Mobile IP Network Access Identifier Extension for IPv4

Status of this Memo

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Abstract

AAA servers are in use within the Internet today to provide authentication and authorization services for dial-up computers. Such services are likely to be equally valuable for mobile nodes using Mobile IP when the nodes are attempting to connect to foreign domains with AAA servers. AAA servers today identify clients by using the Network Access Identifier (NAI). Our proposal defines a way for the mobile node to identify itself, by including the NAI along with the Mobile IP Registration Request. This memo also updates RFC 2290 which specifies the Mobile-IPv4 Configuration option for IPCP, by allowing the Mobile Node’s Home Address field of this option to be zero.
1. Introduction

AAA servers are in use within the Internet today to provide authentication and authorization services for dial-up computers. Such services are likely to be equally valuable for mobile nodes using Mobile IP when the nodes are attempting to connect to foreign domains with AAA servers. AAA servers today identify clients by using the Network Access Identifier (NAI) [1]. This document specifies the Mobile Node NAI extension to the Mobile IP Registration Request [7] message from the mobile node.

Since the NAI is typically used to uniquely identify the mobile node, the mobile node’s home address is not always necessary to provide that function. Thus, it is possible for a mobile node to authenticate itself, and be authorized for connection to the foreign domain, without even having a home address. A message containing the Mobile Node NAI extension MAY set the Home Address field to zero (0) in the Registration Request, to request that a home address be assigned.

The "Mobile-IPv4 Configuration" option to IPCP has been specified in RFC 2290 [8] for proper interaction between a mobile node and a peer, through which the mobile node connects to the network using PPP. According to that specification the Mobile Node’s Home Address field of the option MUST not be zero. However, in the context of this memo which allows a mobile node to be identified by its NAI and to obtain an address after the PPP phase of connection establishment, the Home Address field is allowed to be zero while maintaining all other aspects of RFC 2290. Interpretation of various scenarios from RFC 2290 is given in section 4.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [3].

2. Mobile Node NAI Extension

The Mobile Node NAI extension, shown in figure 1, contains the user name following the format defined in [1]. When it is present in the Registration Request, the Home Address field MAY be set to zero (0). The Mobile Node NAI extension MUST appear in the Registration Request before both the Mobile-Home Authentication extension and Mobile-Foreign Authentication extension, if present.
3. Foreign Agent Considerations

If Home Address is zero in the Registration Request, the foreign agent MUST use the NAI instead in its pending registration request records, along with the Identification field as usual. If the foreign agent cannot manage pending registration request records in this way, it MUST return a Registration Reply with Code indicating NONZERO_HOMEADDR_REQD (see section 5).

If the mobile node includes the Mobile Node NAI extension in its Registration Request, then the Registration Reply from the home agent MUST include the Mobile Node NAI extension. If not, the foreign agent SHOULD send the Registration Reply to the mobile node, changing the Code to the value MISSING_NAI (see section 5). The Registration Reply MUST include a nonzero Home Agent address and mobile node’s Home Address. If not, the foreign agent SHOULD send the Registration Reply to the mobile node, changing the Code to the value MISSING_HOME_AGENT or MISSING_HOMEADDR, respectively (see section 5).

4. Interactions with Mobile-IPv4 Configuration Option to IPCP

In the Mobile-IPv4 Configuration Option to IPCP [8], the Mobile Node’s Home Address field may be zero. In this section, we specify the action to be taken in that case, when the mobile node is using the Mobile Node NAI extension in the Mobile IP Registration Request. Whether or not the IP Address Configuration Option contains a nonzero IP address, the mobile node will subsequently attempt to obtain a home address from the Mobile IP Registration Reply.

If the IP Address Configuration Option to IPCP has IP address equal to zero, the PPP peer is expected to allocate and assign a co-located care-of address to the Mobile Node. If, on the other hand, the IP
Address Configuration Option to IPCP has a nonzero IP address, the
PPP peer is expected to assign that address to the Mobile Node as its
colocated care-of address.

Finally, if the IP Address Configuration Option is left out of the
IPCP Configure-Request, then no colocated care of address is
assigned during IPCP. The mobile node will acquire a colocated care
of address during a later stage of configuration or will use an FA-
colocated care-of address.

5. Error Values

Each entry in the following table contains the name and value for the
Code [7] to be returned in a Registration Reply, and the section in
which the error Code is first mentioned in this specification.

<table>
<thead>
<tr>
<th>Error Name</th>
<th>Value</th>
<th>Section of Document</th>
</tr>
</thead>
<tbody>
<tr>
<td>NONZERO_HOMEADDR_REQD</td>
<td>96</td>
<td>3</td>
</tr>
<tr>
<td>MISSING_NAI</td>
<td>97</td>
<td>3</td>
</tr>
<tr>
<td>MISSING_HOME_AGENT</td>
<td>98</td>
<td>3</td>
</tr>
<tr>
<td>MISSING_HOMEADDR</td>
<td>99</td>
<td>3</td>
</tr>
</tbody>
</table>

6. IANA Considerations

The Mobile Node NAI extension defined in Section 2 is a Mobile IP
registration extension as defined in RFC 2002 [7] and extended in RFC
2356 [6]. IANA should assign a value of 131 for this purpose.

The Code values defined in Section 5 are error codes as defined in
RFC 2002 and extended in RFC 2344 [5] and RFC 2356 [6]. They
 correspond to error values conventionally associated with rejection
by the foreign agent (i.e., values from the range 64-127). IANA
should record the values as defined in Section 5.

7. Security Considerations

Mobile IP registration messages are authenticated, and the
authentication verified by the recipient. This proposal does not
prohibit the mobile node from sending its NAI in the clear over the
network, but that is not expected to be a security issue.

8. IPv6 Considerations

Supporting NAI-based registrations for Mobile IPv6 [4] is outside the
scope of this document. This section contains some ideas how
Stateless Address Autoconfiguration [9] and DHCPv6 [2] might be
extended to support NAI-based Mobile IPv6 registrations.
For mobile nodes using IPv6, there are no commonly deployed mechanisms by which a mobile node may present its credentials, such as exist today with IPv4. Nevertheless, a mobile node using IPv6 mobility may wish to specify the domain in which their credentials may be checked, by using a NAI just as this specification proposes for IPv4. In the case of IPv6, however, there is no foreign agent in place to manage the connectivity of the mobile node, and thus to manage the verification of the credentials offered by the mobile node. To identify the HDAF (see appendix A) that has the expected relationship with the mobile node, the NAI would have to be forwarded to a local AAA by the local agent involved with configuring the care-of address of the mobile node.

This agent can either be a router sending out Router Advertisements [9], or a DHCPv6 server. In the former case, the router could signal its ability to handle the NAI by attaching some yet to be defined option to the Router Advertisement. In the latter case, for managed links, the mobile node could include a yet to be defined NAI extension in its DHCP Solicitation message. Such an NAI extension and appropriate authentication would also be required on the subsequent DHCP Request sent by the mobile node to the DHCP Server selected on the basis of received DHCP Advertisements. Once a care-of address on the foreign network has been obtained, the mobile node can use regular MIPv6 [4].

9. Acknowledgements

The authors would like to thank Gabriel Montenegro and Vipul Gupta for their useful discussions. Thanks to Basaravaj Patil and Pete McCann for text describing actions to be taken when the home address is zero but the mobile node wishes to use the Mobile-IPv4 Configuration Option to IPCP defined in RFC 2290.

References


A. Home Domain Allocation Function (HDAF)

This appendix introduces a new function named the Home Domain Allocation Function (HDAF) that can dynamically assign a Home Address to the mobile node.

Figure 2 illustrates the Home HDAF, which receives messages from foreign agents (e.g., FA) and assigns a Home Address within the Home Domain. The HDAF does not perform any Mobile IP processing on the Registration Request, but simply forwards the request to a Home Agent (HA) within the network that is able to handle the request.

```
+------+
|      |
+---+ HA-1 |
|      |       |      |       |      |   |   +------+
|  MN  |-------|  FA  |-------| HDAF ++--+-+   |   |      |
|      |       |      |       |      |   |   +------+
+------+       +------+       +------+   |   |      |
|      |       |      |       |      |   |   +------+
|  MN  |-------|  FA  |-------| HDAF ++--+-+   |   |      |
|      |       |      |       |      |   |   +------+
+------+       +------+       +------+   |   |      |
|      |       |      |       |      |   |   +------+
|      |       |      |       |      |   |   +------+
```

Figure 2: Home Domain Allocator Function (HDAF)

Upon receipt of the Registration Request from the mobile node (MN), FA extracts the NAI and finds the domain name associated with it. FA then finds the HDAF that handles requests for the mobile node’s domain. The discovery protocol is outside of the scope of this specification. As an example, however, FA might delegate the duty of finding a HDAF to a local AAA server. The local AAA server may also assist FA in the process of verifying the credentials of the mobile node, using protocols not specified in this document.
Addresses

The working group can be contacted via the current chairs:

Basavaraj Patil  
Nokia Corporation  
6000 Connection Drive  
M/S M8-540  
Irving, TX 75039  
USA  
Phone: +1 972-894-6709  
Fax : +1 972-894-5349  
EMail: Basavaraj.Patil@nokia.com

Phil Roberts  
Motorola  
1501 West Shure Drive  
Arlington Heights, IL 60004  
USA  
Phone: +1 847-632-3148  
EMail: QA3445@email.mot.com

Questions about this memo can be directed to:

Charles E. Perkins  
Nokia Research Center  
313 Fairchild Drive  
Mountain View, California 94043  
USA  
Phone: +1-650 625-2986  
Fax: +1 650 625-2502  
EMail: charliep@iprg.nokia.com

Pat R. Calhoun  
Sun Microsystems Laboratories  
15 Network Circle  
Menlo Park, California 94025  
USA  
Phone: +1 650-786-7733  
Fax: +1 650-786-6445  
EMail: pcalhoun@eng.sun.com
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