MASTERseries™

MASTERseries
Access Integration Platform
Overview

Networking solutions for wireless service providers

CarrierAccess™

Where wireless meets wire...

Today's wireless market

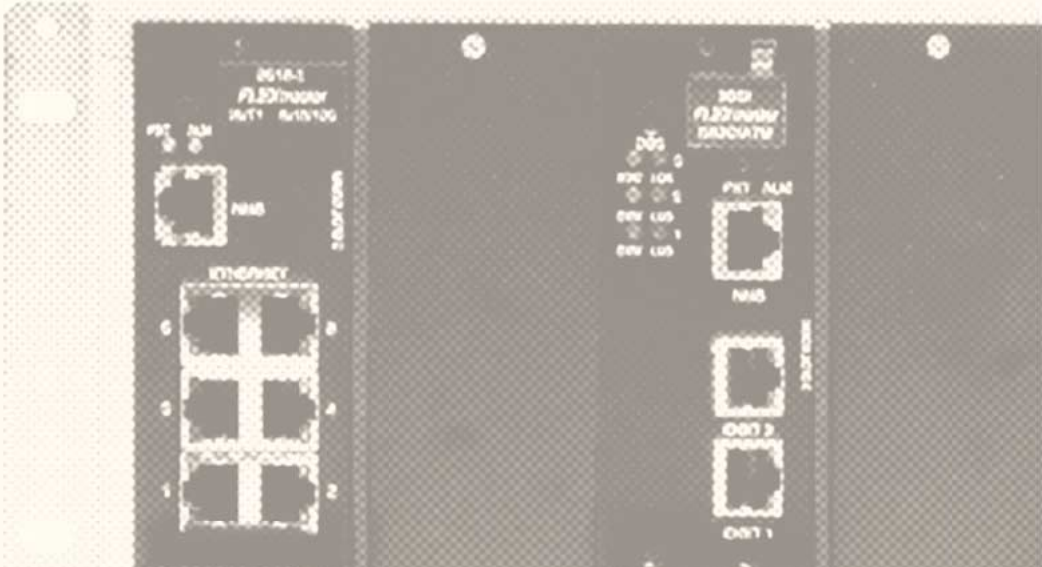
As a wireless service provider, you are facing new demands on your backhaul networks. Minutes of Use are increasing as revenues derived from these same MOU are dropping. Network quality must be increased and service outages eliminated. Coverage areas must continually be expanded, while the network must be readied for the introduction of 3G data services. Accordingly, your backhaul network makes up a large percentage of operational costs — and these costs must be controlled.

The challenge of delivering the latest data service offerings, expanding network coverage, and delivering a higher level of customer service has providers scrambling to maximize existing investments and technology platforms. However, single function network equipment does not have the dependability or the flexibility needed to meet your unique needs as a wireless service provider.

Your environment demands an adaptable and reliable backhaul networking solution that possesses a multi-service feature set to meet the challenging needs of a network in transition.

The MASTERseries solution

The MASTERseries™ FLEXmaster™ Service Module series from Carrier Access is your solution for T1 backhaul and access networking needs. The MASTERseries FLEXmaster modules minimize the total cost of backhaul networks by reducing leased circuit costs as well as maintenance costs of the network; the MASTERseries' highly reliable architecture, superior lightning protection, and Automatic Protection Switching features allow you to maximize billed minutes and substantially improve service quality; and the flexible MASTERseries platform also supports rapid deployment of new sites and services, making it a complete solution for cell and hub site networking for wireless carriers.

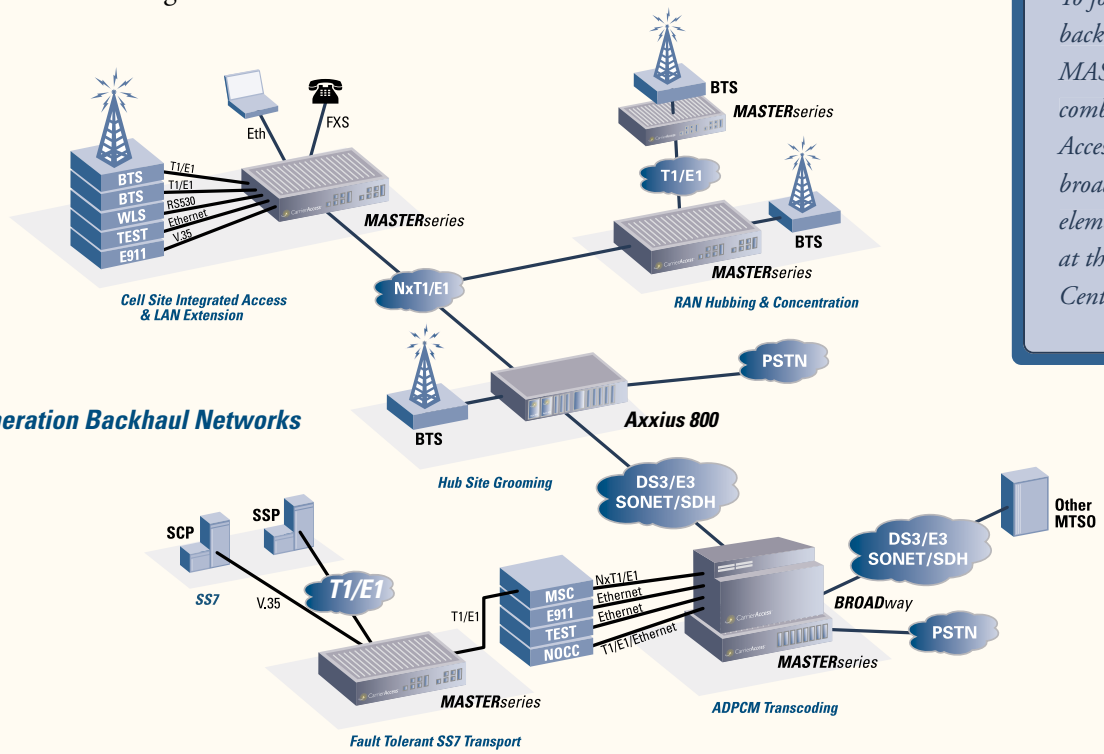


Next-generation backhaul networks

Carrier Access has been delivering solutions for carriers since 1992, and the MASTERseries platform — designed for critical applications — is the answer for backhaul transport network.

At the cell site, MASTERseries handles all integrated access needs — connectivity for analog and digital base stations, E911/location devices, fraud radios, and data devices — in a single, highly reliable platform. The integrated CSU/DSUs and DCS, plus optional IP router, and Ethernet hub functionality eliminate the need for separate pieces of equipment. With the FLEXmaster modules, MASTERseries provides full LAN access to cell site devices for technicians or IP management. When a future upgrade is required for 3G-based ATM transport, MASTERseries supports a seamless integration.

In the narrowband Radio Access Network (RAN), MASTERseries grooms remote cell site traffic onto full T1 circuits for the most efficient networking. This optimal system is created by Automatic Protection Switching providing security for critical traffic; point-to-point and Drop & Insert topologies that are deployed quickly and easily; and MASTERseries' remote management and BERT diminishing the need for technicians to visit distant sites to diagnose and correct trouble conditions.

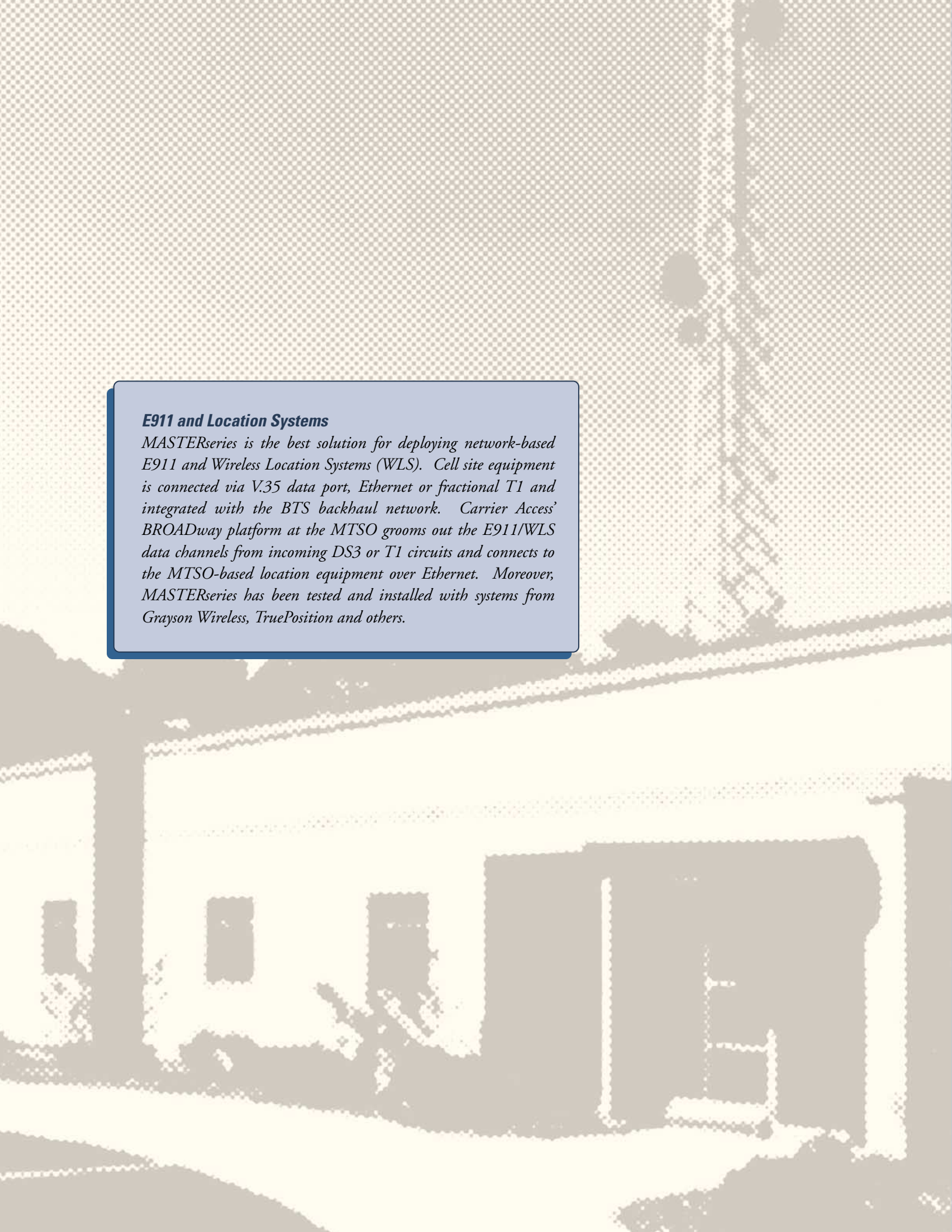


Next-generation Backhaul Networks

IP Access

MASTERseries with FLEXmaster modules uses the backhaul network to provide LAN access from cell sites and other remote locations for technicians. Network operators can eliminate external routers, and management effort by using MASTERseries. In fact, one of our customers estimates that they will save over $100,000 a year in one service area alone since implementing this remote management solution!

To form a complete backhaul solution, the MASTERseries can be combined with Carrier Access' BROADway broadband platform and element management system at the Mobile Switching Center.



E911 and Location Systems

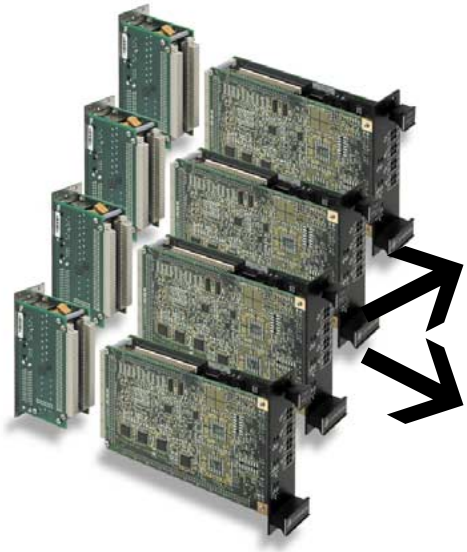
MASTERseries is the best solution for deploying network-based E911 and Wireless Location Systems (WLS). Cell site equipment is connected via V.35 data port, Ethernet or fractional T1 and integrated with the BTS backhaul network. Carrier Access' BROADway platform at the MTSO grooms out the E911/WLS data channels from incoming DS3 or T1 circuits and connects to the MTSO-based location equipment over Ethernet. Moreover, MASTERseries has been tested and installed with systems from Grayson Wireless, TruePosition and others.

The MASTERseries platform uses a passive mid-plane architecture for superior flexibility. Each module consists of a front-mounted processing FLEXengine and a rear mounted interface adapter module. Different application modules add specific capabilities, such as TDM, ATM inverse multiplexing, or DS3 ATM access which are available across the full system. Operators have the ability to mix and match various modules to create systems fully tailored to their needs.

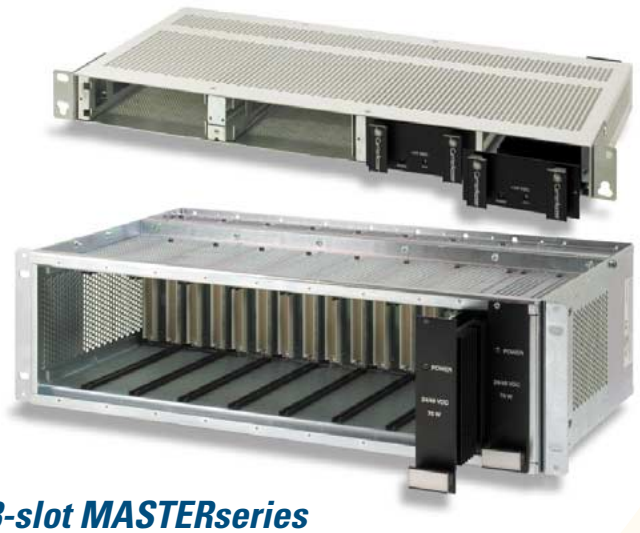
Service Modules

Interface Adapters

Processing Engines



2-slot MASTERseries



8-slot MASTERseries

Architecture

FLEXmaster modules are available with the integrated Ethernet IP Router, which provides a full IP router with 2 Ethernet ports.

With 2-slot, or 8-slot enclosures, MASTERseries products use less physical space than the majority of solutions in the industry. A single FLEXmaster8 T1 module supports up to eight T1s of cross-connect, two Ethernet ports, and one V.35 data port. A rack mountable dual slot 1RU system supports up to 2 FLEXmaster modules and the eight slot supports up to four FLEXmaster modules. In a full eight-slot enclosure configuration, only a 3RU space is required to support up to 32 T1 circuits!

MASTERseries modules are designed around a DS0-granular cross-connect fabric. Each type of application module adds to this capability with T1 ports, data ports, and specialized functions such as TDM, IP routing, and ATM. When installed in a multi-slot chassis, the FLEXmaster modules work together to provide an integrated system.

The distributed MASTERseries switching capability of the FLEXmaster modules is interconnected over two high-speed buses. The TDM communications bus allows any-to-any connection of network traffic between modules. The inter-module Packet Bus, along with the distributed intelligence of the modules, eliminates the need for a dedicated control module in any shelf.

Integrated solutions deliver flexible, seamless next-

Total Backhaul Solution — Converged infrastructure for GSM and UMTS

ATM is the ultimate cellular backhaul technology. ATM can cope with the multiple technologies of the various mobile generations, and can handle different traffic types with great efficiency due to its built-in QoS capabilities that offer traffic prioritization and service differentiation as well as traffic engineering capabilities. ATM gives a mobile operator the ability to transport voice and video streaming with fixed resources using CBR while adaptive traffic flows like Internet surfing or messaging can be handled with VBR.

Mobile operators have greater ability to manage network operations and reduce their operating expenses. This extends to integration of 2G and 3G traffic flows, which is less problematic over a cell-based network than other networks. This also applies to supporting a future packet-based mobile access network since ATM can efficiently map Ethernet/IP over its core.

With the ATM capabilities of the MASTERseries mobile operators can converge all of their existing TDMA, AMPS, GSM and UMTS traffic onto a common ATM access infrastructure. A single converged infrastructure reduces the complexity of managing multiple overlay networks and provides bandwidth flexibility as the usage of different applications rises or declines and as users migrate to newer technologies. A converged ATM infrastructure also reduces the cost of expensive multi-T1 or TDM DS3 leases.

MASTERseries supports interworking between ATM and TDM transport allowing operators to start with network overlays for UMTS and migrate in the future to converged ATM transport. The FLEXmaster ATM modules support legacy traffic transport services over ATM using circuit emulation services in the converged transport model. This traffic can be carried over a multi-T1 IMA group or on ATM DS3 or OC3 services.

The ***FLEXmaster8 or 16*** Service Modules for the Carrier Access MASTERseries platform are intelligent compact devices providing wireless mobile transport networking solutions for voice and data T1 integrated access, and wireless cell site traffic grooming, concentration, backhaul and LAN extension. The FLEXmaster8/16 modules function as an 8- or 16-T1 micro-DCS and multi-link T1 DSU/CSU with router, and features the powerful Carrier Access FLEXengine processor for ATM-based transport migration. The FLEXmaster8/16 modules eliminate the uncertainty of cell site backhaul network protocol migration from TDM to ATM or IP by offering unparalleled backhaul networking flexibility for both UMTS and CDMA2000 migration paths. ATM, IP and GSM A_{bis} compression options are remotely upgradeable to the FLEXmaster8/16 modules via simple software loads once available.

The ***FLEXmaster8 with ATM*** module functions as an 8-T1 ATM access concentrator and multi-link T1 DSU/CSU with Ethernet bridging and features the powerful Carrier Access FLEXengine processor for ATM-based transport. Up to eight T1 Interfaces support ATM-UNI and IMA functions. The T1 ATM UNI support UMTS Node B Radio T1 interfaces and the module provides ATM cell switching and forwarding functions. The module supports T1 ports for structured CES service and AAL1 adaptation with Quality of Service (QoS) support. The FLEXmaster8 ATM module provides ATM multiplexing of legacy radio traffic along with NODE B Radio ATM traffic for converging cell site traffic onto a single ATM access network. The FLEXmaster8 ATM module Ethernet port supports RFC2684 Bridged operation to supply the required connections for the management data channel, providing a data transport pipe for the private management LAN extension network at the cell site.

-generation services with carrier-quality reliability

As bandwidth requirements increase, mobile operators need to evolve their RAN to a cheaper cost per bit transport, and also reduce overall bandwidth requirements by taking advantage of Carrier Access' GSM optimization as well as statistical multiplexing techniques to, in essence, create "bandwidth on demand". This satisfies the dynamic and growing bandwidth needs of the network while offering investment protection allowing the operator the flexibility to adopt new transport technologies without upgrading their entire network.

Wireless Carrier-Class reliability

Lightning, extreme heat, and bitter cold — MASTERseries can withstand whatever Mother Nature dishes out. With a Mean Time Between Failure (MTBF) measured at over 60 years, MASTERseries builds in multiple layers of reliability and redundancy to protect critical traffic.

At the system level, MASTERseries exceeds the Telcordia standards for lightning protection, and provides a self-healing capability that restores the circuit after a lightning strike. The platform is environmentally hardened for operating in extreme temperatures from -40 °C to 65 °C, and is available with redundant power supplies.

Each module is also designed with distributed intelligence so that any and all modules can handle the operation and management of the shelf. Combine all this with integrated Automatic Switching Protection (APS) with up to 16 individual configurations and a route diversity feature that maintains and prioritizes traffic flow during circuit failure or service degradation, and your transport network is always prepared for the unexpected, whatever the application.

The ***FLEXmasterDS3c-3 with ATM*** module provides three DS3 ATM interfaces and interworking functions for collecting of Node B DS3 UMTS 3G UMTS traffic and converging GSM traffic, management and E911 traffic onto the same DS3 ATM access network. The FLEXmasterDS3C/ATM Module is a highly integrated solution, functioning as a stand-alone unit or as fully integrated with the FLEXmaster8 modules in MASTERseries 2-slot and 8-slot enclosures. The FLEXmasterDS3C/ATM Module is comprised of a front-loading FLEXmasterDS3C/ATM processing engine module with and a rear loading interface adapter module containing three DS3C (concatenated) ATM-UNI interfaces.

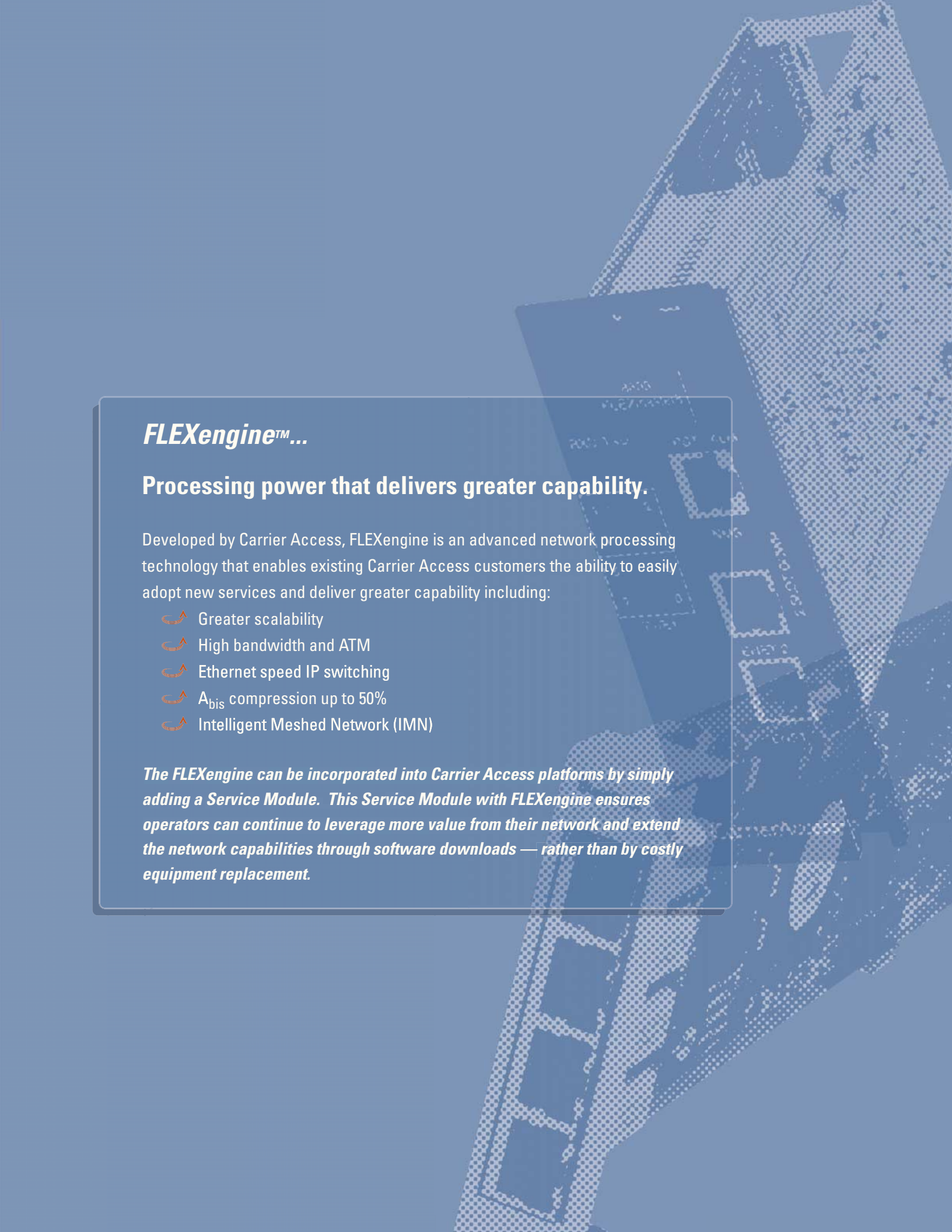
T1 CES and T1 UNI support into a DS3 ATM service can be provided using the FLEXmaster8 Module and T1 backplane connectivity to the DS3C/ATM Module. The DS3C/ATM module can combine traffic from DS3 Node B and T1 Node B interfaces onto a single DS3 ATM network. T1 CES service on the FLEXmasterDS3C/ATM module provides the capability to combine GSM traffic and UMTS ATM Node B traffic over the ATM access network.

The ***HUBmaster*** module is a five-port 10/100 Ethernet hub. The HUBmaster expands the number of Ethernet ports available while conserving space. Its environmental hardening ensures that it will stand up to the extreme temperature and humidity requirements of cell sites and remote locations. Integration with the MASTERseries platform simplifies power and mounting in locations where space is at a premium.

At cell sites, HUBmaster connects to IP-based devices such as remote testing units, management ports on other equipment, location devices, and the technician's laptop.

What makes the MASTERseries different?

Feature	Benefit
◗ FLEXmaster™ Modules with FLEXengine™ on board	◗ Quickly introduce new services with software upgrades
◗ Software upgrades for ATM services and A_{bis} optimization	◗ Seamless migration of services ◗ Integrates multiple functions for a variety of networking solutions ◗ Reduces cell site to mobile switching center transport costs
◗ Converged WAN services in a fully ATM-featured product	◗ Consolidate traffic to save transport access charges and equipment costs ◗ Advanced QoS traffic management ensures high utilization of ATM links ◗ Unify 2G, 2.5G and 3G cell site traffic streams over a single optimized transport
◗ Integrated Router for IP-based remote management and control	◗ Reduce operating expenses with remote management and Performance monitoring
◗ Integrated BERT and loopback test capability	◗ Quick problem isolation and trouble-shooting ◗ No need for external test gear ◗ System configuration validation
◗ Environmentally hardened (-40 °C to 65 °C) ◗ Mean Time Between Failure (MTBF) of over 60 years ◗ Event-driven automatic protection switching (APS) ◗ Lightning protection	◗ High reliability ◗ Reduces service outages
◗ FLEXmaster Modules operate in dual and eight slot enclosures	◗ Hot-swappable modules and power supplies ◗ Universal +24 VDC or -48 VDC power with optional redundancy ◗ Reduces space and power requirements with a compact design ◗ Eliminates the need for multiple box solutions ◗ Multi-services modular platform



FLEXengine™...

Processing power that delivers greater capability.

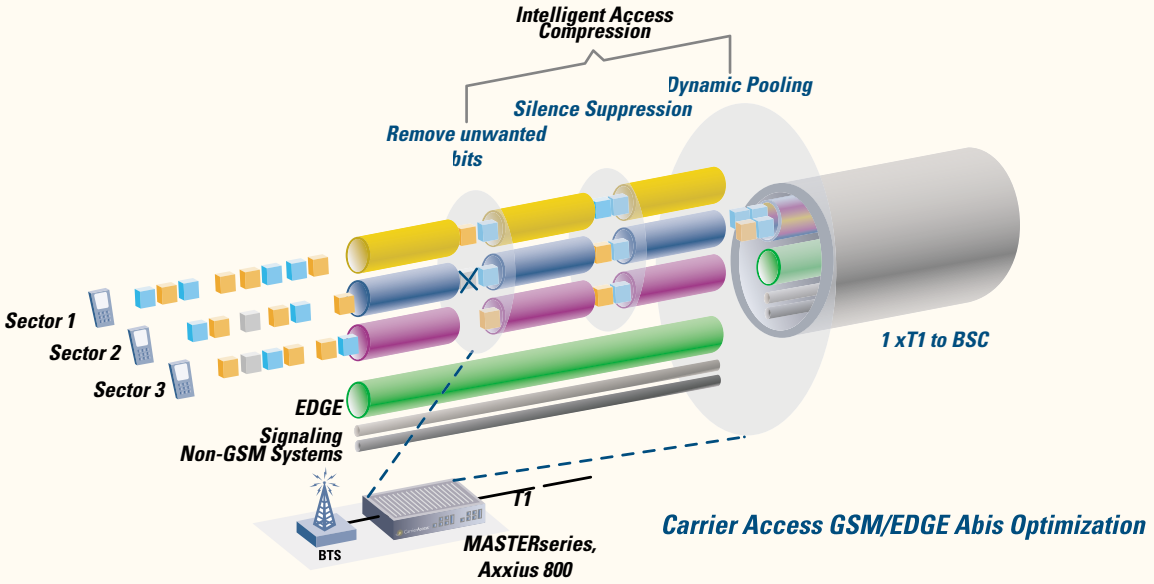
Developed by Carrier Access, FLEXengine is an advanced network processing technology that enables existing Carrier Access customers the ability to easily adopt new services and deliver greater capability including:

- Greater scalability
- High bandwidth and ATM
- Ethernet speed IP switching
- A_{bis} compression up to 50%
- Intelligent Meshed Network (IMN)

The FLEXengine can be incorporated into Carrier Access platforms by simply adding a Service Module. This Service Module with FLEXengine ensures operators can continue to leverage more value from their network and extend the network capabilities through software downloads — rather than by costly equipment replacement.

Dynamic bandwidth with bonded T1s

MASTERseries FLEXmaster ATM modules support the bonding of up to 8 x T1s into an ATM IMA group today through the use of our deployed FLEXengine technology. The FLEXengine forms the heart of your efficient transport strategy and allows through software upgrades utilization of our A_{bis} optimization, ATM transport, and eventual migration to an all IP transport.



Carrier Access GSM/EDGE Abis Optimization

By taking advantage of Carrier Access' A_{bis} optimization technology — Intelligent Access Compression — not only do GSM bandwidth requirements drop by as much as 50%, but the technique packetizes the traffic, making it suitable for immediate transport over ATM.

A prudent, forward-looking cellular backhaul strategy must take into account current voice requirements and limited data traffic while minimizing network operating expenses or capital equipment outlays. Yet it must also have the capability to factor in future broadband services, which will eventually encompass multimedia imaging, broadcast video and video conferencing. MASTERseries with FLEXmaster meet these challenges and provide the mobile operator with plenty of available options.

OMC Companion - Managing Your Access Network

Managing your backhaul network could not be easier or more comprehensive with Carrier Access. MASTERseries platforms can be remotely managed via Telnet, SNMP, or the Operations & Maintenance Center (OMC) Companion, Carrier Access' industry-leading web-based management application. An extensive set of loopbacks, performance monitoring, and integrated Bit Error Rate Tester (BERT) allow for complete diagnostics.

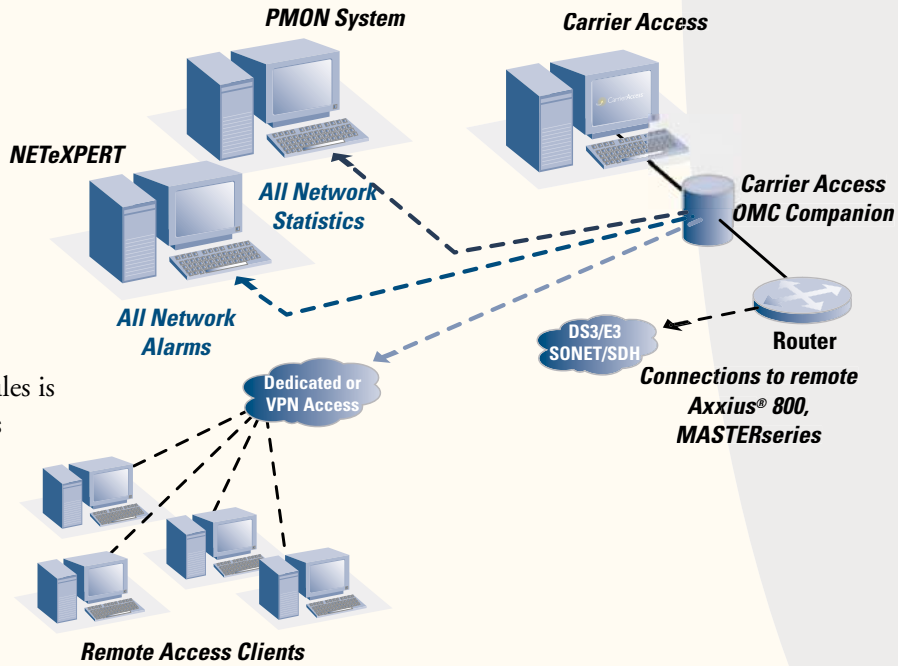
The OMC™ Companion enables wireless carriers to effectively manage, monitor, configure, and provision Carrier Access Network Elements (NEs) throughout the network:

- Immediately identifies and reports cell site alarms.
- Enables remote provisioning and software upgrades.
- Eliminates or substantially reduces the need for technician cell site visits.
- Inventory all Carrier Access network element's software versions and configuration changes for each individual market and provide that information to your inventory management system.

The OMC Companion supports a variety of key applications addressing all of the FCAPS capabilities required to manage Carrier Access' transport solutions.

Key applications supported are:

- Fault Management
- Configuration Management
- Discovery
- Performance Management
- Security



Delivering more with less

The MASTERseries platform with the flexiblity of delivering a powerful new generation of modules is designed to deliver real value to mobile operators through reduced operating costs and a reduction in overall transport bandwidth.

The FLEXmaster modules make it easy for operators to expand and roll out new services while meeting existing bandwidth requirements and the requirement that all traffic flow through a single access device. FLEXmaster modules allow operators to fully utilize MASTERseries platforms to overlay, converge and/or compress their transport networks and meet their specific needs with a standards base access device. Carrier Access continues to innovate in the wireless transport access market — delivering the most value in the transport network.

CarrierAccess™

for more information, see the Product Specifications sheets for the MASTERseries Service Modules,

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