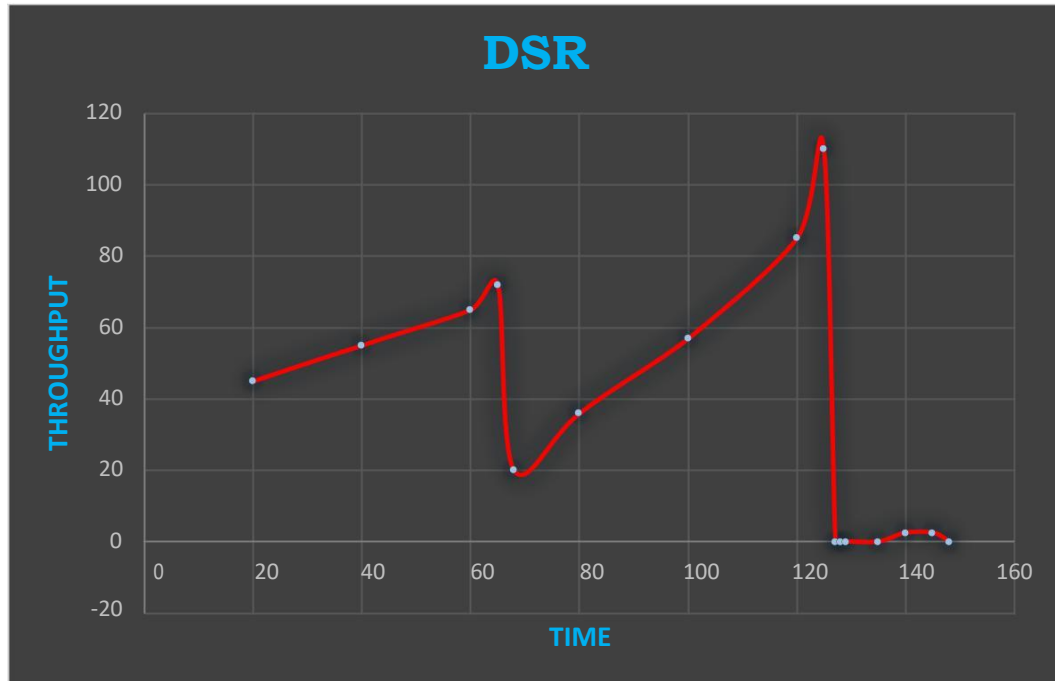


Fig 5.6.1.2 Throughput vs Time for DSR protocol [2]

At the point when time has been expanded the estimate on of throughput additionally expanded. But when it's near to 70 second then it's go down. After that its increases .When the period was near about 130seconds the rate of the throughput was top [2].And then its go to 0.

DSDV

In fig 5.6.1.3 we can see that it's a graph of Throughput vs Time of DSDV protocol. In this graph when time was 20 second then the value of Throughput was up to 0 KB [2].

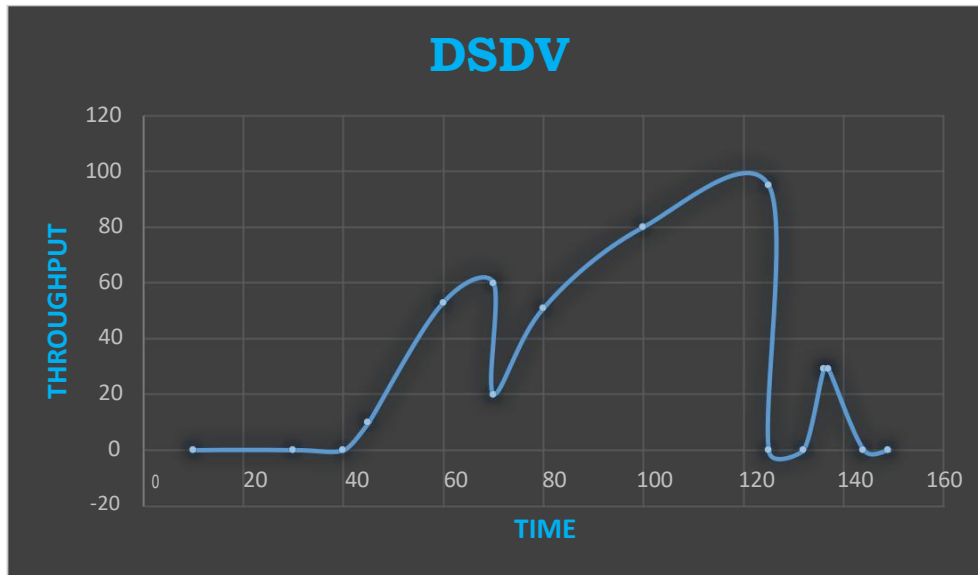


Fig 5.6.1.3 Throughput vs Time for DSDV protocol [2]

At the point when time was 40 second then its increases. But when it's near to 70 second then it's go down. After that its increases again .When the period was near about 130seconds the rate of the throughput was top [2].And then the time of near to 145 second it's go to 0.

TORA

In fig 5.6.1.4 we can see that it's a graph of Throughput vs Time of TORA protocol. In this graph when time was 20 second then the rate of Throughput was 40 KB up.

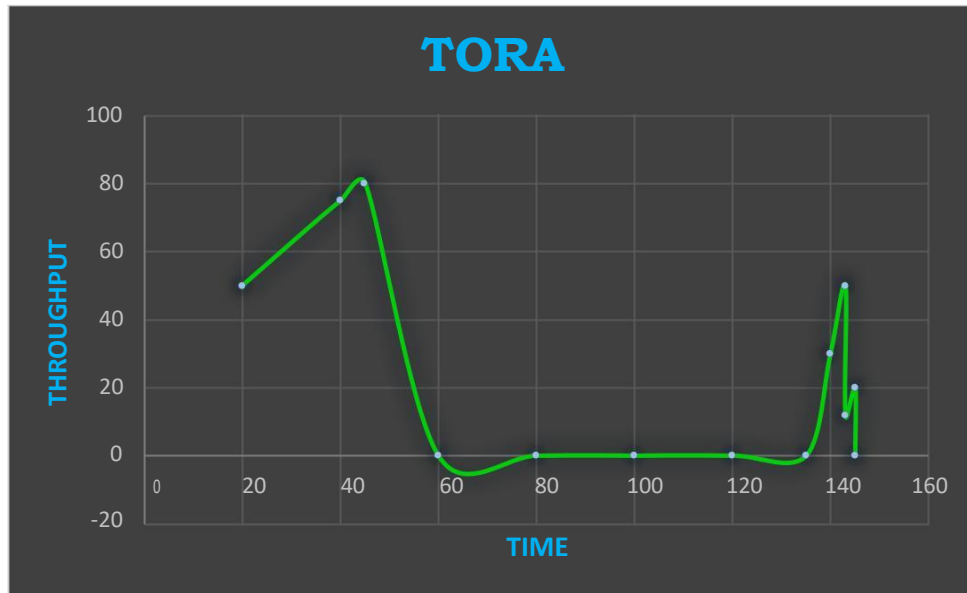


Fig 5.6.1.4 Throughput vs Time for TORA protocol [2]

Then its increases. At the point when time was near to 70 second then its go down. After that again its increases. When the period was close about 130seconds the rate of the throughput was maximum [2].

Here we see the graph of four protocols.

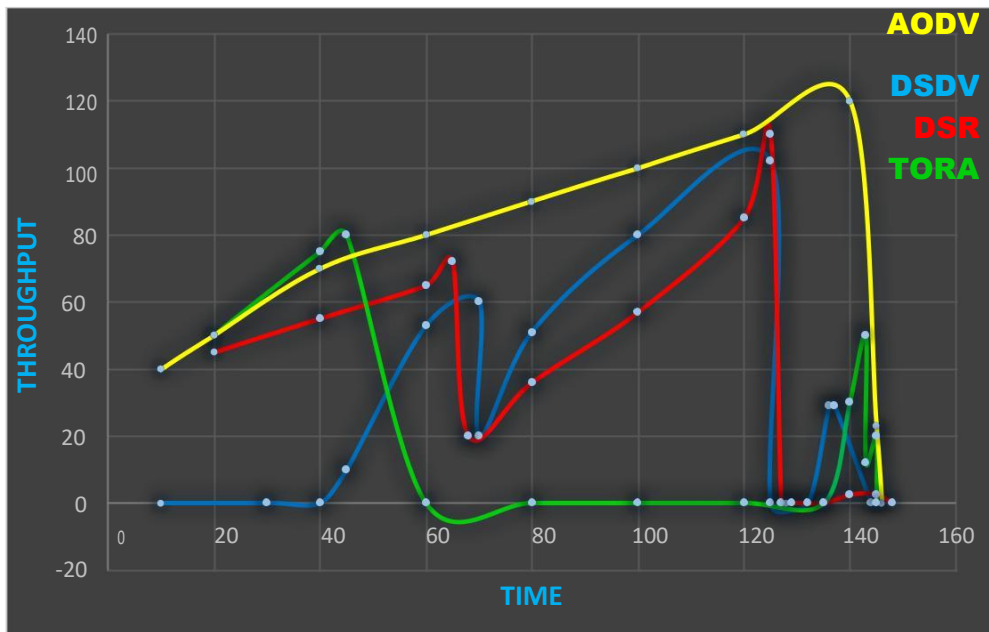


Fig 5.6.1.5 Throughput vs. Time for Compression concerning four protocols [2]

In this graphs we say that AODV and DSR protocol is better than others [2]. Because their throughput is higher than other protocols.

5.6.2 Packet Drop

In Fig 5.6.2 we can see that there is the percentage of packet dropping for four routing protocols and they are AODV, DSR, DSDV and TORA [2].

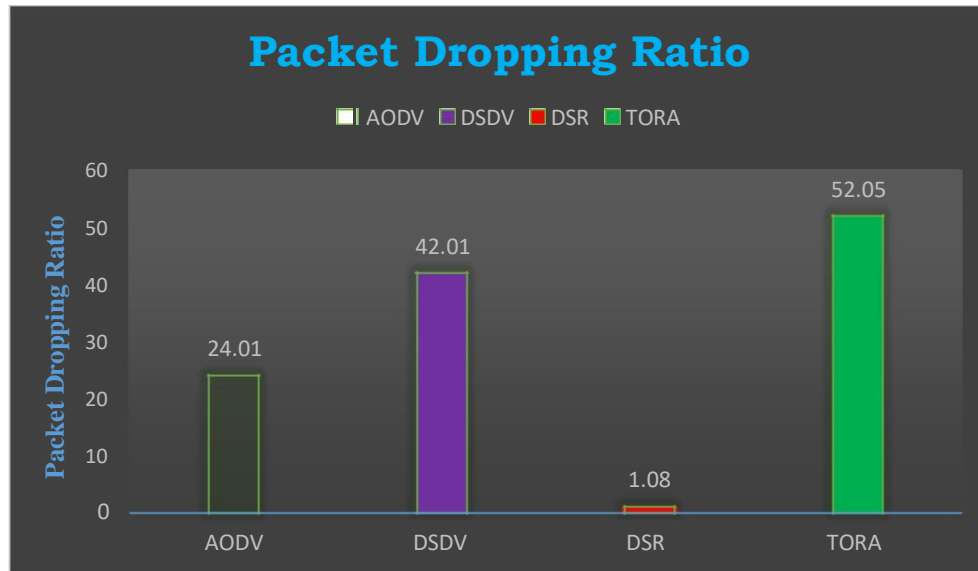


Fig 5.6.2 Packet dropping percentage for four routing protocols [2]

A protocol whose package dipping percentage is less that executes better. In this fig the extreme packet dropping in TORA then in DSDV and then in AODV. DSR protocol is much lower than other protocols. As a result DSR perform well [2].

5.6.3 End To End Delay

Postpone alludes to the period booked by parcels to navigate the Network and achieve the goal.

AODV

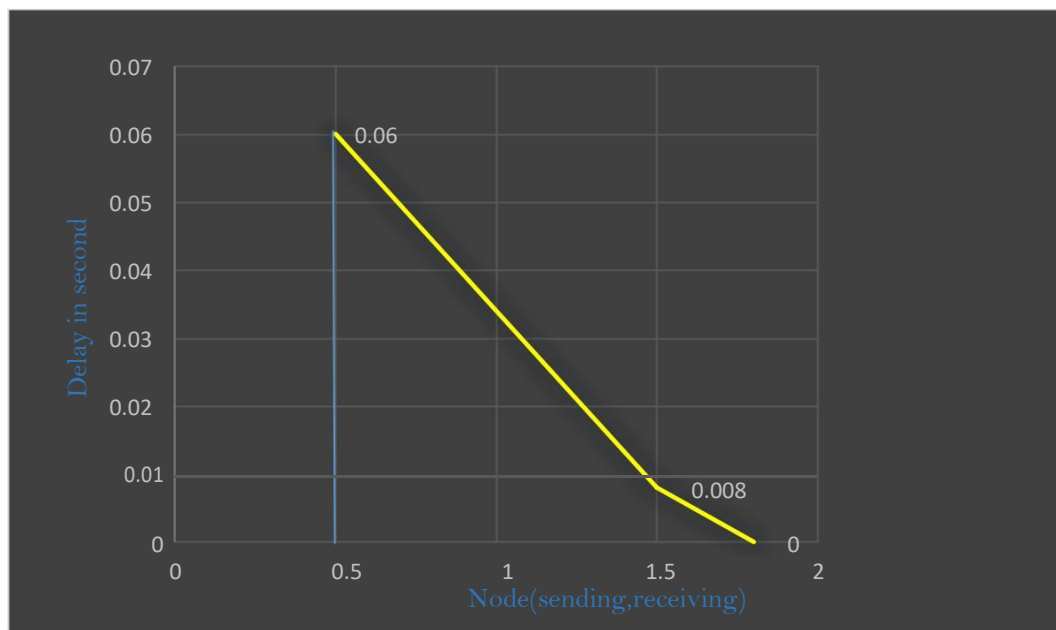


Fig 5.6.3.1. End to End delay vs. Node (Sending, Receiving) for AODV [2].

In this investigation DSR takes the least end to end delay in receptive conventions and DSDV has most reduced end to end delay in Proactive directing conventions.

DSR

At the point when the development of the hub has been expanded the conclusion to end delay additionally expanded [2].

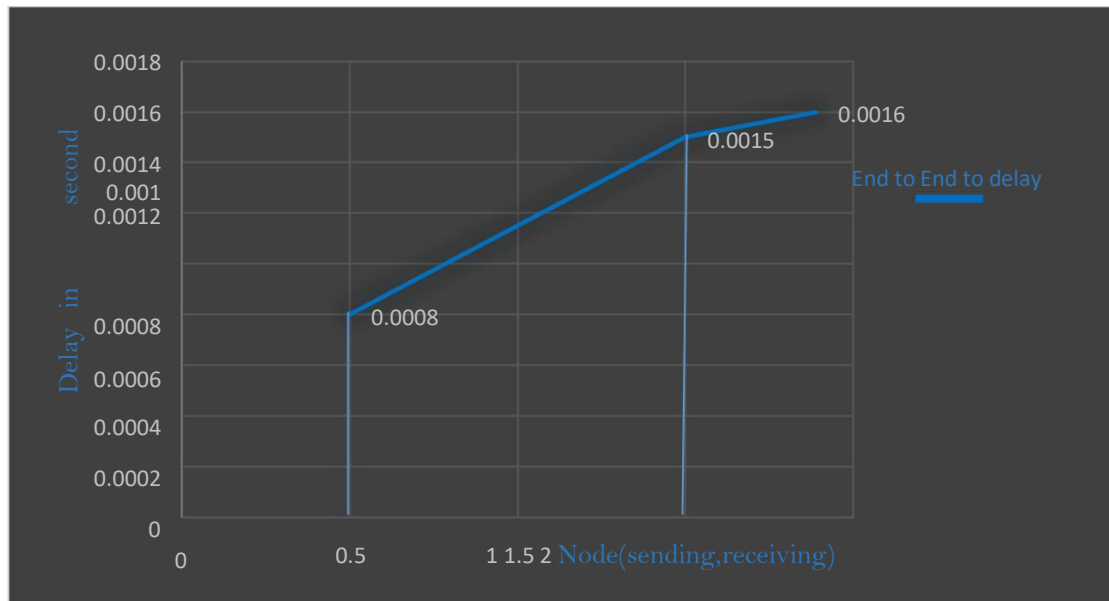


Fig 5.6.3.2 End to End delay vs. Node (Sending, Receiving) for DSR [2]

When the node position is 0.5, 1.5 and 1.890 then delay is 0.0008. 0.0015 and 0.0016

DSDV

When the node position is 0.5, 1.5 and 1.8 then delay is 0.002, 0.029 and 0.0035

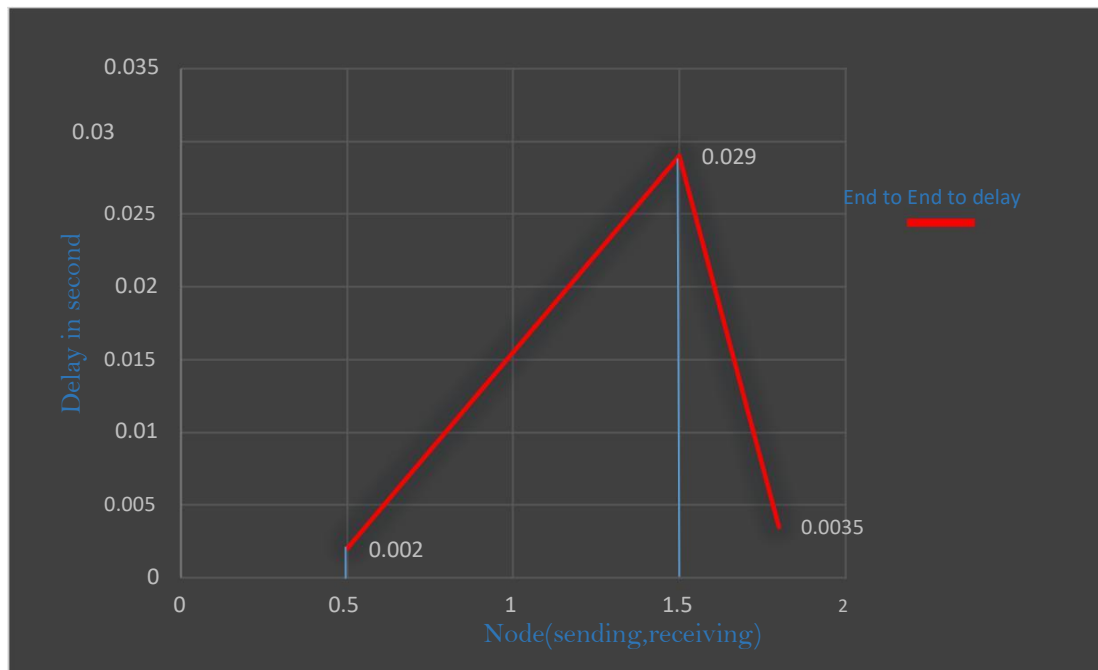


Fig 5.6.3.3 End to End delay vs. Node (Sending, Receiving) for DSDV [2]

TORA

The conclusion to end delay is a lot higher in TORA then in AODV [2].

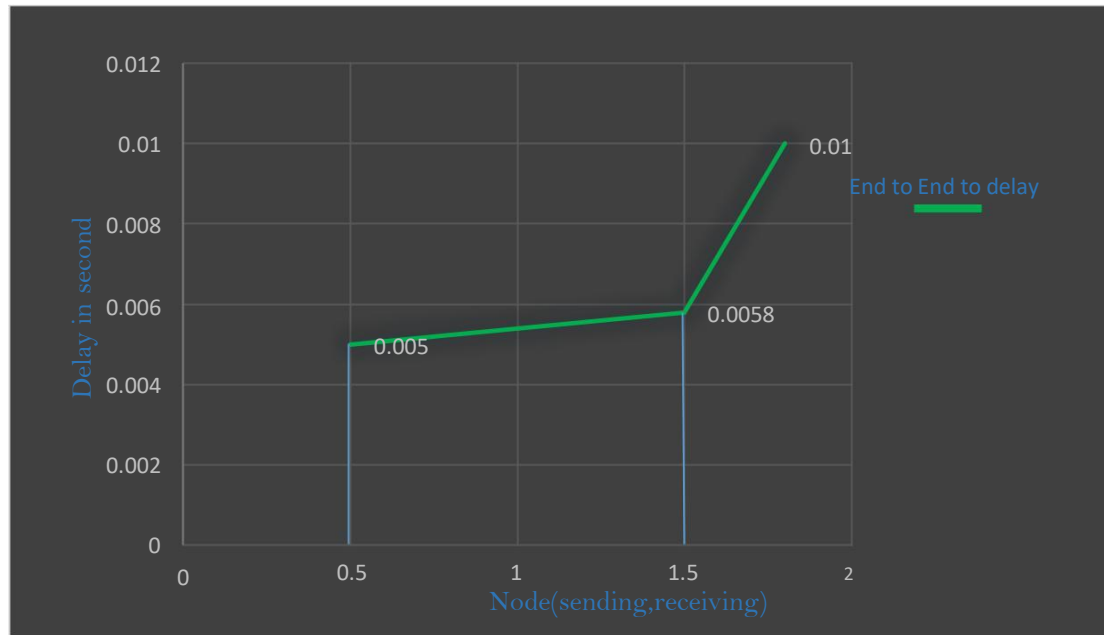


Fig 5.6.3.4 End to End delay vs. Node (Sending, Receiving) for TORA [2]

Be that as it may, the conclusion to end postponement of DSR and DSDV much brings down so these conventions perform superior [2].

5.6.4 Routing Overhead

In this fig we can see that there are the most elevated measure of steering circulation is sent by the AODV and TORA directing convention. DSDV convention steering upstairs is less as contrast with AODV and TORA.DSR convention are less as contrast with other three directing conventions [2].

The explanation behind DSR, bringing about less overhead is that, it sends the direction-finding traffic just when it has information to communicate, which wipe out the need to send pointless directing traffic [2].

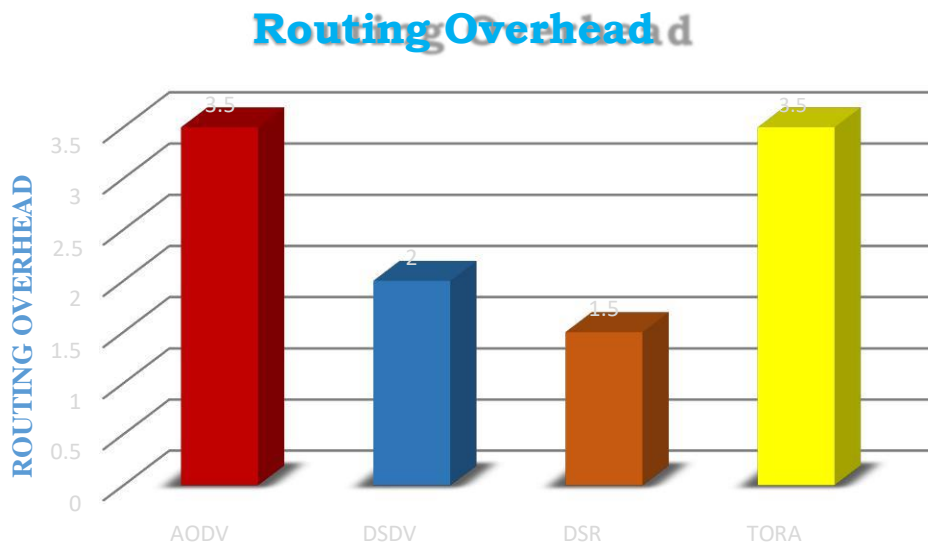


Fig 5.6.4 Routing Overhead for four routing protocols [2]

AODV has directing overhead a lot higher than DSR as a result of different course answers to a solitary course ask. The directing upstairs for TORA is same to the upstairs of AODV steering conventions in view of the occasional refresh and HELLO parcels, which it sent on the system for course revelation. Therefore DSR perform better as contrast with the other directing conventions [2].

5.6.5 Bandwidth

In this figures we can see that the most elevated measure of steering traffic flow is conducted by the AODV and TORA directing convention.

AODV

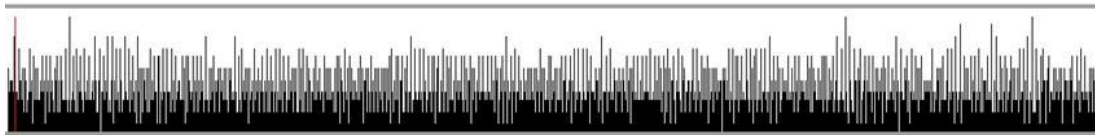


Fig 5.6.5.1: Bandwidth for AODV [2]

DSR



Fig 5.6.5.2: Bandwidth for DSR [2]

DSDV



Fig 5.6.5.3: Bandwidth for DSDV [2]

TORA



Fig 5.6.5.4: Bandwidth for TORA [2]

DSDV convention steering overhead is fewer as contrast with AODV and TORA. DSR convention are fewer as contrast with other three directing conventions [2].

The explanation behind DSR, transporting about less above is that, it directs the steering traffic just when it has evidence to communicate, which wipe out the need to send pointless directing traffic. AODV has guiding overhead a lot greater than DSR as a result of different course answers to a private course ask. The directing above for TORA is similar to the above of AODV steering conventions in view of the occasional revive and HELLO parcels, which it sent on the system for course revelation. Therefore DSR perform better as contrast with the other directing conventions [2].

Chapter 6

Conclusion

In this work, the analysis of different routing protocol of Ad-hoc networks using packet level simulation has been evaluated. This report introduces complete knowledge about Ad-hoc network with four routing protocols which is AODV, DSR, DSDV and TORA. Now a days a lot of research done with Ad hoc network and trying to find out how this network is more reliable in communications. Therefore, this work investigated to find out more reliable protocol in routing. And finally, it is found that DSR protocol performs better than other protocol in routing.

References

- [1] Iftekharul Mobin, Sifat Momen, and Nabeel Mohammed , “Packet Level Simulation Study of Adhoc network with Network Simulator-2 (NS-2)” Department of Computer Science and Engineering University of Liberal Arts Bangladesh, 4/A Dhanmondi, Dhaka-1209, 09 March 2017.
- [2] Md.Masud Parvez, Shohana Chowdhury and S.M.Bulbul Ahammed, “Improved comparative analysis of Manet” Department of Electronics and Telecommunication Engineering Daffodil International University, August 2012
- [3] Parikshit Machwe, Neha Jha, Sunil Arora, Raghav Mittal, “Routing Protocols For Ad-hoc Networks”, .
- [4] Naeem Raza, Muhammad Umar Aftab, Muhammad Qasim Akbar, Omair Ashraf, Muhammad Irfan, “Mobile Ad-Hoc Networks Applications and Its Challenges” 20 July2016.
- [5] Samyak Shah, Amit Khandre, Mahesh Shirole and Girish Bhole, “Performance Evaluation of Ad Hoc Routing Protocols Using NS2 Simulation”, CoMPC– 2008
- [6] Anuj K. Gupta, Member, IACSIT, Dr. Harsh Sadawarti, Dr. Anil K. Verma, “Performance analysis of AODV, DSR & TORA Routing Protocols”, IACSIT International Journal of Engineering and Technology, Vol.2, No.2, April 2010
- [7] S.Vanthana, Dr.V.Sinthu Janita Prakash, “Comparative Study Of Proactive and Reactive Ad-hoc Routing Protocols Using NS2” Asst Professors, Dept of Computer Science, Cauvery College for Women,Tiruchirappali.
- [8] Charles E. Perkins, Elizabeth M. Royer, “Ad-hoc On-Demand Distance Vector Routing” Sun Microsystems Laboratories Advanced Development Group, Dept. of Electrical and Computer Engineering University of California, Santa Barbara.
- [9] Prof. Hardik D Patel, Prof. Purvi G Trivedi, “Mobile Ad-Hoc Network: Working of Routing protocols and Application”,Department of Computer Science, Ganpat University, Kherva, Gujarat, India., 2013
- [10] L. A. Hassnawi, R.B Ahmad, Abid Yahya, S. A. Aljunid, M. Elshaikh,“Performance Analysis of Various Routing Protocols for Motorway Surveillance System Cameras’ Network”, School of Computer and Communication Engineering, University Malaysia Perlis, Malaysia 02000, Kuala Perlis – MALAYSIA, March 2012

- [11] Okoro Obinna, Sellappan Palaniappana, Seyed Mohammadreza Ghadiri, “Mobile Ad-hoc Network (MANET) Routing Protocol Comparison between Temporary Ordered Routing Algorithm (TORA) and Dynamic Source Routing (DSR) – A Review”, School of Science and Engineering, Malaysia University of Science and Technology, Selangor, Malaysia, 28 August 2014.

Appendix 1

Trace file:

AODV

```
s 1.000000000 _0_ AGT --- 0 tcp 40 [0 0 0 0] ----- [0:0 10:0 32 0] [0 0] 0 0
s 1.000000000 _0_ RTR --- 0 AODV 48 [0 0 0 0] ----- [0:255 -1:255 30 0] [0x2 1 1
[10 0] [0 4]] (REQUEST)
r 1.000963632 _6_ MAC --- 0 AODV 48 [0 ffffffff 0 800] ----- [0:255 -1:255 30 0]
[0x2 1 1 [10 0] [0 4]] (REQUEST)
r 1.000988632 _6_ RTR --- 0 AODV 48 [0 ffffffff 0 800] ----- [0:255 -1:255 30 0]
[0x2 1 1 [10 0] [0 4]] (REQUEST)
s 1.001869859 _6_ RTR --- 0 AODV 48 [0 ffffffff 0 800] ----- [6:255 -1:255 29 0]
[0x2 2 1 [10 0] [0 4]] (REQUEST)
r 1.002793491 _0_ MAC --- 0 AODV 48 [0 ffffffff 6 800] ----- [6:255 -1:255 29 0]
[0x2 2 1 [10 0] [0 4]] (REQUEST)
r 1.002818521 _7_ RTR --- 0 AODV 48 [0 ffffffff 6 800] ----- [6:255 -1:255 29 0]
[0x2 2 1 [10 0] [0 4]] (REQUEST)
s 1.005164555 _2_ RTR --- 0 AODV 48 [0 ffffffff 6 800] ----- [2:255 -1:255 28 0]
[0x2 3 1 [10 0] [0 4]] (REQUEST)
r 1.006448080 _7_ MAC --- 0 AODV 48 [0 ffffffff 2 800] ----- [2:255 -1:255 28 0]
[0x2 3 1 [10 0] [0 4]] (REQUEST)
r 1.024542766 _5_ MAC --- 0 AODV 44 [13a 5 9 800] ----- [10:255 0:255 29 5]
[0x4 2 [10 4] 10.000000] (REPLY)
s 1.026567759 _2_ MAC --- 0 ARP 86 [13a 5 2 806] ----- [REPLY 2/2 5/5]
r 1.027571088 _2_ MAC --- 0 ACK 38 [0 2 0 0]
D 1.201 r 7.920000000 _6_ RTR --- 570 cbr 1000 [0 0 0 0] ----- [6:0 9:0 32 0]
[490] 0 0
s 7.920000000 _6_ RTR --- 570 cbr 1020 [0 0 0 0] ----- [6:0 9:0 30 2] [490] 0 0
```

D 7.920025000 _6_ IFQ --- 570 cbr 1020 [0 2 6 800] ----- [6:0 9:0 30 2] [490] 0 0
r 7.921948144 _9_ MAC --- 329 cbr 1020 [13a 9 5 800] ----- [6:0 9:0 28 9] [255] 3
0
s 7.921958144 _9_ MAC --- 0 ACK 38 [0 5 0 0]
r 7.921973144 _9_ AGT --- 329 cbr 1020 [13a 9 5 800] ----- [6:0 9:0 28 9] [255] 3
0
r 7.922262636 _5_ MAC --- 0 ACK 38 [0 5 0 0]
s 7.922692636 _5_ MAC --- 0 RTS 44 [242e 9 5 0] 877420 _5_ MAC COL 0 RTS
44 [58e 5 9 0]

r-s=delay

DSR

s 1.000000000 _0_ AGT --- 0 tcp 40 [0 0 0 0] ----- [0:0 10:0 32 0] [0 0] 0 0
s 1.007686855 _0_ RTR --- 1 DSR 32 [0 0 0 0] ----- [0:255 10:255 32 0] 1 [1 1] [0
1 0 0->0] [0 0 0 0->0]
r 1.008962487 _6_ MAC --- 1 DSR 32 [0 ffffffff 0 800] ----- [0:255 10:255 32 0] 1
[1 1] [0 1 0 0->0] [0 0 0 0->0]
r 1.008987487 _6_ RTR --- 1 DSR 32 [0 ffffffff 0 800] ----- [0:255 10:255 32 0] 1
[1 1] [0 1 0 0->0] [0 0 0 0->0]
s 1.041554188 _0_ RTR --- 2 DSR 32 [0 0 0 0] ----- [0:255 10:255 32 0] 1 [1 2] [0
2 0 0->0] [0 0 0 0->0]
r 1.042489820 _6_ MAC --- 2 DSR 32 [0 ffffffff 0 800] ----- [0:255 10:255 32 0] 1
[1 2] [0 2 0 0->0] [0 0 0 0->0]
r 1.086243002 _9_ MAC --- 0 RTS 44 [52e 9 8 0]
r 1.086557725 _8_ MAC --- 0 CTS 38 [3f4 8 0 0]
s 1.086567725 _8_ MAC --- 0 ARP 86 [13a 9 8 806] ----- [REPLY 8/8 9/9]

r 1.087571169 _8_ MAC --- 0 ACK 38 [0 8 0 0]
 D 1.088349580 _8_ MAC COL 0 ARP 86 [0 ffffffff 5 806] ----- [REQUEST 5/5
 0/7]
 D 1.088349774 _4_ MAC COL 0 ARP 86 [0 ffffffff 5 806] ----- [REQUEST 5/5
 0/7]
 s 1.089343744 _9_ MAC --- 0 RTS 44 [6ae 8 9 0]
 r 1.090011189 _9_ MAC --- 0 CTS 38 [574 9 0 0]
 s 1.091103911 _8_ MAC --- 0 ACK 38 [0 9 0 0]
 f 1.091118911 _8_ RTR --- 3 DSR 76 [13a 8 9 800] ----- [10:255 0:255 252 7] 6 [0
 2] [1 2 6 0->10] [0 0 0 0->0]
 r 1.133102903 _9_ MAC --- 0 ACK 38 [0 9 0 0] s
 1.133572181 _8_ MAC --- 0 RTS 44 [72e 7 8 0] r
 1.133924898 _7_ MAC --- 0 RTS 44 [72e 7 8 0] s
 1.133934898 _7_ MAC --- 0 CTS 38 [5f4 8 0 0] r
 1.134239615 _8_ MAC --- 0 CTS 38 [5f4 8 0 0]
 s 1.134249615 _8_ MAC --- 6 ack 150 [13a 7 8 800] ----- [10:0 0:0 30 7] [0 0] 2 0
 r 1.135450332 _7_ MAC --- 6 ack 92 [13a 7 8 800] ----- [10:0 0:0 30 7] [0 0] 3 0

r-s=delay

DSDV

s 0.030050775 _1_ RTR --- 0 message 32 [0 0 0 0] ----- [1:255 -1:255 32 0]
 r 0.031006333 _2_ MAC --- 0 message 32 [0 ffffffff 1 800] ----- [1:255 -1:255 32
 0]
 r 0.031006424 _0_ MAC --- 0 message 32 [0 ffffffff 1 800] ----- [1:255 -1:255 32
 0]
 r 0.031031336 _3_ RTR --- 0 message 32 [0 ffffffff 1 800] ----- [1:255 -1:255 32 0]

s 0.184842620 _2_ RTR --- 1 message 32 [0 0 0 0] ----- [2:255 -1:255 32 0]
r 0.186118177 _1_ MAC --- 1 message 32 [0 ffffffff 2 800] ----- [2:255 -1:255 32 0]
r 0.186118298 _6_ MAC --- 1 message 32 [0 ffffffff 2 800] ----- [2:255 -1:255 32 0]
r 0.186143215 _3_ RTR --- 1 message 32 [0 ffffffff 2 800] ----- [2:255 -1:255 32 0]
r 0.186143298 _6_ RTR --- 1 message 32 [0 ffffffff 2 800] ----- [2:255 -1:255 32 0]
s 0.477568789 _7_ MAC --- 2 message 90 [0 ffffffff 7 800] ----- [7:255 -1:255 32 0]
r 0.478289505 _5_ MAC --- 2 message 32 [0 ffffffff 7 800] ----- [7:255 -1:255 32 0]
r 0.478314315 _2_ RTR --- 2 message 32 [0 ffffffff 7 800] ----- [7:255 -1:255 32 0]
s 0.623344604 _9_ RTR --- 3 message 32 [0 0 0 0] ----- [9:255 -1:255 32 0]
r 0.624320207 _10_ MAC --- 3 message 32 [0 ffffffff 9 800] ----- [9:255 -1:255 32 0]
s 0.634321795 _5_ RTR --- 4 message 32 [0 0 0 0] ----- [5:255 -1:255 32 0]
r 0.635477474 _4_ MAC --- 4 message 32 [0 ffffffff 5 800] ----- [5:255 -1:255 32 0]
s 0.889120254 _3_ RTR --- 5 message 32 [0 0 0 0] ----- [3:255 -1:255 32 0]
r 0.890055814 _1_ MAC --- 5 message 32 [0 ffffffff 3 800] ----- [3:255 -1:255 32 0]
r 0.890080801 _4_ RTR --- 5 message 32 [0 ffffffff 3 800] ----- [3:255 -1:255 32 0]

r-s=delay

TORA Protocol:

M 1.00000 0 (5.00, 5.00, 0.00), (250.00, 250.00), 3.00

s 1.000000000 _0_ AGT --- 0 tcp 40 [0 0 0 0] ----- [0:0 1:0 32 0] [0 0] 0 0

T 1.000000000 _0_ tora enq 0->1

T 1.000000000 _0_ tora sendQRY 1

s 1.000000000 _0_ RTR --- 2 IMEP 38 [0 0 0 0] ----- [0:255 -1:255 1 0] [- - O
0x0012]

s 1.100000000 _1_ RTR --- 3 IMEP 24 [0 0 0 0] ----- [1:255 -1:255 1 0] [- - -
0x0004]

s 1.200000000 _2_ RTR --- 8 IMEP 32 [0 0 0 0] ----- [2:255 -1:255 1 0] [- H -
0x000c]

s 1.300000000 _3_ RTR --- 12 IMEP 36 [0 0 0 0] ----- [3:255 -1:255 1 0] [- H -
0x0010]

s 1.374232729 _1_ RTR --- 17 IMEP 36 [0 0 0 0] ----- [1:255 -1:255 1 0] [- H -
0x0010]

s 1.534436401 _2_ RTR --- 18 IMEP 36 [0 0 0 0] ----- [2:255 -1:255 1 0] [- H -
0x0010]

s 2.000000000 _0_ RTR --- 19 IMEP 24 [0 0 0 0] ----- [0:255 -1:255 1 0] [- - -
0x0004]

s 2.162089658 _3_ RTR --- 24 IMEP 40 [0 0 0 0] ----- [3:255 -1:255 1 0] [- H -
0x0014] T 2.162926489 _0_ QRY 1 for 3 (rtreq set)

T 2.162926489 _0_ tora sendQRY 1

s 2.163867877 _0_ RTR --- 27 IMEP 50 [0 0 0 0] ----- [0:255 -1:255 1 0] [- H O
0x001e]

s 2.167365588 _3_ RTR --- 30 IMEP 86 [0 0 0 0] ----- [3:255 -1:255 1 0] [A - O
0x0042]

r-s=delay