Foreign Agent Error Extension for Mobile IPv4

Status of This Memo

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Abstract

This document specifies a new extension for use by Foreign Agents operating Mobile IP for IPv4. Currently, a foreign agent cannot supply status information without destroying the ability for a mobile node to verify authentication data supplied by the home agent. The new extension solves this problem by making a better place for the foreign agent to provide its status information to the mobile node.
1. Introduction

This document specifies a new non-skippable extension for use by Foreign Agents operating Mobile IP for IPv4 [4]. The new extension option allows a foreign agent to supply an error code without disturbing the data supplied by the Home Agent within the Registration Reply message. In this way, the mobile node can verify that the Registration Reply message was generated by the Home Agent even in cases where the foreign agent is required by protocol to insert new status information into the Registration Reply message.

2. Terminology

The keywords "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [1]. Other terminology is used as already defined in [4].

3. FA Error Extension Format

The format of the FA Error Extension conforms to the Short Extension format specified for Mobile IPv4 [4]. The FA Error Extension is not skippable.

```
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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     Type      |   Length      |    Sub-Type   |     Status    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Type
45

Length
2

Sub-Type
0

Status
A status code used by the foreign agent to supply status information to the mobile node.
4. Operation and Use of the FA Error Extension

The FA Error Extension is only valid for use within Mobile IPv4 Registration Reply messages. The FA Error Extension is not skippable. A mobile node that cannot correctly interpret the contents of the FA Error Extension MUST NOT use the care-of address provided in the Registration Reply message, until another Registration Request message has been sent and a successful Registration Reply message received.

Status codes allowable for use within the FA Error Extension are within the range 64-127. The currently specified codes are as follows:

64 reason unspecified
65 administratively prohibited
66 insufficient resources
68 home agent failed authentication
71 poorly formed Reply
77 invalid care-of address
78 registration timeout

as defined in RFC 3344 [4] for use by the Foreign Agent. Status codes for use with the FA Error extensions must not be differently defined for use in the Code field of Registration Reply messages.

When a foreign agent appends a FA Error Extension to the Registration Reply as received from the Home Agent, it has to update the UDP Length field in the UDP header [5] to account for the extra 4 bytes of length.

This document updates the Mobile IP base specification [4] regarding the procedures followed by the foreign agent in the case that the home agent fails authentication. Instead of modifying the "status" field of the Registration Reply to contain the value 68, now the foreign agent should append the Foreign Agent Error Extension containing the status value 68.

5. Mobile Node Considerations

If a mobile node receives a successful Registration Reply (status code 0 or 1), with a FA Error Extension indicating that the foreign agent is not honoring said Registration Reply, the mobile node SHOULD then send a deregistration message to the home agent. In this way, the home agent will not maintain a registration status that is inconsistent with the status maintained by the foreign agent.
6. Foreign Agent Considerations

When denying a successful Registration Reply, the Foreign Agent
SHOULD send a Registration Revocation message [2] to the Home Agent
if a mobility security association exists between them. For cases
when the foreign agent does have the required security association,
this way of informing the home agent does not have the vulnerability
from detrimental actions by malicious foreign agents, as noted in
section 8.

7. IANA Considerations

This specification reserves one number for the FA Error Extension
(see section 3) from the space of numbers for non-skippable mobility
extensions (i.e., 0-127) defined in the specification for Mobile IPv4
[4].

This specification also creates a new number space of sub-types for
the type number of this extension. Sub-type zero is to be allocated
from this number space for the protocol extension specified in this
document. Similar to the procedures specified for Mobile IP [4]
number spaces, future allocations from this number space require
expert review [3].

The status codes that are allowable in the FA Error Extension are a
subset of the status codes defined in the specification for Mobile
IPv4 [4]. If, in the future, additional status codes are defined for
Mobile IPv4, the definition for each new status code must indicate
whether the new status code is allowable for use in the FA Error
Extension.

8. Security Considerations

The extension in this document improves the security features of
Mobile IPv4 by allowing the mobile node to be assured of the
authenticity of the information supplied within a Registration
Request. Previously, whenever the foreign agent was required to
provide status information to the mobile node, it could only do so by
destroying the ability of the mobile device to verify the Mobile-Home
Authentication Extension data.

In many common cases, the mobile node will not have a security
association with the foreign agent that has sent the extension.
Thus, the mobile node will be unable to ascertain that the foreign
agent sending the extended Registration Reply message is the same
foreign agent that earlier received the associated Registration
Request from the mobile node. Because of this, a malicious foreign
agent could cause a mobile node to operate as if the registration had
failed, when in fact its home agent and a correctly operating foreign
agent had both accepted the mobile node’s Registration Request. In
order to reduce the vulnerability to such maliciously transmitted
Registration Reply messages with the unauthenticated extension, the
mobile node MAY delay processing of such denied Registration Reply
messages for a short while in order to determine whether another
successful Registration Reply might be received from the foreign
agent.

9. Acknowledgements

Thanks to Kent Leung and Henrik Lefkowitz for suggested improvements
to this specification.

10. Normative References

[1] Bradner, S., "Key words for use in RFCs to Indicate Requirement


Considerations Section in RFCs", BCP 26, RFC 2434, October 1998.

2002.

1980.

Author’s Address

Charles E. Perkins
Palo Alto Systems Research Lab
Nokia Research Center
975 Page Mill Road, Suite 200
Palo Alto, CA 94304-1003

Phone: +1 650-496-4402
Fax: +1-650-739-0779
EMail: charles.perkins@nokia.com
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