IPv6 Support Within IETF work
draft-george-ipv6-support-01

Abstract

   This document recommends that IETF formally require its standards
   work to be IP version agnostic or to explicitly include support for
   IPv6, with some exceptions. It recommends that future IPv4 work be
   limited to solving documented operational problems identified through
   deployment experience.

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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   Task Force (IETF). Note that other groups may also distribute
   working documents as Internet-Drafts. The list of current Internet-
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   and may be updated, replaced, or obsoleted by other documents at any
   time. It is inappropriate to use Internet-Drafts as reference
   material or to cite them other than as "work in progress."

   This Internet-Draft will expire on August 24, 2012.

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1. Introduction

   [I-D.ietf-intarea-ipv6-required] gives guidance to implementers that
   in order to ensure interoperability and proper function after IPv4
   exhaustion, IP-capable devices need to support IPv6, because global
   IPv4 exhaustion creates many circumstances where the use of IPv6 will
   no longer be optional.

   In the above draft, IETF is making the recommendation that IP-capable
   devices need to support IPv6. Therefore, it is imperative that the
   results of IETF efforts enable implementers to follow that
   recommendation. This document provides explicit recommendations and
   guidance as to how IETF itself should handle future work as it
   relates to Internet Protocol versions.

1.1. 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. Requirements and Recommendation

   When considering support for IPv4 vs IPv6 within IETF work, the
   general goal is to provide tools that enable networks and
   applications to operate seamlessly in any combination of IPv4-only,
   dual-stack, or IPv6-only as their needs dictate.

   As IPv6 deployment grows, IETF will naturally focus on features and
   protocols that enhance and extend IPv6, along with continuing work on
   items that are IP version agnostic. New features and protocols will
   not typically be introduced for use as IPv4-only. However, as of
   this document's writing, there is no documented requirement for all
   IETF work to support IPv6, either implicitly by being network-layer
   agnostic or explicitly by having an IPv6-specific implementation.

   Due to the existing operational base of IPv4, it is not realistic to
   completely bar further work on IPv4 within the IETF at this time, nor
   to formally declare it historic. This draft is viewed as a first
   step in IPv4's eventual phase-out, in that it limits IPv4-specific
   activities within the IETF to a few key areas. Until the time when
   IPv4 is no longer in wide use and/or declared historic, the IETF
   needs to continue to update IPv4-only protocols and features for
   vital operational or security issues. Similarly, IETF needs to
   continue the work related to IPv4-to-IPv6 transition tools for
   migrating more traffic to IPv6. As the transition to IPv6-capable
   networks accelerates, it is also likely that some changes may be

necessary in IPv4 protocols to facilitate decommissioning IPv4 in a
way that does not create unacceptable impact to applications or
users. These sorts of IPv4-focused activities should be allowed to
continue, especially if they are accompanied by real operational
experience documenting the problem to be solved.

Generally, the IETF should be focused on two goals as it relates to
IP version support:

1. Transition technologies that enable IPv6

2. Complete support for IPv6-only operation

It is helpful to clarify what the above statements mean. "Transition
technologies" is a fairly broad term that can be interpreted in a lot
of different ways. At its broadest, it includes providing IPv6
support over an IPv4 network and vice versa, methods to interwork
IPv4-only devices and IPv6-only devices, as well as technologies to
extend IPv4's life despite the lack of additional globally unique
addresses to provide to hosts and networks. This document makes the
distinction between those technologies which provide a path for an
IPv4-only network to become dual-stack or otherwise use native IPv6,
and those which primarily serve to extend the life of IPv4 while not
providing a path to native IPv6 support on the network in question.
The IETF needs to be focusing their work on transition mechanisms
that provide progress toward native IPv6, are simple, stateless, and
use mechanisms which preserve end-to-end connectivity as much as
possible.

While the eventual end state may be networks and end points that are
IPv6-only, the timeframe for that to become a reality is likely to be
different within each network. This means that there are multiple
legitimate use cases for continued support for IPv4, including
methods to translate between IPv4-only hosts and IPv6-only hosts, as
well as methods for IPv4 address sharing in order to reduce the
impact of IPv4 exhaustion on implementations that still use IPv4.
The IETF has provided several soutions that have implementations to
address the need to keep business running and users happy during this
transition, including Dual Stack Lite RFC 6333 [RFC6333], NAT64 RFC
6146 [RFC6146], as well as Carrier Grade NAT
([I-D.ietf-behave-lsn-requirements] and RFC 6264 [RFC6264]). As the
above documents complete the IETF document lifecycle and become RFCs,
and the BEHAVE WG closes after completion of its charter, this should
comprise a body of solutions to meet the needs of the majority of
IPv4's continued use cases such that work on additional protocols to
extend the life of IPv4 no longer needs to be an area of focus for
the IETF.

[**authors' note, remove before publication**]

This document is not intended to be yet another survey of available
transition mechanisms, so the list above does not have to be
exhaustive. The intent was to cite the most likely candidates for
wide deployment as evidence that there exists a consensus solution
for each major case. There are a number of other drafts that could
be included in the above list of solutions, but as draft documents,
they have not yet found consensus. For example, A+P is an
Experimental RFC (6346), and its derivative works such as MAP
(draft-mdt-softwire-mapping-address-and-port) and potentially 4rd-
{E,T,U}, dIVI-PD, stateless 4over6, etc. are current internet-draft
documents. Under the structure proposed in this document, a working
group would need to find consensus on a problem statement, defining a
real operational problem that the proposed solution would solve,
before any proposed solution could be adopted as a WG item.

[end author's note]

It is not possible to document completely which technologies and
drafts are and are not acceptable, so this document is intended to be
a guideline for working groups and IESG members when evaluating new
and existing work, rather than being an exhaustive list. There are
corner cases and use cases for which the existing solutions may not
be a perfect fit, as well as unsolved theoretical problems, but
standardizing solutions for every possible permutation moves into the
realm of diminishing returns, and solutions applicable only to one or
two networks are best pursued between the operator and their vendors.
Thus, further work on IPv4-extension protocols such as those
mentioned MUST be triggered by a draft documenting actual operational
experiences, focusing on problems encountered in deployment that the
IETF needs to solve through protocol changes. This will ensure that
IETF is focusing its energies on solving real operational problems
that exist in IPv4 and transition technologies, rather than
interesting theoretical problems, corner cases or new features.

To put this set of guidelines succinctly:

    IETF SHOULD continue to update IPv4-only protocols and features to
    address vital operational or security issues.

    IETF work SHOULD update existing IPv4 to IPv6 transition and
    interworking technologies as necessary to address operational
    problems encountered during the implementation phase.

    IETF work SHOULD continue to make updates to IPv4 protocols and
    features to facilitate IPv4 decommissioning

    IETF work that is not related to the above exceptions MUST be IP
    version agnostic (because it is implemented above the network
    layer) or MUST explicitly support IPv6.

    IETF SHOULD NOT initiate new IPv4 extension technology
    development.

    IETF work MAY support IPv6-only applications and protocols,
    especially in cases where supporting the protocol or feature in
    IPv4 would be difficult or impossible.

    IETF work SHOULD continue to update IPv4-only protocols and
    applications to support IPv6 as necessary and appropriate.

This last item raises a question about where feature parity between
IPv4 and IPv6 fits into the discussion. In this context, feature
parity ensures that there are no gaps where functionality exists in
IPv4 but has no equivalent in IPv6. Note that this does not mean a
direct 1:1 relationship where every feature that exists in IPv4 will
exist in IPv6. This is because IPv6 eliminates the need for some
features that exist in IPv4, IPv4 supports some legacy features that
are no longer in use, and some existing IPv4 features are integrated
into other parts of IPv6. In addition, as new features and
implementations take advantage of the differences between IPv6 and
IPv4, it is expected that IPv6 will surpass IPv4 and certain features
and protocols will not have specific support for IPv4. A
comprehensive list of needed parity items and enhancements for IPv6
is outside the scope of this document, but this document recommends
that the charters and work items of currently active IETF Working
Groups (WGs) be evaluated to ensure that they are supporting a goal
to eliminate of any remaining places in IETF standards and protocols
where IPv4 is required for complete and proper function, and that
they do not focus on IPv4 extension technologies. This document does
not suggest a timeline where this must be completed, as it will
likely happen organically over a long period of time.

3. Acknowledgements

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Droms, Scott Brim, Margaret Wasserman. Thanks also to Randy Bush,
Mark Townsley, and Dan Wing for their discussion in IntArea WG at
IETF 81 in Taipei, TW regarding transition technologies, IPv4 life
extension, and IPv6 support.

4. IANA Considerations

   This memo includes no request to IANA.

5. Security Considerations

   This document generates no new security considerations because it is
   not defining a new protocol. However, it is important to note that
   the recommendations above to stop work on IPv4-only protocols and
   applications include an exception for fixes to critical security
   issues. The definition of critical in this context will be left to
   the appropriate ADs, but while IPv4 is still in wide use, it is
   expected that these exceptions will occur from time to time.

6. References

6.1. Normative References

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

6.2. Informative References

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              NAT64: Network Address and Protocol Translation from IPv6
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              Exhaustion", RFC 6333, August 2011.

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