

Using PCP To Coordinate Between the CGN and Home Gateway Via Port Allocation

draft-tsou-pcp-natcoord-07

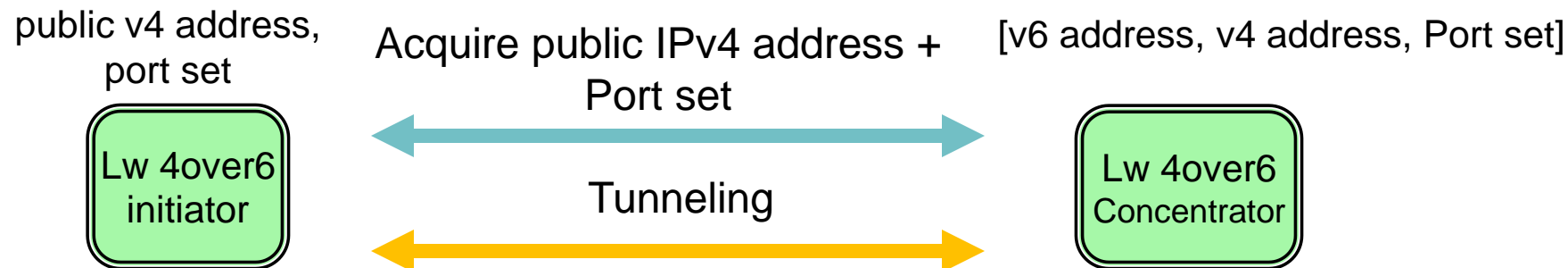
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Motivation

- The requirement on CGN processing capability grows with increasing subscribers;
- Delegating NAT function to the Home Gateway will offload the burden on CGN.
- It is motivated for lightweight 4over6
 - <http://tools.ietf.org/html/draft-cui-softwire-b4-translated-ds-lite-07>
 - Given, PCP is already used to instruct individual mappings and PCP provides a flexible means for port set management, **we need to extend PCP with the ability to reserve port sets** instead of individual mappings

Overview of Lightweight 4over6



- NAT44 **within restricted port set**
- Tunnel encapsulation/de-capsulation.

- Subscriber-level binding record
- Tunnel encapsulation/de-capsulation.
- **No NAT** anymore

So, we need to extend PCP with the ability to reserve port set instead of individual mapping.

Why do we need PCP extension?

- Lightweight 4over6 has mandatory port-set allocation mechanism using DHCPv4-over-v6 port-set extension.
- However, PCP based extension is more suitable for the following situation:
 - Operators who do not have existing DHCPv4 server.
 - PPP extension can only be used when TC is deployed in BRAS, but not for higher layer.
 - Dynamic port-set allocation when one subscriber needs multiple port-sets when necessary.
 - Operators planning to migrate the DS-Lite AFTR to behave as a port range router
 - PCP is likely to be deployed to manage individual mapping
 - Extending PCP to delegate port range would help in that migration path

Changes since -05

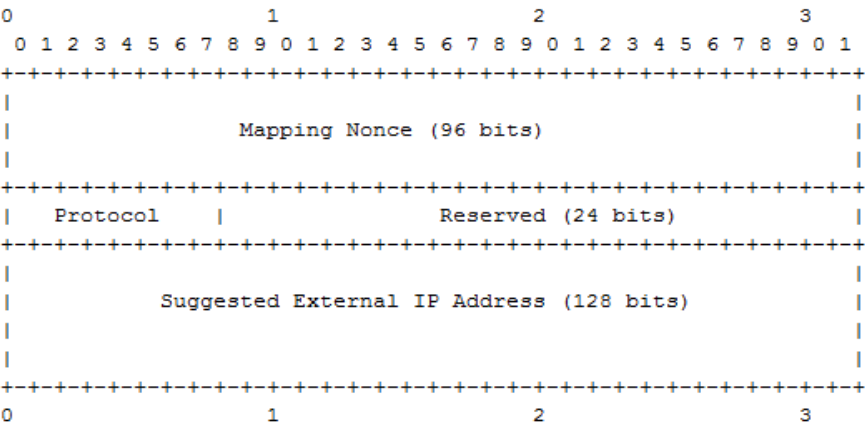
- MAP_PORT_SET OpCode format is updated according to MAP format.
- Explain the corner cases for MAP_PORT_SET
 - How to determine error codes
 - How to deal with the case when one subscriber needs multiple port-sets
 - How to deal with the situation when there is an existing mapping, or there is no existing mapping

Our basic idea

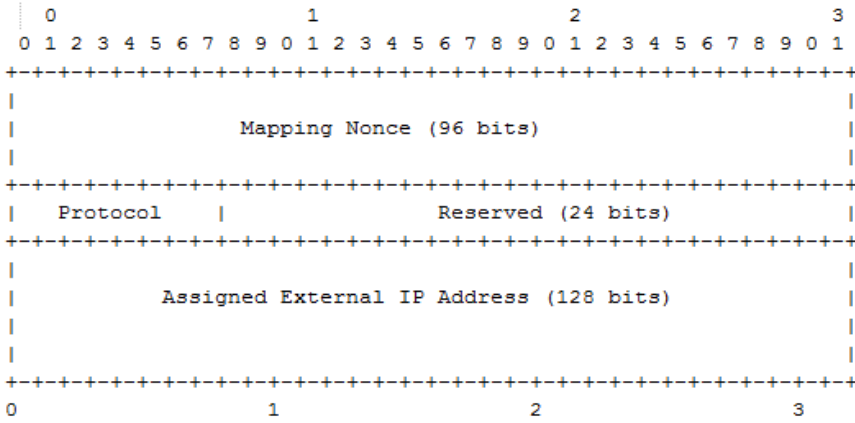
- It is inherent from MAP OpCode, with limited functionalities.
- The reason that we define a new OpCode to request a range of ports: MAP_PORT_SET
 - avoid overloading MAP
 - ease separating the port-range function from the handling of individual mappings.
- Define two options to assign port sets:
 - Port-Set option: convey contiguous, non-contiguous port-set
 - Cryptographically Random Port Range Option: convey pseudo-random port sets.

MAP_PORT_SET OpCode

MAP_PORT_SET Request



MAP_PORT_SET Reply



- MAP_PORT_SET OpCode format is quite similar to MAP.
- The only difference is that the PCP server needs to remember **N Mapping Nonces** in case one client can ask for **N** port-set.
 - Each port-set binding will keep ONE Mapping Nonce Value.
- Port-Set Options
 - In Port Range Value/Port Range Mask format
 - In Cryptographically Random Port Range format : function/starting point/ number of delegated ports/k

Procedure Overview

- Two port-set PCP Options MUST be supported
- Several policies can be enforced in the PCP Server's side
 - Size of the port-set to allocate
 - Maximum number of port-sets for a subscriber
 - Enable random port sets
 - Allow multiple port sets
 - Port Quota
 - Assign Well-Known Ports
- The PCP Server MUST maintain a binding for each port set allocation
 - {PCP Client IP Address, (External IP Address, Port Set)}

Procedure Overview

- Generating a MAP_PORT_SET Request
 - Contains at least one of the port-set Options
 - PREFERE_FAILURE can be used if required
 - Generate Mapping Nonce randomly, independent of different requests
 - In retransmission case, Mapping Nonce should be copied from the previous MAP_PORT_SET request
- Renewing a MAP_PORT_SET Mapping
 - Renew each port-set mapping independently, update Mapping Nonce
- Processing a MAP_PORT_SET Request
 - One port-set should be treated consistently
 - Deal with the cases when there is a mapping already exists, or no mapping exists yet.

Next Steps

- Comments ?
- Adopt the document as WG item ?