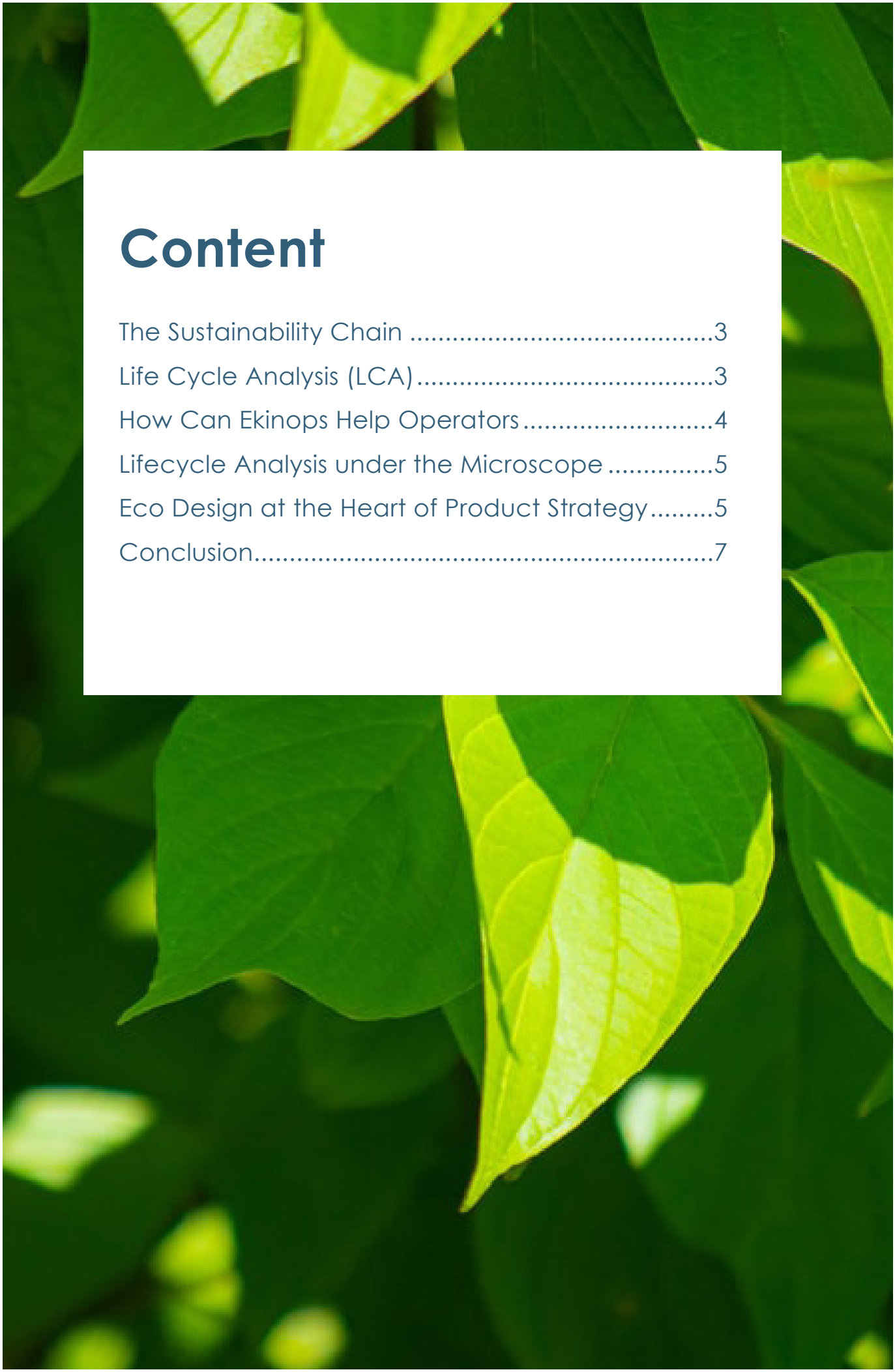
Empowering Networks

WHITE PAPER

Sustainability:
A new frontier for network connectivity

July 2024



Content

The Sustainability Chain

Sustainable development has become one of the key challenges in the digital transformation of companies and telecoms operators. The carbon footprint is now a major component and measurement for sustainable development in corporations.

Most companies in Europe and in other parts of the world now have a regulatory framework in which they need to calculate their carbon footprint and set targets for reducing it. This impacts most of their business activities, including their communications and connectivity services. The importance of the carbon footprint is therefore reflected when enterprises submit calls for tender to telecoms operators and is considered as an increasingly important criteria when choosing a solution. It's not uncommon for carbon footprint impact to account for 15 to 25% of the final decision score. At that level of importance, a poor response on that criteria can easily result in losing the tender.

Telecom operators carry the heavy responsibility of also setting reduction targets themselves. So, it is fully understandable that, when it comes to equipment (hardware and software), they naturally turn to their vendors to alleviate this burden.

As a result, equipment and services suppliers must strengthen their efforts to reduce the environmental impact of the solutions they bring to market, making this a real selling point and turning the constraint into a differentiator.

Life Cycle Analysis (LCA)

The calculation of equipment's carbon footprint is made from a careful life-cycle analysis. The method is based on a "cradle-to- grave" approach, basing the calculation on the entire life cycle of a product, including all its components, manufacturing, transport, usage and end-of-life.

The calculation is defined by the international standard, ISO 14040/14044. One of the most widely used indicators is that of climate change. For a non-technical audience, this is sometimes referred to as the carbon footprint.

This is a bit of a misnomer, as the carbon footprint focuses solely on greenhouse gas emissions, whereas the climate change indicator has a broader scope.

The LCA considers a total of sixteen indicators to be measured (figure 1), in addition to climate impact (e.g. the impact on resources, human toxicity, etc.).

Since comparisons between products are rather complicated, a single indicator called the single score represents a synthesis of all the other indicators.

Figure 1: Environmental impact categories - as per EN15804 (A+A2)

As far as equipment suppliers are concerned, the "cradle-to-grave" approach is actually becoming "cradle-to-gate", as operators are responsible for transportation to the end customers' sites. Nevertheless, transport is marginal, and 90% of this environmental impact can be considered to come from the equipment supplier.

How Can Ekinops Help Operators,
A deep dive on sustainable network access connectivity

The first action is to enable operators to calculate their carbon footprint by providing the climate change indicator for all the Ekinops products they have deployed. Initiated just over two years ago, this calculation has now been automated, and it is easy for Ekinops to provide these indicators on request for any of the Access portfolio product codes.

In addition to the climate change indicator, we provide all 17 indicators for each stage in the life cycle of our products. The results are summarized in a report, which enables our operator customers to either facilitate their carbon footprint calculations and position themselves favorably in their various tender responses, or to be used as real criteria of choice with their customers.

The report sets out the calculation conditions and climate indicators for a product leaving the factory (including end-of-life treatment) and for a total use of x years (including transport).

Date	xx-xx-2024

LIFE CYCLE ANALYSIS

CONDITIONS

Product code	XXXXX	Power consumption (Watt)	28.15	Period of usage (Yr)	10
Product description	ONE-xxxxxxxx				

CALCULATION METHOD

ISO 10044 / Ecoinvent 3.8 (2022), Ecoinvent 3.9 (2023), ELCD (2018), Ecosystem (2020)

CARBON FOOTPRINT

Country of usage	France		Carbon footprint Exworks (kg CO2 eq)	115.34	Carbon footprint Usage (kg CO2 eq)	332.11

INDICATORS VALUES

		BOM	Factory	Packing	Transport	Usage	EOL	Total
Climate change	kg CO2 eq	1.10E+02	1.15E+00	8.07E-03	1.41E-01	2.17E+02	4.01E+00	3.32E+02
Ozone layer depletion	kg CFC11 eq	1.02E-05	9.80E-08	4.03E-10	2.15E-10	8.95E-06	3.74E-08	1.92E-05
Ionizing radiation	Bq U-235 eq	1.36E+01	8.22E-01	6.82E-04	3.42E-04	1.33E+03	1.07E-02	1.34E+03
Photochemical ozone generation	kg NMVOC eq	4.55E-01	2.24E-03	3.29E-05	1.18E-03	8.15E-01	2.96E-03	1.28E+00
Particle emissions	disease inc.	5.79E-06	1.49E-08	3.63E-10	7.81E-09	1.48E-05	4.16E-08	2.07E-05
Human toxicity - non-cancerous	CTUh	5.40E-06	8.91E-09	8.07E-11	6.07E-11	2.58E-07	9.14E-08	5.76E-06
Human toxicity - cancerous	CTUh	1.27E-07	3.10E-10	1.43E-11	2.51E-12	1.12E-05	7.81E-10	1.13E-05
Acidification	mol H+ eq	8.22E-01	4.92E-03	3.22E-05	9.06E-04	1.51E+00	2.26E-03	2.34E+00
Eutrophication, fresh water	kg P eq	1.66E-01	1.12E-03	1.98E-06	5.26E-08	9.07E-02	5.60E-05	2.58E-01
Eutrophication, seawater	kg N eq	1.62E-01	9.41E-04	8.77E-06	4.26E-04	2.92E-01	2.57E-03	4.58E-01
Eutrophication, terrestrial	mol N eq	1.76E+00	7.74E-03	7.84E-05	4.67E-03	2.39E+00	1.12E-02	4.18E+00
Ecotoxicity, fresh water	CTUe	1.14E+04	1.04E+01	9.63E-02	9.46E-02	1.80E+03	2.40E+01	1.32E+04
Land use	Pt	6.07E+02	4.59E+00	8.32E-01	0.00E+00	1.47E+03	5.65E-01	2.08E+03
Water usage	m3 depriv.	2.62E+01	2.51E-01	5.03E-03	5.33E-04	8.02E+01	2.27E-02	1.07E+02
Depletion of fossil resources	MJ	1.40E+03	2.83E+01	1.71E-01	1.96E+00	2.94E+04	2.25E+00	3.08E+04
Depletion of mineral resources, metals	kg Sb eq	4.88E-02	2.31E-06	4.13E-08	5.52E-09	1.02E-02	3.17E-07	5.90E-02
Single score	µPt	7.35E+04	1.20E+02	8.65E-04	1.14E-02	8.22E+04	1.47E+02	1.56E+05

INDICATORS CONTRIBUTION (%)

		BOM	Factory	Packing	Transport	Usage	EOL	Total
Climate change	kg CO2 eq	33.2%	0.3%	0.0%	0.0%	65.2%	1.2%	100.0%
Ozone layer depletion	kg CFC11 eq	52.8%	0.5%	0.0%	0.0%	46.5%	0.2%	100.0%
Ionizing radiation	Bq U-235 eq	1.0%	0.1%	0.0%	0.0%	98.9%	0.0%	100.0%
Photochemical ozone generation	kg NMVOC eq	35.6%	0.2%	0.0%	0.1%	63.9%	0.2%	100.0%
Particle emissions	disease inc.	28.0%	0.1%	0.0%	0.0%	71.7%	0.2%	100.0%
Human toxicity - non-cancerous	CTUh	93.8%	0.2%	0.0%	0.0%	4.5%	1.6%	100.0%
Human toxicity - cancerous	CTUh	1.1%	0.0%	0.0%	0.0%	98.9%	0.0%	100.0%
Acidification	mol H+ eq	35.1%	0.2%	0.0%	0.0%	64.5%	0.1%	100.0%
Eutrophication, fresh water	kg P eq	64.4%	0.4%	0.0%	0.0%	35.2%	0.0%	100.0%
Eutrophication, seawater	kg N eq	35.4%	0.2%	0.0%	0.1%	63.8%	0.6%	100.0%
Eutrophication, terrestrial	mol N eq	42.1%	0.2%	0.0%	0.1%	57.3%	0.3%	100.0%
Ecotoxicity, fresh water	CTUe	86.1%	0.1%	0.0%	0.0%	13.6%	0.2%	100.0%
Land use	Pt	29.1%	0.2%	0.0%	0.0%	70.6%	0.0%	100.0%
Water usage	m3 depriv.	24.6%	0.2%	0.0%	0.0%	75.2%	0.0%	100.0%
Depletion of fossil resources	MJ	4.6%	0.1%	0.0%	0.0%	95.3%	0.0%	100.0%
Depletion of mineral resources, metals	kg Sb eq	82.8%	0.0%	0.0%	0.0%	17.2%	0.0%	100.0%
Single score	µPt	47.1%	0.1%	0.0%	0.0%	52.7%	0.1%	100.0%

Figure 2: Life Cycle Analysis Report

Lifecycle Analysis under the Microscope

The indicators provided are detailed below for each phase of the life cycle:

- For the "**BOM**" part: this refers to the contribution of the various components used in the manufacture of the product. This takes into account not only the component categories, but also their origin and the way they are transported to the factory.
- For the "**Factory**" section: this covers the impact of the manufacturing process, and in particular the resources used (electricity, water, gas, etc.).
- For the "**Packaging**" section: this refers to the contribution made by product packaging (individual packaging, palletization).
- For "**Transport**": This refers to the impact of transporting the product to the operator's logistics site. In particular, it takes into account the type of transport used, as each will have a different impact.
- For the "**Usage**" part: This is the impact linked to the use of the product. In other words, the electrical current consumed throughout the period of use.
  The calculation is based on use twenty-four hours a day, seven days a week. The power consumption considered is the average between maximum consumption and stand-by configuration.
- For the "**EOL**" part: This is the impact linked to the destruction or recycling of product components. The calculations are based on the assumption of end-of-life in France. End-of-life data for materials in the countries where routers are marketed is very limited.

Eco Design at the Heart of Product Strategy

Our work on product life-cycle analysis has incentivized Ekinops Access product teams to optimize factory operations by minimizing the use of resources and waste management.

To name only two measures taken:

- The dimensions of our product packaging have been adjusted to match the pallet size modulo. This has made it possible to increase the number of products per pallet for a given volume. In this way, we were able to increase the number of products per pallet from 109 to 152. The environmental impact has been reduced accordingly (around 50 g CO2 eq(*) when leaving the factory).

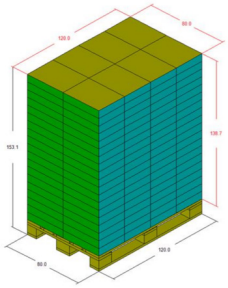
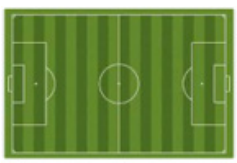


Figure 3: Pallet size



- We asked our component suppliers to deliver on EuroPalet format pallets. This has enabled us to reduce waste and save resources by reusing pallets to deliver products to our customers. For Ekinops, the percentage of re used pallets is today up to 40% and the remaining pallets (60%) are bought second-hand. The reduction in waste represents almost 18 tons per year, or 215 trees per year, or 28 tons of CO2 per year. To put it in perspective, this represents the equivalent of a soccer pitch's worth of mature trees every year.

(*) "Carbon dioxide equivalent" or "CO2 eq" is a term for describing different greenhouse gases in a common unit. For any quantity and type of greenhouse gas, CO2e signifies the amount of CO2 which would have the equivalent global warming impact.

Ekinops' aim is to provide business service operators with tailor-made equipment. Instead of a modular structure (chassis with multiple cells to support a whole range of interfaces), Ekinops' eco-design approach favors a monolithic structure that integrates all the functionalities required for service provision into a single box.

The result is a range of products adopting a smaller form factor, which, by using fewer resources, reduces their environmental impact. For reference, one kilogram of steel is equivalent to almost 5 kg CO2 eq for manufacturing in Asia.

But beyond this, and taking into account the predominant impact linked to use (and therefore power consumption), we have placed "Eco-design" at the heart of our product development.

By basing our products on ARM (Advanced Risk Machine) architectures, we have been able to improve the power consumption to routing performance ratio. It is important to consider this ratio and not just power consumption. In fact, the digital transformation of companies requires more and more performance from access routers. It is therefore virtually impossible to compare today's products with previous generations of routers, given the extent to which their performance levels have evolved.

Let's take a look at the routers in Ekinops' OneAccess branded range.

Just over 10 years ago, routers had a power consumption/performance ratio of around four watts per 100 MBps of performance.

The use of routers based on multi-core ARM architecture has reduced this ratio by a factor of four.

As an example, the environmental impact of a Gigabit Ethernet router is identical to an older model delivering only a quarter of the performance of the current model.

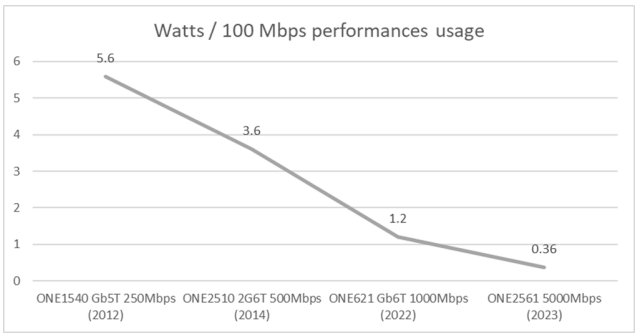


Figure 4: Power consumption/performance ratio over time

Efforts to reduce power consumption and reduce carbon footprint do not stop there. Here are 3 other amelioration paths Ekinops is working on:

Implementing green Ethernet:

Energy Efficient Ethernet

The new range of Ekinops1 routers implements green Ethernet. Also known by the acronym EEE for Energy Efficient Ethernet, it optimizes the electrical power consumed by Ethernet ports. As this type of interface is omnipresent, power savings are far from negligible. In the case of a ONE621, for example, it can reduce the router's power consumption by up to 10%.

Put unused cores in sleep mode:

On-premise enterprise routers are powered up twenty-four hours a day, but are only used at maximum performance for around a third of the day. On the new OneAccess branded routers, cores can be dynamically put in sleep mode. In non-working hours, router power consumption can be reduced by 10%.

Wi-Fi power off:

WiFi in any typical enterprise/business is only used for about a third of the day, and not at all at weekends.

In the most recent models of Ekinops routers, the Wi-Fi module's power supply can be switched off completely. This reduces power consumption by around 4 Watts during non-working hours and at weekends.

By implementing all or parts of these power consumption reduction features, the average carbon footprint can be reduced by up to 10%.

Spotlight on the latest ONE641, multi-gigabit router for SMB

This router features two 10GB ports, 4 GBE ports and a dual-band Wi-Fi 6 access point. It offers 10Gbps service connectivity with 100,000 sessions.

In total usage over 10 years in France, its carbon footprint is 224 kg CO2 eq (73 kg CO2 eq ex-factory). That's only twice as much as the ONE521, but with performance levels that bear no comparison.

By applying the various measures, we can reduce the carbon footprint under the same conditions of use by almost 30 kg CO2 eq per year (35 kWatts per year). That's a 13% reduction on carbon footprint.

- Green Ethernet (2 watts 50% of the time): 8 kg CO2 eq per year
- Core sleep (2 watts 50% of the time): 7 kg CO2 eq per year
- Wi-Fi shutdown (4 watts 50% of the time): 16 kg CO2 eq per year

The ONE641 carbon footprint over 10 year is only a third of the carbon footprint of a heavy X86 based 10G router.

Conclusion

As part of its ESG (Environmental, Social and Governance) commitments, Ekinops continues to implement several sustainability initiatives, centered around reducing the environmental footprint of its operations and products. For its access solutions, eco-design products are a key element of Ekinops strategy and development, which is based around key factors:

- Measuring product climate impact through Life Cycle Analysis
- Reducing form factor whilst maintaining performance
- Improving consumption/performance ratio 'by design'
- Enhancing packaging & delivery
- Improving repairs and product end-of-life

Operators can leverage these initiatives and in turn improve their sustainability ratings.

More resources can be found here: https://www.ekinops.com/

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 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 and Nuvla 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.

EKINOPS360 Dynamic Optical Transport

COMPOSE

ONEACCESS Fast Network Virtualization

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