

CMPS1134

Fundamentals of Computing

Networking and the Internet 2

Computer Science: An Overview

Eleventh Edition

J. Glenn Brookshear

Chapter 4

Copyright © 2012/ 2015 Pearson Education, Inc. Modified for UB-CMPS1134 (DGV2015, Rev18S1)

Chapter 4: Networking & Internet

- ☐ The World Wide Web
- ☐ Internet Protocols
- ☐ Security

Copyright © 2012/ 2015 Pearson Education, Inc. Modified for UB-CMPS1134 (DGV2015, Rev18S1)

2

World Wide Web

- **Hypertext** combines internet technology with concept of linked-documents
 - Embeds **hyperlinks** to other documents
- **Browsers** present materials to the user
- **Webservers** provide access to documents
- Documents are identified by **URLs** and transferred using the **HTTP** protocol.

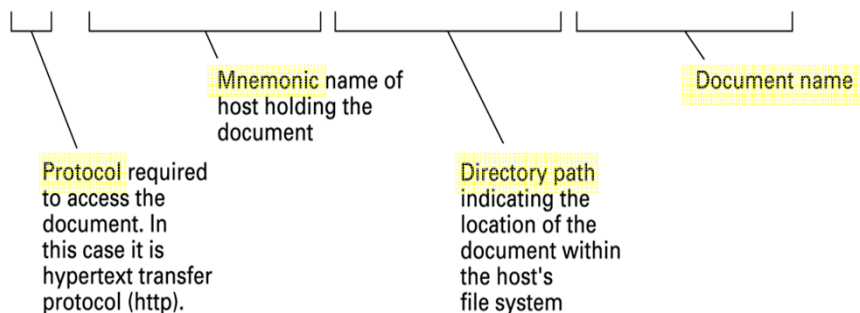
Copyright © 2012/ 2015 Pearson Education, Inc. Modified for UB-CMPS1134 (DGV2015, Rev18S1)

3

Figure 4.8 A typical URL

Uniform Resource Locator (URL) is a unique address used to locate and retrieve documents on the WWW.

`http://ssenterprise.aw.com/authors/Shakespeare/Julius_Caesar.html`



Copyright © 2012/ 2015 Pearson Education, Inc. Modified for UB-CMPS1134 (DGV2015, Rev18S1)

4

Hypertext Document Format

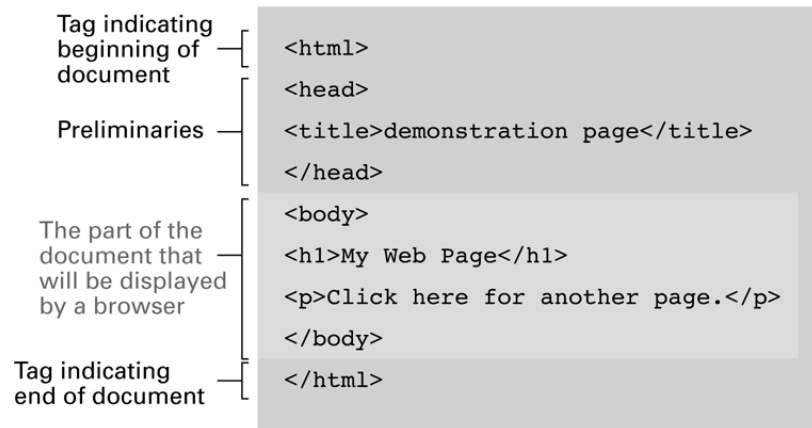
- ❑ Encoded as text file
- ❑ Contains tags to communicate with browser
 - Appearance
 - ❑ <h1> to start a level one heading
 - ❑ <p> to start a new paragraph
 - Links to other documents and content
 - ❑
 - Insert images
 - ❑

Copyright © 2012/ 2015 Pearson Education, Inc. Modified for UB-CMPS1134 (DGV2015, Rev18S1)

5

Figure 4.9 A simple Web page

a. The page encoded using HTML.



Copyright © 2012/ 2015 Pearson Education, Inc. Modified for UB-CMPS1134 (DGV2015, Rev18S1)

6

Figure 4.9 A simple Web page (cont)

b. The page as it would appear on a computer screen.



Copyright © 2012/ 2015 Pearson Education, Inc. Modified for UB-CMPS1134 (DGV2015, Rev18S1)

7

Figure 4.10 An enhanced simple Web page

a. The page encoded using HTML.

Anchor tag
containing
parameter —

Closing
anchor tag —

```
<html>
<head>
<title>demonstration page</title>
</head>
<body>
<h1>My Web Page</h1>
<p>Click
  <a href="http://crafty.com/demo.html">
    here
  </a>
  for another page.</p>
</body>
</html>
```

```
data:text/html,
<html>
<head>
<title>demonstration page</title>
</head>
<body>
<h1>My Web Page</h1>
<p>Click
  <a href="http://www.ub.edu.bz">
    here
  </a>
  for another page. </p>
</body>
</html>
```

Copyright © 2012/ 2015 Pearson Education, Inc. Modified for UB-CMPS1134 (DGV2015, Rev18S1)

8

Figure 4.10 **An enhanced simple Web page (cont)**

b. The page as it would appear on a computer screen.



Copyright © 2012/ 2015 Pearson Education, Inc. Modified for UB-CMPS1134 (DGV2015, Rev18S1)

9

Extensible Markup Language (XML)

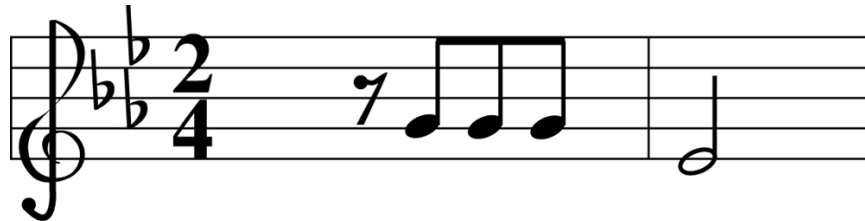
- XML: A language for constructing markup languages similar to HTML
 - A descendant of SGML (Standard Generalized Markup Language)
 - Opens door to a World Wide *Semantic* Web

Copyright © 2012/ 2015 Pearson Education, Inc. Modified for UB-CMPS1134 (DGV2015, Rev18S1)

10

Using XML

Figure 4.11 The first two bars of Beethoven's Fifth Symphony



Possible XML representation:

```
<staff clef = "treble"> <key>C minor</key>
<time> 2/4 </time>
<measure> < rest> egth </rest> <notes> egth G, egth G, egth
    G </notes></measure>
<measure> <notes> hlf E </notes></measure>
</staff>
```

Copyright © 2012/ 2015 Pearson Education, Inc. Modified for UB-CMPS1134 (DGV2015, Rev18S1)

11

Client Side Versus Server Side

☐ **Client-side** activities

■ Examples:

- ☐ Java applets
- ☐ Javascript
- ☐ Macromedia Flash

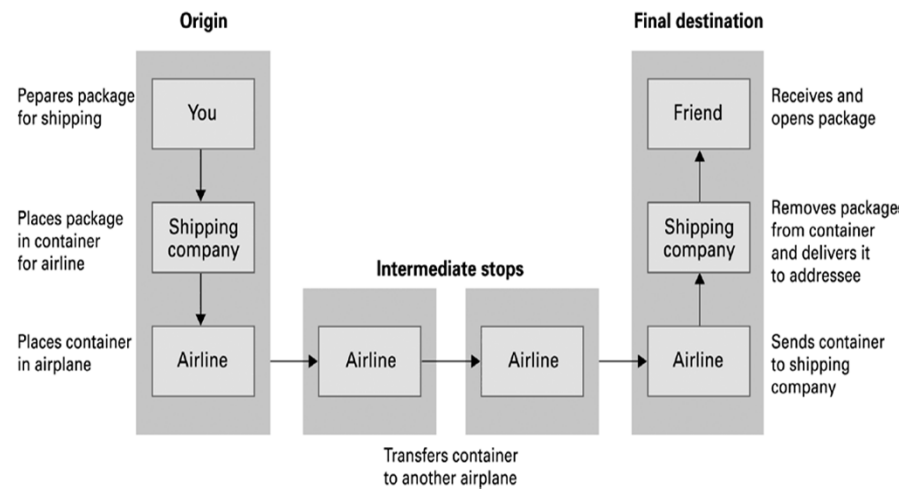
☐ **Server-side** activities

- Common Gateway Interface (CGI)
- Servlets
- PHP

Copyright © 2012/ 2015 Pearson Education, Inc. Modified for UB-CMPS1134 (DGV2015, Rev18S1)

12

Fig 4.12 Package-shipping example



Copyright © 2012/ 2015 Pearson Education, Inc. Modified for UB-CMPS1134 (DGV2015, Rev18S1)

13

Internet Software Layers

- ☐ **Application:**
Constructs message with address
- ☐ **Transport:**
Chops message into **segments**
- ☐ **Network:**
Converts segments into **packets** and routes them through the Internet
- ☐ **Link:**
Handles actual transmission of packets

Copyright © 2012/ 2015 Pearson Education, Inc. Modified for UB-CMPS1134 (DGV2015, Rev18S1)

14

Internet software layers

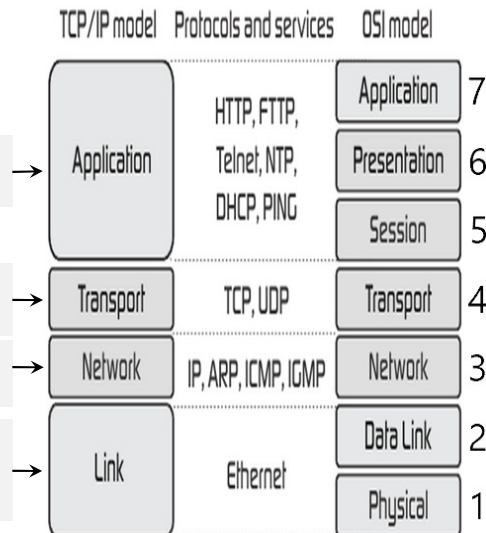
Transmission Control Protocol/ Internet Protocol (TCP/ IP) Open Systems Interconnect (OSI)

Represents data to the user plus encoding and dialog control

Supports communications between diverse devices and diverse networks

Determines the best path through the network (aka: internet, internetwork)

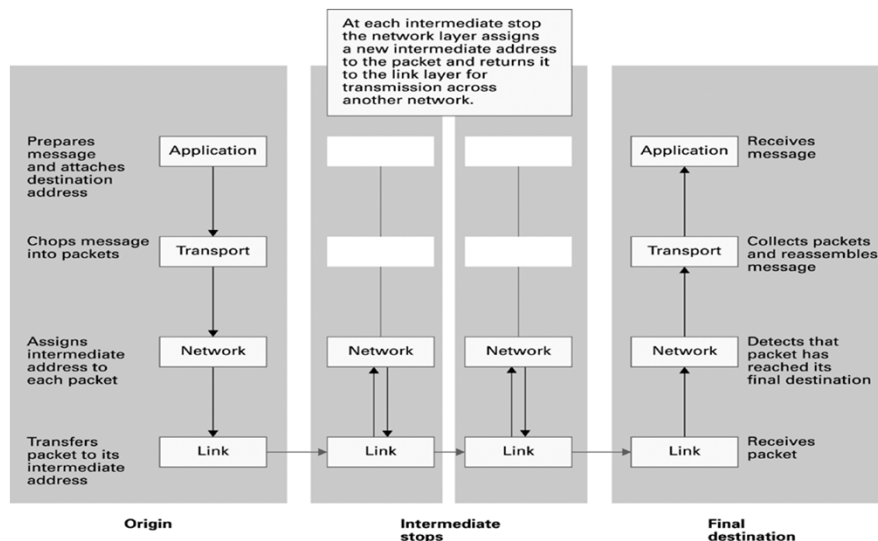
Controls the hardware devices and media that make up the network (aka: network access, network interface)



Copyright © 2012/ 2015 Pearson Education, Inc. Modified for UB-CMPS1134 (DGV2015, Rev18S1)

15

Fig 4.14 Following a message through the Internet



Copyright © 2012/ 2015 Pearson Education, Inc. Modified for UB-CMPS1134 (DGV2015, Rev18S1)

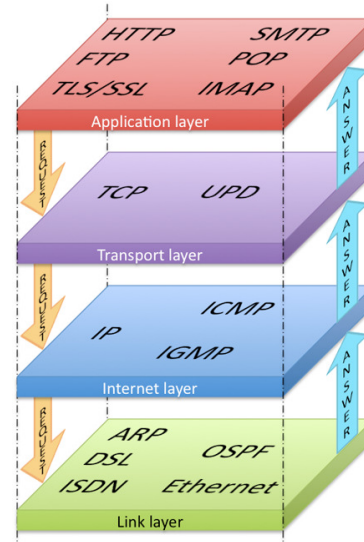
16

TCP/IP Protocol Suite

Collection of protocol standards used to implement the four-level hierarchy implemented in the Internet.

Protocol suite named from two protocols of the collection:

- ☐ Transport Layer
 - **TCP**
 - **UDP**
- ☐ Network Layer
 - **IP** (IPv4 and IPv6)



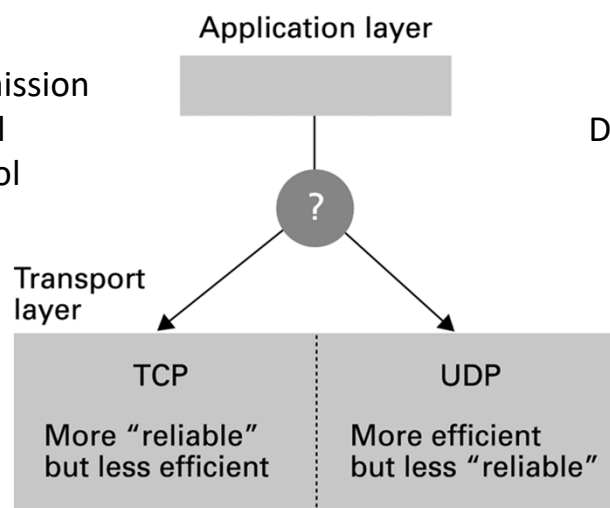
Copyright © 2012/ 2015 Pearson Education, Inc. Modified for UB-CMPS1134 (DGV2015, Rev18S1)

17

Fig 4.15 Choosing between TCP and UDP

TCP:
Transmission
Control
Protocol

UDP:
User
Datagram
Protocol



Copyright © 2012/ 2015 Pearson Education, Inc. Modified for UB-CMPS1134 (DGV2015, Rev18S1)

18

Security

Attacks

- Malware (viruses, worms, Trojan horses, spyware, phishing software, ...)
- Denial of service (DoS, DDoS)
- Spam ...

Protection

- Firewalls
- Spam filters
- Proxy Servers
- Antivirus software



Copyright © 2012/ 2015 Pearson Education, Inc. Modified for UB-CMPS1134 (DGV2015, Rev18S1)

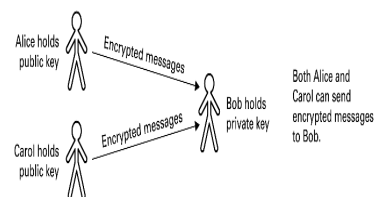
19

Encryption

FTPS, HTTPS, SSL

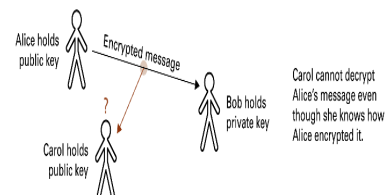
Public-key Encryption

- Public key:
Typically used to encrypt messages
- Private key:
Typically used to decrypt messages



Certificates and Digital Signatures

- Certificate authorities



Copyright © 2012/ 2015 Pearson Education, Inc. Modified for UB-CMPS1134 (DGV2015, Rev18S1)

20