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Generic Signaling Message for Mobile IPv6
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Abstract

This document specifies a new Mobility Header message type that allows Mobile IPv6 entities to send and receive generic signaling messages.

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[1.](#) Introduction

[RFC 3775](#) [[RFC3775](#)] contains no provision for Mobile IPv6 entities, such as a home agent or mobile node, to send and receive signaling messages during a mobility session.

This document describes a generic signaling message protocol that can be used by Mobile IPv6 entities for sending and receiving simple signaling events.

It also provides common semantics and a framework that can be used for defining new event types, and carrying them using the protocol defined in this document.

The document does not define any specific events, or the corresponding actions that the receiver is required to do upon receiving an event. The receiver actions specified in this document are within the scope of the message delivery and acknowledgment that

are common to all events carried using this messaging protocol.

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2. 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 [RFC-2119](#) [[RFC2119](#)].

3. Generic Signaling Messages

The messages described below follow the Mobility Header format specified in [Section 6.1 of \[RFC3775\]](#):

```

+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| Payload Proto | Header Len   | MH Type     | Reserved    |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                Checksum                |
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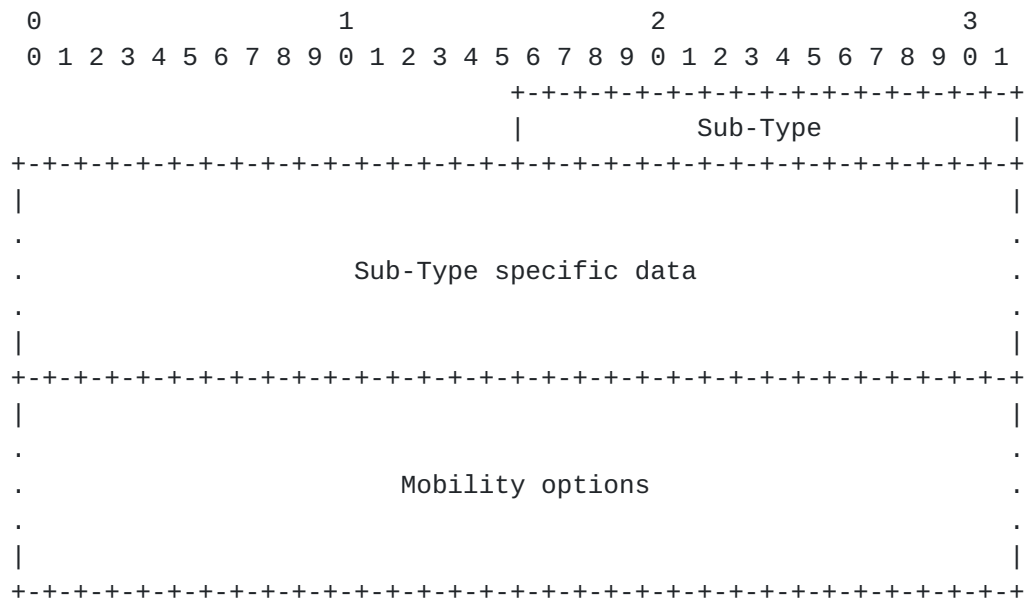
```

Message Data

3.1 Generic Signaling Messages

The Generic Signaling messages are used by the home agent to notify the mobile node, or vice-versa, that there is an event that requires attention. This packet is sent as described in [Section 5](#).

The Generic Signaling messages use the MH Type value (TBD1) or (TBD2). When either value is indicated in the MH Type field, the format of the Message Data field in the Mobility Header is as follows:



Sub-Type

A 16-bit unsigned integer. This field describes the particular type of notification which is carried in the Generic Signaling message.

This specification defines three Sub-types valid for the Generic Signaling message.

Sub-Type specific data

Variable-length field containing data specific to the Sub-Type.
This could be zero bytes in length.

This specification defines two Sub-type data layouts valid for the Generic Signaling message.

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Variable-length field of such length that the complete Mobility Header is an integer multiple of 8 octets long. This field contains zero or more TLV-encoded mobility options. The encoding and format of defined options MUST follow the format specified in [Section 6.2 of \[RFC3775\]](#). The receiver MUST ignore and skip any options with it does not understand.

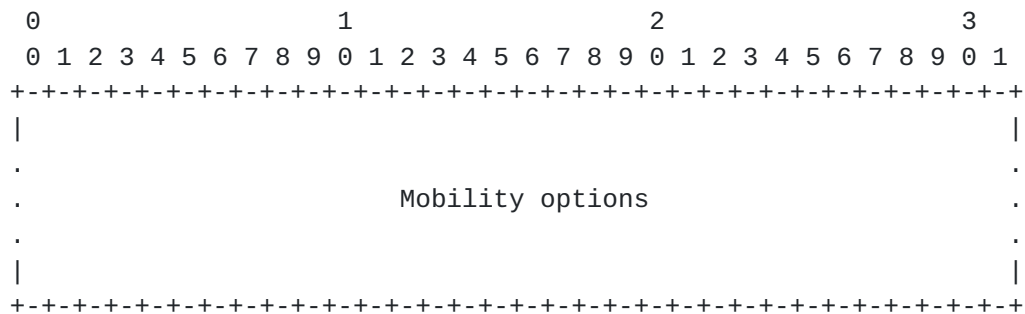
This specification does not define any options valid for the Generic Signaling message.

4. Generic Signaling Sub-types

4.1 Generic Signaling Option Sub-type

The Generic Signaling Option sub-type specifies an un-bounded signaling message. This packet is sent as described in [Section 5](#).

The Generic Signaling Option uses the sub-type value 0 (zero). When this value is indicated in the Sub-Type field, there is no data contained in the Sub-Type Specific Data field in the Generic Signaling message, there are only Mobility Options, and the format is as follows:



Mobility options

Variable-length field of such length that the complete Mobility Header is an integer multiple of 8 octets long. This field contains zero or more TLV-encoded mobility options. The encoding and format of defined options MUST follow the format specified in [Section 6.2 of \[RFC3775\]](#). The receiver MUST ignore and skip any options which it does not understand.

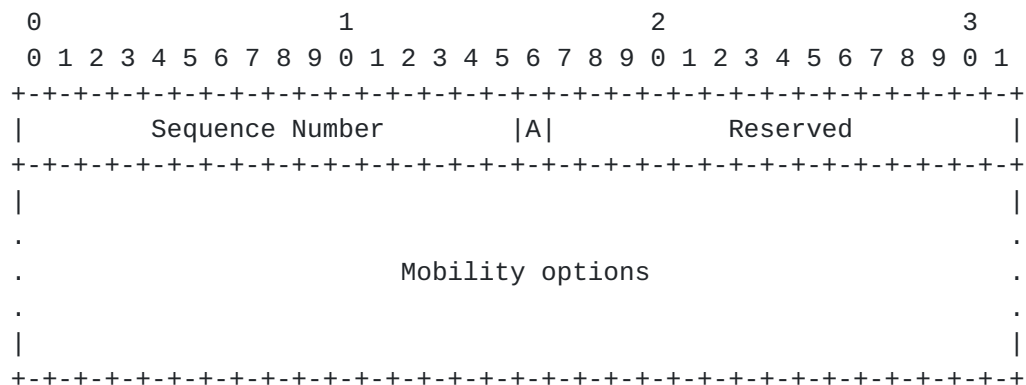
This specification does not define any options valid for the Generic Signaling Option message.

If no options are present in this message, no padding is necessary and the Header Len field in the Mobility Header will be set to 0.

4.2 Generic Signaling Request Sub-type

The Generic Signaling Request sub-type specifies a sequenced type of signaling message. This packet is sent as described in [Section 5](#).

The Generic Signaling Request uses the sub-type value 1. When this value is indicated in the Sub-Type field, the format of the Sub-Type Specific Data field in the Generic Signaling message is as follows:



Sequence Number

A 16-bit unsigned integer used by the receiving node to sequence Signaling Requests and by the sending node to match a returned Signaling Acknowledgement with this Signaling Request.

Acknowledge (A)

The Acknowledge (A) bit is set by the sender to request a Signaling Acknowledgement ([Section 4.3](#)) be returned upon receipt of a Signaling Request.

Reserved

These fields are unused. They MUST be initialized to zero by the sender, and MUST be ignored by the receiver.

Mobility options

Variable-length field of such length that the complete Mobility Header is an integer multiple of 8 octets long. This field contains zero or more TLV-encoded mobility options. The encoding and format of defined options MUST follow the format specified in [Section 6.2 of \[RFC3775\]](#). The receiver MUST ignore and skip any options with it does not understand.

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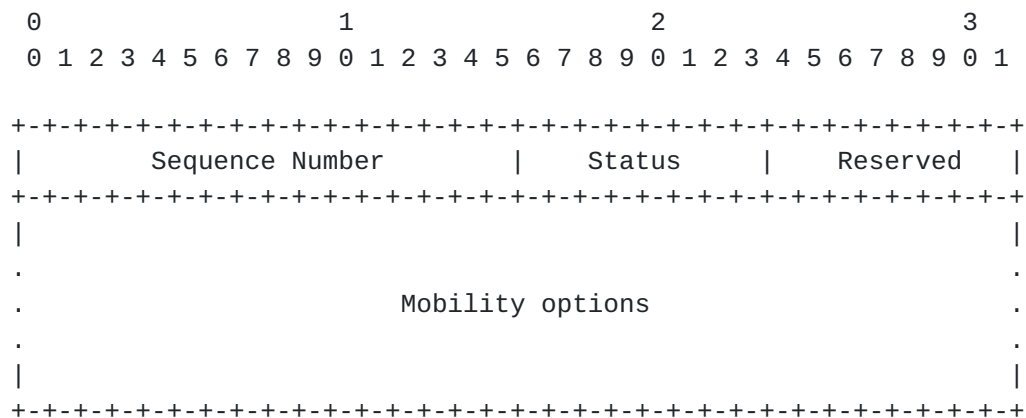
This specification does not define any options valid for the Signaling Request message.

If no options are present in this message, no padding is necessary and the Header Len field in the Mobility Header will be set to 0.

4.3 Generic Signaling Acknowledgement Sub-type

The Generic Signaling Acknowledgement sub-type is used to acknowledge receipt of a Generic Signaling Request ([Section 4.2](#)). This packet is sent as described in [Section 5](#).

The Generic Signaling Acknowledgement uses the Sub-Type value 2. When this value is indicated in the Sub-Type field, the format of the Sub-type Specific Data field in the Generic Signaling message is as follows:



Sequence Number

The sequence number in the Signaling Acknowledgement is copied from the sequence number field in the Signaling Request. It is used by the receiving node in matching this Signaling Acknowledgement with an outstanding Signaling Request.

Status

8-bit unsigned integer indicating the disposition of the Signaling Request. Values of the Status field less than 128 indicate that the Signaling Request was accepted by the receiving node. Values greater than or equal to 128 indicate that the Signaling Request was rejected by the receiving node. The following Status values are currently defined:

```
0 Signaling Request accepted
```


- 128 Reason unspecified
- 129 Administratively prohibited
- 130 Insufficient resources
- 131 Unsupported mobility option
- 132 Not home agent for this mobile node

Mobility options

Variable-length field of such length that the complete Mobility Header is an integer multiple of 8 octets long. This field contains zero or more TLV-encoded mobility options. The encoding and format of defined options MUST follow the format specified in [Section 6.2 of \[RFC3775\]](#). The receiver MUST ignore and skip any options with it does not understand.

This specification does not define any options valid for the Signaling Request sub-type.

If no options are present in this message, no padding is necessary and the Header Len field in the Mobility Header will be set to 0.

[5. Sending Generic Signaling Messages](#)

When sending a Generic Signaling message, the sending node constructs the packet as it would any other Mobility Header, except:

- o The MH Type field MUST be set to (TBD1) if IPsec protection of the message is not required.
- o The MH Type field MUST be set to (TBD2) if IPsec protection of the message is required. In this case, the Generic Signaling Request message MUST use the home agent to mobile node IPsec ESP authentication SA for integrity protection

[5.1 Sending Generic Signaling Option Messages](#)

When sending a Generic Signaling Option, the sending node just adds mobility options to the message.

[5.2 Sending Generic Signaling Request Messages](#)

When sending a Generic Signaling Request message, the sending node constructs the packet as specified in [Section 5](#), except:

- o The Acknowledge (A) bit MAY be set to indicate the receiver must send a Generic Signaling Acknowledgement.

5.3 Sending Generic Signaling Acknowledgement Messages

A Generic Signaling Acknowledgement message should be sent to indicate receipt of a Generic Signaling Request as follows:

- o If the Generic Signaling Request was discarded because it does not meet the requirements as specified in [\[RFC3775\]](#) described in [Section 6](#), a Generic Signaling Acknowledgement MUST NOT be sent. Otherwise, the treatment depends on the below rule.
- o If the Acknowledgement (A) bit is set in the Generic Signaling Request, a Generic Signaling Acknowledgement MUST be sent. Otherwise, the treatment depends on the below rule.
- o If the Generic Signaling Request was discarded for any other reason, a Generic Signaling Acknowledgement SHOULD be sent.

If the Source Address field of the IPv6 header that carried the Generic Signaling Request does not contain a unicast address, the Generic Signaling Acknowledgement MUST NOT be sent, and the Generic Signaling Request packet MUST be silently discarded. Otherwise, the acknowledgement MUST be sent to the Source Address.

6. Receiving Generic Signaling Messages

Upon receiving a Generic Signaling message, the Mobility Header MUST be verified as specified in [\[RFC3775\]](#), specifically:

- o The Checksum, MH type, Payload Proto and Header Len fields MUST meet the requirements of [Section 9.2 of \[RFC3775\]](#).
- o If the MH Type field is set to (TBD2) (IPsec protection of the message is required), then the packet MUST be covered by the home agent to mobile node IPsec ESP authentication SA for integrity protection.

If the packet is dropped due to the above tests, the receiving node MUST follow the processing rules as [Section 9.2 of \[RFC3775\]](#). For example, it MUST send a Binding Error message with the Status field set to 2 (unrecognized MH Type value) if it does not support the message type.

- o If the Generic Signaling message is valid according to the tests above, then it is processed according to the rules specific to the Sub-Type specified in the header.

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Subsequent checks depend on the current mode of operation of the node.

6.1 Receiving Generic Signaling Option Messages

If the Generic Signaling Option message is valid according to the tests in [Section 6](#), then it is processed further as follows:

- o If the receiving node does not allow Generic Signaling Option messages, or does not support the type of Mobility Option in the message, it MUST reject the request and SHOULD silently discard the message.

Subsequent checks depend on the current mode of operation of the node.

6.2 Receiving Generic Signaling Request Messages

If the Generic Signaling Request message is valid according to the tests in [Section 6](#), then it is processed further as follows:

- o If the receiving node does not allow Generic Signaling Request messages, it MUST reject the request and SHOULD return a Generic Signaling Acknowledgement to the sender in which the Status field is set to 129 (administratively prohibited).
- o If the receiving node does not support the type of Mobility Option in the Generic Signaling Request message, it MUST reject the request and SHOULD return a Generic Signaling Acknowledgement to the sender in which the Status field is set to 131 (unsupported mobility option).

Subsequent checks depend on the current mode of operation of the node.

6.2.1 Mobile Node Operation

If the mobile node rejects the Generic Signaling Request message for any other reason than specified in [Section 6](#), it SHOULD return a Generic Signaling Acknowledgement to the home agent in which the Status field is set to 128 (reason unspecified).

6.2.2 Home Agent Operation

If the receiving node is a home agent, it MUST perform these additional checks:

- o If the home agent has no entry marked as a home registration in its Binding Cache for this mobile node, then this node **MUST** reject the request and **SHOULD** return a Generic Signaling Acknowledgement to the mobile node in which the Status field is set to 132 (not home agent for this mobile node).
- o If the home agent cannot process the Generic Signaling Request message because it is over-utilized, it **MUST** reject the request and **SHOULD** return a Generic Signaling Acknowledgement to the mobile node in which the Status field is set to 130 (insufficient resources).

If the home agent rejects the Generic Signaling Request message for any other reason, it **SHOULD** return a Generic Signaling Acknowledgement to the mobile node in which the Status field is set to 128 (reason unspecified).

6.2.3 Retransmissions

If the sender has set the Acknowledge (A) bit in the Generic Signaling Request, but does not receive a Generic Signaling Acknowledgement, then it **MAY** retransmit the message, until a response is received. The initial value for the retransmission timer is INITIAL_MH_SIGNALING_TIMEOUT. The retransmissions by the sender **MUST** use an exponential back-off mechanism, in which the timeout period is doubled upon each retransmission, until either the sender gets a response from the target node, or the timeout period reaches the value MAX_MH_SIGNALING_TIMEOUT.

7. Protocol Constants

INITIAL_MH_SIGNALING_TIMEOUT	5 seconds
MAX_MH_SIGNALING_TIMEOUT	20 seconds

8. IANA Considerations

Two new Mobility Header types are required for the following new message described in [Section 2](#):

- (TBD1) Generic Signaling Message with
- (TBD2) Secure Generic Signaling Message

New Generic Signaling Message Sub-Types are required for the following described in [Section 4](#):

- 0 Generic Signaling Option
- 1 Generic Signaling Request
- 2 Generic Signaling Acknowledgement

9. Security Considerations

Considerations have been made to support an "insecure" Generic Signaling Message type, MH type (TBD1).

In addition, a secure message, called the Secure Generic Signaling message, MH type (TBD2), is specified. This message MUST use the home agent to mobile node ESP encryption SA for confidentiality protection, and MUST use the home agent to mobile node ESP authentication SA for integrity protection.

The Secure Generic Signaling message MAY use the IPsec ESP SA in place for Binding Updates and Acknowledgements as specified in [Section 5.1 of \[RFC3775\]](#), in order to reduce the number of configured security associations. This also gives the message authenticity protection.

10. References

10.1 Normative Reference

10.2 Informative references

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