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Modification to Ipv6 Neighbor Discovery and Mobile Node Operation

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Abstract: *In this paper we describe Modification to IPv6 Neighbor Discovery & Mobile Node Operation. Moreover we discuss Mobile IPv6 Messages and Related Data Structures and a lean and efficient IPv6 routing protocol for networks. Mobile nodes care-of address shortens the communicating path to be used. When routing packet directly to the mobile node, the correspondent node sets the destination address in the IPv6 header to the care-of address of the mobile node. The mobile node add a new IPv6 "home Address" destination option to carry its home address. In this case, the mobile node may not know the IPv6 address of its own home agent and even the home subnet prefixes may change over time. A mechanism, known as "dynamic home agent address discovery" allows a mobile node to dynamically discover the IPv6 address of home agent on its home link, even when the mobile node is away from home. We report on its Modified Prefix Information Option Format result. Moreover we discuss Formal Protocol Verification and operating over Mobile Node Operation. This paper we study in Comparison with Mobile IPv4 for Mobile IPv6.*

Keywords: *IPv6, IPv4, Cellular Phone network, ICMP, routing protocols, Mobile Node Operation, Protocol, node.*

1. Introduction

In modern area Cellular phones are most important factor in human life. Cellular phones allow a person to make or receive a call from almost anywhere. All cellular phone communicate the role regulation process. In this protocol allows nodes to remain in contact with each other in the IPv6 internet. The protocol allows a mobile node to move from one link to another without changing the mobile nodes "home address". Packet may be routed to the mobile node using this address regardless of the mobile nodes current location at the internet. While a mobile node is always from home is sends the information about its current location to a home agents which intercepts packets addresses to the mobile node and tunnels them to the mobile nodes present location. This protocol is not only limited to wireless network but also to wired network.

2. Basic Operation:

While a mobile node is attached to some foreign link away from home, it can address in one or more care-of addresses. A care-of address is an IP address associated with a mobile node that has the subnet prefix of a particular foreign link. The mobile node can acquire its care-of address through stateless or stateful address auto configuration. As long as mobile node stays in the location, packets addresses to this care-of address will be sent to the mobile node. The association between a mobile node home address and care-of address is known as a "binding" for the mobile node. While away from home, a mobile node registers its primary care-of address with a router on its home link, requesting this router of function as the "home agent" for the mobile node. The mobile node performs this binding registration by sending a "binding update" message to the home agent. The home agent replies to the mobile node by retuning a "binding acknowledgement" message. One of this ways for communicating between the mobile node and a correspondent node is called "route optimization", which requires the mobile node to register its current binding at the correspondent node. Packet from the correspondent node can be routed directly to the care-of address of the mobile node. When sending a packet any IPv6 destination, the correspondent node checks its cached bindings for an entry for the packet destination address. If a cached binding for this destination address is found, the node uses a new type of IPv6 routing header [11] to route the packet to the mobile node by way of the care-of address indicated in this binding. Routing packets directly to the mobile nodes care-of address shortens the communicating path to be used. When routing packet directly to the mobile node, the correspondent node sets the destination address in the IPv6 header to the care-of address of the mobile node. A new type IPv6 routing header is also used in packet to carry the desired home address. Similarly, mobile node sets the source address in the packet IPv6 header to its current care-of addresses. The mobile node add a new IPv6 "home Address" destination option to carry its home address. In this case, the mobile node may not know the IPv6 address of its own home agent and even the home subnet prefixes may change over time. A mechanism, known as "dynamic home agent address discovery" allows a mobile node to dynamically discover the IPv6 address of home agent on its home link, even when the mobile

node is away from home. Mobile nodes can also learn new information about home subnet prefixes through the "mobile prefix discovery" mechanism.

2.2. Mobile IPv6 Messages and Related Data Structures

All new messages used in MIPv6 are defined as IPv6 destination options. These options are uses in IPv6 to carry additional information that needs to be examined only by a packets destination node.

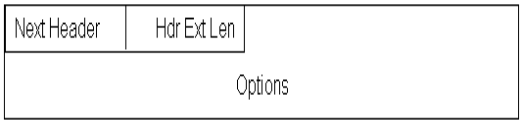

Figure1 : IPv6 Option

Four new destination options:

1. **Binding update**

- ✓ A binding update is used by a mobile node to notify a correspondent node or the mobile nodes home agent of its current binding.
- ✓ The binding update sent to the mobile nodes home agent to register its primary care-of address is marked as a "home registration".

2. **Binding acknowledgement**

- ✓ Used to acknowledge the receipt of a binding update.
- ✓ A binding acknowledgement is used to acknowledge receipt of a binding update, if an acknowledgement was requested in the binding update, the binding update was sent to a home agent, or an error occurred.

3. **Binding request**

- ✓ Used by any node to request an MN to send a binding update with the current care-of address
- ✓ A binding refresh request is used by a correspondent node to request a mobile node to reestablish its binding with the correspondent node. This message is typically used when the cached binding is in active use but the binding's lifetime is close to expiration. The correspondent node may use, for instance, recent traffic and open transport layer connections as an indication of active use.

4. **Home address**

- ✓ Used in a packet sent by a mobile node to inform the receiver of this packet about the mobile nodes home address

Mobile IPv6 Messages

Binding refresh request message:

The binding refresh request message is sent by correspondent nodes to requests a mobile node to update its mobility binding.

Reserved-

16 bit field reserved for future use. The value 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.

Home test init message:

A mobile node uses the home test init (HoT1) message to initiate the return rout ability procedure and request a home keygen token from a correspondent node. The home test init message uses the MH type value 1

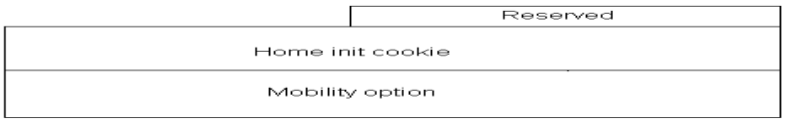

Figure 2 : Home test init message

Care-of test Init Message:

A mobile node uses the care-of test init (CoTI) message to initiate the return rout ability procedure and request a care-of keygen token from a correspondent node. The care-of test init message uses the MH type value

Reserved-

16 bit field reserved for future use. The value MUST be initialized to zero by the sender, and MUST be ignored by the receiver.

Care-of Init cookie-

64 bit field which contains a random value, the care-of Init cookie.

Mobility options-

Variable length of such length that the complete mobility header in an integer multiple of 8 octets long. This field contains zero or more TLV encoded mobility options. The receiver MUST ignore and skip any options which it does not understand.

Home test message:

The home test (HoT) message is a response to the home test Init message, and is sent from the correspondent node to the mobile node. The home test message uses the MH type value 3.

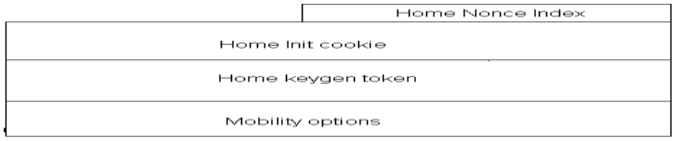

Figure 3: Home test message

Care-of test message-

The care-of test (CoT) message is a response to the care-of test init message, and is sent from the correspondent node to the mobile node. The care-of test message uses the MH type value 4.

Care-of Nonce Index-

This value will be echoed back by the mobile node to the correspondent node in a subsequent binding update.

Care-of cookie-

64 bit field which contains the care-of init cookie.

Care-of keygen token-

This field contains the 64 bit care-of keygen token used in the return rout ability procedure.

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 options. The receiver MUST ignore and skip any options which it does not understand.

Sequence #-

A 16 bit unsigned integer used by the receiving node to sequence binding updates and by the sending node to match a returned binding acknowledgement with this binding update.

Acknowledge (A)-

A acknowledgement (A) bit is set by the sending mobile node request a binding acknowledgement be returned upon receipt of the binding update.

Home registration (H)-

The home registration (H) bit is set by the sending mobile node to request that the receiving node could act as this nodes home agent.

Link local address compatibility (L)-

The link local address compatibility (L) bit is set when the home address reported by the mobile node has the same interface identifier as the mobile nodes link local nodes address.

Key management mobile capability (K)-

If this bit is cleared, the protocol used for establishing the IP sec security associations between the mobile node and the home agent does not survive movements. It may then have to be return. If manual IP sec configuration is used, the bit must be cleared. This bit is valid only in binding updates sent to the home agent, and must be cleared in other binding updates. Correspondent nodes must ignore this bit.

Reserved-

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

Lifetime-

16 bit unsigned integer. The number of time units remaining before the binding must be considered expired. A value of zero indicates that the binding cache entry for the mobile node must be deleted. One unit is 4 seconds.

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 following options are valid in a binding update:

- Binding authorization data option (this option is mandatory in binding updates sent to a correspondent node).
- Nonce indices option
- Alternate care-of address option

If no options are present in this message, 4 octets of padding is necessary and the header length field will be set to 1.

Binding acknowledgement message:

The binding acknowledgement is used acknowledge receipt of a binding update. The binding acknowledgment has the MH type value 6. When this value is indicated in the MH type field, the format of the message data field in the mobility header is as follows;

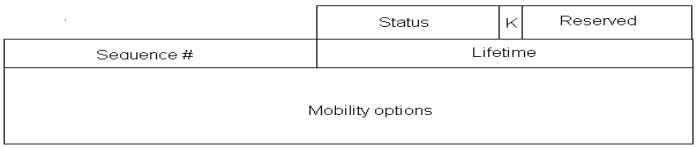

Figure 4: binding acknowledgement message

Status-

8 bit unsigned integer indicating the reason for this message. The following values are currently defined.

1 Unknown binding for home address destination option.
2 Unrecognized MH type value

Reserved-

A 8 bit field reserved for future use. The value MUST be initialized to zero by the sender, and MUST be ignored by the receiver

Home address-

The home address that was contained in the home address destination options. The mobile node uses this information to determine which binding does not exist, in cases where the mobile node has several home addresses.

Mobility options-

Variable length field of such length that the complete mobility header in an integer multiple of 8 octets long. This field contains zero or more TLV encoded mobility options. The receiver MUST ignore and skip any options which it does not understand.

ICMP home agent address discovery request message:

The ICMP home agent address discovery request message is used by a mobile node to initiate the dynamic home agent address discovery mechanism. The mobile node sends the home agent address discovery request message to the mobile IPv6 home agents anycast address [16] for its own home subnet prefix.

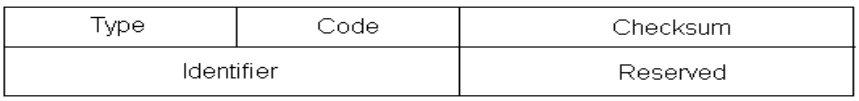

Figure 5: ICMP home agent

Type-

150 (to be assigned by IANA)

Code-

0.

Checksum-

The ICMP checksum

Identifier-

An identifier to aid in matching home agent address discovery

ICMP home agent address discovery reply message:

The ICMP home agent address discovery reply message is used by a home agent to respond to a mobile node that home agent address discovery mechanism.

Type-

151 (to be assigned by IANA).

Code-

0

Checksum-

The ICMP checksum

Identifier-

The identifier from the invoking home agent address discovery request message

Reserved-

This field is unused. It MUST be initialized to zero by the sender and MUST be ignored by the receiver.

Home agent addresses-

A list of addresses of home agents on the home link for the mobile node. The number of addresses present in the list is indicated by the remaining length of the IPv6 packet carrying the home agent address discovery reply message.

ICMP mobile prefix solicitation message:

The ICMP mobile prefix solicitation message is sent by a mobile node to its home agent while it is away from home. The purpose of the message is to solicit a mobile prefix advertisement from the home agent, which will allow the mobile node to gather prefix information about its home network. This information can be used to configure and update home addresses according to changes in prefix information supplied by the home agent.

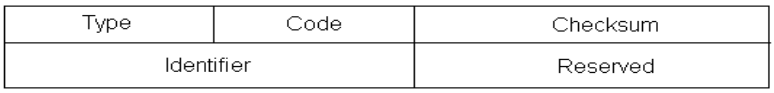

Figure 6: ICMP mobile prefix

Type-

153(to be assigned by IANA)

Code-

0

Checksum-

The ICMP checksum

Identifier-

An identifier is used in matching the mobile prefix advertisement to a previous mobile prefix solicitation

M-

1 bit managed address configuration flag. When set, hosts use the administered (stateful) protocol for address auto configuration.

O-

1 bit other stateful configuration flag. When set, hosts use the administered (stateful) protocol for auto configuration of other (non-address) information.

Reserved-

This field is unused. It MUST be initialized to zero by the sender and MUST be ignored by the receiver.

The mobile prefix advertisement message may have options.

Prefix information-

Each message contains one or more prefix information options.

Data Structures

- **Binding cache**
  A cache of bindings for other nodes. This cache is maintained by home agents and correspondent nodes. The cache contains both "correspondent registration" entries and "Home registration" entries.
- **Binding update list**
  This list maintained by each mobile node. The list has an item for every binding that the mobile node has or is trying to establish with a specific other node. Both correspondent and home registration are included in this list. Entries from the list are deleted as the life time of the binding expires.

- **Home agent list**
  Home agents need to know which other home agents are on the same link. This information is stored in the home agent list. The list is used for informing mobile nodes during dynamic home agent address discovery.

2.3. Modifications to IPv6 Neighbor Discovery

Modified Router Advertisement Message Format:

Mobile IPv6 modifies the format of the router advertisement message by adding a single flag bit to indicate that the router sending the advertisement message is serving as a home agent on this link.

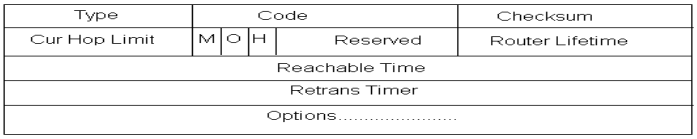

Figure 7: Mobile IPv6 modifies

Home agent (H)-

The home agent (H) bit is sent in a router advertisement to indicate that the router sending router advertisement is also functioning as a mobile IPv6 home agent on this link.

Reserved-

Reduced from a 6bit field to a 5 bit field due to the addition of the H field.

Modified Prefix Information Option Format:

Mobile IPv6 requires knowledge of a routers global address in building a home agents list during the dynamic home agent address discovery mechanism. Mobile IPv6 extends neighbor discovery to allow a router to advertise its global address, by adding a single flag bit in the format of a prefix information option for use in router advertisement messages.

Router address (R)-

1 bit router address flag. When set, indicates that the prefix field contains a complete IPv6 address assigned to the sending router.

Reserved 1-

Reduced from a 6 bit field to a 5 bit field due to addition of the **R** bit.

New Advertisement Interval Option Format:

Mobile IPv6 defines a new advertisement interval option, used in router advertisement messages to advertise the interval at which the sending router sends unsolicited multicast router advertisements. The format of the advertisement interval option is as follows:

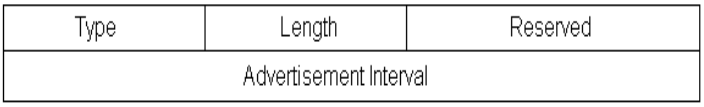

Figure 8: Advertisement interval option

Type-

It is 7.

Reserved-

This field is unused. It must be initialized to zero by the sender and must be ignored by the receiver.

Advertisement interval-

32 bit unsigned integer. The maximum time (in milliseconds) between successive solicited router advertisement messages sent by the router on this network interface. Routers may include this option in router advertisements. A mobile node receiving a router advertisement containing this option should uses this specified advertisement interval for that router in its movement detection algorithm.

This option must be ignored for other neighbor messages.

New Home Agent Information Option Format:

Mobile IPv6 defines a new home agent information option, used in router advertisements sent by a home agent to advertise information specific to this router's functionality as a home agent.

Type-

It is 8.

Length-

8 bit unsigned integer. The value of this field must be 1.

Reserved-

This field is unused. It must be initializes to zero by the sender and must be ignored by the receiver.

Home agent preference-

16 bit unsigned. The preference for home agent sending this router advertisement, for use in ordering addresses returned to a mobile node in the home addresses field of a home agent address discovery reply message. Higher values mean more preferable. If this option is not included in a router advertisement in which the home agent (H) bit is set, the preferable value for this home agent must be considered to be 0. greater value indicates a more preferable home agent than lower values.

Home agent lifetime-

16 bit unsigned integer. The life time associated with the home agent in units of seconds. The default value is the same as the router lifetime, as specified in the main body of the router advertisement. The maximum value corresponds to 18.2 hours. A value of 0 must not be used. The home agent lifetime applies only to this router usefulness as a home agent. It does not apply to information contained in other message fields or options.

If both the home agent preference and home agent lifetime are set to their default values specified above, this option should not be included in the router advertisement messages sent by this home agent.

2.4 Correspondent Node Operation

2.4.1 Conceptual Data Structures

IPv6 nodes with route optimization support maintain a binding cache of bindings for other nodes. Each binding cache entry conceptually contains the following fields:

- The home address of the mobile node
- The care-of address for the mobile node
- A lifetime value, indicating the remaining lifetime for this binding cache entry
- A flag indicating whether or not this binding cache entry is a home registration entry
- The maximum value of the sequence number field received in previous binding updates for this home address
- Usage information for this binding cache entry

2.4.2 Processing Mobility Headers

Mobility header processing must observe the following rules:

- The checksum must be verified
- The MH type field must have a known value
- The payload proto field must be IPPROTO_NONE
- The header Len field in the mobility header must not be less than the length specified for this particular type of message

2.4.3 Packet Processing

2.4.3.1. Receiving packets with home address option

Packets containing a home address option must be drop if the given home address is not a unicast router address. If the packet is drop due the above tests, the correspondent node m must send the binding message. The correspondent node must process the option in a manner consistent with exchanging the home address field from the home address option into a IPv6 header and replacing the original value of the source address field there. The use of IP sec authentication header (AH) for the home address option is not required,

except that if the IPv6 header of a packet is covered by AH, then the authentication must also cover the home address option.

2.4.3.2. Sending Packets to a Mobile Node

Before sending any packet, the sending node should examine its binding cache for an entry for the destination address to which the packet is being sent. If the sending node has a binding cache entry for this address, the sending node should use a type 2 routing header to route the packet to this mobile node (the destination node) by way 9of its care-of address. However, the mobile node must not do this in the following cases:

- When sending an IPv6 neighbor discovery packet.
- The destination address in the packet's IPv6 header is sent to the mobile node's home address.
- The routing header is initialized to contain a single route segment, containing the mobile node's care-of address copied from the binding cache entry. The segment left field is, however, temporarily sent to zero.

2.4.3.3. Sending Binding Error Messages

A binding error message is sent directly to the address that appeared in the IPv6 source address field of the offending packet. The home address field in the binding error message must be copied from the home address field in the home address destination option of the offending packet, or set to the unspecified address if no such option appeared in the packet.

2.4.3.4. Receiving ICMP error Messages

When the correspondent node has a binding cache entry for a mobile node, all traffic destination to the mobile node goes directly to the current care-of address of the mobile node using a routing header. On the other hand, if the correspondent node has no binding cache entry for the mobile node, the packet will be routed through the mobile node's home link.

2.4.4. Processing Bindings

These messages are:

- Binding update
- Binding refresh request
- Binding acknowledgement
- Binding error

2.4.4.1. Receiving binding updates

Before accepting a binding update, the receiving node must validate the binding update according to the following tests:

* The packet must contain a unicast routable home address, either in the home address option or in the source address, if the home address option is not present.
* The sequence number field in the binding update is greater than the sequence number received in the previous valid binding update for this home address, if any.

When the home registration (H) bit is not set, the following are also required:

* A nonce indices mobility option must be present.
* The correspondent node must re-generate the home keygen token and the acre-of keygen token from the information contained in the packet.
* The binding authorization data mobility option must be present.
* The binding authorization data mobility option must be the last option and must not have trailing padding.
  If the home registration (H) bit is set, the nonce indices mobility option must not be present.
* If the mobile node sends a sequence number which is not greater than the sequence number from the last valid binding update for this home address, then the receiving node must send back a binding.
* If a binding already exist for the given home addresses and the home registration flag has a different value than the home registration (H) bit in the binding update, then the receiving node MUST send back a binding acknowledgement with status code 132.5. If the binding update is valid according to the tests above, then the binding update is processed further as follows:
* The sequence number value received from a mobile node in a binding update is stored by the receiving node in its binding cache entry for the given home address.
* If the life time specified in the binding update is nonzero and the specified care-of address is not equal to the home address for the binding, then this is a request to cache a binding for the home address.
* If the life time specified in the binding update is zero or the specified care-of address matches the home address for the binding, then this is a request to delete the cache binding for the home address.
  The specified care-of address must be determined as follows:

* If the alternate care-of address option is present, the care-of address is the address in that option.
* Otherwise, the care-of address is the source address field in the packet's IPv6 header.

The home address for the binding must be determined as follows:

* If the home address destination option is present, the home address is the address in that option.
* Otherwise, the home address is the source address field in the packet's IPv6 header.

2.4.4.2. Request to cache a binding

This section describes the processing of a valid binding update that requests a node to cache a binding, for which the home registration (H) bit is not set in the binding update.

2.4.4.3. Sending binding acknowledgements

A binding acknowledgement may be sent to indicate receipt of a binding update as follows:

If the binding update was discarded-

* If the acknowledgement (A) bit set is set in the binding update, a binding acknowledgement must be sent if the node rejects the binding update due to an expired nonce index, sequence number being out of window or insufficiency of resources a accepts the binding update, the binding acknowledgement should net be sent
* If the node accepts the binding update and creates or updates an entry for this binding, the status field in the binding acknowledgement MUST be set to a value less than 128 if the status field in the binding acknowledgement contains the value
* 136 (expired home nonce index), 137 (expired care-of nonce index), or
* 138 (expired nonce) then the message MUST NOT include the binding authorization data mobility option.

2.5. Home Agent Operation

2.5.1 Conceptual Data Structures:

Each home agent MUST maintain a binding cache and home agents list. The rules for maintaining a binding cache are the same for home agents and correspondent nodes. The rules for maintaining for its data structure. Each home agents list entry conceptually contains the following fields:

* The link-local IP address of a home agent on the link.
* One or more global IP addresses for this home agent.
* The remaining lifetime of this home agents list entry.

The preference for this home agent, higher values indicate a more preferable home agent.

2.5.2. Processing Bindings:

Primary care-of address registration

When a node receives a binding update, it must validate it and determine the type of binding update. To begin processing the binding update, the home agent must perform the following sequence of tests:

* If the node implements only correspondent node functionally, or has not been configured to act as a home agent, then the node must reject the binding update.
* If the home address for the binding is not an on-link IPv6 address with respect to the home agents current prefix list, then the home agent must reject the binding update and should return a binding acknowledgment to the mobile node.
* If the home agent chooses to reject the binding update for any other reason, then the home agent should return a binding acknowledgement to the mobile node.
* A home address destination option must be present in the message.

If home agent accepts the binding update, it must then create a new entry in its binding cache for this mobile node. The home agent must mark this binding cache entry as a home registration to indicate that the node is serving as a home agent for this binding.

To begin processing the binding update, the home agent MUST perform the following test.

* If the receiving node has no entry marked as a home registration in its binding cache for this mobile node, then this node must reject the binding update and should return a binding acknowledgement to the mobile node.
* The status field must be set to a value 0, indicating success.
* The key management mobility capability (K) bit is set or cleared and actions based on its value are performed.
* The sequence number field must be copied from the sequence number given in the binding update.
* The lifetime field must be set to 0.
* The binding refresh advice mobility option must be omitted.

In addition, the home agent must stop intercepting packets on the mobile nodes home link that are addressed to the mobile node.

2.5.3. Packet Processing:

Intercepting packets for mobile node

When a node serving as the home agent for mobile node it must try to intercept packets on the mobile nodes home link that are addressed to the mobile node. All fields in each such neighbor advertisement message should be set to in the same way they would be set by mobile node with the following exceptions:

* The target address in the neighbor advertisement must be set to the specific IP address for the mobile node
* The advertisement must include a target link layer address option specifying the home agents link layer address.
* The router (R) bit in the advertisement must be set to 0.
* The solicited flag (S) in the advertisement must not be set.
* The override flag (O) in the advertisement must be set.
* The source address in the IPv6 header must be set to the home agents IP address on the interface used.

Any node on the home link receiving one of the neighbor advertisement messages described above thus update its neighbor cache to associated the mobile nodes address with the home agents link layer address, causing it to transmit any future packets normally destined to the mobile node on the mobile nodes home agent.

Processing Intercepted packets

While the home agent is operating as a correspondent of the mobile node, the home agent then uses a routing header to route the packet to the mobile node primary care-of address in the home agents binding cache. While the mobile node is away from home, the home agent intercepts any packets on the home link address to the mobile nodes home address. To forward each intercepted packet to the mobile node, the home agent must tunnel the packet to the mobile node using IPv6 encapsulation. When a home agent encapsulates an intercepted packet for forwarding to the mobile node, the home agent sets the source address in the new tunnel IP header to the mobile nodes primary care of address.

2.6. Mobile Node Operation

2.6.1 Conceptual Data Structures:

Each mobile node maintains a binding update list. The binding update list records information for each binding update sent by this mobile node. Each binding update list entry conceptually contains the following fields:

* The IP address of the node to which a binding update was sent.
* The home address for which that binding was sent.
* The care of address sent in that binding update.
* The initial value of the lifetime field sent in that binding update.
* The remaining lifetime of that binding.
  This lifetime is initialized from the lifetime value sent in the binding update and is decremented until it reaches 0, at which time this entry must be deleted from the binding update list.
* The maximum value of the sequence number field sent in the previous binding updates to this destination.
* The time at which a binding update was last sent to this destination, as needed to implement the rate lifetime estriction for sending binding updates.
* The state of any retransmissions needed for this binding update.
* A flag specifying whether or not future binding updates should be sent to this destination. The mobile node sets this flag in the binding update list entry when it receives an ICMP parameter problem, code 1, error message in response to a return rout ability message or binding update sent to that destination.

2.6.2 Packet Processing:

Sending packets while away from home

While a mobile node is away from home, it continues to use its home address, as well as also using one or more care of addresses. When sending a packet while away from home, a mobile node may choose among these in selecting the address that it will use as the source of the packet as follows:

* Protocol at the layer over IP will generally treat the mobile nodes home address as its IP address for most packets.
* The mobile node may choose to directly use one of its cares of addresses as the source of the packet.
* While not in its home link, the mobile node must not use the home address destination option when communicating with link local or site local peers, if the scope of the home address is larger than the scope of the peers address.

Receiving Packets while away from home

While away from the home, a mobile node will receive packets addressed to its home address, by one of two methods:

* Packets sent by a correspondent node that does not have a binding cache entry for the mobile node, will be sent to home address, captured by the home agent and tunneled to the mobile node.
* Packets sent by a correspondent node that has a binding cache entry for the mobile node that contains the mobile nodes current care-of address, will be sent by the correspondent node using a type routing header.

Routing Multicast packets

A mobile node when connected to its home link functions in the same way as any other node. Thus, at home, a mobile node functions identically to other multicast senders and receivers. To receive packet sent to some multicast group, a mobile node must join that multicast group. One method by which a mobile node may join the group is via a multicast router on the foreign link being visited. A mobile node that wants to send packets to a multicast group also has two options:

1. Send directly on the foreign link being visited.
2. Send via a tunnel to its home agent.

3. Comparison with Mobile IPv4 for Mobile IPv6

1. There is no need to deploy special routers as "foreign agents" as in mobile IPv4. Mobile IPv6 operates in any location without any special support required from the local router.
2. Support for route optimization is a fundamental part of the protocol, rather than a nonstandard set of extensions.
3. Mobile IPv6 route optimization can operate securely even without pre-arranged security associations. It is expected that route optimization can be deployed on a global scale between all mobile nodes and correspondent nodes.
4. Support is also integrated into mobile IPv6 for allowing route optimization to coexist efficiently with routers that perform "ingress filtering"
5. The IPv6 neighbor unreachability detection assures symmetric reachability between the mobile node and its default router in the current location.
6. Most packets sent to a mobile node while away from home in mobile IPv6 are sent using an IPv6 routing header rather than IP encapsulation, reducing the amount of resulting overhead compared to mobile IPv4.
7. Mobile IPv6 is decoupled from any particular link layer, as it uses IPv6 neighbor discovery instead of ARP. This also improves the robustness of the protocol
8. The use of IPv6 encapsulation removes the need in mobile IPv6 to manage "tunnel soft state".
9. The dynamic home agent address discovery mechanism in mobile IPv6 returns a single reply to the mobile node. The detection broadcast approach used in IPv4 returns separate replies from each home agent.

4. Conclusion:

This paper work is to our knowledge the first to study a range of computer network in order to determine where the limit actually is when performing model checking on an IPV6 protocol. The mobile node can acquire its care-of address through stateless or state full address auto configuration. As long as mobile node stays in the location, packets addresses to this care-of address will be sent to the mobile node. The association between a mobile node home address and care-of address is known as a "binding" for the mobile node. The simulation for the association time is carried out with different values for the link bandwidth, link delay and duplicate address detection time (by the mobile node). The link delay and link bandwidth are same for the entire link present. We develop the Mobile IPv6 requires every mobile node to support IPv6 de-capsulation, Address auto-configuration, Neighbor discovery. On the other hand, our study enables us not only to analyze the Modification to IPv6 Neighbor Discovery and Mobile Node Operation that have to be imposed, but also provides us with a solid starting point for the further work we intend to pursue in the direction of verification and linked of routing protocols.

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