



European Network of
Transmission System Operators
for Electricity

METADATA FOR DATASET AND DISTRIBUTION SPECIFICATION

2024-10-16

ICTC APPROVED
VERSION 2.4.0

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- 20 • SHALL: This word, or the terms "REQUIRED" or "MUST", means that the definition is an
21 absolute requirement of the specification.
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23 absolute prohibition of the specification.
- 24 • SHOULD: This word, or the adjective "RECOMMENDED", means that there may exist valid
25 reasons in particular circumstances to ignore a particular item, but the full implications must
26 be understood and carefully weighed before choosing a different course.
- 27 • SHOULD NOT: This phrase, or the phrase "NOT RECOMMENDED", means that there may
28 exist valid reasons in particular circumstances when the particular behaviour is acceptable
29 or even useful, but the full implications should be understood and the case carefully weighed
30 before implementing any behaviour described with this label.
- 31 • MAY: This word, or the adjective "OPTIONAL", means that an item is truly optional.

32

Revision History

Version	Date	Comments
1.0.0	2021-03-22	Document for SOC approval.
2.0.0	2022-02-16	Document for SOC approval. Attributes added to the header to match DCAT3. Attributes of md namespace header are set to optional to enable transition. SOC approved.
2.1.0	2022-09-21	SOC approved.
2.2.0	2023-04-20	For ICTC approval.
2.2.0	2023-05-10	Updated with maintenance request to fix a bug and make clarifications Added section 6.4 RDFS schema and SHACL constraints modified Examples in Annex B modified ICTC approved.
2.3.0	2023-09-20	Implements maintenance request on the header Added new attributes to better manage version control identified by CSA Business Process and in order to align with DCAT-3 vocabulary. Other attributes were deprecated. Refer to Annex C better understanding of the change log. For ICTC approval.
2.4.0-alpha	2024-09-10	For CIM WG review and ICTC approval Fixing of the issues identified in the standard-vetting interoperability (SV-IOP) test held in 2024. Additionally, Implements maintenance request on the header. Refer to Annex C. Changing name to Metadata for Dataset Distribution Specification. New Annex D explaining how to transition between versions of the specification for different uses of the metadata.
2.4.0	2024-10-16	ICTC approved

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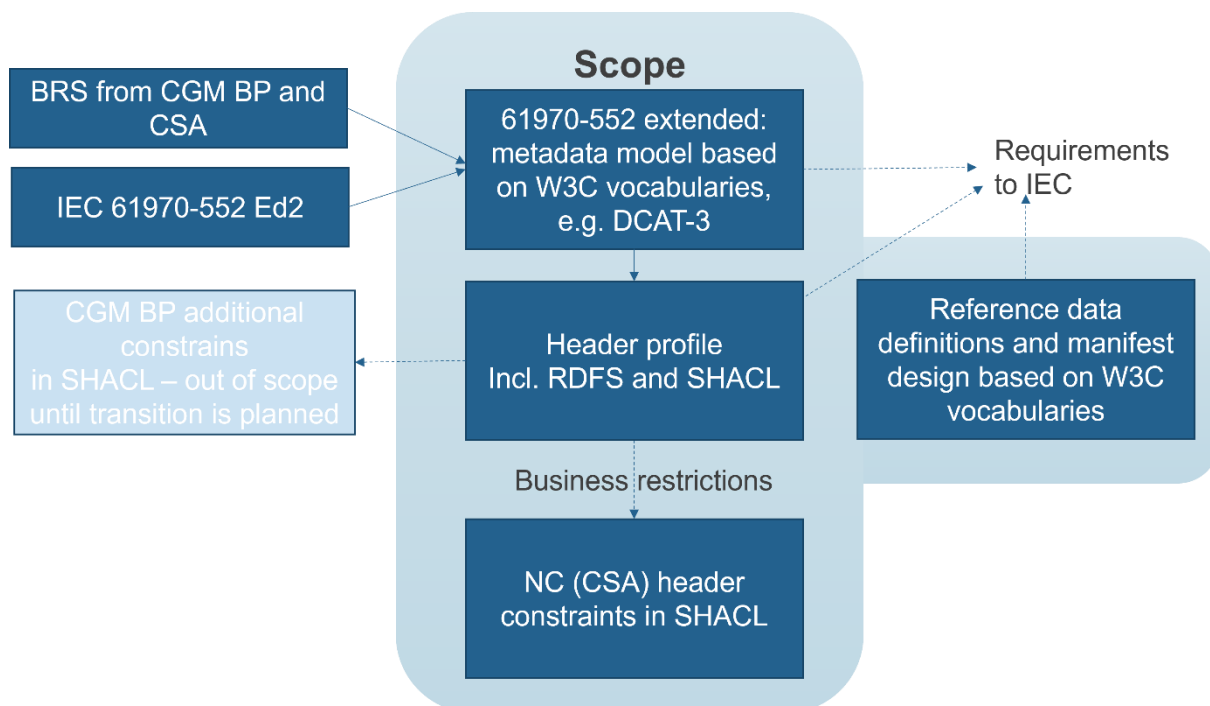
103 **1 Scope**

104 This document defines the specification of metadata for dataset and distribution which applies
105 to the datasets exchanged with Network Codes (NC) Profiles. The specification can be applied
106 to exchanges using other profiles as well upon agreement within the business process
107 governing the exchange.

108 The document was designed with the following scope illustrated in Figure 1 which can be
109 summarized as follows:

- 110 • In scope
 - 111 ○ Meet requirements for CGM Build Process and data exchanges based on NC
 - 112 profiles;
 - 113 ○ Focus on dataset data header that can be used in upcoming IEC standards and
 - 114 to support [Common European Data Spaces](#)
 - 115 ○ Develop canonical model and a “header application profile” for the purpose of
 - 116 generating machine understandable artifacts.
- 117 • Out of scope
 - 118 ○ The standardization work related to the process defined in IEC;
 - 119 ○ The implementation of the header in different projects based on IEC 61970 –
 - 120 CGMES exchanges.

121



122

123

Figure 1. Scope of the project

124 The document specifies the packaging of reference data and the header of dataset and
125 distribution provided in instance files. This version of the specification aligns with W3C DCAT
126 version 3 which is in its final stage of approval by W3C. The way how the main body of reference

127 data instances are structured is explained in the “Boundary and reference data exchange
128 application specification” document.

129 Dataset (Model), distribution (document) header, manifest and reference data use the following
130 W3C vocabulary. These vocabularies are used in a relation to be able to better describe the
131 semantic meaning of the data.

132 • DCAT (W3C Data Catalog Vocabulary) is an RDF vocabulary designed to facilitate
133 interoperability between data catalogs published on the Web. By using DCAT to
134 describe datasets in catalogs, publishers increase discoverability and enable
135 applications to consume metadata from multiple catalogs. It enables decentralized
136 publishing of catalogs and facilitates federated dataset search across catalogs.
137 Aggregated DCAT metadata can serve as a manifest file to facilitate digital preservation.

138 • SKOS (W3C Simple Knowledge Organization System) designed for representation of
139 thesauri, classification schemes, taxonomies, subject-heading systems, or any other
140 type of structured controlled vocabulary. SKOS is part of the Semantic Web family of
141 standards built upon RDF and RDFS, and its main objective is to enable easy publication
142 and use of such vocabularies as linked data.

143
144 Annex A gives background information on the dataset (model) and distribution (document)
145 header in the part related to modelling authority sets and versioning. Annex B contains one
146 example of a document header which is used to illustrate some of the properties included in the
147 header. Annex C provides information on changes applied in this version and Annex D provides
148 guidance related to the transition and usage of different versions of the metadata.

149 2 Normative references

150 The following documents, in whole or in part, are normatively referenced in this document and
151 are indispensable for its application. For dated references, only the edition cited applies. For
152 undated references, the latest edition of the referenced document (including any amendments)
153 applies.

154 • [W3C PROV-O: The PROV Ontology](#),

155 • [W3C Data Catalog Vocabulary \(DCAT\) – version 3](#)

156 • European Commission: Data Catalog Vocabulary Application Profile (DCAT-AP) for data
157 portals in Europe¹

158 • IEC 61970-552 Energy management system application program interface (EMS-API)
159 Part 552: CIMXML Model exchange format

160 • IEC 61970-457 Energy management system application program interface (EMS-API)
161 Part 457: Dynamics profile

162 • Semantic versioning, [Semantic Versioning 2.0.0 | Semantic Versioning \(semver.org\)](#)

163 3 Terms and definitions

164 3.1

165 serialisation

166 encoding of an ontology or dataset into a format that can be stored, typically in a file.

167 Note 1 to entry: The definition is adapted from W3C-RDF11-XML.

168 [SOURCE: ISO 21597-1:2020, 3.1.13]

¹ For details, see here: <https://joinup.ec.europa.eu/collection/semantic-interoperability-community-semic/solution/dcat-application-profile-data-portals-europe/releases>

- 169 **3.2**
- 170 **ontology**
- 171 specification of concrete or abstract things, and the relationships among them, in a prescribed
- 172 domain of knowledge
- 173 Note 1 to entry: The specification should be computer processable.
- 174 Note 2 to entry: The definition is adapted from W3C-OWL2-SPEC.
- 175 [SOURCE: ISO 21597-1:2020, 3.1.7]
- 176 **3.3**
- 177 **payload**
- 178 primary information in the form of documents that is included within the container
- 179 Note 1 to entry: This does not include the header file or the ontology resource files.
- 180 [SOURCE: ISO 21597-1:2020, 3.1.2]
- 181 **3.4**
- 182 **document**
- 183 fixed and structured amount of information that can be managed and interchanged as a unit
- 184 between users and systems
- 185 Note 1 to entry: This unit may not necessarily be human perceptible. Information is usually stored on a data medium.
- 186 Note 2 to entry: Used in the ISO 21597 series to refer to any document that forms part of the payload in the container,
- 187 including any 2D or 3D models that represent built or natural assets in the physical world; these may be held in any
- 188 standard or proprietary format.
- 189 [SOURCE: ISO 21597-1:2020, 3.1.3]
- 190 **3.5**
- 191 **namespace**
- 192 group of identifiers for elements and attributes that are collectively bound to a URI such that
- 193 their use will not cause naming conflicts
- 194 Note 1 to entry: The definition is adapted from W3C-RDF11-CONCEPTS, 1.
- 195 [SOURCE: ISO 21597-1:2020, 3.1.19]
- 196 **3.6**
- 197 **resource**
- 198 something in the world (the “universe of discourse”) denoted by an IRI or literal
- 199 Note 1 to entry: Anything can be a resource, including physical things, documents, abstract concepts, numbers and
- 200 strings; the term is synonymous with “entity” as it is used in the RDF Semantics specification.
- 201 Note 2 to entry: The definition is adapted from W3C-RDF11-CONCEPTS.
- 202 [SOURCE: ISO 21597-1:2020, 3.1.14]
- 203 **3.7**
- 204 **dataset**
- 205 RDF(S)/OWL file that contains individuals that comply with the classes as specified by
- 206 ontologies
- 207 [SOURCE: ISO 21597-1:2020, 3.1.10]

208 **3.8**
209 **supersede**
210 an entity (document, model, standard, profile, etc.) that has been replaced with a newer version
211 of the same entity, or by a suitable other entity that contains the most current, reliable and/or
212 available information

213 Note 1 to entry: The definition is adapted from ISO/IEC Guide 59:2019, 3.11.

214 **3.9**

215 **model**

216 collection of data describing instances, objects or entities, real or computed. In the context of
217 CIM the semantics of the data is defined by profiles. Hence a model can contain equipment
218 data, power flow initial values, power flow results etc.

219 Note 1 to entry: In power system analysis, a model is a set of static data describing the power system. Examples of
220 Models include the Static Network Model, the Topology Solution, and the Network Solution produced by a power flow
221 or state estimator application.

222 [SOURCE: IEC 61970-552:2016, 3.8]

223 **3.10**

224 **modelling authority set**

225 an abstract entity which is attributed to an agent (modelling authority). The modelling authority
226 set is versioned by the agent.

227 **3.11**

228 **modelling authority set version**

229 a specialization of the modelling authority set which is attributed to an agent. A version of the
230 modelling authority set can be seen as an envelop for models which conform to different
231 profiles.

232 **3.12**

233 **model exchange**

234 the storing, accessing, transferring, and archiving of models

235 **3.13**

236 **profile**

237 A specification that constrains, extends, combines, or provides guidance or explanation about
238 the usage of other specifications. This definition includes what are sometimes called
239 "application profiles", "metadata application profiles", or "metadata profiles".

240 Note 1 to entry: A Profile is a restricted subset of the more general CIM. Schema that defines the structure and
241 semantics of a model that may be exchanged [SOURCE: IEC 61970-552:2016, 3.9]

242 [SOURCE: W2C DX-PROF]

243 **3.14**

244 **profile document**

245 collection of profiles intended to be used together for a particular business purpose

246 [SOURCE: IEC 61970-552:2016, 3.10]

247 **3.15**

248 **object property; property**

249 name that may be used to qualify an object reference to get a value from or pass a value to an
250 object

251 [SOURCE: ISO/IEC 1989:2014, 4.140]

252

253 4 Abbreviated terms

254	CIM	Common Information Model (electricity)
255	CGMES	Common Grid Model Exchange Standard
256	CGM BP	Common Grid Model Build Process
257	DSO	Distribution System Operator
258	ENTSO-E	European Network of Transmission System Operators for Electricity
259	IEC	The International Electrotechnical Commission
260	IOP	Interoperability Test
261	SO	System Operator
262	MAS	Model Authority Set
263	mRID	CIM Master Resource Identifier
264	OCL	Object Constraint Language
265	OWL	Web Ontology Language
266	RDF	Resource Description Framework
267	RDFS	RDF Schema
268	SHACL	Shapes Constraint Language
269	TSO	Transmission System Operator
270	URI	Uniform Resource Identifier
271	UUID	Universally Unique Identifier
272	XML	Extensible Markup Language
273	XSD	XML Schema Definition

274

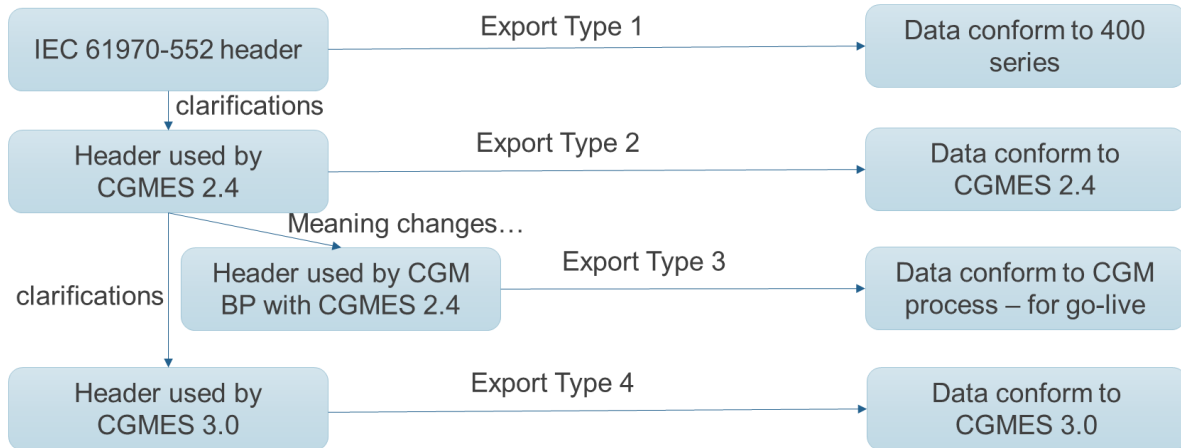
275 5 Overview and methodology**276 5.1 Overview of current status of metadata discussion**

277 A few years ago, IEC WG13 opened the discussion on 61970-303 (canonical metadata) and
278 61970-459 (profile) realizing this will need to grow to cover many use cases and wanted to
279 remove the header from IEC 61970-552.

280 All IEC 61970-45x series and -600 series profiles (CGMES), as well as CGMES 2.4 do not
281 include document header as part of the profile, i.e. when documents refer to EQ profile this
282 does not include header definition.

283 There is a requirement that the current header (IEC 61970-552) shall not be changed, and all
284 additional requirements should be implemented as extensions to allow transition and
285 compatibility with CGMES v3.0. Main driver is the scheduled implementation of CGMES 2.4 and
286 eventual transition to higher versions. It should be noted that when a document header is to be
287 implemented, it impacts every import and export tool as it affects every single instance file.

288 Figure 2 Is a high-level illustration on different export types that are maintained in tools.



289

290 **Figure 2. Different types of headers existing for IEC 61970 implementations**

291 This document is not providing the implementation instruction on how this dataset and
 292 distribution header information should be in different project. This and the recommendation
 293 transition from existing header information will be provided in supporting documents.

294 **5.2 Methodology and approach taken**

295 As the metadata is in general data that describes other data, the project that developed this
 296 document had to keep close collaboration with CGM BP and NC projects in order to collect
 297 requirements and consult to collect feedback on the proposed solution for header and metadata.
 298 During the stage of collecting requirement more than 50 potential data fields (attributes or
 299 properties) were collected. These data field covered the following main groups:

- 300 • Data identification (e.g. identifiers, date of creation, version)
- 301 • Data linking (e.g. dependency or revision of data)
- 302 • Instance file type (e.g. type of profile, conformance to document/standard)
- 303 • Exact time period which the data represents/is valid for (e.g. scenario time, period start
 304 and end)
- 305 • Data description (e.g. free text description)
- 306 • Involved entity and its role (e.g. source data provider, service provider, intended data
 307 receiver)
- 308 • The area which the data represents (e.g. region, domain level)
- 309 • Process type (e.g. usage, service, CGM creation process, CSA)
- 310 • Process target period (e.g. time frame, target period)
- 311 • Document or process status (e.g. coordination run, iteration, document status)
- 312 • Data on the tool that created the data (e.g. Name of the tool and version or release)
- 313 • Data on Process Settings (e.g. power flow settings)

314 All requirements were reviewed and identified which of the requested data fields are overlapping
 315 in terms of meaning. A harmonization effort was performed and as a result a smaller set of data
 316 fields remained to be described and included in the proposed solution.

317 It has been taken into account that both CGMES v2.4 (IEC TS 61970-600-1 and -2) and CGMES
318 v3.0 (IEC 61970-600-1 and -2) utilize the header and metadata definitions by IEC 61970-552
319 with minimal adaptations. Within ENTSO-E and IEC there are discussions and standardisation
320 work in progress which is focused on defining dedicated data model and profiles related to the
321 exchange of metadata. These efforts aim at separation of the metadata from the instance data
322 related to the so called “content” profiles.

323 Considering this several W3C recommendations which are used worldwide and are positively
324 recognised by the European Commission (EC) were investigated. The analysis of available
325 material from W3C and EC concluded that it is recommended to design a solution which mainly
326 uses Provenance ontology (PROV-O²), Time Ontology and Data Catalog Vocabulary (DCAT³).
327 However, in cases where it is not possible to find necessary information in the ontologies the
328 project agreed to extend with properties under European metadata namespace (eumd).

329 The header/metadata requires availability of a set of reference metadata. For instance, the
330 attribute prov:wasGeneratedBy requires a reference to an activity which produced the model or
331 the related process. The activities are defined as reference metadata and their identifiers are
332 referenced from the header to enable the receiving entity to retrieve the “static” (reference)
333 information that it is not modified frequently. This approach imposes a requirement that both
334 the sending entity and the receiving entity have access to a unique version of the reference
335 metadata. Therefore, each business process shall define which reference metadata is used and
336 where it is located.

337 The proposed solution based on W3C approach will support any direction chosen in future,
338 including the manifest approach currently under discussion in the scope of IEC 61970-303. In
339 addition, the use of W3C ontologies will enable implementors to use a wide range of tooling not
340 necessary designed for power system modelling, but which can interpret and visualise metadata
341 natively.

342 In order to link between W3C Time Ontology, W3C Provenance ontology, W3C DCAT, the
343 existing header defined in IEC 61970-552 was extended with attributes and associations. It
344 should be noted that the objective is to extend the existing header and the task to finalise the
345 canonical model clarifying all details, which are to a large extent related to overall metadata
346 exchange, is still to happen. In addition, this work faces multiple constraints such as profiling
347 methods are currently not designed for metadata related profiles, the backwards compatibility,
348 etc. Various directions were considered and the option to not introduce nested structure in the
349 document header in order to keep the same kind of exchange as currently done. However, this
350 is seen as a transition and to fully utilize W3C DCAT and Provenance next versions will need
351 to be allowed to go beyond current practices. Especially for the purpose of manifest data
352 exchange and in the description of provenance of the data. Therefore the approach to extend
353 the md:Model class, published with version 2.3 of this specification, was taken to support a
354 transition to new header setup. The feedback received from SV-IOP in July 2024 highlighted
355 the complexity of using md:Model. Therefore this version of the specification focuses on the
356 metadata using dcat:Dataset and provides guidance to support the transition process.

357 Dataset metadata related to reference data and manifest shall use dcat:Dataset as defined in
358 this document.

359 **5.3 Dataset (Model), Distribution (Document) and its header**

360 W3C DCAT-3 introduces terminology for Dataset and Distribution which can be applied to CIM
361 based data exchanges. DCAT Dataset is matching with Model and DCAT Distribution is
362 matching with Document, which represent the instance data of a model serialised in some form,
363 e.g., CIM XML. The Distribution has a header which provides basis metadata information that
364 is referred from the Manifest (which described the rest of the metadata).

² [PROV-O: The PROV Ontology \(w3.org\)](https://www.w3.org/2011/prov/)

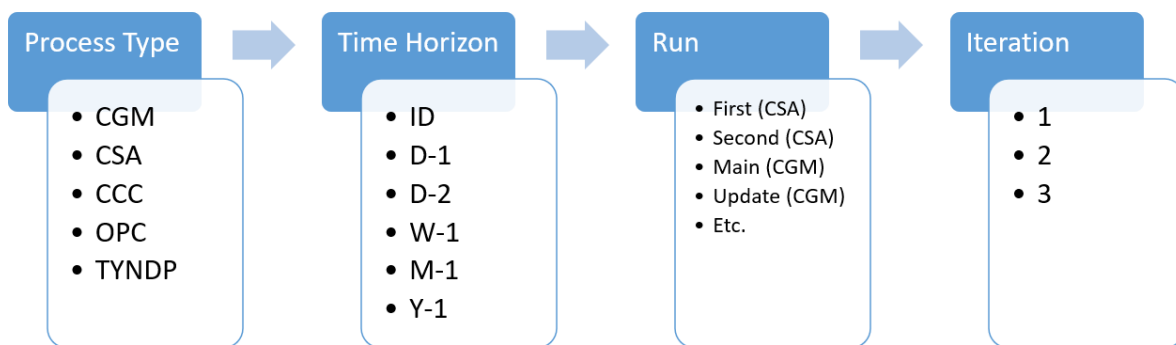
³ [Data Catalog Vocabulary \(DCAT\) - Version 3 \(w3.org\)](https://www.w3.org/2014/01/07-data-catalog-vocab/)

365 At present stage the header contains information about the metadata related to the dataset as
366 well as its serialisation – the distribution. This is considered intermediate solution until the
367 overall framework and manifest exchange is standardised.

368 5.4 Business Process, Time Horizon, Run and Iteration

369 Information related to the relationship between business process, time horizon, run and iteration
370 is important for the functioning of the business processes. The information provided here is not
371 meant to be directly used in the dataset metadata, but it needs to be taken into account when
372 reference data is prepared. Then this reference data is referred to from the dataset metadata
373 (header).

374 A concept was introduced to reason about granularity of the Business. The idea is to enable
375 data provider to implicitly indicate for which Business Process sub process the data is intended
376 for and the Service Provider to explicitly indicate in which Business Process sub process the
377 data was generated in.



378

379 **Figure 3. Business Granularity**

380 It is essential to allow that different input data is used for different business sub processes. For
381 example, if data provider does not plan to update their data for specific Run and Iteration, then
382 they only need to define the Process Type and Time Horizon and Service Provider can pick up
383 the latest version of data with that metadata for each Run and Iteration. Data Provider could
384 also want to provide data without Time Horizon or Process Type, if they do plan to use exactly
385 the same data in different Time Horizons and Processes.

386 W3C PROV vocabulary is used to describe the content of the different actions part of the
387 business processes.

388 The following principles apply to the setup of the actions as prov:Activity

- 389 • Actions shall be defined as part of the reference data and be available. The pattern for
390 the URL is [https://energy.referencedata.eu/{Process}-{Timeframe}-{Run}-](https://energy.referencedata.eu/{Process}-{Timeframe}-{Run}-{Profile_keyword})
391 [{Profile_keyword}](https://energy.referencedata.eu/{Process}-{Timeframe}-{Run}-{Profile_keyword}), where
 - 392 ○ {Process} identifies the business process such as CGM, TYNDP, CSA, CC,
393 OPC, STA, etc.
 - 394 ○ {Timeframe} is the defined timeframes that are valid for the business processes.
395 Examples for timeframes are real time (RT), intraday (ID), day ahead (1D), two-
396 days ahead (2D), week ahead (WK), month ahead (MO), year ahead (YR), tan
397 years ahead (TY)
 - 398 ○ {Run} is the coordination run which some processes have for instance intraday
399 coordination run 1 (ID-1), day ahead coordination run 2 (1D-2)

400 ○ {Profile_keyword} the keyword of the profile, e.g. EQ for equipment profile.

401 However not all actions are required to follow the same pattern.

402 • The dataset metadata that is included in the instance data that is exchanged includes a
403 property prov:wasGeneratedBy which refers to the action defined in the reference data.

404 • Reference data also includes actions that cover the verification of data. For instance,
405 the URL of an action to verify instance data that conforms to equipment profile will be
406 https://energy.referencedata.eu/CGM-EQ-VF

407 **5.5 Process settings**

408 Definitions and SimulationSettings profile defined in IEC 61970-457:2024 are used to cover the
409 exchange of power flow calculation settings.

410 **6 Application profile specification**

411 **6.1 Version information**

412 The content is generated from UML model file CIM17-2_CGMES31v01_PROF-
413 20v02_NC23v65_MS10v01_DES10v01.eap.

414 The document header profile uses extensions. The prefix and the uri of the namespaces used
415 are as follows:

416 - Prefix: dcat; URI: <http://www.w3.org/ns/dcat#> - namespace defined by W3C

417 - Prefix: dcat-cim; URI: <https://cim4.eu/nc/dcat-cim#> - namespace defined by ENTSO-E

418 - Prefix: dcterms; URI: <http://purl.org/dc/terms/#> - namespace defined by W3C, note that
419 # sign is added in order to cope with CIM XML serialisation

420 - Prefix: adms; URI: <http://www.w3.org/ns/adms#> - namespace defined by W3C

421 - Prefix: prov; URI: <http://www.w3.org/ns/prov#> - namespace defined by W3C

422 **6.1.1 Distribution (Document header profile)**

423 - Title: Dataset metadata vocabulary

424 - Keyword: DM

425 - Description: This vocabulary is describing the dataset metadata profile.

426 - Version IRI: <https://ap-voc.cim4.eu/DatasetMetadata/2.4>

427 - Version info: 2.4.0

428 - Prior version:

429 - Conforms to: urn:iso:std:iec:61970-401:draft:ed-1|urn:iso:std:iec:61970-501:draft:ed-
430 2

431 - Identifier: urn:uuid:f7bb07f7-8614-4ff5-88da-2b4824b143f1

432 **6.2 Profile constraints**

433 This clause defines requirements and constraints that shall be fulfilled by applications that
434 conform to this document. The naming of the rules shall not be used for machine processing.

435 The rule names are just a string. The naming convention of the constraints is as follows.

436 “{rule.Type}:{rule.Standard}:{rule.Profile}:{rule.Property}:{rule.Name}”

437 where

438 rule.Type: C – for constraint; R – for requirement

439 rule.Standard: the number of the standard e.g. 301 for 61970-301, 456 for 61970-456, 13 for
440 61968-13. 61970-600 specific constraints refer to 600 although they are related to one or
441 combination of the 61970-450 series profiles. For document header, DH is used. For reference
442 data, RD is used.

443 rule.Profile: the abbreviation of the profile, e.g. TP for Topology profile. If set to “ALL” the
444 constraint is applicable to all IEC 61970-600 profiles.

445 rule.Property: for UML classes, the name of the class, for attributes and associations, the name
446 of the class and attribute or association end, e.g. EnergyConsumer, IdentifiedObject.name, etc.
447 If set to “NA” the property is not applicable to a specific UML element.

448 rule.Name: the name of the rule. It is unique for the same property.

449 Example: C:600:ALL:IdentifiedObject.name:stringLength

450 This document is the master for rules and constraints tagged "MD". For the sake of self-
451 containment, the list below also includes a copy of the relevant rules from IEC 61970-452,
452 tagged "452".

453 • C:452:ALL:NA:datatypes

454 According to 61970-501, datatypes are not exchanged in the instance data. The
455 UnitMultiplier is 1 in cases none value is specified in the profile.

456 • R:452:ALL:NA:exchange

457 Optional and required attributes and associations must be imported and exported if they
458 are in the model file prior to import.

459 • R:452:ALL:NA:exchange1

460 If an optional attribute does not exist in the imported file, it does not have to be exported
461 in case exactly the same data set is exported, i.e. the tool is not obliged to automatically
462 provide this attribute. If the export is resulting from an action by the user performed after
463 the import, e.g. data processing or model update the export can contain optional
464 attributes.

465 • R:MD:ALL:NA:exchange

466 The selection of optional and required attributes as well as their cardinality is made so
467 as to ensure a minimum set of required attributes without which the exchange does not
468 fulfil its basic purpose. Business processes governing different exchanges can require
469 mandatory exchange of certain optional attributes or associations or restrict the usage
470 of some attributes, without modifying their meaning. Optional and required attributes
471 and associations shall therefore be supported by applications which claim conformance
472 with this document. This provides flexibility for the business processes to adapt to
473 different business requirements and base the exchanges on profile compliant
474 applications.

475 • R:MD:ALL:NA:exchange1

476 An exporter may, at his or her discretion, produce a serialization containing additional
477 data described by the metadata profiles or in a custom namespace. This data is not
478 subject to extensive data validation and shall not invalidate the document which is
479 exchanged.

- 480 • R:MD:ALL:NA:previousHeader

481 The present version of the header contains all attributes defined in IEC 61970-552. This
482 is done only for the purpose of having one vocabulary for header and to ensure transition
483 for data exchanges that are using IEC 61970-552:2016 header. New profiles shall not
484 use previous header attributes but rely only on the new attributes.

- 485 • R:MD:ALL:NA:BoundaryIdentification

486 dcterms:spatial is used to identify the boundary set. This is done by referring to the
487 boundary frame as follows:

```
488 <dcterms:spatial  
489 rdf:resource="https://energy.referencedata.eu/Frame/BoundaryModel"/> .
```

- 490 • C:MD:ALL:Dataset.conformsTo:cardinality

491 dcterms:conformsTo is required only if the dataset conforms to all validation constraints
492 defined for the profile. In case the dataset does not conform to the profile the
493 dcterms:conformsTo is not exchanged. It is expected that datasets that are exchanged
494 conform to at least one profile. An exception to this rule is the boundary dataset where
495 dcterms:conformsTo is not provided because 1) it is assumed that there is another
496 process that makes the boundary dataset valid and 2) the boundary dataset can contain
497 objects that are not necessarily conforming to a profile.
498 R:MD:ALL:NA:BoundaryIdentification is used to identify the boundary dataset.

499

500 6.3 Available Application Profiles

501 The following artifacts and application profiles are available:

- 502 • Enterprise architect project file
- 503 • RDFS: The RDFS for the header is generated by CimSyntaxGen. The version (type of
504 export) of RDFS v2020 which represents an augmented version of IEC 51970-501.
505 Version information related to the RDFS is included in an ontology-based file header of
506 the RDFS.
- 507 • SHACL constraints for the header: In this release only basic SHACL shapes are derived.
508 In case of additional requirements and dependencies are found the set of constraints
509 can be further developed.

510 6.4 Metadata (Header) Serialisation

511 To support transition, process the header follows most of the serialisation principles defined in
512 IEC 61970-552. However new attributes added to the md:Model class follow principles defined
513 by W3C RDF-serialisation RDF/XML version 1.1. The difference is that in IEC 61970-552, which
514 is inspired by an earlier version of the standard, the predicate of the triple i.e., the property
515 (attribute or association) of the instantiated class has the following notation:

516 {Class}.{Property}, e.g. md:Model.scenarioTime

517 while the new properties are serialised without the {Class} notation, e.g.

518 • dcat:keyword not dcat:Model.keyword

519 • dcterms:conformsTo not dcterms:Model.conformsTo

520 This rule applies for new attributes that are defined in DCAT, Dublin Core terms⁴ and PROV
521 vocabularies used in the header.

522 It should be taken into account that header definitions, in general, are not following all rules in
523 CIM. For instance, when CIM classes are defined and serialised attributes (serialised as literal
524 in RDF serialisation) have cardinality 0..1, while in the header a literal (attribute) can have
525 cardinality 0..*. This is the case in the existing header defined in IEC 61970-552 where
526 md:Model.profile is defined as literal and cardinality 0..*. In the new header defined in this
527 document this rule applied for dcat:keyword. Since update of the header need to be done by
528 create a new version, there is no need to be able to identify the separate dcat:keyword.

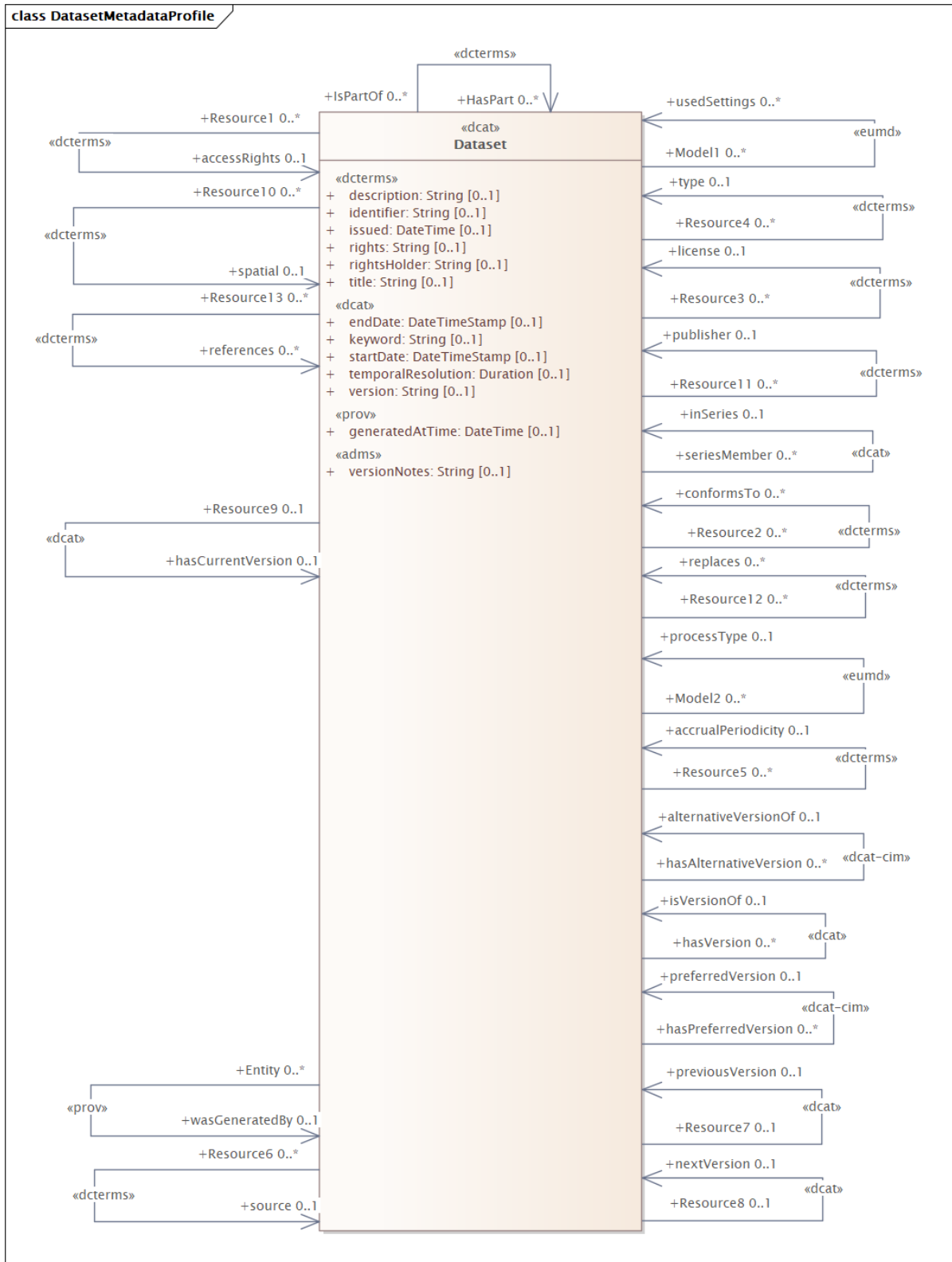
529 Chapter 7 lists the relationships in the distribution header. In order to conform with W3C and
530 be able to serialise some properties as rdf:resource, it was necessary that they are modelled
531 as self-associations to md:Model class. This is why in Chapter 7 tables, there are many
532 references to md:Model. It should be noted that in many cases these associations are not to a
533 md:Model but is referencing dcat:Resource that can be reference data or dataset.

534 **7 Detailed dataset metadata specification**

535 **7.1 General**

536 The package describes the profile of metadata for dataset and distribution.

⁴ [DCMI: DCMI Metadata Terms \(dublincore.org\)](http://dublincore.org/)



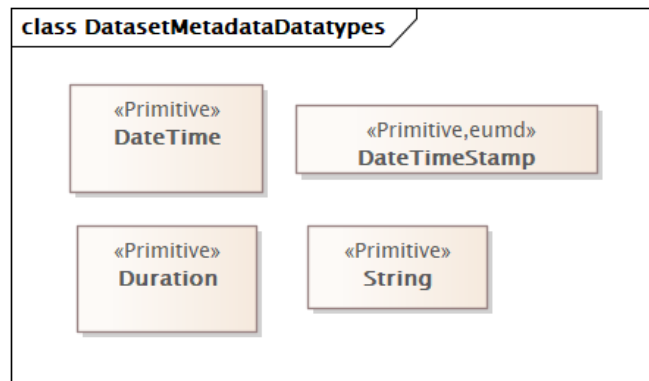
537

538

Figure 4 – Class diagram DatasetMetadataProfile::DatasetMetadataProfile

539

Figure 4: The diagram defines the profile of metadata for dataset and distribution.



540

541 **Figure 5 – Class diagram DatasetMetadataProfile::DatasetMetadataDatatypes**

542 Figure 5: The diagram shows datatypes that are used by classes in the profile. Stereotypes are
 543 used to describe the datatypes. The following stereotypes are defined:

544 <<enumeration>> A list of permissible constant values.

545 <<Primitive>> The most basic data types used to compose all other data types.

546 <<CIMDatatype>> A datatype that contains a value attribute, an optional unit of measure and
 547 a unit multiplier. The unit and multiplier may be specified as a static variable initialized to the
 548 allowed value.

549 <<Compound>> A composite of Primitive, enumeration, CIMDatatype or other Compound
 550 classes, as long as the Compound classes do not recurse.

551 For all datatypes both positive and negative values are allowed unless stated otherwise for a
 552 particular datatype.

553 **7.2 (dcat) Dataset root class**

554 A collection of data, published or curated by a single source, and available for access or
 555 download in one or more representations.

556 Table 1 shows all attributes of Dataset.

557

Table 1 – Attributes of DatasetMetadataProfile::Dataset

name	mult	type	description
temporalResolution	0..1	Duration	(dcat) Minimum time period resolvable in a dataset. [CIM context: Describes the Market Time Unit (MTU), e.g. hourly, 15 min., etc.]
description	0..1	String	(dcterms) A free-text account of the resource. Description may include but is not limited to: an abstract, a table of contents, a graphical representation, or a free-text account of the resource.
identifier	0..1	String	(dcterms) A unique identifier of the resource being described or cataloged. The identifier might be used as part of the IRI of the resource, but still having it represented explicitly is useful. The identifier is a text string which is assigned to the resource to provide an unambiguous reference within a particular context. [CIM context: A unique identifier of the model which is serialised in the document where the header is located. The identifier is persistent for a given

name	mult	type	description
			<p>version of the model and shall change when the model changes.</p> <p>If a model is serialized as complete (full) model or as difference model exchange the identifier shall be the same. The identifier shall not be used as an identifier of the document which can be different for a given version of a model.].</p>
issued	0..1	DateTime	<p>(dcterms) Date of formal issuance of the resource.</p> <p>Recommended practice is to describe the date, date/time, or period of time as recommended for the property Date, of which this is a subproperty.</p> <p>[CIM context: Reference to the date that the complete data set was made valid/available.].</p>
keyword	0..1	String	<p>(dcat) A keyword or tag describing a resource.</p> <p>[CIM context: The intended content type of the model, usually the profile keyword. Used to identify what profiles and content is expected in the document, e.g., Equipment, Boundary, SSH, AE, etc. The same keyword is used for different versions of same profile. It can be also used to identify different content based on the same profile.</p> <p>For instance, as the equipment profile can be used for both boundary data and equipment not related to boundary, the keyword is different to indicate that boundary data is exchanged. In order to avoid ambiguity the property is not exchanged in cases where the document contains multiple profiles referenced by dcterms:conformsTo.].</p>
rights	0..1	String	<p>(dcterms) A statement that concerns all rights not addressed with dct:license or dct:accessRights, such as copyright statements.</p>
rightsHolder	0..1	String	<p>(dcterms) Information about rights held in and over the resource.</p> <p>Typically, rights information includes a statement about various property rights associated with the resource, including intellectual property rights. Recommended practice is to refer to a rights statement with a URI. If this is not possible or feasible, a literal value (name, label, or short text) may be provided.</p>
title	0..1	String	<p>(dcterms) A name given to the resource.</p> <p>[CIM context: The human readable name of the dataset that can form the instance file name.]</p>
version	0..1	String	<p>(dcat) The version indicator (name or identifier) of a resource.</p>
versionNotes	0..1	String	<p>(adms) A description of changes between this version and the previous version of the resource.</p>
endDate	0..1	DateTimeStamp	<p>(dcat) This property contains the end of the period.</p> <p>[CIM context: The end date and time of the validity period of the model that it is serialized in the document where the header is located. It is only used in relation to the startDate property which indicates</p>

name	mult	type	description
			the beginning of the validity period of the model.].
startDate	0..1	DateTimeStamp	(dcat) This property contains the start of the period. [CIM context: The date and time that this model represents, i.e. for which the model is (or was) valid. It indicates the beginning of the validity period. It is indicating either an instant (in cases where the model is only valid for a point in time) or the start time of a period. If not provided the model is considered valid for any time stamp. The format is an extended format according to the ISO 8601-2005. European exchanges shall refer to UTC.].
generatedAtTime	0..1	DateTime	(prov) Generation is the completion of production of a new entity by an activity. This entity did not exist before generation and becomes available for usage after this generation. [CIM context: The date and time when the model was serialized in the document where the header is located. The format is an extended format according to the ISO 8601-2005. European exchanges shall refer to UTC.].

558

559 Table 2 shows all association ends of Dataset with other classes.

560

Table 2 – Association ends of DatasetMetadataProfile::Dataset with other classes

mult from	name	mult to	type	description
0..*	wasGeneratedBy	0..1	Dataset	(prov) Generation is the completion of production of a new entity by an activity. This entity did not exist before generation and becomes available for usage after this generation. [CIM context: Reference to an activity or the exact business nature (process, configuration) which produced or uses the model.].
0..*	source	0..1	Dataset	(dcterms) A related resource from which the described resource is derived. This property is intended to be used with non-literal values. The described resource may be derived from the related resource in whole or in part. Best practice is to identify the related resource by means of a URI or a string conforming to a formal identification system.
0..1	previousVersion	0..1	Dataset	(dcat) The previous version of a resource in a lineage. This property is meant to be used to specify a version chain, consisting of snapshots of a resource. The notion of version used by this property is limited to versions resulting from revisions occurring to a resource as part of its life-cycle. One of the typical cases here is representing the history of

mult from	name	mult to	type	description
				the versions of a dataset that have been released over time.
0..1	nextVersion	0..1	Dataset	(dcat) The next version for the resource.
0..*	isVersionOf	0..1	Dataset	(dcat) This resource has a more specific, versioned resource. This property is intended for relating a non-versioned or abstract resource to several versioned resources, e.g., snapshots. The notion of version used by this property is limited to versions resulting from revisions occurring to a resource as part of its life-cycle. Therefore, its semantics is more specific than its super-property dcterms:hasVersion, which makes use of a broader notion of version, including editions and adaptations.
0..1	hasCurrentVersion	0..1	Dataset	(dcat) This resource has a more specific, versioned resource with equivalent content. This property is intended for relating a non-versioned or abstract resource to a single snapshot that can be used as a permalink to indicate the current version of the content. The notion of version used by this property is limited to versions resulting from revisions occurring to a resource as part of its life-cycle.
0..*	spatial	0..1	Dataset	(dcterms) The geographical area covered by the dataset. [CIM context: The responsibility area that multiple model can describe, also referred to frame.]
0..*	accrualPeriodicity	0..1	Dataset	(dcterms) The frequency with which items are added to a collection. [CIM context: Reference to the time frame.]
0..*	type	0..1	Dataset	(dcterms) The nature or genre of the resource. Recommended practice is to use a controlled vocabulary such as the DCMI Type Vocabulary [DCMI-TYPE]. To describe the file format, physical medium, or dimensions of the resource, use the property Format.
0..*	license	0..1	Dataset	(dcterms) A legal document giving official permission to do something with the resource. Recommended practice is to identify the license document with a URI. If this is not possible or feasible, a literal value that identifies the license may be provided. [CIM context: Reference to the license under which the data is made available. If no license holder is defined, then the original data provider holds the license.]
0..*	publisher	0..1	Dataset	(dcterms) An entity responsible for making the resource available.

mult from	name	mult to	type	description
				[CIM context: The agent that is publishing the dataset on the given platform.]
0..*	conformsTo	0..*	Dataset	(dcterms) An established standard to which the described resource conforms. [CIM context: An IRI describing the profile that governs this model. It uniquely identifies the profile and its version. Multiple instances of the property describe all standards or specifications to which the model and the document representing this model conform to. A document would normally conform to profile definitions, the constraints that relate to the profile and/or the set of business specific constrains. A reference to a machine- readable constraints or specification indicates that the document was tested against these constraints and it conforms to them.]
0..*	replaces	0..*	Dataset	(dcterms) A related resource that is supplanted, displaced, or superseded by the described resource [CIM context: The referenced dataset is being replaced by this dataset.]
0..*	references	0..*	Dataset	(dcterms) A related resource that is referenced, cited, or otherwise pointed to by the described resource[. [CIM context: The referenced resource that is being complemented in this dataset, e.g. SSH is referencing EQ.]
0..*	accessRights	0..1	Dataset	(dcterms) Information about who access the resource or an indication of its security status. Access Rights may include information regarding access or restrictions based on privacy, security, or other policies. [CIM context: Reference to the confidentiality level that shall be applied when handling this model.]
0..*	processType	0..1	Dataset	(eumd) The exact business nature. Reference to Business Process configurations.
0..*	usedSettings	0..*	Dataset	(eumd) Reference to a set of parameters describing used settings (e.g. power flow settings, process settings, etc.) applied to the model prior its serialisation.
0..*	inSeries	0..1	Dataset	(dcat) A dataset series of which the dataset is part.
0..*	alternativeVersionOf	0..1	Dataset	(dcat-cim) This resource is an alternative version of a non-versioned or abstract resource. This property is intended for relating a versioned resource to a non-versioned

mult from	name	mult to	type	description
				or abstract resource at the same time express that multiple versions exist. dcat-cim:alternativeVersionOf is a specialisation of dcat:isVersionOf with the restriction that the resource shall have a preferred version (dcat-cim:preferredVersion) so that the preferred dataset can be used when there is no need to access all alternative versions.
0..*	preferredVersion	0..1	Dataset	(dcat-cim) The preferred version of a resource in a lineage of alternative versions. This property is used to specify a specific version to be the preference in a chain of alternatives, consisting of snapshots of a resource.
0..*	HasPart	0..*	Dataset	(dcterms) The dataset which is part of another dataset.

561

562 **7.3 DateTime primitive**

563 Date and time as "yyyy-mm-ddThh:mm:ss.sss", which conforms with ISO 8601. UTC time zone
564 is specified as "yyyy-mm-ddThh:mm:ss.sssZ". A local timezone relative UTC is specified as
565 "yyyy-mm-ddThh:mm:ss.sss-hh:mm". The second component (shown here as "ss.sss") could
566 have any number of digits in its fractional part to allow any kind of precision beyond seconds.

567 **7.4 String primitive**

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

570 **7.5 Duration primitive**

571 Duration as "PnYnMnDTnHnMnS" which conforms to ISO 8601, where nY expresses a number
572 of years, nM a number of months, nD a number of days. The letter T separates the date
573 expression from the time expression and, after it, nH identifies a number of hours, nM a number
574 of minutes and nS a number of seconds. The number of seconds could be expressed as a
575 decimal number, but all other numbers are integers.

576 **7.6 (eumd) DateTimeStamp primitive**

577 Position of an instant, expressed using xsd:dateTimeStamp, in which the time-zone field is
578 mandatory.

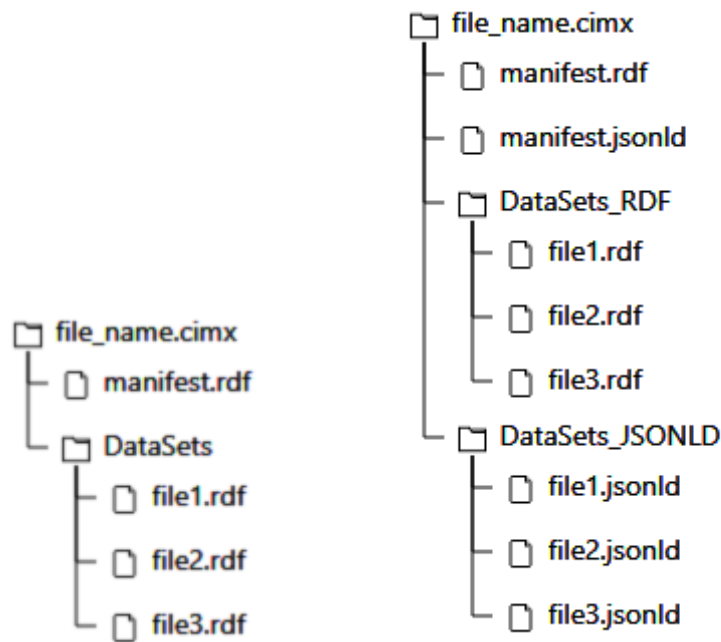
579 **8 Metadata packaging**

580 **8.1 General**

581 The approach on data packaging is inspired by [Office Open XML File Formats specification](#). In
582 short, it means that this specification uses the .cimx extension for indicating packaging rather
583 than just using .zip.

584 Using the extension .cimx allows to understand that this file can directly be read by using
585 efficient data parsing technique and not necessarily unzipped, stored separately and then
586 processed. In any case both options are still available, but with this technique the
587 implementations are leaner.

588 The data package of cimx can include different structure. The following figure illustrates two
589 options.



590

591

Figure 6. Structure of cimx

592 The structure allows different organisation of the data depending on the serialisation format
 593 used for this data. It is not meant that such structure is required. The only required part is that
 594 there is manifest.xml in the root of the structure. Subfolders are optional and only facilitate data
 595 organisation.

596 Note that specifications related to JSON-LD are still to be developed, so this should be
 597 considered in future releases.

598 Manifest file explains the content of the package. It can be in different serialisation forms, but
 599 the content shall be identical. The name of the file shall be manifest, the file extension will be
 600 different depending on the serialisation format.

601 The manifest file is based on DCAT. Reference data folder contains different reference data in
 602 different serialisation forms referenced from the manifest. Selections of different serialisation
 603 forms can change over time and different business processes can pick the form they need. For
 604 instance, a given process can use a subset of reference data provided by OPDE in a single
 605 serialisation form and then transition to other serialisation forms.

606 This approach is applied for any package. It could be all files though history (e.g., year ahead
 607 process) or just only one time stamp. The package can also contain boundary data in cases
 608 where it is desired to package boundary data and reference data in one package. The general
 609 approach is that the package can contain any file and the manifest describes it. The business
 610 processes will decide how this will be applied for different use cases. Inclusion of more data in
 611 the package supports applications that are in secure environment that cannot link to any outside
 612 sources.

613 8.2 Manifest specification

614 Manifest specification is built on DCAT, namely using the classes `dcatalog:Catalog`, `dcatalog:Dataset`,
 615 `dcatalog:DatasetSeries` and `dcatalog:Distribution`. Figure 7 provides information on what is included in
 616 DCAT and the relationships. This manifest specification follows the main concepts outlines in
 617 DCAT and further specifies how this is used for CIM based data exchanges.

618 The manifest instance file has the following main elements:

- 619 • A file header which is using the main dcat:Catalog
- 620 • A file body which contains classes describing the content of the manifest.

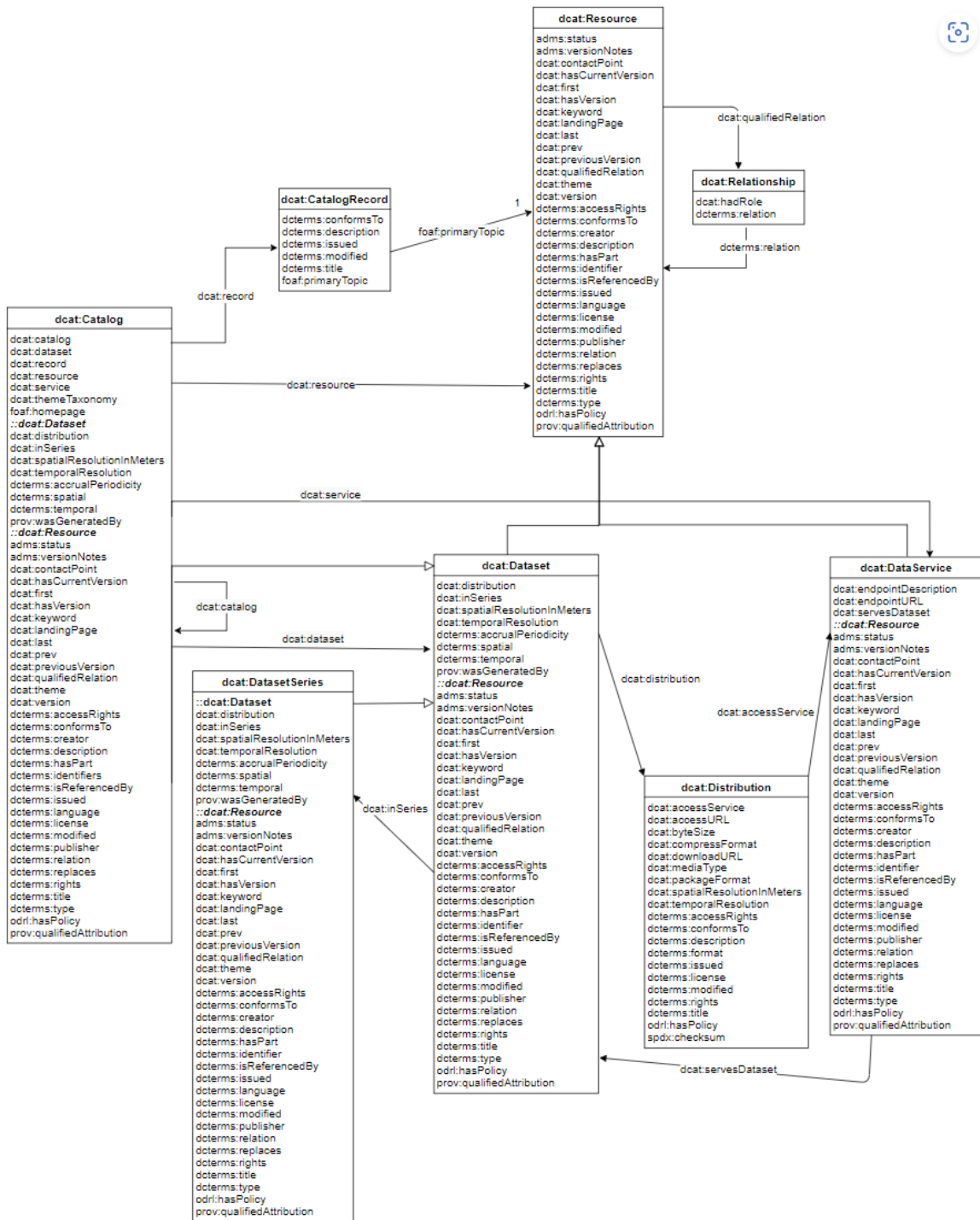
621 In general, the objective of the manifest instance file is to provide a linking mechanism between
622 different datasets and their distributions (instances of datasets in different serialisation formats,
623 e.g. a pdf document of a profile, CIMXML serialisation of a profile or dataset, JSON-LD
624 serialisation, etc.).

625 This document focuses on reference data, but the manifest specification is applicable to
626 reference data as well as other data exchanges which involve CGMES or NC profiles.

627 8.2.1 Manifest file/document header

628 The file header for the manifest uses dcat:Catalog. The following commented example
629 illustrates the usage. In case of multiple dcat:Catalog objects in the manifest then main
630 dcat:Catalog serves as a header of the manifest.

```
631 <dcat:Catalog rdf:about="urn:uuid:4261296f-4625-4a92-9b8e-ab5369f29a86"> <!-- the ID of the
632 manifest catalog which is serialised in this instance file -->
633 <dcterms:modified>2022-09-16T11:29:33.781670</dcterms:modified> <!-- Indicates when the
634 content of the data was modified-->
635 <dcat:startDate>2022-09-17T13:30:00Z</dcat:startDate> <!-- Indicates the start date for
636 the validity of this manifest instance file. This property is a result of flattening of the
637 dcterms:temporal in order to avoid usage of compound in the header.-->
638 <dcat:endDate>2023-01-17T13:30:00Z</dcat:endDate> <!-- Indicates the end date for the
639 validity of this manifest instance file. This property is a result of flattening of the
640 dcterms:temporal in order to avoid usage of compound in the header.-->
641 <dcat:version>2.0.0</dcat:version> <!-- the current version-->
642 <dcterms:title>OPDE Reference data</dcterms:title>
643 <dcterms:identifier> 4261296f-4625-4a92-9b8e-ab5369f29a86</dcterms:identifier>
644 <dcterms:description xml:lang="en">Manifest for OPDE reference data</dcterms:description>
645 <adms:versionNotes xml:lang="en">This version includes update version of BaseVoltage
646 reference data</adms:versionNotes>
647 <dcat:previousVersion rdf:resource="urn:uuid:6c64405d-0142-48ff-91cf-111f69255d67"/> <!--
648 the ID of the previous version of a manifest.-->
649 <dcterms:replaces rdf:resource="urn:uuid:6c64405d-0142-48ff-91cf-111f69255d67"/> <!--
650 the ID of the previous version of a manifest, which this version is replacing.-->
651 <dcterms:catalog rdf:resource="urn:uuid:5c4ab034-a673-4af6-a2af-35de5cc2dfce"/> <!--
652 the ID of other catalogs present in the manifest.-->
653 <dcterms:catalog rdf:resource="urn:uuid:1497b3f4-71fb-4bad-a55f-9ace42555aec"/> <!--
654 the ID of other catalogs present in the manifest.-->
655
656 </dcat:Catalog>
657
```



658

659

660

Figure 7. Overview of DCAT model, showing the classes of resources that can be members of a Catalog, and the relationships between them.

661

8.2.2 Manifest file/document body

662

663

664

665

Using DCAT and the classes related to the dcat:Catalog, a relationship between abstract entities can be described. For instance, a dcat:Catalog for reference data includes a dcat:Dataset representing reference data for base voltages as well as a reference data (another

666 dcat:Dataset) for confidentiality. This abstract description of the relationship can include also
667 information on different data services described by using dcat:DataService. The description of
668 abstract entities and the relationship between them would be used in the implementation of
669 different applications that would need to understand the process.

670 Here for the purpose of the manifest only concrete instances are included as the manifest needs
671 to contain all references to various parts of reference data for the purpose of a process.

672 The commented example below specifies how DCAT is used to support the package of
673 reference data. Note that the manifest can also include references to boundary datasets as they
674 could be seen as part of reference data.

675 Although the example presented below serialises dcat:Dataset and dcat:Distribution as well
676 defined RDF nodes, i.e. not blank nodes, it is possible that blank nodes serialisation is used as
677 the dcat:Distribution does not need rdf:about identifier and dcat:Dataset has separate property
678 dcterms:identifier.

679 A. One Catalog that is describing the collection of files related to boundary data. The
680 example includes one Dataset which is representing Equipment Boundary dataset and
681 two distributions in CIMXML and JSON-LD. Note that if the boundary equipment data is
682 separated in different datasets (instance files) that represent boundary points per border
683 between two MAS, there will be multiple dcat:Dataset objects in this dcat:Catalog.

```
684 <dcat:Catalog rdf:about="urn:uuid:5c4ab034-a673-4af6-a2af-35de5cc2dfce"> <!-- the
685 ID of the catalog which is serialised in this instance file-->
686 <dcterms:identifier> 5c4ab034-a673-4af6-a2af-35de5cc2dfce</dcterms:identifier>
687 <dcterms:modified>2022-09-15T11:29:33.781670</dcterms:modified> <!-- Indicates
688 when the content of the data was modified-->
689 <dcat:startDate>2022-09-16T13:30:00Z</dcat:startDate> <!-- Indicates the start
690 date for the validity of this catalog. This property is a result of flattening of the
691 dcterms:temporal in order to avoid usage of compound in the header.-->
692 <dcat:endDate>2023-01-17T13:30:00Z</dcat:endDate> <!-- Indicates the end date
693 for the validity of this catalog. This property is a result of flattening of the
694 dcterms:temporal in order to avoid usage of compound in the header.-->
695 <dcat:version>2.0.0</dcat:version> <!-- the current version-->
696 <dcterms:title>Boundary data</dcterms:title>
697 <dcterms:description xml:lang="en">Boundary data for OPDE</dcterms:description>
698 <adms:versionNotes xml:lang="en">This version includes update version of boundary
699 points between Spain and Portugal.</adms:versionNotes>
700 <dcat:previousVersion rdf:resource="urn:uuid:32775166-3a1a-4556-92ba-
701 ee41f5e8a5c6"/> <!-- the ID of the previous version of the catalog.-->
702 <dcterms:replaces rdf:resource="urn:uuid:32775166-3a1a-4556-92ba-
703 ee41f5e8a5c6"/> <!-- the ID of the previous version of the catalog, which this
704 version is replacing.
705 <dcat:dataset rdf:resource="urn:uuid:e1ba0a36-0e27-4ce3-ba46-b386b20b89b0"/>
706 <!-- the reference to the dataset-->
707 </dcat:Catalog>
```

- Dataset which is representing Equipment Boundary dataset

```
711 <dcat:Dataset rdf:about="urn:uuid:e1ba0a36-0e27-4ce3-ba46-b386b20b89b0"> <!-- the ID of the
712 dataset which is representing boundary EQ instance file in different serialisations. This is
713 also the ID that would appear in the file header of the distribution instance file-->
714 <dcterms:identifier> e1ba0a36-0e27-4ce3-ba46-b386b20b89b0</dcterms:identifier>
715 <dcterms:modified>2022-09-16T11:29:33.781670</dcterms:modified> <!-- Indicates when the
716 content of the data was modified, in this example the content is instance of the EQ boundary--
717 >
718 <dcat:startDate>2022-09-17T13:30:00Z</dcat:startDate> <!-- Indicates the start date for
719 the validity of this dataset. This property is a result of flattening of the dcterms:temporal
720 in order to avoid usage of compound in the header.-->
721 <dcat:endDate>2023-01-17T13:30:00Z</dcat:endDate> <!-- Indicates the end date for the
722 validity of this dataset. This property is a result of flattening of the dcterms:temporal in
723 order to avoid usage of compound in the header.-->
724 <dcat:version>2.0.0</dcat:version> <!-- the current version-->
725 <dcterms:title>Equipment boundary</dcterms:title>
726 <dcterms:description xml:lang="en">Equipment boundary exported from
727 NMD</dcterms:description>
```

```

728     <adms:versionNotes xml:lang="en">This version includes update of two boundary
729 points</adms:versionNotes>
730     <dcat:previousVersion rdf:resource="urn:uuid:24d4bfa1-280d-4f07-95fa-4f1197bf3b27"/> <!--
731 the ID of the previous version of a boundary EQ.-->
732     <dcterms:replaces rdf:resource="urn:uuid:24d4bfa1-280d-4f07-95fa-4f1197bf3b27"/> <!-- the
733 ID of the previous version of a boundary EQ, which this version is replacing.-->
734     <dcat:distribution rdf:resource="urn:uuid:9841e818-0f6f-4d26-899a-bb0d05ecacfb"/> <!--
735 the ID of the CIMXML distribution of this dataset.-->
736     <dcat:distribution rdf:resource="urn:uuid:33320ecb-be41-43dc-b0a0-eab589a8244c"/> <!--
737 the ID of the JSON-LD distribution of this dataset.-->
738     </dcat:Dataset>
739
740     • two distributions in CIMXML and JSON-LD
741
742     <dcat:Distribution rdf:about="urn:uuid:9841e818-0f6f-4d26-899a-bb0d05ecacfb"> <!-- the ID of
743 the distribution. Used only for serialisation purposes. This could be URL if the distributions
744 are accessible via URL, e.g. https://test.org/distribution/1-->
745     <dcterms:description xml:lang="en">CIMXML serialisation of the boundary
746 EQ</dcterms:description>
747     <dcat:mediaType rdf:resource="https://www.iana.org/assignments/media-
748 types/application/rdf+xml"/> <!-- identifies that this is XML.-->
749     <dcat:compressFormat rdf:resource="https://www.iana.org/assignments/media-
750 types/application/zip"/> <!-- identifies that the compression is ZIP.-->
751     <dcterms:conformsTo>urn:iso:std:iec:61970-552:2016</dcterms:conformsTo> <!-- indicates to
752 which standard this distribution conforms to-->
753     <dcat:downloadURL rdf:resource="https://entsoe.eu/data/EQBDxml.zip"/> <!-- this is the URL
754 where the distribution can be downloaded. The attribute is primarily used when HTTP Get
755 request is possible-->
756     <dcat:accessURL rdf:resource="file://BoundaryData/EQBDxml.zip"/> <!-- It can be used to
757 refer to a zip file store in a folder structure -->
758     </dcat:Distribution >
759
760     <dcat:Distribution rdf:about="urn:uuid:33320ecb-be41-43dc-b0a0-eab589a8244c "> <!-- the ID
761 of the distribution. Used only for serialisation purposes. This could be URL if the
762 distributions are accessible via URL, e.g. https://test.org/distribution/1-->
763     <dcterms:description xml:lang="en">JSON-LD serialisation of the boundary
764 EQ</dcterms:description>
765     <dcat:mediaType rdf:resource="https://www.w3.org/ns/iana/media-types/application/ld-
766 json"/> <!-- identifies that this is JSON-LD.-->
767     <dcat:compressFormat rdf:resource="https://www.iana.org/assignments/media-
768 types/application/zip"/> <!-- identifies that the compression is ZIP.-->
769     <dcterms:conformsTo>urn:iso:std:iec:61970-553:draft:ed-1</dcterms:conformsTo> <!--
770 indicates to which standard this distribution conforms to. It can be URL as well:
771 https://www.w3.org/TR/json-ld11/ -->
772     <dcat:downloadURL rdf:resource="https://entsoe.eu/data/EQBDjsonld.zip"/> <!-- this is the
773 URL where the distribution can be downloaded. The attribute is primarily used when HTTP Get
774 request is possible-->
775     <dcat:accessURL rdf:resource="file://BoundaryData/EQBDjsonld.zip"/> <!-- It can be used to
776 refer to a zip file store in a folder structure-->
777     </dcat:Distribution >
778
779
780     B. One Catalog that is describing the collection of files related to reference data. The
781 example includes one Dataset which is representing reference data with base voltages
782 and one Dataset representing reference data on confidentiality. Each of the datasets
783 have one Distribution which is the CIMXML serialisation of the dataset. The logic is the
784 same as the Catalog for boundary data, thus some of the comments are not included in
785 the example below.
786
787 <dcat:Catalog rdf:about="urn:uuid:1497b3f4-71fb-4bad-a55f-9ace42555aec">
788 <dcterms:identifier> 1497b3f4-71fb-4bad-a55f-9ace42555aec</dcterms:identifier>
789 <dcterms:modified>2022-09-15T11:29:33.781670</dcterms:modified>
790 <dcat:startDate>2022-09-16T13:30:00Z</dcat:startDate>
791 <dcat:endDate>2023-01-17T13:30:00Z</dcat:endDate>
792 <dcat:version>2.0.0</dcat:version>
793 <dcterms:title>Reference data</dcterms:title>
794 <dcterms:description xml:lang="en">Reference data for OPDE</dcterms:description>
795 <adms:versionNotes xml:lang="en">This version includes update version of confidentiality
796 levels and additional 1 kV BaseVoltage.</adms:versionNotes>

```

```

797     <dcat:previousVersion rdf:resource="urn:uuid:7cd64129-e435-41f2-aaeb-9619181ef0e5"/>
798     <dcterms:replaces rdf:resource="urn:uuid:7cd64129-e435-41f2-aaeb-9619181ef0e5"/>
799     <dcat:dataset rdf:resource="http://energy.referencedata.eu/BaseVoltage"/> <!-- The
800 reference to the BaseVoltage reference data-->
801     <dcat:dataset rdf:resource="http://energy.referencedata.eu/Confidentiality"/> <!-- The
802 reference to the Confidentiality reference data-->
803     </dcat:Catalog>
804
805     • Dataset which is representing BaseVoltage reference dataset
806
807     <dcat:Dataset rdf:about="http://energy.referencedata.eu/BaseVoltage"> <!-- the ID of the
808 dataset which is representing Base voltage reference instance file in different
809 serialisations. This is also the ID that would appear in the file header of the distribution
810 instance file-->
811     <dcterms:identifier> 4261296f-4625-4a92-9b8e-ab5369f29a86</dcterms:identifier>
812     <dcterms:modified>2022-09-16T11:29:33.781670</dcterms:modified>
813     <dcat:startDate>2022-09-17T13:30:00Z</dcat:startDate>
814     <dcat:endDate>2023-01-17T13:30:00Z</dcat:endDate>
815     <dcat:version>2.0.0</dcat:version>
816     <dcterms:title>BaseVoltage reference data</dcterms:title>
817     <dcterms:description xml:lang="en">List of commonly used Base
818 Voltages</dcterms:description>
819     <adms:versionNotes xml:lang="en">This version includes 1kV BaseVoltage</adms:versionNotes>
820     <dcat:previousVersion rdf:resource="urn:uuid:e92cd151-a423-49fb-9293-90f1aa87495b"/>
821     <dcterms:replaces rdf:resource="urn:uuid:e92cd151-a423-49fb-9293-90f1aa87495b"/>
822     <dcat:distribution rdf:resource="urn:uuid:95d276f6-0f15-4b9d-a159-7526097d3d87"/> <!--
823 the ID of the CIMXML distribution of this dataset.-->
824     </dcat:Dataset>
825
826
827     • Dataset which is representing Confidentiality reference dataset
828
829     <dcat:Dataset rdf:about="http://energy.referencedata.eu/Confidentiality"> <!-- the ID of the
830 dataset which is representing Confidentiality reference data instance file in different
831 serialisations. This is also the ID that would appear in the file header of the distribution
832 instance file-->
833     <dcterms:identifier> 4d19c86f-884e-4e94-b8b5-386655d2fcb2</dcterms:identifier>
834     <dcterms:modified>2022-09-16T11:29:33.781670</dcterms:modified>
835     <dcat:startDate>2022-09-17T13:30:00Z</dcat:startDate>
836     <dcat:endDate>2023-01-17T13:30:00Z</dcat:endDate>
837     <dcat:version>2.0.0</dcat:version>
838     <dcterms:title>Confidentiality levels</dcterms:title>
839     <dcterms:description xml:lang="en">List of commonly used confidentiality
840 categories</dcterms:description>
841     <adms:versionNotes xml:lang="en">This version includes update adding confidentiality level
842 Public</adms:versionNotes>
843     <dcat:previousVersion rdf:resource="urn:uuid:4e2da394-cec6-4ef9-8814-6e76cd971693"/>
844     <dcterms:replaces rdf:resource="urn:uuid:4e2da394-cec6-4ef9-8814-6e76cd971693"/>
845     <dcat:distribution rdf:resource="urn:uuid:c85b471b-208a-4dd6-ad09-741cf29bad4c"/> <!--
846 the ID of the CIMXML distribution of this dataset.-->
847     </dcat:Dataset>
848
849     • two distributions in CIMXML – one for BaseVoltage dataset and one for Confidentiality dataset
850
851     <dcat:Distribution rdf:about="urn:uuid:95d276f6-0f15-4b9d-a159-7526097d3d87"> <!-- the ID of
852 the distribution. Used only for serialisation purposes. This could be URL if the distributions
853 are accessible via URL, e.g. https://test.org/distribution/1-->
854     <dcterms:description xml:lang="en">CIMXML serialisation of the base voltage reference
855 data</dcterms:description>
856     <dcat:mediaType rdf:resource="https://www.iana.org/assignments/media-
857 types/application/rdf+xml"/>
858     <dcat:compressFormat rdf:resource="https://www.iana.org/assignments/media-
859 types/application/zip"/>
860     <dcterms:conformsTo>urn:iso:std:iec:61970-552:2016</dcterms:conformsTo>
861     <dcat:downloadURL rdf:resource="http://energy.referencedata.eu/BaseVoltage"/>
862     <dcat:accessURL rdf:resource="file://ReferenceData/BaseVoltage_CIMXML.zip"/>
863     </dcat:Distribution >
864
865     <dcat:Distribution rdf:about="urn:uuid:c85b471b-208a-4dd6-ad09-741cf29bad4c"> <!-- the ID of
866 the distribution. Used only for serialisation purposes. This could be URL if the distributions
867 are accessible via URL, e.g. https://test.org/distribution/1-->
868     <dcterms:description xml:lang="en">CIMXML serialisation of the confidentiality reference
869 data </dcterms:description>

```

```

870     <dcat:mediaType rdf:resource="https://www.iana.org/assignments/media-
871 types/application/rdf+xml"/>
872     <dcat:compressFormat rdf:resource="https://www.iana.org/assignments/media-
873 types/application/zip"/>
874     <dcterms:conformsTo>urn:iso:std:iec:61970-552:2016</dcterms:conformsTo>
875     <dcat:downloadURL rdf:resource="http://energy.referencedata.eu/Confidentiality"/>
876     <dcat:accessURL rdf:resource="file://ReferenceData/Confidentiality_CIMXML.zip"/>
877     </dcat:Distribution >
878

```

879 8.3 File Naming

880 The core idea of having manifest dataset and DCAT is to avoid implementation to rely on naming
 881 standards. There shall be no information derived from the file name by the tools handling the
 882 profiles. However, for human readability, the following file naming convention is recommended:

883 <dcat:startDate>_<dcterms:publisher>_<prov:wasGeneratedBy>[_dcat:version]

884 where dcat:startDate, dcterms:publisher, prov:wasGeneratedBy, and dcat:version are
 885 properties exchanged as part of the dataset header.

- 886 • dcat:startDate: Date and Time when the data is valid for (YYYYMMDDThhmm). E.g.
 887 20180118T0930. In case that we have a daily file, Thhmm is not required.
 - 888 ○ YYYY= Year
 - 889 ○ MM= Month
 - 890 ○ DD = Day
 - 891 ○ hh = hour
 - 892 ○ mm = minutes (30)
- 893 • dcterms:publisher: Party sending the dataset. For instance, Elia, Coreso. This is defined
 894 in the list of publishers.
- 895 • prov:wasGeneratedBy: Taking into account that the prov:wasGeneratedBy represents
 896 the action, it includes information about the process, the timeframe, the coordination
 897 run and the profile keyword.
- 898 • dcat:version: The dcat:version follows Semantic Versioning 2.0, i.e. it has three
 899 components and it is provided only if it is different from version 1 (e.g. different from
 900 1.0.0). As the "." is used for file extension separator the "." in the version in the file name
 901 is replaces by "-".

902 Examples:

- 903 ○ 20180118T0930Z_APG_CGM-1D-SSH.xml
- 904 ○ 20180117T2230Z_APG_CGM-1D-EQ.xml
- 905 ○ 20180117T2230Z_APG_CGM-EQ_1-2-0.xml
- 906 ○ 20180118T1130Z_TSCNET-EU_CGM-1D-SV.xml
- 907 ○ 20180118T1130Z_TSCNET-EU-APG_CGM-1D-SSH.xml
- 908 ○ 20230512T2230Z_APG_CGM-RA_2-0-0.xml
- 909 ○ 20230512T2230Z_APG_CGM-1D-1-RAS.xml

910

911 **9 Reference data and dataset metadata**

912 Reference data is by definition a DCAT dataset and uses SKOS skos:ConceptScheme and
913 skos:Concept in combination with CIM attributes, where necessary in order to manage
914 transition periods. SKOS is primarily applied for taxonomy.

915 As illustrated in Section 8, the manifest is describing the linkage between different datasets
916 representing reference data. Theoretically different distributions do not need a header, however
917 for completeness and to support individual usage of the instance files independently of the
918 manifest it is agreed that a reference data instance file shall also have a header. This header
919 shall be either skos:ConceptScheme, which plays the role of a header and it is also of type
920 dcat:Dataset, or dcat:Dataset.

921 The two options are illustrated by the following examples:

922 **A. Example of skos:ConceptScheme for reference data:**

```
923 <skos:ConceptScheme rdf:about="http://energy.referencedata.eu/BaseVoltage">
924   <rdf:type rdf:resource="http://www.w3.org/ns/dcat#Dataset"/>
925   <dcterms:identifier> 4261296f-4625-4a92-9b8e-ab5369f29a86</dcterms:identifier> <!--
926   Indicates when the content of the data was modified-->
927   <dcterms:modified>2022-09-16T11:29:33.781670</dcterms:modified>
928   <dcat:startDate>2022-09-17T13:30:00Z</dcat:startDate> <!-- Indicates the start date for
929   the validity of this manifest instance file. This property is a result of flattening of the
930   dcterms:temporal in order to avoid usage of compound in the header.-->
931   <dcat:endDate>2023-01-17T13:30:00Z</dcat:endDate> <!-- Indicates the end date for the
932   validity of this manifest instance file. This property is a result of flattening of the
933   dcterms:temporal in order to avoid usage of compound in the header.-->
934   <dcat:version>2.0.0</dcat:version> - the current version
935   <dcterms:title>BaseVoltage reference data</dcterms:title> <!-- It can be omitted as the
936   information is already in the skos:prefLabel-->
937   <dcterms:description xml:lang="en">List of commonly used Base
938   Voltages</dcterms:description> <!-- It can be omitted as the information is already in the
939   skos:definition-->
940   <adms:versionNotes xml:lang="en">This version includes 1kV BaseVoltage</adms:versionNotes>
941   <dcat:previousVersion rdf:resource="urn:uuid:e92cd151-a423-49fb-9293-90f1aa87495b"/> <!--
942   the ID of the previous version of a manifest.-->
943   <dcterms:replaces rdf:resource="urn:uuid:e92cd151-a423-49fb-9293-90f1aa87495b"/> <!-- the
944   ID of the previous version of a manifest, which this version is replacing.-->
945   <skos:prefLabel>BaseVoltage</skos:prefLabel>
946   <skos:definition xml:lang="en">List of commonly used Base Voltages</skos:definition>
947 </skos:ConceptScheme>
```

949 In this example the URL <http://energy.referencedata.eu/BaseVoltage> is providing the reference
950 to the reference dataset that is describing BaseVoltage and the dcterms:identifier is the unique
951 identifier. The skos:ConceptScheme is also of RDF type dcat:Dataset which allows to use it as
952 a header and inherit important DCAT properties.

953 Note that there will be different views of the data to enable applications to consume the data as
954 part of the common data.

955

956

957

958

959 **B. Example of dcat:Dataset for reference data:**

```
960 <dcat:Dataset rdf:about="urn:uuid:4261296f-4625-4a92-9b8e-ab5369f29a86">
961   <dcterms:identifier> 4261296f-4625-4a92-9b8e-ab5369f29a86</dcterms:identifier> <!--
962   Indicates when the content of the data was modified-->
```



```

964     <dcterms:modified>2022-09-16T11:29:33.781670</dcterms:modified>
965     <dcat:startDate>2022-09-17T13:30:00Z</dcat:startDate> <!-- Indicates the start date for
966 the validity of this manifest instance file. This property is a result of flattening of the
967 dcterms:temporal in order to avoid usage of compound in the header.-->
968     <dcat:endDate>2023-01-17T13:30:00Z</dcat:endDate> <!-- Indicates the end date for the
969 validity of this manifest instance file. This property is a result of flattening of the
970 dcterms:temporal in order to avoid usage of compound in the header.-->
971     <dcat:version>2.0.0</dcat:version> - the current version
972     <dcterms:title>BaseVoltage reference data</dcterms:title>
973     <dcterms:description xml:lang="en">List of commonly used Base
974 Voltages</dcterms:description>
975     <adms:versionNotes xml:lang="en">This version includes 1kV BaseVoltage</adms:versionNotes>
976     <dcat:previousVersion rdf:resource="urn:uuid:e92cd151-a423-49fb-9293-90f1aa87495b"/> <!--
977 the ID of the previous version of a manifest.-->
978     <dcterms:replaces rdf:resource="urn:uuid:e92cd151-a423-49fb-9293-90f1aa87495b"/> <!-- the
979 ID of the previous version of a manifest, which this version is replacing.-->
980 </dcat:Dataset>

```

981 The option which uses skos:ConceptScheme is required for instance files representing
982 reference data that is built using SKOS.

983 The option which uses dcat:Dataset is required for instance files representing any other
984 reference data. This is necessary as in the reference data is not built using SKO there is no
985 point to define skos:ConceptScheme as a header. In addition in cases where the reference data
986 has to contain multiple skos:ConceptScheme objects it is recommended to have the header as
987 dcat:Dataset. In general, it is not expected to have multiple skos:ConceptScheme objects in a
988 dcat:Dataset, but the setup would allow this in case of a need.

989

990 **Annex A: Distribution (Document) header and Dataset (model) exchange**

991 **A.1 General**

992 Due to the present stage of development and standardisation of approaches related to metadata
993 and document header information the defined solution in this document is considered as a
994 transitory solution. Taking into account this nature it is necessary to clarify some assumptions
995 that are applied when designing the solution. The aim of this section is to bring clarity of some
996 of the attributes in the document header that were protentional misused in past and current
997 model exchanges.

998 **A.2 Modelling authority set, model and their versions**

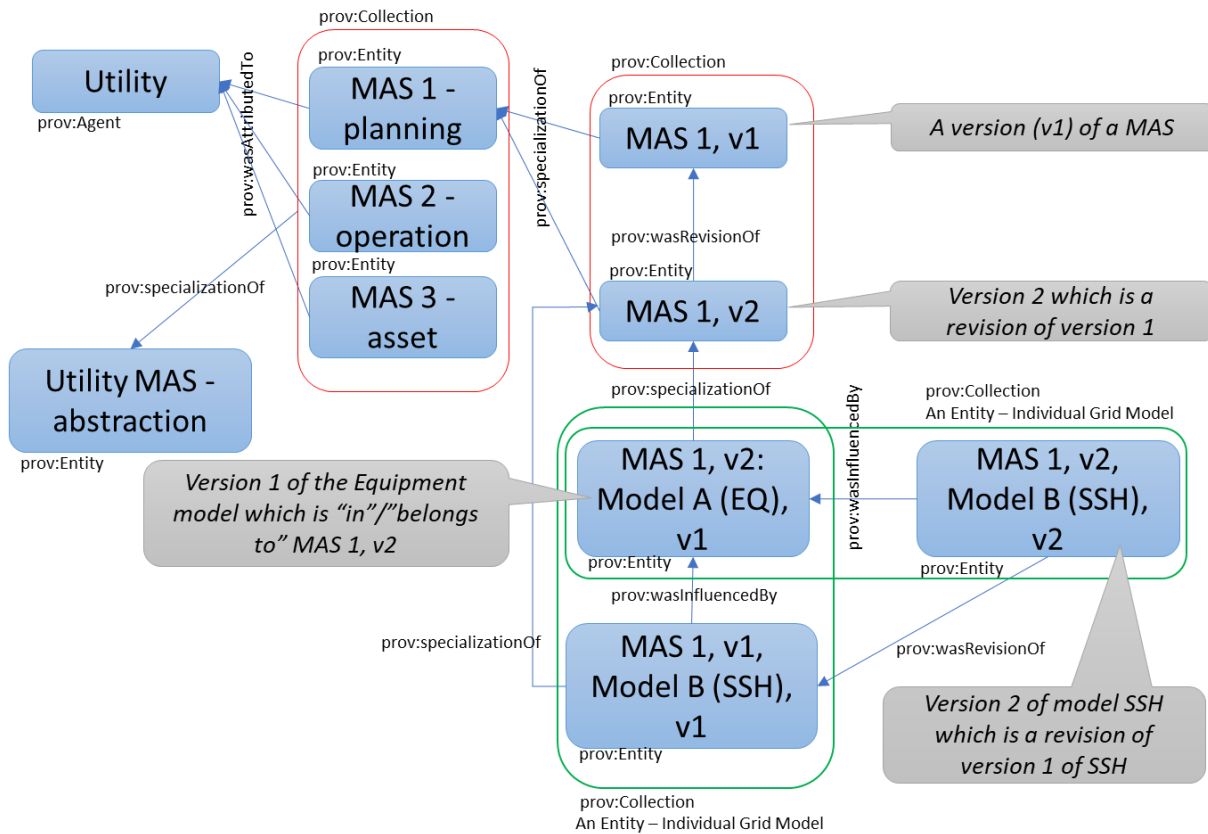
999 Modelling authority set (MAS) is seen as an abstract entity. It is more related to the sender of
1000 the information as it is linked and maintained by the sender of the information. A utility, a TSO,
1001 can have multiple abstract entities (in terms of W3C provenance Entity) to represent different
1002 scope. These could be MAS for planning, MAS for operation, MAS for asset, etc. The choice is
1003 up to the utility how to internally organise. Each of these abstract MAS entities have their
1004 versions which are important for the sending party to understand where models that are
1005 associated to a given MAS fit. This needs to be considered together with the knowledge of the
1006 definition of a model. The set of data governed by a profile is considered a model. For instance,
1007 data that relate to equipment profile is a model, data that relate to state variables profile is a
1008 model. However, a collection of equipment and state variables is also a model that can be called
1009 individual grid model.

1010 Depending on the nature of models that are part of a version of a MAS, the MAS will be
1011 considered as a kind of envelop for models and will contain information where the MAS fits in
1012 the overall model exchange framework.

1013 Note that the MAS or its version is not directly identifying the agent that is responsible for it or
1014 belonging to region or process, as this is more or less the current practice due to lack of other
1015 mechanisms to express that information. However, receiving party can retrieve information to
1016 the version of the modelling authority set via the reference data in case the business process
1017 agrees that this information is maintained in the master reference data. In this way, additional
1018 data such as the name of the agent, its location, role, models part of the version of the mas,
1019 contact information, other dependencies can be retrieved from the reference data.

1020 Figure 8 is illustrating the relationship between a utility (agent), the modelling authority set, its
1021 versions, models part of a version of MAS and the versions of the models. Please note that
1022 some part of the abstraction is not explicitly included in the figure in order not to confuse. Also,
1023 only the terms related to W3C provenance are indicated as the link to W3C DCAT will make the
1024 view more complex. More detailed information will be part of the standardisation efforts which
1025 will be dealing with overall framework.

1026 When using master reference data, the concept is that a document header or a manifest
1027 document (in the future) would refer to an identification of a version of a MAS. The URN, IRI or
1028 URL of the version of the MAS is part of the reference data and when that data is consulted
1029 (queried) additional information about the version of the MAS can be collected. Such information
1030 can be the name of the utility (TSO), what models' types are part of this version of MAS, e.g. is
1031 it only EQ and SSH or also TP or DL can be part of it, etc.



1032

1033

Figure 8. Modelling authority set, its version and model versions

1034 **A.3 Identification and versioning**

1035 The following terms are important for the understanding of the identification of the datasets:

- 1036 • a distribution serialised as a RDF (Resource Description Framework) is uniquely
1037 identified as a resource through `rdf:about` and the use of URI (Uniform Resource
1038 Identifier) or IRI (Internationalized Resource Identifier).
- 1039 • `dcterms:identifier` is a property from the Dublin Core Metadata Initiative (DCMI)
1040 vocabulary. It is used to provide a value that uniquely identifies the resource described
1041 in an RDF triple. Unlike `rdf:about`, which identifies the subject of the triple (i.e., the
1042 resource itself), `dcterms:identifier` is used to specify a particular identifier for the
1043 resource.

1044 In order to respect these terms, the following rules are defined:

- 1045 • The `rdf:about` shall be using `urn:uuid:` namespace for the UUID, e.g.,

```
1046 <md:FullModel rdf:about="urn:uuid:d2630bd5-9578-4fab-9647-13991c692d07">
```

1047 Or Dataset in cases of Dataset metadata

```
1048 <dcat:Dataset rdf:about="urn:uuid:d2630bd5-9578-4fab-9647-13991c692d07">
```

- 1049 • The `dcterms:identifier` shall be a UUID without any namespace since the identifier does
1050 not need to be resolvable, e.g,

```
1051 <dcterms:identifier>d2630bd5-9578-4fab-9647-13991c692d07</dcterms:identifier>
```

1052 • The `rdf:about` shall include the same UUID as used in the `dcterms:identifier` (`rdf:about`
1053 = `urn:uuid: + dcterms:identifier` UUID).

1054 Therefore, the `dcterms:identifier` and `rdf:about` (in case of RDF serialization) of the distribution
1055 header have an identical identification.

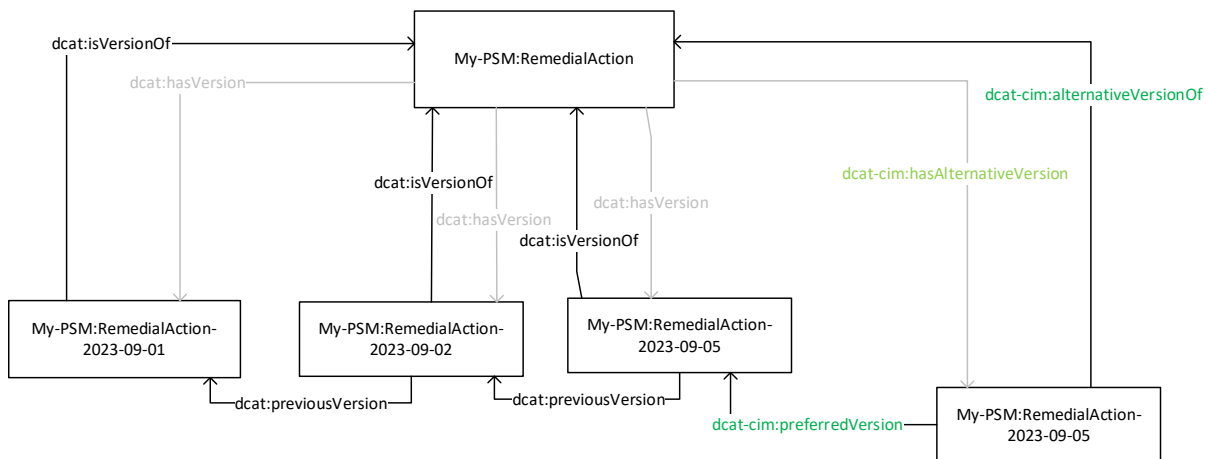
1056 The versioning information included in the header is following the DCAT-3 vocabulary, which is
1057 built upon existing W3C vocabularies. The versioning supports the life-cycle of a resource and
1058 can be applied to all the classes inheriting DCAT resource, including Catalog (Manifest),
1059 Datasets (FullModel) and Distribution (instance of CIM XML).

1060 Versioning relies on the following:

- 1061 • All versions are uniquely identifiable through `rdf:about` and `dcterms:identifier`.
- 1062 • Additional pieces of information like `dc:version` (`md:version` in the previous header)
1063 are used to understand the changes in a revision where a version is
1064 replaced/superseded by another one. For all version chain and hierarchy (the version
1065 history) where the version will typically have different validity period, the `dc:version` is
1066 giving the "quality" (e.g. is this a test model etc). This is why it is important that
1067 `dc:version` uses the semantic versioning ([Semantic Versioning 2.0.0 | Semantic](#)
1068 [Versioning \(semver.org\)](#)), i.e. a given version number follows the form
1069 Major.Minor.Patch.
- 1070 • The `dc:version` information provided in a header of a distribution related to the dataset
1071 and not to its distribution, its specific serialisation.
- 1072 • There are different properties such as `dc:isVersionOf`, `dc:previousVersion` and
1073 `dcterms:replaces` that provide important information on the relationships between
1074 versions

1075 For instance, a chain of version of My-Power System Model (PSM) Remedial Action offline (i.e.,
1076 structural) dataset can be described as shown in the following figure:

1077



1078

1079 **Figure 9. Chain of version using DCAT**

1080 This figure shows the standard use. The inverse associations are provided in a lighter colour.
1081 This information is not exchanged, but created as part of reasoning. ENTSO-E DCAT extension
1082 (`dc: Cim`) was added to the standard vocabulary to address the need for alternative model
1083 (dataset) that represents potential development. This information could have been added as
1084 attributes to the dataset and just used `dc:isVersionOf`. However, this would not enable us to

1085 require needed functionality when creating consistent IGM and CGM in an efficient way also for
1086 future scenarios.
1087

1088 My-PSM:RemedialAction is the abstract representation the of My-PSM:RemedialAction and the
1089 persistent identification of all version of the remedial action for the same relevance. My-
1090 PSM:RemedialAction-2023-09-01 represents a particular version of the remedial action with a
1091 particular validity, e.g. startDate 2023-09-01.

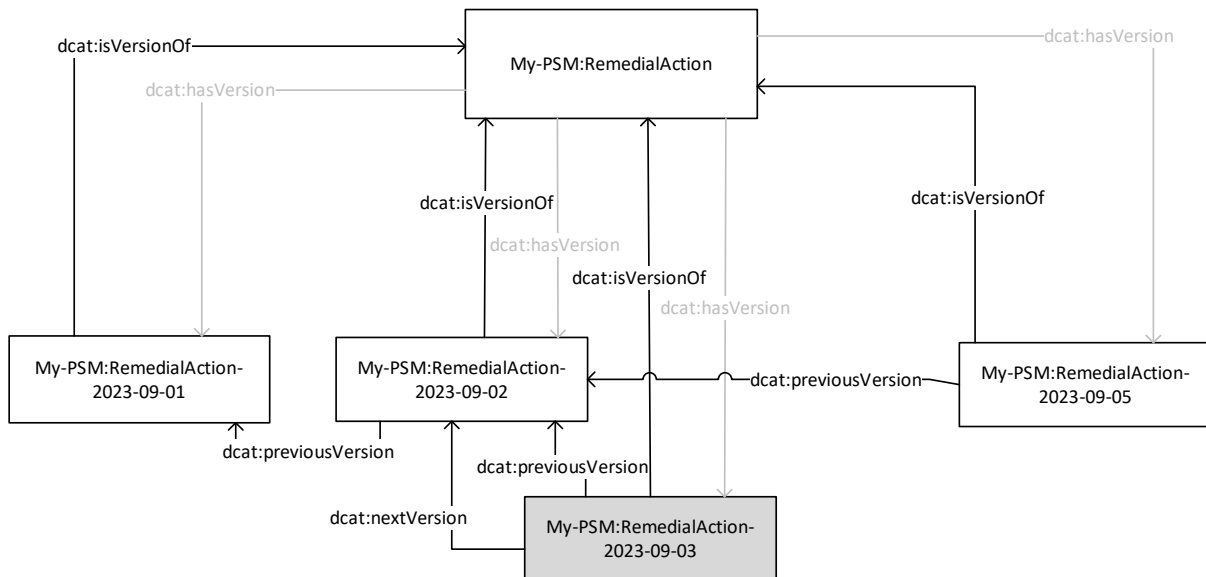
1092 All versioned datasets are related to the My-PSM:RemedialAction through the relationship
1093 dcat:isVersionOf and the inverse association dcat:hasVersion.

1094 dcat:previousVersion provides the lineage of a version chain, consisting of snapshots of an
1095 abstract resource given by dcat:isVersionOf. This gives the possibility to navigate the resource
1096 (dataset) through it life-cycle. Specifying dcat:previousVersion is preventing us to fully rely on
1097 the temporal (validity period) to secure that the chain is consistent and not missing any item.

1098 dcat-cim:alternativeVersionOf (dcat-cim:hasAlternativeVersion, the inverse association, is
1099 derived through reasoning of the vocabulary) provides the information that the dataset is a
1100 version of My-PSM:RemedialAction, but should not be considered to be in the chain of version.
1101 It is only relevant when alternative version should be analysed as part of a specific business
1102 process. This would present these datasets to be assembled as part of the chain of IGM and
1103 CGM.

1104 dcat-cim:preferredVersion is a required association for an alternative version to be able to
1105 navigate to the dataset version that is part of the chain of versions. In the case of multiple
1106 alternative version for a given dataset, the dcat-cim:preferredVersion for the set can all point
1107 directly to the dataset that is part of the chain or they can provide a chain of prioritised dataset
1108 versions.

1110 A dataset version can be valid for multiple days, e.g. My-PSM:RemedialAction-2023-09-02, that
1111 is valid from 2023-09-02 to 2023-09-05. In the case that we would like to interject a dataset that
1112 should be valid only for 2023-09-03. This is done by including the two associations
1113 dcat:previousVersion and dcat:nextVersion that point to the same version.
1114

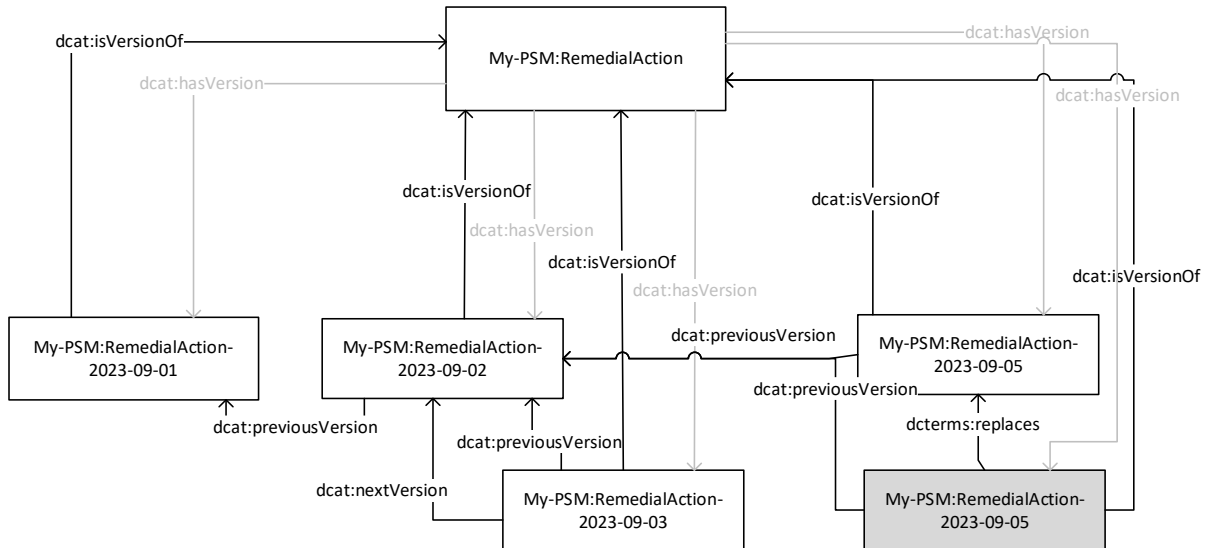


1115
1116 **Figure 10. Inserting a dataset into an existing chain of version**

1117 The figure shows the insertion of My-PSM:RemedialAction-2023-09-03 into the chain to give
1118 valid for the period for only 2023-09-03. This method makes it possible to insert it without the
1119 need to update the existing dataset My-PSM:RemedialAction-2023-09-02 and My-

1120 PSM:RemedialAction-2023-09-05. This is, in principle, only relevant for dataset that is valid into
 1121 the future. However, this is controlled by business rules. This feature is relevant for supporting
 1122 the year-ahead process when there is a need to describe the general assumed situation, but
 1123 would need to address particular scenarios as part of improved forecasting.

1124
 1125 Deleting a version is done by providing a replacement of a dataset that is empty. Replacing a
 1126 dataset with another dataset into the chain of version is done by using dcterms:replaces.
 1127



1128
 1129 **Figure 11. Replacing a dataset using dcterms:replaces**

1130 dcterms:replaces provides the information that a previous exchanged dataset has now been
 1131 replaced another dataset. The replacing dataset must be for the same dcat:isVersionOf and it
 1132 must fit into the chain of version. That could mean that there is a need for multiple dataset set
 1133 to be replaced. The dcat:version must be updated and should follow the semantic versioning so
 1134 that application can provide necessary function to handle different level of updates, e.g.
 1135 handling non breaking change versus breaking change (patch, minor version or major version).
 1136 The adms:versionNotes shall also be updated so that a user can understand the changes that
 1137 is done to make necessary action.

1138
 1139
 1140
 1141
 1142

1143 **Annex B (informative): Sample data**1144 **B.1 General**

1145 This Annex is designed to illustrate the profile by using fragments of sample data. It is not meant
1146 to be a complete set of examples covering all possibilities of using the profile. Defining a
1147 complete set of test data is considered a separate activity to be performed for the purpose of
1148 setting up interoperability testing and conformity related to this profile.

1149 The sample data is not covering all possibilities of different references or information that can
1150 be provided.

1151 **B.2 Sample instance data – dataset metadata**

```
1152 <rdf:RDF
1153   xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
1154   xmlns:nc="https://cim4.eu/ns/nc#"
1155   xmlns:adms="http://www.w3.org/ns/adms#"
1156   xmlns:cim="https://cim.ucaiug.io/ns#"
1157   xmlns:prov="http://www.w3.org/ns/prov#"
1158   xmlns:md="http://iec.ch/TC57/61970-552/ModelDescription/1#"
1159   xmlns:skos="http://www.w3.org/2004/02/skos/core#"
1160   xmlns:eu="https://cim.ucaiug.io/ns/eu#"
1161   xmlns:eumd="https://cim4.eu/ns/Metadata-European#"
1162   xmlns:dcat="http://www.w3.org/ns/dcat#"
1163   xmlns:dcterms="http://purl.org/dc/terms/#">
1164
1165   <dcat:Dataset rdf:about="urn:uuid:6b7387f2-c7f9-11ed-afaf-0242ac120002">
1166     <dcterms:accessRights
1167   rdf:resource="https://energy.referencedata.eu/Confidentiality/OPCSTACConfidential"/>
1168     <dcterms:conformsTo rdf:resource="https://ap.cim4.eu/ObjectRegistry"/>
1169     <dcterms:description>OR profile for testing purposes</dcterms:description>
1170     <dcterms:identifier>6b7387f2-c7f9-11ed-afaf-0242ac120002</dcterms:identifier>
1171     <dcterms:issued>2024-04-10T10:00:00Z</dcterms:issued>
1172     <dcat:isVersionOf rdf:resource="https://energy.referencedata.eu/Model/HOPS-
1173   OR"/>
1174     <dcat:keyword>OR</dcat:keyword>
1175     <dcterms:license rdf:resource="https://creativecommons.org/licenses/by/4.0"/>
1176     <dcterms:publisher rdf:resource="https://energy.referencedata.eu/EIC/10XHR-HEP-
1177   OPS--A"/>
1178     <dcterms:references rdf:resource="urn:uuid:99ae9f41-0a91-4d21-a483-
1179   7398c160da96"/>
1180     <dcterms:spatial rdf:resource="https://energy.referencedata.eu/Frame/HR-Power-
1181   Transmission-System"/>
1182     <dcat:startDate>2024-04-10T05:00:00Z</dcat:startDate>
1183     <dcterms:title>20240410_HR-OPC-Example</dcterms:title>
1184     <dcat:version>1.0.0</dcat:version>
1185     <adms:versionNotes>This is the first version of object registry sample
1186   data.</adms:versionNotes>
1187     <prov:wasGeneratedBy rdf:resource="https://energy.referencedata.eu/Action/OPC-
1188   OR"/>
1189   </dcat:Dataset>
1190
1191   <!-- Here below is the content of the Object registry instance data -->
1192
1193 </rdf:RDF>
```

1194 **B.3 Sample profile description**

```
1195 <?xml version="1.0"?>
1196 <rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
1197   xmlns:owl="http://www.w3.org/2002/07/owl#"
```

```

1198     xmlns:dcat="http://www.w3.org/ns/dcat#"
1199     xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
1200     xmlns:prof="http://www.w3.org/ns/dx/prof/"
1201     xmlns:role="http://www.w3.org/ns/dx/prof/role/"
1202     xmlns:dcterms="http://purl.org/dc/terms/"
1203     xml:base="http://www.w3.org/ns/dx/prof/"
1204     <rdf:Description rdf:about="https://ap.cim4.eu/RemedialAction">
1205         <dcterms:creator>ENTSO-E CIM WG NC project </dcterms:creator>
1206         <dcterms:description>This profile is describing the remedial
1207 action.</dcterms:description>
1208         <dcterms:identifier>dea53891-6fc6-4abb-bf98-fc927a859a26</dcterms:identifier>
1209         <dcat:keyword>RA</dcat:keyword>
1210         <dcterms:language>en-GB</dcterms:language>
1211         <dcterms:license>https://www.apache.org/licenses/LICENSE-2.0</dcterms:license>
1212         <dcterms:modified rdf:datatype="http://www.w3.org/2001/XMLSchema#date">2024-09-
1213 05</dcterms:modified>
1214         <owl:priorVersion rdf:resource="http://entsoe.eu/ns/CIM/RemedialAction-
1215 EU/2.2"/>
1216         <dcterms:publisher>ENTSO-E</dcterms:publisher>
1217         <dcterms:rightsHolder>ENTSO-E</dcterms:rightsHolder>
1218         <dcat:theme>profile</dcat:theme>
1219         <dcterms:title>Remedial action Profile</dcterms:title>
1220         <rdf:type rdf:resource="http://www.w3.org/ns/dx/prof/Profile"/>
1221         <owl:versionIRI rdf:resource="https://ap.cim4.eu/RemedialAction/2.3"/>
1222         <owl:versionInfo>2.3.1</owl:versionInfo>
1223         <prof:hasResource rdf:resource="https://ap-voc.cim4.eu/RemedialAction/2.3"/>
1224         <prof:hasResource rdf:resource="https://ap-con.cim4.eu/RemedialAction-
1225 Simple/2.3"/>
1226         <prof:hasResource rdf:resource="https://ap-con.cim4.eu/RemedialAction-
1227 Complex/2.3"/>
1228         <prof:hasResource rdf:resource="https://ap-spec.cim4.eu/RemedialAction/2.3"/>
1229         <prof:hasResource rdf:resource="https://ap-val.cim4.eu/RemedialAction/2.3"/>
1230     </rdf:Description>
1231     <rdf:Description rdf:about="https://ap-voc.cim4.eu/RemedialAction/2.3">
1232         <prof:hasRole rdf:resource="http://www.w3.org/ns/dx/prof/role/vocabulary"/>
1233         <prof:hasArtifact rdf:resource="https://ap-
1234 voc.cim4.eu/RemedialAction/2.3/RemedialAction-AP-Voc-RDFS2020.rdf"/>
1235         <dcterms:format rdf:resource="https://www.iana.org/assignments/media-
1236 types/application/rdf+xml"/>
1237         <dcterms:title>Remedial Action Vocabulary</dcterms:title>
1238         <dcterms:description>Vocabulary for the remedial action profile. It is the
1239 RDFS.</dcterms:description>
1240         <rdf:type rdf:resource="http://www.w3.org/ns/dx/prof/ResourceDescriptor"/>
1241     </rdf:Description>
1242     <rdf:Description rdf:about="https://ap-con.cim4.eu/RemedialAction-Simple/2.3">
1243         <prof:hasRole rdf:resource="http://www.w3.org/ns/dx/prof/role/constraints"/>
1244         <prof:hasArtifact rdf:resource="https://ap-con.cim4.eu/RemedialAction-
1245 Simple/2.3/RemedialAction-AP-Con-Simple-SHACL.ttl"/>
1246         <dcterms:format rdf:resource="https://www.iana.org/assignments/media-
1247 types/text/turtle"/>
1248         <dcterms:conformsTo>http://www.w3.org/ns/shacl</dcterms:conformsTo>
1249         <rdfs:label>Remedial Action Simple Constraints</rdfs:label>
1250         <dcterms:description>SHACL based constraints used to validate datatypes,
1251 cardinality, associations value types.</dcterms:description>
1252         <rdf:type rdf:resource="http://www.w3.org/ns/dx/prof/ResourceDescriptor"/>
1253     </rdf:Description>
1254     <rdf:Description rdf:about="https://ap-con.cim4.eu/RemedialAction-Complex/2.3">
1255         <prof:hasRole rdf:resource="http://www.w3.org/ns/dx/prof/role/constraints"/>
1256         <prof:hasArtifact rdf:resource="https://ap-con.cim4.eu/RemedialAction-
1257 Complex/2.3/RemedialAction-AP-Con-Complex-SHACL.ttl"/>
1258         <dcterms:format rdf:resource="https://www.iana.org/assignments/media-
1259 types/text/turtle"/>
1260         <dcterms:conformsTo>http://www.w3.org/ns/shacl</dcterms:conformsTo>
1261         <rdfs:label>Remedial Action Complex Constraints</rdfs:label>
1262         <dcterms:description>SHACL based constraints designed on the basis of the
1263 English written constraints part of the profile specification document.</dcterms:description>
1264         <rdf:type rdf:resource="http://www.w3.org/ns/dx/prof/ResourceDescriptor"/>
1265     </rdf:Description>
1266     <rdf:Description rdf:about="https://ap-val.cim4.eu/RemedialAction/2.3">
1267         <prof:hasRole rdf:resource="http://www.w3.org/ns/dx/prof/role/validation"/>
1268         <prof:hasArtifact rdf:resource="https://ap-
1269 con.cim4.eu/RemedialAction/2.3/RemedialAction-AP-Con-Validation-SHACL.ttl"/>

```



```

1270         <dcterms:format rdf:resource="https://www.iana.org/assignments/media-
1271 types/text/turtle"/>
1272         <dcterms:conformsTo>http://www.w3.org/ns/shacl</dcterms:conformsTo>
1273         <rdfs:label>Remedial Action Validation</rdfs:label>
1274         <dcterms:description>A set of SHACL based constraints that shall be executed
1275 when validating a dataset that conforms to remedial action profile.</dcterms:description>
1276         <rdf:type rdf:resource="http://www.w3.org/ns/dx/prof/ResourceDescriptor"/>
1277     </rdf:Description>
1278     <rdf:Description rdf:about="https://ap-spec.cim4.eu/RemedialAction/2.3">
1279         <prof:hasRole rdf:resource="http://www.w3.org/ns/dx/prof/role/specification"/>
1280         <prof:hasArtifact rdf:resource="https://ap.cim4.eu/RemedialAction-
1281 Specification/2.3/RemedialAction_Profile_Specification.pdf"/>
1282         <dcterms:format rdf:resource="https://www.iana.org/assignments/media-
1283 types/application/pdf"/>
1284         <rdfs:label>Remedial Action Specification</rdfs:label>
1285         <dcterms:description>The specification of the remedial action
1286 profile.</dcterms:description>
1287         <rdf:type rdf:resource="http://www.w3.org/ns/dx/prof/ResourceDescriptor"/>
1288     </rdf:Description>
1289 </rdf:RDF>
1290
1291

```

1291

1292 B.4 Sample instance data – extended header based on md:Model

1293 This example is for NC profiles release 2.3 where CIM, NC, EU namespaces were modified so
 1294 that they are kept stable over time. In case the combined header needs to be applied for
 1295 different CIM versions and NC profile version the namespaces need to be adapted accordingly.

```

1296 <?xml version="1.0" encoding="utf-8"?>
1297 <rdf:RDF
1298   xmlns:cim="https://cim.ucaiug.io/ns#"
1299   xmlns:md="http://iec.ch/TC57/61970-552/ModelDescription/1#"
1300   xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
1301   xmlns:eu="https://cim.ucaiug.io/ns/eu#"
1302   xmlns:dcterms="http://purl.org/dc/terms/"
1303   xmlns:dcat="http://www.w3.org/ns/dcat#"
1304   xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
1305   xmlns:eumd="https://cim4.eu/ns/Metadata-European#"
1306   xmlns:owl="http://www.w3.org/2002/07/owl#"
1307   xmlns:nc="https://cim4.eu/ns/nc#"
1308   xmlns:prov="http://www.w3.org/ns/prov#">
1309
1310   <!--Header -->
1311   <md:FullModel rdf:about="urn:uuid:d2630bd5-9578-4fab-9647-13991c692d07"><!-- ID
1312 of the Full Model in RDF-->
1313
1314     <!-- ID of the Full Model in Data Model-->
1315     <dcterms:identifier>d2630bd5-9578-4fab-9647-13991c692d07</dcterms:identifier>
1316 <!--This is an example for mRID of the header -->
1317
1318     <!-- creation time of the Document -->
1319     <dcterms:issued>2021-01-28T17:01:03Z</dcterms:issued>
1320
1321     <!-- Version of the Document -->
1322     <dcat:version>1.0.0</dcat:version>
1323
1324     <!-- Validity/scenario period / delivery day [Optional]-->
1325     <dcat:startDate>2023-01-25T17:00:00Z</dcat:startDate>
1326     <dcat:endDate>2023-02-25T17:00:00Z</dcat:endDate>
1327
1328     <!-- Description -->
1329     <dcterms:description xml:lang="en">This is an example of available remedial
1330 action</dcterms:description>
1331
1332     <!-- Profile, Schema or Specification -->

```

```

1333     <dcterms:conformsTo rdf:resource="https://ap-con.cim4.eu/RemedialAction/2.3" />
1334     <dcterms:conformsTo rdf:resource="https://ap-con.cim4.eu/RemedialAction/2.3" />
1335     <!--This is an example how to refer to SHACL constraints in case there is no
1336     description of the profile following DX-PROF. Normally there should be one
1337     dcterms:conformsTo referring to the profile description and this implies that all
1338     constraints are being validated.-->
1339
1340     <!-- Message Type -->
1341     <dcat:keyword>RA</dcat:keyword>
1342     <dcat:keyword>Remedial Action</dcat:keyword>
1343
1344     <!-- md:Model.DependentOn -->
1345     <dcterms:references rdf:resource="urn:uuid:f0063d01-1dac-46f0-91a4-
1346     2b7479991173" />
1347
1348     <!-- md:Model.Supersedes [OPTIONAL] (ID of pervious version of the Model) -->
1349     <dcterms:replaces rdf:resource="urn:uuid:8341cd19-779b-4a84-bafb-06b8bb56f767"
1350     />
1351
1352     <!-- Modeling Authority -->
1353     <dcterms:publisher
1354     rdf:resource="https://energy.referencedata.eu/EIC/10X1001A1001A094"/>
1355
1356
1357     <!-- Confidentiality for Security Plan -->
1358     <dcterms:accessRights
1359     rdf:resource="https://energy.referencedata.eu/Confidentiality/OPDEConfidential"/>
1360
1361     <prov:wasGeneratedBy rdf:resource=https://energy.referencedata.eu/Action/CGM-1D-RAS/>
1362     <!--The attribute below is the persistent part between each of the RAS
1363     dataset versions.-->
1364     <dcat:isVersionOf rdf:resource=https://energy.referencedata.eu/Model/ELIA-RAS/> <!--
1365     The attribute below indicates that this model is filling the frame of the Belgian
1366     electrical power transmission system-->
1367     <dcterms:spatial rdf:resource=https://energy.referencedata.eu/Frame/BE-Power-
1368     Transmission-System/>
1369     <!--The title below should be the name of the file. Convention could be
1370     start date, publisher and then the wasGeneratedBy.-->
1371     <dcterms:title>20221219_ELIA_CGM-1D-RAS</dcterms:title>
1372
1373
1374     </md:FullModel>
1375
1376     <!-- Here below is the content of the RA (remedial action) instance data -->
1377
1378     </rdf:RDF>
1379

```

1380 The example below shows a combination of old IEC 61970-552 reader and usage of some of
1381 the new header attributes.

```

1382     <md:FullModel rdf:about="urn:uuid:062cf28e-499f-434f-b95d-73768b5c975f">
1383     <dcterms:identifier>062cf28e-499f-434f-b95d-73768b5c975f</dcterms:identifier>
1384     <md:Model.profile>http://entsoe.eu/CIM/EquipmentOperation/3/1</md:Model.profile>
1385     <md:Model.profile>http://entsoe.eu/CIM/EquipmentCore/3/1</md:Model.profile>
1386     <dcterms:conformsTo rdf:resource="http://entsoe.eu/CIM/EquipmentOperation/3/1" />
1387     <dcterms:conformsTo rdf:resource=" http://entsoe.eu/CIM/EquipmentCore/3/1" />
1388     <md:Model.modelingAuthoritySet>http://www.elia.be/OperationalPlanning</md:Model.modelingAuthor
1389     itySet>
1390     <dcterms:publisher rdf:resource="https://energy.referencedata.eu/EIC/10X1001A1001A094"/>
1391     <md:Model.version>001</md:Model.version>
1392     <dcat:version>1.0.0</dcat:version>
1393     <md:Model.DependentOn rdf:resource="urn:uuid:cc7a2f34-c0a0-46a9-b602-9d33c8b2a476"/>
1394     <dcterms:references rdf:resource="urn:uuid:cc7a2f34-c0a0-46a9-b602-9d33c8b2a476" />
1395     <md:Model.created>2021-04-20T13:02:42Z</md:Model.created>

```

```
1396 <dcterms:issued>2021-04-20T13:02:42Z</dcterms:issued>
1397 <md:Model.scenarioTime>2023-03-10T00:30:00Z</md:Model.scenarioTime>
1398 <dcat:startDate>2023-03-10T00:30:00Z</dcat:startDate>
1399 <md:Model.description>This is an example</md:Model.description>
1400 <dcterms:description xml:lang="en">This is an example</dcterms:description>
1401 </md:FullModel>
1402
```

1403

Annex C (informative): Change Log Version 2.3.0 to 2.4.0

1404 This version was motivated by a maintenance request to align with the approved ENTSO-E
1405 document “Regional Cooperation Processes Data Exchange Specification (RCP DES)” and
1406 published IEC 61970-457:2014. Changes related to the properties were validated in the
1407 Standard Vetting Interoperability Test (SV-IOP) conducted in July 2024. The changes made
1408 during this process are described in the following paragraphs for ease and for the sake of a
1409 better understanding.

1410 • Full alignment with DCAT 3 and use of dcat:Dataset to provide the necessary metadata.

1411 • Allowance of the usage of md:FullModel based metadata only for the purpose of
1412 transition and backwards compatibility.

1413 • Deletion of the part that relates to exchange of power flow settings as this information
1414 is now published as part of the IEC 61970-457:2024.

1415 • Providing information on how to use references to Action in the dataset metadata.

1416

1417

1418

Annex D: Transition Guidance

1419 This annex provides guidance on how the transition between different versions of the header
1420 can be realized for different exchanges relying on various data exchange standards and
1421 specifications.

1422 **D.1 CGMES v2.4**

1423 CGMES v2.4 uses the header specified in the IEC 61970-552 as well as implementation
1424 clarifications included in IEC TS 61970-600-1:2017 and IEC TS 61970-600-2:2017. Application
1425 profiles, namely RDFS is available which instructs on the requires attributes.

1426 Exchanges that use CGMES v2.4 can add additional header properties as this is generally
1427 allowed in RDF based exchanges. An example of a combined header is provided in Annex B.

1428 **D.2 CGMES v3.0**

1429 CGMES v3.0 uses the header specified in the IEC 61970-552 as well as implementation
1430 clarifications included in IEC 61970-600-1:2021 and IEC 61970-600-2:2021. Application
1431 profiles, namely RDFS and SHACL based constraints are available to instruct on the required
1432 attributes and datatypes.

1433 Exchanges that use CGMES v3.0 can add additional header properties as this is generally
1434 allowed in RDF based exchanges. An example of a combined header is provided in Annex B.

1435 **D.3 CGM Build Process**

1436 Exchanges realised in the CGM Build Process are based on CGMES v2.4 and QoCDC.
1437 Transition to different CGMES version and QoCDC content is being discussed as part of the
1438 CGM Action Plan to improve the CGM Build Process. Therefore, this process can use the
1439 guidance provided in D.1. It should be taken into account that QoCDC is evolving and some of
1440 the rules related to the header defined in QoCDC have been modified.

1441 It is strongly recommended to utilize upper versions of the standards and specifications and do
1442 not make business specific implementation rules potentially abusing the semantic meaning of
1443 the defined properties.

1444 **D.4 CSA business process using header defined in v2.3 (and prior) of the** 1445 **specification**

1446 The Regional Coordination Processes Data Exchange Specification (RCP DES) and NC Profiles
1447 versions 2.3 and prior use ENTSO-E Header specification that allowed for a combined usage
1448 of md:FullModel class containing properties of older header and new properties from W3C
1449 DCAT v3

1450 Version 2.2 and 2.3 of the headers have shortcomings which led to multiple maintenance
1451 requests. Business processes that use RCP DES can, in transition, apply md:FullModel header
1452 by relying on the application profiles – RDFS and SHACL based constraints – published as
1453 v2.3.4. v2.3.4 of the header includes fixes applied to the RDFS which were recommended by
1454 the SV-IOP held in July 2024.

1455 It is recommended that NC Profiles based exchanges transition to use v2.4 of the header which
1456 is defined as a dcat:Dataset and not md:FullModel.

1457