CN Lab (17CSL57)

Exp 02:
Congestion in 6 Nodes Network

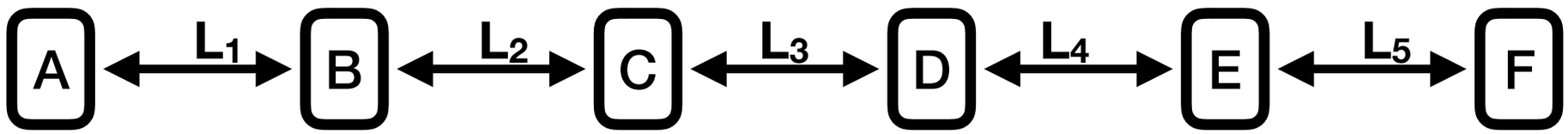
Dr. Ram P Rustagi
Dept of CSE, KSIT
KRP-KSGI
rprustagi@ksit.edu.in

Lab02 Program

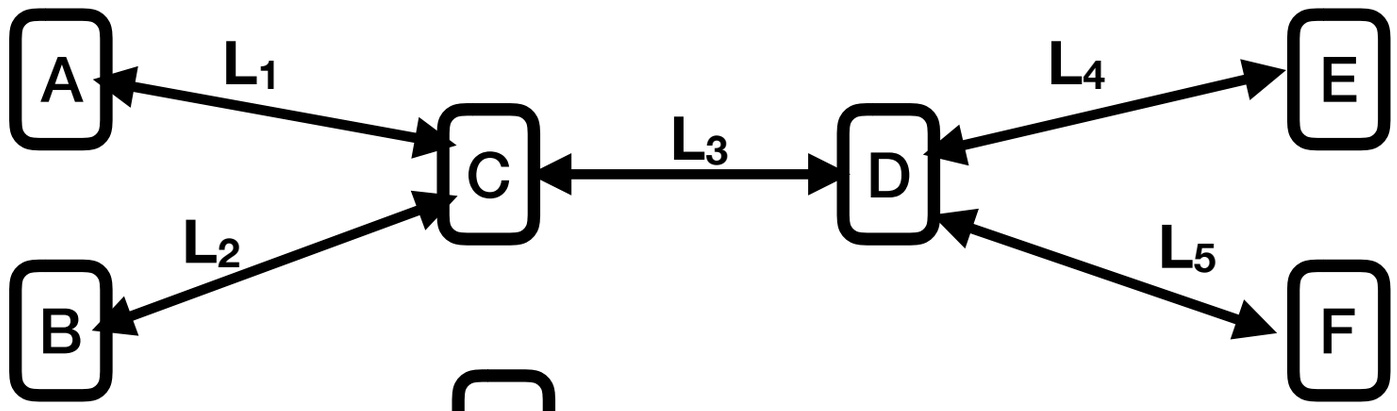
- Program 02
  - Implement transmission of ping messages/trace route over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.

Lab02: Design Parameters

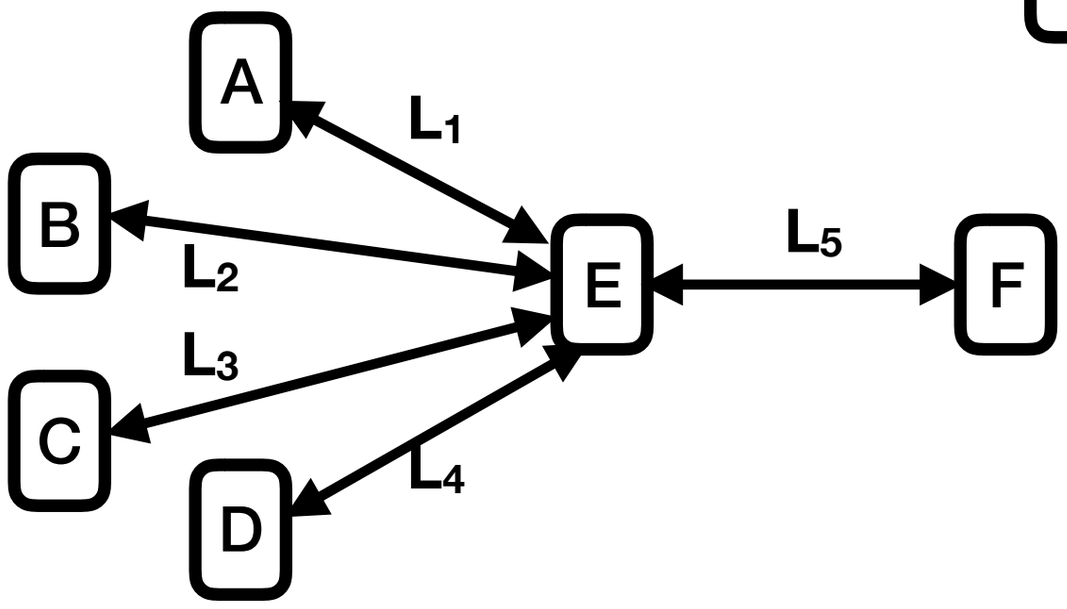
- Design of Lab02: Topologies
  - Topology: many topologies possible. Few examples



Topo 1



Topo 2



Topo 3

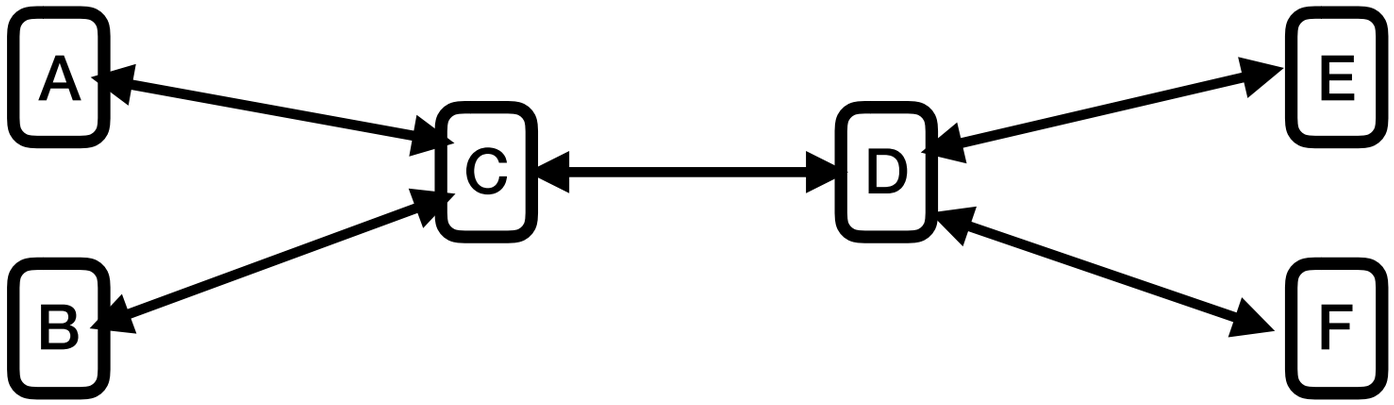
Lab02: Design Parameters

- Design of Lab02: Q parameters
  - Packet queuing will occur when on a link packet receive rate is greater than packet transmit rate
  - Packets will drop number of pkts in Q exceed Q size
  - Arrival/departe rate depends upon
    - Bandwidth, Packet size, propagation delay
      - Propgation delay depends upon link length, speed
  - Parameter specification
    - Bandwidth: Mbps;
    - packet size: Bytes;
    - Propagation delay: ms
    - Q size: number of packets

Lab02: Link Parameters

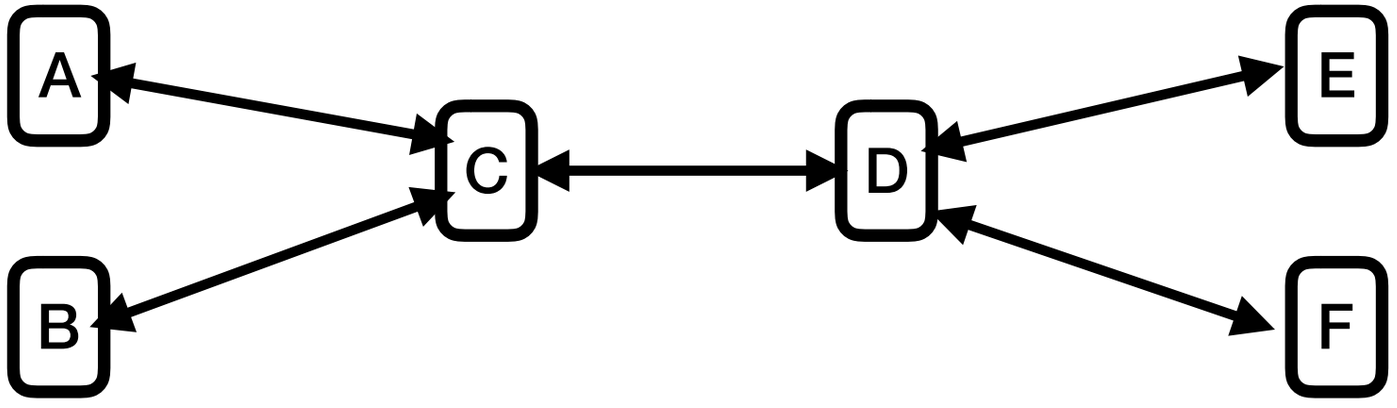
- Example of Link parameters
- packet size: 1000 bytes, num pkts = 20
  - L_1: BW= 8Mbps, Prop. delay=1ms, Qsize=5
  - L_2: BW= 4Mbps, Prop. delay=1ms, Qsize=5
  - L_3: BW= 2Mbps, Prop. delay=1ms, Qsize=5
  - L_4: BW= 1Mbps, Prop. delay=1ms, Qsize=5
  - L_5: BW= 4Mbps, Prop. delay=1ms, Qsize=5

Experiment 2a (Simplest Topology)



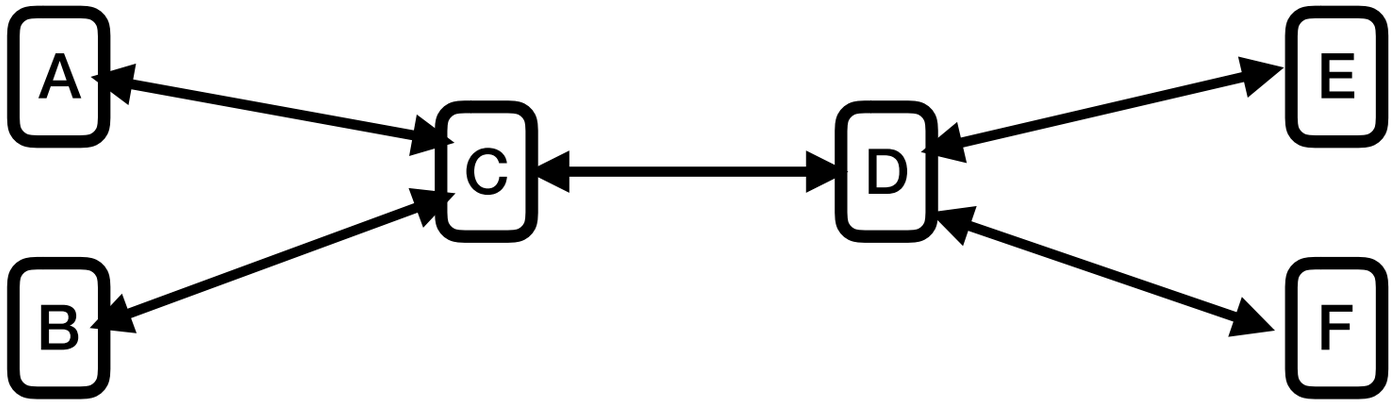
- All links (except C↔D): BW= 1 Mbps, Q: default
- Link C↔D: BW=1.5Mbps, Q=3
- Propagation delay of all links 1ms
- Packet size 750 bytes (6000 bits)
- Delay computation
  - All links (except C↔D):7ms (Trans:6ms, Prop:1ms)
  - Link C↔D: 5ms (4ms: Trans, 1ms: Prop)
- Packet transmission rate
  - A sends Ping traffic to E, one pkt every 7ms
  - B sends UDP traffic to F, one pkt every 7ms

Experiment 2a: Analysis of Q status



- C receives 2 pkts every 7ms (ping from A, cbr from B)
  - First 2 pkts at 7ms, then at
    - 14ms, 21ms, 28ms, …
- C transmits 1 pkt every 4ms
  - First pkt trasmission is at 7ms,
  - Subsequent pkts transmission at
    - 11ms
    - 15ms
    - 19ms
    - …

Experiment 2a: Analysis of Q status

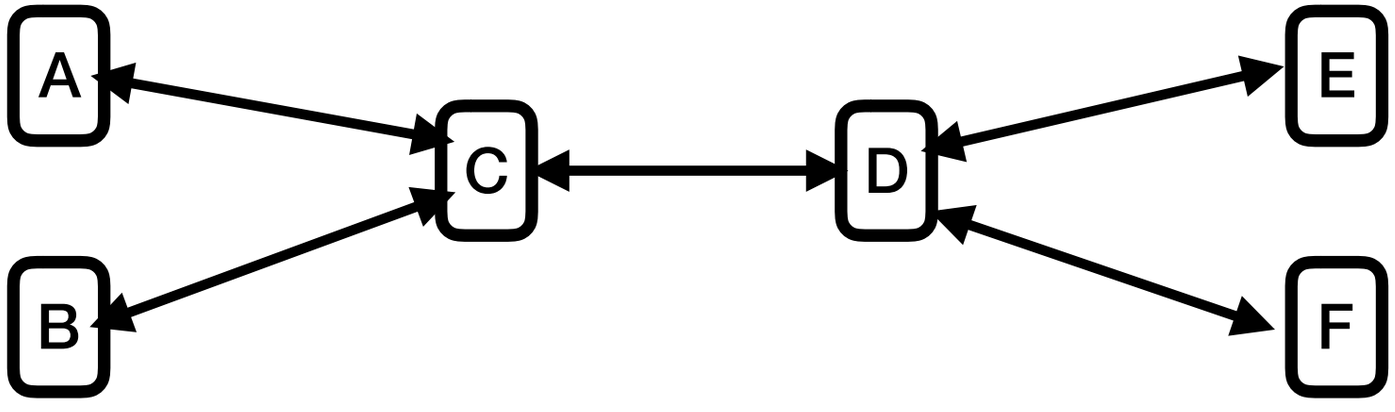


- Q Status at C (for link C↔D)

```
Time    Q   Comment
 7ms    2   Received pkt0:A(ping),pkt1:B(cbr)
 7ms    2   pkt0 (ping) is transmitted
11ms    1   pkt1(cbr) is transmitted

14ms    3   recd pkt2: A(ping), pkt3: B(cbr).
15ms    2   pkt2 (cbr) is transmitted
19ms    1   pkt3(cbr) is transmitted
19ms    1   pkt6(ping resp pkt0) generated at E
```

Experiment 2a: Analysis of Q status



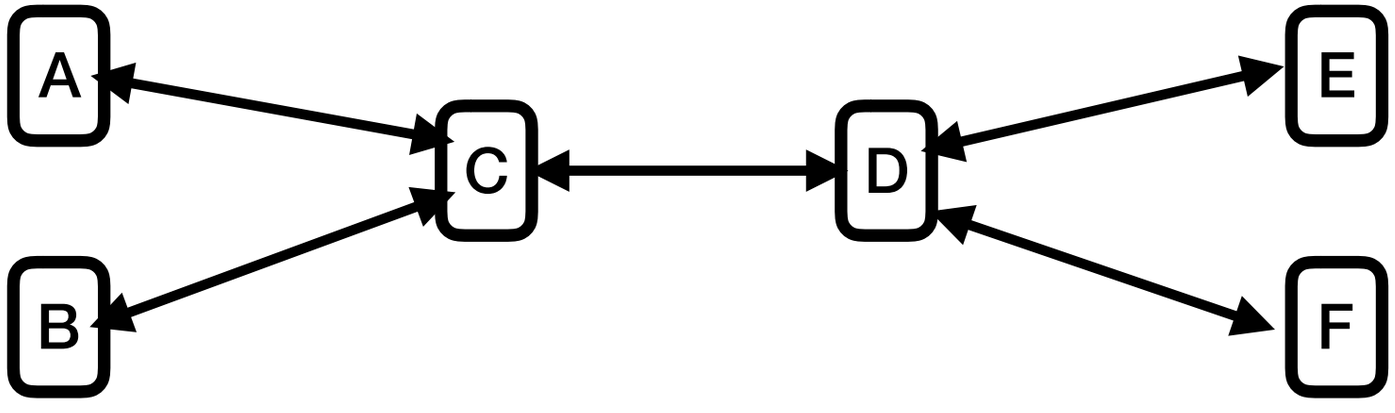
- Q Status at C (for link C↔D)

Time Q Comment

```
21ms   3   recd pkt4: A(ping), pkt5: B(cbr)
23ms   2   pkt4(ping) is transmitted
27ms   1   pkt5(cbr) is transmitted
27ms   1   pkt9(ping resp pkt 2) generated at E

28ms  3   recd pkt7: A(ping), pkt8: B(cbr)
31ms  2   pkt7(ping) is transmitted
```

Experiment 2a: Analysis of Q status



- Q Status at C (for link C↔D)

Time	Q	Comment
35ms	4	recd pkt10: A(ping), pkt11: B(cbr)
35ms	3	Queue exceeds, pkt 11 is dropped.
35ms	2	pkt8(cbr) is transmitted
39ms	1	pkt10(ping) is transmitted
42ms	3	recd pkt12: A(ping), pkt13: B(cbr)

Experiment 2b

- Work with differnet values of bandwidths, packet size, Q Size, pkt transmission rate and work out the queueing and packet loss,
- Example
  - Pkt size: 1000 bytes
  - All link bandwidths 2Mbps
  - A and B transmits pkts every 6ms.
  - Q Size at C is 4.

Summary

- 6 nodes networks
  - Multiple topologies possible