Responsiveness under Working Conditions

draft-cpaasch-ippm-responsiveness

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Why?

**Problem #1**
- 10+ years of Bufferbloat
- Still very widespread

Need to raise awareness & tools
- End-user as forcing-function
- Forcing-function creates market incentive
- Easy usable tools to measure “bufferbloat”

**Problem #2**
- What is “bufferbloat”
- ICMP-ping, UDP-ping, TCP request/response, H3?
- How to “load” the network?
- Huge differences in existing tools
  - DSLReports, Fast.com, waveform,…
- Need for a standardized metric of “Responsiveness under working conditions”
Responsiveness for the end-user

- "Bufferbloat" may happen anywhere between client and server application
- Use modern protocols (HTTP/2, HTTP/3, TLS, ...)
- Measure all stages of the connections (DNS, TCP-handshake, TLS, ...)
- User-friendliness
Working conditions

Need to fill buffers to measure responsiveness

- Use “realistic” traffic patterns
  - HTTP/2 bulk-data transfer
- Need to create full working conditions for extended period of time
  - Gradually add flows and monitor goodput evolution
Stable “working conditions”

- Create 4 connections
- Max goodput reached
- Add more connections
- Max goodput reached
- Add more connections
- No change in goodput, Declare Saturation
Measuring Responsiveness

- HTTP/2 GET request on load-bearing connections
  - Exposes bad HTTP/2 & TCP implementations
  - Exposes bad buffering in the network
- Separate short-lived parallel HTTP/2 GET requests
  - Allows to measure DNS/TCP/TLS/GET requests
  - Exposes flow-queueing in the network
- Aggregating latency measurements into single number
  - Average? 75th percentile?
Responsiveness Metric & Tool

• Round-trips per Minute (RPM)
  • Higher is better
  • Integer range from low tens (> 1 second of latency) to a few thousand (less than 50 ms of latency)
  • Nice analogy to car engine’s “revolutions per minute”

• /usr/bin/networkQuality in macOS Monterey

• Responsiveness UI in iOS 15

$ networkQuality
==== SUMMARY ====
Upload capacity: 191.175 Mbps
Download capacity: 275.957 Mbps
Upload flows: 20
Download flows: 12
Responsiveness: High (3047 RPM)
Responsiveness under Working Conditions
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Please contribute at:

https://github.com/network-quality/draft-cpaasch-ippm-responsiveness