CSC-318
Web Technology
(BSc CSIT, TU)

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Module Structure

- Semester : V
- Nature of the Course
  - Theory + Lab
- Full Marks : 60 + 20 + 20
- Pass Marks : 24 + 8 + 8
- Credit Hours : 3
- Total Teaching Hours : 45

Module Objectives

- to provide basic knowledge of
  - web design using HTML5 and CSS3
  - client side scripting using JavaScript
  - handling web data using XML
  - server side scripting using PHP and MySQL

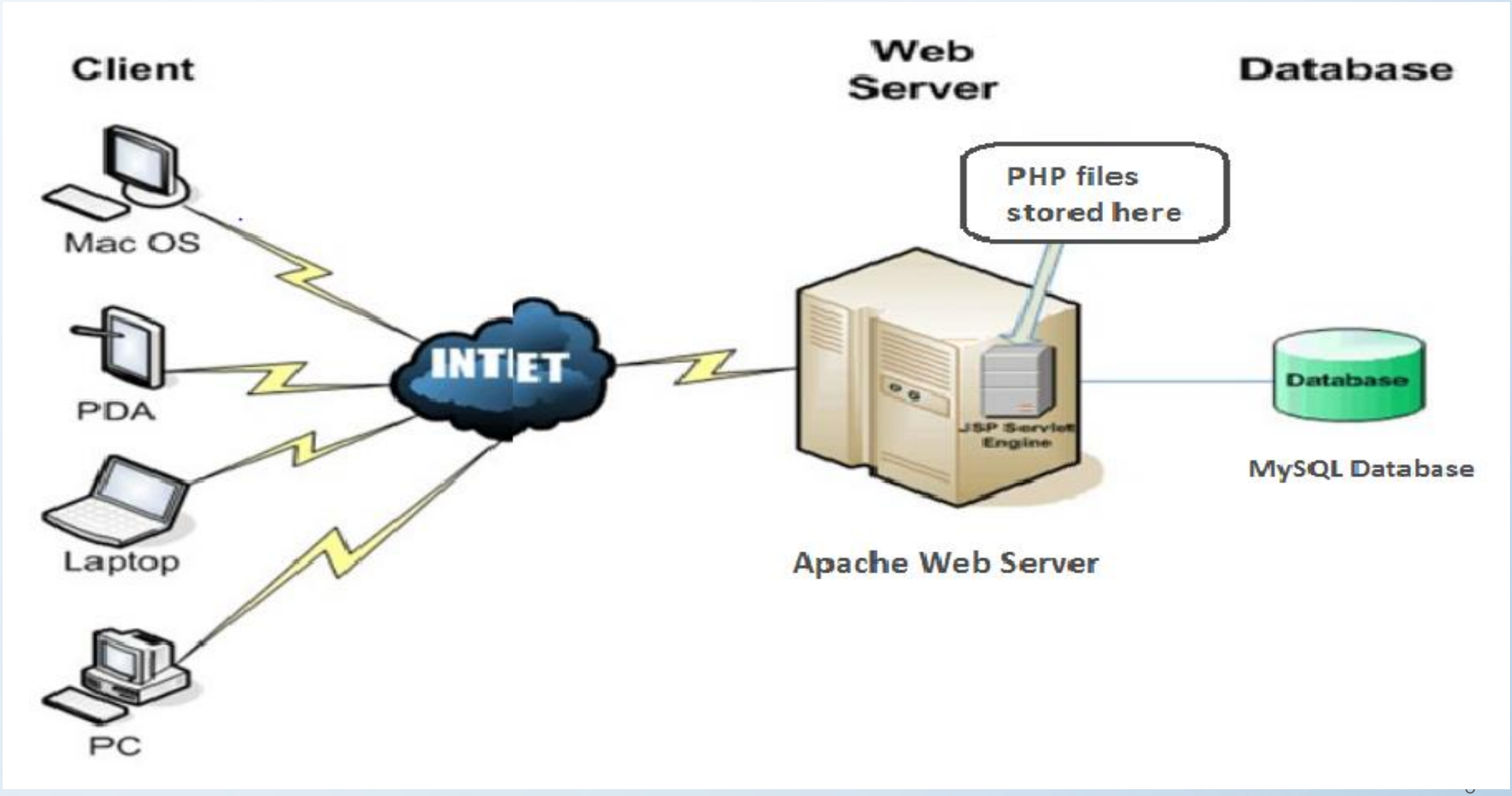
Unit 1 : Web Introduction

- Internet, Intranet
- WWW
- Static and Dynamic web pages
- Web clients and Web servers
- Client Server Architecture : Single Tier, Two tier, Multi tier
- HTTP request and response
- URL
- Client side scripting and Server side scripting
- Web 1.0 and 2.0

Internet

- is a short form of the technical term internetwork, the result of interconnecting computer networks with special gateways or routers
- also often referred to as the Net
- is a massive network of networks, a networking infrastructure
- connects millions of computers together globally, forming a network in which any computer can communicate with any other computer as long as they are both connected to the Internet
- consists of private, public, academic, business, and government networks of local to global scope, linked by a broad array of electronic, wireless, and optical networking technologies
- Based on Client – Server Architecture

Internet


Client
Web Server
Database
PHP files stored here
Mac OS
PDA
INTERNET
Laptop
PC
JSP Servlet Engine
Database
MySQL Database
Apache Web Server

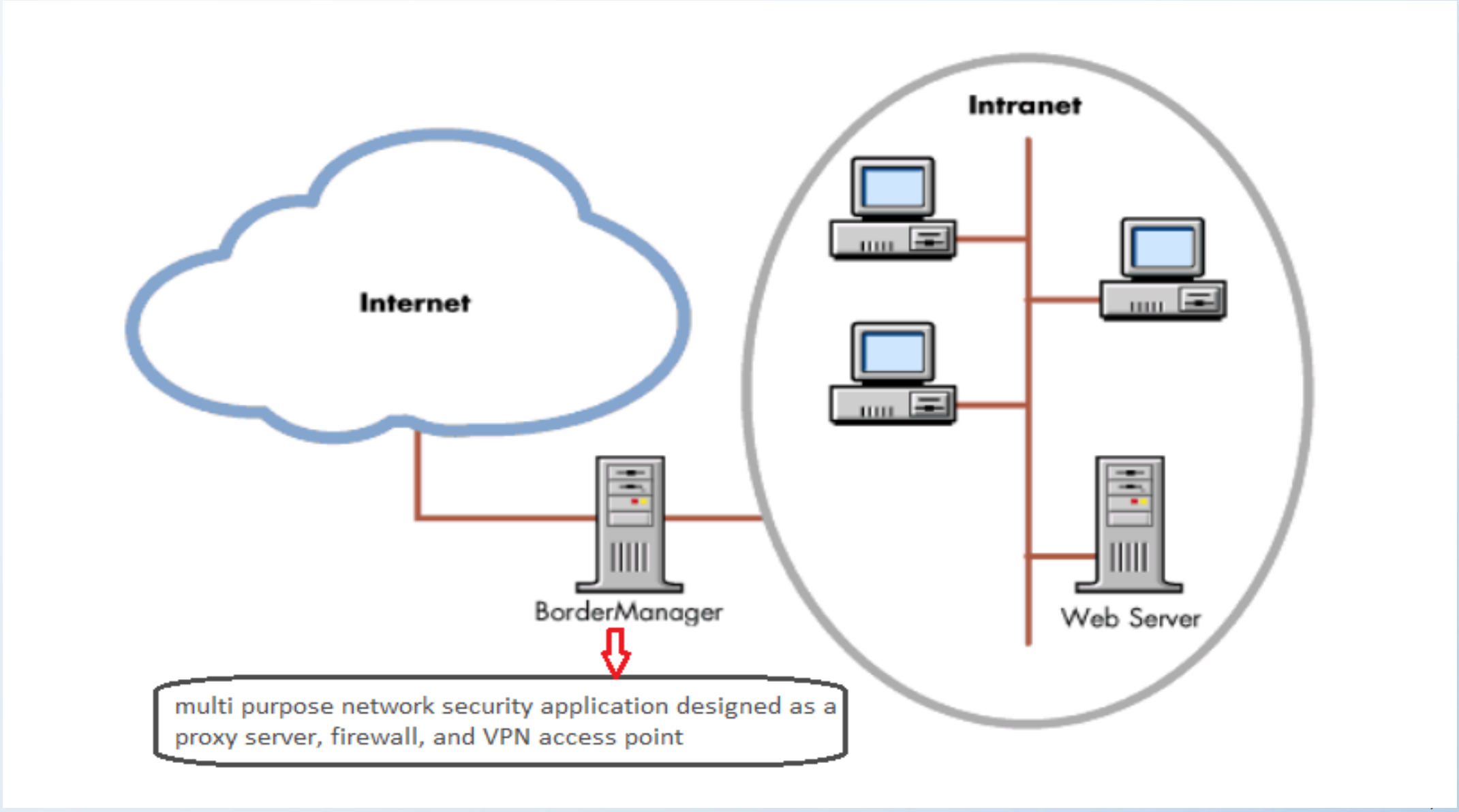
Internet Usage

- Emailing
- Social networking, chat
- Information sharing
- Getting updates – news around the world
- Entertainment – games, videos and music
- Virtual classrooms
- Remote access
- Online jobs etc.

Intranet

- is a private network contained within an enterprise that is used to securely share company information and computing resources among employees
- can also be used to facilitate working in groups and teleconferences
- increase communication within an organization by allowing employees to easily access important information, links, applications and forms as well as databases that can provide company records
- Security can also be increased within the intranet by establishing a database that maintains all of the usernames of people who are allowed access to the network

Intranet

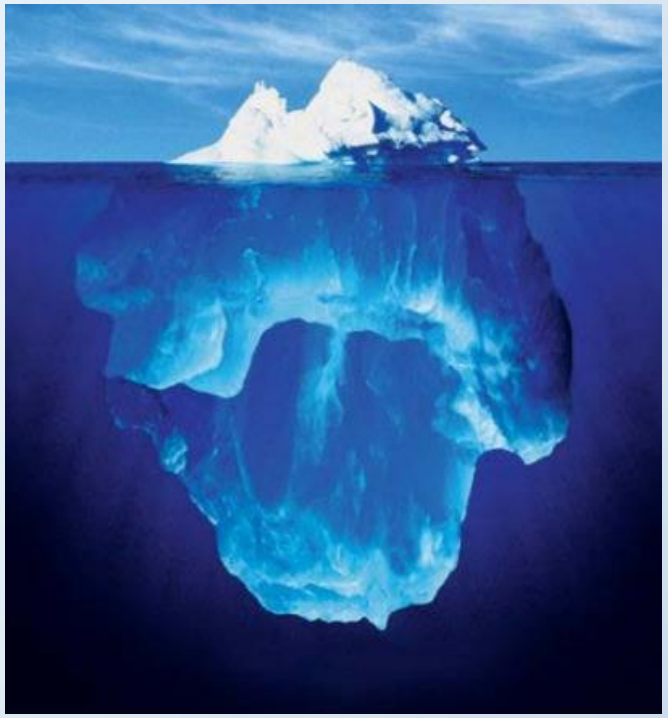

Intranet
Internet
BorderManager
Web Server
multi purpose network security application designed as a proxy server, firewall, and VPN access point

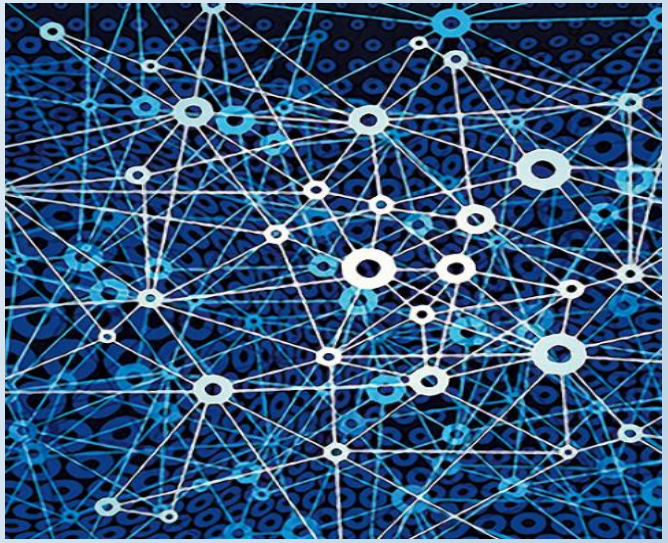
Intranet Usage

- Streamlining everyday activities by making repeated tasks more feasible
- Centralizing and managing important information and company data in a single database
- Making collaboration easier since information can be shared across the entire network
- Providing personalized content to employees based on their role within the company
- Improving internal communication by making employee directories, company news and organization charts readily available
- Providing fast and easy access to information about company policies, benefits and updates

World Wide 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
- is a way of accessing information over the medium of the Internet
- is an information-sharing model that is built on top of the Internet
- uses the HTTP protocol, only one of the languages used over the Internet, to transmit data
- utilizes browsers, such as Internet Explorer or Firefox or google chrome, to access Web documents called Web pages that are linked to each other via hyperlinks
- Web documents also contain graphics, sounds, text and video
- It is a collection of textual documents and other resources, linked by hyperlinks and URLs, transmitted by web browsers and web servers





Web Pages

- is a collection of hyperlinks as a web document found in internet
- is a document commonly written in HTML (Hypertext Markup Language) that is accessible through the Internet or other networks using an Internet browser
- is accessed by entering a URL address and may contain text, graphics, and hyperlinks to other web pages and files
- refers to what is visible, but may also refer to the contents of the source code itself, which is usually a text file containing hypertext written in HTML or a comparable markup language

Websites

- is basically a collection of web pages and web contents
- is a collection of related network web resources, such as web pages, multimedia content, which are typically identified with a common domain name, and published on at least one web server
- websites can have many functions and can be used in various fashions
- a website can be a personal website, a corporate website for a company, a government website, an organization website, etc.

Static Web Pages

- is a page that is built using HTML code and features the same presentation and content, regardless of user identity or other factors
- sometimes called a flat page or a stationary page
- static Web pages are easier to code and assemble than dynamic Web pages, which may feature customizable content according to a user's identity or other factors
- it is very difficult to manage the static web pages
- web pages should be edited in the server to change the content
- A static Web page is ready before it is accessed

Dynamic Web Pages

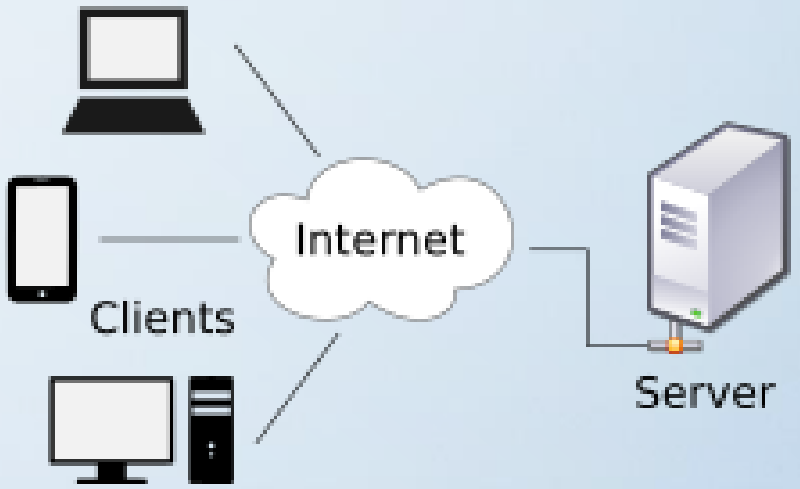
- is a web page that displays different content each time it's viewed
- is a web page whose construction is controlled by an application server processing server-side scripts
- very easy to manage
- web pages should not be edited to change the content rather contents are changed by the user from backend of the web site
- dynamic web pages are generally rendered by database operations in the server
- The content of a dynamic Web page is generated by server each time it is accessed

Web Browsers

- A web browser (commonly referred to as a browser) is a software application for accessing information on the World Wide Web
- When a user requests a particular website, the web browser retrieves the necessary content from a web server and then displays the resulting web page on the user's device
- Examples include Internet explorer, Mozilla firefox, google chrome etc.

Web Clients

- is an electronic device or computer or computer program that requests a web server for web resources and server sends resource back to the client
- A web browser can be considered as a web client



Web Servers

- is a computer or computer software that listens and responds to a client computer's request made through a web browser
- in other words, a web server is server software, or hardware dedicated to running said software, that can satisfy WWW client requests
- machine that hosts web pages and other web documents
- provides web documents and other online services using HTTP
- web server can, in general, contain one or more websites

Web Server

Web Servers

- processes incoming network requests over HTTP and several other related protocols
- primary function of a web server is to store, process and deliver web pages to web clients
- communication between client and server takes place using the Hypertext Transfer Protocol (HTTP)
- pages delivered are most frequently HTML documents, which may include images, style sheets and scripts in addition to the text content

Web Server

Functions of Web Servers

- Stores and secures website data
  - store all website data and secures it from unauthorized users when it is properly configured
- Provides web database access
  - provide access to websites that are hosted
  - web hosting service providers own some web servers that are used in variable ways to provide different web hosting services, such as backend database servers
- Serve the end user requests
  - accept requests from different users connected over the internet and serve them accordingly
- Bandwidth controlling to regulate network traffic
  - it is a feature available in web server to minimize excess network traffic
  - web Hosts can set bandwidth values to regulate the rate of data transmission over the internet
  - this feature avoids the down time caused by high web traffic

Functions of Web Servers

- Virtual Hosting
  - is a type of web hosting service in which a web server hosts other software based virtual web-servers web sites, data, applications and other services
  - virtualized Web servers do possess this feature to provide virtual hosting
- Server Side Web Scripting
  - this feature of web server enables the user to create dynamic web pages
  - the popular server side scripting languages include PHP, Perl, Ruby, Python, Java, .NET, etc.

Load Limits of a Web Server

- Load limit of a web server is a maximum number of concurrent client connections per IP address that can be handled by it.
- it is usually between 2 and 80,000, by default between 500 and 1,000 per IP address (and TCP port)
- a server can serve only a certain maximum number of requests per second(RPS) depending on
  - its own settings
  - the HTTP request type
  - whether the content is static or dynamic
  - whether the content is cached
  - hardware and software limitations of the OS of the server computer
- When a web server is near to or over its limit, it becomes unresponsive

Causes of Server Overload

- Excess legitimate web traffic
  - thousands or even millions of clients connecting to the web site in a short interval
- Distributed Denial of Service attacks
  - A denial-of-service attack (DoS attack) or distributed denial-of-service attack (DDoS attack) is an attempt to make a computer or network resource unavailable to its intended users
- XSS Worms
  - can cause high traffic because of millions of infected browsers or web servers

Causes of Server Overload

- Internal Bots
  - Traffic not filtered/limited on large web sites with very few resources (bandwidth, etc.)
- Web servers partial unavailability
  - This can happen because of required or urgent maintenance or upgrade, hardware or software failures, back-end (e.g., database) failures, etc.
  - in these cases, the remaining web servers get too much traffic and become overloaded

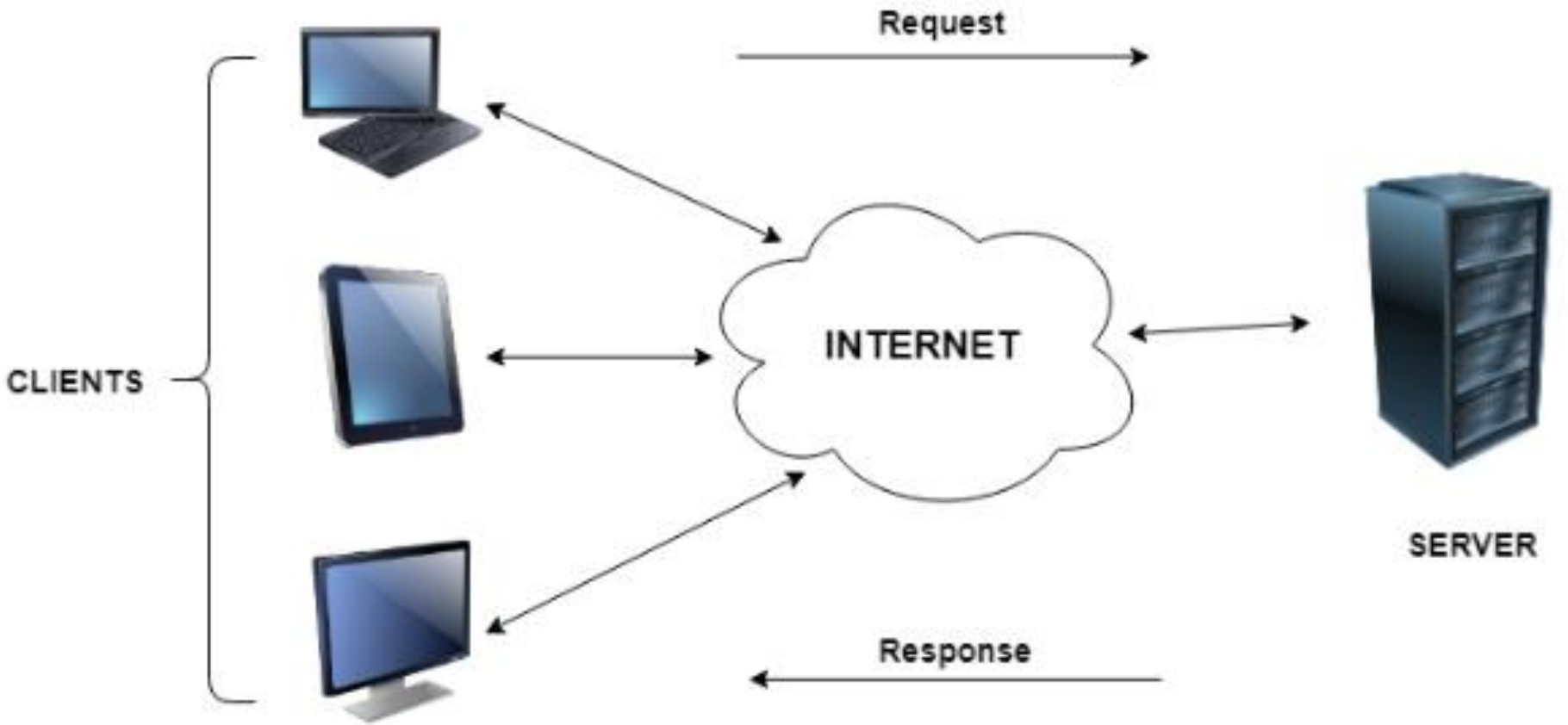
Anti - Overload Techniques

- Managing network traffic, by using
  - Firewalls to block unwanted traffic coming from bad IP sources or having bad patterns
  - HTTP traffic managers to drop, redirect or rewrite requests having bad HTTP patterns
  - Bandwidth management and traffic shaping, in order to smooth down peaks in network usage
- Deploying web cache techniques
- Using different domain names or IP addresses to serve different (static and dynamic) content by separate web servers, e.g.
  - http://images.example.com
  - http://example.com

Server Anti - Overload Techniques

- Using different domain names or computers to separate big files from small and medium-sized files; the idea is to be able to fully cache small and medium-sized files and to efficiently serve big or huge (over 10 – 1000 MB) files by using different settings
- Using many internet servers (programs) per computer, each one bound to its own network card and IP address
- Using many internet servers (computers) that are grouped together behind a load balancer so that they act or are seen as one big web server
- Adding more hardware resources (i.e. RAM, disks) to each computer
- Using more efficient computer programs for web servers, etc.

Client - Server Architecture



Client – Server Architecture

- Client/server architecture is a computing model in which the server hosts, delivers and manages most of the resources and services to be consumed by the client
- it has one or more clients connected to a central server over a network or internet connection
- is also known as a networking computing model or client/server network because all the requests and services are delivered over a network
- WWW is based on this architecture
- Client/server architecture is a producer/consumer computing architecture where the server acts as the producer and the client as a consumer

Client – Server Architecture : Advantages

- All the required data is concentrated in a single place i.e. the server. So it is easy to protect the data and provide authorization and authentication
- The server need not be located physically close to the clients. Yet the data can be accessed efficiently
- It is easy to replace, upgrade or relocate the nodes in the client server model because all the nodes are independent and request data only from the server
- All the nodes i.e clients and server may not be build on similar platforms yet they can easily facilitate the transfer of data
- Easy to implement security policies, since the data are stored in central location
- Simplified network administration

Client – Server Architecture : Disadvantages

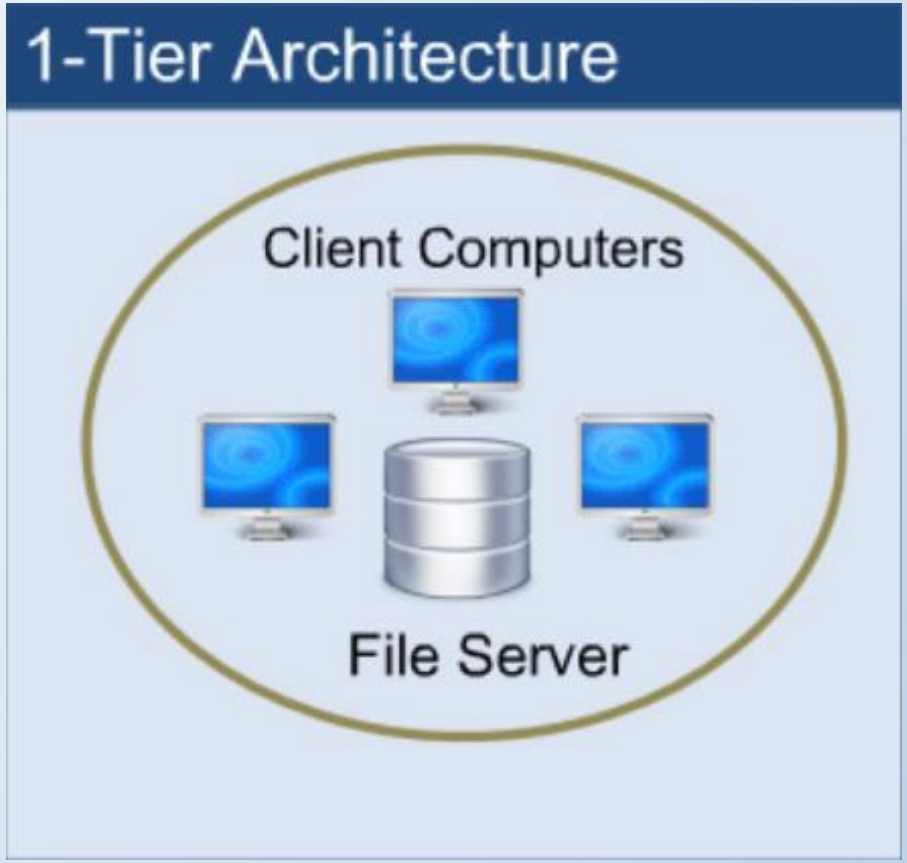
- Failure of the server causes whole network to be collapsed
- Expensive than Peer to Peer, dedicated powerful servers are needed
- Extra effort are needed for administering and managing the server
- If all the clients simultaneously request data from the server, it may get overloaded.

Client – Server Architecture : Types

- Three types :
  - One Tier
  - Two Tier
  - Multi Tier

One Tier Architecture

- the user interface, marketing logic and data logic are present in the same system
- This kind of service is reasonable
- Presentation, Business, Data Access layers within a single software package
- The data is usually stored in the local system or a shared drive
- Completely unscalable. Only one user can access the system at a given time via the local client



Two Tier Architecture

- the user interface is stored at client machine and the database is stored on the server
- Database logic and business logic are filed at either client or server but it needs to be maintained
- If Business Logic and Data Logic are collected at a client side, it is named as fat client thin server architecture
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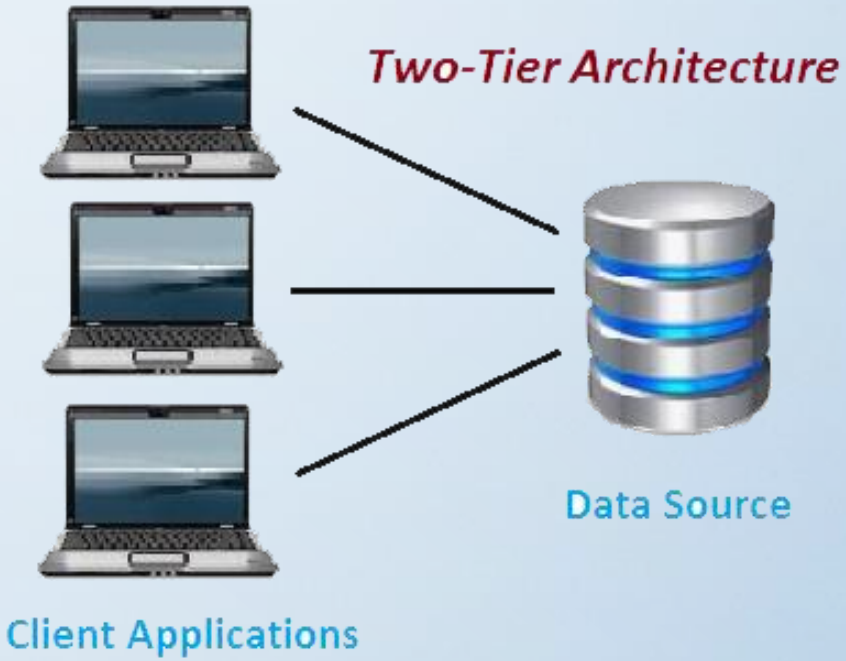
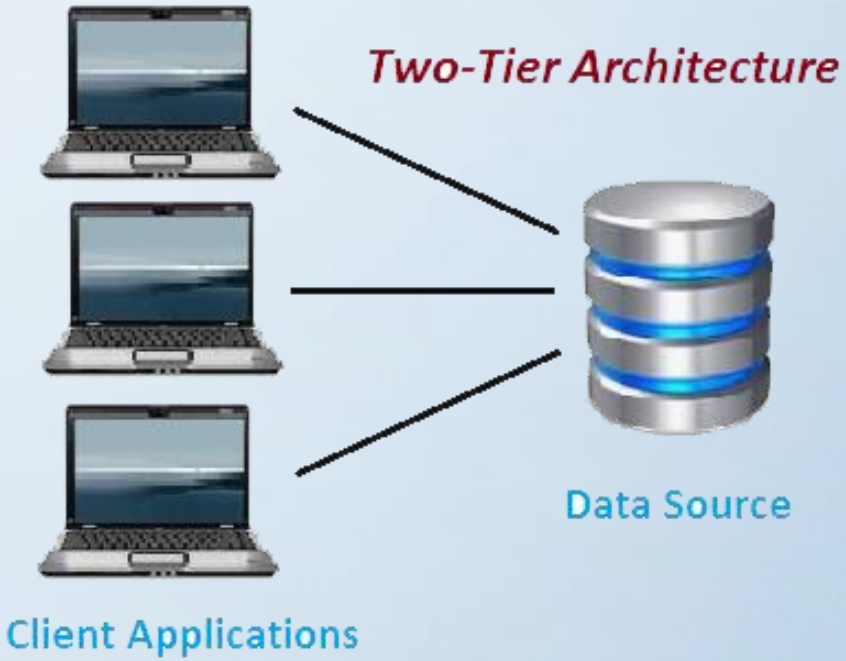


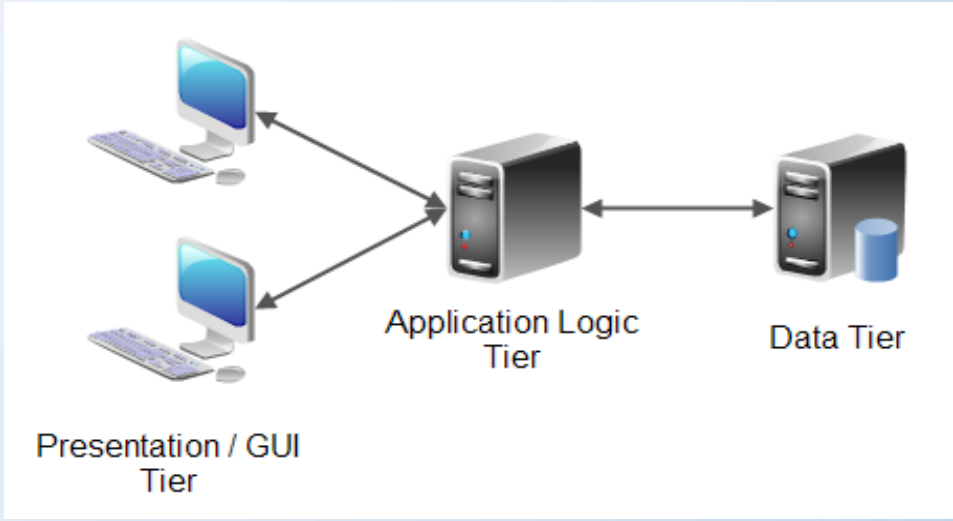
Two Tier Architecture

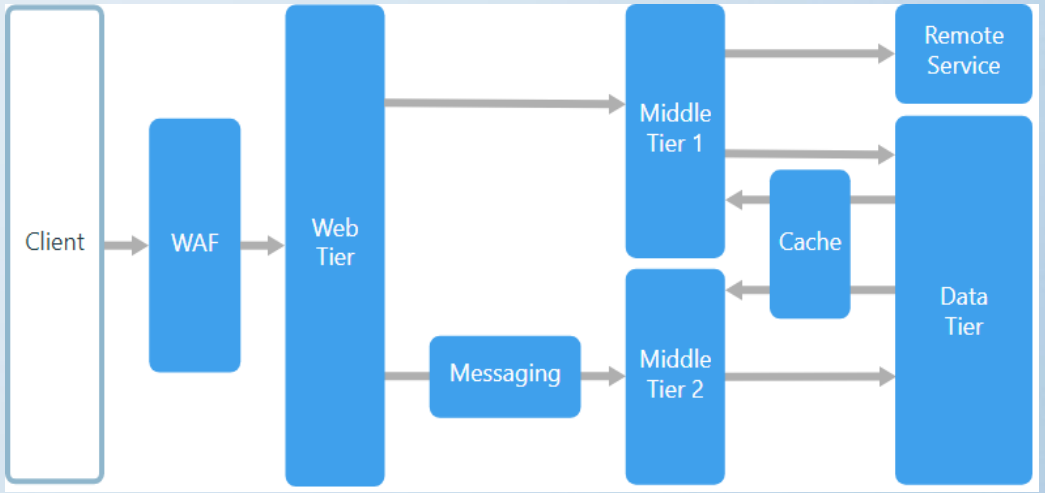
- in this architecture, client and server have to come in direct incorporation
- If a client is giving an input to the server, there shouldn't be any intermediate
- This is done for rapid results and to avoid confusion between different clients
- It is considered as affordable architecture
- Multiple users can connect to the server at once
- Is not suitable for security reasons



Multi Tier Architecture

- N-tier architecture (with N more than 2) is really 3 tier architecture in which the middle tier may or may not be split up into new tiers
- The application tier is broken down into separate parts
- The primary advantage of N-tier architectures is that they make load balancing possible
- Since the application logic is distributed between several servers, processing can then be more evenly distributed among those servers
- N-tiered architectures are also more easily scalable, since only servers experiencing high demand, such as the application server, need be upgraded
- The primary disadvantage of N-tier architectures is that it is also more difficult to program and test an N-tier architecture due to its increased complexity





HTTP

- Stands for Hyper Text Transfer protocol
- is the underlying protocol used by the World Wide Web
- defines how messages are formatted and transmitted, and what actions Web servers and browsers should take in response to various commands
- For example, when you enter a URL in your browser, this actually sends an HTTP command to the Web server directing it to fetch and transmit the requested Web page
- HTTP is based on the request-response communication model
  - Client sends a request
  - Server sends a response
  - HTTP is a stateless protocol : where the protocol does not require the server to remember anything about the client between requests

HTTP

- Normally implemented over a TCP connection (80 is standard port number for HTTP)
- The following is the typical browser-server interaction using HTTP
  - User enters Web address in browser
  - Browser uses DNS to locate IP address
  - Browser opens TCP connection to server
  - Browser sends HTTP request over connection
  - Server sends HTTP response to browser over connection
  - Browser displays body of response in the client area of the browser window

Client Side Scripting

- refers to writing the class of computer programs (scripts) on the web that are executed at client-side, by the user's web browser, instead of server-side (on the web server)
- Usually scripts are embedded in the HTML page itself
- JavaScript , VBScript, Jscript, Java Applets etc. are the examples of client side scripting technologies
- JavaScript is probably the most widely used client-side scripting language
- Client-side scripts have greater access to the information and functions available on the user's browser, whereas server-side scripts have greater access to the information and functions available on the server
- Client-side scripts may also contain instructions for the browser to follow in response to certain user actions, (e.g., clicking a button)
- Often, these instructions can be followed without further communication with the server

Server Side Scripting

- Includes writing the applications executed by the server at run-time to process client input or generate document in response to client request
- So server side script consists the directives embedded in Web page for server to process before passing page to requestor
- usually used to provide interactive web sites that interface to databases or other data stores
- This is different from client-side scripting where scripts are run by the viewing web browser, usually in JavaScript
- primary advantage to server-side scripting is the ability to highly customize the response based on the user's requirements, access rights, or queries into data stores
- Examples : PHP, ASP, Perl, Java, Python etc,

Web 1.0 vs Web 2.0 vs Web 3.0

- Web 1.0
  - It is the "readable" phrase of the World Wide Web with flat data
  - there is only limited interaction between sites and web users
  - Web 1.0 is simply an information portal where users passively receive information without being given the opportunity to post reviews, comments, and feedback
- Web 2.0
  - It is the "writable" phrase of the World Wide Web with interactive data
  - Unlike Web 1.0, Web 2.0 facilitates interaction between web users and sites
  - so it allows users to interact more freely with each other
  - Web 2.0 encourages participation, collaboration, and information sharing
  - Eg. Youtube, Wiki, Flickr, Facebook, and so on

Web 3.0

- It is the "executable" phrase of Word Wide Web with dynamic applications, interactive services, and "machine-to-machine" interaction
- Web 3.0 is a semantic web which refers to the future
- it is Web 2.0 with flavor of artificial intelligence
- computers can interpret information like humans and intelligently generate and distribute useful content tailored to the needs of users
- One example of Web 3.0 is Tivo, a digital video recorder
  - It is recording program which can search the web and read what it finds to you based on your preferences
- Google voice search, Siri (Iphone) etc.