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How to Combat COVID-19 with Wireless Networks

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ABSTRACT: The beautiful earth has become into a grave. There have been almost 7.5 million fatalities to date, with the death toll increasing by 5000 each day. The regional, social, and educational pillars have fallen. In the absence of any treatments or vaccines, social seclusion and self-isolation are the only ways to halt the spread of this COVID-19 illness. Those who spread the Wuhan viruses aren't even aware that they are sick because it spreads silently through silent carriers. The world has moved away from stationary computers and towards mobile computing thanks to wireless networks. Wireless network devices have complete mobility. No direct physical contact is required. The COVID-19 pandemic has been a major issue since the year ended. It has restricted my ability to interact with people physically. The COVID-19 outbreak has had an impact on people from all areas of life. The COVID-19 epidemic, on the other hand, is changing practically every area of our life. The other barriers are explained in this study report. The COVID-19 epidemic has prompted discussion of several wireless network applications.

KEYWORDS: Wireless Network, WLAN, Wimax, Manet, Vanet, Covid-19.

I. INTRODUCTION

One of the greatest achievements in human history can be attributed to the invention of the computer as a calculator and subsequent developments in computers for communication networks. This accomplishment has completely changed how people throughout the world calculate, analyse data, communicate, and process information. The network capabilities of computers have all been increased for the benefit of society, industry, and individuals. The network allowed for the efficient control of equipment, access to, processing of, and transport of data. While a wireless network sends data using electromagnetic waves, a wired network, usually referred to as a fixed link, employs cables. A fixed link made available by fibre optics and Ethernet serves as the foundation for the entire communication network. The need for a network must be established quickly because the demands are growing daily. Because of the distinctive characteristics of each network, their popularity has increased. [1].

The significance of the fixed connection network has decreased recently. Offices and educational institutions are the main settings for this. Currently, the wired network is switching over to the wireless network. In recent years, smart phones have revolutionised communication and its uses. [2]. Until and unless we have a cure for COVID-19, researchers from all over the world and in a variety of professions, including biomedicine, virology, and artificial intelligence, are doing everything they can to stop the spread of the Wuhan virus. The use of digital technologies and virtual communications has overtaken traditional communications in the business world. use of artificial intelligence to understand trends in COVID-19 growth or control, robots to aid medical professionals, and drones to monitor population density in various areas. This study covers the new challenges and uses of wireless networks in several industries following COVID-19. Section 2 discusses various wireless networks, including WLAN, UWBC, MANET, and VANET. Section 3 discusses recent issues. Following COVID-19, Section 4 describes wireless network applications. The fifth portion contains the conclusion.

II. WIRELESS LOCAL AREA NETWORKS

One of the most admirable inventions in the history of communications. At a time when everyone was experiencing issues with conventional networks, the concept of a wireless network completely transformed everything. Today, the wireless network is a part of all facets of contemporary life. Smart phones, the Internet, digital devices, businesses, payments, and other technology are all used in our daily life. A wireless network is currently taking over the world. The wireless network began as a 1G network and has since evolved to 2G, 3G, 4G, and is gradually transitioning to 5G and

6G. From 1G to the present, the telecommunications sector has seen substantial improvements in performance and service quality. An increased than in prior years, thanks to the reduction in wireless network fees data usage has increased dramatically throughout the COVID-19 era. [2].

2.1 URBAN WIRELESS BROADBAND CONNECTIVITY

Beyond enabling or enhancing connectivity in remote locations, demand for broadband internet is soaring in urban and suburban areas. Broadband internet is typically provided using buried underground fibre optic cables; however, in crowded urban areas, this may not be practical. As a result, Facebook unveiled Terra graph, an integrated backhaul access technology for urban settings, by adapting the concept of fibre backbone routing to Terra graph (Terra graph, 2020). Terra graph, which Facebook says has an average internet speed of 500 Mbps, is currently being tested globally. Since Terra graph operates in the 60-GHz range, one of its main drawbacks is the strict line-of-sight requirements it has. [3].

Important elements of the wireless local area network (WLAN) design are the station and access point (AP). A station may be a laptop, desktop, or cell phone. The access point (AP) is essential in a WLAN. The station's network interface card (NIC) connects it to the wireless media. On the other hand, an access point serves as a bridge between a wired network, such as an IEEE 802.3 LAN, and a wireless medium. The AP connects IEEE 802.11 devices to a wired network, such as a LAN, acting as their base station [4]. There are two types of WLAN, called infrastructure WLAN and infrastructure less WLAN or ad-hoc network, as shown in figs. 1 and 2. WLAN architecture

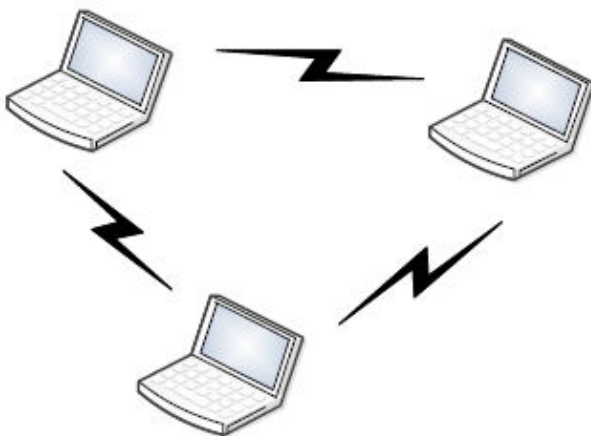


Fig. 1 Infrastructure less WLAN(ad-hoc network) [4]

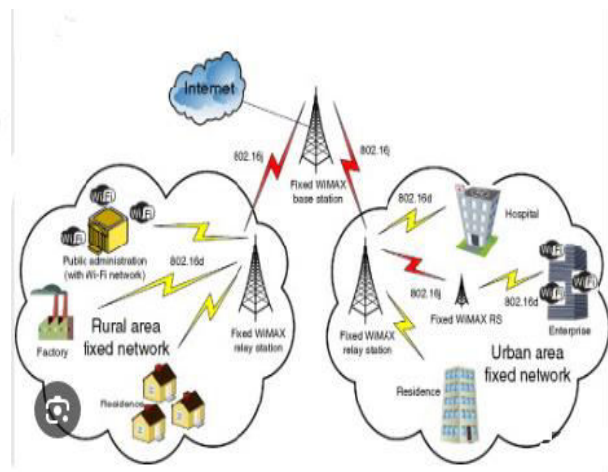


Fig. 2 Infrastructure UWBC [4]

Wired networks are not at all cost-effective in isolated, rural places. An alternative remedy for the issue of information availability in rural areas is wireless networking. By overcoming issues today related to distance and location, they have undoubtedly revolutionised how individuals communicate and share information among themselves.

2.2 WIRELESS FIDELITY

Wi-Fi is a member of the IEEE 802.11 family of standards, which primarily consists of a local area networking (LAN) technology that resembles a highly localised version of MMDS but does not require line of sight. IEEE 802.11 is an international standard outlining the properties of a Wireless Local Area Network. [5]. Today, Wi-Fi has replaced cable as the predominant technology for broadband connectivity in homes, offices, and public hotspots. [6]. Up to 54 Mbps of high-speed internet connectivity is made possible by Wi-Fi. Wi-Fi devices use IEEE 802.11 standard-based technology to transport data with the assistance of a wireless access point. [7].

Wi-Fi uses a low frequency band, requires less power from its transmitters, and still has a long range. The throughput of the WiMAX network falls between that of Wi-Fi and that of a 4G network. WiMAX enables customers to connect to the internet when DSL cable is unable to do so. Along with offering GPS and other applications, mobile WIMAX can be placed in cars [5].

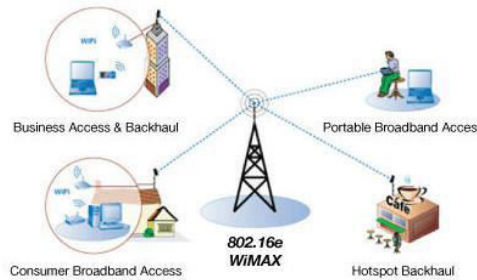


Fig.3 WiMAX (Worldwide Interoperability for Microwave Access) Network [5]

2.3 MANET

There is little infrastructure. WLAN is also known as the ad hoc network. It is a sort of wireless network made up of a number of autonomous mobile nodes that are linked to one another without the use of any infrastructure or common communication services. Decentralised networks called MANETs use mobile nodes to act as both hosts and routers. [6]. A network of wirelessly capable portable devices called a MANET is specially set up and can dynamically connect to another node at any time and in any location. Mobile hosts can roam about at whim since they are connected to one another via wireless networks and function as routing devices in an ad hoc network. As a result, the network architecture is continually changing, creating a mobile station network that is independent and self-contained. Packets can be routed from any source node in the network to any destination node by using intervening multiple nodes because each node in the MANET has a limited transmission range. [7].

Mobile nodes in the network may send the packets to other nodes located within their coverage area. The moving nodes within its coverage range pass the packets to the following hop till they reach the destination node if a moving node intends to send a packet to another moving node outside of its coverage area. MANETs are also known as mobile multi hop wireless networks. MANETs have the benefit of being able to be enlarged by connecting to a lot of nodes or set up between a few nodes. [6].

Three wireless mobile nodes, labelled A, B, and C in Figure 4, make up a mobile ad hoc network. The transmission range of a mobile node is shown as a dotted circle. Mobile Node A's and Mobile Node C's transmission ranges are incompatible. Node A uses node B, which is within the transmission range of both nodes A and C, to transfer packets to node C. It transmits the packets to node C, enabling A and C to establish communication. thanks to node C's participation. The main distinction between fixed networks and MANETs is that MANET nodes are mobile [6].

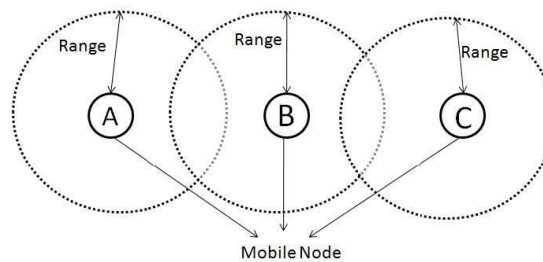


Fig. 4 Mobile Adhoc Network [6]

2.4 VANET

The VANET (MANET) is a component of the Mobile Ad hoc Network. When cars are used in place of mobile nodes, the Vehicular Ad hoc Network (VANET) is created. The high mobility of VANET is one of its most crucial features. It moves at rates between 10 and 100 km per hour. The outcome is exceedingly inconsistent, fluctuating, and unpredictable intermediate communication between vehicle nodes. A VANET is referred to as a Random Graph. The vehicles are represented by the Random Graph's nodes, and the potential edges between any two nodes show how related they are to one another. The fundamental characteristics of the vehicle nodes, such as their speed, priority, direction of movement, and placement on the road, influence the connectivity between them. These characteristics quickly alter in a defined way. [8].

A crucial application for vehicle-to-roadside communications that has recently received a lot of interest is the vehicular delay tolerant network (VDTN). In a VDTN, stationary roadside units (RSUs) are positioned randomly along routes. RSUs are frequently far apart from one another. Communication is lost when a vehicle leaves the range of one RSU until it enters the range of another RSU. The multi-hop relaying method can be used to increase the coverage area of an RSU. The throughput rapidly decreases to zero as the number of hops increases. Multi-hop routing has a significant

overhead due to the frequent handovers brought on by dynamic changes in the network topology brought on by user mobility. [10]

III. POSSIBLE CHALLENGES

We must take into consideration the benefits of wireless communication technologies in the fight against the COVID-19 pandemic.

However, wireless technologies also come with several challenges. B. in terms of false information, safety, and privacy. In the sections that follow, we go into further depth about each of these issues and potential solutions.

3.1 PRIVACY ISSUES.

Although the contact tracking technology successfully stops the spread of the virus, it invades people's privacy. Governments can use tracking software to access and track a person's location information and use it for a variety of purposes. Human rights advocates are concerned that the use of mobile apps in pandemics will eventually become a common kind of surveillance. [11]. This software are one approach to access user data and make proper use of it. There should be strict data protection laws implemented by the government. Authorities will provide answers to important questions like who will store the data, how long it will be stored, who will have access to it, what penalties and fines would be applied for data misuse, and so on. For secure data transfer in meetings, classrooms, and other environments where a lot of information is transmitted, privacy issues are particularly important. Keeping government meetings and materials hidden from attackers becomes challenging when officials share them online. Concerns regarding privacy and freedom have been raised by the growing usage of drones to observe social gatherings.

3.2 CYBER SECURITY

The highly increased use of wireless network in the COVID-19 pandemic is causing a big cyber security issue. The entire global Internet traffic has been increased many times than the year 2019. This increased use of the Internet creates vulnerability with the spike in malicious attacks, such as phishing emails, inserting the malware to COVID-19 related resources, selling of fake medicines for COVID-19 [11]. Many enterprise employees work from home and it is one of the challenging tasks to provide authentication solutions for all users. Now all the businesses are transferred into the online mode so more cyber-attacks are expected. It is the major challenge to secure the cyber world from the attackers. The automation of industries has connected all the devices with one place. Devices are connected wirelessly using sensors with the remote server. It has made the invitation to hackers and cyber criminals. They can target to the any place and can perform the malicious act. Now this is the challenge to secure the network.

3.3 CYBER FRAUD

Cyber fraud is one of the major problems during the COVID-19 period. The malicious mind person making calls to the person for the purpose of taking personal information, bank details, credit card number, password, OTP, etc. The innocent people get confused and some time they provide information. Also, the information given to the delivery boys, vendors, shopkeepers etc. are also misused. This received information by these persons is misused. Lot of cases is coming during the COVID-19 period. The challenge is stopping the fraud.

3.3 NETWORK TRAFFIC CHALLENGES

The amount of traffic on the network has grown in 2020. The direction of everything is towards internet services. The burden on the network has increased as a result of this. Every day, a lot of internet data is used. Online meetings, classes, and other activities have increased the pressure on the wireless network [12]. A huge video considerably more and more traffic in a network area requires high speed network services for streaming video. With a 500 GB consumption of data each month, it should now rise [12]. The management of the network's heavy traffic load will be difficult.

IV. APPLICATION OF WIRELESS NETWORK AFTER THE COVID-19

The wireless network is equipped to handle the fresh issues brought on by the COVID-19 epidemic. The use of wireless networks with data sciences and artificial intelligence is beneficial in many different industries. The following are a few uses for wireless networks. [7]: -

4.1 DEFENCE FIELD

Wireless networks in particular In order to maintain any information network between vehicles, the armed forces, and information headquarters, MANET can enable the army and navy to take advantage of traditional network knowledge [7]. The MANET will be highly useful in the big battlefield.

4.2 COOPERATIVE WORK

Wireless networks are the superior option for facilitating social and economic activity.

4.3 PAN AND BLUETOOTH

A PAN is a small, localised network that often contains devices that belong to a single person. Bluetooth and other limited-range MANET technologies can facilitate communication between various portable devices, including computers, laptops, and cell phones. A small network can be readily set up inside a home. [7].

4.4 EMERGENCY SERVICES

The wireless network is one of the networks that can rescue people and offer emergency aid in the event of a flood, fire, or earthquake. Emergency saving measures should be employed when there are broken, or non-existent transmission structures and rapid creation of a transmission network is necessary [7]. In a short period of time, a wireless network can deliver urgent support.

4.5 BUSINESS SECTOR

Worldwide meetings and conferences are moving online. Once more, videoconferencing needs a strong, fast internet connection. Additionally, in the COVID-19 period, online conferences and meetings are more entertaining than in-person ones. [11].

4.6 CONTACTLESS SERVICE

The contactless service works perfectly on the wireless network. It can manage and controlling many applications that are placed both close and far away. Sensors can be used on wireless networks to track a variety of items, including people and other living things. Additionally, it can carry out commercial tasks like taking staff attendance without touching them, making modest payments using a debit card without touching the machine, etc.

4.7 CLUSTERING OF DIFFERENT DEVICES

The cluster's objects may be like one a different one, but not the same as those in other clusters. A cluster of devices can be created using the proximity of different items. Device clustering works best on the wireless network. [13].

4.8 MEDICAL SYSTEM

The wireless network will be very helpful for the medical system. Remote control is possible for medical robots that have sensor networks. In order to reduce the risk of the virus spreading to medical personnel, they can transfer medications, check patients' temperatures, and sanitize hospital rooms. These machines can assist medical professionals deal with a lack of personal protective equipment [11].

4.9 EDUCATION SYSTEM IN RURAL AND REMOTE AREAS

The whole educational system has been forced online by the COVID-19 pandemic. Every school in the globe has been closed for several months. There is no way to begin operating as they did to COVID-19 on a regular basis. To preserve social division, it has prompted school administrators to transfer classes online. The sole option for continuing your education at the moment is online study. When it comes to delivering online education in rural areas without enough infrastructure, the wireless network will be essential. [11].

V. CONCLUSION

Wireless communication technology is crucial in the battle against the pandemic's disruption of daily life and in the transition to the "new normal."

In this paper, we discussed the various COVID-19-related global challenges and emphasized the importance of wireless communication technologies in addressing issues like tracking the virus's spread, enabling healthcare automation, and enabling online learning and conferencing. In addition, we have discussed the dangers connected with these with severe effects on the globe's economy and health, COVID-19 has permanently changed how the world views pandemics. In just eleven months (from January to November 2020), there have been reports of infected persons all throughout the world, along with thousands of fatalities. The human being now must overcome additional challenges as a result. At this point, COVID-19 is battling people throughout their entire lives. The COVID-19 virus is still dangerous. The law of nature, however, states that advancement never ceases. Despite everything, it will carry on. The pandemic problem has opened new growth prospects. The wireless network has made it possible for people to fight the COVID-19. It enables us to function without being in touch.

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