The Internet

To

IP Address: 123.21.12.131

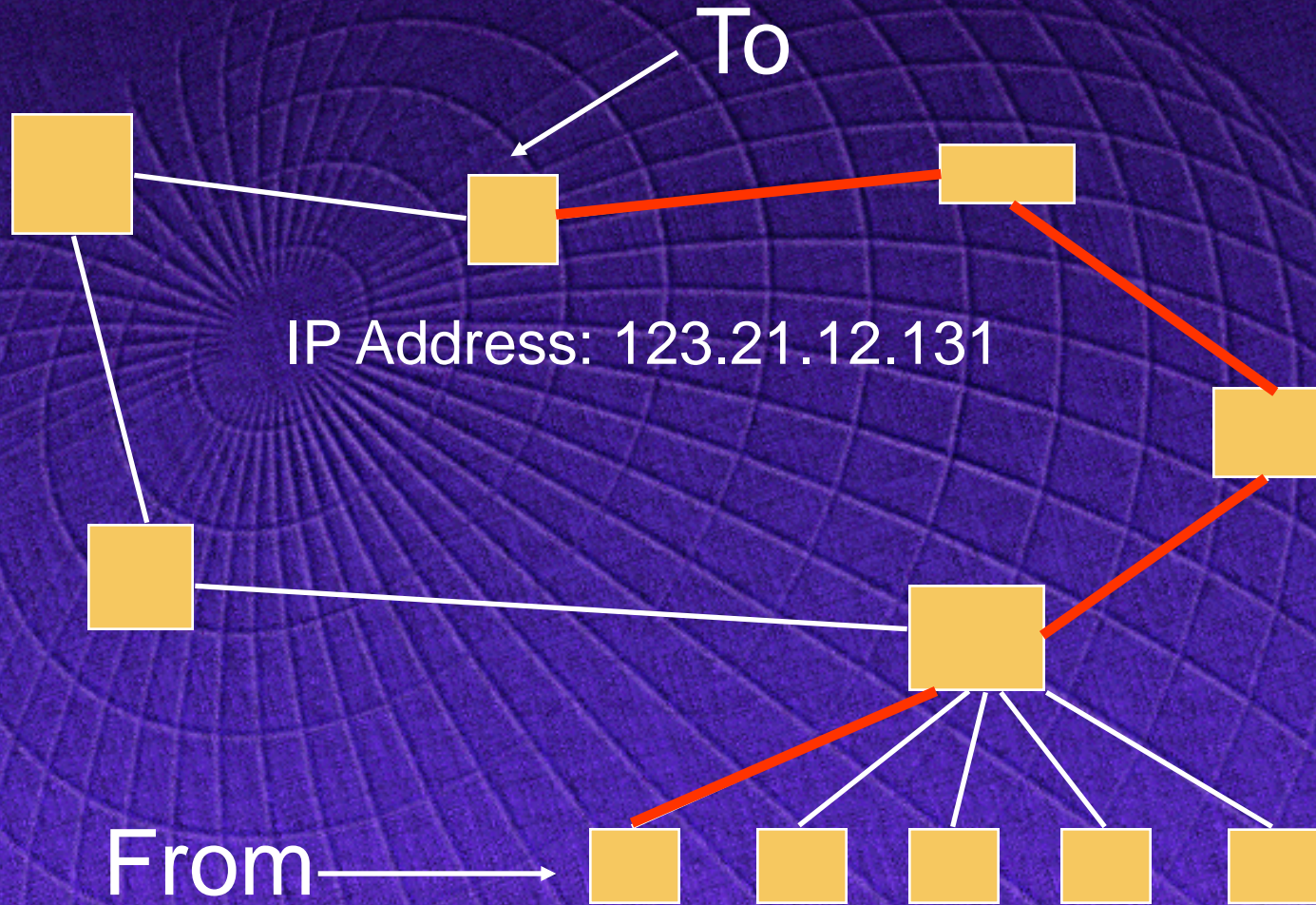From

The Internet

Worldwide collection of interconnected networks.

◆ Began in late '60s in ARPANET, a US project, investigating how to build networks that could withstand partial outages.

◆ Starting with a few nodes, Internet estimated to have over 100 million users in 1997, and over 270 million users in over 100 countries in 1998, with one million new users joining each month.

Historical View: Internet

- **1969 - Telnet**
- **1970 - 4 computers**
  - **Stanford, UCLA, UC Santa Barbara, U Utah**
- **1971 - FTP**
- **1983 - 562 computers on the internet**
- **1993 - 1.2 million computers on the internet**
- **1999 - …..**

Outline

◆ The Internet

◆ **The Web**

◆ What makes the Web work?

> ➢ HTTP

> ➢ URL

> ➢ HTML

> ➢ CGI

◆ Example of a Web page

◆ Summary

The Web

- ◆ World-Wide Web (Web, WWW)
  - ➤ networked information system that provides a simple way of browsing different types (text, pictures, video, audio, etc.) of information on the Internet using hyperlinks.

- ◆ Web pages
  - ➤ electronic documents that typically contains several types of information accessible via the World Wide Web

- ◆ Web sites
  - ➤ a collection of related Web pages of a certain individual, group, or organization.

- ◆ The Web uses a client/server model

Client-Server Model

Browser - software to interact
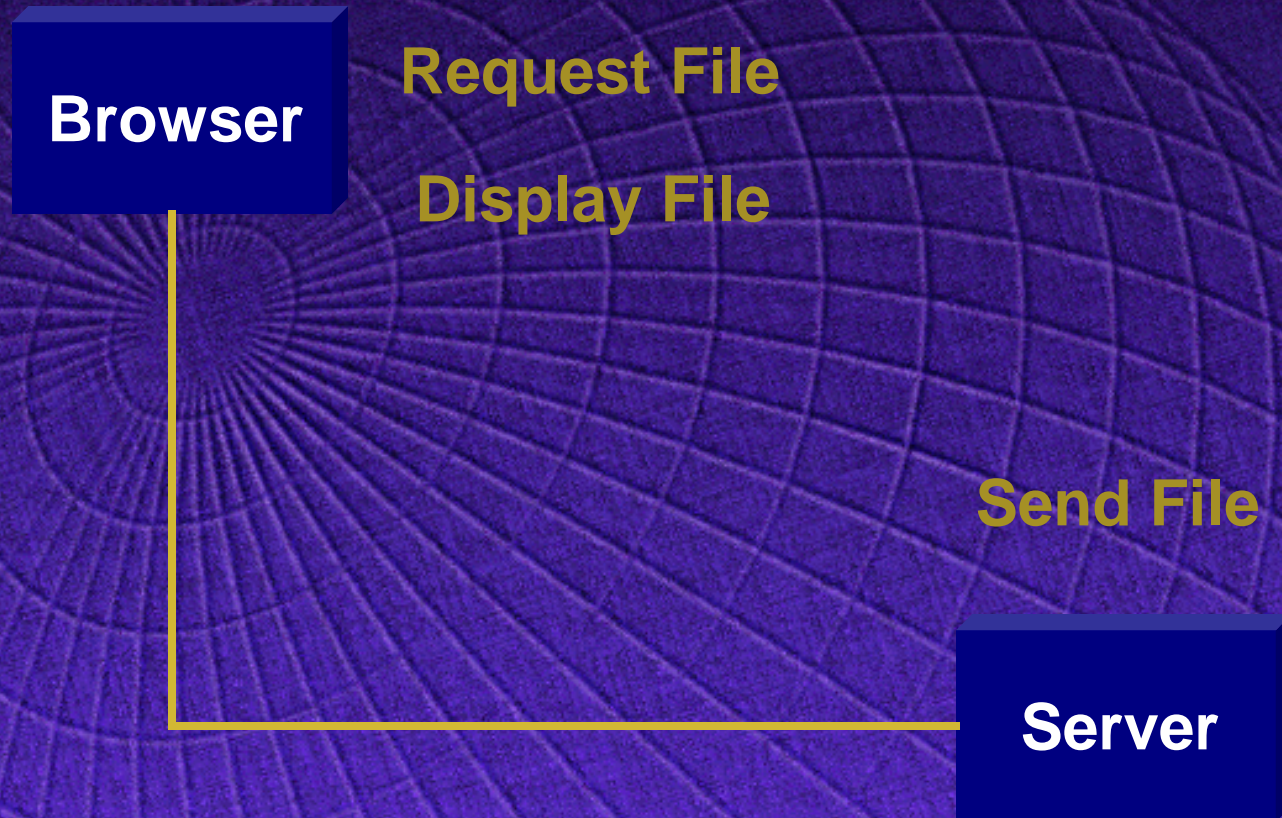with internet data at the client

machine that services internet request

client a

internet

client b

server x

file

server y

file
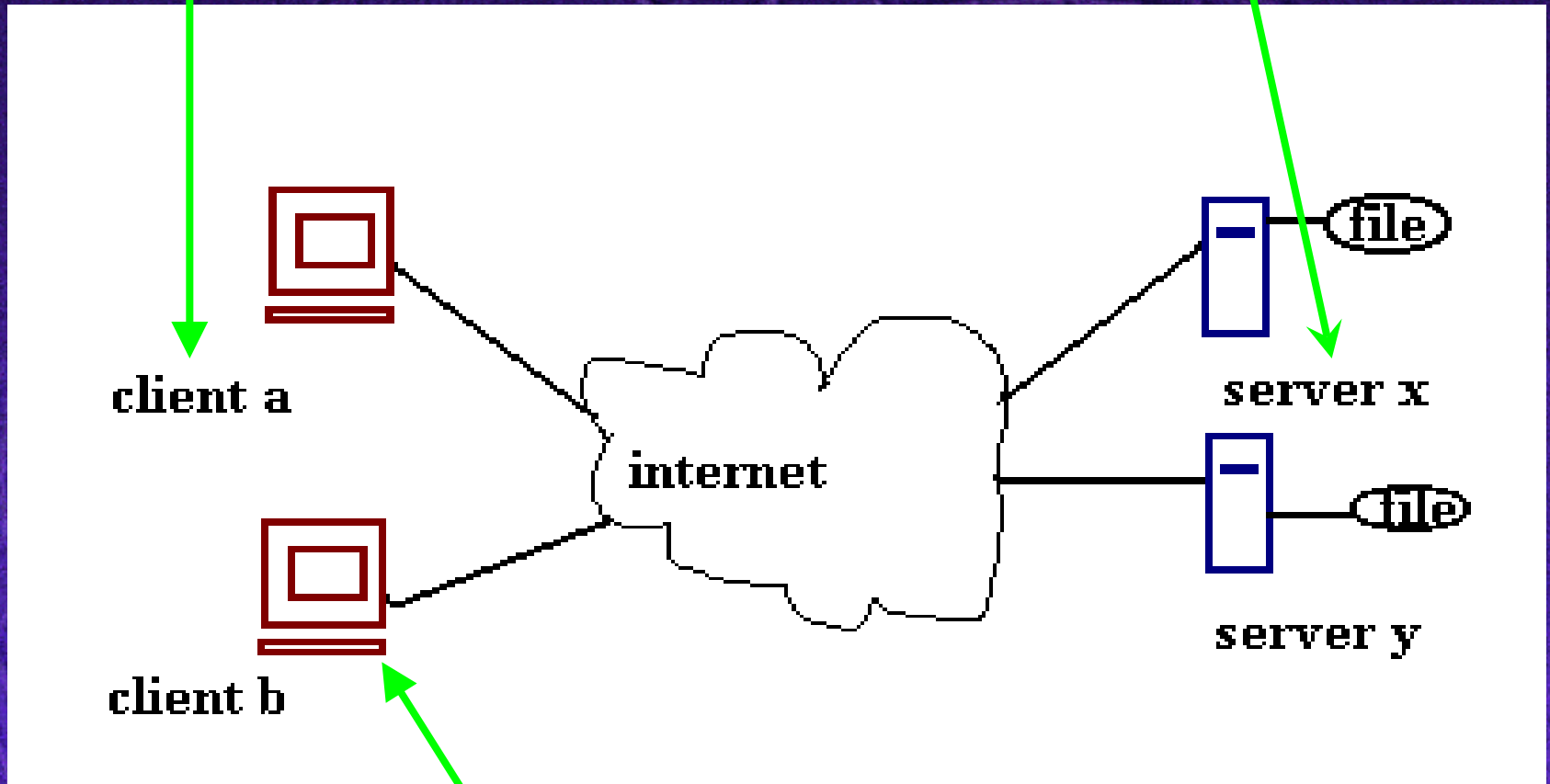
machine that initiates internet request

Client/Server Interaction

Browser

Request File

Display File

Send File

Server

What is a Web Server?

Web server

- computer running application software that listens and responds to a client computer's request made through a web browser

- machine that hosts web pages and other web documents

- provides web documents and other online services using HTTP

What is a Web Browser?

Web browser

◆ application software that is used to locate and issue a request for the page on the web server that hosts the document

◆ It also interpret the page sent back by the web server and display it on the monitor of the client computer

◆ computer program that lets you view and explore information on the World Wide Web

Web Browsers

- **Microsoft Internet Explorer – browser integrated with the Windows operating system. Mac versions are available.**

- **Netscape Navigator - available for Windows, Mac, and Unix platforms.**

- **Opera – one of the alternatives to the two most popular browser mentioned above**

- **Mozilla – open source web browser software**

- **Lynx - popular Unix text-based browser**

- **Google Chrome is a Google browser that combines a minimal design with sophisticated technology.**

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  ➢ CGI …...

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What Makes the Web Work?

The Web relies on these mechanisms:

◆ <u>Protocols</u> - set of standards used to access resources via the Web

◆ <u>Universal Resource Locator (URL)</u> - uniform naming scheme for Internet resources

◆ <u>HTML</u> - Document formatting language used to design most Web pages

◆ <u>CGI</u> - Common Gateway Interface

◆ <u>Servlet</u> - Application run by a server connected to the WWW. It is one of the most popular avenues for Java development today.

Protocols

◆ Standard set of rules that governs how computers communicate with each other, i.e. HTTP, FTP and SMTP.

◆ HTTP (HyperText Transfer Protocol) is the underlying protocol used to transmit information over the Web.

◆ HTTP is based on request-response paradigm:

➤ Connection: Client establishes connection with Web server.

➤ Request: Client sends request to Web server.

➤ Response: Web server sends response (HTML document) to client.

➤ Close: Connection closed by Web server.

HTTP Connection
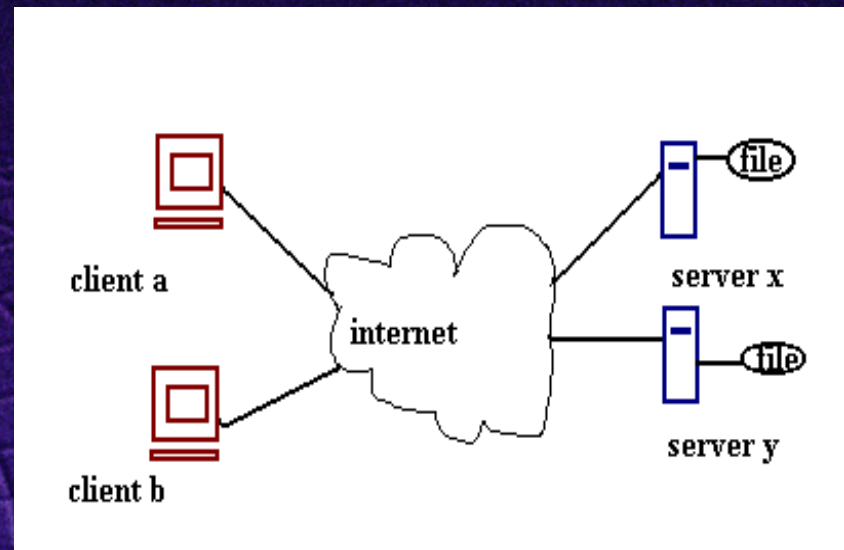
- ◆ **1. Client**
  - ➢ makes an HTTP request for a web page
  - ➢ makes a TCP/IP connection
- ◆ **2. Server accepts request**
  - ➢ sends page as HTTP
- ◆ **3. Client downloads page**
- ◆ **4. Server breaks the connection**

Uniform Resource Locators (URLs)

- Identifies the file to request
  - Specifies server and file
  - Defaults used for missing values

Address http://www.unesco.org/webworld/portal_bib/index.shtml

protocol **host computer** **directory path** **file name**

Note: Not all URLs will have the directory and filename

Address http://www.unesco.org

HyperText Markup Language (HTML)

◆ Hypertext
  ➢ presents and relates information as hyperlinked documents that point to other documents or resources.

◆ HTML
  ➢ A standard markup language that defines a hypertext document.
  ➢ A simple, powerful, platform-independent document language.
  ➢ Specifies what displays should look like
  ➢ Browser interprets HTML
  ➢ Same HTML file often looks different across browsers
  ➢ HTML files are the source files of Web pages

HTML File Structure

```
<HTML>
<HEAD>
<TITLE>Page Title</TITLE>
</HEAD>
<BODY>
Stuff
</BODY>
</HTML>
```

What About Graphics?

◆ An HTML file can refer to an image file

```
Here is a nice picture:
<IMG SRC="stars.gif">
```

What About Hyperlinks?

◆ An HTML file can refer to another HTML file

```
<h2>Teaching</h2>

<p><a href="http://ai.uwaterloo.ca/3421.html">
COSC 3421 Fall 2002</a></p>

<p><a href="http://ai.uwaterloo.ca/3221.html">
COSC 3221 Winter 2003</a></p>
```

Simple Formatting

```
<H1><FONT COLOR="#b80000">
Heading level 1</FONT></H1>
<H2><FONT COLOR="#ff0000">
Heading level 2 </FONT> </H2>
<P>Paragraph with <B>bold</B> and
<I>italic</I> text.</P>
<HR>
```
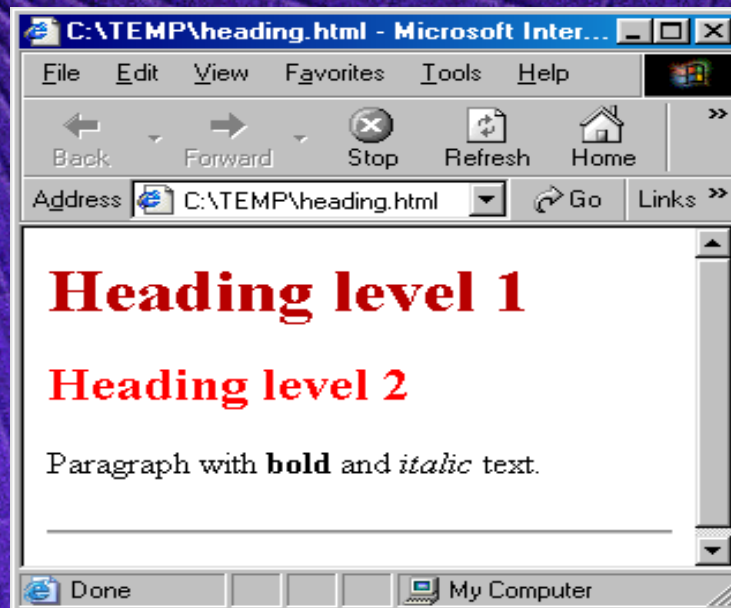
Creating HTML Files

◆ Text editor (Notepad, Pico)

◆ HTML Editor (FrontPage, Netscape Gold and HoTMetaL)

Moving Files to Servers

Browser ———————————— **Server**

User views files in browser

Author sends files to server

Author creates files

Author
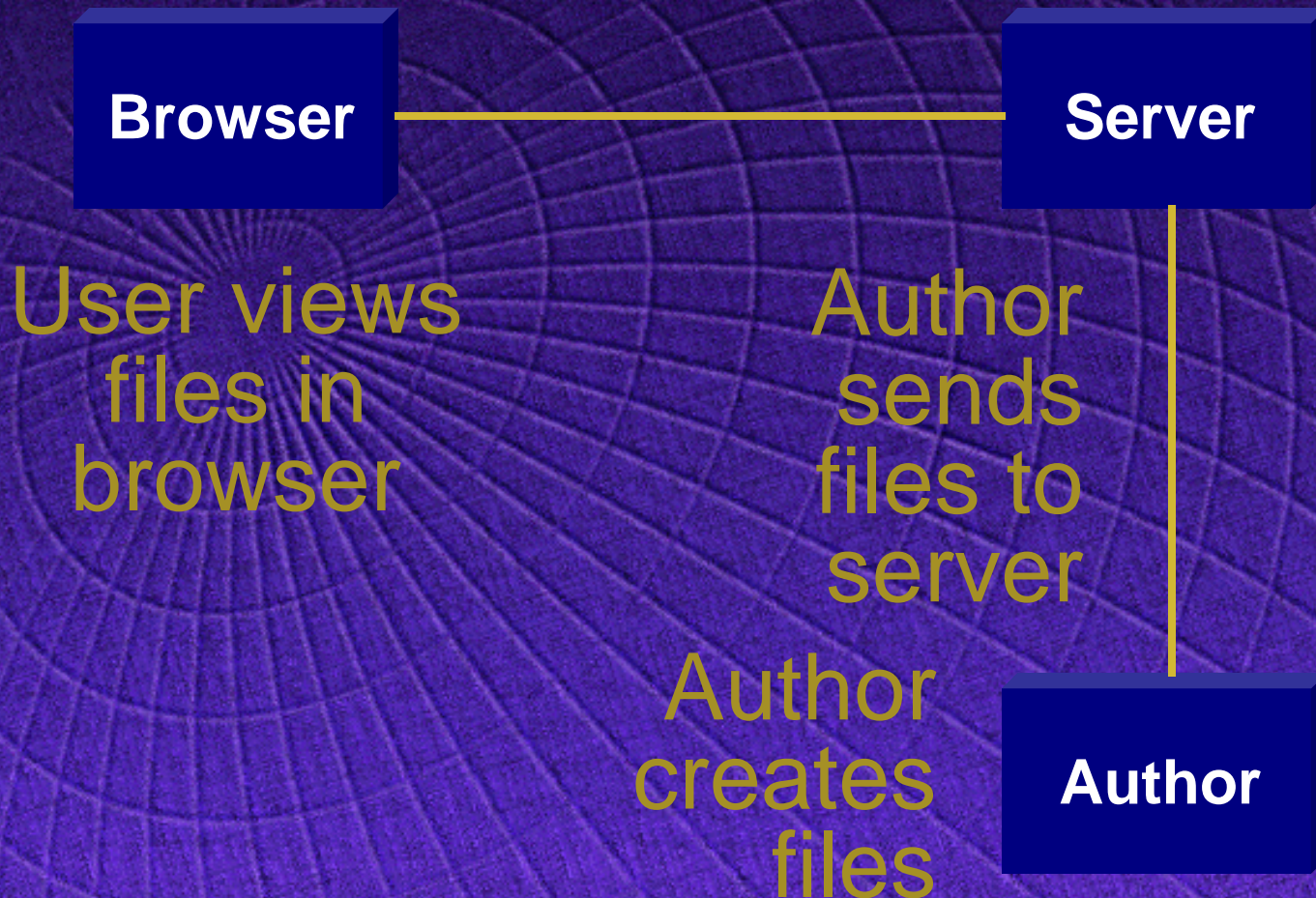
Introduction to Client-Server Systems

Web Server
Hosting web pages

Retrieving web pages using HTTP protocol

Internet

Web Client
Browser

Web Authoring System
create web pages

Publish web pages

Scanner

Video capture

Sound card
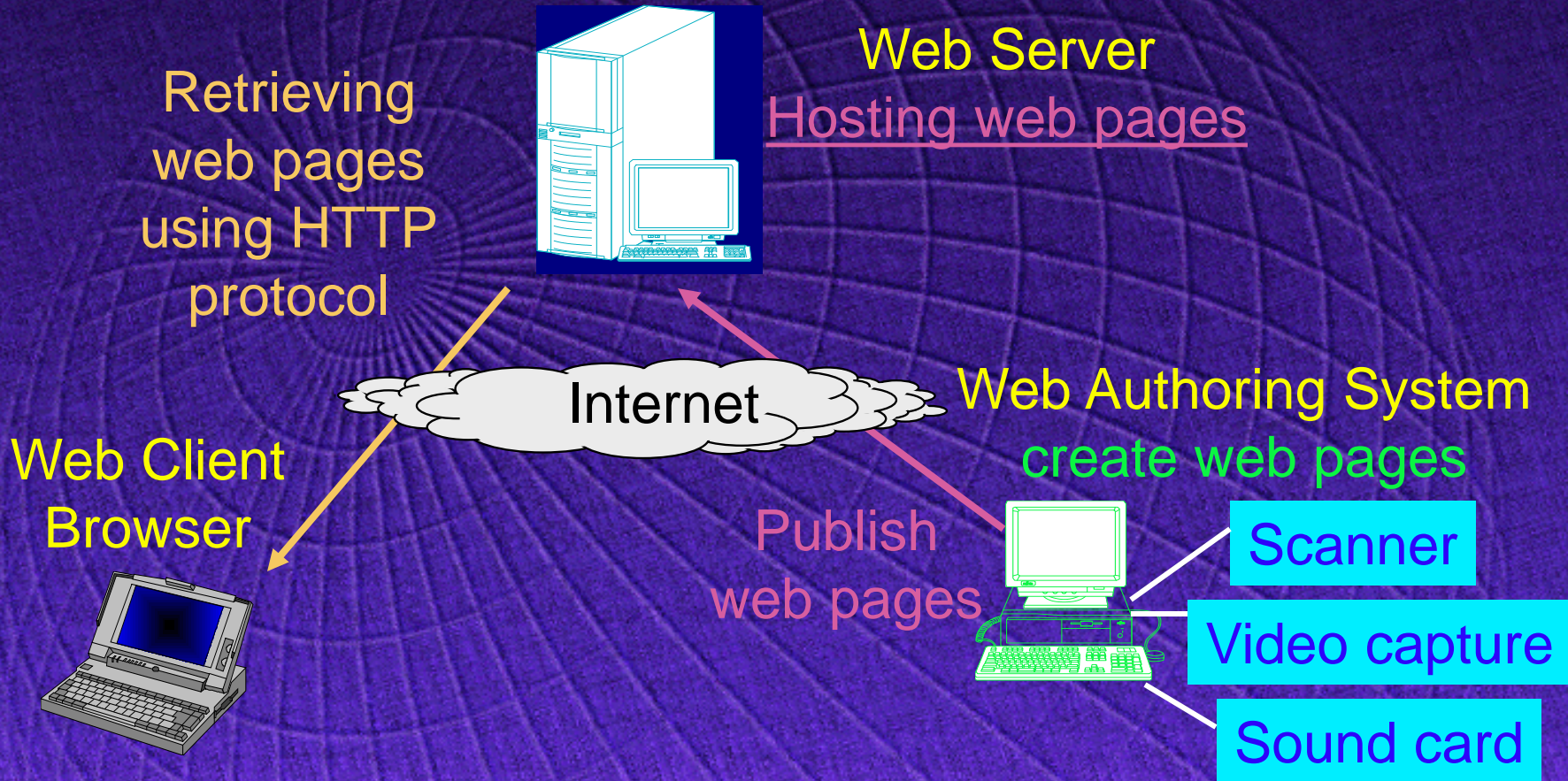
Web page: document written in HTML,JSP and ASP.

Internet Client-Server Systems

Internet Client-Server Systems

Internet Client-Server Systems

Clip slide

Order processing

Picks the passenger and brings him to the destination

Request for ride

Notification of request

Notification of acceptance

Accepts request

Driver

Passenger

Pay the ride
Give feedback

App
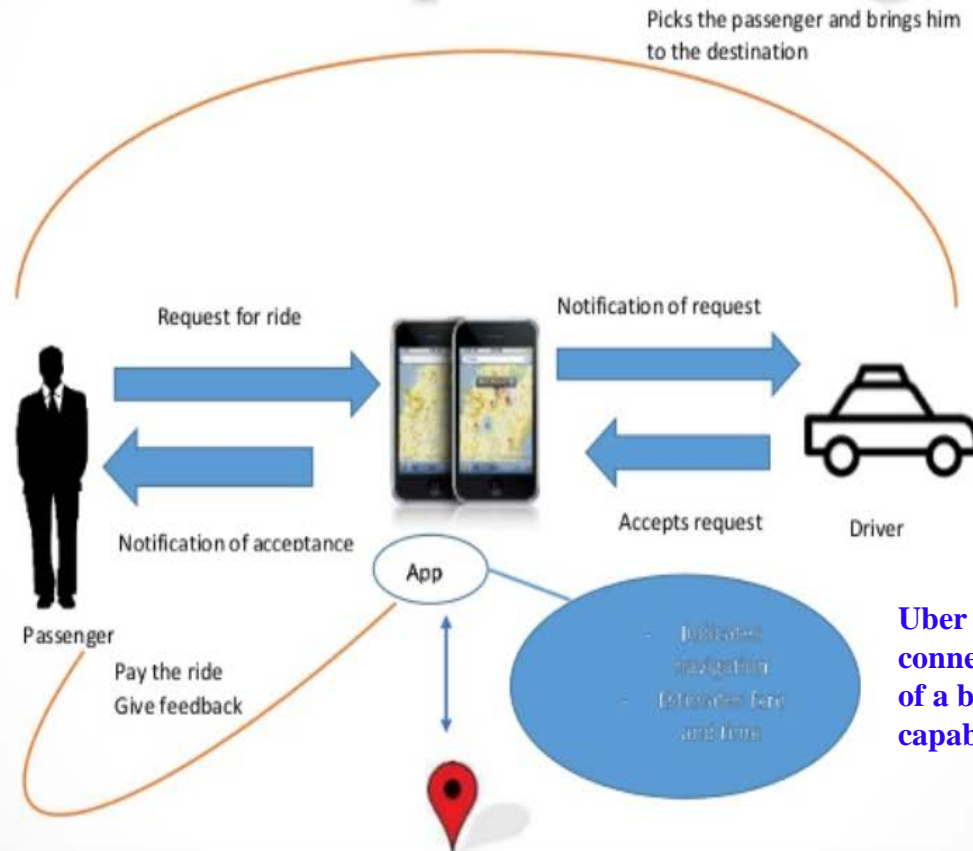
Uber is an app and taxi service that connects riders and drivers with the tap of a button by using their phone's GPS capabilities

Static and Dynamic Web Pages

◆ A static Web page is ready before it is accessed.

◆ The content of a dynamic Web page is generated each time it is accessed.

Common Gateway Interface (CGI)

◆ CGI programming techniques were introduced to provide dynamic Web pages via server-side interaction.

◆ A standard method to extend the functionality of the web server.

◆ Any programming language can be used. Common ones include: Perl, C++, Visual Basic.

CGI-based Web Application
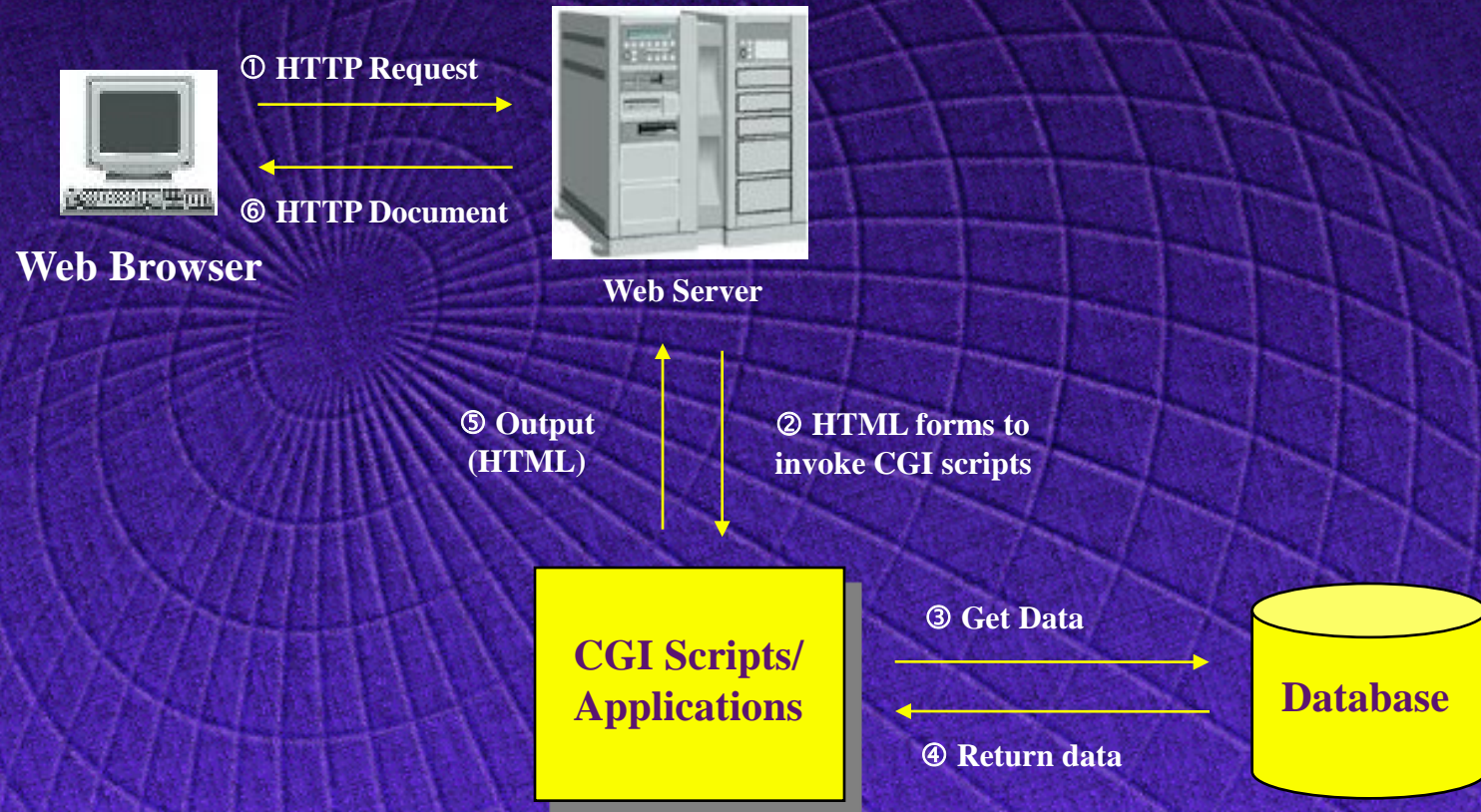
How Web Page Works

Sample web page and its source.

◆ **The source contains the instructions that define the contents, layout, and structure of a web page.**

◆ **The instructions are written in HTML or another web authoring tool used in creating the page.**

◆ **The browser uses these instructions to interpret and display the web page on the screen.**

How Web Page Works

URL

Navigational tools

Navigational tools

Graphics / Hyperlinks

Hyperlinks

Cookies

◆ A piece of information generated by the web-server and stored in the client side ready for future access.

◆ Cookies can make CGI scripts more interactive.

◆ Cookies are text files stored on Web client.

◆ CGI script creates cookie and has a Web server sent it to client's browser to store on hard disk.

◆ Later, when client revisits Web site and uses a CGI script that requests this cookie, client's browser sends information stored in the cookie.

Cookies

- ## How do cookies work?

| Client | → Request → | Origin Server A |

| Client | ← Response ← Set-Cookie: XYZ | Origin Server A |

| Client | → Request → Cookie: XYZ | Origin Server A |

- ## Where are cookies used?

- ✓ **Shopping applications**
- ✓ **Storing login information**
- ✓ **Tracking pages visited by a user**

Summary

◆ The Web is a networked information system that contains a huge collection of files

◆ The Web relies on clients and servers

◆ HTML and other files are sent from servers to clients

◆ Files are identified by URLs

◆ Servers send files to browsers

◆ Browsers interpret HTML

◆ Cookies is a piece of information generated by the web-server and stored in the client side.