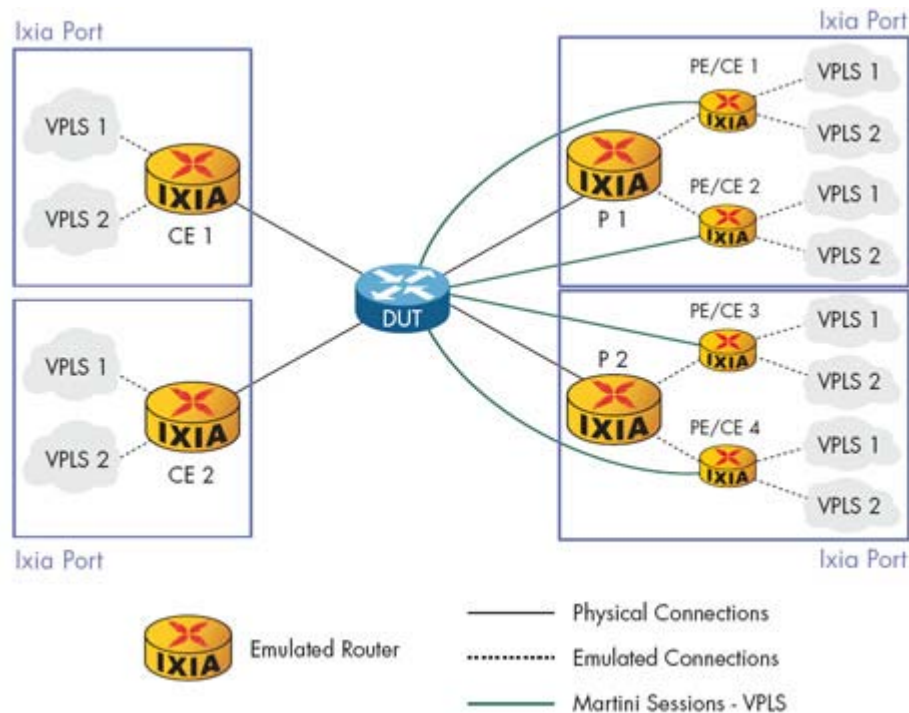


IxNetwork VPLS Emulation Software

Ixia's Aptixia IxNetwork Virtual Private LAN Services (VPLS) Test Solution emulates both the control and data planes for the complete performance and functional testing of VPLS capable devices. For highly flexible and detailed testing, Ixia's IxNetwork application allows for the comprehensive control of the protocol state machines required to emulate and test VPLS systems. For automated testing, Ixia's IxAutomate (formerly IxScriptMate) application supports a suite of VPLS tests that a simple and quick-to-use interface for setting up large and complex test scenarios. Together, these applications provide the complete solution for stressing and validating Provider Edge (PE) routers supporting VPLS per the IETF Standards and drafts, which define the technology.

The VPLS Test Solution operates in conjunction with Ixia's routing (OSPF, ISIS) and MPLS (LDP, RSVP-TE) protocol emulations required to establish the network topology and Virtual Private Network (VPN) signaling for building a VPLS network. Ixia's Graphical User Interface (GUI) allows for a wide array of configuration options and features. VPLS tests can be constructed in a many-to-many configuration across multiple device ports. Multiple Virtual Circuits (VCs) can be established, corresponding to multiple Virtual Switching Instances (VSIs) residing in the service provider network.

The Ixia VPLS Test Solution is supported on a number of Ixia Ethernet-based Load Modules which feature a CPU per port. Multiple Ixia protocol emulations can be run concurrently on each test port together with wire-speed traffic generation to simulate real-world networks.



Test environment for VPLS

Key Features

- Emulate hundreds of PE routers per Ixia test port
- Support both VPLS flavors: the LDP extended and the MP-iBGP (K. Kompella draft)
- Signal hundreds of thousands of VCs per Ixia test port
- Establish hundreds of IGP adjacencies per Ixia test port
- Facilitate test setup with easy-of-use yet powerful protocol wizard
- Automate testing with scripts supporting session scalability, traffic performance, and L2 address cache scalability
- Configure large entries of VC Forwarding Equivalency Class (FEC) ranges and MAC addresses quickly using Ixia's powerful spreadsheet entry mode
- Modify configuration entries while state machines are running to simulate realistic network conditions
- Purge MAC addresses using VPLS withdraw messages
- View and filter both tunnel and VC (Martini/VPLS) learned labels

- Generate and analyze up to wire-speed MPLS traffic over emulated topologies with full control of MAC address and VLAN information
- Debug control plane operation with comprehensive trace feature
- LDP-VPLS auto-discovery support using BGP

Test Automation

To simplify VPLS device testing, a number of test suites are available in Aptixia IxAutomate application that automate the testing process. These tests provide an easy-to-use interface for configuring test parameters and executing timed tests. Results are directly generated and displayed. The following tests are available for VPLS testing:

Peer-to-Peer Throughput Test

Analyzes the data plane throughput of a PE router using VPLS to route traffic to and from customer edge (CE) routers. This test uses a one-to-one traffic map in which each port transmits to a single destination port.

Partially-Meshed Throughput Test

Similar to the Peer-to-Peer test except a partial-mesh traffic pattern is used in which multiple ports transmit to the same destinations.

Address Cache Capacity Test

Determines the maximum number of MAC addresses the router's Layer 2 VPLS forwarding table can maintain at a single time.

Address Rate Test

Determines the maximum rate at which a VPLS-enabled router can learn the MAC addresses of VPLS endpoints.

LDP Extended Discovery Session Scalability Test

Determines the maximum number of LDP extended discovery protocol sessions the router can sustain at once per physical port.

VC Scalability Test

Determines the maximum number of LDP-VPLS VCs the router can sustain at once per physical port.

Emulation Flexibility

Ixia's VPLS Test Solution supports the emulation of multiple P, PE, and CE routers within a test network. Both flavors of VPLS – using either LDP extended or using MP-iBGP (also known as K. Kompella VPLS or simply BGP VPLS) as the signaling protocol for the VPLS instance label – are supported. One or more VPNs (corresponding to VPLS VSIs) can be emulated per PE router. CE interfaces can be configured as 802.1Q trunks with appropriate VLAN tags. Real network scenarios can be simulated via session flapping or MAC address withdrawals. IGP and MPLS signaling protocol metrics can be introduced real-time allowing for pre-emption and prioritization techniques to be tested. This flexibility allows test engineers to construct complex test scenarios. Once tests have been customized, the configurations can be exported via a Tcl conversion tool.

In addition, BGP auto-discovery mechanisms can be tested with LDP-based VPLS. Use IxNetwork to advertise BGP L2VPN NLRI information to verify the SUT's discovery capability, and use the convenience of IxNetwork to dynamically learn VPLS information from the SUT and automatically establish LDP-VPLS VCs.

High Scalability

Hundreds of VPLS VPN sessions and hundreds of thousands of FECs can be advertised from a single Ixia test port. Across an Ixia chassis, these capacities scale by several orders of magnitude, enabling the simulation of large size networks with a minimum amount of test hardware. Each Ixia VPLS test port supports its own CPU for control plane emulation, providing dedicated resources to each network interface and allowing users to increase test size with port density. Protocols can be run simultaneously over each port in conjunction with data plane traffic generation and analysis. Once tests have been configured, they can be easily manipulated or increased/decreased on the fly.

Traffic Generation

Traffic generation for data plane verification is one of the key components in VPLS system testing. Ixia offers a simple and automated mechanism to generate VPLS traffic. Once the control plane has been established and tunnel and VC labels have been learned, a stream generation tool provides an easy-to-use tool to automatically build traffic flows. These flows are configured with the appropriate MPLS labels learned via the control plane. Statistical and graphical views

are available to view and correlate results. In the IxScriptMate environment, traffic verification is completely automated.

Easy-to-Use GUI

Ixia's IxNetwork spreadsheet-based GUI facilitates the entry of large configurations for protocol emulations. A test environment can be customized by displaying only the relevant protocol values. A range of parameters can be selected and the values automatically populated as an increment or decrement from the first value in the range. This allows for very quick configuration of large scale topologies. VPLS configurations can be copied/pasted across multiple interfaces. Customizable statistics views allows users to create their own presentation of results applicable to the test they are running. This data can be exported in different formats as well. Graphing tools are available for visual display of test results.

Tcl Automation

The Ixia Tcl Automation Environment provides complete control of VPLS configurations and testing via Tcl, the most popular test scripting language in the industry. Automated scripts can be quickly created to establish configurations and execute tests. Alternatively, the IxNetwork GUI can be used to set up test configurations, and then the ScriptGen utility used to translate the GUI settings to Tcl code. Tcl support is available on both Windows and UNIX platforms.

Specifications

Feature	Description
Tunnel Signaling	LDP Basic discovery or RSVP-TE sessions
VPLS Signaling	LDP Extended Martini MP-iBGP LDP with BGP-AD
Label Advertising Mode	Downstream Unsolicited
Emulated VCs	Ethernet (Type 5), VPLS (deprecated) (Type B)
VC FEC Parameters	General: Peer, VC ID, C-Bit, MTU, Description, Label Start, and Label Increment Mode
MAC Address Withdrawal	Individual MAC and entire VC purge using MAC TLV

Flapping	Sessions, emulated Layer 2 groups, and individual VC. FEC ranges can be flapped on demand
Labels	Create, advertise, and withdraw VC FEC entries. VC FEC information, peers and label spaces displayed for learned labels. VC FEC learned labels can be filtered based on Peer Address, Label, Group ID, VC Type, VC ID, and interface description.
Diagnostics	Elapsed time (msec) for advertising or withdrawing FEC entries, notifications, and debug messages

Requirements

- IXIA 250, 400T, 1600T, Optixia X16 or Optima XL10 chassis
- At least one Ixia Load Module: Gigabit TXS, LSM10GE, OC-3/12 POS/ATM, MSM 2.5G (OC-48c), MSM 10G (10GE, OC-192c POS), ALM, ELM
- LDP Emulation Software
- L2 VPN Emulation Software
- IxScriptmate 4.10 or later

IETF Standards

- LDP Specification, RFC 3036
- LDP Applicability, RFC 3037
- LDP State Machine, RFC 3215
- Transport of Layer 2 Frames Over MPLS, RFC 4906
- Virtual Private LAN Service (VPLS) Using Label Distribution Protocol (LDP) Signaling, RFC 4762
- Virtual Private LAN Service (VPLS) Using BGP for Auto-Discovery and Signaling, RFC 4761
- Provisioning, Autodiscovery, and Signaling in L2VPNs, draft-ietf-l2vpn-signaling-08

Pseudo-wire emulations:

- Encapsulation Methods for Transport of Ethernet Frames over MPLS Networks, RFC 4448
- Encapsulation Methods for Transport of ATM over MPLS Networks, RFC 4717
- Encapsulation Methods for Transport of Frame Relay over MPLS Networks, RFC 4619

- Encapsulation Methods for Transport of PPP/HDLC over MPLS Networks, RFC 4618
- SONET/SDH CES over MPLS Encapsulation, RFC 5143

Product Ordering Information

930-2014

Aptixia IxNetwork, Optional Software, MPLS RSVP-TE Emulation; Includes Media Kit

930-2015

Aptixia IxNetwork, Optional Software, MPLS LDP Emulation includes Layer 2 MPLS VPN and VPLS support; REQUIRES 930-1999; Includes Media Kit

930-2001

Aptixia IxNetwork, Optional Software Bundle, IPv4 Routing Protocols; Includes 930-2005 BGP-4 Emulation, 930-2008 OSPFV2 Emulation, 930-2010 IS-IS Emulation, 930-2012 RIPV2 Emulation; REQUIRES 930-1999; Includes Media Kit

930-2003

Aptixia IxNetwork, Optional Software Bundle, MPLS VPN; Includes 930-2006 Layer 3 MPLS/VPLS Support, 930-2014 RSVP-TE Emulation, 930-2015 LDP Emulation; REQUIRES 930-1999 and 930-2001 Optional Software Bundle, IPv4 Routing Protocols; Includes Media Kit

930-2006

Aptixia IxNetwork, Optional Software, BGP4 Emulation with additional Layer 3 MPLS/VPN, VPLS & Multicast VPN Support; REQUIRES 930-1999 Base Software AND 930-2005 BGP4 emulation

930-2052

Aptixia IxNetwork, Optional Software, LDP extension to support FEC 129; REQUIRES: 930-1999 Base Software, 930-2005 BGP Emulation, 930-2006 BGP ext to support MPLS L3VPN/L2VPN/VPLS, 930-2015 LDP Emulation

Companion Test Automation Libraries

928-0284

Aptixia IxAutomate, Optional Software, VPLS Test Suite

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