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Enabling Smart and Efficient Transportation and Logistics with POL

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Overview

Transportation and logistics facilities are facing challenges as traffic—both people and goods—increase, while labor shortages and energy costs intensify. Large transportation and logistics facilities are planning to upgrade their internal communications networks, according to Omdia's IT Spend Predictor survey. Now is the right time to adopt an optical LAN, known as a Passive Optical LAN (POL). A POL enables transportation and logistics facilities to support a wide and growing array of applications, meeting data and video bandwidth requirements for staff, tenants, customers, visitors, equipment, and security. POLs are future-proof, flexible, and sustainable, three important attributes as these facilities evolve and expand over time. Furthermore, a POL can support communications across 20km from a small communications closet without the need for active, field-based components or power at every 100m. Consequently, POL enables significant space and power savings, meaning additional space can be rented out and energy bills reduced. These advantages lead to improved profitability and lower total cost of ownership (TCO).

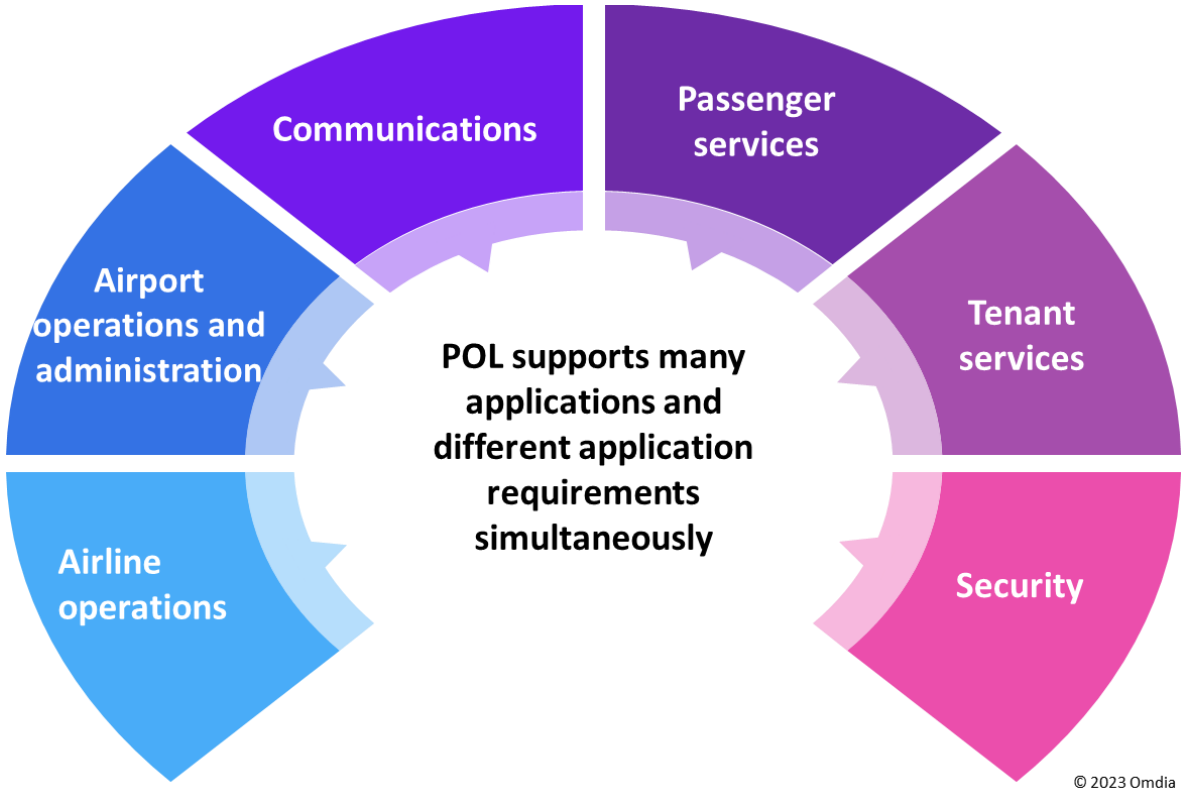
The need for POL in transportation and logistics

Transportation and logistics facilities, such as airports, train stations, shipping ports, and warehouses, rely on numerous applications to support secure and efficient operations. A POL can support multiple applications simultaneously across large physical areas. A POL is based on optical fiber with passive

splitters, making it immune from electromagnetic interference and various environmental factors, such as ice-melting salt or grease and oil.

Within an airport setting, a POL can manage numerous applications. **Figure 1** provides an overview of the major application groups that require networking within an airport facility.

Figure 1: Airport scenario – major application groups requiring networking



Source: Omdia

Each major category includes multiple applications. For example, the passenger services category covers restaurants, shops, money exchanges, onsite hotels, and ground transportation. Security encompasses staff access, passenger access, CCTV, and video analytics. Airport operations includes gate control applications along with asset control and management. The communications category covers signage, paging, and Wi-Fi.

Each application has different requirements in terms of bandwidth, latency, and jitter. POL infrastructure meets these varying requirements with symmetrical bandwidth, ranging from 2.5G to 10G, 25G, and even 50G. Upgrades can be done without touching the underlying fiber cabling, known as the optical distribution network (ODN). Furthermore, dynamic bandwidth algorithms can assign different traffic priorities to applications accordingly.

POLs are managed through a single management platform. A POL can be virtually sliced, enabling different users and even competitors, such as airlines or trucking companies, to have their own, end-to-end secure communications networks. POL equipment and network provide the “five 9s” (99.999%) reliability associated with communications service provider (CSP) networks.

With POL, optical line terminals (OLTs) and optical network terminals (ONTs) can be upgraded without touching the ODN. This is a major advantage over traditional LANs. Traditional LANs use CAT cabling, which needs to be completely removed and replaced with the next-generation cabling to improve network performance. POL upgrades can be achieved by replacing the OLTs and ONTs, moving from 2.5G to 10G or 25G equipment and beyond.

In addition, not all ONTs need to be upgraded at the same time. A facility's IT administrator can upgrade ONTs when and where needed to meet bandwidth requirements. POL fiber cabling has a long life, which means that the ODN can be left in place for years. In addition to their scalability and longevity, POLs are flexible. Additional ONTs can be added as a facility expands or as internal space is changed. For example, new check-in counters, gates, and retail stores can be accommodated quickly.

POL infrastructure is considered highly secure. These networks are based on end-to-end traffic encryption along with message and user integrity checks. In addition, there are options for redundancy, such as path protection, OLT equipment redundancy, ONT equipment redundancy, and combinations of these options.

POL within an airport setting

In an airport setting, the OLT is installed at a central communication point in each terminal or catering or maintenance building. POL uses fiber cabling and splitters, enabling support to multiple points, often 64 locations from a single Passive Optical Networking (PON) port. An ONT is installed at each communication endpoint, such as a gate, sign, store, or CCTV, for example. Single-mode fiber supports two-way communications (downstream, upstream) with PON's built-in wavelength management system. **Figure 2** shows a simplified POL within an airline terminal.

Figure 2: POL within an airport setting

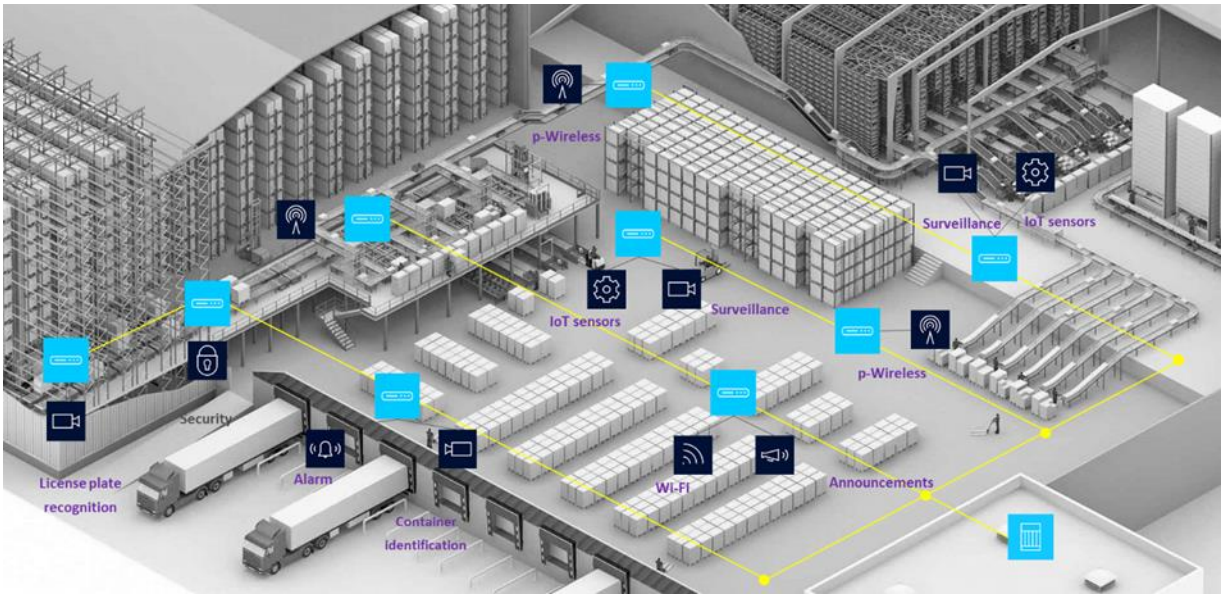
Source: Nokia and Omdia

Airports are just one example of a transportation facility. POLs are also being installed within shipping port facilities, train stations, large transit facilities, and warehouses, where a POL becomes the communications backbone for asset management, logistics, and security. Though people traffic may be significantly less within a shipping port or warehouse, asset tracking, security, and logistics are vital to efficient and secure operations.

POL within a warehouse setting

POL's advantages apply to a warehouse setting as shown in **Figure 3**. One additional advantage is worth highlighting further. A new tenant may request a different communications network layout from the previous tenant. It is relatively easy and fast to change sections of the communications network within the POL without touching most of the ODN and with no impact on other tenants. This is important, since it leads to faster rent revenue accruals, as discussed in ***POL's financial advantages***.

Figure 3: POL within a warehouse setting



Source: Nokia and Omdia

POL's financial advantages

A POL uses fewer racks and switches than a traditional LAN. In turn, fewer pieces of networking equipment mean less space and power. Also, optical cabling is smaller than Cat 5 or Cat 6 cabling, thereby reducing the amount of physical space needed for cabling. Consequently, POLs lead to savings in both capital expenditure (capex) and operational expenditure (opex).

Let us focus first on space and power savings because these savings increase with larger facilities, and POL can easily support expansive facilities up to 20km. Space savings lead to additional rental income for transportation and logistics facilities. For example, if 100m^2 are saved per airport terminal and an airport has four terminals, an additional 400m^2 become available for use as retail space. At $100 per square meter per year, the rental value would be $40,000 per year. Over a 10-year period, the airport authority

would accrue $400,000 in additional revenue. This additional revenue opportunity also applies to warehouse facilities, shipping ports, and train stations.

Energy savings are also significant and come from several sources. First, less equipment (such as switches) is required. If two switches are saved per terminal, an airport authority with four terminals may achieve energy savings of $2,200 per year or $220,000 over a 10-year period. Second, there are direct electricity savings from the use of PON in POL infrastructure rather than Active Ethernet in a traditional LAN. This saving could reach $10,000 per year or $100,000 over a 10-year period. These energy savings would also apply to other transportation and warehouse facilities.

In addition to these advantages, POLs are easier to upgrade since the underlying ODN remains the same. This means that only the active equipment, such as the OLTs, would be upgraded, followed by the ONTs when transportation or warehouse IT management decides to do so. This leads to lower long-term capex and fewer operational disruptions.

The focus has been on the quantifiable costs, but there are “softer” advantages:

- Simplified network management and IT operations
- Improved customer/tenant experiences
- Reduced waste because the underlying ODN remains usable for many years
- Achieving sustainability or energy savings targets
- Offering end-to-end network-slicing options for tenants
- Minimizing disruptions

POL facility managers have cited TCO savings of between 30% and 70% compared with a traditional LAN, depending on facility size, network requirements, energy costs, and rental rates.

Recommendations and next steps

Transportation and logistics facilities are benefiting from investing in POLs, seeing clear TCO advantages over traditional LANs. A POL enables a facility to support multiple applications for different users with varying networking requirements on a single, secure, upgradable fiber-based optical network. POLs are environmentally sustainable, using passive components while reducing energy-consuming network elements. POLs are easy to upgrade without touching the underlying ODN. Furthermore, POLs are adaptable, a key requirement in an ever-changing world. Large transportation and logistics facilities are investing above-average IT budgets in LAN upgrades. A POL will provide a future-proof LAN solution for years to come.

Appendix

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Omdia commissioned research

This piece of research was commissioned by Nokia.

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