Designing economy and growth into multiservice switch platforms

IBM 2225 Nways Multiservice Switch Models 400 and 450

Highlights

- ***Frame Relay, SMDS and ATM services on a single platform***
- ***Multiservice interworking for ease of migration***
- ***Easy expansion through modular design***
- ***High reliability and network availability with full redundancy***
- ***Flexible port capacity***
- ***Wide range of port speeds on one platform: 9.6 Kbps to 155 Mbps***
- ***Feature-rich software implementation***
- ***Standards-based network management platform***
- ***Reliable and predictable network quality of service***
- ***Standards-based distributed routing***
- ***Comprehensive implementation of standards***
- ***High performance—1.2 Gbps***

Multiservice connectivity

Network managers are today faced with several new options for interconnecting sites over WANs. Frame Relay, Switched Multi-Megabit Data Service (SMDS) and ATM, in addition to traditional leased lines and ISDN, are the economically attractive choices available for this purpose.

The IBM 2225 Nways™ Multiservice Switch Models 400 and 450 provide a flexible, cost-effective and multiservice WAN platform based on ATM cell-switching for interworking among Frame Relay, SMDS and ATM. Interworking lets different technologies at either endpoint of a connection communicate seamlessly with one another or make use of new network transport services. Interworking delivers a clear migration path to ATM while taking advantage of today's attractive Frame Relay and SMDS services. By providing all three multiservice packet services, these switches give users the flexibility of choosing the service that suits the particular needs of their networked applications.

Product description

Model 400 and 450 products are fully redundant, high-performance and flexible multiservice packet switches that utilize a standards-based foundation suited for both public carrier and private networks.

Model 400

Model 400 is an eight-slot, modular multiservice platform providing the right balance of price and performance—including the reliability, management and multiservice capabilities of the products. It is designed to provide a cost-effective solution in meeting the rapidly growing needs of low-to-medium-density sites within public network carriers and enterprise end-user networks.



Model 450

Model 450
Model 450 is a 16-slot, high-capacity, modular multiservice platform for interworking among multiservice public and wide area packet networks, including Frame Relay, SMDS and ATM. Model 450 is packaged to accommodate large networks with high bandwidth requirements.

Hardware
The hardware architecture employs symmetrical, RISC multiprocessing that consists of a control processor (CP) interacting with multiple I/O modules. The CP provides network and system management and network routing functions in support of the real-time switching functions provided by the I/O modules.

High availability
The 2225 Nways Multiservice Switches provide reliable and highly available networking solutions. Features include:

- Fully redundant CP, I/O modules, power supplies and fan modules for high reliability in mission-critical applications
- Live insertion and hot-swapping of all CP and I/O modules, power supplies and fan modules to ensure maximum network availability
- Dynamic re-routing of permanent virtual circuits (PVCs) using the OSPF algorithm in the event of network outage
- Very high re-routing rate can be achieved as the result of the 2225's distributed OSPF architecture
- Data-center backup (re-route all PVCs)
- Trunk-failure recovery over ISDN
- Access-port-failure recovery over ISDN (DTE-initiated)

The CP and I/O modules utilize the RISC processor to deliver scalable, high-performance packet-switching needed for ATM and high-bandwidth transmission environments or high-port-density configurations.

Software
The modular design of the 2225 Nways Switch software enables flexibility in the design and implementation of the network, and reliability and ease in managing the network. All products share this common software component for minimizing feature upgrades and customer training costs, allowing backward compatibility and providing consistent and timely support of new features.

A unique software component allows public packet networks based on Frame Relay, ATM or SMDS to be used as trunk links between switches. Another software capability lets network managers choose the network quality of service that most closely matches the needs of their applications environment and allows them to manage the delay characteristics of each virtual circuit in the network.

All ports employ a symmetrical architecture and are software-defined as trunks, Network-to-Network Interface (NNI) or User-to-Network Interface (UNI) links. Any port can be used for any of the software-configurable interfaces, whether it's Frame Relay, SMDS or ATM services. This symmetrical architecture lets network designers mix user network connections and interswitch trunk connections on any single I/O module, allowing for high capacity in a compact platform and economical use of I/O module cards.

Network management
The management application operates in conjunction with a standards-based family of network management products to deliver sophisticated, standards-based capabilities for managing and controlling WANs. It provides a native SNMP agent that supports an enterprise MIB. This MIB includes standard MIB II and other MIBs required by the Frame Relay and ATM Forums. The network management capabilities include: standards-based (OSPF) routing of virtual circuits, rate monitoring, diagnostics, sophisticated congestion management and usage statistics generation.

Remote software download
Software installations, network reconfigurations and software upgrades are downloaded locally or remotely from the network management station to flash memory and nonvolatile configuration memory in the 2225. Flash memory increases reliability by eliminating moving parts such as hard disks, ensuring consistent software revision distribution and keeping upgrade costs low. A replication server function automatically creates a redundant configuration database.

The interswitch trunk software feature allows network operators to maintain the control and manageability of their private networks while enjoying the low cost of shared Frame Relay, SMDS and ATM services from public carriers.

Network services

Frame Relay

I/O modules of the 2225 can act as DCE or DTE at transmission rates of 9.6 Kbps to 45 Mbps, providing comprehensive Frame Relay PVC and switched virtual circuit (SVC) functions, such as Frame Relay switch interface (UNI-DCE), Frame Relay feeder interface (UNI-DTE), Frame Relay NNI, leased-line trunk, multicast or interswitch trunk over Frame Relay.

If the incoming traffic is not Frame Relay, the 2225 will encapsulate the data links into Frame Relay format (FRAD) for protocols such as X.25/HDLC or SNA/SDLC that are not Frame Relay. A unique Translation FRAD function converts protocols such as PPP-encapsulated protocols (such as IP, NetWare SPX/IPX and transparent bridging) to Frame Relay standards based on the Frame Relay Forum's implementation agreement. The Encapsulation FRAD and Translation FRAD functions provide consolidation of all WAN data traffic carried on a single, multiservice packet backbone.

The 2225 supports the most robust set of Frame Relay rate-monitoring and enforcement functions including Committed Information Rate (CIR), Committed Burst Size (Bc) and Excess Burst Size (Be) rate-monitoring; congestion avoidance through Forward Explicit Congestion Notification (FECN), Backward Explicit Congestion Notification (BECN) and congestion recovery mechanisms according to ANSI and ITU standards.

A Frame Relay best effort mode (CIR=0) is offered for lower priority traffic. A closed-loop congestion control optimizes usage of network resources and reduces frame loss. The product allows the network operator the option to pass Excess Burst Rate packets through the network to optimize the use of available bandwidth.

SMDS

The 2225 family provides SMDS services defined by Bellcore and the SMDS Interest Group for SMDS Data Exchange Interface (DXI), Subscriber-Network Interface (SNI), and Server-Switch Interface (SSI) at speeds ranging from 56 Kbps to 45 Mbps. It delivers the functionality of an SMDS Access Server as defined by Bellcore TA-1239 specifications. This provides local SMDS switching for low-speed (less than T1) SMDS and concentration of traffic for large, central-office SMDS Switching Systems in carrier applications. Also delivered is DXI switching functionality, through which multiple 2225 platforms can be interconnected with trunks to build a large, frame-based SMDS Switching System. SMDS Inter-Carrier Interface (ICI) functionality will also be delivered.

ISDN

The 2225 Nways products provide ISDN remote access to Frame Relay, SMDS and ATM WAN switching, enabling private or public remote access services. Dial-secured access is ensured using standard security protocols, including Password Authentication Protocol (PAP), Challenge Handshake Authentication Protocol (CHAP), and RADIUS. ISDN T1/E1 I/O modules are provided for support of ISDN in the U.S., Europe and Australia.

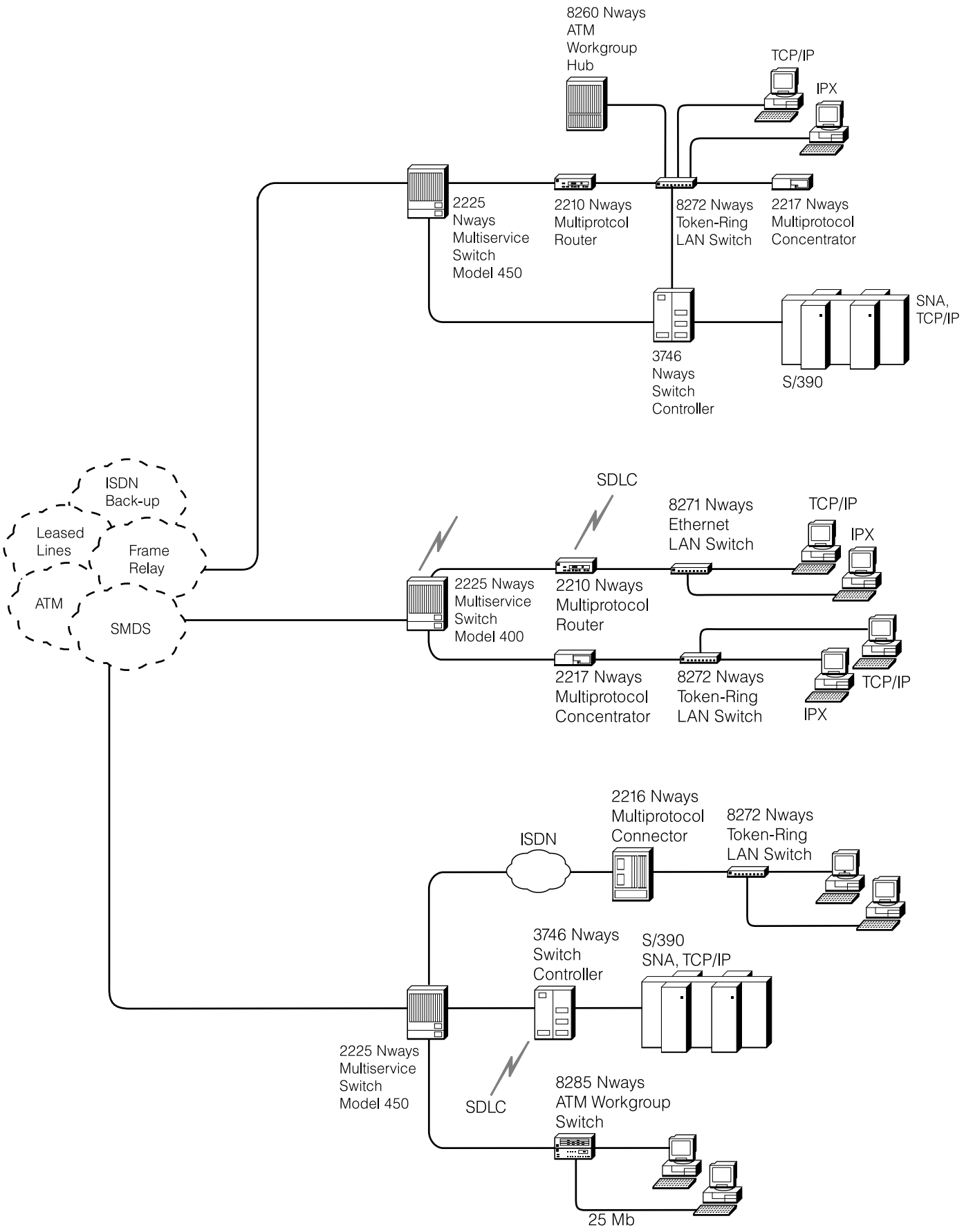
ATM

The 2225 Nways products provide ATM DXI, ATM Framed User Network Interface (FUNI), ATM switching and Frame Relay/ATM interworking. ATM T3, E3 and OC3/STM1 UNI Version 3.0/3.1 is supported. Models 400 and 450 have ATM capability and standards compliance according to ATM UNI specifications to build reliable ATM WANs. These products allow existing network services to make use of an ATM network backbone or convert these services to ATM utilizing the established standards for ATM Adaptation (AAL-5 and Frame Relay/ATM interworking standards).

Frame Relay/ATM interworking provides both network interworking (Frame Relay NNI or trunk over ATM) and service interworking. The 2225 can also perform cell-switching and therefore can also be used as an ATM concentrator. The 2225 can connect to another 2225 or to a 2230 through an ATM trunk. The 2225 and the 2230 can be seamlessly interconnected in the same routing domain and be managed from the same network management station (NMS) platform.

I/O modules

A variety of I/O modules accommodate numerous interface specifications, speeds and protocols. Both the CP and the I/O modules utilize passive I/O adapters that allow any failed I/O module, power supply or fan module to be removed under power without disconnecting cables. This results in a low mean time to repair (MTTR) for the system.


8260 Nways
ATM
Workgroup
Hub
TCP/IP
IPX
2225
Nways
Multiservice
Switch
Model 450
2210 Nways
Multiprotocol
Router
8272 Nways
Token-Ring
LAN Switch
2217 Nways
Multiprotocol
Concentrator
SNA,
TCP/IP
3746
Nways
Switch
Controller
S/390
ISDN
Back-up
Leased
Lines
Frame
Relay
ATM
SMDS
SDLC
8271 Nways
Ethernet
LAN Switch
TCP/IP
IPX
2225 Nways
Multiservice
Switch
Model 400
2210 Nways
Multiprotocol
Router
2217 Nways
Multiprotocol
Concentrator
8272 Nways
Token-Ring
LAN Switch
TCP/IP
IPX
2216 Nways
Multiprotocol
Connector
8272 Nways
Token-Ring
LAN Switch
ISDN
3746 Nways
Switch
Controller
S/390
SNA, TCP/IP
2225 Nways
Multiservice
Switch
Model 450
SDLC
8285 Nways
ATM Workgroup
Switch
25 Mb

I/O Module	*Port Speed*	*ATM*	*SMDS*	*Frame Relay*
Universal I/O (V.35, X.21)	Up to 8 Mbps	Yes	Yes	Yes
Unchannelized T1/E1	1.54/2.05 Mbps	Yes (DXI)	Yes	Yes
Channelized T1/E1	24 or 31, 56/64-Kbps channels	Yes	Yes	Yes
ISDN T1/E1	24 or 31, 56/64-Kbps channels	Yes	Yes	Yes
HSSI	Up to 45 Mbps	Yes (DXI)	Yes	Yes
DSX-1	1.54 Mbps	Yes (DXI)	Yes	Yes
ATM UNI T3/E3 IWU	45/34 Mbps	Yes	No	No
Channelized DS3	28 x T1	No	No	Yes
ATM UNI OC3/STM1 CS/IWU	155 Mbps	Yes	No	No
ATM UNI T3 CS/IWU	45 Mbps	Yes	No	No

Network standard protocols supported

- ANSI T1.606 (and the corresponding ITU 1.233) Frame Relay Architectural Framework
- ANSI T1.606 Addendum 1 (and the corresponding ITU 1.370) for congestion management
- ANSI T1.617/Annex D (and the corresponding ITU Q.933/Annex A) for LMI processing
- ANSI T1.618 (and the corresponding ITU Q.922) Core Aspects of Frame Protocol for Frame Relay Service
- ATM Forum ATM UNI Specification V 3.0
- ATM Forum ATM Data Exchange Interface (DXI) Specification V 1.0
- Bellcore ISDN Exchange Termination to Frame Handler Interface FA-NWT-001328 Issue 1
- Bellcore ISDN Nailed-Up Access to Frame PVC Service SR-NWT-002447
- Bellcore TA-TSV-001239 Generic Requirements for Low-Speed SMDS Access
- Bellcore TA-TSV-000772 Generic Requirements for SMDS
- ITU 1.361 B-ISDN Layer Specifications
- ITU 1.362 B-ISDN Adaptation Layer Specifications
- ITU 1.363 ATM Adaptation Layer (AAL) Specification including AAL-5
- ITU 1.365.1 Frame Relay Service Specific Convergence Sublayer (FR-SSCS)
- ITU 1.555 Frame Relay Bearer Service Interworking Specifications
- ITU Recommendation Q.931, Q.920-Q.921
- Frame Relay Forum UNI Implementation Agreements
- Frame Relay Forum NNI Implementation Agreements
- Frame Relay Forum UNI Switched Virtual Circuits (SVC) Implementation Agreements
- Frame Relay Forum Frame Relay/ATM Interworking Implementation Agreements
- Frame Relay Forum Multiprotocol Encapsulation over Frame Relay Implementation Agreements
- Internet RFC 1157 SNMP Protocol and RFC 1213 MIB II
- Internet RFC 1247 OSPF V 2 Protocol
- Internet RFC 1483 Multiprotocol Encapsulation over ATM
- Internet RFC 1490 Multiprotocol Encapsulation over Frame Relay
- ISDN security: PAP, CHAP, RADIUS
- ISDN signaling:
  - AT&T ESS No. 4
  - AT&T ESS No. 5
  - Nortel DMS 100/250
  - ETSI Euro-ISDN
  - AUSTEL (TS-014)-Australian ISDN
- SMDS Interest Group SMDS Data Exchange Interface (DXI) Protocol Revision 3.2
- SMDS Interest Group Frame Based Interface Protocol for SMDS Networks using the DXI/SNI Revision 1.0

Network management application

Network management is implemented using the SNMP protocol. Configuration management, fault management and performance monitoring are provided by Nways Wide Area Element Manager for HP OpenView/Solaris.

For more information

To find out more about the IBM 2225 Nways Multiservice Switch and other high-performance IBM communications and networking products, contact your IBM representative or call IBM Direct at 1 800 IBM-CALL (1 800 426-2255). You can also access the IBM Networking Home Page at http://www.networking.ibm.com.

Copies of this and other related product specification sheets can be obtained from the IBM FAX Information Service by dialing 1 800 IBM-4-FAX (1 800 426-4329) in the U.S. or Canada or by dialing (415) 855-4329 outside the U.S. and Canada and requesting any of the following document numbers:

4491: *IBM 2219 Nways Frame Relay Switch Model 250*

4492: *IBM 2230 Nways ATM Switch Models 600 and 650*

4493: *IBM 2225 Nways Multiservice Switch Models 400 and 450*

IBM 2225 Nways Multiservice Switch Models 400 and 450 at a glance

Interface specifications	• ITU V.35, 34-pin ISO 2593 • EIA 19-inch rear-, mid- or front-mount or 23-inch central office style option • EIA-449 (ITU V.36) (ISO 4902) 37-pin D sub, ITU X.21 15-pin D sub • T1 per ATT TR 62411 Accunet 1.5 Service Description and Interface Specification • E1 G.703 coaxial unbalanced DB 15 connector or G.703 symmetrical pair 120-ohm balanced DB 15 connector • DS3 Channelized: M13 C-bit Parity, ANSI TI.102, AT&T Pubs 62145 • High Speed Serial Interface (HSSI) Specification Revision 2.11 • OC3 ATM: ATM Forum 3.0/3.1, ANSI T1M1.3/92-005R1, Bellcore TR-NWT-001112 SC Connector • STM1 ATM: ATM Forum 3.0/3.1, ANSI T1M1.3/92-005R1, STM G.707, G.708, G.709, G.783 SC Connector • T3 ATM: ATM Forum 3.0/3.1, ANSI T1.103, T1.107, T1.107a, ANSI T1M1.3/91-003R3, Bellcore TR.NWT.000499 ATT TR-45016
NEBS compliance	Network Equipment Building System (NEBS) Compliant to TR-NWT-000063, Issue 5 Bellcore TR-NWT-001089, Issue 1
Performance	1.2-Gbps backplane 1.0-Gbps full-duplex throughput 2 million cells per second or 500 K packets per second throughput
Physical specifications	Width: 441 mm (17.5 in.) Depth: 378 mm (15 in.) Height: 756 mm (29.75 in.) Weight: 77 kg (170 lb)
Rack-mounting options	EIA 19-inch or 23-inch mid-mount central office style
Power requirements	AC power: auto-ranging 100 to 240 V ac DC power: -48 to -60 V dc 12 amps at 120 V ac or 20 amps at -48 V dc
Thermal dissipation	1000 watts maximum
Operating environment	Operating temperature: 0° to 49°C (32° to 120°F) Relative humidity: 10% to 80% (non-condensing)

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IBM Corporation
DepartmentTYCA
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RTP NC 27709
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