BCA

Semester: V

MIS AND E-BUSINESS

The Network infrastructure for E-Commerce

REFERENCE NOTE

Unit-2: The Network infrastructure for E-commerce

Introduction to Information Superhighway (I-Way)

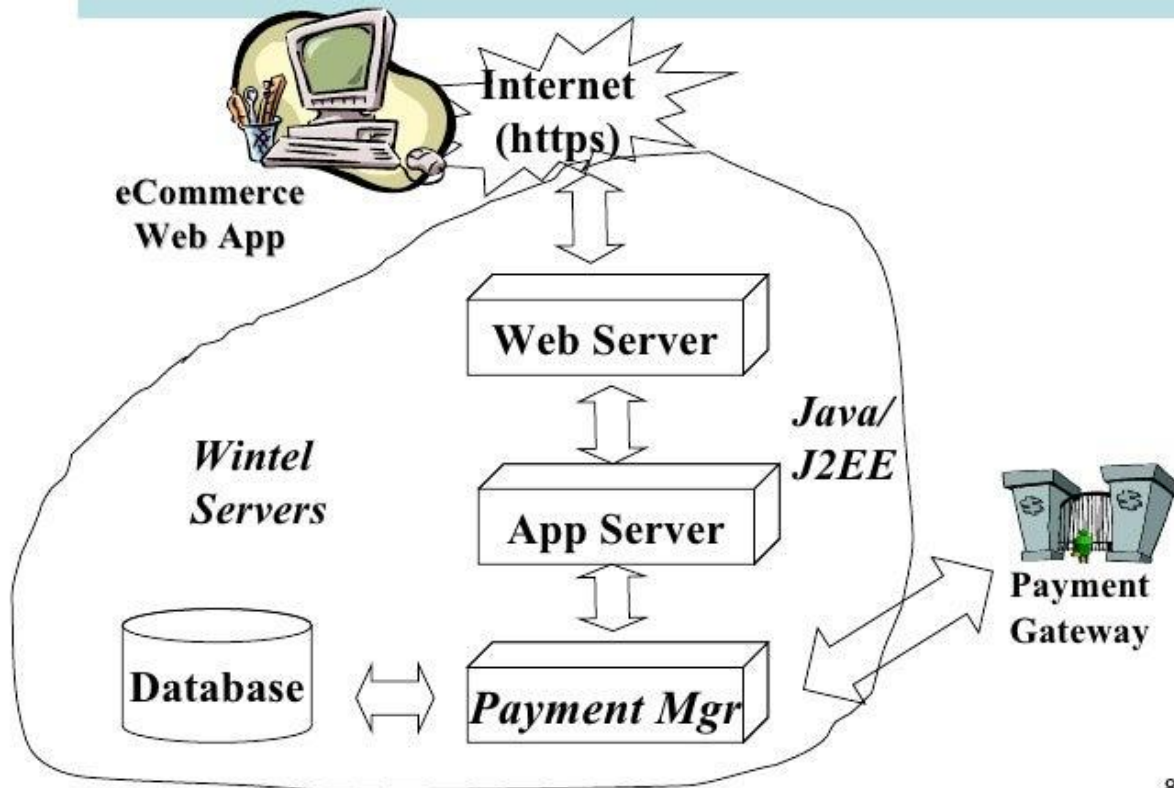- Components of the I-Way
- Internet as a network infrastructure

Wireless Application Protocol:

- Wireless Application Protocol (WAP)
- Architecture of WAP
- Working of WAP

Wireless Technologies:

- ADSL
- WiMAX
- WLAN
- WMAN

- Wi-Fi
- UMTS (3G)
- LTE (4G)
- (5G NR).

➤ **Security Issues related to Wireless Communications.**

Introduction to Information Superhighway (I-Way)

I-Way:

- Global network of computers that potentially, will connect most of world's individuals, firms, and organizations. It is envisioned to provide very high speed access to information in all forms (text, graphics, audio, and video) via a telephone or wireless connection. The term was first used in 1985 by Al Gore.
- The Information Superhighway is very much a physical network, an infrastructure of modern High-capacity, interactive electronic pipeline providing integrated services. I-way links everyone at home or office to everything else.
- The Information Superhighway is a physical network, facilitating the broadband, two-way transmission of any type of digital information, within its own virtual space.

I-Way:

Any e-commerce application will need the I-Way infrastructure in the same manner as any normal business would require the interstate highway network to carry goods from one place to the other.

I-Way is a network of interconnected data highway of several types:

- Cable TV wires
- Cellular and satellite
- Telephone wires
- Radio-based wireless

I-Way is an interactive two-way high-capacity method of transporting information and services. I-Way is applicable in large volume e-commerce applications as it provides traffic-free telecommunication service. I-Way helps organizations, firms and companies in upgrading their network infrastructure. It also helps companies and organizations in recognizing the following:

1. Their infrastructure
2. Ways to change their business
3. Transaction strategies (marketing, advertising, etc.)
4. Ways to sell their products and services
5. Ways to change their relationship with the customer
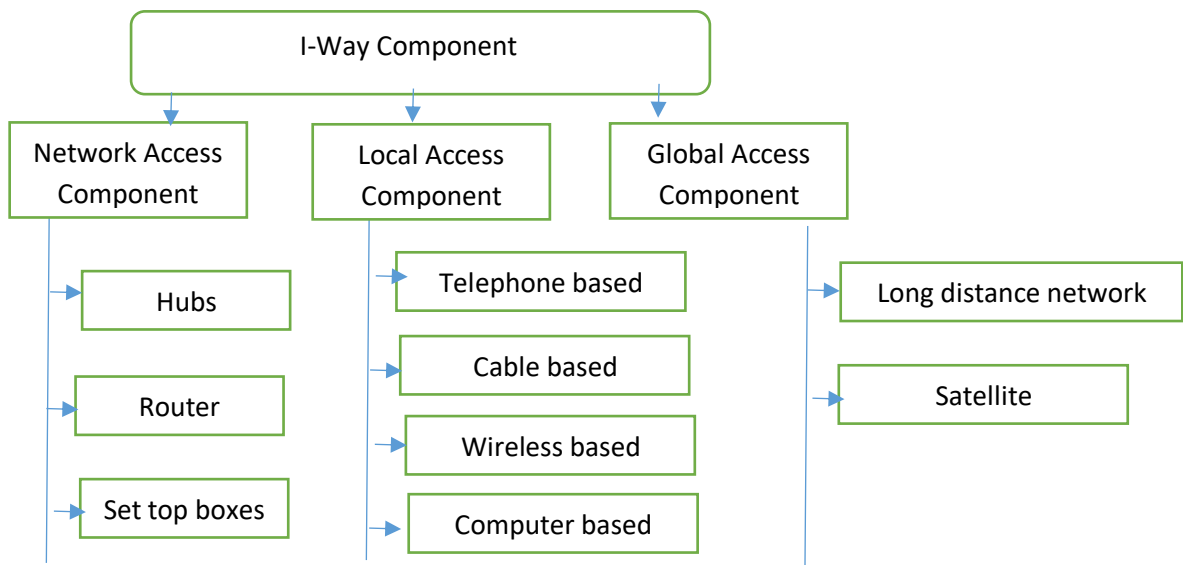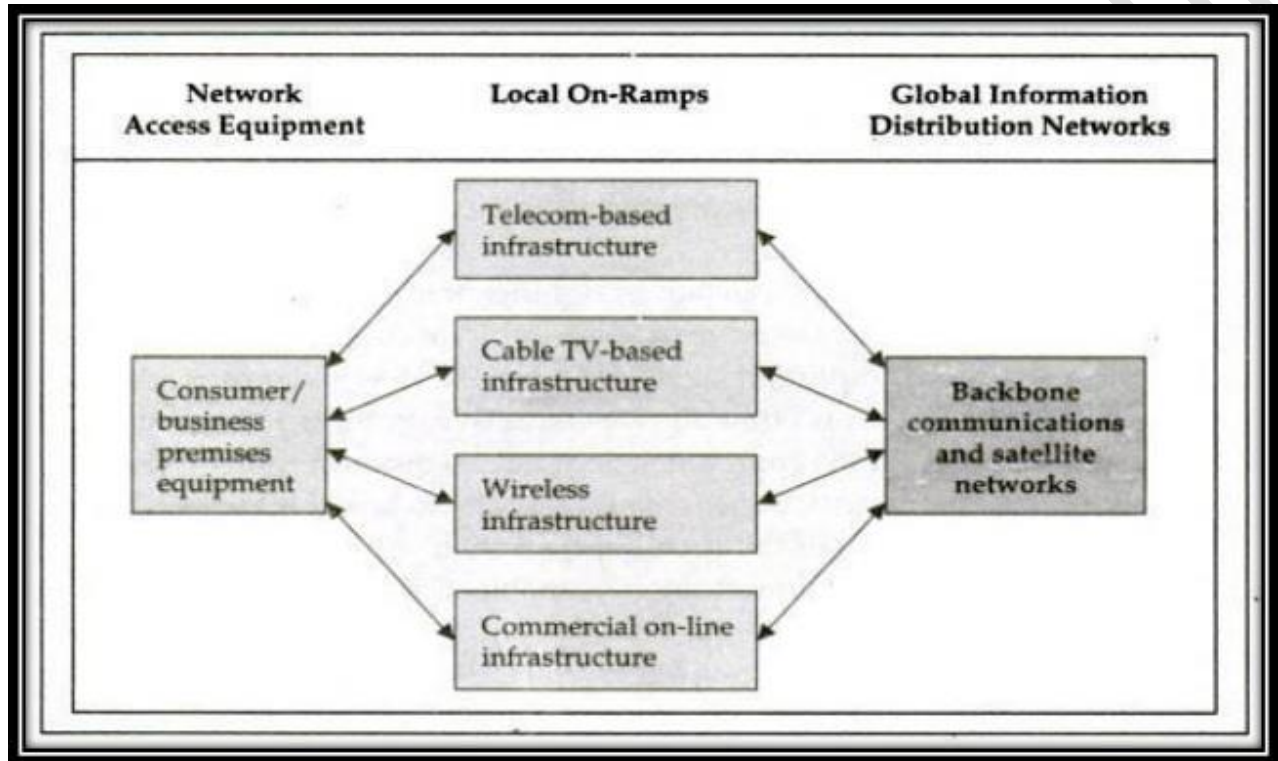
Network access equipment

➤ To access any network, specific equipment is required at the customer and this enables the consumer to access the network. It consists of hardware, such as routers, switches and access devices, such as computers and set-top boxes. Software platforms are browsers and operating systems.

Local access component

➤ Local access component is the link between businesses, homes, schools and organizations to the main communication point also referred to as the 'last mile'. Last mile connection represents a tremendous investment that cannot be easily replaced or overlooked in any network strategy. It provides the following types of connections:

    (a) Telephone-based channel

    (b) Cable-based last channel

    (c) Electrical-based last channel

    (d) Wireless-based last channel

Global access component

Nowadays, e-commerce activities are not limited to any country; and with the world becoming a global village, a proper network infrastructure is required to connect people and businesses across the world. These types of networks include:

    (a) Long distance networks (via coaxial cable or fiber-optic cable)

    (b) Satellite

Internet as network infrastructure

Internet:

➤ It is a "network of networks" that includes millions of private and public, academic, business, and government networks (local or Global), linked by copper wires, wireless connections, and other technologies.

➤ Interconnected network of thousands of networks and millions of computers that links businesses, educational institutions, government agencies, and individuals.

➤ Intranet, extranet and cloud computing (SaaS, PaaS, IaaS) are possible with use internet.

World Wide Web (Web)

➤ One of the Internet's most popular services.

➤ Provides access to billions, possibly trillions, of Web pages.

Backbone

➤ High-bandwidth fiber optic cable that transports data across the Internet

Network Service Provider (NSP)

➤ Owns and controls one of the major networks comprising the Internet backbone.

Bandwidth

➤ Measures how much data can be transferred over a communications medium within a fixed period of time; is usually expressed in bits per second (bps), kilobits per second (Kbps), or megabits per second (Mbps)

Network Access Points and Metropolitan Area Exchanges

➢ One of the hubs where the backbone intersects with regional and local networks, and where the backbone owners connect with one another.

➢ Metropolitan Area Exchanges (MAES) another name for one of the hubs where the backbone intersects with regional and local networks.
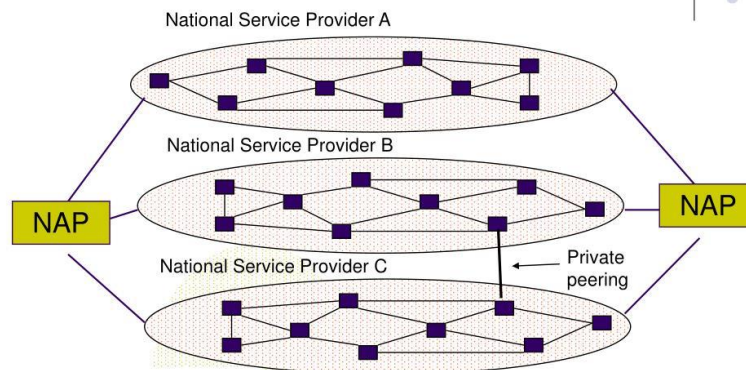
Campus Networks

➢ Generally local area networks operating with a organization that leases access to the Web directly from regional and national carriers

Internet Service Providers

➢ Firm that provides the lowest level of service in the multi-tiered Internet architecture by leasing Internet access to home owners, small businesses, and some large institutions.

Narrowband

➢ The traditional telephone modem connections, now operating at 56.6 Kbps

Broadband

➢ Refers to any communication technology that permits clients to play streaming audio and video files at acceptable speeds -- generally above 100 Kbps Broadband service is based on DSL, cable modem, telephone (T1 and T3 lines), and satellite technologies.

Cable modem

➢ It refers to a cable television technology that piggybacks digital access to the Internet using the same analog or digital video cable providing television signals to a home. Cable Internet is a major broadband alternative to DSL service, generally providing faster speeds and a "triple play" subscription: telephone, television, and Internet for a single monthly payment.

Digital Subscriber Line (DSL)

➢ It is a telephone technology that provides high-speed access to the Internet through ordinary telephone lines found in a home or business. Service levels range from about 768 Kbps up to 7 MBPS.

T1

➢ An international telephone standard for digital communication that offers guaranteed delivery at 1.54 Mbps

T3

➢ An international telephone standard for digital communication that offers guaranteed delivery at 45Mbps

Satellite

➢ Satellite companies provide high-speed broadband Internet access, primarily to homes and offices located in rural areas where DSL or cable access is not available.
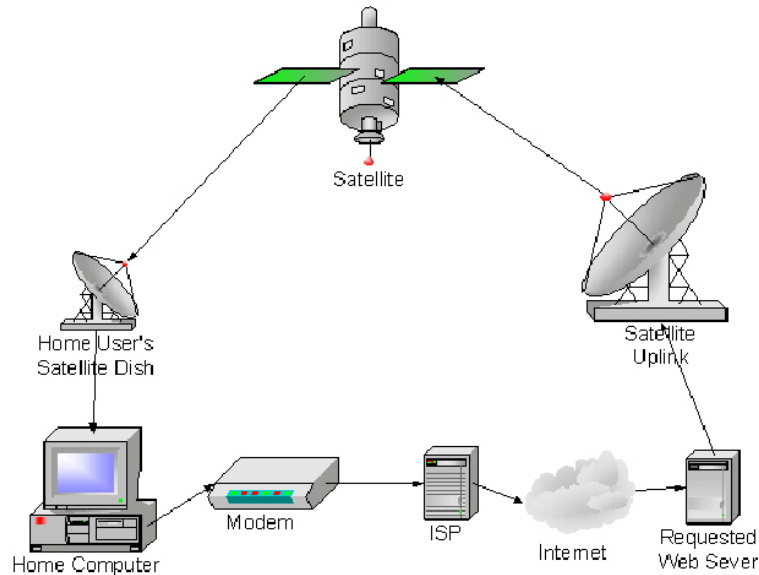
INTRANET

➢ Intranet is defined as private network of computers within an organization with its own server and firewall. Intranet is system in which multiple PCs are networked to be connected to each other. PCs in intranet are not available to the world outside of the intranet. Usually each company or organization has their own Intranet network and members/employees of that company can access the computers in their intranet.

Intranet	Internet
1. Localized Network.	1. Worldwide Network
2. Doesn't have access to Intranet	2. Have access to Internet.
3. More Expensive	3. Less Expensive
4. More Safe	4. Less Safe
5. More Reliability	5. Less Reliability

Extranet

➢ Extranet refers to network within an organization, using internet to connect to the outsiders in controlled manner. It helps to connect businesses with their customers and suppliers and therefore allows working in a collaborative manner.
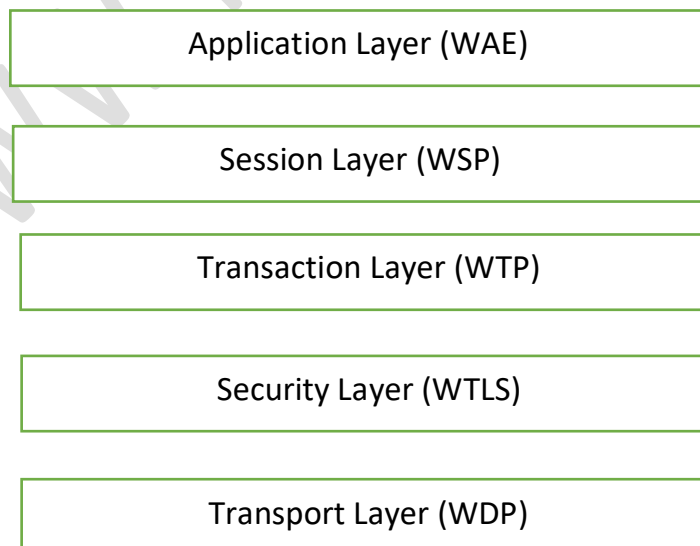
Extranet	Intranet
Internal network that can be accessed externally.	Internal network that cannot be accessed externally.
Extranet is extension of company's Intranet.	Only limited users of a company
For limited external communication between customers, suppliers and business partners.	Only for communication within a company.

Wireless Application Protocol

- ➢ WAP stands for Wireless Application Protocol.
- ➢ It is a protocol designed for micro browser and it enables the access of internet in the mobile device.
- ➢ It uses the mark-up language WML (Wireless Markup Language and not HTML), WML is defined as XML 1.0 application.
- ➢ It enables creating web applications for mobile devices.
- ➢ In 1998, WAP Forum was founded by Ericson, Motorola, Nokia and Unwired Planet whose aim was to standardize the various wireless technologies via protocols.
- ➢ WAP protocol was resulted by the joint efforts of the various members of WAP Forum.
- ➢ In 2002, WAP forum was merged with various other forums of the industry resulting in resulting in the formation of Open Mobile Alliance (OMA).
- ➢ WAP achieved some popularity in the early 2000s.
- ➢ From the 2010s it had been largely superseded by more modern standards.
- ➢ Most modern handset internet browsers now fully support HTML, so they do not need to use WAP markup for web page compatibility, and therefore, most are no longer able to render and display pages written in WML, WAP's markup language.
- ➢ Most modern handset internet browsers now support full HTML, CSS, and most of JavaScript, and do not need to use any kind of WAP markup for webpage compatibility.
- ➢ The list of handsets supporting HTML is extensive, and includes all Android handsets, all versions of the iPhone handset, all Blackberry devices, all devices running Windows Phone, and many Nokia handsets.

Architecture of WAP

Application Layer (WAE)

Session Layer (WSP)

Transaction Layer (WTP)

Security Layer (WTLS)

Transport Layer (WDP)

Architecture of WAP

Application Layer:
This layer contains the *Wireless Application Environment (WAE).* It contains mobile device specifications and content development programming languages like WML.

Session Layer:
This layer contains *Wireless Session Protocol (WSP)*. It provides fast connection suspension and reconnection.

Transaction Layer:
This layer contains *Wireless Transaction Protocol (WTP)*. It runs on top of UDP (User Datagram Protocol) and is a part of TCP/IP and offers transaction support.

Security Layer:
This layer contains *Wireless Transaction Layer Security (WTLS).* It offers data integrity, privacy and authentication.

Transport Layer:
This layer contains *Wireless Datagram Protocol*. It presents consistent data format to higher layers of WAP protocol stack.
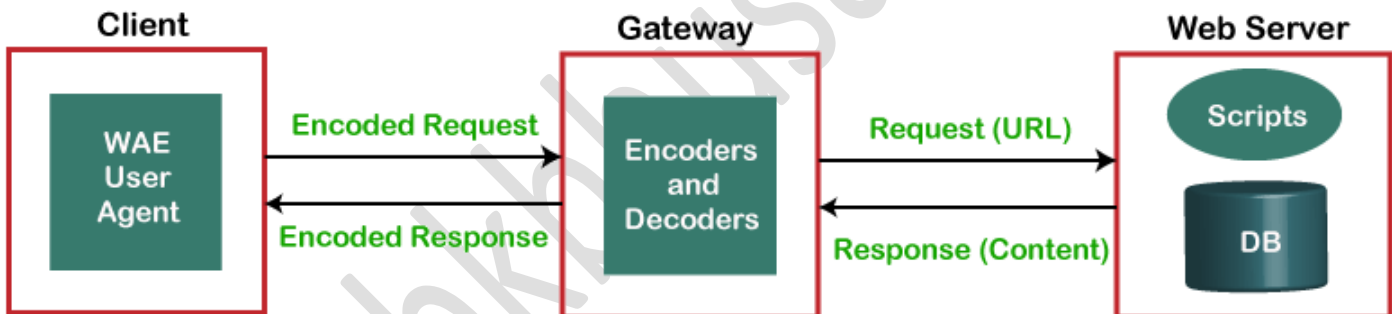
- ➤ The user opens the mini-browser in a mobile device. He selects a website that he wants to view.
- ➤ The mobile device sends the URL encoded request via network to a WAP gateway using WAP protocol.
- ➤ The WAP gateway translates this WAP request into a conventional HTTP URL request and sends it over the internet.
- ➤ The request reaches to a specified Web server and it processes the request just as it would have processed any other request and sends the response back to the mobile device through WAP gateway in WML file which can be seen in the micro-browser.

Wireless Technologies
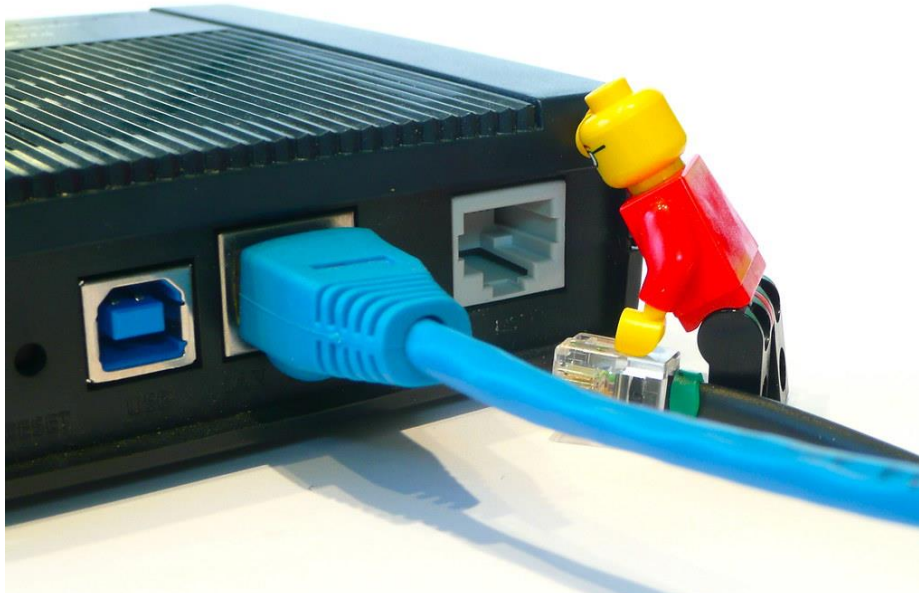
- ADSL (Asymmetric Digital Subscriber Line) is a high-speed Internet access service that utilizes existing copper telephones lines to send and receive data conventional dial-up modems.
- ADSL uses standard telephone lines to transmit upstream and downstream data on a digital frequency, which sets these data streams apart from the analog signals telephones and fax machines use.
- ADSL allows data steam speeds from 1.5 to 8 megabits per second (Mbps).

ADSL download and Upload
- The "asymmetric" in ADSL refers to the fact that the downstream data rate, or the data coming to your computer from the Internet, is traveling faster than upstream data, or the data traveling from your computer to the Internet.
- Upstream data rates are slower because Web page requests are fairly miniscule data strings that do not require much bandwidth to handle efficiently.

SDSL or Symmetric Digital Subscriber Line
- Some businesses, however, may require matching upstream rates for uploading large files. SDSL, or Symmetric Digital Subscriber Line is an option. "Symmetric" indicates that both DataStream are operating at the same speed of 1.5 to 7 Mbps.
- SDSL service requires a dedicated telephone line because, unlike ADSL, telephone and fax services cannot share a line with SDSL service.

Wireless (LMW) Area Network
- Wireless WAN is a wide area network in which separate areas of coverage or cells are connected wirelessly to provide service to a large geographic area.
- This network enables you to access the Internet via a wireless wide area network (WWAN) access card and a PDA or laptop.
- These networks provide a very fast data speed compared with the data rates of mobile telecommunications technology, and their range is also extensive. Cellular and mobile networks based on CDMA (Code division multiple) and GSM (Global System for Mobile Communications), satellite are good examples of WWAN.
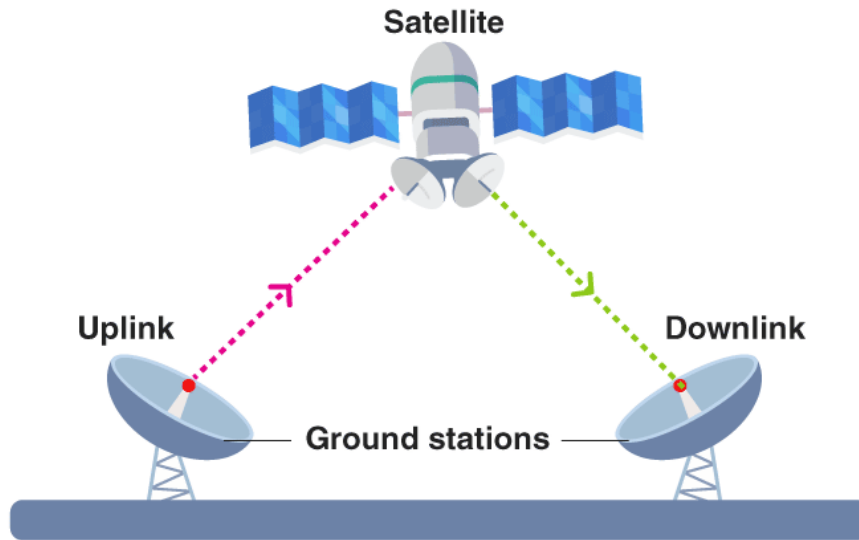
What is WiMAX?

WiMAX stands for Worldwide Interoperability for Microwave Access.
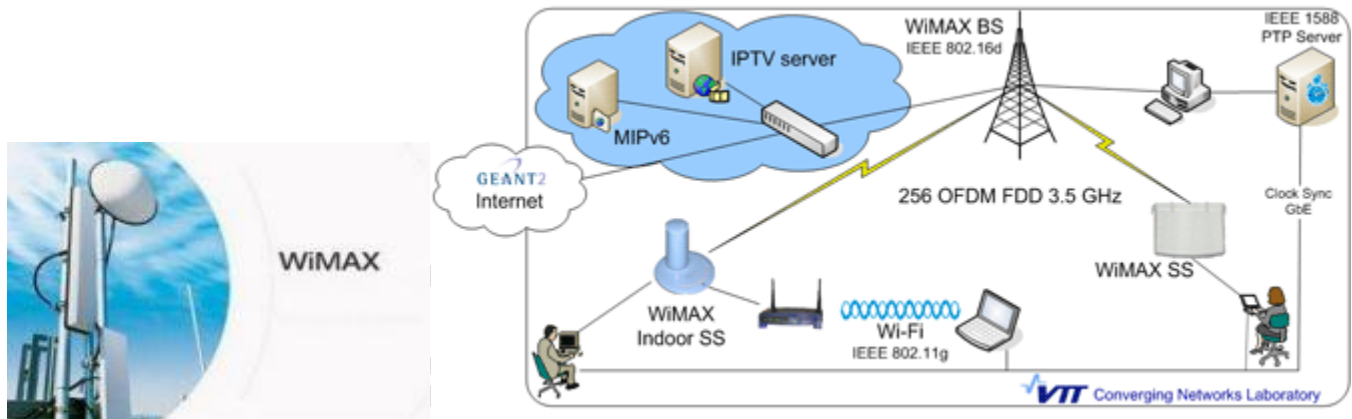
- ➢ Orthogonal Frequency Division Multiplexing (OFDM) (carriers of width of 5MHz or greater can be used) connectivity at speeds up to 70 Mbps.
- ➢ WiMAX refers to broadband wireless networks that are based on the IEEE 802.16 standard, which ensures compatibility and interoperability between broadband wireless access equipment.
- ➢ WiMAX, which will have a range of up to 31 miles, is primarily aimed at making broadband network access widely available without the expense of stringing wires (as in cable-access broadband) or the distance limitations of Digital Subscriber Line.

Fundamental WiMAX Concepts

- ➢ Base Station (BS) The BS is the node that logically connects wireless subscriber devices to operator networks. The BS maintains communications with subscriber devices and governs access to the operator networks.
- ➢ A WiMAX tower, similar in concept to a cell-phone tower - A single WiMAX tower can provide coverage to a very large area.

➢ Subscriber Station (SS). The SS is a stationary WiMAX-capable radio system that communicates with a base station, although it may also connect to a relay station in multi-hop relay network operations.

What is Wi-Fi?

➢ Wi-Fi is stands for Wireless Fidelity
➢ Wi-Fi is a wireless technology that uses radio frequency to transmit data through the air.
➢ Wi-Fi is a universal wireless networking technology that utilizes radio frequencies to transfer data.
➢ Vic-Hayes has been called the "father of Wi-Fi".
➢ Wi-Fi allows you to use your computer or other device to connect to the internet from anywhere there is a Wi-Fi access point (often known as a hot Spot).
➢ Wi-Fi is the wireless way to handle networking.
➢ It is also known as 802.11 networking.
➢ The big advantage of Wi-Fi is its simplicity.
➢ We can connect computers anywhere in our home or office without the need for wires. The computers connect to the network using radio signals, computers can be up to 100 feet or so apart.

3G (UMTS)

➢ 3G actually stands for "third generation", as it is the third type of access technology that has been made widely commercially available for connecting mobile phones.
➢ It is also known as UMTS System. GENE (3G) stands for Universal Mobile Telecommunication System.
➢ It is one of the THIRD mobile phone technology
➢ It is standardized by 3GPP (Third Generation Partnership Project)
➢ First step towards all-IP vision.
➢ It is an evolution of GSM technology (Global System for Mobile)
➢ UMTS, the 3G successor to GSM, utilizes the W-CDMA(Wideband Code-Division Multiple Access) air interface and GSM infrastructures, so it is also called 3GSM
➢ UMTS is an upgrade from GSM via GPRS (General Packet Radio Service)
➢ **Data rates of UMTS are:**
➢ 144 kbps for rural
➢ 384 kbps for urban outdoor
➢ 2048 kbps for indoor and low range outdoor

Advantages and Disadvantage

➢ Fast Internet
➢ Smooth Multimedia Messaging (MMS)
➢ Enhanced Location based services
➢ Enhanced Communication (Email, IM, File sharing) Campus
➢ Increased Capacity compared to 2G.

Disadvantage

➢ Poor Video Experience
➢ Drains battery
➢ Expensive that GSM
➢ Still not full Broadband

4G (LTE)

➢ 4G means the fourth generation of data technology for cellular networks following 3G, the third generation. LTE stands for Long Term Evolution and is short for a very technical process for high-speed data for phones and other mobile devices. Together, they make 4G LTE-the fastest 4G service available today.

➢ It is designed to provide up to 10x the speeds of 3G networks for mobile devices such as smartphones, tablets, netbooks, notebooks and wireless hotspots.

➢ 4G technologies are designed to provide IP-based voice, data and multimedia streaming at speeds of at least 100 Mbit per second and up to as fast as 1 GB per second.

➢ With the power of 4G LTE, you can share and stream video in high definition; game in near-real time; surf quickly and easily; and download songs and photos in seconds and movies in minutes.

Comparison	2G	3G	4G	5G
Introduced in year	1993	2001	2009	2018
Technology	GSM	WCDMA	LTE, WiMAX	MIMO, mm Waves
Access system	TDMA, CDMA	CDMA	CDMA	OFDM, BDMA
Switching type	Circuit switching for voice and packet switching for data	Packet switching except for air interference	Packet switching	Packet switching
Internet service	Narrowband	Broadband	Ultra broadband	Wireless World Wide Web
Bandwidth	25 MHz	25 MHz	100 MHz	30 GHz to 300 GHz
Advantage	Multimedia features (SMS, MMS), internet access and SIM introduced	High security, international roaming	Speed, high speed handoffs, global mobility	Extremely high speeds, low latency
Applications	Voice calls, short messages	Video conferencing, mobile TV, GPS	High speed applications, mobile TV, wearable devices	High resolution video streaming, remote control of vehicles, robots, and medical procedures

Security Issues related to wireless Communications

1. DENIAL OF SERVICE

➢ Denial of service is a simple a wired or wireless network. by routing a that relies on limiting access to services on wire and wireless network.

➢ This is hack is commonly accomplished by routing a tremendous amount of traffic at a specified target.

➢ With this approach, the high volume of traffic overwhelms the target machine and disrupts service.

➢ It is also possible for hackers to launch a denial of service attack by simply disrupting the signal on the network.

➢ This can be achieved by causing enough interference on one channel to interrupt the service.

2. ROGUE ACCESS

- ➢ A common method of attack used by hackers is the use of a rogue access point that is setup within range of your existing wireless network.
- ➢ The concept behind a rogue access point is simple. Hackers establish these false networks to fool people and devices in range to use those access points.
- ➢ This allows hackers to access data and information on legitimate devices that should be secure.

3. PASSIVE CAPTURING

- ➢ Security Issues related to Wireless Communications
- ➢ Passive capturing is another threat to security on your wireless network.
- ➢ Passive capturing is accomplished by setting up devices within range of the network and "listening" to the data traffic traveling along your network and capturing that information.
- ➢ What hackers do with that information differs depending upon the goal of the hacker.
- ➢ Some attempt to breakthrough your existing security settings by analyzing network traffic, while others simply look through the non-secured traffic to potentially access sensitive information regarding business operations.

Assignment

1. What is I-way? Explain components of I-way?
2. Explain four pillar of e-commerce infrastructure?
3. What is WAP? Explain working mechanism of WAP.
4. What is WAP? Explain working major limitation of WAP.
5. Comparatively explain 2G, 3G, 4G and 5G Technology to provide wireless services.
6. Explain wireless security issues.