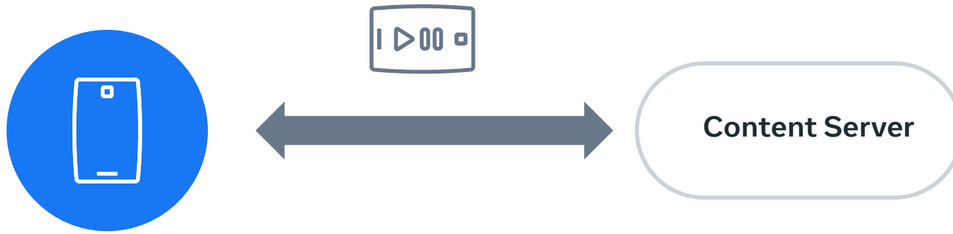
Adaptive Bitrate (ABR) Video Shaping

- Common practice in **several** access network types, not just mobile
  - Reduce traffic volume to manage load.
  - Differentiate between subscription tiers.
- Shaper typically implemented as Token Bucket Filter that either delays or drops packets.

- Configured so player adapts video quality to target bitrate (e.g. 2Mbps)

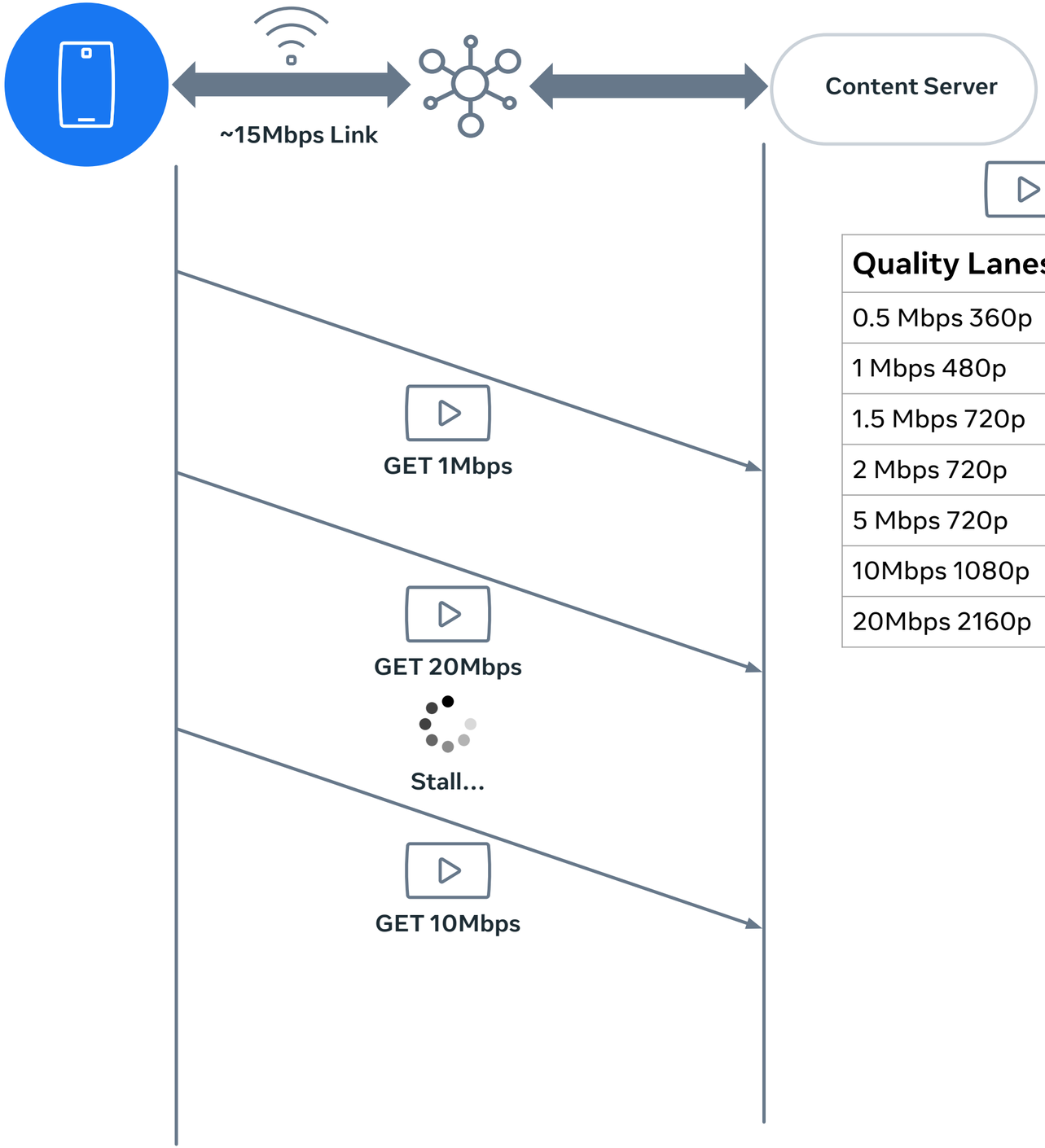


Adaptive Bitrate Video w/o Shaping

Modern ABR schemes can vary video quality requested per segment (e.g. HLS or DASH).

Adapts quality fetched to try to maximize bitrate without stalling based on measured bandwidth.

Real time video often has a similar (trial and error) approach to find the optimal bitrate.



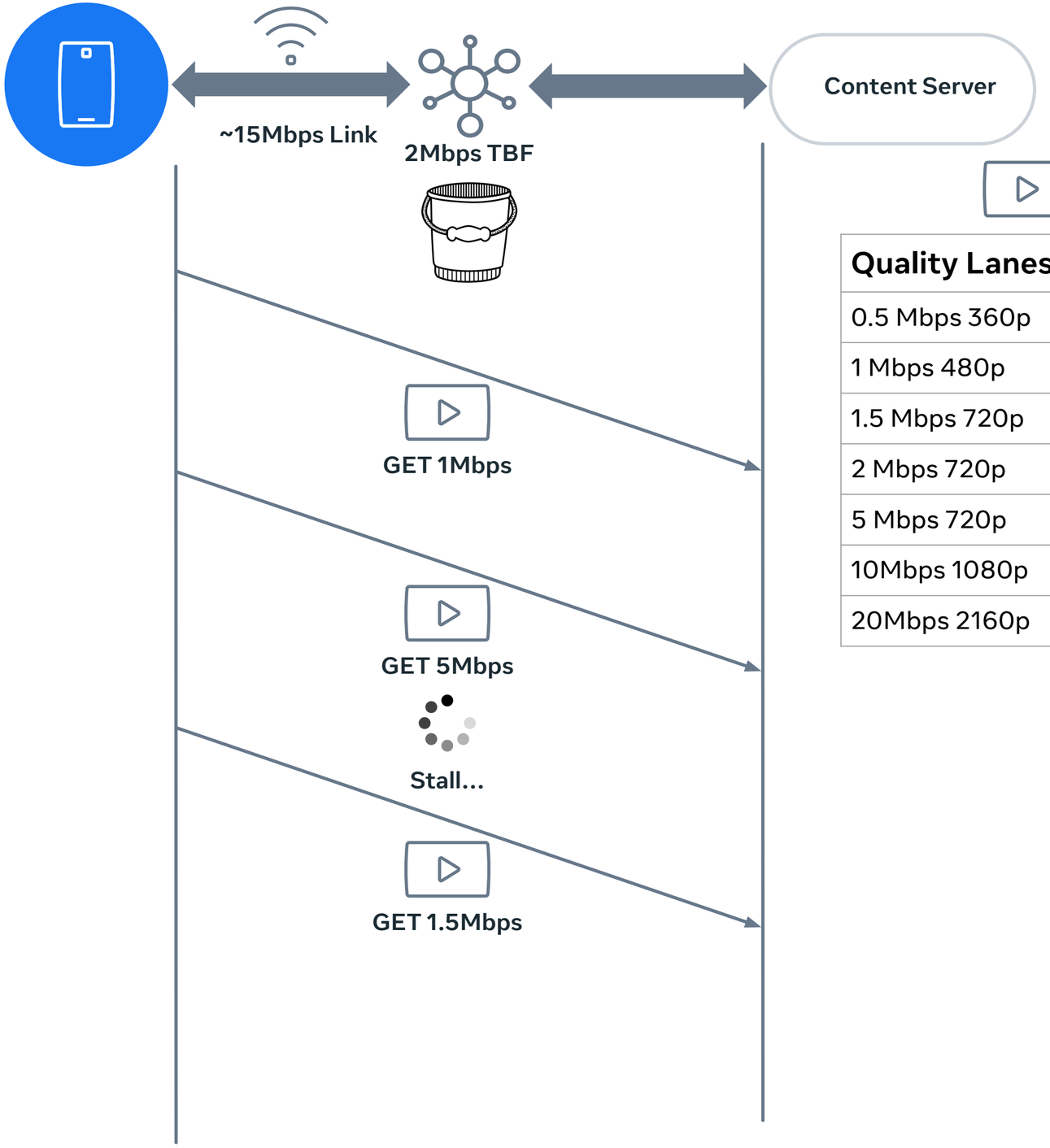
Quality Lanes Available
0.5 Mbps 360p
1 Mbps 480p
1.5 Mbps 720p
2 Mbps 720p
5 Mbps 720p
10Mbps 1080p
20Mbps 2160p

Adaptive Bitrate Video w/ Shaping

Video in particular can be expensive for networks and users.

Under congestion or to conform to subscription plans, traffic shaping is applied.

Desired outcome: ABR selects 2Mbps.



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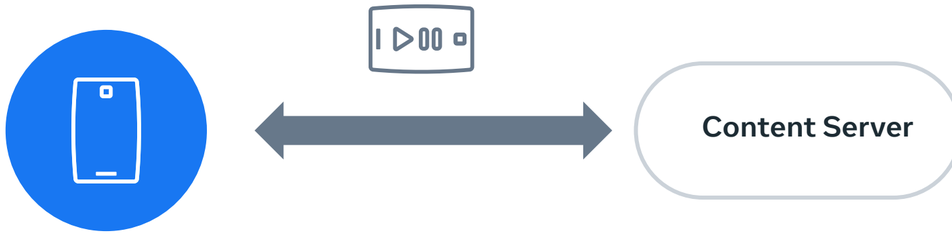
It works but...

- ABR schemes are not perfect and don’t converge quickly, causing poor user experience and stalling as it “ping pong” between qualities.
- Congestion Controllers are better suited to simple queueing and often make the “ping ponging” worse.
- CC's (and ABR's) bandwidth estimation often overshoot significantly due to the burst allowance of the TBF.
- The limit imposed by the TBF is *artificial* – it can support instantaneously more bandwidth, leading to periods of underutilization and difficulty for radio equipment to optimize spectrum usage.



Adaptive Bitrate Video w/ Informed Bitrate Cap

Video content provider receives maximum instantaneous throughput property from the network

The shaper is removed or “dialed back”.

Less stalling and better utilization of network resources.

Moves from ***congestion-limited*** from the TBF, to ***application-limited*** from the cap.

Quality Lanes Available
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1.5 Mbps 720p
2 Mbps 720p
~~5 Mbps 720p~~
~~10Mbps 1080p~~
~~20Mbps 2160p~~