IT & Library: Internet Technology
The World Wide Web

Lecture V :- Introduction to Internet Technology

Computer Science,

Nile University of Nigeria

Outline

1. Introduction

2. Internet Architecture

3. The World Wide Web

Motivation

✗ Internet and World Wide Web is modifying in a radical way how individuals and organizations interacts, for business, learning or leisure

✗ Millions of people around the world have access to an extraordinary amount of information, they can search it, exchange email, make phone calls, buy and sell goods and services.

✗ All of this is changing and will keep changing the world we live in.

Definition

What is Internet technology?

✗ Internet technology is the ability of the Internet to transmit information and data through different servers and systems.

✗ Internet technology is important in many different industries because it allows people to communicate with each other through means that were not necessarily available.

✗ The Internet is essentially a large database where all different types of information can be passed and transmitted.

Definition

What is Internet technology?

✗ It can be passively passed along in the form of non interactive websites and blogs;

✗ It can also be actively passed along in the form of file sharing and document loading.

✗ Internet technology has lead to a wealth of information available to anyone who is able to access the Internet.

✗ It has allowed people who were accustomed to textbooks and libraries to learn anything they could want from the comfort of a computer.

Purpose of the Internet: Connect Stuff

- ✗ The main purpose of the Internet is offering effective information sharing and communication globally using computers.

- ✗ Notably, the Internet is the biggest player in the realization of the concept of globalization today. With the Internet, the world has become a global village.

- ✗ A person can now communicate comfortably with anyone in corner of the world.

- ✗ The Internet is a global network of computers interconnected through different media using a standard protocol.

- ✗ Essentially, a computer in America may be connected to another computer in remotest of Africa.

Outline	Introduction	Internet Architecture	The World Wide Web	References

Purpose

Purpose of the Internet: Connect Stuff

✗ The Internet plays a big part in the life of a modern human being. People rely on the Internet for their education, trade, socialization and entertainment, among many other important aspects of human life.

✗ Social networking has gone viral in the modern days, thanks to the Internet.

✗ Evidently, the Internet could be the biggest revolution in the computing and communications world.

✗ Initially, the Internet was meant to connect researchers to share and communicate their research information on a common platform.

Purpose of the Internet: Connect Stuff

✗ The Internet is a network of autonomous computers linked together by wireless, cable or fiber links; devices exchange information over the network through data packets. It is governed by a set of protocols called TCP/IP.

✗ Every Internet-enabled device understands the TCP/IP protocol. It allows these devices to electronically send, receive, interpret and describe data over the network.

Protocol Layering

Internet Architecture

Fortunately, nobody owns the Internet, there is no centralized control, and nobody can it off. Its evolution depends on rough consensus about technical proposals, and on running code. Engineering feed-back from real implementations is more important than any architectural principles.

✗ So What is the **Internet architecture**?

✗ It is by definition a **meta-network**, a constantly changing collection of thousands of individual networks intercommunicating with a common protocol.

Protocol Layering

Internet Architecture

✗ The Internet's architecture is described in its name, a short from
   of the compound word "inter-networking".

✗ This architecture is based in the very specification of the standard
   TCP/IP protocol,

✗ Designed to connect any two networks which may be very
   different in internal hardware, software, and technical design.

✗ Once **two networks** are interconnected, **communication with
   TCP/IP is enabled end-to-end**, so that any node on the Internet
   has the near magical ability to communicate with any other no
   matter where they are.

Internet Architecture
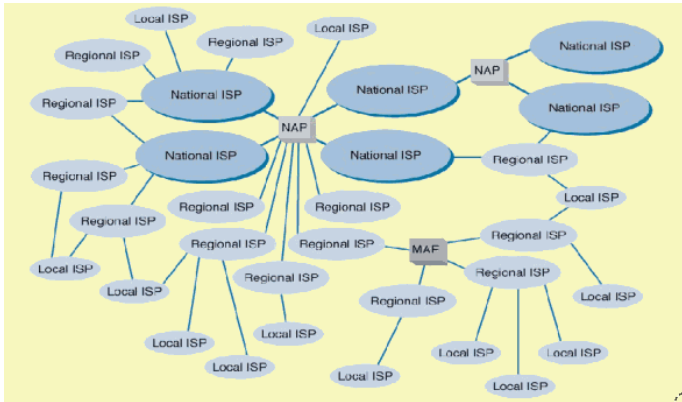
Internet Architecture Model

Design theory: "rough consensus and running code"
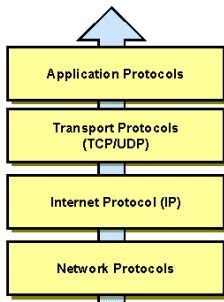
The IETF culture requires that new layers provide a protocol specification and at least two or three running implementations.

Likely, the four layer model will not grow in complexity (unless the internet does first.)

Protocol Layering

Basic Internet Architecture

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NAP: Network Access Point; MAP: Management Application Functionality

Protocol Layering

- ✗ TCP/IP is short for Transmission Control Protocol/Internet Protocol.

- ✗ TCP/IP is the suite of communications protocols used to connect hosts on the Internet.

- ✗ TCP/IP uses several protocols, the two main ones being TCP and IP.

Protocol Layering

Internet Layering Model

Application Layer
Transport Layer
Internet Layer
Link Layer
Physical Layer

✗ **Internet layer**: responsible for transferring data between the source and destination computers.

Transmitting data to the Network Interface layer.

Routing the data to the correct destination

✗ **Application layer**: contains the communications protocols and interface methods used in process-to-process communications across an Internet Protocol (IP) computer network.

✗ **Link layer**: provides the functional and procedural means to transfer data between network entities and might provide the means to detect and possibly correct errors that may occur in the physical layer.

✗ **Transport layer**: includes two major protocols Transmission Control Protocol (TCP) and User Datagram Protocol (UDP).

Interfaces for network applications to access the network.

Error checking, flow control, and verification.

✗ **Physical layer**: defines the means of transmitting raw bits rather than logical data packets over a physical link connecting network nodes.

Protocol Layering

layering by example

Protocol Layering
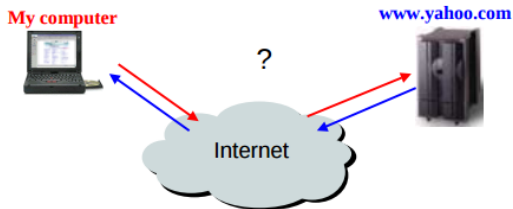
layering by example

Application layer (HTTP)

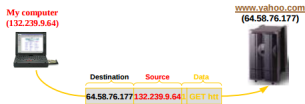## Transport layer (HTTP)

- Break message into packets (TCP segments), and should be delivered reliably & in-order

"and let me know when they got there"

Application layer: name resolution (DNS)

Network layer: IP Addressing

- Address each packet so it can traverse network and arrive at host

Protocol Layering

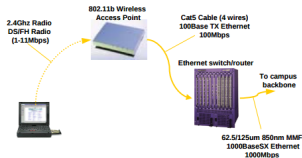# layering by example

Network layer: IP Routing

- Each router forwards packet towards destination
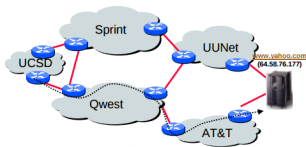
Datalink layer (Ethernet)

- Break message into frames
- Media Access Control (MAC)
- Send frame

Physical layer

Protocol Layering

Internet functions

✗ The Internet is a network of autonomous computers linked together by wireless, cable or fiber links;

✗ Devices exchange information over the network through data packets.

✗ It is governed by a set of protocols called TCP/IP.

✗ Every Internet-enabled device understands the TCP/IP protocol.

✗ It allows these devices to electronically send, receive, interpret and describe data over the network.

Architecture of the Web

Internet and the WWW

- ✗ The Internet does not equate the World Wide Web. The Internet is a system which enables multiple computers to connect to each other.

- ✗ The Web is an application that makes use of the system (Leaver, 2011). Without the Internet, there is no access to the Web.

- ✗ The Web is an application on the Internet that allows people to communicate and share information, whereas the Internet is the connection between computers for data transmission.

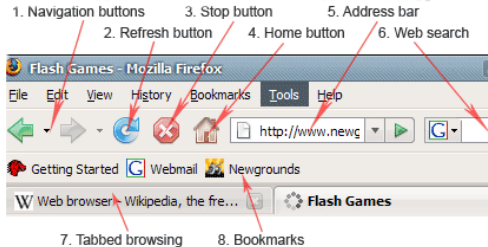# Architecture of the World Wide Web

✗ Web Architecture focuses on the foundation technologies and principles which sustain the Web, including URIs and HTTP.

✗ The World Wide Web uses relatively simple technologies with sufficient scalability, efficiency and utility that they have resulted in a remarkable information space of interrelated resources, growing across languages, cultures, and media.

Internet browser

- ✗ An internet browser, also known as a browser or a web browser, is a software program that you use to access the internet and view web pages on your computer.

- ✗ You can think of your browser as your gateway to the internet.

- ✗ If you want to enter online sweepstakes, for example, you must first open their websites in your internet browser. Without browsers, the internet as we know it today would be impossible.

Internet browser

1. Navigation buttons 3. Stop button 5. Address bar
2. Refresh button 4. Home button 6. Web search
7. Tabbed browsing 8. Bookmarks

HTML and HTTP

✗ HTTP (Hyper-Text Transfer Protocol), is plain text and stateless protocol residing in the application layer.

✗ Make request:

  ✤ You type the URL(Uniform Resource Locator) in the browser: **http://www.google.com**

  ✤ So what is a URL

$$\underbrace{\text{protocol}} \qquad \underbrace{\text{port}} \qquad \underbrace{\text{query}}$$

http://www.domain.com:1234/path/to/resource?a=b&x=y

$$\underbrace{\text{host}} \qquad \underbrace{\text{resource path}}$$

Architecture of the Web

HTML and HTTP

✗ Get IP address

- After you type the address, another application layer protocol is used to get the IP address: the **Domaine Name Server (DNS)**

Domain Name Server   Web Browser

What's the IP to Google's server?

Google's IP is 65.246.5.22
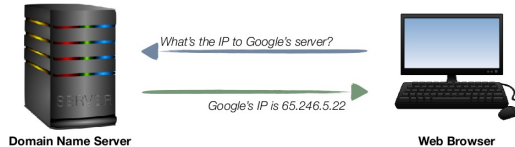
HTTP Request Message Format

method	URL or pathname	HTTP version	headers	message body
GET	//www.dcs.qmw.ac.uk/index.html	HTTP/ 1.1		

- **Method:** a type of an operation to be performed on a resource

- **URL:** unique name of a resource

- **HTTP version:** protocol version

- **Headers:** additional information about the resource

- **Message body:** the data itself

HTTP Response Message Format

HTTP version	status code	reason	headers	message body
HTTP/1.1	200	OK		resource data

- **code:** Status indicates success or failure

- **Reason:** human-readable explanation of the code

Overview of HTML

✗ HTML is the standard markup language for creating Web pages.

✢ HTML stands for Hyper Text Markup Language
✢ HTML describes the structure of Web pages using markup
✢ HTML elements are the building blocks of HTML pages
✢ HTML elements are represented by tags
✢ HTML tags label pieces of content such as "heading", "paragraph", "table", and so on
✢ Browsers do not display the HTML tags, but use them to render the content of the page

Architecture of the Web

Overview of HTML: Example

```
 1   <!DOCTYPE html>
 2     <html>
 3       <head>
 4         <title>Page Title</title>
 5       </head>
 6       <body>
 7
 8         <h1>My First Heading</h1>
 9         <p>My first paragraph.</p>
10
11       </body>
12     </html>
```

Overview of HTML: Example Explained

☞ The <!DOCTYPE html> declaration defines this document to be HTML5

☞ The <html> element is the root element of an HTML page

☞ The <head> element contains meta information about the document

☞ The <title> element specifies a title for the document

☞ The <body> element contains the visible page content

☞ The <h1> element defines a large heading

☞ The <p> element defines a paragraph

Architecture of the Web

Overview of HTML: Example

```
1   Manipulation of list in HTML
2   <ul>
3       <li>To learn HTML</li>
4       <li>
5           To show off
6           <ol>
7               <li>To my boss</li>
8               <li>To my friends</li>
9               <li>To my cat</li>
10              <li>To the little talking duck in my brain</li>
11          </ol>
12      </li>
13      <li>Because I have fallen in love with my computer and want to give her
14          some HTML loving.
15      </li>
16  </ul>
```

- If you look at this in your browser, you will see a bulleted list. Simply change the **ul** tags to **ol** and you will see that the list will become numbered.

Overview of HTML: Example

```
1   Manipulating paragraph
2   <p>This is my first web page</p>
3   <p>How exciting</p>
4
5   <h2>Where to find the tutorial</h2>
6   <p><a href="http://www.htmldog.com">HTML Dog</a></p>
7
8   <h2>Creating tables</h2>
9   <table>
10      <tr>
11          <td>Row 1, cell 1</td>
12          <td>Row 1, cell 2</td>
13      </tr>
14      <tr>
15          <td>Row 2, cell 1</td>
16          <td>Row 2, cell 2</td>
17      </tr>
18  </table>
```

- The table element defines the **table**.
  The **tr** element defines a table row.
  The **td** element defines a data cell. These must be enclosed in **tr** tags, as shown above.

Overview of HTML: Insert image

```
1   <style>
2   img {
3       width:100%;
4   }
5   </style>
6
7   <img src="url" alt="some_text" style="width:width;height:height;">
8
9   <h2>Spectacular Mountain</h2>
10  <img src="pic_mountain.jpg" alt="Mountain View" style="width:304px;height:228px;">
11
12  <h2>Image Size — Width and Height</h2>
13  <img src="html5.gif" alt="HTML5 Icon" style="width:128px;height:128px;">
14
15  Alternatively, you can use the width and height attributes. Here, the values
16  are specified in pixels by default:
17  <img src="html5.gif" alt="HTML5 Icon" width="128" height="128">
```

Architecture of the Web

Overview of HTML: Form

```html
<form action="action_page.php">
  Username: <input type="text" name="user">
  Encryption: <keygen name="security">
  <input type="submit">
</form>

<form>
  First name:<br>
  <input type="text" name="firstname"><br>
  Last name:<br>
  <input type="text" name="lastname">
</form>
```

Architecture of the Web

Overview of HTML: Form

```html
 1  <form>
 2    <input type="radio" name="gender" value="male" checked> Male<br>
 3    <input type="radio" name="gender" value="female"> Female<br>
 4    <input type="radio" name="gender" value="other"> Other
 5  </form>
 6
 7  <select multiple>
 8    <option value="volvo">Volvo</option>
 9    <option value="saab">Saab</option>
10    <option value="opel">Opel</option>
11    <option value="audi">Audi</option>
12  </select>
```

- A drop-down list that allows multiple selections:

Overview of HTML: Creating Frames

- To use frames on a page we use <frameset> tag instead of **<body>** tag. The **<frameset>** tag defines how to divide the window into frames.

```
1   <frameset rows="10%,80%,10%">
2       <frame name="top" src="/html/top_frame.htm" />
3       <frame name="main" src="/html/main_frame.htm" />
4       <frame name="bottom" src="/html/bottom_frame.htm" />
5       <noframes>
6       <body>
7           Your browser does not support frames.
8       </body>
9       </noframes>
10  </frameset>
```

Overview of HTML: Creating Frames

- To use frames on a page we use <frameset> tag instead of
  <body> tag. The **<frameset>** tag defines how to divide the
  window into frames.

```
1   <frameset cols="25%,50%,25%">
2       <frame name="left" src="/html/top_frame.htm" />
3       <frame name="center" src="/html/main_frame.htm" />
4       <frame name="right" src="/html/bottom_frame.htm" />
5       <noframes>
6       <body>
7           Your browser does not support frames.
8       </body>
9       </noframes>
10  </frameset>
```

References