0-RTT TCP Converters

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The Basic Design

• Converter Protocol is an application-level protocol listening on a specific TCP port
  – Commands and responses are encoded as TLVs
    • Ensures extensibility
  – Commands are sent inside SYN
    • Provides 0-RTT to minimize connection establishment delays
  – Responses are returned in SYN+ACK
  – A plain transport mode is used between Clients and Converters (no encapsulation)

• Clients can learn TCP options supported by Servers
  – Allows Clients to bypass the Converter
A Simplified Example

TLV message in SYN payload

Data

SYN [Connect @s:p]
SYN+ACK [Ok]

Data

No TLV is supplied

TLV in the payload

SYN

SYN+ACK

@t

@c

@s
Main Changes Since IETF#103

• Integrate feedback from implementors
  – Various tweaks and clarifications
    • Removed error TLV from RSTs since some stacks cannot send/parse such packets easily
  – Open-source client library and wireshark dissectors released by Tessares (See https://www.tessares.net/technology/open-source-contributions/)

• Simplified the design by removing the requirement from using TFO
  – The protection provided by TFO in the previous design is now provided in the Convert protocol itself
The Converter Cookie

@c ==> Cookie=ABC

SYN [Connect @s:p, C=ABC]  |+ACK
SYN [Connect @s:p]
SYN+ACK [...]

No cookie
Valid cookie

SYN
SYN+ACK
The Converter Cookie

SYN [Connect @s:p,C=ABC]

SYN+ACK
[Not Authorized]

@c

@t

@c ==> Cookie=VAL

Cookie Validation
ABC!=VAL

@s

C
Converted-Assisted MPTCP

SYN (MPC, MSS=x) [Connect @s:p]

SYN+ACK (MPC(Kc)) [ExtTCPH(MSS=z)]

SYN(MPC, MSS=y)

SYN+ACK (MSS=z)

Copy of extended TCP header returned by server.
Converted-Assisted MPTCP: Bypass

Client knows that server supports MPTCP
Status & Next Step

• A simplified design which takes into account feedback from implementors and comments raised during email discussions

• Adoption from other standardisation bodies
  – Broadband Forum for WT-378
  – 3GPP for the ATSSS service in 5G networks (TS 23.501)

• We believe that the document is ready for WG Last Call
Backup

• Examples from a first packet trace
SYN from client to converter
SYN+ACK returned by converter
Response returned by converter

![Network packet capture interface with TCP data and additional text information including frame details, protocol version, transmission control protocol data, and TCP header information.](image-url)
HTTP GET from client

- Frame 63: 149 bytes on wire (1192 bits), 149 bytes captured (1192 bits)
- Linux cooked capture
- Internet Protocol Version 4, Src: 1.1.1.1, Dst: 1.1.3.2

Hypertext Transfer Protocol
- GET /100KB HTTP/1.1
  User-Agent: curl/7.29.0
  Host: 1.1.3.2:8080
  Accept: */*

  HTTP request 1/1