Internet technology from networks to streaming servers

Chapter 1: Internet and The World Wide Web

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The contents of this presentation have been prepared from Internet Technology from networks to streaming servers.

Why should I read this chapter?

- The Internet has changed the world, and will continue to have an amazing impact on our day-to-day lives. For example, cars promise to soon be able to drive themselves, avoid traffic accidents and congestion, and automatically adjust personal schedules and much more.
- This chapter covers the things you need to know to be prepared for this ever-changing digital world, including:
  - Information about evolution of internet and internat.
  - Information about web and its technologie .
  - Applications—web programming languages used in creating websites.

Learning Objectives

After you have read this chapter, you should be able to:

1. Define the Internet.
2. Compare the difference between Circuit Switching and Packet Switching.
3. Describe the IP address.
4. Explain The Intranet and Extranet working mechanism.
5. Describe the ISP.
6. Distinguish between the internet access technologies.
7. Discuss the advantages and disadvantages of using the internet .
8. Compare the differences between Internet and WWW.
9. Explain the web programming languages.
10. Compare the difference between Client side and Server side.
11. Know how finding information on the web.

Evolution of Internet

- **Pre-Internet :** Computers are used for computing.

- **With the Internet :** The most interesting information problems rely on communication.There are massive kinds of information available as Text documents, graphics files,.....etc.

Concept of the Internet

- In the late 1960s, DARPA (Defense Advanced Research Projects Agency) was looking for different communication ways of networks of computers that coordinate and control nuclear weapons to Resist attack and will continue to function even if it was down.

- In 1969,ARPA used this network model to connect 4 computers, this network was called **ARPANET**.

- Many Networks were created that used different technologies and protocols to exchange information across these networks.

Concept of the Internet – continue..

- In 1989, a number of protocols were combined to form ARPANET protocol which developed to create TCP/IP (Transmission Control Protocol / Internet Protocol).

- In 1993, All computers that are connected to networks have been used TCP/IP Model.

Packet Switching Vs Circuit Switching

- Packet Switching or Circuit Switching Networks can be classified as circuit-switched networks or packet-switched networks.
- This classification has been done based on the way in which data is passed between the source and the destination computers.

Packet Switching Vs Circuit Switching

- In the case of a circuit-switched network : a direct physical connection is established between the sender and receiver.
- The data needs to be sent only through the connection that has been established. The other computers cannot use the communication channel until it is released.
- In the case of packet-switched networks : data that is to be transmitted, such as a file, is divided into small units of data called packets or data packets. The data packets can take different paths to reach the destination.
- An intermediate devices called routers can be used to identify the shortest path to a destination and transmit the data packets through that path.

Internet

- An Internet refers to a group of networks that are connected to each other.
- However, the Internet refers to the global network of networks and is the largest internetwork
- Internet also refers to the products, concepts, technologies used to develop the connections among disparate networks.

There are three fast-growing Internet technologies :

1. World-Wide Web (TCP/IP to the masses)
2. Multimedia streaming (real-time, on-demand audio/video to the home)
3. Wireless networks (freedom from physical constraints of wires (anything, anytime, anywhere))

Internet Services

Task of Internet: Provide Services for Users Services:

- World Wide Web (WWW)
- Video Conferencing
- File Transfer Protocol (FTP)
- TELNET
- Email
- Internet Relay Chat (IRC)

Who governs the Internet ?

- No corporation owns or operate all the networks.
- No governing body of the Internet.
- Volunteer Groups had been formed to : Help coordinate and Guide Technical parts of internet.
- **Volunteer Groups as :**
  - **Internet Society Professional Membership Society (ISOC) :** to provide leadership in Internet-related standards, education, access, and policy.
  - **World Wide Web (WWW) :** Responsible for drafting, circulating for review and modifying web standards.
  - **Internet Network Information Center (InterNIC) :** Responsible for Domain Registeration.

Who governs the Internet ?

- **The Main technologies that are essential in connecting computers and assigning space on internet :**
  - Doman Name System “ DNS ”
  - Internet Protocol Address “ IP ”

Who governs the Internet ?

- **United States Government :**
  - Still maintains ultimate control of the root system of DNS.
  - Has handed day-to-day administration of DNS.
- **Internet corporation for Assigned Names and Numbers (ICANN) :**
  - Manages the root name server of the internet.
  - Responsibility for the IP address space allocation, protocol parameter assignment, domain name system management, and root server system management.
- **Internet Engineering Task Force (IETF) :**
  - It is an open community of engineers, vendors, operators and researchers to develop new standards and innovations for the internet.
  - Responsible for overseeing how the internet's TCP/IP protocol evolve.
- **International Telecommunication Union (ITU) :**
  - Developing International communications standards.

Figue 1.5

Who manages IP address ?

- Internet Addresses must be unique and address space on the internet is limited.
- So, there is a need for some organizations to control and allocate address number blocks.
- **Internet Assigned Numbers Authority (IANA) :**
  - Responsible for IP address management.
  - Responsible for the global coordination of the DNS Root
  - Responsible for IP addressing.
  - Responsible for Internet Protocol Resources.

Who manages IP address ?

- **In Dec 1997, IANA turned this responsibility over to :**
  - **American Registry For Internet Numbers (ARIN):**
    - Responsible for internet registers in Canada, many Caribbean, North Atlantic Islands and The United States.
  - **Asia-Pacific Network Information Center (APNIC):**
    - Manages the assignment of Internet number resources within the Asian region.
  - **Réseaux IP Européens Network Coordination Center (RIPE NCC) .**
  - **African Network Information Center (AFRINIC) .**

Figure 1.6

Continuous ...

- Today, there isn't any particular organization who exercise control over the Internet. It is still governed by volunteer group who exercise control over Internet to some extent but there is no complete authority.
  - **Internet Activities Board (IAB) :**
    - Comprised of IETF and IRTF.
    - Technical body that supervises the development of the internet suite of protocols.
  - **Internet Network Information Center (InterNIC) :**
    - Provides registry services needed for the internet to operate effectively.
  - **World Wide Web (W3C) :**
    - which is thorganization responsible for drafting , circulating for review and modifing web standards.

Figure 1.4

Intranet and Extranet

- **Intranet**
  - A Private version of the Internet which have the same architecture as in Internet.
  - An Internal Network (not available to the world outside of Intranet).
  - Uses TCP/IP.
  - Founds in corporations for secure sharing organization's information.
  - The Intranet will reside behind a firewall that helps to control access between the intranet and Internet to permit access to intranet only to people who are members of the same organization.
- **Advantages of Intranet:**
  - Easy Access of company data to employees.
  - communication between employees in large organizations is improved.

Intranet and Extranet

- **Intranet**

  ***Applications of Intranet* :**

  - Sharing of company polices/rules.
  - Access employee Database.
  - Access product & Customer Data
  - Sharing of information of common interest.
  - Submission of reports.

Intranet and Extranet

- **Extranet**
  - Is an Intranet for outside authorized users using same internet technology.
  - The actual server (PC) will reside behind a firewall.
  - The firewall helps to control access between Intranet and Internet permitting access to the Intranet only to people who are suitably authorized.
  - Extranet is considered as an Large- Organizational information system.
  - The access can be based on a username and password or an IP address (a unique set of numbers as 209.33.27.100 that defines the computer) .

What is an Internet Service Provider ?

- IS a company provides users/companies access to the Internet.
- Sometimes referred as IAP (Internet Access Provider) which used as an abbreviation for independent service provider to distinguish a service provider that is an independent.
- The Larger ISPs have their own high-speed leased lines so that they are less dependent on the telecommunication providers and can provide better service.
  - Ex. Vodafone, Etisalat, Orange

Layered System View

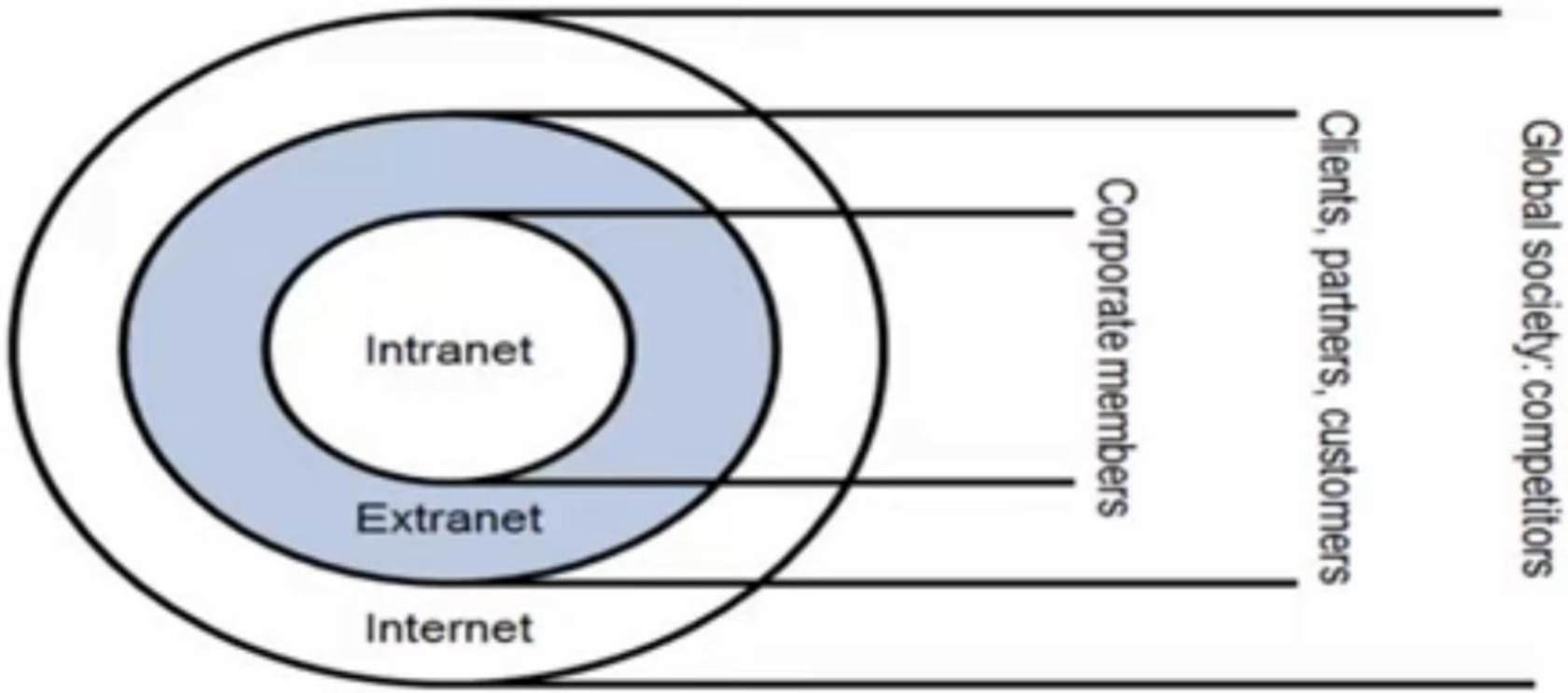


Figure 1.7 Layered System View

How does ISP connect you to the internet ?

- When the user is connected to the internet through your service provider , communication between the user and the ISP is established using simple protocol PPP.
- **PPP (point to point protocol) ,** a protocol making it possible for two remote computers to without having IP address .
- **communication between the user and the service provider is established according to the PPP protocol which is characterized by :**
  - A telephone call
  - Initialization of communication
  - Verification of the user name (login or user ID)
  - Verification of the password

Internet access technologies

- **Internet access**
  - Internet access connects individual computers , terminals , computers ,mobile devices and computer networks to the internet enabling users to access internet service .
  - **The main new access technologies are :**

    1-Digital subscriber line.

    2-Wireless internet access.

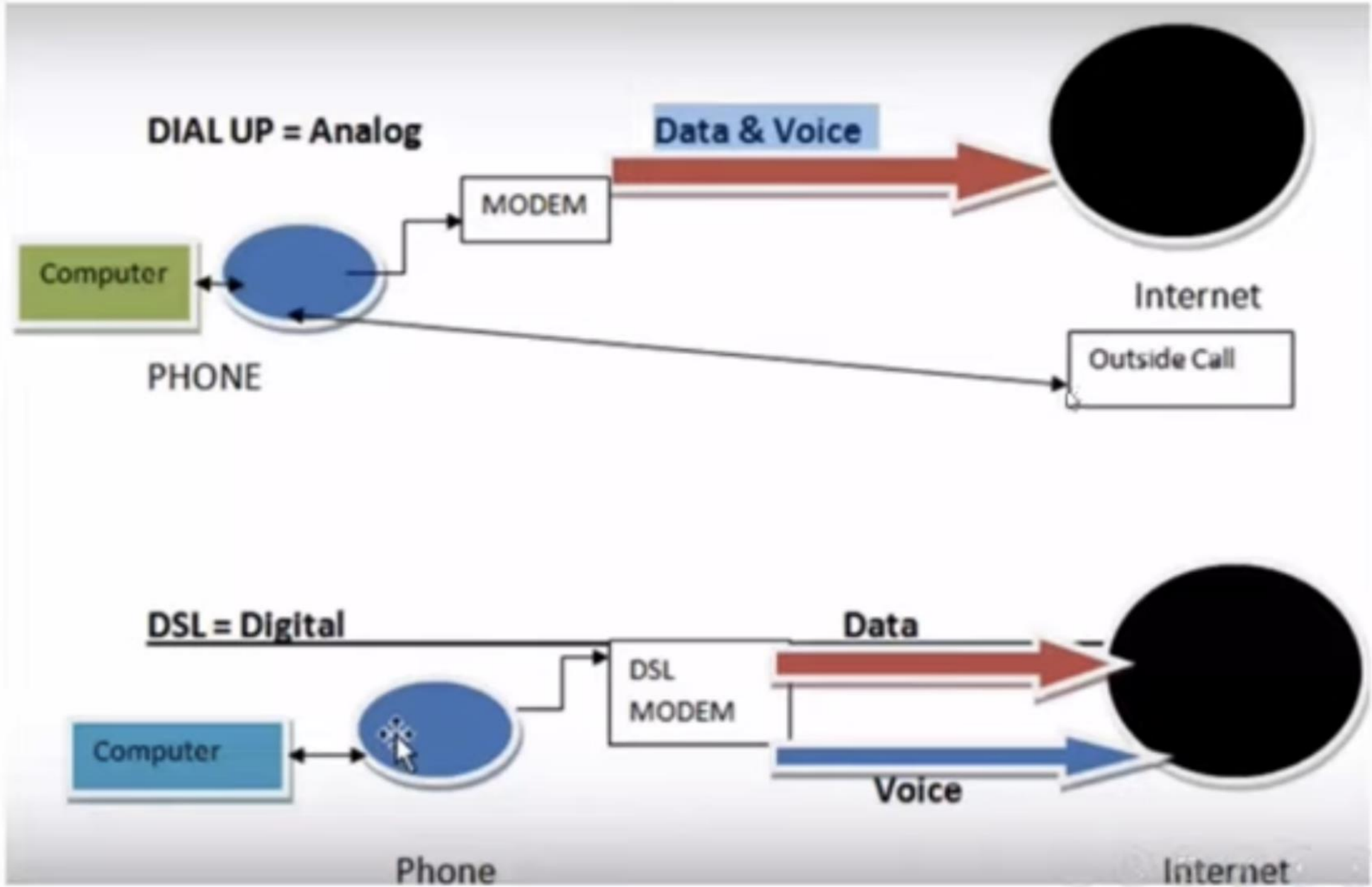
1-Digital subscriber line (DSL)

- **DSl (digital subscriber line)** is a group of technologies that provide high , speed internet access by using the ordinary telephone lines . the main categories of DSL services are ADSL and VDSL .
- **Asymmetric Digital subscriber line (ADSL)**

  ADSL is the most common type of DSL , it is asymmetric since downstream is faster than upstream.

Characteristics of ADSL :

- Allow download speed of up to about 256 Kbit/s to 20 Mbit/s depending on DSL technology , line condition and service level implementation .
- Uses standard telephone lines.
- Telephone can be used normally , even when surfing in the web.
- An “always on” service.


DIAL UP = Analog
Data & Voice
MODEM
Computer
Internet
Outside Call
PHONE
DSL = Digital
Data
DSL
MODEM
Computer
Voice
Phone
Internet

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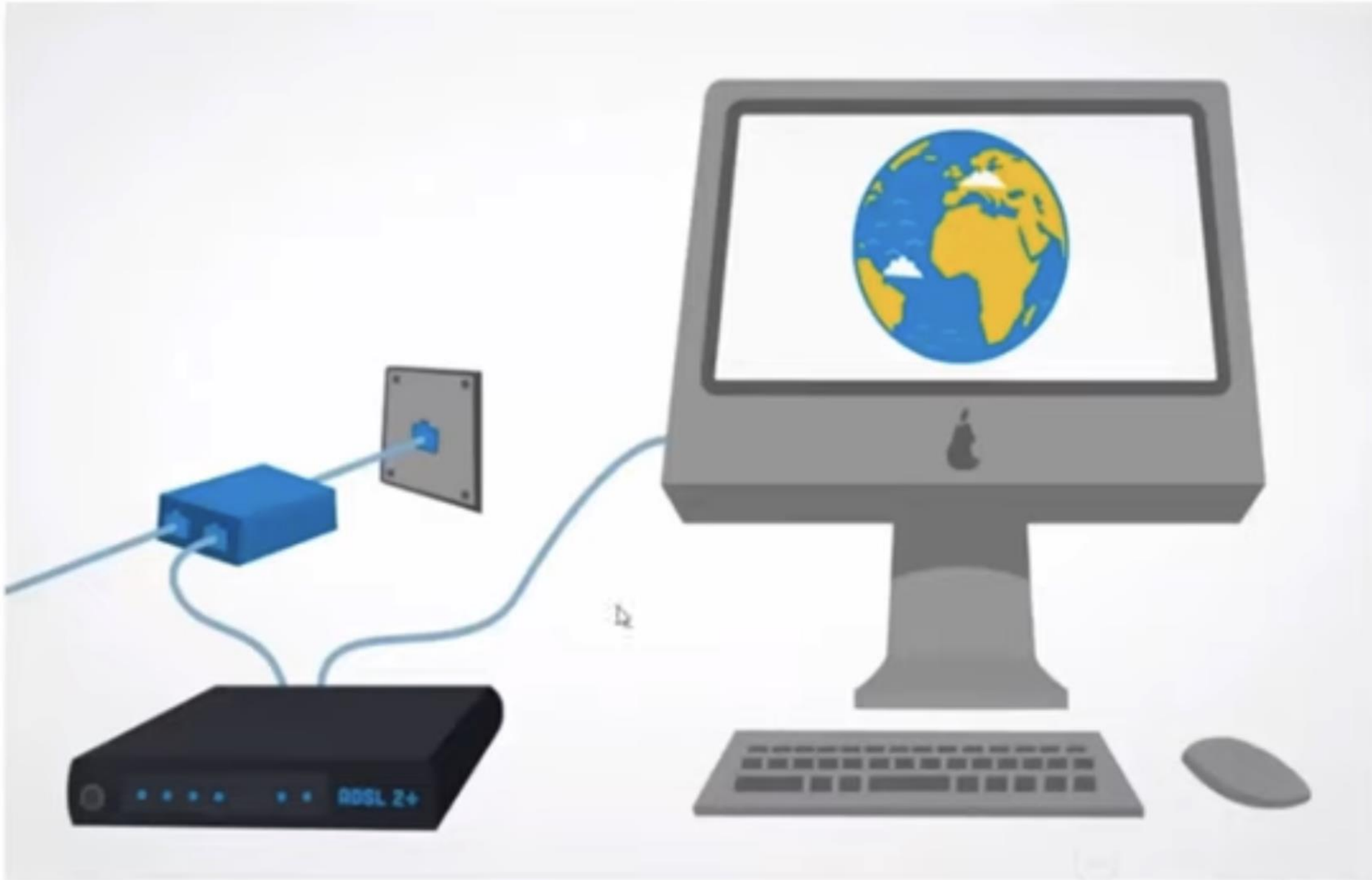
1-Digital subscriber line (DSL)

- **The requirements of ADSL :**
  - ADSL splitter separates the analog voice (phone) traffic from data (ADSL) traffic.
  - ADSL modem converts digital signals from your PC into analog signals that can be transmitted over telephone cable in the local loop.
  - Local loop is the path of telephone line that will take from customer house to the local exchange .
  - Service provider.
  - The cable consists of a “ copper pair”.


ADSL 2+

1-Digital subscriber line (DSL)

- **Very-high-data-rate DSL (VDSL or VHDSL ,ITU G.993.1)**

  VDSL is a digital subscriber line (DSL) standard approved in 2001.

- **Characteristics of VDSL:**
  - Provides data rates up to 52 Mbit/s downstream and 16 Mbit/s upstream over a single flat untwisted or twisted pair of copper wires and up to 85 Mbit/s downstream and upstream on coaxial cable.
  - Supports applications such as high definition television , telephone services (voice over IP) and general internet access , over a single **physical connection .**

2-Wireless internet access

- It is provided by wireless internet service provider (WISP)
- There are several of forms of wireless internet service , based on Wi-Fi , WiMax , cellular and satellite technologies .Internet access provide internet access for mobile network devices such as laptops , handheld computers and cell phones in airports ,coffee shops , conference rooms,...etc.

- **Types of Wireless internet access :**
  - Fixed wireless(including satellite access).
  - Mobile internet access (WAP).

Advantages of using the internet :

- Enables communication across networks regardless of the underlying of network technologies.
- Addresses the problems that could arise in reliability ,connectivity, flexibility and network management.
- Connects and effectively transmits data even across networks that operate at varying speeds .
- Allows latest news and online reference.
- Social networking and staying connected.
- Online services and E-commerce.
- Marketing and publicizing products and services.
- Gathering valuable feedback and suggestions from customers and business partners.

Disadvantages of using the internet

- Information overload.
- There is a lot of wrong information on the internet.
- Some viruses can get into the PC's and destroy valuable data.
- Hackers can use internet for identity theft.

The world wide web

- The world wide web (WWW) is defined as a distributed client-server service , in which a client using a browser can access a service using a server .However, the service provided is distributed over many locations called sites ,Each site hold one or more documents, referred as web pages. These documents are connected together through the use of hyperlinks or hypertext (hyperlink is a text which contains links to other texts) and are created with hypertext markup language such as HTML.

The internet and the web (what is the difference ?)

- In fact , thery are separate entities , but are also welded together ,the web is one of the most recent additions to the internet which consider as internet information resource but internet transports information to or from users.
- **Thus we can define both of them as:**
  - The internet is the hardware and software protocols which enables communication across computer networks , whereas the world wide web is a software system which resides upon the internet and uses hypertext protocol to link documents together.
  - For users to gain access To the world wide web , they will need to access the internet and software program (web browser).

Web Generation

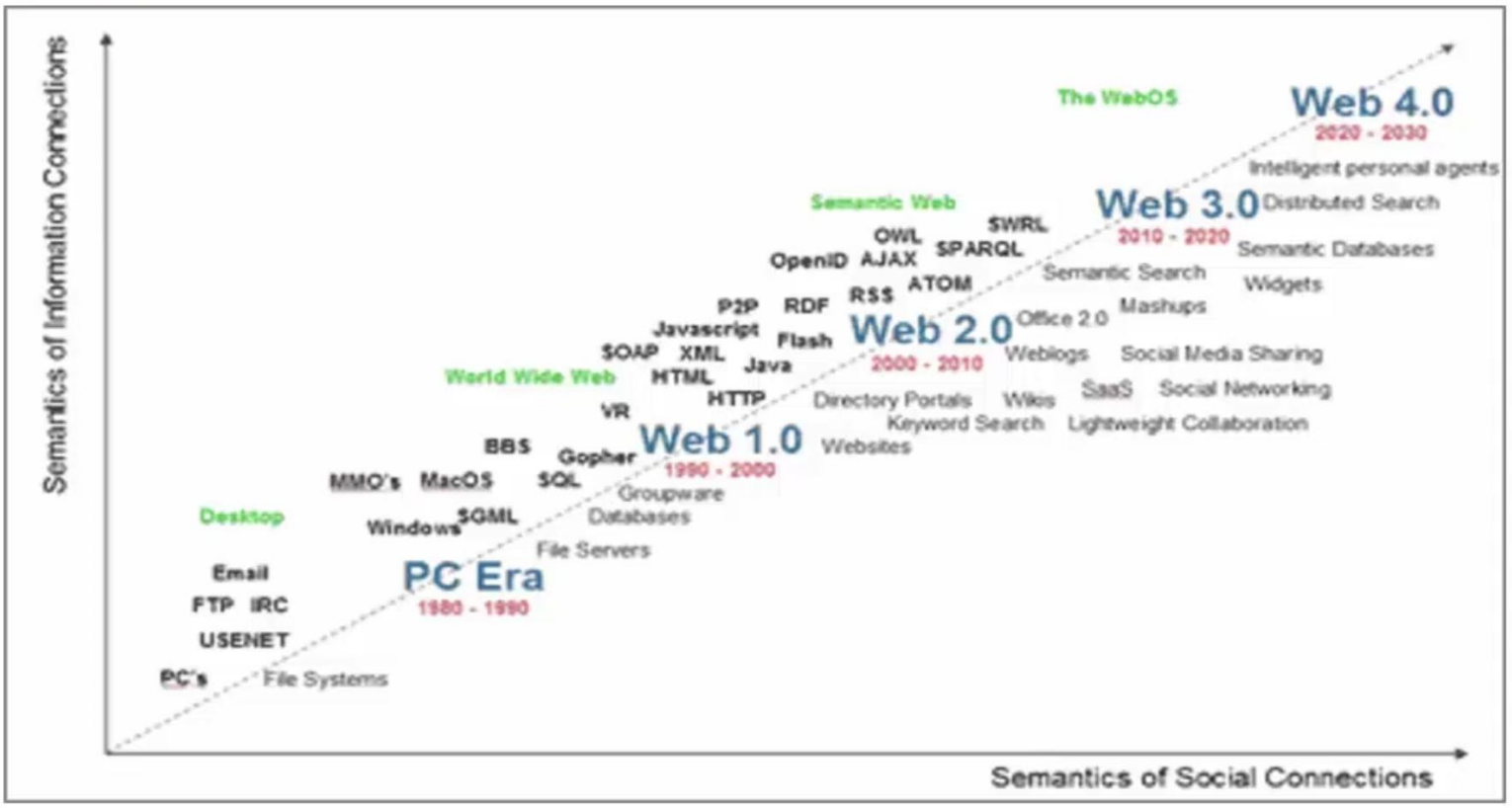


Figure 1.8

Web 1.0

- Web 1.0 was the first generation of the Web. It was generally used before 1999 when experts called it the Read -Only era. During this phase the focus was primarily on building the Web, making it accessible, and commercializing it for the first time.
- The main features of Web 1.0 were hyper-linking and Bookmarking of the web pages. Users could only view web pages but not contribute to the content of them. Also, the emails were sent through the HIM L form. Web 1.0 web page's information is closed to external editing. Thus, information is not dynamic, being updated only by the webmaster. Key areas of interest centered on protocols such as HTTP, open standard markup languages such as HTML and XMI .

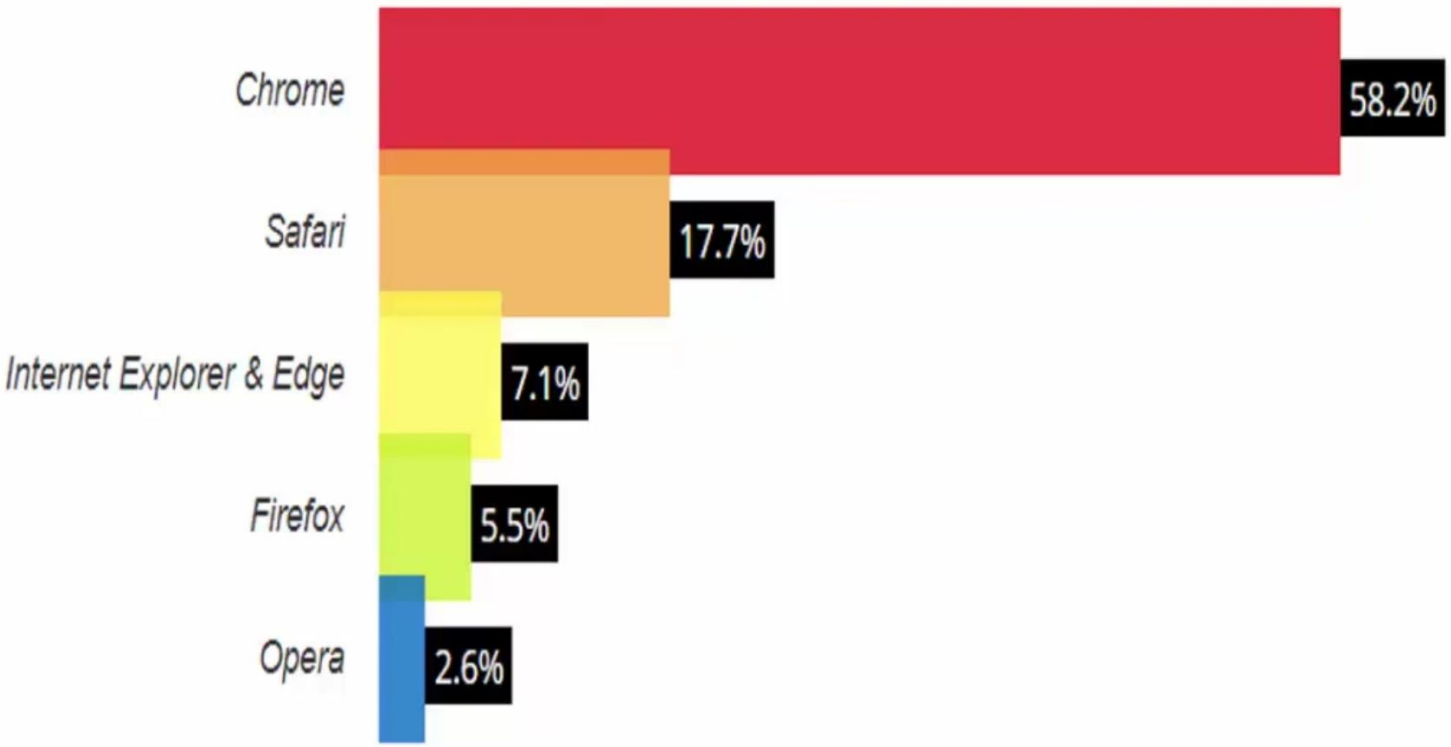
Web 2.0

- Web 2 was popularized by Tim O'Reilly at the O'Reilly Media in 2004, refers to a supposed second generation of Internet-based services — such as social networking sites (Twitter and Facebook), blogs ,wikis, communication tools and video streaming that emphasize online collaboration and sharing among users.
- Another trend that has been a major factor in Web 2.0 emergence of the mobile Internet and mobile devices (including camera phones) as a major new platform driving the adoption and growth of the Web .

Web 3.0

- Web 3.0, was invented by john Markoff of the New York Times in 2006, refers to a supposed third generation of Internet-based services that collectively comprise what might be called the intelligent Web — such as those using semantic web, microformats. natural language search, data-mining, machine learning, recommendation agents, and artificial Intelligence technologies – which emphasize machine-facilitated understanding of information in order to provide a more productive and Intuitive user experience.
- The most popular Web browsers.
  - Web Browser (Web Client) Is a program that retrieves information from the Web by displaying Web pages and linked items such as Microsoft Internet Explore, Firefox, Opera, etc…

The most popular Web browsers 1/2020



Web Server

- A web server can refer to either the hardware (the computer) or the software (the computer application) that responds to the request from the web browser. The most common use of web servers is to host websites, but there are other uses such as gaming, data storage or running enterprise.
- **Web Server provides four major functions :**
  - Serving web pages.
  - Running gateway programs (CG1) and returning output.
  - Controlling access to the server.
  - Monitoring and logging all access.
- **Apache HTTP Server and Microsoft IIS (Internet Information service) are two of the world's most popular web servers.**

Web Programming Languages

- All web programming is done with web programming languages which called Scripting Languages. These languages can include in static technologies like HTML, XHTML, CSS, JavaScript, and XML. However, most web site programming is done using server-side web programming languages.
- This code runs on the server and then gives static information back to the web browser.

Web Programming Languages

- **HTML**
  - Hypertext Markup Language (HTML), it is not a programming language science it Cannot be used to describe computations - HTML used to describe the general form and layout of document like Paragraphs, blocks, lists, images, tables, focus, comments be displayed by the browser.

- **Extensible Markup Language (XML)**
  - It provides a standard way to allow the information to be stored and interchanged among any internet-connected devices.
  - It is a meta-markup language that specifies rules for creating markup languages.
  - Browsers use XML parsers to isolate and extract the information from XML documents.

Web Programming Languages

- **XHTML**
  - The extensible Hypertext Markup language.
  - A reformulation of HTML 4 in XML 1.0.
  - Consists all HTML 4.0.1 predefined components combined with XML standards.
  - A way of making XML documents that look and act like HTML documents.
  - Using XHTML helps you strengthen the structure and syntax of your markup.

- **JavaScript**
  - tells the browser how to change the web page in response to events that happen (like clicking on something, or changing the value in a form input) .

How does website programming work ?

- You will embed code within your normal HTML pages like this:

```
<html>
<head>
<title>MY Web Page</title>
</head>
<body>
<?php
Print date("Y/m/d");
?>
</body>
</html>
```

How does website programming work ?

- When you access your page with a browser the web server will read the HTML page line by line.
- Because of it comes with a programming language it executes the code and write the current date on the page and then sends the page back to the web browser.
- The web browser see a normal web page with a date.

Client side and server side programming

- Most web programming languages are designed to run on client side **(front-end)** and server side **(back-end)**.
- The server : is responsible for serving pages.
- The client : requests pages from server and displays them to the user (most cases is “web browser”).
- The user : uses the client in order to surf the web , watch videos ect.
- Each side’s programming refers to code which runs at the specific machine.
- Client side embedded in <script> elements and execute in the browser
  - Provides immediate feedback to the user.
  - Reduces the load on the server.
  - Reduces network traffic.

Server-side programming

- Is the general name for programs which run on a server for generating dynamic contect
- It's main tasks are :
  - Process user input.
  - Display pages.
  - Structure web applications.
  - Interact with permanent storage (sql,files).
- Server side programming can be done in a lot of scripting languages.
  - ASP , JSP , python , ISAPI/NSAPI programs.
- The person in charge of server side programming should know at least one the languages mentioned : HTML , SQL , Linux/Unix shell scripting.

Client-side programming

- **Has to do with the user interface.**
- **It's main tasks are :**
  - Make interactive web pages.
  - Interact with temporary storage and local storage (cookies , local storage).
  - Send and receive data from the server.
  - Provide a remote for client side applications such as (sw registration , multi-player gaming).
- **Client side programming can be done in a lot of scripting languages : Jscript , JB script.**
- **The person in charge of client side programming should know : CSS , Ajax , HTML UI design.**

How does the web work ?

1. The web information is stored in the web pages in HTML format.
2. The web pages are stored in web server file system.
3. The web client with specific web browser reads the pages.
4. The web server waits for the request from the web client over the internet (IIS , Apache).

Finding information on the web

- Internet protocol (IP) address : every device connected to the internet have a unique network identifier.
- Uniform resource locator (URL) : is a unique address for a file that is accessible on the internet used for specifying internet resources (web pages , email address).

URL

- **URL strings consist of three parts :**
  - Network protocol
  - Host name or address
  - File or resource location (path)
  - **These substrings are separated by special characters : protocol://host/location**
- **URL Protocol**
  - The protocol is the client/server program used to retrieve the document , the most common today is HTTP.
  - Typical URLs include http:// (can use ftp: // or mailto://)
- **URL Host**
  - It comes from standard internet databases such as DNS and can be names or IP addresses
  - Such as : http://w3schools.com
- **URL Location**
  - is the location of this web page including two subdirectories and the file name such as: “default.asp.”

Different Domains on the WWW

- .com : commercial
- .net : network
- .edu : educational
- .org : organization
- .gov : government