UKERNA
IP Multicast Hands-on Workshop

Lab 2: **IP Multicast, Intra-domain**
(Site multicast)

Networkshop 2006

Laboratory 2 Overview

- Consider site-wide IP multicast deployment
- Include IP multicast access router
  - Connecting to the edge router from Laboratory #1
- Configure multicast on access router
- Configure PIM-SM rendezvous point on access router
  - Run asmping between workstation systems
  - Run ethereal to observe packets on the links
  - Observe multicast state in both routers

In the previous exercise we 'simulated' working with IP multicast at a departmental perspective on campus, understanding LAN issues, how IGMP works, and router states as multicast groups are joined.

In this session we consider site (campus) wide multicast, including deployment of a PIM-SM Rendezvous Point (RP). This represents the campus access router, which may act as the central multicast router on your site.

So in this session we cover the intra-domain issues and features.

You'll configure the access router for your Team network, allowing multicast to flow between the access router, edge router and workstation systems, and configure the uplink on your edge router for multicast.

Then, you will define a PIM-SM Rendezvous Point (RP) for your domain on your access router, and configure your edge router to use the RP.

Having done that, you can use the asmping variant of ssmping to study how traffic flows within the domain, and how state changes in multicast routing occur on the routers.

Edge Router uplink

- The first step is to enable multicast on the edge router uplink
  - Turn on PIM
- We don't need to enable IGMPv3, as that is a host-to-router protocol and this link is router-to-router
- We will then move on to configure your Team's access router.

At the end of lab session 1, we had not configured uplink links from the edge router, since we were only studying multicast on the downstream (workstation) links.

Now we need to enable multicast on the uplink.

Select the interface, and enable PIM:

```
int fa0/0
ip pim sparse-mode
```

Multicast on access router

- There are three steps to configuring the access router
  - First, turn on multicast
  - Second, enable multicast interfaces (PIM)
  - Third, configure the RP
- Here we do the first two steps.
- Note Teams A-C have a Cisco 2801 access router, while Teams D-F have a Cisco 3825, so the interfaces will be slightly different
  - fa0/1 (on 2801) as opposed to gi0/1 (on 3825)

First, turn on multicast on the router at the conf level:

```
ip multicast-routing
ip pim ssm default
```

Then enable multicast on the access router's internal domain interface:

For the 2810 (Teams A-C):

```
int fa0/1
ip pim sparse-mode
```

For the 3825 (Teams D-F):

```
int gi0/1
ip pim sparse-mode
```

The next step is to configure a PIM RP on the access router.

Configuring the RP

- The RP function runs on one router in the PIM domain
  - We don't consider failover or Anycast-RP here
- Need to pick an RP address
- Next, we configure the RP

For multicast senders and receivers to meet in a campus scale PIM domain we need an RP configured. While this may seem overkill for our lab network, we couldn't expect Cisco to loan us up to 50 routers per Team ☺

The common thing to do these days, is to configure the RP address statically on all routers, and put that address on a loopback interface on the router chosen to be the RP. Then you can easily move the RP another router as needed. Also, when using Anycast-RP, that address might be on the loopback on multiple routers.

You typically also have a loopback address per router that is used for management (addresses on physical interfaces are only available if interface is up), often also used for BGP peerings, as ID in multiple routing protocols etc. It's nice to keep that loopback address separate from the RP one that might move or be in multiple places.

The RP address needs to be a unicast address within your IP allocation.

Your Team RP address is listed on the network topology diagram in the Team section; you may pick a different address, but this will cause problems when we look in Lab session 3 at the MSDP protocol that runs between RPs.

Configuring the RP address

- First we need to create a loopback interface and assign it an IP address (that will be the RP address)
- We need to configure the RP address on the edge and access router
  - See the topology diagram for allocated RP addresses

We need to configure the RP address on both the edge and access router.

The access router will be the RP; we will first create a loopback interface to bind the RP's IP address to:

```
int loopback1
ip address <rpaddress> 255.255.255.255
```

While still on the access router, then configure the RP address:

```
ip pim rp-address <rp_address>
```

Finally, on the edge router:

```
ip pim rp-address <rp_address>
```

Remember, your RP address is on the topology diagram for your Team.

Exploring the PIM domain

- Having configured the PIM RP and interface multicast, you can now test the multicast operation using asmping
  - asmping is the ASM variant of ssmping
- Run asmping between two workstations
  - Observe PIM messages with Ethereal
  - Observe PIM-SM protocol in action
  - Observe router multicast states/routing tables

While our PIM domain setup is relatively simple, it allows you to get an insight into the operation of PIM-SM as described in the preceding theory session.

We'll use asmping between a client and server on each of your Team's workstation subnets to generate multicast (*,G) traffic.

While asmping is running, you can use the tools you learnt in Lab session 1 to capture packets and analyse them – to verify that the PIM messages and protocol is behaving as expected – and look at the multicast routing tables and related state on both routers to see how they change over time while the asmping is running, and after it is stopped.

Note that host snooping will not show PIM messages exchanged between routers; you will need to check the router states via IOS commands… see the next page…

IOS commands to try

- There are some specific IOS commands to try to view the PIM state on the router(s)
  - Look at the PIM interfaces
  - Look at the PIM neighbours
  - Check RP information
  - Look at the multicast routing table
  - Show how router is doing RPF

Here are some commands you can try before, after or while running asmping.

Look at the PIM interfaces:

show ip pim interface

Show your PIM neighbours:

show ip pim neighbor

Look at the RP information:

show ip pim rp

For RPF information:

show ip rpf

As well as commands you learnt from Lab session 1, e.g.

show ip mroute

show ip mroute count

Using asmping

- The asmping client works similarly to ssmping
  - But you need to specify a group address to use
    - asmping <multicast_group> <server_ip>
  - An example group to use could be 224.1.2.234
- Note that the group address you use must end .234 (a 'security' feature of asmping).

Start Ethereal to capture packets on one or both hosts, using a multicast filter if you wish (in a live network this may filter out a lot of uninteresting 'background' traffic).

Start ssmpingd on your chosen ssmping server host:

ssmpingd.exe

Run asmping from one client workstation to the server workstation:

asmping-0.8.1.exe <group> <server_ip>

Study the router multicast routing information.

Stop the asmping flow.

Look at the Ethereal results and subsequent router statuses.

Lab Overview

- What did we do
- What did we learn
- What would be different in the real world
- What's coming up next