Abstract

This draft addresses the problems of routing datagrams to nodes located in an IPv6 mobile network. A mobile network is one or more IP-subnets attached to a mobile router and mobile as a unit. The mobile router dynamically changes its point of attachment. Applications of mobile networks include networks attached to people (PANs) and networks of sensors deployed in an aircraft, a boat, or a car.

Mobile IPv6 [4] is a solution that has been developed to support mobile nodes, i.e. mobile hosts and mobile routers. We discuss its ability to support an entire network attached to a mobile router and
show, by means of an experiment, that the Home Agent is unable to redirect packets to the mobile network, and that optimal routing can not be performed. Indeed, some implementations may interpret the Mobile IPv6 specification in a way that would allow the HA to redirect packets to the mobile network, but we advocate that is surely leading to misinterpretation and therefore pitfalls.

We therefore propose to extend Mobile IPv6 with Prefix Scope Binding Updates to support mobile networks in the Internet. Prefix Scope Binding Updates both allow redirection from the HA to the mobile network in a clean way and optimal routing. Prefix Scope Binding Updates contain a binding between a prefix and a care-of address. All nodes in the mobile network share the same Mobile Network Prefix and the care-of address belongs to the Mobile Router. As a result of the reception of a Prefix Scope Binding Update, the receiver is able to route via the care-of address of the Mobile Router all packets intended to nodes in the mobile network.

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Introduction

Mobile IPv4 [8] and Mobile IPv6 [4] have introduced mobility support for IPv4 and IPv6 [3] nodes respectively. The purpose of mobility support is to provide continuous Internet connectivity to mobile nodes. Mobile IP is a solution to support mobile nodes but does not handle mobile networks.

There are situations where an entire network might move and attach to different places in the Internet topology. In this draft, we refer to a network as a set of nodes that share the same IP prefix and that are attached to the Internet through a single border router. We refer to a mobile network as a network whose border router dynamically changes its point of attachment to the Internet and thus its reachability in the IP topology. A mobile network may be composed by one or more IP-subnets. The internal architecture of a mobile network is preserved while it is roaming. As such, nodes in the mobile network do not move with respect to the others and shouldn’t take part in mobility management.

Applications of mobile networks include networks attached to people (Personal Area Network or PANs) and networks of sensors deployed in aircrafts, boats, cars, trains, etc. (see [8] section 4.5). As an example of a mobile network, we could imagine that an airways company provides permanent on-board Internet connectivity. This allows all passengers to use their laptops to connect to remote hosts, download music or video from any provider, or browse the web. The Internet could also be used to exchange information between the aircraft and air traffic control stations. During the flight, the aircraft changes
its point of attachment to the Internet and is reachable by distinct IP addresses owned by distinct Internet service providers. This scenario justifies that mobile networks may be of a big size, containing hundreds of hosts and several routers and may attach to very distant parts of the Internet topology.

Although the designers of Mobile IPv4 claim that it could support mobile networks equally as mobile nodes ([8] section 4.5, [9] section 5.12, [7] section 11.2), we argue that this is not true for Mobile IPv6. Indeed, we have carefully studied the adequacy of Mobile IPv6 for supporting mobile networks and we came to the conclusion that some modifications are needed to support them.

![Diagram](image)

Figure 1: Mobile Network attached to its home link

2. Terminology

2.1. General terms and Mobile IPv6 terms

General terms and Mobile IPv6 terms are as defined in the Mobile IPv6 specification [4].
2.2. Mobile Network specific terms

Mobile Network
A set of nodes which are mobile, as a unit, with respect to the rest of the Internet, i.e. a Mobile Router and all its attached nodes. The Mobile Router is dynamically changing its point of attachment to the Internet and thus its reachability in the IP topology. All nodes in the mobile network share the same IP prefix: the Mobile Network Prefix. Note that a Mobile Network may be composed by one or more IP-subnets.

Mobile IP-subnet
A Mobile Network that is limited to a single IP-subnet.

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Figure 2: Mobile Network attached to a foreign link

Mobile Router (MR)
The border router of the mobile network which attaches the mobile network to the rest of the Internet. The MR has (at least) two interfaces. The first interface is attached to the home link if the mobile network is at home, or it is attached to a foreign link if the mobile network is in a foreign...
network. Other interfaces are attached to links internal to the mobile network and are configured with the Mobile Network Prefix (see below). The Mobile Router maintains the Internet connectivity for the mobile network. It is used to route packets between the mobile network and the fixed Internet.

Stationary Node (SN)
Any host or router permanently located within the mobile network and that is fixed with respect to the MR.

Visiting Mobile Node (VN)
A Mobile Node mobile with respect to the mobile network that is temporarily visiting the mobile network and whose home network is not the mobile network itself. A VN may visit the mobile network and obtain a care-of address from a router within the mobile network.

Local Mobile Node
A Mobile Node mobile with respect to the mobile network whose home network is the mobile network itself.

Node behind the MR
A node behind the MR is a Mobile Network Node (MNN). See definition of MNN.

Mobile Network Node (MNN)
Any host or router located within the mobile network, either permanently or temporarily. (Mobile Router, Stationary Node, Visiting Mobile Node or a Local mobile Node). From the fixed network, a MNN is seen as a "Node behind the Mobile Router".

Correspondent Node (CN)
External nodes corresponding with one or more MNNs of the mobile network.

Foreign Gateways (FGs)
Subsequent points of attachment of the mobile network

Mobile Network Prefix

The network prefix that is common to all IP addresses in the Mobile Network when the Mobile Router is attached to the home link. For a mobile network containing only one subnet, the Mobile Network Prefix is the prefix of this subnet ("home subnet prefix" as defined in [4]). Note that the Mobile Network Prefix is NOT the home subnet prefix (i.e. the IP subnet prefix corresponding to the mobile node’s home address, as defined in [4]).
An organization wishing to support larger mobile networks may decide to split the SLA field of the IPv6 address in several sub-fields (SLA1, SLA2). In this case, the mobile network may be identified by a unique SLA1 field. If the length of the SLA1 field is 8 bits, the length of the Mobile Network Prefix is 60 bits and the mobile network could contain up to $2^{4}$ subnets.

Figure 1 illustrates a mobile network attached to its home link. In figure 2, the mobile network has moved and attaches to a foreign link. Figure 3 illustrates a larger mobile network.

2.3. Assumptions

In order to keep things as simple as possible, we make the following assumptions in our draft:

- the mobile network attaches to the Internet through only one
mobile router.

- the mobile router is not multihomed.

- all nodes and interfaces in the mobile network are configured with a common and unique prefix: the mobile network prefix.

- nodes behind the Mobile Router (MNNs) are only Stationary Nodes (SNs). We therefore do not consider nodes mobile with respect to the mobile network, i.e. neither local nor visiting mobile nodes (see section 2.2 for the terminology) as this is illustrated on figure 4.

Note that the proposal outlined in this draft is not limited to the above assumptions. The purpose of this draft is to allow communication between a CN and a SN. It may also be adapted to the particular case of Visiting Mobile Nodes but we have not already investigated the particular issues that may arise in this case. Note that Hierarchical Mobile IPv6 Extended Mode [12] proposes to handle this case, but may need additional features such as the ones proposed in this draft.

![Diagram](attachment:image)

**Figure 4:** Visiting Mobile Nodes - not covered by this internet draft
3. Why can’t Mobile IPv6 support mobile networks?

In this section, we first review how the Mobile IP specifications deal with mobile networks. We then show the results of an experimentation we have conducted to outline Mobile IPv6’s inability to support mobile networks. Then we discuss why the existing Mobile IPv6 specification is unable to support mobile networks if the mobile router MR performs Mobile IPv6.

3.1. Review of Mobile IP and Mobile Networks

The Mobile IPv4 specification proposes to support mobile networks as standard mobile nodes (see [8] section 4.5, [9] section 5.12, [7] section 11.2). In this situation, the mobile node is the border router MR of the mobile network. It has a permanent home address on its home link and gets a new care-of address at each subsequent point of attachment. As any mobile node, MR sends a Binding Update to its home agent HA to instruct it to intercept and tunnels packets to its care-of address. The HA is therefore able to intercept packets destined to the home address of MR.

In order to intercept packets intended to Stationary Nodes on the mobile network:

- either the Home Agent may be configured to have a permanent registration for each Stationary Node that indicates the Mobile Router’s address as the Stationary Node’s care-of address.
- either the mobile router may advertise connectivity to the entire mobile network using normal IP routing protocols.

Mobile IPv6 and Mobile IPv4 with Routing Optimization [11] could actually support mobile networks similarly as in Mobile IPv4. However, although mentioned in the Mobile IPv4 specification, the current specifications of Mobile IPv4 with Routing Optimization and Mobile IPv6 don’t mention them anymore.

3.2. Experimentation

The following sections describe an experimentation that shows that the existing Mobile IPv6 specification does not allow to route a packet from the fixed Internet to a Stationary Node on the mobile network. This experimentation has been conducted on our IPv6 test bed using Francis Dupont "INRIA" IPv6 implementation under FreeBSD.

3.2.1. Test Bed
As this is illustrated on figure 5, the Mobile Router MR has two interfaces. The first is attached to the home link (3ffe:306:1130:100::/64) and is configured with the home address (3ffe:306:1130:100::eui64). The second interface is on the Mobile Network (3ffe:306:1130:200::/64).


3.2.2. Registration with the Home Agent

MR obtains a care-of address on the foreign link and registers its primary care-of address with its Home Agent HA. Once it receives a valid Binding Update, HA records in its Binding Cache the binding between the home address of the sender and its care-of address. The home address is used as the key for searching the Binding Cache ([4] section 4.6). In order to intercept packets, HA claims it is the MR. This is performed by the way of a "gratuitous" Neighbor Advertisement message on behalf of the mobile node (i.e. MR), as described in section 9.5 of the Mobile IPv6 specification.

More precisely, when it receives a home registration from MR, the HA:

- opens a NDP proxy to intercept packets addressed to the home address of MR.
- opens a tug (a virtual interface, i.e. IPv6 in IPv6 tunnel) between the care-of address of MR and itself.
- adds a host-specific route (a route to a host, not to a prefix) for the home address of MR via its care-of address through the tug.

3.2.3. First experiment: Communication between CN and MR

CN sends a ping packet to MR’s home address (3ffe:306:1130:100::eui64). When the packet gets to the home network, BR sends NDP messages to discover the MAC address of MR. HA answers with its address on behalf of MR. The packet gets routed to the HA. In the standard IPv6 input function of the HA, the packet is routed through the tug, i.e. tunneled to MR’s care-of address.
3.2.4. Second experiment: Communication between CN and SN1

CN sends a ping packet to node SN1’s IP address (3ffe:306:1130:200::eui64). When the packet gets to the home network, BR checks its routing table to reach SN1. BR has a route to the mobile network; MR’s home address is the next hop towards SN1. BR sends NDP messages to discover the MAC address of MR. HA answers with its address on behalf of the MR. The HA intercepts the packet, but does not have a route to the mobile network. So it sends the ping packet to its default route (i.e. the BR) which forwards it again to the HA. THE PING PACKET ENTERS A ROUTING LOOP UNTIL THE TTL EXPIRES.

Figure 5: Packets sent from CN to SN1 are dropped by Home Agent

3.3. Discussion

We see that obtaining a care-of address and requesting the HA to redirect incoming packets intended for the MR doesn’t require
modifications in the Mobile IPv6 specification as this could be done independently for a host or for a router. As a result, packets destined to the MR are correctly intercepted by the HA and tunneled to the MR.

However, although the HA is able to intercept datagrams intended to the Stationary Nodes on the mobile network, it is unable to encapsulate them to the care-of address of the MR because it does not have a route to the mobile network. The MR registration only tells the HA to record a host-specific route in its routing table. A network route for the mobile network prefix (prefix of the second interface of MR) via the care-of address of MR is missing.

Indeed, some other implementations of the Mobile IPv6 specification interpret the behavior of the Home Agent in face of a Mobile Router registration. In such implementation, the HA may have a network route for the mobile network via the care-of address of the MR. We advocate that such implementations do not strictly follow the Mobile IPv6 specification and may probably not complain with it. Leaving too much room for interpretation surely leads to misinterpretation and pitfalls, not to say security holes. Then, this lack should at least be clarified in an updated version of the Mobile IPv6 specification.

3.4. Conclusion

Since the HA is unable to redirect packets intended to the Stationary nodes and CNs don’t have an entry in their Binding Cache to route packets directly to the Stationary Nodes, no communication at all is possible between CNs and the Stationary Nodes.

We conclude that the Mobile IPv6 specification needs:

- to be at least explicitly clarified in order for the HA to redirect all packets intended to the mobile network, but extensions are more likely needed.
- to be extended in order to transmit packets from the CN to the Stationary Nodes by the most optimal route.

4. Mobile IPv6 extensions to support mobile networks

4.0. Overview

According to the observations made in section 3.2.4, we propose to extend Mobile IPv6 with "Prefix Scope Binding Updates". Instead of establishing a one-to-one relationship between a home address and a
care-of-address, the binding establishes a many-to-one relationship between the set of nodes that share the same mobile network prefix and a care-of-address. Prefix Scope Binding Updates are Binding Updates that associate a care-of-address with the mobile network prefix instead of the full 128-bits IPv6 home address. The mobile network prefix is used as a netmask in the Binding Cache.

The Mobile Router sends Prefix Scope Binding Updates containing both its care-of-address and the mobile network prefix to all the Correspondent Nodes that communicate with itself or any Stationary Node on the mobile network it is serving. The Prefix Scope Binding Update instructs its recipients to use the care-of-address of the Mobile Router for all packets which destination address corresponds to the mobile network prefix.

As a result, a sole copy of the Prefix Scope Binding Update allows optimal routing between a CN and any Stationary Node on the same mobile network.

The mobile network prefix is carried in a new Sub-Option and requires a new flag in the Mobile IPv6 Binding Update Option. The procedure for searching the Binding Cache is slightly modified.

4.1. Packet Format of the Binding Update

We propose to extend the Mobile IPv6 Binding Update Option with an extra flag "Prefix Scope Registration" (P) taken from the "Reserved" field. In addition, the "Mobile Network Prefix" is a new sub-option that contains the mobile network prefix.

4.1.1. New Binding Update Option format

The Binding Update option is encoded in type-length-value (TLV) format as follows:

```
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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  Option Type  | Option Length |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|A|H|R|D|P|Rsrvd| Prefix Length |        Sequence Number        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                            Lifetime                           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   Sub-Options...         |
+-+-+-+-+-+-+-+-+-+-+-+
```

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Prefix Scope Registration (P)

When set, it indicates that the sending mobile node attempts to register a care-of address for an entire network. It also requests the receiving node to process the Mobile Network Prefix Sub-Option and to re-route packets with a destination address that corresponds to the Mobile Network Prefix.

Rsrvd

This field is reduced from a 4-bit field to a 3-bit field to account for the addition of the "Prefix Scope Registration" bit. The remaining 3 bits are unused and MUST be initialized to zero by the sender and MUST be ignored by the receiver.

4.1.2. Mobile Network Prefix Sub-Option

<table>
<thead>
<tr>
<th>Sub-Option Type</th>
<th>Sub-Option Len</th>
<th>Prefix Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>+----------------</td>
<td>----------------</td>
<td>--------------</td>
</tr>
<tr>
<td>+----------------</td>
<td>Mobile Network Prefix</td>
<td></td>
</tr>
</tbody>
</table>

The Mobile Network Prefix is filled by the sending mobile node to request the receiving node to record a Prefix Scope entry in the Binding Cache (see section 4.2).

The Prefix Length field is set to the (nonzero) length of the mobile network prefix.

The Mobile Network Prefix field is set to the prefix of the mobile network.

4.2. Cache Management

4.2.1. Binding Cache entries

Each Binding Cache entry contains the same fields as defined in [4]. A new "Prefix Scope Registration" flag is added:

- a flag "Prefix Scope Registration" (P) indicating whether
or not this Binding Cache entry represents a mobile network served by a mobile router whose prefix is recorded in the "Home Address" field.

- the value of the "Prefix Length" field received in the Binding Update that created or last modified this Binding Cache entry. This field is only valid if the "Prefix Scope Registration" flag or the "Home Registration" flag is set on this Binding Cache entry. If the "Prefix Scope Registration" flag is set, the "Prefix Length" field corresponds to the length of the mobile network prefix, otherwise the meaning is as defined in [4].

- if the "Prefix Scope Registration" (P) flag is set, the "home address" field is filled with the mobile network prefix.

4.2.2. Searching the Binding Cache entries

The Binding Cache is searched for an entry corresponding to the destination address of the packet. The destination address is compared with the home address field of entries recorded in the Binding Cache.

If the "Prefix Scope Registration" flag is set in the entry under comparison, the comparison is made between the "Prefix Length" set of initial bits of the destination address and the "home address" field. If the prefix of the destination matches the mobile network prefix recorded in the entry, the destination is located in a mobile network.

If the "Prefix Scope Registration" flag is not set, the comparison is made on the 128-bits addresses. If the destination address matches the home address, the destination is a mobile node.

In both case, the care-of address of the corresponding entry is returned.

4.3. Extended Mobile IPv6 protocol operation

The Mobile Node operation is extended to set the (P) bit to 1 and to fill the Mobile Network Prefix Sub-Option when it is a Mobile Router that serves as the gateway of a mobile network. It is also extended to send Binding Updates to all CNs that communicate with any Stationary Node on the mobile network.

The Correspondent Node and the Home Agent operations are extended
to process Mobile Network Prefix Sub-Option and to transmit packets to the care-of address of the Mobile Router. The Mobile Network Prefix Sub-Option is processed if the (P) bit from the Binding Update Option is set. Packets are transmitted to the care-of address of the Mobile Router if the destination address matches the Mobile Network Prefix.

The following sections only describe changes according to sections 8, 9 and 10 of the Mobile IPv6 specification [4].

4.3.1. Correspondent Node Operation

Receiving (Prefix Scope) Binding Updates

Upon receiving a Binding Update, the CN performs validity checks as described in [4] section 8.2. In addition, if the "Prefix Scope Registration" (P) bit in the Binding Update Option is set, the CN received a Binding Update from a Mobile Router serving a mobile network. The Mobile Network Prefix Sub-Option MUST be ignored if the "Prefix Scope Registration" (P) bit from the Binding Update Option is not set.

If the Binding Update is valid, the CN creates a new entry in its Binding Cache for this mobile node. This is performed as described in [4].

In addition, if the (P) bit is set, the CN creates a second Binding Cache entry similar to the first one and copies in the Binding Cache entry the "Prefix Scope Registration" bit from the Binding Update Option, the "Prefix Length" field from the Mobile Network Prefix Sub-Option. The "Home Address" field in the Binding Cache is filled from the Mobile Network Prefix field in the Mobile Network Prefix Sub-Option.

Figure 6 shows the content of the Binding Cache.

Sending Packets

Before sending any packet, the sending node examines its Binding Cache for an entry for the destination address to which the packet is being sent (see section 4.2.2 "Searching the Binding Cache"). If the sending node has a Binding Cache entry, the sending node uses a routing header to route the packet to the destination node via the returned care-of address.
4.3.2. Home Agent Operation

Primary care-of address registration

Upon receiving a Binding Update, the HA performs validity checks as described in [4] section 9.3. In addition, if the "Prefix Scope Registration" (P) bit in the Binding Update Option is set, the HA received a Binding Update from a Mobile Router serving a mobile network. The Mobile Network Prefix Sub-Option MUST be ignored if the "Prefix Scope Registration" (P) bit from the Binding Update Option is not set.

If the Binding Update is valid, the HA creates a new entry in its Binding Cache for this mobile node as it is performed in [4].

In addition, if the (P) bit is set, the sending node is a Mobile Router and the HA creates a second Binding Cache entry similar to the first one and copies the "Prefix Scope Registration" bit from the Binding Update Option, the "Prefix Length" field from the Mobile Network Prefix Sub-Option. The "Home Address" field in the Binding Cache is filled from the Mobile Network Prefix" field in the Mobile Network Prefix Sub-Option.

Figure 6 shows the content of the Binding Cache.

Intercepting Packets

Datagrams sent by the CN to the IP address of the Stationary Node are routed towards the home link of the mobile router where they are intercepted by the HA as specified in [4] section 9.5.

Tunneling Intercepted Packets to a Mobile Node

For any packet sent to a mobile node or a Stationary Node for which the Home Agent is the original sender of the packet, the Home Agent is operating as a Correspondent Node and the procedures described in section 4.3.2 applies.

While acting as a Home Agent, the Home Agent intercepts any packet on the home link addressed to a mobile node or to a Stationary Node. The Home Agent examines its Binding Cache for an entry for the destination address to which the packet is being sent (see section 4.2.2 "Searching the Binding Cache"). If the sending node has a Binding Cache entry, the
4.3.3. Mobile Router Operation

Obtaining a care-of address

Similarly to a standard mobile node as defined in the Mobile IPv6 specification [4], the Mobile Router obtains a new care-of address at each of its subsequent points of attachment using either stateless or stateful DHCPv6 address configuration.

Figure 6: Mobile Network Prefix is recorded in the Binding Cache
Receiving encapsulated packets from the Home Agent

The Mobile Router may receive packet encapsulated to its care-of address. Those packets may indeed be intended to the Mobile Router itself or to any MNN served by the Mobile Router. The reception of an encapsulated packet tunneled from the Mobile Router’s Home Agent is an indication that the original sender may not have a Binding Cache entry for the Mobile Network Prefix. In this case, the Mobile Router may deduce that a Prefix Scope Binding Update should be sent to the original sender of the packet.

Sending Prefix Scope Binding Updates

A Mobile Router serving as a gateway to a mobile network sends Prefix Scope Binding Update datagrams to its Home Agent, its own CNs, and CNs of the Stationary Nodes it is serving. Prefix Scope Binding Updates are sent as specified in [4] section 10.6 and 10.8 and the Binding List is filled accordingly. In addition, the Mobile Router sets the "Prefix Scope Registration" bit in the Binding Update Option and inserts a Mobile Network Sub-Option. The "Prefix Length" and the "Mobile Network Prefix" fields are filled according to the Mobile Network Prefix owned by the Mobile Router.

Bypassing ingress filtering

In order to bypass ingress filtering, the Mobile Router may encapsulate all outgoing packets to the destination with its care-of address as the outer source address.

5. Security Issues

5.1. Authentication

The registration of the Mobile Router’s care-of address for a set of nodes that share the same network prefix (Mobile Network Prefix) does not break authentication and does not differ from the standard Mobile IPv6 registration for a mobile node. In Mobile IPv6, the Mobile Node is authenticated by the CN based on its home address, whatever the content of the Binding Update. Similarly, nothing breaks the authentication of the sender of a Prefix Scope Binding Update. The Mobile Router operates as a standard Mobile Node and has a home address. Authentication is still based on this home address. Recipients of the prefix scope Binding Updates are not misled about the identity of the sender. The mobile router is clearly authenticated by its HA and CNs whatever is contained in
the Binding Update.

5.2. Authorization

Recent discussion in the mailing list and IETF meetings have advocated a need to extend Mobile IPv6 with authorization. In the standard Mobile IPv6, the Mobile Node is authenticated by its HA and CNs but those have no guarantee that the Mobile Node is allowed to send a Binding Update for the home address specified in the Binding Update. Indeed, the Mobile IPv6 policy is to accept whatever is being carried in the Binding Update as long as the sender is authenticated.

A Mobile Router willing to send Prefix Scope Binding Updates faces the same authorization issue. In addition, a means is required to authorize a Mobile Router to register a binding between the Mobile Network Prefix and its care-of address. In other words, we need a means to certify that the Mobile Router actually serves the Mobile Network Prefix.

5.2.1. How to certify that the MR owns the prefix

Proposals [14,15,16] that require the participation of the Home Agent to authorize a Mobile Node are suitable to operate with Mobile Routers as well. We consider only BAKE [16] in the following since it appears to be the most advanced submission as well as the one that introduces the less computational overhead. The very aim of BAKE is to distribute keys between a Mobile Node and a Correspondent Node, making the CN aware that the MN has actually the right to send a Binding Update for a specific Home Address. Prior to sending the Binding Update, three new messages are supposed to be exchanged within that proposal:

- Binding Warning (MN --> CN)
- Binding Request (CN --> HA & HA --> MN)
- Binding Key Establishment (MN --> CN)

This kind of messaging (involving the Home Agent to check whether the Mobile Node can be reached at the Home Address it provided) can be reused with a Mobile Router. A few modifications are however required to make BAKE support Mobile Networks. Basically, the authorization mechanism should be extended so that it supports a Binding Update for a prefix. Obviously, we must avoid a situation where any node served by the Mobile Router would be able to send a Prefix Scope Binding
Update instead of the Mobile Router.

To do so, the easiest way would be to add a flag to the Binding Request message, telling the HA that the Binding Warning the CN just received was sent by a Mobile Router (at least claiming to be one). The HA would then have to check whether this claim is true; according to the result of this check, the Binding Request would be either silently discarded or would be forwarded to the Mobile Router.

5.2.2. Assumptions concerning the Home Agent

The HA MUST be aware that the Mobile Router is not a basic host but actually a Router. The HA MUST know the Mobile Network Prefix served by the Mobile Router.

A means MUST be given to the Mobile Router to make it able to securely (i.e. being both authenticated and authorized) send a Binding Update to its HA, thus updating the HA binding cache prior to initiating BAKE procedure (in case of BAKE implementation).

6. Main changes since last draft

6.2. Changes from draft-v1 to draft-v2

- Abstract rewritten
- Extended section about security issues.
- Clarification between "home subnet prefix" and "Mobile Network Prefix" in the terminology.
- Section 3.3 divided into 3.3 and 3.4
- Added section "Receiving encapsulated packets from the Home Agent"
- Minor misspelling corrections

6.1. Changes from draft-v0 to draft-v1

- Updated definitions of the terminology section 2.2, particularly:
  - clarified the distinction between possible kinds of nodes located in the mobile network: Fixed Nodes (FN) and Visiting mobile Nodes (VN).
Clarified that the Mobile Router has (at least) two interfaces, one on the home link, one on the mobile network.

- New example showing IPv6 addresses

- Added a description of an experimentation outlining HA is unable to tunnel packets to the mobile network if the final destination is not the Mobile Router itself.

- Enhanced section about security concerns

7. Acknowledgements

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8. References


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