KG REDDY
College of Engineering
& Technology

Web Programming and Design

Mr.K Umashankar
Assistant Professor-CSE

KG REDDY College of Engineering & Technology

Outline

- Overview of syllabus and class policies
- Learning strategies
- Introduction to web technologies

KG REDDY College of Engineering & Technology

Overview of Syllabus and Class Policies

- Please see handout
- Syllabus can also be downloaded from our class website:
  - www.csupomona.edu/~ftang/www/courses/CS299-S09/

KG REDDY College of Engineering & Technology

Learning Strategies

- Class format: a mixture of lecture and in-class exercises/projects
- Lectures will be posted online, which provide a guideline of what is covered in class
- Series of in-class exercises/projects will give you a chance to start building your own web pages step by step with the technologies you learn along this quarter
- There will be a final presentation of your quarter-long project
- Learn from existing examples

KG REDDY College of Engineering & Technology

Your Grade

- Projects:
  - Programming assignments (60%)
    - For most of the time, turn in by providing a link to your web page
    - Form a group of two, keep a report (write a blog) of the work done by individual
    - Follow the deadline of each project, since the final project is built up by the previous small projects
  - Final project presentation (10%)
    - Oral presentation of your group work (5 mins)
    - Instructor evaluation + students evaluation of your final work
- Exams:
  - Final (focus on concept) (25%)
- Other:
  - Class participation (5%)

KG REDDY
College of Engineering
& Technology

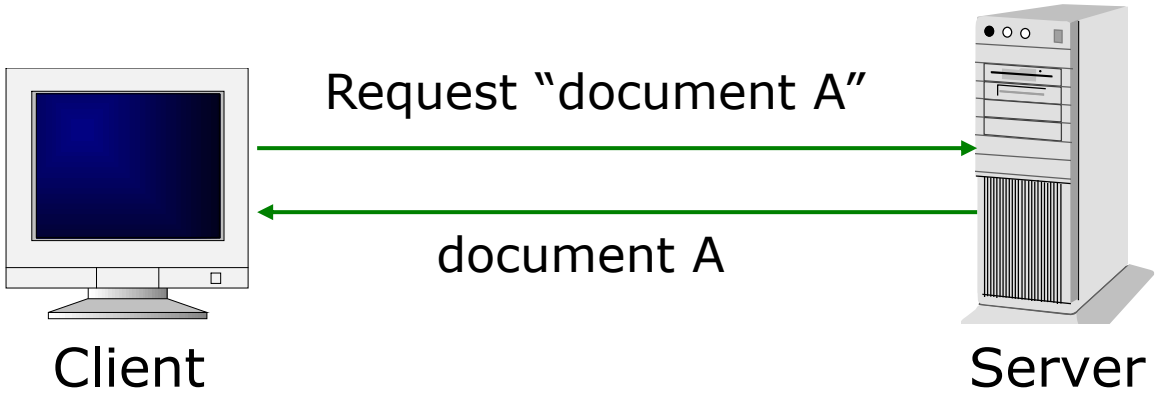
The Big Picture

Web Essentials:
Clients, Servers, and Communication

KG REDDY College of Engineering & Technology

Web Essentials

- **Client**: web browsers, used to surf the Web
- **Server** systems: used to supply information to these browsers
- Computer **networks**: used to support the browser-server communication



KG REDDY College of Engineering & Technology

Internet v.s. Web

- **The Internet**: a inter-connected computer networks, linked by wires, cables, wireless connections, etc.
- **Web**: a collection of interconnected documents and other resources.
- The world wide web (**WWW**) is accessible via the Internet, as are many other services including email, file sharing, etc.

KG REDDY College of Engineering & Technology

How does the Internet Work?

- Through communication protocols
- A **communication protocol** is a specification of how communication between two computers will be carried out
  - **IP** (Internet Protocol): defines the packets that carry blocks of data from one node to another
  - **TCP** (Transmission Control Protocol) and **UDP** (User Datagram Protocol): the protocols by which one host sends data to another.
  - Other application protocols: **DNS** (Domain Name Service), **SMTP** (Simple Mail Transmission Protocol), and **FTP** (File Transmission Protocol)

KG REDDY College of Engineering & Technology

The Internet Protocol (IP)

- A key element of IP is IP address, a 32-bit number
- The Internet authorities assign ranges of numbers to different organizations
- IP is responsible for moving packet of data from node to node
- A packet contains information such as the data to be transferred, the source and destination IP addresses, etc.
- Packets are sent through different local network through gateways
- A checksum is created to ensure the correctness of the data; corrupted packets are discarded
- IP-based communication is unreliable

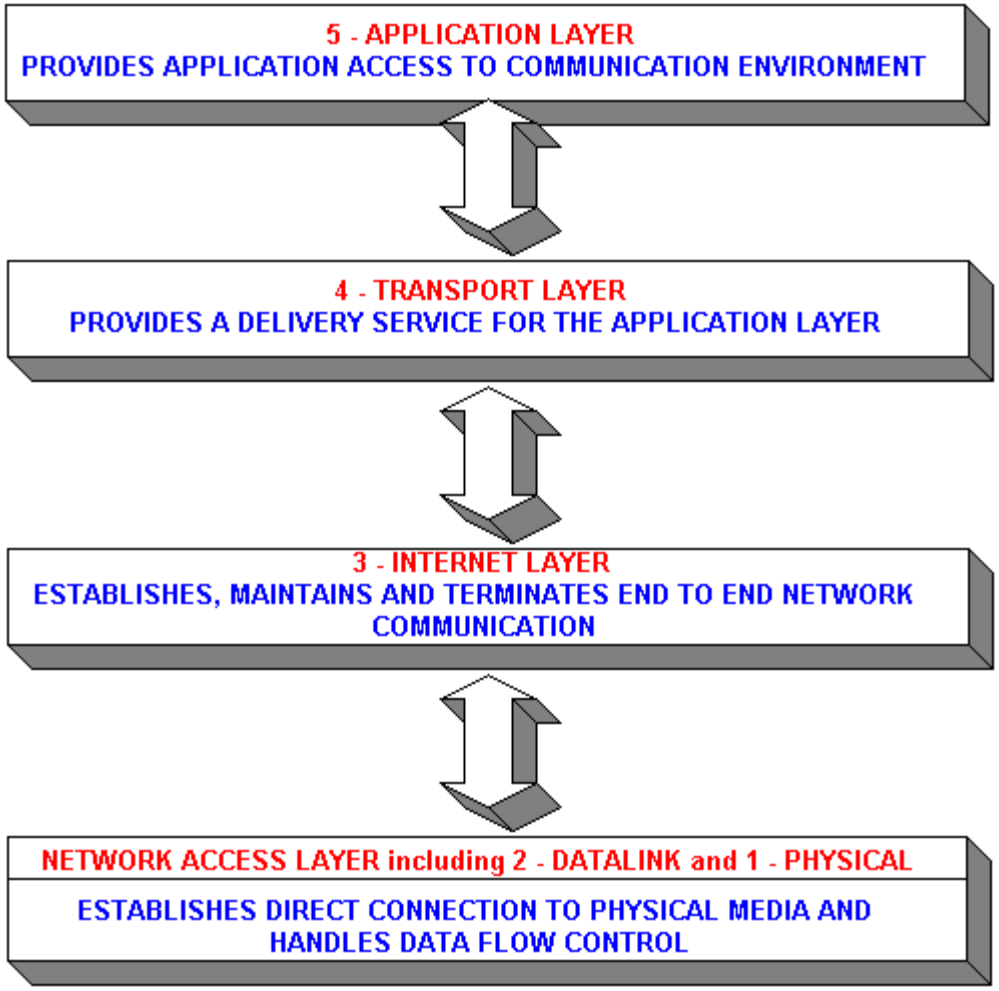
KG REDDY College of Engineering & Technology

The Transmission Control Protocol (TCP)

- TCP is a higher-level protocol that extends IP to provide additional functionality: reliable communication
- TCP adds support to detect errors or lost data and to trigger retransmission until the data is correctly and completely received
- Connection
- Acknowledgment

KG REDDY College of Engineering & Technology

TCP/IP Protocol Suites



HTTP, FTP, Telnet, DNS, SMTP, etc.

TCP, UDP

IP (IPv4, IPv6)

KG REDDY College of Engineering & Technology

The World Wide Web (WWW)

- **WWW** is a system of interlinked, hypertext documents that runs over the Internet
- Two types of software:
  - **Client**: a system that wishes to access the information provided by servers must run client software (e.g., web browser)
  - **Server**: an internet-connected computer that wishes to provide information to others must run server software
  - Client and server applications communicate over the Internet by following a protocol built on top of TCP/IP – HyperText Transport Protocol (**HTTP**)

KG REDDY College of Engineering & Technology

Basics of the WWW

- **Hypertext**: a format of information which allows one to move from one part of a document to another or from one document to another through **hyperlinks**
- Uniform Resource Locator (**URL**): unique identifiers used to locate a particular resource on the network
- **Markup language**: defines the structure and content of hypertext documents

KG REDDY College of Engineering & Technology

Web Client: Browser

- Makes HTTP requests on behalf of the user
  - Reformat the URL entered as a valid HTTP request
  - Use DNS to convert server's host name to appropriate IP address
  - Establish a TCP connection using the IP address
  - Send HTTP request over the connection and wait for server's response
  - Display the document contained in the response
    - If the document is not a plain-text document but instead is written in HTML, this involves rendering the document (positioning text, graphics, creating table borders, using appropriate fonts, etc.)

KG REDDY College of Engineering & Technology

Web Servers

- Main functionalities:
  - Server waits for connect requests
  - When a connection request is received, the server creates a new process to handle this connection
  - The new process establishes the TCP connection and waits for HTTP requests
  - The new process invokes software that maps the requested URL to a resource on the server
  - If the resource is a file, creates an HTTP response that contains the file in the body of the response message
  - If the resource is a program, runs the program, and returns the output

KG REDDY College of Engineering & Technology

Static Web: HTML/XHTML, CSS

- **HTML** stands for **H**yper**T**ext **M**arkup **L**anguage
  - It is a text file containing small markup tags that tell the Web browser how to display the page
- **XHTML** stands for e**X**tensible **H**yper**T**ext **M**arkup **L**anguage
  - It is identical to HTML 4.01
  - It is a stricter and cleaner version of HTML
- **CSS** stands for **C**ascading **S**tyle **S**heets
  - It defines how to display HTML elements

KG REDDY College of Engineering & Technology

Why Programmability?

- What's the drawback to simple document model?
  - Static
  - Assume that documents are created before they are requested
- What are examples of information that might be part of web documents that may not be known before they are requested?

KG REDDY College of Engineering & Technology

Client-Side Programmability

- Scripting language: a lightweight programming language
- Browser scripting: **JavaScript**
  - Designed to add interactivity to HTML pages
  - Usually embedded into HTML pages
  - What can a JavaScript Do?
    - Put dynamic text into an HTML page
    - React to events
    - Read and write HTML elements
    - Validate data before it is submitted to a server
    - Create cookies
    - …

KG REDDY College of Engineering & Technology

Server-Side Programmability

- The requests cause the response to be generated
- Server scripting:
  - **CGI/Perl**: Common Gate Way Interface (*.pl, *.cgi)
  - PHP: Open source, strong database support (*.php)
  - ASP: Microsoft product, uses .Net framework (*.asp)
  - Java via JavaServer Pages (*.jsp)
  - …

KG REDDY College of Engineering & Technology

CGI

- Common Gateway Interface:
  - CGI provides a way by which a web server can obtain data from (or send data to) database, and other programs, and present that data to viewers via the web.
  - A CGI program can be written in any programming language, but Perl is one of the most popular

KG REDDY College of Engineering & Technology

What's Ahead?

- HTML, XHTML
- CSS
- Simple client-side interactivity (JavaScript)
- Simple server-side interactivity (CGI/Perl)

- We will not "teach" these languages
- We will provide an overview of the basics, and learn how to use the web resources to help build a web page