MANETS for 5G Communication Networking

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***Abstract*:- Mobile Ad-hoc Networks (MANETs) have been studied for many years and they are the networks formed solely from mobile User Equipment (EU) that are cooperating to exchange data in an Infrastructure-less environment MANET can be used for many applications include the tactical edge operations, disastrous areas, and in the congested environments like campuses and stadiums where many users are willing to exchange information directly with each other or using others' devices are routers. Fifth generation (5G) of wireless communications is intended to provide much higher data rates and much lower end-to-end over-the-air (OTA) latency.**

Keywords: MANETS, 5G, VANET, Ahoc Networks

I. INTRODUCTION:

Some prospective applications for the 5G (besides the traditional cellular communications) are the wireless virtual reality (VR), Augmented Reality (AR), Device to Device (D2D) communications in the network edges, and the autonomous vehicles in the Vehicular Ad-hoc Networks (VANET) which can be part of an infrastructural or infrastructure-less networks. Millimeter wave frequencies (mm Wave) are expected to have a major role in the 5G standards. They have their advantages of huge available bandwidth (several GHz) and reduced delay, while they also have some limitations that are related to the limited transmission range, and the need for transmitting narrow beams to cover larger distances. This work is intended to test the performance of a mobile ad-hoc network that consists of only mm Wave user equipment (UE) without eNodeB (or gNodeB as suggested recently by the 3GPP. two mobile nodes in the network is of a significant importance for the feasibility and stability of the mm Wave MANET applications [1]. This type of networks with dynamic topology (because of mobility and lack of Infrastructure) is unsuitable for traditional end-to-end routing algorithms, and that is why many MANET routing protocols have been proposed to control forwarding data from any node to any other node in the multi-hop MANET network.

II. MOBILE ADHOC NETWORK

Traditional routing protocols for ad-hoc networks are usually dependent on the broadcast nature of wireless signals in the sub-6 GHz bandwidth the mm Wave's directional antennas and beam forming; this argument about wireless signals is no longer true [2]. To compensate for such a shortage, mm Wave devices use many approaches to scan the entire environment around them like beam sweeping, random beam forming (RBF), et al. and send narrow directional beams towards the intended destination nodes to mitigate the large propagation path loss.

A MANET consists of a number of mobile devices that come together to form a network as needed, without any support from any existing internet infrastructure or any other kind of fixed stations [3]. A MANET can be defined as an autonomous system of nodes or MSs (also serving as routers) connected by wireless links, the union of which forms a communication network modeled in the form of an arbitrary communication graph.

This is in contrast to the well-known single hop cellular network model that supports the needs of wireless communication between two mobile nodes relies on the wired backbone and fixed base stations. In a MANET, no such infrastructure exists and network topology may be changed dynamically in an unpredictable manner since nodes are free to move and each node has limiting transmitting power, restricting access to the node only in the neighboring range [4]. MANETs are basically peer-to-peer, multi-hop wireless networks in which information packets are transmitted in a store and forward manner from a source to an arbitrary destination, via intermediate nodes as given in the Fig.1

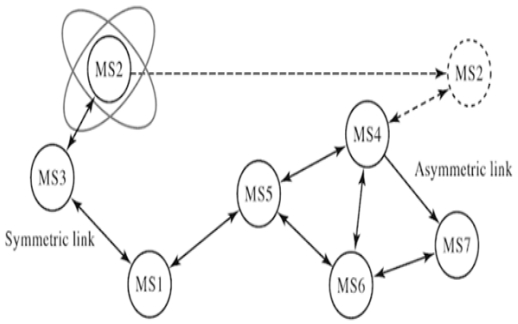

Fig.1 Structure of MANETS used for 5G communication Networks

As nodes move, the connectivity may change based on relative locations of other nodes. The resulting change in the network topology known at the local level must be passed on to other nodes so that old topology information can be updated. For example, as MS2 in the figure changes its point of attachment from MS3 to MS4, other nodes that are part of the network should use this new route to forward packets to MS2 [5]. In the figure, we assume that it is not possible to have all nodes within each other's radio range. In case all nodes are closed by within each other's radio range, there are no routing issues to be addressed.

In figures raise another issue, that of symmetric and asymmetric (bidirectional) and asymmetric (unidirectional) links. Consider symmetric links with associative radio range; for example, if MS1 is within radio range of MS3, then MS3 is also within radio range of MS1. The communication links are symmetric [6]. This assumption is

not always valid because of differences in transmitting power levels and the terrain.

Routing in asymmetric networks is relatively hard task. In certain cases, it is possible to find routes that exclude asymmetric links, since it is cumbersome to find the return path. The issue of efficient is one of the several challenges encountered in a MANET. The other issue is varying the mobility patterns of different nodes. Some other nodes are highly mobile, while others are primarily stationary [7]. It is difficult to predict a node's movement and direction of movement and numerous studies have been performed to evaluate their performance using different simulators.

III. CHARACTERISTICS OF MANET

Some characteristics of adhoc network are as follows:

A. Dynamic topologies:

Nodes are free to move arbitrarily; thus the network topology may be changed randomly and unpredictably and primarily consists of bidirectional links. In some cases where the transmission power of two nodes is different, a unidirectional link may exist.

B. Bandwidth-constrained and variable capacity links:

Wireless links continue to have significantly lower capacity than infrastructure networks. Energy-constrained operation: some or all of the MSs in a MANET may rely on batteries or other exhaustible means for their energy [8]. For these nodes or devices, the most important system design optimization criteria may be energy conservation.

C. Limited physical security:

MANETs are generally more prone to physical security threats than wire line networks. The increased possibility of eavesdropping, spoofing, and denial of services (DoS) attacks should be considered carefully. To reduce security threats, many existing link security techniques are often applied within wireless networks.

IV. APPLICATIONS OF MANET

Some specific applications of ad hoc networks include industrial and commercial applications involving cooperative mobile data exchange. There are many existing and future military networking requirements for robust, IP-compliant data services within mobile wireless communication networks, with many of these networks consist of highly dynamic autonomous topology segments. Advanced features of Mobile ad hoc networks, including data rates compatible with multimedia applications global roaming capability, and coordination with other network structures are enabling new applications.

Many defense applications require on the fly communications set-up, and ad hoc/sensor networks are excellent candidates for use in battlefield management. Crisis management applications: These arise, for example, as a result of natural disasters in which the entire communication infrastructure is in disarray. Restoring communications quickly is essential.

The paramedic assisting the victim of a traffic accident in a remote location must access medical records (e.g. X-rays) and may need video conference assistance from a surgeon for an emergency intervention. In fact, the paramedic may need to instantaneously relay back to the hospital the victim's X-rays and other diagnostic tests from the site of the accident. Tele-geo-processing application: The combination of GPS, GIS (Geographical Information Systems), and high-capacity wireless mobile systems enables a new type of application referred to as tele- geo processing.

A remote database contains the graphical representation of building, streets, and physical characteristics of a large metropolis. They may also "virtually" see the internal layout of buildings, including an emergency rescue plan, or find possible points of interest.

Educational opportunities available on the internet or remote areas because of the economic infeasibility of providing expensive last-mile wire line internet access in these areas to all subscribers. This a growing and very useful application of adhoc network in providing emergency services and other information [9]. This is equally effective in both urban and rural setup. The basic and exchange necessary data that is beneficial in a given situation.

In the next generation of computing, Mobile ad-hoc network (MANET) will play a very important role in the Internet of Things (IoT). The MANET is a kind of wireless networks that are self-organizing and auto connected in a decentralized system. Every device in MANET can be moved freely from one location to another in any direction. They can create a network with their neighbor's smart devices and forward data to another device. The IoT Cloud MANET framework of smart devices is composed of IoT, cloud computing, and MANET.

This framework can access and deliver cloud services to the MANET users through their smart devices in the IoT framework where all computations, data handling, and resource management are performed. The smart devices can move from one location to another within the range of the MANET network [10]. Various MANETs can connect to the same cloud, they can use cloud service in a real time. For connecting the smart device of MANET to cloud needs integration with mobile apps. My main contribution in this research links a new methodology for providing secure communication on the internet of smart devices using MANET Concept in 5G. The research methodology uses the correct and efficient simulation of the desired study and can be implemented in a framework of the Internet of Things in 5G.

V. CONCLUSION

In this paper, we have discussed the feasibility of some well known routing protocols for mobile ad-hoc networks with mm Wave frequency bands and showed how utilizing mm Wave frequencies can increase the network efficiency and delivery ratio for 5G communication networks. Several parameters of the network have been adjusted and in each case the MANET with mm Wave was shown to be better than the Wi-Fi counterpart. A MANET in 5G will be a radio system aimed at extremely high data rate, low latency, lower energy and cost. To support this, routing protocols in the MANET must be flexible, energy-efficient and highly performance achievable.

VI. REFERENCES

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