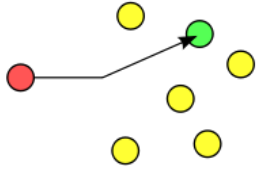


# WAGO LEAN MANAGED SWITCHES

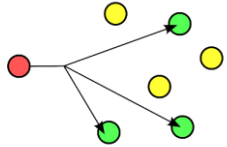
## IGMP Snooping Overview



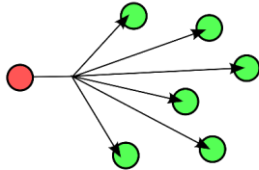
# WHAT IS IGMP AND WHAT IS MULTICAST



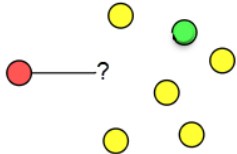
**Unicast** – single sender to single receiver



**Multicast** – single sender to many receivers



**Broadcast** – single sender to all receivers



**DLF** – Destination Lookup Failure ( no where to send)

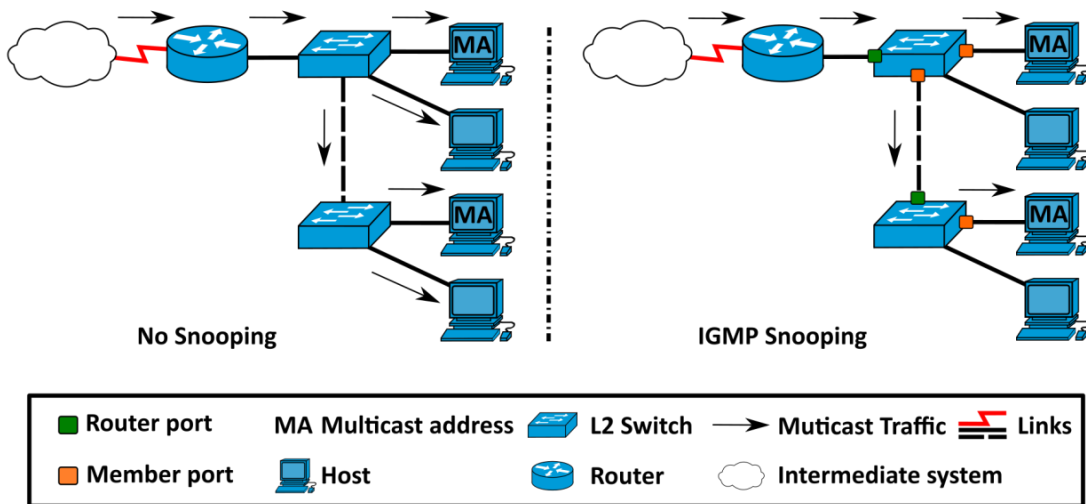
## IGMP ( Internet Group Multicast Protocol)

The Internet Group Management Protocol (IGMP) is a communications protocol used by hosts (PLCs, Drives, othe) and adjacent level 2 switches and level 3 routers on IPv4 networks to establish multicast group memberships. IGMP is an integral part of IP multicast and allows the network to direct multicast transmissions only to hosts that have requested them.

IGMP can be used for one-to-many networking applications such as online streaming video and gaming, and allows more efficient use of resources when supporting these types of applications.

# WHAT IS IGMP SNOOPING

IGMP snooping is the process of listening to Internet Group Management Protocol (IGMP) network traffic to control delivery of IP multicasts. Network switches with IGMP snooping listen in on the IGMP conversation between hosts and routers and maintain a map of which links need which IP multicast transmission. Multicasts may be filtered from the links which do not need them, conserving bandwidth on those links.



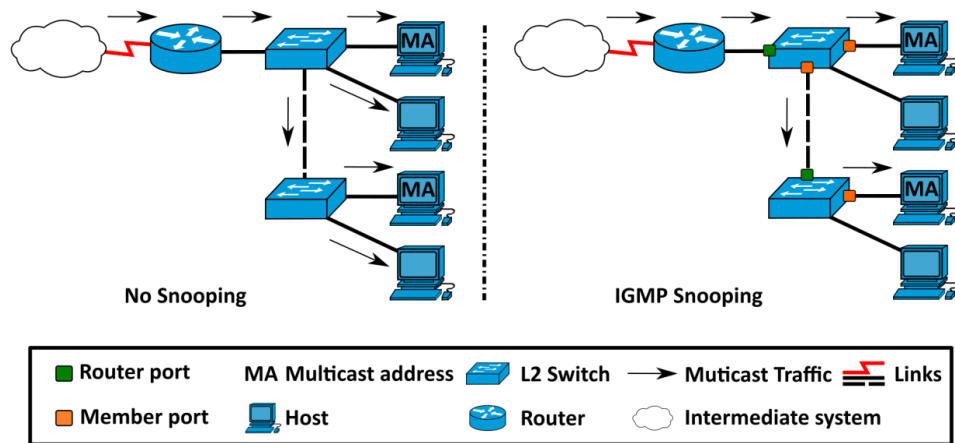
# WHAT IS IGMP SNOOPING QUERIER

## IGMP querier

In order for IGMP, and thus IGMP snooping, to function, a multicast router must exist on the network and generate IGMP queries. Without a querier IGMP membership reporting may be incomplete and the tables associating member ports and multicast groups are potentially incomplete and snooping will not work reliably. Some IGMP snooping implementations include full querier capability.

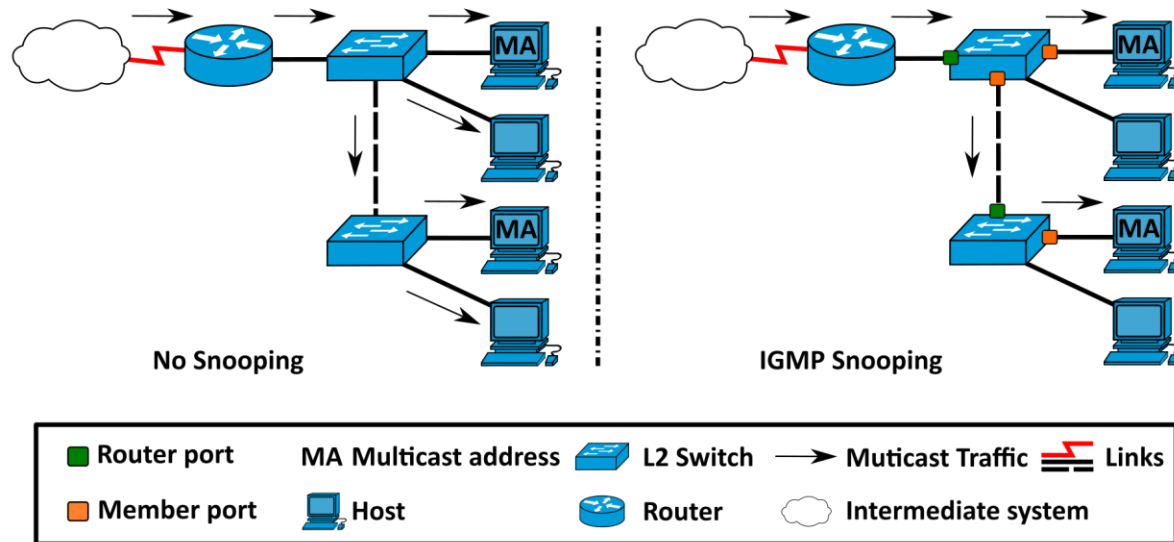
IGMPv2 and IGMPv3 contain provision for selecting a querier when multiple are available. The querier with the lowest IP address is given the role.[2][3]

IGMP general queries from the querier must be unconditionally forwarded by all switches involved in IGMP snooping.[1]



# HOW DOES IGMP WORK

A Layer 2 switch monitors the queries sent from the router and generates a table of what host devices subscribe to the multicast. When a multicast message is sent, then the switch will forward the message only to ports with devices that are subscribed.



# WHAT ARE MULTICAST MESSAGES

A **multicast address** is a logical identifier for a group of hosts in a computer network that are available to process datagrams or frames intended to be multicast for a designated network service. Multicast addressing can be used in the link layer (layer 2 in the OSI model), such as Ethernet multicast, and at the internet layer (layer 3 for OSI) for Internet Protocol Version 4 (IPv4) or Version 6 (IPv6) multicast.

IP multicast address range	Description	Routable
224.0.0.0 to 224.0.0.255	Local subnetwork <sup>[1]</sup>	No
224.0.1.0 to 224.0.1.255	Internetwork control	Yes
224.0.2.0 to 224.0.255.255	AD-HOC block 1 <sup>[2]</sup>	Yes
224.1.0.0 - 224.1.255.255	Reserved <sup>[3][4]</sup>	
224.3.0.0 to 224.4.255.255	AD-HOC block 2 <sup>[5]</sup>	Yes
225.0.0.0 to 231.255.255.255	Reserved <sup>[3][4]</sup>	
232.0.0.0 to 232.255.255.255	Source-specific multicast <sup>[1]</sup>	Yes
233.0.0.0 to 233.251.255.255	GLOP addressing <sup>[6]</sup>	Yes
233.252.0.0 to 233.255.255.255	AD-HOC block 3 <sup>[7]</sup>	Yes
234.0.0.0 to 234.255.255.255 <sup>[citation needed]</sup>	Unicast-prefix-based	Yes
234.0.0.0 to 238.255.255.255	Reserved <sup>[3][4]</sup>	
239.0.0.0 to 239.255.255.255	Administratively scoped <sup>[1]</sup>	Yes

IGMPv2 destination address<sup>[9]:§9</sup>

Message Type	Multicast Address
General Query	All hosts (224.0.0.1)
Group-Specific Query	The group being queried
Membership Report (all IGMP versions)	The group being reported
Leave Group	All routers (224.0.0.2)

# WHAT ARE MULTICAST MESSAGES

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A multicast address is associated with a group of interested receivers. According to RFC 3171, addresses 224.0.0.0 to 239.255.255.255 (formerly Class D addresses) are reserved as multicast addresses in IPv4.

## IGMP SNOOPING – ETHERNET/IP



### Layer 3 – Network

LAN Transmission Methods - IPv4 vs. IPv6

**Rockwell Automation**

- Unicast
  - A method by which a packet is sent to a single destination.
- Multicast
  - A technique that allows copies of a single packet to be passed to a selected subset of possible destinations
  - 224.0.0.0 - 239.255.255.255
  - Ethernet/IP IP Multicast Address Range:
    - 239.192.0.0 - 239.195.255.255
- Broadcast
  - A packet delivery system that delivers a given packet to all hosts on the LAN.
  - 255.255.255.255

- Unicast
  - Global - routable across the internet  
2000::NNNN::SSSS::HHHH::HHHH::HHHH::HHHH  
3FFF::NNNN::NNNN::SSSS::HHHH::HHHH::HHHH::HHHH
  - Link Local - non routable  
FE80::0000:0000:0000::HHHH::HHHH::HHHH::HHHH
  - Unique Local - routable within administrative domain
- Multicast
  - Solicited Node
- Anycast

Network Portion      Host Portion

NNNN::NNNN::NNNN: SSSS :HHHH::HHHH::HHHH::HHHH

Global Routing Prefix      Subnet Id      Host Id

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# HOW TO SET UP IGMP SNOOPING IN A WAGO LEAN MANAGED SWITCH

IGMP Snooping is not available via the Web Based Management...

192.168.1.254 - PuTTY

```
login as: admin
L2SWITCH>enable
user:admin
password:
L2SWITCH#configure terminal
L2SWITCH(config)#igmp-snooping enable
Success!

L2SWITCH(config)#igmp-snooping vlan 1
Success!

L2SWITCH(config)#
```

- Use a terminal program like PuTTY to connect to the switch
- Log in as admin
- Next type in enable to configure the switch
- Default: admin/wago
- Enter the configure terminal mode
- To enable Igmp snooping type in igmp-snooping enable
- Should see Success!
- Next you need to assign the vlan to be used. If no vlans are setup on the switch you need to assign the default vlan 1
- Type in igmp-snooping vlan 1
- Should see Success!



# HOW TO CHECK IF IGMP SNOOPING IS ENABLED

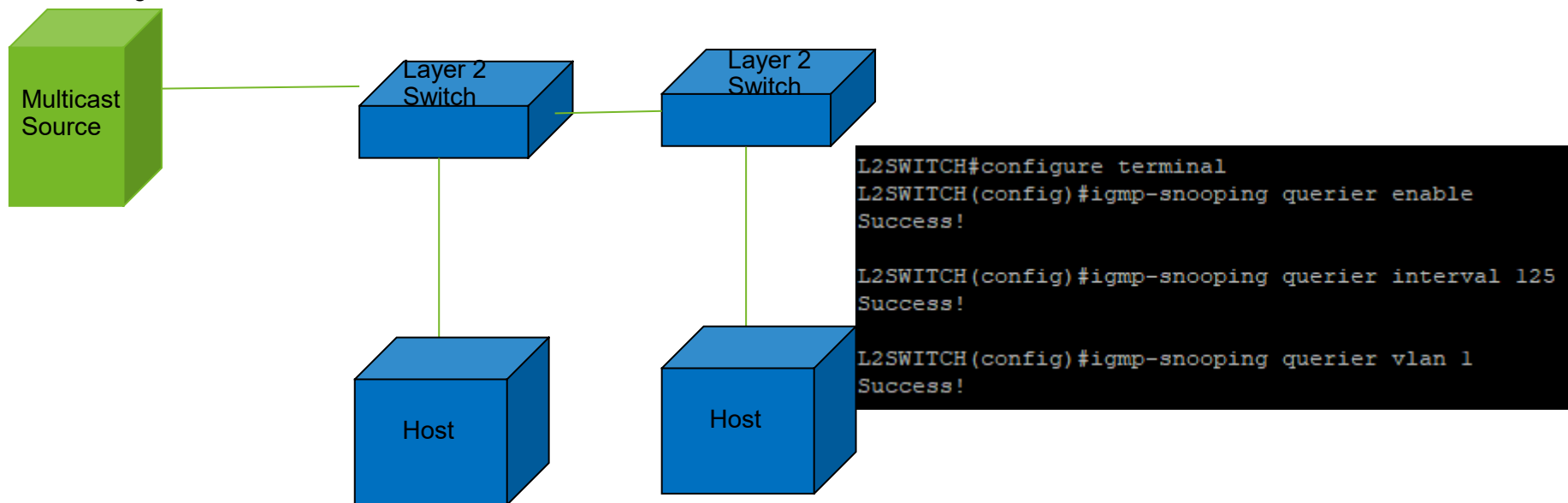
```
L2SWITCH#show running-config
Current configuration:
port 1 role access vlan 1 tag off
port 2 role access vlan 1 tag off
port 3 role access vlan 1 tag off
port 4 role access vlan 1 tag off
port 5 role access vlan 1 tag off
port 6 role access vlan 1 tag off
port 7 role access vlan 1 tag off
port 8 role access vlan 1 tag off
!
igmp-snooping vlan 1
igmp-snooping enable
```

- Use a terminal program like PuTTY to connect to the switch
- Log in as admin
- Type in show running-config
- The switch will indicate that Igmp-snooping is enabled on Vlan1

# WHAT IF THERE IS NO ROUTER ON THE NETWORK??

In local networks there may not be a router in the network to send out the general query (GQ). If there is no GQ then the layer 2 switch will not know where the multicast information should be sent.

Therefore the WAGO Lean managed switch can be set up to be the querier and the user can set up how often the GQ is sent. The standard is 125 seconds. Also the vlan to be used needs to be setup. If no vlans set up, you must configure the default as vlan 1



## WIRESHARK EXAMPLE

Sent by LMS with IGMP-Snooping Querier enabled to all hosts

No.	Time	Source	Destination	Protocol	Length	Info
211	114.499532	192.168.42.70	192.168.42.255	UDP	86	Source port: 57621 Destination port: 57621
212	114.499631	192.168.222.70	192.168.222.255	UDP	86	Source port: 57621 Destination port: 57621
213	114.804470	192.168.1.254	224.0.0.1	IGMP	60	V2 Membership Query, general
214	114.805505	192.168.1.254	224.0.0.1	IGMP	64	V2 Membership Query, general
215	115.430385	wagoKont_44:17:db	LLDP_Multicast	LLDP	200	Chassis Id = 00:30:de:44:17:db Port Id = GigabitEthernet1/0/5 TTL =

< >

Frame 213: 60 bytes on wire (480 bits), 60 bytes captured (480 bits)

Ethernet II, Src: wagoKont\_44:11:60 (00:30:de:44:11:60), Dst: IPv4mcast\_00:00:01 (01:00:5e:00:00:01)

- Destination: IPv4mcast\_00:00:01 (01:00:5e:00:00:01)
- Source: wagoKont\_44:11:60 (00:30:de:44:11:60)
  - Type: IP (0x0800)
  - Trailer: 00000000000000000000000000000000

Internet Protocol Version 4, Src: 192.168.1.254 (192.168.1.254), Dst: 224.0.0.1 (224.0.0.1)

- Version: 4
- Header length: 20 bytes
- Differentiated Services Field: 0xfc (DSCP 0x3f: Unknown DSCP; ECN: 0x00: Not-ECT (Not ECN-Capable Transport))
- Total Length: 28
- Identification: 0x55ac (21932)
- Flags: 0x00
- Fragment offset: 0
- Time to live: 1
- Protocol: IGMP (?)

# HOW TO CHECK IGMP SNOOPING INFORMATION

```
L2SWITCH#show igmp-snooping vlan VLANLISTS
The IGMP snooping on the Switch is enabled.
The IGMP snooping is enabled in VLAN(s): 1
The unknown multicast packets will be dropped.
```

Use show igmp-snooping vlan VLANLIST

Port	Querier mode	Immediate leave	Group Counts	Port	Querier mode	Immediate leave	Group Counts
1	auto	disabled	0/256	2	auto	disabled	0/256
3	auto	disabled	0/256	4	auto	disabled	0/256
5	auto	disabled	0/256	6	auto	disabled	0/256
7	auto	disabled	0/256	8	auto	disabled	0/256

```
L2SWITCH#show igmp-snooping querier vlan VLANLISTS
The IGMP snooping querier on the Switch is enabled.
The IGMP snooping querier interval is 125.
```

Use show igmp-snooping querier vlan VLANLIST

```
The IGMP snooping querier is enabled in VLAN(s): 1
  VLAN      Querier
  ----      -
    1      192.168.1.254
```

# UNKNOWN MULTICAST DATA

Unknown multicast data refers to multicast data for which no forwarding entries exist in the IGMP snooping forwarding table. This feature enables the device to forward unknown multicast data only to the router port. If the device does not have a router port, unknown multicast data will be dropped.

It is possible to set up the switches to either drop the unknown multicast data or set it to flood all the ports in the VLAN

```
login as: admin
L2SWITCH>enable
user:admin
password:
L2SWITCH#configure terminal
L2SWITCH(config)#igmp-snooping unknown-multicast flooding
Success!

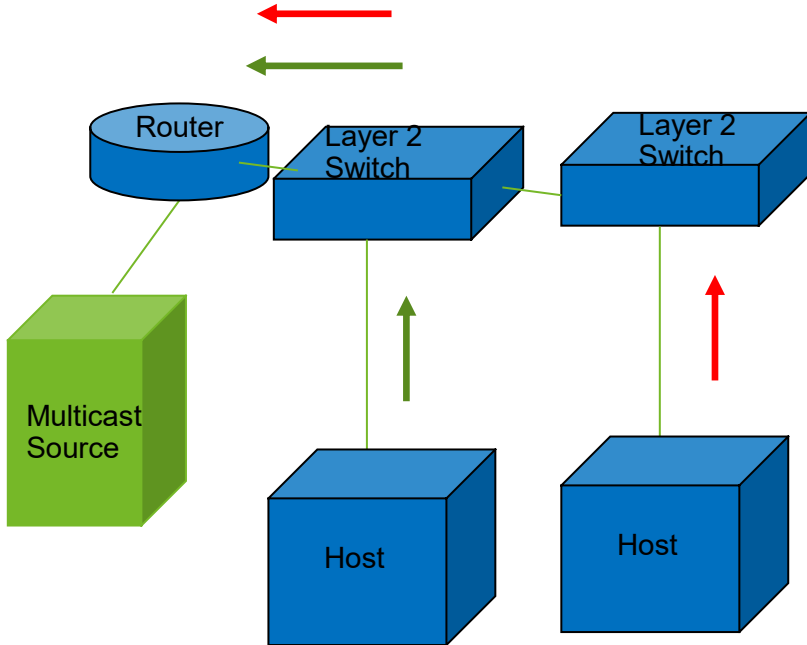
L2SWITCH(config)#igmp-snooping unknown-multicast drop
Success!

L2SWITCH(config)#
```

# WHAT IS IGMP PROXY

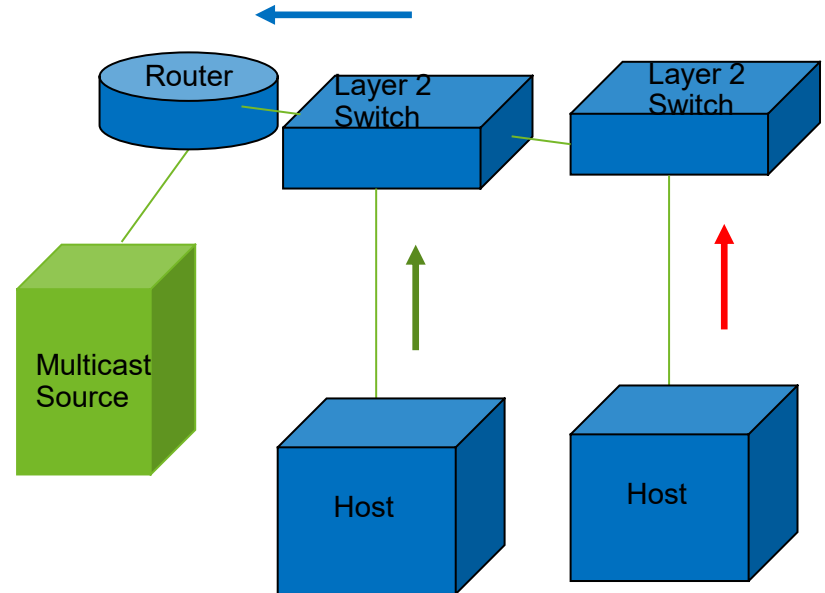
IGMP Proxy will aggregate reports to Routers

Proxy Disabled: All responses to IGMP queries are forwarded to the router



Proxy Enabled: Switch will send aggregated report to router

Proxy snooping reduces the number of IGMP reports sent toward an IGMP router.



# IGMP SNOOPING PROXY SETUP

To enable or disable IGMP Snooping Proxy in the Lean Managed Switch use the CLI

```
L2SWITCH#configure terminal
L2SWITCH(config)#igmp-snooping proxy enable
Success!

L2SWITCH(config)#igmp-snooping proxy disable
Success!

L2SWITCH(config)#
```

# TOOLS: SHOW IGMP GROUPS

To show the current IGMP group membership type in the CLI `show ip igmp groups`

```
L2SWITCH#show ip igmp groups
Total entries: 3.
Group  IP          Server IP      Status  VLAN  Ports
-----
-----
239.255.255.250  172. 29.233. 70 Dynamic   1     3
224.  0. 23. 12   0.  0.  0.  0 Dynamic   1     3
239. 83.100.109   0.  0.  0.  0 Dynamic   1     3

L2SWITCH#
```



# TOOLS: SHOW IGMP SNOOPING QUERIER

To display information about the IP address and receiving port for the IGMP query type show ip ipmg snooping querier

```
L2SWITCH#show ip ipmg snooping querier
Total entries: 3.
```

Group	IP	Server IP	Status	VLAN	Ports
239.255.255.250		172. 29.233. 70	Dynamic	1	3
224. 0. 23. 12		0. 0. 0. 0	Dynamic	1	3
239. 83.100.109		0. 0. 0. 0	Dynamic	1	3

# TOOLS: SHOW IP MROUTE

To display information about the IP multicast routing table type show ip mroute

```
L2SWITCH#show ip mroute
Total entries: 3.
Group IP          Server IP          Status  VLAN  Ports
-----
239.255.255.250  172. 29.233. 70   Dynamic  1     3
224. 0. 23. 12   0. 0. 0. 0       Dynamic  1     3
239. 83.100.109  0. 0. 0. 0       Dynamic  1     3
```