

# INTERNATIONAL STANDARD

**Information technology – Home electronic system (HES) architecture –  
Part 3-1: Communication layers – Application layer for network based control  
of HES Class 1**

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## CONTENTS

|                                                                                              |    |
|----------------------------------------------------------------------------------------------|----|
| FOREWORD.....                                                                                | 5  |
| INTRODUCTION.....                                                                            | 6  |
| 1 Scope.....                                                                                 | 7  |
| 2 Normative references.....                                                                  | 7  |
| 3 Terms, definitions and abbreviations.....                                                  | 7  |
| 3.1 Terms and definitions.....                                                               | 7  |
| 3.2 Abbreviations.....                                                                       | 8  |
| 4 Conformance.....                                                                           | 8  |
| 5 Services of the application layer.....                                                     | 8  |
| 5.1 Communication modes.....                                                                 | 8  |
| 5.2 Service primitives of the application layer.....                                         | 9  |
| 6 Application layer protocol data unit (APDU).....                                           | 10 |
| 7 Application layer services.....                                                            | 12 |
| 7.1 Application layer services on multicast communication mode.....                          | 12 |
| 7.1.1 General.....                                                                           | 12 |
| 7.1.2 A_GroupValue_Read Service.....                                                         | 13 |
| 7.1.3 A_GroupValue_Write Service.....                                                        | 17 |
| 7.2 Application layer services on broadcast communication mode.....                          | 19 |
| 7.2.1 A_IndividualAddress_Write Service.....                                                 | 19 |
| 7.2.2 A_IndividualAddress_Read-Service.....                                                  | 20 |
| 7.2.3 A_IndividualAddressSerialNumber_Read-Service.....                                      | 23 |
| 7.2.4 A_IndividualAddressSerialNumber_Write Service.....                                     | 26 |
| 7.2.5 A_ServiceInformation_Indication_Write Service.....                                     | 27 |
| 7.2.6 A_DomainAddress_Write Service.....                                                     | 28 |
| 7.2.7 A_DomainAddress_Read Service.....                                                      | 30 |
| 7.2.8 A_DomainAddressSelective_Read Service.....                                             | 32 |
| 7.2.9 A_NetworkParameter_Read Service.....                                                   | 33 |
| 7.2.10 A_NetworkParameter_Write Service.....                                                 | 36 |
| 7.3 Application layer services on point-to-point connectionless communication mode.....      | 37 |
| 7.3.1 General.....                                                                           | 37 |
| 7.3.2 A_PropertyValue_Read Service.....                                                      | 38 |
| 7.3.3 A_PropertyValue_Write Service.....                                                     | 41 |
| 7.3.4 A_PropertyDescription_Read Service.....                                                | 43 |
| 7.3.5 A_DeviceDescriptor_Read Service.....                                                   | 46 |
| 7.3.6 A_Link_Read Service.....                                                               | 49 |
| 7.3.7 A_Link_Write Service.....                                                              | 50 |
| 7.4 Application layer services on point-to-point connection-oriented communication mode..... | 51 |
| 7.4.1 General.....                                                                           | 51 |
| 7.4.2 A_ADC_Read Service.....                                                                | 52 |
| 7.4.3 A_Memory_Read Service.....                                                             | 54 |
| 7.4.4 A_Memory_Write Service.....                                                            | 57 |
| 7.4.5 A_MemoryBit_Write Service.....                                                         | 59 |
| 7.4.6 A_UserData.....                                                                        | 62 |

|       |                                                                                                           |    |
|-------|-----------------------------------------------------------------------------------------------------------|----|
| 7.4.7 | A_Restart Service .....                                                                                   | 73 |
| 7.4.8 | A_Authorize_Request Service .....                                                                         | 74 |
| 7.4.9 | A_Key_Write Service .....                                                                                 | 76 |
| 7.5   | Router-specific application layer services on point-to-point connection-oriented communication mode ..... | 78 |
| 8     | Parameters of application layer .....                                                                     | 79 |
| 8.1   | Association table .....                                                                                   | 79 |
| 8.2   | Verify flag .....                                                                                         | 79 |
|       | Bibliography .....                                                                                        | 80 |
|       | Figure 1 – Interaction of the application layer for services that are not remote confirmed .....          | 9  |
|       | Figure 2 – Interaction of the application layer for services that are remote confirmed .....              | 10 |
|       | Figure 3 – APDU (Example) .....                                                                           | 10 |
|       | Figure 4 – Mapping the ASAP to the TSAP (Example) .....                                                   | 13 |
|       | Figure 5 – Mapping a TSAP to an ASAP .....                                                                | 13 |
|       | Figure 6 – Handling requests and responses .....                                                          | 13 |
|       | Figure 7 – Message flow for the A_Group_Value_Read service .....                                          | 13 |
|       | Figure 8 – A_GroupValue_Read-PDU (Example) .....                                                          | 14 |
|       | Figure 9 – A_GroupValue_Response-PDU (Example), length of ASAP data is more than 6 bit .....              | 14 |
|       | Figure 10 – A_GroupValue_Response-PDU (Example) length of ASAP data is 6 bit or less .....                | 15 |
|       | Figure 11 – Message flow for the A_Group_Value_Write service .....                                        | 17 |
|       | Figure 12 – A_GroupValue_Write-PDU (Example), length of ASAP data is more than 6 bit .....                | 17 |
|       | Figure 13 – A_GroupValue_Write-PDU (Example), length of ASAP data is 6 bit or less .....                  | 18 |
|       | Figure 14 – A_IndividualAddress_Write-PDU (Example) .....                                                 | 19 |
|       | Figure 15 – A_IndividualAddress_Read-PDU (Example) .....                                                  | 21 |
|       | Figure 16 – A_IndividualAddress_Response-PDU (Example) .....                                              | 21 |
|       | Figure 17 – Message flow for the A_IndividualAddressSerialNumber_Read service .....                       | 23 |
|       | Figure 18 – A_IndividualAddressSerialNumber_Read-PDU (Example) .....                                      | 23 |
|       | Figure 19 – A_IndividualAddressSerialNumber_Response-PDU (Example) .....                                  | 24 |
|       | Figure 20 – A_IndividualAddressSerialNumber_Write-PDU (Example) .....                                     | 26 |
|       | Figure 21 – A_ServiceInformation_Indication_Write-PDU (Example) .....                                     | 27 |
|       | Figure 22 – A_DomainAddress_Write-PDU .....                                                               | 29 |
|       | Figure 23 – A_DomainAddress_Read-PDU (Example) .....                                                      | 30 |
|       | Figure 24 – A_DomainAddress_Response-PDU (Example) .....                                                  | 30 |
|       | Figure 25 – A_DomainAddressSelective_Read-PDU (Example) .....                                             | 32 |
|       | Figure 26 – A_NetworkParameter_Read-PDU (Example) .....                                                   | 34 |
|       | Figure 27 – A_NetworkParameter_Response-PDU (Example) .....                                               | 34 |
|       | Figure 28 – A_NetworkParameter_Write-PDU (Example) .....                                                  | 36 |
|       | Figure 29 – A_PropertyValue_Read-PDU (Example) .....                                                      | 38 |
|       | Figure 30 – A_PropertyValue_Response-PDU (Example) .....                                                  | 39 |
|       | Figure 31 – A_PropertyValue_Write-PDU (Example) .....                                                     | 41 |
|       | Figure 32 – A_PropertyDescription_Read-PDU (Example) .....                                                | 44 |

|                                                                   |        |
|-------------------------------------------------------------------|--------|
| Figure 33 – A_PropertyDescription_Response-PDU (Example) .....    | 44     |
| Figure 34 – A_DeviceDescriptor_Read-PDU (Example) .....           | 47     |
| Figure 35 – A_DeviceDescriptor_Response-PDU (Example) .....       | 47     |
| Figure 36 – Message flow for A_Link_Read Service .....            | 49     |
| Figure 37 – A_Link_Read-PDU (Example) .....                       | 49     |
| Figure 38 – A_Link_Response-PDU .....                             | 49     |
| Figure 39 – Message flow for A_Link_Write Service .....           | 50     |
| Figure 40 – A_Link_Write-PDU .....                                | 51     |
| Figure 41 – A_ADC_Read-PDU (Example) .....                        | 52     |
| Figure 42 – A_ADC_Response-PDU (Example) .....                    | 52     |
| Figure 43 – A_Memory_Read-PDU (Example) .....                     | 55     |
| Figure 44 – A_Memory_Response-PDU (Example) .....                 | 55     |
| Figure 45 – A_Memory_Write-PDU (Example) .....                    | 57     |
| Figure 46 – A_MemoryBit_Write-PDU .....                           | 61     |
| Figure 47 – A_UserMemory_Read-PDU (Example) .....                 | 63     |
| Figure 48 – A_UserMemory_Response-PDU .....                       | 63     |
| Figure 49 – A_UserMemory_Write-PDU .....                          | 66     |
| Figure 50 – A_UserMemoryBit_Write-PDU (Example) .....             | 69     |
| Figure 51 – A_UserManufacturerInfo_Read-PDU (Example) .....       | 71     |
| Figure 52 – A_UserManufacturerInfo_Response-PDU .....             | 72     |
| Figure 53 – A_Restart-PDU (Example) .....                         | 74     |
| Figure 54 – A_Authorize_Request-PDU (Example) .....               | 75     |
| Figure 55 – A_Authorize_Response-PDU (Example) .....              | 75     |
| Figure 56 – A_Key_Write-PDU (Example) .....                       | 77     |
| Figure 57 – A_Key_Response-PDU (Example) .....                    | 77     |
| <br>Table 1 – APCI overview .....                                 | <br>11 |
| Table 2 – Function table for A_MemoryBit_Write-Services .....     | 60     |
| Table 3 – Function table for A_UserMemoryBit_Write-Services ..... | 68     |
| Table 4 – Association table of keys to access levels .....        | 76     |

## **INFORMATION TECHNOLOGY – HOME ELECTRONIC SYSTEM (HES) ARCHITECTURE –**

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

#### **FOREWORD**

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International Standard ISO/IEC 14543-3-1 was prepared by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology.

This International Standard together with ISO/IEC 14543-3-2 cancels and replaces ISO/IEC TR 14543-3, published in 2000. It constitutes a complete revision of the principles outlined in ISO/IEC TR 14543-3 and provides the specifications essential for an international standard.

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

This International Standard has been approved by vote of the member bodies, and the voting results may be obtained from the address given on the title page.

## 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.

Currently, ISO/IEC 14543, *Information technology – Home Electronic System (HES) architecture*, consists of the following parts:

- Part 2-1: *Introduction and device modularity*
- Part 3-1: *Communication layers – Application layer for network based control of HES Class 1*
- Part 3-2: *Communication layers – Transport, network and general parts of data link layer for network based control of HES Class 1*
- 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 may be added later.*

# INFORMATION TECHNOLOGY – HOME ELECTRONIC SYSTEM (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 as provided by the transport layer, the network layer and the 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.

ISO/IEC 11801, *Information technology – Generic cabling for customer premises*

ISO/IEC 14543-2-1, *Information technology – Home electronic system (HES) architecture – Part 2-1: Introduction and device modularity*

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

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

NOTE 1 Reference to this standard will be replaced by reference to International Standard ISO/IEC 14543-3-3 which is currently under consideration. Please refer to bibliography.

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

NOTE 2 Reference to this standard will be replaced by reference to International Standard ISO/IEC 14543-3-4 which is currently under consideration. Please refer to bibliography.

### 3 Terms, definitions and abbreviations

#### 3.1 Terms and definitions

For the purposes of this document 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 the requirements of 7.1, 7.2.1, 7.2.2, 7.3.5, 7.4.3, 7.4.4, 7.4.7 and clause 8.

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

**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, connectionless (multicast);
- b) point-to-domain, connectionless (broadcast);

- c) point-to-all-points, connectionless (system broadcast);
- d) point-to-point, connectionless;
- e) point-to-point, connection-oriented.

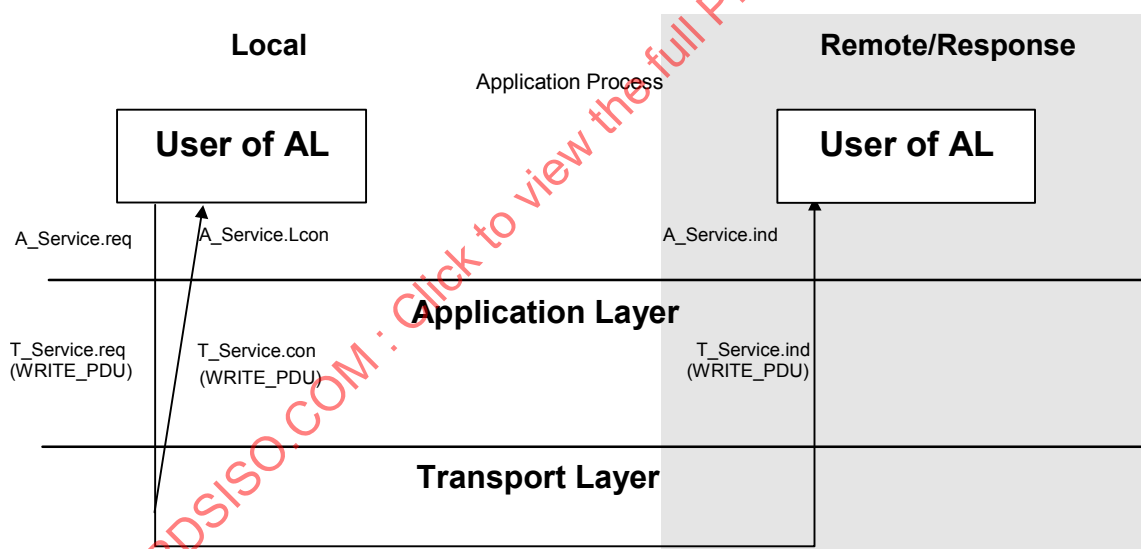
The application layer services that are offered shall depend on the communication mode. An application layer service shall not be applied on a communication mode for which it is not specified.

Some services may be used on the point-to-point connection-oriented, as well as the point-to-point connectionless 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). See Figure 1 and Figure 2 for the interaction of the application layer.



**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 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.

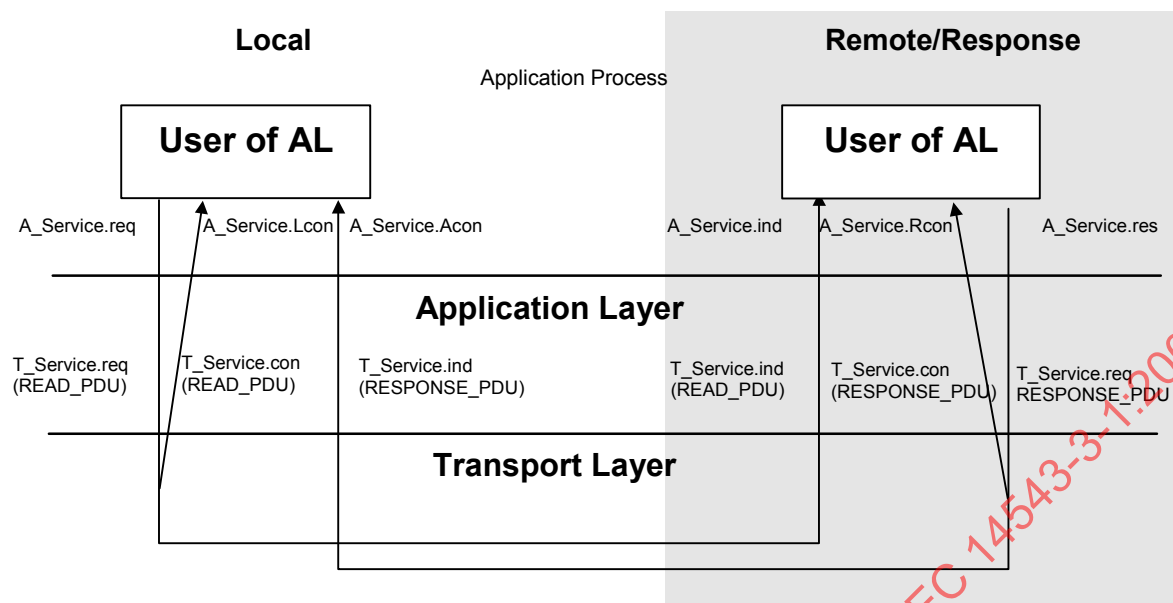


Figure 2 – Interaction of the application layer for services that are remote confirmed

## 6 Application layer protocol data unit (APDU)

An example of an APDU is shown in Figure 3.

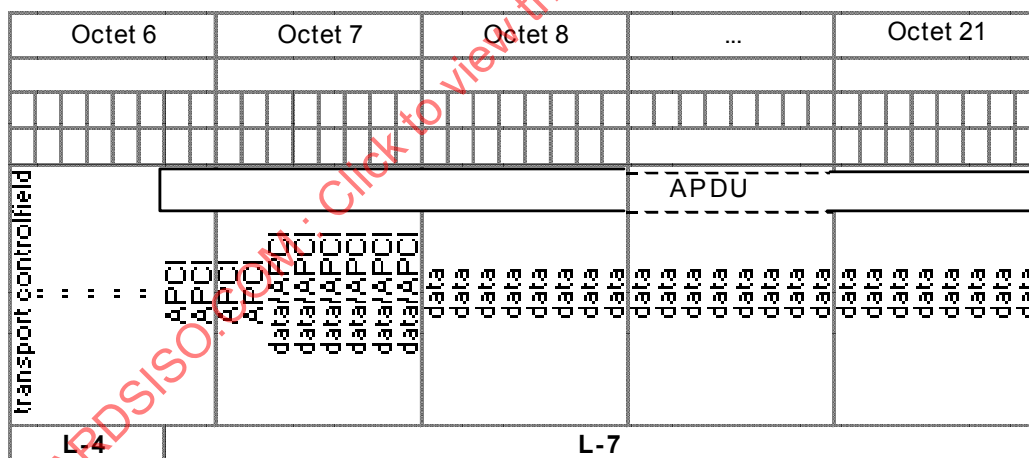


Figure 3 – APDU (Example)

### Table 1 – APCI overview

[illegible]

Table 1 (continued)

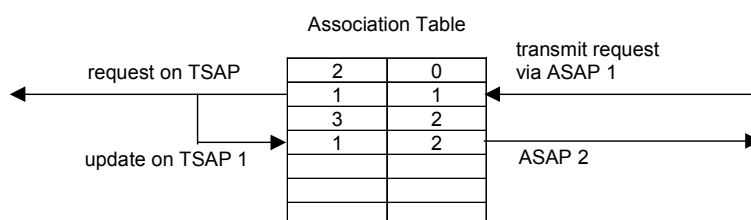
| APCI<br>(bit position) |   |   |   |   |   |   |   |                                                                                         |   |   |   |   |   |   |   | Application layer service    |  |  |  |  |  |  |  |  |  | Allowed communication mode(s)                                                                                                                                   |  |  |  |  |
|------------------------|---|---|---|---|---|---|---|-----------------------------------------------------------------------------------------|---|---|---|---|---|---|---|------------------------------|--|--|--|--|--|--|--|--|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
| Octet <i>n</i>         |   |   |   |   |   |   |   | Octet <i>n</i> +1                                                                       |   |   |   |   |   |   |   |                              |  |  |  |  |  |  |  |  |  |                                                                                                                                                                 |  |  |  |  |
| 8                      | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 8                                                                                       | 7 | 6 | 5 | 4 | 3 | 2 | 1 |                              |  |  |  |  |  |  |  |  |  |                                                                                                                                                                 |  |  |  |  |
|                        |   |   |   |   |   |   |   |                                                                                         |   |   |   |   |   |   |   |                              |  |  |  |  |  |  |  |  |  |                                                                                                                                                                 |  |  |  |  |
|                        |   |   |   |   |   |   |   | data/APCI<br>data/APCI<br>data/APCI<br>data/APCI<br>data/APCI<br>data/APCI<br>data/APCI |   |   |   |   |   |   |   |                              |  |  |  |  |  |  |  |  |  | Multicast<br><br>Broadcast<br><br>Point-to-all-point<br>connectionless<br><br>Point-to-point<br>connectionless<br><br>Point-to-point<br>connection-<br>oriented |  |  |  |  |
|                        |   |   |   |   |   |   |   |                                                                                         |   |   |   |   |   |   |   |                              |  |  |  |  |  |  |  |  |  |                                                                                                                                                                 |  |  |  |  |
|                        |   |   |   |   |   |   |   |                                                                                         |   |   |   |   |   |   |   |                              |  |  |  |  |  |  |  |  |  |                                                                                                                                                                 |  |  |  |  |
|                        |   |   |   |   |   |   |   |                                                                                         |   |   |   |   |   |   |   |                              |  |  |  |  |  |  |  |  |  |                                                                                                                                                                 |  |  |  |  |
|                        |   |   |   |   |   | 1 | 1 | 0                                                                                       | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0A_DeviceDescriptor_Read     |  |  |  |  |  |  |  |  |  |                                                                                                                                                                 |  |  |  |  |
|                        |   |   |   |   |   | 1 | 1 | 0                                                                                       | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0A_DeviceDescriptor_Response |  |  |  |  |  |  |  |  |  |                                                                                                                                                                 |  |  |  |  |
|                        |   |   |   |   |   | 1 | 1 | 1                                                                                       | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0A_Restart                   |  |  |  |  |  |  |  |  |  |                                                                                                                                                                 |  |  |  |  |

| Coupler specific services |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |                                     |                  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---------------------------|--|--|--|--|--|---|---|---|---|---|---|---|---|---|---|-------------------------------------|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|
|                           |  |  |  |  |  | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0A_Open_Routing_Table_Req<br>(use)  | (not for future) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                           |  |  |  |  |  | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1A_Read_Routing_Table_Req<br>(use)  | (not for future) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                           |  |  |  |  |  | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0A_Read_Routing_Table_Res<br>(use)  | (not for future) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                           |  |  |  |  |  | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1A_Write_Routing_Table_Req<br>(use) | (not for future) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                           |  |  |  |  |  | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0A_Read_Router_Memory_Res<br>(use)  | (not for future) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                           |  |  |  |  |  | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1A_Read_Router_Memory_Res<br>(use)  | (not for future) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                           |  |  |  |  |  | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0A_Write_Router_Memory_Req<br>(use) | (not for future) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                           |  |  |  |  |  | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1A_Read_Router_Status_Req<br>(use)  | (not for future) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                           |  |  |  |  |  | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0A_Read_Router_Status_Res<br>(use)  | (not for future) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                           |  |  |  |  |  | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1A_Write_Router_Status_Req<br>(use) | (not for future) |  |  |  |  |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |                             |                  |  |  |  |  |
|--|--|--|--|--|--|---|---|---|---|---|---|---|---|---|---|-----------------------------|------------------|--|--|--|--|
|  |  |  |  |  |  | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0A_MemoryBit_Write<br>(use) | (not for future) |  |  |  |  |
|  |  |  |  |  |  | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1A_Authorize_Request        |                  |  |  |  |  |
|  |  |  |  |  |  | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0A_Authorize_Response       |                  |  |  |  |  |
|  |  |  |  |  |  | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1A_Key_Write                |                  |  |  |  |  |
|  |  |  |  |  |  | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0A_Key_Response             |                  |  |  |  |  |

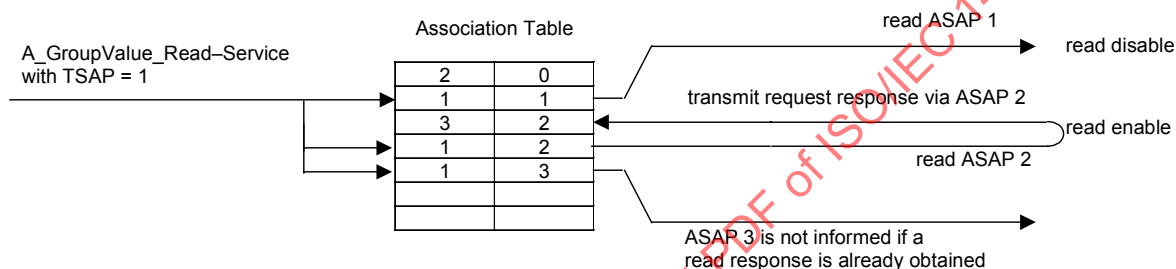
| Open Media Specific Services |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |                                |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|------------------------------|--|--|--|--|--|---|---|---|---|---|---|---|---|---|---|--------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
|                              |  |  |  |  |  | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0A_DomainAddress_Write         |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                              |  |  |  |  |  | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1A_DomainAddress_Read          |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                              |  |  |  |  |  | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0A_DomainAddress_Response      |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                              |  |  |  |  |  | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1A_DomainAddressSelective_Read |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

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, see Figure 4.



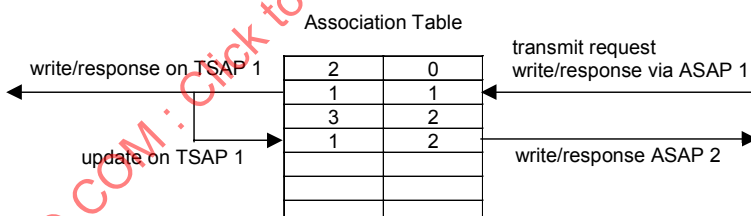
**Figure 4 – Mapping the ASAP to the TSAP (example)**

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, see Figure 5.



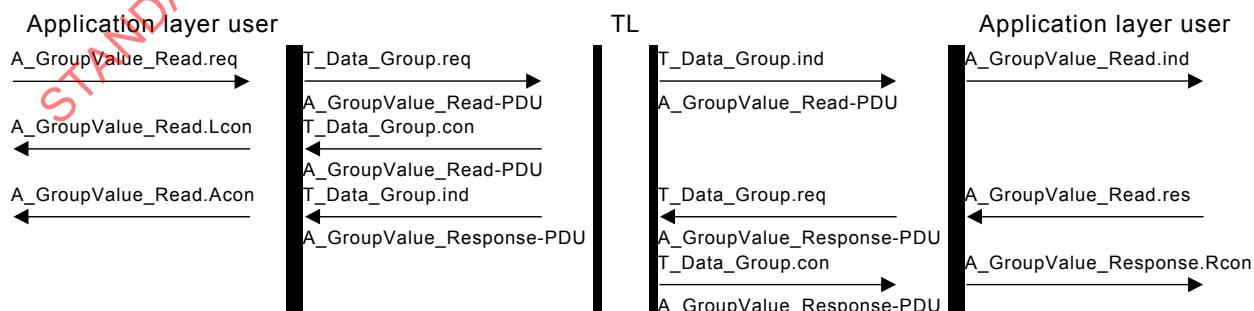
**Figure 5 – Mapping a TSAP to an ASAP**

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, see Figure 6.



**Figure 6 – Handling requests and responses**

### 7.1.2 A\_GroupValue\_Read Service



**Figure 7 – Message flow for the A\_GroupValue\_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 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, see Figure 7.

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.

NOTE 1 During configuration the user of the HES system can decide about the 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\_GroupValue\_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, see Figure 8.

NOTE 2 During configuration, the user of the HES system can decide whether or not the A\_GroupValue\_Read.res primitive is generated, although one ASAP should generate the A\_GroupValue\_Read.res primitive.

NOTE 3 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, see Figure 9.

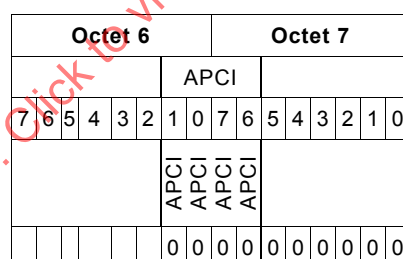


Figure 8 – A\_GroupValue\_Read-PDU (Example)

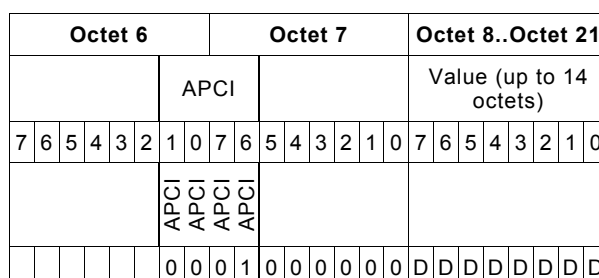
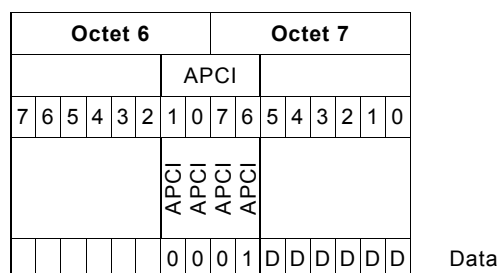


Figure 9 – A\_GroupValue\_Response-PDU (Example),  
length of ASAP data is more than 6 bit

Values that only consist of 6 bits or less shall have the following optimized A\_GroupValue\_Response-PDU format, see Figure 10.



**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

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

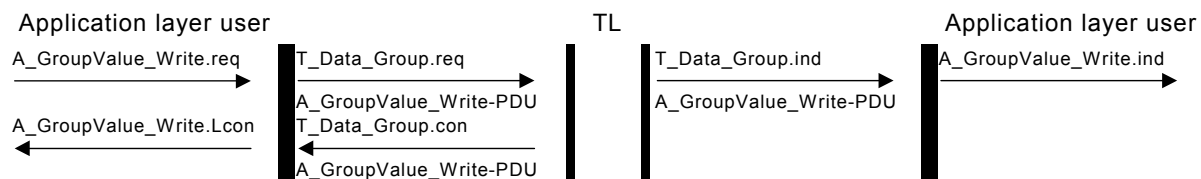
A\_GroupValue\_Read.Rcon(ack\_request, ASAP, priority, hop\_count\_type, data, a\_status)

- 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 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: the value of this parameter shall be used to indicate that the transmission of the A\_GroupValue\_Read.res has been successful
- not\_ok: the 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

### 7.1.3 A\_GroupValue\_Write Service



**Figure 11 – Message flow for the A\_GroupValue\_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, see Figure 11. 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 During configuration the user of the HES system can 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 see Figure 12.

| 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 | 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, see Figure 13.

| 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**

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 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: the value of this parameters shall be used to indicate that the transmission of the A\_GroupValue\_Write.req has been successful
- not\_ok: the 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 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, see Figure 14.

| 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 |  |
|         |   |   |   |   |   | APCI    | APCI | APCI | APCI |   |   |                    |   |   |   |   |   |                   |   |   |   |   |   |  |
|         |   |   |   |   |   | 0       | 0    | 1    | 1    | 0 | 0 | 0                  | 0 | 0 | 0 | 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

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: the value of this parameter shall be used to indicate that the transmission of the A\_IndividualAddress\_Write.req has been successful

not\_ok: the 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, see Figure 15.

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)

| 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    | 1    | 0 | 0 | 0 | 0 | 0 | 0 |

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, see Figure 16. 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 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: the 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

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 the 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

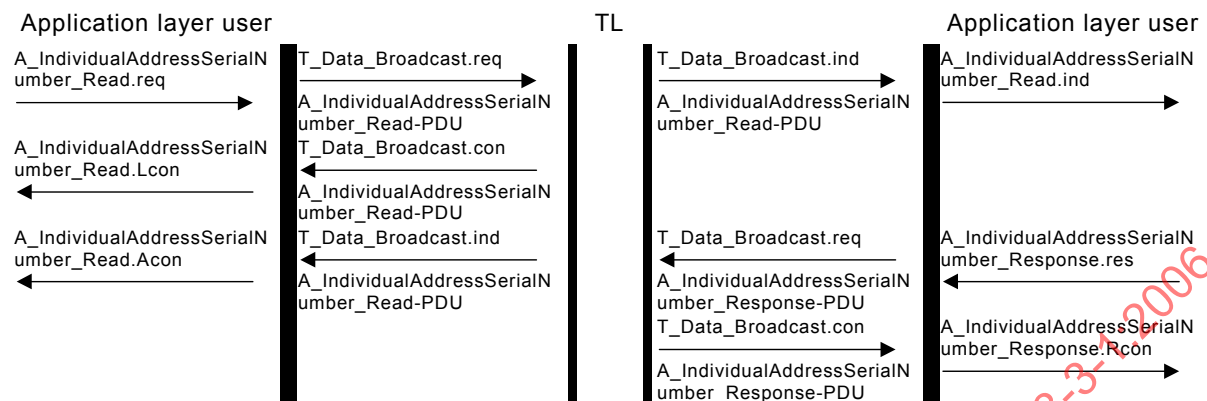


Figure 17 – Message flow for the A\_IndividualAddressSerialNumber\_Read service<sup>120</sup>

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, see Figure 17.

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, see Figure 18.

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 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\_IndividualAddressSerialNumber\_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<br>(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 |  |  |  |  |
|         |   |   |   |   |   | APC |   | APC     |   | APC |   | APC |   | APC |   |                             |   |   |   |   |   |   |   |  |  |  |  |
|         |   |   |   |   |   | 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, see Figure 19.

| Octet 6 |   |   |   |   |   |   |   | Octet 7 |      |      |      |      |      |      |      | Octet 8 to Octet 13         |   |   |   |   |   | Octet 14       |   |   |   |   |   |   |   | Octet 15 |   |   |   |   |   |   |   | Octet 16 |   |   |   |   |   |   |   | Octet 17 |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 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| 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 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  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 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|         |   |   |   |   |   |   |   | APCI    | APCI | APCI | APCI | APCI | APCI | APCI | APCI | APCI                        |   |   |   |   |   |                |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |          |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  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 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  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 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**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 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\_IndividualAddressSerialNumber\_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 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: the 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

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: the value of this parameter shall be used to indicate that the transmission of the A\_IndividualAddressSerialNumber\_Read.res has been successful

not\_ok: the 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, see Figure 20.

| Octet 6 |   |   |   |   |   | Octet 7 |      |      |      |      |      | Octet 8 to Octet 13         |      |      |      |   |   | Octet 14              |   |   |   |   |   | Octet 15             |   |   |   |   |   | Octet 16 to Octet 19   |   |   |   |   |   |   |   |   |   |
|---------|---|---|---|---|---|---------|------|------|------|------|------|-----------------------------|------|------|------|---|---|-----------------------|---|---|---|---|---|----------------------|---|---|---|---|---|------------------------|---|---|---|---|---|---|---|---|---|
|         |   |   |   |   |   | APCI    |      |      |      |      |      | Serial number<br>(6 octets) |      |      |      |   |   | New address<br>(high) |   |   |   |   |   | New address<br>(low) |   |   |   |   |   | Reserved<br>(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 |
|         |   |   |   |   |   | APCI    | APCI | 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\_IndividualAddressSerialNumber\_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 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: the value of this parameter shall be used to indicate that the transmission of the A\_IndividualAddressSerialNumber\_Write.req did not succeed

A\_IndividualAddressSerialNumber\_Write.ind(priority, hop\_count\_type, serial\_number, new-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

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, see Figure 21.

| 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        |          |          |          |          |
|         |   |   |   |   |   | APCI    | APCI | APCI | APCI | APCI | APCI | APCI    | APCI     | APCI     | APCI     | reserved | reserved | reserved | reserved | verify mode | dupl. phys. Addr | appl. stopped | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved |          |          |          |
|         |   |   |   |   |   | APCI    | APCI | APCI | APCI | APCI | APCI | APCI    | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved    | reserved         | reserved      | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved |
|         |   |   |   |   |   | APCI    | APCI | APCI | APCI | APCI | APCI | APCI    | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved    | reserved         | reserved      | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved |
|         |   |   |   |   |   | APCI    | APCI | APCI | APCI | APCI | APCI | APCI    | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved    | reserved         | reserved      | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved | reserved |
|         |   |   |   |   |   | 1       | 1    | 1    | 1    | 1    | 0    | 1       | 1        | 1        | 1        | 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\_Indi-

cation\_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

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: the value of this parameter shall be used to indicate that the transmission of the A\_ServiceInformation\_Indication\_Write.req has been successful

not\_ok: the 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 be 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, see Figure 22.

| Octet 6 |   |   |   |   |   | Octet 7 |      |      |      |      |      | Octet 8               |      |      |      |   |   | Octet 9              |   |   |   |   |   |
|---------|---|---|---|---|---|---------|------|------|------|------|------|-----------------------|------|------|------|---|---|----------------------|---|---|---|---|---|
|         |   |   |   |   |   | APCI    |      |      |      |      |      | Domain address (high) |      |      |      |   |   | Domain 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 |
|         |   |   |   |   |   | APCI    | APCI | APCI | APCI | APCI | APCI | APCI                  | APCI | APCI | APCI |   |   |                      |   |   |   |   |   |
|         |   |   |   |   |   | 1       | 1    | 1    | 1    | 1    | 0    | 0                     | 0    | 0    | 0    |   |   |                      |   |   |   |   |   |

**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'.

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 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: the value of this parameter shall be used to indicate that the transmission of the A\_DomainAddress\_Write.req has been successful

not\_ok: the 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 mapped to the corresponding parameter of the T\_Data\_SystemBroadcast.req primitive, the TSDU shall be an A\_DomainAddress\_Read-PDU, see Figure 23.

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'.

| 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 | APCI | APCI | APCI | APCI | APCI | APCI |
|         |   |   |   |   |   | APCI    | APCI | APCI | APCI | APCI | APCI | APCI | APCI | APCI | APCI |
|         |   |   |   |   |   | APCI    | APCI | APCI | APCI | APCI | APCI | APCI | APCI | APCI | APCI |
|         |   |   |   |   |   | APCI    | APCI | APCI | APCI | APCI | APCI | APCI | APCI | APCI | APCI |
|         |   |   |   |   |   | APCI    | APCI | APCI | APCI | APCI | APCI | APCI | APCI | APCI | APCI |
|         |   |   |   |   |   | 1       | 1    | 1    | 1    | 1    | 0    | 0    | 0    | 0    | 1    |

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\_DomainAddress\_Response-PDU, see Figure 24.

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

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 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: the value of this parameter shall be used to indicate that the transmission of the A\_DomainAddress\_Read.req has been successful

not\_ok: the 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, see Figure 25.

| 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 |  |  |
|         |   |   |   |   |   | APCI    | APCI | APCI | APCI | APCI | APCI | APCI                  | APCI | APCI | APCI |   |   |                      |   |   |   |   |   |                      |   |   |   |   |   |                     |   |   |   |   |   |          |   |   |   |  |  |
|         |   |   |   |   |   | 1       | 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 the 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)          |
| 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 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, see Figure 26.

**Figure 26 – A\_NetworkParameter\_Read-PDU (example)**

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`, see Figure 27.

**Figure 27 – A\_NetworkParameter\_Response-PDU (example)**

A NetworkParameter Read.req(hop\_count type, parameter\_type, priority, test\_info)

parameter\_type: network parameter type that is verified, structured as Interface Object Type and Property Identifier

|            |                                                                        |
|------------|------------------------------------------------------------------------|
| test info: | value against which the resource indicated by parameter type is tested |
|------------|------------------------------------------------------------------------|

|                 |                                                                                                      |
|-----------------|------------------------------------------------------------------------------------------------------|
| 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

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

|                     |                                                                                                      |
|---------------------|------------------------------------------------------------------------------------------------------|
| 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                                                                    |

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 connectionless 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`, see Figure 28.

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.

[illegible]

**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).

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 connectionless communication mode

#### 7.3.1 General

A point-to-point connectionless communication mode shall be used to connect one device with another device. The following services can be applied on the point-to-point connectionless communication mode as well as on the point-to-point connection-oriented communication mode. The following subclauses specify the mapping of the services on the point-to-point connectionless 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 connectionless communication mode the ASAP parameter shall be the individual address of the communication partner.

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

The services on the point-to-point connectionless 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, see Figure 29.

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, for example, 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 |   |              |   |   |   |   |   |   |   |             |   |   |   |   |   |   |   |            |   |   |   |             |   |   |   |          |   |   |   |   |   |   |   |
|         |   |   |   |   |   | 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 |  |  |
|         |   |   |   |   |   |   | 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, see Figure 30.

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 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: the value of this parameter shall be used to indicate that the transmission of the A_PropertyValue_Read.req has been successful<br>not_ok: the value of this parameter shall be used to indicate that the transmission of the A_PropertyValue_Read.req did not succeed |
| 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                                                                                                                                                                       |

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, see Figure 31.

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.

| 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 |                     |  |  |  |  |  |  |  |  |  |
|         |   |   |   |   |   |   |   | APCI    | APCI | APCI | APCI | APCI | APCI | APCI | APCI | APCI         |   |   |   |   |   |   |   |             |   |   |   |   |   |   |   |            |   |   |   |   |   |   |   |             |   |   |   |   |   |   |   |                     |  |  |  |  |  |  |  |  |  |
|         |   |   |   |   |   | 1 | 1 | 1       | 1    | 1    | 0    | 1    | 0    | 1    | 1    | 1            |   |   |   |   |   |   |   |             |   |   |   |   |   |   |   |            |   |   |   |   |   |   |   |             |   |   |   |   |   |   |   |                     |  |  |  |  |  |  |  |  |  |

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, for example 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.

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

`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 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, for example, 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, see Figure 32.

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, for example, 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 | 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 |   |

**Figure 32 – A\_PropertyDescription\_Read-PDU (example)**

| 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    |   |   |   |   |   |   |   |              |   |   |   |   |   |   |   |             |   |   |   |   |   |   |   |                |   |   |   |   |   |   |   |
|         |   |   |   |   |   | 1 | 1 | 1       | 1 | 0 | 1 | 1 | 0 | 0 | 1 |              |   |   |   |   |   |   |   |             |   |   |   |   |   |   |   |                |   |   |   |   |   |   |   |

| Octet 11 |   |   |   |   |   |   |   | Octet 12       |   |   |   |   |   |   |   | Octet 13 |   |   |   |   |   |   |   | Octet 14   |   |   |   |             |   |   |   |
|----------|---|---|---|---|---|---|---|----------------|---|---|---|---|---|---|---|----------|---|---|---|---|---|---|---|------------|---|---|---|-------------|---|---|---|
| Type     |   |   |   |   |   |   |   | max_nr_of_elem |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   | 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 |
|          |   |   |   |   |   |   |   |                |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   | read_level |   |   |   | write_level |   |   |   |
|          |   |   |   |   |   |   |   |                |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |            |   |   |   |             |   |   |   |
|          |   |   |   |   |   |   | 1 | 1              | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1        |   |   |   |   |   |   |   |            |   |   |   |             |   |   |   |

**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, see Figure 33.

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

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 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: the value of this parameter shall be used to indicate that the transmission of the A\_PropertyDescription\_Read.req has been successful
- not\_ok: the 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

**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 mapped to the corresponding parameters of the T\_Data\_Individual.req primitive, the TSDU shall be an A\_DeviceDescriptor\_Read-PDU, see Figure 34.

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.

| Octet 6 |   |   |   |   |   |      |      | Octet 7 |      |   |   |                 |   |   |   |
|---------|---|---|---|---|---|------|------|---------|------|---|---|-----------------|---|---|---|
|         |   |   |   |   |   |      |      | APCI    |      |   |   | Descriptor_type |   |   |   |
| 7       | 6 | 5 | 4 | 3 | 2 | 1    | 0    | 7       | 6    | 5 | 4 | 3               | 2 | 1 | 0 |
|         |   |   |   |   |   | APCI | APCI | APCI    | APCI |   |   |                 |   |   |   |
|         |   |   |   |   |   | 1    | 1    | 0       | 0    | x | x | x               | x | x | x |

**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).

| Octet 6 |   |   |   |   |   |      |      | Octet 7 |                 |   |   |   |   |                   |   | Octet 8 to Octet n |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---------|---|---|---|---|---|------|------|---------|-----------------|---|---|---|---|-------------------|---|--------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|         |   |   |   |   |   | APCI |      |         | Descriptor type |   |   |   |   | Device descriptor |   |                    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 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    |                 |   |   |   |   |                   |   |                    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|         |   |   |   |   |   | 1    | 1    | 0       | 1               | x | x | x | x | x                 | x | x                  | x | x | x | x | x | x | x | x | x | x | x | x | x | x |   |

**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, see Figure 35.

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

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 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: the value of this parameter shall be used to indicate that the transmission of the A\_DeviceDescriptor\_Read.req has been successful

not\_ok: the 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"

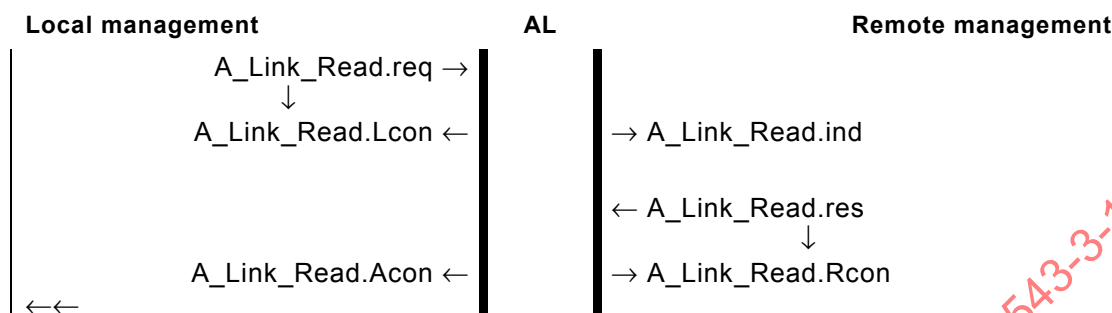
hop\_count\_type: this parameter shall be used to indicate whether the hop count of the received frame equals 7 or not

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

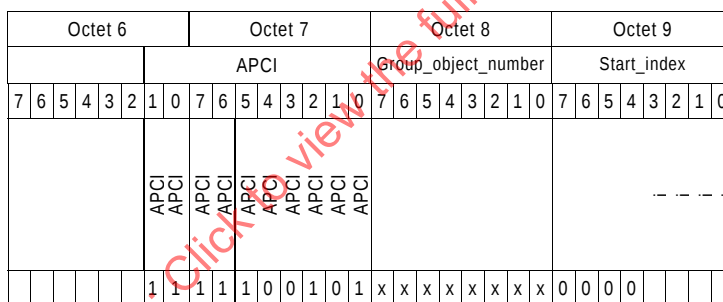
### 7.3.6 A Link Read service



**Figure 36 – Message flow for A Link Read service**

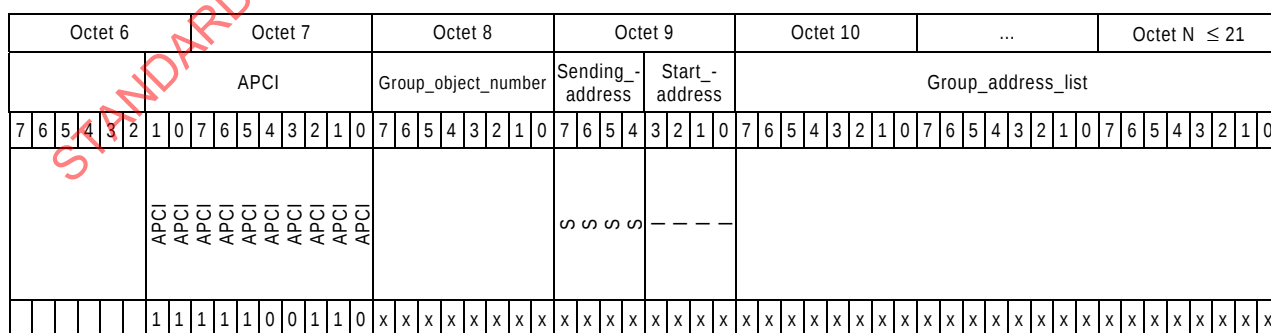
The message flow of the A Link Read service is shown in Figure 36.

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. The TSDU used by the local application layer shall be an A\_Link\_Read-PDU, see Figure 37.



**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. The TSDU used by the remote application layer shall be an A\_Link\_Read-PDU, see Figure 38.

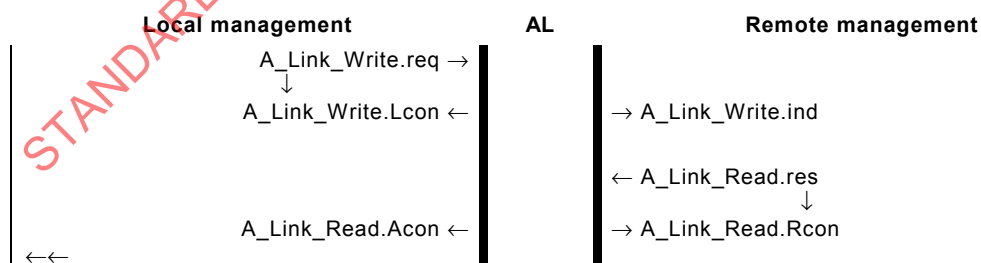


### Figure 38 – A Link Response-PDU

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

|                                                                                                                                      |                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 the 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

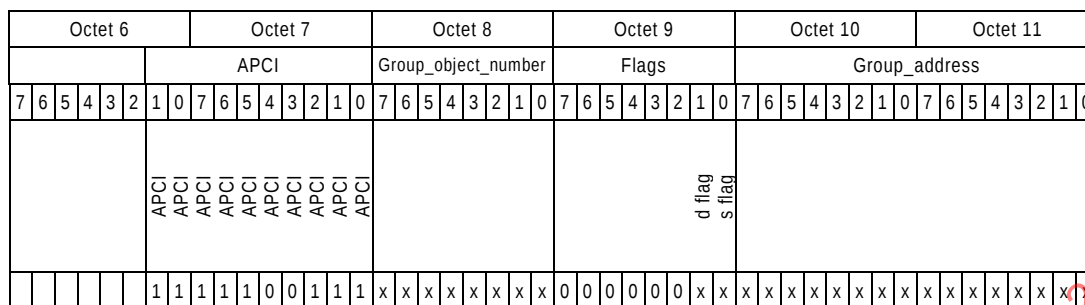


**Figure 39 – Message flow for A\_Link\_Write service**

The message flow of the A\_Link\_Write service is shown in Figure 39.

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. The TSDU used by the local application layer shall be an A\_Link\_Write-PDU, see Figure 1.



**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 an 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.

### 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, see Figure 41.

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 | APCI | APCI | Channel_nr | channel_nr | channel_nr | channel_nr | channel_nr | 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, for example 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 |   |   |   |   |   |   |   |  |
|---------|---|---|---|---|---|---|---|------------|---|---|---|---|---|---|---|---------|---|------------|---|---|---|------------|---|---------|---|----------------------------|---|---|---|-----------|---|----------|---|---|---|---|---|---|---|--|
|         |   |   |   |   |   |   |   | APC        |   |   |   |   |   |   |   |         |   | 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 |   |          |   |   |   |   |   |   |   |  |
|         |   |   |   |   |   |   |   | APC        |   |   |   |   |   |   |   |         |   |            |   |   |   |            |   |         |   |                            |   |   |   |           |   |          |   |   |   |   |   |   |   |  |
|         |   |   |   |   |   |   |   | APC        |   |   |   |   |   |   |   |         |   |            |   |   |   |            |   |         |   |                            |   |   |   |           |   |          |   |   |   |   |   |   |   |  |
|         |   |   |   |   |   | 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 |   |   |  |

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, see Figure 42.

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 parameters TSAP and priority shall be mapped to the corresponding parameters ASAP and priority of the A\_ADC\_Read.Acon primitive.

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 contain the 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 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:       | <div>ok: this value of this parameter shall be used to indicate that the transmission of the A_ADC_Read.req service has been successful</div> <div>not_ok: the value of this parameter shall be used to indicate that the transmission of the A_ADC_Read.req service did not succeed</div> |

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 |

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, see Figure 43.

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.

| 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<br>APCI<br>APCI<br>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             |   |  |  |  |  |  |  |  |  |

### 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, for example 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, see Figure 44.

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

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 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: the value of this parameter shall be used to indicate that the transmission of the A\_Memory\_Read.req has been successful

not\_ok: the 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` 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, see Figure 45.

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; the parameters number, memory\_address and data shall not be evaluated by the application layer.

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, for example 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.

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 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: the value of this parameter shall be used to indicate that the transmission of the A\_Memory\_Write.req service has been successful

not\_ok: the 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

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:

$$\text{result\_bit}(i) = ( \text{and\_data\_bit}(i) \text{ AND } \text{block\_bit}(i) ) \text{ XOR } \text{xor\_data\_bit}(i)$$

The possible results are specified in Table 2:

**Table 2 – Function table for A\_MemoryBit\_Write-Services**

| <code>and_data_bit(i)</code> | <code>xor_data_bit(i)</code> | <code>result_bit(i)</code>    |
|------------------------------|------------------------------|-------------------------------|
| 0                            | 0                            | 0                             |
| 0                            | 1                            | 1                             |
| 1                            | 0                            | <code>block_bit(i)</code>     |
| 1                            | 1                            | NOT <code>block_bit(i)</code> |

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`, see Figure 46.

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; the parameters `number`, `memory_address` and `data` shall not be evaluated by the application layer.

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, for example 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.

| Octet 6 |   |   |   |   |   |   |   | Octet 7 |      |      |      |      |      |      |      | Octet 8 |   |   |   |   |   |   |   | Octet 9        |   |   |   |   |   |   |   | Octet 10      |  |  |  |  |  |  |  |  |
|---------|---|---|---|---|---|---|---|---------|------|------|------|------|------|------|------|---------|---|---|---|---|---|---|---|----------------|---|---|---|---|---|---|---|---------------|--|--|--|--|--|--|--|--|
|         |   |   |   |   |   |   |   | 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 | APCI | APCI | APCI | APCI | APCI    |   |   |   |   |   |   |   |                |   |   |   |   |   |   |   |               |  |  |  |  |  |  |  |  |
|         |   |   |   |   |   | 1 | 1 | 1       | 1    | 1    | 0    | 1    | 0    | 0    | 0    |         |   |   |   |   |   |   |   |                |   |   |   |   |   |   |   |               |  |  |  |  |  |  |  |  |

| Octet 11 to Octet n |   |   |   |   |   |   |   | Octet (n+1) to Octet m |   |   |   |   |   |   |   |
|---------------------|---|---|---|---|---|---|---|------------------------|---|---|---|---|---|---|---|
| and_data            |   |   |   |   |   |   |   | xor_data               |   |   |   |   |   |   |   |
| 7                   | 6 | 5 | 4 | 3 | 2 | 1 | 0 | 7                      | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|                     |   |   |   |   |   |   |   |                        |   |   |   |   |   |   |   |
|                     |   |   |   |   |   |   |   |                        |   |   |   |   |   |   |   |
|                     |   |   |   |   |   |   |   |                        |   |   |   |   |   |   |   |
|                     |   |   |   |   |   |   |   |                        |   |   |   |   |   |   |   |
|                     |   |   |   |   |   |   |   |                        |   |   |   |   |   |   |   |

$$n = 10 + \text{number}$$
$$m = 10 + 2 \times \text{number}$$

**Figure 46 – A\_MemoryBit\_Write-PDU**

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 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:                                                                                     | the value of this parameter shall be used to indicate that the transmission of the A_MemoryBit_Write.req has been successful                                                   |
| not_ok:                                                                                           | the value of this parameter shall be used to indicate that the transmission of the A_MemoryBit_Write.req did not succeed                                                       |
| 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 no 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 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, see Figure 48.

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.

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 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: the value of this parameter shall be used to indicate that the transmission of the A\_UserMemory\_Read.req has been successful

not\_ok: the 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

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, see Figure 49.

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.