

HiMI Pv6: Hierarchical Mobile I Pv6 Development Concept

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Outline

- Basic Purpose
- HiMIPv6: Functionality
- Benefits
- Usage
- Our Contribution

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- ***Basic Purpose***
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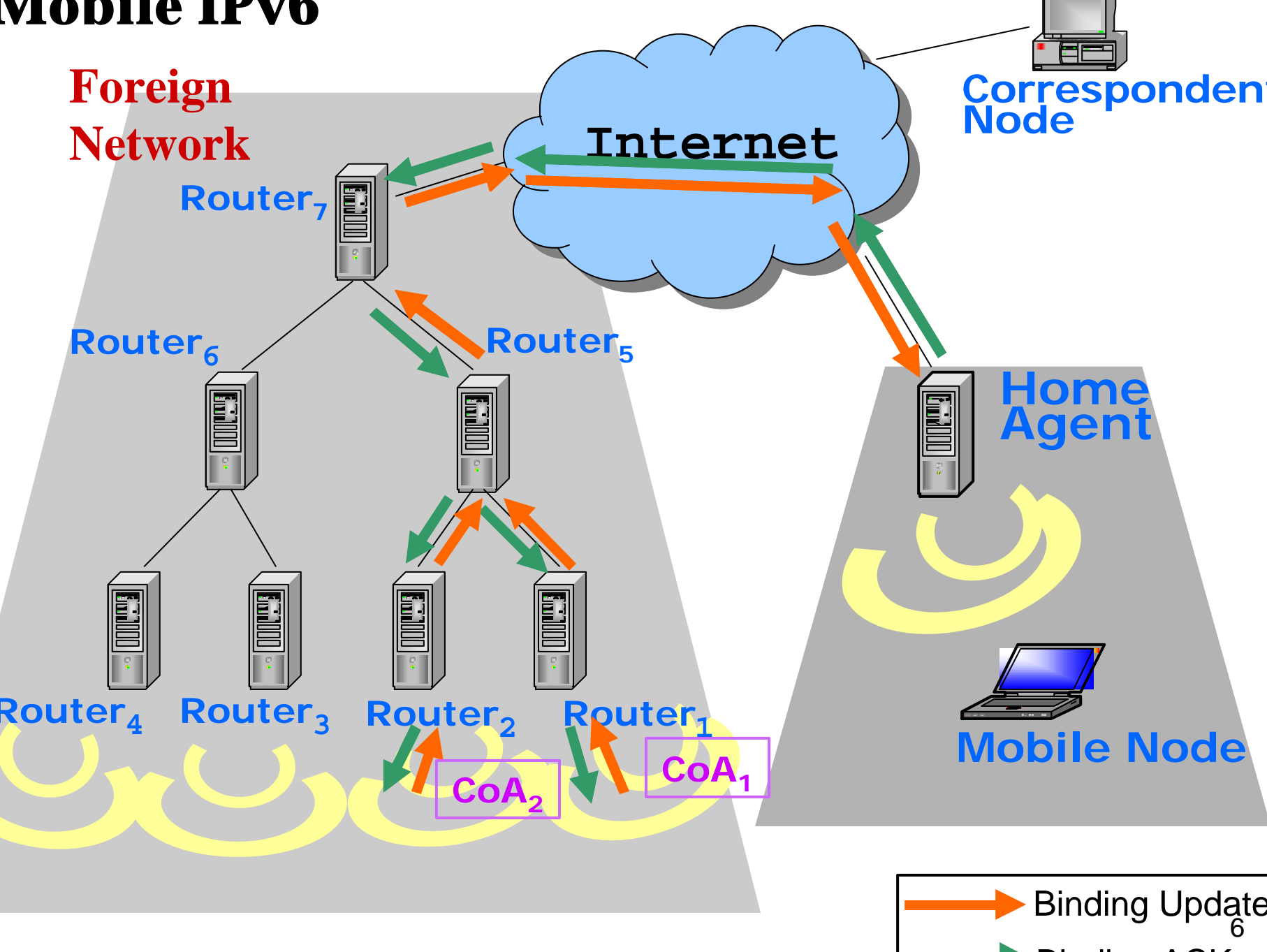
Basic Purpose

- Improve the shortcomings of existing Mobile IPv6.
 - Avoid redundant registration message packets.
 - Minimize the handoff delay.
 - Increase the quality of service (QoS) of Mobile IPv6.

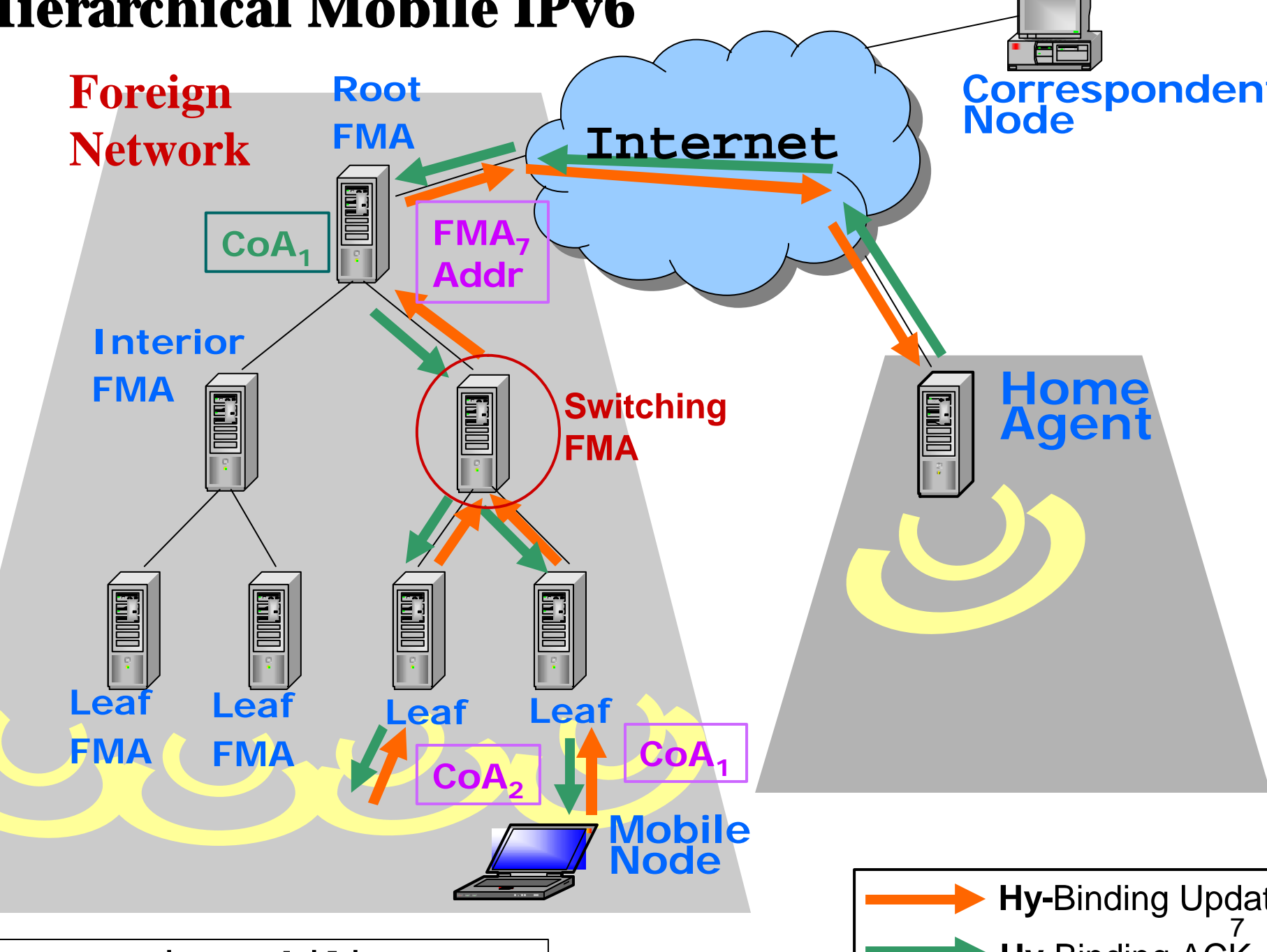
Mobile IPv6: Protocol Overview

- *Mobile node* is always addressable by its **home address**, whether at home or visiting a foreign network.
- Besides, a **care-of address** is associated with a mobile node while visiting a particular *foreign* link.
- “**Binding**” - the association between a mobile node's *home address* and *care-of address*.

Mobile IPv6



Hierarchical Mobile IPv6



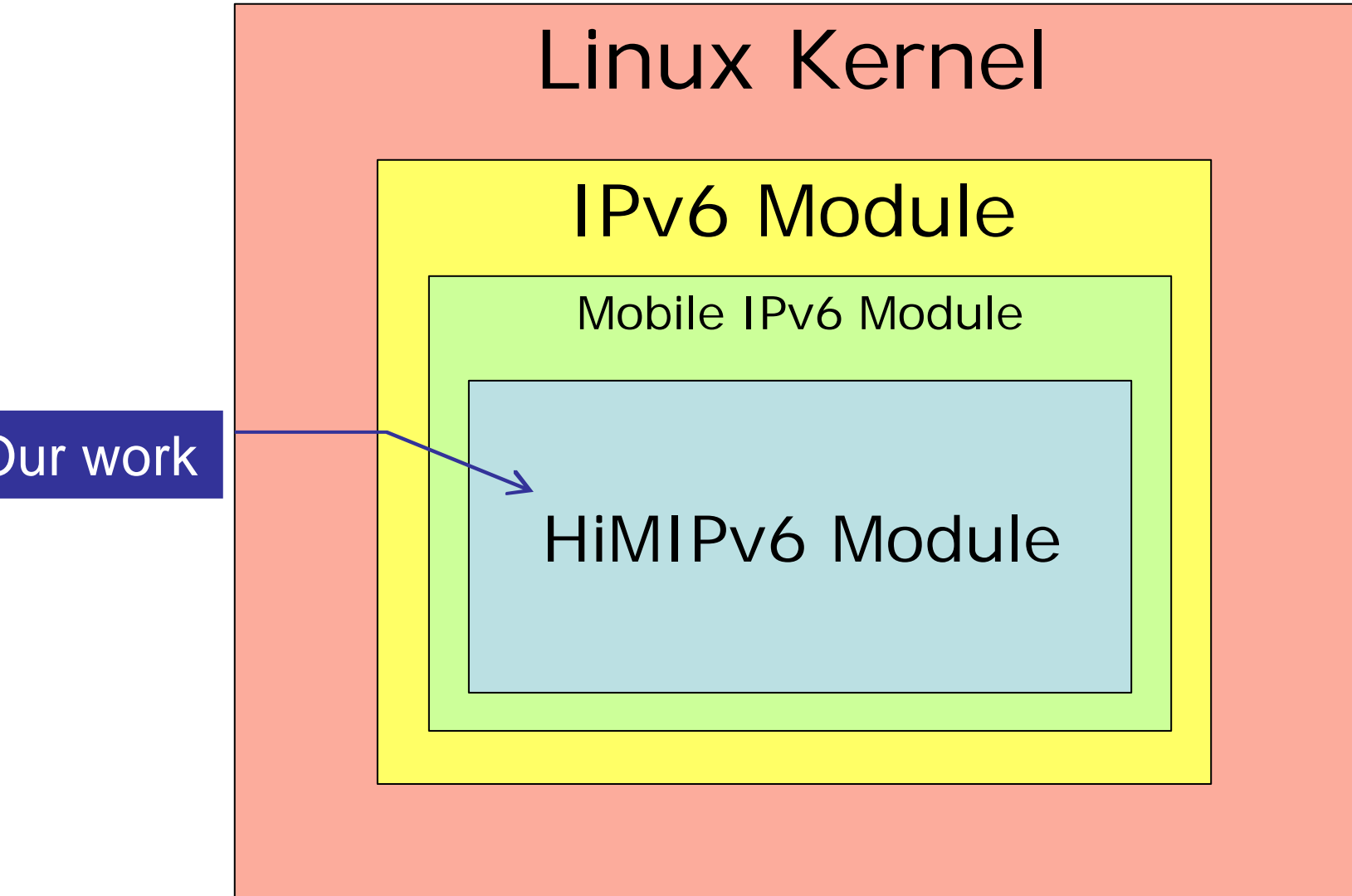
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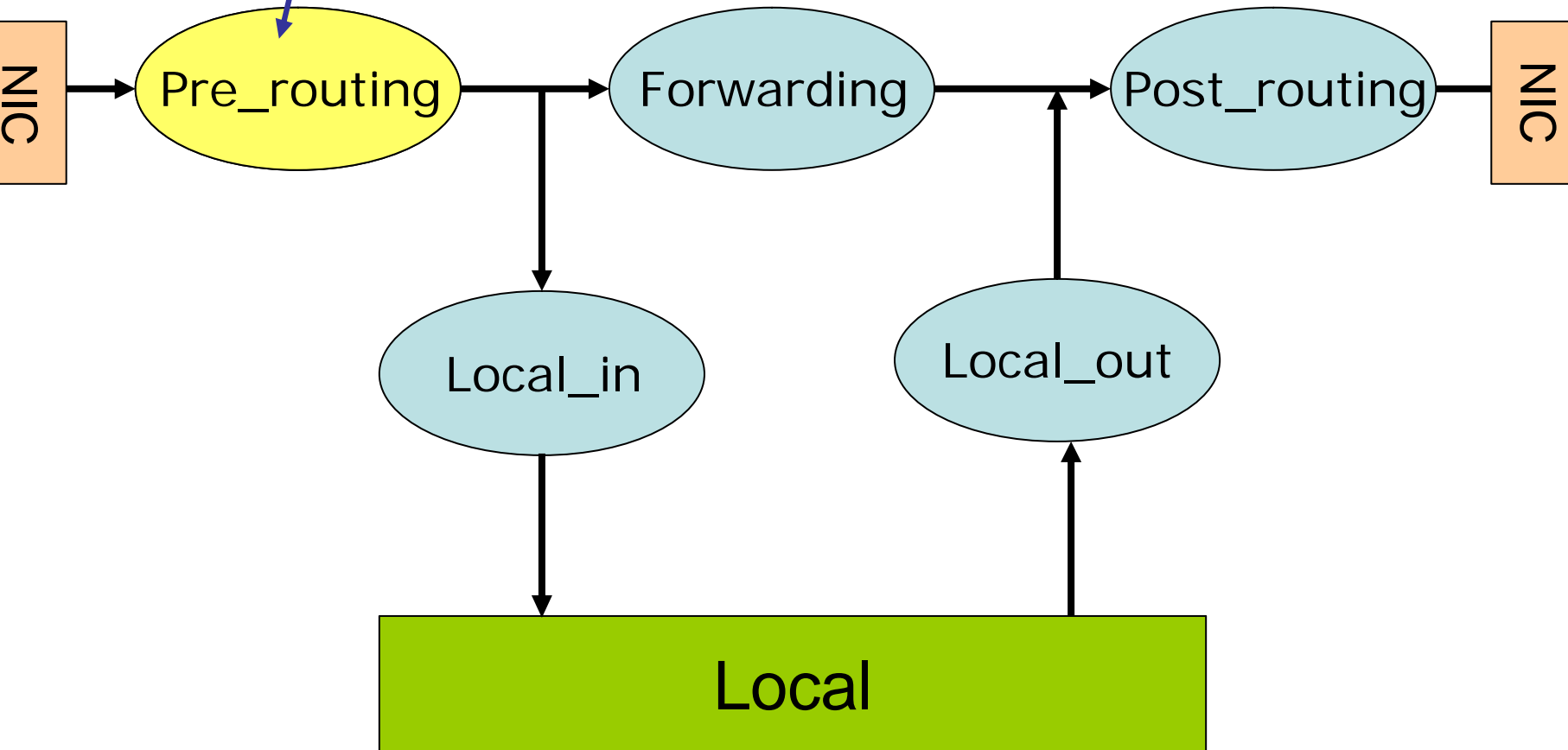
Implementation Environment

- Linux RedHat 7.2
- Mobile IPv6 package (MIPL)
 - developed by the HUT Telecommunications and Multimedia Lab
- Based on MIPL, we develop our HiMIPv6 functionality as a *loadable module*.

Module Dependence



In each Foreign Mobility Agent,
we intercept all the packets
going through it by our own
function: `fma_packet_parser()`



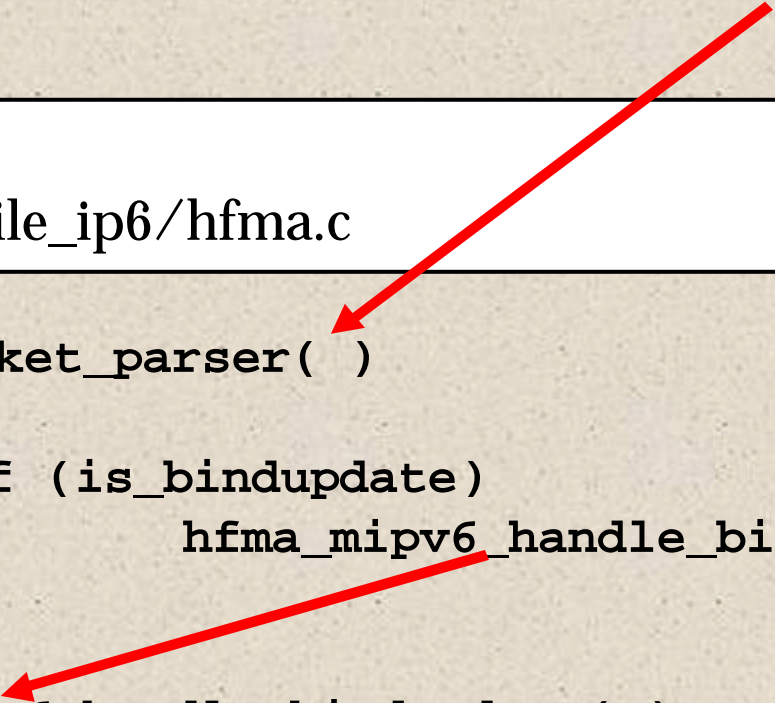
Function Call

pv6/ipv6_input.c

```
ip6_rcv( )  
{  
    HFMA_CALLFUNC( fma_packet_parser );  
}
```

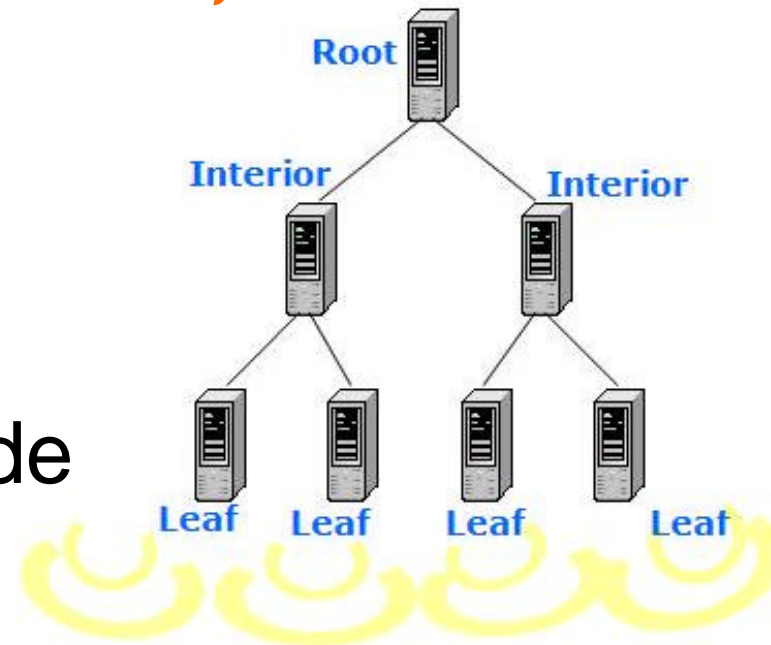
pv6/mobile_ip6/hfma.c

```
hfma_packet_parser( )  
{  
    if (is_bindupdate)  
        hfma_mipv6_handle_bindupdate()  
}  
  
hfma_mipv6_handle_bindupdate( )  
{ }  
hfma_mipv6_handle_bindack( )  
{ }  
hfma_mipv6_handle_bindrequest( )  
{ }
```



HiMI Pv6 System Components

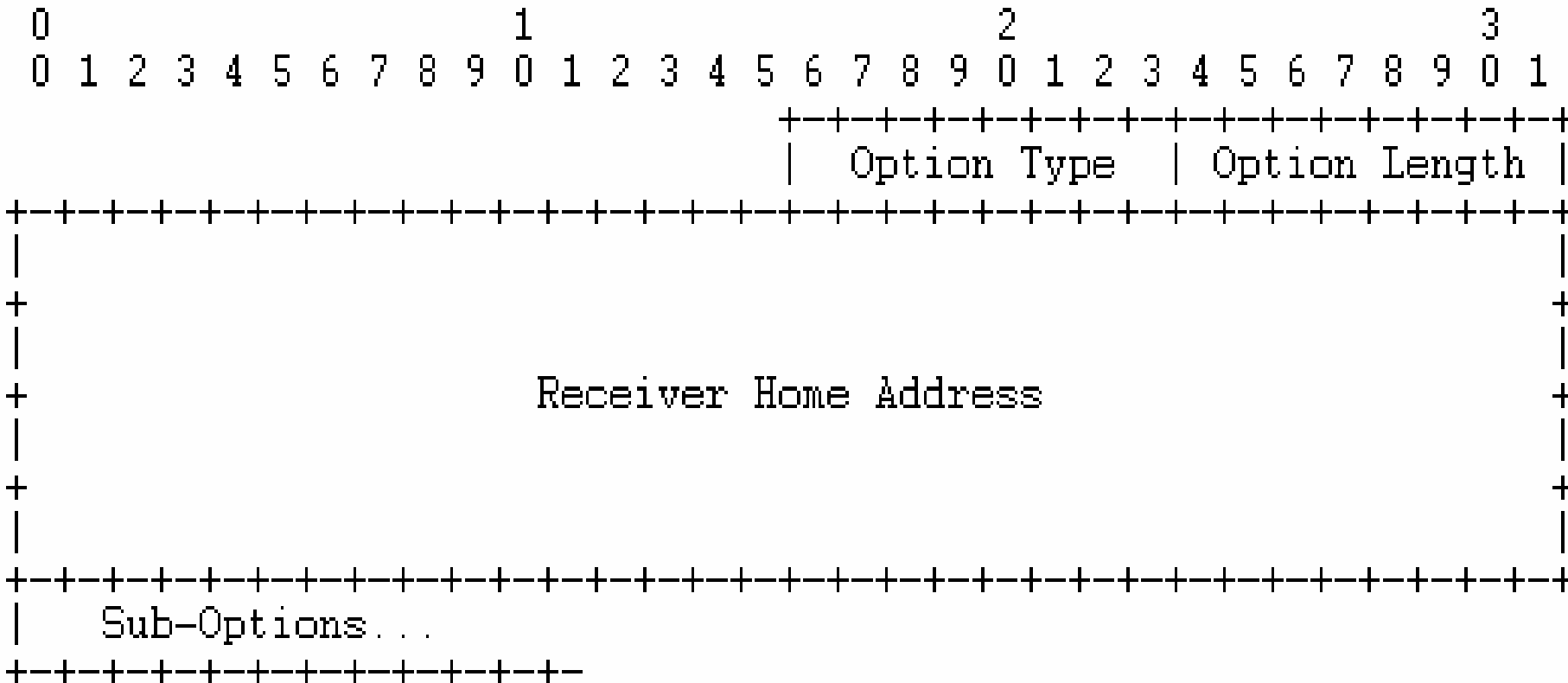
- Hierarchical-structured Foreign Mobility Agents (FMAs)
 - *Root-FMA, Interior-FMA, Leaf-FMA*
- Mobile Node
- Home Agent
- Correspondent Node



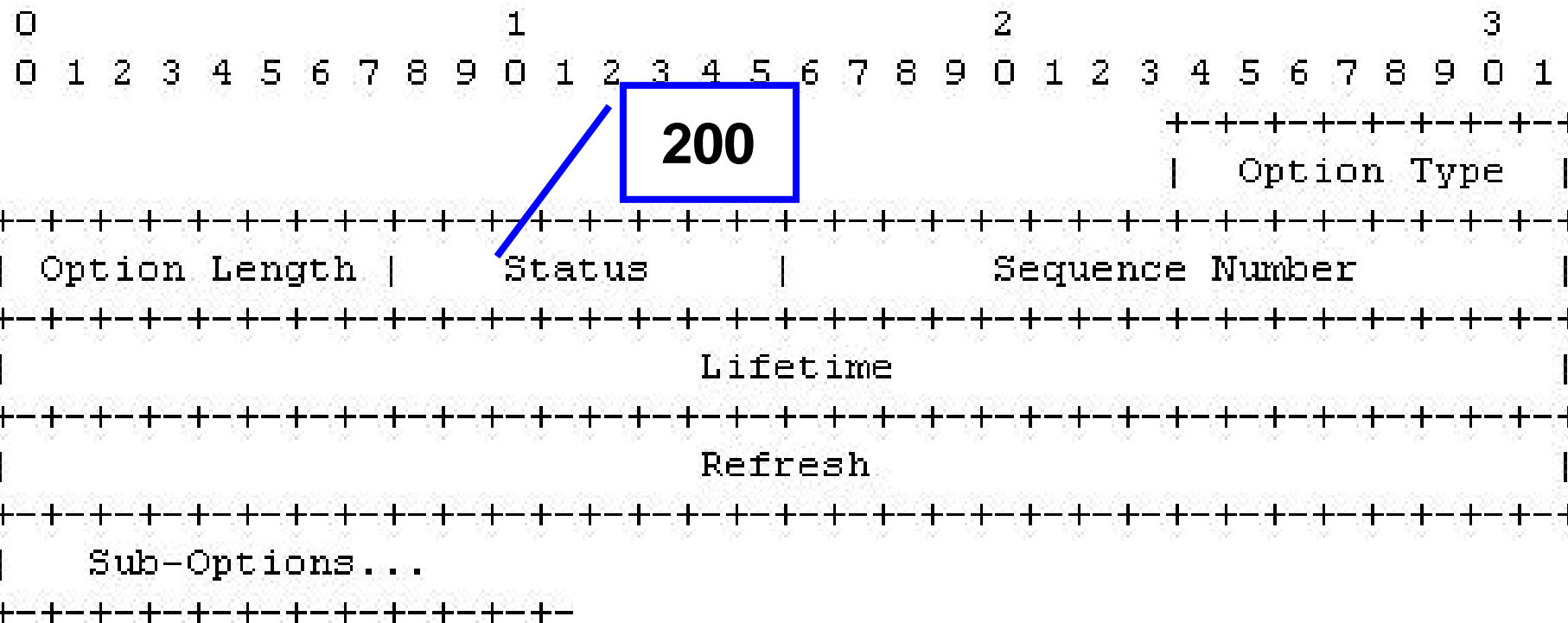
HiMI Pv6 Control Message Types

- Define new and modify existing Mobile IPv6 message types
 - New:
 - Receiver Home Address Option
 - Hy- Binding Inform
 - Modified :
 - Hy- Binding Update
 - Hy- Router Advertisement

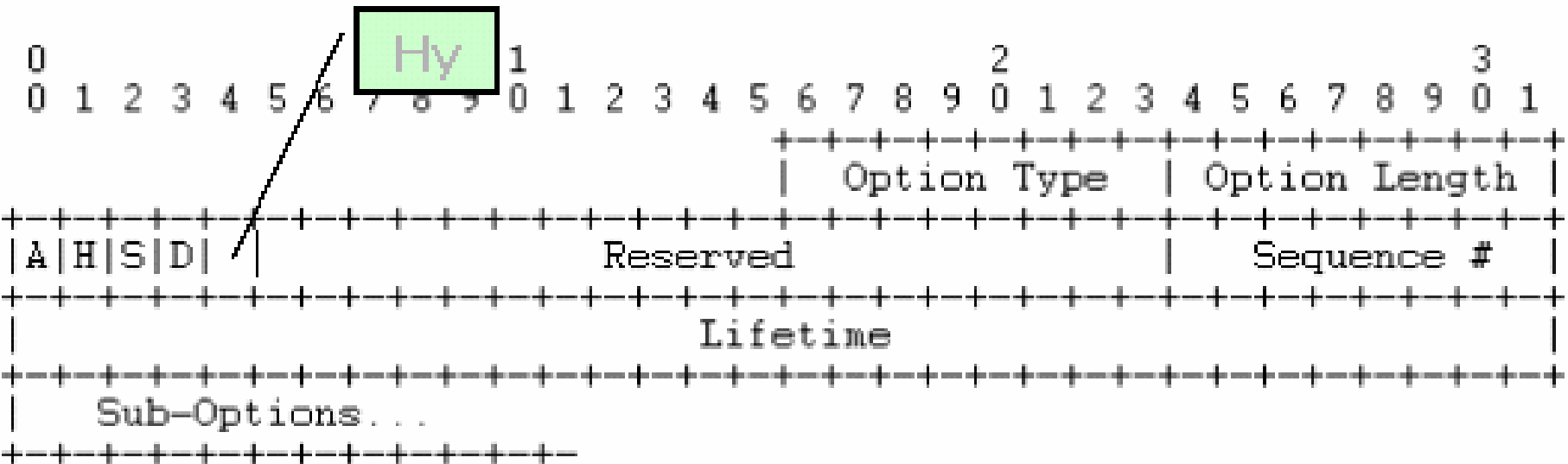
Receiver Home Address Option



Hierarchical Binding Inform

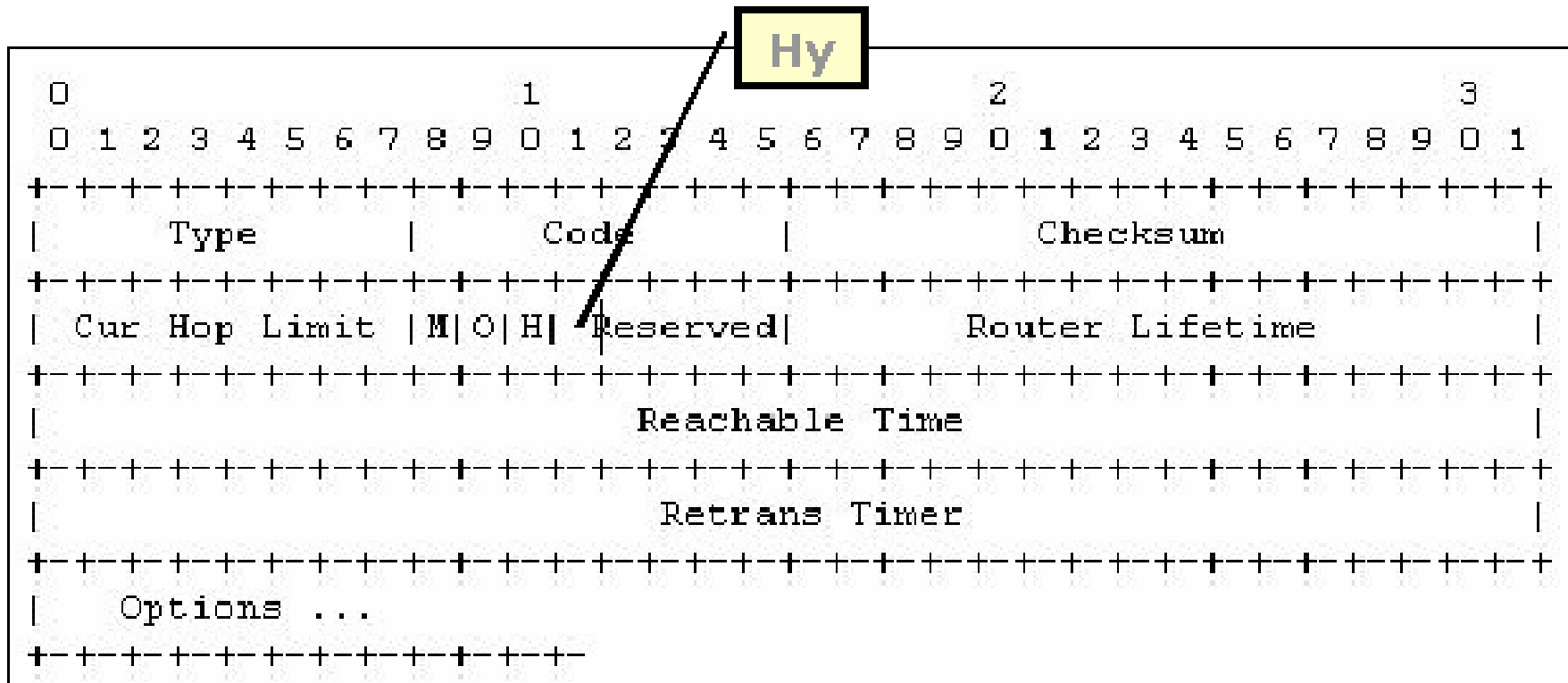


Hierarchical Binding Update



Hierarchical Router Advertisement

- “Hy” bit represents “hierarchy.”



Foreign Mobility Agent (FMA)

- Intercept HiMIPv6 control messages
- Hy-Binding Update / Hy-Binding Ack paradigm kept by *switching FMA*
- Maintain Visitor List
 - Record the information of mobile nodes under its network domain

Visitor List

- Mobile Node's home address
- the address of each node received a hierarchical binding update from the Mobile Node
- current care-of address
- MN's registration state
- Lifetime
- Type (whether Home Registration)
- Sequence
- Prefix Length

“State” in Visitor List

- 0: initial
- 1: authenticated
- 2: waiting for Binding Ack from Home Agent or Correspondent Node, which responds to BR
- 3: Mobile node is left (informed by Hierarchical Binding Inform)

HiMI Pv6: Network Management

- Considering network management issue, we also implement a monitoring tool by using SNMP (Simple Network Management Protocol)
- *SNMP Agent* resides on every HiMIPv6 system components
- *SNMP Manager* collects the information of every SNMP agents
- *HiMIPv6 MIB* (Management Information Base)
- Web-based *Monitoring Tool*

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HiMI Pv6: Benefits

- **Minimize** Mobile IPv6 handoff delay
- **Reduce** Mobile IPv6 signaling overhead
 - Redundant Binding Update & Acknowledge
- **Minimal** impacts on Mobile IPv6
 - Fewest modifications of mobile node, home agent, and correspondent node.
- Location privacy
 - Nodes *outside* the foreign network know mobile node's care-of address as the IPv6 address of the *Root Foreign Mobility Agent*
- Scalability
 - Flexibility in the number of the hierarchy

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HiMI Pv6: Usage

- Users with high mobility
 - Business people
 - Especially for users equipped with small mobile devices, e.g. laptops, PDAs.
- ISP (Internet Service Provider)
 - HiMIPv6 can be directly applied to current network configuration.
 - Only modifications on software, not hardware.
 - Improve Quality of Service

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Our Contributions

- Design and implement Hierarchical Mobile IPv6
- New System Component
 - Hierarchical-structured Foreign Mobility Agents
- Definition of HiMIPv6 control message types
 - Hy-BU, Hy-BA, Hy-BI, Hy-RA, receiver home address option
- Network Management Monitoring Tool

Thank You!!!