COMP 4021
Internet Computing

The Internet -
Some Context for the Course

This Presentation

- What is Internet Computing? Is it just a buzzword?
- What is the Internet – how big is the Internet?
- What is Web and Web 2.0?

What is "Internet Computing"?

- Internet Computing = Internet + Computing
- Internet = Network (of two or more computers) implemented on TCP/IP network protocol
- Contrast with "Desktop computing": Office, Calendar, which only run on one machine (What about Office 365?)
- Internet Computing = Applications running on internet to accomplish a task

What is Internet Applications?

- Today, it is hard to imagine applications that do not involve a "network" or "internet": Emails, file transfer, web, etc.
- Internet must adhere to the "Internet" protocol: TCP/IP
- Internet applications must adhere to the corresponding protocol defined over TCP/IP protocols
  - Web: HTTP (Hypertext Transfer Protocol)
  - Email: POP and SMTP

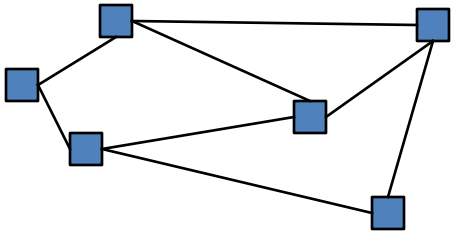
What is Internet?

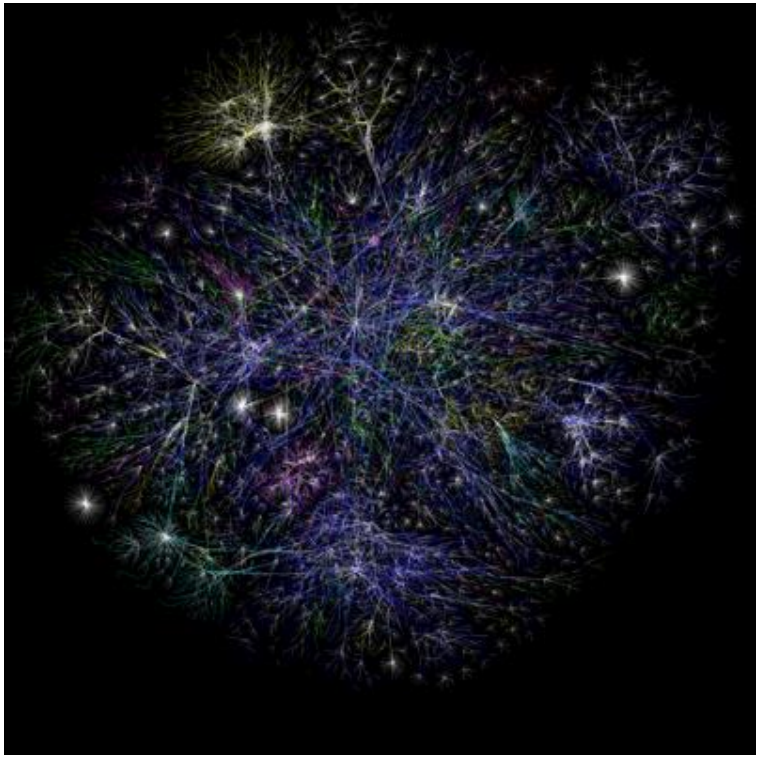
- What is the difference between a "network" and the "internet"?
- A network could have different architectures:
  - Star/Tree shape: One master computer is connected to many other computers by direct links
  - Ring shape: One computer is connected to two neighbors to form a ring
  - Bus shape: Every computers connected to the same wire (Ethernet)
  - Graph shape: A computer can connect to any other computers
- Internet must be scalable; hence Internet is a graph (although a particular segment can take any shape)

What is the formal definition of Internet?

What does the Internet look like?

- A network of computers connected like a graph
- How is it compared to other topologies: Star, Ring, Bus, etc.,?





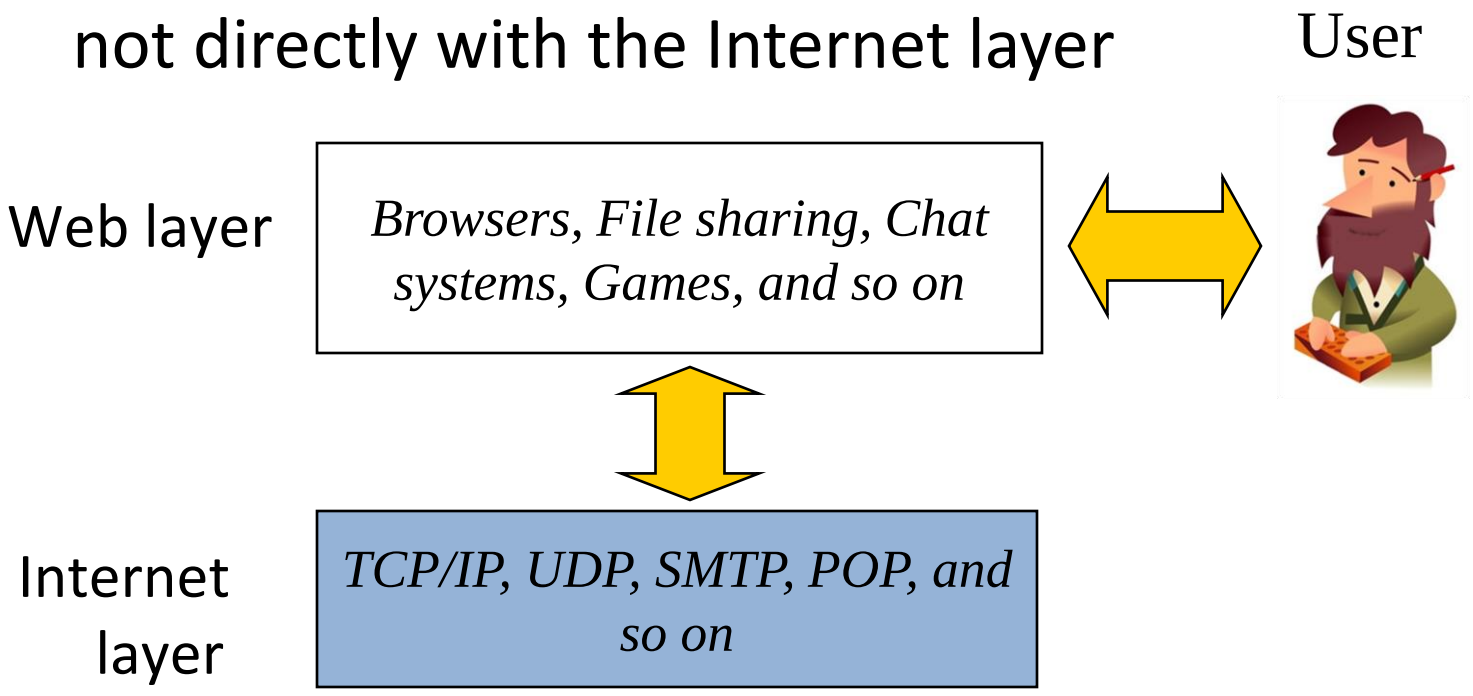
- Blue: North America
- Yellow: Asia
- White: Unknown

What is the Internet good for?

- Fast?
  - Traverse multiple hoops to deliver a message
- Flexible/Reliable?
  - It is not easy to partition the Internet
- Low cost?
  - Hoop-by-hoop vs direct connections between every pair of nodes
- Universal?
  - Adhere to international standards
- Accessible?
  - Available (almost) everywhere, including mobile internet/phones
- Distributed?
  - Ten of millions of computers on the Internet
- Expandable?
  - A new node just attaches to an existing node

What is the Web?

- The web is the ‘layer’ above the Internet
- Users typically interact with the web layer, not directly with the Internet layer



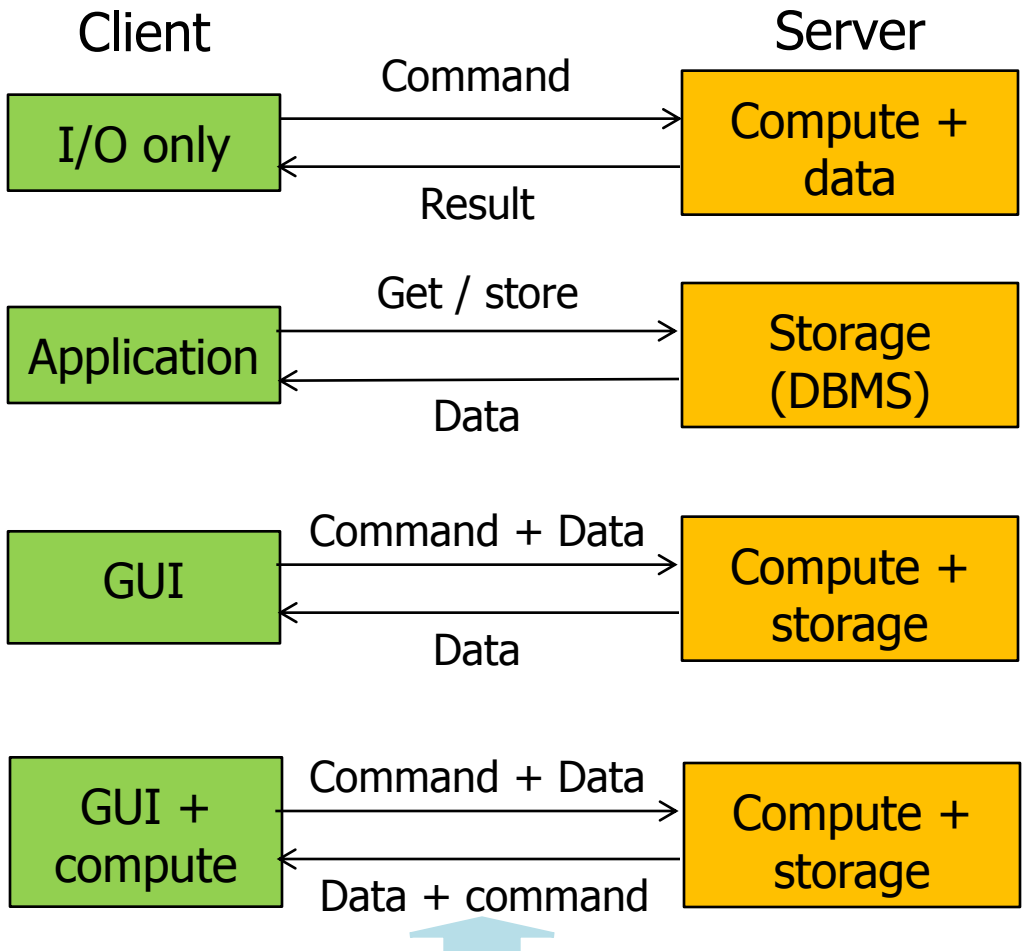
Architecture Involving Two Parties

Dumb Client: Client does almost nothing (e.g., ssh terminal)

Desktop: Client does almost everything (e.g., Office editing a file on network drive)

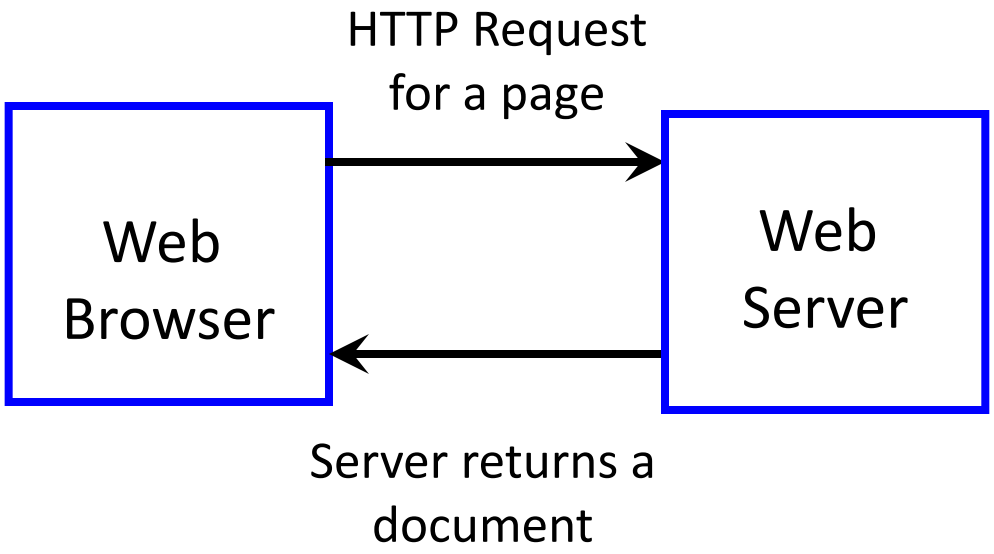
Client-server (Thin client): Client does GUI only (e.g., control mouse and windows

Client-server (**Thick** client): Intelligent partitioning of work between client and server



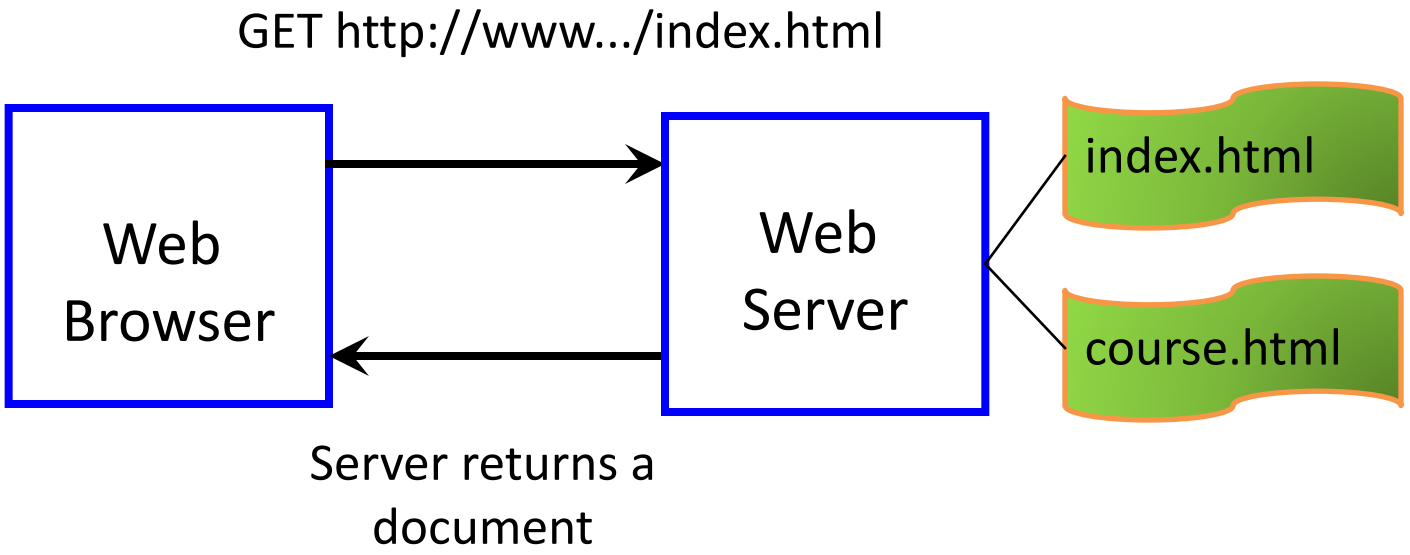
On this slide, we have not mentioned the network protocol between the two communicating parties

The Web (2-Tier)



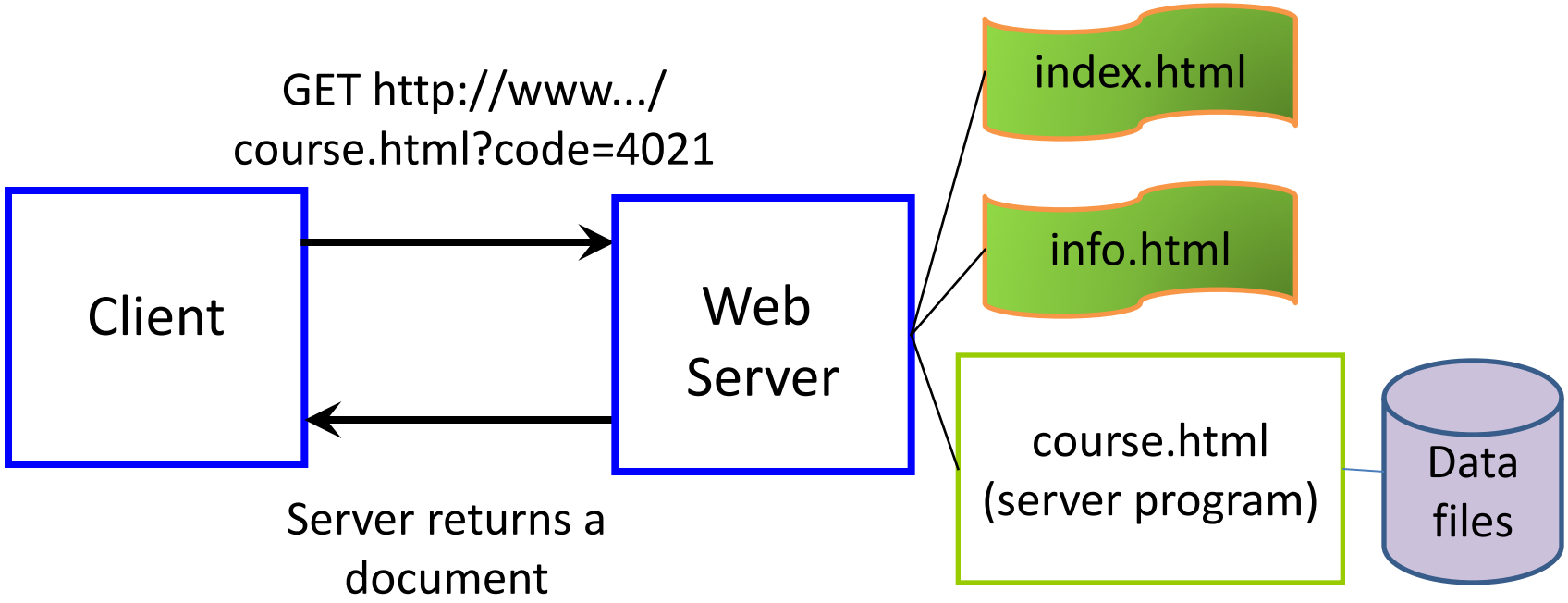
- Client-server is a general term, which include non-http (non-web) clients and servers
- Popular web servers: Apache, IIS, WebSphere, etc.

Web with Static Pages



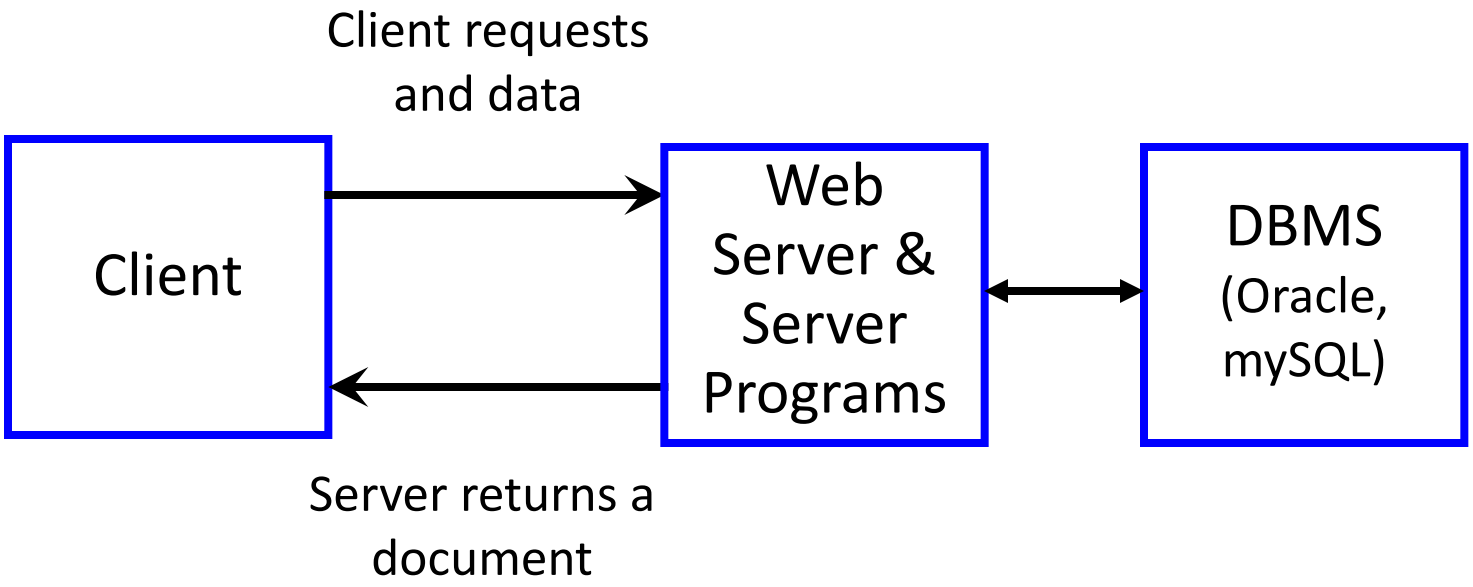
- Pages are static HTML pages with specific URLs (non-parameterized)
- Web Server does nothing more than mapping the URL to the local file and return it to the browser

Web with Dynamic Pages

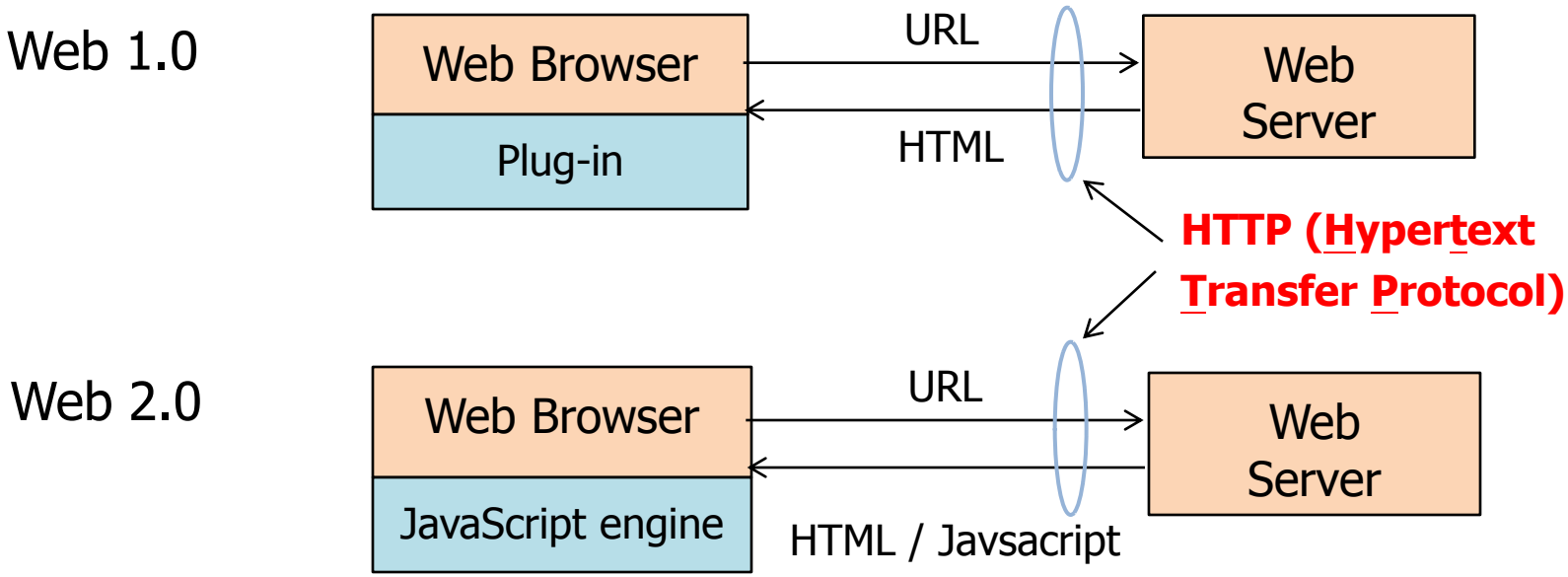


- Contents are assembled dynamically by a server program
- Request URL can contain parameters or be form data
- Server programs can be written in PHP, JSP, Python, Perl, C, etc. and accept parameters on the URL string

3-Tier Architecture



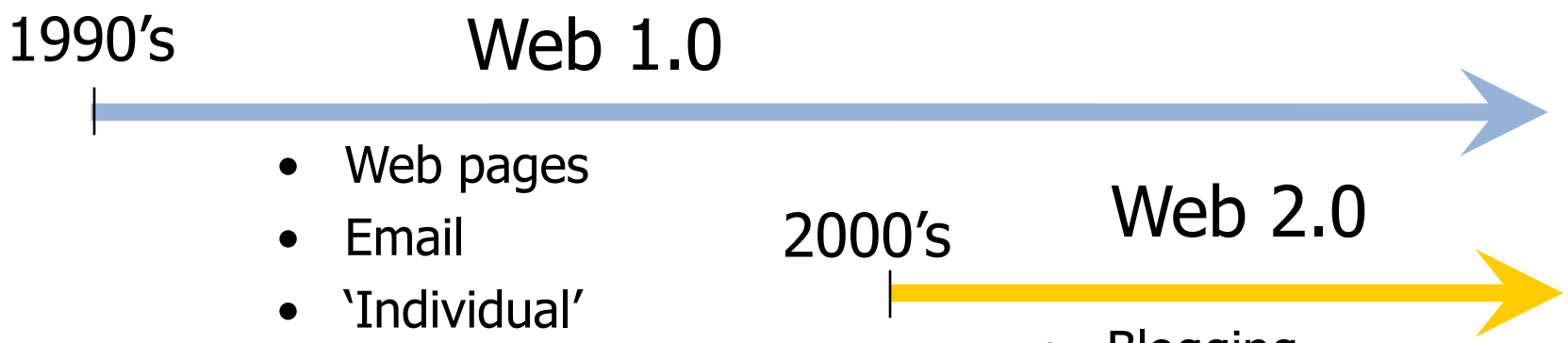
Rich Internet Applications (RIAs)



Web 1.0	Web 2.0
Dumb browser	Smart browser
Dumb web pages	Smart web pages
Dumb interaction	Smart interaction

- Web browsers become very powerful (Javascript, HTML5, Ajax, etc.)
- Web browsers shield the users from the underlying operating systems

Web 2.0 Timeline



- These days most people don't use the term 'Web 2.0', because almost everything is 'Web 2.0'

Common properties of these applications?

Take Home Message

- Web is one of the most influential and popular applications developed on Internet
- Internet Computing
  = Web programming
  = Browser programming + Server programming + Communication