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Kim Kinnear
Mark Stapp
Richard Johnson
Jay Kumarasamy
Cisco Systems

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Virtual Subnet Selection Sub-Option for the Relay Agent Information Option for DHCPv4 <draft-ietf-dhc-agent-vpn-id-04.txt>

Status of this Memo

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Abstract

In some environments, a relay agent resides in a network element which also has access to one or more virtual private networks (VPNs). If one DHCP server wishes to offer service to DHCP clients on those

different VPNs the DHCP server needs to know information about the VPN on which each client resides. The virtual-subnet-selection sub-option of the relay-agent-information option is used by the relay agent to tell the DHCP server important information about the VPN (called the Virtual Subnet Selection information, or VSS) for every DHCP request it passes on to the DHCP server, and is also used to properly forward any DHCP reply that the DHCP server sends back to the relay agent.

1. Introduction

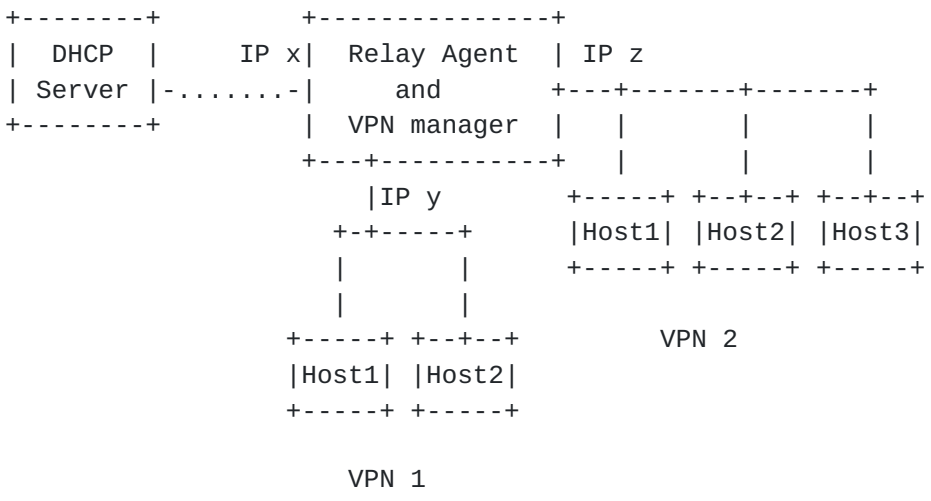
There exist situations where there are multiple VPNs serviced by one or more network elements which also contain relay agents. These VPNs contain DHCP clients, and there is a desire to allow one DHCP server to supply the full range of DHCP services to these DHCP clients.

The network element which contains the relay agent typically is also the network element which knows about the VPN association of the DHCP client and could include information about the VPN in the relay-agent-information option in the client's DHCP requests. This information about the VPN is called the Virtual Subnet Selection information, or VSS information. This document defines a sub-option for the relay-agent-information option which contains this VSS information, and which allows the relay agent to communicate the VSS information to the DHCP server.

When the DHCP server sends its response to the relay agent for forwarding back to the DHCP client, the relay agent will also need to use the virtual-subnet-selection sub-option to determine to which VPN to send the DHCP response.

This sub-option can also be used by the DHCP server to inform a relay agent that a particular DHCP client is associated with a particular VPN by sending the virtual-subnet-selection sub-option in the relay-agent-information option back to the relay agent.

Consider the following architecture:



In this architecture, the relay agent knows the VPN for each of the DHCP clients, and inserts the VSS information about the VPN in the virtual-subnet-selection sub-option in every DHCP request it forwards on to the DHCP server.

When the DHCP server copies over the relay-agent-information option from the request to the reply packet, it will copy over the virtual-subnet-selection sub-option as well.

When the relay agent receives a DHCP reply packet from the server with a virtual-subnet-selection sub-option, it will forward the packet onto the proper VPN based on the VSS information in the virtual-subnet-selection sub-option.

2.

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

This document uses the following terms:

- "DHCP client"

  A DHCP client is an Internet host using DHCP to obtain configuration parameters such as a network address.

- "DHCP relay agent"

  A DHCP relay agent is a third-party agent that transfers BOOTP and DHCP messages between clients and servers residing on different subnets, per [RFC 951] and [RFC 1542].

- "DHCP server"

  A DHCP server is an Internet host that returns configuration parameters to DHCP clients.

- "downstream"

  Downstream is the direction from the access concentrator towards the subscriber.

- "upstream"

  Upstream is the direction from the subscriber towards the access concentrator.

- "VSS information"

  Information about a VPN necessary to allocate an address to a DHCP client on that VPN and necessary to forward a DHCP reply packet to a DHCP client on that VPN.

- "VPN"

  Virtual private network. A network which appears to the client to be a private network.

- "VPN Identifier"

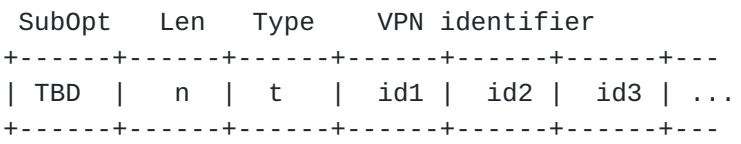
  The VPN-ID is defined by [RFC 2685] to be a sequence of 14 hex digits.

3. Virtual Subnet Selection Sub-Option Definition

The virtual-subnet-selection sub-option MAY be used by any DHCP relay agent which desires to specify the VSS information about a VPN from which a DHCP client request was sent.

The virtual-subnet-selection sub-option contains a generalized way to specify the VSS information about a VPN.

The format of the option is:



Type: 0 NVT ASCII VPN identifier
1 RFC2685 VPN-ID
2-255 Not Allowed

There are two types of identifiers which can be placed in the virtual-subnet-selection sub-option. The first type of identifier which can be placed in the virtual-subnet-selection sub-option is an NVT ASCII string. It MUST NOT be terminated with a zero byte.

The second type of identifier which can be placed in the virtual-subnet-selection sub-option is an RFC2685 VPN-ID [RFC 2685], which is typically 14 hex digits in length (though it can be any length as far as the virtual-subnet-selection sub-option is concerned).

All other values of the type field are invalid as of this memo and VSS sub-options containing any other value than zero (0) or one (1) SHOULD be ignored.

A relay agent which recieves a DHCP request from a DHCP client on a VPN SHOULD include a virtual-subnet-selection sub-option in the relay-agent-information option that it inserts in the DHCP packet prior to forwarding it on to the DHCP server.

The value placed in the virtual-subnet-selection sub-option SHOULD be sufficient for the relay agent to properly route any DHCP reply packet returned from the DHCP server to the DHCP client for which it is destined. Servers supporting this sub-option MUST return an instance of this sub-option in the relay-agent-info option to any relay-agent that sends it. Servers SHOULD return the an exact copy of the sub-option unless they desire to change the VPN on which a client was configured, which would typically be a very unusual thing to do.

In the event that a virtual-subnet-selection option and a virtual-subnet-selection sub-option are both received in a particular DHCP client packet, the information from the virtual-subnet-selection sub-option MUST be used in preference to the information in the virtual-subnet-selection option.

Relay agents which include this sub-option when forwarding DHCP client requests MUST discard DHCPOFFER or DHCPACK packets that do not contain this sub-option in their associated relay-agent-info options. This does not imply any memory of the particular packets forwarded with this sub-option included. Rather, the expectation is that the relay agent will use whatever algorithm that it used on the DHCPDISCOVER and DHCPREQUEST packets to decide to include this sub-option on the DHCPOFFER and DHCPACK packets to decide if they MUST have this sub-option included in their relay-agent-info options.

In some cases, a DHCP server may use the virtual-subnet-selection sub-option to inform a relay agent that a particular DHCP client is associated with a particular VPN. It does this by sending the virtual-subnet-selection sub-option with the appropriate information to the relay agent in the relay-agent-information option. If the relay agent is unable to honor the DHCP server's requirement to place the DHCP client into that VPN it MUST drop the packet and not send it to the DHCP client.

This sub-option SHOULD NOT be used without also making use of some form of authentication for relay-agent-information option.

4. Security

Message authentication in DHCP for intradomain use where the out-of-band exchange of a shared secret is feasible is defined in [RFC 3118]. Potential exposures to attack are discussed in section 7 of the DHCP protocol specification in [RFC 2131].

The virtual-subnet-selection sub-option could be used by a client in order to obtain an IP address from a VPN other than the one on which it resides. This attack can be partially prevented by the relay agent not forwarding any DHCP packet which already contains a relay-agent-information option.

Any program which unicasts a DHCP packet to the DHCP server with a relay-agent-information option in it with a vpn-id for a different VPN would cause the DHCP server to allocate an address from that different VPN, but since the DHCP server cannot (in general) communicate directly back to the program that sent in the malicious DHCP packet, the entire cycle of creating a lease will not be completed. Certainly many leases could be offered, which would result in a temporaty form of address-pool exhaustion.

Servers that implement the virtual-subnet-selection sub-option MUST by default disable use of the feature; it must specifically be enabled through configuration. Moreover, a server SHOULD provide the ability to selectively enable use of the feature under restricted

conditions, e.g., by enabling use of the option only from explicitly configured client-ids, enabling its use only by clients on a particular subnet, or restricting the VPNs from which addresses may be requested.

5. IANA Considerations

IANA has assigned the value of TBD for the VPN Identifier sub-option from the DHCP Relay Agent Sub-options space [RFC 3046] for the VPN Identifier sub-option defined in Section 3.

This document defines a number space for the type byte of the virtual-subnet-selection sub-option. Certain allowable values for this byte are defined in this specification (see Section 3). New values may only be defined by IETF Consensus, as described in [RFC 2434]. Basically, this means that they are defined by RFCs approved by the IESG.

Moreover, any changes or additions to the type byte codes MUST be made concurrently in the type byte codes of the virtual-subnet-selection option. The type bytes and data formats of the virtual-subnet-selection option and virtual-subnet-selection sub-option MUST always be identical.

6. Acknowledgments

None.

7. Normative References

[RFC 951] Croft, B. and J. Gilmore, "Bootstrap Protocol", RFC 951, September 1985.

[RFC 1542] Wimer, W., "Clarifications and Extensions for the Bootstrap Protol", RFC 1542, October 1993.

[RFC 2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", RFC 2119, March 1997.

[RFC 2131] Droms, R., "Dynamic Host Configuration Protocol", RFC 2131, March 1997.

[RFC 2685] Fox, B., Gleeson, B., "Virtual Private Networks Identifier", Internet RFC 2685, September 1999.

[RFC 3046] Patrick, M., "DHCP Relay Agent Information Option", RFC

3046, January 2001.

8. Authors' Addresses

Kim Kinnear
Mark Stapp
Cisco Systems
1414 Massachusetts Ave.
Boxborough, Massachusetts 01719

Phone: (978) 936-0000

EMail: kkinnear@cisco.com
mjs@cisco.com

Jay Kumarasamy
Richard Johnson
Cisco Systems
170 W. Tasman Dr.
San Jose, CA 95134

Phone: (408) 526-4000

EMail: jayk@cisco.com
raj@cisco.com

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