Multihoming in Fixed Network

Koshiro Mitsuya
Julien Charbon
Manabu Tsukada

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Abstract

The main purpose of these tests is study the multihoming support in IPv6 for fixed network in case of multiple mobile router and multiple different network prefix advertisements to get a better tolerance against network faults. At the same time make an analogy with the multihomed mobile networks.

Table of Contents

1. Default Router Selection

Purpose

Test the case where a network link has several default router.

Summary

When several default router are on a same link - i.e. announce valid Router Advertisement on this link -, the network nodes on this link manage a Default router List and act a Default Router Selection. This mechanism provide a fault tolerance benefits against default router failure.

Moreover the Redirect Message inform a host of a better first-hop node on the path to a destination. This message and its operations provide a fault tolerance benefit against losing the connexion to Internet.

References

RFC-2461 - Neighbor Discovery for IP Version 6 (IPv6)

Section 6.3.4. Processing Received Router Advertisements

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On receipt of a valid Router Advertisement, a host extracts the
source address of the packet and does the following:

  * If the address is not already present in the host's Default
    Router List, and the advertisement's Router Lifetime is non-
    zero, create a new entry in the list, and initialize its
    invalidation timer value from the advertisement's Router
    Lifetime field.

  * If the address is already present in the host's Default Router
    List as a result of a previously-received advertisement, reset
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its invalidation timer to the Router Lifetime value in the newly-received advertisement.

* If the address is already present in the host's Default Router List and the received Router Lifetime value is zero, immediately time-out the entry as specified in Section 6.3.5.

To limit the storage needed for the Default Router List, a host MAY choose not to store all of the router addresses discovered via advertisements. However, a host MUST retain at least two router addresses and SHOULD retain more. Default router selections are made whenever communication to a destination appears to be failing. Thus, the more routers on the list, the more likely an alternative working router can be found quickly (e.g., without having to wait for the next advertisement to arrive).

6.3.6. Default Router Selection

The policy for selecting routers from the Default Router List is as follows:

1) Routers that are reachable or probably reachable (i.e., in any state other than INCOMPLETE) SHOULD be preferred over routers whose reachability is unknown or suspect (i.e., in the INCOMPLETE state, or for which no Neighbor Cache entry exists). An implementation may choose to always return the same router or cycle through the router list in a round-robin fashion as long as it always returns a reachable or a probably reachable router when one is available.

2) When no routers on the list are known to be reachable or probably reachable, routers SHOULD be selected in a round-robin fashion, so that subsequent requests for a default router do not return the same router until all other routers have been selected.

   Cycling through the router list in this case ensures that all available routers are actively probed by the Neighbor Unreachability Detection algorithm. A request for a default router is made in conjunction with the sending of a packet to a router, and the selected router will be probed for reachability as a side effect.

3) If the Default Router List is empty, assume that all destinations are on-link as specified in Section 5.2.

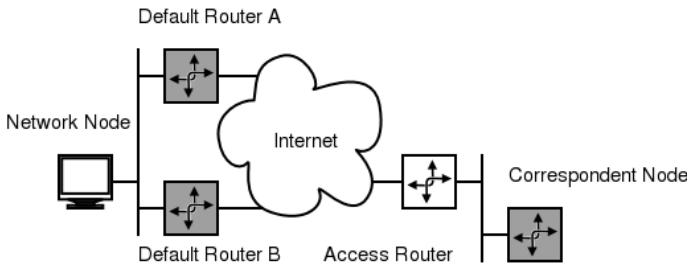
Resources Requirement

- Two Nodes: One on-link network node and one correspondent node.
- Two Default Routers.

Last Updates

None

Initial State



Initial state topology..

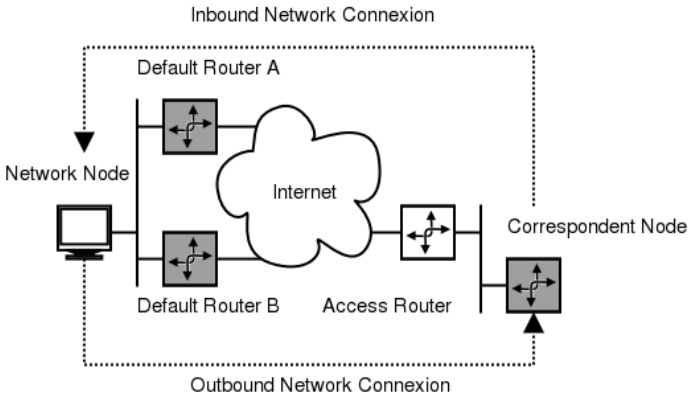
Comment: The access router is optional.

Configuration

- An routing protocol [i.e. OSPF, RIPng,...] run between the router and provide the IP packet carriage between the network node and the correspondent node.
- Both of default routers advertise the same network prefix.

Test Procedure

1. Verify that the network node has both default routers IPv6 link local address in its Default Router List.
2. Establish a network connexion between the network node and the correspondent node.

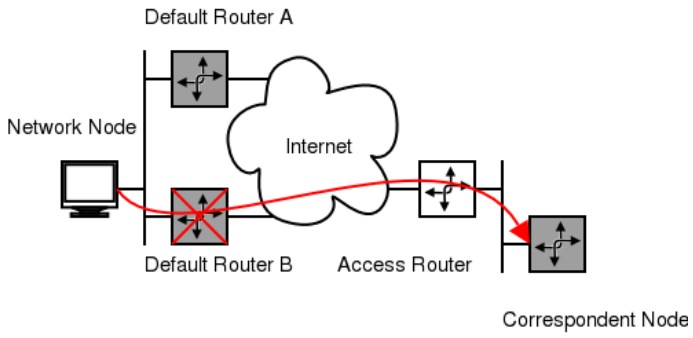


Connexion between the network node and correspondent node.

Comments: The outbound and inbound network traffic can use the same default router or not.

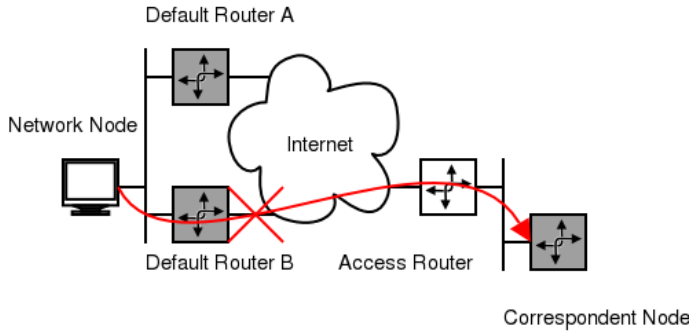
3. Create a network fault:

   a. The default router used for the outbound connexion fail:



Default Router Failure.

b. A link used for the outbound connexion between a default router and the Internet fail:



Internet Connexion Failure.

Final State

The connexion between the network node and the correspondent node is keep using the other default router and then the other Internet connexion.

Observable Variable

- The time for the network node to change of Default Router.

See also

Section 2, “Source Address Selection” and Section 3, “Default Router Selection and Source Address Selection”.

2. Source Address Selection

Purpose

Test the case where several distinct and delegated network prefix are announced on a same link.

Summary

When a Router Advertisement contains several Prefix Information options, the target network node should autoconfigure several IPv6 global address and then act a Source Address Selection.

Here the network prefix are delegated by the Prefix Delegation mechanism of DHCPv6. Because in a case of mobile network, the mobile router get its network prefix by Prefix Delegation.

References

RFC-3484 - Default Address Selection for Internet Protocol version 6 (IPv6)

Section 5. Source Address Selection

Internet-Draft: Requirements for IPv6 prefix delegation [`draft-ietf-ipv6-prefix-delegation-requirement-03.txt`]

Internet-Draft: IPv6 Prefix Options for DHCPv6 [`draft-ietf-dhc-dhcpv6-opt-prefix-delegation-04.txt`]

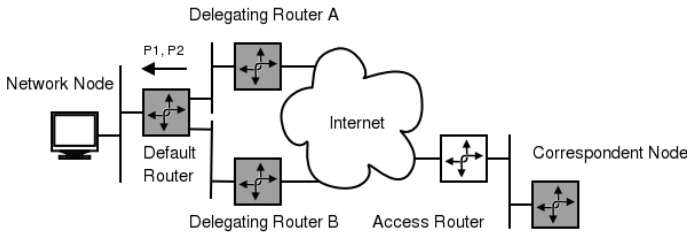
Resource Requirement

- Two Nodes: One on-link network node and one correspondent node.
- One Default Router.
- Two Delegating Router.

Last Updates

None

Initial State



Initial State topology.

Comments: The Access Router is optional

Configuration

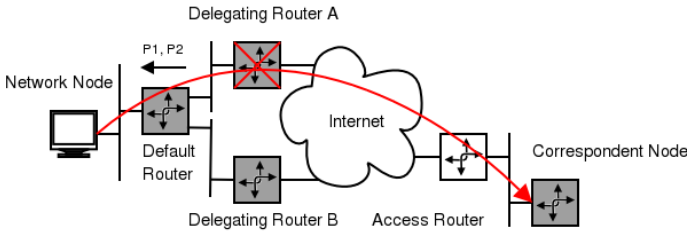
- An routing protocol [*i.e.* OSPF, RIPng,...] run between the router and provide the IP packet carriage between the network node and the correspondent node.

  The distinct network prefixes announced by the default router are delegated from both delegating routers.

- Both delegating routers make Ingress Filtering like Reverse Path Filtering.

Test Procedure

1. Verify that the network node has two global source addresses.
2. Establish a network connexion between the network node and the correspondent node.
3. Create a network fault: The delegating router used for the outbound connexion fail:



Delegating Router Failure.

Final State

The connexion between the network node and the correspondent node is keep using the other source address and then the other delegating router.

Observable Variable

- The time for the network node to change of source address.

See also

Section 1, “Default Router Selection” and Section 3, “Default Router Selection and Source Address Selection”.

3. Default Router Selection and Source Address Selection

Purpose

Test the case where a network link has several default router which announced distinct network prefix.

Summary

This test focus on relation between the Default Router Selection and the Source Address Selection. Because the network node should use the Default Router through which it learn the currently used Source Address to avoid the Ingress Filtering.

References

See section "References" in Section 1, “Default Router Selection” and Section 2, “Source Address Selection”.

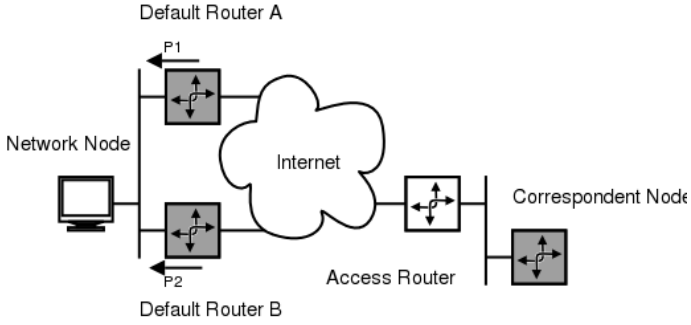
Resource Requirement

- Two Nodes: One on-link network node and one correspondent node.
- Two Default Router.

Last Updates

None

Initial State



Initial State topology.

Comments: The Access Router is optional

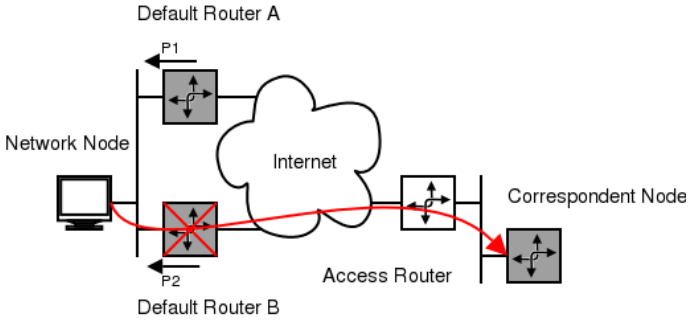
Configuration

- An routing protocol [*i.e.* OSPF, RIPng] run between the router and provide the IP packet carriage between the network node and the correspondent node.
- Both of default routers advertise the distinct network prefixes.
- Both delegating routers make Ingress Filtering like Reverse Path Filtering.

Test Procedure

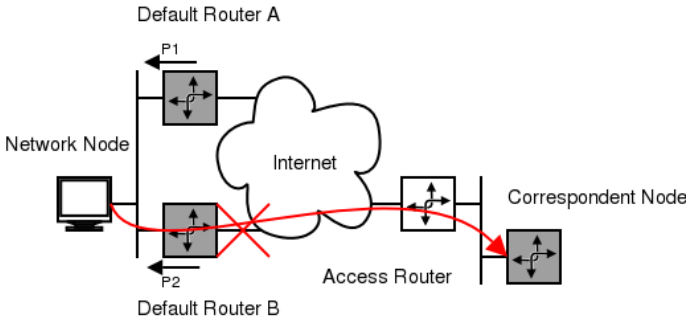
1. Verify that the network node has both default routers IPv6 link local address in its Default Router List.
2. Verify that the network node has two IPv6 Global Addresses.
3. Establish a network connexion between the network node and the correspondent node.
4. Create a network fault:

   a. The default router used for the outbound connexion fail:



Default Router Failure.

   b. A link used for the outbound connexion between a default router and the Internet fail:



Internet Connexion Failure.

Final State

The connexion between the network node and the correspondent node is keep using the other source address and then the other default router.

Observable Variable

- The time for the network node to change of source address and default router.

See also

Section 1, “Default Router Selection” and Section 2, “Source Address Selection”.