# 23ITT204 - COMPUTER NETWORK

## UNIT 4 - ROUTING

## MULTICAST ROUTING : DVMRP AND PIM

# Multicast Routing: DVMRP and PIM in Computer Networks

Exploring efficient protocols for one-to-many communication in modern network infrastructures

NETWORKING FUNDAMENTALS

# What is Multicast Routing?

Multicastrouting enables a single data stream to reach multiple receivers simultaneously, eliminating the need for duplicate transmissions that burden networks in traditional unicast communication.

This approach is essential for bandwidth-intensive applications like IPTV, video conferencing, online gaming, and live streaming4where sending individual copies would be inefficient and costly.

Multicast routing protocols intelligently direct packets only to network segments with active group members, dramatically optimizing resource utilization.

## IPTV Broadcasting

Efficient delivery of live TV channels to thousands of subscribers

## Video Conferencing

Real-time collaboration across distributed teams

## Online Gaming

Low-latency state updates for multiplayer experiences

LEGACY PROTOCOL

# Distance Vector Multicast Routing Protocol (DVMRP)

DVMRP emerged in 1988 as one of the pioneering multicast routing protocols, documented in RFC 1075. Built upon the foundation of the Routing Information Protocol(RIP),it introduced theinnovativeflood-and-prunemechanism forconstructing multicast distribution trees.

01

## Initial Flooding

Multicast packets are broadcast across all network paths using reverse path forwarding to ensure complete coverage

02

## Pruning Process

Routers without interested receivers send prune messages upstream, eliminating unnecessary branches from the distribution tree

03

## Tree Optimization

The protocol maintains an efficient delivery path, though periodic reflooding is required to accommodate topology changes

## Strengths & Limitations

**Advantages:** Simple implementation, effective in smaller networks with dense receiver populations, and provided the backbone for the early Internet multicast backbone (MBone).

**Challenges:** Poor scalability due to periodic flooding overhead, flat routing architecture limits efficiency, and struggles with sparse receiver distribution across large networks.

MODERN STANDARD

# Protocol Independent Multicast (PIM)

Introduced in the 1990s , PIM revolutionized multicast routing by leveraging existing unicast routing infrastructure. Unlike DVMRP, PIM doesn't maintain separate routing tables— it intelligently uses information for many unicast protocol including OSPF,BGP, or EIGRP.

## PIM Dense Mode

Operates similarly to DVMRP with flood-and-prune behavior, optimized for networks where receivers are densely distributed throughout the topology.

- Assumes most subnets have interested receivers
- Floods first, then prunes unnecessary paths
- Best for smaller, localized multicast groups

## PIM Sparse Mode

Introduces Rendezvous Points (RP) for efficient tree building, ideal for large-scale deployments with sparsely distributed receivers across the network.

- Receivers explicitly join multicast groups
- Uses shared trees rooted at RPs
- Dramatically reduces unnecessary traffic

## Key Advantages of PIM

### Protocol Independence

Works seamlessly with any existing unicast routing protocol, eliminating the need for separate multicast routing infrastructure.

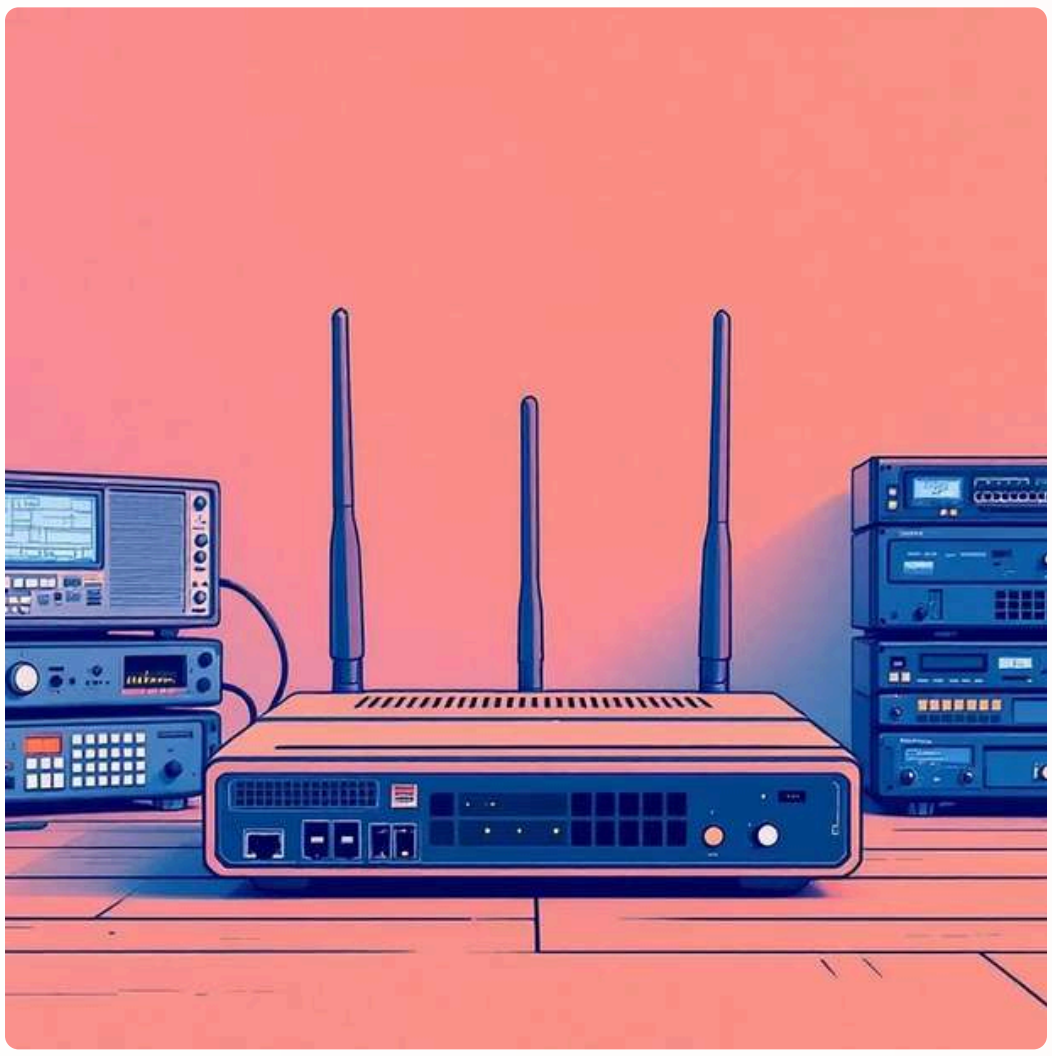
### Superior Scalability

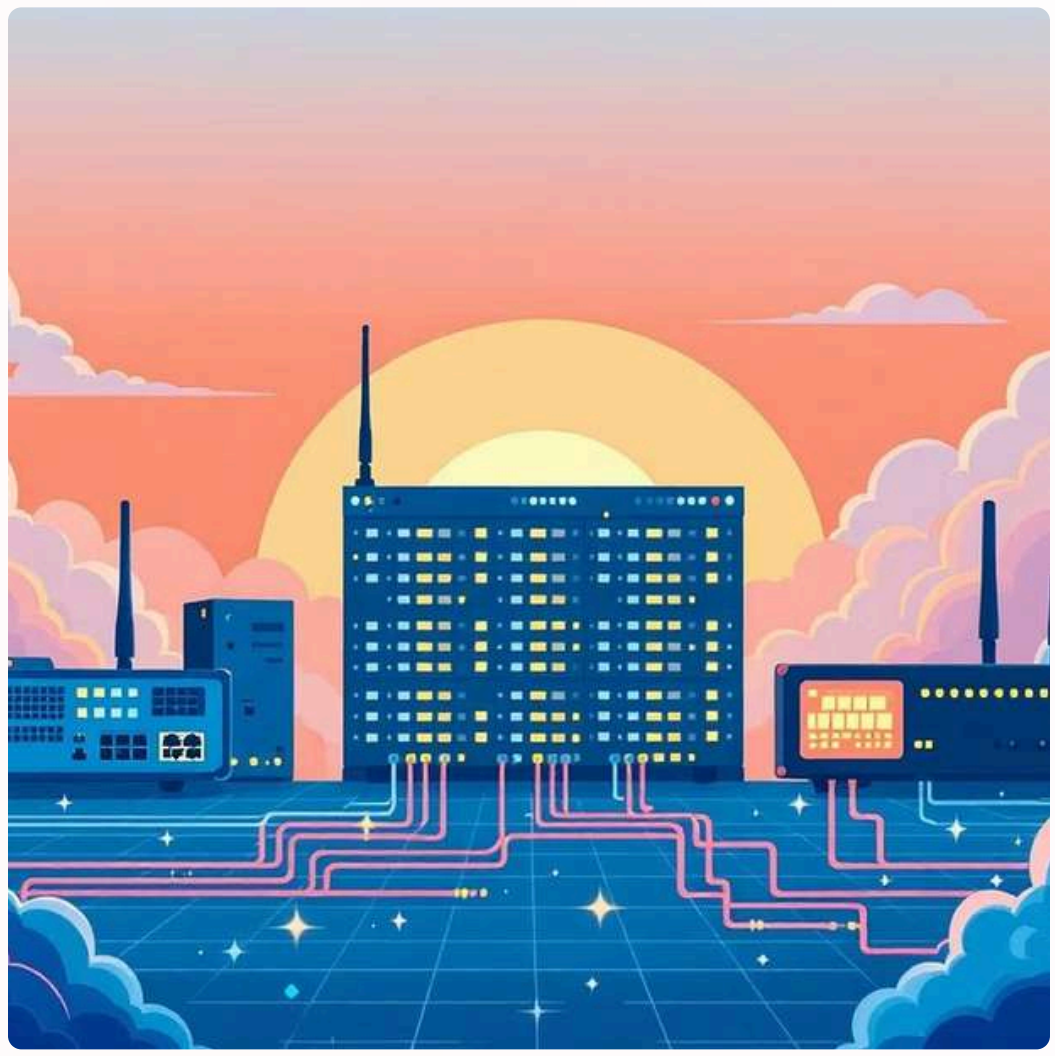
Efficiently handles large enterprise and service provider networks with thousands of multicast groups and receivers.

### Widespread Adoption

Industry standard for modern multicast deployments across enterprise, ISP, and cloud environments.

# DVMRP vs PIM: Key Differences & Use Cases





## DVMRP Characteristics

Simple flood-and-prune architecture suited for small networks and legacy systems. Limited by scalability constraints and periodic flooding overhead.

## PIM Advantages

Protocol-independent design with flexible modes for both dense and sparse topologies. Scales efficiently to support enterprise and carrier-grade deployments.

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## Protocol Comparison Matrix

| Feat u re | DVMRP | PIM |
|---|---|---|
| Routing Dependency | Uses own distance-vector protocol | Leverages existing unicast routes |
| Tree Building | Source-based with flood-and-prune | Shared (Sparse) or Source (Dense) trees |
| Scalability | Limited to small/medium networks | Excellent for large-scale deployments |
| Network Overhead | High due to periodic flooding | Minimal with efficient join/prune |
| Modern Adoption | Legacy systems only | Industry standard |

**Interoperability Note:** Cisco routers and other enterprise equipment support seamless integration between PIM and DVMRP domains through multicast tunneling, enabling gradual migration from legacy to modern infrastructure.

Today's multicast deployments overwhelmingly favor PIM for its flexibility, efficiency, and scalability. PIM Sparse Mode with carefully planned Rendezvous Point placement provides optimal performance in complex, geographically distributed networks while maintaining compatibility with legacy DVMRP systems when needed.