

4. What else was affected by the outage?

In previous examples we have shown how Route Explorer can pinpoint the exact nature of an outage so that the appropriate corrective action can be taken with minimum loss of time. In this example we show how post-mortem analysis of the outage can reveal information that can help you engineer your network better.

Many routing outages can lead to cascade failures as traffic load is shifted from the failing router or link to other routers and links. Figure 11 illustrates such an outage. The four screen shots from Route Explorer are spaced 10 minutes apart and show the progression of an outage among 3 core routers. Upper-left: 2:34 pm: the 3 core routers in a POP, prior to cascade outage. Upper right: 2:40 pm. First core router down. Lower left: 2:50 pm. Second core router down, First router coming up. Lower right: 3:00 pm. Both core routers are back up.

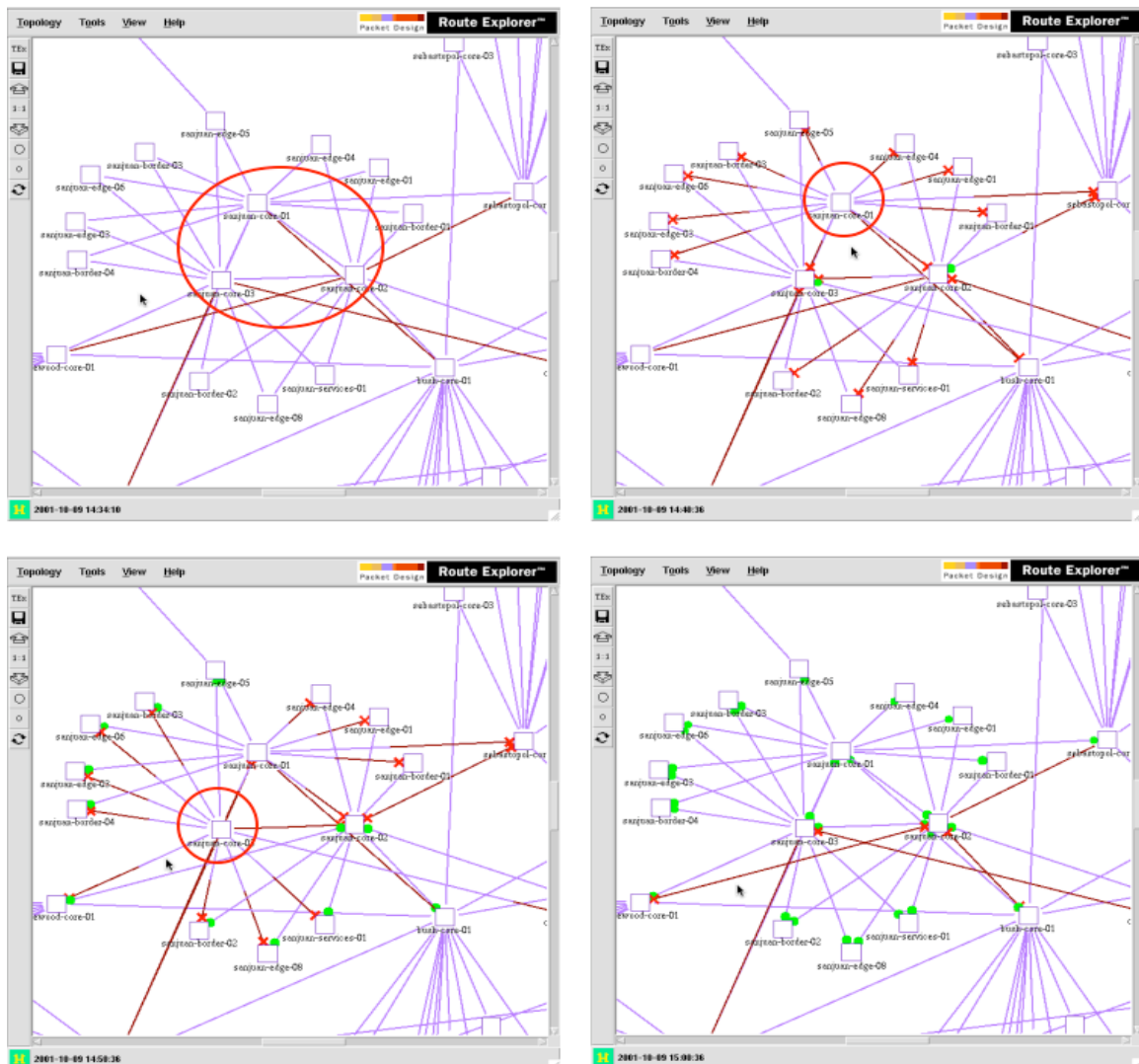


Figure 11

During event diagnosis and post-mortem analysis Route Explorer can reveal much finer grain detail on this outage. Figure 12 illustrates the events list for the entire time period of the outage.

Time	Router	Operation	Neighbor/Prefix	Attributes	Area
10/9 14:40:07.026706	sanjuan-border-04	Add Neighbor	sanjuan-core-01	Metric: 5 (TE)	DemoJitterSPOct01.isis/Backbone
10/9 14:40:07.138894	sanjuan-edge-06	Add Neighbor	sanjuan-core-01	Metric: 5 (TE)	DemoJitterSPOct01.isis/Backbone
10/9 14:40:07.234927	sanjuan-edge-03	Add Neighbor	sanjuan-core-01	Metric: 5 (TE)	DemoJitterSPOct01.isis/Backbone
10/9 14:40:08.002852	saratoga-core-01	Add InternalNet	50.84.250.152/29	Metric: 1 (TE)	DemoJitterSPOct01.isis/Backbone
10/9 14:40:17.363626	washarea-core-02	Add InternalNet	50.84.250.112/29	Metric: 43 (TE)	DemoJitterSPOct01.isis/Backbone
10/9 14:40:22.099970	washarea-core-02	Add Neighbor	sanjuan-core-03	Metric: 43 (TE)	DemoJitterSPOct01.isis/Backbone
10/9 14:40:23.523959	sanjuan-core-03	Add Neighbor	washarea-core-02	Metric: 43 (TE)	DemoJitterSPOct01.isis/Backbone
10/9 14:40:36.084930	sanjuan-core-03	Drop Neighbor	sanjuan-core-01	Metric: DOWN (TE)	DemoJitterSPOct01.isis/Backbone
10/9 14:40:36.212889	sanjuan-border-03	Drop Neighbor	sanjuan-core-01	Metric: DOWN (TE)	DemoJitterSPOct01.isis/Backbone
10/9 14:40:36.357096	sanjuan-edge-06	Drop Neighbor	sanjuan-core-01	Metric: DOWN (TE)	DemoJitterSPOct01.isis/Backbone
10/9 14:40:36.485092	sanjuan-edge-03	Drop Neighbor	sanjuan-core-01	Metric: DOWN (TE)	DemoJitterSPOct01.isis/Backbone
10/9 14:40:36.613109	sanjuan-edge-05	Drop Neighbor	sanjuan-core-01	Metric: DOWN (TE)	DemoJitterSPOct01.isis/Backbone
10/9 14:40:36.708978	sanjuan-border-04	Drop Neighbor	sanjuan-core-01	Metric: DOWN (TE)	DemoJitterSPOct01.isis/Backbone
10/9 14:40:49.990997	saratoga-core-01	Drop InternalNet	50.84.250.152/29	Metric: DOWN (TE)	DemoJitterSPOct01.isis/Backbone
10/9 14:40:52.582356	saratoga-core-01	Add InternalNet	50.84.250.152/29	Metric: 1 (TE)	DemoJitterSPOct01.isis/Backbone
10/9 14:40:58.023677	saratoga-core-01	Add Neighbor	sanjuan-core-03	Metric: 1 (TE)	DemoJitterSPOct01.isis/Backbone
10/9 14:41:33.961469	bush-core-01	Add InternalNet	50.84.250.104/29	Metric: 28 (TE)	DemoJitterSPOct01.isis/Backbone
10/9 14:41:52.666878	bush-core-01	Add Neighbor	sanjuan-core-02	Metric: 28 (TE)	DemoJitterSPOct01.isis/Backbone

Figure 12

The routing engineer may “replay” the event list, a single event at a time to show the structure and dependencies of the failures. The entry in red marks the next event to be played. The “Execute” button at the bottom replays a single event with each click. The topology map is updated with each event playback. A down link event is marked by a red “X” in the topology map, an up event is marked by a green dot.

Some of the fine grain details revealed by Route Explorer:

- Two of the core routers flapped their adjacencies with 2 other core routers several times just prior to going down.
- All three core routers experienced total or partial outages and severe flapping of their interfaces throughout the outage.
- The outage lasted for 23 minutes.

Fine grain routing analysis from Route Explorer’s event history along with ancillary data (such as MRTG traffic graphs) can reveal the failure dependencies in your network. This information can help you diagnose a repeating cascade failure or to prevent it in the future.

HOW TO:

1. Open an X Windows or VNC session to the Route Explorer.
2. Open topology and open History Navigator (see above)
3. Show the event list for the time period of interest (see above)
4. To replay history, a single event at a time:

- a. Position red cursor in the History Navigator window timeline to where you wish to start replaying individual events. The “current” event (next event to be played and closest to the selected time) will be highlighted in red text.
- b. If you don't see the red event but the Show Current button is active, clicking that button will reposition the window to the time in the event list where the current event will be displayed.
- c. To position the current event to any event in the list simply click the right mouse button on that event and click “Take Time Here”.
- d. If you don't see the current event and if the Show Current and Execute buttons are inactive (shown in grey color), the current event is not in the first 1000 events of the period. To add the next 1000 events to the list, click the More button. Clicking this button will add another 1000 events each time.
- e. To execute the current event and see its effect on the topology, click Execute. Ensure that the topology window is visible.
- f. Continue clicking Execute to single step through the event history.