

CSC 337



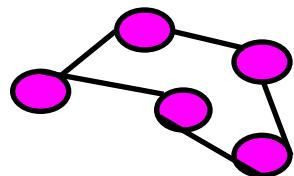
The Internet

National Science Foundation

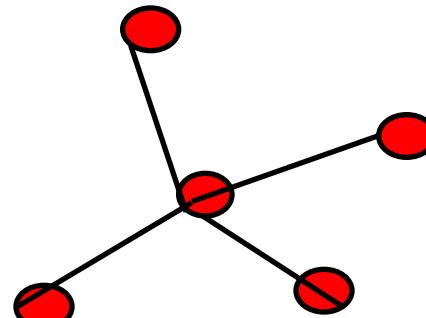
Rick Mercer

Computer Networks

- A *computer network* is a group of two or more computers that are linked together
- Each type of network will have its *protocols* (rules) that determine how computers communicate



Token Ring Protocol



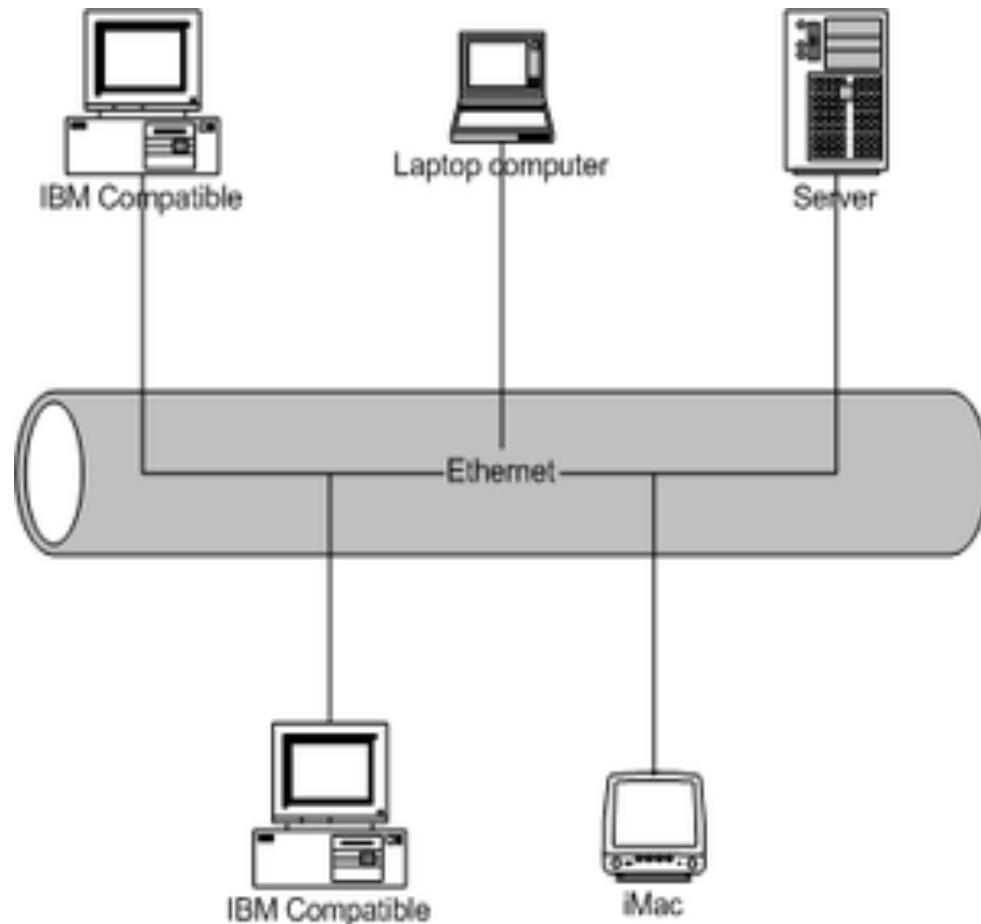
Wifi Protocol



Ethernet Protocol

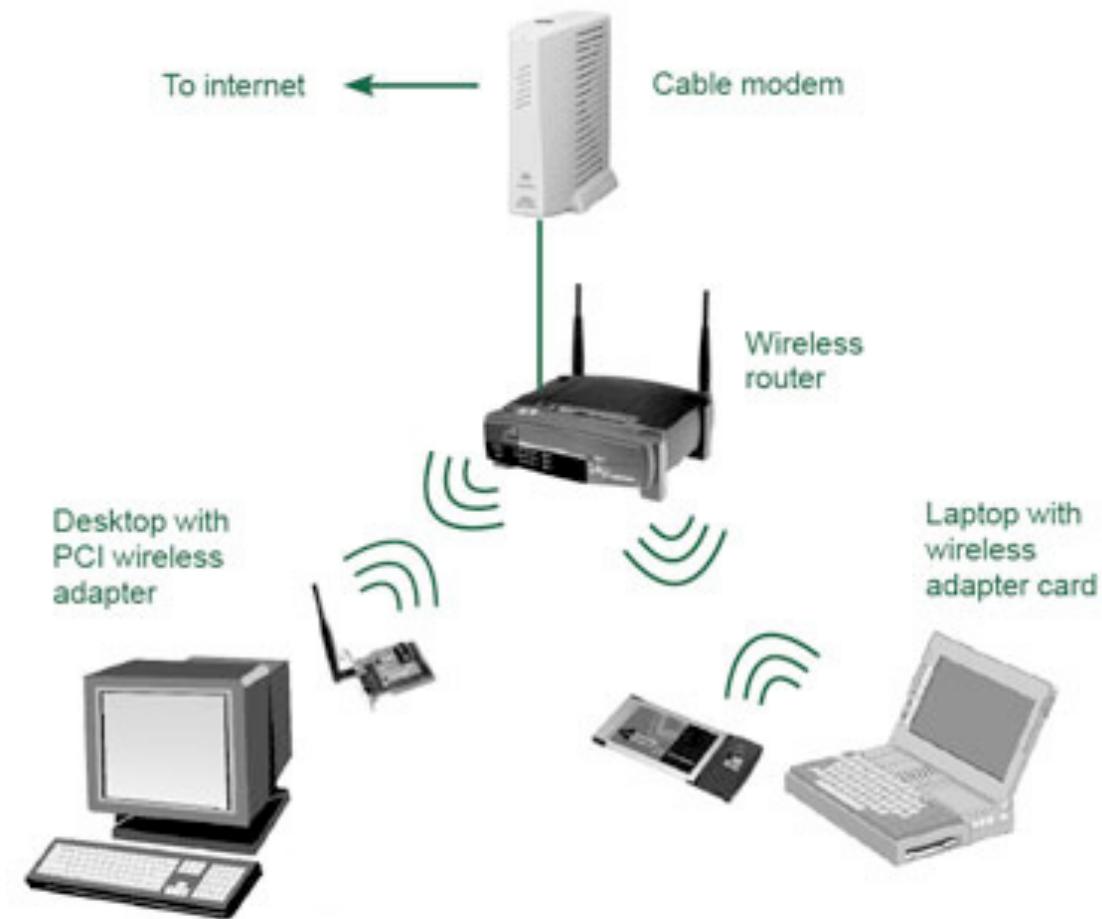
Local Area Network (LAN)

- A *local area network* (*LAN*) connects computers within a school or home
- An *ethernet* network uses wires  to connect computers



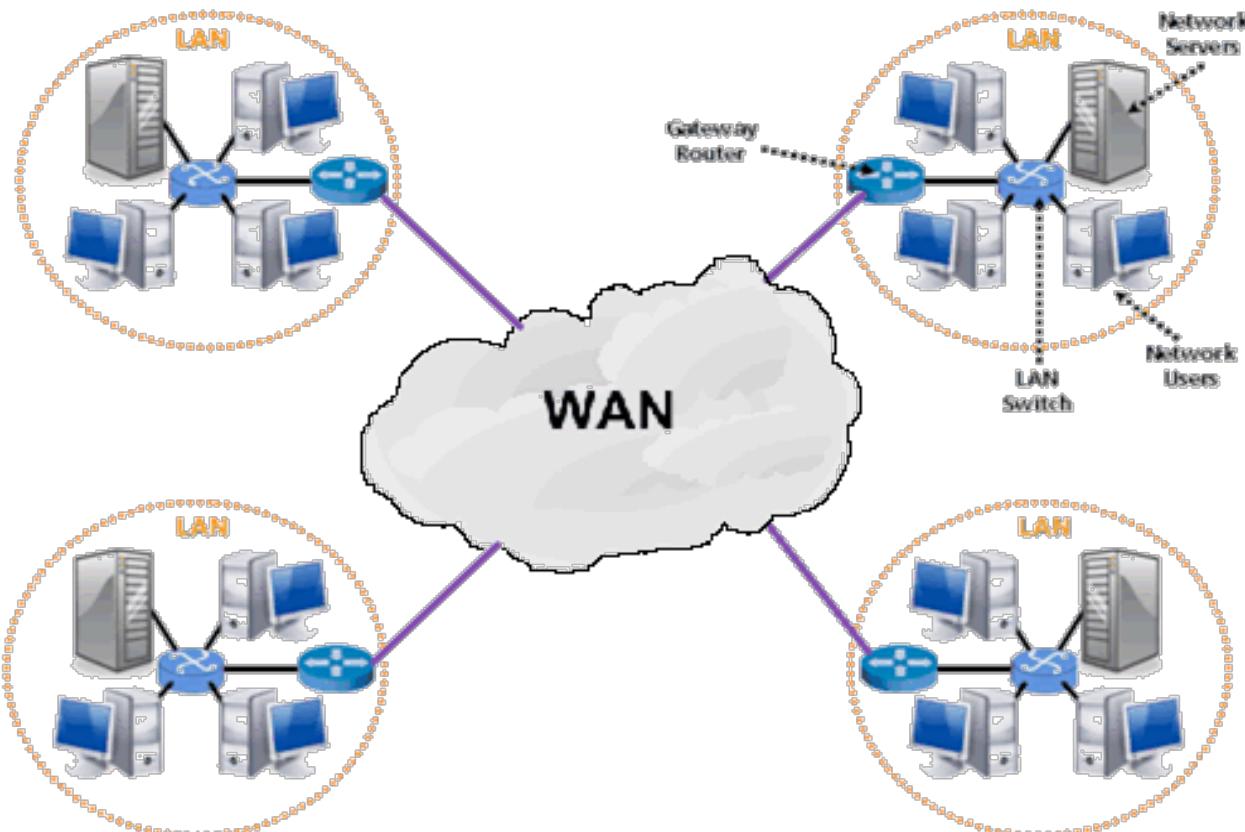
Wifi: A Wireless LAN

- A *Wifi* network uses radio waves to connect devices (computers, smart phones, printers)



Wide Area Network (WAN)

- A *wide area network (WAN)* connects devices over a broad geographic region, 2 or more local area networks
- The largest WAN is the Internet



How's it Sent?

- Connecting new devices to the Internet is enabled by assignment of an Internet protocol (IP) address.
- An IP address is an identifier for a computer or device
- Networks using the TCP/IP protocol route messages based on the IP address of the destination

http://en.wikipedia.org/wiki/IP_address

Domain name servers translate
domain names like a phonebook

Site24x7

Find IP Address

Find IP Address of your website. Sign up for a Site24x7 Free A

Domain Name

cicada.cs.arizona.edu

Find IP

An IPv4 address (dotted-decimal notation)

172 . 16 . 254 . 1



10101100 .00010000 .11111110 .00000001

One byte = Eight bits

Thirty-two bits (4×8), or 4 bytes

Name servers on campus

```
mercer$ whois arizona.edu
```

Domain Name: ARIZONA.EDU

Registrant:

University of Arizona
Computer Center
1077 N Highland Ave
Tucson, AZ 85721
UNITED STATES

... contacts deleted

Name Servers:

MAGGIE.TELCOM.ARIZONA.EDU	128.196.128.233
PENNY.UITS.ARIZONA.EDU	128.196.130.9
OPTIMA.CS.ARIZONA.EDU	192.12.69.5
PENDRAGON.CS.PURDUE.EDU	
NS-REMOTE.ARIZONA.EDU	192.245.12.56

Domain record activated: 23-Jan-1986

Domain record last updated: 07-Apr-2017

Domain expires: 31-Jul-2018

Data moves in Packets

- The Internet is a packet-switched system through which digital data is sent by breaking the data into blocks of bits called packets
 - Packets contain both the data being transmitted and control information for routing the data
 - This is an IPv4 packet header (before the data and CRC)

Internet Enables Collaboration

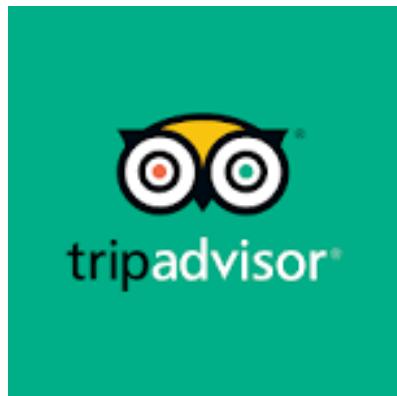


Wiki Wiki



WIKIPEDIA
The Free Encyclopedia

GitHub



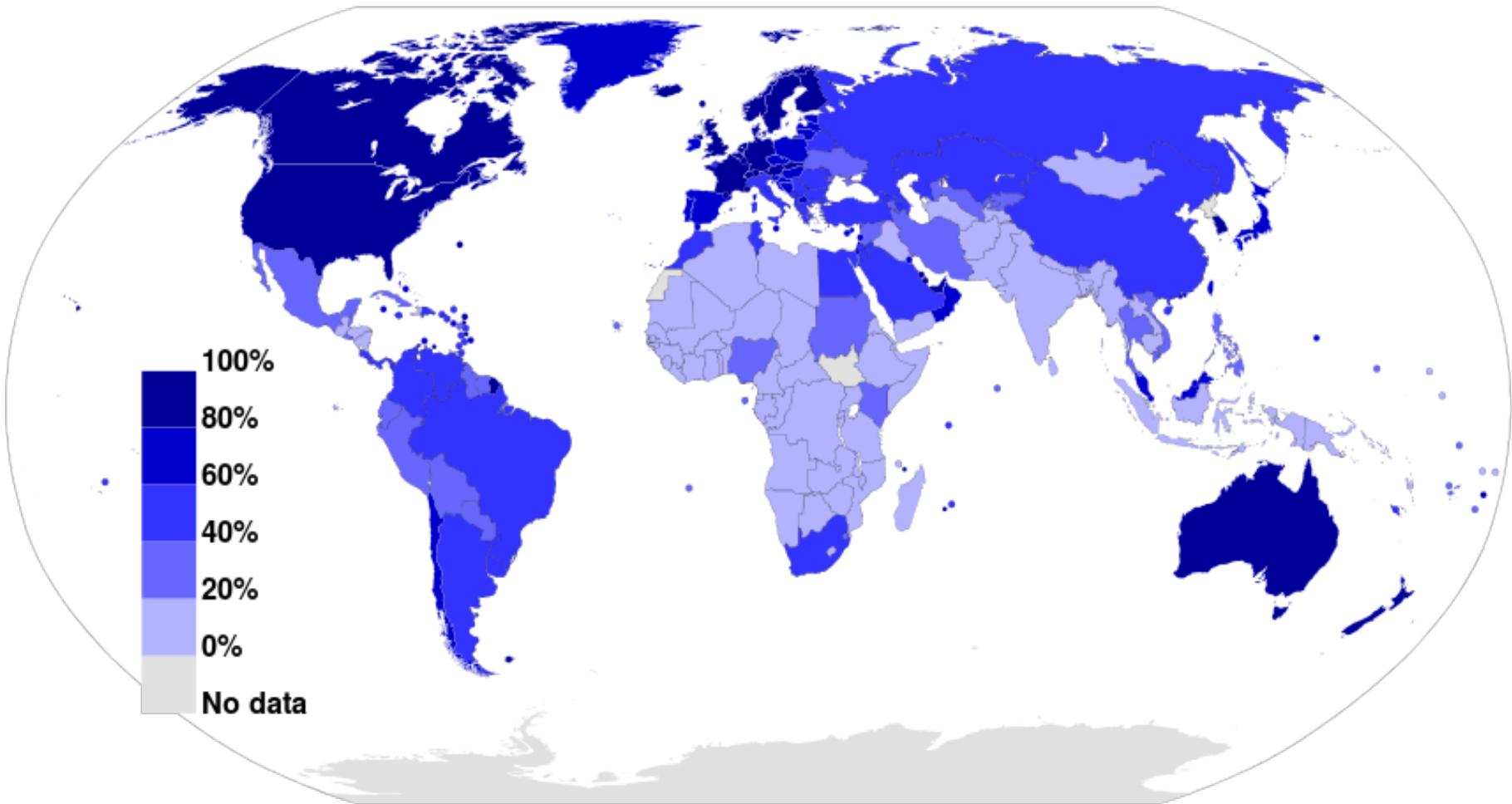
Applications
in the cloud



Not just on
your
computer

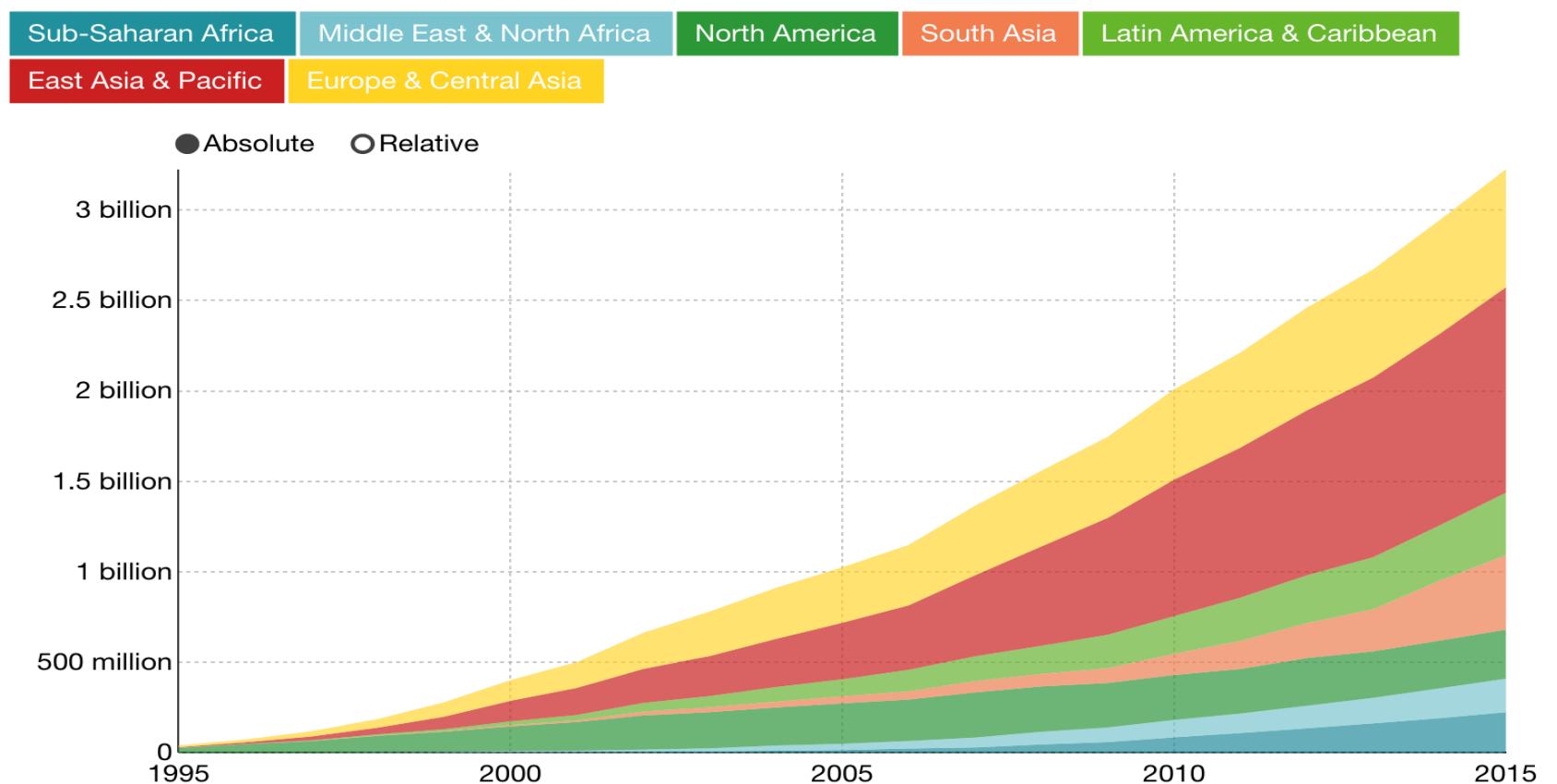
Internet Connectivity

- The world is connected
- Internet users as % of country's population



Growth of the Internet

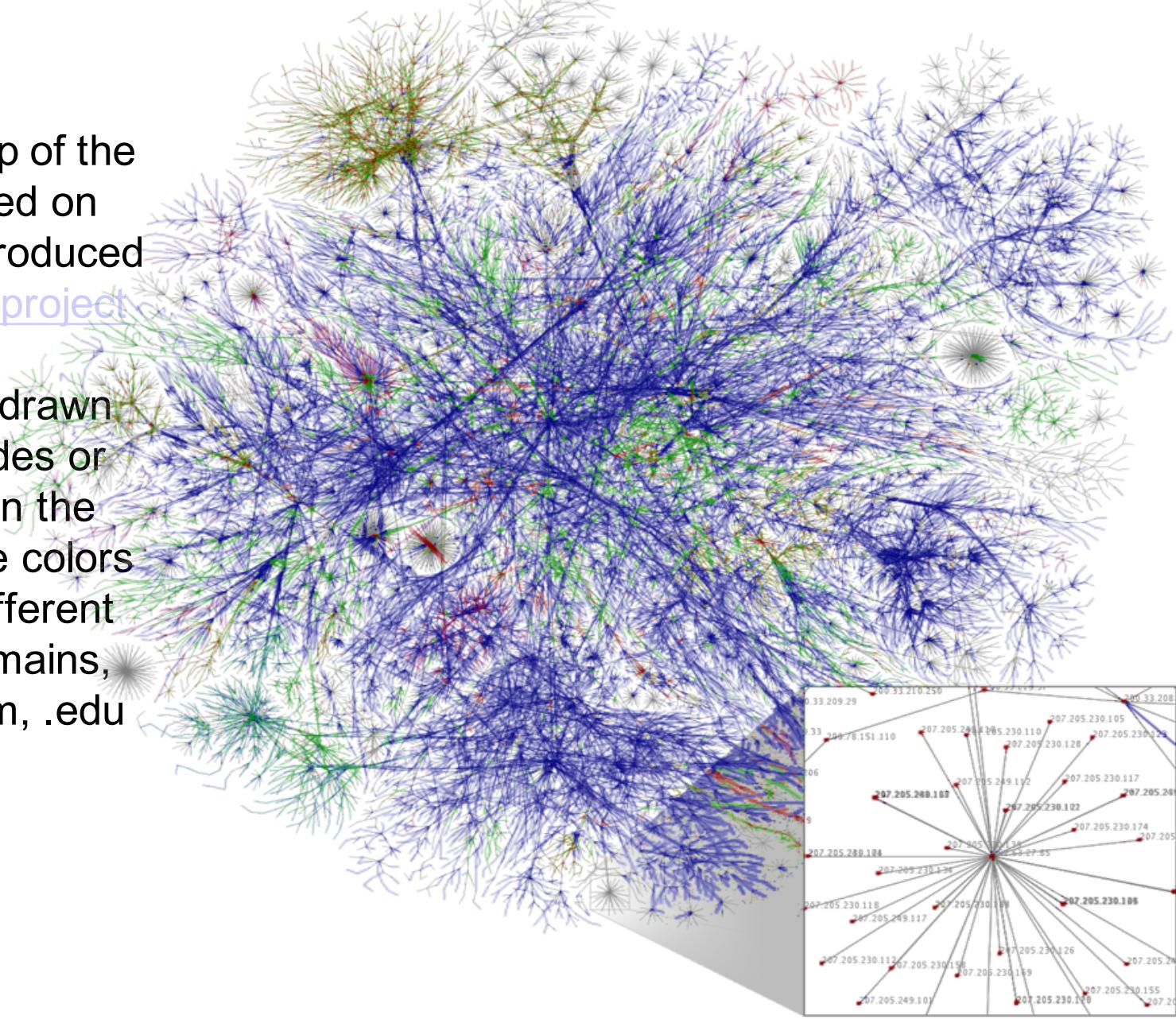
- The number of computers on Internet has grown exponentially since its inception in 1984 (94-15 here)



A Picture of the Internet

A partial map of the Internet based on 2005 data produced by [the Opte project](#)

Each line is drawn between nodes or addresses on the Internet. The colors represent different top-level domains, such as .com, .edu and .org



WWW is an Application Service

- The **WWW** is the set of application services that run on the Internet
- Other application services include:
 - E-mail: *Simple Mail Transfer Protocol (SMTP)* or *Post Office Protocol (POP)*
 - Secure Shell (*SSH*) to log into another computer over the network (we can no longer use *ftp*)
 - Instant Messaging: *Internet Relay Chat (IRC)*
 - Telephony: *Voice Over IP (VoIP)*
- These are *distributed applications* because they run on a network, not on a single computer

Sir Tim Berners-Lee

- The WWW was invented by [Tim Berners-Lee](#)
- Who, instead of patenting his invention, made his idea freely available without royalties
- In his view, the WWW brought the Internet to a higher level of abstraction



"I just had to take the hypertext idea and connect it to the [Transmission Control Protocol](#) and [domain name system](#) ideas and—ta-da!—the World Wide Web ... Creating the web was really an act of desperation, because the situation without it was very difficult when I was working at CERN later. Most of the technology involved in the web, like the hypertext, like the Internet, multifont text objects, had all been designed already. I just had to put them together. It was a step of generalising, ***going to a higher level of abstraction***, thinking about all the documentation systems out there as being possibly part of a larger imaginary documentation system."

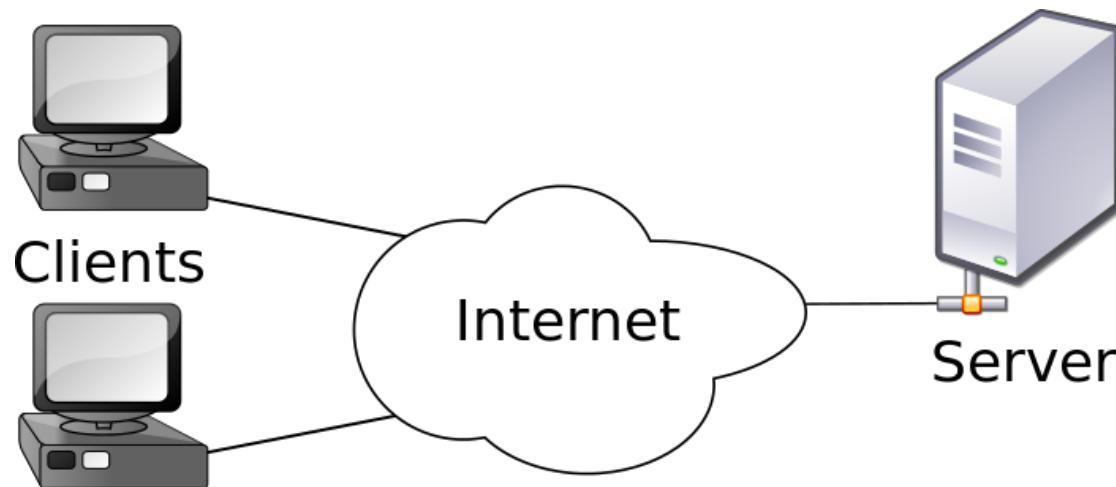
The HTTP Protocol

- WWW resources are accessed using the *HyperText Transfer Protocol (HTTP)*
- Resources are accessed by their Uniform Resource Identifiers (URIs)
 - <http://en.wikipedia.org/index.html>
- Resources are accessed by browsers
 - Firefox, Chrome, Safari, IE Spartan
- Web resources are hosted by *Web servers* that respond to HTTP requests



The Client/Server Model

- Client computers request services from a server located on the internet
- Gmail stores messages on Google's servers (or for CatMail, here on campus) and processes requests to send/retrieve messages



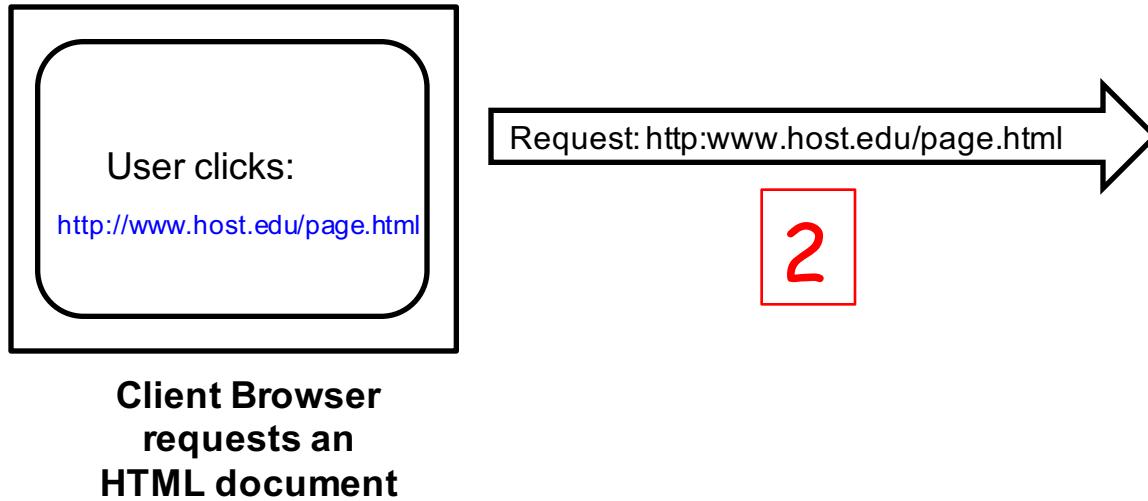
The HTTP Client/Server Model



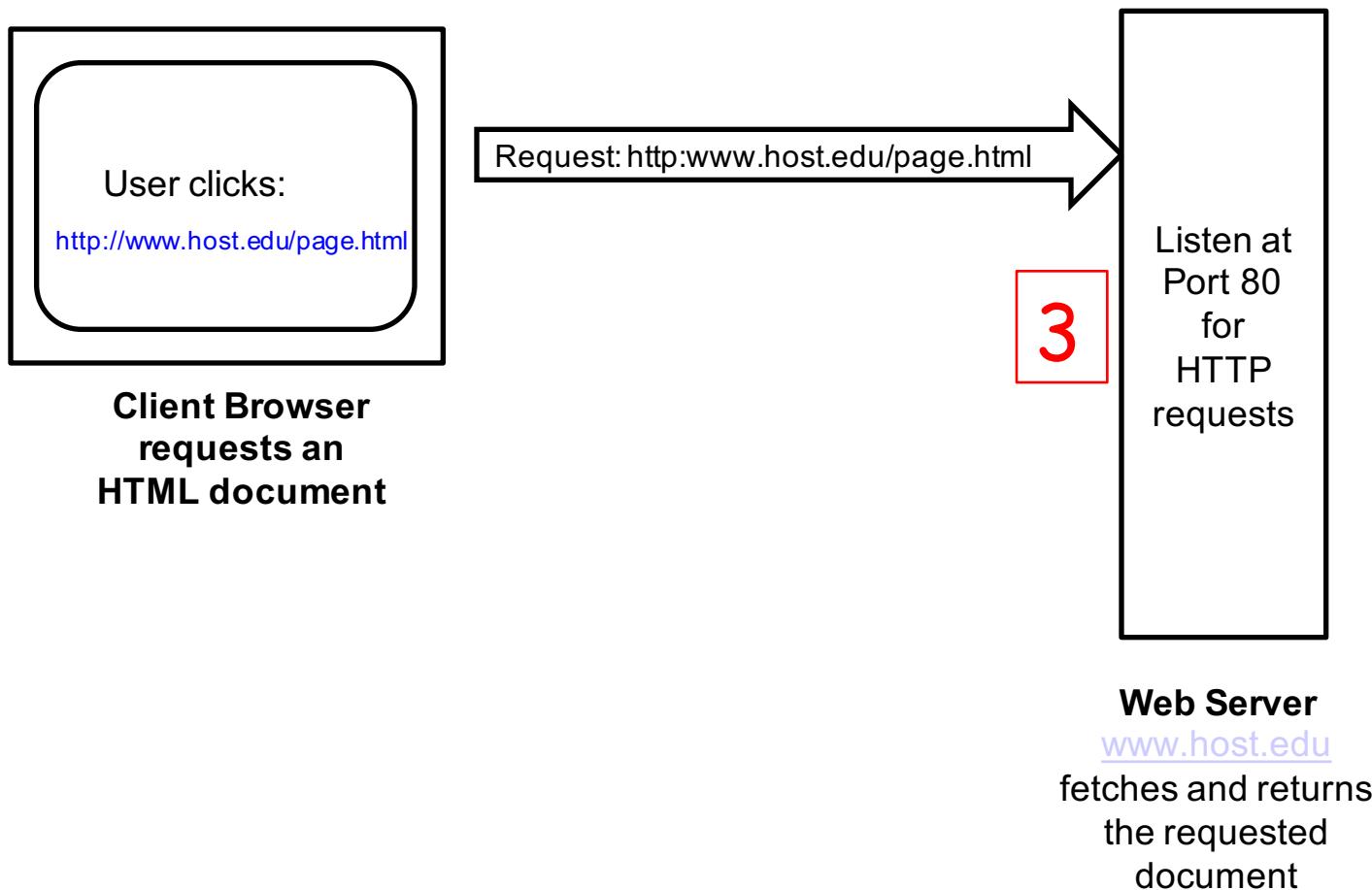
**Client Browser
requests an
HTML document**

1

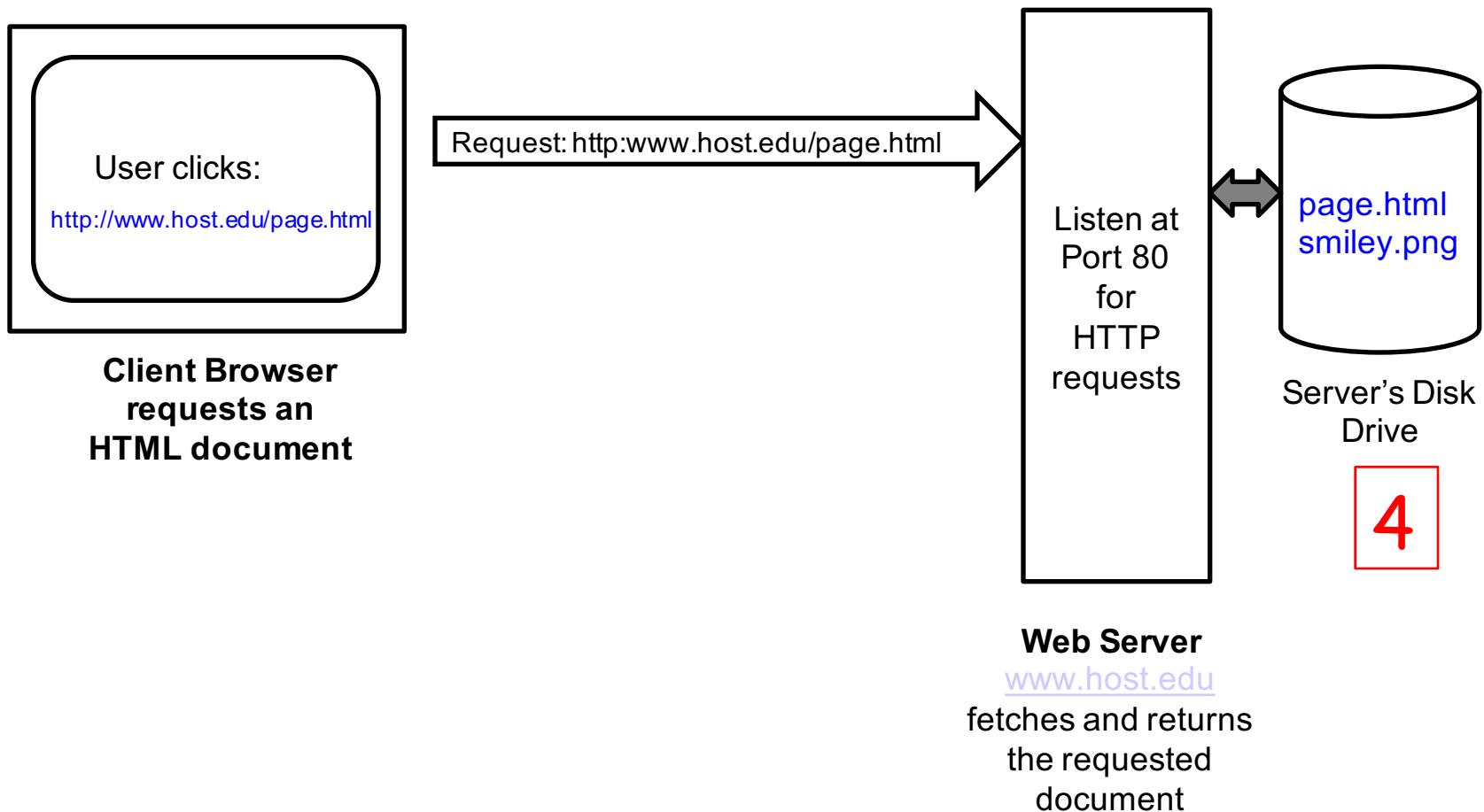
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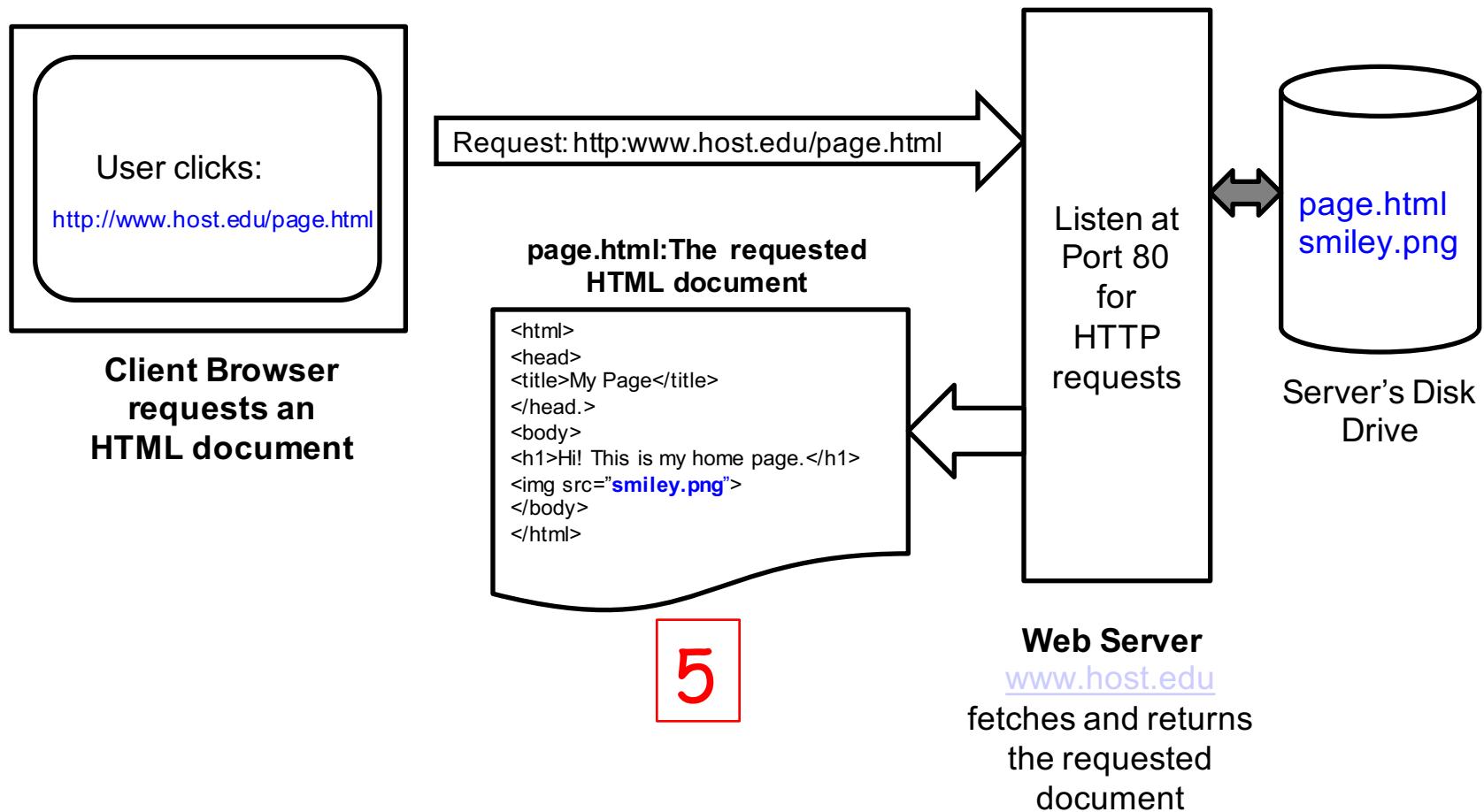
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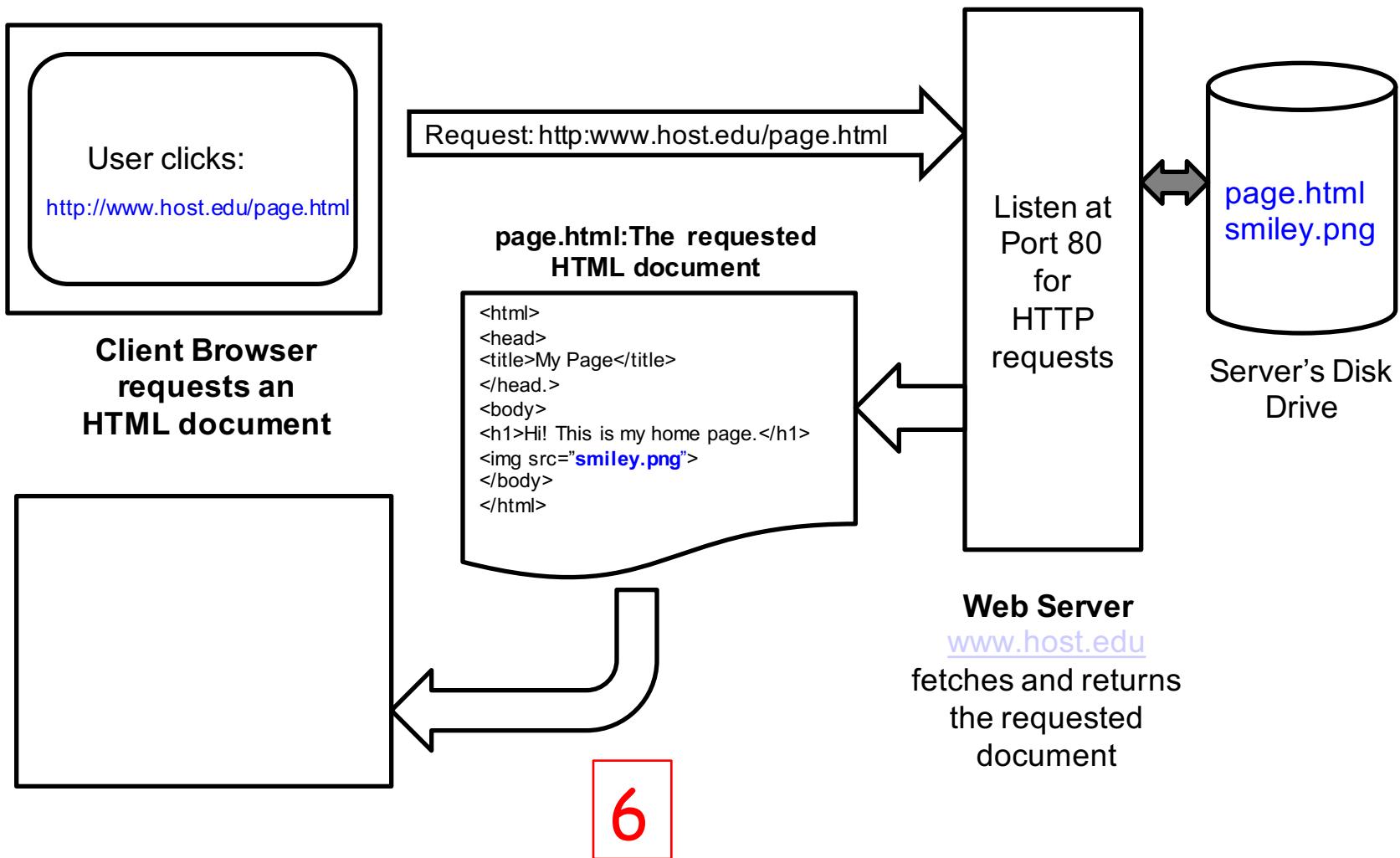
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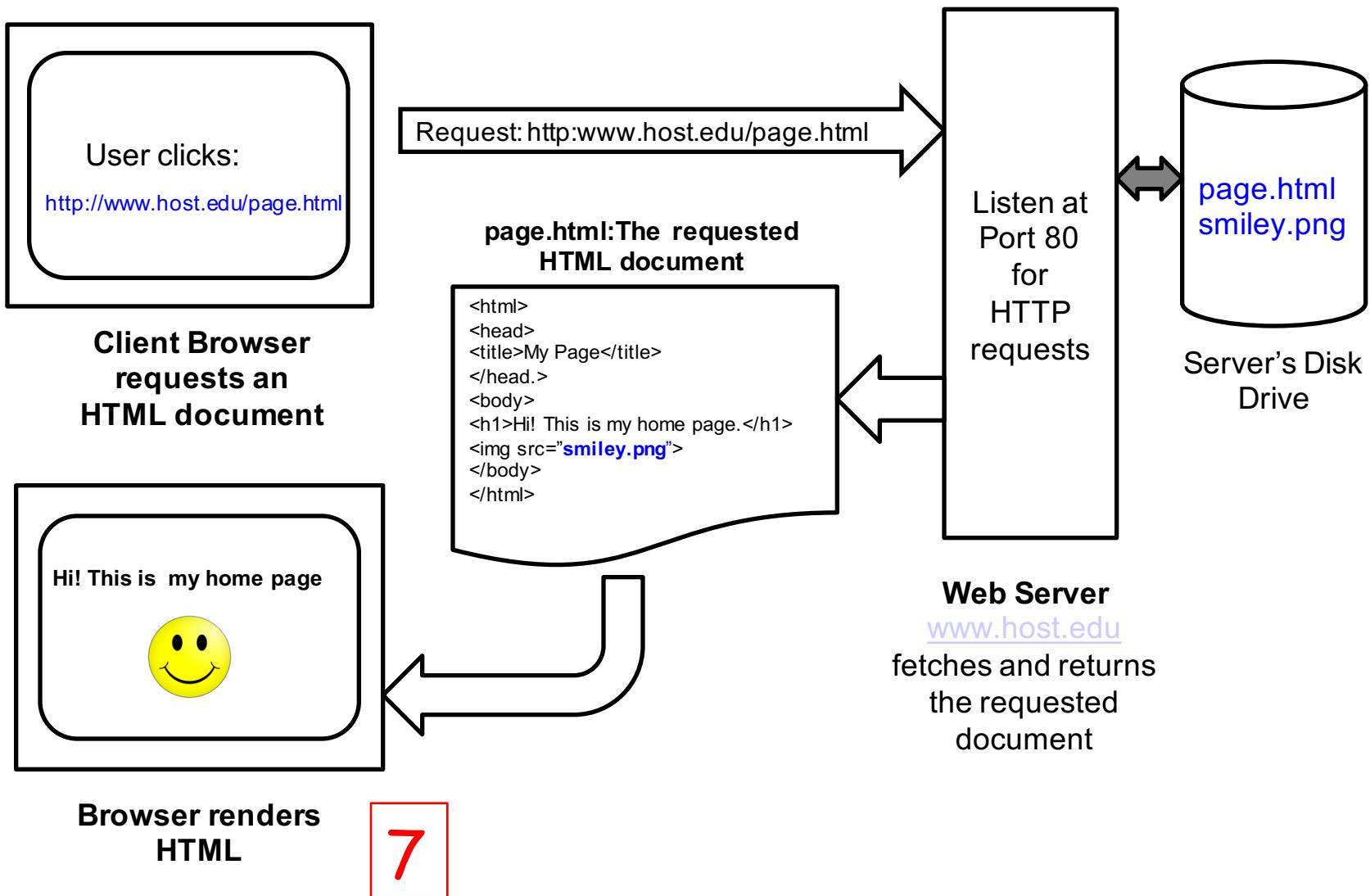
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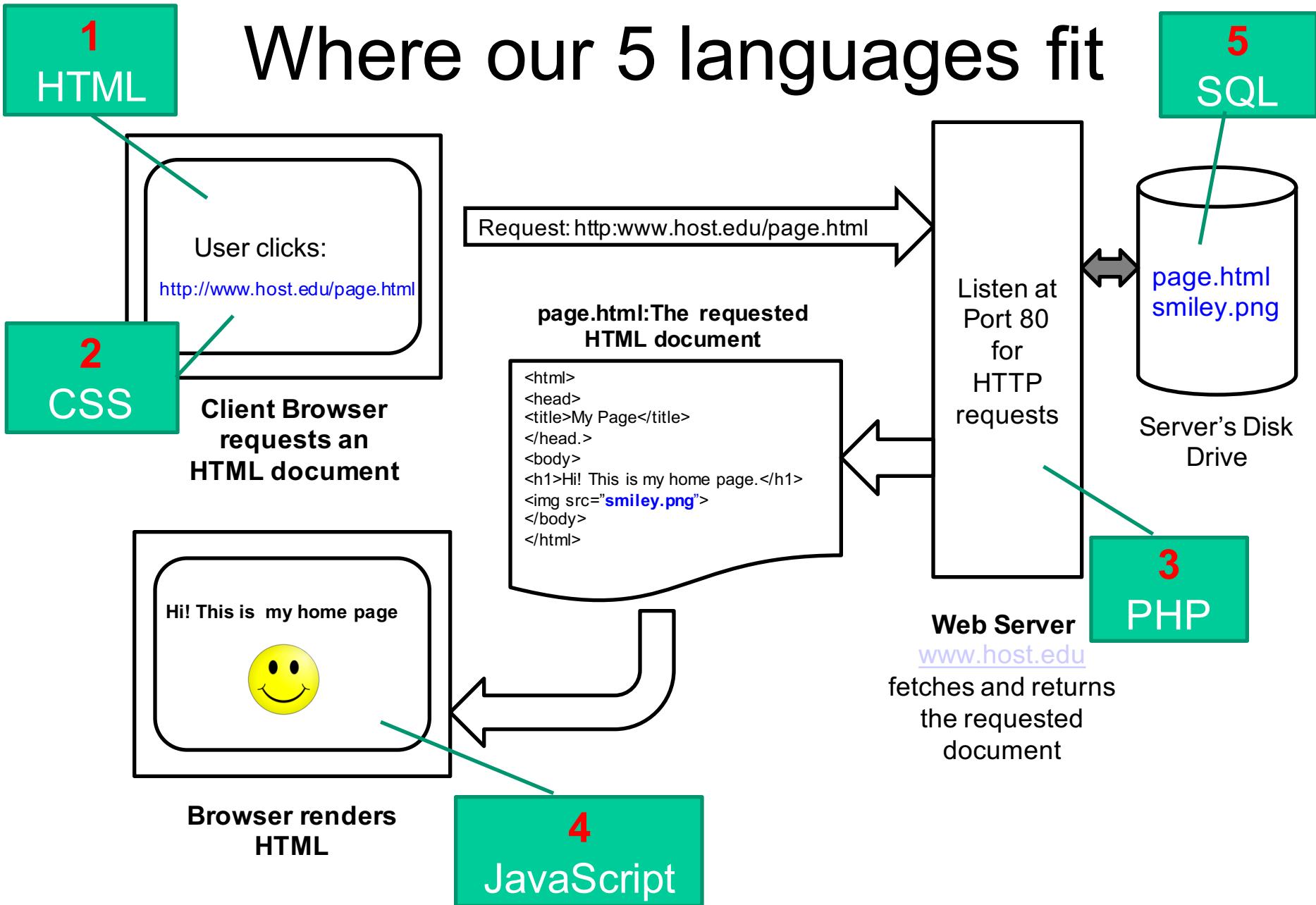
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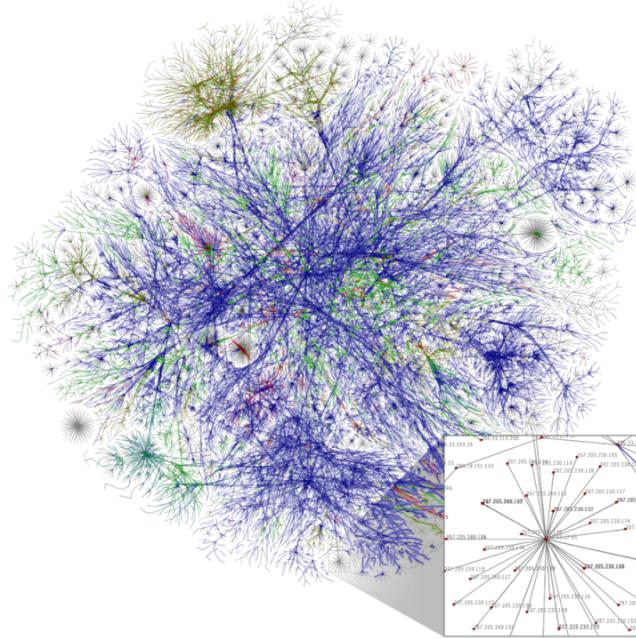
The HTTP Client/Server Model



Where our 5 languages fit



What is the Internet?



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