ETALIQ
intelligent quality

Test Automation:

Do More Testing with Less Hardware

A Case Study
by Etaliq Inc.

innovation in automation

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Brackground

Test automation is normally written for specific configurations where the test will setup, test, and then unconfigure the test lab resources. Using this methodology means that each script begins knowing that it has exclusive use of the lab and will be unaffected by other scripts that have run. On the positive side, re-running of scripts due to false failure happens less often, while on the negative side, most scripts do not set up elaborate configurations upon which to test.

Executive Summary

Who • Carrier class network equipment provider • Over 10,000 engineers
Challenge • Determine current testbed configuration, and adapt test cases to suit • Give summarized reports of result by combination
Solution • ETA Client and Server Install • 4 person months development time • Developed a configuration reader • Created 130 adaptable tests
Result • Up to 2,500 results per day, per testbed • ROI well beyond expectations

Traditionally, automation lab setups normally used five nodes configured respectively as CE, PE, P, PE and CE. Each script would operate on a single specific configuration, normally using one or several interfaces, one topology type, one routing type and one or more hardware types. Some scripts could be run multiple times to expand coverage to include additional interfaces, topology types, routing and hardware types.

Challenge

The challenge was to create a methodology to reduce hardware resource requirements, increase the complexity of the configurations being tested, and provide the ability to test many different configurations on separate lab setups with the same

set of tests. Additionally, the objective was to reduce the number of times configurations were added and removed from the test lab configuration.

They wanted a tool that would determine current hardware and software configuration, and adapt as many tests as possible to run against it. The tool would need to connect to all lab devices and determine end to end data paths, as well as connect to a pre-configured traffic generator/analyzer and match up the streams and routes with the testbed configuration. The tool would then run a set of tests. Summarized reports would show which tests were actually run as opposed to those that were not applicable to the existing configuration as well as summarize how well the tests had performed with unique results for Node Class, Card Type, Spa Type, Link Type, connection Topology and Routing Types.

No Automated Test Utility of this type had ever been attempted in this organization.

Testbed Details

Two unique devices under test (DUTs) are used simultaneously when source CE/PE pairs are unique while sink P/PE/CE are common. This was done to reduce the overall dual lab setup by three nodes, while creating two virtual automation labs. This provided the ability to use this single lab setup as separate automation labs. The testbed in question is preconfigured with up to 1,000 unique interfaces, while supporting many combinations of topology, routing, traffic and interface types.

"Combining two testbeds into one with Common sink nodes, reduced the hardware setup requirements by 30%."

Requirements

The system must analyze its own and shared portions of the testbed, determining its hardware and configuration content and which of the connections are up and operational. Further basic verifications of all hardware, interfaces, routes and connections would identify which components of the configuration were eligible for further testing. Failure reports would identify which components had specific problems requiring further investigation.

More specific testbed and configuration details are given at the end of this document.

Solution

ETA was installed on a new Linux server. Etaliq provided a custom Node Class to match their DUTs. In two days the test system was operational, and they started the development process.

A Senior Etaliq Automation Engineer produced the custom system they desired in just three months. An existing Senior Networking Engineer worked alongside part-time to verify the system, and independently write new test cases for the system.

While the Automation Engineer worked to create a configuration reader and verifier, the Network Engineer set up the new combined shared testbed.

Results

Four person months of combined effort produced a configuration reader in only 2,000 lines of code. The tools is fast and moderately complex and requires the support of a Senior

Automation Engineer. However, two DUTs are tested simultaneously, providing 30% savings in lab resources. The two simultaneous executions are providing up to 2,500 unique test results in a 24 hour period. Each unique result contains the required attributes for Node Class, Card Type, Spa Type, Link Type, connection Topology and Routing Types. The configuration reader applies to many testbeds and operates against all existing hardware, software, topology and routing configuration specifications tested.

The system is highly reliable, and sees frequent us during the development and feature test cycles.

In total, 130 test cases are part of the system, each providing up to 30 unique sub-test results. Test cases are created with, on average, 200 lines of ETA code each. Existing automation and non-automation resources are able to add or modify test cases themselves with only a couple hours of training.

The complex configuration highlighted many defects within the product in only its first project. The client has begun the process of expanding this type of lab setup throughout the business unit providing much more savings in lab resources. Additional automation labs are being set up using the hardware saved from previous installations, contributing to the ability to get even more configuration-specific results on a daily, weekly and monthly basis. Additional scaled complex configurations are being created, emulating many of their own clients' most popular configurations, further enhancing test coverage in general.

The project has been a huge success providing many significant ROI savings in both human and lab resourcing.

Appendices

General Requirements

1. For Topology related components:

   (a) Traffic movement, Ping, Traceroute, Statistics, and States
2. Interfaces Operations:
   (a) Flap, Config Modification, Various Framing/MTU/IP Change
3. Routing Operations:
   (a) Disable/enable, flap, flood, modify configuration, un-config/re-config
4. Applications:
   (a) QoS, Filter, Marking, Stats gathering, traffic
5. Availability:
   (a) Router, Line card, Spa reloads, Process kill/restart, Redundancy Switchovers
6. Topology Specific:
   (a) L2VPN, L3VPN

Network Requirements

1. Layer 2 controller and interface/sub-interface configurations required:
   (a) Channelized support for DS0, T1, T3, Sonet (STS)
   (b) Bundled interface support for POS and Ethernet
   (c) Multi-link interface support for Frame-Relay and PPP
   (d) Sub-interface support for Frame-Relay and VLAN
   (e) Main interface support for Serial (HDLC, PPP), FastEthernet, GigEth, TenGigE, POS, Frame-Relay
2. Routing protocol support
   (a) Edge routing support for BGP, OSPF, IS-IS, RIP, and Static
   (b) Create filters such that each unique traffic path gets traffic and flooding routes
   (c) Core support
      i. Tunnels
      ii. Any routing protocol
      iii. MPLS or IP Core
3. Topology support:
   (a) CE, PE, P, class router configurations

   (b) VRF: VPNv4, VPNv6, Dual Stack, with Multi-Physical links possible per VRF
   (c) L2VPN: Pseudo-wire, Bridge Domains
   (d) Native: All
   (e) MPLS or IP Core
4. Configured Traffic support for
   (a) IPv4, IPv6
   (b) Mcast v4
   (c) Mcast v6
   (d) Igmp/Pim

Traffic Analyzer/Generator Requirements

1. Streams
   (a) CE to CE
   (b) Added for all end-to-end paths
   (c) Configured with correct Total bandwidth for each Path
   (d) Any combination of IPv4, IPv6, Mcast v4, Mcast v6
2. Routing
   (a) BGP routes generated for all above noted Traffic Paths
   (b) Additional BGP Flooding Routes generated for Stress
3. Multicast
   (a) Sources and Groups for all Mcast Streams
   (b) PIM or IGMP
   (c) Joins, Leaves, . . .