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Stateless Automatic IPv4 over IPv6 Encapsulation / Decapsulation Technology with IPv4 Address Sharing
draft-matsuhira-sa46t-as-09

Abstract

This document specifies Stateless Automatic IPv4 over IPv6 Encapsulation / Decapsulation Technology with IPv4 Address Sharing (SA46T-AS) base specification. SA46T-AS is basically the same technology with SA46T, however that have IPv4 address sharing capability. SA46T-SA is gateway technology, not protocol.

Requirements Language

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 RFC 2119 [RFC2119].

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 January 24, 2016.

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1. Introduction

This document provides Stateless Automatic IPv4 over IPv6 Encapsulation / Decapsulation Technology with IPv4 Address Sharing (SA46T-AS) base specification.

SA46T-AS is basically the same technology with SA46T [I-D.draft-matsuhira-sa46t-spec] , however that have IPv4 address sharing capability.

The basic architecture of the SA46T-AS is the same with SA46T, so SA46T-AS can provide all of SA46T function, such as making bachbone network IPv6 only , or provide many IPv4 network planes over single IPv6 backbone network.

SA46T-AS add IPv4 address sharing function to SA46T. So, SA46T-AS enable many host to share single IPv4 global address.

SA46T is gateway technology, not protocol.

2. Architecture of SA46T-AS

Figure 1 shows SA46T address architecture. SA46T map IPv4 address to SA46T address keeping locator - identifier relation. The n bits identifier part of IPv4 address and n bits identifier part of IPv6 address is the same value, and the 32-n bits locator part in IPv4 address and 128 - n bits locator part in IPv6 address is the same meaning. So, the meaning of routing information is the same between IPv4 space and IPv6 space.

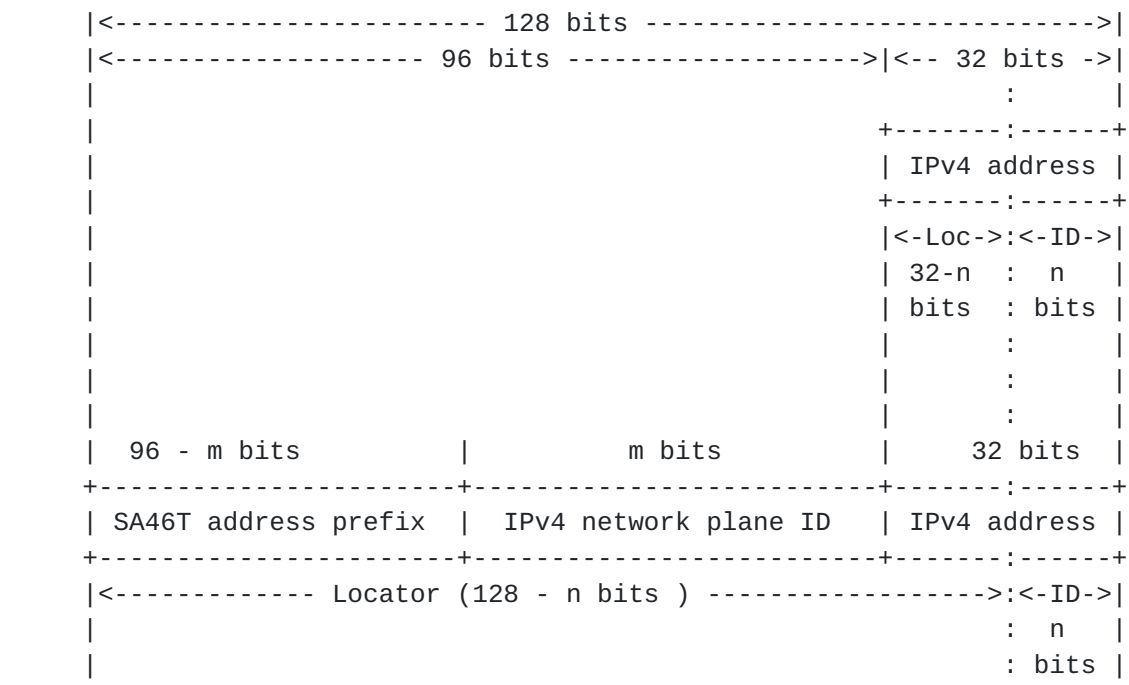

Figure 1

Figure 2 shows SA46T-AS address architecture. SA46T-AS address consists four parts, SA46T-AS prefix, IPv4 network plane ID, IPv4 address, and Port number. That mean SA46T-AS address consists SA46T address and port number.

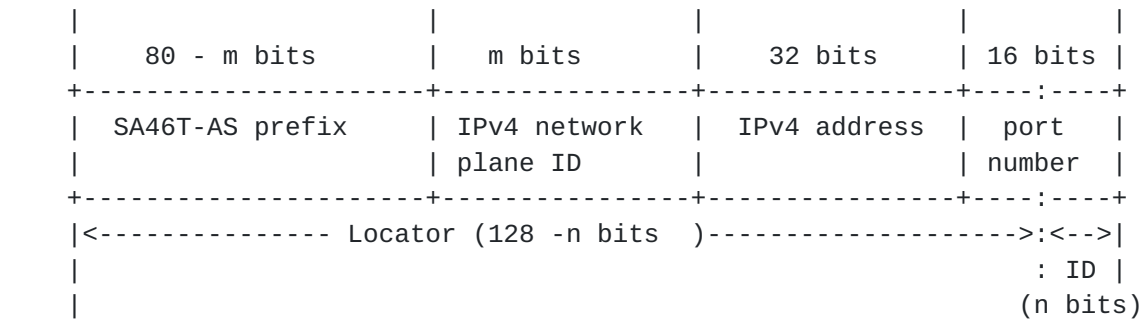

Figure 2

In SA46T, boundary of locator and identifier is in IPv4 address part, however in SA46T-AS, boundary of locator and identifier is in port number part, that mean, SA46T-AS use upper part of port number as locator, and lower part of port number as identifier.

3. SA46T-AS address format

Figure 3 show a example of SA46T-AS address format. In this example, 16bits IPv4 network plane ID is used, that provide 65535 IPv4 network plane.

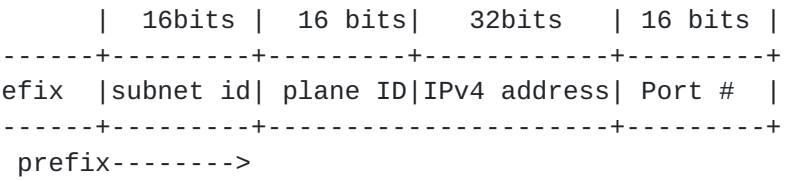

Figure 3

4. Using SA46T-AS in client server environments

4.1. Client environments

Figure 4 shows a example of SA46T-AS usage in client environments. In this document, NAPT is IPv4 - IPv4 Netowrk address and port number translator. Coopetation with NAPT, SA46T-AS provide IPv4 address sharing with different users.

Figure 4

4.2. Server environments

Figure 5 shows an example of SA46T-AS usage in server environments. In this example, server terminate SA46T-AS tunnel. This case, Server require at least one port number per server, that mean, 128bits host route advertise for server access via IPv4. This case, full access is provided via IPv6.

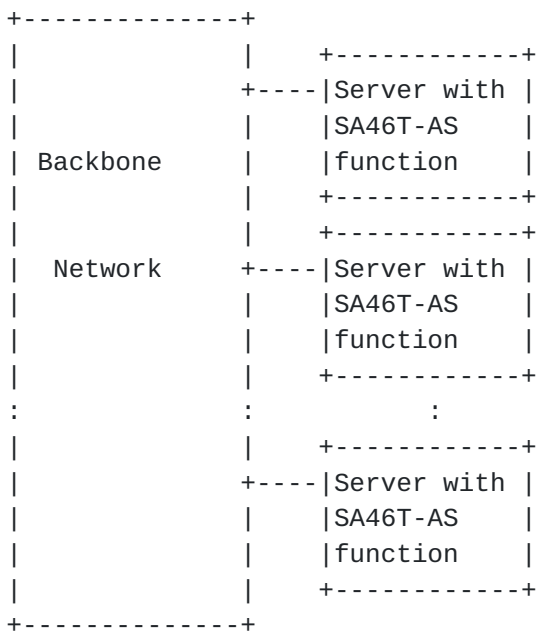

Figure 5

4.3. Data Center Environments

Figure 6 shows an example of SA46T-AS usage in Data Center environments. In this example, SA46T-AS is used only in Data Center Backend Network closely. Client which is connected via backbone network does not know the exists of SA46T-AS. SA46T-AS can provide at least one port number per server, this case, 128bits host route is advertised, however this route in advertised only in data center backbone network. Ofcource, IPv6 address may allocated to the server, so full access is provided via IPv6.

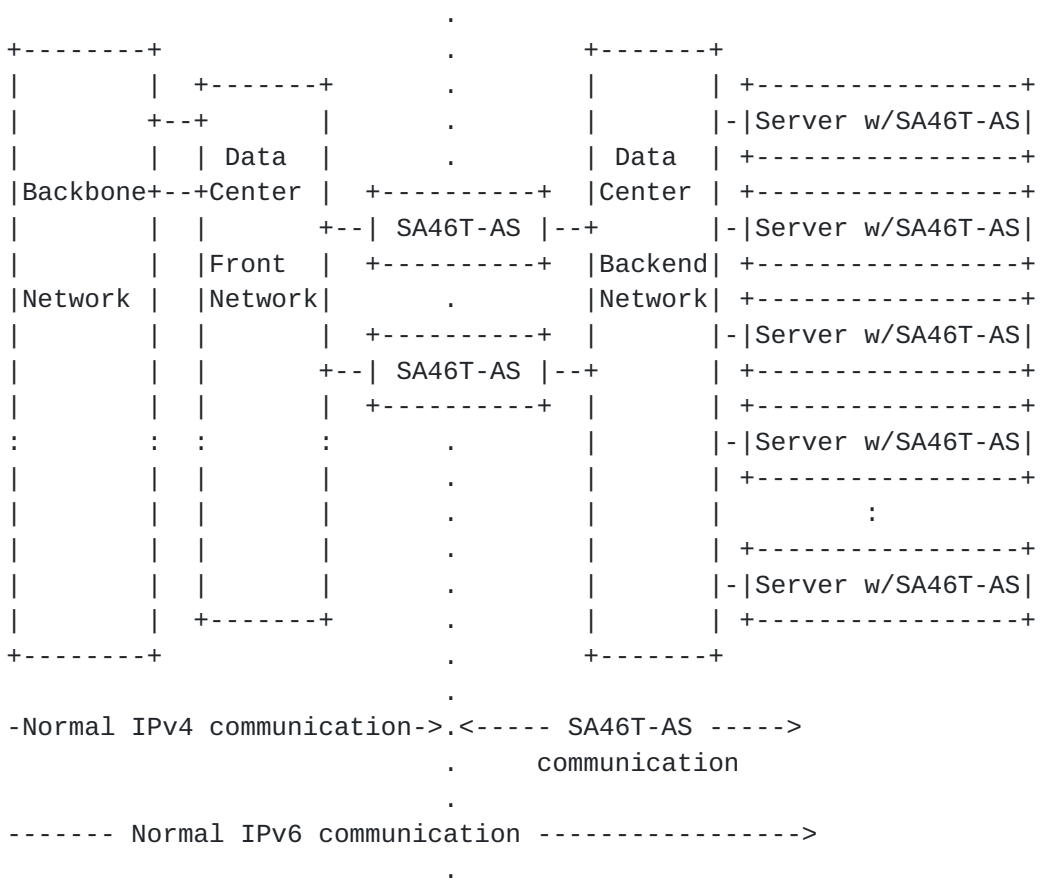

Figure 6

5. Port Number Issue

SA46T-AS require port number of transport layer. SA46T-AS can not support ICMPv4 [RFC0792]. The function provided by ICMPv4 does not work in SA46T-AS environments, such as Path MTU Discovery [RFC1191], ping command, etc.

SA46T-AS can not also support IPv4 ESP[RFC4303] because transport header is encrypted.

6. Characteristic

SA46T has following useful characteristics.

- Reduce backbone network operation cost with IPv6 single stack (at least less than Dual Stack)

- Can allocate IPv4 address to stub networks, which used in backbone network before installing SA46T
- Less configuration
- No need for special protocol
- No dependent Layer 2 network
- Can Stack IPv4 Private networks
- Easy stop IPv4 operation in stub network for future (just remove SA46T)
- Provide redundancy

Moreover, SA46T-AS add following characteristsics to SA46T.

- Provide IPv4 address sharig function

7. IANA Considerations

This document makes no request of IANA.

Note to RFC Editor: this section may be removed on publication as an RFC.

8. Security Considerations

SA46T-AS use automatic tunneling technologies. Security consideration related tunneling technologies are discussed in RFC2893 [RFC2893], RFC2267 [RFC2267], etc.

9. References

9.1. Normative References

[I-D.draft-matsuhira-sa46t-spec]
Matsuhira, N., "Stateless Automatic IPv4 over IPv6 Encapsulation / Decapsulation Technology: Specification", January 2014.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

9.2. References

[RFC0792] Postel, J., "Internet Control Message Protocol", STD 5, RFC 792, September 1981.

[RFC1191] Mogul, J. and S. Deering, "Path MTU discovery", RFC 1191, November 1990.

[RFC2267] Ferguson, P. and D. Senie, "Network Ingress Filtering: Defeating Denial of Service Attacks which employ IP Source Address Spoofing", RFC 2267, January 1998.

[RFC2893] Gilligan, R. and E. Nordmark, "Transition Mechanisms for IPv6 Hosts and Routers", RFC 2893, August 2000.

[RFC4303] Kent, S., "IP Encapsulating Security Payload (ESP)", RFC 4303, December 2005.

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