

Test-beds of the EU project NOMAD

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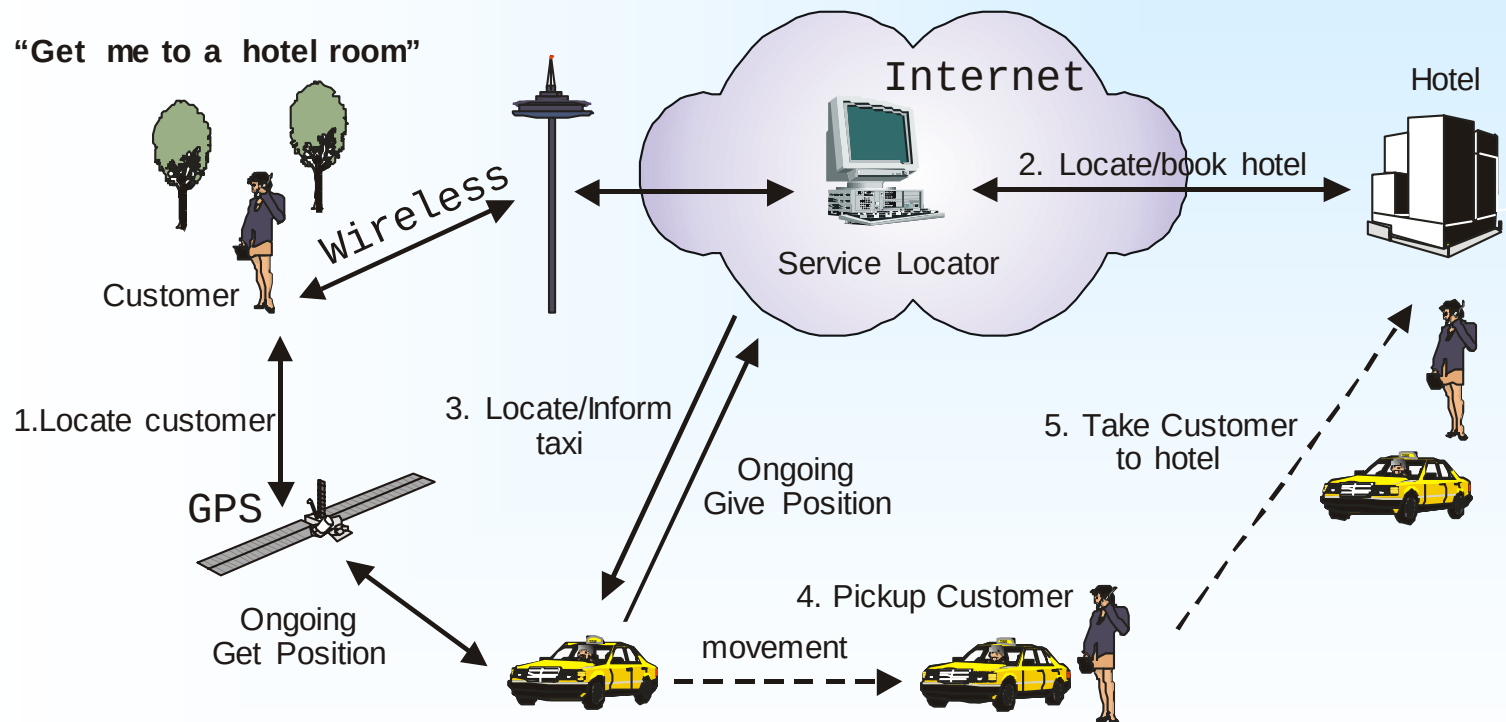
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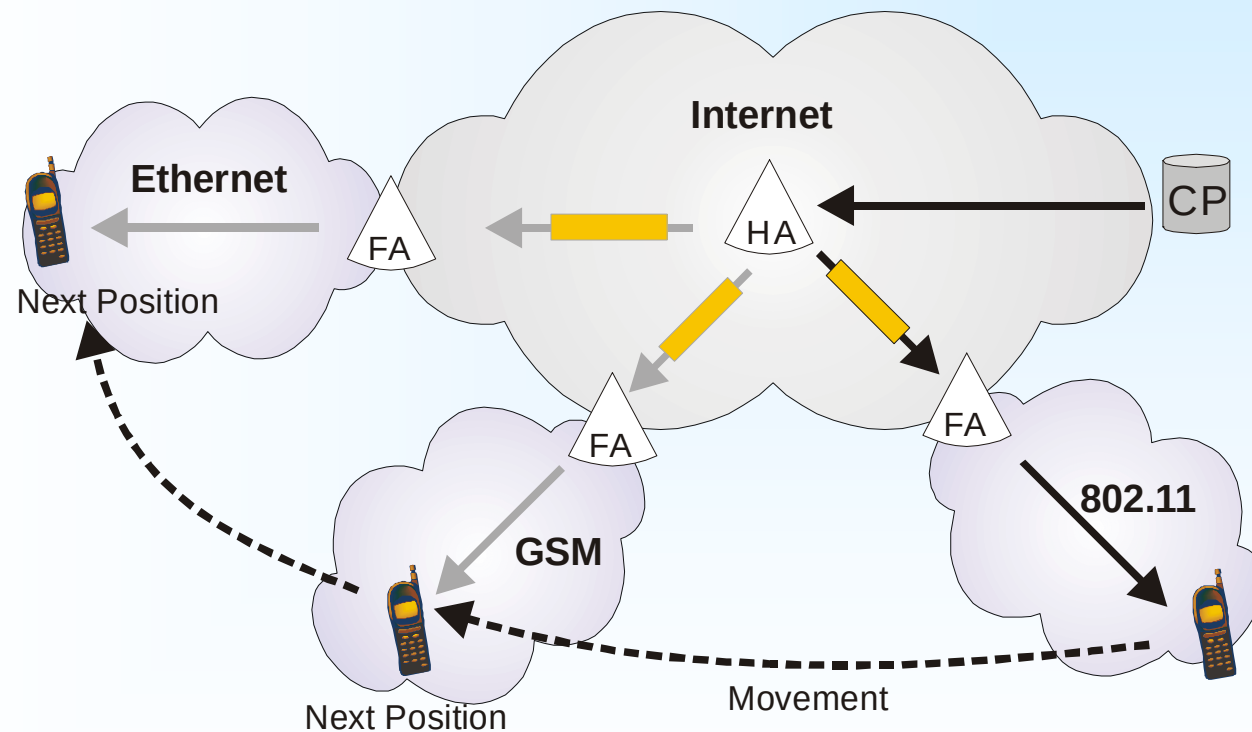
Scenarios

1. **Discovery and seamless combination of services:** concentrates on the service related aspects of NOMAD. Issues like transparent service discovery and automatic composition are here the main focus.
2. **Mobility in integrated networks:** concentrates on the integrated network related aspects of NOMAD. Issues like transparent roaming and usage of the best available bearer technology are here strongly represented.
3. **Combine NOMAD functionality:** attempts to provide a combined view of the whole NOMAD platform by describing the usage of transparent service discovery mechanisms over an integrated network platform.

Discovery and seamless combination of services



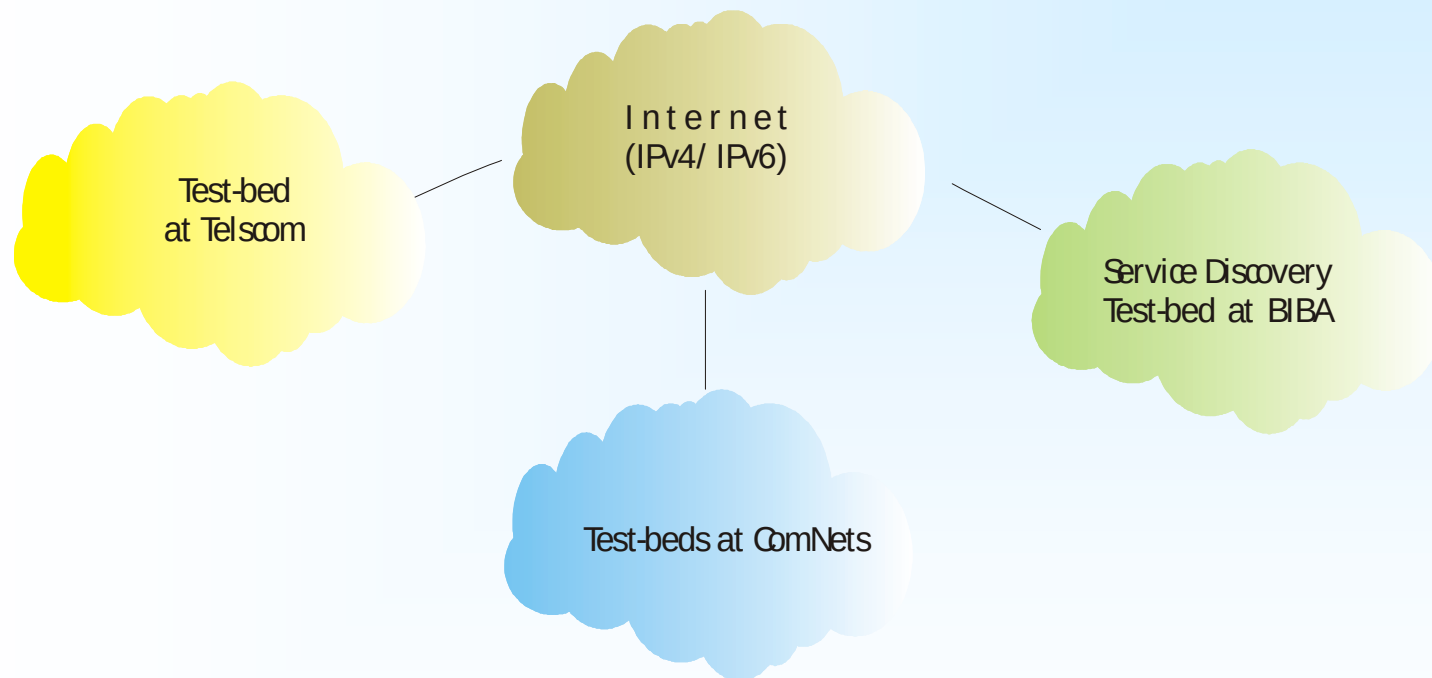
Mobility in Integrated Networks



Objectives of the field trials

- To verify that all components developed in the frame of the project are compatible with each other and can seamlessly interoperate (i.e. IPv4, IPv6)
- To verify that the platform developed can offer indeed to the end-user the agreed services with the expected performance and quality
- To test the impact of the various bearer technologies (WLAN, Bluetooth) to the performance of the system.
- To verify that the proposed NOMAD architecture for service discovery is not only operational but also effective
- To evaluate the operation and performance of the NOMAD platform and propose future enhancements

NOMAD Test-bed connectivity



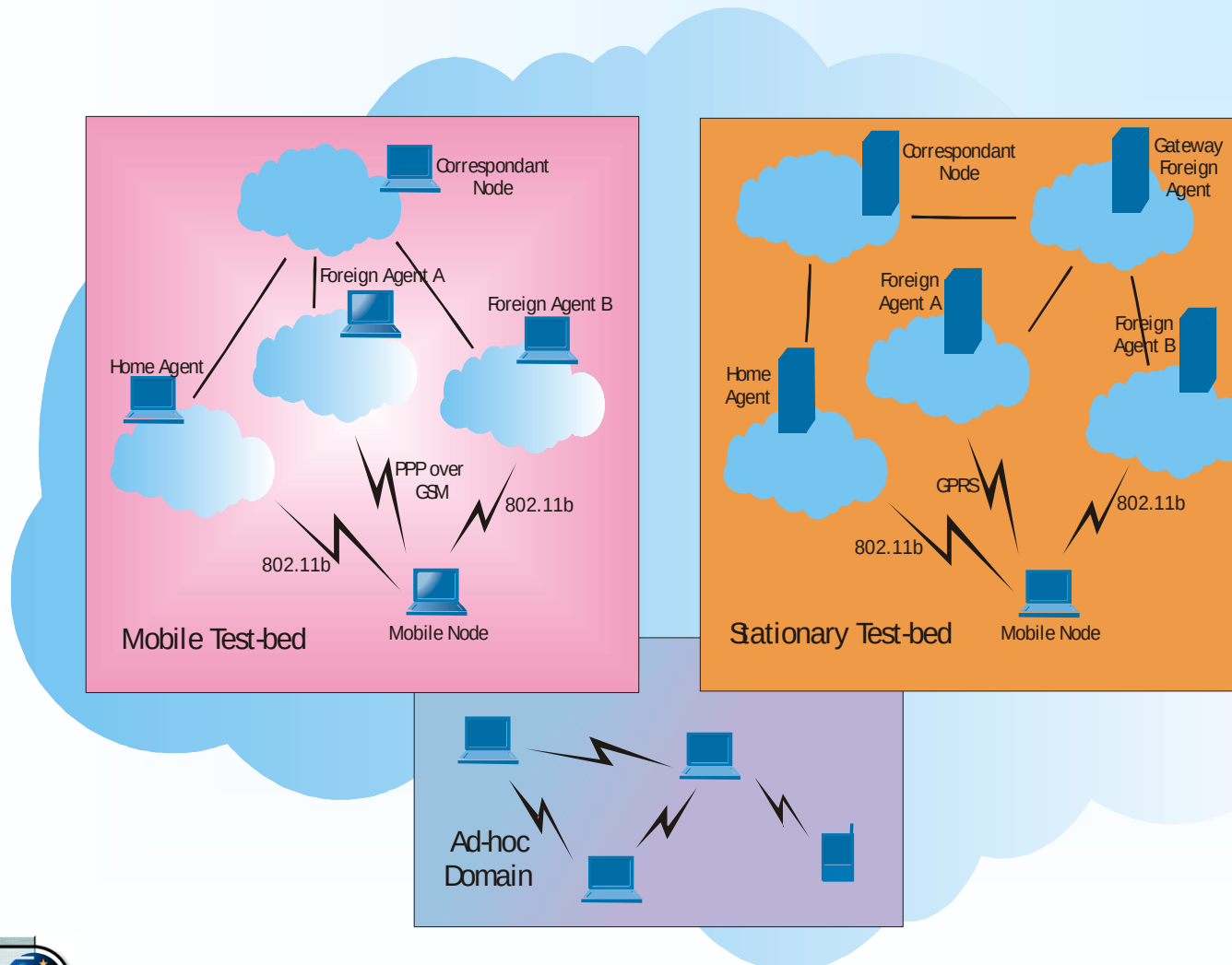
IPv4 Test-bed in Bremen

- Major features:
 - IP based (IPv4 & IPv6)
 - Multi-structured (Flat & Hierarchical)
 - Mobility support (for IPv4 and IPv6)
 - Ad-hoc networking capability
 - Simulation capability for multiple foreign networks
 - Connectivity through multiple bearer technologies (wireless & wireline)

IPv4 Test-bed in Bremen implementations

- Stationary test-bed
- Mobile test-bed (Easy to transport for conferences, workshops and exhibitions)
- Ad-hoc test-bed
- Bearer Technologies
 - Ethernet
 - WLAN (802.11b)
 - GPRS
 - GSM

IPv4 Test-bed Overview



IPv4 Test-beds Specifications

- **Hardware**

Stationary test-bed

- Siemens APs & Cisco & Elsa - PCMCIA cards
- Agents are Athlon 800MHz
- Mobile Node is Samsung Laptop

Mobile test-bed

- Cisco APs & PCMCIA cards
- Notebooks of Mobile AMD Duron(1.1GHz & 256 MB RAM)

Ad-hoc test-bed

- Notebooks of Mobile AMD Duron(1.1GHz & 256 MB RAM)

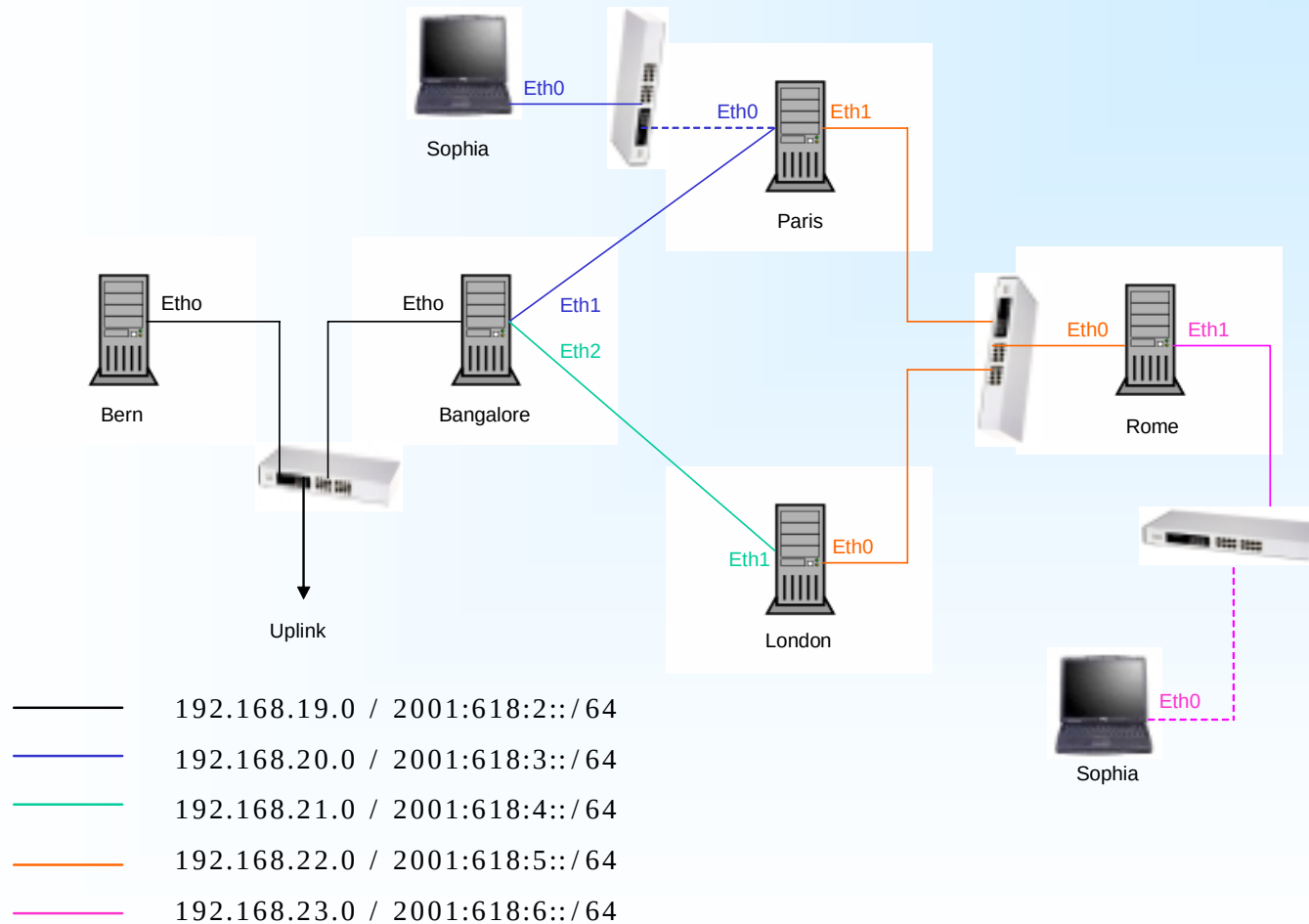
- **Software**

- Linux Kernel 2.4.18
- IPv4 & IPv6
- SunLabs Mobile IPv4
 - Extended to support ECS & FHCS
- MIPL, Mobile IPv6
- tcpdump and ethereal network monitor
- kernel module to support AODV 1.5 developed by NIST
- Applications (RAT, Gnome Meeting, VIC)

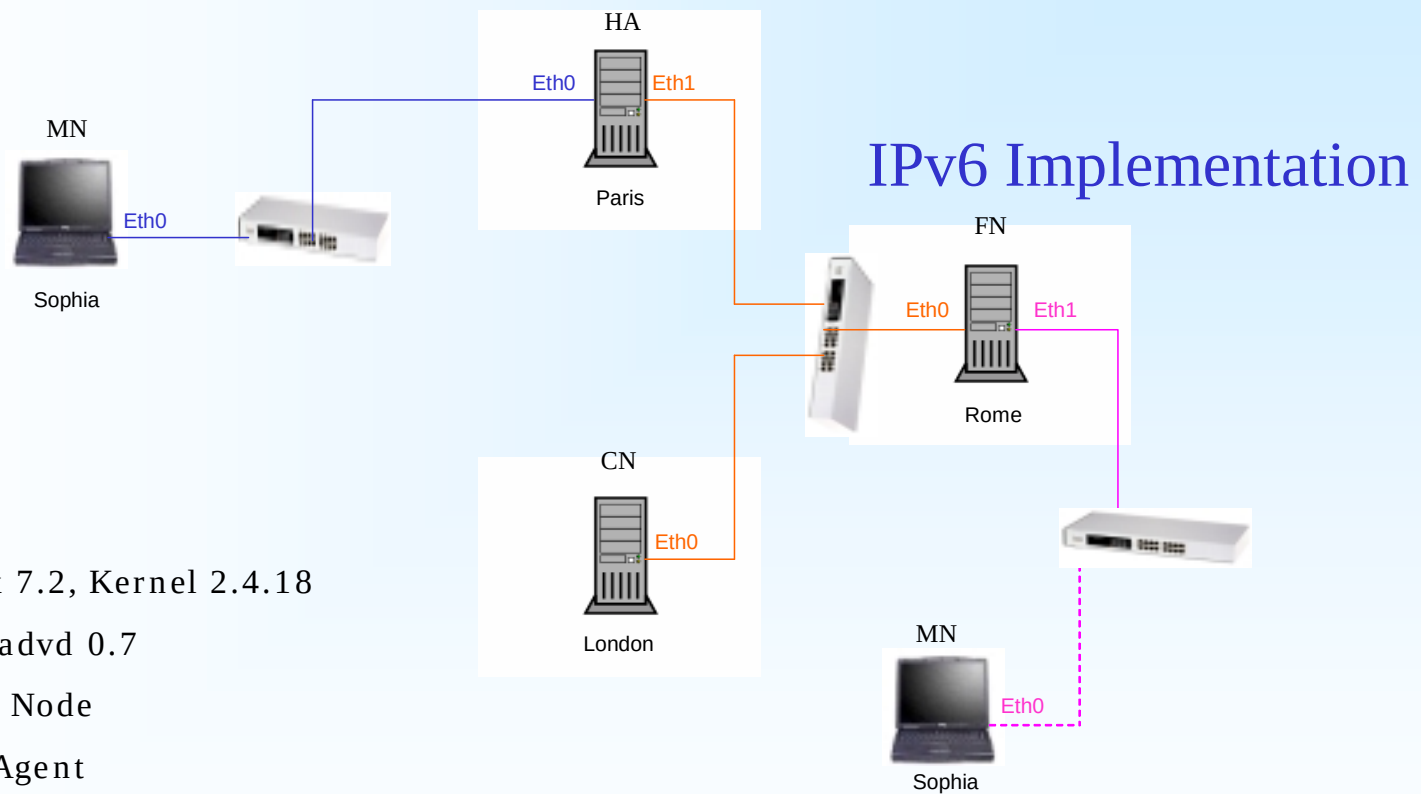
IPv6 Test-bed in Basel

- Main features:
 - Mobility by Wireless LAN (WLAN) and GPRS connectivity
 - Basel site is connected to the Pan-European GEANT network, which has links to multiple potential collaborative partners
 - IPv4/IPv6 migration strategies
 - Routing (Mobile IP)
 - Quality-of-Service (QoS) by DiffServ and Flow-Label
 - IP Security Implementation

IPv6 Test-bed Overview



IPv6 Test-bed implementations (1)



Redhat Linux 7.2, Kernel 2.4.18

MIPL 0.9.3, radvd 0.7

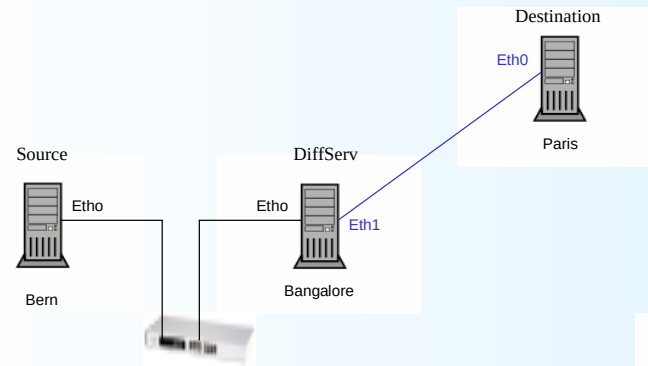
MN → Mobile Node

HA → Home Agent

FN → Foreign Network

CN → Corresponding Node

IPv6 Test-bed Implementations (2)

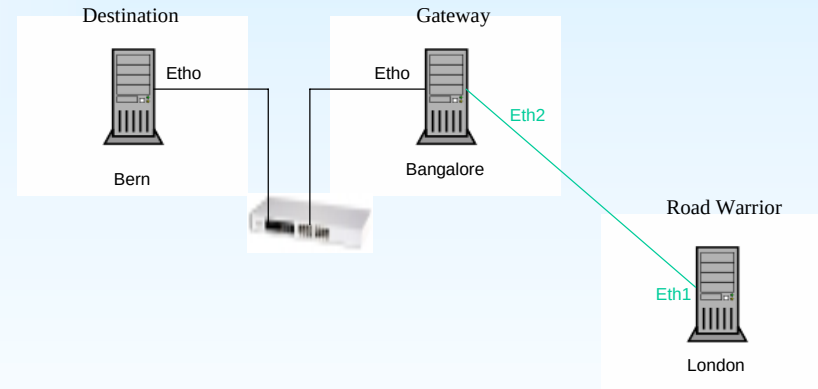


DiffServ Implementation

Redhat Linux 7.2, Kernel 2.4.18

Iproute2-ipv6

Voice Over IPv6



Security Implementation

Redhat Linux 7.2, Kernel 2.4.7

Freeswan 1.9.1

VoIP6, RAT

IPv6 Test-bed Specification

- **Hardware**

- Pentium IV 1.6 GHz (3 Nos), Dell Machines (2 HA, 1 MN)
- 256 MB RAM, Intel built in Soundcard,
- Mic and Speaker
- Pentium III 450 MHz (2 Nos) (1 HA, 1 CN)
- 128 MB RAM (2 Nos), Creative Soundcards Mic and Speaker

- **Software**

- Mobile IPv6 software: mipv6-0.9-v2.4.7
- Kernel: 2.4.7
- Routing Daemon: radvd-0.7.1
- Robust Audio Tool (RAT)
- Voice Over IPv6 (VoIP6)
- Video LAN
- Video Conference Tool (VIC)
- Apache Web Server
- telnet
- ftp

Next steps/issues

- Mobile IPv4 and Mobile IPv6
- Mitigation strategies between IPv4 and IPv6
- Service discovery and seamless services
- Hand-over and roaming behaviour
- Working of different bearer technologies
- Implementation and testing of existing QoS mechanisms
- User and service profiling
- Service definition, creation, deployment, announcement, and discovery
- Service management