

Application Note



Triple Play with KEYMILE's MileGate 2500 IP-Multi-Service Access Platform

MileGate 2500 IP-MSAN provides:

- Triple Play access over ADSL2plus, VDSL2 and Fast Ethernet
- Transport of multimedia voice, video and data services
- Best-in-class scalability matching high and low subscriber density scenarios
- Migration of legacy services such as voice and leased line services
- Outdoor-hardened for street cabinet installations
- Carrier-class quality and reliability

Providing Access to Triple Play Services

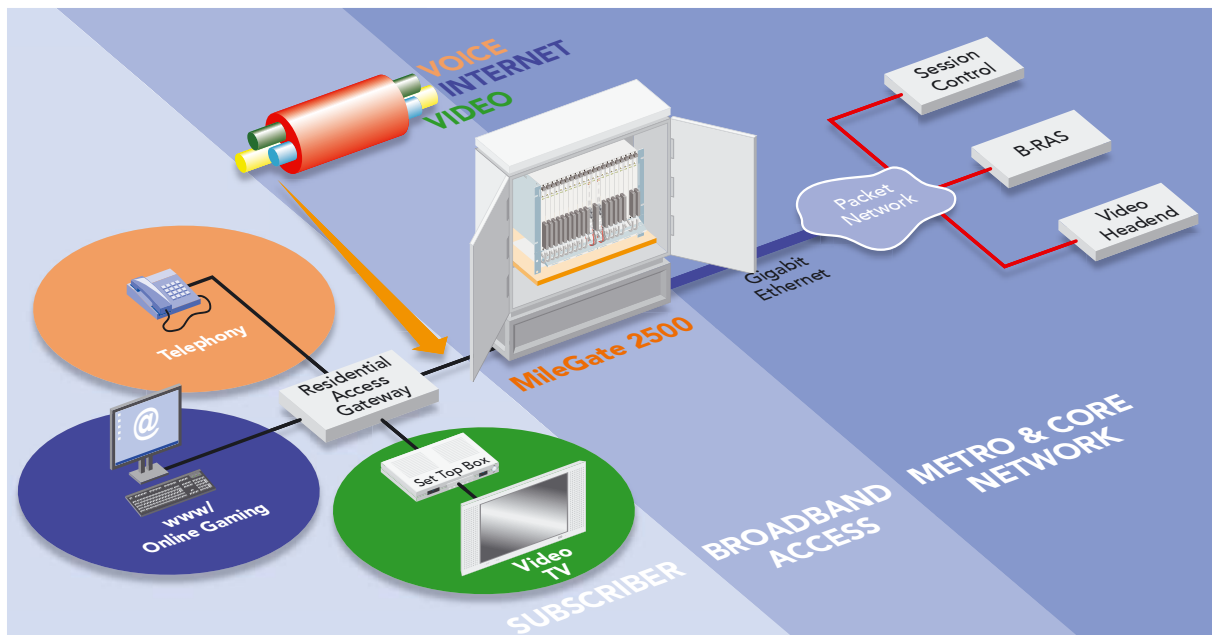


Figure 1: The Triple Play services

IP-Multi-Service Access Platform

The use of copper for access in telephony networks has been the norm for over a century with voice communications gradually becoming a utility type service. Over the last decade using the same copper access line for broadband internet access has developed. The broadband access market has currently reached a penetration rate of more than 50% of Western European households. The concept of Triple Play services over the copper access line has been widely discussed in the information, communications, and telecommunications industry (ICT) under the general trend for communication convergence, i.e. in this case a combination of voice, data and television services. Consumers have been able to receive terrestrial TV for many years before Triple Play services, but from the industry perspective it means service providers are now able to create blended, enhanced, interactive services with developing synergies between the three network services groups, and even four if mobile devices are added to the market offering.

As the first wave of Triple Play networks have been deployed and the first insights gained it is clear that the delivery of television and entertainment services adds a new level of complex-

ity to the supporting network and existing infrastructure. The delivery of video services to the consumer in the form of a quality experience makes the access layer network a crucial component and a place of convergence for an end-to-end Triple Play solution.

Importance of the access network in a Triple Play solution

In recent years driven by the Internet and the efficiency of carrier class Ethernet/IP technologies, carriers have started the migration from circuit-switched towards packet-based networks. As broadband data services have always been packet based, the first legacy service which evolved to IP was voice. From an end user perspective the initial voice over IP (VoIP) services were web-based, such as Microsoft's NetMeeting™, or Skype™. To the wireline access network these services appear transparent, as they are transported in a best-effort data flow. Today POTS and ISDN services can be delivered using VoIP, thus making use of more efficient packet-based core networks and Softswitch technology. These so called life-line services have to meet a certain industry standard with regard to copper loop length, reliability, prioritisation, emergency call handling, etc.

IP-Multi-Service Access Nodes (IP-MSAN) such as the MileGate 2500 from KEYMILE have the functionality to meet regulatory network demands in the access network.

Providing TV services over IP networks (IPTV) places even more demands on the access node, requiring low latency transport, responsive consumer interactive services, and increased bandwidth required for video streaming. In the past public operators could make use of heavy overbooking, in order to minimise the actually needed network capacity. For TV-broadcast and Video on Demand (VoD) service offerings, bandwidth must be available continuously, which puts exceptional performance requirements on the access node. Peak data rates of >50 Mbps, and >20 Mbps of continuous video traffic per user set the benchmark much higher than legacy DSLAMs could ever support. To deliver this capacity the access

network equipment needs either to be moved closer to the end user (Fiber to the Curb [FTTC] or Fiber to the Building [FTTB]), or it needs to be deployed as an all-optical Fiber to the Home (FTTH) network in the long-term.

The three Triple Play network services – voice, data and video – have to be managed individually in a quality controlled and secure way. TV broadcast streams need to be multicasted within the access node, land lines need to be converted to VoIP, different qualities of data services need to be provided in order to deliver different Service Level Agreements (SLA) to different customer groups. These industry considerations have been incorporated by KEYMILE into the design of the MileGate IP-MSAN platform, delivering carrier-class access technology to KEYMILE's partners and service provider customers world wide.

Access node requirements for IPTV services

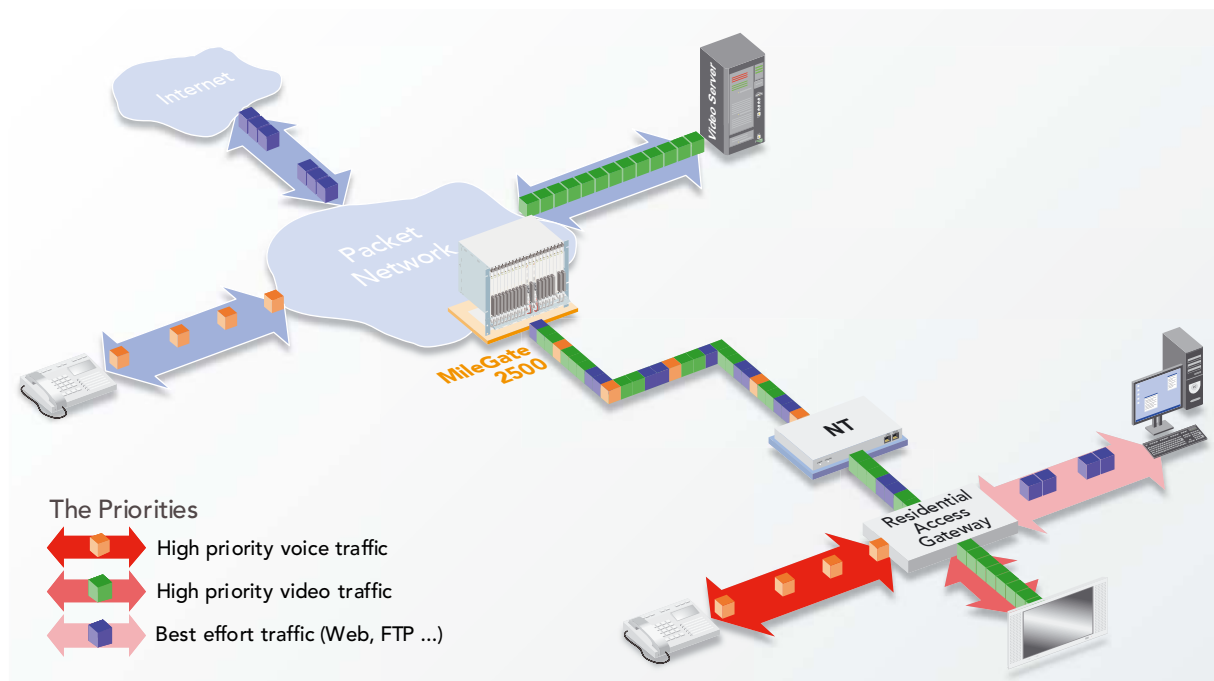


Figure 2: Data streams and Quality of Service (QoS) differentiation

Telecom network operators now compete for market share with a host of diverse and different competitors. The development and deployment of next generation networks (NGN) by carriers allows the opportunity to deliver new services and create new revenue streams such as IPTV, VoD, etc.

Opportunities do not come without risk and offering TV services can be very challenging due the vast number of factors to be considered. Especially critical aspects are the network design and the integration of all the elements which will make TV services a reality such as Video Head Ends, VoD servers, Transcoders, Set Top Boxes (STB), access equipment, etc.

However, for the end customer what matters most is the Quality of Experience (QoE) comprising:

- Technical aspects like picture quality, channel change time and reliability
- Commercial issues such as content, pricing, support, billing etc.

The combination of these technical and commercial building blocks together with the appropriate marketing messages allows for the successful introduction and adoption of TV and Triple Play services to an existing telecom operator's customer base.

IPTV bandwidth requirements

IPTV and specifically VoD are very demanding services from a bandwidth point of view. Standard Definition TV (SDTV) channels require between 1 and 4 Mbps while High Definition TV (HDTV) channels can go as far as 12 Mbps (MPEG4 encoding).

For example with a broadcast TV offering of 300 channels with 20% HDTV (at an average of 8 Mbps each) and 80% SDTV at 2 Mbps we reach approximately 1 Gbps of bandwidth required per Central Office (CO).

For VoD the most difficult aspect is to correctly find the peak concurrency rate. Assuming 10,000 homes served by a CO with 40% of TV usage (4,000 users) with an average of 2 TV sets per subscriber and 20% of peak concurrency we have 1600 streams per CO. Assuming 94% SD VoD and 6% of HD we reach 4 Gbps per CO.

How IPTV works

IPTV relies on IGMP (Internet Group Management Protocol) for the efficient delivery of broadcast streams to subscribers. It is responsible for the subscription of users to specific TV channels. The access platform must support IGMP snooping to correctly assign channels to subscriber ports. In this way, channels watched by several users are delivered only once to the access platform enabling an efficient use of the core network infrastructure. In this approach the multicast routing is performed in the aggregation part of the network, as shown in the following figure. Its main advantages are easy provisioning, core network bandwidth savings and scalability.

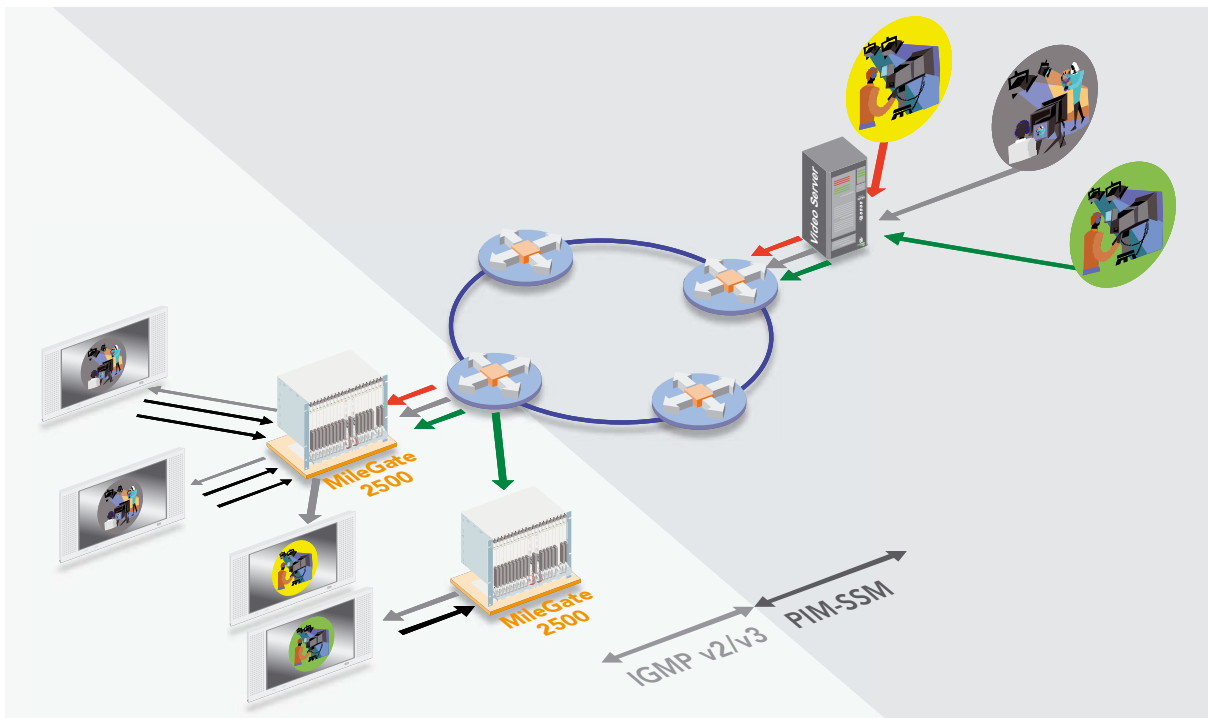


Figure 3: Multicast routing performance in the aggregate/core network mode. Only watched channels are delivered to the access nodes

The MileGate platform supports this approach and further improves upon it. By offering IGMP with proxy reporting and message suppression functionality the processing load on the video servers can be further reduced. It also supports IGMP v3 which enables faster channel change times and enhances security.

Another approach is to perform the multicast routing, based on PIM (Protocol-Independent Multicast) in the access platform. The main advantage of this is reduced channel change time because all broadcast streams are delivered to the access node directly. The drawbacks are increased provisioning complexity and the amount of required bandwidth in the core network.

In order to fulfil the bandwidth requirements mentioned earlier, the access platform must support high bandwidth delivery and processing capacity. KEYMILE's MileGate platform can easily cope with this requirement thanks to its all IP architecture. MileGate supports ADSL2plus and VDSL2 for even higher bandwidth deployments. In addition to xDSL transport, it also supports active Ethernet in the First Mile with all FTTx varieties.

Offering bundled services without having the certainty and guarantee that they will be delivered correctly will result in an unacceptable Quality of Experience (QoE) for the end user. This can only be achieved by enforcing Quality of Service (QoS) in all network elements involved. For this reason MileGate supports industry defined 802.1p (traffic prioritisation) and 802.1q (VLAN tagging) for all types of traffic delivered through the platform. In addition to these protocols, WFQ (Weight Fair Queuing), WRR (Weighted Round Robin) and strict priority queuing allow operators to define how priorities will be handled within the access nodes providing increased fine tuning of the QoS.

Another important aspect is operation and maintenance (OAM) of the network. MileGate makes use of the recently standardised Ethernet OAM protocol 802.1ag permitting end-to-end service monitoring even through different management domains ensuring faster fault identification and resolution.

High-Speed data services – Demands on access nodes in real network roll-outs

In addition to the protocol-level feature-set, access nodes which are used for large scale deployments have to fulfil certain criteria to meet the tough demands of public network environments, often quoted as carrier-class quality. Assuming the functional features are met, an IP-MSAN such as MileGate 2500 needs to comply with the following requirements:

- Support of all FTTx access network topologies, such as:
 - FTTE feat. ADSL2plus, SHDSL and POTS/ISDN subscriber lines
 - FTTC feat. VDSL2 subscriber lines in addition
 - FTTB using Micro-DSLAMs providing VDSL2-inhouse access lines
 - FTTH feat. optical Ethernet links
- Applicability for street cabinet deployments:
 - Environmentally hardened chassis and boards with extended temperature ranges
 - Chassis depth is less than 30cm and provides front cabling access
 - Availability of various street cabinet concepts meeting different regional criteria (climatic, regulatory...)
- Carrier-class reliability to ensure the best service availability, supporting features such as hot-swappable boards and redundancy of mission-critical components in the access node.
- Scalability to deploy access nodes with a high subscriber density as well as rural sites with only a few subscribers in a commercially reasonable way.
- Built-in migration path from TDM-services towards IP.
- Network management system providing different user profiles and a graphical user interfaces enabling quick fault allocation by remote line test functions.

A Triple Play network is always a multi-vendor environment. Due to network integration issues it is therefore obligatory to select components with open and standardized interfaces. Proprietary elements or dependencies do not fit well in an environment like this.

Migration of legacy services

New NGN type services aside it remains important for network operators to maintain existing revenues, to optimise margins and to protect investments. Traditional consumer voice revenues are rapidly declining. Corporate customers are migrating from high-priced TDM leased lines to cheaper packet-based services which also negatively impacts on existing revenue streams.

Due to these developments it is imperative for operators to keep providing legacy services to the end user, while migrating the network to cost efficient IP-based platforms. The most common strategy related to the introduction of a NGN architecture is to collapse the many traditional network stovepipes into a single converged platform, retiring legacy platforms gradually.

KEYMILE's MileGate IP-MSAN provides a next generation access solution to complement the introduction of a NGN in the core network. One key asset of MileGate in this context is the hybrid Ethernet-TDM backplane design, which enables service delivery of both Ethernet and TDM without any trade-offs. TDM-oriented subscriber services such as POTS and ISDN can be connected via V5.2 signaling to a local exchange. Symmetrical 2 Mbps leased lines or $n \times 64$ kbps services can be fed via E1 G.703 interfaces to a SDH feeder network, fulfilling real-time critical demands such as clocking.

Using gateway cards for VoIP (SIP, H.248) or circuit-emulation over packet (CESoP, SAToP or CESoPSN) conversion, MileGate enables a smooth migration towards all-IP core networks, without the need for additional hardware. Leveraging the functionality of a carrier-class network management platform KEYMILE's IP-MSAN can be remotely upgraded via a simple software-download, keeping service interruptions to a minimum during the migration procedure. This approach ensures existing investments are protected, TDM service quality and reliability are not affected and the operational costs can be significantly reduced.

Summary

KEYMILE is a technology-driven high-tech company specialising in the development of wireline access solutions. KEYMILE's Swiss-German heritage stretches back in time and today. The company operates internationally maintaining long term relationships to both incumbent carriers as well as competitive local exchange carriers. The MileGate product is a multi-service access platform designed to meet the overall demands of a Triple Play service offering, which is innovative, carrier-class and cost efficient. As green-field roll-outs are rare, MileGate makes use of a hybrid backplane design, thus enabling Triple Play services based on the IP protocol, as well as incorporating legacy TDM services. KEYMILE provides network operators and partners leading edge technology and professional services expertise to deliver new multimedia services in the access network.