



# Flow control algorithms revisited

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# Overview

- Flow control algorithms revisited
  - Bandwidth management
  - Max and min station adapter configuration
- What does it mean to send at a specific rate.



# Bandwidth Management

- All stations send at a Default/PreAllocated/Provisioned Rate
- This is the same as if every station has a (pre) negotiated Weight
- How to use/allocate excess bandwidth ?
- How to throttle the use of excess bandwidth ?



# Default rates - Weights

- The sum of all default rates does not congest the system (if configured correctly)
- Can be 0 for all
- Could be  $1/N$  for all
  - where  $N$  is number of stations on the ring
- Could / should be partitioned into segments (by all stations – per VOQ)

VOQ: Virtual Output Queue

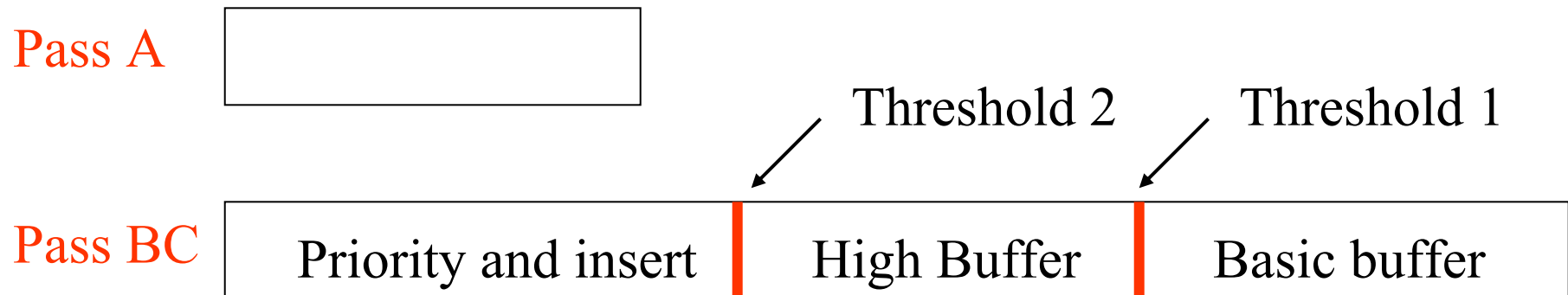


# Station adapter configuration

## Full station passthru configuration

Two Passthru fifos

- A has absolute priority over BC
- Pass A has priority over Add/Transmit A.





# Minimum Passthru config.

One small Passthru fifo only

Pass ABC



The buffer part of the passAB fifo has collapsed to nothing

The insert/prio of passBC and passA has collapsed into one

Lemma: All passthru traffic has priority over Add traffic



# Flow control/ Fairness algorithm

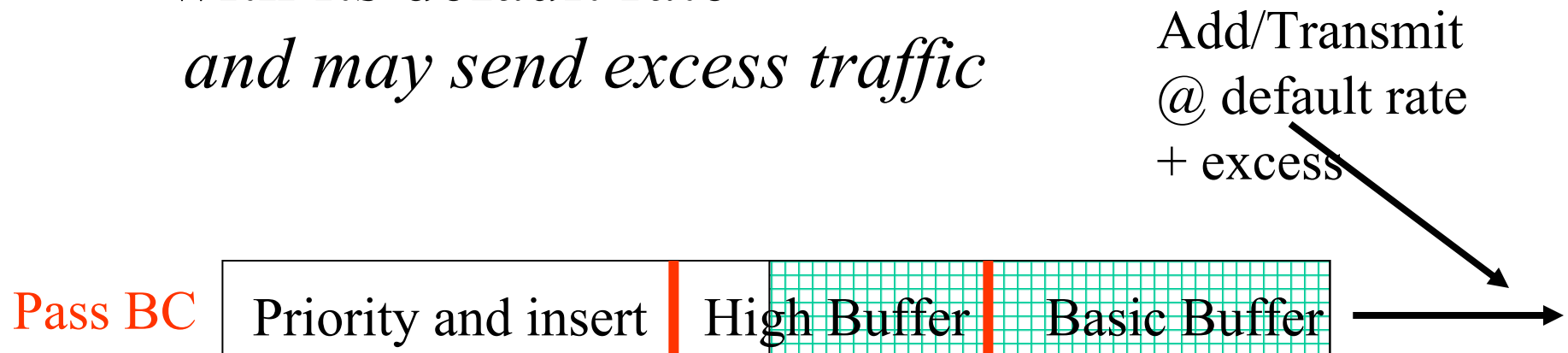
(What we want)

- The same algorithm for both max and min configurations (and in-between configs.)
- The same control messages for all configurations (we hope)

# Station add traffic

(max configuration)

- As long as there are packets in the Buffer part of the passthru fifo, and not in the prio&insert part, the station adds traffic with its default rate  
*and may send excess traffic*

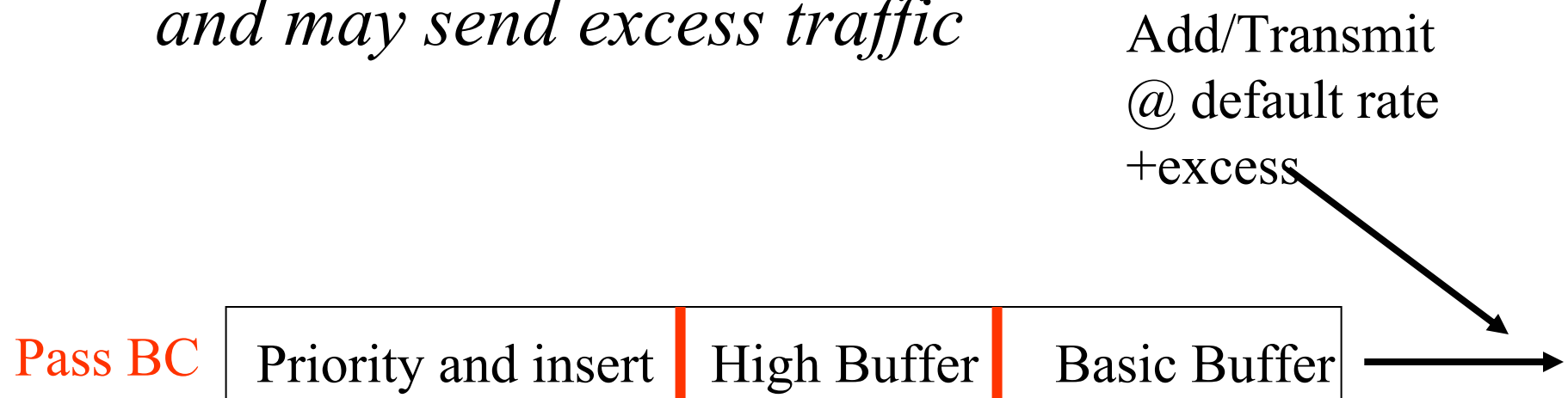




# Station add traffic

(max configuration)

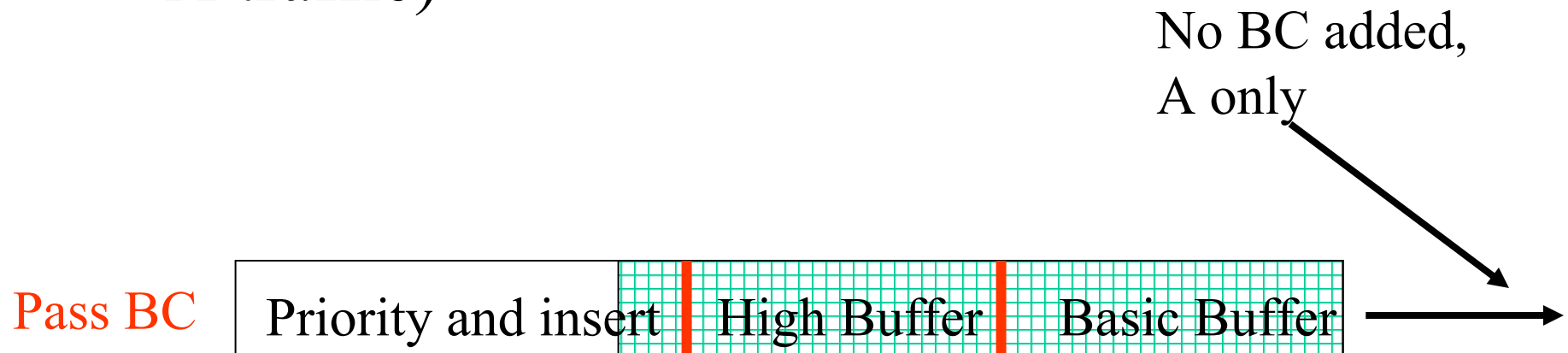
- As long as there are no packets in the passthru BC fifo, the station adds BC traffic with its default rate  
*and may send excess traffic*



# Station add traffic

(max configuration)

- As long as there are packets in the Priority and insert part of the passthru fifo, the station does not add traffic (except for A traffic)

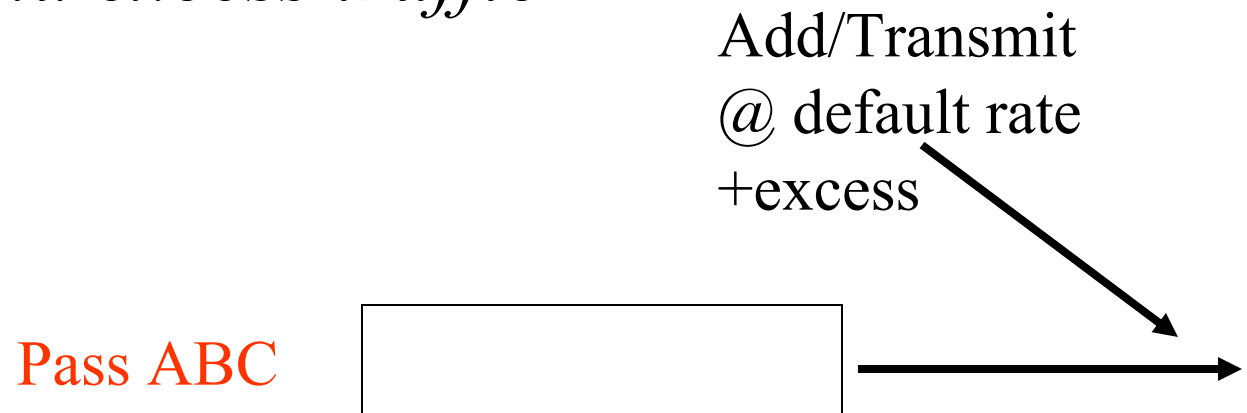




# Station add traffic

(min configuration)

- As long as there are no packets in the passthru fifo, the station adds traffic with its default rate  
*and may send excess traffic*

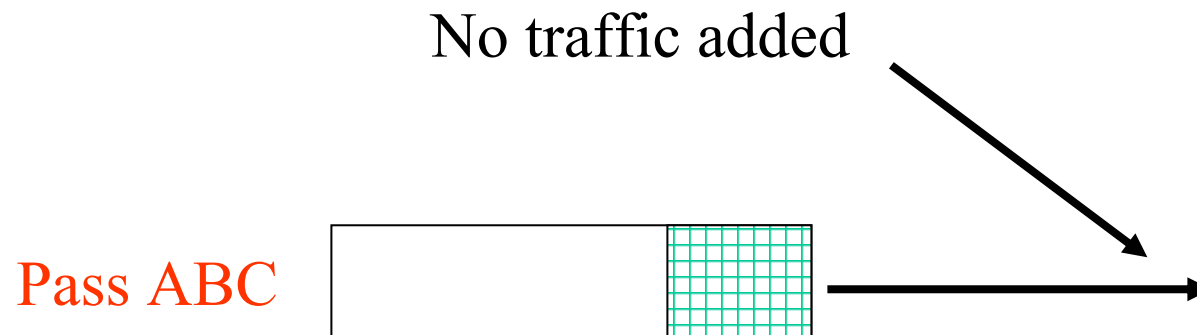




# Station add traffic

(min configuration)

- As long as there are packets in the passthru fifo, the station does not add traffic





# In between configuration

Pass A



Pass BC

Priority and insert

- As long as there are no packets in the passthru BC fifo, the station adds BC traffic at its default rate  
*and may send excess traffic*



# The ultimate questions

- When can a station send excess traffic?
- How to allocate and de-allocate excess traffic
- Dynamically by MAC ?
- By MAC or by Clients ?
- Congestion avoidance ? or
- Congestion detection and relief ?



# Congestion avoidance

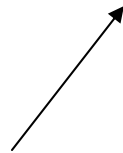
- Notify other of available bandwidth
- Notify again when this bandwidth is not available any more
- (as outlined in am\_macdraft\_01)



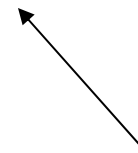
# Congestion detection and relief

- Congestion detection
  - PassBC is filled above Threshold 1
- Congestion avoidance
  - Send usage rate or idle count upstream

nu\_draft\_01,



dvj\_draft\_0.15:27





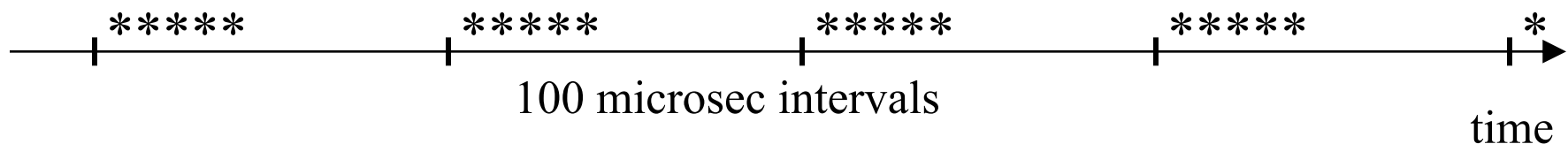
# Congestion

- Avoidance is a more long term scheme
- Detection and relief is a more short-term / dynamic scheme
- Can we have both?
- Similarities:
  - Signal OK to send excess traffic
    - or just do it and beg forgiveness (i.e. be stopped)
  - Signal stop sending excess traffic

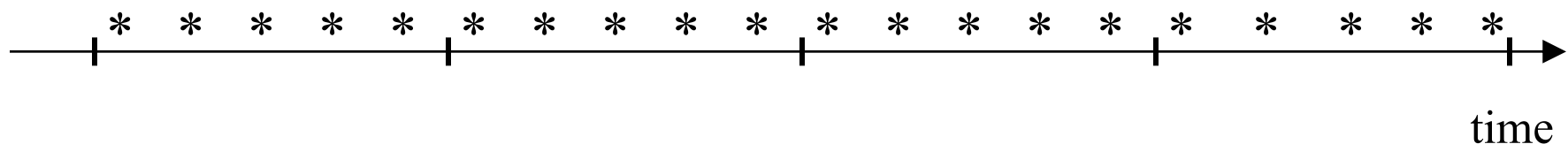


# What does it mean to send at a specific rate

- The stations should send packets ALL the time according to its allowed rate
- Means: Not in bursts
- E.g. not in 100 microsecond bursts like:



- But like:



\* Means one packet sent