

dnsop
Crocker
Internet-Draft
InternetWorking
Intended status: Standards Track
2018
Expires: April 13, 2019

D.

Brandenburg

October 10,

**DNS Scoped Data Through "Underscore" Naming of Attribute Leaves
draft-ietf-dnsop-attrleaf-14**

Abstract

Formally, any DNS resource record may occur under any domain name. However some services use an operational convention for defining specific interpretations of an RRset, by locating the records in a DNS branch, under the parent domain to which the RRset actually applies. The top of this subordinate branch is defined by a naming convention that uses a reserved node name, which begins 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](#).

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <https://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on April 13, 2019.

Copyright Notice

Copyright (c) 2018 IETF Trust and the persons identified as the document authors. All rights reserved.

Crocker
1]

Expires April 13, 2019

[Page

This document is subject to [BCP 78](#) and the IETF Trust's Legal Provisions Relating to IETF Documents (<https://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

Table of Contents

[1](#). Introduction
[2](#)
[1.1](#). Underscore Scoping
[3](#)
[1.2](#). Scaling Benefits
[4](#)
[1.3](#). "Global" Underscored Node Names
[4](#)
[1.4](#). Interaction with DNS wildcards
[5](#)
[2](#). DNS Underscore Scoped Entry Registries Function
[5](#)
[3](#). RRset Use Registration Template
[6](#)
[4](#). IANA Considerations
[7](#)
[4.1](#). DNS Underscore Global Scoped Entry Registry
[7](#)
[4.2](#). DNS Underscore Global Scoped Entry Registry Definition
[8](#)
[4.3](#). Initial entries
[8](#)
[5](#). Guidance for Expert Review
[9](#)
[6](#). Security Considerations
[10](#)
[7](#). References
[10](#)
[7.1](#). Normative References
[10](#)
[7.2](#). URIs
[12](#)
[Appendix A](#). Acknowledgements
[13](#)
 Author's Address
[13](#)

[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 resource record types 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.

Crocker
3]

Expires April 13, 2019

[Page

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", "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.

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.

Crocker
4]

Expires April 13, 2019

[Page

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 node 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.

- o 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.

- o 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.

Crocker
5]

Expires April 13, 2019

[Page

Crocker
6]

Expires April 13, 2019

[Page

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 | {citation for the document making
+ | | name} | the addition.} |
+-----+-----+-----+
+

```

Table 2: 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.

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

to the organization controlling that registry entry.

Crocker
7]

Expires April 13, 2019

[Page

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 simplify 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] |
| PTR | _tcp | [RFC6763] |
| PTR | _udp | [RFC6763] |
| SMIMEA | _smimecert | [RFC8162] |
| SRV | _dccp | [RFC2782] |
| SRV | _ipv6 | [RFC5026] |
| SRV | _sip | [RFC5509] |
| SRV | _sctp | [RFC2782] |
| SRV | _tcp | [RFC2782] |
| SRV | _udp | [RFC2782] |
| SRV | _xmpp | [RFC3921] |
| TLSA | _dane | [RFC7671] |
| TLSA | _sctp | [RFC6698] |
| TLSA | _tcp | [RFC6698] |
| TLSA | _udp | [RFC6698] |
| TXT | _mta-sts | [MTA-STTS] |
| TXT | _acme-challenge | [ACME] |
| TXT | _dmarc | [RFC7489] |
| TXT | _domainkey | [RFC6376] |

Crocker
8]

Expires April 13, 2019

[Page

| | | | | | | |
|---------------------------|-----|--|--------------|--|-----------|--|
| | TXT | | _spf | | [RFC7208] | |
| | TXT | | _vouch | | [RFC5518] | |
| | URI | | _iax | | [RFC6315] | |
| | URI | | _acct | | [RFC7566] | |
| | URI | | _dccp | | [RFC6118] | |
| | URI | | _email | | [RFC6118] | |
| | URI | | _ems | | [RFC6118] | |
| | URI | | _fax | | [RFC6118] | |
| | URI | | _ft | | [RFC6118] | |
| | URI | | _h323 | | [RFC6118] | |
| | URI | | _ical-sched | | [RFC6118] | |
| | URI | | _ical-access | | [RFC6118] | |
| | URI | | _ifax | | [RFC6118] | |
| | URI | | _im | | [RFC6118] | |
| | URI | | _mms | | [RFC6118] | |
| | URI | | _pres | | [RFC6118] | |
| | URI | | _pstn | | [RFC7553] | |
| | URI | | _sctp | | [RFC7553] | |
| | URI | | _sip | | [RFC7553] | |
| | URI | | _sms | | [RFC6118] | |
| | URI | | _tcp | | [RFC6118] | |
| | URI | | _udp | | [RFC6118] | |
| | URI | | _unifmsg | | [RFC6118] | |
| | URI | | _vcard | | [RFC6118] | |
| | URI | | _videomsg | | [RFC6118] | |
| | URI | | _voice | | [RFC6118] | |
| | URI | | _voicemsg | | [RFC6118] | |
| | URI | | _vpim | | [RFC6118] | |
| | URI | | _web | | [RFC6118] | |
| | URI | | _xmpp | | [RFC6118] | |
| +-----+-----+-----+-----+ | | | | | | |

Table 3: 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 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:

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

- [ACME] Barnes, R., Hoffman-Andrews, J., McCarney, D., and J. Kasten, "Automatic Certificate Management Environment (ACME)", I-D [draft-ietf-acme-acme-11](#), March 2018.
- [IANA] M. Cotton, B. Leiba, and T. Narten, "Guidelines for Writing an IANA Considerations Section in RFCs", [RFC 8126](#), June 2017.
- [MTA-STTS] Margolis, D., Risher, M., Ramakrishnan, B., Brotman, A., and J. Jones, "SMTP MTA Strict Transport Security (MTA-STTS)", I-D [draft-ietf-uta-mta-sts](#).
- [RFC1034] Mockapetris, P., "Domain Names - Concepts and Facilities", STD 13, [RFC 1034](#), November 1987.
- [RFC1035] Mockapetris, P., "Domain Names - Implementation and Specification", STD 13, [RFC 1035](#), November 1987.
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC2181] Elz, R. and R. Bush, "Clarifications to the DNS Specification", [RFC 2181](#), July 1997.

Crocker
10]

Expires April 13, 2019

[Page

- [RFC2782] Gulbrandsen, A., Vixie, P., and L. Esibov, "A DNS RR for specifying the location of services (DNS SRV)", [RFC 2782](#), February 2000.
- [RFC3921] Saint-Andre, P., Ed., "Extensible Messaging and Presence Protocol (XMPP): Instant Messaging and Presence", [RFC 3921](#), DOI 10.17487/RFC3921, October 2004, <<https://www.rfc-editor.org/info/rfc3921>>.
- [RFC5026] Gaietta, G., Ed., Kempf, J., and V. Devarapalli, Ed., "Mobile IPv6 Bootstrapping in Split Scenario", [RFC 5026](#), DOI 10.17487/RFC5026, October 2007, <<https://www.rfc-editor.org/info/rfc5026>>.
- [RFC5509] Loreto, S., "Internet Assigned Numbers Authority (IANA) Registration of Instant Messaging and Presence DNS SRV RRs for the Session Initiation Protocol (SIP)", [RFC 5509](#), DOI 10.17487/RFC5509, April 2009, <<https://www.rfc-editor.org/info/rfc5509>>.
- [RFC5518] Hoffman, P., Levine, J., and A. Hathcock, "Vouch By Reference", [RFC 5518](#), April 2009.
- [RFC6118] Hoeneisen, B. and A. Mayrhofer, "Update of Legacy IANA Registrations of Enumservices", [RFC 6118](#), DOI 10.17487/RFC6118, March 2011, <<https://www.rfc-editor.org/info/rfc6118>>.
- [RFC6315] Guy, E. and K. Darilion, "IANA Registration for Enumservice 'iax'", [RFC 6315](#), DOI 10.17487/RFC6315, July 2011, <<https://www.rfc-editor.org/info/rfc6315>>.
- [RFC6335] Cotton, M., Eggert, L., Tsuchi, J., Westerlund, M., and S. Cheshire, "Internet Assigned Numbers Authority (IANA) Procedures for the Management of the Service Name and Transport Protocol Port Number Registry", [RFC 6335](#), Aug 2011.
- [RFC6376] Crocker, D., Hansen, T., and M. Kucherawy, "DomainKeys Identified Mail (DKIM) Signatures", [RFC 6376](#), Sept 2011.
- [RFC6698] Hoffman, J. and J. Schlyter, "The DNS-Based Authentication of Named Entities (DANE) Transport Layer Security (TLS) Protocol: TLSA", [RFC 6698](#), August .
- [RFC6763] Cheshire, S. and M. Krochmal, "DNS-Based Service Discovery", [RFC 6763](#), DOI 10.17487/RFC6763, February 2013, <<https://www.rfc-editor.org/info/rfc6763>>.

Crocker
11]

Expires April 13, 2019

[Page

- [RFC7208] Kitterman, S., "Sender Policy Framework (SPF) for Authorizing Use of Domains in E-Mail, Version 1", [RFC 7208](#), April 2014.
- [RFC7489] Kucherawy, M., Ed. and E. Zwicky, Ed., "Domain-based Message Authentication, Reporting, and Conformance (DMARC)", [RFC 7489](#), March 2015.
- [RFC7553] Falstrom, P. and O. Kolkman, "The Uniform Resource Identifier (URI) DNS Resource Record", [RFC 7553](#), ISSN 2070-1721, June 2015.
- [RFC7566] Goix, L. and K. Li, "Enumservice Registration for 'acct' URI", [RFC 7566](#), DOI 10.17487/RFC7566, June 2015, <<https://www.rfc-editor.org/info/rfc7566>>.
- [RFC7671] Dukhovni, V. and W. Hardaker, "The DNS-Based Authentication of Named Entities (DANE) Protocol: Updates and Operational Guidance", [RFC 7671](#), DOI 10.17487/RFC7671, October 2015, <<https://www.rfc-editor.org/info/rfc7671>>.
- [RFC7929] Wouters, P., , [RFC 7929](#), August 2016.
- [RFC8126] Cotton, M., Leiba, B., and T. Narten, "Guidelines for Writing an IANA Considerations Section in RFCs", [RFC 8126](#), June 2017.
- [RFC8145] Wessels, D., Kumari, W., and P. Hoffman, "Signaling Trust Anchor Knowledge in DNS Security Extensions (DNSSEC)", [RFC 8145](#), April 2017.
- [RFC8162] Hoffman, P. and J. Schlyter, "Using Secure DNS to Associate Certificates with Domain Names for S/MIME", [RFC 8162](#), May 2017.
- [RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in [RFC 2119](#) Key Words", [RFC 8162](#), May 2017.
- [RFC952] Harrenstien, K., Stahl, M., and E. Feinler, "DOD Internet Host Table Specification", [RFC 952](#), October 1985.

[7.2.](#) URIs

[1] <mailto:dnsop@ietf.org>

Crocker
12]

Expires April 13, 2019

[Page

Appendix A. Acknowledgements

Thanks go to Bill Fenner, Dick Franks, Tony Hansen, Martin Hoffmann, Paul Hoffman, Peter Koch, Olaf Kolkman, Murray Kucherawy, John Levine, and Andrew Sullivan for diligent review of the (much) earlier drafts. For the later enhancements, thanks to: Stephane Bortzmeyer, Alissa Cooper, Bob Harold, Benjamin Kaduk, Mirja Kuehlewind, Warren Kumari, John Levine, Joel Jaeggli, Benno Overeinder, Eric Rescorla, Adam Roach, Petr Paek, Ondrej Sury, Paul Vixie, Tim Wicinski, and Paul Wouters.

Special thanks to Ray Bellis for his persistent encouragement to continue this effort, as well as the suggestion for an essential simplification to the registration model.

Author's Address

Dave Crocker
Brandenburg InternetWorking
675 Spruce Dr.
Sunnyvale, CA 94086
USA

Phone: +1.408.246.8253
Email: dcrocker@bbiw.net
URI: <http://bbiw.net/>

