Alcatel·Lucent Enterprise

交通解決方案指南

Transportation Solution Guide

10 個實際應用案例，深入瞭解當今與未來的交通挑戰

本文件為 Alcatel-Lucent Enterprise 交通解決方案指南（Transportation Solution Guide）電子書之繁體中文整理版。技術術語、產品名稱及型號保留原文。

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目 錄

| 概述
| 任務關鍵型可靠架構
| 解決方案 1：將視頻監控與緊急求助點同步
| 解決方案 2：在 SCADA 平台中整合電話子系統
| 解決方案 3：加強行動控制中心 (OCC) 的緊急應變
| 解決方案 4：提升售票機和自助服務站的協助能力
| 解決方案 5：確保鐵路和道路交叉口的安全
| 解決方案 6：為無人駕駛列車提供安全的車載通訊
| 解決方案 7：將通訊整合至 OCC 生態系統
| 解決方案 8：為港口和物流啟用私人 5G
| 解決方案 9：確保多個交通運營商之間的有效協調
| 解決方案 10：整合路側的 OT 和 IT 網路

所有交通基礎設施都是任務關鍵型的，因為它們影響著市民、乘客的生命安全以及整體經濟。人員和企業始終在移動，無論是航空、鐵路、道路還是港口的交通系統，都必須以安全、可靠且高效的方式保持運作。

本電子書探討交通領域的任務關鍵型通訊與網路基礎設施，提出行業面臨的 10 大主要挑戰，並提供創新解決方案加以應對。

概 述

Alcatel-Lucent 提供數位基礎設施，提供連接交通應用程式和流程的通訊及網路子系統。

透過這一基礎，我們的客戶能夠：

- 提升乘客體驗
- 增強安全與保障
- 改善營運效率並降低成本

交通環境複雜，涵蓋多個涉及不同功能模組的子系統。這些環境必須獲得能夠無縫且安全地互聯所有功能模組的通訊和網路解決方案的支援。Alcatel-Lucent 解決方案配備一套 API，可整合至所有交通子系統。

任務關鍵型架構

交通專案無論是新建工程或現有基礎設施的改善，均可能需要數年時間才能完成，並會造成重大的服務中斷。這些專案必須不僅滿足當前需求，還需考量未來 10 至 20 年的需求。

網路解決方案

- 任務關鍵型 AI 驅動自動化網路，能自動且安全地連接人員、流程、應用程式與物件。
- 使用分段技術安全高效地接入 IoT 設備，將整個網路受損的風險降至最低。
- 工作流程自動化，提升生產力並開創新的收入來源。

通訊與協作解決方案

- 高可用性和可擴展性的 Alcatel-Lucent OmniPCX Enterprise 通訊伺服器
- 多設備相容：IP、SIP、WLAN、IP-DECT、DECT、數位、類比
- 透過 Alcatel-Lucent Enterprise 的 Rainbow™ 提供本地、混合或雲端連線以支援協作功能
- 具備智慧語音呼叫路由和全通路互動 360° 視圖的聯絡中心解決方案
- 通訊加密及強化軟體以抵禦網路攻擊
- 適用於私有雲的虛擬化多實例架構
- 錄音、通知伺服器、API 閘道和緊急伺服器等補充解決方案

專業服務

在解決方案部署的每個階段，我們的專業服務團隊全程陪伴交通客戶，並補充我們的業務合作夥伴或系統整合商的能力。提供各類現成或量身定制的服務，可在現場或遠端交付，以更好地整合我們的解決方案並降低風險。

任務關鍵型可靠架構

Alcatel-Lucent 解決方案可部署於多種用途的應用場景，包括：

軌道側或路側

連網資產對於鐵路和智慧交通系統 (ITS) 行業的日常運作和安全事件管理至關重要，例如：

- 監控並確保緊急求助點 (EHP) 的可用性
- 縮短維修時間並記錄故障位置
- 當任何 EHP 故障時向多部設備發送通知
- 生成每日報告
- SCADA 整合

鐵路和公路隧道

隧道運營是一項關鍵活動，因為它涉及在潛在危險區域內工作。行動控制中心 (OCC) 與現場維護人員之間的密切協作至關重要，以便：

- 確保有效的維護作業
- 保障隧道工作人員的安全
- 迅速處理問題和緊急事件

互聯車站和機場

火車站和機場容納了眾多提供各類服務的企業，跨越多個運營區域。多服務和多租戶服務可滿足各實體的特定需求，包括：運營管理、無線電通訊互聯、終端用戶自助服務站整合、CCTV 監控和緊急求助點監管。

互聯港口和物流

港口是一個大型區域，包括倉庫、碼頭和維修區。Wi-Fi 與私人 5G 互聯的結合有助於港口、船廠和物流運營商最大化投資回報率並降低複雜性。

碼頭的商業服務

無論是透過實體地點還是虛擬平台，面向客戶的功能都必須提供與乘客的高效溝通。聯絡中心和自動接待員在提升乘客歡迎體驗和整體服務體驗方面發揮著關鍵作用。

將視頻監控與緊急求助點同步

透過同步視頻監控和緊急語音通話，提升控制中心效率和乘客安全

概述

在鐵路和地鐵站中，緊急求助點 (EHP) 安裝在每個站台，提供乘客與控制中心之間的雙向語音通訊。對 EHP 周圍區域的視覺覆蓋，有助於控制中心人員更好地評估並應對緊急情況。EHP 和視頻監控系統必須同步，以使操作人員能夠看到並安撫與其通話的乘客。必須控制事件附近的攝影機，以清晰、直接地查看緊急情況。為確保視頻監控服務的持續可用性，運營團隊需要快速檢測攝影機故障並恢復服務。

解決方案

OmniPCX® Open Gateway (O2G) 簡化了 EHP 和視頻監控系統之間的整合。O2G 即時監控所有電話，並使用 RESTful API 在發生緊急呼叫時通知視頻監控系統和 SCADA 系統。無論電話的技術類型如何，相應區域的視頻圖像均會顯示和記錄。透過伺服器對伺服器整合，即使在呼叫轉移或溢出情況下，視頻顯示也會與處理呼叫的控制中心操作人員同步。OmniSwitch® Milestone VMS 插件可將視頻管理系統 (VMS) 與交換基礎設施連接，更輕鬆地監控攝影機連線和狀態、診斷故障並加速攝影機恢復。

關鍵優勢

- 相容任何緊急電話（類比或 SIP）
- 透過 RESTful API 輕鬆整合
- 可選協定適配
- 更快的攝影機故障排除和服務恢復

訂購項目

- 具備進階電話 RESTful API 的 OmniPCX Open Gateway
- API 指導或協定適配的專業服務
- OmniSwitch Milestone VMS 插件

在 SCADA 平台中整合電話子系統

透過將電話子系統與監督平台整合，提供 24/7 緊急求助點服務

概述

在交通網路中，EHP 的可用性是關鍵服務品質 (QoS) 指標，必須全天 24 小時確保。控制中心必須立即收到任何事件的通知，以便快速規劃維護作業並實施糾正措施。電話子系統必須將所有電話和伺服器的即時狀態傳輸至 SCADA 系統，該系統負責監督整體交通網路子系統。為維持 SCADA 通訊的可靠性並確保適當的優先級，網路基礎設施必須能夠識別 SCADA 流量並應用適當的策略，確保連續性並防止運營中斷。

解決方案

OmniPCX Open Gateway (O2G) 透過基於 RESTful API 的單一介面提供所有 EHP、電話和伺服器的狀態。額外的開發可增強 O2G，包括：透過定期例行程序自動測試類比線路；透過 SNMP 進行第三方設備的電話狀態報告；協定適配以簡化與 SCADA 或其他監督平台的整合。OmniSwitch 6860 可使用基於特徵的流量識別來檢測 SCADA 流量，並自動執行相應的規則和策略。

關鍵優勢

- 電話和對講子系統的單一介面
- 相容任何電話：SIP、類比電話和 Alcatel-Lucent 電話
- 可選協定適配
- 基於特徵的 SCADA 流量識別，具備自動策略執行 (QoS)

訂購項目

- 具備進階電話 RESTful API 用戶的 OmniPCX Open Gateway
- API 指導或協定適配的專業服務
- OmniSwitch 6860 三層多千兆以太網交換機

加強行動控制中心 (OCC) 的緊急應變

改善呼叫管理、流程自動化和法規合規性

概述

現代 OCC 必須優化通訊，以便在危機中協調應對、更快回應並做出準確決策。高效的呼叫管理加上可靠的錄音，對於服務品質和法規合規性至關重要。自動化工作流程對於處理事件觸發器、應用適當腳本以及簡化與其他系統的整合也是關鍵。

解決方案

Dispatch Console（調度控制台）透過用戶友好的圖形介面簡化呼叫管理，提供可視化呼叫佇列、呼叫優先級、呼叫接聽、會議設置和靈活的路由選項。Visual Notification Assistant（可視通知助手）協調緊急和非緊急事件的通知，收集來自電話、警報、IoT 設備、HTTP 請求或即時訊息的觸發器和輸入。OmniPCX Record
透過記錄和監督傳入和傳出的呼叫來支援風險管理，確保法規合規性和資料保護。

關鍵優勢

- 無縫整合至現有環境
- 高度可客製化的應用程式套件
- 適用於任務關鍵型通訊的高可用性解決方案
- 可從電腦存取的 Web 介面

訂購項目

- Dispatch Console（調度控制台）
- Visual Notification Assistant（可視通知助手）
- OmniPCX Record
- 按需客製化的專業服務

提升售票機和自助服務站的協助能力

透過即時通訊改善乘客體驗

概述

乘客在旅途中越來越重視自主性，無論是購票、查詢路線資訊還是預訂服務。他們使用交通運營商的網站和行動應用程式，以及售票機 (TVM) 和自助服務站。然而，當問題發生時，透過與交通運營商工作人員的即時互動提供及時支援，可以顯著改善乘客體驗。

解決方案

虛擬服務台使乘客能夠透過各種媒體管道與協助團隊或聯絡中心人員聯繫。Alcatel-Lucent Enterprise 的 Rainbow 提供雲端通訊平台即服務
(CPaaS)，可將視頻和語音通話、聊天機器人、文件共享和即時訊息等通訊服務整合至 TVM
或自助服務站應用程式中。ALE Connect 賦能客戶關係管理人員，使其能夠透過多個管道（電子郵件、即時網路聊天、社交媒體和電話）處理大量互動。

關鍵優勢

- 終端用戶自主性
- 遠端協助，實現無障礙旅程
- 非接觸式互動
- 透過任何工作人員設備和任何數位管道提供多媒體通話協助

訂購項目

- Rainbow 雲端通訊平台
- Rainbow CPaaS
- ALE Connect
- 按需客製化的專業服務

確保鐵路和道路交叉口的安全

提供支援多個系統的高可用性、任務關鍵型網路和通訊基礎設施

概述

鐵路和道路交叉口是鐵路運營商、ITS 和地方市政的重大安全隱患。智慧照明、警告鈴、交通測量感測器、標誌、雷達系統、緊急呼叫系統和攝影機等組件必須全天 24
小時保持連線。連接所有這些系統需要能夠提供高功率以太網供電 (PoE)
並支援乾接點的網路基礎設施，以確保軌道側和路側機箱的安全門鎖。

解決方案

強健的通訊和網路基礎設施提供沿鐵路軌道或路側的任務關鍵型連線，支援全天候監控所需的組件。解決方案包括在每個鐵路或道路交叉口部署 LAN 和 WLAN，要求包括：PoE 和 LAN 連線（用於
Wi-Fi、攝影機和感測器）、Wi-Fi 存取點
(AP)、緊急電話、用於警報中繼的乾接點、地理冗餘通訊基礎設施。

關鍵優勢

- 加固型以太網設備
- 長期支援（10 年以上）
- IEEE 802.3bt PoE（最高 60W）
- 警報中繼連線
- MACsec 支援
- 集中通訊系統和管理工具

訂購項目

- OmniSwitch 6465 緊湊型加固以太網交換機
- OmniSwitch 6575 精密工業加固以太網交換機
- OmniAccess Stellar AP1360
- OmniVista 2500 網路管理系統
- OmniPCX Enterprise 通訊伺服器
- OmniVista 8770 網路管理系統

為無人駕駛列車提供安全的車載通訊

為安全高效的自動化操作提供關鍵支援

概述

鐵路行業繼續快速向全自動化未來邁進（即無人駕駛或無人列車），但確保安全仍是鐵路運營商的首要任務。在列車無人駕駛且需要持續即時協助的場景中，提升運營效率和乘客安全至關重要。車載電話成為關鍵組件，支援維護活動、運營協調和緊急應變。

解決方案

通訊架構分為兩部分：地面端（OmniPCX Enterprise 管理整個地鐵站和行動控制中心的通訊；OmniPCX Record 記錄車載和車站的通訊，包括車載秘密監聽）；車載端（基於 SIP 伺服器的嵌入式電話單元，互聯 EHP 和司機艙電話功能，並在列車與 OCC
之間的連結中斷時記錄通話）。此架構確保車載和地面系統之間的無縫通訊、通話記錄和運營控制。

關鍵優勢

- 始終在線的車載電話
- 可靠的通話記錄
- 強健的語音基礎設施

訂購項目

- OmniPCX Enterprise 通訊伺服器
- OmniPCX Record
- 按需客製化的專業服務

將通訊整合至 OCC 生態系統

在異構第三方環境中實現開放、透明的互通，以提升運營效率

概述

總承包商的主要挑戰是向最終客戶交付由多個必須無縫協作的功能模組組成的交鑰匙解決方案。OCC 是一個關鍵服務單元，其中多個應用程式相互連接以管理運營活動和安全事件。解決方案必須提供開放能力，以便在異構 OCC
生態系統中實現無縫整合，同時解決安全需求，包括來自乘客協助的緊急呼叫和日常運營活動。

解決方案

Rainbow Hub 和 Rainbow Edge
是多合一平台，提供運營通訊和協作服務，包括視頻會議、文件共享、聊天、群組創建和 CPaaS
功能。私有雲部署模式（Rainbow Edge）使客戶能夠在保持本地安全性的同時利用雲技術服務。此解決方案處理所有運營和安全通訊系統，例如 EHP、公共廣播 (PA)
和車載通訊協助，並包括通話記錄以及與監控和監督應用程式的無縫整合。

關鍵優勢

- 靈活的雲端實施模式
- 開放能力，可輕鬆整合至 OCC 生態系統
- 與第三方系統互聯

訂購項目

- Rainbow Hub
- Rainbow Edge 私有雲

為港口和物流啟用私人 5G

透過私人 5G 為關鍵操作提供無縫連線

概述

港口和物流運營商需要在大型室外堆場和具有挑戰性的室內區域（倉庫、碼頭、維修區）實現可靠的無線連線。傳統 Wi-Fi 在室外廣域覆蓋、移動性和干擾方面可能存在困難，而公共蜂窩網路往往無法提供業務關鍵型操作所需的控制水準、安全性和 QoS 保障。私人 5G
為自動化車輛、廠區拖拉機、起重機、手持終端和安全設備等移動和任務關鍵型資產提供連線。

解決方案

Alcatel-Lucent 將私人 5G 整合至端到端企業網路框架，結合 LAN、WLAN
和私人無線網路以及統一的安全方法。Alcatel-Lucent 私人 5G 網路為關鍵系統提供安全、低延遲的 LTE/5G 連線，解決苛刻環境中的覆蓋、移動性和 QoS
需求，並在港口和物流場所典型的大型室外空間中提供可靠連線。

關鍵優勢

- 無干擾頻譜，在擁擠 RF 環境中提供一致、無中斷的性能
- 低延遲和確定性連線，支援即時控制和任務關鍵型工作流程
- 基於 SIM 的驗證增強安全性，與 Alcatel-Lucent LAN 和 WLAN 零信任能力一致
- 可擴展的室內和室外覆蓋，適用於廣大複雜環境（堆場、碼頭、倉庫）

訂購項目

- Alcatel-Lucent 私人 5G
- 適用於業務關鍵型連線的進階私人 5G

確保多個交通運營商之間的有效協調

在多城市運營商環境中促進資訊共享和決策制定

概述

城市交通行業面臨重大挑戰：將多個交通運營商聯合在一起，共同為乘客提供無縫整合的服務。目前的背景是資源有限、技能短缺、成本優化壓力和乘客期望不斷演變。交通運營商必須密切合作，建立強有力的協調機制，以維持高品質服務。語音電話會議在運營協調中發揮關鍵作用，特別是在服務中斷期間。

解決方案

Visual Notification Assistant 透過在任何授權成員撥打指定主叫號碼時自動啟動與所有授權成員的電話會議，來協調緊急會議。授權呼叫號碼預先登記，確保只有經批准的用戶才能在需要時觸發電話會議。每次電話會議均會錄音，錄音內容分發給所有參與者，以支援流程記錄和持續服務品質改善。

關鍵優勢

- 運營商間協調電話會議
- 透過緊急電話會議實現即時協作，縮短應變時間
- 運營商之間透明共享事件資訊

訂購項目

- Visual Notification Assistant（可視通知助手）
- 基於專案的專業服務

整合路側的 OT 和 IT 網路連線

為高速公路和路側設備提供高可用性連線

概述

攝影機、感測器、交通控制器、可變資訊標誌 (VMS)、氣象站、收費系統和緊急設備等路側資產廣泛分佈於高速公路基礎設施中。傳統上，高速公路運營商部署了多個並行網路，每個網路專用於特定系統或供應商。為支援現代和未來的高速公路運營，運營商需要一種統一的網路管理方法，在 OT 和 IT 之間保持物理或邏輯分離，同時提供集中可見性、自動化接入、微細分和強健的網路安全性。

解決方案

加固型工業交換機為路側設備提供高可用性連線，設計用於承受惡劣環境，同時滿足長期生命週期和安全要求。設備在連接時會被自動發現、分析和接入。流量流透過基於策略的控制進行動態分類和分段，使 OT 和 IT 環境保持邏輯或物理分離，以降低網路安全風險。集中管理和 AI 輔助監控提供即時可見性和對異常的主動檢測。

關鍵優勢

- 統一的 OT/IT 網路管理架構
- 自動化設備發現、分析和清單管理
- 微細分和基於策略的執行
- 透過集中管理實現端到端可見性
- AI 輔助網路監控和分析
- 長期硬體和軟體支援（10 年）

訂購項目

- OmniSwitch 工業以太網交換機
- OmniVista 網路管理系統
- OmniVista Network Advisor
- Alcatel-Lucent OT/IT 網路概覽

讓萬物互聯，為您提供有效的技術解決方案

我們的願景是為客戶提供客製化的技術體驗。我們的使命是透過提供數位化時代的網路、通訊和雲端解決方案，以及針對您業務成功量身定制的服務，讓萬物互聯。

雲端 本地部署 混合部署

Alcatel·Lucent Enterprise

附 件

Annex — Original eBook (English)

【附件說明】

文件名稱 ALE Transportation Solution Guide — 原始電子書

文件格式 PDF 電子書（eBook）

頁 數 15 頁

語 言 英文（原始版本）

說 明 以下內容為本繁體中文整理文件所依據之原始英文電子書，由 Alcatel·Lucent Enterprise 製作，供參考對照之用。技術規格及產品資訊以原始文件為準。

nmars INTERNATIONAL 惠商實業股份有限公司

本文件由 惠商實業股份有限公司 Nmars International 協助翻譯製作。

Transportation Solution Guide

10 practical use cases to understand transportation challenges for today and tomorrow

Alcatel·Lucent

eBook

Table of contents

- Overview
- Mission-critical reliable architectures
- Solution 1: Synchronize video surveillance with EHPs
- Solution 2: Integrate the telephony subsystem within the SCADA platform
- Solution 3: Enhance the mergency response at the OCC
- Solution 4: Enhance assistance at ticket vending machines and kiosks
- Solution 5: Ensure safety at rail and road crossings
- Solution 6: Secure on-board communications for driverless trains
- Solution 7: Integrate communications into the OCC ecosystem
- Solution 8: Enable private 5G for ports and logistics
- Solution 9: Ensure effective coordination among multiple transport operators
- Solution 10: Converge OT and IT network across roadsides

All transportation infrastructures are mission-critical as they affect the lives and safety of citizens, passengers and the economy. People and businesses are always on the move, and transportation systems, whether it's air, rail, roads or ports need to keep them moving in a safe, secure and efficient manner.

This eBook addresses mission-critical communications and networks infrastructures for transportation. It presents 10 major challenges facing the industry and provides innovative solutions to address them.

Overview

Alcatel-Lucent provides the digital infrastructure to deliver the communications and network subsystems that connect transportation applications and processes.

With this foundation, our customers can:

- Transform the passenger experience
- Increase safety and security
- Improve operations while decreasing costs

The transportation environment is complex. It includes several subsystems involving different functional blocks. It is critical that these environments be supported with communications and network solutions that can interconnect all the functional blocks seamlessly and securely. Alcatel-Lucent solutions are equipped with a set of APIs to allow integration into all transportation subsystems.

Mission-critical architectures

Transportation projects, whether new construction or improvements to existing infrastructure, can take years to complete and cause major service disruptions. It is imperative that these projects address not only the immediate requirements, but also the requirements for the next 10 to 20 years.

Network solutions

- Mission-critical AI-powered and automated networks that automatically and securely connect people, processes, applications and objects.
- Secure and efficient onboarding of IoT devices using segmentation techniques that minimize the risk of having the entire network being compromised.
- Workflow automation that enhances productivity and enables new revenue streams.

Communications and collaboration solutions

- Highly available and scalable Alcatel-Lucent OmniPCX Enterprise Communication Server
- Multi-device compliant: IP, SIP, WLAN, IP-DECT, DECT, digital, analog
- On-premises, hybrid or cloud connectivity with Rainbow™ by Alcatel-Lucent Enterprise for collaboration features
- Contact center solution with intelligent voice call routing and 360° view of omnichannel interactions
- Encryption of communications and hardened software against cyberattacks
- Virtualized multi-instance architecture for private cloud
- Complementary solutions such as recording, notification server, API gateway and emergency server

Professional Services

At every step of the solution deployment, our Professional Services accompany transport customers and complement our Business Partners or System Integrators. A range of services are available off-the-shelf or tailored to specific needs, delivered on premises or remotely to better integrate our solutions and decrease risks.

Alcatel-Lucent solutions can be deployed for multi-purpose applications including:

Trackside or roadside

Connected assets are essential in the railway and Intelligent Transportation System (ITS) sectors for the management of daily operations and security incidents such as:

- Monitoring and guaranteeing Emergency Help Point (EHP) availability
- Reducing repair time and map faults
- Notification over multiple devices when any EHP fails
- Daily report generation
- SCADA integration

Rail and road tunnels

Tunnel operation is a critical activity as it involves working in potentially dangerous zones. Close collaboration between the Operations Control Center (OCC) and maintenance staff in the field is vital to:

- Ensure efficient maintenance operations
- Keep tunnel workers safe and secure
- Address issues and emergency incidents quickly

In most tunnels, especially longer ones, radio is the only viable way to communicate. Therefore, any communications system deployed in the OCC must be able to integrate or interwork with the radio communications system.

Connected stations and airports

Train stations and airports host numerous businesses that deliver a wide range of services across multiple operational areas. These businesses often have diverse connectivity requirements and user profiles, including customer service teams, control centers, ground handling staff, security contractors, commercial agencies, back-office personnel and many others.

Multi-service and multi-tenant services meet the specific needs of each entity. They may include operations management, radio communication interconnection, end-user kiosk integration, CCTV monitoring and emergency help point supervision. Security requirements—such as alarm notifications, emergency request and recording systems—can also be effectively addressed.

Connected ports and logistics

Ports comprise a large area—including warehouses, terminals and maintenance zones—where connected equipment must be controlled or remotely managed, 24/7, in all weather conditions. The combination of Wi-Fi and Private 5G interconnection helps ports, shipyards and logistics operators maximize ROI and reduce complexity.

Commercial services at terminals

From physical locations or through virtual platforms, customer-facing functions must provide efficient communication with passengers. The contact center and automated attendant play a key role in enhancing the passenger welcome and overall service experience, contributing to business success and strengthening the brand image.

Solution 1

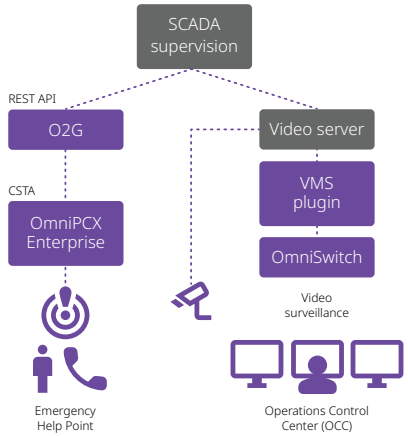
Synchronise video surveillance with EHPs

Improve control center efficiency and passenger security with synchronized video surveillance and emergency voice calls

Overview

In rail and metro stations, Emergency Help Points (EHPs) are installed on each platform to provide two-way voice communication between passengers requesting help and the control center. Visual coverage of the area surrounding an EHP enables control center agents to better assess and respond to emergencies.

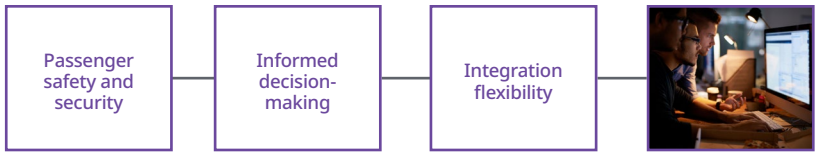
EHPs and video surveillance systems must be synchronized to enable operators to see and reassure the passengers with whom they are communicating. Cameras around the incident area must be controlled to get a clear, first-hand view of the emergency.



To ensure continuous availability of the video surveillance service, the operations team needs to quickly detect camera malfunctions and restore service.

The solution

The **OmniPCX® Open Gateway (O2G)** simplifies the integration between EHPs and video surveillance systems. The O2G monitors all phones in real-time and uses RESTful APIs to notify the video surveillance system and SCADA system when an emergency call occurs.



The video image from the corresponding area is displayed and recorded, regardless of the phone's technology.

With server-to-server integration, the video display is synchronized with the control center operator handling the call, even in call-forward or overflow cases. Our Professional Services can also develop protocol adaptation to provide information in the format and protocol expected by the SCADA system.

The **OmniSwitch® Milestone VMS Plugin** has been developed by Alcatel-Lucent to connect the Video Management System (VMS) with the switching infrastructure. This integration plugin makes it easier to monitor camera connectivity and status, diagnose faults and accelerate camera recovery, reducing troubleshooting time and limiting the need for field interventions.

Key differentiators

- Compatible with any emergency phone (analog or SIP)
- Ease of integration through RESTful API
- Optional protocol adaptation
- Faster camera troubleshooting and service recovery

What to order

OmniPCX Open Gateway with advanced telephony RESTful API

Professional Services for API coaching or protocol adaptation

OmniSwitch Milestone VMS Plugin

Solution 2

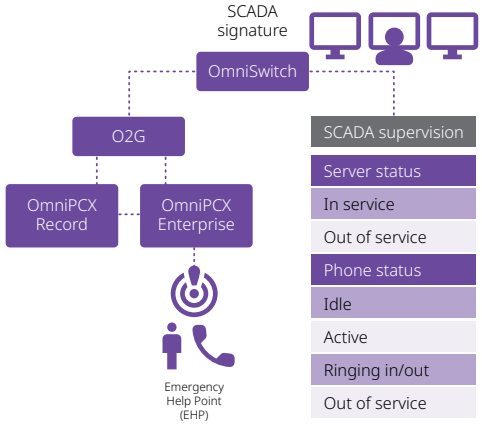
Integrate the telephony subsystem within the SCADA platform

Provide 24/7 EHPs by integrating the telephony subsystem with the supervision platform

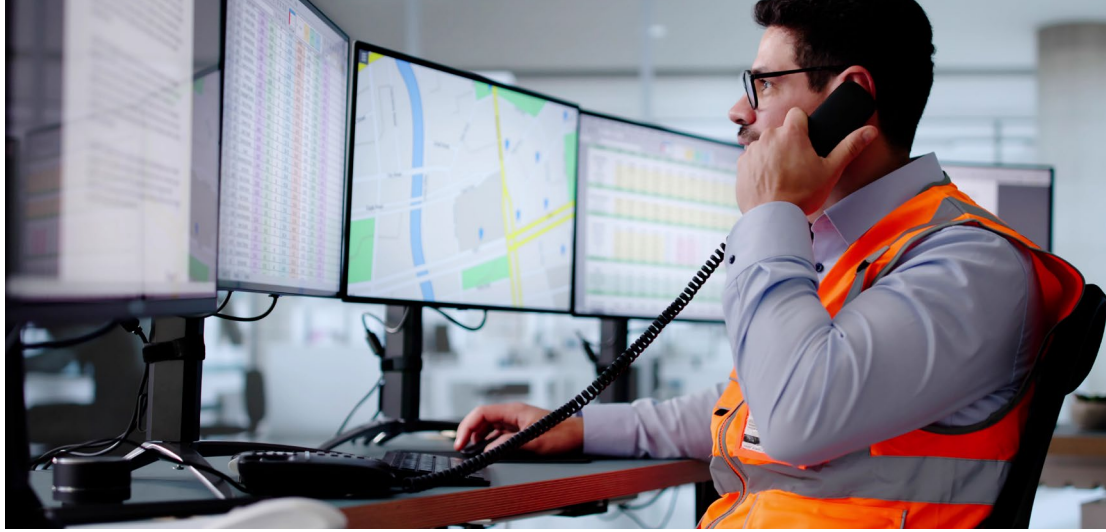
Overview

In transportation networks, the availability of EHPs is a key quality of service (QoS) metric and must be ensured 24/7. The control center must immediately be notified of any incidents in order to quickly plan maintenance operations and implement corrective actions.

The telephony subsystem must transmit the real-time status of all phones and servers to the SCADA system that supervises the overall transportation network subsystems.



To maintain reliable SCADA communications with the proper prioritization, the network infrastructure must be designed to recognize SCADA traffic and apply the appropriate policies, ensuring continuity and preventing operational disruptions.



The solution

The **OmniPCX Open Gateway (O2G)** provides the status of all EHPs, phones and servers from a single interface based on RESTful APIs.

Additional development can enhance O2G, including:

- Automatic testing of analog lines through periodic routines
- Phone status reporting via Simple Network Management Protocol (SNMP) for third-party devices (e.g., hardware status of SIP emergency phones including microphones and loudspeakers)
- Protocol adaptation to simplify the integration with SCADA or other supervision platforms

The **OmniSwitch 6860** can detect SCADA traffic using signature-based traffic recognition and automatically enforce the appropriate rules and policies.

Key differentiators

- Single interface for telephony and interphone subsystem
- Compatible with any phone: SIP, analog phones and Alcatel-Lucent phones*
- Optional protocol adaptation
- Signature-based SCADA traffic recognition with automatic policy enforcement (QoS)

(*level of service depends on phone type)

What to order

OmniPCX Open Gateway with advanced telephony RESTful API users

Professional Services for API coaching or protocol adaptation

OmniSwitch 6860 Layer 3 Multi-Gigabit Switch

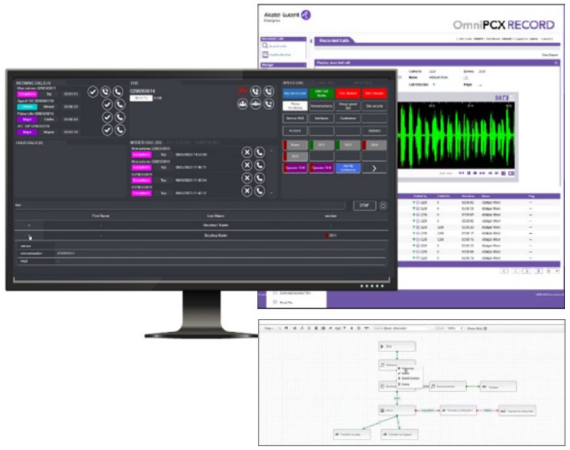
Solution 3

Enhance the emergency response at the OCC

Improve call management, process automation and regulation compliance

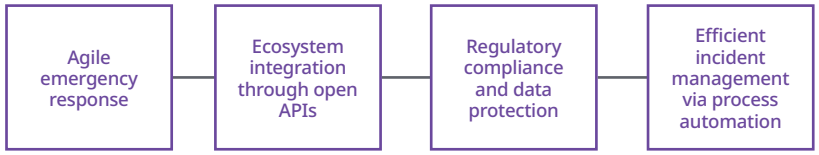
Overview

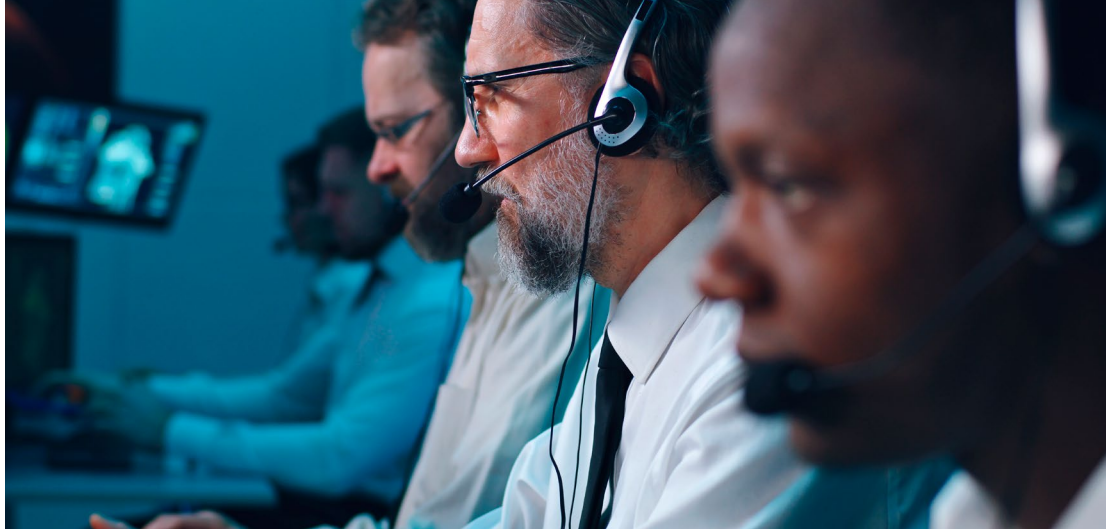
Modern OCCs must optimize communications to coordinate during crises, respond faster and make accurate decisions. Efficient call management, combined with reliable recording, is essential for service quality and regulatory compliance. Automated workflows are also key for processing event triggers, applying appropriate scripts and simplifying integration with other systems.



Solution

The **Dispatch Console** streamlines call management through a user-friendly graphical interface with a visual call queue, call prioritization, call pickup, conference setup and flexible routing options.





The **Visual Notification Assistant** orchestrates notifications for emergency and non-emergency incidents, collecting triggers and inputs from phones, alarms, IoT devices, HTTP requests or instant messages. Scripts defining triggers, rules and actions, are created via an intuitive interface without the need for programming skills. Notifications are delivered through broadcasts, conference calls, emails, SMS or HTTP interactions with other applications.

The **OmniPCX Record** supports risk management by recording and supervising incoming and outgoing calls, enabling review during incident investigations.
It ensures regulatory compliance and data protection through strict security policies, while quality monitoring helps identify improvement areas and enhance employee performance.

Key differentiators

- Seamless integration into existing environments
- Highly customizable suite of applications
- High availability solutions for mission-critical communications
- Web interface accessible from PC

What to order

Dispatch Console

Visual Notification Assistant

OmniPCX Record

Professional Services for on-demand customization

Solution 4

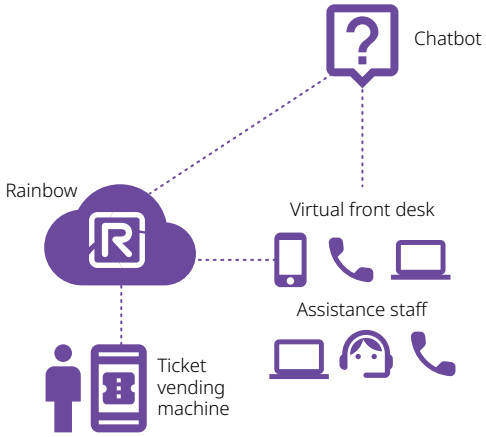
Enhance assistance at ticket vending machines and kiosks

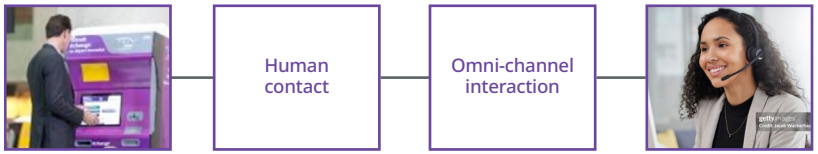
Improve passenger experience through real-time communications

Overview

Passengers increasingly value independence through their journey, whether buying a ticket, requesting itinerary information or booking a service. They use transport operator websites and mobile applications as well as ticket vending machines (TVM) and kiosks.

However, when problems happen, timely support through real-time interactions with transport operator staff can significantly improve the passenger experience.





The solution

A virtual desk enables passengers to connect with the assistance team or contact center agents through various media channels.

Rainbow by Alcatel-Lucent Enterprise provides a cloud Communication Platform as a Service (CPaaS), enabling the integration of communication services such as video and voice sessions, chatbots, document sharing and chat messaging into the TVM or kiosk applications. This integration streamlines the assistance process by eliminating communication barriers between passengers and staff.

ALE Connect empowers customer relationship management staff to handle a large volume of interactions across multiple channels—email, live web chat, social media and phone—while maintaining the quality and efficiency passengers expect.

Key differentiators

- End-user independence
- Remote assistance enabling a problem-free journey
- Contactless interaction
- Multimedia session assistance over any staff device (desktop, desk phone and smartphone) and any digital channel

How to engage

Rainbow Cloud Communication Platform

Rainbow CPaaS

ALE Connect

Professional Services for on-demand customization

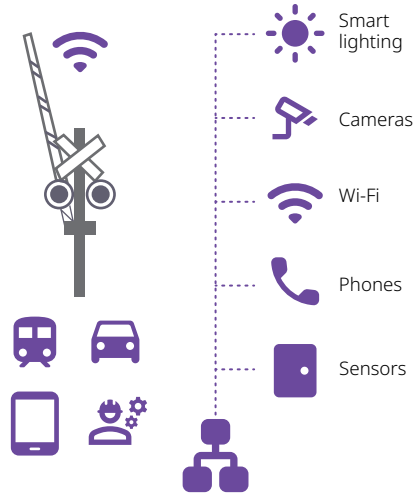
Solution 5

Ensure safety at rail and road crossings

Provide high availability, mission-critical network and communications infrastructure supporting multiple systems

Overview

Rail and road crossings are a major safety concern for train operators, ITS and local municipalities. Smart lighting, warning bells, traffic measurement sensors, signage, radar systems, emergency call systems and cameras are among the components that must remain connected 24/7.



Connecting all these systems requires a network infrastructure capable of delivering high-power Power over Ethernet (PoE) and supporting dry contacts for secure door locking of rail- and roadside cabinets. The infrastructure must also withstand extreme outdoor temperatures (both high and low) and provide centralized remote management and control.

The solution

Robust communications and network infrastructure provide mission-critical connectivity along railway tracks or roadsides, supporting the components required for around-the-clock monitoring.

The solution consists of a LAN and WLAN deployment at each rail or road crossing, with the following requirements:

- PoE and LAN connectivity for Wi-Fi, cameras and sensors
- Wi-Fi Access Points (APs)
- Emergency phones
- Dry contacts for alarm relay
- Geographical redundant communication infrastructure

Key differentiators

- Ruggedized Ethernet equipment
- Long-term support (10+ years)
- IEEE 802.3bt PoE (up to 60W)
- Alarm relay connectivity
- MACsec support
- Centralized communication system and management tool

What to order

OmniSwitch 6465 Compact Hardened Ethernet Switch

OmniSwitch 6575 Precision Industrial Hardened Ethernet Switch

OmniAccess Stellar AP1360

OmniVista 2500 Network Management System

OmniPCX Enterprise Communication Server

OmniVista 8770 Network Management System

Solution 6

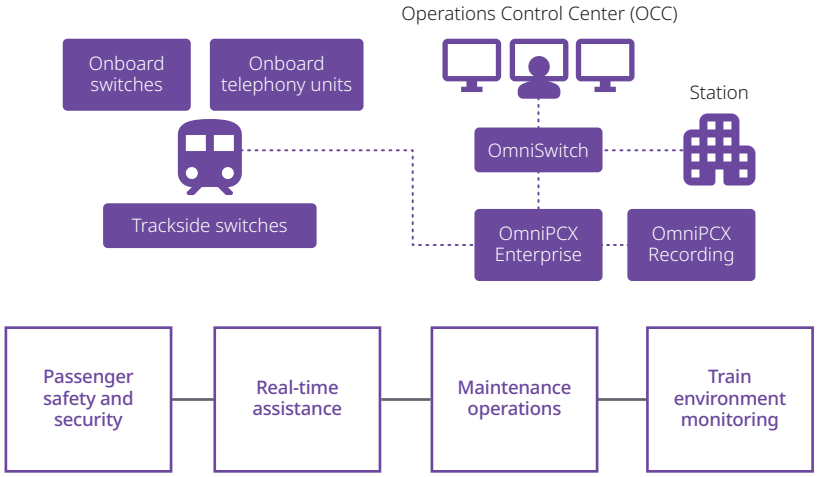
Secure onboard communications for driverless trains

Provide the essential assistant for safe and efficient automated operations

Overview

The railway sector continues to advance rapidly toward a fully automated future, also called driverless or unmanned trains—but ensuring safety remains a top priority for railway operators.

Enhancing operational efficiency and passenger safety is essential in scenarios where trains operate without onboard drivers and where real-time assistance is consistently required. Onboard telephony becomes a critical component, supporting maintenance activities, operational coordination and emergency response.



The solution

The communications architecture is divided into two parts:

- On the ground — **OmniPCX Enterprise** manages communications across the entire metro stations and operations control center. The **OmniPCX Record** captures communications both onboard and at the stations, including secret listening onboard.
- Onboard — **Embarked telephony units**, based on a SIP server, interconnect the EHPs and driver cabin telephony features and record calls if the link between the train and OCC is interrupted. A server orchestrator coordinates the telephony units, EHPs and interconnection with the hypervisor.

This architecture ensures seamless communication, call recording and operational control across both onboard and ground systems.

Key differentiators

- Always-on onboard telephony
- Reliable call recording
- Robust voice infrastructure

What to order

OmniPCX Enterprise Communication Server

OmniPCX Record

Professional Services for on-demand customization

Solution 7

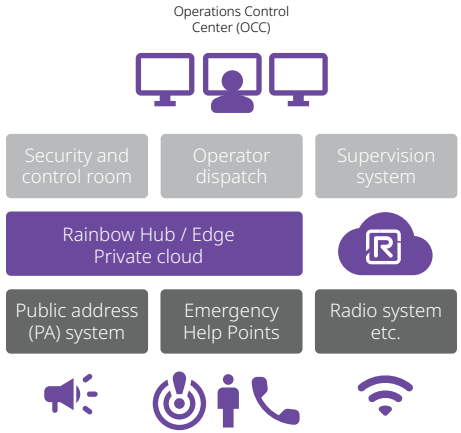
Integrate communications into the OCC ecosystem

Enable open, transparent interworking across heterogeneous third-party environments for efficient operations

Overview

The main challenge for general contractors is delivering a turnkey solution to end customers, composed of multiple functional blocks that must work together seamlessly. The OCC is a critical service unit where several applications are interconnected to manage operational activities and security incidents.

The solution must offer open capabilities to enable seamless integration within a heterogeneous OCC ecosystem while addressing security requirements, including emergency calls from passenger assistance and routine operational activities.



The solution

Rainbow Hub and Rainbow Edge are all-in-one platforms that provide operational communications and collaboration services, including video conferencing, file sharing, chat, group creation and CPaaS capabilities.

The private cloud deployment model (Rainbow Edge) enables customers to leverage cloud technology services while maintaining on-premises security.

This solution handles all operational and security communications systems, such as EHPs, Public Announcements (PAs) and onboard communication assistance. In addition, it includes call recording and seamless integration with monitoring and supervision applications, providing a complete end-to-end operational communication solution.

Key differentiators

- Flexible implementation cloud model
- Openness capabilities enabling easy integration in the OCC ecosystem
- Interconnection to third party systems

What to order

Rainbow Hub

Rainbow Edge Private Cloud

Solution 8

Enable private 5G for ports and logistics

Enable seamless connectivity for critical operations with Private 5G

Overview

Ports and logistics operators need reliable wireless connectivity across large outdoor yards and challenging indoor areas (warehouses, terminals, maintenance zones). Traditional Wi-Fi can struggle with outdoor wide coverage, mobility and interference, while public cellular networks often don't offer the level of control, security and guaranteed QoS required for business-critical operations.

Private 5G provides connectivity for mobile and mission-critical assets such as automated vehicles, yard tractors, cranes, handheld terminals and safety equipment—supporting latency-sensitive, always-on workflows. It also enables data-intensive applications such as high-definition video surveillance, IoT sensors and digital twin systems, delivering real-time visibility and faster decision-making across terminal operations.

The solution

Alcatel-Lucent integrates Private 5G into an end-to-end enterprise networking framework, combining LAN, WLAN and Private Wireless with a unified security approach.

The **Alcatel-Lucent Private 5G** network delivers secure, low-latency LTE/5G connectivity for critical systems, addressing coverage, mobility and QoS requirements in demanding environments. It complements Wi-Fi deployments and provides reliable connectivity in vast, uncarpeted outdoor spaces typical of ports and logistics sites, ensuring service continuity where Wi-Fi or public networks may fall short.

Key differentiators

- Interference-free spectrum for consistent, disruption-free performance in congested RF environments
- Low latency and deterministic connectivity to support real-time control and mission-critical workflows
- Enhanced security with SIM-based authentication, aligned with Alcatel-Lucent LAN and WLAN Zero Trust capabilities
- Scalable indoor and outdoor coverage for vast and complex environments (yards, terminals, warehouses)

What to order

Alcatel-Lucent Private 5G

Advanced Private 5G for Business-Critical Connectivity

Solution 9

Ensure effective coordination among multiple transport operators

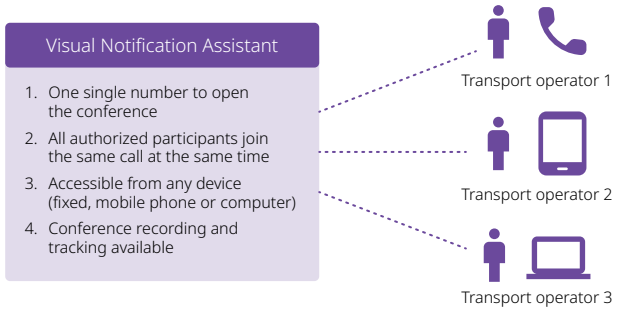
Facilitate information sharing and decision-making in multi-urban operator environments

Overview

The urban transport sector faces a significant challenge: bringing together multiple transport operators under the common goal to deliver a seamless and integrated service for passengers. The current context is marked by limited resources, skill shortages, cost optimization pressures and evolving passenger expectations.

Transport operators must collaborate closely and establish strong coordination mechanisms to maintain high quality services. Effective cooperation is essential.

Voice conferences play a critical role in operational coordination, particularly during service disruptions. They enable rapid information sharing as well as collective decision-making to implement corrective actions (onsite intervention, etc.) and restore normal operations as quickly as possible.



The solution

The **Visual Notification Assistant** orchestrates an emergency conference by automatically initiating a conference session with all authorized members whenever one of them dials the designated master number. Authorized calling numbers are pre-registered to ensure that only approved users can trigger a conference when required.

Each conference is recorded, and the recording is distributed to all participants to support process documentation and continuous service quality improvement.

Key differentiators

- Inter-operator coordination conference
- Real-time collaboration through emergency conference to reduce response time
- Transparent sharing of incident information between operators

What to order

Visual Notification Assistant

Project-based Professional Services

Solution 10

Converge OT and IT network connectivity across roadsides

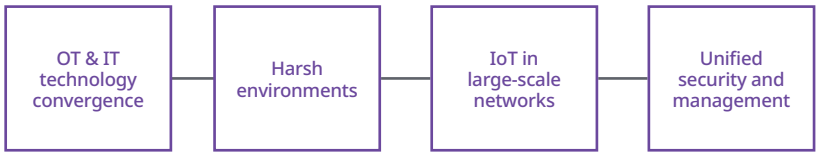
Deliver highly available connectivity for highway and roadside devices

Overview

Roadside assets such as cameras, sensors, traffic controllers, Variable Message Signs (VMS), weather stations, tolling systems and emergency equipment are widely distributed across highway infrastructure. These operational technology (OT) systems must operate continuously —often in harsh outdoor environments—while remaining securely interconnected with IT systems at traffic control centers and data centers.

Traditionally, highway operators have deployed multiple parallel networks, each dedicated to a specific system or vendor. This approach increases operational complexity, limits visibility and creates cybersecurity risks, especially as legacy OT systems become IP-based and connected to central platforms and cloud services.

To support modern and future highway operations, operators require a unified networking management approach that maintains physical or logical separation between OT and IT while providing centralized visibility, automated onboarding, micro-segmentation and robust cybersecurity—without disrupting existing brownfield infrastructure.



The solution

Ruggedized industrial switches deliver highly available connectivity for roadside devices, designed to withstand harsh environments while meeting long lifecycle and security requirements. Devices are automatically discovered, profiled and onboarded upon connection.

Traffic flows are dynamically classified and segmented through policy-based controls, keeping OT and IT environments logically or physically separated to reduce cyber risks.

Centralized management and AI-assisted monitoring provide real-time visibility and proactive detection of anomalies to help maintain service availability.

Key differentiators

- Unified OT/IT networking management architecture
- Automated device discovery, profiling and inventory
- Micro-segmentation and policy-based enforcement
- End-to-end visibility through centralized management
- AI-assisted network monitoring and analytics
- Long-term hardware and software support (10 years)

What to order

OmniSwitch Industrial Ethernet Switches

OmniVista Network Management System

OmniVista Network Advisor

Alcatel-Lucent OT/IT networking overview

We make everything connect by delivering technology that works for you

Our vision is to deliver the customized technology experiences our customers need. Our mission is to make everything connect by delivering digital age networking, communications and cloud solutions with services tailored for your business success.

In the Cloud. On Premises. Hybrid.

Alcatel·Lucent