

DNS-SD/mDNS Extensions
Internet-Draft
Intended status: Informational
Expires: April 13, 2013

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October 10, 2012

Requirements for DNS-SD/mDNS Extensions
draft-lynn-mdnsext-requirements-00

Abstract

DNS-SD/mDNS is widely used today for discovery and resolution of services and names on a local link, but there is market demand to extend DNS-SD/mDNS to enable service discovery beyond the local link.

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1. Introduction

The DNS-SD/mDNS Extensions Working Group (MDNSEXT) will develop extensions to DNS-Based Service Discovery [DNS-SD] and Multicast DNS [mDNS] protocols to enable service discovery beyond the local link.

DNS-SD/mDNS is widely used today for discovery and resolution of services and names on a local link. In principle DNS-SD can also be used in conjunction with conventional unicast DNS to enable wide-area service discovery, but in practice this capability is not widely used. This disconnect between customer needs and current practice has led to calls for improvement, such as the Educause petition [EP].

In response to this and similar evidence of market demand, several companies have recently announced "Bonjour gateway" products that allow service discovery beyond the local link. However, these were brought to market rapidly and it's unclear whether they represent the best long-term direction for service discovery protocol development.

Similarly, DNS-SD/mDNS in its present form is not well suited for emerging technologies such as multi-link subnets like 6LoWPAN where "link local" is defined as a node's first-hop neighbors, subnet-scoped multicast is problematic, and battery powered devices may be offline for significant periods of time.

For these and other reasons, it is therefore beneficial for end users, network operators, vendors, and for the long-term health of the Internet to bring this work into the IETF where all interested parties can cooperate to develop efficient and scalable solutions.

This document defines the problem statement and gathers requirements for DNS-SD/mDNS Extensions.

2. Problem Statement

There is no single problem statement that motivates the need to extend DNS-SD/mDNS, but "service discovery beyond the local link" comes closest. What follows is a roughly prioritized list of issues.

2.1. Multilink Naming and Discovery

While DNS-SD/mDNS is well-suited for zero-configuration of naming and discovery of hosts and services on a local link, users are frustrated by the inability to discover services on other subnets.

DNS-SD is a conventional use of existing DNS Resource Records and can, in practice, be deployed over unicast DNS. However, this mode

is not commonly used.

This resulted in a call from network administrators in the form of the Educause petition [EP]. Some highlights from that petition included:

- o Airplay does not work when Apple TV's and Apple client devices are on different IP subnets. It is common for the enterprise wireless and wired networks in our institutions to utilize different IP subnets.
- o Students are requesting the ability to utilize Airprint to print from their Apple devices on our enterprise networks.
- o That Apple establish a way for Apple TV's be accessible from Apple's client devices across multiple IPv4 and IPv6 sub-nets.
- o That Apple improve Bonjour technology so that it will work in scalable and supportable fashion in large enterprise wireless and wired networks.

The Educause petition [EP] asked that any enterprise Airplay / Bonjour solution needs to meet the following criteria:

- o It must scale to a range of hundreds to thousands of Airplay and Bonjour enabled devices in a given environment.
- o It must work with wired and wireless networks from different vendors.
- o It must not significantly negatively impact network traffic (wired and wireless).
- o It must be easily manageable at an enterprise scale.
- o If it requires a separate hardware solution, that the solution must be enterprise grade (rack mountable, dual power supplies, etc.)
- o It must be provided at a reasonable cost.

2.2. Low Power and Lossy Networks (LLNs)

Emerging wireless mesh networking technologies such as RPL/6LoWPAN [RFC4944] [RFC6550] present several challenges for the current DNS-SD/mDNS design. First, "local link" is defined as a node's one-hop neighbors. This effectively means that a mesh is a multi-link single-prefix subnet and that link-local multicast scope is

insufficient to span it.

Not only is subnet-scoped multicast difficult on such networks, but low-power nodes may be offline for significant periods either because they are "sleeping" or due to connectivity problems. In such cases LLN nodes might fail to defend their names using the current design.

2.3. Fine-grained Discovery

As an illustration of this issue, consider a web server that exposes several resources, each with a unique URI, at the same port. MDNSEXT will consider whether implementing a fine-grained service discovery mechanism is in scope.

2.4. Deployment Scenarios

The MDNSEXT working group will develop service discovery solutions suitable for:

- a. Enterprise networks
- b. Academic/Educational/University networks
- c. Multi-link home networks, such as those envisaged by HOMENET*
- d. Multi-link/single prefix (mesh) networks, such as RPL/6LoWPAN LLNs

* It is intended that MDNSEXT develop a DNS-based solution that is suitable for these four network environments, including the HOMENET case. Of course, the HOMENET WG is free to evaluate whether or not to adopt the MDNSEXT solution or develop an alternative.

3. Requirements

REQ01: Enable discovery of services across multiple links.

REQ02: Zero configuration operation possible, but not mandatory.

- i.e. Zero configuration operation is supported by the protocols, but administrative control is also available on networks where that is desired.

REQ03: Scalability, in terms of:

- Network traffic
- CPU and memory requirements on network entities
- User interface (huge flat list is not user friendly)
- Having a smooth continuum of operation from local link to site to global, rather than vastly different incompatible modes of operation at different network scales
- Granularity of services available on a server (extend the notion of service?)

REQ04: Suitable for both local (zero-config) and global (minimal config) use.

- i.e. Suitable out-of-the box defaults should enable zero-configuration use on many small- to medium-sized networks, while still allowing for administrative control in networks where that's

REQ05: Incremental deployability.

- Identify what changes to existing network elements will be required, and attempt to minimize those changes.
- Don't break existing DNS-SD/mDNS functionality and devices

4. IANA Considerations

This document currently makes no request of IANA.

Note to RFC Editor: this section may be removed on publication as an RFC.

5. Security Considerations

[TBD]

6. Acknowledgments

We gratefully acknowledge contributions and review comments made by Tim Chown, Educause, Ralph Droms, and Thomas Narten.

7. References

7.1. Normative References

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7.2. Informative References

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