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Advertising Proxy for DNS-SD Service Registration Protocol

Abstract

An Advertising Proxy allows a device that accepts service registrations using Service Registration Protocol (SRP) to make those registrations visible to legacy clients that only implement Multicast DNS.

Status of This Memo

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1. Introduction

DNS-Based Service Discovery [[RFC6763](#)] [[ROADMAP](#)] was designed to facilitate Zero Configuration IP Networking [[RFC6760](#)] [[ZC](#)]. When used with Multicast DNS [[RFC6762](#)] with ".local" domain names [[RFC6761](#)] this works well on a single link (a single broadcast domain).

There is also a desire to have DNS-Based Service Discovery work between multiple links that aren't part of the same broadcast domain [[RFC7558](#)]. Even within a single Wi-Fi broadcast domain it is beneficial to reduce multicast traffic, because, in comparison to Wi-Fi unicast traffic, Wi-Fi multicast is inefficient, slow, and unreliable [[MCAST](#)].

There are three variant ways that this move to greater use of unicast is achieved.

One variant is pure end-to-end unicast, with services using unicast Service Registration Protocol [[SRP](#)] to register with a service registry, and clients using unicast DNS Push Notifications [[RFC8765](#)] over DNS Stateful Operations [[RFC8490](#)] to communicate with the service registry to discover and track changes to those registered services.

A second variant is a hybrid approach that facilitates legacy devices that only implement link-local Multicast DNS (like your ten-year-old network laser printer) having their services discovered by remote clients, using a unicast DNS Push Notifications session to a Discovery Proxy [[RFC8766](#)].

The third variant, documented here, is a logical complement to the second variant. It enables legacy clients (that only implement link-local Multicast DNS) to discover services registered (using unicast) with a service registry. The service registry accepts service registrations using unicast Service Registration Protocol [[SRP](#)], and makes those service registrations visible, both to remote clients using unicast DNS Push Notifications [[RFC8765](#)] and, using the Advertising Proxy mechanism documented here, to local clients using Multicast DNS [[RFC6762](#)].

1.1. Conventions and Terminology Used in This Document

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 BCP 14 [[RFC2119](#)] [[RFC8174](#)] when, and only when, they appear in all capitals, as shown here.

2. Advertising Proxy

An Advertising Proxy can be a component of any DNS authoritative server, though it logically makes most sense as a component of a service registry (a DNS authoritative server that implements Service Registration Protocol [[SRP](#)]). A client can send registration requests for any valid DNS records to a service registry, though in practice the most common use is to register the PTR, SRV and TXT records that describe a DNS-SD service [[RFC6763](#)].

When a service registry accepts a registration request for DNS records, a service registry that implements an Advertising Proxy also advertises equivalent records using Multicast DNS on one or more configured local multicast-capable interfaces. An Advertising Proxy could also advertise on one or more configured remote multicast-capable interfaces using a Multicast DNS Relay [[RELAY](#)]. For the purposes of this document, a local multicast-capable interface directly attached to the host and a remote multicast-capable interface connected via a relay are considered to be equivalent.

2.1. Name Conflicts

In the event that an SRP client attempts to register a record with a name that was already created in that registry by a different SRP client, or is otherwise disallowed by policy, a name conflict is reported and the new client is required to choose a new name.

Similarly, Multicast DNS implements first-come-first-served name allocation. When a registered record is advertised using Multicast DNS it may suffer a name conflict if a different Multicast DNS record with that name already exists on that link. In the case of network failures, Multicast DNS can also signal name conflicts at a later time during the life of a record registration. For example, if the network link is partitioned at the time of record registration, the name conflict may not be discovered until later when the partition is healed.

Specifically, a name conflict can occur:

1. During the SRP validation process, because another SRP client has already registered the same name.
2. Immediately while the Advertising Proxy is registering the name.
3. After the name has been successfully registered, but before the response has been sent to the client.
4. After the initial response has been sent to the client.

In the first three cases, the client can be notified of the conflict at the time of registration, and is expected to choose a new name. In the last case, SRP clients must be coded defensively to handle the case where an apparently successful record registration is later determined to be in conflict, just as existing Multicast DNS clients have to be coded defensively to handle late conflicts gracefully. With a sleepy SRP client there may be no way to notify it of the conflict until it next re-registers. In this case, the service registry with Advertising Proxy capability is responsible for selecting a new name. The service registry sends the client the name it chose when it next renews.

The registration process has several steps. First the hostname claimed by the SRP client must be registered. Once this has succeeded, the Advertising Proxy can register all of the service instances that point to that hostname. When all of these registrations have succeeded, the service registry can finally send its response to the SRP client. If any of them fail, they must all be removed and the client notified of the failure. If the failure is a result of a name conflict, the response code should be YXDOMAIN. Other SRP failures are documented in the SRP specification. Any other failure returns SERVFAIL.

2.2. Data Translation

As with a Discovery Proxy [[RFC8766](#)] some translation needs to be performed before the Advertising Proxy makes the registered unicast data visible using Multicast DNS. Specifically, the unicast DNS domain name suffix configured for Advertising Proxy use is stripped off and replaced with the top-level label "local".

2.3. No Text-Encoding Translation

As with a Discovery Proxy [[RFC8766](#)], an Advertising Proxy does no translation between text encodings [[RFC6055](#)]. Specifically, an Advertising Proxy does no translation between Punycode encoding [[RFC3492](#)] and UTF-8 encoding [[RFC3629](#)], either in the owner name of DNS records or anywhere in the RDATA of DNS records (such as the RDATA of PTR records, SRV records, NS records, or other record types like TXT, where it is ambiguous whether the RDATA may contain DNS names). All bytes are treated as-is with no attempt at text-encoding translation. A server implementing DNS-based Service Discovery [[RFC6763](#)] will use UTF-8 encoding for its unicast DNS-based record registrations, which the Advertising Proxy passes through without any text-encoding translation to the Multicast DNS subsystem. Queries from peers on the configured multicast-capable interface are answered directly from the advertised data without any text-encoding translation.

2.4. No Address Suppression

Unlike a Discovery Proxy [[RFC8766](#)], an Advertising Proxy does not need to selectively suppress link-local [[RFC3927](#)] [[RFC4862](#)] or other addresses. Since the clients of the service registry are registering their records in a unicast DNS namespace, there is a presumption they they will only register addresses with sufficient scope to be usable by the anticipated clients. No further filtering or suppression by the service registry is required.

2.5. No Support for Reconfirm

For network efficiency, Multicast DNS [[RFC6762](#)] uses fairly long record lifetimes (typically 75 minutes). When a client is unable to reach a service that it discovered, Multicast DNS provides a "reconfirm" mechanism that enables the client to signal to the Multicast DNS subsystem that its cached data may be suspect, which causes the Multicast DNS subsystem to reissue queries, and remove the stale records if the queries are not answered.

Similarly, when using unicast service discovery with a Discovery Proxy [[RFC8766](#)], the DNS Push Notifications [[RFC8765](#)] protocol provides the RECONFIRM mechanism to signal that the Discovery Proxy should perform a local Multicast DNS reconfirm operation to re-verify the validity of the records.

When an Advertising Proxy is used, to support legacy clients that only implement Multicast DNS, reconfirm operations have no effect. If a device uses unicast Service Registration Protocol [[SRP](#)] to register its services with a service registry with Advertising Proxy capability, and the device then gets disconnected from the network, the Advertising Proxy will continue to advertise those records until the registrations expire. If a client discovers the service instance using Multicast DNS and is unable to reach it, and uses a Multicast DNS reconfirm operation to re-verify the validity of the records, then the Advertising Proxy will continue to answer on behalf of the departed device until the record registrations expire. The Advertising Proxy has no reliable way to determine whether the additional Multicast DNS queries are due to a reconfirm operation, or due to other routine causes, like a client being rebooted, or disconnecting and then reconnecting to the network. The service registry has no reliable automatic way to determine whether a device that registered records has failed or disconnected from the network. Particularly with sleepy battery powered devices, the service registry does not know what active duty cycle any given service is expected to provide.

Consequently, reconfirm operations are not supported with an Advertising Proxy. In cases where use of the reconfirm mechanism is

important, clients should be upgraded to use the unicast DNS Push Notifications [[RFC8765](#)] protocol's RECONFIRM message. This RECONFIRM message provides an unambiguous signal to the service registry that it may be retaining stale records. (A future update to the Service Registration Protocol document [[SRP](#)] will consider ways that this unambiguous signal can be used to trigger expedited removal of stale data.)

3. Security Considerations

An Advertising Proxy may made data visible to eavesdroppers on the configured multicast-capable link(s).

4. IANA Considerations

This document has no IANA actions.

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