Mobility Related Research at the InternetCAR Project

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WIDE

ToC

- Implementation Status
- Multihomed MN
  - Multiple Care-of address Registration
  - Vertical Handover
- Network Mobility
  - Basic Solution
  - Current Status
- BPA: Binding Proxy Agent
- Demonstration System

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Implementation Status

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Features of SFCMIP

- MIPv6 support since 1999
- Base Mobile IPv6 support
- ha-ipsec support (not IKE)
- Multiple Interfaces Support
  - Interface Switching Support (vertical Handoff)
  - Multiple Network Interfaces Support (MultiAccess)
- L2 trigger for movement detection
  - mobility socket
- Network Mobility Extension (NEMO)

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Mobile IPv6 Status

- Supporting draft
  - draft-ietf-mobileip-ipv6-20.txt
  - draft-ietf-mobileip-mipv6-ha-ipsec-02.txt
- Target Node
  - i386 FreeBSD-RELEASE w/out KAME stack
  - Porting to NetBSD-RELEASE now
  - iTRON4.0 RealTimeOS (H8 CPU)
- Supporting MN, CN and HA(i386 only)
- To-Do
  - IKE support
  - Bugs fix

Mobile IPv6 on ITron4.0

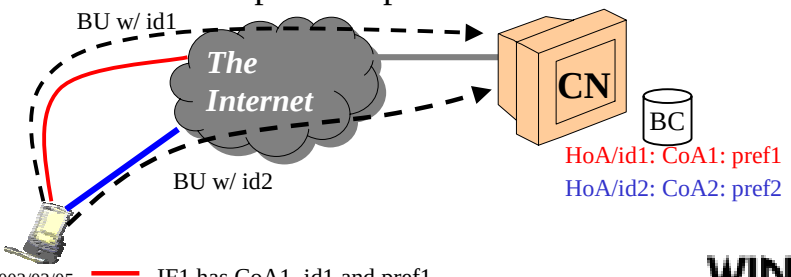
- micro ITRON4.0 79APIs
- simple IPv6 stack
- Porting MIP6 by Hiroki Matsutani
- MOZUKU running environments
  - Hitachi H8 series
  - Simulator on UNIX

- http://www.sfc.wide.ad.jp/~nn/mozuku/
- Spec.
  - H8/3048F (Hitachi)
  - 16MHz @ 5V
  - 128KByte ROM, 4KByte RAM
  - I/O pin 78 (Max)
  - 16bit timer 5ch, DRAM interface
  - SCI 2ch, 10bit A/D 8ch, 8bit D/A 2ch

Multihomed MN

Multiple Care-of Address Registration

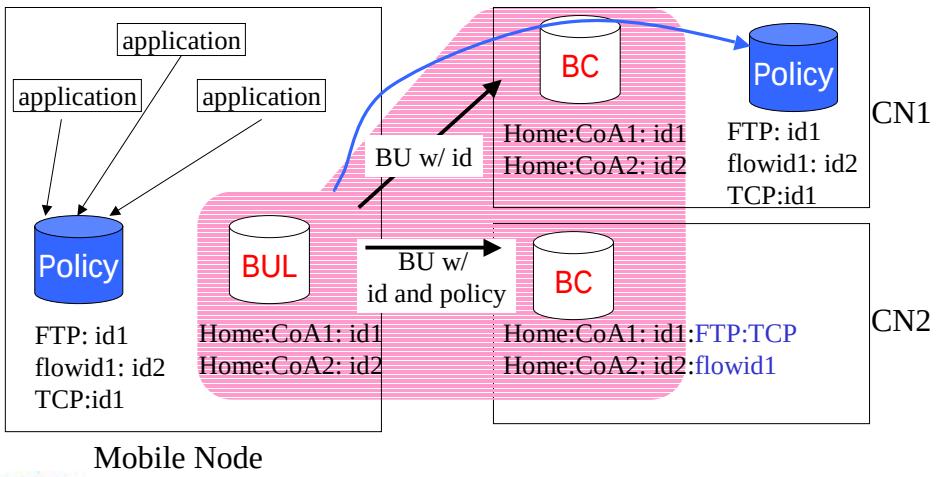
- MN assigns ID and Pref. to each network interface
  - ex. if MN has eth0 and eth1, it generates random id and assigns pref.
- MN sends BU w/ the id and the pref. assigned to the IF
- draft-wakikawa-mip6-multiplecoa-00.txt



Multiple Care-of Address Registration

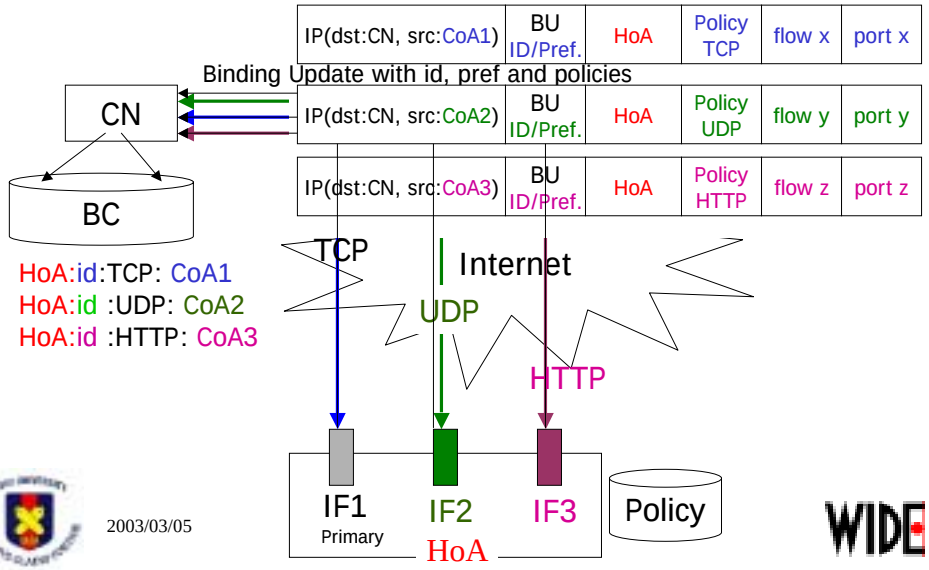
- When MN changes the attached point of IF1, it updates the binding for IF1
  - CoA1 was changed, but CN still identify the binding by ID
- Binding Search is done w/ home address and ID if ID is available
- Selection of Binding is not discussed in the draft
- Policy Management can be operated by anyway
  - Bind policy to “binding” by Mobile IP
  - Manage policy with id

System Architecture

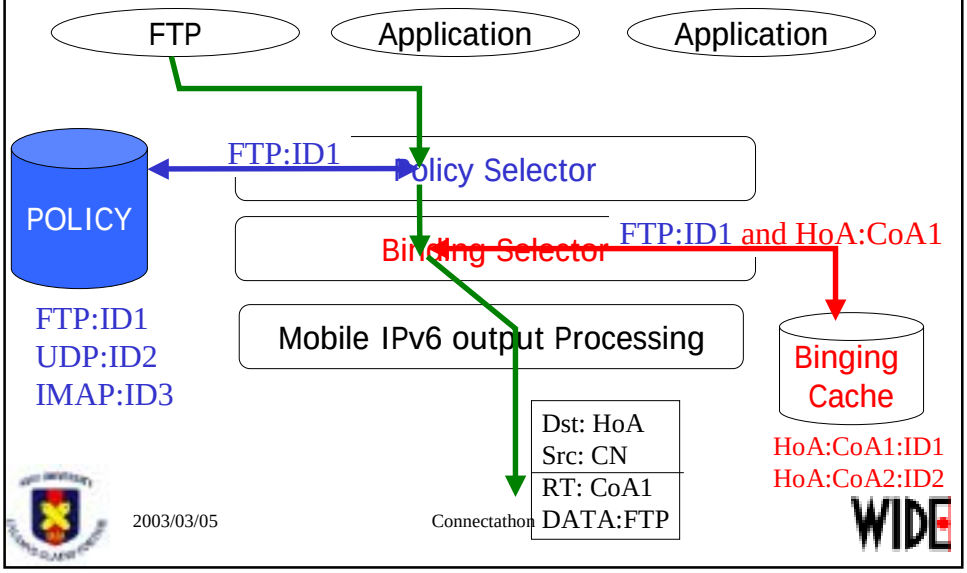


Binding Selection instead of source address selection

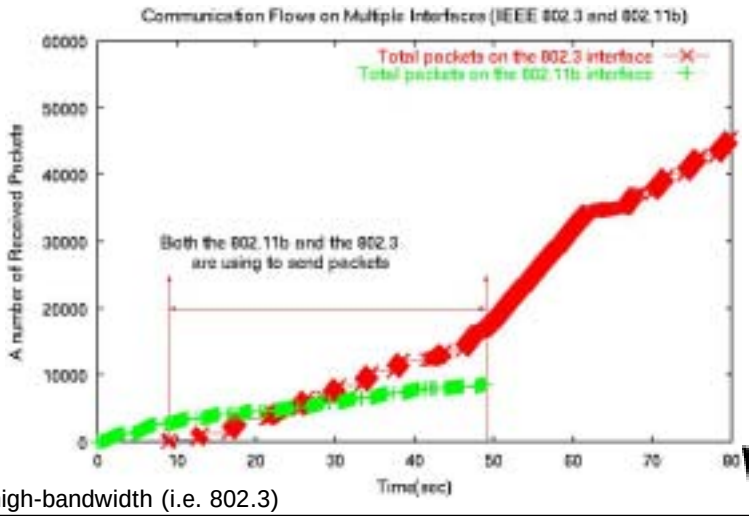
Policy Based Routing



CN Output Processing



Effectiveness of Policy-Based Routing



UDP: high-bandwidth (i.e. 802.3)

Network Mobility

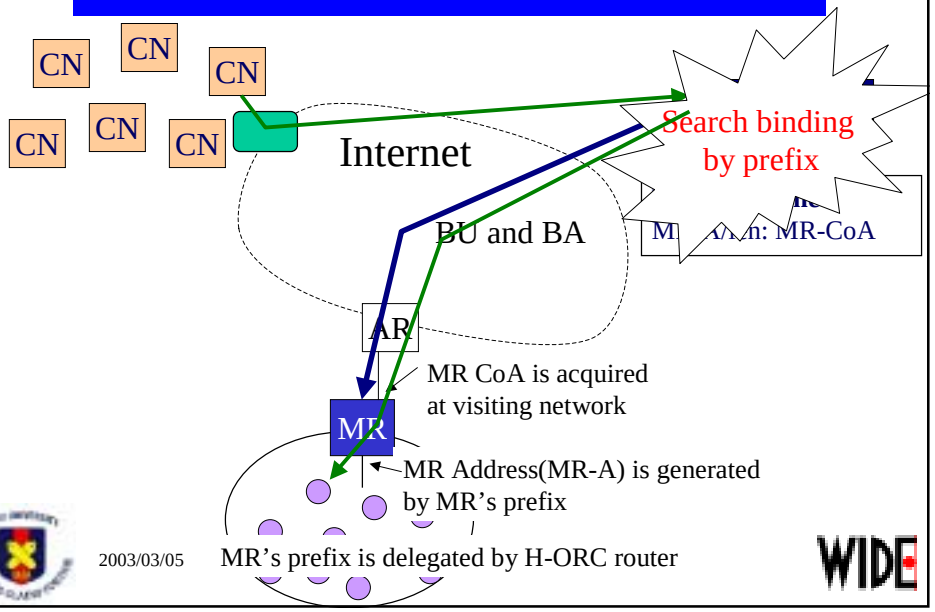
Network Mobility Basic Support

- MR-A is the home address for MR
- BU

IP(dst:CN, src:CoA)	MR-A	AH	BU N flag	Prefix Length

- Prefix is authorized and authenticated by HA with IPsec
- CN registers MR-A, CoA, and Prefix Length to Binding Cache
- Binding Comparison
  - Step.1 Comparison by 128-bit prefix length
  - Step.2 Comparison by registered prefix length

Overview



NEMO Status

- Documentation
  - draft-wakikawa-nemo-basic-00.txt
  - "ORC: Optimized Route Cache Management Protocol for Network Mobility", **10th International Conference on Telecommunications at Papeete, 2003 Feb.**
- Implementation
  - Implementation of MR and HA on Mobile IPv6
  - Nested Mobility is working (VMN)
  - Support RO
    - RO is not present in the draft, but is in my paper
- ToDO
  - Multihomed Mobile Network
  - Prefix Delegation

Conclusion

- More Info. will be available at
  - www.wakikawa.net or www.mobileip.jp
- Any Question: ryuji@sfc.wide.ad.jp
- Software Release
  - Hopefully before this Summer

BPA: Operation of Binding Proxy Agent with Mobile IPv6

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Abstract

- To avoid routing via HA when CN is not Mobile IPv6 Capable
  - Considering that it will take some time for nodes to support Mobile IPv6
  - Some may not be capable of supporting it
- Optimized Route needed for some applications
- Proxy Node maintains Bindings for CN
  - Route Optimization with MN

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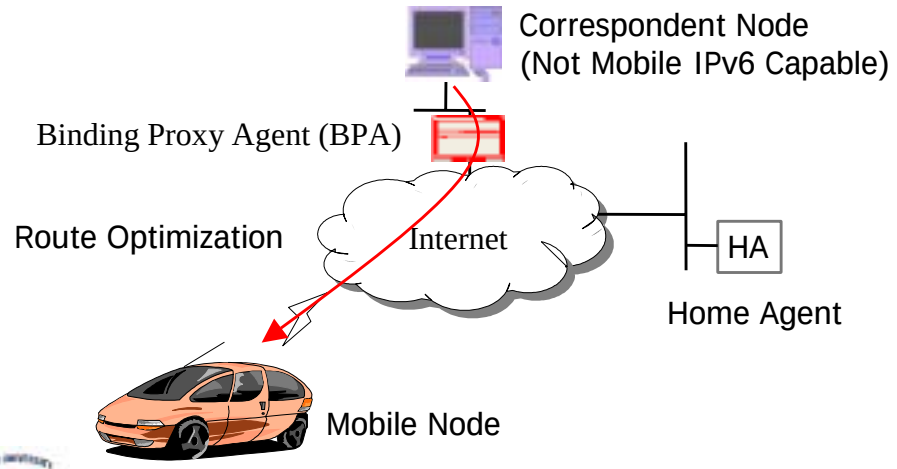
Route Optimization with BPA



Requirements

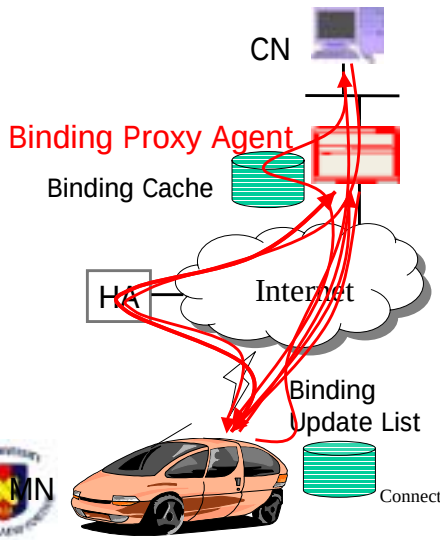
- No modification to the Mobile IPv6 specification
  - No changes to MN and HA
- No modification to the IPv6 specification
  - No changes to CN

⇒ Help promotion of Mobile IPv6

Maintaining a Binding

- BPA must processes Return Routability for CN
  - Detect HoTI, COTI destined to CN
  - Reply HoT, CoT
- BPA maintains BC for CN
  - Detect BU destined to CN
  - Reply BA to MN
  - Make BC for CN

Packet Processing



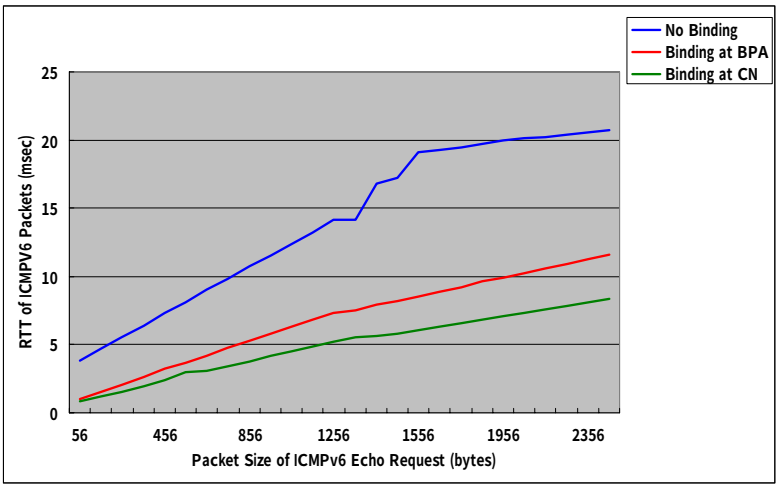
BPA

- Detect HoTI & CoTI
- Send HoT & CoT
- Detect Binding Update
- Create Binding Cache
- Added Routing Header
- Remove Home Address Option

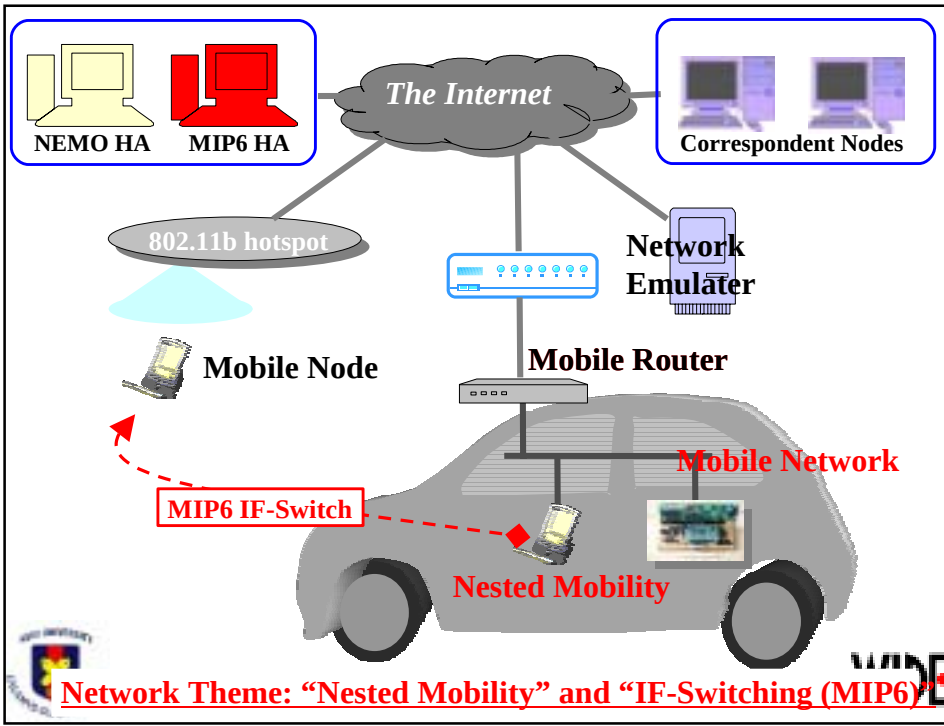
Implementation

- FreeBSD 4.6-RELEASE with KAME IPv6 stack
  - September 23, 2002 released snap
  - draft-ietf-mobileip-ipv6-19 based

Evaluation



InternetCAR Workshop Demo at Keio University (March 12th 2003)



Network Theme: “Nested Mobility” and “IF-Switching (MIP6)”

Currently Running on the demo

- Mobile IPv6
  - draft-ietf-mobileip-ipv6-20 based
  - Mozuku
- Interface Switching on Mobile IPv6
- Network Mobility
  - Draft-wakikawa-nemo-basic-00
- Nested Mobility

- Any comments or Questions?

Thank you