Multipath TCP Support for Single-homed End-systems

draft-wr-mptcp-single-homed-03
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Motivation

• There clearly is an increasing number of end systems that have multiple interfaces (mobile devices, servers and the like) but...
  – ...even if you have multiple interfaces, it is not necessarily obvious to always use both at the same time (e.g. energy consumption on mobile devices) and...
  – ...there is (and likely will be for a long time) a large number of single-homed end systems (office PCs etc.)
• In the network however, multiple interfaces/paths is the norm rather than the exception
• The motivation for this document is to make multiple paths available to single-homed MPTCP-capable end systems (without changing MPTCP)
New in version 03

• Added details on heuristics to use multiple paths in the network
  – exploiting ECMP
One scenario

• SoHo/enterprise network
„Exposing“ multiple paths to the end system

Diagram:
- Host
- Gateway
- ISP 1
- ISP 2
- IP addresses: 10.2.2.5, 10.1.2.6, 10.2.0.0/16, 10.1.0.0/16
Autoconfiguration

Request MP proxy avail

MP proxy avail 1 + other config

Configure physical, create virt. interface

Send MP range 1

Config
Implementation

• Implemented using ISC DHCP server/client
  – Required only a little scripting on the client side but mostly config
• Trialed in a testbed setup
Heuristic use of multiple paths

• Autoconfiguring multiple paths works well when these paths are close to the end system
  – But there are multiple paths deeper inside the network
  – Autoconfiguration means need to be available
• It is possible to apply heuristics to exploit common multipath mechanisms (ECMP)
  – Requires change of the 5-tuple
  – Best common practices would be good (when to actually apply heuristics and how)
Changing the 5-tuple

- ADD_ADDR allows you to add the same IP address with a different port
- MP_JOIN could potentially be used with the same IP and different source port
  - Address ID handling in the implementation needs to be able to support this (spec unclear in this respect)
Applying heuristics

• Changing the 5-tuple will (with a certain probability) result in a different path (or path segment) being used
  – Fortunately the CC algorithm will make sure that MPTCP is fair in case multiple subflows use the same path

• But
  – When to apply these heuristics?
  – How many attempts should be taken?
Next steps

• Extend the heuristic use of multiple paths section

• Hoping to get clarification on some unclear sections in the MPTCP protocol spec

• **Fits the charter** („Another scenario is to enable, without changing the MPTCP protocol, operation of a single-homed, MPTCP end host on a campus network that has multiple providers“)

  – Adopt as WG item?