SEE 6DISS - Session A – IPv6 Basics Hands-on

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1. Lab information

Network Topology

The network topology is shown in Figure 1. PCs belong to different VLANs, each of them having a different IPv6 address prefix. For example, the first three routers in the 2nd row belong in the VLAN 3 and use the 2001:648:E000:3::/64 address space.
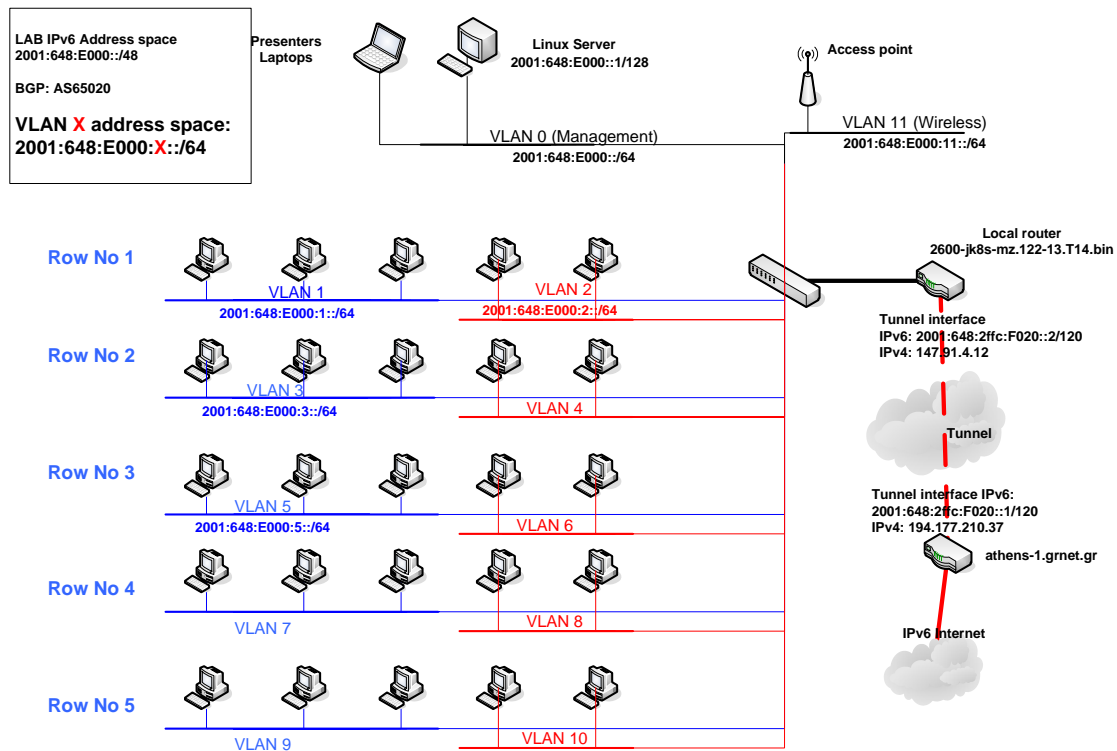

Figure 1: Lab topology
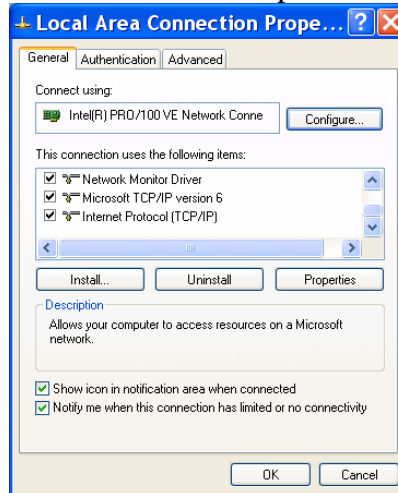
Exercise A: Enable IPv6 to WinXP

Objectives

Activate IPv6 protocol stack at the WinXP PCs and understand basic IPv6 concepts.

Exercises steps

1. There are two alternative methods for activation IPv6 in WinXP (SP2)

- Use the WinXP GUI to install the new protocol

Local Area Connection Prope...

General | Authentication | Advanced

Connect using:
Intel(R) PRO/100 VE Network Conne   Configure...

This connection uses the following items:
☑ Network Monitor Driver
☑ Microsoft TCP/IP version 6
☑ Internet Protocol (TCP/IP)

Install...   Uninstall   Properties

Description
Allows your computer to access resources on a Microsoft network.

☑ Show icon in notification area when connected
☑ Notify me when this connection has limited or no connectivity

OK   Cancel

- From a CLI run `"ipv6 install"`

2. Identify the available interface at your PC. Identify which of these interfaces are related to IPv6 transition mechanisms? From a CLI run the following commands
   - `ipconfig /all`
   - `netsh interface ipv6 show interface`
   - `ipv6 -v if`
3. Identify all the IPv6 addresses (link local, public addresses, etc)
   - Link local (Tip: Search for `fe80::...`)
   - Identify the auto-configuration IPv6 address (Tip: Search for `...ff:fe...`)
   - Identify the IPv6 address due to privacy extension
   - Identify the validity of addresses (Tip: Use the command `netsh interface ipv6 show address <interface>`)
4. Ping / traceroute IPv6 hosts
   - Ping the IPv6 localhost addresse (`::1`)
   - Ping other addresses
   - Ping IPv6 web sites (www.grnet.gr, www.6diss.org, etc)
5. Find IPv6 neighbours in your LAN. What could be the problem in terms of security?
   - (Tip: Use the command `netsh interface ipv6 show neighbors`)
6. Identify the local router address.
   - What is the appropriate command? "`traceroute`"? "... `show neighbours`"?
7. Use "ethereal" tool to capture IPv6 traffic, e.g. advertisements (RAs), or own traffic. Which IPv6 address is used when communicating?
   - Tip: See at the end of the document for ethereal filters.
8. Disable privacy extensions (RFC3041). What could be the problem in terms of security if you enable / disable privacy extension?
   - (Tip: Use the command `netsh interface ipv6 set privacy ...`)

Exercise B: Transition mechanisms

Objectives

Familiarise with IPv6 in IPv4 static tunnels.

Exercises steps

At the beginning of this exercise, the local edge routers stops to send any route advertisements (RAs). This causes the PCs to loose IPv6 connectivity with the rest of IPv6 Internet. Students are requested to create static tunnels between different VLANs and partially restore connectivity between two VLANs. Students in the same row of PCs should work as a group in order to complete the below exercises.

1. Reboot the system. Why is this needed? Why the connectivity is broken?
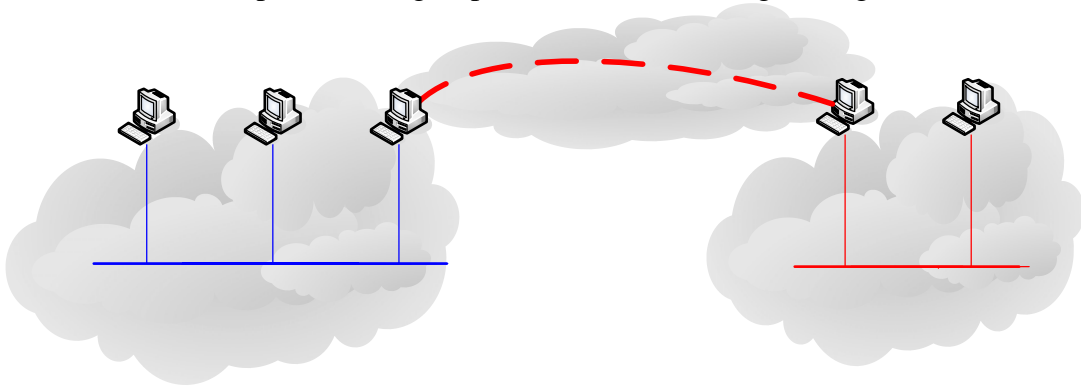2. Create the address plan for the group of five PCs according the Figure 2.

Figure 2: Transition labs

- (Tip: Find the IPv4 addresses for the tunnel interfaces before start)
3. Put static IPv6 addresses in the appropriate interfaces. When finish, validate the connectivity inside the LAN.
   - (Tip: `netsh interface ipv6 add address <if_index> 2001:648:E000:VLAN_X::a type=unicast valid=infinite`)
4. Create a static tunnels between the two routers (PCs)
   - (Tip: `netsh interface ipv6 add v6v4tunnel "Tunnel" <local_IPv4_addr> <remote_IPv4_add>`)
   - (Tip: `netsh interface ipv6 add address "Tunnel" 2001:648:E000:100::1`)
5. Is there any connectivity between PCs in different VLANs? Yes? No? Explain.
6. Validate the IPv6 routes for PCs that terminate the tunnels.
   - (Tip: `netsh interface ipv6 show routes`)
   - (Tip: `netsh interface ipv6 show routes level=verbose`)
7. Add static route to tunnel interface.
   - (Tip: `netsh interface ipv6 add route ::/0 "Tunnel" 2001:648:E000:100::1 publish=yes`)
8. Is there connectivity between the LANs? Yes? No? Partially? Explain.
9. Allow packet forwarding to "PC - routers"
   - (Tip: `netsh interface ipv6 set interface "Tunnel" forwarding=enable`)
10. Why we did not use auto-configuration? What could be a problem?

PC **a**   PC **b**   Router 1

2001:648:E000:10

2001:648:E000:VLAN_X::a

2001:648:E000:VLAN_X::b

2001:648:E000:VLAN

VLAN X

2001:648:E000:VLAN_X::/64

- (Tip: How to select a router in the LAN!)
- (Tip: `netsh interface ipv6 set interface "Local Area Network" forwarding=enable advertise=enable`)

Supporting info

Compact "Ethereal" documentation

Ethereal is used by network professionals around the world for troubleshooting, protocol analysis, software and protocol development, and education. Its open source license allows talented experts in the networking community to add enhancements. It runs on all popular computing platforms, including Unix, Linux, and Windows. See further information at http://www.ethereal.com/.

In order to capture packets, use the menu (Capture -> Start)
If you want to capture only a specific set of packets, use *capture filters* (Capture->Options), as shown in Figure 3.
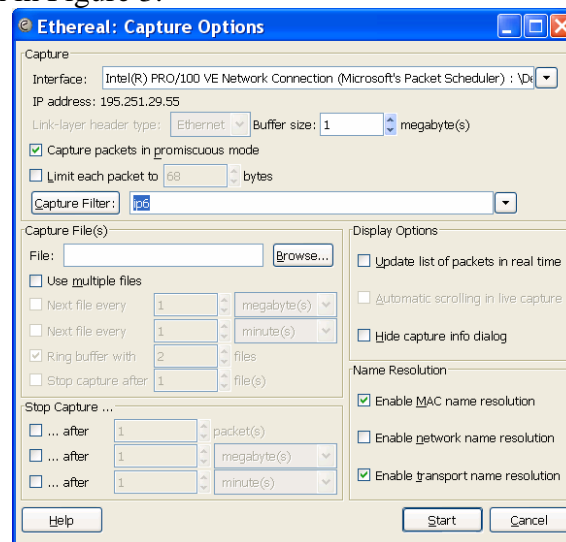
Figure 3: Ethereal packet capture filters

(Tip: Use the capture filter "`ip6`" to capture only IPv6 packets or "`icmp6`" capture only ICMPv6 packets)

After having captured some traffic, you can also filter the results using the "Filter" option, as shown in the Figure 4.
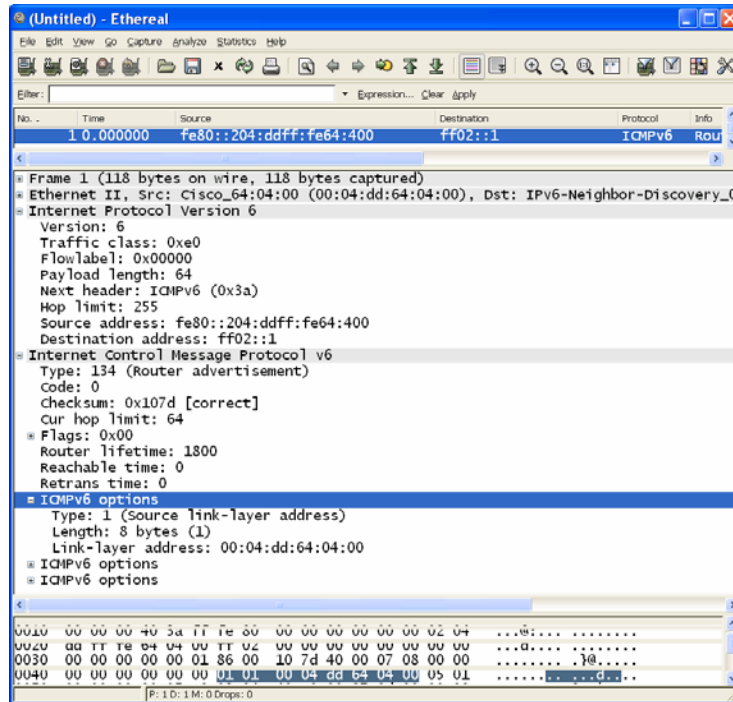
Figure 4: Ethereal interface

(Tip: Use the filter "`ip6`" to show only IPv6 packets, "`icmpv6.code==0`" to show ICMP packets of specific code or "`http`" to show HTTP traffic.)

Lab specifications

PCs are running WinXP (SP2) while Ethereal Version 0.10.13 is installed. Router is an Cisco 2610 using 2600-jk8s-mz.122-13.T14.bin IOS.