

Na cestě za standardem

Matěj Grégr

Vysoké učení technické v Brně

igregr@fit.vutbr.cz

RFC = standard?

- Původně využíváno RFC 2026
 - Proposed Standard → Draft Standard → Internet Standard
- Zjednodušeno v RFC 6410
 - Proposed Standard → Internet Standard
- Řada dalších “RFC standardů”
 - Experimental
 - Informational
 - Best Current Practice (BCP)

Jaké jsou požadavky na standard?

- Dvě nezávislé interoperující implementace, široce rozšířené, zkušenost s provozem
- Žádná Errata, která by způsobila, že nová implementace by byla nekompatibilní
- Žádné nepoužívané funkce, které zvyšují komplexitu implementace
- Pokud je vyžadovaná patentovaná technologie, musí proběhnout alespoň dva úspěšné licenční procesy

Draft Standard dokumenty

- RFC2460 – Internet Protocol, Version 6 (IPv6) Specification
- RFC4291 – IP Version 6 Addressing Architecture
- RFC4443 – Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification
- RFC3596 – DNS Extensions to Support IP Version 6
- RFC1981 – Path MTU Discovery for IP version 6
- RFC4861 – Neighbor Discovery for IP version 6 (IPv6)
- RFC4862 – IPv6 Stateless Address Autoconfiguration
- RFC4941 – Privacy Extensions for Stateless Address Autoconfiguration in IPv6

Draft Standard dokumenty

- RFC2460 – Internet Protocol, Version 6 (IPv6) Specification
- RFC4291 – IP Version 6 Addressing Architecture
- ✓ RFC4443 – Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification
- RFC3596 – DNS Extensions to Support IP Version 6
- RFC1981 – Path MTU Discovery for IP version 6
- RFC4861 – Neighbor Discovery for IP version 6 (IPv6)
- RFC4862 – IPv6 Stateless Address Autoconfiguration
- RFC4941 – Privacy Extensions for Stateless Address Autoconfiguration in IPv6

Draft Standard dokumenty

- RFC2460 – Internet Protocol, Version 6 (IPv6) Specification
- RFC4291 – IP Version 6 Addressing Architecture
- ✓ RFC4443 – Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification
- ✓ RFC3596 – DNS Extensions to Support IP Version 6
- RFC1981 – Path MTU Discovery for IP version 6
- RFC4861 – Neighbor Discovery for IP version 6 (IPv6)
- RFC4862 – IPv6 Stateless Address Autoconfiguration
- RFC4941 – Privacy Extensions for Stateless Address Autoconfiguration in IPv6

Draft Standard dokumenty

- RFC2460 – Internet Protocol, Version 6 (IPv6) Specification
- RFC4291 – IP Version 6 Addressing Architecture
- ✓ RFC4443 – Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification
- ✓ RFC3596 – DNS Extensions to Support IP Version 6
- ✓ RFC1981 – Path MTU Discovery for IP version 6
- RFC4861 – Neighbor Discovery for IP version 6 (IPv6)
- RFC4862 – IPv6 Stateless Address Autoconfiguration
- RFC4941 – Privacy Extensions for Stateless Address Autoconfiguration in IPv6

RFC 2460: IPv6 Specification

- Updated by:
 - Deprecation of Type 0 Routing Headers in IPv6
 - Handling of Overlapping IPv6 Fragment (1 errata)
 - IANA considerations for routing types
 - Flow label specification
 - Uniform IPv6 extension header format
 - UDP checksum for tunneled packets (1 errata)
 - Processing of atomic fragments
 - Transmission and processing of IPv6 extension headers
 - Implications of oversized IPv6 header chains
- 2x Errata

RFC 2460-bis

- Největší spory:
 - RFC 2119 (MUST, SHOULD ...)
 - Extension headers

With one exception, extension headers are not examined or processed by any node along a packet's delivery path

- Nyní:

Extension headers (except for the Hop-by-Hop Options header) are not processed, inserted, or deleted by any node along a packet's delivery path

- Současný stav z května:

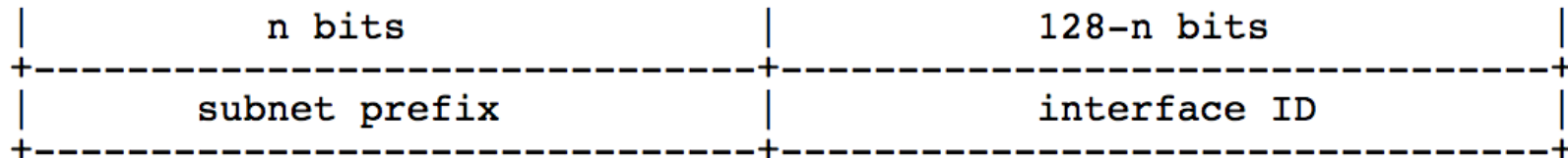
The IESG has approved the following document: - 'Internet Protocol, Version 6 (IPv6) Specification' (draft-ietf-6man-rfc2460bis-13.txt) as Internet Standard

RFC4291: IPv6 Addressing Architecture

- Updated by:
 - IPv6 address text representation (1)
 - IPv6 addressing of IPv4/IPv6 translators
 - Significance of IPv6 Interface Identifiers
 - IPv6 multicast address scopes
 - Updates to the IPv6 multicast addressing architectures
- 2x Errata

RFC 4291bis

- Hlavní spor:



- Interface IDs are required to be 64 bits long and to be constructed in Modified EUI-64 format.

RFC 4291bis

- RFC 7934: Host Address Availability Recommendations
- RFC 7421: Analysis of the 64-bit Boundary in IPv6 Addressing
- draft: IPv6 is Classless
 - (~100 emailů za 48 hodin)

- Konsensus bude těžký

Document history

Date	Rev.	By	Action
2017-05-02	07	Gunter Van de Velde	Request for Last Call review by OPSDIR Completed: Has Nits. Reviewer: Menachem Dodge.
2017-04-27	07	Ole Troan	No consensus found in IETF last call.
2017-04-27	07	Ole Troan	IETF WG state changed to Parked WG Document from WG Document

RFC4861: Neighbor Discovery

- Updated by:
 - IPv6 subnet model, links and subnet prefixes
 - Security issues with ipv6 fragmentation and ipv6 ND
 - NUD is too impatient
 - Enhanced duplicate address detection
 - Packet loss resiliency for router solicitations
- 7x errata

RFC4861: Neighbor Discovery

- Standardizace ještě nebyla zahájena
- Lze očekávat spory:
 - Délka prefixu
 - onlink / offlink
 - Prefix Information Option
- draft: Clarifications on On-link and Subnet IPv6 Prefixes
- RFC 5942: IPv6 Subnet Model: The Relationship between Links and Subnet Prefixes

RFC 4862: SLAAC

- Updated by:
 - Enhanced duplicate address detection
- 1x errata

- Standardizace ještě nezačala
- Lze očekávat standardní spory
 - SLAAC, DHCP
 - Co znamená Managed/Other flag a jak reagovat
 - ...

Draft Standard dokumenty

- ✓ RFC2460 – Internet Protocol, Version 6 (IPv6) Specification
- RFC4291 – IP Version 6 Addressing Architecture
- ✓ RFC4443 – Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification
- ✓ RFC3596 – DNS Extensions to Support IP Version 6
- ✓ RFC1981 – Path MTU Discovery for IP version 6
- RFC4861 – Neighbor Discovery for IP version 6 (IPv6)
- RFC4862 – IPv6 Stateless Address Autoconfiguration
- RFC4941 – Privacy Extensions for Stateless Address Autoconfiguration in IPv6

Další fáze – IPv6 over foo

- RFC2464 – Transmission of IPv6 Packets over Ethernet Networks
- RFC2467 – Transmission of IPv6 Packets over FDDI Networks
- RFC2470 – Transmission of IPv6 Packets over Token Ring Networks
- RFC2473 – Generic Packet Tunneling in IPv6 Specification
- RFC2491 – IPv6 over Non-Broadcast Multiple Access (NBMA) networks
- RFC2492 – IPv6 over ATM Networks
- RFC2497 – Transmission of IPv6 Packets over ARCnet Networks
- RFC2590 – Transmission of IPv6 Packets over Frame Relay Networks Specification
- RFC3146 – Transmission of IPv6 Packets over IEEE 1394 Networks
- RFC4338 – Transmission of IPv6, IPv4 and Address Resolution Protocol (ARP) Packets over Fibre Channel
- RFC4944 – Transmission of IPv6 Packets over IEEE 802.15.4 Networks
- RFC5121 – Transmission of IPv6 via the IPv6 Convergence Sublayer over IEEE 802.16 Networks
- RFC7428 – Transmission of IPv6 Packets over ITU-T G.9959 Networks

Závěr

- Proces standardizace probíhá a dlouho probíhat bude
 - Problematický dokument typický kolem 2 let
- Lze očekávat další diskuze na téma SLAAC, DHCP ...
- Časem se (možná) dočkáme celkové standardizace IPv6 a hlavních protokolů (NDP)