

WEB TECHNOLOGY

Chapter 1: WEB ESSENTIALS

Lecture Three/Four

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Quick Lookback of Previous Class:

- TCP/IP Protocol Suite:
 - Network Access Layer
 - Internet Layer
 - Transport Layer
 - Application Layer
- TCP/IP 3-way handshake protocol.
- Client/Server Architecture.
 - Components of Client/Server Architecture
 - Workstation
 - Server
 - Networking Devices

Tier Technology

- Tier Technology is a layered system in which distinct layers appear to execute separate tasks.
- The web's communication method is divided over numerous layers, which can be found on a single or numerous devices on a network.
- Communications will be done conveniently and effectively using a such method.
- Most of the Web application is made up of the three distinct logics:
 - *Presentation Logic - (Client)*
 - *Business/Application Logic - Application Server (Middleware))*
 - *Data Access Logic - (Database Server)*

Presentation Logic (Presentation Tier)

- The presentation tier is the user interface and communication layer of the application, where the end user interacts with the application. Its main purpose is to display information to and collect information from the user. This top-level tier can run on a web browser, as desktop application, or a graphical user interface (GUI), for example. Web presentation tiers are usually developed using HTML, CSS and JavaScript. Desktop applications can be written in a variety of languages depending on the platform.

Business(*Application*) Logic(Business Tier)

- The Business Tier also called as application tier and also known as the logic tier or middle tier, is the heart of the application. In this tier, information collected in the presentation tier is processed - sometimes against other information in the data tier - using business logic, a specific set of business rules. The application tier can also add, delete or modify data in the data tier.
- The application tier is typically developed using Python, Java, Perl, PHP or Ruby, and communicates with the data tier using API calls.

Data Access Logic - Data tier

- The data tier, sometimes called database tier, data access tier or back-end, is where the information processed by the application is stored and managed. This can be a relational database management system such as PostgreSQL, MySQL, MariaDB, Oracle, DB2, Informix or Microsoft SQL Server, or in a NoSQL Database server such as Cassandra, CouchDB or MongoDB.

Different Types of Tier Technology:

- 1 Tier Technology
- 2 Tier Technology
- 3 Tier Technology

1 Tier Technology

- A presentation, business, and data access logic program are placed on a standalone computer, and the user must use that computer to use the system.
- It makes no difference whether the PC is linked to the Network. So, while discussing web technology, we may avoid discussing 1-tier technology

2 TIER TECHNOLOGY

- In the two-tier mechanism, the presentation and business units act as one and the data unit as another, giving the appearance of two tiers.
- A two-tier architecture is shown by the Client-Server concept The client system transmits the request to the server system, which processes it and returns the data to the client system
- Client and server systems do not need to be on separate machines to demonstrate how this mechanism works, but if you want your system to be accessed by multiple users, you must set up one computer as a server where the application will be hosted, and multiple clients send a request to that server through their client application.

2 TIER TECHNOLOGY

- Thin clients and Thick (Fat) clients are the two most common categories of clients.
 - Thin Client: A thin client is a computer that uses resources from a central server rather than a local hard disk.
 - Thick (Fat) client: A "thick client" also referred to as "Fat Client" is a well-equipped personal computer that does all data processing on its own and is not constantly linked to the server.

3 TIER TECHNOLOGY

- The client system handles the presentation logic, the application server handles the business logic, and the database server handles the data access logic in the 3-tier technology.
- To achieve program data independence, three-tier technology isolates user applications from physical databases and support. Web-based apps use three-tiered techniques.
- The three-tier design method boosts productivity and better handles program components.
- It enhances the flexibility of a program and allows those who deploy it to reuse existing code and grow their applications as needed.

- Because components are reusable, you may share them with others who may require comparable functionality as your components.
- The main advantage of three-tier architecture is the logical and physical separation of functionality.
- Each Storage tier can run on a different operating system and server platform, such as a web server, application server. or database server, depending on its functional requirements.
- Furthermore, each tier runs on at least one dedicated server hardware or virtual server, allowing each tier's services to be customized and optimized without affecting the other tiers.

N-tier Technology

- It is often referred to as "Multi-Tier Architecture" The presentation, processing, and data management activities are conceptually and physically separated in this design.
- Because there is no resource sharing the services may be supplied at full capacity with this distribution.
- It is appropriate for supporting enterprise-level client-server applications by offering scalability, security, reusability, and maintainability solutions.

N-tier Technology

- The primary benefit of N-tier architectures is that they enable load balancing. Because the application logic is distributed across multiple servers, processing can be more evenly distributed across those servers.
- N tiered architectures are also more easily scalable because only high-demand servers, such as the application server, need to be upgraded.
- The primary disadvantage of N-tier architectures is that they are more difficult to program and test due to their increased complexity.

Advantages of N-Tier(Multi-Tier) Technology:

- Changes to the user interface or application logic are mostly independent of one another, allowing the application to easily evolve to meet new requirements.
- Network bottlenecks are reduced because the application layer only sends what is required to complete a task to the client.
- The client is not exposed to database or network operations. The client can easily and quickly access data without having to know where the data is or how many servers are on the system.
- Database connections can be 'pooled and thus shared by multiple users, lowering the cost of per-user licensing significantly. Because the data layer is written in standard SQL, which is platform independent, the organization has database independence.
- The application layer can be written in the languages familiar to the organization's in-house programmers, such as PHP.

Other benefits (compared to single- or two-tier architecture) include:

- **Faster development:** Because each tier can be developed simultaneously by different teams, an organization can bring the application to market faster, and programmers can use the latest and best languages and tools for each tier.
- **Improved scalability:** Any tier can be scaled independently of the others as needed.
- **Improved reliability:** An outage in one tier is less likely to impact the availability or performance of the other tiers.
- **Improved security:** Because the presentation tier and data tier can't communicate directly, a well-designed application tier can function as a sort of internal firewall, preventing SQL injections and other malicious exploits.

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World Wide Web(WWW):

- World Wide Web, abbreviated as www and commonly known as the web, is a system of interlinked hypertext documents accessed via the Internet.
- & we know that:
- *Internet is rich resources for the information and data, never ending, always changing and completely dynamic.*

World Wide Web(WWW):

- Originally, one of several systems for organizing Internet-based information
 - Competitors:
 - *WAIS(Wide Area Information Servers): WAIS knows about hundreds of databases that contain information on both computer- related topics and other general topics.*
 - *Gopher: Gopher is a menu-driven front end to other Internet resource services, such as Archie, WAIS, and anonymous FTP*
 - *ARCHIE: Archie provides a directory of thousands of FTP servers across the Internet*
- Distinctive feature of Web: support for hypertext (text containing links)

- Communication via Hypertext Transport Protocol (HTTP)
- Document representation using Hypertext Markup Language (HTML)
- The Web is the collection of machines (Web servers) on the Internet that provide information, particularly HTML documents, via HTTP.
- Machines that access information on the Web are known as Web clients. A Web browser is software used by an end user to access the Web.

Web Server & Web Client, What is it?

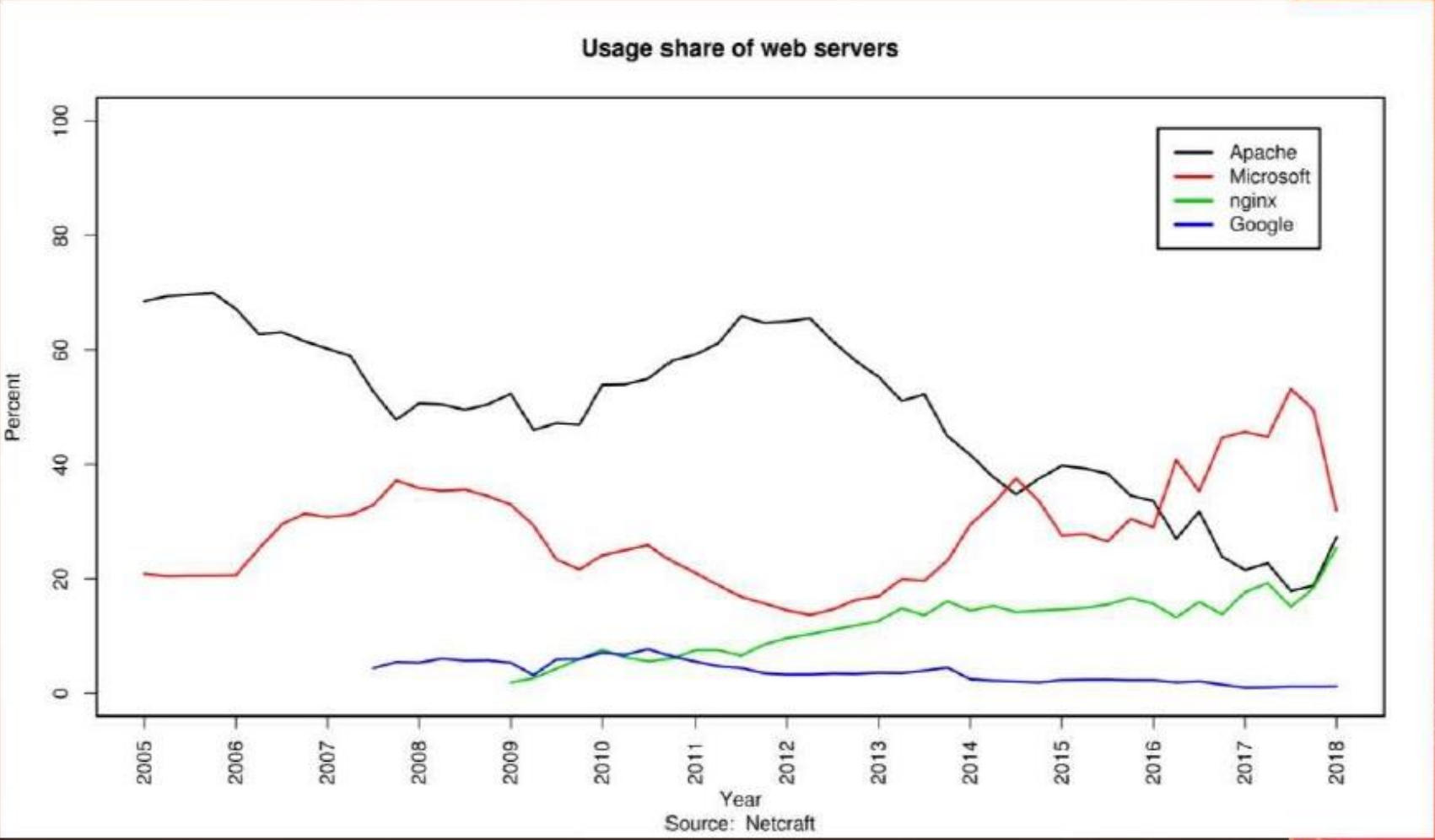
- A web server and web client are two components of the World Wide Web.
- The web server is a computer system that stores webpages and responds to requests from web clients.
- The web client is a computer system that sends requests to the web server and displays the webpages it receives in response.
- Together, the web server and web client enable users to access and view webpages from anywhere in the world.

What is a Web Server?

- A web server is a computer system that stores webpages and responds to requests from web clients.
- It is responsible for hosting websites and providing webpages to users. Web servers are typically connected to the internet and can be accessed by any web client.
- Web servers can be either physical or virtual, and they can be located in a data center or in the cloud.
- Web servers are typically configured to run web server software, such as Apache or Nginx, which is responsible for responding to requests from web clients.

Market Share of Web Servers

Product	Vendor	Percent
Apache	Apache	44.30%
nginx	NGINX, Inc.	41.00%
IIS	Microsoft	8.90%
LiteSpeed Web Server	LiteSpeed Technologies	3.90%
GWS	Google	0.90%



What is a Web Client?

- A web client is a computer system that sends requests to the web server and displays the webpages it receives in response.
- Web clients can be either physical or virtual, and they can be located in a data center or in the cloud.
- Web clients are typically configured to run web browser software, such as Chrome or Firefox, which is responsible for sending requests to the web server and displaying the webpages it receives in response.
- Web clients can also be used to access web-based applications, such as email or online banking.

How Do Web Servers and Web Clients Work Together?

- Web servers and web clients work together to enable users to access and view webpages from anywhere in the world.
- When a user enters a web address into their web browser, the web browser sends a request to the web server.
- The web server then responds by sending the requested webpages to the web client.
- The web client then displays the webpages to the user.
- This process is repeated each time a user requests a webpage from the web server.

Domain Names, DNS, and URLs:

Domain Name

- IP addresses are not convenient for users to remember easily. So an IP address can be represented by
- a natural language convention called a domain name

Domain Name System

- Domain name system (DNS) translates domain names into IP addresses. DNS is
- the “phone book” for the Internet, it maps between host names and IP addresses.

URL

- A uniform resource locator (URL), which is the address used by a Web browser to identify the
- location of content on the Web, also uses a domain name as part of the URL.

http://www.example.org:56789/a/b/c.txt?t=win&s=chess#para5

host (FQDN) port path query fragment

authority Request-URI

DNS

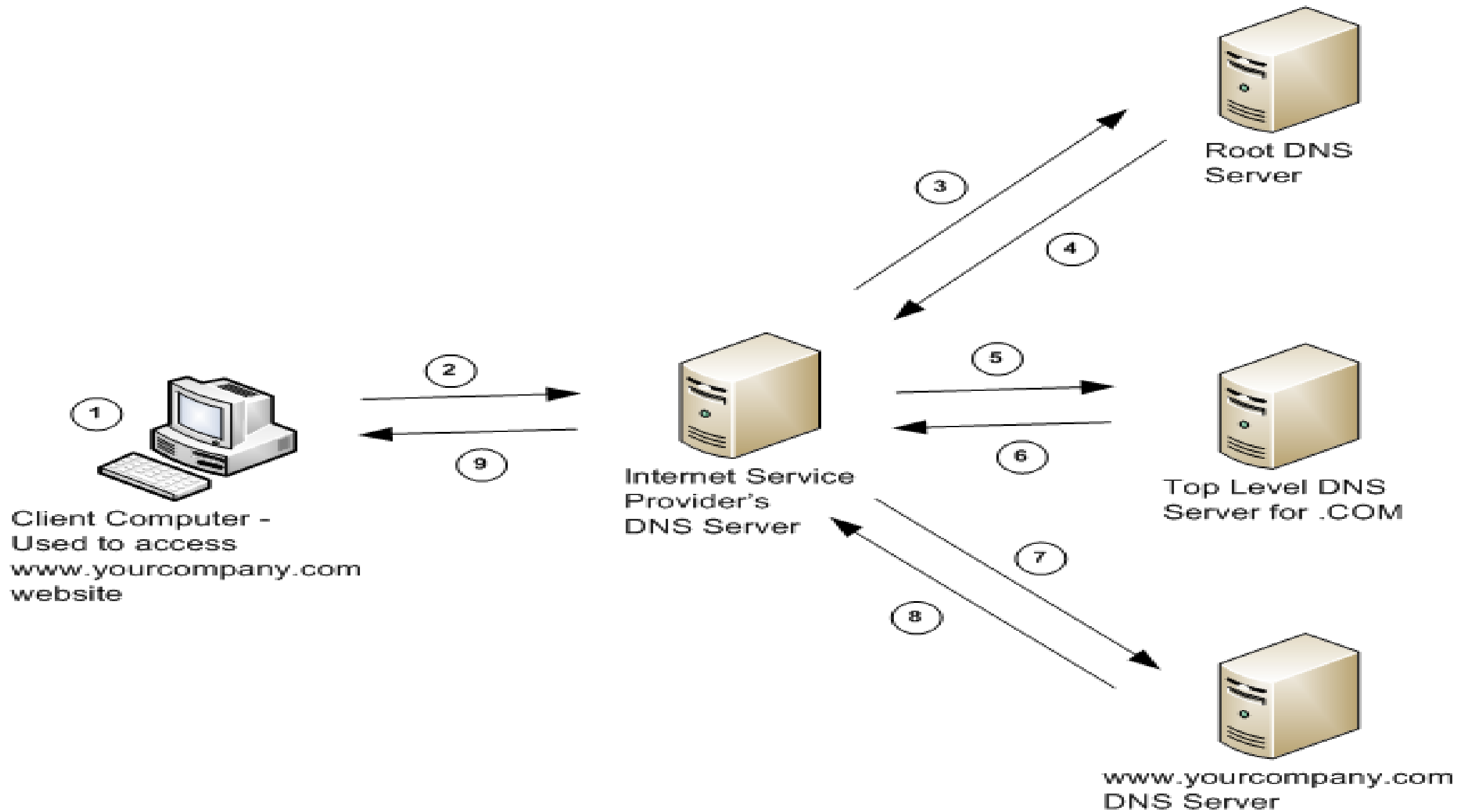
- A mechanism to map domain name to ip address and vice-versa
- (or)
- A system by which it will be converting domain name into ip address and vice versa.

Working of DNS

- 1. Client enters 'www.yourcompany.com' internet address. Client computer needs the IP address translation of 'yourcompany.com' and first checks its own DNS cache for this information. If this is the first time using this website or the cache has been cleared it cannot find the IP address here.
- 2. The client computer (or “query”?) is then redirected to the Internet Service Provider's (ISP's) DNS Server. The ISP's DNS server checks its own cache but it will not be there if the site has not been accessed before.
- 3. The ISP's DNS server redirects the query to the Root DNS Server. Every DNS server has a file that contains a list of all of the root DNS servers.

- 4. The root DNS server maintains information about where a top-level (.com) DNS server is located and returns this information to the ISP's DNS Server.
- 5. The ISP's DNS server redirects the query to a top-level (.com) DNS server.
- 6. The top-level (.com) DNS server knows the IP address of the DNS server for the yourcompany.com domain and returns that information to the ISP's DNS server.

- 7. The ISP's DNS server redirects the query to the actual DNS server for the yourcompany.com domain.
- 8. The DNS server for www.yourcompany.com returns the IP address of the host of www.yourcompany.com to the ISP's DNS server.
- 9. Lastly, the ISP's DNS server sends the IP address to the client computer so the client can access www.yourcompany.com.





Web Pages & Websites

Web Pages

- A web page is a document or information resource that is suitable for the World Wide Web and can be accessed through a web browser and displayed on a monitor or mobile device.
- This information is usually in HTML or XHTML format and may provide navigation to other web pages via hypertext links. Web pages frequently subsume other resources such as style sheets, scripts and images into their final presentation.
- Web pages may be retrieved from a local computer or from a remote web server. The web server may restrict access only to a private network, e.g. a corporate intranet, or it may publish pages on the World Wide Web.

- Web pages are requested and served from web servers using Hypertext Transfer Protocol (HTTP).
- Web pages may consist of files of static text and other content stored within the web server's file system (static web pages), or may be constructed by server-side software when they are requested (dynamic web pages).
- Client-side scripting can make web pages more responsive to user input once on the client browser.

Website

- A website or simply site, is a collection of related web pages containing images, videos or other digital assets.
- A website is hosted on at least one web server, accessible via a network such as the Internet or a private local area network through an Internet address known as a Uniform Resource Locator.
- All publicly accessible websites collectively constitute the World Wide Web. Web sites can be static or dynamic.

Static Website:

- A static website is one that has web pages stored on the server in the format that is sent to a client web browser. It is primarily coded in Hypertext Markup Language, HTML.
- Simple forms or marketing examples of websites, such as classic website, a five-page website or a brochure website are often static websites, because they present pre-defined, static information to the user.
- This may include information about a company and its products and services via text, photos, animations, audio/video and interactive menus and navigation.

- This type of website usually displays the same information to all visitors. Similar to handing out a printed brochure to customers or clients, a static website will generally provide consistent, standard information for an extended period of time.
- Although the website owner may make updates periodically, it is a manual process to edit the text, photos and other content and may require basic website design skills and software.
- In summary, visitors are not able to control what information they receive via a static website, and must instead settle for whatever content the website owner has decided to offer at that time.

Dynamic Website:

- A dynamic website is one that changes or customizes itself frequently and automatically, based on certain criteria.
- Dynamic websites can have two types of dynamic activity: Code and Content. Dynamic code is invisible or behind the scenes and dynamic content is visible or fully displayed.
- The first type is a web page with dynamic code. The code is constructed dynamically on the fly using active programming language instead of plain, static HTML.
- The second type is a website with dynamic content displayed in plain view. Variable content is displayed dynamically on the fly based on certain criteria, usually by retrieving content stored in a database.

Last Slide for a Day!

Any Questions?