

## *IPITEK's MSP-10GE Product Family*

### Introduction

The demand for more bandwidth is clearly driven by IP-based applications and consequently service providers are looking at infrastructure that best support such applications. It has become clear that a packet-centric infrastructure is preferred and such technologies are therefore displacing technologies like SONET, ATM and Frame Relay in new build-outs due to the high cost and lack of flexibility associated with legacy technologies. Ethernet is rapidly becoming the transport technology of choice in access and metro networks because a worldwide deployment in LANs together with standardization has driven the price down considerably.

This application note describes the IPITEK family of optical 10GE Ethernet transport equipment and in particular various applications where the MSP-10GE adds value to the service provider. Key features and benefits in each of these applications, ranging from Video on Demand to business services and cellular backhaul, are described.

### IPITEK's Ethernet Product Offering

The MSP-10GE platform is based on next generation technology that integrates key networking functions into a compact 1RU footprint. This makes it a truly unique solution for the service provider who wants to expand or build metro network infrastructure for cost-effective delivery of residential and business services.

Whether it is for VoD distribution, edge aggregation of business customers or providing 10GE directly to the customer, the MSP-10GE offers a compact cost-effective solution.

### MSP-10GE Optical Model



### MSP-10GE Copper Model



### Models

- MSP-10GE-OP-DC
- MSP-10GE-CO-DC
- MSP-10GE-CO-AC

### Key Features

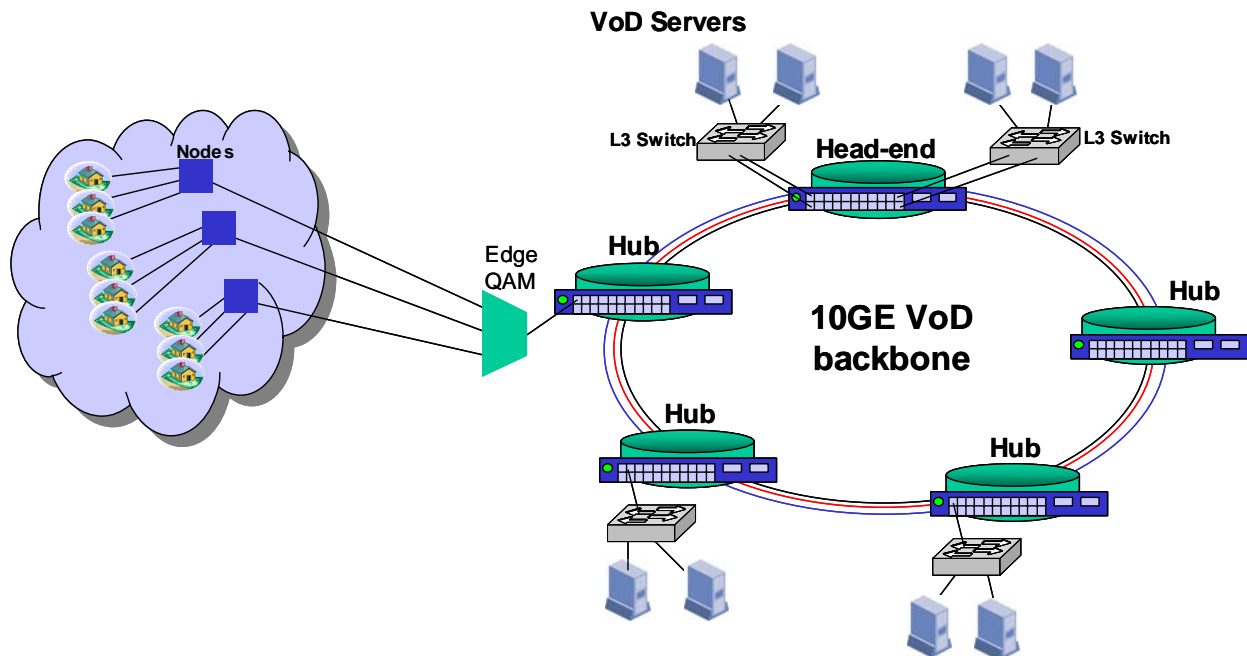
- **Scalable protected capacity**  
2x10GE trunk ports (XENPAK) & 24x1GE client ports (SFP or RJ-45)
- **IEEE-based Ethernet transport**  
Open standard based transport ensures interoperability with 3<sup>rd</sup>-party Ethernet equipment. Protects your capital expenditure.
- **Integrates switching, aggregation and DWDM transport**  
A networking solution in 1RU that traditionally is performed in multiple platforms with other vendor solutions.
- **VLAN-based forwarding**  
Support of MEF-defined E-Line and L-LAN services for any topology
- **Extensive management**  
CLI, WEB & SNMP-v2c support with in-band and out-of-band mgmt ensures easy provisioning and seamless integration with an NMS system
- **Extensive monitoring**  
Optical layer measurements, detailed Ethernet statistics and ability to set threshold alert levels on each port
- **Hot-pluggable optics**  
Enables true “pay-as-you-grow” as well as on-site upgrades.
- **Compact platform with low power consumption**  
1RU with 80W power consumption ensures low operating costs at the CO and carrier hotel. 20Gbit/s capacity in 1RU!

## Video on Demand

Figure 1 shows a high-level illustration of a Video on Demand (VoD) network. The focus here is on the transport network rather than the overlay software system that is necessary for interactive VoD applications. Figure 1 shows a distributed VoD server architecture but other designs are in use as well. Regardless of whether a central or distributed server network is used, VoD applications greatly benefit from a packet-based network because of high bandwidth utilization and very importantly the flexibility of bandwidth provisioning.

The MSP-10GE offers a very cost-effective and flexible solution due to the following key features:

- Support of any logical topology; point-to-point, hub and spoke, ring, multipoint-to-multipoint
- “Drop and continue” allows a single stream to be sent to any number of outputs in the network saving bandwidth resources as compared with other solutions that require multiple circuits to accomplish the same
- Native support for 10GE enabling a seamless addition of HDTV channels
- Ring protection switching ensures that no single point of failure causes traffic or revenue disruption
- Per port QoS makes it possible to mix VoD traffic with other revenue generating traffic such a voice or data



*Figure 1: MSP-10GE in a Video on Demand application*

The MSP-10GE offers bandwidth flexibility, bandwidth scalability and support for converged services. With standard channels in the 2-4Mbit/s range and HDTV channels in the 7-15Mbit/s range, clearly bandwidth scalability is essential and the MSP-10GE delivers bandwidth scalability up to 400Gbit/s with 10GE per lambda and support for 40 wavelengths.

At the same time, converged network architecture is possible due to data transparency and strict scheduling that ensures that low-priority traffic is dropped before high-priority traffic. In addition, the switched architecture ensures low end-to-end latency and jitter, which is essential for real-time services. Compared to a routed solution, the switched architecture of the MSP-10GE also significantly reduces CAPEX and OPEX requirements.

## Edge Aggregation of Business Customers

Service providers are rapidly expanding their business service offerings, as this is an area that is projected to grow substantially over the coming years. The fastest growing segment is Ethernet-based services because of the low cost benefits and the fact that it connects seamlessly to a worldwide-deployed LAN infrastructure.

The MSP-10GE can be used in this application as an edge aggregation device, connecting to business customers and interfacing to already deployed backbone infrastructure. Figure 2, 3 and 4 illustrates how the MSP-10GE fits into this application under various scenarios.

Key benefits of the MSP-10GE for business services include:

- Aggregation of up to 24 customers into 1 x 10GE or 2 x 10GE
- Reach customers up to >120km away with 1GE or 10GE pipes with support for CWDM or DWDM
- Rate control on each port (in 0.15Mbit/s increments) ensures that customers only get what is paid for, while 1GE physical pipes allow bandwidth scalability and makes it easy for service providers to sell add-on services
- QoS on a per port basis together with strict scheduling for high-priority traffic makes it possible to overbook the switch with low priority data for more revenue
- Each customer is mapped on a separate customer independent VLAN for routing and security purposes
- <50ms protection switching on protected 10GE links
- User configurable threshold alert levels on optical power levels and Ethernet statistics on each port gives significant monitoring capabilities of the health of the network and deployed equipment

## 1GE Business Customers

Figure 2 illustrates that the MSP-10GE supports interfacing to the backbone infrastructure using either 10GE or 1GE ports. Each customer can be connected with one or multiple 1GE pipes depending on bandwidth requirements.

Rate control and QoS settings on a per port basis ensures that traffic from each customer is processed according to the SLA. By using the MSP-10GE at multiple sites, point-to-point and even multipoint-to-multipoint circuits can easily be set up across a 3<sup>rd</sup> party backbone infrastructure.

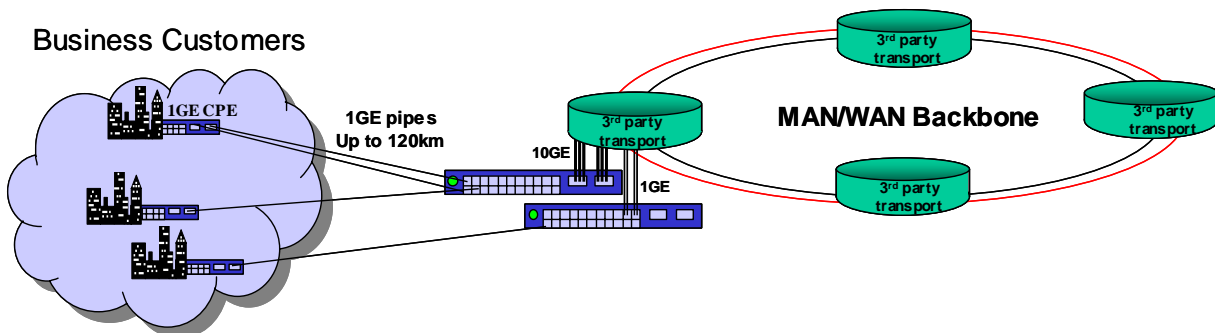


Figure 2: MSP-10GE as an edge aggregation device of 1GE business customers

Because the MSP-10GE uses VLAN stacking to forward and separate traffic, the MSP-10GE is transparent to customers IP and VLAN addressing schemes. This greatly improves the network scalability, while at the same time reducing planning and operational requirements for the service provider.

## Service Extension

Due to the small form factor and low power consumption (80W in 1RU), the MSP-10GE is ideal for OTN applications, where small enclosures are utilized. Figure 3 shows how the MSP-10GE can be used to increase the reach of the system

# Converged Service Transport Using Intelligent Optical 10GE Equipment

to 200km, while at the same time being able to carry up to 20Gbit/s of user data by exploiting DWDM. Additional wavelengths can easily be added by using additional MSP-10GE units.

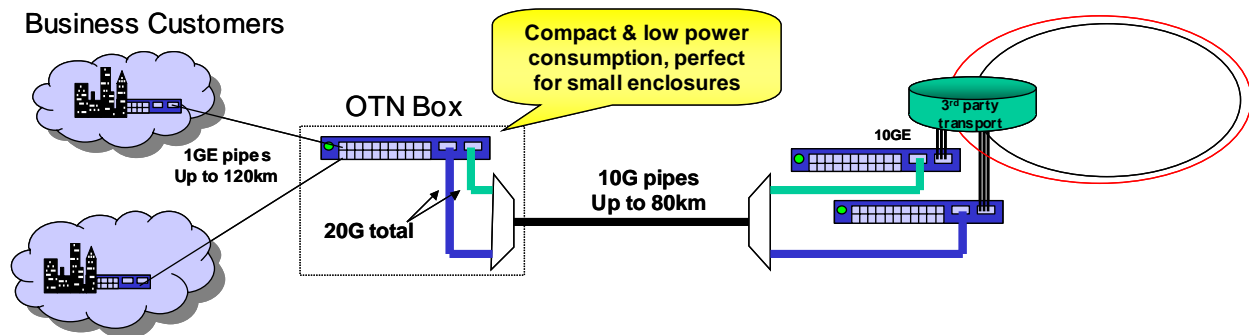


Figure 3: MSP-10GE used for service extension

Per port monitoring of optical power levels and Ethernet statistics together with user configurable threshold alert settings for these parameters gives an accurate view of network conditions and gives both the service provider and the customer assurance that problems are discovered before network failures occur. In addition, the health of optical plug-ins is monitored to assess aging effects.

## 10GE Business Customers

Many large corporations and data centers have tremendous bandwidth requirements. This trend is on the rise with the adoption of native Ethernet over light and as a consequence, 10GE directly to the customer is today very cost-competitive compared to other access technologies. By some estimations, YouTube consumes ~80Gbit/s of sustained data rate each month with much higher peak loads.

Figure 4 shows how the MSP-10GE can be used to offer a protected point-to-point 10GE service between customer locations. The solution, which only takes up 2RU, utilizes an optical protection switch, which has the advantage of ultra fast protection switching – typically below 10ms.

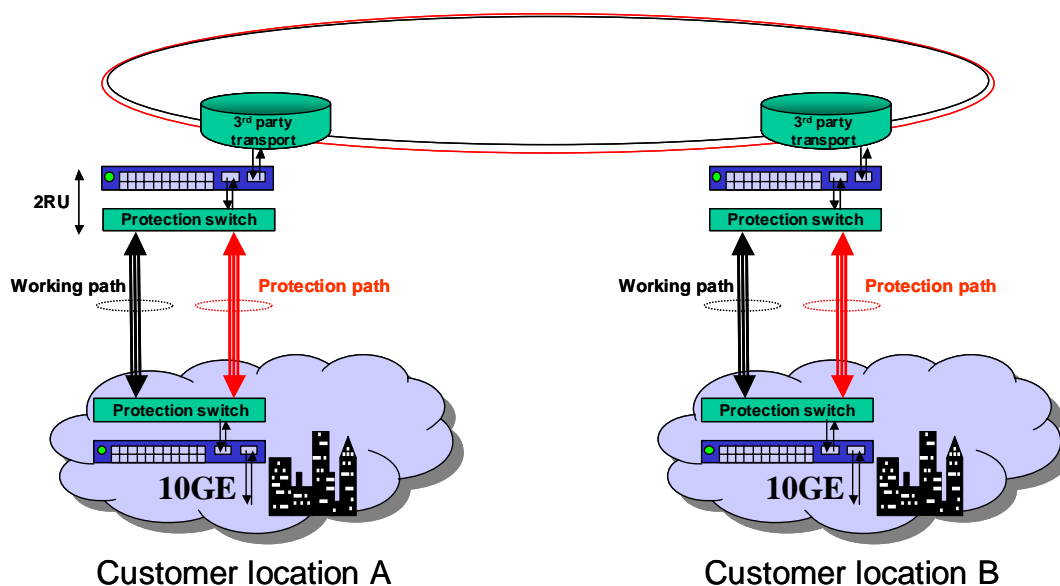
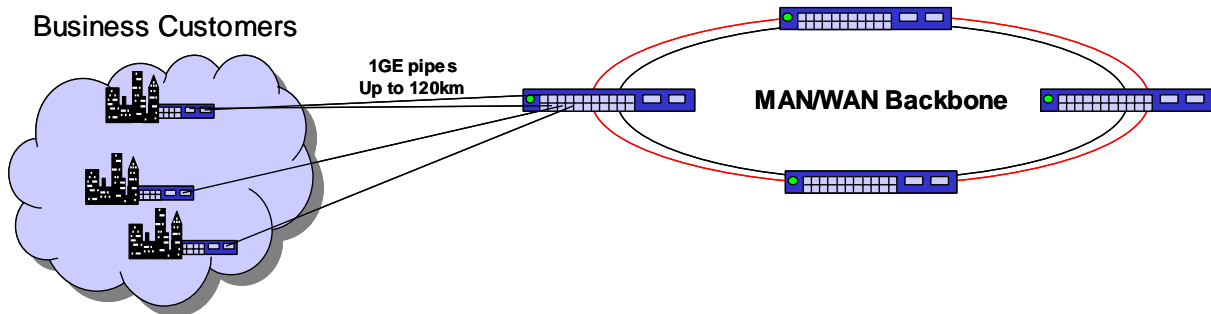


Figure 4: MSP-10GE used to provide 10GE protected services to business customers

# Converged Service Transport Using Intelligent Optical 10GE Equipment

## MAN/WAN Transport

The MSP-10GE's support for protected DWDM transport in ring architectures also makes it an ideal platform for the Metro backbone itself and thereby omitting 3<sup>rd</sup> party transport equipment. In this application, the MSP-10GE offers a very cost-effective backbone that scales to 400Gbit/s in addition to all the benefits described in the above sections.



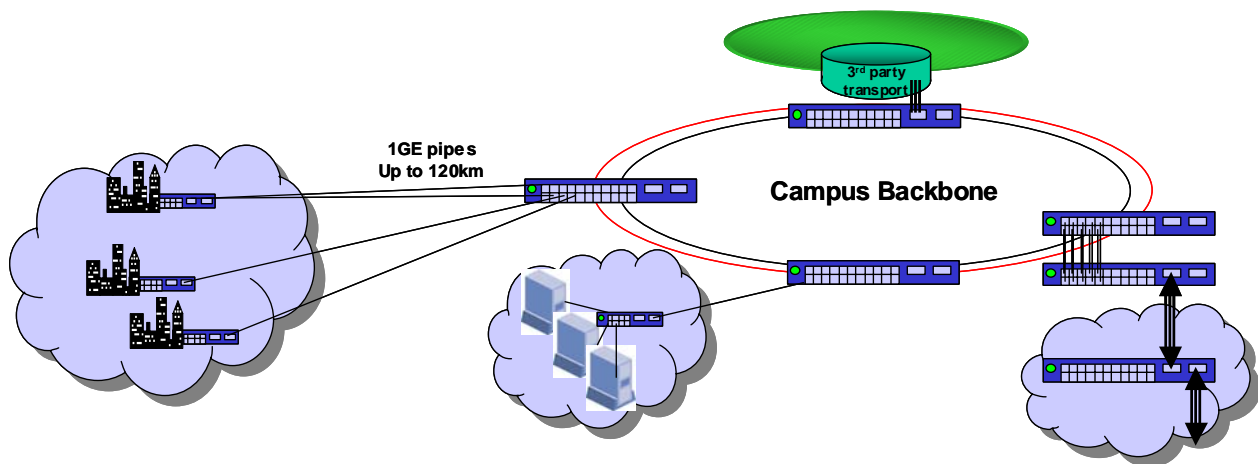
*Figure 5: MSP-10GE used for edge aggregation and backbone transport*

A key differentiator in this application is the 10GE link self test capability. Used during turn-up, this unique feature allows each 10GE fiber link in the network to be tested and qualified using internally generated test patterns before live traffic is added to the network thereby significantly reducing turn-up time and cost for the service provider.

## Campus Rings

Just as larger businesses are starting to require 10GE connectivity, a campus is a very bandwidth hungry environment. Campus backbones have often been designed using 1GbE links or lower. However, with equipment cost continuously decreasing and the certainty that a Campus environment can use all the bandwidth that is thrown at it, 10GE DWDM should be a natural choice going forward.

The MSP-10GE offers the high backbone bandwidth together with 1GE connectivity to various departments. The connectivity can even be extended to multiple of 1GE pipes or a 10GE pipe as shown in Figure 6. The 10GE pipe would naturally need its own wavelength on the backbone. Although an unprotected 10GE connection is shown in Figure 6, a protected connection can also be set-up by using the optical protection switch shown in Figure 4.



*Figure 6: MSP-10GE in a Campus environment*

## Cellular Backhaul

Wireless carriers are competing for customers on the promise of mobile video services, music download and other data intensive applications. To fulfill the bandwidth requirements, wireless carriers are deploying 3G-based networks such as High-Speed Packet Access (HSPA) and Evolution-Data Optimized (EV-DO). At the same time it is recognized that transport equipment accounts for 25% of the cost of building out backhaul infrastructure.

The MSP-10GE is a switched system with several key benefits:

- Much lower cost than TDM circuits or routed solutions
- Very low packet latency and jitter, critical parameters for real-time traffic
- Strict QoS to allow transporting voice, video and data services on the same network
- Flexible support for point-to-point, ring and mesh networks, which enables traffic aggregation before interfacing with backbone infrastructure

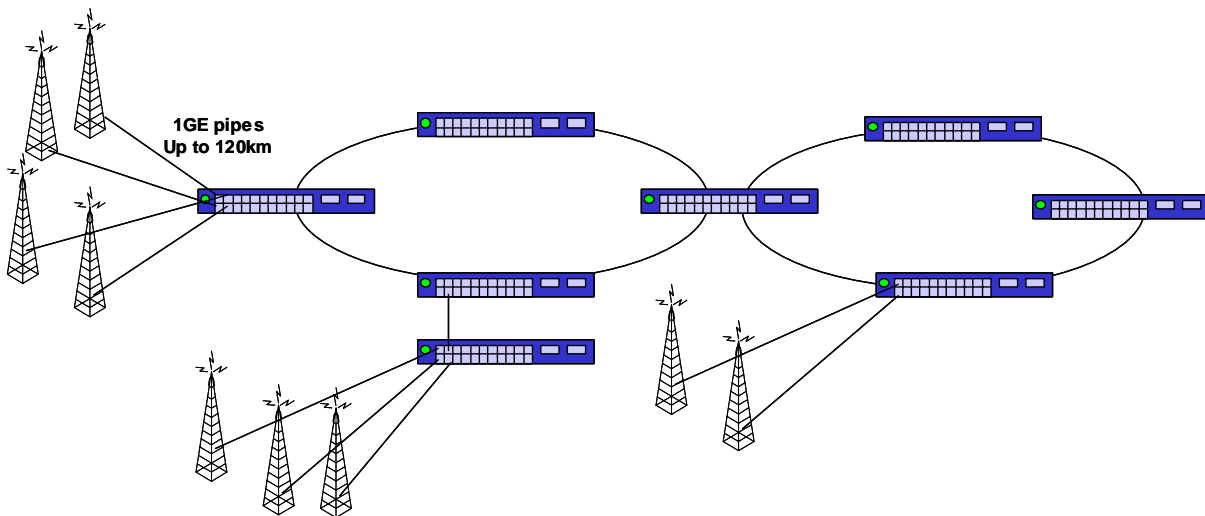


Figure 7: Cellular backhaul

## Summary

The MSP-10GE is a compact yet feature rich Ethernet-based networking platform integrating switching, aggregation and high-capacity DWDM transport with innovative management and monitoring features. Built upon next generation technology, the platform offers extensive support of quality of service, data security, flexible bandwidth provisioning and reliable transport. This makes the MSP-10GE an ideal solution for a wide range of applications as described in this application note.