# UKERNA
# IP Multicast Hands-on Workshop

Lab 4: **IPv6 Multicast**

Networkshop 2006

# Laboratory 4 Overview

- Enable IPv6 on your workstation
  - Decide privacy address (RFC3041) policy
- Configure IPv6 multicast routing on your edge and access router
- Configure an organisational scope RP on your access router
- Use an Embedded-RP on the core router (7206)
- Try IPv6 ASM applications (e.g. vlc) and asmping

In the previous exercises we have only considered IPv4.

In IPv6, multicast is more of an inherent part of the protocol. IPv6 nodes use multicast for a number of basic protocols. There are no broadcast addresses in IPv6 networks.

In this session you'll enable IPv6 multicast on your edge and access routers, then set up an organisational scope RP for use in your 'campus', and finally use Embedded-RP to see how IPv6 streamlines multicast deployment by removing the need for MSDP.

Unfortunately Windows XP does not support IPv6 MLDv2, so we can't use IPv6 SSM in these exercises. MLDv2 is supported on other platforms, including Linux, and will be supported in Windows Vista and Longhorn server.

We will also run various application tests, including Videolan Client (vlc) and asmping.

# Current setup

- IPv6 present in 'provider'
  - IPv4 is configured as at the end of Lab session 3
  - Unicast IPv6 routing (RIPng) has been added for you
  - Thus you are deploying IPv6 dual-stack with IPv4
    - A realistic IPv6 deployment environment
- You will configure IPv6 multicast on your network
  - And turn on IPv6 on the WinXP workstations

In this lab session we develop the IPv4 setup as it was (or should have been!) when you ended Lab session 3 (inter-domain IPv4 multicast).

The IPv6 addressing plan is shown on the network topology diagram.

The lab network has a /48 IPv6 prefix assigned: 2001:630:23f::/48.

Each Team network has a /56 network prefix.

Each IPv6 subnet has a /64 prefix, such that Stateless Address Autoconfiguration (SLAAC) will operate properly. SLAAC will be used when you enable IPv6 on your XP hosts.

The edge and access routers have had IPv6 unicast routes added, are running RIPng to exchange routing information, and have IPv6 Router Advertisements configured on their host interfaces. But your workstations are not yet configured to be IPv6-enabled.

You now need to enable IPv6 on your workstations, such that the Router Advertisements being sent from the edge routers can be used by your workstations to generate an autoconfigured IPv6 address and default gateway.

# Enable IPv6 on client nodes

- IPv6-enable the clients first
- Decide privacy address policy (on or off)
  - An important issue to be aware of as an IPv6 administrator
- Observe IPv6 addresses
- Check IPv6 connectivity works
  - ping between hosts



The first step you need to do is to enable IPv6 on your XP workstations.

A simple way to do this is to run

ipv6 install

At a command prompt.

Alternatively you can look for and install/enable 'Microsoft TCP/IP version 6' in the network settings GUI.

You need to decide whether to allow IPv6 privacy addresses (RFC3041). Windows XP nodes will initiate IPv6 connections using their (random host part) privacy address. To avoid ssmpingd receiving connections to its public address and replying with a different privacy (source) address, you need to either:

Disable privacy addresses:

netsh interface ipv6 set privacy state=disabled store=persistent

(and then reboot) or be aware of the issue and target asmping at a node's active privacy address.

Having done this, check your IPv6 addresses

ipv6 if

You should be able to ping6 between workstations in your two IPv6 host subnets now.

# Turn on IPv6 multicast routing

- Next, turn on IPv6 multicast routing on your edge and access routers
  - PIM-SM and MLDv2 are enabled by default on IOS when IPv6 multicast is enabled



Check MLD status on your edge router:

```
show ipv6 mld interface
```

Now turn on IPv6 multicast routing, entering the following command on your edge and access routers:

```
ipv6 multicast-routing
```

This will also enable PIM-SM and (where necessary) MLDv2 by default on IOS, which is handy.

Check the MLD status again to verify that it has been enabled by default:

```
show ipv6 mld interface
```

# Configure a local (site/org) scope RP

- On the access router, we'll configure a site and organisational scope RP
  - ff05::/16, ff15::/16, ff08::/16, ff18::/16
- We'll also restrict the group traffic with IPv6 access control lists



We'll now create an organisational scope RP for IPv6 on the access router. This exercise is similar to setting up the PIM-SM RP for IPv4 that we did in Lab session 2. Only here the scope is limited to the Team (campus) network and the RP will only be used internally on your network.

Select the RP's loopback interface and assign it the RP address:

```
int loopback1
ipv6 address 2001:630:23f:7x10::2/128
```

where 'x' is your group number (A=1, B=2, … F=6).

Next, add ACLs to both your edge and access routers:

```
conf t
ipv6 access-list v6rp
  permit ipv6 any ff05::/16
  permit ipv6 any ff08::/16
  permit ipv6 any ff15::/16
  permit ipv6 any ff18::/16
```

Then apply that filter list when you configure the RP:

```
ipv6 pim rp-address 2001:630:23f:7x10::2 v6rp
```

# Setting up the RP (2)

- First, set the scope boundary on the access router
  - Multicast scope boundary
  - BSR border (we're not using this protocol, but good practice to limit it)
- Then check the router status



We also need to define the scope boundary on the access router's uplink interface:

On the 2801 (Teams A-C):

```
int fa0/0
ipv6 multicast boundary scope 8
ipv6 pim bsr border
```

or on the 3825 (Teams D-F):

```
int gi0/0
ipv6 multicast boundary scope 8
ipv6 pim bsr border
```

To check RP is set up properly try:

```
show ipv6 pim group-map
show ipv6 pim range-list
```

# Testing with asmping

- Now we use asmping to test ASM connectivity between hosts on your edge router subnets
  - Test with various scopes
  - Test that you can't reach another Team's hosts



Use asmping with various scopes:

asmping-0.8.1.exe ff05:: <target_address>

asmping will fill in the group ID for you by default (4321:1234). This is the equivalent of the .234 address used by IPv4 ssmpingd.

Repeat for the other scopes.

You should not be able to target other Team's hosts, due to the scope limitations (in theory!).

# Checking MLD status in IOS

- There are various commands you can use on the host-facing routers:
  - Show groups
  - Look at interfaces
  - Show traffic



Some interesting commands to try include:

```
show ipv6 mld groups summary
show ipv6 mld interface
show ipv6 mld traffic
```

# Using Embedded-RP

- The core 7206 router is configured as an IPv6 Embedded RP router
- Calculate the multicast group address to use for asmping when using RP address 2001:630:23f::1 and the group ID ‘baad:cafe’
- Try asmping with that group to a host in another Team’s subnet

Next, we test Embedded-RP that’s configured on the Cisco 7206.

You should be able to calculate/work out the group address to use. The 7206’s RP address is 2001:630:23f::1.

Note that the Embedded-RP address should have scope e (global), and remember the prefix length (/48) is encoded in hex in the group address.

Use asmping to another Team’s host (you’ll need to talk here, as this isn’t on the topology sheet, and they may or may not be using privacy addresses) using this multicast address:

asmping-0.8.1.exe <group_address> <target_ip>

# ECS-TV via Embedded-RP

- Try to connect to ECS-TV using Embedded-RP
  - Use VideoLAN (vlc) as the client
  - Target to the group address
- This should be showing a TV channel
- Demonstrates ASM PIM running between Hatfield and Southampton without inter-domain specific protocols (MSDP) that are needed for IPv4

Load up vlc.

Select ‘File’ and ‘Open network stream’. Enter the following udp target:

udp::/@[ff7e:140:2001:630:d0:f000:feed:20]

This should work… showing IPv6 multicast ASM between sites without the need for MSDP.

You should also be able to deduce the IP address of the ECS-TV RP.

# Other IOS commands

- You should also try out other IOS commands that you've used for IPv4 in previous exercises, but now for IPv6…
  - PIM neighbours
  - Multicast routes
  - etc.



You may wish to use these commands at various points in the exercise:

```
sh ipv6 pim neighbor
sh ipv6 pim neighbor detail
sh ipv6 pim tunnel
sh ipv6 mroute
sh ipv6 mroute count
```

# Experiment!

- If you have time left, experiment!
- The ‘helpers’ may have installed extra applications at the workshop network since the exercises went to print…

# Lab Overview

- What did we do
- What did we learn
- What would be different in the real world