Routers Use Multiple Paths in an Internetwork

This simulation shows how routers forward packets in an internetwork and provide fault tolerance when there are multiple paths to the destination network. To simplify the demonstration, we'll use single digit network IDs and single-digit host IDs and a simplified routing table.

In this simulation, the routers are configured to use the RIP routing protocol using the metric of hop-count to determine the best path to the destination. Suppose Host 1.1 wants to send a packet to Host 4.1. When the packet arrives at Router A, Router A consults its routing table to find the best path to Network 4. Router A forwards the packet to Router C as specified by the routing table since the metric is 2 hops. Router B can deliver the packet to Network 4 but it would take three hops to do so. When Router C receives the packet, its routing table specifies that Router E is the next hop in the path. When the packet arrives at Router E, the routing table indicates that Network 4 is directly connected, so Router E formats the packet with Host 4.1's MAC address and delivers the frame to Host 4.1.

In similar fashion, if Host 2.1 sends a packet to Host 3.1, the packet takes the path from Router B, to Router C to Router D where it is delivered to Host 3.1.

Let's look what happens if the link between Router A and Router C becomes unavailable and Host 1.1 again sends a packet to Host 4.1. RIP packets that are exchanged among the routers detect that the link is down and the routing tables of each router automatically adjust to exclude the path between Routers A and C. For example, Router A will now use the path through Router B to reach networks 3, 4, and 5. Router A forwards the packet to Router B and then on to Router C and Router E, where the frame is formatted for final delivery to Host 4.1.

If the link between Routers A and C is restored, the routing tables would once again be reconfigured to reflect the shortest path in hops between all networks.