Service providers challenges
There are many vendors and access system claiming to deliver IPTV. But the service provider finds it must design and architect its network around the functions and capabilities the platform supports. Zhone Technologies, Inc., the world leader in Broadband Loop Carrier (BLC), offers the most complete IPTV and triple play enabled access platform, along with optical transport, CPE and OSP cabinet products to create a high performance, full service and adaptable IPTV delivery system.

IPTV, along with many emerging IP based broadband services, continues to evolve and change. So, too, do the networks and infrastructure required to support it. At the same time, service providers’ networks have different needs depending on markets, distribution areas, plant and density. Increasingly, service providers need access platforms to launch service from different points in the network, to utilize different copper or fiber facilities, and to incorporate more quality and performance with the services offered. Adaptability becomes an important aspect for access to meet a variety of needs, with the choice in the hands of the service provider rather than dictated by the limitations of technology. MALC is designed for adaptability, realizing that every service provider has its own requirements, and many have a variety of requirements within its own service network.

The MALC solution
The technical and functional needs to support IPTV are well defined, and are implemented with a combination of systems. MALC, Zhone’s BLC, is unique in its ability to deliver IPTV by having the requisite functionality and features integrated into the access node itself. A combination of software provisioned options for IPTV service delivery and copper and fiber broadband subscriber interfaces puts the service provider in control of implementing IPTV the most efficient way for its network and service needs.
**IGMP multicast**

IGMPv2 multicast is at the heart of IPTV service delivery, providing access to content and channel changing. MALC offers service providers the option to do simple bridged video multicast at the MALC using IGMP snooping in conjunction with a core router, or to provision MALC as the multicast router itself, fully distributing multicast and channel changing to the access node nearer the subscriber. Using imbedded IGMPv2 Proxy, MALC further enables features such as active query to manage IGMP joins and leaves, and Access Control to secure and protect content. Fast, reliable and consistent performance results from IGMP proxy as subscribers increase. MALC also incorporates a fully multicast back plane, allowing broadcast video to be terminated on the back plane in dense mode, or provisioned for forwarding from the head end only when demanded in sparse mode. The service provider can choose which way it provisions IPTV in MALC, with the option of course to change provisioning as needed in the future.
IPTV provisioning
MALC supports DHCP server/relay with Option 82. Service providers can choose to create dynamic sub-networks for IP set top booting using DHCP, managing IPTV service activation separately from other Internet data DHCP transactions. MALC also supports IP and MAC address limiting for IPTV and VOD services, along with IP to ATM mapping of multicast.

Copper or fiber IPTV distribution
IPTV is a bandwidth intensive service, one in which rate and reach over DSL becomes a major challenge for a service provider. MALC offers a wide range of copper and fiber line card options that can be provisioned on a per slot basis to meet plant and serving areas requirements based on a service providers network. Options include ADSL2+, ADSL2+ bonded, VDSL2, Active Ethernet and GPON/BPON line cards supporting IPTV bandwidth needs on either copper or fiber.

Scalability
With bandwidth critical to IPTV, the location of access in the network is critical. It is common to use a combination of central offices, OSP cabinets, and small pole or pedestal cabinets to deliver IPTV effectively within range of the subscriber. Further more, subscriber densities and take rates for IPTV place needs to have access scaled to the size of the area served to avoid stranded (and costly) capacity. MALC is available in 1U self contained 48 port models up to 3U (319) and 7U (719/723) chassis models. ADSL2+, for example, can be scaled from 48 ports in a MALC 100 to as much as 984 ports in a MALC 723. MALC 319, 719 and 723 share common line card and uplink cards, and every MALC product use the same software and management system. A service provider can utilize central offices, OSP cabinets, neighborhood pole or pedestal cabinets or MDU’s to launch IPTV by choosing the right MALC for the right location for economic scaling capacity to service needs.

Uplink options
MALC supports both SONET/SDH and Gigabit Ethernet uplinks depending on the service provider network design. With Gigabit Ethernet, service providers can choose to design point

Figure 2: MALC: IPTV delivery over fiber or copper
to point links or utilize Resilient Packet Ring (RPR) for video distribution. RPR is ideally suited for delivering unicast VOD to multiple nodes on a ring.

**Quality of service**
MALC supports industry defined 802.1p and 802.1q VLAN tagging and prioritization for IPTV services along with voice and data triple play. Taking it a step further, Zhone incorporates its own Multimedia Traffic Management (MTM) service awareness, going beyond normal QoS to create Layer 4 service classification, traffic management and flow control, and prioritization by service class.

**IP and RF video**
Using fiber PON (BPON or GPON), MALC supports RF video overlay as well as IPTV for service providers with existing cable head ends or those transitioning from RF to IP video service.

**Zhone IPTV solution portfolio**
Zhone develops and offers a full line of IPTV capable CPE products supporting the line card options in MALC. Simple bridged single port modems and multi port routing modems for ADSL2+, ADSL2+ bonded and VDSL are available. Models with WiFi for broadband data and video are also available. ONT’s for Active Ethernet, BPON and GPON fiber termination are also offered.

As VOD, HDTV and other high capacity service demands grow, Zhone offers a family of xWDM Optical Transport products to distribute video from a head end over the backbone and/or metro fiber networks. With CWDM or DWDM options, bandwidth on existing fiber transport can be increased up to 10 Gb/s using incremental wavelength additions.
Conclusion
Zhone designed MALC for IPTV and enhanced broadband IP services, therefore incorporating intelligence and functionality in access and nearest to the subscriber. MALC also supports options for multicast, copper or fiber subscriber distribution, and scaled systems for location throughout the network. MALC is a fully featured IPTV triple play platform with the features and functions to adapt to the needs of the service provider, as well as migrate to the changing service demands of tomorrow.