Information Communication Technologies

Lecture 10. Network Systems

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Agenda

1. Network Systems

2. Internet basics

3. MIME types

4. Internet Languages

HOW I FEEL WHEN MY INTERNET IS NOT WORKING

*Le me derping on roflindia.com

When internet
stops working
for 5 seconds,
so does my heart!

a day without
~~internet~~ *internet* is like

a year without
a rain.

26.11.12

Sometimes when my internet is down,
I forget that the rest
of my computer still
works...

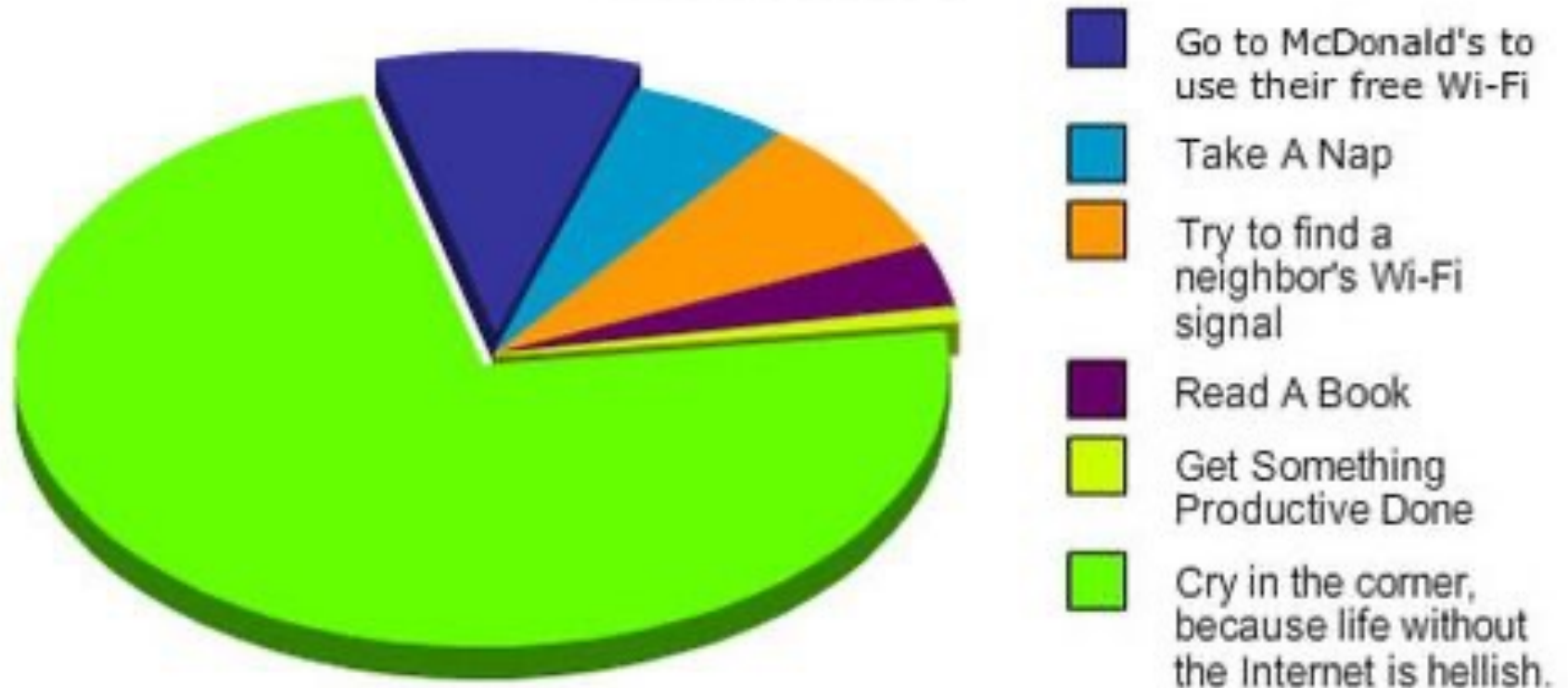26.11.12

26.11.12

Things to Do Without Access To The Internet

- ■ Go to McDonald's to use their free Wi-Fi
- ■ Take A Nap
- ■ Try to find a neighbor's Wi-Fi signal
- ■ Read A Book
- ■ Get Something Productive Done
- ■ Cry in the corner, because life without the Internet is hellish.

GraphJam.com

26.11.12

The Day That Albert Einstein Feared Has Arrived!

Having coffee with frens

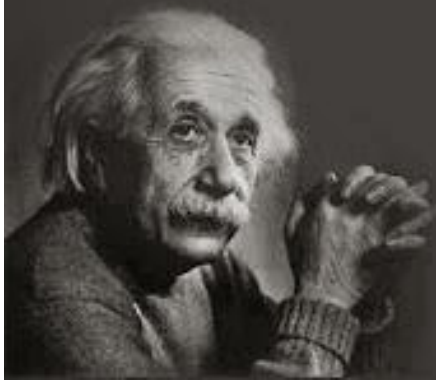A day in a beach

Cheering your team

Out on an intimate date

Enjoying the sights

Having dinner

"I fear the day that technology will surpass our human interaction. The world will have a generation of idiots"
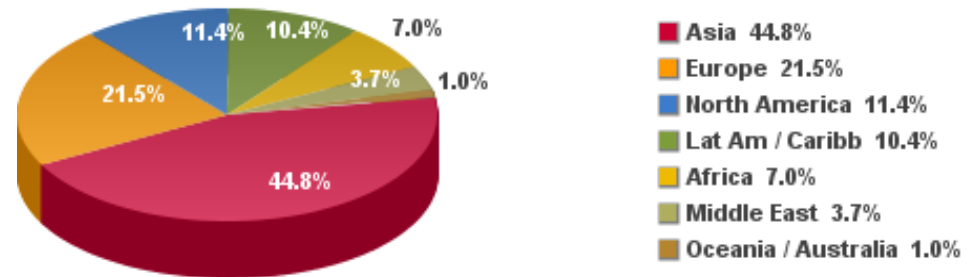
Albert Einstein

The Internet is a computer network that interconnects hundreds of millions of computing devices

throughout the world.

As of July 2012, there were nearly 5 billion end systems attached to the Internet [ISC 2012], not counting smartphones and other devices that are only intermittently connected to the Internet.

Overall, more there are an estimated 2.27 billion Internet users [ITU 2012].

Internet Users in the World
Distribution by World Regions - 2012 Q2

11.4%   10.4%   7.0%
3.7%   1.0%
21.5%
44.8%

- ■ Asia 44.8%
- ■ Europe 21.5%
- ■ North America 11.4%
- ■ Lat Am / Caribb 10.4%
- ■ Africa 7.0%
- ■ Middle East 3.7%
- ■ Oceania / Australia 1.0%

Source: Internet World Stats - www.internetworldstats.com/stats.htm
Basis: 2,405,518,376 Internet users on June 30, 2012
Copyright © 2012, Miniwatts Marketing Group

"Fun" internet appliances

IP picture frame
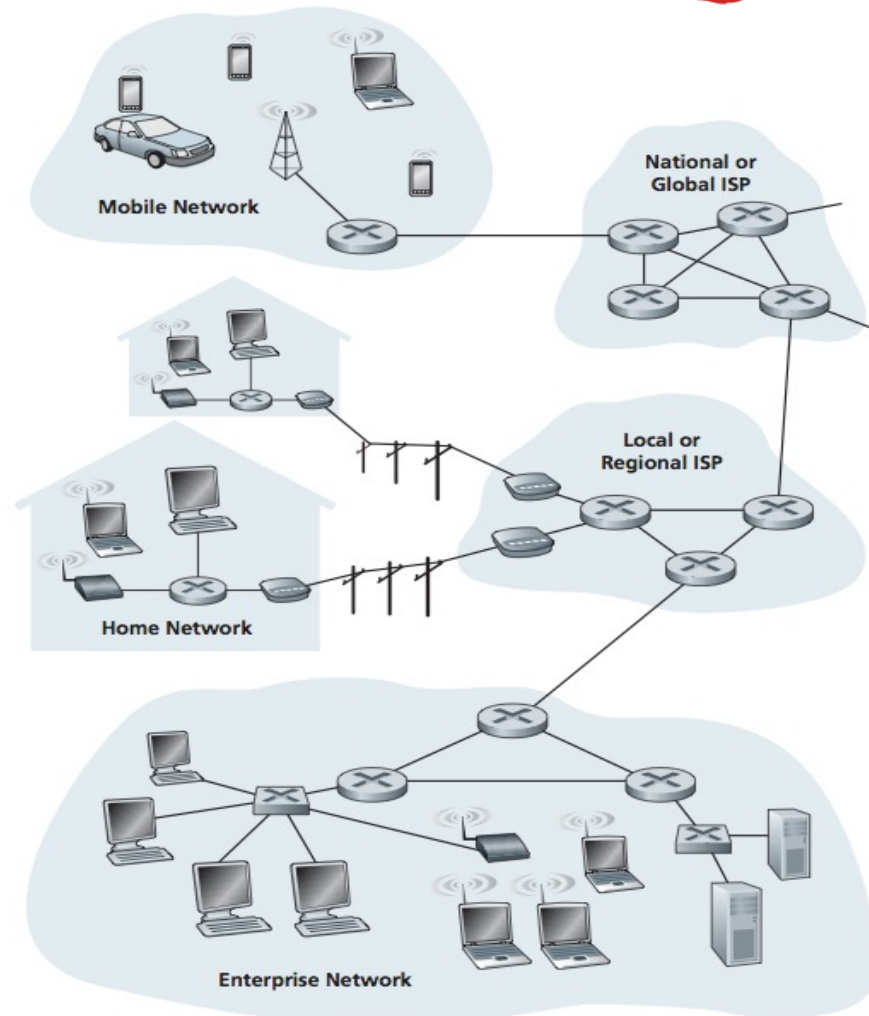http://www.ceiva.com/

A Weather Forecasting
Smart Toaster

Internet refrigerator

What's the Internet

❖ **millions of connected computing devices:**
  - *hosts* = *end systems*
  - running *network apps*

❖ *communication links*
  - fiber, copper, radio, satellite
  - transmission rate: *bandwidth*

❖ *Packet switches:* forward packets (chunks of data)
routers and *link-layer switches*

Internet Basics

- **Internet:** *collection of local, regional, national and international computer networks that are linked together to exchange data and distribute processing tasks.*

- The Internet began as a Cold War project to create a communications network that was immune to a nuclear attack.

ARPANET

- In 1969, the U.S. government created **ARPANET (**Advanced Research Projects Agency Network), connecting four western universities and allowing researchers to use the mainframes of any of the networked computers.

Internet Basics (continued)

- ARPANET - **Advanced Research Projects Agency (ARPA)**

- There were <u>23 Internet sites in 1971</u>, <u>111 in 1977</u>, and up to almost <u>4 million in 1994</u>.

- Today more than 266,848,493

- In 1986, another U.S. government agency, the National Science Foundation (NSF), set up a network of five supercomputer centers called **NSFnet**.

Internet Basics

- **1990**, a British scientist Tim Berners-Lee

    -Developed specifications for URLs, HTML, and HTTP

    -Group of technologies designed to help researchers share information by creating access to a sort of "web" of electronic documents.

- **1993** - Marc Andreessen and his colleagues (University of Illinois) created Mosaic, a graphical browser.
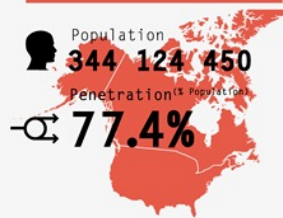
- Browser Netscape

Internet Growth

- The size of the Internet based on

- Number of people using it.

- Number of computers connected

- Quantity of data flowing.

- *Internet host:* A computer on the Internet that provides services
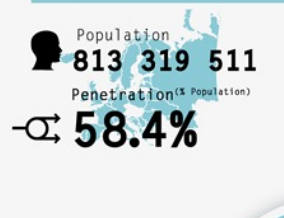
  - data routing
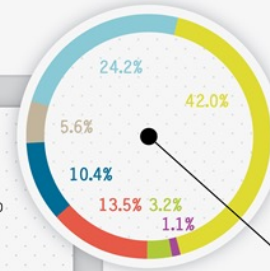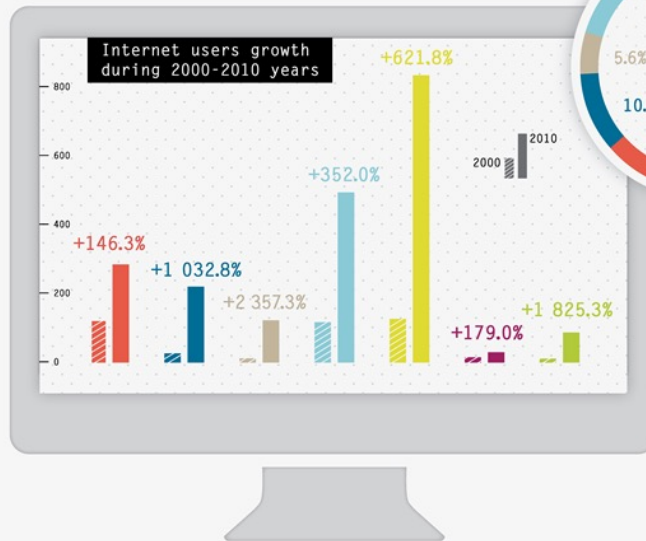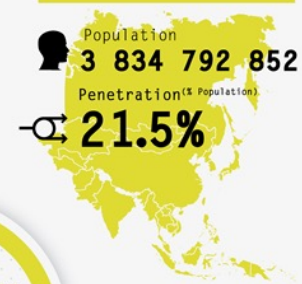
  - e-mail

  - Web pages

← THE INTERNET GROWTH →

North America
Population
344 124 450
Penetration (% Population)
77.4%

Europe
Population
813 319 511
Penetration (% Population)
58.4%

Asia
Population
3 834 792 852
Penetration (% Population)
21.5%

Internet users growth during 2000-2010 years

- +146.3%
- +1 032.8%
- +2 357.3%
- +352.0%
- +621.8%
- +179.0%
- +1 825.3%

800
600
400
200
0

2000   2010

Internet users by region
- 24.2%
- 42.0%
- 5.6%
- 10.4%
- 13.5% 3.2%
- 1.1%

Middle East
Population
212,336,924
Penetration (% Population)
29.8%

Latin America/Caribbean
Population
592 556 972
Penetration (% Population)
34.5%

Africa
Population
1 013 779 050
Penetration (% Population)
10.9%

Oceania/Australia
Population
34 700 201
Penetration (% Population)
61.3%

26.11.12

© WebHostingGeeks.com
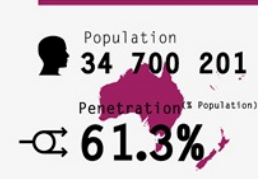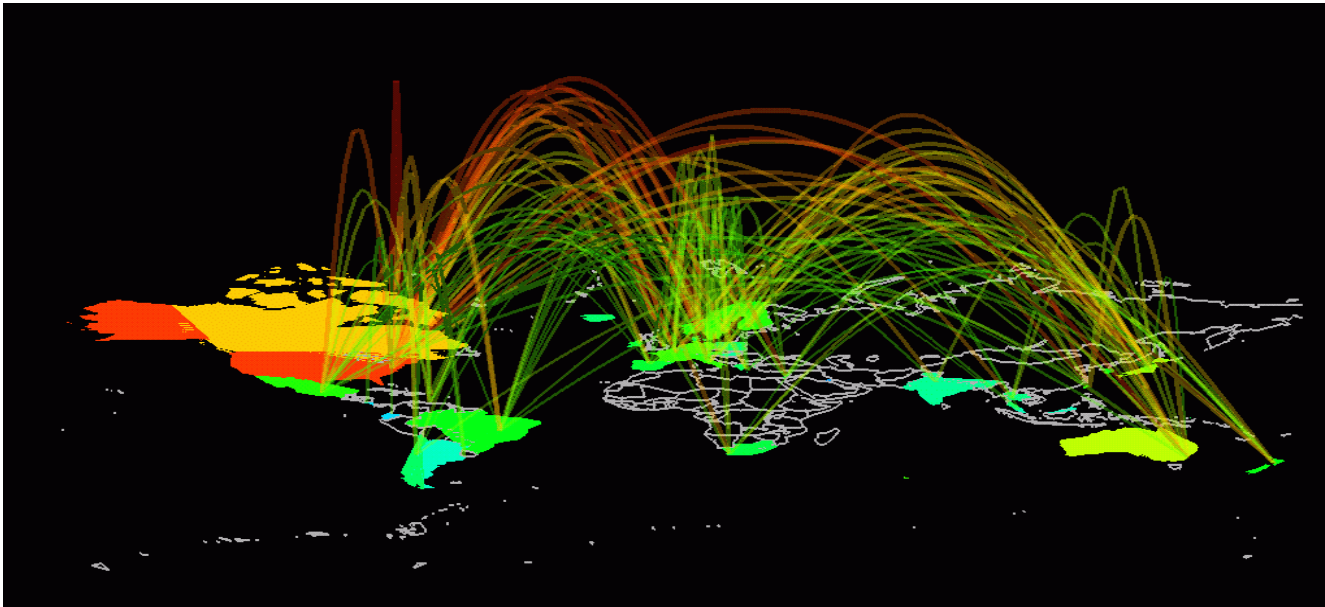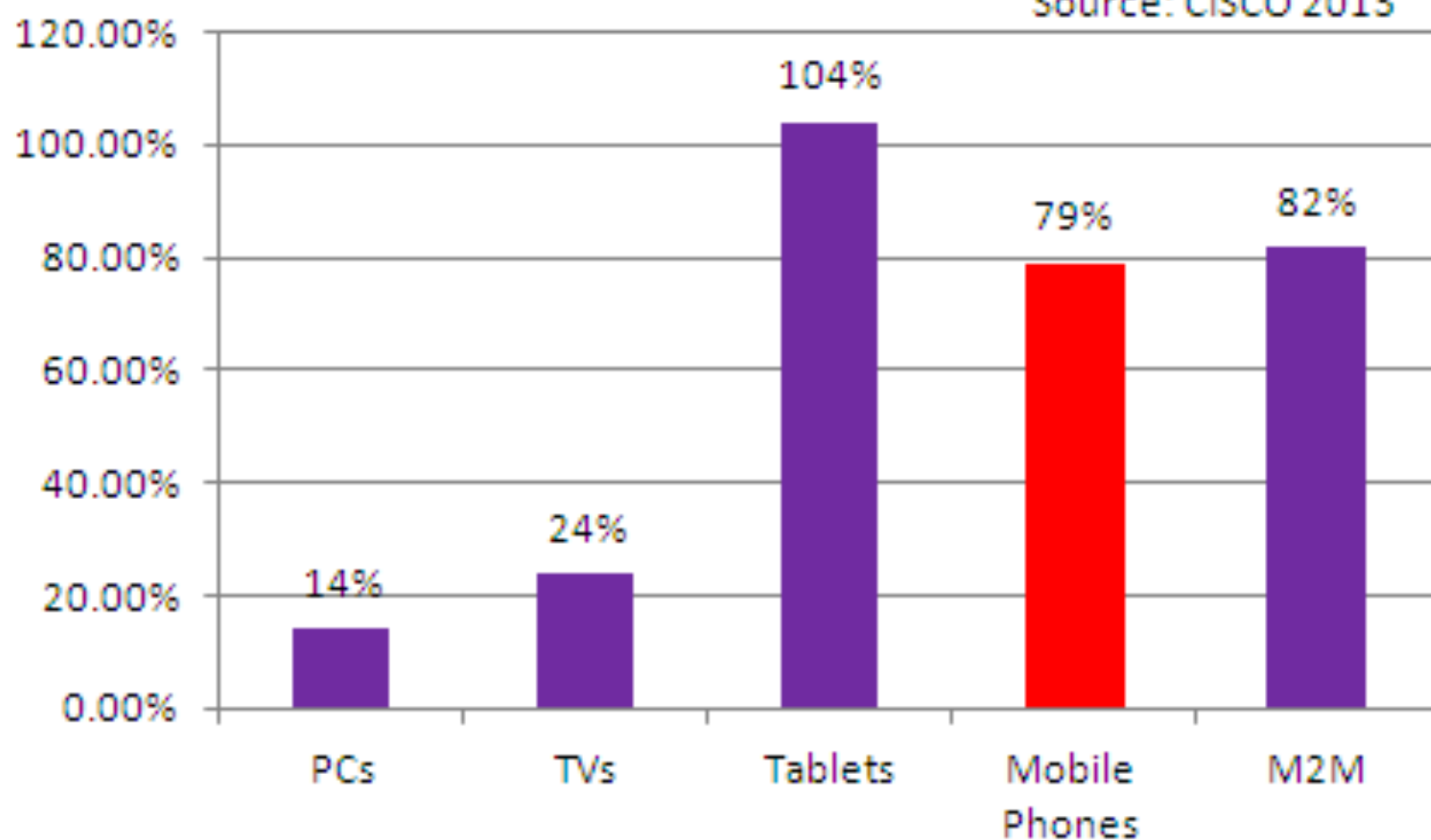
Internet Growth (continued)

- Today there are millions of host computers available.

- ***Internet traffic:*** Number of bytes transmitted from one host to another computer.

2012-2017 Internet Traffic Growth

Source: CISCO 2013

	PCs	TVs	Tablets	Mobile Phones	M2M
Value	14%	24%	104%	79%	82%

Internet Technology

- *Network Service Provider (NSP)* - business or organization that sells bandwidth or network access by providing direct backbone access to the Internet and usually access to its **network access points (NAPs)**

- AT&T: based in the USA

- Verizon: based in the USA

- BT: based in the UK

- NTT Communications Corp: based in Japan

- SingTel: based in Singapore

NAP or Internet Exchange Point

- *Physical infrastructure* through which *Internet service providers (ISPs)* exchange Internet traffic between their networks

- Internet Exchange Point in Kazakhstan: **Kaz-IX**

- Internet Exchange Point in Russia: **Msk-IX (www.msk-ix.ru)**

- Internet Exchange Point in Tashkent: **Tas-IX**

21

Internet Technology (continued)

- ***Internet Backbone:*** Major internet communication links.

- ***TCP/IP (Transport control Protocol/Internet Protocol):*** A standard set of communication rules used by every computer that connects to the internet.

You connect to the Internet by connecting to an *Internet Service Provider* (ISP) which connects to the Internet backbone

The Internet

ISP

Telephone Lines

Your Home

Backbone
NSP
Network Service Provider
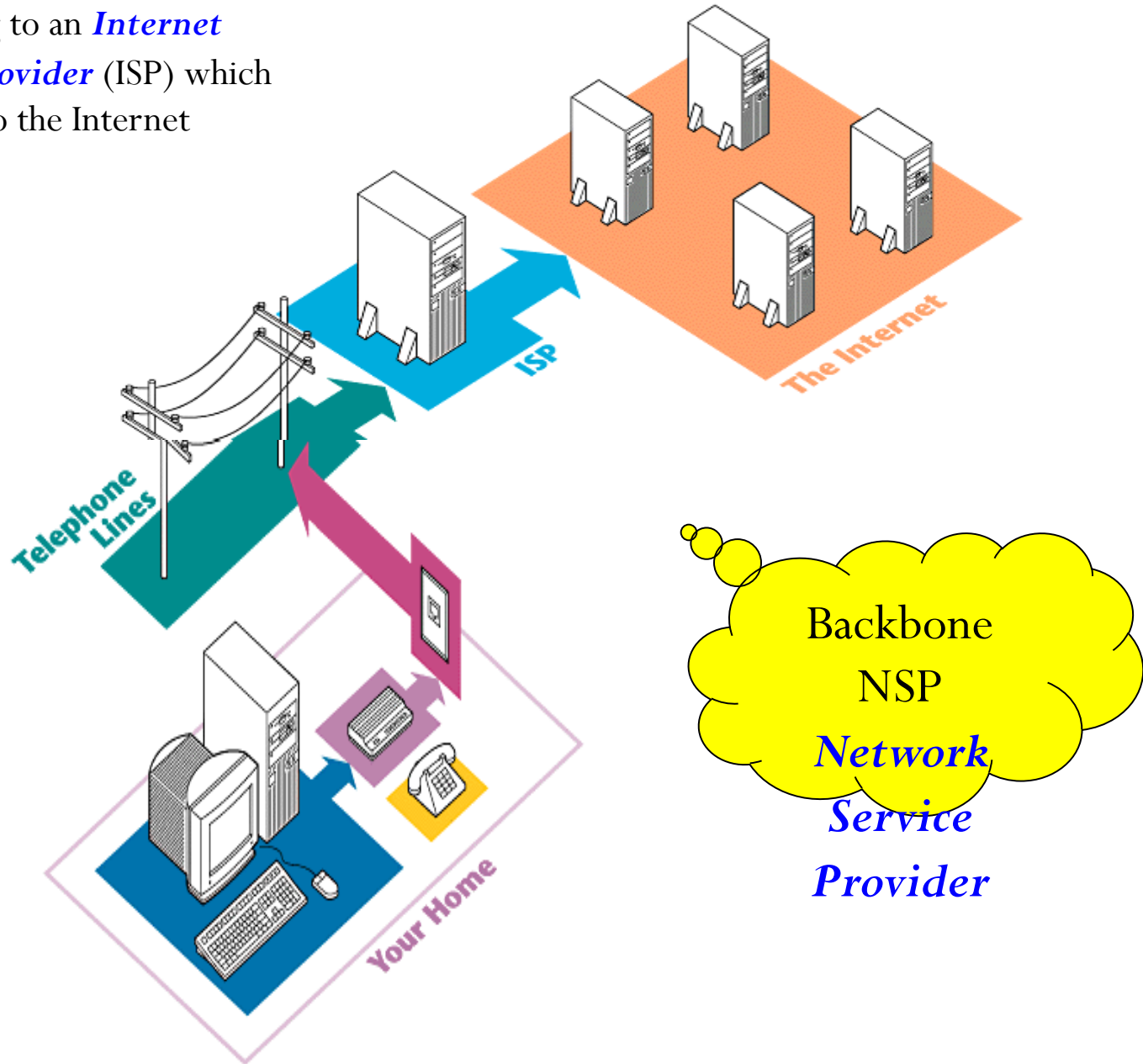
Internet Service Provider (ISP)

- *Internet Service Provider* (ISP) a company that provides access to the Internet.

  - **provides Internet access to businesses and individuals**

  - **charges monthly fee**

  - **offered over telephone lines, cable TV, or satellite dish**

- *Dial-up connection:* A connection that uses a phone line to establish a temporary Internet connection (56 Kilobits-per-second).

24

Internet Address and Domains

- *IP Address:*

- An identifier for a computer or device on a TCP/IP network.

- The format of an IP address is a 32-bit numeric address written as four numbers separated by periods.

- Each number can be zero to 255. For example, 204.194.30.130

- **www.whois-service.ru**

- **MAIL.RU or 94.100.191.201**

Internet Address and Domains

- ***Router:*** device that forwards data packets along networks (at least two networks)
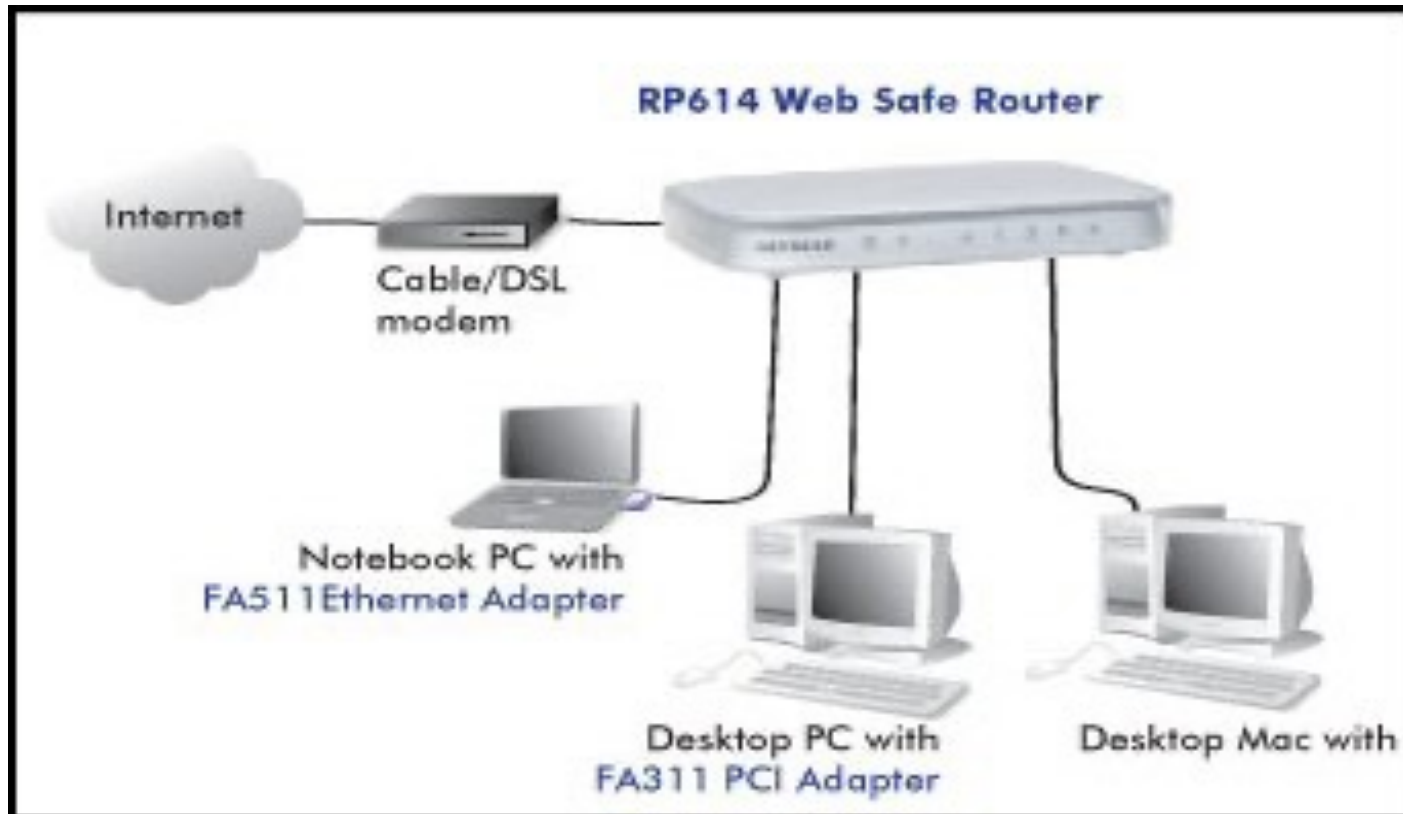
Domain Names

- Typed in lowercase

- Ends with three letter extension which is its *top-level domain*

  - A name that identifies one or more IP addresses

- A computer with a domain name is referred to as a *site*.

- *Web site* - location in a computer somewhere on the Internet.

Internet Top-level domains

Domain	Description
com	Commercial businesses
edu	Four-year colleges and universities
gov	U.S. government agencies
int	Organizations established by international treaties
mil	U.S. military organizations
net	Internet administrative organizations
org	Professional and nonprofit organizations

The Web

- *Web Browser* - a software application used to locate, retrieve and also display content on the World Wide Web, including Web pages, images, video and other files

Worldwide IE market share: February 2013

Other, 0.55%
Opera, 1.82%
Safari, 5.42%
Chrome, 16.27%
Firefox, 20.12%
IE, 55.82%

IE10, 1.58%
IE9, 21.67%
IE8, 23.38%
IE7, 2.01%
IE6, 6.33%

TNW
THE NEXT WEB
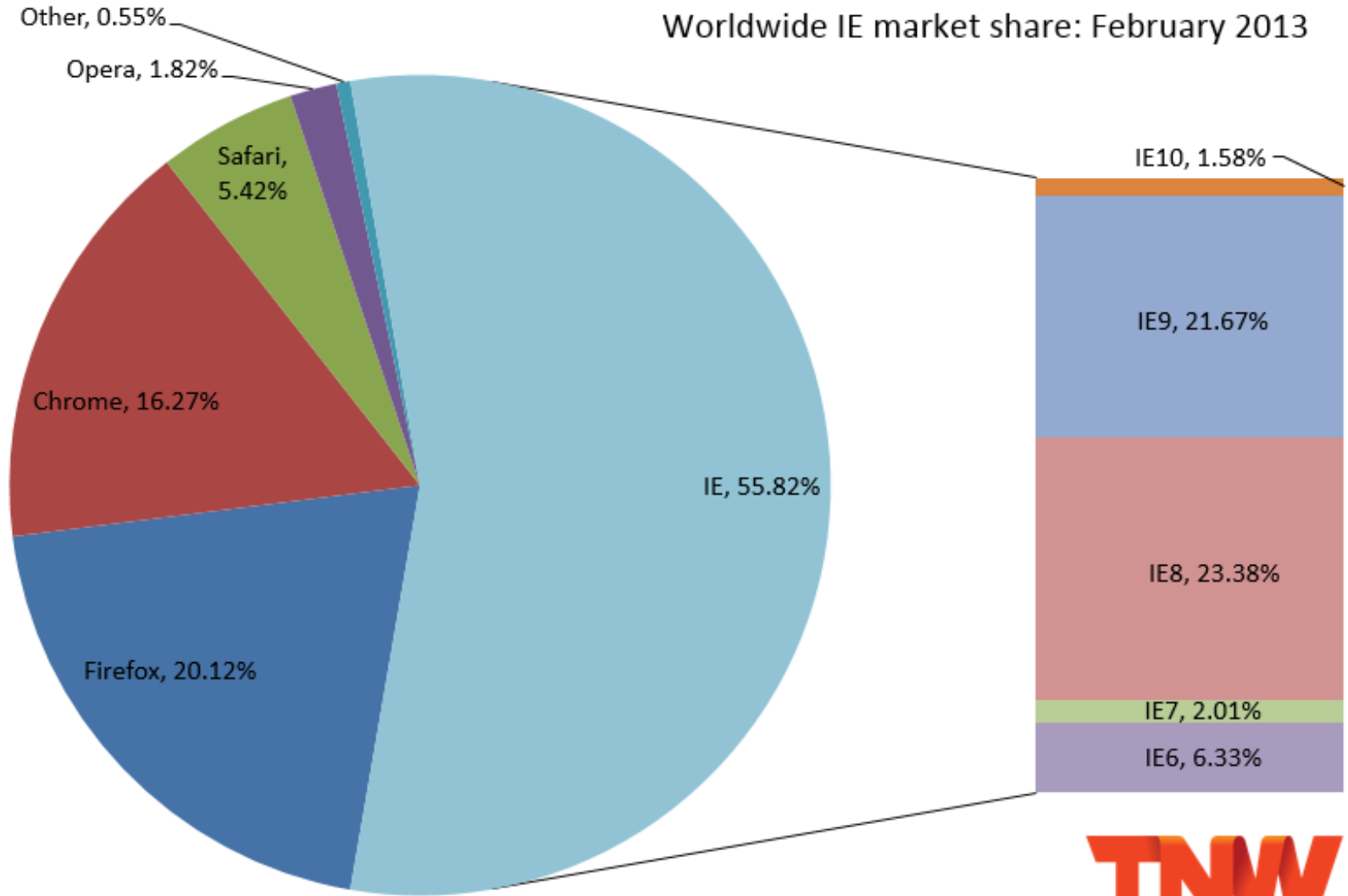
WEB basics

Web - an interlinked collection of information

- Web-based apps (Google Docs)

- Amateur video, photos, and music (traffic)

- Online-shopping   WEB 2.0

- Blogs (politics, news)

- Podcasts (Webcasts), Videocasts

- Social networking sites (Twitter)

- Wiki

The Web (continued)

- **Netscape Navigator** (1994)

- **1998** Netscape source code became open source software Mozilla

- **2004** - new version of Mozilla **Firefox**

- **1995** - Internet Explorer (IE) 1.0 Microsoft

- **1996 – Opera** was written from scratch

- **2008 –** was engineered specifically to support Web-based e-mail and similar online applications

- **2003 –** Safari, passed **Acid2 test** **-** means it follows

- W3C standards and can correctly display all complying Web pages.

Websites

- *HTTP* (**Hypertext Transfer Protocol)** - is the protocol that allows Web browsers to communicate with Web servers.

- HTTP defines how messages are formatted and transmitted, and what actions Web servers and browsers should take in response to various commands.

HTTP

- **GET** - most frequently used HTTP method

- **Socket –** an abstract concept that represents one end of a connection (port 80)

1. The URL in the browser's Address box contains the domain name of the Web server that your browser contacts.

Address   www.infoweblinks.com/np/chapter7.htm

GET np/chapter7.htm HTTP/1.1

2. Your browser opens a socket and connects to a similar open socket at the Web server.

3. Next, your browser generates and sends an HTTP message through the socket.

HTTP/1.1 200 OK
Date: Fri 24 Dec 2011
Content-Type: text.htm
Content-Length: 1354
<html>
<body>
<h1> NP InfoWebs</h1>
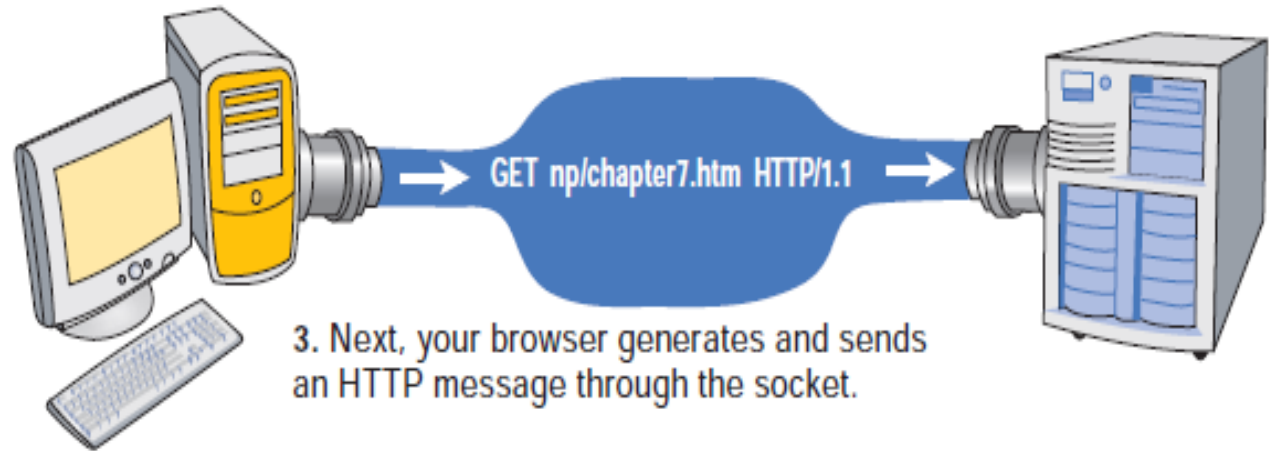
4. The server sends back the requested HTML document through the open sockets.
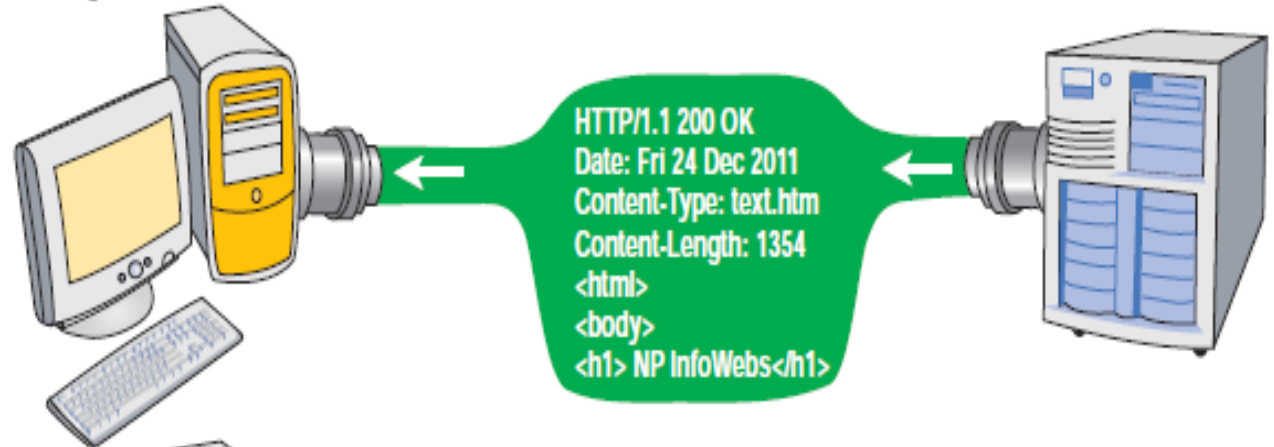
5. After sending the response, the server closes its socket and the browser closes its socket.
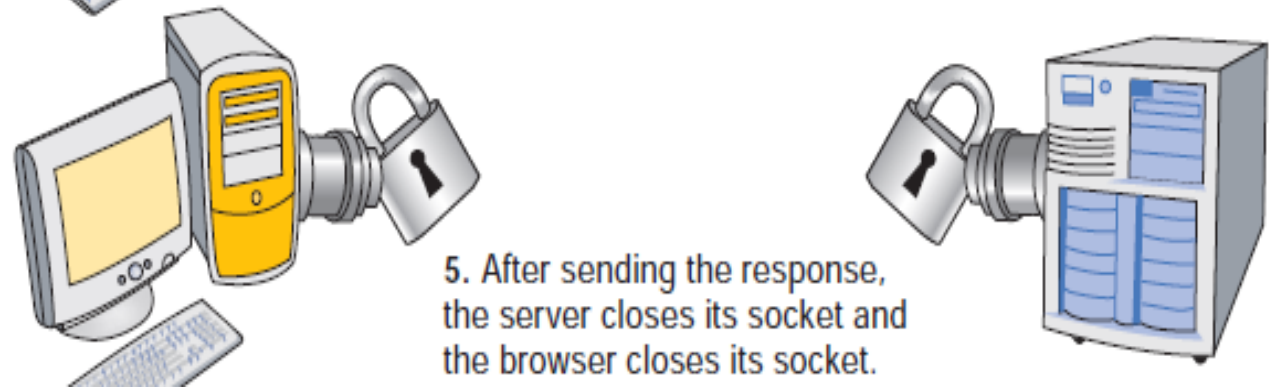
HTTP Cookie

- **Technically an HTTP cookie –** a small chunk of data generated by a Web server and stored in a text file on your computer's hard disk

1. Monitor your path through a site to keep track of the pages you viewed or the items you purchased.

2. Gather information that allows a Web server to present ad banners targeted to products you previously purchased at that Web site.

3. Collect personal information you type into a Web page form and retain it for the next time you visit the Web site.

Websites (continued)

- **_URL_** (Uniform Resource Locator, part of URI) is a global Internet address of a document on a computer that begin

http://	www.cnn.com	/showbiz/	movies.htm
Web protocol standard	Web server name	Folder name	File name and file extension

URLs

- *Web server* - computer with special software for transmitting Web pages over the Internet

  - domain names prefixed with www

Other Types of Internet Servers

- *FTP server* - a software.html application running the *File Transfer Protocol* (FTP), which is the protocol for exchanging files over the Internet

- *Usenet servers* and *IRC servers* (Internet Relay Chat servers) handle the exchange of comments among members of Internet discussion groups and chat groups.

- dir.yahoo.com/Computers_and_Internet/Internet/Chats_and_Forums/Usenet/

Web Portals

- **_Web Portal_:** web site that provides a group of popular services, such as search engine, e-mail access, chat rooms and links to shopping, weather, news and sports.

  - Lycos

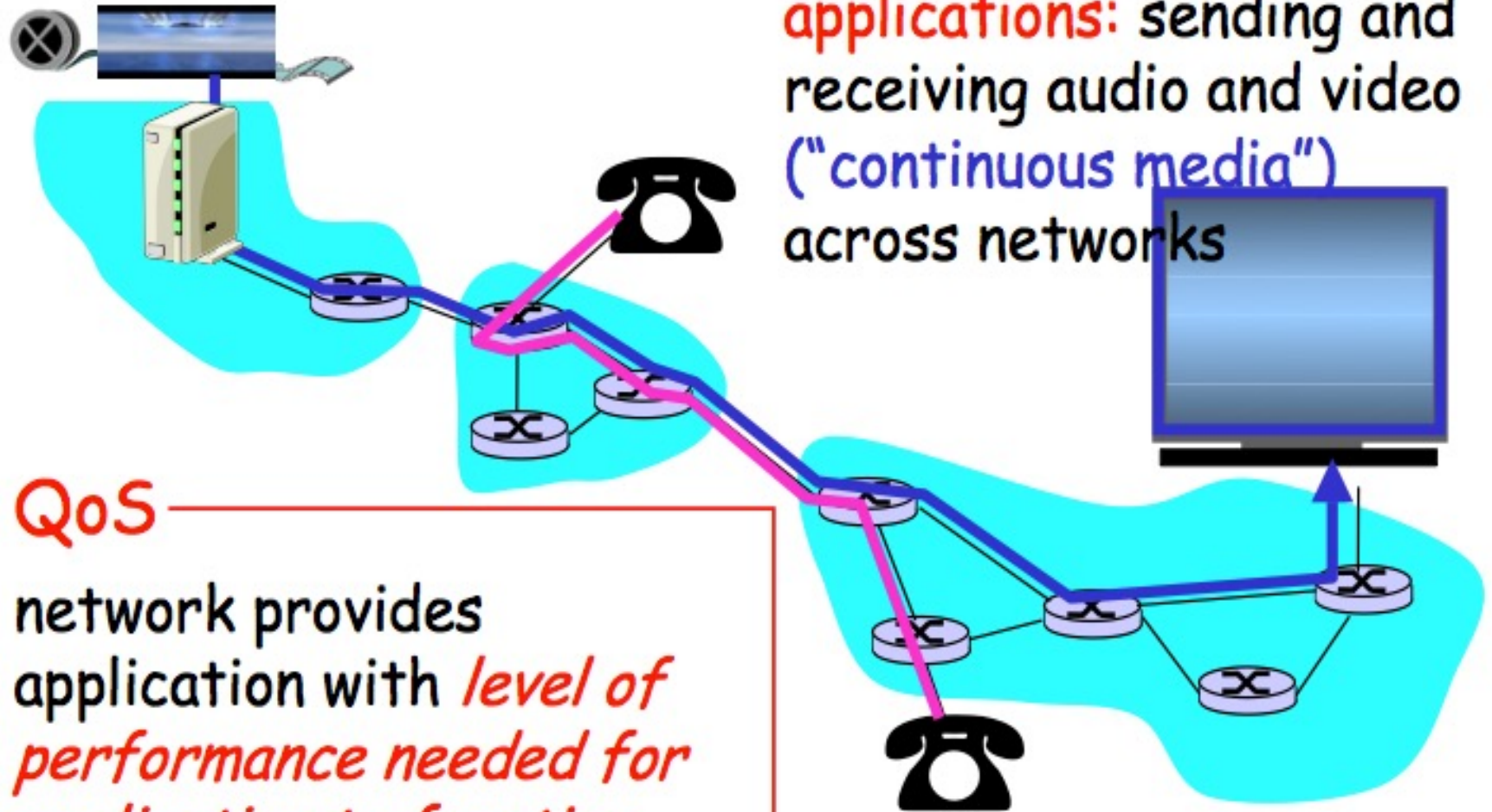 - America Online

  - Yahoo

  - Microsoft Network

Multimedia network application
- any network application that employs audio or video

Multimedia network application

Network Multimedia applications: sending and receiving audio and video ("continuous media") across networks

QoS

network provides application with *level of performance needed for application to function.*

Multimedia networking: 3 application types

- *streaming, stored* audio, video
  - *streaming:* can begin playout before downloading entire file
  - *stored (at server):* can transmit faster than audio/video will be rendered (implies storing/buffering at client)
  - e.g., YouTube, Netflix, Hulu
- *conversational* voice/video over IP
  - interactive nature of human-to-human conversation limits delay tolerance
  - e.g., Skype
- *streaming live* audio, video
  - e.g., live sporting event (futbol)

Internet Multimedia (continued)

- *Multimedia Overlay technology* adds a separate window to play the media element.

- **Plug-in, Player, Viewer:** Software module that provides system the capability to run a specific type of file (.wav and .avi files).

Multimedia overlay technology
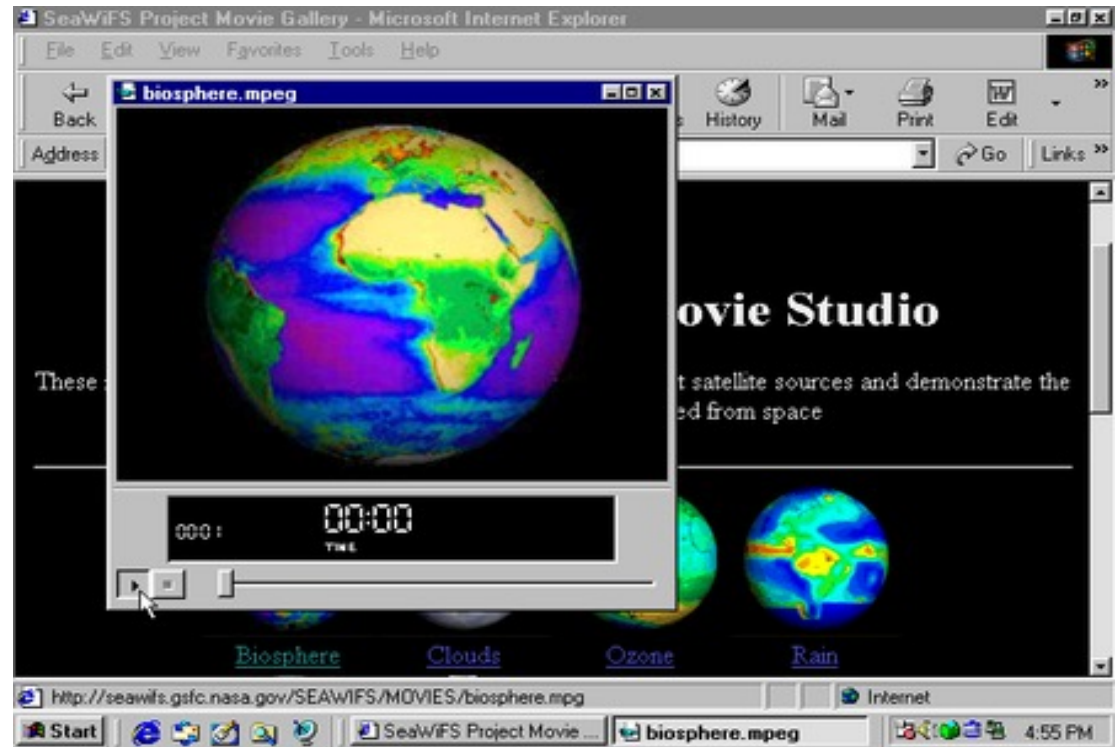
File Transfers

- *Downloading:* Process of transferring the file from remote computer to your computer.

- *Uploading:* Process of sending a copy of files from your computer to remote computer.

Internet Interactions

- ***Discussion group****.*

  - takes place ***asynchronously****,* meaning discussion participants are not online at the same time

- ***Chat group***

  - is a discussion group which takes place *synchronously* (participants are online at the same time).

- ***Newsgroups***

HTML Authoring

- *HTML* or **Hypertext Markup Language** is a scripting language used for writing Web pages.

- Developed by Tim Berners-Lee

- World Wide Web Consortium (W3C)

- Tags are used <html> </html>

  - Usually a pair of tags beginning and ending

  - *Java applets* are embedded in HTML files

HTML Authoring

- **XHTML** is a markup language very similar to HTML 4.01, but is more easily customized.

- **DHTML (Dynamic HTML)** and **Ajax (Asynchronous JavaScript and XML)** - offer tools and techniques for extending basic HTML (more interactive, visually appealing, and media-rich).

MIME Types

- *MIME* or *Multipurpose Internet Mail Extension*

- Specification that defines how an attachment is to be read

  - type/subtype

  - text/html, image/gif, application/msword

- With Web browsers, **MIME** types tell it what plug-ins to use

- **Helper application** (called a **browser add-on**) is a program that extends a browser's ability to work with file formats (MOV, PDF, SWF).
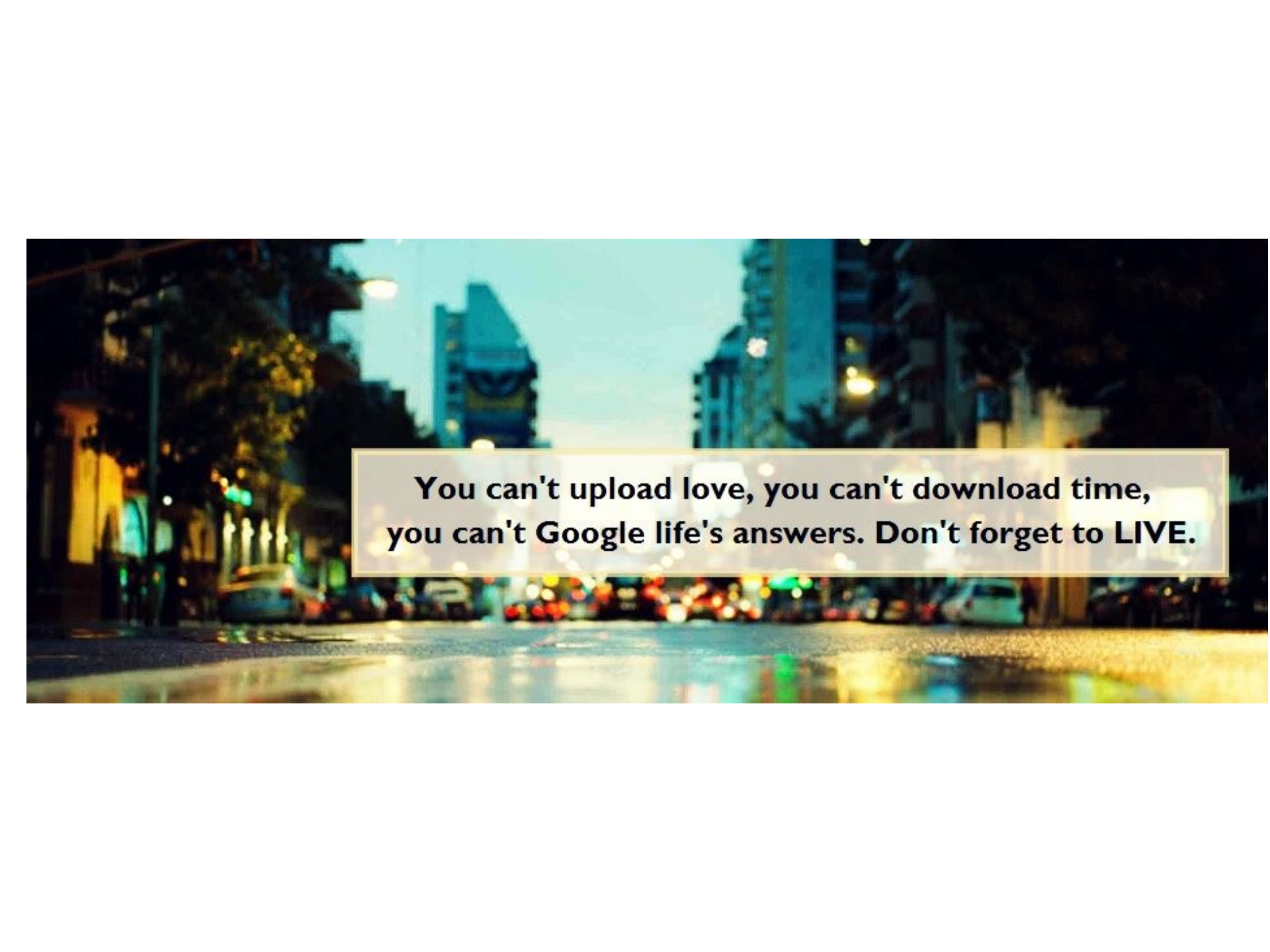
Plug-in

- **Plug-in** - type of helper application, pioneered by Netscape developers <embed> or <object>
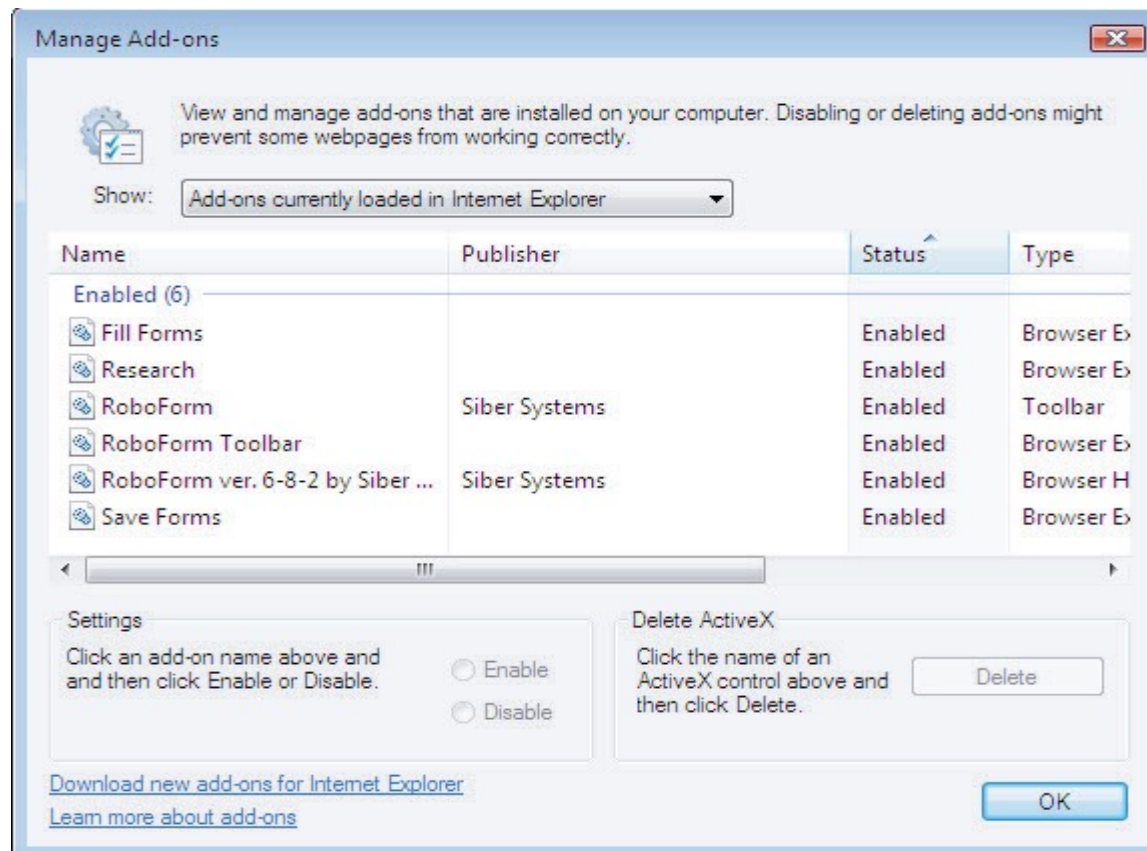
Other Internet Technologies

- *XML* or *eXtensible Markup Language*

  - User defined tags using a stylesheet

- *JavaScript* uses the syntax of Java in a scripting language (enable interactive sites)

  - <SCRIPT> </SCRIPT>

- *Java* – OOP language

  - Code is interpreted instead of compiled in the JVM

- *Flash* – small, compact, vector based animation tool

- *QuickTime* – larger, better video quality, bitmap

You can't upload love, you can't download time, you can't Google life's answers. Don't forget to LIVE.

End of Lecture 10