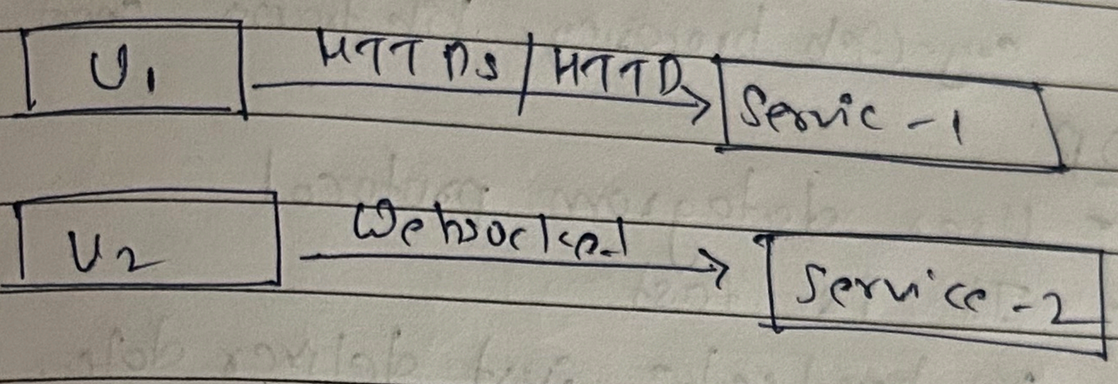
Video Conferencing

Functional

- one to one call
- group call
- Audio/video/screen share
- Recording

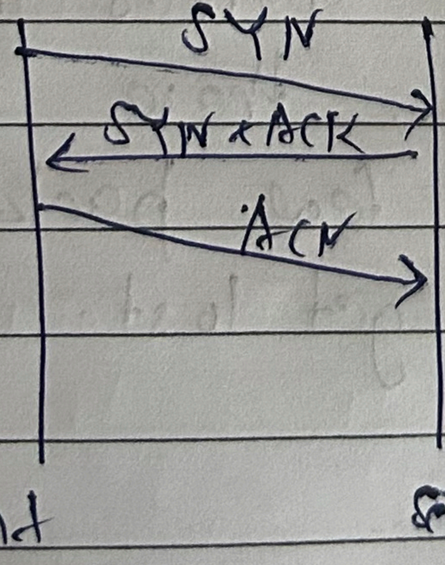
Non-functional

- Super fast
- High availability
- Data loss is o/k



- All thes HTTS, websockets built of TCP protol.

- Tcp (Transmission control protocol)
  - It does 3-way handshake to make the connection



- I want to creat a connect
- You can make
- OK.

- Data sharing in the form of packet which get sent from client to seres.

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- TCP
  - Transmission control protocol
  - Connection is established ~~co~~ using 3-way handshake
  - Ensure all data receive in order and without duplication.
  - Flow control and congestion control

  e.g.- Web browsing, file transfer, chat, email.

- <u>UDP</u>
  - User datagram protocol
  - It is fast
  - No handsake just deliver data.
  - No gurantee on ~~der~~. delivery in order

Use cas -> Zoom, Vide confrensing.

For video confrencing we ~~can~~ will use UDP because we want our packet shoud deliver to server in fast way, there may be chance few packet for few frames get lost.

RTMP - real time messaging protocol

Note :-

So, now if we are going with UDP it doesn't mean we will go ahead with UDP for everything.
We use this only for Video conferencing

But for other operation we will use TCP. (HTTP calls, initiating the connection b/w two users)

Peer to Peer Communication

In theory, the fastest way for two devices to communicate is directly with one another.

- Do we always want to do this? Probably not.
- In a big group chat we would have to send video to and receive from many other different places.
- What we do for recording?

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- Let's say it was 1:1 call, how we can we do peer to peer ?

Network Address translation (NAT)

- Private IPs (192.168.x.x)
  (10.x.x.x)

- When ever our device want internet or trying to search anything we want to with our private IP. we need public IP

but also we can't assign public IP to every device because these are limited so we need some sort of mechanism which resolve this issue that is called NAT.

NAT basically it map the private IP with public IP

- IPV4 addres are 32 bits log

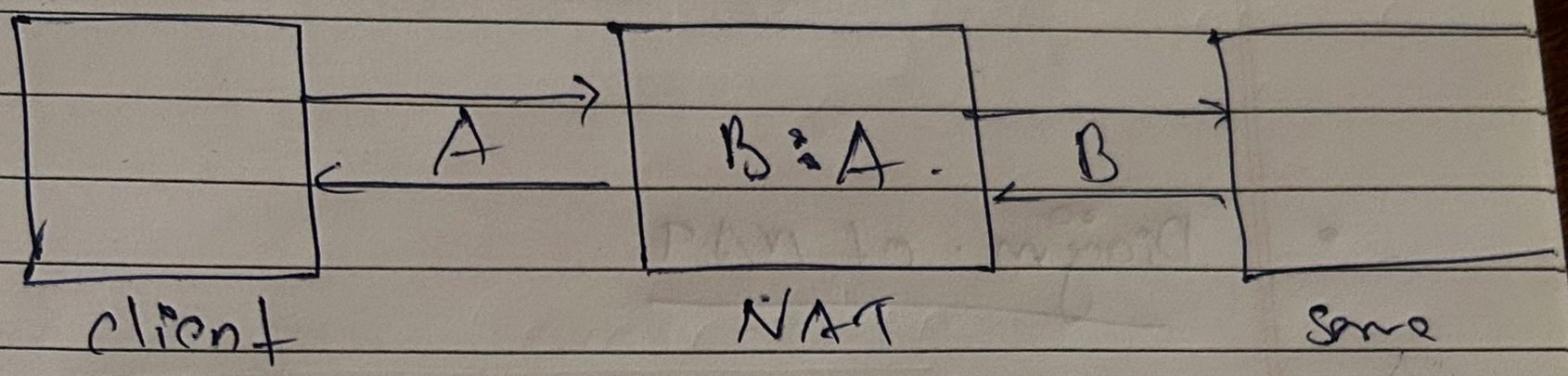
  ex- 192.168.0.1
  ↓ ↓ ↓ ↓
  8b 8b 8b 8b = 32 bits

$2^8 = 256$ (value 0 to 255)

00000000 = 0

to

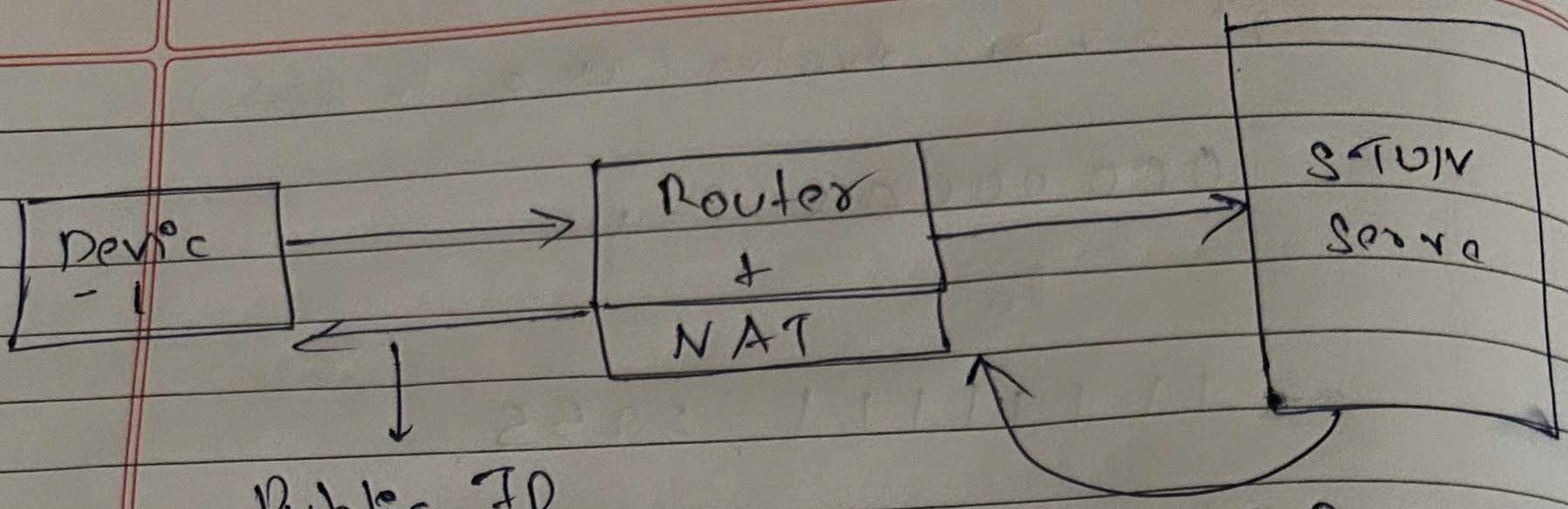
11111111 = 255



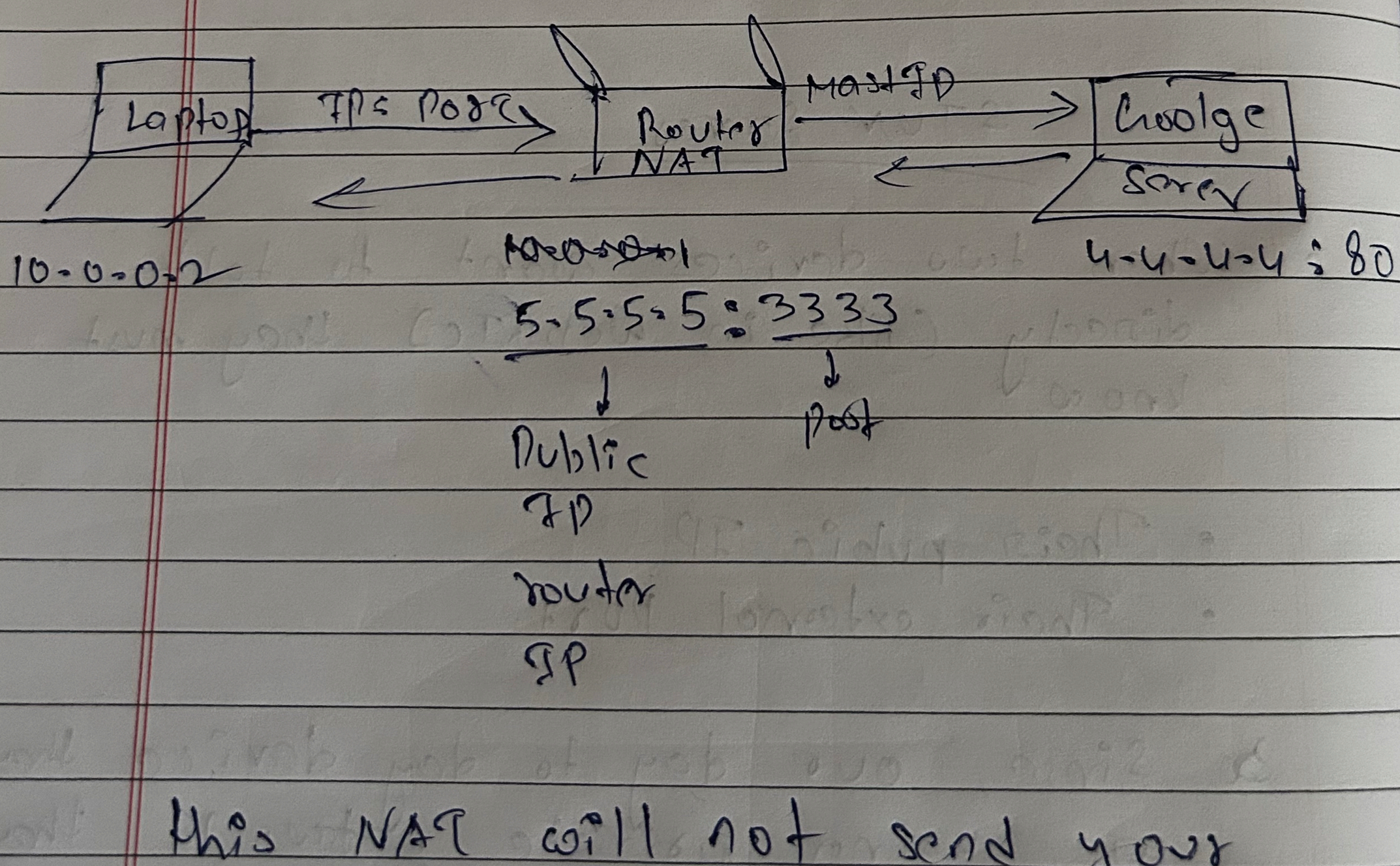
STUN Server

- When two devices want to talk directly (like in WebRTC) they must know
  - Their pubic IP
  - Their external port.

So since, our day to day device they are using private network they can't directly connect they need help.
Their the STUN server comes in



- Diagram of NAT



This NAT will not send your private IP over the internet. It do some masking and then send.

It creates a Table

Internal IP	Internal Port
10.0.0.2	8992

External IP	External Port
5.5.5.5	3333

Destination IP	Destination Port
4.4.4.4	80

Central chat server

- The above one are step one
- In step two user has to share the pubic IP's.

now for sharing the IP's there are multiple ways

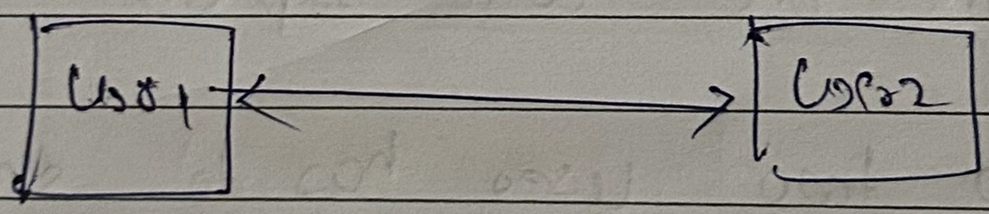
- HTTP.
- Websocket.

example exchange:
SDP -> session description protocol
A format that describe

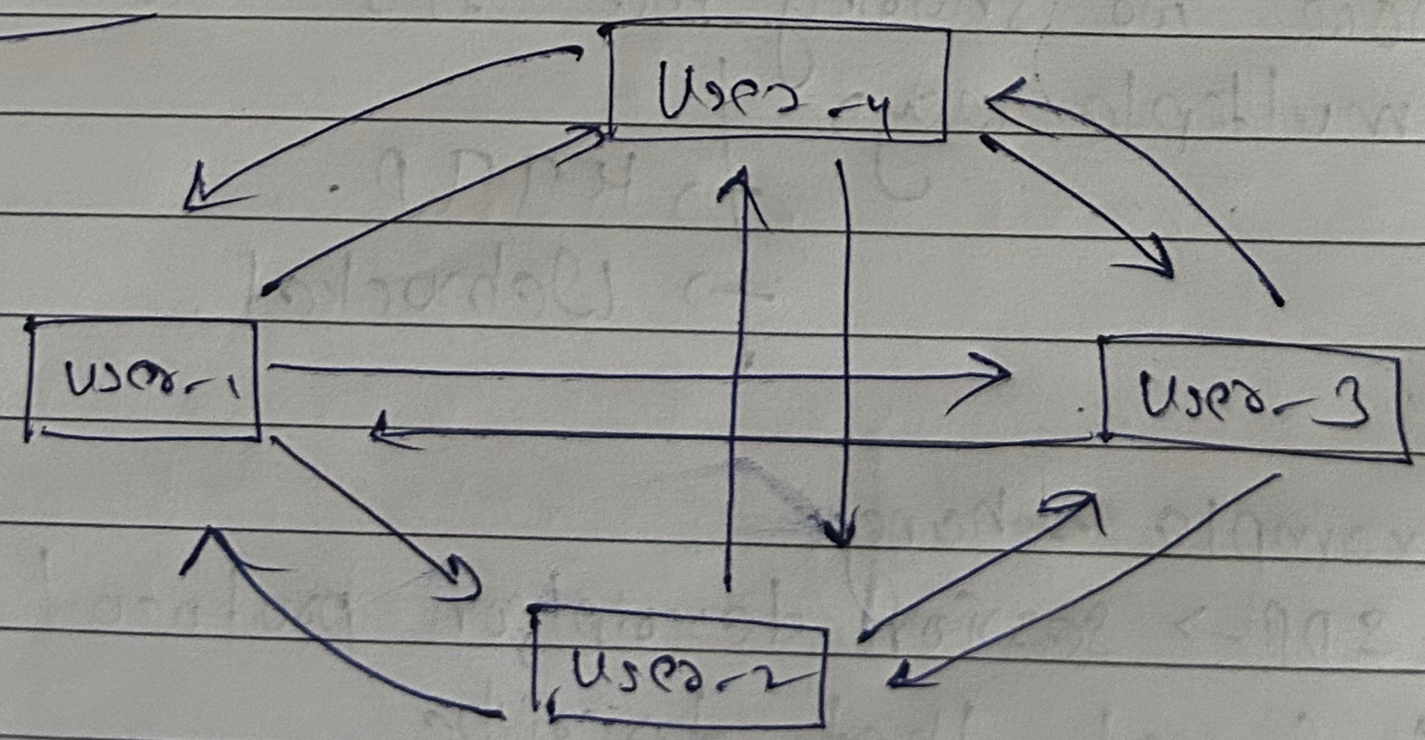
- SDP stands for Session Description protocol. It is a text based format which used in WebRTC. and other real time communication systems to describe.
  - The media capabilities
  - Network details
  - Session related details.

- So now we have successfully make the connection b/w users.

Peer to Peer



In Group Call - 1



4 x (4-1) => 12

the approach is only fasible
when we have very less number
of people

~~N user be.~~
and over wire

N use
(n-1) connection

$$\text{Total} = N \times (N-1)$$
$$= N^2 - N$$
$$\sim N^2$$

Group Call - 2 (~~..~~ Live streaming / ~~...~~)

- ok so ~~...~~ now if we want to
record the entire conversation then
the peer-to-peer approach will not
be feasible
because we don't have any centralized
serve where all the data passing
through
~~Such~~ ~~the~~

that is known as SFU