

## 6. Monitor the redundancy between ASes

From large multi-AS enterprises to multi-homed enterprises of all sizes to service providers with multiple peers, maintaining constant connectivity between ASes is a business imperative. Multiple BGP connection points between ASes for redundancy are the norm and monitoring the availability of these routes is key.

Like IGP prefix monitoring discussed above, Route Explorer can provide unmatched capability in watching, analyzing and alerting on BGP prefix redundancy. Route Explorer automatically calculates a baseline of stable prefixes over several days. Figure 12 illustrates an example AS redundancy report. The report shows all reachable ASes from this network, the next hops for each redundant path and the AS-PATH.

The screenshot displays the 'Baseline AS Reachability' report in Route Explorer™. The report is generated for the database 'ucb\_bgp\_AS25' and is sorted by AS number. The table below shows the details for several ASes, including their next hops and the AS paths used to reach them.

AS	# Next Hops	Next Hops	AS Path
65397	2	137.164.24.141 137.164.24.105	2152 16631 174 3561 65397 2152 16631 174 3561 65397
65252	2	192.0.2.52 192.0.2.33	65252 65252
65000	2	137.164.24.141 137.164.24.105	2152 16631 174 701 145 ; 150 3376 65000 ; 2152 16631 174 701 145 ; 150 3376 65000 ;
64666	2	169.229.51.225 169.229.51.229	64666 64666
64512	3	137.164.24.141 137.164.24.105 137.164.23.29	2152 16631 174 3561 64512 2152 16631 174 3561 64512 2152 2153 11537 16430 64512
64198	1	137.164.23.29	2152 2153 11537 10886 22767 64198
31758	2	137.164.24.141 137.164.24.105	2152 3356 2914 23342 31758 2152 3356 2914 23342 31758

Figure 12

In this example, the report has been sorted to show the private ASes at the top. Note that there are several. Two are directly connected and others via a transit provider at multiple peering points. Also note that one of the private AS's connection is not redundant.

Let us assume that this network that Route Explorer is monitoring provides transit for the two directly connected private ASes, which may be business units of an enterprise or research labs associated with a university. If transit is indeed being provided for these networks, making sure that the two connections from each are always available is very important. Route Explorer's UI helps you locate the prefixes advertised from these ASes. Figure 13 shows a list of neighbor ASes (at left), including the two private ASes and all the routes from one of them (at right).

The screenshot shows the Route Explorer interface. On the left, a table displays BGP peer analysis:

Peer	Neighbor ASN	Route Count
NextHop	2152	279306
LocalPref	65252	950
Internal	Internal	29
MED	7018	4
Communities	64666	2
NeighAS		
2ndHopAS		
OriginAS		
AnyAS		
ASPeers	5 entries	

Buttons at the bottom of this table include "Color Routers" and "View as Bar Chart".

On the right, a window titled "List of Prefixes for Matched Router or Attribute" displays a table of prefixes:

Prefix	Router/Net	Attributes	Area or AS	State
169.229.48.0/22				
169.229.48.0/22	128.32.1.222	Local-Pref: 100 MED: 1 AS Path: 64666 (IGP) Next Hop: 169.229.51.229	ucb.bgp/AS25	UP
169.229.48.0/22	128.32.1.221	Local-Pref: 100 MED: 1 AS Path: 64666 (IGP) Next Hop: 169.229.51.225	ucb.bgp/AS25	UP

Buttons at the bottom of this window include "Flat View", "Collapse All", "Reload", and "Close".

Figure 13

Based on its learned baseline of prefixes and AS connectivity, Route Explorer can help monitor redundancy to these prefixes. Figure 14 shows the configuration of Route Explorer's BGP Lost Redundancy Alert.

Note that any level of redundancy that you consider to be "impaired" can trigger the alert, not just singly connected. Also note that there is a watch list associated with this alert. Since the total number of BGP prefixes in the full Internet route table can be very large, Route Explorer requires the user to select the specific prefixes to watch.

The screenshot shows the "Bgp Lost Redundancy Alert Configuration" page in Route Explorer. The page title is "Bgp Lost Redundancy Alert Configuration" and the user is logged in as "admin".

The page includes a navigation menu with the following items: Home, Recorder Config., VNC, Alerts, Queries, System, Software Update, Users, View Log, View Config, Logout, Support.

The main content area is titled "Alert Notification Options" and includes the following configuration options:

- Alert Notification Options:  SNMP Trap,  Remote Syslog,  Both,  None
- Submit Notification Options: [Submit Notification Options]

The next section is "Bgp Lost Redundancy Threshold Configuration" and includes the following configuration options:

- Minimum # next-hops: [ ]
- Configure threshold: [Configure threshold]

The final section is "Watch List Configuration [Optional]" and includes the following configuration options:

- Network: [ ]
- Mask: [ ]
- Update: [Update]

Figure 14

Watching the history of BGP routes, learning a baseline of stable routes, and generating proactive prefix redundancy alerts from this knowledge is a capability not available from any network management solution other than Route Explorer. Having this capability can mean substantially reduced risk of outage in your BGP-connected networks and much higher ROI on the investment you've made in redundancy.

## HOW TO:

1. To see BGP Baseline AS redundancy, go to Route Explorer's BGP reports web page

- a. Select the report by clicking on the “Baseline AS Reachability” link
  - b. Select a database from the DB drop-down menu
  - c. Select the time of the baseline (“latest” or a time in the past)
  - d. Click “Submit Query”
2. To see the neighbor ASes in the Route Explorer UI and get a list of route from each:
    - a. Open the Route Explorer UI
    - b. Open the online and recording network topology
    - c. To access the RIB Browser, open Tools-> History Navigator
    - d. In the History Navigator window, click “Analysis” drop down menu and select “RIB Browser”
    - e. The current RIB will be analysed and summarized in a window.
    - f. Click the “NeighAS” tab at the left.
    - g. Select the AS of interest, and right click on the row
    - h. Select Show Details in the pop-up menu. A second window will appear with the list of prefixes from that AS.
  3. To place a prefix from the neighbor AS on the BGP Prefix Redundancy watch list be alerted, select “Bgp Lost Redundancy” in the Alerts page of the Route Explorer Admin page
    - a. Select the alert notification options (SNMP and/or Syslog)
    - b. Enter the number of next hops remaining when you wish to be alerted. Normally this would be one.
    - c. Enter the prefix you wish to watch into the watch list.
    - d. To see the alert from Route Explorer, you must also enable it in your SNMP manager, or view it on your Syslog server