

SOLUTION BRIEF

Delivery of business Ethernet services



Why Ethernet?

Ethernet services are widely embraced by both service providers and business customers due to a range of compelling advantages. One of the key strengths lies in their ability to deliver high bandwidth, making them well-suited for data-intensive applications like cloud services, video conferencing, and large-scale data transfers. This capacity for handling substantial data volumes positions Ethernet as a powerful solution in the digital era.

In addition to high bandwidth, Ethernet services offer exceptional scalability, providing businesses with the flexibility to seamlessly expand their network capacity to meet evolving demands. This scalability is a crucial attribute, allowing organizations to grow their network infrastructure in tandem with the expanding needs of their operations.

Cost-effectiveness is another driving factor behind the widespread adoption of Ethernet services. Compared to traditional WAN solutions, Ethernet presents a more economical option for connecting geographically dispersed locations, contributing to overall cost savings for businesses.

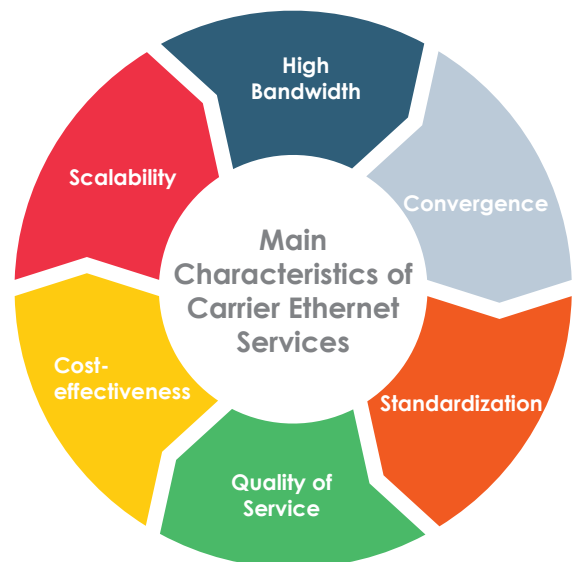
Ethernet services also facilitate the convergence of various types of traffic, including data, voice, and video, over a unified network infrastructure. This convergence simplifies network management, eliminating the need for separate networks for different applications.

Moreover, Ethernet networks can be designed with redundancy features to ensure high availability and reliability. These redundancies, alongside failover mechanisms, minimize downtime and contribute to the overall resilience of the network.

Standardization is a key advantage of Ethernet, as it adheres to industry-standard protocols. This standardization fosters interoperability between equipment from different vendors, providing businesses with a diverse range of compatible devices and preventing vendor lock-in.

Finally, Ethernet services support Quality of Service (QoS) mechanisms, enabling businesses to prioritize critical applications. This ensures consistent and reliable performance for time-sensitive data, such as voice and video, enhancing the overall quality of the network service.

Ethernet services provide a compelling mix of high performance, scalability, cost-effectiveness, simplicity, and reliability. These advantages collectively position Ethernet as a preferred solution for building robust, flexible, and efficient network infrastructures in today's dynamic business landscape.



Ethernet Service Demarcation

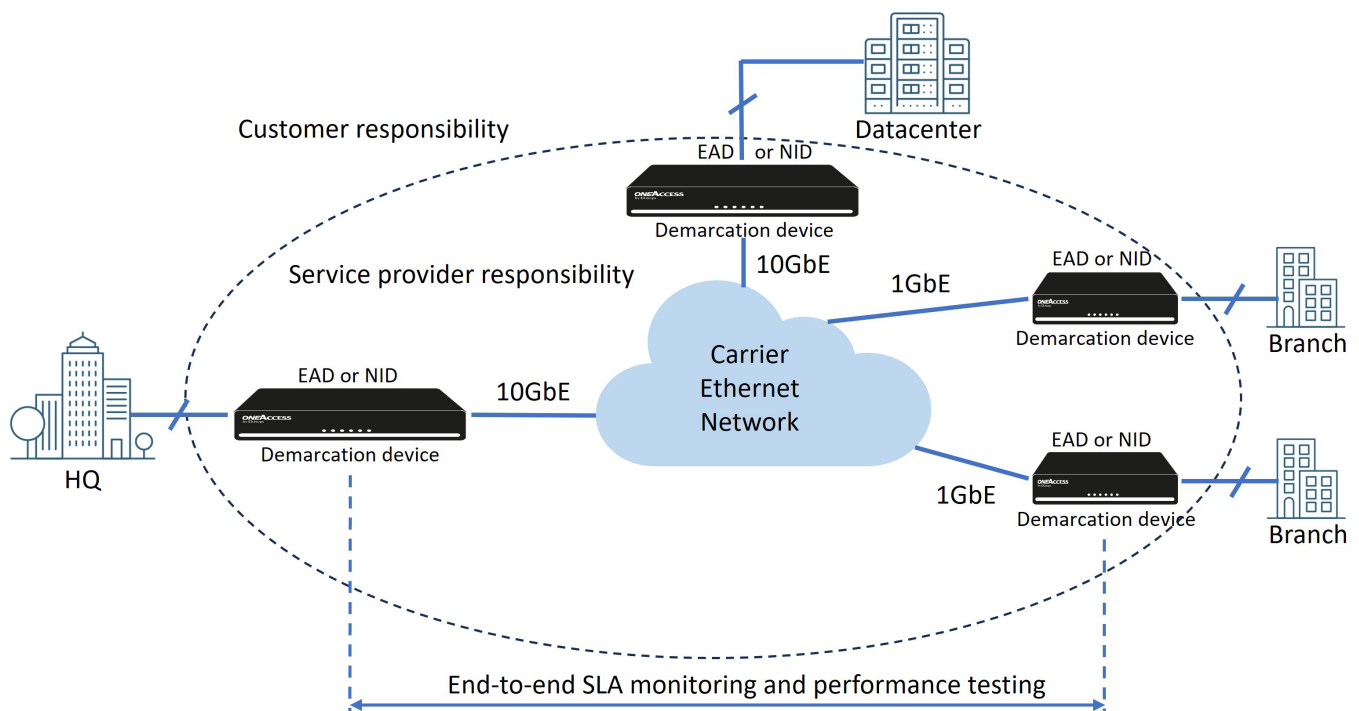
Ethernet service demarcation establishes a clear division between service provider and customer responsibilities in a network. This involves defining a specific location, typically marked by a dedicated device, where the service provider's network concludes, and the customer's network begins.

Demarcation delineates roles: the service provider ensures a stable connection up to the demarcation point, while the customer manages their network beyond it. This distinction simplifies troubleshooting, with pre-demarcation issues falling under the service provider's jurisdiction, and post-demarcation issues becoming the customer's responsibility.

This concept is integral to the Service Level Agreement (SLA), providing contractual clarity on Ethernet service terms, including specifics about the demarcation point. Demarcation devices are crucial for testing during installation, ensuring that delivered services align with agreed specifications and meet performance expectations.

Beyond technical functions, demarcation devices enhance network security by explicitly defining the boundary between the service provider's infrastructure and the customer's network, preventing unauthorized access.

Ethernet service demarcation devices are commonly referred to as Ethernet Access Devices (EADs) or Network Interface Devices (NIDs).



Ethernet demarcation with EADs or NIDs

Ekinops Ethernet Access Devices or NIDs

Part of the OneAccess brand, Ekinops' EADs or NIDs provide a robust set of features, ensuring MEF 3.0 CE compliance, comprehensive SLA monitoring, advanced service activation testing, and multiple resiliency options. The devices are designed for seamless integration into existing workflows while offering the flexibility to extend their functionality beyond Ethernet demarcation to routing for more complex IP services. They are all based on a unique and robust operating system called OneOS6.

Key Features

MEF Services (MEF 3.0 CE-certified)



- Ekinops Ethernet Access Devices deliver MEF services and are MEF 3.0 Carrier Ethernet certified for all services (E-Line, E-LAN, E-Tree, E-Access, E-Transit). This ensures compliance with industry standards, providing a solid foundation for a variety of Ethernet services.

SLA Monitoring



- **Local Link OAM:** Offers monitoring capabilities at the local link level, ensuring the health and performance of individual connections.
- **End-to-End CFM OAM:** Implements Connectivity Fault Management (CFM) for end-to-end monitoring, identifying and addressing faults across the entire service path.
- **End-to-End Quality OAM Y.1731:** Monitors and maintains the quality of service through Y.1731 standards, addressing parameters like frame delay, frame loss, and inter-frame delay variation.

Service Activation Testing



- **RFC-2544:** Supports RFC-2544-based testing, a standardized method for benchmarking network devices to ensure they meet performance criteria.
- **Y.1564 with Birth Certificate:** Implements Y.1564-based testing, a more advanced method, providing a clear text birth certificate for archiving or local storage. This ensures comprehensive service activation testing.

Resiliency and Backup Options



- **LAG/LACP (Local Protection):** Utilizes Link Aggregation Group (LAG) or Link Aggregation Control Protocol (LACP) for local protection, enhancing reliability by aggregating multiple links into a single logical link.
- **G.8031 APS (End-to-End Protection):** Implements G.8031 Automatic Protection Switching (APS) for end-to-end EVC protection, ensuring seamless switchover in case of link failures.
- **4G or 5G Backup Options:** Provides backup connectivity options using 4G or 5G networks, ensuring network continuity in scenarios where primary connections face disruptions. Alternatively, 4G or 5G connectivity can also serve as a primary link in case no fixed alternatives are available.

Integration into Workflows



- **Standard CLI:** Supports a standard Command Line Interface (CLI) for manual configuration and operation, ensuring compatibility with existing operational practices.
- **Netconf/YANG:** Integrates into automated workflows using Netconf/YANG interfaces, offering a future-proof solution for managing Ethernet services within modern network orchestration environments.

Extended Functionality



- **IP Routing:** Goes beyond demarcation by offering the option to extend functionality to include IPv4/IPv6 routing. This transforms the device into a comprehensive solution that can handle routing protocols (RIP, OSPF, BGP), virtual routing (VRF), redundancy (VRRP), and IP Quality of Service (QoS).

Ekinops Portfolio

1647: 1 Gbps fiber EAD

This platform is based on a 2.2GHz Quadcore ARM processor with 2G RAM

- Network interfaces: 2x 1G COMBO
- Subscriber interfaces: 2x 1G SFP, 4x 1G UTP
- Dual power supply, rack/wall mountable and fanless

4 versions are available:

- 1647 basic unit
- 1647 basic unit with LTE/4G CAT6 MIMO 2x2 radio interface
- 1647 basic unit with LTE/4G CAT12 MIMO 2x2 radio interface
- 1647 basic unit with 4G/5G MIMO 4x4 interface



1651: 10 Gbps fiber EAD

This platform is based on a 50Gbps Ethernet switch and comes in two configurations:

- Demarcation version with 4x 10G SFP+ and 2x 1G COMBO interfaces
- Aggregation version with 4x 10G SFP+, 6x 1G COMBO, 4x 1G UTP and 4x 1G SFP interfaces

The Demarcation version is available in both desktop and rackmount versions and can be delivered with or without hardware accelerator for generating wirespeed service activation traffic at 10 Gbps.

The Aggregation version is available in rackmount version only and comes with hardware accelerator by default.

The desktop version supports 2 external DC or AC power supplies while the rackmount version comes with dual hot swappable internal DC or AC power supplies.

5 different versions are available:

- 1651 demarcation desktop
- 1651 demarcation desktop with hardware accelerator
- 1651 demarcation rackmount
- 1651 demarcation rackmount with hardware accelerator
- 1651 aggregation rackmount with default hardware accelerator



Ekinops 1G and 10G Ethernet access device families

EAD/NID Features

Feature	1647	1651
MEF 3.0 Carrier Ethernet Services: E-Line, E-LAN, E-Tree, E-Access, E-Transit	MEF3.0 Certified (1 Gbps)	MEF3.0 Certified (10 Gbps)
VLAN Tagging, QinQ, IEEE802.1ad (C-Tag, S-Tag), VLAN single TAG switching/double TAG switching, Nb of EVCs	64 EVCs	254 EVCs
Ethernet frame handling: L2 Access lists, configurable L2CP handling (peer, drop, tunnel)	√	√
QoS with 8 priority classes, ingress policing, egress shaping	√	√
Comprehensive SLA monitoring with link OAM, CFM OAM, Y.1731, link state tracking, dying gasp, SFP Digital Diagnostics Monitoring (DDM)	√	√
Service activation testing with RFC2544 or Y.1564 with "birth certificate"	√	Up to 10G on "X" versions <500M on other versions
Resiliency	LAG/LACP & G.8031 APS	LAG/LACP & G.8031 APS
Tunneling	Tunneling of L2 over L3 with GRE over IPSec	Tunneling of L2 over L3 with GRE
Management: CLI over console port or SSH, Netconf, TR-069, SNMP MIB II or proprietary MIB	√	√
ZTP provisioning, configuration and software management with OneManage	√	√

Table 1 - Feature list

IP Routing Functions (requires additional license)

Feature	1647 (IP routing license)	1651 (IP routing license)
Internet access	NAT/PAT, ACL, DHCP, DNS server/relay, IGMP, stateful firewall, IP filtering, ALG	L3 Access Control Lists
QoS	QoS with 8 priority classes, Hierarchical QoS, RED, WRED	L3 Access Control Lists
Routing protocol	Static, Policy-based, RIPv1/v2, OSPFv2, BGPv4	Static, OSPFv2, BGPv4
Routing instances resiliency	VRF, VRRP, BFD	VRF, VRRP, BFD
Tunneling	GRE, L2TP, IPSec	GRE (for L2)
IPv6	Static, RIPv6, OSPFv3, BGP4, VRF	Roadmap Q1 2024
Performance	1 Gbps (IMIX409)	10 Gbps (64 bytes)

Table 2 - Layer 3 routing functions

OneManage: Zero Touch Provisioning Tool

OneManage is a comprehensive solution for automating the provisioning, management, and monitoring of network devices. It provides a streamlined approach to handling software updates, configurations, and maintaining an inventory of devices. The northbound interface allows for the integration of the tool with OSS/BSS systems and realization of a fully automated workflow.



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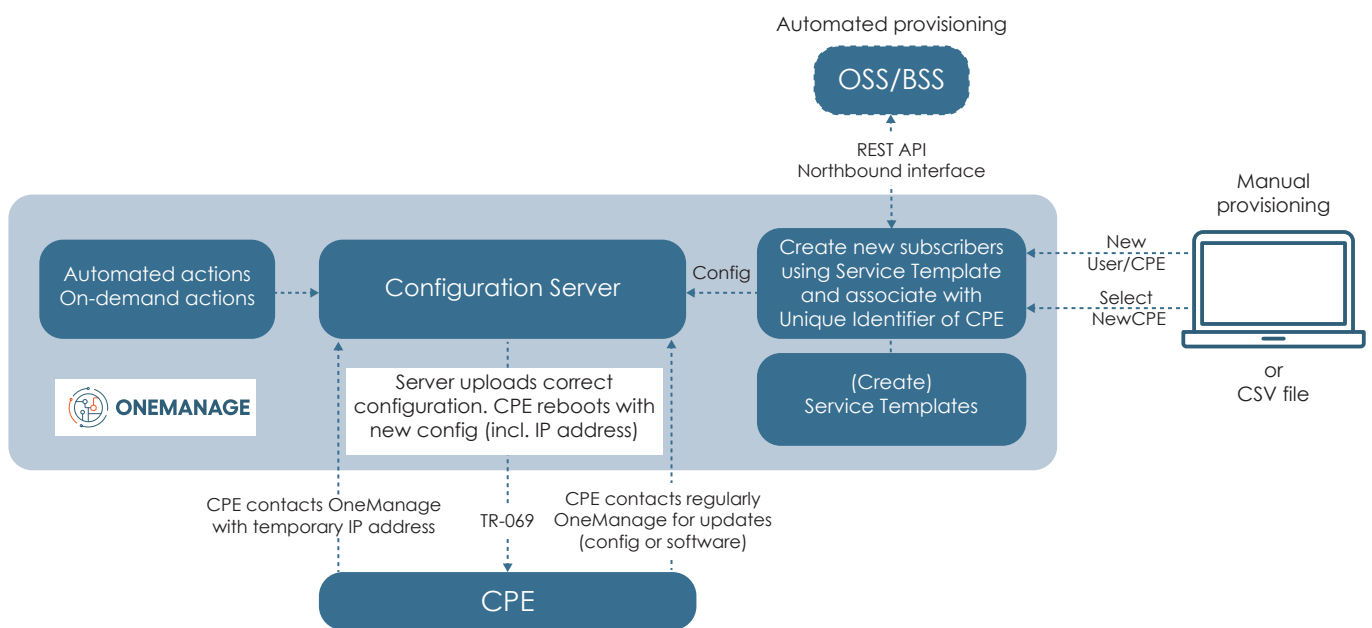
The OneManage ZTP server, based on TR-069, automates the initial configuration using template-based service descriptions and initializes the network devices automatically when connected to the network for the first time.

The included software management functionality ensures that devices are running the latest software versions. Software updates can be organized per CPE group, type of equipment or customer and can be done on request or on a scheduled moment in time.

Configuration management centrally manages and deploys configurations to remote network devices and helps to ensure that all devices are configured consistently according to the deployed service for a particular customer. The configuration manager will permanently monitor the configurations on the remote devices and verify if it is consistent with the versioned archive of parameters and templates. Even if configuration consistency is not imposed on the network, the configuration manager will backup the configuration of the remote device with every configuration change, safeguarding the deployed configuration in case something goes wrong with the connected network device.

OneManage also keeps track of all network devices, their configurations and other relevant information. It provides a comprehensive view of the network infrastructure.

Although OneManage can be deployed as a turnkey system, it still has the ability to be integrated in a fully automated provisioning workflow through its northbound interface. The OSS/BSS system can provide customer-specific service parameters to be filled-in in the service templates of the service the customer subscribed to. The communication between OneManage and the OSS/BSS system is done over a REST API and can work both in a pull-mode and a notification-mode.



OneManage functional blocks

OneManage can be operated by multiple users over a web-based GUI with each having their own role-based access to the system. It is possible to deploy OneManage in a high-availability configuration over multiple server.

OneManage Benefits

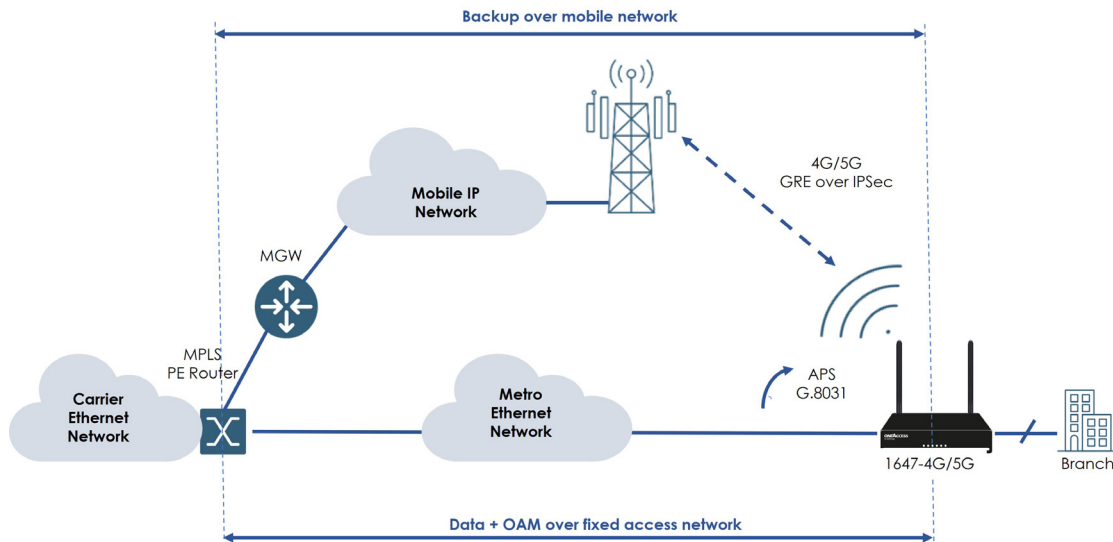
Provides operators a hassle-free, efficient and cost-effective solution for network device provisioning, configuration and software management. The turn-key nature, combined with straightforward integration and a single point of contact, contributes to a smoother deployment process and ongoing operational efficiency.

Use Cases

Ekinops EADs like the 1647 and 1651 are versatile solutions that can be deployed for various use cases. Here are some popular scenarios where these EADs can be successfully applied:

Backup of Ethernet Virtual Circuits over 4G/5G

Ethernet Virtual Circuits can be backed up by the 1647 using SLA monitoring and providing the mechanism to switch over to the radio network using G.8031 APS and providing an alternative path with GRE over IPSec over the mobile IP network. The same type of connectivity can be used for permanent fixed mobile connections in case no alternative is available.



Backup of fixed Ethernet access over 4G/5G

High-Speed Internet Services

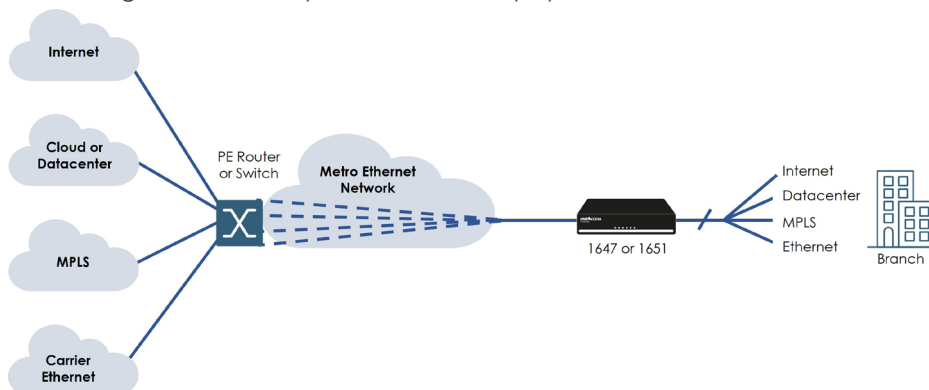
The most cost-effective solution for high-speed Internet connectivity can be provided by a Direct Internet Access (DIA) service, which provides a dedicated and unrestricted connection to the Internet, with the customer providing their own router to terminate the circuit. This also provides improved performance in terms of latency and bandwidth flexibility. SLA monitoring of the Metro Ethernet portion of the network makes it easier to pinpoint the source of network problems.



DIA (Direct Internet Access) service over L2

Multi-Service Access

Ethernet Virtual Circuits can be used to access multiple services or networks with a single device, and the same demarcation equipment can be used for a wide range of business services such as Internet access, cloud, or data center access, MPLS access and Carrier Ethernet access. Ekinops EADs also have the ability to support Ethernet demarcation and IP routing simultaneously across different physical or virtual interfaces.



Access to multiple services over Ethernet

Conclusion

Ekinops EADs/NIDs provide a comprehensive solution for delivering Carrier Ethernet services. The 1647 and 1651 address different bandwidth requirements, offer versatile deployment options and a unique operating system for a consistent user experience. This solution is well positioned to meet the evolving needs of Ethernet service providers in a variety of scenarios.

Key differentiators of the 1647 include MEF3.0 CE certification, an IP router option for branch office connectivity, futureproofing with Netconf/Yang support, and flexible connectivity options with 4G and 5G.

The 1651 serves a dual role as a 10 Gbps demarcation device and a mid-size aggregation platform. The 1651 differentiates itself with its ability to generate test traffic (10 Gbps wire speed with the smallest packet size). In addition to being a MEF3.0 CE certified demarcation device, the 1651 can optionally be used as a 10G router offering high-speed basic IP services.

OneManage provides a turnkey solution for network device management, ensuring faster deployment, lower costs and predictable timelines. It eliminates the need for in-house development, easily integrates with existing IT systems, and provides a single point of contact for CPE and management servers, streamlining operations for operators.

About Ekinops

Ekinops is a leading provider of open, trusted and innovative network connectivity 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 as well as 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 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 and SixSq Edge-to-Cloud solutions.

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, Ekinops (EKI) - a public company traded on the Euronext Paris exchange operates on four continents.

