         **Deprecating Anycast Prefix for 6to4 Relay Routers**
                 **draft-ietf-v6ops-6to4-to-historic-11.txt**

Abstract

   Experience with the "Connection of IPv6 Domains via IPv4 Clouds
   (6to4)" IPv6 transition mechanism defined in RFC 3056 has shown that
   when used in its anycast mode, the mechanism is unsuitable for
   widespread deployment and use in the Internet.  This document
   therefore requests that RFC 3068, "An Anycast Prefix for 6to4 Relay
   Routers", be made obsolete and moved to historic status.  It also
   obsoletes RFC 6732 "6to4 Provider Managed Tunnels".  It recommends
   that future products should not support 6to4 anycast and that
   existing deployments should be reviewed.  This complements the
   guidelines in RFC 6343.

Status of This Memo

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## 1.  Introduction

The original form of the 6to4 transition mechanism [RFC3056] relies
on unicast addressing.  However, its extension specified in "An
Anycast Prefix for 6to4 Relay Routers" [RFC3068] has been shown to
have severe practical problems when used in the Internet.  This
document requests that RFC 3068 and RFC 6732 be moved to Historic
status as defined in section 4.2.4 of [RFC2026].  It complements the
deployment guidelines in [RFC6343].

6to4 was designed to help transition the Internet from IPv4 to IPv6.
It has been a good mechanism for experimenting with IPv6, but because
of the high failure rates seen with anycast 6to4 [HUSTON], end users
may end up disabling IPv6 on hosts as a result, and in the past some
content providers were reluctant to make content available over IPv6
for this reason.

[RFC6343] analyses the known operational issues in detail and
describes a set of suggestions to improve 6to4 reliability, given the
widespread presence of hosts and customer premises equipment that
support it.  The advice to disable 6to4 by default has been widely
adopted in recent operating systems, and the failure modes have been
widely hidden from users by many browsers adopting the "Happy
Eyeballs" approach [RFC6555].

Nevertheless, a measurable amount of 6to4 traffic is still observed
by IPv6 content providers.  The remaining successful users of anycast
6to4 are likely to be on hosts using the obsolete policy table
[RFC3484], which prefers 6to4 above IPv4, and running without Happy
Eyeballs.  Furthermore, they must have a route to an operational
anycast relay and they must be accessing an IPv6 host that has a
route to an operational return relay.

However, experience shows that operational failures caused by anycast
6to4 have continued, despite the advice in RFC 6343 being available.

## 1.1.  Related Work

IPv6 Rapid Deployment on IPv4 Infrastructures (6rd) [RFC5969]
explicitly builds on the 6to4 mechanism, using a service provider
prefix instead of 2002::/16.  However, the deployment model is based
on service provider support, such that 6rd avoids the problems
observed with anycast 6to4.

The framework for 6to4 Provider Managed Tunnels [RFC6732] is intended
to help a service provider manage 6to4 anycast tunnels.  This
framework only exists because of the problems observed with anycast
6to4.

## 2.  Conventions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT",
"SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and
"OPTIONAL" in this document are to be interpreted as described in RFC
2119 [RFC2119].

The word "deprecate" and its derivatives are used only in their
generic sense of "criticize or express disapproval" and do not have
any specific normative meaning.  A deprecated function might exist in
the Internet for many years to allow backwards compatibility.

## 3.  6to4 operational problems

6to4 is a mechanism designed to allow isolated IPv6 islands to reach
each other using IPv6 over IPv4 automatic tunneling.  To reach the
native IPv6 Internet the mechanism uses relay routers both in the
forward and reverse direction.  The mechanism is supported in many
IPv6 implementations.  With the increased deployment of IPv6, the
mechanism has been shown to have a number of shortcomings.

In the forward direction a 6to4 node will send IPv4 encapsulated IPv6
traffic to a 6to4 relay, that is connected both to the 6to4 cloud and
to native IPv6.  In the reverse direction a 2002::/16 route is

injected into the native IPv6 routing domain to attract traffic from
native IPv6 nodes to a 6to4 relay router.  It is expected that
traffic will use different relays in the forward and reverse
direction.

One model of 6to4 deployment, described in section 5.2 of RFC 3056,
suggests that a 6to4 router should have a set of managed connections
(via BGP connections) to a set of 6to4 relay routers.  While this
makes the forward path more controlled, it does not guarantee a
functional reverse path.  In any case this model has the same
operational burden as manually configured tunnels and has seen no
deployment in the public Internet.

RFC 3068 adds an extension that allows the use of a well known IPv4
anycast address to reach the nearest 6to4 relay in the forward
direction.  However, this anycast mechanism has a number of
operational issues and problems, which are described in detail in
Section 3 of [RFC6343].  This document is intended to deprecate the
anycast mechanism.

Peer-to-peer usage of the 6to4 mechanism exists in the Internet,
likely unknown to many operators.  This usage is harmless to third
parties and is not dependent on the anycast 6to4 mechanism that this
document deprecates.

## 4.  Deprecation

This document formally deprecates the anycast 6to4 transition
mechanism defined in [RFC3068] and the associated anycast IPv4
address 192.88.99.1.  It is no longer considered to be a useful
service of last resort.

The prefix 192.88.99.0/24 MUST NOT be reassigned for other use except
by a future IETF standards action.

The basic unicast 6to4 mechanism defined in [RFC3056] and the
associated 6to4 IPv6 prefix 2002::/16 are not deprecated.  The
default address selection rules specified in [RFC6724] are not
modified.

In the absence of 6to4 anycast, 6to4 Provider Managed Tunnels
[RFC6732] will no longer be necessary, so they are also deprecated by
this document.

Incidental references to 6to4 should be reviewed and possibly removed
from other IETF documents if and when they are updated.  These
documents include RFC3162, RFC3178, RFC3790, RFC4191, RFC4213,

RFC4389, RFC4779, RFC4852, RFC4891, RFC4903, RFC5157, RFC5245,
RFC5375, RFC5971, RFC6071 and RFC6890.

## 5.  Implementation Recommendations

It is NOT RECOMMENDED to include the anycast 6to4 transition
mechanism in new implementations.  If included in any
implementations, the anycast 6to4 mechanism MUST be disabled by
default.

In host implementations, unicast 6to4 MUST also be disabled by
default.  All hosts using 6to4 MUST support the IPv6 address
selection policy described in [RFC6724].

In router implementations, 6to4 MUST be disabled by default.  In
particular, enabling IPv6 forwarding on a device MUST NOT
automatically enable 6to4.

## 6.  Operational Recommendations

This document does not imply a recommendation for the generalized
filtering of traffic or routes for 6to4 or even anycast 6to4.  It
simply recommends against further deployment of the anycast 6to4
mechanism, calls for current 6to4 deployments to evaluate the
efficacy of continued use of the anycast 6to4 mechanism, and makes
recommendations intended to prevent any use of 6to4 from hampering
broader deployment and use of native IPv6 on the Internet as a whole.

Networks SHOULD NOT filter out packets whose source address is
192.88.99.1, because this is normal 6to4 traffic from a 6to4 return
relay somewhere in the Internet.  This includes ensuring that traffic
from a local 6to4 return relay with a source address of 192.88.99.1
is allowed through anti-spoofing filters such as those described in
[RFC2827] and [RFC3704] or through Unicast Reverse-Path-Forwarding
(uRPF) checks [RFC5635].

The guidelines in Section 4 of [RFC6343] remain valid for those who
choose to continue operating Anycast 6to4 despite its deprecation.

Current operators of an anycast 6to4 relay with the IPv4 address
192.88.99.1 SHOULD review the information in [RFC6343] and the
present document, and then consider carefully whether the anycast
relay can be discontinued as traffic diminishes.  Internet service
providers that do not operate an anycast relay but do provide their
customers with a route to 192.88.99.1 SHOULD verify that it does in
fact lead to an operational anycast relay, as discussed in
Section 4.2.1 of [RFC6343].  Furthermore, Internet service providers
and other network providers MUST NOT originate a route to

192.88.99.1, unless they actively operate and monitor an anycast 6to4 relay service as detailed in Section 4.2.1 of [RFC6343].

Operators of a 6to4 return relay responding to the IPv6 prefix 2002::/16 SHOULD review the information in [RFC6343] and the present document, and then consider carefully whether the return relay can be discontinued as traffic diminishes.  To avoid confusion, note that nothing in the design of 6to4 assumes or requires that return packets are handled by the same relay as outbound packets.  As discussed in Section 4.5 of RFC 6343, content providers might choose to continue operating a return relay for the benefit of their own residual 6to4 clients.  Internet service providers SHOULD announce the IPv6 prefix 2002::/16 to their own customers if and only if it leads to a correctly operating return relay as described in RFC 6343.  IPv6-only service providers, including those operating a NAT64 service [RFC6146], are advised that their own customers need a route to such a relay in case a residual 6to4 user served by a different service provider attempts to communicate with them.

Operators of 6to4 Provider Managed Tunnels [RFC6732] SHOULD carefully consider when this service can be discontinued as traffic diminishes.

## 7.  IANA Considerations

The document creating the IANA IPv4 Special-Purpose Address Registry [RFC6890] included the 6to4 relay anycast prefix (192.88.99.0/24) as Table 10.  Instead, IANA is requested to mark the 192.88.99.0/24 prefix originally defined by [RFC3068] as "Deprecated (6to4 Relay Anycast)", pointing to the present document.  Redelegation of this prefix for any usage requires justification via an IETF Standards Action [RFC5226].

## 8.  Security Considerations

There are no new security considerations pertaining to this document. General security issues with tunnels are listed in [RFC6169] and more specifically to 6to4 in [RFC3964] and [RFC6324].

## 9.  Acknowledgements

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