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PCP Third Party ID Option
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Abstract

This document describes a new Port Control Protocol (PCP) option called THIRD_PARTY_ID. It serves for identifying a Third Party in addition to the means that PCP's THIRD_PARTY option already provides for that purpose.

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1. Introduction

The IETF has specified the Port Control Protocol (PCP) ([RFC6887]) to control how packets are translated and forwarded by a PCP-controlled device such as a network address translator (NAT) or firewall.

This draft focuses on the application of PCP's `THIRD_PARTY` option that is used when the PCP client sends requests that concern other internal hosts than the host of the PCP client. This is, for example, the case if port mapping requests for a carrier grade NAT (CGN) are not sent from PCP clients at the subscribers, but from a PCP Interworking Function which requests port mappings.

The issue addressed by the `THIRD_PARTY_ID` option is that there are CGN deployments that do not distinguish internal hosts by their IP address only, but use further identifiers for unique subscriber identification. This is, for example, the case if a CGN supports overlapping private IP address spaces according to [RFC1918] for internal hosts of different subscribers. Then different internal hosts are identified and mapped at the CGN by their IP address and an additional ID, for example, the ID of a tunnel between the CGN and the subscriber. In such cases, the IP address contained in the `THIRD_PARTY` option is not sufficient. An additional identifier needs

to be carried by the PCP protocol in order to uniquely identify the internal host. The THIRD_PARTY_ID option serves this purpose.

The THIRD_PARTY_ID option is defined for use in combination with the THIRD_PARTY option for the PCP opcodes MAP and PEER.

We renamed the option name from TUNNEL_ID to THIRD_PARTY_ID to reflect the fact that this identifier is an extended THIRD_PARTY option for general applicability.

2. Terminology

The terminology defined in the specification of PCP [RFC6887] applies.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119].

3. Target Scenarios

This section describes two scenarios that illustrate the use of the THIRD_PARTY_ID option:

1. a UPnP IGD-PCP IWF (Universal Plug and Play Internet Gateway Device - Port Control Protocol Interworking Function),
2. a carrier web portal for port mapping.

Both scenarios are variants of the same basic scenario shown in Figure 1. It has a carrier operating a CGN and a Port Control Protocol Interworking Function (PCP IWF) for subscribers to request port mappings at the CGN. The PCP IWF communicates with the CGN using PCP. For this purpose the PCP IWF contains a PCP client and the CGN is co-located with a PCP server. The way subscribers interact with the PCP IWF for requesting port mapping for their internal hosts is not specified in this basic scenario, but more elaborated in the specific scenarios below.

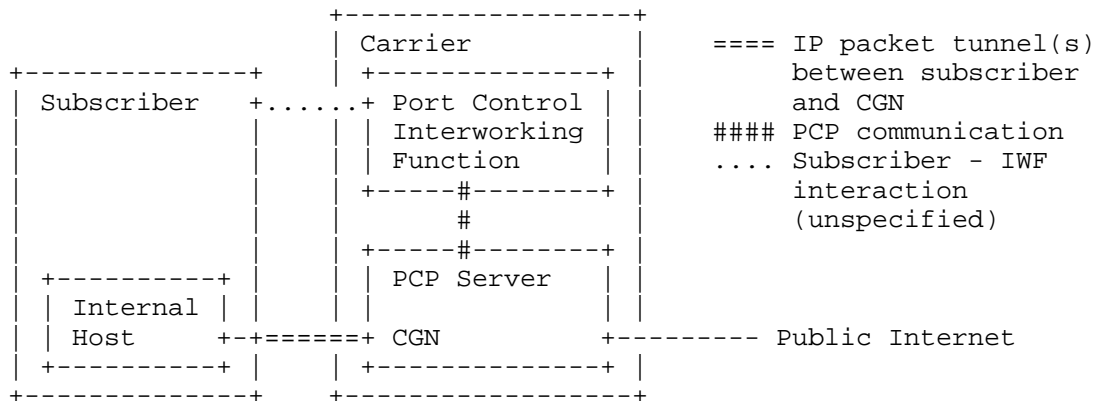


Figure 1: Carrier hosted PCP IWF for port mapping requests

Internal hosts in the subscriber's network use private IP addresses as specified in [RFC1918]. Since there is no NAT between the internal host and the CGN, there is an overlap of addresses used by internal hosts at different subscribers. That is why the CGN needs more than just the internal host's IP address to distinguish internal hosts at different subscribers. A commonly deployed method for solving this issue is using an additional identifier for this purpose. A very good candidate for this additional identifier at the CGN is the ID of the tunnel that connects the CGN to the subscriber's network.

Requests for port mappings from the PCP IWF to the CGN need to uniquely identify the internal host for which a port mapping is to be established or modified. Already existing for this purpose is the THIRD_PARTY option that can be used to specify the internal host's IP address. The THIRD_PARTY_ID option is introduced for carrying the additional (tunnel) information needed to identify the internal host in this scenario.

The additional identifier for internal hosts needs to be included in MAP requests from the PCP IWF in order to uniquely identify the internal host that should have its address mapped. This is the purpose that the new `THIRD_PARTY_ID` serves in this scenario. It carries the additional identifier, that is the tunnel ID, that serves for identifying an internal host in combination with the internal host's (private) IP address. The IP address of the internal host is included in the PCP IWF's mapping requests by using the `THIRD_PARTY` option.

The information carried by the `THIRD_PARTY_ID` is not just needed to identify an internal host in a PCP request. The CGN needs this

information in its internal mapping tables for translating packet addresses and for forwarding packets to subscriber-specific tunnels.

How the carrier PCP IWF is managing port mappings, such as, for example, automatically extending the lifetime of a mapping, is beyond the scope of this document.

3.1. Carrier-hosted UPnP IGD-PCP IWF

This scenario further elaborates the basic one above by choosing UPnP as communication protocol between subscriber and the carrier's PCP IWF. Then obviously, the PCP IWF is realized as an UPnP IGD-PCP IWF as specified in [RFC6970].

As shown in Figure 2 it is assumed here that the UPnP IGD-PCP IWF is not embedded in the subscriber premises router, but offered as a service to the subscriber. Further, it is assumed that the UPnP IGD-PCP IWF is not providing NAT functionality.

This requires that the subscriber has a UPnP connection to the UPnP IGD-PCP IWF, which can, for example, be provided via (one of the) tunnel(s) connecting the subscriber's network to the CGN. This connection can then be used by hosts in the subscriber's network to request port mappings at the CGN using UPnP as specified in [RFC6970].

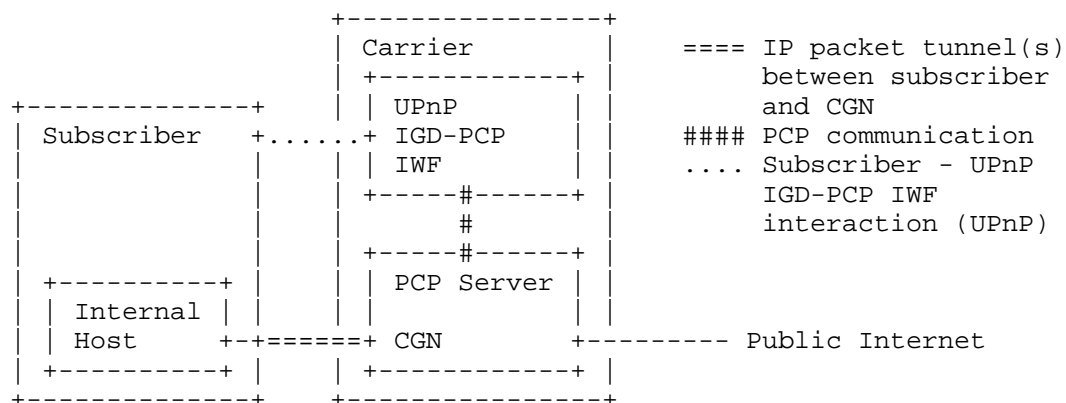


Figure 2: UPnP IGD-PCP IWF

A potential extension to [RFC6970] regarding an additional state variable for the THIRD_PARTY_ID and regarding an additional error code for a mismatched THIRD_PARTY_ID and its processing might be a logical next step. However, this is not in the scope of this document.

3.2. Carrier Web Portal

This scenario shown in Figure 3 is different from the previous one concerning the protocol used between the subscriber and the IWF. Here HTTP(S) is the protocol that the subscriber uses for port mapping requests. The subscriber may make requests manually using a web browser or automatically - as in the previous scenario - with hosts in the subscriber's network issuing port mapping requests on demand.

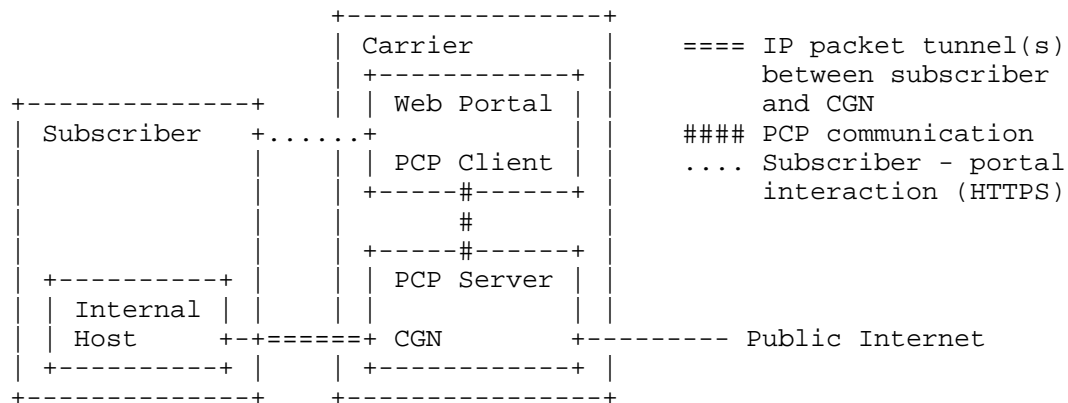


Figure 3: Carrier Web Portal

The PCP IWF is realized as a combination of a web server and a PCP Client. This scenario is also described as HTTP-triggered PCP client model in section 5.2 of [I-D.boucadair-pcp-deployment-cases].

3.3. Other Use Cases

Despite the fact that above scenarios solely use tunnel IDs the THIRD_PARTY_ID can include any layer 2 identifier like a MAC address or other subscriber identifiers as mentioned in section 6 of [I-D.boucadair-pcp-sfc-classifier-control].

4. Format

The THIRD_PARTY_ID option is formatted as shown in Figure 4.

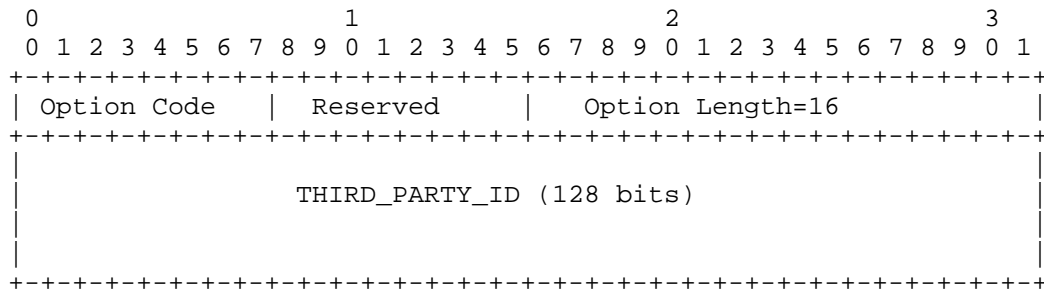


Figure 4: THIRD_PARTY_ID Option

- o Option Name: THIRD_PARTY_ID
- o Number: TBD
- o Purpose: Identifies a request of an external IP address and port.
- o Valid for opcodes: MAP, PEER, and all other for which the THIRD_PARTY option is valid for.
- o Length: 16 octets
- o May appear in: Request. Must appear in response if it appeared in the associated request.
- o Maximum occurrences: 1

The fields are as follows:

- o THIRD_PARTY_ID: A vendor specific identifier that can be used to identify a subscriber's CGN session and the port ranges to apply this request to.
- o The THIRD_PARTY_ID is not bound to a specific identifier. The size of 128 bits should be large enough for general applicability.

The identifier field can contain any vendor specific value. The option number is in the mandatory-to-process range (0-127), meaning that a request with a THIRD_PARTY_ID option is executed by the PCP server if and only if the THIRD_PARTY_ID option is supported by the PCP server.

5. Behavior

The following sections describe the operations of a PCP client and a PCP server when generating the request and processing the request and response.

5.1. Generating a Request

In addition to generating a PCP request that is described in [RFC6887] the following has to be applied. The THIRD_PARTY_ID option can be used together either with a PCP MAP or PEER opcode. It MUST be used in combination with the THIRD_PARTY option which provides an IP address and port entered by the subscriber. The THIRD_PARTY_ID option holds an identifier to allow the CGN to uniquely identify the internal host (specified in the THIRD_PARTY option) for which the port mapping is to be established or modified. If the identifier is shorter than 128 bits then the THIRD_PARTY_ID option field is to be filled up with leading zeros up to 128 bits.

5.2. Processing a Request

The THIRD_PARTY_ID option is in the mandatory-to-process range and if the PCP server does not support this option it MUST return an UNSUPP_OPTION response. If the provided THIRD_PARTY_ID is unknown/unavailable the PCP server MUST return a THIRD_PARTY_ID_UNKNOWN response.

5.3. Processing a Response

If the PCP client receives a THIRD_PARTY_ID_UNKNOWN response back for its previous request it SHOULD report an error message. To where to report an error message is implementation dependent.

6. Alternative

An alternative to identify a tunnel affiliation in the given scenario could be using the DESCRIPTION ([RFC7220]) option to carry a tunnel ID option. The DESCRIPTION option is to allow a text description to be attached to a port mapping. But using the DESCRIPTION option for a tunnel ID might not be appropriate because it specifies using UTF-8 and another requirement is that the description text must not be null terminated, which cannot always be met.

7. IANA Considerations

The following PCP Option Code is to be allocated in the mandatory-to-process range:

THIRD_PARTY_ID

[NOTE for IANA: Please allocate a PCP Option Code at <http://www.iana.org/assignments/pcp-parameters/pcp-parameters.xml#option-rules>]

The following PCP Result Code is to be allocated:

THIRD_PARTY_ID_UNKNOWN

[NOTE for IANA: Please allocate a PCP Result Code at <http://www.iana.org/assignments/pcp-parameters/pcp-parameters.xml#result-codes>]

8. Security Considerations

As this option is related to the use of the THIRD_PARTY option the corresponding security considerations apply. Especially, the network on which the PCP messages are sent must be fully trusted.

9. References

9.1. Normative References

- [RFC1918] Rekhter, Y., Moskowitz, R., Karrenberg, D., Groot, G., and E. Lear, "Address Allocation for Private Internets", BCP 5, RFC 1918, February 1996.
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.
- [RFC6887] Wing, D., Cheshire, S., Boucadair, M., Penno, R., and P. Selkirk, "Port Control Protocol (PCP)", RFC 6887, April 2013.

9.2. Informative References

- [I-D.boucadair-pcp-deployment-cases]
Boucadair, M., "Port Control Protocol (PCP) Deployment Models", draft-boucadair-pcp-deployment-cases-03 (work in progress), July 2014.
- [I-D.boucadair-pcp-sfc-classifier-control]
Boucadair, M., "PCP as a Traffic Classifier Control Protocol", draft-boucadair-pcp-sfc-classifier-control-01 (work in progress), October 2014.

[RFC6970] Boucadair, M., Penno, R., and D. Wing, "Universal Plug and Play (UPnP) Internet Gateway Device - Port Control Protocol Interworking Function (IGD-PCP IWF)", RFC 6970, July 2013.

[RFC7220] Boucadair, M., Penno, R., and D. Wing, "Description Option for the Port Control Protocol (PCP)", RFC 7220, May 2014.

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