Agenda

- Catalyst 49xx Positioning and How to Sell
- Catalyst 49xx Overview
- Catalyst 49xx Architecture
- Day in a life of the packet
- Performance
- Catalyst 49xx Series Comparison
- Q&A
 Agenda

- Catalyst 49xx Positioning and How to Sell
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Cisco Data Center Portfolio

Core, Aggregation and End-of-Row

- Catalyst 6500 and 6500-E
- Catalyst 6500 Virtual Switching System 1440
- Nexus 7000

Rack and Blade Server Access

- Catalyst Blade Switches
- Catalyst 4900
- Nexus 5000
Cisco Mid-Market and Branch Portfolio
Catalyst 4900 Series
Competitive Differentiators

- **Manageability:**
  - Generic On-Line Diagnostics (GOLD)
  - Out-of-band Ethernet management
  - Embedded Event Manager (EEM)

- **High Availability**
  - Dual hot-swappable power supplies and AC/DC power
  - Redundant field-replaceable fans

- **Rich Media communications:**
  - Low Latency
  - Large Buffers
  - Robust multicast

- **4900M Interface flexibility:**
  Wide range of optics and GE/10G copper interfaces
Catalyst 4900 Data Center Positioning

Catalyst 4900M
- 10/100/1G/10G Access
- 10GbE Uplinks

Catalyst 4948-10GE
- 10/100/1000 Access
- 10 GbE Uplinks

Catalyst 4928-10GE
- 1G Access
- 10 GbE Uplinks

Catalyst 4948
- 10/100/1000 Access
- GbE Uplinks
Server Connectivity & Virtualization

Top Of Rack: Base Solution: Dual 4948-GE

- **Base Solution**
  - 2 x 4948-GE, dual power
  - 48 10/100/1000 + 4 SFP
  - Including dual SX SFP for switch interconnect
  - **approx list USD$25K**

- **Care-abouts Addressed**
  - Cost Reduction
  - Fault Tolerance (dual path)
  - Fault Tolerance (redundant power)
  - Supports server virtualization and Vmotion by adding Nexus 1000V

  *Note: C3750 is not positioned as top of rack, because of its lack of buffers to handle traffic burst and not providing 100% throughput at all packet size.

- **Who To Sell To**
  - Basic requirement for 10/100 or 1GB server connectivity, dual-path to two core switches connected by 1G SFP optics

  - Customers with Top of Rack topology and < 48 servers per rack

Provides 10/100/1000 server connectivity, dual power supplies in each chassis, dual-path to two core switches connected by 1G SFP optics.
Server Connectivity & Virtualization

Top Of Rack: Plus 1 Solution: Dual 4948-10G

- **Plus 1 Solution**
  - 2 x 4948-10G, dual power, dual X2 CX4 (for 2x10G switch interconnect)
  - approx list USD$35K

- **Care-Abouts Addressed**
  - Cost Reduction
  - Fault Tolerance (dual path)
  - Fault Tolerance (redundant power)
  - Bandwidth (10G uplinks)
  - Supports server virtualization and Vmotion by adding Nexus 1000V

- **Who to Sell**
  - Basic requirement for 10/100 or 1GB server connectivity, dual-path to two core switches with 10GbE uplinks.
  - Customers with Top of Rack topology and < 48 servers per rack

Add X2 10GE optics to connect the core switches on multimode or single mode fiber or WDM at greater distance.

GbE servers
Server Connectivity & Virtualization
Top Of Rack: Plus 2 Solution: Dual 4900M

- **Plus 2 Solution**
  - 2 x 4900M,
  - 8 x 10GE X2 (including dual X2 CX4 for 2 x 10G switch interconnect)
  - plus 2 x 20 port 10/100/1000 modules each
  - approx list USD$55K

- **Care-abouts Addressed**
  - Cost Reduction
  - Fault Tolerance (dual path)
  - Fault Tolerance (redundant power)
  - Flexibility (1GE & 10GE)
  - Scale (add 10GE ports)
  - Investment Protection (Easy 1G to 10G migration)
  - Supports server virtualization and Vmotion by adding Nexus 1000V

- **Who to Sell**
  - Requirement to support 10/100/1000 plus several ports for 10GE server connectivity in next 18 months. Easy migration from GbE to 10GbE through daughter card upgrade for future scalability enhancements.
**Server Connectivity & Virtualization**

**Collapsed Core/Aggregation/Server Farm: Base Solution: Dual 4900M**

- **Base Solution**
  - 2 x 4900M, Each with
  - 8 x 10GE X2 (including dual X2 LRM for 2 x 10G switch interconnect)
  - 20 port 10/100/1000 modules
  - 16 port GbE (8 port 10G module + 8 X2 to SFP converters)
  - **approx list USD$67K**

- **Care-abouts Addressed**
  - Mixed interfaces (1G copper, 1G fiber, 10G)
  - Fault Tolerance (dual path)
  - Fault Tolerance (redundant power)
  - Investment Protection (Easy 1G to 10G migration)
  - Small form factor
  - Supports server virtualization and Vmotion by adding Nexus 1000V

- **Who to Sell**
  - Customers with collapsed core/distribution or space constrained distribution requiring GbE fiber and 10G connectivity in a small form factor. Ideal for customers with <20 direct attached servers.

Provides 10/100/1000 and 10GB server connectivity, dual power supplies in each chassis, dual 10GbE paths for inter-core connectivity, 1G fiber downlinks to wiring closets and 1 or 10G uplinks to WAN.
Where is the 4900 Series selling today?

- Cloud computing
- Web 2.0/3.0 established and start up companies
- Content delivery networks
- Financials (there are a few left), includes banks
- Hospitals and health care
- Film and entertainment content creation and content distribution
- Oil and gas, energy companies
- Metro data centers
- Enterprise data centers
Where to sell Catalyst 4900 series?

<table>
<thead>
<tr>
<th>Type of Application</th>
<th>Financials</th>
<th>Web Services (OTT/WSEP)</th>
<th>Enterprise DC</th>
<th>SP Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Data</td>
<td></td>
<td>1- Web tier Aggregation</td>
<td>Top of Rack</td>
<td>1/10 Fiber aggregation</td>
</tr>
<tr>
<td>Architecture</td>
<td></td>
<td>2- BGP peering</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3- 1/10 fiber and</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>copper aggreg.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Key Benefits:

- Financials
  - Low Latency
  - Robust multicast
  - L3 features

- Web Services (OTT/WSEP)
  - L2/L3
  - Buffering
  - Latency
  - Interface Flexibility

- Enterprise DC
  - 1:4 to 1:1 OS control
  - Wide range of optics and 1/10 copper interfaces

- SP Transport
  - Interface flexibility
  - Form factor
  - Widest range of optics

+ Collapse Disti/Core Space Constrained Environments
Search
WSEP/ Web 2.0 Catalyst 49xx Use Case

Access Layer Switches
- Large buffers for micro burst protection
- Intelligent buffer management

Search Grid
- Multicast search queries
- Dropped packets are lost
- Inconsistent search results
## Financial Markets Business Drivers

<table>
<thead>
<tr>
<th>Business Driver</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competitive Pressure &amp; Economic downturn</td>
<td>Financial Market Consolidation</td>
</tr>
<tr>
<td></td>
<td>Competitive commission pricing</td>
</tr>
<tr>
<td></td>
<td>Increased adoption of algorithmic trading</td>
</tr>
<tr>
<td>Market Data Volume increase</td>
<td>Market data has quadrupled over the last 2 years driving electronic trading</td>
</tr>
<tr>
<td>Application SLA</td>
<td>Low latency trade execution</td>
</tr>
<tr>
<td></td>
<td>Guarantee application SLA’s</td>
</tr>
<tr>
<td></td>
<td>Customers diversifying away from a “single prime” broker</td>
</tr>
<tr>
<td>Regulatory Compliance</td>
<td>Reg. NMS: Order protection rule requires real-time trading venue with best execution price</td>
</tr>
<tr>
<td></td>
<td>MiFID: Need to prove best execution; buy-side obtains data to ensure best execution</td>
</tr>
<tr>
<td>Globalization</td>
<td>24*7 Global market trading</td>
</tr>
<tr>
<td></td>
<td>Emerging market growth driving trades in international orders</td>
</tr>
</tbody>
</table>
High-Level Market Data Architecture

- **Execution Monitors**
- **IP Phone Alerting**
- **Trading Systems**
- **Performance Dashboards**
- **End-User Applications**
- **High-Level Market Data Architecture**
- **Feed Handlers**
- **Pricing Engine**
- **Algorithmic Trading**
- **Order Mgmt.**
- **Execution Monitors**
- **Execution Alerts**
- **Trading Systems**
- **Performance Dashboards**
- **Compliance Surveillance**
- **Message Bus**
- **FIX Engine**
- **High Performance Computing Cluster**
- **RESILIENT MULTICAST NETWORK**
- **Market Data Providers** (Exchanges, Market Data Aggregators, ECNs)
- **Latency Monitoring**
- **Quality of Service**
- **Application Virtualization**
- **Data Virtualization**
- **OS Virtualization**
- **Storage Virtualization**
- **SERVICES**
- **Messaging Bus**
- **IP Phone Alerting**
- **Mobile Alerting**
- **Performance Dashboards**
- **Compliance Surveillance**
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## Design Considerations

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Details</th>
<th>Cat49xx Value Add</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficient transport</td>
<td>• End-to-End deterministic low latency transport</td>
<td>• Non-blocking architecture</td>
</tr>
<tr>
<td></td>
<td>• Sufficient bandwidth to minimize latency</td>
<td>• deterministic 3-5us latency across all ports</td>
</tr>
<tr>
<td>Scalability &amp; Capacity</td>
<td>• Sufficient capacity to handle exponential increase in market data volume</td>
<td>• Support for 1 and 10GbE port channels</td>
</tr>
<tr>
<td></td>
<td>• Maximize server capacity using latest hardware technology</td>
<td></td>
</tr>
<tr>
<td>Investment Protection</td>
<td>• Compatible with existing systems and enterprise model</td>
<td>• Cisco IOS software</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Out-of-band management port standard</td>
</tr>
<tr>
<td>Business Resiliency</td>
<td>• High availability architecture</td>
<td>• Redundant power and cooling</td>
</tr>
<tr>
<td></td>
<td>• Infrastructure needs to be controlled and secured</td>
<td>• Full support for L2-3 switching and routing</td>
</tr>
<tr>
<td></td>
<td>• Ability to support multiple data sources in the event of an outage or discrepancy from a single source</td>
<td></td>
</tr>
<tr>
<td>Managing &amp; Monitoring</td>
<td>• Application and traffic flow visibility</td>
<td>• Support for SNMP based management</td>
</tr>
<tr>
<td></td>
<td>• Detect micro-burst impact on latency across the trading cycle.</td>
<td>• track buffer performance through CLI</td>
</tr>
</tbody>
</table>
Monitoring and Management...

- Management using CMM

Rupeshkumar, 12/22/2008
Enterprise Video
AVID ISIS Certified
Enterprise class real time media network
- Catalyst 49xx series listed as the preferred switch

AVID ISIS is a storage architecture that distributes high resolution video to enterprise users for pre and post video production.
Green
Catalyst Power Consumption is 30-40% lower than Datasheet Value

**Cat4948**
**Datasheet 300W**

- No Ports Connected
- 48xGE Connected
  - No Traffic
  - Line Rate Traffic

Redundant Power Supplies, both connected through power meter

Catalyst 4948 typical power consumption is 30% lower than Datasheet values
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Catalyst 49xx Series Common Attributes

**Power Supply**
- Supports both **DC and AC**
- Dual hot-swappable power supply
- Can **mix** AC and DC in the same chassis

**Fan Tray**
- Hot-Swappable
- Variable speed fans

**Device Management**
- Console
- **10/100/1000 Ethernet Out Of Band management port**

No PoE supports
Catalyst 4928-10GE: Hardware Attributes

Unicast (IPv4): 71Mpps
Multicast (IPv4): 71Mpps
Switching Capacity: 96Gbps

SDRAM: 256MB
Bootflash: 64MB
NVRAM: 512KB

28 port SFP GE interface
  Copper: GLC-T GigE
  Optical: SX, LH, ZX, CWDM, DWDM

2 port 10GE X2 interface
  CX4, LX4, SR, ER, LR, LRM, DWDM, ZR

Now Shipping
**Catalyst 4948: Hardware Attributes**

- **Unicast (IPv4):** 71Mpps
- **Multicast (IPv4):** 71Mpps
- **Switching Capacity:** 96Gbps
- **SDRAM:** 256MB
- **Bootflash:** 64MB
- **NVRAM:** 512KB

**48 10/100/1000 RJ45 Ports**
Last 4 ports are Alternative wired and can be configured either 10/100/1000 or 1G SFP

**4 port SFP GE interface (Alternative wired)**
- Copper : GLC-T GigE
- Optical : SX, LH, ZX, CWDM, DWDM

C4948(config-if)#media-type ?
  - rj45 Use RJ45 connector
  - sfp Use SFP connector
Catalyst 4948-10GE: Hardware Attributes

Unicast (IPv4): 102Mpps
Multicast (IPv4): 102Mpps
Switching Capacity: 136Gbps

SDRAM: 256MB
Bootflash: 64MB
NVRAM: 512KB

48 10/100/1000 RJ45 Ports
2 port 10GE X2 interface
  CX4, LX4, SR, ER, LR, LRM, DWDM, ZR
Catalyst 4900M: Hardware Attributes

Unicast (IPv4/IPv6): 250Mpps/125Mpps
Multicast (IPv4/IPv6): 250Mpps /125Mpps
Switching Capacity: 320Gbps

SDRAM: 512MB
Bootflash: 128MB
NVRAM: 512KB

8x 10GE X2 baseports
  X2 : CX4, LX4, SR, ER, LR, LRM, DWDM, ZR
  OneX (X2 to SFP+ converter): SR, CX1

2 half-slots:
  - 4x 10GE (non-blocking) half card
  - 8x 10GE (2:1 oversubscription) half card
  - 20x 10/100/1000 RJ45 half card

USB
Compact Flash
Catalyst 4900M half-cards

- **WS-X4904-10GE**
  - **4x 10GE Ports (non-blocking)**
  - Pluggable:
    - X2: CX4, LX4, SR, ER, LR, LRM, DWDM, ZR
    - OneX: SR, CX1 (Copper)

- **WS-X4908-10GE**
  - **8x 10GE Ports (2:1 Oversubscription)**
  - Pluggable:
    - X2: CX4, LX4, SR, ER, LR, LRM, DWDM, ZR
    - OneX: SR, CX1 (Copper)
    - TwinGig: (Optical) SX, LH, ZX, CWDM, DWDM

- **WS-X4920-GB-RJ45**
  - **20x 10/100/1000 Ethernet Ports**
OneX Adapter

- OneX is a converter module that allows a SFP+ to be used in a X2 slot.
- OneX fits into a X2 slot and in turn has a slot into which a SFP+ can be plugged in.
- Compatible with all 10GE ports on the Catalyst 4900M
TwinGig Converter Module

- Provides seats for 2 x GbE SFP slots into a single X2 10GE port
- Allows Customers to mix GbE & 10GbE fiber downlinks
- Compatible with 8-port half card only
TwinGig Converter Module
With 8 port 10GbE half card

- 8 Port Half card has 4 port groupings (in Red)
- X2 pluggables & TwinGig modules cannot be mixed within a group
- X2 pluggables & TwinGig modules can be mixed between the 4 groupings

C4900(config)#hw-module slot 2 port-group 1 select ?
  gigabitethernet  Select this port-group's gigabit interfaces
  tengigabitethernet Select this port-group's 10G interfaces
Popular Catalyst 4900M Configurations

1. **Top of Rack or Space constrained aggregation**
   - 10GbE wire rate
   - 12 total 10 GE Ports (X2)
   - 8 ports wire speed 10GE
   - 4 ports wire speed 10 GE

2. **Top of Rack or Space constrained aggregation**
   - 10GbE wire rate
   - 16 total 10 GE Ports (X2)
   - 8 ports wire speed 10 GE
   - 8 ports wire speed 10 GE

3. **Collapsed core/distribution**
   - Offer simple GbE to 10GbE migration
   - 24 total 10 GE Ports (X2)
   - 8 ports wire speed 10 GE
   - + 16 ports 2:1 oversubscribed 10 GE
   - – OR –
   - 32 Ports wire speed 1 GE SFP

4. **Top of Rack**
   - 1GbE to server, 10GbE to aggregation
   - 8 10 GE Ports (X2) + 40
   - 10/100/1000
   - 8 ports wire speed 10 GE
   - + 40 ports wire speed 10/100/1000 (RJ-45)
Ease of Deployment of 4900 Switches
DHCP Auto-Install

- Switch Boots up
- Config not present (requirement)
- Sends out DHCP Discover
- DHCP server identifies the switch by the MAC address and assigns IP address
- DHCP Server also provides the config file location
- Switch downloads and config file
- Switch is configured

Auto-provisioning: Zero touch image upgrade using Auto-Install + EEM

Shipping 12.2(20)EW
“Cisco Catalyst 4900M Helps Clear the Way to 10G”

"This near-dizzying array of configuration choices boils down to enough flexibility to **accommodate almost any transition plan for servers that need to move from 1G to 10G network connectivity.**"

"Cisco's new switch deserves a spot near the top of your data center equipment evaluation list. I tested the 4900M in a configuration with **16 10G ports running at full line speed.**"

“Layer 2 and 3 latency for packet forwarding **for packets ranging from 64- to 9198-byte jumbo frames remained steady at ~2.6 microseconds** ....All tests were 5 minutes in duration and conducted at 100% and 10% utilization ...

“Top 10 products of the year”

Cisco Catalyst 4900M

“The 4900M is a 2U (3.5-inch) form factor data center switch that's designed to sit atop a rack of servers, aggregate their traffic and uplink to an end-of-row switch such as a Catalyst 6500. The “M” in 4900M stands for modular, with the intention that 1G modules will be replaced with 10G modules as data center server network connections increase in bandwidth”

—Cameron Sturdevant

http://www.eweek.com/c/a/Enterprise-Applications/The-Top-10-Products-of-the-Year/1/
Cisco Catalyst 49xx Series Software Options

Single Cisco IOS® image across all Cisco® Catalyst® 49xx Series switches

- **IP Base Software**
  - Ships Standard on Catalyst 4900: RIP v1/2, static routes, EIGRP Stub

- **Enterprise Enhance Layer3 Image contains**
  - All IP Base features
  - All routing protocols - OSPF, EIGRP, BGP
  - All other L3 features (VRF-lite)

- **Crypto images - SSH v1 & SSH v2**

- **Security: DHCP Snooping, Dynamic ARP inspection, IP source Guard**
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Catalyst 4928-10GE Architecture

CPU Subsystem

Fast Forwarding Engine (FFE)

Packet Process Engine (PPE)

1G Ports

1G Ports

1G Ports

10GE X2

10GE X2
Catalyst 4948-10GE Architecture

- **CPU Subsystem**
- **Fast Forwarding Engine (FFE)**
- **Packet Process Engine (PPE)**

- **Stub ASIC (1)**
  - 10/100/1000 Ports

- **Stub ASIC (6)**
  - 10/100/1000 Ports

- **10GE X2**
- **10GE X2**
Catalyst 4928/4948 Series Block Diagram

- **Packet Memory**
- **CPU**
  - **STP Memory**
  - **ICC TCAM**
  - **FWD TCAM**
- **FPGA**
- **Ingress Security / QoS ACLs**
- **Forwarding Tables**
- **FWD Memory 1**
- **FWD Memory 2**
- **OCC TCAM**
- **FFE (Fast Forwarding Engine) ASIC**
  - **Queue Memory**
  - **DBL Memory**
  - **Multicast Expansion Table**
  - **Congestion Avoidance**
- **PPE (Packet Processing Engine) ASIC**
  - **FE (Fast Forwarding Engine) ASIC**
  - **PLD**
  - **PTD**

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Catalyst 4900M Series Architecture

- Very Fast Forwarding Engine (VFE)
- Intelligent Packet Processor (IPP)

- CPU Subsystem
- 80 Gbps
- 8x 10GEX2 Baseports
- Slot2
- 40 Gbps
- Slot3
- 40 Gbps
Catalyst 4900M Block Diagram

- Packet Memory
- CPU
- STP Memory
- ICC TCAM
- FWD TCAM
- FWD Memory 1
- FWD Memory 2
- OCC TCAM
- Queue Memory
- DBL Mem
- RET
- Congestion Avoidance
- Ingress Security / QoS ACLs
- Forwarding Tables
- IPP (Intelligent Packet Processor) ASIC
- VFE (Very Fast Forwarding Engine) ASIC
- FabricPorts
- CPU FPGA
- PLD
- PTD
Half-card Architecture (WS-X4920-GB-RJ45)

20 Port 10/100/1000 RJ45 (non-blocking)
Half-card Architecture (WS-X4908-GB-10GE)

8 Port 10GE (2:1 oversubscription)
Or 16 Port 1G SPF using TwinGig (non-blocking)
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Catalyst 4900M – Packet Walk

Half Card or baseports

Catalyst 4900M

Packet Memory

CPU

CPU FPGA

STP Memory

ICC TCAM

FLC TCAM

FWD Memory

FWD Memory 1

FWD Memory 2

OCC TCAM

Queue Memory

DBL Mem

RET

IPP (Intelligent Packet Processor) ASIC

VFE (Very Fast Forwarding Engine) ASIC

PLD

PTD

PHY
### IPP Role

#### IPP: Packet Reception, Packet Storage, Packet Retransmission

**Packet Processing Engine**
- Packet copied into Packet Memory
- Vlan tag is stripped and Vlan information is stored
- Packets Header Parsing: L2, L3 (IPv4, IPv6), L4
- Packet Rewrite: L2 and L3 for IPv4, IPv6

**Centralized Packet Memory**
- 17.5 MB of Packet Memory
- 64K of Cells
- Each cell is 280 Byte
- Cells maintained in Link-List Manner
Catalyst 4900M – Packet Walk

Half Card or baseports

Catalyst 4900M

- Packet Memory
- CPU
- FPGA
- STP Memory
- ICC TCAM
- FLC TCAM
- FWD Memory
- FWD Memory 1
- FWD Memory 2
- OCC TCAM
- Queue Memory
- DBL Mem
- RET
- IPP (Intelligent Packet Processor) ASIC
- VFE (Very Fast Forwarding Engine) ASIC
- PHY
- OCC
- PTD
- PLD
Catalyst 4900M – Packet Walk

STP Memory
(Spanning Tree Memory)

Stores Per Port Per VLAN Spanning Tree State

ICC
Input Classification TCAM

Stores Input ACL / QoS Rules in TCAM4

FLC
Forwarding Lookup TCAM

Stores L3 or L2 Lookup Forwarding for IPv4 and IPv6 FIB Entries

VFE
(Very Fast Forwarding Engine) ASIC

Queue Memory

Stores all Transmit Queues Queue memory increased from 4 transmit queues / port to 8 transmit queues / port.

DBL Memory
Dynamic Buffer Limiting

Stores Dynamic Buffer Limiting flow hash table

RET
Replica Extension Table

Stores L2 multicast, broadcast, flood-vlan / Portsets, and IP Multicast Forwarding

Forwarding Lookup Memory
FLM 1

Forwarding Lookup Memory
FLM 2

FLM1 and FLM2 Store associated forwarding information – Adjacencies and RET indices Implemented in 2 SRAMs referred as FLM1 and FLM2 FLM2 contains RPF Rules

OCC
Output Classification TCAM

Stores Output ACL / QoS Rules in TCAM4
Catalyst 4900M – Packet Walk

Half Card or baseports

Catalyst 4900M

IPP (Intelligent Packet Processor) ASIC

VFE (Very Fast Forwarding Engine) ASIC

Packet Memory

CPU

STP Memory

FLC TCAM

FWD Memory

ADC Mem

Queue Memory

DBL Mem

RET

PLD

PTD

1

2

3

4

5

6

7

8

9

10
## Buffering Capability

<table>
<thead>
<tr>
<th></th>
<th>Catalyst 4928-10GE</th>
<th>Catalyst 4948</th>
<th>Catalyst 4900M</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Queues</strong></td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td><strong>Queue Depth per Queue</strong></td>
<td>Fixed</td>
<td>Fixed</td>
<td>Configurable</td>
</tr>
<tr>
<td><strong>Queue Depth</strong></td>
<td>2080</td>
<td>2336</td>
<td>Up to 8184</td>
</tr>
<tr>
<td><strong>Packet Memory Size</strong></td>
<td>16MB</td>
<td>16MB</td>
<td>17.5MB</td>
</tr>
</tbody>
</table>

Queue **only holds the header**  
Packet Memory holds the entire packets
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Unicast throughput performance
Cat4928-10GE, Cat4948, Cat4948-10GE

Line rate for all packet size

Throughput (Mpps)

Packet Size (Byte)

64 128 256 512 1024 1280 1518 1580

Cat4928-10GE
Cat4948
Cat4948-10GE
10GE to 10GE RFC2544 Latency
Catalyst 4928-10GE and Catalyst 4948-10GE

10GE to 10GE Latency

Packet Size (Byte)

Latency (microsecond)

Layer 2 (us)
Layer 3 (us)
Cat 4928-10GE GE to GE RFC2544 Latency

GE to GE Latency

Packet Size (Byte)

Latency (microsecond)

- Fiber L2
- Fiber L3
- Copper L2
- Copper L3
GE to GE RFC2544 Latency
Cat4948 and Cat4948-10GE

GE to GE Latency

Latency (microsecond)

Packet Size (Byte)

Layer 2 (us)

Layer 3 (us)
Catalyst 4900M Unicast Performance

Line rate at all packet size
320Gbps

Throughput (Mpps)

Packet Size (Bytes)
C4900M 10GE to 10GE RFC2544 Latency

10GE to 10GE Latency

Packet Size (Byte)

Latency (microsecond)

- Layer 2 (us)
- Layer 3 (us)
C4900M GE to GE RFC2544 Latency

GE to GE Latency

Latency (microsecond)

Packet Size (Byte)

Layer 2 (us)

Layer 3 (us)
Catalyst 4900M Multicast Performance

Tested with 500 groups

![Graph showing multicast performance with packet sizes from 64 to 9216 bytes]

Throughput (Mpps)

Packet Size (Bytes)

- IPv4
- IPv6
C4900M 10GE to 10GE Multicast Latency

Multicast Latency

Latency (microsecond)

Packet Size (Byte)

IPv4 (us)
IPv6 (us)
Agenda

- Catalyst 49xx Positioning and How to Sell
- Catalyst 49xx Overview
- Catalyst 49xx Architecture
- Day in a life of the packet
- Performance
- Catalyst 49xx Series Comparison
- Q&A
## Catalyst 49xx Series Models Summary

<table>
<thead>
<tr>
<th></th>
<th>Catalyst 4928-10GE</th>
<th>Catalyst 4948-10GE</th>
<th>Catalyst 4948-10GE</th>
<th>Catalyst 4900M</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Switching capacity</strong></td>
<td>96 Gbps</td>
<td>96 Gbps</td>
<td>136 Gbps</td>
<td>320 Gbps</td>
</tr>
<tr>
<td><strong>Throughput</strong></td>
<td>71 Mpps</td>
<td>71 Mpps</td>
<td>102 Mpps</td>
<td>250 Mpps IPv4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>125 Mpps IPv6</td>
</tr>
<tr>
<td><strong>Height</strong></td>
<td>1 RU</td>
<td>1 RU</td>
<td>1 RU</td>
<td>2 RU</td>
</tr>
<tr>
<td><strong>Half card slots</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>Max 10/100/1000 Copper ports</strong></td>
<td>0</td>
<td>48</td>
<td>48</td>
<td>40</td>
</tr>
<tr>
<td><strong>Max 10GE ports</strong></td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>24</td>
</tr>
<tr>
<td><strong>Max 1 GE fiber ports</strong></td>
<td>28</td>
<td>4</td>
<td>0</td>
<td>32</td>
</tr>
<tr>
<td><strong>Routes</strong></td>
<td>32K</td>
<td>32K</td>
<td>32K</td>
<td>200K IPv4 128K</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IPv6</td>
</tr>
<tr>
<td><strong>Average power use</strong></td>
<td>176 Watts</td>
<td>176 Watts</td>
<td>212 Watts</td>
<td>318-356 Watts</td>
</tr>
<tr>
<td><strong>Air flow</strong></td>
<td>Side to back</td>
<td>Side to back</td>
<td>Side to back</td>
<td>Side to side</td>
</tr>
</tbody>
</table>
Additional Resources

External Resources:

- **4900 Series Collaterals:**

- **Mid-Market and Branch Positioning:**

Internal Resources:


Agenda

- Catalyst 49xx Positioning and How to Sell
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