Module
8

Routing

Lesson

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Routing I

8.1.1 INTRODUCTION

The main function of the network layer is routing packets from the source machine to the destination machine. In most subnets, packets will require multiple hops to make the journey. The routing algorithm is that part of the network layer software responsible for deciding which output line an incoming line packet should be transmitted on. This decision has to be made for each packet in case of Connectionless packet Switching and once per session for Connection Oriented service. Regardless of whether routes are chosen independently for each packet or only when new connections are established, there are certain properties that are desirable in a routing algorithm: correctness, simplicity, robustness, stability, fairness and optimality. Robustness implies that the routing algorithm should be able to cope with the changes in the topology and traffic without requiring all jobs in all hosts to be aborted and the network be rebooted every time any router crashes.

8.1.2 ROUTING TECHNIQUES

Routing requires a router to have a routing table. Several techniques are employed to make the size of the routing table manageable and handle issues such as security. Some of these techniques are discussed here.

NEXT-HOP ROUTING
In this technique, the routing table only holds the information that leads to the next hop instead of holding the complete information.

NETWORK-SPECIFIC ROUTING
In this method instead of having an entry for every host connected to the same physical network, we have only one entry to define the address of the network itself. We treat all hosts connected to the same network as one single entity.

HOST-SPECIFIC ROUTING
In this technique the destination address of the host is given in the routing table. This concept is opposite to the Network-specific routing technique. This leads to loss of efficiency. This method is used for specific purposes such as checking the route or providing security measures.

8.1.3 ROUTING ALGORITHMS

The routing algorithm is that part of the network later software responsible for deciding which output line an incoming packet should be transmitted on. If the subnet uses datagrams internally, this decision must be made anew for every arriving data packet since the best route may have changed since last time. If the subnet uses virtual circuits internally, routing decisions are made only when a new virtual circuit is being set up. Thereafter, data packets just follow the previously established route. The latter case is sometimes called session routing, because a route remains in force for an entire user session (e.g., a login session at a terminal or a file transfer)

Routing algorithms may be classified into two major classes: non-adaptive and adaptive, depending on how the routes are calculated.

Non adaptive algorithms, also known as S*tatic algorithms* do not base their routing decisions on the estimates of current traffic and topology. Instead the route is pre-computed and fed into the routers offline.

Adaptive algorithms on the other hand change their routing decisions to reflect the changes in the topology and usually in traffic as well. The various adaptive algorithms differ in where they get their information (from adjacent routers, or from all routers), when they change the routes (when the load changes or when the topology changes), and what metric is used for optimization (distance, number of hops, residual bandwidth). These algorithms are also known as D*ynamic algorithms.*

The routing may be performed for the Unicast, one source to one destination or Multicast, one source to a group of destinations scenario. In Unicast routing, when a router receives a packet it forwards the packet only through one of its ports (the one belonging to the optimum path). The network can be so large that a single routing protocol cannot handle the task of updating the routing table of all the routers. So we divide the internet into Autonomous systems (AS). Routing inside an autonomous system is interior routing. Routing between autonomous systems is exterior routing. Each autonomous system can choose an interior routing protocol to handle routing inside the autonomous system. Several routing protocols are in use. Through this course we shall cover only the most popular ones.

Objective Questions

Subjective Questions

Level 2 Questions