CityGML Utility Network ADE

Recap of the previous months

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5th Joint SIG 3D and OGC Workshop on the CityGML Utility Network ADE
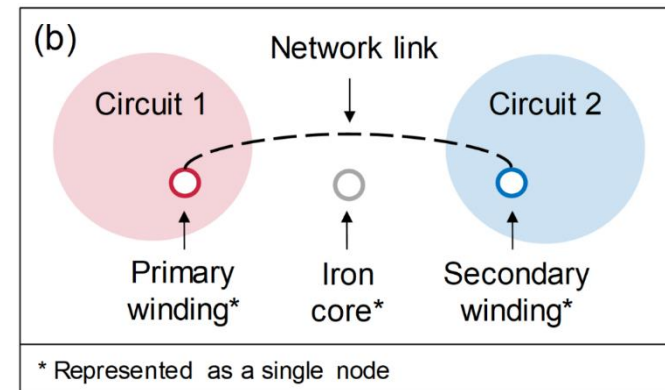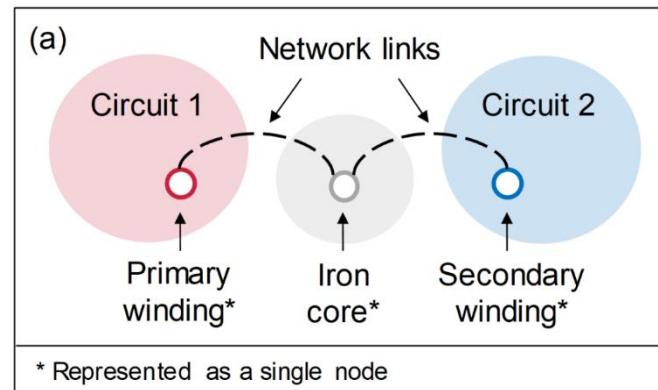Munich, 13/14 May, 2019

UML model updates

▶ Improved modelling of network-to-network relationship

▶ Improved connection between networks and city objects

▶ Restructuring of functional components in the Components module

▶ Introduction of a new class "Actor"

▶ A new Electricity network package was added which defines components specific to electricity networks

▶ Renaming of
  ● several classes to provide better semantics
  ● several attributes to better comply with the names of other attributes or with their data types
  → Please check https://github.com/TatjanaKutzner/CityGML-UtilityNetwork-ADE/blob/master/CHANGES.md for details

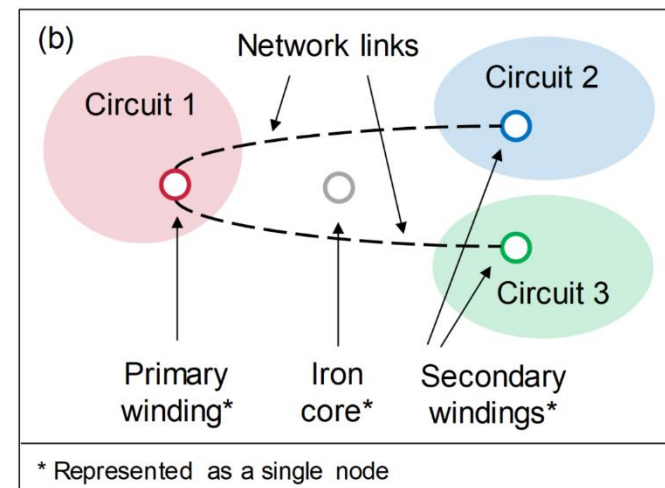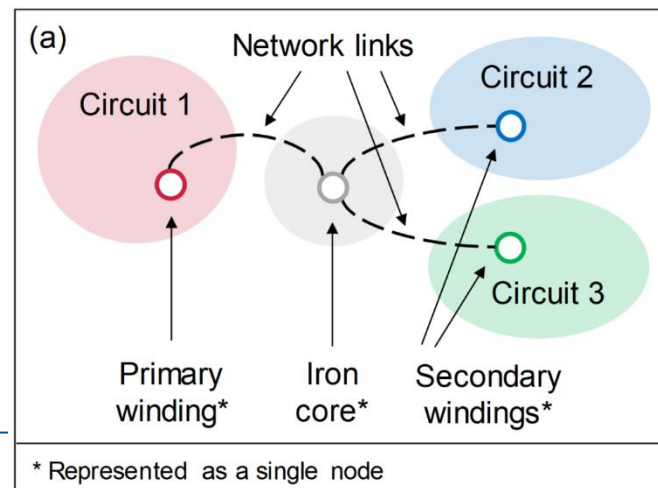# Improved modelling of network-to-network relationship (I)

► Network links between networks transporting the **same type of commodity**

Representation options of a transformer acting as network link between

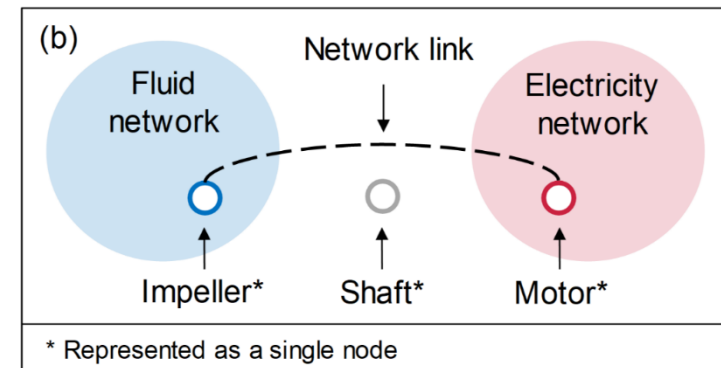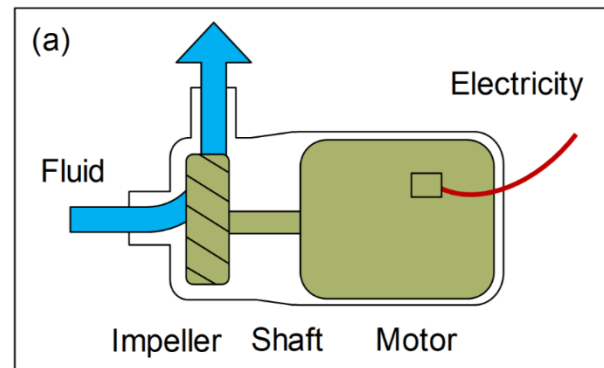- one primary and one secondary electrical circuit

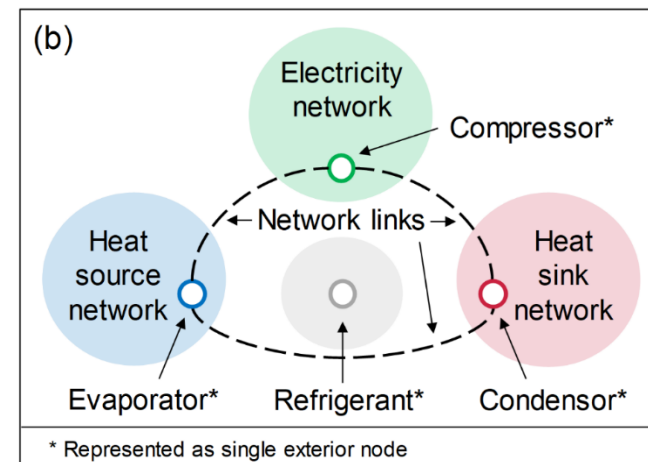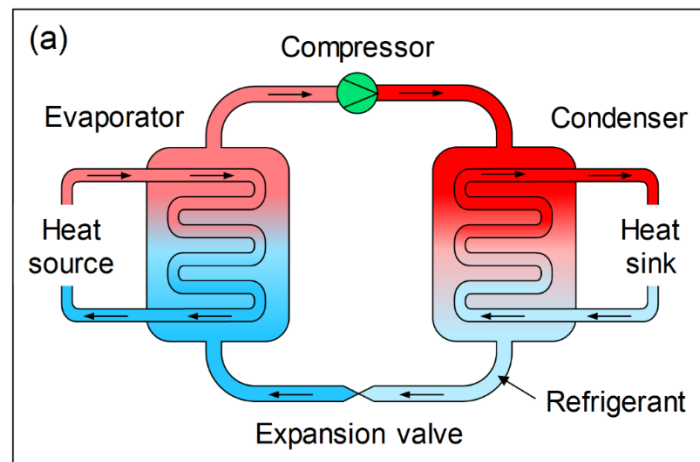- one primary and two secondary electrical circuits

Improved modelling of network-to-network relationship (II)

► Network links between networks transporting **different types of commodity**

- Electrical pump representations as schematic drawing and acting as network link

- Heat pump representations as schematic drawing and acting as network link

Improved connection between networks and city objects

► The **attribute "connectedCityObject"** of type "URI" was remodelled into an association that **references now the class "AbstractCityObject"** of the CityGML core model to specify more explicitly that the referenced city objects are city objects defined by the CityGML standard
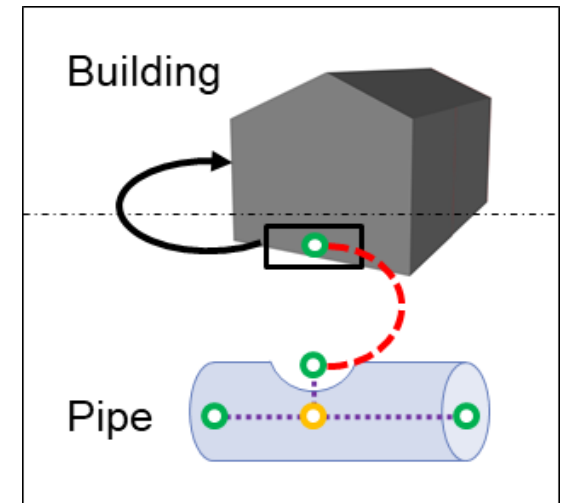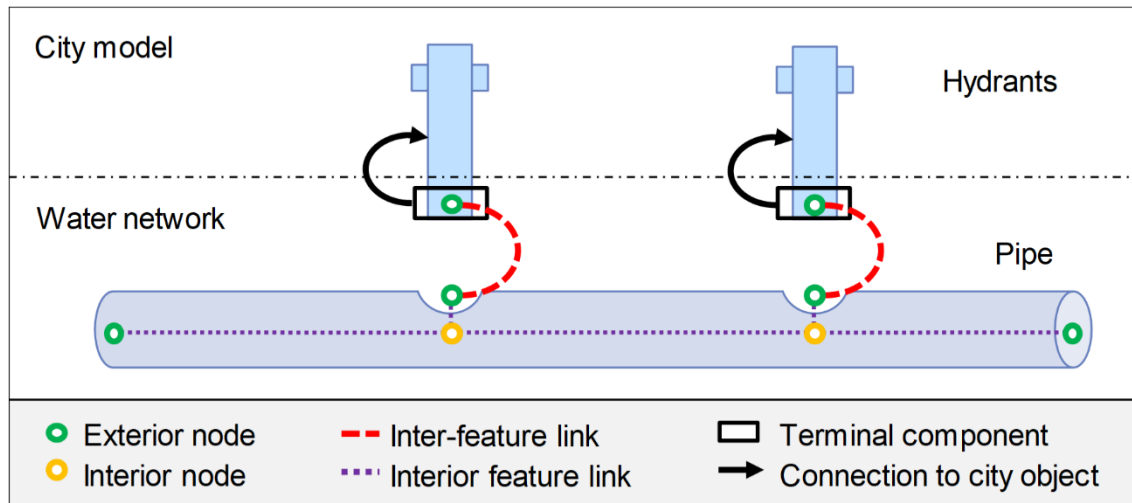
Restructuring of the functional components (I)

► The classification of the individual network components into distribution, functional, and protective elements is now clearly represented through the **three classes *AbstractDistributionElement*, *AbstractFunctionalElement*, and *ProtectiveElement***
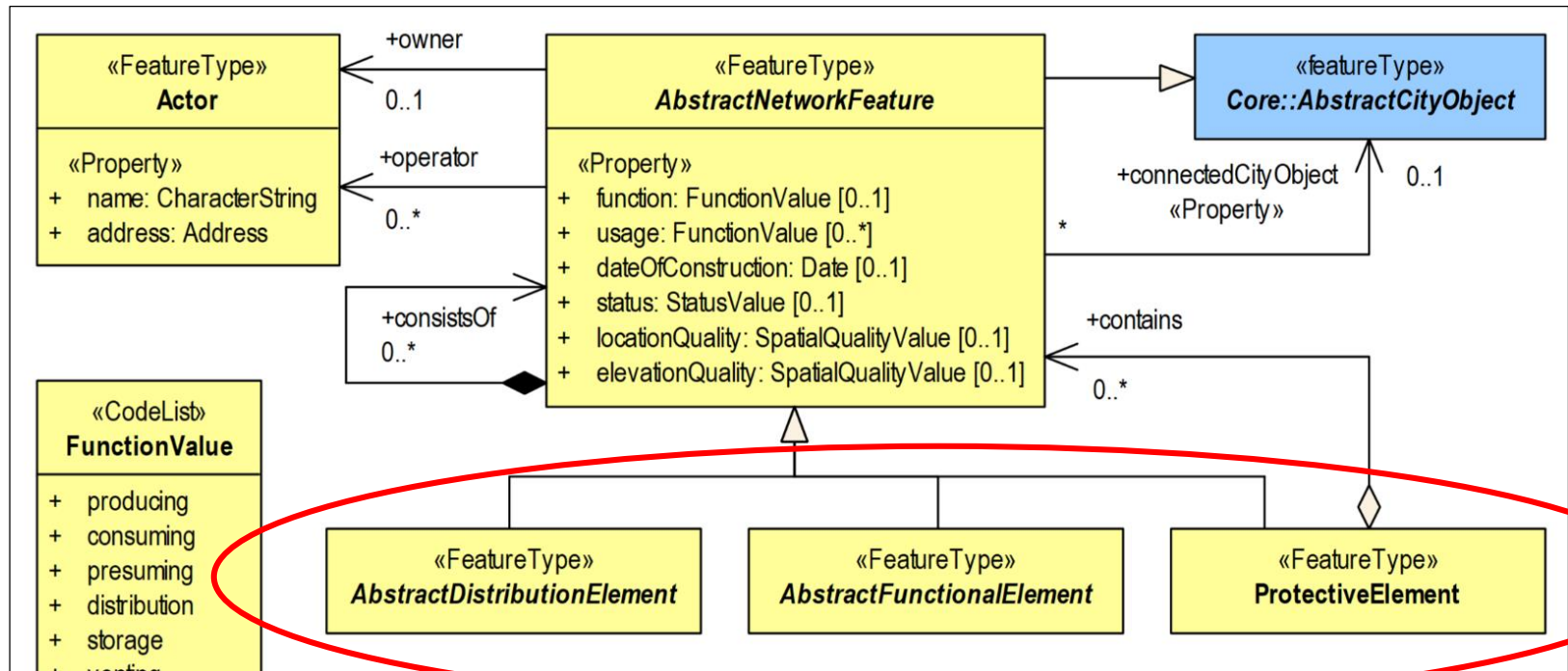
Restructuring of the functional components (II)

► All functional components are now subclasses of *AbstractFunctionalElement*

► New subclass ~~ConnectionComponent~~

13.5.2019
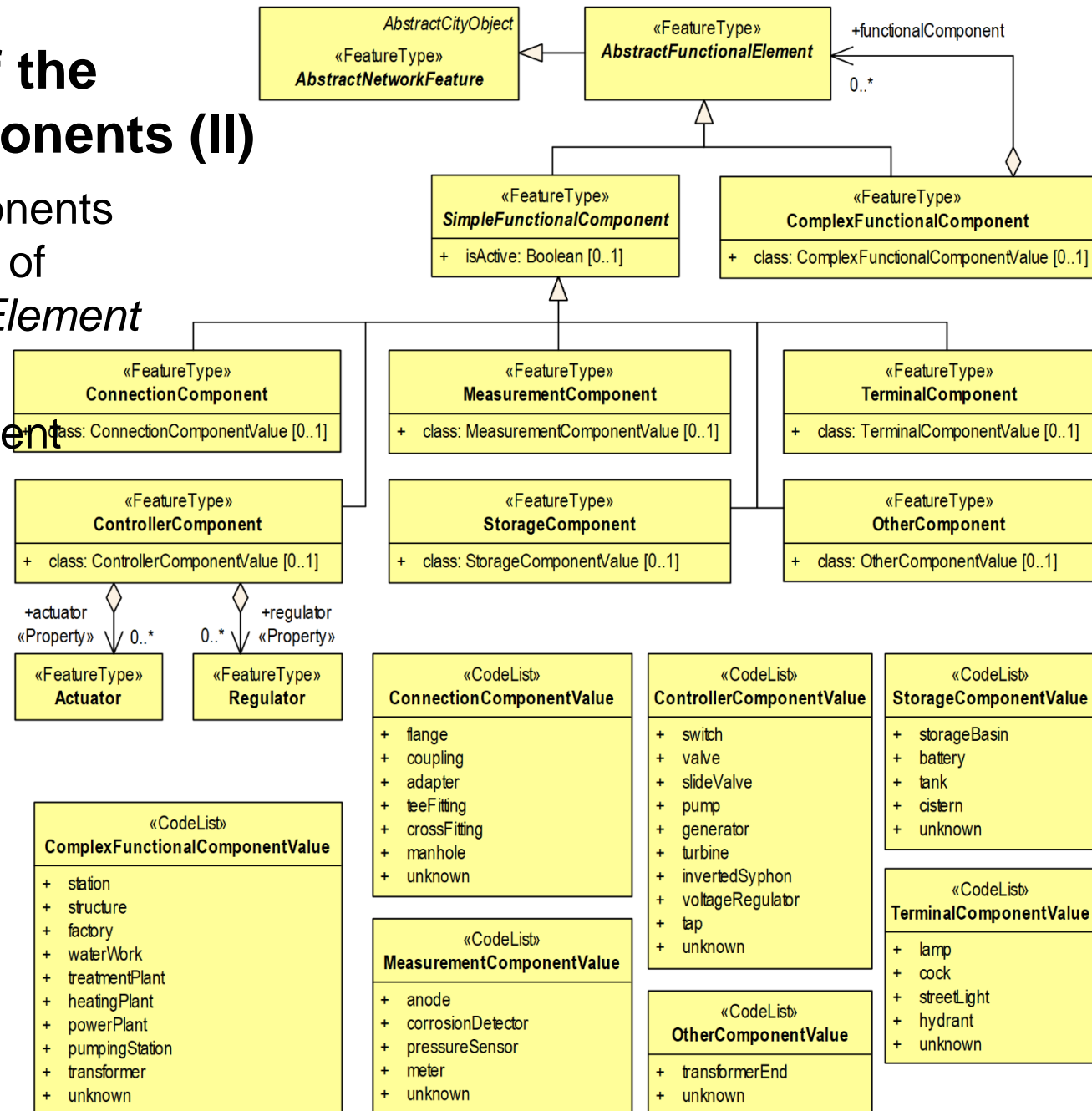
Introduction of a new class "Actor"

► Can be used to provide information on the owner and operator of network elements

Common Information Model (CIM)

Overview CIM– 1

- Model type
  - Conceptual data model represented in UML
  - An encoding of the complete model does not exist
- Application range
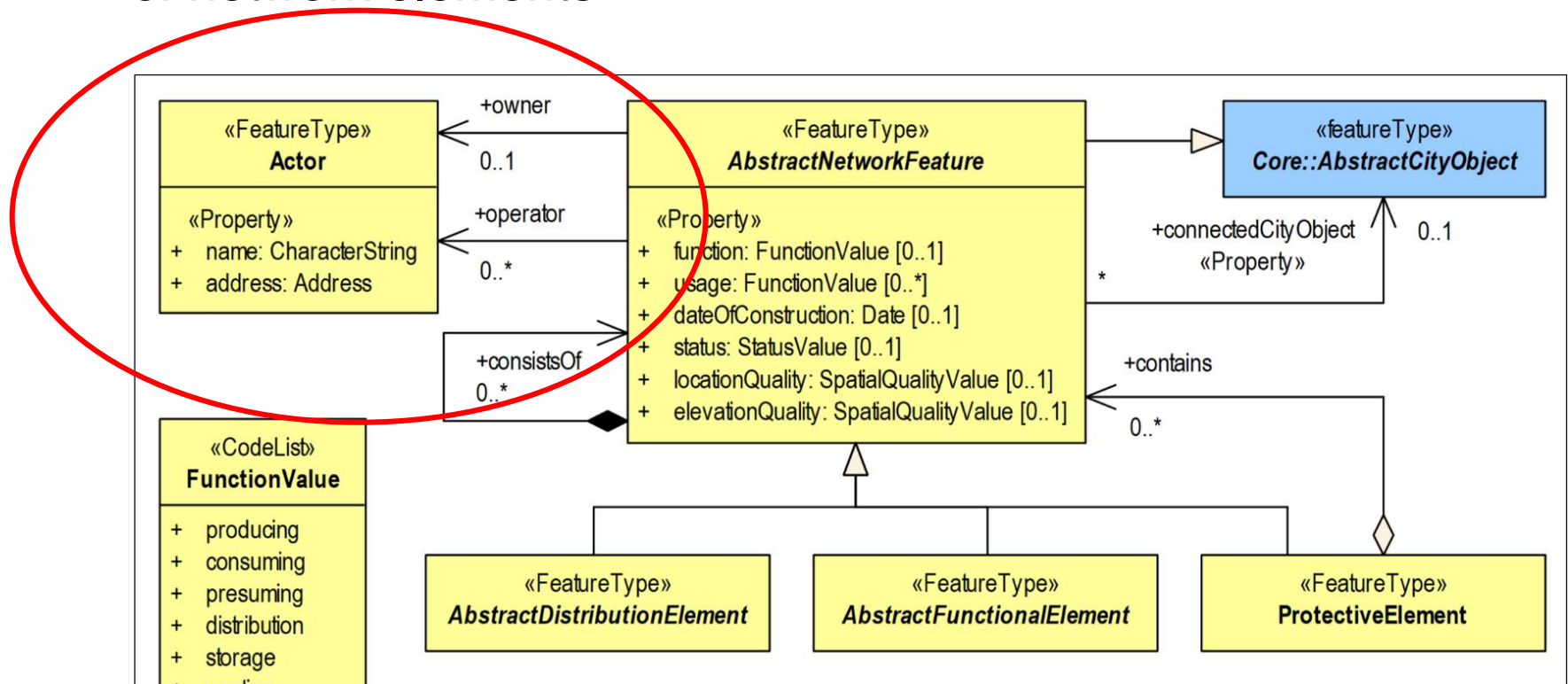 - Modeling of electricity networks, including information on power system components and their relations, Energy Management Systems (EMS), Supervisory Control and Data Acquisition (SCADA) systems, planning and optimization, asset management, work schedules, payment metering, customer information systems and enterprise resource planning
- Responsible organization
  - International Electrotechnical Commission (IEC), TC57, WG14
    - IEC 61970-301 (Base package)
    - IEC 61968-11 (Extension)
  - Adopted by European und German National standards

Common Information Model (CIM) – Base model
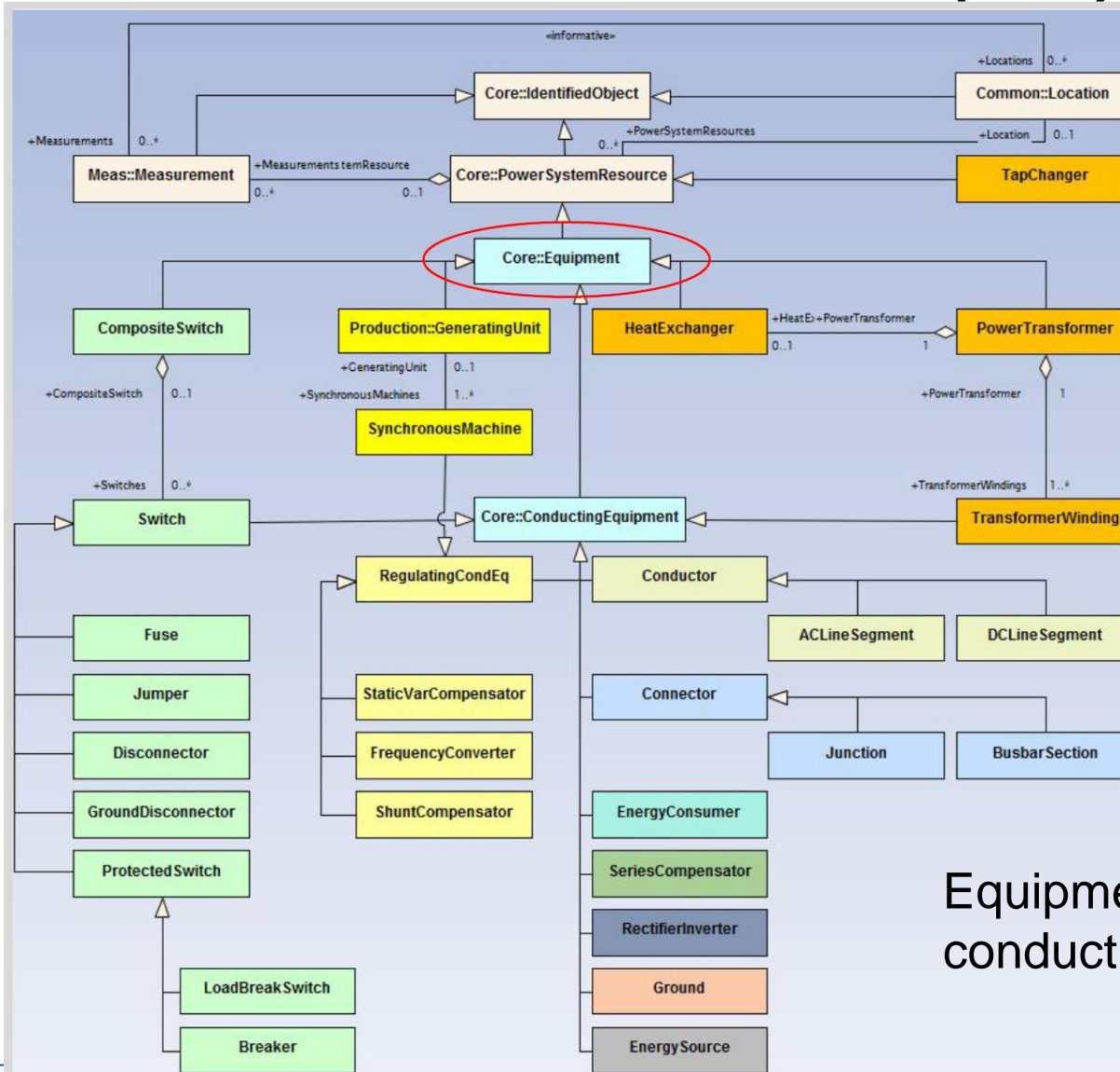
The parts of a power system that are physical devices, electronic or mechanical
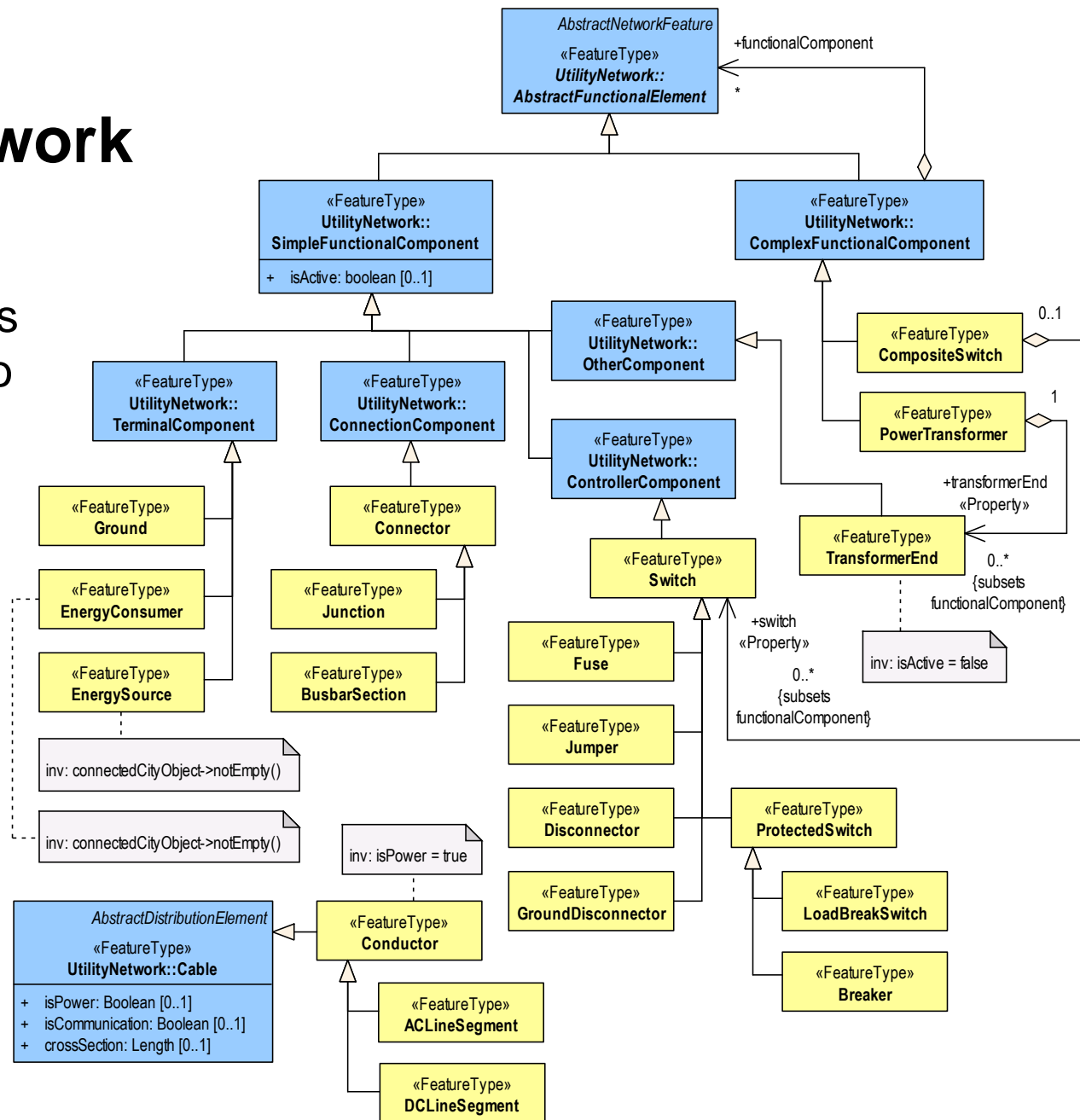
Equipment and conducting equipment

Electricity Network Package

- Defines components which are specific to electricity networks
- The development is based on the CIM model
- Allows for interoperability between the CIM model and the Utility Network ADE

Master theses using the Utility Network ADE (I)

► **Isaac Boates (University of Applied Sciences Karlsruhe / EIFER), 2018:**

Demonstrating Utility Network Interdependency Modelling Using the Utility Network Application Domain Extension for CityGML

- Modelling, simulation, and visualisation of dependencies between the water network and electrical network at a hydroelectric power generation facility in Nanaimo, British Columbia, Canada using the 3DCityDB and QGIS
- Topological routing within the water network using pgRouting

► **Xander den Dujin (TU Delft), 2018:**

A 3D data modeling approach for integrated management of below and above ground utility network features

- Linking above-ground city furniture objects (manhole covers and street lights) with the below-ground sewer and electricity network of Rotterdam, Netherlands
- Network analyses and visualisation of which network features and city objects are affected in case of a utility strike using the 3DCityDB, pgRouting, and ArcGIS

Master theses using the Utility Network ADE (II)

► **Fernando Gonzalez Balcarce (Technical University of Munich), ongoing work:**

Integration of the sewer standard ISYBau with the CityGML Utility Network ADE for improved representation of sewer networks

- Specification of a sewer network package that improves interoperability with ISYBau, a German standardized exchange format for sewer networks.

PDEng thesis using the Utility Network ADE

► **Ramon ter Huurne (University of Twente), 2019:**

Operations and Maintenance ADE

- Development of a data specification for operations and maintenance of subsurface infrastructure which is based on the Utility Network ADE and adds those concepts and relations relevant for the domain of operations and maintenance

PDEng thesis using the Utility Network ADE

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Operations and Maintenance ADE

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Ongoing work

► Finalisation of test data
sets for fresh water, gas,
and electricity based on
data provided by AED-
SICAD

☑ ⊞ Building (190)
☑ ⊞ CityFurniture (44) → Hydrants
☑ ⊞ CityModel (1)
☑ ⊞ ControllerDevice (262) → Valves
☑ ⊞ FeatureGraph (593)
☑ ⊞ InterFeatureLink (378)
☑ ⊞ InteriorFeatureLink (868)
☑ ⊞ LiquidMedium (1)
☑ ⊞ Network (1)
☑ ⊞ NetworkGraph (1)
☑ ⊞ Node (1142)
☑ ⊞ RoundPipe (549)

T-fittings, saddle clamps,
reducers, network termination
☑ ⊞ RoundShell (62)
☑ ⊞ SimpleFunctionalElement (235) → components, controller cabinet
☑ ⊞ TerminalElement (247) → Connection to hydrants and buildings

Freshwater network