- No ICMP message will be generated for a datagram having a special address such as 127.0.0.0 or 0.0.0.0.

- Data section mein kya hota hai, toh data-section mein IP-header hota hai aur first 8 byte of data hota hai us data gram ka.

- Toh first 8 byte mein hota hai kya toh us first 8 byte mein Port no aur sequence no hota hai TCP-packet ka.

- Yeh information isliye chahiye rahati hai so that ICMP, TCP-protocol ko error k baare mein bata sake.

- Now we are discussing in detail about various error reporting message.

i) → Unreachable destination :→

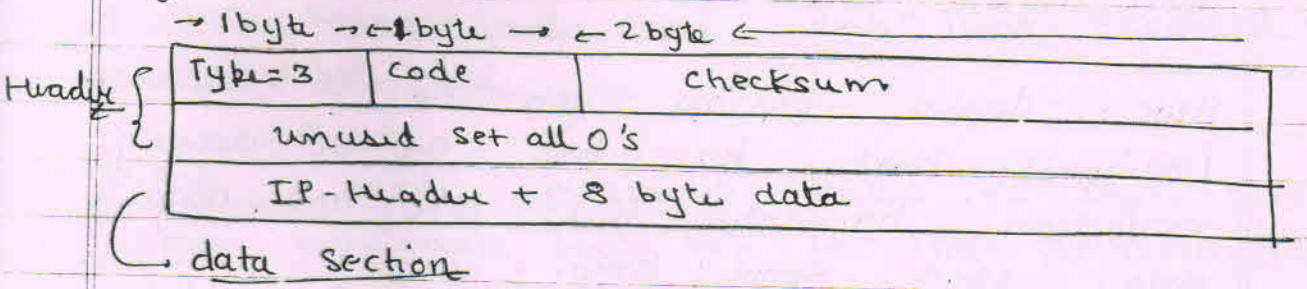
- Yeh error kab aati hai jab :→

i) Host destination host reachable na ho.
ii) destination network reachable na ho.
iii) destination host exist nahi karta hai
iv) Jab DF = 1 set ho aur apko packet aage forward karne k liye packet k aur fragment karna pare tab Unreachable destination ICMP through karta hai.

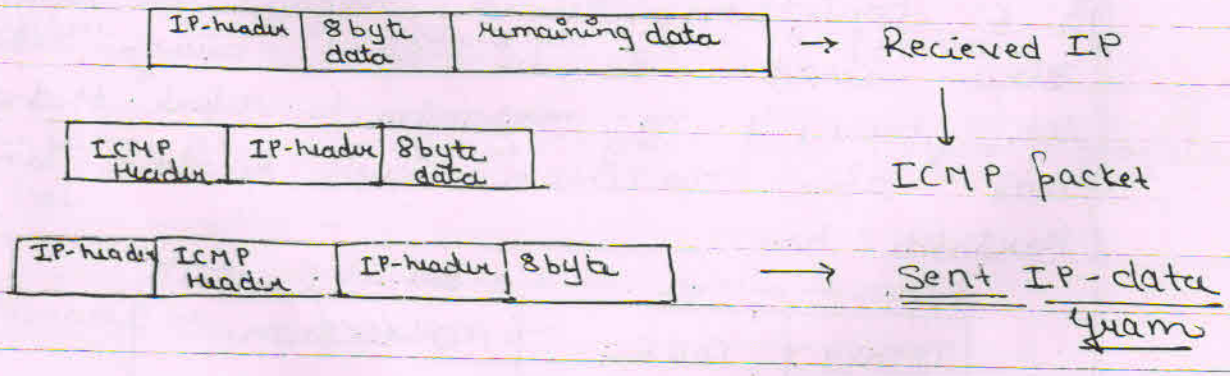
v] The port is unreachable

Is insabhi mein router will first discard the packet and send ICMP error reporting message to orignal source:→

Header:



Now sabse pahale IP packet recieve hua:-



- ICMP saare problem ko detect nahi karpakta agar ICMP packet generate nahi hua toh iska yeh matlab nahi hai ki data deliver ho hi jayega.

2] Source Quench :-

- Since IP- Layer mein kohi flow control aur congestion control ka funda nahi hota hai, toh is kind ka feature dene k liye Source Quench message error ka use karte hai

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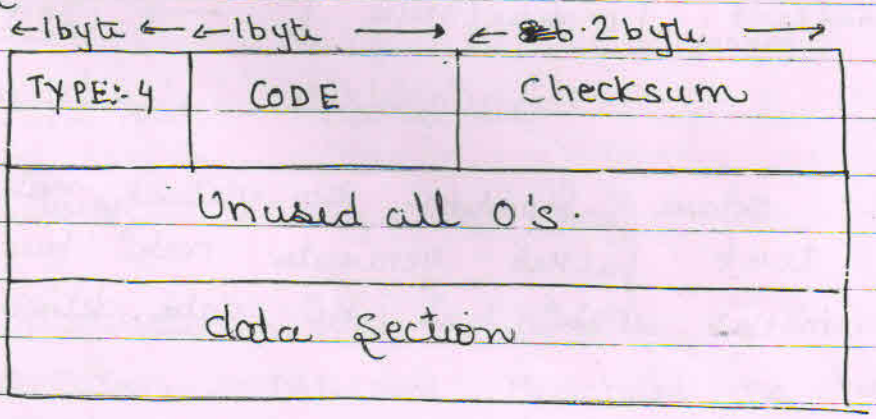
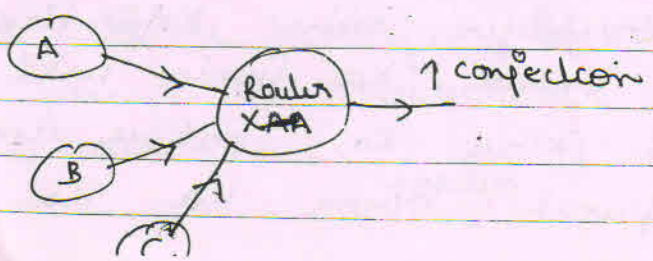
- Jab Router ya host/Source conjestion k karan packet discard karta hai toh it will send source quench message, is message k do purpose hote hai ek toh origonal source ko inform karna ki conjection k problem hai toh aapka packet discard kar diya gaya.

- Aur dusra purpose yeh ki woh source/origonal host ko bole ga ki aagey conjection ho raha hai toh aap apna data slow send karo.

- Now isme problem kya hogi agar aage ja k conjection resolve hogaya toh sender slow speed se hi send karega aabhi toh there is no mechanism to report that ab aab apne maximum speed se data send karsakta ho.



Now see the situation



Now X send source quench message to all the routers.

3) ~~Time Exceeded~~

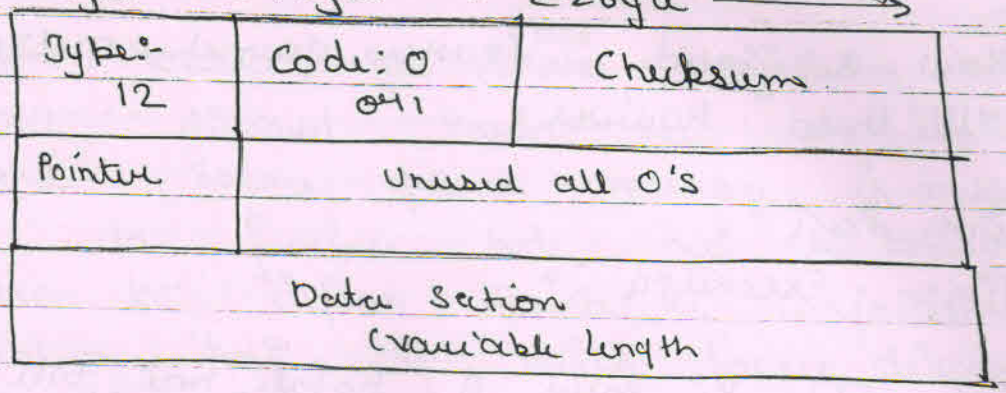
3] Time - Exceeded :→

- Jab TTL ki value 0 hojati hai ton packet drop karna parta hai, tab Time - Exceeded error send hoti hai.
- Jab saare fragment packet ki kuch time par nahi aate hai tab bhi Time - Exceeded error aati hai.
- Pahli wali problem router par aati hai aur dusri wali receiver par aati hai.

(same as previous one but Type = 5 hojata hai.

4] Parameter problem :→

- Jab header (IP k headers) mein kuch problem aati hai ya toh kuch corrupt hogaya ja phir kuch field missing hai, jab parameter problem message send hota hai source ko.
- Yeh problem router par bhi create ho sakta aur destination host par bhi.



- Pointer :→ Agar hamare kisi field mein problem aarahi hai toh pointer mein us field ki first byte ka address rahaga.

  aur

  Agar kohi field missing hai toh us case pointer use mein nahi karta hai it is useless field.

5] # Redirection :→

↳ Redirection mein packet agar ko traverse karna ka aur kohi shortest path hai toh us packet ko waha redirect ka diga.

Yaha kohi packet discard nahi hota dusre message ki tarah.

Query Messages :-

i] Echo Request and Replay :→ (8040) request ↑ reply ↗

This message are designed for diagonstic purpose.

- Network work manager and users utilize this pair of message to identify network problem.

- The combination of echo-request & echo-replay message determines whether two system can communicate to each other (host/router).

- Echo-request and Echo-replay messages can be used by network managers to check the operation of the IP protocol.

- practically "ping" command se Echo-request/reply Ka laab (finida) utaya jata hai.

- Echo-request and Echo-reply message can test the reachability of the host. This is usually done by invoking the ping command.

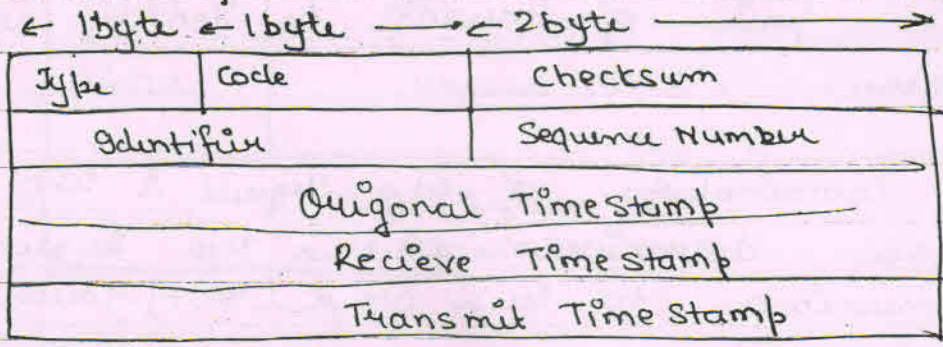
Time.stamp Request and Timestamp Reply:-

request ← 13/(14) → reply

→ Similar hota hai echo-request and echo Reply bus yaha par time bhi note kiya jata hai.

- Two machine (host/router) can use the timestamp-request and time-stamp reply message to determine the round-trip time needed for the IP datagram to travel b/w them.

Format of Timestamp - Request | reply message.



Yaha timestamp ms mein measure kiya jata hai.

(1 day)

Time field = 4*8 = 32 bit ki hai toh 32 bit mein hum $(2^{32}-1)$ store karwa sakte hai but there is restriction on that we can give time up $24*60*60*1000 = 864*10^5$ tak.

Original Timestamp :→

→ Kab data send hua hai sender se.

Receive Timestamp :→

→ Kab receive k pass receive hua hai

Transmit Timestamp :

Kab receiver se Reply msg send kiya hai.

- Now jab Time stamp request send hoti hai toh original Time-stamp ki value set hote hai aur baki dono Time-stamp ki value 0-0 karke send karta hai.

- Now, jab Recievur send karta hai reply message toh original toh as its copy karde-ga aur sath mein undono ki value bhi rak duga.

Transmit karne mein kitana Time = Recieva - original Timestamp Timestamp

Recieved Time = Return Time - Transmit Time:

→ Round trip Time = Sending Time + Reciving Time.

- Time Stamp - request and Time-Stamp reply message can be used to calculate RTT b/w source & distination even if clock is not synchronized.

- Time-Stamp request and Time-Stamp reply message can be used to synchronize two clocks in two machine if exact one way time duration is known.

Ques:→ Original Timestamp = 46
Recieve Timestamp = 59
Transmit Timestamp = 60
Return Time = 67.

Transport layer

What is Round Trip Time ??

Ans:- Sending Time = 59 - 46 = 13

Recieving Time = 67 - 60 = 7

Round Time time = 20 ms

#. The checksum for ICMP is calculated using both header and the data-field of the ICMP message.

Transport Layer :-

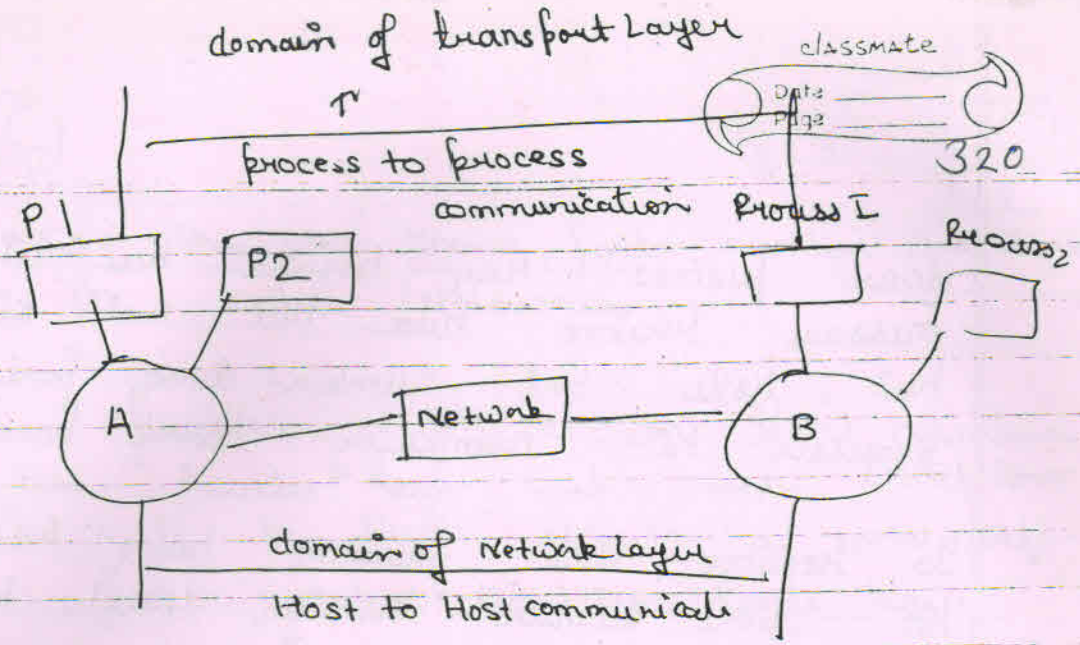
- It is a heart of TCP/IP suit. It is located bitween network layer and application layer
- It recieves servics from network layer.

Servics provided by Transport layer :-

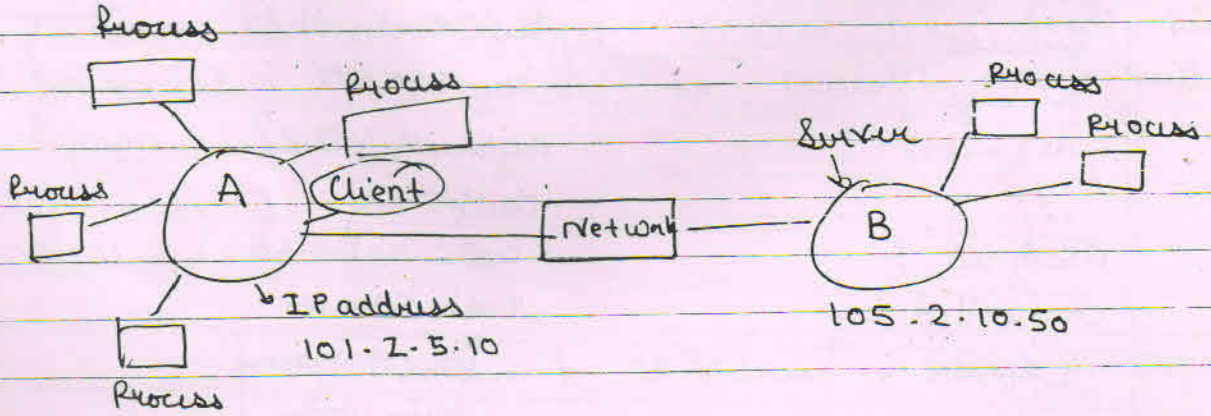
1. Process To Process Communication :-

→ Sabse pahala job/kaam hota hai transport layer ka process to process communication provide kare.

→ Sabse pahale hum dekte hai process to process aur host to host communication mein kya difference hai ??



- Network layer kya karta hai, it deliver the packet to desired distination, but this is an incomplete delivery
- aabhi process message hamne correct process ko dena hai toh yeh correct process ko dena ka kaam transport Layer ka hota hai.
- A transport layer protocol is responsible for delivery of the message to the appropriate process.
- Now consider the following scenario.



Now to System A (i.e client) aur server ko define karne k liye hamare pass kya hai ip address. Par server par bhi bahut