

Setting up a Mobile IPV6 Lab

IPV6 Research Group
Computer Science and
Engineering
University of Mauritius

Dr O Moonian (Group leader)

S Agarwal

A Chutoo

D Sathan

Setting up a Mobile IPV6 lab

- IPV6 – An introduction
- IPV4 to IPV6
- Mobile IPV6
 - Setting up a Mobile IPV6 lab
 - Windows
 - Linux
 - Connect to existing LAN and resources

Introduction

- Internet Protocol version 6 (IPv6)
 - Network layer IP standard used by electronic devices to exchange data across a network.
 - Follows IPV4 as the second version of the Internet Protocol and is also known as IP Next Generation (IPng).
 - Design intentionally targeted for minimal impact on upper and lower layer protocols by avoiding the random addition of new features.
- Designed to solve the problems of IPv4 serving the same function as IPv4, but without the same limitations of IPv4.
- The differences between IPv6 and IPv4 are in five major areas: addressing and routing, security, network address translation, administrative workload, and **support for mobile devices.**

IPV4 to IPV6

- Exhaustion of the IPv4 address space.
- The growth of the Internet and the ability of Internet backbone routers to maintain large routing tables.
- The need for simpler configuration.
- The requirement for security at the IP level.
 - Optional and Prevalent proprietary solutions for Security standard for IPv4 packets (IPSec)

IPV4 to IPV6

- The need for better support for real-time delivery of data—Quality of Service (QoS).
 - Real-time traffic support relies on the IPv4 Type of Service (TOS) field and the identification of the payload, typically using a UDP or TCP port.
 - IPv4 TOS field has limited functionality and over time there were various local interpretations.
 - Payload identification using a TCP and UDP port is not possible when the IPv4 packet payload is encrypted.

Features of IPV6

- Larger address space:

- IPv4 addresses have 32 bits in them and so allow a maximum of four billion addresses
- IPv6 addresses have 128 bits, thus allowing 3.4×10^{38} addresses.

- Stateless autoconfiguration of hosts:

- IPv6 hosts configured automatically when connected to a routed IPv6 network.
- When first connected to network, host sends a link-local multicast request for its configuration parameters;
- If configured suitably, routers respond to such a request with a router advertisement packet that contains network-layer configuration parameters.

Features of IPV6 (Contd)

- Multicast: is part of the base protocol suite in IPv6.
- Network-layer security:IPSec, the protocol for IP network-layer encryption and authentication, is an integral part of the base protocol suite in IPv6

Mobile IPV6

- Mobile Internet Protocol version 6 (IPv6) allows node to arbitrarily change its location on Internet - and still maintain existing connections.
- Such Connection maintenance ensures the correct delivery of data regardless of the mobile node's location.
 - Mobile nodes Identified by its Home Address, irrespective of current point of attachment to the Internet
 - Each mobile node will need a Care-of-Address while away from its home subnet
 - Indicates current location
 - Can be cached by sender so it sends packets directly to Mobile Node at Care-of-Address

Mobile IPv6

- All nodes in IPv6 attached to a subnet
 - Routing based on network prefix in packet's destination IP address
 - All mobile nodes assigned a permanent IP address (**Home Address**)
 - Thus, the IP address is transparent to Transport and other Higher network protocols and applications
 - Standard routing delivers packets to **Home Subnet**
 - Mobile node can change its point of attachment from one IP subnet to the other

Mobile IPV6

- Some definitions

- Home Address:** a permanent IP address assigned All mobile nodes

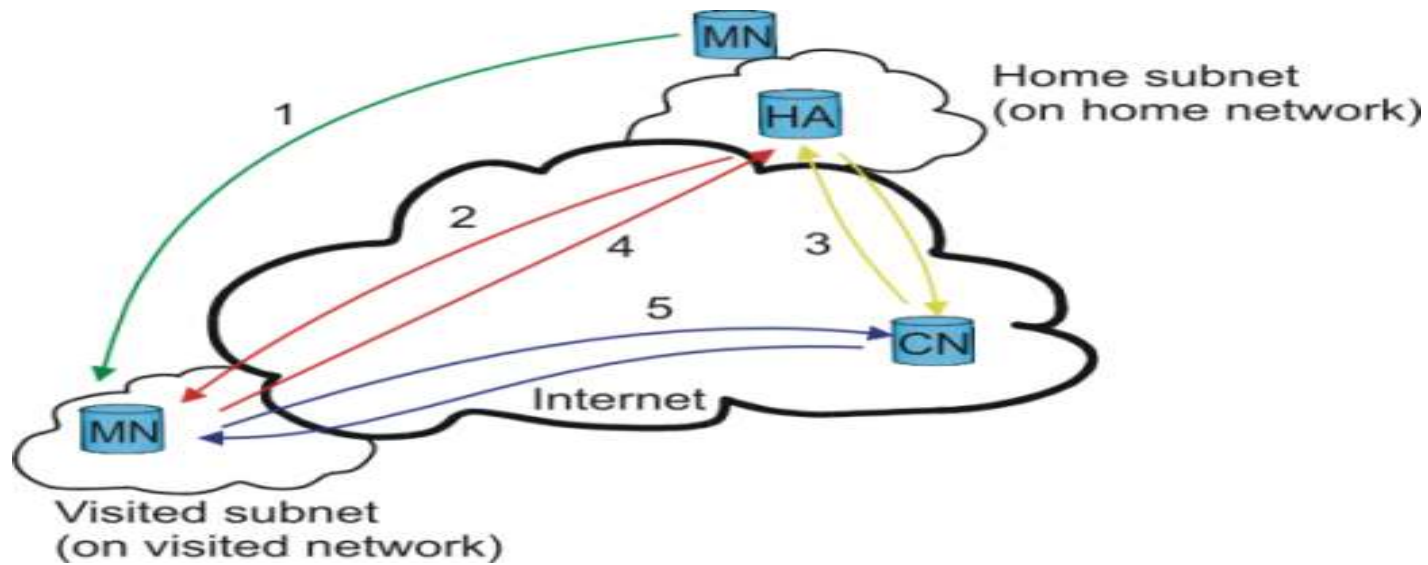
- Correspondent node:** Node that communicates with Mobile node

- Care-of-address:** Globally-routable address acquired by mobile nodes autoconfiguration in foreign subnet

- Binding:** Association between mobile node's Home address and care-of-address

- Home Agent:** Router on mobile node's Home Subnet

How it works?



Our group objectives

- Setting up of wireless network using IPV6 addresses
 - **Short-Term Objective**
 - Setting-up of small mobile LANs on Windows & Linux Platforms
 - Expand the wireless LAN to the whole CSE department
 - Service about 30 lecturers
 - Investigate the security aspect to secure lecturers critical data.
 - Accessing Internet through the existing University IPV4 LAN.

Our group objectives

- Medium-Term Objectives
 - Investigate the concept of Care-of-Address when mobile nodes change their points of attachment.
 - Deploy applications over the mobile IPV6 network
 - Development of smart spaces
 - Channelling Phone calls
 - Automatic access to facilities based on location

Our group objectives

- Long-Term Objectives
 - A Campus-Wise mobile IPV6 network
 - Co-existence with current IPV4 LAN

Mobile IPV6

- Why?

- *Range of mobile devices that can be connected to the Internet being available on the local market*
- *Allow lecturers to be connected to the LAN and Internet throughout the department and eventually, throughout campus*
- *Investigate applications over mobile IPV6*

Mobile IPV6 Lab

- Divide Short-term plan in different phases

–Phase 1

- *Windows IPV6 Wireless network*
- *Linux IPV6 Wireless network*

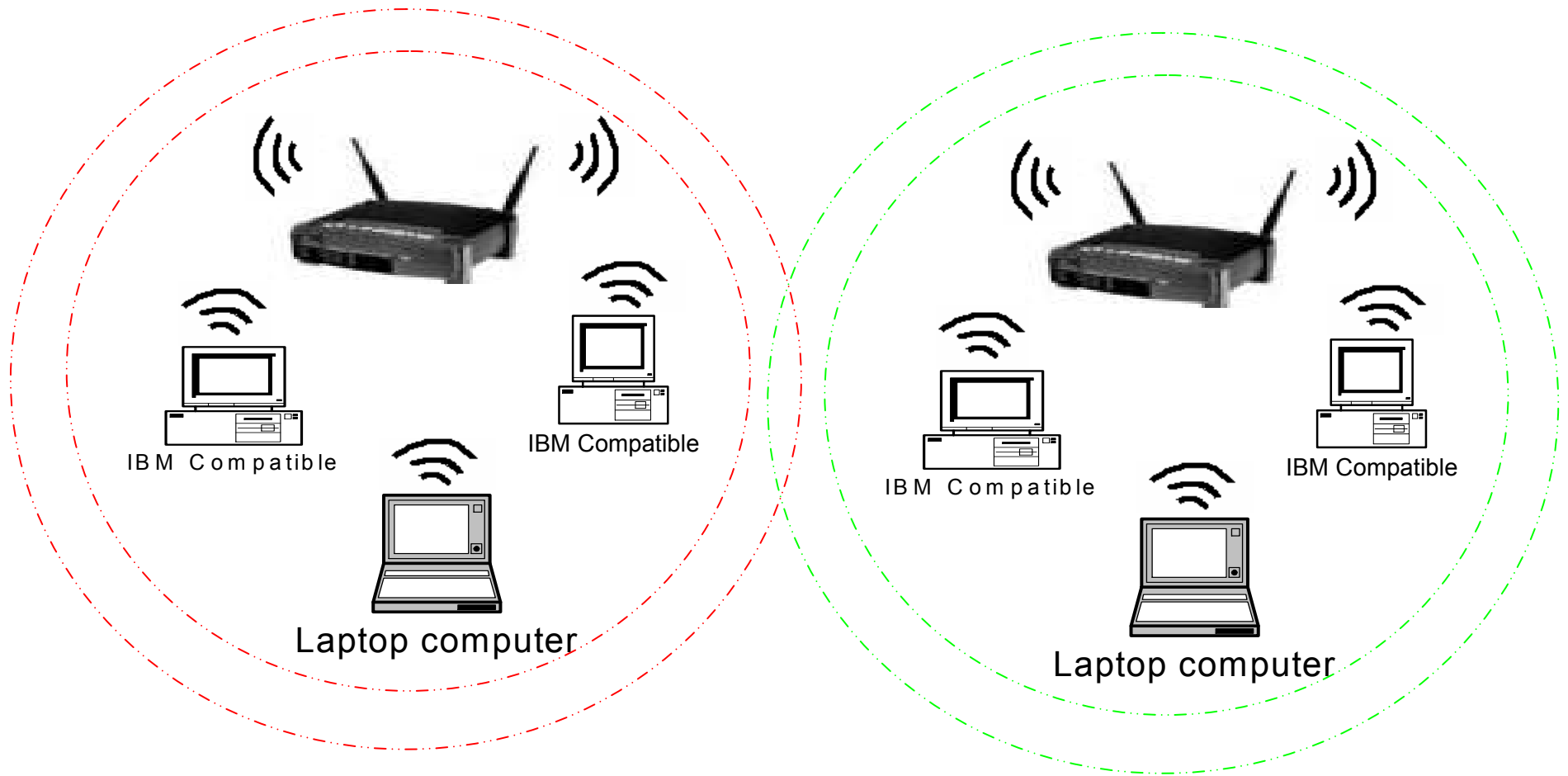
–Phase 2

- *Extend wireless Network outside of lab*
 - Use access points as repeaters*
 - Use existing VLAN cables*
- *Security*

–Phase 3

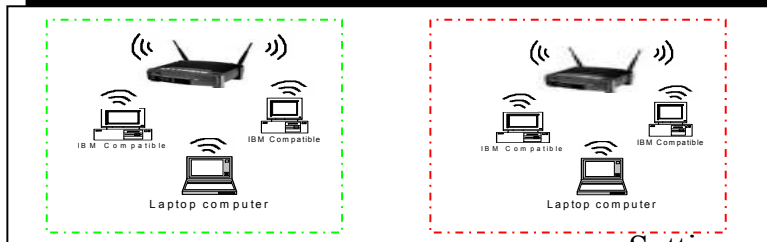
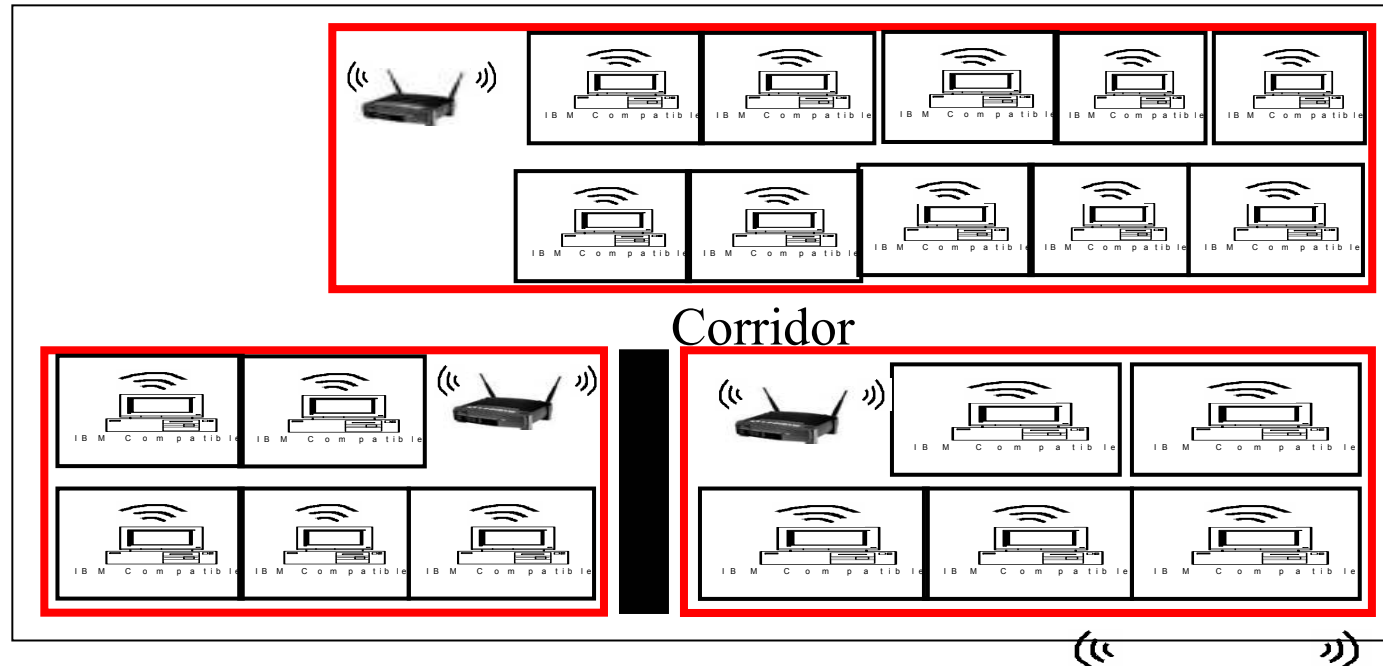
- *Connect LAN to existing IPV4 LAN*
- *Access existing resources*
- *Security*

Phase 1



Phase 2 (Option a)

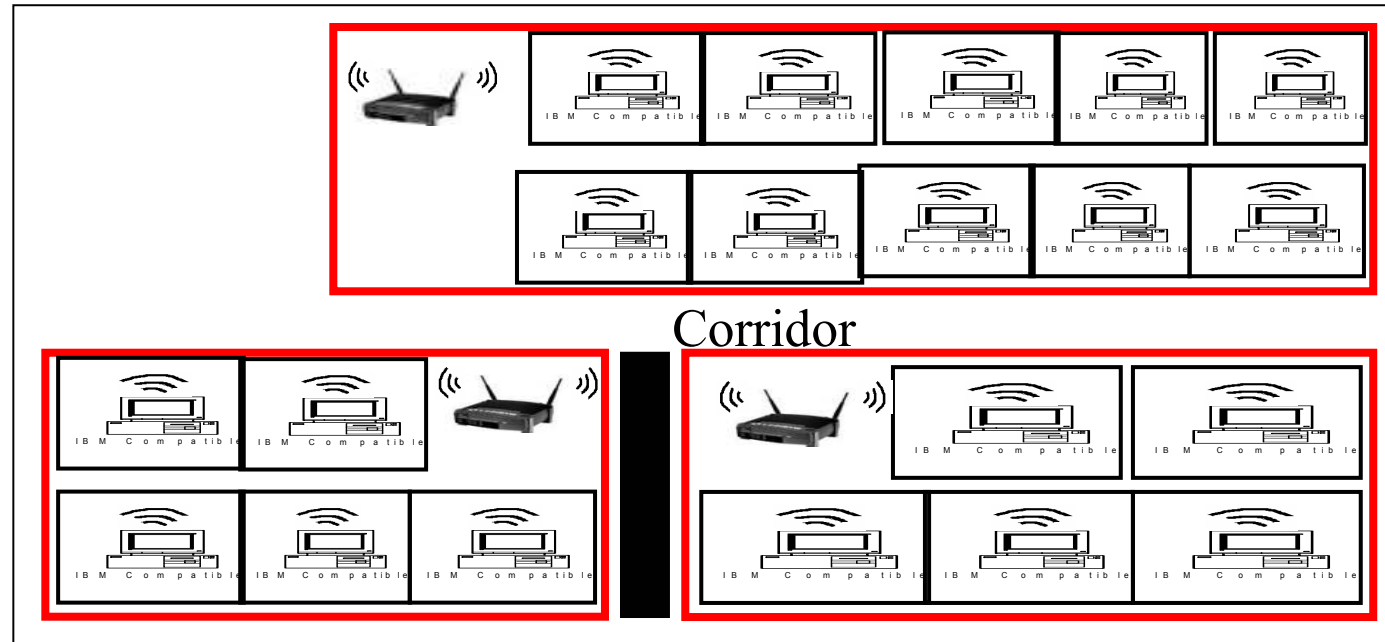
Lecturer
Offices— 2nd
Floor



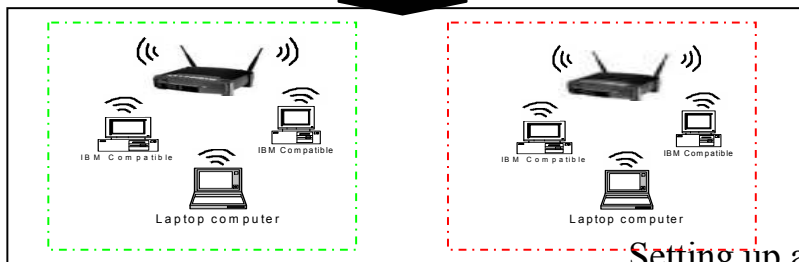
Setting up a Mobile IPV6 Lab

Phase 2 (Option b)

Lecturer
Offices— 2nd
Floor



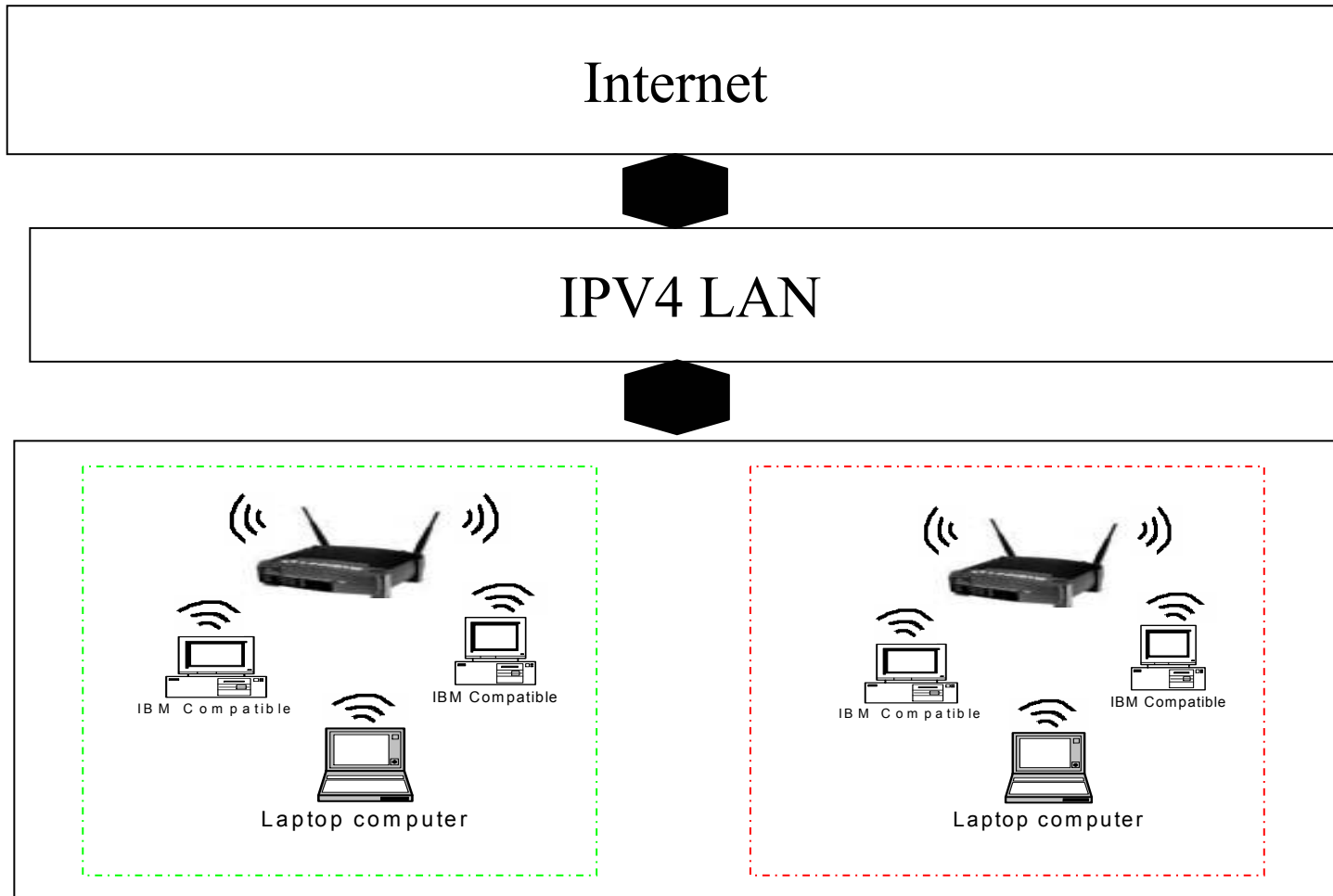
IPV4 LAN



Mobile IPV6 – 1st Floor

Setting up a Mobile IPV6 Lab

Phase 3



Phase 1 Linux Setup

- Currently we are setting up Windows and Linux Wireless LAN's in parallel
- Linux with two members of the group (D Sathan, A Chutoo)
- The nodes within the Linux wireless LAN will be using Ubuntu Linux version
- Downloaded and installed the mipv6 from mobile-ipv6.org.
- Upgrade the kernel to 2.6.16 for mobility support

Phase 1 Windows Setup

- Currently we are setting up the wireless LAN with two members of the group (Dr.Moonian and Mrs.Agarwal) working on Windows Server 2003 platform.
- Microsoft provides supported IPv6 implementations for Windows Server 2003, Windows XP with Service Pack 1 (SP1), Windows XP with Service Pack 2 (SP2), and Windows CE .NET 4.1 and later.
- IPV6 Address
 - *By default, IPv6 configures link-local IPv6 addresses for each IPv6 interface.*
 - *Additional site-local and global addresses might also be configured depending on whether you have routers that are sending Router Advertisement messages.*

Phase 1 Windows Setup

- For Windows Server 2003, Windows XP with SP2, and Windows XP with SP1, we can use the **ipconfig** command or **netsh interface ipv6 show address** to view our IPv6 addresses.
- Does the IPV6 protocol for windows support Mobile IPv6 ?
 - *The IPv6 protocol for Windows does not provide support for mobile node or home agent support.*
 - *By default, the correspondent node functionality is disabled and binding updates are required to use the IPsec Authentication Header (AH) for authentication.*

Phase 1 Windows Setup

- To enable the correspondent node functionality, use the **netsh interface ipv6 set mobility correspondentnode=enabled** command.
- IPsec for the IPv6 protocol for Windows Server 2003 and Windows XP is supported, with certain limitations.
- The Authentication Header (AH) and Encapsulating Security Payload (ESP) are supported for both transport and tunnel modes. However, ESP for the IPv6 protocol for Windows does not support data encryption.

Phase 1 Windows Setup

- IPsec in the IPv6 protocol for Windows does not support the use of Internet Key Exchange (IKE) to negotiate security associations (SAs). I
- Psec policies, SAs, and the keys to calculate the Message Digest 5 (MD5) or Secure Hash Algorithm 1 (SHA-1) keyed hash for AH or ESP must be manually configured
- **The Mobile IPv6 Technology Preview**
 - The Mobile IPv6 Technology Preview was developed by Microsoft Research and supports correspondent node, mobile node, and home agent functionality for computers running various versions of Windows.

Phase 1 Windows Setup

The IPV6 protocol for windows supports DNS in the following ways:-

- The DNS client supports the querying, processing, and dynamic registration of IPv6 host resource records, also known as AAAA (quad-A) records.
- The DNS Server service in Windows Server 2003 supports the storage, querying, and dynamic registration of IPv6 host resource records. DNS messages can be exchanged over either IPv4 or IPv6.
- The DNS client automatically configures the DNS server addresses of FEC0:0:0:FFFF::1, FEC0:0:0:FFFF::2, and FEC0:0:0:FFFF::3. We can also configure additional IPv6 addresses of IPv6-capable DNS servers using the **netsh interface ipv6 add dns** command.

Phase 1 Windows Setup

- Forcing Web Browser to use IPV6
 - The new Internet extensions DLL, Wininet.dll, enables Web browsers to access IPv6-enabled Web servers.
 - For example, Wininet.dll is used by Microsoft Internet Explorer to make connections with a Web server to view Web pages.
 - Internet Explorer uses IPv6 to download Web pages when the Domain Name System (DNS) query (or Hosts file) for the name of the Web server in the URL returns an IPv6 address.
 - We can then connect to names that resolve only to IPv6.

Next Stages

- Expand the wireless LAN to the whole CSE department
 - Service to Lecturers
 - Investigate the security aspect to secure lecturers critical data.
 - Accessing Internet through the existing University IPV4 LAN.
- Using care-of-address to allow nodes to move from one point of attachment to another
- Deploying applications over Mobile IPV6
- Development of SMART Spaces

Future

- A Campus-Wise mobile IPV6 network
 - Smart Spaces Throughout Campus

Sponsor

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Contact Details

- ovn@uom.ac.mu
- s.agarwal@uom.ac.mu
- a.chutoo@uom.ac.mu
- d.sathan@uom.ac.mu