A Survey of Mobile Adhoc Network (MANET), its Applications, Characteristics and Challenges.

Syed Ahteshamuddin Quadri, Research Student, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, India, syedahtesham1432@gmail.com
Pratibha P. Dapke, Research Student, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, India, pratibhadapke189@gmail.com
Samadhan M. Nagare, Research Student, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, India, samadhannagre340@gmail.com
Sagar B. Bandal, Research Student, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, India, sagarbandal2901@gmail.com
Manasi Ram Baheti, Assistant Professor, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, India, **mrb.csit@bamu.ac.in**

Abstract: A mobile Adhoc Network (MANET) or a mesh network is a wireless network where wireless devices like laptops, mobile phones, radios, or sensors etc., are connected to each other without having any centralized control or server are called as infrastructure-less network. They can be installed (Set-up) anytime, anywhere, wherever emergency communication or collaborativework is needed. They are easy to install, self-configured network. It can be connected to internet if needed. Routing, Security, and Energy consumption are the main issues in MANET network. Inthis paper a review of Adhoc network, some common applications and main challenges are presented.

Keywords — MANET, Routing, Security, Energy Consumption.

I. INTRODUCTION

Network Infrastructure-based and infrastructure-less are the two categories into which wireless networks fall. An Infrastructure-based is a network in which the access points, routers, switches or network layered switches are used in wireless local area network (WANs) that provides internet services and helps to communicate between mobile devices. They can be established easily where infrastructure devices are less-expensive or acceptable in cost and efficient when needed in a proper place [1]. Fig.1 shows some typical of this network.

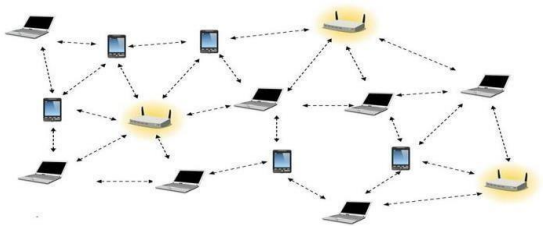

Fig.1: Infrastructure-based wireless network.

While an Infrastructureless network or a MANET network is a collection of portable devices, where each and every device have same permissions and authority to freely connect and share theresources in the network and does not require any use of access points, routers, or switches to connect [2]. To put it another way, the network is known as Ad-hoc because it can be installed or set-up anytime, anywhere in any emergency situations like earthquakes, natural disasters, in military services for sending important information, meeting in offices or outside, for conferences, seminars, workshops, events in industries etc. wherever required. There are different kinds of applications in Ad-hoc network depends on its uses. Some common ad hoc networks are for vehicles, aircraft, and mobile devices (VANET, FANET, and MANET)

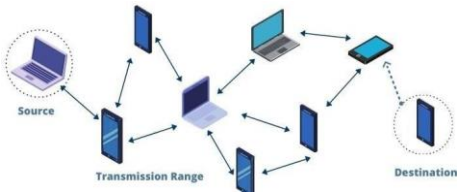

Fig.2: Infrastructure-less wireless network [14]

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This paper is focused on MANET due to its multiple uses and uniqueness from infrastructure- based network and other applications. We will see the common and main issue in MANET that is necessary to be implemented and improved such as dynamic topology, energy consumption, security and routing etc. Routing is one of the main issue in MANET, as the use of Ad-hoc networks have increased. The issues occurs in it needs to be solved. Due to its strong mobility, lack of physical firewalls, limited resources, human interruption. MANET issues and challenges are different from traditional networks.

II. LITERATURE SURVEY

This literature survey shows the overview, characteristics, applications, challenges/issues Researchers have been interested in Ad-hoc networks, and numerous routing protocols specifically for these networks that have been proposed.

'Nancy A. AlShaer' et.al. Examines the development, uses, benefits, and technical issues of ad hoc networks. As a very unique and significant issue in Ad Hoc networks, routing. The introduction includes a thorough examination and comparison of ad hoc routing protocols. This survey is concluded by representing problems requiring further research in the future [1].

'Abdalftah Kaid Said Ali' et.al. Gives a thorough introduction to ad hoc mobile networks. This essay also covers the various characteristics, challenges, and uses of MANETS. In this paper, a routing protocol for MANET is also presented. [2].

'Sahabdeen Aysha Asra' data from previously published studies were obtained from publishers using a systematic review strategy, also underwent analysis and evaluation. The study discovers the fact that there are many MANET technology applications across numerous industries. Two of the study's drawbacks were the size of the dataset and the insufficiency of quality attributes. [3].

'Umesh Kumar Singh' et.al explains the core issues with ad hoc networks by outlining the background research in the field, including the idea, characteristics, state and MANET's vulnerabilities. This paper examines routing protocols and provides an overview of them. Include the numerous challenging issues, upcoming MANET trends, and developing applications. [4].

'Ashraf Mohamed Abdelhamid' et.al provides some challenges which are common and explained the MANET routing protocols, classified them and evaluated to see the best performance protocols[5].

'Sameer Alani' et.al this article presents a review of research in regards to mobile adhoc network and its hybrid, on demand, and table-driven protocols. This article also discusses the difficulties with MANET and its uses. [6].

'Mueen Uddin' et.al the study suggested in this paper using the Fitness Function method, AOMDV routing protocol can reduce its energy consumption, highlighting the very specific issue of energy consumption in MANET. Fitness Function On Demand Multipath Distance Vector (FF-AOMDV) is the name of the proposed protocol, and have examined issues with implementations and given a way to solutions [7].

'Sathish Kumar G' et.al. Presented the fundamental introduction about mobile adhoc network, characteristics and challenges of mobile ad-hoc network, and has shown that many improvements can be done on mobile adhoc network. [May 2022] [8].

'Aditya gupta' et.al. Discusses various attacks, gives information about possible applications for ad hoc networks, and highlights the technical difficulties that network developers and protocol designers [2018] [9].

'Shakti Raj Chopra' [2019] has described various issues with energy consumption and the routing techniques which can be useful to overcome problem lying with energy consumption in MANET [Mar 2019] [10].

'Jyoti upadhyaya' et.al. Presented a survey on routing protocols with a low energy consumption. These methodologies and algorithms change the routing protocol in order to save energy and prolong network life. These suggested methodologies reduce energy usage as well by choosing anenergy-efficient route. [May 2016] [11].

'Iram Nausheen Ahmed' et.al have done a comparison analysis of varied Routing protocol issues with a discussion of routing methods, route selection, routing tables, and route maintenance, and protocol operation Power and Weakness and security issues in them [Jan 2021][12].

'S C Dutta' et.al are analyzing implementation problems and providing a path to solutions. Through proposed work we have eliminated the weakness of Ad hoc wireless network. Also through proposed work there is a highest level of secure communication [2016] [13].

III. APPLICATIONS OF MANET

1) Gaming Services. 2) Emergency Services. 3) Bluetooth Communication. 4) Commercial use. 5) Military Services. 6) Industrial Sector. 7) Education Sector. 8) Sensor Networks. 9) Backup Services [3].

IV. MAIN CHALLENGES IN ADHOC NETWORK

Scalability: In MANET the nodes can freely move in and out of the network without more discontinuity. This brings up the issue of having enough credentials to offer specific services to alot of nodes. [4].

Quality of Services (QoS): In MANET there is an issue of quality of service, due to its strong mobility of the users/nodes and difficult in providing a steadfast services.

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A flexible QoS has to be implemented to support multimedia services, because it requires a certain amount of quality [5].

Dynamic topology: In mobile Ad-hoc network, the structure of the network might alter variably at any time. The network's nodes can move at will or shift positions with varying speeds. Therefore in MANET the nodes dynamically establishes routing in themselves. As they move nearby associating with their own network [6].

Energy Consumption: Unlike traditional network, MANET nodes depend on battery and have limited power supply. These networks' performance is impacted by this limitation, which is also a weakness that that might be manipulated by attackers. As the mobility increases, it consumes more power. This is because the work nodes provide to the services provided to the nodes. So it directly affects from the mobility on the energy consumption for providing more services to other nodes, Study on energy has found that improving and implementing routing protocols

will solve some energy consumption issues [7].

Security: Due to the lack of resources, infrastructure, and hardware firewalls, security is the most crucial issue for MANETs, Because they depend on nearby nodes, which could be hidden by malicious users, MANET nodes are more vulnerable to malicious activity than infrastructure., the signals travel through air, and the radio waves transmits the data/information to the destination and to the harmful user, and wireless nodes can become weaker anytime, so attack can happen on the network easily [8].

Routing: In networks, choosing a route for traffic within, between, or across them is called as routing. Routing in Ad-hoc wireless significant due to highly fluctuating environment. An Adhoc network is the group of mobile nodes that automatically forms terminable network without any use of base station. In a normal ad-hoc network, mobile nodes gather for some time to share information. While sharing the information within them, the nodes moves across each other, so the network must be ready to transform continuously to establish routes between themselves without any external support [5].

V. Routing Classification in MANET

ROUTING PROTOCOL CAN BE CLASSIFIED AS:

5.1 Pro-active protocol – also known as table-driven protocol.

5.2 Re-active protocol – also known as On-demand Routing Protocol.

5.3 Hybrid protocol – It combines both of their benefits re-active and pro-active routing protocol.

Combination feature of proactive and reactive routing protocol.

Proactive - It is suitable for high traffic load.
- It have low latency.
- Have low mobility.
- Routing overhead is high.

Reactive - Suitable for low traffic load.
- Have high latency.
- Have moderate mobility.
- Routing overhead is low.

Hybrid - Suitable for both traffic load.
- Inside zone low & outside high latency.
- Combination of both.
- Medium routing overhead.

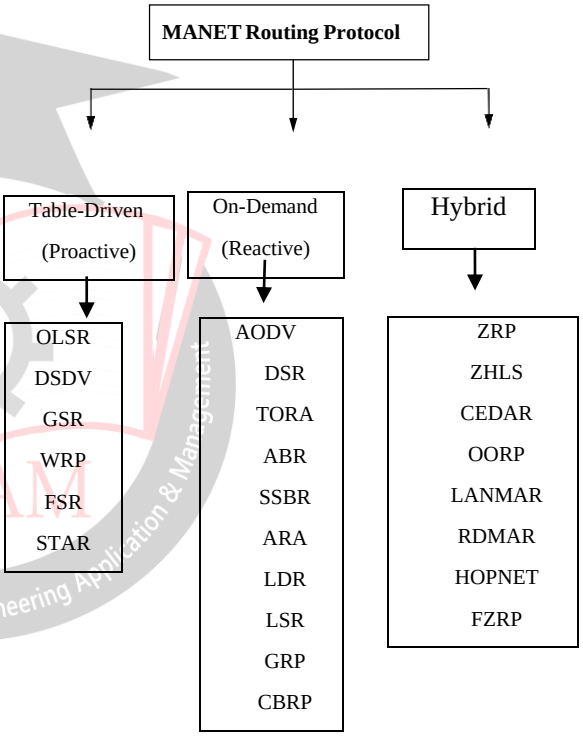

Fig 3: Types of routing protocols [15] [16].

VI. Conclusion

The overview of MANET is covered in this paper. Additionally, we have focused on the key traits and difficulties, and the type of MANETS and various MANET applications were provided in this paper. In the MANET is a wireless network where data is sent from source to destination without the use of wires or other physical devices. This means that while the source and final location are acknowledged, the route of communication is not predetermined and a different route is chosen each time. Any MANET device can move around the network at will, only the aim is that each device must update and maintain

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information required to properly route traffic, improvement in performance like speed, energy consumption and security is required.

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