Throughput Guidance

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Throughput Guidance

• Throughput Guidance (TG) provider is deployed within the mobile operator network in the RAN
• The TG provider estimates/measures the best sustainable bitrate for the UE in real time
  • The best sustainable bitrate is passed in TCP Option in the upstream TCP ACK
  • The mechanism ensures end-to-end consistency of the TCP flow control
• CDN server uses the TG estimate to adjust its sending rate
• TG benefits: Faster reaction to changing radio conditions leading to higher Quality of Experience (QoE) and higher network efficiency, i.e. less packet dropping
Changes in version 04

• Simplified message format
  • Supports two modes – plain text mode and authentication mode
  • More compact TCP option (<40 bytes), which would avoid TCP option fragmentation

• The delivery bitrate is decided by the application on the CDN server
  • The decision is not made at the TCP/IP layer (TCP CWND window does not have to be modified directly)

• Captures results from a large scale field deployment
Recap from previous field trial with Google in LTE network

- Video resolution is consistently higher, and the number of resolution changes is reduced.
- Huge improvement in mean throughput shortens download time and thus releases network resources earlier, and saves battery life.
- Significant improvements in TCP round trip time and retransmissions.

**Without TG**

**With TG**
Summary of the field trials from 3G and LTE

• Configuration
  • TG function located next to LTE eNB
  • TCP CUBIC
• Setup
  • Production LTE network
• Results
  • Time to play: -8%
  • Rebuffer time: -19.7%
  • Video resolution: +6.2%

• Configuration
  • TG function located next to the 3G RNC
  • TCP CUBIC
• Setup
  • Production 3G network (1600 cells)
• Results
  • Time to play: -1.34%
  • Rebuffer time: -13.9%
  • Video resolution: +0.5%
  • QoE Benefit increases during Busy Hours