# QUIC and Satellite Open Stakeholder Meeting

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Computer Science 7
Computer Networks and
Communication Systems

DLR

FRIEDRICH-ALEXANDER
UNIVERSITÄT
ERLANGEN-NÜRNBERG

TECHNISCHE FAKULTÄT

# So far... QUIC performance measurements

## NetSys 2019

- Three different European satellite operators (A: 20/2 Mbps; B: 30/2 Mbps; C: 15/3 Mbps)
- Outdated Google QUIC Q043 implementations, no 0-RTT
  - Chromium QUIC `19eaae6`, 09/2018
  - quic-go `ffdfa1f`, 08/2018
- Static website (34 objects, total size 1.4 Mbyte)
- Page Load Time increases with VPNs or QUIC
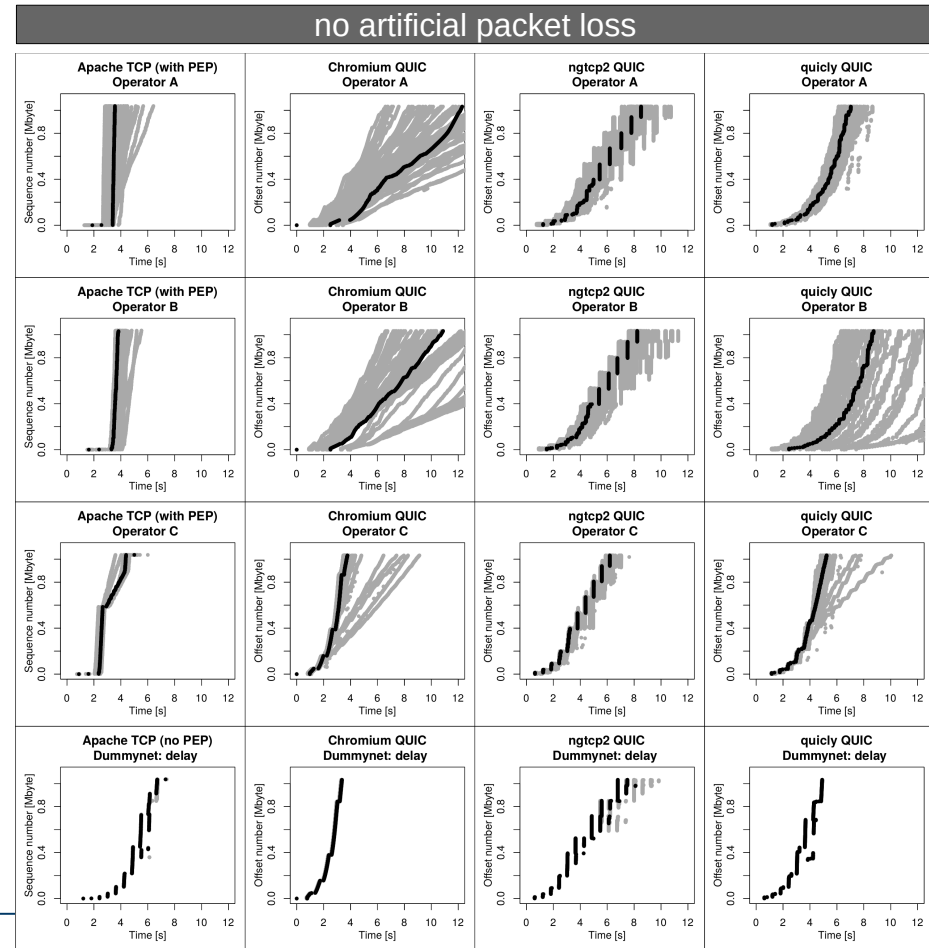- QUIC performance depends on operator and implementation

Papers are available at
https://www7content.cs.fau.de/~deutschmann/TMC-IPv6
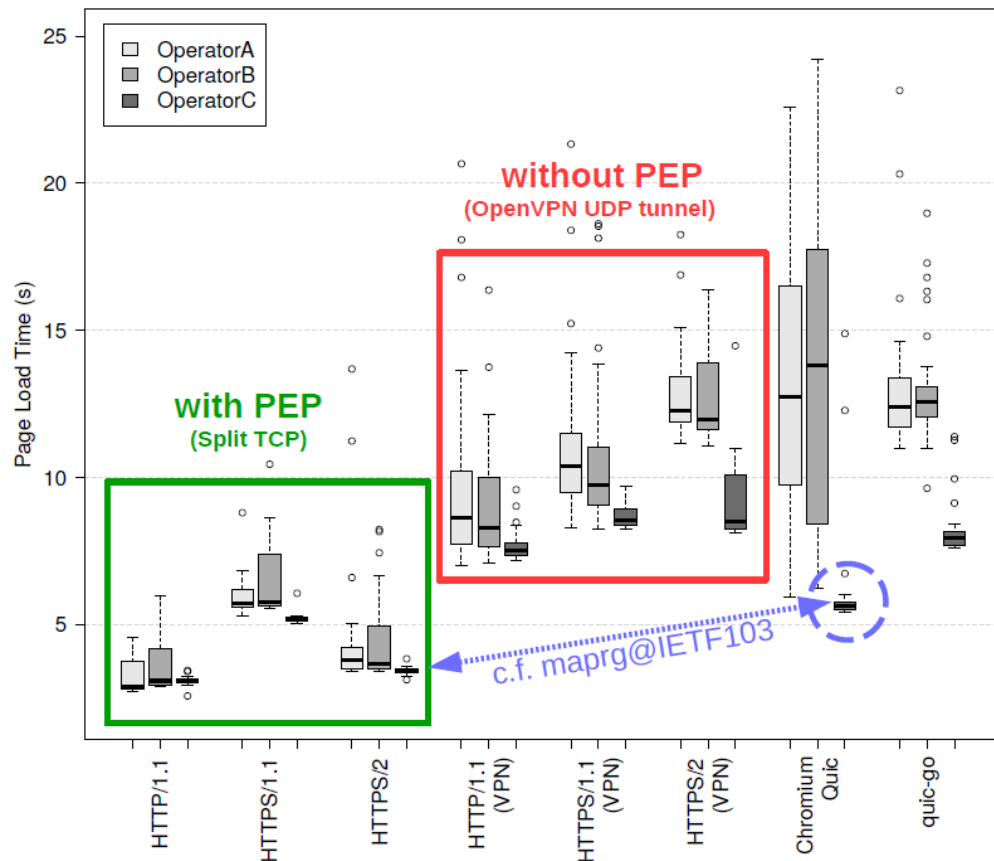
# So far... QUIC performance measurements

## KaConf 2019

- Three different European satellite operators (A: 20/2 Mbps; B: 30/2 Mbps; C: 16/3 Mbps) + DummyNet (20/2 Mbps)
- Outdated QUIC implementations, no 0-RTT
  - Chromium QUIC Q046 `8179a83`, 08/2019
  - quicly draft-22 `56dcc95`, 07/2019
  - ngtcp draft-22 `d00bf08`, 08/2019
- 1 Mbyte object
- QUIC performance depends on operator and implementation

Papers are available at
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# So far... QUIC performance measurements

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## KaConf 2019

- Three different European satellite operators (A: 20/2 Mbps; B: 30/2 Mbps; C: 16/3 Mbps) + DummyNet (20/2 Mbps)
- Outdated QUIC implementations, no 0-RTT
  - Chromium QUIC Q046 `8179a83`, 08/2019
  - quicly draft-22 `56dcc95`, 07/2019
  - ngtcp draft-22 `d00bf08`, 08/2019
- 1 Mbyte object
- QUIC performance depends on operator and implementation
- Packet loss has negative impact

Papers are available at
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1% artificial packet loss
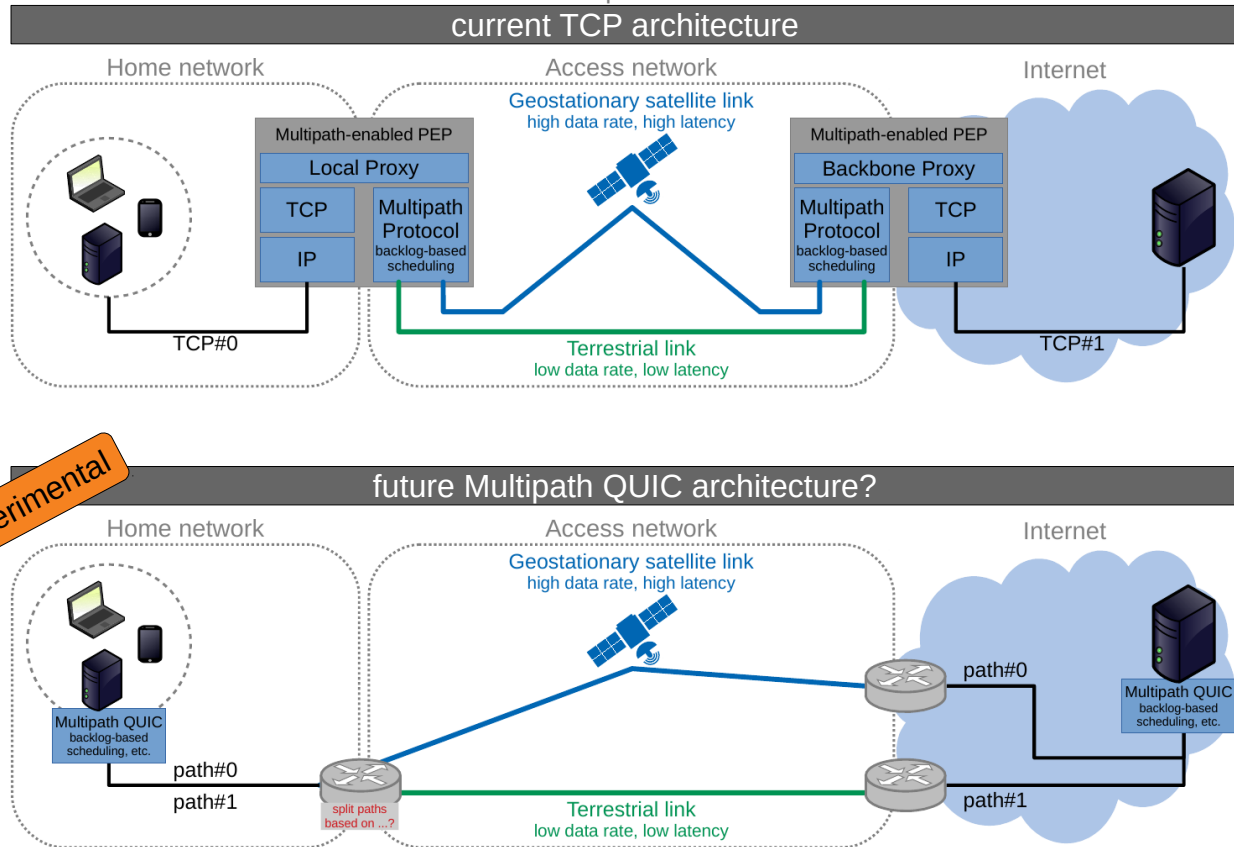
# Future Research
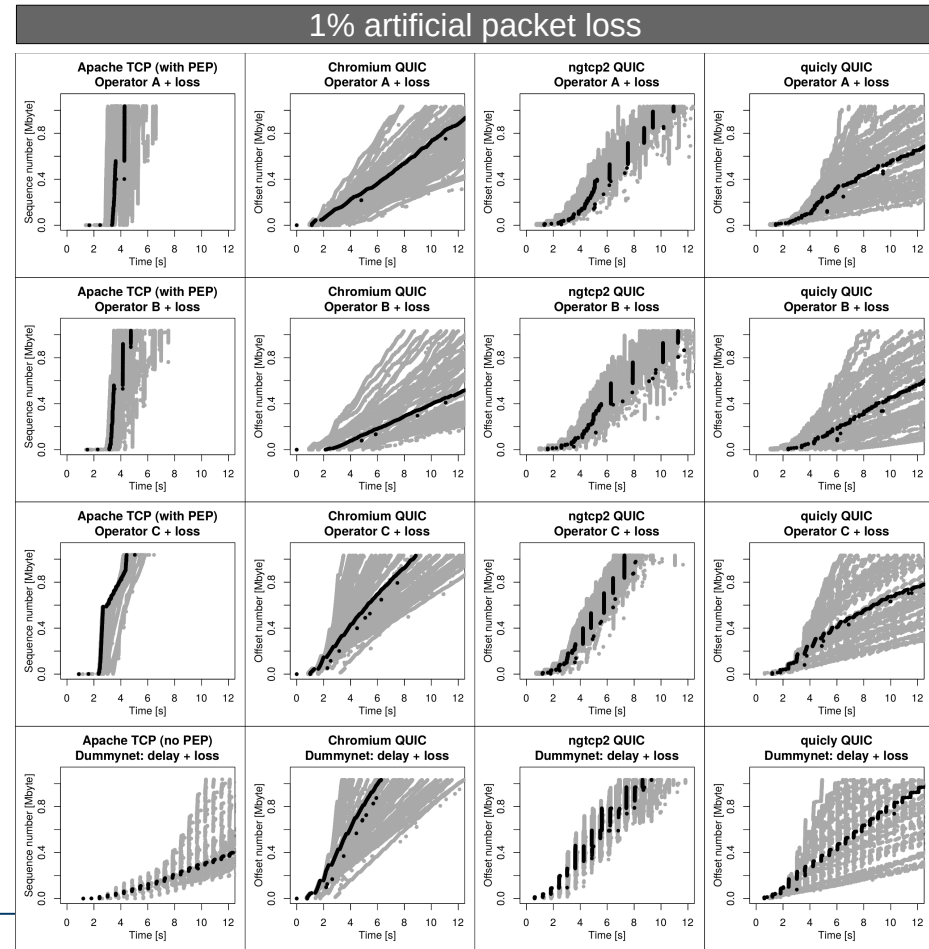
## Multipath communication

- Figures:
  End-users combining very heterogeneous link

- Multipath QUIC currently discussed at the IETF
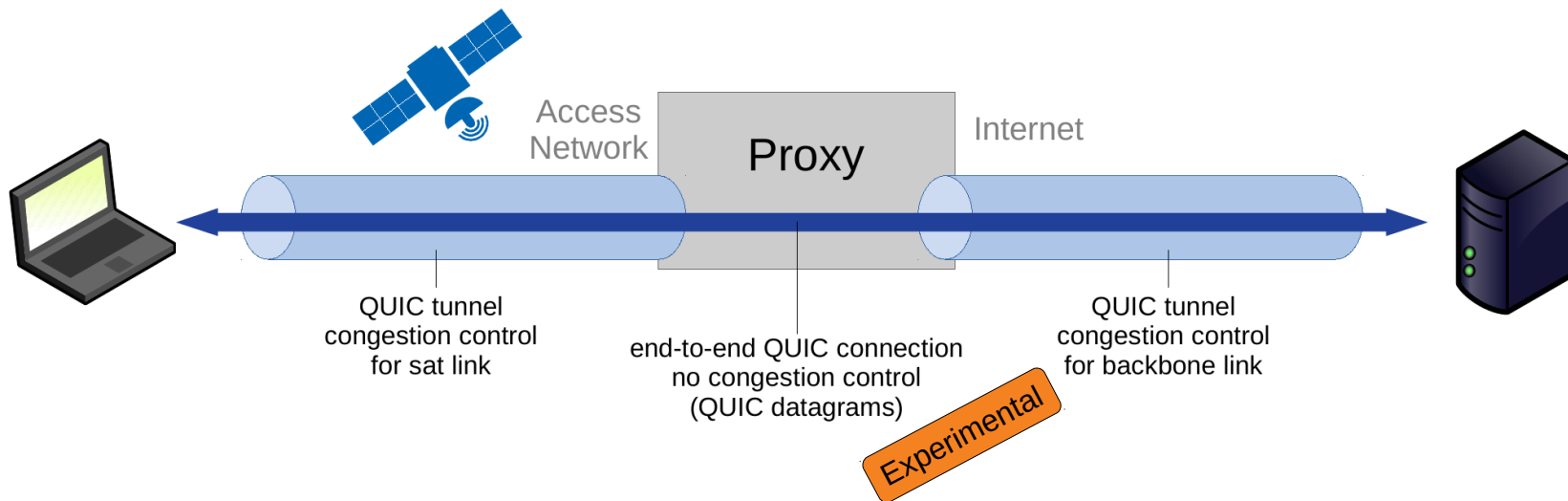
- See also
  - Backhauling
  - 5G ATSSS

See IETF QUIC mailing list and/or 3GPP documents for discussion

More information https://www7content.cs.fau.de/~deutschmann/TMC-IPv6

## Explicit QUIC proxies?

- IETF MASQUE?
- Relevant for 5G (non-terrestrial) networks?



QUIC tunnel
congestion control
for sat link

end-to-end QUIC connection
no congestion control
(QUIC datagrams)

QUIC tunnel
congestion control
for backbone link

Experimental

See IETF MASQUE mailing list for discussion
https://mailarchive.ietf.org/arch/msg/masque/VbKoI7mNVOGGo1ZNcsvKisSeDEw

*"But I do expect QUIC will eventually include support for explicit proxies to terminate some or all of the congestion control independently of the underlying content."*    Jan 23, 2015
https://groups.google.com/a/chromium.org/g/proto-quic/c/k_tPUf6JkkA/m/xueEGOJReHoJ
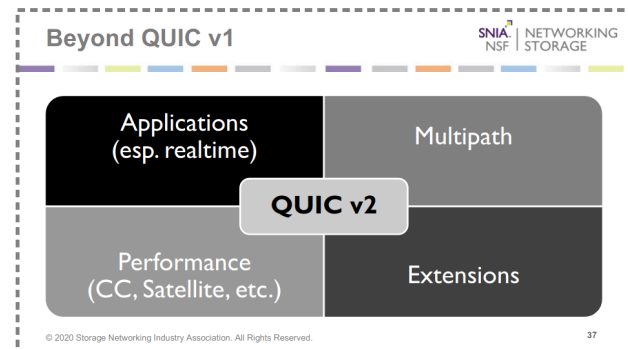
# Conclusion

## PEPs become inapplicable

- Problem: performance impacts
- Opportunity: architecture without middleboxes

## Need for much more performance testing and IETF participation!

- Single path end-to-end QUIC over Sat
  (without multipath; without proxies)
- `draft-kuhn-quic-4-sat`



Source:
Lars Eggert (QUIC WG chair), *QUIC – Will it Replace TCP/IP?*
BrightTALK Webcast
https://www.brighttalk.com/webcast/663/382768/quic-will-it-replace-tcp-ip