

ABR Video Shaping



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Why do some access networks throttle video?



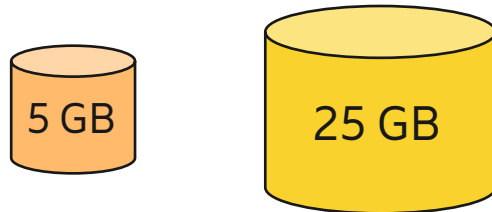
- RF spectrum is a shared and limited resource.
- Video is becoming the dominant form of media on the Internet
 - Dedicated video platforms.
 - Social media platforms dominated by short-form videos aka “reels”.
- Despite continuous capacity investments it is hard to keep up with demand for data.

Network Management Through Tiered Subscriptions



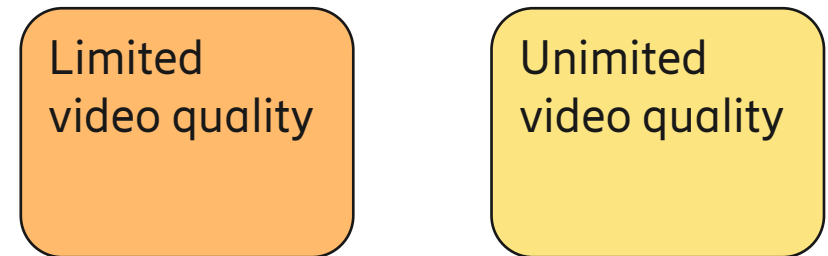
Data Cap

- Limited data buckets
- Pay more, get more data

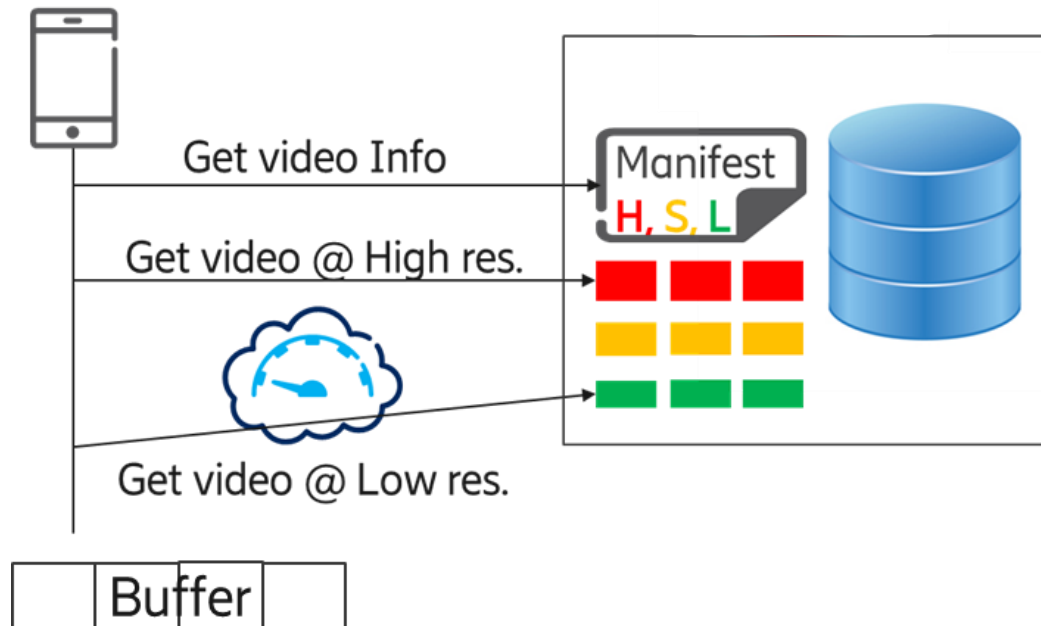


Bitrate Cap

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

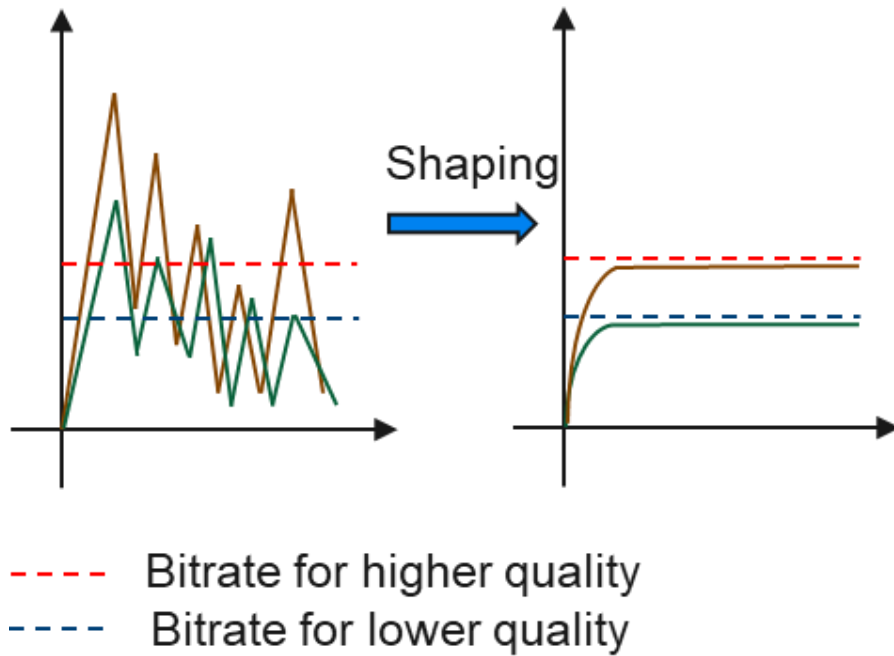


Adaptive Bitrate (ABR) Video



- ❑ 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

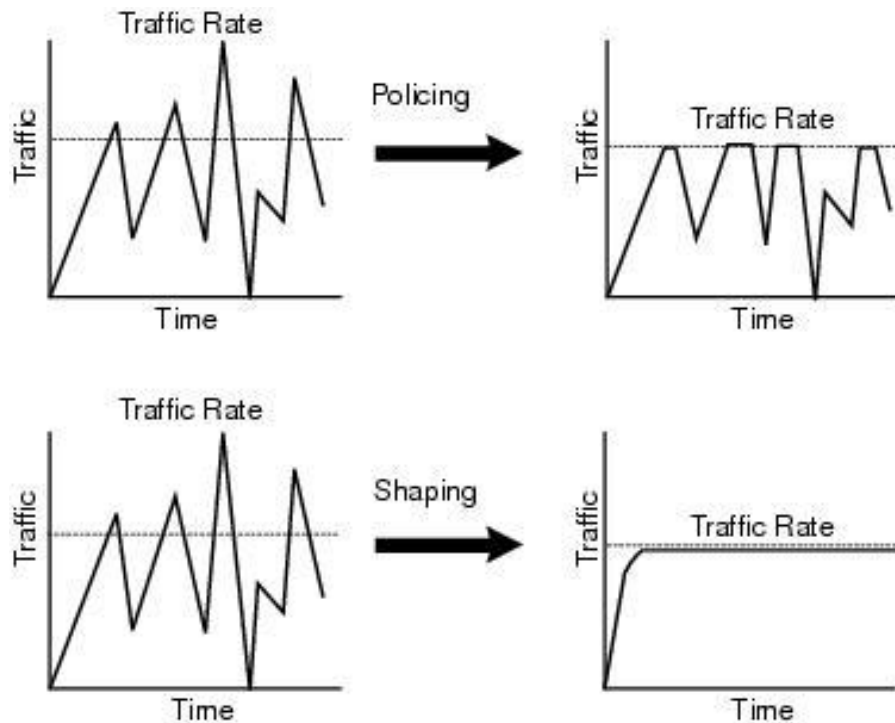


- Detect a video flow through deep packet inspection or heuristic methods.
 - Often implies trial decryption of QUIC Initial packets.
- Throttle the flow with a shaper or policer.
- Bitrate determined based on:
 - Subscription policy
 - Network state
- ABR client measures network capacity and fetches 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.
- Different communication service providers work with different vendors
 - Each network behaves differently.
 - Applications build heuristics to detect the presence and kind of shaping in networks.
 - Some networks work directly with application providers using proprietary mechanisms.

Can we do better?



