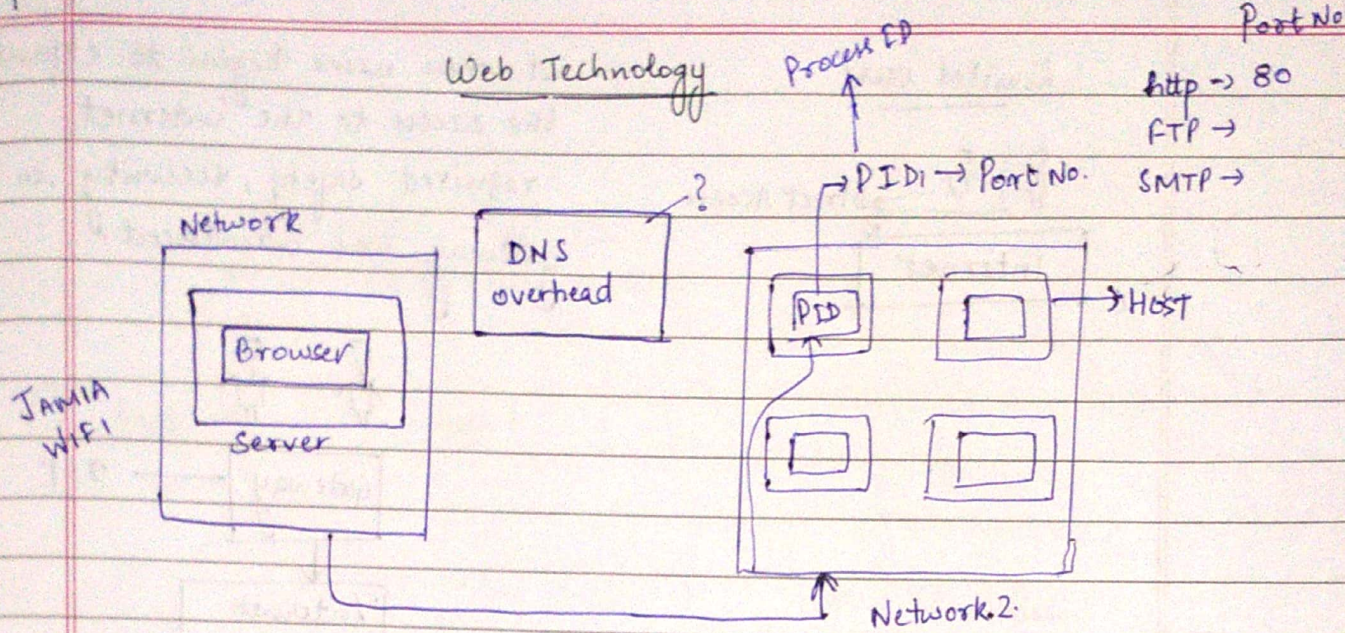
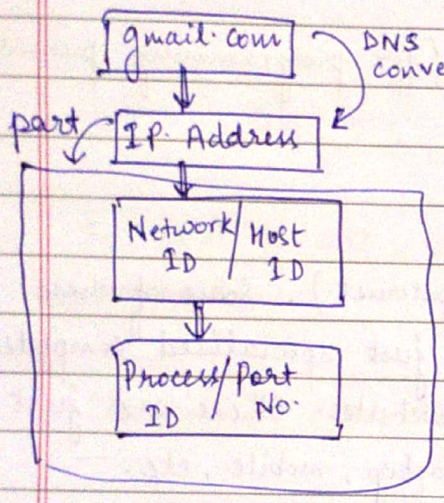
Web Technology





Website = n× webpage

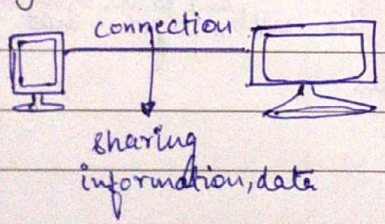
Webpage → the particular page that is displayed on writing a URL.

Webserver → URL are hosted here

Q. How internet works ?

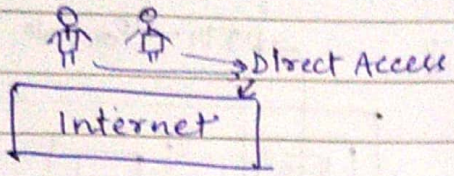
Q. How google works ?

Q. How proxy works ?

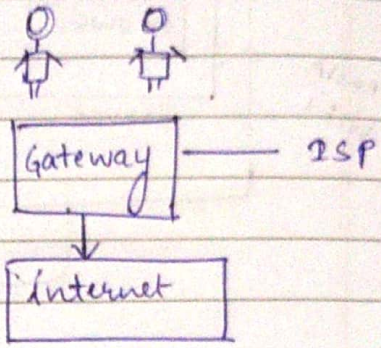


Network 1969 → developed for Research purpose for USA Defence Department

Limited Users



but when users began to expand the access to the internet required safety, security so gateway was introduced.



* Fundamentals of Algorithm By Cormen (for programming purpose)

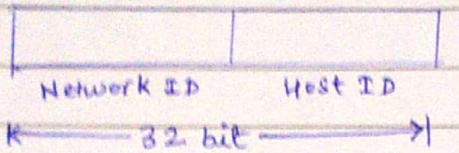
Internet

Interconnected Network of computers (internet). Some of these computers are web servers which are just specialised computers that contain and serve content from websites. Others are just client devices we use everyday like laptop, mobile, etc.

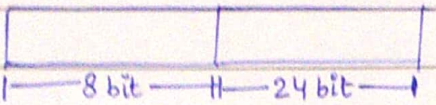
How google works

When we search for any keyword the Google actually searches its database and not the actual web. Google spiders and crawlers are the programs that crawl the web and go on indexing the web pages that they find ~~and~~ display in the search results.

IP Address



① Statically (1970 - 1980)



2^{24} = 16 Million

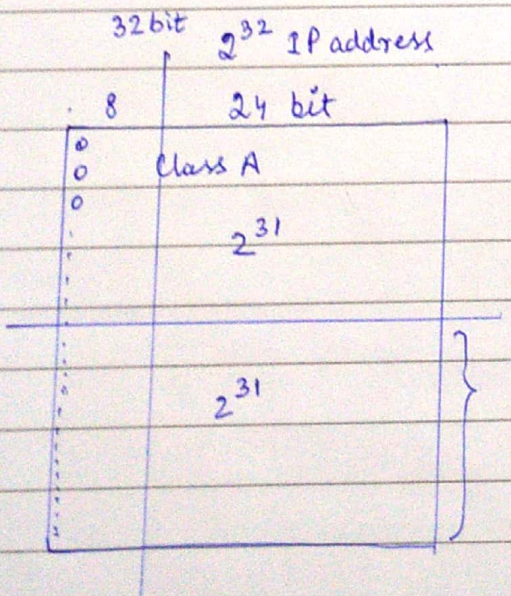
2^8 = 256 binary number are possible

1 of 256 Network have 16M individually.

total no. of bits = $2^8 \times 2^{24} = 2^{32}$ bits

to exist a site, there should be a place it would be called as host.

Classfull IP Addressing



$\frac{2^{32}}{2} = 2^{31}$

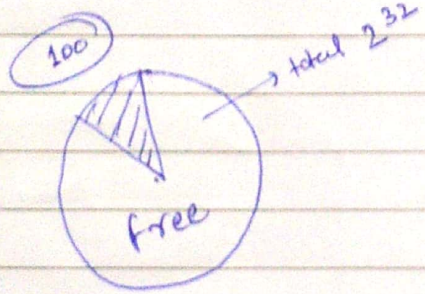
Class A → 0 - 127
Class B → 128 - 191
Class C → 192 - 223
Class D → 224 - 239
Class E → 240 - 255

0000 — Subnetting
127 — Broadcasting

Host = IP Address − 2

	NID	HID
Class A	8	24
Class B	16	16
Class C	24	8

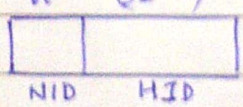
CIDR (Classless Interdomain Routing)



a.b.c.d/(n)

n → no. of network ID bits

(32-n) → no. of Host ID bits.



100.7.11.64	20

No. of host

20	12
NID	HID

$2^{12} = 4096$ IP

172.1.0.128/18

No. of Host

NID | 18 | 14 | HID

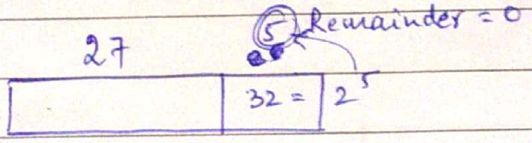
2^{14} = 16384 IP address ⇒ Hosts = 16382

Use for classless inter domain routing

1. All the IP Addresses in a block should be contigeous.
2. The block size of the IP Addresses should always be a power of 2
3. The first IP Address of the block should be completely divisible by the block size.

100.1.2.32
100.1.2.33
100.1.2.34
.
.
.
100.1.2.63

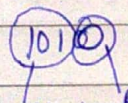
1. True
2. 32 ⇒ 2^5 True
3. 100.1.2.001 | 00000
   ← 27 bit → ← 5 bit →



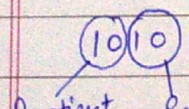
Logic

Binary	Decimal
1010	10

if we divide by 2^1 ⇒ quotient = 5, remainder = 0



if we divide by 2^4 = quotient = 2, remainder = 2



20.10.1.48
⋮
20.10.1.79

① Contiguous — T
② Block size = $32 = 2^5$ — T
③ 20.10.1.48 — F

NID	HID
24	6

20.10.1.00 | 110000 ← Remainder ≠ 0 fail

20.10.1.64
⋮
20.10.1.95

① Contiguous — T
② Block size = $32 = 2^5$ — T
③ 20.10.1.64 — T

NID	HID
27	5

20.10.1.01 | 00000 ← Remainder = 0 True

8. 20.10.1.61/27

NID	HID
27	5

20.10.1.00 | 11101

20.10.1.001 | 00000 → 32

20.10.1.001 | 11111 → 63

20.10.1.32
⋮
20.10.1.63

Q 100.10.11.64/22

NID	HID
22	10

100.10.000010 | 11.01000000

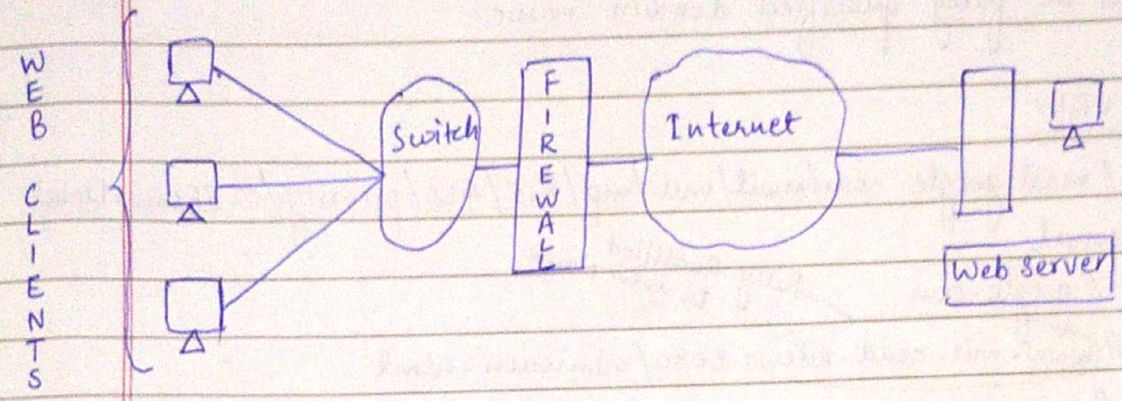
100.10.8.0

100.10.000010 | 11.11111111

100.10.11.255

100.10.8.0
⋮
100.10.11.255

Web Architecture



Hypertext ⇒

Hyperlink ⇒

Each and everything that satisfies the need of a user is resource.

URL → Uniform Resource Locater.

HTTP → Hyper Text Transfer Protocol

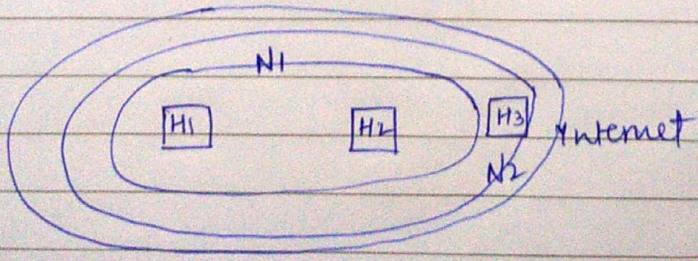
Syntax & Semantics of URL

protocol : // host [port] / [path [? params] [# anchor]]

Protocol → HTTP / FTP / mail to / HTTPS

Q. Find difference between different protocols?

host → FQDN (Fully Qualified Domain Name)



H1. N1. N2. net

H2. N1. N2. net

H3. N2. net

The domain name that fully describes the path of a host so that it can be accessed from anywhere in the world is called as fully qualified domain name.

Some URLs

→ http://mail.google.com/mail/mu/mp/875/#tl/priority/%5Esmartlabel_personal

→ http://google.com — Fully Qualified Domain Name

→ http://www.mit.acad.edu:8080/admission.html

→ http://202.100.170.170:8080/admission.html

→ http://ieee.research.ac.in/local.html#howtoaccess

http://mail.google.com/#inbox → mobile / desktop

mu/1 → Flag value

mu/0 → Flag value

http → protocol

mail.google.com → Domain Name

mail → host

Domain Name → FQDN

#inbox → Anchor

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CSS

↓

Cascading Style Sheet → platform on which inheriting of properties is done

↓ inheriting

↓ properties/attributes

```
<!DOCTYPE html>
<head>
<title>
  =
  =
</title>
</head>
<body background = 'html5.png'; style = background-repeat: no-repeat;
background attachment: fixed; background-position: center; text-allign:
justify '>
We are here
</body>
</html>
```

(CSS)

Features of CSS

1. Flexibility
2. Code Rendering
3. Accessibility
4. Ease of Management
5. ~~Global~~ Reduced Time Complexity
6. Dynamic Styling

(a) Inline

(b) Internal / Embedded

(c) External

(d) ~~Em~~ Imported

1. Faster Page Load
2. Multiple Device Compatibility

CSS Structure

```
<html>
<head>
<style type = "text/css">
        {
          —
          —
        }
</style> </head>
<body>
  —
  —
  —
</body>
</html>
```

* ; Semicolon is used for seperating two attributes

```
<!DOCTYPE html>
<head>
<style type = "text/css">
```

(or in html 5 we can write <style>)

div — selector

values of attributes

```
{
  color : blue ; font-size : 20 px ; font-family : corsiva ;
}
```

attributes

everything written in div selector will be implemented

```
</style> </head>
<body>
<div> Welcome </div>
</body>
</html>
```

classmate
Date
Page

div tag

The div tag defines a division/section in the html code. It is used to group a block of elements that needs to be formatted using CSS.

Types of Selector

① Tag selector/Type selector	Universal
② ID selector	Child
③ Class selector	Pseudo class
④ Grouping selector	Attribute
⑤ Customised selector	

①
```
<style>
h1 {
    color: blue;
}
</style>
<body>
<h1> Cross Over </h1>
```

②
```
<style>
#h1 {
    color: red;
}
</style>
<body>
<p id="h1"> why use this </p>
```

There can be any tag here ← p#h1

This ID selector will work only for p tag.

and then also we need to write

```
<p id="h1"> why </p>
```

ID Selector :-

SYNTAX without Prefix

```
# div
   {
      attributes ;
   }
```

SYNTAX with Prefix { syntactically its stronger and thus used in practical applications

```
div# div
   {
      attributes ;
   }
```

We can also make customised tag with any name like <h>, <hello>, etc -

class selector

```
. div
   {
      Attributes
   }
```

<body> → class = div> using class .

13/10/17

Homework

①

② Imagine a webpage and write steps from the scratch to final implementation including technical and non-technical aspects.

Applying CSS to HTML

tags x n ⟶ webpage x n ⟶ Website

① Inline
↓
just for a particular line of text.

ex:- `<p style = color:blue ;> Hello Bro ! </p>`

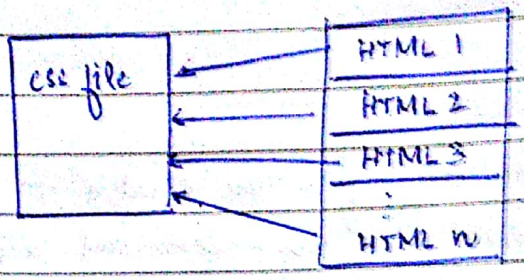
② Internal
↓
used for changing style of one complete webpage.

ex:
```
<head>
<style>
p{ color:blue ;
}
h1{ color: magenda;
}
</style>
</head>
```

③ External
↓
used for changing style of whole website (or n-webpages).

Homework

Q. How do we identify different versions of HTML ?



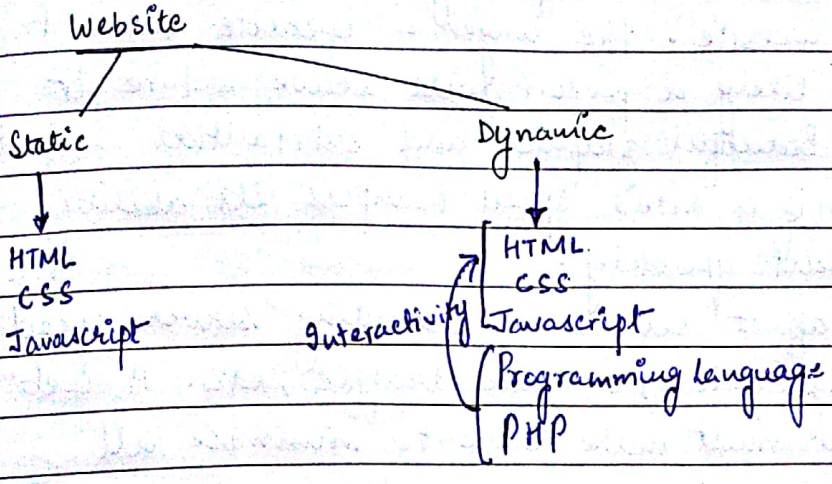
Features of a Well-built Web Design

1. SEO (Search Engine Optimisation)
2. Platform Independent / Device Portable
3. Quality Web Content
4. User-Friendly
5. Web page Speed
6. Style Reusability

Criteria for evaluating a Web Page / Web Framework

1. Business Point of view
   - Audience
   - Licencing
   - Other business aspect like SEO
2. Technical
   - Data
   - Testing
   - Documentation
   - Extension & Plugin
3. Operation
   - Servability
   - Speed & Security

(4) Team point of view
- Community
- Longevity



In Dynamic websites only the Dynamic content is reloaded but Static content is loaded only once.

17/11/17

Java Script

① Scripting language — Scripts → Pre-compiled
Programming language — Program
Object oriented — class based
Prototype based

Javascript is a programming language that is used to make webpages interactive. Its an interpreted language.
Javascript doesn't require special servers for its execution like PHP

Web browser ← Text editor

```
<!DOCTYPE HTML>
<html>
<head>
<title> Basics of JS </title>
<script src = "main.js" > </script>
</head>
<body>
<script> . . . . </script>
</body>
</html>
```

Use it either way

```
<body>
<div class = "container" >
<script>  var num1 = 10;
          var num2 = 70;
          alert ( num1 + num2 );
</script> </div>
</body>
```

it is optional

by using var that variable becomes local to that function without var it remains global.

if we write var num1 = '10';
var num2 = '502';
alert(num1 + num2); o/p = 10502
or
console.log(num1+num2);
↓
answer will be in the console

Array

<Script>
0 1 2 3
var arr = [1, 2, 7, Eight]
alert(arr[4]) o/p undefined
alert(arr[3]) o/p Eight
alert(arr[]) o/p 1 2 7 Eight

arr.push(7,8); finally arr becomes 1,2,7,Eight,7,8
arr.pop( ); one element is popped out.

Loop
- for loop
- while loop
- forEach loop

```
for (var i=0; i<4; i++)
{
  console.log(arr[i]);
}
```

```
arr.forEach(function(number))
{
  console.log(number);
}
```

sort function just checks the first letter

like for arr = [1, 2, 33, 4]

sorting is 1, 2, 33, 4 but it should have been 1, 2, 4, 33.

or we can use

```
alert (arr.sort ( function (a,b)
        { return a-b; } );
```

a-b → ascending

b-a → descending.

```
arr = [4, 2, 33, 5, eight, green, blue ];
```

sorting

arr = [2, 4, 5, 33, Blue, ~~green~~ eight, green]

```
Var arr = [ [ ], [ ], [ ] ];
  arr[0].push (10, 20, 30);
  arr[1].push (40, 50, 60);
  arr[2].push (70, 80, 90);
```

```
var arr = [
        [10, 20, 30],
        [40, 50, 60],
        [70, 80, 90].
      ];
```

```
<body>
<div class = "header">
  <h1 id = "header"> Learning Event </h1>
  </div>
<div class = "container">
  <button onClick = "doClick()"> ~~checkbox~~ Click here </button>
~~</body>~~
<script>
function doClick()
{ alert (Date()); } </script> </body>
```

Learning Event

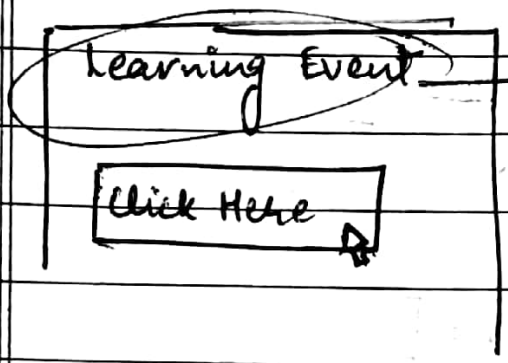
Click Here

Document of Method

DOM statement

```
function doClick()
{ var head = document.getElementById('heading');
  head.innerHTML = "You have rolled over";
}
```

Changes



→ You have rolled over.

Firewall

A firewall is a device that can be a hardware software or a combination of both that is designed ① to prevent unauthorized outside users from accessing a network or workstation.

② To prevent inside users from transmitting sensitive information or accessing unsecure resources

A firewall protects a local network from the outside global network.

The firewall works by inspecting each inbound or outbound packet and determining whether it should be blocked or allowed to pass through

Firewall Security Policies

Def A Firewall Security Policy is a set of rules that a firewall relies upon to determine which traffic should be allowed to pass through and which should be blocked.

① Block all accesses from outside and allow all accesses to the outside.

② Allow access from outside only for certain activities on certain networks or hosts application for users.

Types of Firewall

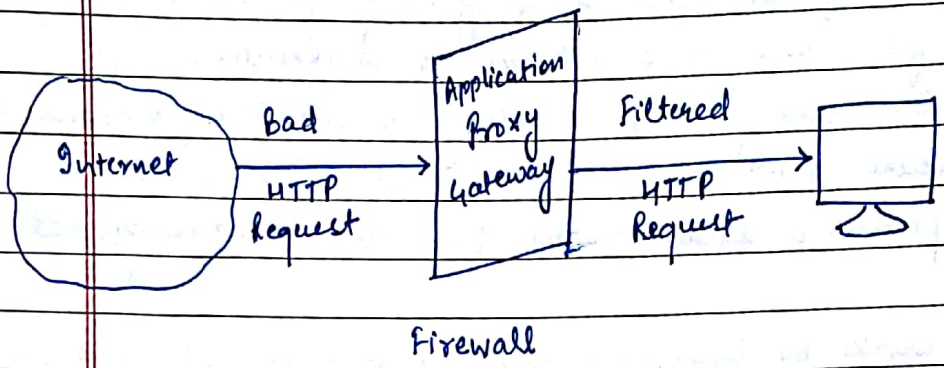
① Guard Firewall

A Guard Firewall is an advance type of firewall that examines the contents of packets while they are in transit across the network boundary

This guard firewall can modify the contents or block the packets all together it can be programmed to perform any sort of packet

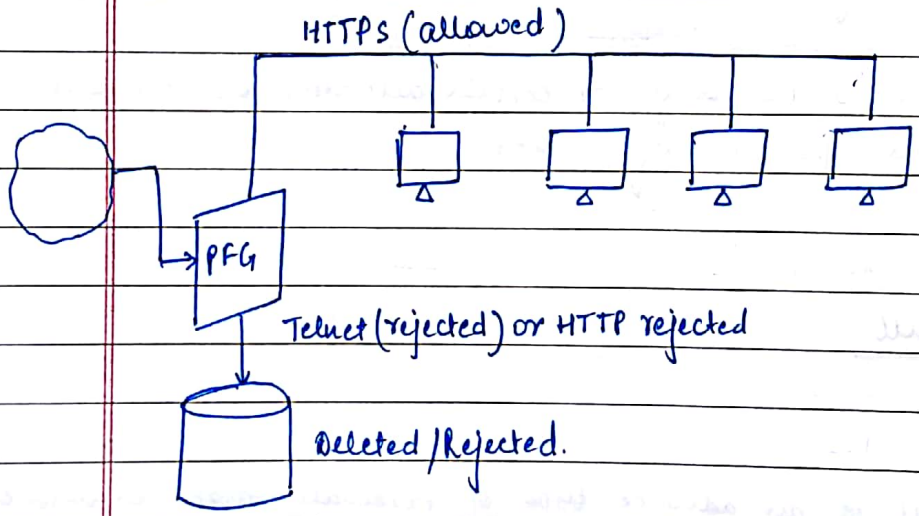
filtering, scanning or modification in the packet.

② Application Proxy Gateway / Bastion Host



An application proxy gateway is a type of firewall that runs pseudo applications which mimic the proper behaviour of real applications. It examines the content of the packet travelling between applications inside the network boundary and application users from outside that network boundary.

③ Packet Filtering Gateway (PFG)



A packet filtering gateway is a type of firewall that regul network boundary access by:-

① Examining the source and destination IP Address. for each

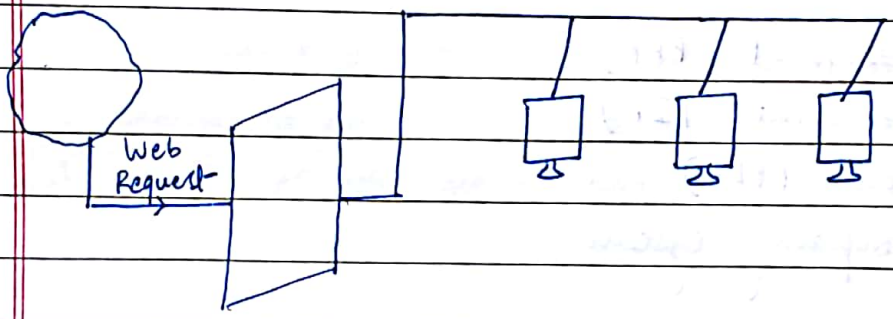
packet.

(2) Examining the type of transport protocol for each packet.

(4) Personal Firewall

A personal firewall is a type of firewall that is implemented purely as a software program they are installed on computing devices and inspect inbound or outbound network traffic to determine whether it should be blocked or not. For example Antivirus, windows Defender, etc.

(5) The Stateful Inspection Firewall



A stateful inspection firewall consider the state or context of the packets that it evaluates these firewalls remember the various network activities of the packets and of the hosts it is coming from. The goal of this firewall is to identify the hosts that represent a threat by accumulating evidences against them.

If the negative evidence against the host exceeds the threshold established by the firewall security policy that host can be blocked.

Network authentication, authorisation and accounting

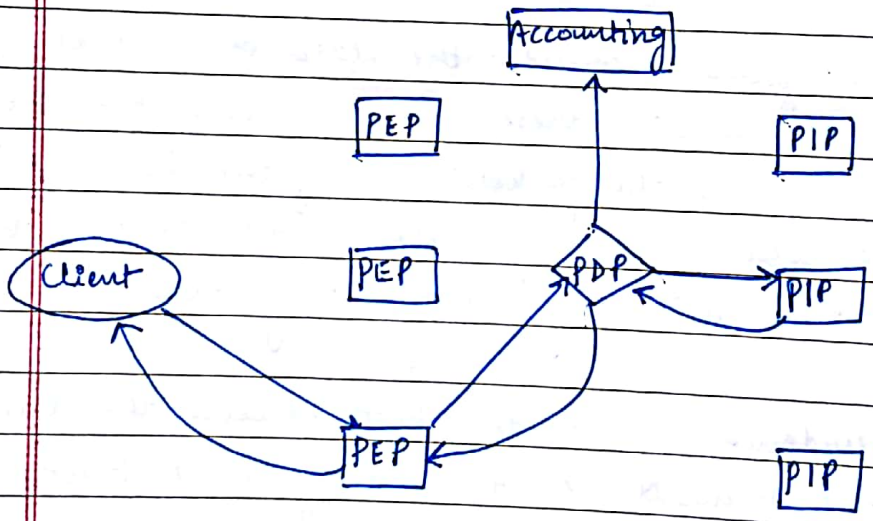
The AAA (Network authentication, authorization & accounting) is a technology that asks the user for his authentication it allows the user what they can do after authentication and then keep an account of the things done by the user. in a particular session.

Main purpose of implementing the AAA was :-

1. Provide mobility
2. Dynamic Security

Core Components of AAA

1. Clients
2. Policy Enforcement Point (PEP)
3. Policy Information Point (PIP)
4. Policy Decision Point (PDP)
5. Accounting and Reporting System



Control flow for AAA technology.

classmate
Date
Page

Process of e-mail

(1) After composing a message and sending the mail your email client connects to Domain SMTP server.
The local email client communicates with the SMTP server giving the source email address, the recepient email address, message body, attachments, etc

(2) The SMTP server processes the recepient email address if the domain is the same as the sender's the message is routed directly over to the domain's ~~POP (Post Office Protocol)~~ IMAP server.
If the domain is different the SMTP server will have to communicate with the other domain server.

(3) In order to find the recipient server the senden SMTP server communicates with the DNS. The DNS takes the recipient's email domain name and translate into IP address, after getting the IP address it can connect to the recipient's SMTP server.

(4) The recipient SMTP server scans the incoming message and if it recognises the domain and username it forwards the email message along the IMAP server.

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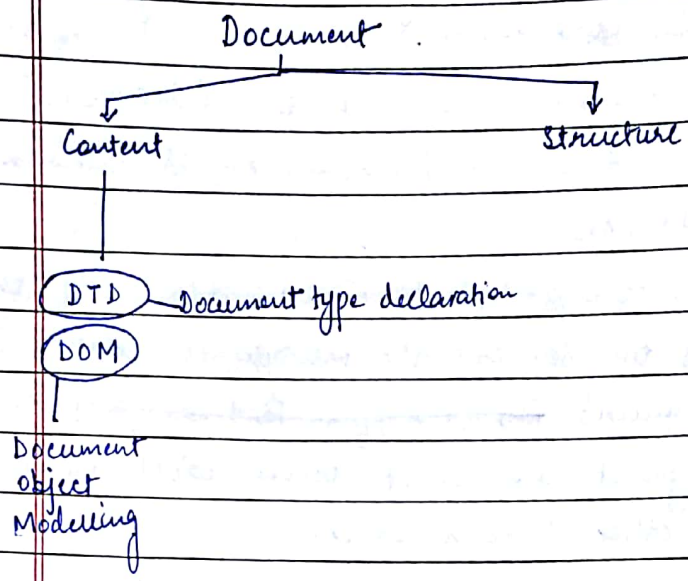
XML (eXtensible Markup Language)



XML is a ~~generalised~~ restricted form of standard generalised Markup language (SGML). The primary purpose of this standard is to provide a way to store self-describing data easily. Self describing data are those that describe both their content and the structure.

The HTML documents describe how data should appear on the browser, they carry no information about the data. In contrast XML documents describes the meaning of data. Today XML is a primary means to manipulate and transfer structured data over the web.

The content and structure of the XML documents are accessed by a software module called XML processor.

In XML we can define new tags and use them to satisfy the need of a user or application

Role of XML

1. XML seperates contents from presentation.
2. Promotes easy data sharing between application.

1. XML document seperate content from their presentation. The formatting task is imposed on an external style sheet.
2. XML promotes easy data sharing between applications. Different applications hold data in different structures. Thus mapping of data from one application to another can be difficult. Each data structure is mapped to an agreed to XML structure. This XML structure can then be used by other applications. So each application has to deal with only two structures

(I) Its own structure
(II) XML structure.

```
<?xml version="1.0" ?>
```
attributes ① Standalone ② Encoding

encoding="UTF-8" standalone="yes" />

```
<email>
    <to> xyz@gmail.com </to>
    <from> abc@gmail.com </from>
    <subject> Well being </subject>
    <body> Dates of next meeting </body>
</email>
```

An XML document consists of two parts.

(I) Prolog
(II) Body

The Prolog of the XML document may contain the following part

1. XML declaration
2. Processing instruction
3. Comments
4. Document type declaration (DTD)

<? xml-stylesheet href = "style.css" type = text/xsl ? >

The document type declaration is used to specify the logical structure of XML documents. The DTD contains the following

1. Name of the root element
2. reference to an external document type definition
3. Element declaration
4. Entity declaration.

For writing a comment

<! -- comment -- >

→ Do not use double -- in the comment.
→ Never place a comment inside an entity declaration.
→ A comment should not be placed within a tag.
→ A comment should not be placed before XML declaration

```
<? xml version = "1.0" >
<Detail>
 <person>
    <name> XYZ </name>
    <contact> 9212765498 </contact>
 </person>
 <person>
   <name> ABC </name>
    <contact> 9811002645 </contact>
 </person>
</Detail>
```

	A > B	A < B	A &quo B
o/p	A > B	A < B	

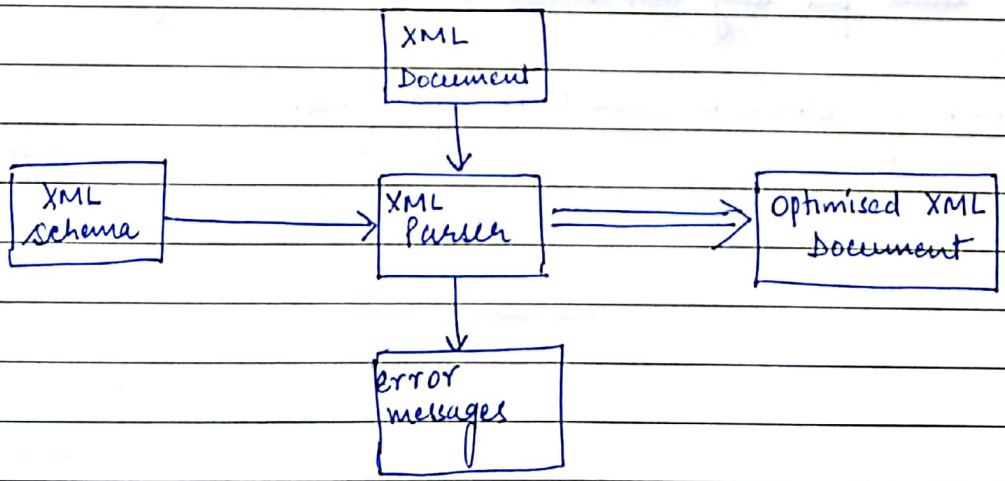
Conditions to determine if a given XML document is well formed

An XML document must have exactly one root element
All tags must be closed.
All the tags must be properly nested.
XML tags are case sensitive
Attributes of a tag must always be open.
Certain characters are reserved for processing.

XML Schema

Schema is an abstract representation of objects characteristics and its relationship to other objects. An XML schema represents the interrelation between the elements and attributes in an XML document. It contains the basic syntactical constraints (well formedness) imposed by XML. It is a description expressed in terms of constraints on the structure and content of XML It specifies a list of valid elements and attributes. An XML schema language is a formal language to express XML schemas. DTD is one such example of XML schema language

Validation of an XML Document



XML validation is a procedure to verify whether an XML document confirms to the rules specified by XML schema The task is accomplished by a special program called XML parser also called XML processor. Optimisation of XML document includes removal of void spaces, insertion of defaut elements attributes, etc.

DTD

The purpose of a DTD is to define the legal building blocks of an XML document. In order to link a DTD with an XML document we have three ways :-

1. The DTD can be embedded directly in an XML document, this is called internal linking.
2. External linking : from an XML document a reference to an external file containing the DTD can be made.
3. The combination of internal and external.

Limitations of DTD

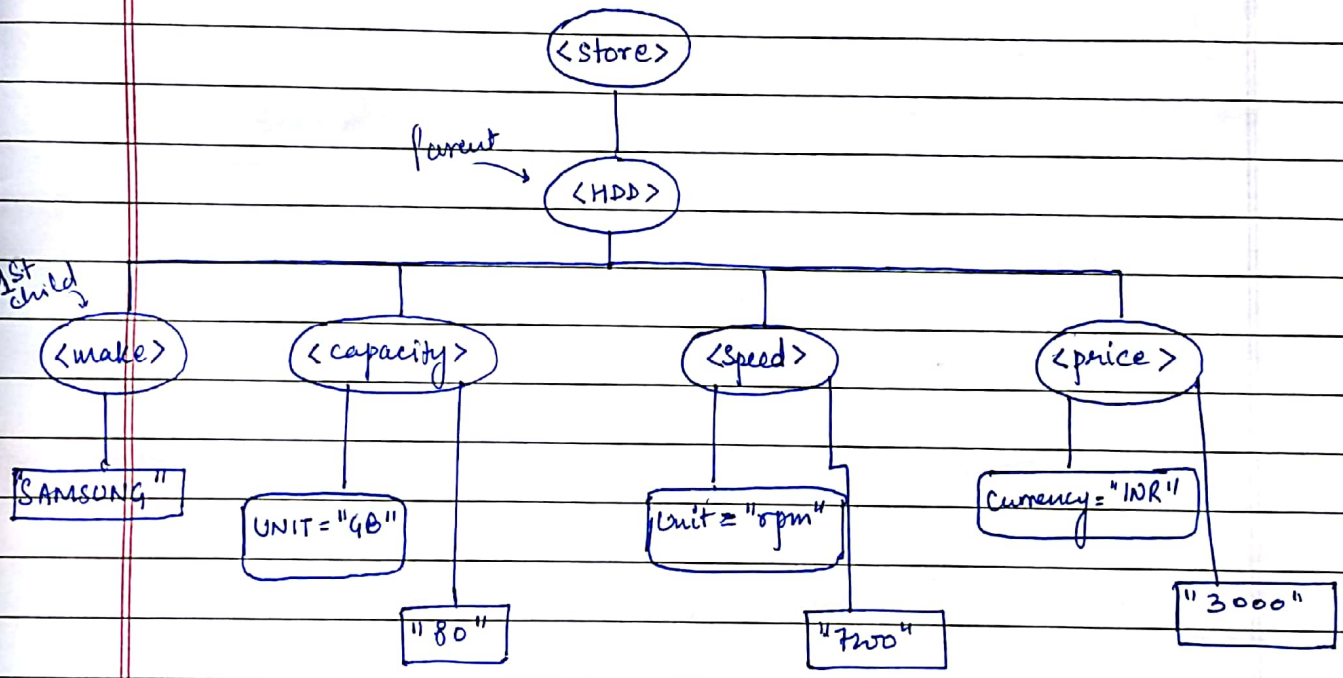
1. There is no built in datatypes in DTD.
2. The use of cardinality (no. of occurence of an element within its enclosing element)
3. We cannot put any restrictions on the content of the text.
4. Defaults for elements cannot be specified.

DOM (Document Object Modelling)

for eg:
make.xml

```
<? xml version = "1.0" ?>
<store>
    <HDD type = "SATA">
        <make> SAMSUNG </make>
        <capacity unit = "GB" > 80 </capacity>
        <speed unit = "rpm" > 7200 </speed unit>
        <price currency = "INR" > 3000 </price >
    </HDD>
</store>
```

DOM for make.xml



DOM is a language neutral and platform independent object model that is used to represent XML document.
DOM helps the program to access, add, delete or edit the content, structure and style of XML documents. It is divided into three major parts:

(1) DOM core

(2) DOM XML

(3) HTML DOM

The DOM models a document as a hierarchy of structure consisting of different kinds of nodes. Each of these nodes represent specific portion of the document. Some nodes may have children while others may not have anything below it in the hierarchy structure. These are called leaf nodes. The DOM is an object oriented model that describes the structure and the behaviour of the document.