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Requirements for address selection mechanisms
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Abstract

In a multi-prefix environment, nodes could have multiple addresses on one network interface. RFC 3484 defines source and destination address-selection algorithm, which is commonly deployed in current popular OSs. However, nodes could encounter some difficulties in network communication when they use default address selection rules

defined in RFC 3484. Some mechanisms for solving address selection problems are proposed including the RFC 3484 policy table distribution and ICMP error-based mechanisms. This document describes the requirements for these address selection mechanisms.

Table of Contents

1. Introduction 3
2. Requirements of Address Selection 3
2.1. Effectiveness 3
2.2. Timing 3
2.3. Dynamic Behavior Update 4
2.4. Node-Specific Behavior 4
2.5. Application-Specific Behavior 4
2.6. Multiple Interface 4
2.7. Central Control 4
2.8. Next-hop Selection 4
3. Security Considerations 4
4. IANA Considerations 5
5. References 5
5.1. Normative References 5
5.2. Informative References 5
Authors' Addresses 5
Intellectual Property and Copyright Statements 7

1. Introduction

One physical network can have multiple logical networks. In that case, an end-host has multiple IP addresses. (e.g. In the IPv4-IPv6 dual-stack environment, in a site that uses both ULA [RFC4193] and global scope addresses or in a site connected to multiple upstream IPv6 networks) For such a host, RFC 3484 [RFC3484] defines default address-selection rules for the source and destination addresses.

Today, the RFC 3484 mechanism is widely implemented in major OSs. However, we and others have found that in many sites the default address-selection rules are not appropriate for the network structure. PS [I-D.ietf-v6ops-addr-select-ps] lists problematic cases that resulted from incorrect address selection.

Though RFC 3484 made the address-selection behavior of a host configurable, typical users cannot make use of that because of the complexity of the mechanism and lack of knowledge about their network topologies. Therefore, an address-selection autoconfiguration mechanism is necessary, especially for unmanaged hosts of typical users.

This document contains requirements for address-selection mechanisms that enable hosts to perform appropriate address selection automatically.

2. Requirements of Address Selection

Address-selection mechanisms have to fulfill the following seven requirements.

2.1. Effectiveness

The mechanism can modify RFC 3484 default address-selection behavior at nodes. As documented in PS [I-D.ietf-v6ops-addr-select-ps], the default rules defined in RFC 3484 do not work properly in some environment. Therefore, the mechanism has to be able to modify address-selection behavior of a host.

2.2. Timing

Nodes can obtain address selection information when necessary. If nodes need to have address-selection information before performing address selection, then the mechanism has to provide a way for nodes to obtain necessary information beforehand. The mechanism should not degrade userbility. The mechanism should not enforce long address-selection processing time upon users.

2.3. Dynamic Behavior Update

Address-selection behavior of nodes can be dynamically updated. When the network structure changes and address-selection behavior has to be changed accordingly, a network administrator can modify the address-selection behavior of nodes.

2.4. Node-Specific Behavior

The mechanism can support node-specific address-selection behavior. Even when multiple nodes are on the same subnet, the mechanism should be able to provide a method for the network administrator to make nodes behave differently. For example, each node may have a different set of assigned prefixes. In such a case, the appropriate address-selection behavior may be different.

2.5. Application-Specific Behavior

The mechanism can support application-specific address-selection behavior or combined use with an application-specific address-selection mechanism such as address-selection APIs.

2.6. Multiple Interface

The mechanism can support those nodes equipped with multiple interfaces. The mechanism has to assume that nodes have multiple interfaces and makes address selection of those nodes work appropriately.

2.7. Central Control

The address selection behavior of nodes can be centrally controlled. A site administrator or a service provider can determine or have effect on address-selection behavior at their users' hosts.

2.8. Next-hop Selection

The mechanism can control next-hop-selection behavior at hosts or cooperate with other routing mechanisms, such as routing protocols and RFC 4191 [RFC4191]. If the address-selection mechanism is used with a routing mechanism, the two mechanisms has to be able to work synchronously.

3. Security Considerations

Incorrect address-selection can lead to serious security problems, such as session hijack. However, we should note that address-

selection is ultimately decided by nodes and their users. There are no means to enforce a specific address-selection behavior upon every end-host from outside of the host. Therefore, a network administrator has to take countermeasures for unexpected address selection.

4. IANA Considerations

This document has no actions for IANA.

5. References

5.1. Normative References

[I-D.ietf-v6ops-addr-select-ps]
Matsumoto, A., "Problem Statement of Default Address Selection in Multi-prefix Environment: Operational Issues of RFC3484 Default Rules", draft-ietf-v6ops-addr-select-ps-01 (work in progress), April 2007.

[RFC3484] Draves, R., "Default Address Selection for Internet Protocol version 6 (IPv6)", RFC 3484, February 2003.

5.2. Informative References

[RFC4191] Draves, R. and D. Thaler, "Default Router Preferences and More-Specific Routes", RFC 4191, November 2005.

[RFC4193] Hinden, R. and B. Haberman, "Unique Local IPv6 Unicast Addresses", RFC 4193, October 2005.

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