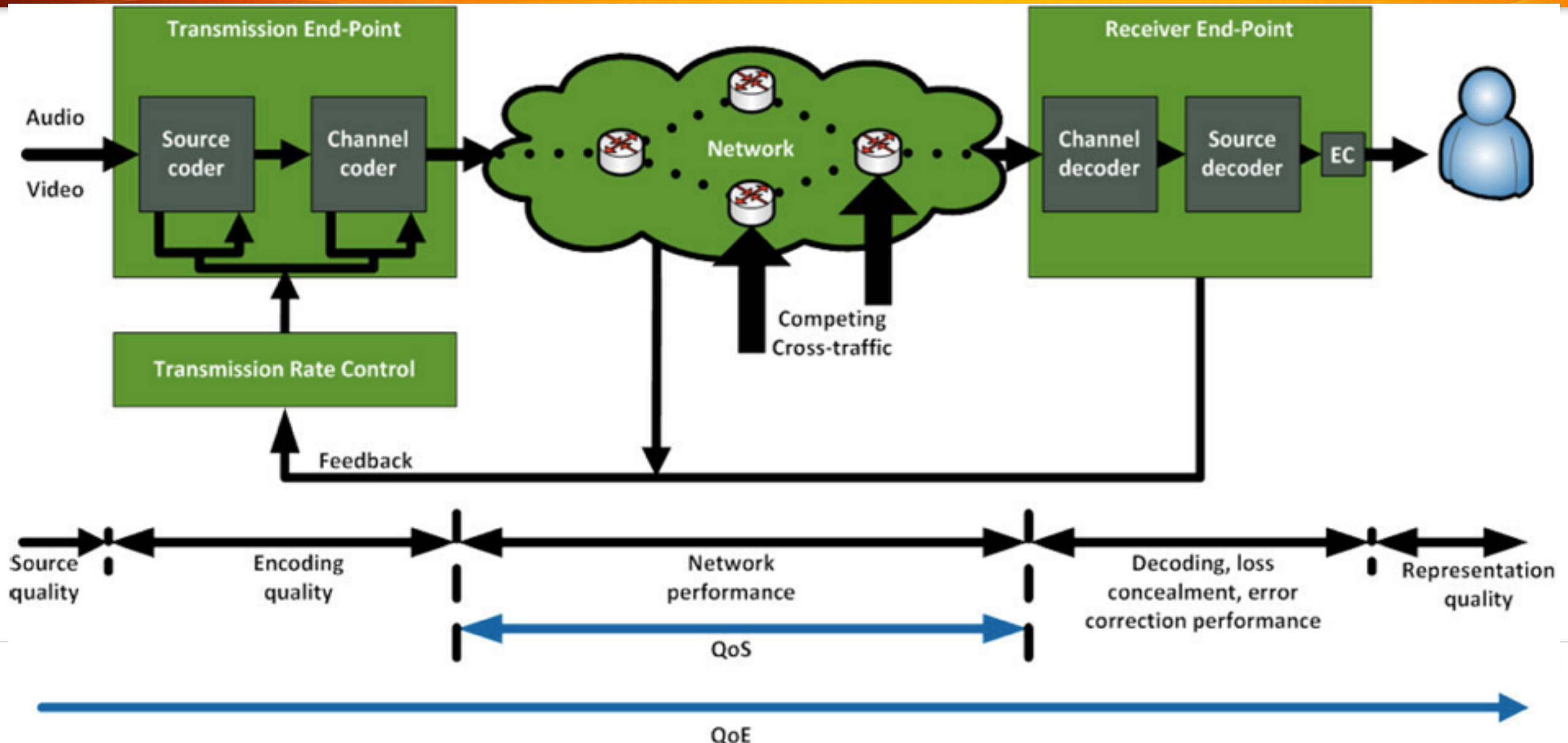
实时音视频传输QoS的挑战与优化

2016-08-30 王旺@Caton

Relationship between QoS and QoE



QoS Metrics

- Throughput
- Packet Loss
- BER
- Latency
- Jitter
- Disorder

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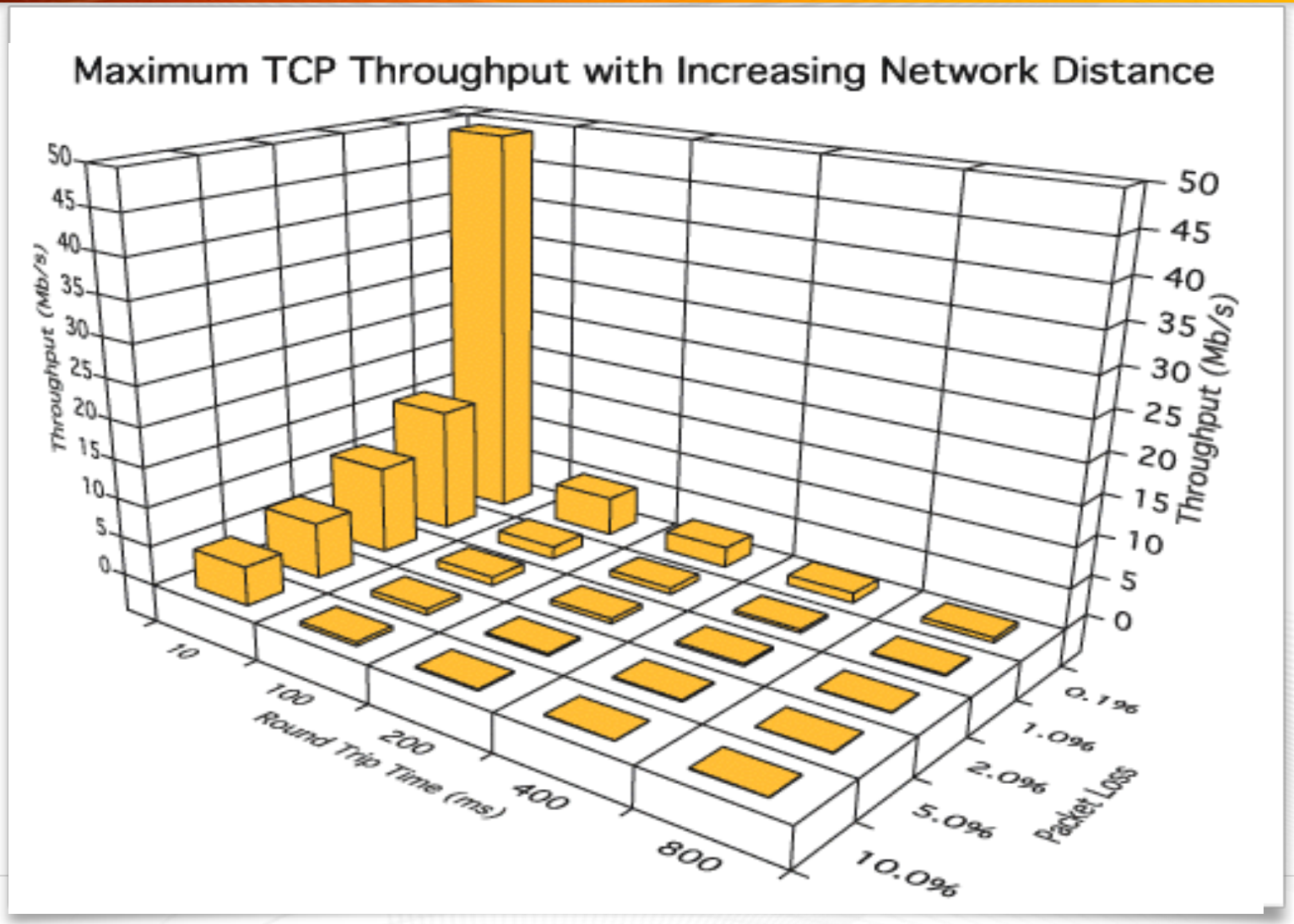
TCP Throughput

$$\text{Throughput} \approx 1.22 \times \frac{MSS}{RTT \cdot \sqrt{Loss}}$$

(Based on Mathis 1997)

TCP Throughput



Example TCP Test:

- *Relationship between BUR of TCP sharply decrease when transmit distance (RTT) increases.*
- *Bar Graph shown the Max throughput achievable under various packets loss and network latency conditions on a 50 Mbps link.*

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Packet Loss

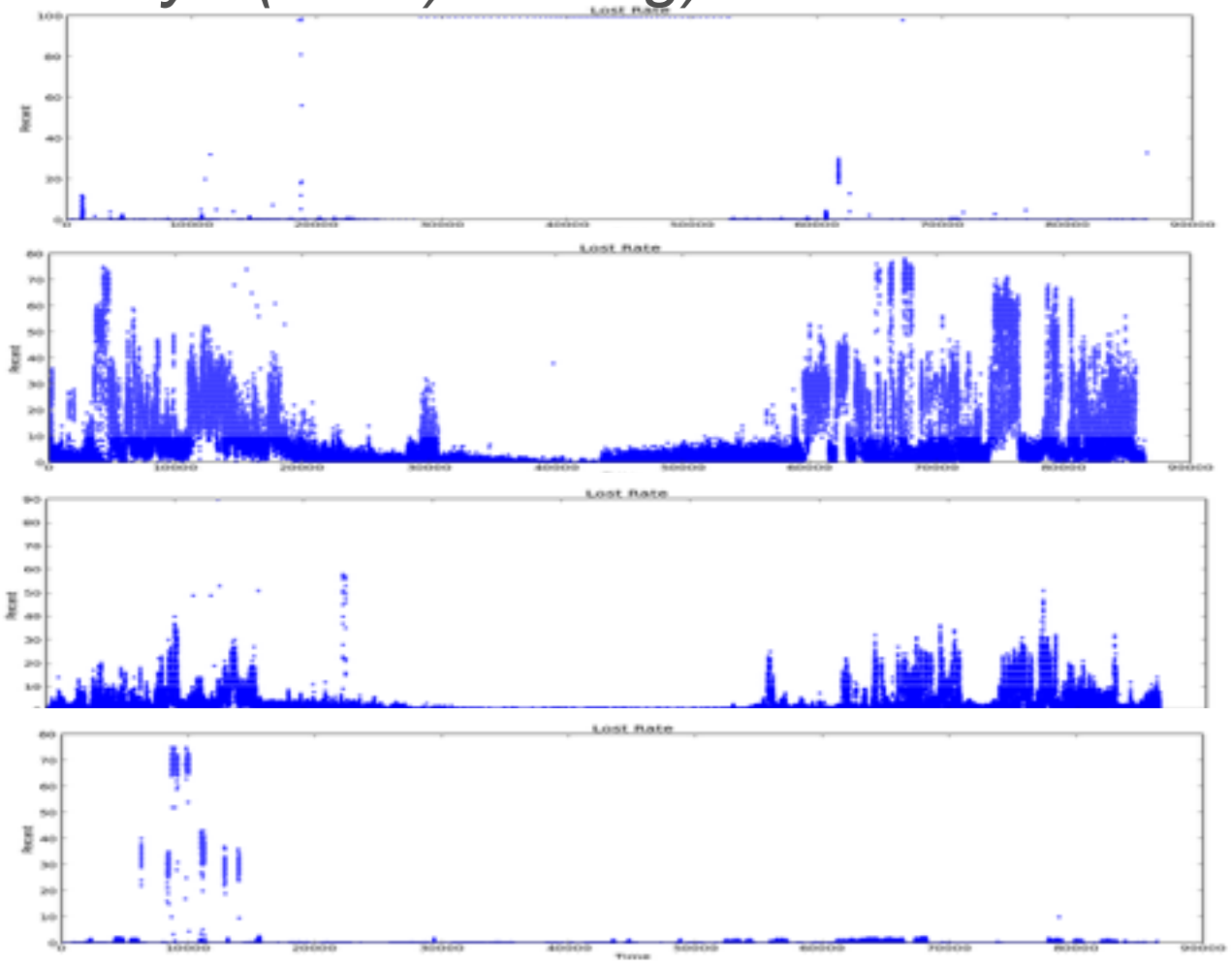
*(Drop rate in 7 days (7*24) testing)*

Beijing-Sao Paulo

Sao Paulo-BJ

TW - SH

SFO-TW



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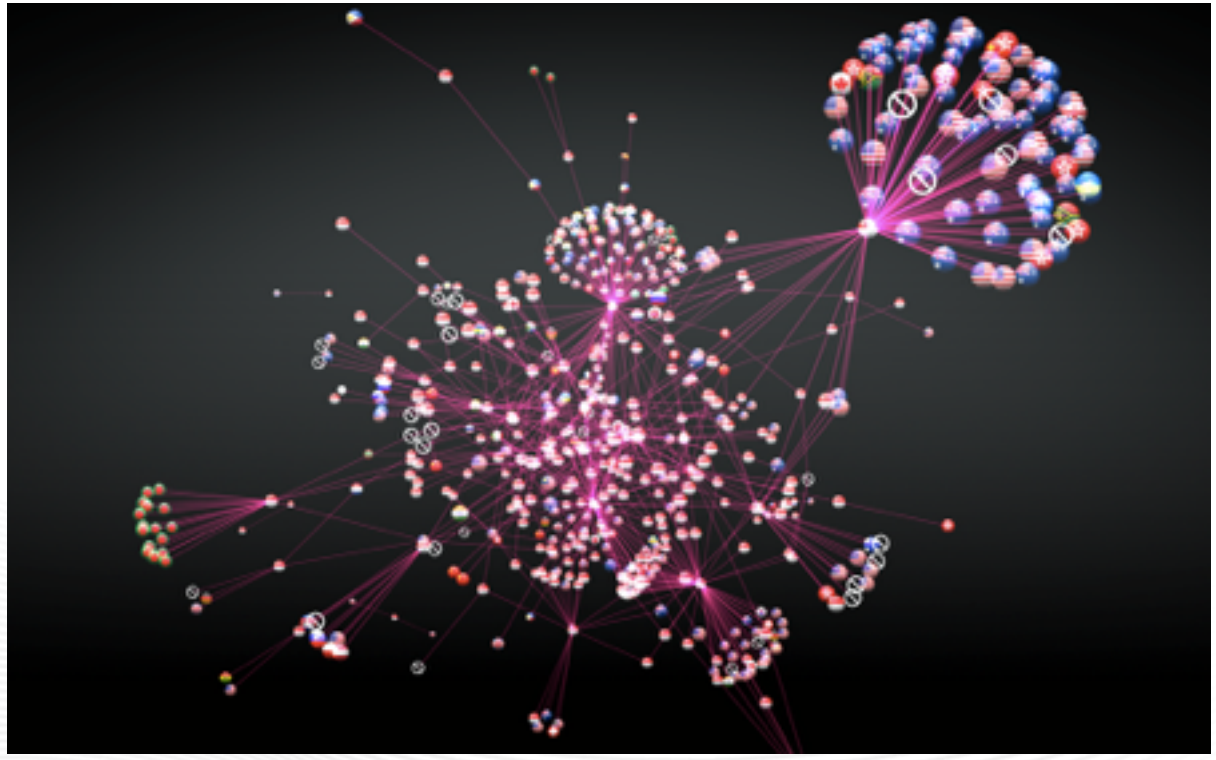
BER,Latency,Jitter…

Always Changing!

Internet changes every second of of every day:
basic infrastructure,firewall rules, Concurrent users, growing number of mobile Apps …



X-Raying the Singapore internet backbone to 3D view

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How to improve?

TCP Optimization

UDP based protocols

TCP Optimization

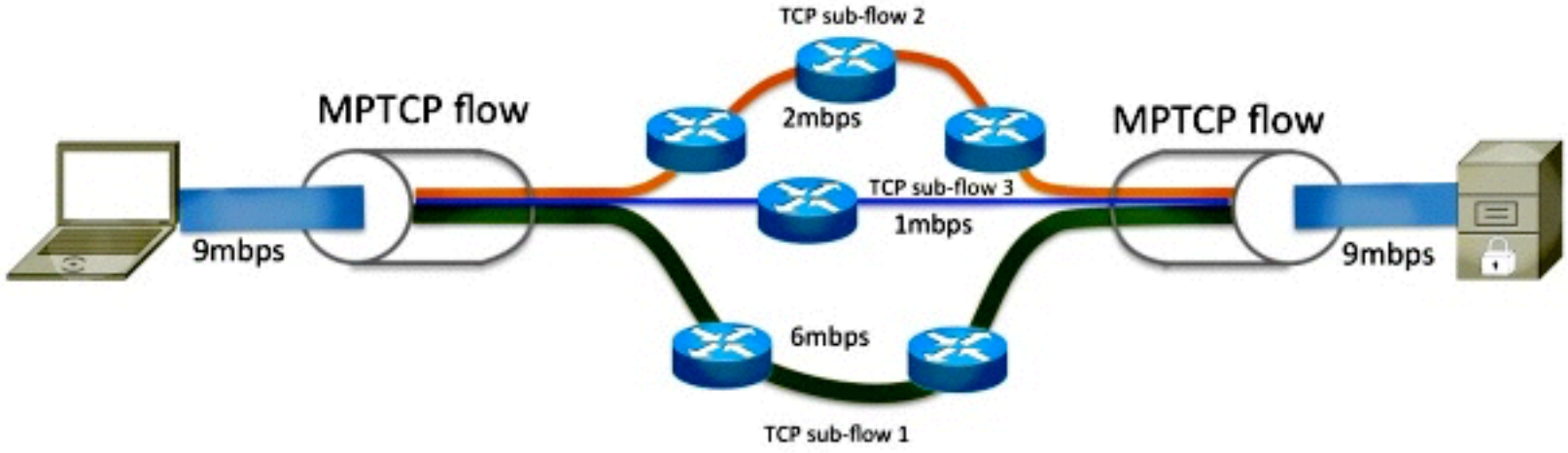
1. **Initial congestion window**
2. **Increase CW factor in slow-start phase**
3. **Increase CW factor in congestion-avoidance phase**
4. **Decrease shrink CW factor when loss detected**
5. **FastTCP …**

UDP-based protocol approaches

1. **ARQ**
2. **FEC**
   (Pro-MPEG, RaptorQ, etc.)
3. **Hybrid FEC**

Lessons learned

Low bandwidth?



Multi-path

Lessons learned

Firewalls

- UDP port blocked
- Bandwidth limitation
- Drop packets

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Thank you!