SNS COLLEGE OF TECHNOLOGY

Coimbatore-35

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19ECT301-COMMUNICATION NETWORKS

III YEAR/ V SEMESTER

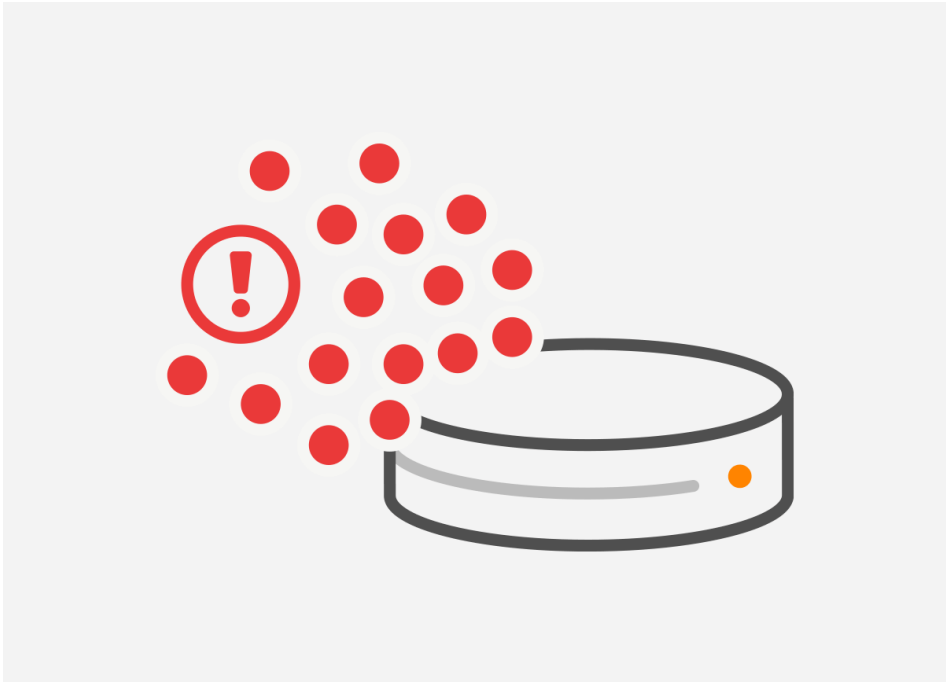
UNIT 3- TRANSPORT LAYER & APPLICATION LAYER

TOPIC 3 –CONGESTION CONTROL

CONGESTION IN NETWORK-

Congestion refers to a network state where-

The message traffic becomes so heavy that it slows down the network response time.



CONGESTION IN NETWORK-

- Congestion is an important issue that can arise in Packet Switched Network.
- Congestion leads to the loss of packets in transit.
- So, it is necessary to control the congestion in network.
- It is not possible to completely avoid the congestion.

CONGESTION CONTROL

Congestion control refers to techniques and mechanisms that can-

- Either prevent congestion before it happens
- Or remove congestion after it has happened

TCP CONGESTION CONTROL

- **TCP reacts to congestion by reducing the sender window size.**

The size of the sender window is determined by the following two factors-

- **Receiver window size**
- **Congestion window size**

1. RECEIVER WINDOW SIZE

- Sender should not send data greater than receiver window size.
- Otherwise, it leads to dropping the TCP segments which causes TCP Retransmission.
- So, sender should always send data less than or equal to receiver window size.
- Receiver dictates its window size to the sender through TCP Header.

CONGESTION WINDOW

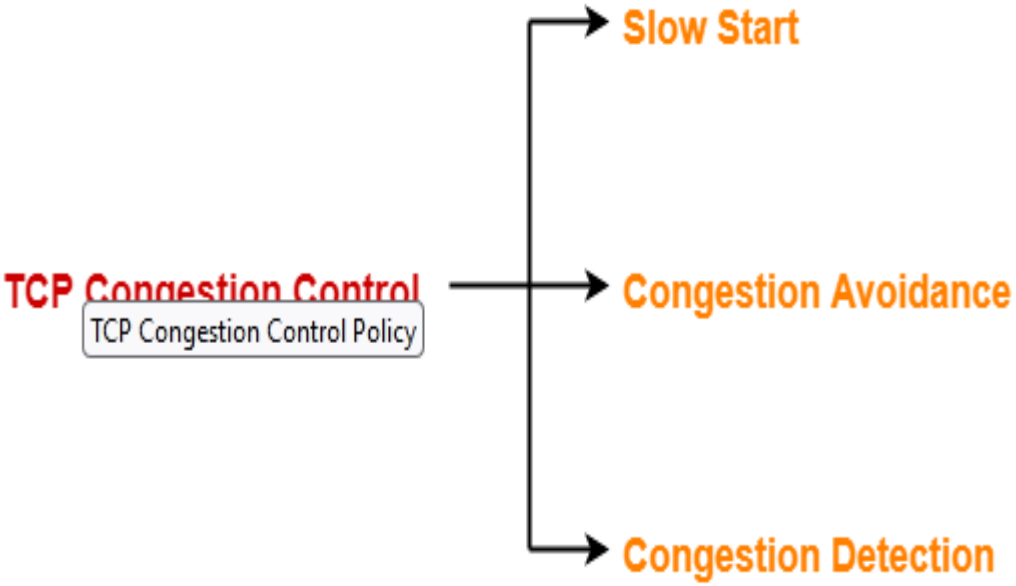
- Sender should not send data greater than congestion window size.
- Otherwise, it leads to dropping the TCP segments which causes TCP Retransmission.
- So, sender should always send data less than or equal to congestion window size.

CONGESTION WINDOW

- Sender window size = Minimum (Receiver window size, Congestion window size)

TCP CONGESTION POLICY

TCP's general policy for handling congestion consists of following three phases-

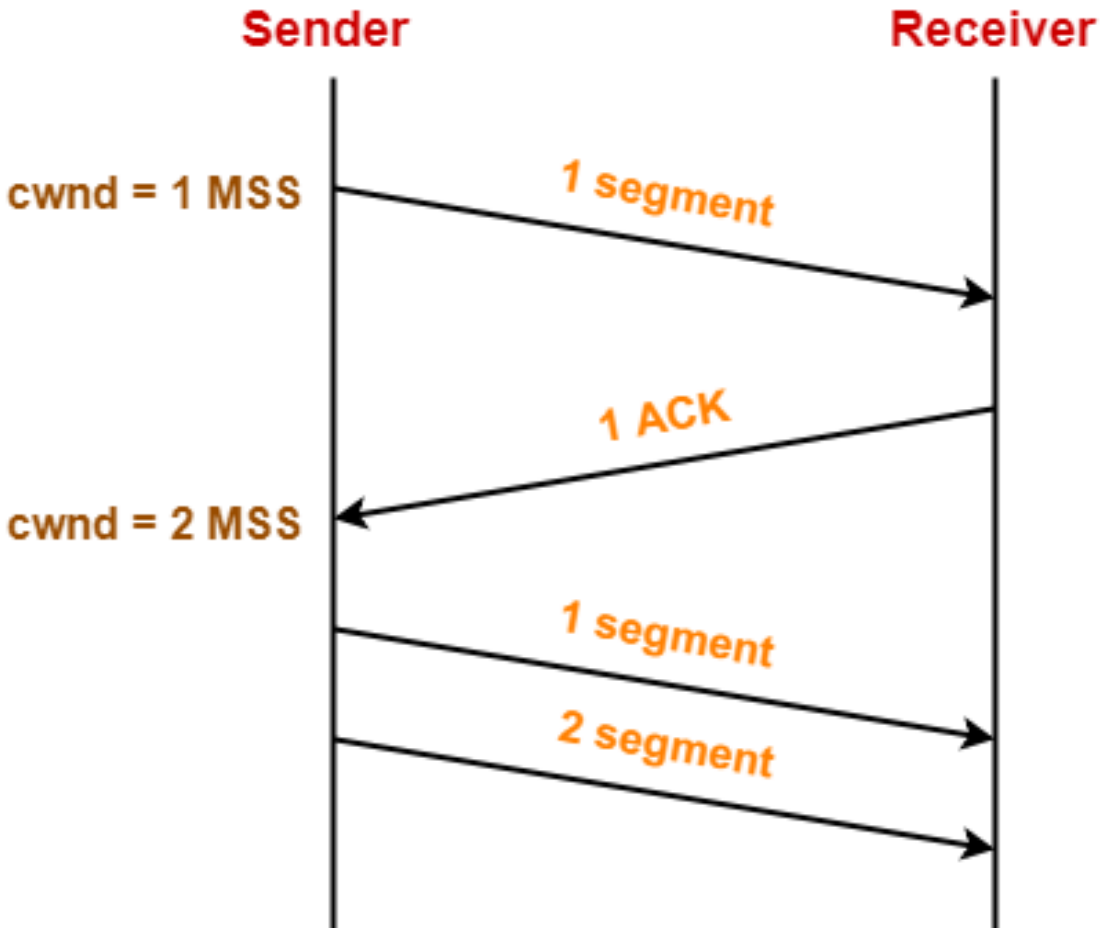


1. Slow Start Phase

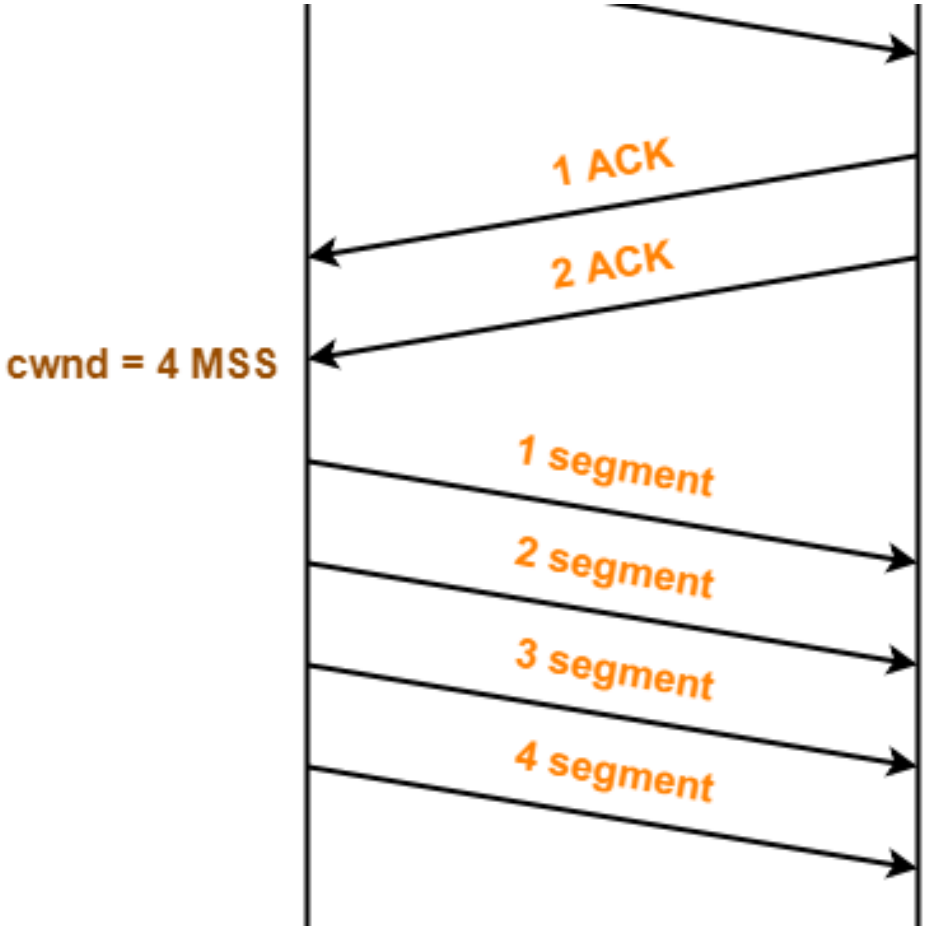
- Initially, sender sets congestion window size = Maximum Segment Size (1 MSS).
- After receiving each acknowledgment, sender increases the congestion window size by 1 MSS.
- In this phase, the size of congestion window increases exponentially.

Congestion window size = Congestion window size + Maximum segment size

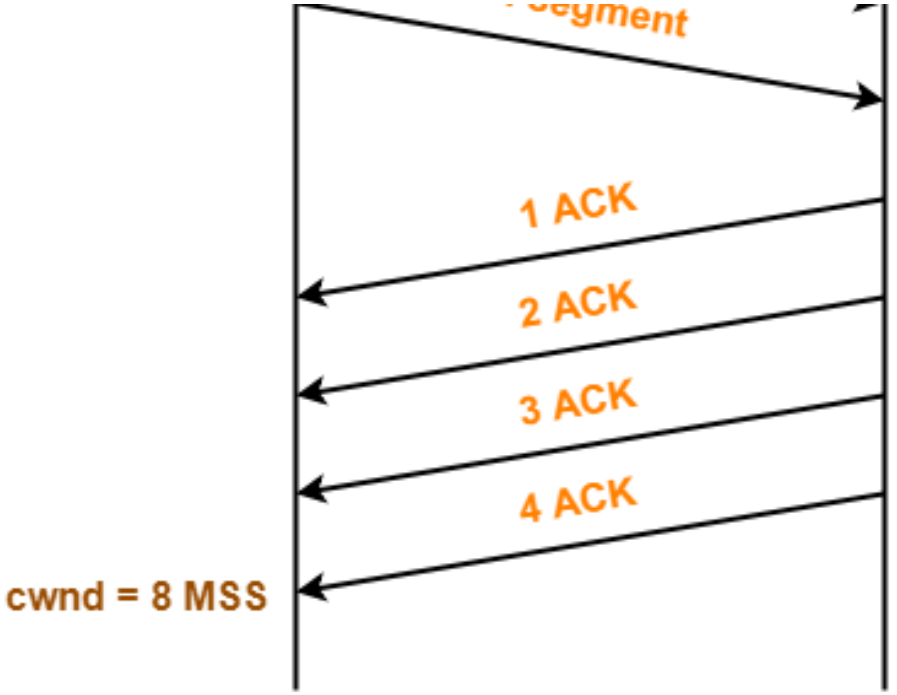
1. Slow Start Phase



1. Slow Start Phase

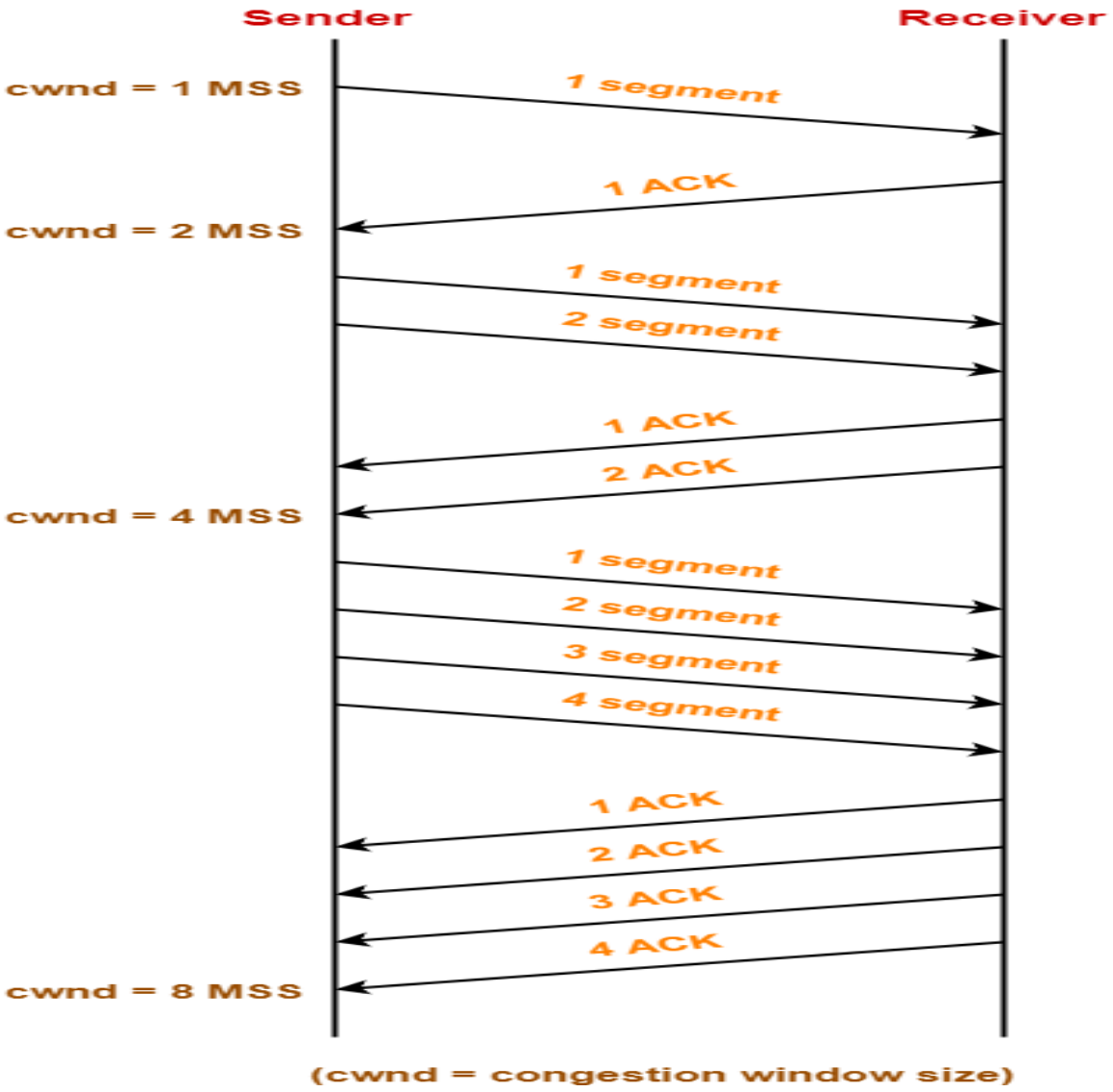


1. Slow Start Phase



(cwnd = congestion window size)

1. Slow Start Phase



1. Slow Start Phase

- After 1 round trip time, congestion window size = $(2)^1$ = 2 MSS
- After 2 round trip time, congestion window size = $(2)^2$ = 4 MSS
- After 3 round trip time, congestion window size = $(2)^3$ = 8 MSS and so on.

1. Slow Start Phase

This phase continues until the congestion window size reaches the **slow start threshold**.

Threshold

= Maximum number of TCP segments that receiver window can accommodate / 2

= (Receiver window size / Maximum Segment Size) / 2

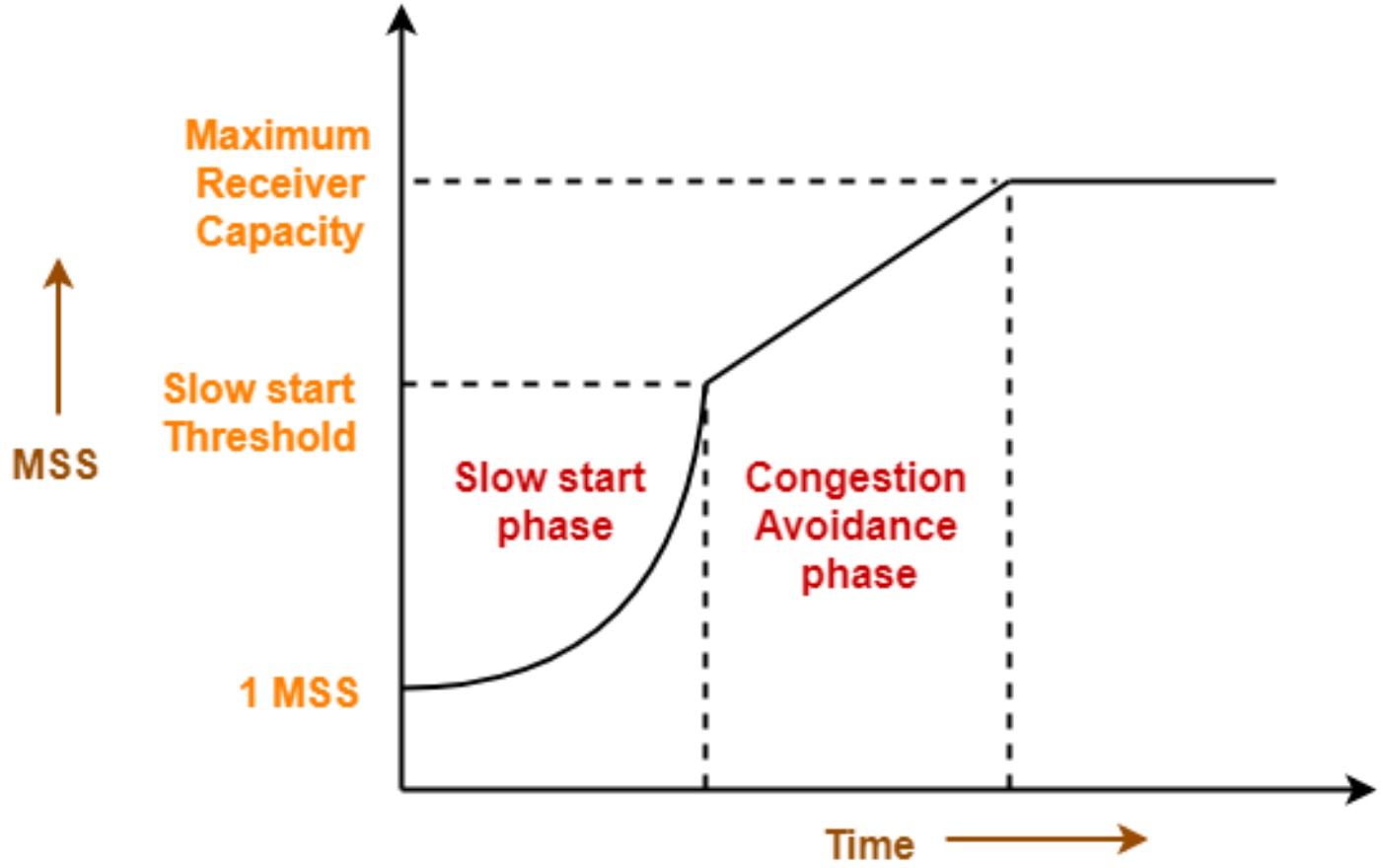
2. Congestion Avoidance Phase-

After reaching the threshold,

- Sender increases the congestion window size linearly to avoid the congestion.
- On receiving each acknowledgement, sender increments the congestion window size by 1.

Congestion window size = Congestion window size + 1

2. Congestion Avoidance Phase-



3. Congestion Detection Phase-

Case-01: Detection On Time Out-

- Time out Timer expires before receiving the acknowledgement for a segment.
- This case suggests the stronger possibility of congestion in the network.
- There are chances that a segment has been dropped in the network.

3. Congestion Detection Phase-

Reaction-

In this case, sender reacts by-

- Setting the slow start threshold to half of the current congestion window size.
- Decreasing the congestion window size to 1 MSS.
- Resuming the slow start phase.

3. Congestion Detection Phase-

Case-02: Detection On Receiving 3 Duplicate Acknowledgements-

- Sender receives 3 duplicate acknowledgements for a segment.
- This case suggests the weaker possibility of congestion in the network.
- There are chances that a segment has been dropped but few segments sent later may have reached.

3. Congestion Detection Phase-

Reaction-

In this case, sender reacts by-

- Setting the slow start threshold to half of the current congestion window size.
- **Decreasing the congestion window size to slow start threshold.**
- Resuming the congestion avoidance phase.

Animation Video of TCP congestion Control

ASSESSMENT

1.What is the message format in Transport layer ?

2.List the Congestion control mechanism in TCP

3.Mention the applications of TCP

THANK YOU