LinuxTweaks - CAKE QoS Configuration (Optus VDSL2 / F@ST 3864V3HP)

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This guide documents the reasoning and calculations used to apply optimal CAKE (Common Applications Kept Enhanced) QoS settings for a typical Optus VDSL2 (PTM) connection on Linux, using the tc (Traffic Control) utility.

System Summary

Modem Model: F@ST 3864V3HP

ISP: Optus (Australia)

Connection Type: VDSL2 over PTM

Encapsulation: PPPoE

Upload Sync Rate: 22,600 Kbps

Download Sync Rate: 60,104 Kbps

Bandwidth Calculation

Upload

Actual Upload Sync Rate: 22.6 Mbps

Shaping Target (95%):

22.6 Mbps × 0.95 = 21.47 Mbps -> use: bandwidth 21Mbit

Overhead Calculation

PTM + PPPoE encapsulation adds extra per-packet overhead:

PTM Framing: 22 Bytes

PPPoE Header: 8 Bytes

Ethernet II Header: 14 Bytes

Total Overhead: 44 Bytes

Use: overhead 44

Full tc Command

```
tc qdisc replace dev wlp3s0 root cake \
  bandwidth 21Mbit \
  diffserv4 \
  triple-isolate \
  nat \
  nowash \
  ack-filter \
  split-gso \
  rtt 25ms \
  overhead 44
```

Option Breakdown

```
bandwidth 21Mbit  -> Sets shaping rate below your line rate
diffserv4         -> Enables 4-class DiffServ
triple-isolate    -> Fairness across flows and hosts
nat               -> NAT awareness
nowash            -> Preserves DSCP marks
ack-filter        -> Drops redundant TCP ACKs
split-gso         -> Avoids large-packet unfairness
rtt 25ms          -> Typical Australian ISP RTT
overhead 44       -> DSL framing + PPPoE overhead
```

Ingress (Download) Shaping

Linux can't shape downloads directly. Options:

- Use ifb with ingress mirroring.
- Shape uploads only (practical).
- Shape on modem (rare with locked firmware).

Example Output (tc -s qdisc show dev wlp3s0)

```
qdisc cake 8001: root refcnt 2 bandwidth 21Mbit diffserv4 triple-isolate nat nowash ack-filter split-gso rtt 25ms raw overhead 44
 Sent 31134535 bytes 108864 pkt (dropped 2, overlimits 7151 requeues 0)
```

backlog 0b 0p requeues 0

memory used: 23400b of 5000000b

capacity estimate: 21Mbit

Persistence via systemd

/etc/systemd/system/linuxtweaks-cake.service

[Unit]

Description=Apply CAKE qdisc to wlp3s0 at boot

After=network-online.target

Wants=network-online.target

[Service]

Type=oneshot

ExecStart=/usr/sbin/tc qdisc replace dev wlp3s0 root cake bandwidth 21Mbit diffserv4 triple-isolate nat nowash ack-filter split-gso rtt 25ms overhead 44

RemainAfterExit=yes

[Install]

WantedBy=multi-user.target

Enable it:

sudo systemctl daemon-reexec

sudo systemctl enable --now linuxtweaks-cake.service

Also create linuxtweaks-cake-resume.service for suspend-resume support.

References

- https://www.bufferbloat.net/projects/codel/wiki/Cake/
- https://openwrt.org/docs/guide-user/network/traffic-shaping/sqm
- https://man7.org/linux/man-pages/man8/tc-cake.8.html

This config helps reduce bufferbloat, improve VoIP/gaming quality, and ensure fair bandwidth use on LAN

clients.