

Network Working Group
Internet-Draft
Expires: September 1, 2010

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February 28, 2010

Unique IPv4-Mapped Addresses
draft-thaler-6man-unique-v4mapped-00.txt

Abstract

This document proposes an IPv6 address format for uniquely identifying IPv4 destinations. Today the IPv4-mapped format, when used with private IPv4 addresses, does not provide this capability.

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1. Introduction

The use of non-global ([\[RFC1918\]](#), [\[RFC3927\]](#)) IPv4 addresses presents some problems for multihomed nodes, when attached to two networks using the same address space. Typically, the impact is that applications can only talk to destinations on one of the two networks. The issue is that the address alone is ambiguous, and typical application APIs do not provide a mechanism to distinguish between them.

In IPv6, non-global addresses were also introduced in the form of link-local addresses [\[RFC4291\]](#) and unique local addresses [\[RFC4193\]](#) (as well as site-local addresses, which were deprecated in [\[RFC3879\]](#)). To resolve the ambiguity, the basic IPv6 APIs were defined (in [\[RFC3493\]](#)) to include a "scope id" field, where the scope id is defined as a machine-local identifier for a set of interfaces.

The IPv6 address architecture [\[RFC4291\]](#) also defines an IPv6 address format known as an IPv4-mapped IPv6 address, for representing the addresses of IPv4 nodes as IPv6 addresses. These addresses were used in the basic IPv6 APIs so that host stacks could let applications use the IPv4 stack under an AF_INET6 socket, by using with addresses in IPv4-mapped format (for more information see [\[RFC4038\]](#)). As such, IPv4-mapped addresses also have a scope id in socket APIs, and in theory this would provide an incentive for applications to use IPv6 APIs even when talking to IPv4-only destinations. However, there are still several problems with using IPv6 APIs to disambiguate between IPv4 destinations.

1. [\[RFC3484\] section 3.3](#) specifies that IPv4-mapped addresses should be treated as having global scope for purposes of address selection. As a result, OS's have used a 0 scope id, as with all global addresses per [\[RFC4007\] section 11.2](#).
2. [\[RFC4007\]](#) specifies a textual address syntax with an '%' character to indicate a scope id. However, this character is not legal in an IPv6 literal within a URI (see [\[RFC3986\] section 3.2.2](#)).

3. Requiring use of a scope id in addition to an address is error prone and confusing to developers and end users. These issues are discussed in more detail in [[RFC3879](#)] and led to the deprecation of site-local addresses.

2. Address Format

Unique local addresses [[RFC4193](#)] replaced the concept of a machine-specific scope id value with a 40-bit shared network-specific identifier that was embedded in the address itself. As a result, addresses became unambiguous and were usable without requiring a

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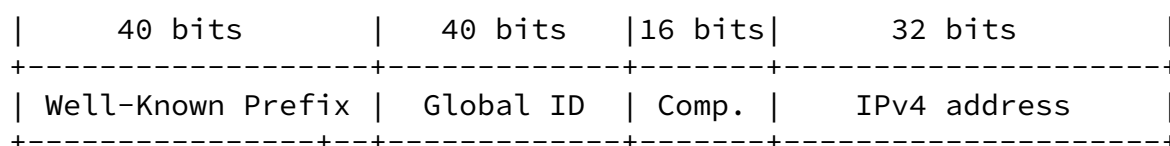
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separate scope id.

We propose applying a similar solution for IPv4-mapped addresses. The proposed format of the "Unique IPv4-mapped IPv6 address" is as follows:



Well-Known Prefix: The proposed prefix is 0:0:FF00::/40. The use of a well-known prefix allows hosts and applications to easily detect this type of address, e.g. to distinguish a native address from one involving translation. (It is for this reason that a ULA is not used for this purpose.) This prefix also ensures that the address range cannot conflict with the IPv4-translatable address range defined in [[RFC2765](#)] [section 2.1](#) (which is ::ffff:0:a.b.c.d).

Global ID: A Global ID as specified in [[RFC4193](#)] [section 3.2](#). For hosts with Unique Local Addresses, the Global ID may be the same Global ID as used in the IPv6 unique local addresses on the same network.

Comp.: The 1's complement checksum of the first 80 bits of the address, to avoid any changes to the transport protocol's pseudo header checksum.

IPv4 address: The IPv4 address appears in the last 32 bits so that

dotted-decimal format can be used in the textual representation of an address, as defined in [\[RFC4291\] section 2.2](#).

[3.](#) Security Considerations

As noted in [\[RFC4007\] section 12](#), requiring the use of a scope id in addition to an address introduced some security complications. By making an IPv4-mapped address unique, these addresses become more usable in security contexts.

[4.](#) IANA Considerations

The Well-Known Prefix falls into the range `::/8` reserved by the IETF. Hence this document has no actions for IANA.

[5.](#) References

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