



Multicast Implementation

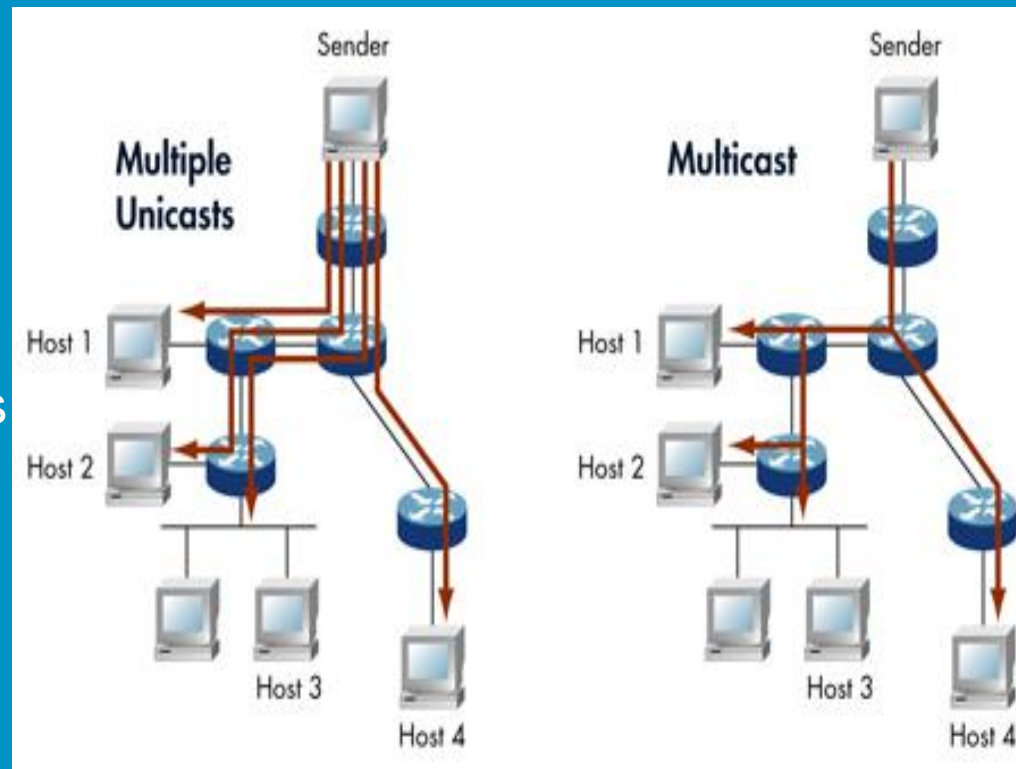
Saqib Chughtai

Optical Regional Advanced Network of Ontario



Introduction - Multicast

- Bandwidth conserving technology
 - Delivering a single stream of information to large number of recipients.
- Applications that take advantage of multicast includes
 - Video conferencing
 - Corporate communications
 - Distance learning
 - stock quotes and news.



IP Multicast Addresses

- IANA has assigned Class D address space for IP Multicast
 - 224.0.0.0 - 239.255.255.255
- Administratively/Limited Scoped Addresses (RFC 2365)
 - 239.0.0.0 - 239.255.255.255
- Globally Scoped Addresses
 - 224.0.1.0 - 238.255.255.255 can be used to multicast data between organizations and across the Internet.
- Glop Addressing (RFC 2770)
 - 233.0.0.0/8 reserved for statically defined addresses by organizations that already have an AS number reserved



Multicast Protocols used in ORION

- **Multi-protocol Border Gateway Protocol (MBGP)**
- **Protocol Independent Multicast Sparse Mode (PIM-SM)**
- **Multicast Source Discovery Protocol (MSDP)**



Multi-protocol Border Gateway Protocol (MBGP)

- Defined in RFC 2283 (extensions to BGP)
- Separate BGP tables maintained for unicast and multicast
- Still need PIM to build Distribution Trees
- Same path selection and validation rules
 - AS-Path, LocalPref, MED, ...
- The MBGP policy will be consistent with existing BGP policy

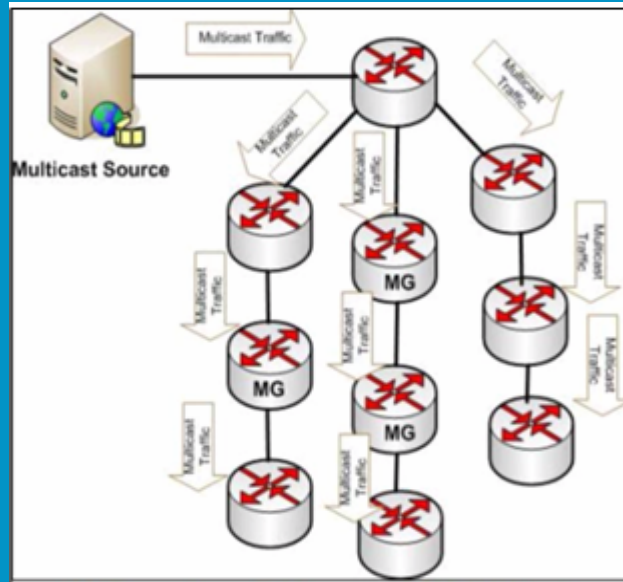


Protocol Independent Multicast (PIM)

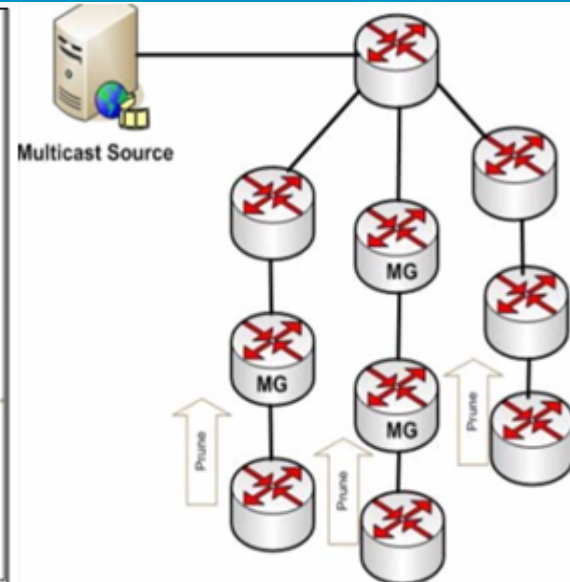
- Multicast forwarding protocol
- PIM uses unicast routing information to perform the multicast forwarding function.
- Supports virtually all routing protocols
- PIM routers communicate via message passing
- Mode of PIM
 - **Dense mode:** Flood multicast traffic to every corner of the network
 - **Sparse Mode:** Data forward to active receivers only who requested explicitly.



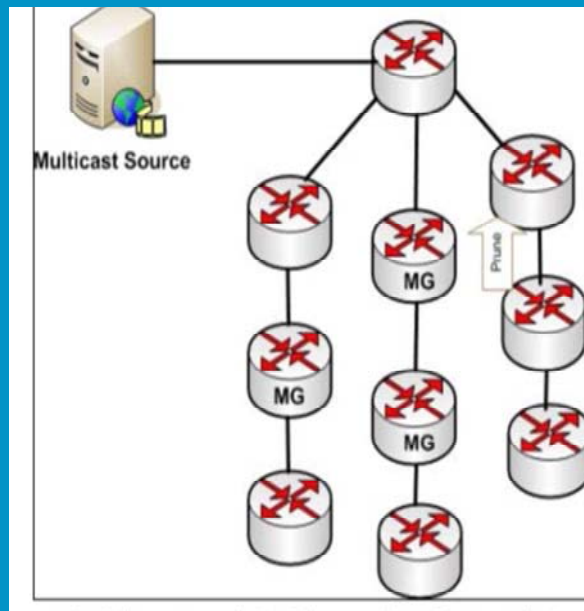
- **Dense mode**
- Push Method



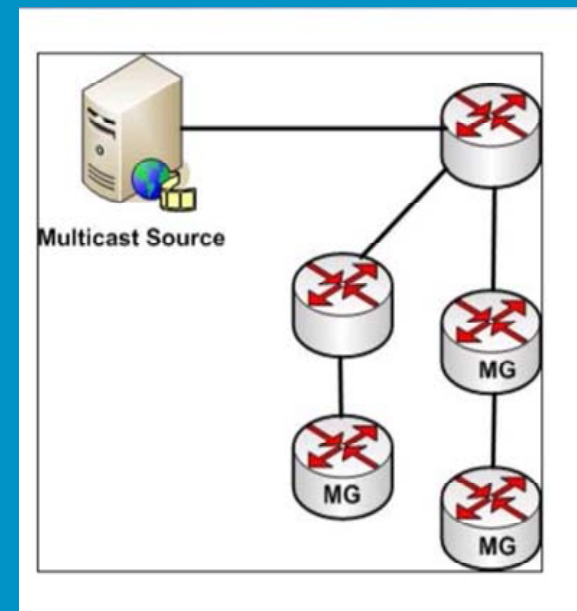
PIM-Dense; Flooding at start



PIM-Dense; Non interested hosts starts sending Prune messages



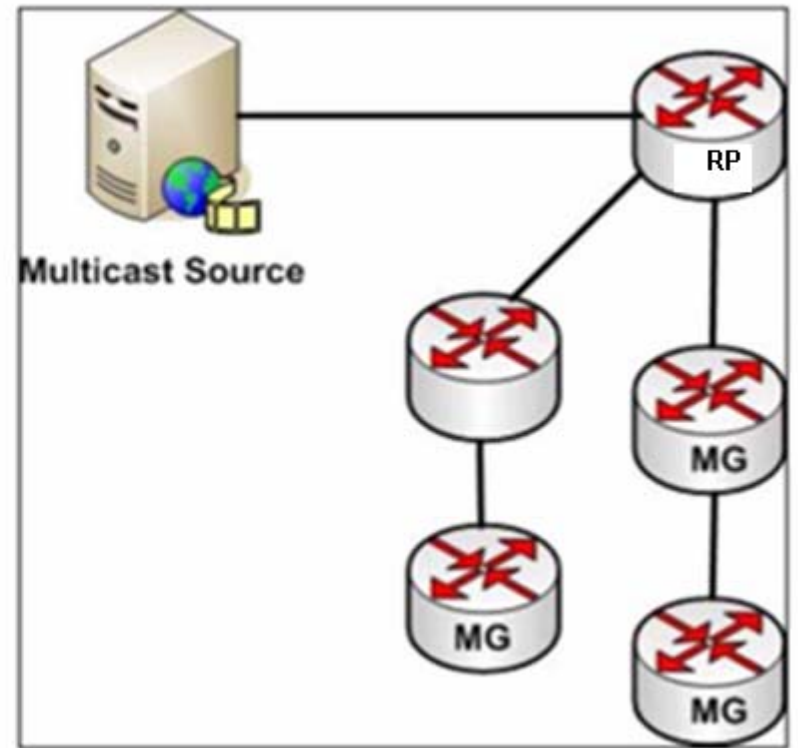
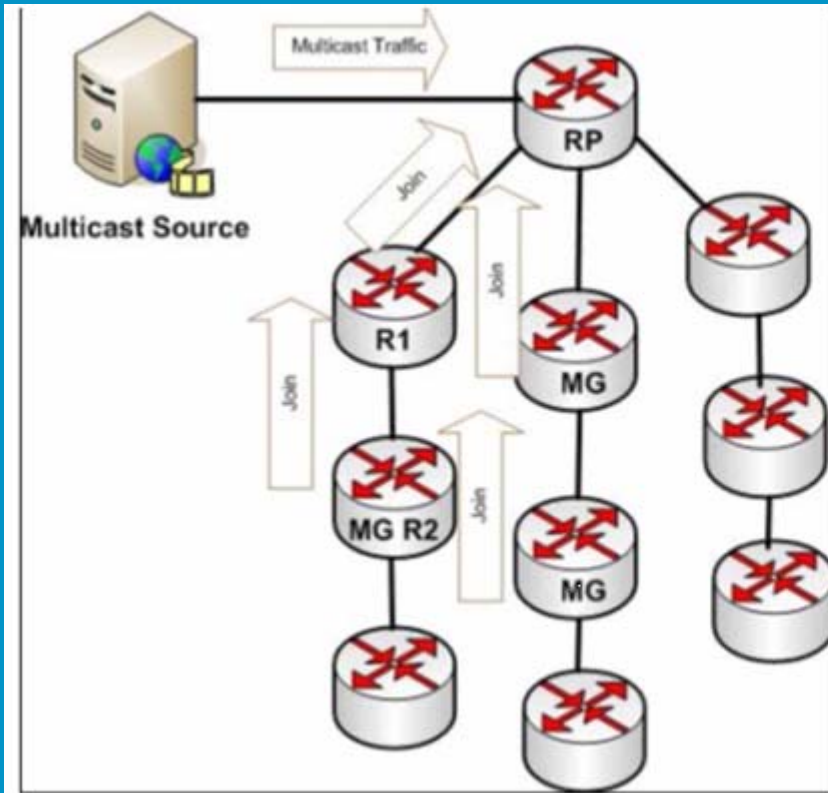
PIM-Dense; Pruning process continuous



PIM-Dense; Multicast tree after pruning



- **Sparse mode:** Pull method



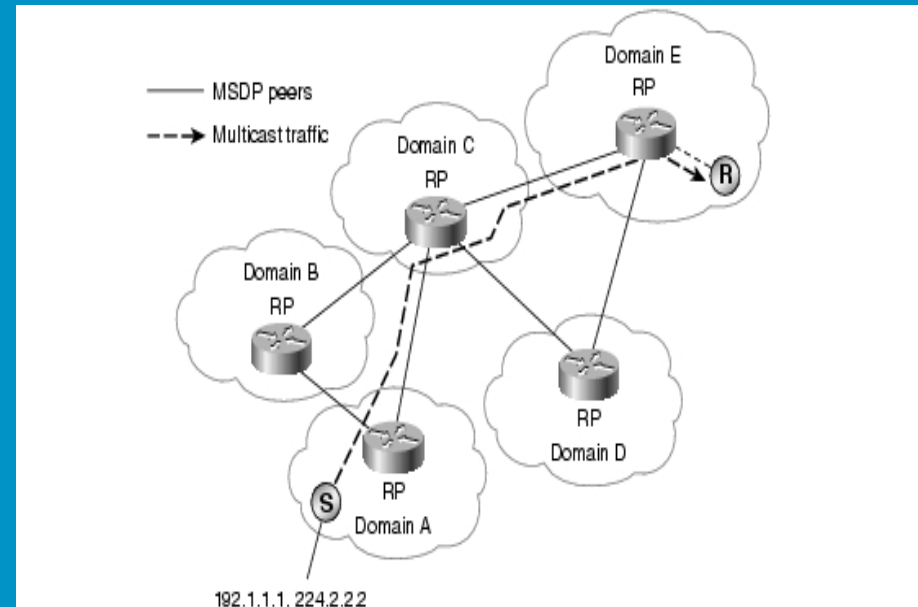
PIM-SM (Cont'd)

- PIM-SM uses Rendezvous Point (RP).
 - RP is used to register multicast sources and forward data to receivers.
- RP could be defined as:
 - Static
 - Auto - RP
 - Using Bootstrap Protocol
- ORION will be supporting only sparse mode
- Members need to configure their own RP.

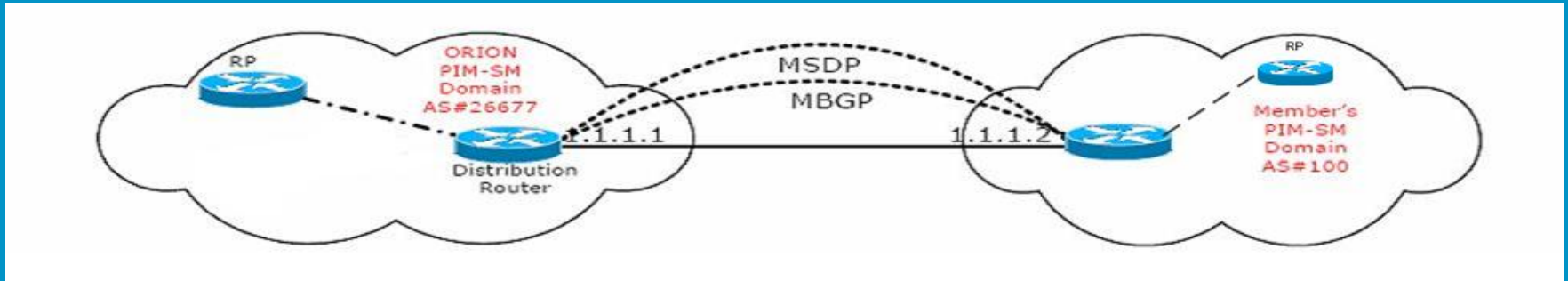


MSDP

- MSDP is a mechanism that allows Rendezvous Point (RPs) to share information about Active Sources.
- MSDP allows each domain to maintain an independent RP which does not rely on other domains
- ORION MSDP peering will follow the MBGP session.



Members connectivity



- ORION will be used MBGP and MSDP for multicast peering with Members
- Members need to configure their own PIM-SM domain and RP
- ORION will be filtering
 - MSDP source-active messages for announcements of sources.
 - Administrative scope

Multicast feeds available via ORION

- **OSTIN:** <http://www.orion.on.ca/ostn.html>
- **Reliable DVTS and Videolan Multicast Feeds**
<http://tech.orion.on.ca/advanced/feeds.html>

- **DVTS**

• Group	• Port	• Content
• 233.0.73.25	• 8000	ResearchChannel
• 233.22.29.128	• 8000	University of South Florida (Jazz Surge)

- **Videolan**

• Group	• Port	• Content
• 233.0.73.26	• 1234	MPEG2 HD 1080i Stream (Research Channel)
• 233.0.73.28	• 1234	UWTV
• 233.0.73.29	• 1234	ResearchChannel
• 233.0.73.30	• 1234	KEXP Radio (Washington)



ORION Multicast Enabled Members

- GTANet
 - INUK Network
 - Lakehead University
 - Laurentian University
 - Royal Conservatory of Music (RCM)
 - Sheridan College
 - Trent University
 - University of Guelph
 - University of Waterloo
 - etc.....
- How to JOIN ORION Multicast backbone network
 - Send an email to engineering@orion.on.ca



Members Configuration

- Global Configuration

```
ip multicast routing
```

- Interface Configuration

```
interface gigabitethernet 1/0  
ip address 1.1.1.2 255.255.255.252  
ip multicast boundary 10 !Administrative scope filtering  
ip pim sparse-mode
```

- MBGP configuration

```
router bgp 100  
neighbor 1.1.1.1 remote-as 26677  
address-family ipv4 multicast  
neighbor 1.1.1.1 activate  
network x.x.x.x
```



Members Configuration (Cont'd)

- MSDP configuration

```
ip msdp peer 1.1.1.1
ip msdp sa-filter in 1.1.1.1 list 110 !Inbound SA-filtering
ip msdp sa-filter out 1.1.1.1 list 110 !Outbound SA-filtering
```

- Administrative scope filtering

```
access-list 10 deny 239.0.0.0 0.255.255.255
access-list 10 deny host 224.0.1.39 !Auto-RP announcement
access-list 10 deny host 224.0.1.40 !Auto-RP discovery
access-list 10 permit any
```



Members Configuration (Cont'd)

- MSDP SA Filtering

! domain-local applications

```
access-list 110 deny ip any host 224.0.2.2
access-list 110 deny ip any host 224.0.1.3 ! Rwhod
access-list 110 deny ip any host 224.0.1.24 ! Microsoft-ds
access-list 110 deny ip any host 224.0.1.22 ! SVRLOC
access-list 110 deny ip any host 224.0.1.2 ! SGI-Dogfight
access-list 110 deny ip any host 224.0.1.35 ! SVRLOC-DA
access-list 110 deny ip any host 224.0.1.60 ! hp-device-disc
access-list 110 deny ip any host 224.0.1.39 ! Auto-RP Announcement
access-list 110 deny ip any host 224.0.1.40 ! Auto-RP discovery
access-list 110 deny ip any 239.0.0.0 0.255.255.255 ! Scoped groups
```

! Loopback and private addresses (RFC 1918)

```
access-list 110 deny ip 10.0.0.0 0.255.255.255 any
access-list 110 deny ip 127.0.0.0 0.255.255.255 any
access-list 110 deny ip 172.16.0.0 0.15.255.255 any
access-list 110 deny ip 192.168.0.0 0.0.255.255 any
access-list 110 permit ip any any
```



Members Configuration (Cont'd)

- sh ip mbgp sum
- sh ip msdp sum
- show ip igmp groups
- show ip igmp interface
- debug ip igmp
- show ip mroute

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
66.97.18.8	4	26677	1054395	6237520	5701992	0	0	10w3d	5
66.97.18.11	4	26677	3272931	6173331	5701992	0	0	44w2d	8
66.97.18.14	4	26677	1050277	6172698	5701992	0	0	44w2d	3
66.97.18.15	4	26677	5600839	1909081	5701992	0	0	50w1d	2697
66.97.18.16	4	26677	5642031	1909498	5701992	0	0	50w1d	2697
66.97.23.6	4	14661	1053236	4348821	5701992	0	0	5d19h	1

```
Router# sh ip msdp sum
```

```
MSDP Peer Status Summary
```

Peer Address	AS	State	Uptime/	Reset	SA	Peer Name
			Downtime	Count	Count	
66.97.18.18	26677	Up	7w0d	1	2812	BRDR2-TORO.orion.on.ca
66.97.18.10	26677	Up	7w0d	1	0	DIST1-SDBR.orion.on.ca
66.97.18.2	26677	Up	7w0d	6	89	DIST1-LOND.orion.on.ca
66.97.18.6	26677	Up	7w0d	3	0	DIST1-HMTN.orion.on.ca
66.97.18.13	26677	Up	2w4d	5	0	DIST1-KNTN.orion.on.ca
205.211.94.2	549	Up	1w3d	61	2	ut-hub-mcast-loopback-if.gtinet.ca
66.97.18.14	26677	Up	7w0d	0	0	DIST1-PTBO.orion.on.ca
66.97.23.238	42689	Up	7w0d	0	11	?





The Ontario Research and Innovation Optical Network

34 King Street East

8th Floor

Toronto, Ontario M5C 2X8

T. 416-507-9860

F. 416-507-9862

www.orion.on.ca

