2. How much do I need to change metrics to affect a change in the traffic flow?

In a previous example, we saw how Route Explorer can provide unique link failure simulation capabilities during the network planning and service rollout process. Here we show how Route Explorer can go further, with simulation capability for adjusting link metrics to affect routing paths.

Figure 10 shows an OSPF network monitored by Route Explorer. The highlighted route shows the path from the source router in the top center of the topology. The network has a pair of high capacity core switch/routers, but this particular flow is taking a peripheral route, presumably because it is lower cost. But let us suppose that this traffic flow is placing an undesirable load on link A shown and it is desirable to steer this flow over link B towards the core of the network. One way to accomplish this is to increase the cost (link metric) of link A.

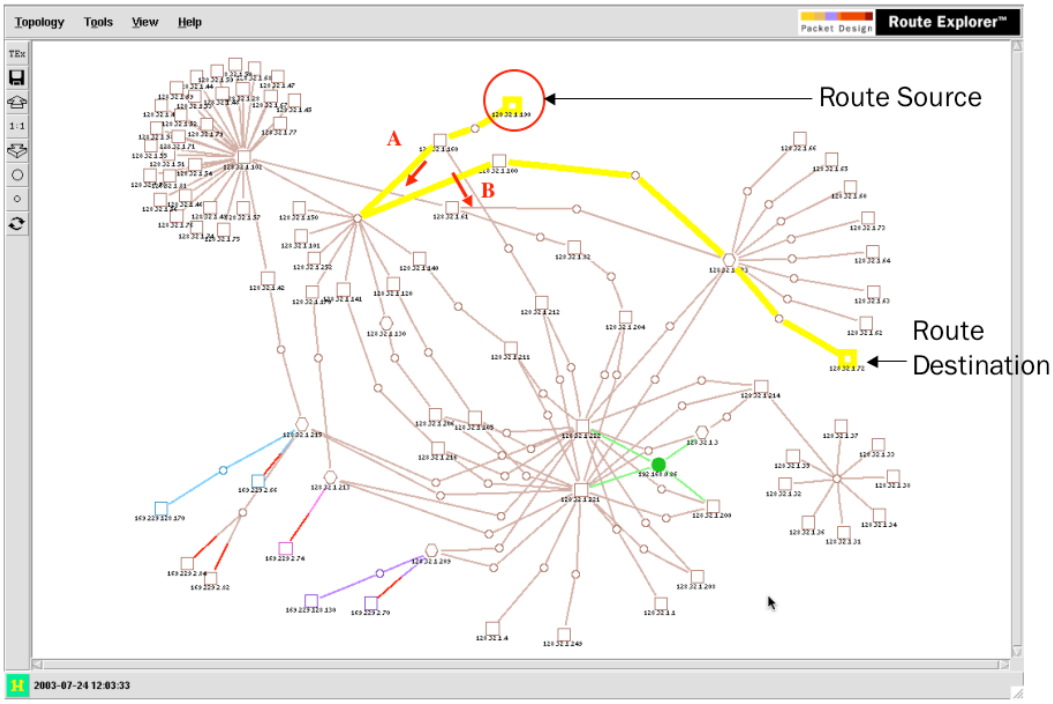

Figure 10

To set the metric of a link right click on the link itself in Route Explorer's topology map. In the resulting popup menu, click "Set Metric". A popup menu such as that at the left in Figure 11 will be displayed. Enter the new metric you wish to simulate. In this example, we have used 120 in place of the existing 100. The List of Route/Link Edits displays the changes made (at the right in Figure 11).

Figure 11

As a result of this simulated metric change, Route Explorer recalculates the highlighted path. Figure 12 shows that the new path does indeed follow link B through the core of the network as desired.

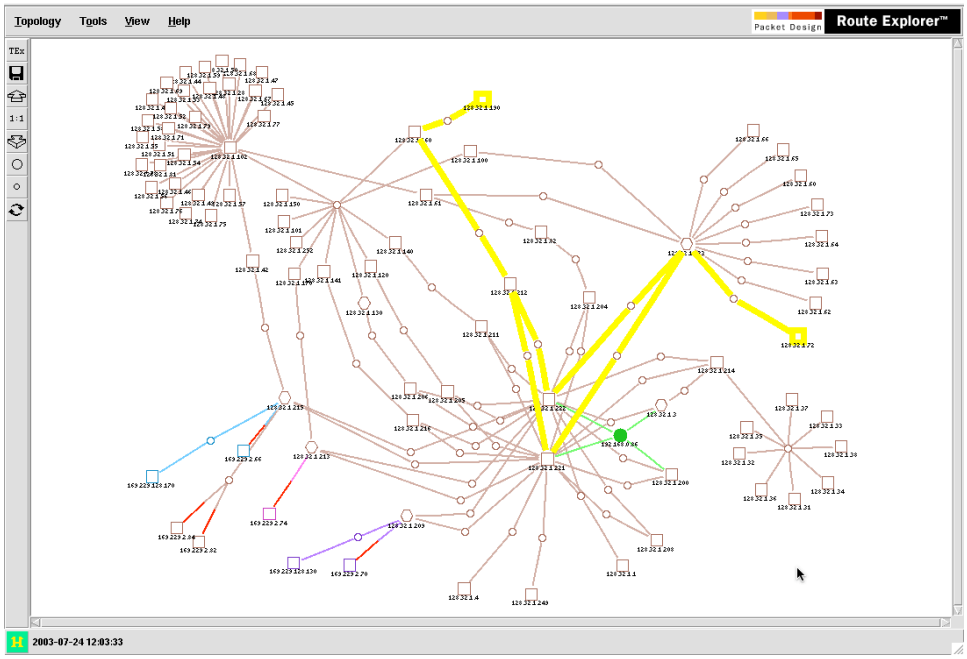

Figure 12

Next, we need to find the optimum metric value to affect this change. Further experimentation with Route Explorer shows that 110 is that number. (Alternatively, one may simulate the first link going down using Route Explorer as shown above, and examine the link metrics of the secondary route to arrive at the same result). At the metric setting of 110, both paths are of equal cost, as shown in Figure 13. The details of the three ECMP routes are shown in Figure 14.

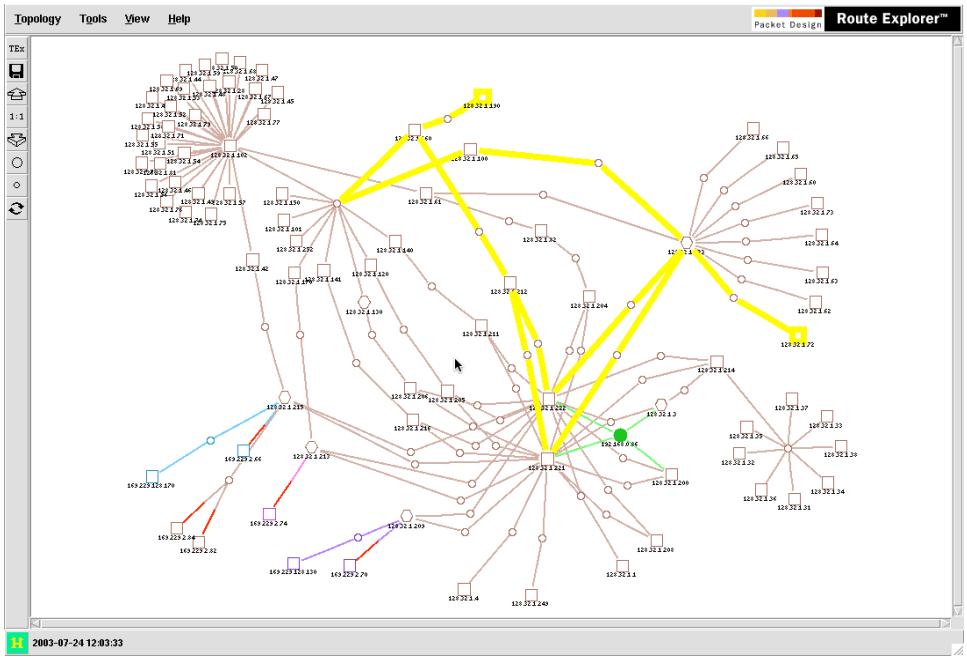

Figure 13

List of Highlighted Paths

Path	Source Node	Destination Node	Metric	Protocol	Resolved by Prefix
128.32.1.190 -> 128.32.1.72					
1	128.32.1.190	169.229.1.148/30	100	OSPF	128.32.1.72/32
2	169.229.1.148/30	128.32.1.160	0	OSPF	128.32.1.72/32
3	128.32.1.160	128.32.235.0/24	110	OSPF	128.32.1.72/32
4	128.32.235.0/24	128.32.1.100	0	OSPF	128.32.1.72/32
5	128.32.1.100	128.32.0.112/29	100	OSPF	128.32.1.72/32
6	128.32.0.112/29	128.32.1.223	0	OSPF	128.32.1.72/32
7	128.32.1.223	169.229.0.160/29	100	OSPF	128.32.1.72/32
8	169.229.0.160/29	128.32.1.72	0	OSPF	128.32.1.72/32
128.32.1.190 -> 128.32.1.72					
1	128.32.1.190	169.229.1.148/30	100	OSPF	128.32.1.72/32
2	169.229.1.148/30	128.32.1.160	0	OSPF	128.32.1.72/32
3	128.32.1.160	128.32.0.124/30	100	OSPF	128.32.1.72/32
4	128.32.0.124/30	128.32.1.212	0	OSPF	128.32.1.72/32
5	128.32.1.212	128.32.255.36/30	100	OSPF	128.32.1.72/32
6	128.32.255.36/30	128.32.1.221	0	OSPF	128.32.1.72/32
7	128.32.1.221	128.32.255.0/29	10	OSPF	128.32.1.72/32
8	128.32.255.0/29	128.32.1.223	0	OSPF	128.32.1.72/32
9	128.32.1.223	169.229.0.160/29	100	OSPF	128.32.1.72/32
10	169.229.0.160/29	128.32.1.72	0	OSPF	128.32.1.72/32
128.32.1.190 -> 128.32.1.72					
1	128.32.1.190	169.229.1.148/30	100	OSPF	128.32.1.72/32
2	169.229.1.148/30	128.32.1.160	0	OSPF	128.32.1.72/32
3	128.32.1.160	128.32.0.124/30	100	OSPF	128.32.1.72/32
4	128.32.0.124/30	128.32.1.212	0	OSPF	128.32.1.72/32
5	128.32.1.212	128.32.255.40/29	100	OSPF	128.32.1.72/32
6	128.32.255.40/29	128.32.1.222	0	OSPF	128.32.1.72/32
7	128.32.1.222	128.32.255.8/30	10	OSPF	128.32.1.72/32
8	128.32.255.8/30	128.32.1.223	0	OSPF	128.32.1.72/32
9	128.32.1.223	169.229.0.160/29	100	OSPF	128.32.1.72/32
10	169.229.0.160/29	128.32.1.72	0	OSPF	128.32.1.72/32

3 entries

Unhighlight All Paths | Flat View | Collapse All | Reload | Close

Figure 14

Please note that while the three paths shown in Figure 14 do not look to be “equal cost” in terms of hop count, the total cost of the paths in terms of the sum of their hop-by-hop link metrics is the same.

This example has shown that Route Explorer's unique link metric simulation capability can help network designers experiment with network tuning in real-time, on a production network with virtually no risk. This in turn can help them respond to short-term traffic overloading or propose longer-term network changes with high confidence and reduced risk.

HOW TO:

1. Open an X Windows or VNC session to the Route Explorer. See Route Explorer User Guide for details.
2. Click on File->Open Topology
3. Select the topology domain "UCBJul03a" from menu.
4. Click Open.
5. Highlight a route:
    a. Right-click on source router
    b. Click "Route Source" in node pop-up menu
    c. Right-click on destination router
    d. Click "Route Destination" in pop-up
6. To see the route in hop-by-hop detail, select Tools->List Highlighted Paths
7. Change metric:
    a. Right-click on link
    b. Click "Set Metric" in link pop-up menu
    c. Enter metrics in resulting dialog and click on "set"
8. Show all simulated changes: Select Tools->List Router/Link Edits
9. Restore edits:
    a. Click on "Restore All" in list of edits
    b. Up the individual links or nodes via pop-up menu (right-click on item)

