

Books → Comp Net Top down (Kurose) ✓

(Fawzen) ←

FECHA \_\_\_\_\_

## Computer Networks

1 → Netfix

0 → postfix

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Host address - ~~the number of bits available for host~~ of 32 bit

→ IPv4 — 32 bit

→ IPv6 ~~not used for communication~~ (128 bits)

→ MAC (Ethernet Address) (NIC → LAN) Unique (48 bit)

IP - Add ~~the number of bits available for host~~ of 32 bit

8bit

~~large of 32 bits~~ on connection basis  
Decimal conversion

Intermediate

Computer — switch — dest? (with link)

Suppose created lab of 20 comp. how work

→ For this Subnet Mask is used to create network.

source bits N/w + broadcast bits  
255.255.255.00000000 Broadcast  
 $2^{8+8+8} = 2304$  Host

$2^8 \rightarrow$  Addresses can be assigned in one network

$2^8 - 2 \rightarrow 254$  laptops can be connected in one network

IP's are reserved

N/W IP

Broadcast add

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PREGUNTA \_\_\_\_\_

RESPUESTA \_\_\_\_\_

## How to assign addresses:

① Static Method

② Dynamic Method

① Static -

1) IP Ad

2) static

3) Gateway

4) DN switch



MAC Bydefault by N/W

I/S N/W

outside N/W for Domain

used to connect NO. of computer to send packet  
within N/W (LAN)

\* From LAN to LAN → Router

(TWO diff N/W)

Public

private

Public → Internet

private → Intranet

② Dynamic -

DHCP server

IP Address --- Dynamic

can assigned Static by own or by DHCP server

at Internet port port 67 at Eth0

comp

class C

192.168.0.2

on lease IP Address

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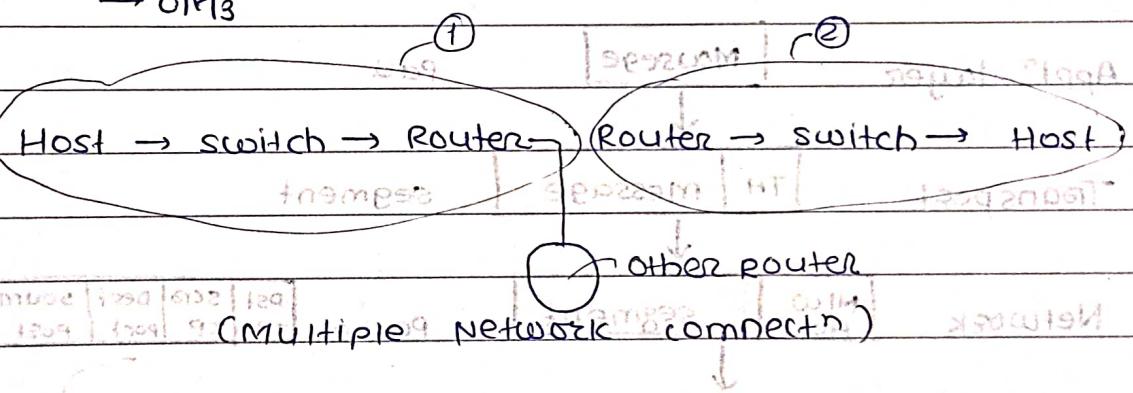
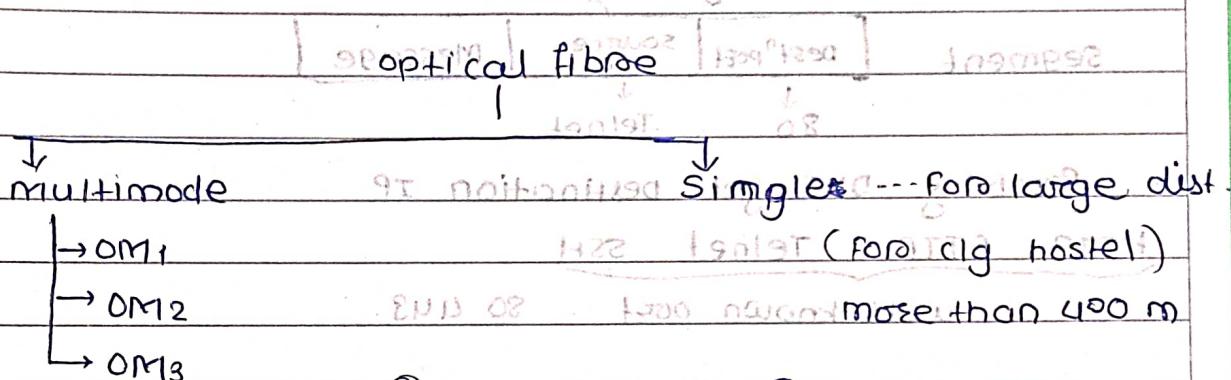
who assigns IP immediately?  
 → DHCP

Static IP Add used for server.

- (OEP's example):

Public IP  
 [210.212.183.43] → mapped

Now if this assigned by DHCP (dynamic) then IP address will change & not convenient, user not found web. Hence static.



- TCP/IP → 5 layers, where does it reside?
- ① At Host (Host can be PC, laptop i.e. has OS)  
 physical layer will have cable.

- ② switch → Datalink ~~subnetwork~~

It builds table (MAC Table, ARP Table) to forward frames

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① Can client and server be host?

↓  
source

↓  
Host

name of host file or host

TCP / IP model :

Google.com

Application layer

Message PDU

TH Message

Segment

dest port source port | Message

↓ 80

↓ Telnet

Resolving - DNS get destination IP

(HTTP, FTP, Telnet, SSH)

in port 80 well known port 80 443.

Appl' layer

Message

PDU

Transport

TH Message

segment

Network

New Host segment

Packet

DST IP SRC IP DEST PORT SOURCE PORT

DLL

DLL Head

Packet

frame

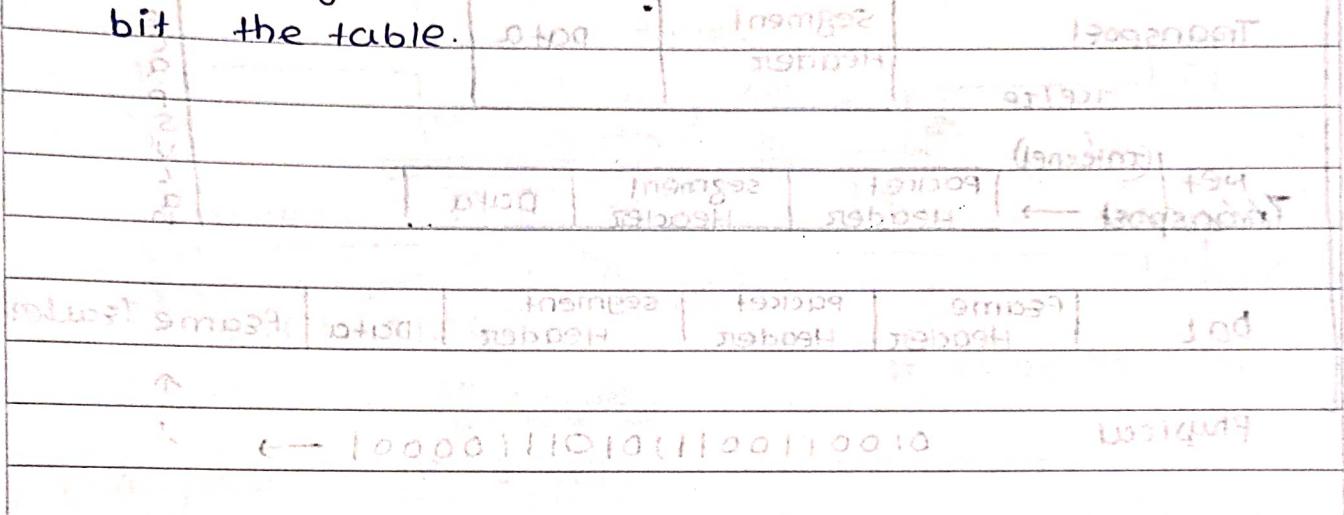
DLL Head

mac  
src

mac  
dest

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- To get destination mac computer sent ARP request to gateway (Router)
- Router also has its own ARP table and routing table.
- Role of the switch is to learn the MAC & bit the table.



Host sends ARP request to gateway b. 192.168.1.1

The gateway uses static IP address 192.168.1.1 (IP+MAC) to forward the request to the destination host.

Switch learns MAC address of host

Switch learns MAC address of gateway

Host sends data packet to gateway b. 192.168.1.1

Switch learns MAC address of host

Switch learns MAC address of gateway

192.168.1.100

192.168.1.1

ARP reply from gateway

72.27.52.72 - bba.5990619 •

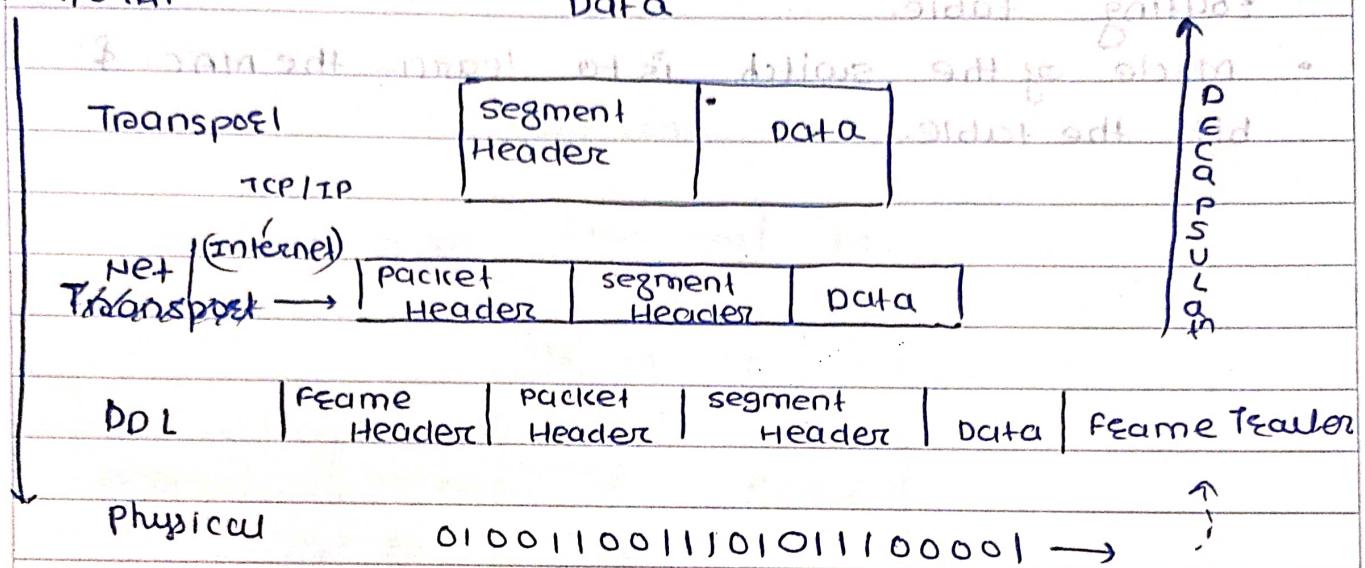
FECHA 22 July

## LESSON 99 Encapsulation &amp; De-encapsulation

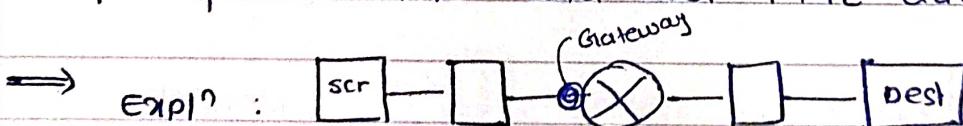
(actual) process of

bin add 99A now off and auto routing.

## Encapsulation



\* which port is assigned at source?

→ Temporary (mostly) dest<sup>n</sup> → well known\*\*\* Suppose src IP —— Dest<sup>n</sup> IP —— \*\*\*Find | map src MAC and Dest<sup>n</sup> MAC add

192.168.1.101

192.168.1.102

can be obtained by ARP.

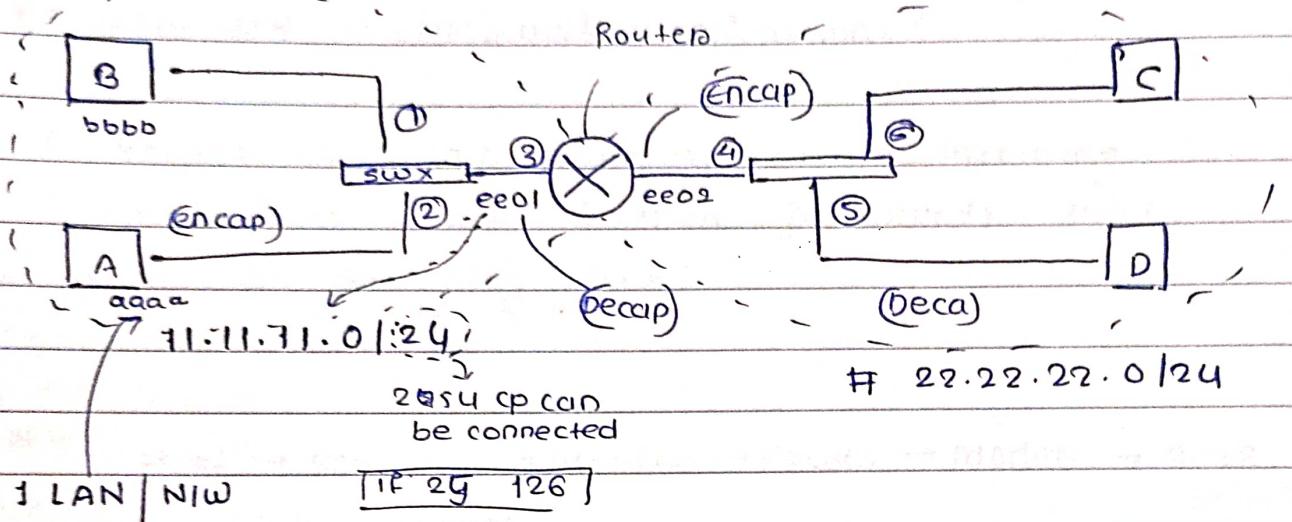
- Broadcast add - 255.255.255.255

Reciva

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- Address resolution protocol: ARP  $\dashv \dashv$  Data link layer
- It maps IP address to MAC address

FF:FF:FF:FF:FF:FF used for broadcast



- A, B, C, D has ARP table
- switch  $\rightarrow$  Mac table  $\rightarrow$  (map switchport to MAC add)
- Router  $\rightarrow$  Router, ARP table  $\rightarrow$  (map IP NW to Interface)

Router Table		$\rightarrow$ Doesn't know best?
eth1	11.11.11.0/24	only knows NW ID
eth2	22.22.22.0/24	

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① Host A has data for D load. Churna workload.

switch stat at switch at port IT.

Host A: Last broad cast time: 79:77:77:77:77:77

Host A: Last broadcast time: 79:77:77:77:77:77

23/07/24

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## Internet: the world's largest computer network

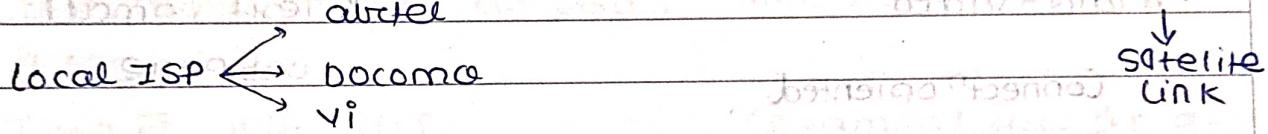
or broadband, then we can say that it has a lot of bandwidth.

- Network infrastructure that provides services to distributed applications.

Q \*\* what are distributed applications?

\* Router takes info arriving on its incoming communication link & then forwards that info to outgoing link.

\*\* Host → server → Mobile → Router → Modem → Base



• Acc. Technical & development level: Net is made possible through creation, testing & implementation of standards.

• Standards are developed by Internet engineers (IETF)

\*\* Req. For comment. (RFC)

Q. connect oriented? connect less?

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Sexto año

Oriented → guarantees that data transmitted from sender to receiver will delivered to receiver in order & entirely.

Protocol x guarantee eventual delivery

TCP - connection oriented protocol  
UDP - connectionless protocol.

connection oriented

\* Q where TCP used & which app & why  
why TCP used in connect' oriented? \*\*

connectionless - mechanism for setting up of data flow to connect' point.

- Audio-video

text, email

connection oriented.

web page

① Handshaking - 3 way

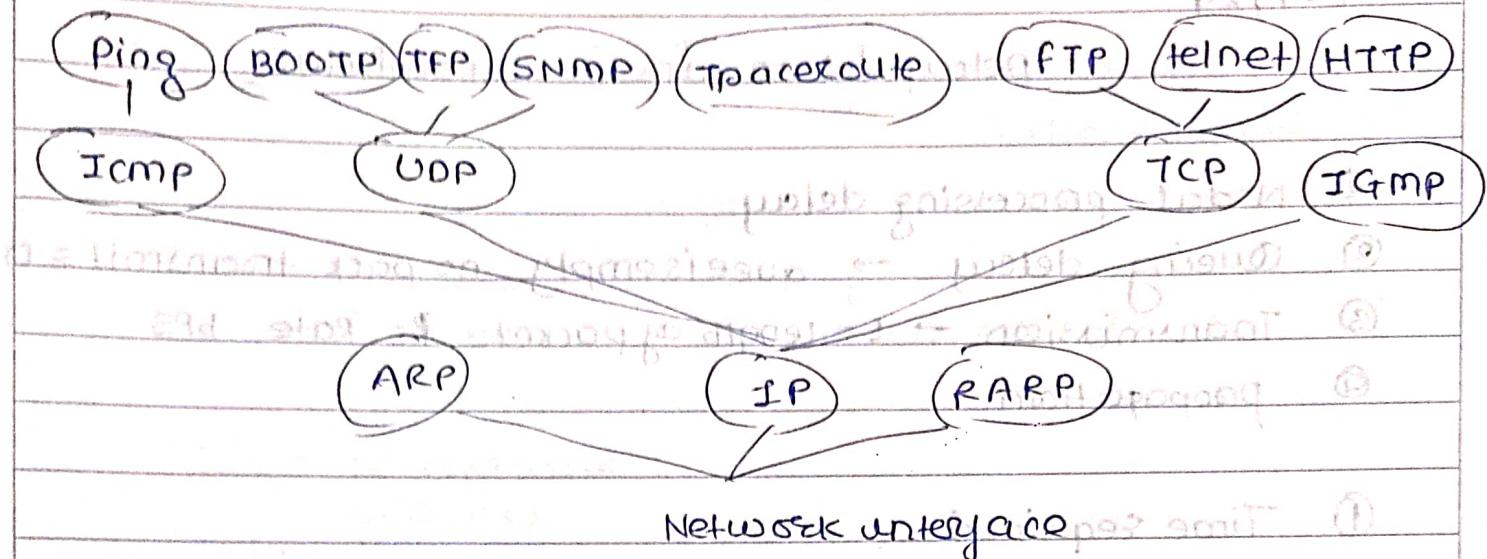
what is protocol?

\* Q: Host is client or server?  
→ Both.

protocol defines format, order of messages

& received among N/W entities.

Q what are ports used for TCP IP



Transmission protocol:- convergat? eg

\* Q How many images are sent, time required when it sends?

Time  $\equiv$  RTP RDT

--- Examples will be discussed

Network Infrastructure

### Switching

circuit



packet (internet)

① Dedicated path established

① packets are send

② Transmit

② store & forward

③ End phase

Add: one to one access

dis: path will be engaged even if not in use

③ Delays (upcoming)

- queueing delay
- processing delay
- transmission delay
- propagation delay

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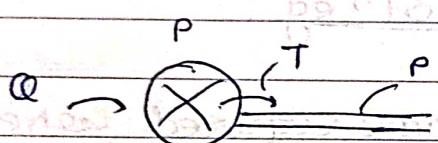
\* calculate all delays  $D_T$  and loss  $L_T$  over a link  $T$

24/07/24

delay & loss in packet switching

- ① Nodal processing delay
- ② Queuing delay  $\rightarrow$  queue is empty  $\Rightarrow$  no pack transmitted = 0
- ③ Transmission  $\rightarrow$   $L$  = length of packet  $R$  = Rate bPS
- ④ propagation

- ① Time required



\*\*③ Delays occur?

Application layers - OSI TCP/IP

- ① DNS  $\rightarrow$  Resolve Internet name to IP add
- ② Telnet  $\rightarrow$  Terminal emulat<sup>or</sup>  
SSH  $\rightarrow$  secure
- ③ Email Transfer mail ie attachments  
- HTTP, SMTP, POP3 / IMAP servers used
- ④ DHCP  $\rightarrow$  Assign IP add to other parameters to host  
Gateway  $\leftarrow$

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## ⑤ Web servers:

- HTTP → Transfer client

FTP - Interactive file transfer bet' system

(client server)

HTTP (137) (138) (139) (80)

peers to peer

client server

D's → Decentralise services

- Both client server

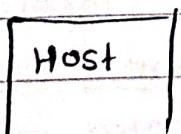
- commonly used protocols

\* protocol no. used by HTP or any APP.

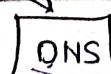
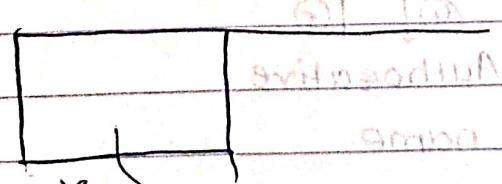
## \* DNS :- Domain name system. (4-6 marks)

- Translate host name → IP add.

e.g. Google.com → where IP add (in host)



first will go here cache



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• Root server iana.com

ENVAZADO

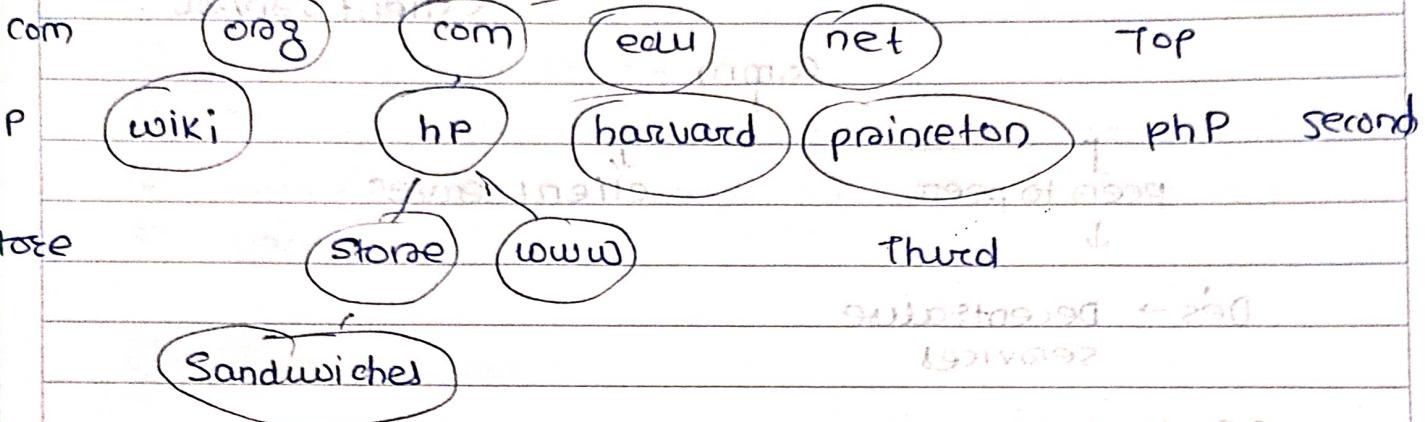
Instit

REFRESCA -&gt; SITIO

https://store.hp.com/p

(•) Root DNS

Root level



\*\*① which one is root, com etc

nslookup

nslookup &lt;ip&gt; To see command prompt.

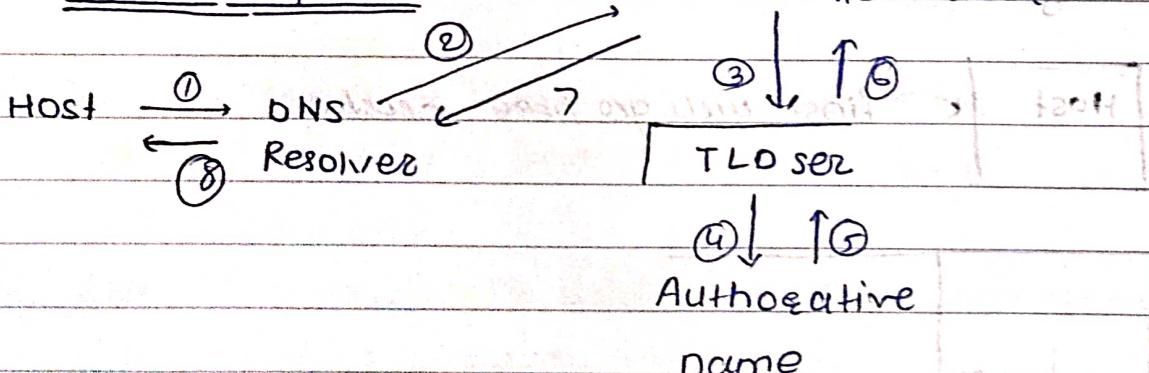
facebook.com

To

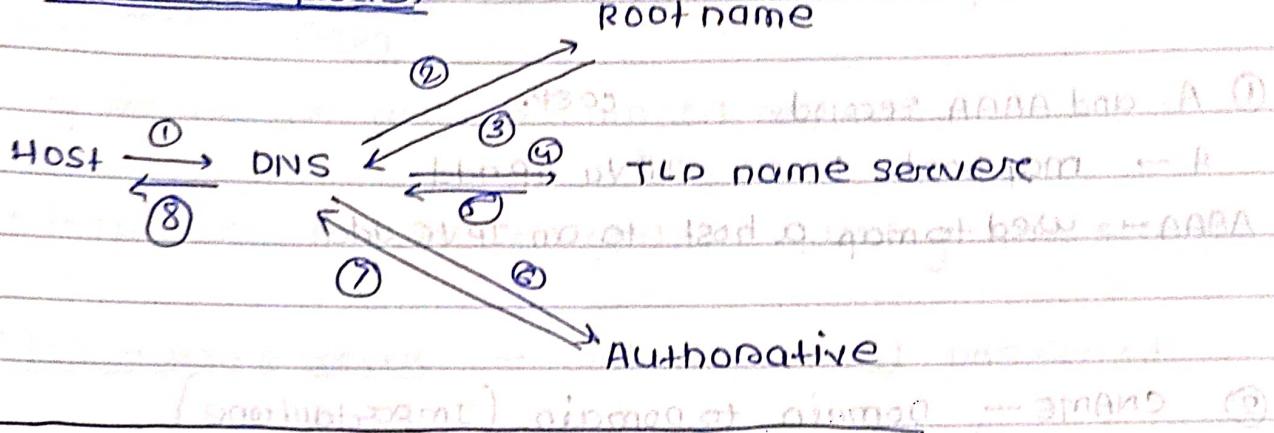
bbdo95.com -&gt; send food 2 queries:

① Recursive query

bbdo95 Root name server



## ② Iterative queries



## \* \* ③ Two types of queries

Here, Authoritative returns IP address (both cases)  
Actual web page is resolved by this.

why IP add required?

→ To create packet → DNS required.

## ③ Non-recursive : If it is in cache, directly give

IP address of site even though it isn't cached

\* ① what port is used by DNS

\* ② what servers hierarchical

\* ③ queries used by host

\* ④ How many Root servers

\* ⑤ why DNS is distributed? → if one stops other still works

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## DNS zones / Resolves (4 records)

## ① A and AAAA Record: coep.

A → maps host to an IPv4 IP add.

AAAA → used to map a host to an IPv6 add.

## ② CNAME → Domain to domain (Important one)

Never points to IP but domain www.coep.com

## ③ MX records → records email to mail server.

## ④ TXT

## ⑤ NS

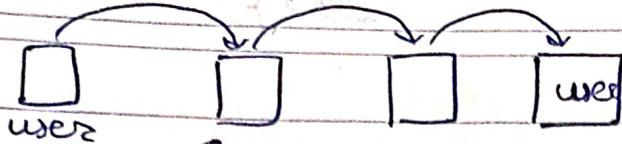
## ⑥ SOA

what is the use of all these records?

whenever there is change from one ISP to another it will have to add new IPs

MX record.

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If server goes down → contains next one in audio.

- MTA → Mail Transfer agent. → querying MX records

④ NS → Name server → contains actual DNS record.

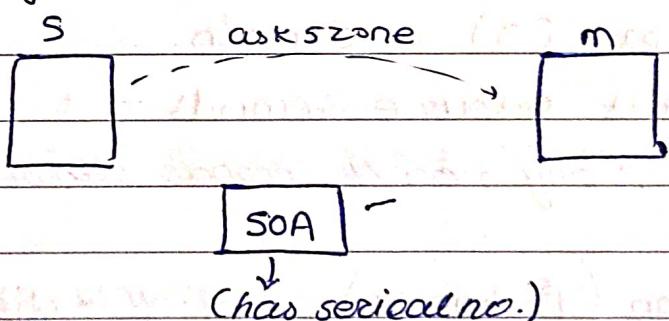
⑤ SOA : Start of authority to tell host

Domainname TTL Class ResourceType Authorised name  
server  
Transfers from master to slave.

Class type:

IN - Internet

\* Zone S is always created on master server.



hostmaster.example.com.

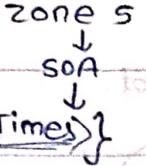
----- serial no.

12h : Refresh .... slave will ask updated of zone S (so)

1sm : Retry .... if not getting reply, trying to M

3w : Expiry .... To stop trying if server of master is

2h : Neg. cache. ....



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Negative cache TTL :

If not able to resolve ; Errors (not able to resolve)  
 :: slave will wait for 2 hours after. Long value

DNS cache policies -> longer negative times = better

Q. SOA questions:

Assignment 1 - for given IP add and subnet mask,  
 find N/w ID and Broadcast address.

Usable host addresses

## DNS :

- ① Explain concept of DNS
- ② Types of DNS servers (use) → Explain basic 2 stages
- ③ DNS queries (3) → explain
- ④ DNS records / resource records → A, AAA, NS, SOA, TXT etc.  
 (Any 3 or 4 records can be asked in test)

## Introduction (1<sup>st</sup> chapter)

• client server point to point

diff

- ① Internet
- ② ISP
- ③ IP add
- ④ what are end devices used in N/S → • TCP/IP layer vs OSI
- ⑤ Hosts end, Host/Cloud/Server → • protocols
- ⑥ how MAC is obtained

⑦ Which device at which layer

⑧ What is RFC who produce it (IPM) only for

HTTP - Hypertext Transfer protocol.

- communication between webserver & clients.
- provide structure to seq. web from client.
- defined in RFC. 1945

192.168.1.0 }

⑩ IP add have to be brought. How

191.19.1.10

much price?

→ These are private Hence free

⑪ How PC contacts DNS?

→ ① DHCP provider → ② IP ③ Gateway ④ DNS

⑫ Where is the entry of DNS server.

→ In RAM or ROM (BIOS) of system board

⑬ Which protocol & port is used under HTTP

→ TCP and 80 port is used under HTTP

→ 80 port is used under HTTP

• It is stateless

• Methods → 1) Get 2) Post 3) Put 4) Delete

• Status codes

1) Client uses HTTP servers

2) Server responds by status code

method / path / version of protocol

GET / HTTP/1.1 - seq

version → status cod

HTTP / 1.1 200 OK

stat message

200 OK

Response

Header

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Req line (method path version) URL HTTP ver

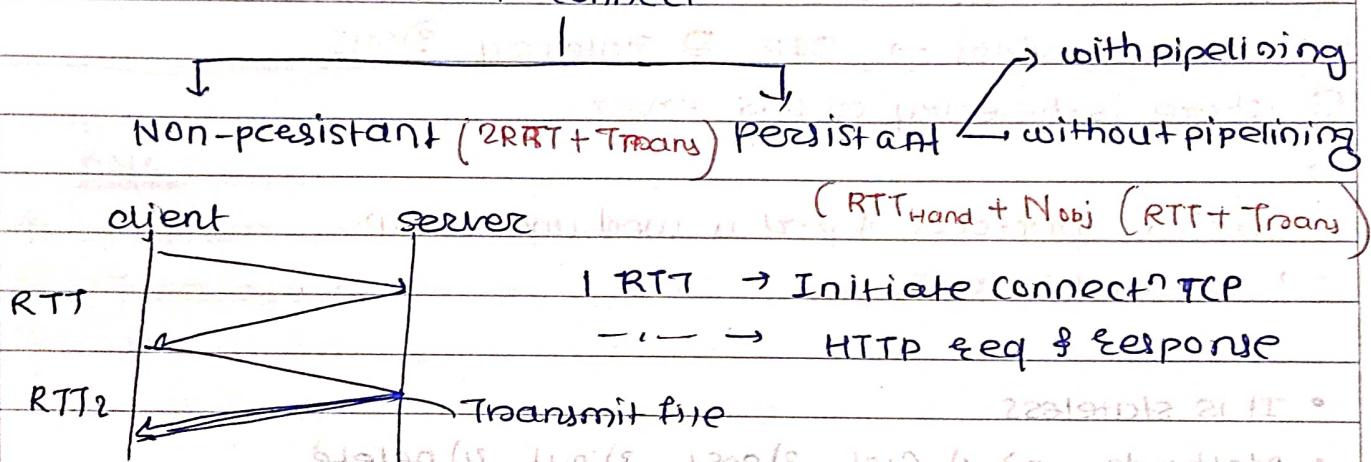
HTTP version response status code

- Q Match last status code with message just obvious  
 Q Ans query

{ Socket = IP + port }

HTTP → have no info about clients This is stateless.

HTTP connect



RTT - Round Trip Time

- \* Q How many RTT required for  $n$  obj? (1 RTT per object)  
 Q HTML file having 10 JPEG images, client will req for a page  
 RTT required?  $\rightarrow 12 \text{ RTT}$  (12 RTT for non-persistent) bottom  
 P.S.  $\rightarrow 12$  - one for connect (2) open close

one req one resp

operation type

background

100 302 111 511

no body

without → issue

ATM card from Germany → bank transfer (ITAM → ATM)

Example: screenshot.

→ Non → 46 persistent → 24

31 July

Electronic mail

SMTP - simple mail transfer protocol

MIME

POP3

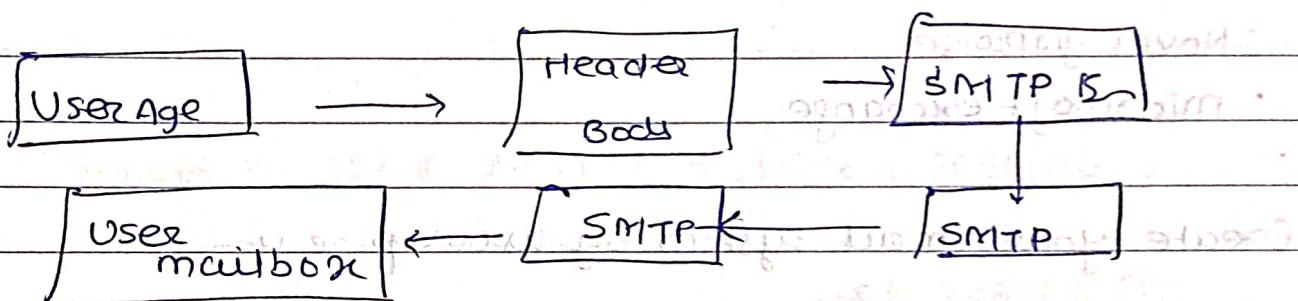
send → RFC 822

(push) # naming

against broadcasting

9 AM: Janotosaq Email services via Israfil → GAMT

SMTP → 465, 25 port → Push protocol



- Commands used :-

HELO, EHLO, MAIL FROM, RCPT TO etc.

- Response from server -

MUA → Mail User Agent. (client)

Q. what is MUA, what is its sole?

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push message

to server

MTA → MAIL Transfer agent. → SMTP  
 MDA → MAIL Delivery Agent. (accepts mail from MTA)

• POP3 protocol:

- (It pulls the message)
  - ① Download & delete
  - ② Download & keep

• IMAP — Internet Message Access protocol IMAP

other alternatives

- IBM Lotus Notes
- Novell Groupwise
- Microsoft Exchange

Create your email system by using pipe line.

mail sending procedure.

- ↳ what is pop3 or rfc822, maaa, rfc821, rfc820
- ↳ Image will be given when SMTP, IMAP, POP3 is used

Final - design some links - exam

↳ start in windows and it takes

12:00 AM

31 July 2024

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## PORTS

Ports - Facility offered by transmission layer of TCP/IP model

Port  $\rightarrow$  16-bit numbers  $2^{16} = 65536$

① Reserved  $\rightarrow$  0 to 1023

- standard ports for well-known services

② Registered ports - 1024 to 49151  
(ephemeral)

③ Dynamic / private - 49152 to 65535

\* ④ Range of all ports

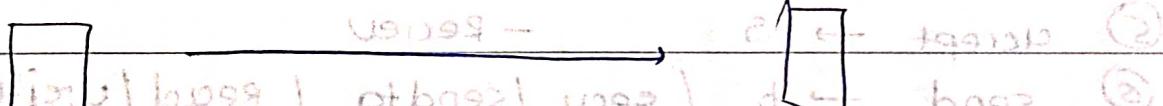
These are allocated by OS - e.g. web servers

Socket = 32bit IP add + 16bit port no.

Transfer request - 200 → (2 bid)

client IP (192.168.1.10) → web server IP (10.0.0.10)

192.168.1.10 → 10.0.0.10



→ 8901

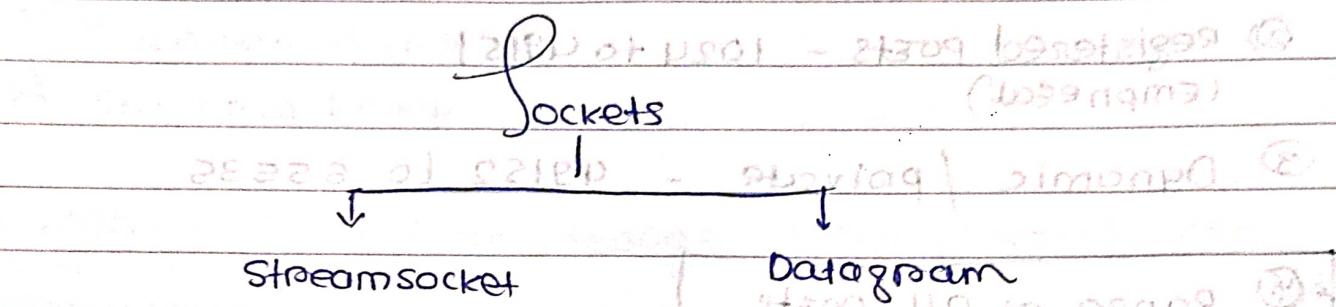
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18/09/1997

Socket use → To communicate b/w client - server

System. 8080 = 80 port 201admin file at 1000

Diff b/w port & socket. port is for hardware -

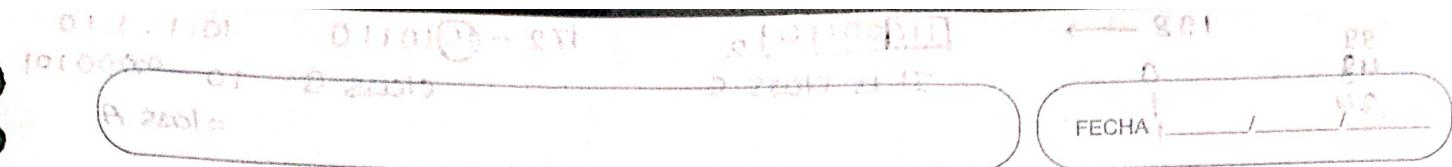


- Unix system call API
- functions:

- ① `socket()` → client / server → Endpoint for communication
- ② `bind()` →  $S \in S$  - Assign unique teleno
- ③ `listen()` →  $S \in S$  - Wait for caller
- ④ `connect()` →  $C \in C$  - Dial 01.1.231.821
- ⑤ `accept()` →  $S$  - Recieve
- ⑥ `send()` →  $b$  / `recv()` / `sendto()` / `read()` / `write()` }  $b$  - Data
- ⑦ `close()` →

- To send.

Socket, connect, write



- To receive : socket programming
- socket , bind , listen , accept.

- CREATE SOCKET -> how you would do it in C++  
 how to do it

Syntax : int socket (int family , int type , int protocol)

Q what is the meaning of socket , bind , receive etc.

- TCP socket programming -

Why we run socket first?

→ socket creation

0.0.0.8080

0.0.0.80

getaddrinfo

0.0.0.80

to leverage DNS

Input : a DNS - hostname

Output : a list of potential IPs to connect to / listen on

0.0.0.8080

Standard

bba

0.0.0.8080

0.0.0.8080

0.0.0.8080

0.0.0.8080

0.0.0.8080

0.0.0.8080

0.0.0.8080

0.0.0.8080

0.0.0.8080

0.0.0.8080

0.0.0.8080

0.0.0.8080

0.0.0.8080

0.0.0.8080

99  
49  
24

198 →

11000110<sub>2</sub>

0

It is class C

172 - 1010110

class B

10.1.3.10

10 - 10000101

class A

### Transport layers:

Q. Octet will be given, find out the class

→ convert in binary and acc MSB's decide.

127 is used

Subnet:

255.255.255.0 — class C subnet

Default /24

$$\begin{array}{c} 8 \quad 8 \quad 8 \\ \text{N} \quad \text{N} \quad \text{N} \\ \underbrace{\quad\quad\quad}_{24 \text{ N/W}} \end{array} \quad 2^8 = 256 \quad \therefore 2^3 - 2 = 6$$

192.168.6.6

192.168.0.1

class C  
Sub

192.168.0.10

192.168.0.10

+ 255.255.255.0 (bits)

192.168.0.0 — Net id

starting add

192.168.0.10

192.168.0.255 — Broadcast Add

192.168.0.1

192.168.0.254

All are 256 add

divide in 2 parts:

Subnet 1 - 128 IP add --- 192.0.281.881/25

Subnet 2 - 128 IP addresses --- 192.0.281.289/25 QM

Find the first subnet address --- 192.0.281.881

255.255.255.00000000

192.0.281.881/25 --- 192.0.281.0/25

This bit changed is subnet 192.0.281.881/25

$\therefore 2^1 = 2$  Subnets are available 192.0.281.881

192.0.281.881 --- 192.0.281.289

$\therefore$  Subnet mask for above:

255.255.255.128  $\therefore /25$

Q. What is subnet mask eg 125.8.124.255/24

$\rightarrow$  For this IP /11, O/P = 2 Subnet bandua : 192.0.0.0

Suppose subnet value = 18 bandua : 192.0.223.223/25

192.168.0.20 belongs to subnet class A bandua : 192.0.0.0

AND 255.255.255.128

192.168.0.0.0  $\rightarrow$  Net id

NOT

0.0.0.127

OR 192.168.0.128  $\rightarrow$  Given IP

192.168.0.127  $\rightarrow$  Broadcast add

$\therefore$  Subnet 1 - 192.168.0.0

192.168.0.127  $\rightarrow$  192.168.0.223/25 QM

192.0.281.881  $\rightarrow$  192.0.281.289/25 QM

223.0.281.881  $\rightarrow$  223.0.281.881/25 QM

223.0.281.881

bandua --- it's 1st subnet address 192.0.281.881

# Subnet mask range /24 to /30

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If 192.168.0.140 — Given IP ~~8.1~~ — 1st subnet

AND 255.255.255.128 — Subnet mask ~~8.1~~ — 8 band 128

192.168.0.128 — Net id belongs from 2nd subnet

0.0.0.127

192.168.0.128

OR 192.168.0.140 ~~and 2nd subnet~~

192.168.0.255 ~~id belongs to 1st subnet~~

Hence it belongs from subnet 2.

Subnet mask /28 ~~as 1 goes to 8, 8, 18, 4, 0, 11110000, 11110000~~

Step 1: Subnet mask?

255.255.255.240

$2^4 = 16$  subnets can be

Host per subnet ~~9 bits found at 8.0.821.001~~

$\rightarrow 16 - 2 = 14$

Usable Host add



(e) Given IP : 192.168.0.250 ~~0.0.821.001 is not found~~

AND - 255.255.255.240 ~~192.0.250 OR 192.1.0.250~~ 0.0.0.

192.168.0.250

192.168.0.240

192.168.0.250

192.168.0.255

192.168.0.255

Given IP belongs to 16<sup>th</sup> ~~not~~ subnet

FECHA \_\_\_\_\_

172.16.0.10 /25  $\rightarrow$  /25  $\div 2^7 = 128$

192.168.0.10 /25  $\rightarrow$   $2^9 = 128$

10.0.0.10 /25  $\rightarrow$   $2^5 = 32$

Q) create N/w subnet mask for 6 cps.

900 lesson about broadcast IA

Q. 25 --- subnet mask

Q. 30 IP add gave =  $\rightarrow 127$

7/ Aug

Transport layers  $\rightarrow$  size from port to port  $\rightarrow 224M$

services provided by transport layer  $\rightarrow 4TM$

Trans - process to spread over all hosts in local net size

N/w  $\rightarrow$  Host to Host  $\rightarrow$   $\rightarrow$  port number under Q

DLL  $\rightarrow$  Node to Node comm  $\rightarrow$  each node has its own address

① Transport layer  $\rightarrow$  performs multiplexing and segmentation

- performs : ① Multiplexing ② Segmentation

90 & 900 Q&A

Q) process level Address  $\rightarrow$  points to  $\rightarrow$  C

- M

Process level address

Q) where does multiplexing occur?  $\rightarrow$  Transp.

$\rightarrow$  Both

segmentation  $\rightarrow$  Both

$\rightarrow$  Both

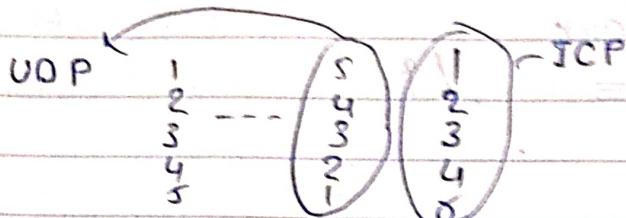
host level address  $\rightarrow$  90

FECHA \_\_\_\_\_

Q1) Data multiplexed  $\rightarrow$  segment.

Can segments carry diff. applicat?  $\Rightarrow$   
 → No, one seg carries one app.

At Transport layer used UDP



• Multiplexing      • Demultiplexing

• MSS - maximum segment size

MW    MTU - max. transfer unit. {frag } layers  
 Seg - layer

size of packet is dependent on channel size.

Q why fragments seq?

→ seq occurs at Host. Frag occurs everywhere.

Q what are the apps supported by UDP?

Diff b/w UDP & TCP.

- Reordering is not done by UDP.

when packets get duplicate?

when pack get lost, then will send again.

TCP is connection oriented.

FECHA \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

3 way handshaking for connect<sup>n</sup> creat<sup>n</sup> / establ

Books By: Kevin Knight & Elaine Rich  
Stuart Russell & Peter Norvig

FECHA 22 / 01

DBMS → Injobase      AI → knowledgebase

Human-computer interaction

Comp. vision: AI + photos (Images) software

Robotics : software + Hardware

Computer communication (com), taken as a communication facility

Human-computer interface

object recognition

Programmatic interface → programmatic interface

Environ. user

programmatic

object detection

area search

most orthogonal concept taken as a communication

navigation at 8 and above at home robot level

need to define what is available

the objects are available

area search

FECHA 2 23 Aug

- Database design:
  - logical design → designing schema
  - physical design → - physical layout of database

Design Approaches:

Two ways:

- Entity Relationship model (ER)
- Normalisation Theory

• Database engine

- Storage manager
- Query Processing
- Transaction manager

① Storage man.

• Storage manager - provides interface between the low level data stored in database & the application programs & queries submitted to system.

Tasks:

- (a) Interact with OS file man
- (b) Eff storing, retrieval

Issue:

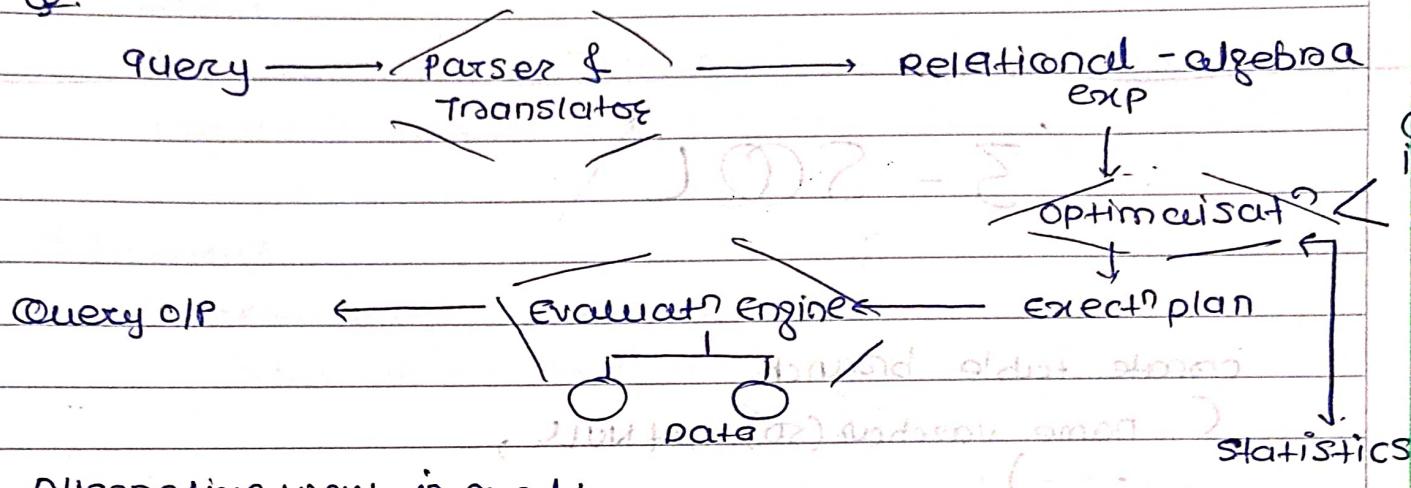
storage

file, Indexing

## ② Query Processing

- 1) Parsing & Translation
- 2) Optimisation
- 3) Evaluation

③



Alternative way in eval:

- ① Equivalent EXP.
- ② diff algo for each

- Need to estimate the cost
- Depends on statistical info
- Needs to estimate statistics

## ③ Transaction Management

- collect? operat? that performs single logical

funct in database applicat

• ex. insert, update, delete, etc. after that

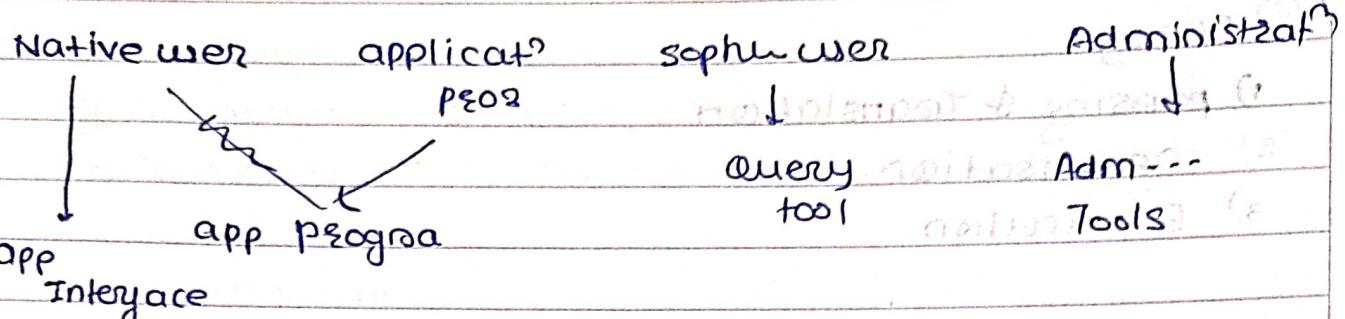
transactional, and a transactional, transactional, transactional

ex. in books in add files to

ex. (workshop) work set final states to

workset 100

FECHA \_\_\_\_\_ / \_\_\_\_ / \_\_\_\_



Conjunto de sentencias SQL que realizan una operación

## 3 - SQL

create table branch

```
( name varchar(50) not NULL ,  
-- );
```

Constraints:

create table branch

```
( branch_name char(15) not NULL constraint br_name ,  
primary key (branch_name) )
```

+ rename operation:

```
select customers.name , borrower.name as loan_no  
from borrower , loan  
where borrower.loan_no = loan.loan_no
```

\* It will be not stored in mem.

It exists only for query (scope = query) , Hence not for others

FECHA \_\_\_\_\_

## Tuples Variables:

Tuple var are defined in the form clause via  
use of 'as' clause

~~from borrower as T, loan as S~~

~~Select --~~ ~~loan = current loan~~

~~from borrower as T, loan as S~~

~~where T.loan-no = S.loan-no~~

## ① Distinct:

~~Select distinct T.branch-name~~

~~from branch as T~~

~~order by (10) Anatomical location~~



## String Operations:

% - for substring      (-) The - char matches on char

- and \_ - char (second most used help)

- Find name of customer whose street include subs main

~~Select customer-name~~

~~From customer~~

~~Where customer-street like "% Main %"~~

- Supports Variety of string op: ~~Concat, substring, etc.~~

~~Concat '||'~~

~~substr extraction - slice~~

~~mid(10, 10) - mid 10 from 10 to 10~~

~~length for segment - length~~

FECHA \_\_\_\_\_

## Ordering & displaying Tuples

```

    select * from adn
    from customer
    where branch-power-loan-n = loan.lan-n and
    branch-name = 'peru'
    order by customer-name
    * Default Ascending
  
```

Set operations : ( performs on tuples )

Union, Intersect, except (Not)

① ( select cust-name  
from deposito )

union ( select cust-name  
from borrower )

( select cust-name  
from depositor )

② ( select cust-name  
from depositor )

Intersect

- - -

② - - - except - - -

Depositor minus

Depositor minus

Depositor minus Depositor minus

Aggregate function: avg, count, min, max, sum

① Avg - Average

② min - minimum value

③ max - maximum

④ sum - sum of values

⑤ count - number of values

(Note - funct' & procedure diff) funt' return value  
procedure need not be return

- |  |                                      |
|--|--------------------------------------|
| ① select avg(balance) bna<br>from --<br>where --   | ② select count(*) n<br>from customer |
| ③ select count(distinct name) n<br>from depositors |                                      |
| ④ D = 14 days                                      |                                      |

Group by -

```
select bN, count(distinct name)
from depositors, acc
where deposit.acctno = acc.accno
group by branch-name;
```

\* Along with group by we use having

```
select branch-name, avg(balance)
from account
```

group by branch-name

having avg(balance) > 1200

FECHA

9 Aug 2024

NULL values:  $\neq 0$ 

will not be used in any numeric value.

 $N \text{ or } T = T \text{ or } N \text{ and } T = T \text{ and } N$  $N \text{ or } F = N \text{ and } F = F \text{ and } N$  $N \text{ or } N = N \text{ and } N = N \text{ and } N$ not  $V = 0$ 

(among British) natural sense

Nested Subqueries

customers having both an account &amp; loan at bank

select d1.name

from depositor

where customername in (select name from depositor)

contains

— —

no in

# All can be done by self theory also.

FECHA \_\_\_\_\_

cust both loan & p → ~~join with required info from branch~~

select name

from b, l

where b.loan\_no = l.loan\_number

and branch = 'P' and

(branch, name) in (select branch, name)

→

storing in

Q All branch having greater asset than some branch located in B (self comparison Hence virtual table)

select T.branch\_name

from branch as T, branch as S

where T.assets > S.assets and

S.branch-city = 'B'

(B is with branch)

Same using > Some clause

select branch-name

from branch

where assets > some

( select assets

from branch

where branch-city = 'B')

If some ⇒ atleast one / more than one

FECHA \_\_\_\_\_

Q) name of all branches having greater assets than 1000000

—

where assets &gt; all

~~—~~ ~~maximum assets = maximum branch~~~~branch with maximum branch~~

exist → seconds (true) if not empty (empty)

not exists

Q) find cities which have an account at all branches in B (branches like)

branch with greatest number of accounts (150) → 8 cities

SOL:

select S.name

from depo. as S

where not exists (branch T in branch of S)

( select name from branch R &lt; branch T branch of S )

from branch

where city = 'B'

except

select R.branch

from depo. as T, acc as R

where T.no = R.no &amp;

S.name = R.name )

branch of S

branch of R

( R = branch of S )

Soes each branch can receive 150 accounts

Test for Absence of Duplicates (unique)

cust at least two account branches no HA

History

select T.name (outer) ~~group by name, accno~~

from depositors as T ~~(group by name, accno)~~

where not unique ~~group by name, accno, month~~

(~~group by name, accno, month~~)

select R.name ~~group by name, no, month~~

from ~~branchder~~ as R ~~group by no, month~~

where T.name = R.name and

R.accNO = acc.accNO and

~~to PWD acc.branch = R.no~~ (~~group by branch, no~~) ~~group by branch, no~~ ~~HA~~ ~~PWD~~

~~as acc branch no HA group by branch, no~~ ~~branch, no~~ ~~total sum~~

variable outer level  $\Rightarrow$  correlative variable.

~~T.in (and nov, sum) total - demand after~~

~~(group by month, year, branch, no)~~

Derived Relations:

Q find avg (acc.bal)  $> 1200$  ~~group by branch, no~~ ~~branch, no~~

select name, avg ~~(group by branch, no)~~ ~~group by branch, no~~

from ( select name, avg(balance) ~~group by branch, no~~ ~~branch, no~~ ) ~~group by branch, no~~

from acc ~~group by branch, no~~ ~~branch, no~~

~~group by name~~ ~~group by branch, no~~ ~~branch, no~~

as branch\_avg (name, avg) ~~group by branch, no~~ ~~branch, no~~

where avg  $> 1200$

FECHA \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

with clause: ... omitiendo los resultados que no

All acc with maxbalance(p) and most to two  
variable

with maxbalance (value) as

select max(balance) as

from acc

select acc-no.

from acc , maxbalance

where acc.balance = maxbalance.value

bmo 900000000 = 900000000

abm 900000000 = 900000000

Q All branch where Total deposito is > avg of  
all total acc deposits at all branch

with branch>Total (name,value) as

select name, sum(balance)

from account

group by name

with branch-total-avg (value) as

select avg (value)

from (branch-total)

select name

from branch-total , branch-total-avg

where (branch-total.value) > branch-total-

name . avg . value

Views: creates Temp table.

provide mechanism to hide certain data from  
view by certain user

create view V as <query expression>

A view by branch & their cust

create view all-cust as

(select name, cust  
from  
where acc.no =  $\sim$ )

union

(select branch, cust  
from  
 $\sim$ )

View defined by another view.

Modificat' - Delete:

Insert table to table.

FECHA \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

## SE Linux Commands

- 1) ls → Used for list directory contents
- 2) ls -l → Detail list
- 3) ls -a → Include Hidden files
- 4) cd /path/2 /directory → Used to move file to target place
- 5) cd.. move on directory w another
- 6) mkdir → Create new directory
- 7) rm < > → Remove files
- 8) rmdir → Remove an empty directory
- 9) rm -r directory → Remove directory & its content also
- 10) cp → Used to copy a file to the destination folders
- 11) cp -r → Source directory      destination directory
- 12) md → To move or rename file directory
- 13) space oddname space newname.
- 14) cat → To concatenate & display the file content.  
cat space <filename: extension>
- 15) sudo → Used to execute command with  
T1 runs or administrator commands
- 16) apt -K → Package handling utility
- 17) Sudo apt -get update → update the package list.

- 18) sudo apt-get upgrade → To upgrade installed package
- 19) sudo apt-get install <packagename> → Install package
- 20) sudo apt-get remove <packagename> → Remove package
- 21) ps → Display currently running processes.
- 22) top → Display real time system
- 23) df → Display Disk space usage
- 24) du → Display directory space usage.
- 25) chmod → change file permissions
- 26) chmod 777 <file> Used to set permissions for the file.

FECHA 6 Aug.

- ① file test operators -b filename  
It checks file is a block or special file
- ② -c file  
It checks file is a char special file.
- ③ -d file  
It checks file directory
- ④ -f file  
It checks file is an ordinary file as opposed to a directory or special file.
- ⑤ -g file.  
It checks if the file has its set group ID with setfacl
- ⑥ -k file It checks file has sticky bit set
- ⑦ -p file - It checks the file is named pipe
- ⑧ -t file - It checks the file descriptor is open & associated with a terminal.
- ⑨ -u file - It checks the file has its set user ID
- ⑩ -r file - It checks file is readable or not.
- ⑪ -w file - if file is writable
- ⑫ -x file - if file is executable.
- ⑬ -s file - If file is size of greater than 0.
- ⑭ -e file - It checks if file exist.

Write down the shell scripting to enter 2 no. from user.

```
→ $  
#!/bin/sh
```

```
echo -n "Enter first number"
```

```
read num1
```

```
echo -n "Enter second no: "
```

```
read num2
```

```
sum=expr $num1 + $num2
```

```
echo "sum of two no. is: $sum"
```

```
sub=expr $num1 - $num2
```

```
echo "subtraction is $sub"
```

```
MULT=expr $num1 * $num2
```

```
echo "multiplication is $MULT"
```

```
DIV=expr $num1 / $num2
```

```
echo "Division is $DIV"
```

```
MOD=expr $num1 % $num2
```

```
echo "MOD is $MOD"
```

1 → 20 to 20

2 → 12 to 19

3 → 15 to 15

4 → 10 to 10

5 → 10 to 10

6 → 10 to 10

7 → 10 to 10

8 → 10 to 10

9 → 10 to 10

# Computer Organisation:

FECHA \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

~~clock cycle = Instruction count x cycle per instruction~~

$$\text{CPU Time} = N \times \text{CPI} \times T \mid \frac{1}{F}$$

$$= 8 \times 2 \times 1 \quad 250 \text{ ns}$$

$$= 8 \times 1 \times 2.5 \quad 1.6 \mu\text{s}$$

Q. A - cycle time = 250 ns  $\text{N} = ?$  CPI = 2.0  $\text{I} = ?$

B -  $= 500 \text{ ps}$  CPI = 1.2

$\text{I} = ?$  Instruction count

which is faster & by how much?

$$\rightarrow \text{CPU A} = f \times 2.0 \times 250$$

$$\text{CPU B} = 600 \text{ ns} \times 1.2 \times 500$$

$$= 1 \times 8 + 1 \times 5 + 1 \times 0$$

$$= 8 \times 8 + 3 \times 5 + 1 \times 0$$

$$\therefore \frac{\text{CPU}_B}{\text{CPU}_A} = \frac{600}{500} = 1.2 \quad \text{--- A is 1.2 times faster than B.}$$

CPI = ~~number of bus cycles required to execute a program~~ sum of I A

- If diff. instruction classes take diff. numbers of cycle

$$\text{clock cycle} = \sum_{i=1}^n (\text{CPI}_i \times \text{Instruction count}_i)$$

~~number of bus cycles required to execute a program~~ sum of I A

$$\bullet \text{CPI} = \frac{\text{clock cycle}}{\text{Instruction count}} = \sum_{i=1}^n \left( \frac{\text{CPI}_i \times \text{Instruction count}_i}{\text{Instruction count}} \right)$$

~~number of bus cycles required to execute a program~~ sum of I A

Relative frequency

~~number of bus cycles required to execute a program~~ sum of I A

second term

FECHA \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

Q Alternative compiled code sequenced using  
instructions in classes A, B, C

	A	B	C	Total
Instructions for class	1	2	3	
IC in seq 1	2	1	2	
IC in seq 2	4	1	1	

① Seq 1 IC = 5 & Seq 2 IC = 6

- clock cycles

$$2 \times 1 + 2 \times 1 + 3 \times 2 = 10$$

- clk cycle = 0.093

$$4 \times 1 + 2 \times 1 + 3 \times 1 =$$

- Avg CPI = 2.0

② A 400 MHz processor was used to execute

a benchmark program with following instructions

mix & clock cycle counts:

Instruction type	count	clk cycle count
Int arithmetic	45,0000	1
Data Transfer	32,0000	2
Floating	150,000	2
Control Transfer	80000	2

Given CPI, MIPS rate & execution time?

$$450000 \times 1 + 320000 \times 2 + 150000 \times 2 + 80000 \times 2$$

$$(450000 + 320000 + 150000 + 80000) \text{ clock cycles}$$

Avg CPI = 1.55

② Execution time:  $N \times CPI \times T$ 

$$= (N \times Ic) \times CPI \times T$$

$$= 400 \times 1.55 \times 10^6 \text{ ms}$$

$$= 620 \times 10^6 \text{ ms} = 620 \text{ ms}$$

Instruct <sup>n</sup> type	CPI	Instruct <sup>n</sup> mix
Arithmetic	1	60%
store with cache hit	2	18%
Branch memory ref	4	12%
memory ref	8	10%

$$CPI = \frac{\text{Avg CPI}}{(1 \times 0.6 + 2 \times 0.18 + 4 \times 0.12 + 8 \times 0.1)}$$

$$MIPS = \frac{400 \times 10^6}{2.24 \times 10^6} = 175.57 \text{ MIPS}$$

MIPS Rate:  $\frac{175.57}{10^6} = 175.57 \text{ million instructions per second}$ 

$$MIPS = \frac{Ic(f)}{T \times 10^6} = \frac{f \times Ic}{CPI \times 10^6}$$

$$\frac{400 \times 10^6}{1.55 \times 10^6} = \frac{258}{1.55} = 258 \text{ million instructions per second (MIPS)}$$

FECHA  
1.6

Q The execution time of 4 programs on three computers  
 Assume 10<sup>9</sup> instructions were executed

Exe Time (sec)

prog.	A	B	C	D
1	1	10	20	100
2	1000	1000	2000	2000
3	500	1000	500	1000
4	100	8000	100	100

→ Calculate MIPS of each & put on graph

xior student	I90	each student
100	1	1000000000
80	2	4000000000
50	10	10000000000
10	80	80000000000

Amdahl's law - fixed load Model: defines

$$\text{Execution time} = \frac{\text{Execution time}}{1 - f + f \cdot \frac{1}{MIPS}} \quad [ \text{Execution time} = \frac{1000}{1 - f + f \cdot \frac{1}{I90}} ] = 1000$$

$$\text{Execution time} = \frac{\text{Execution time}}{1 - f + f \cdot \frac{1}{MIPS}} \quad [ \text{Execution time} = \frac{1000}{1 - f + f \cdot \frac{1}{I90}} ] = \frac{F}{S}$$

$$\text{fractional increase} \leq 1 \quad (f)$$

Speedup enhancement  $f > 1 \quad (s) \quad = 2000$

$$1000 = \frac{1000}{1 - f + f \cdot \frac{1}{I90}}$$

$$s = \frac{1}{1 - f + f \cdot \frac{1}{I90}}$$

$$1000 = \frac{(1 - f) + f / I90}{1 - f + f / I90} = \frac{1000 \times 1000}{1000 - 1000f + f}$$

Q.1

$$\text{fractionenhance} = 0.4 \quad \text{speedupenhance} = 10$$

$$\text{speedupoverall} = \frac{1}{0.6 \times \frac{0.4}{10}} \approx 1.56$$

Q.2 → for FP case for FPSQR

$$S = 1.6$$

$$f = 0.2$$

$$f = 0.5 \quad S = 10$$

$$\therefore \text{overall speedup} = \frac{1}{(1-f) + f/S}$$

$$= \frac{1}{(1-0.5) + 0.5/1.6} \quad \text{--- for FP}$$

$$\text{Same for FPSQR} = 1.23$$

overall speedup of FP is greater hence choose FP.

$$Q.3 \rightarrow \text{FP op} = 25\%$$

$$\text{Avg CPI} = 4.0$$

$$\text{CPI of other} = 1.33$$

$$\text{freq of FPSQR} = 2\%$$

$$\text{CPI of FPSQR} = 20$$

Solve by :

$$EI = N * CPI * I \quad \left\{ \begin{array}{l} \text{processors} \\ \text{performance} \\ \text{utilization} \end{array} \right.$$

$$= \frac{N * CPI}{f}$$

$$\rightarrow \text{CPI with new FPSQR} = \text{CPI original} - 2\% \quad (\text{CPI ofd FPSQR})$$

$$- \text{CPI of new FPSQR only}$$

$$= 2.0 \times 2\% (20 - 2) = 1.64$$

FECHA \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

12

we can compute CPI of enhancement of all FP instructions the same way or by summing the FP and

$$\frac{1.0 \times 0.0}{0.1} = 0.0$$

$$\text{Speedup new FP} = \frac{\text{CPU Time original}}{\text{CPU Time new FP}}$$

$$\frac{\text{IC} \times \text{clockcycle} \times \text{CPI}_{\text{new}}}{{\text{IC} \times \text{clockcycle} \times \text{CPI}_{\text{original}}}}$$

$$= \frac{0.9 \times 0.0}{0.1 \times 0.0} = 0.9$$

Q.4 I don't understand what's going on.

$$\text{Speedup} = \frac{0.9 \times 0.0}{0.1 \times 0.0} = 9.0$$

$$(a) 1.25 \text{ speed}$$

$$(b) \frac{0.9 \times 0.0}{0.1 \times 0.0} = 9.0$$

$\Rightarrow$  speedup

$$(c) 1.19$$

$$(d) 1.11$$

$$\text{Speedup} = \frac{0.9 \times 0.0}{0.1 \times 0.0} = 9.0$$

$$\text{Speedup} = \frac{0.9 \times 0.0}{0.1 \times 0.0} = 9.0$$

$$\text{Speedup} = \frac{0.9 \times 0.0}{0.1 \times 0.0} = 9.0$$

$$\text{Speedup} = \frac{0.9 \times 0.0}{0.1 \times 0.0} = 9.0$$

$$0.9 \times 0.0 = 0.0$$

Q.6

a) when parallelizing an app, ideal speedup is speeding up by the number of processors.

This is limited (why I am not understanding this)

Q.7

speedup from pipelining

$$= \frac{\text{Avg Instruction time unpipelined}}{\text{Avg Instruction time pipelined}}$$

$$= \frac{4.4 \text{ ns}}{1.2 \text{ ns}} = 3.7 \text{ times}$$

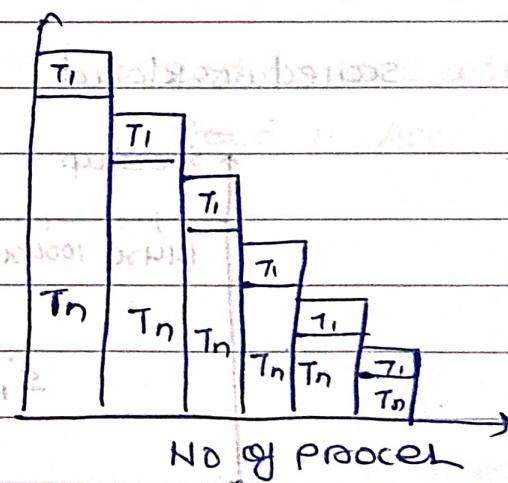
Amdahl's law:

$$S_n = n$$

$$1 + (n-1)\alpha$$

work time

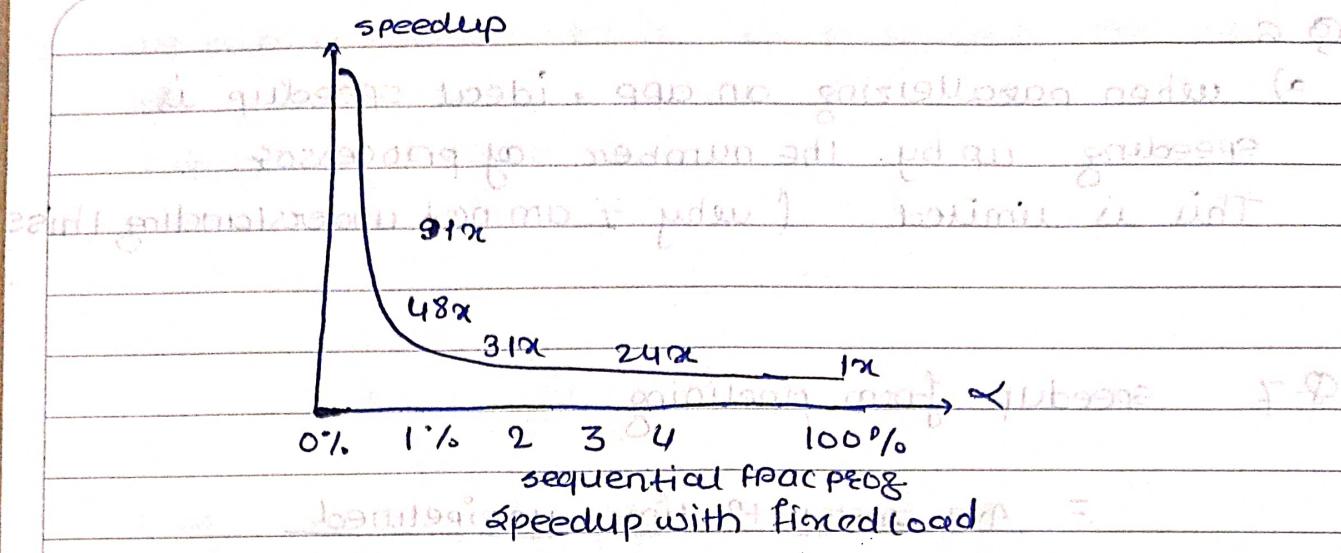
	$w_1$	$w_2$	$w_3$	$w_4$	$w_5$	$w_6$
	$w_n$	$w_n$	$w_n$	$w_n$	$w_n$	$w_n$



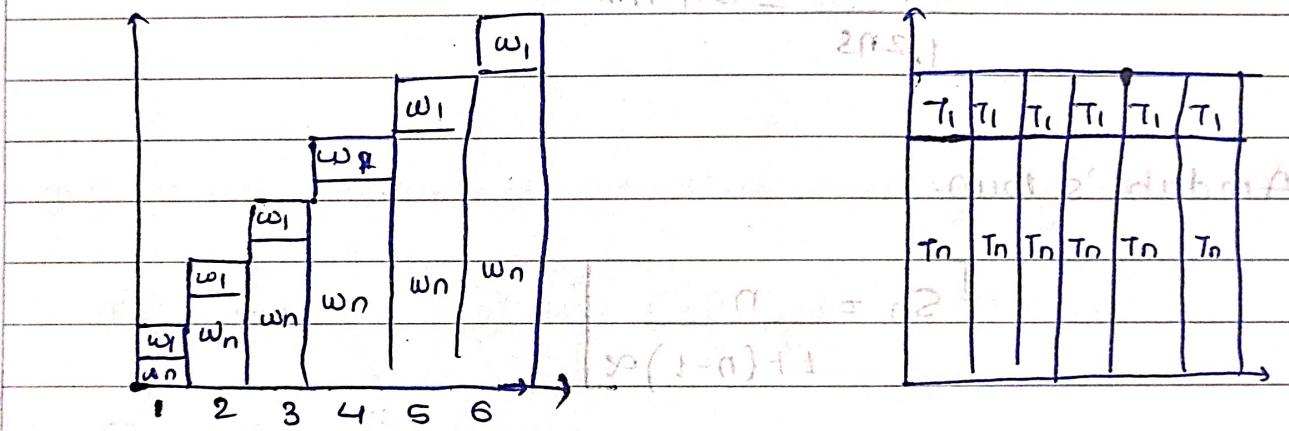
Fixed

Decreasing Exec? time

PREGUNTA PRACTICA



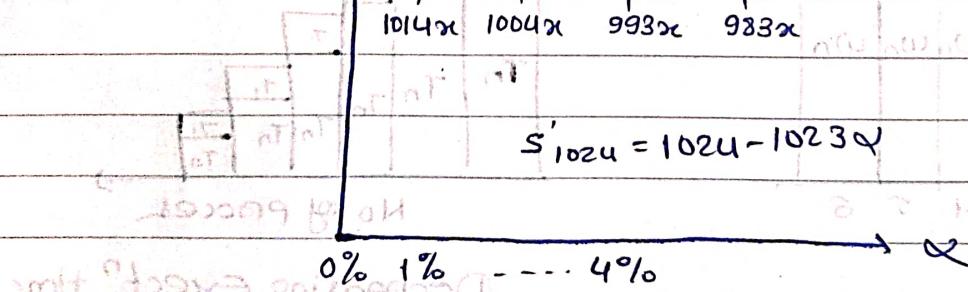
### Gustafson's Law



scaled workload

fixed execution time

Speedup



200 KN columns

BPF 12

FECHA \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

$$S_n = \frac{w_1 + w_n}{w_1 + w_n/n} = \frac{w_1 + G(n)w_n}{w_1 + G(n)w_n/n}$$

accesible  
imponible

(constant)

(0, 8, F) Kbytes

Amdahl & Gustafson are special case of fixememn  
(memory bounded speedup)

## Instructions

3 ddd

2 add

101 - -

0 - -

$$Z = K + B * C$$

OP —, —, —  
 $\underbrace{d}_{\text{dest}}$ ,  $\underbrace{—, —}_{\text{source}}$ ,  $\underbrace{C}_{\text{constant}}$

operands

d - dest

s - source

$$OP \quad d \uparrow, s \uparrow \quad d \uparrow + s \uparrow = Z \uparrow$$

101 - -

0000000000000000

0000000000000000

0000000000000000

0000000000000000

0000000000000000

0000000000000000

0000000000000000

① OP — — — add contents with Acc  
 $\uparrow$   
 store in Acc.

② OP ↑

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5/Aug

3 Address :  ~~$A + B * C$~~  1001 Address :  ~~$A + B * C$~~ ~~2 Addresses~~  $A: \text{add}(A) + \text{add}$  ~~$A + B * C$~~ 

MPY Z, B, C

(2 Instruction)

ADD Z, Z, K

Initial step of optimization &amp; addition

(quicks, behaved pattern)

2 Address:

MPY B, C | M R<sub>1</sub>, CADD B, B | MUL R<sub>1</sub>, BMOV Z, B | ADD R<sub>1</sub>, KMOV Z, R<sub>1</sub>

(4)

1 Address :

 $A + B * C = Z$ 

bb62

LOAD C

bb63

MUL B

(4)

ADD K

bb64

STORE Z

Postback

Postfix eq  $Z = K + B * C$  = KBC \* +

0 Address PUSH K ————— 90 (1)

PUSH B

T2

PUSH C

(6)

MUL

T90

ADD

POP

Postfix eq

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$$Y = \frac{(A - B) \cdot w}{C + (D \cdot E)} \quad \leftarrow \text{Hasta}$$

3-Address	2 Add	1 Add
SUB Y, A, B	MOV Y, A	LOAD D $\leftarrow A \leftarrow C$
MUL Y, T, D, E	SUB Y, B	MUL E $\leftarrow D$
ADD T, T, C	MOV T, D	ADD C $\leftarrow A$
DIV Y, Y, T	MUL T, E	STORE Y $\leftarrow Y \leftarrow A$
	ADD T, C	LOAD A $\leftarrow B$
	DIV Y, T	SUB B $\leftarrow D$
		DIV Y
		STORE Y $\leftarrow Y \leftarrow A$

$$(A - B) / C + (D * E)$$

$AB - C / DE * +$  is the postfix

PUSH A

PUSH B

SUB B

PUSH C

DIV

PUSH D , PUSH E

MUL

ADD

10 Instructions

FECHA \_\_\_\_\_

$$z = \frac{((c_p - (\alpha + s) * T) / (u / (v - w)))}{(\beta * \alpha) + \gamma}$$

3dd →

	bba p	bba s	bba e
C → SUB	R1, V, W	P.L. VOM	HALF BOP
DIV	R1, U, R1	B.U BOP	E.O.T VOM
ADD	R2, C, S	A.T VOM ⑥	E.O.T OAH
MUL	R2, R2, T	E.T POM	T.P.P. VIO
SUB	R2, P, R2	J.T OOP	
DIV	Z, R1, R2	T.D VIO	
	E VIO		

3d - 2 Add → P R0 T2SIR

MOV R1, W	(β * MOV R0, (S-A))
SUB R1, V	ADD R0 C
DIV R1, U	MOV R1, P
MOV R2, S	SUB R1, R0
ADD R2, C	MUL R1, T ⑨
MUL R2, T	MOV R0, V
SUB R2, P	SUB R0, W
DIV R2, R1	MOV R2, U
MOV BZ, R2	DIV R2, R0
	DIV R1, R2

1 Address

(16)

MOV Z R1

LDW W	OP C
SUB V	ADDS E H209 + A H209
DIV U	STORT
STOR U	LDW P 909

SUBT

410 10

búsqueda

90

Ex

FECHA 8-12-17

o Add

1 Add - 15

LDQ Q

ADD S

STORE T

LD P

SUB T

MUL T

LDQ V

SUB W

STORE T1

LD U

DIV T1

STORE T1

LDQ T1

DIV T1

STORE Z1

PCOS + T ← UVW - 11 21

14

PUSH P

Q 0001 00

S 1001 00

ADD

0001 00

- fixed length, variable length instruction.

Análisis de la memoria

Estructura de datos

R7

OP

operand

FECHA

8421

0000

1

2

3

16 bits of 16 R	16 bits of 16 R	16 bits of 16 R
then no number of type 3 valid instruction?	0000	0000
30 type 2	0000	0000
28 type 1	0000	0000
64 type 0	0000	0000

type 3:

each operand field 3 bits:

$$\therefore 4 \times 3 = 12 \text{ bits for operands.}$$

0000	01	02	03	-	-	-
:						
1101	-	-	-			

IT 1000 - IT 00012

IT 0010 - IT 00012

IT 0001 - IT 00012

IT 0000 - IT 00012

IT 0001 - IT 00012

IT 0000 - IT 00012

IT 0001 - IT 00012

IT 0000 - IT 00012

IT 0001 - IT 00012

IT 0000 - IT 00012

Type 2: 2 operands  $\therefore 2 \times 4 = 8$  remaining 8 opcode

1110 0000	-	-	-	-	-	-	-
1111 1101	-	-	-	-	-	-	-

remaining 8 bits for 8 opcodes

Type 1 1 operand  $\therefore 1 \times 4 = 4$  remaining 12 opcode.

0000	-	-	-	-	-	-	-
111111 00000	-	-	-	-	-	-	-

(27)

1  
2  
3  
4

16

Type 0: All 16 bits represent op

~~11111111111100000000~~ data bits available?

~~1111111111111111~~ bits = data available

~~1111111111111111~~ bits = data available

By solving these all we get total no. of add

$$\text{Type 3} = 14 \times 2^{12}$$

$$+ 80 \times 2^8 \quad \text{Type 2} \quad \text{operations available}$$

$$+ 28 \times 2^4 \quad \text{Type 1}$$

$$+ 64 \quad \text{operations available}$$

~~ABLE~~

$$655 = 2^{16}$$

### Example 1:

Consider a machine with 16 bit instruction & 16 reg.

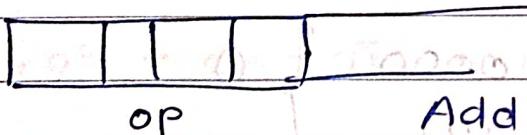
Instruction format: ~~1111111111111111~~

opcode + Mem. address

→ If 4KB byte addressable mem. we need 12 bits to

specify add locat? ~~1111111111111111~~

Remaining for 4 bits opcode.

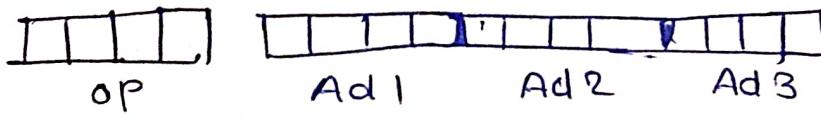


opcode + Reg Add

need 4 bits to select one of the 16 available reg.

Suppose we have 4 bit op encode 16 diff ins

with 3 operand  $3 \times 4 = 12$  bits



FECHA \_\_\_\_\_

Ex. 2 Consider machine with 16 bit instruction & 16 registers. And wish to encode the following instructions.

- 15 instructions with 3 Add

14                      2

15                      3  
16                      4

Can we encode this instruction set in 16 bits?

→ Yes, if we can use expanding opcodes.

$\Rightarrow 0000 \dots \overset{15}{\dots} \dots \overset{2}{\dots} \dots \overset{3}{\dots}$

14 - 1110

escape code → 111      000011- $\begin{cases} R_1+R_2 \\ R_1-R_2 \end{cases}$  } 2 operation  
1111 - 1101 (3)      R<sub>1</sub>, R<sub>2</sub> - 4 operand

7 masked id's 11111110 or 0000 depending plus 8 positions

1111 1110 (3) plus bba get read

0000 1111 1111      0000 } 0 1 1 1  
1111 1110 - - -      bba } 9c

bba 9c + 9b999

After shifting up at 3rd position false of sign is given

and then at 9b999 add it is taken as 9c

1111 1110 bba 9c

1111 1110 bba 9c

LEP 8.01.88

84.25

FECHA 8/1/88

15 instructions + 92 bits per operand = 61440 bits

$$+ 15 \times 2^4 \times 2^4 \times 2^4 = 15 \times 2^{12} = 30720 \text{ bits}$$

14 ins

$$14 \times 2^8 = 3584$$

31 ins

$$31 \times 2^4 = 496$$

16 ins +

$$16 \times 2^0 = 16$$

$$3584 + 496 + 16 = 3996 \text{ bits}$$

we have exact matches with no wastage Hence possible.

0010 0000 0111 1000  
0111 1111

Ex. 3: Is it possible to design an expanding opcode to allow the following to be encoded with 92 bit ? Assume each operand requires 3 bits

4 ins + 3 reg      0000 R1 R2 R3  
255 ins + 1 reg      0110

16 ins + 0 reg

$$\rightarrow 21 \times 2^9 + 255 \times 2^3 + 16 = 14104 \text{ bits} \not\models 92 \text{ bits}$$

instructions length  $\leq 12$  bits  $\therefore 2^{12} = 4096$

000 R1 R2 R3		100 000 000 --- } type 1
100		011 111 111 --- }

111 111 111	0000
111 111 111	111

1111 1111

83  
1G  
4S  
56  
9

32. 16 8. 4 ? !

FECHA

Ans 64

Q4 Assume CPU having 16 reg & instruction length is 16 bits. It should be having 14 types of instructions.

31 Type 2

min. 11

12 Type 1

min. 18

Calculate almost how many no. of Type 0 instruction should have. Show proper encoding.

Type 3: 00000 R12, R2 R3

11010 R1 R2 R3

Type 2: 1110 0000 R1 R2

1111 1110

Type 1: 1111101110 0000 R1 R2 R3

1111111111101110 R1 R2 R3

Type 0: 1111111111111100 0000 R1 R2 R3

1111111111111110 1000 R1 R2 R3

0000000000000000 R1 R2 R3

$$14 \times 2^{12} + 31 \times 2^8 + 12 \times 2^4 + 2^0 = 2^{16}$$

2P00 = 1000 1101 0000 0000

1000 1101 0000 0000

1111 1111 1111 1111

0000 0000 0000 0000

0000 0000 0000 0000

0000 0000 0000 0000

0000 0000 0000 0000

0000 0000 0000 0000

0000 0000 0000 0000

0000 0000 0000 0000

0000 0000 0000 0000

0000 0000 0000 0000

# Binomial Distribution formula

MSD

Set

$$\textcircled{1} \quad P(X=k) = \left( \frac{n}{k} \right) p^k (1-p)^{n-k}$$

$\frac{n}{k}$  is binomial coefficient calculated as  $\frac{n!}{k!(n-k)!}$

$p$  is probability of success

$n$  is number of trials

$k$  is number of successes

$$n = 20 \quad k = 2$$

$$\frac{20!}{2! 18!} = \frac{10}{20 \times 19 \times 18!} = \frac{190}{18!} = 190$$

$$190 p^2 \times (1-p)^{18}$$

$$190 \times (0.05)^2 \times (0.95)^{18}$$

$$= 0.2008 \text{ or } 20.08\%$$

FECHA

Chap 5.1 Binomial

Success rate 70%

$$\therefore P = 0.70$$

$$\text{no. of trials } (n) = 10$$

$$\text{no. of success } (k) = 7$$

$$10! \\ 7! \quad 3!$$

$$10 \times 9 \times 8 \times 7!$$

$$720 \quad 360 \quad 120$$

$$8 \times 7$$

$$\boxed{120}$$

$$120 (0.7)^7 \times (0.3)^3$$

$$= 0.267 \text{ or } 26.7\%$$

parameter, formula, cell u, result

Poisson DF:  $\lambda = \text{Avg no. of events} (3 \text{ book/h})$   
 $P(x=k) = \frac{\lambda^k e^{-\lambda}}{k!}$   $k = \text{no. of occurrences (5 books)}$

$$\lambda^5 e^{-3} = 880 \quad = 80 \times (3,0-1) = (x=k)$$

$$= \frac{3^5 \times e^{-3}}{5!} = \frac{-243e^{-3}}{120}$$

calculate  $e^{-3} \approx 0.0498$   $(e=2.718)$

How many books bought on average = 3 books

Ex 1:  $\lambda = 6 \quad k = 8$  average value

$$P(x=k) = \frac{6^8 e^{-6}}{8!} = 0.103 \approx 10.3\%$$

$$(9-1)8! = 7 \cdot 8! = 90 \cdot 16 = 1440$$

Geometric Distribution:  $P(x=k) = (1-p)^{k-1} p$

probability of success ( $p$ )

failure ( $q$ )

$$\text{mean} = \mu = \frac{1}{p}$$

$$\text{var } \sigma^2 = \frac{1-p}{p^2}$$

Q.  $p=10 \quad n=5$

$$p = (1-0.1)^{5-1} \times 0.1$$

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(Q.) Success rate = 80% Third attempt: 0.098162

$$P = 0.8 \quad K = 3$$

$$P(X=K) = (1-0.8)^2 \times 0.8 = 0.032 = 3.2\%$$

Summary

① parameter ② formula ③ cell ④ result

(S1E5 - 2)

8 PPT 9.2.2018 8.5.2018

Binomial - fixed no. of trials

Geometric - variable no. of trials continues until first success

$$\boxed{\text{mean} = \mu = NP \quad \text{var} \sigma^2 = NP(1-P)}$$

Diff. b/w binomial, poisson &amp; geometric.

Si  $(q+1) = (1-p)q$ , la continuidad de distribuciónContinuous: (a) example no. probability  
(b) normal

- ① Normal
- ② Exponential
- ③ Chi-square
- ④ T-student

① Normal:

$$Z\text{-score} = \frac{x-\mu}{\sigma} \quad \text{z-score} = 9$$

FECHA / /

Q.  $\mu$  (mean) = 100

Standard deviation ( $\sigma$ ) : 15