IETF
Internet-Draft
Intended status: Informational
Expires: July 26, 2014

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January 22, 2014

Requirements for Labels to Interoperate Between mDNS and DNS
draft-sullivan-dnssd-mdns-dns-interop-00

Abstract

Despite its name, DNS-Based Service Discovery can use naming systems other than the Domain Name System when looking for services. Different name systems use different conventions for the characters allowed in any name. In order for DNS-SD to be used effectively in environments where multiple different name systems are in use, it is important to follow a common set of conventions for naming. This memo presents an outline of the reqiurements for selection of labels for mDNS and DNS when they are expected to interoperate in this manner.

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1. Introduction

DNS-Based Service Discovery (DNS-SD, [RFC6763]) specifies a mechanism for discovering services using queries both to the Domain Name System (DNS, [RFC1034], [RFC1035]) and to Multicast DNS (mDNS, [RFC6762]). Conventional use of the DNS generally follows the host name rules [RFC0952] for labels -- the so-called LDH rule. That convention is the reason behind the development of Internationalized Domain Names for Applications (IDNA2008, [RFC5890], [RFC5891], [RFC5892], [RFC5893], [RFC5894], [RFC5895]). It is worth noting that the LDH rule is a convention, and not a strict rule of the DNS. It is assumed to be true widely enough, however, that in many circumstances names cannot be used unless they cleave to the LDH rule.

At the same time, mDNS requires that labels be encoded in UTF-8, and permits a range of characters in labels that are not permitted by IDNA2008 or the LDH rule. For example, mDNS encourages the use of spaces and punctuation in mDNS names (see [RFC6763], section 4.1.3). It does not restrict which Unicode code points may be used in those labels, so long as the code points are UTF-8 in Net-Unicode [RFC5198] format.

Users of applications are, of course, frequently unconcerned with (not to say oblivious to) the name-resolution system(s) in service at any given moment, and are inclined simply to use the same names in different contexts. As a result, the same string might be tried as a name using different name resolution technologies. If DNS-SD is to be used in an environment where both mDNS and DNS are to be queried

for services, then the names to be queried will need to be compatible with the rules and conventions for both DNS and mDNS.

One approach to interoperability under these circumstances is to use a single operational convention for names under the different naming systems. This memo posits such a use profile, and outlines what is necessary to make it work.

1.1. Conventions and terms used in this document

Wherever appropriate, this memo uses the terminology defined in Section 2 of [RFC5890]. In particular, the reader is assumed to be familiar with the terms "U-label", "LDH label", and "A-label" from that document. Similarly, the reader is assumed to be familiar with the U+NNNN notation for Unicode code points used in [RFC5890] and other documents dealing with Unicode code points. In the interests of brevity and consistency, the definitions are not repeated here.

This memo refers to names in the DNS as though the LDH rule and IDNA2008 are strict requirements. They are not. DNS labels are, in principle, just collections of octets, and therefore in principle the LDH rule is not a constraint. In practice, applications often intercept labels that do not conform to the LDH rule and apply IDNA and other transformations.

The term "owner name" (common to the DNS vernacular) is used here to apply not just to the names to be looked up in the DNS, but to any name that might be looked up either in the DNS or using mDNS.

2. Requirements for a profile for label interoperation

Any interoperability between mDNS and DNS will require interoperability across some of the portions of a DNS-SD Service Instance Name (see Section 3) that are implicated in regular mDNS and DNS lookups. The open question is which of the portions are implicated. In any case, if a given portion is implicated, the profile will need to apply to all labels in that portion.

Because the profile will need to apply to names that might need to interoperate with names in the DNS, and because mDNS permits labels that IDNA does not, the profile will reduce the labels that may be used with mDNS. Consequently, some recommendations from [RFC6763] will not really be possible to implement using names subject to the profile. In particular, [RFC6763], section 4.1.3 recommends that rich text, human-readable labels be used, and includes punctuation and space characters in the examples. It is not clear whether such uses will be possible, because spaces and most punctuation are permitted neither in U-labels nor in LDH labels. In addition, the

same section recommends that labels always be stored and communicated as UTF-8, even in the DNS. Because IDNA2008 libraries will treat any Unicode-encoded labels as candidate U-labels and attempt to perform resolution in A-label form, the advice to store and transmit labels as UTF-8 in the DNS is likely to encounter problems. By contrast, mDNS normally uses UTF-8.

U-labels cannot contain upper case letters. That restriction extends to ASCII-range upper case letters that work fine in LDH-labels. It may be confusing that the character "A" works in the DNS when none of the characters in the label has a diacritic, but does not work when there is such a diacritic in the label. Labels in mDNS names may contain upper case characters, so the profile will need either to restrict the use of upper case or come up with a reliable and predictable convention for case folding.

3. DNS-SD portions

DNS-SD specifies three portions of the owner name for a DNS-SD resource record. These are the <Instance> portion, the <Service> portion, and the <Domain>. The owner name made of these three parts is called the Service Instance Name. It is worth observing that a portion may be more than one label long. See [RFC6763], section 4.1.

3.1. The <Instance> Portion of the Service Instance Name

[RFC6763] is clear that the <Instance> portion of the Service Instance Name is intended for presentation to users, and therefore virtually any character is permitted in it. There are two ways that a profile might address this portion; a specification of the profile will need to select one of these strategies.

The first option is to treat this portion as likely to be intercepted by system-wide IDNA-aware resolvers. In this case, the portion needs to be made subject to the profile, thereby curtailing what characters may appear in this portion. This approach permits DNS-SD to use any standard system resolver but presents inconsistencies with the DNS-SD specification and with DNS-SD that is exclusively mDNS-based.

The second option is to specify that the portion never be handled by "normal" DNS resolution, and that it instead be handled by a special DNS-SD resolution path. In this case, DNS-SD works as it always does, but at the cost of a possibly more complicated system-wide resolver or special resolution code built into the DNS-SD system.

3.2. The <Service> Portion of the Service Instance Name

DNS-SD includes a <Service> component in the Service Instance Name. This component is not really user-facing data, but is instead control data embedded in the Service Instance Name. This component includes so-called "underscore labels", which are labels prepended with U+005F (_). The underscore label convention was established by DNS SRV ([RFC2782]) for identifying metadata inside DNS names. A system-wide resolver (or DNS middlebox) that cannot handle underscore labels will not work with DNS-SD at all, so it is safe to suppose that such resolvers will not attempt to do special processing on these labels. Therefore, the <Service> portion of the Service Instance Name will not be subject to the profile.

3.3. The <Domain> Portion of the Service Instance Name

The <Domain> portion of the service instance name forms an integral part of the QNAME submitted for DNS resolution, and a system-wide resolver that is IDNA2008-aware is likely to interpret labels with UTF-8 in the QNAME as candidates for IDNA2008 processing. Therefore, these labels will need to be subject to the profile.

4. Acknowledgements

The author gratefully acknowledges the insights of Kerry Lynn.

5. IANA Considerations

This memo makes no requests of IANA.

6. Security Considerations

This memo presents some requirements for future development, but does not specify anything. Therefore, it has no imlpications for security.

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