



MXK Product Guide

Bandwidth Changes Everything!™

Building the Fastest and
Highest Quality All-IP
Multi-Service networks!

THE IP ZHONE

First Responders • Medical • Education • Military and Government • Small and Large Business • Public Utility • Residential

Quality of Experience in the Next Wave of Access Network Evolution

As telecom operators face ever more competition, they are experiencing an accelerating shift in the demands placed on their access networks. Over the past several years, efforts in response to competitive pressure have been focused largely on expansion into triple-play service models, assembling the right combination of video technologies and content licensing on top of current networks.

More recently, as growing adoption of these services is accompanied by a rapid shift to high definition content and applications like on demand video and YouTube — moving more and more traffic from broadcast to unicast models — demands on the underlying network are intensifying at an incredible pace. Focus is now returning to the access network technology itself. The implications of provisioning 50 to 100 Mbps of non-blocking bandwidth to every residence, common planning metrics for today's operators targeting support of 3 to 5 separate HD streams per home, are profound.

To complicate matters further, subscriber expectations for wireline voice quality remain uncompromising no matter what else they may have in their service bundle, which underlying technology is being used to carry their calls, or what they may have become accustomed to with their mobile phone. Hence the challenge of meeting the rapidly rising demand for raw streaming media bandwidth is compounded by increasing requirements for intelligent, nuanced management of sessions and traffic in different service classes, to ensure consistently high quality of experience across voice, data, and video simultaneously. Subscriber expectations for quality TV are as stringent as they are for voice quality, and meanwhile their Internet connections can never be fast enough.

Competitive pressure is driving down service prices, which requires operators to manage capital and operating costs all the more closely. For access networks, this translates into pursuit of higher efficiencies in deployment, control, and administration even as operators move through complex transitions from TDM to IP, from copper to the various FTTx architectures, and into broader service portfolios.



What's Next in Access

- *Dramatic increases in bandwidth per subscriber*
- *Shift to non-blocking architectures to support high-definition streaming media*
- *Intelligent control to maintain quality of experience across voice, video, and data*
- *Greater capex and opex value from converged multi-service access platforms as applications, service classes, and network designs proliferate*

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Intelligent Terabit-Scale Access Concentration

In response to all of these challenges, Zhone has worked closely with innovative operators large and small throughout the global telecom community over the past several years to produce a completely new path forward in access network architecture.

Zhone's MXK is the industry's first intelligent terabit-scale access concentrator, leading the field across the full spectrum of next-generation multi-service access platform capabilities, whether over fiber, copper, or wireless. The MXK gets right to the heart of the matter, taking the fundamental drivers of customer quality of experience in modern access networks — bandwidth, intelligence, reliability, efficiency, and security — to unrivaled levels of scale and performance.

Bandwidth. Center stage in the MXK design is non-blocking capacity up to 3,600 100 Mbps GPON subscribers or 360 1G Active Ethernet subscribers per chassis, served by an all-IP switching fabric capable of scaling to many hundreds of Gbps. With fully redundant, dual-star 20 Gbps connections to every slot in the chassis, the MXK provides unmatched non-blocking bandwidth for HD and unicast-rich services.

Intelligence. Defying the old adage that brawn and brains don't mix, the MXK complements massive bandwidth with the utmost in access intelligence, tapping directly into nine years worth of Zhone's development of the SLMS access operating system. The product of hundreds of operator engagements in over 70 countries, SLMS brings a wealth of layer 3 routing, traffic policing, rate shaping, and multicast group management to the platform from day one.

Reliability. From the fully-redundant and hot-swappable design of the hardware itself all the way up through its software for link aggregation and resilient networking protocols such as EAPS, RSTP, and MSTP, the MXK is

designed to deliver rock-solid performance and uptime as your network's front line of defense in the harsh reality of last-mile access.

Efficiency. The MXK continues Zhone's tradition of pioneering MSAP-based efficiencies for telecom operators, through futureproof flexibility and powerful management interfaces. Unparalleled port density saves you capital, space, power, and maintenance costs. Any service, any slot flexibility, along with tight integration with the rest of Zhone's SLMS portfolio, allow you to use a single access platform across your network for a wide variety of situations - from GPON and Active Ethernet to ADSL2+, VDSL2, EFM, metro Wi-Fi, and POTS — thereby reducing operational costs throughout your organization, and protecting your investment as your service portfolio grows. The flexibility and responsiveness of the Zhone engineering team allows you to quickly tailor an MXK deployment to your specific needs, driving greater service differentiation for you on a shorter timeline.

Management. In a smaller network, the MXK can be managed through a Web interface while larger networks utilize Zhone Management System (ZMS) and OSS gateway.

Security. As the the managed network element closest to the end customer, access concentration platforms can potentially represent significant security risk and vulnerability. To maintain tight security in the last mile, the MXK mounts considerable defenses powered by all of Zhone's SLMS security features, including multicast control lists, secure bridging, broadcast suppression, dynamic IP filtering, SSH and SFTP, and RADIUS authentication.

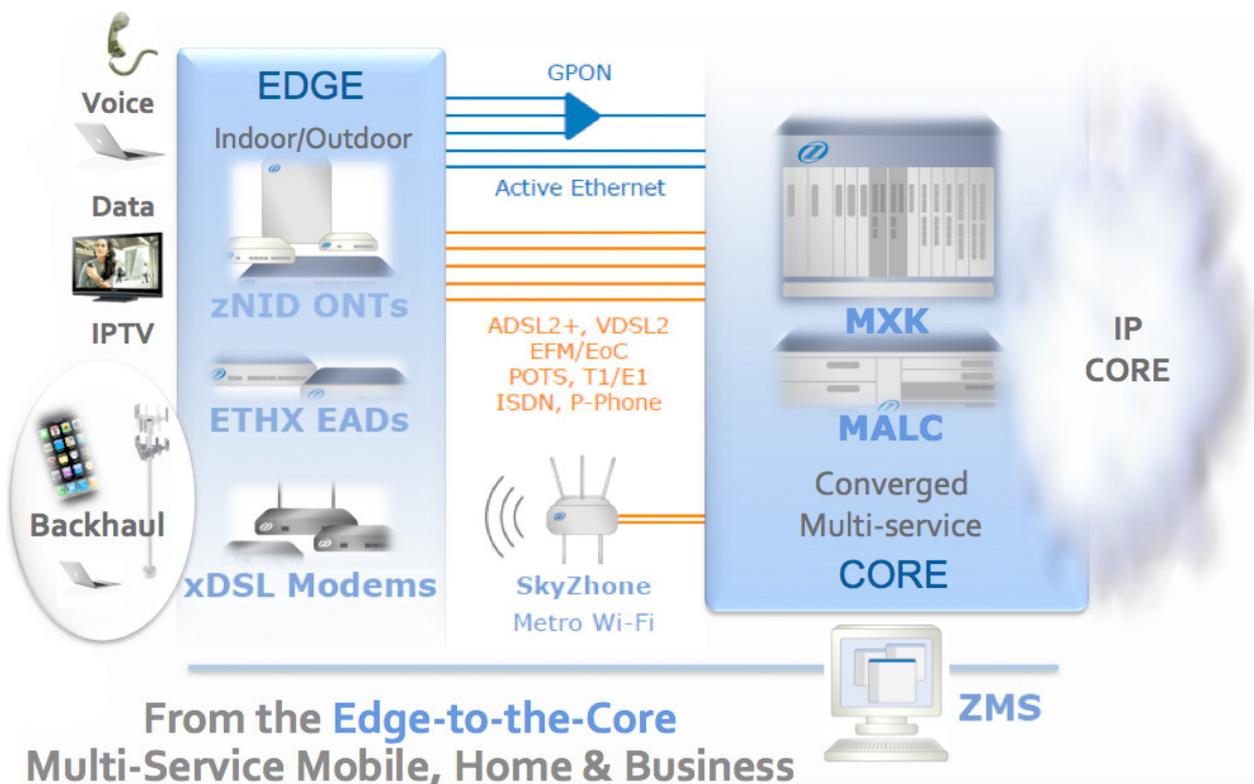
Operators worldwide are embracing MXK today — please contact us to learn more about how intelligent terabit-scale access can help drive greater profits for your operation.

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Intelligent Terabit-Scale Access Concentration

MXK Features at a Glance

- Non-blocking capacity of up to 3,600 100 Mbps GPON subs or 360 1G Active Ethernet subs
- Intelligent network control, through IGMPv3, 802.1p, Q-in-Q, 3-color policing with QoS, DSCP, and a host of other Quality of Experience and security features
- Carrier-grade reliability via hardware redundancy, LACP, EAPS, RSTP, and MSTP
- Delivering on the efficiency promise of truly integrated multi-service access platforms — with GPON and Active Ethernet as well as high-density copper interfaces for EFM, VDSL2, ADSL2+/POTS combo, and ADSL2+.
- Powered by the extensively field-proven Zhone SLMS access operating system, tightly integrated with complete Zhone access platform portfolio
- Web UI management for smaller networks and ZMS & OSS gateway for larger networks



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FTTx Access Network Evolution

The steadily increasing demands for bandwidth driven by on-demand content, HDTV, faster Internet access, new applications and emerging streaming video unicast models have operators worldwide moving deeper into fiber deployments for both residential and business services. The MXK MSAP is a fiber OLT with GPON and Active Ethernet cards for seamless migration to FTTx.



FTTH GPON Services MXK supports G.994.x standards-based GPON to the home with 2.5 Gbps downstream and 1.25 Gbps upstream. MXK offers both 4 or 8 port GPON card that supports 1-64 PON splits per fiber. RF video overlay is supported using a 1550nm wavelength for the RF signal over GPON.

FTTH/FTTP Active Ethernet MXK offers 100/1000 Mbps Active Ethernet (SFP based) fiber services for point-to-point applications. Active Ethernet can be used for residential Triple Play applications, and is especially suited for higher bandwidth business services. Active Ethernet works with either single or dual fibers, with MXK supporting 10 or 20 ports per Active Ethernet line card.



Complete FTTx Solution

Zhone provides complete FTTx solutions for GPON and Active Ethernet to simplify installation and enhance services. Zhone has the industry's broadest range of outdoor and indoor zNID ONTs, PON splitter modules and chassis, and WDM combiner modules. Zhone offers HPNA home networking and advanced IP intelligence on numerous zNID ONTs to deliver triple play services over fiber quickly and easily with no new wiring at the premise.



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Management

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 : 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 MXK, MALC and Raptor products.



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Access Aggregation Platform

MXK is the industry's first intelligent terabit-scale access concentrator, leading the field across the full spectrum of next-generation multi-service access platform capabilities, whether over fiber or copper.

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

| | MXK 823 | MXK 819 | MXK 319 |
|-------------------|---|---|--|
| Total Slots | 20 | 16 | 9 |
| Universal Slots | 18 | 14 | 7 |
| Dimensions | 8U 13.97 x 21.18 x 11.15" 35.5 x 53.8 x 28.3 cm | 8U 13.97 x 17.25 x 11.15" 35.5 x 43.8 x 28.3 cm | 3U 5.22 x 17.25 x 11.15" 13.3 x 43.8 x 28.3 cm |
| Cable Access | Front | Front | Front |
| Compliance | NEBS Level 3 | NEBS level 3 | NEBS level 3 |
| Powering | -48V DC | -48V DC | -48V DC |
| Environmental Use | Hardened CO, RT | Hardened CO, RT | Hardened CO, RT |

Line Connectivity Options

| LINE CARDS (SUBS) | MXK 823 | MXK 819 | MXK 319 |
|---------------------------------|----------|----------|----------|
| COPPER | | | |
| POTS | 72-1296 | 72-1008 | 72-504 |
| ADSL2+ | 72-1296 | 72-1008 | 72-504 |
| ADSL2+ with splitters | 48-384 | 48-288 | 48-144 |
| VDSL2 | 24-432 | 24-336 | 24-168 |
| EFM G.SHDSL | 24-432 | 24-336 | 24-168 |
| PWE | 24-432 | 24-336 | 24-168 |
| FIBER | | | |
| GPON-4* | 256-4608 | 256-3584 | 256-1792 |
| GPON-8* | 512-9216 | 512-7618 | 512-3584 |
| Active Ethernet-Single Slot | 20-360 | 20-280 | 20-140 |
| Active Ethernet-Dual Slot | 20-160 | 20-120 | 20-60 |
| SERVICE CARDS | | | |
| MTAC with POTS ringer | • | • | • |
| Enhanced MTAC (integrated test) | • | • | • |

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