

# Train & Subway

Wireless communication solutions  
for connected mobility (train-to-track,  
car-to-car & onboard applications)



**SARTELCO® SISTEMI SRL**

Via Torri Bianche, 1  
20871 Vimercate (MB)

Tel. +39- 039- 62905.1 Fax. +39- 039- 62905.99  
e-mail [sistemi@sartelco.it](mailto:sistemi@sartelco.it) Web [www.sartelco.it](http://www.sartelco.it)

**ACKSYS**  
COMMUNICATIONS & SYSTEMS

# Train & Subway

## TRAIN-TO-TRACKSIDE COMMUNICATIONS

One of the major concerns of rail operators is to establish a high-speed, reliable and continuous communication between a train in motion and the trackside for a smooth CBTC operation and also to collect data from CCTV, preventive maintenance, VoIP, PIS, etc. and retrieve real-time information of these data streams.

> THESE APPLICATIONS REQUIRE HIGHLY-AVAILABLE NETWORKS.

ACKSYS' latest products combining WiFi 802.11ac and cellular connectivity enable a truly uninterrupted communication to be established with a seamless data flow between the on-board equipment and the trackside thanks to :

- a <30ms roaming between APs allowing error-free communications
- a redundant train-to-ground wireless link allowing a continuous communication even in case of failure of one trackside AP or one onboard client
- up to 500 Mbps high-speed data throughput at 350 km/h



- Up to 500 Mbps at 350 km/h
- Secure backup connection for maintenance applications

## Application highlights

### > MULTIPLE REDUNDANT MECHANISMS

- Redundant train-to-ground communication, automatic assignment of front or rear radio (VRRP)
- Onboard : dual radio APs / Trackside : triple radio APs
- Hardware redundancy (WiFi, Ethernet, power supply)

### > 500 MBPS DATA THROUGHPUT AT 350 KM/H

- Connect before break technology
- Packet error rate (PER) < 0.1%

### > ROAMING LATENCY < 30 ms

- Dualband, limitless channels
- Highly versatile roaming algorithm able to handle two-way traffic of a train
- IEEE802.11r fast transition protocol
- WiFi pre-authentication, OKC...

### > DIRECT CONNECTION TO TRAIN POWER SUPPLY

- 24-110 VDC insulated dual input power supply

### > NETWORK EFFICIENCY AND SAFETY

- Supports VLANs and tunnels
- Security : radius authentication

### > EASY MAINTENANCE

- Configuration stored on a removable key

### > RAILWAY HARDENED

- IP66
- Radio : WiFi : EN 300 328 (2.4 GHz), EN 301 893 (5 GHz, DFS) / LTE : EN 301 908 [-1, -2, -13], EN 301 511, EN 303 413
- EMC : WiFi : EN 301 489 [-1], [-17] / LTE : EN 301 489 [-19], [-52] / Railway : EN 50155, EN 50121-3.2
- Safety : EN45545-2 (HL3), NF F16-101 (M1F1) (Fire and Smoke), EN60950-1, EN62311
- Environmental : EN61373 (shock & vibration), EN60068 (climatic)

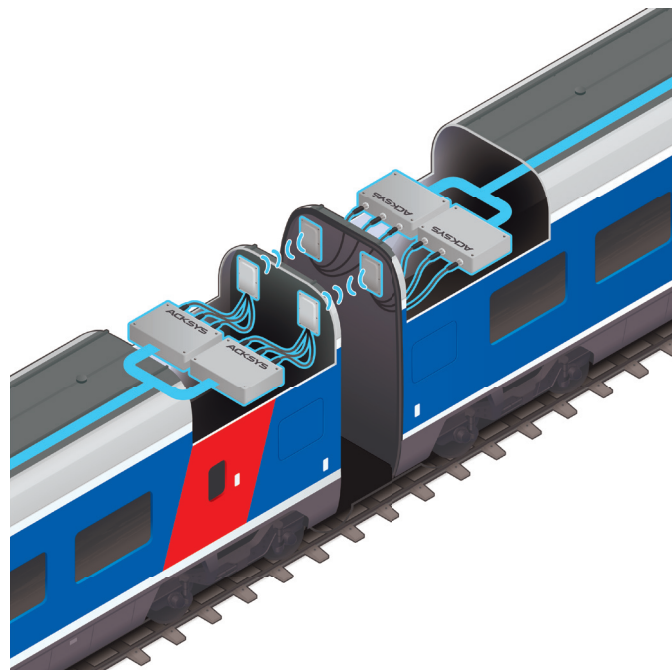
# CAR-TO-CAR COUPLING SYSTEM

Since network wiring between carriages may be difficult or often impossible, particularly in case of refurbishment operations because of aging or poor quality connectors, WiFi has naturally established itself as the most efficient solution by allowing redundancy, reliability and high-speed networking.

ACKSYS' SRCC solution relies on wireless couplers that only need to be configured once and thus :

- supports any train composition change
- provides a redundant and reliable onboard network

SRCC and to train-to-trackside communication combined offer a complete network solution based on wireless to fulfill any application requirements : CBTC, CCTV, PIS, passengers WiFi access...



## Application highlights

- > **SMART REDUNDANT CARRIAGE COUPLING (SRCC\*)**
  - Redundant onboard network with 2 WiFi couplers at both ends of each carriage
  - Self-forming network : automatic carriage association in any order
  - Smart pairing system preventing interconnection with neighboring train networks
- > **HIGH THROUGHPUT COUPLING 802.11ac (900 Mbps)**
  - To support heavy data transfers (CCTV, infotainment ...)
- > **DIRECT CONNECTION TO TRAIN POWER SUPPLY**
  - 24-110 VDC insulated dual input power supply, PoE+
- > **DUAL RADIO DEVICES**
  - One RF for carriage coupling and the other one for in-car WiFi coverage
- > **RAILWAY HARDENED**
  - IP66
  - Radio : WiFi : EN 300 328 (2.4 GHz), EN 301 893 (5 GHz, DFS) / LTE : EN 301 908 [-1, -2, -13], EN 301 511, EN 303 413
  - EMC : WiFi : EN 301 489 [-1], [-17] / LTE : EN 301 489 [-19], [-52] / Railway : EN 50155, EN 50121-3.2
  - Safety : EN45545-2 (HL3), NF F16-101 (M1F1) (Fire and Smoke), EN60950-1, EN62311
  - Environmental : EN61373 (shock & vibration), EN60068 (climatic)

\* SRCC is also available in non-redundant version with only 2 products by car.

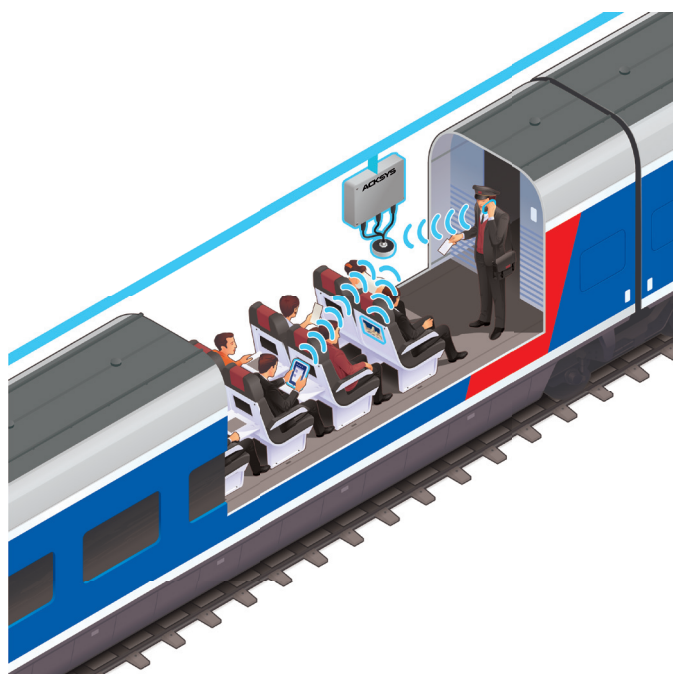
## IN-CAR RADIO COVERAGE

Nowadays, setting up a highly-available wireless network in a train is an absolute requirement for operations but also for passengers\*. In this perspective, ACKSYS offers WiFi devices allowing a seamless in-car coverage through an easy deployment.

The complete solution enable the management of multiple networks (physically separated) dedicated to passenger WiFi, train announcements, PIS, CCTV, VoIP, infotainment...

Thanks to a multi-core CPU architecture, RailBox is able to support simultaneously two 802.11ac streams, allowing achieving higher speeds while avoiding potential interference with other networks and increasing the number of users connected and the connection speed.

The multi-user sharing features integrated into the 802.11ac combined to a standardized beamforming technology allow better signals concentration and direction over to the users for an enhanced WiFi experience.



## Application highlights

### > SEAMLESS & SECURE CAR COVERAGE

- Passengers network separated from service network (VLAN, QoS/WMM, tunnel)
- Dual WiFi for simultaneous 2.4/5 GHz operation
- Maximum 125 clients per radio. Number of clients recommended for an optimal WiFi experience: 60 per radio
- High-speed 802.11ac (backward compatible 802.11a/b/g/n)
- WPA/WPA2, 802.11i, 802.1x (radius authentication)

### > SEAMLESS DEPLOYMENT

- Dual radio architecture allows using the same product for in-car AP and carriage coupler (SRCC)
- Bypass relay option for "Daisy Chain" Ethernet topologies

### > DIRECT CONNECTION TO TRAIN POWER SUPPLY

- 24-110 VDC insulated dual input power supply, PoE+

### > RAILWAY HARDENED

- IP66
- Radio : WiFi : EN 300 328 (2.4 GHz), EN 301 893 (5 GHz, DFS) / LTE : EN 301 908 [-1, -2, -13], EN 301 511, EN 303 413
- EMC : WiFi : EN 301 489 [-1], [-17] / LTE : EN 301 489 [-19], [-52] / Railway : EN 50155, EN 50121-3.2
- Safety : EN45545-2 (HL3), NF F16-101 (M1F1) (Fire and Smoke), EN60950-1, EN62311
- Environmental : EN61373 (shock & vibration), EN60068 (climatic)

\* ACKSYS relies on its partners for multi-cellular routers (passengers WiFi).

# Railway WiFi access points & cellular routers



**RailBox**



**RuggedAir**



**RailTrack**

	<b>RailBox</b>	<b>RuggedAir</b>	<b>RailTrack</b>
<b>Function</b>	Cellular router or dual WiFi access point	WiFi access point, client, repeater	WiFi access point & backbone repeater
<b>Recommended for</b>	ONBOARD	ONBOARD	TRACKSIDE & TUNNEL INFRASTRUCTURES
<b>WiFi interface</b>	WiFi 1 : 802.11n or ac WiFi 2* : 802.11n or ac 2.4 / 5 GHz	802.11ac 2.4 / 5 GHz	WiFi 1 : 802.11n or ac WiFi 2 : 802.11n or ac WiFi 3 : 802.11n or ac 2.4 / 5 GHz
<b>Cellular interface</b>	2G / 3G / 4G LTE* Dual SIM Multi-constellation GNSS	-	-
<b>Maximum number of clients simultaneously connected in AP mode</b>	125 per radio (number of clients recommended for an optimal WiFi experience: 60 per radio)	125 per radio (number of clients recommended for an optimal WiFi experience: 40 per radio)	N/A
<b>TECHNICAL CHARACTERISTICS</b>			
<b>Ethernet interface</b>	2 x 10/100/1000 M12	2 x 10/100/1000 M12	2 x 10/100/1000 (M12) 2 x fiber (SFP cage) PoE+ PSE injector
<b>I/O</b>	1 isolated input 1 isolated output	1 isolated input 1 isolated output	1 isolated input 1 isolated output
<b>Dimensions (mm)</b>	80 x 175 x 57	80 x 175 x 57	305 x 200 x 75
<b>Power supply</b>	Dual input - Isolated 24 to 110 VDC - PoE +	Dual input - Isolated 9 to 48 VDC - PoE	Isolated 110 to 230 VAC (50 / 60 Hz)
<b>Environment</b> Operating temperature IP rating	-25°C to +70°C Or -40°C to +75°C IP66	-40°C to +75°C IP66	-25°C to +70°C Or -40°C to +75°C IP66
<b>FUNCTIONALITIES</b>			
<b>Roaming</b>	< 30 ms	< 30 ms	N/A
<b>Mesh (802.11s)</b>	✓	✓	✓
<b>Security</b>	Firewall, DoS, https, MAC filtering, WPA/WPA2-Personal & Enterprise (IEEE 802.1X/RADIUS), WEP, tunnels L2 (GRE), VPN (OpenVPN), SNMP V3		
<b>Ethernet networking</b>	Frames filtering, bridging, repeater, STP/RSTP, VLAN, DHCP (server & client), DNS relay		
<b>Ethernet routing</b>	Multicast (PIM), IP redundancy (VRRP), static routes, NAT router, router		
<b>Carriage coupling system SRCC</b>	✓	✓	N/A
<b>Administration</b>	http, https, SNMP agent (V1, V2C, V3), WaveManager administration software		
<b>Bypass relay option</b> (Daisy Chain Ethernet topologies)	✓	-	✓
<b>C-Key**</b>	✓	-	✓

\* Optional 2nd radio interface (WiFi or cellular) \*\* Hardened memory key (configuration backup)

# Why choose ACKSYS ?

## > RELIABILITY AND ROBUSTNESS

ACKSYS' products are designed to be used in harsh environment, this is why their manufacturing components are carefully selected, controlled and submitted to endurance tests. They come with a 5-year or lifetime warranty.

## > LONG LASTING PRODUCTS

In order to provide long lasting solutions to its customers, ACKSYS works closely with its suppliers to foresee any eventual obsolete products and thus back-up its product line to avoid any stock rupture. ACKSYS also pay attention to develop products compatible with existing solutions.

## > RELEVANT SOLUTIONS

ACKSYS develops tailored solutions designed to fit its customers' specific business needs or unique application environment and is also able to adapt its products upon request. All ACKSYS' products are compliant with the standards in the various targeted markets.

## > CUSTOMER SERVICE COMMITMENT

ACKSYS has developed a solid pre-sales and after-sales process to ensure that customers receive the highest level of support at every stage of their projects. ACKSYS commits to provide state-of-the-art technology, products and training to keep its customers, distributors and VARs in the forefront of the communication age.

**ACKSYS**  
COMMUNICATIONS & SYSTEMS

Since 1984, ACKSYS Communications & Systems has acquired a strong know-how in designing and manufacturing industrial data communication solutions (WLAN / LAN / serial).

Its expertise and high quality standards allows it to meet the most severe requirements in transportation (rail & road), industrial (M2M IIoT, automation), military (marine, land, air), aeronautics, mining (underground and above ground), oil & gas and environment (renewable energy, water, waste water).

Its inbuilt engineering, technical and commercial teams are able to meet accurately the expectations of its customers and assist them from the definition of their needs to the deployment. Thanks to a qualified and structured distribution network, ACKSYS is present on the five continents and can therefore meet any industrial application need, any time.

