

# DIN EN 16603-70-31:2015-04 (E)

Space engineering - Ground systems and operations - Monitoring and control data definition; English version EN 16603-70-31:2015

---

## Table of contents

---

- Foreword .....8**
- Introduction.....8**
- 1 Scope..... 10**
- 2 Normative references ..... 11**
- 3 Terms, definitions and abbreviated terms..... 12**
  - 3.1 Terms from other standards..... 12
  - 3.2 Terms specific to the present standard ..... 12
  - 3.3 Abbreviated terms..... 13
- 4 Background and context..... 15**
  - 4.1 The space system model..... 15
  - 4.2 Monitoring and control view of the SSM..... 16
    - 4.2.1 Introduction ..... 16
    - 4.2.2 Standard SSM definitions..... 16
    - 4.2.3 Product-specific SSM tailoring ..... 18
- 5 Conventions ..... 20**
  - 5.1 Data definition..... 20
  - 5.2 Railroad diagrams..... 21
  - 5.3 Case sensitivity..... 22
  - 5.4 Names ..... 22
  - 5.5 Data types ..... 24
    - 5.5.1 General ..... 24
    - 5.5.2 Simple Data Types..... 25
    - 5.5.3 Complex Data Types..... 37
- 6 Monitoring and control data requirements..... 38**
  - 6.1 Data exchange ..... 38
  - 6.2 Specification of complex data types..... 39
    - 6.2.1 General ..... 39
    - 6.2.2 Activity call ..... 39

6.2.3	Expression .....	40
6.2.4	Interpretation function .....	40
6.2.5	Procedure .....	41
6.2.6	Synthetic parameter .....	41
6.2.7	Value set.....	42
6.3	Product data .....	42
6.3.1	Introduction .....	42
6.3.2	Product configuration data .....	43
6.4	Data population .....	47
6.5	System element data .....	49
6.5.1	Introduction .....	49
6.5.2	System element generic data.....	50
6.5.3	System data.....	51
6.5.4	Application process data .....	53
6.5.5	Service data .....	55
6.5.6	MAP data .....	93
6.5.7	VC data.....	93
6.5.8	Functions .....	94
6.5.9	Memory data.....	95
6.5.10	Memory sub-block data.....	95
6.5.11	Store data .....	96
6.5.12	CPDU data.....	97
6.5.13	On/Off device data .....	97
6.5.14	Register load device data.....	98
6.5.15	Sensor data.....	98
6.6	Reporting data .....	99
6.6.1	Introduction .....	99
6.6.2	General.....	99
6.6.3	Parameters .....	101
6.6.4	Compound parameters .....	104
6.6.5	Synthetic reporting data .....	106
6.6.6	Checking data.....	106
6.7	Activities .....	111
6.7.1	General.....	111
6.7.2	Activity argument value set .....	114
6.7.3	Activity execution data .....	114
6.7.4	Telecommands .....	118

6.7.5	Procedures .....	123
6.8	Events .....	125
<b>Annex A (informative) PUS service tailoring.....</b>		<b>126</b>
A.1	Introduction.....	126
A.2	Telecommand verification service.....	127
A.2.1	The PUS service model .....	127
A.2.2	Service tailoring data.....	128
A.2.3	Service requests and reports .....	129
A.3	Device command distribution service.....	131
A.3.1	The PUS service model .....	131
A.3.2	Service tailoring data.....	133
A.3.3	Service requests and reports .....	134
A.4	Housekeeping and diagnostic data reporting service .....	134
A.4.1	The PUS service model .....	134
A.4.2	Service tailoring data.....	136
A.4.3	Service requests and reports .....	142
A.5	Parameter statistics reporting service .....	148
A.5.1	The PUS service model .....	148
A.5.2	Service tailoring data.....	148
A.5.3	Service requests and reports .....	150
A.6	Event reporting service .....	151
A.6.1	The PUS service model .....	151
A.6.2	Service tailoring data.....	152
A.6.3	Service requests and reports .....	152
A.7	Memory management service.....	153
A.7.1	The PUS service model .....	153
A.7.2	Service tailoring data.....	154
A.7.3	Service requests and reports .....	156
A.8	Function management service .....	158
A.8.1	The PUS service model .....	158
A.8.2	Service tailoring data.....	158
A.8.3	Service requests and reports .....	159
A.9	Time management service.....	159
A.9.1	The PUS service model .....	159
A.9.2	Service tailoring data.....	160
A.9.3	Service requests and reports .....	160
A.10	On-board operations scheduling service .....	161

A.10.1	The PUS service model .....	161
A.10.2	Service tailoring data.....	162
A.10.3	Service requests and reports .....	164
A.11	On-board monitoring service.....	169
A.11.1	The PUS service model .....	169
A.11.2	Service tailoring data.....	169
A.11.3	Service requests and reports .....	173
A.12	Large data transfer service .....	177
A.12.1	The PUS service model .....	177
A.12.2	Service tailoring data.....	177
A.12.3	Service requests and reports .....	180
A.13	Packet forwarding control service .....	182
A.13.1	The PUS service model .....	182
A.13.2	Service tailoring data.....	182
A.13.3	Service requests and reports .....	184
A.14	On-board storage and retrieval service .....	187
A.14.1	The PUS service model .....	187
A.14.2	Service tailoring data.....	188
A.14.3	Service requests and reports .....	192
A.15	Test service .....	195
A.15.1	The PUS service model .....	195
A.15.2	Service tailoring data.....	195
A.15.3	Service requests and reports .....	196
A.16	On-board operations procedure service.....	196
A.16.1	The PUS service model .....	196
A.16.2	Service tailoring data.....	196
A.16.3	Service requests and reports .....	197
A.17	Event/action service.....	200
A.17.1	The PUS service model .....	200
A.17.2	Service tailoring data.....	200
A.17.3	Service requests and reports .....	202
<b>Annex B (informative)</b>	<b>Data type definitions .....</b>	<b>204</b>
B.1	Conventions.....	204
B.2	Comments .....	205
B.3	Data types and data items .....	205
B.3.1	Definitions .....	205
B.3.2	EBNF Representation .....	206

B.4	Activity Call .....	214
B.5	EXPL - Expression Language .....	214
B.5.1	Definitions .....	214
B.5.2	EBNF Representation .....	216
B.6	IFL - Interpretation Function Language .....	218
B.6.1	Definition .....	218
B.6.2	EBNF Representation .....	220
B.7	SPEL - Synthetic Parameter Expression Language .....	222
B.7.1	Definitions .....	222
B.7.2	Bit-manipulation functions .....	227
B.7.3	EBNF Representation .....	228
B.8	PLUTO – Procedure Language.....	232
B.9	VAL – Value Language.....	233
B.9.1	Definition.....	233
B.9.2	EBNF Representation .....	234
<b>Bibliography.....</b>		<b>236</b>

## Figures

Figure 4-1: Example product delivery system element hierarchy .....	16
Figure 4-2: Monitoring and control knowledge associated with a system element .....	18
Figure 5-1: Example railroad diagram.....	21
Figure A-1 : Diagram convention for PUS packet structures.....	127
Figure A-2 : Tailoring choices for the telecommand verification service .....	129
Figure A-3 : Tailoring choices for the device command distribution service .....	133
Figure A-4 : Tailoring choices for the housekeeping and diagnostic data reporting service (View 1).....	137
Figure A-5 Tailoring choices for the parameter statistics reporting service .....	149
Figure A-6 : Tailoring choices for the event reporting service .....	152
Figure A-7 : Tailoring choices for the memory management service (View 1).....	154
Figure A-8 : Tailoring choices for the function management service .....	158
Figure A-9 : Tailoring choices for the time management service.....	160
Figure A-10 : Tailoring choices for the on-board operations scheduling service (View 1)....	162
Figure A-11 : Tailoring choices for the on-board monitoring service (View 1) .....	170
Figure A-12 : Tailoring choices for the large data transfer service (View 1) .....	178
Figure A-13 : Tailoring choices for the packet forwarding control service (View 1).....	183
Figure A-14 : Tailoring choices for the on-board storage and retrieval service (View 1).....	189
Figure A-15 : Tailoring choices for the on-board operations procedure service .....	197
Figure A-16 Tailoring choices for the event/action service .....	201