Train Communication Network (TCN)

Trainnet® TCN is a highly reliable Train Communication Network used all around the world. It complies with the IEC 61375 standard for TCNs.

WHAT IS A TCN?

A Train Communication Network (TCN) is the infrastructure enabling the exchange of information throughout the train. It usually consists of a Vehicle Bus for intra-vehicle communications and a Train Bus for train-wide information exchange. Traditionally the highly standardized WTB (Wire Train Bus) technology is used as a train bus and MVB (Multifunction Vehicle Bus) as a vehicle bus. Other bus technologies such as CAN and Serial Links are also widely used as vehicle buses. MVB or CAN can also be used to develop train-wide communication networks. The Ethernet bus technology (e.g Ethernet Train Backbone, ETB) is a relative newcomer to be used as part of a TCN but has gained popularity in recent years, providing larger bandwidth and more flexible networks.

EFFICIENT INTEGRATION

There is often a lack of interoperability and harmonization between the different train sub-systems. Consequently, it is common to have several sub-systems within the train that use their own separate communication network and technologies. This leads to a complicated architecture and Software as well as excess wiring. The development of a single, fully integrated system greatly simplifies train management system architecture and allows significant savings.

Trainnet® Train Communication Network enables the concurrent use of multiple bus technologies including Ethernet, WTB, MVB, CAN and Serial Links, making it suitable for both new trains and refurbishment projects. By selecting only the bus technologies that you need, you can develop a fully customized system and keep costs down. This versatility allows the deployment of a single integrated communication network across the train, connecting all the train sub-systems together. Multiple independent networks can of course be deployed if that is what your project requires

The Trainnet® TCN provides efficient and reliable communication and data-routing between systems and different networks throughout the train as well as to the wayside. The information conveyed by the Trainnet® TCN can be accessed from any point on the network and even remotely (e.g. from depot). Redundancy can be implemented for additional reliability, with the possibility to use a different technology for the redundant path if required. Finally, the Trainnet® open Software (Linux) enables you to develop your own applications freely and keep control over your project at all times. EKE also has the expertise to make all or a part of the Software for you, or alternatively provide training, tools and guidance to support your own developments. EKE can give you the intellectual property rights (IPR) of all applications Software to make sure you make a safe long-term investment.
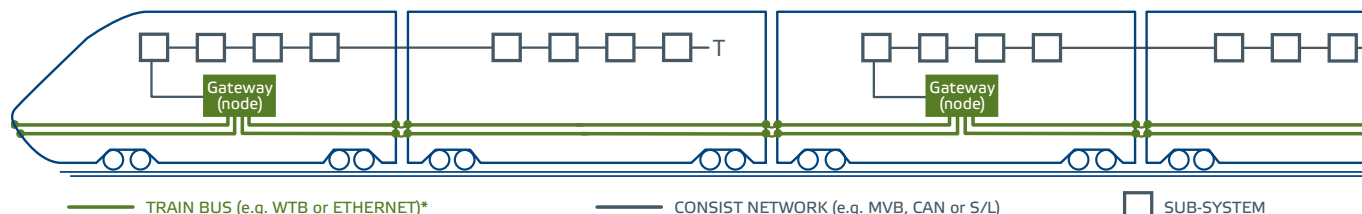
COMPARISON OF TRAIN BUS TECHNOLOGIES:

	WTB (Wire Train Bus)	ETB (Ethernet Train Backbone)
Bandwidth	1 Mbit/s	100 Mbit/s or 1Gbit/s*
Maximum network length	32 nodes and a maximum overall length of 860 meters	63 nodes and a maximum length of 100 m between nodes
Standard	IEC 61375-2-1	IEC 61375-2-5

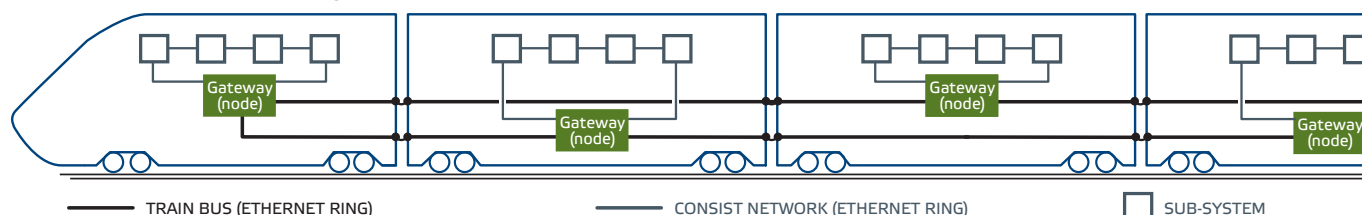*1Gbit/s is not standardized but technically available*

Example 1: Dynamic train configuration, no redundancy

TRAIN BUS (e.g. WTB or ETHERNET)* — CONSIST NETWORK (e.g. MVB, CAN, ETHERNET, S/L etc.) ☐ SUB-SYSTEM
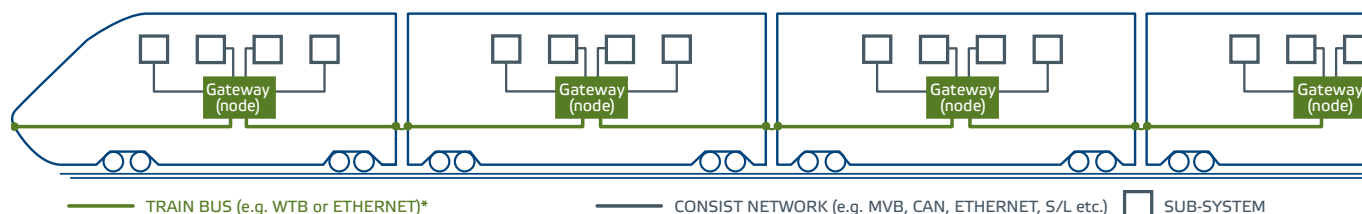
Example 2: Dynamic train configuration, redundant train bus

TRAIN BUS (e.g. WTB or ETHERNET)* — CONSIST NETWORK (e.g. MVB, CAN or S/L) ☐ SUB-SYSTEM

Example 3: Fixed train configuration, fully redundant network

TRAIN BUS (ETHERNET RING) — CONSIST NETWORK (ETHERNET RING) ☐ SUB-SYSTEM

KEY APPLICATIONS

→ Redundancy

Building a redundant Train Communication Network (TCN) enables you to ensure continuous operations in case of a failure somewhere in the network. Where a single point of failure would disable the entire network (see Example 1), a redundant network provides alternative communication paths (see Example 3). Redundancy aims at eliminating single point of failures for flawless operations, even when malfunctions or breakdowns occur in the network. Implementing redundant networks helps preventing train immobilization and ensures availability of train functionalities at all time. Redundancy improves reliability and safety while saving costs in the long run.

→ Automatic Train Inauguration

Automatic Train Inauguration means that train consists can be connected, disconnected or switched without jeopardizing the train operations (Examples 1 and 2). Train configuration changes are automatically detected and the inauguration identify each car and its orientation thus enabling communications across the Train Communication Network. In the case of a fixed train set, the automatic inauguration may also be required in order to connect several trains together.

Trainnet® train bus technologies such as WTB and ETB (Ethernet Train Backbone) enable automatic inauguration. Even thought MVB does not allow automatic inauguration EKE has developed a solution to dynamically configure trains using MVB bus as backbone. When a completely fixed train set is used, a cost-effective train communication network can be built without a dynamic train bus (Example 3).

→ Decentralized Event Management

Trainnet® TCN technology enables you to build a centralized system with full control over the system from anywhere in the network. It is also able to keep key information and instructions spread over the network. Where in some systems, the applications and event logs are kept in a central computer, Trainnet® TCN allows for each car to run its own applications as well as logging its faults and alarms. It means that if one computer fails, the functionality and logs of the other coach computers are preserved.

COMPATIBILITY

For a compact and efficient system, Trainnet® TCN Gateways can be used as part of a broader Trainnet® solution, for instance associated with an Event recorder, a Vehicle Control Unit (VCU) or as part of a complete TCMS. The Trainnet® TCN Gateways can also be used together with your own equipment or with sub-systems from other providers.

QUALITY AND RELIABILITY

The outstanding quality and the unique design of Trainnet® products guarantee unparalleled reliability. Trainnet® products minimize the need for maintenance while maximizing train availability, providing a long-term cost benefit to operators. We provide support for more than 30 years in order to ensure that our customers are satisfied during the entire life-time of their project.

EKE is IRIS certified and Trainnet® complies with the railway industry standards, including the IEC 61375 series, IEC 61131 and EN 50155.

Advantages

Versatility
Cover all your needs with a single system.

Modularity
Only pay for the features you need.

Open software
Keep control over your project at all times.

Long term support
Get support during the lifetime of your project.