Multipath TCP (MPTCP) Path Selection using Port Control Protocol (PCP)

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Problem Statement

➢ Determine access link maximum capability without sending data
MPTCP API Requirements (RFC 6897)

- **REQ 8**: An application should be able to inform the MPTCP implementation about its high-level performance requirements, e.g., in the form of a profile.
- **REQ 9**: An application should be able to indicate communication characteristics, e.g., the expected amount of data to be sent, the expected duration of the connection, or the expected rate at which data is provided.
Port Control Protocol

- Hosts use Port Control Protocol (PCP, RFC6887) to describe a flow to the network
  - Initial purpose: NAT and firewall devices.
  - Now: signal flow characteristics (bandwidth, importance), get feedback from network
PCP Flowdata Example

PCP Client | PCP Server | TCP Server
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TCP three-way handshake
PCP PEER + FLOWDATA
SUCCESS

flow is not prioritized
flow is prioritized

MPTCP path selection using Port Control Protocol (PCP)
Message Flow

Application with MPTCP stack and PCP client

ADDRESS A

PCP Server
ISP A

PCP PEER with FLOWDATA

Success

ISP A is the best path indicated by PCP

TCP 3 way handshake (MP_CAPABLE)

Set up Additional Sub-flows

ADDRESS B

PCP Server
ISP B

PCP PEER with FLOWDATA

Success

MPTCP Server

TCP 3 way handshake (MP_JOIN)

MPTCP path selection using Port Control Protocol (PCP)
MPTCP stack using PCP

Host

Application

MPTCP Stack

PCP Client

Subflow (TCP)

UDP

IP
Advantages of MPTCP + PCP

- Network information available before sending data
- Reduces thrashing
  - Avoid requesting 1Gbps flow over 100kbps link
- Network can inform of changed characteristics
- Information useful to tune MP_PRIO values
- Use PCP with ADD_ADDR (if ADD_ADDR survives!)
Questions