

Centillion 20

Token Ring 24-port Workgroup Switch

Centillion 20 Token Ring Workgroup Switch Features and Benefits

- Token Ring-ATM Integration
- Total Availability
- Application-Intelligent Desktop Switching
- Comprehensive Investment Protection

Providing backbone switching at a stackable price, the Centillion 20 Token Ring 24-Port Workgroup Switch maximizes the productivity of both new and existing networks.

The Centillion* 20 Token Ring 24-port Workgroup Switch is designed for deployment in the wiring closet and workgroup environments, and is the latest addition to the Centillion family of Token Ring switching solutions from Nortel Networks. The switch provides 24 RJ-45 ports for 4/16/32 Mbps Dedicated Token Ring (DTR) connectivity, and supports insertion of an optional unshielded twisted pair (UTP) or multimode fiber optic asynchronous transfer mode (ATM) expansion module.

For maximum performance, each end user or network device can be directly connected to the switch, supplying each node with access to 4/16/32 Mbps of dedicated bandwidth. In existing local

area networks (LANs) with multiple 4/16 Mbps hubs, each hub can be connected directly to the Centillion 20 switch, significantly increasing available bandwidth and removing data bottlenecks in busy workgroups. At under \$200 per port, the Centillion 20 switch delivers a quick, cost-effective solution for upgrading shared Token Ring environments.

The Centillion Token Ring solutions support the deployment of identical switching technology across the entire LAN-ATM network, from the workgroup to the wiring closet to the network center, offering a highly scalable, cohesively integrated solution that is unique in the

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industry. Centillion 20 switches provide relief to congested backbones and underpowered Token Ring bridges by increasing aggregate throughput, reducing response times, and simplifying network evolution. In pure Token Ring environments, the Centillion architecture retains the simplicity of Token Ring bridging while providing much higher switching capacity. In mission-critical networks, redundant power capability can be added for up to four Centillion 20 switches via connection to a Nortel Networks RPSU (Redundant Power Supply Unit).

In enterprise environments, an optional multiport expansion module (see Ordering Information) can be installed to provide Token Ring workstations or workgroups with high-speed ATM connectivity to key resources in the network center. The expansion modules support redundant, load-sharing connections over multimode fiber optic or UTP cable, and extend the resilient, fault-tolerant characteristics of the Centillion ATM infrastructure to the network edge. Bandwidth is increased to

routers, servers, workgroups, and desktops, and infrastructure availability for mission-critical applications is ensured.

The multiport expansion modules are also ideal for creating switch workgroups capable of supporting over 700 users. In addition, the modules can be used to interconnect multiple Centillion 20 switches with genuine Network-to-Network Interface (NNI) links, creating a distributed network of workgroup switches capable of supporting high-density switched Token Ring environments (see Figure 1).

The Centillion 20 Token Ring Workgroup Switch is a key component of the Nortel Networks family of high-performance Token Ring solutions. Working with the BayStack* 500 Series Token Ring hubs, System 2000*, System 3000*, and System 5000* Token Ring shared access hubs, Nortel Networks routers, Centillion LAN-ATM switches, and Centillion 1000 Multiservice ATM switches, the Centillion 20 Workgroup Switch contributes to the industry's most complete Token Ring networking solution.

Benefits

Token Ring-ATM Integration

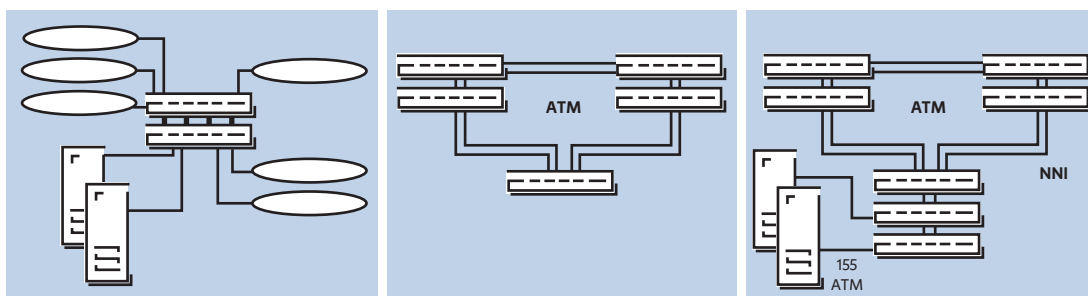
Adding the Centillion 20 Workgroup Switch to existing Token Ring LANs dramatically enhances network performance and availability. The distributed switching capabilities and interface density, combined with the powerful 3 Gbps switching fabric, eliminate the design constraints and data bottlenecks typical of legacy networking systems. The tight integration of Token Ring and ATM switching in Centillion solutions allows networks of all sizes to benefit from the scalability, resiliency, and inherent Quality of Service (QoS) of ATM without expensive forklift upgrades. The Centillion family of switches supports unmatched LAN-ATM capabilities, including highly redundant, cooperating Token Ring LAN Emulation (LANE) services, application-intelligent QoS, Private Network-to-Network Interface (PNNI) dynamic call routing, and per-port Layer 3 routing using standards-based Multiprotocol over ATM (MPOA) client and server facilities (see Figure 2 on next page).

The Centillion 20 switch delivers high-speed Token Ring switching with

integrated ATM riser and backbone capabilities, providing switched 4/16/32 Mbps connectivity between Token Ring users at full wire speed. The switch provides a smooth migration path to a high-density Token Ring

infrastructure that delivers switched connectivity to the desktop. In addition, the switch supports true NNI connectivity between switches, eliminating the requirement of a network center ATM switch to scale the network. In larger environments, the switch supports redundant load-sharing ATM uplinks to network center switches and other centralized resources.

Figure 1: Standards-Based Expansion and Stackability with Centillion 20 Token Ring Switches.



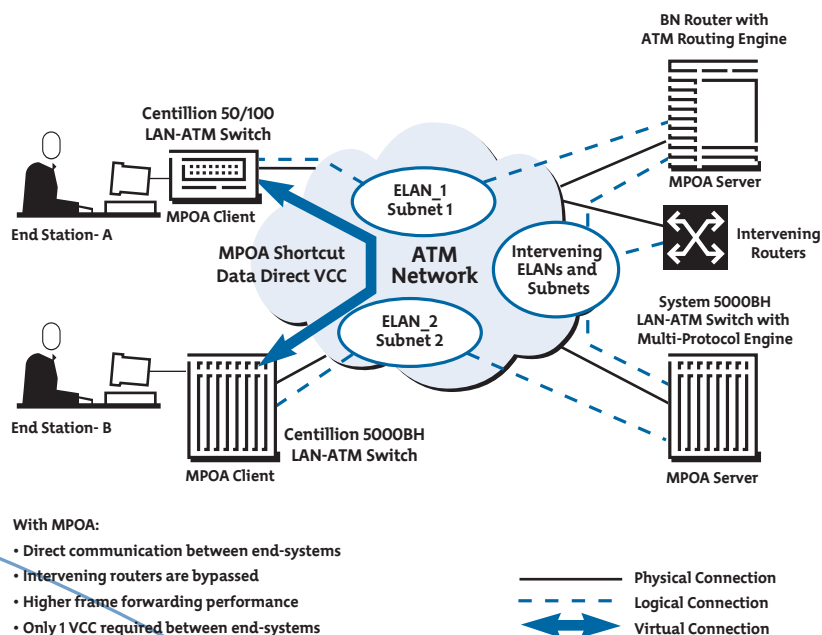
Interswitch Token Ring desktop and server traffic is transported via LANE over resilient, scalable ATM riser connections. Centillion Switching Software delivers the industry's most comprehensive, straightforward, and fault-tolerant implementation of LANE, providing highly interoperable connectivity between LAN-attached desktops, file servers, routers, and high-performance ATM networks. Token Ring LANE clients and fault-tolerant cooperating LANE services are supported with minimal management intervention.

As networks grow, multiple Centillion 20 Workgroup Switches and Centillion 50, Centillion 100, or System 5000BH Series LAN-ATM Switches can be interconnected over a high-bandwidth, low-latency ATM backbone to create a resilient, fully meshed topology. In larger networks, Centillion LAN-ATM Switches can also be connected via one or more ATM ports to high-speed, high-availability Centillion 1000 multiservice network center switches, creating a totally available, multi-homed network topology.

Total Availability

Networks constructed with Nortel Networks Centillion switches deliver interconnected, 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 Interim Interswitch Signaling Protocol (IISP) static routes, or via the PNNI dynamic path determination protocol. This capability sets Centillion Token Ring-ATM solutions apart from third-party products that only interconnect via limited-intelligence User Network Interfaces (UNIs). To ensure ongoing system availability, Centillion switches provide fast fail-over, cooperating LANE services that guarantee LAN Emulation Client (LEC) connectivity and performance.

Figure 2: MPOA Shortcuts – Enhanced Routing Performance.



Total availability is further ensured by providing the network's Centillion 20 switches with a fully redundant power supply. This is accomplished by connecting up to four Centillion switches to a Nortel Networks RPSU, which provides four 130-watt DC outputs. In addition to offering power redundancy through the DC outputs, the RPSU also provides two load-sharing AC inputs, which can be connected to two different AC power sources. The combination of the two redundant power strategies ensures power availability in any possible situation except a total AC power failure, making the RPSU ideal for deployment in mission-critical networks.

Application-Intelligent Desktop Switching

Without bandwidth management, high-performance switches can overload Token Ring network servers and routers, degrading application performance. Centillion 20 switches provide comprehensive application control through extensive deep packet filtering,

mirroring, and access control capabilities. Packet filtering allows actions to be performed on application flows on a packet-by-packet basis, according to the matching of specified bit patterns. This empowers managers to restrict traffic by protocol, such as Internet Protocol (IP) or Internet Packet Exchange (IPX), ensuring that only appropriate traffic is forwarded onto a specific network segment. These facilities provide unequalled application control and traffic reduction capabilities, and are the foundation for the transition to policy-based, application-optimized networking.

With the explosive growth of intranet applications, ever-increasing amounts of IP traffic must traverse multiple routers, causing delay and jitter. Layer 3 switching capabilities are becoming increasingly necessary to alleviate the restrictions of conventional collapsed router network architectures. This distributed, resilient, IP-optimized architecture provides support for advanced technologies such as business-critical intranets, voice, video-conferencing, and video on demand.

The integrated ATM capabilities of all Centillion switches accelerates Token Ring application performance, and is capable of providing the intelligence necessary to guarantee end-to-end prioritization of mission-critical traffic. ATM switch interconnection ensures low end-to-end network latency, with ATM cells flowing through the core of the network with less than 10 microseconds of latency per intermediate switch hop.

Centillion 20 switches support additional application intelligence through prioritization of mission-critical information flows. This new approach will also take application behavior into account when queuing traffic during periods of high network loading. Multiple queues and ATM Forum QoS services will combine to deliver true end-to-end application intelligence.

Comprehensive Investment Protection

Centillion 20 switches provide a cost-effective solution for creating switched Token Ring networks of all sizes, from small workgroups to enterprise networks. Fully compatible with existing Token Ring networks, the Centillion 20 switches operate within all protocol environments, provide seamless interoperation with bridges, and are transparent to routers. The high-density Centillion workgroup switches also provide support for DTR operation, offering relief to congested servers by doubling the available bandwidth of a dedicated Token Ring server to 32 Mbps. In addition, all switch ports support direct station, hub, or Ring-In/Ring-Out (RI/RO) attachment. Table 1 lists the operating modes supported by the Centillion 20 switch.

Operating Modes

Table 1: Centillion 20 Token Ring Workgroup Switch Operating Modes.

Hub	Detects phantom, Network Interface Cards attached to a port
Station	Sources phantom, attached to a port
Ring Out	Connects to a Ring In port
Ring In	Connects to a Ring Out port
Auto	Automatically detects Hub or Station modes
FDTR Station	Full-duplex Token Ring, sources phantom, used for interswitch links

Capital expenditures are further optimized by using ATM to interconnect switches and establish direct connections to servers, empowering network managers to avoid the 'lock in' of proprietary schemes. As traffic demands increase, multiport expansion modules can be added to support bandwidth growth. The multi-homed, load-sharing Centillion architecture delivers more than 2.4 Gbps of riser bandwidth between wiring closets and network centers.

Features

Comprehensive Token Ring Connectivity

Every RJ-45 port on the Centillion 20 Workgroup Switch provides auto-detecting and selectable interface speeds of 4/16 Mbps, or 32 Mbps (full-duplex Institute of Electrical and Electronics Engineers (IEEE) 802.5r DTR). All Token Ring frame sizes up to 17 Kbytes are supported, and flexibility is enhanced through support for selectable or autodetecting direct station, hub, or RI/RO attachment on all ports. For additional resiliency in frame-based environments, both IEEE- and IBM-compliant Spanning Tree protocols are supported.

The switch provides a full suite of Token Ring facilities, including Source Route, Transparent, and Source Route Transparent bridging, and transparent switching of source router packets. Token Ring frame sizes ranging from 14 bytes to 17 Kbytes are supported, along with early token release (16 Mbps) to provide optimal, low-latency performance. The patented Virtual Ring (VRing) technology from Nortel Networks allows multiple physical rings to appear as a single 'virtual' ring within the enterprise network.

The Centillion 20 switch is equipped with a Light Emitting Diode (LED) matrix providing two LEDs per port. These indicate link status and attachment mode, and attachment speed. In addition, LEDs are included to provide at-a-glance status monitoring of the switch's fan, main power supply, and redundant power systems.

Flexible Forwarding Engine

The third generation, high-density Centillion 20 Workgroup Switch uses the industry's first Token Ring Media Access Control (MAC) application-specific integrated circuit (ASIC) designed for switched (rather than shared) Token Ring media. Centillion 20 switches are fitted with three Octal MAC ASICs, each of which provides MAC services for up to eight ports, and contains an integrated, programmable Flexible Forwarding Engine (FFE).

Centillion 20 switches combine the price/performance of hardware switches with the scalable features and investment protection previously offered only in software-based architectures. The embedded FFE on each Octal MAC ASIC is rated at over 300 million instructions per second (MIPS), and readily performs all switching calculations at full line rate (see Figure 3). Since the FFE's functions are programmable, it provides support for new features and emerging standards via straightforward and cost-effective software upgrades. Along with unmatched wire speed performance and investment protection, the FFE also provides extensive traffic mirroring, security, and traffic prioritization capabilities.

The FFE supports full traffic scanning on both inbound and outbound traffic flows on a port-by-port basis, delivering flexibility typically found only in lower-performance software-based architectures. Network managers can implement filtering, mirroring, or access rules based on any bit pattern within a frame. This removes the limitations of competitive, hardware-based switch architectures that are only able to provide filtering based on MAC address or destination service access point (DSAP).

Deep Packet Filtering, Frame Mirroring, Security, and Access Control

The Centillion 20 Token Ring Workgroup Switch provides the most comprehensive wire-rate packet filtering, mirroring, and security features in the industry. Extensive packet filtering recognizes any pattern within the first 255 bytes of a packet, and filters frames according to matching of specified patterns. These tools provide unequalled traffic control and bandwidth control capabilities.

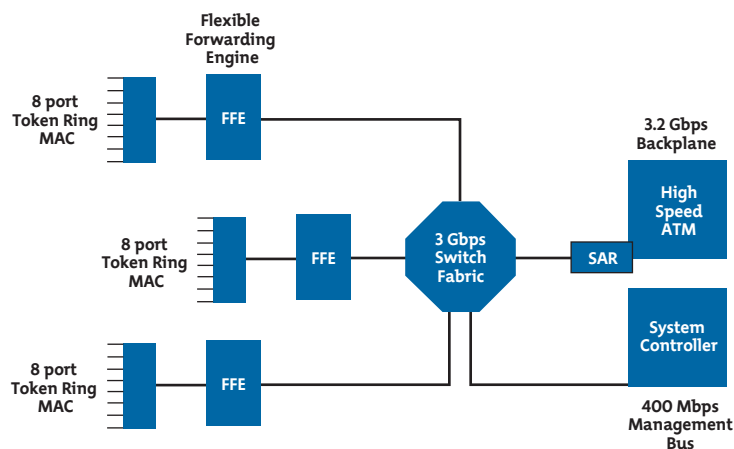
Deep packet filters match any bit pattern, at any location up to the application layer within frames entering or exiting a port, and can be deployed with operators including:

- Equal to, Less than, Less than or Equal to, Greater than, and Greater than or Equal to
- Logical "AND" or "OR"
- Nested "if-then-else" formats
- Range comparisons

Frames that meet specified filter conditions may be forwarded to additional destinations, forwarded to a monitoring port, dropped altogether, or subjected to another, different filter. Up to 90 filters can be activated on any port, and filters can be easily replicated and applied across multiple ports. Network performance can also be monitored and analyzed by routing a copy, or mirrored stream, of application traffic to analysis tools attached to any other Token Ring switch port. User or workgroup network resource utilization can also be monitored by mirroring traffic to an accounting server.

In addition, access to network services and resources can be controlled through redirection of frames that meet certain criteria. These frames can be redirected to a specified destination instead of, or in addition to, the destination addresses. This process can be used to protect against intrusive and/or non-productive traffic on a ring, port, or an entire virtual LAN (VLAN).

Figure 3: Centillion 20 Switching Architecture.



Traffic Prioritization and Priority Queues

Centillion Token Ring environments provide support for traffic prioritization. In this implementation, each Octal MAC port within the Centillion 20 switch has both high- and normal-priority traffic queues, and the onboard FFE will assume control of information flows that are assigned higher priorities. The following filtering criteria are available to prioritize Token Ring frames, including:

- Token Ring priority bits in the frame control byte
- DSAP or SSAP protocol types (including Systems Network Architecture (SNA), IP, IPX, and Network Basic Input/Output System (NetBIOS))
- Layer 4 sockets (including SAP)
- Specific instances, or ranges of: MAC, Layer 3, and/or NetBIOS addresses
- Association with selected mission-critical servers, users, or both
- Any combination of the above

Intelligent Broadcast Reduction

All networking protocols use broadcasts to locate network resources, advertise network services, or establish sessions between clients and servers. In a switched intranet, broadcasts are transmitted to every device attached to Layer 2 VLANs. The use of multiple redundant paths in a source routed network results in the multiple broadcast of many frames. Broadcast traffic can become a significant proportion of the overall network traffic, and in some cases traffic can burst to cause 'broadcast storms'.

Intelligent Broadcast Reduction (IBR) provides a suite of mechanisms to eliminate redundant broadcast traffic. Working in conjunction with the FFE, IBR provides a powerful tool for managing broadcast traffic and preventing broadcast storms. Key features of the IBR suite include All Routes Explorer reduction, Explorer Proxy, NetBIOS Proxy, Datagram Discard, and Unknown Unicast Pacing.

Powerful 3 Gbps Non-Blocking Switch

In currently available second-generation Token Ring switches, full line-rate switching is assured only when one or two ports are active. With several ports active, insufficient bandwidth is available to support full line-rate switching across all ports. Frames are blocked, and application performance is compromised. Packet retransmissions frequently take place, compounding switch overloads and decreasing application performance.

Centillion 20 switches feature a third-generation, non-blocking 3 Gbps switching architecture that delivers aggregate switch throughput exceeding line speeds even when all module ports are active. This powerful architecture guarantees sustained performance, even under heavy network loading.

Centillion ATM Scalability

The processing power required to transport Token Ring frames and ATM cells is distributed throughout the Centillion infrastructure. Each Centillion 20 switch or Centillion switching module has the processing power to support communication among users, workgroups, and interconnected switches. Distributed processing also scales the segmentation and reassembly (SAR) performance of Centillion switches. Each switch or switching module features an onboard ATM SAR engine to convert traffic into cell streams for transport over the ATM

backbone. Packet-to-cell conversion occurs only once, delivering a low-latency, high-performance solution. Most importantly, overall SAR capabilities increase as additional switches and switching modules are added, ensuring sustained performance as network traffic increases.

Dynamically Allocated Buffering

Within Token Ring networks it is common for devices that support centralized information resources, such as servers, to simultaneously conduct multiple conversations. The traffic generated by these multiple sessions can exceed the line speed of the server's Token Ring switch port. Consequently, even with Centillion 20 switch's line-rate switching, some traffic may need to be queued to await transmission from busy server ports. Under congested conditions, the FFE queues traffic in a dynamically allocated buffer pool.

Third-party Token Ring switches tend to permanently assign a small amount of fixed buffer memory to each port or set of ports. This architecture only provides satisfactory performance when traffic is evenly balanced between all switch ports, which is rare in today's networks with multiple, bandwidth-intensive uplinks to centralized servers. Statically-assigned buffer memory is quickly filled on busy ports, causing packets to be dropped. In the meantime, static buffer memory associated with the less heavily-loaded switch ports is underutilized.

The Centillion 20 switch's architecture features a single, large memory pool from which buffers are dynamically allocated to all module ports. Buffer memory is assigned — as required — in real time to ports servicing higher traffic streams. This results in more effective utilization of the entire buffer memory, and dramatically improves application performance.

Intelligent Congestion Control

Even with the Centillion 20 switch's advanced architecture, there are times during heavy traffic when the buffer pool is full and packets must be dropped. The common industry practice is to drop older packets from the 'front of the line', and then send the newer 'end of the line' packets into the queue when buffer space becomes available. In current networks utilizing protocols such as IP or IPX, this causes transmission of redundant traffic onto the network, compounding traffic congestion.

Centillion switches feature a more intelligent method of congestion control by discarding newer packets first when buffers reach full capacity, while older 'front of the line' packets are queued normally. Some packets must still be retransmitted, but there is no need to resend the entire transmission because the early packets are received normally. Redundant retransmissions are eliminated, and congestion conditions are controlled instead of increased.

Network-Wide Virtual LANs

VRing and VLAN capabilities are supported across all Centillion Token Ring switches. VRings provide a convenient partitioning approach for departments spanning multiple segments. This solution facilitates microsegmentation, while eliminating concerns about increasing bridge hops or requiring new ring numbers. Token Ring ports on Centillion switches across the network can be grouped together into a VRing. By offering Transparent bridging between ports that make up a VRing and using Source Route or Source Route Transparent bridging to other rings, localized topology changes are easily accommodated without incurring changes to the logical network configuration.

Support of network-wide VLANs also supports network partitioning and provides integration between Token Ring and ATM devices. Any number of Centillion Token Ring ports and/or VRings can be grouped into a VLAN. This group of bridged rings can be widely dispersed, spanning the ATM backbone to include rings on other switches. Where LANE is deployed to support ATM-attached server farms, these devices can also be included in VLAN groups via ATM Forum-compliant Emulated LANs (ELANs).

Comprehensive System-Level Network Management

All Centillion switches can be configured, monitored, and controlled through the Nortel Networks Optivity* and SpeedView* management applications, and by IBM LAN Network Manager.

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. For Windows environments, SpeedView is available as a standalone application that is bundled with Optivity Campus* and Optivity Enterprise* management software. The software delivers 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.

Optivity, the industry leading management solution, provides sophisticated yet straightforward management of Centillion Token Ring and ATM environments. A key component of Optivity Enterprise, the 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 multiuser, client/server design that enables users to select from several configuration workspaces. The Configuration Editor manages concurrency across simultaneous editing sessions, and intelligently verifies and validates configuration changes for accuracy. This greatly reduces the potential for misconfigurations, and minimizes the need for troubleshooting during installation rollouts.

In addition to Optivity management software, the Centillion switches can also be managed by LAN Network Manager software from IBM. This is achieved through support for network management agents normally contained in IBM-compatible source route bridges, such as the IBM 8209. This enables all Centillion switch ports to be treated as a collection of bridges, each with one port connected to a LAN segment and the other connected to a common backbone ring.

Applications

Centillion 20 Workgroup Switches facilitate the creation of network topologies that deliver fast, reliable, and controllable desktop application access to critical server-based information. Advanced intranet application intelligent services address the demands of both traditional and Web-intensive environments.

All Centillion LAN-ATM switches implement full LANE services (LAN Emulation Server (LES), LAN Emulation Client (LEC), LAN Emulation Configuration Server (LECS), Broadcast and Unknown Server (BUS)) with unmatched fail-over capabilities. ATM riser and backbone interfaces adhere to and map between the ATM Forum UNI 3.0 and UNI 3.1 signaling standards, as well as IISP and PNNI interswitch path determination protocols. In large enterprise networks, fully meshed, redundant ATM risers and intracampus links ensure ultra-high availability through the Centillion architecture's unique, fault-tolerant, load-sharing switching capabilities.

Switched Workgroup and Medium-Density Wiring Closet Applications

Centillion 20 Token Ring Workgroup Switches can be deployed in wiring closets, and are ideal for providing low-cost switched 4/16 and 32 Mbps Token Ring connectivity to the desktop. The switches support high-speed, resilient ATM backbone connectivity and local 32 Mbps Token Ring and ATM-attached servers. Additional workgroup flexibility is provided by the interconnection of BayStack 500 Series Token Ring Hubs.

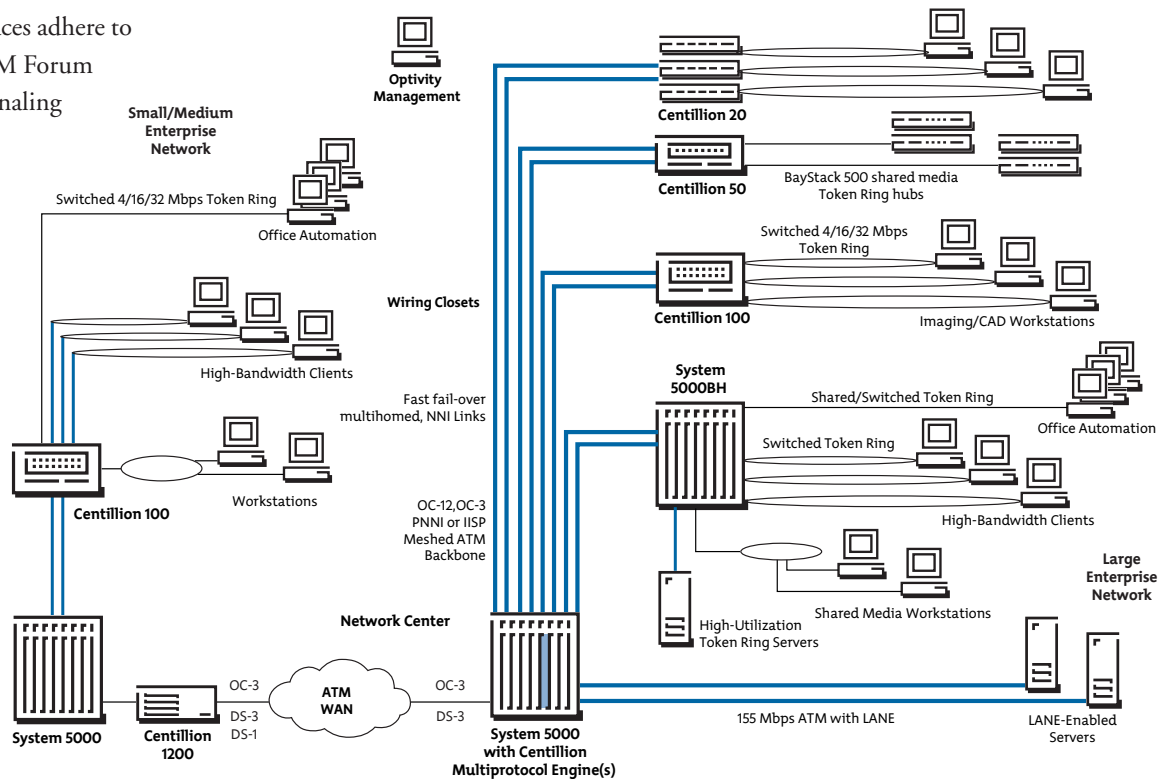
Enterprise Applications and Server/Network Center Connectivity

As networking requirements increase, multiple Centillion 20 Workgroup Switches can be interconnected via ATM 155 Expansion Modules. By using true NNI connections between switches, a scalable, standalone network of Centillion 20 switches can be created.

The Centillion 20 Switches will support stackability through the insertion of multiport expansion modules into each switch. This configuration enables the switches to be stacked, offering a higher capacity solution for networking environments of 700 or more users. The switches can be deployed in high-density wiring closets, where high-speed ATM uplinks provide connectivity to high-powered servers and Centillion 1000 multiservice switches in the network center (see Figure 4).

Through the creation of VRings, Source Route Switching, and comprehensive bridging, all Centillion Token Ring switches facilitate the microsegmentation of large congested rings, making additional bandwidth available to each user without adding network complexity. Multiple physical rings can be grouped into a VRing, retaining the same ring number or subnet addressing as before and preserving the logical network configuration. Support for all standard bridging methods ensures easy integration into any existing Token Ring environments.

Figure 4: Centillion 20 Applications.



Technical Specifications

Table 2: Centillion 20 Token Ring 24-Port Workgroup Switch Technical Specifications.

Number of Ports	24 Token Ring UTP/STP ports with 8-pin modular RJ-45 connectors, one service port with DB-9 connector
Data Rates	4/16/32 Mbps full-duplex switched Token Ring
Cabling	Category 3, 4, 5 unshielded twisted pair and shielded twisted pair cable
Industry Protocols and Standards	
Token Ring	IEEE 802.5r Token Ring
Microprocessors	64-bit MIPS 5000 series processor, 180 MHz per module (250 MIPS)
Memory	
Processing	8 MB
Dynamically Allocated Buffer Pool	8 MB
Electrical Specifications	
Power Consumption	38 W (max)
Thermal Rating	290 BTU/hr. (max)
Physical Specifications	
Dimensions	(L) 10.5 x (W) 12.5 x (H) 1.0 in. [(L) 26.7 x (W) 31.7 x (H) 2.5 cm]
Weight	14.8 lb (6.6 kg)
Environmental Specifications	
Operating Temperature	41° to 104° F [5° to 40° C]
Storage Temperature	-13° to 158° F [-25° to 70° C]
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	ISO 4180-s, NATA 1A
Vibration	IEC 68-2-6/34
Shock/Bump	IEC 68-2-27-29

Table 2: Centillion 20 Token Ring 24-Port Workgroup Switch 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
Safety Agency Approvals	
	UL listed (UL 1950) UL/CUL listed (UL 9K66) TUV licensed (EN 60 950) Meets UL-94-V1 flammability requirements
MTBF	156,000 hrs

Ordering Information

Table 3: Centillion 20 Token Ring 24-Port Workgroup Switch Ordering Information.

Order No.	Description
Centillion 20 Token Ring Workgroup Switch	
AS1701?05	Centillion 20 Token Ring Workgroup Switch with 24-port UTP/STP RJ-45 and 1 expansion slot for an Expansion Module
AS1733001	ATM Expansion Module (2-port copper)
AS1733002	ATM Expansion Module (2-port MMF fiber)
AS1733003	ATM Expansion Module (4-port - 2 copper and 2 fiber ports)

Notes: 1. The “?” in the seventh character of the order number must be replaced with one of the following letter code to indicate desired country:

- A – No power cord included.
- B – European Schuko power cord common in Austria, Belgium, Finland, France, Germany, The Netherlands, Norway and Sweden.
- C – Power cord commonly used in the United Kingdom and Ireland.
- D – Power cord commonly used in Japan.
- E – North American power cord.
- F – Australian power cord, also used in New Zealand and the People’s Republic of China.

Acronym Glossary

ASIC	Application-Specific Integrated Circuit	LED	Light Emitting Diode
ATM	Asynchronous Transfer Mode	LES	LAN Emulation Server
BUS	Broadcast and Unknown Server	MAC	Media Access Control
DSAP	Destination Service Access Point	MIPS	Million Instructions Per Second
DTR	Dedicated Token Ring	MPC	MPOA Client
ELAN	Emulated LAN	MPOA	Multiprotocol Over ATM
ESD	Electrostatic Discharge	MPS	MPOA Server
FDTR	Full-Duplex Token Ring	NetBIOS	Network Basic Input/Output System
FFE	Flexible Forwarding Engine	NNI	Network-to-Network Interface
IBR	Intelligent Broadcast Reduction	PNNI	Private Network-to-Network Interface
IEEE	Institute of Electrical and Electronics Engineers	QoS	Quality of Service
IISP	Interim Interswitch Signaling Protocol	RI/RO	Ring-In/Ring-Out
IP	Internet Protocol	RPSU	Redundant Power Supply Unit
IPX	Internet Packet Exchange (Novell)	SAP	Service Access Point
LAN	Local Area Network	SAR	Segmentation and Reassembly
LANE	LAN Emulation	SNA	Systems Network Architecture
LEC	LAN Emulation Client	SRT	Source Route Transparent
LECS	LAN Emulation Configuration Server	SSAP	Session Service Access Point
		UNI	User Network Interface
		UTP	Unshielded Twisted Pair
		VLAN	Virtual LAN
		VoIP	Voice over IP
		VRing	Virtual Ring



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