Optimizing NAT and Firewall Keepalives using PCP

draft-reddy-pcp-optimize-keepalives-01

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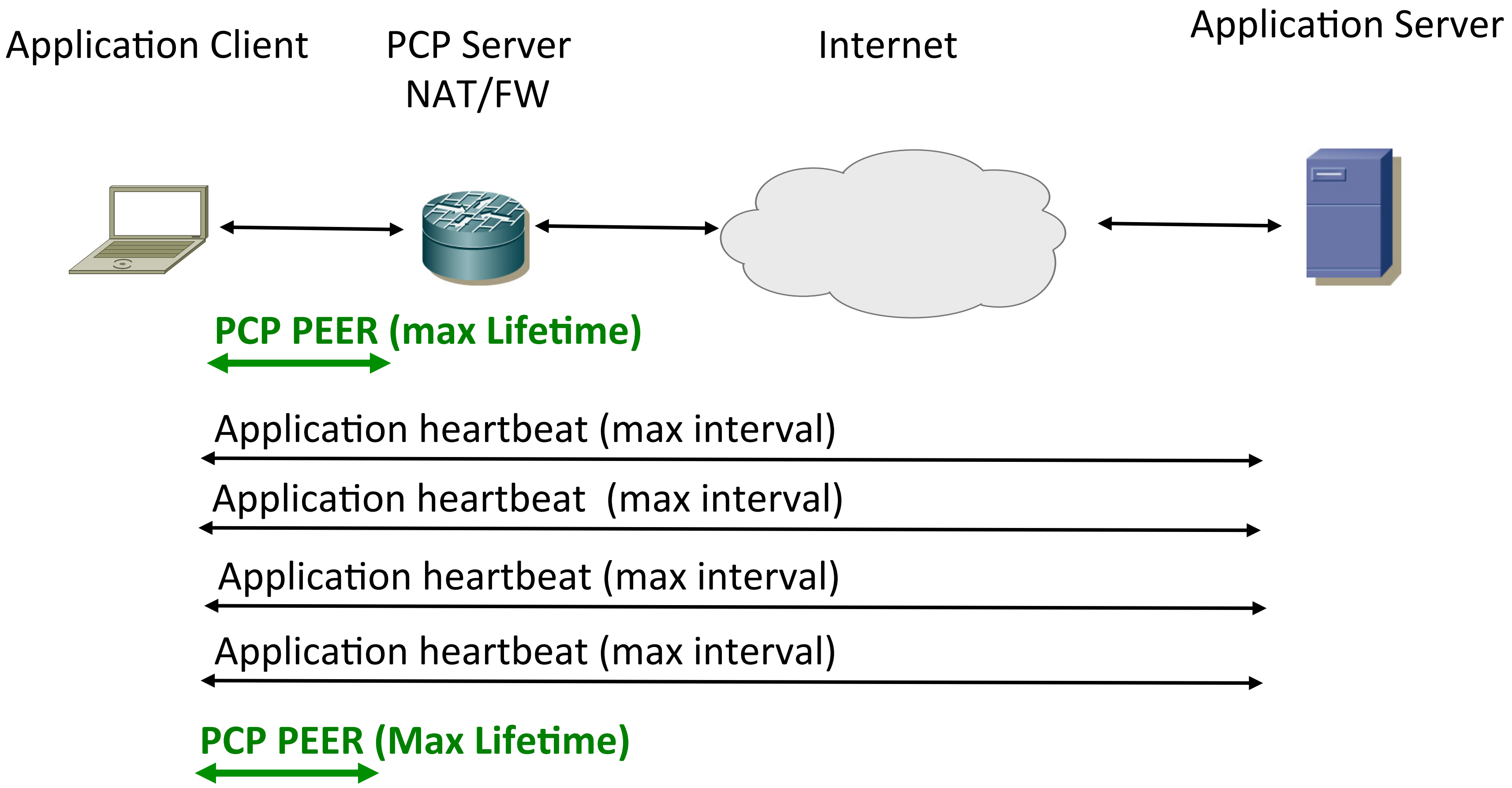
Keep-alive Optimization



Application Client

PCP Server
NAT/FW

Internet

Application Server

PCP PEER (max Lifetime)

Application heartbeat (max interval)

Application heartbeat (max interval)

Application heartbeat (max interval)

Application heartbeat (max interval)

PCP PEER (Max Lifetime)

- Synchronize PCP and application messages to save power

Approaches in General

1. Application uses PCP but continues using predetermined fixed keep-alive interval
   - PCP adds robustness, but no reductions on keep-alive rate
2. Application uses PCP **and** uses some dynamic mechanism to detect and optimize keep-alive interval
   - Just detect a (seemingly) working interval or also try to detect if there are additional NATs or firewalls on the path
   - Adds risk but keep-alive interval can be reduced

- This draft explores and recommends the mechanisms apps can use in case 2.

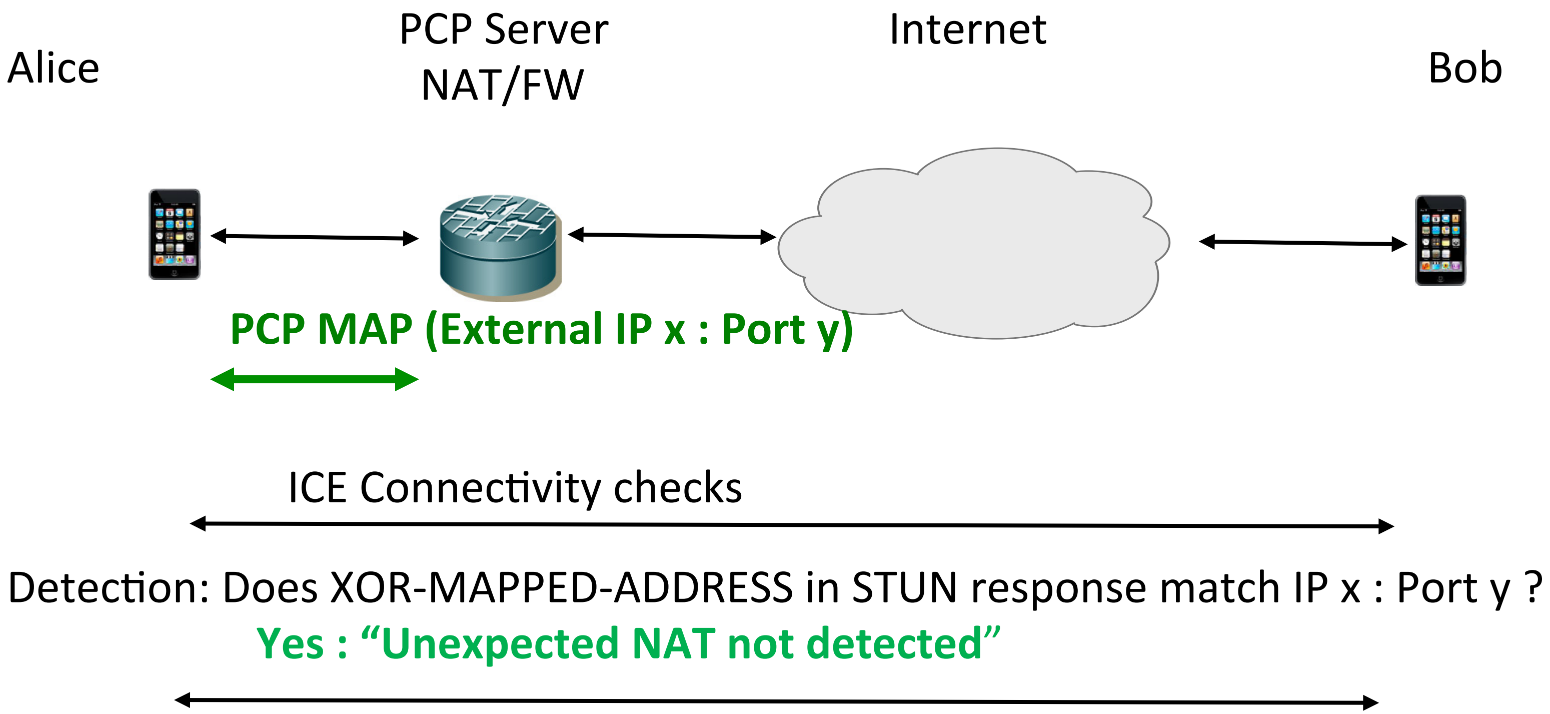
Updates since IETF 85

- Scenarios
  - Client-Server applications
  - Peer-to-Peer applications
- Detection
  - Unexpected NATs before or after PCP server
  - **PCP Unaware Firewalls on the path (New)**
- **Keep-alive optimization (Updated)**
- **Keepalive Interval Determination Procedure when PCP unaware Firewall or NAT is detected (New)**
- Operation with App protocols
  - SIP, HTTP, RTP, RTCWeb Data Channel
  - (XMPP, WebSocket, …)

Update on Keep-alive Optimization

- Sending a PEER request with a very short Requested Lifetime can be used to query the lifetime of an existing mapping. PCP clients can reduce the frequency of their NAT and firewall keep-alive message.
- PCP base draft recommends that lifetimes of mappings created or lengthened with PEER be longer than the lifetimes of implicitly-created mappings - **PCP can thus be used to save battery consumption by making PCP PEER message interval longer than what the application would normally use the keep middle box state alive, and strictly shorter than the server state refresh interval.**

ICE - Detecting Unexpected NATs



Alice

PCP Server
NAT/FW

Internet

Bob

PCP MAP (External IP x : Port y)

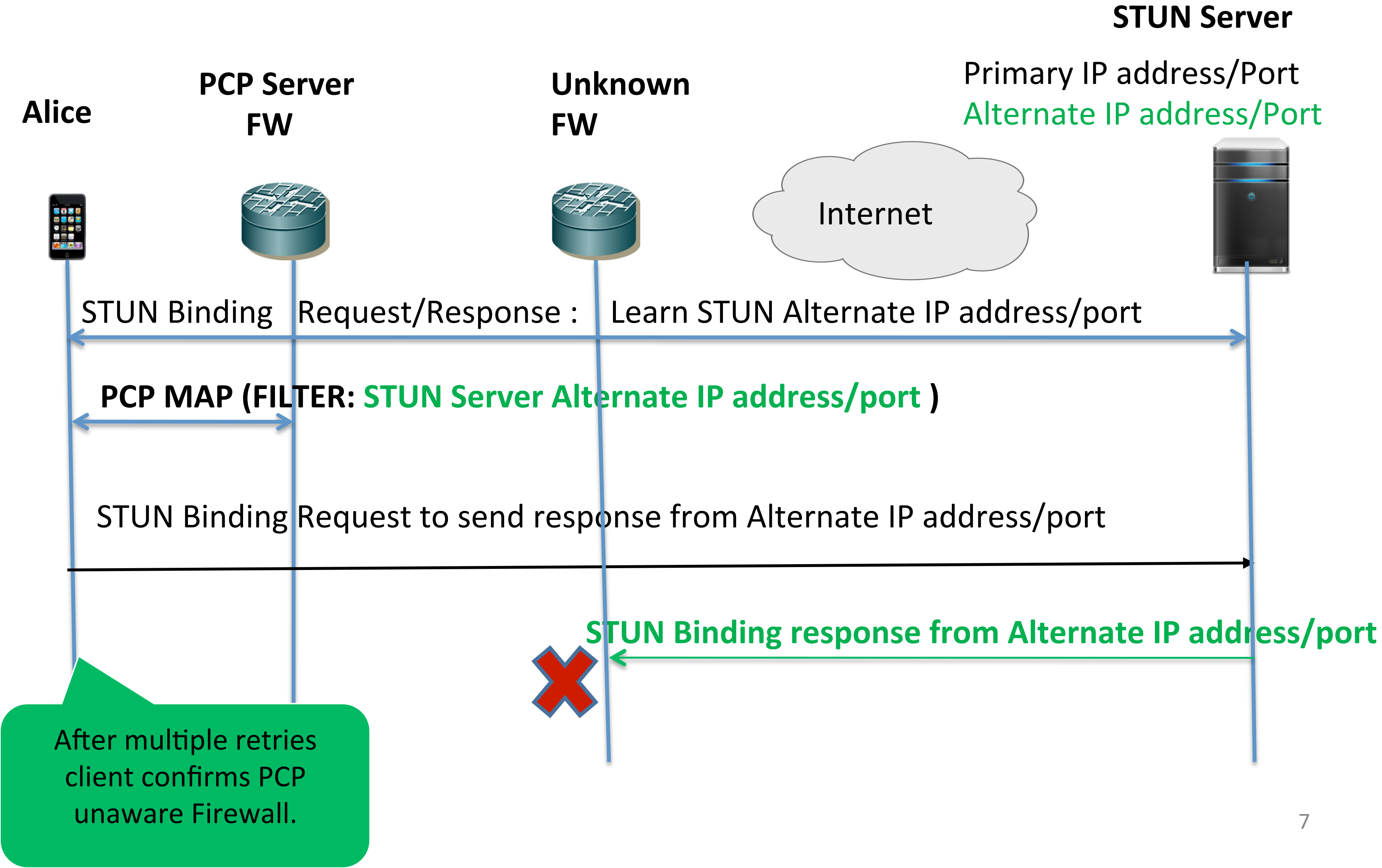
ICE Connectivity checks

Detection: Does XOR-MAPPED-ADDRESS in STUN response match IP x : Port y ?

Yes : "Unexpected NAT not detected"

- Server-reflexive candidates gathered using PCP and STUN/TURN
- PCP itself can detect unexpected NATs between client and PCP server
- Application can detect unexpected NATs behind PCP server using ICE

Detecting Unexpected Firewalls



STUN Server

Primary IP address/Port

Alternate IP address/Port

Alice

PCP Server FW

Unknown FW

Internet

STUN Binding Request/Response : Learn STUN Alternate IP address/port

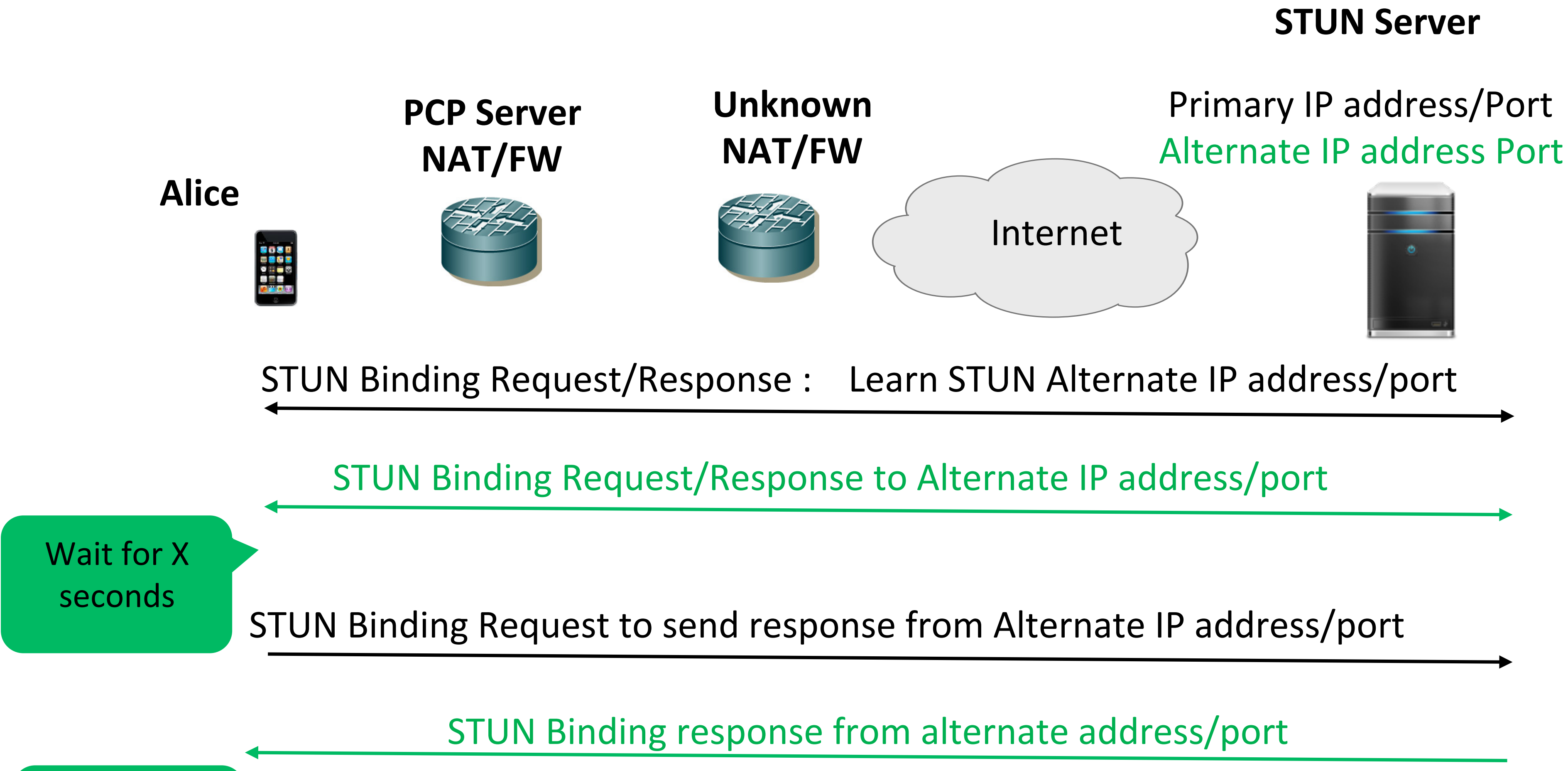
PCP MAP (FILTER: STUN Server Alternate IP address/port)

STUN Binding Request to send response from Alternate IP address/port

STUN Binding response from Alternate IP address/port

After multiple retries client confirms PCP unaware Firewall.

PCP unaware Firewall or NAT is detected - Heuristics



STUN Binding Request/Response : Learn STUN Alternate IP address/port

STUN Binding Request/Response to Alternate IP address/port

Wait for X seconds

STUN Binding Request to send response from Alternate IP address/port

STUN Binding response from alternate address/port

Wait for (X + X/2) seconds

- **Repeat procedure until no response received to determine Keepalive interval value of “X”**
- **Repeat for each transport protocol**
- **Other protocols like Teredo use it’s own mechanism**

Other changes

- **To improve reliability, applications SHOULD continue** to **use PCP to lengthen the FW/NAT mappings even if the PCP unaware NAT/Firewall is detected. This ensures that PCP aware FW/NAT do not close old mappings with no packet exchange when there is a resource-crunch situation.**
- **In cases of an intermediary device e.g. transparent HTTP proxy then PCP client must use Heuristics and compare the results with the lifetime learnt using PCP PEER request.**

Next Steps

- **Consider adoption of this document as WG item.**