



CIM Profiles

Theory and Practice

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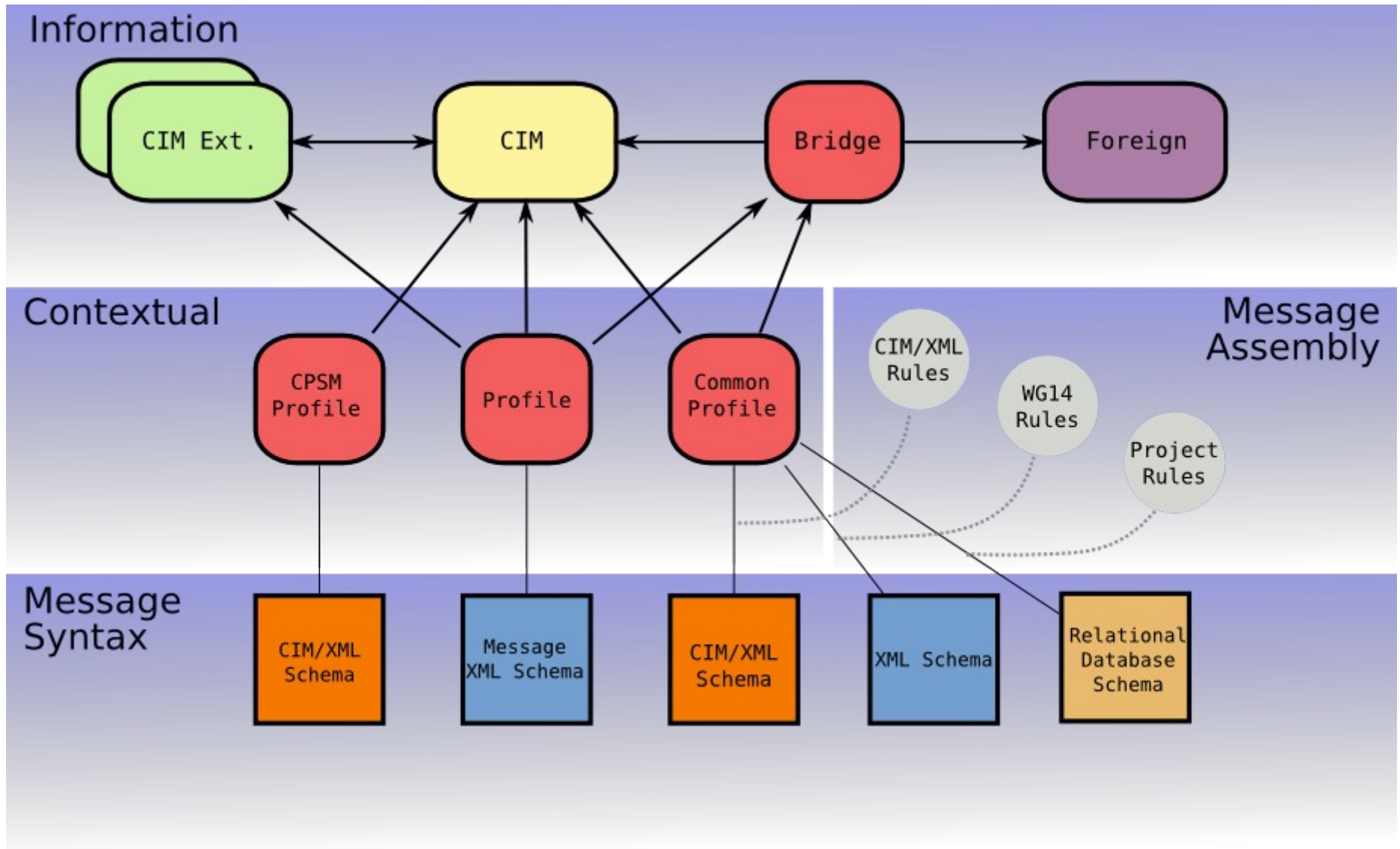
The Problem

- CIM is vast forrest of classes.
- My project is only concerned with a small part of the forrest.
- But still: it is missing some things I need in my project.

The Solution

- Modify the CIM!
 - But in a 'compatible' way.
- Use two, separate phases:
 - Extension
 - Restriction
- Is it still the CIM?

Extension and Restriction Layers



How the CIM is Used

- Within the application:
 - e.g. Convert CIM UML to Java
 - Conventional interpretation of UML in terms of software artifacts
 - Maybe useful but not the stuff of standards.

How the CIM is Used

- In an interface:
 - To specify information exchanged.
 - Interpret the CIM UML as an ***information model***
 - The stuff of standards.

Information Model Theory

- An Information model is:
 - a collection of (mathematical) sets
 - governed by logical predicates.
- The information is in the sets which may be
 - Unary relations
 - Set of individuals, a class
 - Binary relations
 - Set of 2-tuples, an association
 - Higher order relations

CIM as an Information Model

- UML Class
 - Defines a set of individuals (unary relation)
- UML Association
 - Defines a set of 2-tuples or links (binary relation)
- UML Generalisation
 - Defines a subset. (The derived class is the subset!)
- More....

Contextual Model Theory

- A contextual model is an information model
 - Relations are subsets of CIM relations
 - Subsets of Classes *and Associations*
 - Predicates 'stronger but consistent' with CIM
 - No contradiction of CIM definitions.
- Liskov Principle (adapted):
 - A population that conforms to the contextual model also conforms to the CIM.

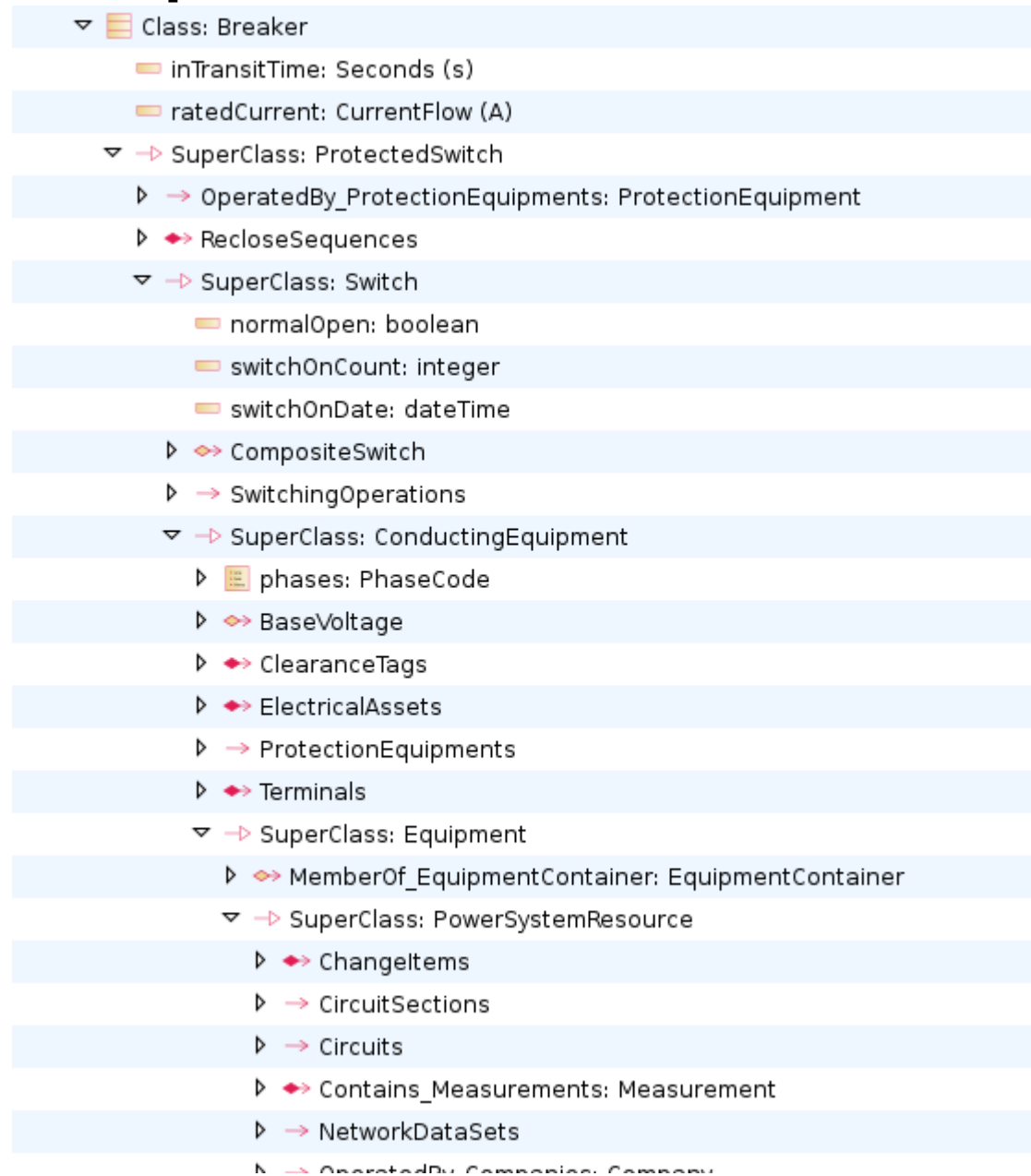
How to Extend

- Create an Extension Model
 - Model the domain not the application.
 - Add new classes and associations
 - Do not remove or rename
 - Reuse.
 - Petition WG's to refactor.

How to Restrict

- Create a Contextual Model.
 - Model the application not the whole domain
 - Remove classes and associations
 - Do not add.
 - Restrict the model: most associations mandatory

Example: Information Model




Example: Profile


▼  profile

▼  Breaker

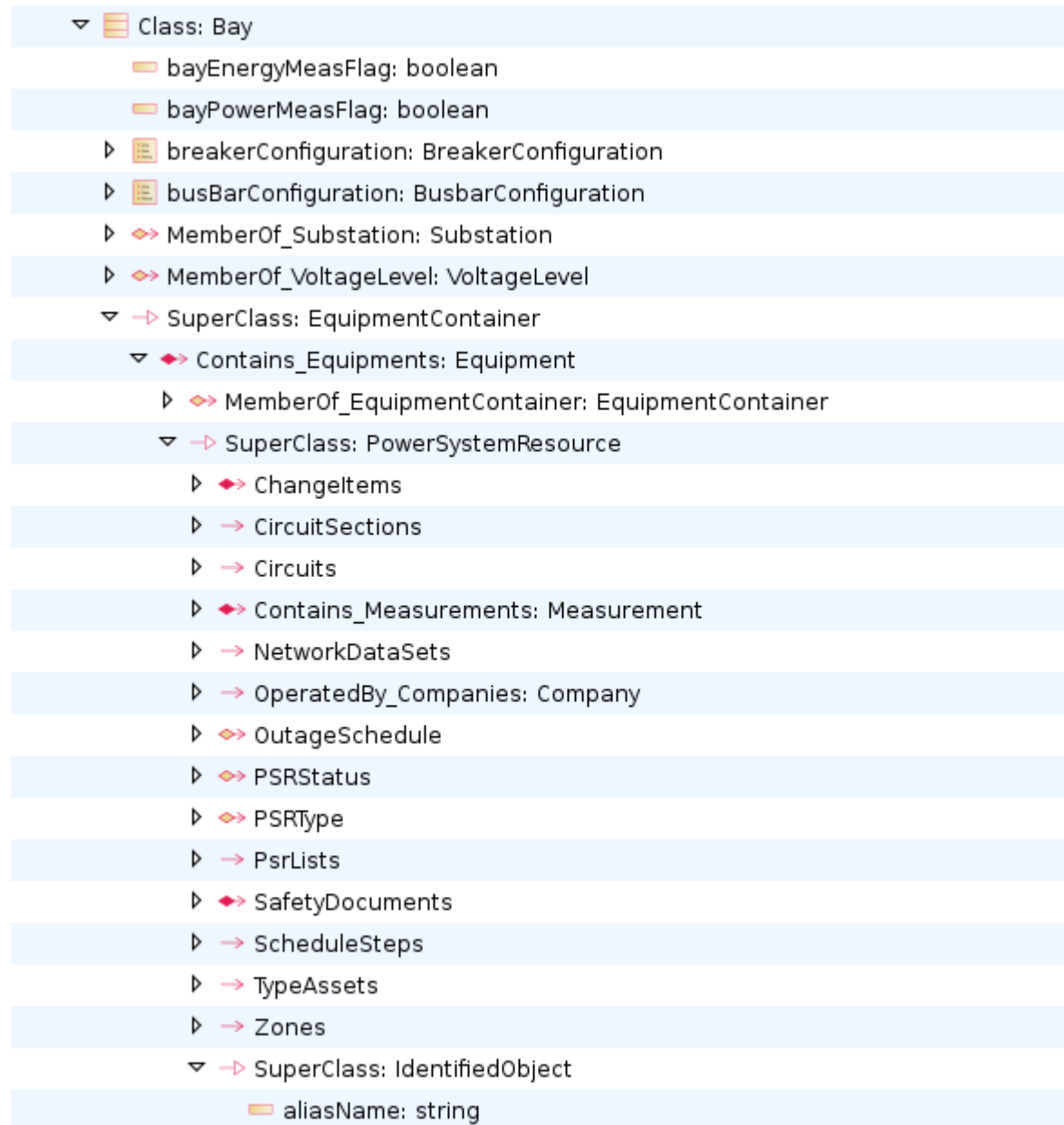
 name 1..1

 normalOpen 1..1

▼  MemberOf_EquipmentContainer 1..1

 Bay

Example: Information Model



Example: Profile

▼  Bay

 name 1..1

▼  Contains_Equipments 1..2

▶  Breaker

Contextual Modelling Tricks

- **Classes:**
 - Omit classes
 - Create unions
 - Subset enumerations
 - Collapse inheritance

Contextual Modelling Tricks

- Associations
 - Omit associations
 - Restrict cardinality
 - Narrow to subtype or union of subtypes
 - Promote/demote to superclass/subclass

Contextual Modelling Languages

- The Good
 - UML
 - Familiar graphics but no built-in constructs to relate contextual model to CIM
 - OWL
 - Has necessary constructs but no graphics
- The Bad
 - Java, XML Schema
 - These don't describe data models

Contextual Modelling

- The Ugly
 - Use a spreadsheet
 - Easy but error prone and not precise
 - Many other representations for contextual models have been tried over the years.
 - Generally fell into disuse because impractical to maintain.

How to Assemble Message Definitions

- Use XML Schema
 - Syntax Decisions:
 - How to represent an individual
 - How to represent a link between individuals
 - How to represent an attribute value
 - Schema Decisions:
 - Which XML Schema constructs?
 - ComplexTypes, Groups, Anonymous types.
 - Does it matter?

How to Assemble Message Definitions

- Use RDF + any RDF syntax
 - RDF/XML Syntax
 - CIM/XML syntax
 - Incremental CIM/XML Syntax

PJM Project

- Information Model Layer:
 - CIM + Extensions in UML
 - Classes extended by inheritance and association
- Contextual Model Layer
 - Many small contextual models
 - Using OWL
- Syntax Layer
 - XML Schema

ERCOT Project

- Information Model Layer:
 - CIM + Extensions in UML
 - Classes extended by inheritance and association
- Contextual Model Layer
 - A few large contextual models
 - Using OWL
- Syntax Layer
 - CIM/XML and Incremental CIM/XML (RDF)

CPSM

- Information Model Layer:
 - CIM in UML, no extensions
- Contextual Model Layer
 - One medium size contextual model in OWL
 - Also as a text document.
- Syntax Layer
 - CIM/XML and Incremental CIM/XML (RDF)

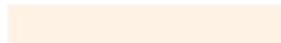
Role of CIMTool

- CIMTool is used to
 - Create and edit the contextual model
 - Edit the message assembly rules
 - Generate the XML and RDF Schema documents

Is it still the CIM?

- We think so because:
 - We follow the 'Liskov principle' for contextual models
 - We have traceability
 - Syntax ->Contextual Model -> CIM

Fin



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