Networking Basics

Think of a hub as a four-way intersection where everyone has to stop. If more than one car reaches the intersection at the same time, they have to wait for their turn to proceed. Imagine that each vehicle is a packet of data waiting for an opportunity to continue on its trip.

Now imagine what this would be like with a dozen or even a hundred roads intersecting at a single point. The amount of waiting and the potential for a collision increases significantly. But wouldn't it be amazing if you could take an exit ramp from any one of those roads to the road of your choosing? That is exactly what a switch does for network traffic. A switch is like a cloverleaf intersection – each car can take an exit ramp to get to its destination without having to stop and wait for other traffic to go by.

The vital difference between a hub and a switch is that all the nodes connected to a hub share the bandwidth among themselves, while a device connected to a switch port has the full bandwidth all to itself. For example, if 10 nodes are communicating using a hub on a 10-Mbps network, then each node may only get a portion of the 10 Mbps if other nodes on the hub want to communicate as well. But with a switch, each node could possibly communicate at the full 10 Mbps. Think about our road analogy, if all of the traffic is coming to a common intersection, then each car has to share that intersection with every other car. But a cloverleaf allows all of the traffic to continue at full speed from one road to the next.

Switching allows a network to maintain full-duplex Ethernet. Before switching, Ethernet was half-duplex, which means that data could be transmitted in only one direction at a time. In a fully switched network, each node communicates only with switch, not directly with other nodes. Information can travel from node to switch and from switch to node simultaneously.

Fully switched networks employ either twisted-pair or fiber-optic cabling, both of which use separate conductors for sending and receiving data. In this type of

environment, Ethernet nodes can forgo the collision detection process and transmit at will, since they are the only potential devices that can access the medium. In other words, traffic flowing in each direction has a lane to itself. This allows nodes to transmit to the switch as the switch transmits to them – it's a collision-free environment. Transmitting in both directions can effectively double the apparent speed of the network when two nodes are exchanging information. If the speed of the network is 10 Mbps, then each node can transmit simultaneously at 10 Mbps.