

What is Route Flap Convergence?

Agilent Technologies RouterTester
Application Note

Introduction

Routers in the Internet core exchange between three and six million routing prefixes each day, and the fluctuation of network topology can have a direct impact on a router's performance. A router that has not yet reached convergence in its internal routing tables may drop packets or deliver packets to the wrong next-hop router. Topology changes in the Internet must be reflected in both the routing and forwarding tables within routers. The router architecture illustrated in Figure 1 indicates that the routing table and the forwarding table are likely to be implemented in separate hardware modules within routers. In fact, in modern carrier-class routers, the forwarding table is often duplicated on each line card. The operations by which changes propagate from the routing table to the forwarding tables are potentially complex, and certainly very time-critical. These databases must remain closely synchronized or routing loops and packet loss are likely.

Route flapping refers to pathological conditions (hardware errors, software errors, configuration errors, unreliable connections, etc.) within the Internet that



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The operations by which changes propagate from the routing table to the forwarding table are potentially complex, and can have a direct impact on the forwarding performance and QoS delivery of a router.

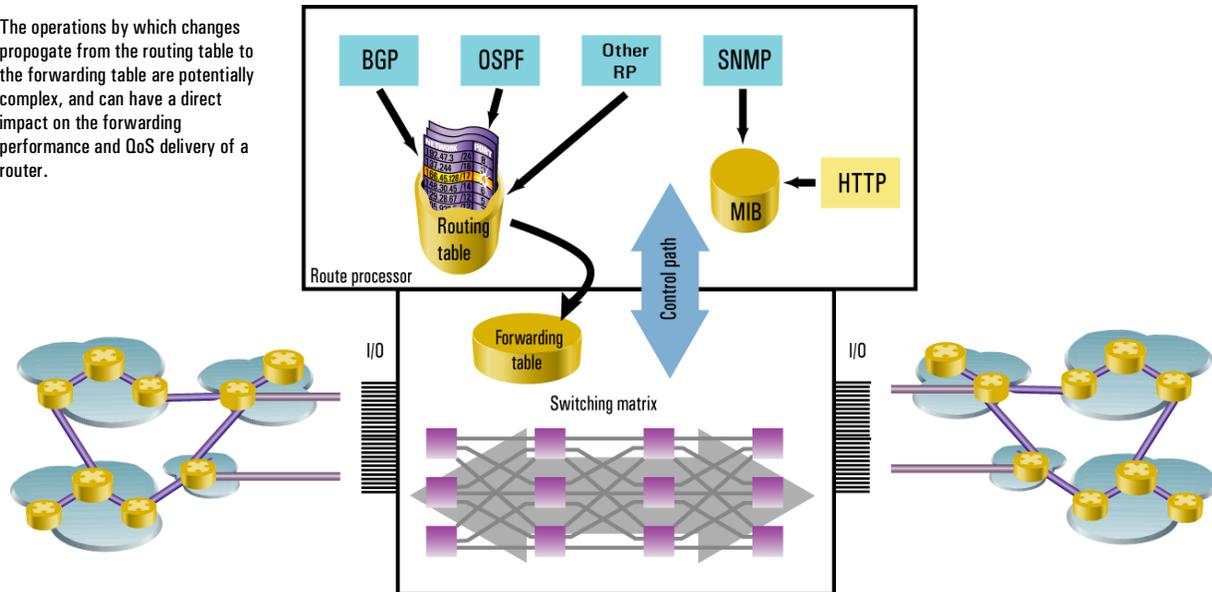


Figure 1: High performance router

cause certain reachability information to be repeatedly advertised and withdrawn. Route flapping often forces a router to recalculate a new or preferred route to a particular network, while traffic destined for that network is in transit through the router. Convergence refers to the time it takes for a router to process a routing update, calculate a new preferred route, and then update its forwarding table(s). High performance routers are expected to perform these process-intensive calculations while forwarding traffic at wire speed, and maintaining quality of service guarantees. However, routers may experience increasing levels of packet loss, delay, and time to reach route convergence.

Tests that verify the timing and accuracy of data forwarding with respect to routing changes will test the interaction between the forwarding and routing tables and

reveal the router's ability to effectively converge routing information while forwarding traffic at wire-speed. By dynamically manipulating the simulated Internet topology as traffic is generated through the router under test, Agilent Technologies' RouterTester evaluates how the forwarding performance of the router is effected by routing instabilities.

Figure 2 depicts a test scenario that stresses the interaction between the routing table and the forwarding table. By flapping specific routes to a particular simulated network, RouterTester forces the router under test to compute alternate paths to the destination networks. RouterTester then delivers performance measurements for the traffic streams in real-time to determine how throughput, latency and loss metrics are affected as the router calculates and ultimately forwards traffic across the alternate routes.

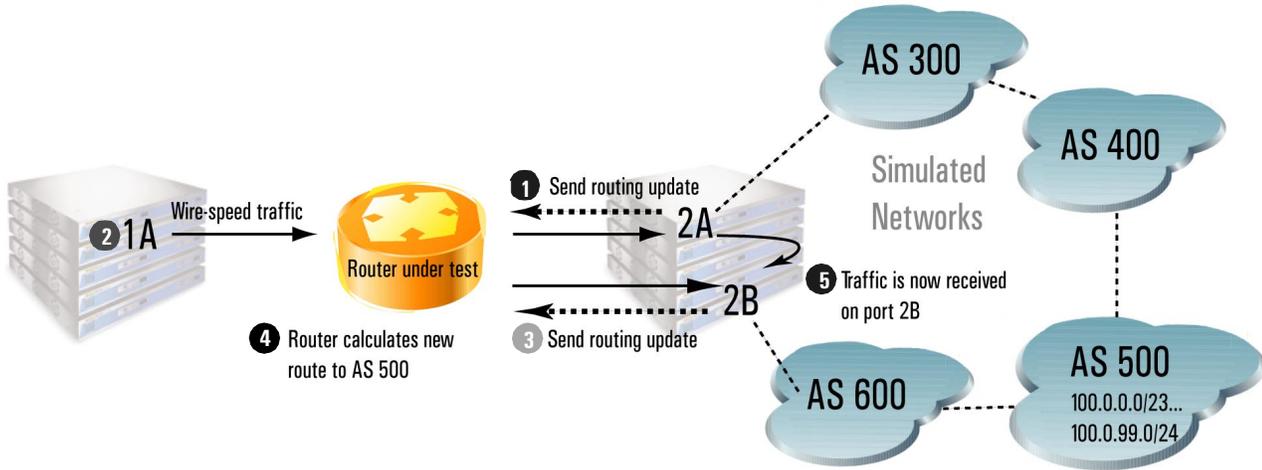


Figure 2: Testing route convergence

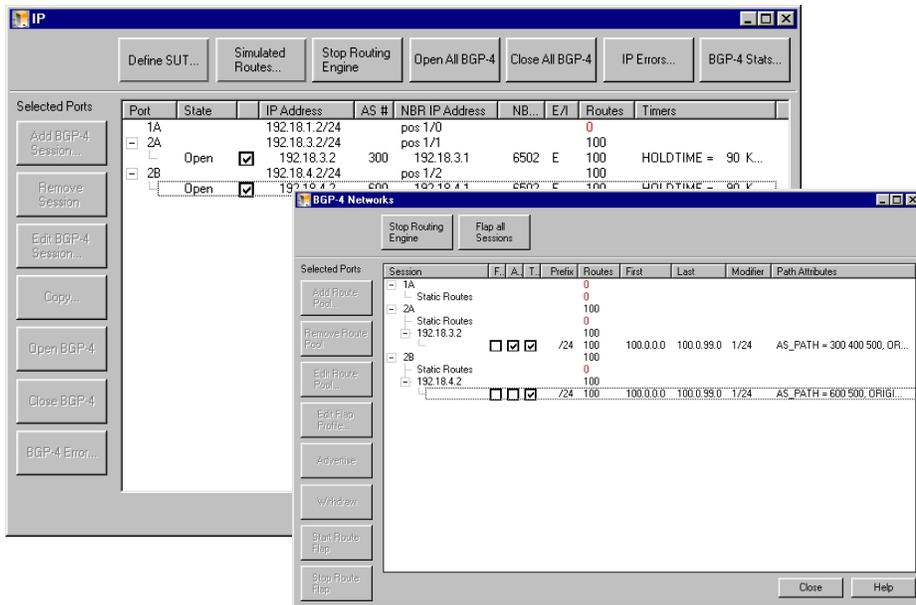


Figure 3: Internet simulation

Basic test steps

- As shown in Figure 3, RouterTester establishes BGP-4 peering sessions with the router under test, and port 2A advertises routes to a set of destination networks via AS_PATH 300, 400, 500.
- Port 1A generates wire-speed traffic to the destination networks through the router under test.
- As shown in Figure 2, while traffic is still being generated to the destination networks, port 2B advertises new preferred routes to the destination networks via AS_PATH 600, 500.
- The router calculates new routes the destination networks, and the routing table changes are propagated to the forwarding table.
- Traffic is now received on port 2B.

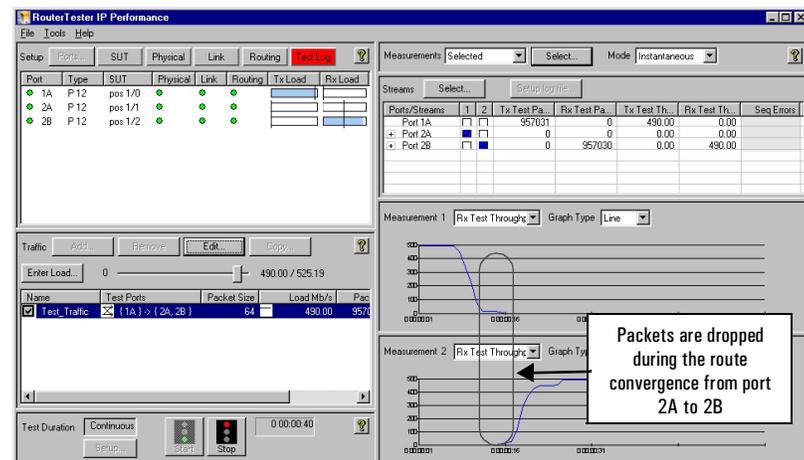


Figure 4: IP Measurements



Agilent Technologies RouterTester

RouterTester provides true Internet-scale testing through realistic routing protocol support, multi-stream wire-speed traffic generation and real-time analysis, and multi-port scalability. RouterTester is set to grow as the testing needs of the carrier class router industry evolve to meet the challenges of scale and Quality of Service within the Internet.

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