

# THE INTERNET AND THE WORLD WIDE WEB

# What is the internet?

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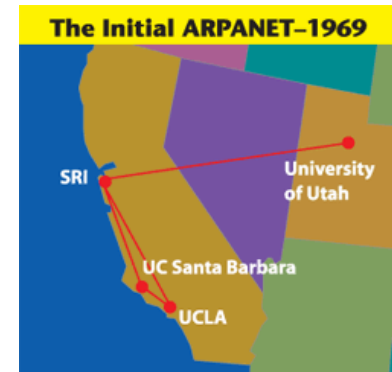
- A collection of computer networks that use a protocol to exchange data
- Is the World Wide Web (WWW) and the internet the same?



# Brief history

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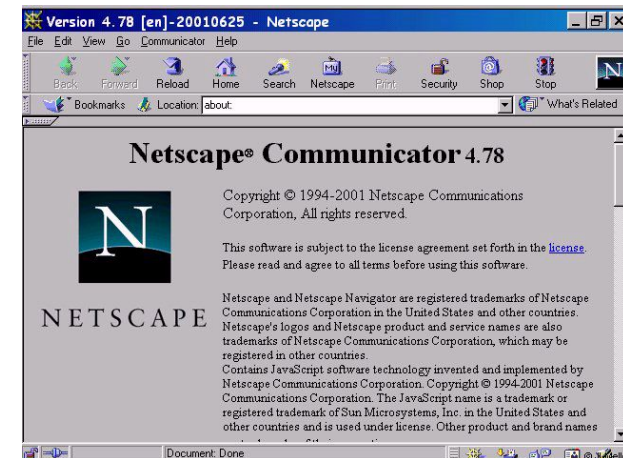
- Began as a US Department of Defense network called ARPANET (1960s-70s)
- Packet switching (in the 60s)
- E-mail is born on 1971
- TCP/IP beginning on 1974 (Vinton Cerf)
- By 1987: Internet includes nearly 30,000 hosts



# Brief history (cont.)

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- WWW created in 1989-91 by Tim Berners-Lee
- Popular web browsers released:
  - ▣ Netscape 1994
  - ▣ IE 1995
- Amazon.com opens in 1995
- Google January 1996
- Wikipedia launched in 2001
- MySpace opens in 2003
- Facebook February 2004



# The future of the internet?

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# Key aspects of the internet

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- ❑ Sub-networks are independent
- ❑ Computers can dynamically join and leave the network
- ❑ Built on open standards
- ❑ Lack of centralized control (mostly)
- ❑ Everyone can use it with simple, commonly available software

# People and organizations

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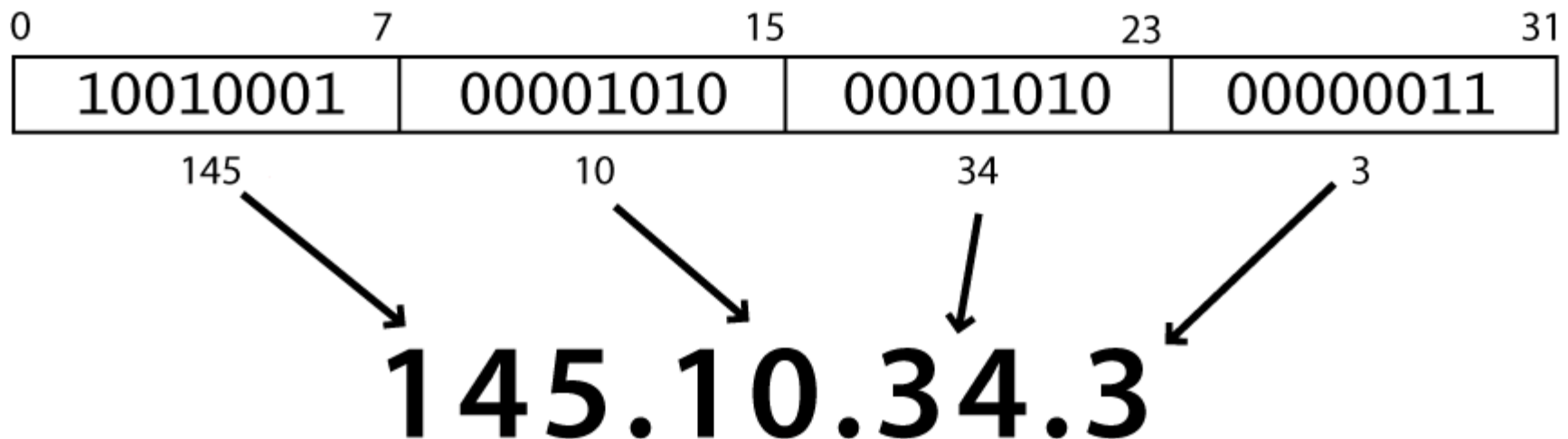
- Internet Engineering Task Force (IETF): internet protocol standards
- Internet Corporation for Assigned Names and Numbers (ICANN): decides top-level domain names
- World Wide Web Consortium (W3C): web standards



# Internet Protocol (IP)

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- Simple protocol for data exchange between computers
- IP Addresses:
  - ▣ 32-bit for IPv5
  - ▣ 128-bit for IPv6



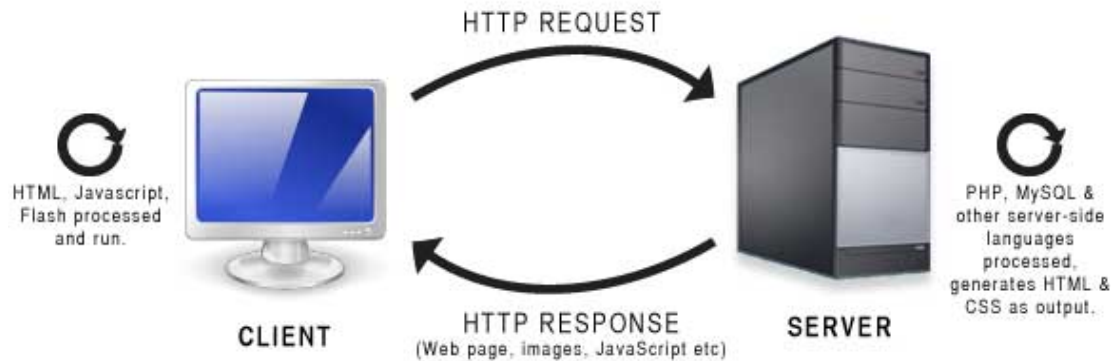


# Transmission Control Protocol (TCP)

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- Adds multiplexing and reliable delivery on top of IP
  - ▣ Multiplexing: multiple programs using the same IP address
  - ▣ Reliability: guaranteed, ordered and error-checked delivery
- Port: a number given to each program or service
  - ▣ port 80: web browser (port 443 for secure browsing)
  - ▣ port 25: email
  - ▣ port 22: ssh
- Some programs (games, streaming media programs) use simpler UDP protocol instead of TCP

# Web Browser vs Web Server



**Web Browser** requests and parses documents from web servers

- Mozilla Firefox
- Microsoft Internet Explorer (IE)
- Apple Safari
- Google Chrome
- ...

**Web Server** listens for web page requests

- Apache
- Microsoft Internet Information Server (IIS)
- ...

# Domain Name Server (DNS)

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- Set of servers that map (translate) written names to IP addresses
  - ▣ Example: `www.cs.toronto.edu` → **128.100.3.40**
- Many systems maintain a local cache called a hosts file
  - ▣ Windows: `C:\Windows\system32\drivers\etc\hosts`
  - ▣ Mac: `/private/etc/hosts`
  - ▣ Linux: `/etc/hosts`

# Uniform Resource Locator (URL)

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- Identifies the path to a document on the web server

Example URL:

`http://www.cs.toronto.edu/~mashiyat/csc309/index.htm`

Upon entering this URL into the browser, it would:

- ▣ ask the DNS server for the IP address of the URL
- ▣ connect to that IP address at port 80
- ▣ request the document from the server by sending  
`GET mashiyat/csc309/index.htm`
- ▣ parse and display the resulting page on the screen

# Hypertext Transport Protocol (HTTP)

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- Set of commands understood by a web server and sent from a browser
- Some HTTP commands (your browser sends these internally):
  - ▣ GET filename: **download**
  - ▣ POST filename: **send a web form response**
  - ▣ PUT filename: **upload**

# HTTP Error Codes

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- When something goes wrong, the web server returns a special "error code" number
- Common error codes:

Number	Meaning
200	OK
301-303	page has moved (permanently or temporarily)
403	you are forbidden to access this page
404	page not found
500	internal server error

# Internet Media (“MIME”) types

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MIME type	file extension
text/html	.html
text/plain	.txt
image/gif	.gif
image/jpeg	.jpg
video/quicktime	.mov
application/octet-stream	.exe

# Enabling Web Technologies

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- Hypertext Markup Language (HTML)  
Used for writing web pages
- Cascading Style Sheets (CSS)  
Stylistic info for web pages
- JavaScript  
Interactive web pages (on the client)
- Server side Programming language (Python, Nodejs, etc.)  
Dynamic and data-driven pages (on the web server)



# Enabling Web Technologies (cont.)

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- eXtensible Markup Language (XML):  
Markup language for describing and exchanging data
- Asynchronous JavaScript and XML (Ajax)  
Creating asynchronous Web applications
- ...