

Date : 5th - Nov- 2020

Morning Session : 9am – 11.00 PM

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Topics: Computer Networks - 3 & System Design-1

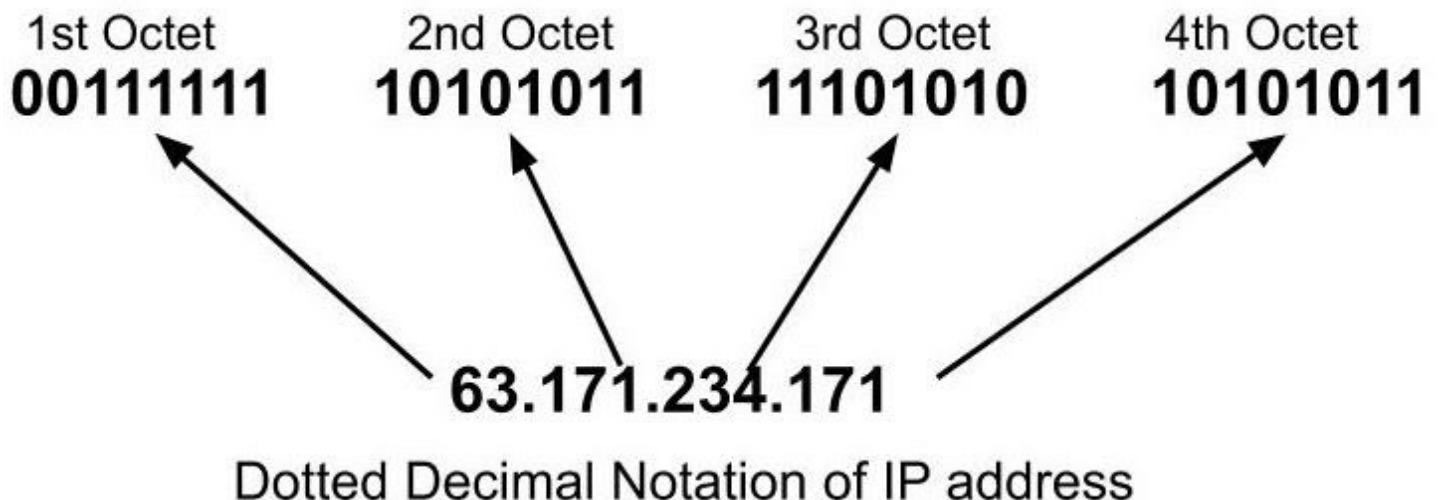
classes of IPV4

IP addressing is the most popular way to identify a device on the network. The address has 32 bits which can be broken into four octets(1 octet=8 bit). These octets provide an addressing method through which we can accommodate large and small networks. Accordingly, there are **5 classes of the network** about which we will study in this blog. So, let's get started.

IPv4

IP version 4 is 32 bits long. The maximum value of a number that can be formed by using 32 bits is 2^{32} . So, the maximum number of IPv4 addresses is 4,294,967,296 addresses i.e. 2^{32} addresses. It consists of four octets each of which can contain one to three digits ranging from 0 to 255 separated by a single dot(.). Here, each number is the decimal representation(base-10) for an 8 digit binary number(base-2).

Example of an IPv4 address: **63.171.234.171**



Classes of IPv4

1. Class A
2. Class B
3. Class C
4. Class D
5. Class E

The order of the bits in the first octet of the IP address decides the class of the IP address.

Some bits of the IP address represents the network and the remaining bits represent the host. **The IP address can be further be divided into two parts:**

Network ID: It identifies which network you are on. The number of networks in any class is given by the formula:

Number of Networks= $2^{\text{networkBits}}$

Host ID: It identifies your machine on the network. The number of hosts in any class is given by the formula:

Number of Hosts= $2^{\text{hostBits}} - 2$.

Here, 2 IP addresses are subtracted because

1. Host ID in which all the bits are set to 0 is not assigned because this represents the network ID.
2. Host ID in which the bits are set to 1 is reserved for **Direct Broadcast Address**(for sending the data from one network to all the other hosts in another network).

Class A

The IP address belonging to Class A uses only the first octet to identify the network and the last three octets are used to identify the host.

1. The Network ID has 8 bits.
2. The Host ID has 24 bits.

The first bit of the first octet is always set to **0**.



Class A

The default subnet mask for Class A IP address is 255.0.0.0. Subnet masks are used to tell hosts on the network which part is the network address and which part is the host address of an IP address.

How does the subnet mask do this?

Suppose you have an IP address as

10.20.15.3 = 00001010.00010100.00001111.00000011

and the mask as,

255.0.0.0 = 11111111.00000000.00000000.00000000

The IP address bits that have corresponding mask bits as **1** represents the **network ID** and the address bits that have corresponding mask bits as set to **0** represent the **host ID**.

10.20.15.1 = 00001010.00010100.00001111.00000001

255.0.0.0 = 11111111.00000000.00000000.00000000

by comparing corresponding bits of address bits and mask bits we get,

netid = 00001010 = 10

hostid = 00010100.00001111.00000011 = 20.15.3

Class A has:

- **Network ID** = $2^7 - 2 = 126$ (Here 2 addresses are subtracted because 0.0.0.0 and 127.x.x.x are special addresses. 127.x.x.x is reserved for localhost)
- **Host ID** = $2^{24} - 2 = 16,777,214$

The IP address belonging to Class A range from 1.a.a.a to 126.a.a.a.(where a ranges from 0 to 255)

Class B

The IP address belonging to Class B uses the first two octets to identify the network and the last two octets are used to identify the host.

1. The Network ID has 14 bits.
2. The Host ID has 16 bits.

The first two bit of the first octet are always set to **10**.

1	0	Network bits (14bits)	Host bits(16 bits)
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Class B

10000000-10111111(Network bits of first Octet)
(128-191)

The subnet mask for class B is 255.255.0.0.

So, class B has:

- Network IDs = 2^{14} = 16384 network ID
- Host IDs = 2^{16} = 65534 host address

The IP address belonging to Class B range from 128.0.a.a to 191.255.a.a.

(where a ranges from 0 to 255)

Class C

The IP address belonging to Class C uses the first three octets to identify the network and the last octet is used to identify the host.

1. The Network ID has 21 bits.
2. The Host ID has 8 bits.

The first two bit of the first octet is always set to **110**.

1	1	0	Network bits (21 bits)	Host bits(8 bits)
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Class C

11000000-11011111(Network bits of first Octet)
(192-223)

The subnet mask for class B is 255.255.255.0.

So, class C has:

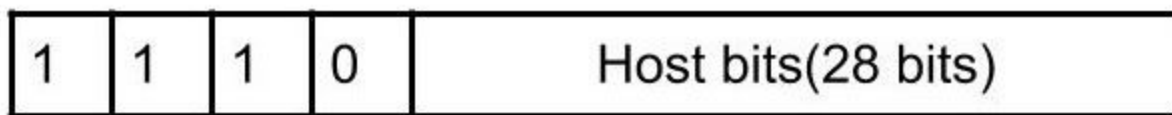
- Network IDs = 2^{21} = 2097152
- Host IDs = 2^8 = 254

The IP address belonging to Class C range from 192.0.0.a to 223.255.255.a.

where a ranges from 0 to 255)

Class D

The IP address belonging to Class D has the first four bits of the first octet set as 1110. The remaining bits are the host bits.



Class D

11100000-11101111(Network bits of first Octet)
(224-239)

The IP address belonging to Class D ranges from 224.0.0.0 to 239.255.255.255.

Class D is reserved for multicasting. Also, this class doesn't have any subnet mask.

Class E

The IP address belonging to Class E has the first four bits of the first octet set as 1111. The remaining bits are the host bits.



Class E

The IP address belonging to Class D ranges from 240.0.0.0 to 255.255.255.254. This class is reserved for future use, research and development purposes. It also doesn't have any subnet mask.

App Server & Web Server :

Server is a device or a computer program that accepts and responds to the request made by other program, known as a client. It is used to manage the network resources and for running the program or software that provides services.

There are two types of servers:

1. Web Server
2. Application Server

Web Server:

Web server contains only web or servlet container. It can be used for servlet, jsp, struts, jsf etc. It can't be used for EJB.

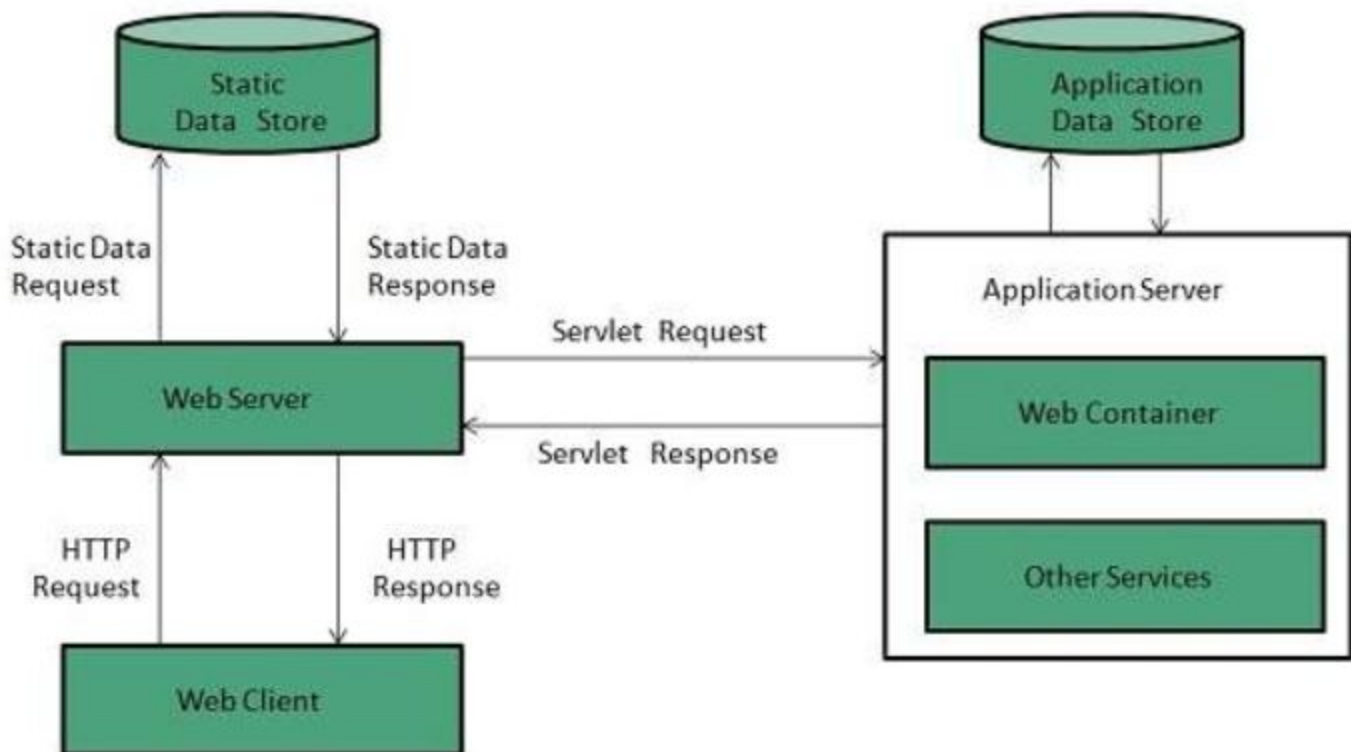
It is a computer where the web content can be stored. In general web server can be used to host the web sites but there also used some other web servers also such as FTP, email, storage, gaming etc.

Examples of Web Servers are: Apache Tomcat and Resin.

Web Server Working

It can respond to the client request in either of the following two possible ways:

- Generating response by using the script and communicating with the database.
- Sending file to the client associated with the requested URL.



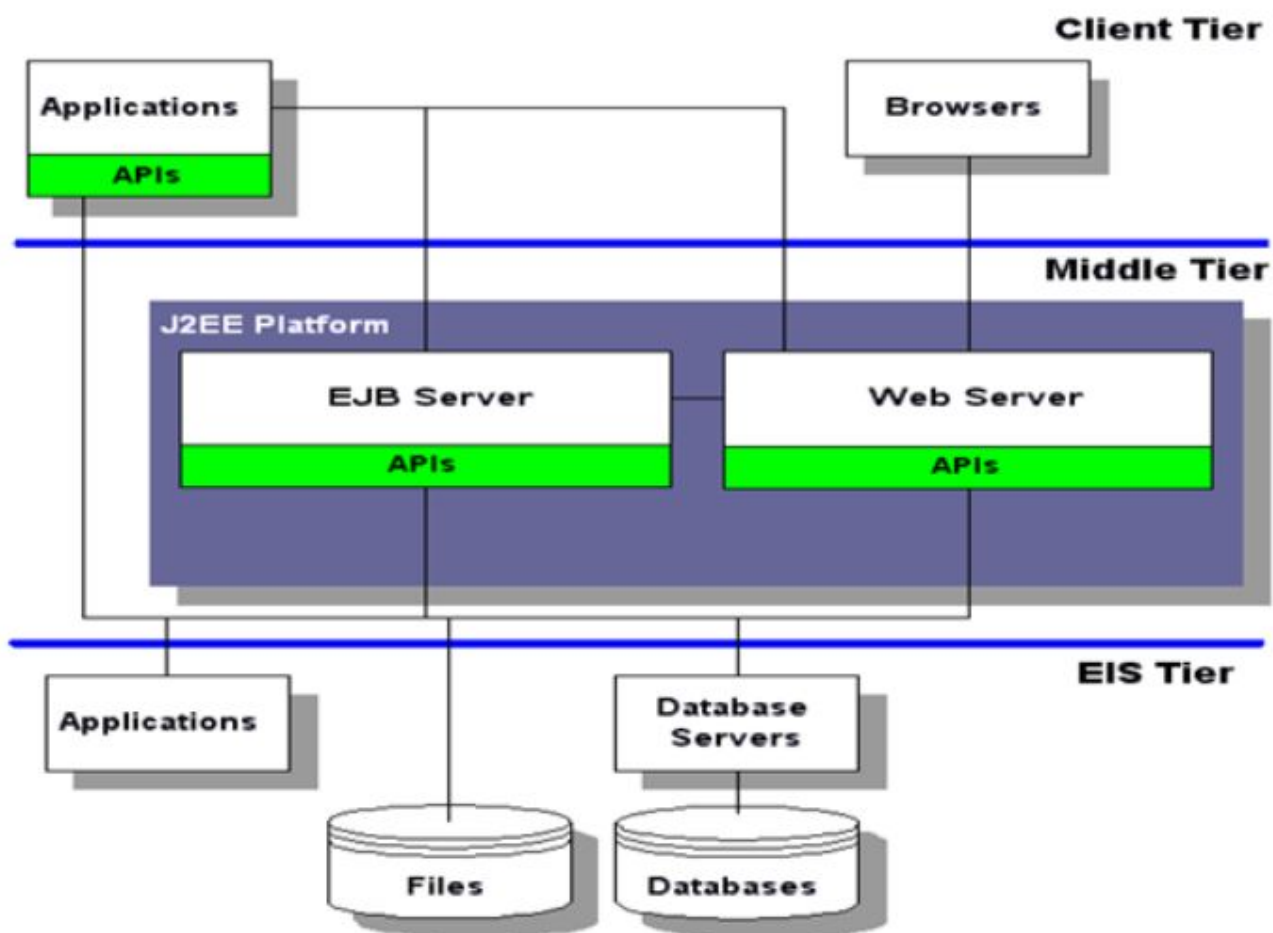
Important points

- If the requested web page at the client side is not found, then web server will send the HTTP response: Error 404 Not found.
- When the web server searches the requested page if the requested page is found then it will send to the client with an HTTP response.
- If the client requests some other resources then the web server will contact the application server and data is stored for constructing the HTTP response.

Application Server

Application server contains Web and EJB containers. It can be used for servlet, jsp, struts, jsf, ejb etc. It is a component based product that lies in the middle-tier of a server centric architecture.

It provides the middleware services for state maintenance and security, along with persistence and data access. It is a type of server designed to install, operate and host associated services and applications for the IT services, end users and organizations.



The Example of Application Servers are:

1. **JBoss**: Open-source server from JBoss community.

2. **Glassfish:** Provided by Sun Microsystem. Now acquired by Oracle.
3. **Weblogic:** Provided by Oracle. It is more secure.
4. **Websphere:** Provided by IBM.

System Design :

Please go through the below PPT PDF

[System Design PDF](#)

1. If a system is reliable, is it available?
 - a. True
 - b. False

Answer: A

2. What is horizontal scaling?
 - a. Scale by adding more servers into your pool of resources
 - b. scale by adding more power to an existing server

Answer: A.

3. Data Sharding is?

- a. technique to break up a big database (DB) into many smaller parts.
- b. It helps to spread the traffic across a cluster of servers to improve responsiveness and availability of applications, websites or databases

Answer: A

4. Which database is fast and scalable?

- a. SQL
- b. NoSQL

Answer: B