IEC 61970-453
CIM Based Graphics Exchange
IEC 61970 CIM Overview

Data model, semantics

UML Tool -> UML -> Reporting Tool -> 301

Profile

Data format, syntax

552 CIMXML

... and other XML Schema based

Network Model
Solution
Graphics
... and more

Base CIM
History Of CIM Based Graphics Exchange

- Started back in 2003 on initiative by Siemens Erich Wurgler
- Was initially based on SVG
  - 61970-453 ed1.0 described the data model, released 2008-06-24
  - 61970-553 described an extended SVG xml format
- At an on paper IOP 2008-01-21 in Santa Clara a debate on the format took off
- 2009 it was agreed not to exchange exact format but layout only
  - Layout
    - Drawing co-ordinates with no detailed rendering
    - Object presentation style
- Layout based specifications
  - 61970-453 described the data model
  - 61970-552 CIMXML format for the exchange
- Persons that worked on the layout based spec
  - Erich Wurgler, Alan McMorran, Jay Britton, Hans Diehl, Lars-Ola Österlund
Diagram Example, ABB40Bus Bowman Substation
Use Cases

- Network model exchange does not include network diagrams, a problem
  - Visualization of network is useful and labor saving
  - Diagrams are required in operation and planning

- Avoid redrawing network diagrams at exchange of network models
  - TSO – RTOs, e.g. ERCOT
  - TSOs – TSOs, e.g. ENTSO-E members
  - RTOs – RTOs
  - ...

- Reuse of existing network diagrams at system upgrade
More Use Case Actors
UML model

class Domain Objects

DiagramObject
+ isPolygon: Boolean
+ offset: int
+ offsetDirection: int
+ rotate: int
+ drawingOrder: int

DiagramObjectPoint
+ sequence: int
+ xPosition: float
+ yPosition: float
+ zPosition: float [0..1]

DiagramObjectGluePoint
+ DiagramObjectGluePoint 2..*

Diagram
+ orientation: OrientationKind
+ x1InitialView: float
+ x2InitialView: float
+ y1InitialView: float
+ y2InitialView: float
+ DiagramObjects 1..*

IdentifiedDiagramObject
+ Diagram

VisibilityLayer
+ drawingOrder: int
+ DiagramObjects 0..*

IdentifiedDiagramObject
+ Diagram

DiagramObjectStyle
+ drawingOrder: int
+ name: char
+ DiagramObjectPoints 0..*
+ DiagramObject 0..1

IdentifiedDiagramObject
+ DiagramObjects 0..*
+ DiagramObject 0..1

DiagramObjectGluePoint
+ DiagramObjectGluePoint 0..1
+ DiagramObjectPoints

DiagramObject
+ isPolygon: Boolean
+ offset: int
+ offsetDirection: int
+ rotate: int
+ drawingOrder: int
+ DiagramObjects 0..1

IdentifiedObject
+ DiagramObject 0..1
+ IdentifiedObject

OrientationKind
+ positive
+ negative
A Graphical Notation Of The UML
Point Objects

Terminal
(CIM Base)

DiagramObjectGluePoint
(CIM Graphics)

DiagramObjectPoint
(CIM Graphics)

SynchronousMachine
EnergyConsumer

PowerSystemResource
DiagramObject
with single DiagramObjectPoint
and single Terminal

MeasurementDiagramObject

Disconnector
Breaker

PowerTransformer
2 wdg
PowerTransformer
3 wdg

PowerSystemResource
DiagramObject
with single DiagramObjectPoint
and two or three Terminals
A Graphical Notation Of The UML
Polygon Objects

- **BusbarSection**: PowerSystemResource DiagramObject with multiple DiagramObjectPoints and single Terminal
- **ACLineSegment**: PowerSystemResource DiagramObject with multiple DiagramObjectPoints and two Terminals
- **Terminal DiagramObject**
Simple Bay Example

Diagram as rendered
GIS Style Rendering

Diagram with objects
EMS Style Rendering

Diagram with objects

BusbarSection

BusbarSection
CIMXML Example

```xml
<uc:DiagramObjectGluePoint rdf:id="_10000">
  <uc:DiagramObjectGluePoint.Point rdf:resource="#_300"/>
  <uc:DiagramObjectGluePoint.Point rdf:resource="#_600"/>
  <uc:DiagramObjectGluePoint.Point rdf:resource="#_700"/>
</uc:DiagramObjectGluePoint>

<uc:DiagramObject rdf:id="_600">
  <uc:DiagramObject.IdentifiedObject rdf:about="#Disconnector200Terminal1"/>
  <uc:DiagramObject.Style rdf:about="#TerminalStyle1"/>
</uc:DiagramObject>

<uc:DiagramObjectPoint rdf:id="_601">
  <uc:DiagramObjectPoint.DiagramObject rdf:resource="#_600"/>
  <uc:DiagramObjectPoint.sequence>1</uc:DiagramObjectPoint.sequence>
  <uc:DiagramObjectPoint.xPosition>x</uc:DiagramObjectPoint.xPosition>
  <uc:DiagramObjectPoint.yPosition>y</uc:DiagramObjectPoint.yPosition>
</uc:DiagramObjectPoint>

<uc:DiagramObjectPoint rdf:id="_602">
  <uc:DiagramObjectPoint.DiagramObject rdf:resource="#_600"/>
  <uc:DiagramObjectPoint.sequence>2</uc:DiagramObjectPoint.sequence>
  <uc:DiagramObjectPoint.xPosition>x</uc:DiagramObjectPoint.xPosition>
  <uc:DiagramObjectPoint.yPosition>y</uc:DiagramObjectPoint.yPosition>
</uc:DiagramObjectPoint>

<uc:DiagramObject rdf:id="_300">
  <uc:DiagramObject.DomainObject rdf:about="#Disconnector300"/>
  <uc:DiagramObject.Style rdf:about="#DisconnectorStyle1"/>
</uc:DiagramObject>

<uc:DiagramObjectPoint rdf:id="_301">
  <uc:DiagramObjectPoint.DiagramObject rdf:resource="#_300"/>
  <uc:DiagramObjectPoint.sequence>1</uc:DiagramObjectPoint.sequence>
  <uc:DiagramObjectPoint.xPosition>x</uc:DiagramObjectPoint.xPosition>
  <uc:DiagramObjectPoint.yPosition>y</uc:DiagramObjectPoint.yPosition>
</uc:DiagramObjectPoint>
```

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