

Research on opening IPTV Service using IPRAN multicast

Yuqin Gong

Taian branch of China Unicom, China

690040026@qq.com

Abstract

This paper mainly studies the use of protocol-independent multicast sparse mode (PIM-SM) in IPRAN network to open IPTV multicast service. Less resources are used to get better economic effect.

Keywords

IPTV, multicast, protocol- independent.

1. Introduction

Based on the existing network, China Unicom Tai'an Branch aims at opening IPTV technical solutions, focusing on solving the problem that IPTV multicast services occupy a large amount of network resources. In PIM-SM mode, the whole ring multicast service consumes only one share of the traffic, which greatly reduces the network resource consumption and effectively saves investment.

2. Research background

Since 2013, three major telecom operators of china have vigorously promoted IPTV video services. By the end of July 2021, the total number of IPTV users reached 336 million, a net increase of 21.08 million households compared with the end of last year. China's IPTV industry has developed rapidly, with a large scale of users, a high frequency of using IPTV, and a strong sense of payment, so the IPTV market can be expected in the future. However, the opening of a large number of IPTV services will take up a lot of resources. How to use a little resources to achieve the opening of IPTV services is the focus of our research.

3. IPTV access difficulties and PIM-SM principle

At present, access rings are mostly connected to GE links, and the three telecom operator have more than 80 live channels for IPTV services. If all the services use the pre-adding mode for network flow diversion on OLT, the IPRAN network consumes about 320M of bandwidth. After IPTV services are added to the IPRAN network, the link bandwidth may become a bottleneck.

Protocol Independent Multicast (PIM) indicates that any unicast routing Protocol, such as static route, RIP, OSPF, IS-IS, or BGP, can provide routing information for IP Multicast. Multicast routing has nothing to do with unicast routing protocols, but generates corresponding multicast routing entries through unicast routing tables. The PIM uses the Reverse Path Forwarding (RPF) mechanism to forward multicast packets. RPF mechanism uses the existing unicast routing information to build multicast forwarding tree in the network. When a multicast packet reaches the router, the RPF check is performed first. If the RPF check passes, the corresponding multicast routing entry is created and the multicast packets are forwarded. If the RPF check fails, the packet is discarded.

PIM-SM works in the following ways: neighbor discovery, Assert, DR election, RP discovery, join, prune, register, and SPT switching.

4. Solutions

4.1. IPTV architecture

The IPRAN network adopts the three-layer to edge mode, as shown in the following figure 1.

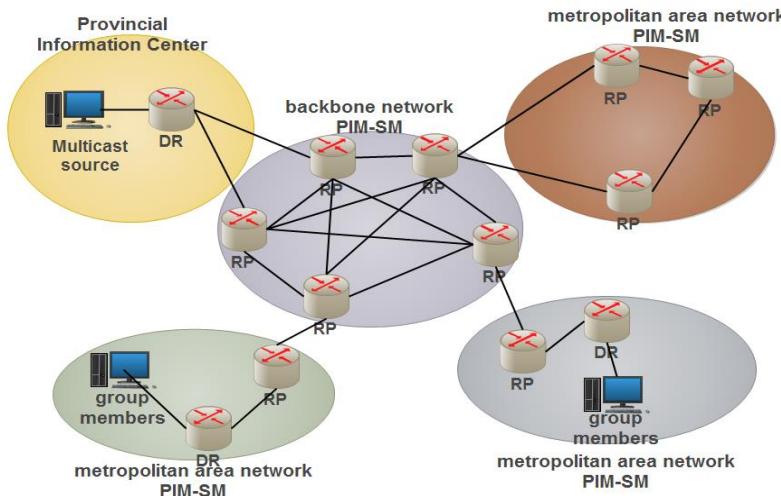


Fig.1 IPTV architecture

4.2. Network reform

4.2.1. Deploying the PIM protocol in each IPRAN access ring

Firstly, each IPRAN access loop uses an independent process and closes the process between the ASGs through sub-interfaces. PIM relies on the ISIS process in IPRAN to build a distribution tree. Therefore, each IGP process in the IPRAN is need to be deployed PIM.

Secondly, MAN and IPRAN PIM domain are connected. The edge of the PIM domain in MAN is BAS, and the IPRAN PIM domain is connected the ASG to the MAN. So a Layer 3 sub-interface between the BAS and the ASG is needed to be deployed, IP address is needed to be configured and a PIM neighbor on the sub-interface connecting the BAS and the ASG is needed to be established, for completing the PIM domain connection. (LSW Indicates only the VLAN used by the transparently transmitted sub-interface and does not participate in PIM operation)

4.2.2. Reforming from OLT to upstream IGMP domain

Before the reforming, the EDGE of PIM domain of man is in BAS, so it is necessary to connect IGMP domain between OLT and BAS, and use PWE3 to carry the MULTICAST VLAN of OL in the internal part of IPRAN to carry out layer 2 communication.

After the reforming, the PIM domain has been connected to the CSG directly connected to the OLT. Therefore, the PWE3 (or composite service) that carries the multicast VLAN needs to be deleted from the IPRAN. The CSGS use layer 3 sub-interfaces to deploy IP addresses and IGMP to terminate the multicast VLAN.

4.3. The configuration steps

Task name	Task definition
Network elements check	Check whether the NE supports the multicast function
Loading LICENSE	Load a LICENSE file to enable the device to support multicast
Enable multicast	Enable multicast function globally on the device
Enable PIM protocol	Enable PIM protocol globally on the device

Enable PIM protocol on the interface	Enable PIM protocol in access loop process
RP Route Leakage	Perform an import operation for the ISIS process on the ASG
Multicast source routes Leakage	Perform an import operation for the ISIS process
Plan the IP address for connecting the CSG to the OLT	Plan an IP address for the interface with a 30-bit mask
IPRAN internal business transformation	Each port that connects to the OLT directly to the CSG must be deployed

4.4. Results

Some commands are used to verify the PIM neighbor configuration:

display pim neighbor

VPN-Instance : public net

Total Number of Neighbors = 1

Neighbor Interface Uptime Expires Dr-Priority BFD-Session

172.10.74.100 GE0/1/0 2w:4d 00:02:30 1 N

5. Conclusion

The IPTV service is enabled in PIM-SM mode, and the multicast feature is used to greatly reduce the occupation of IPTV service on packet network link resources. Only a small amount of network flow on one loop can solve the flow of all IPTV users in the whole loop. The occupied resources do not increase with the increase of users, greatly saving the cost of network expansion and construction caused by the increase of users, especially suitable for the promotion of IPTV services in rural areas.

References

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