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Wireless Internet

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Abstract: The arrival of wireless technology has reduced the human efforts for acessing data at various locations by replacing wired infrastructure with wireless infrastructure and also providing access to devices having mobility.Since wireless devices need to be small and bandwidth constrained, some of the key challenges in wireless networks are Signal fading, mobility, data rate enhancements, minimizing size and cost, user security and (Quality of service) QoS. This paper is intended to provide the reader with an overview of the Research Issues and Challenges in wireless networks.

Keywords: Wireless Local Area Networks (WLANs), Quality of Service (QoS).

I. INTRODUCTION

The explosive growth in wireless networks over the last few years resembles the rapid growth of the internet within the last decade. Wireless communication continues to enjoy exponential growth in the cellular telephony, wireless internet and wireless home networking arenas. With advent of Wireless LAN (WLAN) technology, computer networks could achieve connectivity with a useable amount of bandwidth without being networked via a wall socket. New generations of handheld devices allowed users access to stored data even when they travel. Users could set their laptops down anywhere and instantly be granted access to all networking resources. This was, and is, the vision of wireless networks, and what they are capable of delivering.

Today, while wireless networks [1] have seen widespread adoption in the home user markets, widely reported and easily exploited holes in the standard security system have stunted wireless deployment rate in enterprise environments. Over time, it became apparent that some form of security was required to prevent outsiders from exploiting the connected resources. We believe that the current wireless access points present a larger security problem than the early lntemet connections. As more wireless technology is wireless technology, this will be a good stepping-stone for providing a good secure solution to any wireless solution.

II. EVOLUTION OF WIRELESS TECHNOLOGIES

This section mentions in short the evolution of wireless and cellular systems based on the four main key aspects: -radio access, data rates, bandwidth and switching schemes.

Review of Previous Fourth Generations Systems

A. First-Generation Systems (1G)

The 1st generation was pioneered for voice service in early 1980‘s, where almost all of them were analog systems using the frequency modulation technique for radio transmission using frequency division multiple access (FDMA) with channel capacity of 30 KHz and frequency band was 824-894 MHz [6], which was based on a technology known as Advance Mobile Phone Service (AMPS).

B. Second Generation Systems (2G)

The 2nd generation was accomplished in later 1990‘s. The 2G mobile communication system is a digital system; this system is still mostly used in different parts of the world. This generation mainly used for voice communication also offered additional services such as SMS and e-mail. In this generation two digital modulation schemes are used; one is time division multiple access (TDMA) and the 2nd is code division multiple access (CDMA) [7] and frequency band is 850-1900 MHz. In 2G, GSM technology uses eight channels per carrier with a gross data rate of 22.8 kbps (a net rate of 13 kbps) in the full rate channel and a frame of 4.6 milliseconds (ms) duration [14].The family of this generation includes of 2G, 2.5G and 2.75G.

C. Third Generation Systems (3G)

Third generation (3G) services combine high speed mobile access with Internet Protocol (IP)-based services. The main features of 3G technology include wireless web base access, multimedia services, email, and video conferencing. The 3G W-CDMA air interface standard had been designed for ―always-on‖ packet-based wireless service, so that computer, entertainment devices and telephones may all share the same wireless network and be connected internet anytime, anywhere [13]. 3G systems offer high data rates up to 2 Mbps, over 5 MHz channel carrier width, depending on mobility/velocity, and high spectrum efficiency. The data rate supported by 3G networks depends also on the environment the call is being made in; 144 kbps in satellite and rural outdoor, 384 kbps in urban outdoor and 2Mbps in indoor and

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low range outdoor [4]. The frequency band is 1.8 - 2.5 GHz [16].

D. Fourth Generation Systems (4G)

4G usually refers to the successor of the 3G and 2G standards. In fact, the 3GPP is recently standardizing LTE Advanced [8] as future 4G standard. A 4G system may upgrade existing communication networks and is expected to provide a comprehensive and secure IP based solution where facilities such as voice, streamed multimedia and data will be provided to users on an "Anytime, Anywhere" basis and at much higher data rates compared to previous generations. One common characteristic of the new services to be provided by 4G is their demanding requirements in terms of QoS. Applications such as wireless broadband access, Multimedia Messaging Service (MMS), video chat, mobile TV, HDTV content and Digital Video Broadcasting (DVB) are being developed to use a 4G network.

LTE advanced

LTE release 10, also referred to as LTE-Advanced, is claimed to be the true 4G evolution step. Earlier releases of LTE are included as integrated parts of LTE release 10, providing a more straightforward backwards compatibility and support of legacy terminals, for example. The main requirement specification for LTE advanced as approved in [8] are:

Peak Downlink data rate: 1 Gbs, Peak Uplink data rate: 500 Mbps.

- Transmission bandwidth: Wider than approximately 70 MHz in DL and 40 MHz in UL.
- User throughput at cell edge 2 times higher than that in LTE.
- Average user throughput is 3 times higher than that in LTE.
- Spectrum efficiency 3 times higher than that in LTE; Peak spectrum efficiency downlink: 30 bps/Hz,
- Uplink: 15 bps/Hz.
- Mobility: Same as that in LTE.
- Coverage should be optimized or deployment in local areas/micro cell environments with Inter Site Distance (ISD) up to 1 km.

E. 5G Wireless Communication Systems

5G Technology stands for 5th Generation Mobile Technology. 5G technology has changed to use cell phones within very high bandwidth. 5G is a packet switched wireless system with wide area coverage and high throughput. 5G technologies use CDMA and BDMA and millimeter wireless that enables seed is greater than 100Mbps at full mobility and higher than1Gbps at low mobility. The 5G technologies include all types of advanced features which make 5G technology most powerful and in huge demand in the near future. It is not amazing, such a huge collection of technology being integrated into a small device. The 5G technology provides the mobile phone users more features and efficiency. A user of mobile phone can easily hook their 5G technology gadget with laptops or tablets to acquire broadband internet connectivity. Up till now following features of the 5G technology have come to surface- High resolution is offered by 5G for extreme mobile users, it also offers bidirectional huge bandwidth [2], higher data rates and the finest Quality of Service (QoS)

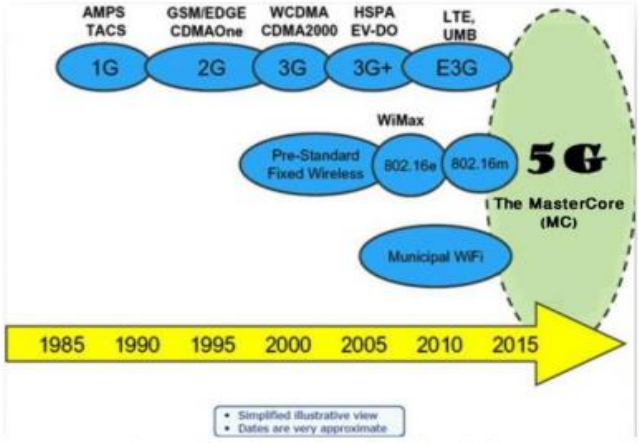

Figure 1: Evolution of Mobile Technologies

Table 1: Basic comparison among 3G, 4G and 5G Technology

Technology/ features	3G	4G	5G
Data Bandwidth	2Mbps	2Mbps to 1Gbps	1Gbps & Higher (as demand)
Frequency Band	1.8 - 2.5 GHz [16]	2 - 8 GHz [16]	3-300GHz [16],[18]
Standards	WCDMA CDMA-200 TD-SCDMA [19]	All access convergence including:OFMDA,MC-CDMA Network-LMPS [19]	CDMA & BDMA
Technology	Broad bandwidth CDMA,IP technology [19]	Unified IP And seamless combination of broadband LAN/WAN/ PAN and WLAN [19];	Unified IP and seamless combination of broadband, LAN/WAN/PAN/WLAN [19] and technologies for 5G new deployment (could be OFDM etc.);
Service	Integrated high quality audio, video and data	Dynamic information access, wear-able devices, HD streaming; global roaming;	Dynamic information access, wear-able devices, HD streaming; any demand of users; upcoming all technologies; global roaming smoothly;
Multiple Access	CDMA	CDMA	CDMA & BDMA
Core Network	Packet Network	All IP Network	Flatter IP Network & 5G Network Interfacing(5G-NI)
Definition	Digital Broadband, packet data	Digital Broad band, Packet data, All IP	Digital Broadband, Packet data All IP, Very high throughput
Hand off	Horizontal	Horizontal & Vertical	Horizontal & Vertical
Start from	2001 [12]	2010 [12]	2015 [12]

III. WHAT DO I NEED TO USE THE WIRELESS NETWORK ?

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A laptop or other device with a wireless Internet card that supports the WiFi standard. This standard is also referred to as IEEE802.11 a, b or g. A charged battery. There are only a few electrical outlets available.Headphones/ear buds if you plan to use audio/visual files.

IV. WIRELESS LANS

An 802.11 network is the ideal solution for a network administrator in many respects. No longer is it a requirement that every workstation and conference room be wired up to hubs and switches with cables in hard-to-reach areas. Wireless networking allows for imprompt meetings in cafeterias, hallways, courtyards, or wherever inspiration strikes while providing real-time LAN connectivity for business applications such as sending e-mail, working on spreadsheets on shared drives, and conducting market research. Wireless networking has become common place, and with prices reduced to a fraction of what they were, it is no wonder that wireless networking products have transitioned from the office and into the home. For the home user, a wireless network provides freedom in convenience and lifestyle to exchange words, data, and music or video with any computer across the Internet, or around the world. Home users can create a wireless network out of an existing wired network and wirelessly extend the reach of the Internet throughout the home on multiple computers, making it more convenient for everyone to get online.

V. DIFFERENT WLAN TECHNOLOGIES

As various wireless networking technologies have advanced over time, several WLAN technologies have emerged, including: narrowband, spread spectrum, frequency hopping spread spectrum.

Narrowband

As the name suggests, narrowband technology uses a specific radio frequency (in the range of 50 cps to 64 Kbps) for data transmission.

Spread Spectrum

Originally developed for military use, spread spectrum technology allows for greater bandwidth by continually altering the frequency of the transmitted signal, thus spreading thetransmission across multiple frequencies.Spread spectrum uses more bandwidth than narrowband, but the transmission is more secure, reliable, and easier to detect.

Frequency Hopping Spread Spectrum(FHSS)

Frequency hopping spread spectrum (FHSS) technology synchronizes the changing frequency of both the transmitter and receiver (using a narrowband carrier) to, in effect, produce a single transmission signal. This frequency"hopping" can occur as often as several times a second; it is constantly changing from one frequency to another, transmitting data for a certain period of time before changing frequency again. Like spread spectrum technology, FHSS technology consumes additional bandwidth,however, this is over the course of multiple carrier frequencies

VI. WIRELESS NETWORK COMPONENTS

Much like a traditional wired LAN, a WLAN is a grouping of computers and peripheraldevices that share a common communications backbone. As is implied by the name, a WLAN allows users to connect to the LAN wirelessly via radio transmission. The following are the most common components of a WLAN.

Access Point

The access point is a device that links a wireless network to a wired LAN. It increases the effective range of a wireless network and provides additional network management and security features. Wireless networks of three or fewer PCs do not require an access point forad hoc networking. Access points are useful for larger networks, and they are particularly well-suited for adding wireless capability to an existing wired network.

PC Card

A wireless PC card enables laptop users to connect wirelessly to the LAN. U.S. Robotics 22 Mbps Wireless PC Cards allow for ad hoc networking of up to three computers at an effective range of up to 1000 feet in open spaces .

PCI Adapter

Just as a wireless access PC card allows portable and laptop computers access to the LAN, a wireless access PCI adapter allows desktop PC users access to the LAN. U.S. Robotics 22 Mbps Wireless PCI Adapters allow for ad hoc networking of up to three computers at an effective range of up to 1000 feet in open spaces.

Router

Router is a networking device commonly specialized hardware that forwords data packets between computer network. This creates and over lay internetwork as a router is connected to two or more data lines from different networks. When a data packet comes in one of the lines the router leads the address information in the packets to determine to ultimate destination than using information in its routing table or routing policy. it directs the packets to the next network on its journey. Router performs the traffic directing functions on the internet. a data packet is typically forworded from one router to the another through the networks that constitute the internetwork until it reaches its destination node.

VII. WIRELESS SECURITY

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Security is an obvious concern with any network, wired or wireless. Because communication over a traditionally wired network is, by its very nature, over physical wires, security is often built into the physical environment itself. WLANs operate over radio signals, so the same security measures cannot be assumed. For many wireless users, the enabling of the built-in security known as Wireless Equivalent Privacy (WEP) is sufficient for their home or small to medium office WLAN. WEP uses 64- and 128-bit encryption and is the cipher scheme designated for use in 802.11b networking. U.S. Robotics 22 Mbps wireless products include enhanced 256-bit WEP encryption that is not commonly available in the 802.11b standard. WEP encrypts the data transmitted over a WLAN, protecting the once vulnerable communication between the client and access point. When combined with traditional security measures (password protection, authentication, encryption, virtual private networks), WEP can be very effective.

Change Common Passwords Frequently:-Most of the top manufacturers have default passwords for all of their equipment. Users should be diligent in changing any default passwords and to change them on a regular basis in order to avoid detection.

Disable DHCP:- By default, some access points respond directly to Dynamic Host Configuration Protocol (DHCP) requests or allow the forwarding of DHCP requests from clients. DHCP is a protocol for assigning IP addresses dynamically on a network. However, with DHCP enabled on a WLAN, and without proper security measures enabled, a user can connect automatically to the network.

VIII. CONCLUSION

In this paper we have discussed the existing wireless mobile communication generation evaluation of wireless technologies , wireless security , and also 5G main development challenges and explain the necessity for 5G .the 5G mobile technology be implemented at the end of current decade. We have proposed the master code and hardware implementations. We expect that this paper has to uplift stronger links between people working in different fields creating future concept of mobile communication internet services.

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