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IPv6 Node Requirements RFC 4294-bis
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Abstract

This document defines requirements for IPv6 nodes. It is expected that IPv6 will be deployed in a wide range of devices and situations. Specifying the requirements for IPv6 nodes allows IPv6 to function well and interoperate in a large number of situations and deployments.

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 June 19, 2011.

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1. 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].

2. Introduction

The goal of this document is to define the common functionality required from both IPv6 hosts and routers. Many IPv6 nodes will implement optional or additional features, but this document collects and summarizes requirements from other published Standards Track documents in one place.

This document tries to avoid discussion of protocol details, and references RFCs for this purpose. This document is intended to be an Applicability Statement and provide guidance as to which IPv6 specifications should be implemented in the general case, and which specification may be of interest to specific deployment scenarios. This document does not update any individual protocol document RFCs.

Although the document points to different specifications, it should be noted that in many cases, the granularity of a particular requirement will be smaller than a single specification, as many specifications define multiple, independent pieces, some of which may not be mandatory. In addition, most specifications define both client and server behavior in the same specification, while many implementations will be focused on only one of those roles.

This document defines a minimal level of requirement needed for a device to provide useful internet service and considers a broad range of device types and deployment scenarios. Because of the wide range of deployment scenarios, the minimal requirements specified in this document may not be sufficient for all deployment scenarios. It is perfectly reasonable (and indeed expected) for other profiles to define additional or stricter requirements appropriate for specific usage and deployment environments. For example, this document does not mandate that all clients support DHCP, but some some deployment scenarios may deem it appropriate to make such a requirement. For example, government agencies in the USA have defined profiles for specialized requirements for IPv6 in target environments [DODv6] and [USGv6].

As it is not always possible for an implementer to know the exact usage of IPv6 in a node, an overriding requirement for IPv6 nodes is that they should adhere to Jon Postel's Robustness Principle:

Be conservative in what you do, be liberal in what you accept from others [RFC0793].

2.1. Scope of This Document

IPv6 covers many specifications. It is intended that IPv6 will be deployed in many different situations and environments. Therefore, it is important to develop the requirements for IPv6 nodes to ensure interoperability.

This document assumes that all IPv6 nodes meet the minimum requirements specified here.

2.2. Description of IPv6 Nodes

From the Internet Protocol, Version 6 (IPv6) Specification [RFC2460], we have the following definitions:

Description of an IPv6 Node

- a device that implements IPv6.

Description of an IPv6 router

- a node that forwards IPv6 packets not explicitly addressed to itself.

Description of an IPv6 Host

- any node that is not a router.

3. Abbreviations Used in This Document

ATM Asynchronous Transfer Mode
AH Authentication Header
DAD Duplicate Address Detection
ESP Encapsulating Security Payload
ICMP Internet Control Message Protocol
IKE Internet Key Exchange
MIB Management Information Base
MLD Multicast Listener Discovery
MTU Maximum Transfer Unit
NA Neighbor Advertisement

NBMA Non-Broadcast Multiple Access
ND Neighbor Discovery
NS Neighbor Solicitation
NUD Neighbor Unreachability Detection
PPP Point-to-Point Protocol
PVC Permanent Virtual Circuit
SVC Switched Virtual Circuit

4. Sub-IP Layer

An IPv6 node must include support for one or more IPv6 link-layer specifications. Which link-layer specifications an implementation should include will depend upon what link-layers are supported by the hardware available on the system. It is possible for a conformant IPv6 node to support IPv6 on some of its interfaces and not on others.

As IPv6 is run over new layer 2 technologies, it is expected that new specifications will be issued. In the following, we list some of the link-layers for which an IPv6 specification has been developed. It is provided for information purposes only, and may not be complete.

- Transmission of IPv6 Packets over Ethernet Networks [RFC2464]
- IPv6 over ATM Networks [RFC2492]
- Transmission of IPv6 Packets over Frame Relay Networks Specification [RFC2590]
- Transmission of IPv6 Packets over IEEE 1394 Networks [RFC3146]
- Transmission of IPv6, IPv4, and Address Resolution Protocol (ARP) Packets over Fibre Channel [RFC4338]
- Transmission of IPv6 Packets over IEEE 802.15.4 Networks [RFC4944]
- Transmission of IPv6 via the IPv6 Convergence Sublayer over IEEE 802.16 Networks [RFC5121]
- IP version 6 over PPP [RFC5072]

In addition to traditional physical link-layers, it is also possible to tunnel IPv6 over other protocols. Examples include:

- Teredo: Tunneling IPv6 over UDP through Network Address Translations (NATs) [RFC4380]
- Transmission of IPv6 over IPv4 Domains without Explicit Tunnels [RFC2529]

5. IP Layer

5.1. Internet Protocol Version 6 - RFC 2460

The Internet Protocol Version 6 is specified in [RFC2460]. This specification MUST be supported.

Unrecognized options in Hop-by-Hop Options or Destination Options extensions MUST be processed as described in RFC 2460.

The node MUST follow the packet transmission rules in RFC 2460.

Nodes MUST always be able to send, receive, and process fragment headers. All conformant IPv6 implementations MUST be capable of sending and receiving IPv6 packets; the forwarding functionality MAY be supported. Overlapping fragments MUST be handled as described in [RFC5722].

RFC 2460 specifies extension headers and the processing for these headers.

A full implementation of IPv6 includes implementation of the following extension headers: Hop-by-Hop Options, Routing (Type 0), Fragment, Destination Options, Authentication and Encapsulating Security Payload [RFC2460].

An IPv6 node MUST be able to process these headers. An exception is Routing Header type 0 (RH0) which was deprecated by [RFC5095] due to security concerns, and which MUST be treated as an unrecognized routing type.

5.2. Neighbor Discovery for IPv6 - RFC 4861

Neighbor Discovery is defined in [RFC4861] and was updated by [RFC5942]. Neighbor Discovery SHOULD be supported. RFC4861 states:

> Unless specified otherwise (in a document that covers operating IP over a particular link type) this document applies to all link types. However, because ND uses link-layer multicast for some of its services, it is possible that on some link types (e.g., NBMA links) alternative protocols or mechanisms to implement those services will be specified (in the appropriate document covering the operation of IP over a particular link type). The services described in this document that are not directly dependent on multicast, such as Redirects, Next-hop determination, Neighbor Unreachability Detection, etc., are expected to be provided as specified in this document. The details of how one uses ND on NBMA links is an area for further study.

Some detailed analysis of Neighbor Discovery follows:

Router Discovery is how hosts locate routers that reside on an attached link. Hosts MUST support Router Discovery functionality.

Prefix Discovery is how hosts discover the set of address prefixes that define which destinations are on-link for an attached link. Hosts MUST support Prefix discovery.

Hosts MUST also implement Neighbor Unreachability Detection (NUD) for all paths between hosts and neighboring nodes. NUD is not required for paths between routers. However, all nodes MUST respond to unicast Neighbor Solicitation (NS) messages.

Hosts MUST support the sending of Router Solicitations and the receiving of Router Advertisements. The ability to understand individual Router Advertisement options is dependent on supporting the functionality making use of the particular option.

All nodes MUST support the Sending and Receiving of Neighbor Solicitation (NS) and Neighbor Advertisement (NA) messages. NS and NA messages are required for Duplicate Address Detection (DAD).

Hosts SHOULD support the processing of Redirect functionality. Routers MUST support the sending of Redirects, though not necessarily for every individual packet (e.g., due to rate limiting). Redirects are only useful on networks supporting hosts. In core networks dominated by routers, redirects are typically disabled. The sending of redirects SHOULD be disabled by default on backbone routers. They MAY be enabled by default on routers intended to support hosts on edge networks.

"IPv6 Host-to-Router Load Sharing" [RFC4311] includes additional recommendations on how to select from a set of available routers. RFC 4311 SHOULD be supported.

5.3. SEcure Neighbor Discovery (SEND) - RFC 3971

SEND [RFC3971] and Cryptographically Generated Address (CGA) [RFC3972] provide a way to secure the message exchanges of Neighbor Discovery. SEND is a new technology, in that it has no IPv4 counterpart but it has significant potential to address certain classes of spoofing attacks. While there have been some implementations of SEND, there has been only limited deployment experience to date in using the technology. In addition, the IETF working group Cga & Send maIntenance (csi) is currently working on additional extensions intended to make SEND more attractive for deployment.

At this time, SEND is considered optional and IPv6 nodes MAY provide

SEND functionality.

5.4. IPv6 Router Advertisement Flags Option - RFC 5175

Router Advertisements include an 8-bit field of single-bit Router Advertisement flags. The Router Advertisement Flags Option extends the number of available flag bits by 48 bits. At the time of this writing, 6 of the original 8 bit flags have been assigned, while 2 remain available for future assignment. No flags have been defined that make use of the new option, and thus strictly speaking, there is no requirement to implement the option today. However, implementations that are able to pass unrecognized options to a higher level entity that may be able to understand them (e.g., a user-level process using a "raw socket" facility), MAY take steps to handle the option in anticipation of a future usage.

5.5. Path MTU Discovery and Packet Size

5.5.1. Path MTU Discovery - RFC 1981

From [RFC2460]:

> It is strongly recommended that IPv6 nodes implement Path MTU Discovery [RFC1981], in order to discover and take advantage of path MTUs greater than 1280 octets. However, a minimal IPv6 implementation (e.g., in a boot ROM) may simply restrict itself to sending packets no larger than 1280 octets, and omit implementation of Path MTU Discovery.

The rules in [RFC2460] and [RFC5722] MUST be followed for packet fragmentation and reassembly.

5.6. IPv6 Jumbograms - RFC 2675

IPv6 Jumbograms [RFC2675] MAY be supported.

5.7. ICMP for the Internet Protocol Version 6 (IPv6) - RFC 4443

ICMPv6 [RFC4443] MUST be supported. "Extended ICMP to Support Multi-Part Messages" [RFC4884] MAY be supported.

5.8. Addressing

5.8.1. IP Version 6 Addressing Architecture - RFC 4291

The IPv6 Addressing Architecture [RFC4291] MUST be supported.

5.8.2. IPv6 Stateless Address Autoconfiguration - RFC 4862

Hosts MUST support IPv6 Stateless Address Autoconfiguration as defined in [RFC4862]. Static address may be supported as well.

Nodes that are routers MUST be able to generate link local addresses as described in RFC 4862 [RFC4862].

From 4862:

> The autoconfiguration process specified in this document applies only to hosts and not routers. Since host autoconfiguration uses information advertised by routers, routers will need to be configured by some other means. However, it is expected that routers will generate link-local addresses using the mechanism described in this document. In addition, routers are expected to successfully pass the Duplicate Address Detection procedure described in this document on all addresses prior to assigning them to an interface.

All nodes MUST implement Duplicate Address Detection. Quoting from Section 5.4 of RFC 4862:

> Duplicate Address Detection MUST be performed on all unicast addresses prior to assigning them to an interface, regardless of whether they are obtained through stateless autoconfiguration, DHCPv6, or manual configuration, with the following [exceptions noted therein].

5.8.3. Privacy Extensions for Address Configuration in IPv6 - RFC 4941

Privacy Extensions for Stateless Address Autoconfiguration [RFC4941] addresses a specific problem involving a client device whose user is concerned about its activity or location being tracked. The problem arises both for a static client and for one that regularly changes its point of attachment to the Internet. When using Stateless Address Autoconfiguration [RFC4862], the Interface Identifier portion of formed addresses stays constant and is globally unique. Thus, although a node's global IPv6 address will change if it changes its point of attachment, the Interface Identifier portion of those addresses remain the same, making it possible for servers to track the location of an individual device as it moves around, or its pattern of activity if it remains in one place. This may raise privacy concerns as described in [RFC4862].

In such situations, RFC4941 SHOULD be implemented. In other cases, such as with dedicated servers in a data center, RFC4941 provides limited or no benefit.

5.8.4. Default Address Selection for IPv6 - RFC 3484

The rules specified in the Default Address Selection for IPv6 [RFC3484] document MUST be implemented. IPv6 nodes will need to deal with multiple addresses configured simultaneously.

5.8.5. Stateful Address Autoconfiguration

DHCP can be used to obtain and configure addresses. In general, a network may provide for the configuration of addresses through Router Advertisements, DHCP or both. At the present time, the configuration of stateless address autoconfiguraiton is more widely implemented in hosts than address configuration through DHCP. However, some environments may require the use of DHCP and may not support the configuration of addresses via RAs. Implementations should be aware of what operating environment their devices will be deployed. Hosts MAY implement address configuration via DHCP.

In the absence of a router, IPv6 nodes using DHCP for address assignment MAY initiate DHCP to obtain IPv6 addresses and other configuration information, as described in Section 5.5.2 of [RFC4862].

5.9. Multicast Listener Discovery (MLD) for IPv6 - RFC 2710

Nodes that need to join multicast groups MUST support MLDv1 [RFC2710]. MLDv1 is needed by any node that is expected to receive and process multicast traffic. Note that Neighbor Discovery (as used on most link types -- see Section 5.2) depends on multicast and requires that nodes join Solicited Node multicast addresses.

Nodes that need to join multicast groups SHOULD also implement MLDv2 [RFC3810]. Specifically, if the node has applications that need support for Source-Specific Multicast [RFC3569], the node MUST support MLDv2 as defined in [RFC3810], [RFC4604] and [RFC4607]. If the node only supports applications that use Any-Source Multicast (i.e, they do not use source-specific multicast), implementing MLDv1 [RFC2710] is sufficient. In all cases, nodes are strongly encouraged to implement MLDv2 rather than MLDv1, as the presence of a single MLDv1 participant on a link requires that all other nodes on the link operate in version 1 compatibility mode.

When MLDv1 is used, the rules in the Source Address Selection for the Multicast Listener Discovery (MLD) Protocol [RFC3590] MUST be followed.

6. DHCP vs. Router Advertisement Options for Host Configuration

In IPv6, there are two main protocol mechanisms for propagating configuration information to hosts: Router Advertisements and DHCP. Historically, RA options have been restricted to those deemed essential for basic network functioning and for which all nodes are configured with exactly the same information. Examples include the Prefix Information Options, the MTU option, etc. On the other hand, DHCP has generally been preferred for configuration of more general parameters and for parameters that may be client-specific. That said, identifying the exact line on whether a particular option should be configured via DHCP vs. an RA option has not always been easy. Generally speaking, however, there has been a desire to define only one mechanism for configuring a given option, rather than defining multiple (different) ways of configuring the same information.

One issue with having multiple ways of configuring the same information is that if a host chooses one mechanism, but the network operator chooses a different mechanism, interoperability suffers. For "closed" environments, where the network operator has significant influence over what devices connect to the network and thus what configuration mechanisms they support, the operator may be able to ensure that a particular mechanism is supported by all connected hosts. In more open environments, however, where arbitrary devices may connect (e.g., a WIFI hotspot), problems can arise. To maximize interoperability in such environments hosts may need to implement multiple configuration mechanisms to ensure interoperability.

Originally in IPv6, configuring information about DNS servers was performed exclusively via DHCP. In 2007, an RA option was defined, but was published as Experimental [RFC5006]. In 2010, "IPv6 Router Advertisement Options for DNS Configuration" [RFC6106] was published as a Standards Track Document. Consequently, DNS configuration information can now be learned either through DHCP or through RAs. Hosts will need to decide which mechanism (or whether both) should be implemented.

7. DNS and DHCP

7.1. DNS

DNS is described in [RFC1034], [RFC1035], [RFC3363], and [RFC3596]. Not all nodes will need to resolve names; those that will never need to resolve DNS names do not need to implement resolver functionality. However, the ability to resolve names is a basic infrastructure capability that applications rely on and most nodes will need to

provide support. All nodes SHOULD implement stub-resolver [RFC1034] functionality, as in RFC 1034, Section 5.3.1, with support for:

- AAAA type Resource Records [RFC3596];
- reverse addressing in ip6.arpa using PTR records [RFC3596];
- EDNS0 [RFC2671] to allow for DNS packet sizes larger than 512 octets.

Those nodes are RECOMMENDED to support DNS security extensions [RFC4033], [RFC4034], and [RFC4035].

Those nodes are NOT RECOMMENDED to support the experimental A6 Resource Records [RFC3363].

7.2. Dynamic Host Configuration Protocol for IPv6 (DHCPv6) - RFC 3315

7.2.1. Other Configuration Information

IPv6 nodes use DHCP [RFC3315] to obtain address configuration information (See Section 5.8.5) and to obtain additional (non-address) configuration. If a host implementation supports applications or other protocols that require configuration that is only available via DHCP, hosts SHOULD implement DHCP. For specialized devices on which no such configuration need is present, DHCP may not be necessary.

An IPv6 node can use the subset of DHCP (described in [RFC3736]) to obtain other configuration information.

7.2.2. Use of Router Advertisements in Managed Environments

Nodes using the Dynamic Host Configuration Protocol for IPv6 (DHCPv6) are expected to determine their default router information and on-link prefix information from received Router Advertisements.

7.3. IPv6 Router Advertisement Options for DNS Configuration - RFC 6106

Router Advertisements have historically limited options to those that are critical to basic IPv6 functioning. Originally, DNS configuration was not included as an RA option and DHCP was the recommended way to obtain DNS configuration information. Over time, the thinking surrounding such an option has evolved. It is now generally recognized that few nodes can function adequately without having access to a working DNS resolver. RFC 5006 was published as an experimental document in 2007, and recently, a revised version was placed on the Standards Track [RFC6106].

Implementations SHOULD implement the DNS RA option [RFC6106].

8. IPv4 Support and Transition

IPv6 nodes MAY support IPv4.

8.1. Transition Mechanisms

8.1.1. Basic Transition Mechanisms for IPv6 Hosts and Routers - RFC 4213

If an IPv6 node implements dual stack and tunneling, then [RFC4213] MUST be supported.

9. Application Support

9.1. Textual Representation of IPv6 Addresses - RFC 5952

Software that allows users and operators to input IPv6 addresses in text form SHOULD suppport "A Recommendation for IPv6 Address Text Representation" [RFC5952].

10. Mobility

Mobile IPv6 [RFC3775] and associated specifications [RFC3776] [RFC4877] allow a node to change its point of attachment within the Internet, while maintaining (and using) a permanent address. All communication using the permanent address continues to proceed as expected even as the node moves around. The definition of Mobile IP includes requirements for the following types of nodes:

- mobile nodes
- correspondent nodes with support for route optimization
- home agents
- all IPv6 routers

At the present time, Mobile IP has seen only limited implementation and no significant deployment, partly because it originally assumed an IPv6-only environment, rather than a mixed IPv4/IPv6 Internet. Recently, additional work has been done to support mobility in mixed-mode IPv4 and IPv6 networks[RFC5555].

More usage and deployment experience is needed with mobility before any one can be recommended for broad implementation in all hosts and routers. Consequently, [RFC3775], [RFC5555], and associated standards such as [RFC4877] are considered a MAY at this time.

11. Security

This section describes the specification for security for IPv6 nodes.

Achieving security in practice is a complex undertaking. Operational procedures, protocols, key distribution mechanisms, certificate management approaches, etc. are all components that impact the level of security actually achieved in practice. More importantly, deficiencies or a poor fit in any one individual component can significantly reduce the overall effectiveness of a particular security approach.

IPsec provides channel security at the Internet layer, making it possible to provide secure communication for all (or a subset of) communication flows at the IP layer between pairs of internet nodes. IPsec provides sufficient flexibility and granularity that individual TCP connections can (selectively) be protected, etc.

Although IPsec can be used with manual keying in some cases, such usage has limited applicability and is not recommended.

A range of security technologies and approaches proliferate today (e.g., IPsec, TLS, SSH, etc.) No one approach has emerged as an ideal technology for all needs and environments. Moreover, IPsec is not viewed as the ideal security technology in all cases and is unlikely to displace the others.

Previously, IPv6 mandated implementation of IPsec and recommended the key management approach of IKE. This document updates that recommendation by making support of the IP Security Architecture [RFC 4301] a SHOULD for all IPv6 nodes. Note that the IPsec Architecture requires (e.g., Sec. 4.5 of RFC 4301) the implementation of both manual and automatic key management. Currently the default automated key management protocol to implement is IKEv2 [RFC5996].

This document recognizes that there exists a range of device types and environments where other approaches to security than IPsec can be justified. For example, special-purpose devices may support only a very limited number or type of applications and an application-specific security approach may be sufficient for limited management or configuration capabilities. Alternatively, some devices my run on extremely constrained hardware (e.g., sensors) where the full IP Security Architecture is not justified.

11.1. Requirements

"Security Architecture for the Internet Protocol" [RFC4301] SHOULD be supported by all IPv6 nodes. Note that the IPsec Architecture

requires (e.g., Sec. 4.5 of RFC 4301) the implementation of both manual and automatic key management. Currently the default automated key management protocol to implement is IKEv2. As required in [RFC4301], IPv6 nodes implementing the IPsec Architecture MUST implement ESP [RFC4303] and MAY implement AH [RFC4302].

11.2. Transforms and Algorithms

The current set of mandatory-to-implement algorithms for the IP Security Architecture are defined in 'Cryptographic Algorithm Implementation Requirements For ESP and AH' [RFC4835]. IPv6 nodes implementing the IP Security Architecture MUST conform to the requirements in [RFC4835]. Preferred cryptographic algorithms often change more frequently than security protocols. Therefore implementations MUST allow for migration to new algorithms, as RFC4835 is replaced or updated in the future.

The current set of mandatory-to-implement algorithms for IKEv2 are defined in 'Cryptographic Algorithms for Use in the Internet Key Exchange Version 2 (IKEv2)' [RFC4307]. IPv6 nodes implementing IKEv2 MUST conform to the requirements in [RFC4307] and/or any future updates or replacements to [RFC4307].

12. Router-Specific Functionality

This section defines general host considerations for IPv6 nodes that act as routers. Currently, this section does not discuss routing-specific requirements.

12.1. General

12.1.1. IPv6 Router Alert Option - RFC 2711

The IPv6 Router Alert Option [RFC2711] is an optional IPv6 Hop-by-Hop Header that is used in conjunction with some protocols (e.g., RSVP [RFC2205] or MLD [RFC2710]). The Router Alert option will need to be implemented whenever protocols that mandate its usage (e.g., MLD) are implemented. See Section 5.9.

12.1.2. Neighbor Discovery for IPv6 - RFC 4861

Sending Router Advertisements and processing Router Solicitation MUST be supported.

Section 7 of RFC 3775 includes some mobility-specific extensions to Neighbor Discovery. Routers SHOULD implement Sections 7.3 and 7.5, even if they do not implement Home Agent functionality.

13. Network Management

Network Management MAY be supported by IPv6 nodes. However, for IPv6 nodes that are embedded devices, network management may be the only possible way of controlling these nodes.

13.1. Management Information Base Modules (MIBs)

The following two MIBs SHOULD be supported by nodes that support an SNMP agent.

13.1.1. IP Forwarding Table MIB

IP Forwarding Table MIB [RFC4292] SHOULD be supported by nodes that support an SNMP agent.

13.1.2. Management Information Base for the Internet Protocol (IP)

IP MIB [RFC4293] SHOULD be supported by nodes that support an SNMP agent.

14. Security Considerations

This document does not directly affect the security of the Internet, beyond the security considerations associated with the individual protocols.

Security is also discussed in Section 10 above.

15. IANA Considerations

This document has no requests for IANA.

16. Authors and Acknowledgments

16.1. Authors and Acknowledgments (Current Document)

To be filled out.

16.2. Authors and Acknowledgments From RFC 4279

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17. Appendix: Changes from -06 to -07

1. Added recommendation that routers implement Section 7.3 and 7.5 of RFC 3775.
2. "IPv6 Router Advertisement Options for DNS Configuration" (RFC 6106) has been published.
3. Further clarifications to the MLD recommendation.
4. "Extended ICMP to Support Multi- Part Messages" [RFC4884] added as a MAY.
5. Added pointer to subnet clarification document (RFC 5942).
6. Added text that "IPv6 Host-to-Router Load Sharing" [RFC4311] SHOULD be implemented

7. Added reference to RFC5722 (Overlapping Fragments), made it a MUST to implement.

18. Appendix: Changes from -05 to -06

1. Completely revised IPsec/IKEv2 section. Text has been discussed by 6man and saag.

2. Added text to introduction clarifying that this document applies to general nodes and that other profiles may be more specific in their requirements

3. Editorial cleanups in Neighbor Discovery section in particular. Text made more crisp.

4. Moved some of the DHCP text around. Moved stateful address discussion to Section 5.8.5.

5. Added additional nuance to the redirect requirements w.r.t. default configuration setting.

19. Appendix: Changes from -04 to -05

1. Cleaned up IPsec section, but key questions (MUST vs. SHOULD) still open.

2. Added background section on DHCP vs. RA options.

3. Added SHOULD recommendation for DNS configuration vi RAs (RFC5006bis).

4. Cleaned up DHCP section, as it was referring to the M&O bits.

5. Cleaned up the Security Considerations Section.

20. Appendix: Changes from -03 to -04

1. Updated the Introduction to indicate document is an applicability statement

2. Updated the section on Mobility protocols

3. Changed Sub-IP Layer Section to just list relevant RFCs, and added some more RFCs.

4. Added Section on SEND (make it a MAY)

5. Redid Section on Privacy Extensions (RFC4941) to add more nuance to recommendation

6. Redid section on Mobility, and added additional RFCs [

21. Appendix: Changes from RFC 4294

This appendix keeps track of the chances from RFC 4294

1. Section 5.1, removed "and DNAME" from the discussion about RFC-3363.

2. RFC 2463 references updated to RFC 4443.

3. RFC 3513 references updated to RFC 4291.

4. RFC 3152 references updated to RFC 3596.

5. RFC 2893 references updated to RFC 4213.

6. AH [RFC4302] support chanced from MUST to MAY.

7. The reference for RFC 3152 has been deleted, as the RFC has been obsoleted, and has been incorporated into RFC 3596.

8. The reference for RFC 3879 has been removed as the material from RFC 3879 has been incorporated into RFC 4291.

22. References

22.1. Normative References

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