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Road vehicles — Media Oriented Systems Transport (MOST) —

Part 4: Transport layer and network layer

Véhicules routiers — Système de transport axé sur les médias —

Partie 4: Couche de transport et couche réseau

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 31, *Data communication*.

A list of all parts in the ISO 21806 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The Media Oriented Systems Transport (MOST) communication technology was initially developed at the end of the 1990s in order to support complex audio applications in cars. The MOST Cooperation was founded in 1998 with the goal to develop and enable the technology for the automotive industry. Today, MOST[1)] enables the transport of high quality of service (QoS) audio and video together with packet data and real-time control to support modern automotive multimedia and similar applications. MOST is a function-oriented communication technology to network a variety of multimedia devices comprising one or more MOST nodes.

Figure 1 shows a MOST network example.

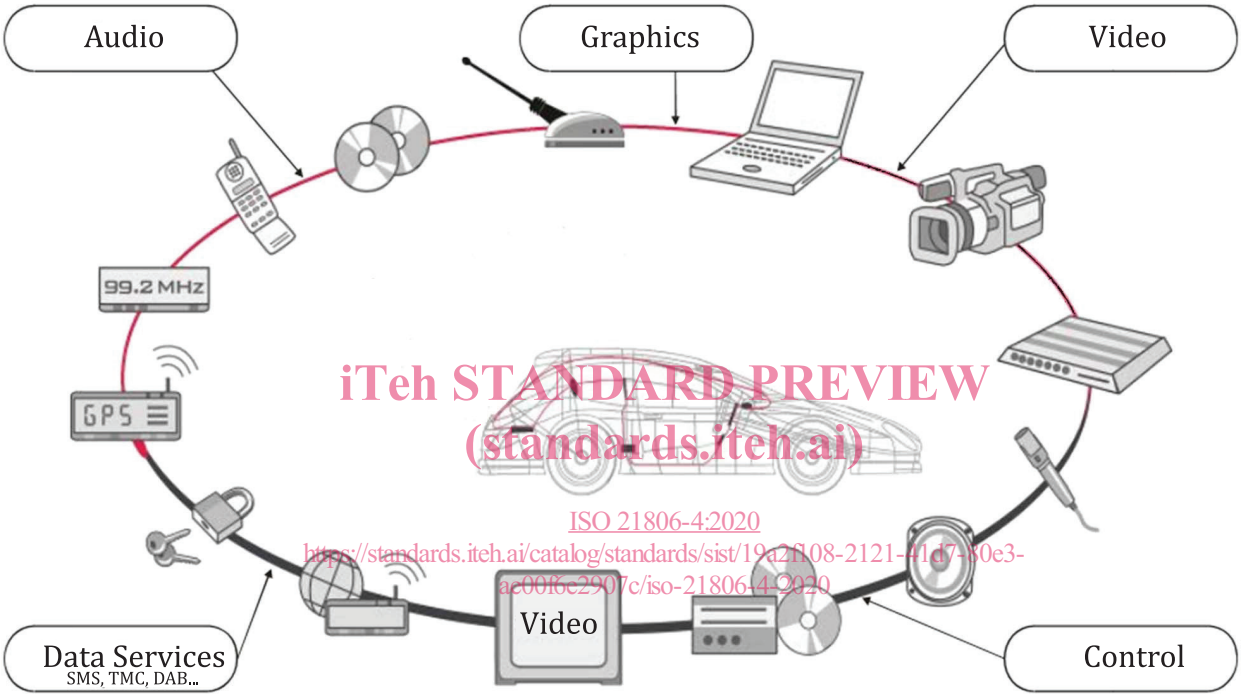

Figure 1 — MOST network example

The MOST communication technology provides:

— synchronous and isochronous streaming,

— small overhead for administrative communication control,

— a functional and hierarchical system model,

— API standardization through a function block (FBlock) framework,

— free partitioning of functionality to real devices,

— service discovery and notification, and

— flexibly scalable automotive-ready Ethernet communication according to ISO/IEC/IEEE 8802-3[6].

MOST is a synchronous time-division-multiplexing (TDM) network that transports different data types on separate channels at low latency. MOST supports different bit rates and physical layers. The network clock is provided with a continuous data signal.

1) MOST® is the registered trademark of Microchip Technology Inc. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO.

Within the synchronous base data signal, the content of multiple streaming connections and control data is transported. For streaming data connections, bandwidth is reserved to avoid interruptions, collisions, or delays in the transport of the data stream.

MOST specifies mechanisms for sending anisochronous, packet-based data in addition to control data and streaming data. The transmission of packet-based data is separated from the transmission of control data and streaming data. None of them interfere with each other.

A MOST network consists of devices that are connected to one common control channel and packet channel.

In summary, MOST is a network that has mechanisms to transport the various signals and data streams that occur in multimedia and infotainment systems.

The ISO standards maintenance portal (https://standards.iso.org/iso/) provides references to MOST specifications implemented in today's road vehicles because easy access via hyperlinks to these specifications is necessary. It references documents that are normative or informative for the MOST versions 4V0, 3V1, 3V0, and 2V5.

The ISO 21806 series has been established in order to specify requirements and recommendations for implementing the MOST communication technology into multimedia devices and to provide conformance test plans for implementing related test tools and test procedures.

To achieve this, the ISO 21806 series is based on the open systems interconnection (OSI) basic reference model in accordance with ISO/IEC 7498-1[1] and ISO/IEC 10731[4], which structures communication systems into seven layers as shown in Figure 2. Stream transmission applications use a direct stream data interface (transparent) to the data link layer.

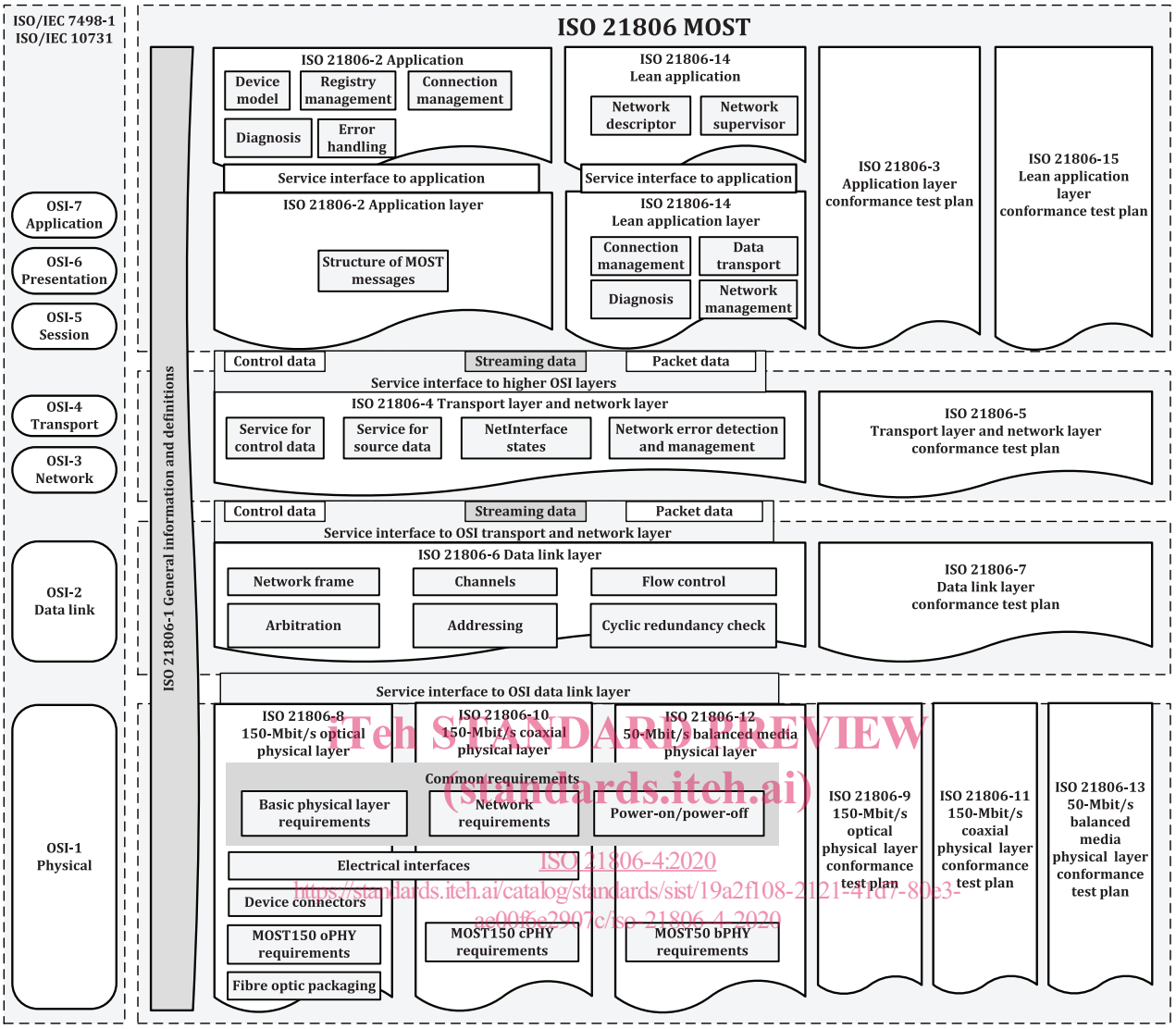

Figure 2 — The ISO 21806 series reference according to the OSI model

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Road vehicles — Media Oriented Systems Transport (MOST) —

Part 4:
Transport layer and network layer

1 Scope

This document specifies technical requirements related to the MOST transport layer and network layer functionality:

— the service interface to application layer;

— the network layer services;

— the data transport mechanism;

— the dynamic behaviour of a node;

— the network error management.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 21806-1, *Road vehicles — Media Oriented Systems Transport (MOST) — Part 1: General information and definitions*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 21806-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
active TimingSlave
TimingSlave that initiates a *network startup* (3.2)

3.2
network startup
network activity that commences so that all nodes in the MOST network change to `s_NetInterface_Normal_Operation`

3.3
network wake-up
process of all nodes in the MOST network exiting `s_NetInterface_Sleep`

3.4
network wake-up event
network activity or electrical wake-up line activity

3.5
passive TimingSlave
node that participates in a *network startup* (3.2), not initiating it

3.6
qualified local wake-up event
local trigger (one that does not affect all devices) that causes exiting `s_NetInterface_Sleep`

3.7
wake-up event
trigger for exiting `s_NetInterface_Sleep`

4 Symbols and abbreviated terms

4.1 Symbols

---	empty cell/undefined
L_{AMSmax}	maximum payload length for AMS
L_{CMmax}	maximum payload length for control data

4.2 Abbreviated terms

A:	action
AMS	application message service
C:	condition
`ev_`	prefix event name
`MsgID`	message identifier
NL	network layer
RBD	ring break diagnosis
`s_`	prefix state name
`SegCnt`	segment counter
`TelID`	telegram identifier
`TelLen`	telegram length
TL	transport layer

5 Conventions

This document is based on OSI service conventions as specified in ISO/IEC 10731[4].

6 Transport layer service interface to upper OSI layers

6.1 Overview of services

Figure 3 shows the transport layer (TL) service interface, which specifies the interface to the upper OSI layers, see ISO 21806-2[1].

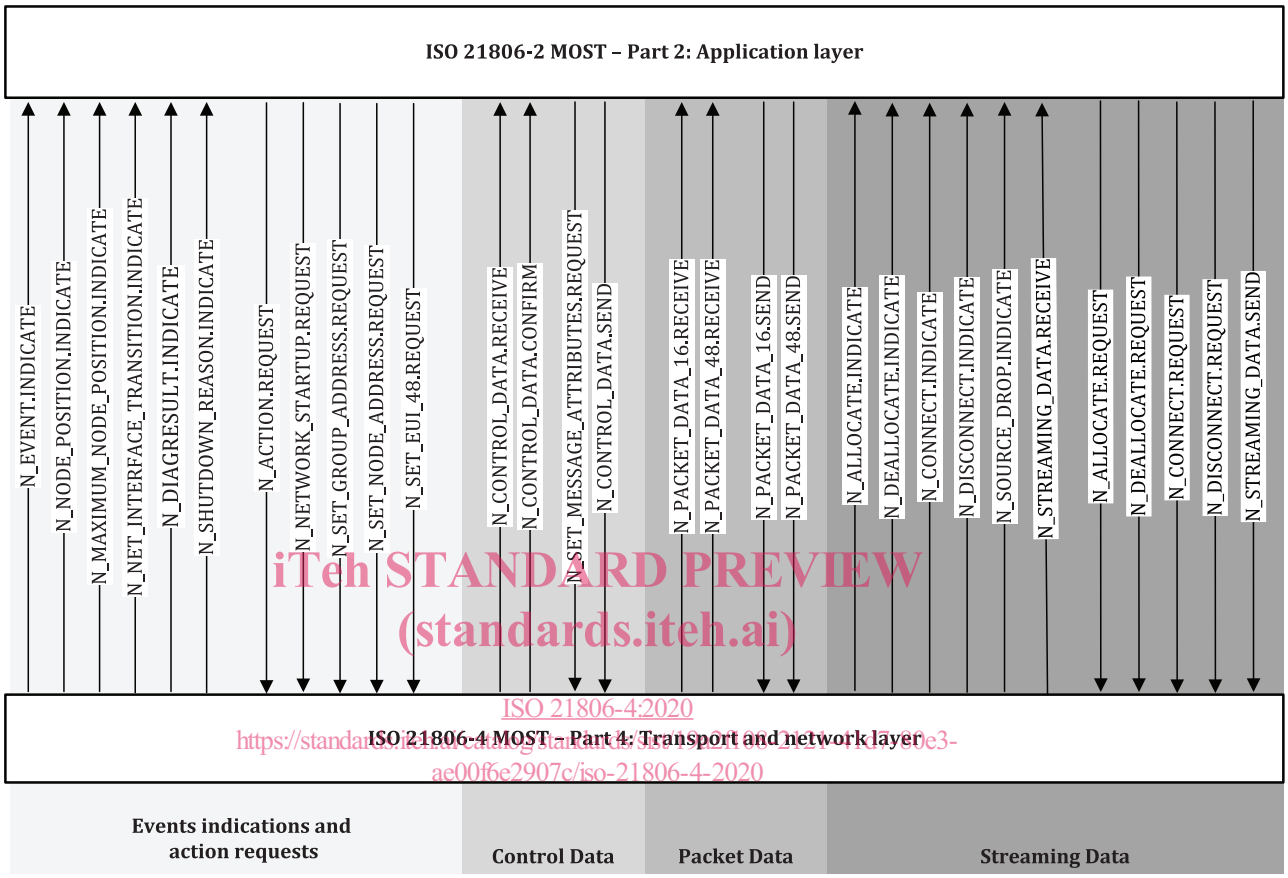

Figure 3 — Service interface to upper OSI layers

6.2 Data type definitions

REQ	4.1 Service interface – Data type definitions
The data types shall be in accordance to: — `Enum`: 8-bit enumeration; — `Unsigned Byte`: 8-bit unsigned numeric value; — `Unsigned Word`: 16-bit unsigned numeric value; — `Unsigned Long`: 32-bit unsigned numeric value; — `EUI-48`: 48-bit address value; — `Byte Array`: sequence of 8-bit aligned data.	

6.3 Parameters

6.3.1 Parameters — NL/TL to upper layers

6.3.1.1 Overview

Table 1 specifies the parameters that are used in the service interface and passed from NL/TL to upper layers.

Table 1 — Parameters passed from NL/TL to upper layers

Parameter	Data type	Description

Application_Event	Enum {
	    Unlock,
	    Stable_Lock,
	    Lock_Flag,
	    Network_Change_Event,
	    Shutdown_Flag,
	    MOST_Output_Off,
	    Network_Activity
	}
		An event that is reported to the application.

NetInterface_Transition	Enum {
	    ev_Wake_Up,
	    ev_Sleep,
	    ev_Start_Up,
	    ev_Diagnosis_Start,
	    ev_Init_Error_Shutdown,
	    ev_Init_Diagnosis_Start,
	    ev_Init_Ready,
	    ev_Error_Shutdown,
	    ev_Normal_Shutdown,
	    ev_Diagnosis_Ready,
	    ev_Diagnosis_End
	}
		A transition between NetInterface states

DiagResult	Enum {
	    No_Error,
	    Ring_Break,
	    Weak_Signal,
	    Diagnosis_Inconclusive
	}
		DiagResult of the ring break diagnosis

Relative_Position	Unsigned Byte	Relative position of a node to a ring break

Shutdown_Reason	Enum {
	    No_Result_Available,
	    No_Fault_Saved,
	    Sudden_Signal_Off,
	    Critical_Unlock
	}
		Shutdown reason

Node_Position	Unsigned Byte	Position of the node
Maximum_Position	Unsigned Byte	Maximum position information

Transmission_Status	Enum {
	    Success,
	    Buffer_Full,
	    CRC_Error,
	    Wrong_Target
	}
		Transmission status that is reported back to the sender.

6.3.1.2 Application_Event

`Application_Event` corresponds to events that are used to notify the application about changes in lower layers, which require no additional information.

REQ	4.2 Service interface – Parameters – NL/TL to upper layers – Application_Event
The `Application_Event` parameter shall be of data type `Enum` and shall contain the value specified according to Table 2.	

Table 2 — Application_Event values

Enum value	Description
`Unlock`	Unlock event occurred.
`Stable_Lock`	Stable lock reached.
`Lock_Flag`	Lock flag detected.
`Network_Change_Event`	Network change event (NCE) occurred.
`Shutdown_Flag`	Shutdown flag detected.
`Network_Activity_End`	Network activity ends.
`Network_Activity`	Network activity detected.

6.3.1.3 NetInterface_Transition

`NetInterface_Transition` corresponds to events that are used to notify the application about transitions from one NetInterface state to another.

REQ	4.3 Service interface – Parameters – NL/TL to upper layers – NetInterface_Transition
The `NetInterface_Transition` values shall be of data type `Enum` and shall contain the value specified according to Table 3.	

Table 3 — NetInterface_Transition values

Enum value	Description
`ev_Wake_Up`	The `ev_Wake_Up` transition from `s_NetInterface_Sleep` to `s_NetInterface_Off` is taken.
`ev_Sleep`	The `ev_Sleep` transition from `s_NetInterface_Off` to `s_NetInterface_Sleep` is taken.
`ev_Start_Up`	The `ev_Start_Up` transition from `s_NetInterface_Off` to `s_NetInterface_Init` is taken.
`ev_Diagnosis_Start`	The `ev_Diagnosis_Start` transition from `s_NetInterface_Off` to `s_NetInterface_Diagnosis` is taken.
`ev_Init_Error_Shutdown`	The `ev_Init_Error_Shutdown` transition from `s_NetInterface_Init` to `s_NetInterface_Off` is taken.
`ev_Init_Diagnosis_Start`	The `ev_Init_Diagnosis_Start` transition from `s_NetInterface_Init` to `s_NetInterface_Diagnosis` is taken.
`ev_Init_Ready`	The `ev_Init_Ready` transition from `s_NetInterface_Init` to `s_NetInterface_Normal_Operation` is taken.
`ev_Error_Shutdown`	The `ev_Error_Shutdown` transition from `s_NetInterface_Normal_Operation` to `s_NetInterface_Off` is taken.
`ev_Normal_Shutdown`	The `ev_Normal_Shutdown` transition from `s_NetInterface_Normal_Operation` to `s_NetInterface_Off` is taken.
`ev_Diagnosis_Ready`	The `ev_Diagnosis_Ready` transition from `s_NetInterface_Diagnosis` to `s_NetInterface_Normal_Operation` is taken.

Table 3 *(continued)*

Enum value	Description
ev_Diagnosis_End	The ev_Diagnosis_End transition from s_NetInterface_Diagnosis to s_NetInterface_Off is taken.

6.3.1.4 DiagResult

DiagResult corresponds to the possible diagnosis to be provided to the application. The structure of DiagResult depends on the kind of diagnosis that is performed and should be adopted from the corresponding specification.

REQ	4.4 Service interface – Parameters – NL/TL to upper layers – DiagResult
The DiagResult values for ring break diagnosis, as specified in Annex A (informative), shall be of data type Enum and shall contain the value specified according to Table 4.	

Table 4 — DiagResult values for ring break diagnosis

Enum value	Description
No_Error	No error detected.
Ring_Break	Ring break detected. The result indicates the relative position of ring break in the Relative_Position parameter.
Weak_Signal	Excessive attenuation detected at the input.
Diagnosis_Inconclusive	The ring break diagnosis inconclusive.

6.3.1.5 Relative_Position

The content of the Relative_Position parameter is relevant if the DiagResult parameter contains the value Ring_Break.

REQ	4.5 Service interface – Parameters – NL/TL to upper layers – Relative_Position
The Relative_Position parameter shall be of data type Unsigned Byte and shall contain the relative position of the node to a ring break.	

6.3.1.6 Shutdown_Reason

Shutdown_Reason corresponds to the possible causes of a shutdown to be provided to the application.

REQ	4.6 Service interface – Parameters – NL/TL to upper layers – Shutdown_Reason
The Shutdown_Reason parameter shall be of data type Enum and shall contain the value specified according to Table 5.	

Table 5 — Shutdown_Reason values

Enum value	Description
No_Result_Available	Initial value of the shutdown reason.
No_Fault_Saved	Shutdown flag detected before network activity ceased.
Sudden_Signal_Off	Shutdown caused by a sudden signal off (SSO).
Critical_Unlock	Shutdown caused by a critical unlock.

6.3.1.7 Node_Position

`Node_Position` provides the current node position to the application.

REQ	4.7 Service interface – Parameters – NL/TL to upper layers – Node_Position
The `Node_Position` parameter shall be of data type `Unsigned Byte` and shall contain the current node position.	

6.3.1.8 Maximum_Position

`Maximum_Position` provides the maximum node position information to the application.

REQ	4.8 Service interface – Parameters – NL/TL to upper layers – Maximum_Position
The `Maximum_Position` parameter shall be of data type `Unsigned Byte` and shall contain the maximum node position information.	

6.3.1.9 Transmission_Status

`Transmission_Status` corresponds to the possible outcomes of a message transmission to be provided to the application.

REQ	4.9 Service interface – Parameters – NL/TL to upper layers – Transmission_Status
The `Transmission_Status` parameter shall be of data type `Enum` and shall contain the value specified according to Table 6.	

Table 6 — Transmission_Status values

Enum value	Description
`Success`	The message is transmitted successfully.
`Buffer_Full`	The receiver buffer is full.
`CRC_Error`	A CRC error occurred.
`Wrong_Target`	There is no such target.
`Segmentation_Error_01`	First segment missing, that is, the first telegram of a segmented transfer is not received.
`Segmentation_Error_02`	Target node does not provide enough buffers to handle a message of this size.
`Segmentation_Error_03`	Unexpected segment number
`Segmentation_Error_04`	Too many unfinished segmentation messages pending.
`Segmentation_Error_05`	Timeout while waiting for next segment.
`Segmentation_Error_06`	Node not capable of handling segmented transfers.
`Segmentation_Error_07`	Segmented transfer has not been finished before the arrival of another message with identical `MsgID` sent by the same node.

6.3.2 Parameters — Upper layers to TL/NL

6.3.2.1 Overview

Table 7 specifies the parameters that are used in the service interface and received from upper layers.