MikroTik User Meeting
PIM protocol on MikroTik devices

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About Us

- Inter Projekt S.A
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Why that topic?

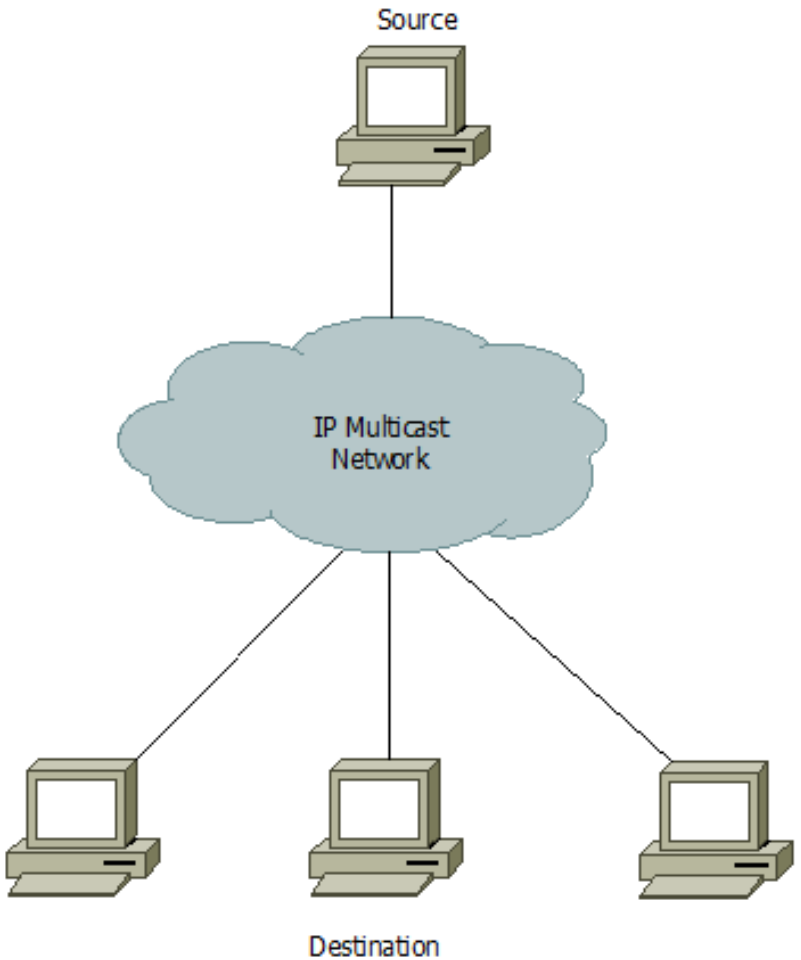
Using multicast in network let administrators to offer many new services. However, it can be difficult to configure and, if it is not done well, it could be a source of many problems.

Why we choose that topic?

- more multicast traffic in network
- many services which could be interesting, like Internet Television
- complains about difficulties while configuring PIM
- not well known technology which can increase network efficiency

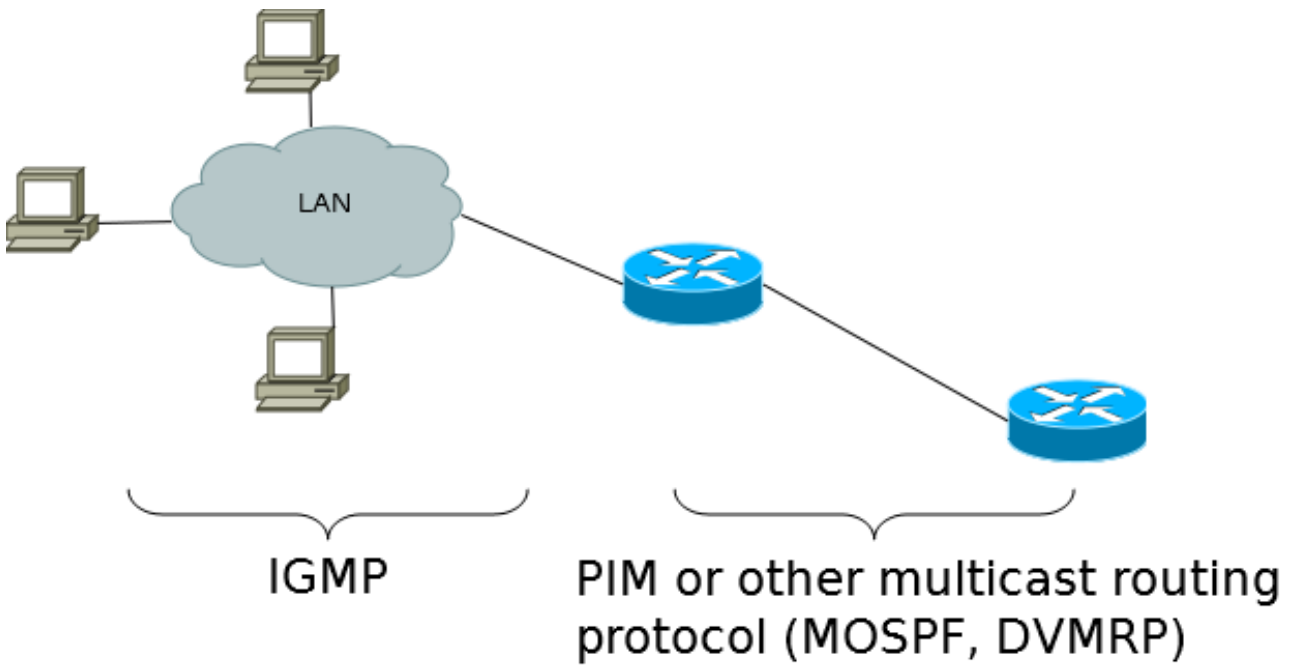
What is it?

Multicast is the way of delivery packets in computer networks to group of destination points at the one time. In unicast communication, each packet goes exactly to one receiver, even if the same data have to be sent to many hosts. Multicast provides special addresses, which identify not one computer, but a group of hosts.



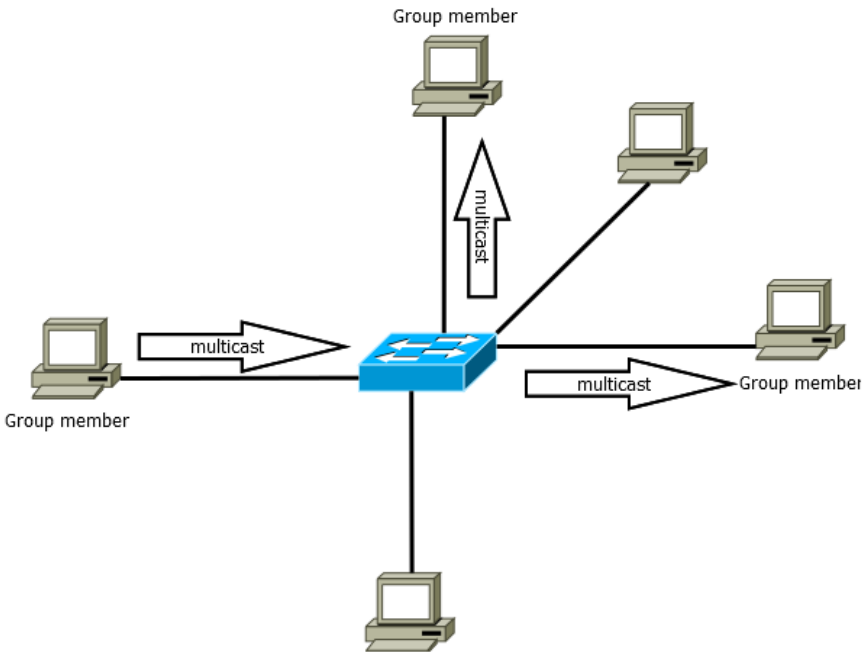
IGMP - LAN multicasting

- IGMP - Internet Group Management Protocol
- three versions of IGMP
- IGMP messages are encapsulated in IP packets
- works usually in LAN and manage the group



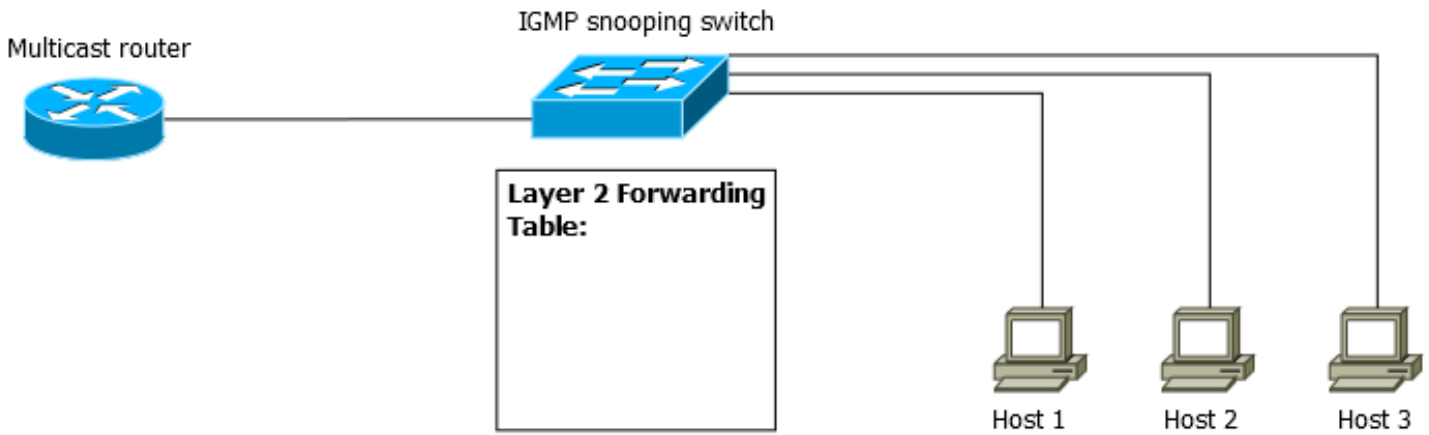
L2 in L3 territory

Many switches usually treats multicast traffic as a broadcast, resend these packets through all its ports. That could be a source of problem and reduce a network performance. IGMP snooping is a technology, which allows switch to monitor IGMP packets normally intended for routers. In that way switch learn, which of hosts are real destination points of multicast traffic and direct packets only to them.



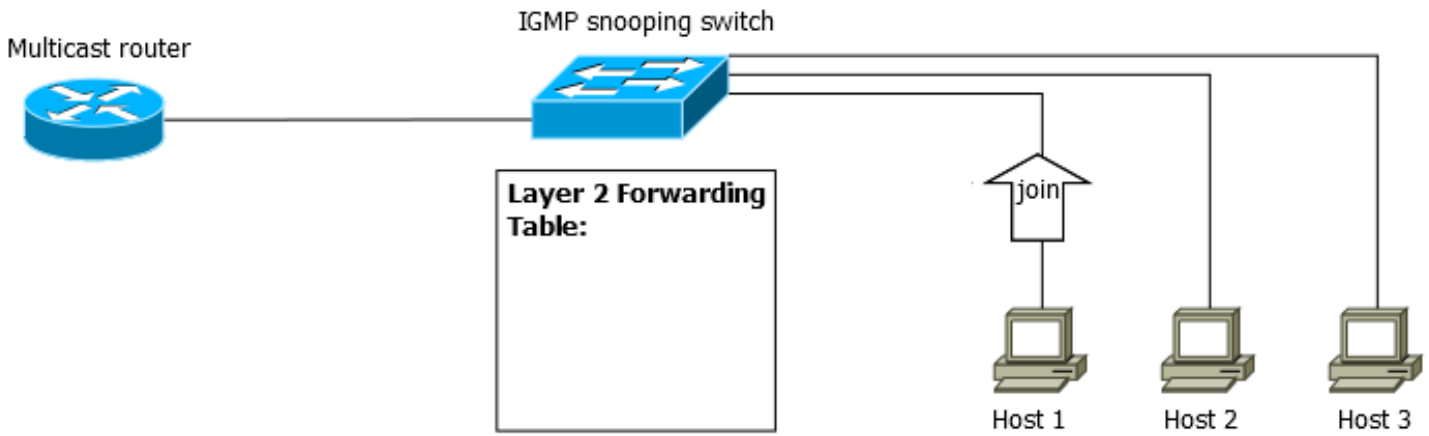
IGMP snooping process

Testing environment:



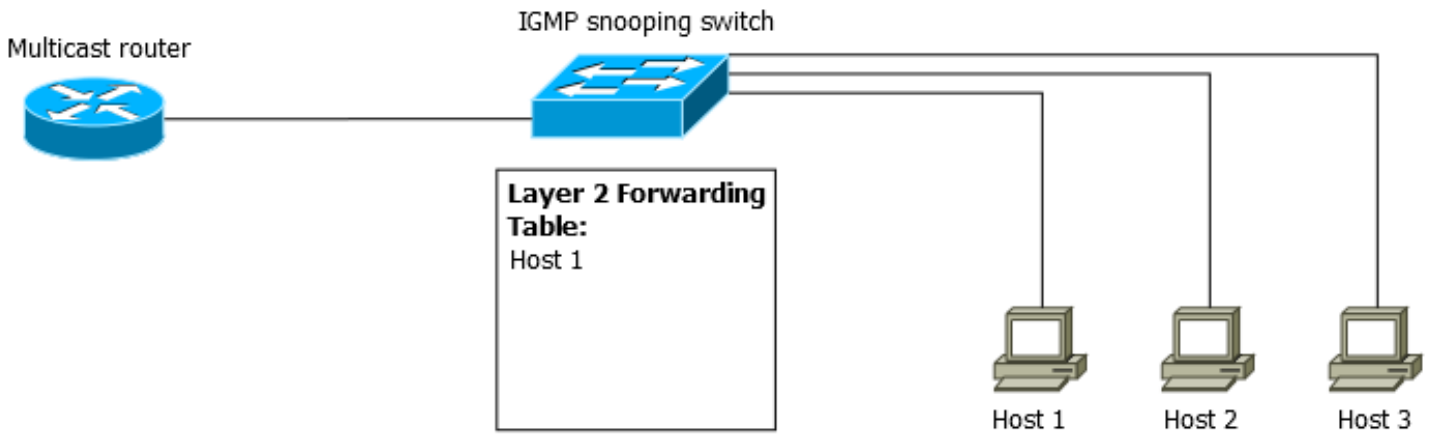
IGMP snooping process

Stage 1: Host1 send join message to switch



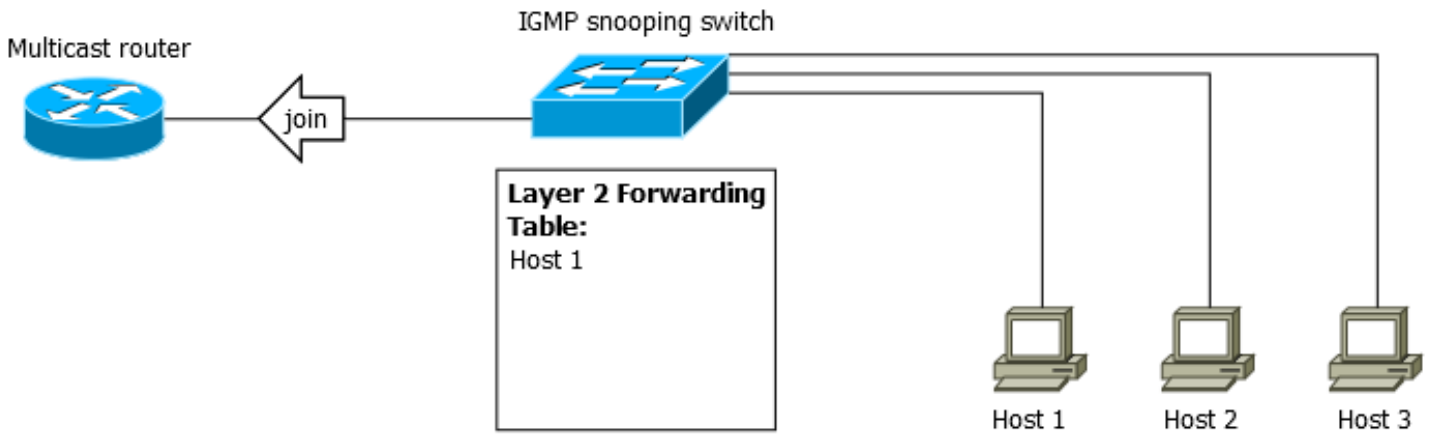
IGMP snooping process

Stage 2: Switch add entry in his Forwarding Table



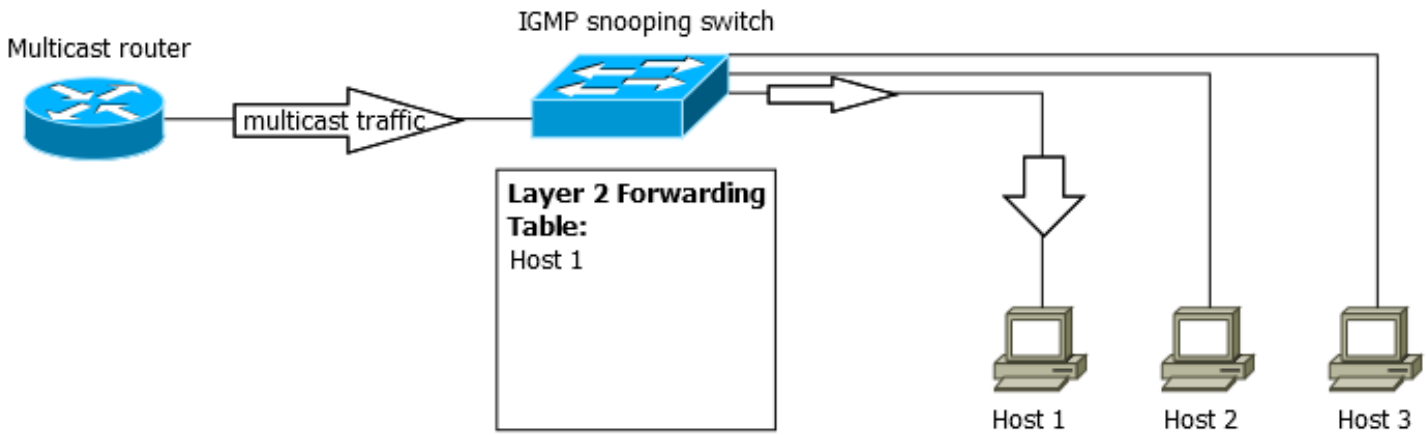
IGMP snooping process

Stage 3: Join message is forward to router



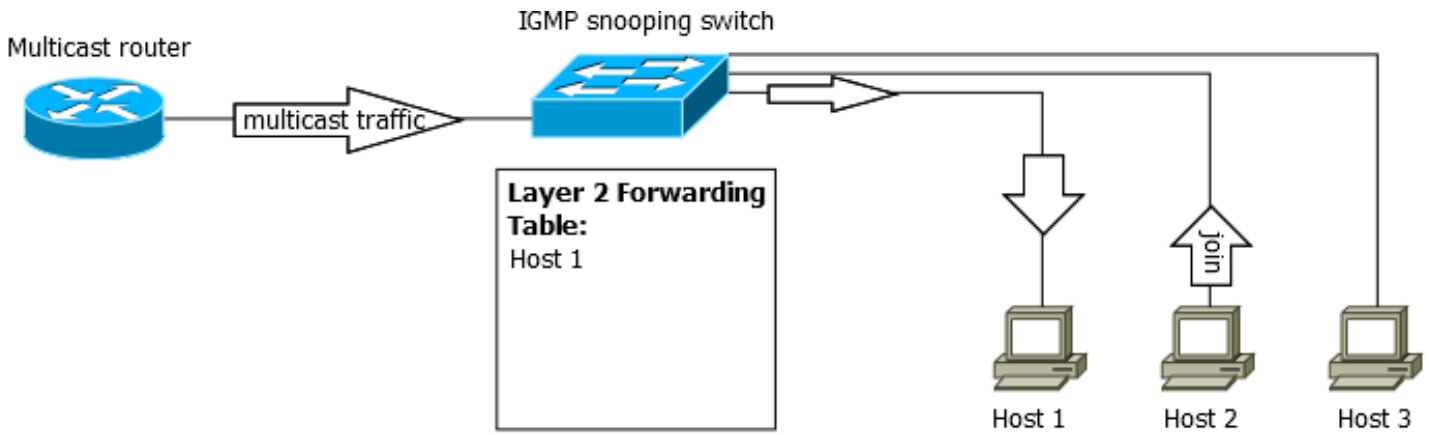
IGMP snooping process

Stage 4: Multicast traffic goes only to Host1



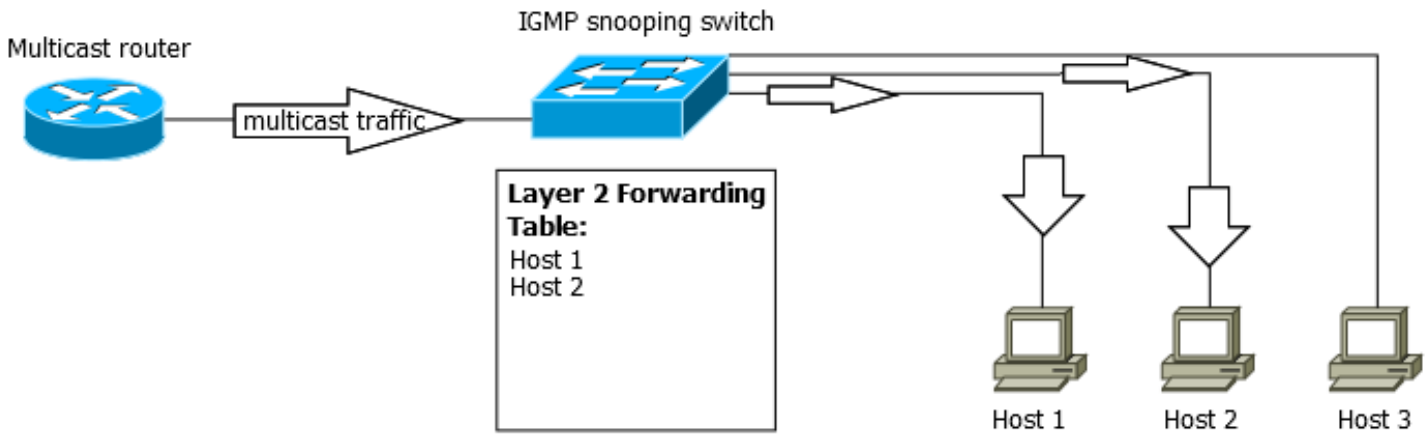
IGMP snooping process

Stage 5: Host2 want to get multicast traffic too - send join request to switch



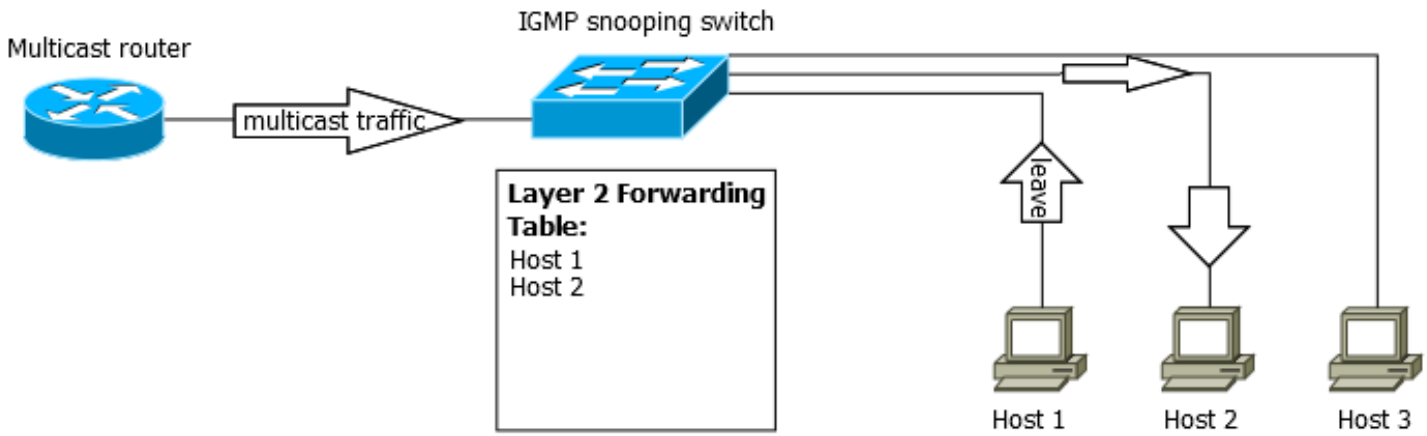
IGMP snooping process

Stage 6: Multicast traffic goes to Host1 and Host2



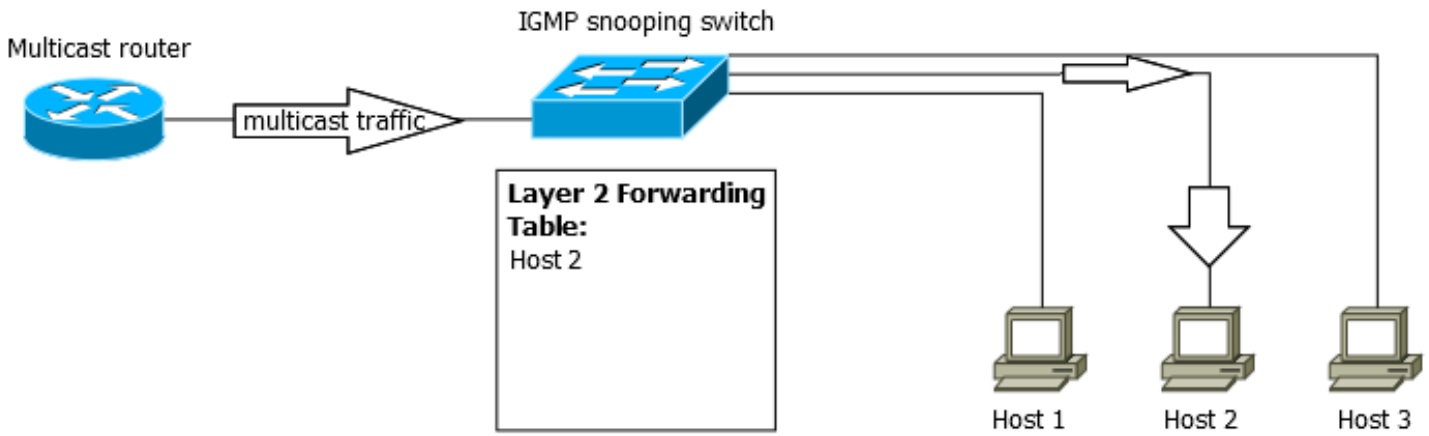
IGMP snooping process

Stage 7: Host1 want to leave multicast group



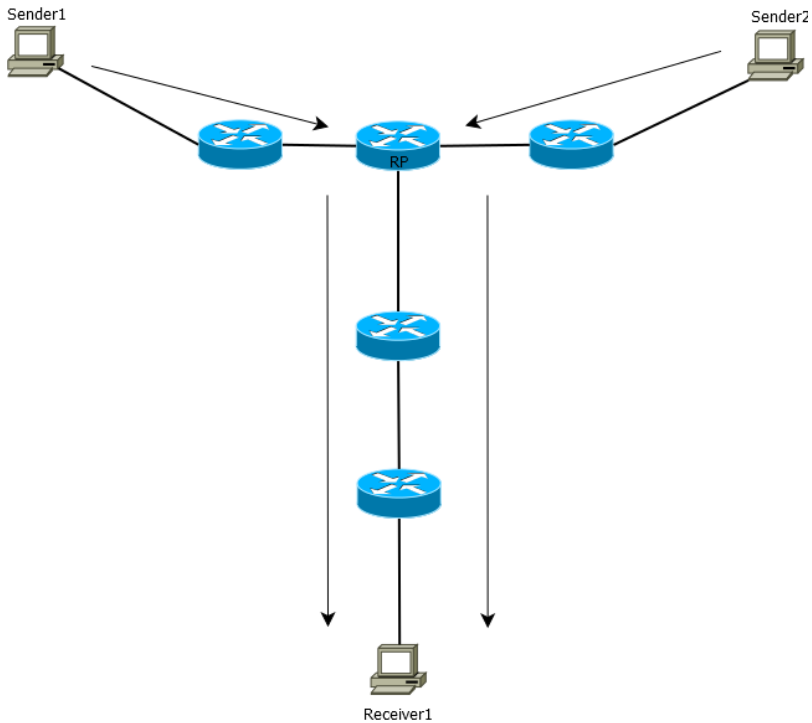
IGMP snooping process

Stage 8: Multicast traffic goes only to Host2



Some basic information...

PIM is a multicast routing protocol. It is relatively new solution. Mikrotik supports PIM-SM (sparse mode) version. It was designed mainly to WAN networks in order to reduce number of routers, which do not hold IP group, but still receive multicast packets. In sparse mode protocol used control messages to ensure data were delivery to appropriate hosts.



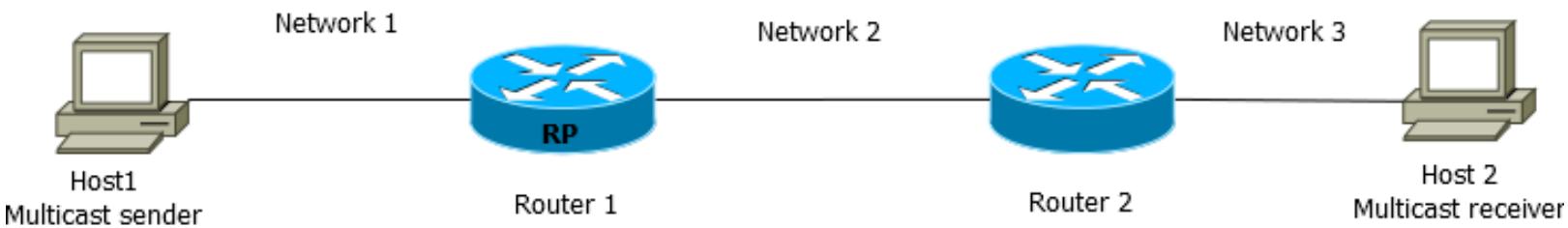
...more information...

Helpful terms:

- protocol independent - use the route information delivered by other routing protocols
- sparse mode - designed mainly for wide-area usage
- shared trees (aka RP trees) - multicast distribution trees rooted at some selected node
- Rendezvous Point - root of the shared tree that receives all the traffic from the sources and forwards that traffic to the receivers

...and a small example

In this example PIM is enabled on both routers. Router 1 is Rendezvous Point. Computer connected to port ether1 work as multicast sender. Router 2 has configured RP as a Router 1 port. Host 2 is multicast receiver.



...and a small example

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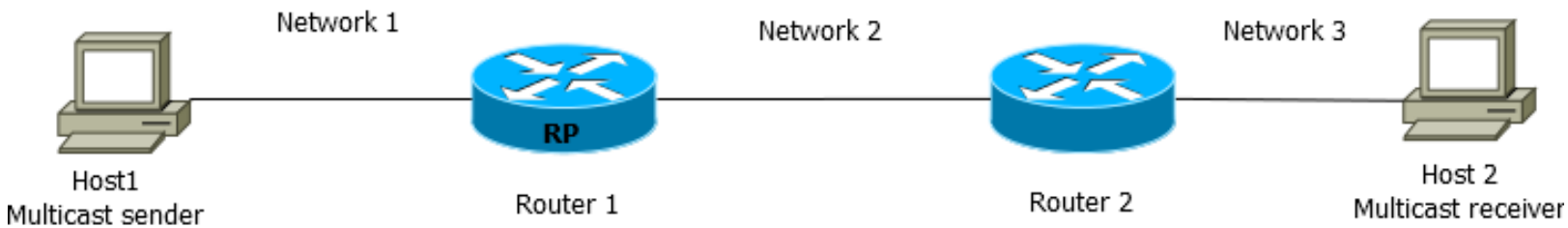
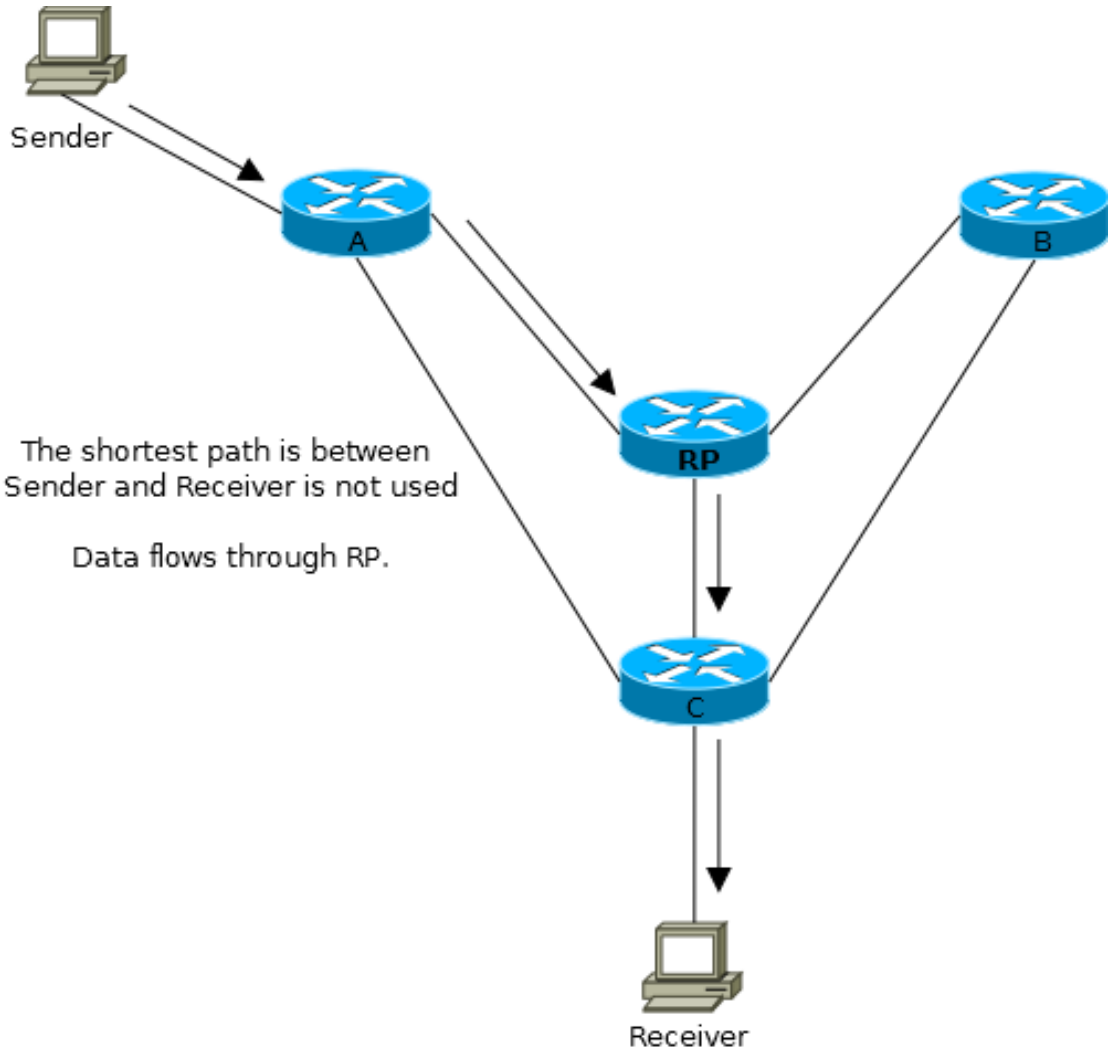
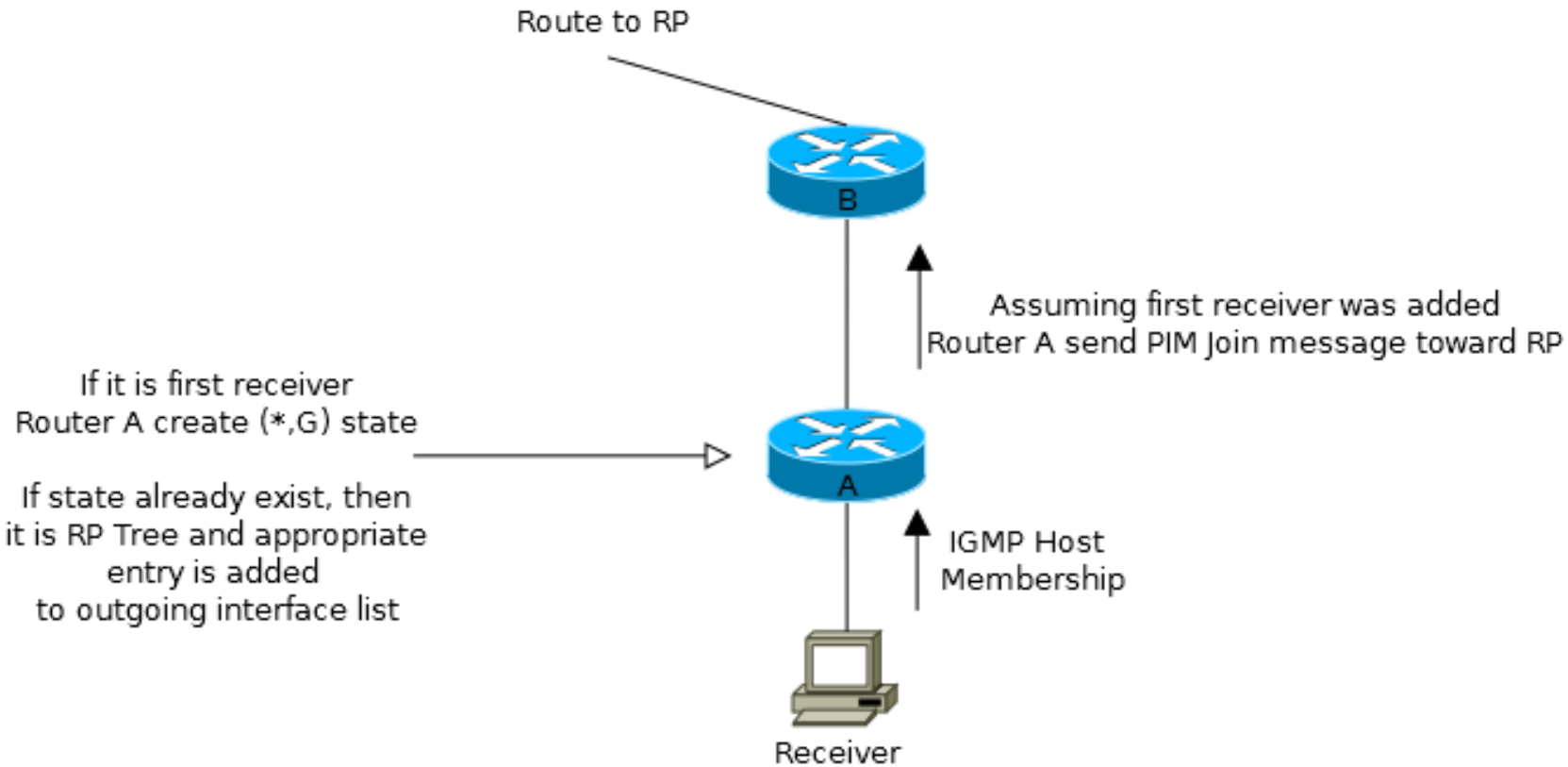


Ok, but how does it really work?

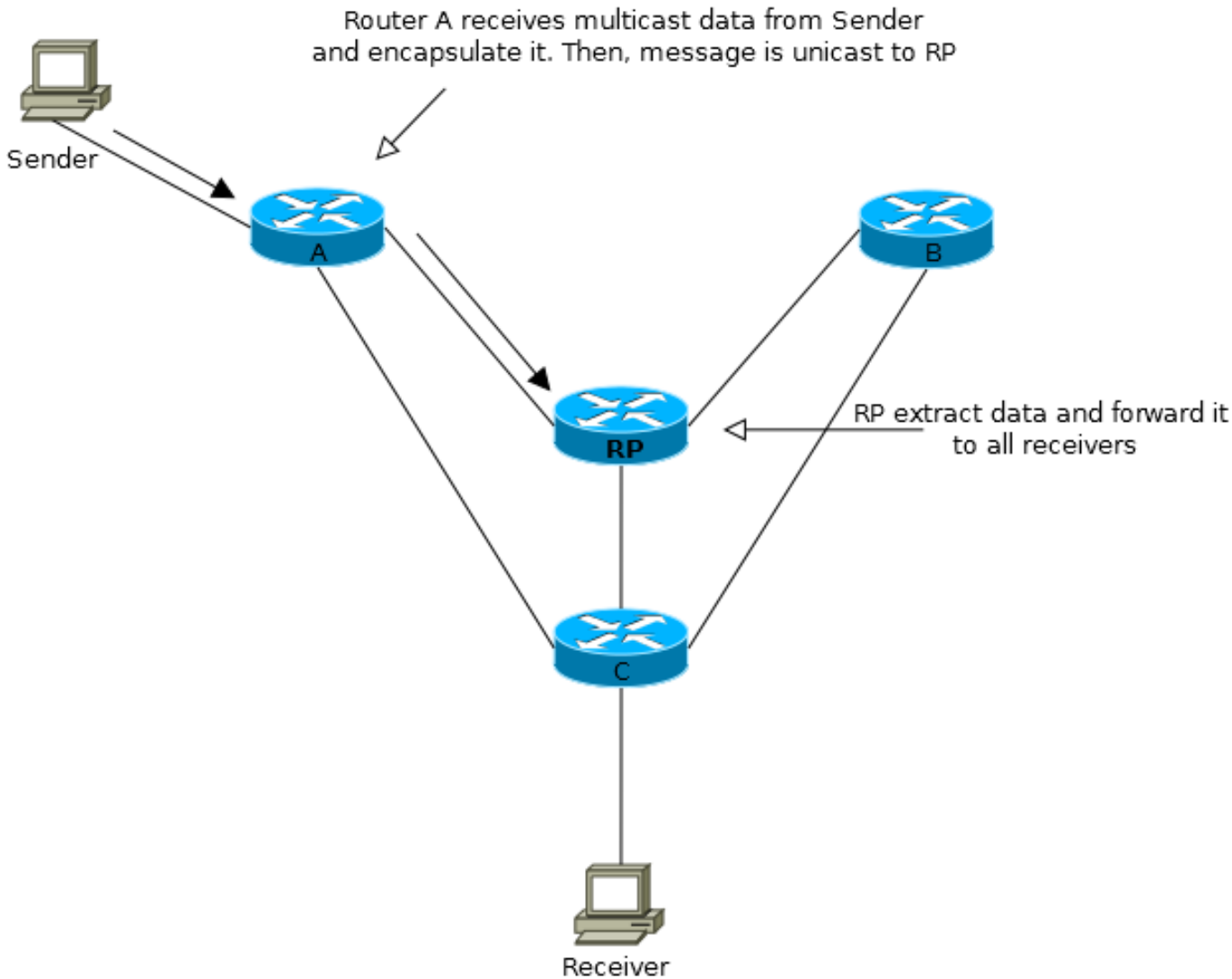
Shared Tree (RP Tree)



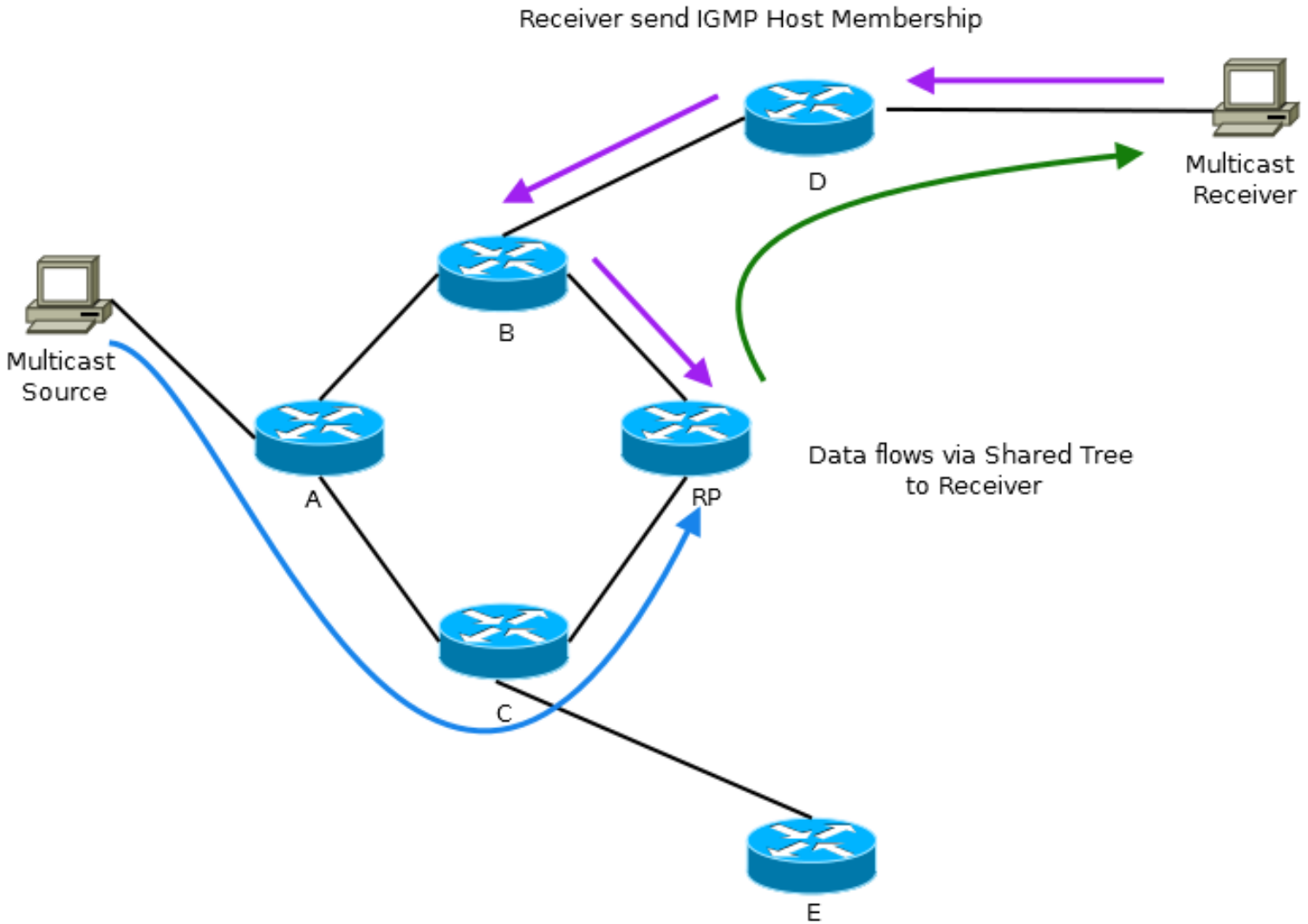
Joining the RP Tree



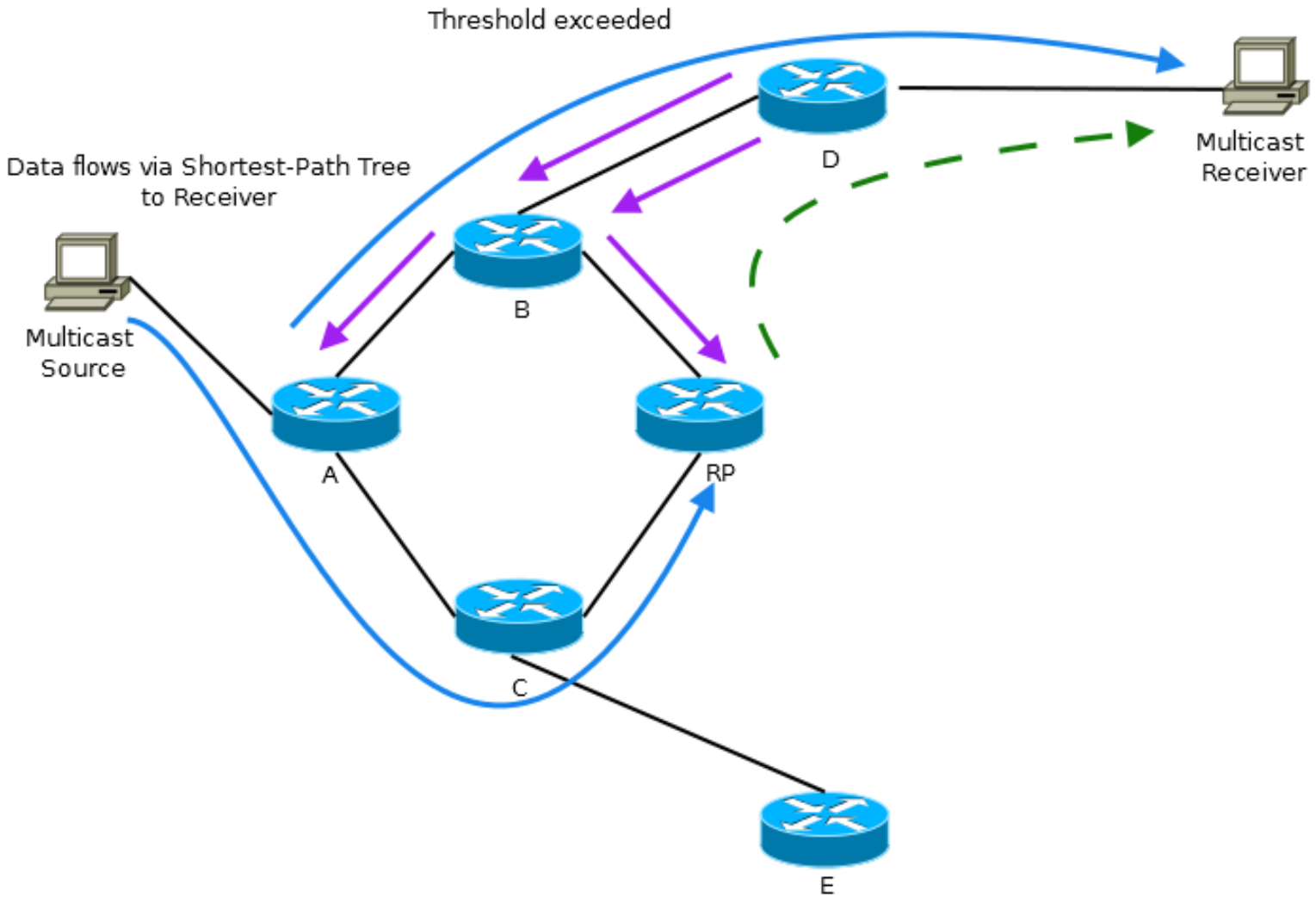
Establishing path from Sender to RP



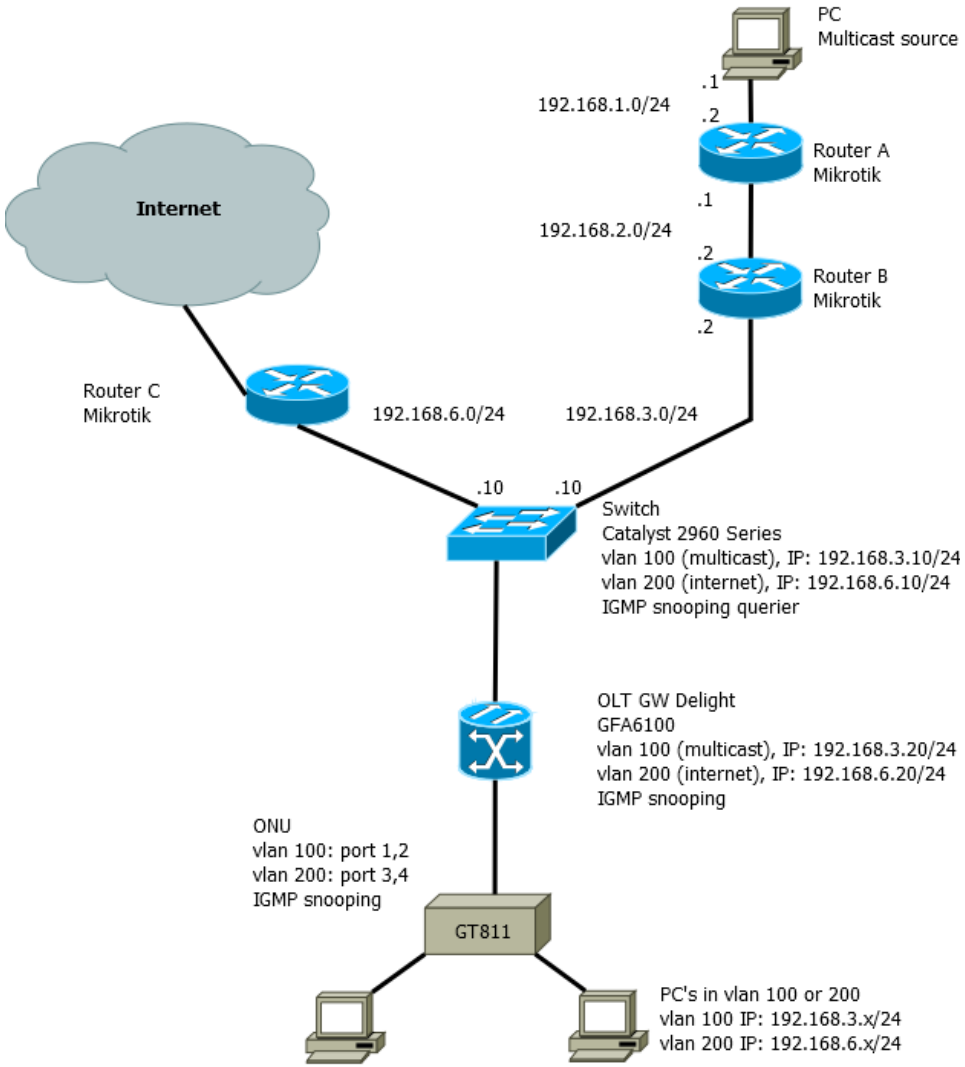
SPT switching



SPT switching



Network topology:



Router A

Router A is connected to multicast source. Besides that, it is a Rendezvous Point - a router that has been configured to serve a bootstrapping role for certain multicast groups.

The main configuration points:

- ether1 port in 192.168.1.0/24 network (with multicast source)
- ether2 port in 192.168.2.0/24 network
- PIM enabled
- Router A as Rendezvous Point

Router A

Route List

Routes | Nexthops | Rules | VRF

Find all

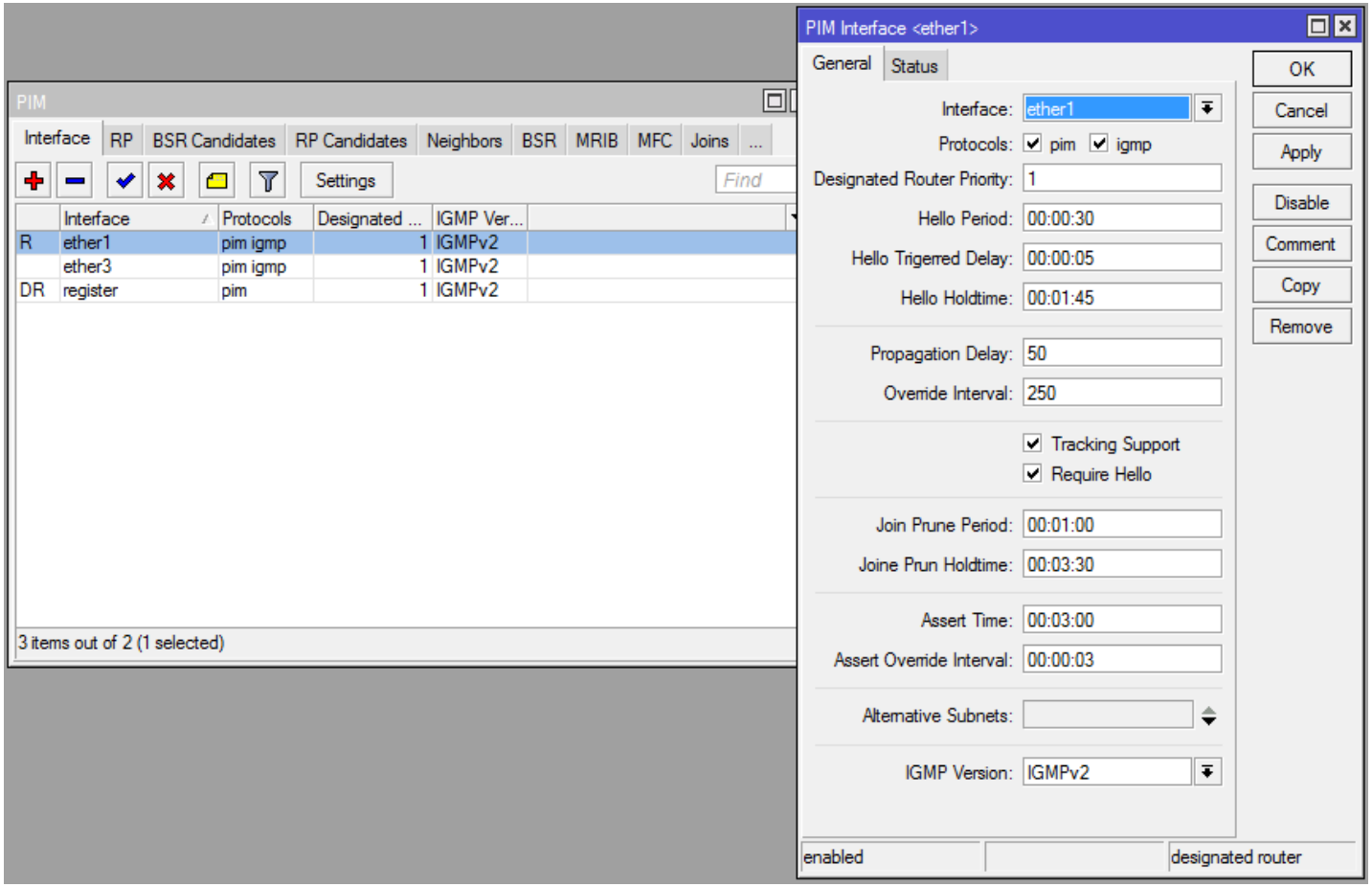
	Dst. Address	Gateway	Distance	Routing Mark	
DAC	192.168.1.0/24	ether1 reachable	0		192
DAC	192.168.2.0/24	ether3 reachable	0		192
AS	192.168.3.0/24	192.168.2.2 reachable ether3	1		
AS	192.168.4.0/24	192.168.2.2 reachable ether3	1		
AS	192.168.5.0/24	192.168.2.2 reachable ether3	1		

5 items

PIM-SM protocol use the information which is in the routing table.

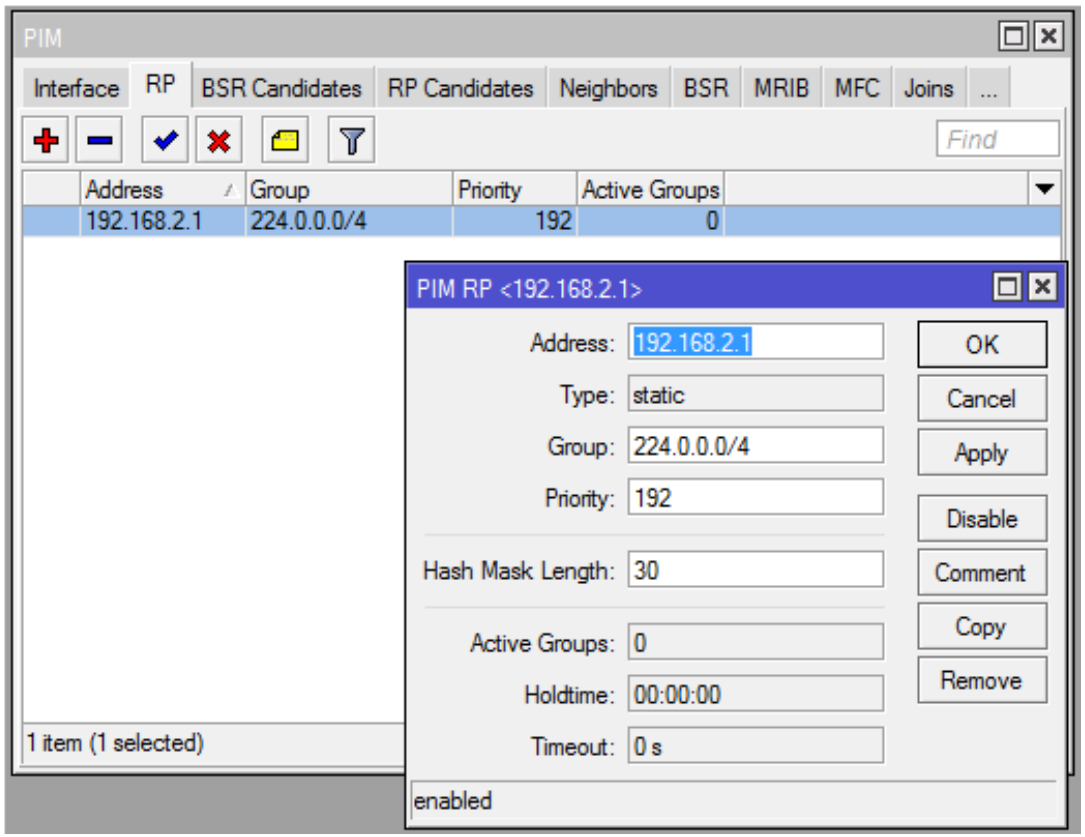
Routers

Router A



Interfaces have to be enable to serve PIM and IGMP traffic.

Router A



Configuration of Rendezvous Point. RP is a central router, where the senders and receivers "meet" to tell about their existence. Each multicast group must have one RP.

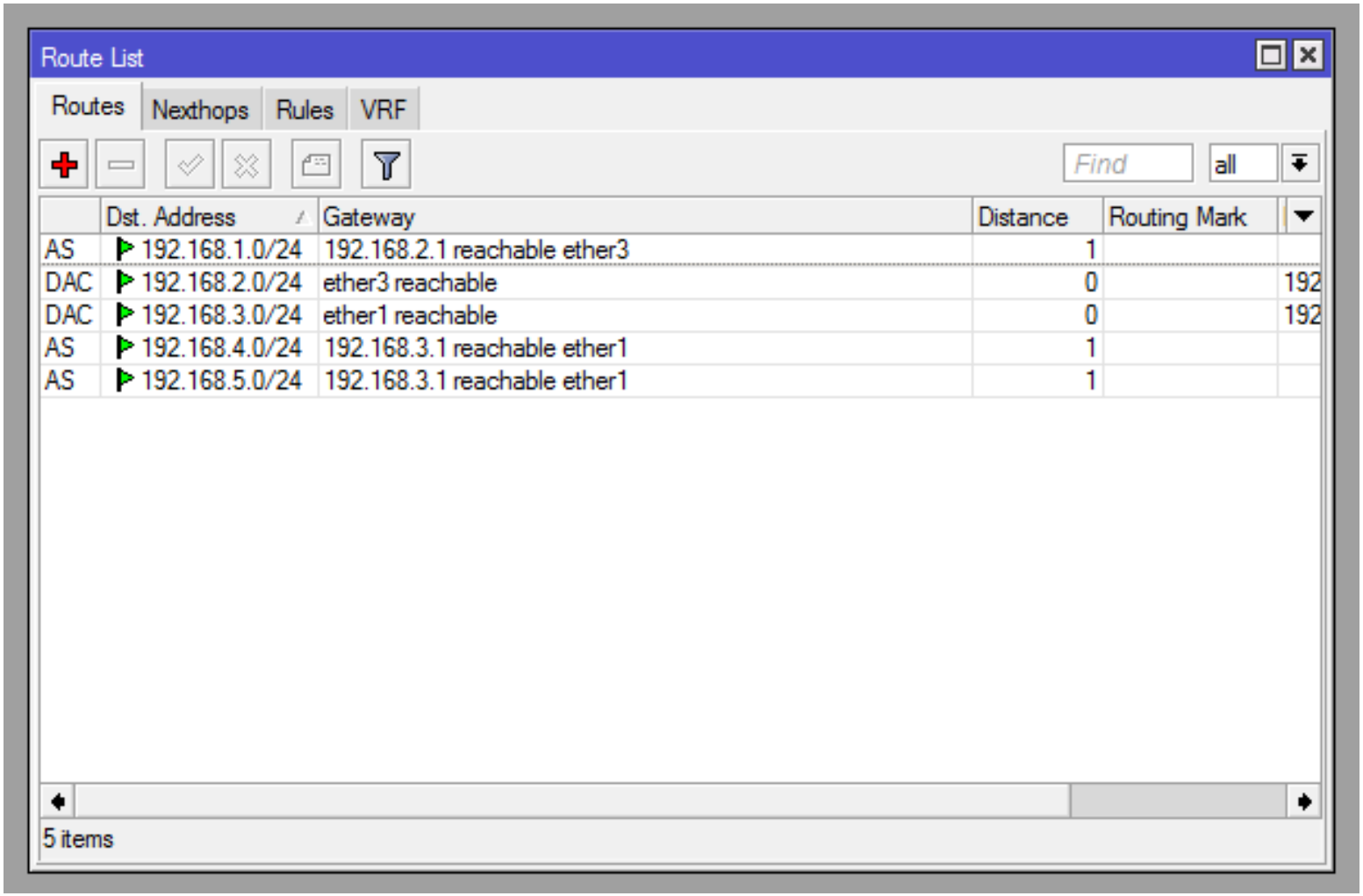
Router B

The configuration is pretty similar to previous configuration of Router A.

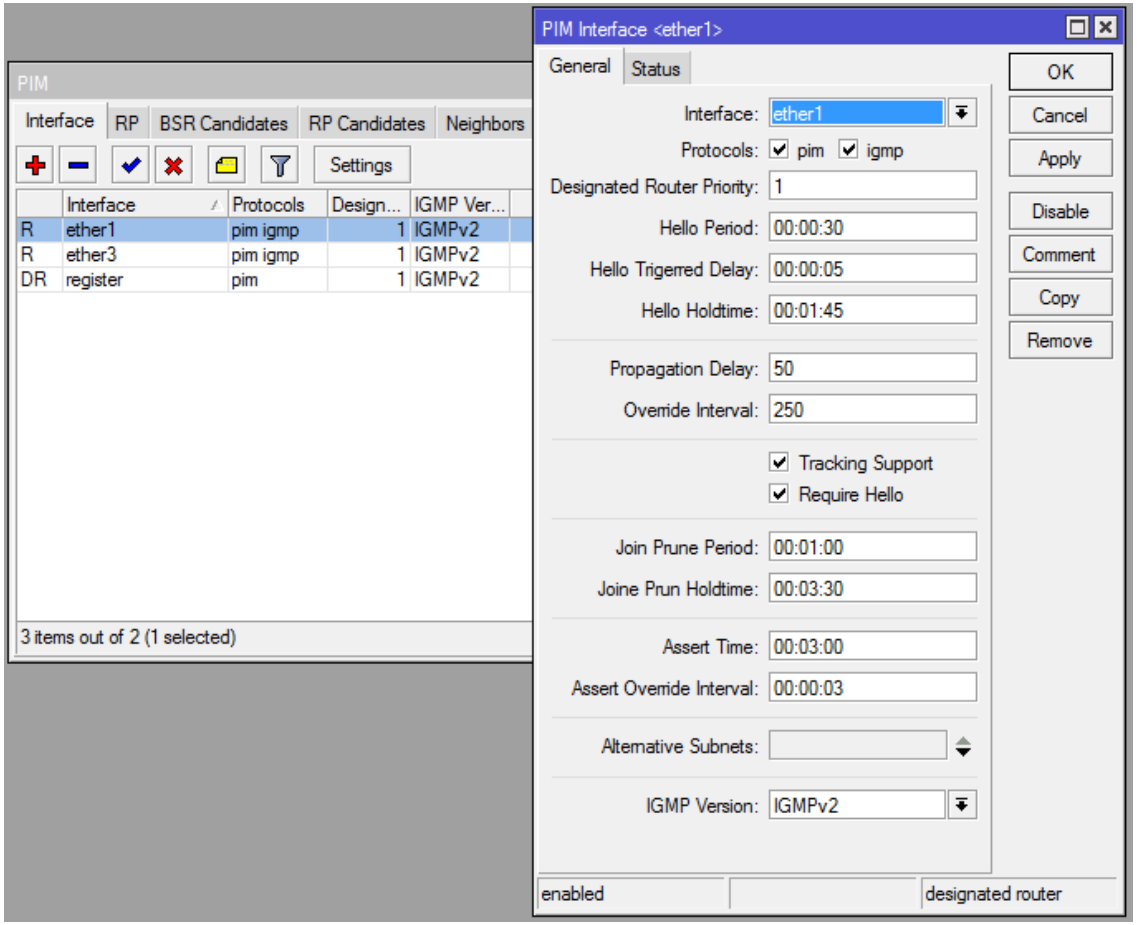
The main configuration points:

- ether1 port in 192.168.2.0/24 network
- ether2 port in 192.168.3.0/24 network
- PIM enabled
- Router A is set as Rendezvous Point

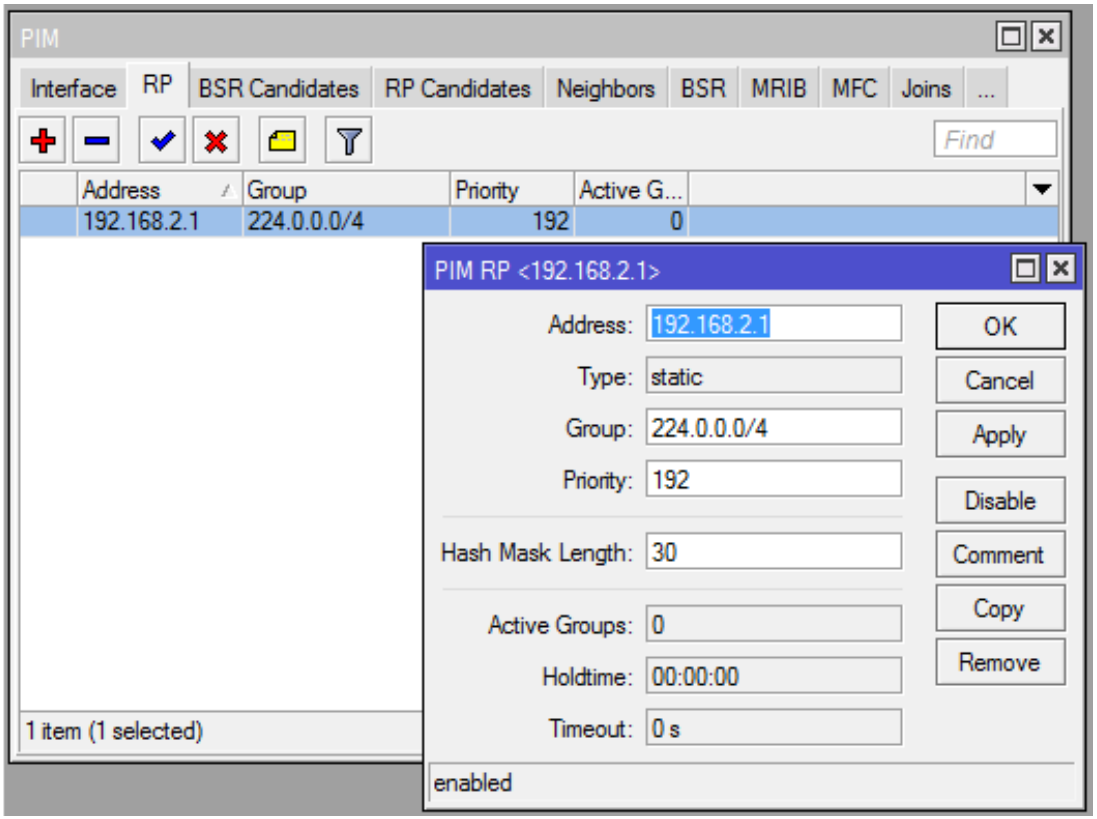
Router B


Route List
Routes
Nexthops
Rules
VRF
Find
all
Dst. Address
Gateway
Distance
Routing Mark
AS 192.168.1.0/24 192.168.2.1 reachable ether3 1
DAC 192.168.2.0/24 ether3 reachable 0 192
DAC 192.168.3.0/24 ether1 reachable 0 192
AS 192.168.4.0/24 192.168.3.1 reachable ether1 1
AS 192.168.5.0/24 192.168.3.1 reachable ether1 1
5 items

Router B


PIM
Interface
RP
BSR Candidates
RP Candidates
Neighbors
Settings
Interface
Protocols
Design...
IGMP Ver...
R ether1 pim igmp 1 IGMPv2
R ether3 pim igmp 1 IGMPv2
DR register pim 1 IGMPv2
3 items out of 2 (1 selected)
PIM Interface <ether1>
General
Status
OK
Cancel
Apply
Disable
Comment
Copy
Remove
Interface: ether1
Protocols: pim igmp
Designated Router Priority: 1
Hello Period: 00:00:30
Hello Trigerred Delay: 00:00:05
Hello Holdtime: 00:01:45
Propagation Delay: 50
Override Interval: 250
Tracking Support
Require Hello
Join Prune Period: 00:01:00
Joine Prun Holdtime: 00:03:30
Assert Time: 00:03:00
Assert Override Interval: 00:00:03
Alternative Subnets:
IGMP Version: IGMPv2
enabled
designated router

Router B



Here the RP point is set to Router A interface.

OLT

The configuration is not hard, but can take several minutes. Because of the network have to provide multicast transmission and Internet access, vlans are needed. Here IGMP snooping is enabled too.

The main configuration points:

- create vlan 100, assign IP address and add two ports - Ethernet and PON - in tagged mode
- create vlan 200, assign IP address and add two ports - Ethernet and PON - in tagged mode
- IGMP snooping enable
- set port, which is connected to router
- add routes to route table

OLT

OLT configuration

```
interface vlan m100 100
add port 1/1 tagged
add port 2/1 tagged
ip address 192.168.3.20 255.255.255.0
mcastmode 2
exit
interface vlan m200 200
add port 1/1 tagged
add port 2/1 tagged
ip address 192.168.6.20 255.255.255.0
mcastmode 2
exit
```

OLT

OLT configuration

```
!L2 multicast config
igmp-snooping enable
igmp-snooping addrouter 1/1 vlan m100
.
.
.
!Static routes config
ip route 192.168.1.0/24 192.168.3.2
ip route 192.168.2.0/24 192.168.3.2
!
```

ONU - GW Delight

Device located near end user. It is configured and managed through OLT. Here vlans must be configured too. In case when multiport ONU's are used, administrators can make a choice about how use each port separately.

The main configuration points:

- create vlan 100 and add Ethernet ports (untagged) which be used to multicast transmission
- create vlan 200 and add Ethernet ports (untagged) which be used to Internet access
- to each vlan add PON port (tagged)
- IGMP snooping enable

ONU - GW Delight

ONU configuration

```
interface vlan m100 100
add port 1/5 tagged
add port 1/1-2 untagged
exit
interface vlan m200 200
add port 1/5 tagged
add port 1/3-4 untagged
.
.
.
!L2 multicast config
igmp-snooping enable
exit
```

Questions and Answers

Any questions?

For interested in

- http://wiki.mikrotik.com/wiki/Manual:Multicast_detailed_example
- http://technet.microsoft.com/en-us/library/bb742462.aspx
- http://network-technologies.metaswitch.com/multicast/what-is-pim.aspx
- http://www.netcraftsmen.net/resources/archived-articles/424.html

The End

Thank you for your attention.