

State of West Virginia

RFQ ISCM0046 NETWORKING INFRASTRUCTURE EQUIPMENT



RFQ No.: ISCM0046

Bid Opening Date: 10/18/2011

Bid Opening Time: 1:30 PM

BID #2

Presented to:

Krista Ferrell
Department of Administration
1900 Kanawha Blvd. E.
Building 5 / 10th Floor
Charleston, WV 25305
304-558-5472

Submitted by:

Todd May
Client Relationship Manager

Date:

October 18, 2011

Version:

Version 1.8

RECEIVED

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WV PURCHASING
DIVISION

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October 18, 2011

Krista Ferrell
Department of Administration
WVOT Networking Supervisor
1900 Kanawha Blvd. E.
Building 5 / 10th Floor
Charleston, WV 25305

RE: RFQ ISCM0046; Networking Infrastructure Equipment

Ms. Ferrell:

AdvizeX Technologies, LLC (AdvizeX) appreciates the opportunity to respond to your RFQ related to Networking Infrastructure Equipment.

I, Todd May, am the authorized contact person that can speak on behalf of AdvizeX.

My contact information is as follows:

Todd May
Client Relationship Manager
AdvizeX
6480 Rockside Woods Blvd. S, Suite 190
Independence, OH 44131
216-643-9150
tmay@advizex.com

Based upon our review of RFQ ISCM0046, it is confirmed that AdvizeX meets all mandatory requirements established in said RFQ.

AdvizeX has opted to provide an "equal or better" option to the RFQ. Therefore we are requesting a formal review to explain our proposal prior to the award of this RFP.

We look forward to the next step in the selection process.

Sincerely,

A handwritten signature in cursive script that reads "Todd May".

Todd May
Client Relationship Manager

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SECTION 1 – EXECUTIVE SUMMARY

AdvizeX Technologies, LLC (AdvizeX) appreciates the opportunity to present the State of West Virginia with an alternate HP networking solution in response to the RFP ISCM0046. AdvizeX understands the technical and business requirements of the State of West Virginia and this proposal response will demonstrate the depth of HP's expertise as a world-class network and computing solution provider.

1.1 OUR RECOMMENDED ALTERNATE SOLUTION

Following a review of RFP ISCM0046, AdvizeX has chosen to propose you an alternate solution that offers:

- Increased performance
- More connection ports
- Greater device management capabilities
- Greater expansion capabilities
- Leverage technology with the largest market share
- Leverage technology that exists in the upper right quadrant of the Gartner chart
- Reduced procurement and operating costs

Most importantly, OCLC (Ohio College Library Center), an organization of your type, size, and technology base was faced with the same decision. Once presented with an alternate solution using HP Networking and Blade Servers, given the chance to compare feature sets, review pricing, decided immediately to accept our recommended alternate solution as their new standard.

1.2 ALTERNATE SOLUTION FINANCIAL IMPACT

AdvizeX is keenly aware of product and solution pricing from HP and Cisco. It is our estimate that the following pricing facts will prove true with this proposal:

- The estimated Cisco list price for their infrastructure devices should total close to \$6,729,000
- The estimated Cisco selling price for those devices should total \$3,700,000
- The proposed HP Networking solution has a list price for their infrastructure devices that should total close to \$5,000,000
- The estimated HP Networking selling price for those devices should total \$2,250,000

This is an estimated savings of \$1,500,000 for a solution that gives you additional functionality, ports, and expansion.

We fully expect the proposed pricing for the blade server solution to offer the same financial benefits

1.2 ALTERNATE SOLUTION PRODUCT TYPES

We identified the following product sections in your RFP pricing request and have quoted the following alternate products:

- **Fifteen (15) chassis-based switches and routers**
(7) HP A10500 Class Chassis-based Switches
(4) HP A8800 Provider Class Routers
- **Four (4) Cisco ASA Firewall Security Devices**
Cisco ASA5550 Stand Alone Devices
- **Ten (10) Fixed-port switches**
HP 3800 Class Fixed-port Switches
- **Twenty (20) Long-range SFP modules**
HP SFP Modules
- **Five hundred (500) education credits**
Equal Education Credits
- **Blade-based server devices**
(4) HP C7000 Class Blade Chassis and (24) Blade Servers
(16) Licenses of VMware 5 Enterprise Plus and VCenter

1.3 WHY HP PRODUCTS?

AdvizeX has chosen to recommend an HP product solution for the following reasons:

- **AdvizeX has invested a large amount of time and resources to offer unique expertise with HP Networking and Server products. We currently hold the highest level of certification with HP for those product lines**
- **HP Networking products have been recognized by Gartner and exists in their upper right quadrant right next to Cisco**
Please refer to the updated version of research and advisory firm Gartner Inc.'s 2010 Magic Quadrant for Enterprise LAN (Global) HP is positioned in the Leaders quadrant located in Section 7 of this proposal
- **HP has created a global networking powerhouse and is changing the rules of networking. It is raising the bar through innovation to deliver a differentiated portfolio of edge to core and data center networking solutions, complemented by global service and support capabilities.**
- **HP is in a unique position to deliver on the promise of the Converged Infrastructure, with advanced technology, broad innovation, unparalleled expertise in technology services and enterprise services, and our broad partner ecosystem.**
- **Here are some of the benefits that the State of West Virginia can realize with an HP networking and server solution:**

- **Open standards-based networking and servers** facilitates incremental migration and leverages the existing expertise of trained network engineers and partners. Allows customer-focused innovation and interoperability instead of vendor lock-in, allowing a choice of best-in-class products and solutions with each purchase.
- **Comprehensive interoperability with tools, best practices and expertise** ensures that you can take advantage of HP networking and server solutions incrementally with no disruption in existing operations and no rip and replace. This allows customers to evolve networks in a deliberate and safe fashion.
- **Better energy efficiency is achieved** with technologies like variable-speed fans and front-to-back cooling. Our solutions complement HP data center smart grid technologies by driving higher utilization and reducing hardware needs as well as power and cooling requirements.
- **Best- in-class solutions working with industry-leading partners** (“HP AllianceONE”) have been pretested and configured to run either within the network fabric infrastructure or by way of dedicated platforms. These include UC&C partners like Microsoft, Avaya, and Aastra, application delivery partners, like Riverbed and F5, and a variety of security partners for fast time-to-value.
- **Leading warranties** across our entire Enterprise Networking portfolio contribute to significantly lower TCO and reduce reliance on expensive support contracts.
- **HP FlexFabric architecture** provides a converged, high-performance and orchestrated data center fabric. It addresses both virtualized and non-virtualized environments; supports different delivery models, including private clouds, and aligns with business demands at the lowest possible TCO.
- **Single-pane-of-glass management deeply integrated with industry-leading IT orchestration software** offers seamless heterogeneous network management and provisioning linked directly to end-user and business demands. HP networking solutions are also integrated with solutions from HP Software to facilitate top-to-bottom management and orchestration across the infrastructure.
- **Secure unified wired and wireless solutions** deliver a seamless experience managed from a single pane of glass across the entire secure campus LAN and branch network.
- **Security that’s easy to implement and manage** can monitor, detect and respond to threats with proactive defense solutions and powerful intrusion prevention system, leverages industry-leading research capabilities, and be implemented across the infrastructure very quickly

SECTION 2 – BID RESPONSES AND ACKNOWLEDGEMENTS



State of West Virginia
Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

**Request for
Quotation**

RFQ NUMBER
ISCM0046

PAGE
1

ADDRESS CORRESPONDENCE TO ATTENTION OF:
KRISTA FERRELL 304-558-2596

VENDOR	RFQ COPY
	TYPE NAME/ADDRESS HERE

SHIP TO	DEPARTMENT OF ADMINISTRATION
	WVOT NETWORKING SUPERVISOR
	1900 KANAWHA BLVD. E.
	BUILDING 5, 10TH FLOOR
	CHARLESTON, WV 25305 304-558-5472

DATE PRINTED	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS		
09/15/2011						
BID OPENING DATE: 10/11/2011		BID OPENING TIME 01:30PM				
LINE	QUANTITY	UOP	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
0001	1	EA		205-43		
<p>NETWORKING INFRASTRUCTURE EQUIPMENT</p> <p>REQUEST FOR QUOTATION (RFQ)</p> <p>THE WEST VIRGINIA STATE PURCHASING DIVISION FOR THE AGENCY, THE WEST VIRGINIA OFFICE OF TECHNOLOGY, IS SOLICITING BIDS TO ESTABLISH AN OPEN END CONTRACT FOR NETWORK INFRASTRUCTURE EQUIPMENT PER THE ATTACHED SPECIFICATIONS.</p> <p>THIS CONTRACT SHALL BE FOR EQUIPMENT ONLY. NO INSTALLATION IS REQUIRED.</p> <p>TECHNICAL QUESTIONS CONCERNING THIS SOLICITATION MUST BE SUBMITTED IN WRITING TO KRISTA FERRELL IN THE WEST VIRGINIA STATE PURCHASING DIVISION VIA FAX AT 304-558-4115 OR VIA EMAIL AT KRISTA.S.FERRELL@WV.GOV.</p> <p>DEADLINE FOR ALL TECHNICAL QUESTIONS IS 09/27/2011 AT THE CLOSE OF BUSINESS.</p> <p>ANY TECHNICAL QUESTIONS RECEIVED WILL BE ANSWERED BY BY FORMAL WRITTEN ADDENDUM NOT BE ISSUED BY THE PURCHASING DIVISION AFTER THE DEADLINE HAS LAPSED.</p> <p>VERBAL COMMUNICATION: ANY VERBAL COMMUNICATION BETWEEN THE VENDOR AND ANY STATE PERSONNEL IS NOT BINDING. ONLY INFORMATION ISSUED IN WRITING AND ADDED TO THE RF</p>						
SEE REVERSE SIDE FOR TERMS AND CONDITIONS						
SIGNATURE			TELEPHONE		DATE	
TITLE		FAX		ADDRESS CHANGES TO BE NOTED ABOVE		

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'



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2019 Washington Street East
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Charleston, WV 25305-0130

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ISCM0046

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KRISTA FERRELL
304-558-2596

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DEPARTMENT OF ADMINISTRATION
WVOT NETWORKING SUPERVISOR
1900 KANAWHA BLVD. E.
BUILDING 5, 10TH FLOOR
CHARLESTON, WV
25305 304-558-5472

DATE PRINTED	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS		
09/15/2011						
BID OPENING DATE: 10/11/2011		BID OPENING TIME 01:30PM				
LINE	QUANTITY	UOP	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
<p>SPECIFICATIONS BY FORMAL WRITTEN ADDENDUM IS BINDING.</p> <p>NO CONTACT BETWEEN THE VENDOR AND THE AGENCY IS PERMITTED. VIOLATION MAY RESULT IN THE REJECTION OF THE BID. THE STATE BUYER LISTED ABOVE IS THE SOLE CONTACT FOR ANY AND ALL INQUIRIES AFTER THIS RFQ HAS BEEN RELEASED.</p> <p>EXHIBIT 10</p> <p>REQUISITION NO.: <i>ISCM0046</i></p> <p>ADDENDUM ACKNOWLEDGEMENT</p> <p>I HEREBY ACKNOWLEDGE RECEIPT OF THE FOLLOWING CHECKED ADDENDUM(S) AND HAVE MADE THE NECESSARY REVISIONS TO MY PROPOSAL, PLANS AND/OR SPECIFICATION, ETC.</p> <p>ADDENDUM NO.'S:</p> <p>NO. 1 <i>[initials]</i></p> <p>NO. 2 <i>[initials]</i></p> <p>NO. 3</p> <p>NO. 4</p> <p>NO. 5</p> <p>I UNDERSTAND THAT FAILURE TO CONFIRM THE RECEIPT OF THE ADDENDUM(S) MAY BE CAUSE FOR REJECTION OF BIDS.</p> <p>VENDOR MUST CLEARLY UNDERSTAND THAT ANY VERBAL REPRESENTATION MADE OR ASSUMED TO BE MADE DURING ANY ORAL DISCUSSION HELD BETWEEN VENDOR'S REPRESENTATIVES</p> <p>SEE REVERSE SIDE FOR TERMS AND CONDITIONS</p>						
SIGNATURE <i>[Signature]</i>			TELEPHONE <i>216-643-9150</i>		DATE <i>10/17/2011</i>	
TITLE <i>CRM</i>			FAX <i>37-1504931</i>		ADDRESS CHANGES TO BE NOTED ABOVE	

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'



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Department of Administration
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Charleston, WV 25305-0130

**Request for
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RFQ NUMBER	PAGE
ISCM0046	3
ADDRESS CORRESPONDENCE TO ATTENTION OF:	
KRISTA FERRELL 304-558-2596	

RFQ COPY
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VENDOR

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WVOT NETWORKING SUPERVISOR
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25305 304-558-5472

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09/15/2011						
BID OPENING DATE: 10/11/2011		BID OPENING TIME 01:30PM				
LINE	QUANTITY	UOP	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
<p>AND ANY STATE PERSONNEL IS NOT BINDING. ONLY THE INFORMATION ISSUED IN WRITING AND ADDED TO THE SPECIFICATIONS BY AN OFFICIAL ADDENDUM IS BINDING.</p> <p style="text-align: center;"> <i>Lodd May</i> SIGNATURE ADVIZEX COMPANY 10/17/2011 DATE </p> <p>NOTE: THIS ADDENDUM ACKNOWLEDGEMENT SHOULD BE SUBMITTED WITH THE BID</p> <p>REV. 09/21/2009</p> <p>BANKRUPTCY: IN THE EVENT THE VENDOR/CONTRACTOR FILES FOR BANKRUPTCY PROTECTION, THE STATE MAY DEEM THE CONTRACT NULL AND VOID AND TERMINATE SUCH CONTRACT WITHOUT FURTHER ORDER.</p> <p style="text-align: center;">NOTICE</p> <p>A SIGNED BID MUST BE SUBMITTED TO:</p> <p style="text-align: center;"> DEPARTMENT OF ADMINISTRATION PURCHASING DIVISION BUILDING 15 2019 WASHINGTON STREET, EAST CHARLESTON, WV 25305-0130 </p>						
SEE REVERSE SIDE FOR TERMS AND CONDITIONS						
SIGNATURE <i>Lodd May</i>		TELEPHONE 216-643-9150		DATE 10/17/2011		
TITLE CRM		FAX 37-1504931		ADDRESS CHANGES TO BE NOTED ABOVE		

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'



State of West Virginia
Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

**Request for
Quotation**

RFQ NUMBER	PAGE
ISCM0046	4

ADDRESS CORRESPONDENCE TO ATTENTION OF:
KRISTA FERRELL 804-558-2596

RFQ COPY
TYPE NAME/ADDRESS HERE

VENDOR

SHIP TO

DEPARTMENT OF ADMINISTRATION
WVOT NETWORKING SUPERVISOR
1900 KANAWHA BLVD. E.
BUILDING 5, 10TH FLOOR
CHARLESTON, WV
25305 304-558-5472

DATE PRINTED	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS
09/15/2011				

BID OPENING DATE: 10/11/2011 BID OPENING TIME 01:30PM

LINE	QUANTITY	UOP	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
<p>THE BID SHOULD CONTAIN THIS INFORMATION ON THE FACE OF THE ENVELOPE OR THE BID MAY NOT BE CONSIDERED:</p> <p>SEALED BID</p> <p>BUYER: KRISTA FERRELL-FILE 21</p> <p>RFQ. NO.: ISCM0046</p> <p>BID OPENING DATE: 10/11/2011</p> <p>BID OPENING TIME: 1:30 PM</p> <p>PLEASE PROVIDE A FAX NUMBER IN CASE IT IS NECESSARY TO CONTACT YOU REGARDING YOUR BID:</p> <p style="text-align: center;">----- 216-901 1447 -----</p> <p>CONTACT PERSON (PLEASE PRINT CLEARLY):</p> <p style="text-align: center;">----- TODD MAJ -----</p>						

SEE REVERSE SIDE FOR TERMS AND CONDITIONS			
SIGNATURE	TELEPHONE	DATE	
<i>Todd Maj</i>	216-643-9150	10/11/2011	
TITLE	FEIN	ADDRESS CHANGES TO BE NOTED ABOVE	
CEM	31-1504931		

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

SECTION 3 – GENERAL TERMS AND CONDITIONS

AdvizeX Technologies, LLC (AdvizeX) has reviewed and accepts the General Terms and Conditions of this RFP.

GENERAL TERMS & CONDITIONS REQUEST FOR QUOTATION (RFQ) AND REQUEST FOR PROPOSAL (RFP)

1. Awards will be made in the best interest of the State of West Virginia.
 2. The State may accept or reject in part, or in whole, any bid.
 3. Prior to any award, the apparent successful vendor must be properly registered with the Purchasing Division and have paid the required \$125 fee.
 4. All services performed or goods delivered under State Purchase Order/Contracts are to be continued for the term of the Purchase Order/Contracts, contingent upon funds being appropriated by the Legislature or otherwise being made available. In the event funds are not appropriated or otherwise available for these services or goods this Purchase Order/Contract becomes void and of no effect after June 30.
 5. Payment may only be made after the delivery and acceptance of goods or services.
 6. Interest may be paid for late payment in accordance with the *West Virginia Code*.
 7. Vendor preference will be granted upon written request in accordance with the *West Virginia Code*.
 8. The State of West Virginia is exempt from federal and state taxes and will not pay or reimburse such taxes.
 9. The Director of Purchasing may cancel any Purchase Order/Contract upon 30 days written notice to the seller.
 10. The laws of the State of West Virginia and the *Legislative Rules* of the Purchasing Division shall govern the purchasing process.
 11. Any reference to automatic renewal is hereby deleted. The Contract may be renewed only upon mutual written agreement of the parties.
 12. **BANKRUPTCY:** In the event the vendor/contractor files for bankruptcy protection, the State may deem this contract null and void, and terminate such contract without further order.
 13. **HIPAA BUSINESS ASSOCIATE ADDENDUM:** The West Virginia State Government HIPAA Business Associate Addendum (BAA), approved by the Attorney General, is available online at www.state.wv.us/admin/purchase/vrc/hipaa.htm and is hereby made part of the agreement. Provided that the Agency meets the definition of a Cover Entity (45 CFR §160.103) and will be disclosing Protected Health Information (45 CFR §160.103) to the vendor.
 14. **CONFIDENTIALITY:** The vendor agrees that he or she will not disclose to anyone, directly or indirectly, any such personally identifiable information or other confidential information gained from the agency, unless the individual who is the subject of the information consents to the disclosure in writing or the disclosure is made pursuant to the agency's policies, procedures, and rules. Vendor further agrees to comply with the Confidentiality Policies and Information Security Accountability Requirements, set forth in <http://www.state.wv.us/admin/purchase/privacy/noticeConfidentiality.pdf>.
 15. **LICENSING:** Vendors must be licensed and in good standing in accordance with any and all state and local laws and requirements by any state or local agency of West Virginia, including, but not limited to, the West Virginia Secretary of State's Office, the West Virginia Tax Department, and the West Virginia Insurance Commission. The vendor must provide all necessary releases to obtain information to enable the director or spending unit to verify that the vendor is licensed and in good standing with the above entities.
 16. **ANTITRUST:** In submitting a bid to any agency for the State of West Virginia, the bidder offers and agrees that if the bid is accepted the bidder will convey, sell, assign or transfer to the State of West Virginia all rights, title and interest in and to all causes of action it may now or hereafter acquire under the antitrust laws of the United States and the State of West Virginia for price fixing and/or unreasonable restraints of trade relating to the particular commodities or services purchased or acquired by the State of West Virginia. Such assignment shall be made and become effective at the time the purchasing agency tenders the initial payment to the bidder.
- I certify that this bid is made without prior understanding, agreement, or connection with any corporation, firm, limited liability company, partnership, or person or entity submitting a bid for the same material, supplies, equipment or services and is in all respects fair and without collusion or fraud. I further certify that I am authorized to sign the certification on behalf of the bidder of this bid.

INSTRUCTIONS TO BIDDERS

1. Use the quotation forms provided by the Purchasing Division. Complete all sections of the quotation form.
2. Items offered must be in compliance with the specifications. Any deviation from the specifications must be clearly indicated by the bidder. Alternates offered by the bidder as EQUAL to the specifications must be clearly defined. A bidder offering an alternate should attach complete specifications and literature to the bid. The Purchasing Division may waive minor deviations to specifications.
3. Unit prices shall prevail in case of discrepancy. All quotations are considered F.O.B. destination unless alternate shipping terms are clearly identified in the quotation.
4. All quotations must be delivered by the bidder to the office listed below prior to the date and time of the bid opening. Failure of the bidder to deliver the quotations on time will result in bid disqualifications: Department of Administration, Purchasing Division, 2019 Washington Street East, P.O. Box 50130, Charleston, WV 25305-0130
5. Communication during the solicitation, bid, evaluation or award periods, except through the Purchasing Division, is strictly prohibited (W.Va. C.S.R. §148-1-6.6).

SECTION 4 – REQUEST FOR QUOTATION

AdvizeX has reviewed and understands the following sections of the Request for Quotation section of ISCM0046 found on page 5:

- 1.0 Purpose
- 1.1 Definitions
- 2.0 Background
- 3.0 Procurement Specifications
 - 3.1 Special Condition
 - 3.2 Price Stability
 - 3.3 Warranty
 - 3.4 Equipment Requirements
- 5.0 Delivery
- 6.0 Shipping and Invoicing
- 7.0 Award

SECTION 5 – ALTERNATE SOLUTION FEATURE COMPARISON

AdvizeX has chosen to recommend an alternate infrastructure solution using HP Networking and HP Blade Server products.

Based upon your requested list of products, our recommended configurations offer the following improvements:

Switch #1	
Original Specifications	HP Networking Alternative Improvements
9 Slot Chassis (<u>7 Usable</u> , 2 Used by Fabric Modules) 2 Fabric Modules 2Tb/s Fabric Speed 20 10Gb Ethernet Ports 24 1Gb Ethernet Ports DC Power Supplies	8 Slot Chassis (<u>All 8 Usable</u>) 4 Fabric Modules 2.6Tb/s Fabric Speed 26 10Gb Ethernet Ports 24 1Gb Ethernet Ports DC Power Supplies
Switch #2	
Original Specifications	HP Networking Alternative Improvements
9 Slot Chassis (<u>7 Usable</u> , 2 Used by Fabric Modules) 2 Fabric Modules 2Tb/s Fabric Speed 20 10Gb Ethernet Ports 96 1Gb Ethernet Ports	8 Slot Chassis (<u>All 8 Usable</u>) 4 Fabric Modules 2.6Tb/s Fabric Speed 24 10Gb Ethernet Ports 96 1Gb Ethernet Ports
Switch #3	
Original Specifications	HP Networking Alternative Improvements
6 Slot Chassis (<u>4 Usable</u> , 2 Used by Fabric Modules) 2 Fabric Modules 2Tb/s Fabric Speed 20 10Gb Ethernet Ports 96 1Gb Ethernet Ports	8 Slot Chassis (<u>All 8 Usable</u>) 4 Fabric Modules 2.6Tb/s Fabric Speed 24 10Gb Ethernet Ports 96 1Gb Ethernet Ports

Switch #4	
Original Specifications	HP Networking Alternative Improvements
6 Slot Chassis (4 <u>Usable</u> , 2 Used by Fabric Modules) 2 Fabric Modules 2Tb/s Fabric Speed 20 10Gb Ethernet Ports 96 1Gb Ethernet Ports	8 Slot Chassis (<u>All 8 Usable</u>) 4 Fabric Modules 2.6Tb/s Fabric Speed 24 10Gb Ethernet Ports 96 1Gb Ethernet Ports
Switch #5	
Original Specifications	HP Networking Alternative Improvements
6 Slot Chassis (4 <u>Usable</u> , 2 Used by Fabric Modules) 2 Fabric Modules 2Tb/s Fabric Speed 20 10Gb Ethernet Ports 96 1Gb Ethernet Ports	8 Slot Chassis (<u>All 8 Usable</u>) 4 Fabric Modules 2.6Tb/s Fabric Speed 24 10Gb Ethernet Ports 96 1Gb Ethernet Ports
Switch #6	
Original Specifications	HP Networking Alternative Improvements
9 Slot Chassis (7 <u>Usable</u> , 2 Used by Fabric Modules) 2 Fabric Modules 2Tb/s Fabric Speed 20 10Gb Ethernet Ports 24 1Gb Ethernet Ports DC Power Supplies	8 Slot Chassis (<u>All 8 Usable</u>) 4 Fabric Modules 2.6Tb/s Fabric Speed 26 10Gb Ethernet Ports 24 1Gb Ethernet Ports DC Power Supplies
Switch #7	
Original Specifications	HP Networking Alternative Improvements
6 Slot Chassis (4 <u>Usable</u> , 2 Used by Fabric Modules) 2 Fabric Modules 2Tb/s Fabric Speed 20 10Gb Ethernet Ports 24 1Gb Ethernet Ports	8 Slot Chassis (<u>All 8 Usable</u>) 4 Fabric Modules 2.6Tb/s Fabric Speed 26 10Gb Ethernet Ports 24 1Gb Ethernet Ports

Switch #8	
Original Specifications	HP Networking Alternative Improvements
9 Slot Chassis (<u>7 Usable</u> , 2 Used by Fabric Modules) 2 Fabric Modules 1.4Tb/s Fabric Speed 24 10Gb Ethernet Ports 96 1Gb Ethernet Ports	8 Slot Chassis (<u>All 8 Usable</u>) 4 Fabric Modules 2.6Tb/s Fabric Speed 24 10Gb Ethernet Ports 96 1Gb Ethernet Ports
Switch #9	
Original Specifications	HP Networking Alternative Improvements
9 Slot Chassis (<u>7 Usable</u> , 2 Used by Fabric Modules) 2 Fabric Modules 1.4Tb/s Fabric Speed 24 10Gb Ethernet Ports 96 1Gb Ethernet Ports	8 Slot Chassis (<u>All 8 Usable</u>) 4 Fabric Modules 2.6Tb/s Fabric Speed 24 10Gb Ethernet Ports 96 1Gb Ethernet Ports
Switch #10	
Original Specifications	HP Networking Alternative Improvements
6 Slot Chassis (<u>6 Usable</u> , 2 Used by Fabric Modules) 2 Fabric Modules 1.4Tb/s Fabric Speed 24 10Gb Ethernet Ports 96 1Gb Ethernet Ports	8 Slot Chassis (<u>All 8 Usable</u>) 4 Fabric Modules 2.6Tb/s Fabric Speed 24 10Gb Ethernet Ports 96 1Gb Ethernet Ports
Switch #11	
Original Specifications	HP Networking Alternative Improvements
6 Slot Chassis (<u>6 Usable</u> , 2 Used by Fabric Modules) 2 Fabric Modules 1.4Tb/s Fabric Speed 24 10Gb Ethernet Ports 96 1Gb Ethernet Ports	8 Slot Chassis (<u>All 8 Usable</u>) 4 Fabric Modules 2.6Tb/s Fabric Speed 24 10Gb Ethernet Ports 96 1Gb Ethernet Ports

Switch #12	
Original Specifications	HP Networking Alternative Improvements
9 Slot Chassis (<u>7 Usable</u> , 2 Used by Fabric Modules) 2 Fabric Modules 2Tb/s Fabric Speed 20 10Gb Ethernet Ports 24 1Gb Ethernet Ports	8 Slot Chassis (<u>All 8 Usable</u>) 4 Fabric Modules 2.6Tb/s Fabric Speed 26 10Gb Ethernet Ports 24 1Gb Ethernet Ports
Switch #13	
Original Specifications	HP Networking Alternative Improvements
9 Slot Chassis (<u>7 Usable</u> , 2 Used by Fabric Modules) 2 Fabric Modules 2Tb/s Fabric Speed 20 10Gb Ethernet Ports 96 1Gb Ethernet Ports	8 Slot Chassis (<u>All 8 Usable</u>) 4 Fabric Modules 2.6Tb/s Fabric Speed 26 10Gb Ethernet Ports 96 1Gb Ethernet Ports
Switch #14	
Original Specifications	HP Networking Alternative Improvements
9 Slot Chassis (<u>7 Usable</u> , 2 Used by Fabric Modules) 2 Fabric Modules 2Tb/s Fabric Speed 20 10Gb Ethernet Ports 96 1Gb Ethernet Ports	8 Slot Chassis (<u>All 8 Usable</u>) 4 Fabric Modules 2.6Tb/s Fabric Speed 26 10Gb Ethernet Ports 96 1Gb Ethernet Ports
Switch #15	
Original Specifications	HP Networking Alternative Improvements
9 Slot Chassis (<u>7 Usable</u> , 2 Used by Fabric Modules) 2 Fabric Modules 2Tb/s Fabric Speed 20 10Gb Ethernet Ports 96 1Gb Ethernet Ports	8 Slot Chassis (<u>All 8 Usable</u>) 4 Fabric Modules 2.6Tb/s Fabric Speed 26 10Gb Ethernet Ports 96 1Gb Ethernet Ports



SECTION 6 – VENDOR PREFERENCE CERTIFICATE

AdvizeX is not requesting any vendor preference treatment on this RFQ.



SECTION 7 – PURCHASING AFFIDAVIT

SECTION 7 – PURCHASING AFFIDAVIT

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RFQ No. ISCM0046

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

West Virginia Code §5A-3-10a states: No contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and the debt owed is an amount greater than one thousand dollars in the aggregate.

DEFINITIONS:

"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Debtor" means any individual, corporation, partnership, association, limited liability company or any other form or business association owing a debt to the state or any of its political subdivisions. "Political subdivision" means any county commission; municipality; county board of education; any instrumentality established by a county or municipality; any separate corporation or instrumentality established by one or more counties or municipalities, as permitted by law; or any public body charged by law with the performance of a government function or whose jurisdiction is coextensive with one or more counties or municipalities. "Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceeds five percent of the total contract amount.

EXCEPTION: The prohibition of this section does not apply where a vendor has contested any tax administered pursuant to chapter eleven of this code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

Under penalty of law for false swearing (West Virginia Code §61-5-3), it is hereby certified that the vendor affirms and acknowledges the information in this affidavit and is in compliance with the requirements as stated.

WITNESS THE FOLLOWING SIGNATURE

Vendor's Name: ADVIZEX TECHNOLOGIES

Authorized Signature: [Signature] Date: 10/17/2011

State of OHIO

County of CUYAHOGA, to-wit:

Taken, subscribed, and sworn to before me this 17 day of October, 2011.

My Commission expires 2/16, 2012

AFFIX SEAL HERE

NOTARY PUBLIC [Signature]

PATRICIA A. TOMMES
Notary Public, State of Ohio
Recorded in Cuyahoga City
My Comm. Expires 02/06/12

Purchasing Affidavit (Revised 12/15/09)

SECTION 8 – GARTNER MAGIC QUADRANT AND HP NETWORKING



Gartner.

Magic Quadrant for Enterprise LAN (Global)

10 June 2010

Mark Fabbi, Tim Zimmerman

Gartner RAS Core Research Note G00200240

Cisco remains the leader in the enterprise LAN Magic Quadrant; however, a stratification of the alternative players is resulting in new opportunities for enterprises.

What You Need to Know

This is an updated version of research last published on 30 April 2009. The vendors (see Figure 1) in the 2010 Magic Quadrant for Enterprise LAN (Global) provide viable, well-supported LAN infrastructures for mainstream enterprise requirements, but are able to provide differentiation through global strategies and functionality, such as wireless LAN (WLAN), Industrial Ethernet and advanced security features that may be applicable to vertical market strategies. Enterprises must balance requirements for largely standardized feature sets with new capabilities and the total cost of ownership (TCO) for the anticipated seven-year life span of new switches. Major LAN purchases and upgrades should not take place without a full competitive review, with enterprises targeting capital cost reductions for enterprise LAN infrastructures of at least 30%.

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Vendors Added or Dropped

We review and adjust our inclusion criteria for Magic Quadrants and MarketScopes as markets change. As a result of these adjustments, the mix of vendors in any Magic Quadrant or MarketScope may change over time. A vendor appearing in a Magic Quadrant or MarketScope one year and not the next does not necessarily indicate that we have changed our opinion of that vendor. This may be a reflection of a change in the market and, therefore, changed evaluation criteria, or a change of focus by a vendor.

Evaluation Criteria Definitions

Ability to Execute

Product/Service: Core goods and services offered by the vendor that compete in the defined market. This includes current product/service capabilities, quality, feature sets, skills, etc., whether offered natively or through OEM agreements/partnerships as defined in the market definition and detailed in the subcriteria.

Overall Viability (Business Unit, Financial, Strategy, Organization): Viability includes an assessment of the overall organization's financial health, the financial and practical success of the business unit, and the likelihood of the individual business unit to continue investing in the product, to continue offering the product and to advance the state of the art within the organization's portfolio of products.

Sales Execution/Pricing: The vendor's capabilities in all pre-sales activities and the structure that supports them. This includes deal management, pricing and negotiation, pre-sales support and the overall effectiveness of the sales channel.

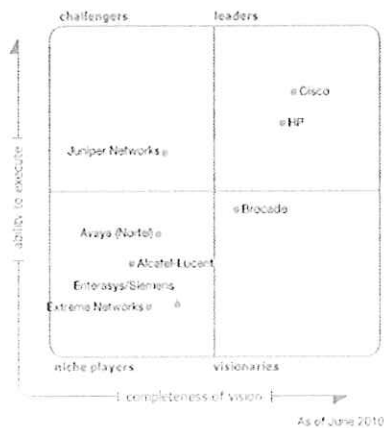
Market Responsiveness and Track Record: Ability to respond, change direction, be flexible and achieve competitive success as opportunities develop, competitors act, customer needs evolve and market dynamics change. This criterion also considers the vendor's history of responsiveness.

Marketing Execution: The clarity, quality, creativity and efficacy of programs designed to deliver the organization's message in order to influence the market, promote the brand and business, increase awareness of the products, and establish a positive identification with the product/brand and organization in the minds of buyers. This "mind share" can be driven by a combination of publicity, promotional, thought leadership, word-of-mouth and sales activities.

Customer Experience: Relationships, products and service programs that enable clients to be successful with the products evaluated. Specifically, this includes the ways customers receive technical support or account support. This can also include incentive trials.

Magic Quadrant

Figure 1. Magic Quadrant for Enterprise LAN (Global)



Source: Gartner (June 2010)

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Market Overview

The LAN switching market is mature; however, it continues to evolve, as enterprises move toward a secure, collaborative workplace. Ethernet is used in more environments beyond traditional IT systems (such as process control, building automation and security), as Ethernet switching functionality is integrated into more data center

infrastructures. For campus networking, most enterprises should start by looking at their business requirements and being diligent about delivering solutions that meet these requirements with a well-standardized feature set that all the vendors can easily provide.

Gartner is seeing a shift in buying practices from one that approaches the LAN as a homogeneous mass to one that is looking at three largely independent decisions. These LAN building blocks are the campus edge (increasingly in combination with WLAN access), the campus core and the data center. Each has distinct requirements.

Beyond the technology evolution, the overarching issue in LAN switching is cost containment. Although the economic conditions of the past 18 months have induced many organizations to re-establish best practices to drive down infrastructure costs, many have not. There is a huge difference in prices among the various vendors' solutions and even among alternatives within a single vendor's product offering. In addition, there are major differences in support programs and an increasing variety of offerings in lifetime warranties that need to be considered. Organizations not following best practices for network architecture, design and procurement will find themselves at a functional and financial disadvantage.

During the past 12 months, the vendor landscape has continued to shift. Cisco is still the dominant vendor; however, in 2009, it lost roughly 2.5% of market share in revenue and port shipments. Exiting 4Q09, Cisco's port share dropped to 49.5% of the total enterprise Ethernet ports shipped. The biggest news in LAN switching during 2009 was the announcement of HP's acquisition of 3Com (which closed 12 April 2010). As of 4Q09, the combined entity achieved 37.5% port market share. Juniper also executed well during 2009 and now shows up in most of the competitive situations we see in our clients. The other significant news was Avaya acquiring all of Nortel's enterprise networking business, including its LAN switching portfolio. In our conversations with clients, we are seeing early positive signs from the Nortel installed base because of the relative stability of its new owner.

The net result of these changes is a more clearly delineated and tiered marketplace. HP (bolstered by the broad 3Com/H3C portfolio) and Juniper Networks have become established as the viable mainstream Tier 1 vendors, with the financial resources to compete directly with Cisco across nearly all fronts. This is further supported by customers increasingly evaluating HP and Juniper as alternative vendors for their enterprise networking projects and adding them to shortlists that historically may have only included Cisco. Brocade has strength in the data center; however, it is still on the fence as to competing with recognized Tier 1 players. Surprisingly, Brocade appears to be losing customer mind share in the switching market. According to Gartner client feedback and reference checks, there is a major decline in the number of customers considering Brocade as an alternate vendor. Other vendors will increasingly be squeezed by these new market dynamics, rather than major technology shortfalls; but, due to their relative size and ability to compete with large and committed vendors, they will show up on most enterprise shortlists.

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Market Definition/Description

LAN switching is a longstanding and mature market. LAN infrastructure is one of the largest network equipment expenditures for enterprises. In 2009, the market contracted by 20% from the previous year, reflecting the difficult market for basic infrastructure. Total revenue in 2009 was \$12.4 billion, and only three vendors increased revenue during 2009 — Juniper's revenue grew every quarter during the downturn, after entering the market in 2Q08, and Brocade and H3C also showed marginal revenue increases year over year. The other notable performance during a difficult 2009 was Alcatel-Lucent, which was roughly flat in its performance, compared with the first three quarters of 2008, according to Gartner enterprise network equipment market analysis.

The market has evolved to one in which products are expected to have a useful deployment life of seven years. Although mature, this market is not commodity-based. Significant innovation exists in the market at a technology and economic level; however, enterprises should look at many of the requirements being standards-driven, and a significant percentage of the market should be looking for more-cost-effective, easier-to-manage solutions for their infrastructures.

Many new and emerging decision criteria must be considered when looking at the market. Internet Protocol telephony (IPT) requirements — technologies such as Link Layer Discover Protocol-Media Endpoint Discovery (LLDP-MED), Power Over Ethernet (PoE), quality of service (QoS) and resiliency have largely become standardized. The primary difference among vendors is their ability and willingness to support diverse vendor requirements across the unified communications market space. Vendors with their own telephony solutions have been less willing to provide the required level of integration support to meet their customers' requirements. 2009 saw the standardization of PoE Plus (or IEEE 802.3at), which provides up to 30W of power to connected devices. Gartner expects support for this to become widespread during 2010, along with more power supply options to give enterprises choice in available PoE power.

On the security front, network access control (NAC) is another area of interest in the market. We expect NAC to be a mainstream requirement in the next two years, especially for those end-user organizations that integrate their wired and wireless access deployments. However, a lack of standard implementations means that integrated approaches are largely proprietary. Although NAC will become an important capability, embedded security will expand to provide more-complete protection, including wireless connectivity, and will include technologies such as postadmission control, threat containment and content security. New vendors are emerging with embedded network security as their core competency, and they are adding comprehensive switching features to compete at the edge of the network.

In the core of the network, we're also observing an evolution of requirements. Large data centers increasingly depend on the network layer. Requirements for emerging data centers can involve thousands of Gigabit Ethernet server connections and an increasing use of 10G server connections when larger servers aggressively use server virtualization technologies. The core now clearly uses 10G interconnections between switches, and large data centers are anticipating the delivery of 40G and 100G Ethernet standards. Another emerging approach is to deploy a dedicated top-of-rack switch with a 10G uplink into the core. To meet either of these high-end architectures, an individual core switch must support many hundreds of gigabit connections and have dense, wire-speed, low-latency

customer support programs (and the quality thereof), availability of user groups, service-level agreements, etc.

Operations: The ability of the organization to meet its goals and commitments. Factors include the quality of the organizational structure including skills, experiences, programs, systems and other vehicles that enable the organization to operate effectively and efficiently on an ongoing basis.

Completeness of Vision

Market Understanding: Ability of the vendor to understand buyers' wants and needs and to translate those into products and services. Vendors that show the highest degree of vision listen and understand buyers' wants and needs, and can shape or enhance those with their added vision.

Marketing Strategy: A clear, differentiated set of messages consistently communicated throughout the organization and externalized through the website, advertising, customer programs and positioning statements.

Sales Strategy: The strategy for selling product that uses the appropriate network of direct and indirect sales, marketing, service and communication affiliates that extend the scope and depth of market reach, skills, expertise, technologies, services and the customer base.

Offering (Product) Strategy: The vendor's approach to product development and delivery that emphasizes differentiation, functionality, methodology and feature set as they map to current and future requirements.

Business Model: The soundness and logic of the vendor's underlying business proposition.

Vertical/Industry Strategy: The vendor's strategy to direct resources, skills and offerings to meet the specific needs of individual market segments, including verticals.

Innovation: Direct, related, complementary and synergistic layouts of resources, expertise or capital for investment, consolidation, defensive or pre-emptive purposes.

Geographic Strategy: The vendor's strategy to direct resources, skills and offerings to meet the specific needs of geographies outside the "home" or native geography, either directly or through partners, channels and subsidiaries as appropriate for that geography and market.

10G capabilities. We have seen the emergence of data-center-focused vendors — the most obvious and successful is Blade Network Technologies, the leading provider of integrated blade switches, which has expanded its portfolio to include top-of-rack switches.

Core data center switches need to have enough combined port density to allow a switch interconnection without seriously reducing the number of devices connected to the switch. We are finding the high-end market stratified, with vendors such as Brocade, Cisco, Juniper Networks and 3Com (now HP) emerging as the leading players in high-capacity, scalable architectures. We are also seeing the beginning of converged data center networks using Fibre Channel over Ethernet (FCoE) and Data Center Bridging (DCB). Although in their infancy, the FCoE and DCB protocols are contributing to the shift in physical and logical network architectures in the data center.

We are also seeing growing interest in converging the access layer. Vendors are integrating WLAN controller functionality into the switching platform as the need for a separate appliance declines, as well as taking steps to ensure that they have a WLAN strategy, through acquisition or strategic partnership. In our survey of vendor references, more than 60% purchased their WLAN solutions from the same vendors as their wired LANs. Roughly half of these decisions were made as part of a single decision process. Although our client inquiries don't reflect quite this level of convergence, we have clearly seen a trend in this direction, and we have considered a vendor's activities in this area as a part of its product capabilities and vision.

The net result is that we are seeing a new segmented market where access, enterprise core and data center are increasingly separate decisions, with clearly defined and different requirements. It is no longer valid to think of one switching market, where there is a near-total overlap between the connectivity required to support user connections and that required for connecting servers and storage in the data center. This split between aggregation and data center connectivity will become more prevalent.

The final key evaluation criterion is focused on delivering a cost-effective infrastructure solution. A significant portion of the market hasn't used the sophisticated features available in many vendors' products, and now faces upgrades as their installed bases age. In the overall market, vendors achieve a 60% to 65% gross margin in LAN switching, indicating that more-cost-effective approaches are certainly possible. Organizations should focus on the life cycle costs of their infrastructures, including capital costs, warranty terms and conditions, power utilization and available services.

Organizations that are upgrading infrastructures that are more than seven years old should focus on procuring a standard, rich feature set, but should target cost reductions for capital and maintenance costs of at least 50%. The market has options for lower-cost switches (from a range of providers), comprehensive lifetime warranties and free software upgrades to provide a more-cost-effective economic model, without giving up the required level of functionality. For the access layer, there should be no hurdles to easily achieving a seven-year life span with either 10/100 Mbps or gigabit switches.

For the broader market, cost should be an elemental consideration when looking at LAN infrastructures. Many enterprises overprovision their LANs, especially at the edge. Enterprises can procure 10/100 edge switches with PoE for most of their user populations, or can look to vendors with significant value propositions for 10/100/1,000 options. Only functions with exceptional network requirements (such as video production engineering, medical imaging, geographic information systems, high-end computer-aided design and scientific research) would justify the use of gigabit to the desktop. The adjustment to purchase 10/100 or WLAN as the standard connection would save more than 15% of overall LAN procurement and maintenance costs for the enterprise. Further fine-tuning of requirements, combined with competitive bidding, would reduce these costs by an additional 15% to 50%.

Because of the large discrepancy between Cisco's LAN revenue and the rest of the market, vendor viability comes up in many of our discussions. However, we see no risk with the other Tier 1 vendors we have identified, and only marginal medium to long-term risk with any of the players in this analysis.

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Inclusion and Exclusion Criteria

Vendors in this Magic Quadrant must demonstrate two clear capabilities to be included in our analysis. The first is the ability to deliver enterprise-class solutions for LAN infrastructures and to be relevant to our client base. Second, a vendor's market share needs to be at 1% revenue or port share of the broad, enterprise-focused Ethernet market, or at least 5% in a significant market segment. Vendors included in this research have the ability to provide a full campus LAN infrastructure, or have innovations in select areas to provide key and differentiated functionality.

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Added

Juniper Networks is being added to the 2010 Magic Quadrant, because it has clearly surpassed both inclusion criteria.

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Dropped

3Com was dropped from the Magic Quadrant due to the completion of its acquisition by HP. The Nortel Networks name has been replaced by Avaya (Nortel) with the December 2009 acquisition of Nortel's enterprise data business.

Evaluation Criteria

Ability to Execute

The following provides some insight into the criteria Gartner uses when evaluating a vendor's ability to execute. At a high level, our analysis of ability to execute attempts to capture how well a vendor is performing across primary functional units of the business — product, sales/channels, marketing, service/support and financial.

Product: Evaluates vendors by looking at their overall portfolios, with a particular focus on the four attributes identified: convergence, embedded security, data center scalability and life cycle attributes. More emphasis was placed on capabilities that would apply in an open, multivendor application scenario, because many of these areas cross boundaries of the IT architecture, making proprietary protocols a problem.

Overall Viability: Looks at a vendor's investments in the LAN switching market, its financial investments and capabilities, and its long-term viability.

Sales Execution/Pricing: Was weighted higher than others on the execution axis, because it combines an evaluation of the presales and go-to-market activities, as well as an analysis of the resulting pricing and solution to the enterprise. On presales activity, the evaluation focuses on the vendor and its channel's ability to deliver comprehensive LAN infrastructure solutions — especially those focused on the three technical areas of innovation: convergence, security and data center. The second aspect of this criterion includes our evaluation of the cost-effectiveness of the solutions for capital purchase and long-term maintenance.

Market Execution: Focuses on how the vendor is perceived in the market, and how well its marketing programs are recognized. For LAN infrastructure, the evaluation focused on how well the vendor was able to influence the market around key messages and attributes related to the four key areas in the market. An additional indicator for this criterion is how often Gartner clients consider a vendor as a possible supplier in a shortlist evaluation. The change in momentum in this indicator is particularly important.

Customer Experience: Looks at all aspects of the customer interaction, with a heavier weighting on postsales service and support activities (see Table 1).

Table 1. Ability to Execute Evaluation Criteria

Evaluation Criteria	Weighting
Product/Service	standard
Overall Viability (Business Unit, Financial, Strategy, Organization)	standard
Sales Execution/Pricing	high
Market Responsiveness and Track Record	standard
Marketing Execution	standard
Customer Experience	standard
Operations	no rating

Source: Gartner (June 2010)

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Completeness of Vision

Evaluations for completeness of vision attempt to determine how well the vendor understands and is preparing for future market conditions, as well as shaping the future market.

Market Understanding: Looks at the vendor's ability to look into the future and drive new ideas into product road maps and offerings. In this market, leadership in driving the four key areas into the product offering is a good example, and demonstrates key abilities in this area.

Marketing Strategy: Evaluates the ability of the vendor to influence the market through its messaging and marketing campaigns. Vendors that have incorporated the key LAN criteria discussion points in the industry have demonstrated an ability to use their marketing strategies to their advantage. Examples are Cisco's "self-defending network" marketing campaign or Nortel's Energy Efficiency Calculator.

Offering Strategy: Evaluates how the vendor invests in R&D to continue to innovate in key areas and ensure that future products continue to evolve.

Innovation: Measures the vendor's ability to drive into new, related areas of LAN switching, and to move its own business, as well as the market.

Geographic Strategy: Measures how a vendor is approaching global opportunities and takes advantage of a global marketplace.

Sales Strategy and Vertical/Industry Strategy: Were not ranked, given the maturity and horizontal nature of the market (see Table 2).

Table 2. Completeness of Vision Evaluation Criteria

Evaluation Criteria	Weighting
Market Understanding	standard
Marketing Strategy	standard
Sales Strategy	no rating
Offering (Product) Strategy	standard
Business Model	standard
Vertical/Industry Strategy	no rating
Innovation	standard
Geographic Strategy	low

Source: Gartner (June 2010)

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Leaders

A leader has demonstrated a sustained ability to meet the changing needs for mainstream LAN switching architectures. A leader also has an ability to shape the market and maintain strong relationships with its channels and customers, while offering solutions for the edge, core and data center.

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Challengers

A challenger has demonstrated sustained execution in the marketplace, and has clear, long-term viability in the market, but has not shown the ability to shape and transform the market.

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Visionaries

A visionary has demonstrated an ability to increase features in its offering, to provide a unique and differentiated approach to the market. A visionary has innovated in one or more of the key areas of campus LAN technologies, such as convergence, security, data center and operational efficiency.

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Niche Players

A niche player has a complete or near-complete product offering, but does not have strong go-to-market capabilities or innovation in its product offering. A niche player has a viable product offering, and, in some cases, will be an appropriate choice for large infrastructure deals.

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Vendor Strengths and Cautions

Alcatel-Lucent

Alcatel-Lucent has a strong, but regionally biased, position in enterprise voice technologies, applications and services that can help Alcatel-Lucent in some markets. Alcatel-Lucent should be considered for LAN switching when customers are adding to an installed base or looking to leverage one-stop convergence with an Alcatel voice solution.

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Strengths

- Has stayed the course with a competitive, but basic product strategy and by leveraging its strong telephony base. This has allowed Alcatel-Lucent to weather a difficult economic market, while increasing its market share.
- After a flurry of new product releases in 2009, Alcatel-Lucent started 2010 by adding functionality, including PoE Plus and 10G support, as enterprises continued their move from Fast Ethernet to GigE. Alcatel-Lucent is

one of the only players with an industrial Ethernet portfolio.

- The introduction of the 6250 provides a stackable, fanless switch with connectivity to address the small or midsize business (SMB) market.
- Performance was doubled on the OmniSwitch 9000 platform with the addition of active-active support for data centers with redundancy requirements.

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Cautions

- Despite continuing to increase market share, Alcatel-Lucent is a small player with a 1% to 2% market share in the enterprise data market.
- Alcatel-Lucent's strategy to leverage integration between service provider voice and data switching solutions and enterprise is questionable and may distract resources from developing and delivering more enterprise-relevant solutions.
- Better known for its European presence, Alcatel-Lucent continues to have limited exposure in North America, but is making efforts to improve visibility.
- The OEM WLAN strategy through Aruba is strong, but Alcatel-Lucent needs to develop differentiating functionality with Aruba or acquire a WLAN company, as enterprises begin to look for a single access layer vendor.

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Avaya (Nortel)

Avaya re-entered the enterprise data market with the acquisition of Nortel's enterprise products and team. The company now has business units that address the global needs of enterprise infrastructure networking, unified communications and contact centers. Large enterprises and SMBs looking for a fully converged solution combining voice and data should consider Avaya.

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Strengths

- Avaya Data Solutions picks up where the Nortel Enterprise team left off — with a stated commitment and a product family that historically has been one of the strongest in the industry.
- Avaya continues to invest and expand the product line with the launch of the ERS 5600 stackable switch, a refresh of the ERS 8000 family, as well as the announced VSP 9000 core switch.
- Avaya can draw on the large installed base of Nortel data products, as well as the combined Nortel and Avaya voice base to increase market traction. The Data Solutions team will need to leverage the joint customer installed base and ramp up new marketing efforts to increase market share.
- Avaya (operating as Nortel in 2009) survived a difficult period that combined a major market downturn, while dealing with bankruptcy protection proceedings. Despite this turmoil, its performance, while worse than market rates, allowed Avaya to emerge as the No. 3 vendor in the LAN marketplace (after combining HP and 3Com into the new No. 2 player).

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Cautions

- Despite a solid overall portfolio, Avaya struggles for brand recognition in the enterprise LAN marketplace and must invest in this market for recognition outside the historical Nortel and Avaya customer base.
- After enduring a difficult and uncertain period as Nortel consolidated investments and dispersed its assets, the installed base remains cautious and skeptical about Avaya's commitment to the market.

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Brocade

Brocade has depth of expertise across all data center networking technologies; however, 2009 was a mixed year for the vendor. The first part of 2009 saw revenue performance exceed that of the market, though this was likely a rebound from a disappointing 2008, when Brocade's acquisition of Foundry took longer than expected. However, the last quarter of 2009 was disappointing, as revenue did not increase with the rest of the industry, and strong evidence of the integration of the classic Foundry and Brocade offerings was limited. Brocade must establish itself as a key player within the complete data center networking marketplace in 2010.

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Strengths

- A strong presence in corporate data centers and the collective assets of high-end LAN switching, Fibre Channel and FCoE technologies put Brocade in a solid technology position.
- Customer support remains a strength, and Brocade's greater geographic reach and services capabilities have enhanced its capabilities during 2009.
- Converging server and storage solutions into a unified network continues to add unique differentiation, and

enhances the Brocade (Foundry) advanced data center vision.

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Cautions

- Although Brocade is in the process of combining its enterprise LAN solutions into a few powerful offerings, it still has a confusing portfolio of products that make it difficult for channels and partners to properly represent the product offering in the field.
- Brocade needs to continue its 2009 investments to drive more of its business through an engaged channel partner program.
- Its OEM WLAN strategy with Motorola is struck in late 2009 after changing its Meru Networks relationship from OEM to reseller. Brocade needs to quickly eliminate any confusion in the market by documenting its strategy and developing differentiating functionality, as enterprises begin to look for a converged services, rich access layer vendor.

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Cisco

Cisco is the market leader and a primary influence on LAN switching, offering a breadth of products and feature sets to meet a variety of requirements based on the customer's needs for resiliency, scale and depth of Borderless Network services. Cisco should be on a shortlist of vendors for all mainstream requirements, although no vendor should be considered a sole-source provider.

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Strengths

- Cisco maintains the broadest portfolio of LAN switching and WLAN solutions. With continuing changes in the market, the introduction of the Borderless Network highlights the breadth of the product family.
- StackPower (introduced on the new Catalyst 3750X series) is an innovative power pooling technology for Cisco workgroup switching platforms that enhances resiliency. It may also improve energy efficiency.
- The continued evolution of NX-OS and investment and the maturity of the Nexus product family provides Cisco with a leadership opportunity in emerging data center connectivity.
- The introduction of the 1140 series of access points in addition to enriching its MediaNet and TrustSec network application services, enables Cisco to compete with any WLAN vendor, regardless of its point of differentiation.

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Cautions

- Although Cisco appears to understand the need for wired and wireless integration, its execution is lagging behind the competitors. ClientLink and now CleanAir address customer needs, but the functionality was launched after competitive offerings were in the market.
- Despite the marketing success and the potential for continued innovation of EnergyWise, little progress has been made on third-party integration, which provides differentiation from other competitive programs.
- The breadth of Cisco's product family, the introduction of different levels of service for different product families and limited lifetime warranty for some switching products is confusing to customers and requires them to fully understand the warranty options before they can select an appropriate service offering.
- Cisco needs to better articulate how networking services and existing Catalyst-based data centers will be integrated into their new Nexus architecture.
- Reference checks, while still strong, show that some Cisco customers are increasingly critical of Cisco's efforts in sales, engineering and support relationships.

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Enterasys/Siemens

Enterasys needs to find a compelling position in the marketplace as it continues to tread water in a market that continues to consolidate around it. Consider Enterasys when its flow-based policy-driven integrated security features offer key differentiation.

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Strengths

- Enterasys continues to enhance its portfolio, with refreshed solutions expected from edge to core in 2010. We also see a growing understanding of emerging data center requirements.
- Enterasys has developed a strong wired and internally developed wireless networking solution that has focused on TCO. Integrated controller functionality into its switching platform, converged wired and wireless network management, security and additional network application services positions Enterasys well as the market continues to move toward a converged access layer.
- A tightly integrated security message and solution makes this vendor a good candidate in its target markets.

where security is a priority buying point.

- Customer feedback continues to highlight customer support and service as a differentiator.

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Cautions

- Enterasys continues to have a small market footprint, with 1% to 2% market share and somewhat limited geographically to North America and Western Europe coverage
- As part of Siemens' enterprise communications organization, there is potential for longer-term leverage; however, we've seen no benefits from the combined company to date.
- Continued delays with corporate rebranding efforts continue to limit Enterasys' ability to create visible and compelling messages in the broader market.

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Extreme Networks

Extreme Networks provides converged Ethernet network infrastructure that supports data, voice and video for enterprises and service providers. The company's network solutions focus on high-performance, high-availability and scalable switching solutions. Like Enterasys, it needs to carve out a differentiated position in this rapidly consolidating market. Consider Extreme when its XOS solutions bring specific value to campus or data center deployments.

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Strengths

- Extreme Networks continued to broaden its XOS-based product family with the release of the BlackDiamond high-performance 8900 series modules for the 8090 series platform and enhancements to the X650.
- A focus on autohealing and provisioning within XOS makes Extreme components resilient and easy to deploy.
- Key investments in security with McAfee and wireless with Motorola address functionality that is increasingly important in the enterprise.

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Cautions

- Extreme continued to struggle in 2009 to increase its brand recognition and differentiation, resulting in further market share loss to competitors.
- Extreme has not been able to leverage capabilities within XOS to provide a compelling value proposition that is sufficiently differentiated from others in the market, although recent investments are hoping to reverse this.
- Although there is increased investment in security and wireless, these features are delivered via partnership relationships that are subject to change and do not allow Extreme to control the direction of this critical functionality. Enterprises need to think about longer-term support issues in these cases.
- Extreme's OEM WLAN strategy with Motorola was struck in late 2009. Extreme needs to quickly identify and develop differentiating functionality with Motorola or acquire a WLAN company as enterprises begin to look for a converged services, rich access layer vendor.

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HP

On its own, HP had another solid year in 2009. However, the recent completion of the 3Com acquisition completely changes the face of the enterprise networking market. Combining the clear No. 2 and No. 3 players in the market results in a new network powerhouse that collectively shipped more than 36% of the medium and large enterprise LAN ports during 2009, compared with 51% for Cisco and only 2.9% for the No. 3 player Avaya (Nortel).

Consider HP for all LAN switching opportunities in the LAN edge, LAN core and data center. Every organization should at least consider and competitively include HP on its network evaluations.

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Strengths

- HP now has a complete, end-to-end LAN switching portfolio that can address the needs of all organizations from small to large enterprises, from the LAN edge to the network core and into the data center.
- The continued integration of HP Networking into the HP Enterprise Servers Storage and Networking (ESSN) organization provides HP with a extremely large sales force and complete global reach.
- The combination of a large, productive R&D organization based in China and HP's supply chain and design expertise offers a potentially disruptive force that can change the economics of the enterprise networking marketplace.
- Lifetime hardware warranties, software upgrades and business-day telephone support across much of the portfolio ensure that HP's longer-term maintenance costs are the lowest in the industry.

- HP offers the most complete integration of wired and wireless solutions in the market. The WLAN portfolio includes the integration of controller functionality into its switches, as well as a converged network management and security functionality for single pane of glass management. They are well-positioned to continue their growth at the edge of the network.
- HP Networking has the ability to leverage the global capabilities and experience provided by Technology Services and Enterprise Services (previously EDS), both of which have been large partners for other major vendors.

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Cautions

- Integration of the two product offerings will take some time and, to date, it is not clear how they will serve the respective installed bases and ultimately provide an integrated enterprise solution. Some products will have to be de-emphasized during the transition.
- The combined portfolio is large, and even with the positioning of the A- E- and V- series offerings, there can be too much choice and potential confusion between similar offerings in the A- and E- series. HP must ensure that it provides appropriate guidance and accelerates its solutions focus to maximize clarity to customers and partners.
- HP's enterprise sales force has not been as conversant about enterprise networking solutions and must provide a seamless extension to the HP Networking dedicated field experts.
- HP's channel strategy is limiting its ability to expand, especially when dealing with the breadth of the HP product line and the ability to deal with larger enterprise networking opportunities. The past two years have seen organic improvement using HP Enterprise Services; however, HP must develop other global-class alternatives for its customers.

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Juniper Networks

Juniper is a new entrant in this year's Magic Quadrant that has demonstrated strong execution on the product and go-to-market fronts. From the introduction of its EX product offering in 2Q08 to 4Q09, Juniper is now the fifth-largest LAN switching vendor, surpassing longtime players such as Extreme, Enterasys and Alcatel-Lucent. Based on client inquiry and recent reference checks, Juniper has emerged in the top three for enterprise mind share.

Consider this vendor for all campus and data center upgrade and refresh requirements.

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Strengths

- Juniper has a strong history of technology execution, especially with Layer 3 technologies. Organizations can expect products to deliver as specified and to have robust and well-tested feature sets.
- Juniper has introduced a streamlined portfolio of products with largely single product groups targeted at LAN edge, LAN core and data center switching requirements.
- Juniper demonstrated a surprisingly aggressive pricing approach to the market in competitive situations. This shows that, despite being a new entrant in the market, Juniper was well-prepared for the increasingly competitive nature of the LAN switching market.
- A strong partnership with IBM has helped the business ramp up and provide additional credibility with large accounts and complex data center opportunities.

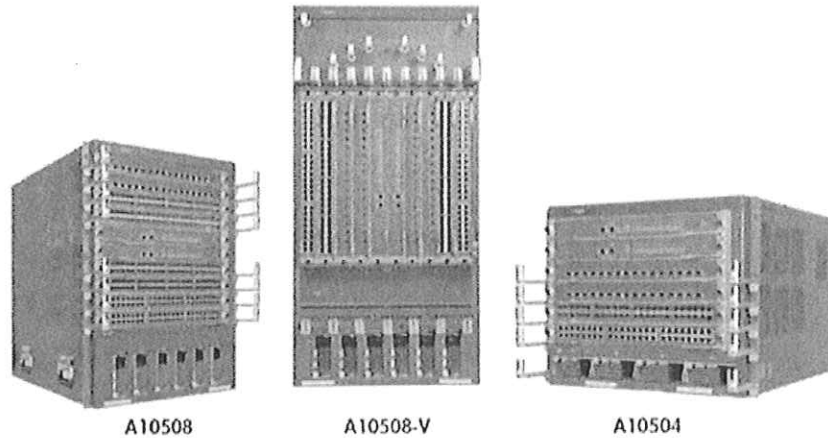
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Cautions

- Channels and account coverage continue to limit Juniper's opportunities, and many channels are still ramping up their expertise in LAN switching. With Juniper's enterprise heritage being largely security-based, work needs to be done to focus on and understand networking solutions.
- Part of the data center portfolio — notably the EX2500 from Blade Network Technologies — is an OEM product; although Blade is becoming the showcase partner for its commitment to Junos, delivering important products through partnerships always increases risk.
- Juniper must continue to expand its portfolio, move quickly to keep up with market requirements and fill various holes to deliver a more complete product.
- Juniper has not articulated its approach to next-generation data centers in enough detail to demonstrate how it will approach emerging fabric architecture requirements.
- Although Juniper has made aggressive strides in the edge and data center switch parts of its portfolio, it is the only vendor without a clear WLAN strategy. Its incomplete vision at the edge will limit its growth at the edge of the network, as enterprises begin to look for a converged services, rich access layer vendor.

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SECTION 9 – HP 105XX ENTERPRISE NETWORKING EQUIPMENT



HP A10500 Series Enterprise Core Switches

Fact Sheet

Overview

The HP A10500 series of switches for HP's FlexCampus solution is ideally positioned for enterprise campus core deployment. The A10500 is designed to set a new benchmark for performance, low-latency, reliability, future-proof scalability as well as green technology to enable a video-ready network and provide an unmatched user experience with an advanced, simplified network architecture. The A10500 delivers ultra-high 10GbE density and 3 microsecond latency, and features HP Intelligent Resilient Framework (IRF) running on the proven Comware operating system. The A10500 is seamlessly managed with a single-pane-of-glass view as part of the HP networking portfolio by HP Intelligent Management Center (IMC).

Feature and Benefit Highlights

- Advanced CLOS architecture for high capacity, scalability and reliability
- HP Intelligent Resilient Framework for architectural simplicity and unmatched resiliency, with full L2/L3/MPLS/VPLS and application support across all IRF links
- Ultra-high 10GbE and Gigabit port density; 40GbE and 100GbE-ready platform
- IPv6, MPLS support for advanced network deployment
- Green features include, advanced chassis power management, efficient front to back cooling, intelligent power consumption monitoring and management that contribute to overall OPEX savings and ROHS compliance

New Benchmark for Performance

- **High-speed fully distributed architecture:** The A10500 provides single-switch capacity up to 2.56 Tbps with throughput of up to 1.92 Bpps; 3 microsecond latency; supports up to 128 10GbE ports at line rate or 384GbE ports. Utilizing IRF on the first release of the A10500 chassis can deliver 256 10GbE ports at line rate. In future versions, for large campuses, a super core with four A10500 chassis's in an IRF system combined with high density 48-port 10GbE line cards can deliver more than 1,500 10GbE ports.
- **Scalable system design:** The A10500 is designed for maximum scalability in three dimensions: performance, connectivity, and functionality. The A10500 backplane is designed for maximum bandwidth and throughput. Its CLOS architecture and innovative design delivers a future-proof solution and investment protection to support video and other high-bandwidth, latency-intolerant applications and services
- **Flexible chassis and port density options:** The A10500 features a choice of three chassis, ranging from 8-slot vertical and horizontal chassis models and a 4-slot model for lower density deployments. For deployment flexibility, a wide range of copper and fiber Fast Ethernet and Gigabit modules will be available with the initial release. 16-port line rate

10GbE modules will also be available with the initial release, with 48-port line-rate 10GbE and 4-port line rate 40GbE and 100GbE modules coming in the future.

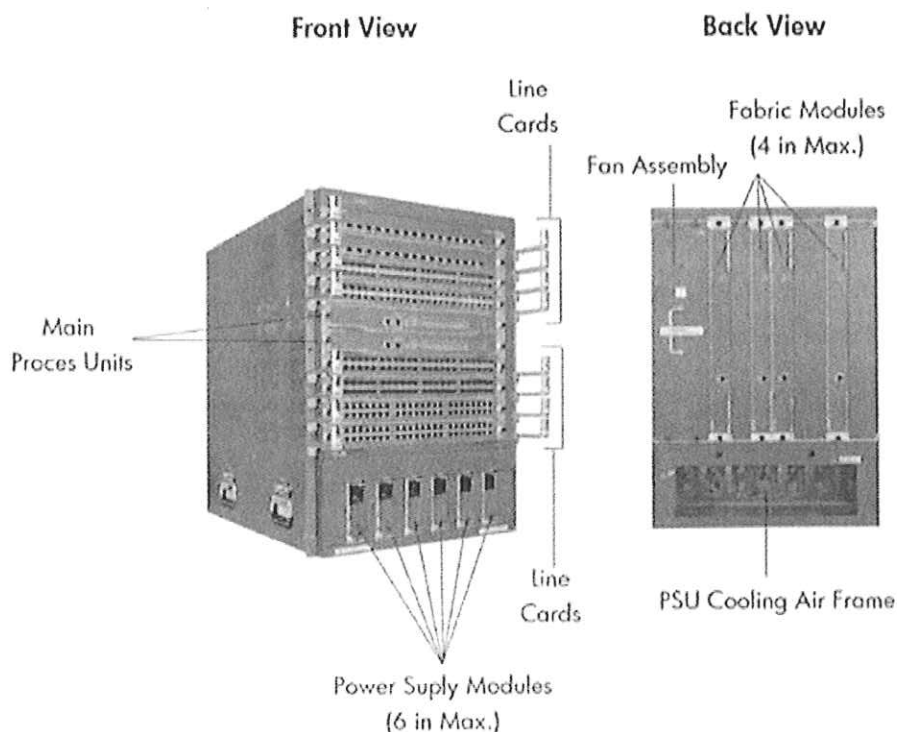
Ultra-high Resiliency and Availability for Mission-critical Enterprise Core Applications

- **Intelligent Resilient Framework (IRF):** The A10500 fully supports HP IRF technology and can dramatically simplify the campus core network by consolidating the core layer into a single logical switch fabric. Additionally IRF extends network control over multiple active HP A10500 switches for management as a single switch with a single IP address, simplifying network design and management.
- **Separate data and control paths:** To increase security and performance, the A10500 maintains separate control and services paths and isolates service processing.
- **Redundant/load-sharing fabrics, management, fan assemblies, and power supplies:** Ideally positioned for the enterprise campus core, the A10500 is a fully modular switch with redundant, load-sharing and hot-swappable components to increase total performance and power available while providing hitless, stateful failover

Table 1: HP A10500 Platforms

Model	A10504	A10508	A10508-V
Maximum Backplane Bandwidth	5.75 Tbps	11.52 Tbps	11.52 Tbps
Switching Capacity	1.28 Tbps	2.56 Tbps	2.56 Tbps
Packet Forwarding Rate	960 Mpps	1.92 Bpps	1.92 Bpps
Engine Slots	2	2	2
Fabric Slots	4 (Vertical)	4 (Vertical)	4 (Horizontal)
I/O Slots	4 (Horizontal)	8 (Horizontal)	8 (vertical)
Maximum Number of Line rate Gigabit Ports	192	384	384
Maximum Number of Line rate 10Gigabit Ports	64	128	128
Power Supply Units	3+1	5+1	5+1

Figure 1: Hardware



- In Service Software (ISS) Upgrades:** Utilizing IRF, the A10500 can install patches and deploy new service features without restarting the entire virtual switch fabric, increasing network uptime and simplifying maintenance
- Graceful restart:** The HP A10500, delivers graceful restart for OSPF, IS-IS, BGP, LDP, and RSVP. With the A10500 the network remains stable during the active-standby switchover, and afterward the device quickly learns the network routes by communicating with adjacent routers so packet forwarding remains uninterrupted.

Table 2: Specifications

Chassis
HP A10508-V Switch Chassis
HP A10508 Switch Chassis
HP A10504 Switch Chassis
Processing Units and Fabrics
HP A10500 Main Processing Unit
HP A10504 320Gbps Type A Fabric Module
HP A10508 640Gbps Type A Fabric Module

Table 2: Specifications Continued

10GbE Modules
HP A10500 16-port 10 GbE SFP+ Module
HP A10500 8-port 10-GbE SFP+ Module
HP A10500 4-port 10-GbE XFP Module
10/100/1000 Modules
HP A10500 48-port GbE SFP Module
HP A10500 48-port Gig-T Module
HP A10500 24p GbE / 2p 10 GbE XFP Module
Power Supplies and Accessories
HP A10508 Spare Fan Assembly
HP A10508-V Spare Fan Assembly
HP A10504 Spare Fan Assembly
HP A10500 2500W AC Power Supply

<p>Large Installed Base: Cisco SVP John McCool claims that the Catalyst 6500 has generated \$42B in revenue since 1999 and has close to 700,000 systems (110 million ports) installed globally to more than 25,000 customers.</p>	<p>The Catalyst 6500 is more than a decade old platform that has seen nothing more than incremental updates. As for the large installed base, these are the customer's who continue to turn their backs on Cisco and lift HP's market share results each quarter, proving that a real alternative exists.</p>
<p>Market Share: Cisco SVP John McCool claims that Cisco's market share in switching has been steady.</p>	<p>According to the Dell'Oro Group HP Networking had 12% market share for the WW L2-3 Ethernet switching market in Q111. This was up 2.5 percentage point's year-over-year, while Cisco's market share continued to slide with a 5.8 percentage point decline year-over-year. HP also gained 3.7 percentage points (ports shipped) of modular switching market share. The market share losses which Cisco has been experiencing are an obvious reflection of the market's reaction to being forced to pay a premium for legacy architectures on outdated platforms.</p>

Analyst Comments:

- "The 6500 was a fantastic workhorse, but is it going to be another five-year or seven-year platform?" – Andre Kindness, Forrester Research
- "Customer's may remain confused about whether they should place long-term bets on the Catalyst 6500." – Alan Weckel, Dell'Oro Group
- "Coming in with a supervisor only refresh opens up the customer to choice and evaluation of alternatives." – Mike Spanbauer, Current Analysis

Bottom Line:

Cisco's announcement comes two months after HP Networking announced the Flex Network architecture and A10500 series. This announcement is one that Cisco clearly had to make even though the Catalyst 6500 is very long in the tooth. The Catalyst 6500 is one of Cisco's more important installed bases and since the Catalyst 6500 carries much better margins than the Nexus line and Cisco shareholders have been very concerned with Cisco's shrinking gross margins this announcement was a necessity. The bottom line is that Cisco is facing declining switching profits and they have never before seen competition like they are currently seeing from HP. This announcement which lacks accuracy and material substance is just another sign that their downward spiral is continuing. It is obvious now more than ever that the market place finally has a real choice, as HP has brought competition to a stagnant and overpriced market and it's the customer's who are benefitting the most.

Press Coverage:

- [HP Challenges Cisco Catalyst 6500 Upgrade Claims – July 13, 2011 – CRN](#)
- [Cisco Live 2011: Catalyst 6500 Upgrade The Game Changer? – July 13, 2011 - CRN](#)
- [Cisco Is Set to Unveil Upgraded Switching – July 12, 2011 – Wall Street Journal](#)
- [Cisco Refreshes Top Catalyst Switch Line – July 12, 2011 – CRN](#)
- [Cisco Pushes Back on Switching – July 12, 2011 – Light Reading](#)
- [Cisco Upgrades Catalyst Series of Switches – July 13, 2011 – Channel Insider](#)
- [Cisco Injects New Life Into Catalyst 6500 Switch – July 13, 2011 – Network World](#)

Cisco Collateral:

- [Cisco Press Release](#)
- [Catalyst 6500 Data Sheets](#)

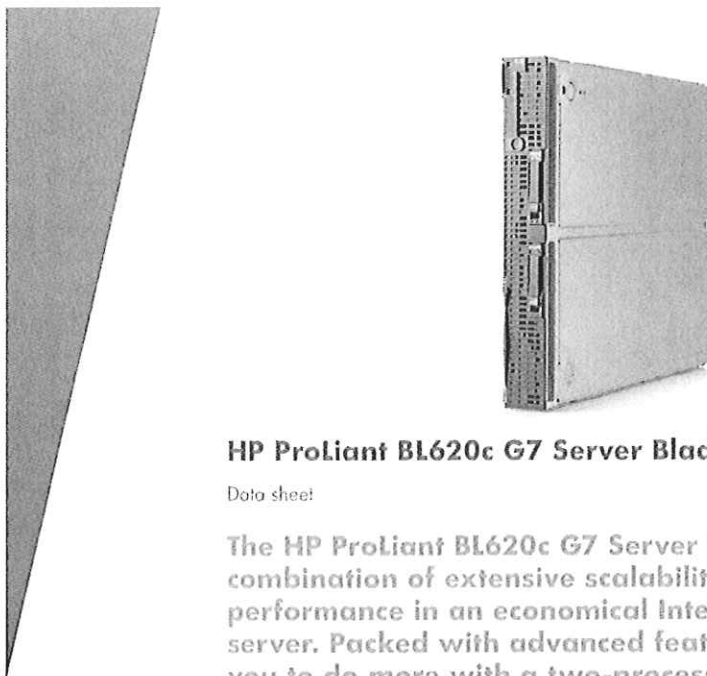
HP Networking Supporting Information/Tools:

- [HP Networking July "Pause" Cisco Disruption Campaign](#)
- [HP Accelerates Market Share Gains in Networking Worldwide and in Every Region](#)
- [Competitive Battlecard: Defending and Attacking Cisco FUD on HPN](#)
- [HP Networking Playbook: Cisco EOL Products](#)
- [Cisco Quarterly Earnings Analysis FY11Q3](#)
- [HP Networking Competitive Intelligence Web Portal](#)

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- [Michael Nielson – Director, HP Networking Solution and Vertical Marketing](#)
- [Brian Greenberg – Global Competitive Intelligence Manager](#)

SECTION 10 – HP BLADE PRODUCT INFORMATION



HP ProLiant BL620c G7 Server Blade

Data sheet

The HP ProLiant BL620c G7 Server Blade provides an ideal combination of extensive scalability, virtualization, and performance in an economical Intel® Xeon® multiprocessor server. Packed with advanced features, the BL620c G7 allows you to do more with a two-processor server than ever before.

Redefining scalability in a two-processor (2P) architecture, the ProLiant BL620c G7 Server Blade provides a fully balanced server platform. Two models are now available, one optimized for the Intel Xeon processor E7-2800 product family (E7-2800 series) and the other optimized for the Intel Xeon 6500/7500 series. The servers support up to two top-performing Intel Xeon 130-watt processors and 32 DIMM slots for up to 1.0 TB (BL620c G7 E7-2800 models) and 512 MB (BL620c G7 6500/7500 models). The ProLiant BL620c G7 Server Blade also comes with two hot-plug drive bays plus four 10 Gb FlexFabric ports combined with the three mezzanine slots to yield an outstanding 96 Gb of I/O bandwidth. All these features work together to help you expand your business and improve performance significantly. The ProLiant BL620c G7 Server Blade is ideal for your virtualization and compute-intensive database workloads such as SAP, larger virtualization consolidation projects, and scale-up applications. It is also perfect for 2P applications requiring scalability, performance, and features greater than typical dual processor (DP) Intel Xeon 5500/5600 offerings.

Beyond the traditional dual core processor
The ProLiant BL620c G7 Server Blade is a unique 2P blade that is fully balanced to ensure all subsystems are used effectively. Traditional multiprocessor (MP) server blades are typically unbalanced, providing processor performance and density at the expense of proportional memory capacity and bandwidth.

These unbalanced servers fail when faced with high-density virtualization applications and general data-intensive workloads.

Today, you have a better alternative. Unlike other traditional multiprocessor server blades, the ProLiant BL620c G7 Server Blade provides performance without compromising on proportional memory capacity and I/O bandwidth. Being one of the most robust 2P virtualization and scale-up servers, it is capable of handling x86 two-socket applications that require superior performance and scalability.



Why RAS?

In a memory-intensive computing environment, RAS is paramount. Multiprocessor servers provide industry-leading RAS capabilities primarily in memory and chipset to protect data transfer points throughout the system. The Intel Xeon E7-2800 and 6500/7500 series architectures offer considerably more robust RAS features than Intel Xeon 5500/5600 dual processor technology.

Key features and benefits

Unmatched 2P scalability

Seamlessly scale up to 1.0 TB of registered DDR3 RAM to 1066 MHz in a 2S configuration with the ProLiant BL620c G7 Server Blade. By fully utilizing the design architecture of the Intel Xeon 7500 chipset, up to two top-performing 130-watt processors, you can now expand your business with confidence and also realize ultimate virtualization efficiency. The ProLiant BL620c G7 Server Blade provides:

- Up to two Intel Xeon E7-2800 or 6500/7500 processors, each up to 130 watts to deliver higher computing power for a 2S server blade.
- 32 DIMM slots for up to 1.0 TB of memory for high-threaded and memory-intensive applications and a variety of data-demanding workloads.
- Up to 133 VMs per server for large virtualization and consolidation projects.
- Two memory controllers, per each processor socket, connect to four Intel Scalable Memory Buffers for optimal memory capacity and bandwidth as well as overall improved system performance.
- 40 Gb of embedded FlexFabric ports and three I/O expansion slots bring the total I/O bandwidth to an outstanding 96 Gb.
- High-performance integrated Smart Array P410i Controller with RAID 0 and 1 with flash-backed write cache options up to 1 GB.
- Two hot-plug SAS/SATA/SSD drive bays supporting up to 2.0 TB of internal storage for versatile configuration and deployment options.

Redefining server economics

The ProLiant BL620c G7 Server Blade is an industry-leading 2S, full-height blade server that offers excellent value for your money and superior performance in a high-density multiprocessor form factor. It provides:

- Up to 8x of memory capacity and enhanced performance compared to the competing 2P Intel Xeon server blades¹ with over twice the number of RAS features.²
- Up to 10x of memory capacity, 20x embedded Ethernet bandwidth, and 150 percent the onboard I/O slots than traditional 2P Intel Xeon 5500/5600 series processor server blades.³
- Up to 2 ten-core processors provide more performance as 4 four-core previous generation Intel Xeon 7400 series processors. This brings down the number of sockets by half—reducing licensing costs of software based on the number of sockets. In other words, the BL620c G7 server blade will give you a great price/performance ratio.
- 2S Intel Xeon E7-2800 and 6500 series processors offers the same performance as their matching more expensive E7-4800 and 7500 series counterparts, respectively.

Advanced networking technology

With four embedded HP 10 Gb NC553i FlexFabric Converged Network Adapters (CNAs), the ProLiant BL620c G7 Server Blade delivers improved performance and cost savings of converged network connectivity. It helps to:

- Sustain sufficient bandwidth for network-intensive applications
- Streamline, simplify, and increase network and storage traffic with Fibre Channel over Ethernet (FCoE), hardware-based iSCSI acceleration, and stateless TCP/IP offloading
- Integrate FCoE and hardware-based iSCSI with iSCSI boot simplify management and lower infrastructure costs by converging LAN and SAN traffic over the same flexible connection
- Connect to network and storage, with up to 16 connections, without the need for add-in mezzanine cards
- Divide and fine-tune network and storage bandwidth to match application requirements

HP Services

HP Technology Services has a robust portfolio of packaged lifecycle support solutions that enable you to optimize ProLiant support for better business outcome.

Optimized Care: Delivers optimum performance and continuous availability of crucial ProLiant systems through deployments and proactive management practices.

- HP Installation and Startup for HP BladeSystem c-Class Infrastructure plus HP Enhanced Network
- 3-Year HP Critical Advantage

Standard Care: Maintains high level of server availability along with expert help to cut the cost and complexity of implementing and supporting ProLiant servers.

- HP Installation and Startup for HP BladeSystem c-Class Infrastructure plus HP Enhanced Network
- 3-Year HP 6-hour Call-to-Repair Hardware Support
- 3-Year HP 24x7 Software Support for Insight Control

Basic Care: Delivers minimum recommended support service level with expert advice, implementation, and support.

- HP Installation and Startup for HP BladeSystem c-Class Infrastructure
- 3-Year HP 24x7 4-hour Response, Hardware Support
- 3-Year HP 24x7 Software Support for Insight Control

All come with Insight Remote Support, available at no additional cost, delivering remote monitoring, diagnosis, and problem resolution.

Only HP brings together deep expertise, proactive and business critical support, and a strong partner network.

For more information visit: www.hp.com/services/bladesteam

Compared to competing Intel Xeon 6500/7500 Server Blades that support a maximum of 128 GB of memory in a single wide, full height form factor. Compared to the HP ProLiant BL620c G5 Server Blade.

Based on dual processor servers with 96 GB of memory, two embedded 10 Gb Ethernet adapters, and two I/O slots.

Technical specifications

HP ProLiant BL620c G7 Server Blade

Processor	
Number of processors	• One or two, up to 130 watts each
Maximum number of cores	• Up to ten per processor
Processors supported	• Intel Xeon E72800 and 6500/7500 series
Low-wattage processors	• Intel Xeon E7 8867L and L7555
Cache	• Up to 30 MB L3 per processor
Processor speed	• Up to 2.26 GHz
Memory	
Memory type	• DDR3 Registered DIMM (RDIMM)
Memory slots	• 64 DDR3 RDIMM slots
Low voltage DIMM support	• 8 GB, 16 GB, and 32 GB (BL620c G7 Intel Xeon E72800 series models)
Standard memory	• 8 GB (2 x 4 GB DIMMs) (BL620c G7 Intel Xeon E72800 series preconfigured models) • 32 GB (4 x 8 GB DIMMs) (BL620c G7 Intel Xeon 6500 series preconfigured models)
Maximum memory	• 1.0 TB (32 x 32 GB DIMMs) (BL620c G7 Intel Xeon E72800 series models) • 0.5 TB (32 x 16 GB DIMMs) (BL620c G7 Intel Xeon 6500/7500 series models)
Advanced memory protection	<ul style="list-style-type: none"> • HP Memory Quarantine (i.e. Intel MCA Recovery)* • Double Device Data Correction (DDDC)* (BL620c G7 Intel Xeon E72800 series preconfigured models) • Advanced ECC/Chip Spare/SDDC • Intel SMI clock fallover • Intel SMI packet retry • Demand scrubbing • Intra socket memory mirroring • Memory fallover • Rank Sparring (Online Spare) • Failed DIMM isolation • Data bus ECC protection • DIMM Address/Control Bus Parity Protection
Networking and I/O	
Integrated network adapter	• Four HP embedded 10 Gb NC553i FlexFabric Converged Network Adapter ports
I/O expansion slots	• Three PCIe Gen2
Standard/maximum I/O bandwidth	• 40 Gb/96 Gb
Networking options	• Multiple, redundant port 10 Gb FlexFabric, 10GbE Flex10, 10 Gb and 1 Gb Ethernet, and QDR (40 Gb) InfiniBand
Storage	
Storage type	<ul style="list-style-type: none"> • Hot plug SFF SAS • Hot plug SFF SATA • Hot plug SFF SSD
Maximum internal storage	• Two hot plug SAS/SATA/SSD bays supporting up to 2.0 TB
Integrated storage controller	• 6 Gb Smart Array P410i Controller with RAID 0 and 1 with optional FBWC options to 1 GB
Storage options	<ul style="list-style-type: none"> • 4 Gb and 8 Gb Fibre Channel mezzanine adapters (Brocade, Emulex, and QLogic options) • StorageWorks Controller mezzanines options with BBWC or FBWC to 1 GB for connection to external direct attached or shared storage • I/O accelerator cards for high-performance I/O • HP StorageWorks Ultrium Tape Blades for an integrated direct attached data protection solution • Optional HP StorageWorks Ultrium Tape Blades • Optional D2200sb PCIe Storage Blades for direct attached and shared storage within the c-Class enclosures • Compatible with HP StorageWorks MSA, EVA, and XFHP, and select third party SANs
Flash media	<ul style="list-style-type: none"> • Internal USB 2.0 port • Internal MicroSDHC slot
Deployment	
Form factor	<ul style="list-style-type: none"> • Full height, single-wide server blade • Eight server blades per c7000 10U enclosure • Four server blades per c3000 6U enclosure
System management	<ul style="list-style-type: none"> • HP Integrated Lights Out 3 • HP Insight Foundation • BladeSystem enclosure Onboard Administrator (OA) with KVM (optional redundant OA) • HP Insight Control (optional) • HP Insight Dynamics for ProLiant (optional)

* This is a "ready" feature meaning the hardware is capable of supporting the feature with only a future planned software upgrade.

Technical specifications (continued)

Other	
Power and fans	<ul style="list-style-type: none"> • True N+N redundant hot-plug, high-efficiency, enclosure-based power supplies • Redundant hot-plug HP Active Cool fans • HP Thermal Logic Technology/Sea of Sensors • HP Dynamic Power Saver Mode • HP Power Regulator • Parallel Redundant Scalable Enclosure Cooling (PARSEC) design • Power workload balancing
RAS	<ul style="list-style-type: none"> • Nearily forty (40) system-wide reliability, availability, and serviceability features
Security	<ul style="list-style-type: none"> • Intel Trusted Execution Environment (TXT)* (BL620c G7 Intel Xeon E7-2800 series preconfigured models) • Trusted Platform Module 1.2 option • Intel AES NI (BL620c G7 E7-2800 series models) • Power on password • Administrator password • iLO 3 with 12 customizable user accounts • SSL encryption SSH v2 • AES and Triple Data Encryption Standard on browser • CLP and XML scripting interface
Warranty	<ul style="list-style-type: none"> • 3-year parts/3-year labor/3-year onsite
For additional technical specifications, please visit: http://h18000.www1.hp.com/products/quickspecs/13747_div/13747_div.pdf	

* This is a "ready" feature meaning the hardware is capable of supporting the feature with only a future planned software upgrade.

Why choose the ProLiant BL620c G7 Server Blade?

The expansion needs of your business will determine your server choice. It is recommended that you consider what you need in order to:

- Increase the scalability performance of your compute-intensive workloads
- Realize your virtualization roadmap
- Get the right price/performance ratio
- Enable efficient remote manageability

The ProLiant BL620c G7 Server Blade can help you achieve all of these goals. With advanced features and extensive scalability in a two-socket server blade, it is an appropriate choice for organizations looking to make the most of their investment.

The HP iLO 3 is a standard component of the ProLiant BL620c G7 Server Blade that facilitates remote server manageability. It includes an intelligent microprocessor, secure memory, and a dedicated network interface. In addition to providing world-class remote management functionality, iLO 3 is also responsible for managing the health of your server. For more information about HP iLO 3 for ProLiant servers, visit www.hp.com/go/insightcontrol

HP Financial Services

HP Financial Services provides innovative financing and financial asset management programs to help you cost-effectively acquire, manage, and ultimately retire your HP solutions. For more information, contact your local HP representative or visit: www.hp.com/go/hpfinancialservices

The HP ProLiant BL620c G7 Server Blade can help you expand business with ease as it offers you unmatched scalability and reliability. To learn how industry-leading blade servers can redefine your server economics and enhance performance, visit www.hp.com/servers/bl620c-g7



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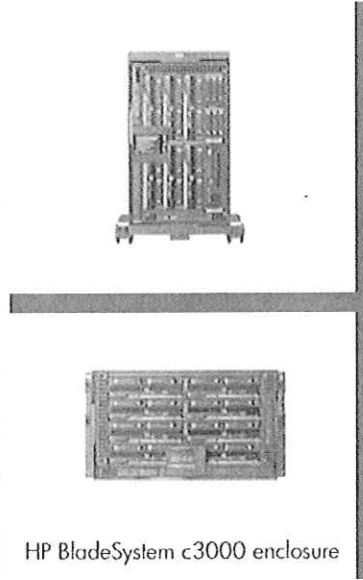
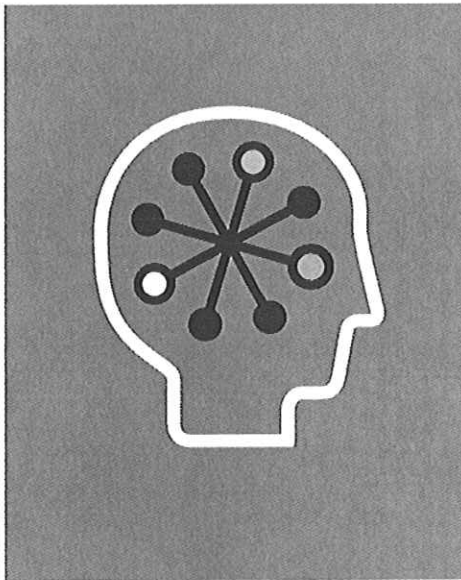
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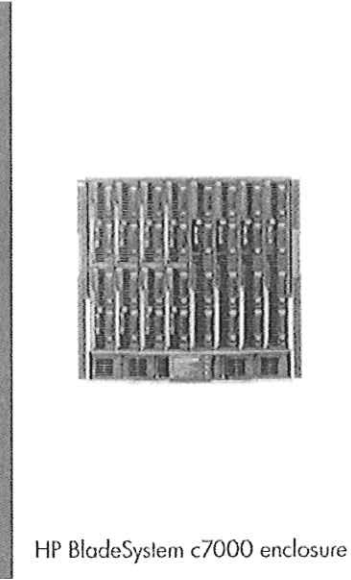
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4AA3 0935ENW, Created October 2010, Updated March 2011, Rev. 1





HP BladeSystem c3000 enclosure



HP BladeSystem c7000 enclosure



HP BladeSystem c-Class enclosures

Family data sheet

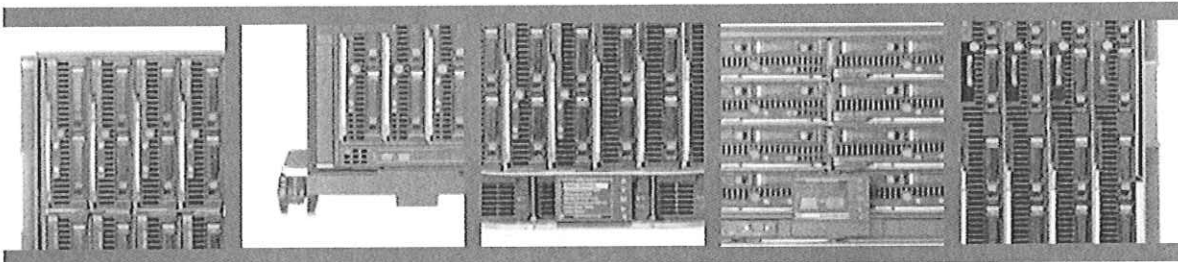
Choosing a BladeSystem, can transform your infrastructure into something simpler and more useful to your business. HP BladeSystem enclosure is the secret behind that transformation. By consolidating everything from the start, the HP BladeSystem enclosure tackles four big problems:

- **Cost:** Existing infrastructures are more expensive to purchase, run, and maintain. HP BladeSystem reduces purchase and running costs
- **Time:** HP BladeSystem is faster to deploy and with Virtual Connect can rapidly adapt to infrastructure changes
- **Change:** Simplifies Networking and Storage connections so your infrastructure can adapt to your changing business needs
- **Energy:** Reclaim trapped power and reduce energy consumption by up to 48% compared to competitors servers¹

Today, HP offers many versatile enclosures to match the unique needs of large or small IT environments. The BladeSystem c7000 enclosure is ideal for larger data centers with more dynamic data center environments and holds up to 16 storage and server blades. The HP BladeSystem c3000 enclosure is built uniquely for small spaces without special power and cooling capabilities. The c3000 is available in rack and tower designs that support up to 8 storage and server blades.

Each enclosure repackages the moving parts of your infrastructure cables, power supplies and fans, networking, and redundancy—for greater convenience during setup, maintenance, and daily operations. This means a BladeSystem is economical, plus it adds useful features that save you time, hassles, and energy while still making change easy.

Based on measurements by HP engineers.



Each BladeSystem enclosure is easy to upgrade and customize. Inside, you can mix and match almost any combination of ProLiant, Integrity, and StorageWorks blades to run your choice of thousands of applications. You can also connect to your same networks, but with up to 94 percent fewer cables.² You can share and swap the same blades and network options between other BladeSystem enclosures and manage it all with the same tools.

How to pick the right enclosure for you

Choose the HP BladeSystem c3000 enclosure for small offices or remote sites without an IT staff.

The HP BladeSystem c3000 is the right choice if:

- You only need between 2 and 8 servers or storage blades per enclosure
- You have between 3 and 100 servers in your company or organization
- You purchase between 2 and 8 servers, slowly over time
- You require simple power connections, such as connecting to a UPS or wall outlets

If you do not have racks in your environment, the BladeSystem c3000 also comes in a tower design on wheels. Choose the HP BladeSystem c3000 tower enclosure if you are a small to mid-size company, branch office, or if you have remote sites that have little or no rack space.

Choose the HP BladeSystem c7000 for larger and dynamic data center environments.

The c7000 is the right choice if:

- You need more than 8 servers or storage blades per enclosure
- You purchase more than 8 servers at a time
- Your environment is growing rapidly, with frequent server purchases
- You are connecting to redundant rack level PDUs, or data center UPS
- You have rack space available in your data center or leased facility
- You require the highest levels of availability and redundancy
- You want to attach the servers to multiple rack-based shared storage arrays

Why HP over other blade choices?

HP combined the best technology from across HP to make BladeSystem not only easy to use, but also useful to you—regardless of whether you choose the c3000 or c7000 enclosure.

- **Thermal Logic technologies:** Combine energy reduction technologies like the 80 Plus Gold³ certified HP 2400W Power Supply with pin-point measurement and control through Dynamic Power Capping to save energy and reclaim trapped capacity without sacrificing performance.

²Comparing all cable requirements of 16 c-Class server blades versus 16 standard 1U servers.

³http://www.80plus.org/manifest/pwr/pwr_detail.asp?id=413&pp=1

HP Services

When Technology Works. Business Works

The challenge of virtually every IT organization is similar: To develop and maintain an agile, efficient server infrastructure that delivers the service levels your business needs.

HP Technology Services offer a comprehensive portfolio of HP Care Pack Services to help design, deploy, manage and support your Blades environment, with easy-to-buy, easy-to-use support packages.

Minimum Recommended HP Care Pack offerings

- Three-year, 4-hour response onsite 24-hour x 7-day hardware support
- Blades Infrastructure plus Enhanced Network installation and startup services

Enhanced service level Care Pack offerings

- **Three-year Support Plus 24:** Integrated 24x7 hardware and software support
- **Proactive Select:** Access to HP best-in-class technical consultants. Purchase service credits and obtain expertise's when needed

Benefit from HP Care Pack Services helping you:

- Reduce deployment time and manage Blades server solutions smoothly and efficiently
- Increase uptime and performance of servers availability to your business
- Detect, diagnose, and repair problems to quickly save time, money, and resources

For more information, visit:

www.hp.com/services/bladeSystem or

www.hp.com/go/proliant/corepack

- **Virtual Connect architecture:** Wire once, then add, replace or recover blades on the fly, without impacting networks and storage or creating extra steps.
- **Insight Control management:** Simple software package provides all the tools to streamline operations and increase administrator productivity up to tenfold.
- **Dynamic Power Capping:** Combines real time measurement with worry free hardware based control to cap or limit enclosure power without compromising performance.

- **NonStop midplane:** The same million-dollar reliability that helps run Wall Street is built-in to keep your business up and running.

- **Onboard administrator:** Wizards get you up and running fast and are paired with useful tools to simplify daily tasks, warn of potential issues, and assist you with repairs.

No-compromise capability

Share the same components with other HP BladeSystem enclosures to make it fast and easy to create, customize, and grow.

- **Run your same business applications** with industry standards to support your operating systems and thousands of application choices.
- **Trust the same server and storage blades:** Proliant, Integrity, StorageWorks and more can be mixed and matched in a single box.
- **Connect to your same networks:** Use the latest Ethernet, Fibre Channel, and InfiniBand standards and trusted brands.
- **Get more blades with more capability:** HP BladeSystem enclosures get two to four times more features into each. That means less infrastructure for more capabilities.

HP Financial Services

HP Financial Services is a smart, economical way to help you plan and manage your BladeSystem investment. Get the most out of your IT budget with Financial Services that help you manage your cash flow, improve your return on investment, and avoid being stuck with obsolete technology. Our flexible leasing options can help you adapt to your business needs, avoid maintenance fees, and depreciation expenses. For more information on these services, contact your HP representative, or visit: www.hp.com/go/hpfinancialservices

For more information

For more information about HP BladeSystem enclosures please contact your local HP representative, or visit: www.hp.com/go/bladeSystem/enclosures

Technical Specifications	HP BladeSystem c3000 Enclosure (Rack Version)	HP BladeSystem c3000 Enclosure (Tower Version)	HP BladeSystem c7000 Enclosure
Device bays	Up to 4 full height Up to 8 half height Mixed configurations supported	Up to 4 full height Up to 8 half height Mixed configurations supported	Up to 8 full height Up to 16 half height Mixed configurations supported
Interconnect bays	1x Ethernet only 3 additional interconnect bays with support for any I/O fabric	1x Ethernet only 3 additional interconnect bays with support for any I/O fabric	8 interconnect bays with support for any I/O fabric
Power	Integrated in enclosure, single-phase, lowline or highline voltage, -48V DC Power	Integrated in enclosure, single-phase, lowline or highline voltage, -48V DC Power	Integrated in enclosure, 3-phase, single phase or -48V DC Power
Cooling	Centralized redundant fans	Centralized redundant fans	Centralized redundant fans
Management	Single onboard administrator—LAN and serial access Insight Control Environment for BladeSystem Local KVM connection option	Single onboard administrator—LAN and serial access Insight Control Environment for BladeSystem Local KVM connection option	Redundant onboard administrator—LAN and serial access Insight Control Environment for BladeSystem Local KVM connection option
Model	6U rackable	Tower enclosure	10U rackable
Enclosure power			
Input voltage	lowline: 100VAC to 120VAC Highline: 200VAC to 240VAC DC: -36VDC to -72VDC	lowline: 100VAC to 120VAC Highline: 200VAC to 240VAC DC: -36VDC to -72VDC	Highline: 200VAC to 240VAC DC: -36VDC to -72VDC
3-phase North America and Japan model power connections	Not offered	Not offered	2 x NEMA L15-30p
3-phase international model power connections	Not offered	Not offered	2 x IEC-309 5-pin, 6h, red, 16A
Single-phase model power	6 x c13/c14 PDU Power; Optional lowline power cords for wall outlets	6 x c13/c14 PDU Power; Optional lowline power cords for wall outlets	6 x IEC-320 C20
DC Input	D SUB Power 3W3	D SUB Power 3W3	Terminal lug: 4SDG 4AWG 1/4 2H
Interconnects			
Ethernet	HP Virtual Connect Flex-10 10Gb Ethernet Module HP 1Gb Virtual Connect Ethernet Module HP 1/10Gb-F Virtual connect module Cisco Catalyst Blade Switch 3020 Cisco Catalyst Blade Switch 3120 HP GbE2c Ethernet Blade Switch HP GbE2c layer 2/3 Ethernet Switch HP 110Gb Ethernet Switch HP 10Gb Ethernet Switch HP 1Gb Ethernet Pass-Thru Module	HP Virtual Connect Flex-10 10Gb Ethernet Module HP 1Gb Virtual Connect Ethernet Module HP 1/10Gb-F Virtual connect module Cisco Catalyst Blade Switch 3020 Cisco Catalyst Blade Switch 3120 HP GbE2c Ethernet Blade Switch HP GbE2c layer 2/3 Ethernet Switch HP 110Gb Ethernet Switch HP 10Gb Ethernet Switch HP 1Gb Ethernet Pass-Thru Module	HP Virtual Connect Flex-10 10Gb Ethernet Module HP 1Gb Virtual Connect Ethernet Module HP 1/10Gb-F Virtual connect module Cisco Catalyst Blade Switch 3020 Cisco Catalyst Blade Switch 3120 HP GbE2c Ethernet Blade Switch HP GbE2c layer 2/3 Ethernet Switch HP 110Gb Ethernet Switch HP 10Gb Ethernet Switch HP 1Gb Ethernet Pass-Thru Module
Fibre Channel	HP 4Gb Virtual Connect FC Module Brocade 4/12 SAN Switch Brocade 8/12c SAN Switch Cisco MDS 9124e 12 port Fabric Switch HP 4Gb FC Pass-Thru Module	HP 4Gb Virtual Connect FC Module Brocade 4/12 SAN Switch Brocade 8/12c SAN Switch Cisco MDS 9124e 12 port Fabric Switch HP 4Gb FC Pass-Thru Module	HP 4Gb Virtual Connect FC Module Brocade 4Gb SAN Switch (12 or 24 ports) Brocade 8Gb SAN Switch (12 or 24 ports) Cisco MDS 9124e Fabric Switch (12 or 24 ports) HP 4Gb FC Pass-Thru Module
SAS (Serial Attached SCSI)	HP StorageWorks 3Gb SAS BL Switch Module	HP StorageWorks 3Gb SAS BL Switch Module	HP StorageWorks 3Gb SAS BL Switch Module
InfiniBand	HP 4X DDR IB Switch Module	HP 4X DDR IB Switch Module	HP 4X DDR IB Switch Module
Enclosure dimensions			
Height	6U—10.4 in (265 mm)	Tower—21.29 in (54.08 cm)	10U—17.4 in (442 mm)
Width	17.5 in (445 mm)	13.48 in (34.24 cm)	17.6 in (447 mm)
Depth	32 in (813 mm)	34.43 in (87.45 cm)	32 in (813 mm)
Warranty (parts/labor/on-site)	3-year/3-year/3-year	3-year/3-year/3-year	3-year/3-year/3-year

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AAA0-59782NW Rev. 6, February 2009



Technology for better business outcomes

SECTION 11 – HP 3800 SWITCH PERFORMANCE COMPARISON



#211127
September 2011
Commissioned by
Hewlett-Packard Company

HP 3800 Switch Series

Competitive Performance, Power Consumption and TCO Evaluation
Versus Cisco Catalyst 3750-X and Juniper EX4200 Series

Executive Summary

Enterprise-class networks are facing increasing demands for higher port-density and throughput driven by rich media applications like voice and video over IP. Traditionally, network access layer switches delivered the port-density, fault-tolerance and scalability using either a chassis or a stack of fixed-port switches. Stackable switches, when properly architected, can offer network managers a solution that can be scaled as the needs of the network grow over time. In this report, the HP 3800 series switches were compared against Cisco's Catalyst 3750-X and Juniper's EX4200 series switches.

The performance of the HP FlexChassis-Mesh technology used by the HP 3800 Switch Series was compared against the Cisco Catalyst 3750-X with StackWise Plus technology, and Juniper's EX4200 switches using the Virtual Chassis stacking technology. Test results show the HP switches deliver significantly higher throughput at lower latency in both a standalone and in a four-switch stack configuration. According to HP, its new switches were designed with a large per-port buffer to deal with bursty traffic, allowing them to handle larger microbursts than the Juniper and Cisco switches.

Furthermore, the HP switches showed demonstrably lower power consumption than the Juniper and Cisco switches. The HP switches implemented Energy Efficient Ethernet features, resulting in further savings in long-term power and cooling costs.

The Bottom Line

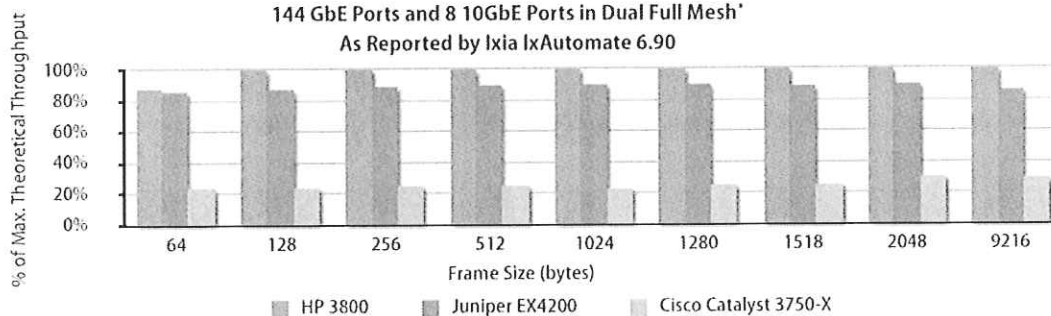
The HP 3800 series switches:

- 1 Delivered 1.2x and 4.4x the throughput delivered by Juniper and Cisco switches respectively
- 2 Outperformed standalone Juniper and Cisco switches by up to 20 Gbps and 27.5 Gbps respectively
- 3 Delivered up to 48% and 76% lower latency respectively than the Juniper and Cisco switches in a four switch stack
- 4 Buffered up to 3.6x and 25x as many frames in a microburst as the Juniper and Cisco switches, respectively.
- 5 Consumed up to 45% and 14% less power respectively than standalone Juniper and Cisco switches; and in four-switch stack configurations, the savings are 38% and 16% respectively
- 6 Demonstrated 42% and 35% savings in TCO over 3-years than 4-switch stacks of Cisco and Juniper switches respectively in a 5,000-port deployment

4-Switch Stack Performance: RFC 2889 Layer 2 Full Mesh Throughput

144 GbE Ports and 8 10GbE Ports in Dual Full Mesh*

As Reported by Ixia IxAutomate 6.90



Source: Tolly, July 2011

* Dual full mesh consisted of the GbE ports in one full mesh and the 10GbE ports in a separate full-mesh.

Figure 1



Background

Virtualization, video and audio are driving demand for higher performance and lower latency in the network. Consequently, the network access layer needs solutions that can not only meet today's performance needs, but also keep pace with the projected increase in network-intensive applications in the near future.

As mission critical applications like telephony, video, access points, etc... share a common data network infrastructure, guaranteed availability of the network becomes a very critical element of every network. Not only in the core but also at the edge of the network - hence having a cost-effective high availability (HA) solution is critical for future networks.

Network managers are simultaneously being asked to reduce the total cost of ownership, while retaining the aforementioned capabilities and performance. The consideration of networking gear acquisition costs and power consumption aspects are integral in selecting vendors and their equipment.

Performance Test Results

Performance tests focused on evaluating the aggregate throughput and latency exhibited by the products under test as per the RFC 2889 methodology. Each product under test was configured with 144 GbE ports in full-mesh and two 10GbE ports in a port-pair. This option was chosen to evaluate the performance when any port could send and receive traffic from any other port in the chassis or a switch-stack, thus representing a highly unrestricted distribution of traffic.

Layer 2 Throughput

The throughput tests show that the HP 3800 switch consistently delivered better throughput than the Cisco 3750-X and Juniper EX4200 switches: both in a standalone configuration, as well as in a four-switch stack.

In a single switch configuration, the HP 3800 switch delivered an aggregate throughput of 88 Gbps, equivalent to 100% of theoretical maximum throughput across its 48 GbE ports and four 10 GbE ports. The Cisco and Juniper switches were equipped similarly, except for two fewer 10GbE ports per switch. This meant that even though the Cisco and Juniper switches achieved 100% throughput across almost all frame sizes, the HP 3800 switch delivered 20 Gbps more throughput than Cisco and Juniper. The Cisco switch was unable to achieve line rate, coming in at ~13% below line rate in the jumbo frame size.

See Figures 1 and 2.

Hewlett- Packard
Company

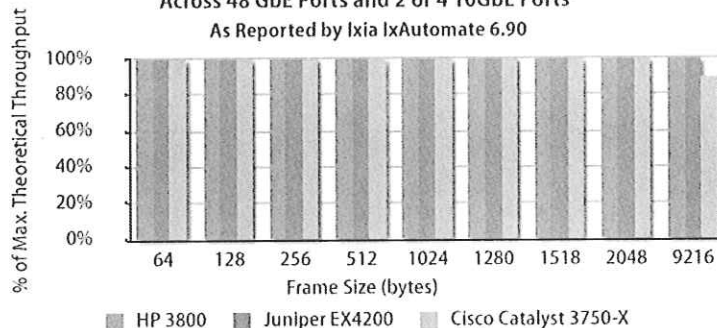
3800 Switch
Series

Performance,
Power
Consumption
and TCO
Evaluation



Tested
July
2011

**Single Switch Performance: RFC 2889 Layer 2 Full Mesh Throughput
Across 48 GbE Ports and 2 or 4 10GbE Ports*
As Reported by Ixia IxAutomate 6.90**



Frame Size (bytes)	Aggregate Throughput (Gbps)		
	HP 3800	Juniper EX4200	Cisco Catalyst 3750-X
64	88.00	68.00	68.00
128	88.00	68.00	68.00
256	88.00	68.00	68.00
512	88.00	68.00	68.00
1024	88.00	68.00	68.00
1280	88.00	68.00	68.00
1518	88.00	68.00	68.00
2048	88.00	68.00	68.00
9216	88.00	68.00	60.48

* The switches were tested in their configurations with maximum GbE and 10GbE ports supported per switch. The HP 3800 was equipped with 48 GbE and four 10GbE ports, while the Cisco Catalyst 3750-X and Juniper EX4200 were equipped with 48 GbE ports and two 10GbE ports.

Source: Tolly, July 2011

Figure 2



HP's Architectural Advantages[†]

Stacking Throughput:

The HP FlexChassis-Mesh technology supports 336 Gbps of bidirectional stacking throughput while Cisco's StackWise Plus stacking technology supports 64 Gbps and Juniper's Virtual Chassis technology supported 128 Gbps of stacking throughput.

Theoretically, this means the HP 3800 switches have 5.5x and 2.6x the stacking throughput of Cisco Catalyst 3750-X switches and Juniper EX4200 switches, respectively.

Stack Height:

The HP 3800 switches support stacking of up to 10 switches using the FlexChassis-Mesh technology, while the Cisco StackWise Plus technology allows for 9 switches and the Juniper Virtual Chassis technology allows for up to 10 switches in a single stack.

10GbE Port Density:

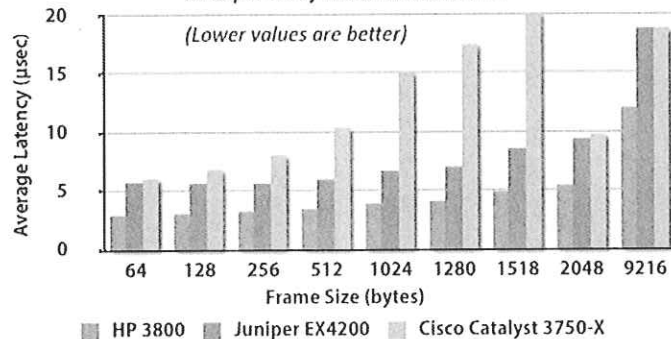
This allows the HP 3800 to support up to 40 10GbE ports in a stack (four 10GbE ports per switch) while the Cisco Catalyst 3750-X supports up to 18 10GbE ports (two 10GbE ports per switch), and the Juniper EX4200 supports up to 20 10GbE ports (two 10GbE ports per switch).

This means that the HP 3800 switch supports 2.2x the number of 10GbE ports in a stack compared to the Cisco Catalyst 3750-X, and 2x the number of 10GbE ports in a stack compared to the Juniper EX4200.

Disclaimer:

[†] Claims not validated by Tolly, but taken directly from the corresponding vendor's data sheet for the switch(es) under consideration.

RFC 2889 Layer 2 Store-and-Forward Latency
@10% Load Across 144 GbE Ports and 8 10GbE Ports in Dual Full Mesh*
As Reported by Ixia IxAutomate 6.90



Frame Size (bytes)	Average Store-and-Forward Latency (µsec)		
	HP 3800	Juniper EX4200	Cisco Catalyst 3750-X
64	3.0	5.8	6.1
128	3.1	5.7	6.9
256	3.3	5.7	8.1
512	3.5	6.0	10.5
1024	4.0	6.8	15.2
1280	4.2	7.1	17.5
1518	4.9	8.6	20.2
2048	5.5	9.4	9.8
9216	12.0	18.8	23.8

* Dual full mesh consisted of the GbE ports in one full mesh and the 10GbE ports in a separate full-mesh.

Source: Tolly, July 2011

Figure 3

Layer 2 Latency

The HP 3800 delivered consistently lower latency compared to the Juniper EX4200 and the Cisco 3750-X switches. The HP 3800 exhibited between 3.0 and 12.0 microseconds of latency for the 64- to 9216-byte frame sizes. In comparison, the Cisco 3750-X exhibited latency between 6.1 and 23.8 microseconds. This means that the HP switch delivered up to 76% and 48% less latency than Cisco and Juniper, respectively. See Figure 3.

Microburst Tolerance

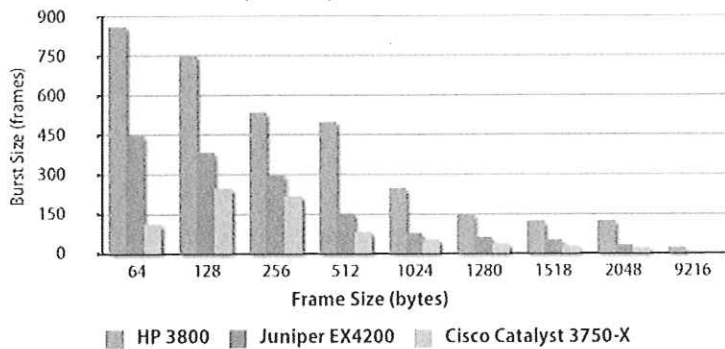
Microbursts are defined as sub-second periods of time when major bursts of network usage occurs causing the utilization of network interfaces to become temporarily

oversubscribed. This can possibly result in packet loss depending on the network device's capacity to buffer the excess packets. The HP 3800 demonstrated the capability to buffer considerably larger microbursts - between .8 times to as much as 2.6 times more frames - compared to Juniper, and between 2 times and 24 times more frames compared to Cisco. See Figure 4.

The switches were configured with four queues, to match the highest number of queues supported by Cisco and Juniper. The HP switch supported 2, 4, or 8 queues, and HP engineers contend that with two queues, the HP switch could buffer larger microbursts from bursty applications and datacenter environments.



**Microburst Tolerance With Simultaneous Bursts Across 48GbE Ports
As Reported by Ixia IxAutomate 6.90**



Frame Size (bytes)	HP 3800	Juniper EX4200-48P	Cisco 3750-X-48P-S
64	860	450	115
128	750	385	250
256	535	300	110
512	500	155	85
1024	250	80	55
1280	150	65	40
1518	125	55	30
2048	125	35	25
9216	25	8	1

Source: Tolly, July 2011

Figure 4

Power Consumption

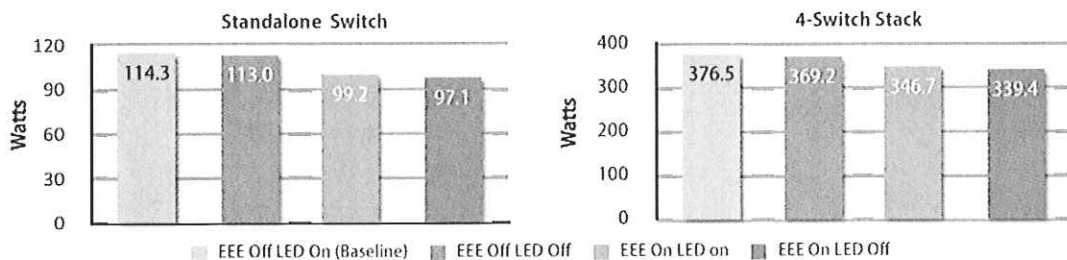
The HP 3800 series switches implemented power-saving features like Energy Efficient Ethernet (EEE), and the ability to turn off front-panel LEDs, resulting in further power savings over the product's deployment lifecycle. As shown in Figure 5, enabling EEE features and turning off the front-panel LEDs yielded power savings of almost 17 W per switch, and almost 37 W in a 4-switch stack, while the switches are in idle condition.

To evaluate the power consumption of the various switches under test, engineers measured power consumption at various traffic loads and then calculated weighted averaged power consumption as per the ATIS (Alliance for Telecommunications Industry Solutions) standards. See the Test Methodology section for details on the ATIS standards used. See Figure 6.

Total Cost of Ownership (TCO)

As can be seen in Figure 7, acquisition costs (hardware, software licensing, support contracts, etc.) as well as the power and

**Power Consumption Savings at Idle
With Energy Efficient Ethernet (EEE) Features On HP 3800 Series Switches**



Feature	Power Consumption of a Standalone Switch		Power Consumption of a 4-Switch Stack	
	Power Consumption	Savings over Baseline	Power Consumption	Savings over Baseline
EEE Off, LED On (Baseline)	114.28 W		376.5 W	
EEE Off, LED Off	112.95 W	1% (1.33 W)	369.2 W	2% (7.3 W)
EEE On, LED on	99.21 W	13% (15.07 W)	346.7 W	8% (29.8 W)
EEE On, LED Off	97.12 W	15% (17.16 W)	339.4 W	10% (37.1 W)

Source: Tolly, July 2011

Figure 5



cooling costs of a standalone 48-port PoE/PoE+ switch and a stack of 4-switches were used to estimate the total cost of ownership (TCO) of a hypothetical 5,000-port deployment of the solutions tested over a 3-year period.

Engineers used single-unit street prices for the Cisco and Juniper switches based on CDW.com's prices in September 2011. Retail pricing for HP's equipment was estimated based on a 23% discount on top of HP's list price as the HP switches were not yet available at retail at the time of publication.

A detailed breakdown of the pricing used in the TCO model can be found in the companion document for this report, Tolly document 211127-Appendix.

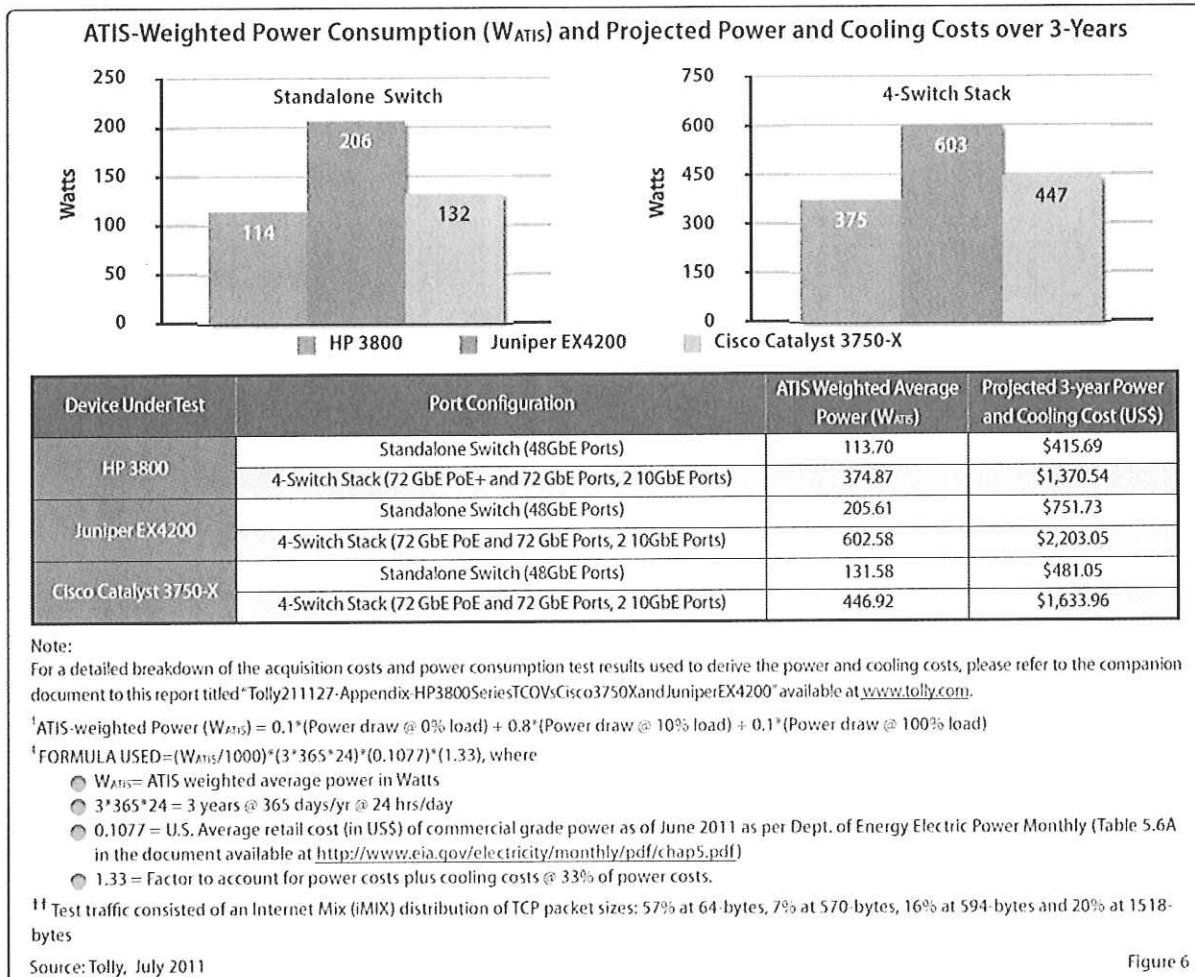
The TCO estimates show that the HP 3800 series switches delivered significant TCO savings over comparable Cisco and Juniper switches.

In a standalone 48-port PoE/PoE+ switch configuration, the HP 3800 switch delivered a savings of 42% and 35% in TCO over the Cisco Catalyst 3750-X and Juniper EX4200 switches, respectively.

In a 4-switch stack configuration, the HP 3800 switch delivered a TCO savings of 54% and 53% over the Cisco Catalyst 3750-X and the Juniper EX4200 switches, respectively.

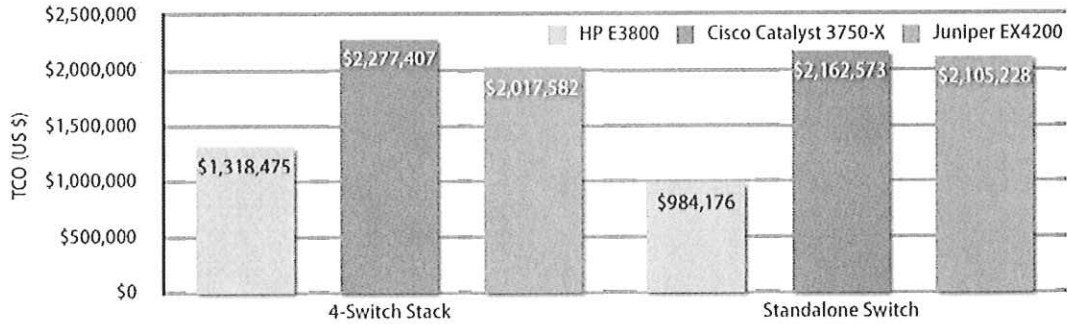
Test Bed Setup

The devices under test consisted of up to four HP, Juniper and Cisco switches, as shown in Figure 6. Each vendor solution was connected to an Ixia Optixia XM12 traffic generator for test traffic generation and validation purposes. A laptop running Microsoft Windows 7 was connected to the





Total Cost of Ownership Comparison of a 5,000-port Network Deployment of HP 3800 Switches Versus Cisco Catalyst 3750-X and Juniper EX4200



DUT	Port Configuration	Per Unit Acquisition Cost (US \$)	Per Unit Power and Cooling Costs Over 3 yrs. (US \$)	No. Of Units in a 5,000-port Deployment	Projected 3-year TCO (US \$)
HP 3800	4-switch stack with 72 GbE PoE+ and 72 GbE ports, and 12x 10GbE ports (J9574A, J9575A, J9576A, J9573A)	36,037.02	1,411.16	35	1,310,686.30
	Standalone switch with 48 GbE PoE+ ports and 4x 10GbE ports (J9574A 3800-48G-PoE+ 45FP+ Switch)	8,945.09	428.01	105	984,175.5
Cisco Catalyst 3750-X	4-Switch Stack with 72 GbE PoE and 72 GbE non-PoE ports, plus 8x 10GbE ports: (WS-C3750X-24-T-S, WS-C3750X-24-P-S, WS-C3750X-48-P-S and WS-C3750X-48-T-S)	63,386.39	1,682.39	35	2,277,407.3
	48 GbE PoE ports and 2x 10GbE ports (WS-C3750X-48P-S)	20,100.62	495.31	105	2,162,572.65
Juniper EX4200	4-Switch Stack with 72 GbE PoE and 72 GbE non-PoE ports, plus 8x 10GbE ports: (EX4200-24P, EX4200-48P, EX4200-24T, EX4200-48T)	56,871.19	774.01	35	2,017,582
	Standalone switch with 48 GbE PoE ports and 2x 10GbE ports (EX4200-48P)	17,710.76	2,339.03	105	2,105,227.95

Note:

A 5,000 port deployment is assumed to consist of:

- 35 units of a four-switch stack configuration with up to 72 PoE/PoE+ GbE ports, 72 non-PoE GbE ports and 2 10GbE ports, or
- 105 units of a switch configuration with 48 GbE PoE/PoE+ ports.

For a detailed breakdown of the acquisition costs and power consumption test results used to derive the power and cooling costs, please refer to the companion document to this report titled "Tolly211127-Appendix-HP3800SeriesTCOVsCisco3750XandJuniperEX4200" available at www.tolly.com.

The acquisition costs, plus the power and cooling costs of the unit solution are extrapolated to a 5,000 port deployment size when multiplied by a factor of 35 for the 4-switch stack configuration, or by a factor of 105 for the 48-port standalone switch configuration.

DUT	Projected 3-year TCO			
	In a 4-Switch Stack	HP's TCO Savings	As a Standalone Switch	HP's TCO Savings
HP 3800	\$1,310,686.30	--	\$984,175.50	--
Cisco Catalyst 3750-X	\$2,277,407.30	42%	\$2,162,572.65	54%
Juniper EX4200	\$2,017,582.00	35%	\$2,105,227.95	53%

Source: Tolly, September 2011

Figure 7



Device(s) Under Test

Vendor	Software Version	Model Name	Module(s) Included
Hewlett-Packard Company	KA.15.03.0000x Ver 1:00:01	J9573A HP 3800-24G-PoE+-2SFP+ Switch	<ul style="list-style-type: none"> ● J9577A HP 3800 4-Port Stacking Module ● J9578A HP 0.5m Stacking Cable ● J9665A HP 3800 1.0m Stacking Cable ● J9580A HP X312 1000W 100-240VAC to 54VDC PS ● J9581A HP X311 400W 100-240VAC to 12VDC PS
		J9574A HP 3800-48G-PoE+-4SFP+ Switch	
		J9575A HP 3800-24G-2SFP+ Switch	
		J9576A HP 3800-48G-4SFP+ Switch	
Vendor	Software Version	Model Name	Module(s) Included
Juniper Networks, Inc	Ver 11.1R3.5	EX4200-48T REV C	8 PoE Ports Built-in 4-Port 10GbE Module With 2 Ports Populated
		EX4200-48P REV C	48 PoE Ports Built-in 4-Port 10GbE Module With 2 Ports Populated
		EX4200-24P REV A	24 PoE Ports Built-in 4-Port 10GbE Module With 2 Ports Populated
		EX4200-24T REV A	8 PoE Ports Built-in 4-Port 10GbE Module With 2 Ports Populated
Vendor	Software Version	Model Name	Module(s) Included
Cisco Systems, Inc.	IOS Ver 12.2.53-SE2	WS-C3750X-24T-SV01	C3KX-PWR-350WAC PSU C3KX-NM-10G 10G Module With 2X SFP+
		WS-C3750X-48T-SV01	C3KX-PWR-350WAC PSU C3KX-NM-10G 10G Module With 2X SFP+
		WS-C3750X-24P-SV01	C3KX-PWR-715WAC PSU C3KX-NM-10G 10G Module With 2X SFP+
		WS-C3750X-48P-SV01	C3KX-PWR-715WAC PSU C3KX-NM-10G 10G Module With 2X SFP+

Source: Tolly, July 2011

Table 1

Interaction with Competitors

In accordance with Tolly's Fair Testing Charter, prior to the start of the testing, Tolly personnel invited representatives from Cisco and Juniper to participate in the project and provided details on the proposed tests and methodology. Cisco and Juniper representatives chose not to participate in this review.

For more information on the Tolly Fair Testing Charter, visit:
<http://www.tolly.com/FTC.aspx>.





LAN to manage the switches, as well as to configure the Ixia traffic generator using Ixia IxAutomate application.

To measure the power consumption, the switches were connected to the power outlets with California Instruments power analyzers measuring the power draw.

Test Methodology

RFC 2889 Layer 2 Throughput

To measure the throughput, each switch under test was connected to the Ixia Optixia XM12 chassis using 144 GbE ports and up to eight 10GbE ports. The 144 GbE ports were configured in a full-mesh topology, meaning that each port on the switch sent traffic to, and received traffic from every other port in the switch. The 10GbE ports were connected in a separate full-mesh by themselves. All the ports on the switch were configured in the same IP subnet.

The test traffic consisted of bidirectional streams of Layer 2 traffic consisting of frames of 64-, 128-, 256-, 512-, 1024-, 1280-, 1518-, 2048-, 4096- and 9216-bytes, as specified by the RFC 2889.

The Ixia IxAutomate application was used to configure the Ixia ports to generate the test traffic, and to find the maximum zero-loss throughput using binary search algorithm. Each test was run for 60 seconds, and repeated three times to ensure repeatability of the results. Final results were announced as the average of the three test runs.

RFC 2889 Layer 2 Store-and-Forward Latency

The test bed setup and network topology for the latency tests was the same as that used for the throughput tests. The test traffic consisted of frames/packets ranging in size from 64 to 9216 bytes.

Since the Cisco switches exhibited throughput as low as 23%, engineers ran the latency tests at 10% line-rate on all the

switches under test. The average "store and forward" latency was measured, and reported as the average of three test runs of 60 seconds duration each.

Microburst Tolerance Tests

To test the microburst tolerance of the devices under test, engineers connected the 48 GbE PoE/PoE+ ports on the switch to the Ixia chassis. The 48 GbE ports were split into two sets of 24 ports each, each set of ports then configured in a full-mesh. All the switches were configured with four queues, even though the HP switch supported 2, 4, or 8 queues.

The microburst traffic consisted of the standard frame sizes from 64-bytes to 9216-bytes at line-rate, and the number of frames in the microburst were generated using a custom command issued from Ixia IxAutomate. Thus, two microbursts at the given burst size were input to the device under test at the same time, and the no-loss microburst size was determined at each frame size. Tests were repeated three times to ensure repeatability of the results.

Power Consumption Tests

To measure the power consumption, engineers followed the methodology prescribed by two ATIS (Alliance for Telecommunications Industry Solutions) standards documents:

- ATIS-0600015.03.2009: Energy Efficiency for Telecommunication Equipment: Methodology for Measuring and Reporting For Router and Ethernet Switch Products, and
- ATIS-0600015.2009: Energy Efficiency for Telecommunications Equipment: Methodology for Measuring and Reporting - General Requirements

The power consumption of each product was measured at various load points: idle (0%), 10% and 100%. The test traffic consisted of an Internet Mix (IMIX)

distribution of TCP packets of various sizes: 57% at 64-bytes, 7% at 570-bytes, 16% at 594-bytes and 20% at 1,518-bytes.

The final power consumption was reported as a weighted average calculated using the formula:

$$W_{ATIS} = 0.1 * (\text{Power draw at 0\% load}) + 0.8 * (\text{Power draw at 10\% load}) + 0.1 * (\text{Power draw at 100\% load}).$$

The formula above applies to access layer switches. Once again, all measurements were taken over a period of 60 seconds at each load level, and repeated three times to ensure repeatability of the results. Final results were reported as the average of the three runs.



About Tolly


The Tolly Group companies have been delivering world-class IT services for more than 20 years. Tolly is a leading global provider of third-party validation services for vendors of IT products, components and services.

You can reach the company by E-mail at sales@tolly.com, or by telephone at +1 561.391.5610.

Visit Tolly on the Internet at:
<http://www.tolly.com>

Test Equipment Summary

The Tolly Group gratefully acknowledges the providers of test equipment/software used in this project.

Vendor	Product	Web
Ixia	Chassis Type: Optixia XM12 Interfaces: 12 x 10Gbps 144x 1Gbps Software: IxAutomate 6.90 GA SP1	 http://www.ixiacom.com/
Voltech	PM3000A Universal Power Analyzer	http://www.voltech.com/products/poweranalyzers/PM3000.aspx
California Instruments	5001i 5 kVA AC Power Source	http://www.elgar.com/products/i-ix-Series-II/i-IX-Series-II-Overview.htm

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SECTION 12 – HP 8800 ROUTER FEATURES

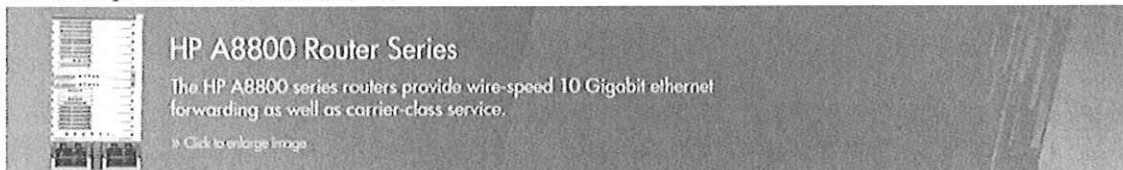


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HP A8800 Router Series
The HP A8800 series routers provide wire-speed 10 Gigabit ethernet forwarding as well as carrier-class service.
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Overview Features Models Accessories Services & Support Resources

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HP A8800 Router Series

- » Quality of Service (QoS)
- » Management
- » Connectivity
- » Performance
- » Resiliency and high availability
- » Layer 2 switching
- » Layer 3 services
- » Layer 3 routing
- » Security
- » Multicast support
- » Integration
- » Additional information
- » Product architecture
- » Warranty and support

Quality of Service (QoS)

- **Hierarchical QoS (HQoS)** — provides a built-in QoS engine that supports hierarchical QoS (HQoS) and can implement a hierarchical scheduling mechanism based on ports, user groups, users, and user services; also cooperates with MPLS TE to implement bandwidth reservation and scheduling based on tunnels and services
- **Schedule Algorithm** — supports PQ, LLQ, WFO, and CBWFQ
- **Congestion Avoidance Mechanism** — supports Tail-drop and Weighted Random Early Detection (WRED)

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Management

- **Management interface control** — provides management access through modem port terminal interface, as well as in-band and out-of-band Ethernet ports; provides access through terminal interface, telnet, or SSH
- **Industry-standard CLI with a hierarchical structure** — reduces training time and expenses, and increases productivity in multi-vendor installations
- **Management security** — includes multiple administration levels, with password protection and restricted access to critical configuration commands; ACLs provide telnet and SNMP access; local and remote syslog capability allows logging of all access
- **SNMP v1, v2, and v3** — provides complete support of SNMP as well as full support of industry-standard MIBs and private MIB extensions
- **Remote monitoring (RMON)** — uses standard SNMP to monitor essential network functions; supports events, alarm, history, and statistics group plus a private alarm extension group
- **Debug and sampler utility** — supports ping and traceroute for both IPv4 and IPv6
- **Network Quality Analyzer (NQA)** — analyzes network performance and service quality by sending test packets, and provides network performance and service quality parameters such as jitter, TCP, or FTP connection delays and file transfer rates; allows network manager to determine overall network performance and to diagnose and locate network congestion points or failures
- **Network Time Protocol (NTP)** — synchronizes timekeeping among distributed time servers and clients; keeps consistent timekeeping among all clock-dependent devices within the network so that the devices can provide diverse applications based on the consistent time
- **Info center** — provides a central information center for system and network information; aggregates all logs, traps, and debugging information generated by the system and maintains them in order of severity; outputs the network information to multiple channels based on user-defined rules
- **FTP and TFTP support** — File Transfer Protocol allows bidirectional transfers over a TCP/IP network and is used for configuration updates; Trivial FTP is a simpler method using UDP
- **Loopback** — supports internal loopback testing for maintenance purposes and high availability; loopback detection protects system from incorrect cabling or network configurations, and can be enabled on a port or VLAN
- **Ethernet OAM** — provides a monitoring tool for Layer 2 performance and fault detection, which reduces failover and network convergence times

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Connectivity

- **High port density** — provides up to 12 interface module slots, up to 96 OC3 POS ports, or 240 Gigabit Ethernet ports (fiber or copper) per A8812 system
- **Flexible port selection** — provides a combination of fiber and copper interface modules, 100/1000BASE-X auto-speed selection, and 10/100/1000BASE-T auto-speed detection plus auto duplex and MDI/MDI-X speed adaptable between 155 MPOS and 622 MPOS/Gigabit Ethernet
- **Packet storm protection** — protects against broadcast, multicast, or unicast storms with user-defined thresholds
- **Multiple WAN interfaces** — support Fast Ethernet/Gigabit Ethernet/10 GbE ports, OC3-OC192 POS, ATM ports, and 10 GbE RPR

Performance

- **Industry-leading performance**—provides switching capacity up to 1440 Gbps and forwarding performance up to 864 Mpps
- **Flexible chassis selection**—consists of 4 models: 12 I/O-slot chassis, 8 I/O-slot chassis, 5 I/O-slot chassis, and 2 I/O-slot chassis
- **Scalable system design**—backplane is designed for smooth bandwidth upgrade

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Resiliency and high availability

- **Separate data and control plane**—separate data and control plane provide continual services
- **Passive backplane design**—backplane has no active components to increase the system reliability
- **Redundant design of main processing unit and power supply**—increases the overall system availability
- **IP Fast Reroute Framework (FRR)**—nodes are configured with backup ports and routes; local implementation requires no cooperation of adjacent devices, simplifying the deployment, solves the traditional convergence faults in IP forwarding; realizes restoration within 50 ms, with the restoration time independent of the number of routes and fast link switchovers without route convergence
- **Hitless patch upgrades**—allow patches to be installed without restarting the equipment, increasing network uptime and facilitating maintenance
- **Virtual Router Redundancy Protocol**—helps ensure the system's high availability without changing configurations when a device fails; prevents network interruption caused by a single link failure
- **Graceful restart**—features are fully supported, including graceful restart for OSPF, IS-IS, BGP, LDP, and RSVP; network remains stable during the active-standby switchover; after the switchover, the device quickly learns the network routes by communicating with adjacent routers; forwarding remains uninterrupted during the switchover to realize NSF
- **Hot swappable**—hot-swappable modules allow modules to be replaced without any impact on traffic

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Layer 2 switching

- **VLANs**—support up to 4096 port or IEEE 802.1Q-based VLANs
- **Spanning Tree**—fully supports standard IEEE 802.1D Spanning Tree Protocol, IEEE 802.1w Rapid Spanning Tree Protocol for faster convergence, and IEEE 802.1s Multiple Spanning Tree Protocol
- **BPDU tunneling**—transmits Spanning Tree Protocol BPDUs transparently, allowing correct tree calculations across service providers, WANs, or MANs
- **IGMP and MLD snooping**—effectively control and manage the flooding of multicast packets in a Layer 2 network
- **Port mirroring**—duplicates port traffic (ingress and egress) to a local or remote monitoring port; supports 64 mirroring groups, with an unlimited number of ports per group
- **Port isolation**—increases security by isolating ports within a VLAN while still allowing them to communicate with other VLANs

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Layer 3 services

- **Address Resolution Protocol (ARP)**—determines the MAC address of another IP host in the same subnet; supports static ARPs; gratuitous ARP allows detection of duplicate IP addresses; proxy ARP allows normal ARP operation between subnets or when subnets are separated by a Layer 2 network
- **User Datagram Protocol (UDP) helper**—redirects UDP broadcasts to specific IP subnets to prevent server spoofing
- **Dynamic Host Configuration Protocol (DHCP)**—simplifies the management of large IP networks and supports client and server; DHCP Relay enables DHCP operation across subnets
- **Domain Name System (DNS)**—is a distributed database that provides translation between a domain name and an IP address, which simplifies network design; supports client and server

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Layer 3 routing

- **Static IPv4 routing**—provides simple, manually configured IPv4 routing
- **Routing Information Protocol (RIP)**—uses a distance vector algorithm with UDP packets for route determination; supports RIPv1 and RIPv2 routing; includes loop protection
- **OSPF**—Interior Gateway Protocol (IGP) using link-state protocol for faster convergence; supports ECMP, NSSA, and MD5 authentication for increased security and graceful restart for faster failure recovery
- **Intermediate system to intermediate system (IS-IS)**—Interior Gateway Protocol (IGP) using path-vector protocol, which is defined by the ISO organization for IS-IS routing and extended by IETF RFC 1195 to operate in both TCP/IP and the OSI reference model (integrated IS-IS)
- **Static IPv6 routing**—provides simple, manually configured IPv6 routing
- **Dual stack**—maintains separate stacks for IPv4 and IPv6 to ease transition from an IPv4-only network to an IPv6-only network design
- **Routing Information Protocol next generation (RIPvng)**—extends RIPv2 to support IPv6 addressing
- **OSPFv3**—extends OSPFv2 to support IPv6 addressing
- **BGP+**—extends BGP-4 to support Multiprotocol BGP (MBGP), including support for IPv6 addressing
- **IS-IS for IPv6**—extends IS-IS to support IPv6 addressing
- **Multiprotocol Label Switching Traffic Engineering (MPLS TE)**—Traffic Engineering (TE) is used to enhance traffic over large MPLS networks based on type of traffic and available resources. TE dynamically tunes traffic management attributes and enables true load balancing. MPLS TE supports route backup using Fast Reroute (FRR)
- **Multiprotocol Label Switching (MPLS) Layer 3 VPN**—allows Layer 3 VPNs across a provider network; uses MP-BGP to establish private routes for increased

security supports RFC 2547bis multiple autonomous system VPNs for added flexibility

- **Multiprotocol Label Switching (MPLS) Layer 2 VPN** — establishes simple Layer 2 point-to-point VPNs across a provider network using only MPLS LDPs; requires no routing and therefore decreases complexity, increases performance, and allows VPNs of non-routable protocols; uses no routing information for increased security supports Circuit Cross Connect (CCC), State Virtual Circuits (SVCs), Martini draft, and Kompella-draft technologies
- **Virtual Private LAN Service (VPLS)** — establishes point-to-multipoint Layer 2 VPNs across a provider network
- **Policy routing** — allows custom filters for increased performance and security; supports ACLs, IP prefix, AS paths, community lists, and aggregate policies
- **Bidirectional Forwarding Detection (BFD)** — enables link connectivity monitoring and reduces network convergence time for RIP, OSPF, BGP, IS-IS, VRRP, MPLS, and IRF
- **Multicast VPN** — supports MD multicast VPN, which can be distributed on separate service cards, providing high performance and flexible configuration
- **IPv6 tunneling** — is an important element for the transition from IPv4 to IPv6; allows IPv6 packets to traverse IPv4-only networks by encapsulating the IPv6 packet into a standard IPv4 packet, supports manually configured, 6to4 and Intra-Site Automatic Tunnel Addressing Protocol (ISATAP) tunnels
- **Border Gateway Protocol 4** — Exterior Gateway Protocol (EGP) with path vector protocol uses TCP for enhanced reliability for the route discovery process, reduces bandwidth consumption by advertising only incremental updates, and supports extensive policies to increase flexibility and scale to large networks

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Security

- **Access control list (ACL)** — supports powerful ACLs for both IPv4 and IPv6; ACLs are used for filtering traffic to prevent illegal users from accessing the network, or for controlling network traffic to save resources; rules can either deny or permit traffic to be forwarded; rules can be based on a Layer 2 header or a Layer 3 protocol header; rules can be set to operate on specific dates or times
- **Network login** — standard IEEE 802.1x allows authentication of multiple users per port, or when a port is shared with an IP phone
- **RADIUS** — eases switch security access administration by using a password authentication server
- **TACACS+** — is an authentication tool using TCP with encryption of the full authentication request that provides added security
- **MAC authentication** — provides simple authentication based on a user's MAC address; supports local or RADIUS-based authentication
- **Attack protection** — protects from attacks that use a large number of ARP requests by using a host-specific, user-selectable threshold; provides Address Scanning Attack Prevention, MAC Address Flooding Attack Prevention, and STP Attack Prevention
- **Network address translation (NAT)** — supports repeated multiplexing of a port and automatic 5-tuple collision detection, enabling NAT1 to support unlimited connections; supports backlist in NAT/NAT1/internal server, a limit on the number of connections, session log, and multi-instance
- **Secure Shell (SSHv2)** — uses external servers to securely log in to a remote device; with authentication and encryption, it protects against IP spoofing and plain text password interception; increases the security of SFTP transfers
- **Unicast Reverse Path Forwarding (URPF)** — allows normal packets to be forwarded correctly, but discards the attaching packet due to lack of reverse path route or incorrect inbound interface; prevents source spoofing and distributed attacks, supports distributed URPF

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Multicast support

- **Internet Group Management Protocol (IGMP)** — is used by IP hosts to establish and maintain multicast groups; supports v1, v2, and v3; utilizes Any-Source Multicast (ASM) or Source-Specific Multicast (SSM) to manage IPv4 multicast networks
- **Protocol Independent Multicast (PIM)** — is used for IPv4 and IPv6 multicast applications; supports PIM dense mode (PIM-DM), sparse mode (PIM-SM), and source-specific mode (PIM-SSM)
- **Multicast Source Discovery Protocol (MSDP)** — is used for inter-domain multicast applications, allowing multiple PIM-SM domains to interoperate
- **Multicast Border Gateway Protocol (MBGP)** — allows multicast traffic to be forwarded across BGP networks, separate from unicast traffic
- **Multicast Listener Discovery Protocol** — is used by IP hosts to establish and maintain multicast groups; supports v1 and v2 and utilizes Any-Source Multicast (ASM) or Source-Specific Multicast (SSM) to manage IPv4 multicast networks
- **Multicast VLAN** — allows multiple VLANs to receive the same IPv4 or IPv6 multicast traffic, reducing network bandwidth demand by eliminating multiple streams to each VLAN

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Integration

- **Open Application Architecture** — provides both software and hardware platform based on open standards, so that third-party applications can be integrated seamlessly into routers

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Additional information

- **Green Initiative support** — provides support for RoHS and WEEE regulations

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Product architecture

- **10 Gbps NP platform** — is perfect for new service expansion; supports wire-speed 10 GbE POS and precise QoS/H-QoS and multicast VPN
- **Crossbar nonblocking switching** — includes two crossbars on MCU to provide performance and reliability; service processing engine and crossbar work together to complete VoQ and E2E flow control and implement granular switch-fabric-level QoS, offering genuine SLA services
- **10 GbE Resilient Packet Ring (RPR)** — provides advanced technology on MAC layer with high usage of ring bandwidth, self-healing, automatic topology discovery, and node plug and play; provides protection on switching using steering or wrapping, with fast recovery time of 50 ms, satisfying the carrier-class requirement; provides weighted fair algorithm for bandwidth allocation
- **High-capacity buffer** — each network processor of the A8800 router offers a 200 ms ingress buffer and a 200 ms egress buffer, providing time delay-sensitive services

- **Separate SPE card and interface card** — interface cards are separated from SPE cards to support flexible service configurations
- **Dedicated OAM engine** — reduces CPU loads and improves link fault detection performance, realizes 30 ms fault detection and 20 ms service switchover

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Warranty and support

- **1-year warranty** — with advance replacement and 30-calendar-day delivery (available in most countries)
- **Electronic and telephone support** — limited electronic and telephone support is available from HP; refer to www.hp.com/networking/warranty for details on the support provided and the period during which support is available
- **Software releases** — refer to www.hp.com/networking/warranty for details on the software releases provided and the period during which software releases are available for your product(s)

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 - » StorageWorks Networking Switches & Solutions
- » Wireless
 - » ProLiant networking
- » Routers
 - » HP 9000 and HP Integrity server connectivity
- » Network Management
 - » Blade Switches
- » HP TippingPoint security
 - » HP NonStop™ networking products
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 - » HP switch selector
 - » HP Networking product configurator
- #### End of sale updates & legacy products
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SECTION 13 – REFERENCE HP NETWORKING CLIENTS

<p>Financial Services</p>	<p>Transportation And Logistics</p>	<p>Manufacturing</p>	<p>Oil and Gas</p>
<p>Hospitality</p>	<p>Media, Internet and Software</p>	<p>Telecom</p>	<p>Health Care</p>
<p>Retail</p>	<p>Government</p>	<p>Education</p>	

SECTION 14 – PRICING

Switch 1

Part Number	Description	Qty	Unit Price	Extended Price
JC612A	HP 10508 Switch Chassis	1	\$3,825.00	\$3,825.00
J9580A	HP 10500 1000W 54VDC Power Supply	6	\$386.55	\$2,319.30
JC616A	HP 10508 640Gbps Type A Fabric Module	4	\$2,925.00	\$11,700.00
JC614A	HP 10500 Main Processing Unit	2	\$4,050.00	\$8,100.00
JD089B	HP X120 1G SFP RJ45 T Transceiver	12	\$161.55	\$1,938.60
JD061A	HP X125 1G SFP LC LH40 1310nm Transceiver	12	\$373.05	\$4,476.60
JC617A	HP 10500 24p GbE / 2p 10GbE XFP SE Mod	1	\$7,425.00	\$7,425.00
JD093B	HP X130 10G SFP+ LC LRM Transceiver	12	\$652.05	\$7,824.60
JD094B	HP X130 10G SFP+ LC LR Transceiver	12	\$1,763.55	\$21,162.60
JC631A	HP 10500 8-port 10GbE SFP+ SE Module	3	\$11,250.00	\$33,750.00
HT109E	HP 5y 4h 13x5 10508 Switch HW Support	1	\$21,685.50	\$21,685.50
Sub Total				\$124,207.20

Switch 2

Part Number	Description	Qty	Unit Price	Extended Price
JC612A	HP 10508 Switch Chassis	1	\$3,825.00	\$3,825.00
JC610A	HP 10500 2500W AC Power Supply	4	\$900.00	\$3,600.00
JC616A	HP 10508 640Gbps Type A Fabric Module	4	\$2,925.00	\$11,700.00
JC614A	HP 10500 Main Processing Unit	2	\$4,050.00	\$8,100.00
JD089B	HP X120 1G SFP RJ45 T Transceiver	48	\$161.55	\$7,754.40
JD061A	HP X125 1G SFP LC LH40 1310nm Transceiver	48	\$373.05	\$17,906.40
JD093B	HP X130 10G SFP+ LC LRM Transceiver	12	\$652.05	\$7,824.60
JD094B	HP X130 10G SFP+ LC LR Transceiver	12	\$1,763.55	\$21,162.60
JC631A	HP 10500 8-port 10GbE SFP+ SE Module	3	\$11,250.00	\$33,750.00
HT109E	HP 5y 4h 13x5 10508 Switch HW Support	1	\$21,685.50	\$21,685.50
JC619A	HP 10500 48-port GbE SFP SE Module	2	\$8,550.00	\$17,100.00
Sub Total				\$154,408.50

Switch 3

Part Number	Description	Qty	Unit Price	Extended Price
JC612A	HP 10508 Switch Chassis	1	\$3,825.00	\$3,825.00
JC610A	HP 10500 2500W AC Power Supply	4	\$900.00	\$3,600.00
JC616A	HP 10508 640Gbps Type A Fabric Module	4	\$2,925.00	\$11,700.00
JC614A	HP 10500 Main Processing Unit	2	\$4,050.00	\$8,100.00
JD089B	HP X120 1G SFP RJ45 T Transceiver	48	\$161.55	\$7,754.40
JD061A	HP X125 1G SFP LC LH40 1310nm Transceiver	48	\$373.05	\$17,906.40
JD093B	HP X130 10G SFP+ LC LRM Transceiver	12	\$652.05	\$7,824.60
JD094B	HP X130 10G SFP+ LC LR Transceiver	12	\$1,763.55	\$21,162.60
JC631A	HP 10500 8-port 10GbE SFP+ SE Module	3	\$11,250.00	\$33,750.00
HT109E	HP 5y 4h 13x5 10508 Switch HW Support	1	\$21,685.50	\$21,685.50
JC619A	HP 10500 48-port GbE SFP SE Module	2	\$8,550.00	\$17,100.00
Sub Total				\$154,408.50

Switch 4

Part Number	Description	Qty	Unit Price	Extended Price
JC612A	HP 10508 Switch Chassis	1	\$3,825.00	\$3,825.00
JC610A	HP 10500 2500W AC Power Supply	4	\$900.00	\$3,600.00
JC616A	HP 10508 640Gbps Type A Fabric Module	4	\$2,925.00	\$11,700.00
JC614A	HP 10500 Main Processing Unit	2	\$4,050.00	\$8,100.00
JD089B	HP X120 1G SFP RJ45 T Transceiver	48	\$161.55	\$7,754.40
JD061A	HP X125 1G SFP LC LH40 1310nm Transceiver	48	\$373.05	\$17,906.40
JD093B	HP X130 10G SFP+ LC LRM Transceiver	12	\$652.05	\$7,824.60
JD094B	HP X130 10G SFP+ LC LR Transceiver	12	\$1,763.55	\$21,162.60
JC631A	HP 10500 8-port 10GbE SFP+ SE Module	3	\$11,250.00	\$33,750.00
HT109E	HP 5y 4h 13x5 10508 Switch HW Support	1	\$21,685.50	\$21,685.50
JC619A	HP 10500 48-port GbE SFP SE Module	2	\$8,550.00	\$17,100.00
Sub Total				\$154,408.50

Switch 5

Part Number	Description	Qty	Unit Price	Extended Price
JC612A	HP 10508 Switch Chassis	1	\$3,825.00	\$3,825.00
JC610A	HP 10500 2500W AC Power Supply	4	\$900.00	\$3,600.00
JC616A	HP 10508 640Gbps Type A Fabric Module	4	\$2,925.00	\$11,700.00
JC614A	HP 10500 Main Processing Unit	2	\$4,050.00	\$8,100.00
JD089B	HP X120 1G SFP RJ45 T Transceiver	48	\$161.55	\$7,754.40
JD061A	HP X125 1G SFP LC LH40 1310nm Transceiver	48	\$373.05	\$17,906.40
JD093B	HP X130 10G SFP+ LC LRM Transceiver	12	\$652.05	\$7,824.60
JD094B	HP X130 10G SFP+ LC LR Transceiver	12	\$1,763.55	\$21,162.60
JC631A	HP 10500 8-port 10GbE SFP+ SE Module	3	\$11,250.00	\$33,750.00
HT109E	HP 5y 4h 13x5 10508 Switch HW Support	1	\$21,685.50	\$21,685.50
JC619A	HP 10500 48-port GbE SFP SE Module	2	\$8,550.00	\$17,100.00
Sub Total				\$154,408.50

Switch 6

Part Number	Description	Qty	Unit Price	Extended Price
JC612A	HP 10508 Switch Chassis	1	\$3,825.00	\$3,825.00
J9580A	HP 10500 1000W 54VDC Power Supply	6	\$386.55	\$2,319.30
JC616A	HP 10508 640Gbps Type A Fabric Module	4	\$2,925.00	\$11,700.00
JC614A	HP 10500 Main Processing Unit	2	\$4,050.00	\$8,100.00
JD089B	HP X120 1G SFP RJ45 T Transceiver	12	\$161.55	\$1,938.60
JD061A	HP X125 1G SFP LC LH40 1310nm Transceiver	12	\$373.05	\$4,476.60
JC617A	HP 10500 24p GbE / 2p 10GbE XFP SE Mod	1	\$7,425.00	\$7,425.00
JD093B	HP X130 10G SFP+ LC LRM Transceiver	12	\$652.05	\$7,824.60
JD094B	HP X130 10G SFP+ LC LR Transceiver	12	\$1,763.55	\$21,162.60
JC631A	HP 10500 8-port 10GbE SFP+ SE Module	3	\$11,250.00	\$33,750.00
HT109E	HP 5y 4h 13x5 10508 Switch HW Support	1	\$21,685.50	\$21,685.50
Sub Total				\$124,207.20

Switch 7

Part Number	Description	Qty	Unit Price	Extended Price
JC612A	HP 10508 Switch Chassis	1	\$3,825.00	\$3,825.00
JC610A	HP 10500 2500W AC Power Supply	4	\$900.00	\$3,600.00
JC616A	HP 10508 640Gbps Type A Fabric Module	4	\$2,925.00	\$11,700.00
JC614A	HP 10500 Main Processing Unit	2	\$4,050.00	\$8,100.00
JD089B	HP X120 1G SFP RJ45 T Transceiver	12	\$161.55	\$1,938.60
JD061A	HP X125 1G SFP LC LH40 1310nm Transceiver	12	\$373.05	\$4,476.60
JC617A	HP 10500 24p GbE / 2p 10GbE XFP SE Mod	1	\$7,425.00	\$7,425.00
JD093B	HP X130 10G SFP+ LC LRM Transceiver	12	\$652.05	\$7,824.60
JD094B	HP X130 10G SFP+ LC LR Transceiver	12	\$1,763.55	\$21,162.60
JC631A	HP 10500 8-port 10GbE SFP+ SE Module	3	\$11,250.00	\$33,750.00
HT109E	HP 5y 4h 13x5 10508 Switch HW Support	1	\$21,685.50	\$21,685.50
Sub Total				\$125,487.90

Switch 8

Part Number	Description	Qty	Unit Price	Extended Price
JC149B	HP 8808 Router Chassis	1	\$6,173.55	\$6,173.55
JC157A	HP 8800 Router Software License	1	\$3,086.55	\$3,086.55
JC111A	HP 9500 3500W AC Power Frame	2	\$328.05	\$656.10
JC110B	HP 9500/8800 1800W AC Power Supply	2	\$656.55	\$1,313.10
JD108B	HP X130 10G XFP LC LR Transceiver	20	\$1,439.55	\$28,791.00
JC602A	HP 8800 4-port 10GbE XFP Svc Proc Mod	5	\$8,189.55	\$40,947.75
JD089B	HP X120 1G SFP RJ45 T Transceiver	45	\$161.55	\$7,269.75
JC604A	HP 8800 48-port GbE SFP Svc Proc Mod	2	\$10,259.55	\$20,519.10
JD119B	HP X120 1G SFP LC LX Transceiver	45	\$346.05	\$15,572.25
JC597A	HP 8800 Single Fabric MPU	2	\$6,929.55	\$13,859.10
UW067E	HP 5y 4h 13x5 Networks A88xx HW Supp	1	\$43,370.55	\$43,370.55
HU586E	HP 5 year Critical Advantage L1 Network SW Grp 170 Service	1	\$3,745.80	\$3,745.80
Sub Total				\$185,304.60



Switch 9

Part Number	Description	Qty	Unit Price	Extended Price
JC149B	HP 8808 Router Chassis	1	\$6,173.55	\$6,173.55
JC157A	HP 8800 Router Software License	1	\$3,086.55	\$3,086.55
JC111A	HP 9500 3500W AC Power Frame	2	\$328.05	\$656.10
JC110B	HP 9500/8800 1800W AC Power Supply	2	\$656.55	\$1,313.10
JD108B	HP X130 10G XFP LC LR Transceiver	20	\$1,439.55	\$28,791.00
JC602A	HP 8800 4-port 10GbE XFP Svc Proc Mod	5	\$8,189.55	\$40,947.75
JD089B	HP X120 1G SFP RJ45 T Transceiver	45	\$161.55	\$7,269.75
JC604A	HP 8800 48-port GbE SFP Svc Proc Mod	2	\$10,259.55	\$20,519.10
JD119B	HP X120 1G SFP LC LX Transceiver	45	\$346.05	\$15,572.25
JC597A	HP 8800 Single Fabric MPU	2	\$6,929.55	\$13,859.10
UW067E	HP 5y 4h 13x5 Networks A88xx HW Supp	1	\$43,370.55	\$43,370.55
HU586E	HP 5 year Critical Advantage L1 Network SW Grp 170 Service	1	\$3,745.80	\$3,745.80
Sub Total				\$185,304.60

Switch10

Part Number	Description	Qty	Unit Price	Extended Price
JC149B	HP 8808 Router Chassis	1	\$6,173.55	\$6,173.55
JC157A	HP 8800 Router Software License	1	\$3,086.55	\$3,086.55
JC111A	HP 9500 3500W AC Power Frame	2	\$328.05	\$656.10
JC110B	HP 9500/8800 1800W AC Power Supply	2	\$656.55	\$1,313.10
JD108B	HP X130 10G XFP LC LR Transceiver	20	\$1,439.55	\$28,791.00
JC602A	HP 8800 4-port 10GbE XFP Svc Proc Mod	5	\$8,189.55	\$40,947.75
JD089B	HP X120 1G SFP RJ45 T Transceiver	45	\$161.55	\$7,269.75
JC604A	HP 8800 48-port GbE SFP Svc Proc Mod	2	\$10,259.55	\$20,519.10
JD119B	HP X120 1G SFP LC LX Transceiver	45	\$346.05	\$15,572.25
JC597A	HP 8800 Single Fabric MPU	2	\$6,929.55	\$13,859.10
UW067E	HP 5y 4h 13x5 Networks A88xx HW Supp	1	\$43,370.55	\$43,370.55
HU586E	HP 5 year Critical Advantage L1 Network SW Grp 170 Service	1	\$3,745.80	\$3,745.80
Sub Total				\$185,304.60

Switch11

Part Number	Description	Qty	Unit Price	Extended Price
JC149B	HP 8808 Router Chassis	1	\$6,173.55	\$6,173.55
JC157A	HP 8800 Router Software License	1	\$3,086.55	\$3,086.55
JC111A	HP 9500 3500W AC Power Frame	2	\$328.05	\$656.10
JC110B	HP 9500/8800 1800W AC Power Supply	2	\$656.55	\$1,313.10
JD108B	HP X130 10G XFP LC LR Transceiver	20	\$1,439.55	\$28,791.00
JC602A	HP 8800 4-port 10GbE XFP Svc Proc Mod	5	\$8,189.55	\$40,947.75
JD089B	HP X120 1G SFP RJ45 T Transceiver	45	\$161.55	\$7,269.75
JC604A	HP 8800 48-port GbE SFP Svc Proc Mod	2	\$10,259.55	\$20,519.10
JD119B	HP X120 1G SFP LC LX Transceiver	45	\$346.05	\$15,572.25
JC597A	HP 8800 Single Fabric MPU	2	\$6,929.55	\$13,859.10
UW067E	HP 5y 4h 13x5 Networks A88xx HW Supp	1	\$43,370.55	\$43,370.55
HU586E	HP 5 year Critical Advantage L1 Network SW Grp 170 Service	1	\$3,745.80	\$3,745.80
Sub Total				\$185,304.60

Switch 12

Part Number	Description	Qty	Unit Price	Extended Price
JC612A	HP 10508 Switch Chassis	1	\$3,825.00	\$3,825.00
JC610A	HP 10500 2500W AC Power Supply	4	\$900.00	\$3,600.00
JC616A	HP 10508 640Gbps Type A Fabric Module	4	\$2,925.00	\$11,700.00
JC614A	HP 10500 Main Processing Unit	2	\$4,050.00	\$8,100.00
JD089B	HP X120 1G SFP RJ45 T Transceiver	48	\$161.55	\$7,754.40
JD061A	HP X125 1G SFP LC LH40 1310nm Transceiver	48	\$373.05	\$17,906.40
JD093B	HP X130 10G SFP+ LC LRM Transceiver	12	\$652.05	\$7,824.60
JD094B	HP X130 10G SFP+ LC LR Transceiver	12	\$1,763.55	\$21,162.60
HT109E	HP 5y 4h 13x5 10508 Switch HW Support	1	\$21,685.50	\$21,685.50
JC629A	HP 10500 8-port 10GbE SFP+ EB Module	3	\$15,750.00	\$47,250.00
JC625A	HP 10500 48-port GbE SFP EB Module	2	\$13,500.00	\$27,000.00
Sub Total				\$177,808.50



Switch 13				
Part Number	Description	Qty	Unit Price	Extended Price
JC612A	HP 10508 Switch Chassis	1	\$3,825.00	\$3,825.00
JC610A	HP 10500 2500W AC Power Supply	4	\$900.00	\$3,600.00
JC616A	HP 10508 640Gbps Type A Fabric Module	4	\$2,925.00	\$11,700.00
JC614A	HP 10500 Main Processing Unit	2	\$4,050.00	\$8,100.00
JD089B	HP X120 1G SFP RJ45 T Transceiver	48	\$161.55	\$7,754.40
JD061A	HP X125 1G SFP LC LH40 1310nm Transceiver	48	\$373.05	\$17,906.40
JD093B	HP X130 10G SFP+ LC LRM Transceiver	12	\$652.05	\$7,824.60
JD094B	HP X130 10G SFP+ LC LR Transceiver	12	\$1,763.55	\$21,162.60
JC631A	HP 10500 8-port 10GbE SFP+ SE Module	3	\$11,250.00	\$33,750.00
HT109E	HP 5y 4h 13x5 10508 Switch HW Support	1	\$21,685.50	\$21,685.50
JC619A	HP 10500 48-port GbE SFP SE Module	2	\$8,550.00	\$17,100.00
Sub Total				\$154,408.50

Switch 14				
Part Number	Description	Qty	Unit Price	Extended Price
JC612A	HP 10508 Switch Chassis	1	\$3,825.00	\$3,825.00
JC610A	HP 10500 2500W AC Power Supply	4	\$900.00	\$3,600.00
JC616A	HP 10508 640Gbps Type A Fabric Module	4	\$2,925.00	\$11,700.00
JC614A	HP 10500 Main Processing Unit	2	\$4,050.00	\$8,100.00
JD089B	HP X120 1G SFP RJ45 T Transceiver	48	\$161.55	\$7,754.40
JD061A	HP X125 1G SFP LC LH40 1310nm Transceiver	48	\$373.05	\$17,906.40
JD093B	HP X130 10G SFP+ LC LRM Transceiver	12	\$652.05	\$7,824.60
JD094B	HP X130 10G SFP+ LC LR Transceiver	12	\$1,763.55	\$21,162.60
JC631A	HP 10500 8-port 10GbE SFP+ SE Module	3	\$11,250.00	\$33,750.00
HT109E	HP 5y 4h 13x5 10508 Switch HW Support	1	\$21,685.50	\$21,685.50
JC619A	HP 10500 48-port GbE SFP SE Module	2	\$8,550.00	\$17,100.00
Sub Total				\$154,408.50

Switch 15				
Part Number	Description	Qty	Unit Price	Extended Price
JC612A	HP 10508 Switch Chassis	1	\$3,825.00	\$3,825.00
JC610A	HP 10500 2500W AC Power Supply	4	\$900.00	\$3,600.00
JC616A	HP 10508 640Gbps Type A Fabric Module	4	\$2,925.00	\$11,700.00
JC614A	HP 10500 Main Processing Unit	2	\$4,050.00	\$8,100.00
JD089B	HP X120 1G SFP RJ45 T Transceiver	48	\$161.55	\$7,754.40
JD061A	HP X125 1G SFP LC LH40 1310nm Transceiver	48	\$373.05	\$17,906.40
JD093B	HP X130 10G SFP+ LC LRM Transceiver	12	\$652.05	\$7,824.60
JD094B	HP X130 10G SFP+ LC LR Transceiver	12	\$1,763.55	\$21,162.60
JC631A	HP 10500 8-port 10GbE SFP+ SE Module	3	\$11,250.00	\$33,750.00
HT109E	HP 5y 4h 13x5 10508 Switch HW Support	1	\$21,685.50	\$21,685.50
JC619A	HP 10500 48-port GbE SFP SE Module	2	\$8,550.00	\$17,100.00
Sub Total				\$154,408.50

15 Core Switch Pricing Total

\$2,373,788.70



Cisco ASA Firewall

Part Number	Description	Qty	Unit Price	Extended Price
ASA5550-BUN-K9	ASA 5550 Appliance with SW, HA, 8GE+1FE, 3DES/AES	4	\$12,628.00	\$50,512.00
CAB-AC	AC Power Cord (North America), C13, NEMA 5-15P, 2.1m	4	\$35.00	\$140.00
SF-ASA-8.5-K8	ASA 5500 Series Software Version 8.5 for ASA 5510-5550, DES	4	\$628.00	\$2,512.00
ASA-ADV-END-SEC	ASA 5500 Adv Endpoint Assessment License for SSL VPN	4	\$950.00	\$3,800.00
ASA5500-SC-20	ASA 5500 20 Security Contexts License	4	\$7,455.00	\$29,820.00
CON-SNTP-ASA5550	Smartnet Maintenance	4	\$2,789.00	\$11,156.00

ASA Firewall Pricing Total \$97,940.00

Fixed Port Switches

Part Number	Description	Qty	Unit Price	Extended Price
J9573A	HP 3800-24G-PoE+-2SFP+ Switch	10	\$5,519.00	\$55,190.00
J9580A	HP X312 1000W 100-240VAC to 54VDC PS	10	\$859.00	\$8,590.00
J9577A	HP 3800 4-port Stacking Module	10	\$1,399.00	\$13,990.00
J9152A	HP X132 10G SFP+ LC LRM Transceiver	20	\$2,169.00	\$43,380.00
HT041E	HP 5 y 4 h 13x5 3800 Switch HW Support	10	\$2,266.00	\$22,660.00
J9578A	HP 3800 0.5m Stacking Cable	10	\$249.00	\$2,490.00

Sub Total \$146,300.00

Fixed Port Switch Pricing Total \$146,300.00

Long Range SFPs

Part Number	Description	Qty	Unit Price	Extended Price
JD094B	HP X130 10G SFP+ LC LR Transceiver	12	\$1,763.55	\$21,162.60

Long Range SFP Pricing Total \$21,162.60

Education Credits

Part Number	Description	Qty	Unit Price	Extended Price
U5466S 4NK	Total Education One Svc	500	\$75.00	\$37,500.00

Education Pricing Total \$37,500.00

Product Number	Description	Qty	Unit Price	Extended Price
	Complex 1 C7000 Chassis with 6 BL620 Blades 2 Svrs with 128GB RAM 4 with 192GB RAM			
507019-B21	HP BLc7000 CTO 3 IN LCD ROHS Encl	1	\$2,902.20	\$2,902.20
534516-B21	HP PL Foundation Pk Single Rel FIO SW	1	\$0.60	\$0.60
643786-B21	HP BL620c G7 W CTO Blade	6	\$2,882.40	\$17,294.40
643786-B21 0D1	Factory integrated	6	\$0.00	\$0.00
643755-L21	HP BL620c G7 E7-2830 1P FIO Kit	12	\$1,469.40	\$17,632.80
643755-B21	HP BL620c G7 E7-2830 CPU Kit	12	\$1,469.40	\$17,632.80
643755-B21 0D1	Factory integrated	12	\$0.00	\$0.00
627814-B21	HP 32GB 4Rx4 PC3L-8500R-7 Kit	32	\$2,699.40	\$86,380.80
627814-B21 0D1	Factory integrated	32	\$0.00	\$0.00
AJ876A	HP 80GB IO Accelerator for BladeSystem	12	\$2,640.00	\$31,680.00
AJ876A 0D1	Factory integrated	12	\$0.00	\$0.00
538113-B21	HP BLc 10GbE Pass Thru Mod Opt Kit	2	\$2,999.40	\$5,998.80
538113-B21 0D1	Factory integrated	2	\$0.00	\$0.00
517521-B21	HP 6X 2400W Gold Ht Plg FIO Pwr Sply Kit	1	\$1,193.40	\$1,193.40
456204-B21	HP BLc7000 DDR2 Encl Mgmt Option	1	\$539.40	\$539.40
456204-B21 0D1	Factory integrated	1	\$0.00	\$0.00
413379-B21	HP BLc7000 1 PH FIO Power Module Opt	1	\$105.00	\$105.00
517520-B21	HP BLc 6X Active Cool 200 FIO Fan Opt	1	\$536.40	\$536.40
HA104A3	HP 3y 4h 24x7 HW Support	1	\$0.00	\$0.00
HA104A3 4S8	IO Accelerator for c-Class Supp	12	\$1,086.60	\$13,039.20
HA104A3 7FX	c7000 Enclosure HW Supp	1	\$556.20	\$556.20
HA104A3 7XF	BL6xxc Svr Bld HW Support	6	\$496.80	\$2,980.80
HA113A1	HP Installation Service	1	\$0.00	\$0.00
HA113A1 5FY	HP BladeSystem c7000 Install SVC	1	\$360.00	\$360.00
HA124A1	HP Technical Installation Startup SVC	1	\$0.00	\$0.00
HA124A1 56H	HP Startup BladSys c7000 Encl Ntwk SVC	1	\$1,707.00	\$1,707.00
	Sub Total			\$200,539.80

Complex 2 C7000 Chassis with 8 BL620 Blades 8 Svrs with 128GB RAM				
507019-B21	HP BLc7000 CTO 3 IN LCD ROHS Encl	1	\$2,902.20	\$2,902.20
643786-B21	HP BL620c G7 W CTO Blade	6	\$2,882.40	\$17,294.40
643786-B21 OD1	Factory integrated	6	\$0.00	\$0.00
643755-L21	HP BL620c G7 E7-2830 1P FIO Kit	6	\$1,469.40	\$8,816.40
643755-B21	HP BL620c G7 E7-2830 CPU Kit	6	\$1,469.40	\$8,816.40
643755-B21 OD1	Factory integrated	6	\$0.00	\$0.00
627814-B21	HP 32GB 4Rx4 PC3L-8500R-7 Kit	24	\$2,699.40	\$64,785.60
627814-B21 OD1	Factory integrated	24	\$0.00	\$0.00
AJ876A	HP 80GB IO Accelerator for BladeSystem	12	\$2,640.00	\$31,680.00
AJ876A OD1	Factory integrated	12	\$0.00	\$0.00
538113-B21	HP BLc 10GbE Pass Thru Mod Opt Kit	2	\$2,999.40	\$5,998.80
538113-B21 OD1	Factory integrated	2	\$0.00	\$0.00
517521-B21	HP 6X 2400W Gold Ht Plg FIO Pwr Sply Kit	1	\$1,193.40	\$1,193.40
456204-B21	HP BLc7000 DDR2 Encl Mgmt Option	1	\$539.40	\$539.40
456204-B21 OD1	Factory integrated	1	\$0.00	\$0.00
413379-B21	HP BLc7000 1 PH FIO Power Module Opt	1	\$105.00	\$105.00
517520-B21	HP BLc 6X Active Cool 200 FIO Fan Opt	1	\$536.40	\$536.40
HA104A3	HP 3y 4h 24x7 HW Support	1	\$0.00	\$0.00
HA104A3 4S8	IO Accelerator for c-Class Supp	12	\$1,086.60	\$13,039.20
HA104A3 7FX	c7000 Enclosure HW Supp	1	\$556.20	\$556.20
HA104A3 7XF	BL6xxc Svr Bld HW Support	6	\$496.80	\$2,980.80
HA113A1	HP Installation Service	1	\$0.00	\$0.00
HA113A1 5FY	HP BladeSystem c7000 Install SVC	1	\$360.00	\$360.00
Sub Total				\$159,604.20

Complex 3 C7000 Chassis with 8 BL620 Blades 6 Svrs with 128GB RAM				
507019-B21	HP BLc7000 CTO 3 IN LCD ROHS Encl	1	\$2,902.20	\$2,902.20
643786-B21	HP BL620c G7 W CTO Blade	6	\$2,882.40	\$17,294.40
643786-B21 OD1	Factory integrated	6	\$0.00	\$0.00
643755-L21	HP BL620c G7 E7-2830 1P FIO Kit	6	\$1,469.40	\$8,816.40
643755-B21	HP BL620c G7 E7-2830 CPU Kit	6	\$1,469.40	\$8,816.40
643755-B21 OD1	Factory integrated	6	\$0.00	\$0.00
627814-B21	HP 32GB 4Rx4 PC3L-8500R-7 Kit	24	\$2,699.40	\$64,785.60
627814-B21 OD1	Factory integrated	24	\$0.00	\$0.00
AJ876A	HP 80GB IO Accelerator for BladeSystem	12	\$2,640.00	\$31,680.00
AJ876A OD1	Factory integrated	12	\$0.00	\$0.00
538113-B21	HP BLc 10GbE Pass Thru Mod Opt Kit	2	\$2,999.40	\$5,998.80
538113-B21 OD1	Factory integrated	2	\$0.00	\$0.00
517521-B21	HP 6X 2400W Gold Ht Plg FIO Pwr Sply Kit	1	\$1,193.40	\$1,193.40
456204-B21	HP BLc7000 DDR2 Encl Mgmt Option	1	\$539.40	\$539.40
456204-B21 OD1	Factory integrated	1	\$0.00	\$0.00
413379-B21	HP BLc7000 1 PH FIO Power Module Opt	1	\$105.00	\$105.00
517520-B21	HP BLc 6X Active Cool 200 FIO Fan Opt	1	\$536.40	\$536.40
HA104A3	HP 3y 4h 24x7 HW Support	1	\$0.00	\$0.00
HA104A3 4S8	IO Accelerator for c-Class Supp	12	\$1,086.60	\$13,039.20
HA104A3 7FX	c7000 Enclosure HW Supp	1	\$556.20	\$556.20
HA104A3 7XF	BL6xxc Svr Bld HW Support	6	\$496.80	\$2,980.80
HA113A1	HP Installation Service	1	\$0.00	\$0.00
HA113A1 5FY	HP BladeSystem c7000 Install SVC	1	\$360.00	\$360.00
Sub Total				\$159,604.20

Complex 4 C7000 Chassis with 6 BL620 Blades 6 Svrs with 128GB RAM and Top of Rack Switches to Connect Back to Core				
507019-B21	HP BLc7000 CTO 3 IN LCD ROHS Encl	1	\$2,902.20	\$2,902.20
534516-B21	HP PL Foundation Pk Single Rel FIO SW	1	\$0.60	\$0.60
643786-B21	HP BL620c G7 W CTO Blade	6	\$2,882.40	\$17,294.40
643786-B21 OD1	Factory integrated	6	\$0.00	\$0.00
643755-L21	HP BL620c G7 E7-2830 1P FIO Kit	6	\$1,469.40	\$8,816.40
643755-B21	HP BL620c G7 E7-2830 CPU Kit	6	\$1,469.40	\$8,816.40
643755-B21 OD1	Factory integrated	6	\$0.00	\$0.00
627814-B21	HP 32GB 4Rx4 PC3L-8500R-7 Kit	24	\$2,699.40	\$64,785.60
627814-B21 OD1	Factory integrated	24	\$0.00	\$0.00
AJ876A	HP 80GB IO Accelerator for BladeSystem	12	\$2,640.00	\$31,680.00
AJ876A OD1	Factory integrated	12	\$0.00	\$0.00
538113-B21	HP BLc 10GbE Pass Thru Mod Opt Kit	2	\$2,999.40	\$5,998.80
538113-B21 OD1	Factory integrated	2	\$0.00	\$0.00
517521-B21	HP 6X 2400W Gold Ht Plg FIO Pwr Sply Kit	1	\$1,193.40	\$1,193.40
456204-B21	HP BLc7000 DDR2 Encl Mgmt Option	1	\$539.40	\$539.40
456204-B21 OD1	Factory integrated	1	\$0.00	\$0.00
413379-B21	HP BLc7000 1 PH FIO Power Module Opt	1	\$105.00	\$105.00
517520-B21	HP BLc 6X Active Cool 200 FIO Fan Opt	1	\$536.40	\$536.40
HA104A3	HP 3y 4h 24x7 HW Support	1	\$0.00	\$0.00
HA104A3 4S8	IO Accelerator for c-Class Supp	12	\$1,086.60	\$13,039.20
HA104A3 7FX	c7000 Enclosure HW Supp	1	\$556.20	\$556.20
HA104A3 7XF	BL6xxc Svr Bld HW Support	6	\$496.80	\$2,980.80
HA113A1	HP Installation Service	1	\$0.00	\$0.00
HA113A1 5FY	HP BladeSystem c7000 Install SVC	1	\$360.00	\$360.00
JC087A	HP 5800 300W AC Power Supply	8	\$269.40	\$2,155.20
JC087A ABA	U.S. - English localization	8	\$0.00	\$0.00
JC106A	HP 5820-14XG-SFP+ Switch with 2 Slots	4	\$8,230.05	\$32,920.20
HA113A1	HP Installation Service	1	\$0.00	\$0.00
HA113A1 5RN	HP Networks 5820 switch install SVC	4	\$157.50	\$630.00
JC530A	HP 5820 4-port 8/4/2 Gbps FCoE SFP+ Mod	8	\$3,170.25	\$25,362.00
HA107A3	HP 3y 24x7 SW Support	1	\$0.00	\$0.00
HA107A3 28Z	HP 582x Switch products Jw Supp	4	\$295.65	\$1,182.60
HA107A3 Q2Y	HP 5820 FCoE module JW Support	8	\$531.45	\$4,251.60
JD092B	HP X130 10G SFP+ LC SR Transceiver	8	\$778.05	\$6,224.40
JD097B	HP X240 10G SFP+ SFP+ 3m DAD Cable	32	\$107.55	\$3,441.60
HA104A3	HP 3y 4h 24x7 HW Support	1	\$0.00	\$0.00
HA104A3 28Z	HP 582x Switch products Jw Supp	4	\$2,339.10	\$9,356.40
HA104A3 699	For HP Internal Entitlement Purposes	48	\$0.00	\$0.00
HA104A3 Q2Y	HP 5820 FCoE module JW Support	8	\$738.45	\$5,907.60
			Sub Total	\$251,036.40
Vmware and Customer Education				
VS5-ENT-PL-C	vSphere 5 Enterprise Plus for 1 proc - 96GB vRAM	16	\$2,970.75	\$47,532.00
VS5-ENT-PL-3P-SSS-C	Production SNS for Enterprise Plus for 1 processor - 3yr	16	\$2,050.68	\$32,810.88
VCS5-STD-C	vCenter Server 5 Standard for vSphere 5 (Per Instance)	1	\$4,245.75	\$4,245.75
VCS5-STD-3P-SSS-C	Production SNS for vCenter Server 5 Standard for vSphere 5 - 3yr	1	\$2,930.20	\$2,930.20
			Sub Total	\$87,518.83

Grand Total Project

\$3,534,994.73