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Electronic railway equipment - Train communication network (TCN) - Part 1: General architecture

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FOREWORD

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IEC 61375-1 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2012. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) Extension of train backbone topologies: aggregated and segregated topology;
b) Added independent consist orientation check with segregated train backbone topology;
c) Introduction of wireless technologies: wireless train backbone and wireless consist network;
d) Possibility of virtual networks;
e) Definition of data classes and protocol requirements suitable for the OMTS domain;
f) New clause about cybersecurity in train communication networks.

Draft	Report on voting
9/3252/FDIS	9/3293/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts of IEC 61375 series, under the general title *Electronic railway equipment - Train communication network (TCN)*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,
– withdrawn, or
– revised.

IEC 61375-1 defines the general architecture of the Train Communication Network (TCN) to achieve compatibility between consist networks and train backbones defined by the IEC 61375 series.

The creation of this fourth edition of the standard has been motivated by advances in technology, namely in the fields of Ethernet communication, wireless communication, and cybersecurity, which made it necessary to adapt or to extend some sections of the TCN general architecture. These changes will then further on be reflected in the detailed technical specifications given in subsequent parts of the IEC 61375 series.

The TCN has a hierarchical structure with two levels of networks, a train backbone and a consist network:

a) for interconnecting vehicles in closed or open trains, this document specifies train backbones with different characteristics.
b) for connecting standard on-board equipment, this document specifies consist networks with different characteristics.

The general architecture of the TCN, which is defined in this document, does

c) establish the rules for interconnecting consist networks with train backbones, as
    1) identifying the interfaces;
    2) defining the principles of how train topology changes can be discovered;
    3) defining the basic communication services provided by train backbones to be used by consist networks;
d) establish basic rules for the train backbone and for the consist network;
e) establish rules for commonalities in operation, as:
    1) patterns for the communication between users;
    2) addressing principles;
    3) data classes to be supported;
f) establish rules to support cybersecurity of the TCN.

This part of IEC 61375 applies to the architecture of data communication systems in open trains, i.e. it covers the architecture of a communication system for the data communication between vehicles of the said open trains, the data communication within the vehicles and the data communication from train to the ground.

The applicability of this part of IEC 61375 to the train network technologies allows for interoperability of individual vehicles within open trains in international traffic. The data communication systems inside vehicles are given as recommended solutions to cope with the said TCN. In any case, proof of compatibility between a proposed train backbone and a proposed consist network will have to be brought by the supplier.

This part of IEC 61375 might be additionally applicable to closed trains and multiple unit trains when so agreed between purchaser and supplier.

NOTE 1 For definitions of open trains, multiple unit trains and closed trains, see Clause 3.

NOTE 2 Road vehicles such as buses and trolley buses are not considered in this part of IEC 61375.

2 Normative references

There are no normative references in this document.

[1] IEEE 802.1Q, *Local and metropolitan area networks - Bridges and Bridged Networks*

[2] UIC CODE 556, *Information transmission in the train (train-bus)*

[3] IEC 62580 (all parts), *Electronic railway equipment - On-board multimedia and telematic subsystems for railways*

[4] ISO/IEC 8824-1:2021, *Information technology - Abstract Syntax Notation One (ASN.1): specification of basic notation*

[5] ISO/IEC 19501:2005, *Information technology - Open Distributed Processing - Unified Modeling Language (UML) Version 1.4.2*

[6] IEC 62280, *Railway applications - Communication, signalling and processing systems - Safety related communication in transmission systems*

[7] IEC 62443 (all parts), *Security for industrial automation and control systems*

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