Introduction to Routers

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Part A

Routers are electronic devices that connect more than two computers and can forward data packets to and from them based on the information within the packet headers as well as routing tables. Packets are the basic units within an information transportation system and form a constituent element of current computers network systems. They have become popular in other communication systems too. Packet headers are the portions within a packet of data that comes before the part of the message that is being transferred. This header consists of a terminus' IP address, control as well as timing data that enable accurate data transmission. These devices are a fundamental part of running the internet. In principle, a network is made up of a minimum of two computers together with other essential devices, for instance, printers, which are connected to allow communication within this network. This arrangement allows files to be shared easily and faster (Inetdaemon.com, 2015).

Moving of data packets from one network to another using suitable channels occurs in a network layer. This layer is tasked with addressing messages and the translation of a logical address into a MAC address. Routers move messages by following a particular protocol such as Internet protocols or internetwork packet exchange. There are those routers that work with only one protocol. Those that function with more than one protocol is referred to as multiprotocol routers. Messages that are not based on routable protocols, for example, NetBIOS, can only be transferred through bridges between LAN systems. Routers make use of ICMP (Internet control message protocols) to transfer information thus they can keep their routing tables updated. This exchange of information also allows routers to map out the best routes between computers in a network. Initially, data transfer was the function of GP computers. Nowadays, there are specialized processors optimized to perform this task. Unix-based operating systems come with

specialized software to aid routing. Routers can link networks with the support of some architectures and media. The type of data they handle does not matter. Thus, there is little data filtering (Inetdaemon.com, 2015).

Routers are used in network design when there is a need to link systems together and thus perform some essential functions. The primary objective of routing in a network design is to ensure the availability of ubiquitous and secure web access, particularly for an organization's employees. When used as an integral element of a network, routers contribute significantly towards optimization of applications availability, enhanced employee output, increased consumer responsiveness, and brand loyalty. This, therefore, will help offshoot an organization's competitiveness in the market. Routers are also used to help businesses overcome geographical limitations that exist between companies, consumers, and suppliers (Aber, 2015).

Routers are incorporated in a network design to help in the restriction of the broadcast to LAN. It is possible to have some devices transmitting simultaneously leading to many collisions. Routers thus help separate larger hosts into diverse broadcasting domains. In most cases, where the exchange of data is an important element of computer networking, routers provide a default gateway. This router receives data from the other computers on the network attempting to create a connection and then makes a decision on the most appropriate route. The required data is sent based on the routing decision and the closest interface. In a system of networks, routers make it easier for different organizations to exchange data. This means that even those networks that would not transfer data ordinarily will be able to share information. In principle, what this does is allow, say, a token-based ring system to communicate with an Ethernet network over serial networks. Where this level of interaction is desired in a network, routers become an essential part of a network design (Aber, 2015).

Part B

To fully comprehend the role of routers in a network setup, it is vital that one understands that routers, being of the 3rd layer, also operate at the 1st and 2nd layers as well. As layer three devices, their principal function is to forward packets of data. One of the primary duties of a router is to ensure packets of data reach the final node. Routers accomplish such a task through the use of a switching function. This process allows routers to receive packets of data from one interface and then send it off to a second interface. Switching functions encapsulate data packets into appropriate outgoing link types (Academy, 2015).

Therefore, it is important to note that in the context in which the term "switching" is used, it refers to moving data packets from one point to another. It should not be mistaken for the 2nd layer's function. The router then works out the exit interface with the aid of a "determination function". To understand what the router does with the packets of data from a given interface, there are three steps that need to be highlighted. First, the router unwraps data packets at the 3rd layer. The router achieves this process by the elimination of the 2nd layer header and tail. The router then scrutinizes the destination's IP address of the data packets so as to establish the most appropriate channel (Academy, 2015).

Once the router determines an appropriate channel, it wraps up the 3rd layer's data packet creating a 2nd layer that it then forwards off to the next interface. Routers have 3rd layer IPv4 address capabilities whereas an Ethernet interface supports a 2nd layer frame link address. Therefore, the 3rd layer's Internet protocol address remains the same as packets of data move from source to their destination. However, the 2nd layer's frame link changes at every turn as the data is unwrapped and re-wrapped into new links by routers in the network. It is common to find data packets that are wrapped at a distinct 2nd layer that is different from that of the entry

interface. Routers are also tasked with the determination of the best path through which to send data packets. Routers achieve this function through the use of routing tables. The routers search these tables for network addresses that match the endpoint's IP address. This quest leads to three possible end results. One, it is possible to establish a direct connection if the IP address of data packets matches that of a device directly linked to the network. Two, if the data packet's IP address is that of a remote network, this packet will be sent to a different router. Lastly, it is possible to find a scenario where no route was found. This occurs where the Data packet's IP address does not belong to either of the two scenarios discussed in one and two. The router is forced to seek "Getaways of last resort" where a default route will be configured. Where there are no such things as a default route, the system discards the packets of data, and an ICMP is then forwarded to the originator IP address (Academy, 2015).

Determination of appropriate routes involves analysis of some routes that lead to the same point with a selection of the shortest of them all. The most suitable path is chosen based on a routing protocol. Dynamic protocols make use of self-made rules to create routing tables. In the event that a router establishes more than two paths with the same metrics, it will send packets of data through both paths. The routing tables are configured in such a manner as to allow multiple exits. Therefore, if the proper configuration is done, balancing loads will increase the effectiveness as well as the performance of a network. For example, Cisco routers have the ability to balance a maximum of four paths. The highest number of cost paths that a router can support is dependent on its moving protocol as well as its version of IOS. Also, it is possible to have routers configured to support multiple protocols as well as static paths. If this scenario arises, the routing tables will provide multiple paths to the same destination (Academy, 2015).

References

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