



Cisco Catalyst 6500 Wiring Closet Innovations Architecture Overview

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Agenda



- **Supervisor Overview**
- **Wiring Closet Supervisor Comparison**
- **Hardware Architecture**
- **Packet Flow – A Refresher of the “Classic” System**
- **Performance and Features, including QoS, Multicast, SPAN**

Supervisor 32

Sup32 – Next Generation Supervisor for the Intelligent Wiring Closet

Supervisor 32

Two uplink options:

- 8xGE SFP + 1x 10/100/1000 RJ-45
- 2x10GE + 1x 10/100/1000 RJ-45

Standard on all Sup32s:

- PFC3B Forwarding Engine Standard allowing Supervisor720 hardware-accelerated services into access networks
- MSFC2a daughter card included for Layer 3 routing

Future PISA + MSFC2a daughter card for IP and Layer 4–7 services

Satellite Ready



Sup32-GE or Sup32-10G

Choice of uplink options for the wiring closet of tomorrow

Supervisor 32

Supervisor 32



The Cisco Catalyst 6500 Supervisor Engine 32

Cisco.com

MSFC2 Complex: Layer 3 Control Plan supporting up to 1G DRAM

PFC3B: Hardware forwarding engine enabling IPv4 and IPv6 Layer 3/4 features



Compact Flash: Integrated 256 MB internal compact Flash; external compact Flash optional

8x SFP and 1x 10/100/1000 Uplink Ports: Each supports advanced QoS features

USB Ports: Support USB host and access ports plus RS-232 console

Supervisor 32

Module Interoperability

- Supported in any 6500 Series chassis (including the E series); not supported in the 600x chassis
- Requires the **high-speed fan tray** and a **minimum of the 2500W** power supply (AC or DC)
- Operates in the same slots as Sup720 (1 and 2 in 3 slot; 5 and 6 in 6/9 slot chassis; 7 and 8 in 13 slot)
- Supervisor 32 interoperates with the following modules:
 - All classic modules
 - All CEF256 modules (without a DFC)
- Supervisor 32 does not support the following modules:
 - Any CEF720 series module (67xx series)
 - Any dCEF720 series module (6802-10GE)
 - Any dCEF256 series module (6816-GBIC)
 - Any DFC or DFC3 (WS-F6K-DFC, WS-F6K-DFC3x, etc.)
 - Any switch fabric module

Wiring Closet Supervisor Comparison

General

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Feature	Sup1a/PFC	Sup2/PFC2	Sup32/PFC3B
MSFC	MSFC/MSFC2 (both optional)	MSFC2 (optional)	MSFC2a default
Backplane	32 Gbps shared bus	32 Gbps shared bus or 256 Gbps crossbar fabric (via SFM)	32 Gbps shared bus
SP CPU	Orion RISC 150 Mhz	R7K 300 Mhz	BCM1120 400 Mhz
SP NVRAM	512 KB (SP)	512 KB (SP)	2 MB (SP)
SP DRAM	128 MB Default	128 MB default (256 MB and 512 MB upgrades)	256 MB default (upgradeable to 1 GB)
SP boot Flash	16 MB	32 MB	256MB via internal compact Flash "bootdisk"
Removable storage	PCMCIA, ATA Flash	PCMCIA, ATA Flash	Compact Flash, USB
Uplink ports	2x GBIC uplinks	2x GBIC uplinks	8x SFP and 1x 10/100/1000 uplink -or- 2x 10GbE Xenpak and 1x 10/100/1000 uplink

Wiring Closet Supervisor Comparison

Based on PFC Access-Layer Features

Cisco.com

Feature	Sup1a/PFC	Sup2/PFC2	Sup32/PFC3B
L2 MAC addresses	128 K (32 K recommended)	128K (32K recommended)	64 K (32 K recommended)
Security ACEs*	16K ACEs for VACLs/RACLs	32K ACEs for VACLs/RACLs	32K ACEs for VACLs/RACLs or PACLs
Security ACLs	512	512	4096
ACE hit counters	No	No	Yes
SP DoS protection	No	No	2x Layer 2 special cases to SP
Management features	SPAN/RSPAN	SPAN/RSPAN	SPAN/RSPAN/ERSPAN*
Catalyst Security Toolkit	DHCP snooping	DHCP snooping / dynamic ARP inspection	IP SourceGuard/ DHCP snooping/ dynamic ARP inspection
802.1x + extensions	Yes	Yes	Yes

*Dependent on future software support

Wiring Closet Supervisor Comparison

Based on PFC QoS Features

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Feature	Sup1a/PFC	Sup2/PFC2	Sup32/PFC3B
Uplink queue structure	1p2q2t Tx Q structure 1p1q4t Rx Q structure 512 KB buffer/port	1p2q2t Tx Q structure 1p1q4t Rx Q structure 512 KB buffer/port	1p3q8t TX Q Structure 2q8t RX Q Structure 9.5 MB buffer/GE port 100 MB buffer/10 GE port
Uplink port scheduler	WRR	WRR	WRR or SRR
QoS ACLs	16 K ACEs for QoS policies (shared with security ACLs)	32K ACEs for QoS policies	32K ACEs for QoS policies
Aggregate policing	Ingress only	Ingress only	Ingress and egress, including ingress per-port/per-VLAN
Microflow policing	Microflow policers (full flow only)	Microflow policers (full flow only)	Microflow policers, including user-based rate limiting
DSCP transparency	No	No	Yes

Wiring Closet Supervisor Comparison

based on PFC Layer 3 Features¹

Cisco.com

Feature	Sup1a/PFC/MSFC2	Sup2/PFC2/MSFC2	Sup32/PFC3B/MSFC2a
Forwarding architecture	Flow-based IPv4, IPX	CEF-Based IPv4, IPX	CEF-based IPv4, IPv6
L3 ACLs	16 K ACEs for RACLs	32 K ACEs for RACLs	32 K ACEs for RACLs
RP DoS protection	None	4 Global	8x L3 Special Cases to RP, Control Plane Policing ²
MPLS	No	No	Yes ^{2,3}
VRF-Lite	No	No	Yes ^{2,3}
GRE	No	No	Yes ²
NAT/PAT	No	No	Yes ²
Bidirectional PIM	No	No	Yes ²

¹ Layer 3 functionality is dependent on hybrid IOS or native IOS software.

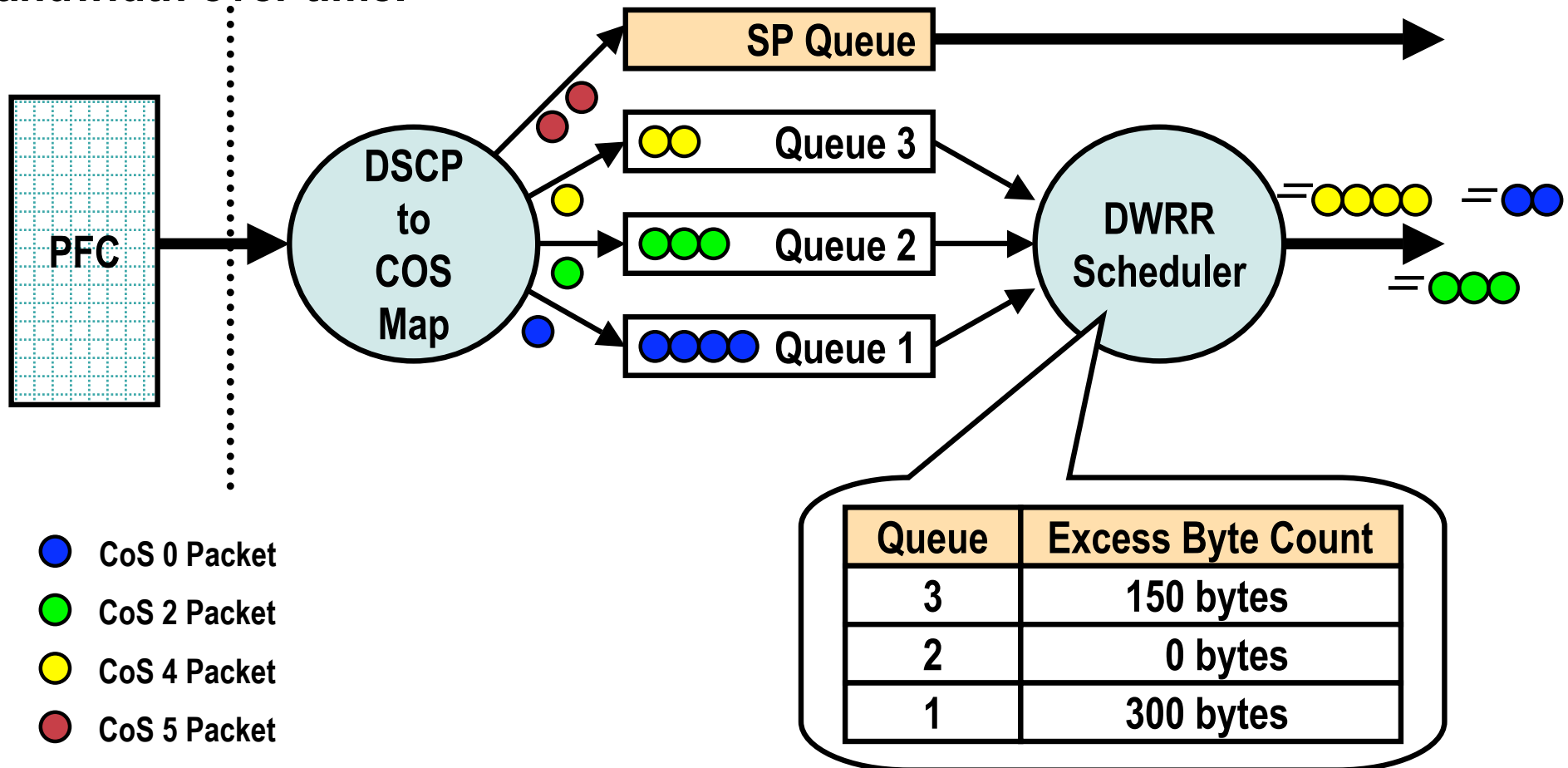
² Feature support is dependent on software version.

³ MPLS requires a specific IOS software license; this license is not necessary for VRF-Lite functionality.

Deficit Weighted Round Robin

Introduction to DWRR

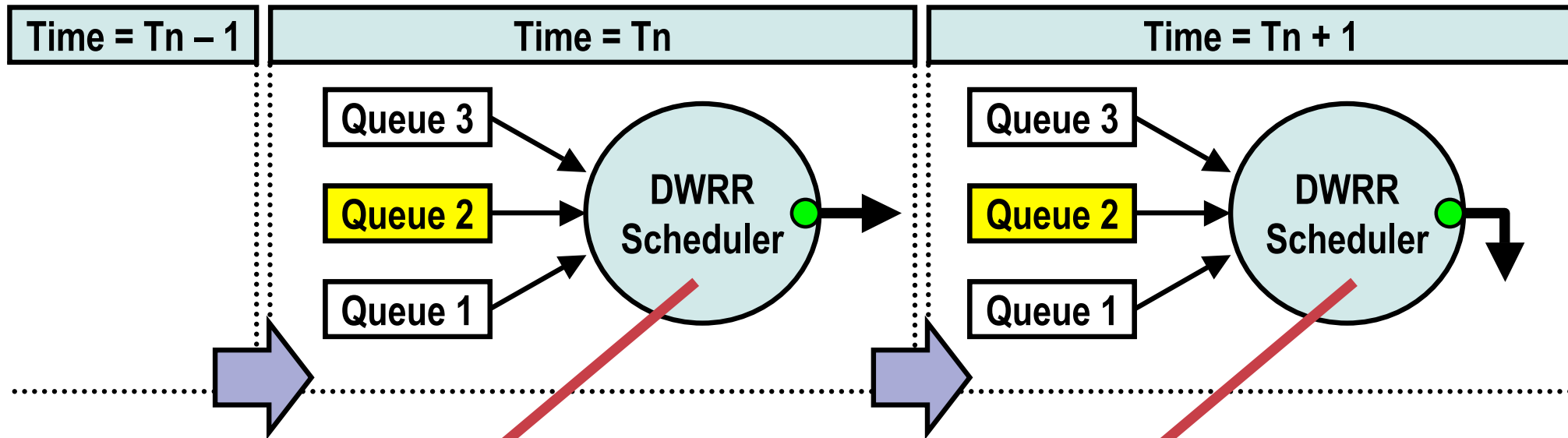
The Deficit Weighted Round Robin (DWRR) algorithm is used to schedule packets from the transmit queues. If a queue uses excess bandwidth, the DWRR algorithm keeps track of this excess usage and subtracts it from the queue's next transmission bandwidth allocation. This results in a fairer use of bandwidth over time.



- CoS 0 Packet
- CoS 2 Packet
- CoS 4 Packet
- CoS 5 Packet

Deficit Weighted Round Robin

DWRR Algorithm



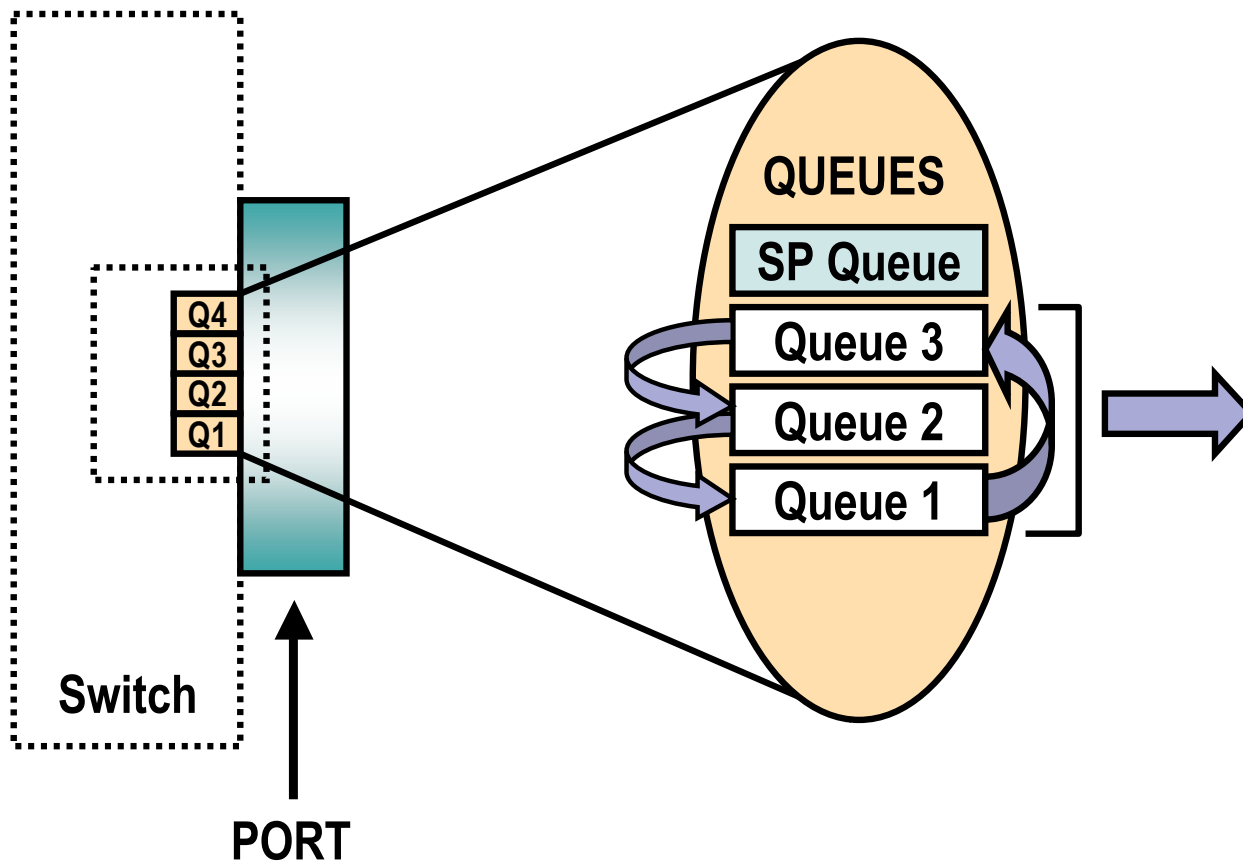
Total KB allocated	100,000
This packet size	512
KB used this cycle	99,999
Excess bytes last cycle	300
Bytes left	800
Action	Send packet

Total KB allocated	100,000
This packet size	512
KB used this cycle	99,999
Excess bytes last cycle	300
Bytes left	288
Action	Drop packet

Egress Shaping

Shaped Round Robin (SRR)

Sup32 introduces support for a new scheduling mechanism (SRR) to de-queue packets from an egress port queue. With SRR, each queue gets a “SHARE” – which translates into a fraction of the output time this queue can send data for.

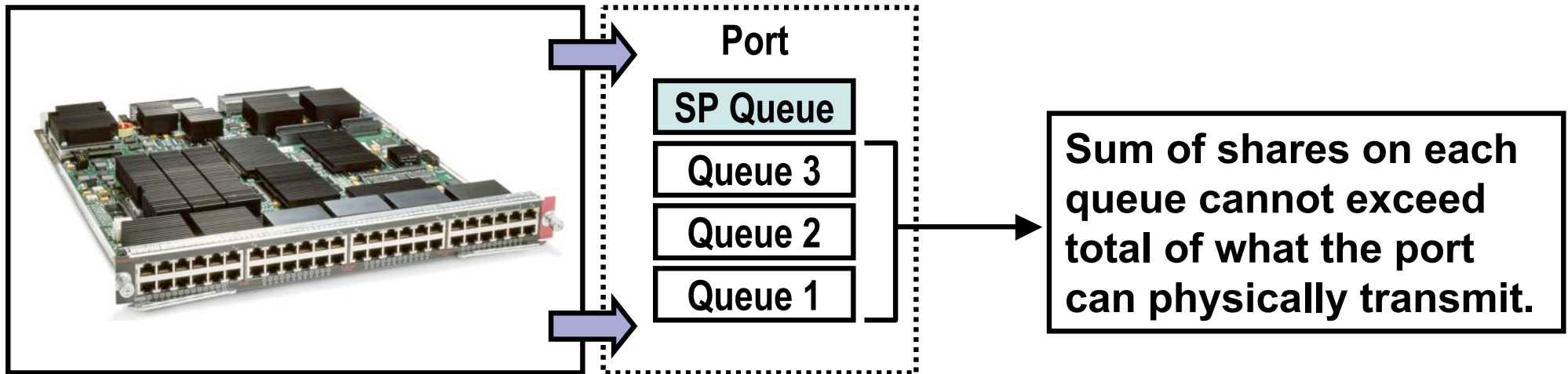


- Each port is configurable to support WRR or SRR.
- Shaped Round Robin (like WRR) can be used to de-queue packets from the non-strict priority queues.

Egress Shaping

Shaped Round Robin (SRR)

Each “share” per queue value is a 16-bit value. For a GE port, this translates into a rate of 16 Kbps to 1 Gbps for each queue. SRR is supported on **1p3q8t** queue structured ports only.



Configuration Command Example

```
Config> (enable) set qos wrr 1p3q8t 80 100 20 srr
```

QoS wrr and srr ratio is set successfully.
WRR/SRR absolute values are affected by hardware granularity.

Wiring Closet Modules



New Hardware

48 Port 10/100 Module

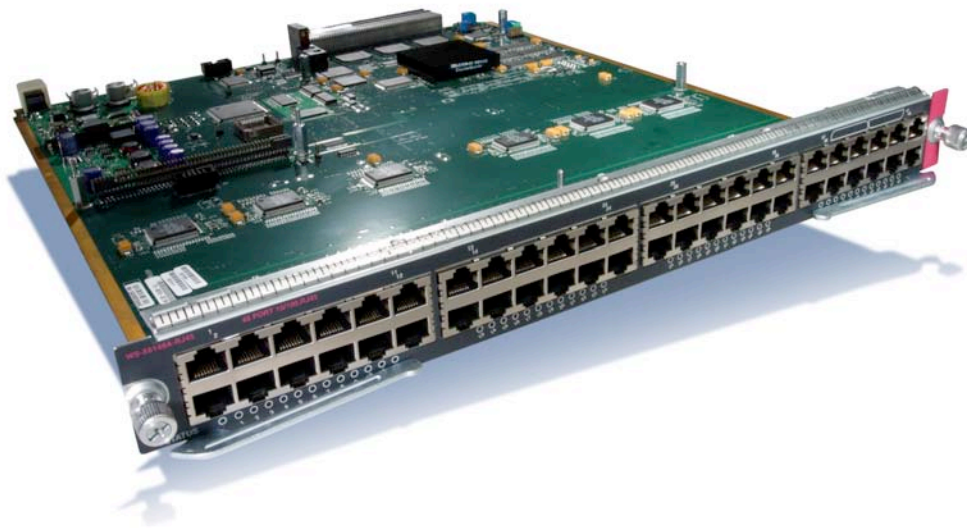
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WS-X6148A-RJ-45

- Classic line card
- 48-port 10/100 RJ-45
- 32 Gbps shared bus connection
- Integrated TDR troubleshooting tool
- Supports optional Cisco/IEEE PoE daughter card with full 15.4W/port
- 5.2 Mb buffering per port
- Transmit QoS includes 4 queues, including strict priority and WRED congestion avoidance

**Targeted for Cisco Catalyst OS 8.4
and IOS TBD**

WS-X6148A-RJ-45



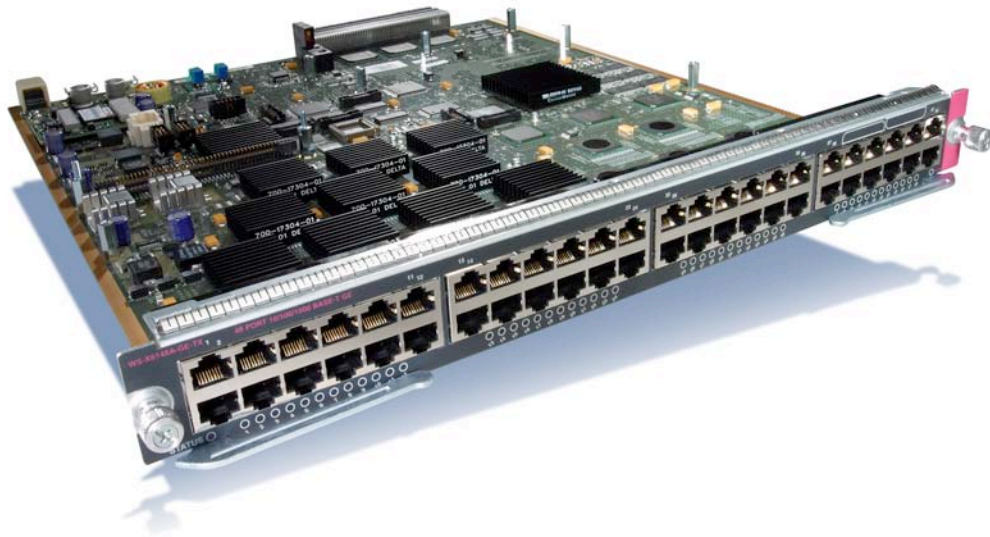
Classic 10/100 Line Card Comparison

Feature	WS-X6148-RJ-45 WS-X6148-45-AF	WS-X6148A-RJ-45 WS-X6148A-45-AF
IEEE + Cisco PoE support	Yes, via WS-F6K-FE-AF (full Class 3 on all 48 ports)	Yes, via WS-F6K-GE-AF (full Class 3 on all 48 ports)
TDR	No	Yes
QoS scheduler	Weighted Round Robin (WRR)	Deficit Weighted Round Robin (DWRR)
Transmit queue/buffer structure	2q2t/112 KB per port	1p3q8t/5.2 MB dedicated per port
Receive queue/buffer structure	1q4t/16 KB per port	1p1q4t/64 KB shared by 8 ports
Maximum frame size	9100 byte jumbo frames	9216 byte jumbo frames
Broadcast/multicast suppression	Yes	Yes
VLAN translation	Not supported	Yes
CoS mutation for Q-in-Q tunneling	Yes	Yes

New Hardware

Enhanced 48 Port 10/100/1000 Copper Module

Cisco.com



WS-X6148A-GE-TX

- Classic line card
- 48-port 10/100/1000 RJ-45
- 32 Gbps shared bus connection
- 5.2 Mb buffering per port
- Integrated TDR troubleshooting tool
- Supports optional Cisco/IEEE PoE daughter card with full 15.4W/port
- Transmit QoS includes 4 queues, including strict priority and WRED congestion avoidance
- Adds jumbo frame support, Q-in-Q tunneling, and many more features

WS-X6148A-GE-TX

Targeted for Cisco Catalyst OS 8.4 and IOS TBD

Classic 10/100/1000 Linecard Comparison

Cisco.com

Feature	WS-X6148-GE-TX	WS-X6148A-GE-TX
IEEE + Cisco PoE support	Yes, via WS-F6K-GE-AF (full Class 3 on all 48 ports)	Yes, via WS-F6K-GE-AF (full Class 3 on all 48 ports)
Time domain reflectometer	Integrated	Integrated
Backplane subscription (for 48 interfaces at 1 Gbps)	8:1	8:1
Transmit queue/buffer structure	1p2q2t/1.4 MB shared by 8 ports	1p3q8t/5.2 MB dedicated per port
Receive queue/buffer structure	1q2t per port/64 KB shared by 8 ports	1q2t/160 KB shared by 8 ports
Maximum frame size	1518 bytes	9216 byte jumbo frames
Broadcast/multicast suppression	No	No
VLAN translation	Not supported in hardware	Supported
Q-in-Q tunneling / CoS mutation	Not supported in hardware	Not supported at FCS, but hardware is capable
Ethernet tagging	802.1q	802.1q/ISL

 = Change from earlier version

New Hardware

96 Port 10/100 Module

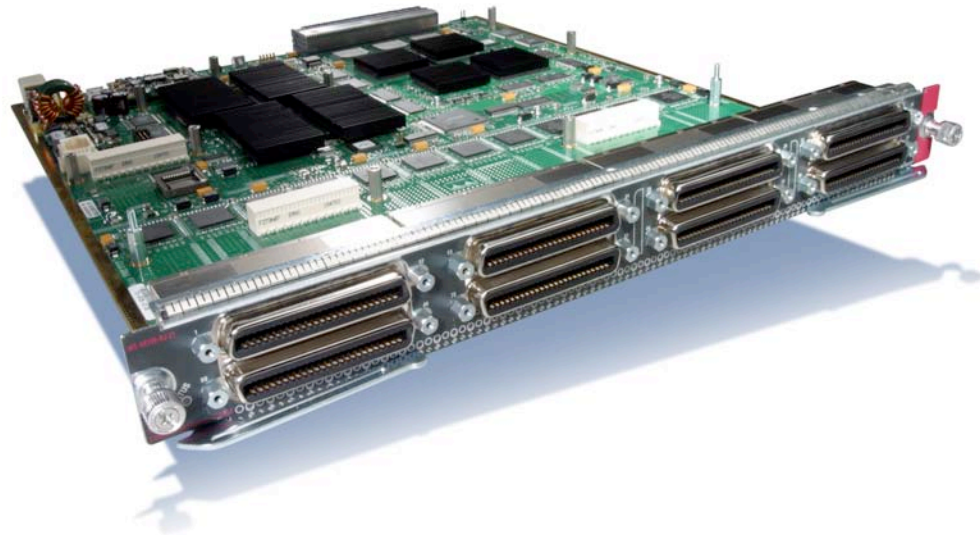
Cisco.com

WS-X6196-RJ-21

- Classic line card
- 96-port 10/100 RJ-21
- Uses standard RJ-21 interface cable
- 32 Gbps shared bus connection
- Supports optional Cisco/IEEE PoE daughter card with up to 960 W of PoE
- 1.2 Mb buffering per port
- Transmit QoS includes 4 queues, including strict priority and WRED congestion avoidance

Targeted for Cisco Catalyst OS 8.4 and IOS TBD

WS-X6196-RJ-21



96 Port 10/100 Line Card Comparison

Feature	WS-X6148X2-RJ45 WS-X6148X2-45AF	WS-X6196-RJ-21 WS-X6196-45-AF
Interface type	RJ-45	RJ-21
External patch panel	Yes, WS-F6K-48X2-SPLTR	No
IEEE + Cisco PoE support	Yes, via WS-F6K-FE48X2-AF (up to 960 W of PoE)	Yes, via WS-F6K-FE48X2-AF (up to 960 W of PoE)
TDR	No	No
QoS scheduler	Deficit Weighted Round Robin (DWRR)	Deficit Weighted Round Robin (DWRR)
Transmit queue/buffer structure	1p3q1t/1.1 MB per port	1p3q1t/1.1 MB per port
Receive queue/buffer structure	1p1q0t/28 KB per port	1p1q0t/28 KB per port
Maximum frame size	9216 byte jumbo frames	9216 byte jumbo frames
Broadcast/multicast suppression	Yes	Yes

Catalyst 6500 Series

Calculating PoE Capacity

To help aid in the configuration and sizing of PoE on Catalyst switches, Cisco has built an **online Power Calculator**. This tool, available on CCO, allows customers and partners to input their specific configurations. The tool then recommends the power supply and total number of PDs that each configuration can support.

www.cisco.com/go/powercalculator

New Hardware

48 Port 100 SFP Module

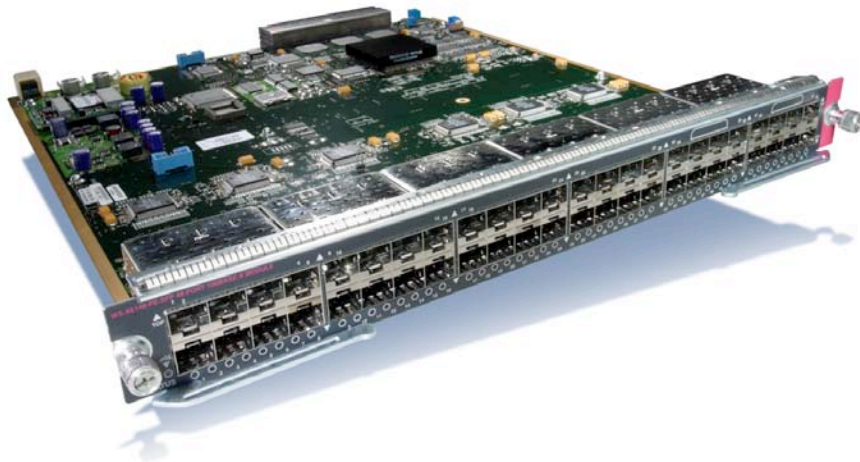
Cisco.com

WS-X6148-FE-SFP

- Classic line card
- 48-port 100 SFP
- 32 Gbps shared bus connection
- 5.2 Mb buffering per port
- Transmit QoS includes 4 queues, including strict priority and WRED congestion avoidance
- Designed for high-density “fiber-to-the-X” applications

**Targeted for Cisco Catalyst OS 8.4
and IOS TBD**

WS-X6148-FE-SFP



100FX Line Card Comparison

Feature	WS-X6324-100FX-SM WS-X6324-100FX-MM	WS-X6524-100FX-MM	WS-X6148-FE-SFP
Switch fabric connection	32 Gbps shared bus	32 Gbps shared bus or 256 Gbps crossbar fabric (8 Gbps fabric channel)	32 Gbps shared bus
Optics	Fixed	Fixed	Modular (SFP)
QoS scheduler	Weighted Round Robin (WRR)	Deficit Weighted Round Robin (DWRR)	DWRR
Transmit queue/ buffer structure	2q2t/112 KB per port	1p3q1t/1.1 MB per port	1p3q8t/5.2 MB dedicated per port
Receive queue/ buffer structure	1p4t/16 KB per port	1p1q0t/28 KB per port	1p1q4t/64 KB shared by 8 ports
Maximum Frame Size	9216 byte jumbo frames	9216 byte jumbo frames	9216 byte jumbo frames
Broadcast/multicast suppression	Yes	Yes	Yes
VLAN translation	Not supported	32 translations	??
Q-in-Q tunneling/ CoS mutation	Yes	Yes	Yes

WS-X6148-FE-SFP Features

Small Form Factor Pluggable (SFPs)



SFP Support

- **GLC-FE-100FX**
100BASE-FX (MMF)
- **GLC-FE-100LX**
100BASE-LX
FX SMF – 10 km
- **GLC-FE-100BX-D**
100BASE-BX10-D
single-strand SMF – 10 km
- **GLC-FE-100BX-U**
100BASE-BX10-U
single-strand SMF – 10 km

100FX is targeted for Cisco Catalyst OS 8.4; the other SFPs are planned for a future software release.

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