Multipath TCP Support for Single-homed End-systems

draft-wr-mptcp-single-homed-03

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Motivation

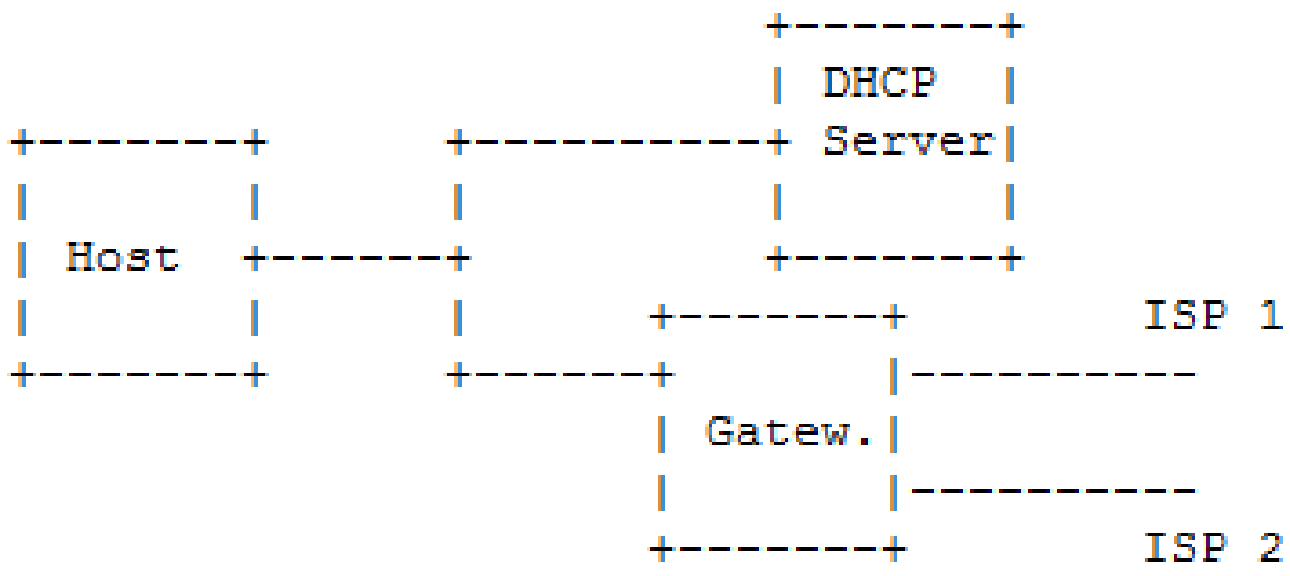
- There clearly is an increasing number of end systems that have multiple interfaces (mobile devices, servers and the like) but...
  - ...even if you have multiple interfaces, it is not necessarily obvious to always use both at the same time (e.g. energy consumption on mobile devices) and...
  - ...there 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

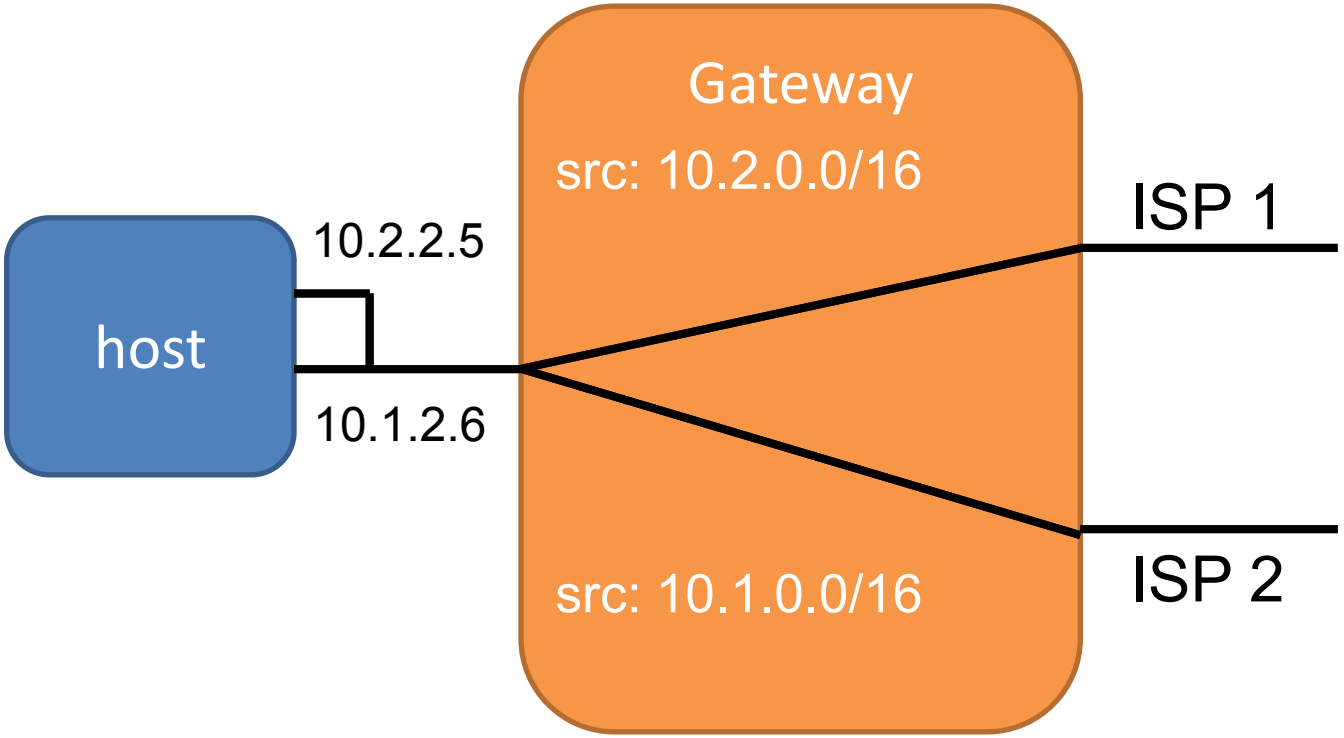
- Added details on heuristics to use multiple paths in the network
  - exploiting ECMP

One scenario

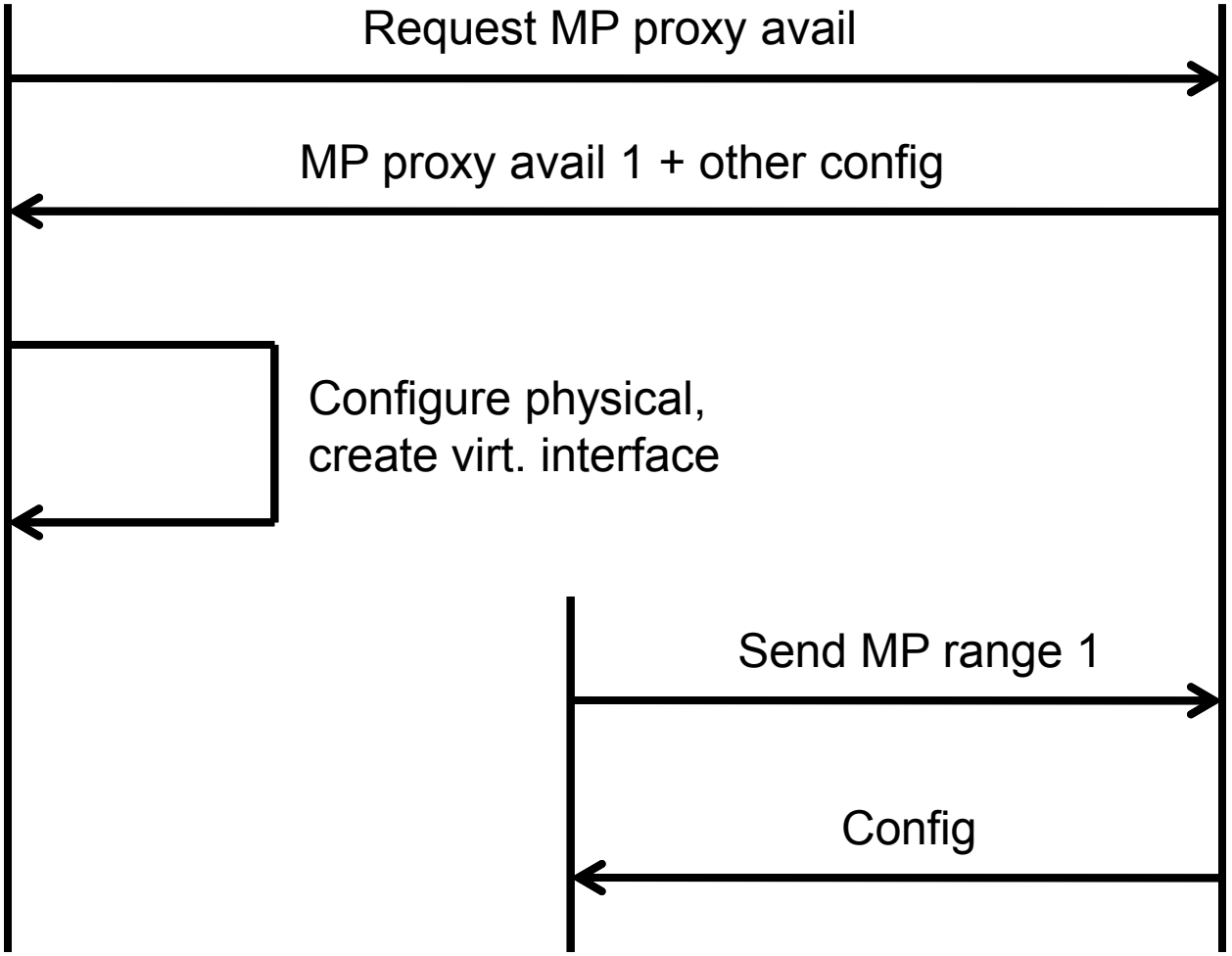
- SoHo/enterprise network



„Exposing“ multiple paths to the end system



Autoconfiguration



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?