ABR Video Shaping

Marcus Ihlar
IETF 119
SCONEPRO BoF

x

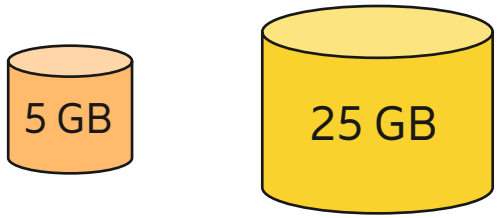
Why do some access networks throttle video?

- Bandwidth is a shared and limited resource.
- Bandwidth on network paths that rely on RF spectrum are even more limited
- Video is becoming the dominant form of media on the Internet
  - Dedicated video platforms.
  - Social media platforms dominated by short-form videos aka “reels”.
- Despite continuous capacity investments it is hard to keep up with demand for data.

Network Management Through Tiered Subscriptions

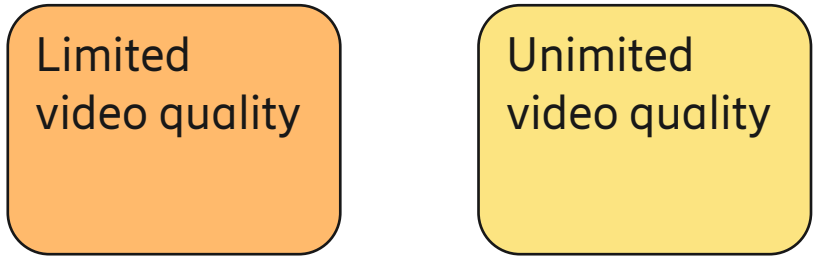
Data Cap

- Limited data buckets
- Pay more, get more data

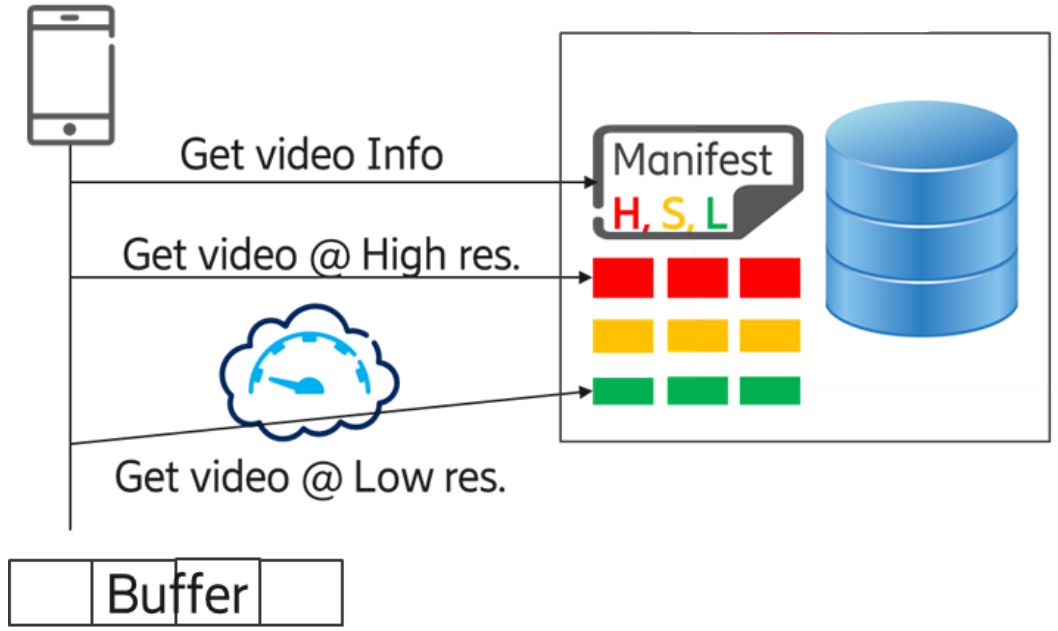


Bitrate Cap

- Unlimited data buckets
- Pay more, get higher resolution media content.

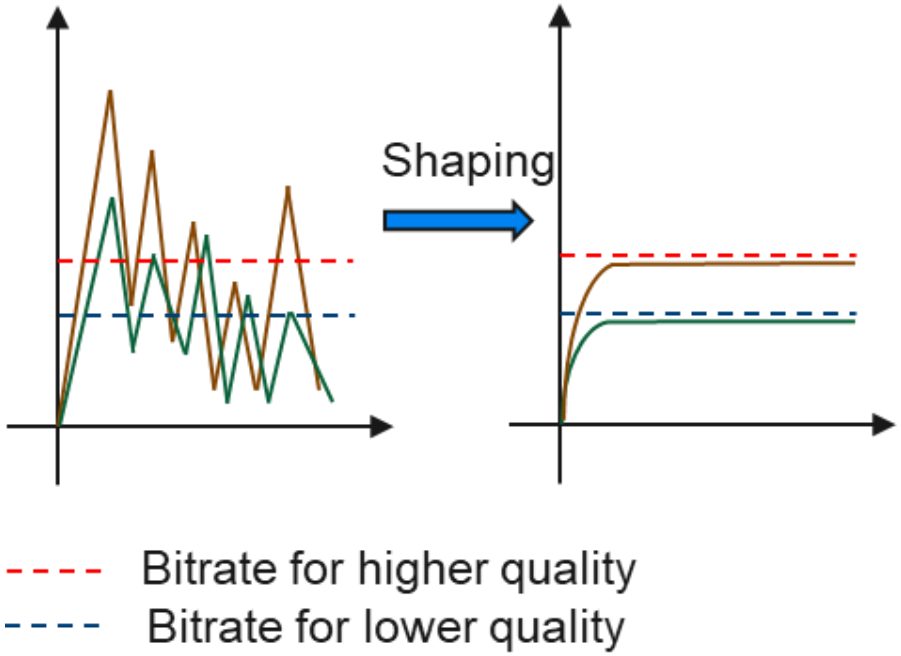


Adaptive Bitrate (ABR) Video



- Dynamic video resolution based on estimates and prediction of network capacity.
- Video divided into segments; each segment available in multiple resolutions and video qualities.
- Client selects resolution of next segment based on estimated network capacity and size of its playout buffer.

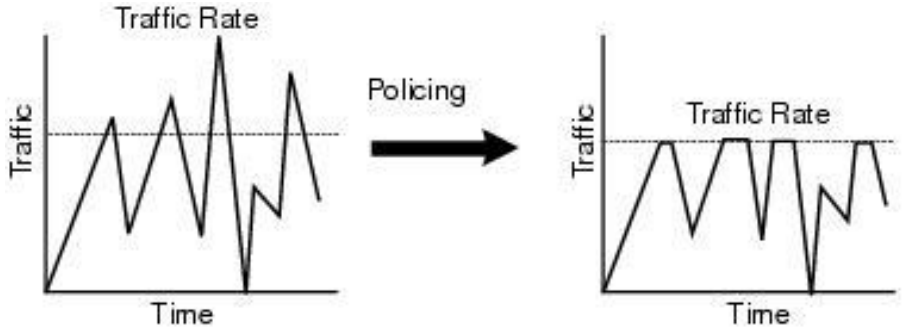
ABR Video Shaping



- Detect a video flow through deep packet inspection or heuristic methods.
  - Often implies trial decryption of QUIC Initial packets.
- Throttle the flow with a shaper or policer.
- Bitrate determined based on:
  - Subscription policy
  - Network state
- ABR client measures network capacity and fetches segments with restricted quality.

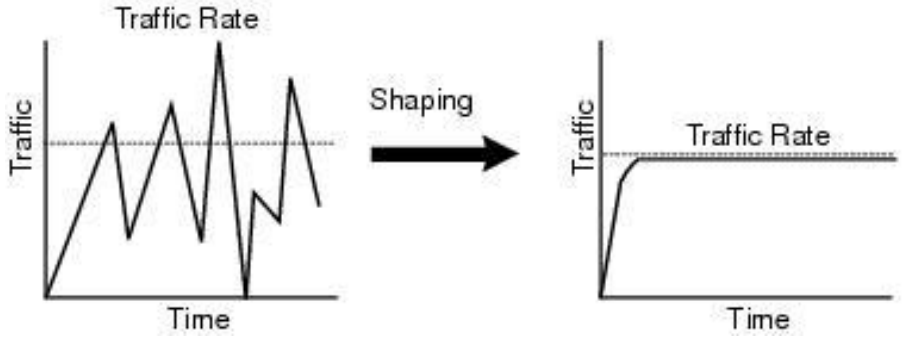
Policing and Shaping

A shaper or policer is an artificial bottleneck where out-of-policy packets are either dropped or buffered.



Packet loss in bursts at low RTTs.

Might allow traffic peaks – erratic and hard to predict loss patterns



Adds delay

Might allow traffic peaks – adds delay variation.

More costly due to buffering.

Issues with ABR Video Shaping

- Shapers and policers are designed to enforce a network policy.
  - User experience is not the primary objective.
- Tuning shapers and policers for video is difficult.
  - QoE impacts of tuning decisions are often not well known.
- Video detection is increasingly difficult as protocol fields gets increasingly encrypted.
  - Heuristic alternatives to DPI are fragile and error-prone.
- Different communication service providers work with different vendors
  - Each network behaves differently.
  - Applications builds heuristics to detect the presence and kind of shaping in networks.
  - Some networks work directly with application providers using proprietary mechanisms.

Is this as good as it gets?