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Road vehicles — Communication on FlexRay —

Part 1: General information and use case definition

Véhicules routiers — Communication par FlexRay —

Partie 1: Informations générales et définitions du cas d'utilisation

Reference number
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Foreword

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ISO 10681-1 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronic equipment*.

ISO 10681 consists of the following parts, under the general title *Road vehicles — Communication on FlexRay*:

— *Part 1: General information and use case definition*

— *Part 2: Communication layer services*

Introduction

This part of ISO 10681 is based on the Open Systems Interconnection (OSI) Basic Reference Model specified in ISO/IEC 7498 and ISO/IEC 10731, which structures communication systems into seven layers (see example in Table 1). When mapped on this model, ISO 10681 incorporates the network layer (layer 3) and the transport layer (layer 4) services as communication layer services.

The ISO 10681 document set provides an implementer with all documents and references required to support the communication implementation on FlexRay networks.

— ISO 10681-1: *General information and use case definition* (this part), provides an overview of the document set along with the use case definitions and a common set of resources (definitions, references) for use by all subsequent parts.

— ISO 10681-2: *Communication layer services* specifies a communication protocol to meet the requirements of FlexRay-based vehicle network systems as specified in the FlexRay Communications Systems Protocol Specification.

NOTE Additional parts of ISO 10681 will be introduced as necessary.

Table 1 — Example of enhanced diagnostic specifications according to the OSI layers

Applicability	OSI layers	Vehicle manufacturer enhanced diagnostics
Seven layer according to ISO/IEC 7498-1 and ISO/IEC 10731	Application layer	ISO 14229-1
	Presentation layer	N/A
	Session layer	ISO 14229-2
	Transport layer	ISO 10681-2
	Network layer	
	Data link layer	FlexRay Communications Systems Protocol Specification
	Physical layer	FlexRay Communications System Electrical Physical Layer Specification

Road vehicles — Communication on FlexRay —

Part 1: General information and use case definition

1 Scope

This part of ISO 10681 defines common requirements for vehicle systems implemented on a FlexRay communication link, as specified in the FlexRay Communications Systems Protocol Specification.

It also describes general use cases and communication scenarios that are covered by FlexRay transport and network layer. Each use case drives specific communication capabilities and requirements of the vehicle communication interface.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 7498-1, *Information technology — Open Systems Interconnection — Basic Reference Model: The Basic Model*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 7498-1 and the following apply.

3.1
communication layer
CL
layer that includes the network layer (layer 3) and the transport layer (layer 4)

4 Use case definitions and requirements

4.1 Overview

The following subclauses provide an overview of all the kinds of reasonable communication use cases.

4.2 Identified use cases

4.2.1 Use case 1: Multipurpose communication layer

The communication layer shall be able to handle various message transmission types such as Diagnostics, Multi Media or Inter ECU communication. However, usage purposes are not limited to the ones stated above.

a) **Transmit messages with known data length:** Message transmission where the length of the transmitted message is known by the application. This kind of feature applies to most known applications (e.g. ECU programming, diagnostics, etc.).

b) **Transmit messages with unknown but finite data length:** The final message length is unknown at start of message transmission. However, the data shall be finite in order to keep the transport layer implementation manageable. The feature might be used for any data streaming applications.

c) **Additional acknowledgement with retry mechanism:** A message transmission is acknowledged (positive / negative) once it is completed. In addition, a retry mechanism might be supported, where the message transmission is being repeated at the detected first wrong byte position. This feature might be used for, e.g., Inter ECU communication mechanism.

d) **Routing data on the fly:** Gateway mechanism, where the data are already transmitted onto the target subnet, while it is still in the process of being received on the source subnet.

e) **Support of dynamic frame length:** Variable payload length (PDU_Size) in a single FlexRay frame, e.g. for optimized gateway handling in regard of buffer requirements. Possible applications could be “routing data on the fly” or “data streaming”.

4.2.2 Use case 2: Optimize flash programming time

a) **Flexible bandwidth usage:** Achieve optimized message transmission independent of the given network bandwidth assignment.

b) **Support of parallel diagnostic communication:** The communication layer shall be capable to support concurrent ECU programming events.

4.2.3 Use case 3: Optimize gateway implementations

a) **Routing data on the fly:** See d) in use case 1 (4.2.1).

b) **Receive and forward:** Allow to transfer a message from a given network onto FlexRay (and vice versa) without re-mapping payload information of a frame, where only the PCI information needs to be adapted.

c) **Optimize addressing scheme:** – See d) in use case 1 (4.2.1).

4.2.4 Use case 4: Communication layer definition

The communication layer definition shall be independent of static or dynamic segment usage as far as possible.

Bibliography

[1] ISO/IEC 10731, *Information technology — Open Systems Interconnection — Basic Reference Model — Conventions for the definition of OSI services*

[2] ISO 14229-1 [1], *Road vehicles — Unified diagnostic services (UDS) — Part 1: Specification and requirements*

[3] ISO 14229-2[2], *Road vehicles — Unified diagnostic services (UDS) — Part 2: Session layer services*

[4] ISO 14229-4[2], *Road vehicles — Unified diagnostic services (UDS) — Part 4: Unified diagnostic services on FlexRay implementation (UDSonFR)*

[5] *FlexRay Communications System — Protocol Specification*

1) Under preparation. (Revision of ISO 14229-1:2006)

2) Under preparation.

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