CENTILLION 50, CENTILLION 100, AND SYSTEM 5000BH SWITCHES

CENTILLION LAN-ATM SWITCHING

The Centillion™ 50, Centillion 100 and System 5000™ BH LAN-ATM switches from Bay Networks combine frame- and cell-based technologies to offer Ethernet, Token Ring and ATM switching on a single platform.

Unparalleled LAN-ATM Integration

Total Availability

Intranet Application Intelligence

Plug and Play ATM

Unparalleled Manageability

Comprehensive Investment Protection

Year 2000 Compliant

Bay Networks *Where Information Flows.™*

Unmatched levels of flexibility and integration enable the Centillion LAN-ATM switches to maximize the life of installed LANs while leveraging the scalability, mission-critical performance, and rich application intelligence of ATM.

The multigigabit capacities of the Centillion LAN-ATM switches boost the performance of LAN backbones, increasing bandwidth to routers, servers, and power desktops, and ensuring infrastructure availability for mission-critical applications. Centillion LAN-ATM switches also feature comprehensive IP intelligence to scale the performance and reliability of corporate Intranet applications.

Each Centillion switch can be configured with the precise combination of Ethernet, Token Ring, and ATM switching modules necessary to fit the specific requirements of any location throughout the enterprise network. The Centillion switching modules provide a comprehensive set of LAN and ATM media interfaces, and leverage a common, feature-rich software platform to guarantee flexibility and manageability.

CENTILLION 50

Designed for deployment in workgroups, low-density wiring closets, and small network centers, the Centillion 50 chassis supports up to three switch modules (see Figure 1). Several preconfigured switching systems are also available, providing Ethernet-ATM, Token Ring-ATM, and pure Token Ring solutions. Identical switching modules can be installed in either the Centillion 50 and Centillion 100 platforms. The Centillion 50 provides support for up to three 622 Mbps OC-12c or 12 155 Mbps OC-3c ATM ports, up to 48 switched Ethernet ports, and up to 40 switched 4/16/32 Mbps Token Ring ports. DS3 and E3 ATM connectivity is also available.

CENTILLION 100

Designed for use in higher-density wiring closets and small- to medium-sized network centers, the Centillion 100 chassis supports up to six switch modules and is preconfigured with two power supplies to maximize mission-critical availability (see Figure 1). The Centillion 100 provides support for up to six 622 Mbps OC-12c or 24 155 Mbps OC-3c ATM ports, up to 120 switched Ethernet ports, and up to 88 switched 4/16/32 Mbps Token Ring ports. DS3 and E3 ATM connectivity is also available.

SYSTEM 5000BH

The Bay Networks System 5000 platform delivers the industry's leading high-performance, ultra-high density modular chassis-based solution. Along with Centillion switched LAN-ATM capabilities, the System 5000 chassis provides support for shared Ethernet, Token Ring, and FDDI media, comprehensive remote access services, and frame-based Ethernet and Token Ring routing. System 5000BH chassis provide ATM virtual network routing, MultiProtocol over ATM (MPOA) Server facilities, and ATM wide area services via BayRS software running on multiple Model 5782 Centillion Multiprotocol Engine modules. DS3 and E3 connectivity is also available for all System 5000BH platforms.

Figure 1: Centillion LAN-ATM Solutions.

Centillion 50 LAN-ATM Switch.

System 5000BH LAN-ATM Switch.

Centillion 100 LAN-ATM Switch.

System 5005BH LAN-ATM Switch.

The Centillion-enabled System 5000BH is available in two form factors:

- The 14-slot System 5000BH LAN-ATM switch is designed for deployment in ultra-high density wiring closets and medium- to large- network centers (see Figure 1). An additional Fast Ethernet backplane can be added to the chassis to support various non-Centillion System 5000 modules, creating a configuration known as the System 5000BHC. Both chassis configurations support up to twelve 622 Mbps OC-12c or 48 155 Mbps OC-3c ATM ports, up to 240 switched, autosensing 10/100 Ethernet ports, and up to 240 switched 4/16/32 Mbps Token Ring ports.
- The eight-slot System 5005BH LAN-ATM platform delivers similar functionality for lower-density environments (see Figure 1), and supports up to six 622 Mbps OC-12c or 24 155 Mbps OC-3c ATM ports, up to 120 switched, autosensing 10/100 Ethernet ports, and up to 120 switched 4/16/32 Mbps Token Ring ports.

Powerful, feature-rich switching modules complete the Centillion LAN-ATM solution. ATMSpeed,™ EtherSpeed,™ and TokenSpeed™ modules are available in a variety of flexible configurations, providing support for all commonly used physical media. All Centillion switching modules feature powerful on-board processing and full local switching, guaranteeing consistently high performance in the densest chassis configurations. Centillion LAN-ATM switches require at least one Master Control Processor (MCP) module running Centillion Switching Software for system activation. All MCP modules deliver full switching functionality to preserve the utility of every chassis slot.

Centillion switches operate in any standards-based networking environment, and feature advanced ATM Forum LAN Emulation (LANE), Quality of Service (QoS), Interim Interswitch Signaling Protocol (IISP), Private Network-Network Interface (PNNI) and MPOA implementations. When combined with Bay Networks Centillion 1000 ATM multiservice switches, BN® (Backbone Node) routers, Bay Networks Multimedia networking solutions, and MX ATM WAN Access platforms, the Centillion LAN-ATM switches contribute to the industry's most complete ATM enterprise networking solution.

BENEFITS

Unparalleled LAN-ATM Integration

Adding the powerful capabilities of Centillion solutions to existing Ethernet and Token Ring LANs dramatically enhances network performance. The distributed switching capabilities and interface density of EtherSpeed and TokenSpeed modules, combined with the powerful and proven Centillion LAN-ATM switching fabric, eliminate the design constraints and data bottlenecks typical of legacy networking systems.

Centillion LAN-ATM switching delivers the industry's most comprehensive LAN Emulation implementation. Centillion LANE provides straightforward and highly interoperable connectivity of LAN-attached desktops, file servers, and routers into high-performance ATM networks. Ethernet and Token Ring LANE clients and fault-tolerant cooperating LANE services are supported with minimal management intervention. If LANE services or an

MCP module should fail, the affected LECS, LES, and BUS are seamlessly redirected to an alternative active MCP to ensure ongoing network availability. Important enhancements to these capabilities, including ATM Forum LANE 2.0, User Network Interface (UNI) 4.0, and MPOA client (MPC) services will be available in the near future.

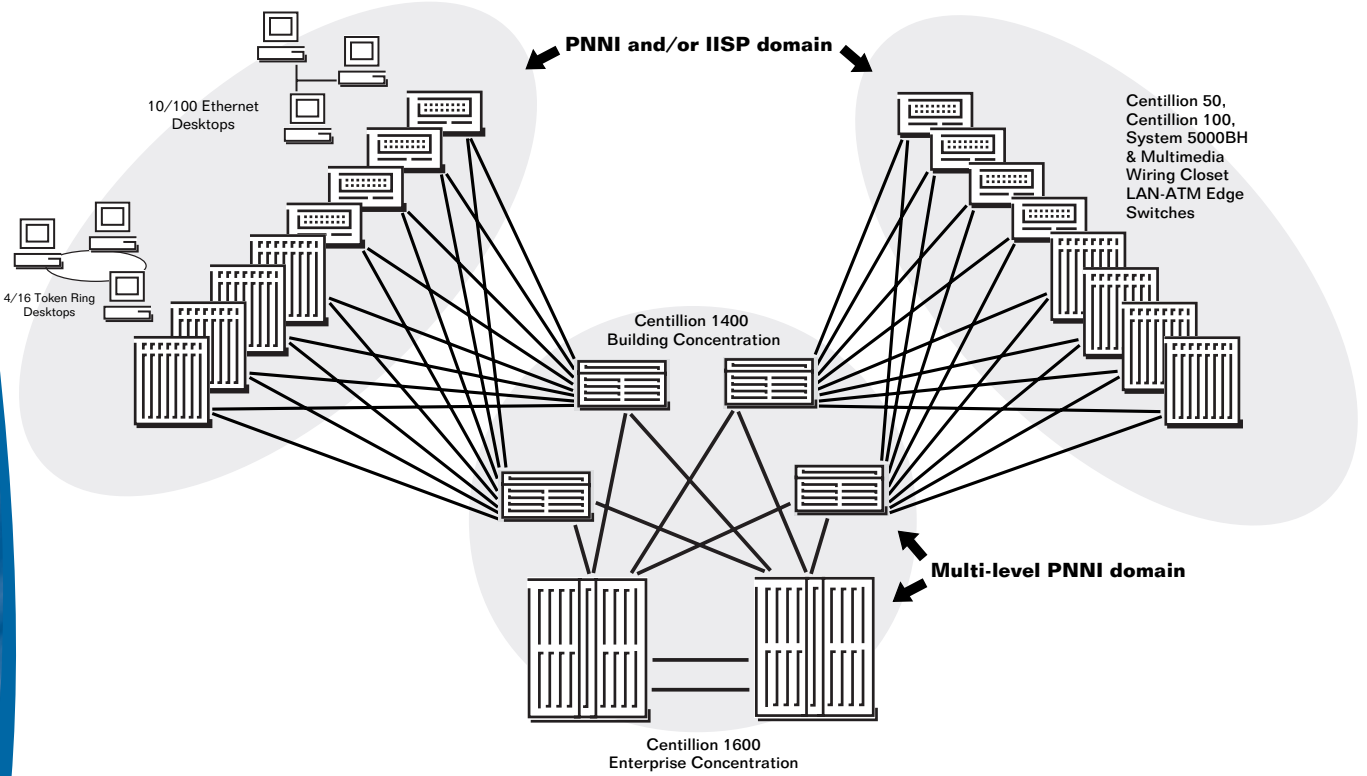
The Centillion LAN-ATM family leads the industry in Token Ring-to-Ethernet migration. The capability to flexibly deploy Ethernet and Token Ring connectivity in a unified chassis, and achieve full interoperation of these disparate infrastructures using industry standards is a unique and key benefit of all Centillion solutions.

Total Availability

Networks constructed with Bay Networks Centillion solutions deliver interconnected, highly redundant physical topologies featuring multi-homed, active load-sharing riser links between wiring closet and network center switches. Link and switch failures are rapidly detected, enabling mission-critical traffic to be instantly rerouted through IISP static routes, or via the PNNI dynamic topology protocol onto alternate paths. This capability sets Centillion LAN-ATM solutions apart from third-party products that interconnect only via limited intelligence UNI interfaces.

The Centillion architecture enables PNNI to be implemented from the edge to the core of the network—a capability offered only by Bay Networks—delivering vastly improved end-to-end network availability and application intelligence (see Figure 2). For additional system stability, Centillion switches provide fast failover, cooperating LANE services to guarantee LAN Emulation Client (LEC) connectivity and performance. Centillion Switching Software also boosts overall system availability by supporting dual, fully redundant ATMSpeed MCP modules. All ports on the secondary ATMSpeed MCP provide full switching functionality, preserving the utility of all chassis slots.

Figure 2: Centillion PNNI Deployment.



Centillion LAN-ATM switches also offer redundant, load-sharing power supplies. All switching modules—ATMSpeed, EtherSpeed, and TokenSpeed—and power supplies are fully hot-swappable. In the event of a switch module failure, only the users connected to the failed module are affected; other modules continue to service the rest of the network while the failed module is replaced.

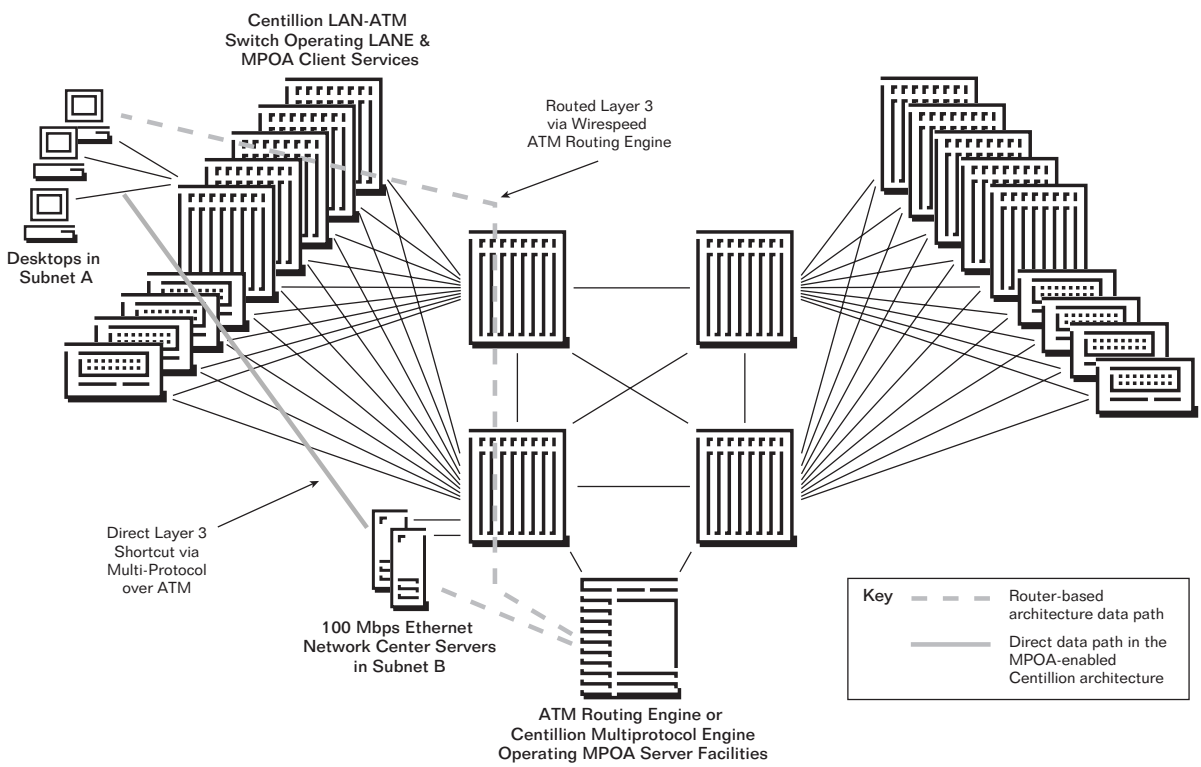
Centillion hardware and software scales seamlessly to guarantee infrastructure availability in even the largest and most critical ATM enterprise networks, and has proven its capability to support topologies of several hundred switches and upwards of 10,000 user connections.

Intranet Application Intelligence

With the explosion of intranet applications, dramatically increasing amounts of IP traffic are traversing overburdened routers. Every router along the path must process the same packet, and this type of hop-by-hop processing causes the network traffic to experience significant delay and jitter. Centillion switches provide for a standards-based solution to router bottlenecks through the ATM Forum's MPOA specification. MPOA allows direct forwarding of intersubnet traffic between ATM edge switches, bypassing overloaded routers and dramatically improving the IP performance of the overall network.

Offloading IP forwarding functions to edge switches frees routers to process other protocols, including IPX, DECnet, and AppleTalk, relieving the Layer 3 traffic jam for legacy applications. MPOA is fully backwards-compatible and can be deployed in any existing LANE-based network. In essence, MPOA transforms an ATM network, with all its ATM-attached routers and edge switches, into a single distributed router with each destination a maximum of one hop away (see Figure 3). This deterministic, delay-free architecture provides support for intranet applications and for emerging technologies such as IP-ATM QoS mapping, voice over IP, video conferencing, and video-on-demand.

Figure 3: Intranet Application Intelligence in the MPOA-enabled Centillion Network.



Plug-and-Play ATM

High-performance PNNI from Bay Networks greatly reduces the day-to-day burden on the administrators of large networks by eliminating static inter-switch route configuration. PNNI empowers ATM enterprise networks to dynamically and automatically negotiate and configure system-wide topologies, and eliminates manual inter-switch route configuration. In large enterprise networks, PNNI simplifies deployment and enhances system performance and reliability. The ability to implement PNNI anywhere throughout the network, from the wiring closet edge to the network core, is unique to Centillion infrastructures. Mixed PNNI and IISP environments are also supported, providing additional network design flexibility.

Unparalleled Manageability

Optivity®, the industry leading management solution from Bay Networks, provides sophisticated yet straightforward management of Centillion ATM environments. A key component of Optivity Enterprise™, the Optivity NETarchitect™ application delivers system-level ATM management via an intuitive, object-oriented interface to simplify detailed management tasks. Features such as rules-based configuration, automatic addressing, and the ability to drag and drop configurations of emulated LANs on a system-wide basis dramatically reduce the time required to manage large networks. In addition, by automating sophisticated switch configuration and image file management tasks, the administration of ATM networks is optimized and any potential for error is greatly reduced.

Featuring design and analysis tools that leverage the embedded instrumentation present in all Bay Networks equipment, Optivity provides the optimum solution for managing any switched network infrastructure. Optivity supports all popular management platforms, including Tivoli NetView for AIX, HP OpenView Network Node Manager, and Sun Microsystems Solstice Domain Manager.

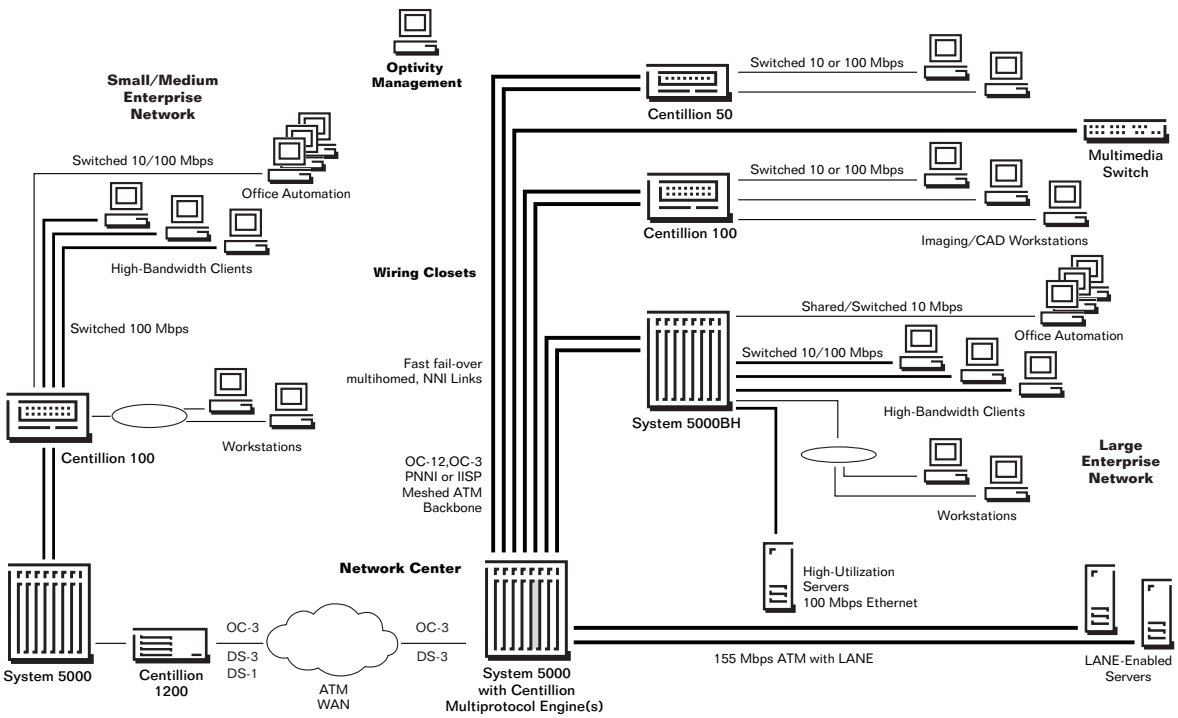
Comprehensive Investment Protection

The flexibility inherent to the Centillion LAN-ATM architecture maximizes chassis utility by enabling the deployment and reconfiguration of Ethernet and Token Ring LAN media with minimal incremental expense. The Centillion distributed processing architecture ensures sustained switching performance as network demand grows. For instance, activation of intranet application intelligent MPOA client services is supported by current Centillion LAN-ATM platforms, minimizing the need for future hardware upgrades.

Capital expenditure is further optimized through the use of standards-based ATM to interconnect switches—enabling network managers to avoid the 'lock in' of proprietary schemes. As traffic demands increase, ATM ports are easily added to support bandwidth growth. The Centillion multi-homed, load-sharing architecture delivers 310 Mbps to more than 2.4 Gbps of riser bandwidth between wiring closets and network centers. ATMSpeed, EtherSpeed, and TokenSpeed switching modules also provide comprehensive support for all commonly used physical media.

The Centillion solution's incremental integration strategy facilitates the deployment of powerful ATM technology with minimal disruption, eliminating costly and time-consuming network upgrades. In medium- to large-sized networks, Centillion

Figure 4: Centillion LAN-ATM Enterprise Network Applications.



LAN-ATM switches can be directly interconnected via ATMSpeed modules, lowering total equipment costs by eliminating the need for separate ATM switches at the core of the network. As networks grow and powerful Centillion 1000 multi-service switches are deployed at the network core, existing Centillion LAN-ATM switches are readily redeployed to support wiring closets and/or server farms.

APPLICATIONS

Centillion LAN-ATM switching solutions offer a single, consistent architecture across all facets of the network. This unified approach ensures maximum network availability, efficiency, and interoperability across the full range of ATM applications, and minimizes the need for additional user training.

The size of the network governs both switch selection and the location of switch deployment. In medium- to large-sized networks, the Centillion 100 and System 5000BH switches are ideal for network center installations. In the largest enterprise environments, these switches can be used for high-density wiring closet installations, with high-speed riser connections to Centillion 1000 multiservice switches located in the network center. And in networks of all sizes, the Centillion 50 switch is ideal for deployment in lower-density wiring closets or workgroup environments.

Enterprise Network Center Applications

The Centillion 100 and System 5000 switches are both well-suited for deployment in medium-to-large network centers and wiring closets. Both platforms are ideal for deployment in networks where multiple switches can be interconnected via PNNI and/or IISP to build a scalable, high-performance backbone network. Single-mode and multimode fiber, UTP, DS3, and E3 connectivity is supported for maximum flexibility, enabling switches to be installed in network centers or other locations across the campus backbone (see Figure 4).

Existing networking environments can be smoothly integrated into the ATM environment. As additional bandwidth, wide area and voice demands increase, the Bay Networks Centillion 1000 ATM multiservice switches provide a scalable path for expanded ATM network center services.

Wiring Closet Applications

A fully configured Centillion 100 or System 5000BH LAN-ATM switch supports ultra-high 10/100 Ethernet and Token Ring switching densities (up to 240 ports per chassis), offering an exceptional concentration of large workgroup and desktop populations.

Centillion 50 workgroup switches are readily deployed in smaller closets (see Figure 4). The full benefits of switching at the workgroup are realized in environments where high-capacity connections to the backbone are required to access corporate resources. As shown in the diagram, Centillion technology delivers multiple load-balancing ATM links, providing an integrated solution for switched Ethernet or Token Ring connectivity with fast failover NNI (network-to-network interface) links to the ATM backbone.

PNNI can be implemented from the edge to the network core to automatically determine the optimal path between switches, and the Centillion solution provides for accelerated Layer 3 intranet performance via a straightforward and cost-effective software migration to MPOA.

MAN and WAN Applications

Two approaches are available for establishing metropolitan or wide area connectivity in the Centillion LAN-ATM switching environment. A direct, cost-effective approach is to configure ATMSpeed modules with either DS3 or E3 MDA modules, establishing connectivity over corporate WANs at rates of 45 or 34 Mbps. In environments where connectivity over public data networks is desired, the Model 5782 Multiprotocol Engine (MPE) can be installed into a System 5000BH switch to provide traffic shaping services, eliminating bursty transmissions not tolerated by carrier services. Traffic shaping capabilities can also be implemented by the Bay Networks BN router's ATM Routing Engine.

Alternatively, deployment of Bay Networks Centillion 1000 or MX ATM WAN Access platforms integrates regional and branch office environments into corporate ATM private networks via public carrier services (see Figure 4). This capability enables organizations to consolidate traditionally separate voice, video, and data traffic onto a common network infrastructure, dramatically lowering the cost of WAN connectivity.

FEATURES

Scalable Architecture For Sustained Performance

Every Centillion LAN-ATM chassis is based on the ultra high-performance Centillion architecture (see Figure 5), leveraging parallel switching intelligence distributed between a 3.2 Gbps ATM backplane and multiple 1.2 Gbps switching modules. Whenever traffic flows from one port to another within the same switching module, it is forwarded locally in native mode by a flexible, high-capacity switching engine.

Contention between user information and signaling/control traffic is prevented by the Centillion management bus. The management bus operates separately from the ATM backplane at 400 Mbps. In direct contrast to products based on centralized architectures, Centillion distributed processing reserves core ATM bandwidth exclusively for inter-module traffic, sustaining performance as port densities and traffic increase. The System 5000BH chassis houses two 3.2 Gbps backplanes and accommodates up to twelve switching modules. Table 1 outlines the overall switching capacities of each of the Centillion LAN-ATM platforms.

Distributed processing also scales the segmentation and reassembly (SAR) performance of Centillion LAN-ATM platforms. Each EtherSpeed and TokenSpeed switching module features an onboard ATM SAR engine to convert cross-module traffic into cell streams for transport over the ATM core fabric. Packet-to-cell conversion occurs only once, delivering a low-latency, high-performance solution. Most importantly, overall segmentation and reassembly capabilities increase as switching modules are added to ensure sustained performance as network demands grow (see Table 1).

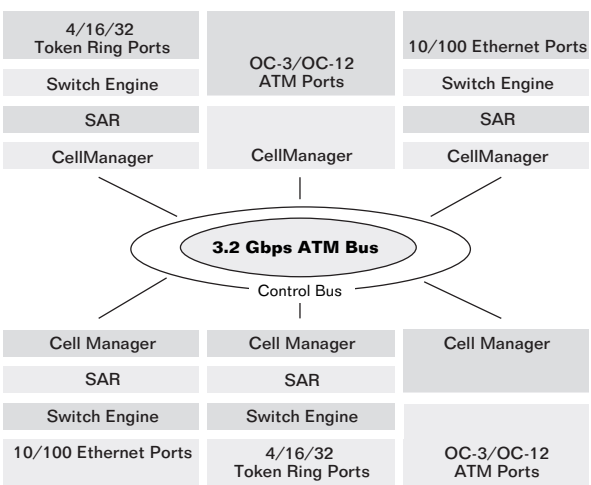
The distributed nature of Centillion LAN-ATM technology also enables the addition of powerful new software features—such as MPOA intranet application intelligence—without expensive hardware upgrades.

PLATFORM CAPACITIES

Table 1: Centillion LAN-ATM Platform Capacities

Switching Platform	Backplane Capacity	Total Switching Capacity	Total Segmentation & Reassembly Capacity
Centillion 50	3.2 Gbps	6 Gbps	800 Mbps
Centillion 100	3.2 Gbps	10 Gbps	2 Gbps
System 5005BH	3.2 Gbps	10 Gbps	2 Gbps
System 5000BH/BHC	6.4 Gbps	20 Gbps	4 Gbps

Figure 5: Centillion LAN-ATM Integration.



Flexible, Modular Connectivity

The Centillion switching modules provide comprehensive support for integrated Ethernet, Fast Ethernet, Token Ring, and ATM connectivity across the enterprise. All modules feature input/output ports, buffer memory, and CellManager™ ASICs, as shown in Figure 5. EtherSpeed and TokenSpeed modules provide local frame switching via high performance

switching processors. The CellManager ASIC handles module-to-backplane transfers and, in ATMSpeed modules, performs local cell switching tasks.

Centillion LAN-ATM platforms withstand temporary network congestion through the abundant onboard buffering facilities offered by all switching modules. In addition, multiple queues provide application-intelligent traffic prioritization and ATM Forum-compliant Quality of Service support.

ATMSpeed modules go beyond limited intelligence UNI facilities to provide intelligent, fault-tolerant Network-Network Interfaces. This allows Centillion LAN-ATM switches to multi-home their interconnections via genuine load-sharing, fast recovery links, and facilitates the construction of heavily meshed network topologies.

MCP facilities are available in both the ATMSpeed and TokenSpeed module families—EtherSpeed modules do not support MCP services. Switch modules with MCP capabilities also handle chassis-wide housekeeping functions such as network management, LAN Emulation, ATM switched virtual circuit signaling, and interswitch topology services. Secondary, standby ATM MCP modules can be added to all platforms and also provide full switching capacity while in their idle MCP state.

As shown in Table 2, the Centillion 50 and Centillion 100 chassis utilize a common set of switching and MCP modules.

SWITCHING MODULE CAPABILITY MATRIX

Table 2: Centillion 50 and Centillion 100 Switching Modules.

Module	Number and Type of Ports	Connector
ATMSpeed Modules		
ATMSpeed Flex 155 MCP Module	2-4 OC-3c 2-4 DS3 2-4 E3	SC SM/MM Fiber or RJ-45 BNC BNC
ATM Speed Flex 155 Switch Module	2-4 OC-3c 2-4 DS3 2-4 E3	SC SM/MM Fiber or RJ-45 BNC BNC
EtherSpeed Modules		
24-Port EtherSpeed Switch Module	24 10BASE-T	Two 50-pin Telco
16-port EtherSpeed 100 Mbps Segment Switch Module	4 100BASE-TX segments, 4 ports per segment	RJ-45
16-Port EtherSpeed Switch Module*	16 10BASE-T	RJ-45
10-Port EtherSpeed 10/100 Switch Module	8 10BASE-T 2 100BASE-TX	RJ-45 RJ-45
10-Port 10/100 EtherSpeed Switch Module	8 10BASE-T 2 100BASE-FX	RJ-45 SC Fiber
8-Port EtherSpeed Switch Module	8 10BASE-FL	ST Fiber
4-Port EtherSpeed 10/100 Switch Module	4 Autosensing 10BASE-T/100BASE-TX	RJ-45
TokenSpeed Modules		
16-Port TokenSpeed Switch Module	16 UTP/STP	RJ-45
8-Port TokenSpeed MCP Module	8 UTP/STP	RJ-45

*** Two versions of this module are available, fitted with different amounts of Content Addressable Memory (CAM).**

Virtual network routing and MPOA server functions are supplied by the Model 5782 Centillion Multiprotocol Engine module, available only in the System 5000BH platform. Further details on the Model 5782 Centillion Multiprotocol Engine are available in the ATM Virtual Network Routing data sheet.

As shown in Table 3, the switching and MCP modules designed for the System 5000BH chassis utilize a higher density form factor.

SWITCHING MODULE CAPABILITY MATRIX

Table 3: System 5000BH Switching Modules.

Module	Number and Type of Ports	Connector
ATM Virtual Network Routing		
Model 5782 Centillion Multiprotocol Engine (MPE)	via ATMSpeed modules	Integrated into ATM fabric.
ATMSpeed Modules		
Model 57622M-SM ATMSpeed 622 MCP Module	1 OC-12c	SC Single-mode Fiber
Model 57622M-MM ATMSpeed 622 MCP Module	1 OC-12c	SC Multimode Fiber
Model 5720 ATMSpeed 155 Flex MCP Module	2-4 OC-3c 2-4 DS3 2-4 E3	SC SM/MM Fiber or RJ-45 BNC BNC
Model 5720M ATMSpeed 155 Flex Switch Module	2-4 OC-3c 2-4 DS3 2-4 E3	SC SM/MM Fiber or RJ-45 BNC BNC
EtherSpeed Modules		
Model 5625 24-Port EtherSpeed 10/100 Switch Module	24 Autosensing 10BASE-T/100BASE-TX	RJ-45
Model 5328HD 24-Port EtherSpeed Switch Module	24 10BASE-T	RJ-45
Model 5455 16-port EtherSpeed 100 Mbps Segment Switch Module	4 100BASE-TX segments, 4 ports per segment	RJ-45
Model 5324 12-Port EtherSpeed Switch Module	12 10BASE-FL	ST Fiber
Model 5425 4-Port EtherSpeed 10/100 Switch Module	4 Autosensing 10BASE-T/100BASE-TX	RJ-45
TokenSpeed Modules		
Model 5525HD 24-Port TokenSpeed Switch Module	24 UTP/STP	RJ-45
Model 5524 8-Port TokenSpeed Switch Module	8 802.5j Fiber	ST Fiber

Further information on specific modules is available in the ATMSpeed, EtherSpeed, and TokenSpeed data sheets.

Proven, Feature-Rich Software

Centillion Switching Software—available in Standard and Advanced versions—facilitates the construction of highly redundant network topologies scaling to hundreds of switches and thousands of user ports. To do this, Centillion LAN-ATM switches support a full complement of ATM Forum standards, including UNI Switched Virtual Circuit (SVC) 3.0/3.1 signaling, LAN Emulation (LANE), PNNI, MPOA services, and IISP, delivering full interoperability in multivendor environments. UNI SVC signaling provides support for a wide variety of multivendor ATM configurations, enabling the switches to interoperate with ATM router and server interfaces. Centillion LAN-ATM solutions also support automatic mapping between UNI 3.0 to UNI 3.1 in mixed environments.

Centillion Switching Software also enables the overlay of fully interoperable, standards-based VLANs over the meshed physical network topology, facilitating the creation of logical topologies that precisely match the Internet or intranet requirements of the network architecture. In addition, Centillion software provides fundamental system performance and resiliency features, including redundant and load-sharing links, cooperating LECS, LES, and BUS services, IGMP (Internet Group Management Protocol) control of multicast traffic, and redundant MCP services.

Powerful custom filters provide the ability to define and apply 64 filters per port, and filter any fields within the first 255 bytes of a frame. Filtered traffic can be forwarded, discarded, redirected to other LAN ports, or copied to one or more monitor ports. Conversation steering based on filtered conditions simplifies network diagnostics as familiar LAN analyzer or RMON tools can be used to monitor mirrored traffic.

In larger networking environments where overall scaling, management, and application intelligence are even greater considerations, the Advanced Centillion Switching Software supports key ATM Forum PNNI and QoS capabilities—along with all Standard software features.

QoS awareness enables applications to utilize the intelligence of ATM constant bit rate (CBR), variable bit rate (VBR), and unspecified bit rate (UBR) services to guarantee bandwidth availability and prioritization for mission-critical applications and latency-sensitive traffic.

Private Network-Network Interface (PNNI)

PNNI (Private Network-Network Interface) is a topology determination and call routing protocol that enables switches in large ATM networks to dynamically find optimum paths when establishing virtual connections. A valuable time-saver for network managers, PNNI eliminates the need to manually configure and update direct paths between ATM switches. PNNI also communicates key QoS (Quality of Service) metrics to ensure path selection is optimized according to each application's bandwidth and latency requirements, burstiness, and jitter. PNNI supports ATM networks of any size, scaling from campus deployments to global infrastructures, and provides exceptionally fast convergence around network outages.

LAN Emulation (LANE)

Centillion Switching Software features the industry's most comprehensive LANE implementation, providing a standards-based method for connecting LAN-attached endstations, file servers, and routers directly to the ATM network. Both Ethernet and Token Ring LANE clients and services are supported, preserving investments in existing technology while increasing bandwidth and improving network performance.

MPOA Client Support

Intranet applications and server centralization are heightening demand for Layer 3 IP bandwidth. Advanced Centillion Switching Software will provide MPOA client

(MPC) facilities to vastly increase the Layer 3 forwarding capacity of existing switching hardware, such as the high-density EtherSpeed and TokenSpeed switching modules. This new feature will enable the Layer 3 capacity of Centillion networks to scale to millions of packets per second. In contrast to third-party products based on centralized processing architectures, MPC activation in Centillion LAN-ATM solutions will not require the installation of additional hardware modules.

Network Management

The Centillion switches can be configured, monitored, and controlled through the Bay Networks Optivity and SpeedView™ management applications.

Optivity,® the industry leading management solution from Bay Networks, provides sophisticated yet straightforward management of Centillion ATM environments.

A key component of Optivity Enterprise, the Optivity NETarchitect™ application automates and simplifies crucial management tasks, particularly:

- Configuration of sophisticated Centillion LAN-ATM network systems.
- Distribution of configurations into the appropriate parts of the overall switched network infrastructure.

NETarchitect consists of two basic system-oriented tools—File Manager and Configuration Editor. The File Manager delivers a comprehensive and scalable system for configuring and maintaining sophisticated image files for an entire enterprise network.

The NETarchitect Configuration Editor uses an intuitive, object-oriented interface to automate LANE service setup and overall ATM network configuration. Unauthorized changes are prevented by Security Editor, which only enables authorized individuals to access an integrated, object-oriented database for switch configuration tasks.

The Configuration Editor presents an object hierarchy with associated attribute panels in an easy-to use interface consistent with many popular Windows software products. NETarchitect features a multi-user, client/server design that enables users to select from several configuration workspaces. Concurrency is managed across simultaneous editing sessions, and configuration changes are intelligently verified and validated for accuracy. This greatly reduces the potential for misconfigurations, and minimizes the need for troubleshooting during installation roll-outs.

Suitable for smaller networks and device-by-device configuration, the easy-to-use, graphical SpeedView application also enables network managers to configure and monitor networks of Centillion switches. In Windows environments, SpeedView is available as a standalone application that is bundled with Optivity Campus™ management software. In UNIX environments, SpeedView is a component of Optivity Enterprise. Both versions deliver rich statistical displays that are complemented by simple, intuitive utilities for configuring switching parameters, enabling performance to be finely tuned to meet varying network conditions. The SpeedView application can be used to set up ATM signaling, create and configure LECs, and enable redundant LANE services.

Year 2000 Compliance

Centillion switches have been tested and certified Year 2000 compliant by Bay Networks according to the test cases identified in Bay Networks Year 2000 Test Strategy/Plan. (See http://www.baynetworks.com/year2000 for more delails.)

TECHNICAL SPECIFICATIONS

Table 4: Centillion LAN-ATM Switches Technical Specifications.

Svstem Hardware	
Aggregate Capacity	
Centillion 50	6 Gbps
Centillion 100	10 Gbps
System 5005BH	10 Gbps
System 5000BH/BHC	20 Gbps
Redundant Power	
Centillion 50	Optional
Centillion 100	Standard
System 5005BH	Standard
System 5000BH/BHC	Standard
Module Slots	
Centillion 50	3 slots
Centillion 100	6 slots
System 5005BH	8 slots—6 for Centillion modules
System 5000BH/BHC	14 slots—12 for Centillion modules
All modules are hot-swappable	
Rack mount capability—19 in. universal EIA	
Centillion 50	Standard
Centillion 100	Standard
System 5005BH	Standard
System 5000BH/BHC	Standard
Serial Management Access	Mini-DIN-8 (Centillion 50 and 100), DB-25 (System 5000)
Data Rates	See individual EtherSpeed, TokenSpeed, and ATMSpeed family data sheets
Microprocessors	See individual EtherSpeed, TokenSpeed, and ATMSpeed family data sheets
Memory	See individual EtherSpeed, TokenSpeed, and ATMSpeed family data sheets
Standards Compliance	CCITT 1.361 ATM Layer Specification ATM Forum UNI 3.0 and 3.1 ATM Forum LAN Emulation (LANE) v1.0 ATM Forum Private Network-Network Interface (PNNI) ATM Forum Multi Protocol Over ATM (MPOA) ATM Forum Interim Interswitch Signaling Protocol (IISP)
Environmental Specifications	
Operating Temperature	5° to 40° C (41° to 104° F)
Storage Temperature	-25° to 70° C (-13° to 158° F)
Operating Humidity	85% maximum relative humidity, noncondensing
Storage Humidity	95% maximum relative humidity, noncondensing
Operating Altitude	10,000 ft. (3,000 m) max
Free Fall/Drop	IEC 68-2-32, NSTA 1A
Vibration	IEC 68-2-6/34
Shock/Bump	IEC 68-2-27-29

Further standards compliance information is supplied in the ATMSpeed, EtherSpeed, and TokenSpeed data sheets.

Table 4: Centillion LAN-ATM Switches Technical Specifications (continued).

Electromagnetic Emissions		
Meets requirements of:		FCC Part 15, Subpart B, Class A EN 55 022 (CISPR 22:1985), Class A VCCI Class 1 ITE
Electromagnetic Susceptibility		
Electrostatic Discharge (ESD)		EC 801-2, Level 2
Radiated Electromagnetic Field		EC 801-2, Level 2
Electrical Fast Transient/Burst		EC 801-4, Level 2
Electrical Surge		IEC 801-5, Levels 1 and 2 Complies with EN 50082-1 (European CE mark requirements)
Safety Agency Approvals		International Electrical Code of 950 (IEC 950) Underwriters Laboratories (UL 1950) Canadian Standards Association (C22.2 No. 950) or Bi-national Standard (UL 1950 and C22.2 No. 950) equivalent to UL and cUL European Union (EN60950) Norma Oficial Mexicana (NOM-19-SCFI) Meets UL-94-V1 (PWB) flammability requirements
Physical Dimensions		
Centillion 50 Chassis	Tabletop	(H) 7 x (W) 17.25 x (D) 14 in. [(H) 22.1 x (W) 43.8 x (D) 36.6 cm]
	Rack Mount	(H) 7 x (W) 17.25 x (D) 16 in. [(H) 22.1 x (W) 43.8 x (D) 41.6 cm]
Centillion 100 Chassis	Tabletop	(H) 8.75 in. x (W) 17.25 in. x (D) 14 in. [(H) 22.2 cm x (W) 43.8 cm x (D) 35.6 cm]
	Rack Mount	(H) 8.75 in. x (W)17.25 in. x (D) 16 in. [(H) 22.2 cm x (W) 43.8 cm x (D) 40.6 cm]
System 5000BH/BHC Chassis	Rack Mount	(H) 22.7 in. x (W) 17.7 in. x (D) 21 in. [(H) 57.7 cm x (W) 44.9 cm x (D) 53.3 cm]
System 5005BH Chassis	Rack Mount	(H) 22.7 in. x (W) 17.7 in. x (D) 14 in. [(H) 57.7 cm x (W) 44.9 cm x (D) 35.5 cm]
Weight		
Centillion 50 Chassis (single power supply)		26 lb. (11.8 kg)
Centillion 100 Chassis		30 lb. (13.6 kg)
System 5005BH Chassis		65.5 lb. (29.5 kg)
System 5000BH/BHC Chassis		84 lb. (38.1 kg)
Power Requirements		
Centillion 50 Chassis		250 W max.
Centillion 100 Chassis		300 W max.
System 5005BH Chassis		1200 W max.
System 5000BH/BHC Chassis		1550 W max.

Table 4: Centillion LAN-ATM Switches Technical Specifications (continued).

Thermal Output	
Centillion 50 Chassis	860 BTU/hr. max.
Centillion 100 Chassis	1032 BTU/hr. max.
System 5005BH Chassis	6585 BTU/hr. max.
System 5000BH Chassis	6585 BTU/hr. max.
Module Power Consumption	See individual EtherSpeed, TokenSpeed, and ATMSpeed family data sheets

ORDERING INFORMATION

Table 5: Centillion LAN-ATM Chassis and Switching System Ordering Information.

Order No.	Platform	Description
AS0002?03	Centillion 50	Centillion 50 Chassis, single power supply, rack mount kit
AS1901?03	Centillion 50	Centillion 50 System with ATMSpeed 155 Flex MCP and EtherSpeed 24-port 10 Mbps module (separate purchase of ATMSpeed MDA necessary)
AS1901?04	Centillion 50	Centillion 50 System with ATMSpeed 155 Flex MCP and EtherSpeed 16-port 10 Mbps module (separate purchase of ATMSpeed MDA necessary)
AS1901?05	Centillion 50	Centillion 50 System with ATMSpeed 155 Flex MCP module and EtherSpeed 16-port 100 Mbps Segment Switch module (separate purchase of ATMSpeed MDA necessary)
AS1701?03	Centillion 50	Centillion 50 System with ATMSpeed 155 Flex MCP and 8-Port TokenSpeed Switch module (separate purchase of ATMSpeed MDA necessary)
AS1701?04	Centillion 50	Centillion 50 System with TokenSpeed 8-port MCP module
AS0002?02	Centillion 100	Centillion 100 Ethernet/Token Ring/ATM-capable chassis, dual power supplies, rack mount kit
AD1402003	System 5000	System 5005BH Ethernet/Token Ring/ATM-capable chassis, redundant power supplies, rack mount kit
AD1402001	System 5000	System 5000BH Ethernet/Token Ring/ATM-capable chassis, redundant power supplies, rack mount kit
AD1402002	System 5000	System 5000BHC Ethernet/Fast Ethernet/Token Ring/ATM-capable chassis, redundant power supplies, rack mount kit

*** The seventh character (?) of the order number must be replaced with the proper code to indicate desired power cord nationalization preference.**

Note: Several preconfigured Centillion 50 systems are currently available, providing Bay Networks customers with cost-effective solutions in the key edge and workgroup switch markets. Configurations of these bundled systems may vary over time.

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