57/1216/NP

NEW WORK ITEM PROPOSAL

	Proposer US NC Secretariat	Date of proposal 2012-01-30
	TC/SC TC 57	Secretariat Germany
Classification according to IEC Directives Supplement, Table 1	Date of circulation 2012-02-17	Closing date for voting 2012-05-18

A proposal for a new work item within the scope of an existing technical committee or subcommittee shall be submitted to the Central Office. The proposal will be distributed to the P-members of the technical committee or subcommittee for voting, and to the O-members for information. The proposer may be a National Committee of the IEC, the secretariat itself, another technical committee or subcommittee, an organization in liaison, the Standardization Management Board or one of the advisory committees, or the General Secretary. Guidelines for proposing and justifying a new work item are given in ISO/IEC Directives, Part 1, Annex C (see extract overleaf). **This form is not to be used for amendments or revisions to existing publications.**

The proposal (to be completed by the proposer)

Title of proposal
Draft IEC 62361-101: Common Information Model Profiles

☒ Standard	☐ Technical Specification

Scope (as defined in ISO/IEC Directives, Part 2, 6.2.1)

The Part 101 standard describes the scope, intent, and form of CIM profiles. The Common Information Model (CIM) specifies the basis for the semantics for message exchanges defined by WG13, WG14 and WG16. The profile specifications, which are contained in other parts of the IEC 61970, IEC 61968 and IEC 62325 standards, specify the content of the messages exchanged.

The objects represented in the CIM are abstract in nature and may be used in a wide variety of applications. The use of the CIM goes far beyond its application in an EMS. This standard should be understood as a tool to enable integration in any domain where a common set of power system semantics is needed to facilitate interoperability and plug compatibility between applications and systems independent of any particular implementation. This document is intended to guide and control the way Profiles are to be created.

This scope of this NP is to create and document 62361-101: Common Information Model Profiles and is intended to be used by any IEC TC57 group that needs to define a Profile Standard.

WG-19 will also maintain a close liaison with other groups doing work with the CIM, namely WG-13, WG-14 and WG-16.

Purpose and justification, including the market relevance and relationship to Safety (Guide 104), EMC (Guide 107), Environmental aspects (Guide 109) and Quality assurance (Guide 102). (attach a separate page as annex, if necessary)

This International Standard provides a means to generate a 'profile', where a profile is a specification that governs information required in a specific business exchange context. Normally this business context is considered a message that conforms to the semantics of the CIM. The profile's purpose, content and structure are described as well as profile relationships to the information model, other profiles, and instance messages. The Standard describes the canonical methodology of creating and using profiles.We know from experience that ad hoc implementation of data exchanges leads over time to a complicated enterprise IT structure that is expensive to maintain and difficult to modify as business requirements change. A preferred approach is to have a canonical CIM with the intent to achieve semantic and methodological consistency.The goal is to enable implementations using potentially different exchange technologies and different internal technologies to efficiently cooperate as one larger system

Target date	for first CD January 2012	for FDIS December 2013
Estimated number of meetings 6	Frequency of meetings: 3 per year	Date and place of first meeting: Nuremberg
Proposed working methods	☒ E-mail	☒ ftp

Relevant documents to be considered
W3C Standards
IEC 61970-301, IEC 61970-452, IEC 61970-456, IEC 61970-552, IEC 61968-11, IEC 61968-9
IEC 62325-301, IEC 62325-451, IEC 62325-351, IEC 62361-100

Relationship of project to activities of other international bodies

Liaison organizations	**Need for coordination within ISO or IEC**
UN/CEFACT ENTSO-E	

Preparatory work

Ensure that all copyright issues are identified. Check one of the two following boxes

☒ A draft is attached for vote and comment ☐ An outline is attached

We nominate a project leader as follows in accordance with ISO/IEC Directives, Part 1, 2.3.4 (name, address, fax and e-mail):

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Concerns known patented items (see ISO/IEC Directives, Part 2)	**Name and/or signature of the proposer**
☐ yes If yes, provide full information as an annex ☒ no	*Charles T. Zegers* General Secretary, USNC/IEC

Comments and recommendations from the TC/SC officers

1) Work allocation
☐ Project team ☐ New working group ☒ Existing working group no: WG-16, 14, 13, 19

2) Draft suitable for direct submission as
☒ CD ☐ CDV

3) General quality of the draft (conformity to ISO/IEC Directives, Part 2)
☐ Little redrafting needed ☒ Substantial redrafting needed ☐ no draft (outline only) (Outline included below)

4) Relationship with other activities
In IEC WG-19

In other organizations

Remarks from the TC/SC officers

WG19 approves this proposal.
The secretary supports this proposal

Elements to be clarified when proposing a new work item

Title

Indicate the subject matter of the proposed new standard.

Indicate whether it is intended to prepare a standard, a technical report or an amendment to an existing standard.

Scope

Give a clear indication of the coverage of the proposed new work item and, if necessary for clarity, exclusions.

Indicate whether the subject proposed relates to one or more of the fields of safety, EMC, the environment or quality assurance.

Purpose and justification

Give details based on a critical study of the following elements wherever practicable.

a) The specific aims and reason for the standardization activity, with particular emphasis on the aspects of standardization to be covered, the problems it is expected to solve or the difficulties it is intended to overcome.

b) The main interests that might benefit from or be affected by the activity, such as industry, consumers, trade, governments, distributors.

c) Feasibility of the activity: Are there factors that could hinder the successful establishment or general application of the standard?

d) Timeliness of the standard to be produced: Is the technology reasonably stabilized? If not, how much time is likely to be available before advances in technology may render the proposed standard outdated? Is the proposed standard required as a basis for the future development of the technology in question?

e) Urgency of the activity, considering the needs of the market (industry, consumers, trade, governments etc.) as well as other fields or organizations. Indicate target date and, when a series of standards is proposed, suggest priorities.

f) The benefits to be gained by the implementation of the proposed standard; alternatively, the loss or disadvantage(s) if no standard is established within a reasonable time. Data such as product volume of value of trade should be included and quantified.

g) If the standardization activity is, or is likely to be, the subject of regulations or to require the harmonization of existing regulations, this should be indicated.

If a series of new work items is proposed, the purpose and justification of which is common, a common proposal may be drafted including all elements to be clarified and enumerating the titles and scopes of each individual item.

Relevant documents

List any known relevant documents (such as standards and regulations), regardless of their source. When the proposer considers that an existing well-established document may be acceptable as a standard (with or without amendments), indicate this with appropriate justification and attach a copy to the proposal.

Cooperation and liaison

List relevant organizations or bodies with which cooperation and liaison should exist.

Preparatory work

Indicate the name of the project leader nominated by the proposer.

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6 **DRAFT IEC 62361 Part 101: Common Information Model (CIM) Profiles**
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8 **Revision 001**
9 **2012-01-05**
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

Common Information Model (CIM) Profiles

IEC 62361-Part 101

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.

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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.

International Standard IEC 62361-101 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

This is the first edition.

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

FDIS	Report on voting
57/XX/FDIS	57/XX/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.

103 The committee has decided that the contents of this publication will remain unchanged until
104 the maintenance result date[1] indicated on the IEC web site under "http://webstore.iec.ch" in
105 the data related to the specific publication. At this date, the publication will be

106 • reconfirmed,
107 • withdrawn,
108 • replaced by a revised edition, or
109 • amended.

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

111

112

INTRODUCTION

This standard is one of the IEC 62361 series which define standards that may be used by all Working Groups within TC57. These standards address areas of interest that impact multiple standards and provide consistency for implementations.

The Part 101 standard describes the scope, intent, and form of CIM profiles.

The Common Information Model (CIM) specifies the basis for the semantics for message exchanges defined by WG13, WG14 and WG16. The profile specifications, which are contained in other parts of the IEC 61970, IEC 61968 and IEC 62325 standards, specify the content of the messages exchanged.

The objects represented in the CIM are abstract in nature and may be used in a wide variety of applications. The use of the CIM goes far beyond its application in an EMS. This standard should be understood as a tool to enable integration in any domain where a common power system model is needed to facilitate interoperability and plug compatibility between applications and systems independent of any particular implementation.

This part of the standard, IEC 62361-101, defines CIM message profiles, their scope and how they may be concretely exchanged. Functional areas are standardized in separate IEC documents that augment and reference this base CIM standard. For example, IEC 61970-301 describes the core CIM information model and IEC 61968-11 addresses distribution models and references this base CIM standard. While there are multiple IEC standards dealing with different parts of the CIM, there is a single, unified information model comprising the CIM behind all these individual standards documents.

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent concerning a computer-based implementation of an object-oriented power system model in a relational database. As such, it does not conflict with the development of any logical power system model including the Common Information Model (CIM), where implementation of the model is not defined.

The IEC takes no position concerning the evidence, validity and scope of this patent right.

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Common Information Model (CIM) Profiles

IEC 62361-Part 101

1 Scope

This International Standard provides a means to generate a 'profile', where a profile is a specification that governs information required in a specific business exchange context. Normally this business context is considered a message that conforms to the semantics of the CIM. The profile's purpose, content and structure are described as well as profile relationships to the information model, other profiles, and instance messages. The Standard describes the canonical methodology of creating and using profiles.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050 series, *International Electrotechnical Vocabulary*

IEC 61850-7-4, *Basic communication structure – Compatible logical node classes and data object classes, , First edition, 2003-05*

IEC 61850 (all parts), *Communication Networks and Systems in Substations*

IEC 61968 (all parts), *Standards for distribution management system interfaces*

IEC 61970-2, *Energy Management System Application Program Interface (EMS-API) – Glossary*

IEC 61970-301, *Common Information Model (CIM) Base*

IEC 61968 Part 11, *System Interfaces for Distribution Management: Common Information Model Extensions for Distribution*.

IEC 62325-301, *Framework for Energy Market Communications Common Information Model (CIM) Extensions for Markets.*

IEC 60870-6 (all parts), *Telecontrol equipment and systems – Telecontrol protocols compatible with ISO standards and ITU-T recommendations*

Object Management Group: UML 2.0 Specification – http://www.omg.org

3 Terms and definitions

3.1 Terms and definitions overview

For the purposes of this document, the terms and definitions of IEC 61970-2 apply, as well as the following.

NOTE Refer to International Electrotechnical Vocabulary, IEC 60050, for general glossary definitions.

3.2 energy management system
EMS

computer system comprising a software platform providing basic support services and a set of applications providing the functionality needed for the effective operation of electrical

generation and transmission facilities so as to assure adequate security of energy supply at minimum cost

3.3 application program interface
API

the set of public functions provided by an executable application component for use by other executable application components

3.4 Canonical

Canonical means reduced to the simplest and most significant form possible without loss of generality.

A canonical data model is a semantic model that is used as the common language of a group of software systems that exchange information.

3.5 unified modeling language
UML

formal and comprehensive descriptive language with diagramming techniques used to represent software systems, from requirements analysis, through design and implementation, to documentation

UML has evolved from a collection of methods contributed by different practitioners, into an International Standard. The CIM relies on UML for defining the model, and automated tools generate the documentation, schemas, and other artifacts directly from the UML. A basic understanding of UML is necessary to understand the CIM.

3.6 OWL

Web ontology language as defined by the W3C. An RDF technology …

3.7 profile

subset of CIM classes, associations and attributes needed to accomplish a specific type of interface

It may be expressed in XSD, RDF, and/or OWL files. A profile can be tested between applications. A profile is necessary in order to “use” the DCIM. Several profiles are defined in other parts of the IEC 61968 family of standards.

3.8 MRID

A master resource identifier as represented by the IdentifedObject class attribute of “mRID”. This attribute is used as a unique and opaque identifier of the object and useful for implementing references. The MRID is the identity for an instance of a business concept, though that instance might evolve over time or have alternative implementations, its MRID remains the same.

3.9 IT

Information technology as typically used in defining a group within an organization that focuses on technical aspects of information coordination. For example, the IT department in an organization is usually responsible for the management of user login and cyber security credentials.

4 Problem statement

4.1 Goals

The goal is to reduce costs and increase the quality of information exchanges in an integrated environment.

We know from experience that ad hoc implementation of data exchanges leads over time to a complicated enterprise IT structure that is expensive to maintain and difficult to modify as business requirements change. A preferred approach is to have a canonical CIM with the intent to achieve semantic and methodological consistency.

The goal is to enable implementations using potentially different exchange technologies and different internal technologies to efficiently cooperate as one larger system

4.2 The role of profiles

A CIM profile is the specification that relates an instance exchange to the Canonical CIM. As such it is the key definition of how business exchanges are structured and used. Implementations working with instance data exchanges are strictly governed by profiles. The CIM is used to assist in giving consistency and meaning to the content of profiles but implementation conformance can only be realized against a profile. Consistent semantics at the profile level are critical for creating a working system with multiple implementations and multiple profiles that must work together in achieving business goals.

This means that information about the same instance (i.e. mRID is the same) in different messages/documents generated from different profiles use the same Canonical CIM semantics, i.e. syntactic elements refer to existing semantic CIM definitions.

Deviations from the above prevent interoperability. In cases where the semantics is the same, model transformation may enable interoperability. But if the semantics is different interoperability becomes impossible. In such cases the semantic differences shall be removed by unification at the Canonical CIM level.

4.3 CIM as a Canonical information model

Canonical models, like most information models, are much more effective when they are *normalized*, which means that the canonical model (in this case, CIM) only has one way to describe a given semantic.

Canonical models, as they grow to encompass many different business exchanges, can become quite large and complex. It is important to organize the canonical models to facilitate efficient profile development given that at any point in time there will be many active profiles at all stages of profile life-cycles.

Extending the information model can be done either in the canonical part or in a profile. The specification being created in this work will describe the rules for such extensions.

4.4 Conflicting Interests

There are conflicting interests which must be managed in order to make a Canonical CIM work.

- **Semantic quality vs profile consistency.**
  - The benefits of the Canonical CIM approach depend fundamentally on maintaining a high level of semantic quality in the model:
    - Normalize – there should be only one way to describe a given kind of thing.
    - Effective – the modeling approach uses best available practice (which is an evolving thing).
    - Non-speculative – the modeling is backed up by real use cases.
  - Semantic quality cannot be maintained purely by extensions. We know this from experience with databases.
  - Semantic change is driven by profile activity (either new or update), which is in turn driven by the business problem being addressed by those profiles.
  - When Canonical CIM changes are judged to be desirable, the newest CIM will be inconsistent with some other existing profiles.
    - Q: Should all profiles be updated even though there was no direct business driver from their use cases?
    - A: No, this will be economically and logistically impossible.

298 - It should be assumed that the set of profiles at any time will be derived from a
299 spectrum of CIM versions and will not be completely consistent with one another.
300 • **Product backward compatibility vs currency with latest Canonical CIM.**
301 - Profile updates are driven primarily by the profile's user community.
302 - Primary driver will be new business requirements for the profile.
303 - Secondary driver is 're-sync' with the latest Canonical CIM, the value of
304 which will be situation dependent.
305 - Whenever a profile is updated, products supporting that profile will have to be
306 modified and tested to remain current.
307 - This can be a significant cost.
308 - Products may avoid this cost if transformations are feasible between profile
309 versions.
310 - Transformation between versions should be part of the profile
311 specification.
312 - A given product may support to 1 to n CIM profiles.
313 - Products will be internally simpler if their CIM profiles have high consistency.
314 • **The enterprise canonical vs the standard Canonical CIM.**
315 - Enterprises adopting CIM semantic architecture inevitably need to define their own
316 additional semantics.
317 - Strictly local semantics.
318 - Candidate standard semantics.
319 - An Enterprise CIM should be 'harmonized' with the Canonical CIM.
320 - Harmonization is defined by a profile which specifies a formal and complete
321 transformation between any semantically overlapped parts of the two
322 information models.
323 - Harmonization profiles must be updated as new versions need to be
324 supported.
325 - Costs of products obeying the Canonical CIM will rise to the extent that enterprise
326 CIMs diverge from Canonical CIM.
327 • **Version mismatch and rolling upgrades in the enterprise.**
328 - A CIM enterprise (hundreds of profiles) will constantly need to consider how to
329 implement upgrades of different profiles.
330 - It shall be possible to upgrade any single application to support a new profile
331 without forcing simultaneous upgrade of other profiles supported by that
332 application. i.e. An application can support profiles derived from different Canonical
333 CIM versions.
334 - It shall be possible to upgrade the profile version (i.e. the message payload) without
335 synchronously requiring that all of the applications interoperating via that profile are
336 updated to the same profile.
337 - Generally at least one source app would be upgraded – otherwise there is
338 nothing to produce the new payload.
339 - There may be limits on how out-of-date other applications may be.
340 - Profile specifications shall stipulate any constraints on managing upgrades.
341 • **Historical data managed across Canonical CIM versions.**

- It will be common that data exchange instances via CIM profiles form the backbone of historical information for the enterprise.
- Historical archives therefore will contain instances based on a progression of profile versions.

Applications dealing with history therefore deal with multiple versions of a profile.

4.5 From semantic model to message syntax

The existing IEC process how to create a message from the Canonical CIM is described in Figure 1.

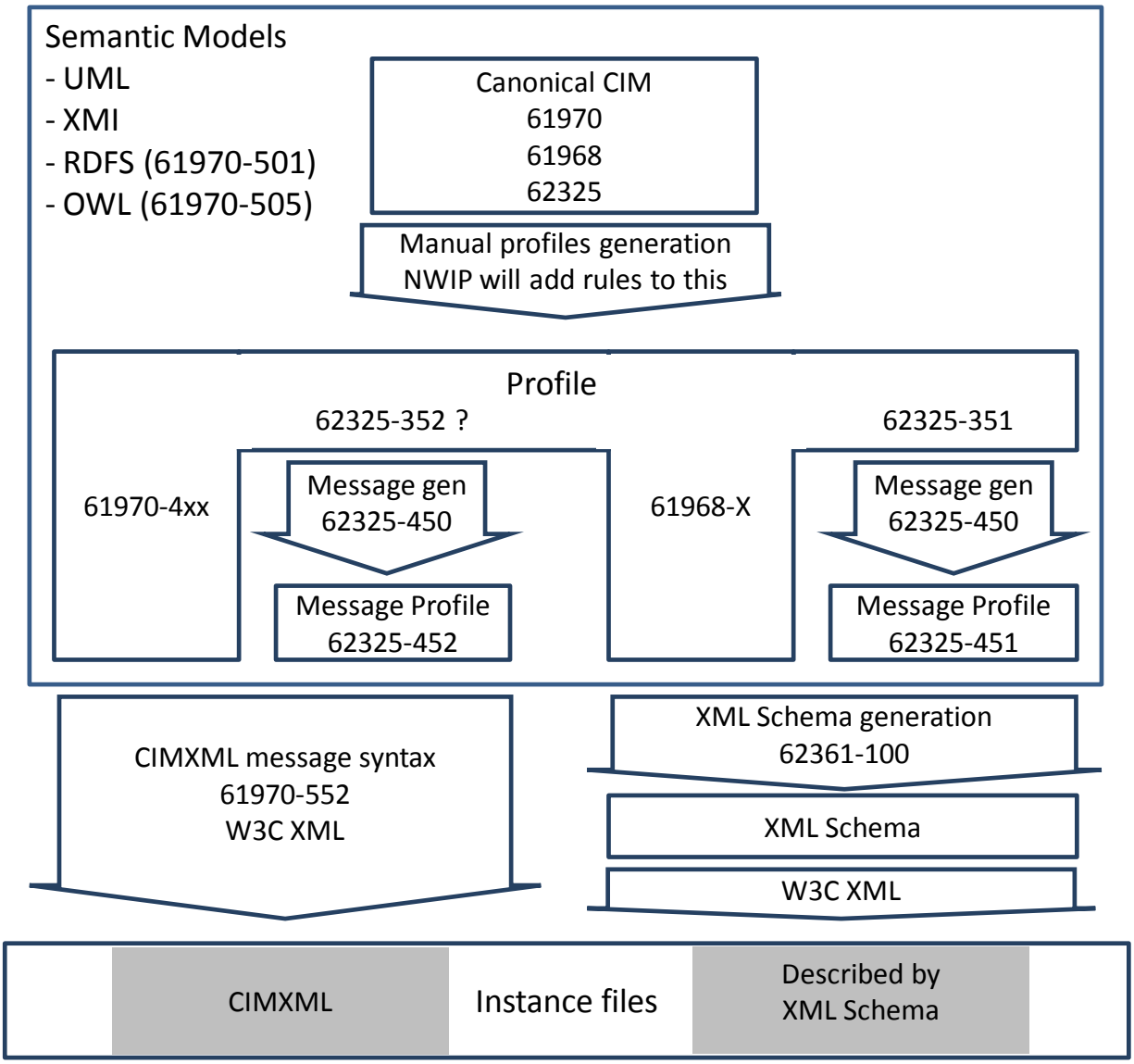

Figure 1 – From semantic model to message syntax

The top of Figure 1 show the Canonical CIM semantic model. It has four alternate and equivalent representations

- UML
- XMI
- RDFS
- OWL

UML and XMI have a graphical representation that is missing in RDFS and OWL. Hence the Canonical CIM is maintained as a UML model. XMI is a representation used for transfer of UML models between different tools.

TC57 working groups WG13, WG14 and WG16 create profiles from the Canonical CIM, this is a manual process. In Figure 1 the profiles are represented by the “F” shaped box labelled “Profile”. The profiles are described in RDFS/OWL but UML may also be used.

In cases when the rules governing the creation of the semantic profiles are insufficient or too limiting a second message generation step is needed. This step is labelled “Message gen” in Figure 1. The generated message is still described as a semantic model using UML or RDFS/OWL.

A profile or a message profile can be used either with CIMXML or XML Schema serialisations. The CIMXML syntax is described by IEC 61970-552. For XML Schema the corresponding schema file need to be derived for the profile or message profile. The XML Schema derivation is described by IEC 61362-100.

4.6 Relationship of Profiles to instance messages

Discuss validation of instance documents. The various kinds of constraints that might be applied and the

4.7 Relationship of Profiles to information model

Discuss the linkage of profile back to the information model. Discussion of restrictions on information model.

4.8 Relationship of Profiles to other profiles

Discuss the linkage of profile back to the information model.

4.9 Profile requirements classifications rationale

Want strong guidance to a normal approach and not steer toward extra complexity unless such complexity is warranted. The classification of different types of message exchange scenarios are useful to focus discussion on the recommended practices and give guidance for approaching situations that may require adjustments to the canonical approach.

4.10 Profile requirements classifications

4.10.1 Profiles in normal situation

Profiles that are not driven by environmental considerations are recommended to use this approach. This type of profile strictly uses a subset of the information model without any structural changes or renaming. The subset of the information model may consist of a select set of classes, attributes, and association ends. Additionally the profile contents may be restricted to a specific range. Examples of this type of profile include the IEC 61970-452 Equipment Profile.

4.10.2 Profiles respecting environmental constraints

Outside factors, referred to as environmental factors may require modifications to the use of a normal profile to achieve specific goals for the message exchange. For example some messages may be required to work with extreme concerns about performance or without the use of MRID values.

4.10.3 Profiles harmonizing with other semantics

In the case a message profile must conform to semantics not based upon the CIM information model. For example when another standard message exists and CIM semantics are to be mapped onto the existing standard. These cases require more complex transformation process which may or may not be suitable to the capabilities provided by restricting the CIM information model.

4.11 Requirements list

Requirements are listed with classification in Table 1 – Requirements with classification.

Table 1 – Requirements with classification

Classification	Requirement
Normal	Any serialization techniques (such as RDF and XSD type messages) should be derived from same profile definition.
Normal	Header versioning in messages
Normal	Subset specification (cherry picking) of information model.
Normal	Constraining information model.
Normal	Typing at profile level
Normal	Inheritance flattening at profile level. Use of abstract classes in profiles.
Normal	Union and other XSD specifics
Normal	Incremental change exchanges work for RDF or XSD messages.
Normal	Traceable to the information source.
Normal/all	Standard means to communicate profile definitions among tools.
Normal/all	UML multiplicity of zero for profiles to work.
Normal/all	Large number of profiles to be managed.
Normal/all	Binding profile to specific information model version(s)
Environmental	Shorter names needed for higher performance.
Environmental	XML nesting required for higher performance.
Harmonization	Associations and identity are addressed without the use of MRID
Harmonization	Renaming to conform to another semantic model.
Harmonization	UML renaming or mapping in profiles – restate in terms of requirement not solution. Match existing names.
	RDF limitations in CIMTool
	Variations of profiles or sub profiles or profile inheritance
Normal	Producer information in headers
	Partitioning of information model and versioning
	MRID specification as UUID or string for example
Normal	Many to one profile association direction guidance
	OWL specification for profile
	UML specification for profile
Normal	Enumerations specifications for profile restrictions of non-enumerated types
Normal	Rules for selecting restrictions of information model
Normal	Transport but not understanding of private profile extension
Normal	Package specification hidden from profiles
	Other technologies (like Protobuf, CIM-E, JASON...)
Normal	Specification of constraints by OCL facets or other means.
Normal	Types for common restrictions on primitive types (like Float to Integer)

4.12 Discussion of inheritance within the profile

Discussion how inheritance in the information model relates to inheritance in the profile specification. Specifically the rules for changing or adjusting the inheritance structure in the profile in support of constraint specification. Also address how some technologies might not support inheritance.

4.13 Use case – Very simple cherry picking

Describe use case for simple selection of content within CIM.

4.14 Use case – Simple – just restrictions on information model

No structural changes, but restrictions in string size or multiplicity (like making an attribute required).

4.15 Use case – Complex – inheritance not maintained

Flatten inheritance like in XSD.

4.16 Use case – Very Complex – ICCP example

We have specially named associations and classes and types with different restrictions.

4.17 Use case – Exchange of profile definition

Use case to be defined for exchanging the profile definition among parties intending to exchange messages based upon profiles.

5 CIM profile specification

CIM profile modeling notations

The CIM is defined using object-oriented modeling techniques. Specifically, the CIM specification uses the Unified Modeling Language (UML) notation, which defines the CIM as a group of packages.

Each package in the CIM contains one or more class diagrams showing graphically all the classes in that package and their relationships. Each class is then defined in text in terms of its attributes and relationships to other classes.

The UML notation is described in Object Management Group (OMG) documents and several published textbooks.

6 CIM profile exchange (normative)

6.1 Profile exchanges

(To be completed.)

6.2 Profile exchange definition in UML

(To be completed.)

6.3 Profile exchange defintion in OWL

(To be completed.)

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448 # Bibliography

449 IEC 61970-501, *Energy Management System Application Program Interface (EMS-API) – CIM*
450 *RDF Schema*

451 RP-3654-1 EPRI Control Center API (CCAPI) research project.

452 CIMTool – Open source CIM profile management tool. http://www.cimtool.org

453 CIM Users Group – The community of CIM users. http://cimug.ucaiug.org

454 DNP (Distributed Network Protocol): Series of standards. http://www.dnp.org/

455 RP570 (RTU Protocol based on IEC 57 part 5-1 (present IEC 870)).
456 http://library.abb.com/GLOBAL/SCOT/scot229.NSF/VerityDisplay/9A5C1896695487E6C2256
457 A7200361578/$File/REC501RP570_EN_A.pdf

458 IEC 60050 International Electrotechnical Vocabulary

459 IEC 61968-11 Ed.1: Application integration at electric utilities - System interfaces for
460 distribution management - Part 11: Common Information Model (CIM) Extensions for
461 Distribution

462 W3C: RDF/XML Syntax Specification http://www.w3.org/RDF/

463 W3C: Extensible Markup Language (XML) 1.0 http://www.w3.org/XML/

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