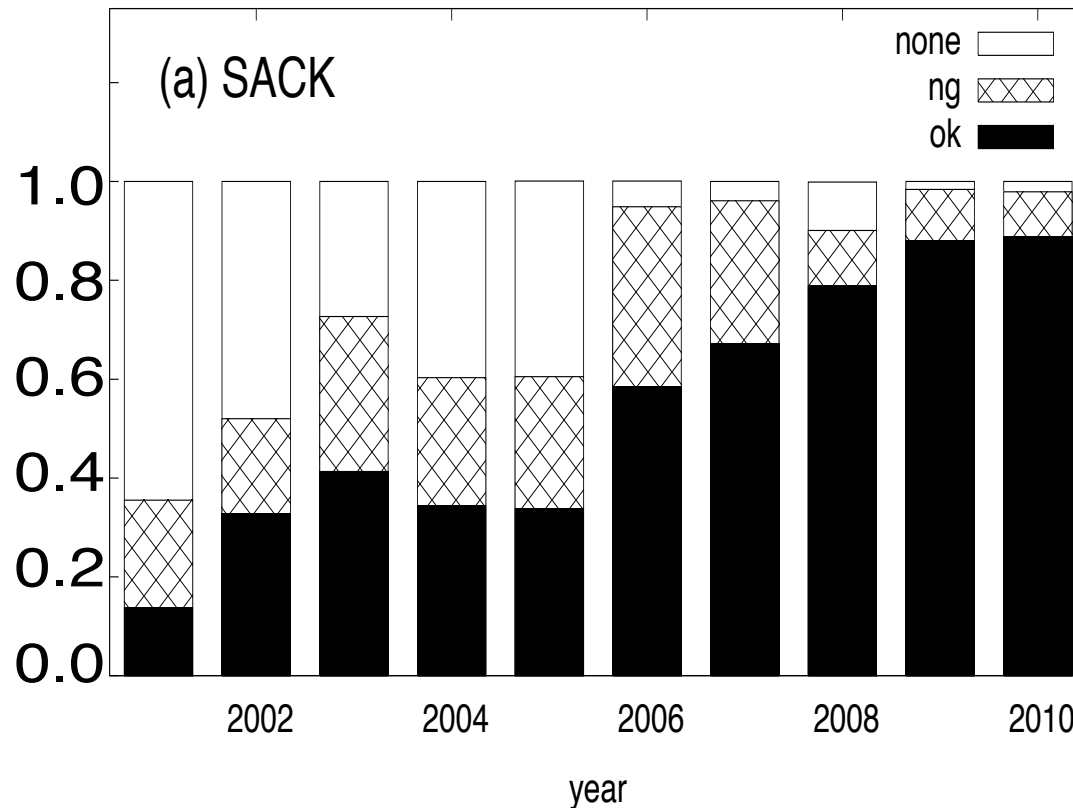# Efficient MPTCP proxy design and use cases

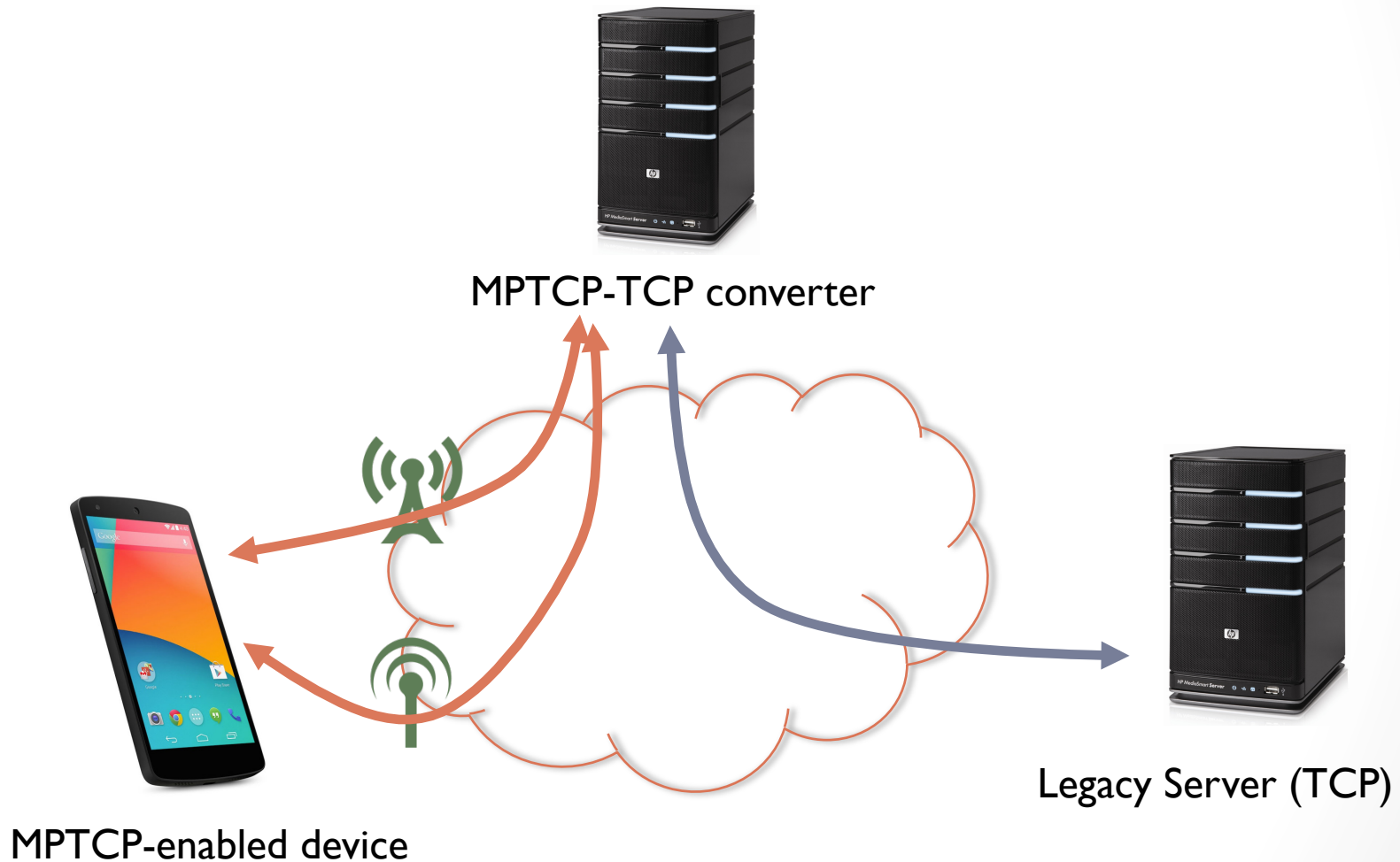Gregory Detal, Sébastien Barré and Olivier Bonaventure

gregory.detal@uclouvain.be

Gregory Detal, Christoph Paasch and Olivier Bonaventure. Multipath in the Middle(Box).
CoNEXT workshop HotMiddlebox, December 2013.

TCP extensions adoption on servers take time

(a) SACK

Legend: none, ng, ok

Kensuke Fukuda. An analysis of longitudinal TCP passive measurements. In Proc. TMA'11.

Converters accelerate the deployment of new extensions

MPTCP-TCP converter

MPTCP-enabled device

Legacy Server (TCP)

HTTP proxy is not sufficient

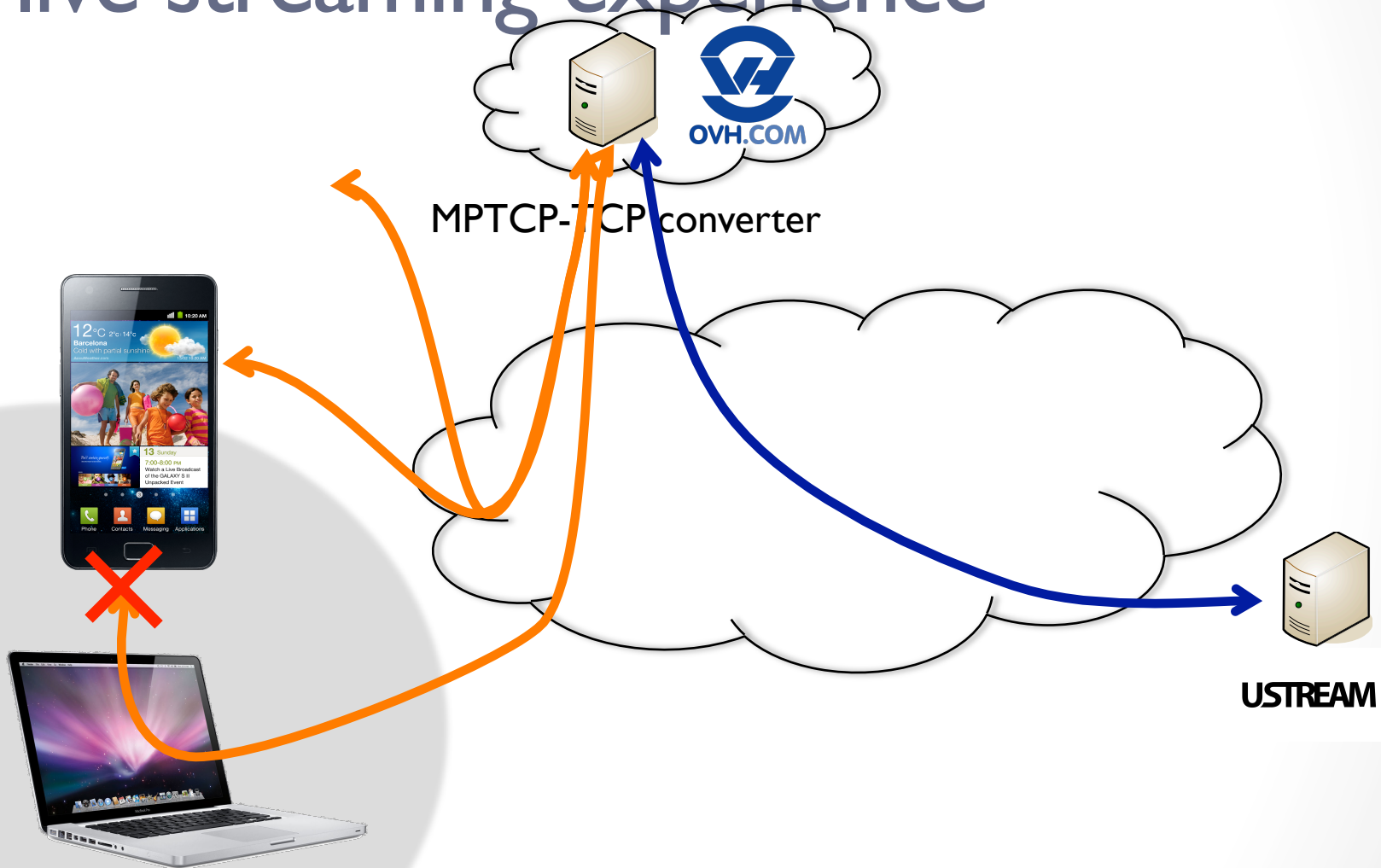| Rank	Upstream Application	Share	Downstream Application	Share	Aggregate Application	Share
1	Facebook	20.62%	YouTube	17.69%	YouTube	16.65%
2	YouTube	13.20%	Facebook	15.44%	Facebook	16.62%
3	HTTP	12.64%	HTTP	14.07%	HTTP	13.74%
4	SSL	11.11%	MPEG - Other	7.92%	SSL	8.59%
5	Pandora Radio	5.19%	SSL	7.84%	MPEG - Other	7.27%
6	MPEG - Other	5.11%	Google Market	5.99%	Google Market	5.75%
7	Google Market	4.95%	Pandora Radio	5.03%	Pandora Radio	5.07%
8	Instagram	3.52%	Netflix	5.01%	Netflix	4.36%
9	Netflix	2.19%	Instagram	3.53%	Instagram	3.53%
10	iTunes	1.59%	iTunes	3.16%	iTunes	2.80%
		80.12%		85.68%		84.40%

sandvine

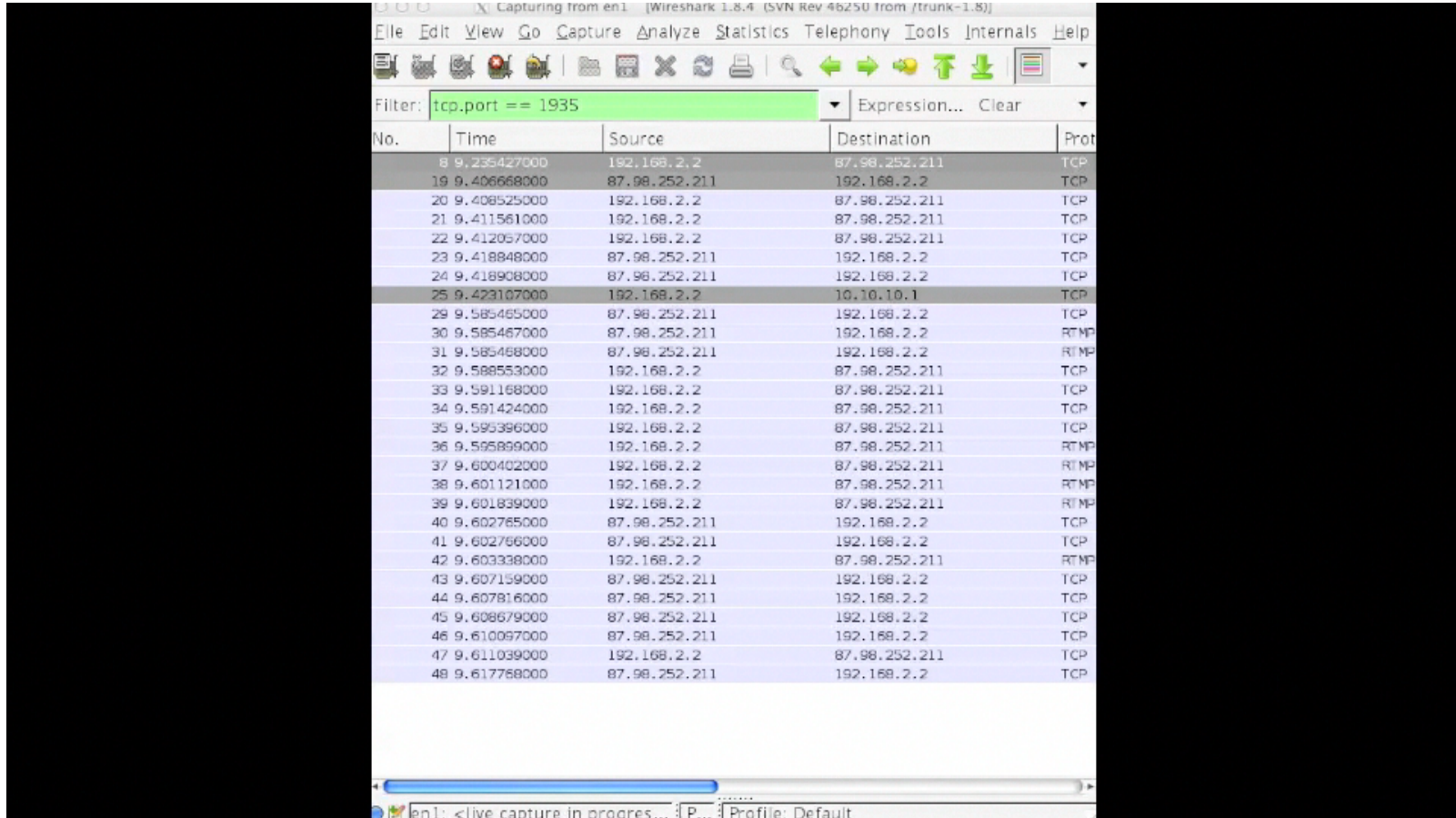Table 4 - Top 10 Peak Period Applications - North America, Mobile Access

The converter uses a redirection mechanism

- The converter can work as on-path or off-path

- Off-path gives more flexibility, however
  - All MPTCP connections **must** be redirected.
  - Add server's address/port into the SYN packet. Can be either:
    - A new TCP option
    - In the SYN's payload (leveraged by TFO [1])

[1] https://tools.ietf.org/html/draft-barre-mptcp-tfo-00

The converter allows for seamless live streaming experience

The converter allows for seamless live streaming experience
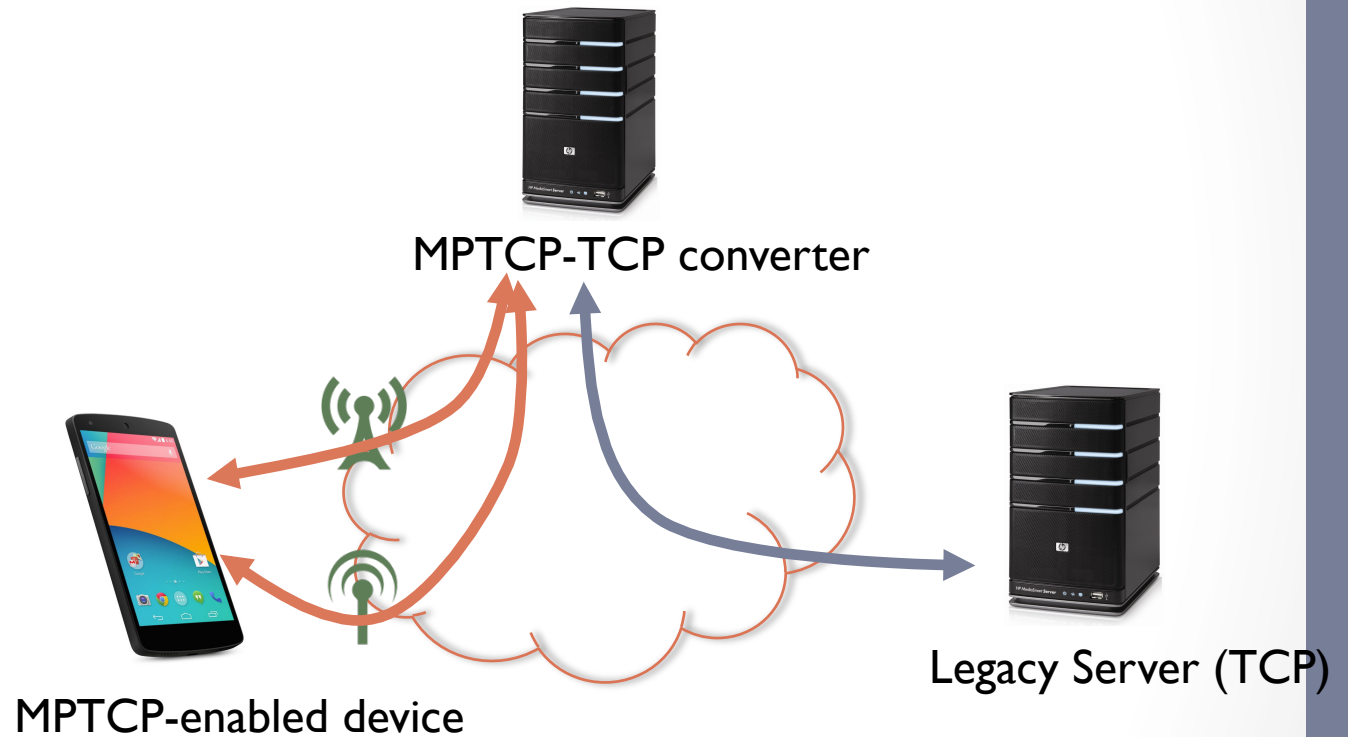
Setup used during the evaluation
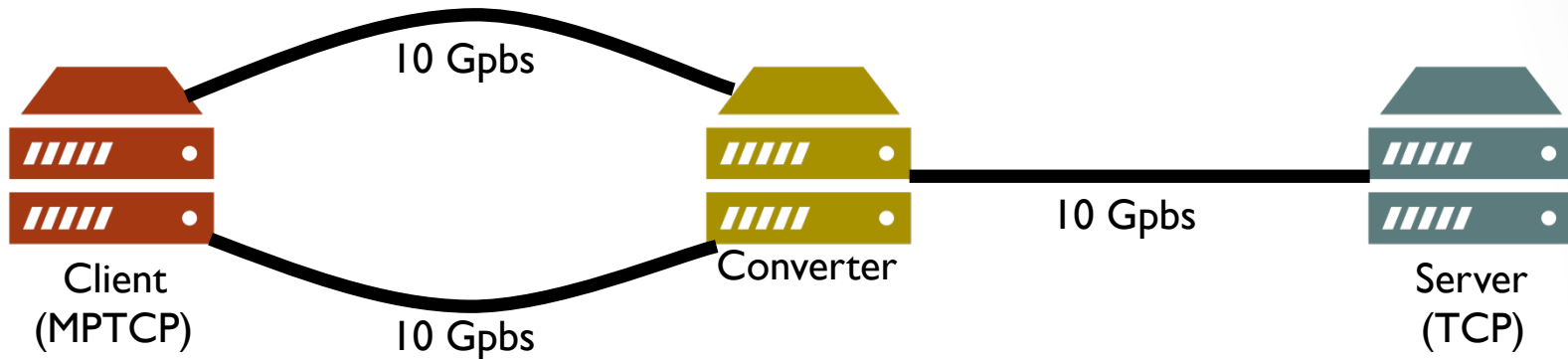
- Applications on client – server:
  - Netperf
- Converter:
  - Router
  - Custom App: bind on specific port and establish connect to server
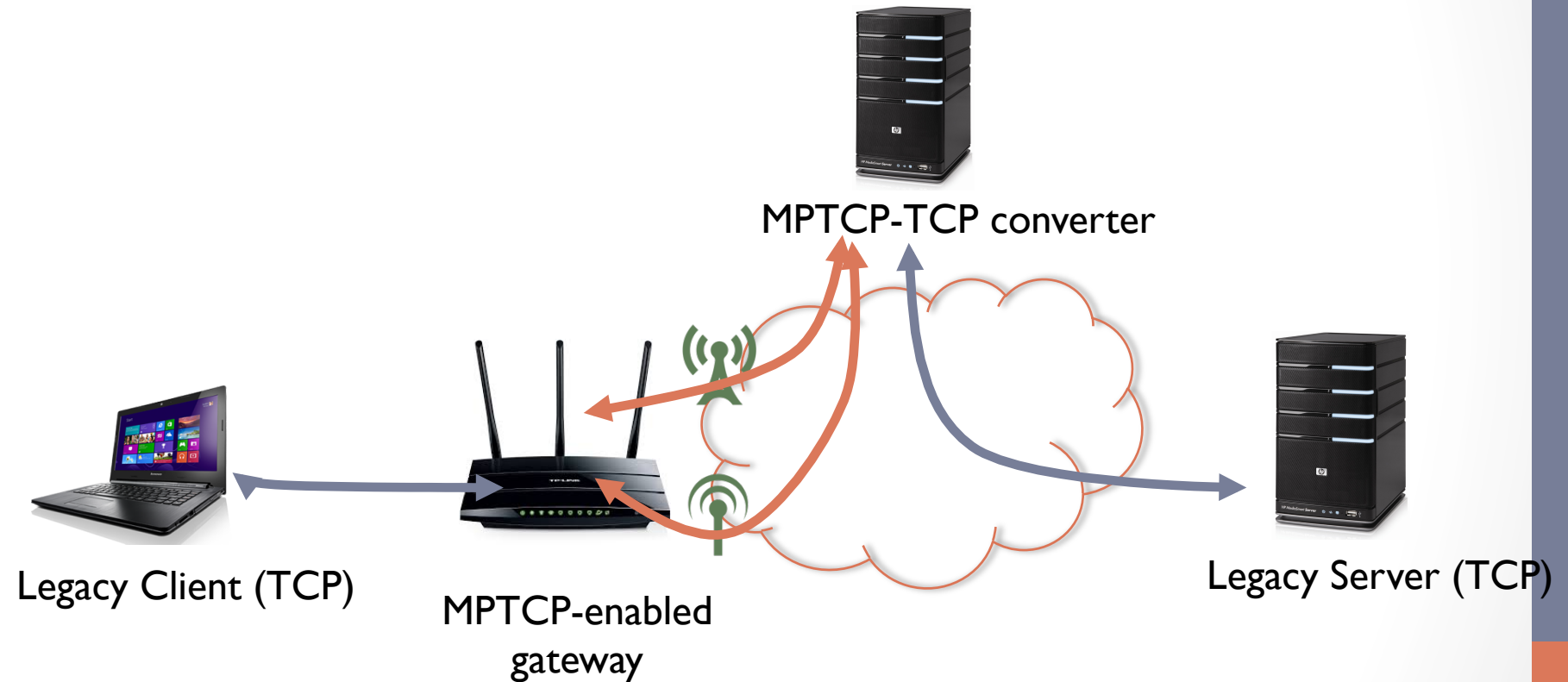 - Our converter

The impact is small

Internet bonding

MPTCP-TCP converter

MPTCP-enabled device

Legacy Server (TCP)

Internet bonding

MPTCP-TCP converter

Legacy Client (TCP)

MPTCP-enabled
gateway

Legacy Server (TCP)
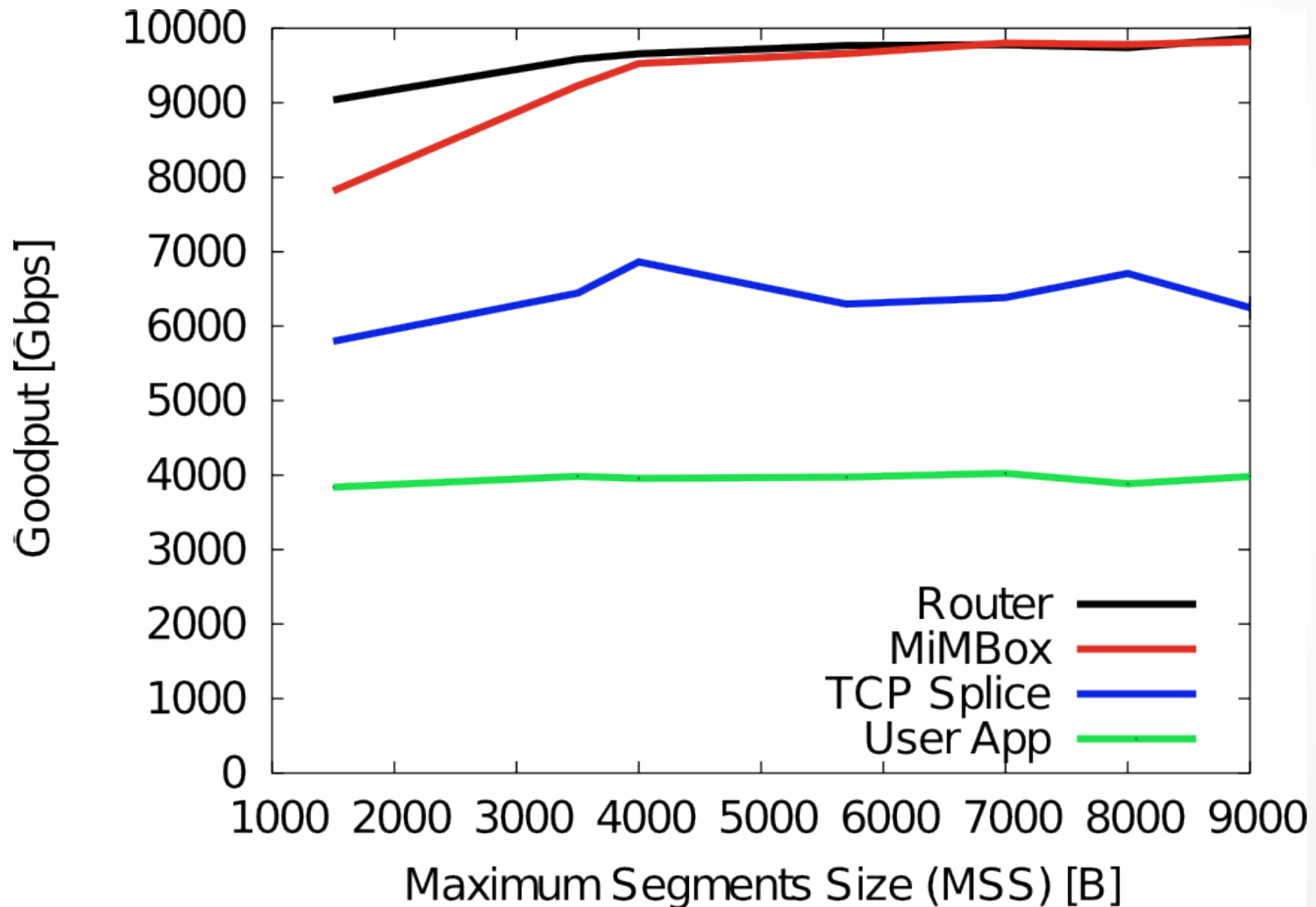
Internet bonding

CPU	PPC @800Mhz
RAM	128MB
OS	OpenWRT (Linux v3.10.49)

➢ Tested with xDSL, 3G and LTE access
➢ With optimizations, our MPTCP proxy reaches ~300Mbps in our lab

Summary

- Efficient proxies are possible even for embedded systems

- Thanks to MPTCP:
  - Multiple Layer 2 bonding:
    - xDSL, LTE, Ethernet, you name it.
  - Multiple Layer 3 bonding:
    - IPv4 and IPv6
    - Even IPv4 to IPv6 to IPv4 are possible with a proxy
  - Mobility and failover w/ session continuity