



MALAYSIAN STANDARD

MS IEC 61970-301:2012

**Energy management system application
program interface (EMS-API) - Part 301:
Common information model (CIM) base
(IEC 61970-301:2011, IDT)**

ICS: 33.200

Descriptors: energy management system application program interface (EMS), common information model (CIM) base

© Copyright 2012

DEPARTMENT OF STANDARDS MALAYSIA

DEVELOPMENT OF MALAYSIAN STANDARDS

The **Department of Standards Malaysia (STANDARDS MALAYSIA)** is the national standards and accreditation body of Malaysia.

The main function of STANDARDS MALAYSIA is to foster and promote standards, standardisation and accreditation as a means of advancing the national economy, promoting industrial efficiency and development, benefiting the health and safety of the public, protecting the consumers, facilitating domestic and international trade and furthering international cooperation in relation to standards and standardisation.

Malaysian Standards (MS) are developed through consensus by committees which comprise balanced representation of producers, users, consumers and others with relevant interests, as may be appropriate to the subject at hand. To the greatest extent possible, Malaysian Standards are aligned to or are adoption of international standards. Approval of a standard as a Malaysian Standard is governed by the Standards of Malaysia Act 1996 [Act 549]. Malaysian Standards are reviewed periodically. The use of Malaysian Standards is voluntary except in so far as they are made mandatory by regulatory authorities by means of regulations, local by-laws or any other similar ways.

For the purposes of Malaysian Standards, the following definitions apply:

Revision: A process where existing Malaysian Standard is reviewed and updated which resulted in the publication of a new edition of the Malaysian Standard.

Confirmed MS: A Malaysian Standard that has been reviewed by the responsible committee and confirmed that its contents are current.

Amendment: A process where a provision(s) of existing Malaysian Standard is altered. The changes are indicated in an amendment page which is incorporated into the existing Malaysian Standard. Amendments can be of technical and/or editorial nature.

Technical corrigendum: A corrected reprint of the current edition which is issued to correct either a technical error or ambiguity in a Malaysian Standard inadvertently introduced either in drafting or in printing and which could lead to incorrect or unsafe application of the publication.

NOTE: Technical corrigenda are not to correct errors which can be assumed to have no consequences in the application of the MS, for example minor printing errors.

STANDARDS MALAYSIA has appointed **SIRIM Berhad** as the agent to develop, distribute and sell the Malaysian Standards.

For further information on Malaysian Standards, please contact:

Department of Standards Malaysia
Ministry of Science, Technology and Innovation
Level 1 & 2, Block 2300, Century Square
Jalan Usahawan
63000 Cyberjaya
Selangor Darul Ehsan
MALAYSIA

Tel: 60 3 8318 0002
Fax: 60 3 8319 3131
<http://www.standardsmalaysia.gov.my>
E-mail: central@standardsmalaysia.gov.my

OR **SIRIM Berhad**
(Company No. 367474 - V)
1, Persiaran Dato' Menteri
Section 2, P. O. Box 7035
40700 Shah Alam
Selangor Darul Ehsan
MALAYSIA

Tel: 60 3 5544 6000
Fax: 60 3 5510 8095
<http://www.sirim.my>
E-mail: msonline@sirim.my

CONTENTS

	Page
Committee representation.....	xii
National foreword.....	xiii
Foreword.....	xv
Introduction.....	xvii
1 Scope.....	16
2 Normative references	16
3 Terms and definitions	17
4 CIM specification	17
4.1 CIM modeling notation.....	17
4.2 CIM packages	17
4.2.1 CIM packages overview.....	17
4.2.2 Domain.....	19
4.2.3 Core	20
4.2.4 OperationalLimits	20
4.2.5 Topology	20
4.2.6 Wires.....	20
4.2.7 Generation	20
4.2.8 LoadModel.....	20
4.2.9 Outage	20
4.2.10 Protection.....	21
4.2.11 Equivalentents.....	21
4.2.12 Meas	21
4.2.13 SCADA.....	21
4.2.14 ControlArea.....	21
4.2.15 Contingency	21
4.3 CIM classes and relationships	21
4.3.1 Classes	21
4.3.2 Generalization	22
4.3.3 Simple association	23
4.3.4 Aggregation.....	24
4.4 CIM model concepts and examples	24
4.4.1 Concepts	24
4.4.2 Containment, equipment hierarchies and naming.....	24
4.4.3 Connectivity model	26
4.4.4 Inheritance hierarchy	29
4.4.5 Transformer model	30
4.4.6 Measurements and controls.....	32
4.4.7 Regulating control models	36
4.5 Modeling guidelines.....	36
4.5.1 Modeling for change	36
4.5.2 Process for amendments to the CIM	37
4.5.3 Changes to the CIM UML model	37
4.5.4 Changes to the CIM standards documents.....	37
4.5.5 CIM profiles.....	37
4.6 Modeling tools	38

CONTENTS *(continued)*

	Page
4.7	User implementation conventions 38
4.7.1	Conventions beyond UML 38
4.7.2	Number of Terminals for ConductingEquipment objects 38
4.8	CIM modeling examples 38
5	Detailed model 39
5.1	Overview 39
5.2	Context 39
6	Package architecture (normative) 41
6.1	IEC 61970 41
6.1.1	IEC 61970 package summary 41
6.1.2	IEC 61970CIMVersion 41
6.2	Domain 42
6.2.1	Domain package summary 42
6.2.2	AbsoluteDate Datatype 46
6.2.3	AbsoluteDateTime Datatype 46
6.2.4	ActivePower Datatype 46
6.2.5	ActivePowerChangeRate Datatype 47
6.2.6	Admittance Datatype 47
6.2.7	AngleDegrees Datatype 47
6.2.8	AngleRadians Datatype 47
6.2.9	ApparentPower Datatype 47
6.2.10	Boolean Primitive 47
6.2.11	Capacitance Datatype 48
6.2.12	Conductance Datatype 48
6.2.13	CostPerEnergyUnit Datatype 48
6.2.14	CostRate Datatype 48
6.2.15	Currency enumeration 48
6.2.16	CurrentFlow Datatype 49
6.2.17	Damping Datatype 49
6.2.18	Float Primitive 49
6.2.19	FloatQuantity Datatype 49
6.2.20	Frequency Datatype 50
6.2.21	Hours Datatype 50
6.2.22	Impedance Datatype 50
6.2.23	Inductance Datatype 50
6.2.24	Integer Primitive 50
6.2.25	IntegerQuantity Datatype 51
6.2.26	KWActivePower Datatype 51
6.2.27	LongLength Datatype 51
6.2.28	Minutes Datatype 51
6.2.29	MonetaryAmountPerEnergyUnit enumeration 51
6.2.30	MonetaryAmountPerHeatUnit enumeration 51
6.2.31	MonetaryAmountRate enumeration 52

CONTENTS *(continued)*

	Page
6.2.32 Money Datatype	52
6.2.33 PerCent Datatype	52
6.2.34 Pressure Datatype	52
6.2.35 PU Datatype	52
6.2.36 Reactance Datatype	53
6.2.37 ReactivePower Datatype	53
6.2.38 RealEnergy Datatype	53
6.2.39 Resistance Datatype	53
6.2.40 RotationSpeed Datatype	53
6.2.41 Seconds Datatype	54
6.2.42 ShortLength Datatype	54
6.2.43 String Primitive	54
6.2.44 StringQuantity Datatype	54
6.2.45 Susceptance Datatype	54
6.2.46 Temperature Datatype	55
6.2.47 UnitMultiplier enumeration	55
6.2.48 UnitSymbol enumeration	55
6.2.49 Voltage Datatype	56
6.2.50 VoltagePerReactivePower Datatype	56
6.2.51 Volume Datatype	56
6.2.52 WaterLevel Datatype	57
6.2.53 Weight Datatype	57
6.3 Core	57
6.3.1 Core package summary	57
6.3.2 BasePower	62
6.3.3 BaseVoltage	62
6.3.4 BasicIntervalSchedule	62
6.3.5 Bay	63
6.3.6 BreakerConfiguration Enumeration	64
6.3.7 BusbarConfiguration Enumeration	64
6.3.8 Company	64
6.3.9 CompanyType enumeration	65
6.3.10 ConductingEquipment	65
6.3.11 ConnectivityNodeContainer	66
6.3.12 Curve	66
6.3.13 CurveData	67
6.3.14 CurveStyle enumeration	67
6.3.15 Equipment	68
6.3.16 EquipmentContainer	68
6.3.17 GeographicalRegion	69
6.3.18 IdentifiedObject	70
6.3.19 IrregularIntervalSchedule	70
6.3.20 IrregularTimePoint	71
6.3.21 ModelingAuthority	71

CONTENTS (continued)

	Page
6.3.22 ModelingAuthoritySet	72
6.3.23 OperatingParticipant	72
6.3.24 OperatingShare	73
6.3.25 PhaseCode enumeration	73
6.3.26 PowerSystemResource	74
6.3.27 PsrList	75
6.3.28 PSRType	75
6.3.29 RegularIntervalSchedule	76
6.3.30 RegularTimePoint	76
6.3.31 ReportingGroup	77
6.3.32 ReportingSuperGroup	77
6.3.33 SubGeographicalRegion	78
6.3.34 Substation	78
6.3.35 Terminal	79
6.3.36 Unit	80
6.3.37 VoltageLevel	81
6.4 OperationalLimits	82
6.4.1 OperationalLimits package summary	82
6.4.2 ActivePowerLimit	83
6.4.3 ApparentPowerLimit	84
6.4.4 BranchGroup	84
6.4.5 BranchGroupTerminal	85
6.4.6 CurrentLimit	85
6.4.7 OperationalLimit	85
6.4.8 OperationalLimitDirectionKind enumeration	86
6.4.9 OperationalLimitSet	86
6.4.10 OperationalLimitType	87
6.4.11 VoltageLimit	87
6.5 Topology	88
6.5.1 Topology package summary	88
6.5.2 BusNameMarker	91
6.5.3 ConnectivityNode	92
6.5.4 TopologicalIsland	93
6.5.5 TopologicalNode	93
6.6 Wires	94
6.6.1 Wires package summary	94
6.6.2 ACLineSegment	104
6.6.3 Breaker	105
6.6.4 BusbarSection	106
6.6.5 CompositeSwitch	107
6.6.6 CompositeSwitchType Datatype	108
6.6.7 Conductor	108
6.6.8 ConductorType	109

CONTENTS *(continued)*

	Page
6.6.9 Connector.....	100
6.6.10 CoolantType enumeration.....	111
6.6.11 DCLineSegment	111
6.6.12 Disconnecter	112
6.6.13 EnergyConsumer.....	113
6.6.14 EnergySource.....	114
6.6.15 FrequencyConverter	115
6.6.16 Fuse.....	116
6.6.17 Ground	117
6.6.18 GroundDisconnecter.....	118
6.6.19 HeatExchanger	118
6.6.20 Jumper	119
6.6.21 Junction.....	120
6.6.22 Line	121
6.6.23 LoadBreakSwitch.....	122
6.6.24 MutualCoupling	123
6.6.25 OperatingMode Datatype.....	123
6.6.26 Plant.....	124
6.6.27 PowerTransformer	124
6.6.28 ProtectedSwitch	125
6.6.29 ReactiveCapabilityCurve	126
6.6.30 RectifierInverter.....	127
6.6.31 RegulatingCondEq.....	128
6.6.32 RegulatingControl.....	129
6.6.33 RegulatingControlModeKind enumeration.....	130
6.6.34 RegulationSchedule.....	130
6.6.35 SeriesCompensator	131
6.6.36 ShuntCompensator	132
6.6.37 StaticVarCompensator.....	133
6.6.38 SVCControlMode enumeration.....	134
6.6.39 Switch	134
6.6.40 SynchronousMachine	135
6.6.41 SynchronousMachineOperatingMode enumeration	138
6.6.42 SynchronousMachineType enumeration.....	138
6.6.43 TapChanger	138
6.6.44 TapChangerKind enumeration	139
6.6.45 TransformerControlMode enumeration.....	139
6.6.46 TransformerCoolingType enumeration	140
6.6.47 TransformerWinding	140
6.6.48 VoltageControlZone.....	141
6.6.49 WindingConnection enumeration	142
6.6.50 WindingTest	142
6.6.51 WindingType enumeration	143
6.6.52 WireArrangement	143
6.6.53 WireType.....	144

CONTENTS *(continued)*

	Page
6.7	Generation- Generation package summary 145
6.8	Production..... 145
6.8.1	Production package summary..... 145
6.8.2	AirCompressor 150
6.8.3	CAESPlant 151
6.8.4	Classification Datatype 152
6.8.5	CogenerationPlant..... 152
6.8.6	CombinedCyclePlant 153
6.8.7	CostPerHeatUnit Datatype..... 153
6.8.8	Emission Datatype..... 153
6.8.9	EmissionAccount 154
6.8.10	EmissionCurve 154
6.8.11	EmissionType enumeration..... 155
6.8.12	EmissionValueSource enumeration 155
6.8.13	FossilFuel..... 156
6.8.14	FuelAllocationSchedule 157
6.8.15	FuelType enumeration 157
6.8.16	GeneratingUnit 158
6.8.17	GeneratorControlMode enumeration 160
6.8.18	GeneratorControlSource enumeration..... 160
6.8.19	GeneratorOperatingMode enumeration 161
6.8.20	GenUnitOpCostCurve 161
6.8.21	GenUnitOpSchedule 162
6.8.22	GrossToNetActivePowerCurve..... 162
6.8.23	HeatInputCurve 163
6.8.24	HeatRate Datatype 164
6.8.25	HeatRateCurve 164
6.8.26	HydroEnergyConversionKind enumeration..... 165
6.8.27	HydroGeneratingEfficiencyCurve 165
6.8.28	HydroGeneratingUnit 166
6.8.29	HydroPlantType enumeration 168
6.8.30	HydroPowerPlant..... 168
6.8.31	HydroPump 169
6.8.32	HydroPumpOpSchedule..... 170
6.8.33	IncrementalHeatRateCurve..... 171
6.8.34	InflowForecast 171
6.8.35	LevelVsVolumeCurve 172
6.8.36	NuclearGeneratingUnit 173
6.8.37	PenstockLossCurve 174
6.8.38	PenstockType enumeration 175
6.8.39	Reservoir..... 175
6.8.40	ShutdownCurve 176
6.8.41	SpillwayGateType Enumeration 177
6.8.42	StartIgnFuelCurve 177
6.8.43	StartMainFuelCurve..... 178

CONTENTS *(continued)*

	Page
6.8.44 StartRampCurve	178
6.8.45 StartupModel	179
6.8.46 SteamSendoutSchedule	180
6.8.47 SurgeTankCode enumeration	181
6.8.48 TailbayLossCurve	181
6.8.49 TargetLevelSchedule	181
6.8.50 ThermalGeneratingUnit.....	182
6.9 GenerationDynamics	185
6.9.1 GenerationDynamics package summary	185
6.9.2 BoilerControlMode enumeration.....	186
6.9.3 BWRSteamSupply	186
6.9.4 CombustionTurbine	187
6.9.5 CTempActivePowerCurve	188
6.9.6 DrumBoiler	189
6.9.7 FossilSteamSupply	190
6.9.8 HeatRecoveryBoiler.....	191
6.9.9 HydroTurbine.....	192
6.9.10 PrimeMover	193
6.9.11 PWRSteamSupply	194
6.9.12 SteamSupply	195
6.9.13 SteamTurbine	196
6.9.14 Subcritical	197
6.9.15 Supercritical	198
6.9.16 TurbineType enumeration	199
6.10 LoadModel	199
6.10.1 LoadModel package summary	199
6.10.2 ConformLoad.....	201
6.10.3 ConformLoadGroup	201
6.10.4 ConformLoadSchedule	202
6.10.5 CustomerLoad	203
6.10.6 DayType.....	204
6.10.7 EnergyArea	204
6.10.8 InductionMotorLoad	204
6.10.9 Load.....	205
6.10.10 LoadArea.....	207
6.10.11 LoadGroup	207
6.10.12 LoadResponseCharacteristic	208
6.10.13 NonConformLoad	209
6.10.14 NonConformLoadGroup.....	210
6.10.15 NonConformLoadSchedule	210
6.10.16 PowerCutZone.....	211
6.10.17 Season	212
6.10.18 SeasonDayTypeSchedule.....	212
6.10.19 SeasonName enumeration.....	212

CONTENTS *(continued)*

	Page
6.10.20 StationSupply	213
6.10.21 SubLoadArea	214
6.11 Outage	214
6.11.1 Outage package summary	214
6.11.2 ClearanceTag	215
6.11.3 ClearanceTagType	216
6.11.4 OutageSchedule	216
6.11.5 SwitchingOperation	217
6.11.6 SwitchState enumeration	218
6.12 Protection	218
6.12.1 Protection package summary	218
6.12.2 CurrentRelay	218
6.12.3 ProtectionEquipment	219
6.12.4 RecloseSequence	220
6.12.5 SynchrocheckRelay	221
6.13 Equivalentents	222
6.13.1 Equivalentents package summary	222
6.13.2 EquivalentBranch	223
6.13.3 EquivalentEquipment	224
6.13.4 EquivalentNetwork	225
6.13.5 EquivalentShunt	226
6.14 Meas	227
6.14.1 Meas package summary	227
6.14.2 Accumulator	231
6.14.3 AccumulatorLimit	232
6.14.4 AccumulatorLimitSet	232
6.14.5 AccumulatorValue	232
6.14.6 Analog	233
6.14.7 AnalogLimit	234
6.14.8 AnalogLimitSet	234
6.14.9 AnalogValue	235
6.14.10 Command	235
6.14.11 Control	236
6.14.12 ControlType	237
6.14.13 Discrete	237
6.14.14 DiscreteValue	238
6.14.15 Limit	238
6.14.16 LimitSet	239
6.14.17 Measurement	239
6.14.18 MeasurementType	240
6.14.19 MeasurementValue	241
6.14.20 MeasurementValueQuality	241
6.14.21 MeasurementValueSource	242
6.14.22 Quality61850	242

CONTENTS *(continued)*

	Page
6.14.23 SetPoint	243
6.14.24 StringMeasurement	244
6.14.25 StringMeasurementValue.....	245
6.14.26 Validity enumeration	245
6.14.27 ValueAliasSet	246
6.14.28 ValueToAlias	246
6.15 SCADA.....	247
6.15.1 SCADA package summary.....	247
6.15.2 CommunicationLink	248
6.15.3 RemoteControl	249
6.15.4 RemotePoint.....	250
6.15.5 RemoteSource.....	250
6.15.6 RemoteUnit	251
6.15.7 RemoteUnitType enumeration	251
6.15.8 Source enumeration	251
6.16 ControlArea.....	252
6.16.1 ControlArea package summary.....	252
6.16.2 AltGeneratingUnitMeas.....	254
6.16.3 AltTieMeas	254
6.16.4 ControlArea	254
6.16.5 ControlAreaGeneratingUnit.....	255
6.16.6 ControlAreaTypeKind enumeration	255
6.16.7 TieFlow	256
6.17 Contingency	256
6.17.1 Contingency package summary	256
6.17.2 Contingency	257
6.17.3 ContingencyElement.....	258
6.17.4 ContingencyEquipment.....	258
6.17.5 ContingencyEquipmentStatusKind enumeration.....	259
Bibliography.....	260
Figure 1 – CIM IEC 61970-301 package diagram	19
Figure 2 – Example of generalization	23
Figure 3 – Example of simple association	23
Figure 4 – Example of aggregation	24
Figure 5 – Equipment containers	26
Figure 6 – Connectivity model.....	27
Figure 7 – Simple network example	28
Figure 8 – Simple network connectivity modeled with CIM topology	29
Figure 9 – Equipment inheritance hierarchy	30
Figure 10 – Transformer model.....	31
Figure 11 – Navigating from PSR to MeasurementValue	33

CONTENTS *(continued)*

	Page
Figure 12 – Measurement placement	35
Figure 13 – Regulating control models	36
Figure 14 – CIM top level packages	39
Figure 15 – Main	41
Figure 16 – CombinedDatatypes	42
Figure 17 – BasicDatatypes	42
Figure 18 – ElectricityDatatypes	43
Figure 19 – EnumeratedUnitDatatypes	44
Figure 20 – GeneralDatatypes	45
Figure 21 – MonetaryDatatypes	45
Figure 22 – TimeDatatypes	46
Figure 23 – Reporting	58
Figure 24 – Main	59
Figure 25 – CurveSchedule	60
Figure 26 – Datatypes	60
Figure 27 – DocumentationExampleAggregation	61
Figure 28 – DocumentationExampleAssociation	61
Figure 29 – Ownership	61
Figure 30 – OperationalLimits	82
Figure 31 – BranchGroup	83
Figure 32 – TopologicalNodeTerminal	88
Figure 33 – TopologyMeasRelations	89
Figure 34 – TopologyReporting	90
Figure 35 – Main	91
Figure 36 – DocumentationExampleInheritance	95
Figure 37 – MutualCoupling	96
Figure 38 – Datatypes	97
Figure 39 – InheritanceHierarchy	98
Figure 40 – LineModel	99
Figure 41 – NamingHierarchyPart1	100
Figure 42 – NamingHierarchyPart2	101
Figure 43 – RegulatingEquipment	102
Figure 44 – TransformerModel	103
Figure 45 – VoltageControl	104
Figure 46 – Main	145
Figure 47 – Nuclear	146
Figure 48 – Main	147
Figure 49 – Datatypes	148
Figure 50 – Hydro	149

CONTENTS *(concluded)*

	Page
Figure 51 – Thermal	150
Figure 52 – Main.....	185
Figure 53 – Datatypes.....	185
Figure 54 – Main.....	200
Figure 55 – Datatypes.....	200
Figure 56 – Datatypes.....	214
Figure 57 – Main.....	215
Figure 58 – Main.....	218
Figure 59 – Main.....	223
Figure 60 – Datatypes.....	227
Figure 61 – Control.....	228
Figure 62 – InheritanceStructure.....	229
Figure 63 – Measurement	230
Figure 64 – Quality	231
Figure 65 – Datatypes.....	247
Figure 66 – Main.....	248
Figure 67 – ControlArea.....	252
Figure 68 – ControlAreaInheritance	253
Figure 69 – Datatypes.....	253
Figure 70 – Contingency	257
Table 1 – MeasurementType naming conventions.....	34
Table 2 – MeasurementValueSource naming conventions.....	35

Committee representation

The Industry Standards Committee on Generation, Transmission and Distribution of Energy (ISC E) under whose authority this Malaysian Standard was adopted, comprises representatives from the following organisations:

Association of Consulting Engineers Malaysia
Atomic Energy Licensing Board
Department of Standards Malaysia
Federation of Malaysian Manufacturers
Jabatan Kerja Raya Malaysia
Malaysian Association of Standards Users
Malaysian Cable Manufacturers Association
Malaysian Electrical Appliances and Distributors Association
Malaysian Green Technology Corporation
Ministry of Domestic Trade, Co-operatives and Consumerism
Ministry of International Trade and Industry
Persatuan Kontraktor Elektrikal dan Mekanikal Melayu Malaysia
SIRIM Berhad (Secretariat)
SIRIM QAS International Sdn Bhd
Suruhanjaya Komunikasi dan Multimedia Malaysia
Suruhanjaya Tenaga
Tenaga Nasional Berhad
The Electrical and Electronics Association of Malaysia
The Institution of Engineers, Malaysia
Universiti Teknologi Malaysia

The Technical Committee on High Voltage Power Transmission which supervised the adoption of the IEC Standard as Malaysian Standard consists of representatives from the following organisations:

Federation of Malaysian Manufacturers
Malaysian National Committee of CIGRE
SIRIM Berhad (Secretariat)
Suruhanjaya Tenaga
Syarikat SESCO Berhad
Tenaga Nasional Berhad (Bahagian Penghantaran)
The Electrical and Electronics Association of Malaysia
The Institution of Engineers, Malaysia
Universiti Teknologi Malaysia

The Working Group on Power Systems Management and Associated Information Exchange which recommended the adoption of the IEC Standard as Malaysian Standard consists of representatives from the following organisations:

ABB Malaysia Sdn Bhd
Petroleum Nasional Berhad
Prestigious Discovery Sdn Bhd
PSI InControl Sdn Bhd
SIRIM Berhad (Secretariat)
Suruhanjaya Tenaga
Tenaga Nasional Berhad (Bahagian Penghantaran)
The Institution of Engineers, Malaysia
TNB Research Sdn Bhd
Universiti Tenaga Nasional

NATIONAL FOREWORD

The adoption of the IEC Standard as a Malaysian Standard was recommended by the Working Group on Power Systems Management and Associated Information Exchange under the authority of the Industry Standards Committee on Generation, Transmission and Distribution of Energy.

This Malaysian Standard is identical with IEC 61970-301:2011, *Energy management system application program interface (EMS-API) - Part 301: Common information model (CIM) base*, published by the International Electrotechnical Commission (IEC). However, for the purposes of this Malaysian Standard, the following apply:

- a) in the source text, "this International Standard" should read "this Malaysian Standard";
- b) the comma which is used as a decimal sign (if any), to read as a point;
- c) the basis IEC 61970-301 is printed in English and French version. However, only the English version is retained for this Malaysian Standard; and
- d) reference to International Standards should be replaced by corresponding Malaysian Standards as follows:

Referenced International Standards

Corresponding Malaysian Standards

IEC 61850-7-4, *Communication networks and systems for power utility automation - Part 7-4: Basic communication structure - Compatible logical node classes and data object classes*

MS IEC 61850-7-4, *Communication networks and systems for power utility automation - Part 7-4: Basic communication structure - Compatible logical node classes and data object classes*

IEC 61970-2, *Energy management system application program interface (EMS-API) - Glossary*

MS IEC 61970-2, *Energy management system application program interface (EMS-API) - Glossary*

- e) reference to International Standards in bibliography should be replaced by corresponding Malaysian Standards as follows:

Referenced International Standards

Corresponding Malaysian Standards

IEC 61850-7-3, *Communication networks and systems for power utility automation - Part 7-3: Basic communication structure - Common data classes*

MS IEC 61850-7-3, *Communication networks and systems for power utility automation -Part 7-3: Basic communication structure -Common data classes*

IEC 61970-501, *Energy management system application program interface (EMS-API) - Part 501: Common Information Model Resource Description Framework (CIM RDF) schema*

MS IEC 61970-501, *Energy management system application program interface (EMS-API) - Part 501: Common Information Model Resource Description Framework (CIM RDF) schema*

NATIONAL FOREWORD *(continued)*

Compliance with a Malaysian Standard does not of itself confer immunity from legal obligations.

NOTE. IDT on the front cover indicates an identical standard i.e. a standard where the technical content, structure, and wording (or is an identical translation) of a Malaysian Standard is exactly the same as in an International Standard or is identical in technical content and structure although it may contain the minimal editorial changes specified in clause 4.2 of ISO/IEC Guide 21-1.

Preview Only

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ENERGY MANAGEMENT SYSTEM APPLICATION
PROGRAM INTERFACE (EMS-API) –****Part 301: Common information model (CIM) base**

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.

International Standard IEC 61970-301 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

This third edition cancels and replaces the second edition, published in 2009. This third edition constitutes a technical revision.

Major changes from the second edition include the following:

- regulation control models were added with a new `RegulatingControl` class which provides the capability to model multiple equipments participating in a regulation scheme;
- new "OperationalLimits" package for equipment ratings;
- partial ownership specification added;
- `LoadResponseCharacteristic` class was enhanced to better model the characteristic response of the load demand due to changes in system conditions such as voltage and frequency;

- new ControlArea package added with load forecast and area interchange specifications;
- EPRI CIM for Planning project proposals to support the exchange of planning models were incorporated;
- branch group “interface” monitoring specification was added;
- composite switch model was changed to better model distribution use cases;
- extensions were added to support powerflow “case input” so that profiles are not required to use time based schedules and detailed connectivity (via new bus-branch model);
- new Equivalents package added to model equivalent networks;
- new Contingency package added to handle contingencies;
- various editorial changes to cleanup UML model;
- non-SI units have been changed to SI units.

The text of this standard is based on the following documents:

FDIS	Report on voting
57/1136/FDIS	57/1167/RVD

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

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

A list of all parts of the IEC 61970 series, 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 web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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.