

Mobility Management in IP based wireless network

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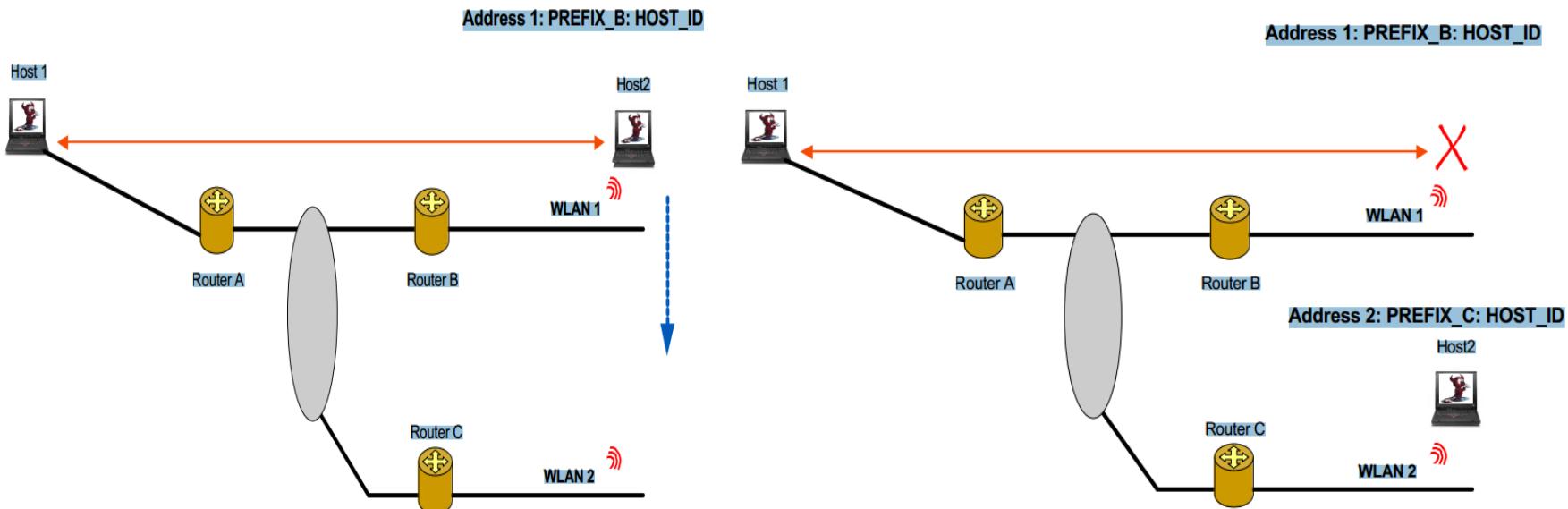
Roadmap

- ▶ Introduction
- ▶ MIPv4
- ▶ MIPv6
- ▶ Distributed Mobility Management
- ▶ My proposal

Introduction

▶ Mobility Management

- Maintain connection while end hosts move
- Typically if you change location, IP address changes. Upper layer connection would break



Introduction

▶ Intrasystem

VS

▶ Intersystem

Introduction

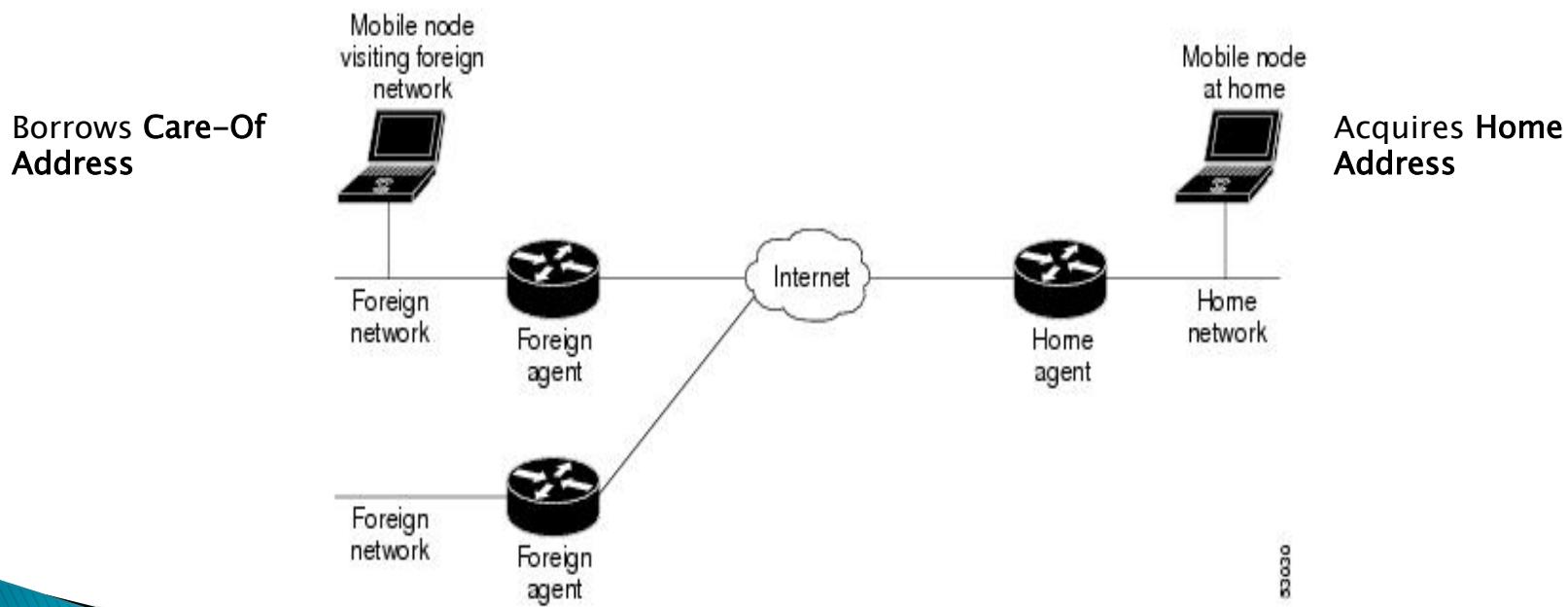
- ▶ Link layer solution(layer2)
- ▶ Network layer solution(layer3)
 - MIPv4
 - MIPv6
- ▶ Cross layer solution(layer2+layer3)

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MIPv4

- ▶ IP Mobility Support for IPv4
- ▶ Standardized in IETF RFC 5944



MIPv4 Key Steps

- ▶ ***Agent Discovery***

A Mobile Node discovers its Foreign and Home Agents during agent discovery

- ▶ ***Registration***

The Mobile Node registers its current location with the Foreign Agent and Home Agent during registration

- ▶ ***Tunneling***

A reciprocal tunnel is set up by the Home Agent to the care-of address to route packets to the Mobile Node as it roams

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Agent Discovery

- ▶ Home Agent and Foreign Agent advertise their services on the network
- ▶ Mobile node can also solicit for an advertisement
- ▶ Mobile node determine whether it is at home network or foreign network by checking network prefix in advertisement

MIPv4 Key Steps

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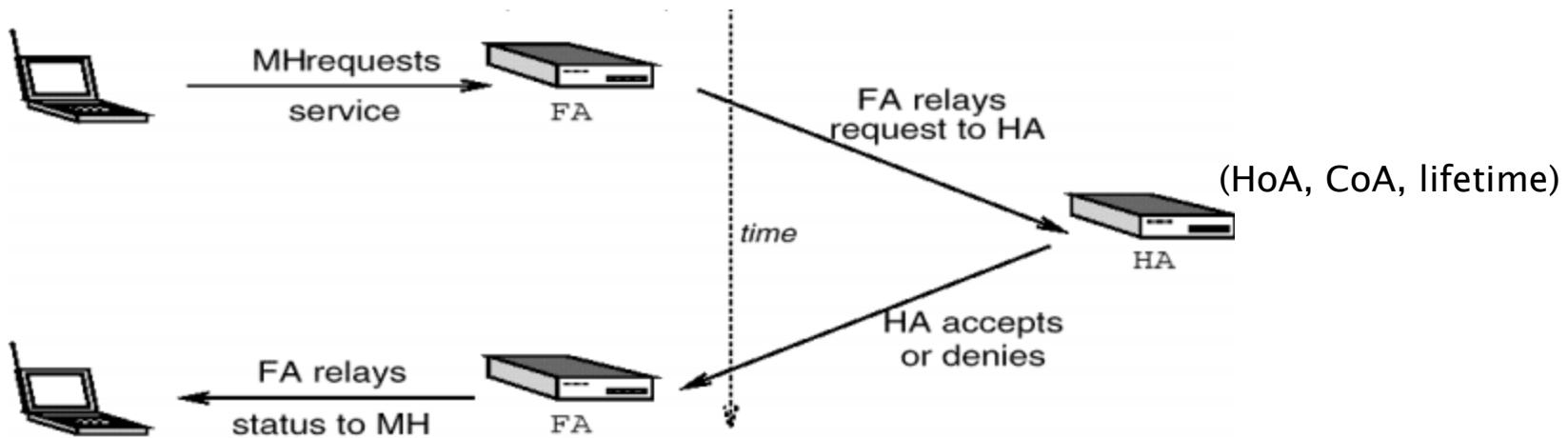
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- ▶ *Tunneling*

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Registration

- ▶ Mobile nodes registers Care-of Address and Home Address pair at both Home Agent and Foreign Agent
- ▶ binding : (home address, care-of address, lifetime)



MIPv4 Key Steps

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- ▶ *Registration*

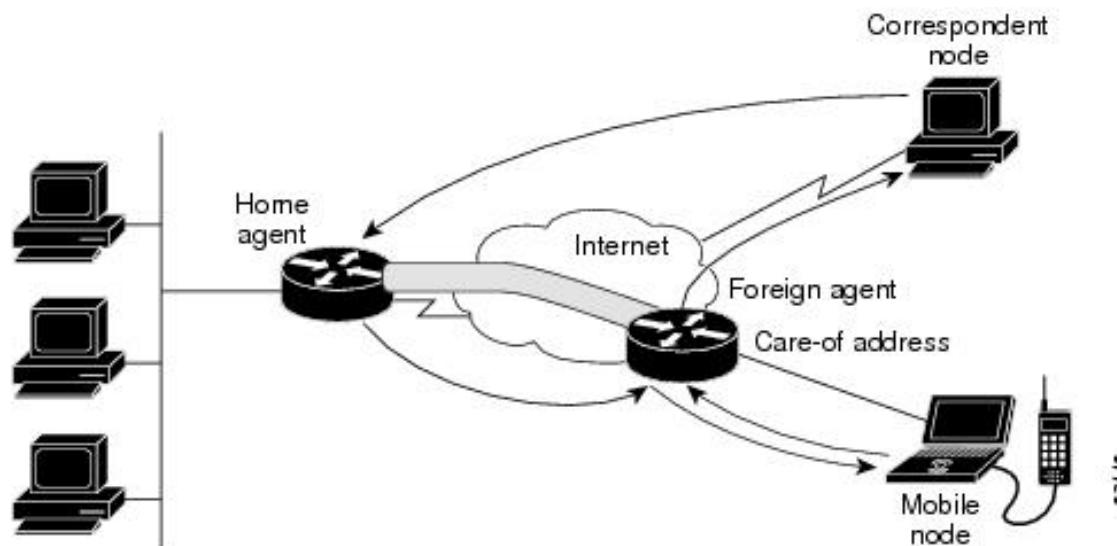
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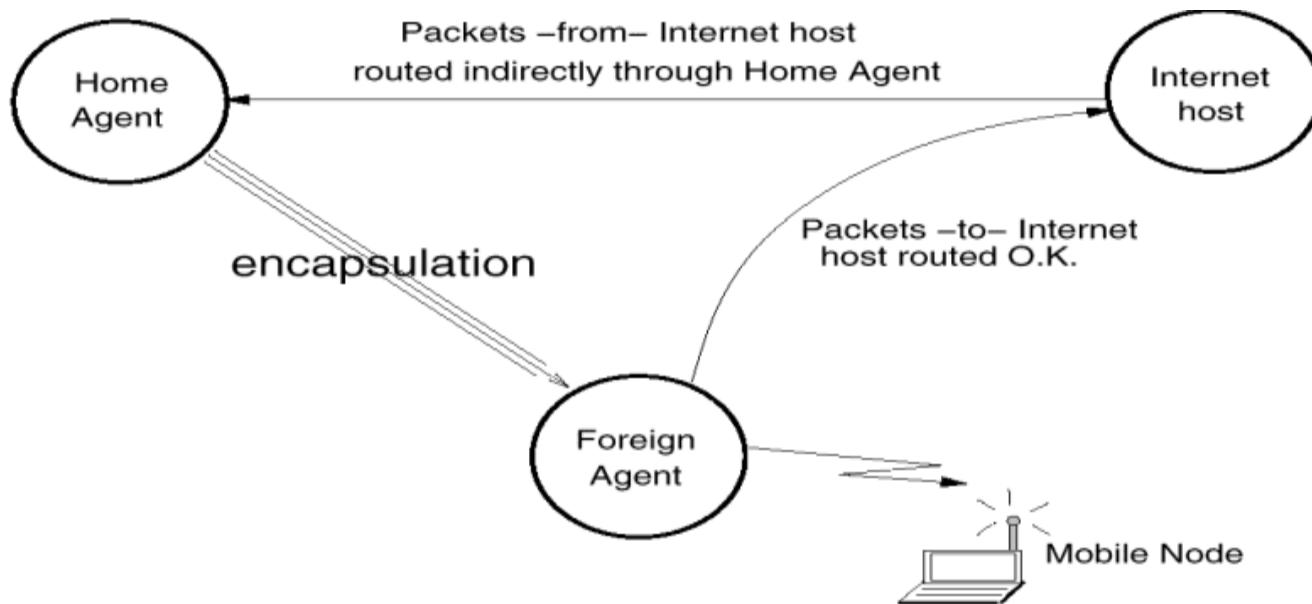
Tunneling

- ▶ Packets destined to Mobile Node are first routed intercepted by Home Agent
- ▶ Home Agent tunnels packets to Foreign Agent or Mobile Node



MIPv4 Problems

▶ Triangle Routing



- Solution

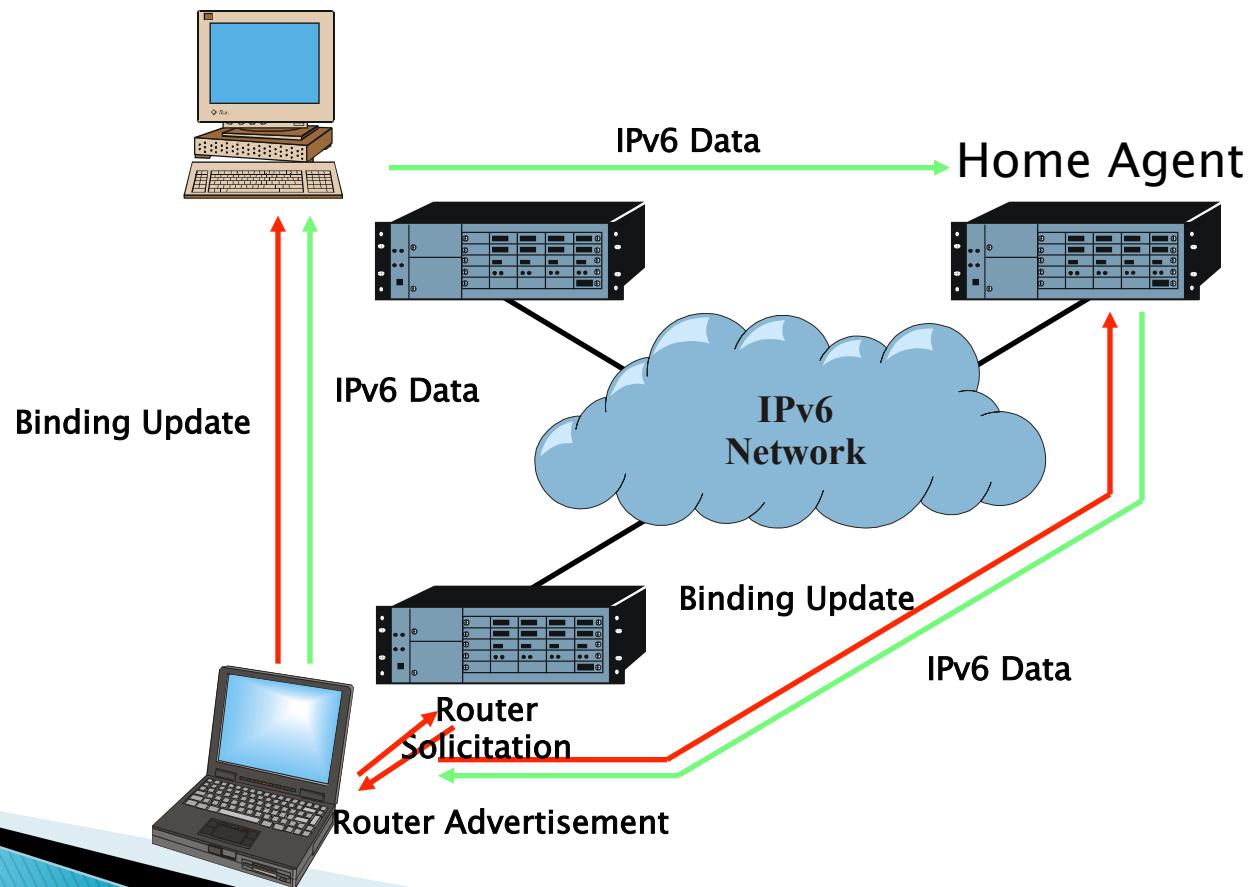
Route optimization—maintain bindings at Correspondent Node as well

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MIPv6

- ▶ IP mobility implementation for the next generation of the Internet Protocol--IPv6
- ▶ Described in IETF RFC 6275

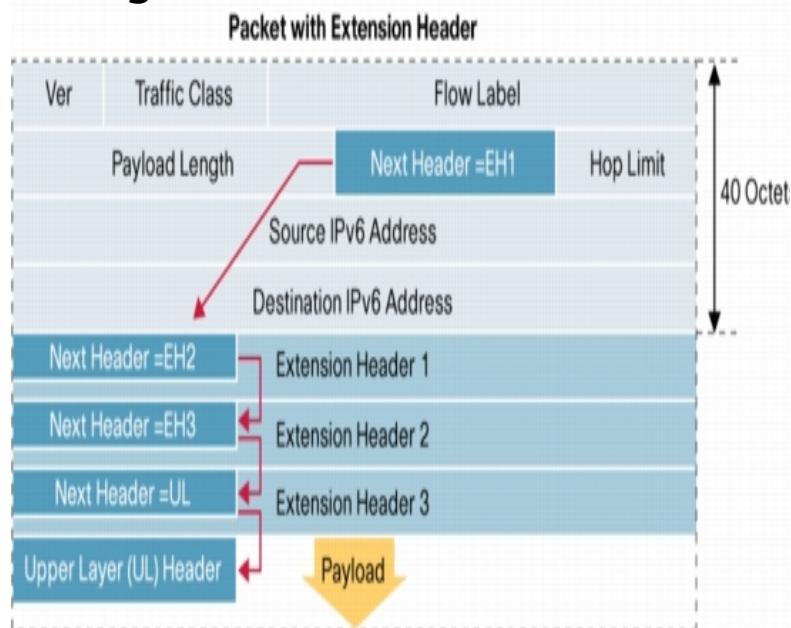


MIPv6 difference from MIPv4

- ▶ No Foreign Agent
- ▶ Route Optimization is inherent in MIPv6 as opposed to MIPv4 where RO is an extension
- ▶ Packets are sent using an IPv6 extension headers rather than tunneling, eliminating tunneling overhead.

MIPv6

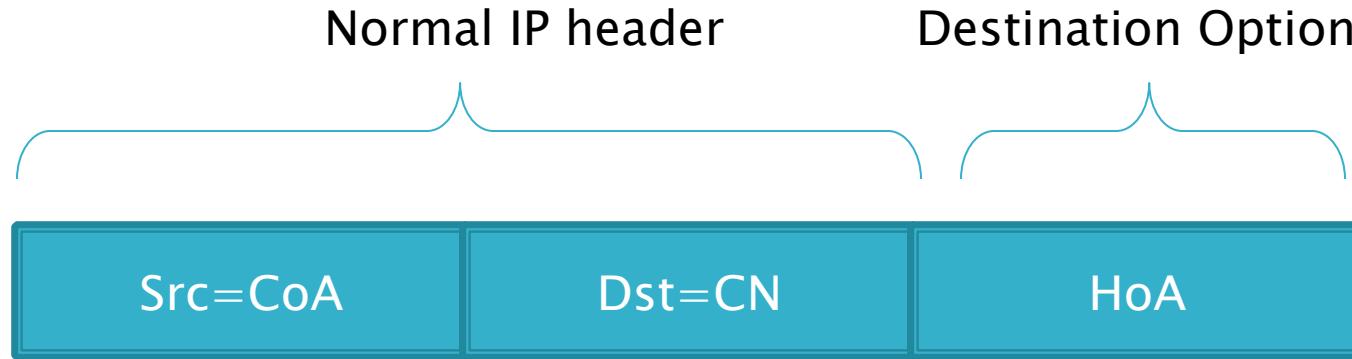
Packets are sent using Care-of Address. Home address can be appended into one of the headers, thus eliminating the need for tunneling.



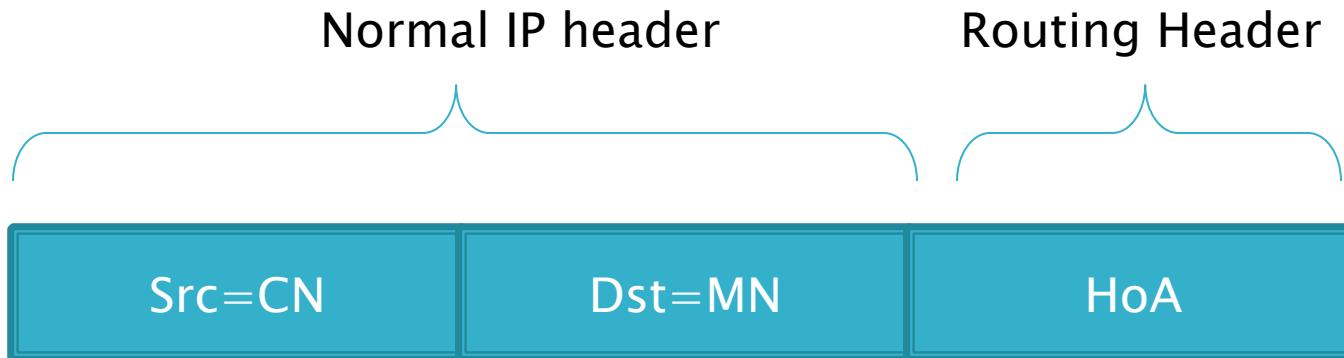
Order	Header Type	Next Header Code
1	Basic IPv6 Header	-
2	Hop-by-Hop Options	0
3	Destination Options (with Routing Options)	60
4	Routing Header	43
5	Fragment Header	44
6	Authentication Header	51
7	Encapsulation Security Payload Header	50
8	Destination Options	60
9	Mobility Header	135
	No next header	59
Upper Layer	TCP	6
Upper Layer	UDP	17
Upper Layer	ICMPv6	58

MIPv6

MN → CN



CN → MN



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Distributed Mobility Management

▶ Motivation

- MIPv4 and MIPv6 features a centralized anchor that governs traffic to/from Mobile Node
- Introduces scalability issues and single point of failure threats
- Distributing anchors seems to be a promising fix

Fully Distributed Mobility Management

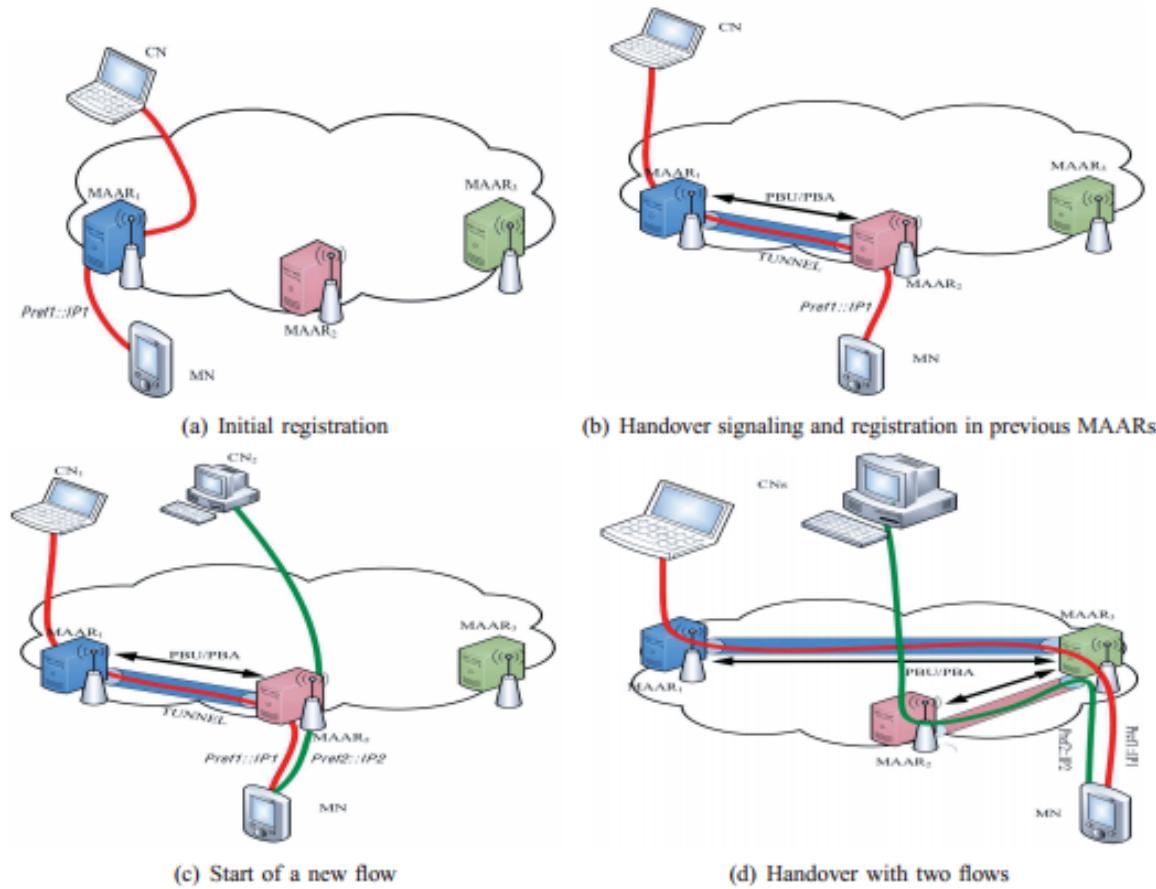
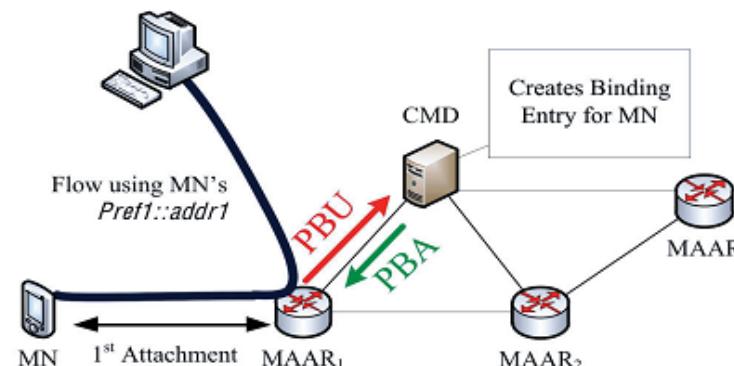
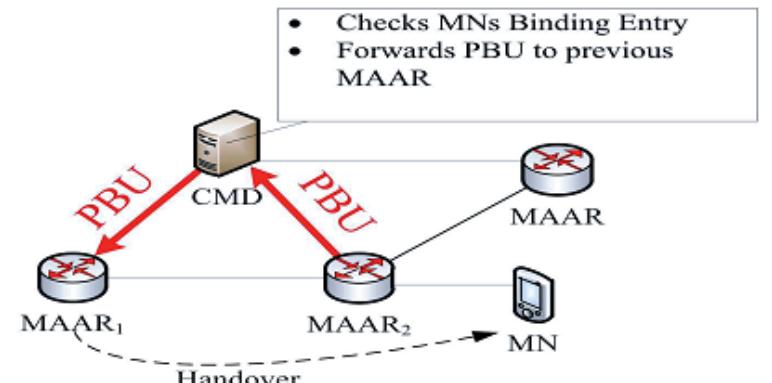


Fig. 1. Fully distributed PMIPv6

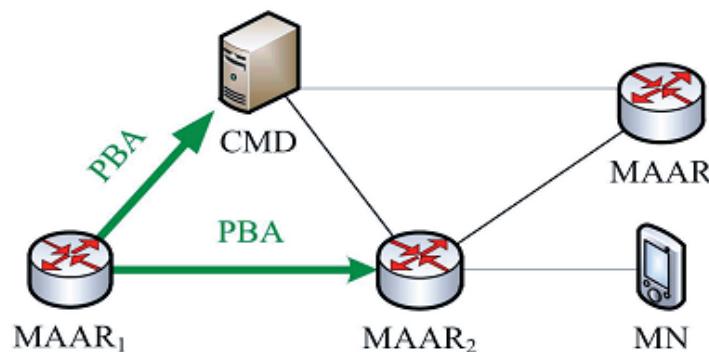
Partially Distributed Mobility Management



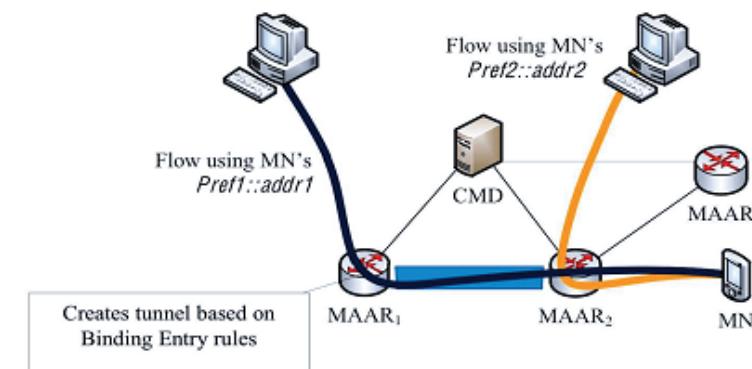
(a) Initial registration



(b) Handover signaling and registration in previous MAARs



(c) Acknowledgement from previous MAARs



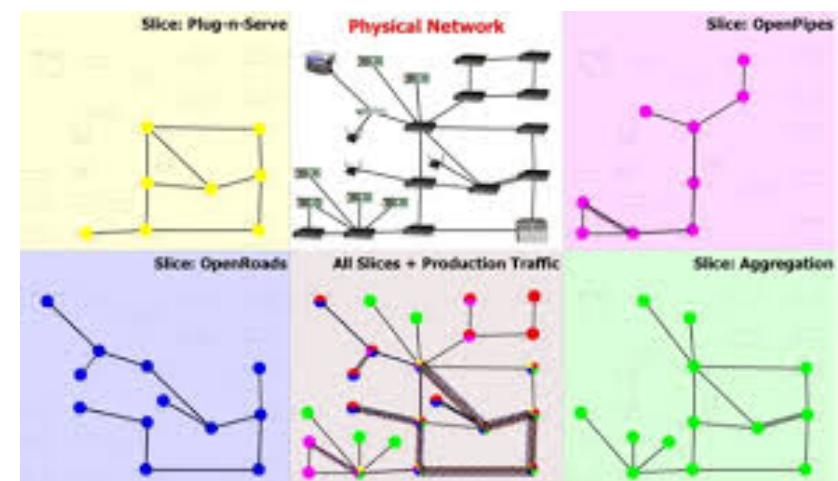
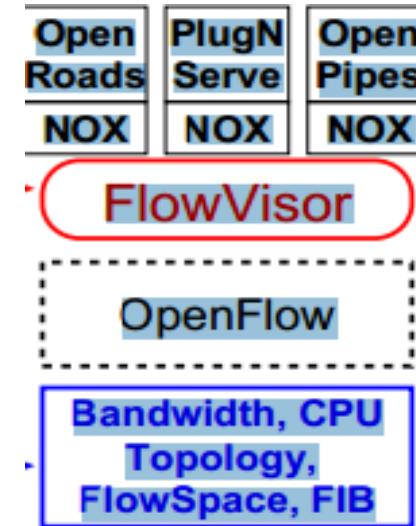
(d) Data tunneling and use of new prefixes

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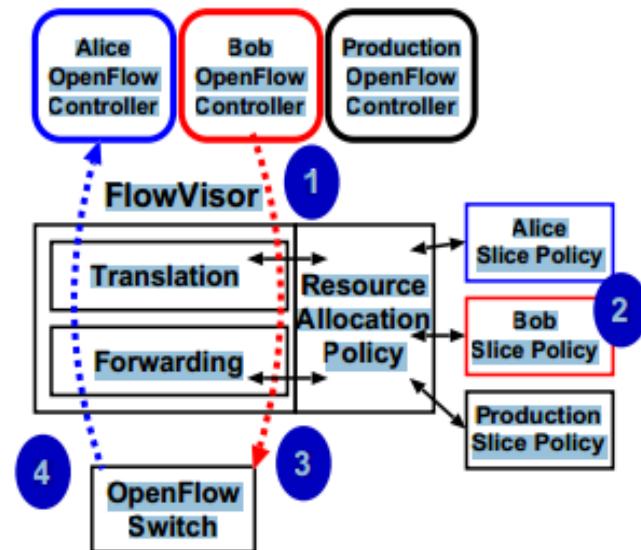
My proposal--Inspiration from flowvisor

- ▶ Flowvisor is a special/proxy controller that sits between control plane and data plane
- ▶ It divides same hardware dataplane into orthogonal logical network slices.
- ▶ Each network slice is controlled by one SDN controller



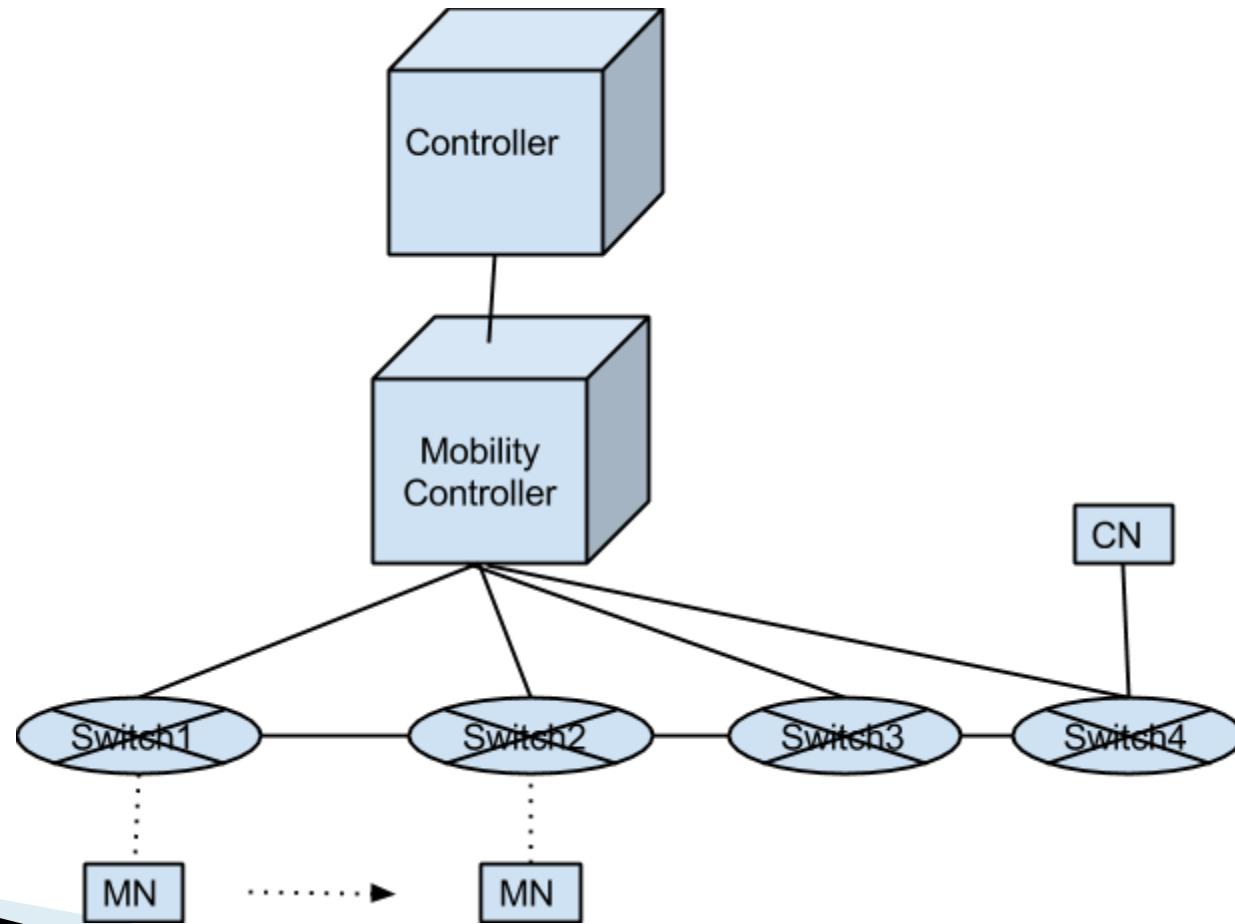
Flowvisor

- Monitors openflow messages from controller, rewrite if necessary to affect only associated slice
- Intercept packets from switch, forward to their controller according to the slice it's in

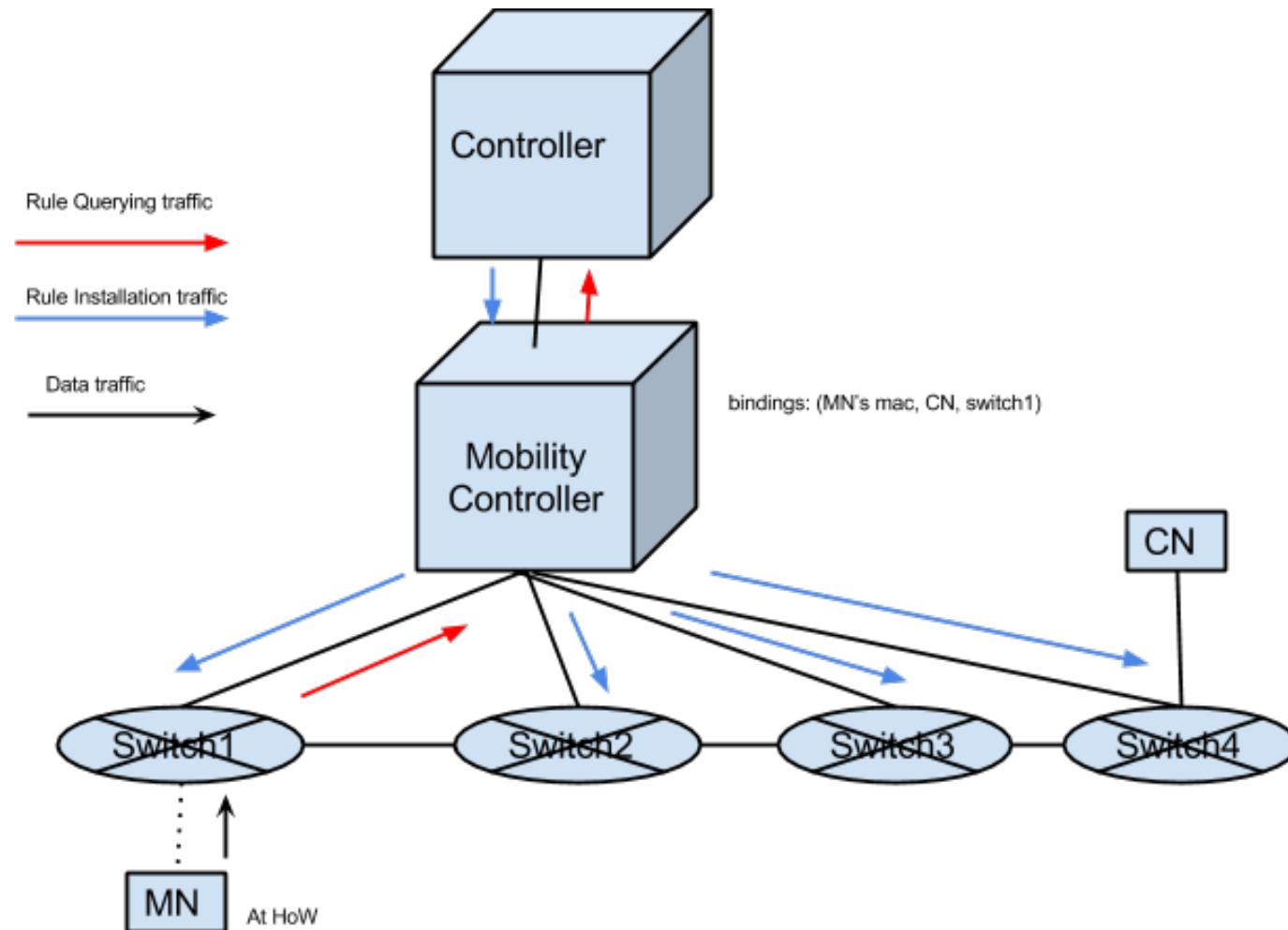


My Proposal

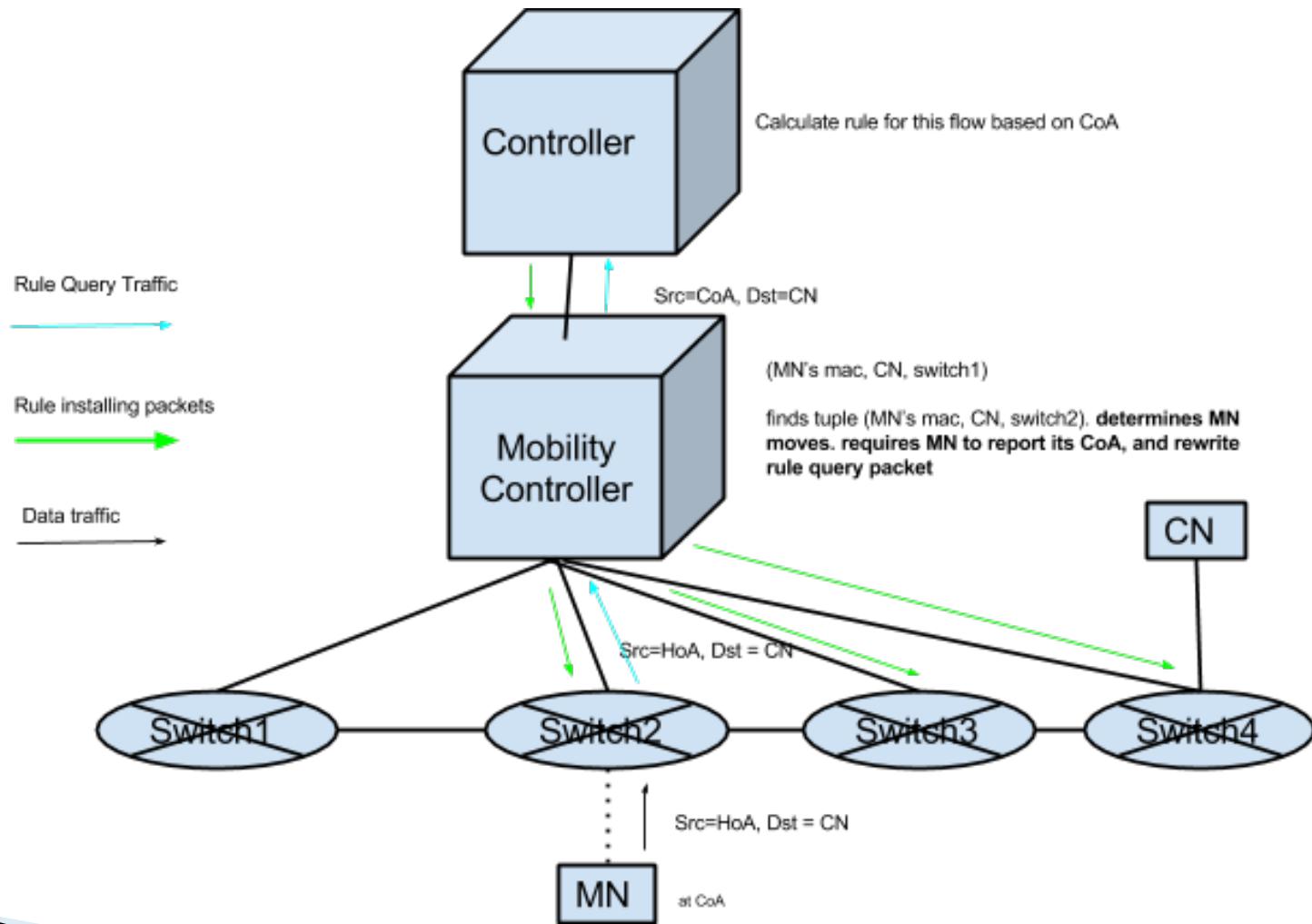
- ▶ Principle of monitor and rewrite



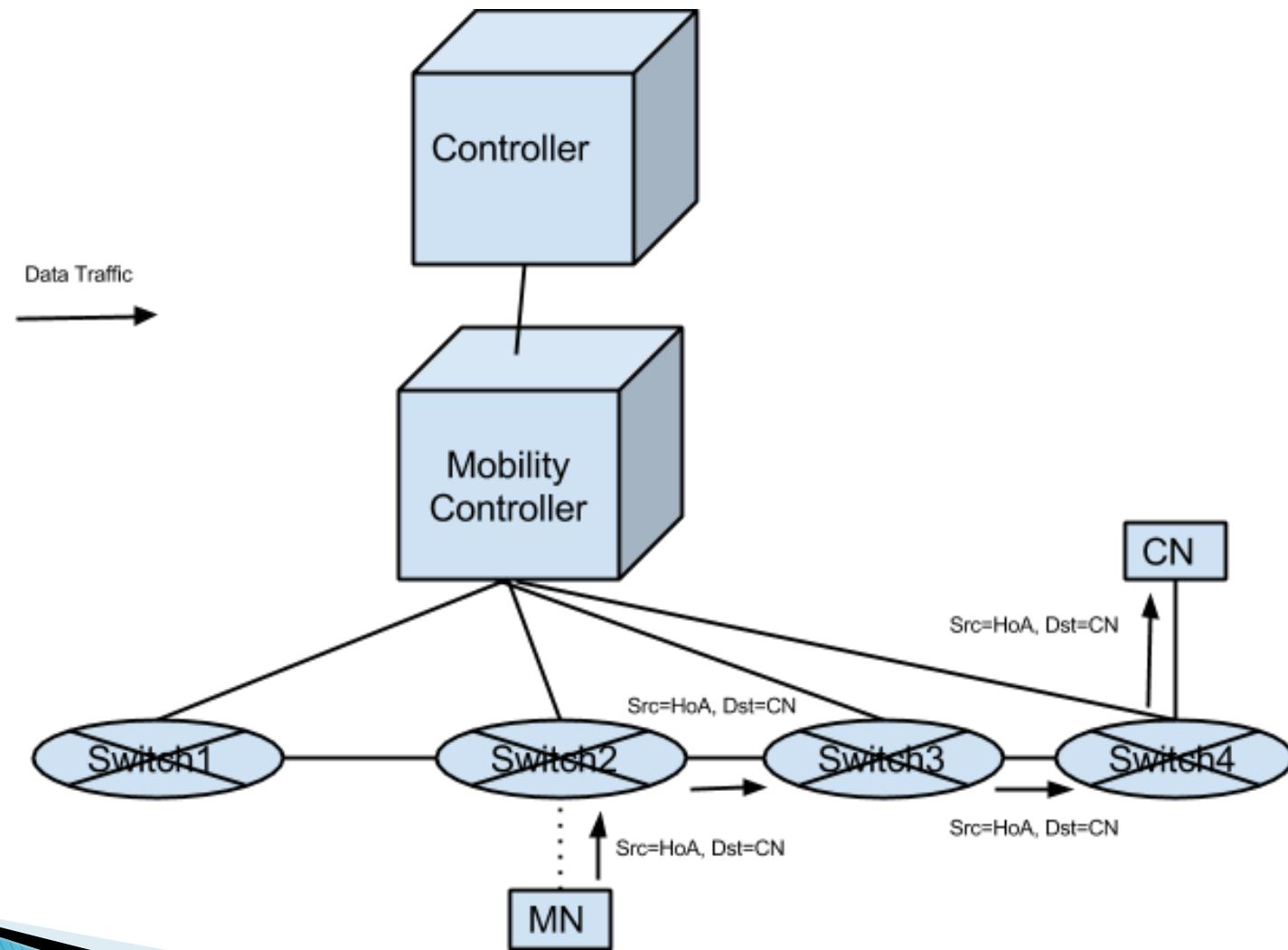
My Proposal



My Proposal



My Proposal



Intuitive Evaluation

- ▶ **Advantage:**
 - No Foreign Agent/Home Agent needed
 - No Tunneling Overhead
 - Route Optimization is inherently achieved since path is calculated according to current location

- ▶ **Disadvantage:**
 - Requires a fine control of the flow, which possibly leads to gigantic flow tables in mobility controller
 - Introduces new overhead in mobility control layer



Thank You !