

**1. - 2. Source and destination port ( 16 bits each):**

TCP port numbers of the sender and receiver.

- TCP and UDP ports are essentially the same, but are assigned separately.
- Thus, TCP port 54 may refer to a different service than UDP port 54.
- Each protocol manages its own ports.

**3. Sequence number (32 bits):**

The sequence number of the first byte of data in the data portion of the segment.

**4. Acknowledgment number (32 bits):**

- The next byte expected.
- The receiver has received up to and including every byte prior to the acknowledgment.
- Transport protocols must always consider the possibility of delayed datagrams arriving unexpectedly.
- Suppose we use a sequence number space of 16 bits (0-65535).
- The time required for 65 Kbytes is only a small part of a second;
- the sequence numbers would wrap very quickly and there would be a high likelihood of old data popping up on the subnet and being confused for the original data.
- Insuring that the sequence number space is large enough to detect old (invalid) datagrams depends on two factors:
  - The amount of wall-clock time that a datagram can remain in the network.
  - The amount of time that elapses before a given sequence number becomes reused.

We use 32 bit sequence numbers. We also use the IP TTL field to insure that datagrams don't stay in the network for too long.

**Note:** TTL is a mechanism that limits the lifespan or lifetime of data in a network. Once the prescribed event count or timespan has elapsed, data is discarded. TTL prevents a data packet from circulating indefinitely.

**Problem:** For which one of the following reasons does Internet Protocol (IP) use the time-to-live (TTL) field in the IP datagram header? **[GATE-2006 : 1 Mark]**

- (a) Ensure packets reach destination within that time
- (b) Discard packets that reach later than that time
- (c) Prevent packets from looping indefinitely
- (d) Limit the time for which a packet gets queued in intermediate routers

Ans.

Soln.

TTL is a mechanism that limits the lifespan or lifetime of data in a network. Once the prescribed event count or timespan has elapsed, data is discarded. TTL prevents a data packet from circulating indefinitely.

**Problem:** While opening a TCP connection, the initial sequence number is to be derived using a time-of-day (ToD) clock that keeps running even when the host is down. The low order 32-bits of the counter of the ToD clock is to be used for the initial sequence numbers. The clock counter increments once per millisecond. The maximum packet lifetime is given to be 64s.

Which one of the choices given below is closest to the minimum permissible rate at which sequence numbers used for packets of a connection can increase? **[GATE-2009 : 2 Marks]**

- (a) 0.015/s
- (b) 0.064/s
- (c) 0.135/s
- (d) 0.327/s

Ans.

Soln.

Maximum packet lifetime = 64 seconds

Sequence of one packet change after 64 sec (otherwise packet duplication possible) and clock counter increment per millisecc. Therefore, min. possible rate = 0.064/sec.

**Problem:** One of the header fields in an IP datagram is the Time-to-Live (TTL) field. Which of the following statements best explains the need for this field? **[GATE-2010 : 1 Mark]**

Ans.

- (a) It can be used to prioritize packets
- (b) It can be used to reduce delays
- (c) It can be used to optimize throughput
- (d) It can be used to prevent packet looping

Soln.

In the IP datagram there is time to live (TTL) field. It is mainly used to prevent packet looping. Means every packet is associated with certain time stamp. If one packet is received after certain stamp (TTL) then this packet discarded so it can be used to prevent looping.