ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 9, Issue 2, February 2020

Wireless Networks in Different Forms at the Present Scneario

Shweta Agarwal

Research Scholar, Sabarmati University, Ahmedabad, Gujarat, India

ABSTRACT: There are four types of wireless networks -- wireless local area networks, wireless metropolitan area networks, wireless personal area networks and wireless wide area networks -- each with its own function. Wireless LAN (WLAN) technology provides internet access within a building or a limited outdoor area. First used within offices and homes, WLAN technology is now also used in stores and restaurants. The use of home networks greatly increased as the COVID-19 pandemic forced office workers, students, teachers and others to work and study from home.Most home network designs are simple. A modem connects to the cable or fiber from a local service provider. A wireless router is connected to the modem and receives the signal from the modem. The router also serves as the wireless access point (AP), which then broadcasts using a wireless protocol, such as the 802.11 standards.Office networks are more complicated. APs are usually mounted on the ceiling, with each broadcasting a wireless signal to the surrounding area. Multiple APs are required in large offices, each connecting to the office backbone network via a wired connection to a switch. APs coordinate support for users walking through the office area and hand off support to maintain open, connected sessions from AP to AP.

KEYWORDS: wireless, LAN, WLAN, protocol, standards, support, office area, connected, AP

I. INTRODUCTION

Wireless metropolitan area networks have been installed in cities worldwide to provide access for people outside an office or home network. These networks cover a wider area than office or home networks, but the principles are the same. APs are located on the sides of buildings or on telephone poles throughout the covered area. APs are connected to the internet via a wired network and broadcast a wireless signal throughout the area. Users connect to their desired destination by connecting to the nearest AP, which forwards the connection through its internet connection. Wireless personal area networks cover a very limited area -- typically a maximum of 100 meters for most applications -- using protocols like Bluetooth and Zigbee. Bluetooth enables hands-free phone calls, connects a phone to earpieces or transmits signals between smart devices. Zigbee connects stations along an IoT network. Infrared technology is limited to line of sight, such as connecting TV remotes to televisions.[1]

Wireless developers have constantly improved technology by discovering new ways to transmit signals to users. These advances enable higher data rates and increasing range for each of these wireless technologies. [2] Wireless WANs use cellular technology to provide access outside the range of a wireless LAN or metropolitan network. These networks enable users to make phone calls to others. WANs can support either speech or data transfer using the same technology. Users can also connect to the internet to access websites or server-based applications.[3]

Cell towers are located nearly everywhere within the U.S. and most other countries. A user connection is routed to the nearest cell tower, which, in turn, is connected either to the wired internet or to another tower connected to wired internet. The advent of 5G has suggested a possible fifth form of wireless, larger than a WAN but smaller than most MANs. Ongoing work is investigating a possibly less expensive alternative to cable: 5G to the home or office.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 9, Issue 2, February 2020

Currently, most cable internet and TV access requires a fiber or coax cable to reach subscribers. Running cable throughout a neighborhood is expensive to install and maintain. With 5G, however, providers could mount a 5G AP on an existing power pole, while each house or building gets a mounted receiver.[4]

5G can compete with cable for data rates and latency, but several drawbacks to this concept could prevent adoption success. Below are some of the drawbacks to 5G:

- 5G signals are point to point. Any obstruction, like a building or tree, disrupts communication.
- Distance is limited from about 1,000 to 2,000 feet.
- Heavy rain and snow can disrupt the signal, which isn't acceptable for internet or TV access.
- National Oceanic and Atmospheric Administration and NASA are concerned 5G could interfere with their satellites that monitor changing atmospheric measurements to help predict upcoming weather.

Assuming providers and organizations can overcome these issues, 5G competition will vary. Most areas in the U.S. are served by cable installed years ago. 5G to the home or office would be competitive only in areas with new housing and office developments or where there is no current cable infrastructure.[5]

As neither a MAN nor a WAN but a combination of the two, 5G to the home or office will constitute a new category of wireless access. Still, whether this 5G option succeeds, the capabilities of 5G will open new applications for wireless. Community Wireless Networks can be designed in many ways. To help you understand these different methods for designing networks, this document covers the basics of what different devices do in wireless networks, and how they can be used in different configurations. Using the knowledge and activities in this document, you can work with others to design the wireless network that works best for your community.[6]

II. DISCUSSION

There are three major “modes” a Wi-Fi device can use. These modes define the role a Wi-Fi device has in the network, and networks must be built out of combinations of devices operating in these different modes.[24] How the devices are configured depends on the types of connections you want to use between parts of the network.In discussing these modes and the examples below, several types of devices are used. In addition to the phones, tablets, and laptops you use in accessing a network, routers make up the hardware that runs the network. These routers are defined in Learn Networking Basics, but for the sake of this document the quick definition of a router is a network device that can connect one network to another, determine what traffic can pass between them, and perform other functions on a network, such as assigning IP addresses.[7]

The three wireless roles are:

Client mode icon (C)Wireless Clients (Station) Wireless clients in a networkDevices such as computers, tablets, and phones are common Clients on a network. When you are accessing a wireless hotspot, or the router in your home or office, your device is the client. This client mode is also known as “station mode” as well.Some routers can operate as Clients as well, which allows them to act like the wireless card in a computer, and connect to other Access Points. This can bridge two Ethernet networks, or connect to more distant APs.A Wireless Client is similar to a person in the

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 9, Issue 2, February 2020

audience of a play or movie. They are one of several or many people accessing information through the same conduit - someone speaking.[8]

Most wireless networks are made using Access Points - devices that host and control the wireless connection for laptops, tablets, or smart phones. If you use Wi-Fi in your home or office, it is most likely through an Access Point. When a router is set up as an AP, it is said to be in "Master" or "Infrastructure" mode.An AP is sometimes a stand-alone device that bridges between a wireless and wired (Ethernet) network, or is part of a router. APs can cover a range of areas with a wireless signal, depending on the power of the device and the type of antenna. There are also some APs that are weatherproof, designed to be mounted outdoors.An Access Point is similar to a person on stage, addressing an audience or crowd - they are providing the information for everyone else. Those audience members can ask questions of the person on the stage, and receive a response.[9]

Some wireless devices (laptops, smart phones, or wireless routers) support a mode called Ad-Hoc. This allows those devices to connect together directly, without an Access Point in-between controlling the connection. This forms a different type of network - in Ad-Hoc mode, all devices are responsible for sending and receiving messages to the other devices - without anything else in between. In an Ad-Hoc network, every device must be in this role, and using the same configuration to participate. Not all devices use this mode, and some have it as a "hidden" feature.Ad-Hoc devices are used to create a Mesh network, so when they are in this mode, they are called "Mesh Nodes".An Ad-Hoc or Mesh node is similar to an individual in a group or roundtable discussion. They can take equal part in the conversation, raising their hand when they want to speak so the others will listen. If someone at the end of the table cannot hear, one of the individuals in-between can repeat the original message for the listener.[10]

Wireless networks can be used to connect distant buildings or areas. It usually requires very focused antennas - such as a dish antenna - that can send a narrow beam in a specific direction. A long-distance connection is often called a "point-to-point", or "PtP" link. The name describes the concept: two points are connected together, and nothing else. This requires two wireless devices: one configured as an Access Point; the other configured as a Client. In the example below, two wireless devices are configured to create a point-to-point link. If we combine the two principles used in the networks above - many client devices connecting to an Access Point, and more powerful antennas used for outdoor devices to create longer links - we can create Point to Multipoint networks. These are larger-scale Access Point networks, where there is a single device in the "center", controlling all of the Clients connected to it and bridging those connections to the Internet.These types of networks are used by Wireless Internet Service Providers (WISPs) to connect homes and businesses to the Internet. Instead of running cables around a neighborhood or town, they put up one or more powerful Access Points on a tall building or tower. By installing directional wireless devices in a Client role on other rooftops, and pointing them back at the tall building or tower, those buildings can be connected to the WISP's networks, and thereby the Internet.[11]

III. RESULTS

A mesh network takes the principle of Point-to-Multipoint, and extends it to the idea of every node connecting to every other node in range. In effect, this creates a "Multipoint-to-Multipoint" network. This requires that all the devices are in the Ad-Hoc mode - wireless devices all in AP mode or Client mode can't perform the same function. Wireless mesh nodes are installed on the rooftops of various buildings, and those nodes that are in range and don't have anything blocking the signals will connect.[23] These nodes will share all resources connected to them such as local servers hosting applications and connections to the Internet. They can also be connected to computers, Access Points, or routers inside the buildings so users can access the resources anywhere on the network. When designing and building town or community-sized networks, it may be difficult or impossible to use a single method to connect everyone. For instance, a single Point-to-Multipoint network may not cover an entire community. Mesh nodes can be used to extend client sites

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 9, Issue 2, February 2020

to nearby buildings. Point-to-point connections can bridge longer distances and join several disconnected networks together.[12]

The first professional wireless network was developed under the brand ALOHAnet in 1969 at the University of Hawaii and became operational in June 1971. The first commercial wireless network was the WaveLAN product family, developed by NCR in 1986.

- 1973 – Ethernet 802.3
- 1991 – 2G cell phone network
- June 1997 – 802.11 "Wi-Fi" protocol first release
- 1999 – 803.11 VoIP integration

Wireless links:-

- Terrestrial microwave – Terrestrial microwave communication uses Earth-based transmitters and receivers resembling satellite dishes. Terrestrial microwaves are in the low gigahertz range, which limits all communications to line-of-sight. Relay stations are spaced approximately 48 km (30 mi) apart.[22]
- Communications satellites – Satellites communicate via microwave radio waves, which are not deflected by the Earth's atmosphere. The satellites are stationed in space, typically in geosynchronous orbit 35,400 km (22,000 mi) above the equator. These Earth-orbiting systems are capable of receiving and relaying voice, data, and TV signals.
- Cellular and PCS systems use several radio communications technologies. The systems divide the region covered into multiple geographic areas. Each area has a low-power transmitter or radio relay antenna device to relay calls from one area to the next area.[21]
- Radio and spread spectrum technologies – Wireless local area networks use a high-frequency radio technology similar to digital cellular and a low-frequency radio technology. Wireless LANs use spread spectrum technology to enable communication between multiple devices in a limited area. IEEE 802.11 defines a common flavor of open-standards wireless radio-wave technology known as Wi-Fi.
- Free-space optical communication uses visible or invisible light for communications. In most cases, line-of-sight propagation is used, which limits the physical positioning of communicating devices.[13]

A cellular network or mobile network is a radio network distributed over land areas called cells, each served by at least one fixed-location transceiver, known as a cell site or base station. In a cellular network, each cell characteristically uses a different set of radio frequencies from all their immediate neighbouring cells to avoid any interference.[20]

When joined these cells provide radio coverage over a wide geographic area. This enables a large number of portable transceivers (e.g., mobile phones, pagers, etc.) to communicate with each other and with fixed transceivers and telephones anywhere in the network, via base stations, even if some of the transceivers are moving through more than one cell during transmission.

Although originally intended for cell phones, with the development of smartphones, cellular telephone networks routinely carry data in addition to telephone conversations:

- Global System for Mobile Communications (GSM): The GSM network is divided into three major systems: the switching system, the base station system, and the operation and support system. The cell phone connects to the base system station which then connects to the operation and support station; it then connects to the switching station where the call is transferred to where it needs to go. GSM is the most common standard and is used for a majority of cell phones.[14]

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 9, Issue 2, February 2020

- Personal Communications Service (PCS): PCS is a radio band that can be used by mobile phones in North America and South Asia. Sprint happened to be the first service to set up a PCS.
- D-AMPS: Digital Advanced Mobile Phone Service, an upgraded version of AMPS, is being phased out due to advancement in technology. The newer GSM networks are replacing the older system.[14]

Some examples of usage include cellular phones which are part of everyday wireless networks, allowing easy personal communications. Another example, Intercontinental network systems, use radio satellites to communicate across the world. Emergency services such as the police utilize wireless networks to communicate effectively as well. Individuals and businesses use wireless networks to send and share data rapidly, whether it be in a small office building or across the world.[19]

IV. CONCLUSIONS

The telecommunications network at the physical layer also consists of many interconnected wireline network elements (NEs). These NEs can be stand-alone systems or products that are either supplied by a single manufacturer or are assembled by the service provider (user) or system integrator with parts from several different manufacturers.[18]

Wireless NEs are the products and devices used by a wireless carrier to provide support for the backhaul network as well as a mobile switching center (MSC).

Reliable wireless service depends on the network elements at the physical layer to be protected against all operational environments and applications (see GR-3171, Generic Requirements for Network Elements Used in Wireless Networks – Physical Layer Criteria). [15]

What are especially important are the NEs that are located on the cell tower to the base station (BS) cabinet. The attachment hardware and the positioning of the antenna and associated closures and cables are required to have adequate strength, robustness, corrosion resistance, and resistance against wind, storms, icing, and other weather conditions. Requirements for individual components, such as hardware, cables, connectors, and closures, shall take into consideration the structure to which they are attached[17]. Wireless access points are also often close to humans, but the drop off in power over distance is fast, following the inverse-square law.The position of the United Kingdom's Health Protection Agency (HPA) is that "...radio frequency (RF) exposures from WiFi are likely to be lower than those from mobile phones". It also saw "...no reason why schools and others should not use WiFi equipment". In October 2007, the HPA launched a new "systematic" study into the effects of WiFi networks on behalf of the UK government, in order to calm fears that had appeared in the media in a recent period up to that time". Dr Michael Clark, of the HPA, says published research on mobile phones and masts does not add up to an indictment of WiFi.[16]

REFERENCES

1. "A New Clusterings Algorithm for Wireless Sensor Networks".
2. ^ "Overview of Wireless Communications". cambridge.org. Retrieved 8 February 2008.
3. ^ "Getting to Know Wireless Networks and Technology". informit.com. Retrieved 8 February 2008.
4. ^ Miao, Guowang; Zander, Jens; Sung, Ki Won; Slimane, Ben (2016). Fundamentals of Mobile Data Networks. Cambridge University Press. ISBN 978-1107143210.
5. ^ Baliga, B. Jayant (2005). Silicon RF Power MOSFETS. World Scientific. ISBN 9789812561213.
6. ^ Asif, Saad (2018). 5G Mobile Communications: Concepts and Technologies. CRC Press. pp. 128–134. ISBN 9780429881343.
7. ^ O'Neill, A. (2008). "Asad Abidi Recognized for Work in RF-CMOS". IEEE Solid-State Circuits Society Newsletter. 13 (1): 57–58. doi:10.1109/N-SSC.2008.4785694. ISSN 1098-4232.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 9, Issue 2, February 2020

8. ^ Colinge, Jean-Pierre; Greer, James C. (2016). Nanowire Transistors: Physics of Devices and Materials in One Dimension. Cambridge University Press. p. 2. ISBN 9781107052406.
9. ^ "Will 5G kill human".
10. ^ "Wireless Network Industry Report". Archived from the original on 29 October 2008. Retrieved 8 July 2008.
11. ^ "Wi-Fi Personal Area Networks get a boost with Windows 7 and Intel My WiFi". Retrieved 27 April 2010.
12. ^ Yu, Jiguo; Wang, Nannan; Wang, Guanghui; Yu, Dongxiao (1 January 2013). "Connected dominating sets in wireless ad hoc and sensor networks – A comprehensive survey". Computer Communications. 36 (2): 121–134. doi:10.1016/j.comcom.2012.10.005.
13. ^ "Facts About WiMAX And Why Is It "The Future of Wireless Broadband"". 20 June 2009.
14. ^ "GSM World statistics". GSM Association. 2010. Archived from the original on 19 July 2011. Retrieved 16 March 2011.
15. ^ "Mobile Broadband Wireless connections (MBWA)". Retrieved 12 November 2011.
16. ^ Dean Tamara (2010). Network+ Guide to Networks (5th ed.). Boston: Cengage Learning. ISBN 978-1-4239-0245-4.
17. ^ "Wireless LAN Technologies". Source Daddy website. Retrieved 29 August 2011.
18. ^ "WLAN Benefits". Wireless Center commercial web site. Retrieved 29 August 2011.
19. ^ "Generic Requirements for Network Elements Used in Wireless Networks – Physical Layer Criteria". Ericsson.
20. ^ Anadiotis, Angelos-Christos; et al. (2010). "Towards Maximising Wireless Testbed Utilization Using Spectrum Slicing". In Thomas Magedanz; Athanasius Gavras; Huu Thanh Nguyen; Jeffrey S. Chase (eds.). Testbeds and Research Infrastructures, Development of Networks and Communities: 6th International ICST Conference, TridentCom 2010, Berlin, Germany, May 18–20, 2010, Revised Selected Papers. 6th International ICST Conference, TridentCom 2010, Berlin, Germany, May 18–20, 2010. Vol. 46. Springer Science & Business Media. p. 302. ISBN 9783642178504. Retrieved 19 July 2015. […] Central Regulatory Domain Agent (CRDA) […] controls the channels to be set on the system, based on the regulations of each country.
21. ^ Foster, Kenneth R (March 2007). "Radiofrequency exposure from wireless LANs utilizing Wi-Fi technology". Health Physics. 92 (3): 280–289. doi:10.1097/01.HP.0000248117.74843.34. PMID 17293700. S2CID 22839684.
22. ^ "WiFi". Health Protection Agency. 26 October 2009. Retrieved 27 December 2009.
23. ^ "Health Protection Agency announces further research into use of WiFi". Health Protection Agency. Retrieved 28 August 2008.
24. ^ Daniels, Nicki (11 December 2006). "Wi-fi: should we be worried?". The Times. London. Retrieved 16 September 2007. All the expert reviews done here and abroad indicate that there is unlikely to be a health risk from wireless networks. … When we have conducted measurements in schools, typical exposures from WiFi are around 20 millionths of the international guideline levels of exposure to radiation. As a comparison, a child on a mobile phone receives up to 50 percent of guideline levels. So a year sitting in a classroom near a wireless network is roughly equivalent to 20 minutes on a mobile. If WiFi should be taken out of schools, then the mobile phone network should be shut down, too—and FM radio and TV, as the strength of their signals is similar to that from WiFi in classrooms....