

# INCREASING CAPACITY OF EXISTING TRANSPORT NETWORKS

**SINCE THE INTRODUCTION OF COHERENT TECHNOLOGIES,** THE COST OF HIGH SPEED OPTICAL TRANSPORT HAS DECLINED AT A RATE UNSURPASSED IN THE HISTORY OF THE INDUSTRY. ONE OF THE BENEFITS OF COHERENT TECHNOLOGY IS THAT IT ALLOWS HIGH SPEED CHANNELS TO OPERATE OVER LINKS THAT, IN THE PAST, HAVE NOT EVEN BE ABLE TO SUPPORT 10G, GIVING IT AN ENORMOUS ADVANTAGE FROM A COST /PERFORMANCE STANDPOINT. IN TODAY'S MARKET, 100G TRANSPORT IS AVAILABLE AT THE COST OF WHAT 10G WAS ONLY A FEW SHORT YEARS AGO WHILE 200G IS BEGINNING TO MAKE INROADS INTO METRO-ACCESS AND EVEN METRO-REGIONAL NETWORKS | THIS PAPER EXPLAINS HOW Ekinops, A LEADER IN DEPLOYING HIGH SPEED 100G AND 200G "ALIEN WAVELENGTHS" ON EXISTING LINE SYSTEMS, CAN BOOST THE TRANSPORT CAPACITY OF YOUR EXISTING NETWORK WITHOUT IMPACTING EXISTING SERVICES AT A COST POINT THAT MAKES ADVANCES YOUR BUSINESS CASE FROM CONCEPT TO REALITY.



Over the past five years, the cost of adding high-speed wavelengths to a transport network has fallen dramatically. Rather than waiting to reach capacity exhaust on existing systems before upgrading, operators now recognize the benefits of adding 100G and even 200G links to existing line systems given the benefits of higher capacity at lower cost per bit without impacting the performance of existing lower speed services.

Though optimized for performance around the current generation of line systems, advancements in coherent technology mean that today's new generation of high speed transponder and muxponders can obtain much greater reach — even over existing line systems compared to the previous generation. This is because more advanced FEC (*Forward Error Correction*) technologies have been introduced on the current generation transponders/muxponders, increasing the distance that can be achieved by improving the OSNR (*Optical Signal to Noise Ratio*) tolerance of the transponder/muxponder.

Improved OSNR performance is what allows these new transponders/muxponders to perform better on older line systems than even the transponders/muxponders that were designed for those systems. Ekinops, for example, has implemented the industry's leading FEC technology (**DYNAFEC®**) on our long reach transponders and muxponders. For 100G technology, the combination of SD FEC and HD FEC provides OSNR as low as 11 dB, good enough to support even trans-oceanic spans up to 10000 Km while 200G can be extended up to 1000 Km, even with a 20 dB OSNR, using advanced, hybrid EDFA-Raman amplification.



This performance is superior to other transponders and muxponders on the market today and a dramatic improvement over similar technology offered even a few years ago. Because of this OSNR/FEC improvement, Ekinops transponders and muxponders perform better over most line systems than the transponders and muxponders designed specifically for that line system from the transport vendor that created it. In many cases, by using Ekinops' transponders and muxponders in place of their

existing vendors' solutions, customers have been able to eliminate regeneration points in their networks these same customers have capped the deployment of transponders and muxponders on their existing systems and instead upgrade with Ekinops. Savings from the lower cost of Ekinops' solutions is due to our industry unique **T-CHIP®** (*Transport-on-a-Chip-technology*) that, combined with the elimination of regeneration sites, can amount to service upgrades at less than half the cost.

## THE SOLUTIONS

Ekinops has a wide variety of transponders and muxponders from 10G to 200G that can be used to upgrade existing transport systems. In fact, moving to Ekinops transponders and muxponders, in addition to reducing upgrade costs, can make additional services types available to you for deployment. For many service providers, 10G will continue to be the primary infrastructure service rate for some time. However, network bandwidth demand continues to grow rapidly and on a global scale with 100G and even 200G line rates increasingly making up a larger share of available bandwidth (see Figure 1). To meet this demand, Ekinops has developed a variety of high speed line cards for its modular C600HC and C200HC chassis that address any application from very short metro access links to ultra-long haul spans.

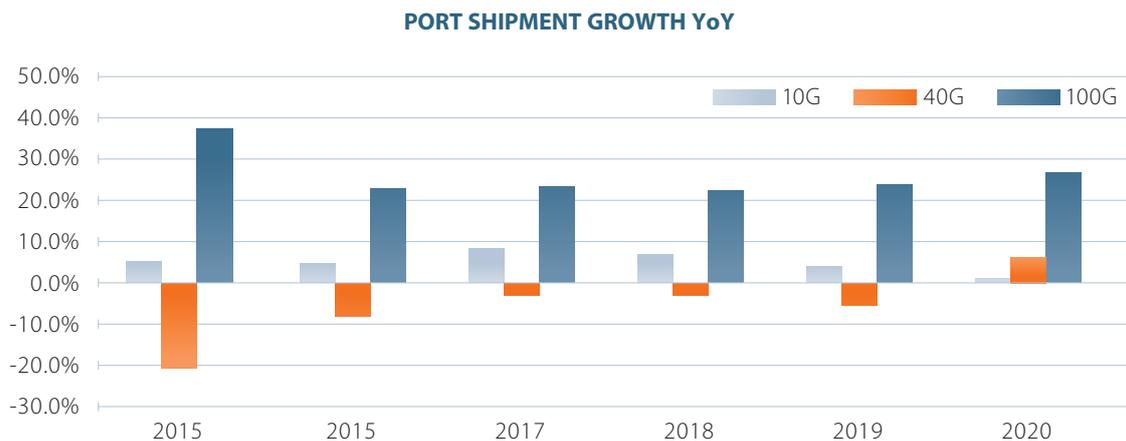


Figure 1: Optical port shipment growth by interface speed  
(Source: OVUM Global Optical Network Forecast, December 2015)



With bandwidth growth inevitable and ongoing, more link capacity will always be needed whether in the core, the metro or even the access portion of the network. As such, it is in the networks operator's interest to deploy as much bandwidth as their budget will support to accommodate future growth. To address this need, Ekinops has developed a family of 200G line modules that delivers twice the capacity of 100G solutions at virtually the same price point as 100G and cutting the cost per bit in half. In essence, the operator gets 100G of bandwidth for free! Ekinops PM 20002-MA and PM 20020-MA modules are designed for metro access applications



Ekinops PM 20002-MA

up to 125 Km such as wireless backhaul/fronthaul and data center inter-connection (DCI) while the 200G-MR Metro Regional versions can extend that transport distance up to 1000 Km.

At 100G, Ekinops also offers a full line of solutions that are optimized to address everything from short reach access to ultra-long haul applications. Ekinops 100G modules reuse the same hardware which helps lower development costs but which have different optical characteristics such as chromatic dispersion (CD) tolerance and OSNR thresholds. To address long haul and ULH requirements, Ekinops 100G solutions provide ultra-low OSNR thresholds for transport up to 10000 Km, enough to reach trans-oceanic distances.



Ekinops RM 100G

For applications where space availability is limited and where only a single high speed channel is required such as wireless backhaul where transport systems sometimes have to be deployed in small cabinets on top of buildings, the Ekinops RM 100G provides a selectable 100G 1RU transponder and muxponder in one, the configuration of which is determined by the firmware it is running. The hardware is the same for both the transponder and muxponder configuration and the profile can be changed at any time from one to the other simply by changing the firmware, a process that can be completed remotely from a single NOC to any Ekinops RM 100G device on the network.

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**INCREASING WDM CAPACITY**

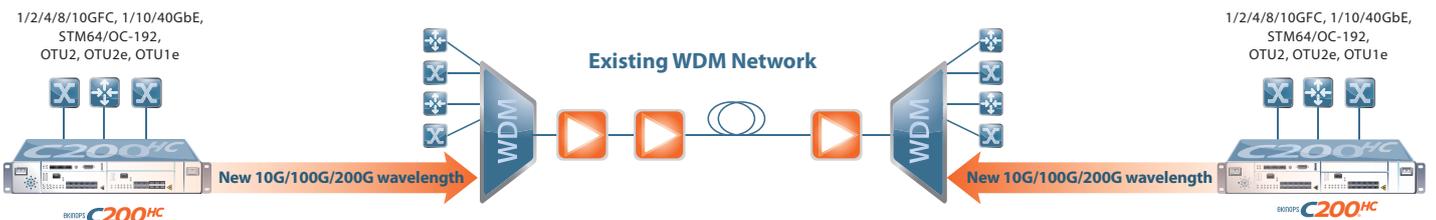


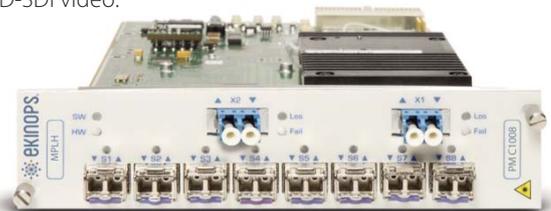
Figure 2: Adding Ekinops Transponders/Muxponders to an existing transport line system

**FLEXIBILITY**

Ekinops 100G and 200G solutions offer flexible multiplexing capability. Because Ekinops utilizes its unique **T-CHIP** (Transport on a Chip technology), and **DYNAMUX** capability, muxponders are not limited to aggregating only 10G services like other vendors' solutions. For lower speed services, Ekinops PM C1008-MP family flexible multiplexer can be directly added into ports on the 100G and 200G muxponders allowing for low-speed service aggregation without an expensive fabric or other external device.

Ekinops PM C1008-MP family allows the aggregation of a mix of 1GbE, 1/2/4G Fibre Channel, STM-4/OC-12, and STM-16/OC-48 along with the traffic being aggregated by the other ports in the muxponder.

Of course, other Ekinops aggregation cards can be utilized to multiplex even lower rate services into the Ekinops PM C1008-MP family, which are then multiplexed into the higher speed 100G or 200G services. Examples would be utilizing the Ekinops PM 124FE to aggregate 10/100 services or the Ekinops PM 1004V to aggregate and transport SD / HD-SDI video.



Ekinops PM C1008-MPLH

## MANAGEMENT

At the element level, both the 100G and 200G PM modules and the RM 100G can be managed through SNMP or via the Ekinops standard element level management interfaces, which includes a CLI (*Command Line Interface*) and an Ekinops java-based GUI (*Graphical User Interface*).

The CLI is accessible via SSH and Telnet remotely or via a local serial port locally. Complete performance monitoring and management is provided, including laser shut off and local and remote loopback which is useful for maintenance and fault isolation.

Digital Diagnostics Management (*DDM*) is supported for SFP+ interfaces. This includes link status, transmit (*TX*) and receive (*RX*) signal power monitoring, and operational temperature, as well as manufacturer and transceiver model. A 10 Mb in-band Data Communications Channel (*DCC*) is embedded in the line side for remote management.

All hardware elements are supported by *ekicraft*, the Ekinops Java Craft Interface and *Celestis pilot*, the Ekinops Network Management System (*NMS*).



## CONCLUSION

NETWORK OPERATORS RECOGNIZE THE NEED TO ADD MORE HIGH-SPEED CAPACITY TO THEIR NETWORKS. THE CHALLENGE IS HOW TO DO THIS QUICKLY AND COST EFFECTIVELY WITHOUT INTERRUPTING EXISTING SERVICES. EKinOPS PROVIDES THE SOLUTIONS TO THESE CHALLENGES WITH ITS 100G AND 200G OPTICAL TRANSPORT SOLUTIONS THAT CAN BE DEPLOYED OVER VIRTUALLY ANY EXISTING LINE SYSTEM. WITH THEIR LOW COST AND SERVICES FLEXIBILITY, EKinOPS SOLUTIONS PROVIDE THE CAPACITY WHERE AND WHEN NEEDED TO MEET BOTH CURRENT AND FUTURE BANDWIDTH REQUIREMENTS ■

## ABOUT EKinOPS

Ekinops is a leading supplier of next generation optical transport equipment for telecommunications service providers. The **EKinOPS360** addresses Metro, Regional, and Long-Haul applications with a single, highly-integrated platform.

Ekinops is a market-leading innovator in 100G and 200Gv transport with a coherent line of products that truly optimizes optical networks and comes in 1RU, 2RU or 7RU chassis.

The **EKinOPS360** relies on the highly-programmable Ekinops **T-CHIP** (*Transport-on-a-Chip*) architecture that enables fast, flexible and cost-effective delivery of new services for high-speed, high-capacity transport. Using the **EKinOPS360** carrier-grade system, operators can simply increase capacity of their networks — *CWDM, DWDM, Ethernet, ESCON, Fiber Channel, SONET/SDH, and uncompressed video (HD-SDI, SD-SDI, ASI)*.

## CONTACT



[www.ekinops.net](http://www.ekinops.net)

Ekinops EMEA  
+33 (0)1 49 97 04 04

Ekinops APAC  
+33 (0)1 49 97 04 04

Ekinops Americas  
+1 (724) 720-9310