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Preference for Multicast Support with Mobile IP
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Abstract

This document specifies a new extension to the Registration Request used by mobile nodes with the mobile-IP protocol. The new extension allows the mobile node to select the particular IP multicasts which the home agent or foreign agent should forward to the mobile node when it attaches to the Internet at a care-of address not on its home network.

1. Introduction

Mobile-IP [[1](#)] allows mobile nodes to move from one point of attachment within the Internet to another, and defines mechanisms by which a home agent on the mobile node's home network can send datagrams to the mobile node. Since the mobile node's IP address makes it seem to other routers as if the mobile node is on the same network as the home agent (i.e., as if the mobile node is on its "home network"), datagrams from other networks destined to the mobile node will be transmitted onto the mobile node's home network, where they can be received by the home agent and encapsulated for delivery to the mobile node's care-of address. The mobile node's care-of address can be an address assigned to one of the mobile node's network interfaces, or it can be an address advertised by a mobility agent near the current whereabouts of the mobile node. Such a mobility agent is called a foreign agent.

A mobile node on a foreign network may need to send and receive multicast packets either directly from the foreign network or from its home network via its home agent. Depending on the application, a mobile node may wish to have any of the above options on a per multicast address basis. While the Mobile-IP specification specifies relevant details about the transmission and reception of multicast datagrams from its home network, it does not specify how a mobile node can choose these options in a foreign network.

This document specifies an extension to the mobile-IP Registration Request message to allow the mobile node to specify its options in sending and receiving multicast datagrams on a per multicast address basis. The mobile node appends the new extension to the Registration Request it sends at its current point of attachment.

2. Multicast Preference Extension

The Multicast Preference extension allows a mobile node to specify, at the time it registers its current care-of address, send and receive options for various multicast addresses. The Multicast Preference extension may be included several times within a single registration request, once for every multicast address.

DISCUSSION:

What other constraints should be considered?


```

      0               1               2               3
    0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|   Type   |   Length   |C|P|A|XH|XF|RH|RF|   rsvd   |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     Multicast IP address                                     |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

Type 41

Length 4 + (4 * number of Multicast IP addresses listed)

C If the 'C' ('Clean') flag is set, the mobility agent is instructed to eliminate any retained specifications for multicast datagrams which the mobile node had included in any previous Multicast Preference extensions.

P If the 'P' ('Permanent') flag is set, the mobility agent is instructed to keep the following multicast datagrams specification active until the mobile node registers again using the 'C' flag.

A If the 'A' ('Additional') flag is set, the mobility agent is instructed to include this preference for receiving multicasts along with other preferences previously specified by the mobile node.

If 'A' flag is not set (0), the mobility agent is instructed to delete all non-permanent preferences previously specified by the mobile node before storing this preference.

If 'P' flag is set, 'A' flag is ignored.

XH If the 'XH' ('Transmit at Home') flag is set, then the mobile node wishes to transmit packets destined to the address specified in the Multicast IP address field, in the mobile node's home network.

XF If the 'XH' ('Transmit in Foreign') flag is set, then the mobile node wishes to transmit packets destined to the address specified in the Multicast IP address field, in the mobile node's foreign network.

RH If the 'RH' ('Receive from Home') flag is set, then the mobile node wishes to receive packets destined to the address specified in the Multicast IP address field, from the mobile node's home network.

RF If the 'RL' ('Receive from Foreign') flag is set, then the mobile node wishes to receive packets destined to the address specified in the Multicast IP address field, in the mobile node's foreign network.

rsvd 0

Multicast IP addresses Flags and options specified by this Multicast Preference extension apply to the Multicast IP addresses listed in this field.

All extensions to the mobile-IP registration request have a type field and a length field, as shown above. The number of Multicast IP addresses listed will determine the length of the Multicast Preference Extension.

If the mobile node wishes to clear ALL of its Multicast Preferences, it sends a Multicast Preference Extension with the 'C' bit set, and zero Multicast IP addresses listed.

3. Home Agent Considerations

If the home agent cannot satisfy the request, it MUST reject the Registration Request by issuing a Registration Reply using the newly defined status code:

145 Multicast Preference Not Supported

When a mobile node is attached to its home network, a home agent MUST not forward multicasts to the mobile node. When a mobile node is away from home, the following actions MUST be taken by the home agent.

- If the 'XH' flag is set, then the home agent should transmit the packets received from the mobile node, on the local network.
- If the 'XF' flag is set, no special actions are required from the home agent.
- If the 'RH' flag is set, the home agent MUST respond to the IGMP membership queries [2, 3] by including the multicast address in its reports. The home agent MAY optionally tunnel the IGMP membership queries to the mobile host. Also, the home agent MUST tunnel the multicast packets to the mobile host for the specified multicast address.

- If the 'RF' flag is set, no special actions are required from the home agent.

When a mobile node includes the 'P' flag in the Multicast Preference extension to a registration request, the home agent MUST keep track of the requested Multicast Preference(s) for the mobile node until the mobile node clears the information with a new Multicast Preference extension containing the 'C' flag. In this way, the mobile node may be relieved of the requirement to send in the same list of Multicast Preference extensions every time it registers at a new care-of address.

4. Foreign Agent Considerations

If the 'XH' flag is set, then the Foreign agent MUST tunnel packets received from the mobile node to the home agent.

If the 'XF' flag is set, and the foreign agent receives an IP-within-IP datagram from the mobile node, then the foreign agent MUST decapsulate the datagram, and replace the source address in the multicast datagram with the Care-of-Address and submit the datagram for IP processing.

If both 'XH' and 'XF' flags are set, both actions above MUST be performed.

If the 'RH' flag is set, then the foreign agent MUST process tunneled datagrams in one of the following ways:

- Transmit the multicast datagram from the interface sharing a link with the mobile node, with TTL set to 1.
- Encapsulate the multicast datagram within a unicast IP datagram addressed to the mobile node's home address, and submit for IP processing.

If the 'RF' flag is set, and the foreign agent is acting as the default router for the mobile node, the foreign agent transmits multicast datagrams with the specified multicast address to the mobile node.

5. Mobile Node Considerations

If the mobile host is attached to its home network, no special action is required by mobile host.

If the mobile host is attached to a foreign network, and the Registration Request with the appended Multicast Preference Extension was accepted by its home agent (and, if applicable, the foreign agent advertising the care-of address used in the Registration), the following actions are required.

If 'XH' flag was set, the mobile host MUST encapsulate every multicast datagram within an unicast IP datagram addressed to the home agent.

If 'XF' flag was set, it MUST do one of the following:

- Encapsulate every multicast datagram within an unicast IP datagram addressed to the foreign agent.
- Transmit every multicast datagram with source address set to the care-of address.

DISCUSSION:

Is this a reasonable way to offload processing from the foreign agent? Should the Preference Extension contain another flag to distinguish the two modes of operation?

If 'RH' flag was set, the mobile host MUST decapsulate IP in IP packets [5].

If 'RF' flag was set, the mobile host MUST respond to the IGMP membership queries.

6. Related Work

This draft specification is related to a companion draft specification for the Broadcast Preference Extension for Mobile-IP [4]. Changes to one document should be considered for their impact on the issues in the other document.

References

- [1] IPv4 Mobility Support. [ietf-draft-mobileip-protocol-15.txt](#) - work in progress, February 1996.
- [2] Steve Deering. Host Extensions for IP Multicasting. [RFC 1112](#), August 1989.
- [3] W. Fenner. Internet Group Management Protocol, Version 2. [draft-ietf-idmr-igmp-v2-02.txt](#) -- work in progress, February 1996.
- [4] B. Patel and C. Perkins. Preference for Broadcast Datagram Support with Mobile IP. [draft-perkins-mobileip-bcastpref-00.txt](#) -- work in progress, February 1996.
- [5] Charles Perkins. IP Encapsulation within IP. [draft-ietf-ip4inip4-01.txt](#) -- work in progress, October 1995.

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