Network Working Group
Internet-Draft
Intended status: BCP
Expires: April 16, 2012

D. Crocker
Brandenburg InternetWorking

October 14, 2011

DNS Scoped Data Through Attribute Leaves
draft-crocker-dns-attrleaf-06

Abstract

Historically, any DNS RR may occur for any domain name. Recent additions have defined DNS leaf nodes that contain a reserved node name, beginning with an underscore. The underscore construct is used to define a semantic scope for DNS records associated with the parent domain. This note explores the nature of this DNS usage and defines the "underscore names" registry with IANA.

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1. Introduction

The core DNS technical specifications assign no semantics to domain names or their parts, and no constraints upon which resource records (RRs) may be associated with particular names. 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. Data semantics have been limited to the specification of particular resource records, on the expectation that new ones would be added as needed.

Some recent service enhancements have defined a restricted scope for the occurrence of particular resource records. That scope is a leaf node, within which the uses of specific resource records can be formally defined and constrained. The leaf has a distinguished naming convention: It uses a reserved DNS node name that begins with an underscore. Because host names are not allowed to use the underscore character, this distinguishes the name from all legal host name. Effectively, this convention creates a space for attributes that are associated with the parent domain, one level up.

An established example is the SRV record [RFC2782] which generalizes concepts long-used for email routing by the MX record [RFC0974][RFC2821]. The use of special DNS names has significant benefits and detriments. Some of these are explored in [RFC5507].

[Comment]: The terms "resolution context" and "scoping rules" have been suggested, in place of "semantic scope". In order to avoid concern for matters of semantics, this specification uses the term "scoping rules", to create a focus on the mechanics being defined, rather than nuances of interpretation for the mechanism.

The scoping feature is particularly useful when generalized resource records are used -- notably TXT and SRV. It provides efficient separation of one use of them from another. Absent this separation, an undifferentiated mass of these RRs are returned to the client which then must parse through the internals of the records in the hope of finding ones that are relevant. With underscore-based scoping, only the relevant RRs are returns.

This specification discusses the underscore "attribute" enhancement, provides an explicit definition of it, and establishes an IANA registry for the reserved names that begin with underscore.

Discussion Venue: Discussion about this draft is directed to the dnsop@lists.uoregon.edu [1] mailing list of the IETF DNSOP Working Group [2].

2. Scaling Benefits and TXT and SRV Resource Records

Some resource records are generic and support a variety of uses. Each additional use defines its own rules and, possibly, its own internal syntax and node-naming conventions to distinguish among particular types. The TXT and SRV records are the notable examples. Used freely, some of these approaches scale poorly, particularly when the same RR can be present in the same leaf node, but with different uses. An increasingly-popular approach, with excellent scaling properties, uses an underscore-based name to a define place in the DNS that is constrained to particular uses for particular RRs. This means that a direct lookup produces only the desired records, at no greater cost than a typical lookup.

In the case of TXT records, different uses have developed largely without coordination. One side-effect is that there is no consistently distinguishable internal syntax for the record; even internal inspection might not be a reliable means of distinguishing among the different uses. Underscore-based names therefore provide an administrative way of separating TXT records that might have different uses, but otherwise would have no syntactic markers for distinguishing among them.

In the case of the SRV RR distinguishing among different types of use was part of the design. [RFC2782] The SRV specification serves as a template, defining an RR that may only be used for specific applications when there is an additional specification. The template definition includes reference to tables of names from which underscore-names should be drawn. The set of <service> names is defined in terms of other IANA tables, namely any table with symbolic names. The other SRV naming field is <proto>, although its pool of names is not explicitly defined.

3. Underscore DNS Registry Function

This specification defines a registry for DNS nodes names, used to define scope of use for specific resource records (RR). A given name defines a specific, constrained context for the use of such records. This does not constrain the use of other resource records that are not specified. The purpose of the registry is to avoid collisions resulting from the use of the same underscore name, for different applications.

Structurally, the registry is defined as a single, flat table of names that begin with underscore. In some cases, such as for SRV, an underscore name might be multi-part, as a sequence of names. Semantically, this is a hierarchical model, thereby making a flat registry unexpected.

The registry requires such hierarchies to be registered as a combinatorial case analysis set, with each entry being a full sequence of underscore names. Given a scheme that is actually structured, this flat design is inelegant. However it has the benefit of being extremely simple, with the added advantage of being easier for readers to understand, as long as these cases are small and few.

NAME
_service1
_service2._protoB
_service3._protoC
_service3._protoC
_service4._protoD._useX

```
| _protoE._region._authority |
+----------------------------+
```

Example of Underscore Names

The flat registry design:

- o provides significantly simpler administration than is needed for hierarchical tables, simples, and

- o is significantly simpler for readers to understand and is likely to produce fewer programming or administration errors.

4. DNS Underscore Registry Definition

A registry entry MUST contain:

Name: Specifies a textual name for a scoped portion of the DNS. The name will usually be taken from the specification cited in the "Purpose" column and is intended for use in discussions about the entry.

DNS Label(s): Specifies a sequence of one or more underscore names that define a single name reservation.

Constraints: Specifies any restrictions on use of the name.

RR(s): Lists the RRs that are defined for use within this scope.

References Lists specifications that define the records and their use under this Name.

Purpose: Specifies the particular purpose/use for specific RR(s), defined for use within the scope of the registered underscore name.

5. IANA Considerations

Per [RFC2434], IANA is requested to establish a DNS Underscore Name Registry, for DNS node names that begin with the underscore character (_) and have been specified in any published RFC, or are documented by a specification published by another standards organization. The contents of each entry are defined in Section 4.

NAME	DNS LABEL	CONSTRAINTS	RR(s)	REFERENCES	PURPOSE
SRV TCP	_srv._tcp		SRV	[RFC2782]	SRV template
SRV UDP	_srv._udp		SRV	[RFC2782]	SRV template
LDAP SRV	_ldap._tcp		SRV	[RFC2782]	LDAP server
SIP TCP	_sip._tcp		NAPTR	[RFC3263], [RFC6011]	Locating SIP Servers and UA configuration
SIPS TCP	_sips._tcp		NAPTR	[RFC3263], [RFC6011]	Locating SIP Servers and UA configuration
SIP UDP	_sip._udp		SRV	[RFC3263], [RFC6011]	Locating SIP servers and UA configuration
SPF	_spf		TXT	[RFC4408]	Authorized IP addresses for sending mail

DKIM	_domainkey		TXT	[RFC4871]	Public key for verifying DKIM signature.
ADSP	_adsp._domainkey		TXT	[RFC5617]	Published DKIM usage practices
PKI LDAP	_PKIXREP._ld		SRV	[RFC438	LDAP PKI

	ap			6]	Repository
PKI HTTP	_PKIXREP._ht		SRV	[RFC438	HTTP PKI
	tp			6]	Repository
PKI OCSP	_PKIXREP._oc		SRV	[RFC438	OCSP PKI
	sp			6]	Repository
VBR	_vouch		TXT	[RFC551	Vouch-by-refe
				8]	rerence domai
					nassertion
DDDS	--unknown!--		SRV	[RFC340	Mapping DDDS
				4]	query to DNS
					records
SOAP	_soap-beep._		SRV	[RFC422	SOAP over
BEEP	tcp			7]	BEEP lookup,
					when no port
					specified
XMLRPC	_xmlrpc-beep		SRV	[RFC352	Resolve url
BEEP	._tcp			9]	for XML-RPC
					using BEEP
Diameter	_diameter._s		SRV	[RFC358	Diameter
SCTP	ctp			8]	rendezvous
					over SCTP
Diameter	_diameter._t		SRV	[RFC358	Diameter
TCP	cp			8]	rendezvous
					over TCP
Tunnel	_tunnel._tcp		SRV	[RFC362	Finding the
				0]	appropriate
					address for
					tunneling
					into a
					particular
					domain
SLP TCP	_slpda._tcp		SRV	[RFC383	Discovering
				2]	desired
					services in
					given DNS
					domains

SLP UDP	_slpda._udp		SRV	[RFC383	Discovering

				2]	desired services in given DNS domains
IM	_im		SRV	[RFC3861]	Instant Messaging address resolution
Pres	_pres		SRV	[RFC3861]	Presence address resolution
Msg Track	_mtqp._tcp		SRV	[RFC3887]	Assist in determining the path that a particular message has taken through a messaging system
XMPP Client	_xmpp-client._tcp		SRV	[RFC6120]	XMPP client lookup of server
XMPP Server	_xmpp-server._tcp		SRV	[RFC6120]	XMPP server-server lookup
DDDS SRV	_???	(unableto discern details. /dcrocker)	SRV (and NAPTR?)	[RFC3958]	Map domain name, application service name, and application protocol dynamically to target server and port
Kerberos TCP	_kerberos._tcp		SRV	[RFC4120]	purpose
Kerberos UDP	_kerberos._udp		SRV	[RFC4120]	purpose
PKI LDAP	_pkixrep._ldap		SRV	[RFC4386]	Enables certificate-using systems to locate PKIrepositories

PKI HTTP	_pkixrep._http		SRV	[RFC4386]	Enables certificate-using systems to locate PKIrepositories
PKI OCSP	_pkixrep._ocsp		SRV	[RFC4386]	Enables certificate-using systems to locate PKIrepositories
Cert Store	_certificates._tcp		SRV	[RFC4387]	Obtain certificates and certificate revocation lists (CRLs) from PKI repositories
Cert Revocation Store	_crls._tcp		SRV	[RFC4387]	Obtain certificates and certificate revocation lists (CRLs) from PKI repositories
PGP Key Store	pgpkeys._tcp		SRV	[RFC4387]	Obtain certificates and certificate revocation lists (CRLs) from PKI repositories
MSRP Relay Locator	_msrp._tcp		SRV	[RFC4976]	purpose
Mobile IPv6 Bootstrap	_mip6._ipv6		SRV	[RFC5026], [RFC5555]	Bootstrap Mobile IPv6 Home Agent information from non-topological information

Digital Video Broadcasting TCP	_dvbservdsc._tcp		SRV	[RFC5328]	Discover non-default DVB entry points addresses
Digital Video Broadcasting UDP	_dvbservdsc._udp		SRV	[RFC5328]	Discover non-default DVB entry points addresses
CAPWAP AC	_capwap-control._udp		rrs	[RFC5415]	Discover the CAPWAP AC address(es)
IM SIP	_im._sip		SRV	[RFC5509]	For resolving Instant Messaging and Presence services with SIP
Pres SIP	_pres._sip		SRV	[RFC5509]	For resolving Instant Messaging and Presence services with SIP
IEEE 802.21 Mobility TCP	_mihis._tcp		NAPTR, SRV	[RFC5679]	Discovering servers that provide IEEE 802.21-definedMobility Services
IEEE 802.21 Mobility UDP	_mihis._udp		NAPTR, SRV	[RFC5679]	Discovering servers that provide IEEE 802.21-definedMobility Services
STUN Client/S	_stun._.tcp		SRV	[RFC5389]	Find a STUN server

erver TCP					
STUN Client/Server UDP	_stun._udp		SRV	[RFC5389]	Find a STUN server

STUN Client/Server TLS	_stuns._tcp		SRV	[RFC5389]	Find a STUN server
TURN TCP	_turn._tcp		SRV	[RFC5766], [RFC5928]	Control the operation of a relay to bypass NAT
TURN UDP	_turn._udp		SRV	[RFC5766], [RFC5928]	Control the operation of a relay to bypass NAT
TURN TLS	_turns._tcp		SRV	[RFC5766], [RFC5928]	Control the operation of a relay to bypass NAT
STUN NAT Behavior DiscoveryTCP	_stun-behavior._tcp		SRV	[RFC5780]	Discover the presence and current behavior of NATs and firewalls between the STUN client and the STUN server
STUN NAT Behavior DiscoveryUDP	_stun-behavior._udp		SRV	[RFC5780]	Discover the presence and current behavior of NATs and firewalls

					between the STUN client and the STUN server
STUN NAT Behavior DiscoveryTLS	_stun-behaviors._tcp		SRV	[RFC5780]	Discover the presence and current behavior of NATs and firewalls between the STUN client and the STUN server

Sieve Management	_sieve._tcp		SRV	[RFC5804]	Manage Sieve scripts on a remote server
AFS VLDB	_afs3-vlserver._udp		SRV	[RFC5864]	Locate services for the AFS distributed file system
AFS PTS	_afs3-prserver._udp		SRV	[RFC5864]	Locate services for the AFS distributed file system
Mail MSA Submission	_submission._tcp		SRV	[RFC6186]	Locate email services
IMAP	_imap._tcp		SRV	[RFC6186]	Locate email services
IMAP TLS	_imaps._tcp		SRV	[RFC6186]	Locate email services
POP	_pop3._tcp		SRV	[RFC6186]	Locate email services
POP TLS	_pop3s._tcp		SRV	[RFC6186]	Locate email services

Table 1: DNS Underscore SCOPE Name Registry (with initial values)

6. Related Registries

Numerous specifications have defined their own, independent registries for use of underscore names. It is likely that adoption of the proposed, integrated registry should render these piecemeal registries obsolete

Registries that are candidates for replacement include:

Instant Messaging SRV Protocol Label Registry

Public Key Infrastructure using X.509 (PKIX) Parameters

Presence SRV Protocol Label Registry

7. Security Considerations

This memo raises no security issues.

8. References

8.1. Normative References

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URIs

[1] <mailto:dnsop@lists.uoregon.edu>

[2] <http://ietf.org/html.charters/dnsop-charter.html>

Appendix A. Acknowledgements

Thanks go to Bill Fenner, Tony Hansen, Peter Koch, Olaf Kolkman, and Andrew Sullivan for diligent review of the earlier drafts.

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/