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Original

Specification "Diagnostic Data Transmission" from railway vehicles

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Summary

The present document specifies a common content and format for "diagnostic data transmission" from railway vehicles. It has been developed by a working group consisting of representatives of SNCF, Trenitalia and DB AG.

Due to a wide range of different ideas and experiences among the railway operators involved, a common denominator was sought which would provide a basis for joint specifications.

Therefore neighbouring areas essentially depending on the operators' individual diagnostic aims, ground IT infrastructures and existing radio infrastructure have intentionally been disregarded, as have areas experiencing rapid technological development, in which standardisation would be unfeasible and of little use. The acceptance, applicability and maintenance of the specifications are to be ensured by focusing on the essentials.

Universal and functional contents which can be used by most operators are described in detail from the users' point of view in the present document. The strong data structure chosen enables coverage of a huge number of user requirements. This has been achieved through high variability in data amount and content, as well as by using an open and standardised data format that is very common for the transmission of information within IT systems. Software developers and users' understanding and use of XML Schema and example files have also been provided with support in the form of additional documents, some already existing, others developed by the working group.

The highest level of consensus was sought in the production of the present specifications, allowing every user comprehensively to meet all its requirements through the use of mandatory and optional parts. Sustainability is achieved thanks to the chosen data structure and its extensibility.

The present specifications do not indicate how data will be generated on the vehicles, transformed into the format specified, transmitted to the ground systems of the operators, and processed and used there.

Basic knowledge of XML is recommended to understand the description of the data format (see references).

1 - Diagnostic Data Transmission

The purpose of Diagnostic Data Transmission is to support train operation and improve the maintenance process.

Diagnostic information present in the onboard diagnostic system is therefore reported via remote data transmission to ground systems and is available for the purpose of assessment and maintenance support.

Many computer systems are used for vehicle [\(see Glossary - page 20\)](#) and function control in modern rail vehicles. Likewise, many diagnostic functions are implemented, such as:

- generation, storage and display of messages in the occurrence of faults, including extensive environmental information,
- manual recording of damage by the train [\(see Glossary - page 20\)](#) crew, e.g. mechanical damage,
- recording of functional events, e.g. driver actions,
- collection of a variety of operating data, e.g. mileage, operating hours, operational cycles,
- supply of additional information, e.g. versions,

The large amount of detailed data generated is not only used on vehicles, but also in operators' ground IT systems to perform many different tasks, such as:

- preparing maintenance work,
- monitoring the reliability of components,
- monitoring in connection with warranty claims,
- monitoring irregularities during service,
- providing statistics on fault [\(see Glossary - page 20\)](#) frequency for the whole fleet,
- assistance software and configuration management of vehicles.

In order for data collected and stored on vehicles to be made available on ground systems as regularly and in the most up-to-date manner as possible, data will be transmitted via radio. Each operator will be able to use the suitable resources for this purpose, according to its requirements and by using the variety of starting data transmission methods on the vehicles. Thanks to regular data transmissions in short intervals to ground systems, a more precise overview of the vehicle status can be represented in those ground systems at any time. With event-dependent data transmission, when for example a serious fault occurs, relevant departments such as hotline services may receive additional information and up-to-date diagnostic details.

The present document specifies diagnostic data to transmit from vehicles to ground IT systems exclusively, in detail and in view of common use. In addition to functional contents, the technical structure and format of the data to transmit have been specified.

2 - General requirements

No.	Requirements	XML label Specification	Comments
1	Diagnostic data transmission content must be transmitted as file or message.		
2	Diagnostic data transmission content must have a unique identifier.		
3	The identifier should include the following information: - type of D-Unit - D-Unit number - date - counter (incremental)		
4	If it is a file, the extension should be .xml.		
5	Data transmission content must be in XML format (see Glossary - page 20).		
6	The content must contain a header part.		
7	The content must contain none, one or more of the following items: - status info, - history, - operating data, - version, - operational information, - manual information, - additional information.		

3 - Data Format

This section specifies the XML data format defining the structure and content of the diagnostic information.

In the following tables:

- The information content is defined in the "Requirements" field.
- The XML representation of this content is defined in the "XML label Specification" field. XML labels (element or attribute name) are marked in bold print. The specification indicates further details relating to the XML label, listed in normal print below the label.
- XML labels starting with a capital letter define XML elements.
- The specification of an element includes the list of its child elements. The "x-y" notation indicates that the child element must occur a minimum of x times and a maximum of y times (e.g. 0-n means that the element may be absent or present in an unlimited number, 0-1 means that the element may be absent or present only once, 1-1 means that the element must be present in any case).
- XML labels without a capital letter at the beginning define XML attributes.
- Attributes always refer to the previous element. For each attribute it is specified if it is mandatory (must be present) or optional (may be empty or unused).
- There are XML examples following and corresponding to each part of the XML specification.

3.1 - XML prologue and root

No.	Requirements	XML label Specification	Comments
1	The XML version should be 1.0	version standard XML attribute	
2	The encoding should be UTF8 or ISO 8859	encoding standard XML attribute	
3	Within the prologue there should be a reference to an XSL stylesheet	xml-stylesheet type href standard XML attribute	
4	XML root	DiagnosticDataTransmission mandatory, contains the following elements: - Header 1-1 - StatusInfo 0-1 - History 0-1 - OperatingData 0-1 - Versions 0-1 - OperationalInfo 0-1 - ManualInfo 0-1 - AdditionalInfo 0-1	

No.	Requirements	XML label Specification	Comments
5	References to XML Schema	xmlns:xsi xsi:noNamespace SchemaLocation standard XML attributes	
6	XML Schema version	schemaVer major and minor part, separated by dot, e.g. 02.23, string, optional	
7	Data transmission content identifier	id string, mandatory	
8	Reference to a request (e.g. from ground systems)	refId string, optional	e.g. file name
<pre><?xml version="1.0" encoding="utf-8"?> <?xml-stylesheet type="text/xsl" href="DiagnosticDataTransmission.xsl"?> <DiagnosticDataTransmission xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation="DiagnosticDataTransmission.xsd" schemaVer="00.02" id="ICE30301080903333.xml" refId="ABCDEF123456789"></pre>			