Network Working Group
Request for Comments: 5446
Category: Informational

J. Korhonen
Nokia Siemens Networks
U. Nilsson
TeliaSonera

February 2009

Service Selection for Mobile IPv4

Status of This Memo

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Abstract

In some Mobile IPv4 deployments, identifying the mobile node or the mobility service subscriber is not enough to distinguish among the multiple services possibly provisioned to the mobile node. The capability to specify different services in addition to the mobile node's identity can be leveraged to provide flexibility for mobility service providers to provide multiple services within a single mobility service subscription. This document describes a Service Selection extension for Mobile IPv4 that is intended to assist home agents to make specific service selections for their mobility service subscriptions during the registration procedure.

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1. Introduction

Mobile IPv4 [RFC3344] can identify mobile nodes in various ways, including home addresses [RFC3344] and Network Access Identifiers (NAIs) [RFC4282] [RFC2794]. In some Mobile IPv4 deployments, identifying the mobile node (MN) or the mobility service subscriber via a Proxy Mobile IPv4 client [LEUNG] (hereafter, the mobile node and the Proxy Mobile IPv4 client are used interchangeably) is not enough to distinguish among the multiple services possibly provisioned to the mobile node.

The capability to specify different services in addition to the mobile node's identity can be leveraged to provide flexibility for mobility service providers to provide multiple services within the same mobility service subscription. For example:

- Provide an enterprise data access for which the mobility service provider hosts connectivity and mobility services on behalf of the enterprise.

- Provide access to service domains that are otherwise not accessible from public networks because of some mobility service providers' business reasons.

- Provide simultaneous access to different service domains that are separated based on policies of the mobility service provider.

- Enable easier policy assignment for mobility service providers based on the subscribed services.

This document describes a Service Selection extension for Mobile IPv4 that is intended to assist home agents to make specific service selections for their mobility service subscriptions during the registration procedure. A Mobile IPv6-equivalent Service Selection Mobility Option has been described in [RFC5149]. The service selection may affect home agent routing decisions, Home Address assignment policies, firewall settings, and security policies. When the service selection is used, every Registration Request must contain the Service Selection extension. The Service Selection extension from the Registration Request may be echoed back in the Registration Reply.

In absence of a specifically indicated service, the home agent must act as if the default service, plain Internet access, had been requested. There is no absolute requirement that this default service would be allowed to all subscribers, but it is highly recommended in order to avoid having normal subscribers employ operator-specific configuration values in order to get basic service.

Some of the potential use cases were listed earlier in this section. The general aim is better manageability of services and service provisioning, from both operators' and service providers' points of view. However, it should be understood that there are potential deployment possibilities where selecting a certain service may restrict simultaneous access to other services from a user point of view (e.g., a "walled garden"). For example, services may be located in different administrative domains or external customer networks that practice excessive filtering of inbound and outbound traffic.

2. Requirements

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 [RFC2119].

3. Service Selection Extension

At most one Service Selection extension MAY be included in any Mobile IPv4 Registration Request message. When the service selection is used, the Service Selection extension MUST be included in every Registration Request message. In absence of a specifically indicated service in the Registration Request for the initial registration or re-registration, the home agent MUST act as if the default service, such as plain Internet access, had been requested. The Service Selection extension MUST be placed in the Registration Request message as follows:

- When present, the extension MUST appear after the MN-NAI extension, if the MN-NAI is also present in the message.

- If the extension was added by the mobile node to a Registration Request, it MUST appear prior to any authentication-enabling extensions [RFC3344] [RFC4721].

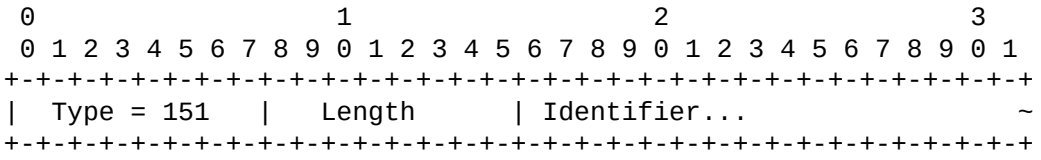
- In the event the foreign agent adds the Service Selection extension to a Registration Request, the extension MUST appear prior to any Foreign-Home authentication-enabling extensions [RFC3344].

The home agent MAY echo the received Service Selection extension option back in a Mobile IPv4 Registration Reply message. The echoed Service Selection extension MUST be an unchanged copy of the Service Selection extension received in the corresponding Registration Request message. The Service Selection extension MUST be placed in the Registration Reply message as follows:

- If the extension was originally added by the mobile node to a Registration Request, it MUST appear in the Registration Reply prior to any authentication-enabling extensions [RFC3344] [RFC4721].

- If the foreign agent added the Service Selection extension to a Registration Request, the extension MUST appear in the Registration Reply prior to any Foreign-Home authentication-enabling extensions [RFC3344].

The Service Selection extension has the following format:



Service Selection Extension

- Type: 8-bit identifier set to 151 (the type of this skippable extension).

- Length: 8-bit unsigned integer, representing the length of the Service Selection extension in octets, excluding the Type and Length fields. A value of zero (0) is not allowed.

- Identifier: A variable-length, encoded service-identifier string used to identify the requested service. The identifier string length is between 1 and 255 octets. This specification allows international identifier strings that are based on the use of Unicode characters, encoded as UTF-8 [RFC3629] and formatted using Normalization Form KC (NFKC) as specified in [NFKC].

  'ims', 'voip', and 'voip.companyxyz.example.com' are valid examples of Service Selection extension Identifiers. At minimum the Identifier MUST be unique among the home agents to which the mobile node is authorized to register.

4. Processing Considerations

4.1. Mobile Node Considerations

A mobile node or its proxy representative MAY include the Service Selection extension into any Registration Request message. The Service Selection extension can be used with any mobile node identification method. The extension is used to identify the service to be associated with the mobility session; if the service selection is used, the Service Selection extension MUST be included into every Registration Request message sent to a home agent. If the mobile node wishes to change the selected service, it is RECOMMENDED that the mobile node de-register the existing binding with the home agent before proceeding with a binding registration for a different service. The provisioning of the service identifiers to the mobile node or its proxy representative is out of the scope of this specification.

If the mobile node receives a Registration Reply message with a Code set to SERVICE_AUTHORIZATION_FAILED and the mobile node has an existing binding with the Home Address used in the failed Registration Request message, the mobile node MUST delete the existing binding. If there is no existing binding, the mobile node proceeds as with any failed initial registration.

4.2. Home Agent Considerations

Upon receiving the Service Selection extension, the home agent authenticates and authorizes the mobile node. If the home agent supports the Service Selection, it MUST also verify that the mobile node is authorized to the service identified by the Service Selection extension. The services the mobile node is authorized to SHOULD be part of the general mobile node subscription data. If the mobile node is not authorized to the service, or the home agent does not

recognize the identified service, the home agent MUST deny the registration and send a Registration Reply with a Code SERVICE_AUTHORIZATION_FAILED (error code 151).

The Service Selection extension is used to assist the mobile node authorization phase and identifies a specific service that is to be authorized. The Service Selection extension MAY also affect the Home Address allocation when, for example, used with the MN-NAI extension. For example, for the same NAI, there MAY be different Home Addresses, depending on the identified service. Furthermore, the Service Selection extension MAY also affect the routing of the outbound IP packets in the home agent depending on the selected service. The home agent MAY also apply different policy or quality of service treatment to traffic flows based on the selected service.

If the newly arrived Registration Request message with a Service Selection extension indicates a change in the selected service, then the home agent MUST re-authorize the mobile node. The absence of the Service Selection extension MUST be treated as a request for the default service, which may also cause the re-authorization of the mobile node. Depending on the home agent's policies, the services policies, the Home Address allocation policies, and the subscription policies, the home agent may or may not be able to authorize the mobile node to the new service. For example the existing service and the new service could require different Home Addresses. If the authorization fails, then the home agent MUST deny the registration, delete any binding with the existing Home Address, and send a Registration Reply with a Code set to SERVICE_AUTHORIZATION_FAILED (error code 151).

Depending on the local home agent's policy, the home agent MAY echo the Service Selection extension in the corresponding Registration Reply message towards the mobile node or the foreign agent. The home agent MUST NOT change the content of the echoed Service Selection extension.

4.3. Foreign Agent Considerations

A foreign agent MUST skip the Service Selection extension if the Registration Request already contains the Service Selection extension. If the Registration Request does not contain the Service Selection extension, the foreign agent MAY add the Service Selection extension to the Registration Request message. How the foreign agent learns the service that the mobile node needs to authorize is outside the scope of this document.

In the case a foreign agent added the Service Selection extension to the Registration Request on behalf of the mobile node, it MUST verify whether the corresponding Registration Reply message from a home agent also contains an echoed Service Selection extension. If the received Registration Reply message contains the echoed Service Selection extension, the foreign agent MUST NOT include the extension to the Registration Reply message that gets forwarded to the mobile node.

5. Security Considerations

The protection for the Service Selection extension depends on the service that is being identified and eventually selected. If the service selection information should not be revealed on the wire, it should be protected in a manner similar to Registration Requests and Registration Replies. The Service Selection extension is protected by the same authentication-enabling extension as the rest of the Registration Request message.

The home agent MUST verify that the mobile node is authorized to the service included in the Service Selection extension. The Service Selection extension authorization is part of the normal mobile node registration and authentication procedure. Both registration authentication and service authorization MUST succeed before the mobile node is allowed to register to the home agent.

6. IANA Considerations

A new Mobile IPv4 Extension type has been assigned in the "Extensions appearing in Mobile IP control messages" registry for the extension described in Section 3. The Extension type has been allocated from the 'skippable' range (128-255):

Service Selection Extension	is set to 151

A new Mobile IPv4 error code has been assigned in the "Registration denied by the home agent" section of the "Code Values for Mobile IP Registration Reply Messages" registry. The error code has been allocated from the 'Error Codes from the Home Agent' range (128-192):

SERVICE_AUTHORIZATION_FAILED	is set to 151

7. Acknowledgments

The authors would like to thank Henrik Levkowetz, Kent Leung, Spencer Dawkins, and Jari Arkko for their comments. Jouni Korhonen also acknowledges TeliaSonera and the TEKES MERCoNe project, where most of the work was conducted.

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Authors' Addresses

Jouni Korhonen
Nokia Siemens Networks
Linnoitustie 6
FIN-02600 Espoo
FINLAND

EMail: jouni.nospam@gmail.com

Ulf Nilsson
TeliaSonera Corporation
Marbackagatan 11
S-123 86 Farsta
SWEDEN

EMail: ulf.s.nilsson@teliasonera.com