SOLUTION BRIEF

Delivery of business Ethernet services

Today Ethernet Services are widely adopted by large Enterprises as a building block for their corporate networks and connectivity to the Cloud. Ethernet services provide a solid backbone on top of which all kinds of data can be transported. There are also good reasons for its popularity because Ethernet simplifies the overall complexity of the network by supporting any type of data traffic and scales up easily for fast growing data traffic caused by the digital transformation of the enterprise. Ethernet services also provide common standardised interfaces to make carrier interconnections straightforward and to extend connectivity to off-net locations. In general, Ethernet services are more cost-effective than similar MPLS services and provide the same kind of TDM-like determinism in terms of resiliency and end-to-end quality control.

Standardization

An important catalyst for Ethernet services to become popular came from the MEF organization which helped to standardize different forms of Ethernet services and Ethernet connectivity in addition to promoting the technology among Telecom Operators, equipment manufacturers and end-users. In addition, by introducing product and service certifications, the MEF provided operators a way to reduce validation costs and time-to-market for introducing new Ethernet-based services in their networks. Therefore MEF certification or compliancy with MEF standards has become an important differentiator for a product or service to be adopted by operators or end-users.

Common standardized Ethernet services for end-users are E-Line (point-to-point), E-LAN (multipoint-to-multipoint) or E-Tree (rooted point to multipoint). These services exist as port-based services (Physical) or as VLAN-based services (Virtual).

Common standardized Ethernet services for operators are the ones mentioned before plus E-Access and E-Transit. These services provide operators with a standardised way to interconnect their networks.

The scope of these standards is to provide a solid framework for establishing Ethernet connectivity, handling of Ethernet Control Protocol packets and providing Quality of service.

Most of the existing Carrier Ethernet equipment today is MEF CE 2.0 certified or compliant. New products are being certified for MEF 3.0 CE compatibility.

SLA Monitoring

Ethernet services deliver well defined connectivity to customers in terms of throughput, availability, latency, delay and jitter. Therefore it is crucial for operators being able to measure these parameters on a permanent base and to offer end-user Service Level Agreements (SLAs) based on these parameters. For end-users it is important to get guarantees about expected network behaviour as this has a direct impact on the performance of applications making use of these networks. This is especially true for cloud-based applications which are dependent on network connectivity for interacting with their end-users.

SLA monitoring in Carrier Ethernet networks is often performed using Y.1731 to monitor availability, loss, delay and jitter using special OAM (Operation And Maintenance) frames sent along with the actual data traffic to get a realistic view on the quality of the delivered services. Other methods can also be used like for example the more IP-oriented TWAMP protocol measuring similar parameters to quantify network quality.

Network Resilience

As more and more business-critical applications require uninterrupted network connectivity 24 by 7, special care needs to be taken on network level to ensure connectivity at all times, even if failures occur in parts of the network. This is also the case for the access network, bridging between the core of the network and the actual customer premises. Several mechanisms can be used at different locations in the network to ensure the integrity of the data being sent. LAG/LACP (Link Aggregation) provides a backup and load-sharing mechanism for physical links between network equipment connected with each other over multiple links. End-to-end backup in Carrier-Ethernet networks can be implemented using G.8031, selecting an alternative transmission path when the main link is broken or unavailable.

Network resiliency for access equipment also implies the presence of multiple WAN interfaces to provide multiple transmission paths, preferably over different transmission technologies. Examples of these are the backup of fiber connections over DSL or LTE/4G. Although the bandwidth of the backup medium might not be sufficient for a 1-to-1 backup it is still possible to reschedule priorities to support most business-critical applications.
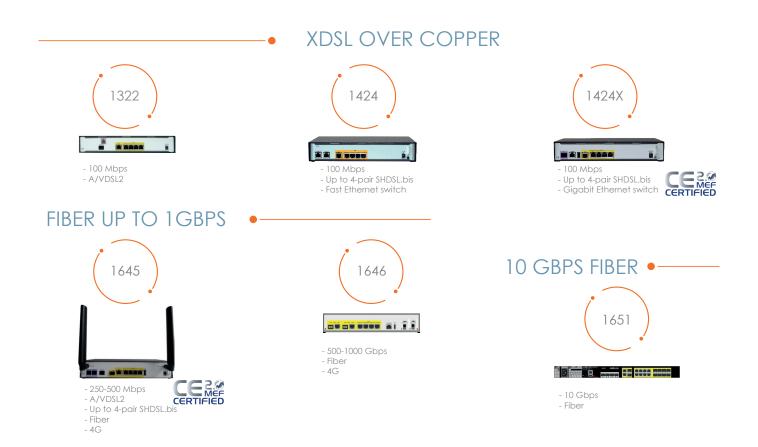
Network Provisioning

Provisioning Carrier Ethernet services is a complex and potentially expensive activity if no attention is paid to automate the process and to introduce procedures to test and document the provisioned services. Automated provisioning like Zero-Touch provisioning can really streamline the provisioning process and eliminate the sources of human error. In addition, it also eliminates the need for qualified network technicians on site to provision the new service. Installation of equipment in a zero-touch provisioning process can be done by less qualified personnel or even by the end-user. Once the connection to the network is done, configuration and testing of the service is done automatically, supervised by the central provisioning server. Well-known methods for Zero-Touch provisioning are using TR-69 or DHCP-based protocols.

Once the service has been provisioned over all participating network elements it still needs to be tested before it can be handed off to the customer. Ideally this should be done over exactly the same path as the actual end-to-end service. Therefore the CPEs should implement an internal data traffic generator, generating representative data for the service at its nominal speed and testing if the overall quality conditions are met. Standardised test sequences for this purpose are defined by RFC2544 or Y.1564. Single-stream performance testing is implemented by RFC2544, testing for the highest reachable throughput without bit-errors. Services based on multiple data streams with different Classes of Service can be tested with Y.1564, testing each stream independently and finally also testing all streams of the overall service together. The presence of these built-in testers eliminates the need for external test equipment and the need to have operators on site to perform the service testing.

Ekinops Ethernet Access Products

Ekinops provides a comprehensive range of Ethernet Access Products for the delivery of Carrier Ethernet services to business and enterprise users.

XDSL OVER COPPER

1322
- 100 Mbps
- A/VDSL2

1424
- 100 Mbps
- Up to 4-pair SHDSL.bis
- Fast Ethernet switch

1424X
- 100 Mbps
- Up to 4-pair SHDSL.bis
- Gigabit Ethernet switch

FIBER UP TO 1GBPS

1645
- 250-500 Mbps
- A/VDSL2
- Up to 4-pair SHDSL.bis
- Fiber
- 4G

1646
- 500-1000 Gbps
- Fiber
- 4G

10 GBPS FIBER

1651
- 10 Gbps
- Fiber

The product range includes products for delivery of Ethernet Services over copper and fiber. The table below provides an overview of the most important characteristics:

Models	Technology	WAN	Backup	LAN	Throughput	MEF
1322	Copper	VDSL2	Fast Ethernet	4-port GigE	100 Mbps	2.0 compliant
1424	Copper	SHDSL.bis	Fast Etherneet	4-port GigE	100 Mbps	1.0 compliant
1424X	Copper	SHDSL.bis	Fast Ethernet	4-port GigE	100 Mbps	2.0 cerfified
1645	Fiber	GigE	GigE, SHDSL.bis, VDSL2, 4G/LTE	4-port GigE	500 Mbps	2.0 certified
1646	Fiber	GibE	GigE, 4G/LTE	4-port GigE	1 Gbps	2.0 compliant
1651	Fiber	10G SPF+	10G SFP+	2-port 10Gbps 2 or 10 port GigE	20 Gbps	3.0 compliant

Below is an overview of the main feature set:

Features	Details
MEF services	E-Line, E-LAN, E-Tree E-Access, E-transit (on selected products only)
Ethernet frame handling	L2 Access Lists, L2PT Tunneling, Configurable L2CP transparency, Configurable multicast traffic behaviour
VLAN support	VLAN Tagging, VLAN Switching, Port-based VLANs, QinQ, 802.1ad
QoS	Up to 8 traffic classes, Egress Shaping, Ingress Policing, Hierarchical QoS per EVC and EVC CoS (selected products only)
SLA monitoring	Link OAM, CFM OAM, Y.1731, Link-State Tracking, Dying Gasp, TWAMP
Service Activation Tseting	RFC2544, Y.1564 with birth certificate
Protection Mechanisms	LAG/LACP (local link protection), G.8031 (end-to-end protection)
Tunneling L2 over L3	GRE
Zero-Touch provisioning	DHCP-based or TR-069, OneManage Provisionng Server
Management	CLI, SNMP, NETCONF/YANG (1651-only)

For more detailed information please refer to http://www.ekinops.com under Access Products.

About Ekinops

Ekinops is a leading provider of open and fully interoperable Layer 1, 2 and 3 solutions to service providers around the world. Our programmable and highly scalable solutions enable the fast, flexible and cost-effective deployment of new services for both high-speed, high-capacity optical transport networks and virtualization-enabled managed enterprise services

Our product portfolio consists of three highly complementary product and service sets: Ekinops360, OneAccess and Compose.

- Ekinops360 provides optical transport solutions for metro, regional and long-distance networks with WDM for high-capacity point-to-point, ring and optical mesh architectures, and OTN for improved bandwidth utilization and efficient multi-service aggregation.

- OneAccess offers a wide choice of physical and virtualized deployment options for Layer 2 and Layer 3 access network functions.

- Compose supports service providers in making their networks software-defined with a variety of software management tools and services, including the scalable SD-WAN Xpress.

As service providers embrace SDN and NFV deployment models, Ekinops enables future-proofed deployment today, enabling operators to seamlessly migrate to an open, virtualized delivery model at a time of their choosing.

A global organization, with operations in 4 continents; Ekinops (EKI) - a public company traded on the Euronext Paris exchange - is headquartered in Lannion, France, and Ekinops Corp., a wholly-owned subsidiary, is incorporated in the USA.