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BROADway

Broadband Network Access Platform



BROADway®

where wireless meets wire...

BROADway

Networking Solutions for Wireless Service Providers



Benefits:

- ▶ Cuts leased circuit costs and saves on costly core switch ports by consolidating traffic at the edge of the network
- ▶ Eliminates cost, rack space, and management complexity by integrating multiple transport and internetworking functions into a compact, modular platform
- ▶ Advanced level of fault tolerance improves network quality of service and protects critical network traffic at all times
- ▶ Supports rapid network capacity growth and new revenue producing services by simply adding additional interface modules or switch processors

Applications:

- ▶ Broadband access concentration
- ▶ Radio Access Network (RAN) traffic hubbing
- ▶ Broadband cell site integrated access
- ▶ SONET/SDH ring extension
- ▶ Fault tolerant SS7 network transport
- ▶ IP traffic aggregation
- ▶ Mobile Switch Center (MSC) interconnection
- ▶ 2G to 3G backhaul network migration
- ▶ Mobile Switch Center multi-services front-end

Features:

- ▶ Modular multi-switch architecture
- ▶ Base System supports up to 2 Ethernet, 60 T1/E1, 4 DS3/E3 and 4 OC3/STM1/EC1 interfaces
- ▶ Stackable system expansion for higher port densities
- ▶ Any to any DS0 and VT/TU granular digital cross connect switching
- ▶ Integrated multi-port IP access routing
- ▶ SONET/SDH add-drop multiplexing
- ▶ Multi-layer, wireless carrier class reliability
- ▶ Adaptive Switching: powerful, node-level traffic protection
- ▶ Integrated CSUs on all T1/E1 interfaces
- ▶ Environmentally hardened (-40 degrees C to +65 degrees C)
- ▶ Lightning protection exceeding Bellcore specifications
- ▶ Web-based GUI, TL1, SNMP, and command line management
- ▶ Advanced circuit diagnostics and troubleshooting utilities
- ▶ Integrated Bit Error Rate Tester (BERT)
- ▶ Compact, 5 Rack Units (RU) high base system

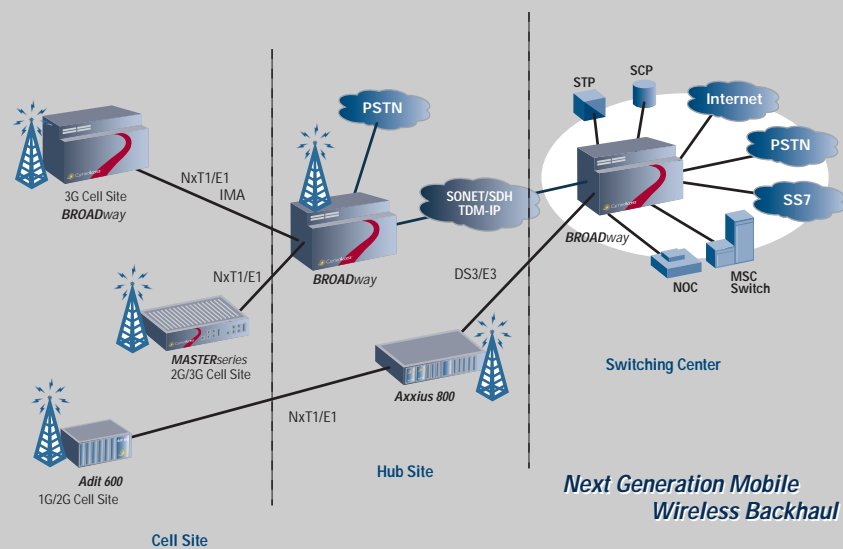
Broadband Network Access Platform

BROADway is designed specifically to address the demanding requirements service providers have in interconnecting their cell sites to the mobile switch center. Together with Carrier Access' Adit® and Axxius® platforms, **BROADway** provides a broadband solution that addresses the needs for both network optimization and new services deployment.

BROADway's integrated functionality can optionally include a SONET/SDH Add-Drop Multiplexer (ADM), VT/TU-level switch, IP access/edge router, 1/0 Digital Crossconnect System (DCS), 1/3 Multiplexer (M13) and multiple Channel Service Units (CSU).

By deploying **BROADway** and moving intelligence to the edge of the backhaul network, service providers can reduce or eliminate costly leased T1/E1 circuits, free up stranded bandwidth and consolidate traffic onto a fewer number of mobile switch interfaces. Advanced multi-services capabilities support the rapid deployment of both mobile subscriber- and non-subscriber-based revenue producing services. **BROADway's** hardened platform design and multi-layer redundancy architecture reduces maintenance truck rolls and improves billed minutes uptime. Advanced management and diagnostic features allow the service provider to take control of the network and rely less on third party wireline carriers.

Designed for the rigorous requirements of wireless carriers, **BROADway** also fits in wireline and enterprise applications that benefit from its high level of availability, flexibility, and scalability.



Reliability

Wireless Carrier Reliability

Carriers can realize many cost-saving benefits from moving network intelligence farther out into the backhaul network, but only if the equipment provides a higher level of reliability and manageability. **BROADway** supports this migration with a multi-layer approach to reliability that provides confidence and control throughout the network. **BROADway** has multi-layer reliability features unmatched in the industry.

System Level

In addition to optional redundant system control logic, **BROADway** contains numerous hardware and software features that ensure high reliability, including:

- Environmental hardening for extreme temperature operation
- Lightning protection that exceeds Bellcore standards
- Multiple network synchronization sources, clock quality evaluation, and ranking
- Redundant fan units and integrated temperature monitoring
- Distributed, redundant power design with a wide ranging DC power input (from +/-20V to +/- 60V)

Switch Matrix

Every switch matrix in the system (TDM and IP) is available with 1:1 or 1:N redundancy.

Interfaces

Software and hardware work together to provide hardware redundancy on all interfaces. 1:1 and 1:N hardware redundancy is designed into the system without the need for custom Y-cables or external devices.

Traffic Protection

BROADway includes multiple methods of protecting critical traffic. All SONET/SDH traffic can be protected in terminal configurations using Linear APS or Multiplex Section Protection (MSP). Ring configurations are protected using Unidirectional Path Switched Ring (UPSR) or Trail protection. Carrier Access has also developed a unique feature providing either Linear APS or UPSR protection for T1, E1, and DS3 circuits. With less than a 50 msec recovery time, low speed circuits can achieve SONET-like reliability.

Adaptive Switching

As an additional layer of protection, **BROADway** incorporates a node level switching feature called Adaptive Switching that allows the system to reconfigure itself in response to circuit or interface failures, performance degradation, or other conditions. This powerful feature reassigns any number of connections and node-level configurations to protect the highest priority traffic and maintain traffic on working circuits.

System Capacity Expansion

Multiple **BROADway** chassis can be stacked using high-speed bus connect processor (BCP) modules to meet a wide variety of higher density applications.

Stacking allows **BROADway** to handle up to:

- 300 T1 or E1 external interfaces in 1/0 DCS applications
- 20 DS3/E3 external interfaces in 3/1 DCS applications
- 12 OC3/STM1 & low-speed interfaces in add drop multiplexer applications

This stacking ability provides the easiest way to increase system capacity without the high up-front costs of other high-density systems. **BROADway** matches costs to the density needed every step of the way.

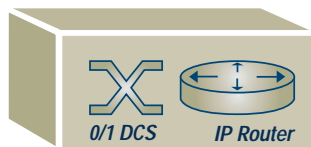


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Architecture Platform Architecture

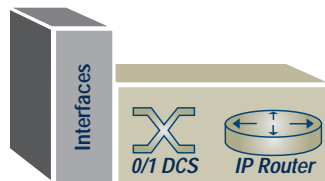
Base System

The **BROADway** Base System includes a twenty slot chassis and a Narrowband Switch Processor (NSP). The chassis' front-access narrowband, broadband, and Ethernet interfaces conserve space and enable hardware interface redundancy without custom Y-cabling or external devices. The NSP module provides the central control for the system, the DS0 granular switching matrix, and a basic IP router with support for termination and routing of packets between multiple logical interfaces – perfect for consolidating many low-speed IP circuits in the network. The base system can also be configured with fully redundant NSP modules.



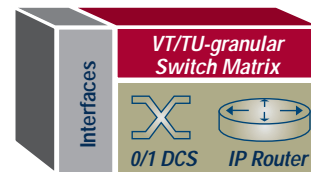
T1/E1 to OC3/STM1 Interfaces

User or network interfaces can be added to the base system by mixing and matching narrowband interface processor (NIP) modules, broadband switching processor (BSP) modules, and optical switch processor (OSP) modules in 16 available slots. The architecture supports a wide variety of interfaces from T1/E1 up to OC3/STM1. All interfaces have access to the DS0 granular matrix and the IP routing engine.



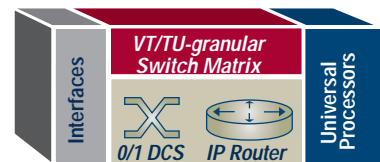
Broadband Switch Matrix

In addition to the DS0 granular narrowband switch matrix that comes standard on all **BROADway** base systems, a distributed VT/TU granular broadband switch matrix can be optionally enabled with the addition of one or more broadband or optical switch processor modules. The combined capacity of the narrowband and broadband switch matrices exceed 508 T1s, 396 E1s, or over 12,000 DS0/E0 equivalent channels per single chassis.



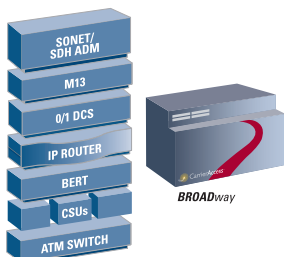
Universal Processors

BROADway is equipped with a unique feature that provides a high level of investment protection. Two Universal Processor slots are available and provide full access to both the narrowband and broadband TDM switch matrices. These slots can be populated with an existing high density T1/E1 interface processor (NHP) module. Systems can be installed today in pure TDM applications and then upgraded to full or hybrid packet/cell handling when needed, reducing initial capital costs.



Compact Design

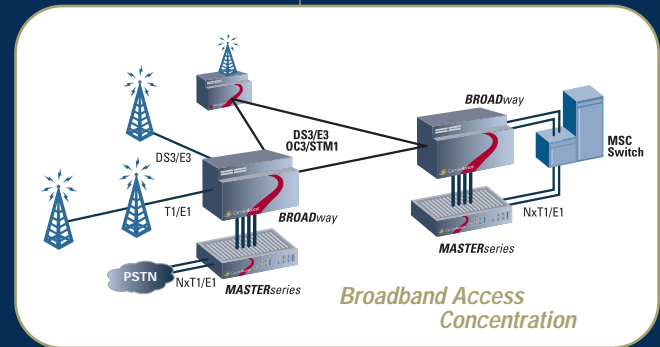
BROADway's integration and compact design result in much lower space and power requirements than traditional solutions. At only five RU high (8.75 in/22.5 cm), **BROADway** replaces the equivalent of an entire seven-foot (213 cm) equipment rack, resulting in a 9:1 or more space reduction. That translates into significant savings in space and power constrained co-location and cell site environments.



BROADway Applications

Broadband Access Concentration

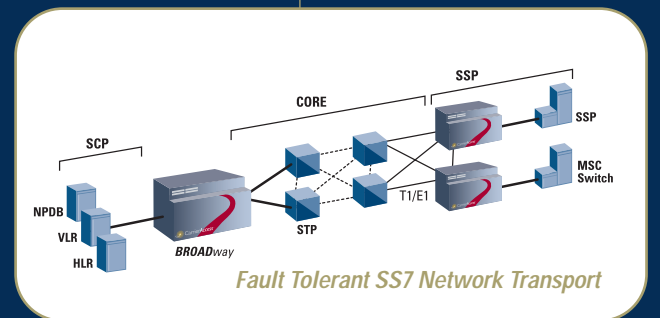
As more cell sites are installed and capacity requirements in the backhaul network increase, wireless carriers are increasingly designing broadband access concentration points into their networks. The ability to converge various traffic types from a variety of leased lines, microwave links, and optical rings at the edge of the network reduces the cost and complexity of providing access from the mobile radio network. Traditional multiplexer and DCS equipment can leave bandwidth stranded. **BROADway's** DS0 granularity and ability to cross connect, multiplex, route and switch in a single platform allows carriers to maximize their capital investment in broadband hub site environments. Multi-layer redundancy provides circuit and traffic protection, enabling the creation of resilient DS3/E3/OC3/STM1 rings or protected point-to-point circuit designs. Carrier Access' **MASTERseries** can be used as a companion system to support ADPCM compression of outbound T1/E1 interconnection circuits to the PSTN providing even further utilization of available bandwidth.



Fault Tolerant SS7 Network Transport

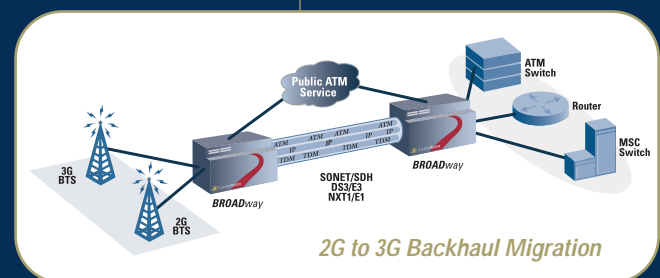
SS7 signaling is a critical component of all mobile wireless networks. Although generally low in bandwidth requirement, the SS7 network must be extremely reliable. Critical functions like call setup, mobile registrations, Prepaid Service, and Short Message Service (SMS) depend on a robust SS7 transport network. As subscriber traffic and service offerings increase, an extremely fault tolerant network is required to protect service revenues.

BROADway's multi-layer reliability provides the ultimate in high availability transport interconnection between various SS7 database and switching nodes. **BROADway** builds redundant circuit paths between SSP and STP elements while consolidating traffic over a fewer number of costly SCP ports. The performance monitoring capabilities of **BROADway** can be used to analyze traffic patterns, identify circuit degradation, and predict growth requirements. When **BROADway** is used within the Radio Access Network (RAN), SS7 traffic can also be groomed along with service traffic to fill unused WAN capacity. Reliability, management, and efficiency are combined into a superior platform for supporting the critical SS7 network—increased reliability at a lower cost, a great combination.



2G to 3G Backhaul Migration

Operators need to support existing 1G and 2G BTS traffic over TDM. **BROADway's** port independent protocol support will provide the transport of mixed TDM and IP over broadband DS3/E3 or SONET/SDH facilities to the MSC. **BROADway** will also provide unified protocol convergence for access to public ATM service providers.



Advanced Advanced Management

Multiple configuration tools and point & click connection management reduces technician time needed to install and configure new circuits, manage the network, and diagnose trouble conditions. An embedded HTTP web server delivers true any time, anywhere remote management, accessible through any Web browser. **BROADway** can also be managed through **MASTERview**, Carrier Access' innovative Web-based, SNMP management platform. Standard support for TL1, a packet services command line interface (CLI), full SONET/SDH DCC, and SNMP management allows for easy integration with existing umbrella management and OSS systems.

BROADway's diagnostics capability is extensive, providing:

- Graphical views of alarms and indicator status
- A wide range of loopbacks and diagnostic tests, including fractional loopbacks
- An integrated Bit Error Rate Tester (BERT) for complete remote testing capability

The management capability also includes performance monitoring on any interface and has the ability to trigger alarms based on performance thresholds.

Web-Based Web-Based GUI

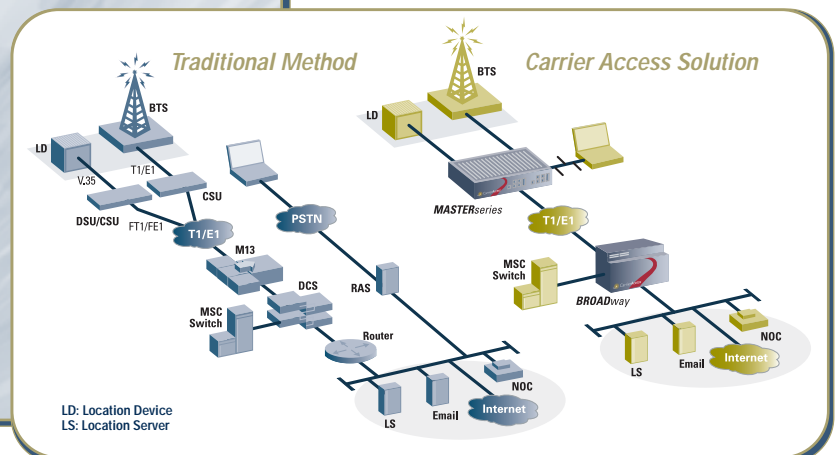


The Web-based GUI built into **BROADway** provides the most convenient and intuitive way to manage the system. All management functions are available from this interface and users can configure new circuits, check alarms, run diagnostics, and set up protection schemes. The GUI also allows a remote technician to view front panel indicator LEDs in real time. In addition, an online, context sensitive help system is in place to guide the user through all aspects of the system.

IP and the Wireless Network

In many wireless networks, IP-based management, E911/location, and user data is backhauled in parallel with BTS traffic. Technicians use a separate POTS line to connect to the corporate LAN for email, network information, or Internet access. At the central site, a combination of M13 Multiplexer, DCS, Remote Access Server (RAS), and IP router are required to connect the BTS and IP traffic to the MSC, location server, management system, Internet, and the LAN.

In Carrier Access' integrated solution for E911/location data, technician LAN access, and IP management, the **MASTERseries** access platform consolidates all cell site traffic onto T1/E1 circuits. At the MSC, **BROADway** combines all functions into a single system, drastically reducing costs and configuration time. The 0/1/3 DCS function of **BROADway** grooms IP traffic channels from incoming T1/E1s or DS3s and terminates them on the built-in IP Routing Engine. The multi-port IP routing capability of **BROADway** supports hundreds of cell sites simultaneously, using PPP or Frame Relay. Multiple pieces of equipment and unneeded leased circuits are eliminated, reducing the cost and complexity of deploying IP-based solutions to BTS sites.



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Technical Specifications

SOFTWARE

Bandwidth Management

- ▶ DS0 level switching, grooming, and time slot interchange
- ▶ VT1.5, VT2, TUI1, and TUI2 grooming and switching
- ▶ STS1, STS3c, AU3, and AU4 switching
- ▶ M13 Multiplexing

Traffic Protection

- ▶ Linear APS, Trail Protection, UPSR, MSP
- ▶ Topologies: Linear, Protected, Ring, Dual-Ring, Mesh

TDM Support

- ▶ SONET – OC3
- ▶ SDH – STM1
- ▶ T1, unchannelized T1, DS3
- ▶ E1, unchannelized E1

Bit Error Rate Tester (BERT)

- ▶ All ones, Alternating, 511, 2047, 2¹⁵-1, QRSS, and 2²³-1 patterns

LAN Protocols

- ▶ TCP/IP, Ethernet

WAN Protocols

- ▶ PPP, Frame Relay, PPP over Frame Relay

Routing/Bridging Support

- ▶ Static routes, RIP/RIP2, OSPF
- ▶ Transparent Bridging, Spanning Tree
- ▶ Multi-port routing (up to 96 simultaneous HDLC terminations)
- ▶ IP QoS – DiffServ, Class-based Queuing, Metering, Traffic Shaping, Random Early Discard, Color Dropping

Security and IP Address Management

- ▶ Access Control Lists (ACL) Layers 1 through 4
- ▶ Network Address Translation (NAT and NAPT)
- ▶ DHCP Relay
- ▶ BootP Relay

HARDWARE

Chassis

- ▶ 8.75" H x 17.4" W x 13" D (222 mm x 442 mm x 330 mm)
- ▶ 19" or 23" rack mount
- ▶ Weight: 30 pounds fully loaded
- ▶ Wide-ranging DC power (+/- 20 to +/- 60 VDC) dual feeds
- ▶ Optional AC power unit
- ▶ Stackable interconnection up to a five chassis system
- ▶ All front access and interfaces
- ▶ 4 alarm contact connections (2 input, 2 output)
- ▶ 20 total slots

Single Chassis Capacity

- ▶ Up to 60 T1 and/or E1 Interfaces
- ▶ Up to 4 DS3 Interfaces
- ▶ Up to 4 OC3 and/or STM1 Interfaces
- ▶ 2 Ethernet Interfaces

Operating Environment

- ▶ Temperature: -40 degrees C to +65 degrees C
- ▶ Relative Humidity: 5% to 95%
- ▶ Altitude: -60 to 3000 meters

NETWORK MANAGEMENT

Applications

- ▶ Statistics/Performance Monitoring
- ▶ Configuration
- ▶ Connection Management
- ▶ Administration
- ▶ Context Sensitive Help
- ▶ Alarms
- ▶ Diagnostics
- ▶ Security
- ▶ Node-Level Adaptive Switching

Connectivity Options

- ▶ Telnet
- ▶ Web-based GUI
- ▶ TL1
- ▶ Industry-standard Command Line Interface
- ▶ HTTP/Web Server in each node
- ▶ SNMP
- ▶ MASTERview
- ▶ SONET/SDH DCC

INTERFACE & SWITCH MODULES

Base System Plus

- ▶ Chassis with front interfaces
- ▶ NSP100 module with I/O DCS and IP Routing
- ▶ (2) Ethernet ports

Narrowband Switch Processor (NSP100)

- ▶ Available for redundant control logic, DCS, and IP Routing

Narrowband Interface Processor (NIP400)

- ▶ (4) T1 or E1 interfaces – software selectable
- ▶ T1 specifications as per TR62411, TR54016, and ANSI T1.403
- ▶ E1 specifications as per ITU G. 703/704/732

High-density Narrowband Processor (NHP160)

- ▶ (16) T1 or E1 interfaces – software selectable
- ▶ T1 specifications as per TR62411, TR54016, and ANSI T1.403
- ▶ E1 specifications as per ITU G. 703/704/732

Broadband Switch Processor (BSP200)

- ▶ (1) DS3 interface
- ▶ DS3 specifications as per ANSI T1.102-1993 and TR-NWT-00049
- ▶ Transmux, M1/3, and VT/TU mapping
- ▶ Distributed VT/TU and M1/3 switch matrix

Optical Switch Processor (OSP155)

- ▶ (1) OC3 or STM1 interface – software defined
- ▶ Distributed VT/TU/STS1/AU3/AU4 switch matrix
- ▶ Duplex, single-mode SC-type interface
- ▶ Optical reach -24.5 dBm (approx. 60 miles/100 km)

Bus Connect Processor (BCP155)

- ▶ (1) 155 Mbps chassis interconnect module

CERTIFICATIONS

US Standards

- ▶ FCC Part 15 and Part 68
- ▶ UL 60950, 3rd Edition

Canadian Standards

- ▶ ICES-003
- ▶ IC CS-03
- ▶ CSA No. 22.2/60950, 3rd Edition

International Standards

- ▶ EN-55022 Emissions
- ▶ EN-300 386-2 Immunity
- ▶ AS 3548
- ▶ EN-60950 Safety
- ▶ VCCI
- ▶ TBR 12/13

