Experiments on HTTP Adaptive Streaming over interconnected Content Delivery Networks

draft-famaey-cdni-has-experiments-01

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Goal

• Evaluate the delivery of HTTP Adaptive Streaming (HAS) services over federated CDNs

• Draft-brandenburg-cdni-has proposes several alternative HAS request routing schemes with different levels of indirection

• Our experiments aim to investigate the effects of such indirection on the quality and performance of HAS services
NS-3 Simulations
Using Smooth Streaming client algorithms

Parameters:
- ID = Internet delay
- DD = Downstream delay
- B = Client bandwidth
- P = Client buffer size
- S = Segment duration

HAS Video:
- LD: 500 kbps
- SD: 1 Mbps
- HD: 2 Mbps
Evaluated request routing policies

• UpstreamRR
  – Content at upstream CDN: uRR -> uCS
  – Content at downstream CDN: uRR -> dRR -> dCS

• DirectRR
  – Content at upstream CDN: uRR -> uCS
  – Content at downstream CDN: dRR -> dCS

• DirectCS
  – Content at upstream CDN: uCS
  – Content at downstream CDN: dCS
Buffer starvation and start-up delay in congested networks

- Under congestion, high-latency redirects cause significant buffer starvation

- The start-up delay of streaming sessions increases linearly with the total redirection latency

$DD = 5 \text{ ms}, B = 1 \text{ Mbps}, P = 24 \text{ s}, S = 2 \text{ s}$
Video quality in uncongested network

• In uncongested scenarios redirects to the upstream CDN can cause significant reductions in quality

• If latency to the downstream CDN is non-negligible, even redirects via downstream request routers can cause significant quality drops

$B = 10 \text{ Mbps}, P = 6 \text{ s}, S = 2 \text{ s}$
Effect of segment duration

• Increasing the segment duration significantly reduces the negative effects of high-latency redirects
• However, it increases start-up delay and time lag in live sessions

DD = 5 ms, B = 5 Mbps, P = 36 s

S = 2 s

S = 12 s
Conclusion

Requesting HAS segments through the upstream request router clearly impacts HAS performance

– In congested scenarios
  • Significant increase in buffer starvation at high upstream latencies
  • Start delay increases even at lower upstream latencies

– In uncongested scenarios
  • Video quality reductions at high upstream latencies
  • Start delay increases even at lower upstream latencies

– Increasing segment duration
  • Reduces impact of redirects on video quality
  • But, increases start-up delay and time lag in live sessions

Questions and remarks:
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