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DNS Scoped Data Through "Underscore" Naming of Attribute Leaves
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Abstract

Formally, any DNS resource record may occur under any domain name. However some services have defined an operational convention, which applies to DNS leaf nodes that are under a DNS branch having one or more reserved node names, each beginning with an _underscore. The underscored naming construct defines a semantic scope for DNS record types that are associated with the parent domain, above the underscored branch. This specification explores the nature of this DNS usage and defines the "DNS Global Underscore Scoped Entry Registry" with IANA. The purpose of the Underscore registry is to avoid collisions resulting from the use of the same underscore-based name, for different services.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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This Internet-Draft will expire on February 22, 2019.

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1. Introduction

The core Domain Name System (DNS) technical specifications assign no semantics to domain names or their parts, and no constraints upon which resource record (RR) types are permitted to be stored under particular names [RFC1035], [RFC2181]. Over time, some leaf node names, such as "www" and "ftp" have come to imply support for particular services, but this is a matter of operational convention, rather than defined protocol semantics. This freedom in the basic technology has permitted a wide range of administrative and semantic policies to be used -- in parallel. DNS data semantics have been limited to the specification of particular resource record types, on the expectation that new ones would be added as needed. Unfortunately, the addition of new resource record types has proven extremely challenging, over the life of the DNS, with significant adoption and use barriers.

1.1. Underscore Scoping

As an alternative to defining a new RR type, some DNS service enhancements call for using an existing resource record type, but specify a restricted scope for its occurrence. Scope is meant as a static property, not one dependent on the nature of the query. It is an artifact of the DNS name. That scope is a leaf node, within which the uses of specific resource record sets can be formally defined and constrained. The leaf occurs in a branch having a distinguished naming convention: At the top of the branch -- beneath the parent domain name to which the scope applies -- one or more reserved DNS node names begin with an underscore ("_"). Because the DNS rules for a "host" (host name) do not allow use of the underscore character, this distinguishes the underscored name from all legal host names [RFC952]. Effectively, this convention for leaf node naming creates a space for the listing of "attributes" -- in the form of resource record types -- that are associated with the parent domain, above the underscored sub-branch.

The scoping feature is particularly useful when generalized resource record types are used -- notably "TXT", "SRV", and "URI" [RFC1035], [RFC2782], [RFC6335], [RFC7553]. It provides efficient separation of one use of them from others. Absent this separation, an undifferentiated mass of these "RRsets" is returned to the DNS client, which then must parse through the internals of the records in the hope of finding ones that are relevant. Worse, in some cases the results are ambiguous because a record type might not adequately self-identify its specific purpose. With underscore-based scoping, only the relevant "RRsets"s are returned.

A simple example is DKIM [RFC6376] , which uses "_domainkey" for defining a place to hold a "TXT" record containing signing information for the parent domain.

This specification formally defines how underscored labels are used as "attribute" enhancements for their parent domain names. For example, domain name "_domainkey.example." acts as an attribute of the parent domain name "example." To avoid collisions resulting from the use of the same underscore-based labels for different applications using the same resource record type, this document establishes the DNS Underscore Global Scoped Entry IANA Registry. Use of such node names, which begin with underscore, are reserved when they are the underscored name closest to the DNS root; they are considered "global". Underscore-based names that are farther down the hierarchy are handled within the scope of the global underscore name.

Discussion Venue: Discussion about this draft should be directed to the dnsop@ietf.org [1] mailing list.

NOTE TO RFC EDITOR: Please remove "Discussion Venue" paragraph prior to publication.

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 [RFC2119].

1.2. Scaling Benefits

Some resource record types are used in a fashion that can create scaling problems, if an entire RRset associated with a domain name is aggregated in the leaf node for that name. An increasingly-popular approach, with excellent scaling properties, places the RRset under a specially named branch, which is in turn under the node name that would otherwise contain the RRset. The rules for naming that branch define the context for interpreting the RRset. That is, rather than:

```
domain-name.example
  /
 RRset
```

the arrangement is:

```
_branch.domain-name.example
  /
 RRset
```

A direct lookup to the subordinate leaf node produces only the desired record types, at no greater cost than a typical DNS lookup.

1.3. "Global" Underscored Node Names

As defined in [RFC1034] the DNS uses names organized in a tree-structured, or hierarchical fashion. A domain name might have multiple node names that begin with an _underscore. A "global" underscored node name is the one that is closest to the root of the DNS hierarchy, also called the highest-level or top-most. In the presentation convention described in Section 3.1 of [RFC1034] this is the right-most name beginning with an underscore. In other presentation environments it might be positioned differently. To avoid concern for the presentation variations, the qualifier "global" is used here.

1.4. Interaction with DNS wildcards

DNS wildcards interact poorly with underscored names in two ways. Since wildcards only are interpreted as leaf names, one cannot create the equivalent of a wildcard name for prefixed names. A name such as label.*.example.com is not a wildcard.

Conversely, a wildcard such as *.example.com can match any name including an underscored name. So, a wildcard might match an underscored name, returning a record that is the type controlled by the underscored name but is not intended to be used in the underscored context and does not conform to its rules.

2. DNS Underscore Scoped Entry Registries Function

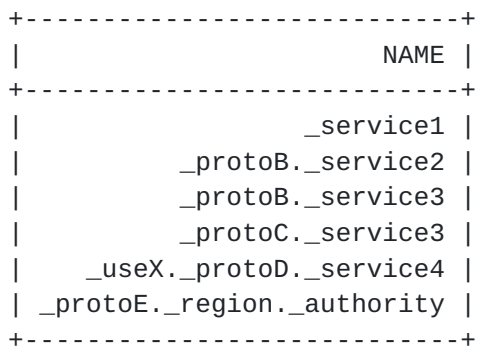
A registry for "global" DNS nodes names that begin with an underscore is defined here. The purpose of the Underscore Global Registry is to avoid collisions resulting from the use of the same underscore-based name, for different applications.

- If a public specification calls for use of an underscore-prefixed domain node name, the "global" underscored name -- the underscored name that is closest to the DNS root -- MUST be entered into this registry.

An underscored name defines the scope of use for specific resource record types, which are associated with the domain name that is the "parent" to the branch defined by the underscored name. A given name defines a specific, constrained context for one or more RR types, where use of such record types conforms to the defined constraints.

- Within an underscore scoped leaf, other RRsets that are not specified as part of the scope MAY be used.

Structurally, the registry is defined as a single, flat table of RR types, under node names beginning with underscore. In some cases, such as for use of an "SRV" record, the full scoping name might be multi-part, as a sequence of underscored names. Semantically, that sequence represents a hierarchical model and it is theoretically reasonable to allow re-use of a subordinate underscored name in a different, global underscored context; that is, a subordinate name is meaningful only within the scope of the global underscored name. Therefore they are ignored by this DNS Underscore Global Scoped Entry Registry. This registry is for the definition of highest-level -- ie, global -- underscored node name used.



Examples of Underscored Names

Only global underscored names are registered in the IANA Underscore Global table.

- The use of underscored node names is specific to each RRTYPE that is being scoped. Each name defines a place, but does not define the rules for what appears underneath that place, either as additional underscored naming or as a leaf node with resource records. Details for those rules are provided by specifications for individual RRTYPEs. The sections below describe the way that existing underscore labels are used with the RRTYPEs that they name.

- Definition and registration of subordinate, underscore node names is the responsibility of the specification that creates the global registry entry.

That is, if a scheme using a global underscore node name has one or more subordinate levels of underscore node naming, the namespaces from which names for those lower levels are chosen are controlled by the parent underscore node name. Each globally-registered underscore name owns a distinct, subordinate name space.

3. RRset Use Registration Template

This section provides a basic template that can be used to register new entries in the IANA DNS Underscore Global Scoped Entry Registry, if the global underscored name above the RRTYPE is not already registered. The text can be added to specifications using RRTYPE/_Node-name combinations that have not already been registered.

> "Per {RFC Attrleaf} please add the following entry to the DNS Underscore Global Scoped Entry Registry:"

Note to RFC Editor: Please replace the above "{RFC Attrleaf}" text with a reference to this document's RFC number. /d

RR Type	_NODE NAME	REFERENCE
{RRTYPE}	_{DNS global node name}	{citation for the document making the addition.}

Table 1: Underscore Global Registry Entry

4. IANA Considerations

Per [RFC8126], IANA is requested to establish the:

DNS Underscore Global Scoped Entry Registry

This section describes actions requested of IANA. The guidance in [IANA] is used.

4.1. DNS Underscore Global Scoped Entry Registry

The DNS Global Underscore Scoped Entry Registry is any DNS node name that begin with the underscore character ("_", ASCII 0x5F) and is the underscored node name closest to the root; that is it defines the highest-level of a DNS branch, under a "parent" domain name.

- This registry is to operate under the IANA rules for "Expert Review" registration; see Section 5.
- The contents of each entry in the Global registry are defined in Section 4.2.
- Each entry in the registry MUST contain values for all of the fields specified in Section 4.2.
- Within the registry, the combination of RR Type and _Node Name MUST be unique.
- The table is to be maintained with entries sorted by the first column (RR Type) and, within that, the second column (_Node Name).
- The required Reference for an entry MUST have a stable resolution to the organization controlling that registry entry.

4.2. DNS Underscore Global Scoped Entry Registry Definition

A registry entry contains:

RR Type: Lists an RR type that is defined for use within this scope

_Node Name: Specifies a single, underscored name that defines a reserved name; this name is the "global" entry name for the scoped resource record types that are associated with that name; for characters in the name that have an upper-case form and a lower-case form, the character MUST be recorded as lower-case, to simply name comparisons.

References: Lists specification that defines a record type and its use under this Name. The organization producing the specification retains control over the registry entry for the _Node Name

Each RR type that is to be used MUST have a separate registry entry.

4.3. Initial entries

Initial entries in the registry are:

RR Type	_NODE NAME	REFERENCE
NULL	_ta-* {see note}	[RFC8145]
OPENPGPKEY	_openpgpkey	[RFC7929]
SMIMEA	_smimecert	[RFC8162]
SRV	_dccp	[RFC2782]
SRV	_ipv6	[RFC5026]
SRV	_sip	[RFC5509]
SRV	_sctp	[RFC2782]
SRV	_tcp	[RFC2782]
SRV	_tls	[RFC6733]
SRV	_udp	[RFC2782]
SRV	_xmpp	[RFC3921]
TLSA	_dane	[RFC7671]
TLSA	_sctp	[RFC6698]
TLSA	_tcp	[RFC6698]
TLSA	_udp	[RFC6698]
TXT	_mta-sts	[MTA-STS]
TXT	_acme-challenge	[ACME]
TXT	_dmarc	[RFC7489]
TXT	_domainkey	[RFC6376]
TXT	_spf	[RFC7208]
TXT	_vouch	[RFC5518]
URI	_iax	[RFC7553]
URI	_acct	[RFC7553]
URI	_dccp	[RFC7553]

URI	_email	[RFC7553]
URI	_ems	[RFC7553]
URI	_fax	[RFC7553]
URI	_ft	[RFC7553]
URI	_h323	[RFC7553]
URI	_ical-sched	[RFC7553]
URI	_ical-access	[RFC7553]
URI	_ifax	[RFC7553]
URI	_im	[RFC7553]
URI	_mms	[RFC7553]
URI	_pres	[RFC7553]
URI	_pstn	[RFC7553]
URI	_sctp	[RFC7553]
URI	_sip	[RFC7553]
URI	_sms	[RFC7553]
URI	_tcp	[RFC7553]
URI	_udp	[RFC7553]
URI	_unifmsg	[RFC7553]
URI	_vcard	[RFC7553]
URI	_videomsg	[RFC7553]
URI	_voice	[RFC7553]
URI	_voicemsg	[RFC7553]
URI	_vpim	[RFC7553]
URI	_xmp	[RFC7553]

Table 2: Underscore Global Registry (initial entries)

NOTE: Under the NULL RR, the entry "_ta-*" is meant to denote all node names beginning with the string "_ta-". It does NOT refer to a DNS wildcard specification.

5. Guidance for Expert Review

This section provides guidance for expert review of registration requests in the of DNS Underscore Global Scoped Entry Registry.

This review is solely to determine adequacy of a requested entry in this Registry, and does not include review of other aspects of the document specifying that entry. For example such a document might also contain a definition of the resource record type that is referenced by the requested entry. Any required review of that definition is separate from the expert review required here.

The review is for the purposes of ensuring that:

- The details for creating the registry entry are sufficiently clear, precise and complete

- The combination of the underscored name, under which the listed resource record type is used, and the resource record type, is unique in the table

For the purposes of this Expert Review, other matters of the specification's technical quality, adequacy or the like are outside of scope.

6. Security Considerations

This memo raises no security issues.

7. References

7.1. Normative References

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7.2. URIs

[1] mailto:dnsop@ietf.org

Appendix A. Acknowledgements

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