Efficient Routing Protocol In Mobile Ad-Hoc Network Based on Awareness of Link Quality

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Abstract- *Users can connect with one another via multi-hop relaying over a mobile ad-hoc network, sometimes referred to as a wireless ad-hoc network, without the aid of any fixed infrastructure. Because of resource constraints, node mobility, and a dynamic topology, this network type still experiences numerous communication issues. Because of the intricate structure and constant node mobility, connection failure frequently happens and results in packet loss during routing. As a result, this suggested solution, which is AODV based on Link Quality Awareness (ALQ-AODV) to handle the link failure issue, constitutes an effective routing algorithm. A routing protocols for MANET's goal is to facilitate data transmission from sender to all receivers while attempting to use available bandwidth efficiently in the event of frequent topology changes. However, providing energy-efficient routing is a tough and time-consuming process. Several routing systems for MANETs have been suggested in recent years. These protocols have distinguishing features and use different mechanisms.*

Keywords- MANET; AODV; ALQ-AODV; DSR;WSN;WRP.

I. INTRODUCTION

Information technology is rapidly changing from regular desktop computing, where isolated workstations communicate through shared servers in a fixed network, to an environment where many different platforms communicate over multiple network platforms. Mobile Ad-Hoc Networks (MANETs) provide communication between all nodes in an network topology without any centralized authority, instead all nodes can function as routers. This provides MANETs two of its most valued characteristics: adaptability and rapid deployment.

Mobile Ad-Hoc Networks (MANETs) consist of nodes that change position frequently. To accommodate the changing topology special routing algorithms are needed. Flat routing methods may be sufficient for small networks. In bigger networks, however, route can be either hierarchical or geographical. techniques are required. There is no single protocol that fully matches all networks. The protocols must be chosen according to network characteristics, such as density, size and the mobility of the nodes. Mobile ad-hoc One of the more popular methods is networking inventive and demanding aspects of wireless networking, and it promises to become more prevalent in our lives. Ad-hoc networks, which are made up of devices that self-organize in networks, provide a high degree of flexibility at a cheaper cost than traditional networking options. Ad-hoc wireless networks are made up a a wireless mobile node network that self-configures without relying on any infrastructure or backbone.

II. LITERATURE SURVEY

1) **Shwaita Kodesia and Asst. Prof. Prem Narayan Arya:" Energy Efficient in Routing Protocols in mobile Ad-hoc Networks", May 2012**

A mobile ad-hoc network is a wireless network that allows users to communicate with one another via multi hop relaying without the usage of any fixed infrastructure. However, resource constraints, node mobility, and changing topology continue to present communication challenges in this form of network. As a result of the intricate structure and continual node mobility, link failure is prevalent and results in packet loss during routing. To address the issue of link failure, this paper proposes an effective routing mechanism known as AODV based on Link Quality Awareness (ALQ-AODV). The proposed technique selects the ultimate path based on an intermediate node's degree, link quality, and residual energy. [1]

2) **k sankar: "energy efficient routing protocols for wireless ad-hoc networks – a survey",june 2012**

Reducing energy use has become a key concern in wireless communication, especially with the aim of increasing the lifespan of battery-powered devices. The effectiveness of the medium access control (MAC) scheme has an impact on the behaviour of the chosen routing strategy as well as the energyuse of the wireless network interface card (NIC). Here, in the framework of power awareness, we look into the shortcomings of MAC schemes created for ad-hoc wireless

networks. There is a significant quantity of energy lost when the topology changes as a result of uncontrolled elements such node mobility, weather, interference, and noise as well as on controllable aspects like transmission power and antenna orientation. Controlling frequent topology changes in ad-hoc wireless networks by minimising maximum transmission power while preserving network connection can significantly extend battery life and therefore network lifespan. Furthermore, we investigate the possible energy consumption hazards of non-power-based and power-based routing systems. We propose a comprehensive energy-based performance evaluation of energy-aware routing methods for wireless mobile ad-hoc networks. We also provide markers of statistical performance obtained from our simulations. [2]

3) **Sunil Taneja & Ashwani Kush:" Energy Efficient, Secure and Stable Routing Protocol for MANET", May 2012**

An effective routing strategy should prevent the supplied packets from being sent within road segments with extremely low density or severe data congestion in vehicular networks given the high mobility and uneven distribution of cars. In order to achieve this, we provide a Traffic aware and Link Quality sensitive Routing Protocol (TLRP) for urban Internet of Vehicles in this study (IoV). In order to take into consideration, the effect of the quantity, caliber, and relative placements of communication connections affecting network performance along a route path, we first create a unique routing measure, called Link Transmission Quality (LTQ). Next, a road weight assessment system is proposed to evaluate each route section by utilising real-time traffic and connection information measured by the LTQ ability to accommodate the changing environment features of IoV. [3]

III. SYSTEM IMPLEMENTATION

1. NS-2 LANGUAGE:

NS-2 is developed mostly in C++, with an OTcl (Object Tool Command Language) interpreter serving as a front-end. It 19 provides a compiled hierarchical class hierarchy in C++ and a comparable one within the OTcl interpreter, called compiled hierarchy and a similar one within the OTcl interpreter, called interpreter hierarchy. Some objects are completely implemented in C++, some others in OTcl and some are implemented in both.

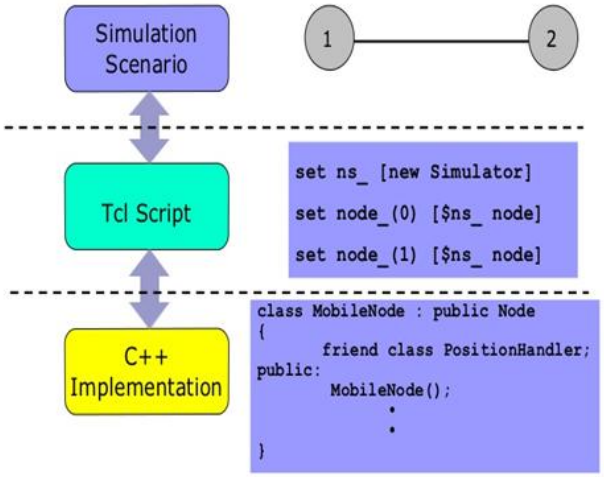


Fig 1 NS-2 language

2. ARCHITECTURE OF NS-2:

NS-2 (Network Simulator-2) is an open-source discrete event network simulator that is widely used to simulate and analyze the performance of various network protocols and applications. The architecture of NS-2 can be divided into four main components:

1.OTcl*:* The Object Tool Command Language (OTcl) is a Tcl-based object-oriented language used to create and configure network simulations in NS-2. It is used to define the network topology, create nodes, and set parameters for various network protocols and applications.

2.C++: The simulation engine of NS-2 is implemented in C++ programming language. It provides the core functionality of the simulator, including the event scheduler, packet processing, and network routing.

3.TCLCL*:* TCLCL is a C++ library used to integrate OTcl with the C++ simulation engine of NS-2. It provides a mechanism for passing parameters and objects between the OTcl and C++ components of the simulator.

4.Trace and Analysis: NS-2 provides built-in support for generating trace files that record the simulation events, such as packet transmissions, receptions, and drops. The trace files can be used for further analysis of the simulation results using various tools, such as AWK, Gnuplot, and Tracegraph.

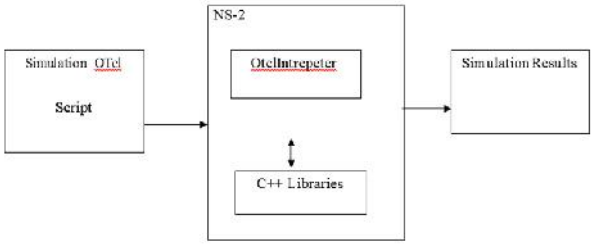


Fig 2 Architecture of NS-2

3. NS PROGRAMMING STRUCTURE:

- Create the event scheduler.
- Turn on tracing.
- Create network topology.
- Create transport connections.
- Generate traffic.
- Insert errors.

Event Scheduler

In this Event scheduler while we are processing many data's at a time it will process one by one (i.e.) FIFO concept, so there is no congestion while transferring the packets.

Packets

It is the collection of data, whether header is called or not all header files where present in the stack registers.

CMN header
IP header
TCP header
RTP header
Trace header

Turn On Tracing

Trace packets on individual link Trace file format. A trace in this format always begins with one of the above header. This character is succeeded by a white space separated list of values specific for the used protocol and the type of the message.

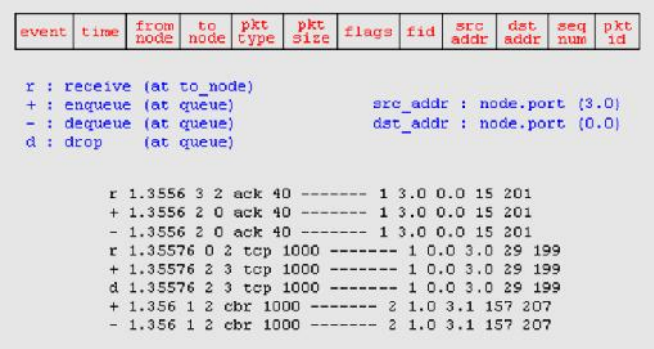


Fig Trace File

Create network topology (physical layer)

In the seven-layer OSI model of computer networking, the Physical Layer is the first and lowest layer. This layer's implementation is frequently referred to as PHY. The Physical Layer consists of a network's core hardware transmission mechanisms. It is the foundational layer that underpins the data structures that are logical of a network's higher level functionalities. This is possibly the most difficult the OSI architecture's layer due to the abundance of accessible hardware technologies with significantly varied features. The Physical Layer specifies how to send raw bits rather than logical data packets transmitted across a physical connection between networking nodes. The bit stream can be broken down into code words or symbols before being translated to a physical that can be sent across Hardware.

Transport connection (transport layer)

Transport layers are contained in both the TCP/IP which is the foundation of the internet and the OSI model of general networking. The definitions of Transport Layer are slightly different in these two models. This article primarily refers to the TCP/IP model, in which TCP is largely for a convenient application programming interface to internet hosts, as opposed to the OSI model of definition interface. The most well-known transport protocol is the (TCP). It lent its name to the title of the entire internet protocol suite TCP/IP. It is used for connection-oriented transmissions, whereas the connectionless user datagram suite (UDP) is used for simpler messaging transmissions. Because of its stateful design, which incorporates TCP is the most advanced protocol for providing dependable transmission and data stream services.

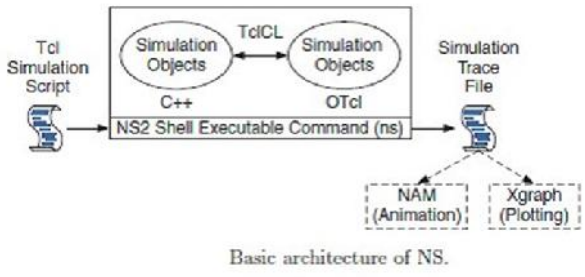
Generate traffic (application layer)

In TCP/IP, the Application Layer contains all protocols and methods that fall into the realm of process-to-process communications via an Internet Protocol (IP) network

using the Transport layer protocols to establish underlying host-to-host connections. The OSI model's Application Layer concept is more limited in scope, explicitly distinguishing additional functionality above.

4. TCL LANGUAGE:

TCL (Tool Command Language) is a scripting language created by “John Ouster out”. Originally "born out of frustration", TCL acquired acceptance on its own, according to the author the programmers created their own languages designed to be embedded inside programmes. It is often used for quick prototyping, automated applications, graphical user interfaces, and testing. TCL is utilised on embedded systems platforms in its complete form as well as various smaller-footprint variants.



Basic architecture of NS.

Fig 4 Image of Heartbeat Sensor

5. Feature of TCL language:

- A Everything can be changed and overridden dynamically.
- All data types, including source code, may be treated as strings.
- An interface to sockets and files that is event-driven. Additionally, time-based and user-defined events are allowed.
- Whenever a command defined by TCL is used incorrectly, error messages are generated.
- Extensibility, via C, C++, Java, and TCL.
- Interpreted language using byte code
- Full Unicode support, first released 1999
- Cross-platform: Windows API, Unix, Linux, Macintosh, etc.
- Close integration with windowing (GUI) interface
- Multiple distribution mechanisms exist:
- Full development version (e.g., Active State TCL)

NS-2 consists mainly of two languages. C++and OTCL. Each of these two languages has its own strengths and weaknesses. NS-2 seamlessly blends these two languages to maximise their strengths.

6. MANET:

MANET is an abbreviation for Mobile Ad-hoc Network, which is also known as a wireless Ad-hoc network or Ad-hoc wireless network and typically features a routable networking environment on top of a Link Layer ad-hoc network. They consist of a number of wirelessly linked mobile nodes that operate independently in a self-configuring, self-healing network without any permanent infrastructure. The MANET nodes are permitted to move at random since the network design is constantly changing. Each node in the network serves as a router, sending traffic to other nodes. Nodes in a Mobile Ad-hoc Network (MANET) do not know the topology of their network; instead, they must find it on their own since the topology in an ad-hoc network is dynamic. The essential requirements are that when a new node joins an ad-hoc network, it must declare its arrival and existence, as well as listen for similar announcement broadcasts from existing mobile nodes.

7. MANET Types:

1)Pro-Active Routing Protocol

These are also known as table-driven routing protocols. Each mobile node maintains a separate routing table which contains the information of the routes to all the possible destination mobile nodes. These routing tables are updated frequently as and when the network topology changes since the mobile ad hoc network's topology is dynamic. Its weakness is that it doesn't function effectively for big networks since the routing table entries get too large as a result of the necessity to keep the route information to every potential node.

2)Re-Active Routing Protocol:

Also known as on-demand routing protocols, they are. In this type of routing, the route is only found when it is necessary. Route request packets are flooded around the mobile network as part of the route discovery process. Route discovery and route maintenance are the two primary steps.

Dynamic Source Routing protocol (DSR):

It is a reactive/on-demand routing mechanism. In this type of routing, the route is only found when it is necessary. Route request packets are flooded around the mobile network as part of the route discovery process.

DSR (Dynamic Source Routing) is developing the notion of source routing Moreover, an on-demand routing protocol. Each host is required to have route caches that limit the source routes that are recognised to it. The host is continually updating the route caches as it discovers new routes.

Ad-Hoc On Demand Vector Routing protocol (AODV):

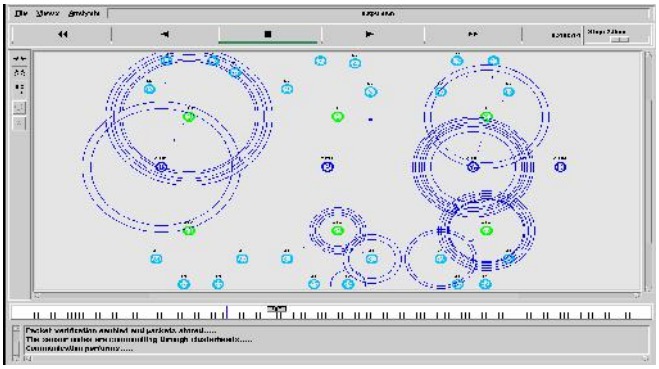
It is a reactive/on-demand routing mechanism. It is a dynamic source routing protocol (DSR) enhancement that aids in removing the dynamic source routing protocol's drawbacks. Following route discovery, the source mobile node includes the whole path in its header when sending a data packet to the destination mobile node. The length of the complete path and the size of the data packet's header therefore increase as the network size increases, slowing down the entire network. The route discovery procedure in AODV (Ad-hoc On demand Distant Vector Routing) is that it initiates route discovery and the routing information in the table is initially empty. First of all a host or a node send broadcast RREQ (route request) or acknowledgement (Ack) packet to all its neighbor nodes. The RREQ packet is a collection of broadcast ID, source address, source sequence no. ,destination address, destination sequence no. and total no. of hop count.

3) Hybrid Routing protocol:

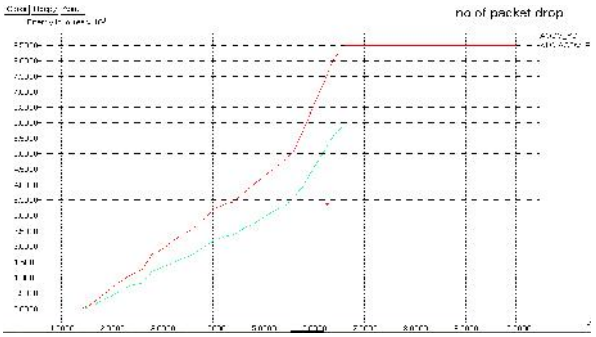
The advantages of proactive and reactive routing strategies are essentially combined. The adaptive nature of these protocols allows them to change according to the zone and position of the source and destination mobile nodes. A typical hybrid routing system is the Zone Routing System (ZRP).

IV. RESULTS AND DISCUSSION

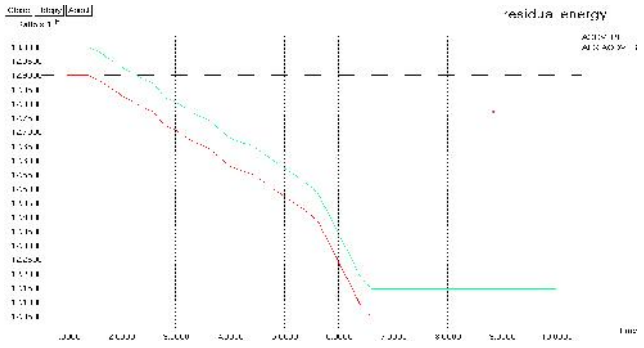
This project improves the performance and reliability of communication between mobile nodes and, also improves packet delivery, Reduced end-to-end delay, Enhanced network scalability, Increased network lifetime.



The above simulation represents transfer of data b/w Nodes using NS-2 Simulator



The above graph shows that number of packets drop between nodes.



The above graph shows that Energy level of node in the network.

V. IMPLEMENTATION OF PROPOSED MODEL

In Implementing efficient routing in mobile ad-hoc networks based on the link quality awareness involves using link quality metrics to select the most reliable path for packet transmission. This can be achieved by measuring the link quality between adjacent nodes and using protocols such as LQSR or AODV-Q to exchange link quality information among the nodes. Once the link quality information is available, the routing protocol can use it choose the best path for packet transmission, considering both the link quality and the separation of nodes. The protocol should also have mechanisms to detect and react to link failures, as link quality

can change dynamically due to node mobility and environmental factors. To assess the effectiveness of the relationship quality-aware routing protocol, various performance metrics such as packet delivery ratio, end-to-end delay, and energy consumption can be measured and compared with those of traditional routing protocols.

VI. CONCLUSIONS

This paper presented an enhanced version of AODV by considering link quality when doing a route finding task in order to enhance overall network performance. The proposed approach incorporated signal strength, energy and node degree parameters along having a hop count and sequence number during route finding process. Additionally, each node continuously updates its neighbourhood information based on received packet signal strength. Performance of the scheme is Implemented outcomes across the network simulator proved that the proposed approach outperforms AODV.

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