

23ITT204 - COMPUTER NETWORK

UNIT 4 - ROUTING

PATH-VECTOR ROUTING

Path Vector Routing in Computer Networks

Understanding the backbone protocol that powers global Internet connectivity

What is Path Vector Routing?

Path vector routing represents a sophisticated approach to network routing that maintains complete path information to each destination, rather than simply storing the next hop. This comprehensive view enables intelligent routing decisions and robust loop prevention.

Each routing update carries the entire path of autonomous systems (AS) traversed, creating a transparent trail that allows routers to make informed decisions and detect potential loops before they occur.

Key Distinction

Unlike distance vector or link-state protocols that focus on intra-domain routing, path vector routing specializes in inter-domain routing across multiple autonomous systems.

Real-World Implementation: Border Gateway Protocol (BGP) serves as the Internet's primary path vector protocol, managing routing between thousands of autonomous systems worldwide.

How Path Vector Routing Works

AS Speaker Initialization

Each autonomous system designates a speaker node responsible for advertising reachable networks along with the complete AS path information to neighboring systems.

Loop Detection Mechanism

If a router identifies its own AS number within an incoming path advertisement, it immediately discards the update, preventing circular routing paths.

Loop Prevention in Action

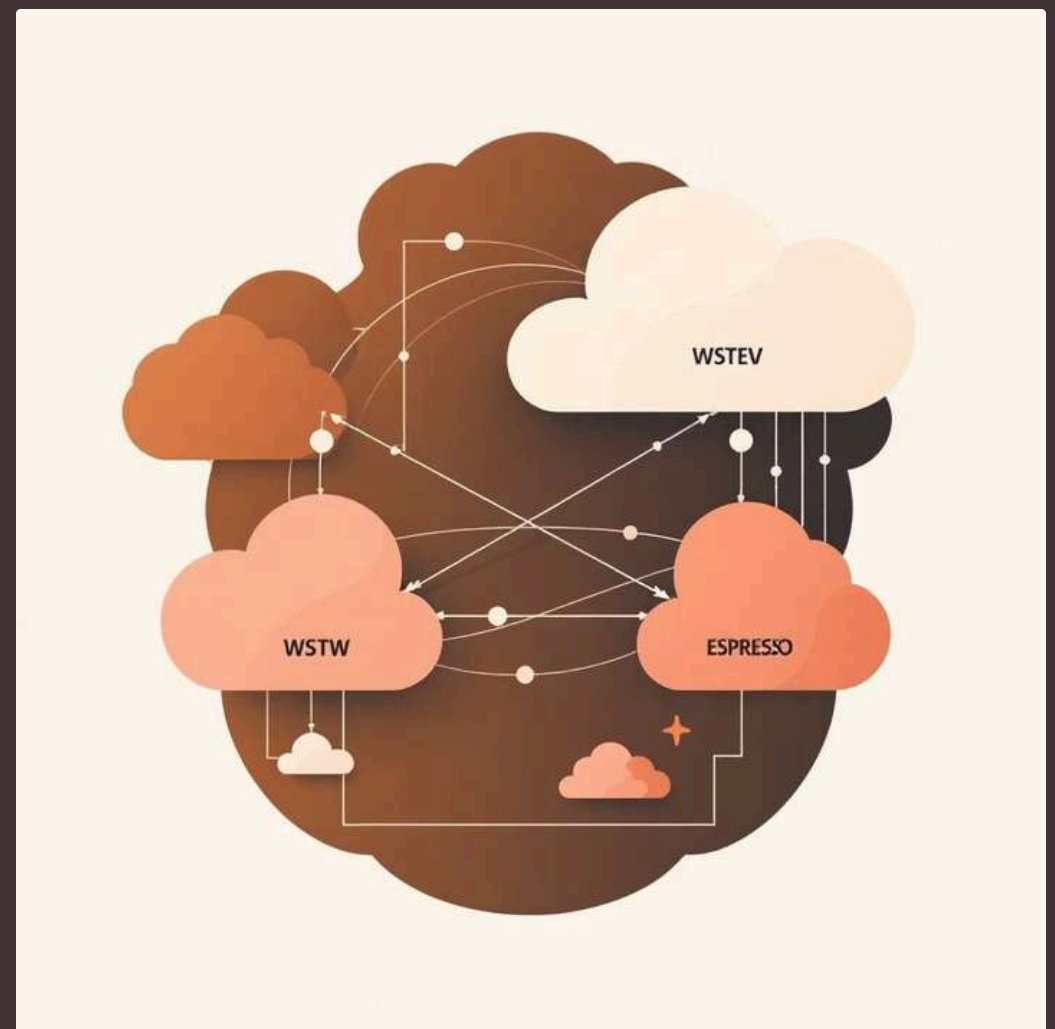
The self-detection mechanism provides , eliminating the "count to infinity" problem that plagues traditional distance vector protocols.

Path Update & Verification

Routers receive updates, verify paths against configured policies, and append their own AS number before forwarding to ensure path transparency and accountability.

Policy-Based Decision

Routes are evaluated and selected based on organizational policies and business rules, not solely on distance metrics or bandwidth considerations.



Why Path Vector Routing Matters



Internet-Scale Scalability

Enables efficient, policy-aware routing between thousands of autonomous systems across the global Internet infrastructure, handling billions of routes daily.



Robust Loop Prevention

Eliminates routing loops and the catastrophic "count to infinity" convergence problems that historically affected distance vector protocols.



BGP Global Dominance

Border Gateway Protocol, the most widely deployed path vector protocol, manages **100% of inter-domain Internet traffic** efficiently and reliably.



Enterprise-Critical Infrastructure

Major organizations like Facebook, Microsoft, and Google depend on path vector routing to manage complex internal networks and external peering relationships.

"Path vector routing transformed the Internet from a small academic network into a globally scalable, policy-driven infrastructure capable of connecting billions of devices across organizational boundaries."