

MALC Product Guide



Multi-Service Access Platform

Access for a Converging World

MALC Multi-Service Access Platform

Delivering Any Service... On Any Network... Over Any Media... Anywhere!

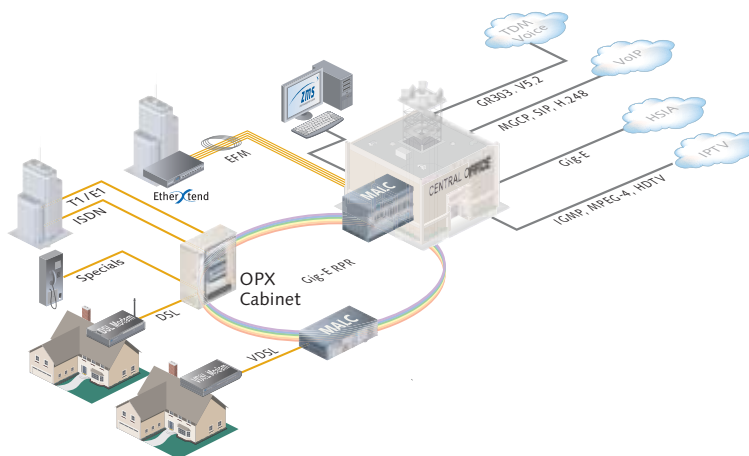
Meeting Today's Carrier Challenges

In a competitive and rapidly-changing market, service providers face increasing technology challenges when it comes to keeping pace with new services and migrating from legacy to advanced IP networks to support them. They are looking for the means to avoid continuous capital investments in technology every time a new need arises. The solution is a **Multi-Service Access Platform (MSAP)** that economically delivers today's service needs, yet has all the features and capabilities to meet tomorrow's requirements. Service providers want an intelligent MSAP that enables new services through line card provisioning and software upgrades rather than forklift replacement. The platform is designed for their unique networks and needs, whether an RBOC, PTT, ILEC, CLEC, or alternative carrier.



MALC Multi-Service Access Platform—MSAP

The MALC™ is an intelligent, next-generation Multi-Service Access Platform (MSAP), built on Zhone's Single Line, Multi-Service (SLMS) architecture. Its advanced software foundation enables the service provider to deliver any type or mix of residential and business services over copper or fiber. Not only does MALC support core POTS and TDM services, but it has all the functionality built-in for enhanced IP services such as IPTV, EFM, and VoIP as well. The ability to provision copper services slot-by-slot and port-by-port provides a service provider a combination of flexibility and service migration that results in lower costs and greater profitability. The MALC is a true MSAP, combining the functions of an NGDLC, IPD SLAM, BLC, and Ethernet Access Device into a single, powerful, seamless service engine.



- Residential
 - POTS, VoIP, IPTV, RFTV and Broadband
- Business
 - POTS, VoIP, T1/E1, DS3/E3
 - EFM, DSL, Specials

MALC Market Leadership

MALC Added Values Set a New Standard for Access

Highest Port density

The MALC offers the highest port densities per rack unit in the industry—an invaluable benefit in co-location and remote node applications.

Unified Management

Support for every type of service, over copper or fiber, supported from one platform with one interface to the OSS, one Element Management System, and one set of training.

Packet Migration

Provides a future-proof migration path from TDM to packet, from copper to fiber, or dedicated to triple play.

CPE and ONT Line

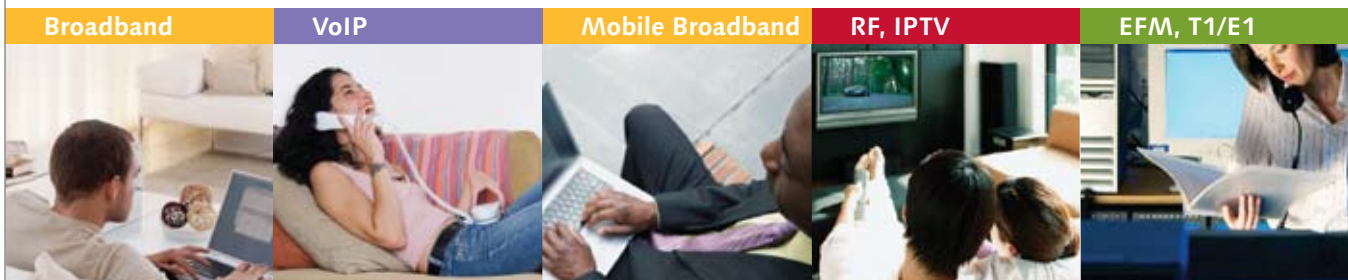
The MALC is supported by a broad line of Zhone products (modems, EADs, OPX cabinets and optical transport) to offer service providers a complete service solution.

Layer 2 and 3 Intelligence

The MALC is an advanced and intelligent Layer 2 and 3 IP platform, with QoS, CoS and other IP functions and features needed for today’s multimedia oriented residential and business services. The MALC increases the resiliency and the scalability of the network by pushing IP functions (e.g., routing and bridging decisions) to the network edge.

Software-Defined Access

MALC is based on Zhone’s Single-Line Multiple Service (SLMS) architecture. SLMS ensures that new features and enhancements are provided through software upgrades. It also means more universal slots in the chassis are available to provision services, so that new subscribers can be added without disrupting service to the existing subscribers.



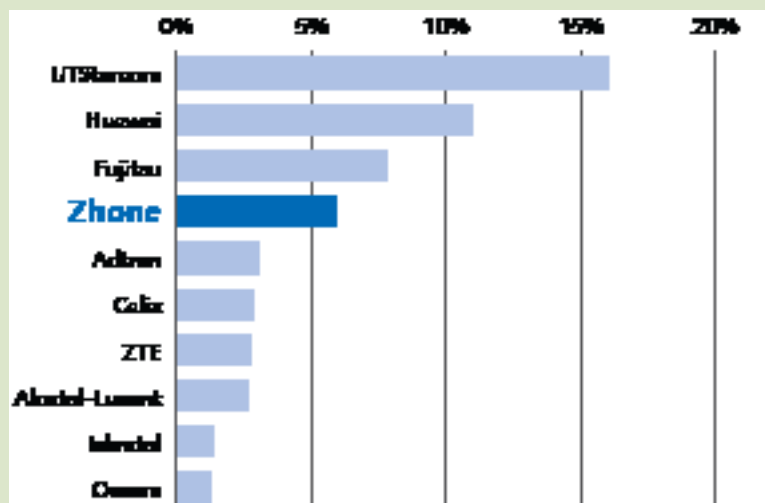
Milestones

Ranked number 1 in MSAP port shipments in Central and Latin America*

Ranked number 4 worldwide in MSAP port shipments*

* Source: Infonetics, Q3 2007

MSAP Market Share



MALC Voice Services

The MALC delivers all types of voice services, whether POTS or VoIP, which are still the core services and revenue generators for most service providers.

The MALC's voice gateway cards provide seamless interoperability between TDM and VoIP, and can also be the voice gateway for migration from TDM to IP voice. The unique ability to convert voice traffic on a port-by-port, service-by-service basis allows the service provider full flexibility in managing the transition of their network from TDM to a pure packet access network.



TDM Voice Services. The MALC can directly connect to TDM switches using GR-303 or V5.2 voice interfaces. The MALC supports transport of any local voice port over T1/E1 interfaces to the switch.

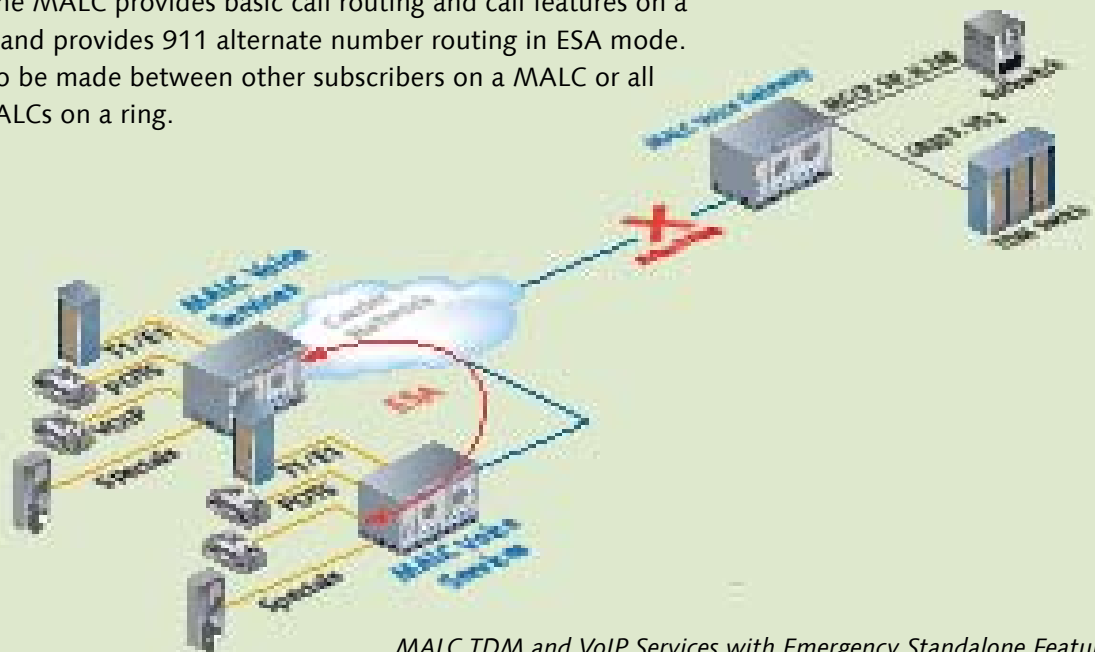
TDM Special Services. The MALC supports a wide range of voice special services such as ISDN (BRI and PRI), Coin, FXS and FXO, POTS pulse dial and ground start, and T1/E1 (PWE/TDM).

Voice Gateway. Voice Gateway cards provide packet voice interfaces to GR-303 and V5.2 voice switches.

Voice over IP (VoIP). The MALC supports MGCP, SIP, and H.248 for VoIP as the VoIP Line Access Gateway. It allows call processing to be distributed to remote terminals as close to the customer as possible, and generates dial-tone for local voice interfaces.

Emergency Stand Alone (ESA)

The MALC has ESA capabilities for both TDM and VoIP services. On a network failure, the MALC provides basic call routing and call features on a standalone basis, and provides 911 alternate number routing in ESA mode. ESA allows calls to be made between other subscribers on a MALC or all subscribers on MALCs on a ring.



MALC TDM and VoIP Services with Emergency Standalone Feature

MALC Broadband Services

Providing residential and business high speed Internet services over DSL is a high demand, high profit and highly competitive business.

The MALC is a complete broadband services solution, supporting a variety of DSL options to meet bandwidth and coverage needs, and with the flexibility and scalability to allow deployment in any location needed to optimize network design.

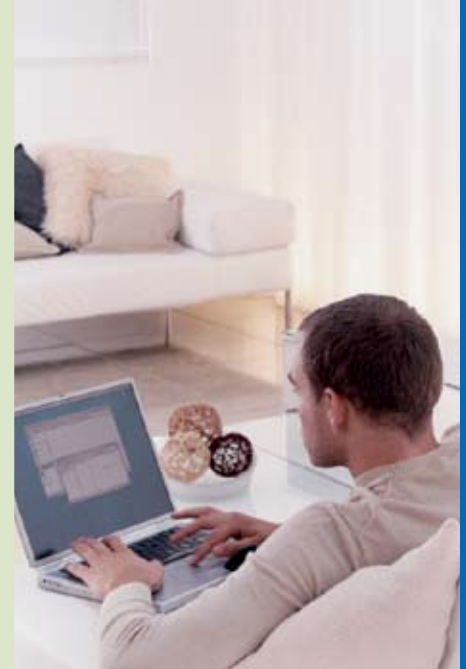


IP DSLAM Capabilities. Bridging or routing subscriber services at the access edge, the MALC provides intelligent features such as DHCP Server/Relay agent with Option 82, PPP, and 802.1p and 802.1Q for QoS.

Ethernet DSLAM Capabilities. In addition to the IP features, the MALC provides Ethernet bridging, Ethernet filtering and snooping, VLANs and a complete packet infrastructure.

ATM DSLAM Capabilities. Co-existing with IP-based services, the MALC can support legacy ATM DSLAM data services including ATM QoS, PVCs, etc. As an ATM DSLAM, the MALC can provide cell relay services.

Zhone also offers a full line of Broadband DSL CPE for residential and business services. (Please refer to the Zhone CPE Product Guide for details.)



Residential Broadband

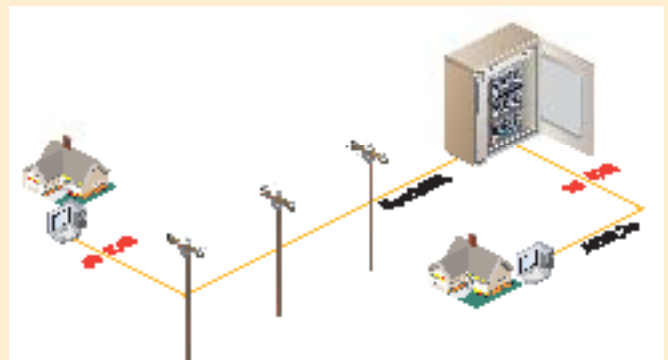
The MALC offers choices in DSL options for residential services from high-density 48-port line cards, including ADSL2+, ADSL2+ and POTS combo, and ADSL2+ with integrated splitters. A 24-port VDSL2 line card is supported for even higher bandwidth needs.

Business Broadband

The MALC provides options from small and medium business to enterprise broadband service needs. SHDSL, EFM, and VDSL2 all support symmetrical bandwidths up to 45 Mbps. Legacy T1/E1 and DS3/E3 TDM services are supported, along with standard ADSL2+. The MALC supports advanced features such as VPN, RADIUS, Q-in-Q VLAN, and Transparent LAN Service (TLS).

ReachDSL

Zhone's Reach version of ADSL is the perfect solution for less-than-ideal copper or long loops serving remote areas. Widely used and field proven, ReachDSL performs on loop up to 40 Kft. with speeds of 256 Kbps.



MALC Video Services

IPTV Functionality Built In

The MALC is designed to deliver multicast and control for IPTV at the most critical point in the network — nearest the subscriber. The MALC allows critical functionality such as multicast and authentication control locally at each node, providing a fully distributed IPTV solution. The MALC can deliver MPEG-2 and MPEG-4 broadcast and unicast VoD streams, whether Standard Definition or High Definition.

MALC IPTV Features

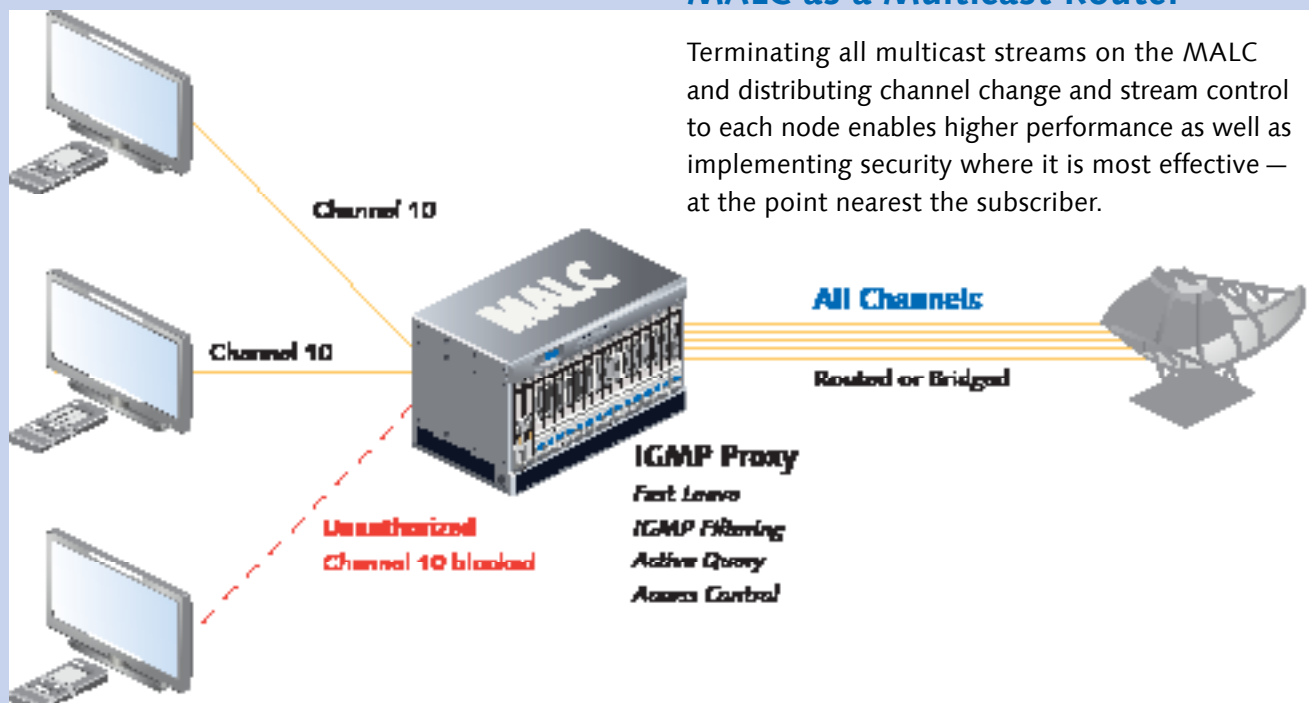
- IGMPv2 bridging or routing with sparse or dense mode broadcast
- Uses a multicast backplane architecture to optimize bandwidth across every port
- Can act as the multicast router to the network
- Can perform IGMP filtering and active query for security and piracy protection
- Manages MAC addresses for authentication
- Can be used with DHCP Server/Relay for IP set top subnets and booting
- Single and dual Gigabit uplinks with Link Aggregation, as well as Resilient Packet Ring (RPR) for multi-node rings

MALC High-bandwidth IPTV Line Cards

- ADSL2+ (48 ports per card)
- VDSL2 (24 ports per card)

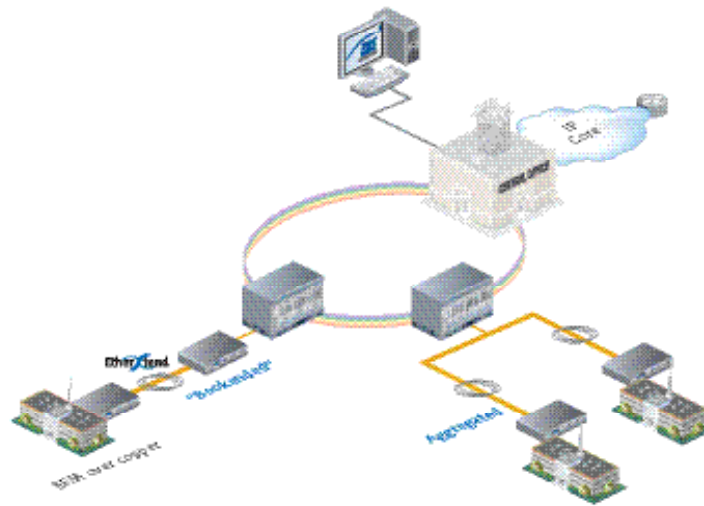
MALC as a Multicast Router

Terminating all multicast streams on the MALC and distributing channel change and stream control to each node enables higher performance as well as implementing security where it is most effective — at the point nearest the subscriber.



MALC Ethernet-over-Copper

Ethernet-over-Copper (EoC) loop bonding is the fast and cost-effective way to deliver higher bandwidth business services without the time and expense required to install fiber. The MALC supports both standards-based 802.3ah and pre-standard Net to Net (N2N) loop bonding, with high-density 24-port SHDSL.bis and T1/E1 line card options. The MALC allows bonding across all ports in a line card and up to 8 ports on a per-connection basis to achieve up to 45 Mbps symmetric data rates. SHDSL.bis card options support network timing, wetting current, and line powering for applications that require them. EoC can be provisioned for either bridging or routing applications, with support for IP QoS, CoS, ToS, and IP SLA among its many advanced features.



Port Density	MALC 723 7U	MALC 719 7U	MALC 319 3U	MALC EFM & EoC
SHDSL.bis	480	384	192	Bonds up to 8 SHDSL.bis ports to deliver 45.6 Mbps
T1/E1	480	384	192	Bonds up to 8 T1 ports to deliver 12 Mbps Bonds up to 8 E1 ports to deliver 16 Mbps

Zhone's family of EtherXtend™ Ethernet Access Devices (EADs) provides a total service solution

- 3400 Series SHDSL.bis 4 or 8 port
- 3000 Series SHDSL.bis 1, 2, or 4 port
- 2200 Series DS3/E3 1 or 2 port
- 2100 Series SHDSL.bis 1 or 2 port
- TNE (T1 Network Extenders 1-8 ports)
- ENE (E1 Network Extenders 1-8 ports)
- SNE (G.SHDSL Network Extenders 1-4 ports)



Raptor & MALC XP Models

Raptor

The Raptor™ is the MALC MSAP platform without the voice services software

Raptor has the same hardware and features as the MALC, except for voice functions and capabilities. Raptor models can be installed as a full-featured IP DSLAM today and upgraded later to full voice MSAP capabilities through a software upgrade. Raptor uses the same line cards and uplinks as the MALC MSAP.



MALC & Raptor XP (1U & OSP)

1U form factor 48-port density products
Pre-provisioned default configuration

MALC XP

- 48 ADSL2+ and 48 POTS (VoIP) ports
- 1U high

Raptor XP

- 48 ports ADSL2+ and 48 ports POTS splitters
- CO or RT cabinet use

MALC & Raptor XP OSP

- Electronics in environmentally sealed enclosure
- Mounts on pole, wall, and side of building



MALC Common Cards

Uplink Options

Gigabit Ethernet SFP-based dual ports (SX, LX, ZX, or TX):
8 TDM ports (optional)



OC3/STM1 2 ATM ports

DS3/E3 4 ATM ports

T1/E1 (ATM UNI/IMA) 8 ports

T1/E1 (TDM-GR303/V5.2)

Functional Card Options

Metallic Test Access Card (MTAC) with POTS ringer

MTAC Integrated Test card for subscriber loop testing without an external test head

T1/E1 Voice Gateway card 32 ports







MALC Compliance and Certification













- | | |
|--------------|-------------------|
| NEBS Level 3 | FCC Parts 15 & 68 |
| GR-1089-CORE | UL Listed |
| RUS Listed | CSA |

MALC Product Specifications

All line cards, uplinks and common cards are interchangeable in any MALC chassis

	 MALC 723	 MALC 719	 MALC 319	 MALC XP
Total Slots	21	17	10	Single Card
Universal Slots	20	16	8	"Pizza Box"
Dimensions	7U 12.22 x 21.18 x 11.15" 31.04 x 53.64 x 28.32 cm	7U 12.22 x 17.25 x 11.15" 31.04 x 43.81 x 28.32 cm	3U 5.22 x 17.40 x 11.3" 13.26 x 44.20 x 28.70 cm	1U 1.72 x 17.31 x 9.61" 4.37 x 43.97 x 24.41 cm
Cable Access	Front	Front	Front	Rear
Compliance	NEBS level 3	NEBS level 3	NEBS Level 3	NEBS level 3
Powering	-48V DC	-48V DC A/B redundant power feeds	-48V DC A/B redundant power feeds	-48V DC
Network Application	CO, RT	CO, RT	CO, RT	CO, RT, MDU

MALC Line Card Choice and Port Capacities

	Line Card Type	MALC 723	MALC 719	MALC 319
	POTS	48-912 ports	48-720 ports	48-384 ports
	ADSL2+	48-960 ports	48-768 ports	48-384 ports
	ADSL2+/POTS combo (double card)	48-432 ports	48-384 ports	48-192 ports
	ADSL2+/Splitter combo (double card)	48-960 ports	48-768 ports	48-384 ports
	ReachDSL	24-480 ports	24-384 ports	24-192 ports
	SHDSL (2-wire/4-wire)	12-960 ports	12-768 ports	12-384 ports
	SHDSL.bis EFM	24-480 ports	24-384 ports	24-192 ports
	T1/E1-ATM	32-640 subs	32-512 subs	32-256 ports
	T1/E1-PWE	24-480 ports	24-384 ports	24-192 ports
	T1/E1-EFM	24-432 ports	24-384 ports	24-384 ports
	DS3/E3	4-80 ports	4-64 ports	4-32 ports
	ISDN V5.2	24-480 ports	24-384 ports	24-192 ports

MALC Management & Test

ZMS

ZMS™ is a standards-based, carrier-class element management solution that provides management support for Zhone multi-service networks. The ZMS client-server architecture uses proven industry standard components to provide a robust platform. ZMS automates a number of complex, tedious and error-prone tasks, thereby raising productivity, improving accuracy and reducing costs for operators. ZMS supports the following applications:

Fault Manager

- Processing of network events to alarms
- Alarm correlation and logging

Configuration Manager

- Device configuration & provisioning

Performance Manager

- Retrieval of real-time statistics

User Administration

- User authentication and privilege control

Database Manager

- Policing of information to and from the database Network Service
- Provide interface between various server components and devices using SNMP

OSS Gateway

- Provides a northbound CORBA IDL interface
- Scalable to large volume service transactions
- Provides single OSS integration point

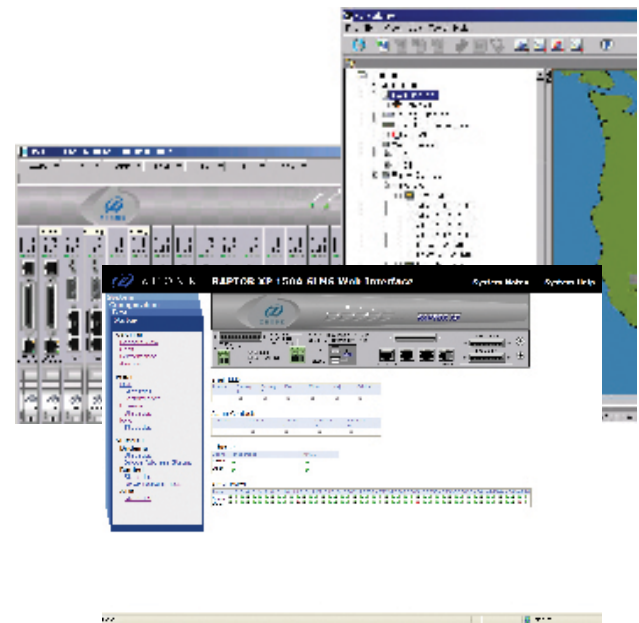
Communication to Devices

- SNMP v2c: configuration, fault and real-time performance management
- FTP: file transfer (download software and historical statistics)

Zhone Web GUI

Simple single device management

Provides configuration, statistical monitoring, and maintenance capability in an embedded web interface enabling Internet access on a PC or laptop with intuitive menus. The Web GUI supports all MALC and Raptor products.



MALC Integrated Line Testing

SELT (Single Ended Loop Testing)

- For DSL line applications
- No CPE required
- For loop qualification before modem installation

DELT (Dual Ended Loop Testing)

- For DSL line applications
- CPE required
- No external test gear required for loop testing after modem installation

MTAC (Metallic Test Access Card)

- For all POTS and DSL services on MALC
- Integrated test access for external test heads
- Optional integrated test functions
- Integrated ringer
- Provides external alarm inputs
- Provides external clock source input
- Supports redundant active or standby operation

OPX Options

Environmental Enclosures Designed for MSAP Access Deployment

Factory configured and wired... installation ready! Zhone has a broad selection of cabinet sizes and configuration for any service need. Cabinets can be ordered for copper or fiber, or both, with battery back up options and environmental alarms. All Zhone cabinets are GR-487 CORE-tested and compliant.

Cabinet sizes range from under 50 ports to up to 1800 ports in capacity, with a variety of splice, door, and accessibility options to choose from. Mounting options include pad, pedestal, and pole mount, depending on capacity and service need.

5200 Series Cabinets

- High-capacity cabinets for MSAP applications
- Pad-mounted sizes and options
- Standard and custom configuration options
- Ideal for MALC 723, 719 and 319 use



4300 Series Cabinets

- Small-footprint cabinets for fewer than 300 lines
- Pad, pedestal, or pole applications
- Standard and custom configuration options
- Ideal for MALC 319 and 1U DSLAM/MSAP applications



MALC XP OSP / Raptor XP OSP

XP OSP is a rugged all-weather, all-temperature environmental enclosure for installation on a pole, pedestal or the side of a building. It is the ideal solution for low-density service needs or coverage at the ends of the access service network.

- MALC XP OSP
 - 48 ports ADSL2+ and 48 ports POTS (VoIP)
- Raptor XP OSP
 - 48 ports ADSL2+ and 48 ports POTS splitters



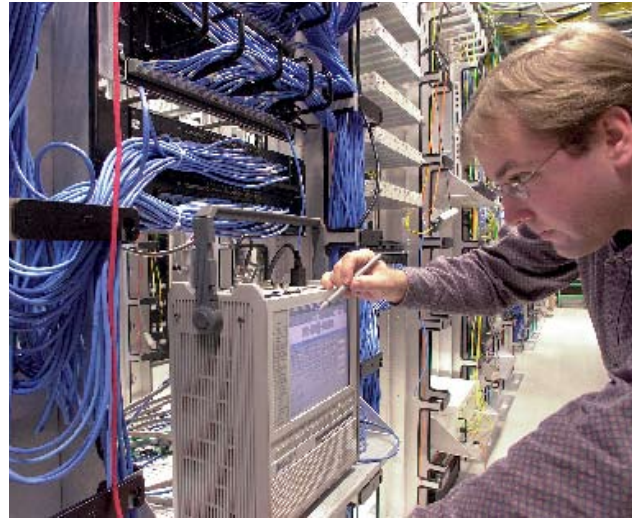
System Configuration

	MALC XP OSP	Raptor XP OSP
Fast/Gigabit Ethernet	2 ports	2 ports
10/100 Ethernet+	1 port	1 port
ADSL2+	48 ports	48 ports
POTS (VoIP)	48 ports	
POTS splitters		48 ports

Zhone Technology & Solutions Partners

Zhone Technology Partners

Zhone's \$50 million investment in its Release Test and Interoperability Lab is the foundation for delivering the most advanced services from MALC. With nearly every type of equipment and system normally found in a carrier's network, Zhone can create real-world environments for testing. In conjunction with VoIP and IPTV technology partners, Zhone can perform integration, interoperability and ecosystem level testing.



Softswitch Interoperability

Zhone continuously tests for interoperability with leading softswitch vendors for MGCP, SIP and H.248 protocols. The MALC supports more softswitches and protocol combinations than any other access platform today. Zhone's program maintains on-going testing and certification with new softswitch releases.

IP Technology Partners

Zhone understands the importance of a complete IPTV ecosystem and therefore maintains an on-going program for IPTV technology testing and integration. Zhone works with most of the leading suppliers of head end systems, encoders, middleware, conditional access, VOD, and IP set top vendors to test interoperability, applications and new features. Zhone extends its IPTV partnerships to content providers and studios to further ensure customers can benefit from the most proven, advanced and integrated IPTV solutions.



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