

# UML diagrams

Last updated on 14 October 2025





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The latest version of this document can be downloaded from:  
[https://github.com/tudelft3d/Energy\\_ADE/tree/main/documentation](https://github.com/tudelft3d/Energy_ADE/tree/main/documentation)

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### Funding

Development of the new Energy ADE has started in spring 2024 within the European [DigiTwins4PEDs](#) project, as part of the Work Package 3. The project is funded by the European Commission under the Horizon Europe Partnership scheme. The [DUT Call 2022](#) also contributes to the Urban Transition Mission of Mission Innovation as part of the MICall 2022 initiative.

### Acknowledgements

The author would like to thank the following people for their suggestions and fruitful discussions that have helped design the current version of the Energy ADE 3.0:

- Rushikesh Padsala and Zhihang Yao (HFT Stuttgart, Germany)
- Thomas Kolbe (TU Munich, Germany)
- Jérôme Kämpf (Idiap, Switzerland)
- Camilo León-Sánchez (TU Delft, The Netherlands)

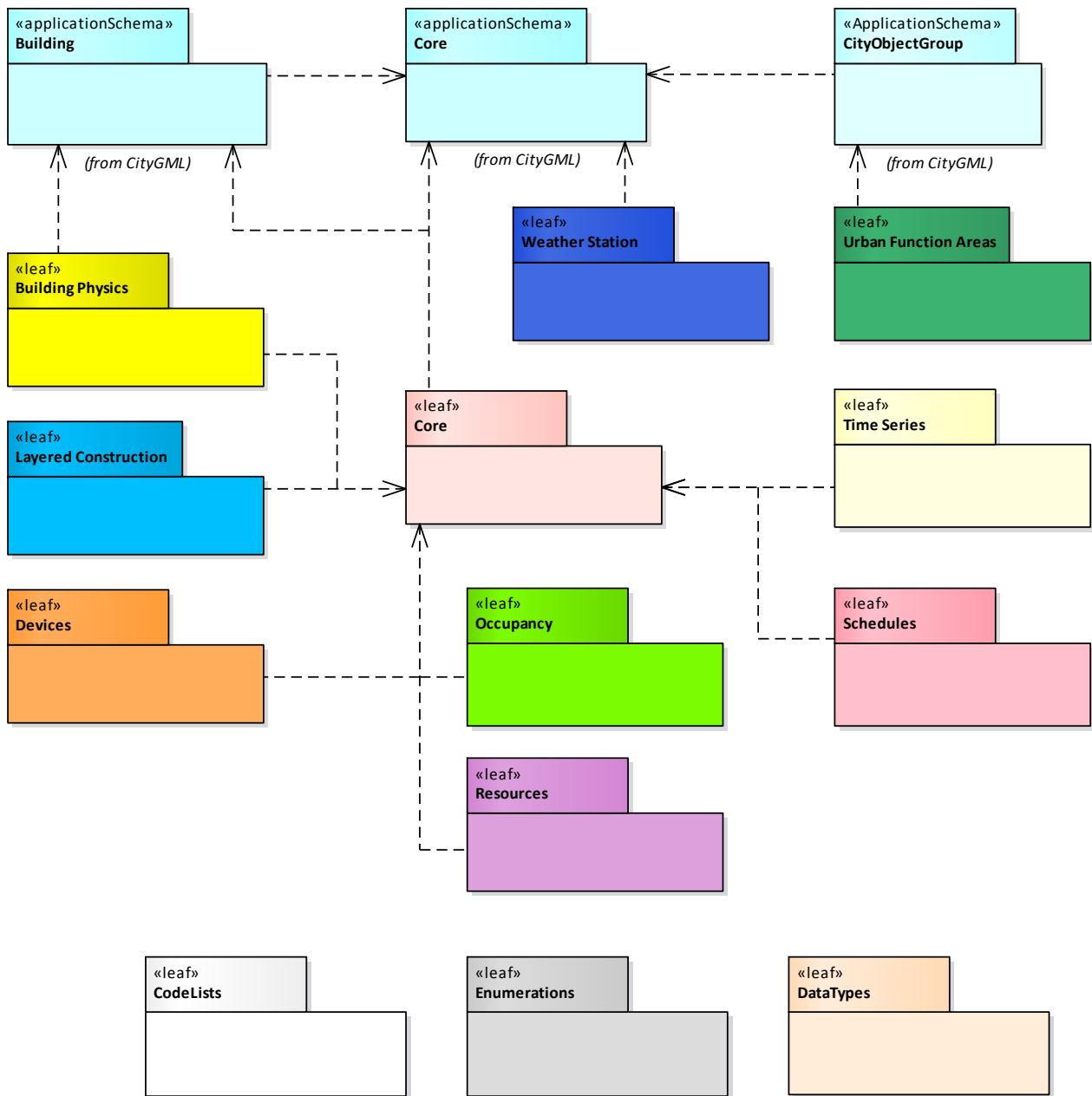
Particular gratitude is due to Daniele Gasparini for designing the Energy ADE logo.

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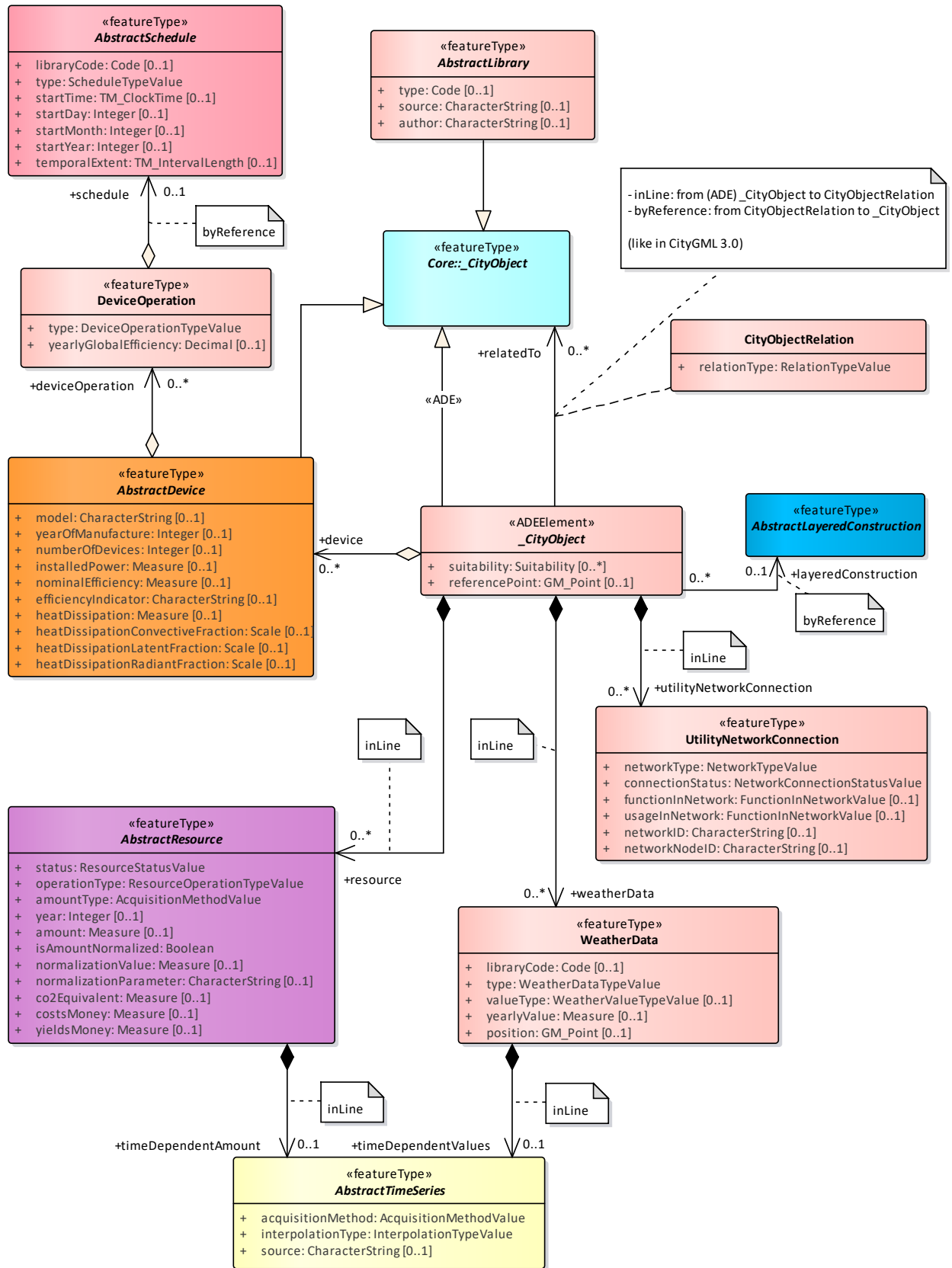
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## Overview of the packages



## Core module



«codeList» CodeLists:: AcquisitionMethodValue
+ measurement + simulation + calibratedSimulation + estimation + unknown

«codeList» CodeLists:: DeviceOperationTypeValue
+ cooking + domesticHotWater + electricalAppliances + lighting + otherOrCombination + process + shading + spaceCooling + spaceHeating + ventilation + unknown

«codeList» CodeLists:: FunctionInNetworkValue
+ producing + consuming + storage + other + unknown

«codeList» CodeLists:: ScheduleTypeValue
+ hour + day + week + month + season + year + typicalDay + typicalWeek + typicalMonth + typicalSeason + typicalYear + monday + tuesday + wednesday + thursday + friday + saturday + sunday + weekday + weekendDay + beerDay + holiday + january + february + march + april + may + june + july + august + september + october + november + december + spring + summer + autumn + winter + other

«codeList» CodeLists:: NetworkTypeValue
+ data + gas + districtHeating + districtCooling + wasteWater + electricalGrid + other + unknown

«codeList» CodeLists:: RelationTypeValue
+ adjacentTo + installedOn + sharedWith

«codeList» CodeLists:: ResourceOperationTypeValue
+ demands + has + hasBalanceOf + produces + stores

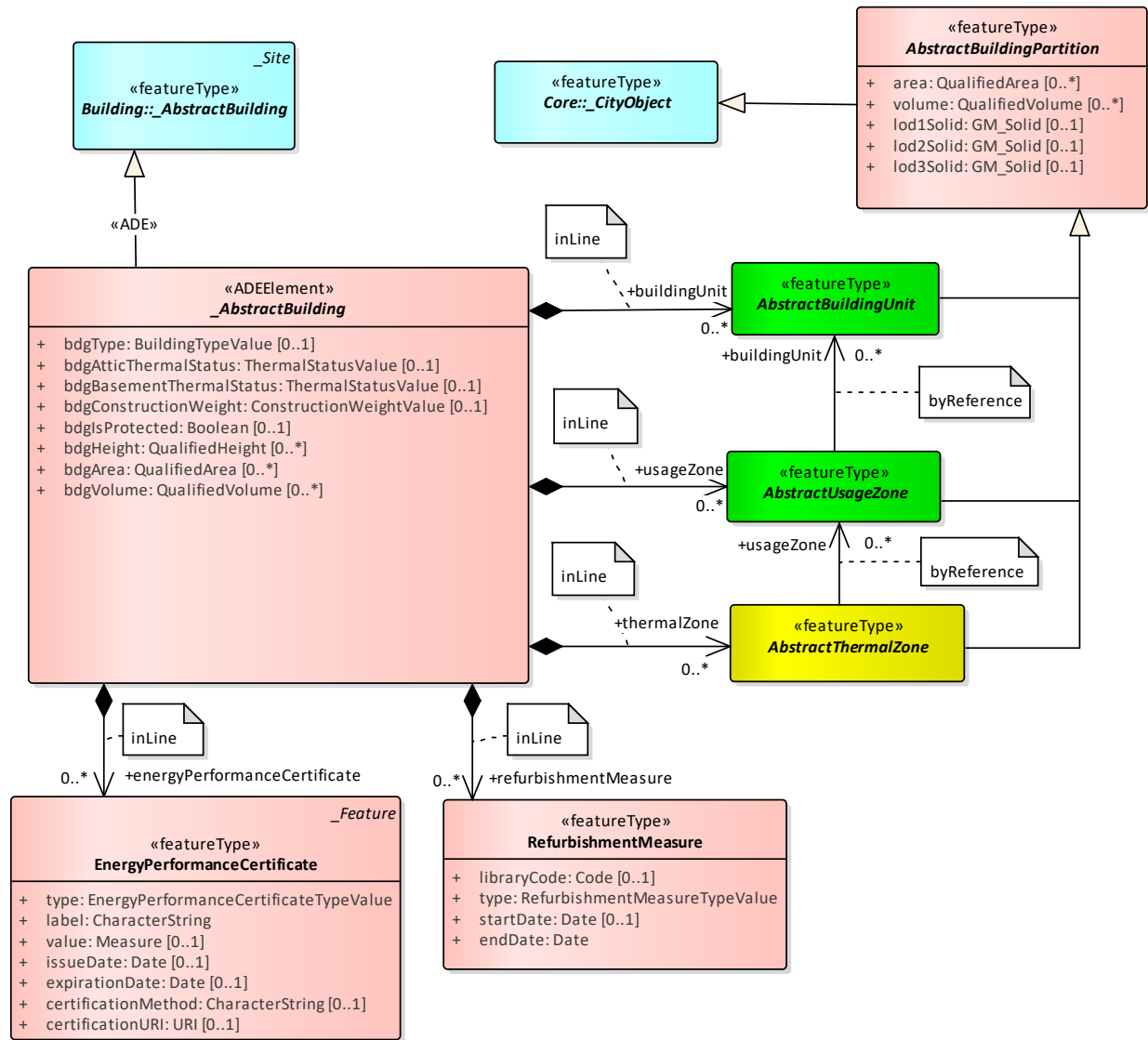
«codeList» CodeLists:: WeatherDataTypeValue
+ airTemperature + humidity + windSpeed + windDirection + cloudiness + globalSolarIrradiance + directSolarIrradiance + diffuseSolarIrradiance + terrestrialEmission + downwardTerrestrialRadiation + daylightIlluminance + shadowingFactor + precipitation

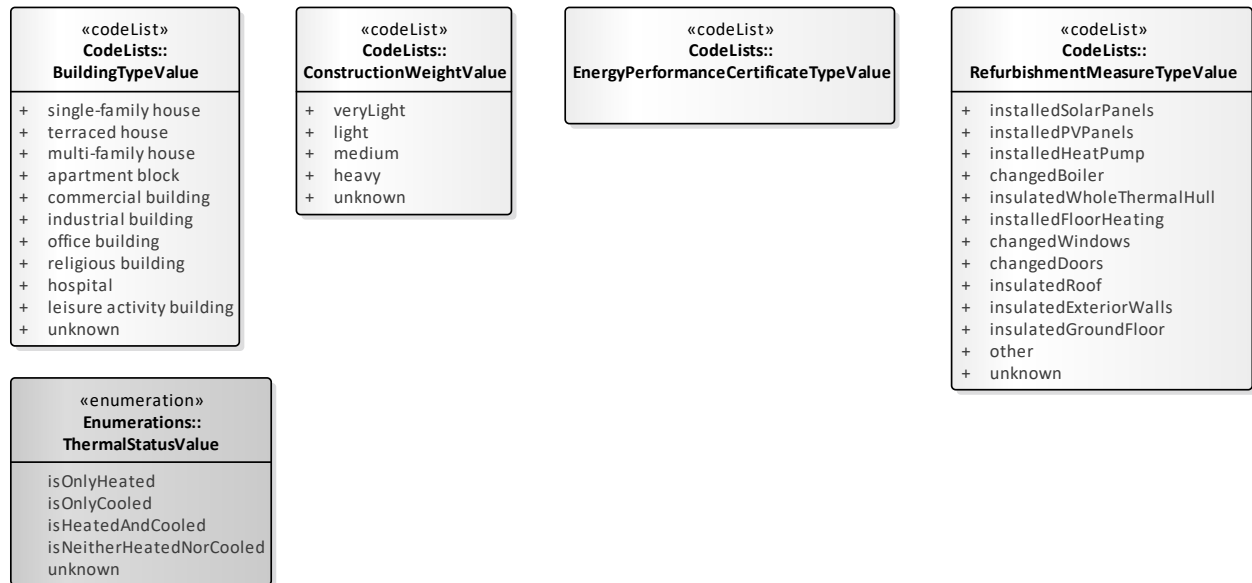
«codeList» CodeLists:: WeatherValueTypeValue
+ absolute maximum + average maximum + average + average minimum + absolute minimum + unknown

«enumeration» Enumerations:: InterpolationTypeValue
averageInPrecedingInterval averageInSucceedingInterval constantInPrecedingInterval constantInSucceedingInterval continuous discontinuous instantaneousTotal maximumInPrecedingInterval maximumInSucceedingInterval minimumInPrecedingInterval minimumInSucceedingInterval precedingTotal succeedingTotal

«enumeration» Enumerations:: NetworkConnectionStatusValue
connected disconnectedButConnectable disconnectedAndNotConnectable unknown

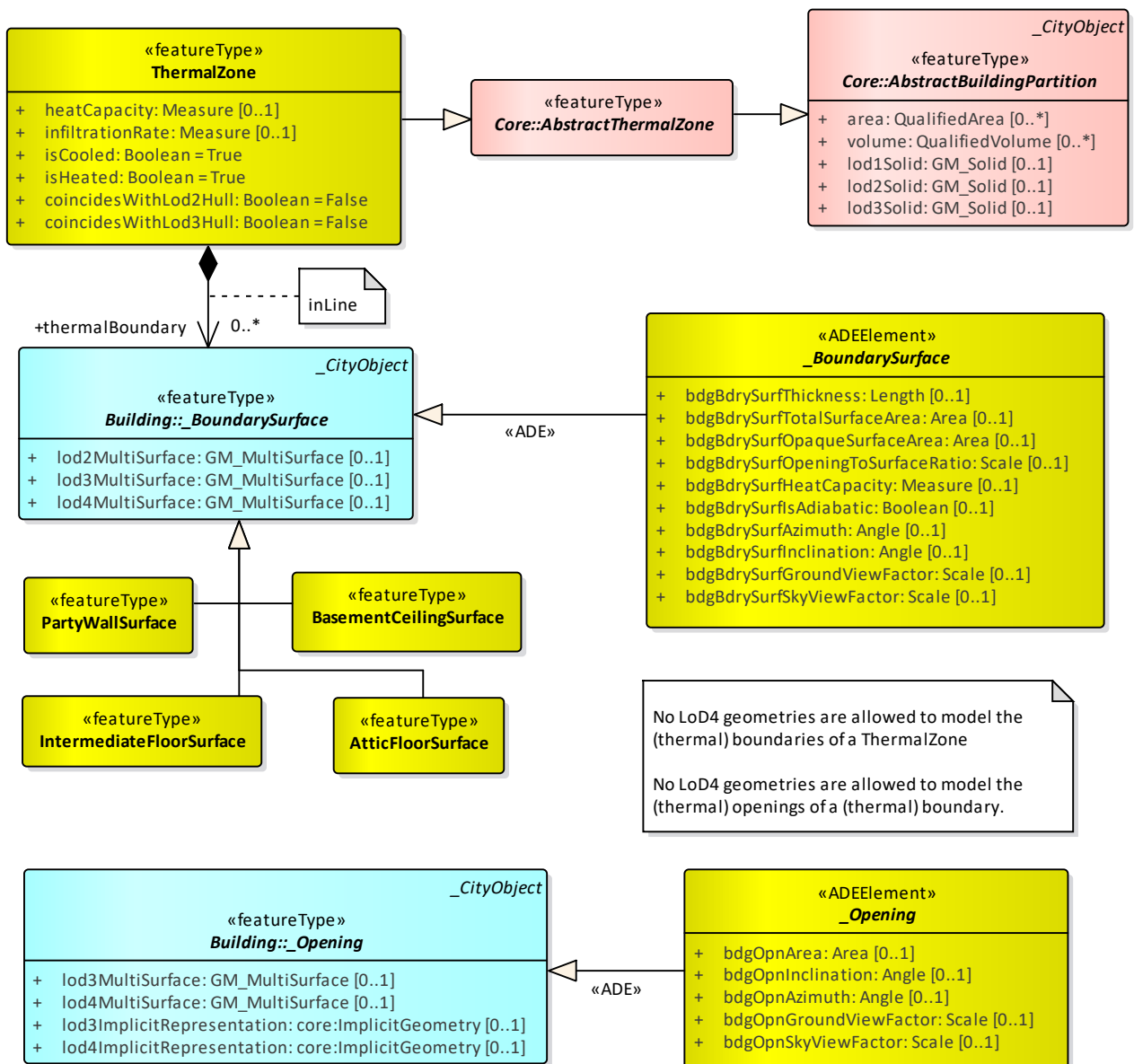
«enumeration» Enumerations:: ResourceStatusValue
actual potential unknown



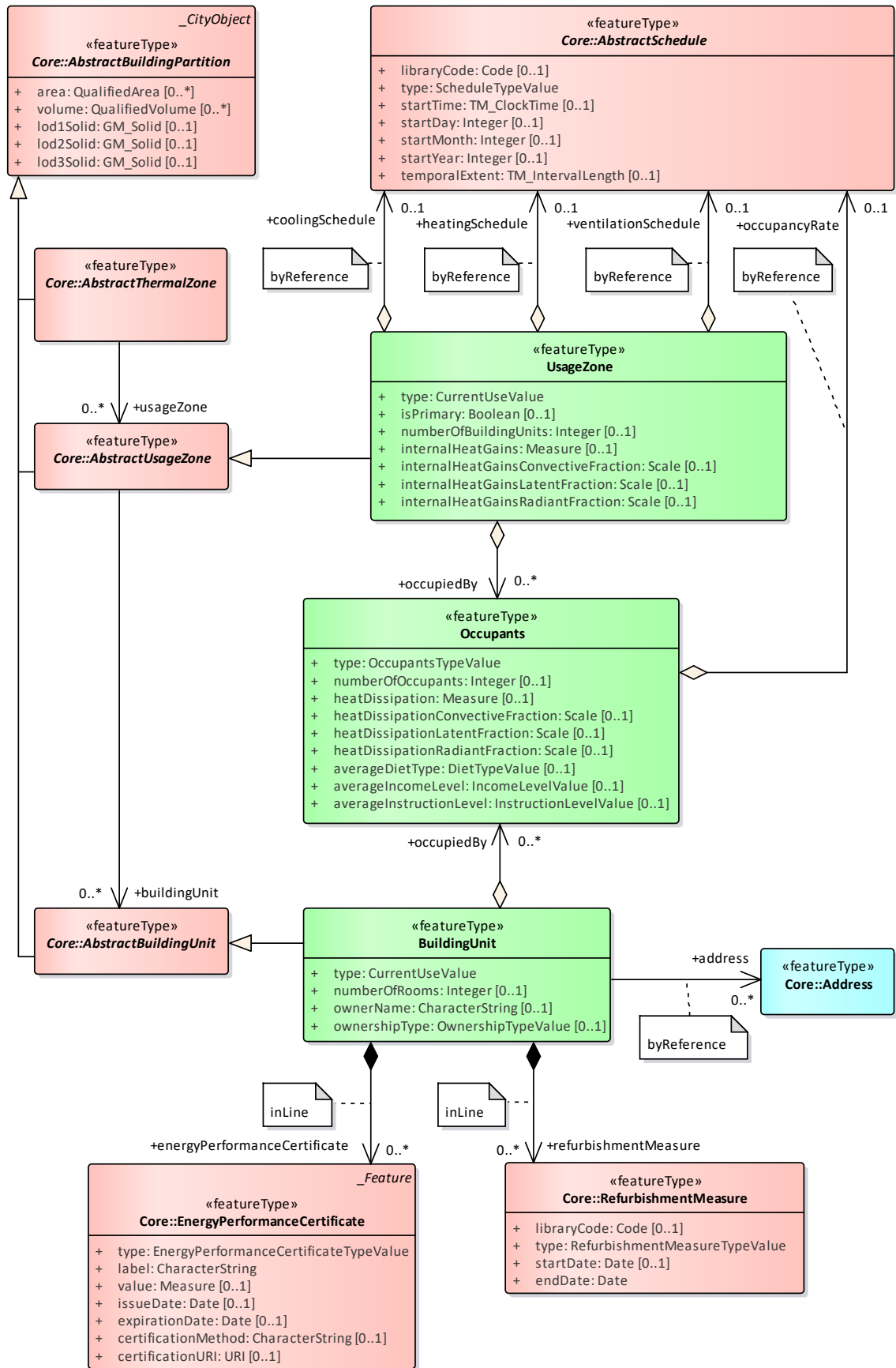


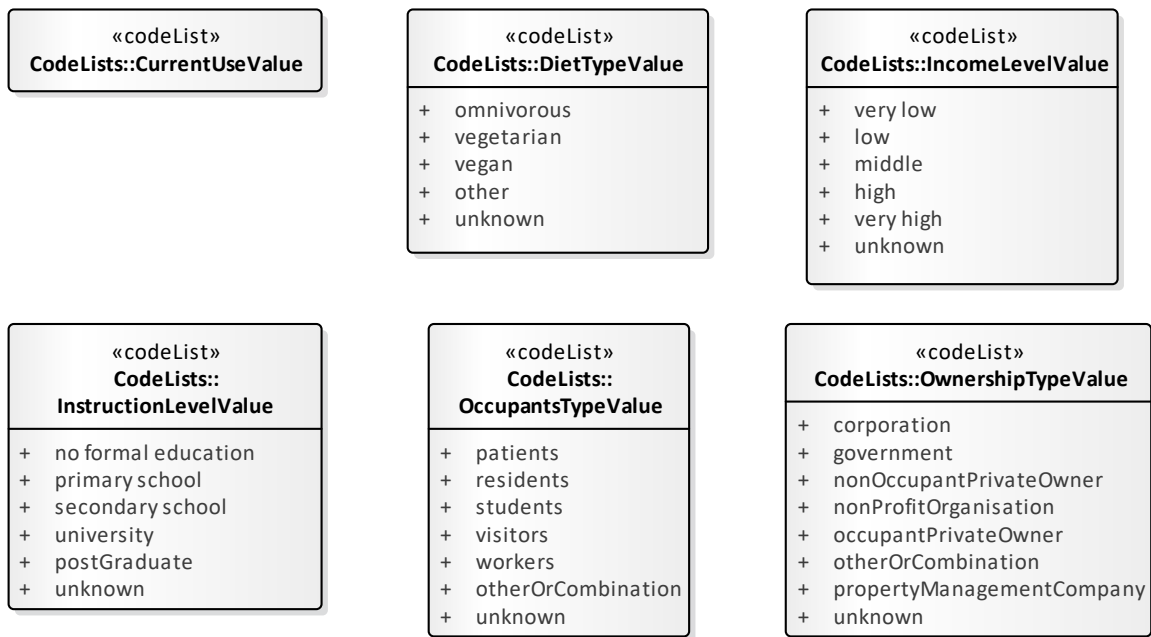


## Building physics module

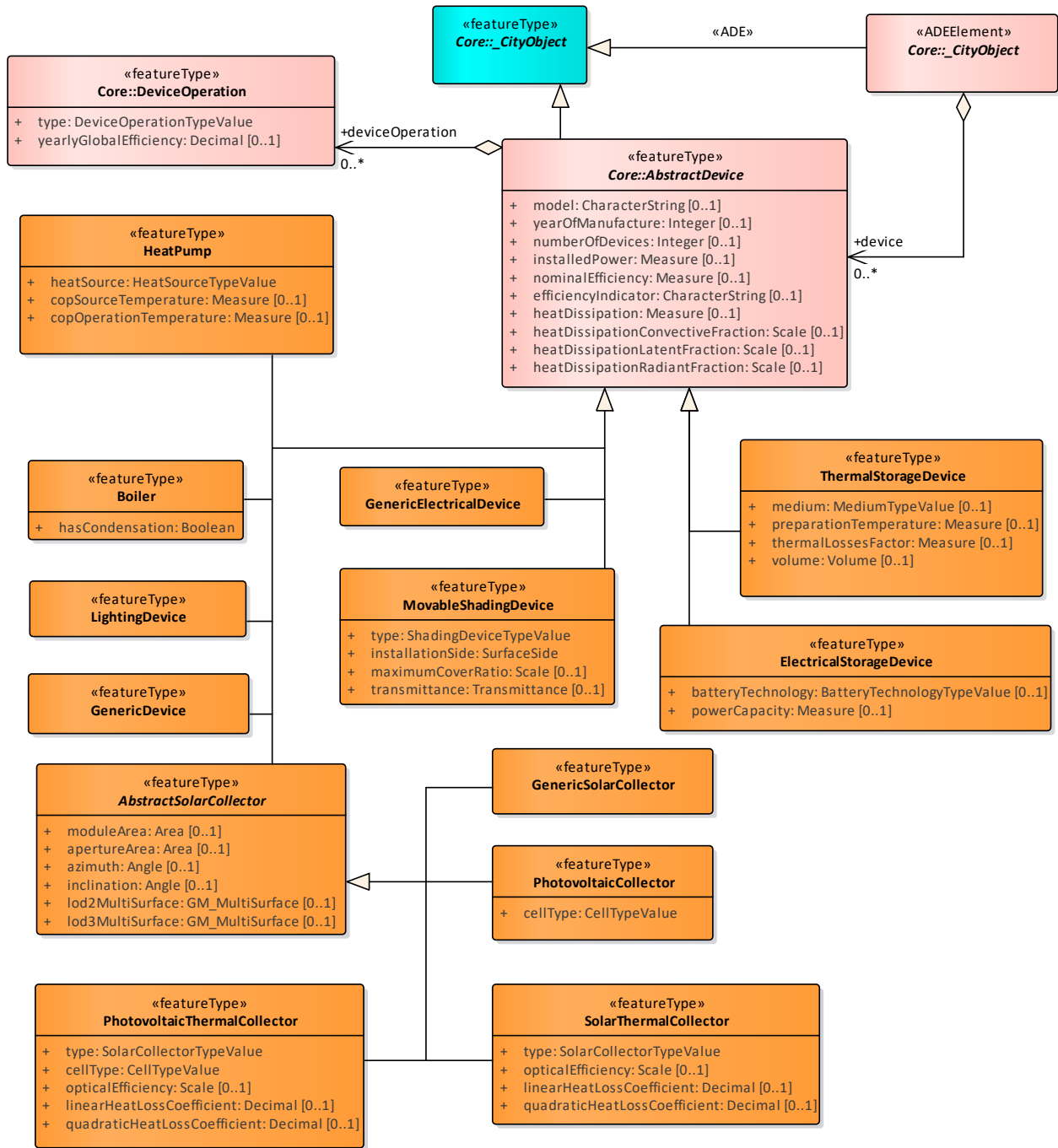


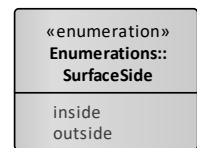
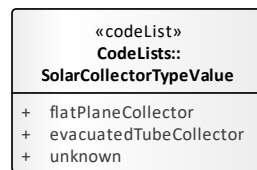
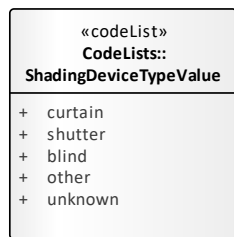
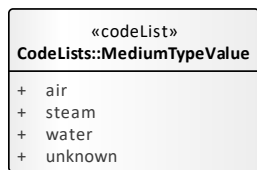
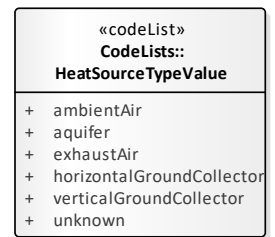
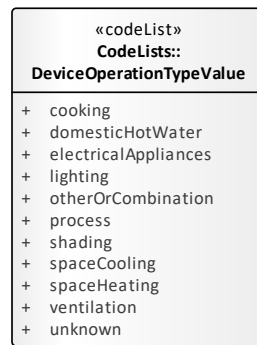
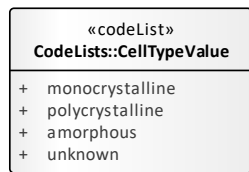
## Occupancy module



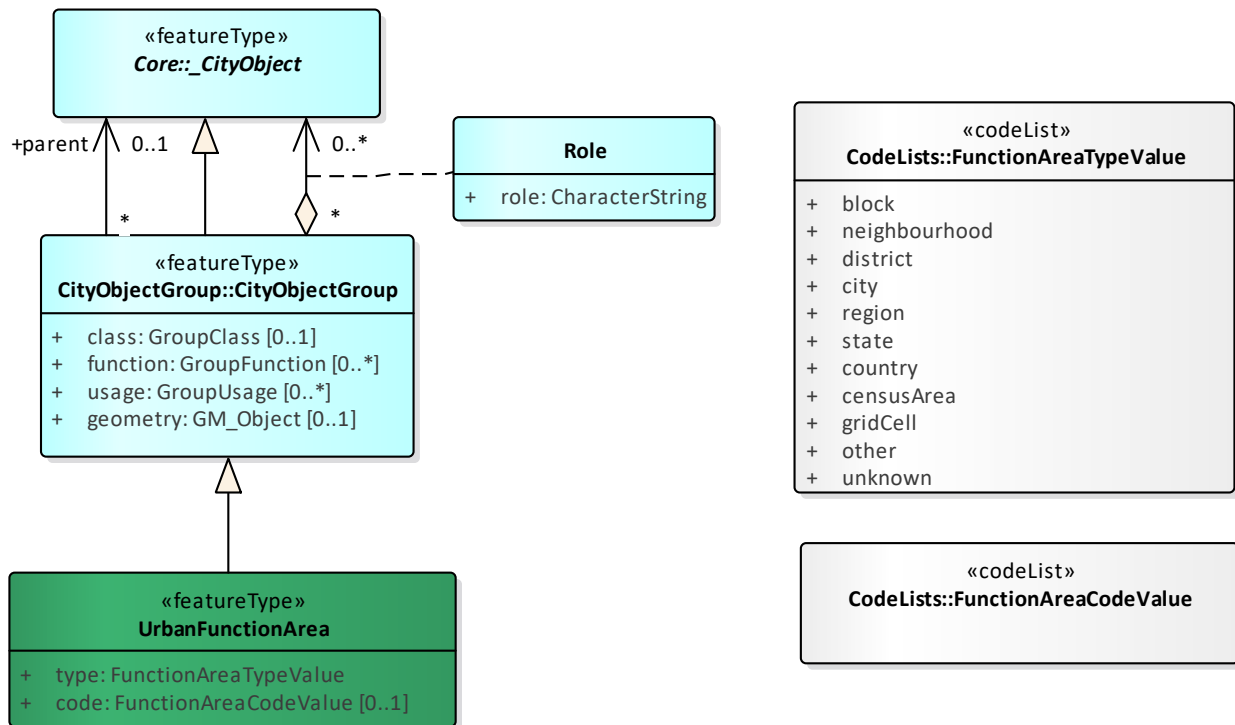


## Devices module

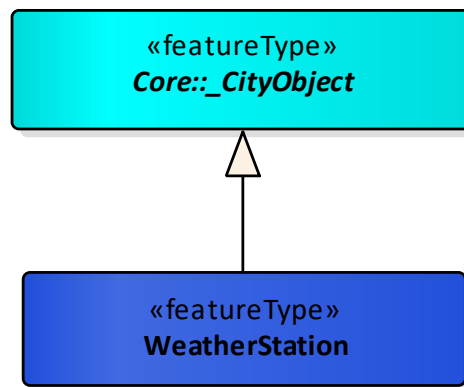




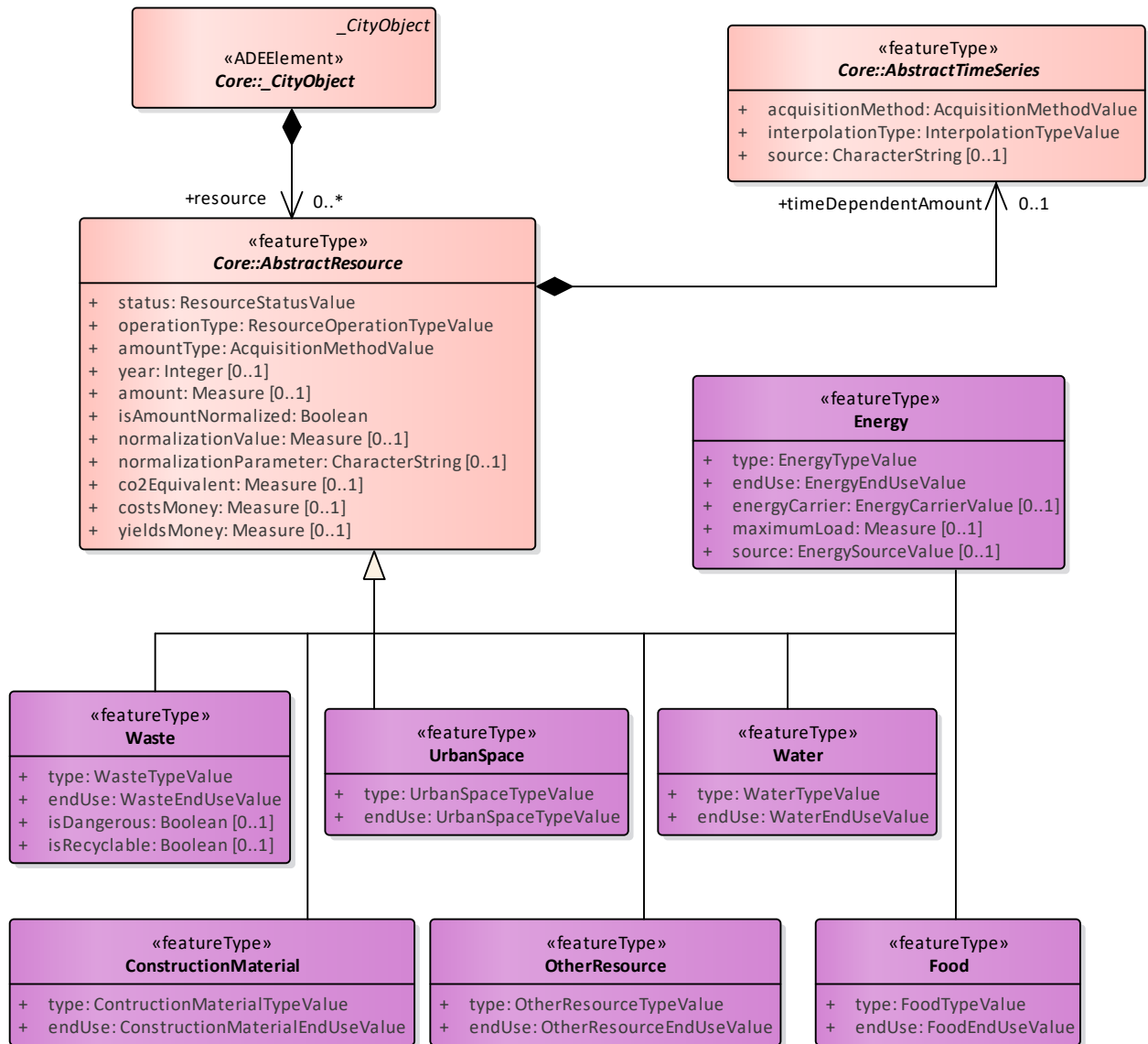
## Urban function areas module



## Weather station module



## Resources module



«codeList» CodeLists:: ConstructionMaterialEndUseValue
+ construction + refurbishment + otherOrCombination + unknown

«codeList» CodeLists:: ConstructionMaterialTypeValue
+ wood + tiles + concrete + sand + soil + otherOrCombination + glass + bricks + unknown

«codeList» CodeLists:: EnergyCarrierValue
+ electricity + coal + naturalGas + chilledAir + chilledWater + fuelOil + hotAir + steam + hotWater + woodChips + hydrogen + propane + woodPallets + other + unknown

«codeList» CodeLists:: EnergyEndUseValue
+ cooking + domesticHotWater + electricalAppliances + lighting + otherOrCombination + spaceCooling + spaceHeating + ventilation + process + construction + unknown

«codeList» CodeLists:: EnergyTypeValue
+ actual + net + primary + secondary + final + useful

«codeList» CodeLists:: EnergySourceValue
+ photovoltaicPanels + powerGrid + districtHeating + solarThermalPanels + heatPump + wind

«codeList» CodeLists:: FoodEndUseValue
+ alimentation + commerce

«codeList» CodeLists:: FoodTypeValue
+ greeneries + meat + cereals + cheese + milk + wine + beer + unknown

«codeList» CodeLists:: OtherResourceEndUseValue
---

«codeList» CodeLists:: OtherResourceTypeValue
---

«codeList» CodeLists:: UrbanSpaceEndUseValue
--

«codeList» CodeLists:: UrbanSpaceTypeValue
--

«codeList» CodeLists:: WaterEndUseValue
+ drinking + washing + processing + otherOrCombination + unknown

«codeList» CodeLists:: WaterTypeValue
+ drinkWater + wasteWater + rainWater + otherOrCombination + unknown

«codeList» CodeLists:: WasteEndUseValue
+ incineration + landFilling + recycling + other + unknown

«codeList» CodeLists:: WasteTypeValue
+ organic + plastic + glass + paper + metal + water + otherOrCombination + unknown

«codeList» CodeLists:: ResourceOperationTypeValue
+ demands + has + hasBalanceOf + produces + stores

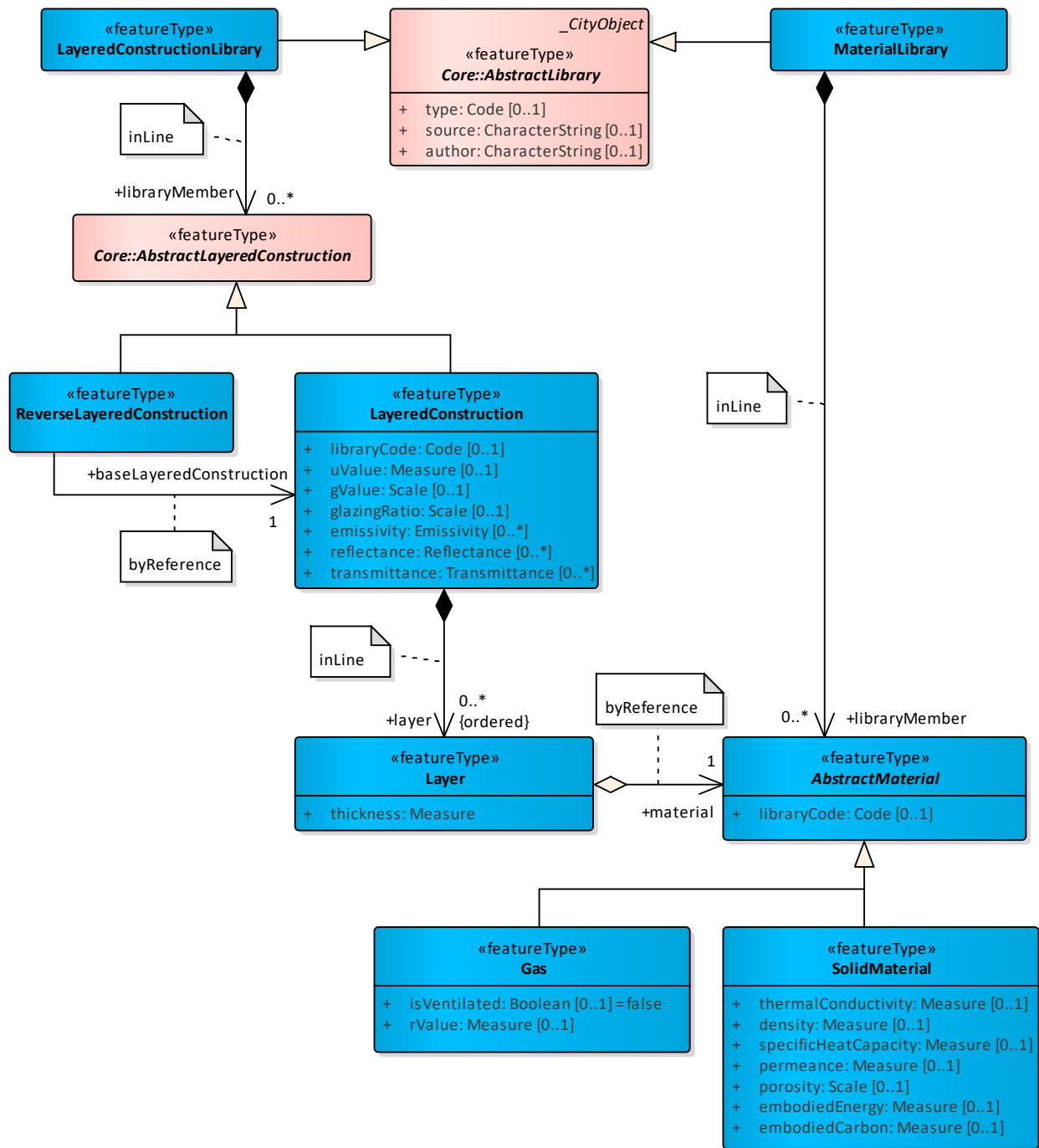
«codeList» CodeLists:: AcquisitionMethodValue
+ measurement + simulation + calibratedSimulation + estimation + unknown

«enumeration» Enumerations:: ResourceStatusValue
actual potential unknown

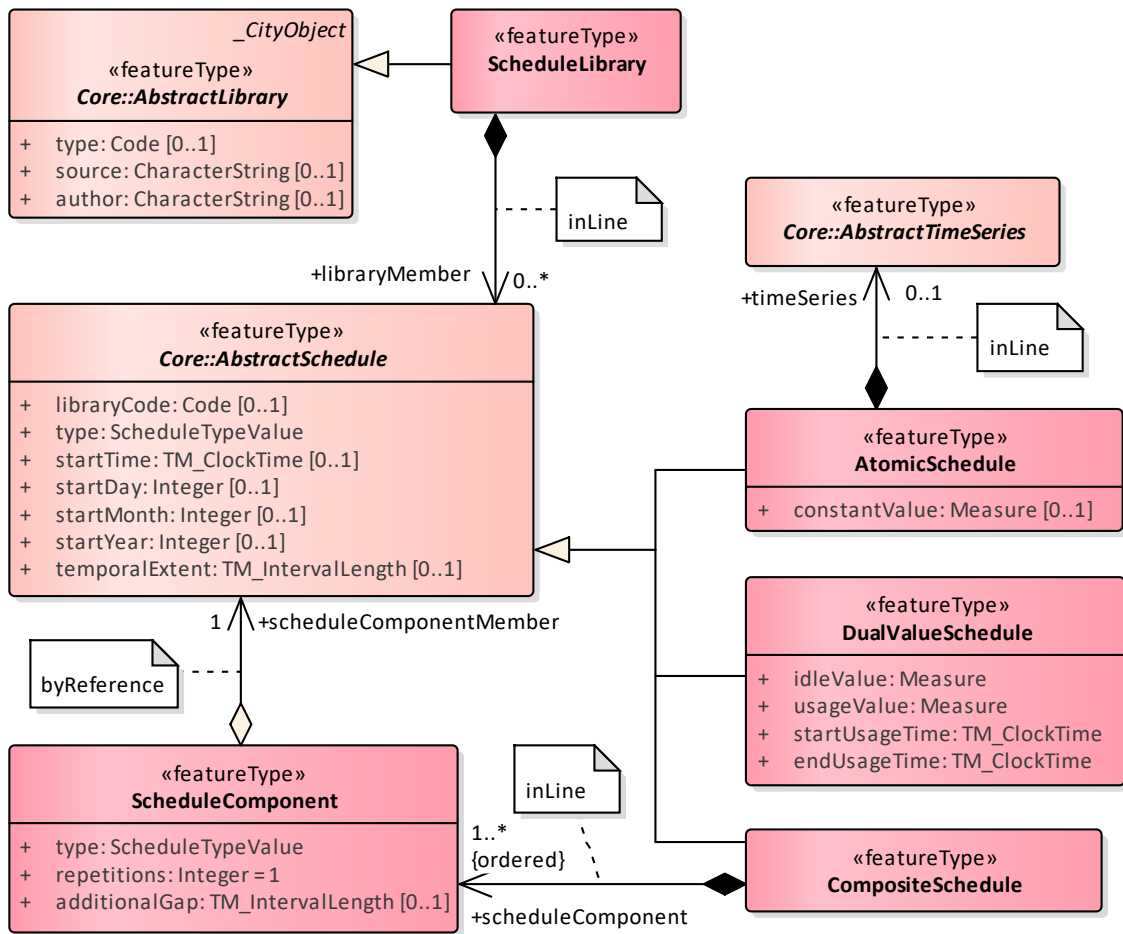
«enumeration» Enumerations:: InterpolationTypeValue
averageInPrecedingInterval averageInSucceedingInterval constantInPrecedingInterval constantInSucceedingInterval continuous discontinuous instantaneousTotal maximumInPrecedingInterval maximumInSucceedingInterval minimumInPrecedingInterval minimumInSucceedingInterval precedingTotal succeedingTotal



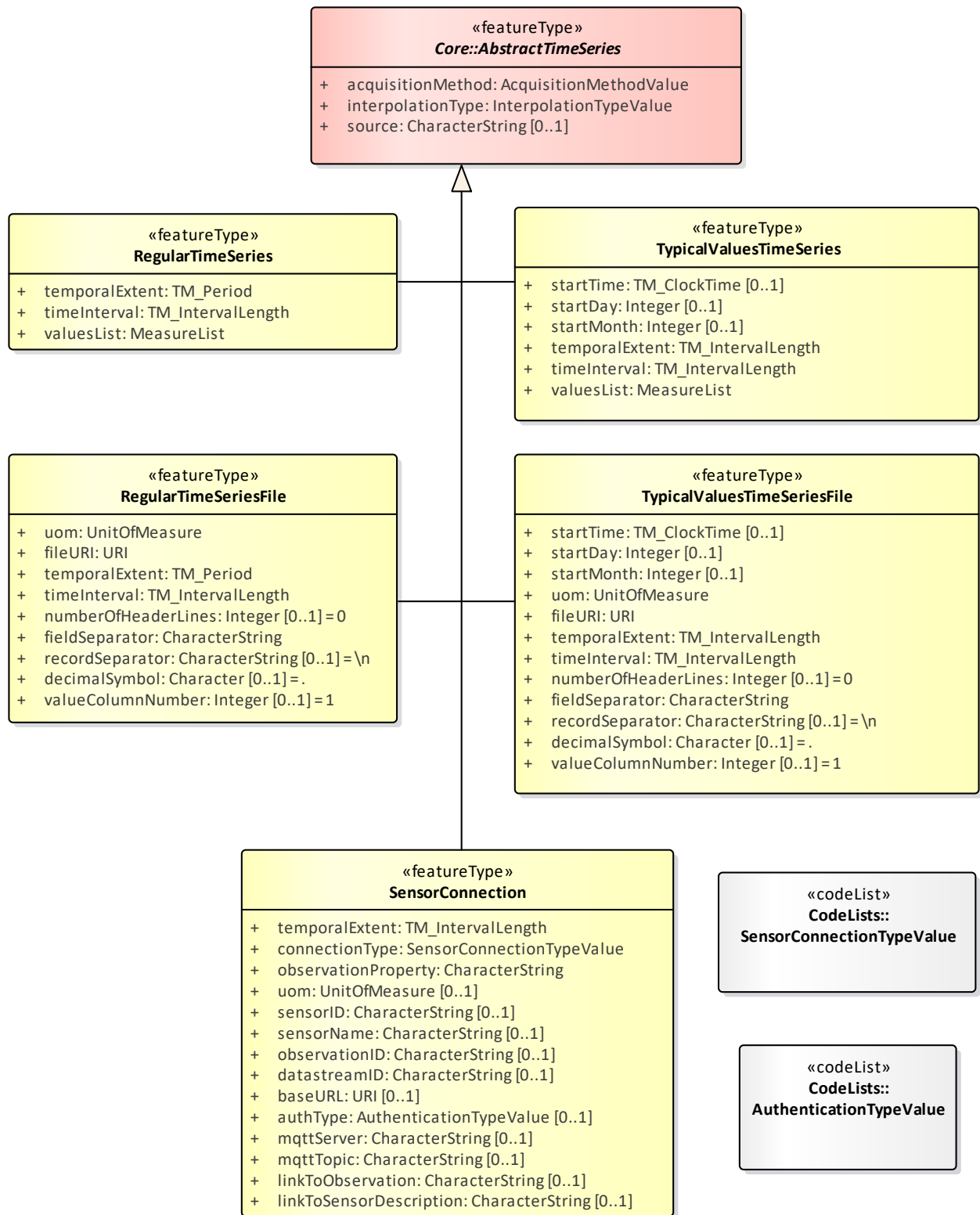
## Layered construction module



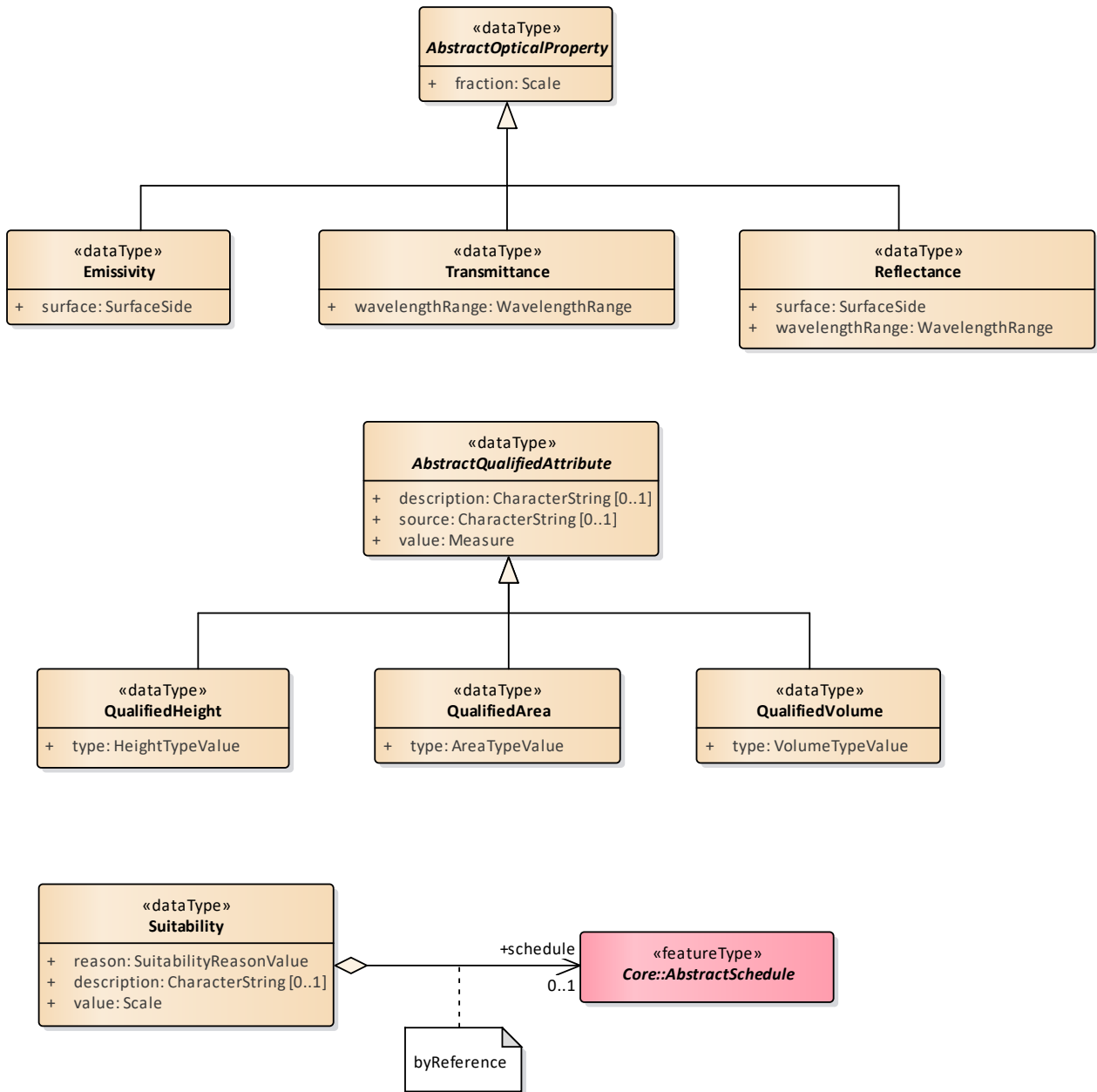
## Schedules module



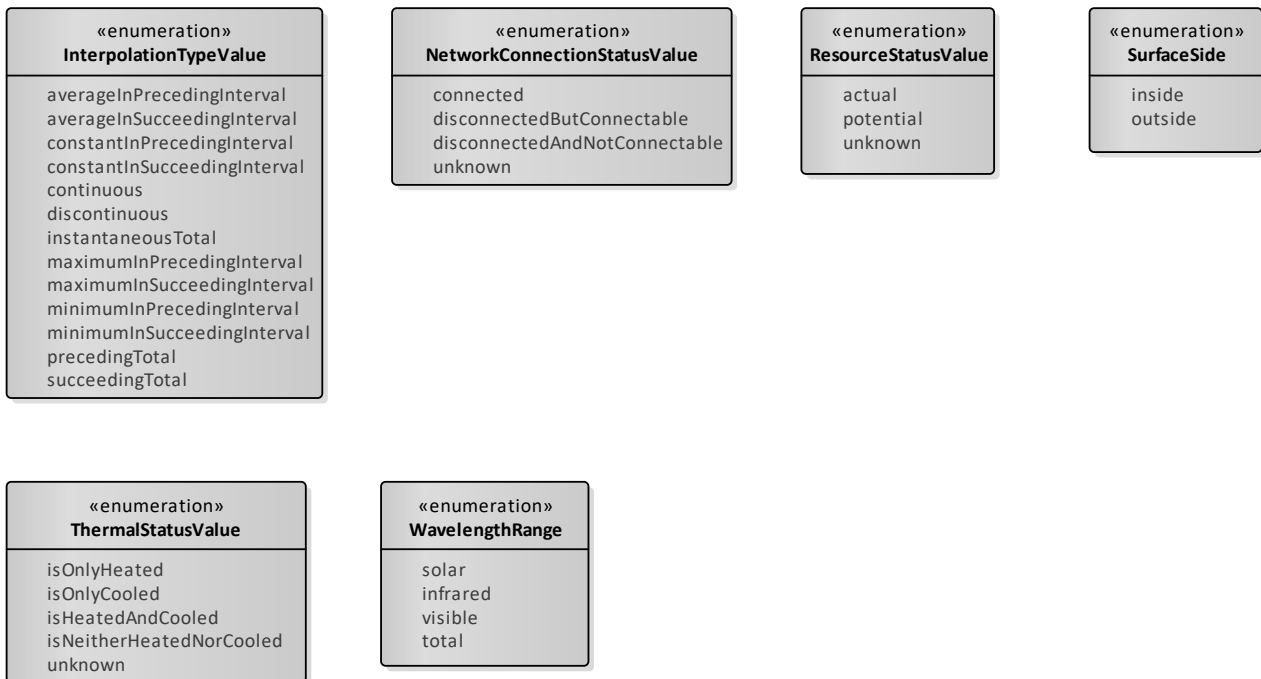
## Time series module



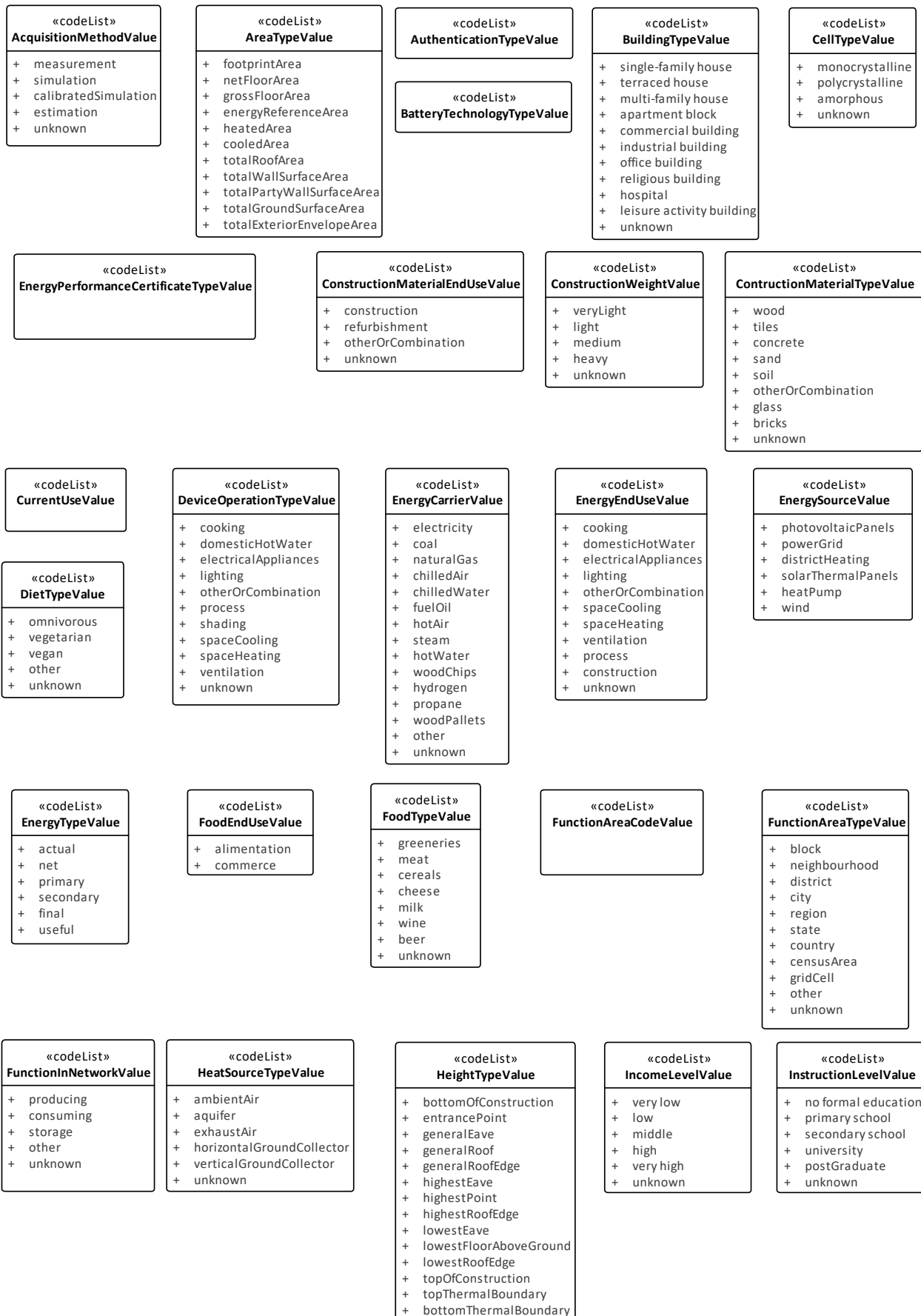
## Supporting classes: DataTypes

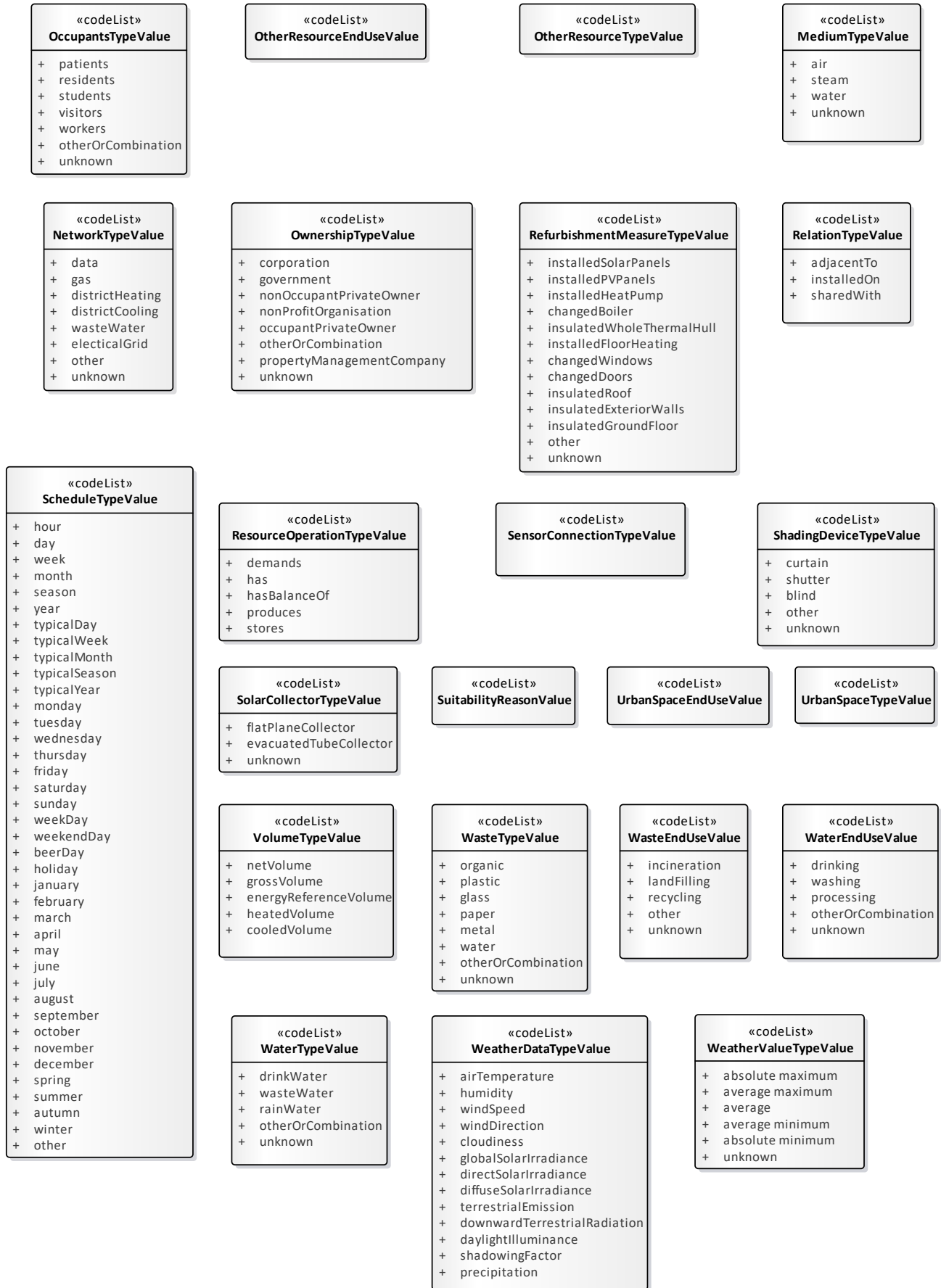


## Supporting classes: Enumerations



## Supporting classes: Codelists





## Changelog

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### Version 3.0 beta 7

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#### 2025-10-14

No changes, except new version from 2.0 to 3.0.

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### Version 2.0 beta 7

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#### 2025-06-25

##### Schedules package:

- Class **ScheduleLibrary**
  - Changed relation type of *libraryMember* to composition

##### Layered Construction package:

- Class **LayeredConstructionLibrary**
  - Changed relation type of *libraryMember* to composition
- Class **LayeredConstruction**
  - Added property *gValue*
- Class **MaterialLibrary**
  - Changed relation type of *libraryMember* to composition

#### 2025-05-30

##### Schedules package:

- Class **AtomicSchedule**
  - Changed multiplicity of relation *timeSeries* to [0..1]
  - Added property *constantValue*

#### 2025-05-13

##### Building physics package:

- Class **ThermalZone**
  - Changed relation type of *thermalBoundary* to composition

#### 2025-05-07

##### Core package:

- Class **ADE\_CityObject**
  - Changed relation type of *device* to aggregation
  - Changed relation type of *weatherData* to composition
- Class **AbstractThermalZone**
  - Changed relation type of *usageZone* to association
- Class **AbstractUsageZone**
  - Changed relation type of *buildingUnit* to association
- Class **AbstractResource**
  - Made relation to **AbstractTimeSeries** explicit and set to composition
- Class **DeviceOperation**
  - Made relation to **AbstractSchedule** explicit and set to aggregation
- Class **WeatherData**
  - Made relation to **AbstractTimeSeries** explicit and set to composition

##### Occupancy package:



- Class **UsageZone**
  - Changed relation type of *occupiedBy* to aggregation
  - Made all relations to **AbstractSchedule** explicit and set to aggregation
- Class **BuildingUnit**
  - Changed relation type of *occupiedBy* to aggregation
- Class **Occupants**
  - Made relation to **AbstractSchedule** explicit and set to aggregation

#### Layered Construction package:

- Class **LayeredConstruction**
  - Changed relation type of *layer* to composition
- Class **Layer**
  - Changed relation type of *material* to aggregation

#### Schedules package:

- Class **ScheduleComponent**
  - Changed relation type of *scheduleComponentMember* to aggregation

#### 2025-05-01

#### Core package:

- Class **ADE\_AbstractSchedule**
  - Moved from package Schedules to Core
- Class **ADE\_AbstractTimeSeries**
  - Moved from package Time Series to Core

#### Occupancy package:

- Class **Occupants**:
  - Added property *averageDietType*
  - Added property *averageIncomeLevel*
  - Added property *averageInstructionLevel*

#### CodeLists package:

- Added class **DietTypeValue**
- Added class **InstructionLevelValue**
- Added class **IncomeLevelValue**

#### 2025-04-23

#### CodeLists package:

- Added values to class **AreaTypeValue**
- Renamed class **HeightReferenceValue** to **HeightTypeValue**
- Added class **SuitabilityReasonValue**
- Added class **UrbanSpaceTypeValue**
- Added class **UrbanSpaceEndUseValue**

#### DataTypes package:

- Added class **Suitability**

#### Core package:

- Class **ADE\_CityObject**
  - Added property *suitability*
- Class **ADE\_AbstractBuilding**
  - Renamed property *bdgFloorArea* to *bdgArea*
  - Renamed property *bdgHeightAboveGround* to *bdgHeight*
- Class **AbstractBuildingPartition**
  - Renamed property *floorArea* to *area*

#### Resources package:

- Added class **UrbanSpace**

## 2025-04-12

### Core package:

- Added class **AbstractLibrary**

### Layered Construction package:

- Added class **LayeredConstructionLibrary**
- Added class **MaterialLibrary**

### Schedules package:

- Added class **ScheduleLibrary**

### CodeLists package:

- Class **FunctionInNetwork** renamed to **FunctionInNetworkValue**

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## Version 2.0 beta 6

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## 2025-02-06

### DataTypes package:

- Dropped class **HeatExchangeType**
- Dropped class **OpticalProperties**

### Core package:

- Class ADE\_ **CityObject**:
  - Renamed property from *operationSchedule* to *deviceOperation*
- Class **AbstractDevice**:
  - Changed type of property *heatDissipation* to gml:Measure
  - Added property *heatDissipationConvectiveFraction*
  - Added property *heatDissipationLatentFraction*
  - Added property *heatDissipationRadiantFraction*

### Occupancy package:

- Class **UsageZone**:
  - Renamed property *averageInternalGains* to *internalGains* and changed type to gml:Measure
  - Added property *internalGainsConvectiveFraction*
  - Added property *internalGainsLatentFraction*
  - Added property *internalGainsRadiantFraction*
- Class **Occupants**:
  - Changed type of property *heatDissipation* to gml:Measure
  - Added property *heatDissipationConvectiveFraction*
  - Added property *heatDissipationLatentFraction*
  - Added property *heatDissipationRadiantFraction*

### Layered Construction package:

- Class **LayeredConstruction**:
  - Dropped property *opticalProperties*
  - Added property *glazingRatio*
  - Added property *emissivity*
  - Added property *reflectance*
  - Added property *transmittance*
- Class **Layer**:
  - Changed multiplicity of property *thickness* to [1]
- Class **AbstractMaterial**:

- Added property *libraryCode*

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### **Version 2.0 beta 5**

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#### **Resources package:**

No changes since beta 4

#### **Weather Station package:**

No changes since beta 4

### **2025-01-30**

#### **Packages**

- Created TimeSeries package and moved all related classes into it
- Created Schedule package and moved all related classes into it
- Dropped Supporting classes package

#### **CodeLists package:**

- Class **CertificateTypeValue** renamed to **EnergyPerformanceCertificateTypeValue**

### **2025-01-28**

#### **CodeLists package:**

- Added class **ScheduleTypeValue**

#### **Enumerations package:**

- Dropped class **DayTypeValue**

#### **Supporting classes package:**

- Dropped class **TimeSeriesSchedule**
- Dropped class **DailyPatternSchedule**
- Dropped class **PeriodOfYear**
- Dropped class **DailySchedule**
- Added class **AtomicSchedule**
- Added class **CompositeSchedule**
- Added class **ScheduleComponent**
- Class **AbstractSchedule**:
  - Added properties *type*, *startTime*, *startDay*, *startMonth*, *startYear*, *temporalExtent*

### **2025-01-22**

#### **Devices package:**

- Class **AbstractSolarCollector**:
  - Added properties *azimuth* and *inclination*
  - Dropped property *surfaceGeometry*
  - Added properties *lod2MultiSurface* and *lod3MultiSurface*

### **2025-01-13**

#### **CodeLists package:**

- Dropped class **ThermalBoundaryTypeValue**
- Added class **ShadingDeviceTypeValue**
- Added class **WeatherValueTypeValue**

#### **DataTypes package:**

- Moved class **PeriodOfYear** from package DataTypes to Supporting classes

- Moved class **DailySchedule** from package DataTypes to Supporting classes
- Class **AbstractQualifiedAttribute**:
  - Added properties *source* and *value*
- Classes **QualifiedHeight**, **QualifiedArea**, **QualifiedVolume**:
  - Dropped property *value*

#### Supporting classes package:

- Class **AbstractTimeSeries**:
  - Moved back from package Core to Supporting classes
  - Changed multiplicity of property *acquisitionMethod* to [1]
  - Changed multiplicity of property *interpolationType* to [1]
- Class **TypicalValuesTimeSeries**:
  - Added properties *startTime*, *startDay*, *startMonth*
- Class **TypicalValuesTimeSeriesFile**:
  - Added properties *startTime*, *startDay*, *startMonth*
- Added class **DualValueSchedule**:
- Class **PeriodOfYear**:
  - Changed stereotype from *dataType* to *featureType*
  - Added properties *startDay*, *startMonth*, *endDay*, *endMonth*
  - Dropped property *period*
- Class **DailySchedule**:
  - Changed stereotype from *dataType* to *featureType*
  - Added property *repetition*
  - Renamed property from *schedule* to *timeSeries*

#### Layered Construction package:

- Added class **ReverseLayeredConstruction**
- Dropped class **LayerComponent**
- Class **Layer**:
  - Removed property *layerComponent*
  - Added property *thickness*
  - Added property *material*
- Class **SolidMaterial**:
  - Renamed property from *specificHeat* to *specificHeatCapacity*
  - (Re)added and renamed property from *conductivity* to *thermalConductivity*
  - (Re)added property *embodiedEnergy*
  - (Re)added property *embodiedCarbon*
  - (Re)added property *porosity*

#### Core package:

- Class **AbstractDevice**:
  - Class is renamed from **AbstractEnergySystem** to **AbstractDevice**
  - Added property *heatDissipation*
  - Added property *operationSchedule*
  - Added property *efficiencyIndicator*
  - Added property *installedPower*
  - Added property *nominalEfficiency*
- Class **AbstractTimeSeries**:
  - Moved back from package Core to Supporting classes
- Class (ADE) **\_CityObject**:
  - Renamed property from *energySystem* to *device*
- Class **OperationSchedule**:
  - Moved from package Devices to Core
- Class **WeatherData**:
  - Renamed property from *timeseries* to *timeDependentValues*
  - Renamed property from *singleValue* to *yearlyValue*
  - Renamed property from *singleValueType* to *valueType*
  - Changed type of property *valueType* from *CharacterString* to *CodeList*
- Added class **AbstractBuildingPartition**

- Classes **AbstractBuildingUnit**, **AbstractUsageZone**, **AbstractThermalZone**
  - Changed parent class

#### Building physics package:

- Dropped class **ThermalBoundary**
- Dropped class **ThermalOpening**
- Class **ThermalZone**
  - Removed property *floorArea* (now inherited via **AbstractBuildingPartition**)
  - Removed property *volume* (now inherited via **AbstractBuildingPartition**)
  - Removed property *volumeGeometry* (now inherited via **AbstractBuildingPartition**)
  - Removed property *boundedBy*
  - Added property *heatCapacity*
  - Added property *coincidesWithLod2Hull*
  - Added property *coincidesWithLod3Hull*
  - Added property *thermalBoundary*
- Added class **PartyWallSurface**
- Added class **BasementCeilingSurface**
- Added class **IntermediateFloorSurface**
- Added class **AtticFloorSurface**
- Class (ADE) **\_BoundarySurface**:
  - Renamed property from *bdgBdrySrfWindowToWallRatio* to *bdgBdrySrfOpeningToSurfaceRatio*
  - Renamed property from *bdgBdrySrfArea* to *bdgBdryTotalSurfaceArea*
  - Added property *bdgBdryOpaqueSurfaceArea*
  - Added property *bdgBdrySrfThickness*
  - Added property *bdgBdrySrfHeatCapacity*

#### Occupancy package:

- Dropped class **AbstractFacilities**
- Dropped class **DHWFacilities**
- Dropped class **LightingFacilities**
- Dropped class **ElectricalAppliances**
- Dropped class **GenericFacilities**
- Class **BuildingUnit**:
  - Removed property *floorArea* (now inherited via **AbstractBuildingPartition**)
  - Removed property *volume* (now inherited via **AbstractBuildingPartition**)
  - Removed property *equippedWith*
- Class **UsageZone**:
  - Removed property *floorArea* (now inherited via **AbstractBuildingPartition**)
  - Removed property *volume* (now inherited via **AbstractBuildingPartition**)
  - Removed property *volumeGeometry* (now inherited via **AbstractBuildingPartition**)
  - Removed property *equippedWith*

#### Devices package:

The former EnergySystems package is renamed to Devices package

- Class **OperationSchedule**:
  - Moved from package Devices to Core
- Dropped class **AbstractEnergyConversionSystem**
  - Now all subclasses are derived directly from **AbstractDevice**
- Dropped class **AbstractStorageSystem**
  - Now all subclasses are derived directly from **AbstractDevice**
- Class **GenericDevice**:
  - Renamed from class **GenericEnergyConversionSystem**
- Class **ElectricalStorageDevice**:
  - Renamed from class **PowerStorageSystem**
- Class **ThermalStorageDevice**:
  - Renamed from class **ThermalStorageSystem**
- Class **AbstractSolarCollector**:
  - Renamed from class **AbstractSolarEnergySystem**
- Class **PhotovoltaicThermalCollector**:

- Renamed from class **PhotovoltaicThermalSystem**
- Class **PhotovoltaicCollector**:
  - Renamed from class **PhotovoltaicSystem**
- Class **SolarThermalCollector**:
  - Renamed from class **SolarThermalSystem**
- Class **GenericSolarCollector**:
  - Renamed from class **GenericSolarEnergySystem**
- Added class **LightingDevice**
- Added class **GenericElectricalDevice**
- Added class **MovableShadingDevice**

#### Urban Function Areas package:

- Class **UrbanFunctionArea**:
  - Removed property *rank*

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#### Version 2.0 beta 4

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##### 2024-09-25

- Codelist **ThermalBoundaryTypeValue**
  - Renamed *outerWall* to *exteriorWall*
  - Renamed *intermediaryFloor* to *intermediateFloor*

##### 2024-09-20

- Minor edits to the layout of the UML diagrams
- Polished Codelist **ThermalBoundaryTypeValue**

##### 2024-08-12

- Class **ADE CityObject**:
  - Renamed association *connectedTo* to *utilityNetworkConnection*
  - Remodelled association class **CityObjectRelation**
- Class **AbstractTimeSeries**:
  - Moved to Core module
- Class **WeatherData**:
  - renamed property *valuesList* to *timeSeries*
  - made the association to **AbstractTimeSeries** explicit
- Added some values to codelist **RelationTypeValue**
- Class **TimeSeriesSchedule**:
  - Changed association to **AbstractTimeSeries** to Composition
- Class **DailySchedule**:
  - Changed association to **AbstractTimeSeries** to Composition
- Class **SensorConnection**:
  - Changed type of *uom* to *UnitOfMeasure*
  - Renamed *linkToSensortDescription* to *linkToSensorDescription*
- Class **AbstractSolarEnergySystem**:
  - Removed association *installedOn* (now taken over by **CityObjectRelation**)
- Class **Energy**:
  - Changed multiplicity of *EnergyCarrier* to [0..1]
- Class **Waste**:
  - Changed multiplicity of *isDanerous* and *isRecyclable* to [0..1]