Multipath TCP Support for Single-homed End-systems

draft-wr-mptcp-single-homed-07

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Origin of this work

• First draft in 2011
  – Specified DHCP options and gateway router behavior

• Then MIF came along
  – Came up with provisioning domains
  – Work halted to let provisioning domains mature
  – Now we have PD specs for DHCPv6 and ND

• Version 7 now uses PD
  – Router behavior unchanged
Problem statement

• Multi-homed end-devices increasingly a reality (in particular mobile devices)
• But for the foreseeable future, there will be a large number of single-homed devices like office PCs or devices in the home
• Even multi-interface devices might resort to only use a single interface (e.g. to conserve energy)
• While single-homing at end devices will remain with us for a long time, multi-homing for Internet access becomes increasingly popular (e.g. hybrid access)
• Big question: can we make multi-homing at the customer edge available to the single-homed end devices?
Scenario
Desirable properties

• No changes to MPTCP → *must work today*
• No complex proxy functionality
  – E.g. no MPTCP state machine or connection tracking on the gateway router → *no complex failure scenarios, no overhead (state and processing)*
  – No “understanding” of the MPTCP protocol necessary at the gateway router → *MPTCP can evolve separately without breaking this mechanism*
• No new signaling or provisioning protocol → *no external dependencies on something that not even exists today*

→ Simple
Key idea

• Create virtual interface(s) (bound to the one physical interface on the host)
• Configure these virtual interfaces in a way that the gateway forwards them differently (through a different access network)
  – Configuration and gateway behavior is defined in this document
• Old version of the draft was implemented and tested on Linux
  – the only thing required was some configuration plus a simple script
Principal Approach

Host (MPTCP-capable) (lb based on source IP address)

Other host must also be MPTCP-capable
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Proposed extension (to DHCP)

• A new DHCP option called EXT_ROUTE, which will be included in each provisioning domain sent by the server
  – In order to signal to the host, that each provisioning domain will result in a different path towards the Internet
• The option value (number) will determine which external interface is used to sent the traffic
Alternative

• Heuristic use of port combinations to leverage ECMP on the gateway
  – Need to know that ECMP is being deployed
  – Will likely result in either more subflows than external interfaces or less flows than external interfaces and an unbalanced number of subflows on these interfaces per MPTCP connection
Next steps

• Add ND
• Expand the text on host behavior
• Muse about potential other deployment scenarios
• Implement and test (the DHCP part)