Networking and the Internet

Coding Blocks – Arnav Gupta

The Internet

Some facts and history

Internet by the Numbers

- > 4 billion users
- 46% of all world population has access
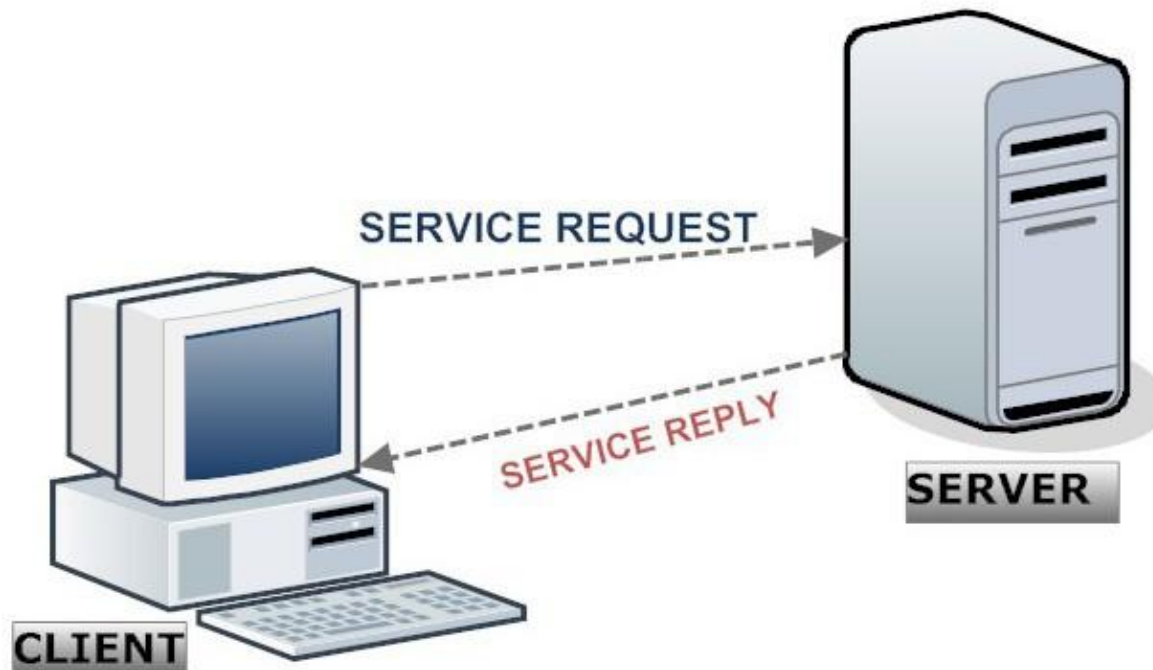- > 1 billion websites
- 10x increase from 1999 to 2013

Internet History

- 1958 – Bell Labs – Modem
- 1961 – MIT – Packet Switching
- 1968 – ARPANET
- 1972 – University Internet Nodes, UCLA Chat
- 1974 – Vint Cerf – TCP

How the Web works

- Servers
- Clients
- ISPs
- DNS
- Datacenters

Client Server Model

Domain Name Server

- Phone book of the Internet

- Maps domains (www.google.com, www.yahoo.com) to IP addresses (112.123.21.22, 8.8.22.56)

- Humans remember domains

- Computers work with IP

Internet Service Provider

▶ Company that provides access to user

▶ Internet can be over DSL, Phone Line, Cable, Fibre, Wireless and other medium

Datacenters

Datacenters

Web terminologies

- ▶ Protocols
- ▶ Addresses
- ▶ Packets

Web Protocols

- TCP/IP
- HTTP
- DHCP
- FTP
- SMTP
- SSH
- Telnet

Web Addresses

- Domain Names
- IP Address
- MAC Address

Domain Names

- Human-readable web address
- <subdomain>.<domain>.<TLD>
- TLD – Top level domain
  - .org
  - .com
  - .net
  - Country based - .uk, .in,
  - Purpose based - .edu, .aero, .info

IP Addresses

- 32-bit, 4-word address (IPv4)

- Uniquely defines a server, a client, a node, or a router.

- IPv6 Address – Default in future - 128-bit (16 octet)

- IP allows –
  - Subnets
  - Gateways
  - Private Ips

MAC Address

- Media Access Control
- An ID unique to a hardware Network Interface
- Is **not** dynamic like IP. Is fixed for a hardware device.
- Used by all IEEE 802 Network Technologies

Components of the Web

- Web Pages
- Web Sites
- Web Servers
- Search Engines

Web Page

- A document that can be viewed over web
- Transported over Internet
- Viewed on a browser
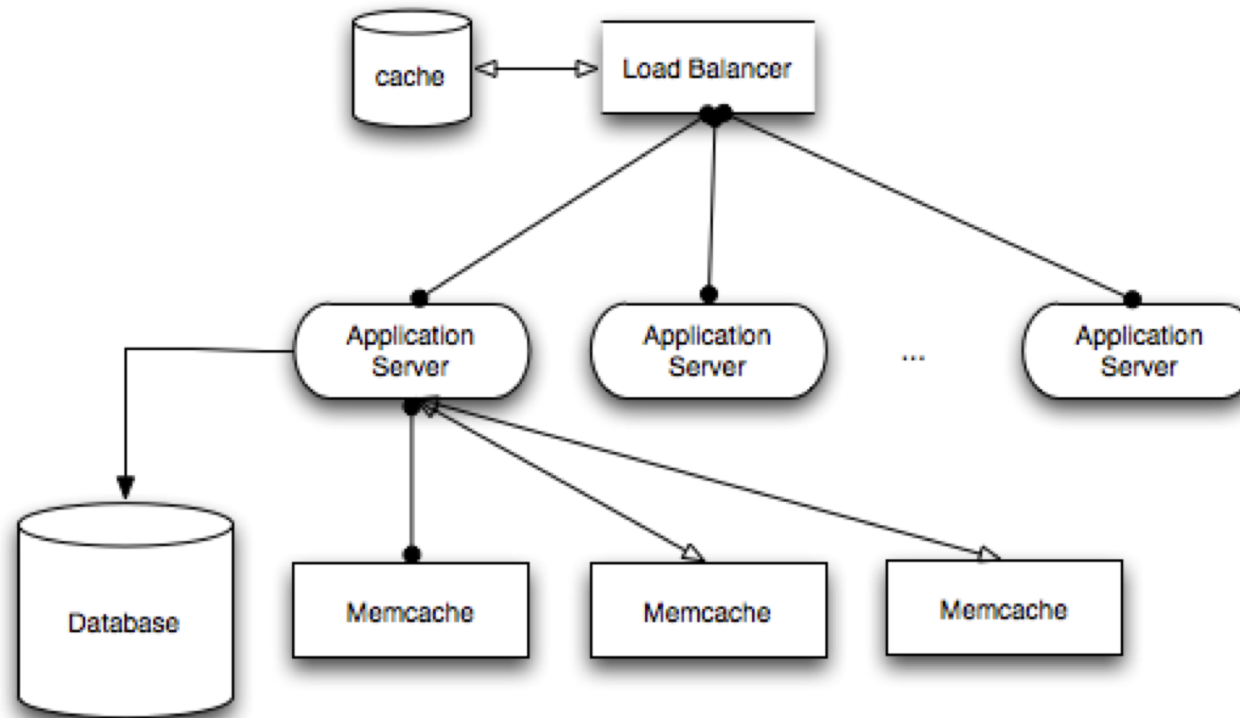- Uses markup (HTML) and styling. Can contain scripts

Web Site

- Collection of webpages
- Also can include other media (audio, images, video)

Web Servers

- A hardware (or software) that hosts the website.
- One website can be spread over multiple servers
- One server can host multiple websites

Web Server Architecture

Search Engines

- A website that indexes other websites/webpages

- Helps you find websites

- Uses techniques like 'crawling' to cache content for searching

- Google.com, Bing.com, Yahoo.com

How web technologies work

Server

- Hardware
- OS
- Server Framework
- Containers/Servlets
- Server Applications

Server Side Frameworks

- Java
  - Spring
  - Play
  - Jboss
- Python
  - Flask
  - Django
  - Bottle

Server Side Frameworks

- Ruby
  - Rails
- PHP
  - Codeigniter
  - Laravel
- Node.js
  - Express
  - Hapi.js

Client Side Techologies

- HTML (Markup)
- CSS (Styling)
  - SASS
  - LESS
- Javascript (Scripting/Events)
  - jQuery
  - Angular
  - React
  - Backbone
  - Knockout

Server-side Databases

- RDBMS
  - MySQL
  - Postgres
  - Oracle
  - MS Database
- NoSQL
  - MongoDB
  - CouchDB
  - Memcache
  - Redis

Client-side Storage

- localStorage
- sessionStorage
- Cookies
- indexedDB
- cache

Types of websites

- **Static Websites**
  - All HTML content is created and saved on server
- **Dynamic Website**
  - Content is generated on demand for each user
- **Responsive**
  - Reacts to user, and his screen size

RESTful APIs

- A contract between servers and clients

- GET

- POST

- PUT

- DELETE

- PATCH

Data exchange formats

- JSON
- XML

Website design principles

- ▶ Reactive websites
- ▶ Single-Page Applications
- ▶ MVC, MVP, MVVM and MV* architectures
- ▶ Web Application Frameworks

Latest developments

- VirtualDOM, ShadowDOM
- Sockets
- Pub/Sub, Push Notifications
- Browser Native APIs (Locations, User data)