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Mobile IPv4 Extension for Carrying Network Access Identifiers

Status of this Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

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Abstract

When a mobile node moves between two foreign networks, it has to be re-authenticated. If the home network has both multiple Authentication Authorization and Accounting (AAA) servers and Home Agents (HAs) in use, the Home AAA server may not have sufficient information to process the re-authentication correctly (i.e., to ensure that the same HA continues to be used). This document defines a Mobile IP extension that carries identities for the Home AAA and HA servers in the form of Network Access Identifiers (NAIs). The extension allows a Home Agent to pass its identity (and that of the Home AAA server) to the mobile node, which can then pass it on to the local AAA server when changing its point of attachment. This extension may also be used in other situations requiring communication of a NAI between Mobile IP nodes.

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1. Introduction

When building networks one would like to be able to have redundancy. In order to achieve this, one might place multiple AAA servers in one domain. When a mobile node registers via a visited network, the authentication will be handled by one of the AAA servers in the home domain. At a later point, when the mobile node moves to another visited domain it again has to be authenticated. However, due to the redundancy offered by the AAA protocol, it can not be guaranteed that the authentication will be handled by the same AAAH server as the previous one, which can result in the new AAAH not knowing to which HA the session was assigned. This document defines a Mobile IP extension which can be used to distribute the information needed to resolve this.

Furthermore, the only information that is normally available about the home agent in the registration request is the IP address as defined in RFC 3344 [5]. Unfortunately this may not be enough since some AAA infrastructures (such as Diameter [6]) use realm based routing; such a AAA infrastructure needs to know the FQDN identity of the home agent to be able to correctly handle the assignment of the home agent. A reverse DNS lookup would only disclose the identity of the Mobile IP interface for that HA IP address, which may or may not have a one-to-one correspondence with the home agent FQDN identity. This is a reason for the HA to also include its own identity in the registration reply. The MIP v4 extension defined in this document also has a subtype defined by which this may be done. The HA identity can then be included by the mobile node in later registration requests when changing the point of attachment.

2. Requirements terminology

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 BCP 14, RFC 2119 [1].

The Mobile IP related terminology described in RFC 3344 [5] is used in this document. In addition, the following terms are used:

AAAH
: One of several possible AAA Servers in the Home Network

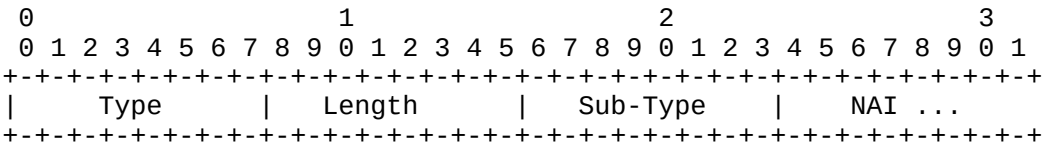
FQDN
Fully Qualified Domain Name.

Identity
The identity of a node is equal to its FQDN.

NAI
Network Access Identifier [2].

3. NAI Carrying Extension

This section defines the NAI Carrying Extension which may be used in Mobile IP Registration Request and Reply messages, and also in Mobile IP Agent Advertisements [5]. The extension may be used by any node that wants to send identity information in the form of a NAI [4]. This document also defines some subtype numbers which identify the specific type of NAI carried in Sections 4 and 5. It is expected that other types of NAI will be defined by other documents in the future.



Type 136 (skippable) [5].

Length 8-bit unsigned integer. Length of the extension, in octets, excluding the extension Type and the extension Length fields. This field MUST be set to 1 plus the total length of the NAI field.

Sub-Type This field describes the particular type NAI which is carried in the NAI field.

NAI Contains the NAI [2] in a string format.

3.1. Processing of the NAI Carrying Extension

When a mobile node or home agent adds a NAI Carrying Extension to a registration message, the extension MUST appear prior to any authentication extensions.

In the event the foreign agent adds a NAI Carrying Extension to a registration message, the extension MUST appear prior to any authentication extensions added by the FA.

If an HA has appended a NAI Carrying Extension to a Registration Reply to an MN, and does not receive the NAI extension in subsequent Registration Request messages from the MN, the HA can assume that the MN does not understand this NAI extension. In this case, the HA SHOULD NOT append this NAI extension to further Registration Reply messages to the MN.

4. HA Identity subtype

The HA identity uses subtype 1 of the NAI Carrying Extension. It contains the NAI of the HA in the form hostname@realm. Together the hostname and realm form the complete FQDN (hostname.realm) of the HA.

A Home Agent using this extension MUST provide it in the first Registration Reply sent to a Mobile Node which is not currently registered. The extension only need to be included in subsequent Registration Replies if the same extension is included in Registration Requests received from the same Mobile Node.

A mobile node using this extension MUST, if it receives it in a registration reply message, provide it in every subsequent registration request when re-authentication is needed. Failure to re-authenticate, for instance because no AAAH can be reached, will result in termination of the Mobile-IP session. Upon initiation of a new session a new HA Identity NAI may be provided to the Mobile node, and the requirement above will apply to the newly received NAI.

If the mobile node requires a specific home agent and it has the NAI available it MUST provide this extension in its initial registration request.

A foreign agent which receives the Home Agent NAI by this extension in a registration request SHOULD include the Home Agent NAI when requesting Mobile Node authentication through the AAA infrastructure if the AAA protocol used can carry the information.

5. AAAH Identity subtype

The AAAH identity uses subtype 2 of the NAI Carrying Extension. It contains the NAI of the home AAA server in the form hostname@realm. Together the hostname and realm form the complete FQDN (hostname.realm) of the home AAA server.

If several AAA servers exist in the Home Network, a Home Agent providing AAAH selection support according to this document MUST provide the AAAH identity in the first Registration Reply sent to the Mobile Node. The extension only needs to be included in subsequent Registration Replies if the same extension is included in Registration Requests received from the same Mobile Node.

A mobile node SHOULD save the latest AAAH Identity received in a registration reply message and SHOULD provide the AAAH Identity in every registration request sent when re-authenticating, for efficiency reasons. Failure to reach the indicated AAAH during re-authentication will result in a new AAAH Identity NAI being returned (which should then be saved and provided in subsequent registration requests). Similarly, failure to re-authenticate, for instance because no AAAH can be reached, will result in termination of the Mobile-IP session; on initiation of a new session, a new AAAH Identity NAI may be provided to the Mobile Node for re-use during later re-registrations.

A foreign agent which receives the AAAH NAI by this extension in a registration request SHOULD include the AAAH NAI provided when requesting Mobile Node authentication through the AAA infrastructure if the AAA protocol used can carry the information.

6. Security Considerations

This specification introduces new Mobile IP extensions that are used to carry mobility agent and AAA server identities, in the form of Network Access Identifiers. The Mobile IP messages that carry this extension MUST be authenticated as described in [4], unless other authentication methods have been agreed upon. Therefore, this specification does not lessen the security of Mobile IP messages.

It should be noted that the identities sent in the extensions specified herein MAY be sent in the clear over the network. However, the authors do not envision that this information would create security issues.

7. IANA Considerations

This document defines one new mobile IP extension, and one new Mobile IP extension sub-type numbering space to be managed by IANA.

Section 3 defines a new Mobile IP extension, the Mobile IP NAI Carrying Extension. The type number for this extension is 136. This extension introduces a new sub-type numbering space where the values

1 and 2 have been assigned in this document. Approval of new Mobile IP NAI Carrying Extension sub-type numbers is subject to Expert Review, and a specification is required [3].

The content and format for this extension is not specific to AAA NAIs, so if in the future new NAIs are defined which do not strictly fall within the category of AAA NAIs, they may nevertheless be accommodated within the subtype numbering space defined for the NAI Carrying Extension defined in this document.

The NAI Carrying Extension should be assigned a type value from both the IANA number space for Mobile IPv4 skippable extensions and from the IANA number space for Mobile IPv4 advertisement extensions. Ideally, the numbers assigned from these two numbering spaces should have the same value.

8. Acknowledgements

Thanks to the original authors of the GNAIE document, Mohamed M Khalil, Emad Qaddoura, Haseeb Akhtar, and Pat R. Calhoun. The original document was removed from the MIP WG charter when no use was seen for the extension. The original ideas have been reused in this document. Also thanks to Henrik Levkowetz and Kevin Purser for valuable feedback and help when writing this document.

9. Normative References

[1] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[2] Aboba, B. and M. Beadles, "The Network Access Identifier", RFC 2486, January 1999.

[3] Narten, T. and H. Alvestrand, "Guidelines for Writing an IANA Considerations Section in RFCs", BCP 26, RFC 2434, October 1998.

[4] Calhoun, P. and C. Perkins, "Mobile IP Network Access Identifier Extension for IPv4", RFC 2794, March 2000.

[5] Perkins, C., "IP Mobility Support for IPv4", RFC 3344, August 2002.

[6] Calhoun, P., Loughney, J., Guttman, E., Zorn, G. and J. Arkko, "Diameter Base Protocol", RFC 3588, September 2003.

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