



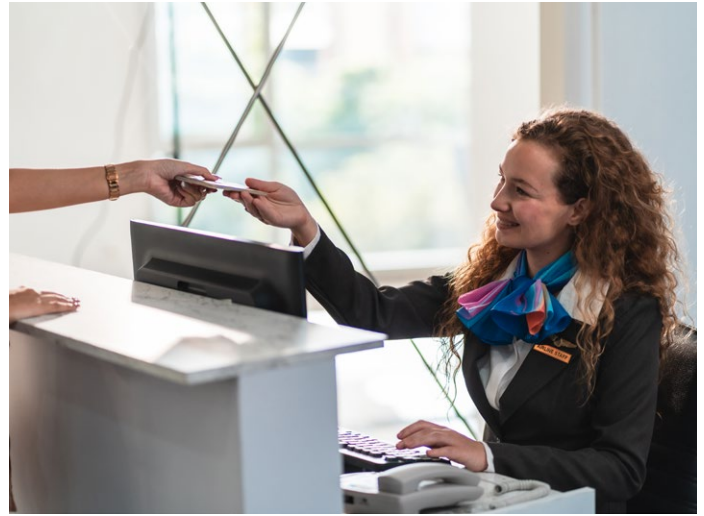
# Modernize communication networks with Single Pair Ethernet (SPE)

The Single Pair Ethernet (SPE) technology, based on the IEEE 802.3cg (10BASE-T1L) standard, is ideally positioned to reconcile the imperatives of digital modernization with the physical and economic constraints of existing buildings.

Today organizations face a costly dilemma: completely replace their legacy cabling with structured Ethernet (Category 6 or higher) or find a way to leverage what they already have. SPE technology, which enables IP traffic and power injection over a single twisted copper pair on long distance (up to 1,000 meters), offers an alternative technological solution to workarounds such as VDSL, Wi-Fi or private 5G.

SPE technology acts as a catalyst for value in different strategic areas:

- **Operational performance**, guaranteeing the quality of service required for modern Voice over IP (VoIP) devices and the critical synchronization of specific equipment such as IP-DECT (IP-Digital Enhanced Cordless Telecommunications) radio base stations and terminals.
- **Security**, by isolating critical voice equipment from the rest of the IP network, creating a separated, independent and resilient voice network in the event of a failure of the main IP network or a cyberattack.
- **Economic viability**, by drastically reducing investment in cabling and operating losses related to construction or renovation work. In addition, it gives the opportunity to continue using existing equipment such as DECT handsets while seamlessly transitioning from TDM DECT to modern IP DECT infrastructure.
- **Environmental excellence**, by promoting a circular economy approach that minimizes the carbon footprint associated with copper mining and the production of new plastics.



## Application areas for SPE technology

- Hospitals and clinics (existing buildings already equipped with legacy copper cabling for phone systems)
- Industrial sites (Energy and Utilities, Oil & Gas, factories, manufacturing, etc.)
- Transportation (railway stations, metro, airports, etc.)
- Listed buildings (hotels, monuments, etc.)

## Advantages

When applied to VoIP infrastructure and communication networks, SPE technology offers numerous advantages:

- Simplified cabling and installation using just one pair of wires instead of traditional multi-pair Ethernet cables
- Extended reach beyond conventional Ethernet limits (up to 1,000 meters per the standard), useful for large premises or distributed equipment
- Remote power feeding capability to simultaneously supply power along with data to devices, reducing the need for separate power lines and associated costs
- Ability to connect any IP/SIP phone or ALE IP-DECT base station to replace legacy telephony equipment (such as analog phones or non-IP compatible DECT base stations)
- Modernized DECT infrastructure by replacing legacy ALE IBS or RBS DECT base stations with modern ALE IP-xBS base stations designed to embed the SPE adapter
- Increased security and resiliency for VoIP devices physically separated from the LAN IP network, which reduces the risk of voice communications being cut off in the event of a cyberattack and enables a preventive network shutdown

### Solution sheet

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## Key technical aspects of the solution

The key technical specifications of 10BASE-T1L, which form the basis of the product's performance, are as follows:

- **Extended reach:** The standard guarantees a link of up to 1,000 meters over a high-quality twisted pair. On existing telephone cables with a smaller cross-section, the range remains well above the standard 100 meters, easily covering the 400 to 800 meter distances common in hospital campuses or large hotels, without the need for intermediate active repeaters.
- **Data rate:** Throughput is 10 Mbps in full duplex mode. Unlike xDSL technologies, which are often asymmetric (downstream higher than upstream), 10BASE-T1L offers a guaranteed symmetric channel. This 10 Mbps throughput is more than sufficient for IP telephony, where a high-definition voice call (G.722 codec) consumes less than 0.1 Mbps and even allows the transport of compressed video streams or multiple simultaneous communications over the same link (such as in the case of a DECT radio base station covering multiple DECT handsets in an area).
- **Remote power feeding:** Switching to IP would theoretically require connecting each device to a local power outlet, which poses problems in terms of management (increased number of power supplies), aesthetics, and service continuity (need for local UPS units). The SPE adapter solves this problem using the remote power feeding capability. This allows direct current (DC) power and Ethernet data to be carried simultaneously over the same pair of conductors.
- **SPE adapter:** The adapter provides the physical link between the existing single-pair cable connection and the VoIP equipment to be connected. This equipment may be an IP phone replacing an obsolete analog phone. It may also be a modern IP-DECT base station replacing the equipment that was in place. In the latter case, as the SPE adapter is supplied with a suitable spacer, it can be mounted on the wall using the existing holes.

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# Use cases by industrial sector

SPE technology is specifically tailored to the pain points of each business vertical. Here are some examples:



## Healthcare and hospitals: The criticality of DECT

- Hospitals and clinics depend vitally on the mobility of healthcare staff. The DECT system is the de facto standard for mobile voice in hospitals due to its reliability and lack of interference with medical equipment. The migration to IP-DECT (radio base stations connected to the IP network) is underway, but hospitals are huge buildings with long corridors where radio base stations often must be placed more than 100 meters (sometimes up to 800 meters) away from technical rooms.
- SPE supports long distances with the ability to reach 1,000 meters, allowing IP-DECT base stations located at the ends of building wings to be connected directly to the Alcatel-Lucent OmniPCX® Enterprise Purple communication server, without the need to install costly and difficult-to-maintain intermediate distribution frames in ceilings.
- Modern IP-DECT systems require precise synchronization (PTP IEEE 1588) between terminals to enable handover (transfer from one terminal to another without interruption of communication). This synchronization is extremely sensitive to network jitter (<500 ns required). The SPE adapter, acting as a direct physical link with fixed latency, offers much greater synchronization stability than VDSL solutions or multiple cascaded switches, ensuring the security of emergency communications.



## Transportation: Critical connectivity and retrofit

- Transport infrastructure (such as railway stations, airports, seaports) is characterized by vast areas, which make the distance limitations of standard Ethernet (100 meters) highly problematic. Furthermore, even inside vehicles (such as maritime ships), the modernization of IP communications faces extreme physical constraints.
- SPE capacity to reach 1,000 meters allows IP-DECT radio base stations or IP/SIP telephones and intercoms to be deployed over very long distances, without having to increase the number of costly technical rooms along the tracks.
- The maritime sector is subject to strict safety and environmental standards, requiring the modernization of onboard communications (IP telephony). SPE allows existing ships to be retrofitted by reusing onboard telephone cables, avoiding the need to drill or modify watertight bulkheads and fire-resistant structures.

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## Hotels and serviced residences: The “connected room” without renovation

- The hotel industry is under pressure to digitize the customer experience (express check-out, room service ordering, digital keys) while managing the obsolescence of analog cabling. Hotels are often complex buildings, sometimes historic, where closing a room for renovation results in a direct loss of revenue.
- SPE is a non-invasive installation with zero downtime. The installation can be done between the departure of one guest and the arrival of the next, without closing the room.
- With 10 Mbps bandwidth dedicated and symmetrical per room, the SPE link is sufficient to simultaneously support an IP/SIP phone for voice, a backup Wi-Fi access point to cover the room (Hospitality AP), and even an HD IPTV stream (using efficient H.264/H.265 compression that requires ~4-6 Mbps).
- Customer experience is improved thanks to the reliability of the wired link ensuring that calls to room service or reception are clear, without the typical dropouts of congested Wi-Fi.



## Industry and manufacturing: Factory 4.0 and harsh environments

- The manufacturing and process industries (chemical, petrochemical, water treatment) are undergoing a transformation towards Industry 4.0, which requires seamless communication and massive real-time data feedback. However, factories are often equipped with obsolete analog fieldbuses (4-20 mA) or simple copper pairs. In addition, these environments are particularly hostile: large areas, explosion-risk zones (ATEX) and extremely noisy warehouses requiring specific IP telephones and emergency intercoms.
- SPE unifies the industrial network allowing sensors, IIoT, and industrial specialized phones to be connected directly to the enterprise IP network, eliminating the need for complex and costly protocol conversion gateways.
- In sensitive areas where ATEX constraints apply, it is essential to be able to deploy and maintain suitable telephone equipment. ALE DECT handsets and ALE IP-DECT indoor and outdoor radio base stations compatible with ATEX restrictions can be deployed via single-pair copper cabling using an SPE adapter supplied by ALE.

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## Technical components of the ALE SPE solution

The 10BT-SPE Adapter equipment supplied by ALE allows an IP-based device (such as an IP-DECT radio base station or an IP phone) to be connected on one side and the network switch connecting to the LAN on the other.

The 10BT-SPE Adapter is supplied with a spacer box compatible with the indoor ALE IP-XBS DECT base station for easy wall mounting. For an outdoor ALE IP-XBS DECT base station, the 10BT-SPE Adapter can be inserted into the protection box.

For larger configurations with many devices connected over a single copper pair, ALE recommends installing specific SPE16-XL boards adapted for Alcatel-Lucent OmniPCX Enterprise (OXE) Communication Server XL-Rack chassis. Each SPE16-XL board can take the role of up to 16 x 10BT-SPE Adapters on the OXE Communication Server side. The OXE XL-Rack chassis also supports the FXS32-XL board, enabling seamless integration of legacy analog interfaces. It provides an ideal platform for delivering communication services across analog, DECT, and IP phones while maximizing the value of existing TDM cabling infrastructure.



10BT-SPE Adapter



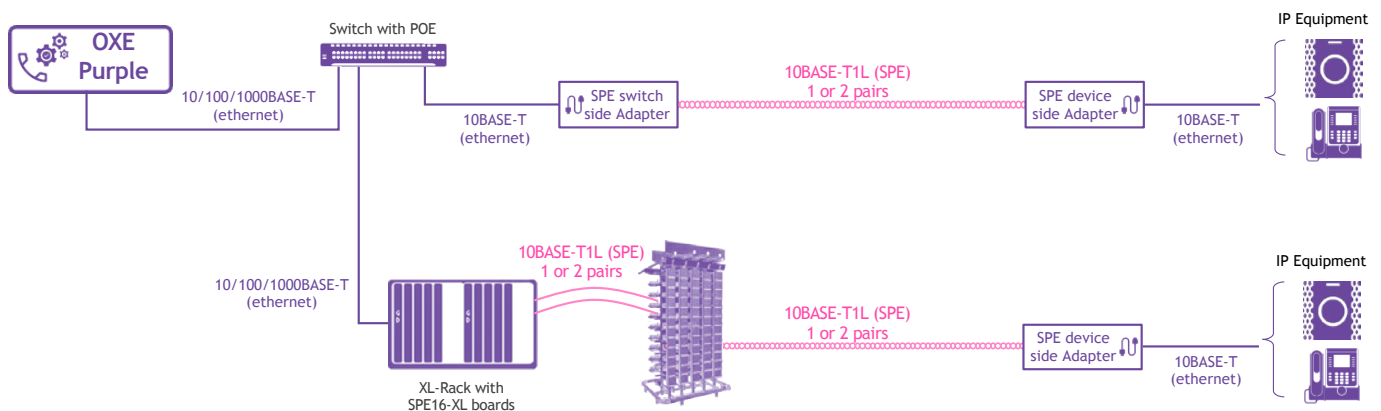
10BT-SPE Adapter connected to ALE DeskPhone IP/SIP



Spacer box for 10BT-SPE Adapter



ALE IP-XBS DECT base station outdoor with 10BT-SPE Adapter



SPE deployment blueprint with the OmniPCX Enterprise Purple Communication Server

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## Take the first step of your transformation project with our experts

Transformation projects involving the use of SPE technology require a comprehensive analysis to choose the best deployment options. Contact an [ALE technical sales representative](#) to discuss the specifics of your project, your needs and your constraints.

Our worldwide network of more than 3,400 Partner resellers accredited by ALE is committed to providing you with tailored offers to accommodate requirements for whatever market and industry you're in, including best-in-class consulting, services and support. Learn more [about our Partners](#).

For more information on SPE technology, please [visit this webpage](#).