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Information technology — Home Electronic Systems (HES) Architecture —

Part 3-1: Communication layers — Application layer for network based control of HES Class 1

Technologies de l'information — Architecture des systèmes électroniques domestiques (HES) —

Partie 3-1: Couches de communication — Couche d'application pour contrôle basé sur réseau de HES de classe 1

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Reference number
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Introduction

This part of ISO/IEC 14543 specifies the services and protocol of the application layer for usage in Home Electronic Systems. Some services are targeted to field level communication between devices. Other services are exclusively reserved for management purposes. Some services can be used for both management and run-time communication.

Presently ISO/IEC 14543 Information technology - Home Electronic Systems (HES) architecture, consists of nine parts:

Part 2-1: Introduction and device modularity
(ISO/IEC 14543-2-1:2006 replaces ISO/IEC TR 14543-1:2000 and ISO/IEC TR 14543-2:2000)
Part 3-1: Communication layers- Application layer for network based control of HES Class 1 (this standard)
Part 3-2: Communication layers – Transport, network and general parts of data link layer for network based control of HES Class 1
(ISO/IEC 14543-3-1:2006 together with ISO/IEC 14543-3-2:2006 replace ISO/IEC TR 14543-3:2000)
Part 3-3: User process for network based control of HES Class 1 (under consideration)
Part 3-4: System Management – Management procedures for network based control of HES Class 1 (under consideration)
Part 3-5: Media and media dependent layers – Power line for network based control of HES Class 1 (under consideration)
Part 3-6: Media and media dependent layers – Twisted pair for network based control of HES Class 1 (under consideration)
Part 3-7: Media and media dependent layers – Radio frequency for network based control of HES Class 1 (under consideration)
Part 4: Home and building automation in a mixed-use building (Technical Report)

Additional parts are being proposed.

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ISO/IEC 14543-3-1: Information technology - Home Electronic Systems (HES) Architecture - Part 3-1: Communication layers- Application layer for network based control of HES Class 1

1 Scope

This part of the ISO/IEC 14543 specifies the services and protocol of the application layer for usage in Home Electronic Systems. It provides the services and the interface to the user process as defined in ISO/IEC 14543-3-3 (EN 50090-3-2). This procedure is based on the services and the protocol is provided by the Transport Layer, Network Layer and Data Link Layer as specified in ISO/IEC 14543-3-2.

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.

2.1 Approved references

ISO/IEC 11801, *Information technology - Generic cabling systems*

ISO/IEC 14543-3-2, *Information technology - Home Electronic Systems (HES) – Part 3-2 Communication layers – Transport, network and general parts of the data link layer for network based control of HES Class 1*

2.2 References under development

ISO/IEC 14543-3-3, *User process for network based control of HES Class 1*

ISO/IEC 14543-3-4, *System Management – Management procedures for network based control of HES Class 1*

2.3 Other references

All references in this subclause were correct at the time of approval of this International Standard.

The provisions of the referenced specifications, as identified in this subclause, are valid within the context of this International Standard. The reference to a specification within this International Standard does not give it any further status within ISO/IEC; in particular, it does not give the referenced specification the status of an International Standard.

EN 50090-3-2:2003, *Home and Building Electronic Systems (HBES) – Part 3-2: Aspects of application – User process for HBES Class 1*

EN 50090-7-1:2003, *Home and Building Electronic Systems (HBES) – Part 7-1: System Management – Management procedures*

Note Reference to EN 50090-3-2 is deleted as soon as ISO/IEC 14543-3-3 is approved. Reference to EN 50090-7-1 is deleted as soon as ISO/IEC 14543-3-4 is approved.

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3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this part the terms and definitions given in ISO/IEC 14543-2-1 and the following apply.

3.1.1
application (in the sense of network application)
system, including its associated transmission method, which is supported by telecommunications cabling
[ISO/IEC 11801:2002, definition 3.1.2]

3.1.2
user application
software functionality, the control algorithm that runs in one single device

3.2 Abbreviations

AL	Application Layer
AD-converter	Analog-to-Digital-converter
APDU	Application layer Protocol Data Unit
APCI	Application layer Protocol Control Information
ASAP	Application layer Service Access Point
Acon	Application layer confirmation
con	confirmation
CPU	Central Processing Unit
HES Class 1	refers to simple control and command
HES Class 2	refers to Class 1 plus simple voice and stable picture transmission
HES Class 3	refers to Class 2 plus complex video transfers
ind	indication
Lcon	Local confirmation
PDU	Protocol Data Unit
Rcon	Remote confirmation
req	request
res	response
TL	Transport Layer
TPDU	Transport layer Protocol Data Unit
TSAP	Transport layer Service Access Point
USERMSG	User Message

4 Conformance

An entity of operational exchange conforming to this International Standard shall meet 7.1, 7.2.1, 7.2.2, 7.3.5, 7.4.3, 7.4.4, 7.4.7 and clause 8.

Meeting of other subclauses of clause 7 is optional.

All services shall be implemented according to the provisions of clauses 5 and 6.

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5 Services of the application layer

5.1 Communication modes

The application layer shall provide a large variety of application services to the application process. Application processes in different devices interoperate by using services of application layer over communication modes. According to the transport layer, the following different types of communication modes shall exist:

a) point-to-multipoint, connection-less (multicast);

b) point-to-domain, connection-less (broadcast);

c) point-to-all-points, connection-less (system broadcast);

d) point-to-point, connection-less;

e) point-to-point, connection-oriented.

The application layer services that are offered shall depend on the communication mode. An application layer service shall not be applied on a communication mode for which it is not specified.

Some services may be used on the point-to-point connection-oriented, as well as the point-to-point connection-less communication mode, although application layer services shall always be mapped to transport layer services depending on the type of the communication mode.

5.2 Service primitives of the application layer

Each specified application layer service shall be invoked by the transport layer primitives request (req), indication (ind) and confirmation (con). For a remote confirmed service, the remote device shall use the same transport layer primitives to respond to the service.

The transport layer confirmation primitive shall only be a confirmation from the transport layer instance and shall include all data from the request plus the state which indicates whether the service was sent successfully or not. The application layer shall map the transport layer confirmation primitive to a local application layer confirmation (Lcon).

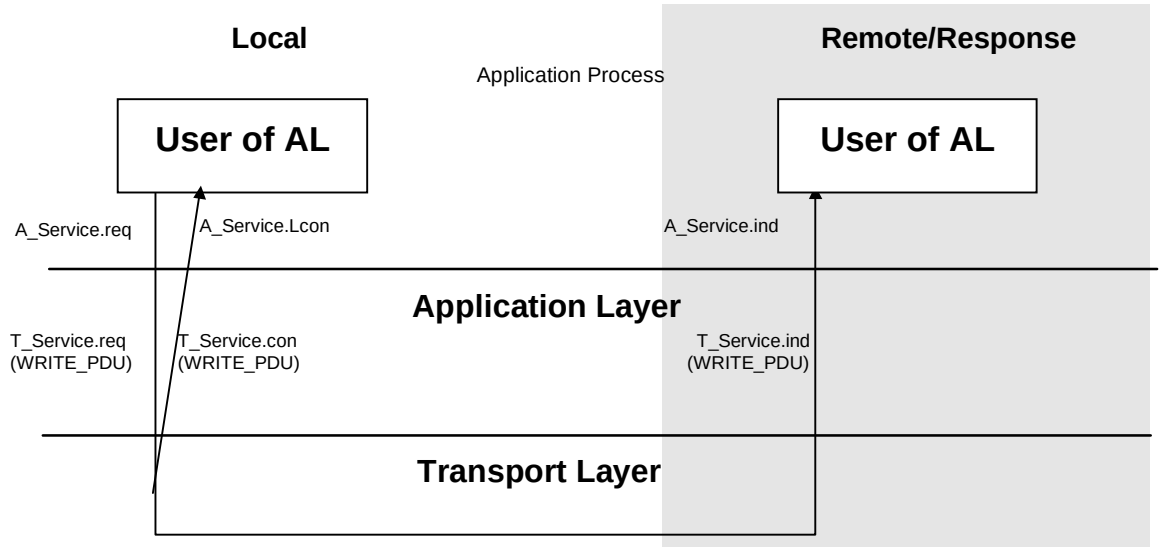


Figure 1 – Interaction of the application layer for services that are not remote confirmed

In case of a remote confirmed service the remote device shall initiate the response (res) primitive and the application layer shall map this service primitive to a transport layer request primitive. The local application layer shall receive the transport layer indication primitive and

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shall map it to an application layer confirmation (Acon). The transport layer confirmation in the remote device shall be mapped by the remote application layer to a remote confirmation (Rcon).

NOTE In the following service specifications the local application layer confirmation and the remote confirmation (Rcon) are not always described.

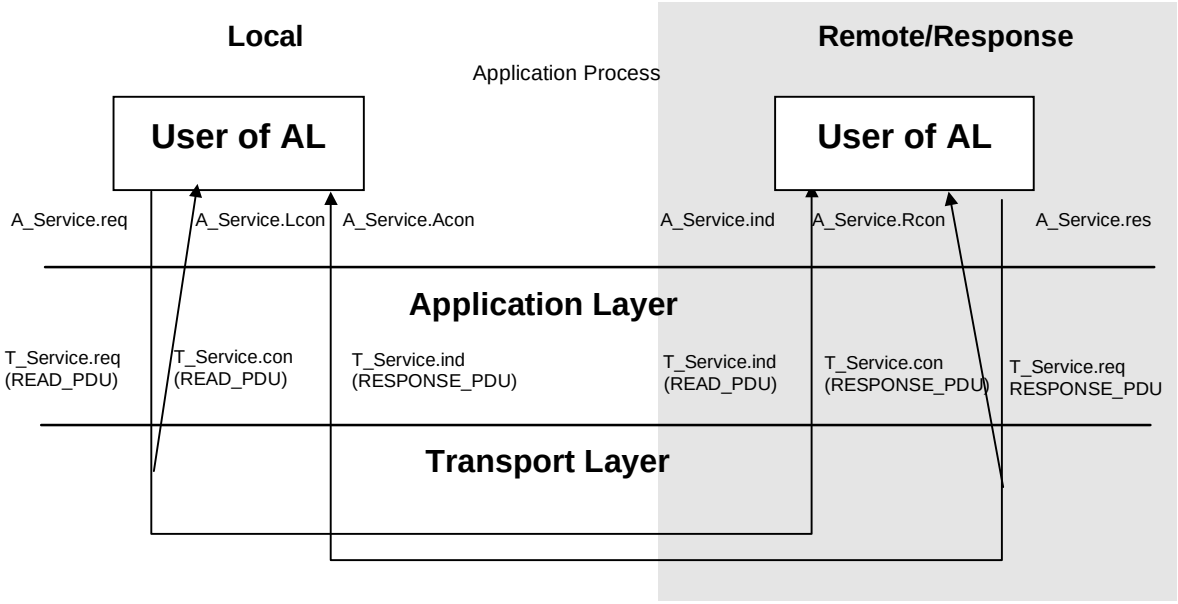


Figure 2 – Interaction of the application layer for services that are remote confirmed

6 Application layer Protocol Data Unit (APDU)

An example of an APDU that can be used is shown in Figure 3.

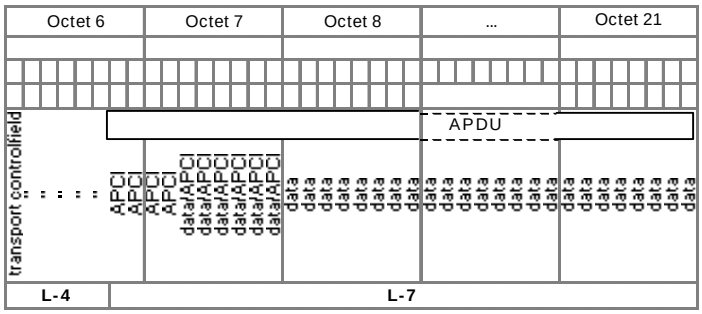


Figure 3 – APDU (Example)

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Table 1 – APCI overview

APCI (bit position) Octet n								APCI (bit position) Octet n+1								Application layer Service	Allowed communication mode(s)				
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1		Multicast	Broadcast	Point-to-all-points connection-less	Point-to-point connection-less	Point-to-point connection-oriented
						APCI	APCI	data/APCI	data/APCI	data/APCI	data/APCI	data/APCI	data/APCI	data/APCI	data/APCI						
						0	0	0	0	0	0	0	0	0	0	A_GroupValue_Read	X				
						0	0	0	1							A_GroupValue_Response	X				
						0	0	1	0							A_GroupValue_Write	X				
						0	0	1	1	0	0	0	0	0	0	A_IndividualAddress_Write		X			
						0	1	0	0	0	0	0	0	0	0	A_IndividualAddress_Read		X			
						0	1	0	1	0	0	0	0	0	0	A_IndividualAddress_Response		X			
						1	1	1	1	0	1	1	1	0	0	A_IndividualAddressSerialNumber_Read		X			
						1	1	1	1	0	1	1	1	0	1	A_IndividualAddressSerialNumber_Response		X			
						1	1	1	1	0	1	1	1	1	0	A_IndividualAddressSerialNumber_Write		X			
						1	1	1	1	0	1	1	1	1	1	A_ServiceInformation_Indication_Write		X			
						1	1	1	1	0	1	1	0	1	0	A_NetworkParameter_Read		X			
						1	1	1	1	0	1	1	0	1	1	A_NetworkParameter_Response			X	X	
						1	1	1	1	1	0	0	1	0	0	A_NetworkParameter_Write		X		X	
						1	1	1	1	0	1	0	1	0	1	A_PropertyValue_Read				X	X
						1	1	1	1	0	1	0	1	1	0	A_PropertyValue_Response				X	X
						1	1	1	1	0	1	0	1	1	1	A_PropertyValue_Write				X	X
						1	1	1	1	0	1	1	0	0	0	A_PropertyDescription_Read				X	X
						1	1	1	1	0	1	1	0	0	1	A_PropertyDescription_Response				X	X
						1	1	1	1	1	0	0	1	0	1	A_Link_Read				X	X
						1	1	1	1	1	0	0	1	1	0	A_Link_Response				X	X
						1	1	1	1	1	0	0	1	1	1	A_Link_Write				X	X
						0	1	1	0							A_ADC_Read					X
						0	1	1	1							A_ADC_Response					X
						1	0	0	0	0	0					A_Memory_Read					X
						1	0	0	1	0	0					A_Memory_Response					X
						1	0	1	0	0	0					A_Memory_Write					X
						1	0	1	1	0	0	0	0	0	0	A_UserMemory_Read					X
						1	0	1	1	0	0	0	0	0	1	A_UserMemory_Response					X
						1	0	1	1	0	0	0	0	1	0	A_UserMemory_Write					X
						1	0	1	1	0	0	0	1	0	0	A_UserMemoryBit_Write (not for future use)					X
						1	0	1	1	0	0	0	1	0	1	A_UserManufacturerInfo_Read					X
						1	0	1	1	0	0	0	1	1	0	A_UserManufacturerInfo_Response					X
						1	0	1	1	0	0	0	1	1	1	.. .. Reserved USERMSG					X
						1	0	1	1	1	1	0	1	1	1						X
						1	0	1	1	1	1	1	0	0	0	.. .. manufacturer specific area for USERMSG					X
						1	0	1	1	1	1	1	1	1	0						X

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Table 1 – APCI overview *(continued)*

APCI (bit position) Octet n 8	7	6	5	4	3	2	1	Octet n+1 8	7	6	5	4	3	2	1	Application layer Service	Allowed communication mode(s) Multicast	Broadcast	Point-to-all-point connection-less	Point-to-point connection-less	Point-to-point connection-oriented
						APCI	APCI	data/APCI	data/APCI	data/APCI	data/APCI	data/APCI	data/APCI	data/APCI	data/APCI						
						1	1	0	0	0	0	0	0	0	0	A_DeviceDescriptor_Read				X	
						1	1	0	1	0	0	0	0	0	0	A_DeviceDescriptor_Response				X	
						1	1	1	0	0	0	0	0	0	0	A_Restart				X	
Coupler specific services																					
						1	1	1	1	0	0	0	0	0	0	A_Open_Routing_Table_Req (not for future use)					X
						1	1	1	1	0	0	0	0	0	1	A_Read_Routing_Table_Req (not for future use)					X
						1	1	1	1	0	0	0	0	1	0	A_Read_Routing_Table__Res (not for future use)					X
						1	1	1	1	0	0	0	0	1	1	A_Write_Routing_Table_Req (not for future use)					X
						1	1	1	1	0	0	1	0	0	0	A_Read_Router_Memory_Res (not for future use)					X
						1	1	1	1	0	0	1	0	0	1	A_Read_Router_Memory_Res (not for future use)					X
						1	1	1	1	0	0	1	0	1	0	A_Write_Router_Memory_Req (not for future use)					X
						1	1	1	1	0	0	1	1	0	1	A_Read_Router_Status_Req (not for future use)					X
						1	1	1	1	0	0	1	1	1	0	A_Read_Router_Status_Res (not for future use)					X
						1	1	1	1	0	0	1	1	1	1	A_Write_Router_Status_Req (not for future use)					X
						1	1	1	1	0	1	0	0	0	0	A_MemoryBit_Write (not for future use)					X
						1	1	1	1	0	1	0	0	0	1	A_Authorize_Request					X
						1	1	1	1	0	1	0	0	1	0	A_Authorize_Response					X
						1	1	1	1	0	1	0	0	1	1	A_Key_Write					X
						1	1	1	1	0	1	0	1	0	0	A_Key_Response					X
Open Media Specific Services																					
						1	1	1	1	1	0	0	0	0	0	A_DomainAddress_Write		X			
						1	1	1	1	1	0	0	0	0	1	A_DomainAddress_Read		X			
						1	1	1	1	1	0	0	0	1	0	A_DomainAddress_Response		X			
						1	1	1	1	1	0	0	0	1	1	A_DomainAddressSelective_Read		X			

The APDU shall correspond to the Transport layer Protocol Data Unit (TPDU), but shall be reduced by the transport control field. The application control field shall be encoded and decoded by application layer and shall contain the application layer service codes (APCI). The application control field shall have a length of either 4 bit or 10 bit, as specified for each application layer service, in Clause 7.

The codes that shall be used for the application control field are shown in Table 1. The complete Protocol Data Unit (PDU) for each service primitive is shown in the description of every service.

Not defined and not supported application layer services shall ignored by the application layer.

7 Application layer services

7.1 Application layer services on multicast communication mode

7.1.1 General

A multicast communication mode shall connect transport layer service access points (TSAP) to application layer service access points (ASAP). When one device sends an A_GroupValue-Service each device which is member of this group shall receive the A_GroupValue_Service.

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If the application layer of a device receives an A_GroupValue_Write-Service, it shall map the contained ASAP to exactly one TSAP; it shall search for other associations between ASAPs and the found TSAP informs all these associated ASAPs as specified in 7.1.3.

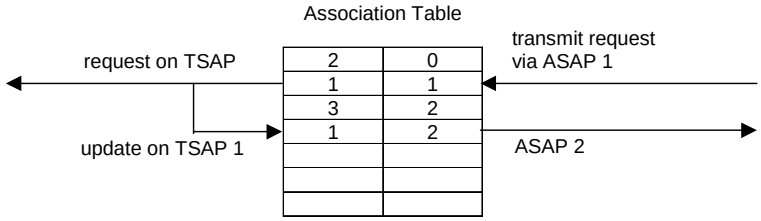


Figure 4 – Mapping the ASAP to the TSAP (Example)

If the application layer of a device receives an A_GroupValue_Read-Service, it shall search for all ASAPs associated to this TSAP and shall inform all the associated ASAPs. Only one read response shall be generated by the user as specified in 7.1.2.

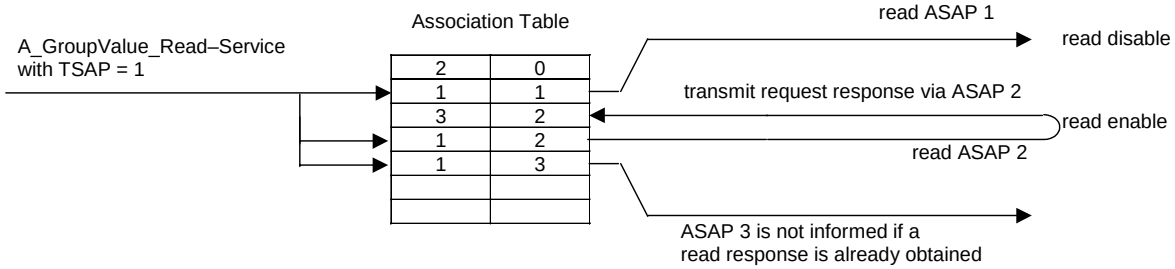


Figure 5 – Mapping a TSAP to an ASAP

If a transmission is requested (read response or write) via an ASAP, the application layer shall take the associated TSAP, update all the ASAPs with the same TSAP and generate an A_Group-Service-Request.

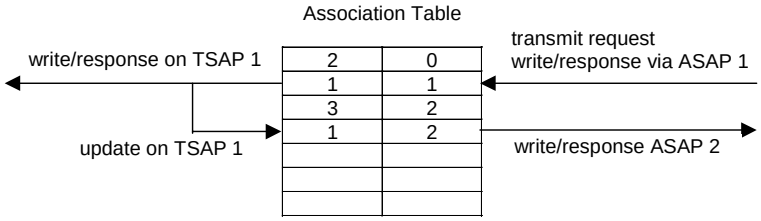


Figure 6 – Handling requests and responses

7.1.2 A_GroupValue_Read Service

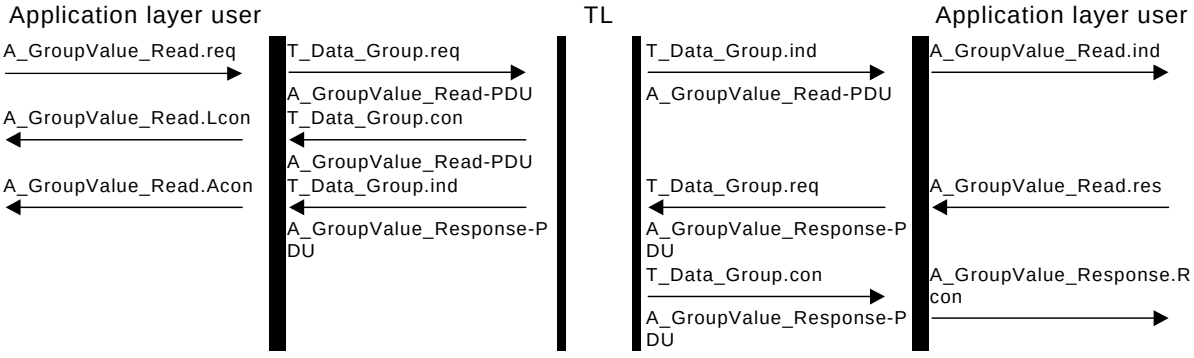


Figure 7 – Message flow for the A_Group_Value_Read service

The A_GroupValue_Read.req primitive shall be applied by the user of application layer, to receive an update of the value of its ASAP by making a communication partner respond with

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an A_GroupValue_Read.res, i.e. the service shall be confirmed by the remote application process. The ASAP shall be associated to the TSAP, i.e. with a group address, as specified in ISO/IEC 14543-3-2. All other group members shall receive the A_GroupValue_Response-PDU as well.

The local application layer shall accept the service request, map the ASAP to the TSAP and pass it with a T_Data_Group.req to the local transport layer. The parameters TSAP and priority shall be mapped to the corresponding parameters of the T_Data_Group.req primitive, the TSDU shall be an A_GroupValue_Read-PDU.

The user of the HES system can during configuration decide about this mapping between ASAPs and TSAPs.

The remote application layer shall map a T_Data_Group.ind primitive with TSDU = A_GroupValue_Read-PDU to an A_GroupValue_Read.ind primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_GroupValue_Read.ind primitive. One A_GroupValue_Read.ind primitive shall be generated per ASAP that is assigned to the corresponding TSAP.

The remote application process shall evaluate the received A_Group_Value_Read-PDU and use the argument ASAP to obtain the response. It shall respond to the A_GroupValue_Read.ind primitive with an A_GroupValue_Read.res primitive containing the obtained response.

The user of the HES system can decide during configuration, whether or not the A_GroupValue_Read.res primitive is generated, although exactly one ASAP should generate the A_GroupValue_Read.res primitive.

It is left to the user application programmer to decide whether an A_GroupValue_Read.Acon time-out supervision is necessary.

Two different formats of the A_GroupValue_Response-PDU are used depending on the length of the value. The maximum length of the value shall be 14 octets. Unused data bits shall be set to zero.

Octet 6								**Octet 7**							
						APCI									
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI						
						0	0	0	0	0	0	0	0	0	0

Figure 8 – A_GroupValue_Read-PDU (Example)

Octet 6								**Octet 7**								**Octet 8..Octet 21**							
						APCI										Value (up to 14 octets)							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI														
						0	0	0	1	0	0	0	0	0	0	D	D	D	D	D	D	D	D

Figure 9 – A_GroupValue_Response-PDU (Example), length of ASAP data is more than 6 bit

Values that only consist of 6 bits or less shall have the following optimized A_GroupValue_Response-PDU format:

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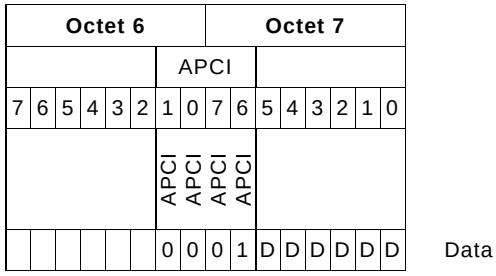


Figure 10 – A_GroupValue_Response-PDU (Example)
length of ASAP data is 6 bit or less

The remote application layer shall accept the service response, map the ASAP to the TSAP and pass it with a T_Data_Group.req to the local transport layer. The parameters ack_request, TSAP, hop_count_type and priority shall be mapped to the corresponding parameters of the T_Data_Group.req primitive, the TSDU shall be a A_GroupValue_Response-PDU.

The local application layer shall map a T_Data_Group.ind primitive with TSDU = A_GroupValue_Response-PDU to an A_GroupValue_Read.Acon primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_GroupValue_Read. Acon primitive. More than one A_GroupValue_Read.Acon primitive may occur depending on the number of group members that have been configured to respond.

A_GroupValue_Read.req(ack_request, ASAP, priority, hop_count_type)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
ASAP:	this parameter shall be used to contain the service access point
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”

A_GroupValue_Read.Lcon(ack_request ,ASAP, priority, hop_count_type, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
ASAP:		this parameter shall be used to contain the service access point
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be “system”, “urgent”, “normal” or “low”
a_status:	ok:	this value of this parameter shall be used to indicate that the transmission of the A_GroupValue_Read.req has been successful
	not_ok:	this value of this parameter shall be used to indicate that the transmission of the A_GroupValue_Read.req did not succeed

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A_GroupValue_Read.ind(ASAP, priority, hop_count_type)

ASAP:		this parameter shall be used to contain the service access point
hop_count_type:		this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
priority:		this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”

A_GroupValue_Read.res(ack_request, ASAP, priority, hop_count_type, data)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
ASAP:		this parameter shall be used to contain the service access point
hop_count_type:		this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
priority:		this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
data:		the parameter shall be used to contain the value of the associated service access point

A_GroupValue_Read.Rcon(ack_request, ASAP, priority, hop_count_type, data, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
ASAP:		this parameter shall be used to contain the service access point
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be “system”, “urgent”, “normal” or “low”
data:		this parameter shall be used to contain the value of the associated service access point
a_status:	ok:	this value of this parameter shall be used to indicate that the transmission of the A_GroupValue_Read.res has been successful
	not_ok:	this value of this parameter shall be used to indicate that the transmission of the A_GroupValue_Read.res did not succeed

A_GroupValue_Read.Acon(ASAP, priority, hop_count_type, data)

ASAP:		this parameter shall be used to contain the service access point
hop_count_type:		this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
priority:		this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
data:		this parameter shall be used to contain the value of the associated service access point

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7.1.3 A_GroupValue_Write Service

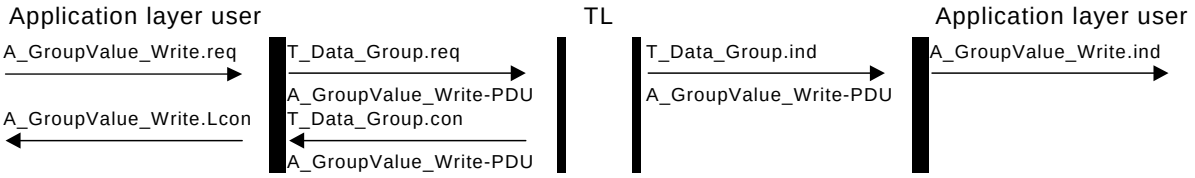


Figure 11 – Message flow for the A_Group_Value_Write service

The A_GroupValue_Write.req primitive shall be applied by the user of application layer, to send an update of its ASAP to all connected ASAPs. The service shall not be confirmed by the remote application process, the confirmation shall be caused by the local T_Data_Group.con. The ASAP shall be associated to the TSAP i.e. with a group address, as specified in ISO/IEC 14543-3-2. All group members shall receive the A_GroupValue_Write-PDU.

The local application layer shall accept the service request, map the ASAP to the TSAP and pass it with a T_Data_Group.req to the local transport layer.

NOTE The user of the HES system can during configuration decide about this mapping between ASAPs and TSAPs.

The parameters TSAP and priority shall be mapped to the corresponding parameters of the T_Data_Group.req primitive, the TSDU shall be an A_GroupValue_Write-PDU.

The remote application layer shall map a T_Data_Group.ind primitive with TSDU = A_GroupValue_Write-PDU to an A_GroupValue_Write.ind primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_GroupValue_Write.ind primitive. One A_GroupValue_Write.ind primitive shall be generated per ASAP that is assigned to the corresponding TSAP (i.e. group_address).

Two different formats of the A_GroupValue_Write-PDU are used depending on the length of the value. The maximum length of the value shall be 14 octets. Unused data bits shall be set to zero.

Octet 6								Octet 7								Octet 8.to.Octet 21							
						APCI										Value (up to 14 octets)							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI														
						0	0	1	0	0	0	0	0	0	0	D	D	D	D	D	D	D	D

Figure 12 – A_GroupValue_Write-PDU (Example), length of ASAP data is more than 6 bit

Values that only consist of 6 bits or less shall have the following optimized A_GroupValue_Write-PDU format:

Octet 6								Octet 7							
						APCI									
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI						
						0	0	1	0	d	d	d	d	d	d

Figure 13 – A_GroupValue_Write-PDU (Example), length of ASAP data is 6 bit or less

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If the local application layer receives a T_Data_Group.con from the local transport layer, it shall pass an A_GroupValue_Write.Lcon primitive to the local application process. If the confirmation is positive (t_status = ok), the local application layer shall pass a positive A_GroupValue_Write.Lcon (a_status = ok) to the local application process. If the confirmation is negative (t_status = not_ok), the local application layer shall pass an A_GroupValue_Write.Lcon (a_status = not_ok) to the local user indicating that the transmission of the associated T_Data_Group.req did not succeed.

A_GroupValue_Write.req(ack_request, ASAP, priority, hop_count_type, data)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
ASAP:	this parameter shall be used to contain the service access point
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
data:	this parameter shall be used to contain the data of the associated application layer service access point

A_GroupValue_Write.Lcon(ack_request, ASAP, priority, hop_count_type, data, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
ASAP:		this parameter shall be used to contain the service access point
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
data:		this parameter shall be used to contain the data of the associated application layer service access point
a_status:	ok:	this value of this parameters shall be used to indicate that the transmission of the A_GroupValue_Write.req has been successful
	not_ok:	this value of this parameters shall be used to indicate that the transmission of the A_GroupValue_Write.req did not succeed

A_GroupValue_Write.ind(ASAP, priority, hop_count_type, data)

ASAP:	this parameter shall be used to contain the service access point
priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
data:	this parameter shall be used to contain the data of the associated application layer service access point

7.2 Application layer services on broadcast communication mode

7.2.1 A_IndividualAddress_Write Service

The A_IndividualAddress_Write.req primitive shall be applied by the user of application layer to modify the individual address in a communication partner. The communication partner shall

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not be identified in the service, i.e. the destination shall be defined by selecting a destination manually. This may be done by pressing a button on exactly one device that brings this device into a ´programming mode´, i.e. only the device where the button is pressed shall accept the A_IndividualAddress_Write.ind, others shall ignore it. The way that a product is set to ´programming mode´ may be manufacturer specific.

The local application layer shall accept the service request and pass it with a T_Data_Broadcast.req to the local transport layer. The parameter priority, implicitly with value 'system', shall be mapped to the corresponding parameter of the T_Data_Broadcast.req primitive, the TSDU shall be an A_IndividualAddress_Write-PDU.

Octet 6								Octet 7								Octet 8								Octet 9							
								APCI								New address (high)								New address (low)							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI																						
						0	0	1	1	0	0	0	0	0	0	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	X

Figure 14 – A_IndividualAddress_Write-PDU (Example)

The remote application layer shall map a T_Data_Broadcast.ind primitive with TSDU = A_IndividualAddress_Write-PDU to an A_IndividualAddress_Write.ind primitive. The argument priority, implicitly with value 'system', shall be mapped to the corresponding argument priority of the A_IndividualAddress_Write.ind primitive.

The application process shall ignore the A_IndividualAddress_Write.ind primitive if the device is not in ´programming mode´. Otherwise the local individual address shall be set to the new address.

If the local application layer receives a T_Data_Broadcast.con from the local transport layer, it shall pass an A_IndividualAddress_Write.Lcon primitive to the local application process. If the confirmation is positive (t_status = ok), the local application layer shall pass a positive A_IndividualAddress_Write.Lcon(a_status = ok) to the local application process. If the confirmation is negative (t_status = not_ok), the local application layer shall pass an A_IndividualAddress_Write.Lcon (a_status = not_ok) to the local user indicating that the transmission of the associated T_Data_Broadcast.req did not succeed.

A_IndividualAddress_Write.req(ack_request, priority, hop_count_type, newaddress)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be "system"
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
newaddress:	this parameter shall be used to contain the new value of the individual address

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A_IndividualAddress_Write.Lcon(ack_request, priority, hop_count_type, newaddress, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be “system”
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
newaddress:		this parameter shall be used to contain the new value of the individual address
a_status:	ok:	this value of this parameter shall be used to indicate that the transmission of the A_IndividualAddress_Write.req has been successful
	not_ok:	this value of this parameter shall be used to indicate that the transmission of the A_IndividualAddress_Write.req did not succeed

A_IndividualAddress_Write.ind(priority, hop_count_type, newaddress)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
newaddress:	this value shall be used to contain the new value of the individual address

7.2.2 A_IndividualAddress_Read-Service

The A_IndividualAddress_Read.req primitive shall be applied by the user of application layer to read the individual address in a communication partner. The communication partner shall not be identified in the service, i.e. the destination shall be defined by selecting a destination manually. This can be done by pressing a button on one or more devices that brings these devices into a ´programming mode´, i.e. only a device where the button is pressed shall accept the A_IndividualAddress_Read.ind, others shall ignore it. The way that a product is set to ´programming mode´ may be manufacturer specific.

The local application layer shall accept the service request and pass it with a T_Data_Broadcast.req to the local transport layer. The parameter priority, implicitly with value ‘system’, shall be mapped to the corresponding parameter of the T_Data_Broadcast.req primitive; the TSDU shall be an A_IndividualAddress_Read-PDU.

The remote application layer shall map a T_Data_Broadcast.ind primitive with TSDU = A_IndividualAddress_Read-PDU to an A_IndividualAddress_Read.ind primitive. The argument priority, implicitly with value ‘system’, shall be mapped to the corresponding argument priority of the A_IndividualAddress_Read.ind primitive.

The remote application process shall respond to the A_IndividualAddress_Read.ind primitive with an A_IndividualAddress_Read.res primitive only if the device is in ´programming mode'.

Octet 6								Octet 7							
						APCI									
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI						
						0	1	0	0	0	0	0	0	0	0

Figure 15 – A_IndividualAddress_Read-PDU (Example)

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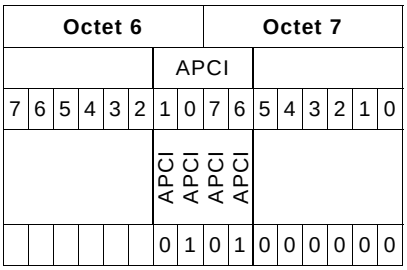


Figure 16 – A_IndividualAddress_Response-PDU (Example)

The remote application layer shall accept the service response and pass it with a T_Data_Broadcast.req to the transport layer; the TSDU shall be an A_IndividualAddress_Response-PDU. The local application layer shall map a T_Data_Broadcast.ind primitive with TSDU = A_IndividualAddress_Response-PDU to an A_IndividualAddress_Read.Acon primitive. The argument priority, implicitly with value 'system', shall be mapped to the corresponding argument priority of the A_IndividualAddress_Read.Acon primitive. The argument source_address shall be mapped to the corresponding argument individual_address of the A_IndividualAddress_Read.Acon primitive.

A_IndividualAddress_Read.req(ack_request, priority, hop_count_type)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:		this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be "system"
hop_count_type:		this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used

A_IndividualAddress_Read.Lcon(ack_request, priority, hop_count_type, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be "system", "urgent", "normal" or "low"
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
a_status:	ok:	this value of this parameter shall be used to indicate that the transmission of the A_IndividualAddress_Read.req has been successful
	not_ok:	this value of this parameter shall be used to indicate that the transmission of the A_IndividualAddress_Read.req did not succeed

A_IndividualAddress_Read.ind(priority, hop_count_type)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be "system"
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not

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A_IndividualAddress_Read.res(ack_request, priority, hop_count_type, individual address)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
individual_address:	this parameter shall be used to contain the individual address of this device

A_IndividualAddress_Read.Rcon(ack_request, priority, hop_count_type, individual_address, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
individual_address:		this parameter shall be used to contain the individual address of this device
a_status:	ok:	this value of this parameter shall be used to indicate that the transmission of the A_IndividualAddress_Read.res has been successful
	not_ok:	this value of this parameter shall be used to indicate that the transmission of the A_IndividualAddress_Read.res did not succeed

A_IndividualAddress_Read.Acon(priority, hop_count_type, individual address)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
individual_address:	this parameter shall be used to contain the individual address of the device that has sent the received frame

7.2.3 A_IndividualAddressSerialNumber_Read-Service

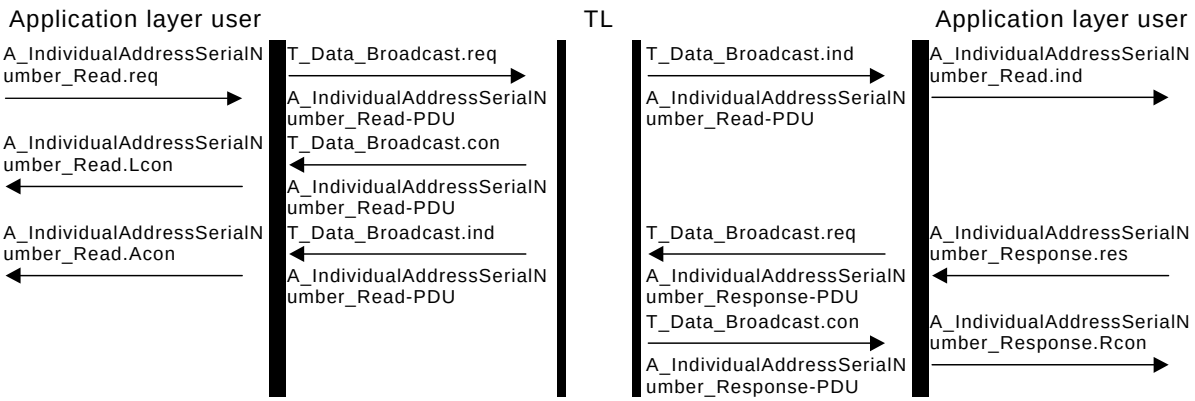


Figure 17 – Message flow for the A_IndividualAddressSerialNumber_Read service

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The A_IndividualAddressSerialNumber_Read.req primitive shall be applied by the user of application layer to read the individual address in a communication partner. The communication partner shall be identified using the unique serial number (6 octets) of the device.

The local application layer shall accept the service request and pass it with a T_Data_Broadcast.req to the local transport layer. The parameter priority, implicitly with value ‘system’, shall be mapped to the corresponding parameter of the T_Data_Broadcast.req primitive; the TSDU shall be an A_IndividualAddressSerialNumber_Read-PDU.

If the local application layer receives a T_Data_Broadcast.con from the local transport layer it shall pass an A_IndividualAddressSerialNumber_Read.Lcon to the to the local user. If the confirmation is positive (t_status = ok), the local application layer shall pass a positive A_IndividualAddressSerialNumber_Read.Lcon (a_status = ok) to the local user. If the confirmation is negative (a_status = not_ok), the local application layer shall pass an A_IndividualAddressSerialNumber_Read.Lcon (a_status = not_ok) to the local user indicating that the transmission of the associated A_IndividualAddressSerialNumber_Read.req did not succeed.

The remote application layer shall map a T_Data_Broadcast.ind primitive with TSDU = A_IndividualAddressSerialNumber_Read-PDU to an A_IndividualAddress-SerialNumber_Read.ind primitive. The argument priority, implicitly with value ‘system’, shall be mapped to the corresponding argument priority of the A_IndividualAddressSerialNumber_Read.ind primitive.

Octet 6								Octet 7								Octet 8 to octet 13							
																Serial number (6 octets)							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI										
						1	1	1	1	0	1	1	1	0	0								

Figure 18 – A_IndividualAddressSerialNumber_Read-PDU (Example)

The remote application process shall respond to the A_IndividualAddressSerialNumber_Read.ind primitive with an A_IndividualAddressSerialNumber_Read.res primitive, if the serial number received is equal to the serial number of the device.

The remote application layer shall accept the service response and pass it with a T_Data_Broadcast.req to the remote transport layer; the TSDU shall be an A_IndividualAddressSerialNumber_Response-PDU.

Octet 6								Octet 7								Octet 8 to Octet 13								Octet 14								Octet 15								Octet 16								Octet 17							
																Serial number (6 octets)								Domain Address																Reserved															
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI																																								
						1	1	1	1	0	1	1	1	0	1																																							

Figure 19 – A_IndividualAddressSerialNumber_Response-PDU (Example)

If the remote application layer receives a T_Data_Broadcast.con from the remote transport layer, it shall pass an A_IndividualAddressSerialNumber_Read.Rcon to the remote user. If the confirmation is positive (t_status = ok), the remote application layer shall pass a positive A_IndividualAddressSerialNumber_Read.Rcon (a_status = ok) to the remote user. If the confirmation is negative (a_status = not_ok), the remote application layer shall pass an

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A_IndividualAddressSerialNumber_Read.Rcon (a_status = not_ok) to the remote user indicating that the transmission of the associated A_IndividualAddressSerialNumber_Read.res did not succeed.

The local application layer shall map a T_Data_Broadcast.ind primitive with TSDU = A_IndividualAddressSerialNumber_Response-PDU to an A_IndividualAddress-SerialNumber_Read.Acon primitive. The argument priority, implicitly with value 'system', shall be mapped to the corresponding argument priority of the A_IndividualAddressSerialNumber_Read.Acon primitive. The argument source_address shall be mapped to the argument individual_address.

A_IndividualAddressSerialNumber_Read.req (ack_request, priority, hop_count_type, serial_number)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:		this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be "system"
hop_count_type:		this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
serial_number:		this parameter shall contain the serial number

A_IndividualAddressSerialNumber_Read.Lcon (ack_request, priority, hop_count_type, serial_number, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be "system"
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
serial_number:		this parameter shall contain the serial number
a_status	ok:	this value of this parameter shall be used to indicate that the transmission of the A_IndividualAddressSerialNumber_Read.req has been successful
	not_ok:	this value of this parameter shall be used to indicate that the transmission of the A_IndividualAddressSerialNumber_Read.req did not succeed

A_IndividualAddressSerialNumber_Read.ind (priority, hop_count_type, serial_number)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be "system"
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
serial-number:	this parameter shall contain the serial number

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A_IndividualAddressSerialNumber_Read.res (ack_request, priority, hop_count_type, serial_number, domain_address)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:		this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
serial_number:		this parameter shall contain the serial number
domain_address:		this parameter shall contain the domain address of the remote device

A_IndividualAddressSerialNumber_Read.Rcon (ack_request, priority, hop_count_type, serial_number, domain_address, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
serial_number:		this parameter shall contain the serial number
domain_address:		this parameter shall contain the domain address of the remote device
a_status	ok:	this value of this parameter shall be used to indicate that the transmission of the A_IndividualAddressSerialNumber_Read.res has been successful
	not_ok:	this value of this parameter shall be used to indicate that the transmission of the A_IndividualAddressSerialNumber_Read.res did not succeed

A_IndividualAddressSerialNumber_Read.Acon (priority, hop_count_type, serial_number, individual_address, domain_address)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
serial_number:	this parameter shall contain the serial number
individual_address:	this parameter shall contain the individual address of the remote device
domain_address:	this parameter shall contain the domain address of the remote device

7.2.4 A_IndividualAddressSerialNumber_Write Service

The A_IndividualAddressSerialNumber_Write.req primitive shall be applied by the user of application layer, to modify the individual address in a communication partner. The communication partner shall be identified using the unique serial number (6 octets) of the device.

The local application layer shall accept the service request and pass it with a T_Data_Broadcast.req to the local transport layer. The parameter priority, implicitly with value ‘system’, shall be mapped to the corresponding parameter of the T_Data_Broadcast.req primitive; the TSDU shall be an A_IndividualAddressSerialNumber_Write-PDU.

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Octet 6						Octet 7								Octet 8 to Octet 13								Octet 14								Octet 15								Octet 16 to Octet 19							
						APCI								Serial number (6 octets)								New address (high)								New address (low)								Reserved (4 octets)							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI																																		
						1	1	1	1	0	1	1	1	1	0																																

Figure 20 – A_IndividualAddressSerialNumber_Write-PDU (Example)

The remote application layer shall map a T_Data_Broadcast.ind primitive with TSDU = A_IndividualAddressSerialNumber_Write-PDU to an A_IndividualAddress-SerialNumber_Write.ind primitive. The argument priority shall be mapped to the corresponding argument priority of the A_IndividualAddressSerialNumber_Write.ind primitive.

If the local application layer receives a T_Data_Broadcast.con from the local transport layer, it shall pass an A_IndividualAddressSerialNumber_Write.Lcon primitive to the local application process. If the confirmation is positive (t_status = ok), the local application layer shall pass a positive A_IndividualAddressSerialNumber_Write.Lcon(a_status = ok) to the local application process. If the confirmation is negative (t_status = not_ok), the local application layer shall pass an A_IndividualAddressSerialNumber_Write.Lcon (a_status = not_ok) to the local user indicating that the transmission of the associated T_Data_Broadcast.req did not succeed.

A_IndividualAddressSerialNumber_Write.req(ack_request, priority, hop_count_type, serial_number, newaddress)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
serial_number:	this parameter shall contain the serial number
newaddress:	this parameter shall contain the new value of the individual address for the remote device

A_IndividualAddressSerialNumber_Write.Lcon(ack_request, priority, hop_count_type, new_address, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
newaddress:		this parameter shall contain the new value of the individual address for the remote device
a_status:	ok:	this value of this parameter shall be used to indicate that the transmission of the A_IndividualAddressSerialNumber_Write.req has been successful
	not_ok:	this value of this parameter shall be used to indicate that the transmission of the A_IndividualAddressSerialNumber_Write.req did not succeed

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A_IndividualAddressSerialNumber_Write.ind(priority, hop_count_type, serial_number, newaddress)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
serial_number:	this parameter shall contain the serial number
newaddress:	this parameter shall contain the new value of the individual address

7.2.5 A_ServiceInformation_Indication_Write Service

The A_ServiceInformation_Indication_Write.req primitive shall be applied by the user of application layer, to inform communication partners about the status of the user application (running/stopped), duplicate individual address and verify mode. These elements are specified in ISO/IEC 14543-3-3 (EN 50090-3-2).

The local application layer shall accept the service request and pass it with a T_Data_Broadcast.req to the local transport layer. The parameter priority, implicitly with value ‘system’, shall be mapped to the corresponding parameter of the T_Data_Broadcast.req primitive, the TSDU shall be an A_ServiceInformation_Indication_Write-PDU.

Octet 6						Octet 7								Octet 8								Octet 9								Octet 10							
						APCI								Info																							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	reserved	reserved	reserved	reserved	reserved	verify mode	dupl. phys. Addr	appl. stopped	reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved
						1	1	1	1	0	1	1	1	1	1	0	0	0	0	0	x	x	x	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 21 – A_ServiceInformation_Indication_Write-PDU (Example)

The remote application layer shall map a T_Data_Broadcast.ind primitive with TSDU = A_ServiceInformation_Indication_Write-PDU to an A_ServiceInformation_Indication_Write.ind primitive. The argument priority shall be mapped to the corresponding argument priority of the A_ServiceInformation_Indication_Write.ind primitive.

If the local application layer receives a T_Data_Broadcast.con from the local transport layer, it shall pass an A_ServiceInformation_Indication_Write.Lcon primitive to the local application process. If the confirmation is positive (t_status = ok), the local application layer shall pass a positive A_ServiceInformation_Indication_Write.Lcon(a_status = ok) to the local application process. If the confirmation is negative (t_status = not_ok), the local application layer shall pass an A_ServiceInformation_Indication_Write.Lcon (a_status = not_ok) to the local user indicating that the transmission of the associated T_Data_Broadcast.req did not succeed.

A_ServiceInformation_Indication_Write.req(ack_request, priority, hop_count_type, info)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
info:	this parameter shall contain the service information

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A_ServiceInformation_Indication_Write.Lcon(ack_request, priority, hop_count_type, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be “system”
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
info:		this parameter shall contain the service information
a_status:	ok:	this value of this parameter shall be used to indicate that the transmission of the A_ServiceInformation_Indication_Write.req has been successful
	not_ok:	this value of this parameter shall be used to indicate that the transmission of the A_ServiceInformation_Indication_Write.req did not succeed

A_ServiceInformation_Indication_Write.ind(priority, hop_count_type, info)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
info:	this parameter shall contain the service information

7.2.6 A_DomainAddress_Write Service

The A_DomainAddress_Write.req primitive shall be applied by the user of application layer, to modify the Domain Address in a communication partner. The communication partner shall not identified in the service, i.e. the destination shall be identified by selecting a destination manually. This can be done by pressing a button on exactly one device that shall bring this device into a ´programming mode´, i.e. only the device where the button is pressed shall accept the A_DomainAddress_Write.ind, others shall ignore it. The way that a product is set to ´programming mode´ may be manufacturer specific.

The local application layer shall accept the service request and pass it with a T_Data_SystemBroadcast.req to the local transport layer. The parameter priority shall be mapped to the corresponding parameter of the T_Data_SystemBroadcast.req primitive, the TSDU shall be an A_DomainAddress_Write-PDU.

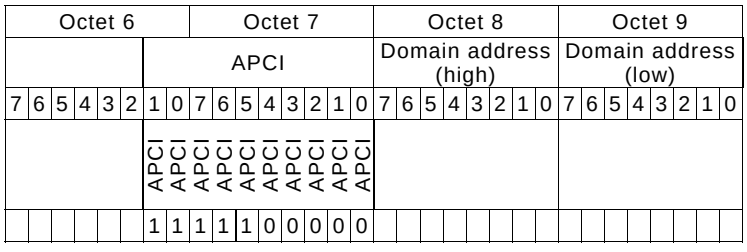


Figure 22 – A_DomainAddress_Write-PDU

The remote application layer shall map a T_Data_SystemBroadcast.ind primitive with TSDU = A_DomainAddress_Write-PDU to an A_DomainAddress_Write.ind primitive. The arguments priority and domain_address_new shall be mapped to the corresponding arguments of the A_DomainAddress_Write.ind primitive.

The application process shall ignore the A_DomainAddress_Write.ind primitive if the device is not in ´programming mode´.

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If the local application layer receives a T_Data_SystemBroadcast.con from the local transport layer it shall pass an A_DomainAddress_Write.Lcon primitive to the local application process. If the confirmation is positive (t_status = ok), the local application layer shall pass a positive A_DomainAddress_Write.Lcon(a_status = ok) to the local application process. If the confirmation is negative (t_status = not_ok), the local application layer shall pass an A_DomainAddress_Write.Lcon (a_status = not_ok) to the local user indicating that the transmission of the associated T_Data_SystemBroadcast.req did not succeed.

A_DomainAddress_Write.req(ack_request, priority, hop_count_type, domain_address_new)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:		this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
domain_address_new:		this parameter shall contain the new value of the Domain Address

A_DomainAddress_Write.Lcon(ack_request, priority, hop_count_type, domain_address_new, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
domain_address_new:		this parameter shall contain the new value of the Domain Address
a_status:	ok:	this value of this parameter shall be used to indicate that the transmission of the A_DomainAddress_Write.req has been successful
	not_ok:	this value of this parameter shall be used to indicate that the transmission of the A_DomainAddress_Write.req did not succeed

A_DomainAddress_Write.ind(priority, hop_count_type, domain_address_new)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
domain_address_new:	this parameter shall contain the new value of the Domain Address

7.2.7 A_DomainAddress_Read Service

The A_DomainAddress_Read.req primitive shall be applied by the user of application layer, to read the Domain Address from a communication partner. The communication partner shall not be identified in the service, i.e. the destination shall be defined by selecting a destination manually. This can be done by pressing a button on one or more devices that shall bring these devices into a ´programming mode´, i.e. only a device where the button is pressed shall accept the A_DomainAddress_Read.ind, others shall ignore it. The way that a product is set to ´programming mode´ may be manufacturer specific.

The local application layer shall accept the service request and pass it with a T_Data_SystemBroadcast.req to the local transport layer. The parameter priority shall be

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mapped to the corresponding parameter of the T_Data_SystemBroadcast.req primitive, the TSDU shall be an A_DomainAddress_Read-PDU.

The remote application layer shall map a T_Data_SystemBroadcast.ind primitive with TSDU = A_DomainAddress_Read-PDU to an A_DomainAddress_Read.ind primitive. The argument priority shall be mapped to the corresponding argument priority of the A_DomainAddress_Read.ind primitive.

The remote application process shall respond to the A_DomainAddress_Read.ind primitive with an A_DomainAddress_Read.res primitive only if the device is in ´programming mode´.

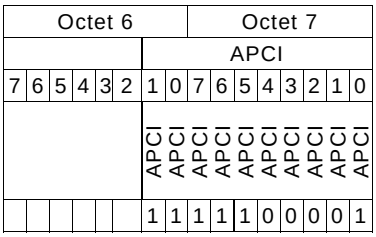


Figure 23 – A_DomainAddress_Read-PDU (Example)

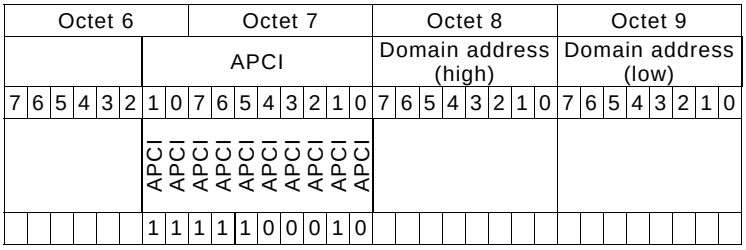


Figure 24 – A_DomainAddress_Response-PDU (Example)

The remote application layer shall accept the service response and pass it with a T_Data_SystemBroadcast.req to the remote transport layer, the TSDU shall be an A_Domain-Address_Response-PDU.

The local application layer shall map a T_Data_SystemBroadcast.ind primitive with TSDU = A_DomainAddress_Response-PDU to an A_DomainAddress_Read.Acon primitive. The argument priority shall be mapped to the corresponding argument priority of the A_DomainAddress_Read.Acon primitive.

A_DomainAddress_Read.req(ack_request, priority, hop_count_type)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used

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A_DomainAddress_Read.Lcon(ack_request, priority, hop_count_type, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
a_status:	ok:	this value of this parameter shall be used to indicate that the transmission of the A_DomainAddress_Read.req has been successful
	not_ok:	this value of this parameter shall be used to indicate that the transmission of the A_DomainAddress_Read.req did not succeed

A_DomainAddress_Read.ind(priority, hop_count_type)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not

A_DomainAddress_Read.res(ack_request, priority, hop_count_type, domain_address)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
domain_address:	this parameter shall contain the value of the domain address

A_DomainAddress_Read.Acon(priority, hop_count_type, domain_address)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
domain_address:	this parameter shall contain the value of the domain address

7.2.8 A_DomainAddressSelective_Read Service

The A_DomainAddressSelective_Read.req primitive shall be applied by the user of application layer, to read the domain address from the communication partner that is identified within the service. This service is particularly used to check the existence of any open media devices with the specified domain address in possibly neighbouring installations.

The local application layer shall accept the service request and pass it with a T_Data_SystemBroadcast.req to the local transport layer. The parameter priority shall be mapped to the corresponding parameter of the T_Data_SystemBroadcast.req primitive, the TSDU shall be an A_DomainAddressSelective_Read-PDU.

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Octet 6						Octet 7								Octet 8								Octet 9								Octet 10								Octet 11								Octet 12							
						APCI								Domain address (high)								Domain address (low)								Start address (high)								Start address (low)								Range							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI																																								
						1	1	1	1	1	0	0	0	1	1																																						

Figure 25 – A_DomainAddressSelective_Read-PDU (Example)

The remote application layer shall map a T_Data_SystemBroadcast.ind primitive with TSDU = A_DomainAddressSelective_Read-PDU to an A_DomainAddressSelective_Read.ind primitive. The arguments priority, domain_address, start_address and range shall be mapped to the corresponding arguments of A_DomainAddressSelective_Read.ind primitive.

The remote application process shall ignore the A_DomainAddressSelective_Read.ind primitive, if the domain address of the remote device does not match with to argument domain_address, or the individual address of the remote device is lower than the argument start_address or the individual address of the remote device is higher than the (start_address + range).

If the remote application process accepts the A_DomainAddressSelective_Read.ind primitive it shall respond with an A_DomainAddress_Read.res primitive after a wait time: (individual_address - start_address) Tmedia. If the received argument range was lower than 0xFF and application process receives during the waiting time an A_DomainAddress_Read.res, the transmission of the response shall be terminated.

A_DomainAddressSelective_Read.req(ack_request, priority, hop_count_type, domain_address, start_address, range)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
domain_address:	this parameter shall contain the domain address to be scanned
start_address:	this parameter shall contain the start individual address
range:	this parameter shall be used to indicate the range of individual addresses involved in the scan process (scan from start_address to start_address+range)

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A_DomainAddressSelective_Read.Lcon(ack_request, priority, hop_count_type, domain_address, start_address, range, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
domain_address:		this parameter shall contain the domain address to be scanned
start_address:		this parameter shall contain the start individual address
range		this parameter shall be used to indicate the range of individual addresses involved in the scan process (scan from start_address to start_address+range)
a_status:	ok:	this value of this parameter shall be used to indicate that the transmission of the A_DomainAddressSelective_Read.req has been successful
	not_ok:	this value of this parameter shall be used to indicate that the transmission of the A_DomainAddressSelective_Read.req has been successful did not succeed

A_DomainAddressSelective_Read.ind(priority, hop_count_type, domain_address, start_address, range)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
domain_address:	this parameter shall contain the domain address to be scanned
start_address:	this parameter shall contain the start individual address
range:	this parameter shall be used to indicate the range of individual addresses involved in the scan process (scan from start_address to start_address+range)

7.2.9 A_NetworkParameter_Read Service

The A_NetworkParameter_Read.req primitive shall be applied by the user of Application Layer of the management client to check about the configuration of a network parameter. The service shall be broadcast to all devices in the network. A device shall respond to the service if it complies to the conditions specified in the service parameters.

The local Application Layer shall accept the service request and pass it with a T_Data_Broadcast.req to the local Transport Layer. The parameter priority, implicitly with value ‘system’, shall be mapped to the corresponding parameter of the T_Data_Broadcast.req primitive, the TSDU shall be an A_NetworkParameter_Read-PDU.

Octet 6								Octet 7								Octet 8								Octet 9								Octet 10								Octet 11 to N							
						APCI										Parameter_type																				Test_info							
																Object_type																PID															
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI																																		
						1	1	1	1	0	1	1	0	1	0																																

Figure 26 – A_NetworkParameter_Read-PDU (Example)

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The remote Application Layer shall map a T_Data_Broadcast.ind primitive with TSDU= A_NetworkParameter_Read-PDU to an A_NetworkParameter_Read.ind primitive. The argument priority, implicitly with value ‘system’, shall be mapped to the corresponding argument priority of the A_NetworkParameter_Read.ind primitive.

The remote Application Layer shall accept the service response. If the parameter comm_mode equals “point_to_point, connectionless”, it shall pass the service with a T_Data_Individual.req to the local Transport Layer; the parameter ASAP shall be mapped to the corresponding parameter TSAP of the T_Data_Individual.req primitive. If the parameter comm_mode equals “point-to-all-points connectionless”, it shall pass the service with a T_Data_Broadcast.req to the local Transport Layer. The TSDU shall be always an A_NetworkParameter_Response-PDU.

Octet 6								Octet 7								Octet 8								Octet 9								Octet 10								Octet 11 to N								Octet N+1 to 21							
						APCI										Parameter_type																				Test_info								Test_result							
																Object_type																PID																			
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI																																									
						1	1	1	1	0	1	1	0	1	1																																								

Figure 27 – A_NetworkParameter_Response-PDU (Example)

The local application layer shall map a T_Data_Broadcast.ind primitive or a T_Data_Individual.ind, with TSDU = A_NetworkParameter_Response-PDU to an A_NetworkParameter_Read.Acon primitive. The parameter priority, implicitly with value ‘system’, shall be mapped to the corresponding parameter priority of the A_NetworkParameter_Read.Acon primitive. The parameter TSAP shall be mapped to the corresponding parameter ASAP of the A_NetworkParameter_Read.Acon primitive.

A_NetworkParameter_Read.req(hop_count_type, parameter_type, priority, test_info)

hop_count_type:	hop count 7 or standard
parameter_type:	network parameter type that is verified, structured as Interface Object Type and Property Identifier
priority:	system, urgent, normal or low priority
test_info:	value against which the resource indicated by parameter_type is tested

A_NetworkParameter_Read.Lcon(hop_count_type, parameter_type, priority, test_info, a_status)

hop_count_type:		hop count 7 or standard
parameter_type:		network parameter type that is verified, structured as Interface Object Type and Property Identifier
priority:		system, urgent, normal or low priority
test_info		value against which the resource indicated by parameter_type is tested
a_status:	OK:	A_NetworkParameter_Read.req sent successfully with T_Data_Broadcast service
	not_ok:	transmission of the associated T_Data_Broadcast request frame did not succeed

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A_NetworkParameter_Read.ind(ASAP, hop_count_type, parameter_type, priority, test_info)

ASAP:	local reference of the service access point or individual address
hop_count_type:	hop count 7 or standard
parameter_type:	network parameter type that is verified, structured as Interface Object Type and Property Identifier
priority:	system, urgent, normal or low priority
test_info:	value against which the resource indicated by parameter_type is tested

A_NetworkParameter_Read.res(ASAP, comm_mode, hop_count_type, parameter_type, priority, test_info, test_result)

ASAP:	local reference of the service access point or individual address
comm_mode:	point-to-all-points connectionless communication mode or point-to-point connectionless communication mode
hop_count_type:	hop count 7 or standard
individual_address:	the destination address for the service
parameter_type:	network parameter type that is verified, structured as Interface Object Type and Property Identifier
priority:	system, urgent, normal or low priority
test_info:	value against which the resource indicated by parameter_type is tested
test_result:	parameter_type dependent response

A_NetworkParameter_Read.Rcon(ASAP, comm_mode, hop_count_type, parameter_type, priority, test_info, test_result, a_status)

ASAP:		local reference of the service access point or individual address
comm_mode:		point-to-all-points connectionless communication mode or point-to-point connectionless communication mode
hop_count_type:		hop count 7 or standard
individual_address:		the destination address for the service
parameter_type:		network parameter type that is verified, structured as Interface Object Type and Property Identifier
priority:		system, urgent, normal or low priority
test_info:		value against which the resource indicated by parameter_type is tested
test_result:		parameter_type dependent response
a_status:	OK:	A_NetworkParameter_Read.res sent successfully with T_Data_Broadcast or T_Data_Individual service
	not_ok:	transmission of the associated T_Data_Broadcast or T_Data_Individual request frame did not succeed

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A_NetworkParameter_Read.Acon(ASAP, hop_count_type, individual_address, parameter_type, priority, test_info, test_result)

ASAP:	local reference of the service access point or individual address
hop_count_type:	hop count 7 or standard
individual_address:	the individual address of the device that has sent the response
parameter_type:	network parameter type that is verified, structured as Interface Object Type and Property Identifier
priority:	system, urgent, normal or low priority
test_info:	value against which the resource indicated by parameter_type is tested
test_result:	parameter_type dependent response

7.2.10 A_NetworkParameter_Write Service

The A_NetworkParameter_Write.req primitive shall be applied by the user of Application Layer of the management client to set network configuration information in one or multiple management servers. The service can be transmitted on either point-to-point connection-less or on point-to-all points (broadcast) communication mode. This shall be specified in the parameter comm_mode of the A_NetworkParameter_Write.req primitive.

The local Application Layer shall accept the service request. If the parameter comm_mode equals “point-to-point, connectionless”, it shall pass the service with a T_Data_Individual.req to the local Transport Layer; the parameter ASAP shall be mapped to the corresponding parameter TSAP of the T_Data_Individual.req primitive. If the parameter comm_mode equals “point-to-all-points connectionless”, it shall pass the service with a T_Data_Broadcast.req to the local Transport Layer. The TSDU shall in both cases always be an A_NetworkParameter_Write-PDU.

If the remote Application Layer receives a T_Data_Individual.ind or a T_Data_Broadcast.ind with TSDU = A_NetworkParameter_Write-PDU, it shall map the service primitive to an A_NetworkParameter_Write.ind primitive. The parameter priority, implicitly with value ‘system’, shall be mapped to the corresponding parameter priority of the A_NetworkParameter_Write.ind primitive.

Octet 6								Octet 7								Octet 8								Octet 9								Octet 10								Octet 11…N							
						APCI										Parameter type																				Value							
																Interface object type																Property-ID															
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI																																		
						1	1	1	1	1	0	0	1	0	0																																

Figure 28 – A_NetworkParameter_Write-PDU (Example)

Prior to passing an A_NetworkParameter_Write.Lcon primitive to the local application process, the local Application Layer needs a T_Data_Individual.con or a T_Data_Broadcast.con, depending on the parameter comm_mode of the service request, from the local Transport Layer. If the confirmation is positive (t_status = ok), the local Application Layer shall pass a positive A_NetworkParameter_Write.Lcon(a_status = ok) to the local application process. If the confirmation is negative (t_status = not_ok), the local Application Layer shall pass an A_NetworkParameter_Write.Lcon (a_status = not_ok) to the local user indicating that the transmission of the associated Transport Layer specification did not succeed.

NOTE This service is as such not confirmed by the remote partner. The A_NetworkParameter_Write.Lcon is only a local confirmation caused by the local Transport Layer confirmation, basically caused by the Data Link Layer confirmation (ok, not_ok).

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A_NetworkParameter_Write.req(ASAP, comm_mode, hop_count_type, parameter_type, priority, value)

ASAP:	local reference of the service access point or individual address
comm_mode:	point-to-all-points connectionless communication mode or point-to-point connectionless communication mode
hop_count_type:	hop count 7 or standard
parameter_type:	the network parameter that shall be set, structured as Interface Object Type and Property Identifier
priority:	system, urgent, normal or low priority
value:	value to which the network parameter indicated by parameter_type shall be set

A_NetworkParameter_Write.Lcon(ASAP, comm_mode, hop_count_type, parameter_type, priority, value, a_status)

ASAP:		local reference of the service access point or individual address
comm_mode:		point-to-all-points connectionless communication mode or point-to-point connectionless communication mode
hop_count_type:		hop count 7 or standard
parameter_type:		the network parameter that shall be set, structured as Interface Object Type and Property Identifier
priority:		system, urgent, normal or low priority
value:		value to which the network parameter indicated by parameter_type shall be set
a_status:	OK:	A_NetworkParameter_Write.req sent successfully with the requested Transport Layer service
	not_ok:	transmission of the requested Transport Layer service did not succeed

A_NetworkParameter_Write.ind(ASAP, parameter_type, priority, value)

ASAP:	local reference of the service access point or individual address
parameter_type:	the network parameter that shall be set, structured as Interface Object Type and Property Identifier
priority:	system, urgent, normal or low priority
value:	value to which the network parameter indicated by parameter_type shall be set

7.3 Application layer services on point-to-point connection-less communication mode

7.3.1 General

A point-to-point connection-less communication mode shall be used to connect one device with another device. The following services can be applied on the point-to-point connection-less communication mode as well as on the point-to-point connection-oriented communication mode. The following sub-clauses specify the mapping of the services on the point-to-point connection-less communication mode. For using these services on a connection oriented communication mode, the T_Data_Connected service of transport layer shall be applied instead of the T_Data_Individual service.

For the connection-less communication mode the ASAP parameter shall be the individual address of the communication partner

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For the connection-oriented communication mode the ASAP parameter shall be the identifier of the communication relationship

The services on the point-to-point connection-less communication mode shall allow accessing properties of interface objects in the communication partner. Interface objects and their structure are specified in ISO/IEC 14543-3-3 (EN 50090-3-2).

7.3.2 A_PropertyValue_Read Service

The A_PropertyValue_Read.req primitive shall be applied by the user of application layer to read the value of a property of an interface object. The communication partner shall be addressed with a local ASAP that shall be mapped to a individual address by transport layer. The object of the partner shall be addressed with an object_index and the property of the object shall be addressed with a property_id. The nr_of_elem and start_index shall indicate the number of array elements starting with the given start_index in the property value that the user wants to read. The user of application layer in the partner device shall respond with an A_PropertyValue_Read.res, i.e. the service shall be confirmed by the remote application process.

The local application layer shall accept the service request and pass it with a T_Data_Individual.req to the local transport layer. The parameters ASAP and priority shall be mapped to the corresponding parameters ASAP and priority of the T_Data_Individual.req primitive, the TSDU shall be an A_PropertyValue_Read-PDU.

The remote application layer shall map a T_Data_Individual.ind primitive with TSDU = A_PropertyValue_Read-PDU to an A_PropertyValue_Read.ind primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_PropertyValue_Read.ind primitive.

The remote application process shall respond to the A_PropertyValue_Read.ind primitive with an A_PropertyValue_Read.res primitive containing the requested number of elements of the property value of the property of the associated interface object. If the remote application process has a problem, e.g. object or property doesn't exist or the data does not fit in a PDU or the requester has not the required access rights, then the nr_of_elem of the A_PropertyValue_Response-PDU shall be zero and shall contain no data.

Octet 6								Octet 7								Octet 8								Octet 9								Octet 10				Octet 11							
						APCI										Object_index								Property_id								nr_of_elem				Start_index							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI																																
						1	1	1	1	0	1	0	1	0	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Figure 29 – A_PropertyValue_Read-PDU (Example)

Octet 6								Octet 7								Octet 8								Octet 9								Octet 10				Octet 11								Octet 12 to Octet N							
						APCI										Object_index								Property_id								nr_of_elem				Start_index								Data							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI																																								
						1	1	1	1	0	1	0	1	1	0																																						

Figure 30 – A_PropertyValue_Response-PDU (Example)

The remote application layer shall accept the service response and pass it with a T_Data_Individual.req to the remote transport layer. The parameters ASAP and priority shall be mapped to the corresponding parameters TSAP and priority of the T_Data_Individual.req primitive, the TSDU shall be an A_PropertyValue_Response-PDU.

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The local application layer shall map a T_Data_Individual.ind primitive with TSDU = A_PropertyValue_Response-PDU to an A_PropertyValue_Read.Acon primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_PropertyValue_Read.Acon primitive.

A_PropertyValue_Read.req(ack_request, priority, hop_count_type, ASAP, object_index, property_id, nr_of_elem, start_index)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point or individual address
object_index:	this parameter shall contain the object_index of the object addressed
property_id:	this parameter shall contain the property_id of the property of the object
nr_of_elem:	this parameter shall contain the number of array elements that shall be read in the property value
start_index:	this parameter shall contain the array index of the first array element that shall be read

A_PropertyValue_Read.Lcon(ack_request, priority, hop_count_type, ASAP, object_index, property_id, nr_of_elem, start_index, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
ASAP:		this parameter shall be used to contain the service access point or individual address
object_index:		this parameter shall contain the object_index of the object addressed
property_id:		this parameter shall contain the property_id of the property of the object
nr_of_elem:		this parameter shall contain the number of array elements that shall be read in the property value
start_index:		this parameter shall contain the array index of the first array element that shall be read
a_status:	ok:	this value of this parameter shall be used to indicate that the transmission of the A_PropertyValue_Read.req has been successful
	not_ok:	this value of this parameter shall be used to indicate that the transmission of the A_PropertyValue_Read.req did not succeed

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A_PropertyValue_Read.ind(priority, hop_count_type, ASAP, object_index, property_id, nr_of_elem, start_index)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point or individual address
object_index:	this parameter shall contain the object_index of the object addressed
property_id:	this parameter shall contain the property_id of the property of the object addressed
nr_of_elem:	this parameter shall contain the number of array elements that shall be read in the property value
start_index:	this parameter shall contain the array index of the first array element that shall be read

A_PropertyValue_Read.res(ack_request, priority, hop_count_type, ASAP, object_index, property_id, nr_of_elem, start_index, data)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point or individual address
object_index:	this parameter shall contain the object_index of the addressed object
property_id:	this parameter shall contain the property_id of the property of the addressed object
nr_of_elem:	this parameter shall contain the number of array elements that has been read in the property value, or zero if a problem occurred
start_index:	this parameter shall contain the array index of the first array element read
data:	this parameter shall contain the value of the array elements read, or no data, if a problem occurred

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A_PropertyValue_Read.Acon(priority, hop_count_type, ASAP, object_index, property_id, nr_of_elem, start_index, data)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point or individual address
object_index:	this parameter shall contain the object_index of the object addressed
property_id:	this parameter shall contain the property_id of the property of the addressed object
nr_of_elem:	this parameter shall contain the number of array elements that has been read in the property value, or zero if a problem occurred
start_index:	this parameter shall contain the array index of the first array element read
data:	this parameter shall contain the value of the array elements read, or no data, if a problem occurred

7.3.3 A_PropertyValue_Write Service

The A_PropertyValue_Write.req primitive shall be applied by the user of application layer to modify the value of a property of an interface object. The communication partner shall be addressed with a local ASAP that shall be mapped to an individual address by the transport layer. The object of the partner shall be addressed with the object_index and the property of the object shall be addressed with the property_id. The nr_of_elem and start_index shall indicate the number of array elements that shall be written in the property value, starting with the given start_index.

The local application layer shall accept the service request and pass it with a T_Data_Individual.req to the local transport layer. The parameters ASAP and priority shall be mapped to the corresponding parameters TSAP and priority of the T_Data_Individual.req primitive, the TSDU shall be an A_PropertyValue_Write-PDU.

The remote application layer shall map a T_Data_Individual.ind primitive with TSDU = A_PropertyValue_Write-PDU to an A_PropertyValue_Write.ind primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_PropertyValue_Write.ind primitive.

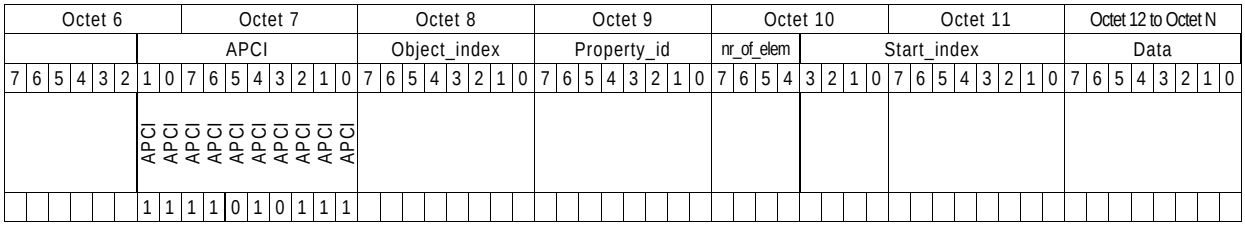


Figure 31 – A_PropertyValue_Write-PDU (Example)

The remote application process shall respond to the A_PropertyValue_Write.ind primitive with an A_PropertyValue_Read.res primitive containing the requested number of elements of the property value of the property of the associated object. The value of the property of the associated object shall be explicitly read back after writing to it.

If the remote application process has a problem, e.g. object or property doesn’t exist or the requester does not have the required access rights, then the nr_of_elem of the A_PropertyValue_Response-PDU, as specified in Figure 30 shall be zero and shall contain no data.

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The remote application layer shall accept the service response and pass it with a T_Data_Individual.req to the local transport layer. The parameters ASAP and priority shall be mapped to the corresponding parameters TSAP and priority of the T_Data_Individual.req primitive, the TSDU shall be an A_PropertyValue_Response-PDU.

The local application layer shall map a T_Data_Individual.ind primitive with TSDU = A_PropertyValue_Response-PDU to an A_PropertyValue_Write.Acon primitive if an A_PropertyValue_Write-PDU has been sent before to this communication partner to this object and property. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_PropertyValue_Read.Acon primitive.

A_PropertyValue_Write.req(ack_request, priority, hop_count_type, ASAP, object_index, property_id, nr_of_elem, start_index, data)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point or individual address
object_index:	this parameter shall contain the object_index of the addressed object
property_id:	this parameter shall contain the property_id of the property of the addressed object
nr_of_elem:	this parameter shall contain the number of array elements that shall be written in the property value
start_index:	this parameter shall contain the array index of the first array element that shall be written
data:	this parameter shall contain the data that shall be written to the array elements

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A_PropertyValue_Write.Lcon(ack_request, priority, hop_count_type, ASAP, object_index, property_id, nr_of_elem, start_index, data, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
ASAP:		this parameter shall be used to contain the service access point or individual address
object_index:		this parameter shall contain the object_index of the addressed object
property_id:		this parameter shall contain the property_id of the property of the addressed object
nr_of_elem:		this parameter shall contain the number of array elements that shall be written in the property value
start_index:		this parameter shall contain the array index of the first array element that shall be written
data:		this parameter shall contain the data that shall be written to the array elements
a_status:	ok:	this value of this parameter shall be used to indicate that the transmission of the A_PropertyValue_Write.req has been successful
	not_ok:	this value of this parameter shall be used to indicate that the transmission of the A_PropertyValue_Write.req did not succeed

A_PropertyValue_Write.ind(priority, hop_count_type, ASAP, object_index, property_id, nr_of_elem, start_index, data)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point or individual address
object_index:	this parameter shall contain the object_index of the addressed object
property_id:	this parameter shall contain the property_id of the property of the addressed object
nr_of_elem:	this parameter shall contain the number of array elements that shall be written in the property value
start_index:	this parameter shall contain the array index of the first array element that shall be written
data:	this parameter shall contain the data that shall be written to the array elements

7.3.4 A_PropertyDescription_Read Service

The A_PropertyDescription_Read.req primitive shall be applied by the user of application layer, to read the description of the property of an object. The communication partner shall be addressed with a local ASAP that shall be mapped to a individual address by transport layer. The object of the partner shall be addressed with an object_index and the property of the

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object shall be addressed with a property_id or with a property_index. The property_index shall be used only if the property_id is zero. The property_index, if evaluated, shall address the property of the object with a sequential number, i.e. property_index = 0 shall mean first property of the associated object, property_index = 1 shall mean second property. The service shall be confirmed by the remote application process.

The local application layer shall accept the service request and pass it with a T_Data_Individual.req to the local transport layer. The parameters ASAP and priority shall be mapped to the corresponding parameters TSAP and priority of the T_Data_Individual.req primitive, the TSDU shall be an A_PropertyDescription_Read-PDU.

The remote application layer shall map a T_Data_Individual.ind primitive with TSDU = A_PropertyDescription_Read-PDU to an A_PropertyDescription_Read.ind primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_PropertyDescription_Read.ind primitive.

The remote application process shall respond to the A_PropertyDescription_Read.ind primitive with an A_PropertyDescription_Read.res primitive containing the description of the property of the associated property of the object addressed.

If the property_id in the A_PropertyDescription_Read-PDU is zero, the remote application process shall use the indicated property_index to access the property description, otherwise the property_id shall be used. If the remote application process has a problem, e.g. object or property doesn't exist, then the max_nr_of_elem of the A_PropertyDescription_Response-PDU shall be zero.

The service shall not be confirmed negative for authorization reasons (see A_Authorize_Request Service in 7.4.8).

Octet 6								Octet 7								Octet 8								Octet 9								Octet 10							
								APCI								Object_index								Property_id								Property_index							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
								APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI																								
						1	1	1	1	0	1	1	0	0	0	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Figure 32 – A_PropertyDescription_Read-PDU (Example)

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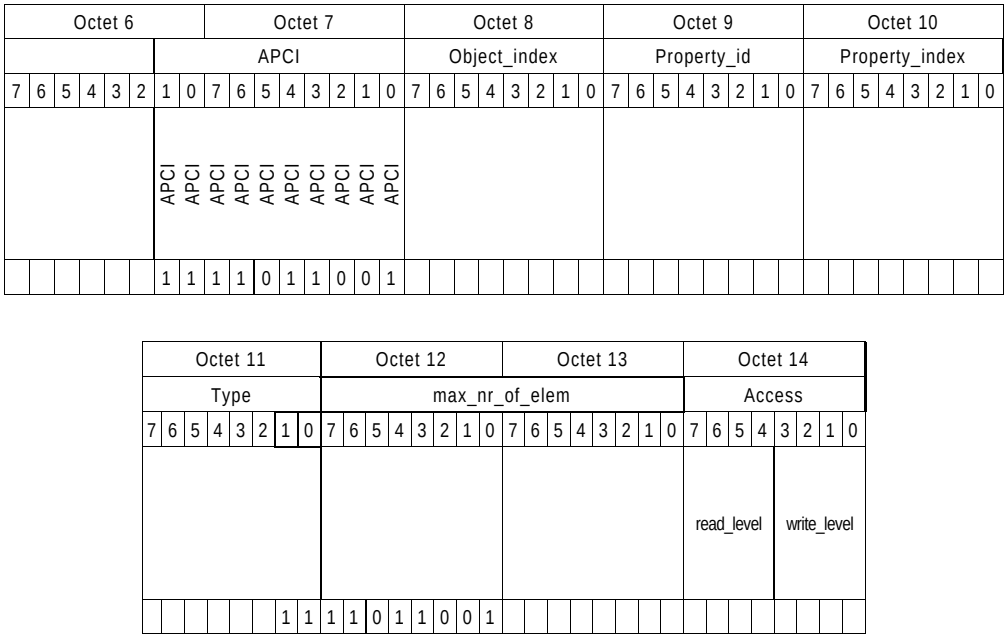


Figure 33 – A_PropertyDescription_Response-PDU (Example)

The remote application layer shall accept the service response and pass it with a T_Data_Individual.req to the local transport layer. The parameters ASAP and priority shall be mapped to the corresponding parameters TSAP and priority of the T_Data_Individual.req primitive, the TSDU shall be a A_PropertyDescription_Response-PDU.

The local application layer shall map a T_Data_Individual.ind primitive with TSDU = A_PropertyDescription_Response-PDU to an A_PropertyDescription_Read.Acon primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_PropertyDescription_Read.Acon primitive.

A_PropertyDescription_Read.req(ack_request, priority, hop_count_type, ASAP, object_index, property_id, property_index)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point or individual address
object_index:	this parameter shall contain the object_index of the addressed object
property_id:	this parameter shall contain the property_id of the property of the addressed object
property_index:	this parameter shall contain the sequential property number of the property of the addressed object

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A_PropertyDescription_Read.Lcon(ack_request, priority, hop_count_type, ASAP, object_index, property_id, property_index, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
ASAP:		this parameter shall be used to contain the service access point or individual address
object_index:		this parameter shall contain the object_index of the addressed object
property_id:		this parameter shall contain the property_id of the property of the addressed object
property_index:		this parameter shall contain the sequential property number of the property of the addressed object
a_status:	ok:	this value of this parameter shall be used to indicate that the transmission of the A_PropertyDescription_Read.req has been successful
	not_ok:	this value of this parameter shall be used to indicate that the transmission of the A_PropertyDescription_Read.req did not succeed

A_PropertyDescription_Read.ind(priority, hop_count_type, ASAP, object_index, property_id, property_index)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point or individual address
object_index:	this parameter shall contain the object_index of the addressed object
property_id:	this parameter shall contain the property_id of the property of the addressed object
property_index:	this parameter shall contain the sequential property number of the property of the addressed object

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A_PropertyDescription_Read.res(ack_request, priority, hop_count_type, ASAP, object_index, property_id, property_index, type, max_nr_of_elem, access)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point or individual address
object_index:	this parameter shall contain the object_index of the addressed object
property_id:	this parameter shall contain the property_id of the property of the addressed object
property_index:	this parameter shall contain the sequential property number of the property of the addressed object
max_nr_of_elem:	this parameter shall contain the maximum number of elements of the array of the property value of the addressed object; it shall contain zero to indicate a problem
access:	this parameter shall contain the access level to read or write to the property value of the property of the addressed object

A_PropertyDescription_Read.Acon(priority, hop_count_type, ASAP, object_index, property_id, property_index, type, max_nr_of_elem, access)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point or individual address
object_index:	this parameter shall contain the object_index of the addressed object
property_id:	this parameter shall contain the property_id of the property of the addressed object
property_index:	this parameter shall contain the sequential property number of the property of the addressed object
max_nr_of_elem:	this parameter shall contain the maximum number of elements of the array of the property value of the addressed object; it shall contain zero to indicate a problem
access:	this parameter shall contain the access level to read or write to the property value of the property of the addressed object

7.3.5 A_DeviceDescriptor_Read Service

The A_DeviceDescriptor_Read.req primitive shall be applied by the user of application layer, to read the device descriptor of the communication controller in a communication partner. The service shall be confirmed by the remote application process containing the device descriptor information.

The local application layer shall accept the service request and pass it with a T_Data_Individual.req to the local transport layer. The parameters ASAP and priority shall be

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mapped to the corresponding parameters of the T_Data_Individual.req primitive, the TSDU shall be an A_DeviceDescriptor_Read-PDU.

The remote application layer shall map a T_Data_Individual.ind primitive with TSDU = A_DeviceDescriptor_Read-PDU to an A_DeviceDescriptor_Read.ind primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_DeviceDescriptor_Read.ind primitive.

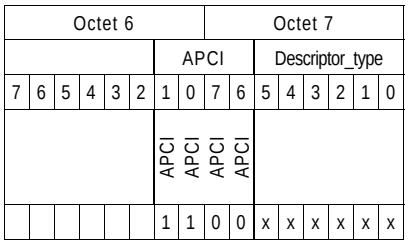


Figure 34 – A_DeviceDescriptor_Read-PDU (Example)

The remote application process shall respond to the A_DeviceDescriptor_Read.ind primitive with an A_DeviceDescriptor_Read.res primitive containing the device descriptor information.

The device descriptor information that shall be used is specified in ISO/IEC 14543-3-4 (EN 50090-7-1).

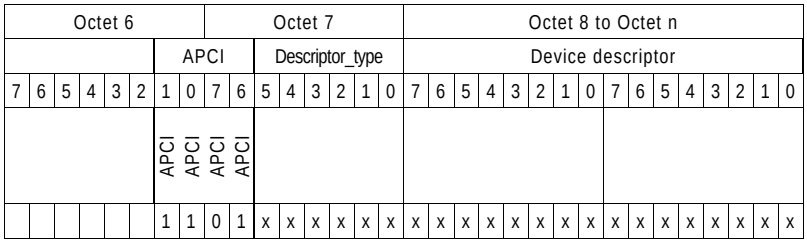


Figure 35 – A_DeviceDescriptor_Response-PDU (Example)

The remote application layer shall accept the service response and pass it with a T_Data_Individual.req to the local transport layer. The parameters TSAP and priority shall be mapped to the corresponding parameters of the T_Data_Individual.req primitive, the TSDU shall be a A_DeviceDescriptor_Response-PDU.

The local application layer shall map a T_Data_Individual.ind primitive with TSDU = A_DeviceDescriptor_Response-PDU to an A_DeviceDescriptor_Read.Acon primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_DeviceDescriptor_Read.Acon primitive.

A_DeviceDescriptor_Read.req(ack_request, priority, hop_count_type, ASAP, descriptor_type)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point
descriptor_type	this parameter shall contain the requested device descriptor type

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A_DeviceDescriptor_Read.Lcon(ack_request, priority, hop_count_type, ASAP, descriptor_type, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
ASAP:		this parameter shall be used to contain the service access point
descriptor_type		this parameter shall contain the requested device descriptor type
a_status:	ok:	this value of this parameter shall be used to indicate that the transmission of the A_DeviceDescriptor_Read.req has been successful
	not_ok:	this value of this parameter shall be used to indicate that the transmission of the A_DeviceDescriptor_Read.req did not succeed

A_DeviceDescriptor_Read.ind(priority, hop_count_type, ASAP, descriptor_type)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point
descriptor_type	this parameter shall contain the requested device descriptor type

A_DeviceDescriptor_Read.res(ack_request, priority, hop_count_type, ASAP, descriptor_type, device_descriptor)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point
descriptor_type	this parameter shall contain the descriptor type of the device descriptor contained in the response
device_descriptor:	this parameter shall contain the device descriptor of the remote device

A_DeviceDescriptor_Read.Acon(priority, hop_count_type, ASAP, descriptor_type, device_descriptor)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point
descriptor_type	this parameter shall contain the descriptor type of the device descriptor contained in the response r
device_descriptor:	this parameter shall contain the device descriptor of the remote device

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7.3.6 A_Link_Read Service

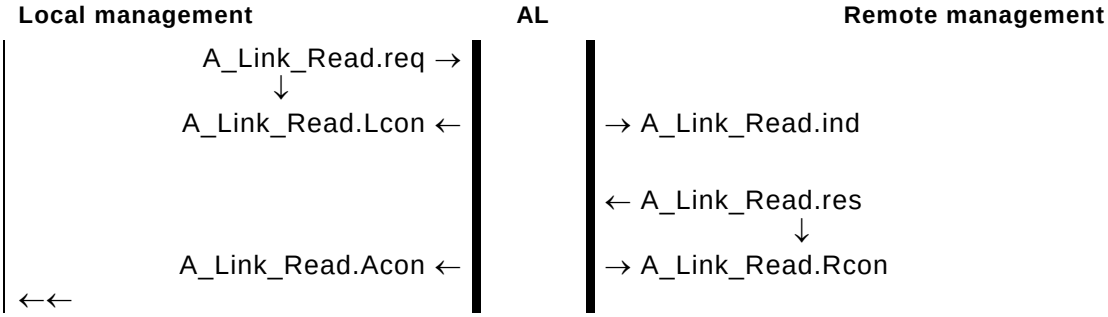


Figure 36 – Message flow for A_Link_Read Service

The A_Link_Read.req primitive shall be applied by the user of Application Layer (Local Management) to read the links to a given Group Object in a communication partner. It shall indicate the start_index from which Group Addresses shall be read in the list of links.

Octet 6								Octet 7								Octet 8								Octet 9							
								APCI								Group_object_number								Start_index							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI																
						1	1	1	1	1	0	0	1	0	1	x	x	x	x	x	x	x	x	0	0	0	0				

Figure 37 – A_Link_Read-PDU (Example)

The remote management process shall respond to the A_Link_Read.ind primitive with an A_Link_Read.res primitive.

Octet 6						Octet 7								Octet 8								Octet 9								Octet 10								...								Octet N ≤ 21							
						APCI								Group_object_number								Sending_-address				Start_-address				Group_address_list																									
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI									S	S	S	S	–	–	–	–																								
						1	1	1	1	1	0	0	1	1	0	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Figure 38 – A_Link_Response-PDU

This response shall indicate the updated list of links on the addressed Group Object, and the sending Group Address if any.

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A_Link_Read.req (ack_request, priority, hop_count_type, ASAP, group_object_number, start_index)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point or individual address
group_object_number:	local index of the intended Group Object
start_index	index of first GA to send back in the list of GAs attached to the Group Object

A_Link_Read.res (ack_request, priority, hop_count_type, ASAP, group_object_number, sending_address, start_index, group_address_list)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point or individual address
group_object_number:	local index of the intended Group Object
sending_address:	index of the sending address in the list of GAs attached to the Group Object
start_index:	index of first transmitted GA in the list of GAs attached to the Group Object
group_address_list:	list of Group Addresses connected to the Group Object; 0 to 6 group addresses can be contained, each occupying.

7.3.7 A_Link_Write Service

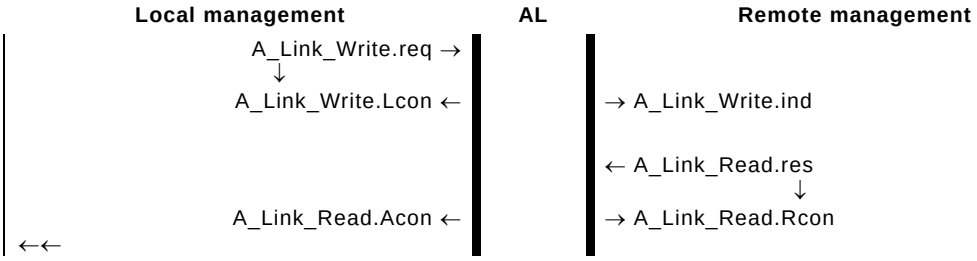


Figure 39 – Message flow for A_Link_Write Service

The A_Link_Write.req primitive shall be applied by the user of Application Layer (Local Management) to write a link to a given Group Object in a communication partner. The contained flags shall indicate that the action is “add a link”. It shall in addition indicate if the Group Address is a sending address or not.

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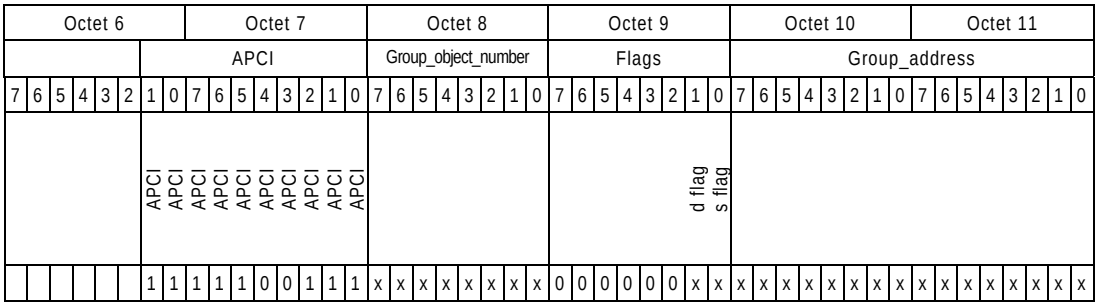


Figure 40 – A_Link_Write-PDU

The remote management process shall respond to the A_Link_Write.ind primitive with an A_Link_Read.res primitive.

The Link Management information that shall be used is specified in ISO/IEC 14543-3-4 (EN 50090-7-1).

A_Link_Write.req (ack_request, priority, hop_count_type, ASAP, group_object_number, flags, group_address)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point or individual address
group_object_number:	local index of the intended Group Object
flags:	action to be done (delete/add); sending at flag (yes/no)
group_address:	Group Address corresponding to the link to add or suppress

7.4 Application layer services on point-to-point connection-oriented communication mode

7.4.1 General

A Point-to-point connection-oriented communication mode shall connect one device with another device. The following services can be applied on point-to-point connection-oriented communication modes if the connection is established; the requirements for establishing a connection between devices are specified in ISO/IEC 14543-3-2. Due to the behaviour of the transport layer state machine, the user of the application layer shall take into account that the connection can be released by the remote communication partner or by an error detected in the communication protocol. Therefore a T_Disconnect.ind primitive can occur at any time, i.e. also if the user of application layer is waiting for a confirmation from the application layer. The transport layer services T_Connect.ind and T_Disconnect.ind shall be mapped transparently to A_Connect.ind and A_Disconnect.ind service and passed to the user of application layer.

The application layer shall also provide an access protection mechanism on the point-to-point connection-oriented communication mode by an authorization procedure. This procedure is described in 7.4.8.

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7.4.2 A_ADC_Read Service

The A_ADC_Read.req primitive shall be applied by the user of application layer to read the value of the Analog-to-Digital (AD)-converter. The service shall be confirmed by the remote application process containing the value of the converter.

The local application layer shall accept the service request and pass it with a T_Data_Connected.req to the local transport layer. The parameters ASAP and priority shall be mapped to the corresponding parameters of the T_Data_Connected.req primitive, the TSDU shall be an A_ADC_Read-PDU.

The remote application layer shall map a T_Data_Connected.ind primitive with TSDU = A_ADC_Read-PDU to an A_ADC_Read.ind primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_ADC_Read.ind primitive.

The A_ADC_Read-PDU shall contain the channel number of the AD-converter and the number of consecutive read operations to the AD-converter.

Octet 6								Octet 7								Octet 8							
						APCI										Read_count							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI		APCI		Channel_nr													
						0	1	1	0	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Figure 41 – A_ADC_Read-PDU (Example)

The remote application process shall respond to the A_ADC_Read.ind primitive with an A_ADC_Read.res primitive containing the value of the AD-converter computed by the summation of the consecutive Central Processing Unit (CPU) accesses. If the remote application process has a problem, e.g. overflow when computing the summation, or wrong channel number, then the read_count of the A_ADC_Response-PDU shall be zero.

Octet 6								Octet 7								Octet 8								Octet 9								Octet 10							
						APCI										Read_count								Sum of AD_converter_access															
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
										Channel_nr													Value high								Value low							
						APCI		APCI																															
						0	1	1	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Figure 42 – A_ADC_Response-PDU (Example)

The remote application layer shall accept the service response and pass it with a T_Data_Connected.req to the local transport layer. The parameters ASAP and priority shall be mapped to the corresponding parameters of the T_Data_Connected.req primitive, the TSDU shall be a A_ADC_Response-PDU.

The local application layer shall map a T_Data_Connected.ind primitive with TSDU = A_ADC_Response-PDU to an A_ADC_Read.Acon primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_ADC_Read.Acon primitive.

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A_ADC_Read.req(ack_request, priority, hop_count_type, ASAP, channel_nr, read_count)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:		this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:		this parameter shall be used to contain the service access point
channel_nr:		this parameter shall number of the channel of the AD-converter that shall be read
read_count:		this parameter shall contain the number of desired consecutive CPU accesses that shall be done to the requested AD-converter channel

A_ADC_Read.Lcon(ack_request, priority, hop_count_type, ASAP, channel_nr, read_count, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
ASAP:		this parameter shall be used to contain the service access point
channel_nr:		this parameter shall contain the number of the AD-converter channel that shall be read
read_count:		this parameter shall contain the number of desired consecutive CPU accesses that shall be done to the requested AD-converter channel
a_status:	ok:	this value of this parameter shall be used to indicate that the transmission of the A_ADC_Read.req service has been successful
	not_ok:	this value of this parameter shall be used to indicate that the transmission of the A_ADC_Read.req service did not succeed

A_ADC_Read.ind(priority, hop_count_type, ASAP, channel_nr, read_count)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point
channel_nr:	this parameter shall contain the number of the AD-converter channel that shall be read
read_count:	this parameter shall contain the number of desired consecutive CPU accesses that shall be done to the requested AD-converter channel

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A_ADC_Read.res(ack_request, priority, hop_count_type, ASAP, channel_nr, read_count, sum)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point
channel_nr:	this parameter shall contain the number of the AD-converter channel that has been read
read_count:	this parameter shall contain the number of executed consecutive CPU accesses to the requested AD-converter channel; it shall contain zero to indicate a problem
sum:	this parameter shall contain the sum of the consecutively read AD-converter values

A_ADC_Read.Acon(priority, hop_count_type, ASAP, channel_nr, read_count, sum)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point
channel_nr:	this parameter shall contain the number of the AD-converter channel that has been read
read_count:	this parameter shall contain the number of executed consecutive CPU accesses to the requested AD-converter channel; it shall contain zero to indicate a problem
sum:	this parameter shall contain the sum of the consecutively read AD-converter values

7.4.3 A_Memory_Read Service

The A_Memory_Read.req primitive shall be applied by the user of application layer, to read between 1 and 12 octets in the address space of the remote communication controller. The parameter memory_address shall specify the 16 bit start address and number shall contain the number of octets that shall be read beginning with the start address to increasing addresses. The service shall be confirmed by the remote application process with the contents of the address space.

The local application layer shall accept the service request and pass it with a T_Data_Connected.req to the local transport layer. The parameters ASAP and priority shall be mapped to the corresponding parameters of the T_Data_Connected.req primitive, the TSDU shall be an A_Memory_Read-PDU.

The remote application layer shall map a T_Data_Connected.ind primitive with TSDU = A_Memory_Read-PDU to an A_Memory_Read.ind primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_Memory_Read.ind primitive.

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Octet 6								Octet 7								Octet 8								Octet 9							
						APCI					Number					Address (high)								Address (low)								
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI																						
						1	0	0	0	0	0	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Figure 43 – A_Memory_Read-PDU (Example)

The remote application process shall respond to the A_Memory_Read.ind primitive with an A_Memory_Read.res primitive containing the number of octets read beginning with the start address to increasing addresses. If the remote application process has a problem, e.g. address space unreachable or protected or an illegal number of octets is requested, then the parameter number of the A_Memory_Response-PDU shall be zero and shall contain no data.

If the remote application process is requested to read data from a protected area or from any logical address that is not associated to physical memory then no data should be returned to indicate an error. The same should apply if only part of the memory that is requested to be read from is protected or physically existing.

Octet 6								Octet 7								Octet 8								Octet 9								Octet 10 to Octet N							
						APCI					Number					Address (high)								Address (low)								Data							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI																																
						1	0	0	1	0	0																														

Figure 44 – A_Memory_Response-PDU (Example)

The remote application layer shall accept the service response and pass it with a T_Data_Connected.req to the local transport layer. The parameters TSAP and priority shall be mapped to the corresponding parameters of the T_Data_Connected.req primitive, the TSDU shall be an A_Memory_Response-PDU.

The application layer shall map a T_Data_Connected.ind primitive with TSDU = A_Memory_Response-PDU to an A_Memory_Read.Acon primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_Memory_Read.Acon primitive.

A_Memory_Read.req(ack_request, priority, hop_count_type, ASAP, number, memory_address)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point
number:	this parameter shall contain the number of octets that shall be read beginning with the start address to increasing addresses
memory_address:	this parameter shall contain the 16 bit start address

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A_Memory_Read.Lcon(ack_request, priority, hop_count_type, ASAP, number, memory_address, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
ASAP:		this parameter shall be used to contain the service access point
number:		this parameter shall contain the number of octets that shall be read beginning with the start address to increasing addresses
memory_address:		this parameter shall contain the 16 bit start address
a_status:	ok:	this value of this parameter shall be used to indicate that the transmission of the A_Memory_Read.req has been successful
	not_ok:	this value of this parameter shall be used to indicate that the transmission of the A_Memory_Read.req did not succeed

A_Memory_Read.ind(priority, hop_count_type, ASAP, number, memory_address)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point
number:	this parameter shall contain the number of octets that shall be read beginning with the start address to increasing addresses
memory_address:	this parameter shall contain the 16 bit start address

A_Memory_Read.res(ack_request, priority, hop_count_type, ASAP, number, memory_address, data)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point
number:	this parameter shall contain the number of octets that has been read beginning with the start address to increasing addresses; it shall contain zero to indicate a problem
memory_address:	this parameter shall contain the 16 bit start address
data:	this parameter shall contain the octet(s) that have been read

7.4.4 A_Memory_Write Service

The A_Memory_Write.req primitive shall be applied by the user of application layer, to write between 1 and 12 octets in the address space of the remote communication controller. The parameter memory_address shall specify the 16 bit start address and the parameter number

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shall contain the number of octets that shall be written beginning with the start address to increasing addresses.

The service shall be a confirmed service if verify mode is active, otherwise it shall be an acknowledged service.

The local application layer shall accept the service request and pass it with a T_Data_Connected.req to the local transport layer. The parameters ASAP and priority shall be mapped to the corresponding parameters of the T_Data_Connected.req primitive, the TSDU shall be an A_Memory_Write-PDU.

The remote application layer shall map a T_Data_Connected.ind primitive with TSDU = A_Memory_Write-PDU to an A_Memory_Write.ind primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments TSAP and priority of the A_Memory_Write.ind primitive.

Octet 6								Octet 7								Octet 8								Octet 9								Octet 10 to N							
						APCI					Number					Address (high)								Address (low)								Data							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI																																
						1	0	1	0	0	0																														

Figure 45 – A_Memory_Write-PDU (Example)

With inactive verify mode the remote application process shall not respond. Instead the local application layer shall map a T_Data_Connected.con primitive to an A_Memory_Write.Lcon primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_Memory_Write.Lcon primitive; number, memory_address and data shall be don't care.

With active verify mode the remote application process shall respond to the A_Memory_Write.ind primitive with an A_Memory_Write.res primitive containing the requested number of octets of the associated memory area. The value of the associated memory area shall be explicitly read back after writing to it. If the remote application process has a problem, e.g. memory area unreachable or protected or an illegal number of octets is requested, then the parameter number shall be zero and shall contain no data.

If the remote application process is requested to write data to a protected area from any logical address which is not associated to physical memory then the service indication shall be ignored. In any case physical memory shall not be addressable via different logical addresses. If only a part of the addressed memory is protected or does not exist, then the complete write operation shall fail. If verify mode is active, then in case of a failed write operation no data should be returned to indicate an error.

The remote application layer shall accept the service response and shall pass it with a T_Data_Connected.req to the local transport layer. The parameters ASAP and priority shall be mapped to the corresponding parameters of the T_Data_Connected.req primitive, the TSDU shall be an A_Memory_Response-PDU.

The local application layer shall map a T_Data_Connected.ind primitive with TSDU = A_Memory_Response-PDU to an A_Memory_Write.Acon primitive if an A_Memory_Write-PDU has been sent before over this connection. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_Memory_Write.Acon primitive.

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A_Memory_Write.req(ack_request, priority, hop_count_type, TSAP, number, memory_address, data)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:		this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:		this parameter shall be used to contain the service access point
number:		this parameter shall contain the number of octets that shall be written beginning with the start address to increasing addresses
memory_address:		this parameter shall contain the 16 bit start address
data:		this parameter contains the octet(s) that shall be written

A_Memory_Write.Lcon(ack_request, priority, hop_count_type, ASAP, number, memory_address, data, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
ASAP:		this parameter shall be used to contain the service access point
number:		this parameter shall contain the number of octets that shall be written beginning with the start address to increasing addresses
memory_address:		this parameter shall contain the 16 bit start address
data:		this parameter contains the octet(s) that shall be written or no data
a_status:	ok:	this value of this parameter shall be used to indicate that the transmission of the A_Memory_Write.req service has been successful
	not_ok:	this value of this parameter shall be used to indicate that the transmission of the A_Memory_Write.req service did not succeed

A_Memory_Write.ind(priority, hop_count_type, TSAP, number, memory_address, data)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point
number:	this parameter shall contain the number of octets that shall be written beginning with the start address to increasing addresses
memory_address:	this parameter shall contain the 16 bit start address
data:	this parameter contains the octet(s) that shall be written

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A_Memory_Write.res(ack_request, priority, hop_count_type, ASAP, number, memory_address, data)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point
number:	this parameter shall contain the number of octets that has been written beginning with the start address to increasing addresses; it shall contain zero to indicate a problem
memory_address:	this parameter shall contain the 16 bit start address
data:	this parameter shall contain the octet(s) that have been read back; it shall contain no data to indicate a problem

A_Memory_Write.Acon(priority, hop_count_type, ASAP, number, memory_address, data)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point
number:	this parameter shall contain the number of octets that has been written beginning with the start address to increasing addresses; it shall contain zero to indicate a problem
memory_address:	this parameter shall contain the 16 bit start address
data:	this parameter shall contain the octet(s) that have been read back; it shall contain no data to indicate a problem

7.4.5 A_MemoryBit_Write Service

The A_MemoryBit_Write.req primitive shall be applied by the user of application layer, to modify between 1 bit and 40 bits in a contiguous block of up to 5 octets in the address space of the remote communication controller. The parameter memory_address shall specify the 16 bit start address and the parameter number shall contain the number of octets that shall be modified beginning with the start address to increasing addresses. The A_MemoryBit_Write shall allow to:

- set individual bits of the contiguous block to zero;
- set individual bits of the contiguous block to one;
- leave individual bits of the contiguous block unmodified;
- invert individual bits of the contiguous block.

This shall be done by using the parameters and_data and xor_data. Both parameters shall have the same number of octets as the contiguous block indicated in the parameter number. The resulting value for each individual bit in the contiguous block shall be computed using the two associated bits of and_data and xor_data with the following function:

result_bit(i) = (and_data_bit(i) AND block_bit(i)) XOR xor_data_bit(i)

This results in the possibilities as specified in Table 2:

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Table 2 – Function table for A_MemoryBit_Write-Services

and_data_bit(i)	xor_data_bit(i)	result_bit(i)
0	0	0
0	1	1
1	0	block_bit(i)
1	1	NOT block_bit(i)

The service shall be a confirmed service if verify mode is active, otherwise it shall be an acknowledged service.

The local application layer shall accept the service request and pass it with a T_Data_Connected.req to the local transport layer. The parameters ASAP and priority shall be mapped to the corresponding parameters of the T_Data_Connected.req primitive, the TSDU shall be an A_MemoryBit_Write-PDU.

With inactive verify mode the remote application process shall not respond. Instead the local application layer shall map a T_Data_Connected.con primitive to an A_MemoryBit_Write.Lcon primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_MemoryBit_Write.Lcon primitive; number, memory_address and data shall be don't care.

With active verify mode the remote application process shall respond to the A_MemoryBit_Write.ind primitive with an A_MemoryBit_Write.res primitive containing the requested number of octets of the associated memory area. The value of the associated memory area shall be explicitly read back after writing to it. If the remote application process has a problem, e.g. memory area unreachable or protected or an illegal number of octets is requested, then the parameter number shall be zero and shall contain no data.

If the remote application process is requested to write data to a protected area or from any logical address which is not associated to physical memory then the service indication shall be ignored. In any case physical memory shall not be addressable via different logical addresses. If only a part of the addressed memory is protected or does not exist, then the complete write operation shall fail. If verify mode is active, then in case of a failed write operation no data should be returned to indicate an error.

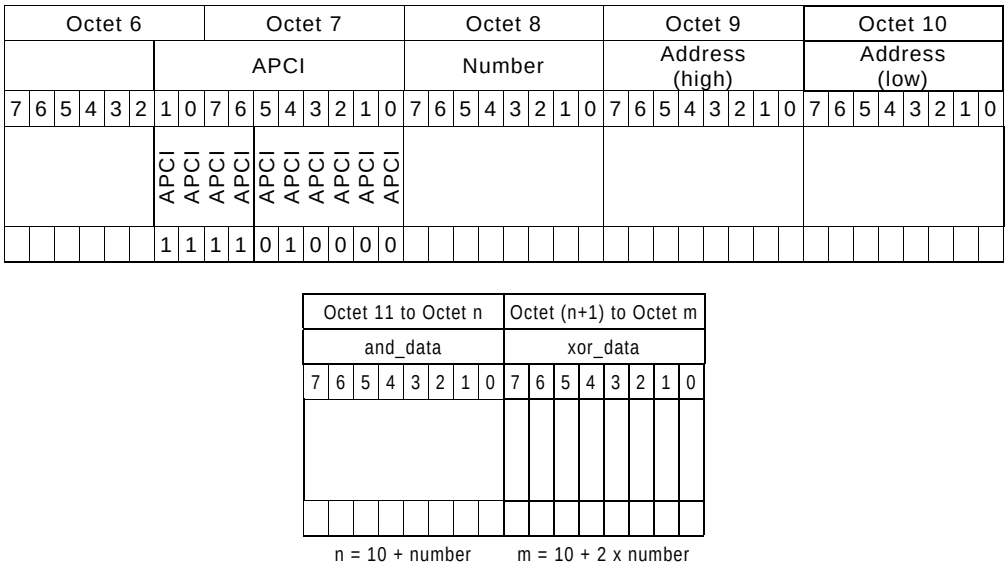


Figure 46 – A_MemoryBit_Write-PDU

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The remote application layer shall accept the service response and shall pass it with a T_Data_Connected.req to the local transport layer. The parameters TSAP and priority shall be mapped to the corresponding parameters of the T_Data_Connected.req primitive, the TSDU shall be a A_Memory_Response-PDU.

The local application layer shall map a T_Data_Connected.ind primitive with TSDU = A_Memory_Response-PDU to an A_MemoryBit_Write.Acon primitive if an A_MemoryBit_Write-PDU has been sent before over this connection. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_MemoryBit_Write.Acon primitive.

A_MemoryBit_Write.req(ack_request, priority, hop_count_type, ASAP, number, memory_address, and_data, xor_data)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point
number:	this parameter shall contain the number of octets that shall be modified beginning with the start address to increasing addresses
memory_address:	this parameter shall contain the 16 bit start address
and_data:	this parameter shall contain the and_data: see Table 2
xor_data:	this parameter shall contain the xor_data: see Table 2

A_MemoryBit_Write.Lcon(ack_request, priority, hop_count_type, ASAP, number, memory_address, and_data, xor_data, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
ASAP:		this parameter shall be used to contain the service access point
number:		this parameter shall contain the number of octets that shall be modified beginning with the start address to increasing addresses
memory_address:		this parameter shall contain the 16 bit start address
and_data:		this parameter shall contain the and_data: see Table 2
xor_data:		this parameter shall contain the xor_data: see Table 2
a_status:	ok:	this value of this parameter shall be used to indicate that the transmission of the A_MemoryBit_Write.req has been successful
	not_ok:	this value of this parameter shall be used to indicate that the transmission of the A_MemoryBit_Write.req did not succeed

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A_MemoryBit_Write.ind(priority, hop_count_type, ASAP, number, memory_address, and_data, xor_data)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point
number:	this parameter shall contain the number of octets that shall be modified beginning with the start address to increasing addresses
memory_address:	this parameter shall contain the 16 bit start address
and_data:	this parameter shall contain the and_data: see Table 2
xor_data:	this parameter shall contain the xor_data: see Table 2

A_MemoryBit_Write.res(ASAP, priority, number, memory_address, data)

ASAP:	this parameter shall be used to contain the service access point
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
number:	this parameter shall contain the number of octets that has been modified beginning with the start address to increasing addresses; it shall contain zero to indicate a problem
memory_address:	this parameter shall contain the 16 bit start address
data:	this parameter shall contain the octet(s) that have been read back; it shall contain not data to indicate a problem

7.4.6 A_UserData

7.4.6.1 Usage

The A_UserData-service shall be used for Application Device Management. The Application Device Management is that part of the device-management, which is implemented in the user application.

The Application Device Management shall use a logical address-space of 1 Mb. The mapping from the logical address space to the individual addresses and vice versa shall be the task of the Application Device Management.

The Application Device Management may also influence directly or indirectly the application-program. But this should be defined individually for each device.

All services provided by the Application Device Management shall be based on the A_USER_DATA-messages and the corresponding service.

7.4.6.2 A_UserMemory_Read Service

The A_UserMemory_Read.req primitive shall be applied by the user of application layer, to read between 1 and 11 octets in the address space of the remote application controller. The parameter memory_address shall specify the 20 bit start address (4 bit AddressExtension + 8 bit Address High + 8 bit Address Low) and the parameter number shall contain the number of octets that shall be read beginning with the start address to increasing addresses. The service shall be confirmed by the remote application process with the contents of the address space.

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The local application layer shall accept the service request and pass it with a T_Data_Connected.req to the local transport layer. The parameters ASAP and priority shall be mapped to the corresponding parameters of the T_Data_Connected.req primitive, the TSDU shall be an A_UserMemory_Read-PDU.

The remote application layer shall map a T_Data_Connected.ind primitive with TSDU = A_UserMemory_Read-PDU to an A_UserMemory_Read.ind primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_UserMemory_Read.ind primitive.

Octet 6	Octet 7	Octet 8	Octet 9	Octet 10
		Address extension / Number	Address (high)	Address (low)
7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0
APCI APCI APCI APCI APCI APCI APCI APCI				
1 0 1 1 0 0 0 0 0 0				

Figure 47 – A_UserMemory_Read-PDU (Example)

The remote application process shall respond to the A_UserMemory_Read.ind primitive with an A_UserMemory_Read.res primitive containing the number of octets read beginning with the start address to increasing addresses. If the remote application process has a problem, e.g. address space unreachable or protected or an illegal number of octets is requested, then the parameter number of the A_UserMemory_Response-PDU shall be zero and shall contain no data.

If the remote application process is requested to read data from a protected area or from any logical address that is not associated to physical memory then no data shall be returned to indicate an error. The same shall apply if only part of the memory to be read is protected or physically existing.

Octet 6	Octet 7	Octet 8	Octet 9	Octet 10	Octet 11 to N
		Address extension / Number	Address (high)	Address (low)	Data
7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0
APCI APCI APCI APCI APCI APCI APCI APCI					
1 0 1 1 0 0 0 0 0 1					

Figure 48 – A_UserMemory_Response-PDU

The remote application layer shall accept the service response and pass it with a T_Data_Connected.req to the local transport layer. The parameters ASAP and priority shall be mapped to the corresponding parameters of the T_Data_Connected.req primitive, the TSDU shall be a A_UserMemory_Response-PDU.

The local application layer shall map a T_Data_Connected.ind primitive with TSDU = A_UserMemory_Response-PDU to an A_UserMemory_Read.Acon primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_UserMemory_Read.Acon primitive.

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A_UserMemory_Read.req(ack_request, priority, hop_count_type, ASAP, number, memory_address)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point
number:	this parameter shall contain the number of octets that shall be read beginning with the start address to increasing addresses
memory_address:	this parameter shall contain the 16 bit start address

A_UserMemory_Read.Lcon(ack_request, priority, hop_count_type, ASAP, number, memory_address, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
ASAP:		this parameter shall be used to contain the service access point
number:		this parameter shall contain the number of octets that shall be read beginning with the start address to increasing addresses
memory_address:		this parameter shall contain the 16 bit start address
a_status:	ok:	this value of this parameter shall be used to indicate that the transmission of the A_UserMemory_Read.req has been successful
	not_ok:	this value of this parameter shall be used to indicate that the transmission of the A_UserMemory_Read.req did not succeed

A_UserMemory_Read.ind(priority, hop_count_type, ASAP, number, memory_address)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point
number:	this parameter shall contain the number of octets that shall be read beginning with the start address to increasing addresses
memory_address:	this parameter shall contain the 16 bit start address

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A_UserMemory_Read.res(ack_request, priority, hop_count_type, ASAP, number, memory_address, data)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point
number:	this parameter shall contain the number of octets that has been read beginning with the start address to increasing addresses; it shall contain zero to indicate a problem
memory_address:	this parameter shall contain the 16 bit start address
data:	this parameter shall contain the octet(s) that have been read

A_UserMemory_Read.Acon(priority, hop_count_type, ASAP, number, memory_address, data)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point
number:	this parameter shall contain the number of octets that has been read beginning with the start address to increasing addresses; it shall contain zero to indicate a problem
memory_address:	this parameter shall contain the 16 bit start address
data:	this parameter shall contain the octet(s) that have been read

7.4.6.3 A_UserMemory_Write Service

The A_UserMemory_Write.req primitive shall be applied by the user of application layer, to write between 1 and 11 octets in the individual address space of the remote application controller. The parameter memory_address shall specify the 20 bit start address (4 bit AddressExtension + 8 bit Address High + 8 bit Address Low) and the parameter number shall contain the number of octets that shall be written beginning with the start address to increasing addresses.

The service shall be a confirmed service if verify mode is active, otherwise it shall be an acknowledged service.

The local application layer shall accept the service request and pass it with a T_Data_Connected.req to the local transport layer. The parameters ASAP and priority shall be mapped to the corresponding parameters of the T_Data_Connected.req primitive, the TSDU shall be an A_UserMemory_Write-PDU.

The remote application layer shall map a T_Data_Connected.ind primitive with TSDU = A_UserMemory_Write-PDU to an A_UserMemory_Write.ind primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_UserMemory_Write.ind primitive.

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Octet 6								Octet 7								Octet 8								Octet 9								Octet 10								Octet 11 to N							
																Address extension				Number				Address (high)								Address (low)								Data							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	8	7	6	5	4	3	2	1
								APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI																																
								1	0	1	1	0	0	0	0	1	0																														

Figure 49 – A_UserMemory_Write-PDU

With inactive verify mode the remote application process shall not respond. Instead the local application layer shall map a T_Data_Connected.con primitive to an A_UserMemory_Write.Lcon primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_UserMemory_Write.Lcon primitive; number, memory_address and data shall be don't care.

With active verify mode the remote application process shall respond to the A_UserMemory_Write.ind primitive with an A_UserMemory_Write.res primitive containing the requested number of octets of the associated memory area. The value of the associated memory area shall be explicitly read back after writing to it. If the remote application process has a problem, e.g. memory area unreachable or protected or an illegal number of octets is requested, then the parameter number shall be zero and shall contain no data.

If the remote application process is requested to write data to a protected area or from any logical address which is not associated to physical memory then the service indication shall be ignored. In any case physical memory shall not be addressable via different logical addresses. If only a part of the addressed memory is protected or does not exist, then the complete write operation shall fail. If verify mode is active, then in case of a failed write operation no data shall be returned to indicate an error.

The remote application layer shall accept the service response and shall pass it with a T_Data_Connected.req to the local transport layer. The parameters TSAP and priority shall be mapped to the corresponding parameters of the T_Data_Connected.req primitive, the TSDU shall be an A_UserMemory_Response-PDU.

The application layer shall map a T_Data_Connected.ind primitive with TSDU = A_UserMemory_Response-PDU to an A_UserMemory_Write.Acon primitive if an A_UserMemory_Write-PDU has been sent before over this connection. The arguments TSAP and priority shall be mapped to the corresponding arguments TSAP and priority of the A_UserMemory_Write.Acon primitive.

A_UserMemory_Write.req(ack_request, priority, hop_count_type, ASAP, number, memory_address, data)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point
number:	this parameter shall contain the number of octets that shall be written beginning with the start address to increasing addresses
memory_address:	this parameter shall contain the 16 bit start address
data:	this parameter shall contain the octet(s) that shall be written

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A_UserMemory_Write.Lcon(ack_request, priority, hop_count_type, ASAP, number, memory_address, data, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
ASAP:		this parameter shall be used to contain the service access point
number:		this parameter shall contain the number of octets that shall be written beginning with the start address to increasing addresses
memory_address:		this parameter shall contain the 16 bit start address
data:		this parameter shall contain the octet(s) that shall be written
a_status:	ok:	this value of this parameter shall be used to indicate that the transmission of the A_UserMemory_Write.req has been successful
	not_ok:	this value of this parameter shall be used to indicate that the transmission of the A_UserMemory_Write.req did not succeed

A_UserMemory_Write.ind(priority, hop_count_type, ASAP, number, memory_address, data)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point
number:	this parameter shall contain the number of octets that shall be written beginning with the start address to increasing addresses
memory_address:	this parameter shall contain the 16 bit start address
data:	this parameter shall contain the octet(s) that shall be written

A_UserMemory_Write.res(ack_request, priority, hop_count_type, TSAP, number, memory_address, data)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point
number:	this parameter shall contain the number of octets that has been written beginning with the start address to increasing addresses; it shall contain zero to indicate a problem
memory_address:	this parameter shall contain the 16 bit start address
data:	this parameter shall contain the octet(s) that have been read back; it shall contain no data to indicate a problem

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A_UserMemory_Write.Acon(priority, hop_count_type, TSAP, number, memory_address, data)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point
number:	this parameter shall contain the number of octets that has been written beginning with the start address to increasing addresses; it shall contain zero to indicate a problem
memory_address:	this parameter shall contain the 16 bit start address
data:	this parameter shall contain the octet(s) that have been read back; it shall contain no data to indicate a problem

7.4.6.4 A_UserMemoryBit_Write Service

The A_UserMemoryBit_Write.req primitive shall be applied by the user of application layer, to modify between 1 bit and 40 bits in a contiguous block of up to 5 octets in the address space of the remote application controller. The parameter memory_address shall specify the 16 bit start address and the parameter number shall contain the number of octets to be modified beginning with the start address to increasing addresses. The A_UserMemoryBit_Write shall allows to:

- set individual bits of the contiguous block to zero;
- set individual bits of the contiguous block to one;
- leave individual bits of the contiguous block unmodified;
- invert individual bits of the contiguous block.

This shall be done by using the parameters and_data and xor_data. Both parameters shall have the same number of octets as the contiguous block indicated in the parameter number. The resulting value for each individual bit in the contiguous block shall be computed using the two associated bits of and_data and xor_data with the following function:

result_bit(i) = (and_data_bit(i) AND block_bit(i)) XOR xor_data_bit(i)

This results in the possibilities as specified in Table 3:

Table 3 – Function table for A_UserMemoryBit_Write-Services

and_data_bit(i)	xor_data_bit(i)	result_bit(i)
0	0	0
0	1	1
1	0	block_bit(i)
1	1	NOT block_bit(i)

The service shall be a confirmed service if verify mode is active, otherwise it shall be an acknowledged service.

The local application layer shall accept the service request and pass it with a T_Data_Connected.req to the local transport layer. The parameters ASAP and priority shall be mapped to the corresponding parameters of the T_Data_Connected.req primitive, the TSDU shall be an A_UserMemoryBit_Write-PDU.

The remote application layer shall map a T_Data_Connected.ind primitive with TSDU = A_UserMemoryBit_Write-PDU to an A_UserMemoryBit_Write.ind primitive. The

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arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_UserMemoryBit_Write.ind primitive.

Octet 6								Octet 7								Octet 8								Octet 9								Octet 10								Octet 11 to Octet n								Oct. (n+1) .to Oct. (m)							
																Number								Address (high)								Address (low)								and_data								xor_data							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI																																						
						1	0	1	1	0	0	0	1	0	0																																						

n=10+number m=10 + 2 x number

Figure 50 – A_UserMemoryBit_Write-PDU (Example)

With inactive verify mode the remote application process shall not respond. Instead the local application layer shall map a T_Data_Connected.con primitive to an A_UserMemoryBit_Write.Lcon primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_UserMemoryBit_Write.Lcon primitive; number, memory_address and data shall be don't care.

With active verify mode the remote application process shall respond to the A_UserMemoryBit_Write.ind primitive with an A_UserMemoryBit_Write.res primitive containing the requested number of octets of the associated memory area. The value of the associated memory area shall be explicitly read back after writing to it. If the remote application process has a problem, e.g. memory area unreachable or protected or an illegal number of octets is requested, then the parameter number shall be zero and shall contain no data.

If the remote application process is requested to write data to a protected area or from any logical address which is not associated to physical memory then the service indication shall be ignored. In any case physical memory shall not be addressable via different logical addresses. If only a part of the addressed memory is protected or does not exist, then the complete write operation shall fail. If verify mode is active, then in case of a failed write operation no data shall be returned to indicate an error.

The remote application layer shall accept the service response and shall pass it with a T_Data_Connected.req to the local transport layer. The parameters TSAP and priority shall be mapped to the corresponding parameters of the T_Data_Connected.req primitive, the TSDU shall be a A_UserMemory_Response-PDU.

The local application layer shall map a T_Data_Connected.ind primitive with TSDU = A_UserMemory_Response-PDU to an A_UserMemoryBit_Write.Acon primitive if an A_UserMemoryBit_Write-PDU has been sent before over this connection. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_UserMemoryBit_Write.Acon primitive.

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A_UserMemoryBit_Write.req(ack_request, priority, hop_count_type, ASAP, number, memory_address, and_data, xor_data)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:		this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:		this parameter shall be used to contain the service access point
number:		this parameter shall contain the number of octets that shall be modified beginning with the start address to increasing addresses
memory_address:		this parameter shall contain the 16 bit start address
and_data:		this parameter shall contain the and_data: see Table 3
xor_data:		this parameter shall contain the xor_data: see Table 3

A_UserMemoryBit_Write.Lcon(ack_request, priority, hop_count_type, ASAP, number, memory_address, and_data, xor_data, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
ASAP:		this parameter shall be used to contain the service access point
number:		this parameter shall contain the number of octets that shall be modified beginning with the start address to increasing addresses
memory_address:		this parameter shall contain the 16 bit start address
and_data:		this parameter shall contain the and_data: see Table 3
xor_data:		this parameter shall contain the xor_data: see Table 3
a_status:	ok:	this value of this parameter shall be used to indicate that the transmission of the A_UserMemoryBit_Write.req service has been successful
	not_ok:	this value of this parameter shall be used to indicate that the transmission of the A_UserMemoryBit_Write.req service did not succeed

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A_UserMemoryBit_Write.ind(priority, hop_count_type, ASAP, number, memory_address, and_data, xor_data)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point
number:	this parameter shall contain the number of octets that shall be modified beginning with the start address to increasing addresses
memory_address:	this parameter shall contain the 16 bit start address
and_data:	this parameter shall contain the and_data: see Table 3
xor_data:	this parameter shall contain the xor_data: see Table 3

A_UserMemoryBit_Write.res(ack_request, priority, hop_count_type, ASAP, number, memory_address, data)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point
number:	this parameter shall contain the number of octets that has been modified beginning with the start address to increasing addresses; it shall contain zero to indicate a problem
memory_address:	this parameter shall contain the 16 bit start address
data:	this parameter shall contain the octet(s) that have been read back; it shall contain not data to indicate a problem

A_UserMemoryBit_Write.Acon(priority, hop_count_type, ASAP, number, memory_address, data)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point
number:	this parameter shall contain the number of octets that has been modified beginning with the start address to increasing addresses; it shall contain zero to indicate a problem
memory_address:	this parameter shall contain the 16 bit start address
data:	this parameter shall contain the octet(s) that have been read back; it shall contain not data to indicate a problem

7.4.6.5 A_UserManufacturerInfo_Read Service

The A_UserManufacturerInfo_Read.req primitive shall be applied by the user of application layer, to read manufacturer information in a communication partner. The manufacturer information shall consist of three octets. Octet zero shall indicate the manufacturer identification of the device. Octets one and two shall be manufacturer specific. The service shall be confirmed by the remote application process.

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The local application layer shall accept the service request and pass it with a T_Data_Connected.req to the local transport layer. The parameters ASAP and priority shall be mapped to the corresponding parameters of the T_Data_Connected.req primitive, the TSDU shall be an A_UserManufacturerInfo_Read-PDU.

The remote application layer shall map a T_Data_Connected.ind primitive with TSDU = A_UserManufacturerInfo_Read-PDU to an A_UserManufacturerInfo_Read.ind primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_UserManufacturerInfo_Read.ind primitive.

Octet 6								Octet 7							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI
						1	0	1	1	0	0	0	1	0	1

Figure 51 – A_UserManufacturerInfo_Read-PDU (Example)

The remote application process shall respond to the A_UserManufacturerInfo_Read.ind primitive with an A_UserManufacturerInfo_Read.res primitive containing the manufacturer information.

Octet 6								Octet 7								Octet 8								Octet 9								Octet 10							
																Manufacturer_id								Manufact. specific								Manufact. specific							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI																										
						1	0	1	1	0	0	0	1	1	0																										

Figure 52 – A_UserManufacturerInfo_Response-PDU

The remote application layer shall accept the service response and pass it with a T_Data_Connected.req to the local transport layer. The parameters ASAP and priority shall be mapped to the corresponding parameters of the T_Data_Connected.req primitive, the TSDU shall be a A_UserManufacturerInfo_Response-PDU.

The local application layer shall map a T_Data_Connected.ind primitive with TSDU = A_UserManufacturerInfo_Response-PDU to an A_UserManufacturerInfo_Read.Acon primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_UserManufacturerInfo_Read.Acon primitive.

A_UserManufacturerInfo_Read.req(ack_request, priority, hop_count_type, ASAP)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point

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A_UserManufacturerInfo_Read.Lcon(ack_request, priority, hop_count_type, ASAP, a_status)

ack_request:		this parameter shall be used to indicate whether a layer-2 acknowledge has been indicated as mandatory or optional in the transmitted frame
priority:		this parameter shall be used to indicate the priority that has been used to the transmit the requested frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:		this parameter shall be used to indicate whether the hop_count of the transmitted frame has been set to 7 or if the network layer parameter has been used
ASAP:		this parameter shall be used to contain the service access point
a_status:	ok:	this value of this parameter shall be used to indicate that the transmission of the A_UserManufacturerInfo_Read.req service has been successful
	not_ok:	his value of this parameter shall be used to indicate that the transmission of the A_UserManufacturerInfo_Read.req service did not succeed

A_UserManufacturerInfo_Read.ind(priority, hop_count_type, ASAP)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point

A_UserManufacturerInfo_Read.res(ack_request, priority, hop_count_type, ASAP, mfact_info)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point
mfact_info:	this parameter shall contain the three octets with the manufacturer information

A_UserManufacturerInfo_Read.Acon(priority, hop_count_type, ASAP, mfact_info)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point
mfact_info:	this parameter shall contain the three octets with the manufacturer information

7.4.7 A_Restart Service

The A_Restart.req primitive shall be applied by the user of application layer, to cause a reset of the communication controller in the remote partner.

The service shall not be confirmed by the remote application process. The application layer confirmation shall be caused by the confirmation from the local transport layer.

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The local application layer shall accept the service request and pass it with a T_Data_Connected.req to the local transport layer. The parameters ASAP and priority shall be mapped to the corresponding parameters of the T_Data_Connected.req primitive, the TSDU shall be an A_Restart-PDU.

The remote application layer shall map a T_Data_Connected.ind primitive with TSDU = A_Restart-PDU to an A_Restart.ind primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_Restart.ind primitive.

The remote application process shall execute a reset which includes the communication system as well. This can result in a breakdown of the transport layer connection.

Octet 6								Octet 7							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI
						1	1	1	0	0	0	0	0	0	0

Figure 53 – A_Restart-PDU (Example)

A_Restart.req(ack_request, priority, hop_count_type, ASAP)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point

A_Restart.ind(priority, hop_count_type, ASAP)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point

7.4.8 A_Authorize_Request Service

The A_Authorize_Request.req primitive shall be applied by the user of application layer, to inform the communication partner about the key which shall be four octet long and shall be of datatype unsigned32. The remote partner shall know a number of valid keys and shall be able to associate a valid key to an access level. This access level shall be stored as the current access level of this partner and shall be sent back in an A_Authorize_Response-PDU. Access levels (unsigned8) between 0 (maximum level, i.e. maximum access rights) and 3 (minimum level, i.e. minimum access rights) or 0 (maximum level, i.e. maximum access rights) and 15 (minimum level, i.e. minimum access rights) shall be allowed. If the communication partner does not authorize himself or if the key is not a valid key, the current access level shall be set to minimum access level.

The current access level shall be used by the remote application process to decide whether or not a communication partner is allowed to request a certain read or write operation.

The remote user may associate different keys to different access levels and handle following services on this connection depending on the current access level.

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A current access level shall only valid until the connection is released or a new key is indicated with the A_Authorize_Request service.

The local application layer shall accept the service request and pass it with a T_Data_Connected.req to the local transport layer. The parameters ASAP and priority shall be mapped to the corresponding parameters of the T_Data_Connected.req primitive, the TSDU shall be an A_Authorize_Request-PDU.

The remote application layer shall map a T_Data_Connected.ind primitive with TSDU = A_Authorize_Request-PDU to an A_Authorize_Request.ind primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_Authorize_Request.ind primitive.

Octet 6								Octet 7								Octet 8								Octet 9								---	Octet 12							
																must be 0								Key																
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0		7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI																										
						1	1	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x

Figure 54 – A_Authorize_Request-PDU (Example)

The remote application process shall respond to the A_Authorize_Request.ind primitive with an A_Authorize_Request.res primitive containing the associated access level. If the key is not a valid key, the remote application process shall respond with the minimum access level which becomes the current access level.

Octet 6								Octet 7								Octet 8							
																Level							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI								
						1	1	1	1	0	1	0	0	1	0								

Figure 55 – A_Authorize_Response-PDU (Example)

The remote application layer shall accept the service response and pass it with a T_Data_Connected.req to the local transport layer. The parameters ASAP and priority shall be mapped to the corresponding parameters of the T_Data_Connected.req primitive, the TSDU shall be an A_Authorize_Response-PDU.

The local application layer shall map a T_Data_Connected.ind primitive with TSDU = A_Authorize_Response-PDU to an A_Authorize_Request.Acon primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_Authorize_Request.Acon primitive.

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A_Authorize_Request.req(ack_request, priority, hop_count_type, ASAP, key)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point
key:	this parameter shall contain the key of the requester

A_Authorize_Request.ind(priority, hop_count_type, ASAP, key)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point
key:	this parameter shall contain the key of the requester

A_Authorize_Request.res(ack_request, priority, hop_count_type, ASAP, level)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point
level:	this parameter shall contain the access level granted to the requester

A_Authorize_Request.Acon(priority, hop_count_type, ASAP, level)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point
level:	this parameter shall contain the access level granted to the requester

7.4.9 A_Key_Write Service

The A_Key_Write.req primitive shall be applied by the user of application layer, to modify or delete a key associated to a certain access level in the communication partner. The parameter level of the A_Key_Write.req primitive shall indicate the access level that shall be modified, the parameter key shall indicate the new key value.

Every device shall be able to handle up to 255 different keys that shall be associated to the 256 different access levels. The number of access levels supported by a device may be manufacturer specific.

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Table 4 – Association table of keys to access levels

Key	Access Level
Key for level 0	0
Key for level 1	1
…	…
Key for Level N-1	N-1
None	N (free access)

If the key indicated in the A_Key_Write.ind primitive is FFFF FFFFh, then the corresponding key entry in the association table of keys to access levels shall be set to invalid, i.e. then there shall be no key associated to the corresponding level any more. The current access level shall be less or equal to the access level indicated in the A_Key_Write.ind primitive, otherwise the remote application process shall return FFh in the A_Key_Response-PDU. In all other cases the remote application process shall store the indicated key in the corresponding entry of the association table of keys to access levels and shall respond to the A_Key_Write.ind primitive with an A_Key_Write.res primitive containing the access level set for the corresponding key.

The local application layer shall accept the service request and pass it with a T_Data_Connected.req to the local transport layer. The parameters ASAP and priority shall be mapped to the corresponding parameters of the T_Data_Connected.req primitive, the TSDU shall be an A_Key_Write-PDU.

The remote application layer shall map a T_Data_Connected.ind primitive with TSDU = A_Key_Write-PDU to an A_Key_Write.ind primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_Key_Write.ind primitive.

Octet 6								Octet 7								Octet 8								Octet 9								---	Octet 12							
																Level								Key																
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0		7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI																										
						1	1	1	1	0	1	0	0	1	1	0	0	0	0	0	0	0	0	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x

Figure 56 – A_Key_Write-PDU (Example)

The remote user shall process the key as described above and shall respond with the A_Key_Write.res primitive.

Octet 6								Octet 7								Octet 8							
												Number				Level							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI	APCI								
						1	1	1	1	0	1	0	1	0	0								

Figure 57 – A_Key_Response-PDU (Example)

The remote application layer shall accept the service response and pass it with a T_Data_Connected.req to the local transport layer. The parameters ASAP and priority shall be mapped to the corresponding parameters of the T_Data_Connected.req primitive, the TSDU shall be a A_Key_Response-PDU.

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The local application layer shall map a T_Data_Connected.ind primitive with TSDU = A_Key_Response-PDU to an A_Key_Write.Acon primitive. The arguments TSAP and priority shall be mapped to the corresponding arguments ASAP and priority of the A_Key_Write.Acon primitive.

A_Key_Write.req(ack_request, priority, hop_count_type, ASAP, level, key)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop_count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point
level:	this parameter shall contain the access level for which the key shall be modified
key:	this parameter shall contain the new value of the key; it shall contain FFFF FFFFh if the key shall be deleted

A_Key_Write.ind(priority, hop_count_type, ASAP, level, key)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point
level:	this parameter shall contain the access level for which the key shall be modified
key:	his parameter shall contain the new value of the key; it shall contain FFFF FFFFh if the key shall be deleted

A_Key_Write.res(ack_request, priority, hop_count_type, ASAP, level)

ack_request:	this parameter shall be used to indicate whether a layer-2 acknowledge is mandatory or optional
priority:	this parameter shall be used to contain the priority that shall be used to transmit the requested service; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count shall be set to 7 or if the network layer parameter shall be used
ASAP:	this parameter shall be used to contain the service access point
level:	this parameter shall contain the access level for which the associated key has been modified; it shall contain the minimum access level if the key has not been modified

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A_Key_Write.Acon(priority, hop_count_type, ASAP, level)

priority:	this parameter shall be used to indicate the priority of the received frame; it shall be “system”, “urgent”, “normal” or “low”
hop_count_type:	this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not
ASAP:	this parameter shall be used to contain the service access point
level:	this parameter shall contain the access level for which the associated key has been modified; it shall contain the minimum access level if the key has not been modified

7.5 Router-specific application layer services on point-to-point connection-oriented communication mode

The application layer services that are encoded with the following APCIs, are reserved for routers:

- 1111000000_b;
- 1111000001_b;
- 1111000010_b;
- 1111000011_b;
- 1111001000_b;
- 1111001001_b;
- 1111001010_b;
- 1111001101_b;
- 1111001110_b;
- 1111001111_b.

8 Parameters of application layer

8.1 Association table

The association table shall map TSAPs of multicast communication modes to Application Layer Service Access Points (ASAPs) and vice versa. One TSAP can be mapped to more than one ASAP and one ASAP can have more than one TSAP. The association table may be downloaded using the network management.

8.2 Verify flag

The verify flag manages if the verify-mode is enable or disabled.

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