Evolving the Internet with Connection Acrobatics

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MPTCP WG meeting - IETF88
Initial MPTCP use cases

Multihomed device

Device in multihomed network
A couple more that came along...

Host Mobility

Intra datacenter traffic engineering
Some new use cases:

• Waypoint migration
• Endpoint migration
• Process migration
Waypoint migration: what is it?

• Destination routing control
  – Move traffic based on policy (this flow needs to flow through this middlebox)
  – Traffic engineering/load balancing
Waypoint migration: How is it done?

- C establishes MPTCP connection with S through M1
- M1 configures forwarding state in M2
- M2 issues an ADD_ADDR msg with M2 address
- C sends an JOIN to M2 address
- M2 translates source and destination address and forwards to S
  - Same with rest of traffic between C and S
- M1 closes the MPTCP flow (RST)
Waypoint migration: experiment

• Implemented the functionality.
• In the test, M1 scanned TCP payload for the word “secure” and redirects connection when match is found
• Negligible effect on performance
• Takes 2 RTT between M1 and M2 (200ms)
Endpoint migration: What is it?

- Connection is transferred from S1 to S2 right after the 3WHS is finished and **before** the app kicks in.
- Use cases:
  - Server load balancing
  - DoS protection
  - TLS offloading
  - Off-by default (connection is redirected after authentication)
Endpoint migration: How is it done?

- C establishes MPTCP connection with S1
- Right after the 3WHS is finished, S1 forwards the crypto material (2 session keys) to S2
- S1 sends ADD_ADDR to C with S2 address
Endpoint migration: experiment

• Implemented the functionality
• The servers were running Apache on a 1 Gbps link serving a 25MB file to 2 clients that repeatedly downloaded the file
• Better performance:
  – Lower delay
  – Lower variance

![File Download Time (ms) vs Time (s) graph]

0 20 40 60 80 100 120 140
0 200 400 600 800 1000 1200 1400
File Download Time (ms)
Time (s)
Process migration: what is it?

- VM migration in the wide area (using different IP addresses)
Process migration: experiment

- Implemented the functionality
- Client in Romania sends periodic requests to a Server in Germany. Server’s VM is migrated to machine in Romania
- Perturbation lasts for few secs
MPTCP use cases

- Multihomed device
- Multihomed site
- Mobility
- Data center TE
- Waypoint migration
- Endpoint migration
- Process migration
- Others...?