Assignment

Name: Hassan Mudassir

Id:13003

Q1)

Ans) The latest and future trends in wireless networks are given below.

1. Wi-Fi

2. 5G Cellular

3. Vehicle-to-Everything (V2X) Wireless

4. Low-Power Wide-Area (LPWA) Networks

5. Wireless Sensing

6. Enhanced Wireless Location Tracking

7. Millimeter Wave Wireless

8. Backscatter Networking

9. Software-Defined Radio (SDR)

Wi-Fi:
Wi-Fi is a wireless network technology that allows devices such as computers (laptops and desktops), mobile devices (smart phones and wearables), and other equipment (printers and video cameras) to interface with the Internet. It allows these devices--and many more--to exchange information with one another, creating a network. It is also use in different types of radar systems.

5G Cellular:
5G is the 5th generation mobile network. It is a new global wireless standard after 1G, 2G, 3G, and 4G networks. 5G enables a new kind of network that is designed to connect virtually everyone and everything together including machines, objects, and devices.

5G wireless technology is meant to deliver higher multi-Gbps peak data speeds, ultra-low latency, more reliability, massive network capacity, increased availability, and a more uniform user experience to more users. Higher performance and improved efficiency empower new user experiences and connects new industries.

Vehicle-to-Everything (V2X) Wireless:

Vehicle-to-everything (V2X) is a technology that allows vehicles to communicate with moving parts of the traffic system around them. Also known as connected-vehicle-to-everything communication, it has several components.

One component of this technology is called vehicle-to-vehicle (V2V) which allows vehicles to communicate with one another. Another component is vehicle to infrastructure (V2I) which allows vehicles to communicate with external systems such as street lights, buildings, and even cyclists or pedestrians. As this technology becomes more sophisticated in the future, what it is capable of will expand.

Low-Power Wide-Area (LPWAN) Networks:

Low-power WAN (LPWAN) is a wireless wide area network technology that interconnects low-bandwidth, battery-powered devices with low bit rates over long ranges. LPWAN technology allows IoT devices to operate reliably for up to 10 years on a single battery charge. LPWAN technology supports data transfer in small intermittent data packets ranging in size from 10 to 1000 bytes.

Wireless Sensing:
Sensor data is the fuel of the Inter of things. The absorption and reflection of wireless signals can be used for sensing purposes, it will use indoor system like reboots or sometimes in drones.

Enhanced Wireless Location Tracking:

A key trend is for wireless communication systems to sense the locations of devices connected to them. High-precision tracking to about 1-m accuracy will be enabled by the upcoming IEEE 802.11az standard and is expected to be a feature of future 5G standards. Location sensing integrated with the core wireless network could provide several benefits such as lower hardware cost and power consumption, as well as improved performance and precision compared to other systems such as finger printing and inertial navigation.

Millimeter-wave wireless:
Millimeter-wave wireless technology operates at frequencies in the range of 30 to 300 GHz, with wavelengths in the range of 1 to 10 mm. The technology can be used by wireless systems such as Wi-Fi and 5G for short-range, high-bandwidth communications. Key drivers include the need for more spectrum and higher bandwidth.

Backscatter networking:
Backscatter-networking technology can send data with very low power consumption, targeting small networked devices. Backscatter networks operate by remodulating ambient wireless signals. Thus, it will be used in applications in which an area is saturated with wireless signals and there is a need for relatively simple IoT devices, such as sensors in smart homes and offices.

Software-defined radio (SDR):
SDR shifts the majority of the signal processing in a radio system away from chips and into software so that the radio can support more frequencies and protocols. Although the technology has been available for many years, it has never taken off because it's more expensive than dedicated chips. Gartner expects SDR to grow in popularity as new protocols emerge. It will enable a device to support legacy protocols and add new protocols with a software upgrade.

Q2)

Ans) I am working as a working specialist in ABC organization and I have to research on the current and future network issue challenges and these are given below

Firstly, we have to discuss on current network issues.

1. Signal fading is the main and big issue which we are facing currently.
2. The second one the mobility which we are also facing and it cause some problems.
3. The third one is the user security issues
4. The other is the minimizing the size and cost.

Now we have discussed the issues which we are facing currently now we have to discuss the challenges with these current issues.

The first one is the limited bandwidth problem.

Ideal services configuration problem is related to security.

Now its turn on Future problems which may cause or may not. Its must be on large scale or on small scale.

1. The first one is the cellular Local area network(LAN)
2. The second one is wireless LAN
3. The third is wireless WLAN
4. The fourth is wireless sensor network

We have discussed some of the future network issues now it time to discuss on the challenges and these are

Using the newly spectrum wisely with consisting all Pons and Cons

Should be focused on Maximizing the problems

Network

And sensors.

Q3)

Ans) EEE 802.11 is part of the IEEE 802 set of LAN protocols, and specifies the set of (MAC) and (PHY) protocols for implementing (WLAN) computer communication in various frequencies, including but not limited to 2.4 GHz, 5 GHz, and 60 GHz frequency bands.

They are the world's most widely used wireless computer networking standards, used in most home and office networks to allow computers and mobile phone to talk to each other and access the Internet without connecting wires. The base version of the standard was released in 1997, and has had subsequent amendments. The standard and amendments provide the basis for wireless network products using the Wi-Fi brand. While each amendment is officially revoked when it is incorporated in the latest version of the standard, the corporate world tends to market to the revisions because they concisely denote capabilities of their products. As a result, in the marketplace, each revision tends to become its own standard.

802.11 technology has its origins in a 1985 ruling by the U.S. Federal Communications Commission that released for unlicensed use

In 1991 nokia labs and LSI invented a precursor to 802.11 in Neogene, the Netherlands. The inventors initially intended to use the technology for cashier systems. The first wireless products were brought to the market under the name WaveLAN with raw data rates of 1 Mbit/s and 2 Mbit/s.

who held the chair of IEEE 802.11 for 10 years, and has been called the "father of Wi-Fi", was involved in designing the initial 802.11b and 802.11a standards within the IEEE

In 1999, the Wi-Fi alliance was formed as a trade association to hold the Wi-Fi trademark under which most products are sold

STANDARDS OF IEEE 802.11

IEEE802.11a

The IEEE802.11a standard was released on September 1999. Networks using 802.11a operate at radio frequency of 5GHz or 3.7GHz and a bandwidth of 20MHz. The specification uses a modulation scheme known as orthogonal frequency-division multiplexing (OFDM) that is especially well suited to use in office settings. In 802.11a, data speeds as high as 54 Mbps are possible. This standard employs the single input, single output (SISO) antenna technologies, and the indoor/outdoor ranges from 35m to 125m for 5GHz operating frequency. The outdoor range goes to 5Km for operating frequency of 3.7G. The IEEE802.11a is

less prone to interference compared to with 802.11b due to the high operating frequency of 5GHz.

IEEE 802.11b

IEEE 802.11b standard was released on September 1999 as well. This standard provides 11 Mbps transmission (with a fallback to 5.5, 2 and 1 Mbps) in the 2.4 GHz operating frequency and bandwidth of 22MHz. The 802.11b uses only DSSS (Direct Sequence Spread Spectrum) modulation technique. This standard also employs the SISO antenna technology as in the IEEE802.11a standard. The IEEE802.11b standard was ratified on 1999 from the original IEEE802.11 standard which allowed wireless functionality comparable to Ethernet. The IEEE802.11b standard is prone to higher interference due to the fact that the 2.4GHz frequency range is becoming crowded with carriers, hence increased interference risk. The indoor and outdoor ranges for this standard is 35m to 140m.

IEEE 802.11g

The standard 802.11g was ratified in 2003 as an IEEE standard for Wi-Fi wireless networking and it supports maximum network bandwidth of 54 Mbps compared to 11 Mbps for 802.11b. This standard operates at 2.4GHz frequency and bandwidth of 20MHz. This standard uses the OFDM or DSSS modulation schemes. This standard employs the SISO antenna technologies, and its indoor/outdoor range are from 38m to 140m respectively.

IEEE 802.11n

The 802.11n standard was ratified in 2009 and it utilizes multiple wireless antennas in tandem to transmit and receive data [3-4]. The IEEE802.11n standard employs OFDM modulation technique. The antenna technology used with the IEEE802.11n standard is known as Multiple Input, Multiple Output (MIMO). This technology refers to the ability of 802.11n and similar technologies to coordinate multiple simultaneous radio signals. The MIMO increases both the range and throughput of a wireless network. An additional technique employed by 802.11n involves increasing the channel bandwidth from 20MHz to 40MHz. The 802.11n standard support maximum theoretical network bandwidth up to 300 Mbps. The IEEE802.11n indoor/outdoor ranges are 75m, and 250m respectively.

IEEE 802.11ac

IEEE 802.11ac is the fifth generation in Wi-Fi networking standards released December 2013[5-6]. This standard operating frequency is 5GHz, and bandwidth of 20, 40, 80, 160MHz sectors. The stream rates range for these bandwidth sectors are 7.2 - 96.3Mbps for 20MHz, and 15 – 200Mbps for 40MHz, 32.5 - 433.3Mbps for 80MHz, and 65 - 866.7Mbps for 160MHz. These standard exhibits better performance, and better coverage compared to IEEE 802.11a, b, g and n standards. The 802.11ac standard uses a wider channel and an improved modulation scheme that also supports more clients. The IEEE 802.11ac standard utilizes a modulation technique known as multi-user MIMO. This technique allows a set of users or wireless terminals, each with one or more antennas, o communicate with each other. The indoor range is 35m, and there is no recorded max for outdoor range.