

AT-9800 (Claymore) Switch

- AT-9800 is a family of Layer 4+ Gigabit Switches offered in two configurations
- Part Numbers
 - AT-9816GB – 16 bay GBIC
 - AT-9812T - 12 port 10/100/1000T + 4 GBIC bays



AT-9800 Value Proposition

Powerhouse of a product in a small package

- Get the features typical found only in larger & more expensive chassis systems
 - Switching, QoS, Multicast all at wirespeed
 - Advanced hardware based QOS and Layer 4 packet classification
 - 4096 Protocol, Subnet, Port and MAC based VLANs
- Highly flexible for a 'fixed' system
 - Hot-swappable GBICs offer all varieties of fiber choices
 - Upgradeable RAM, Forwarding Data Base, & Flash memories
 - AC or DC versions, RPS available

AT-9800 Product Features - Solutions for Aggregation Applications



Layer 3 IP and IPX switching in hardware
Extensive QoS and filtering at wirespeed
Extremely low latency

High performance **350MHz CPU**
64Mbyte packet buffer to handle traffic bursts

Up to 256MB RAM (128MB fixed)
16MB FLASH, and CompactFlash support
Plug in line CAM for up to 232K address entries

32Gbps switch fabric for
non-blocking, wirespeed packet forwarding

8 hardware queues per port

1.5U

Auto-ranging 100-120/200-240VAC
or -48VDC PSU w/external RPS option



AT-9800 Series

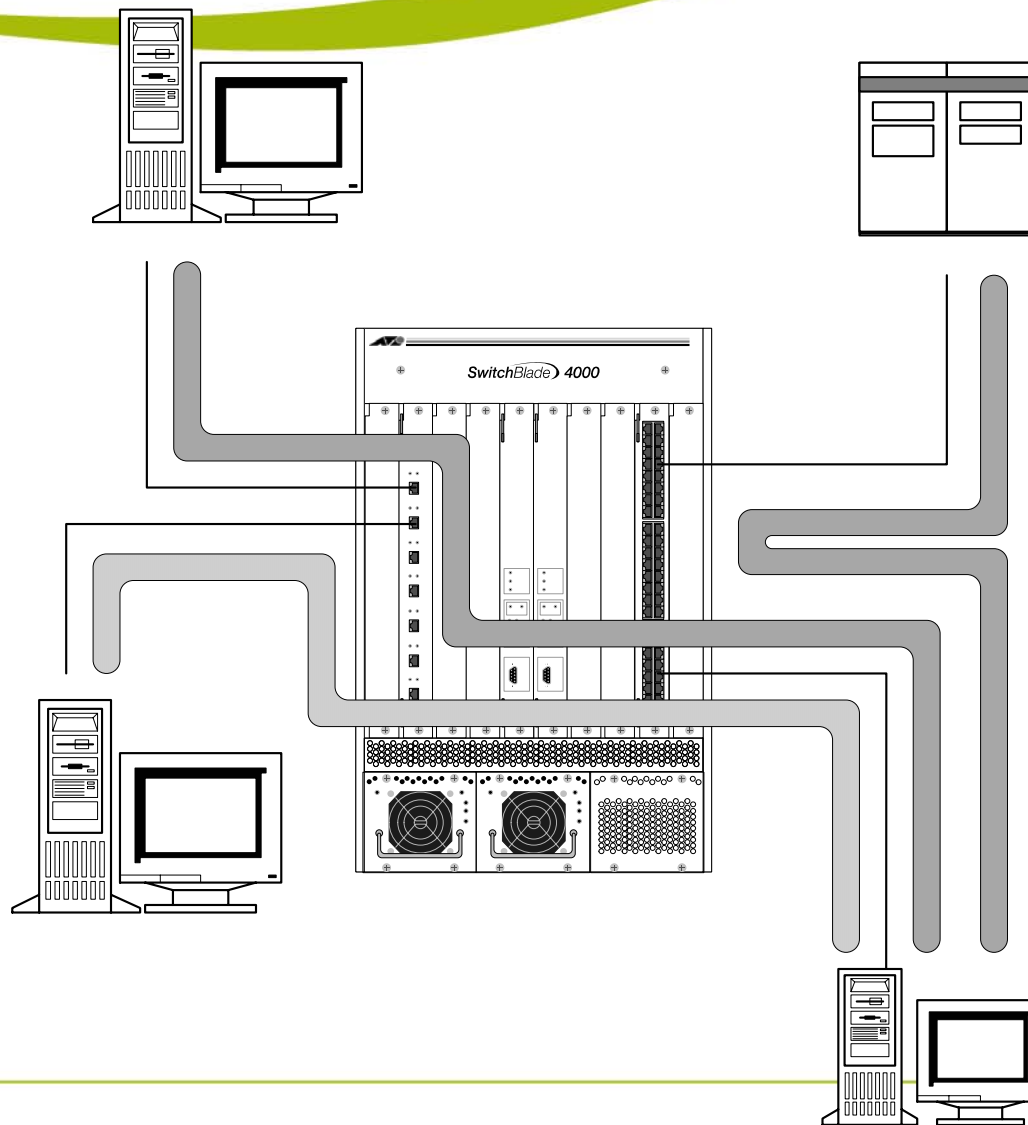
- Non-blocking, wire-speed Layer 2 and Layer 3 IP / IPX on all ports regardless of packet size
- Powerful, wire-speed Quality of Service mechanism allows highly programmable Service Level Agreements
 - VLAN tagging with 4096 Protocol, Subnet, Port, & MAC based VLANs
 - Traffic Classification based on physical layer to Layer 4+ packet characteristics
 - 128 Traffic Classes, 2048 Flows
 - DiffServ
 - RSVP
- Extensive suite of Layer 2 and Layer 3 features including
 - IP, IPX and Appletalk
 - static routing, RIP/RIPv2, OSPF, VRRP with optional BGP-4, IS-IS
 - Multicast protocols (IGMP, IGMP Snooping, DVMRP, PIM-SM, PIM-DM)
- Jumbo frame support to 32k byte frames on both Gig and 10/100T ports
- Includes an robust set of features allowing simple configuration and control without compromising flexibility
- Excellent GUI

Ideal for enterprise mid-tier aggregation, multiple tenant unit aggregation, metro area or campus networks, and server farms

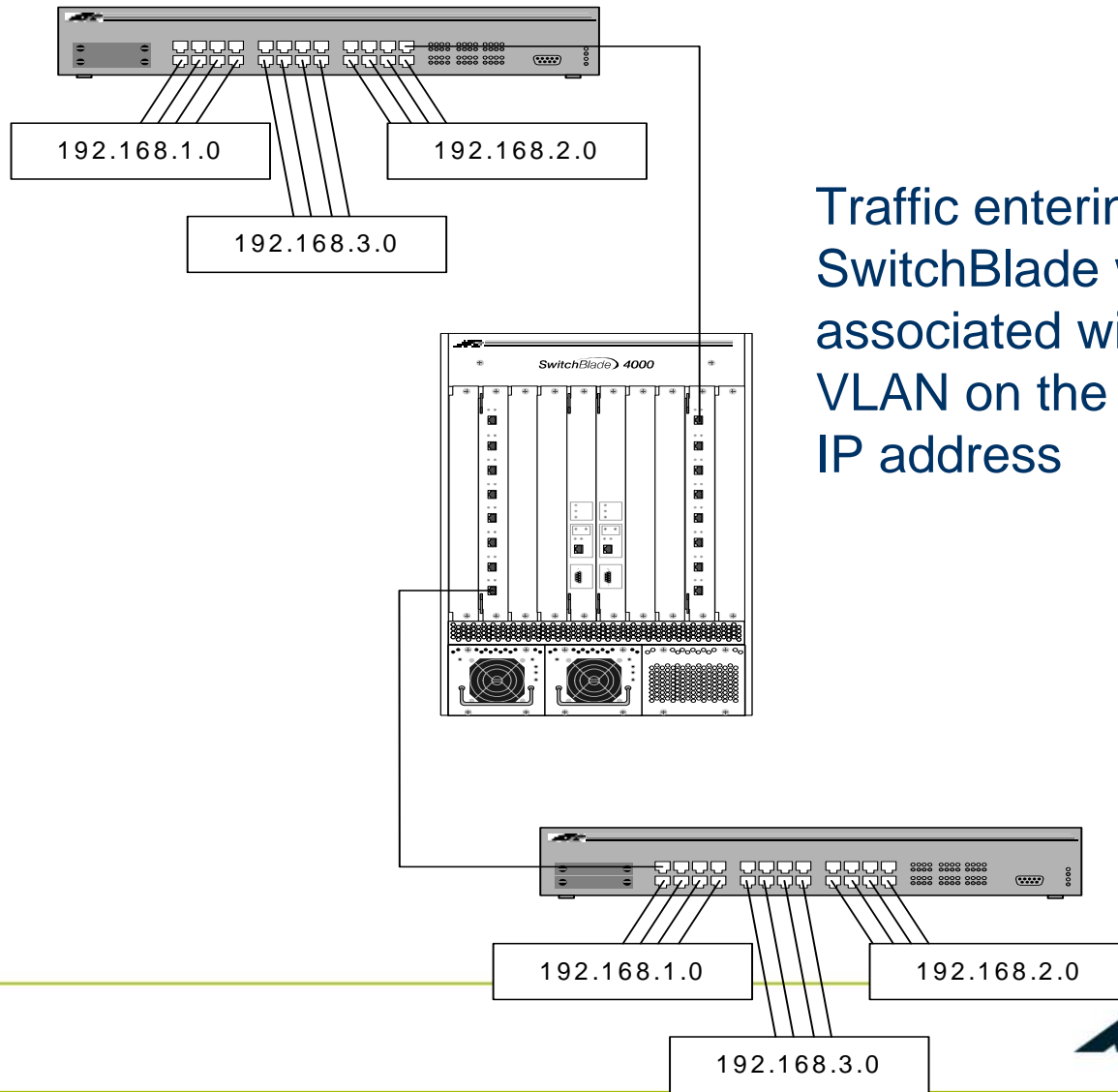
Applications

- Campus Aggregation
 - Highly reliable feature rich design suitable for key points in the network
 - Used to switch traffic between buildings
 - Use QoS features to limit bandwidth to WAN
- Server Aggregation
 - Gigabit switching between servers
 - Link Aggregation to the network
- LAN Aggregation
 - Terminate Gigabit uplinks from workgroup access Layer 2 switches
 - Link Aggregation to the network

Protocol Based VLANs



Subnet Based VLANs



Traffic entering the SwitchBlade will be associated with appropriate VLAN on the basis of source IP address

Layer 2 Features

Feature

Benefit

- Large CAM Forwarding Data Base
 - Rapid Spanning Tree (802.1w)
 - Link Aggregation (802.3ad, static) (flexible – from 1 port per group / 16 groups to 16 port per group / 1 group)
 - MAC address locking
 - Plus all the standard protocol support
 - Spanning Tree (802.1D)
 - Full Auto-negotiation (802.3u)
 - Flow Control (802.3x)
- enabling wirespeed switching in networks of 200,000+ nodes
 - Provide resiliency with <1 sec fail over of redundant links
 - Support application back-up
 - Flexibility in creating larger & redundant links
 - Physical Port Security

Layer 3

Feature

- Hardware based IP / IPX switching
- RIP1/2, OSPF, static routing
- Hardware based Multicasting & snooping
- Extensive filtering
- AppleTalk support
- VRRP

Benefit

- Wire speed switching of the most common protocols
- Full set of basic routing protocols
- Wire speed switching of multicast traffic using DVMRP, PIM-DM PIM-SM
- Create ACLs
- Able to route AppleTalk through the CPU
- Enables routing back-up for resilient operations

QoS

Feature

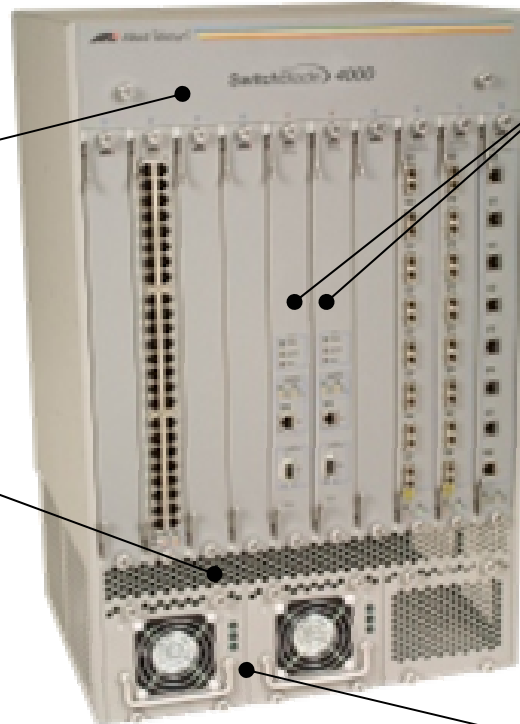
- Policy based QoS
- Hardware based Traffic Classification based on Layer 2, 3, 4+ information
- 8 queues per port
- Two independent traffic schedulers
- DiffServ
- RSVP

Benefit

- Min/Max Bandwidth Limits and Guarantees (64kbps increments)
- Wire speed packet inspection enabling a large number of differing SLAs (128 traffic classes)
- Enables greater granularity in priority control – matches 802.1p standard
- Allows bandwidth control to be set independently from latency control
- Enables traffic prioritization
- Enables end to end bandwidth reservation across a network

AT-SB4100 (SwitchBlade)

Passive Back plane



2 Bays for Switch Controller

500 Mhz CPU
32 Mbytes Flash
SDRAM up to 256 Mbytes
512 Kbytes NV SRAM

8 Bays for Line Cards

15U 19 inch rack mount
(9U for 4 slot Chassis)
Front, middle or rear mounting

3PSU, N+1 Redundancy
AC or DC Power

Fan tray replaceable
without traffic disruption

Front to Back Airflow

Hot Swap all
Cards & Modules

128Gbps switch fabric for non-blocking,
wirespeed packet forwarding

Expandable MAC address memory of up to 232k entries

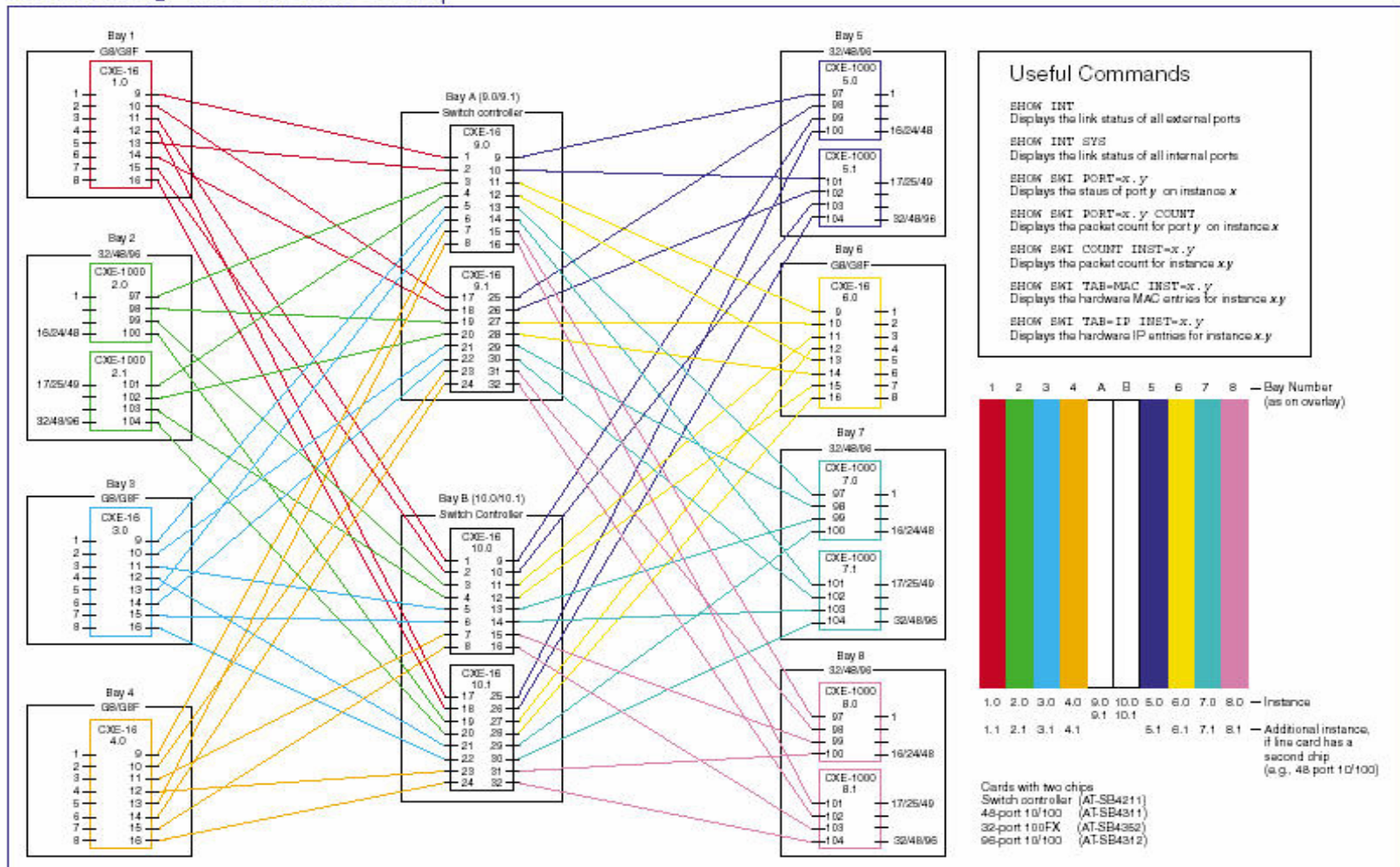
SwitchBlade Chassis Versions



	Height	PSU	Switch Controller	10/100TX Max Port	100FX Max Port	1000X Max Port	1000 Max GBIC Port	1000T Max Port
8 slot	15U	2+1 RPS	<u>Switch Ctrl</u> only	384 RJ45 768 RJ21	256 MTRJ	64 (SX / LX) SC / MTRJ	64 (SX, LX, LX25, LX40, LX70)	64 (RJ45)
4 slot	9U	1+1 RPS	<u>Switch Ctrl</u> <u>BW Expander</u>	192 RJ45 384 RJ21	128 MTRJ	32 (SX / LX) SC / MTRJ	32 40 w/BW Expander (SX, LX, LX25, LX40, LX70)	32 (RJ45)

Internal Port Map

SwitchBlade 4000 Internal Port Map



Switch Controllers - AT-SB4211

- **Processing Core:**

- 500MHz IBM 750L PowerPC
- SDRAM – 2 x 128MBytes DIMM168 ECC - 256MBytes
- 32MBytes Flash
- 512KBytes of Non Volatile SRAM (NVRAM).
- 64 bit 50MHz PCI bus.
- 32 bit 33MHz PCI bus.

- **Switching Core:**

- Two Switchcore CXE-16 chips
- 104 k-entry forwarding address database (expandable to 232 k-entries with SwitchCAMs)
- 128 MByte RAMBUS packet buffer

Line Cards

- There are 8 line card bays which can host
 - AT-SB4311 – 48 Fast Ethernet ports
 - AT-SB4352 – 32 Fast Ethernet fibre ports
 - AT-SB4411 – 8 Gigabit Ethernet ports
 - AT-SB4451 – 8-port SX (SC)
 - AT-SB4461 – 8-Port LX (SC)
 - AT-SB4452 – 8-port SX (MT-RJ)
 - AT-SB4462 – 8-Port LX (MT-RJ)
 - AT-SB4441 – 8 GBIC slots

New 24 port Gigabit Card

- The SB4412 is a linecard for 4 and 8 slot SwitchBlade chassis based switches
- The SB4412 provides 24 * 1 Gigabit ports
- Ports can run in 10/100/1000T Half or Full Duplex



New 24 port Gigabit Card Architecture

- The SB4412 24 port Gigabit card uses two Switchcore CXE16 switch chips providing 16 gigabit ports each
- Each CXE 16 is divided into
 - 12 External ports
 - 4 Internal ports
 - The card will be non blocking for all traffic destined for a port on the same switch chip instance -Highly used connections should be connected in the same switch chip instance

Software Bundles

Standard Features

- Layer 2
 - 802.1Q, 802.1p 4096 VLANs
 - Port security
 - 802.3ad Link Aggregation
 - GVRP
 - Spanning Tree 802.1D and Rapid Spanning Tree 802.1w (Q2)
- Routing
 - IP and IPX & AppleTalk routing (in software)
 - RIP, RIPv2, OSPF
- Multicast
 - ICMP, IGMP & IGMP Snooping
 - DVMRP, PIM-SM, PIM-DM
- Services
 - RADIUS, TACACS
 - BootP, DHCP Client/Server/Relay

Advanced Feature

- RSVP
- BGP4
- VRRP
- IS-IS
- IPv6

Layer 2 Features

Feature

- Large CAM Forwarding Data Base
- Rapid Spanning Tree (802.1w)
- Jumbo Frames
- Link Aggregation (802.3ad) (number of trunks and ports per trunk dependent on system)
- MAC address locking

- Plus all the standard protocol support
 - Spanning Tree (802.1D)
 - Full Auto-negotiation (802.3u)
 - Flow Control (802.3x)

Benefit

- enabling wirespeed switching in networks of 200,000+ nodes
- Provide resiliency with <1 sec fail over of redundant links
- Support application back-up
- Flexibility in creating larger & redundant links

- Physical Port Security

Layer 3 Features

- Multi-protocol Routing Support
 - Wire-speed, silicon-based IP and IPX routing
 - AppleTalk routing (in software)
 - Routing RIP, RIPv2, OSPF, static routing
 - IPX Routing IPX RIP, IPX SAP, address ageing
- Multicast
 - ICMP, IGMP & IGMP Snooping
 - DVMRP, PIM-SM, PIM-DM
- DHCP

VLAN Types



- Port Based
- MAC Address Based
- Limited Protocol Based
- Protocol Based
- Subnet Based

You can use these types in two combination:

IP SUBNET, PROTOCOL, PORT

MAC ADDRESS, LIM. PROTOCOL, PORT

For example: combining IP SUBNET and MAC Address based VLANs is NOT possible
Limitation for the whole device

Classifiers

- Layer 2

- Ethernet Format (802.2, ETHII, SNAP, ...)
- MACTYPE (M'cast, B'cast, Unicast)
- Source/Destination VLAN
- Just Rapier and Rapier "i" can classify source and destination MAC address

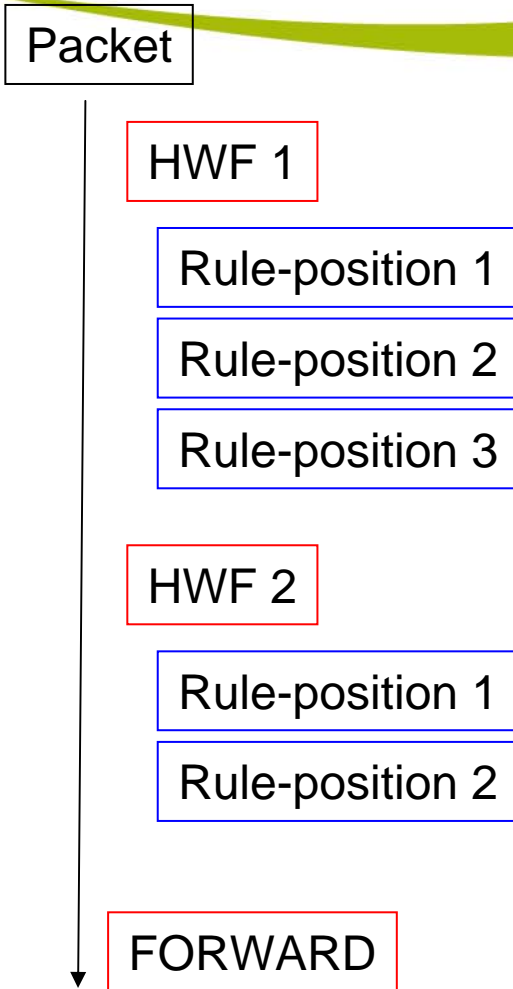
- Layer 3

- Protocol
- IP Source/Destination Address
- IP Protocol (TCP, UDP, ICMP, ...)
- IP DSCP/TOS
- IPX Destination Address

- Layer 4

- TCP / UDP Source Port
- TCP / UDP Destination Port
- IPX Source Socket
- IPX Destination Socket

HWF Diagram



- HW filters and rules are matched in a linear order:
 - Low numbers have precedence over high ones
 - At the first matching the correspondent action is executed
- If none is matched that packet is **FORWARDED**

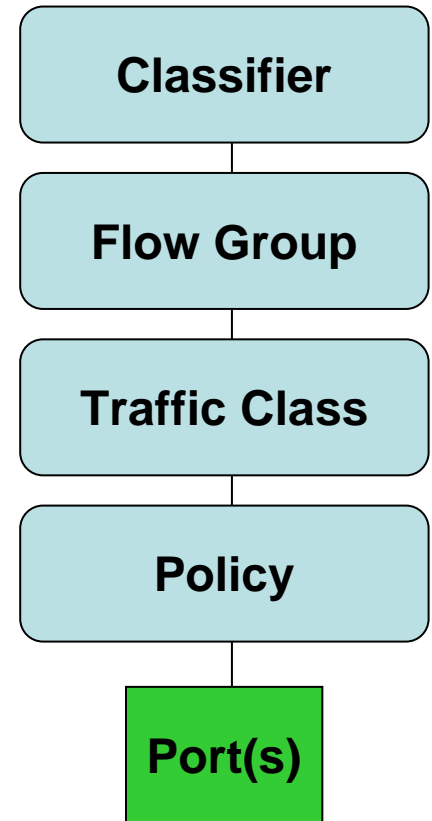
QoS model example

- This example is a policy to apply QoS traffic from servers to clients
- Classifiers match traffic flows based upon different criteria:
 - Source IP, source ports, IP protocols, ...
- Each Flow group contains different classifiers matching the same kind of traffic:
 - FTP, HTTP, VoIP, etc.
- Each Traffic Class groups Flow Groups with different services, but same necessities
- Using this structure you can set different RED, DSCP/TOS, priorities for different Flow Groups, but limit their bandwidth with the same values
- For example VoIP is in its own Traffic Class, because it needs different settings from FTP, WEB, etc.
- VoIP traffic has its own traffic class and bandwidth limit.

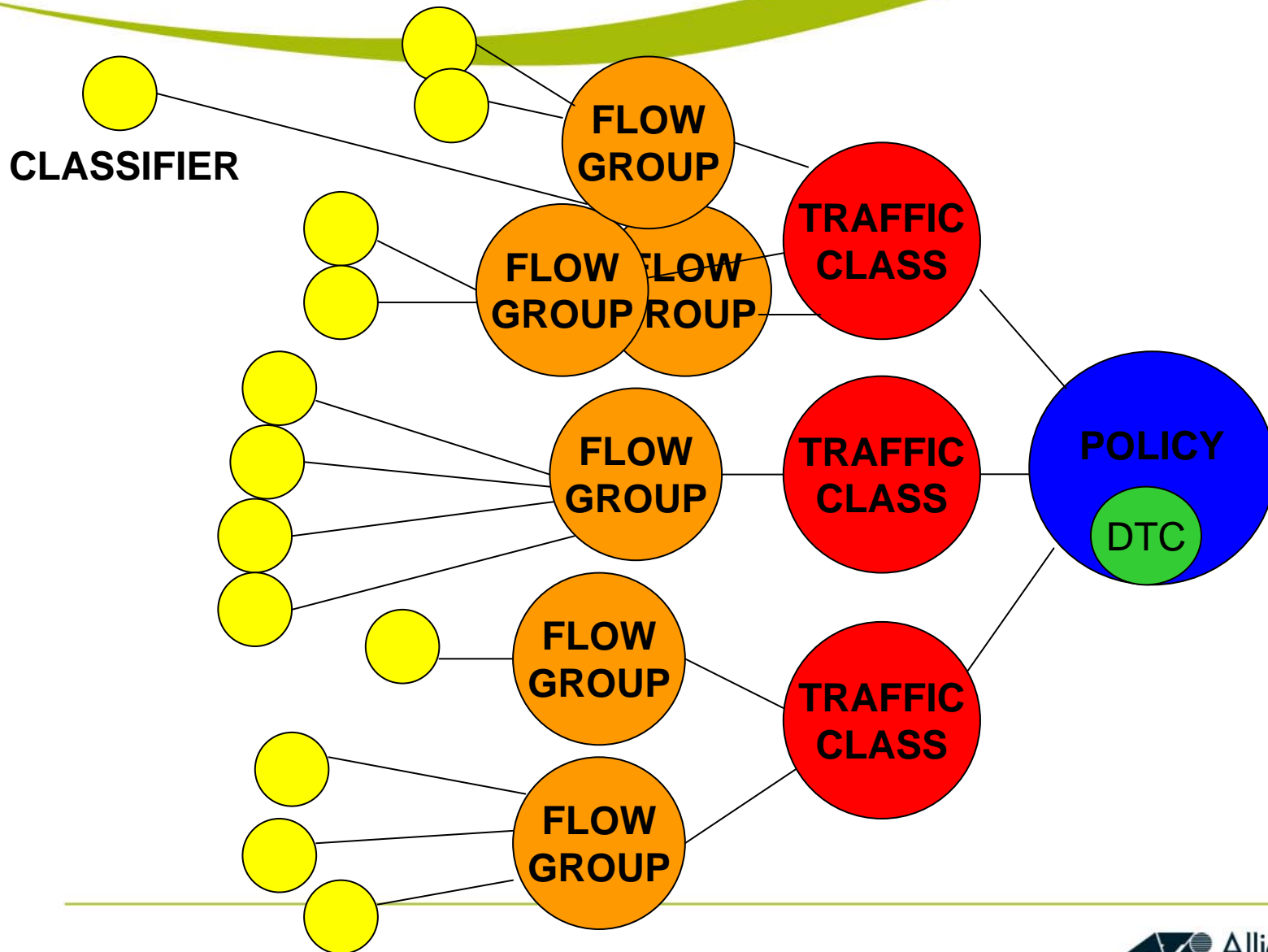
- The traffic that is not matched by any of the Traffic Classes, receives a guaranteed bandwidth by DTC (DTCPercentage value of the policy)

QoS Diagram

- These are the “entities” that must be configured to create a QoS configuration. They’re used to:
- Classifier to match traffic
- Flow Group to group many traffic types (classifiers) and set DSCP/TOS and/or select a priority value
- Traffic class to group flow groups and set many parameters (bandwidth, DSCP/TOS, etc.)
- A policy is the widest group. It groups many traffic classes and a traffic class that bounds non-matched traffic: Default Traffic Class (DTC)



QoS model



QoS model example

