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Traffic Selectors for Flow Bindings
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Abstract

This document defines binary formats for IPv4 and IPv6 traffic selectors to be used in conjunction with flow bindings for Mobile IPv6.

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1. Requirements notation

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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] (Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels," March 1997.).

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2. Introduction

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This document defines binary formats for IPv4 and IPv6 Traffic Selector sub-options as defined in [I-D.ietf-mext-flow-binding] (Soliman, H., Tsirtsis, G., Montavont, N., Giaretta, G., and K. Kuladinithi, "Flow Bindings in Mobile IPv6 and NEMO Basic Support," November 2009.). The binary traffic selector format defined here, allows for efficient identification of flow(s) based on well known fields in IPv4 [RFC0791] (Postel, J., "Internet Protocol," September 1981.), IPv6 [RFC2460] (Deering, S. and R. Hinden, "Internet Protocol, Version 6 (IPv6) Specification," December 1998.), and transport layer headers like TCP [RFC0793] (Postel, J., "Transmission Control Protocol,"

September 1981.) and UDP [RFC0768] (Postel, J., “User Datagram Protocol,” August 1980.).

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3. Traffic Selector Sub-Options

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[I-D.ietf-mext-flow-binding] (Soliman, H., Tsirtsis, G., Montavont, N., Giaretta, G., and K. Kuladinithi, “Flow Bindings in Mobile IPv6 and NEMO Basic Support,” November 2009.) defines the format for the traffic selector sub-option.
The following values of the TS Format field, are defined in this specification for binary traffic selectors.
TS Format:

> 1 IPv4 binary traffic selector
>
> 2 IPv6 binary traffic selector

3.1. IPv4 binary traffic selector

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If the TS Format field of the traffic selector sub-option indicates "IPv4 binary traffic selector", then the traffic selector is formatted as shown below.
The alignment requirement for this sub-option is:

> 4n if A, B, C, D, E, or F is set
>
> 2n if G, H, I, or J is set
>
> n if K, L, M, N is sett

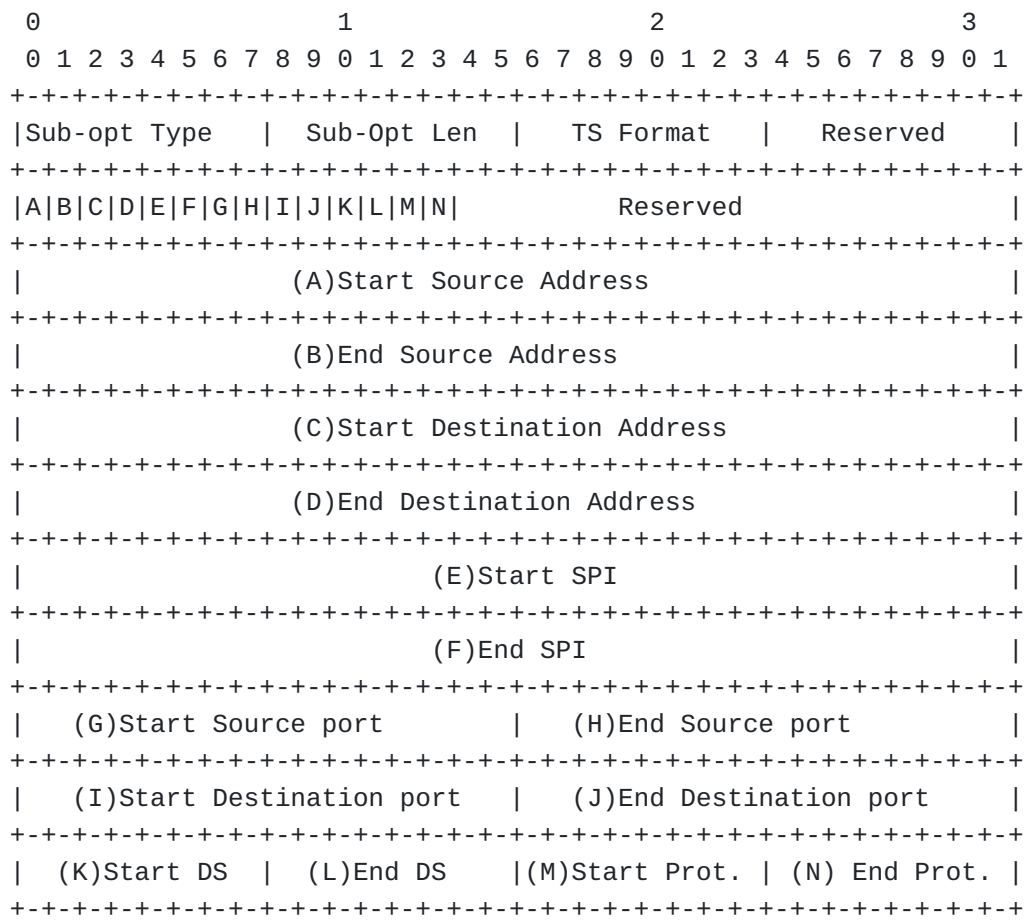


Figure 1: IPv4 binary traffic selector

Flags (A-N)

> Each flag indicates whether the corresponding field is present in the message

(A)Start Source Address

> This field identifies the first source address, from the range of 32-bit IPv4 addresses to be matched, on data packets as seen by the home agent. In other words this is one of the addresses of the correspondent node.

(B)End Source Address

> If more than one contiguous source address needs to be matched then this field can be used to indicate the end value of a range starting from the value of the Start Source Address field. This field MUST NOT be included unless the Start Source Address field is included.

When this field is included the receiver will match all of the addresses between fields (A) and (B), inclusive of (A) and (B).

(C)Start Destination Address

This field identifies the first destination address, from the range of 32-bit IPv4 addresses to be matched, on data packets as seen by the home agent. In other words this is one of the registered home addresses of the mobile node.

(D)End Destination Address

If more than one contiguous destination address needs to be matched then this field can be used to indicate the end value of a range starting from the value of the Start Destination Address field. This field MUST NOT be included unless the Start Destination Address field is included. When this field is included the receiver will match all of the addresses between fields (C) and (D), inclusive of (C) and (D).

(E)Start SPI - Security Parameter Index

This field identifies the first 32-bit SPI value, from the range of SPI values to be matched, on data packets as seen by the home agent. This field is defined in [RFC4303] (Kent, S., “IP Encapsulating Security Payload (ESP),” December 2005.).

(F)End SPI - Security Parameter Index

If more than one contiguous SPI values need to be matched then this field can be used to indicate the end value of a range starting from the value of the Start SPI field. This field MUST NOT be included unless the Start SPI field is included. When this field is included the receiver will match all of the SPI values between fields (E) and (F), inclusive of (E) and (F).

(G)Start Source Port

This field identifies the first 16-bit source port number, from the range of port numbers to be matched, on data packets as seen by the home agent. This is from the range of port numbers defined by IANA (http://www.iana.org/assignments/port-numbers)

(H)End Source Port

If more than one contiguous source port numbers need to be matched then this field can be used to indicate the end value of a range starting from the value of the Start Source Port field. This field MUST NOT be included unless the Start Source Port field is included.

When this field is included the receiver will match all of the port numbers between fields (G) and (H), inclusive of (G) and (H).

(I)Start Destination Port

This field identifies the first 16-bit destination port number, from the range of port numbers to be matched, on data packets as seen by the home agent.

(J)End Destination Port

If more than one contiguous destination port numbers need to be matched then this field can be used to indicate the end value of a range starting from the value of the Start Destination Port field. This field MUST NOT be included unless the Start Destination Port field is included. When this field is included the receiver will match all of the port numbers between fields (I) and (J), inclusive of (I) and (J).

(K)Start DS - Differential Services

This field identifies the first differential services value, from the range of differential services values to be matched, on data packets as seen by the home agent. Note that this field is called Type of Service field in [RFC0791] (Postel, J., “Internet Protocol,” September 1981.). [RFC3260] (Grossman, D., “New Terminology and Clarifications for Diffserv,” April 2002.) then clarified that the field has been redefined as 6 bits DS field and 2 bits reserved, later claimed by Explicit Congestion Notification (ECN) [RFC3168] (Ramakrishnan, K., Floyd, S., and D. Black, “The Addition of Explicit Congestion Notification (ECN) to IP,” September 2001.). For the purpose of this specification the DS field is 8 bits long, were the 6 most significant bits indicating the DS field to be matched and the 2 least significant bits MUST be set to 0 by the sender and ignored by the receiver.

(L)End DS - Differential Services

If more than one contiguous DS values need to be matched then this field can be used to indicate the end value of a range starting from the value of the Start DS field. This field MUST NOT be included unless the Start DS field is included. When this field is included, it MUST be coded the same way as defined for (K). When this field is included the receiver will match all of the values between fields (K) and (L), inclusive of (K) and (L).

(M)Start Protocol

> This field identifies the first 8-bit protocol value, from the range of protocol values to be matched, on data packets as seen by the home agent.

(N)End Protocol

> If more than one contiguous protocol values need to be matched then this field can be used to indicate the end value of a range starting from the value of the Start Protocol field. This field MUST NOT be included unless the Start Protocol field is included. When this field is included the receiver will match all of the values between fields (M) and (N), inclusive of (M) and (N).

Reserved

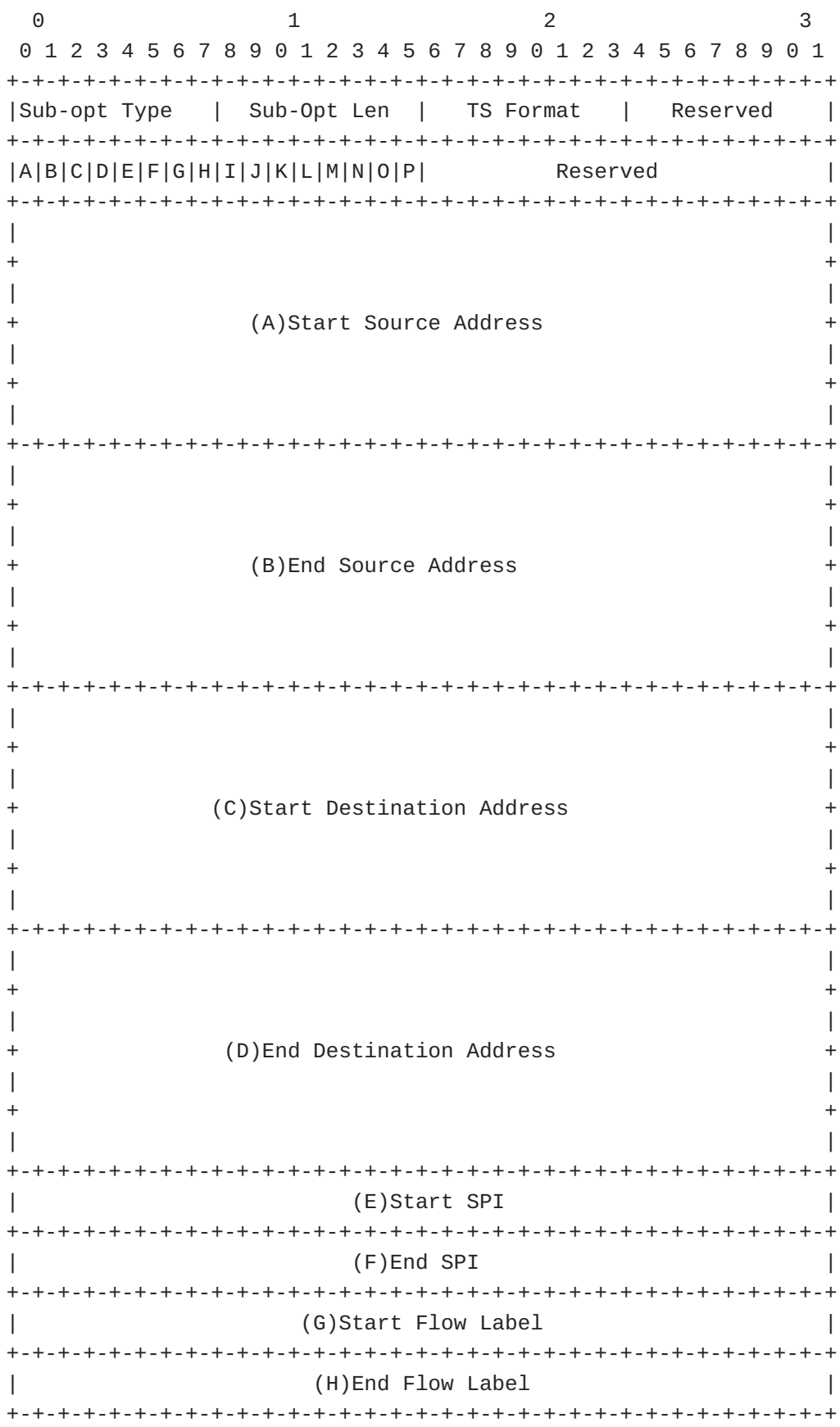
> Reserved for future use. These bits MUST be set to zero by the sender and ignored by the receiver.

3.2. IPv6 binary traffic selector

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If the TS Format field of the traffic selector sub-option indicates "IPv6 binary traffic selector", then the traffic selector is formatted as follows:
The alignment requirement for this sub-option is:

> 8n if A, B, C, or D is set
>
> 4n if E, F, G, or H is set
>
> 2n if I, J, K, or L is set
>
> n if M, N, O, or P is set


0 1 2 3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
Sub-opt Type
Sub-Opt Len
TS Format
Reserved
A B C D E F G H I J K L M N O P
Reserved
(A)Start Source Address
(B)End Source Address
(C)Start Destination Address
(D)End Destination Address
(E)Start SPI
(F)End SPI
(G)Start Flow Label
(H)End Flow Label

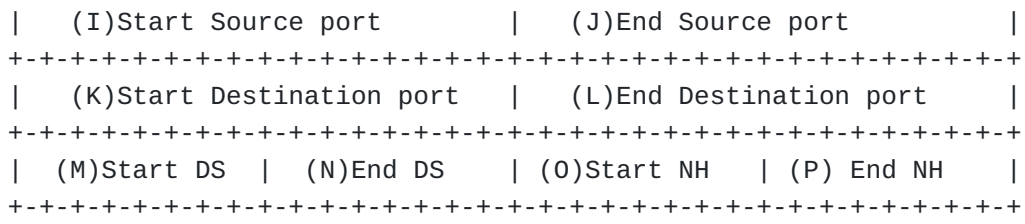


Figure 2: IPv6 binary traffic selector

Flags (A-P)

> Each flag indicates whether the corresponding field is present in the message

(A)Start Source Address

> This field identifies the first source address, from the range of 128-bit IPv6 addresses to be matched, on data packets as seen by the home agent. In other words this is one of the addresses of the correspondent node.

(B)End Source Address

> If more than one contiguous source address needs to be matched then this field can be used to indicate the end value of a range starting from the value of the Start Source Address field. This field MUST NOT be included unless the Start Source Address field is included. When this field is included the receiver will match all of the addresses between fields (A) and (B), inclusive of (A) and (B).

(C)Start Destination Address

> This field identifies the first destination address, from the range of 128-bit IPv6 addresses to be matched, on data packets as seen by the home agent. In other words this is one of the registered home addresses of the mobile node.

(D)End Destination Address

> If more than one contiguous destination address needs to be matched then this field can be used to indicate the end value of a range starting from the value of the Start Destination Address field. This field MUST NOT be included unless the Start Destination Address field is included. When this field is included the receiver will match all of the addresses between fields (C) and (D), inclusive of (C) and (D).

(E)Start SPI - Security Parameter Index

This field identifies the first 32-bit SPI value, from the range of SPI values to be matched, on data packets as seen by the home agent. This field is defined in [RFC4303] (Kent, S., “IP Encapsulating Security Payload (ESP),” December 2005.).

(F)End SPI - Security Parameter Index

If more than one contiguous SPI values need to be matched then this field can be used to indicate the end value of a range starting from the value of the Start SPI field. This field MUST NOT be included unless the Start SPI field is included. When this field is included the receiver will match all of the SPI values between fields (E) and (F), inclusive of (E) and (F).

(G)Start Flow Label

This field identifies the first flow label value, from the range of flow label values to be matched, on data packets as seen by the home agent. According to [RFC2460] (Deering, S. and R. Hinden, “Internet Protocol, Version 6 (IPv6) Specification,” December 1998.) the flow label is 24-bit long. For the purpose of this specification the sender of this option MUST prefix the flow label value with 8-bits of "0" before inserting it in this field. The receiver SHOULD ignore the first 8-bits of this field.

(H)End Flow Label

If more than one contiguous flow label values need to be matched then this field can be used to indicate the end value of a range starting from the value of the Start Flow Label field. This field MUST NOT be included unless the Start Flow Label field is included. When this field is included the receiver will match all of the flow label values between fields (G) and (H), inclusive of (G) and (H).

(I)Start Source Port

This field identifies the first 16-bit source port number, from the range of port numbers to be matched, on data packets as seen by the home agent.

(J)End Source Port

If more than one contiguous source port numbers need to be matched then this field can be used to indicate the end value of a range starting from the value of the Start Source Port field. This field MUST NOT be included unless the Start Source Port field is included. When this field is included the receiver will match all of the port numbers between fields (I) and (J), inclusive of (I) and (J).

(K)Start Destination Port

> This field identifies the first 16-bit destination port number, from the range of port numbers to be matched, on data packets as seen by the home agent.

(L)End Destination Port

> If more than one contiguous destination port numbers need to be matched then this field can be used to indicate the end value of a range starting from the value of the Start Destination Port field. This field MUST NOT be included unless the Start Destination Port field is included. When this field is included the receiver will match all of the port numbers between fields (K) and (L), inclusive of (K) and (L).

(M)Start DS - Differential Services

> This field identifies the first differential services value, from the range of differential services values to be matched, on data packets as seen by the home agent. Note that this field is called Type of Service field in [RFC0791] (Postel, J., “Internet Protocol,” September 1981.). [RFC3260] (Grossman, D., “New Terminology and Clarifications for Diffserv,” April 2002.) then clarified that the field has been redefined as 6 bits DS field and 2 bits reserved, later claimed by Explicit Congestion Notification (ECN) [RFC3168] (Ramakrishnan, K., Floyd, S., and D. Black, “The Addition of Explicit Congestion Notification (ECN) to IP,” September 2001.). For the purpose of this specification the DS field is 8 bits long, were the 6 most significant bits indicating the DS field to be matched and the 2 least significant bits MUST be set to 0 by the sender and ignored by the receiver.

(N)End DS - Differential Services

> If more than one contiguous DS values need to be matched then this field can be used to indicate the end value of a range starting from the value of the Start DS field. This field MUST NOT be included unless the Start DS field is included. When this field is included, it MUST be coded the same way as defined for (M). When this field is included the receiver will match all of the values between fields (M) and (N), inclusive of (M) and (N).

(O)Start NH - Next Header

> This field identifies the first 8-bit next header value, from the range of next header values to be matched, on data packets as seen by the home agent.

(P)End NH - Next Header

> If more than one contiguous next header values need to be matched then this field can be used to indicate the end value of a range starting from the value of the Start NH field. This field MUST NOT be included unless the Start next header field is included. When this field is included the receiver will match all of the values between fields (O) and (P), inclusive of (O) and (P).

Reserved

> Reserved for future use. These bits MUST be set to zero by the sender and ignored by the receiver.

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4. Security Considerations

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This draft defines the format of the traffic selector field of a sub-option defined for flow bindings [I-D.ietf-mext-flow-binding] (Soliman, H., Tsirtsis, G., Montavont, N., Giaretta, G., and K. Kuladinithi, "Flow Bindings in Mobile IPv6 and NEMO Basic Support," November 2009.). The authors have not identified any security concerns pertaining to this draft beyond what is already identified in [I-D.ietf-mext-flow-binding] (Soliman, H., Tsirtsis, G., Montavont, N., Giaretta, G., and K. Kuladinithi, "Flow Bindings in Mobile IPv6 and NEMO Basic Support," November 2009.).

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5. IANA Considerations

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1) New TS format values from the "Traffic Selector Format" namespace for the Traffic Selector sub-option defined in [I-D.ietf-mext-flow-binding] (Soliman, H., Tsirtsis, G., Montavont, N., Giaretta, G., and K. Kuladinithi, "Flow Bindings in Mobile IPv6 and NEMO Basic Support," November 2009.). The following values are requested:

> 1 IPv4 Binary Traffic Selector
>
> 2 IPv6 Binary Traffic Selector

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6. Aknowledgements

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7. References

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7.1. Normative References

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[I-D.ietf-mext-flow-binding]	Soliman, H., Tsirtsis, G., Montavont, N., Giaretta, G., and K. Kuladinithi, “Flow Bindings in Mobile IPv6 and NEMO Basic Support,” draft-ietf-mext-flow-binding-04 (work in progress), November 2009 (TXT).
[RFC0768]	Postel, J., “User Datagram Protocol,” STD 6, RFC 768, August 1980 (TXT).
[RFC0791]	Postel, J., “Internet Protocol,” STD 5, RFC 791, September 1981 (TXT).
[RFC0793]	Postel, J., “Transmission Control Protocol,” STD 7, RFC 793, September 1981 (TXT).
[RFC2119]	Bradner, S., “Key words for use in RFCs to Indicate Requirement Levels,” BCP 14, RFC 2119, March 1997 (TXT, HTML, XML).
[RFC2460]	Deering, S. and R. Hinden, “Internet Protocol, Version 6 (IPv6) Specification,” RFC 2460, December 1998 (TXT, HTML, XML).
[RFC3168]	Ramakrishnan, K., Floyd, S., and D. Black, “The Addition of Explicit Congestion Notification (ECN) to IP,” RFC 3168, September 2001 (TXT).
[RFC4303]	Kent, S., “IP Encapsulating Security Payload (ESP),” RFC 4303, December 2005 (TXT).

7.2. Informative References

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[RFC3260]	Grossman, D., “New Terminology and Clarifications for Diffserv,” RFC 3260, April 2002 (TXT).

Authors' Addresses

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