

Traffic Shaper

[dummynet](http://caia.swin.edu.au/reports/160708A/CAIA-TR-160708A.pdf) - flexible bandwidth manager and delay emulator
<http://caia.swin.edu.au/reports/160708A/CAIA-TR-160708A.pdf>

Some terms:

- **AQM - Active Queue Management**
 - **droptail** - drop packets if full
 - **CoDel**
 - **PIE**
- **pipe** (link, limiter)- virtual path that emulates a connection with a specified bandwidth, propagation delay, and packet loss pattern.
- **scheduler** - arbitrate access of multiple flows to the same link (pipe)
 - FIFO
 - DRR
 - PRIO
 - WF2Q+
 - QFQ
 - KPS
- Simple pipe internally has attached
 - queue (droptail)
 - scheduler (FIFO)
 - pipe (a link emulator with given badwidth and delay)

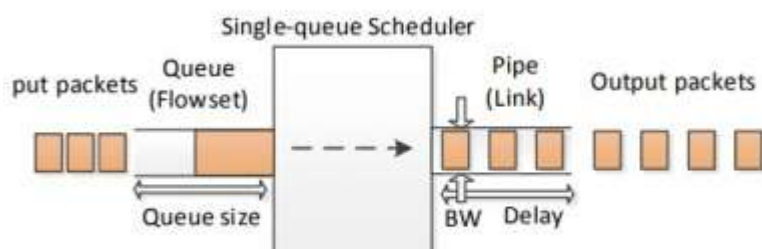


Figure 5: A Simple Dummynet Pipe

FQ-CoDel

The **FlowQueue-CoDel (FQ-CoDel)** algorithm is a combined packet scheduler and Active Queue Management (AQM) algorithm.

- Pipe with fq-CoDel AQM set
 - queue is a dummy queue without any management policy (no droptail). It is not used to buffer incoming packets
 - fq-CoDel scheduler manages internal queues to buffer packets

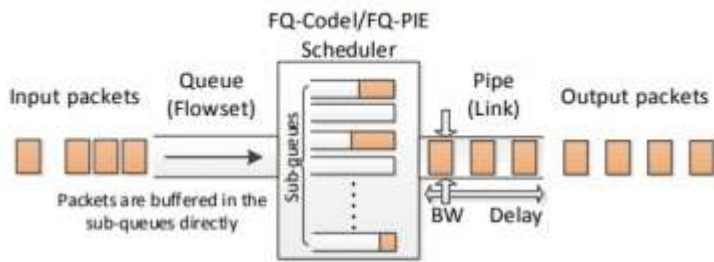


Figure 7: FQ-CoDel/FQ-PIE AQM/Scheduler in Dumynet

REMARKS:

- **fq-CoDel** on queues is ignored when **fq-codel** is enabled on pipe.
 - queue is needed (even if not really used). There is no other way to send packets to **fq-codel** scheduler. So creating a pipe with **fq-codel** will always create a queue.
- number of internal queues in **fq-codel** is configured by **flows** parameter

shell

```
ipfw pipe show
ipfw sched show
ipfw queue show
```

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