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Field Device Tool (FDT) interface specification –

Part 5:
FOUNDATION FIELDBUS communication

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Field Device Tool (FDT) interface specification –

Part 5: FOUNDATION FIELBUS communication

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IEC-PAS 62453-5 has been processed by subcommittee 65C: Digital communications, of IEC technical committee 65: Industrial-process measurement and control.

The text of this PAS is based on the following document:	This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document
Draft PAS	**Report on voting**
65C/398A/NP	65C/411/RVN

Following publication of this PAS, which is a pre-standard, the technical committee or subcommittee concerned will transform it into an International Standard.

This PAS shall remain valid for an initial maximum period of three years starting from 2006-05. The validity may be extended for a single three-year period, following which it shall be revised to become another type of normative document or shall be withdrawn.

IEC 62453 consists of the following parts under the general title *Field Device Tool (FDT) interface specification:*

Part 1: Concepts and detailed description

Part 2: INTERBUS communication

Part 3: PROFIBUS communication

Part 4: HART communication

Part 5: FOUNDATION FIELDBUS communication

INTRODUCTION

This PAS is an interface specification for developers of FDT components for Function Control and Data Access within a Client Server architecture. The specification is a result of an analysis and design process to develop standard interfaces to facilitate the development of servers and clients by multiple vendors that shall inter-operate seamlessly.

With the integration of fieldbusses into control systems, there are a few other tasks which must be performed. This applies to fieldbusses in general. Although there are fieldbus- and device-specific tools, there is no unified way to integrate those tools into higher level system-wide planning or engineering tools. In particular, for use in extensive and heterogeneous control systems, typically in the area of the process industry, the unambiguous definition of engineering interfaces that are easy to use for all those involved, is of great importance.

A device-specific software component, called DTM (Device Type Manager), is supplied by the field device manufacturer with its device. The DTM is integrated into engineering tools via the FDT interfaces defined in this specification. The approach to integration is in general open for all kind of fieldbusses and thus meets the requirements for integrating different kinds of devices into heterogeneous control systems.

Field Device Tool (FDT) interface specification –

Part 5: FOUNDATION FIELDBUS communication

1 Scope

This part of IEC 62435 provides information for integrating the FOUNDATION FIELDBUS (FF) protocol into the FDT interface specification (IEC 62453-1).

This PAS describes communication schemas, protocol-specific extensions and the means for block (e.g. transducer, resource or function blocks) representation.

The new protocol-specific XML schemas are based on FF specifications for H1 and HSE protocols. Furthermore, the schemas contain information about the device that is needed by systems to configure FF Devices.

The focus of this part is Foundation Fieldbus device configuration.

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

IEC 62453-1: *Field Device Tool (FDT) interface specification – Part 1: Concepts and detailed description*

IEC 61158 (all parts), *Digital data communications for measurement and control – Fieldbus for use in industrial control systems*

3 Solution concept

3.1 Overview

For the solution, this part provides communication schemas, protocol-specific extensions and means for block (e.g. resource, transducer or function blocks) configuration.

The communication schemas are created to support System Management (SM), Network Management (NM) and Fieldbus Message Specification (FMS).

Separate schemas are designed to support the different management structures for H1 and HSE devices.

Protocol-specific schemas, as required by the FDT Specification, can be used to identify Foundation Fieldbus devices and their internal structure.

A Foundation Fieldbus device is represented by a Device Type Manager (DTM) together with a group of Block Type Manager (BTM). The BTMs represent the function block functionality in an FF device.

The internal device structure is represented by the following topology, see Figure 1.

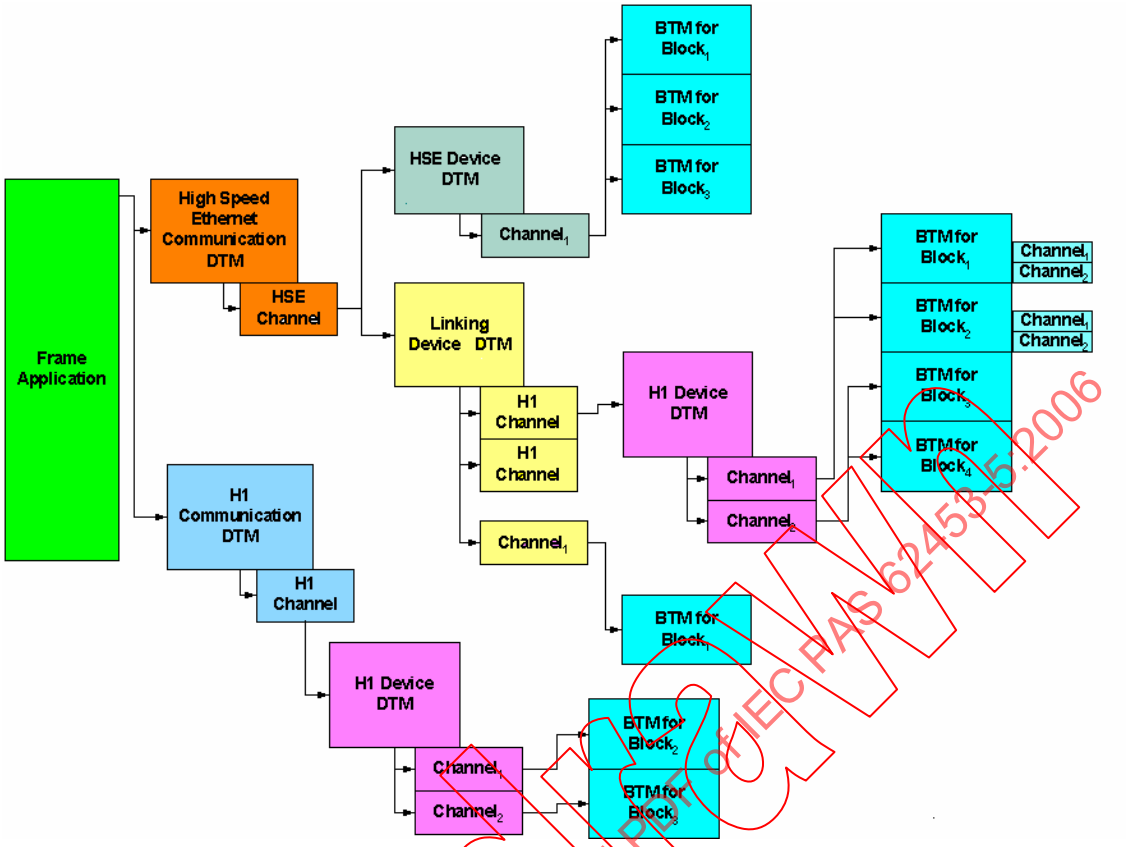

Figure 1 – Example of System Architecture and Components

The following Figure 2 shows all possible object relations for an H1 DeviceDTM.

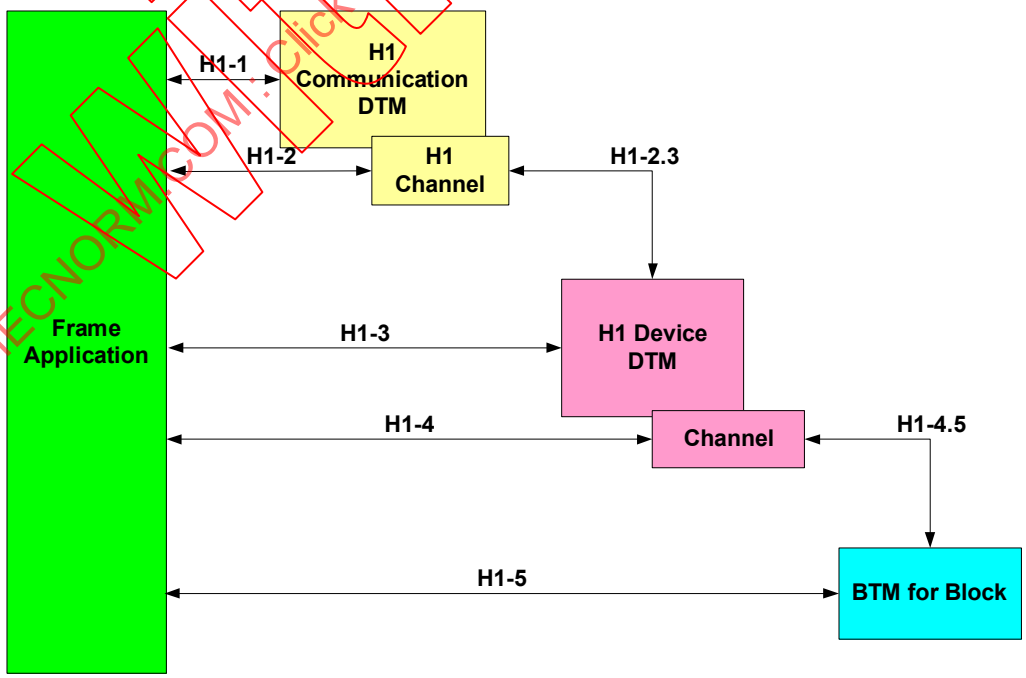

Figure 2 – Object relations for H1 DeviceDTM

For an explanation of the figure components see the following Table 1.

Table 1 – Explanation of object relations for H1 DeviceDTM

Relation	Type of information	Used schemas	Example
H1-1	Management Parameter Access	FdtFFH1ManagementSchema FdtFFDataTypesSchema	FDTFoundationFieldbusH1ManagementSchema
H1-2	Network Topology	DtmFFSchema FdtFFDataTypesSchema FdtFFHseCommunicationSchema	DTMFoundationFieldbusDeviceSchema
	Channel Parameter Access	FDTBasicChannelParameterSchema	FDTFoundationFieldbusChannelParameterSchema
H1-3	Management Parameter Access	FdtFFH1ManagementSchema FdtFFDataTypesSchema	FDTFoundationFieldbusH1ManagementSchema
H1-4	List of instantiated blocks	DtmFFSchema BtmDataTypesSchema FdtFFBlockSchema	BTMTopologyScanSchema
	Channel Parameter Access	FDTBasicChannelParameterSchema	FDTFoundationFieldbusChannelParameterSchema
H1-5	Block Information	BtmInformationSchema BtmDataTypesSchema	BTMInformationSchema
	Initialization of BTM	BtmInitSchema BtmDataTypesSchema	BTMInitSchema
	Parameter Access	BtmParameterSchema BtmDataTypesSchema	BTMParameterSchema
H1-2.3	Communication	FdtFFFmsSchema FdtFFH1CommunicationSchema FdtFFDataTypesSchema	FDTFoundationFieldbusFMSSchema FDTFoundationFieldbusH1Schema
H1-4.5	DTM-BTM Communication	FdtFFFmsSchema BTMFFCommunicationSchema BtmDataTypesSchema FdtFFDataTypesSchema	FDTFoundationFieldbusFMSSchema BtmCommunicationInstanceConnReq.xml BtmCommunicationInstanceConnResp.xml BtmCommunicationInstanceFmsReadReq.xml BtmCommunicationInstanceFmsReadResp.xml

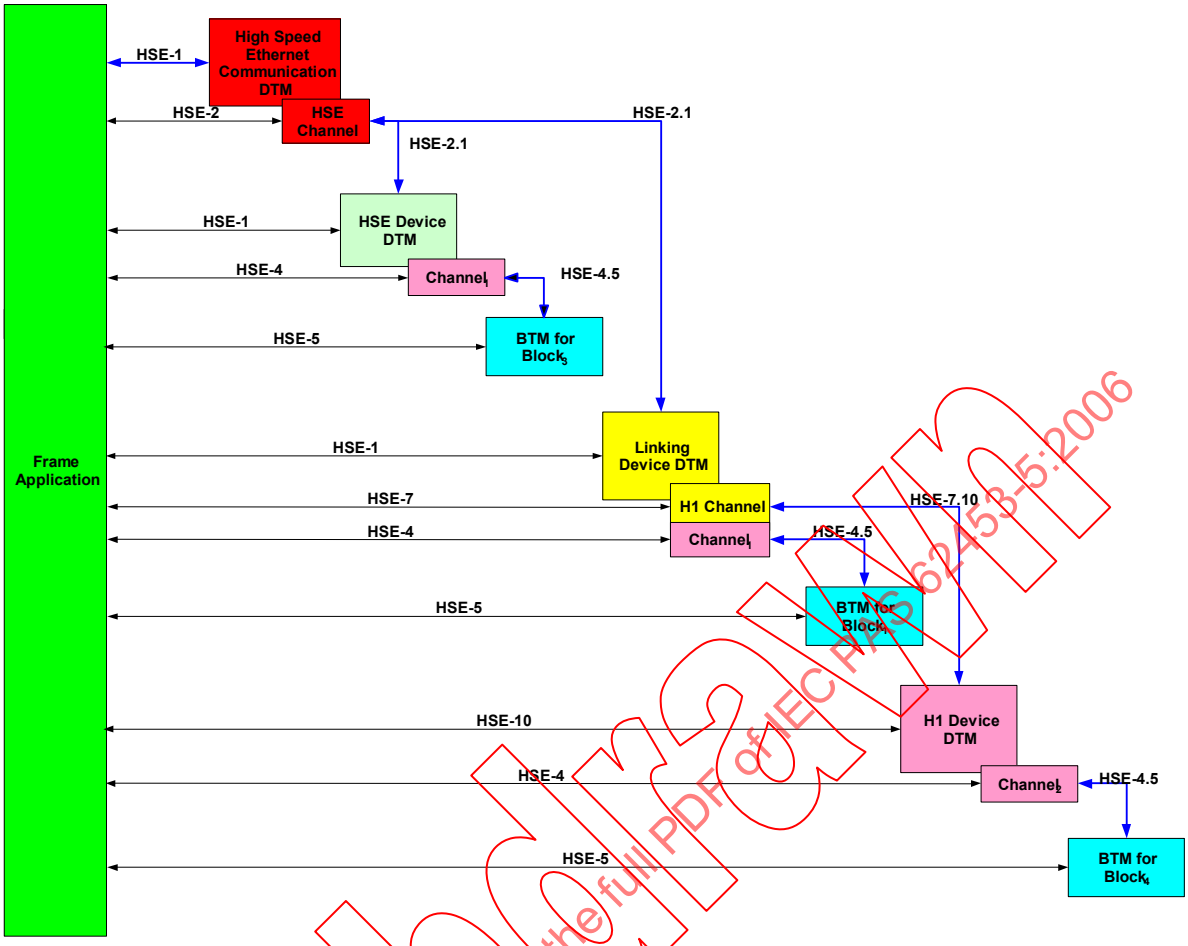

Figure 3 – Object relations for HSE DTMs

In this Figure 3, blue lines show the object hierarchy as it is managed in the FDT Frame Application. The relations are explained in following Table 2.

Table 2 – Explanation of object relations for HSE DTMs

Relation	Type of information	Used schemas	Examples
HSE-1	Management Parameter Access	FdtFFHSEManagementSchema	FDTFoundationFieldbusHSEManagement Schema
HSE-2	Network Topology	DtmFFSchema	DTMFoundationFieldbusDeviceSchema
	Channel Parameter Access	FdtFFChannelParameterSchema	FDTFoundationFieldbusChannelParameter Schema
HSE-2.1	Communication	FdtFFFmsSchema FdtFFHseCommunicationSchema FdtFFDataTypesSchema	FDTFoundationFieldbusFMSSchema FDTFoundationFieldbusHSESchema
HSE-4.5	DTM-BTM Communication	FdtFFFmsSchema BTMFFCommunicationSchema FdtFFDataTypesSchema BtmDataTypesSchema	FDTFoundationFieldbusFMSSchema BtmCommunicationInstanceConnReq.xml BtmCommunicationInstanceConnResp.xml BtmCommunicationInstanceFmsReadReq.xml BtmCommunicationInstanceFmsReadResp.xml

Relation	Type of information	Used schemas	Examples
HSE-4	List of instantiated blocks	DtmFFSchema FdtFFBlockSchema BtmDataTypesSchema	BTMTopologyScanSchema
	Channel Parameter Access	FDTBasicChannelParameterSchema	FDTFoundationFieldbusChannelParameter Schema
HSE-5	Block Information	BtmInformationSchema BtmDataTypesSchema	BTMInformationSchema
	Initialization of BTM	BtmInitSchema BtmDataTypesSchema	BTMInitSchema
	Parameter Access	BtmParameterSchema BtmDataTypesSchema	BTMParameterSchema
HSE-7	Network Topology	DtmFFSchema FdtFFDataTypesSchema FdtFFHseCommunicationSchema FdtFFBlockSchema	DTMFoundationFieldbusDeviceSchema
	Channel Parameter Access	FdtFFChannelParameterSchema FdtFFH1ManagementSchema	FDTFoundationFieldbusChannelParameter Schema
	Parameter Access	BtmParameterSchema	BTMParameterSchema
HSE-10	Management Parameter Access	FdtFFH1ManagementSchema FdtFFDataTypesSchema	FDTFoundationFieldbusH1Management Schema
HSE-7.10	Communication	FdtFFFMSSchema FdtFFH1CommunicationSchema FdtFFDataTypesSchema	FDTFoundationFieldbusFMSSchema FDTFoundationFieldbusH1Schema

3.2 Unique identifier

3.2.1 Component categories

For device-specific BTMs, a bus category (CATID) must be defined for the protocol between DTM and BTM.

The bus category is used by the Frame Application to identify the device-specific blocks. The Frame Application can prevent a device-specific block from Device A being assigned to a Device B that does not support the block.

Different protocols defined by different CATIDs can use the same communication schemas.

CATID description in the registry	Symbolic name of the CATID	UUID of the CATID	Description
“FDT FF STANDARD BLOCK”	CATID_FDT_FF_STD_ BLOCK	{036D1693-387B-11D4-86E1-00E0987270B9}	For FDT FF standard block protocol

The following table shows the valid combination of category ids.

Symbolic name of the CATID	CATID_FDT_DTM	CATID_FDT_DEVICE	CATID_FDT_MODULE	CATID_FDT_BTM	CATID_FDT_STD_BLOCK
CATID_FDT_BTM					√
CATID_FDT_STD_BLOCK				√	

3.2.2 Bus category

FF protocol is identified by the following unique identifier in busCategory attributes within XML BusCategory elements.

BusCategory Element	Description
036D1691-387B-11D4-86E1-00E0987270B9	Object supports FF H1 protocol
036D1692-387B-11D4-86E1-00E0987270B9	Object supports FF HSE protocol
036D1693-387B-11D4-86E1-00E0987270B9	For FDT FF standard block protocol

4 FF communication

4.1 Connection management

FDT Connect request service establishes an FDT Connection. The FDT Connection acts as a container for FMS Connections, as a container for SM connectionless services and as a container for FDA sessions.

It is necessary to maintain the FMS Connection separate from the underlying FDT Connection.

4.1.1 FMS connection

All FMS services are modelled in FDT as Transactions in the respective protocols. This includes the services for the FMS connection management. FMSInitiate and FMSAbort manage the lifetime of a FMS connection.

In order to open multiple **FMS Connections** on the same **FDT Connection,** IFdtCommunication::TransactionRequest() is called with an FmsInitiateRequest element as argument (see Figure 4).

The communication reference passed with the FmsInitiateRequest element identifies the FDT Connection to be used. The FmsInitiateResponse element returned with IFdtCommunicationEvents::OnTransactionResponse provides a communication reference used for all further FMS services on that FMS Connection.

This allows multiple FMS connections on one FDT Connection.

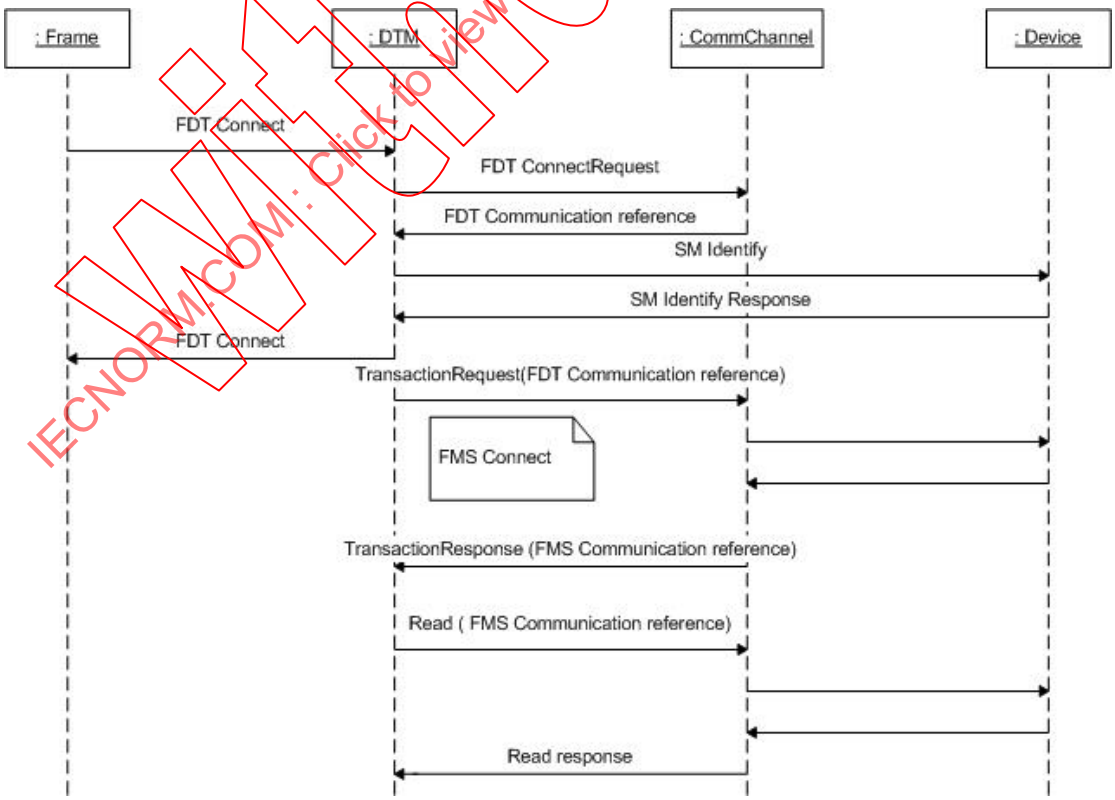

Figure 4 – Creation of an FMS connection

If the FDT connection is closed, the FMS connections for this connection are also closed automatically (by the communication channel) before the FDT Disconnect is completed (see Figure 5).

Any transactions requested after that will fail. No outstanding services will be processed.

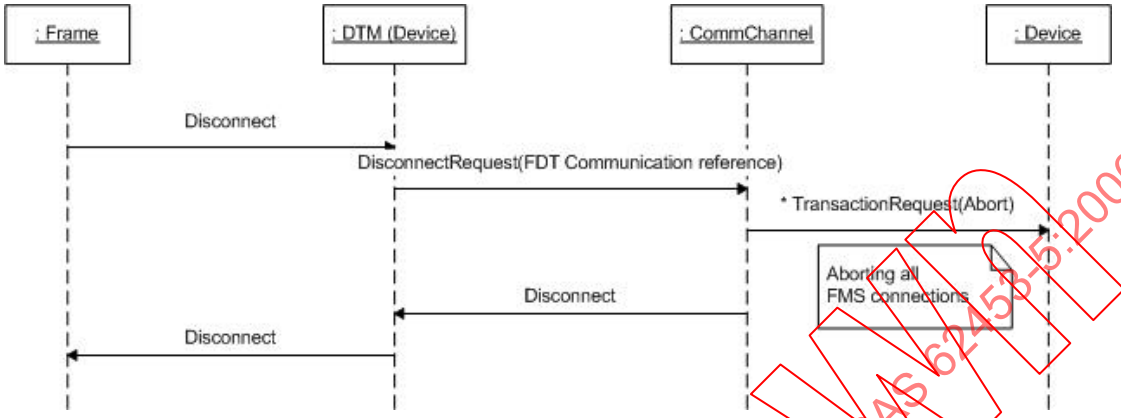

Figure 5 – Termination of an FMS connection

FMSAbort service request closes a single FMS connection.

4.1.2 HSE connection

FDT Connection is using ConnectRequest:

- To establish an FDT connection intended for System Management services only. When FDT connections for SM services only are established, the OpenSessionRequest element is not part of the ConnectRequest. Any request to establish an FMS Connection on this type of FDT Connection shall be rejected.
- To establish an FDT Connection that represents a session as described with the specification FF-588 Field Device Access Agent. FMS Connections can be established by using the FDT Communication reference returned as a result of FDT connection establishment. Note that Multicast SM services are not allowed in this Connection.

If a HSE device needs both types of connections it needs to create System management and FDT Session Connections.

When a Frame Application requests the DTM to disconnect all FMS, and FDT (SM and Session) connections will be terminated.

4.2 Abort

4.2.1 OnAbort indication

At any moment during the lifetime of the (FDT or FMS) Connection an OnAbort event indication can be received by the DTM/BTM from the Communication Channel. There can be two reasons for OnAbort Event:

- FMS Connection Abort
- FDT Connection Abort.

The Communication reference uniquely identifies the Connection to be aborted. If a FDT Connection Abort is indicated, all FMS connections of the corresponding FDT Connection must be terminated. No Abort requests are issued to the Communication Channel. All pending requests must be canceled.

If a FMS Connection Abort is indicated, only the FMS Connection identified by that Communication Reference is terminated.

4.2.2 Abort request

At any moment during the lifetime of the (FDT or FMS) Connections a DTM/BTM can issue an Abort request to the Communication Channel. There can be two types of Communication References in the Abort request:

- FMS Communication Reference
- FDT Communication Reference

The Communication reference uniquely identifies the Connection to be aborted. If an FDT Connection Abort is requested, all related FMS connections in the Communication channel must be terminated.

No separate Abort requests are issued to the Communication Channel for the individual FMS Connections. All pending requests must be canceled.

If an FMS Communication Reference is used in the Abort, only the FMS Connection identified by that Communication Reference is terminated.

4.3 Relation of FMS requests and FMS responses

If a DeviceDTM (communication client) issues a certain FMS request, it has to expect a response from a certain set (one or more) of possible responses. The following Table 3 shows what responses can be expected in regard to different FMS requests.

Table 3 – Relation of FMS requests and FMS responses

Request	Response (s)
FmsInitiateRequest	FmsInitiateResponse FmsInitiateError
FmsAbortRequest	FmsStandardResponse
FmsReadRequest	FmsReadResponse FmsServiceError
FmsWriteRequest	FmsStandardResponse FmsServiceError
FmsStatusRequest	FmsStatusResponse FmsServiceError
FmsIdentifyRequest	FmsIdentifyResponse FmsServiceError
FmsDefineVariableListRequest	FmsDefineVariableListResponse FmsServiceError
FmsDeleteVariableListRequest	FmsStandardResponse FmsServiceError
FmsGetOdRequest	FmsGetOdResponse FmsServiceError
FmsGenericInitiateDownloadSequenceRequest	FmsStandardResponse FmsServiceError
FmsGenericDownloadSegmentRequest	FmsStandardResponse FmsServiceError
FmsGenericTerminateDownloadSequence Request	FmsGenericTerminateDownloadSequenceResponse FmsServiceError

A standard FDT CommunicationError response can be received instead of FMS Transaction response to indicate a general communication error. Communication clients must be prepared to handle such response.

If the FMS connection is shared between several BTMs, all connections will receive OnAbort event.

4.4 Levels of support

Similar to the levels of support for FF devices, this PAS defines levels of support for DTMs (see Table 4).

Table 4 – Levels of support

Services	HSE				H1			
	Level 0 support	Level 1 support	Level 2 support	Level 4 support	Level 0 Support	Level 1 Support	Level 2 Support	Level 4 Support
SmSetPDTag	N/A	N/A	N/A	N/A	O	-	M	-
SmSetAddress	N/A	N/A	N/A	N/A	O	-	M	-
SmFindTag	O	-	M	-	O	-	M	-
SmIdentify	M	-	M	-	M	-	M	-
SmClearAddress	O	-	M	-	O	-	M	-
SmClearAssignmentInfo	O	-	M	-	N/A	N/A	N/A	N/A
SmSetAssignmentInfo	O	-	M	-	N/A	N/A	N/A	N/A
fms:FmsInitiate	M	M	-	-	M	M	-	-
fms:FmsAbort	M	M	-	-	M	M	-	-
fms:FmsStatus	O	M	-	-	O	M	-	-
fms:FmsIdentify	O	M	-	-	O	M	-	-
fms:FmsRead	M	M	-	-	M	M	-	-
fms:FmsWrite	M	M	-	-	M	M	-	-
fms:FmsGetOd	O	M	-	-	O	M	-	-
fms:FmsDefineVariableList	O	-	-	M	O	-	-	M
fms:FmsDeleteVariableList	O	-	-	M	O	-	-	M
fms:FmsGenericDownload	O	-	-	M	O	-	-	M

Legend:

M – Mandatory O – Optional N/A - Not Applicable

Level 0: Minimal Support

Level 1: FMS Mandatory services support

Level 2: SM Address assignment support

Level 4: Download (Domain and Variable List) Services support

FF H1 and HSE support levels for DTMs are a combination of the levels defined in Table 5. The levels in the table are defined in a way that the sum of different levels always yields a unique resulting level number.

Examples:

Mandatory Services on Level 0 will be always implemented.

A fully functional HSE DTM is level HSE-7, since it supports levels HSE-1, HSE-2, and HSE-4 additional to the basic HSE level 0.

An H1 DTM, that supports all Mandatory FMS services and also allow Address and Tag Assignment is of level H1-3, since it supports levels H1-1 and H1-2 additional to the basic H1 level 0.

SM services SetPDTag and SetAddress are H1 specific and therefore not listed in the HSE levels 0 and 2.

SM services ClearAssignmentInfo and SetAssignmentInfo are HSE specific and therefore not listed in the H1 levels 0 and 2.

5 Provided data

5.1 Interface IDtmParameter

The minimum set of provided data should be

- for foundation fieldbus devices, System Management and Network Management parameters should be provided by the DTM as specified in 4.4. "Fieldbus Management" of the FF addendum,
- all standard block parameters should be provided by the corresponding BTM object as specified in 4.2.3. "Parameter Access" of the FF addendum.

5.2 SingleDataAccess interfaces

5.2.1 DTM

All parameters exposed by the DTM to the Frame Application must be accessible by these interfaces.

5.2.2 BTM

BTMs build according to the function block specification must expose all parameters for the corresponding block. This means all parameters defined for a block in the FF specification must be exposed. The manufacturer specific parameters can extend this list. User-defined parameters must be exposed if they exist.

6 Protocol specific usage of XML attributes

The following Table 5 describes the protocol specific use of XML attributes that are defined in protocol independent schemas.

Table 5 – FF specific use of XML attributes

Attribute	Description for use in Fieldbus Foundation
address	The address attribute (defined in FDTDataTypesSchema.xml) is mandatory for the exposed parameters in the DTMs and BTMs. The address attribute string should be constructed according to the following model: VFD:xx.INDEX:yyy[.SUBINDEX:zz], where xx is the VFD tag or index yy is the parameter index from the beginning of the VFD zz is the parameter subindex The numbers are integers (some can be 32-bit) and are presented as decimal digits. There should be no leading zeros for the numbers. The subindex portion of the address is optional and for parameters without subindex it can be skipped or the subindex can be set to 0.
busCategory	See 3.2.2
semanticId applicationDomain	The applicationDomain attribute is: FDT_FoundationFieldbus The semanticId for Foundation Fieldbus related parameter follows the following rules: The semanticId must be built based on the names defined in the FF specification Structured parameters must be combined with a '.' Spaces within the profile definition must be exchanged with an underscore Capital letters should be used For detailed description please refer to "4.2.3 Parameter Access" of the FF addendum. *Examples:* OUT.STATUS OUT.VALUE OUT SemanticID for FF Fieldbus management parameter: Fieldbus management parameter (well-defined with inline schemas within the element 'UserdefinedBus' of the DTMParameterSchema) follow the following rule: 'FDT.UserDefinedBus' followed by the structure of the XML document of the inline schema. Each element must be divided by a '.'. *Example:* FDT.UserDefinedBus.ListOfH1NmaVfds.H1NmaVfd.SMIB.SmAgent.T1.t1

7 XML schemas and definitions

7.1 DTM

7.1.1 Topology scan schema

As a result of the scanning the DTM detects DTMs and objects that are covered by this Addendum. As a result of topology scan a DTM can expose information about the FF linking devices, about FF instruments and about the Blocks in the instruments.

If the DTM detects that the Frame Application supports the objects covered by this addendum it can include directly the reference to the corresponding schemas. The following files have examples demonstrating the reference to the FF schemas:

- DTMTopologyScanInstanceBlockList.xml
- DTMTopologyScanInstanceH1Device.xml

If the DTM detects that the Frame Application does not support the objects covered by this addendum the required definitions have to be defined in an inline schema. The following examples demonstrate the use of inline schemas:

- DTMTopologyScanInstanceBlockList (Inline).xml
- DTMTopologyScanInstanceH1Device (Inline).xml

The in-line schema elements must be the same as the corresponding elements from the schemas defined in this addendum.

7.1.2 DTM FF schema

The DtmFFSchema.XML flie provides description information about the FF Devices.

Data types of this schema are referenced via the prefix **fdtffdevice**: within the other schemas.

Tag	Description
BlockList	Provides the list of blocks in the device
HSEDeviceInformation	HSEDeviceInformation describes High Speed Eternet compatible devices including device version, redundancy, etc.
FoundationFieldbusH1Device	FoundationFieldbusH1Device includes information describing H1 compatible devices
FoundationFieldbusHSEDevice	Describes HSE compatible devices including the device address, VFD information, etc.

7.2 BTM

In case of a BTM the following schemas are used instead of the DTM-specific schemas defined within the FDT specification.

7.2.1 Parameter access - FF specific definitions

BTMs should use standard name attributes for standard Block parameters. The following Table 6 provides the list of the standard block parameter Mnemonic (based on Foundation Fieldbus specifications FF-890, FF-891, FF-892, FF-893, and FF-894) and their mapping to the FDT data types. The parameter mnemonic should be used as name attribute value for parameter definition.

Table 6 – List of the standard block parameter mnemonic

Parameter Mnemonic	Fieldbus Foundation Datatype/Structure	FDT Datatype (Note 1)
ACCEPT_ALM	DS-72	StructuredVariable
ACCEPT_D	Unsigned8	EnumeratorVariable
ACCEPT_PRI	Unsigned8	NumberData
ACK_OPTION	Bit String	BitEnumeratorVariable
ALARM_HYS	Float	NumberData
ALARM_SUM	DS-74	StructuredVariable
ALERT_KEY	Unsigned8	NumberData
ALGORITHM_SEL	Unsigned32	NumberData
ALM_RATE_DN	Float	NumberData
ALM_RATE_UP	Float	NumberData
ARITH_TYPE	Unsigned8	NumberData
AUTO_CYCLE	Unsigned8	EnumeratorVariable
BAL_TIME	Float	NumberData
BIAS	Float	NumberData
BIAS_IN_1	Float	NumberData
BIAS_IN_2	Float	NumberData
BIAS_IN_3	Float	NumberData
BKCAL_HYS	Float	NumberData
BKCAL_IN	DS-65	StructuredVariable
BKCAL_IN_1	DS-65	StructuredVariable
BKCAL_IN_2	DS-65	StructuredVariable
BKCAL_IN_D	DS-66	StructuredVariable
BKCAL_OUT	DS-65	StructuredVariable
BKCAL_OUT_D	DS-66	StructuredVariable
BKCAL_SEL_1	DS-65	StructuredVariable
BKCAL_SEL_2	DS-65	StructuredVariable
BKCAL_SEL_3	DS-65	StructuredVariable
BLOCK_ALM	DS-72	StructuredVariable
BLOCK_ERR	Bit String	BitEnumeratorVariable
BYPASS	Unsigned8	EnumeratorVariable
CAS_IN	DS-65	StructuredVariable
CAS_IN_D	DS-66	StructuredVariable
CFM_ACT1_TIME	Float	NumberData
CFM_ACT2_TIME	Float	NumberData
CFM_PASS_TIME	Float	NumberData
CHANNEL	Unsigned16	NumberData
CHARACTERISTICS (Note 2)	DS-64	StructuredVariable
CLOCK_PER	Float	NumberData
CLR_FSTATE	Unsigned8	EnumeratorVariable
COMB_TYPE	Unsigned8	EnumeratorVariable
COMP_HI_LIM	Float	NumberData
COMP_LO_LIM	Float	NumberData

Parameter Mnemonic	Fieldbus Foundation Datatype/Structure	FDT Datatype (Note 1)
CONFIRM_TIME	Unsigned32	NumberData
CONTENTS_REV	Unsigned32	NumberData
CONTROL_OPTS	Bit String	BitEnumeratorVariable
CRACK_TIME	Float	NumberData
CRACK_TIMER	Float	NumberData
CURVE_X	Float	NumberData
CURVE_Y	Float	NumberData
CYCLE_SEL	Bit String	BitEnumeratorVariable
CYCLE_TYPE	Bit String	BitEnumeratorVariable
DC_STATE	Unsigned8	NumberData
DD_RESOURCE	Visible String	StringData
DD_REV	Unsigned8	NumberData
DEAD_TIME	DS-65	StructuredVariable
DELAY_TIME	Float	NumberData
DELAY_TIMER	Float	NumberData
DEV_REV	Unsigned8	NumberData
DEV_TYPE	Unsigned16	NumberData
DEVICE_OPTS	Bit string	BitEnumeratorVariable
DISABLE_1	DS-66	StructuredVariable
DISABLE_2	DS-66	StructuredVariable
DISABLE_3	DS-66	StructuredVariable
DISABLE_4	DS-66	StructuredVariable
DISC_ALM	DS-72	StructuredVariable
DISC_LIM	Unsigned8	NumberData
DISC_PRI	Unsigned8	NumberData
DURATION	DURATION_TYPE (10 Floats) (Note 3)	StructuredVariable
DV_HI_ALM	DS-71	StructuredVariable
DV_HI_LIM	Float	NumberData
DV_HI_PRI	Unsigned8	NumberData
DV_LO_ALM	DS-71	StructuredVariable
DV_LO_LIM	Float	NumberData
DV_LO_PRI	Unsigned8	NumberData
EXPAND_DN	Float	NumberData
EXPAND_UP	Float	NumberData
FAIL	Unsigned16	NumberData
FAIL_ALM	DS-72	StructuredVariable
FAIL_PRI	Unsigned8	NumberData
FAULT_STATE	Unsigned8	EnumeratorVariable
FCF_LOCATOR	LOCATOR (Unsigned32 Array) (Note 4)	StructuredVariable
FDD_LOCATOR	LOCATOR (Unsigned32 Array)	StructuredVariable
FEATURE_SEL	Bit String	BitEnumeratorVariable
FEATURES	Bit String	BitEnumeratorVariable

Parameter Mnemonic	Fieldbus Foundation Datatype/Structure	FDT Datatype (Note 1)
FF_GAIN	Float	NumberData
FF_SCALE	DS-68	StructuredVariable
FF_VAL	DS-65	StructuredVariable
FIELD_VAL	DS-65	StructuredVariable
FIELD_VAL_D	DS-66	StructuredVariable
FILE_LOCATOR	LOCATOR (Unsigned32 Array)	StructuredVariable
FILE_REV	Unsigned32	NumberData
FOLLOW	DS-66	StructuredVariable
FREE_SPACE	Float	NumberData
FREE_TIME	Float	NumberData
FSTATE_STATUS	Unsigned8	NumberData
FSTATE_TIME	Float	NumberData
FSTATE_VAL	Float	NumberData
FSTATE_VAL_D	Unsigned8	NumberData
FSTATE_VAL_D1	Unsigned8	NumberData
FSTATE_VAL_D2	Unsigned8	NumberData
FSTATE_VAL_D3	Unsigned8	NumberData
FSTATE_VAL_D4	Unsigned8	NumberData
FSTATE_VAL_D5	Unsigned8	NumberData
FSTATE_VAL_D6	Unsigned8	NumberData
FSTATE_VAL_D7	Unsigned8	NumberData
FSTATE_VAL_D8	Unsigned8	NumberData
FSTATE_VAL1	Float	NumberData
FSTATE_VAL2	Float	NumberData
FSTATE_VAL3	Float	NumberData
FSTATE_VAL4	Float	NumberData
FSTATE_VAL5	Float	NumberData
FSTATE_VAL6	Float	NumberData
FSTATE_VAL7	Float	NumberData
FSTATE_VAL8	Float	NumberData
GAIN	Float	NumberData
GAIN_IN_1	Float	NumberData
GAIN_IN_2	Float	NumberData
GAIN_IN_3	Float	NumberData
GOOD_LIM	Float	NumberData
GRANT_DENY	DS-70	StructuredVariable
HARD_TYPES	Bit String	BitEnumeratorVariable
HI_ALM	DS-71	StructuredVariable
HI_BIAS	Float	NumberData
HI_GAIN	Float	NumberData
HI_HI_ALM	DS-71	StructuredVariable
HI_HI_BIAS	Float	NumberData
HI_HI_LIM	Float	NumberData

Parameter Mnemonic	Fieldbus Foundation Datatype/Structure	FDT Datatype (Note 1)
HI_HI_LIMX	Float	NumberData
HI_HI_PRI	Unsigned8	NumberData
HI_LIM	Float	NumberData
HI_LIMX	Float	NumberData
HI_PRI	Unsigned8	NumberData
HYSTVAL	Float	NumberData
IGNORE	Bit String	BitEnumeratorVariable
IGNORE_ALM	DS-72	StructuredVariable
IGNORE_PRI	Unsigned8	NumberData
IGNORE_TIME	Float	NumberData
IN	DS-65	StructuredVariable
IN_1	DS-65	StructuredVariable
IN_2	DS-65	StructuredVariable
IN_3	DS-65	StructuredVariable
IN_4	DS-65	StructuredVariable
IN_5	DS-65	StructuredVariable
IN_6	DS-65	StructuredVariable
IN_7	DS-65	StructuredVariable
IN_8	DS-65	StructuredVariable
IN_ARRAY	Float	NumberData
IN_D	DS-66	StructuredVariable
IN_D1	DS-66	StructuredVariable
IN_D2	DS-66	StructuredVariable
IN_D3	DS-66	StructuredVariable
IN_D4	DS-66	StructuredVariable
IN_LO	DS-65	StructuredVariable
INPUT_OPTS	Bit String	BitEnumeratorVariable
INTEG_OPTS	Bit String	BitEnumeratorVariable
INTEG_TYPE	Unsigned8	NumberData
INTERLOCK_D	DS-66	StructuredVariable
INVERT_OPTS	Bit String	BitEnumeratorVariable
IO_OPTS	Bit String	BitEnumeratorVariable
ITK_VER	Unsigned16	NumberData
L_TYPE	Unsigned8	EnumeratorVariable
LAG_TIME	Float	NumberData
LEAD_TIME	Float	NumberData
LIM_NOTIFY	Unsigned8	NumberData
LO_ALM	DS-71	StructuredVariable
LO_BIAS	Float	NumberData
LO_GAIN	Float	NumberData
LO_LIM	Float	NumberData
LO_LIMX	Float	NumberData
LO_LO_ALM	DS-71	StructuredVariable

Parameter Mnemonic	Fieldbus Foundation Datatype/Structure	FDT Datatype (Note 1)
LO_LO_BIAS	Float	NumberData
LO_LO_LIM	Float	NumberData
LO_LO_LIMX	Float	NumberData
LO_LO_PRI	Unsigned8	NumberData
LO_PRI	Unsigned8	NumberData
LOCKVAL	Unsigned8	EnumeratorVariable
LOW_CUT	Float	NumberData
MANUFAC_ID	Unsigned32	NumberData
MAX_NOTIFY	Unsigned8	NumberData
MEMORY_SIZE	Unsigned16	NumberData
MIN_CYCLE_T	Unsigned32	NumberData
MIN_GOOD	Unsigned8	NumberData
MO_OPTS	Bit String	BitEnumeratorVariable
MODE_BLK	DS-69	StructuredVariable
N_RESET	Float	NumberData
N_START	Unsigned16	NumberData
NV_CYCLE_T	Unsigned32	NumberData
OP_CMD_INT	Unsigned8	EnumeratorVariable
OP_CMD_SPG	Unsigned8	EnumeratorVariable
OP_SELECT	DS-66	StructuredVariable
OUT	DS-65	StructuredVariable
OUT_1	DS-65	StructuredVariable
OUT_1_RANGE	DS-68	StructuredVariable
OUT_2	DS-65	StructuredVariable
OUT_2_RANGE	DS-68	StructuredVariable
OUT_3	DS-65	StructuredVariable
OUT_4	DS-65	StructuredVariable
OUT_5	DS-65	StructuredVariable
OUT_6	DS-65	StructuredVariable
OUT_7	DS-65	StructuredVariable
OUT_8	DS-65	StructuredVariable
OUT_ALM	DS-66	StructuredVariable
OUT_ALM_SUM	Unsigned8	EnumeratorVariable
OUT_ARRAY	Float	NumberData
OUT_D	DS-66	StructuredVariable
OUT_D5	DS-66	StructuredVariable
OUT_D6	DS-66	StructuredVariable
OUT_D7	DS-66	StructuredVariable
OUT_D8	DS-66	StructuredVariable
OUT_EXP	DS-65	StructuredVariable
OUT_HI_LIM	Float	NumberData
OUT_LO_LIM	Float	NumberData
OUT_PTRIP	DS-66	StructuredVariable

Parameter Mnemonic	Fieldbus Foundation Datatype/Structure	FDT Datatype (Note 1)
OUT_RANGE	DS-68	StructuredVariable
OUT_REM	DS-65	StructuredVariable
OUT_SCALE	DS-68	StructuredVariable
OUT_STATE	Unsigned16	NumberData
OUT_TRIP	DS-66	StructuredVariable
OUTAGE_LIM	Float	NumberData
PAUSE	DS-66	StructuredVariable
PAUSE_CAUSE	Unsigned8	EnumeratorVariable
PCT_INCL	Float	NumberData
PERMISSIVE_D	DS-66	StructuredVariable
PI_POINTER	Unsigned32	NumberData
PRE_OUT	DS-65	StructuredVariable
PRE_OUT_ALM	DS-66	StructuredVariable
PRE_OUT_D	DS-66	StructuredVariable
PRE_TRIP	Float	NumberData
PSP	DS-65	StructuredVariable
PULSE_VAL1	Float	NumberData
PULSE_VAL2	Float	NumberData
PV	DS-65	StructuredVariable
PV_D	DS-66	StructuredVariable
PV_FTIME	Float	NumberData
PV_SCALE	DS-68	StructuredVariable
PV_STATE	Unsigned16	NumberData
QUIES_OPT	Unsigned8	EnumeratorVariable
RA_FTIME	Float	NumberData
RANGE_HI	Float	NumberData
RANGE_LO	Float	NumberData
RATE	Float	NumberData
RCAS_IN	DS-65	StructuredVariable
RCAS_IN_D	DS-66	StructuredVariable
RCAS_OUT	DS-65	StructuredVariable
RCAS_OUT_D	DS-66	StructuredVariable
READBACK	DS-65	StructuredVariable
READBACK_D	DS-66	StructuredVariable
RESET	Float	NumberData
RESET_CONFIRM	DS-66	StructuredVariable
RESET_D	Unsigned8	NumberData
RESET_IN	DS-66	StructuredVariable
RESTART	Unsigned8	NumberData
RESTART_TIME	Float	NumberData
REV_FLOW1	DS-66	StructuredVariable
REV_FLOW2	DS-66	StructuredVariable
ROUT_IN	DS-65	StructuredVariable

Parameter Mnemonic	Fieldbus Foundation Datatype/Structure	FDT Datatype (Note 1)
ROUT_OUT	DS-65	StructuredVariable
RS_STATE	Unsigned8	EnumeratorVariable
RTOTAL	Float	NumberData
SEL_1	DS-65	StructuredVariable
SEL_2	DS-65	StructuredVariable
SEL_3	DS-65	StructuredVariable
SEL_TYPE	Unsigned8	EnumeratorVariable
SELECT_TYPE	Unsigned8	EnumeratorVariable
SELECTED	DS-66	StructuredVariable
SET_FSTATE	Unsigned8	EnumeratorVariable
SHED_OPT	Unsigned8	NumberData
SHED_RCAS	Unsigned32	NumberData
SHED_ROUT	Unsigned32	NumberData
SHUTDOWN_D	DS-66	StructuredVariable
SIMULATE	DS-82	StructuredVariable
SIMULATE_D	DS-83	StructuredVariable
SP	DS-65	StructuredVariable
SP_D	DS-66	StructuredVariable
SP_HI_LIM	Float	NumberData
SP_LO_LIM	Float	NumberData
SP_RATE_DN	Float	NumberData
SP_RATE_UP	Float	NumberData
SPG_STATE	Unsigned8	EnumeratorVariable
SRTOTAL	Float	NumberData
SSP	Float	NumberData
ST_REV	Unsigned16	NumberData
START	DS-66	StructuredVariable
START_TYPE	Unsigned8	EnumeratorVariable
START_VAL	START_VAL _TYPE (11 Floats) (Note5)	StructuredVariable
STATUS_OPTS	Bit String	BitEnumeratorVariable
STEP_POSN	DS-66	StructuredVariable
STOTAL	Float	NumberData
STRATEGY	Unsigned16	NumberData
SWAP_2	Unsigned8	EnumeratorVariable
TAG_DESC	Octet String	StringData
TEST_RW	DS-85	StructuredVariable
TIME_POSN	DS-65	StructuredVariable
TIME_POSN_T	DS-65	StructuredVariable
TIME_UNIT1	Unsigned8	EnumeratorVariable
TIME_UNIT2	Unsigned8	EnumeratorVariable
TIME_UNITS	Unsigned8	EnumeratorVariable
TIMER_SP	Float	NumberData
TIMER_TYPE	Unsigned8	EnumeratorVariable

Parameter Mnemonic	Fieldbus Foundation Datatype/Structure	FDT Datatype (Note 1)
TOTAL_SP	Float	NumberData
TRAVEL_TIMER	Float	NumberData
TRIP_TIME	Float	NumberData
TRK_IN_D	DS-66	StructuredVariable
TRK_SCALE	DS-68	StructuredVariable
TRK_VAL	DS-65	StructuredVariable
UNCERT_LIM	Float	NumberData
UNIT_CONV	Float	NumberData
UPDATE_EVT	DS-73	StructuredVariable
WRITE_ALM	DS-72	StructuredVariable
WRITE_LOCK	Unsigned8	EnumeratorVariable
WRITE_PRI	Unsigned8	NumberData
X_RANGE	DS-68	StructuredVariable
XD_SCALE	DS-68	StructuredVariable
XD_STATE	Unsigned16	NumberData
Y_RANGE	DS-68	StructuredVariable
NOTE 1 The term FDT Datatype corresponds to an element of the fdt:Variant.ElementType as defined with the FDTDataTypesSchema. NOTE 2 Represents the Block Structure of the block as defined with Subclause 5.14.1 of the specification FF-890. NOTE 3 Defined as an array of 10 floats within Fieldbus Foundation specification FF-892 and will be mapped to a StructuredVariable containing the elements of the array NOTE 4 Defined as an array of 3 Unsigned32 values within Fieldbus Foundation specification FF-894 and will be mapped to a StructuredVariable containing the elements of the array. NOTE 5 Defined as an array of 11 floats within Fieldbus Foundation specification FF-892 and will be mapped to a StructuredVariable containing the elements of the array.		

The following Table 7 describes the structure definitions (according to the FF specification) and their mapping to FDT data type definitions.

Table 7 – Datatype definitions and mapping (structured types)

Structure	Parameter Mnemonic of Member	Fieldbus Foundation Datatype/Structure	FDT Datatype 1
DS-64		DS-64	StructuredVariable
	BLOCK_TAG	Visible String	StringData
	DD_MEMBER	Unsigned32	NumberData
	DD_ITEM	Unsigned32	NumberData
	DD_REVIS	Unsigned16	NumberData
	PROFILE	Unsigned16	NumberData
	PROFILE_REVISION	Unsigned16	NumberData
	EXECUTION_TIME	Unsigned32	NumberData
	EXECUTION_PERIOD	Unsigned32	NumberData
	NUM_OF_PARAMS	Unsigned16	NumberData
	NEXT_FB_TO_EXECUTE	Unsigned16	NumberData

Structure	Parameter Mnemonic of Member	Fieldbus Foundation Datatype/Structure	FDT Datatype 1
	VIEWS_INDEX	Unsigned16	NumberData
	NUMBER_VIEW_3	Unsigned8	NumberData
	NUMBER_VIEW_4	Unsigned8	NumberData
DS-65		DS-65	StructuredVariable
	STATUS	Unsigned8	NumberData
	VALUE	Float	NumberData
DS-66		DS-66	StructuredVariable
	STATUS	Unsigned8	NumberData
	VALUE	Unsigned8	NumberData
DS-67		DS-67	StructuredVariable
	STATUS	Unsigned8	NumberData
	VALUE	Bit String	BitEnumeratorVariable
DS-68		DS-68	StructuredVariable
	EU_100	Float	NumberData
	EU_0	Float	NumberData
	UNITS_INDEX	Unsigned16	NumberData
	DECIMAL	Integer8	NumberData
DS-69		DS-69	StructuredVariable
	TARGET	Bit String	BitEnumeratorVariable
	ACTUAL	Bit String	BitEnumeratorVariable
	PERMITTED	Bit String	BitEnumeratorVariable
	NORMAL	Bit String	BitEnumeratorVariable
DS-70		DS-70	StructuredVariable
	GRANT	Bit String	BitEnumeratorVariable
	DENY	Bit String	BitEnumeratorVariable
DS-71		DS-71	
	UNACKNOWLEDGED	Unsigned8	EnumeratorVariable
	ALARM_STATE	Unsigned8	EnumeratorVariable
	TIME_STAMP	Time value	TimeData
	SUB_CODE	Unsigned16	EnumeratorVariable
	VALUE	Float	NumberData
DS-72		DS-72	
	UNACKNOWLEDGED	Unsigned8	EnumeratorVariable
	ALARM_STATE	Unsigned8	EnumeratorVariable
	TIME_STAMP	Time value	TimeData

Structure	Parameter Mnemonic of Member	Fieldbus Foundation Datatype/Structure	FDT Datatype 1
	SUB_CODE	Unsigned16	EnumeratorVariable
	VALUE	Unsigned8	NumberData
DS-73		DS-73	
	UNACKNOWLEDGED	Unsigned8	EnumeratorVariable
	UPDATE_STATE	Unsigned8	EnumeratorVariable
	TIME_STAMP	Time value	TimeData
	STATIC_REVISION	Unsigned16	NumberData
	RELATIVE_INDEX	Unsigned16	NumberData
DS-74		DS-74	
	CURRENT	Bit String	BitEnumeratorVariable
	UNACKNOWLEDGED	Bit String	BitEnumeratorVariable
	UNREPORTED	Bit String	BitEnumeratorVariable
	DISABLED	Bit String	BitEnumeratorVariable
DS-82		DS-82	
	SIMULATE_STATUS	Unsigned8	NumberData
	SIMULATE_VALUE	Float	NumberData
	TRANSDUCER_STATUS	Unsigned8	NumberData
	TRANSDUCER_VALUE	Float	NumberData
	ENABLE_DISABLE	Unsigned8	EnumeratorVariable
DS-83			
	SIMULATE_STATUS	Unsigned8	NumberData
	SIMULATE_VALUE	Float	NumberData
	TRANSDUCER_STATUS	Unsigned8	NumberData
	TRANSDUCER_VALUE	Float	NumberData
	ENABLE_DISABLE	Unsigned8	EnumeratorVariable
DS-85		DS-85	
	VALUE_1	Boolean	NumberData
	VALUE_2	Integer8	NumberData
	VALUE_3	Integer16	NumberData
	VALUE_4	Integer32	NumberData
	VALUE_5	Unsigned8	NumberData
	VALUE_6	Unsigned16	NumberData
	VALUE_7	Unsigned32	NumberData
	VALUE_8	Float	NumberData
	VALUE_9	Visible String	StringData
	VALUE_10	Octet String	StringData
	VALUE_11	Date	TimeData
	VALUE_12	Time of Day	TimeData

Structure	Parameter Mnemonic of Member	Fieldbus Foundation Datatype/Structure	FDT Datatype 1
	VALUE_13	Time Difference	TimeData
	VALUE_14	Bit String	BitEnumeratorVariable
	VALUE_15	Time Value	TimeData
DURATION_TYPE	DURATION_1 -	Float	NumberData
	DURATION_10	Float	NumberData
START_VAL _TYPE	START_VAL _1	Float	NumberData
	START_VAL _11	Float	NumberData
LOCATOR	KEY	Unsigned32	NumberData
	LENGTH	Unsigned32	NumberData
	LOCATION_INDEX	Unsigned32	NumberData
NOTE[1] The term FDT Datatype corresponds to an element of the fdt:VariantElementType as defined with the FDTDataTypesSchema.			

The following Table 8 describes the simple parameter definitions (according to the FF specification) and their mapping to FDT data type definitions.

Table 8 – Datatype definitions and mapping (simple types)

FF Data type definition	FDT Datatype	Note
Boolean	Int	Definition: == 0 is False != 0 is True
Integer 8	Int	Note that only the first 8 bits (LSBs) will be used
Integer 16	Int	Note that only the first 16 bits (LSBs) will be used
Integer 32	Int	
Unsigned 8	Unsigned	Note that only the first 8 bits (LSBs) will be used
Unsigned 16	Unsigned	Note that only the first 16 bits (LSBs) will be used
Unsigned 32	Unsigned	
Floating Point	Float	
Visible String	ascii	Please see FF-870 chapter 9.3.1.5 for a detailed definition and byte sequence.
Octet String	hexString	Please see FF-870 chapter 9.3.1.6 for a detailed definition and byte sequence of Octet string.
Date	dateAndTime	The standard dateTime data type will be used to present the value
Time of Day	dateAndTime	The standard dateTime data type will be used to present the value
Time Difference	hexString	Please see FF-870 chapter 9.3.1.9 for a detailed definition and byte sequence of Time Difference.
Bit String	bitString	Note: Bit enumerations will be used if possible.
Time Value	hexString	Please see FF-870 chapter 9.3.1.11 for a detailed definition and byte sequence of Time Value.

7.3 Communication

7.3.1 ChannelParameter Schema

Used at:

- IFdtChannel::GetChannelParameters()
- IFdtChannel::SetChannelParameters()

The XML document describes how to access a channel for DTM and BTM. Table 9 explains the attributes and elements of the schema.

Table 9 – FoundationFieldbusChannelParameterSchema – attributes and elements

Attribute	Description
frameApplicationTag	Frame Application-specific tag used for identification and navigation. The DTM/BTM should display this tag at channel-specific user interfaces
gatewayBusCategory	Unique identifier for a supported bus type (H1 or HSE) according to the specific CATID
index	Address information
invalidBit	Bit position of the invalid status channel
logic	Additional data type information: positive 0=FALSE 1TRUE
number	Address information
protectedByChannelAssignment	TRUE if the channel is set to Read Only by the Frame Application. Usually set to TRUE if a channel assignment exists
simulationBit	Bit position of the simulation status channel
statusChannel	TRUE if the channel is for status information only
substituteValueBit	Bit position of the substitute status channel
Tag	**Description**
FDT	Root Tag
FDTChannelType	Description of the channel component in case of channels with gateway functionality
FDTChannel	Description of the channel
StatusInformation	Description of additional status information for channels
ParameterAddress	Address of parameter

See FDTFoundationFieldbusChannelParameterSchema.xml.

Examples:

FDTFoundationFieldbusChannelParameterInstance1.xml

FDTFoundationFieldbusChannelParameterInstance2.xml

7.3.2 FF data type

The FdtFFDataTypesSchema is used as a global FF definition. Data types of this schema are referenced via the prefix **fftypes**: within the other schemas. Table 10 explains the attributes and Table 11 explains the elements of the schema.

Table 10 – FdtFFDataTypesSchema – attributes

Attribute	Description
communicationReference	A unique identifier for the communication endpoint. Identifier of the virtual communication relationship used in communicating the request to the field device.
ddRevision	Device Description revision as provided in the VFD – resource block.
deviceIndex	This attribute is a site administered number that identifies the device. This index is unique within an HSE subnet. FF-803 FS 1.19 SM Subclause 6.2.5.
devID	The Device ID is a system independent identifier that is provided by the manufacturer. FF-880 Subclause 5.3
devType	Device Type as provided in the VFD – resource block.
deviceType	Device type specifies the capabilities of the device as described in FF-589 Subclause 6.2.3.1
deviceRevision	Device Revision as provided in the VFD – resource block.
ip	String representation of the IP address as described in RFC 791 Internet protocol (IP).
linkId	Link designator according to FF-822
listCount	List Count.
nodeId	Node designator according to FF-822
port	Communication end point as described in RFC 791 Internet protocol (IP).
selector	Selector according to FF-822
smServiceID	An enumeration attribute used for system management service identification.
subIndex	Parameter subindex value.
versionNumber	An integer identifying the version number.
versionOd	Object dictionary version number.
vfdRef	VFD Reference according to FF-880 Clause 8. This attribute is the numeric identifier for a VFD. It is assigned by the device. The VFD Ref is unique within the context of the NMA VFD in which it is defined. Within a linking device, if a VFD appears in the VFD List of more than one interface (HSE or H1), then its VFD Ref may be different in each. However, when qualified by its interface, it uniquely identifies the VFD. FF-803 FS 1.19 SM Subclause 6.2.4.1.
vfdTag	An unique identifyer of the Virtual Field Device (VFD) in readable form. This attribute is the alphanumeric identifier for the VFD. It may be assigned by the user. FF-803 FS 1.19 SM Subclause 6.2.4.1.
macroCycleDuration	A period for schedule repetition.
manufacturerId	Device Manufacturer ID as described in the Resource block
operationalPowerup	An element describing System Management State of the device
scheduleActivation	This is used to activate one of the FB Schedules resident in the SMIB. To activate a schedule, the Version Number of the schedule to be activated is written to this variable. FF-803 FS 1.19 SM Subclause 6.2.5.
fmsFeaturesSupported	See FF-870 Subclause 3.3.4 - FMS services and the options supported by the server
vfdTag	Virtual Field Device Tag. The VFD tag can be obtained from the device or from the CFF file describing the device.

Table 11 – FdtFFDataTypesSchema – elements

Tag	Description
DataLinkAddress	Denotes the Data link (DL) Addresses. For H1 see FF-822 Annex A. For HSE see FDA Address use of the specification FF-588 Field Device Access Agent – Annex B
Index	Element index. Can be used for IndexList element
IndexList	An element including a list of parameter indexes. Values for the indexes are absolute. Block starting index offset is required for correct index value
IP	Element denotes a full IP address comprised of the IP address denoted with the attribute "ip" and the port number denoted with the attribute "port"
SubIndex	Element SubIndex
VfdIdentification	Provides Device VFD identification information including Device Manufacturer, Device type, revision, etc.
VfdRef	VFD Reference according to FF-880 Clause 8. This attribute is the numeric identifier for a VFD. It is assigned by the device. The VFD Ref is unique within the context of the NMA VFD in which it is defined. Within a linking device, if a VFD appears in the VFD List of more than one interface (HSE or H1), then its VFD Ref may be different in each. However, when qualified by its interface, it uniquely identifies the VFD. FF-803 FS 1.19 SM Subclause 6.2.4.1

See FDTFoundationFieldbusDataTypesSchema.xml.

7.3.3 FF FMS data types

The FF FMS data type schema is used as a global FF FMS definition. Data types and services defined in this schema are referenced via the prefix **fms**: within the other schemas. Table 12 explains the attributes and Table 13 explains the elements of the schema.

Table 12 – FdtFFFMSDataTypesSchema – attributes

Attribute	Description
accessProtection	See FMS-870 Subclause 3.6.3.6 - Access groups and access rights
accessProtectionSupportedCalled	See FMS-870 Subclause 3.3.4 - Access Protection Supported attribute of the server's OD object description
accessProtectionSupportedCalling	See FF-870 Subclause 3.3.4 - Access Protection Supported attribute of the client's OD object description
additionalCode	See FMS-870 Subclause 6.1
additionalDescription	See FMS-870 Subclause 6.1
allAttributes	See FF-870 Subclause 3.2.6 OD shall be transferred in the short form (false) or in the long form (true)
errorClass	Error classes for ErrorInfo element according to FF-870 Subclauses 6.1 and 10.1.4.4 the error class values defined with the attribute errorClass shall comply with the codes defined with FF-870 Subclause 10.1.4.4
errorCode	Error codes for ErrorInfo element according to FF-870 Subclauses 6.1 and 10.1.4.4 the error code values defined with the attribute errorCode shall comply with the codes defined with FF-870 Subclause 10.1.4.4
finalResult	See FMS-870 Subclause 3.4.3.3 - informs client whether or not the server successfully finished the Download
fmsFeaturesSupportedCalled	See FF-870 Subclause 3.3.4 - FMS services and the options supported by the server
localDetail	See FMS-870 Subclause 3.1.3.1 - local state of the application and the device
logicalStatus	See FMS-870 Subclause 3.1.3.1 - state of the communication capabilities of the device

Attribute	Description
maxFmsPduReceivingCalled	See FF-870 Subclause 3.3.4 - maximum length of the FMS PDU to be received
maxFmsPduSendingCalled	See FF-870 Subclause 3.3.4 - maximum length of the MS PDU to be sent on VCR
modelName	See FMS-870 Subclause 3.1.3.3 - model name
moreFollows	See FF-870 Subclause 3.2.6 - more object descriptions follow
numberOfObjectDescriptions	See FF-870 Subclause 3.2.6 - number of object descriptions
passwordAndAccessGroupsCalled	See FMS-870 Subclause 3.3.4
passwordAndAccessGroupsCalling	See FF-870 Subclause 3.3.4 - password to be used for the access to all objects of the server on this VCR and membership in access groups
physicalStatus	See FMS-870 Subclause 3.1.3.1 - coarse summary of the state of the real device
profileNumberCalled	See FF-870 Subclause 3.3.4 - Profile Number of the server
profileNumberCalling	See FF-870 Subclause 3.3.4 - Profile Number of the client
responseType	Attribute of element FmsStandardResponse - refers to NULL response according to FF-870 Clause 10
revision	See FMS-870 Subclause 3.1.3.3 - Revision attribute of the VFD
startFlag	See FF-588 Subclause 6.5.3.7.1 - get multiple consecutive OD entries true / false
versionOdCalling	See FF-870 Subclause 3.3.4 - version of the client's Object Dictionary

Table 13 – FdtFFFMSDataTypesSchema – elements

Tag	Description
AccessSpecificationDomain	Element AccessSpecificationDomain - Selection of type of domain access used for Domain management services (see FF-870 Subclause 3.4.3)
AccessSpecificationOd	Element AccessSpecificationOd - Selection of type of OD access used by OD management services (see FF-870 Subclause 3.2.6). See also element FmsGetOdRequest
AccessSpecificationVar	Element AccessSpecificationVar - Selection of type of variable access used for variable access services (see FF-870 Subclause 3.6.3)
AccessSpecificationVL	Element AccessSpecificationVL - Selection of type of variable list access used for service FMS DeleteVariableList (see FF-870 Subclause 3.6.3.7)
CommonErrorType	ErrorInfo element according to error classes FF-870 Subclause 10.1.4.4
DomainName	Element DomainName identifies name of a domain. Used by OD management (see FF-870 Subclause 3.2.6) and Domain management services (see FF-870 Subclause 3.4.3)
ErrorDescription	Error description shall contain the following entries: One EnumeratorEntry for the error class describing the error class. One EnumeratorEntry for the error code. EnumeratorEntry for error class: EnumeratorEntry/@index - shall contain the error class according to FF-870 Subclause 10.1.4.4 EnumeratorEntry/@name - shall contain a descriptive name of the error class that complies withthe error class names defined with FF-870 Subclause 10.1.4.4 (e.g. access). EnumeratorEntry/@descriptor - free description of error class - could also be a localized text.

Tag	Description
	EnumeratorEntry for error code: EnumeratorEntry/@index - shall contain the error code according to FF-870 Subclause 10.1.4.4 EnumeratorEntry/@name - shall contain a descriptive name of the error code that complies with the error code names defined with FF-870 Subclause 10.1.4.4 (e.g. invalid-address). EnumeratorEntry/@descriptor - free description of error code - could also be a localized text
ErrorInfo	ErrorInfo element according to error classes FF-870 Subclause 10.1.4.4
EventName	Element EventName identifies name of an event. Used by OD management (see FF-870 Subclause 3.2.6) services
FmsDefineVariableListRequest	Variable access see FF-870 Subclause 3.6.3 and Subclause 10.1.10
FmsDefineVariableListResponse	Variable access see FF-870 Subclause 3.6.3 and Subclause 10.1.10
FmsDeleteVariableListRequest	Variable access see FF-870 Subclause 3.6.3 and Subclause 10.1.10
FmsGenericDownloadSegmentRequest	Domain management see FF-870 Subclause 3.4.3 and Subclause 10.1.8
FmsGenericInitiateDownloadSequenceRequest	Domain management see FF-870 Subclause 3.4.3 and Subclause 10.1.8
FmsGenericTerminateDownloadSequenceRequest	Domain management see FF-870 Subclause 3.4.3 and Subclause 10.1.8
FmsGenericTerminateDownloadSequenceResponse	Domain management see FF-870 Subclause 3.4.3 and Subclause 10.1.8
FmsGetOdRequest	OD Management see FF-870 Subclause 3.2.6 and Subclause 10.1.6
FmsGetOdResponse	OD Management see FF-870 Subclause 3.2.6 and Subclause 10.1.6
FmsIdentifyRequest	VFD Support see FF-870 Subclause 3.1.3 and Subclause 10.1.5
FmsIdentifyResponse	VFD Support see FF-870 Subclause 3.1.3 and Subclause 10.1.5
FmsInitiateError	Context management see FF-870 Subclause 3.3.4 and Subclause 10.1.7
FmsInitiateRequest	Context management see FF-870 Subclause 3.3.4 and Subclause 10.1.7
FmsInitiateResponse	Context management see FF-870 Subclause 3.3.4 and Subclause 10.1.7
FmsReadRequest	Variable access see FF-870 Subclause 3.6.3 and Subclause 10.1.10
FmsReadResponse	Variable access see FF-870 Subclause 3.6.3 and Subclause 10.1.10
FmsServiceError	Element FmsServiceError - refers to FMS ServiceError response according to FF-870 Subclause 10.1.4
FmsStandardResponse	Element FmsStandardResponse - refers to NULL response according to FF-870 Clause 10
FmsStatusRequest	VFD Support see FF-870 Subclause 3.1.3 and Subclause 10.1.5
FmsStatusResponse	VFD Support see FF-870 Subclause 3.1.3 and Subclause 10.1.5
FmsWriteRequest	Variable access see FF-870 Subclause 3.6.3 and Subclause 10.1.10
OdErrorType	ErrorInfo element according to error classes FF-870 Subclause 10.1.4.4
PiName	Element PiName identifies name of a program invocation object. Used by OD management services (see FF-870 Subclause 3.2.6)

Tag	Description
StartIndex	Index, starting with which the object descriptions shall be read. OD management (see FF-870 Subclause 3.2.6) services
VariableListItem	Element VariableListItem - Selection of type of variable access used for service FMS DefineVariableList (see FF-870 Subclause 3.6.3.6) see also element FmsDefineVariableListRequest
VariableListName	Element VariableListName identifies the name of variable list. Used by variable access services - see FF-870 Subclause 3.6.3 and Subclause 10.1.10 and OD management service see FF-870 Subclause 3.2.6
VariableName	Element VariableName identifies the name for a variable. Used by variable access services - see FF-870 Subclause 3.6.3 and Subclause 10.1.10

See FDTFoundationFieldbusFMSSchema.xml

7.3.4 H1 communication schema

Used at:

IFdtCommunication::ConnectRequest()

IFdtCommunication::OnConnectResponse)

IFdtCommunication::DisconnectRequest()

IFdtCommunication::OnDisconnectResponse ()

IFdtCommunication::TransactionRequest()

IFdtCommunication::OnTransactionResponse)

The XML document contains the address information and the communication data. Table 14 explains the attributes and Table 15 explains the elements of the schema.

Table 14 – FdtFFH1CommunicationSchema – attributes

Attribute	Description
clearPDTag	System management related attributes
delayTime	Delay time in [ms] between two communication calls
elementID	Used by system management service Find Tag Query according to FF-880 Subclause 5.5.2.1 This is the unsigned 32-bit integer that, when present, together with the Tag identifies the element (e.g. FB parameter) to be located. See also element SmQueryFB and SmFindTagQuery
moreVCRL	Used by system management service Find Tag Reply according to FF-880 Subclause 5.5.2.2. This Boolean flag is true when there are additional communication relationships in the remote device which may be used for the communication path. See also elements SmReplyVFD, SmReplyFB and SmFindTagReply
reasonCode	Reason code according to FF-880 Clause 7
sequenceTime	Period of time in [ms] for the whole sequence
smAPClockSyncInterval	Application clock synchronization interval for the link on which the field device resides. See system management service Set Address FF-880 Subclause 5.2.1.2.2.
smPrimaryAPTimePublisher	This is the address of the primary application clock time publisher for the link on which the field device resides. See system management service Set Address FF-880 Subclause 5.2.1.2.2

Table 15 — FdtFFH1CommunicationSchema –elements

Tag	Description
Abort	Describes the abort
ConnectError	Context management see FF-870 Subclause 3.3.4 and Subclause 10.1.7
ConnectRequest	Context management see FF-870 Subclause 3.3.4 and Subclause 10.1.7
ConnectResponse	Context management see FF-870 Subclause 3.3.4 and Subclause 10.1.7
DisconnectRequest	Context management see FF-870 Subclause 3.3.4 and Subclause 10.1.7
DisconnectResponse	Context management see FF-870 Subclause 3.3.4 and Subclause 10.1.7
FDT	Root tag
SequenceBegin	General sequence support see FDT spec IFdtCommunication sequence processing
SequenceEnd	General sequence support see FDT spec IFdtCommunication sequence processing
SequenceStart	General sequence support see FDT spec IFdtCommunication sequence processing
SmClearAddressRequest	System management service Clear Address see FF-880 Subclause 5.2.1.3.1
SmFindTagQuery	System management service Find Tag Query see FF-880 Subclause 5.5.2.1 if the SmFindTagQuery could not be transmitted, a SmStandardResponse with reasonCode will be received
SmFindTagReply	System management service Find Tag Reply see FF-880 Subclause 5.5.2.2
SmIdentifyRequest	System management service SM Identify see FF-880 Subclause 5.3.1
SmIdentifyResponse	System management service SM Identify see FF-880 Subclause 5.3.1
SmSetAddressRequest	System management service Set Address see FF-880 Subclause 5.2.1.2.2
SmSetPDTagRequest	System management service Set PD-Tag see FF-880 Subclause 5.2.1.1.2
SmStandardResponse	System management services see FF-880 Clause 5

See FDTFoundationFieldbusH1CommunicationSchema.xml

Example:

FDTFoundationFieldbusH1CommunicationInstanceFmsServiceError.xml
FDTFoundationFieldbusH1CommunicationInstanceFmsReadRequest.xml
FDTFoundationFieldbusH1CommunicationInstanceFmsGetOdRequest.xml
FDTFoundationFieldbusH1CommunicationInstanceFmsStatusResponse.xml
FDTFoundationFieldbusH1CommunicationInstanceSmIdentifyRequest.xml
FDTFoundationFieldbusH1CommunicationInstanceSMIB.xml
FDTFoundationFieldbusH1CommunicationInstanceSmIdentifyResponse.xml
FDTFoundationFieldbusH1CommunicationInstanceSmSetAddressRequest.xml
FDTFoundationFieldbusH1CommunicationInstanceSmSetPDTagRequest.xml

7.3.5 HSE communication schema

Used at:

IFdtCommunication::ConnectRequest()
IFdtCommunication::OnConnectResponse)
IFdtCommunication::DisconnectRequest()
IFdtCommunication::OnDisconnectResponse ()
IFdtCommunication::TransactionRequest()
IFdtCommunication::OnTransactionResponse)

The XML document contains the address information and the communication data. Table 16 explains the attributes and Table 17 explains the elements of the schema.

Table 16 — FdtFFHSECommunicationSchema – attributes

Attribute	Description
configurationUseNMA	NMA configuration use - see FF-588 6.5.1.1.1
connectOption	Indicates which option is to be used to open the FMS connection. See FF-588 Subclause 6.5.3.2
delayTime	Delay time in ms between two communication calls
deviceRedundancyState	Device Redundancy State - see FF-589 and FF-588 Subclause 6.5.2.7.1 used with response to SM Identify service
duplicateDetectionState	indicates duplicate detection state received with SM Find Tag Reply. See FF-588 Subclause 6.5.2.2 and FF-589 5.3.2
inactivityCloseTime	Inactivity close time in seconds - see FF-588 Subclause 6.5.1.1.1
interfaceToClear	identifies the HSE interface to be cleared. see FF-589
maxDeviceIndex	maximum value that the device index may have. See the Redundancy specification FF-593
noError	Indicates that no error occured. Used by SmStandardResponse to encode a SM service response with no error
queryType	Indicates the type of query for SM Find Tag Query service See FF-588 Subclause 6.5.2.1 and FF-589 5.3.1
redundantCapability	Redundant Device Type Capability - see FF-588 Subclause 6.5.2.7.1 used with response to SM Identify service
repeatTimeHSE	HSE Repeat time for device annunciations see FF-589
sequenceTime	Period of time in ms for the whole sequence
stateSMK	State of HSE SMK as defined with FF-589
transmitDelayTime	Transmit delay time in ms - see FF-588 6.5.1.1.1
versionAnnunciation	Version number of SM annunciation message - see FF-589
versionHSEDevice	version of the List of Version Numbers in SM Characteristics in the SMIB - see FF-589

Table 17 — FdtFFHSECommunicationSchema –elements

Tag	Description
Abort	Describes the abort
ConnectError	Context management see FF-588 Subclause 6.5.3.2 and FF-870 Subclauses 3.3.4 and 10.1.7
ConnectRequest	Context management see FF-588 Subclause 6.5.3.2 and FF-870 Subclauses 3.3.4 and 10.1.7
ConnectResponse	Context management see FF-588 Subclause 6.5.3.2 and FF-870 Subclauses 3.3.4 and 10.1.7
DeviceInformation	This attribute specifies the capabilities of the device. It is defined in the FDA specification [FF-588]. FF-803 FS 1.19 SM Subclause 6.2.5
DisconnectRequest	Context management see FF-588 Subclause 6.5.3.2 and FF-870 Subclauses 3.3.4 and 10.1.7
DisconnectResponse	Context management see FF-588 Subclause 6.5.3.2 and FF-870 Subclauses 3.3.4 and 10.1.7
FDT	Root tag
SequenceBegin	General sequence support see FDT spec IFdtCommunication sequence processing

Tag	Description
SequenceEnd	General sequence support see FDT spec IFdtCommunication sequence processing
SequenceStart	General sequence support see FDT spec IFdtCommunication sequence processing
SmClearAddressRequest	See FF-588 Subclause 6.5.2.4 and FF-589 5.3.4
SmClearAssignmentInfoRequest	See FF-588 Subclause 6.5.2.6 and FF-589 5.3.5
SmClearAssignmentInfoResponse	See FF-588 Subclause 6.5.2.6 and FF-589 5.3.5
SmFindTagQuery	See FF-588 Subclause 6.5.2.1 and FF-589 5.3.1
SmFindTagReply	See FF-588 Subclause 6.5.2.2 and FF-589 5.3.2
SmIdentifyRequest	See FF-588 Subclause 6.5.2.3 and FF-589 5.3.3
SmIdentifyResponse	See FF-588 Subclause 6.5.2.3 and FF-589 5.3.3
SmQueryDeviceIndex	Designates the type of query for a device index. Used by element SmFindTagQuery
SmQueryVFDRef	Designates the type of query for VFD Reference. Used by element SmFindTagQuery
SmSetAssignmentInfoRequest	See FF-588 Subclause 6.5.2.5 and FF-589 5.3.6
SmSetAssignmentInfoResponse	See FF-588 Subclause 6.5.2.5 and FF-589 5.3.6
SmStandardResponse	See FF-588 Subclause 6.5.2.3 and FF-589 5.3.3
VersionInformation	Encodes optional version information of device - used with SM Identify service. See element SmIdentifyResponse

See FDTFoundationFieldbusHSECommunicationSchema.xml

Example:

FDTFoundationFieldbusHSECommunicationInstanceHSEConnectRequest.xml

FDTFoundationFieldbusHSECommunicationInstanceHSESmIdentifyRequest.xml

7.3.6 BTM – DTM communication schema

Used at:

IFdtCommunication::ConnectRequest()

IFdtCommunication::OnConnectResponse()

IFdtCommunication::DisconnectRequest()

IFdtCommunication::OnDisconnectResponse ()

IFdtCommunication::TransactionRequest()

IFdtCommunication::OnTransactionResponse()

The XML document contains the information for the communication between a BTM and a DTM. Table 18 explains the attributes and elements of the schema.

Table 18 – BtmFFCommunicationSchema – attributes and elements

Attribute	Description
AdditionalJunk	For additional information
Tag	**Description**
ConnectRequest	Describes the communication request to establish a connection
ConnectResponse	Describes the communication response to the connect request
DisconnectRequest	Describes the communication request to release a connection
DisconnectResponse	Describes the communication response

See BtmFFCommunicationSchema.xml

Examples:

BTMCommunicationInstanceFmsReadReq.xml

BTMCommunicationInstanceConnResp.xm

BTMCommunicationInstanceConnReq.xml

BTMCommunicationInstanceFmsReadResp.xml

BTMCommunicationInstanceFmsServiceError.xml

BTMCommunicationInstanceFmsWriteReq.xml

BTMCommunicationInstanceFmsWriteResp.xml

7.4 Fieldbus management

The management schemas will be used as an inline schema within an instance of the DTMParameterSchema at the element 'BusInformation\UserDefinedBus' as an inline schema.

7.5 H1 management schema

Table 19 explains the attributes and Table 20 explains the elements of the H1 management schema.

Table 19 – FDTFoundationFieldbusH1ManagementSchema – attributes

Attribute	Description
activeScheduleOdIndex	Active Schedule Object Dictionary Index specifies the Object Index of the currently active Link Schedule in the OD. FF-801 Subclause 5.3.3.2
activeScheduleStartingTime	Active Schedule Starting Time specifies the starting time of the currently active schedule (DL time). FF-801 Subclause 5.3.3.2
activeScheduleVersion	Active Schedule Version specifies the version of the currently active Link Schedule. FF-801 Subclause 5.3.3.2
addressSubfieldsN	This attribute contains the address subfields of the DLPDU that the DLE last transmitted or received. If the offending DLPDU contains more than one address, then the attribute contains the destination address. FF-801 Subclause 5.3.2.4
addressSubfieldsNminus1	This attribute contains the address subfields of the DLPDU that the DLE transmitted or received at the 2nd event before the occurrence of that event. If the offending DLPDU contains more than one address, then the attribute contains the destination address. FF-801 Subclause 5.3.2.4
addressSubfieldsNminus2	This attribute contains the address subfields of the DLPDU that the DLE transmitted or received at the 3rd event before the occurrence of that event. If the offending DLPDU contains more than one address, then the attribute contains the destination address. FF-801 Subclause 5.3.2.4
addressSubfieldsNminus3	This attribute contains the address subfields of the DLPDU that the DLE transmitted or received at the 4th event before the occurrence of that event. If the offending DLPDU contains more than one address, then the attribute contains the destination address. FF-801 Subclause 5.3.2.4
agentFunctionsSupported	This attribute defines the functions supported by the NMA Agent. FF-801 Subclause 5.1
applicationClockSyncInterval	This object specifies the application clock synchronization interval. It is downloaded to a device during address assignment
basicStatisticsSupportedFlag	This attribute specifies whether or not Basic Statistics are supported. FF-801 Subclause 5.3.1.2
bootOperatFunctionalClass	This attribute permits the NMgr to configure a device capable of being a Link Master or as a Basic device. FF-801 Subclause 5.4.1.1
channelNumber	Channel Number atribute

Attribute	Description
channelStates	The current state of the transmit and receive channel corresponding to the array index. FF-801 Subclause 5.4.1.1
channelStatisticsSupported	Channel Statistics Supported. FF-801 Subclause 5.4.1.2
clearVcrStatistics	This is a Boolean attribute. When written to with a value of TRUE, this attribute causes the NMA to clear (set to 0) all statistics in the record. When the record has been cleared, this value is set to FALSE by the NMA. FF-801 Subclause 5.2.5
currentTime	Attribute defining Current time. This object holds the current application clock time, as distributed by the time publisher, and consists of the date and time
defMinTokenDelegTime	Defined Minimum Token Delegation Time. This attribute is defined in IEC 61158-4:2000, Subclause 5.7.5.7
defTokenHoldTime	DefTokenHoldTime V(DTHT) This attribute is defined in IEC 61158-4:2000, Subclause 5.7.5.8
deviceId	Device Identifier
dlDeviceConformance	Data Link Device Conformance. This attribute is an OctetString of length 4 as defined in IEC 61158-4:2000, B.3.2.8. FF-801 Subclause 5.3.1.2
dlOperatFunctionalClass	This defines the current operating class of the device. This attribute corresponds to the class of the device as defined in the IEC 61158-4:2000, Subclause 5.6. FF-801 Subclause 5.3.1.2
dlcepDeliveryFeaturesSupported	This attribute specifies the DLCEP Delivery Features supported. FF-801 5.1
dllNumOfDlDataTransferTimeoutFailures	This attribute counts the number of times the DLL has timed-out waiting for a data transfer confirmation. This statistic is collected only if the VcrListCharacteristics attribute StatisticsSupported has the “data_xfer” flag set to TRUE. This attribute may not be written. FF-801 Subclause 5.2.5
dllNumOfDtPdusReceived	This attribute contains the counter for the number of DT DLPDUs received. FF-801 Subclause 5.2.5
dllNumOfDtPdusSent	This attribute contains the counter for the number of DT DLPDUs sent. FF-801 Subclause 5.2.5
dllNumOfRcvrQuFullDlDataFailures	DllNumOfRcvrQuFullDlDataFailures counts the number of DlData failures due a local Receive Queue Full failure condition. This statistic is collected only if the VcrListCharacteristics attribute StatisticsSupported has the “data_xfer” flag set to TRUE. This attribute may not be written
dlmeLinkMasterCapabilities	This attribute specifies the capabilities supported by the Link Master. FF-801 Subclause 5.3.2.1
dynamicsSupportedFlag	This attribute specifies, when TRUE, that the ListOfVcrDynamicRecords is supported by this implementation. FF 801-Subclause 5.2.2
fasArTypeAndRole	AR Type and Role attributes. FF 801-Subclause 5.2.3
fasArTypesAndRolesSupported	FAS Roles supported for each FAS AR Type. FF-801 Subclause 5.1
fasDllActualRemoteAddress	This attribute specifies the actual remote address for the relationship. FF 801-Subclause 5.2.4
fasDllConfiguredRemoteAddr	DLL configured Remote Address. Not used for P-S Communication Relationship. FF-801 Subclause 5.2.3
fasDllLocalAddr	It specifies a DLCEP-Address or a DL(SAP)-Address (individual or group). FF-801 Subclause 5.2.3
fasDllMaxConfirmDelayOnConnect	It is the maximum amount of time to be used to complete the DL Connection establishment process. FF-801 Subclause 5.2.3
fasDllMaxConfirmDelayOnData	It defines the maximum amount of time that the data link layer has to complete individual connectionless and connection-oriented data transfers. FF-801 Subclause 5.2.3
fasDllMaxDlsduSize	It is the maximum permitted Data Link Service Data Unit (DLSDU) size that can be sent on this VCR. FF-801 Subclause 5.2.3
fasDllMaxReceivingQueueDepth	It specifies the depth of the receiving message queue in the

Attribute	Description
	communication stack. The access to this attribute is read only.
fasDllMaxSendingQueueDepth	It specifies the depth of the sending message queue in the communication stack. The access to this attribute is read only. FF 801-Subclause 5.2.4
fasDllPublisherSynchronizingDlcep	This attribute is the DL-address of the DLCEP that is to be used for synchronization within the DLL. FF-801 Subclause 5.2.3
fasDllPublisherTimeWindowSize	This attribute is defined in the DLL mapping portion of the FAS specification as the PublisherTimeWindowSize. FF-801 Subclause 5.2.3
fasDllResidualActivitySupported	It is used for QUB VCRs only, providing the value for both the ResidualActivityAsSender and ResidualActivityAsReceiver QUB AREP attributes. FF-801 Subclause 5.2.3
fasDllSDAP	This attribute is defined as follows FF-801 Subclause 5.2.3: LAS Scheduled DLCEP Data Delivery Features DLPDU Authentication Priority
fasDllSubscriberSynchronizingDlcep	This attribute is defined in the DLL mapping portion of the FAS specification as the SubscriberSynchronizingDlcep. It is used for BNU VCRs only and then only if the SubscriberTimelinessClass (for Subscriber AREPs) is Update or Synchronous. This attribute is the Dladdress of the DLCEP that is to be used for synchronization within the DLL. FF-801 Subclause 5.2.3
fasDllSubscriberTimeWindowSize	This attribute is defined in the DLL mapping portion of the FAS specification as the SubscriberTimeWindowSize. FF-801 Subclause 5.2.3
fasDllTimelinessClass	This attribute is composed of publisher and subscriber timeliness classes and the subscriber's Duplicate PDU Detection Supported flag
fasLocallyGeneratedLastAborted	This attribute specifies whether the last abort has been generated locally or remotely. FF-801 Subclause 5.2.5
fasNumOfAbortsCtr	This attribute counts the number of times the VCR has been aborted, either by the user or by the communication stack. FF-801 Subclause 5.2.5
fasReasonLastAborted	This attribute specifies the reason for the last abort. FF-801 Subclause 5.2.5
fasState	This attribute defines the current state of the FAS portion of the VCR. Its values are: 0 = CLOSED and 1 = OPEN. FF-801 Subclause 5.2.4
fbObjectIndex	Function Block Object index. The index of the First attribute of the FB.
firstUnconfiguredEntry	This attribute references the first static entry in the VCRL that is currently not configured. If there are no unconfigured entries, the value of this attribute is zero. FF 801-Subclause 5.2.2
firstUnpolledNodeId	First-Unpolled-Node V(FUN).This elemtnis defined in IEC 61158-4:2000, Subclause 5.7.5.15
fmsActualMaxOutstandingServicesCalled	This value is set by the FMS during execution of the Initiate service and does not change while the VCR is open. FF-801 Subclause 5.2.4
fmsActualMaxOutstandingServicesCalling	This value is set by the FMS during execution of the Initiate service and does not change while the VCR is open. FF-801 Subclause 5.2.4
fmsFeaturesSupported	It indicates the services that are supported by FMS for the VCR. FF 801-Subclause 5.2.3
fmsMaxOutstandingServicesCalled	This attribute is defined in the FMS Specification MaxOutstandingServicesCalledStatic VCR Information attribute. FF-801 Subclause 5.2.3
fmsMaxOutstandingServicesCalling	This attribute is defined in the FMS Specification as the MaxOutstandingServicesCalling Static VCR Information attribute. FF-801 Subclause 5.2.3.
fmsOutstandingServicesCounterCalled	This attribute defines the number of responses from the user application on confirmed requests currently outstanding at the server on this VCR. FF-801 Subclause 5.2.4

Attribute	Description
fmsOutstandingServicesCounterCalling	This attribute defines the number of remote confirmations currently outstanding at the client on this VCR. It is only used for QUB VCRs. FF-801 Subclause 5.2.4
fmsState	This attribute defines the state of the FMS portion of the VCR. FF-801 Subclause 5.2.4. Its values are: 0 = ConnectionNotEstablished (CLOSED) 1 = ConnectionEstablished (OPEN) 2 = ConnectionEstablishingCalling 3 = ConnectionEstablishingCalled
fmsVfdId	This attribute is defined in the FMS specification as the FMS VFD ID Static VCR Information attribute. It references the VFD associated with this VCR
frameControlOctetN	This attribute contains the frame control octet of the DLPDU that the DLE last transmitted or received immediately before the occurrence of that event. FF-801 Subclause 5.3.2.4
frameControlOctetNminus1	This attribute contains the frame control octet of the DLPDU that the DLE transmitted or received at the 2nd event before the occurrence of that event. FF-801 Subclause 5.3.2.4
frameControlOctetNminus2	This attribute contains the frame control octet of the DLPDU that the DLE transmitted or received at the 3rd event before the occurrence of that event. FF-801 Subclause 5.3.2.4
frameControlOctetNminus3	This attribute contains the frame control octet of the DLPDU that the DLE transmitted or received at the 4th event before the occurrence of that event. FF-801 Subclause 5.3.2.4
iecVersion	This attribute specifies the classes of Physical Layers supported by the communications stack of a given implementation. FF-801 Subclause 5.4.1.2
interfaceMode	Interface mode, and it's values are defined in IEC 61158-2:2000, Subclause 6.2
lasDatabaseStatusSpduDistributionPeriod	Link Active Schedule Database Status SPDU Distribution Period. This attribute is defined in IEC 61158-4:2000, Subclause 5.7.5.20
linkMaintTokHoldTime	Link Maintenance Token Hold Time V(LTHT) This attribute is defined in IEC 61158-4:2000, Subclause 5.7.5.9
linkScheduleActivation	
listControl	VCR list Control atribute is required to control the download procedure for a whole VCRL.FF-801 5.2.1
listVersion	
liveListStatusArray	OctetString of 32 Octets in which each bit represents a node address on the segment. A value of "1" indicates that the device is communicating on the segment, and a value of "0" indicates that the device is not communicating on the segment. FF-801 Subclause 5.3.2.1
localTimeDiff	An attribute, that contains the value that needs to be added to CURRENT_TIME to obtain local time for the purpose of display, etc.
loopBackMode	This attribute and it is values are defined in IEC 61158-2:2000, Subclause 6.2
macrocycleDuration	A period for schedule repetition
macrocycleDuration	A period for schedule repetition
maxDlcepAddressesSupported	This attribute specifies the maximum number of Data Link Connection Endpoint (DLCEP) Addresses supported. FF-801 Subclause 5.1
maxDlsapAddressesSupported	This attribute specifies the maximum number of Data Link Service Access Point (DLSAP) addresses supported. FF-801 Subclause 5.1
maxEntries	This entry contains the number of static VCR entries in the VCRL. FF 801 Subclause 5.2.2
maximumInactivityToClaimLasDelay	Maximum Inactivity To Claim LAS Delay. This attribute is defined in the IEC 61158-4:2000, Subclause 5.7.5.19
maxInterChanSignalSkew	Maximum Inter Channel Signal Skew. This attribute is defined in IEC 61158-2:2000, Subclause 6.2

Attribute	Description
maxResponseDelay	Maximum Response Delay. This element is defined in the IEC 61158-4: 2000, Subclause 5.7.1.3
maxSchedulingOverhead	Maximum Scheduling Overhead V(MSO). This attribute is defined in IEC 61158-4:2000, Subclause 5.7.5.6
maxTokenHoldTime	The initial amount of local link capacity for each active node in the LiveListStatusArrayVariable. FF-801 Subclause 5.4.1.1. The values of this array are specified in IEC 61158-4:2000, Subclause 5.7.5.10
mediaTypeSelected	This attribute defines what media type is selected currently. The number corresponds to the position of the specified medium in the MediumAndDataRatesSupported attribute in the DlmeBasicCharacteristics class. FF-801 Subclause 5.4.1.3
mediumAndDataRatesSupported	Medium and Data rate supported. FF-801 Subclause 5.4.1.2
minInterPduDelay	The minimum inter PDU delay required by the device to operate correctly. This attribute is defined in IEC 61158-4:2000, Subclause 5.7.1.12
numConsecUnpolledNodeId	Number of Consecutive-Unpolled Nodes. This attribute is defined in IEC 61158-4:2000, Subclause 5.7.5.16
numCurrentlyConfigured	This attribute indicates the number of static entries in the VCRL that are currently configured (independently of whether or not they are used). FF 801-Subclause 5.2.2
numEndActivityBeforeEndData	This attribute is defined in IEC 61158-4:2000, D.3.1.2b and FF-801 Subclause 5.4.2.2
numLasRoleDelegOrClaimOrDelegToken HoldTimeout	This attribute is defined in the IEC 61158-4:2000, D.3.1.2g. Here it is related to the link and not to every single device. FF-801 Subclause 5.3.2.3
numOfChannels	It defines the number of sending/receiving channels that are supported. This attribute is defined in IEC 61158-2:2000, Subclause 6.2
numOfDlpduTransmitted	
numOfFcsFailures	Number of Check Sum Failures. This attribute is defined in the IEC 61158-4:2000 D.3.1.2d. FF-801 Subclause 5.3.1.4
numOfGoodDlpduReceived	Number of Good Dl pdu's Received. This attribute is defined in IEC 61158-4:2000 D.3.1.2f. FF-801 Subclause 5.3.1.4
numOfInternAndJabberFaults	This attribute is defined in IEC 61158-4:2000, D.3.1.2a. and FF-801 Subclause 5.4.2.2
numOfJabberFaults	This attribute is defined in IEC 61158-4:2000 Annex D.3.1.2a. and FF-801 Subclause 5.4.2.2
numOfNodeTimeOffsetDiscontinuousChanges	This attribute contains the count of discontinuous data link layer Node Time Offset changes reported to management as defined in IEC 61158-4:2000, 9.4.1.3(e.5)
numOfPartialReceivedDlpdu	Number of Partial Received Dl pdu's. This attribute is defined in IEC 61158-4:2000,.3.1.2c. FF-801 Subclause 5.3.1.4
numOfSchedules	Num Of Schedules specifies the number of Link Schedules in the OD. FF-801 Subclause 5.3.3.2
numOfStatisticsEntries	This attribute specifies the number of VcrStatisticsEntry objects. FF-801 Subclause 5.2.2
numOfSubSchedulesPerSchedule	This attribute specifies the number of Link Subschedules that the DLE is capable of supporting for a single Schedule. FF-801 Subclause 5.3.3.2
numPermanentEntries	This attribute indicates the maximum number of non-volatile entries in the VCRL. Permanent entries are always the first entries in the list. Permanent entries are not removed from the VCRL when the VCRL is cleared by writing to the VcrListControlVariable. They may be removed or overwritten only by explicit FMS Writes, unless they have been implemented in read-only memory. FF 801-Subclause 5.2.2
operationalPowerup	An attribute describing System Management State of the device
pdTag	Physical Device Tag
perDlpduPhlOverhead	Per-DLPDU-PhL-overhead. This attributeis defined in IEC 61158-4:

Attribute	Description
	2000, Subclause 5.7.1.2
postTransGapExtension	Post Transmission Gap Extension. This attribute is defined in IEC 61158-2:2000, Subclause 6.2
powerMode	This attribute specifies if the device is bus powered or line powered. FF-801 Subclause 5.4.1.2
preambleExtension	Preamble Extension. This attribute is defined in IEC 61158-2:2000, Subclause 6.2
preferredReceiveChannel	Preferred receive channel attribute. This attribute is defined in IEC 61158-2:2000, Subclause 6.2
primaryApplicationTimePublisher	An attribute for the address of the primary application clock time publisher for the link on which the field device resides
primaryLinkMasterFlag	Primary Link Master Flag Attribute. If this flag is set to "TRUE," then this node is, or should attempt to become, the primary Link Master which serves as LAS. FF-801 Subclause 5.3.2.1
rcvEnabled	FF-801 Subclause 5.4.1.3.
receiveSelect	This attribute defines the channel number that is supported currently. Its values are the same as those defined for the PreferredReceiveChannel attribute. FF-801 Subclause 5.4.1.3
scheduleVersion	
slotTime	Slot Time is defined in IEC 61158-4:2000, Subclause 5.7.1.1
smSupport	This attribute indicates which features are supported by the System Management Kernel in this device
startTimeOffset	The START_TIME_OFFSET attribute is in the units of time maintained by the data link layer, each count representing 1/32 of a millisecond. A value of FFFFFFFF(hex) for this attribute indicates an unused entry
statisticsSupported	The value of this attribute indicates the statistics supported. FF-801 Subclause 5.2.2
t1	T1 is an intersequence timer. Its purpose is to ensure that devices responding to system management requests have sufficient time to carry out necessary actions and transmit a response
t2	T2 is a sequence duration timer. Its purpose is to ensure that incorrectly executed or incomplete sequences are aborted in the System Management Kernel
t3	The timer T3 allows time for a device at a new address to be accessed and added to the delegated token list of the LAS
targetTokenRotTime	Target Token Rotation Time V(TTRT). This attribute is defined in IEC 61158-4:2000, Subclause 5.7.5.11
thisLink	The address of the link to which the device is currently connected. This attributeis defined in IEC 61158-4:2000, Subclause 5.7.1.9
thisNode	This Node is defined in IEC 61158-4:2000, Subclause 5.7.1.8. This is the currently assigned node address
timeDistributionPeriod	Time Distribution Period V(TDP). This attribute is defined in IEC 61158-4:2000, Subclause 5.7.1.18
timeLastReceived	This attribute holds the application clock time contained in the last clock message
timePublisherAddress	The address of the device which broadcast the last clock message is stored in this object. FF-880 Subclause 5.4.1.1
timeResolution	
timeSyncClass	
totalGoodMsgsRcvd	This attribute counts the number of good frames received, as seen from the physical media viewpoint. FF-801 Subclause 5.4.2.2
totalGoodMsgsSent	This attribute counts the number of good frames sent, as seen from the physical media viewpoint. FF-801 Subclause 5.4.2.2
vcrStaticEntryOdIndex	

Attribute	Description
version	This attribute specifies the version of the FF DLL specification supported in its low order three bits, as defined in IEC 61158-4:2000, Subclause 8. FF-801 Subclause 5.3.1.2
versionOfNmSpecSupported	This attribute describes the FF version of the Network Management specification supported. FF-801 Subclause 5.1
versionOfSchedule	
vfdRef	VFD Reference according to FF-880 Subclause 8. This attribute is the numeric identifier for a VFD. It is assigned by the device. The VFD Ref is unique within the context of the NMA VFD in which it is defined. Within a linking device, if a VFD appears in the VFD List of more than one interface (HSE or H1), then its VFD Ref may be different in each. However, when qualified by its interface, it uniquely identifies the VFD. FF-803 FS 1.19 SM Subclause 6.2.4.1
vfdTag	Virtual Field Device Tag. This attribute is the alphanumeric identifier for the VFD. It may be assigned by the user. FF-803 FS 1.19 SM Subclause 6.2.4.1
xmitEnabled	This variable indicates if transmission is enabled on a channel

Table 20 – FDTFoundationFieldbusH1ManagementSchema –elements

Tag	Description
ActiveScheduleOdIndex	Active Schedule Object Dictionary Index specifies the Object Index of the currently active Link Schedule in the OD. FF-801 Subclause 5.3.3.2
ActiveScheduleStartingTime	Active Schedule Starting Time specifies the starting time of the currently active schedule (DL time). FF-801 Subclause 5.3.3.2
ActiveScheduleVersion	Active Schedule Version specifies the version of the currently active Link Schedule. FF-801 Subclause 5.3.3.2
AddressAssignment	Address assignment element and associated device identification information
AddressSubfieldsN	This element contains the address subfields of the DLPDU that the DLE last transmitted or received. If the offending DLPDU contains more than one address, then the element contains the destination address. FF-801 Subclause 5.3.2.4
AddressSubfieldsNminus1	This element contains the address subfields of the DLPDU that the DLE transmitted or received at the 2nd event before the occurrence of that event. If the offending DLPDU contains more than one address, then the element contains the destination address. FF-801 Subclause 5.3.2.4
AddressSubfieldsNminus2	This element contains the address subfields of the DLPDU that the DLE transmitted or received at the 3rd event before the occurrence of that event. If the offending DLPDU contains more than one address, then the element contains the destination address. FF-801 Subclause 5.3.2.4
AddressSubfieldsNminus3	This element contains the address subfields of the DLPDU that the DLE transmitted or received at the 4th event before the occurrence of that event. If the offending DLPDU contains more than one address, then the element contains the destination address. FF-801 Subclause 5.3.2.4
AgentFunctionsSupported	This element defines the functions supported by the NMA Agent. FF-801 Subclause 5.1
ApplicationClockSyncInterval	This object specifies the application clock synchronization interval. It is downloaded to a device during address assignment
BasicStatisticsSupportedFlag	This element specifies whether or not Basic Statistics are supported. FF-801 Subclause 5.3.1.2

Tag	Description
BootOperatFunctionalClass	This element specifies the device behavior after it boots up. FF-801 Subclause 5.3.2.1
ChannelNumber	Channel Number element
ChannelStates	This element is the second element in the Physical Layer composite. It is an array of 8 Unsigned8 entries. Each entry indicates the current state of transmit and receive channel corresponding to the array index. FF-801 Subclause 5.4.1.1
ChannelStatisticsSupported	Channel Statistics Supported. FF-801 Subclause 5.4.1.2
ClearVcrStatistics	This element is a Boolean element. When written to with a value of TRUE, this element causes the NMA to clear (set to 0) all statistics in the record. When the record has been cleared, this value is set to FALSE by the NMA. FF-801 Subclause 5.2.5
CurrentTime	Element defining Current time. This object holds the current application clock time, as distributed by the time publisher, and consists of the date and time
DefMinTokenDelegTime	Defined Minimum Token Delegation Time. This element is defined in IEC 61158-4:2000, Subclause 5.7.5.7
DefTokenHoldTime	Defined Token Hold Time V(DTHT). This element defined in IEC 61158-4:2000, Subclause 5.7.5.8
DeviceId	Device Identifier
DlcepDeliveryFeaturesSupported	This element specifies the DLCEP Delivery Features supported. FF-801 Subclause 5.1
DlDeviceConformance	Data Link Device Conformance. This element is an OctetString of length 4 as defined in the IEC 61158-4:2000, Annex B.3.2.8. FF-801 Subclause 5.3.1.2
DlOperatFunctionalClass	This defines the current operating class of the device. This element corresponds to the class of the device as defined in the IEC 61158-4:2000, Subclause 5.6. FF-801 Subclause 5.3.1.2
DllNumOfDlDataTransferTimeoutFailures	This element counts the number of times the DLL has timed-out waiting for a data transfer confirmation. This statistic is collected only if the VcrListCharacteristics element StatisticsSupported has the “data_xfer” flag set to TRUE. This element may not be written. FF-801 Subclause 5.2.5
DllNumOfDtPdusReceived	This element contains the counter for the number of DT DLPDUs received. FF-801 Subclause 5.2.5
DllNumOfDtPdusSent	This element contains the counter for the number of DT DLPDUs sent. FF-801 Subclause 5.2.5
DllNumOfRcvrQuFullDlDataFailures	DllNumOfRcvrQuFullDlDataFailures counts the number of DlData failures due a local Receive Queue Full failure condition. This statistic is collected only if the VcrListCharacteristics element StatisticsSupported has the “data_xfer” flag set to TRUE. This element may not be written. FF-801 Subclause 5.2.5
DlmeBasic	Data Link Layer Management Entity Basic functionality definiton. Includes Characteristics, Info and statistics for the basic device.
DlmeBasicCharacteristics	This elemtnspecifies characteristics for all classes of DLEs. FF 801-Subclause 5.3.1.2
DlmeBasicInfo	The Dlme Basic Information record contains the information for all classes of DLEs. FF 801-Subclause 5.3.1.3
DlmeBasicStatistics	The DlmeBasicStatistics defines the basic statistics for all classes of DLEs. FF 801-Subclause 5.3.1.4
DlmeBridge	Describes the Bridge information related to Data Link Layer Management Entity
DlmeConfiguredLinkSettings	FF 801-Subclause 5.3.2.1. This represents the desired configuration of DLL and PhL management information for the link. If the device is or becomes LAS, and if the values are different from the CurrentLinkSettingsRecord, the LAS should clear its live list and reconstruct it using the normal link maintenance procedures

Tag	Description
DlmeCurrentLinkSettings	FF 801-Subclause 5.3.2.1. This record reflects the current settings for the link. For Link Master devices that are not acting as the LAS, this represents the settings received from the LAS
DlmeLinkMaster	Provides Data Link Layer Management Entity definitions for Data Link Master
DlmeLinkMasterCapabilities	This element specifies the capabilities supported by the Link Master. FF-801 Subclause 5.3.2.1
DlmeLinkMasterInfo	This element defines general information of the Dlme of Link Master devices. FF 801-Subclause 5.3.2.2
DlmeLinkMasterStatistics	This element specifies statistics information of DL Link Master related management. FF 801-Subclause 5.3.2.1
DlmeLinkSettings	DlmeLinkSettings record is used to describe the current settings of the link. FF 801-Subclauses 5.3.2.5 and 8.3.9
DynamicsSupportedFlag	This element specifies, when TRUE, that the ListOfVcrDynamicRecords is supported by this implementation. FF 801-Subclause 5.2.2
FasArTypeAndRole	AR Type and Role elements. FF 801-Subclause 5.2.3
FasArTypesAndRolesSupported	FAS Roles supported for each FAS AR Type. FF-801 Subclause 5.1
FasDllActualRemoteAddress	This element specifies the actual remote address for the relationship. FF 801-Subclause 5.2.4
FasDllConfiguredRemoteAddr	DLL configured Remote Address. Not used for P-S Communication Relationship. FF-801 Subclause 5.2.3
FasDllLocalAddr	It specifies a DLCEP-Address or a DL(SAP)-Address (individual or group). FF-801 Subclause 5.2.3
FasDllMaxConfirmDelayOnConnect	It is the maximum amount of time to be used to complete the DL Connection establishment process. FF-801 Subclause 5.2.3
FasDllMaxConfirmDelayOnData	It defines the maximum amount of time that the data link layer has to complete individual connectionless and connection-oriented data transfers. FF-801 Subclause 5.2.3
FasDllMaxDlsduSize	It is the maximum permitted Data Link Service Data Unit (DLSDU) size that can be sent on this VCR. FF-801 Subclause 5.2.3
FasDllMaxReceivingQueueDepth	It specifies the depth of the receiving message queue in the communication stack. The access to this element is read only. FF 801-Subclause 5.2.4
FasDllMaxSendingQueueDepth	It specifies the depth of the sending message queue in the communication stack. The access to this element is read only. FF 801-Subclause 5.2.4
FasDllPublisherSynchronizingDlcep	This element is the DL-address of the DLCEP that is to be used for synchronization within the DLL. FF-801 Subclause 5.2.3
FasDllPublisherTimeWindowSize	This element is defined in the DLL mapping portion of the FAS specification as the PublisherTimeWindowSize. FF-801 Subclause 5.2.3
FasDllResidualActivitySupported	It is used for QUB VCRs only, providing the value for both the ResidualActivityAsSender and ResidualActivityAsReceiver QUB AREP elements. FF-801 Subclause 5.2.3
FasDllSDAP	This element is defined as follows FF-801 Subclause 5.2.3.: LAS Scheduled DLCEP Data Delivery Features DLPDU Authentication Priority

Tag	Description
FasDllSubscriberSynchronizingDlcep	This element is defined in the DLL mapping portion of the FAS specification as the SubscriberSynchronizingDlcep. It is used for BNU VCRs only and then only if the SubscriberTimelinessClass (for Subscriber AREPs) is Update or Synchronous. This element is the Dladdress of the DLCEP that is to be used for synchronization within the DLL. FF-801 Subclause 5.2.3
FasDllSubscriberTimeWindowSize	This element is defined in the DLL mapping portion of the FAS specification as the SubscriberTimeWindowSize
FasDllTimelinessClass	This element is composed of publisher and subscriber timeliness classes and the subscriber's Duplicate PDU Detection Supported flag
FasLocallyGeneratedLastAborted	This element specifies whether the last abort has been generated locally or remotely. FF-801 Subclause 5.2.5
FasNumOfAbortsCtr	This element counts the number of times the VCR has been aborted, either by the user or by the communication stack. FF-801 Subclause 5.2.5
FasReasonLastAborted	This element specifies the reason for the last abort. FF-801 Subclause 5.2.5
FasState	This element defines the current state of the FAS portion of the VCR. Its values are: 0 = CLOSED and 1 = OPEN. FF-801 Subclause 5.2.4
FbObjectIndex	Function Block Object index. The index of the First element of the FB
FbSchedule	An element providing the Function block schedule information.
FbStartEntry	Element providing the Starting index of the Function blocks in a schedule
FDT	
FirstUnconfiguredEntry	This element references the first static entry in the VCRL that is currently not configured. If there are no unconfigured entries, the value of this element is zero. FF-801-Subclause 5.2.2
FirstUnpolledNodeId	First-Unpolled-Node V(FUN).This element is defined in IEC 61158-4:2000, Subclause 5.7.5.15
FmsActualMaxOutstandingServicesCalled	This value is set by the FMS during execution of the Initiate service and does not change while the VCR is open. FF-801 Subclause 5.2.4
FmsActualMaxOutstandingServicesCalling	This value is set by the FMS during execution of the Initiate service and does not change while the VCR is open. FF-801 Subclause 5.2.4
FmsFeaturesSupported	It indicates the services that are supported by FMS for the VCR. FF-801-Subclause 5.2.3
FmsMaxOutstandingServicesCalled	This element is defined in the FMS Specification MaxOutstandingServicesCalledStatic VCR Information element. FF-801 Subclause 5.2.3
FmsMaxOutstandingServicesCalling	This element is defined in the FMS Specification as the MaxOutstandingServicesCalling Static VCR Information element. FF-801 Subclause 5.2.3
FmsOutstandingServicesCounterCalled	This element defines the number of responses from the user application on confirmed requests currently outstanding at the server on this VCR. FF-801 Subclause 5.2.4
FmsOutstandingServicesCounterCalling	This element defines the number of remote confirmations currently outstanding at the client on this VCR. It is only used for QUB VCRs. FF-801 Subclause 5.2.4
FmsState	This element defines the state of the FMS portion of the VCR. FF-801 Subclause 5.2.4
FmsVfdId	This element is defined in the FMS specification as the FMS VFD ID Static VCR Information element. It references the VFD associated with this VCR. FF-801 Subclause 5.2.3

Tag	Description
FrameControlOctetN	This element contains the frame control octet of the DLPDU that the DLE last transmitted or received immediately before the occurrence of that event. FF-801 Subclause 5.3.2.4
FrameControlOctetNminus1	This element contains the frame control octet of the DLPDU that the DLE transmitted or received at the 2nd event before the occurrence of that event. FF-801 Subclause 5.3.2.4
FrameControlOctetNminus2	This element contains the frame control octet of the DLPDU that the DLE transmitted or received at the 3rd event before the occurrence of that event. FF-801 Subclause 5.3.2.4
FrameControlOctetNminus3	This element contains the frame control octet of the DLPDU that the DLE transmitted or received at the 4th event before the occurrence of that event. FF-801 Subclause 5.3.2.4
H1NmaVfd	The Network Management Agent is an application process modeled by the Management VFD. The Management VFD is shared between the NMA and the System Management Kernel, and contains the NMIB and the SMIB
IecVersion	IEC Version specifies the classes of Physical Layers supported by the communications stack of a given implementation. FF-801 Subclause 5.4.1.2
InterfaceMode	Interface mode and its values are defined in IEC 61158-2:2000, Subclause 6.2
LasDatabaseStatusSpduDistributionPeriod	Link Active Schedule Database Status SPDU Distribution Period. This element is defined in IEC 61158-4:2000, Subclause 5.7.5.20
LastValues	This element is part of DLME master definition and contains information monitored immediately before a NumLasRoleDeleg/Claim/DelegTokenHoldTimeout occurred
LinkMaintTokHoldTime	Link Maintenance Token Hold Time V(LTHT). This element is defined in IEC 61158-4:2000, Subclause 5.7.5.9
LinkScheduleActivation	This element is used to activate one of the LAS Schedules resident in the NMIB. FF-801 Subclause 5.3.3.1
LinkScheduleList	Schedules loaded by the schedule builder to a Link Master. It includes entries for Schedules of which only one can be active
LinkScheduleListCharacteristics	This element specifies characteristics of the active Link Schedule
ListCharacteristics	The VcrListCharacteristics class defines the elements of the VCR List as a whole. It is often referred to as the VCRL Header. FF-801 Subclause 5.2.2
ListControl	VCR list Control element is required to control the download procedure for a whole VCRL.FF-801 Subclause 5.2.1
ListOfFBStartEntries	Element providing the list of Starting Entries of the Function Blocks for each node on the network
ListOfH1NmaVfds	List of Network Management VFDs
ListOfMmeWireStatistics	List of elements for statistic information collected by Media Management Entity (MME) for the errors on the wire
ListOfScheduleDescriptors	This is a list of elements, each of which describes its correspondent schedule contained in the ListOfScheduleDomains (i.e. the first element in this list describes the first schedule, the second element describes the second schedule, and so forth). Each entry in this list is defined as an instance of the DlmeScheduleDescriptor class
ListOfScheduleDomains	Each entry in this list is represented as an FMS Domain object that contains an LAS Schedule. The internal structure of the schedule and its download behavior is defined in Annex B of the FF DLL Protocol specification

Tag	Description
ListOfVcrStaticEntries	Each entry in the list is defined as an instance of a VcrStaticEntry Class. Writing to a VcrStaticEntry record when the VCR is not in use (i.e. it is closed or unconfigured) results in the NMA modifying the VCR and returning a positive write response. An attempt to write to a VcrStaticEntry record that is in use causes the NMA to abort the connection related to the written VCR. Once a VCR Entry has been written, it can be used by the VFD configured for it
ListOfVcrDynamicEntries	An optional element that represents the list of dynamic information for the VCRs. When supported, there is one entry for each entry in the ListOfVcrStaticRecords. The entries correspond positionally with each other in their list for the same VCR. That is, the entry *k* in each list is defined for VCR *k*. Each entry is defined as an instance of a VcrDynamicEntry Class
ListOfVcrStatisticsEntries	An optional element that represents the list of performance and fault related statistics for the VCRs. Each entry in the list contains an OD Index that identifies the VCRStaticEntry of the VCR for which statistics are being collected. Each entry is an instance of the VcrStatisitics class
ListVersion	
LiveListStatusArray	OctetString of 32 Octets in which each bit represents a node address on the segment. A value of "1" indicates that the device is communicating on the segment, and a value of "0" indicates that the device is not communicating on the segment. FF-801 Subclause 5.3.2.1
LocalTimeDiff	An element, that contains the value that needs to be added to CURRENT_TIME to obtain local time for the purpose of display, etc.
LoopBackMode	Loop Back Mode and its values are defined in IEC 61158-2:2000, Subclause 6.2
MacrocycleDuration	
MacrocycleDuration	Macro cycle Duration FF-880 Subclause 5.6.2.1
MaxDlcepAddressesSupported	This element specifies the maximum number of Data Link Connection Endpoint (DLCEP) Addresses supported. FF-801 Subclause 5.1
MaxDlsapAddressesSupported	This element specifies the maximum number of Data Link Service Access Point (DLSAP) addresses supported. FF-801 Subclause 5.1
MaxEntries	This entry contains the number of static VCR entries in the VCRL. FF 801-Subclause 5.2.2
MaximumInactivityToClaimLasDelay	Maximum Inactivity To Claim LAS Delay. This elemtnis defined in IEC 61158-4:2000, Subclause 5.7.5.19
MaxInterChanSignalSkew	Maximum Inter Channel Signal Skew. This element is defined in IEC 61158-2:2000, Subclause 6.2
MaxResponseDelay	Maximum Response Delay. This element is defined in IEC 61158-4:2000, Subclause 5.7.1.3
MaxSchedulingOverhead	Maximum Scheduling Overhead V(MSO). This element is defined in IEC 61158-4:2000, Subclause 5.7.5.6
MaxTokenHoldTime	An array type of element providing Maximum token hold time for each device. FF-801 Subclause 5.4.1.1. The values of this array are specified in IEC 61158-4:2000, Subclause 5.7.5.10
MediaTypeSelected	This element defines what media type is selected currently. The number corresponds to the position of the specified medium in the MediumAndDataRatesSupported element in the DlmeBasicCharacteristics class. FF-801 Subclause 5.4.1.3
MediumAndDataRatesSupported	Medium and Data rate supported. FF-801 Subclause 5.4.1.2
MinInterPduDelay	The minimum inter PDU delay required by the device to operate correctly. This elemen tis defined in IEC 61158-4:2000, Subclause 5.7.1.12

Tag	Description
MmeWireStatistics	Media Management Entity (MME) for the statistics information about the errors on the communication channel
NMIB	Network Management Information Base
NumConsecUnpolledNodeId	Number of Consecutive-Unpolled-Nodes. This element is defined in IEC 61158-4:2000, Subclause 5.7.5.16
NumCurrentlyConfigured	This element indicates the number of static entries in the VCRL that are currently configured (independently of whether or not they are used). FF 801-Subclause 5.2.2
NumEndActivityBeforeEndData	This element is defined in IEC 61158-4:2000, D.3.1.2b, and FF-801 Subclause 5.4.2.2
NumLasRoleDelegOrClaimOrDelegTokenHoldTimeout	This element is defined in IEC 61158-4:2000, D.3.1.2g. Here it is related to the link and not to every single device. FF-801 Subclause 5.3.2.3
NumOfChannels	It defines the number of sending/receiving channels that are supported. This element is defined in IEC 61158-2:2000, Subclause 6.2
NumOfDlpduTransmitted	Number of Dl pdu's Transmitted. This elementis defined in the IEC 61158-4:2000, D.3.1.1c. FF-801 Subclause 5.3.1.4
NumOfFcsFailures	Number of Check Sum Failures. This element is defined in IEC 61158-4:2000, D.3.1.2d. FF-801 Subclause 5.3.1.4
NumOfGoodDlpduReceived	Number of Good Dl pdu's Received. This elementis defined in IEC 61158-4:2000, D.3.1.2f. FF-801 Subclause 5.3.1.4
NumOfInternAndJabberFaults	This element is defined in IEC 61158-4:2000, D.3.1.2a, and FF-801 Subclause 5.4.2.2
NumOfJabberFaults	Number of Jabber Faults. This element is defined in IEC 61158-4:2000, D.3.1.2a, and FF-801 Subclause 5.4.2.2
NumOfNodeTimeOffsetDiscontinuousChanges	This element contains the count of discontinuous data link layer Node Time Offset changes reported to management as defined in IEC 61158-4:2000, 9.4.1.3(e.5). FF-801 Subclause 5.3.1.4
NumOfPartialReceivedDlpdu	Number of Partial Received Dl pdus. This element is defined in IEC 61158-4:2000, D.3.1.2c. FF-801 Subclause 5.3.1.4
NumOfSchedules	Num Of Schedules specifies the number of Link Schedules in the OD. FF-801 Subclause 5.3.3.2
NumOfStatisticsEntries	This element specifies the number of VcrStatisticsEntry objects. FF-801 Subclause 5.2.1
NumOfSubSchedulesPerSchedule	This element specifies the number of Link Subschedules that the DLE is capable of supporting for a single Schedule. FF-801 Subclause 5.3.3.2
NumPermanentEntries	This element indicates the maximum number of non-volatile entries in the VCRL. Permanent entries are always the first entries in the list. Permanent entries are not removed from the VCRL when the VCRL is cleared by writing to the VcrListControlVariable. They may be removed or overwritten only by explicit FMS Writes, unless they have been implemented in read-only memory. FF 801 Subclause 5.2.2
OperationalPowerup	An element describing System Management State of the device
PdTag	Physical Device Tag
PerDlpduPhlOverhead	Per-DLPDU-PhL-overhead. This element is defined in IEC 61158-4:2000, Subclause 5.7.1.2
PlmeBasic	Defines the management of the physical layer and communication media. FF 801 Subclause 5.4.1.1
PlmeBasicCharacteristics	The PlmeBasicCharacteristics element specifies basic characteristics of Physical Layer related management. Its elements are defined in the Plme Basic Characteristics Class. Subclause 5.4.1.2 in FF801
PlmeBasicInfo	The PlmeBasicInfo element specifies basic information of Physical Layer related management. Its elements are defined in the Plme Basic Information Class. FF 801 Subclause 5.4.1.3

Tag	Description
PostTransGapExtension	Post Transmission Gap Extension. This element is defined in IEC 61158-2:2000, Subclause 6.2
PowerMode	This element specifies if the device is bus powered or line powered. FF-801 Subclause 5.4.1.2
PreambleExtension	Preamble Extension. This element is defined in IEC 61158-2:2000, Subclause 6.2
PreferredReceiveChannel	Preferred receive channel element. This element is defined in IEC 61158-2:2000, Subclause 6.2
PrimaryApplicationTimePublisher	An element for the address of the primary application clock time publisher for the link on which the field device resides
PrimaryLinkMasterFlag	Primary Link Master Flag element. If this flag is set to "TRUE," then this node is, or should attempt to become, the primary Link Master which serves as LAS. FF-801 Subclause 5.3.2.1
RcvEnabled	Receive Enabled element indicates whether or not reception is enabled on a channel. FF-801 Subclause 5.4.1.3
ReceiveSelect	This element defines the channel number that is supported currently. Its values are the same as those defined for the PreferredReceiveChannel element. FF-801 Subclause 5.4.1.3.
ScheduleDescriptor	There is 1 ScheduleDescriptorRecord for each ScheduleDomain. FF 801-Subclause 5.3.3.3
ScheduleDomain	Schedule Domain. An FMS Domain object that contains an LAS Schedule. FF-801 Subclause 5.3.3.1
ScheduleVersion	
SlotTime	Slot Time is defined in the IEC/TS 61158-4: 1999, Subclause 5.7.1.1
SmAgent	System Management Agent
SMIB	System Management Information Base
SmSupport	This element indicates which features are supported by the System Management Kernel in this device
StackCapabilities	StackCapabilities includes such nformation as FMS function supported, Fas Application Relationship Types And Roles Supported, version of NM version supported, etc. FF 801-Subclause 8.1.1
StackMgmt	Stack management provides stack Capabilities information
StartTimeOffset	The START_TIME_OFFSET element is in the units of time maintained by the data link layer, each count representing 1/32 of a millisecond. A value of FFFFFFFF(hex) for this element indicates an unused entry
StatisticsSupported	
SyncAndScheduling	Syncronization and scheduling information
T1	T1 is an intersequence timer. Its purpose is to ensure that devices responding to system management requests have sufficient time to carry out necessary actions and transmit a response
T2	T2 is a sequence duration timer. Its purpose is to ensure that incorrectly executed or incomplete sequences are aborted in the System Management Kernel
T3	The timer T3 allows time for a device at a new address to be accessed and added to the delegated token list of the LAS
TargetTokenRotTime	Target Token Rotation Time V(TTRT). This elementis defined in IEC 61158-4:2000, Subclause 5.7.5.11
ThisLink	The address of the link to which the device is currently connected. This elementis defined in IEC 61158-4:2000, Subclause 5.7.1.9
ThisNode	This Node is defined in IEC 61158-4:2000, Subclause 5.7.1.8. This is the currently assigned node addres

Tag	Description
TimeDistributionPeriod	Time Distribution Period V(TDP). This element is defined in IEC 61158-4:2000, Subclause 5.7.1.18
TimeLastReceived	This element holds the application clock time contained in the last clock message
TimePublisherAddress	The address of the device which broadcast the last clock message is stored in this object. FF-880 Subclause 5.4.1.1
TimeResolution	
TimeSyncClass	Time Synchronization Class. This element is defined in IEC/TS 61158-4: 1999, Subclause 5.7.1.25. This represents the TimeSyncClass for the link
TotalGoodMsgsRcvd	This element counts the number of good frames received, as seen from the physical media viewpoint. FF-801 Subclause 5.4.2.2
TotalGoodMsgsSent	This element counts the number of good frames sent, as seen from the physical media viewpoint. FF-801 Subclause 5.4.2.2
VcrDynamicEntry	This elementcontains the dynamic elements of a VCR (Virtual Communication Relationship) entry. It includes information for Outstanding services, state of the VCR, etc. FF-801 Subclause 5.2.4
VcrList	A list of VCRs (Virtual Communication Relationship) existing in the device
VcrStaticEntry	Virtual Communication Relationship
VcrStaticEntryOdIndex	This element contains the Static elements of a VCR. It includes information for maxPDU size, max delay time, etc. FF-801 Subclause 5.2.3. In case of VCR statistics (FF-801 Subclause 5.2.5.), this element specifies the OD Index of the VCR Static Entry object to which the statistics collected in this record apply
VcrStatisticsEntry	This element contains the Statistics elements of a VCR (Virtual Communication Relationship) entry. FF-801 Subclause 5.2.5
Version	Version element. In case of FB schedule provide the schedule version. In case of DLL provides specification version supported in its low order three bits, as defined in IEC 61158-4:2000, Subclause 8. FF-801 Subclause 5.3.1.2
VersionOfNmSpecSupported	This element describes the FF version of the Network Management specification supported. FF-801 Subclause 5.1
VersionOfSchedule	
VfdList	An element providing the list of the Virtual Field devices in a Physical device (part of the SMIB Directory Object). FF-880 Clause 8.
VfdRef	VFD Reference according to FF-880 Subclause 8. This attribute is the numeric identifier for a VFD. It is assigned by the device. The VFD Ref is unique within the context of the NMA VFD in which it is defined. Within a linking device, if a VFD appears in the VFD List of more than one interface (HSE or H1), then its VFD Ref may be different in each. However, when qualified by its interface, it uniquely identifies the VFD. FF-803 FS 1.19 SM Subclause 6.2.4.1
VfdRefEntry	VFD Reference Entry Element. There will be (Number of VFD List Objects) of these entries identifying the VFDs in this device. FF-880 Clause 8
VfdTag	Virtual Field Device Tag. This attribute is the alphanumeric identifier for the VFD. It may be assigned by the user. FF-803 FS 1.19 SM Subclause 6.2.4.1
XmitEnabled	

See FDTFoundationFieldbusH1ManagementSchema.xml

Example:

FDTFoundationFieldbusH1ManagementInstance.xml

7.5.1 HSE management schema

Table 21 explains the attributes and Table 22 explains the elements of the HSE management schema.

Table 21 – FDTFoundationFieldbusHSEManagementSchema – attributes

Attribute	Description
actualNumberOfVFDs	Actual Number of VFDs. FF-803 FS 1.19 SM Subclause 6.2.1
bufferSize	This attribute is defined in the Field Device Access (FDA) Agent Specification [FF-588] as the Buffer Size. DEFAULT_BUFFER_SIZE = 1460 FF-803 FS 1.19 NM Subclause 5.1.2
capableTimeSyncClass	This variable specifies the time sync class that the SNTP time client in the HSE Presence is capable of supporting. The enumeration of time sync classes is as shown below, defined in IEC 61158-4, Subclause relating to Structure and encoding of TD parameters, subfield TTT. FF-803 FS 1.19 SM Subclause 6.2.2.1
currentNmaConfigurationAccess	This attribute, when not zero, is a record object containing the identification of the HSE or H1 configurator application that currently has configuration access to any (or all) linking device NMA VFD(s). FF-803 FS 1.19 NM Subclause 5.9.1
daylightTimeDifference	This variable contains the number of signed ticks to add to Current Time to obtain Daylight time-stamp time. It is used instead of Standard Time Difference when Current Time is inside of the interval defined by Start Daylight Time and End Daylight Time. FF-803 FS 1.19 SM Subclause 6.2.2.1
deviceType	This attribute specifies the capabilities of the device. It is defined in the FDA specification [FF-588]. FF-803 FS 1.19 SM Subclause 6.2.5
discardedForForwardingDelayExceeded	
discardedForLackOfBuffers	This element counts the number of valid frames that should have been submitted for transmission on one or more outbound interfaces, but were discarded because of a lack of available forwarding buffers. FF-803 FS 1.19 NM Subclause 5.9.6
dstLinkAddress	This attribute contains the 16-bit destination address (HL) of the message that should be forwarded by the H1 Bridge. If the value is 0, then this entry is not configured. FF-803 FS 1.19 NM Subclause 5.9.5
endpointType	This attribute is defined in the Field Device Access (FDA) Agent Specification [FF-588] as the Endpoint Type, and indicates the type of the endpoint. FF-803 FS 1.19 NM Subclause 5.1.2
fasDllMaxConfirmDelayOnConnect	This element is defined in the Network Management Specification [FF-801] as FasDllMaxConfirmDelayOnConnect. FF-803 FS 1.19 NM Subclause 5.9.4
fasDllMaxDlsduSize	This element is defined in the Network Management Specification [FF-801] as FasDllMaxDlsduSize. FF-803 FS 1.19 NM Subclause 5.9.4
fasDllSDAP	This element is defined in the Network Management Specification [FF-801] as FasDllSDAP. . FF-803 FS 1.19 NM Subclause 5.9.4
fBScheduleDescriptor	This attribute is the OD index of the FB Schedule Descriptor Record. The value of this attribute is FB Schedule OD Index + 2 + offset, where offset represents the zero-based position in the list. That is, the offset of the first record in the list is zero. The offset is no greater than the number of schedules specified in the FB Schedule List Characteristics record minus 1. FF-803 FS 1.19 SM Subclause 6.2.5.2
fdaAddress	This attribute is defined in the Field Device Access (FDA) Agent Specification [FF-588] as the FDA Address. FF-803 FS 1.19 NM Subclause 5.1.3

Attribute	Description
fdaGuardBand	This attribute is defined in the Field Device Access (FDA) Agent Specification [FF-588] as the Guard Band. FF-803 FS 1.19 NM Subclause 5.2.1
filteringDatabaseListHeaderOdIndex	This is an instance of the ListHeader class representing the Filtering Database header. FF-803 FS 1.19 NM Subclause 5.9.1
forwardedInbound	This element counts the number of valid frames received by the interface that were submitted for transmission on one or more outbound interfaces. FF-803 FS 1.19 NM Subclause 5.9.6
h1ConfiguratorAddress	This element contains the H1 address of the H1 configurator device. FF-803 FS 1.19 NM Subclause 5.9.3
h1DlOperatFunctionalClassSupported	This attribute corresponds to the class supported by all H1 interfaces of a linking device. It has the same definition of DlOperatFunctionalClass attribute specified in the Network Management Specification [FF-801]. Its value is zero when the HSE device is not a linking device. FF-803 FS 1.19 NM Subclause 5.2.1
h1Timeout	This attribute defines the amount of time, in ms, that the Linking Device waits before releasing invoke ids that were allocated for FMS and/or SM requests sent on any H1 interface. FF-803 FS 1.19 NM Subclause 5.2.1
hseSubnetMask	This attribute is defined in the Field Device Access (FDA) Agent Specification [FF-588] as the HSE Subnet Mask. FF-803 FS 1.19 NM Subclause 5.1.3
hseSubnetMaskBits	This attribute when ANDED with an IP address or HSE Subnet Mask yields the HSE subnet address defined in the Field Device Access (FDA) Agent Specification [FF-588]. It is used for HSE VCRs with the HSE Subnet Mask attribute. FF-803 FS 1.19 NM Subclause 5.2.1
hseVcrType	This attribute is defined in the Field Device Access (FDA) Agent Specification [FF-588] as the HSE VCR Type, and indicates the type of the HSE VCR. FF-803 FS 1.19 NM Subclause 5.1.3
ignoredInbound	This element counts the number of valid frames received by the interface that the Forwarding Process determined did not need forwarding. FF-803 FS 1.19 NM Subclause 5.9.6.
inactivityCloseTime	This attribute is defined in the Field Device Access (FDA) Agent Specification [FF-588] as the Inactivity Close Time. DEFAULT_INACTIVITY_CLOSE_TIME = 30 s. FF-803 FS 1.19 NM Subclause 5.1.2
installedInterfaces	Installed Interfaces. The entry "Installed" means the hardware is in place and functioning. Each bit in the entry corresponds to an H1 interface with bit k corresponding to interface k. Bit 1 is the MSB. FF-803 FS 1.19 SM Subclause 6.2.1
interfaceActualStateArray	This array of unsigned 8-bit integers is used to define the interface actual state, as described in the Data Link Protocol Specification: Bridge Operation Addendum [FF-806]. Each element in this array represents the actual state of a specific interface, which are sequentially numbered from 1 to n, where *n* is the number of H1 interfaces supported by the H1 Bridge. FF-803 FS 1.19 NM Subclause 5.9.1
interfaceDesiredStateArray	This non-volatile array of unsigned 8-bit integers is used to define the interface desired state. Each element in this array represents the desired state of a specific interface, which are sequentially numbered from 1 to n, where *n* is the number of H1 interfaces supported by the H1 Bridge. FF-803 FS 1.19 NM Subclause 5.9.1
interfaceLinkId	
interfaceNodeId	
interfaceNumber	This attribute specifies the index into the InterfaceAddressArray for forwarding. FF-803 FS 1.19 NM Subclause 5.9.5
interfaceStatisticsSupported	The value of this element indicates the interface statistics supported. FF-803 FS 1.19 NM Subclause 5.9.2
lastSNTPMessage	This object holds the first 48 octets of the last SNTP message received. This object contains only dynamic data, which does not affect the calculation of version numbers. FF-803 FS 1.19 SM Subclause 6.2.2
maxForwardingDelayNormal	This attribute is defined in the Data Link Protocol Specification: Bridge Operation Addendum [FF-806]. 1/32 ms FF-803 FS 1.19 NM Subclause 5.9.2

Attribute	Description
maxForwardingDelayTimeAvailable	This attribute is defined in the Data Link Protocol Specification: Bridge Operation Addendum [FF-806]. Unit = 1/32 ms. FF-803 FS 1.19 NM Subclause 5.9.2
maxForwardingDelayUrgent	This attribute is defined in the Data Link Protocol Specification: Bridge Operation Addendum [FF-806]. Unit = 1/32 ms. FF-803 FS 1.19 NM Subclause 5.9.2
maxMessageLength	This attribute is defined in the Field Device Access (FDA) Agent Specification [FF-588] as the Max Message Length. FF-803 FS 1.19 NM Subclause 5.1.2
maxNumberOfInterfaces	The entry "Max number of interfaces (M)" indicates the maximum number of H1 interfaces that can be installed into the device. The maximum value for this entry is 30. See the Network Management specification [FF-803] on Bridge Characteristics. FF-803 FS 1.19 SM Subclause 6.2.1
maxNumberOfVFDs	Maximal Number of VFDs. FF-803 FS 1.19 SM Subclause 6.2.1
maxNumEntries	This element indicates the maximum number of entries that may be defined in the list (NumConfigured + NumUnconfigured). FF-803 FS 1.19 NM Subclause 5.1.1
maxNumOfVcrs	This element contains the counter for the maximum number of HSE VCRs that have been concurrently related to the Session Endpoint Entry object. This element represents the “high water mark” for the number of VCRs related to this session. This attribute may not be written. FF-803 FS 1.19 NM Subclause 5.5.2
minForwardingDelayNormal	This attribute is defined in the Data Link Protocol Specification: Bridge Operation Addendum [FF-806]. 1/32 ms. FF-803 FS 1.19 NM Subclause 5.9.2
minForwardingDelayTimeAvailable	This attribute specifies the lowest value the device supports for MinForwardingDelayTimeAvailable. Unit = 1/32 ms. FF-803 FS 1.19 NM Subclause 5.9.2
minForwardingDelayUrgent	This attribute specifies the lowest value the device supports for MaxForwardingDelayUrgent. Unit = 1/32 ms. FF-803 FS 1.19 NM Subclause 5.9.2
minRepublishingDelay	This attribute is defined in the Data Link Protocol Specification: Bridge Operation Addendum [FF-806]. Unit = 1/32 ms. FF-803 FS 1.19 NM Subclause 5.9.2
msgHdrOptions	This attribute is defined in the Field Device Access (FDA) Agent Specification [FF-588] as the Message Header Options. DEFAULT_HDR_OPTIONS = 0 FF-803 FS 1.19 NM Subclause 5.1.2
msgHdrOptionsSupported	This attribute defines the message header options that are supported by the HSE device. FF-803 FS 1.19 NM Subclause 5.2.1
nmaConfigurationUse	This attribute is defined in the Field Device Access (FDA) Agent Specification [FF-588] as the NMA Configuration Use. Set this attribute to zero when writing to any attribute of the SessionEndpointEntry class. FF-803 FS 1.19 NM Subclause 5.1.2
numberOfInterfaces	This attribute defines the number of H1 interfaces of the H1 Bridge. Its maximum value is 30, because of the FasDllMaxDlsduSize attribute of Standardized Management Relationship in the Network Management Specification [FF-801]. FF-803 FS 1.19 NM Subclause 5.9.2
numberOfSchedule	This attribute contains the number of schedule domains that contain schedules. It is incremented each time that a new schedule domain is downloaded. It is decremented each time that a schedule domain is initialized. FF-803 FS 1.19 SM Subclause 6.2.5.1
numConfigured	This element indicates the number of entries in the list that are currently configured (independently of whether or not they are being used). It may be written, but only the value zero should be written. Writing zero causes the list to be cleared, with three exceptions. FF-803 FS 1.19 NM Subclause 5.1.1
numOfAborts	This element contains the counter for the number of times the HSE VCR has been aborted, either by the user or by the communication stack. This attribute may not be written. FF-803 FS 1.19 NM Subclause 5.8.2
NumOfConfirmedRequestMessages Received	NumOfRequestMessagesReceived This element contains the counter for the number of confirmed request messages received from the VCR. This attribute may not be written. FF-803 FS 1.19 NM Subclause 5.8.2

Attribute	Description
NumOfConfirmedRequestMessages Sent	This element contains the counter for the number of confirmed request messages sent from the VCR. This attribute may not be written. . FF-803 FS 1.19 NM Subclause 5.8.2
numOfConnects	This element contains the counter for the number of times the HSE VCR has been connected, either by the user or by the communication stack. This attribute may not be written FF-803 FS 1.19 NM Subclause 5.8.2
numOfDuplicatedMessages	This element contains the counter for the number of duplicated messages the HSE VCR has received. See Field Device Access (FDA) Agent Specification [FF-588]. FF-803 FS 1.19 NM Subclause 5.8.2
numOfErrorMessagesReceived	This element contains the counter for the number of negative response messages received through the HSE VCR. This attribute may not be written. FF-803 FS 1.19 NM Subclause 5.8.2
numOfErrorMessagesSent	This element contains the counter for the number of negative response messages sent through the HSE VCR. This attribute may not be written. FF-803 FS 1.19 NM Subclause 5.8.2
numOfInvalidMsgsReceived	This element contains the counter for the number of invalid FDA messages received. This attribute may not be written. FF-803 FS 1.19 NM Subclause 5.5.2
numOfLateMessages	This element contains the counter for the number of late messages the HSE VCR has received. See Field Device Access (FDA) Agent Specification [FF-588]. FF-803 FS 1.19 NM Subclause 5.8.2
numOfLossOfSyncMessages	This element contains the counter for the number of losses of sync the HSE VCR has detected. See Field Device Access (FDA) Agent Specification [FF-588]. FF-803 FS 1.19 NM Subclause 5.8.2
numOfMissedMessages	This element contains the counter for the number of messages the HSE VCR has missed. See Field Device Access (FDA) Agent Specification [FF-588]. FF-803 FS 1.19 NM Subclause 5.8.2
numOfMsgsReceived	This element contains the counter for the number of FDA messages received. This attribute may not be written. FF-803 FS 1.19 NM Subclause 5.5.2
numOfMsgsSent	This element contains the counter for the number of FDA messages sent. This attribute may not be written. FF-803 FS 1.19 NM Subclause 5.5.2
numOfNonMisorderedMessages	
numOfOpenStateCtr	This element contains the counter for the number of times the Session Endpoint was opened. This attribute may not be written. FF-803 FS 1.19 NM Subclause 5.5.2
numOfResponseMessagesReceived	This element contains the counter for the number of positive response messages received through the HSE VCR. This attribute may not be written. FF-803 FS 1.19 NM Subclause 5.8.2
numOfResponseMessagesSent	NumOfPositiveResponseMessagesSent. This element contains the counter for the number of positive response messages sent through the HSE VCR. This attribute may not be written. FF-803 FS 1.19 NM Subclause 5.8.2
numOfUnconfirmedMessagesReceived	This element contains the counter for the number of unconfirmed request messages received from the VCR. This attribute may not be written. FF-803 FS 1.19 NM Subclause 5.8.2
numOfUnconfirmedMessagesSent	
onChangeRefreshRate	This attribute is used for an HSE Local Publisher VCR that is not transferring due OnChangeThreshold (see Field Device Access (FDA) Agent Specification [FF-588]). It determines how many publisher execution cycles the HSE Local Publisher VCR must wait before transferring the latest published variable value. FF-803 FS 1.19 NM Subclause 5.2.1
onChangeThreshold	This attribute is defined in the Field Device Access (FDA) Agent Specification [FF-588] as the On Change Threshold. FF-803 FS 1.19 NM Subclause 5.1.3
previousNmaConfigurationAccess	This attribute, when not zero, is a record object containing the identification of the HSE or H1 configurator application that previously had configuration access to any (or all) linking device NMA VFD(s). It is defined by the NmaConfigurationAccess Class. FF-803 FS 1.19 NM Subclause 5.9.1
repubAddress	This is the 32-bit republishing address: FF-803 FS 1.19 NM Subclause 5.9.4
republishingDatabaseListHeaderOd Index	

Attribute	Description
restartStatisticsCollectionControl	This element is used to restart statistics collection of all entries in the specified statistics entry list. Restarting statistics collection causes the StatisticsCollectionStartTime to be updated and all statistics counters to be cleared and restarted. FF-803 FS 1.19 NM Subclause 5.2.1. 0 Do nothing 1 Restart statistics collection for all entries of the Session Statistics List. 2 Restart statistics collection for all entries of the HSE VCR Statistics List. 3 Restart statistics collection for all entries of the Session Statistics List and of the HSE VCR Statistics List
rootInterface	The interface number of the H1 Bridge which is the root interface, if any. FF-803 FS 1.19 NM Subclause 5.9.2
scheduleSyncPeriod	This variable contains an argument of the modulus function described in Subclause 4.6 that is used to determine the next start time for a macrocycle, in ticks. FF-803 FS 1.19 SM Subclause 6.2.2.1
sessionMaxOutstanding	This element represents the maximum number of requests that a client or server endpoint may have outstanding at any point in time (see Field Device Access (FDA) Agent Specification [FF-588]). FF-803 FS 1.19 NM Subclause 5.2.1
sessionStatisticsControlDefaultValue	This element contains the default value used for the StatisticsControl attribute of the SessionStatistics entry. Its initial value is “OnOpening”. When a SessionStatistics entry is initialized, the value of its StatisticsControl attribute is set to this value. FF-803 FS 1.19 NM Subclause 5.2.1
sNTPTimestamp	This array object holds the four times used to calculate delay and offset, described in RFC-2030 as T1, T2, T3 and T4. The first element in the array holds the integer seconds part of T1. The second element holds the fractional seconds of T1. The remaining records repeat this sequence for the remaining SNTP times. This object contains only dynamic data, which does not affect the calculation of version numbers. FF-803 FS 1.19 SM Subclause 6.2.2
standardTimeDifference	This variable contains the number of signed ticks to add to Current Time to obtain Standard time-stamp time. It is used instead of Daylight Time Difference when Current Time is outside the interval defined by Start Daylight Time and End Daylight Time, or if Start Daylight Time is zero.FF-803 FS 1.19 SM Subclause 6.2.2.1
state	This read-only attribute is defined in the Field Device Access (FDA) Agent Specification [FF-588] as the State, and specifies the session endpoint state. Set this attribute to zero when writing to any attribute of the SessionEndpointEntry class. FF-803 FS 1.19 NM Subclause 5.2.1
statisticsControl	This attribute specifies when statistics collection is to be started and restarted. Restarting statistics collection causes the StatisticsCollectionStartTime to be updated and all statistics counters to be cleared and restarted. FF-803 FS 1.19 NM Subclause 5.8.2
subAddress	This is the 32-bit subscribe to address. If the value is 0, then this entry is not configured. FF-803 FS 1.19 NM Subclause 5.9.4
targetTimeSyncClass	This variable represents the configured time synchronization class for the SNTP time client in the HSE Presence. The enumeration is the same as the Capable Time Sync Class. FF-803 FS 1.19 SM Subclause 6.2.2.1
tcpProtocolSupported	This attribute defines if the HSE device supports the TCP protocol or not. It is set to TRUE when the HSE device supports the TCP protocol. Otherwise, it is set to FALSE. FF-803 FS 1.19 NM Subclause 5.2.1
timeRequestInterval	This variable contains the time in ticks that the SNTP time client in the HSE Presence waits between sending requests to the time server. A value of zero means that the device will calculate this number. Values less than 10 s are not allowed if the device cannot calculate the interval.FF-803 FS 1.19 SM Subclause 6.2.2.1
timeRequestTimeout	This variable contains the time in ticks that the SNTP time client in the HSE Presence waits for the time server to answer a time request. FF-803 FS 1.19 SM Subclause 6.2.2.1

Attribute	Description
transmitDelayTime	This attribute is defined in the Field Device Access (FDA) Agent Specification [FF-588] as the Transmit Delay Time. DEFAULT_TRANSMIT_DELAY = 0 FF-803 FS 1.19 NM Subclause 5.1.2
transportProtocol	This attribute is defined in the Field Device Access (FDA) Agent Specification [FF-588] as the Transport Protocol, and identifies the transport protocol used for the session. FF-803 FS 1.19 NM Subclause 5.1.2
vcrStatisticsControlDefaultValue	This element contains the default value used for the StatisticsControl attribute of the VcrStatistics entry. Its initial value is “OnOpening”. FF-803 FS 1.19 NM Subclause 5.2.1
vcrUserId	This attribute contains the value of the VCR User Id attribute of the VCR entry identified by the HseVcrEntryOdIndex attribute of this entry. FF-803 FS 1.19 NM Subclause 5.8.2
vfdServerSelector	This attribute is the selector for the generic server VCR for this VFD. The VFD Server Selector attribute of the HSE and H1 NMA VFDs is set to 0 to indicate that the FMS VCR Selector Connect Option cannot be used with these VFDs. See the FDA specification [FF-588]. It is assigned by the device. FF-803 FS 1.19 SM Subclause 6.2.4.1

Table 22 – FDTFoundationFieldbusHSEManagementSchema – elements

Tag	Description
ActiveScheduleIndex	This attribute is the index of the domain of the currently active schedule. FF-803 FS 1.19 SM Subclause 6.2.5.1
ActiveScheduleVersion	This attribute specifies the version of the schedule currently executed. FF-803 FS 1.19 SM Subclause 6.2.5.1
ActualNumberOfVFDs	FF-803 FS 1.19 NM Subclause 5.2.1
AutomaticSessionList	Automatic Session List element definition. FF-803 FS 1.19 NM Subclause 5.4.1
BridgeCharacteristics	Bridge Characteristics element definition. FF-803 FS 1.19 NM Subclause 5.9.2
BufferSize	This attribute is defined in the Field Device Access (FDA) Agent Specification [FF-588] as the Buffer Size. DEFAULT_BUFFER_SIZE = 1460. FF-803 FS 1.19 NM Subclause 5.1.2
CapableTimeSyncClass	This variable specifies the time sync class that the SNTP time client in the HSE Presence is capable of supporting. The enumeration of time sync classes is as shown below, defined in IEC 61158-4, Subclause relating to Structure and encoding of TD-parameters, subfield TTT. FF-803 FS 1.19 SM Subclause 6.2.2.1
ConfiguredSessionList	The ConfiguredSessionList is the list of Configured Session definitions. Each entry in the list may contain a defined Configured Session, or it may be empty. FF-803 FS 1.19 NM Subclause 5.3.1
CurrentNmaConfigurationAccess	This attribute, when not zero, is a record object containing the identification of the HSE or H1 configurator application that currently has configuration access to any (or all) linking device NMA VFD(s). FF-803 FS 1.19 NM Subclause 5.9.1
CurrentTime	This variable contains the number of signed ticks to add to Current Time to obtain Standard time-stamp time. It is used instead of Daylight Time Difference when Current Time is outside the interval defined by Start Daylight Time and End Daylight Time, or if Start Daylight Time is zero.FF-803 FS 1.19 SM Subclause 6.2.2.1. FF-803 FS 1.19 SM Subclause 6.2.2.1
DaylightTimeDifference	This variable contains the number of signed ticks to add to Current Time to obtain Daylight time-stamp time. It is used instead of Standard Time Difference when Current Time is inside of the interval defined by Start Daylight Time and End Daylight Time. FF-803 FS 1.19 SM Subclause 6.2.2.1

Tag	Description
DDDomainIndex	This attribute is the numeric identifier for the domain that contains any device resident DD. It is assigned by the device. FF-803 FS 1.19 SM Subclause 6.2.4.1
DeviceContentsDomain	This allows for software upload and download of the device. Device manufacturers define the content of the domain. FF-803 FS 1.19 SM Subclause 6.2.1
DeviceId	Device Identifier FF-803 FS 1.19 NM Subclause 5.2.1
DeviceIdentification	The Device Identification record contains the data for the unique identification of the physical device and the application currently assigned to it. FF-803 FS 1.19 SM Subclause 6.2.3
DeviceIndex	This attribute is a site-administered number that identifies the device. This index is unique within an HSE subnet. FF-803 FS 1.19 SM Subclause 6.2.5
DeviceType	FF-803 FS 1.19 NM Subclause 5.2.1
DiscardedForForwardingDelayExceeded	FF-803 FS 1.19 NM Subclause 5.2.1
DiscardedForLackOfBuffers	This element counts the number of valid frames that should have been submitted for transmission on one or more outbound interfaces, but were discarded because of a lack of available forwarding buffers. FF-803 FS 1.19 NM Subclause 5.9.6
DlmeBridge	This element defines the management of the Data Link Bridge. FF-803 FS 1.19 NM Subclause 5.9.1
DomainIndex	This attribute is the OD index of the domain for this schedule descriptor. It is set by the manufacturer. FF-803 FS 1.19 SM Subclause 6.2.5.2
DstLinkAddress	This attribute contains the 16-bit destination address (HL) of the message that should be forwarded by the H1 Bridge. If the value is 0, then this entry is not configured. FF-803 FS 1.19 NM Subclause 5.9.5
EndDaylightTime	This variable contains the value of Current Time that defines the end of the Daylight Time interval. Daylight Time never starts if the value is less than Start Daylight Time. FF-803 FS 1.19 SM Subclause 6.2.2.1
EndpointType	This attribute is defined in the Field Device Access (FDA) Agent Specification [FF-588] as the Endpoint Type, and indicates the type of the endpoint. FF-803 FS 1.19 NM Subclause 5.1.2
FasDllMaxConfirmDelayOnConnect	This element is defined in the Network Management Specification [FF-801] as FasDllMaxConfirmDelayOnConnect. FF-803 FS 1.19 NM Subclause 5.9.4
FasDllMaxDlsduSize	This element is defined in the Network Management Specification [FF-801] as FasDllMaxDlsduSize. FF-803 FS 1.19 NM Subclause 5.9.4
FasDllSDAP	This element is defined in the Network Management Specification [FF-801] as FasDllSDAP. FF-803 FS 1.19 NM Subclause 5.9.4
FbSchedule	FF-803 FS 1.19 NM Subclause 5.2.1
FBScheduleDescriptor	The FB Schedule objects pertain to FBs scheduled in this device. FF-589 FS 1.19 SM Subclause 6.2.5. This attribute is the OD index of the FB Schedule Descriptor Record. The value of this attribute is FB Schedule OD Index + 2 + offset, where offset represents the zero-based position in the list. That is, the offset of the first record in the list is zero. The offset is no greater than the number of schedules specified in the FB Schedule List Characteristics record minus 1. FF-803 FS 1.19 SM Subclause 6.2.5.2
FdaAddress	This attribute is defined in the Field Device Access (FDA) Agent Specification [FF-588] as the FDA Address. FF-803 FS 1.19 NM Subclause 5.1.3
FdaGuardBand	This attribute is defined in the Field Device Access (FDA) Agent Specification [FF-588] as the Guard Band. FF-803 FS 1.19 NM Subclause 5.2.1
FilteringDatabase	The NMIB FilteringDatabase is used for cascaded bridges (for links not immediately attached to this H1 Bridge). The NMA loads information from InterfaceAddressArray and NMIB FilteringDatabase into DLL Bridge filtering database. FF-803 FS 1.19 NM Subclause 5.2.1
FilteringDatabaseListHeaderOdIndex	This is an instance of the ListHeader class representing the Filtering Database header. FF-803 FS 1.19 NM Subclause 5.9.1

Tag	Description
FilteringEntry	This class is used to define the data routing between H1 interfaces. Each FilteringEntry may contain information for forwarding, or it may be empty (unconfigured). FF-803 FS 1.19 NM Subclause 5.2.1
FirstConfiguredIndex	This element is the OD Index of the first entry in the list that is currently configured. If there are no configured entries, the value of this element is zero. Note that configured entries are not necessarily consecutive (i.e. one should not assume consecutive OD Indexes for configured entries). FF-803 FS 1.19 NM Subclause 5.1.1
FirstUnconfiguredIndex	This element is the OD Index of the first entry in the list that is currently not configured. If there are no unconfigured entries (all entries are configured), the value of this element is zero. Note that unconfigured entries are not necessarily consecutive (i.e. one should not assume consecutive OD Indexes for unconfigured entries). FF-803 FS 1.19 NM Subclause 5.1.1.
FmsFeaturesSupported	This attribute indicates the services that are supported by FDA FMS for the HSE device. FF-803 FS 1.19 NM Subclause 5.2.1
ForwardedInbound	This element counts the number of valid frames received by the interface that were submitted for transmission on one or more outbound interfaces. FF-803 FS 1.19 NM Subclause 5.9.6
H1ConfiguratorAddress	This element contains the H1 address of the H1 configurator device. FF-803 FS 1.19 NM Subclause 5.9.3
H1DlOperatFunctionalClassSupported	This attribute corresponds to the class supported by all H1 interfaces of a linking device. It has the same definition of DlOperatFunctionalClass attribute specified in the Network Management Specification [FF-801]. Its value is zero when the HSE device is not a linking device. FF-803 FS 1.19 NM Subclause 5.2.1
H1Timeout	This attribute defines the amount of time, in ms, that the Linking Device waits before releasing invoke ids that were allocated for FMS and/or SM requests sent on any H1 interface. FF-803 FS 1.19 NM Subclause 5.2.1
HseAutomaticVcrList	The HseAutomaticVcrList is the list of HSE Automatic VCR definitions. Each entry in the list may contain a defined HSE Automatic VCR, or it may be empty. FF-803 FS 1.19 NM Subclause 5.2.1
HseConfiguratorIpAddress	This attribute is the IP Address used by the HSE configurator device. Set this attribute to 0 if the configurator device is not an HSE device. FF-803 FS 1.19 NM Subclause 5.9.3
HseConfiguredVcrList	The HseConfiguredVcrList is the list of HSE Configured VCR definitions. Each entry in the list may contain a defined HSE Configured VCR, or it may be empty. There should be no pre-configured HSE Configured VCR in this list if the HSE device is unconfigured, i.e., without any configuration at all. FF-803 FS 1.19 NM Subclause 5.6.1
HSEDeviceVersion	HSE device Version. FF-803 FS 1.19 SM Subclause 6.2.1
HseNmaVfd	FF-803 FS 1.19 NM Subclause 5.2.1
HseSubnetMask	This attribute is defined in the Field Device Access (FDA) Agent Specification [FF-588] as the HSE Subnet Mask. FF-803 FS 1.19 NM Subclause 5.1.3
HseSubnetMaskBits	This attribute when ANDED with an IP address or HSE Subnet Mask yields the HSE subnet address defined in the Field Device Access (FDA) Agent Specification [FF-588]. It is used for HSE VCRs with the HSE Subnet Mask attribute. FF-803 FS 1.19 NM Subclause 5.2.1.FF-803 FS 1.19 NM Subclause 5.2.1
HseVcrEndpoint	HSE VCR Entry. FF-803 FS 1.19 NM Subclause 7.5
HseVcrEntryOdIndex	This attribute specifies the OD Index of the HSE VCR Entry object for which statistics are collected. FF-803 FS 1.19 NM Subclause 5.8.2
HseVcrStatisticsEntry	This class is used to define the characteristics of a HSE VCR Statistics entry. FF-803 FS 1.19 NM Subclause 5.8.2
HseVcrStatisticsList	A list of VCR statistics information. FF-803 FS 1.19 NM Subclause 5.8.1
HseVcrType	This attribute is defined in the Field Device Access (FDA) Agent Specification [FF-588] as the HSE VCR Type, and indicates the type of the HSE VCR. FF-803 FS 1.19 NM Subclause 5.1.3
IgnoredInbound	This element counts the number of valid frames received by the interface that the Forwarding Process determined did not need forwarding. FF-803 FS 1.19 NM Subclause 5.9.6

Tag	Description
InactivityCloseTime	This attribute is defined in the Field Device Access (FDA) Agent Specification [FF-588] as the Inactivity Close Time. DEFAULT_INACTIVITY_CLOSE_TIME = 30 s. FF-803 FS 1.19 NM Subclause 5.1.2
InstalledInterfaces	FF-803 FS 1.19 NM Subclause 5.2.1
InterfaceActualStateArray	This array of unsigned 8-bit integers is used to define the interface actual state, as described in the Data Link Protocol Specification: Bridge Operation Addendum [FF-806]. Each element in this array represents the actual state of a specific interface, which are sequentially numbered from 1 to n, where *n* is the number of H1 interfaces supported by the H1 Bridge. FF-803 FS 1.19 NM Subclause 5.9.1
InterfaceAddress	An element in InterfaceAddressArray is the H1 Link Id.Node 00 of a specific interface. Interfaces and their indexes into this array are sequentially numbered from 1 to n, where '1' represents the first H1 interface (see List Of Version Numbers in the HSE System Management [FF-589]) and *n* is the maximum number of H1 interfaces supported by the H1 Bridge. Writing to ConfiguredLinkSettingsRecord (see Network Management Specification [FF-801]) for the H1 Bridge device does not change the ThisLink attribute, whose value is defined in InterfaceAddressArray. FF-803 FS 1.19 NM Subclause 5.9.1
InterfaceAddressArray	This array is used to define the H1 addresses of the H1 bridge interfaces. Each element in this array is the H1 Link Id Node 00 of a specific interface. FF-803 FS 1.19 NM Subclause 5.9.1
InterfaceDesiredStateArray	This non-volatile array of unsigned 8-bit integers is used to define the interface desired state. Each element in this array represents the desired state of a specific interface, which are sequentially numbered from 1 to n, where *n* is the number of H1 interfaces supported by the H1 Bridge. FF-803 FS 1.19 NM Subclause 5.9.1
InterfaceNumber	This attribute specifies the index into the InterfaceAddressArray for forwarding. FF-803 FS 1.19 NM Subclause 5.9.5
InterfaceStatisticsEntry	This class is used to define statistics collected for a H1 Bridge Interface. FF-803 FS 1.19 NM Subclause 5.9.6
InterfaceStatisticsList	This conditional element is present if InterfaceStatisticsSupported in the BridgeCharacteristics is not zero. It represents the list of performance and fault-related statistics for the interfaces. FF-803 FS 1.19 NM Subclause 5.9.1
InterfaceStatisticsSupported	The value of this element indicates the interface statistics supported. FF-803 FS 1.19 NM Subclause 5.9.2
LastSNTPMessage	This object holds the first 48 octets of the last SNTP message received. This object contains only dynamic data, which does not affect the calculation of version numbers. FF-803 FS 1.19 SM Subclause 6.2.2
ListHeader	This is a generic header for the lists in the HSE NMA NMIB. The list header provides references to the first configured entry and the first unconfigured entry for direct access to them. It also provides the number of entries in the list to allow the user to read a series of entries from the list. FF-803 FS 1.19 NM Subclause 5.1.1
ListOfFBScheduleDescriptors	List of Function Block Schedule Descriptors FF-803 FS 1.19 SM Subclause 6.4.5
ListOfFilteringDatabaseRecords	This attribute is the list of Filtering Database records. Each entry in the list is an instance of the FilteringEntry class. FF-803 FS 1.19 NM Subclause 5.2.1
ListOfHseVcrEndpoints	List of HSE VCR Entries. FF-803 FS 1.19 NM Subclause 7.5
ListOfHseVcrStatisticsEntries	It represents the list of performance and fault-related statistics for the HSE VCRs. FF-803 FS 1.19 NM Subclause 5.8.1
ListOfLocalIPAddresses	This array contains the Local IP Address of each Ethernet interface supported by the HSE device. Each entry in this array is an IP6 address. The number of elements in this array depends on the number of Ethernet interfaces supported by the HSE device. FF-803 FS 1.19 SM Subclause 6.2.1
ListOfRepublishingDatabaseRecords	This attribute is the list of Republishing Database records. Each entry in the list is an instance of the RepublishingEntry class. FF-803 FS 1.19 NM Subclause 5.9.1
ListOfSessionEndpoints	List of Session Endpoints elements. FF-803 FS 1.19 NM Subclause 7.3