Network Assisted MPTCP

draft-boucadair-mptcp-plain-mode-08
draft-peirens-mptcp-transparent-00

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use-cases for network assisted MPTCP

- Leverage MPTCP capabilities of end-devices for fast-handover, mobility, bandwidth aggregation when only one end supports MPTCP
  ⇒'proxy' deployment converting TCP<->MPTCP within the access network

- Have same end-devices benefit from same benefits within their access network when not (yet) supporting MPTCP. (neither side)
  ⇒back-2-back deployment of two 'proxies' converting TCP<->MPTCP
- Rationale:
  - neither end-hosts or servers are under operator control to push mptcp significant adoption

focus today

Single Access networks may not be sufficient

- Downstream BW improvements
- Upstream BW improvements

⇒Using resource pooling of existing networks

⇒Overcoming deployment limitations

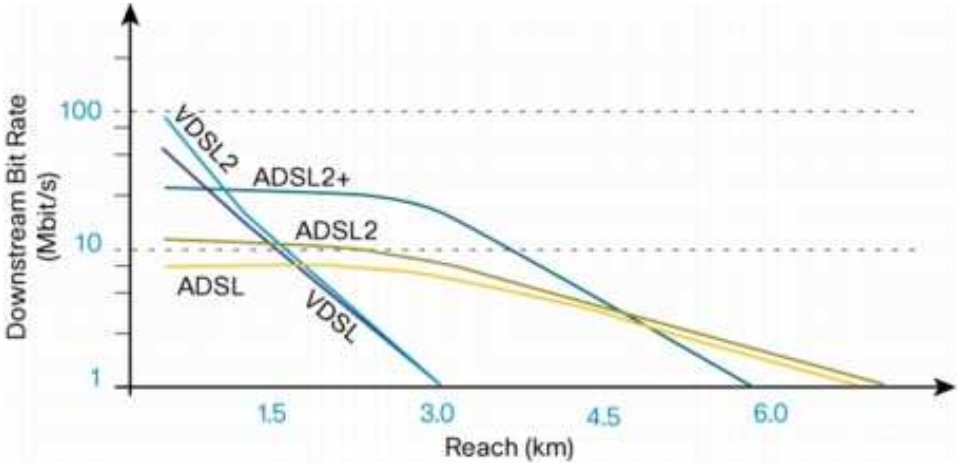
- Backup service
- Fast service turn-up

not (necessary) a new service/product
improvements of existing @ services

- Service model worked on within BBF, WT-348 => ‘Hybrid Access’

xDSL deployment limitations

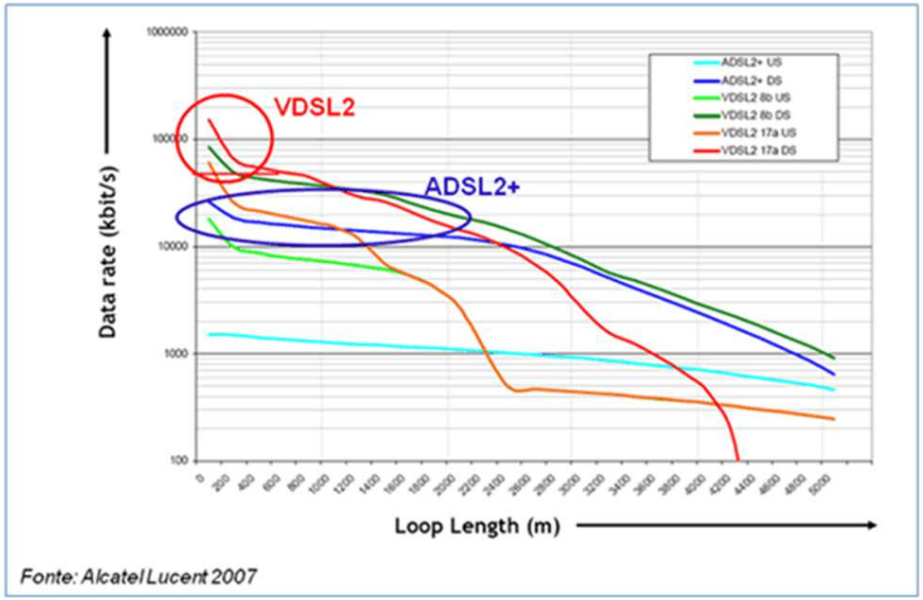
Downstream



Source: cisco

Upstream

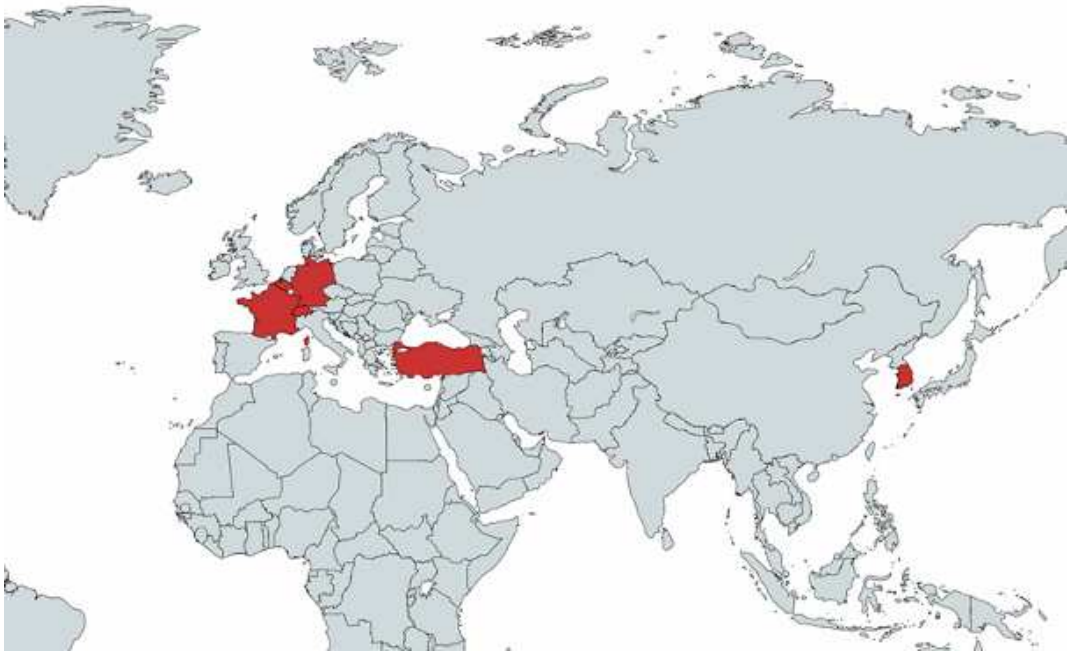
Figure 8 Debit versus distance for xDSL



Source: Alcatel-Lucent (2007)

Speeds degrades with distance

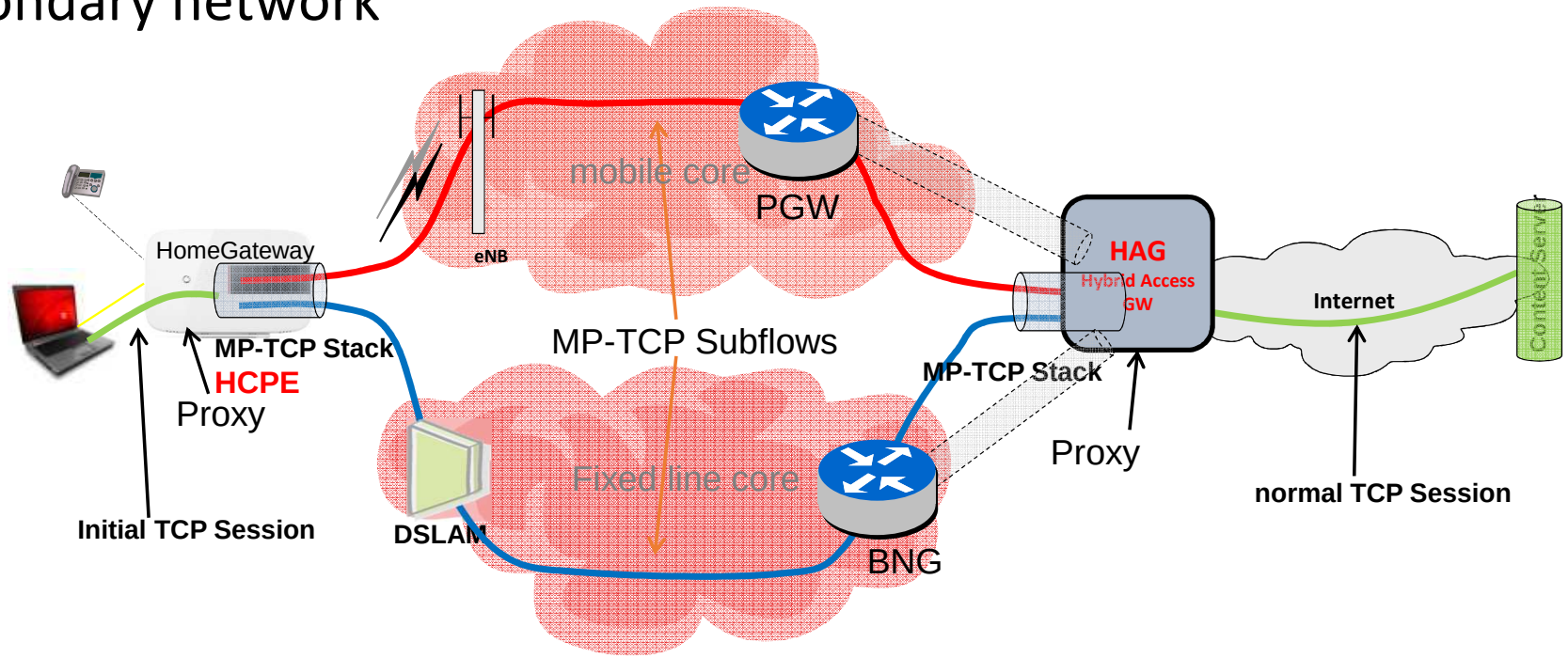
Hybrid Access usage today



- Belgium, France, Switzerland, South Korea (3) , Germany, Turkey
- Variety of different proprietary solutions today
- Interest and lab trials by many more today
- Multiple equipment vendors adopting HA/MPTCP

Hybrid Access/MPTCP - Reference architecture

High-Level Objective: Complement primary access network with secondary network



Hybrid Access – Why using Network Assisted MPTCP?

- Access networks typically vary in RTT/BW over time
  - Wireless/Cellular networks vary based on load
  - Fixed networks vary based on interference in cable bundle

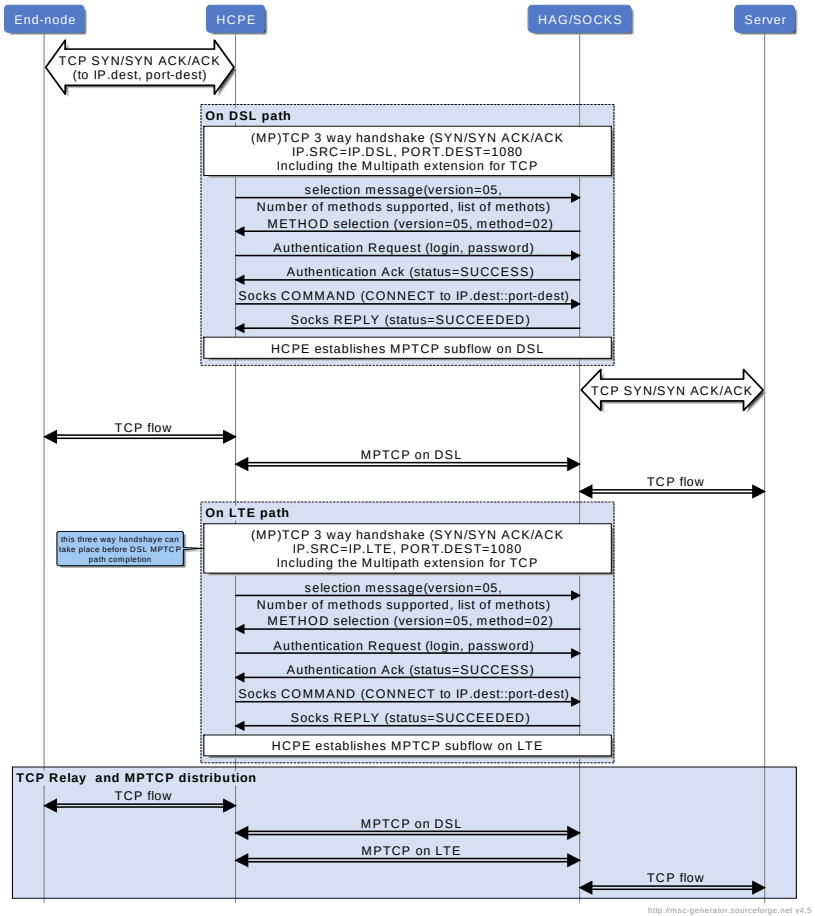
  $\Rightarrow$ Flow and congestion control required

  $\Rightarrow$ natively provided by MPTCP per sub-flow
- Minimize overhead using MPTCP
  - No additional latency for session setup compared to SOCKS
  - No additional encapsulation required
- No mandatory additional address assignment required
- Avoid stacking of flow/congestion control
- Single end-2-end flow can be split over multiple access networks
- Accommodates various deployment models

backup

Why not MPTCP+SOCKS?

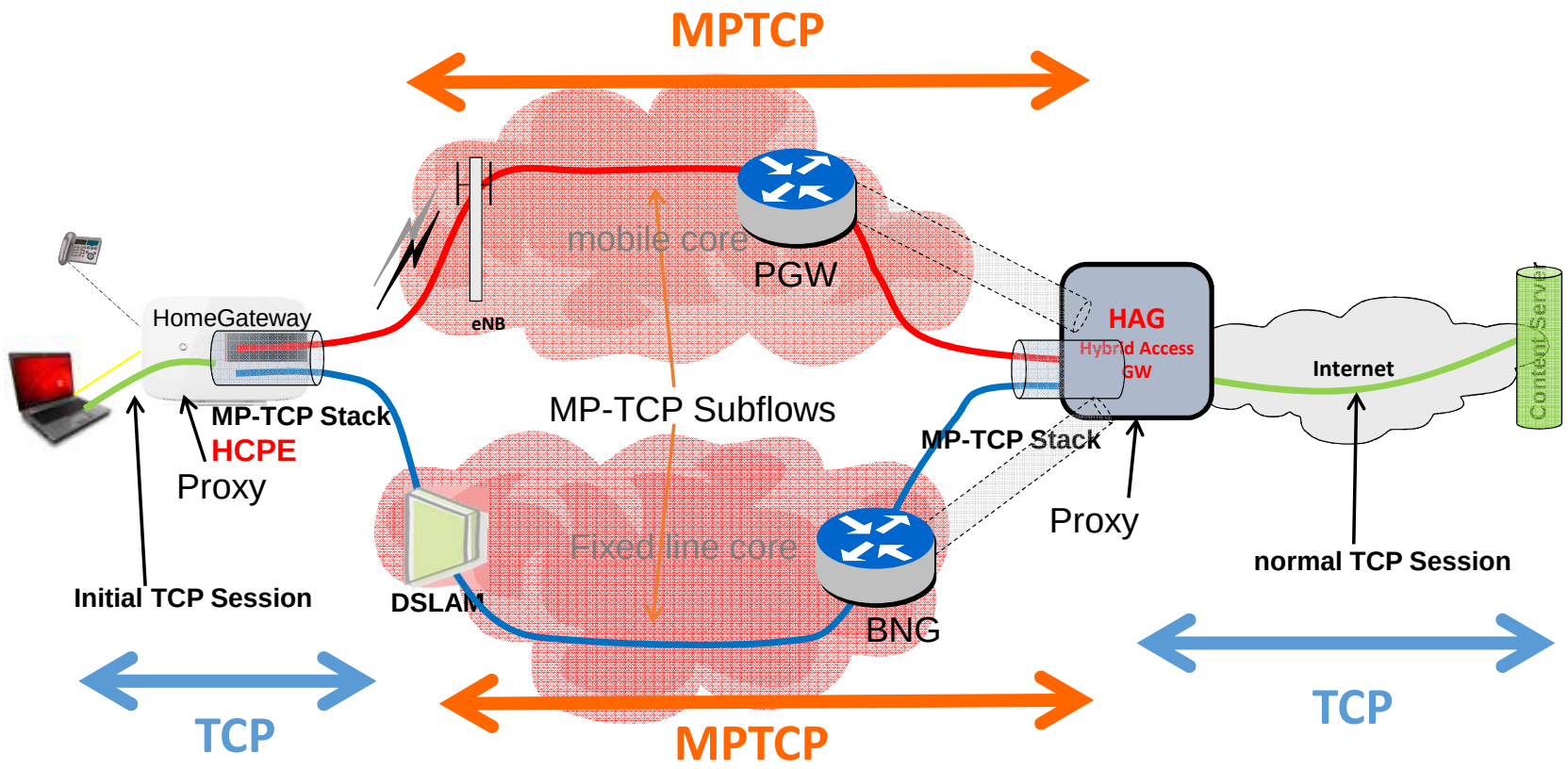
- Too chatty
- Extra delay to setup subflows
  - several tens of ms per subflow
- UDP bonding is not natively supported
- Need for UPnP IGD-SOCKS interworking



credits: P. Seite

Proxies for Network assisted MPTCP

- Transparently use MPTCP in access networks



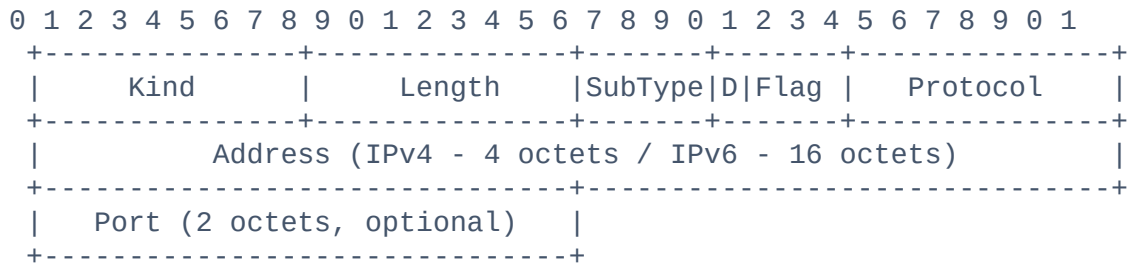
Deployment variations

- Two drafts today, multiple deployment variation
  - draft-boucadair-mptcp-plain-mode-08
  - draft-peirens-mptcp-transparent-00
- Different variations of traffic steering from HCPE <-> HAG
- Optionally remapping of host addresses to local pool on HAG
- Optionally mapping of UDP traffic in MPTCP

- Agreement to merge two drafts to accommodate all use-cases

One Single MPTCP Option, Multiple Uses

Plain Transport Mode (PM) option



- **D-bit (direction bit)**: indicates whether the enclosed IP address and/or port number are the original source (D-bit is set) or destination (D-bit is unset) IP address and/or port
- **Protocol**: Indicates the protocol that is carried in the MPTCP connection, e.g., 6 (TCP), 17 (UDP)
- **“Flag”:** A set of reserved bits for future assignment as additional flag bits
- **IPv4/IPv6 Address**: Includes a source or destination IPv4/v6 address
- **Port**: May be used to carry a source or destination port number; valid for protocols that use a 16-bit port number

- Up to two PM instances may be conveyed

Changes since Last IETF

- Clarify that one MPTCP connection is bound to one UDP flow (Yoshi)
- More text about handling UDP fragmentation (Rao)
- Precise the behavior when a plain mode option includes multicast and broadcast addresses
- Call out that CGN optimization are inherited (e.g., optimize logging files, address pooling, deterministic NAT, port set assignment, etc.)
- Add a new section to explicit the target deployment and middlebox interference (Yoshi)
- Add some text about checksum adjustment

Comment #1: Need to understand the main pros/cons vs. other solutions (Yoshi)

Feature	GRE	MPTCP PM
Encapsulation	Required by design	Not required
New control plane	Required	Leverages TCP
New flow control mechanism	Required, yet to be specified	Leverages TCP
DHCP Server on the concentrator	Required	Not required
IPv4 addressing	Sub-optimized	Supports address sharing
Timestamping	Required	Leverages TCP
NAT traversal	Requires encapsulation over UDP	Natively supported

Comment #2: Applicability of the UDP Bonding to Client/Server (Rao)

- The PM option may be used to aggregate UDP flows between MPTCP-capable client/servers
  - No address embedded in the option
  - Address field will become optional in merged draft
- Such applicability is not detailed in this draft

Comment #3: Ingress Filtering (Bart)

- Focus on the source address preservation
  - Accommodated by making address field optional in merged draft
- Anti-spoofing filters as currently deployed in operational networks are still required
- A local validation check can be enforced at the concentrator, e.g.,:
  - the address in the PM with D flag set and one IP address of the CPE must belong to the same IPv6 prefix (e.g., /56 for fixed, /64 for 3GPP, /56 for 3GPP with prefix delegation)
  - Security considerations will be updated in merged draft

Next Steps

- Consider adding a charter item for network assisted mptcp using proxy deployment(s) & discovery mechanism
  - Consider the merged plain-mode draft as candidate
- Consider adding an item for specifying DHCP options to provision MPTCP concentrators
  - Used in both explicit and implicit designs
  - A candidate document has been reviewed in dhc
    - dhc review is available here
    - Many thanks to Dan Seibel, Bernie Volz, Niall O'Reilly, Simon Hobson, and Ted Lemon
  - dhc WG charter states:
    - "*Definitions of new DHCP options that are delivered using standard mechanisms with documented semantics are not considered a protocol extension and thus are outside of scope for the DHC WG. Such options should be defined within their respective WGs and reviewed by DHCP experts in the Internet Area Directorate*"