



# Multihoming for Mobile IPv6

Deguang Le



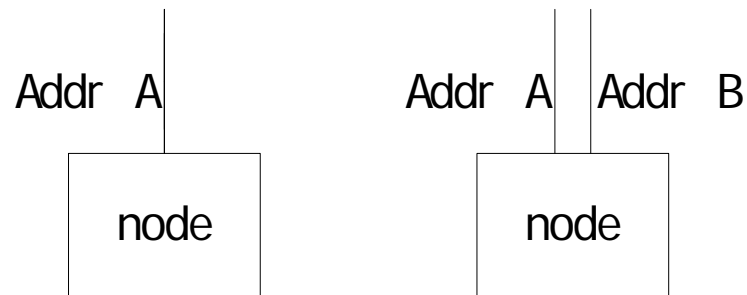
# Outline

- Multihoming Overview
- Multihoming and Mobility
- Multihoming for Mobile IPv6
- Conclusions and Discussion

# Multihoming Overview

- What is Multihoming?

- Multihoming is nothing more than having 2 or more network interface cards with different IP addresses on the same system
- A node has more than one global unicast address
- A node has more than one interfaces



- References:

- R. Braden, Requirements for Internet Hosts - Communication Layers, RFC 1122, IETF, October 1989



# Multihoming Overview

## ■ Benefits of Multihoming

- Redundancy
- Load sharing
- Load balancing
- Enhanced mobility support
- Others:
  - T. Ernst, N. Montavont and R. Wakikawa, “Goals and Benefits of Multihoming”, draft-ernst-generic-goals-and-benefits-01.txt, February, 2005.



# Mulihoming and Mobility

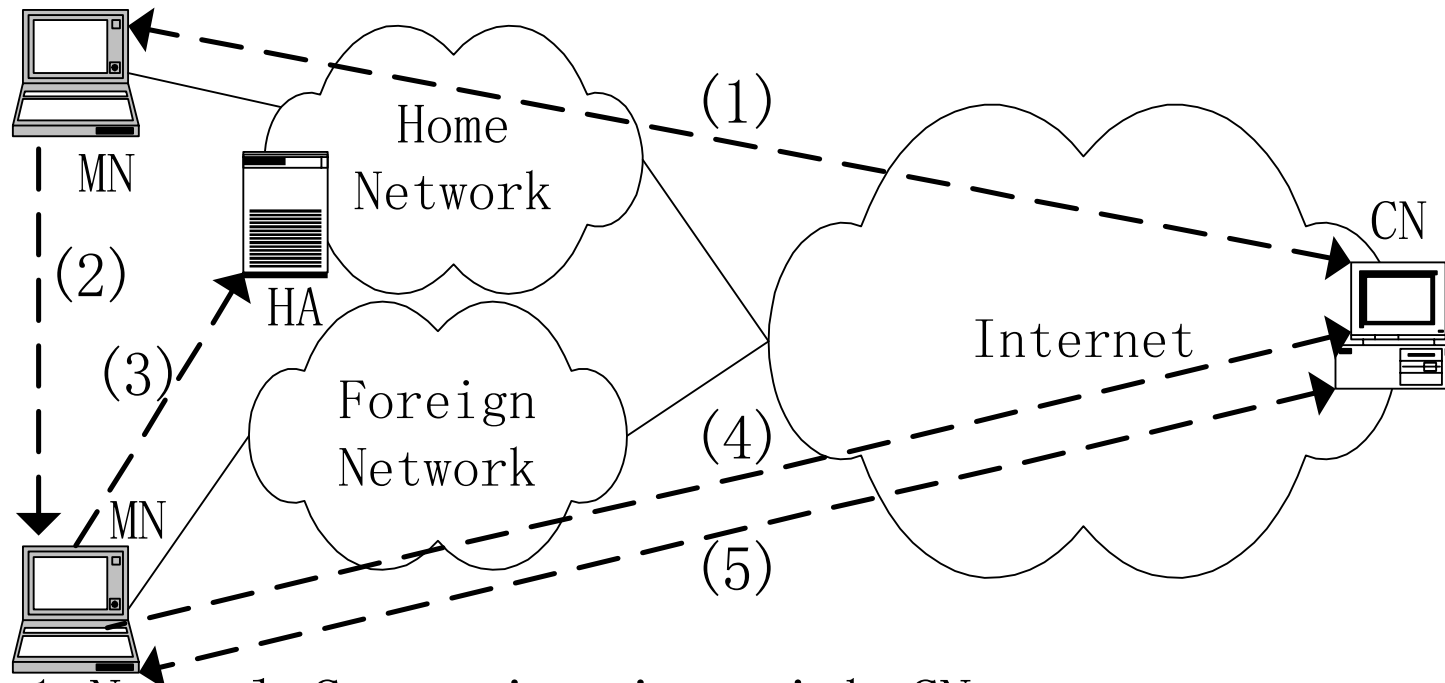
- Mobility can be considered as a multihoming scenario
  - IP address dynamic changing in mobile environment
  - We can see that Mobility is in fact a multihomed scenario where the mobile node has at least two addresses and solves the problem of connection preservation.
- Multihoming can be considered as a mobility scenario
  - Permanent and Ubiquitous Access in multihoming
  - Preserving established communication through outages in multihoming situation is similar to preserving established communications through mobility because both cases require the capability of dynamically changing the locators used during the communication while maintaining the endpoint identifier used by up layer protocol



# Mulithoming for Mobile IPv6

- Mobile IPv6 Overview
- Related Work
- Scenarios of Multihoming for Mobile IPv6
- Multihoming based Handover for Mobile IPv6

# MIPv6 Overview



1. Normal Communication with CN
2. Move
3. Register CoA
4. Binding Update
5. MN Communicates with CN Directly



# Related Work

- Mobile IPv6 for multiple interfaces  
(draft-montavont-mobileip-mmi-01)
- Analysis of Multihoming in Mobile IPv6  
(draft-montavont-mobileip-multihoming-pb-statement-04)
- Multiple Care-of Addresses Registration  
(draft-wakikawa-mobileip-multiplecoa-04)

# Scenario 1 of Multihoming for MIPv6

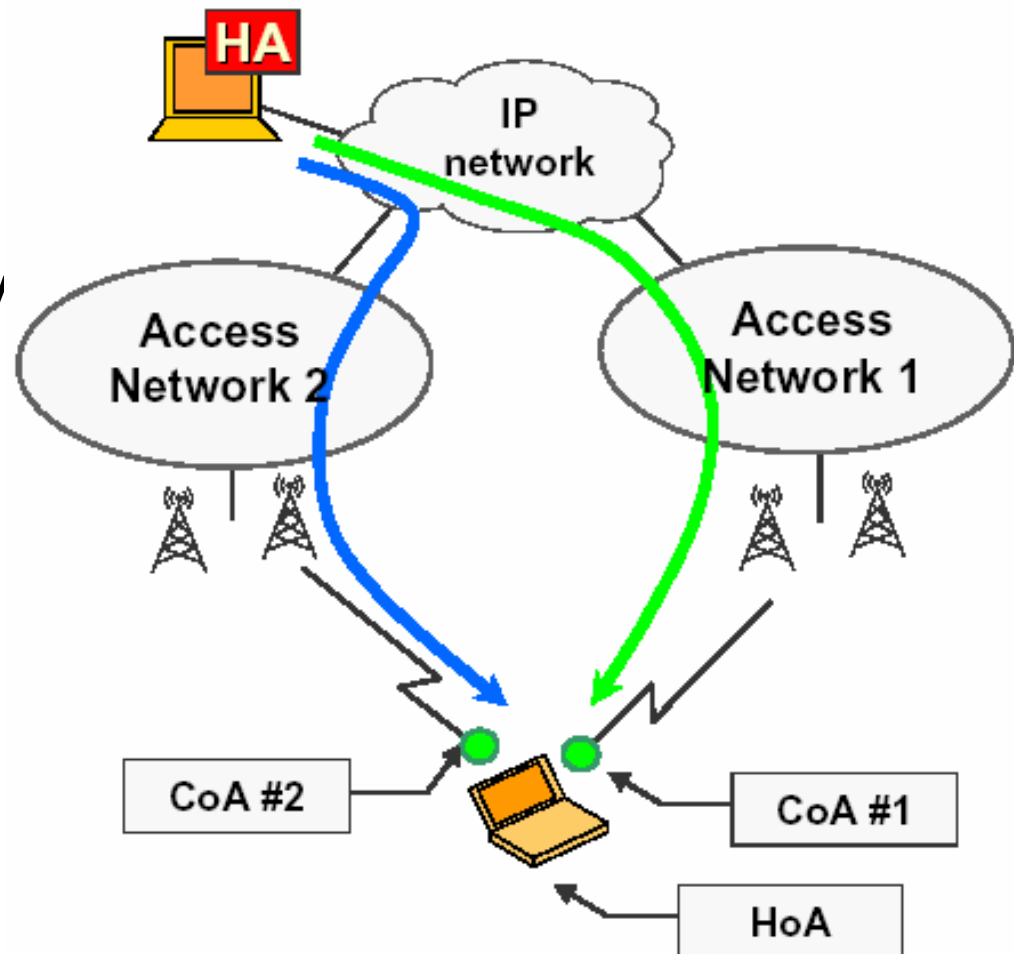
- Single home address and multiple CoA

HoA

- Node identity
- Global reachability

CoAs

- One or more for each interface
- Interface location



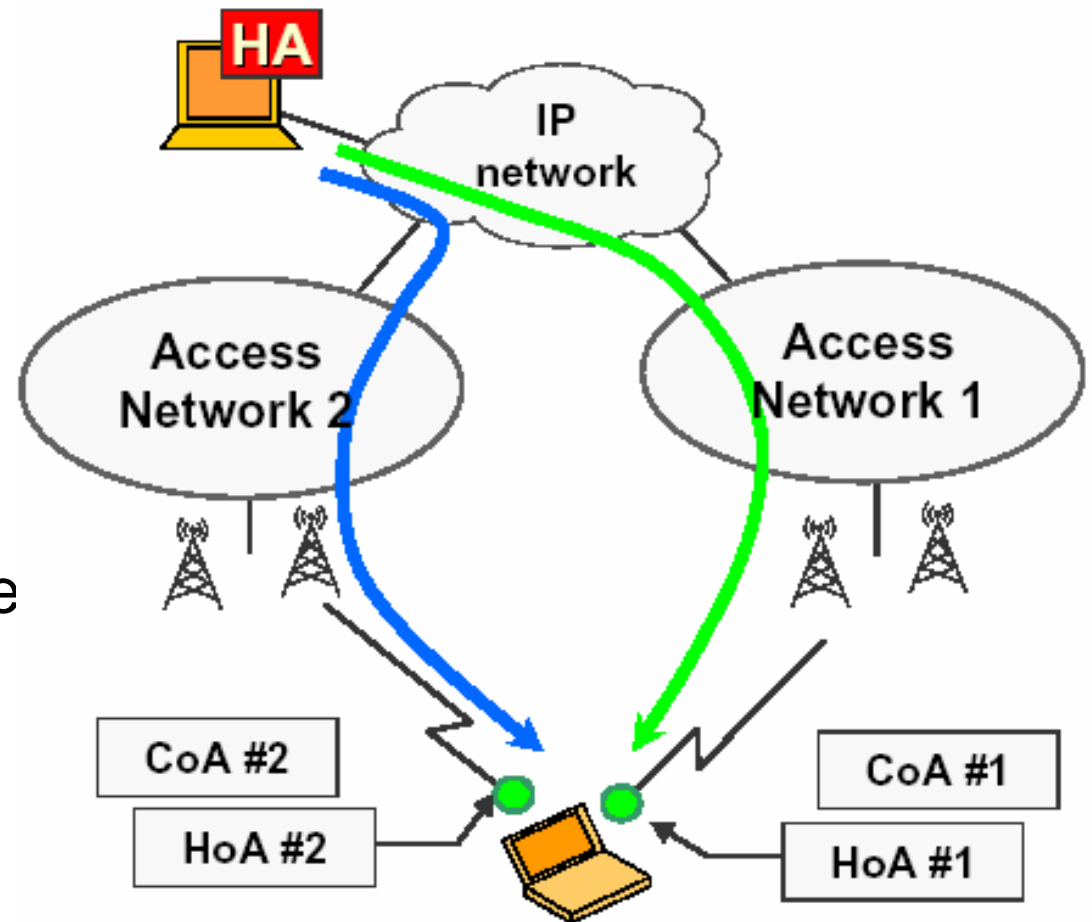
# Scenario2 of Multihoming for MIPv6

## ■ Multiple home address and multiple CoA HoAs

- One for each interface
- Interface identity
- Global reachability
- One or more HAs

## CoAs

- Registering with one or more HAs
- Interface location





# Multihoming Based Handover for MIPv6

## ■ Objectives

- Development of solution to allow the mobile node to use multiple access networks for seamless handover

## ■ Requirements

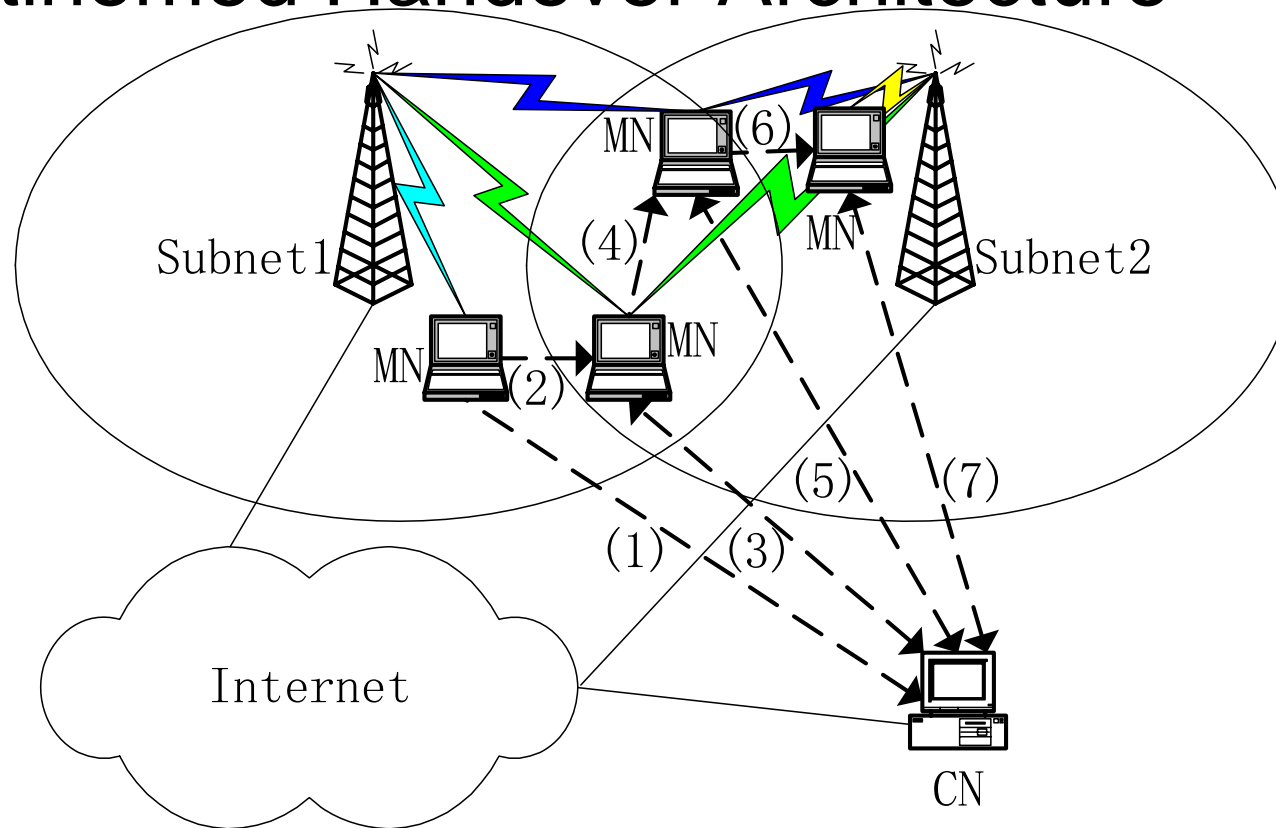
- Overlapping nature of networks for multihoming
- MN with several Interfaces (physical or logical) connected to the IPv6 networks
- At least one IPv6 address configured on each interface
- MN has only one home address and only one home agent

## ■ Approaches

- Prospective movement detection and CoA configuration
- Anticipative CoA registration

# Multihoming Based Handover for MIPv6

## ■ Multihomed Handover Architecture





# Multihoming Based Handover for MIPv6

## ■ Multihomed Handover Initiation Strategy

- Handover Initiation is the ability to decide when to perform a handover
- To allow MN to handover with as little disruption as possible, it is required that the handover is initiated  $T_{HI}$  amount of time before the connection breakdown occurs, where  $T_{HI}$  is given by:

$$T_{HI} > T_{HAReg} + T_{CNReg} - (1)$$

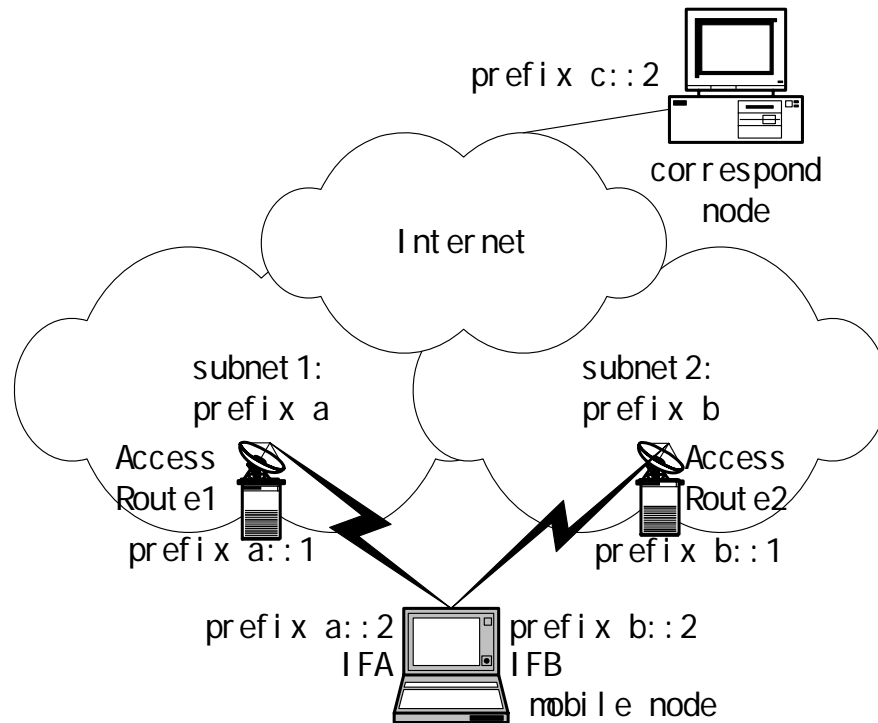
- In general, it is difficult for the mobile node to estimate the values of binding registration time. It is relatively easier for the mobile node to estimate the round trip time. We can approximate binding registration time to be  $T_{RTT}$ , then formula (1) becomes:  $T_{HI} > T_{HA\_RTT} + T_{CN\_RTT}$
- Handover initiation criteria: signal strength



# Multihoming Based Handover for MIPv6

- Operation for Handover between Interfaces
  - Binding Registration
    - Sending binding update messages through the new interface to register the new IP address as new CoA with the HA as well as its CN
  - Local Routing Management
    - Traditional route identification mechanism: destination-based routing
    - Problem: the choice of outgoing interface
    - Proposal: source-based routing

# Problem of Local Routing Management in Multihoming



Typical routing tables of mobile node

Destination	Gateway	Interface
Default	prefix a::1	IFA
prefix a	Direct	IFA
prefix b	Direct	IFB



# Proposal: source-based routing

Source address attached routing table

Source	Destination	Gateway	Interface
Prefix a::2	Default	Prefix a::1	IFA
Prefix b::2	Default	Prefix b::1	IFB
Prefix a::2	Prefix a	Direct	IFA
Prefix b::2	Prefix b	Direct	IFB



# Conclusions

- Multihoming is an important technique in the Internet.
- Different protocols in TCP/IP stack employ Multihoming for performance enhancement
- Multihoming can improve mobility support in mobile Internet
- We propose a multihoming based handover for MIPv6 to enhance mobility support



Thanks for your  
attendance!