PD IEC TS 61970-600-2:2017

BSI Standards Publication

Energy management system application program interface (EMS-API)

Part 600-2: Common Grid Model Exchange Specification (CGMES) – Exchange profiles specification

Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

National foreword

This Published Document is the UK implementation of IEC TS 61970-600-2:2017.

The UK participation in its preparation was entrusted to Technical Committee PEL/57, Power systems management and associated information exchange.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2018
Published by BSI Standards Limited 2018

ISBN 978 0 580 97047 4

ICS 33.200

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 May 2018.

Amendments/corrigenda issued since publication

Date	Text affected

Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

IEC TS 61970-600-2

Edition 1.0 2017-07

TECHNICAL SPECIFICATION

colour inside

Energy management system application program interface (EMS-API) – Part 600-2: Common Grid Model Exchange Specification (CGMES) – Exchange profiles specification

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.200

ISBN 978-2-8322-4574-3

Warning! Make sure that you obtained this publication from an authorized distributor.

® Registered trademark of the International Electrotechnical Commission

Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

CONTENTS

FOREWORD 24
1 Scope 26
2 Normative references 26
3 Terms, definitions and abbreviated terms 27
3.1 Terms and definitions 27
3.2 Abbreviated terms 28
4 EquipmentBoundaryProfile 28
4.1 General 28
4.2 (Entsoe) EquipmentBoundaryVersion(Abstract) 29
4.3 Core 30
4.3.1 ConductingEquipment(Abstract) 30
4.3.2 (Operation) ConnectivityNode 31
4.3.3 ConnectivityNodeContainer(Abstract) 33
4.3.4 Equipment(Abstract) 33
4.3.5 EquipmentContainer(Abstract) 34
4.3.6 PowerSystemResource(Abstract) 34
4.3.7 Terminal 35
4.3.8 BaseVoltage 35
4.3.9 GeographicalRegion 35
4.3.10 IdentifiedObject(Abstract) 36
4.3.11 SubGeographicalRegion 36
4.4 Wires 37
4.4.1 Connector(Abstract) 37
4.4.2 (Entsoe) EnergySchedulingType 38
4.4.3 EnergySource(Abstract) 38
4.4.4 Junction 39
4.4.5 Line 40
4.5 Global Used Datatypes 40
4.5.1 Datatypes – Voltage 40
4.5.2 Enumerations 41
4.5.3 Primitives 42
5 TopologyBoundaryProfile 42
5.1 General 42
5.2 (Entsoe) TopologyBoundaryVersion(Abstract) 43
5.3 Core 44
5.3.1 BaseVoltage(Abstract) 44
5.3.2 (Operation,Description) ConnectivityNode 45
5.3.3 ConnectivityNodeContainer(Abstract) 45
5.3.4 IdentifiedObject(Abstract) 45
5.4 Topology – TopologicalNode 46
5.5 Global Used Datatypes – Primitives 48
5.5.1 String 48
5.5.2 Date 48
5.5.3 Boolean 48
6 EquipmentProfile 48
6.1 General 48

AVA Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

6.2 (Entsoe) EquipmentVersion(Abstract) 49
6.3 DC 51
6.3.1 General 51
6.3.2 ACDCConverter(Abstract) 54
6.3.3 ACDCConverterDCTerminal 56
6.3.4 CsConverter 57
6.3.5 DCBaseTerminal(Abstract) 59
6.3.6 DCBreaker 60
6.3.7 DCBusbar 60
6.3.8 DCChopper 61
6.3.9 DCConductingEquipment(Abstract) 62
6.3.10 DCConverterUnit 63
6.3.11 DCDisconnector 63
6.3.12 DCEquipmentContainer 64
6.3.13 DCGround 64
6.3.14 DCLine 65
6.3.15 DCLineSegment 66
6.3.16 DCNode 67
6.3.17 DCSeriesDevice 68
6.3.18 DCShunt 69
6.3.19 DCSwitch 69
6.3.20 DCTerminal 70
6.3.21 PerLengthDCLineParameter 71
6.3.22 VsCapabilityCurve 71
6.3.23 VsConverter 72
6.3.24 Enumerations 74
6.4 Topology 74
6.4.1 BusNameMarker 74
6.5 Meas 75
6.5.1 General 75
6.5.2 (Operation) Accumulator 78
6.5.3 (Operation) AccumulatorLimit 79
6.5.4 (Operation) AccumulatorLimitSet 80
6.5.5 (Operation) AccumulatorReset 81
6.5.6 (Operation) AccumulatorValue 82
6.5.7 (Operation) Analog 82
6.5.8 (Operation) AnalogControl(Abstract) 83
6.5.9 (Operation) AnalogLimit 84
6.5.10 (Operation) AnalogLimitSet 85
6.5.11 (Operation) AnalogValue 86
6.5.12 (Operation) Command 86
6.5.13 (Operation) Control(Abstract) 87
6.5.14 (Operation) Discrete 88
6.5.15 (Operation) DiscreteValue 89
6.5.16 (Operation) Limit(Abstract) 90
6.5.17 (Operation) LimitSet(Abstract) 91
6.5.18 (Operation) Measurement(Abstract) 91
6.5.19 (Operation) MeasurementValue(Abstract) 93
6.5.20 (Operation) MeasurementValueQuality 94

AVA Documents
Document Sharing Hub

6.5.21 (Operation) MeasurementValueSource 94
6.5.22 (Operation) Quality61850(Abstract) 95
6.5.23 (Operation) RaiseLowerCommand 96
6.5.24 (Operation) SetPoint 97
6.5.25 (Operation) StringMeasurement 98
6.5.26 (Operation) StringMeasurementValue 99
6.5.27 (Operation) ValueAliasSet 100
6.5.28 (Operation) ValueToAlias 101
6.5.29 Enumerations 101
6.6 Production 102
6.6.1 General 102
6.6.2 (Entsoe) EnergySchedulingType 104
6.6.3 EnergySource 105
6.6.4 FossilFuel 106
6.6.5 GeneratingUnit 107
6.6.6 (Operation) GrossToNetActivePowerCurve 109
6.6.7 HydroGeneratingUnit 110
6.6.8 HydroPowerPlant 111
6.6.9 HydroPump 111
6.6.10 NuclearGeneratingUnit 112
6.6.11 SolarGeneratingUnit 113
6.6.12 ThermalGeneratingUnit 114
6.6.13 WindGeneratingUnit 115
6.6.14 Enumerations 116
6.7 Core 118
6.7.1 General 118
6.7.2 ACDCTerminal(Abstract) 120
6.7.3 BaseVoltage 120
6.7.4 BasicIntervalSchedule(Abstract) 121
6.7.5 (Operation) Bay 121
6.7.6 ConductingEquipment(Abstract) 122
6.7.7 (Operation) ConnectivityNode 123
6.7.8 ConnectivityNodeContainer(Abstract) 124
6.7.9 Curve(Abstract) 124
6.7.10 CurveData 125
6.7.11 Equipment(Abstract) 125
6.7.12 EquipmentContainer(Abstract) 126
6.7.13 GeographicalRegion 127
6.7.14 IdentifiedObject(Abstract) 127
6.7.15 PowerSystemResource(Abstract) 128
6.7.16 RegularIntervalSchedule(Abstract) 128
6.7.17 (Operation) RegularTimePoint 129
6.7.18 ReportingGroup 130
6.7.19 SubGeographicalRegion 130
6.7.20 Substation 131
6.7.21 Terminal 131
6.7.22 VoltageLevel 132
6.7.23 Enumerations 133
6.8 OperationalLimits 134

AVA Documents
Document Sharing Hub
Full document details: PD IEC/TS 61970-600-2:2017

6.8.1 General ... 134
6.8.2 (Operation) ActivePowerLimit ... 136
6.8.3 (Operation) ApparentPowerLimit ... 137
6.8.4 CurrentLimit ... 138
6.8.5 OperationalLimit(Abstract) ... 138
6.8.6 OperationalLimitSet ... 139
6.8.7 OperationalLimitType ... 140
6.8.8 VoltageLimit ... 141
6.8.9 Enumerations ... 142
6.9 Wires ... 144
6.9.1 General ... 144
6.9.2 ACLineSegment ... 147
6.9.3 AsynchronousMachine ... 149
6.9.4 Breaker ... 151
6.9.5 BusbarSection ... 152
6.9.6 Conductor(Abstract) ... 153
6.9.7 Connector(Abstract) ... 154
6.9.8 Disconnector ... 154
6.9.9 (ShortCircuit) EarthFaultCompensator(Abstract) ... 155
6.9.10 EnergyConsumer ... 156
6.9.11 ExternalNetworkInjection ... 157
6.9.12 (ShortCircuit,Operation) Ground ... 160
6.9.13 (ShortCircuit,Operation) GroundDisconnector ... 161
6.9.14 (ShortCircuit) GroundingImpedance ... 162
6.9.15 Junction ... 163
6.9.16 Line ... 164
6.9.17 LinearShuntCompensator ... 165
6.9.18 LoadBreakSwitch ... 166
6.9.19 (ShortCircuit) MutualCoupling ... 167
6.9.20 NonlinearShuntCompensator ... 168
6.9.21 NonlinearShuntCompensatorPoint ... 169
6.9.22 (ShortCircuit) PetersenCoil ... 170
6.9.23 PhaseTapChanger(Abstract) ... 172
6.9.24 PhaseTapChangerAsymmetrical ... 172
6.9.25 PhaseTapChangerLinear ... 173
6.9.26 PhaseTapChangerNonLinear(Abstract) ... 174
6.9.27 PhaseTapChangerSymmetrical ... 175
6.9.28 PhaseTapChangerTable ... 176
6.9.29 PhaseTapChangerTablePoint ... 177
6.9.30 PhaseTapChangerTabular ... 177
6.9.31 PowerTransformer ... 178
6.9.32 PowerTransformerEnd ... 181
6.9.33 ProtectedSwitch(Abstract) ... 183
6.9.34 RatioTapChanger ... 184
6.9.35 RatioTapChangerTable ... 185
6.9.36 RatioTapChangerTablePoint ... 185
6.9.37 ReactiveCapabilityCurve ... 186
6.9.38 RegulatingCondEq(Abstract) ... 187
6.9.39 RegulatingControl ... 188

Documents
Document Sharing Hub
Full document details: PD IEC/TS 61970-600-2:2017

6.9.40 (Operation) RegulationSchedule ... 189
6.9.41 RotatingMachine(Abstract) ... 190
6.9.42 SeriesCompensator ... 191
6.9.43 ShuntCompensator(Abstract) ... 192
6.9.44 StaticVarCompensator ... 194
6.9.45 Switch ... 195
6.9.46 (Operation) SwitchSchedule ... 196
6.9.47 SynchronousMachine ... 197
6.9.48 TapChanger(Abstract) ... 201
6.9.49 TapChangerControl ... 202
6.9.50 TapChangerTablePoint ... 203
6.9.51 (Operation) TapSchedule ... 204
6.9.52 TransformerEnd(Abstract) ... 204
6.9.53 Enumerations ... 205
6.10 LoadModel ... 207
6.10.1 General ... 207
6.10.2 ConformLoad ... 210
6.10.3 ConformLoadGroup ... 211
6.10.4 ConformLoadSchedule ... 212
6.10.5 (Operation) DayType ... 213
6.10.6 (Operation) EnergyArea(Abstract) ... 213
6.10.7 (Operation) LoadArea ... 213
6.10.8 LoadGroup(Abstract) ... 214
6.10.9 LoadResponseCharacteristic ... 214
6.10.10 NonConformLoad ... 216
6.10.11 NonConformLoadGroup ... 218
6.10.12 NonConformLoadSchedule ... 219
6.10.13 (Operation) Season ... 220
6.10.14 (Operation) SeasonDayTypeSchedule(Abstract) ... 220
6.10.15 (Operation) StationSupply ... 221
6.10.16 (Operation) SubLoadArea ... 222
6.11 Equivalents ... 223
6.11.1 General ... 223
6.11.2 EquivalentBranch ... 224
6.11.3 EquivalentEquipment(Abstract) ... 226
6.11.4 EquivalentInjection ... 227
6.11.5 EquivalentNetwork ... 229
6.11.6 EquivalentShunt ... 229
6.12 ControlArea ... 230
6.12.1 General ... 230
6.12.2 ControlArea ... 232
6.12.3 ControlAreaGeneratingUnit ... 233
6.12.4 TieFlow ... 233
6.12.5 Enumerations – ControlAreaTypeKind ... 234
6.13 Global Used Datatypes ... 234
6.13.1 ApparentPower ... 234
6.13.2 ActivePower ... 234
6.13.3 Voltage ... 235
6.13.4 Resistance ... 235

AVA Documents
Document Sharing Hub
Full document details: PD IEC/TS 61970-600-2:2017

6.13.5 ActivePowerPerCurrentFlow 235
6.13.6 AngleDegrees 236
6.13.7 CurrentFlow 236
6.13.8 Inductance 236
6.13.9 Capacitance 237
6.13.10 Length 237
6.13.11 CapacitancePerLength 237
6.13.12 InductancePerLength 238
6.13.13 ResistancePerLength 238
6.13.14 Simple_Float 239
6.13.15 PerCent 239
6.13.16 AngleRadians 239
6.13.17 Reactance 239
6.13.18 Money 240
6.13.19 Seconds 240
6.13.20 Susceptance 240
6.13.21 Conductance 241
6.13.22 Temperature 241
6.13.23 Frequency 241
6.13.24 RotationSpeed 242
6.13.25 ReactivePower 242
6.13.26 ActivePowerPerFrequency 242
6.13.27 PU 243
6.13.28 VoltagePerReactivePower 243
6.13.29 Enumerations 244
6.13.30 Primitives 253
7 SteadyStateHypothesisProfile 253
7.1 General 253
7.2 (Entsoe) SteadyStateHypothesisVersion(Abstract) 254
7.3 Core 255
7.3.1 General 255
7.3.2 ACDCTerminal(Abstract) 256
7.3.3 ConductingEquipment(Abstract) 257
7.3.4 Equipment(Abstract) 257
7.3.5 IdentifiedObject(Abstract) 257
7.3.6 PowerSystemResource(Abstract) 258
7.3.7 (Description) Terminal 258
7.4 ControlArea 259
7.4.1 (Description) ControlArea 259
7.5 DC 259
7.5.1 General 259
7.5.2 ACDCConverter(Abstract) 260
7.5.3 (Description) ACDCConverterDCTerminal 261
7.5.4 (Description) CsConverter 261
7.5.5 DCBaseTerminal(Abstract) 262
7.5.6 (Description) DCTerminal 262
7.5.7 (Description) VsConverter 263
7.5.8 Enumerations 263
7.6 Equivalents 264

Documents
Document Sharing Hub
Full document details: PD IEC/TS 61970-600-2:2017

7.6.1 EquivalentEquipment(Abstract) ... 264
7.6.2 (Description) EquivalentInjection ... 265
7.7 Generation ... 265
7.7.1 (Description) GeneratingUnit ... 265
7.7.2 (Description) HydroGeneratingUnit ... 266
7.7.3 (Description) NuclearGeneratingUnit ... 266
7.7.4 (Description) SolarGeneratingUnit ... 266
7.7.5 (Description) ThermalGeneratingUnit ... 267
7.7.6 (Description) WindGeneratingUnit ... 267
7.8 Wires ... 267
7.8.1 (Description) AsynchronousMachine ... 267
7.8.2 (Description) Breaker ... 268
7.8.3 (Description) Disconnector ... 268
7.8.4 (Description) EnergyConsumer ... 269
7.8.5 (Description) EnergySource ... 269
7.8.6 (Description) ExternalNetworkInjection ... 270
7.8.7 (Operation,ShortCircuit,Description) GroundDisconnector ... 270
7.8.8 (Description) LoadBreakSwitch ... 270
7.8.9 PhaseTapChanger(Abstract) ... 271
7.8.10 (Description) PhaseTapChangerAsymmetrical ... 271
7.8.11 (Description) PhaseTapChangerLinear ... 271
7.8.12 PhaseTapChangerNonLinear(Abstract) ... 272
7.8.13 (Description) PhaseTapChangerSymmetrical ... 272
7.8.14 (Description) PhaseTapChangerTabular ... 273
7.8.15 ProtectedSwitch(Abstract) ... 273
7.8.16 (Description) RatioTapChanger ... 273
7.8.17 RegulatingCondEq(Abstract) ... 274
7.8.18 RotatingMachine(Abstract) ... 274
7.8.19 (Description) StaticVarCompensator ... 275
7.8.20 (Description) Switch ... 275
7.8.21 (Description) SynchronousMachine ... 275
7.8.22 (Description) TapChangerControl ... 276
7.8.23 (Description) LinearShuntCompensator ... 276
7.8.24 (Description) NonlinearShuntCompensator ... 277
7.8.25 (Description) RegulatingControl ... 277
7.8.26 ShuntCompensator(Abstract) ... 278
7.8.27 TapChanger(Abstract) ... 278
7.8.28 Enumerations ... 279
7.9 LoadModel ... 279
7.9.1 (Description) ConformLoad ... 279
7.9.2 (Description) NonConformLoad ... 280
7.9.3 (Operation,Description) StationSupply ... 280
7.10 Global Used Datatypes ... 281
7.10.1 Datatypes ... 281
7.10.2 Enumerations ... 284
7.10.3 Primitives ... 286
8 TopologyProfile ... 287
8.1 General ... 287
8.2 (Entsoe) TopologyVersion(Abstract) ... 288

Documents
Document Sharing Hub
Full document details: PD IEC/TS 61970-600-2:2017

8.3 Core ... 289
8.3.1 General ... 289
8.3.2 ACDCTerminal(Abstract) ... 290
8.3.3 BaseVoltage(Abstract) ... 290
8.3.4 (Operation,Description) ConnectivityNode ... 291
8.3.5 ConnectivityNodeContainer(Abstract) ... 291
8.3.6 ReportingGroup(Abstract) ... 291
8.3.7 IdentifiedObject(Abstract) ... 291
8.3.8 (Description) Terminal ... 292
8.4 DC ... 293
8.4.1 General ... 293
8.4.2 (Description) ACDCConverterDCTerminal ... 293
8.4.3 DCBaseTerminal(Abstract) ... 294
8.4.4 DCEquipmentContainer(Abstract) ... 295
8.4.5 (Description) DCNode ... 295
8.4.6 (Description) DCTerminal ... 295
8.4.7 DCTopologicalNode ... 296
8.5 Topology ... 297
8.5.1 TopologicalNode ... 297
8.6 Global Used Datatypes – Primitives ... 297
8.6.1 String ... 297
8.6.2 Date ... 298
9 StateVariablesProfile ... 298
9.1 General ... 298
9.2 (Entsoe) StateVariablesVersion(Abstract) ... 299
9.3 Core ... 300
9.3.1 General ... 300
9.3.2 ACDCTerminal(Abstract) ... 301
9.3.3 ConductingEquipment(Abstract) ... 301
9.3.4 IdentifiedObject(Abstract) ... 301
9.3.5 Terminal(Abstract) ... 302
9.4 DC ... 302
9.4.1 General ... 302
9.4.2 ACDCConverter(Abstract) ... 303
9.4.3 (Description) CsConverter ... 304
9.4.4 DCTopologicalIsland ... 304
9.4.5 (Description) VsConverter ... 304
9.5 StateVariables ... 305
9.5.1 (Operation) SvStatus ... 305
9.5.2 SvInjection ... 305
9.5.3 SvPowerFlow ... 306
9.5.4 SvShuntCompensatorSections ... 307
9.5.5 SvTapStep ... 307
9.5.6 SvVoltage ... 308
9.6 Topology ... 308
9.6.1 General ... 308
9.6.2 DCTopologicalNode(Abstract) ... 309
9.6.3 TopologicalNode(Abstract) ... 309
9.6.4 TopologicalIsland ... 309

AVA Documents
Document Sharing Hub
Full document details: PD IEC/TS 61970-600-2:2017

9.7 Wires ... 310
9.7.1 General ... 310
9.7.2 ShuntCompensator(Abstract) ... 310
9.7.3 TapChanger(Abstract) ... 310
9.8 Global Used Datatypes ... 311
9.8.1 Datatypes ... 311
9.8.2 Enumerations ... 313
9.8.3 Primitives ... 314
10 DiagramLayoutProfile ... 314
10.1 General ... 314
10.2 (Entsoe) DiagramLayoutVersion(Abstract) ... 315
10.3 DiagramLayout ... 316
10.3.1 DiagramStyle ... 316
10.3.2 Diagram ... 317
10.3.3 DiagramObject ... 317
10.3.4 DiagramObjectGluePoint ... 319
10.3.5 DiagramObjectPoint ... 319
10.3.6 DiagramObjectStyle ... 319
10.3.7 TextDiagramObject ... 320
10.3.8 VisibilityLayer ... 320
10.4 Core ... 321
10.4.1 IdentifiedObject(Abstract) ... 321
10.5 Global Used Datatypes ... 322
10.5.1 Datatypes ... 322
10.5.2 Enumerations ... 322
10.5.3 Primitives ... 324
11 GeographicalLocationProfile ... 324
11.1 General ... 324
11.2 (Entsoe) GeographicalLocationVersion(Abstract) ... 325
11.3 Common ... 326
11.3.1 CoordinateSystem ... 326
11.3.2 Location ... 327
11.3.3 PositionPoint ... 327
11.4 Core ... 328
11.4.1 General ... 328
11.4.2 IdentifiedObject(Abstract) ... 328
11.4.3 PowerSystemResource(Abstract) ... 329
11.5 Global Used Datatypes – Primitives ... 329
11.5.1 String ... 329
11.5.2 Date ... 329
11.5.3 Integer ... 329

Figure 1 – diagram EquipmentBoundaryProfile ... 29
Figure 2 – diagram TopologyBoundaryProfile ... 43
Figure 3 – diagram EquipmentProfile ... 49
Figure 4 – diagram ACDCConverter ... 51
Figure 5 – diagram DCContainment ... 52
Figure 6 – diagram DCLineModel ... 53

Documents
Document Sharing Hub
Full document details: PD IEC/TS 61970-600-2:2017

Figure 7 – diagram DCEquipment 53
Figure 8 – diagram ACDCConnectivityModel 54
Figure 9 – diagram Control 76
Figure 10 – diagram Meas 77
Figure 11 – diagram MeasNote 78
Figure 12 – diagram Production 103
Figure 13 – diagram ProductionNotes 104
Figure 14 – diagram ACDCTerminal 118
Figure 15 – diagram CoreNotes 119
Figure 16 – diagram OperationalLimits 135
Figure 17 – diagram OperationalLimitsNotes 136
Figure 18 – diagram ShuntCompensator 144
Figure 19 – diagram Wires 145
Figure 20 – diagram WiresNotes 145
Figure 21 – diagram TapChanger 146
Figure 22 – diagram Transformer 147
Figure 23 – diagram LoadModel 208
Figure 24 – diagram LoadModelNotes 209
Figure 25 – diagram Equivalents 224
Figure 26 – diagram ControlAreaNotes 231
Figure 27 – diagram ControlArea 231
Figure 28 – diagram SteadyStateHypothesisProfile 254
Figure 29 – diagram Core 256
Figure 30 – diagram DC 260
Figure 31 – diagram TopologyProfileNotes 287
Figure 32 – diagram TopologyProfile 288
Figure 33 – diagram Core 290
Figure 34 – diagram DC 293
Figure 35 – diagram StateVariablesProfile 299
Figure 36 – diagram Core 301
Figure 37 – diagram DC 303
Figure 38 – diagram Topology 309
Figure 39 – diagram Wires 310
Figure 40 – diagram DiagramLayoutProfile 315
Figure 41 – diagram GeographicalLocationProfile 325
Figure 42 – diagram Core 328

Table 1 – Attributes of EquipmentBoundaryProfile::EquipmentBoundaryVersion 30
Table 2 – Attributes of Core::ConductingEquipment 31
Table 3 – Association ends of Core::Equipment with other classes 31
Table 4 – Attributes of Core::ConnectivityNode 32
Table 5 – Association ends of Core::ConnectivityNode with other classes 33
Table 6 – Attributes of Core::ConnectivityNodeContainer 33

AVA Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

Table 7 – Attributes of Core::Equipment 34
Table 8 – Association ends of Core::Equipment with other classes 34
Table 9 – Attributes of Core::EquipmentContainer 34
Table 10 – Attributes of Core::PowerSystemResource 35
Table 11 – Attributes of Core::BaseVoltage 35
Table 12 – Attributes of Core::GeographicalRegion 36
Table 13 – Attributes of Core::IdentifiedObject 36
Table 14 – Attributes of Core::SubGeographicalRegion 37
Table 15 – Association ends of Core::SubGeographicalRegion with other classes 37
Table 16 – Attributes of Wires::Connector 37
Table 17 – Association ends of Core::Equipment with other classes 38
Table 18 – Attributes of Wires::EnergySchedulingType 38
Table 19 – Attributes of Wires::EnergySource 38
Table 20 – Association ends of Wires::EnergySource with other classes 39
Table 21 – Attributes of Wires::Junction 39
Table 22 – Association ends of Core::Equipment with other classes 39
Table 23 – Attributes of Wires::Line 40
Table 24 – Association ends of Wires::Line with other classes 40
Table 25 – Attributes of DomainProfile::Voltage. 40
Table 26 – Attributes of TopologyBoundaryProfile::TopologyBoundaryVersion 44
Table 27 – Attributes of Core::BaseVoltage 45
Table 28 – Attributes of Core::IdentifiedObject 46
Table 29 – Attributes of Topology::TopologicalNode 47
Table 30 – Association ends of Topology::TopologicalNode with other classes 48
Table 31 – Attributes of EquipmentProfile::EquipmentVersion 50
Table 32 – Attributes of DC::ACDCConverter 55
Table 33 – Association ends of DC::ACDCConverter with other classes 56
Table 34 – Attributes of DC::ACDCConverterDCTerminal 56
Table 35 – Association ends of DC::ACDCConverterDCTerminal with other classes 57
Table 36 – Attributes of DC::CsConverter 58
Table 37 – Association ends of DC::ACDCConverter with other classes 59
Table 38 – Attributes of DC::DCBaseTerminal 59
Table 39 – Association ends of DC::DCBaseTerminal with other classes 60
Table 40 – Attributes of DC::DCBreaker 60
Table 41 – Association ends of Core::Equipment with other classes 60
Table 42 – Attributes of DC::DCBusbar 61
Table 43 – Association ends of Core::Equipment with other classes 61
Table 44 – Attributes of DC::DCChopper 61
Table 45 – Association ends of Core::Equipment with other classes 62
Table 46 – Attributes of DC::DCConductingEquipment 62
Table 47 – Association ends of Core::Equipment with other classes 62
Table 48 – Attributes of DC::DCConverterUnit 63
Table 49 – Association ends of DC::DCConverterUnit with other classes 63

AVA Documents
Document Sharing Hub

Table 50 – Attributes of DC::DCDisconnector 64
Table 51 – Association ends of Core::Equipment with other classes 64
Table 52 – Attributes of DC::DCEquipmentContainer 64
Table 53 – Attributes of DC::DCGround 65
Table 54 – Association ends of Core::Equipment with other classes 65
Table 55 – Attributes of DC::DCLine 66
Table 56 – Association ends of DC::DCLine with other classes 66
Table 57 – Attributes of DC::DCLineSegment 67
Table 58 – Association ends of DC::DCLineSegment with other classes 67
Table 59 – Attributes of DC::DCNode 68
Table 60 – Association ends of DC::DCNode with other classes 68
Table 61 – Attributes of DC::DCSeriesDevice 68
Table 62 – Association ends of Core::Equipment with other classes 69
Table 63 – Attributes of DC::DCShunt 69
Table 64 – Association ends of Core::Equipment with other classes 69
Table 65 – Attributes of DC::DCSwitch 70
Table 66 – Association ends of Core::Equipment with other classes 70
Table 67 – Attributes of DC::DCTerminal 70
Table 68 – Association ends of DC::DCTerminal with other classes 71
Table 69 – Attributes of DC::PerLengthDCLineParameter 71
Table 70 – Attributes of DC::VsCapabilityCurve 72
Table 71 – Attributes of DC::VsConverter 73
Table 72 – Association ends of DC::VsConverter with other classes 74
Table 73 – Attributes of Topology::BusNameMarker 75
Table 74 – Association ends of Topology::BusNameMarker with other classes 75
Table 75 – Attributes of Meas::Accumulator 79
Table 76 – Association ends of Meas::Measurement with other classes 79
Table 77 – Attributes of Meas::AccumulatorLimit 80
Table 78 – Association ends of Meas::AccumulatorLimit with other classes 80
Table 79 – Attributes of Meas::AccumulatorLimitSet 80
Table 80 – Association ends of Meas::AccumulatorLimitSet with other classes 81
Table 81 – Attributes of Meas::AccumulatorReset 81
Table 82 – Association ends of Meas::AccumulatorReset with other classes 81
Table 83 – Attributes of Meas::AccumulatorValue 82
Table 84 – Association ends of Meas::AccumulatorValue with other classes 82
Table 85 – Attributes of Meas::Analog 83
Table 86 – Association ends of Meas::Measurement with other classes 83
Table 87 – Attributes of Meas::AnalogControl 84
Table 88 – Association ends of Meas::AnalogControl with other classes 84
Table 89 – Attributes of Meas::AnalogLimit 85
Table 90 – Association ends of Meas::AnalogLimit with other classes 85
Table 91 – Attributes of Meas::AnalogLimitSet 85
Table 92 – Association ends of Meas::AnalogLimitSet with other classes 86

AVA Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

Table 93 – Attributes of Meas::AnalogValue 86
Table 94 – Association ends of Meas::AnalogValue with other classes 86
Table 95 – Attributes of Meas::Command 87
Table 96 – Association ends of Meas::Command with other classes 87
Table 97 – Attributes of Meas::Control 88
Table 98 – Association ends of Meas::Control with other classes 88
Table 99 – Attributes of Meas::Discrete 89
Table 100 – Association ends of Meas::Discrete with other classes 89
Table 101 – Attributes of Meas::DiscreteValue 90
Table 102 – Association ends of Meas::DiscreteValue with other classes 90
Table 103 – Attributes of Meas::Limit 90
Table 104 – Attributes of Meas::LimitSet 91
Table 105 – Attributes of Meas::Measurement 92
Table 106 – Association ends of Meas::Measurement with other classes 93
Table 107 – Attributes of Meas::MeasurementValue 93
Table 108 – Association ends of Meas::MeasurementValue with other classes 93
Table 109 – Attributes of Meas::MeasurementValueQuality 94
Table 110 – Association ends of Meas::MeasurementValueQuality with other classes 94
Table 111 – Attributes of Meas::MeasurementValueSource 95
Table 112 – Attributes of Meas::Quality61850 96
Table 113 – Attributes of Meas::RaiseLowerCommand 97
Table 114 – Association ends of Meas::RaiseLowerCommand with other classes 97
Table 115 – Attributes of Meas::SetPoint 98
Table 116 – Association ends of Meas::AnalogControl with other classes 98
Table 117 – Attributes of Meas::StringMeasurement 99
Table 118 – Association ends of Meas::Measurement with other classes 99
Table 119 – Attributes of Meas::StringMeasurementValue 100
Table 120 – Association ends of Meas::StringMeasurementValue with other classes 100
Table 121 – Attributes of Meas::ValueAliasSet 101
Table 122 – Attributes of Meas::ValueToAlias 101
Table 123 – Association ends of Meas::ValueToAlias with other classes 101
Table 124 – Attributes of Production::EnergySchedulingType 104
Table 125 – Attributes of Production::EnergySource 105
Table 126 – Association ends of Production::EnergySource with other classes 106
Table 127 – Attributes of Production::FossilFuel 106
Table 128 – Association ends of Production::FossilFuel with other classes 106
Table 129 – Attributes of Production::GeneratingUnit 108
Table 130 – Association ends of Core::Equipment with other classes 109
Table 131 – Attributes of Production::GrossToNetActivePowerCurve 109
Table 132 – Association ends of Production::GrossToNetActivePowerCurve with other classes 110
Table 133 – Attributes of Production::HydroGeneratingUnit 110
Table 134 – Association ends of Production::HydroGeneratingUnit with other classes 111

AVA Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

Table 135 – Attributes of Production::HydroPowerPlant 111
Table 136 – Attributes of Production::HydroPump 112
Table 137 – Association ends of Production::HydroPump with other classes 112
Table 138 – Attributes of Production::NuclearGeneratingUnit 113
Table 139 – Association ends of Core::Equipment with other classes 113
Table 140 – Attributes of Production::SolarGeneratingUnit 114
Table 141 – Association ends of Core::Equipment with other classes 114
Table 142 – Attributes of Production::ThermalGeneratingUnit 115
Table 143 – Association ends of Core::Equipment with other classes 115
Table 144 – Attributes of Production::WindGeneratingUnit 116
Table 145 – Association ends of Core::Equipment with other classes 116
Table 146 – Attributes of Core::ACDCTerminal 120
Table 147 – Association ends of Core::ACDCTerminal with other classes 120
Table 148 – Attributes of Core::BaseVoltage 121
Table 149 – Attributes of Core::BasicIntervalSchedule 121
Table 150 – Attributes of Core::Bay 122
Table 151 – Association ends of Core::Bay with other classes 122
Table 152 – Attributes of Core::ConductingEquipment 123
Table 153 – Association ends of Core::ConductingEquipment with other classes 123
Table 154 – Attributes of Core::ConnectivityNode 124
Table 155 – Association ends of Core::ConnectivityNode with other classes 124
Table 156 – Attributes of Core::ConnectivityNodeContainer 124
Table 157 – Attributes of Core::Curve 125
Table 158 – Attributes of Core::CurveData 125
Table 159 – Association ends of Core::CurveData with other classes 125
Table 160 – Attributes of Core::Equipment 126
Table 161 – Association ends of Core::Equipment with other classes 126
Table 162 – Attributes of Core::EquipmentContainer 127
Table 163 – Attributes of Core::GeographicalRegion 127
Table 164 – Attributes of Core::IdentifiedObject 128
Table 165 – Attributes of Core::PowerSystemResource 128
Table 166 – Attributes of Core::RegularIntervalSchedule 129
Table 167 – Attributes of Core::RegularTimePoint 129
Table 168 – Association ends of Core::RegularTimePoint with other classes 130
Table 169 – Attributes of Core::ReportingGroup 130
Table 170 – Attributes of Core::SubGeographicalRegion 130
Table 171 – Association ends of Core::SubGeographicalRegion with other classes 131
Table 172 – Attributes of Core::Substation 131
Table 173 – Association ends of Core::Substation with other classes 131
Table 174 – Attributes of Core::Terminal 132
Table 175 – Association ends of Core::Terminal with other classes 132
Table 176 – Attributes of Core::VoltageLevel 133
Table 177 – Association ends of Core::VoltageLevel with other classes 133

AVA Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

Table 178 – Attributes of OperationalLimits::ActivePowerLimit 136
Table 179 – Association ends of OperationalLimits::OperationalLimit with other classes 137
Table 180 – Attributes of OperationalLimits::ApparentPowerLimit 137
Table 181 – Association ends of OperationalLimits::OperationalLimit with other classes 137
Table 182 – Attributes of OperationalLimits::CurrentLimit 138
Table 183 – Association ends of OperationalLimits::OperationalLimit with other classes 138
Table 184 – Attributes of OperationalLimits::OperationalLimit 139
Table 185 – Association ends of OperationalLimits::OperationalLimit with other classes 139
Table 186 – Attributes of OperationalLimits::OperationalLimitSet 140
Table 187 – Association ends of OperationalLimits::OperationalLimitSet with other classes 140
Table 188 – Attributes of OperationalLimits::OperationalLimitType 141
Table 189 – Attributes of OperationalLimits::VoltageLimit 141
Table 190 – Association ends of OperationalLimits::OperationalLimit with other classes 142
Table 191 – Attributes of Wires::ACLineSegment 148
Table 192 – Association ends of Core::ConductingEquipment with other classes 149
Table 193 – Attributes of Wires::AsynchronousMachine 150
Table 194 – Association ends of Wires::RotatingMachine with other classes 151
Table 195 – Attributes of Wires::Breaker 151
Table 196 – Association ends of Core::ConductingEquipment with other classes 152
Table 197 – Attributes of Wires::BusbarSection 152
Table 198 – Association ends of Core::ConductingEquipment with other classes 153
Table 199 – Attributes of Wires::Conductor 153
Table 200 – Association ends of Core::ConductingEquipment with other classes 153
Table 201 – Attributes of Wires::Connector 154
Table 202 – Association ends of Core::ConductingEquipment with other classes 154
Table 203 – Attributes of Wires::Disconnector 155
Table 204 – Association ends of Core::ConductingEquipment with other classes 155
Table 205 – Attributes of Wires::EarthFaultCompensator 156
Table 206 – Association ends of Core::ConductingEquipment with other classes 156
Table 207 – Attributes of Wires::EnergyConsumer 157
Table 208 – Association ends of Wires::EnergyConsumer with other classes 157
Table 209 – Attributes of Wires::ExternalNetworkInjection 159
Table 210 – Association ends of Wires::RegulatingCondEq with other classes 160
Table 211 – Attributes of Wires::Ground 161
Table 212 – Association ends of Core::ConductingEquipment with other classes 161
Table 213 – Attributes of Wires::GroundDisconnector 162
Table 214 – Association ends of Core::ConductingEquipment with other classes 162
Table 215 – Attributes of Wires::GroundingImpedance 163
Table 216 – Association ends of Core::ConductingEquipment with other classes 163
Table 217 – Attributes of Wires::Junction 163
Table 218 – Association ends of Core::ConductingEquipment with other classes 164
Table 219 – Attributes of Wires::Line 164

Documents
Document Sharing Hub

Table 220 – Association ends of Wires::Line with other classes 164
Table 221 – Attributes of Wires::LinearShuntCompensator 165
Table 222 – Association ends of Wires::RegulatingCondEq with other classes 166
Table 223 – Attributes of Wires::LoadBreakSwitch 166
Table 224 – Association ends of Core::ConductingEquipment with other classes 167
Table 225 – Attributes of Wires::MutualCoupling 168
Table 226 – Association ends of Wires::MutualCoupling with other classes 168
Table 227 – Attributes of Wires::NonlinearShuntCompensator 169
Table 228 – Association ends of Wires::RegulatingCondEq with other classes 169
Table 229 – Attributes of Wires::NonlinearShuntCompensatorPoint 170
Table 230 – Association ends of Wires::NonlinearShuntCompensatorPoint with other classes 170
Table 231 – Attributes of Wires::PetersenCoil 171
Table 232 – Association ends of Core::ConductingEquipment with other classes 171
Table 233 – Attributes of Wires::PhaseTapChanger 172
Table 234 – Association ends of Wires::PhaseTapChanger with other classes 172
Table 235 – Attributes of Wires::PhaseTapChangerAsymmetrical 173
Table 236 – Association ends of Wires::PhaseTapChanger with other classes 173
Table 237 – Attributes of Wires::PhaseTapChangerLinear 174
Table 238 – Association ends of Wires::PhaseTapChanger with other classes 174
Table 239 – Attributes of Wires::PhaseTapChangerNonLinear 175
Table 240 – Association ends of Wires::PhaseTapChanger with other classes 175
Table 241 – Attributes of Wires::PhaseTapChangerSymmetrical 176
Table 242 – Association ends of Wires::PhaseTapChanger with other classes 176
Table 243 – Attributes of Wires::PhaseTapChangerTable 177
Table 244 – Attributes of Wires::PhaseTapChangerTablePoint 177
Table 245 – Association ends of Wires::PhaseTapChangerTablePoint with other classes 177
Table 246 – Attributes of Wires::PhaseTapChangerTabular 178
Table 247 – Association ends of Wires::PhaseTapChangerTabular with other classes 178
Table 248 – Attributes of Wires::PowerTransformer 180
Table 249 – Association ends of Core::ConductingEquipment with other classes 181
Table 250 – Attributes of Wires::PowerTransformerEnd 182
Table 251 – Association ends of Wires::PowerTransformerEnd with other classes 183
Table 252 – Attributes of Wires::ProtectedSwitch 183
Table 253 – Association ends of Core::ConductingEquipment with other classes 184
Table 254 – Attributes of Wires::RatioTapChanger 184
Table 255 – Association ends of Wires::RatioTapChanger with other classes 185
Table 256 – Attributes of Wires::RatioTapChangerTable 185
Table 257 – Attributes of Wires::RatioTapChangerTablePoint 186
Table 258 – Association ends of Wires::RatioTapChangerTablePoint with other classes 186
Table 259 – Attributes of Wires::ReactiveCapabilityCurve 187
Table 260 – Attributes of Wires::RegulatingCondEq 187
Table 261 – Association ends of Wires::RegulatingCondEq with other classes 188

Documents
Document Sharing Hub

Table 262 – Attributes of Wires::RegulatingControl 188
Table 263 – Association ends of Wires::RegulatingControl with other classes 189
Table 264 – Attributes of Wires::RegulationSchedule 189
Table 265 – Association ends of Wires::RegulationSchedule with other classes 190
Table 266 – Attributes of Wires::RotatingMachine 190
Table 267 – Association ends of Wires::RotatingMachine with other classes 191
Table 268 – Attributes of Wires::SeriesCompensator 192
Table 269 – Association ends of Core::ConductingEquipment with other classes 192
Table 270 – Attributes of Wires::ShuntCompensator 193
Table 271 – Association ends of Wires::RegulatingCondEq with other classes 193
Table 272 – Attributes of Wires::StaticVarCompensator 194
Table 273 – Association ends of Wires::RegulatingCondEq with other classes 195
Table 274 – Attributes of Wires::Switch 196
Table 275 – Association ends of Core::ConductingEquipment with other classes 196
Table 276 – Attributes of Wires::SwitchSchedule 197
Table 277 – Association ends of Wires::SwitchSchedule with other classes 197
Table 278 – Attributes of Wires::SynchronousMachine 199
Table 279 – Association ends of Wires::SynchronousMachine with other classes 201
Table 280 – Attributes of Wires::TapChanger 202
Table 281 – Association ends of Wires::TapChanger with other classes 202
Table 282 – Attributes of Wires::TapChangerControl 203
Table 283 – Association ends of Wires::RegulatingControl with other classes 203
Table 284 – Attributes of Wires::TapChangerTablePoint 203
Table 285 – Attributes of Wires::TapSchedule 204
Table 286 – Association ends of Wires::TapSchedule with other classes 204
Table 287 – Attributes of Wires::TransformerEnd 205
Table 288 – Association ends of Wires::TransformerEnd with other classes 205
Table 289 – Attributes of LoadModel::ConformLoad 210
Table 290 – Association ends of LoadModel::ConformLoad with other classes 211
Table 291 – Attributes of LoadModel::ConformLoadGroup 211
Table 292 – Association ends of LoadModel::LoadGroup with other classes 211
Table 293 – Attributes of LoadModel::ConformLoadSchedule 212
Table 294 – Association ends of LoadModel::ConformLoadSchedule with other classes 212
Table 295 – Attributes of LoadModel::DayType 213
Table 296 – Attributes of LoadModel::EnergyArea 213
Table 297 – Attributes of LoadModel::LoadArea 214
Table 298 – Attributes of LoadModel::LoadGroup 214
Table 299 – Association ends of LoadModel::LoadGroup with other classes 214
Table 300 – Attributes of LoadModel::LoadResponseCharacteristic 216
Table 301 – Attributes of LoadModel::NonConformLoad 217
Table 302 – Association ends of LoadModel::NonConformLoad with other classes 218
Table 303 – Attributes of LoadModel::NonConformLoadGroup 218
Table 304 – Association ends of LoadModel::LoadGroup with other classes 219

AVA Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

Table 305 – Attributes of LoadModel::NonConformLoadSchedule 219
Table 306 – Association ends of LoadModel::NonConformLoadSchedule with other classes 220
Table 307 – Attributes of LoadModel::Season 220
Table 308 – Attributes of LoadModel::SeasonDayTypeSchedule 221
Table 309 – Association ends of LoadModel::SeasonDayTypeSchedule with other classes 221
Table 310 – Attributes of LoadModel::StationSupply 222
Table 311 – Association ends of Wires::EnergyConsumer with other classes 222
Table 312 – Attributes of LoadModel::SubLoadArea 223
Table 313 – Association ends of LoadModel::SubLoadArea with other classes 223
Table 314 – Attributes of Equivalents::EquivalentBranch 225
Table 315 – Association ends of Equivalents::EquivalentEquipment with other classes 226
Table 316 – Attributes of Equivalents::EquivalentEquipment 227
Table 317 – Association ends of Equivalents::EquivalentEquipment with other classes 227
Table 318 – Attributes of Equivalents::EquivalentInjection 228
Table 319 – Association ends of Equivalents::EquivalentInjection with other classes 229
Table 320 – Attributes of Equivalents::EquivalentNetwork 229
Table 321 – Attributes of Equivalents::EquivalentShunt 230
Table 322 – Association ends of Equivalents::EquivalentEquipment with other classes 230
Table 323 – Attributes of ControlArea::ControlArea 232
Table 324 – Association ends of ControlArea::ControlArea with other classes 232
Table 325 – Attributes of ControlArea::ControlAreaGeneratingUnit 233
Table 326 – Association ends of ControlArea::ControlAreaGeneratingUnit with other classes 233
Table 327 – Attributes of ControlArea::TieFlow 233
Table 328 – Association ends of ControlArea::TieFlow with other classes 234
Table 329 – Attributes of DomainProfile::ApparentPower. 234
Table 330 – Attributes of DomainProfile::ActivePower. 235
Table 331 – Attributes of DomainProfile::Voltage. 235
Table 332 – Attributes of DomainProfile::Resistance. 235
Table 333 – Attributes of DomainProfile::ActivePowerPerCurrentFlow. 236
Table 334 – Attributes of DomainProfile::AngleDegrees. 236
Table 335 – Attributes of DomainProfile::CurrentFlow. 236
Table 336 – Attributes of DomainProfile::Inductance. 237
Table 337 – Attributes of DomainProfile::Capacitance. 237
Table 338 – Attributes of DomainProfile::Length. 237
Table 339 – Attributes of DomainProfile::CapacitancePerLength. 238
Table 340 – Attributes of DomainProfile::InductancePerLength. 238
Table 341 – Attributes of DomainProfile::ResistancePerLength. 238
Table 342 – Attributes of DomainProfile::Simple_Float. 239
Table 343 – Attributes of DomainProfile::PerCent. 239
Table 344 – Attributes of DomainProfile::AngleRadians. 239
Table 345 – Attributes of DomainProfile::Reactance 240

AVA Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

Table 346 – Attributes of DomainProfile::Money....240
Table 347 – Attributes of DomainProfile::Seconds. 240
Table 348 – Attributes of DomainProfile::Susceptance. 241
Table 349 – Attributes of DomainProfile::Conductance....241
Table 350 – Attributes of DomainProfile::Temperature. 241
Table 351 – Attributes of DomainProfile::Frequency....242
Table 352 – Attributes of DomainProfile::RotationSpeed. 242
Table 353 – Attributes of DomainProfile::ReactivePower....242
Table 354 – Attributes of DomainProfile::ActivePowerPerFrequency. 243
Table 355 – Attributes of DomainProfile::PU. 243
Table 356 – Attributes of DomainProfile::VoltagePerReactivePower. 243
Table 357 – Attributes of SteadyStateHypothesisProfile::SteadyStateHypothesisVersion 255
Table 358 – Attributes of Core::ACDCTerminal 257
Table 359 – Attributes of Core::ConductingEquipment 257
Table 360 – Attributes of Core::Equipment....257
Table 361 – Attributes of Core::IdentifiedObject....258
Table 362 – Attributes of Core::PowerSystemResource 258
Table 363 – Attributes of Core::Terminal....259
Table 364 – Attributes of ControlArea::ControlArea....259
Table 365 – Attributes of DC::ACDCConverter 261
Table 366 – Attributes of DC::ACDCConverterDCTerminal....261
Table 367 – Attributes of DC::CsConverter 262
Table 368 – Attributes of DC::DCBaseTerminal....262
Table 369 – Attributes of DC::DCTerminal 263
Table 370 – Attributes of DC::VsConverter....263
Table 371 – Attributes of Equivalents::EquivalentEquipment 265
Table 372 – Attributes of Equivalents::EquivalentInjection 265
Table 373 – Attributes of Generation::GeneratingUnit 266
Table 374 – Attributes of Generation::HydroGeneratingUnit 266
Table 375 – Attributes of Generation::NuclearGeneratingUnit 266
Table 376 – Attributes of Generation::SolarGeneratingUnit 267
Table 377 – Attributes of Generation::ThermalGeneratingUnit 267
Table 378 – Attributes of Generation::WindGeneratingUnit 267
Table 379 – Attributes of Wires::AsynchronousMachine 268
Table 380 – Attributes of Wires::Breaker....268
Table 381 – Attributes of Wires::Disconnector....269
Table 382 – Attributes of Wires::EnergyConsumer 269
Table 383 – Attributes of Wires::EnergySource 269
Table 384 – Attributes of Wires::ExternalNetworkInjection 270
Table 385 – Attributes of Wires::GroundDisconnector 270
Table 386 – Attributes of Wires::LoadBreakSwitch 271
Table 387 – Attributes of Wires::PhaseTapChanger 271

AVA Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

Table 388 – Attributes of Wires::PhaseTapChangerAsymmetrical 271
Table 389 – Attributes of Wires::PhaseTapChangerLinear 272
Table 390 – Attributes of Wires::PhaseTapChangerNonLinear 272
Table 391 – Attributes of Wires::PhaseTapChangerSymmetrical 273
Table 392 – Attributes of Wires::PhaseTapChangerTabular 273
Table 393 – Attributes of Wires::ProtectedSwitch 273
Table 394 – Attributes of Wires::RatioTapChanger 274
Table 395 – Attributes of Wires::RegulatingCondEq 274
Table 396 – Attributes of Wires::RotatingMachine 274
Table 397 – Attributes of Wires::StaticVarCompensator 275
Table 398 – Attributes of Wires::Switch 275
Table 399 – Attributes of Wires::SynchronousMachine 276
Table 400 – Attributes of Wires::TapChangerControl 276
Table 401 – Attributes of Wires::LinearShuntCompensator 277
Table 402 – Attributes of Wires::NonlinearShuntCompensator 277
Table 403 – Attributes of Wires::RegulatingControl 278
Table 404 – Attributes of Wires::ShuntCompensator 278
Table 405 – Attributes of Wires::TapChanger 279
Table 406 – Attributes of LoadModel::ConformLoad 280
Table 407 – Attributes of LoadModel::NonConformLoad 280
Table 408 – Attributes of LoadModel::StationSupply 280
Table 409 – Attributes of DomainProfile::ActivePower 281
Table 410 – Attributes of DomainProfile::ReactivePower 281
Table 411 – Attributes of DomainProfile::Voltage. 282
Table 412 – Attributes of DomainProfile::AngleDegrees. 282
Table 413 – Attributes of DomainProfile::CurrentFlow. 282
Table 414 – Attributes of DomainProfile::PU. 283
Table 415 – Attributes of DomainProfile::Resistance. 283
Table 416 – Attributes of DomainProfile::PerCent. 283
Table 417 – Attributes of DomainProfile::Simple_Float. 284
Table 418 – Attributes of TopologyProfile::TopologyVersion 289
Table 419 – Attributes of Core::ACDCTerminal 290
Table 420 – Attributes of Core::ReportingGroup 291
Table 421 – Attributes of Core::IdentifiedObject 292
Table 422 – Attributes of Core::Terminal 292
Table 423 – Association ends of Core::Terminal with other classes 293
Table 424 – Attributes of DC::ACDCConverterDCTerminal 294
Table 425 – Association ends of DC::DCBaseTerminal with other classes 294
Table 426 – Attributes of DC::DCBaseTerminal 294
Table 427 – Association ends of DC::DCBaseTerminal with other classes 294
Table 428 – Attributes of DC::DCNode 295
Table 429 – Association ends of DC::DCNode with other classes 295
Table 430 – Attributes of DC::DCTerminal 296

AVA Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

Table 431 – Association ends of DC::DCBaseTerminal with other classes 296
Table 432 – Attributes of DC::DCTopologicalNode 296
Table 433 – Association ends of DC::DCTopologicalNode with other classes 296
Table 434 – Attributes of Topology::TopologicalNode 297
Table 435 – Association ends of Topology::TopologicalNode with other classes 297
Table 436 – Attributes of StateVariablesProfile::StateVariablesVersion 300
Table 437 – Attributes of Core::ACDCTerminal 301
Table 438 – Attributes of Core::IdentifiedObject 302
Table 439 – Attributes of Core::Terminal 302
Table 440 – Attributes of DC::ACDCConverter 303
Table 441 – Attributes of DC::CsConverter 304
Table 442 – Attributes of DC::DCTopologicalIsland 304
Table 443 – Association ends of DC::DCTopologicalIsland with other classes 304
Table 444 – Attributes of DC::VsConverter 305
Table 445 – Attributes of StateVariables::SvStatus 305
Table 446 – Association ends of StateVariables::SvStatus with other classes 305
Table 447 – Attributes of StateVariables::SvInjection 306
Table 448 – Association ends of StateVariables::SvInjection with other classes 306
Table 449 – Attributes of StateVariables::SvPowerFlow 306
Table 450 – Association ends of StateVariables::SvPowerFlow with other classes 307
Table 451 – Attributes of StateVariables::SvShuntCompensatorSections 307
Table 452 – Association ends of StateVariables::SvShuntCompensatorSections with other classes 307
Table 453 – Attributes of StateVariables::SvTapStep 307
Table 454 – Association ends of StateVariables::SvTapStep with other classes 308
Table 455 – Attributes of StateVariables::SvVoltage 308
Table 456 – Association ends of StateVariables::SvVoltage with other classes 308
Table 457 – Attributes of Topology::DCTopologicalNode 309
Table 458 – Attributes of Topology::TopologicalIsland 310
Table 459 – Association ends of Topology::TopologicalIsland with other classes 310
Table 460 – Attributes of DomainProfile::CurrentFlow. 311
Table 461 – Attributes of DomainProfile::ActivePower. 311
Table 462 – Attributes of DomainProfile::Voltage. 312
Table 463 – Attributes of DomainProfile::AngleDegrees. 312
Table 464 – Attributes of DomainProfile::ReactivePower. 312
Table 465 – Attributes of DomainProfile::Simple_Float. 313
Table 466 – Attributes of DiagramLayoutProfile::DiagramLayoutVersion 316
Table 467 – Attributes of DiagramLayout::DiagramStyle 317
Table 468 – Attributes of DiagramLayout::Diagram 317
Table 469 – Association ends of DiagramLayout::Diagram with other classes 317
Table 470 – Attributes of DiagramLayout::DiagramObject 318
Table 471 – Association ends of DiagramLayout::DiagramObject with other classes 318
Table 472 – Attributes of DiagramLayout::DiagramObjectPoint 319

AVA Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

Table 473 – Association ends of DiagramLayout::DiagramObjectPoint with other classes 319
Table 474 – Attributes of DiagramLayout::DiagramObjectStyle 320
Table 475 – Attributes of DiagramLayout::TextDiagramObject 320
Table 476 – Association ends of DiagramLayout::DiagramObject with other classes 320
Table 477 – Attributes of DiagramLayout::VisibilityLayer 321
Table 478 – Association ends of DiagramLayout::VisibilityLayer with other classes 321
Table 479 – Attributes of Core::IdentifiedObject 322
Table 480 – Attributes of DomainProfile::Simple_Float. 322
Table 481 – Attributes of DomainProfile::AngleDegrees. 322
Table 482 – Attributes of GeographicalLocationProfile::GeographicalLocationVersion 326
Table 483 – Attributes of Common::CoordinateSystem 327
Table 484 – Attributes of Common::Location 327
Table 485 – Association ends of Common::Location with other classes 327
Table 486 – Attributes of Common::PositionPoint 328
Table 487 – Association ends of Common::PositionPoint with other classes 328
Table 488 – Attributes of Core::IdentifiedObject 329
Table 489 – Attributes of Core::PowerSystemResource 329

Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ENERGY MANAGEMENT SYSTEM APPLICATION PROGRAM INTERFACE (EMS-API) –

Part 600-2: Common Grid Model Exchange Specification (CGMES) – Exchange profiles specification

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 61970-600-2, which is a technical specification, has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

AVA Documents
Document Sharing Hub

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
57/1816/DTS	57/1872/RVDTS

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

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

A list of all the parts in the IEC 61970 series, published under the general title *Energy Management System Application Program Interface (EMS-API)*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

ENERGY MANAGEMENT SYSTEM APPLICATION PROGRAM INTERFACE (EMS-API) –

Part 600-2: Common Grid Model Exchange Specification (CGMES) – Exchange profiles specification

1 Scope

This part of IEC 61970, which is a technical specification on the CGMES, details the requirements of the exchange profiles belonging to the CGMES. The related technical information and documentation (i.e. RDFS, OCL, XMI and HTML) needed for the implementation of the CGMES, which is not copyrighted by either IEC or CENELEC, is available at the ENTSO-E web site (www.entsoe.eu).

The CGMES is defined using information on the Common Information Model (CIM) available in the public domain.

The CGMES is a superset of the former ENTSO-E CIM based data exchange standard (Profile 1) which was based on CIM14 (UML14v02) and has been used for certain network models exchanges since 2009. The CGMES reflects TSO requirements (as known by 2014) for accurate modelling of the ENTSO-E area for power flow, short circuit and dynamics applications whilst also allowing for the exchange of any diagram layouts including GIS data of a grid model.

Future editions of this technical specification will be released to describe following CGMES versions which reflect the additional requirements due to European network codes or guidelines.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61968-4, *Application integration at electric utilities – System interfaces for distribution management – Part 4: Interfaces for records and asset management*

IEC 61970-301, *Energy management system application program interface (EMS-API) – Part 301: Common information model (CIM) base*

IEC 61970-302, *Energy management system application program interface (EMS-API) – Part 302: CIM for dynamics*[1]

IEC 61970-452, *Energy management system application program interface (EMS-API) – Part 452: CIM model exchange specification*

IEC 61970-453, *Energy management system application program interface (EMS-API) – Part 453: Diagram layout profile*

[1] Under preparation. Stage at the time of publication: IEC/AFDIS 61970-302:2017.

Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

IEC 61970-456, *Energy management system application program interface (EMS-API) – Part 456: Solved power system state profiles*

IEC 61970-552, *Energy management system application program interface (EMS-API) – Part 552: CIMXML Model exchange format*

3 Terms, definitions and abbreviated terms

For the purposes of this document, the following terms, definitions and abbreviated terms apply.

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

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

NOTE For definitions which are not specified in the CGMES the definitions in the IEC CIM 61970 standards shall be applied.

3.1 Terms and definitions

3.1.1
Common Grid Model Exchange Specification
CGMES
specification used for the exchange of power system models between TSOs for the purpose of performing bilateral, regional or pan-European studies in the frame of TYNDP or TSOs' projects

Note 1 to entry: This is based on IEC CIM Standards and further extended to meet Network Codes' and projects' requirements. The standard defines a set of data model exchange profiles.

3.1.2
profile
uniquely named subset of classes, associations and attributes needed to accomplish a specific type of interface and based upon a canonical model

Note 1 to entry: The term profile may be used to define either the semantic model for an instance data payload or the syntactic schema for an instance data payload. A profile may be expressed in XSD, RDF, and/or OWL files. An instance data conforming to a profile can be tested in exchanges between applications. A profile is necessary in order to "use" the canonical model.

3.1.3
CIM Extension
collection of classes, attributes and associations, which extend the standard IEC CIM model in order to cover use cases not currently supported by IEC standards, and which are not considered to be international use cases or are covered by a later version of the standard which is not yet supported

3.1.4
ENTSO-E Extension
CIM Extension, specifically managed by ENTSO-E

3.1.5
boundary set
set containing all boundary points necessary for a given grid model exchange

Note 1 to entry: A Boundary set can have different coverage depending on the requirements of the common grid model exchange. A complete boundary set is necessary to assemble a pan-European power system model.

Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

3.1.6
boundary point
BP
connection point between two Model Authority Sets (MAS)

Note 1 to entry: A Boundary point could be a ConnectivityNode or a TopologicalNode placed on a tie-line or in a substation. A Boundary point must be contained in a Boundary Set and must not be contained in the MAS of a TSO. A Boundary point is referenced by Terminals in the MAS of a TSO. ConnectivityNode and TopologicalNode are terms specified in IEC CIM standards. If a Boundary point is placed on a tie-line, the term X-Node is often used instead of Boundary point. X-Node is therefore a specific type of Boundary point.

3.2 Abbreviated terms

IEC	The International Electrotechnical Commission, headquartered in Geneva
TSO	Transmission System Operator
ENTSO-E	European Network of Transmission System Operators for Electricity (ENTSO-E has 43 TSO members)
MRID	CIM Master Resource Identifier
CIM	Common Information Model (electricity)
CGMES	Common Grid Model Exchange Specification
MAS	Model Authority Set
RDF	Resource Description Framework
EQ_BD	Boundary equipment profile or instance file
TP_BD	Boundary topology profile or instance file
EQ	Equipment profile or instance file
TP	Topology profile or instance file
SSH	Steady State Hypothesis profile or instance file
SV	State Variables profile or instance file
DL	Diagram Layout profile or instance file
GL	Geographical Location profile or instance file
BP	Boundary point

4 EquipmentBoundaryProfile

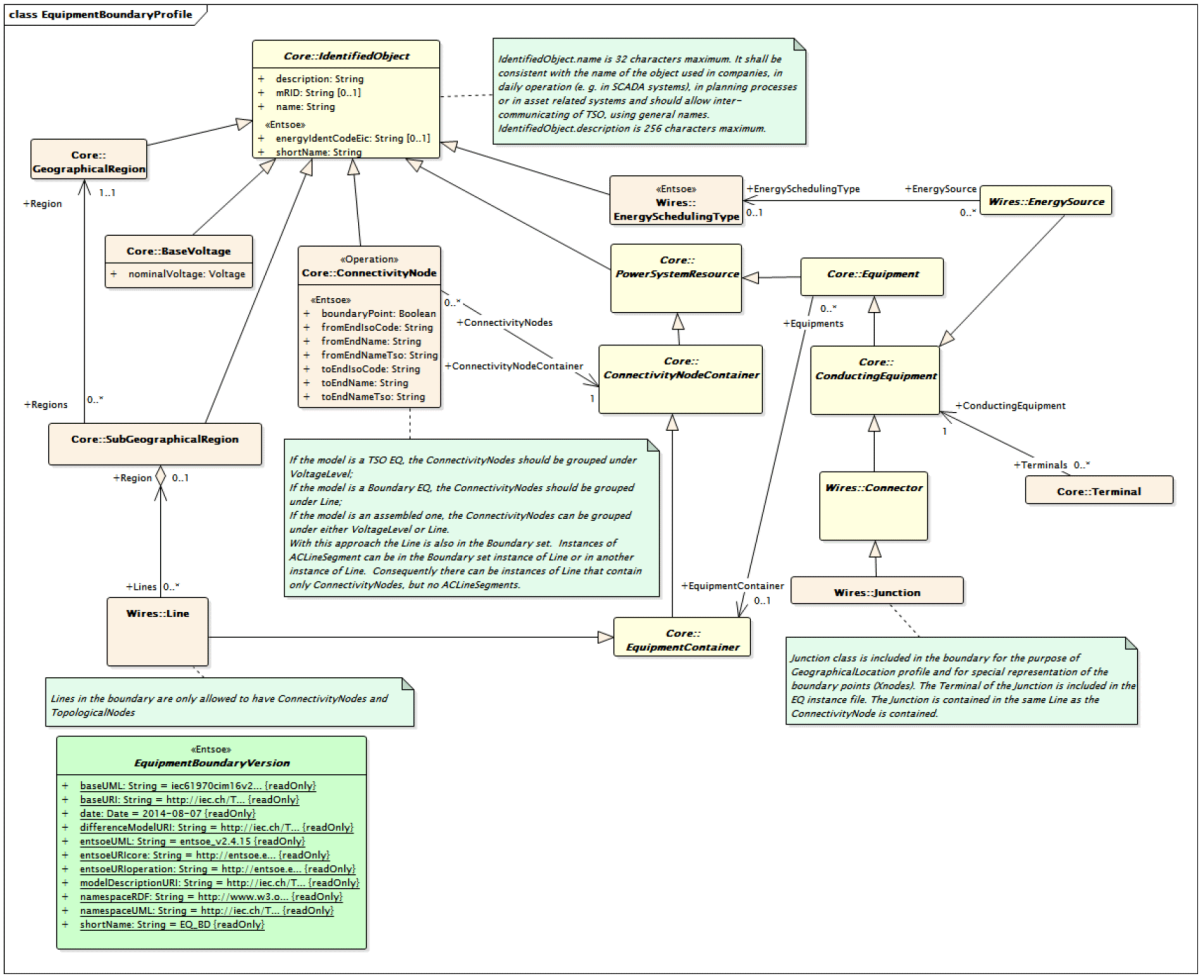
4.1 General

This profile has been built on the basis of IEC 61970-452 and adjusted to fit the purpose of the ENTSO-E boundary profile.

Figure 1 shows the diagram.

Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017



IEC

Figure 1 – diagram EquipmentBoundaryProfile

4.2 (Entsoe) EquipmentBoundaryVersion(Abstract)

Profile version details.

Table 1 shows all attributes of EquipmentBoundaryVersion.

Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

Table 1 – Attributes of EquipmentBoundaryProfile::EquipmentBoundaryVersion

Attribute name	mult.	Attribute type	Description
baseUML (Entsoe)	1..1	String	ConstantValue= iec61970cim16v28_iec61968cim12v08_iec62325cim03v01a Base UML provided by CIM model manager.
baseURI (Entsoe)	1..1	String	ConstantValue= http://iec.ch/TC57/2013/61970-452/EquipmentBoundary/3 Profile URI used in the Model Exchange header and defined in IEC standards. It uniquely identifies the Profile and its version. It is given for information only and to identify the closest IEC profile to which this CGMES profile is based on.
date (Entsoe)	1..1	Date	ConstantValue= 2014-08-07 Profile creation date Form is YYYY-MM-DD for example for January 5, 2009 it is 2009-01-05.
differenceModelURI (Entsoe)	1..1	String	ConstantValue= http://iec.ch/TC57/61970-552/DifferenceModel/1# Difference model URI defined by IEC 61970-552.
entsoeUML (Entsoe)	1..1	String	ConstantValue= entsoe_v2.4.15 UML provided by ENTSO-E.
entsoeURIcore (Entsoe)	1..1	String	ConstantValue= http://entsoe.eu/CIM/EquipmentBoundary/3/1 Profile URI defined by ENTSO-E and used in the Model Exchange header. It uniquely identifies the Profile and its version. The last two elements in the URI (http://entsoe.eu/CIM/EquipmentBoundary/yy/zzz) indicate major and minor versions where: - yy – indicates a major version; - zzz – indicates a minor version.
entsoeURIoperation (Entsoe)	1..1	String	ConstantValue= http://entsoe.eu/CIM/EquipmentBoundaryOperation/3/1 Profile URI defined by ENTSO-E and used in the Model Exchange header. It uniquely identifies the Profile and its version. The last two elements in the URI (http://entsoe.eu/CIM/EquipmentBoundaryOperation/yy/zzz) indicate major and minor versions where: - yy – indicates a major version; - zzz – indicates a minor version.
modelDescriptionURI (Entsoe)	1..1	String	ConstantValue= http://iec.ch/TC57/61970-552/ModelDescription/1# Model Description URI defined by IEC 61970-552.
namespaceRDF (Entsoe)	1..1	String	ConstantValue= http://www.w3.org/1999/02/22-rdf-syntax-ns# RDF namespace.
namespaceUML (Entsoe)	1..1	String	ConstantValue= http://iec.ch/TC57/2013/CIM-schema-cim16# CIM UML namespace.
shortName (Entsoe)	1..1	String	ConstantValue= EQ_BD The short name of the profile used in profile documentation.

4.3 Core

4.3.1 ConductingEquipment(Abstract)

The parts of the AC power system that are designed to carry current or that are conductively connected through terminals.

Inheritance path: ->Equipment->PowerSystemResource->IdentifiedObject

Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

Table 2 shows all attributes of ConductingEquipment.

Table 2 – Attributes of Core::ConductingEquipment

Attribute name	mult.	Attribute type	Description
description	1..1	String	see IdentifiedObject
energyIdentCodeEic (Entsoe)	0..1	String	see IdentifiedObject
mRID	0..1	String	see IdentifiedObject
name	1..1	String	see IdentifiedObject
shortName (Entsoe)	1..1	String	see IdentifiedObject

Table 3 shows all association ends of Equipment with other classes.

Table 3 – Association ends of Core::Equipment with other classes

mult.	mult.	Class type name	Description
EquipmentContainer	0..1	EquipmentContainer	Inherited Association Based On: Core:: EquipmentContainer.EquipmentContainer[0..1] ----- Core:: Equipment.Equipments[0..*]

4.3.2 (Operation) ConnectivityNode

Connectivity nodes are points where terminals of AC conducting equipment are connected together with zero impedance.

If the model is a TSO EQ, the ConnectivityNodes should be grouped under VoltageLevel; If the model is a Boundary EQ, the ConnectivityNodes should be grouped under Line; If the model is an assembled one, the ConnectivityNodes can be grouped under either VoltageLevel or Line. With this approach the Line is also in the Boundary set. Instances of ACLineSegment can be in the Boundary set instance of Line or in another instance of Line. Consequently there can be instances of Line that contain only ConnectivityNodes, but no ACLineSegments.

Inheritance path: ->IdentifiedObject

Table 4 shows all attributes of ConnectivityNode.

Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

Table 4 – Attributes of Core::ConnectivityNode

Attribute name	mult.	Attribute type	Description
boundaryPoint (Entsoe)	1..1	Boolean	Identifies if a node is a BoundaryPoint. If boundaryPoint=true the ConnectivityNode or the TopologicalNode represents a BoundaryPoint.
fromEndIsoCode (Entsoe)	1..1	String	The attribute is used for an exchange of the ISO code of the region to which the “From” side of the Boundary point belongs to or it is connected to. The ISO code is two characters country code as defined by ISO 3166 (http://www.iso.org/iso/country_codes). The length of the string is 2 characters maximum. The attribute is a required for the Boundary Model Authority Set where this attribute is used only for the TopologicalNode in the Boundary Topology profile and ConnectivityNode in the Boundary Equipment profile.
fromEndName (Entsoe)	1..1	String	The attribute is used for an exchange of a human readable name with length of the string 32 characters maximum. The attribute covers two cases: if the Boundary point is placed on a tie-line the attribute is used for exchange of the geographical name of the substation to which the “From” side of the tie-line is connected to. if the Boundary point is placed in a substation the attribute is used for exchange of the name of the element (e.g. PowerTransformer, ACLineSegment, Switch, etc) to which the “From” side of the Boundary point is connected to. The attribute is required for the Boundary Model Authority Set where it is used only for the TopologicalNode in the Boundary Topology profile and ConnectivityNode in the Boundary Equipment profile.
fromEndNameTso (Entsoe)	1..1	String	The attribute is used for an exchange of the name of the TSO to which the “From” side of the Boundary point belongs to or it is connected to. The length of the string is 32 characters maximum. The attribute is required for the Boundary Model Authority Set where it is used only for the TopologicalNode in the Boundary Topology profile and ConnectivityNode in the Boundary Equipment profile.
toEndIsoCode (Entsoe)	1..1	String	The attribute is used for an exchange of the ISO code of the region to which the “To” side of the Boundary point belongs to or it is connected to. The ISO code is two characters country code as defined by ISO 3166 (http://www.iso.org/iso/country_codes). The length of the string is 2 characters maximum. The attribute is a required for the Boundary Model Authority Set where this attribute is used only for the TopologicalNode in the Boundary Topology profile and ConnectivityNode in the Boundary Equipment profile.
toEndName (Entsoe)	1..1	String	The attribute is used for an exchange of a human readable name with length of the string 32 characters maximum. The attribute covers two cases: if the Boundary point is placed on a tie-line the attribute is used for exchange of the geographical name of the substation to which the “To” side of the tie-line is connected to. if the Boundary point is placed in a substation the attribute is used for exchange of the name of the **element** (e.g. PowerTransformer, ACLineSegment, Switch, etc) to which the “To” side of the Boundary point is connected to. The attribute is required for the Boundary Model Authority Set where it is used only for the TopologicalNode in the Boundary Topology profile and ConnectivityNode in the Boundary Equipment profile.

Documents
Document Sharing Hub

Attribute name	mult.	Attribute type	Description
toEndNameTso (Entsoe)	1..1	String	The attribute is used for an exchange of the name of the TSO to which the “To” side of the Boundary point belongs to or it is connected to. The length of the string is 32 characters maximum. The attribute is required for the Boundary Model Authority Set where it is used only for the TopologicalNode in the Boundary Topology profile and ConnectivityNode in the Boundary Equipment profile.
description	1..1	String	see IdentifiedObject
energyIdentCodeEic (Entsoe)	0..1	String	see IdentifiedObject
mRID	0..1	String	see IdentifiedObject
name	1..1	String	see IdentifiedObject
shortName (Entsoe)	1..1	String	see IdentifiedObject

Table 5 shows all association ends of ConnectivityNode with other classes.

Table 5 – Association ends of Core::ConnectivityNode with other classes

mult.	mult.	Class type name	Description
ConnectivityNodeContainer (Operation)	[1..1]	ConnectivityNodeContainer	Container of this connectivity node. Association Based On: Core:: ConnectivityNode.ConnectivityNodes[0..*] ----- Core:: ConnectivityNodeContainer.ConnectivityNodeContainer[1]

4.3.3 ConnectivityNodeContainer(Abstract)

A base class for all objects that may contain connectivity nodes or topological nodes.

Inheritance path: ->PowerSystemResource->IdentifiedObject

Table 6 shows all attributes of ConnectivityNodeContainer.

Table 6 – Attributes of Core::ConnectivityNodeContainer

Attribute name	mult.	Attribute type	Description
description	1..1	String	see IdentifiedObject
energyIdentCodeEic (Entsoe)	0..1	String	see IdentifiedObject
mRID	0..1	String	see IdentifiedObject
name	1..1	String	see IdentifiedObject
shortName (Entsoe)	1..1	String	see IdentifiedObject

4.3.4 Equipment(Abstract)

The parts of a power system that are physical devices, electronic or mechanical.

Inheritance path: ->PowerSystemResource->IdentifiedObject

Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

Table 7 shows all attributes of Equipment.

Table 7 – Attributes of Core::Equipment

Attribute name	mult.	Attribute type	Description
description	1..1	String	see IdentifiedObject
energyIdentCodeEic (Entsoe)	0..1	String	see IdentifiedObject
mRID	0..1	String	see IdentifiedObject
name	1..1	String	see IdentifiedObject
shortName (Entsoe)	1..1	String	see IdentifiedObject

Table 8 shows all association ends of Equipment with other classes.

Table 8 – Association ends of Core::Equipment with other classes

mult.	mult.	Class type name	Description
EquipmentContainer	[0..1]	EquipmentContainer	Container of this equipment. Association Based On: Core:: EquipmentContainer.EquipmentContainer[0..1] ----- Core:: Equipment.Equipments[0..*]

4.3.5 EquipmentContainer(Abstract)

A modeling construct to provide a root class for containing equipment.

Inheritance path: ->ConnectivityNodeContainer->PowerSystemResource->IdentifiedObject

Table 9 shows all attributes of EquipmentContainer.

Table 9 – Attributes of Core::EquipmentContainer

Attribute name	mult.	Attribute type	Description
description	1..1	String	see IdentifiedObject
energyIdentCodeEic (Entsoe)	0..1	String	see IdentifiedObject
mRID	0..1	String	see IdentifiedObject
name	1..1	String	see IdentifiedObject
shortName (Entsoe)	1..1	String	see IdentifiedObject

4.3.6 PowerSystemResource(Abstract)

A power system resource can be an item of equipment such as a switch, an equipment container containing many individual items of equipment such as a substation, or an organisational entity such as sub-control area. Power system resources can have measurements associated.

Inheritance path: ->IdentifiedObject

Table 10 shows all attributes of PowerSystemResource.

Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

Table 10 – Attributes of Core::PowerSystemResource

Attribute name	mult.	Attribute type	Description
description	1..1	String	see IdentifiedObject
energyIdentCodeEic (Entsoe)	0..1	String	see IdentifiedObject
mRID	0..1	String	see IdentifiedObject
name	1..1	String	see IdentifiedObject
shortName (Entsoe)	1..1	String	see IdentifiedObject

4.3.7 Terminal

An AC electrical connection point to a piece of conducting equipment. Terminals are connected at physical connection points called connectivity nodes.

4.3.8 BaseVoltage

Defines a system base voltage which is referenced.

Inheritance path: ->IdentifiedObject

Table 11 shows all attributes of BaseVoltage.

Table 11 – Attributes of Core::BaseVoltage

Attribute name	mult.	Attribute type	Description
nominalVoltage	1..1	Voltage	The power system resource's base voltage.
description	1..1	String	see IdentifiedObject
energyIdentCodeEic (Entsoe)	0..1	String	see IdentifiedObject
mRID	0..1	String	see IdentifiedObject
name	1..1	String	see IdentifiedObject
shortName (Entsoe)	1..1	String	see IdentifiedObject

4.3.9 GeographicalRegion

A geographical region of a power system network model.

Inheritance path: ->IdentifiedObject

Table 12 shows all attributes of GeographicalRegion.

Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

Table 12 – Attributes of Core::GeographicalRegion

Attribute name	mult.	Attribute type	Description
description	1..1	String	see IdentifiedObject
energyIdentCodeEic (Entsoe)	0..1	String	see IdentifiedObject
mRID	0..1	String	see IdentifiedObject
name	1..1	String	see IdentifiedObject
shortName (Entsoe)	1..1	String	see IdentifiedObject

4.3.10 IdentifiedObject(Abstract)

This is a root class to provide common identification for all classes needing identification and naming attributes.

IdentifiedObject.name is 32 characters maximum. It shall be consistent with the name of the object used in companies, in daily operation (e. g. in SCADA systems), in planning processes or in asset related systems and should allow inter-communicating of TSO, using general names. IdentifiedObject.description is 256 characters maximum.

Table 13 shows all attributes of IdentifiedObject.

Table 13 – Attributes of Core::IdentifiedObject

Attribute name	mult.	Attribute type	Description
description	1..1	String	The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.
energyIdentCodeEic (Entsoe)	0..1	String	The attribute is used for an exchange of the EIC code (Energy identification Code). The length of the string is 16 characters as defined by the EIC code. References: Local issuing offices for EIC: https://www.entsoe.eu/publications/edi-library/links-to-eic-websites/ EIC description: https://www.entsoe.eu/index.php?id=73&libCat=eic .
mRID	0..1	String	Master resource identifier issued by a model authority. The mRID is globally unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended. For CIMXML data files in RDF syntax conforming to IEC 61970-552:2013, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.
name	1..1	String	The name is any free human readable and possibly non unique text naming the object.
shortName (Entsoe)	1..1	String	The attribute is used for an exchange of a human readable short name with length of the string 12 characters maximum.

4.3.11 SubGeographicalRegion

A subset of a geographical region of a power system network model.

Inheritance path: ->IdentifiedObject

Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

Table 14 shows all attributes of SubGeographicalRegion.

Table 14 – Attributes of Core::SubGeographicalRegion

Attribute name	mult.	Attribute type	Description
description	1..1	String	see IdentifiedObject
energyIdentCodeEic (Entsoe)	0..1	String	see IdentifiedObject
mRID	0..1	String	see IdentifiedObject
name	1..1	String	see IdentifiedObject
shortName (Entsoe)	1..1	String	see IdentifiedObject

Table 15 shows all association ends of SubGeographicalRegion with other classes.

Table 15 – Association ends of Core::SubGeographicalRegion with other classes

mult.	mult.	Class type name	Description
Region	[1..1]	GeographicalRegion	The geographical region to which this sub-geographical region is within. Association Based On: Core:: GeographicalRegion.Region[0..1] ----- Core:: SubGeographicalRegion.Regions[0..*]

4.4 Wires

4.4.1 Connector(Abstract)

A conductor, or group of conductors, with negligible impedance, that serve to connect other conducting equipment within a single substation and are modelled with a single logical terminal.

Inheritance path: ->ConductingEquipment->Equipment->PowerSystemResource->IdentifiedObject

Table 16 shows all attributes of Connector.

Table 16 – Attributes of Wires::Connector

Attribute name	mult.	Attribute type	Description
description	1..1	String	see IdentifiedObject
energyIdentCodeEic (Entsoe)	0..1	String	see IdentifiedObject
mRID	0..1	String	see IdentifiedObject
name	1..1	String	see IdentifiedObject
shortName (Entsoe)	1..1	String	see IdentifiedObject

Table 17 shows all association ends of Equipment with other classes.

Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

Table 17 – Association ends of Core::Equipment with other classes

mult.	mult.	Class type name	Description
EquipmentContainer	0..1	EquipmentContainer	Inherited Association Based On: Core:: EquipmentContainer.EquipmentContainer[0..1] ----- Core:: Equipment.Equipments[0..*]

4.4.2 (Entsoe) EnergySchedulingType

Used to define the type of generation for scheduling purposes.

Inheritance path: ->IdentifiedObject

Table 18 shows all attributes of EnergySchedulingType.

Table 18 – Attributes of Wires::EnergySchedulingType

Attribute name	mult.	Attribute type	Description
description	1..1	String	see IdentifiedObject
energyIdentCodeEic (Entsoe)	0..1	String	see IdentifiedObject
mRID	0..1	String	see IdentifiedObject
name	1..1	String	see IdentifiedObject
shortName (Entsoe)	1..1	String	see IdentifiedObject

4.4.3 EnergySource(Abstract)

A generic equivalent for an energy supplier on a transmission or distribution voltage level.

Inheritance path: ->ConductingEquipment->Equipment->PowerSystemResource->IdentifiedObject

Table 19 shows all attributes of EnergySource.

Table 19 – Attributes of Wires::EnergySource

Attribute name	mult.	Attribute type	Description
description	1..1	String	see IdentifiedObject
energyIdentCodeEic (Entsoe)	0..1	String	see IdentifiedObject
mRID	0..1	String	see IdentifiedObject
name	1..1	String	see IdentifiedObject
shortName (Entsoe)	1..1	String	see IdentifiedObject

Table 20 shows all association ends of EnergySource with other classes.

Documents
Document Sharing Hub
Full document details: PD IEC/TS 61970-600-2:2017

Table 20 – Association ends of Wires::EnergySource with other classes

mult.	mult.	Class type name	Description
EnergySchedulingType	[0..1]	EnergySchedulingType	Energy Scheduling Type of an Energy Source Association Based On: Wires:: EnergySource.EnergySource[0..*] ----- Extension:: EnergySchedulingType.EnergySchedulingType[0..1]
EquipmentContainer	0..1	EquipmentContainer	Inherited Association Based On: Core:: EquipmentContainer.EquipmentContainer[0..1] ----- Core:: Equipment.Equipments[0..*]

4.4.4 Junction

A point where one or more conducting equipments are connected with zero resistance.

Junction class is included in the boundary for the purpose of GeographicalLocation profile and for special representation of the boundary points (Xnodes). The Terminal of the Junction is included in the EQ instance file. The Junction is contained in the same Line as the ConnectivityNode is contained.

Inheritance path: ->Connector->ConductingEquipment->Equipment->PowerSystemResource->IdentifiedObject

Table 21 shows all attributes of Junction.

Table 21 – Attributes of Wires::Junction

Attribute name	mult.	Attribute type	Description
description	1..1	String	see IdentifiedObject
energyIdentCodeEic (Entsoe)	0..1	String	see IdentifiedObject
mRID	0..1	String	see IdentifiedObject
name	1..1	String	see IdentifiedObject
shortName (Entsoe)	1..1	String	see IdentifiedObject

Table 22 shows all association ends of Equipment with other classes.

Table 22 – Association ends of Core::Equipment with other classes

mult.	mult.	Class type name	Description
EquipmentContainer	0..1	EquipmentContainer	Inherited Association Based On: Core:: EquipmentContainer.EquipmentContainer[0..1] ----- Core:: Equipment.Equipments[0..*]

Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

4.4.5 Line

Contains equipment beyond a substation belonging to a power transmission line.

Lines in the boundary are only allowed to have ConnectivityNodes and TopologicalNodes

Inheritance path: ->EquipmentContainer->ConnectivityNodeContainer->PowerSystemResource->IdentifiedObject

Table 23 shows all attributes of Line.

Table 23 – Attributes of Wires::Line

Attribute name	mult.	Attribute type	Description
description	1..1	String	see IdentifiedObject
energyIdentCodeEic (Entsoe)	0..1	String	see IdentifiedObject
mRID	0..1	String	see IdentifiedObject
name	1..1	String	see IdentifiedObject
shortName (Entsoe)	1..1	String	see IdentifiedObject

Table 24 shows all association ends of Line with other classes.

Table 24 – Association ends of Wires::Line with other classes

mult.	mult.	Class type name	Description
Region	[0..1]	SubGeographicalRegion	The lines within the sub-geographical region. Association Based On: Core:: SubGeographicalRegion.Region[0..1] ----- Wires:: Line.Lines[0..*]

4.5 Global Used Datatypes

4.5.1 Datatypes – Voltage

Electrical voltage, can be both AC and DC.

Value type is IEEE 754 simple precision floating point

Table 25 shows all attributes of Voltage.

Table 25 – Attributes of DomainProfile::Voltage.

Attribute name	mult.	Attribute type	Description
value (CIMDatatype)	0..1	Float	
unit (CIMDatatype)	0..1	UnitSymbol	ConstantValue= V
multiplier (CIMDatatype)	0..1	UnitMultiplier	ConstantValue= k

Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

4.5.2 Enumerations

4.5.2.1 UnitSymbol

The units defined for usage in the CIM.

Literal	Description	Code
VA	Apparent power in volt ampere.	
W	Active power in watt.	
VAr	Reactive power in volt ampere reactive.	
VAh	Apparent energy in volt ampere hours.	
Wh	Real energy in what hours.	
VArh	Reactive energy in volt ampere reactive hours.	
V	Voltage in volt.	
ohm	Resistance in ohm.	
A	Current in ampere.	
F	Capacitance in farad.	
H	Inductance in henry.	
degC	Relative temperature in degrees Celsius. In the SI unit system the symbol is ºC. Electric charge is measured in coulomb that has the unit symbol C. To distinguish degree Celsius form coulomb the symbol used in the UML is degC. Reason for not using ºC is the special character º is difficult to manage in software.	
s	Time in seconds.	
min	Time in minutes.	
h	Time in hours.	
deg	Plane angle in degrees.	
rad	Plane angle in radians.	
J	Energy in joule.	
N	Force in newton.	
S	Conductance in siemens.	
none	Dimension less quantity, e.g. count, per unit, etc.	
Hz	Frequency in hertz.	
g	Mass in gram.	
Pa	Pressure in pascal (n/m2).	
m	Length in meter.	
m2	Area in square meters.	
m3	Volume in cubic meters.	

4.5.2.2 UnitMultiplier

The unit multipliers defined for the CIM.

Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

Literal	Description	Code
p	Pico 10**-12.	
n	Nano 10**-9.	
micro	Micro 10**-6.	
m	Milli 10**-3.	
c	Centi 10**-2.	
d	Deci 10**-1.	
k	Kilo 10**3.	
M	Mega 10**6.	
G	Giga 10**9.	
T	Tera 10**12.	
none	No multiplier or equivalently multiply by 1.	

4.5.3 Primitives

4.5.3.1 String

A string consisting of a sequence of characters. The character encoding is UTF-8. The string length is unspecified and unlimited.

4.5.3.2 Date

Date as "yyyy-mm-dd", which conforms with ISO 8601. UTC time zone is specified as "yyyy-mm-ddZ". A local timezone relative UTC is specified as "yyyy-mm-dd(+/-)hh:mm".

4.5.3.3 Boolean

A type with the value space "true" and "false".

4.5.3.4 Float

A floating point number. The range is unspecified and not limited.

5 TopologyBoundaryProfile

5.1 General

This profile has been built on the basis of the IEC 61970-456 document and adjusted to fit the purpose of the ENTSO-E boundary profile.

Figure 2 shows the diagram.

Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

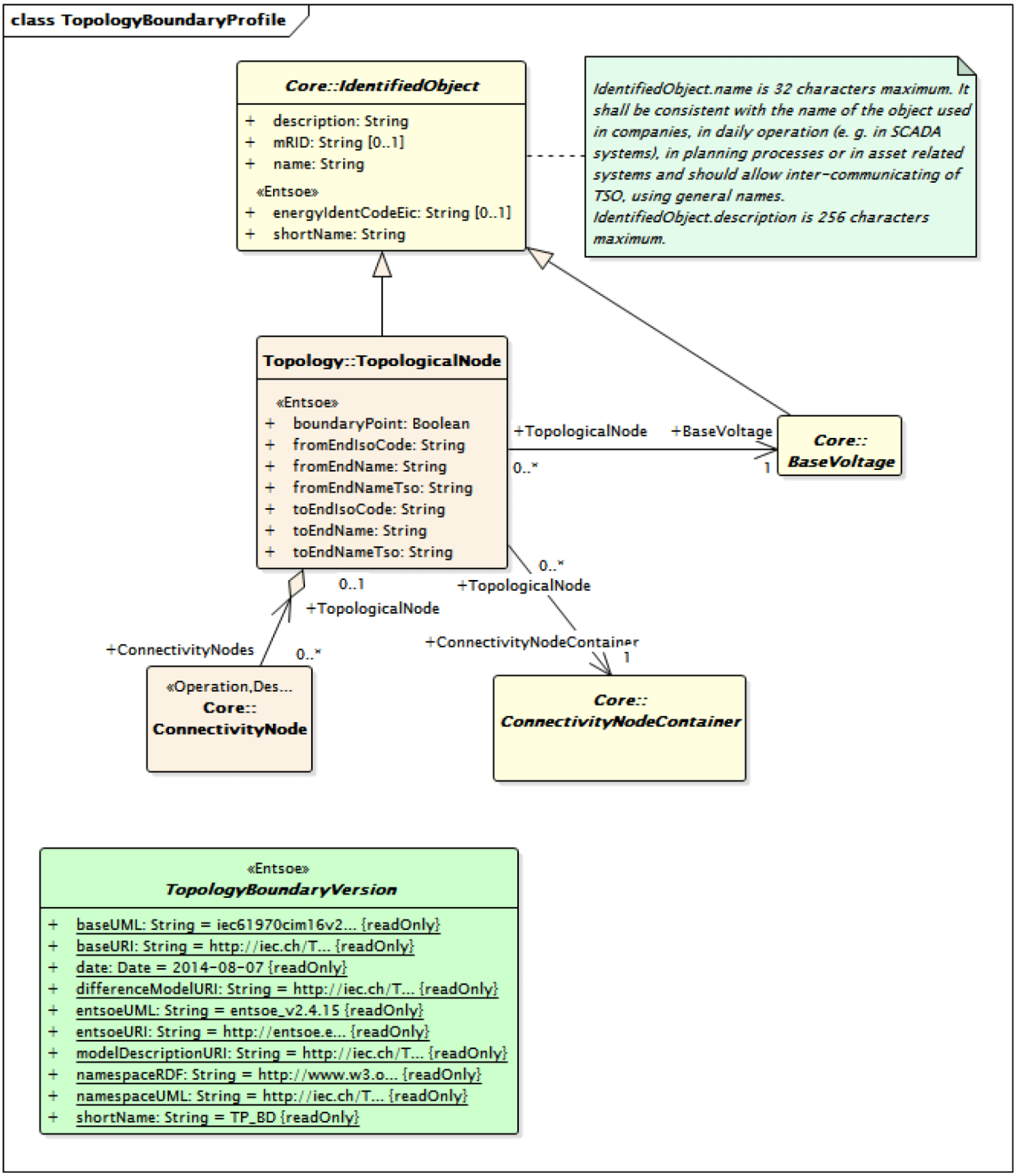


Figure 2 – diagram TopologyBoundaryProfile

5.2 (Entsoe) TopologyBoundaryVersion(Abstract)

Version details.

Table 26 shows all attributes of TopologyBoundaryVersion.

Documents
Document Sharing Hub
Full document details: PD IEC/TS 61970-600-2:2017

Table 26 – Attributes of TopologyBoundaryProfile::TopologyBoundaryVersion

Attribute name	mult.	Attribute type	Description
baseUML (Entsoe)	1..1	String	ConstantValue= iec61970cim16v28_iec61968cim12v08_iec62325cim03v01a Base UML provided by CIM model manager.
baseURI (Entsoe)	1..1	String	ConstantValue= http://iec.ch/TC57/2013/61970-456/TopologyBoundary/3 Profile URI used in the Model Exchange header and defined in IEC standards. It uniquely identifies the Profile and its version. It is given for information only and to identify the closest IEC profile to which this CGMES profile is based on.
date (Entsoe)	1..1	Date	ConstantValue= 2014-08-07 Profile creation date Form is YYYY-MM-DD for example for January 5, 2009 it is 2009-01-05.
differenceModelURI (Entsoe)	1..1	String	ConstantValue= http://iec.ch/TC57/61970-552/DifferenceModel/1# Difference model URI defined by IEC 61970-552.
entsoeUML (Entsoe)	1..1	String	ConstantValue= entsoe_v2.4.15 UML provided by ENTSO-E.
entsoeURI (Entsoe)	1..1	String	ConstantValue= http://entsoe.eu/CIM/TopologyBoundary/3/1 Profile URI defined by ENTSO-E and used in the Model Exchange header. It uniquely identifies the Profile and its version. The last two elements in the URI (http://entsoe.eu/CIM/TopologyBoundary/yy/zzz) indicate major and minor versions where: - yy – indicates a major version; - zzz – indicates a minor version.
modelDescriptionURI (Entsoe)	1..1	String	ConstantValue= http://iec.ch/TC57/61970-552/ModelDescription/1# Model Description URI defined by IEC 61970-552.
namespaceRDF (Entsoe)	1..1	String	ConstantValue= http://www.w3.org/1999/02/22-rdf-syntax-ns# RDF namespace.
namespaceUML (Entsoe)	1..1	String	ConstantValue= http://iec.ch/TC57/2013/CIM-schema-cim16# CIM UML namespace.
shortName (Entsoe)	1..1	String	ConstantValue= TP_BD The short name of the profile used in profile documentation.

5.3 Core

5.3.1 BaseVoltage(Abstract)

Defines a system base voltage which is referenced.

Inheritance path: ->IdentifiedObject

Table 27 shows all attributes of BaseVoltage.

Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

Table 27 – Attributes of Core::BaseVoltage

Attribute name	mult.	Attribute type	Description
description	1..1	String	see IdentifiedObject
energyIdentCodeEic (Entsoe)	0..1	String	see IdentifiedObject
mRID	0..1	String	see IdentifiedObject
name	1..1	String	see IdentifiedObject
shortName (Entsoe)	1..1	String	see IdentifiedObject

5.3.2 (Operation,Description) ConnectivityNode

Connectivity nodes are points where terminals of AC conducting equipment are connected together with zero impedance.

OCL constraint: R.4.10.11. Description length restriction

OCL constraint: R.4.10.11. Energy Ident Code length restriction (optional)

OCL constraint: R.4.10.11. From End ISO Code length restriction

OCL constraint: R.4.10.11. From End Name length restriction

OCL constraint: R.4.10.11. From End Name TSO length restriction

OCL constraint: R.4.10.11. Name length restriction

OCL constraint: R.4.10.11. ShortName length restriction

OCL constraint: R.4.10.11. To End ISO Code length restriction

OCL constraint: R.4.10.11. To End Name length restriction

OCL constraint: R.4.10.11. To End Name TSO length restriction

5.3.3 ConnectivityNodeContainer(Abstract)

A base class for all objects that may contain connectivity nodes or topological nodes.

5.3.4 IdentifiedObject(Abstract)

This is a root class to provide common identification for all classes needing identification and naming attributes.

IdentifiedObject.name is 32 characters maximum. It shall be consistent with the name of the object used in companies, in daily operation (e. g. in SCADA systems), in planning processes or in asset related systems and should allow inter-communicating of TSO, using general names. IdentifiedObject.description is 256 characters maximum.

Table 28 shows all attributes of IdentifiedObject.

Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

Table 28 – Attributes of Core::IdentifiedObject

Attribute name	mult.	Attribute type	Description
description	1..1	String	The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.
energyIdentCodeEic (Entsoe)	0..1	String	The attribute is used for an exchange of the EIC code (Energy identification Code). The length of the string is 16 characters as defined by the EIC code. References: Local issuing offices for EIC: https://www.entsoe.eu/publications/edi-library/links-to-eic-websites/ EIC description: https://www.entsoe.eu/index.php?id=73&libCat=eic .
mRID	0..1	String	Master resource identifier issued by a model authority. The mRID is globally unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended. For CIMXML data files in RDF syntax conforming to IEC 61970-552:2013, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.
name	1..1	String	The name is any free human readable and possibly non unique text naming the object.
shortName (Entsoe)	1..1	String	The attribute is used for an exchange of a human readable short name with length of the string 12 characters maximum.

5.4 Topology – TopologicalNode

For a detailed substation model a topological node is a set of connectivity nodes that, in the current network state, are connected together through any type of closed switches, including jumpers. Topological nodes change as the current network state changes (i.e., switches, breakers, etc. change state). For a planning model, switch statuses are not used to form topological nodes. Instead they are manually created or deleted in a model builder tool. Topological nodes maintained this way are also called "busses".

OCL constraint: R.4.10.11. Description length restriction

OCL constraint: R.4.10.11. Energy Ident Code length restriction (optional)

OCL constraint: R.4.10.11. From End ISO Code length restriction

OCL constraint: R.4.10.11. From End Name length restriction

OCL constraint: R.4.10.11. From End Name TSO length restriction

OCL constraint: R.4.10.11. Name length restriction

OCL constraint: R.4.10.11. ShortName length restriction

OCL constraint: R.4.10.11. To End ISO Code length restriction

OCL constraint: R.4.10.11. To End Name length restriction

OCL constraint: R.4.10.11. To End Name TSO length restriction

Inheritance path: ->IdentifiedObject

Table 29 shows all attributes of TopologicalNode.

Documents
Document Sharing Hub

Full document details: PD IEC/TS 61970-600-2:2017

Table 29 – Attributes of Topology::TopologicalNode

Attribute name	mult.	Attribute type	Description
boundaryPoint (Entsoe)	1..1	Boolean	Identifies if a node is a BoundaryPoint. If boundaryPoint=true the ConnectivityNode or the TopologicalNode represents a BoundaryPoint.
fromEndIsoCode (Entsoe)	1..1	String	The attribute is used for an exchange of the ISO code of the region to which the “From” side of the Boundary point belongs to or it is connected to. The ISO code is two characters country code as defined by ISO 3166 (http://www.iso.org/iso/country_codes). The length of the string is 2 characters maximum. The attribute is a required for the Boundary Model Authority Set where this attribute is used only for the TopologicalNode in the Boundary Topology profile and ConnectivityNode in the Boundary Equipment profile.
fromEndName (Entsoe)	1..1	String	The attribute is used for an exchange of a human readable name with length of the string 32 characters maximum. The attribute covers two cases: if the Boundary point is placed on a tie-line the attribute is used for exchange of the geographical name of the substation to which the “From” side of the tie-line is connected to. if the Boundary point is placed in a substation the attribute is used for exchange of the name of the **element** (e.g. PowerTransformer, ACLineSegment, Switch, etc) to which the “From” side of the Boundary point is connected to. The attribute is required for the Boundary Model Authority Set where it is used only for the TopologicalNode in the Boundary Topology profile and ConnectivityNode in the Boundary Equipment profile.
fromEndNameTso (Entsoe)	1..1	String	The attribute is used for an exchange of the name of the TSO to which the “From” side of the Boundary point belongs to or it is connected to. The length of the string is 32 characters maximum. The attribute is required for the Boundary Model Authority Set where it is used only for the TopologicalNode in the Boundary Topology profile and ConnectivityNode in the Boundary Equipment profile.
toEndIsoCode (Entsoe)	1..1	String	The attribute is used for an exchange of the ISO code of the region to which the “To” side of the Boundary point belongs to or it is connected to. The ISO code is two characters country code as defined by ISO 3166 (http://www.iso.org/iso/country_codes). The length of the string is 2 characters maximum. The attribute is a required for the Boundary Model Authority Set where this attribute is used only for the TopologicalNode in the Boundary Topology profile and ConnectivityNode in the Boundary Equipment profile.
toEndName (Entsoe)	1..1	String	The attribute is used for an exchange of a human readable name with length of the string 32 characters maximum. The attribute covers two cases: if the Boundary point is placed on a tie-line the attribute is used for exchange of the geographical name of the substation to which the “To” side of the tie-line is connected to. if the Boundary point is placed in a substation the attribute is used for exchange of the name of the element (e.g. PowerTransformer, ACLineSegment, Switch, etc) to which the “To” side of the Boundary point is connected to. The attribute is required for the Boundary Model Authority Set where it is used only for the TopologicalNode in the Boundary Topology profile and ConnectivityNode in the Boundary Equipment profile.

Documents
Document Sharing Hub

Attribute name	mult.	Attribute type	Description
toEndNameTso (Entsoe)	1..1	String	The attribute is used for an exchange of the name of the TSO to which the “To” side of the Boundary point belongs to or it is connected to. The length of the string is 32 characters maximum. The attribute is required for the Boundary Model Authority Set where it is used only for the TopologicalNode in the Boundary Topology profile and ConnectivityNode in the Boundary Equipment profile.
description	1..1	String	see IdentifiedObject
energyIdentCodeEic (Entsoe)	0..1	String	see IdentifiedObject
mRID	0..1	String	see IdentifiedObject
name	1..1	String	see IdentifiedObject
shortName (Entsoe)	1..1	String	see IdentifiedObject

Table 30 shows all association ends of TopologicalNode with other classes.

Table 30 – Association ends of Topology::TopologicalNode with other classes

mult.	mult.	Class type name	Description
ConnectivityNodeContainer	[1..1]	ConnectivityNodeContainer	The connectivity node container to which the toplogical node belongs. Association Based On: Topology:: TopologicalNode.TopologicalNode[0..*] ----- Core:: ConnectivityNodeContainer.ConnectivityNodeContainer[0..1]
BaseVoltage	[1..1]	BaseVoltage	The base voltage of the topologocial node. Association Based On: Topology:: TopologicalNode.TopologicalNode[0..*] ----- Core:: BaseVoltage.BaseVoltage[0..1]

5.5 Global Used Datatypes – Primitives

5.5.1 String

A string consisting of a sequence of characters. The character encoding is UTF-8. The string length is unspecified and unlimited.

5.5.2 Date

Date as "yyyy-mm-dd", which conforms with ISO 8601. UTC time zone is specified as "yyyy-mm-ddZ". A local timezone relative UTC is specified as "yyyy-mm-dd(+/-)hh:mm".

5.5.3 Boolean

A type with the value space "true" and "false".

6 EquipmentProfile

6.1 General

This profile has been built on the basis of the IEC 61970-452 document and adjusted to fit the purpose of the ENTSO-E CGMES.

AVA Documents
Document Sharing Hub