PCP Client: Implementation Experiences

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1. Scope

• Implementation of PCP Client:
  – PCP Base I-D v13;
  – THIRD_PARTY option not supported.

• Platform – Meego (A Linux based platform):

  ![MeeGo](image)

• PCP Client Core + Graphical User Interface (for interop testing).
2. PCP Client Core

- PCP Client was implemented in C in user space daemon.

- Multithread client:
  - 1. New PCP Requests handler;
  - 2. Incoming PCP Responses listener;
  - 3. Schedule manager (e.g. refresh mappings, resend requests).

- Built around two lists (1:1 relation):
  - Mappings; (NOT_SENT / WAIT_RESP / MAPPED / REFRESHING / ERROR_WAIT_RESEND)
  - Actions. (when to refresh, when to resend request, etc...)
3. Implementation Considerations (1)

- The PCP Client must maintain the state of each mapping requested in a similar way the PCP Server does.
  - Needs to manage each mapping.
- As per Rev 13, if the PCP client realizes that the server has lost state, it will flood the PCP server with requests for the mapping the client is aware of.
  - So we decided to send requests at 0.5 sec intervals
- Needed to use connected UDP sockets to get PCP server address.
3. Implementation Considerations (2)

- Only one server address is supported.
  - For a Dual-stack client (v4 and v6 default gw), which PCP server to use is the absence of a configuration file? We decided that IPv6 default gw takes precedence.

- Client must track changes on the default route to check if the PCP server if reachable.
  - Can use Linux NETLINK for this. Adds complexity to the code.

- The I-D does not state what to do in case of receiving Port Unreachable from the server.
3. Implementation Considerations (3)

- The I-D was ambiguous about what fields the PCP server must copy into the PCP Request packet in case of a result code different than zero.
- As per rev 13 it was not clear if the O bit can be set by the client or if it was part of the Option definition, which means that Option numbers less than 128 are always mandatory.
- When sending delete all mappings request (lifetime, int_port, proto are zero) what opcode should be used?
4. Graphical User Interface

• Instead of trying to modify some software to use the PCP Client API, we decided to use a GUI just for testing the PCP Client Behavior.
  – Simulates an application that needs mappings.
• Developed in Qt, using QML and C++.
3. GUI
3. GUI

PCP Client

Generates a Request:

- MAP
- PEER

Current mappings:

- Mappings

Set New PCP Server
3. GUI

<table>
<thead>
<tr>
<th>Source</th>
<th>Remote Peer</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.80.30.128:58962</td>
<td>199.59.149.200:80</td>
</tr>
<tr>
<td>10.80.30.128:68881</td>
<td>10.80.30.128:22</td>
</tr>
<tr>
<td>10.80.30.128:50662</td>
<td>174.129.4.72:80</td>
</tr>
<tr>
<td>10.80.30.128:22</td>
<td>10.80.30.128:56881</td>
</tr>
</tbody>
</table>

Select the number of connection: 1

Ok

Skip
3. GUI

* OpCode: PEER4

* Requested Lifetime: 255

* Protocol: 6

Internal Address: fff:10.80.30.128

* Internal Port: 58962

* Remote Peer IP Address: 199.59.149.200

* Remote Peer Port: 80

External IP Address: 

External Port: 0

Send Request
3. GUI

Request sent with success.

Ok
3. GUI

PCP Client

Generates a Request:

MAP

PEER

Current mappings:

Mappings

Set New PCP Server
3. GUI

Mappings

------------------------------- 1 -----------------------------

Opcode: 1
Protocol: 6
Lifetime: 255
State: Port mapped
Internal Port: 22
Internal Address: ::ffff:10.80.30.128
External Port: 0
External Address: ::ffff:64.41.14.10
Remote Peer Port: 0
Remote Peer Address: ::
Result Code: 0
Port Reservation: is NOT SET
Prefer Failure: is NOT SET

Refreshing in 101 seconds...

------------------------------- 2 -----------------------------

Opcode: 3
Protocol: 6
Lifetime: 255
State: Port mapped
Internal Port: 58962
Internal Address: ::ffff:10.80.30.128
External Port: 0
External Address: ::
Remote Peer Port: 80
Remote Peer Address: ::ffff:199.59.149.200
Result Code: 0
Port Reservation: is NOT SET
Questions?

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