

**ORing**

# Transport Automation



**IRIS**  
Certification



EN50121



EN50155

**Transporter  
Series**



[www.ORingnet.com](http://www.ORingnet.com)

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**IEC-61375**

**AFC  
System**



**PIS/CCTV**



## Let ORing Guide You into the Future of Railway Automation

The world is moving into the future of automation and there is no exception for the railway industry. Rail transport commenced in mid-16th century and has developed its own structure such as special linking circuits over centuries of evolution. The transition from manual to automatic operation will require replacement of legacy equipment or integration of modern and legacy equipment. Furthermore, network devices used in railway applications must be of the highest quality and standards due to the harsh operating environment. From the selection of products to the deployment of solutions, every detail must be considered. While railway automation won't happen overnight, it can be achieved in a simple and fast way, provided you have a trustworthy partner along the way. With IRIS certification and a wide range of products designed for railway applications, ORing is undoubtedly the best partner to help you realize railway automation.

## Real-time Remote Diagnostic Monitoring



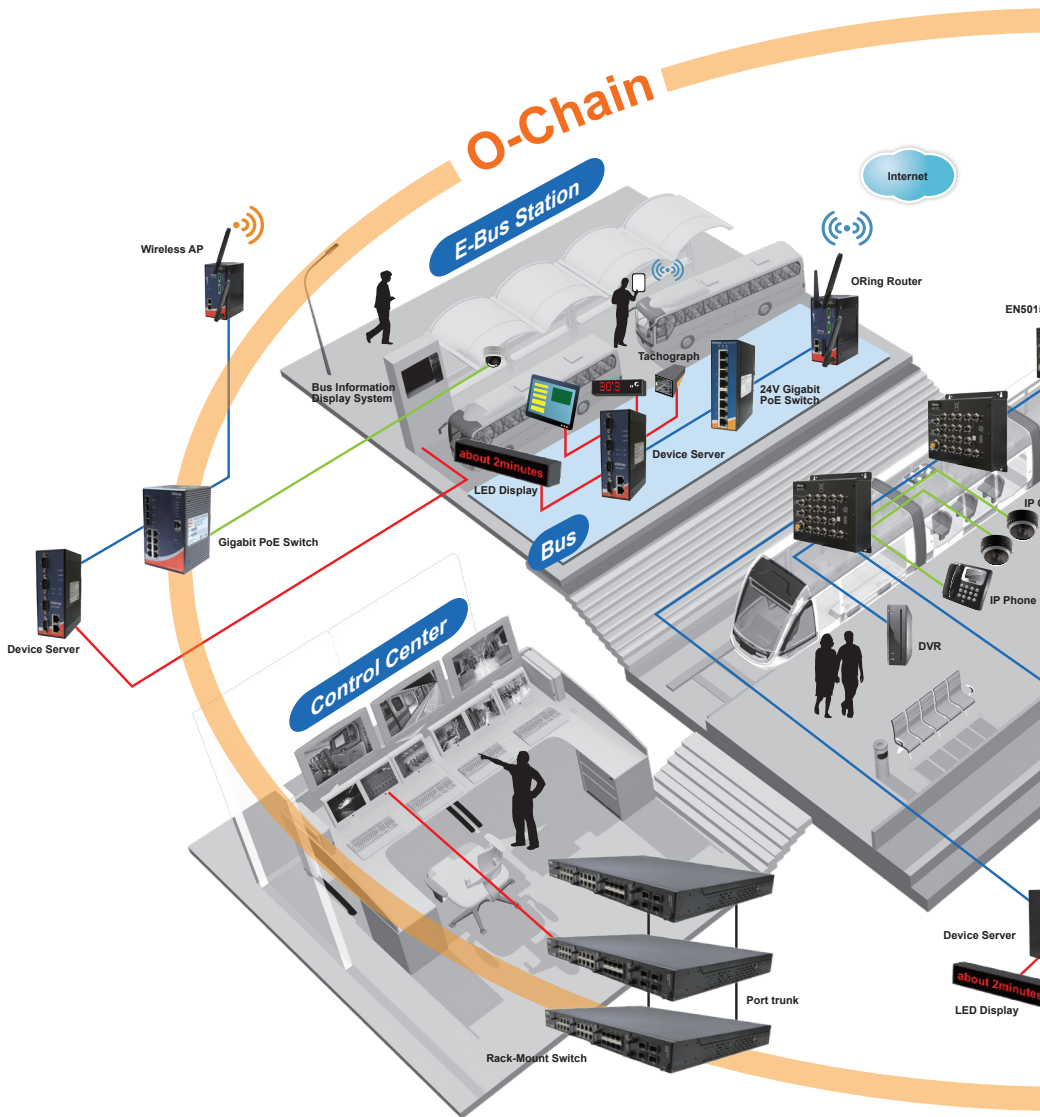
## Passenger WiFi

### CBTC



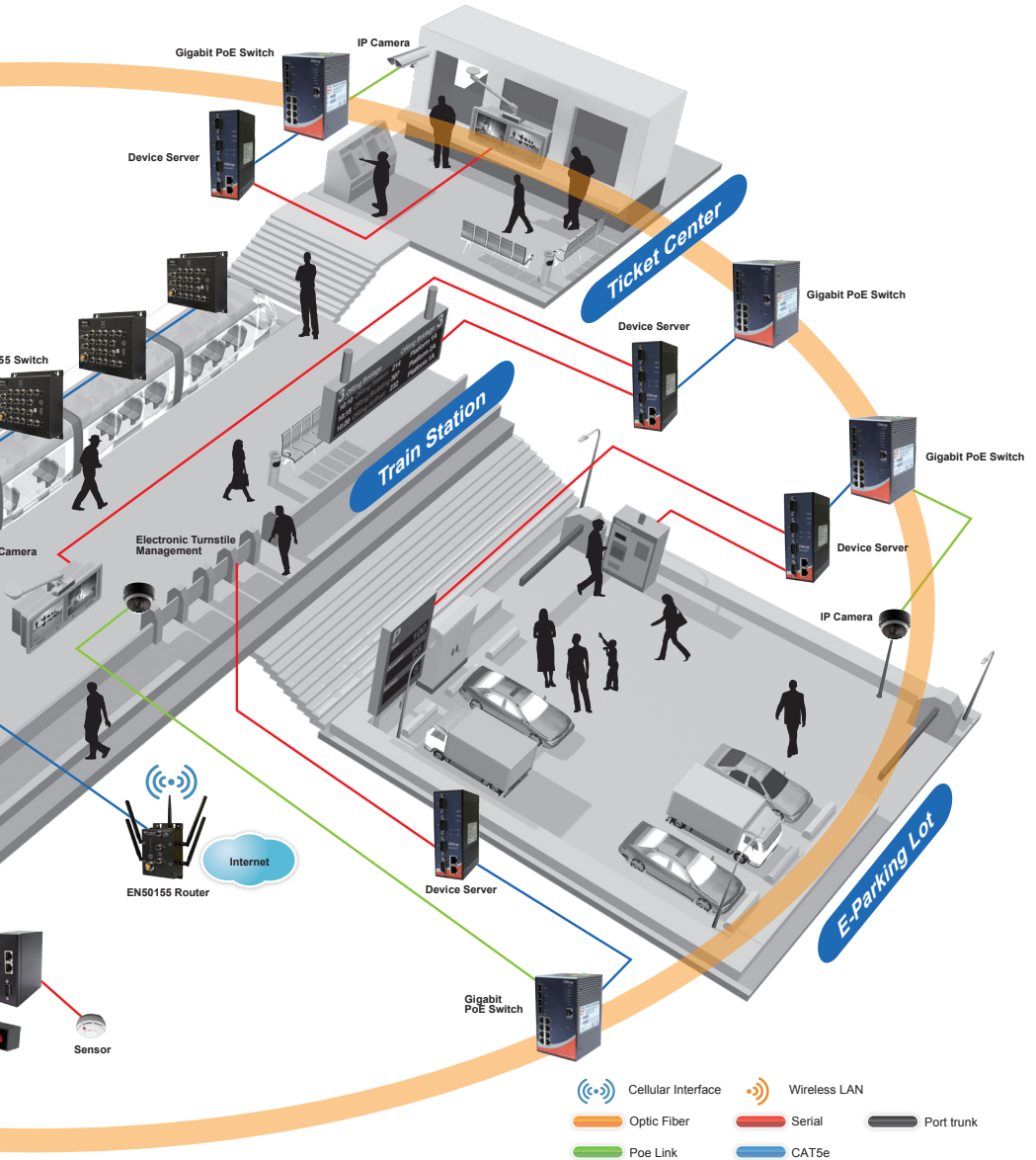
As an IRIS-certified network communication solution provider, ORing has proven its ability to meet the railway industry's rigorous demand for quality, reliability and sustainability. ORing's partners and customers can also rest assured that ORing will constantly improve its management, research, and development processes.

ORing offers a full range of railway solutions featuring EN50155 compliance, a wide operating temperature range, M12 connectors, and IP-grade casings to meet increasingly diverse customer needs and have been widely adopted by railway companies worldwide. Backed by strong engineering and R&D expertise, ORing can provide professional advices, recommendations, solutions and support spanning the entire railway transport industry. Knowing customers' pain, ORing is committed to helping them build railway automation systems while protecting their existing investment.



## Total Solution

Network communications devices used in railway automation systems must meet unique demand in terms of power, cabling, and industry standards. In addition, they need to provide higher durability, wide temperature ranges, and better resistance to vibration and electromagnetic interference than consumer counterparts. As railway networks usually cover a wide area, a variety of devices such



as Ethernet switches, APs, and media converters will be needed. To help customers build railway automation networks easily and cost-effectively, ORing has developed a full range of products. With comprehensive railway automation solutions, ORing brings customers one-stop shopping experience.

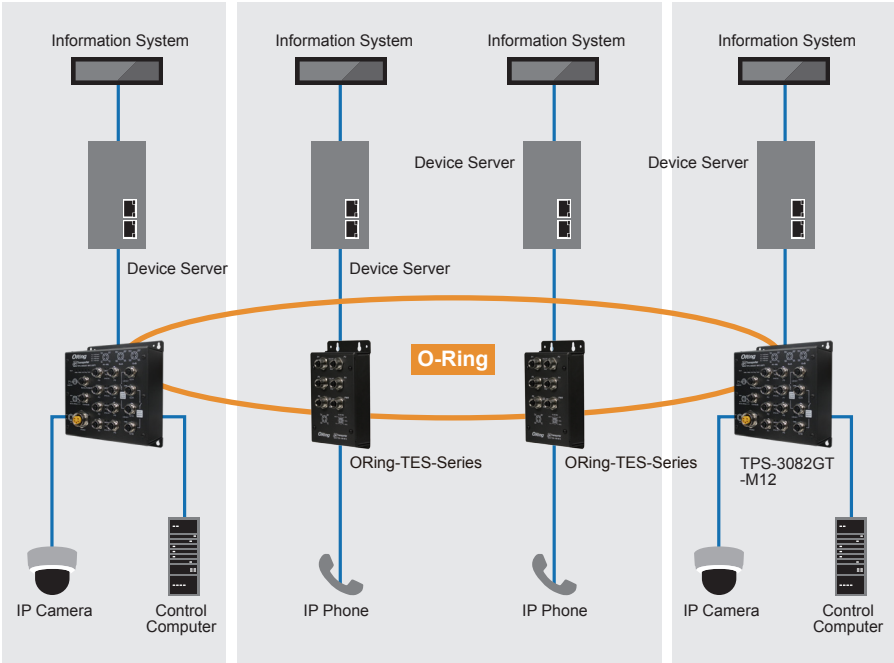
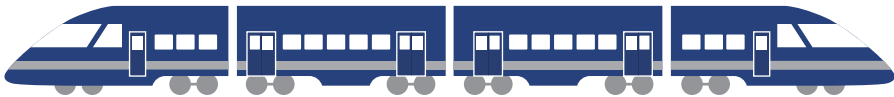


**P**IS (Passenger Information System) and CCTV systems are two important elements in a railway setting. A PIS provides real-time visual and audio information to passengers at stations and transfer facilities to keep them informed of any situations such as next train arrivals, delayed trains, emergency announcements. A CCTV system ensures the safety of passengers and transit property while making train operations more efficient. As these systems need to integrate data from a variety of systems such as track locators, PA systems, cameras, and LED displays, they must be integrated seamlessly with the transport infrastructure through high-performance Ethernet switches.

## ***Puyuma Express***

ORing's T-series industrial Ethernet switches and device servers have been adopted by the Puyuma Express, an express train service provided by the Taiwan Railways Administration (TRA), including the TPS-3082GT-M12 switches, the TES-series switches, and the TDS-5042-I-M12 device servers. The TPS-3082GT-M12 switches are installed in the front and back locomotives to connect onboard switches with other IP devices. As the switches are PoE-enabled, they can provide power to connected powered devices such as IP cameras, significantly reducing installation costs and time. To integrate existing serial devices such as information systems and LED displays, the TDS-5042-I-M12

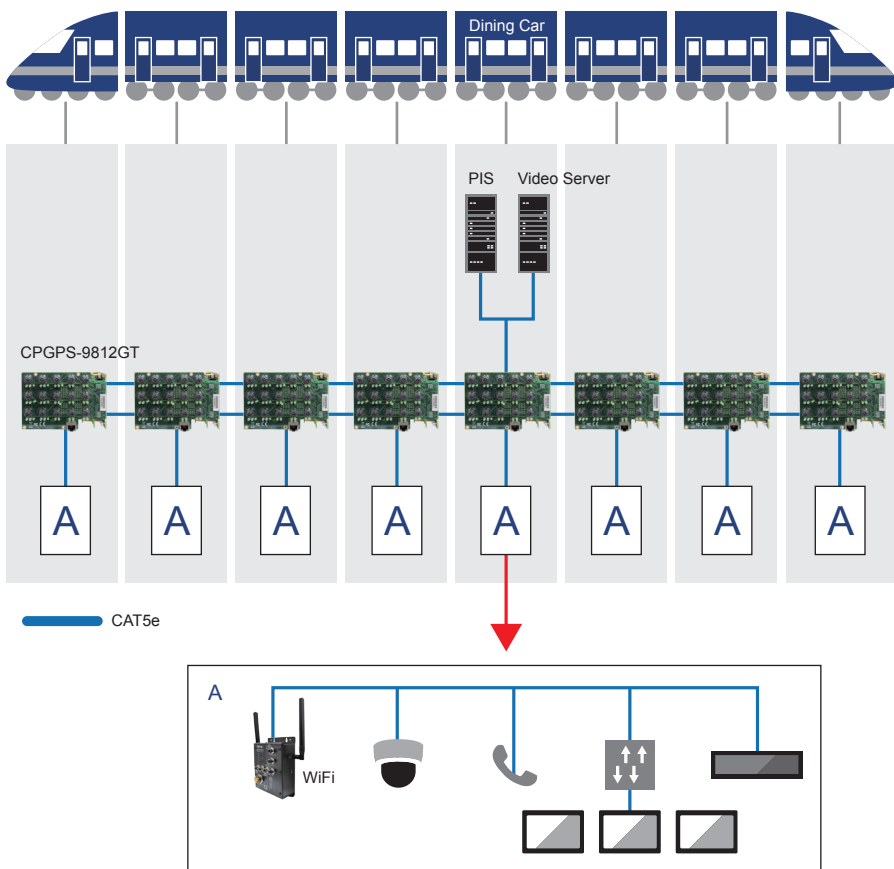
are installed to convert serial signals to digital signals which can then travel over the IP network. The establishment of a complete IP network throughout the train enables the railway company to provide real-time travel information to passengers while keeping an eye on the situation in the train to ensure the highest level of security for passengers.





## China's Fuxing Hao High-speed Train

China's Fuxing Hao high-speed train has adopted ORing's CGPS-9812GT industrial Ethernet switches to provide network communications throughout the train. Each carriage is equipped with a CGPS-9812GT to connect onboard devices. The CGPS-9812GT installed in the dining car of the train is connected to not only the end devices but also the mainframe servers. With 12 Gigabit ports, this switch can provide sufficient bandwidth for video and image data. Part of the ports support bypass function to ensure uninterrupted operation during power failure as data will continue to flow through the bypass relay ports. Therefore, passengers can rest assured that they don't miss any important announcements.



### Why ORing?

- EN50155 compliance
- Industrial-grade design such as M12 connectors and wide temperature range



## 2

### On-board WiFi (Passenger WiFi)

On-board Wi-Fi services are no longer a luxury but a necessity for passengers nowadays. This is especially true for business travelers who have to access the Internet at all times to check emails or process work online during their journey. To provide a pleasant user experience, seamless and high-speed wireless networks must be deployed on trains to ensure passengers remain connected from the start of their journey until reaching their destinations.

#### ***Malaysian Train Company***

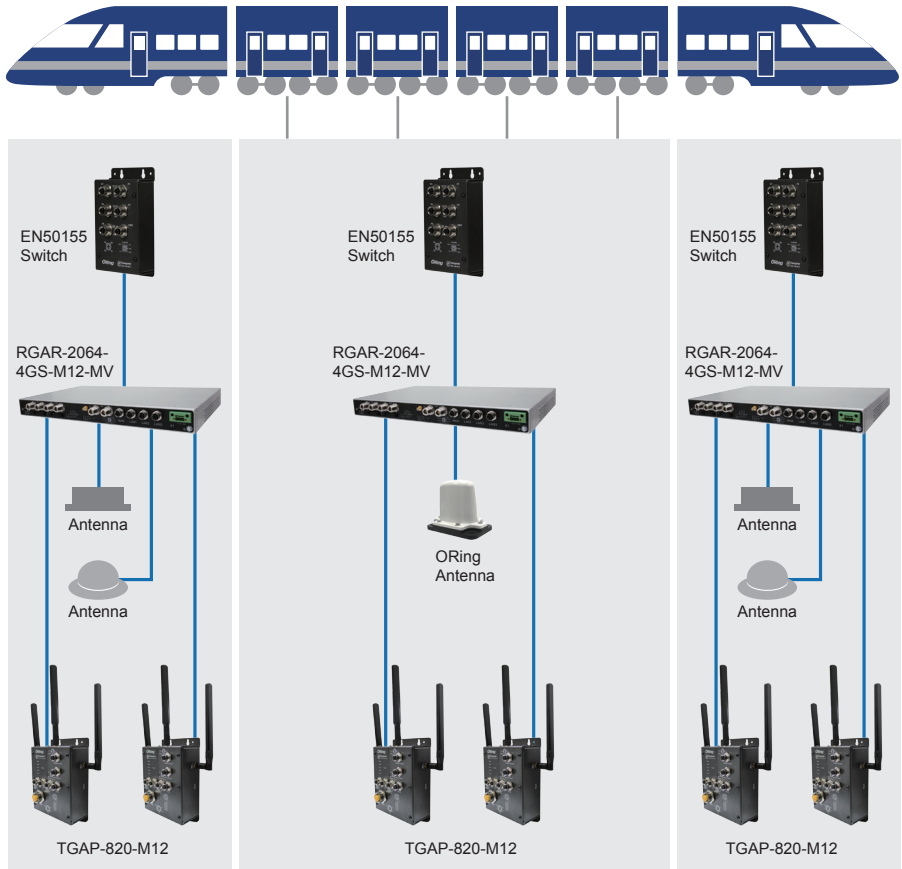
ORing has helped a Malaysian train company establish a complete on-board Wi-Fi network to provide passengers with Internet access anytime, anywhere. In the six-carriage train, each carriage is equipped with ORing's RGAR-2064-4GS-M12-MV 4G router. The routers support all telecoms' networks and provide two SIM card slots for network redundancy. When the primary SIM card fails, a connection will be established automatically via the secondary SIM card. As the RGAR-2064-4GS-M12-MV supports auto dial-up, passengers in one carriage can access the Internet without affecting people in other carriages. ORing's TGAP-820-M12 APs have also been installed in the carriages. These IEEE 802.11ac/g/n APs guarantee a WLAN interface up to 1.3Gbps, giving passengers excellent user experience when watching videos or playing games. The load balancing support can maximize network resource utilization and improve data communications quality. In addition, the

## ● Railway Automation ●

overlapping coverage of two APs can strengthen wireless signals and increase bandwidth, allowing passengers to access the wireless network simultaneously and reliably.

### Why ORing?

- Complete wireless access solution including 4G routers and APs
- Dual SIM card slots to provide connection redundancy
- IEEE 802.11ac/g/n compliance with 3Gbps of throughput
- Load balancing support for higher transmission quality
- Compliance with railway standards such as EN50155



— CAT5e



# 3

## CBTC (Signaling)

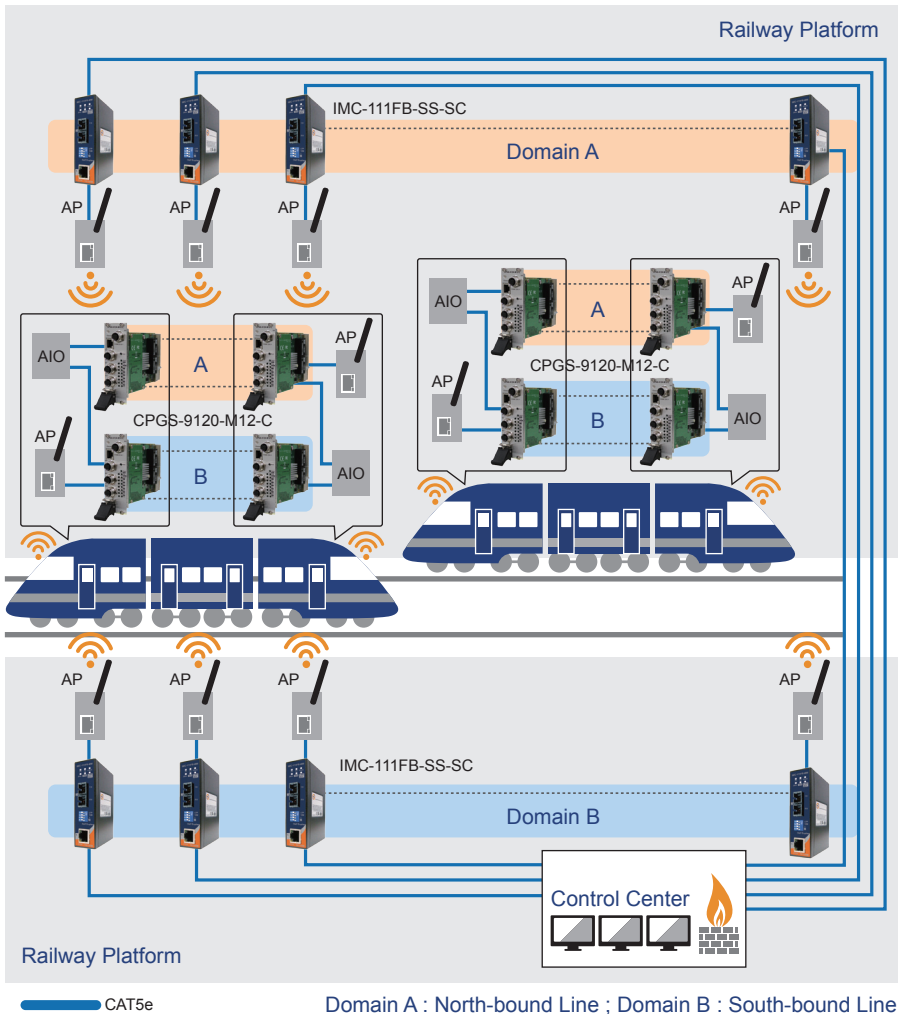
**C**BTC (Communications-Based Train Control) is an automated control system for railway applications. It uses telecommunications between the train and track equipment to manage the traffic and the infrastructure. Through CBCT systems, the position of a train can be located accurately, hence higher efficiency and safety for railway traffic management. When a train is delayed, CBCT systems will automatically adjust the speed of the train or reduce the dwell time, the time spent serving a station, to minimize the impact on successive trains and prevent significant delays.

### *Beijing Subway*

ORing's solution has been adopted in China's subway systems to achieve smooth CBTC operation. Beijing Subway's Line 8 trains have been equipped with ORing's CPGS-9120-M12-C Ethernet switch cards to allow for data transmission between in-vehicle devices. To enable wireless communications between networks in the vehicles and communications between vehicles and stations, a number of APs have been deployed in the trains as well as on the trackside. Each AP is connected to the ground control center via ORing's IMC-111FB-SS-SC media converter. This network design ensures data such as the location of the train and obstacles on the track is transmitted between the vehicles and the control center in real time during the operation of the train. With proven stability and performance, ORing's solution has been further adopted in the Chongqing Metro Line 5.

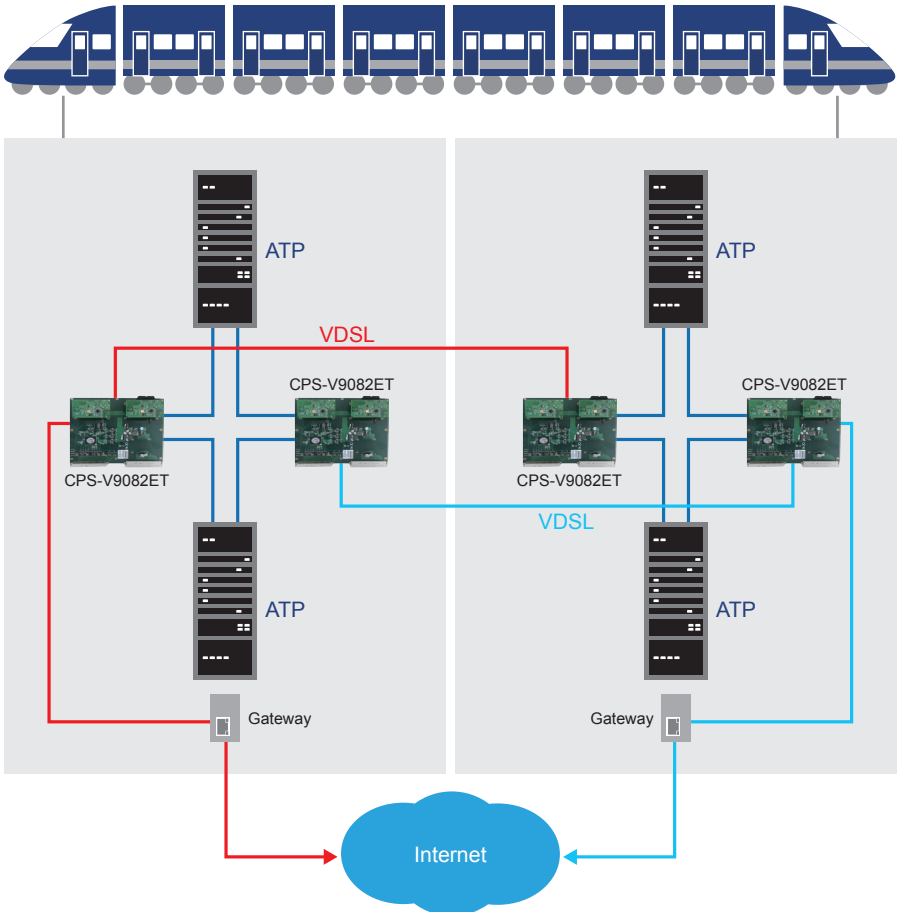
## Why ORing?

- Robust design with outstanding redundancy capability
- Able to provide a comprehensive, proven network communications solution for railway applications
- Compliance with railway standards such as IRIS and EN50155
- Compact PCI form factor with hot-swap support and M12 connectors



## Train Company in China's Henan Province

China's Henan Province is planning to build a CBTC system at the train stations. The CBTC system planned by Henan Province features the same structure as the CBTC system used in Beijing subway, where ORing's products have been adopted to provide smooth system operation. In Henan's CBTC deployment, ORing's CPS-V9082ET is a perfect fit for this project as this industrial Ethernet switch boasts outstanding redundancy. There will be two ATP devices located in every carriage with the main system installed in the first and last carriages. ATP, a control system that helps avoid collisions by automatically controlling the maximum allowable speed that a train can travel, is essential for the security of train systems. By connecting the ATP devices in each carriage through the CPS-V9082ET, service downtime can be prevented when one of the ATP devices breaks down because the other ATP device will take over. The main systems in the first and last carriages are connected via VDSL to ensure uninterrupted services when one of the systems is unavailable. The first and last carriages are also equipped with a gateway which allows for continued remote management via LTE networks.





# 4

## IEC-61375

**T**CMS (Train Control & Management System) is a standard control, communication and management system for all railway vehicle platforms and applications, including trams, metros, passenger coaches, and high-speed trains. Unlike typical networks, the train network topology is constantly changed during operations as cars are added, removed, or replaced frequently. Every time the order of the train cars changes, the network must be reconfigured manually, this is very time-consuming and prone to errors. IEC-61375 has thus been developed to enhance the efficiency of railway network reconfiguration. With an IEC-61375-compliant train communication network, train operators only need to check the leading car on TCMS and then all configurations will be adjusted automatically based on the new order of train cars. With this technology, train operators can vastly improve their operational efficiency and minimize configuration errors.

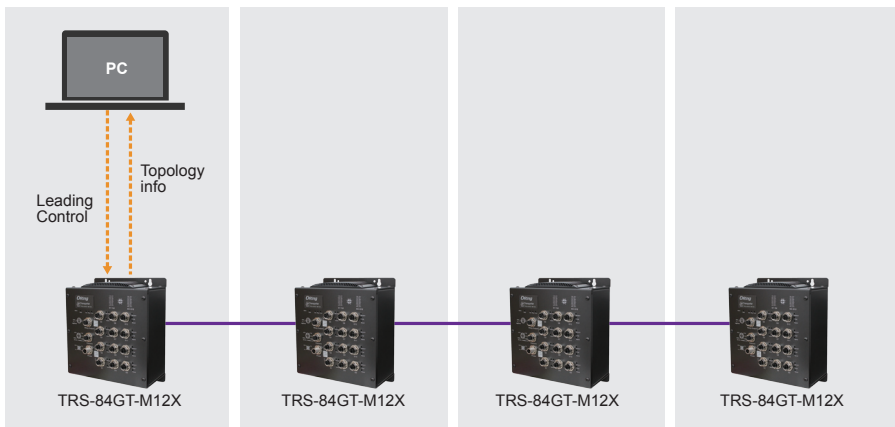
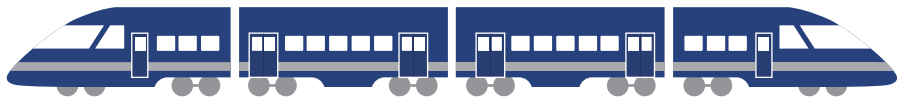
## IEC-61375 Introduction

IEC-61375 standard defines the TCN(Train Communication Network) requirements for train data communication.

<b>IEC-61375-1</b>	General architecture of TCN
<b>IEC-61375-2-1&amp;2</b>	Wire Train Bus (WTB) & conformance testing
<b>IEC-61375-2-3</b>	TCN communication profile, including TRDP (Train Real-Time Data Protocol)
<b>IEC-61375-2-4</b>	TCN application profile for TCMS
<b>IEC-61375-2-5</b>	Ethernet train backbone (ETB) requirements, including TTDP (Train Topology Discovery Protocol)

### ■ IEC-61375-2-3 (TRDP)

Defined in IEC-61375-2-3 standard, TRDP (Train Real-Time Data Protocol) is an open network protocol for communications over IP-based networks in rail vehicles. TCMS functions based on the communication profile laid out in IEC-61375-2-3 specify rules for the data exchange between trains. With TRDP, devices such as door controls, displays, and air conditioners can communicate with each other in a transparent way, providing the basis for communications in future trains and making the entire train topology more dynamic.



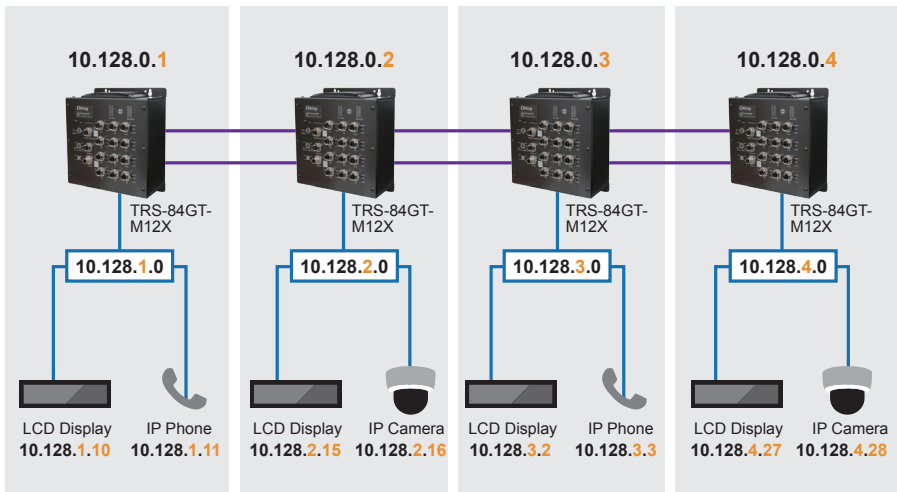
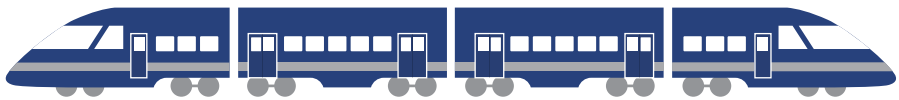


## **Benefits**

- Automatically adjusted based on the new network topology
- Auto-detection when train topology is changed
- Auto-assignment of IP addresses to ETBN(Ethernet Train Backbone nodes) and end devices
- Easy configuration
- Reduce configuration time and minimize configuration errors

### ■ **IEC-61375-2-5 (TTDP)**

IEC-61375-2-5 defines ETB (Ethernet Train Backbone) requirements to fulfill open train data communication systems based on Ethernet technology. TTDP (Train Topology Discovery Protocol) is defined in IEC-61375-2-5 to identify the order of network switches, starting with the switch in the lead train car. Switches will negotiate automatically after the network topology is changed and a new IP address will be assigned to the switches based on the new order of train cars. The auto-negotiation feature of TTDP enables the system to perform network configuration tasks automatically, without the need for operator intervention.

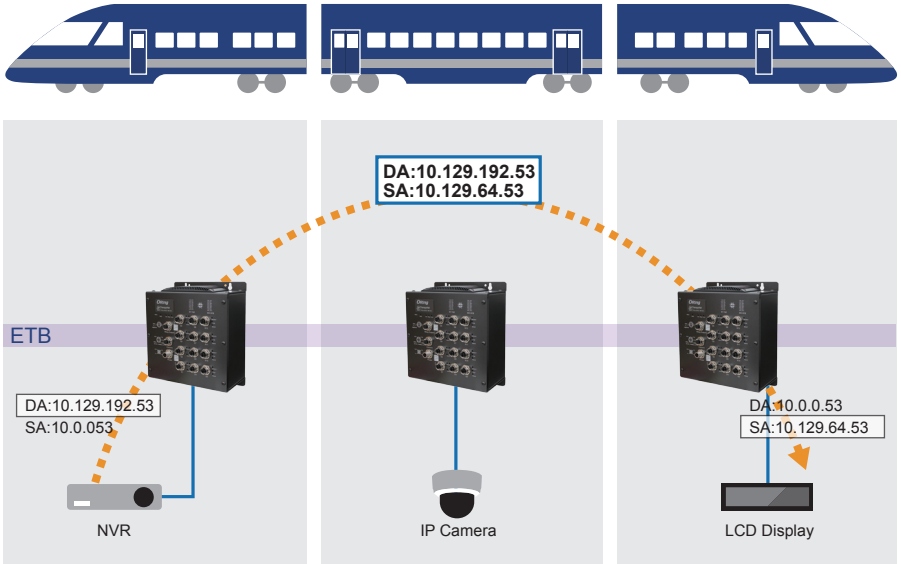


— Ethernet Train Backbone      — Consist Network

## ■ R-NAT (Railway-Network Address Translation)

R-NAT is an algorithm for network address translation between ETB and ECN. This algorithm uses the rules for train and Consist network addresses, which simplify the management of address translation.

For example, R-NAT allows end devices (EDs) in different cars to use duplicated IP addresses. Thus, there is no need to reconfigure EDs when the order of cars changes.





# 5

## AFC System

**D**esigned to reduce the amount of manual transactions to a minimum, AFC (Automatic Fare Collection) systems have been widely used in transportation facilities worldwide. The system automates the ticket accounting and selling processes while providing detailed data on system usage. An AFC system is composed of several components including Ticket vending machines, faregates, and ticket kiosks and checking machines.

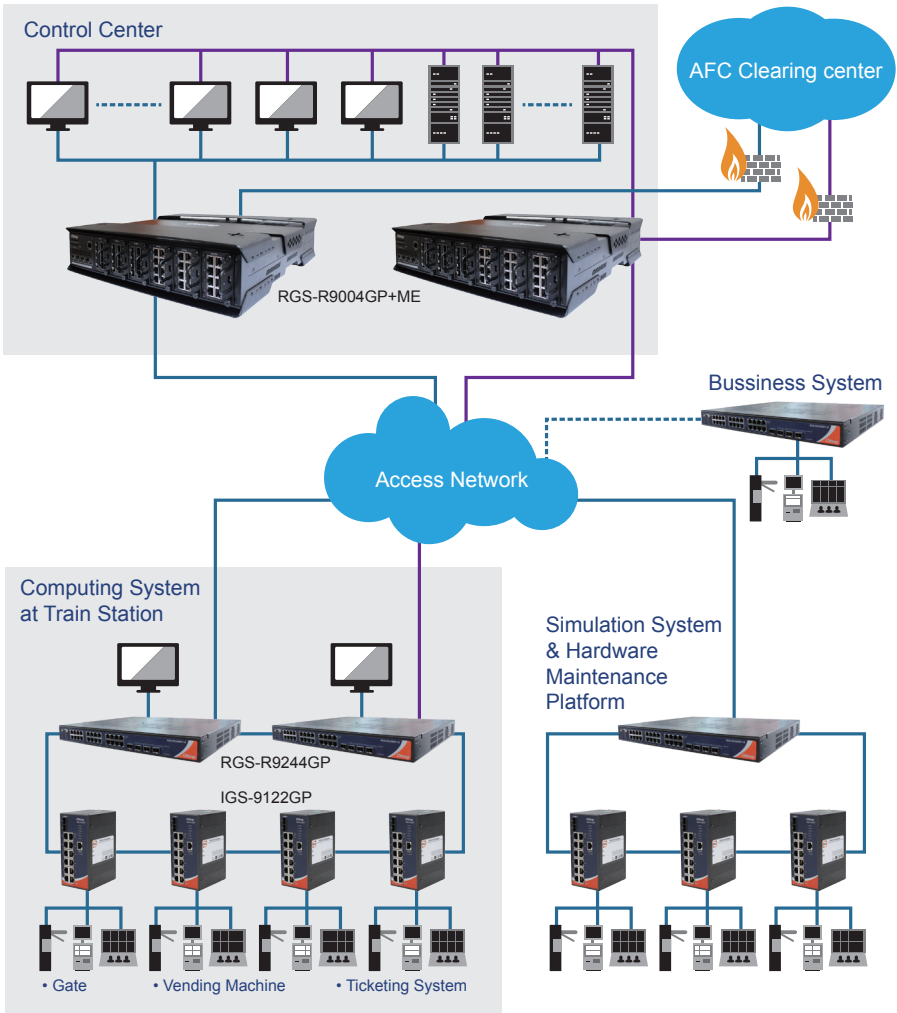
### ***AFC Application***

ORing's IAP-W420+ industrial wireless APs have been adopted in the tram system in Mongolia to help the tram company connect the wireless and wired networks. Each carriage of the tram is equipped with a wireless ticketing machine to allow passengers to pay on the tram. Two IP-W420+ were installed in the carriage to enable data transmission between the wireless ticketing machines. The coverage of these two APs can overlap with each other to boost signal strength. They can also back up each other during network failure. When one of the APs breaks down, the other AP will continue to transmit data, ensuring uninterrupted operation. A TPS-1080-M12 switch was installed in each carriage to connect to the APs. As the ports of the switch are IEEE 802.3at-compliant, they can provide up to 30W of power to the IAP-W420+, eliminating the need for additional power cables. The

company also used ORing's RGS-R9244GP+ to transmit ticketing data to the control center via on-board LAN, creating a reliable communications network for FCS.

## Why ORing?

- Ability to provide time-proven, comprehensive networking solutions for railway applications including wireless APs and access switches
- Compact size with embedded antenna
- 24VDC support





## 6 Real-time Remote Diagnostic Monitoring

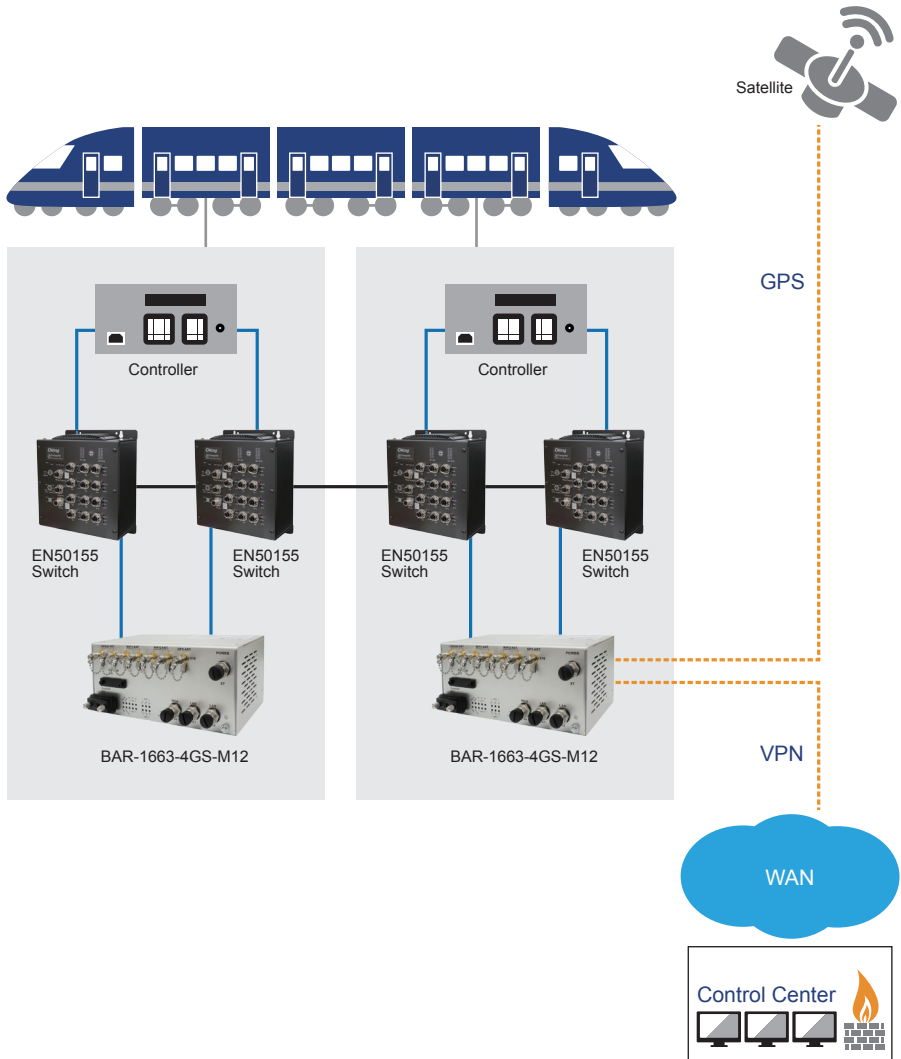
A real-time remote diagnostic monitoring system uses the combination of shore-based software and on-train hardware to process diagnostic data from rail vehicles in real time. Besides sending alerts when faults occur, the system will communicate with the maintenance depots in real time to facilitate fault diagnostics. It also analyzes irregularities of individual components and their behavior across the entire feet to identify their health status so that maintenance can be performed in advance. With this system, the administrator can obtain comprehensive information on railway operation including specific vehicle faults and identifies potential problems before they occur.

### **Canadian Train**

ORing's BAR-1663 industrial IEEE 802.11a/b/g/n router has been installed in a Canadian train to connect on-board PLCs via the Ethernet. The PLCs collect data from all kinds of sensors and perform control to the devices in the vehicle. With a built-in GPS module, the BAR-1663 transmits the data to the remote control center via VPN connections, allowing the control center to monitor and control in-vehicle equipment. When a problem occurs, the control center can detect it immediately and perform troubleshooting automatically. With ORing's solution, the railway company has significantly improved management and operating efficiency.

## Why ORing?

- Supports GPS location and VPN connection
- Accurate and fast troubleshooting
- Immediate response to customer needs and problems



## **Tianjin Metro**

Tianjin Metro Line 1, which is extending for the existing metro line with a total length of 42 kilometers. Across the six major administrative regions of Tianjin, the metro line load in Tianjin people's major commuting.

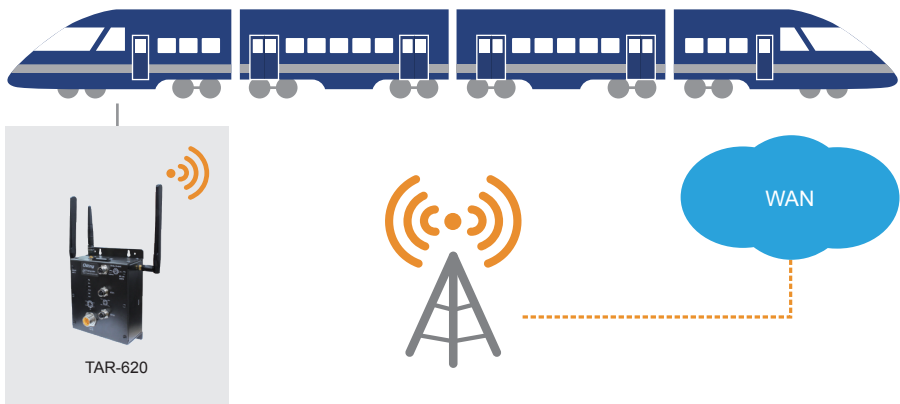
With the progress of development of intelligent, the transportation also enters the intelligent automation generation. And the evaluation of intelligent increasing dramatically, many applications connect with automation field; currently, the autonomous cars become one of mainstream, the Tianjin metro line 1 is driverless car, operate automatically if there are any issue and emergency problems will response to the control center immediately during the operation.

Every car assort with a TAR-620-M12-MV, build-in SIM card slot, support mobile, telecommunications and multi-operation mode. Ensure that when the vehicle working in progress, all the data and status can through by 4G router send to control center.

ORing's cellular router is designed for industrial and rolling stock wireless applications; TAR-620-M12-MV is reliable IEEE802.11 a/b/g/n router with 2 ports LAN which is fully compliant with EN50155 certification. Dual redundant Ethernet ports support Ethernet redundant mode (Recovery time < 10ms) and switch mode in M12 connector (A-coding). In addition, for the demand of power input, the TAR-620-M12-MV also provides 60Vdc to 160Vdc power input, guaranteed power supply stability

## **Why ORing?**

- Provides a complete and time-proven solution for railway applications
- IRIS-certified and compliant with EN50155 railway standard



# Industrial Grade Certifications



## ***IRIS***

IRIS (International Railway Industry Standard) is an extension of the internationally recognized ISO 9001 quality standard but is specific to the railway industry. The standard is developed by the UNIFE Group (the Association of the European Rail Industry) to attest to the quality and reliability of networks products and solutions for railway applications. ORing has been IRIS certified since 2015. ORing's partners and customers can rest assured that their ORing solutions meet the extremely rigorous requirements in the railway industry and that ORing will constantly improve its management, research, and development processes. The IRIS certification not only stands for topnotch quality, but also helps ORing partners save time and costs since they can directly use ORing's solutions to achieve higher safety, cost-effectiveness and quality of their railway appliances without undergoing additional qualifications. Optimal operational reliability and system availability can be guaranteed as comprehensive support ranging from development to production, servicing, and management will be provided.

## ***EN50155***

EN50155 is an international standard set for railway applications. EN50155 requires compliance with temperature, humidity, and electromagnetic interference. The standard guarantees the reliability of railway services by governing the operation, design, construction, and testing of electronic equipment.

## ***EN50121-4***

EN50121-4 is an European standard that applies for emission and immunity of the signalling and telecommunications apparatus in railway applications. It specifies the limits of emission as well as immunity, and identifies products that can operate despite the extreme surge and emissions hazards of railway environments.

## ***EN45545***

EN 45545 is a European standard that specifies the fire protection requirements for materials and products used on railway vehicles. EN 45545-1 includes regulations regarding the classification of rail vehicles in operational and design categories, as well as fire safety objectives. EN 45545-2, which will become mandatory in all European countries in 2016, defines the requirements for the fire behavior of materials and components.



# Notes



# ORing

Get Connected Anytime, Anywhere



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\*Specifications are subject to change without prior notice.