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

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
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bandwidth 21Mbit : Sets the shaping rate below your actual line rate to prevent bufferbloat
diffserv4 : Enables 4-class DiffServ: Bulk, Best Effort, Video, Voice
triple-isolate : Ensures fairness across flows, internal hosts, and IPs
nat : Enables NAT awareness (important for most home routers)
nowash : Preserves DSCP marks; disables default CAKE reset behavior

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ack-filter        : Drops redundant TCP ACKs to save bandwidth
split-gso         : Prevents large packets from causing unfair scheduling
rtt 25ms          : Round-trip time estimate (Australia typical RTT to ISP is ~20-30ms)
overhead 44       : Accounts for actual per-packet DSL framing + PPPoE encapsulation

Ingress (Download) Shaping
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Linux can't shape download traffic directly. Options:
- Use ifb with ingress mirroring.
- Prefer shaping uploads only (practical).
- Apply shaping on modem/router (if supported, usually not on locked Optus 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
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Create a systemd service: /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

For suspend-resume support, also create linuxtweaks-cake-resume.service.

References
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- CAKE: https://www.bufferbloat.net/projects/codel/wiki/Cake/
- OpenWRT SQM Guide: https://openwrt.org/docs/guide-user/network/traffic-shaping/sqm
- tc-cake man page: 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.
```