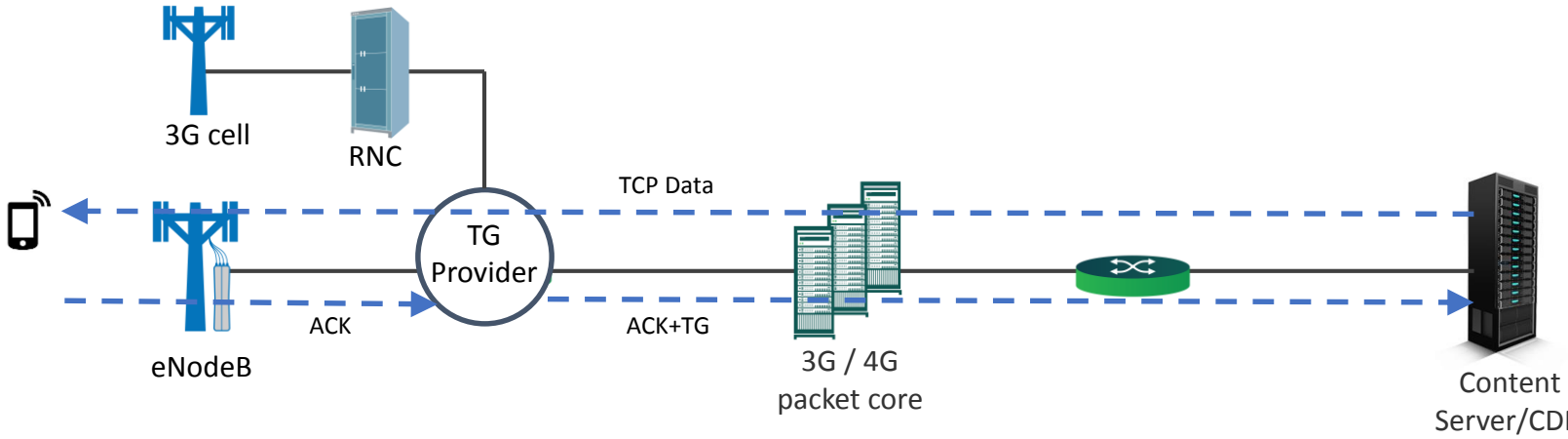
Throughput Guidance

IETF 98, Chicago

Throughput Guidance



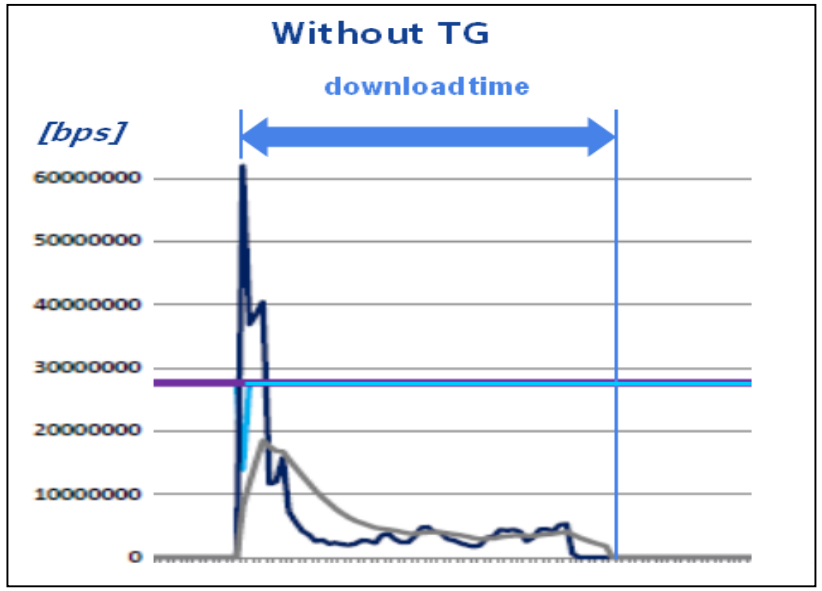
- Throughput Guidance (TG) provider is deployed within the mobile operator network in the RAN
- The TG providers estimates/measures the best sustainable bitrate for the UE in real time
  - The best sustainable bitrate is passed in TCP Option in the upstream TCP ACK
  - The mechanism ensures end-to-end 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

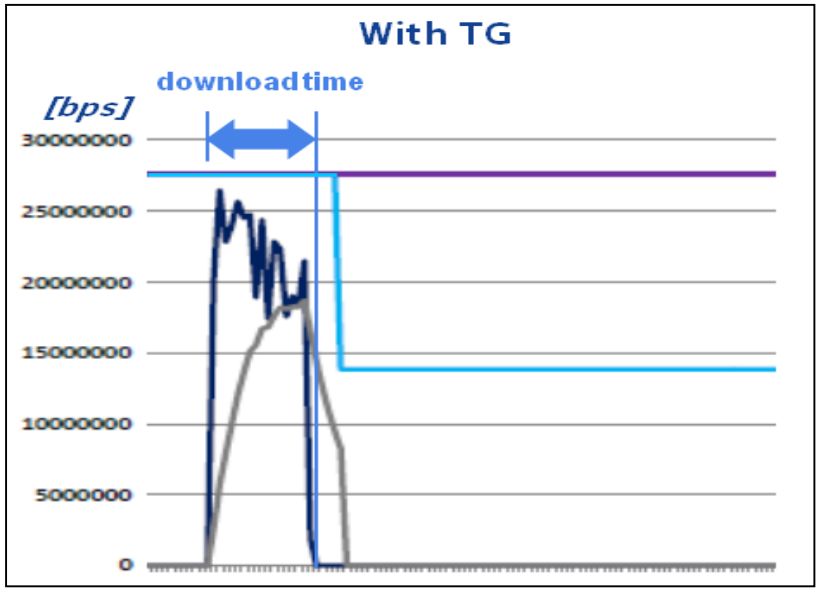
Changes in version 04

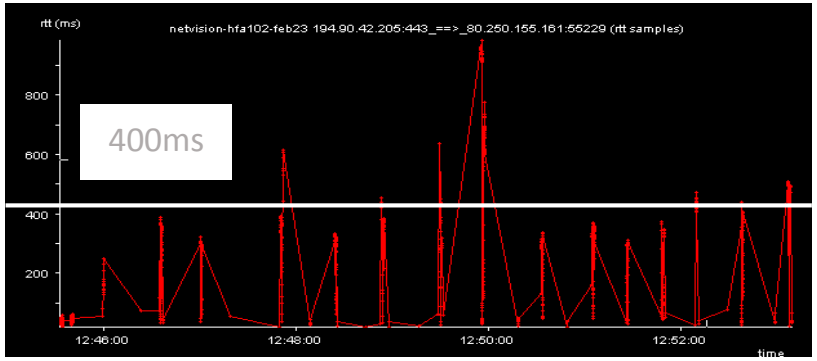
- Simplified message format
  - Supports two modes – plain text mode and authentication mode
  - More compact TCP option (<40 bytes), which would avoid TCP option fragmentation
- The delivery bitrate is decided by the application on the CDN server
  - The decision is not made at the TCP/IP layer (TCP CWND window does not have to be modified directly)
- Captures results from a large scale field deployment

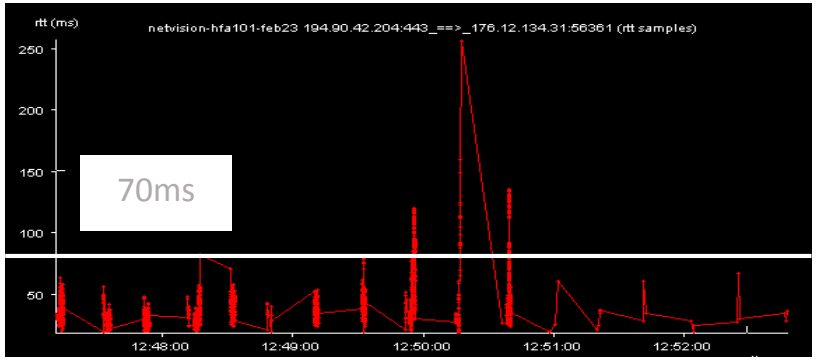
Recap from previous field trial with Google in LTE network

- 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









TG — Measured Throughput — Exponential Averaged Throughput — Cell Capacity

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