What is Anycast

Anycast DNS is a traffic routing algorithm used for the speedy delivery of website content that advertises individual IP addresses on multiple nodes. User requests are directed to specific nodes based on such factors as the capacity and health of your server, as well as the distance between it and the website visitor.

There are several advantages to anycast routing, including:

- Faster connections – Routing users through the nearest intermediary node minimizes round-trip time (RTT), thereby decreasing the number of hops and reducing latency.
- Simplified server configuration – Anycast lets a single DNS server configuration be distributed to all of your network nodes.
- High availability – Advertising an IP address on multiple nodes creates redundancy, thereby providing backup in the event a node becomes overloaded or fails.
- DDoS mitigation – Anycast provides intrinsic DDoS mitigation by offering failover alternatives if a node is attacked or goes down.

Anycast DNS Alternatives: Unicast and Multicast Routing Explained

Both unicast and multicast are effective traffic routing solutions, albeit with limitations that make them less practical alternatives to anycast.

Unicast

Unicast involves assigning a single node to individual IP addresses and then connecting senders and receivers using static routes. Regardless of a request's origin, it always goes through the same routing path.

This is a problematic solution for several reasons. Should a routing path node become overworked or go down, communication channels would be cut short.

Additionally, individual connections between nodes and a host server can be resource intensive, especially when larger files or applications (e.g., videos and software) are being distributed on a large scale.

Multicast

In multicast routing, a source IP sends data to an intermediary multicast node, which then identifies and distributes the data to a group of recipients.

As opposed to unicast, multicast is scalable—the source IP only needs to send a packet once for it to be distributed to a mass of users. This makes it a viable solution for larger data streams such as streaming videos, online stock exchanges and games.

But there are several disadvantages associated with multicast routing. In the event that a node becomes overloaded or fails, the data stream has to be redirected—potentially resulting in significant latency. Furthermore, the cost of operating multicast nodes is high.

The CDN Perspective

CDNs use anycast routing to distribute site content on a massive scale. Strategically placed points of presence (PoPs) advertise similar IP address ranges. Meanwhile border gateway protocol (BGP) pairing discovers and maintains paths to different hosts.

In addition to anycast HTTP request routing, CDNs provide anycast DNS resolution. They do so by setting up a series of name servers and providing low-latency name lookup to ISP-resolving host names. This translates into faster name lookups and file downloads.

Local internet service providers (ISPs) can then choose from multiple access points and determine the most optimized path to route traffic. As a result, your web application benefits from faster connection times, increased security and emergency failover in the event of a server overload.

Reference: https://www.imperva.com/learn/performance/anycast/