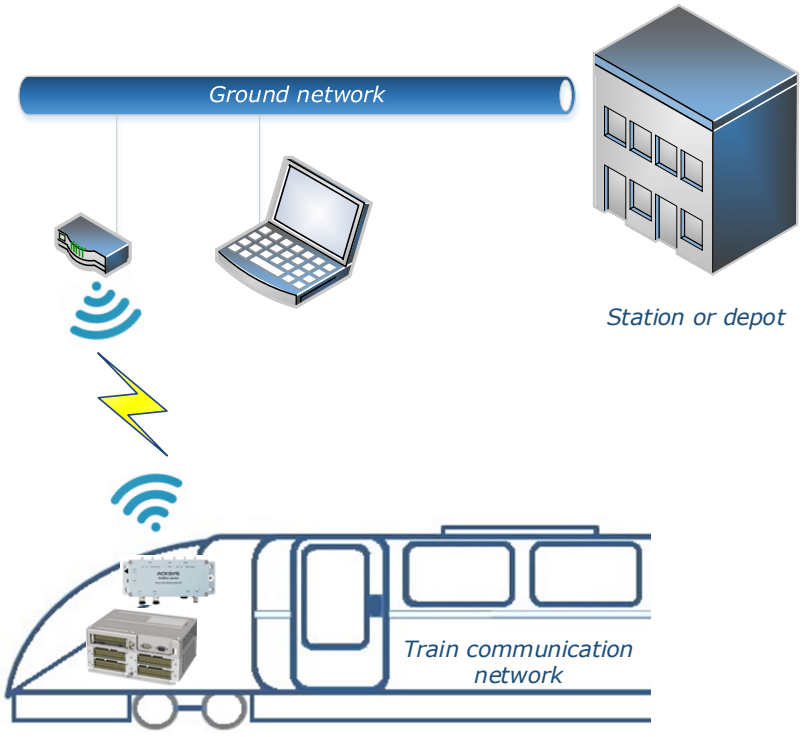
Trackside Communications

EN 50155 / IEC 60571
Train Communication Network



Application note
High-speed data communication at station or depot

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Purpose of document

System integrators and rail vehicle manufacturers need to implement train-to-trackside communications, in order to monitor their train systems. This example of application introduices gateways for railway environnement, in order to set up an effective and reliable wireless communication for high-speed data offload at the station or depot.

Safety instructions

Following symbols are used in this documentation in order to avoid user for potential risks:

 Risk of personal injury or damage to the equipment.

 Risk of an electrical hazard.

Intellectual Property

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1. Introduction

The ACKSYS Railbox gateway is part of the Leroy Automation TCMS offer and allows to establish an on-board to ground wireless communication. The maintenance staff will be able to access securely to the private Train Communication Network (TCN) and establish wireless connections between the on-board railway systems and their own computers, at station or depot locations.

1.1. Glossary and acronyms

TCN	Train Communication Network
TCMS	Train Control Monitoring System
VCU	Vehicle Control Unit
GCG	Ground Communication Gateway
MCG	Mobile Communication Gateway
ETBN	Ethernet Train Backbone Node
NAT	Network Address Translation

1.2. Hardware Description

The RIOM, acting as a VCU or remote IO, the BRIO as a remote IO, the ACKSYS Railbox as Wi-Fi gateway and router, the ANTONICS OmPlecs as a Wi-Fi antenna, the MIOS switch as ETBN router or consist switch are units fully compliant with the EN50155 standard and are designed to be integrated in embedded railway systems and subsystems.

Figure 1 : Leroy Automation RIOM and BRIO

Figure 2 : MIOS MTES6407 Ethernet Train Backbone Node and Consist Switch

Figure 3 : ACKSYS Railbox and ANTONICS OmPlecs TOP 200 Multiband-Train antenna

1.3. System architecture

The system architecture is defined according to IEC61375-2-5 and IEC61375-2-6 standards. The system described here as an example, implements two single consist networks with ETB line redundancy (redundant Ethernet line between each ETBN) and an on-board to ground communication with two ACKSYS Railbox.

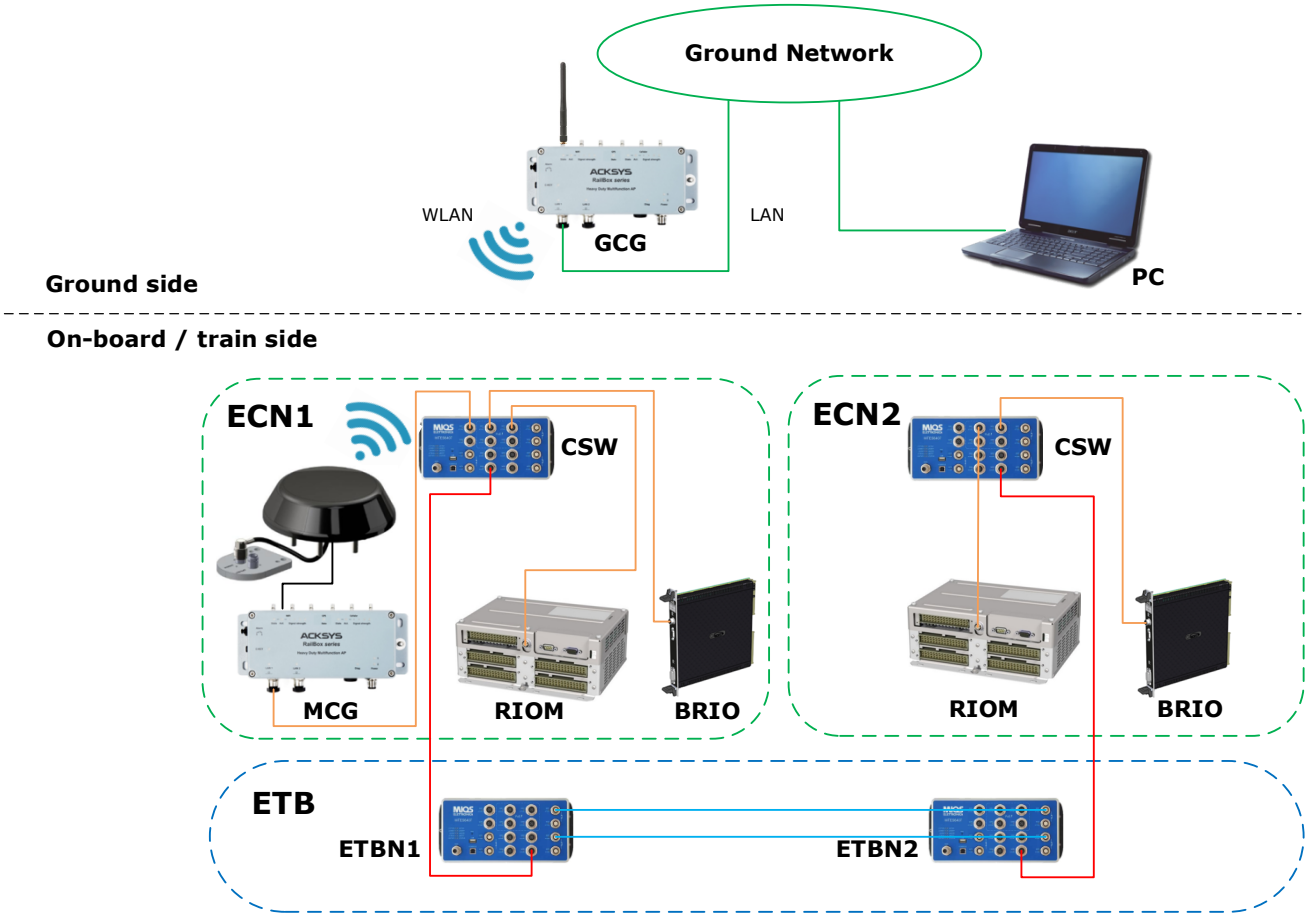

Figure 4 : System architecture with two consists and on-board to ground communication

WLAN and LAN networks include the Wi-Fi communication between both Railbox gateways, and the Ethernet communication between the Ground Communication Gateway (GCG) and the maintenance's PC. In order to establish the wireless connection, the Wi-FI interface is configured as an access point for the GCG and as a client for the MCG.

The NAT mode is activated in the Mobile Communication Gateway (MCG), which means that the PC sees the ECN1 local network as the on-board MCG, although there are in two separate networks.

2. System implementation

2.1. ACKSYS Railbox configuration

The easiest way to configure the Railbox is through its web server, accessible with any web browser. It is also possible to run the Windows application WaveManager (available on the ACKSYS website: www.acksys.com).

For further information about ACKSYS Railbox configuration as GCG and MCG, please refer to the dedicated user's manual « **004_UMA_062** ».

2.2. Wireless security

There are many technologies available to counteract wireless network intrusion. The best strategy may be to combine several security measures.

Possible steps towards securing a wireless network include:

1. All wireless LAN devices need to be secured,
2. All users of the wireless network need to be trained in wireless network security,
3. All wireless networks need to be actively monitored for weaknesses and breaches.

Available wireless security protections are:

- Not broadcasting the SSID (access point only feature),
- WEP encryption,
- Enhanced Open (WPA3-OWE),
- WPA, WPA2, or WPA3 – PSK (Pre-Shared Key),
- WPA, WPA2 or WPA3 – Enterprise, also known as 802.1x or RADIUS,
- OSEN.

For further information please refer to the user guide « **WaveOS-user-guide-DTUS070** » from ACKSYS's documentation.

2.3. System connection test

The IDE used for programming the RIOM is the **Straton** software from Copa-Data, **Straton**'s main features are listed below:

- Process programming in IEC61131-3 languages,
- Network configuration through a Fieldbus editor,
- Real time monitoring tools for the projects debugging.

The configuration of the Railbox are done, now we are going to establish connections between the maintenance's PC and both the RIOM (see **§1.3 System architecture**). In this application the RIOM located in the first consist communicates in TRDP with the second one located in the other consist. The TRDP subscriber program called « VCU_TRDP_SUB » is loaded on the first one and the TRDP publisher « VCU_TRDP_PUB » on the other one.

2.3.1. Communication PC <-> RIOM ECN1

The RIOM is connected to the private network of the MCG, for example the IP address of the RIOM is « 10.0.0.2 » and the port number is 502.

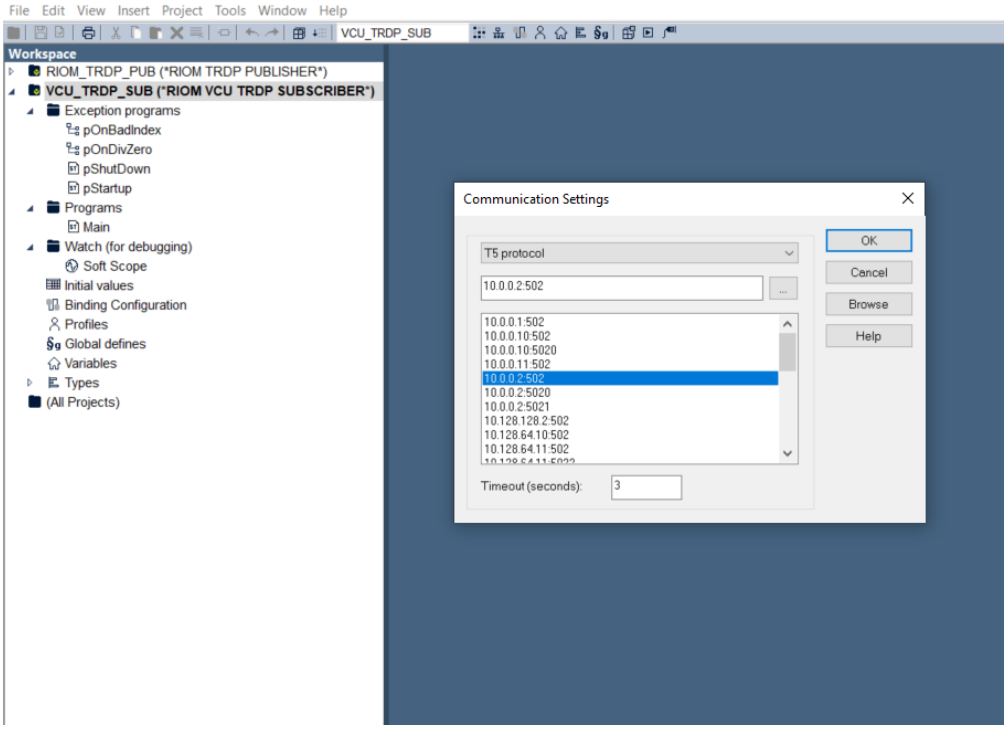

Figure 5 : Straton TRDP subscriber communication settings

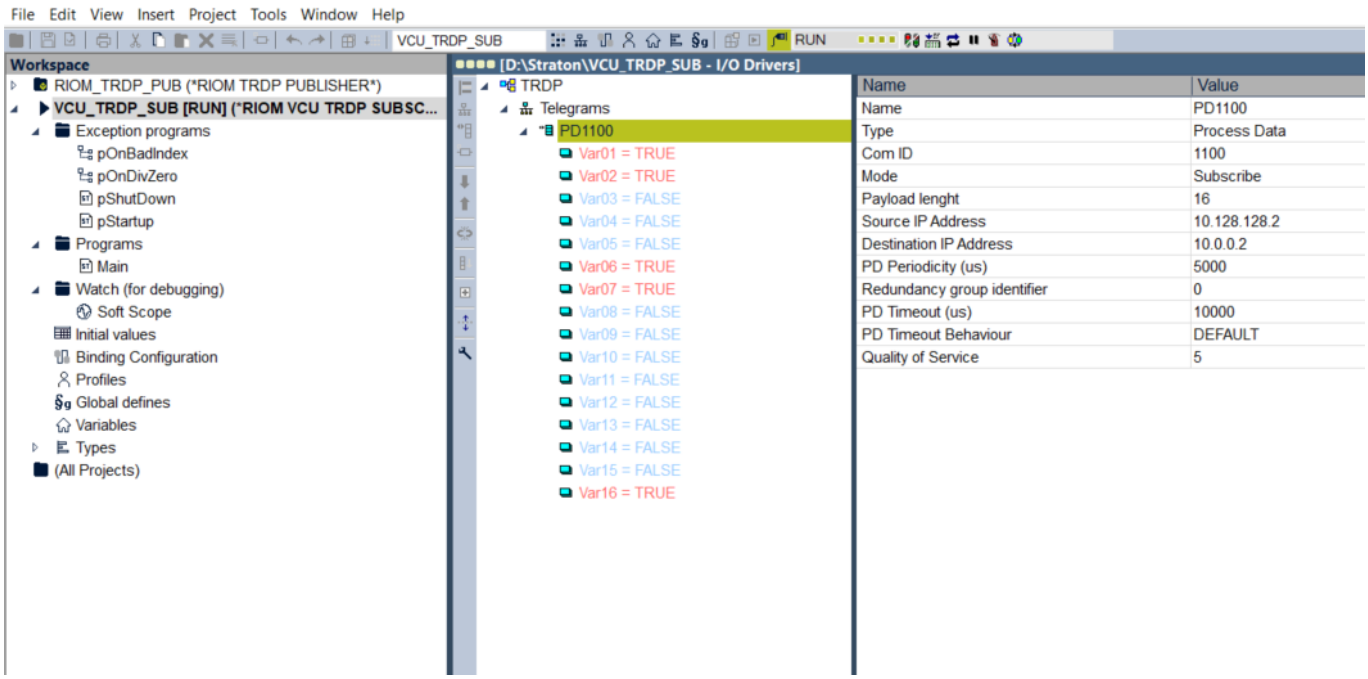

Figure 6 : Straton TRDP subscriber online mode

2.3.2. Communication PC <-> RIOM ECN2

The RIOM is connected on the second local network consist, for example the VLAN IP address of the RIOM is « 10.128.128.2 » and the port number must be 502.

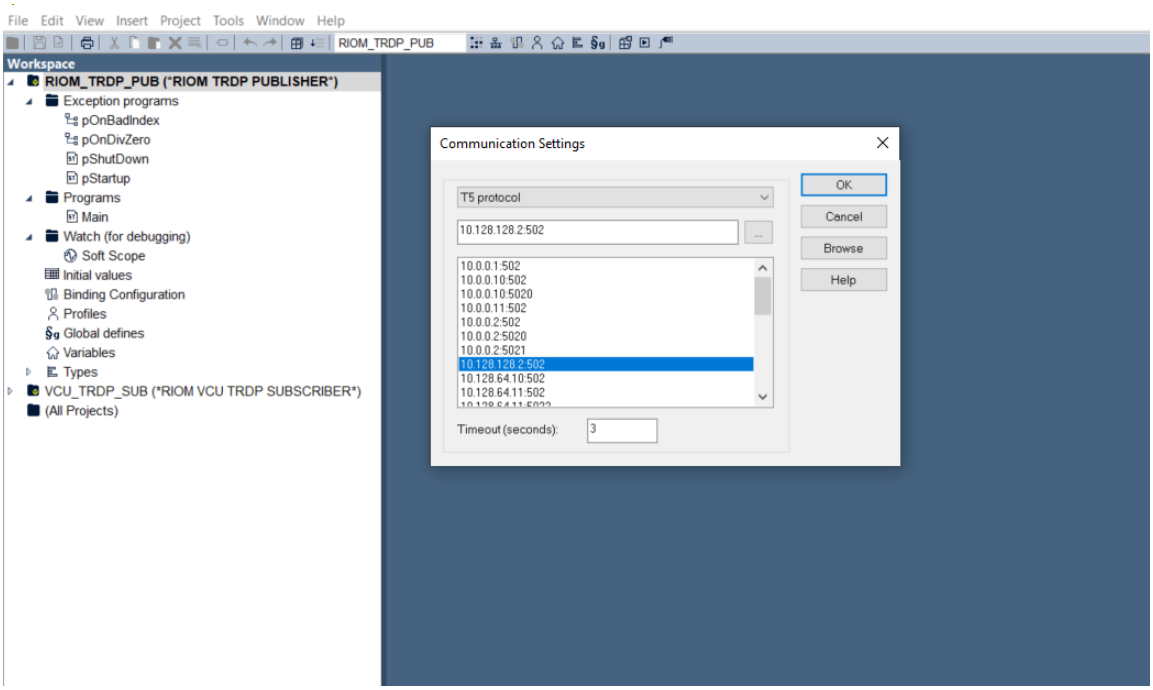

Figure 7 : Straton TRDP publisher communication settings

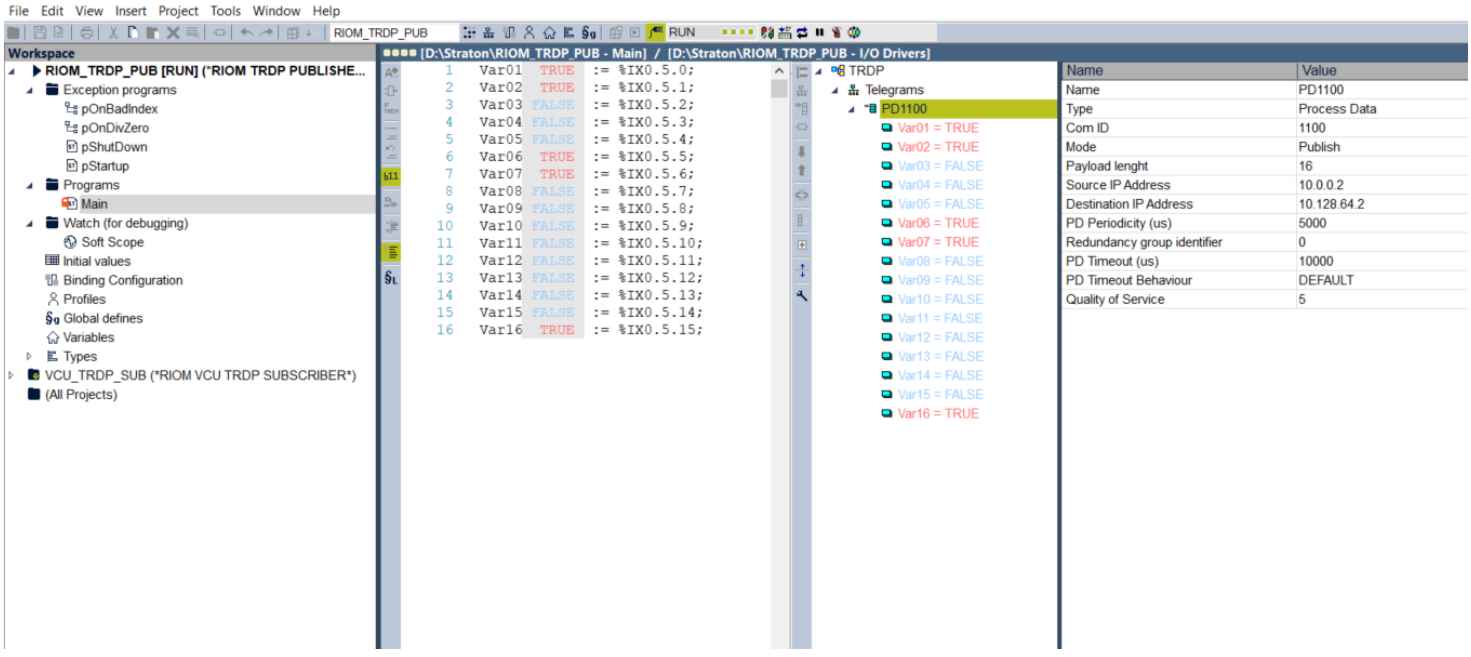

Figure 8 : Straton publisher online mode

This test highlights that Straton software interacts with both RIOM through a secure wireless connection. This application shows that other maintenance operations can be done from the ground into any sub-system in the TCMS through the Railbox.

Appendix: Table of Figures