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An IPv6 Segment Routing (SRv6) Domain Name System (DNS) Resource Record

Abstract

A Domain Name System (DNS) Resource Record (RR) Type is specified for storing IPv6 Segment Routing (SRv6) Information in the DNS.

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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1. Introduction

The Domain Name System (DNS) is a hierarchical, distributed, highly available database with a variety of security features used for bi-directional mapping between domain names and addresses, for email routing, and for other information [RFC1034] [RFC1035]. This data is formatted into resource records (RRs) whose content type and structure are indicated by the RR Type field. General familiarity with the DNS and its terminology [RFC8499] is assumed in this document.

1.1. IPv6 Segment Routing

Internet Protocol versions 4 (IPv4,[RFC0791]) and 6 (IPv5, [RFC8200]) have long provided header options to include an ordered sequence of addresses in a packet header so the packet travels in order through the nodes specified by that sequence of addresses. This is sometimes referred to as "source routing" because the route or path the packet follows is set at least in part when a sequence of addresses is added to the packet, usually at the packet's source, rather than being dynamically determined as the packet proceeds through the network.

IPv6 Segment Routing (SRv6, [RFC8402]) extends "source routing" by generalizing the IPv6 sized "address" quantities in a sequence to be "instructions". [RFC8754] specifies a particular Segment Routing Header (SRH) that may be use used as part of the headers of an IPv6 packet to indicate an IPv6 Segment Routing sequence of addresses/ instructions. And [RFC8986] further specifies the structuring of an IPv6 address size quantity such that it is composed of addressing information followed by a function designation which is optionally further followed by arguments to that function. Thus, segment routing might encode a series of operations to be performed on a packet.

Furthermore, because a sequence of SRv6 instructions may start with the same constant addressing prefix, methods of compression have been suggested to represent this addressing prefix less often and pack an increased number of quantities into a Segment Routing Header where each quantity may consist optionally of additional address information and/or function designation and/or function arguments.

In many ways, the data returned for an SRV6 DNS RR is like an address. For example, it would be reasonable for an application using SRv6 to do a type SRV DNS query [RFC2782] followed by an SRV6 query at the resulting domain name. Furthermore, as a fall back, if no SRV6 RR is present in the DNS at a domain name, an application could try querying for the AAAA IPv6 address RR type.

1.2. Terminology

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.

The following acronyms are used in this document:

DNS - Domain Name System

IANA - Internet Assigned Number Authority

RR - DNS Resource Record

SRv6 - IPv6 Segment Routing

SRV6 - Mnemonic for the SRv6 RR Type

2. SRV6 RR Type RDATA

The SRV6 RR type enables the storage and retrieval of an ordered sequence of SRv6 quantities each of which is the size of IPv6 [RFC8200] addresses. The RDATA for this type of RR is simple a sequence of such quantities preceded by 16 bits that are available for future definition as flags (see Figure 1) and will be 2+(N*16) bytes long where N is the number of such quantities present.

The RR Type Code for the SRV6 RR is TBD1.

The Flags field is for future flexibility and MUST be sent as zero and ignored on receipt.

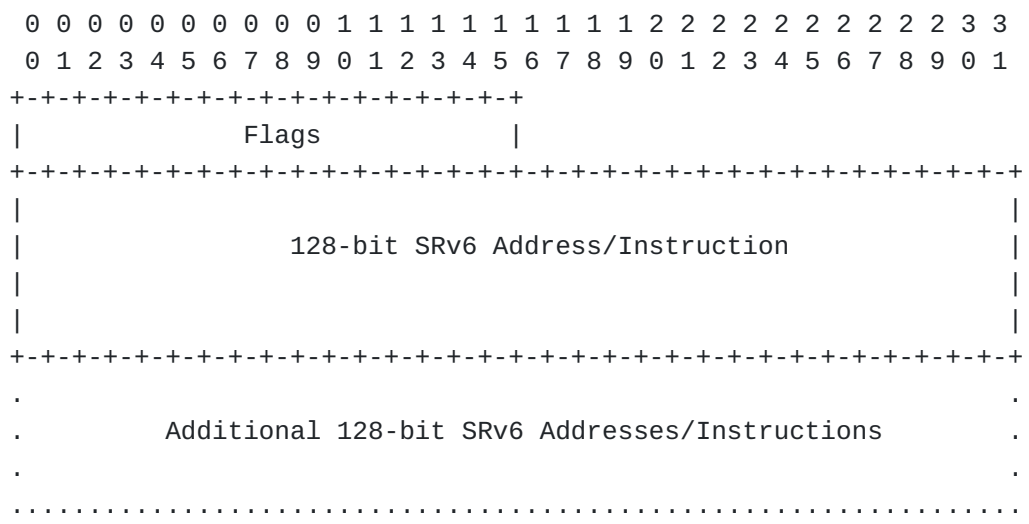

Figure 1: SRV6 RRTYPE Data

3. Acknowledgements

The suggestions and comments of the following persons are gratefully acknowledged:

tbd

4. IANA Considerations

IANA is request to assign an SRV6 RR Type (TBD1) as in the template in Appendix A.

5. Security Considerations

tbd

6. References

6.1. Normative References

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[RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174, May 2017, <https://www.rfc-editor.org/info/rfc8174>.

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[RFC8402] Filsfils, C., Ed., Previdi, S., Ed., Ginsberg, L., Decraene, B., Litkowski, S., and R. Shakir, "Segment Routing Architecture", RFC 8402, DOI 10.17487/RFC8402, July 2018, <https://www.rfc-editor.org/info/rfc8402>.

[RFC8986] Filsfils, C., Ed., Camarillo, P., Ed., Leddy, J., Voyer, D., Matsushima, S., and Z. Li, "Segment Routing over IPv6 (SRv6) Network Programming", RFC 8986, DOI 10.17487/RFC8986, February 2021, <https://www.rfc-editor.org/info/rfc8986>.

6.2. Informative References

[RFC0791] Postel, J., "Internet Protocol", STD 5, RFC 791, DOI 10.17487/RFC0791, September 1981, <https://www.rfc-editor.org/info/rfc791>.

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[RFC2782] Gulbrandsen, A., Vixie, P., and L. Esibov, "A DNS RR for specifying the location of services (DNS SRV)", RFC 2782, DOI 10.17487/RFC2782, February 2000, <https://www.rfc-editor.org/info/rfc2782>.

[RFC3597] Gustafsson, A., "Handling of Unknown DNS Resource Record (RR) Types", RFC 3597, DOI 10.17487/RFC3597, September 2003, <https://www.rfc-editor.org/info/rfc3597>.

[RFC8499] Hoffman, P., Sullivan, A., and K. Fujiwara, "DNS Terminology", BCP 219, RFC 8499, DOI 10.17487/RFC8499, January 2019, <https://www.rfc-editor.org/info/rfc8499>.

[RFC8754] Filsfils, C., Ed., Dukes, D., Ed., Previdi, S., Leddy, J., Matsushima, S., and D. Voyer, "IPv6 Segment Routing Header (SRH)", RFC 8754, DOI 10.17487/RFC8754, March 2020, <https://www.rfc-editor.org/info/rfc8754>.

Appendix A. SRV6 RR Type Template

A. Submission Date: tbd

B.1 Submission Type: [X] New RRTYPE [ ] Modification to RRTYPE
B.2 Kind of RR: [X] Data RR [ ] Meta-RR

C. Contact Information for submitter (will be publicly posted):
Name: Donald Eastlake Email Address: d3e3e3@gmail.com
International telephone number: +1-508-333-2270
Other contact handles:

D. Motivation for the new RRTYPE application.

Need to store IPv6 Segment Routing sequences in the DNS.

E. Description of the proposed RR type.
See draft-eastlake-dnsop-rrtype-srv6

F. What existing RRTYPE or RRTYPEs come closest to filling that need and why are they unsatisfactory?

Perhaps AAAA but that only returns a single IPv6 address, not an ordered sequence of IPv6 sized SRv6 instructions.

G. What mnemonic is requested for the new RRTYPE (optional)?

SRV6

H. Does the requested RRTYPE make use of any existing IANA registry or require the creation of a new IANA subregistry in DNS Parameters? If so, please indicate which registry is to be used or created. If a new subregistry is needed, specify the allocation policy for it and its initial contents.

Does not use any existing registry (other than, of course, the RR Type registry) and does not create a new registry.

I. Does the proposal require/expect any changes in DNS servers/resolvers that prevent the new type from being processed as an unknown RRTYPE (see [RFC3597])?

No.

J. Comments: None.

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