WIDE Technical-Report in 2006

Nautilus6 mobile technology demonstrations at the First IPv6 Summit in Thailand

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Nautilus6 mobile technology demonstrations at the First IPv6 Summit in Thailand

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Abstract

In this memo, we summarize the two demonstrations of mobility technologies performed at the 1st IPv6 summit in Thailand. The first demonstration is a personal area network using a small mobile router, the other demonstration is a transition mechanism that enables mobile hosts/routers to operate the IPv4/IPv6 dual-stack mobility in both the IPv4 and the IPv6 Internet.

1 Introduction

The Thailand IPv6 Forum has organized the First Thailand IPv6 Summit [1], an international seminar, in order to create public awareness about the necessity of IPv6 technology.

At this summit, the WIDE Project [2] has demonstrated several applications of the IPv6 technology, in different areas, including IPv6 Mobility. The Nautilus6 Project [3], which is part of WIDE, has prepared two IPv6 Network Mobility (NEMO) demonstrations to be presented to the public during the Summit, on May 3rd and 4th 2006.

2 Demonstration Overview

We had two kinds of demonstrations, each is described briefly below. Both demonstrations were set up with the open source mobility implementations; SHISA [4], a mobility stack for BSD Operating Systems and NEPL [5], which is developped for the GNU/Linux Operating System. Using both implementations on different entities (Home Agent and Mobile Router), we could also demonstrate the inter-operability of those implementations.

The first demonstration explained the basic principles of the NEMO technology through the E-Bag. The E-Bag is a Personal Area Network (PAN) that can be easily carried by people. It embeds a Mobile Router and several IPv6 devices such as sensors, a PDA, etc. The Mobile Router runs NEMO Basic Support [6] to ensure sessions continuity to all the nodes in the network, while moving in the Internet topology. In this demonstration, the Mobile Router was multihomed and could hand over from the Ethernet network to the the Wireless network. While on-the-move,

uninterrupted Voice-over-IPv6 calls could be done from the PDA in the moving network to another PDA located in another Mobile Network. The IPv6 sensors could also be queried remotly thanks to the MonNemo application [7].

The second demonstration aimed at explaining the need of Dual Stack Mobile IPv6 (DSMIPv6) [8]. As of today, the Internet network is mainly composed of IPv4 networks, that limits the deployment of IPv6 mobility. The use of DSMIPv6 on a Mobile Router allows the Mobile Network not only to go through IPv4-only networks, but also to provide both IPv4 and IPv6 connectivity within the Mobile Network. With DSMIPv6, dual stack (both IPv6 and IPv4) nodes can be used in the NEMO, which can hand over from IPv6 networks to IPv4 networks and conversely. In the demonstration, a multihomed Mobile Router was connected to an IPv4-only network and to an IPv6-only network, and could hand over regularly between both links. Both Voice-over-IPv4 and Voice-over-IPv6 could be performed from the PDA in the NEMO to correspondent nodes located outside the NEMO, without disruptions and independently from the IP (v4 or v6) network that the Mobile Router was passing through.

3 Demonstration Topology

Figure 1 illustrates the topology of the demonstration network used at the Summit.

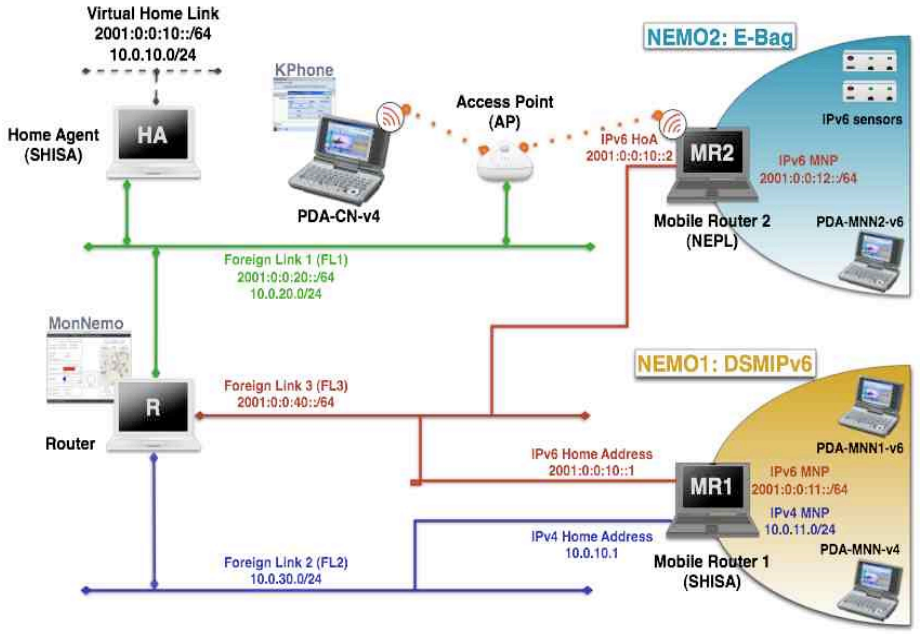

Figure 1: The network topology of the WIDE/Nautilus6 demonstration at the First IPv6 Summit in Thailand

One router (**R**) interconnects three physical IP subnets to create the backbone network of the demonstration. Each network is used as a foreign network for mobile routers. **Foreign Link 1** is a dual stack network that

can be accessed by both an Ethernet and a wireless link. **Foreign Link 2** only provides IPv4 connectivity and **Foreign Link 3** provides only IPv6 connectivity. These two networks are used to demonstrate the DSMIPv6 function. Note that although **Foreign Link 2** has a private IPv4 address block, there is no relationship with the NAT mechanism. We just used the address block as a substitution of the IPv4 global network. The home network of the mobile routers is designed as a virtual dual-stack network and located behind the home agent (**HA**) for mobile routers.

Two mobile routers are operated in the demonstration, one is **MR1** that runs the SHISA mobility stack and the DSMIPv6 fnction. The other is **MR2** that runs the NEPL mobility stack. The **MR1**'s mobile network is a dual-stack network and has two VoIP terminals, one is an IPv4 VoIP terminal (**PDA-MNN-v4**) and the other is an IPv6 VoIP terminal (**PDA-MNN1-v6**). The **MR2**'s mobile network is an IPv6 only network and has several IPv6 sensor nodes and an IPv6 VoIP terminal (**PDA-MNN2-v6**).

There is one another IPv4 VoIP terminal (**PDA-CN-v4**) attached to the **Foreign Link 1**. The VoIP connections are established between **PDA-MNN1-v6** and **PDA-MNN2-v6**, and also between **PDA-MNN-v4** and **PDA-CN-v4**.

The value of the IPv6 sensor nodes can be viewed on the MonNemo application running on the router **R**.

MR1 moves between **Foreign Link 2** and **Foreign Link 3** while the VoIP connections are maintained between **PDA-MNN1-v6** and **PDA-MNN-v4**. **MR2** moves between **Foreign Link 1** via the wireless access point and **Foreign Link 2**, keeping the VoIP connection of **PDA-MNN2-v6**. The sensor nodes are always reachable to their usual IPv6 addresses thanks to the NEMO BS technology.

4 Summary

The demonstration worked well and we received many positive feedbacks from the audience of the summit. However there are still many things to improve for the technologies performed in this demonstration, especially for the DSMIPv6 specification. The current specification does not provide any movement detection mechanism for IPv4, that is definitely required in a real environment. Also, a home agent discovery mechanism while a mobile node is in the IPv4 Internet has to be defined. We will continue to work on both discussion of the specification at the IETF and the implementation.

References

[1] The First Thailand IPv6 Summit, May 2006. http://www.tahilandipv6.net/ipv6summit/en/home/index.html.

[2] WIDE project, 2006. http://www.wide.ad.jp/.

[3] Nautilus6 project, 2006. http://www.nautilus6.org/.

[4] WIDE project. SHISA, 2006. http://www.mobileip.jp/.

[5] Go-core project. NEPL: NEMO Platform for Linux, 2006. http://www.mobile-ipv6.org/.

[6] Vijay Devarapalli, Ryuji Wakikawa, Alexandru Petrescu, and Pascal Thubert. Network Mobility (NEMO) Basic Support Protocol. Technical Report RFC3963, IETF, January 2005.

[7] Nautilus6 project. MonNemo: a NEMO Monitoring application, 2006. http://software.nautilus6.org/.

[8] Hesham Soliman, George Tsirtsis, Vijay Deverapalli, James Kempf, Henrik Levkowetz, Pascal Thubert, and Ryuji Wakikawa. Dual Stack Mobile IPv6 (DSMIPv6) for Hosts and Routers. Technical Report draft-ietf-mip6-nemo-v4traversal-01, IETF, March 2006.

Appendix

The following posters were presented at the summit to to explain the demonstration at the summit.

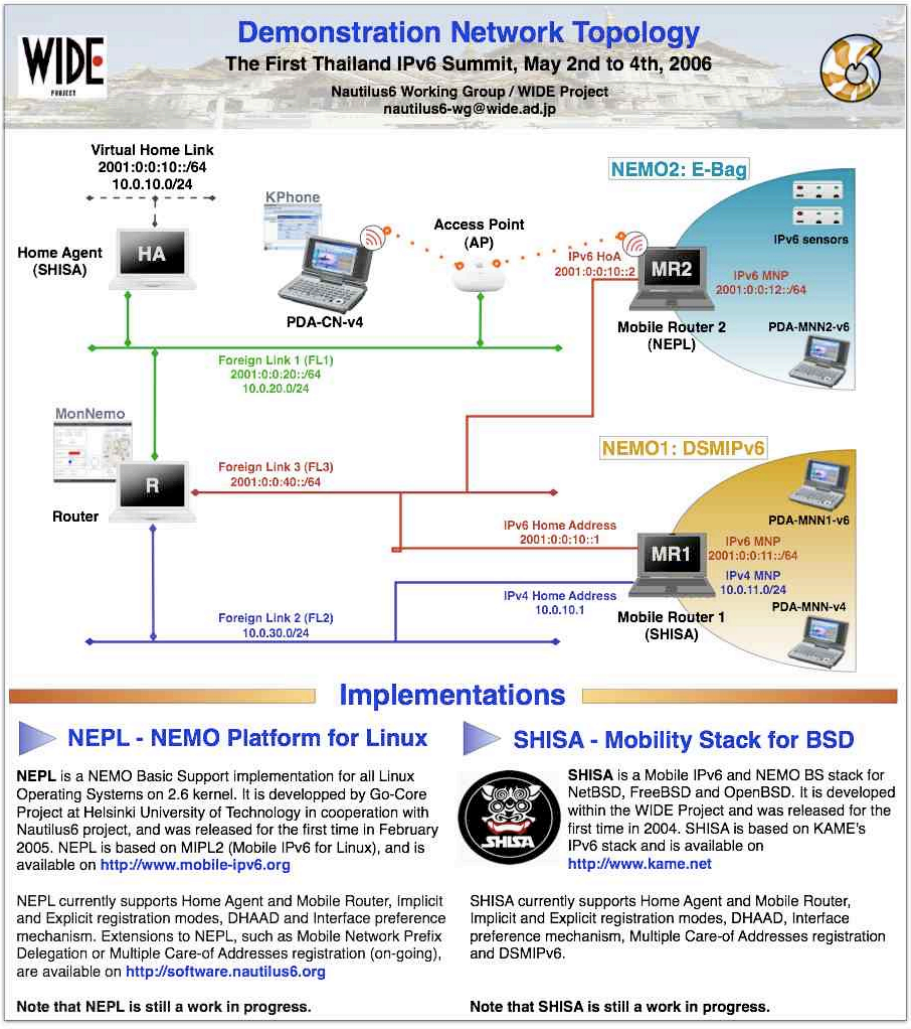

Figure 2: The explanation of the demonstration network topology

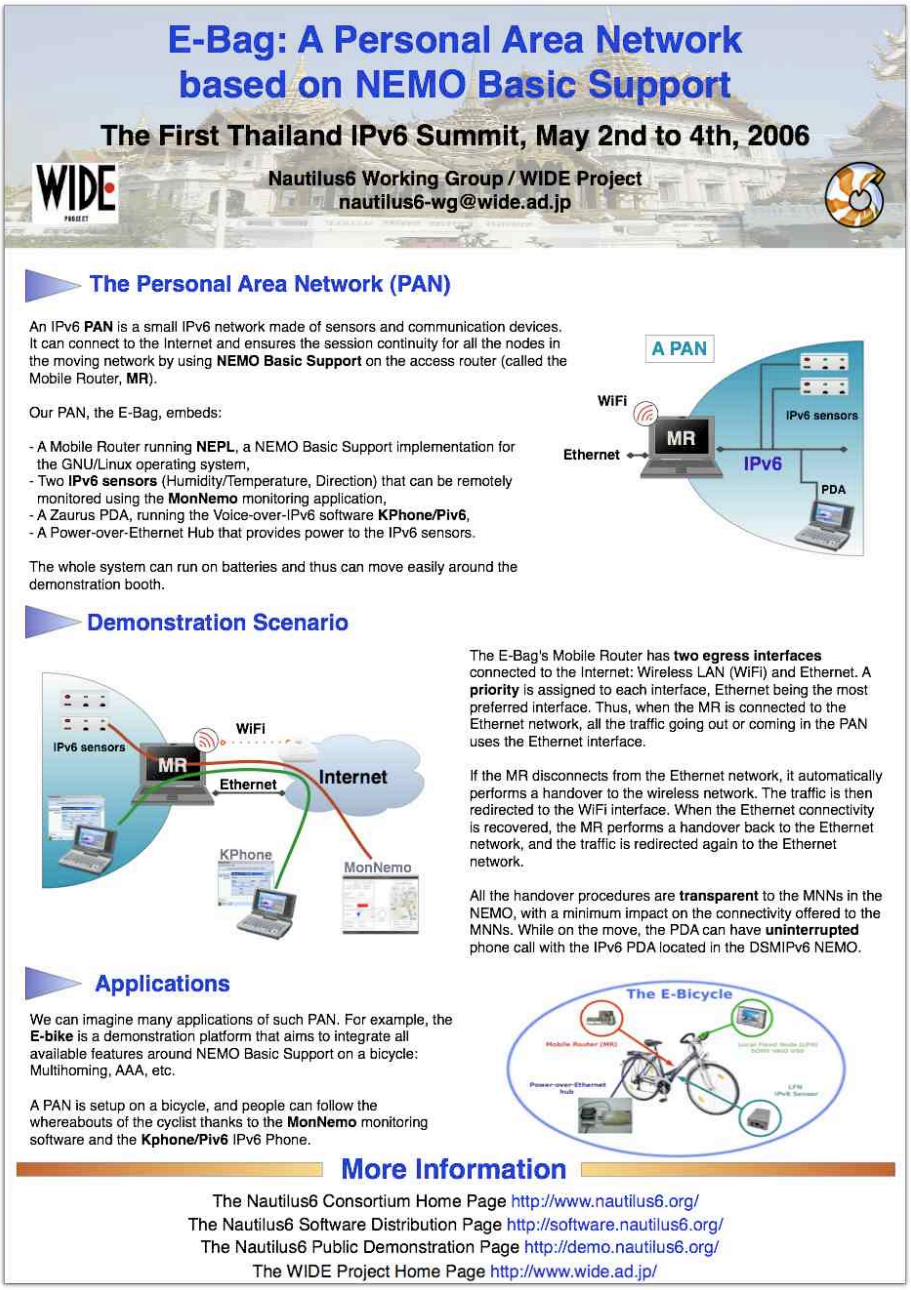

Figure 3: The explanation of the E-Bag demonstration

Dual Stack Mobile IPv6

Supporting both IPv6 and IPv4 mobility

The First Thailand IPv6 Summit, May 2nd to 4th, 2006

Nautilus6 Working Group / WIDE Project
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Dual Stack Mobile IPv6 (DSMIPv6)

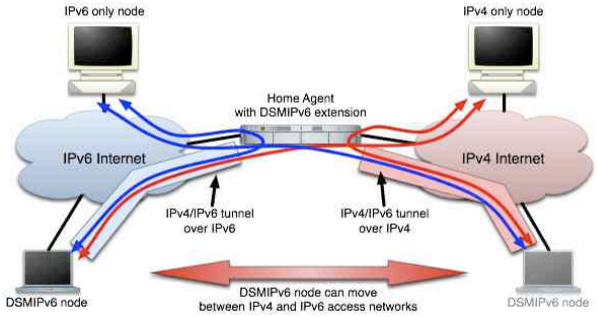
The mobility support for Internet Protocol is getting more and more important. Recent rapid progress in communication devices and small Internet devices will generate more demand for the mobility support.

At the IETF, Mobile IPv6 and NEMO Basic Support (NEMO BS) have been specified as the IETF standard mobility support for IPv6. However, considering the current situation that we have to live with the IPv4 and IPv6 dual stack Internet for a long time before we have completed the transition to all IPv6 world, we need to provide some support to utilize the widely deployed IPv4 Internet.

DSMIPv6 provides the roaming function to Mobile IPv6 nodes to roam to IPv4 networks. Also, it provides IPv4 communication support for Mobile IPv6 nodes.

With DSMIPv6, **we can use both IPv4 and IPv6 simultaneously** on one node. We can use various kinds of existing IPv4 applications on IPv6 nodes. Also, **we can attach to IPv4 access network using DSMIPv6** and can move to another IPv4 or IPv6 networks. The existing connections are kept thanks to Mobile IPv6 function.

DSMIPv6 will help deploying IPv6 mobility by providing IPv4 support and by providing function to roam the IPv4 Internet.



Demonstration Scenario

In this event, we demonstrate the DSMIPv6 operation. The home agent (HA) and the mobile router (MR1) operated in the demonstration network support the DSMIPv6 extension.

There are two IPv6 nodes, one (PDA-MNN1-v6) in the dual stack mobile network behind the MR1 and the other (PDA-MNN2-v6) is in the IPv6 mobile network behind another mobile router. Also there are two IPv4 nodes, one (PDA-MNN-v4) in the dual stack mobile network provided by the MR1, and the other (PDA-CN-v4) on the Foreign Network 1.

All PDAs have an VoIP software (KPhone/Piv6) extended to support both IPv4 and IPv6 communications. We can call PDA-MNN2-v6 from PDA-MNN1-v6 using IPv6 and also we can call PDA-CN-v4 from PDA-MNN-v4 using IPv4. Since MR1 supports DSMIPv6, MR1 can change its attachment point between the IPv4 only network and the IPv6 only network keeping ongoing VoIP sessions.

KPhone/Piv6

More Information

The Nautilus6 Consortium Home Page http://www.nautilus6.org/
The Nautilus6 Software Distribution Page http://software.nautilus6.org/
The WIDE Project Home Page http://www.wide.ad.jp/

Figure 4: The explanation of the DSMIPv6 demonstration