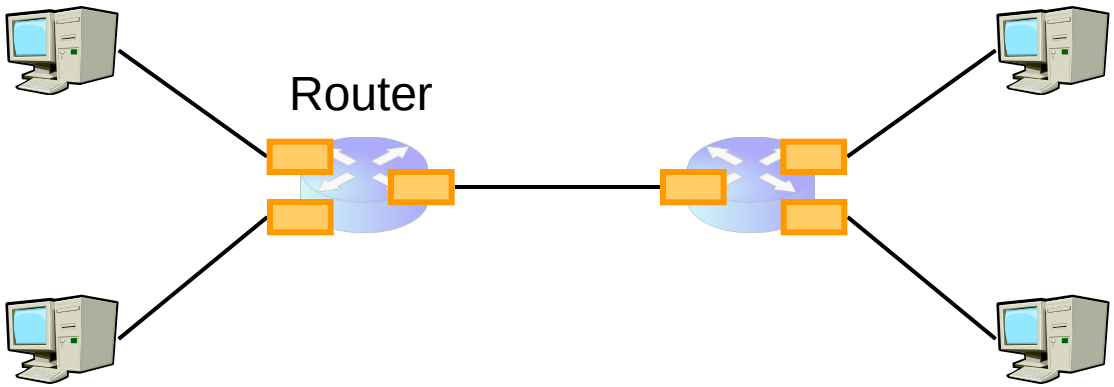
Role and Mechanism of Queue

Practice 1

Information and Communications Technology
Internet Engineering

What is Queue（buffer）

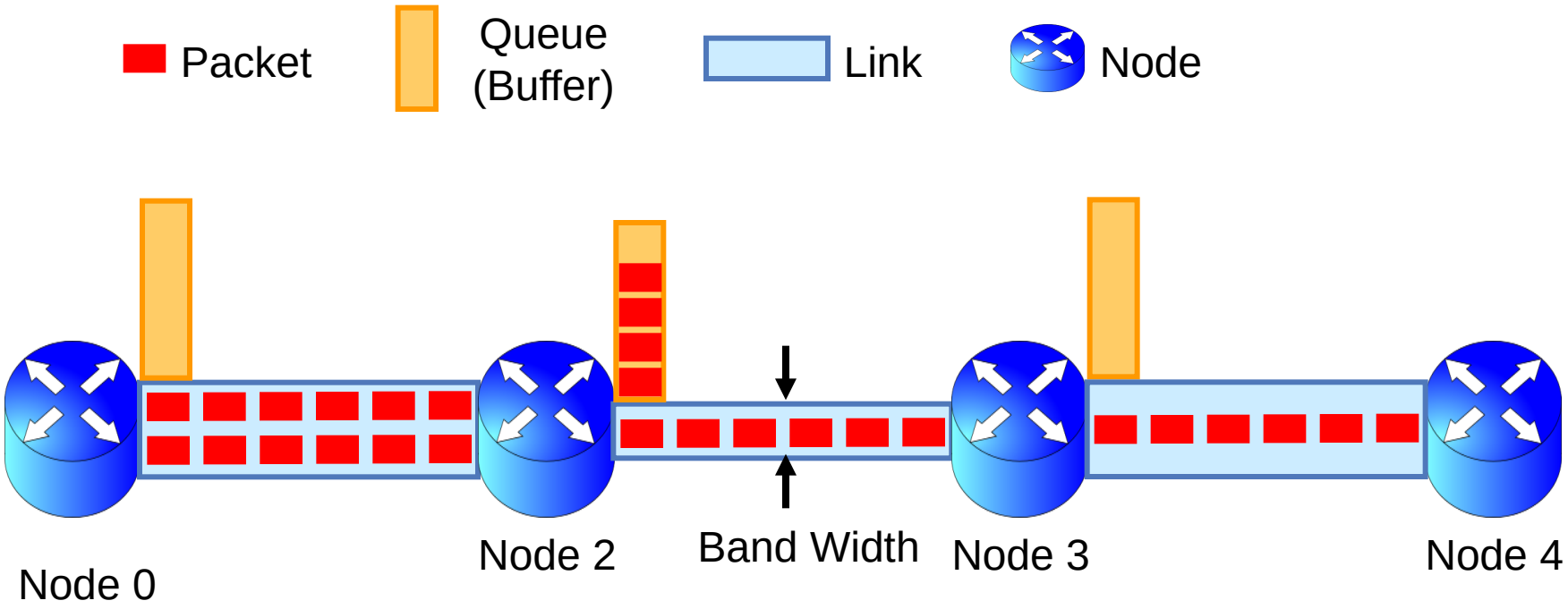
- Packet exchange ＝ Accumulation exchange



Queue
（buffer）

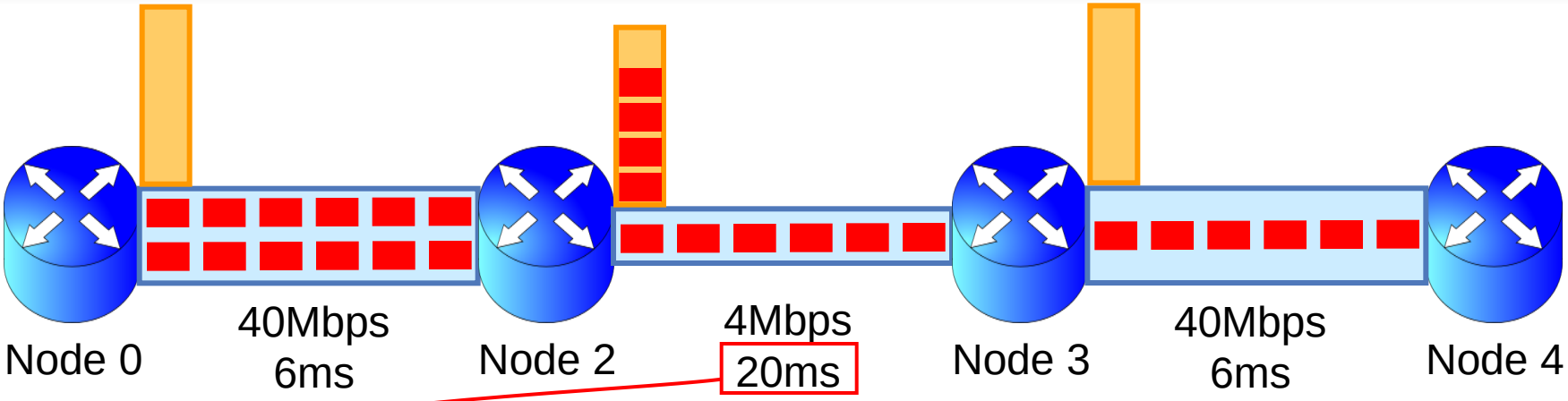
  - Router temporary stored packet in buffer
    - Packet is queued and then stored
    - （In Drop Tail）earlier income packet will transmit soon
  - If the queue overflow, packet will be dropped

Relationship between Node, Queue, Link



- In NS2, all the links have a queue
- Packet go through queue before sending to the link
- If input rate is larger than output rate, over flow packets will be accumulated in Queue
  - It can response in case traffic temporary increase
  - Packet which larger than Queue will be dropped

Packet flow



Why?

84ms

62ms

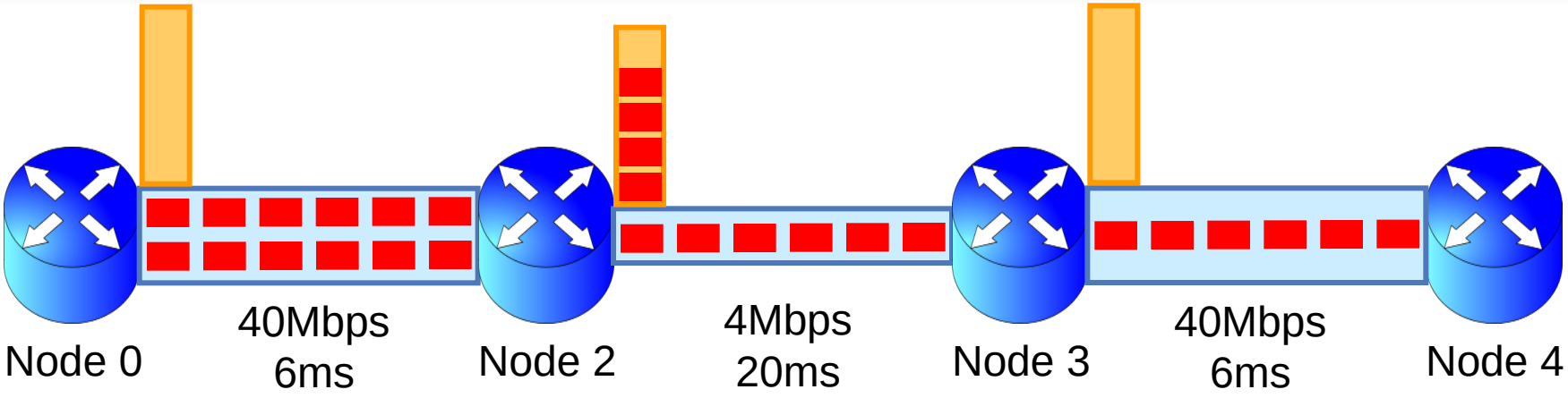
22ms

```
+ 0.062  0 2 cbr 1000 ------- 0 0.0 4.0 62 62
- 0.062  0 2 cbr 1000 ------- 0 0.0 4.0 62 62
r 0.0682 0 2 cbr 1000 ------- 0 0.0 4.0 62 62
+ 0.0682 2 3 cbr 1000 ------- 0 0.0 4.0 62 62
- 0.1302 2 3 cbr 1000 ------- 0 0.0 4.0 62 62
r 0.1522 2 3 cbr 1000 ------- 0 0.0 4.0 62 62
+ 0.1522 3 4 cbr 1000 ------- 0 0.0 4.0 62 62
- 0.1522 3 4 cbr 1000 ------- 0 0.0 4.0 62 62
r 0.1584 3 4 cbr 1000 ------- 0 0.0 4.0 62 62
```

Observe the packet（ID=62）(% awk '$12==62' out.tr)

※experiment 1-1-(b): band width 4Mbps

Time for forwarding packet



Time for sending packet from node 0 to node 2

62ms Queuing time in Queue → (Queue length) × (Time for sending packet out)

※Queue length：the number of packet kept in queue (this ex is)

＋

2ms Forwarding time → (Packet size [bytes]) ÷ (Band Width of Link [Mbps])

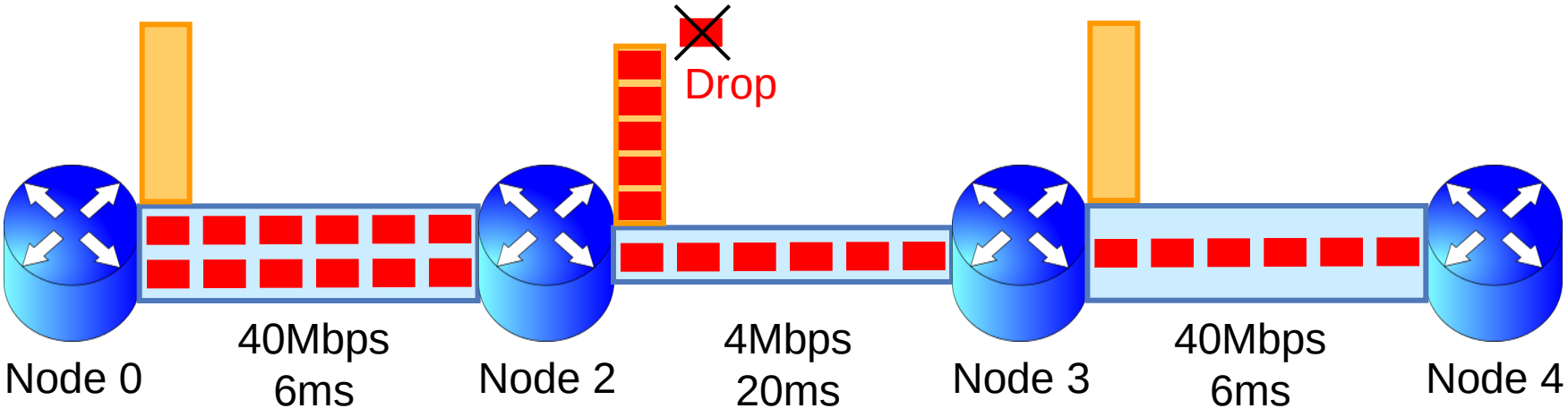
1000[bytes] 4[Mbps]

＋

20ms Time for transmit Between links → （Link delay）

Total *84ms*

Packet flow（Drop packet）



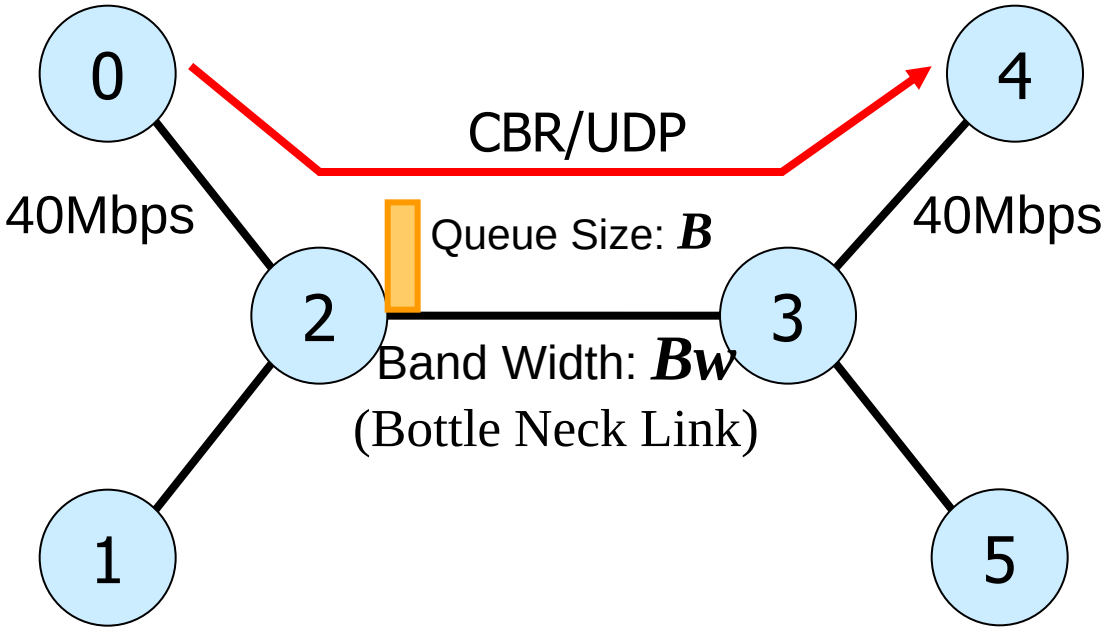
Drop after join a queue

```
+ 0.063   0 2 cbr 1000 ------- 0 0.0 4.0 63 63
- 0.063   0 2 cbr 1000 ------- 0 0.0 4.0 63 63
r 0.0692  0 2 cbr 1000 ------- 0 0.0 4.0 63 63
+ 0.0692  2 3 cbr 1000 ------- 0 0.0 4.0 63 63
d 0.0692  2 3 cbr 1000 ------- 0 0.0 4.0 63 63
```

Observe packet（ID=63）by （% awk ‘$12==63’ out.tr）

※In experiment 1-1-(b), band width is 4Mbps

Experiment 1-2



- Consider following relationship
  - Sending traffic rate
  - Band width of Bottle neck link
  - Queue length
  - Number of byte discarded from queue

【Supplement】Experimental methodology of Experiment 1-2

```
% ns kadai1-2.tcl 1.0Mb 32
                  (Bw)  (B)
```

– out.tr out.nam out.queue out.udp is created

```
% gnuplot
gnuplot> l “kadai1-2.gp”
gnuplot> …
gnuplot> set term post color
gnuplot> set output “graph.ps”
gnuplot> rep
gnuplot> q
```

- If you don’t like the format, you can modify `kadai1-2.gp`

【Supplement】out.queue content

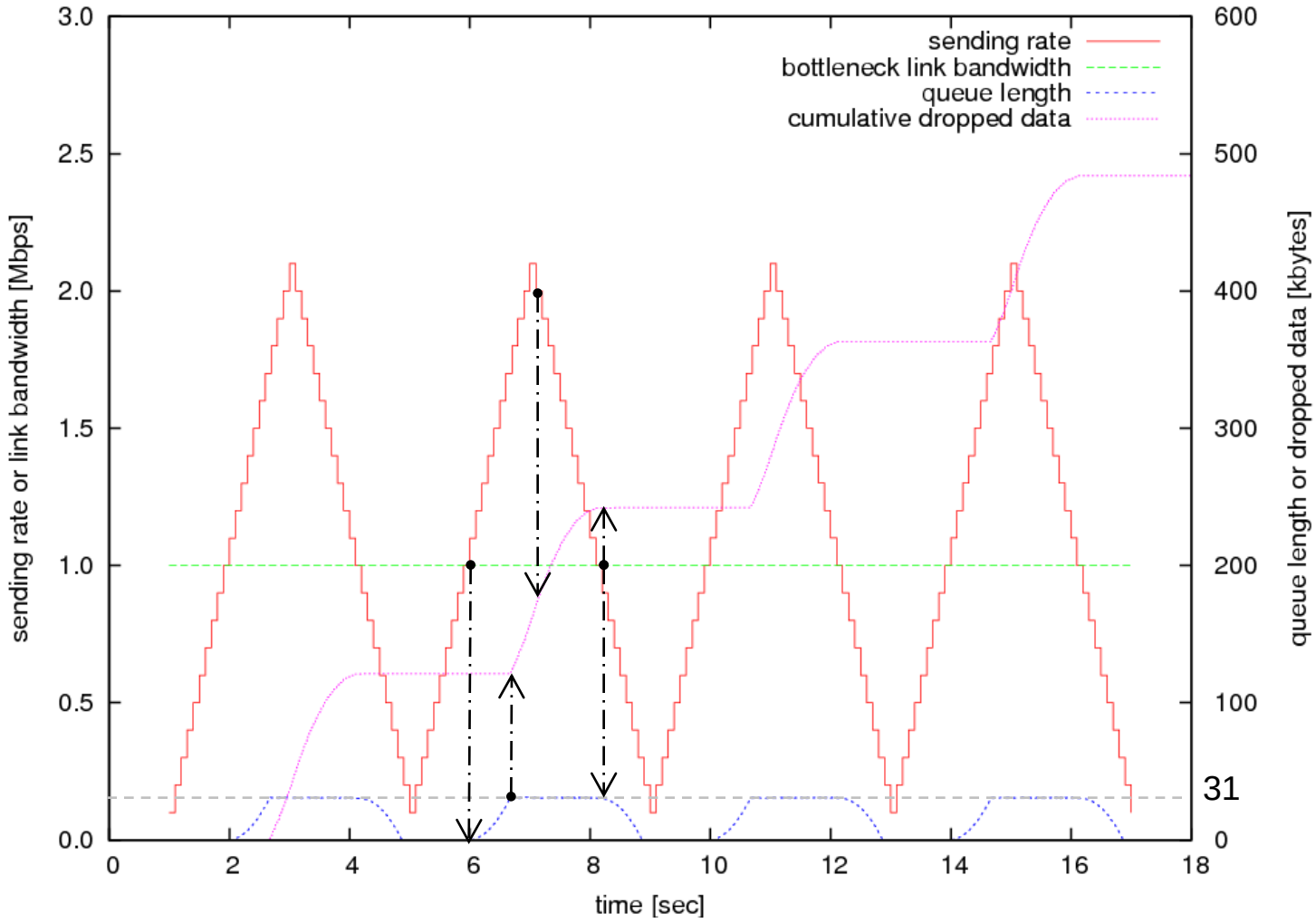
- out.queue (Traced file of queue)
  - $1 : time
  - $2, $3 : position of queue（link）
  - $4 : accumulated data in queue (queue length) [bytes]
  - $5 : accumulated packet number in queue [packets]
  - $6 : number of packet arrived to queue [packets]
  - $7 : number of packet sent out from queue[packets]
  - $8 : number of drop packets by queue [packets]
  - $9 : amount data arrived queue [bytes]
  - $10 : amont of data send out from queue [bytes]
  - $11 : amount of data drop by queue [bytes]

※ $5～$11is cumulative value by simulation time

【 Supplement 】out.udp content

- out.udp (Trace file of UDP)
  - $1 : time
  - $2 : send traffic [Mbps]
  - $3 : bandwidth of bottle neck [Mbps]

Example of graph（attention point）



※In experiment 2 when *Bw* is 1.0Mbps and 32kbytes