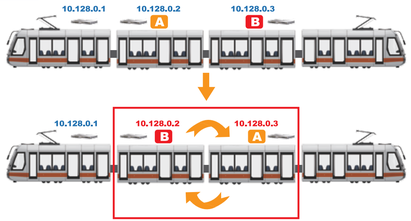
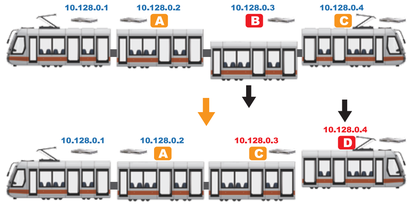
## TTDP(Train Topology Discovery Protocol)

Train topology is dynamic and frequently changes since carriages are constantly added, removed, or replaced. Every time the order of the carriages changes, the network must be reconfigured, which is very time-consuming and prone to errors if it's done manually.
TTDP (Train Topology Discovery Protocol) protocol has thus been developed to enhance the efficiency of railway network reconfiguration. The protocol enables Ethernet switches to negotiate automatically with other network devices after the network topology is changed and will reassign an IP address to the network devices based on the new order of the carriages. Therefore IT staff or operators do not need to reconfigure the network devices manually at all. With this technology, train operators can vastly improve their operational efficiency and minimize configuration errors.

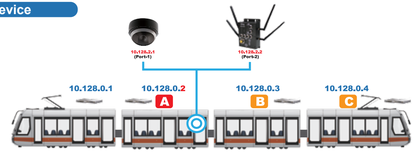
### Exchange




### Remove & Add

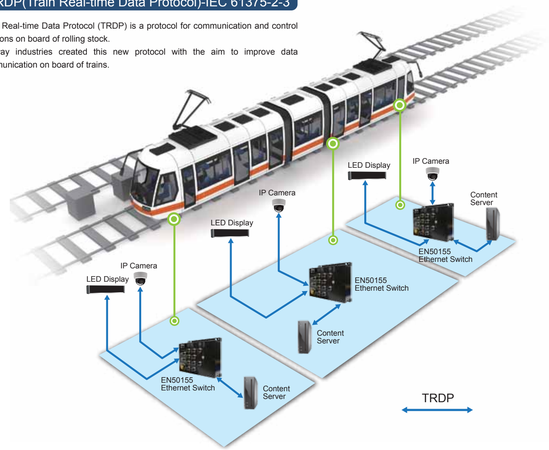



### Add Device




## TRDP(Train Real-time Data Protocol)-IEC 61375-2-3

Train Real-time Data Protocol (TRDP) is a protocol for communication and control solutions on board of rolling stock.
Railway industries created this new protocol with the aim to improve data communication on board of trains.




**ORing**

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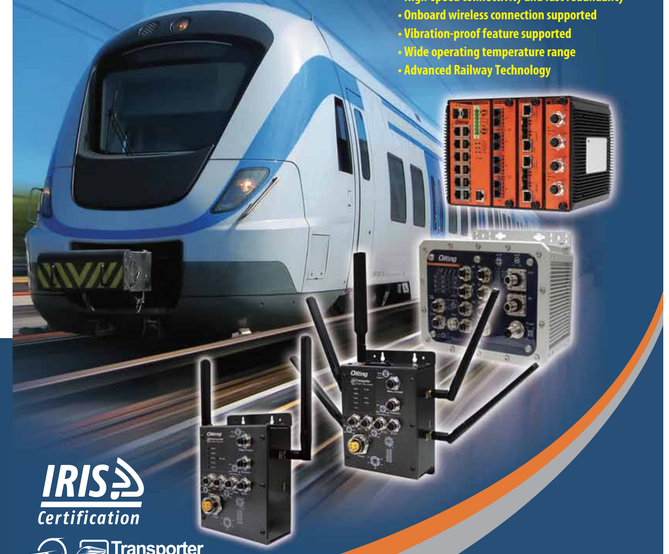
Global Headquarters
**ORing Industrial Networking Corp**
3F., No.542-2, Zhongzheng Rd., Xindian Dist., New Taipei City 23148, Taiwan
TEL: + 886-2-2218-1066
FAX: + 886-2-2218-1014
www.ORingNet.com
E-mail: sales_all@ORingNet.com


2019.10

# Establish Robust and Secure Railway Communication Network Solutions

## Industrial EN50155 Ethernet Switch/ AP/ VPN Router

- EN50155-certified for harsh railway standards
- High-speed connectivity and fast redundancy
- Onboard wireless connection supported
- Vibration-proof feature supported
- Wide operating temperature range
- Advanced Railway Technology



IRIS Certification

EN50121 EN50155 Transporter Series

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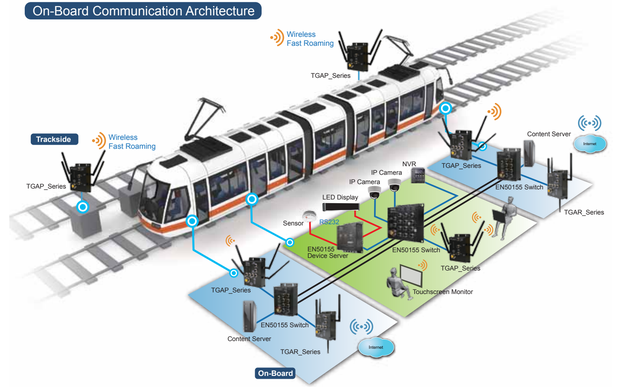
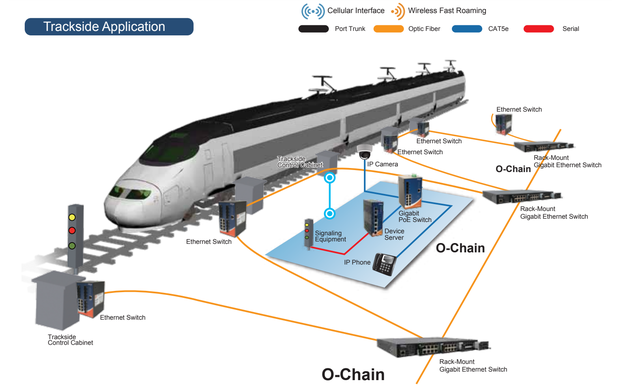
## On-Board Communication Architecture




## Trackside Application



## Industrial EN50121-4(Trackside EMC) Gigabit Ethernet Switch

### IGPS-9084GP-LA

12 Ports | DIN rail | Full Gigabit | 30W PoE

- Supports 8x10/100/1000Base-T(X) P.S.E. ports and 4x100/1000Base-X, SFP socket, Generic version
- Slim type and Rugged enclosure design
- Support PoE on/off scheduled configuration
- Support IPV6 new internet protocol version
- Support EtherNet/IP™ and Modbus TCP protocol
- Support IEEE 802.3az Energy-Efficient Ethernet technology
- Provided HTTPS/SSH protocol to enhance network security

### IGS-9812GP

20 Ports | DIN rail | Full Gigabit

- Supports 8x10/100/1000Base-T(X) ports and 12x100/1000Base-X SFP socket
- Supports multiple ring redundancy technology
- Supports IEEE 1588v2 clock Synchronization
- Supports Modbus TCP protocol
- Supports 9.6K Bytes Jumbo Frame
- Supports ACL, TACACS+ and 802.1x User Authentication for security
- Supports DBU-01 backup unit device to quickly backup/restore configuration
- Web-based ,Telnet, Console (CLI), and Windows utility (Open-Vision) configuration

### IGPS-9822DGP+

12 Ports | DIN rail | 2.5 Gigabit | 10 Gigabit | 30W PoE

- Provide 8x10/100/1G Base-T(X) P.S.E. ports and 2x100/1G/2.5GBase-X + 2x1G/10GBase-X SFP+
- Support IPV6 new internet protocol version
- Provided HTTPS/SSH protocol to enhance network security
- Support application-based QoS management
- Support Device Binding security function
- Support DOS/DDOS auto prevention
- IGMP v2/v3 (IGMP snooping support) for filtering multicast traffic

### IGS-9168GP

24 Ports | DIN rail | Full Gigabit

- Supports 16x10/100/1000Base-T(X) ports and 8x100/1000Base-X SFP socket
- Supports multiple ring redundancy technology
- Supports IEEE 1588v2 clock Synchronization
- Supports Modbus TCP protocol
- Supports 9.6K Bytes Jumbo Frame
- Supports ACL, TACACS+ and 802.1x User Authentication for security
- Supports DBU-01 backup unit device to quickly backup/restore configuration
- Web-based ,Telnet, Console (CLI), and Windows utility (Open-Vision) configuration

### IGPS-9084GP-60W

12 Ports | DIN rail | Full Gigabit | 60W PoE

- 8 port Ultra P.S.E. fully compliant with IEEE802.3at standard, provide up to 60 Watts per port
- Support PoE on/off scheduled configuration
- Support PoE alive check and auto reboot fuction
- Support IEEE 1588v2 clock synchronization
- Support IPV6 new internet protocol version
- Support Modbus TCP protocol
- Support IEEE 802.3az Energy-Efficient Ethernet technology

### IGS-9084GP-LA

12 Ports | DIN rail | Full Gigabit

- Support 8x10/100/1000Base-T(X) ports and 4x100/1000Base-X, SFP socket, Generic version
- Support Modbus TCP protocol
- Support IEEE 802.3az Energy-Efficient Ethernet technology
- Provided HTTPS/SSH protocol to enhance network security
- Support SMTP client and NTP server protocol
- Support IP-based bandwidth management
- Support application-based QoS management
- Support Device Binding security function

### IGS-1082GP

10 Ports | DIN rail | Full Gigabit

- Support 8x10/100/1000Base-T(X) and 2x100/1000Base-X, SFP socket
- Support auto-negotiation and auto-MDI/MDI-X
- Support store and forward transmission
- Support up to 9.6K Bytes Jumbo Frame
- Support up to 4Mbit Packet buffer
- Support wide range power input 12~48VDC
- Rigid IP-30 housing design

### IGPS-1082GP-24V

10 Ports | DIN rail | Full Gigabit

- Support 8 ports IEEE 802.3at compliant PoE and total power budget is 120W with maximum 30W per port of 24V model
- Total power budget is 180Watts with maximum 30Watts per port of IGPS-1082GP model
- Support up to 9.6K Bytes Jumbo Frame
- Support up to 4Mbit Packet buffer
- Support auto-negotiation and auto-MDI/MDI-X
- Support store and forward transmission
- Support flow control

## Industrial EN50155 Ethernet Switch

### TGPS-9164GT-M12X-BP2 -24V

20 Ports | Wall mount | 30W PoE | Full Gigabit | 2 bypass

- Leading EN50155-compliant Ethernet switch for rolling stock application
- Support O-Ring (recovery time < 30ms over 250 units of connection) and MSTP(RSTP/STP compatible) for Ethernet Redundancy
- 16 port P.S.E. fully compliant with IEEE802.3at standard, provide up to 30 Watts per port,95Watts total power budget
- Support PoE scheduled configuration and PoE auto-ping check function
- Supports 24 (16.8~30) VDC power inputs
- Provides galvanic isolation protection on power input

### TGPS-9164GT-M12X-BP2 -MV

20 Ports | Wall mount | 30W PoE | Full Gigabit | 2 Bypass

- Leading EN50155-compliant Ethernet switch for rolling stock application
- Support O-Ring (recovery time < 30ms over 250 units of connection) and MSTP(RSTP/STP compatible) for Ethernet Redundancy
- 16 port P.S.E. fully compliant with IEEE802.3at standard, provide up to 30 Watts per port,95Watts total power budget
- Provides galvanic isolation protection on power input
- Supports 72/110 (50.4~137.5) VDC power input

### TGXPS-1080-M12-BP2-MV

8 Ports | Wall mount | 30W PoE | Full Gigabit | 2 bypass

- Provides 8x10/100/1000Base-T(X) PoE (P.S.E.) ports
- Supports 500Mbps capability with 4-wire Ethernet cable
- Supports 4xIEEE 802.3at compliant PoE with maximum 30Watts per port
- Provides galvanic isolation protection on power input
- Built-in 2 sets of bypass ports
- Supports auto-negotiation and auto-MDI/MDI-X
- Supports 72/110 (50.4~137.5) VDC wide range power input

### TXPS-141XT-M12-MV

5 Ports | Wall mount | 30W PoE

- Provides 5x10/100Base-T(X) copper ports
- Supports 500Mbps capability with 4-wire Ethernet cable
- Supports 4xIEEE 802.3at compliant PoE with maximum 30Watts per port
- Provides galvanic isolation protection on power input
- Supports auto-negotiation and auto-MDI/MDI-X
- Supports 72/110 (50.4~137.5) VDC wide range power input

### TPS-3162GT-M12X-BP1 -MV

18 Ports | Wall mount | 30W PoE | 1 bypass

- Provides 16x10/100Base-T(X) P.S.E. w/ 802.3at PoE port
- Supports O-Ring/O-Chain/MSTP/RSTP/STP protocols for Ethernet redundancy
- Provides galvanic isolation protection on power input
- Built-in 1 set of bypass port
- Supports PTP Client (Precision Time Protocol) clock synchronization
- Supports 72/110 (50.4~137.5) VDC wide range power input

### TRGPS-9084TG-M12X-BP2-MV

12 Ports | Rack mount | 30W PoE | 10 Gigabit | 2 bypass

- Leading EN50155-compliant Ethernet switch for rolling stock application
- Provide 8x10/100/1000Base-T(X) P.S.E. X-coded M12 connector
- Provide 4x10GBase-T X-coded M12 connector
- Built-in 2 sets of bypass ports
- Supports IEEE 802.3at compliant PoE with maximum 30Watts per port
- Provides galvanic isolation protection on power input
- 19" rack-mounting installation
- Supports 72/110 (50.4~137.5) VDC power input

## EN50155 IP67 Ethernet Switch

### TGPS-W9442GF-MM-M12X-QS-MV

10 Ports | Wall mount | Full Gigabit | 30W PoE | 67 IP

- Leading EN50155-compliant Ethernet Switch for rolling stock application
- Fully compliant with IEEE 802.3at
- Provides galvanic isolation protection on power input
- Support 2 Gigabit fiber ports with embedded Q-ODC interface
- IP-67 Water Proof
- Supports 72/110 (50.4~137.5) VDC wide range power input

## EN50155 Modular Ethernet Switch

### IGS-9122GPM

26 Ports | Full Gigabit | DIN rail | Wall mount

- Leading EN50155-compliant Ethernet switch for rolling stock application.
- Din-Rail, Modular designed and Hot-swappable make network planning easy.
- Support IEEE 802.3az Energy-Efficient Ethernet technology.
- Support DBU-01 backup unit device to quickly backup/restore configuration.
- Support O-Ring, O-Chain and MSTP(RSTP/STP compatible) for Ethernet Redundancy.

## Industrial EN50155 Cellular VPN Router Series

### RGAR-2065-D4G6S-M12X

5 Ports | Wifi a/b/g/n | Dual LTE | GPS | Dual 4G | Full Gigabit

- Leading EN50155-compliant wireless access point for rolling stock application
- High Speed Air Connectivity: WLAN interface support up to 300Mbps link speed
- Highly Security Capability: WEP/WPA/WPA-PSK(TKIP,AES)/ WPA2/WPA2-PSK(TKIP,AES)/ 802.1X Authentication supported
- 4 ports 10/100/1000Base-T(X) in switch mode
- 4G LTE modem included

### TGAR-2062+-4GS-M12

2 Ports | Wall mount | Wifi a/b/g/n | Dual 4G | GPS | Dual LTE | Full Gigabit | PoE 802.3af

- Leading EN50155-compliant wireless access point for rolling stock application
- High Speed Air Connectivity: WLAN interface support up to 300Mbps link speed
- Highly Security Capability: WEP/WPA/WPA-PSK(TKIP,AES)/ WPA2/WPA2-PSK(TKIP,AES)/802.1X Authentication supported
- Secured Management by HTTPs
- Supports dual-4G LTE dial up for network backup and load balance

## Industrial EN50155 Wireless Access Point

### TGAP-6620-M12

2 Ports | Wall mount | Dual Raf | Wifi 802.11 | Full Gigabit

- High Speed Air Connectivity: WLAN interface support up to 300 Mbps link speed
- Highly Security Capability: WEP/WPA/WPA-PSK(TKIP,AES)/WPA2/WPA2-PSK(TKIP,AES)/802.1X Authentication supported
- Dual Gigabit Ethernet ports support Ethernet redundant mode (Recovery time < 10ms) and switch mode in M12 connector
- Supports X-Roaming < 60 ms

### TGAP-620+-M12

2 Ports | Wall mount | Wifi a/b/g/n | Full Gigabit

- High Speed Air Connectivity: WLAN interface support up to 300 Mbps link speed
- Highly Security Capability: WEP/WPA/WPA-PSK(TKIP,AES)/WPA2/WPA2-PSK(TKIP,AES)/802.1X Authentication supported
- Dual Gigabit Ethernet ports support Ethernet redundant mode (Recovery time < 10ms) and switch mode in M12 connector
- Supports X-Roaming < 60ms

## EN50155 IP67 Wireless Access Point & Cellular VPN Router

### TGAR-W1061+-4G-M12

Wall mount | IP67 waterproof | 4G LTE | PoE 802.3af | Wifi a/b/g/n

- High Speed Air Connectivity: WLAN interface supports up to 300Mbps link speed
- 4G LTE Modem included
- Rugged IP67-rated housing
- Highly Security Capability: WEP/WPA/WPA-PSK(TKIP,AES)/WPA2/WPA2-PSK(TKIP ,AES)/802.1X Authentication supported
- Secured Management by HTTPs

### TGAP-W6610+ Series

Wall mount | IP67 waterproof | Dual RF | PoE 802.3af

- High Speed Air Connectivity: RF in IEEE 802.11 a/b/g/n WLAN interface support up to 300Mbps link speed
- Dual RF for redundant wireless communication
- Highly Security Capability: WEP/WPA/WPA-PSK(TKIP,AES)/WPA2/WPA2-PSK(TKIP ,AES)/802.1X Authentication supported
- Supports Long Distance Air Connectivity

## EN50155 Injector / Splitter

### TINJ-101GT-M12 Series

1 Ports | Wall mount | 30W PoE

- PoE+ Injector for 1x10/100/1000Base-T(X)
- Fully compliant with IEEE802.3at/af standard
- Auto protection for over voltage power Input and over current output
- Supports power output up to 30Watts
- Supports wide power input range from 12 ~ 57VDC
- Ultra-rugged enclosure M12 connector for toughest industrial usages

### TSPL-101GT-M12 Series

1 Ports | Wall mount

- Leading EN50155-compliant Ethernet switch for rolling stock application
- Fully compliant with IEEE802.3at standard
- Supports 10/100/1000Base-T(X) for PoE In and Data Out
- Power Short Circuit Protection for Power Output
- Auto protection for Over Voltage Power Input
- Supports Power Outputs up to 20Watts Max

## Railway Network Application

| | |
|---|---|
| On-Board | • Passenger Information System<br>• Passenger Entertainment System |
| Trackside | • Video Surveillance<br>• VoIP System<br>• Wireless Connection |
| Train-to-Ground | • Train Status Monitoring<br>• Signaling System |

EN50121 EN50155 Transporter Series

## Industrial Grade Certifications

IRIS Certification | EN50121 | EN50155 | Transporter Series

### 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 attests 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 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.

### EN 45545

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.