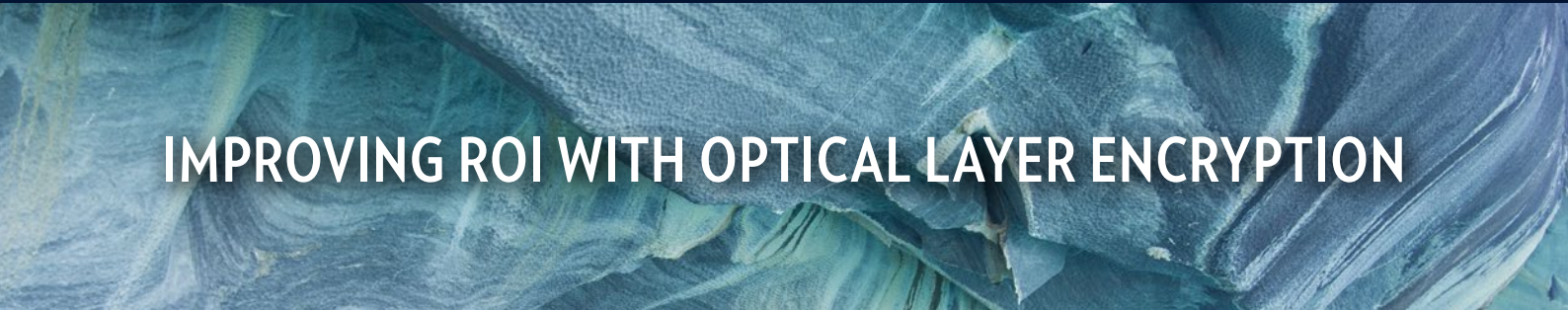
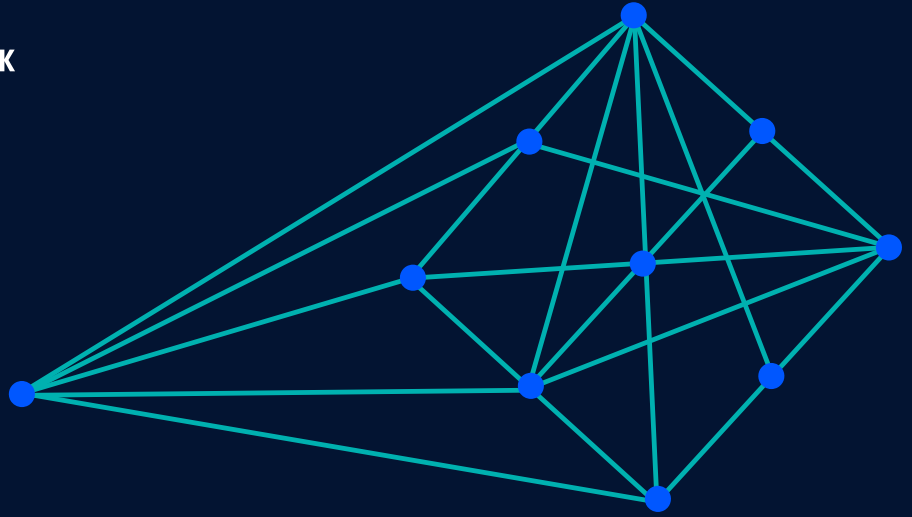


OPTICAL ENCRYPTION AS A SERVICE WITH APOLLO

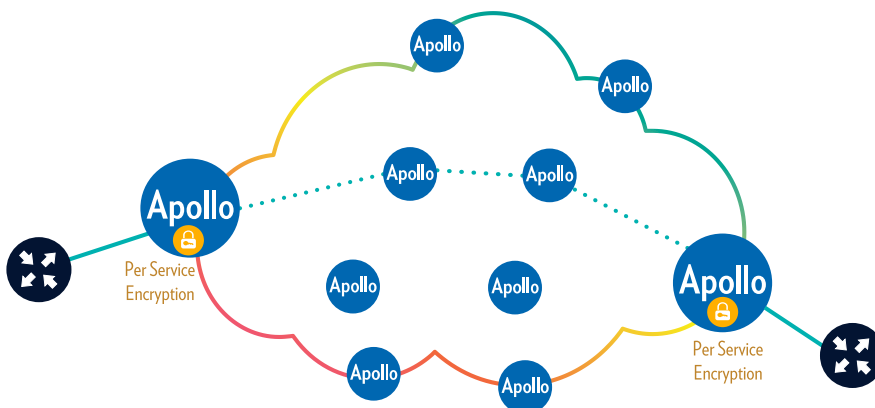


IMPROVING ROI WITH OPTICAL LAYER ENCRYPTION

Information security is a critical business imperative for today's businesses. Information must be secured throughout the data center, enterprise, and interconnecting networks. Optical-layer encryption in particular has emerged as a powerful way to ensure secure communications over interconnecting networks. As optical encryption equipment has become more affordable and flexible, service providers can now offer optical encryption as a service on any optical network.

ECI's Apollo optical product line provides optical encryption via both transponders and muxponders, supporting per-service encryption of up to 100Gbps, with line rates of up to 200Gbps, without sacrificing optical interoperability, scalability, or flexibility. These capabilities enable a variety of flexible options for optical encryption as a service.

- | | | | |
|-------------------------------------------------------|-------------------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------|
| High Speed
Up to 100Gbps services encrypted | Interoperable
Include encryption in any optical network | Flexible
Offer encrypted and unencrypted on the same link | Improved ROI
Greater revenue with minimal additional cost |
|-------------------------------------------------------|-------------------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------|



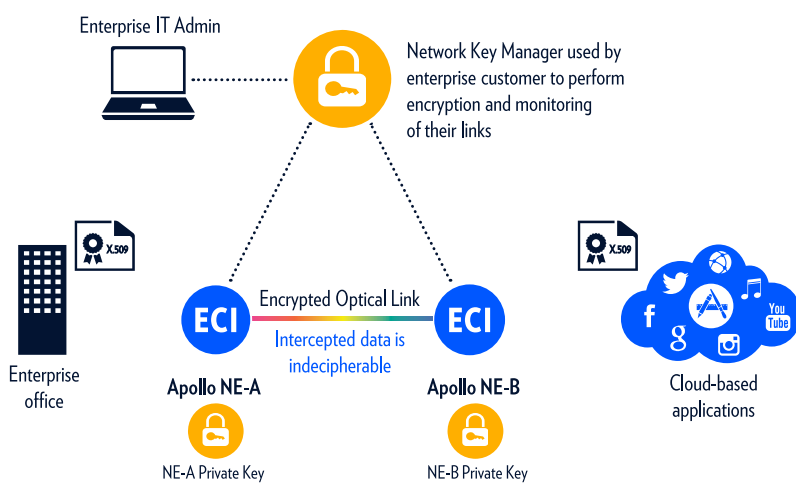
OPTICAL LAYER ENCRYPTION

Optical layer encryption has migrated from a niche application for high-security customers such as governments and large financial institutions into a key part of the security strategy for any optical network.

In Apollo, optical layer encryption is performed on the payload of an OTN-framed signal. The payload is scrambled using standard, highly-secure algorithms that can only be decoded via access to a key that is shared privately between both ends. Key exchange is performed via an external key manager in a very secure transfer technique that ensures that the keys themselves are never actually transmitted, but are calculated securely on-site.

By scrambling the OTN payload and leaving the OTN header in place, the service can still be carried over a standard WDM/OTN network without interoperability issues. And since there is no information in the OTN header about the content of the service, a hacker with access to the optical line will not be able to determine anything about the types of services carried, much less the content.

In contrast with Layer 2 (or higher layer) encryption, optical layer encryption adds almost no latency to the network and can be used to encrypt any service - not just Ethernet-based services. Also, higher-layer encryption can still provide information about the type of services and target machine addresses - information that cannot be retrieved from an optically encrypted signal.



APOLLO ENCRYPTION OPTIONS

Optical layer encryption in Apollo is supported at rates of 10Gbps and higher, via the 10G encrypted transponder and 200G encrypted transponder/muxponder. Encryption on Apollo has been certified per FIPS 140-2 Security Level 1 standards, the US government computer security standard used to accredit cryptographic modules.

Apollo's 10G encrypted transponder is a single-slot card with two independent encrypted 10G transponders that fit into any Apollo 96xx chassis. Each transponder on the card is independently encrypted and can support a variety of signals, including 10G Ethernet, 8G & 10G Fibre Channel, STM64, OC-192, and OTU2/2e.

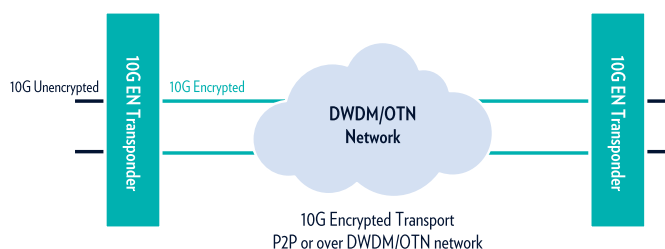
Apollo's 200G encrypted transponder/muxponder boasts the latest innovation in optical encryption. This module is a double-slot card compatible with any Apollo 96xx chassis and can be used as muxponder, combining lower-speed signals into a 200G line, as a 6x10G transponder card, as a 4x10G Y-protected transponder card (1 client, 2 lines), or for a combination of applications. Each client service can be independently encrypted and unencrypted services can be combined on the same line, without restrictions.

OPTICAL ENCRYPTION ON AN OWNED OR LEASED NETWORK

For network operators who own or lease a network, adding optical layer encryption with Apollo is an economical and powerful way to secure fiber networks against intrusion. For a small initial investment, specified or all optical signals over the network can be encrypted. Because OTN is designed to carry multiple signal types and formats, security can be imparted to services ranging from SAN (e.g., Fibre Channel) to WAN (e.g. Ethernet) to TDM (e.g. SONET/SDH). Therefore, any network operator who owns or carries sensitive information can easily add optical layer encryption to any new or existing optical network with the Apollo system.

The framing of the encrypted signal is standard, so that even services that are transmitted over a 3rd-party network can be encrypted. Network operators who lease capacity across 3rd-party networks can use Apollo to add optical-layer encryption to their services and transport those service transparently and securely

across any OTN- or DWDM-based network. This capability ensures that traffic carried by a 3rd-party cannot be intercepted or snooped, since the signal is not unencrypted at any point, until it reaches the final destination. Because the encryption keys in the Apollo system are carried on a different path and are exchanged in a secure manner that does not allow interception (Diffie-Hellman techniques and an external key manager), no intermediary will have access to the encrypted data.

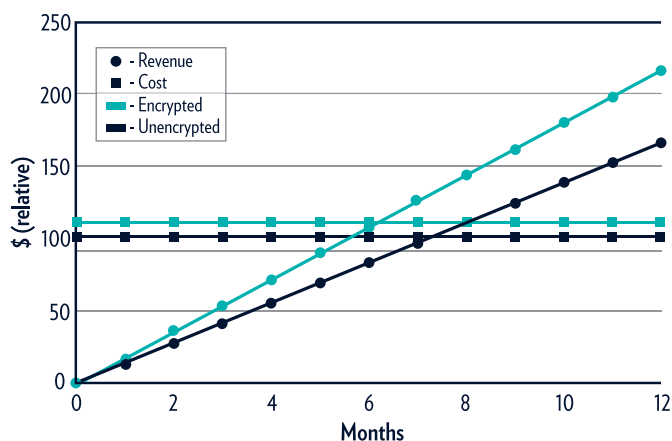


OPTICAL ENCRYPTION AS A SERVICE

With the increased focus on security and the ease with which optical layer encryption can be added to any optical channel, optical encryption is now a legitimate option for service providers as a value-added service for their customers. Optical encryption as a service is most often associated with financial networks, but recent high-profile security breaches in Enterprise and Utility networks have made security a priority for other industries as well. Optical layer encryption provides network operators with peace of mind for minimal additional cost.

Using normalized pricing for Apollo 10Gbps equipment and industry standard revenue from 10Gbps services, the graph below shows the impact of charging a 30% premium for encrypted 10Gbps services. Since the cost of the equipment is similar (within 10%) for encrypted versus unencrypted, the increase in revenue goes directly towards improving ROI, with a month reduction (from 7 months to 6 months) as shown in the graph. These numbers demonstrate that adding encryption as a service does not increase the initial outlay significantly, and in the long-term, can lead to a higher revenue stream with little to no financial risk.

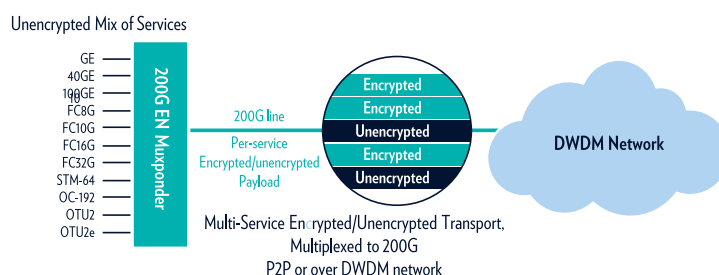
Alternatively, encryption as a service can be provided as a differentiator. By providing the same service at a similar price, but with the added security of optical layer encryption enabled by Apollo's encrypted transponders, service providers can differentiate their services from competitors who are unable or uninterested in providing optical layer encryption. The ROI will be essentially the same as an unencrypted service at the same price (a difference of less than a month in most cases), but the service would be significantly more attractive to end-users.



PER-SERVICE ENCRYPTION

One of the operational issues with offering optical encryption as a service is that the encryption engine is linked to the hardware in such a way that either all or none of the services on a particular piece of hardware are encrypted. As optical hardware has become more compact and more services can be supported on a single card, this means usually means more limited options for offering a la carte encryption services.

ECI's 200G encryption transponder/muxponder solves this problem by offering per-service encryption. With Apollo's TM200EN card, each client service can be independently encrypted, and unencrypted services can be combined on the same line without restrictions. The line output can be either 100Gbps or 200Gbps, depending on the needs of the network operator. For the 200Gbps option in particular, the ability to mix and match encrypted and unencrypted 10Gbps services offers unprecedented flexibility to network operators.



Service providers can now install the hardware for an ultra-high-speed 200Gbps network on day 1 and offer both encrypted and unencrypted services to their clients. Existing clients can be upsold at any time to an encrypted service without the need to replace any hardware, and the service can be enabled instantly via software commands. There is no need to install expensive hardware that will sit idly in anticipation of future encryption needs, and there is no need to give away encryption for free on a line, just because one client has requested that feature.

CONCLUSIONS

In a world where network and data security has become a daily concern, optical layer encryption is a powerful tool in the fight against unwanted intrusion. With ECI's cost-effective and flexible Apollo optical networking system, optical encryption can easily be added to any network – leased, owned, or a combination – allowing network operators to offer optical encryption as a service to their end-users. Either as a value-added service or as a service differentiator, optical encryption can be added on a per-service basis to LAN, WAN, TDM, or other customer offerings. The result is improved ROI, increased attractiveness to customers, and an overall more secure network.

Contact us to find out how our **ELASTIC** networks can help you grow



ABOUT ECI

ECI is a global provider of ELASTIC network solutions to CSPs, utilities as well as data center operators. Along with its long-standing, industry-proven packet-optical transport, ECI offers a variety of SDN/NFV applications, end-to-end network management, a comprehensive cyber security solution, and a range of professional services. ECI's ELASTIC solutions ensure open, future-proof, and secure communications. With ECI, customers have the luxury of choosing a network that can be tailored to their needs today – while being flexible enough to evolve with the changing needs of tomorrow. For more information, visit us at www.ecitele.com