IEC TR 61375-2-7

Edition 1.0 2014-04

TECHNICAL REPORT

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Electronic railway equipment – Train communication network (TCN) – Part 2-7: Wireless Train Backbone (WLTB)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRICE CODE V

ICS 45.060

ISBN 978-2-8322-1518-0

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ELECTRONIC RAILWAY EQUIPMENT – TRAIN COMMUNICATION NETWORK (TCN) –

Part 2-7: Wireless Train Backbone (WLTB)

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The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a technical report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

IEC TR 61375-2-7, which is a technical report, has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
9/1768/DTR	9/1797A/RVC

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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 publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

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INTRODUCTION

IEC TR 61375-2-7 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways, in the frame of the IEC 61375 series.

Considering that:

a) inauguration is not automatic;

b) some parameters are configured manually in the guided traction vehicle;

c) the parameters required in the leading traction vehicle depend on the application;

d) inauguration verification is manual and based on checking pressure in the train pipe;

IEC technical committee 9 decided to consider the result of the preparation work not suitable for being an international standard within the IEC 61375 series, nevertheless decided to publish the result of the work as a technical report which can offer to the reader the status of the technology used for the implementation of a radio based train communication network.

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ELECTRONIC RAILWAY EQUIPMENT – TRAIN COMMUNICATION NETWORK (TCN) –

Part 2-7: Wireless Train Backbone (WLTB)

1 Scope

This part of IEC 61375 describes the protocols stack of a radio based Wireless Train Backbone which is used in distributed power freight trains. This part provides information on the physical layer, the data link layer, the application layer and distributed power application.

The automatic inauguration of the radio based Wireless Train Backbone is not considered in this technical report.

2 Terms, definitions and abbreviations

For the purposes of this document, the following terms, definitions and abbreviations apply.

2.1 Terms and definitions

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application layer
upper layer in the OSI model, interfacing directly to the application

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2.1.2
application process
element within a real open system which performs the information processing for a particular application

2.1.3
broadcast
nearly simultaneous transmission of the same information to several destinations

2.1.4
bus
communication medium which broadcasts the same information to all attached participants at nearly the same time, allowing all devices to obtain the same sight of its state, at least for the purpose of arbitration

2.1.5
communication devices
devices connected to consist network or train backbone with the ability to source and sink data.

2.1.6
composition
number and characteristics of the vehicles forming a train

2.1.7
configuration
definition of the topology of a network, the devices connected to it, their capabilities and the traffic they produce; by extension, the operation of loading the devices with the configuration information before going to regular operation

2.1.8
consist
single vehicle or a group of vehicles which are not separated during normal operation

Note 1 to entry: A consist contains no, one or several consist networks.

2.1.9
consist network
communication network interconnecting communication devices in one consist

2.1.10
function
application process which exchanges messages with another application process

2.1.11
gateway
connection between different communication technologies

2.1.12
inauguration
operation executed in case of composition change, which gives all nodes of the train backbone their train backbone address, their orientation and information about all named nodes on the same backbone

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2.1.13
leading traction vehicle
the traction vehicle at the extremity towards the operation direction

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2.1.14
medium
physical carrier of the signal: electrical wires, optical fibre, wireless, etc.

2.1.15
medium access control
sub-layer of the data link layer, which controls the access to the medium

2.1.16
message
data item transmitted in one or several packets

2.1.17
multi-hop relay communication
communication with each other through the relay function of the other devices for the devices not able to communicate directly

2.1.18
network address
address which identifies a communication device on network layer

2.1.19
network layer
layer in the OSI model responsible for routing between different busses

2.1.20
node
device on the train backbone, which may act as a gateway between train backbone and consist network

2.1.21
operation direction
travelling direction for a train along railway line from one station to another station, normally designated as two directions, i.e. up and down

2.1.22
operator
enterprise or organization which is operating trains

2.1.23
packet
unit of a message (information, acknowledgement or control) transmitted by protocols on network or transport layer

2.1.24
guided traction vehicle
the traction vehicles except the leading traction vehicle of the train

2.1.25
train communication network
data communication network for connecting programmable electronic equipment on-board rail vehicles

2.1.26
transport layer
layer of the OSI model responsible for end-to-end flow control and error recovery

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2.1.27
wireless train backbone
a wireless train communication network for connecting the vehicles of a train

2.1.28
wireless train backbone node
device connected to the wireless train backbone for connecting end devices or consist networks to the wireless train backbone

2.2 Abbreviations

CAN	Control Area Network
CN	Consist Network
ECN	Ethernet Consist Network
ETB	Ethernet Train Backbone
GTV	Guided Traction Vehicle
ISO	International Standardization Organization
LTV	Leading Traction Vehicle
MAC	Medium Access Control
MVB	Multi-function Vehicle Bus
OSI	Open System Interconnect
PD	Process Data
PDU	Protocol Data Unit
TCP/IP	Transport Control Protocol /Internet Protocol
UDP	User Datagram Protocol
VCU	Vehicle Control Unit

VSWR Voltage Standing Wave Ratio
WLTB Wireless Train Backbone
WLTBN Wireless Train Backbone Node
WNG Wireless train backbone Node of Guided traction vehicle
WNL Wireless train backbone Node of Leading traction vehicle
WTB Wire Train Bus

3 Architecture

3.1 Framework of the train communication backbones

The radio based WLTB is one of the several train backbones of the IEC 61375 series. WLTB is used for coupling the traction vehicles of a distributed power freight train. Figure 1 describes the framework of the train communication backbones within the IEC 61375 series.

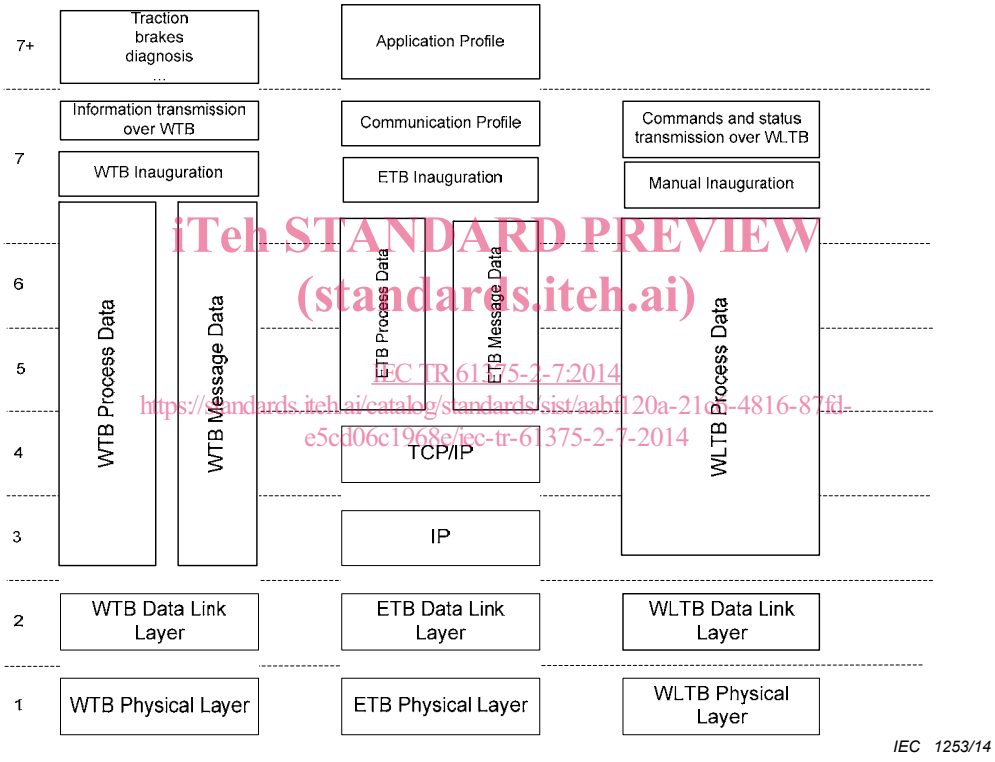

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Figure 1 – Framework of the Train Communication Backbones

The WTB is a widely used train backbone. The communication protocols of the process data, message data and the WTB inauguration are specified by IEC 61375-2-1 and the information transmission over WTB is specified by UIC 556. The applications, in the field of traction, brakes, diagnosis, are specified by a series of the UIC documents, such as UIC 647, UIC 541 and UIC 557, respectively.

The ETB is a wide bandwidth train backbone. The physical layer to the application layer of the ETB, including the data link, IP, TCP, UDP and the ETB inauguration protocols are specified by future IEC 61375-2-5. The communication profile, including the train real-time data protocol, the universal recourse identity addressing and the safety communication are specified in future IEC 61375-2-3. The detailed data for the control and status of a specific device is specified by the application profile in future IEC 61375-2-4.

The following considerations apply: