QFX3500

Sales Deck

Samir Sharma
DCBU PPM
sksharma@juniper.net
AGENDA

1. Trends in 10GbE
2. Summary of the QFX3500
3. Competitive
4. Positioning
5. Use Cases
6. 
7. Product Deep Dive
8. Competitive Deep Dive
9. Summary
10. Reference
“All you have to do is touch the right key at the right time and the instrument will play itself.”

Johann Sebastian Bach
MARKET AND 10GBE REVENUE

10 GbE port revenues
- 10 GbE port revenues for fixed platforms has projected to change from $4.8B in 2009 to $10.6B in 2015
- Module 10GbE revenues remains flat

10 GbE port shipments
- Note: Purpose-built (top-of-rack) shipments are increasing
- 10 GbE port shipments to increase from 4.9M in 2010 to 42.1M in 2015
INTRODUCING QFX3500

- Sub microsecond latency
- Line rate throughput for all frames sizes on all ports
- Standards-based Layer-2, Layer-3, and I/O Convergence
- Supports feature rich implementation of IEEE DCB standards for converged networks; enabling FCoE, iSCSI and NAS deployments
- FCoE transit and FCoE-FC gateway, interoperability with both Brocade and Cisco Fibre Channel SANs (including support for multi-hop FCoE)
- Interoperability with major CNA vendors
- It’s Green, RoHSS, China RoHSS, Gold 80 Plus, Green Recycle, WEEE, REACH
- QFabric ready!

Flexible all-in-one switch, deploy everywhere

Source: Juniper Networks QFX3500 Switch Assessment, Network Test, February 2011
QFX 3500 Summary

- **1 RU high fixed configuration**
- **Low power consumption**
- **48 10GbE ports**
  - 12 Ports 10GbE or **2/4/8G FC**
  - 36 Ports 10GbE or 1Gb
- **4 x 40G fabric uplink ports**
  *(can also operate in 10G mode)*
- **All ports have L2/L3**
- **All ports FCoE and DCB**
- **Redundant AC power supply**
- **Front-to-back air flow**

* Future
QFX3500 AN INDUSTRY FIRST...

Industry’s first shipping high density (>24 ports) 10GE ToR switch that...

- Fastest (sub-microsecond at all packet sizes).
- Highest throughput (1.24Tbps)
- Highest scalability for server virtualization (96K MAC addr.)
- “Flex-uplink support” (can run at 10GbE or *40GbE).
- “Flex-management” (by itself or *QFabric Node).
- “Flex-mode ports” (soft configurable 10GbE or 2/4/8G FC)
- Fully compliant FC-BB-5 FCoE-FC Gateway

* Future
QFX3500 AND NEXUS 5548

Against nearest competitor (Nexus 5548):
  - Non disruptive, no additional hardware for **FC ports**
  - Non disruptive, no additional hardware for Layer-3 support.
  - **2x faster**
  - *40GbE uplinks*
  - **3x scale (MAC addresses)**
  - ½ the power
  - 33% higher throughput

* Future
NETWORK TEST ASSESSMENT

Highlights from QFX3500 testing include the following:

- Sub-microsecond average latency
- Unicast and multicast average latency are virtually identical
- Line-rate throughput for all frame sizes, both for unicast and multicast traffic
- Layer-2 and Layer-3 unicast throughput virtually identical
- Interoperability with the Cisco MDS 9148 Fibre Channel switch
- No impact on latency of multicast traffic when concurrently forwarding multicast and FC/FCoE storage traffic

Source: Juniper Networks QFX3500 Switch Assessment, Network Test, February 2011
### SECURITIES TECHNOLOGY ANALYSIS CENTER (STAC) TEST RESULTS

Simulates Trading Transactional Performance

<table>
<thead>
<tr>
<th>Description</th>
<th>Juniper QFX3500/IBM LLM</th>
<th>Cisco 4900M/29West</th>
<th>Cisco Nexus 5010/29West</th>
<th>Voltaire IB/IBM LLM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest Supply Rate (msg/sec)</td>
<td>1,500,000</td>
<td>1,300,000</td>
<td>1,300,000</td>
<td>1,000,000</td>
</tr>
<tr>
<td>Mean (micro seconds)</td>
<td>9</td>
<td>15</td>
<td>14</td>
<td>8</td>
</tr>
<tr>
<td>Max (micro seconds)</td>
<td>16</td>
<td>30</td>
<td>33</td>
<td>47</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

The Juniper QFX3500 in combination with IBM server and middleware with SolarFlare NICs delivered the best performance to date for product combinations with 10GE switches.

This product combination delivered more messages faster with lower jitter than any other audited report in the STAC library.
PRODUCT STRUCTURE

Base Unit
Front view

Rear view

Spares

Power Supply

Fan

Management Board

Software License

FCoE-FC Gateway feature license

Optics & DAC

1, 3, 5, 7m DAC

10GE USR, SR, LR

8G-FC-SW

1GE SX, LX, BaseT

List Price $34,000

List Price $5,000
QFX3500 MANAGEMENT

- Network device discovery
- Network configuration/control
- XML
- REST API

- Advanced inventory collection
- Advanced performance monitoring and analysis
- Advanced fault monitoring and analysis
- Network services management (firewall, etc.)
- Discovery, configuration, etc.
- Firmware management
- Security monitoring and control
- Status monitoring

SNMP
CLI
NETCONF
*J-WEB

* Future
QFX3500 HIGH-LEVEL ROADMAP 2011

Q1
- Layer-2
- QFabric ready
- FCoE transit switch
- FCoE-FC gateway
- 12 ports 2/4/8 FC
- 48 ports, 1GbE/10GbE

Q2
- 63 10GbE ports

Q3
- Layer-3 (unicast and multicast)

Q4

* Refer to SOPD for detailed roadmap
QFX3500 DATACENTER POSITIONING

- **CORE**
  - MX Series EX8200

- **ACCESS**
  - 10 GbE QFX3500
  - 1 GE EX4200
QFX3500 AND EX4500

QFX3500

- 10GbE access for data center
  - Low latency switch design (<1 µSec)
  - FCoE transit switch & FCoE-FC gateway
  - Lead to QFabric

EX4500

- DC access with a mix of GbE and 10GbE
  - Virtual chassis support
  - FCoE transit switch

- Small campus and DC aggregation/core
  - Virtual chassis support
  - Rich L2/L3 feature set
USE CASE SUMMARY QFX3500

Ultra Low Latency

QFX3500

Feature Rich

Converged I/O

DCB; FCoE-FC Gateway; FCoE Transit Switch

Fabric Attach

Unique Value Add to Scale

FLEXIBLE, ALL-IN-ONE SWITCH, DEPLOY EVERYWHERE
HIGH-PERFORMANCE ETHERNET LAYER-2 ACCESS

Layer-2 access use case

Requirements

- 10GbE server access
- Copper and/or fiber cabling
- Support virtualized servers
- Option for GbE server

QFX3500 solution

- 48 (*63) ports wirespeed 10GbE w/ DCB
- Copper DAC and SFP+ fiber support
- Sever virtualization support
- Supports GbE servers (36 ports)
- Future proof 40GbE uplink hardware

* Future
HIGH-PERFORMANCE ETHERNET LAYER-2/3 ACCESS

Requirements

- 10GbE server access
- Copper and/or fiber cabling
- Support virtualized servers
- Option for GbE server
- L2/L3 switching and routing protocol

QFX3500 solution

- 48 (*63) ports wirespeed 10GbE
- Copper DAC and SFP+ fiber support
- Sever virtualization support with L2/L3 Support
- Supports GbE servers (36 ports)
- *Future proof 40GbE uplink hardware

* Future
HPC USE CASE

Requirements
- 10GbE server access
- ULL switching
- Low over subscription at scale
- Support RDMA applications
- Option for inter cluster routing

QFX3500 solution
- 48 (*63) ports wirespeed 10GbE
- Copper DAC and SFP+ fiber support
- ULL cut-through switching
- L3 routing option on EX8200
- Scale to 1,280 10GbE servers

* Future
HFT/FSI ULL USE CASE

Requirements
- GbE and 10GbE market feed
  - BGP/OSPF peering with exchanges
- Dual feed
- L3 multicast
- 20-40 10GbE attached trading server per switch
  - <1 µSec latency
  - Cut through switching
  - Low jitter L2 multicast
- Wirespeed (Unicast & multicast)

Lexington Avenue solution
- ULL/Cut-through switching
- 48 (*63) ports wirespeed 10GbE
- ULL & low jitter multicast

* Future

Copyright © 2011 Juniper Networks, Inc. www.juniper.net
HIGH-PERFORMANCE DCB, STORAGE, & I/O CONVERGENCE

FCoE transit switch use case

Requirements
- 10GbE server access
- Copper and/or fiber cabling
- DCB support
- FIP snooping support

QFX3500 solution
- 48 (63) ports wire speed 10GbE
- Copper DAC and SFP+ fiber support
- DCB & FCoE Transit switch support
  - FCoE is standard on all ports
  - PFC, ETS, DCBX support
  - FIP snooping support

* Future
FCoE-FC Gateway use case

Requirements
- 10GbE server access
- Copper and/or fiber cabling
- High availability
- DCB & FCoE-FC Gateway support

QFX3500 solution
- 12 ports of 2/4/8G FC (no additional modules needed)
- Copper DAC and SFP+ fiber support
- Hardware & software HA
- DCB & FCoE-FC Gateway support (Note: this is not a FC Switch)
FABRIC EDGE SOLUTION OF JUNIPER QFABRIC ARCHITECTURE

EX8216

MX Series

EX4200

SRX5800

QFabric

QFX3500

Pod 1
Pod 2
QFX3500 DEEP DIVE
**PERFORMANCE & SCALE**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Throughput</td>
<td>1.28 Tbps</td>
</tr>
<tr>
<td>Forwarding</td>
<td>960 MPPS</td>
</tr>
<tr>
<td>Latency</td>
<td>&lt;900 nanoseconds</td>
</tr>
<tr>
<td>Packet buffer</td>
<td>9MB shared</td>
</tr>
<tr>
<td>MAC address</td>
<td>96K</td>
</tr>
<tr>
<td>IPv4 routes</td>
<td>12K prefixes + 8K host routes</td>
</tr>
<tr>
<td>Multicast groups</td>
<td>3500</td>
</tr>
<tr>
<td>Firewall filter</td>
<td>1,500</td>
</tr>
<tr>
<td>Maximum power</td>
<td>365 Watts</td>
</tr>
<tr>
<td>Nominal power</td>
<td>295 Watts</td>
</tr>
<tr>
<td>Nominal power per port</td>
<td>~4 Watts</td>
</tr>
<tr>
<td>Depth</td>
<td>28&quot;</td>
</tr>
<tr>
<td>Air flow</td>
<td>Front to back</td>
</tr>
</tbody>
</table>
ENVIRONMENTAL CONSCIOUS – QFABRIC

**Health and Safety**

Restriction of Hazardous Substances Directive (RoHS): 6/6
Restricts Lead, Mercury, Cadmium and three other substances* 

Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH): Strict EU compliance that addresses the production and use of chemical substances

China Restriction of Hazardous Substances Directive (China RoHS): All items shipped to China have to be marked as compliant or non-compliant*

**Energy Efficient**

80 PLUS: Initiative to promote energy efficiency in power supply units (PSU); GOLD certifies products that have more than 87% energy efficiency

The Waste Electrical and Electronic Equipment (WEEE): European Community directive requires Products designed for recyclability; It imposes the responsibility for the disposal of electronic waste on the manufacturers

**Resource Conservation**

Recycled Material:
A portion of the product, and/or its packaging is made of recycled material

* Restricts Lead, Mercury, Cadmium Hexavalent chromium (Cr6+), Polybrominated biphenyls (PBB) and Polybrominated diphenyl ether (PBDE)
PORTS FLEXIBILITY

*(4 ports, 40G/40GbE, Fiber) or *(15 ports, 10GbE, Fiber)
HIGH AVAILABILITY (HA) DESIGN

- Front view
- Dual redundant fan tray
  - Hot pluggable
- Dual 1+1 redundant power supply
  - Hot pluggable
  - 110-240 volt AC
TRANSCEIVER SUPPORT

- SFP optical transceiver
- 2/4G or 8G FC-SW
- FC SFP
- GbE SFP Copper
- *QSFP+ ports
- SFP transceiver
- SR, LR, 1000BaseT
- GbE SFP Optical
- 10GbE SFP+
- Direct Attached/Twinax SFP+ copper
- 1, 3, 5, 7 meter
- SFP+ optical transceiver
- USR, SR, LR

*Roadmap*
## TRANSCEIVER SELECTION

<table>
<thead>
<tr>
<th>Transceiver Type</th>
<th>Protocol</th>
<th>Speed</th>
<th>Supported ports</th>
<th>Cable type</th>
<th>Cable Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFP+ 10GE-SR</td>
<td>Ethernet</td>
<td>10GbE</td>
<td>All SFP+</td>
<td>MMF</td>
<td>300m (OM3)</td>
</tr>
<tr>
<td>SFP+ 10GE-USR</td>
<td>Ethernet</td>
<td>10GbE</td>
<td>All SFP+</td>
<td>MMF</td>
<td>100m (OM3)</td>
</tr>
<tr>
<td>SFP+ 10GE-LR</td>
<td>Ethernet</td>
<td>10GbE</td>
<td>All SFP+</td>
<td>SMF</td>
<td>10km</td>
</tr>
<tr>
<td>SFP+ DAC</td>
<td>Ethernet</td>
<td>10GbE</td>
<td>All SFP+</td>
<td>Twinax DAC</td>
<td>1, 3, 5, 7m</td>
</tr>
<tr>
<td>SFP 1GE-T</td>
<td>Ethernet</td>
<td>GbE</td>
<td>Top row 6-41</td>
<td>Cat5/6</td>
<td>100m</td>
</tr>
<tr>
<td>SFP 1GE-SX</td>
<td>Ethernet</td>
<td>GbE</td>
<td>6-41</td>
<td>MMF</td>
<td>500m (OM3)</td>
</tr>
<tr>
<td>SFP 1GE-LX</td>
<td>Ethernet</td>
<td>GbE</td>
<td>6-41</td>
<td>SMF</td>
<td>10km</td>
</tr>
<tr>
<td>SFP 8GFC-SW</td>
<td>Fibre Channel</td>
<td>2/4/8G FC</td>
<td>0-5, 42-47</td>
<td>MMF</td>
<td>150m (OM3)</td>
</tr>
<tr>
<td>*QSFP+ to SFP+ DAC</td>
<td>Ethernet</td>
<td>10GbE</td>
<td>4 QSFP+ ports</td>
<td>Twinax DAC</td>
<td>1, 3, 5, 7m</td>
</tr>
</tbody>
</table>

* Please refer to Roadmap
QFX3500 LAYER-2 UNICAST STORE AND FORWARD

Across Different Packet Sizes

SUB MICRO LATENCY

Source: Juniper Networks QFX3500 Switch Assessment, Network Test, February 2011
QFX3500 LAYER-2 UNICAST CUT-THROUGH

Source: Juniper Networks QFX3500 Switch Assessment, Network Test, February 2011

Across Min Size Packet

SUB MICRO LATENCY
ETHERNET DESIGN
• Focused on datacenter network infrastructure deployment
• Provides scalable workflow to apply best practice configuration on a large selection of switches
• Best practice configuration includes port security, QoS, STP

VIRTUAL CONTROL
• Physical and virtual from a single pane of glass
• Open architecture
• No proprietary lock-ins
• Works with open APIs
• Manage 100s of hosts from a single instance

SERVICE NOW
• Fault and case management
• In-device, script-based failure monitoring
• Lights-off incident creation with J-TAC
• 30% MTTR reduction

DAY ONE SUPPORT FOR QFX3500
ONE OPERATING SYSTEM FOR THE NEW NETWORK
COMPETITIVE DEEP DIVE
## PRICING

<table>
<thead>
<tr>
<th>Cost Difference</th>
<th>Juniper QFX 3500</th>
<th>Cisco Nexus 5548</th>
<th>Cost Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Price</td>
<td>$34K</td>
<td>$36.8K</td>
<td>+2.8K</td>
</tr>
<tr>
<td>FCoE to FC gateway</td>
<td>$39K</td>
<td>$43K</td>
<td>+4K</td>
</tr>
</tbody>
</table>

List prices

Copyright © 2011 Juniper Networks, Inc. www.juniper.net
PERFORMANCE AND FEATURES

CISCO NEXUS 5548
- Juniper latency is **2.2 times faster**
- Juniper throughput is **~33% better**
- Juniper scales better for **virtualization**
- Juniper MAC Tables **3 times** larger

ARISTA 7148
- Juniper throughput is **~33% better**
- Juniper scales better for **virtualization**
- Juniper MAC tables **3 times** larger
- No convergence
## QFX3500 VS. CISCO NEXUS 5548

<table>
<thead>
<tr>
<th>Attribute</th>
<th>QFX3500</th>
<th>Cisco 5548</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latency</td>
<td>&lt;900ns cut-through</td>
<td>2usec (N5548)</td>
</tr>
<tr>
<td></td>
<td>&lt;900ns s&amp;f</td>
<td></td>
</tr>
<tr>
<td>Port Density</td>
<td>48</td>
<td>48 (N5548)</td>
</tr>
<tr>
<td>10 G</td>
<td>4 (Future)</td>
<td>None</td>
</tr>
<tr>
<td>40 G (QSFP)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L2/L3</td>
<td>L2, L3</td>
<td>L2, L3: Disruptive new HW required</td>
</tr>
<tr>
<td>Path to Fabric</td>
<td>Building block for Stratus Fabric</td>
<td>FabricPath</td>
</tr>
<tr>
<td>Throughput and packets/sec</td>
<td>1.28 Tbps</td>
<td>960 Gbps</td>
</tr>
<tr>
<td>Convergence</td>
<td>FCoE transit switch</td>
<td>FCoE</td>
</tr>
<tr>
<td></td>
<td>FC gateway</td>
<td>FC needs additional expansion module</td>
</tr>
<tr>
<td>Server virtualization</td>
<td>Path to fabric supporting large L2 domain</td>
<td>Unknown Fabric scale</td>
</tr>
<tr>
<td></td>
<td>96K MAC, 20K IPv4 host</td>
<td>32K MAC</td>
</tr>
<tr>
<td></td>
<td>Standards based virtualization</td>
<td>Proprietary solution based on VN-link</td>
</tr>
<tr>
<td>Management simplification</td>
<td>Multiple devices managed as single switch</td>
<td>Each device managed separately adding to</td>
</tr>
<tr>
<td></td>
<td>with single control plane</td>
<td>OPEX and complexity</td>
</tr>
</tbody>
</table>

*Copyright © 2011 Juniper Networks, Inc. www.juniper.net*
## QFX3500 VS. ARISTA 7148SX

<table>
<thead>
<tr>
<th>Attribute</th>
<th>QFX3500</th>
<th>Arista 7148SX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latency</td>
<td>&lt;900ns</td>
<td>&gt;1200ns US</td>
</tr>
<tr>
<td>10GbE Port Densities</td>
<td>Max 63 10G ports</td>
<td>Max 48 10G ports</td>
</tr>
<tr>
<td>40GbE Port Densities</td>
<td>4 QSFP+ ports (*Future)</td>
<td>None</td>
</tr>
<tr>
<td>Throughput</td>
<td>1.28 Tbps</td>
<td>960 Gbps</td>
</tr>
<tr>
<td>Storage and I/O convergence</td>
<td>FCoE transit switch (Base)</td>
<td>No support</td>
</tr>
<tr>
<td></td>
<td>FC Gateway (License)</td>
<td></td>
</tr>
<tr>
<td>Data center bridging</td>
<td>DCB support: PFC</td>
<td>No support</td>
</tr>
<tr>
<td></td>
<td>ETS and QCN (future)</td>
<td></td>
</tr>
<tr>
<td>HPC support</td>
<td>RoCEE, iWarp</td>
<td>No RoCEE</td>
</tr>
<tr>
<td>Virtualization support with Large L2 domain: MAC Table IPV4 routes</td>
<td>96K MAC 20K IPv4</td>
<td>16K MAC Small 16K IPv4 hosts</td>
</tr>
<tr>
<td>Multicast groups</td>
<td>3,500</td>
<td>2000</td>
</tr>
<tr>
<td>Typical power consumption</td>
<td>295 W</td>
<td>600 W</td>
</tr>
</tbody>
</table>
# QFX3500 VS. BROCADE VDX6720

<table>
<thead>
<tr>
<th>Attribute</th>
<th>QFX3500</th>
<th>Brocade VDX6720</th>
</tr>
</thead>
</table>
| Latency                        | <900 ns cut-through  
<900 ns s&f                                   | >1.2usec  
Cut-through only                             |
| Throughput                     | 1.28 Tbps                                     | 1200 Gbps                         |
| Convergence                    | FCoE FC Gateway                               | Yes No                            |
| Lower Jitter with Single Asic  | Single ASIC                                   | Multiple ASICs                    |
| Protocols                      | L2/L3                                         | L2/No L3                          |
| Port Density: 10G 40G          | 64 4                                          | 60 0                              |
| Large L2: MAC Table            | 96K MAC                                       | 32K                               |
PERFORMANCE: AVERAGE UNICAST LATENCY
QFX3500 VS. CISCO 5548, ARISTA 7148

QFX is the only sub-1us switch at all packet sizes and at 100% load.
PERFORMANCE: **UNICAST JITTER**
QFX3500 VS. CISCO 5548 AND ARISTA 7148

Practically NO jitter.
Consistent performance at all packet sizes at full load.

Performance: Average Unicast Jitter

<table>
<thead>
<tr>
<th>Packet size</th>
<th>QFX3500 Avg Jitter (us)</th>
<th>Nexus Avg Jitter (us)</th>
<th>Arista 7148 Avg Jitter (us)</th>
</tr>
</thead>
<tbody>
<tr>
<td>64</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>128</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>256</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>512</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,024</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,280</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,518</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9,216</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PERFORMANCE: MAX THROUGHPUT
QFX3500 VS. CISCO 5548 AND ARISTA 7148

Cisco starts dropping packets at 87% load
Arista starts dropping packets at 93% load
QFX does not drop a single packet at 100% load for any packet size
# QFX3500: How Do We Stack Up to the Competition?

<table>
<thead>
<tr>
<th></th>
<th>QFX3500</th>
<th>Cisco Nexus 5548</th>
<th>Arista 7148</th>
<th>Brocade VDX6720</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Latency</strong></td>
<td>&lt;900 ns</td>
<td>2000 nsec</td>
<td>1200 nsec</td>
<td>&gt;1.2usec</td>
</tr>
<tr>
<td></td>
<td>Cut-through</td>
<td>Cut-through Only</td>
<td>Cut-through Only</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;900 ns s&amp;f</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Throughput</strong></td>
<td>1.28 Tbps</td>
<td>960 Gbps</td>
<td>90 Gbps</td>
<td>1200Gbps</td>
</tr>
<tr>
<td><strong>Convergence</strong></td>
<td>FCoE</td>
<td>FCoE</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>FC Gateway</td>
<td>FC expansion</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>module</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Lower Jitter with</strong></td>
<td>Single ASIC</td>
<td>Multiple ASICS</td>
<td>Multiple ASICS</td>
<td>Multiple ASICS</td>
</tr>
<tr>
<td><strong>Single ASIC</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Protocols</strong></td>
<td>L2/ L3</td>
<td>Not full L3 at all</td>
<td>L2/L3</td>
<td>No L3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ports. Needs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>expansion module</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Port Density: 10G</strong></td>
<td>64</td>
<td>48</td>
<td>48</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td><strong>Large L2 : MAC</strong></td>
<td>96K MAC</td>
<td>32K</td>
<td>16K</td>
<td>32K</td>
</tr>
<tr>
<td><strong>Table</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY QFX 3500

- Sub microsecond latency
- Line rate throughput for all frames sizes on all ports
- Standards-based Layer-2, Layer-3, and I/O Convergence
- Supports feature rich implementation of IEEE DCB standards for converged networks; enabling FCoE, iSCSI and NAS deployments
- FCoE transit and FCoE-FC gateway, interoperability with both Brocade and Cisco Fibre Channel SANs (including support for multi-hop FCoE)
- Interoperability with major CNA vendors
- It’s Green, RoHSS, China RoHSS, Gold 80 Plus, Green Recycle, WEE, REACH
- QFabric ready!

Flexible all-in-one switch, deploy everywhere

Source: Juniper Networks QFX3500 Switch Assessment, Network Test, February 2011
REFERENCES

1. QFX3500 data sheet :

2. QFX3500 FAQ:
   http://www-int.juniper.net/fst/pdfs/qfx3500_faqs.pdf

3. QFX3500 (SOPD) Statement of Product Direction
   http://www-int.juniper.net/fst/pdfs/qfx3500_sopd.pdf

4. Hotsheets:
   Cisco: https://matrix.juniper.net/docs/DOC-55891
   Arista: https://matrix.juniper.net/docs/DOC-55840
everywhere
BACK UP SLIDES
PERFORMANCE TEST RESULTS
QFX3500 COMPARED WITH:
CISCO NEXUS 5548 & ARISTA 7148S

SUTAPA & XIANGHUI
FSG MKTG.
PERFORMANCE: AVERAGE UNICAST LATENCY
QFX3500 VS. CISCO 5548, ARISTA 7148

QFX is the only sub-1us switch at all packet sizes and at 100% load.
PERFORMANCE: **UNICAST JITTER**

**QFX3500 VS. CISCO 5548 AND ARISTA 7148**

Practically NO jitter.
Consistent performance at all packet sizes at full load.
PERFORMANCE: MAX THROUGHPUT
QFX3500 VS. CISCO 5548 AND ARISTA 7148

Cisco starts dropping packets at 87% load
Arista starts dropping packets at 93% load
QFX does not drop a single packet at 100% load for any packet size
PERFORMANCE: MULTICAST JITTER
QFX3500 VS. CISCO 5548 AND ARISTA 7148

QFX3500 practically has NO jitter.
Nexus 5548 has jitter for all packet sizes.
Nexus 5548 highly unsuitable for financials.
Nexus 5548 avg latency > 200 microsec across packet sizes
PERFORMANCE: AVERAGE MULTICAST LATENCY
QFX3500 VS. CISCO 5548, ARISTA 7148

Performance Average Multicast Latency

QFX3500 multicast latency identical to unicast latency
QFX3500 has sub 1us for all packet sizes at 100% load
Cisco consistent latency of 2.5us, Arista cannot perform less than 1us latency.