IXNETWORK—ROUTING AND SWITCHING TEST SOLUTION

DATA SHEET

VALIDATE INTERNET BACKBONE ROUTING AND SWITCHING

PROBLEM: EXISTING NETWORK STRAINED WITH INCREASED BANDWIDTH DEMAND AND COMPLEXITY

Routing and switching are fundamental Internet backbone infrastructure, providing Ethernet and IP underlay for value-added overlay networks and services. To handle the heterogeneous requirement of the Internet, a set of protocols provide Layer 2 and Layer 3 connectivity across different networks, apply traffic engineering aspects to optimize routing, connect multiple administration domains with policy control, implement fast failure detection and recovery mechanisms, handle abnormal condition, etc. These are all essential to provide a scalable and highly available backbone network. With exploding Internet users and services, as well as the complexity of the network, it is critical to ensure the core network infrastructure can be scaled out with robustness to meet today's business demand with satisfied service level agreement (SLA).

SOLUTION: COMPREHENSIVE TESTING TO ENSURE HIGHLY-AVAILABLE AND ROBUST NETWORK INFRASTRUCTURE

HIGHLIGHTS

- Test Internet infrastructure under realistic conditions with mixed routing and switching protocols running simultaneously
- Test Internet scale with emulation and real Internet routing table import
- Ensure core network high availability by validating the robustness of devices handing abnormal behaviors, through session and route flapping test, as well as long duration test
- Qualify the ability of fast failure detection and sub-second recovery
- Validate graceful restart and routing convergence capability to reduce network instability and downtime
- Assess network readiness to handle mixed IPv4 and IPv6 Internet routes and traffic
- Benchmark data forwarding performance to ensure satisfied latency/jitter and other KPIs
- Characterize performance of multicast infrastructure to efficiently deliver multicast traffic with replication

The IxNetwork Routing and Switching test solution provides a rich set of routing and switching protocol emulations to qualify performance at Internet scale, convergence and failover, restart capability, as well as benchmarking suites for data forwarding performance. It enables users to stress devices and networks under realistic conditions, measure key performance indicators (KPIs) to meet deployment requirements, validate IPv6 readiness of core network infrastructure to ensure smooth network upgrade and new network creation supporting value-added services.

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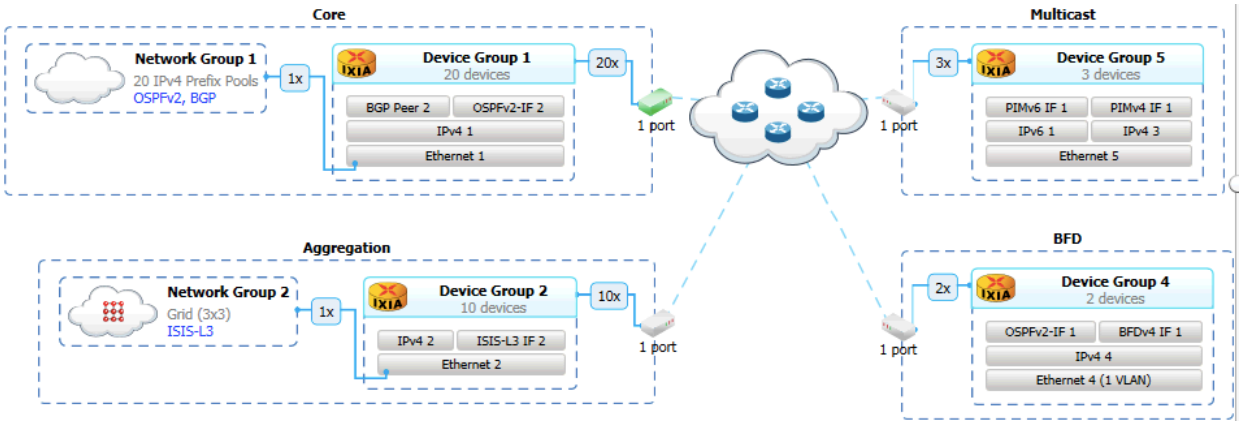
KEY FEATURES

- Emulates IGP speaking routers, supporting ISIS, OSPF, EIGRP and RIP, advertises a large number of routes, and simulates complex IGP topology to test protocol functionality, scale, and performance
- Emulates both IBGP and EBGP advertising large number of routes to stress test DUT performance and policy control, as well as importing real internet routes to validate DUT performance under real internet routing table
- BFD emulates heartbeat sessions along with routing protocols to validate quick failure detection and failover recovery to ensure minimum interruption on network failure
- BGP FlowSpec emulation validates DDoS mitigation as well as policy enforcement in SDN networks at scale with flow match and actions.
- Flexible action sets simulate dynamic network condition with routing sessions and routes flapping to validate the stability and robustness of the implementation handling abnormal behavior of internet network.
- Running multiple protocols simultaneously over one or multiple ports along with line-rate traffic to simulate real network condition
- Emulates Link Aggregation with LACP bundle or static bundle to qualify routing protocols and traffic over LAG
- Support IPv6 version of above mentioned routing protocols to test IPv6 control and data plane performance and mixed v4/v6 support to ensure IPv6 readiness of core network
- Emulate PIM-SM/SSM, IGMP/MLD querier and receiver to qualify multicast infrastructure forwarding and replicating multicast traffic
- Emulate NTP client to validate NTP server function and scale/performance to support large number of NTP clients
- Packaged RFC 2554, 2889, 3918 QuickTest to benchmark data forwarding performance of routing and switching devices and end-to-end networks



IxNetwork scaled routing topology emulation

SPECIFICATIONS

BGP	
Standards	• RFC4271 - A Border Gateway Protocol 4 (BGP-4) • RFC2545 - Use of BGP-4 Multiprotocol Extensions for IPv6 Inter-Domain Routing • RFC4456 - BGP Route Reflection: An Alternative to Full Mesh Internal BGP (IBGP) • RFC1997 - BGP Communities Attribute • RFC5065 - Autonomous System Confederations for BGP • RFC4724 - Graceful Restart Mechanism for BGP • RFC6793 - BGP Support for Four-octet AS Number Space • RFC 7311 The Accumulated IGP Metric Attribute for BGP • RFC 7911 Advertisement of Multiple Paths in BGP • draft-uttaro-idr-bgp-persistence-03 BGP Long-lived BGP Graceful Restart • RFC 8092 – BGP Large Communities Attribute
Protocol Messages	• OPEN • UPDATE • KEEPALIVE • NOTIFICATION
Capabilities	• IPv4 Unicast • IPv4 Multicast • IPv4 MPLS VPN • IPv6 Unicast • IPv6 Multicast • IPv6 MPLS VPN • IPv4 MDT • VPLS • IPv4 Multicast VPN • IPv6 Multicast VPN • Route Refresh • Route Constraint • Link State Non-VPN • EVPN

BGP	
Path Attributes	• ORIGIN • AS_PATH • NEXT_HOP • MULTI_EXIT_DISC • LOCAL_PREF • ATOMIC_AGGREGATE • AGGREGATOR

OSPFV2 AND OSPFV3	
Standards	• RFC 2328 - OSPF Version 2 • RFC3101 - The OSPF Not-So-Stubby Area (NSSA) • RFC3623 - Graceful OSPF Restart • RFC 4203 OSPF Extensions in Support of Generalized Multi-Protocol Label Switching (GMPLS) (SRLG, Link Protection) • RFC4811 - OSPF Out-of-band Link State Database (LSDB) Resynchronization • RFC4812 - OSPF Restart Signaling • RFC4813 - OSPF Link-local Signaling • RFC 5250 - The OSPF Opaque LSA Option • RFC 5340 - OSPF for IPv6 • draft-katz-yeung-ospf-traffic-10.txt - Traffic Engineering Extensions to OSPF Version 2 according to • RFC 7166 – Supporting Authentication Trailer for OSPFv3
OSPFv2 LSAs	• Router • Network • Summary • Summary type 4 • AS-External • Traffic Engineering • Opaque LSA • NSSA

OSPFV2 AND OSPFV3	
OSPFv3 LSAs	• Router • Network • Inter-Area-Prefix • Inter-Area-Router • AS-External • Link • Intra-Area-Prefix
Protocol Message Types	• Hello • Database Description • Link State Request • Link State Update • Link State Acknowledgement
Router Types Supported	• Intra-Area Routers • Area Border Routers • Autonomous System Border Routers • Boundary Routers
Configuration Options	• Hello interval • Dead Interval • Area ID (decimal or IP notation) • Network Type (Point-to-Point, Broadcast) • MD5 • Password • Enable/Disable Graceful Restart • Enable/Disable DR/BDR
Statistics	• OSPF Sessions Configured • OSPF Neighbors in full state • Down State Count • Attempt State Count • Init State Count

OSPFV2 AND OSPFV3	
	• Two Way State Count • ExStart State Count • Exchange State Count • Loading State Count • Full State Count • Hellos TX/RX • DBD TX/RX • LS Request TX/RX • LS Update TX/RX • LS Ack TX/RX • LinkState Advertisement TX/RX • LSA Acknowledge TX/RX • Router LSA TX/RX • Network LSA TX/RX • Summary IP LSA TX/RX • Summary AS LSA TX/RX • External LSA TX/RX • NSSA LSA TX/RX • Opaque Local LSA TX/RX • Opaque Area LSA TX/RX • Opaque Domain LSA TX/RX • GraceLSA Rx • HelperMode Attempted • HelperMode Failed
Learned Information	• Link State ID • Advertising Router • Link Type • Sequence Number • LSA age.

ISIS V4/V6	
Standards	• ISO/IEC 10589 - IS-IS intra-domain routing protocol • RFC 1195 - Use of OSI IS-IS for Routing in TCP/IP and Dual Environments according • draft-ietf-isis-ipv6-02.txt - Routing IPv6 with IS-IS • draft-ietf-isis-traffic-04.txt - IS-IS extensions for Traffic Engineering • draft-ietf-isis-restart-os.txt - Restart signaling for IS-IS • RFC 5307 ISIS Extensions in Support of Generalized Multi-Protocol Label Switching (GMPLS) (SRLG, Link Protection)
Configuration Option	Router Types • Level 1 • Level 2 • Level 1+2 Network Types • Point-to-Point • Broadcast Area Address Adjacency Parameters • Interface IP addresses • Mask • Metric • ID • Hello Interval • Dead Interval • LSP Refresh Rate • LSP Lifetime • Max LSP Size Route Range Parameters • Route IP addresses • Mask • Metric • IP Type (IPv4 or IPv6)

ISIS V4/V6	
	• Router Origin Network Range (Grid) Parameters • Route IP addresses • Mask • Metric • Router IDs • number of Rows • number of Columns • Entry Row • Entry Column • Link Type • IP Type (IPv4 or IPv6) Traffic Engineering • Link Metric • Administrator Group • Maximum Bandwidth • Maximum Reservable Bandwidth • Unreserved Bandwidth (Priority 0-7) • TE Path Authentication Graceful Restart Flapping
Statistics	• Session Configured • Session Up • Neighbors • DB Size • Hellos TX/RX • PTP Hellos TX/RX • LSP TX/RX • CSNP TX/RX • PSNP TX/RX

RIP/RIPNG	
Standards	• RFC 2453 - RIP Version 2 • RFC 2080 - RIPng for IPv6 • RFC 2081 - RIPng Protocol Applicability Statement
Protocol Options	RIP Transmit Packet Mode • Multicast (default) • Broadcast V1 • Broadcast V2 RIP Transmit Packet Mode • Multicast (default) Response Mode: • Split Horizon • Split Horizon, Poison Reverse Others • Update Interval • Update Interval Offset Route Ranges • Router IP address • Route Tag • Network Mask • Next Hop • Metric

EIGRP	
Standards	• Cisco EIGRP
Configuration Options	**EIGRP Router:** • Router ID • AS Number • Active Timer, K1, K2, K3, K4, K5, • EIGRP Major Version

EIGRP	
	• EIGRP Minor Version • IOS Major Version • IOS Major Version Asynchronous **Interfaces:** • Hello Interval • Hold Time • Poisoned Reverse (enable/disable) • Bandwidth • Delay • Load • Reliability • Max TLV/Update **Route Ranges:** • First Route • Mask Width • Number of Routes • Next Hop • Hop Count • Internal/ External Type • Bandwidth • Delay • Load • Reliability • MTU size • Packing (enable/disable) • Destination Count
Statistics	**General Statistics:** • Routers Configured • Routers Running • Neighbors Learned

EIGRP	
	• Hello TX/RX • Updates TX/RX • Queries TX/RX • Replies TX/RX • ACKs TX/RX • Packets TX/RX • Routes TX/RX • Routes Withdrawn TX/RX • Retransmission Count • Routes Learned
Learned Routes	• Destination • Prefix Length • Type • FD • RD • Neighbor • Hop Count • Next Hop

BFD	
Standards	• RFC 5880 – Bidirectional Forwarding Detection (BFD) • RFC 5881 – Bidirectional Forwarding Detection (BFD) for IPv4 and IPv6 (Single Hop) • RFC 5882 – Generic Application of Bidirectional Forwarding Detection (BFD) • RFC 5883 – Bidirectional Forwarding Detection (BFD) for Multihop Paths • RFC 5884 – Bidirectional Forwarding Detection (BFD) for MPLS Label Switched Paths (LSP)

BFD	
Supported Protocols	• BGP and BGP+ • OSPF v2+v3 • ISIS v4+v6 • EIGRP • PIM-SM v4+v6
Configuration Options	**Modes:** • Asynchronous • On-demand • Echo with user configuration interface and timeout **Session:** • Session Type (single or multi-hop), • End-point IP types (v4 or v6), • Remote IP address, • My Discriminator, • Enable auto chosen source, • Enable remote discriminator learnt
Statistics	**General Statistics:** • Routers Configured • Routers Running • Control Tx/Rx • Echo Self Tx/Rx • Echo DUT Loop Back • Echo DUT Received • Session Configured • Session Auto-Created • Configured UP-Sessions • Auto-Created UP-Sessions

BGP FLOW SPECIFICATION	
Standards	• RFC 5575 – Dissemination of Flow Specification Rules • draft-ietf-idr-flow-spec-v6-08 - Dissemination of Flow Specification Rules for IPv6 • RFC 7674 – Clafication of the Flowspec Redirect Extended Community • draft-ietf-idr-flowspec-redirect-ip-02 • RFC 8092 – BGP Large Communities Attribute
Capability	• AFI 1 / SAFI 133 (IPv4 Unicast Flowspec) • AFI 2 / SAFI 133 (IPv6 Unicast Flowspec)
Match Components Type (IPv4)	• Type 1 – Destination Prefix • Type 2 – Source Prefix • Type 3 – IP Protocol • Type 4 – Port • Type 5 – Destination port • Type 6 – Source port • Type 7 – ICMP • Type 8 – ICMP code • Type 9 – TCP flags • Type 10 – Packet length • Type 11 – DSCP (Diffserv Code Point) • Type 12 – Fragment
Match Components changes (IPv6)	• Type 1 – Destination IPv6 Prefix • Type 2 – Source IPv6 Prefix • Type 3 – Next Header IP • Type 12 – Fragment • Type 13 – Flow Label

BGP FLOW SPECIFICATION	

Extended Community for Actions	• Traffic-Rate (0x8006)
	• Traffic-Action (0x8007)
	• Redirect:
	  ○ AS-2byte (0x8008)
	  ○ IPv4 (0x8108)
	  ○ AS-4byte (0x8208)
	  ○ IP Next-Hop (0x0800)
	• Traffic Marking (0x8009)

IGMP/MLD	
Standards	• RFC1112 - IGMP v1 • RFC2236 - IGMP v2 • RFC3376 - IGMP v3 • RFC2710 - MLD v1 • RFC3810 - MLD v2
Message Type Supported	IGMP • Generate “membership reports” (v1, v2, v3) and “leave reports” (v2, v3) • Reply to membership queries • Emulate querier to test IGMP snooping MLD • Generate “multicast listener reports” and “multicast listener done” • Reply to “multicast listener queries” • Emulate “querier to test MLD snooping”
Configuration Options	**Host Operational Settings:** • router alert option (IGMPv2/v3 and MLDv1/v2) • response to general query messages (all versions) • response to group-specific query messages (IGMPv2/v3 and MLDv1/v2) • unsolicited response mode (all versions)

IGMP/MLD	
	• report frequency (seconds) • suppress reports (all versions) • membership reports not transmitted if learned from another host • immediate response (all versions) • packing for record/frame and source/record (IGMPv3 and MLDv2) **Querier Operational Settings:** • Version selection • Startup query count • Enable/disable router alert • General query interval (s) • General query response interval (ms) • Specific query TX count • Specific query response interval (ms) • Support election • Support older version host/querier • Querier rate control
Statistics	**Host Statistics:** • Membership reports TX/RX • Leave TX • General queries RX • Group-specific queries RX • Done TX • Total frames TX/RX • Invalid packets RX **Querier Statistics:** • Querier v1 membership rpts Rx • Querier v2 membership rpts Rx • V1/V2/V3 general query Tx • V2/V3 group-specific query Tx • V3 grp and src specific query Tx

IGMP/MLD	
	• Leave Rx • MLDv1 done Rx • V3 membership rpt Rx • Querier total frames Tx • Querier total frames Rx • Querier invalid packets Rx • General queries Rx • Group-specific queries Rx
Supported Platforms	• All Ixia Ethernet load modules • IxVM

PIM-SM/SSM	
Standards	• RFC 2362 - Protocol Independent Multicast - Sparse Mode (PIM-SM)
Message Types	• Hello • Register • Join/Prune (*,*,RP), (*,G), (S,G), and (S,G,rpt) MLD • Generate “multicast listener reports” and “multicast listener done” • Reply to “multicast listener queries” • Emulate “querier to test MLD snooping”
Configuration Options	**Hello:** • Hold time • LAN prune delay • DR priority • bidirectional capable (Bidir_Capable) • Generation ID (GenID) Register • Border bit (B) and null-register bit (N) automatically encoded by state machine if set as designated router **Join/Prune**

PIM-SM/SSM	
	• Hold time • unicast upstream neighbor • multicast group • join source • prune source addresses • State machine will encode the number of groups, joined sources, and pruned sources based on configuration **Source:** • Version selection • Startup query count • Enable/disable router alert • General query interval (s) • General query response interval (ms) • Specific query TX count • Specific query response interval (ms) • Support election • Support older version host/querier • Querier rate control
Operational Behavior	**Real-Time Configuration:** • Emulated routers, interfaces, multicast groups, and sender sources can be created, deleted, or flapped in real-time while the state machine is running **Timed Switching:** • Auto switch a range of multicast groups from (*,G) to (S,G) based on a delay time (sec) interval **Timed Flapping:** • Based on a timed interval. Default: 60 seconds **State Refresh:** Three modes available: • Constant mode keeps GenID fixed until a change is made to a configuration entry • Incremental mode increments GenID on every hello message

PIM-SM/SSM	
	• Random mode inserts a random GenID value on every hello message **Packed Groups:** • When enabled, all multicast groups are added to one joined/pruned message. Otherwise, a join/pruned message is created for every multicast group **Register Encapsulation Traffic:** • For each emulated multicast sender enabled, Ixia will transmit source traffic encapsulated in register message packets until a "RegisterStop" message is received. Native multicast data packets can be configured and generated from the traffic wizard.
Statistics	• Hello TX/RX • Register TX/RX • Rtrs. Configured • Rtrs. Running • Neighbor Learned • Register Stop TX/RX • Register Null TX/RX • Join (S,G) TX/RX • Join (*,G) TX/RX • Join (*.*, RP) TX/RX • Join (S,G,RPT) TX/RX • Prune (*,G) TX/RX • Prune (S,G) TX/RX • Prune (*,*,RP) TX/RX • Prune (S,G,RPT) TX/RX

LINK AGGREGATION CONTROL PROTOCOL (LACP)	
Standards	• IEEE 802.3ad
Supported Protocols	• BGP and BGP+ • OSPF v2+v3 • ISIS v4+v6 • EIGRP • PIM-SM v4+v6
Configuration Options	**Modes:** • Asynchronous • On-demand • Echo with user configuration interface and timeout **Session:** • Session Type (single or multi-hop), • End-point IP types (v4 or v6), • Remote IP address, • My Discriminator, • Enable auto chosen source, • Enable remote discriminator learnt
Statistics	• Link State • LAG ID • Total LAG Member Ports • LAG Member Ports UP • Session Flap Count • LACPDU Tx • LACPDU Rx • LACPDU Malformed Rx • Marker PDU Tx • Marker PDU Rx • Marker Response PDU Tx • Marker Response PDU Rx

LINK AGGREGATION CONTROL PROTOCOL (LACP)	
	• Marker Response Timeout Count • LACPDU Tx Rate Violation Count • Marker Tx Rate Violation Count

SPANNING TREE PROTOCOLS	
Standards	• IEEE 802.1D - 2004 • IEEE 802.1S • IEEE 802.1Q - 2003 • Cisco PVST+/RPVST+
Protocols	• STP • RSTP • MSTP • PVST • RPVST
Configuration Options	Emulated Bridge • Hello Interval • Max Age • Message Age • Forward Delay • Priority • System ID • Mac Address Emulated Root Bridge • Root Cost • Priority • System ID • Mac Address • VLAN Port Priority

SPANNING TREE PROTOCOLS	
	Interface • Inter BPDU Gap • BPDU Jitter (enable, %) • Point-to-Point Interface • Shared Interface Emulated CIST • Regional Root Priority • Regional Root MAC Address • Regional Root Cost • External Root Priority • External Root MAC Address • External Root Cost, Remaining Hops Emulated MSTIs • Priority • MAC Address • Root Cost • Start VLAN ID • End VLAN ID • Remaining Hops • Port Priority Emulated PVST +/RPVST+ VLANs • VLAN ID • Root Priority • Root MAC Address • Root Path Cost • VLAN Port Priority
Learned Information	• Root Priority • Root Mac Address • Designated Cost • Designated Priority • Designated MAC Address

SPANNING TREE PROTOCOLS	
	• Designated Port ID • Interface Role (Disable, Root, Designated, Alternate, Backup) • Interface State (Discarding, Learning, Forwarding)
Statistics	• BPDUs TX/RX • BPDU Config TC TX/RX • BPDU Config TCA TX/RX • BPDU TCN TX/RX

NETWORK TIME PROTOCOL (NTP)	
Standards	• RFC 5905 – Network Time Protocol Version 4: Protocol and Algorithms Specification
Configuration Options	Protocol Option – NTP • Start Rate • Stop Rate NTP Clock • Active • Precision (log2 seconds) • Maximum frequency tolerance (ppm) • NTP sever count • Minimum survivor count • Accept NTP packets with Crypto-NAK NTP Server • Active • Sever IP Address • Server IPv6 Address • Burst Mode • Initial Burst Mode • Min Poll Interval (log2 seconds) • Max Poll Interval (log2 seconds) • Participate in Clock Select

NETWORK TIME PROTOCOL (NTP)	
	• Authentication – NULL, MD5, SHA1 • Authention Key • Key Identifier • Delay (us)

PLATFORM OPTIONS

VISIT IXIACOM.COM FOR MORE INFORMATION ON IXNETWORK PLATFORM OPTIONS	
Virtual Platform	• IxNetwork Virtual Edition (VE)
Chassis	• XGS12-HSL/SDL/SD Chassis • XGS2-HSL/SDL/SD Chassis
Fixed Chassis	• AresONE-400G QSFP-DD 400/200/100/50GE • AresONE-400G OSFP 400/200/100/50GE • NOVUS ONE PLUS 10GE/5GE/2.5GE/1GE/100M
Appliances	• NOVUS ONE 10GE/1GE/100M
Load Modules	• K400 QSFP-DD 400/200/100/50GE • K400 CFP8 400GE • NOVUS High Density QSFP28 100/50/25GE • NOVUS 10GE/1GE/100M • NOVUS 10GE/5GE/2.5GE/1GE/100M • Xcellon-Multis QSFP28 100/50/25GE • Xcellon-Multis CFP4 100GE • Xcellon-Multis CXP 100/40/10GE • Xcellon-Multis QSFP 40/10GE • Xcellon-Lava CFP 100/40GE • Xcellon-Flex QSFP/SFP+ 40/10GE • NGY SFP+/BASE-T 10GE • XMVDC Dual PHY 1GE

IXNETWORK TECHNOLOGY SOLUTIONS

VISIT IXIACOM.COM FOR MORE INFORMATION ON IXNETWORK TECHNOLOGY SOLUTIONS

- IxNetwork Overview—L2/3 Network Infrastructure Performance Testing
- IxNetwork Software Defined Network (SDN) Test Solution
- IxNetwork Routing and Switching Test Solution
- IxNetwork MPLS Test Solution
- IxNetwork Industrial Ethernet Test Solution
- IxNetwork Broadband and Authentication Test Solution
- IxNetwork Data Center Ethernet Test Solution

ORDERING INFORMATION

Routing

930-2004

IxNetwork, Optional Software, Multicast Emulation, includes IGMPv1/v2/v3, MLDv1/v2, PIM-SM/SSMv4/v6, and Multicast VPN support; REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

930-2005

IxNetwork, Optional Software, BGP4 Emulation; REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

930-2007

IxNetwork, Optional Software, BGP4 Emulation with additional IPv6 support; REQUIRES 930-2005 BGP4 emulation; REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

930-2008

IxNetwork, Optional Software, OSPFv2 Emulation; REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

930-2009

IxNetwork, Optional Software, OSPFv3 Emulation; REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

930-2010

IxNetwork, Optional Software, IS-IS Emulation; REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

930-2011

IxNetwork, Optional Software, IS-IS Emulation with additional IPv6 support; REQUIRES 930-2010 IS-IS emulation; REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

930-2012

IxNetwork, Optional Software, RIPv2 Emulation; REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

930-2013

IxNetwork, Optional Software, RIPng IPv6 Emulation; REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

930-2020

IxNetwork, Optional Software, EIGRP Emulation; REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

930-2023

IxNetwork, Optional Software, BFD Emulation for use with OSPF, BGP, or ISIS; REQUIRES either 930-2008 OSPFv2 Emulation, OR 930-2009 OSPFv3 Emulation, OR 930-2005 BGP4 Emulation, OR 930-2006 BGP4 Emulation with Layer 3 MPLS/VPN & Multicast VPN Support, OR 930-2007 BGP4 Emulation with IPv6 support, OR 930-2010 IS-IS Emulation, OR 930-2011 IS-IS Emulation with IPv6 support. REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

930-2035

IxNetwork, Optional Software, LACP IEEE 802.3ad Protocol Emulation; REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

930-2051

IxNetwork, Optional Software, Protocol emulation over IEEE 802.3ad (LACP); REQUIRES 930-2035 LACP IEEE 802.3ad Protocol Emulation; REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

930-2067

IxNetwork, Optional Software, IGMP/MLD Emulation; REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

930-2068

IxNetwork, Optional Software, PIM-SM/SSM Emulation; Includes PIM-SM/SSMv4/v6 and Multicast VPN emulation; REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

930-2097

IxNetwork, Optional Software, LISP MS/MR and xTR Emulation; REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

BGP FlowSpec Emulation

930-2121

IxNetwork, Optional Software, BGP FlowSpec Emulation; REQUIRES 930-2005 BGP4 Emulation; REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

BUNDLES

930-2001

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 pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

930-2002

IxNetwork, Optional Software Bundle, IPv6 Routing Protocols; includes 930-2007 BGP4 with IPv6 Support, 930-2009 OSPFv3 with IPv6 Emulation, 930-2011 IS-IS IPv6 Support, 930-2013 RIPng Emulation; REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076) and 930-2001 Optional Software Bundle, IPv4 Routing Protocols; includes Media Kit

Switching

930-2017

IxNetwork, Optional Software, STP/RSTP Emulation; REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

930-2018

IxNetwork, Optional Software, MSTP Emulation; REQUIRES 930-2017 STP/RSTP Emulation; REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

930-2055

IxNetwork, Optional Software, Spanning Tree protocol emulation per VLAN (PVST); REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076) AND 930-2017 STP/RSTP Emulation

930-2126

IXIA IxNetwork, Optional Software, Network Time Protocol (NTP) Emulation (930-2126); REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

QuickTest

930-2022
IxNetwork, Optional Software, RFC2544 and Custom Integrated Tests over Advertised Topologies; REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

930-2401
IxNetwork, Optional Software, RFC 2889 QuickTest; REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

930-2403

IxNetwork, Optional Software, IP Multicast RFC 3918 QuickTest; REQUIRES 930-2067 IGMP/MLD Emulation (or 930-2004 IxNetwork Multicast Emulation); REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)

930-2409
IxNetwork, Optional Software, Asymmetric Data Performance QuickTest; REQUIRES pre-existing 930-1999 IxNetwork Base license OR new purchase of either IxNetwork Base PLUS (930-2056) or IxNetwork Base PREMIUM (930-2076)