CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE

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IIJ Internet Initiative Japan

Versatile IPv6 Mobility Deployment with Dual Stack Mobile IPv6

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2008/08/22 - MobiArch

IPv6 and Mobility

In a nutshell

- **Goal**: moving from one IPv6 access network to another, transparently for the applications
- IPv6 Mobility standardized few years ago already:
  - **Mobile IPv6** (RFC3775, June 2004): host mobility
  - **NEMO Basic Support** (RFC3963, Jan. 2005): network mobility
    - Mobility management centralized at the ***Mobile Router***
    - Contemplated solution in the ITS
- Open source implementations: UMIP, SHISA

IPv6 and Mobility

Issues

- Many efforts to achieve seamless communications & ubiquity:
  - Fast Mobile IPv6 (**FMIPv6**),
  - Multiple Care-of Addresses (**MCoA**) registration.
- Still, ubiquity is not possible while IPv4 is still used in the vast majority of networks,
  - Just moving to an IPv4 network breaks all communications
  - Transition mechanisms are essential to ensure a faster deployment.

Dual Stack Mobility

State of the Art

- Operating both Mobile IPv4 and Mobile IPv6 on the same host,
  - Overhead, not efficient if access network is not dual-stack
- IPv6-in-IPv4 tunneling + NAT-PT
  - Location of the NAT-PT device, issues with NAT in the access network
- Dual Stack Mobile IPv4 (DSMIPv4)
  - Based on MIPv4 signaling, thus not working in IPv6-only networks
- **Dual Stack Mobile IPv6 (DSMIPv6)**
  - **draft-ietf-mext-nemo-v4-traversal**

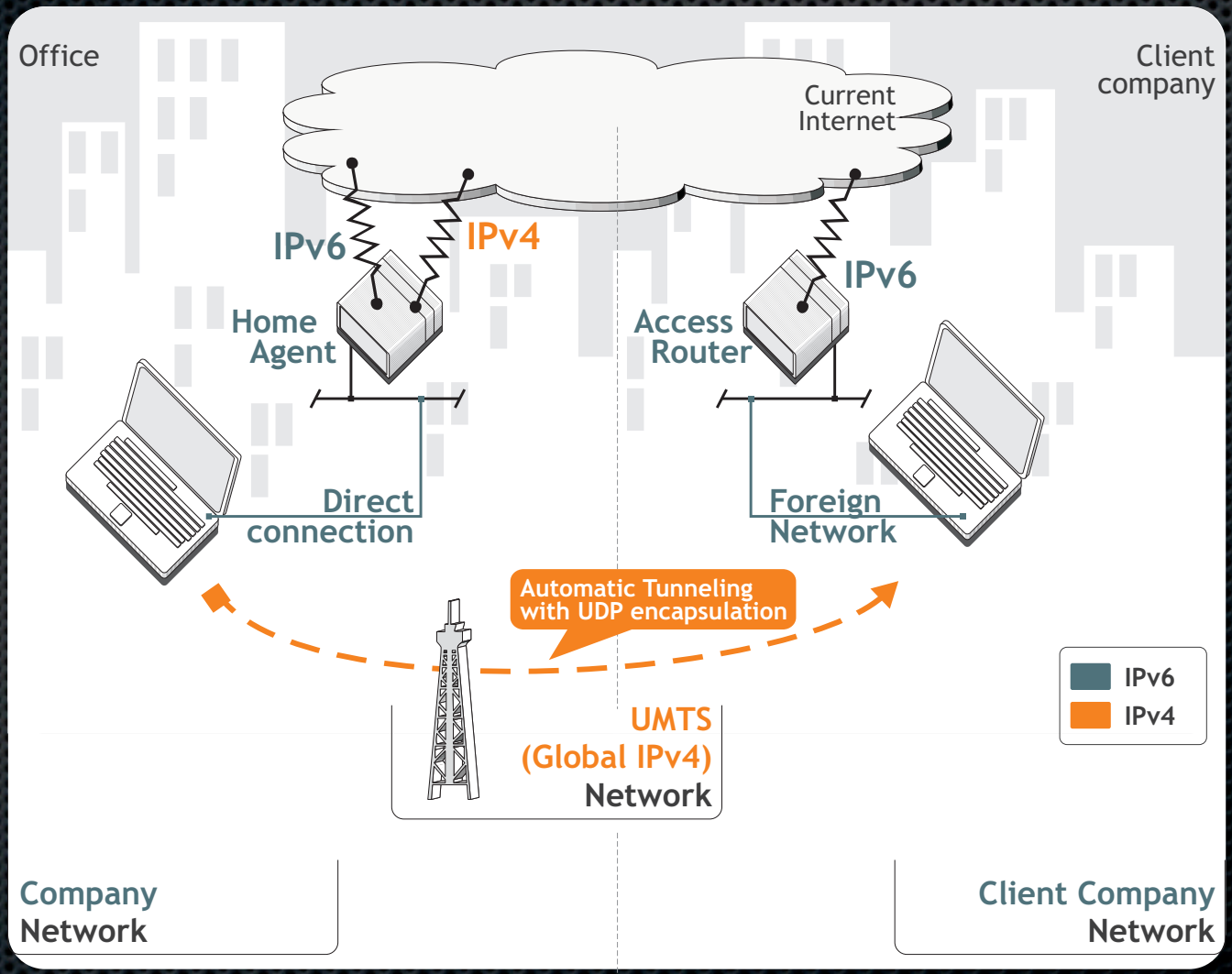
Dual Stack Mobility

DSMIPv6

- Mobility in IPv6-only, IPv4-only and dual stack networks:
  - **IPv4 Care-of Address registration** and IPv6-in-IPv4 tunnels
    - Reduction of the tunneling level
  - **IPv4 Home Address** to use with IPv4-only correspondents
    - No need for a translator
- **NAT detection and traversal** mechanism with UDP encapsulation
- **IPv4 prefix delegation** for a mobile network

Dual Stack Mobility

Use Case



UMIP-DSMIP

Presentation

- DSMIPv6 implementation for GNU/Linux
  - IPv4 CoA registration, NAT detection
- Based on UMIP 0.4, kernel 2.6.24
- Support of NEMO Basic Support
- Freely available
  - First release on May 30th 2008
  - **http://software.nautilus6.org/DSMIP/**

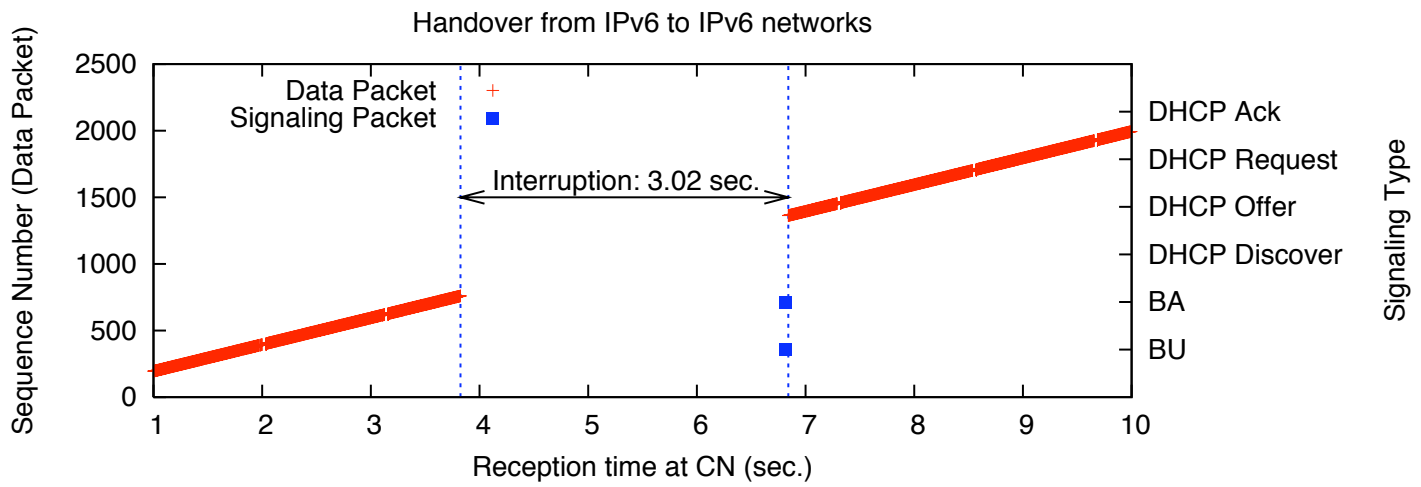
UMIP-DSMIP

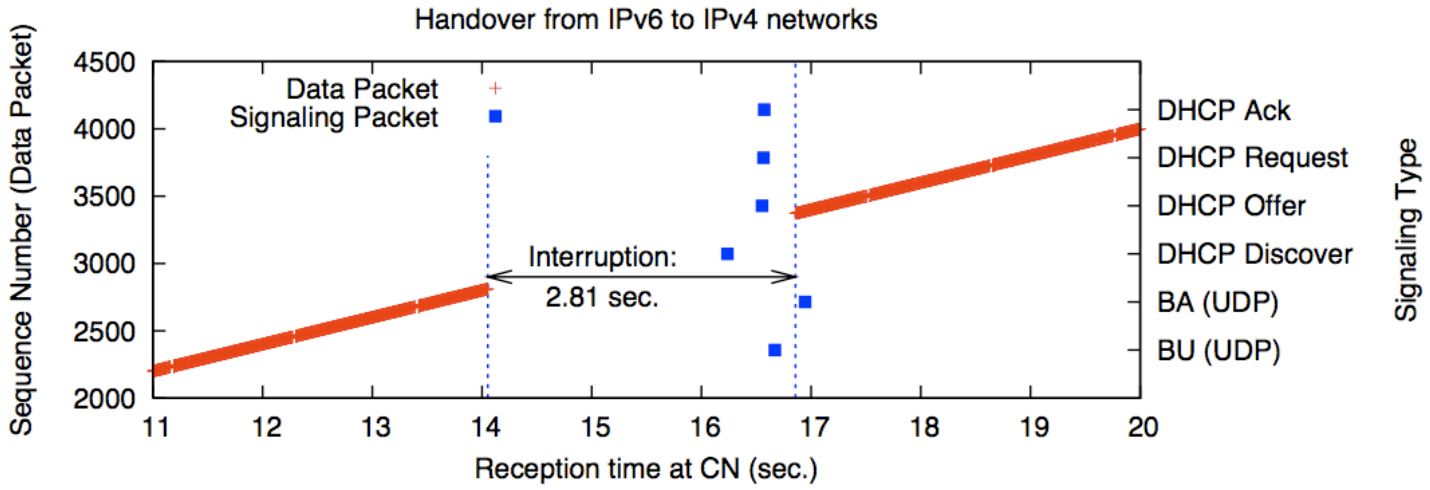
Kernel & Userland

- Kernel:
  - UDP encapsulation for signaling / data (**XFRM**)
- Userland:
  - Movement detection (**DHCP / DNA**)
  - Tunnelling management (**SIT tunnels**)

UMIP-DSMIP

Sample Operation (Horizontal Handovers)





UMIP-DSMIP

Specification/Implementation Issues

- IPsec and NAT detection & traversal
  - IPsec **mandatory** for signaling (BU/BAck)
  - IPv4 source (IP header) compared with IPv4 CoA option (MH)
    - Original IPv4 header **no more available** once the payload has been decrypted by the IPsec stack
  - Need communication between IPsec and MIPv6 stack
    - PF_KEY extensions?
      - draft-sugimoto-mip6-pfkey-migrate
      - draft-ebalard-mext-pfkey-enhanced-migrate

UMIP-DSMIP

Next Steps

- Stabilization,
- Vertical handovers,
- NAT traversal (UDP encapsulation for data packets),
- IPv4 Home Address, IPv4 Prefix,
- Multihoming (Multiple IPv6 & IPv4 CoA registration),
- ...

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Thank you for your attention, Questions?

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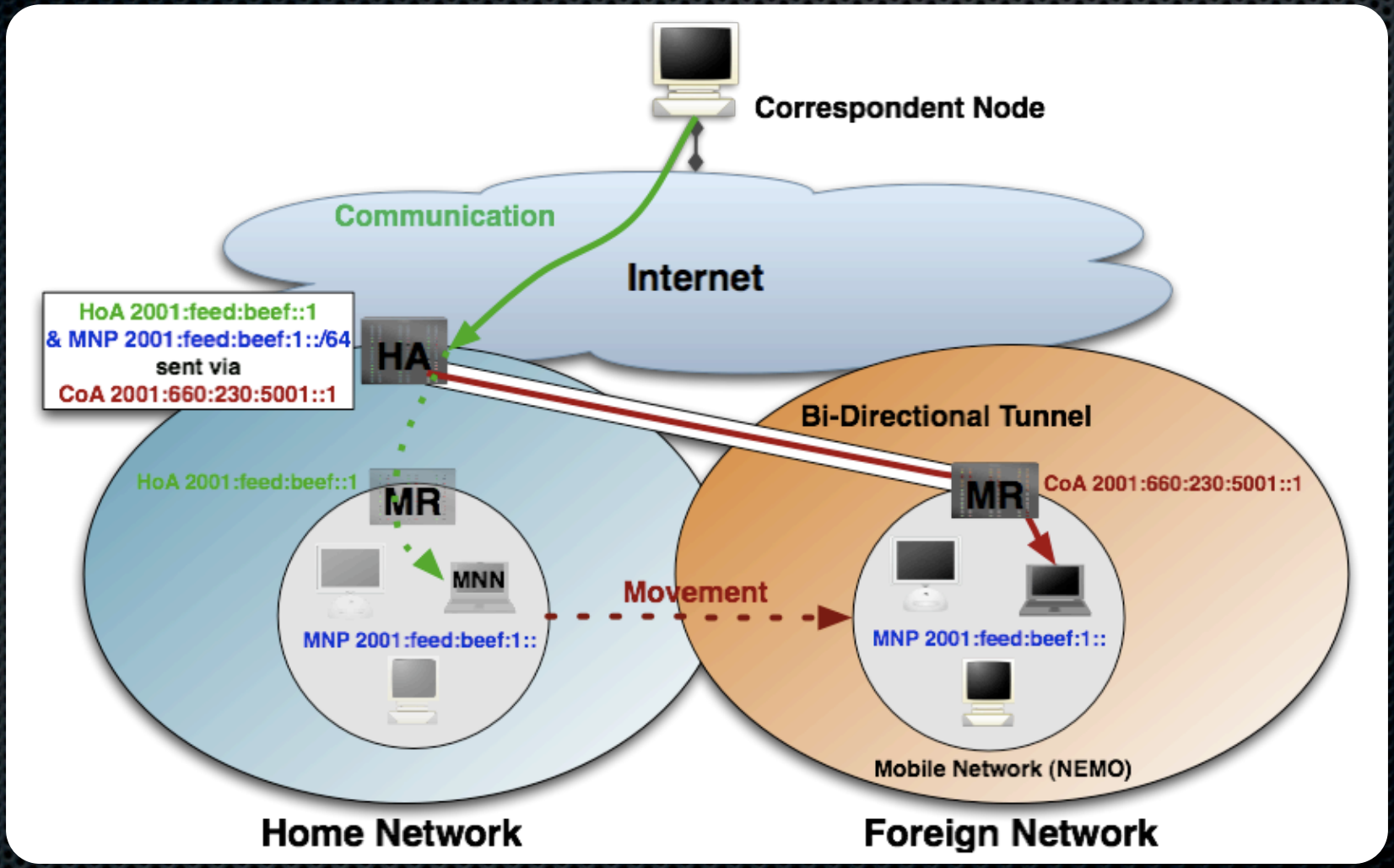
Backup Slides

IPv6 and Mobility

NEMO Basic Support



UMIP-DSMIP

Operation