

Data center out-of-band management with PON

Fixed Networks, Nokia



NOKIA

Rethink data center OOBM with PON technology

Out-of-band management (OOBM) is critical for maintaining control of data center infrastructure when it matters most. But as data centers scale in AI-supercycle, traditional Ethernet based OOBM solutions become complex to scale efficiently, as they rely on a high number of switches and energy consumption.

PON-based OOBM introduces a more efficient, centralized approach that reduces power consumption, footprint of switches and operational overhead.

Based on its market leading PON technology, Nokia's purpose-built solution has a simpler passive architecture, bringing enhanced reliability and resilience, and lower energy consumption. Nokia PON for OOBM is a dependable foundation for modern DC infrastructure management.

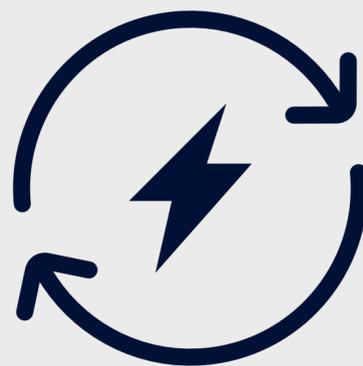


Traditional OOBM design in a hyperscale world

Traditional point-to-point OOBM architectures introduce operational challenges as data centers scale. They require large numbers of dedicated switches, driving up power consumption, rack space usage, and cooling costs. Each additional device increases deployment complexity and ongoing maintenance effort, making expansion slow and expensive. Legacy OOBM networks also use active components throughout the management network. To ensure reliability and minimize the risk of failure, these devices need regular care and attention, ultimately increasing operational cost and management burden.

High power consumption

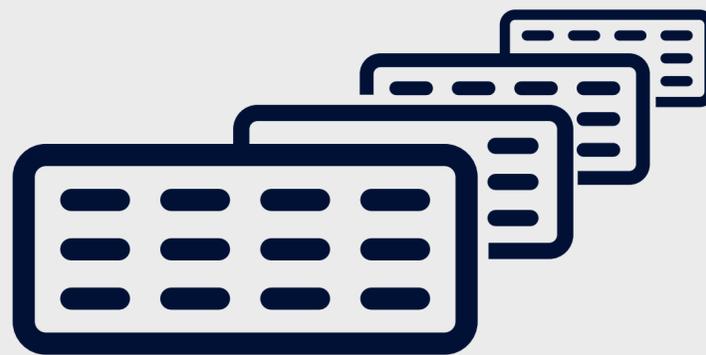
Typical power consumption of 50W-100W per switch results in high costs and environmental impact



870 kWh/rack/year

Large equipment footprint

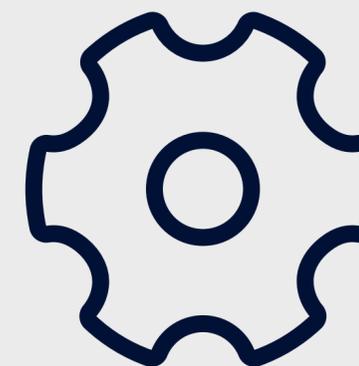
An OOBM switch per rack results in a large amount of active equipment



100s of switches

Complex operations

Inflexible equipment and interfaces that often require visits to each rack

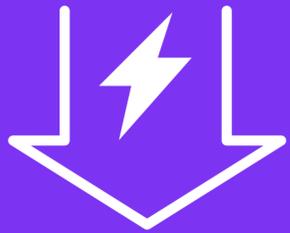


\$1,000 OpEx/rack/year

Leverage PON's efficiency for better OOBM

PON-based OOBM delivers proven reliability, scalability, and operational efficiency. Its point-to-multipoint, fully passive architecture significantly reduces the number of active components, power consumption and operational costs compared to traditional OOBM. A centralized management platform enables automated control and visibility across thousands of endpoints. As data centers and distributed networks scale, PON-based OOBM offers a more efficient, more resilient foundation for always-on operations.

>50%



Less energy consumption

- Passive technology
- Less active equipment
- Less cooling

90%



Fewer switches

- Less space
- Fewer points of failure
- No switches between NOC and racks

80%



Less operational effort

- Centralized architecture
- Remotely managed modems
- Automated operations

100%

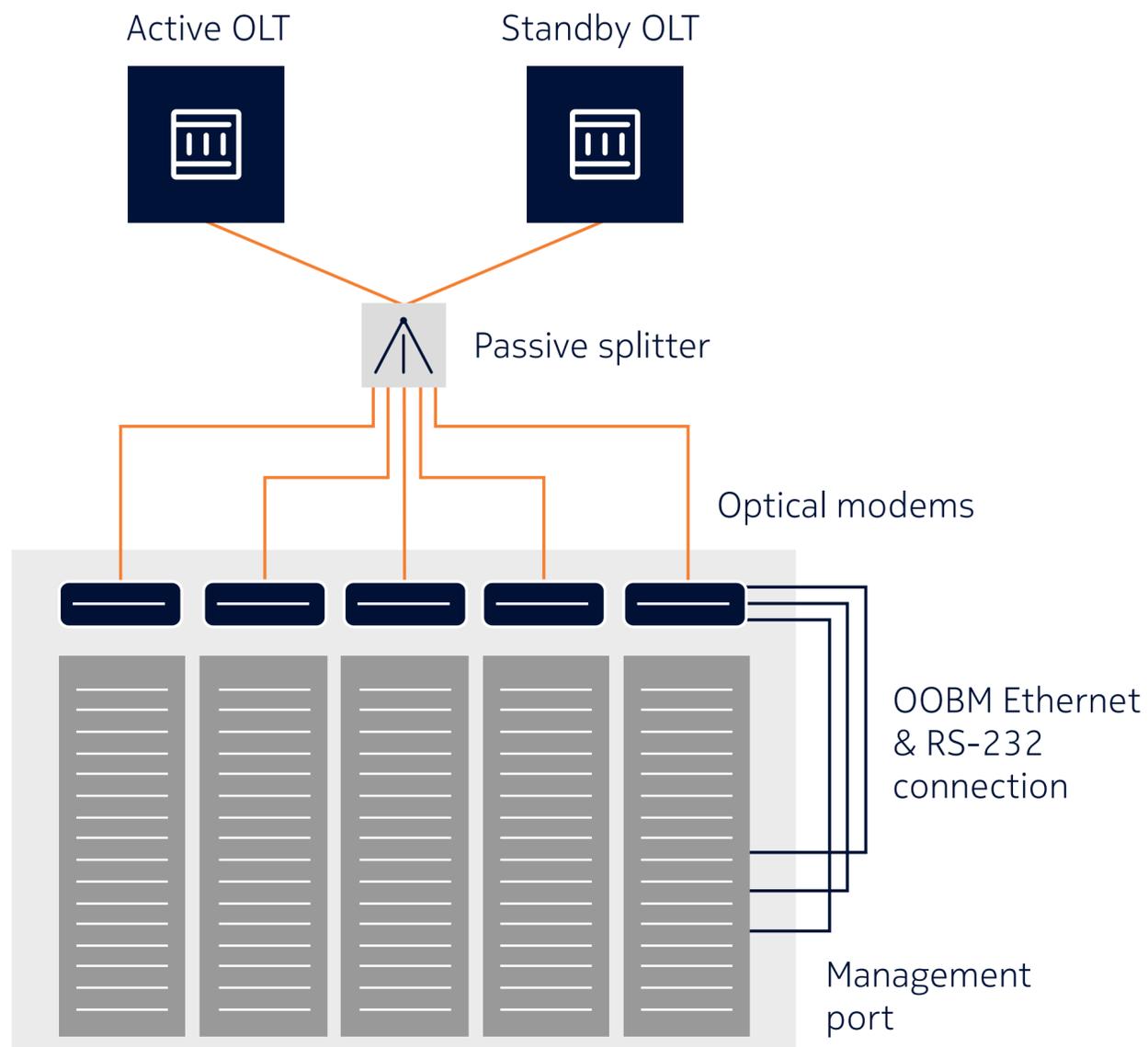


True separation

- Different technology than production network for true life line



PON overview

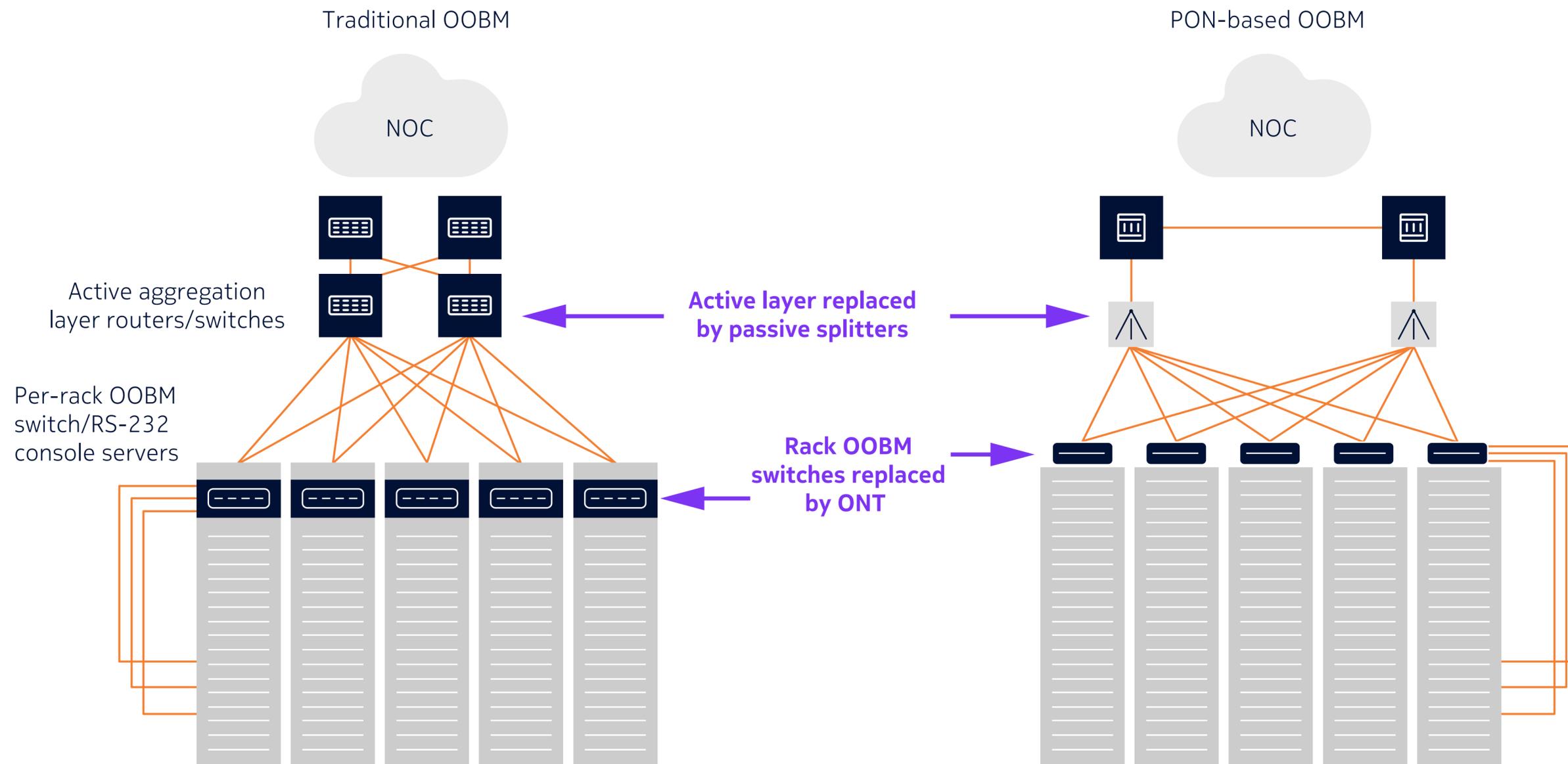


Highlights	
Architecture	Point-to-multi-point (single fiber from one PON port connects up to 128 end points)
Network elements	<p>Optical switch (OLT) A central switch that connects thousands of endpoints</p> <p>Optical modem (ONT) A stateless device that terminates a fiber and converts data signals for Ethernet ports. It has Ethernet and RS-232 interfaces towards rack management ports and is managed remotely.</p> <p>Splitter A passive device that divides incoming fiber feeder into multiple fiber drops (typically 128)</p>
Capacity	10 Gb/s up and down (XGS-PON)
Security:	AES encryption
Cost	Efficient: P2MP architecture, low energy, mature technology, high volumes.
Deployments	Worldwide in defense, enterprises, governments, telcos



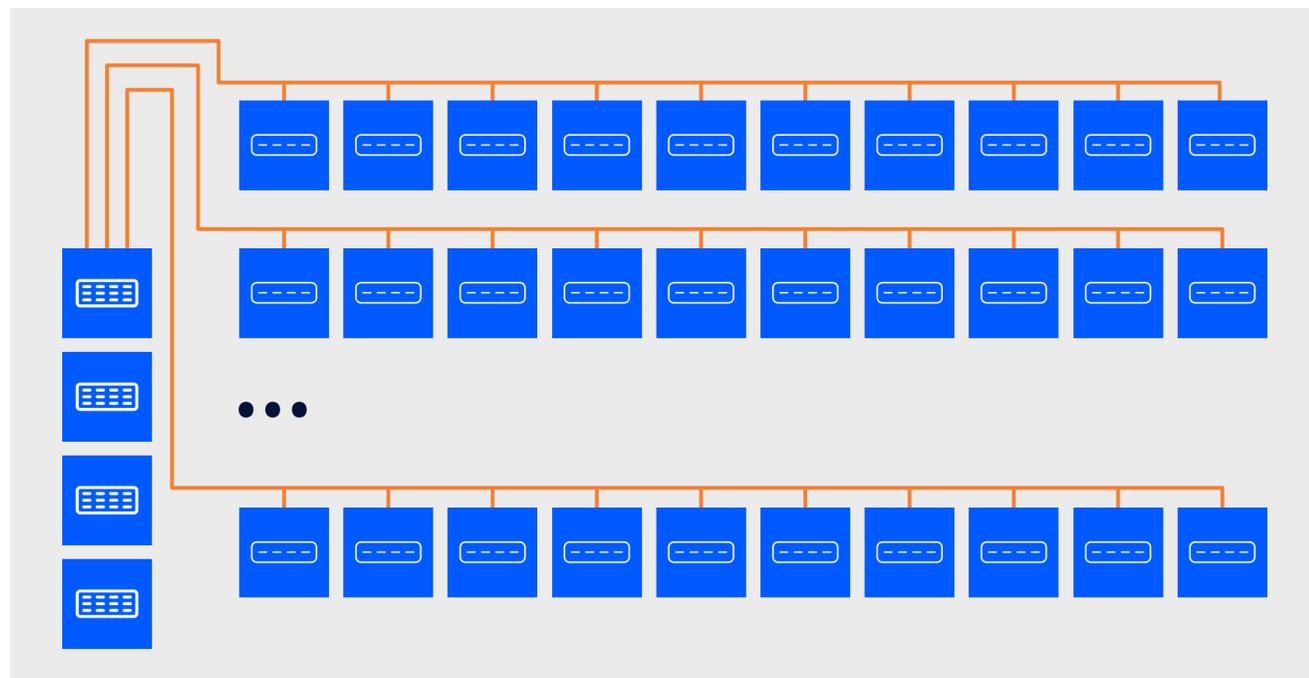
How does PON change the OOBM architecture?

Traditional OOBM architectures rely on rack-level management switches and multiple aggregation switches to connect each device point-to-point. In a PON-based, point-to-multipoint OOBM architecture, these active components are replaced by simple ONTs at the rack and passive optical splitters in the network. This shift dramatically reduces the number of active switches, footprint and energy, while improving scalability and reliability.



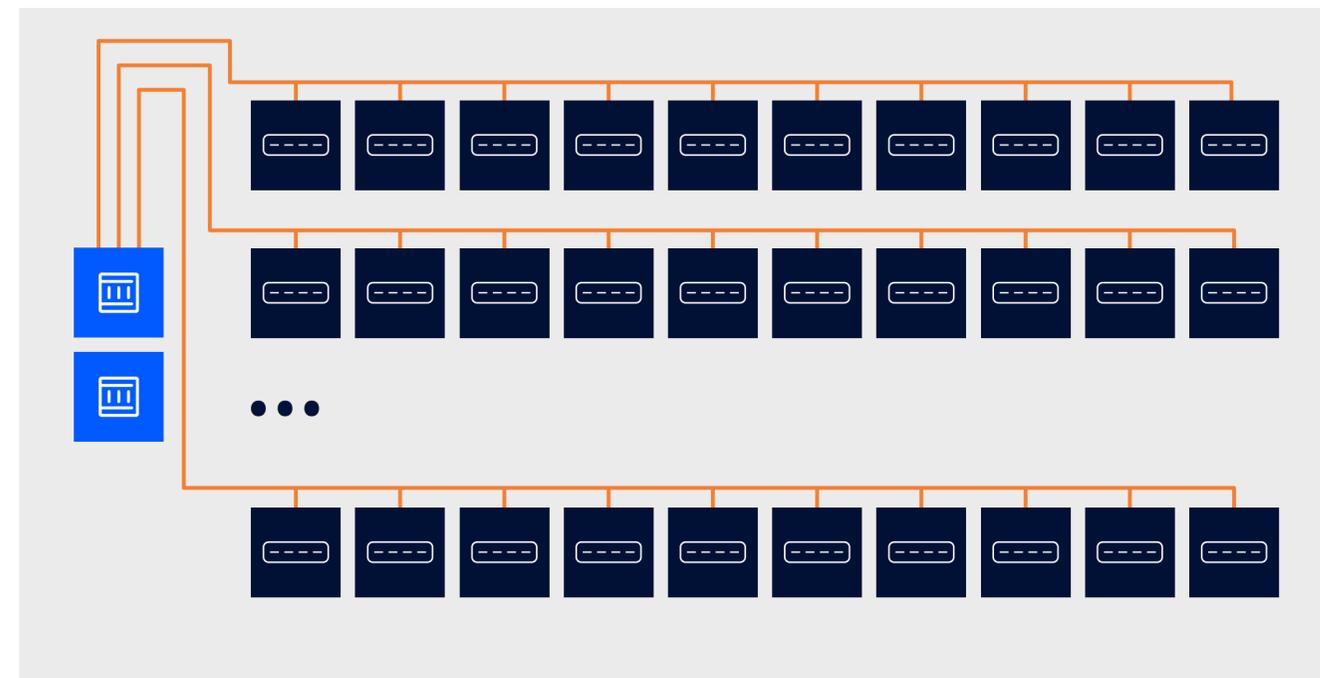
Reduce active switches, floor space and energy

Data center layout: 10 rows, 100 racks



Legacy OOBM switch

In a 100-rack data center (10 racks per row), legacy point-to-point OOBM architectures require extensive switching infrastructure, driving the switch count to **104 switches** to support OOBM. This complexity translates directly into higher power usage, with annual energy consumption reaching approximately **90 MWh/year**.



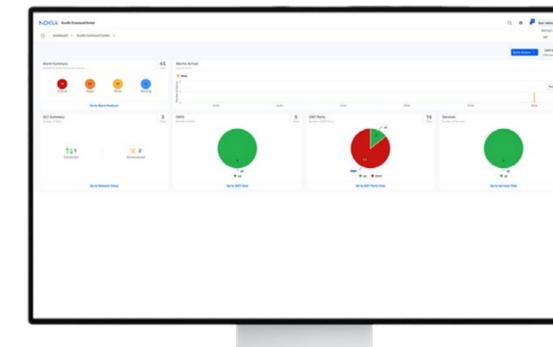
PON based OOBM

By contrast, a PON-based OOBM architecture dramatically simplifies the design, reducing the number of required switches to just **2 centralized systems**. With ONTs consuming x10 less energy, this approach cuts annual power consumption to roughly **33 MWh/year**, delivering substantial savings in energy, space, and operational overhead while improving overall reliability and scalability.



Nokia Aurelis for data centers

Based on the market-leading PON technology, Nokia brings solutions for OOBM designed to enhanced efficiency, security and availability



Aurelis MF Optical Switch

The Aurelis MF is a central switch (OLT), aggregating all OOBM traffic. It is typically deployed in an active-standby configuration for additional availability.

Key features

- High density to connect up to 4000 end point
- Six-nines availability
- Uses 40% less energy than the industry average
- Encryption of data and messages
- Open APIs, easy integration in NOC
- Automated operations

Why it matters

- Easy to deploy and scale
- Energy efficient
- Secure

Aurelis Optical Modems for data centers

Aurelis optical modems are deployed close to managed devices (in rack or Top of Rack), converting fiber connectivity into standard Ethernet interfaces.

Key features

- Variety of options for diverse deployments
 - compact or modular
 - in rack of ToR deployments
 - Ethernet and RS-232 interfaces
 - integrated splitter and combiner

Why it matters

- Energy efficient
- Easy to operate remotely
- Frees rack space

Aurelis Command Center

Aurelis Command Center provides centralized management across the entire OOBM network.

Key features

- Automated operations
- Intent driven
- Zero-touch provisioning
- Simplified fault management

Why it matters

- 90% less integration effort
- 50% faster installation
- Overall 25%-40% lower operational effort

Rely on Nokia, a proven PON leader, for your OOBM

Fiber leader

- #1 market share in PON worldwide
- 180M lines shipped to date
- >1000 deployments for mission critical, enterprise and broadband infrastructure
- #1 in US and worldwide for XGS-PON

Reliable supplier

- >20 years of continuous leadership
- 1st in every major PON innovation
- >200K/month ONT production capability, with diversified sourcing and manufacturing capabilities

Proven expertise in DC

- >100 data center customers
- Comprehensive DC portfolio
- >100K switches shipped



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