IPv6 to Internet Standard

Bob Hinden

IETF95 Buenos Aires

Background

- Goal is to move the core IPv6 RFCs to Internet Standard

- Internet Standard is defined in RFC 2026 as
  - An Internet Standard is characterized by a high degree of technical maturity and by a generally held belief that the specified protocol or service provides significant benefit to the Internet community.

RFC6410 Defines Advancement Process

- There are at least two independent interoperating implementations with widespread deployment and successful operational experience.
  - (1) There are no errata against the specification that would cause a new implementation to fail to interoperate with deployed ones.
  - (2) There are no unused features in the specification that greatly increase implementation complexity.
  - (3) If the technology required to implement the specification requires patented or otherwise controlled technology, then the set of implementations must demonstrate at least two independent, separate and successful uses of the licensing process
  - (4) If the technology required to implement the specification requires patented or otherwise controlled technology, then the set of implementations must demonstrate at least two independent, separate and successful uses of the licensing process.

Advancing Draft Standards

- Any protocol or service that is currently at the abandoned Draft Standard maturity level will retain that classification, absent explicit actions. Two possible actions are available:

  (1) A Draft Standard may be reclassified as an Internet Standard as soon as the criteria in Section 2.2 are satisfied.

  (2) At any time after two years from the approval of this document as a BCP, the IESG may choose to reclassify any Draft Standard document as Proposed Standard.

Updating RFCs

- RFC6410 doesn't mention Updating RFCs
- Current advice from the ADs is that updating RFCs need to be incorporated
- Will have to show that updates have been implemented and meet RFC6410 criteria
- If no implementation experience, we can not include in bis version

Plan Presented at IETF93

- Re-classify to Internet Standard draft standard documents that require no changes. (IESG action)
- Start work on those that require updates. Restricted to errata and updates that meet the criteria for Internet standard.
- Phase 2 (Proposed standards documents)

Documents being Updated

- RFC2460 – Internet Protocol, Version 6 (IPv6) Specification
  - <draft-ietf-6man-rfc2460bis-04>
- RFC4291 – IP Version 6 Addressing Architecture
  - <draft-ietf-6man-rfc4291bis-01>
- RFC1981 - Path MTU Discovery for IP version 6
  - <draft-ietf-6man-rfc1981bis-01>

Documents Ready to Advance

- RFC3596 – DNS Extensions to Support IP Version 6
- RFC4941 – Privacy Extensions for Stateless Address Autoconfiguration in IPv6
- RFC4443 – Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification

Changes to rfc2460bis since IETF94

- 02) Added text to Fragment Header process on handling exact duplicate fragments

  It should be noted that fragments may be duplicated in the network. These exact duplicate fragments will be treated as overlapping fragments and handled as described in the previous paragraph. An implementation may choose to detect this case and not drop the other fragments of the same packet.

Changes to rfc2460bis since IETF94

- 02) Added text to Section 4.8 "Defining New Extension Headers and Options" clarifying why no new hop by hop extension headers should be defined.

  No new extension headers that require hop-by-hop behavior should be defined **because as specified in Section 4 of this document, the only Extension Header that has hop-by-hop behavior is the Hop-by-Hop Options header**..

Changes to rfc2460bis since IETF94

- 03) Clarified the text about decrementing the hop limit.

  Decremented by 1 by each node that forwards the packet. **When forwarding, the packet is discarded if Hop Limit was zero when received or is decremented to zero. A node that is the destination of a packet should not discard a packet with hop limit equal to zero, it should process the packet normally.**

- 03) Removed “IP Next Generation” from the abstract.
- 03) Add reference to the end of Section 4 to IPv6 Extension Header IANA registry

Changes to rfc2460bis since IETF94

- 04) Changed text discussing Fragment ID selection to refer to RFC7739 for example algorithms.

  * "recently" means within the maximum likely lifetime of a packet, including transit time from source to destination and time spent awaiting reassembly with other fragments of the same packet. However, it is not required that a source node know the maximum packet lifetime. Rather, it is assumed that the requirement can be **met by implementing an algorithm that results in a low identification reuse frequency. Examples of algorithms that can meet this requirement are described in [RFC7739].**

rfc2460bis issue raised on mailing list

- Clarification on inserting, deleting, and changing Extension Headers

  Extension headers must never be inserted by any node other than the source of the packet. IP Encapsulation must be used to meet any requirement for inserting headers, for example, as defined in [RFC2473].

  Extension headers must never be deleted or changed in size by any node on the path the packet takes.

  The contents of an Extension header or Option in an Extension header may be modified if this is permitted by the definition of the Extension header or option.

Changes to rfc4291bis since IETF94

- 01) Revised Section 2.4.1 on Interface Identifiers to reflect current approach, this included saying Modified EUI-64 identifiers not recommended and moved the text describing the format to Appendix A.

  The details of forming interface identifiers are defined in other specifications, such as "Privacy Extensions for Stateless Address Autoconfiguration in IPv6" [RFC4941] and "Recommendation on Stable IPv6 Interface Identifiers" [I-D.ietf-6man-default-iids]. Specific cases are described in appropriate "IPv6 over <link>" specifications, such as "IPv6 over Ethernet" [RFC2464] and "Transmission of IPv6 Packets over ITU-T G.9959 Networks" [RFC7428].

  Earlier versions of this document described a method of forming interface identifiers derived from IEEE MAC-layer addresses call Modified EUI-64 format. These are described in Appendix A and are no longer recommended.

RFC7371 Update to rfc4291bis

- Update was to change the flag bits and their definitions in Section 2.6
- Doesn’t appear to be any implementation experience and some issues have been identified
- Recommend removing this update

RFC1981bis

- WG Draft
  - 01) Revised the text about PLPMTUD to use the word "path".
  - 00) Added text to discard an ICMP Packet Too Big message containing an MTU less than the IPv6 minimum link MTU.
  - 00) Revision of text regarding RFC4821.
  - 00) Added R. Hinden as Editor to facilitate ID submission.
- Individual Internet Draft
  - 01) Remove Note about a Packet Too Big message reporting a next-hop MTU that is less than the IPv6 minimum link MTU. This was removed from [I-D.ietf-6man-rfc2460bis].
  - 01) Include a link to RFC4821 along with a short summary of what it does.
  - 00) Establish a baseline from RFC1981.

RFC1981bis

1. Introduction

An extension to Path MTU Discovery defined in this document can be found in [RFC4821]. It defines a method for Packetization Layer Path MTU Discovery (PLPMTUD) designed for use over paths where delivery of ICMP messages to a host is not assured. In this algorithm, the proper MTU is determined by starting with small packets and probing with successively larger packets. The bulk of the algorithm is implemented above IP, in the transport layer (e.g., TCP) or other "Packetization Protocol" that is responsible for determining packet boundaries.

4. Protocol Requirements

If a node receives a Packet Too Big message reporting a next-hop MTU that is less than the IPv6 minimum link MTU, it should discard it.

Next Steps

- Plan sent to IPv6 list
  - http://mailarchive.ietf.org/arch/msg/ipv6/2OLUuUpuGfv3N6e0oHSuAL-djOU
- Working group last calls for Internet Standard
  - RFC2460bis, RFC4291bis, RFC1981bis
  - Request reviewers for the set
- Request IESG to advance to Internet Standard
  - RFC3596, RFC4941, RFC4443
  - Draft letter to IESG in email link

Open Issues

- Make sure any open 6MAN documents are updated to reference rfc2460bis, rfc4291bis, and/or rfc1981bis

- Any other documents to be Obsoleted or made Historic?

- When should we update RFC6434 IPv6 Node Requirements?

QUESTIONS / COMMENTS?