

Multi Protocol Routers

by

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Network traffic is dependent upon being able to route packets to the correct destination reliably and efficiently. In a homogenous closed network this task is simplified. All nodes in that network use the same protocols. However early on in the development of the internet a problem arose when the local area network used one protocol yet the internet was using another. PC Magazine (2009) explains that multi protocol routers were the answer to this problem. A multi protocol router is a router that can communicate with two or more disparate protocols. For example the router might be capable of communication using Novell's IPX/SPX and the internet's TCP/IP. According to PC Magazine (2009), this allows the router to handle both sorts of traffic and to successfully route traffic between the two different networks.

The advent of multi protocol routers has been an asset to establishing wide area networks, according to Cruz (1995). A multi protocol router's ability to connect heterogeneous networks allows two local area networks, regardless of their protocols, to utilize the internet as an interconnection medium. Joining the two local area networks over the internet creates a wide area network. Cruz (1995) was focused on the applications of this process to Novell networks given that at the time of his article they utilized the IPX/SPX suite of protocols rather than the TCP/IP suite used by the internet.

The ability to connect heterogeneous networks was the original intent of multi protocol routers. According to Dean (2009), that is less of a concern now as all major vendors have moved to utilize TCP/IP. Formally Apple used their proprietary AppleTalk protocols and Novell used their proprietary IPX/SPX protocols. Microsoft even used its own proprietary protocol called NetBUI. However all three vendors have been using TCP/IP for some time, according to Dean (2009). One is only likely to find these proprietary protocols in use in legacy network

environments, according to Dean (2009). Some might consider that this move towards protocol standardization has rendered multi protocol routers obsolete and unnecessary. However advances have been made on the original concept of multi protocol routing, that have provided additional benefits, beyond the connection of heterogeneous networks.. Awduche and Jabari (2002) explain how the related concept of multi protocol label switching (MPLS) has enhanced network traffic management. In MPLS each packet is assigned a label. That label is used to route and prioritize the packet, regardless of the protocol of the packet or the contents. This protocol independence is a direct outgrowth from multi protocol routers. While MPLS is not synonymous with multi protocol routing, it is an outgrowth of multi protocol routing.

Another related concept is dynamic routing. Dean (2009) states that in the early days of networks and the internet, all routers utilized static routing. In static routing an individual, usually a network administrator, must manually enter all connected IP addresses into a table in the router. This way the router is aware of what IP addresses can be found out each of its ports. This list of IP addresses is referred to as a routing table. Manually creating and maintaining the routing table is obviously a time consuming and error prone process. Dynamic routing, according to Kodialam and Lakshman (2000) is a technology wherein the router itself examines each packet it receives, and records what IP address it came from and what router port it arrived on. This allows the router to build its own routing table in real time. This clearly reduces administrative overhead. When new nodes are added to the network, the router will discover them and add their IP addresses to its routing table. This is also important since so many networks now utilized dynamic IP addresses rather than static IP addresses according to Dean (2009). Since nodes utilizing dynamic IP addresses can have an IP address that is different than

what they had previously used, it makes dynamic IP addresses and static routing tables incompatible approaches.

Kodialam and Lakshman (2000) go on to explain the routing mechanisms used in dynamic routing networks. In order to facilitate dynamic routing, the routers must communicate routing information with each other. This necessitates the use of routing protocols specifically designed for such exchange of routing information. There are many routing protocols available. Each network or individual router can select its own routing protocol to communicate between the routers in that autonomous system. Routing within a domain is usually accomplished using an interior gateway protocol (IGP) protocol. The most widely used interior gateway protocol is Routing Information Protocol (RIP). A newer IGP is the Open Shortest Path First protocol (OSPF), according to Kodialam and Lakshman (2000). Both are still widely used in dynamic routing.

Kodialam and Lakshman (2000) expand on the original purpose of dynamic routing, that of having real time updateable routing tables. They discuss using dynamic routing for more efficient network traffic management. According to Kodialam and Lakshman (2000), one can setup specific algorithms that will take advantage of dynamic routing tables not only to know what port to send out traffic, but which port would be better able to handle that traffic. This process is called dynamic provisioning. The router selects the route that is best able to handle the traffic.

This work by Kodialam and Lakshman (2000), builds on earlier work by Saewong and Magda (1992). Saewong and Magda (1992) posited using dynamic multi-path routing algorithms for connection oriented homogeneous high speed networks. They wanted to use existing routing mechanisms and expand on those to handle congestion control.

All of these studies show clearly the evolution of routing mechanisms. We first had static routing with routing tables that had to be manually administered. Then we had dynamic routing that built the routing tables in real time from data being received over the network. The advent of dynamic routing eventually required routing protocols to allow routers to exchange routing data and thus increase the efficacy of their routing tables. Finally the process of dynamic routing was co-opted to help address network congestion and to regulate network traffic.

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