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Interaction between DHCP and DNS
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2. Abstract

DHCP provides a powerful mechanism for IP host autoconfiguration. However, the autoconfiguration provided by DHCP does not include updating DNS, and specifically updating the name to address and address to name mappings maintained by DNS.

This document specifies how DHCP clients and servers should use the Dynamic DNS Updates mechanism to update the DNS name to address and address to name mapping, so that the mappings for DHCP clients would be consistent with the IP addresses that the clients acquire via DHCP.

3. Interaction between DHCP and DNS

DNS [RFC1034, RFC1035] maintains (among other things) the information about mapping between hosts' Fully Qualified Domain Names (FQDNs) [RFC1594] and IP addresses assigned to the hosts. The information is maintained in two types of Resource Records (RRs): A and PTR. The A RR contains mapping from a FQDN to an IP address; the PTR RR contains mapping from an IP address to a FQDN.

DHCP [RFC1541] provides a mechanism by which a host (a DHCP client) could acquire certain configuration information, and specifically its IP address(es). However, DHCP does not provide any mechanisms to update the DNS RRs that contain the information about mapping between the host's FQDN and its IP address(es) (A and PTR RRs). Thus the information maintained by DNS for a DHCP client may be incorrect - a host (the client) could acquire its address by using DHCP, but the A RR for the host's FQDN wouldn't reflect the address that the host acquired, and the PTR RR for the acquired address wouldn't reflect the host's FQDN.

Dynamic DNS Updates [DynDNS] is a mechanism that enables DNS information to be updated DNS over a network.

The Dynamic DNS Update protocol can be used to maintain consistency between the information stored in the A and PTR RRs and the actual address assignment done via DHCP. When a host with a particular FQDN acquires its IP address via DHCP, the A RR associated with the host's FQDN would be updated (by using the Dynamic DNS Updates protocol) to reflect the new address. Likewise, when an IP address gets assigned to a host with a particular FQDN, the PTR RR associated with this address would be updated (using the Dynamic DNS Updates protocol) to reflect the new FQDN.

4. Models of operations

When a DHCP client acquires a new address, both the A RR (for the client's FQDN) and the PTR RR (for the acquired address) have to be updated. Therefore, we have two separate Dynamic DNS Update transactions. Acquiring an address via DHCP involves two entities: a DHCP client and a DHCP server. In principle each of these entities could perform none, one, or both of the transactions. However, upon some introspection one could realize that not all permutations make sense. This document covers the possible design permutations:

(1) DHCP client updates the A RR, DHCP server updates the PTR RR

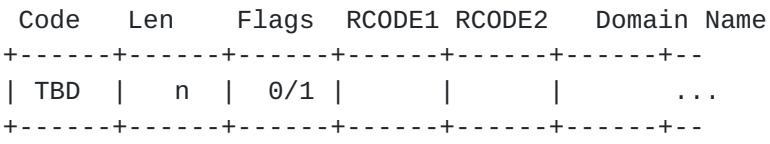
(2) DHCP server updates both the A and the PTR RRs

One could observe that the only difference between these two cases is whether the FQDN to IP address mapping is updated by a DHCP client or by a DHCP server. The IP address to FQDN mapping is updated by a DHCP server in both cases.

4.1. Client FQDN Option

To update the IP address to FQDN mapping a DHCP server needs to know FQDN of the client to which the server leases the address. To allow the client to convey its FQDN to the server this document defines a new option, called "Client FQDN".

The code for this option is TBD. Its minimum length is 2.



The Flags field allows a DHCP client to indicate to a DHCP server whether the client wants the server to be responsible for updating the FQDN to IP address mapping (if Flags is set to 1), or whether the client wants to take this responsibility (if Flags is set to 0).

The RCODE1 and RCODE2 fields are used by a DHCP server to indicate to a DHCP client the Response Code from Dynamic DNS Updates.

The Domain Name part of the option carries FQDN of a client.

4.2. DHCP Client behavior

If a client wants to be responsible for updating the FQDN to IP address mapping for the FQDN and address(es) used by the client, then the client shall include the Client FQDN option in the DHCPREQUEST message originated by the client. The Flags field in the option shall be set to 0. Once the client's DHCP configuration is completed (the client receives a DHCPACK message, and successfully completed a final check on the parameters passed in the message), the client shall originate an update for the A RR (associated with the client's FQDN).

The update shall be originated following the procedures described in [DynDNS].

If a client does not want to be responsible for updating the FQDN to IP address mapping for the FQDN and address(es) used by the client, then the client shall include the Client FQDN option in the DHCPREQUEST message originated by the client. The Flags field in the option shall be set to 1.

Whether the client wants to be responsible for updating the FQDN to IP address mapping, or whether the client wants to delegate this responsibility to a server is a local to the client matter. The choice between the two alternatives may be based on a particular security model that is used with the Dynamic DNS Update protocol (e.g., only a client may have sufficient credentials to perform updates to the FQDN to IP address mapping for its FQDN).

If a client releases its address lease prior to the lease expiration time, and the client is responsible for updating its A RR(s), the client should delete the A RR (following the procedures described in [DynDNS]) associated with the leased address before sending DHCP RELEASE message.

4.3. DHCP Server behavior

When a server receives a DHCPREQUEST message from a client, if the message contains the Client FQDN option, and the server replies to the message with a DHCPACK message, the server shall originate an update for the PTR RR (associated with the address leased to the client). The server shall originate the update before the server sends the DHCPACK message to the client. The update shall be originated following the procedures described in [DynDNS]. The RCODE from the update [DynDNS] should be carried to the client in the RCODE1 field of the Client FQDN option in the DHCPACK message. The RCODE2 field should be set to 0.

In addition, if the Client FQDN option carried in the DHCPREQUEST message has its Flags field set to 1, then the server shall originate an update for the A RR (associated with the FQDN carried in the option). The server shall originate the update before the server sends the DHCPACK message to the client. The update shall be originated following the procedures described in [DynDNS]. The RCODE from the update [DynDNS] should be carried to the client in the RCODE2 field of the Client FQDN option in the DHCPACK message.

When a server receives a DHCPREQUEST message from a client, and the message contains the Client FQDN option, the server shall ignore the value carried in the RCODE field of the option.

If a server originates updates for both the A and PTR RRs, then the order in which the updates are generated is not significant.

If a server detects that a lease on an address that the server leases to a client expires, the server should delete the PTR RR associated with the address. In addition, if the client authorized the server to update its A RR, the server should also delete the A RR. The deletion should follow the procedures described in [DynDNS].

If a server terminates a lease on an address prior to the lease expiration time, the server should delete the PTR RR associated with the address. In addition, if the client (that leased the address) authorized the server to update its A RR, the server should also delete the A RR. The deletion should follow the procedures described in [DynDNS].

5. Updating other RRs

The procedures described in this document cover updates only to the A and PTR RRs. Updating other types of RRs is outside the scope of this document.

6. Security Considerations

Security issues are not discussed in this document.

7. References

[RFC1034] P. Mockapetris, "Domain names - concepts and facilities", RFC1034, 11/01/1987

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8. Acknowledgements

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