



BROCADE'S IPV6 SOLUTIONS

Wes Medley, Principal Architect

wmedley@brocade.com



Agenda

Brocade L 2/3 Product

IPv6 Functionality

UNH IPv6 Testing Status



Brocade MLXe/XMR Series Routers

Enterprise and Data Center



- Leading performance and scalability
 - Up to 15.36 Tbps forwarding capacity in a chassis
 - Up to 1536 1-GbE or 256 10-GbE ports
 - Wire-speed, non-blocking performance
- Optimum flexibility
 - 4, 8, 16, and 32-slot chassis
 - 24 and 48-port copper, 24-port fiber 1 GbE modules
 - 4 and 8 port 10-GbE modules
 - 4- and 8-port OC48 and 2-port OC192 modules
 - 2-port 100 GbE (March 2011)
- High availability
 - Management, fabric, and M+N power redundancy
 - Hitless failover and upgrade; graceful restart
- Advanced, scalable software features
 - Advanced virtualization with multi-VRF
 - Multiservice feature set (IPv4, IPv6, MPLS, QoS)
 - sFlow for granular network traffic accounting
- Operational efficiency
 - Best-in-class power efficiency
 - Front-to-back airflow

Key IPv6 Capabilities on MLXe/XMR Routers

- Dual-stack router with concurrent IPv4 and IPv6 operations
- H/w based IPv6 multicast, 6-to-4 tunneling, and IPv6 ACLs
- Up to 240k IPv6 routes in hardware FIB
- Carrier Trunks allows 32x10G LAG to be deployed using advanced load sharing algorithm that operates on IPv6 headers in addition to IPv4, L2, MPLS L2 VPN, MPLS L3 VPN headers
- Unicast protocols supported: Static, RIPng, OSPFv3, ISIS, BGPv6
- Up to 10M IPv6 routes in RIB with 100 IPv6 neighbors
- Up to 64k IPv6 OSPFv3 routes
- BFD support for OSPFv3
- Multicast support: PIM-SM, PIM-SSM, MLD v1/v2
- 4k multicast IPv6 entries
- ACL scalability:
 - Up to 100 IPv6 ACLs per system with 1k IPv6 ACL clauses
 - Hardware IPv6 ACL entries: 24k inbound, 12k outbound per Network Processor



Distribution and Access Switches

Choice and Flexibility

PoE/ PoE+ Port Density

PoE/ PoE+ Port Density



FastIron X Series



FastIron WS Series

24 to 48 PoE/
PoE+ Ports



FastIron
SuperX/SX Series



FastIron CX Series

192 PoE/ PoE+
Ports



FastIron CX Series

384 PoE/ PoE+
Ports



FastIron SX Series

384 PoE/ PoE+
Ports



Avaya, Cisco, Nortel, Mitel, Siemens, Shoretel
or any other IP Phones



IPv6 Software Capabilities

Dual Stack IPv4/IPv6

Routing

- RIPng
- OSPFv3 with Filtering
- IS-IS for IPv6
- BGP4+

Multicast

- MLDv1 and MLDv2
- PIM-SM
- PIM-SSM
- MBGP for IPv6 Multicast

Security/QoS

- IPv6 standard ACL
- IPv6 extended ACL

Essentials

- IPv6 (RFC 2460)
- ICMPv6 (RFC 2463)
- Neighbor Discovery (RFC 2461)
- Stateless Auto Configuration
- ECMP
- Link Aggregation

Multi-Service IronWare OS

Transitioning

- Dual Stack IPv4/IPv6
- Configured & Automatic Tunnels
- 6to4 Tunnels*

Performance

- Hardware routing for unicast and multicast
- Hardware ACL handling
- Wirespeed 1GE and 10GE

Auxiliary Functions

- DHCPv6 Relay

Management

- Ping, Traceroute, Telnet, SSH & TFTP
- DNS Resolver supporting AAAA records
- SNMP MIBs
- sFlow for wire-speed network monitoring and accounting



Army TIC Performance Testing June 2009

Table A-6. IPv6 Routing Results

Evaluation Engineer: Pol Ou		Test Date (yyymmdd): 090610														
Ref	Operational Requirements	NetIron XMR 8000			BigIron RX-8			NetIron MLX 8000			BigIron RX-4			FastIron SX 800 (R)		
		10GbE	1GbE	FE	10GbE	1GbE	FE	10GbE	1GbE	FE	10GbE	1GbE	FE	10GbE	1GbE	FE
3.1.6.1	Number of ports tested	10	100	40	10	120	96	10	100	40	N/A	N/A	N/A	N/T	72	N/T
3.1.6.2	Number of non-blocking ports per blade	4/4	20/20	20/20	4/4	24/24	24/24	4/4	20/20	20/20	N/A	N/A	N/A	N/T	24/24	N/T
3.1.6.3	76-byte	100	100	100	100	100	100	99.06	99.06	100	N/A	N/A	N/A	N/T	100	N/T
3.1.6.4	128-byte	100	100	100	100	100	100	100	100	100	N/A	N/A	N/A	N/T	100	N/T
3.1.6.5	256-byte	100	100	100	100	100	100	100	99.06	100	N/A	N/A	N/A	N/T	98.12	N/T
3.1.6.6	512-byte	100	100	100	100	100	100	100	100	100	N/A	N/A	N/A	N/T	100	N/T
3.1.6.7	1024-byte	100	100	100	100	100	100	100	99.06	100	N/A	N/A	N/A	N/T	100	N/T
3.1.6.8	1280-byte	100	100	100	100	100	100	100	100	100	N/A	N/A	N/A	N/T	98.12	N/T
3.1.6.9	1518-byte	100	100	100	100	100	100	100	100	100	N/A	N/A	N/A	N/T	100	N/T

Table A-7. IPv4/IPv6 Dual Stack Results

Evaluation Engineer: Pol Ou		Test Date (yyymmdd): 090610														
Ref	Operational Requirements	NetIron XMR 8000			BigIron RX-8			NetIron MLX 8000			BigIron RX-4			FastIron SX 800 (R)		
		10GbE	1GbE	FE	10GbE	1GbE	FE	10GbE	1GbE	FE	10GbE	1GbE	FE	10GbE	1GbE	FE
3.1.7.1	Number of ports tested	10	100	40	10	120	96	10	100	40	N/A	N/A	N/A	N/T	72	N/T
3.1.7.2	76-byte	100	100	100	100	100	100	99.06	98.12	100	N/A	N/A	N/A	N/T	100	N/T
3.1.7.3	128-byte	100	100	100	100	100	100	100	100	100	N/A	N/A	N/A	N/T	100	N/T
3.1.7.4	256-byte	100	100	100	100	100	100	100	100	100	N/A	N/A	N/A	N/T	97.18	N/T
3.1.7.5	512-byte	100	100	100	100	100	100	100	100	100	N/A	N/A	N/A	N/T	100	N/T
3.1.7.6	1024-byte	100	100	100	100	100	100	100	100	100	N/A	N/A	N/A	N/T	100	N/T
3.1.7.7	1280-byte	100	100	100	100	100	100	100	100	100	N/A	N/A	N/A	N/T	95.31	N/T
3.1.7.8	1518-byte	100	100	100	100	100	100	100	100	100	N/A	N/A	N/A	N/T	100	N/T

Comments:
 SX 800 (R): Not tested in 10GbE and FE due to time and equipment availability.
 L2 Edge switches that do not have routing capability are not listed in this table.

BROCADE APPLICATION DELIVERY SOLUTIONS

Accelerating the IPv6 Transition



IPv4

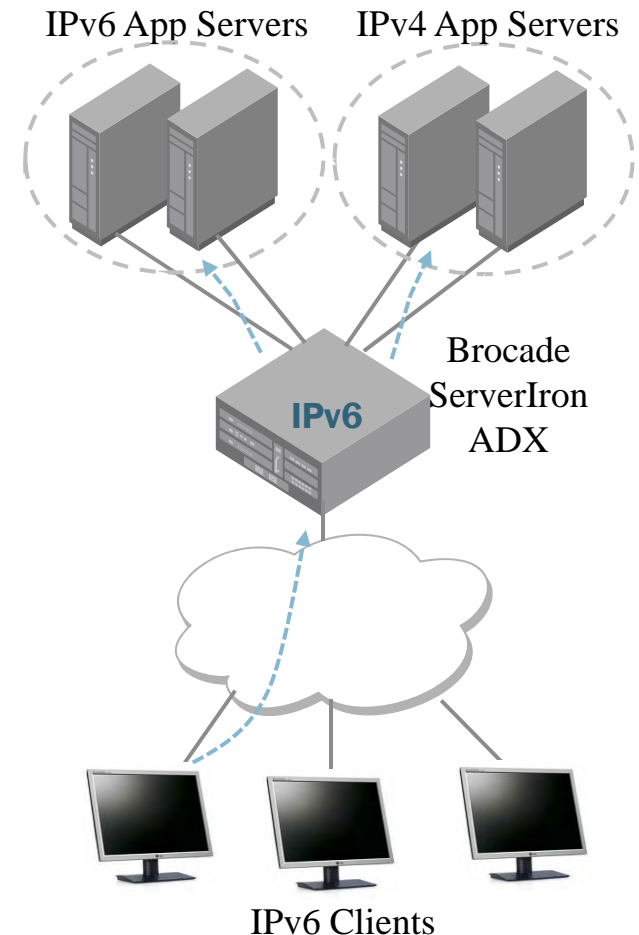


IPv6

Brocade Solution: IPv6 Your Applications

Simple migration to IPv6-enabled applications

- Brocade ADX offers translation for IPv6 services
 - IPv6 VIP → IPv6 Real (v666)
 - IPv6 VIP → IPv4 Real (v664)
 - IPv6 VIP → IPv4 + IPv6 Real (v664+6)
- Additional capabilities for IPv6
 - DoS attack (SYN attack) prevention
 - Preservation of source IPv6 address by inserting it into custom HTTP header
 - Content switching (Layer 7) on IPv6 traffic



UNH-IOL IPv6 Testing Status



UNH-IOL XMR/MLX IPv6 Status



IPv6 Ready Phase-2 Logo Base Conformance Report

UNH-IOL IPv6 Consortium Core Operations Test Report Revision 4.0.6

InterOperability Lab — 121 Technology Drive, Suite 2 — Durham, NH 03824 — (603) 862-2884

Technical Manager: Timothy Winters twinters@iol.unh.edu

Technician: Ashlee Cummings acummings@iol.unh.edu

October 6, 2010

Francescha Walker
Brocade Communication Systems
1745 Technology Drive
San Jose, California USA 95110

Dear Francescha Walker,

Enclosed are the results from the IPv6 Ready Phase-2 Logo Base Specification testing performed on:

Product Name	
Product Description	NetIron XMR 8000
UNH-IOL Product ID	MPLS-FDRY-0000009025
Software Version	V5.0.0T165
Product Category	Router
Int1: MAC Address	00:0c:db:f8:43:00
Int1: Link-Local Address	fe80::20c:dbff:fe8:4300
Int2: MAC Address	00:0c:db:f8:43:01
Int2: Link-Local Address	fe80::20c:dbff:fe8:4301

This testing pertains to a set of standard requirements, put forth in RFC1981, 2460, 2474, 3168, 4291, 4443, 4861, and 5095. As always, we welcome any comments regarding this Test Specification.

UNH-IOL XMR/MLX IPv6 Status

- 282 Test Items Passed
- 14 Test Items Failed
- Failed Items fixed in 5.1 release
- UNH test event scheduled for March 2011

Technical Summary

During the testing process, the following issues were uncovered:

Test	Result
v6LC.1.1.B	An Echo Reply wasn't transmitted in response to a Echo Request with a hop limit of 0.
v6LC.1.1.10c	A packet was forwarded with a source address of the unspecified address.
v6LC.1.2.3a	A Parameter Problem message with the incorrect ICMPv6 pointer field was transmitted in response to Echo Request with an Unknown IPv6 Header.
v6LC.1.2.9b	An IPv6 packet destined to it with an Unrecognized Routing Type value of 0 was not processed properly.
v6LC.1.2.10b	An ICMP Parameter Problem message was not transmitted when it received an Echo Request with an unrecognized Routing Type value and a Segments Left of non-zero.
v6LC.2.1.5a,b	Neighbor Solicitations were not sent at the proper retransmission interval when trying to resolve the address of a neighbor.
v6LC.2.1.14	A Neighbor Solicitation for an anycast address isn't answered.
v6LC.3.1.2b,d	When Duplicate Address Detection fails IP disable isn't performed.
v6LC.3.1.3i,j	When Duplicate Address Detection fails IP disable isn't performed.
v6LC.3.1.4h,j	When Duplicate Address Detection fails IP disable isn't performed.
v6LC.5.1.3a	A Destination Unreachable message isn't transmitted when the route is unreachable.
v6LC.5.1.4a	A Destination Unreachable message is transmitted instead of a Packet Too Big Message when it could not forward a packet because of PMTU limitations.

2



IPv6 Ready Phase-2 Logo Base Conformance Report

v6LC.5.1.5a	A Time Exceeded message isn't transmitted when a received a packet contains a Hop Limit value of 0.
v6LC.5.1.7	A Parameter Problem message with the incorrect ICMPv6 pointer field was transmitted in response to Echo Request with an Unrecognized IPv6 Header.

*NOTE1: Please note that the following test cases were not tested because the device under test does not support multicast routing:

UNH-IOL SX/FESX6 IPv6 Status



IPv6 Consortium Core Operations Test Report Revision 4.0.5

InterOperability Lab — 121 Technology Drive, Suite 2 — Durham, NH 03824 -(603) 862-2804

Technical Manager: Timothy Winters twinters@iol.unh.edu

Technician: Timothy Winters twinters@iol.unh.edu

March 17, 2010

Dennis Ho
Brocade Communications Systems
1745 Technology Drive
San Jose, CA 95110

Dennis Ho

Enclosed are the results from the IPv6 Ready Phase-II Logo Base Specification testing performed on:

Product Name: Brocade FastIron SX
Product Description: switch
Software Version: SXR07001a
Product Category: Router

Interface 1

Mac Address: 00:1b:ed:01:37:00
Link-local Address: fe80::21b:edff:fe01:3700

UNH-IOL SX/FESX IPv6 Status

- 290 Test Items Passed
- 11 Test Items Failed
- Failed Items fixed in 7.2 release
- UNH test event scheduled for Summer 2011

During the testing process, the following issues were uncovered:

Test	Result
v6LC.1.2.10B	The NUT did not transmit a ICMPv6 Parameter Problem message in response to an Unrecognized Routing Type set to zero.
V6LC.2.1.6B	The NUT retransmitted Neighbor Solicitations with different source address while in state PROBE.
v6LC.2.3.16D	The NUT improperly transmitted a Redirect message in response to an Echo Request with a multicast destination address.
v6LC.3.1.2B,D	The NUT does not disable IP Operation after a DAD failure.
v6LC.3.1.3 I, J	The NUT does not disable IP Operation after a DAD failure.
v6LC.3.1.4 H, J	The NUT does not disable IP Operation after a DAD failure.
v6LC.4.1.10	The NUT did not transmit a multicast ping out a specified interface.
v6LC.4.1.11	The NUT did not transmit a multicast ping out a specified interface.

If you have any questions about the test procedures or results, please feel free to contact me via e-mail at winters@iol.unh.edu or by phone at 603-862-2804.

Regards,



Timothy Winters

UNH-IOL SAN Product Test Results

Host

Company	Product Name	Product Version Tested	Applicable Series		Test Selection Table								Notes	
			HW	SW	Basic	SLAAC	ADDR Arch	DHCP Client	DHCP Server	IPSEC	IKE	ESP		
Brocade Communications System, Inc.	FOS	6.4.1a_rc1_bld07	Brocade 300, 5410/5424 /5450/5460 /5470/5480 /NC-5480, 4100, 4900, 5000, 5100, 5300, VA-40FC, 7500/7500E, 7600, 48000, Brocade Encryption Switch (BES), DCX/DCX-4S, 8000, and 7800	6.4.01a or later	v1.2_C (7555) v1.1_J (7558)	v1.1_C (7556) v1.1_J (7559)	v1.2_C (7557) v1.1_J (7560)							



Thank You

