



UML diagrams

Last updated on 25 June 2025



BEWARE

This document is for internal use only

A version of this document will be made available as open access publication at a later date.

The latest version of this document can be downloaded from:

https://github.com/tudelft3d/DigiTwins4PEDs/tree/main/energy_ade_2

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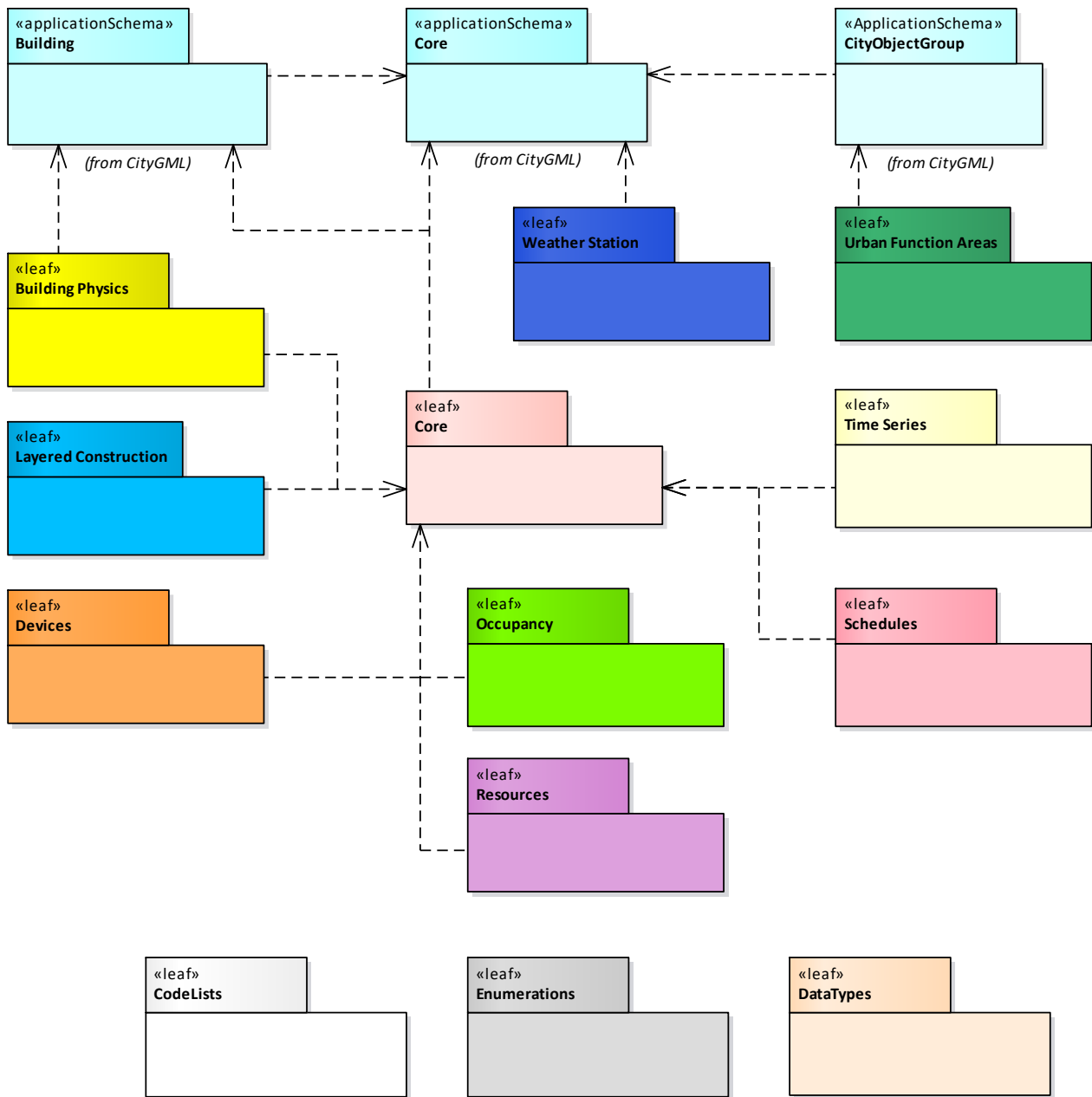
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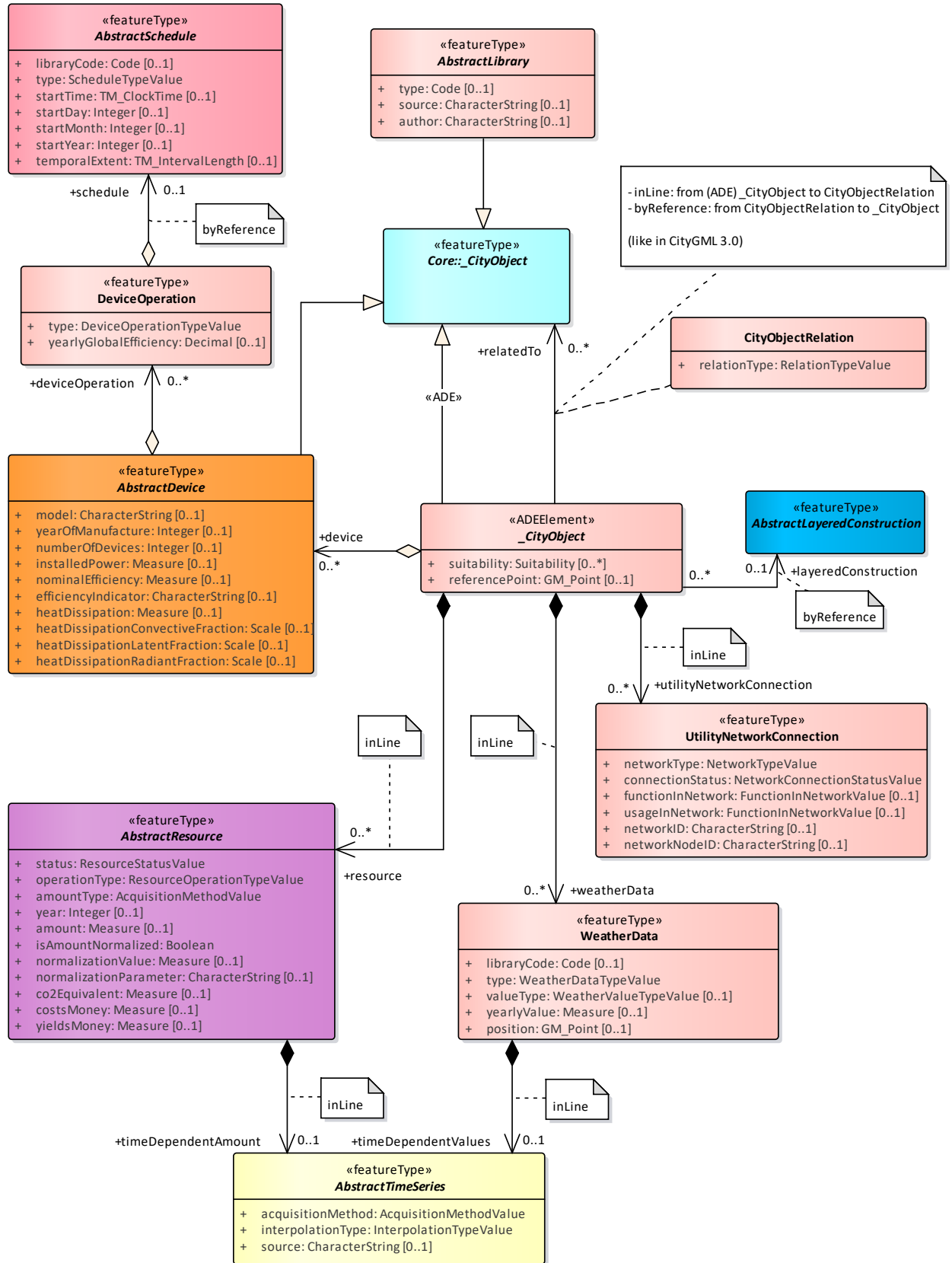
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Overview of the packages



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

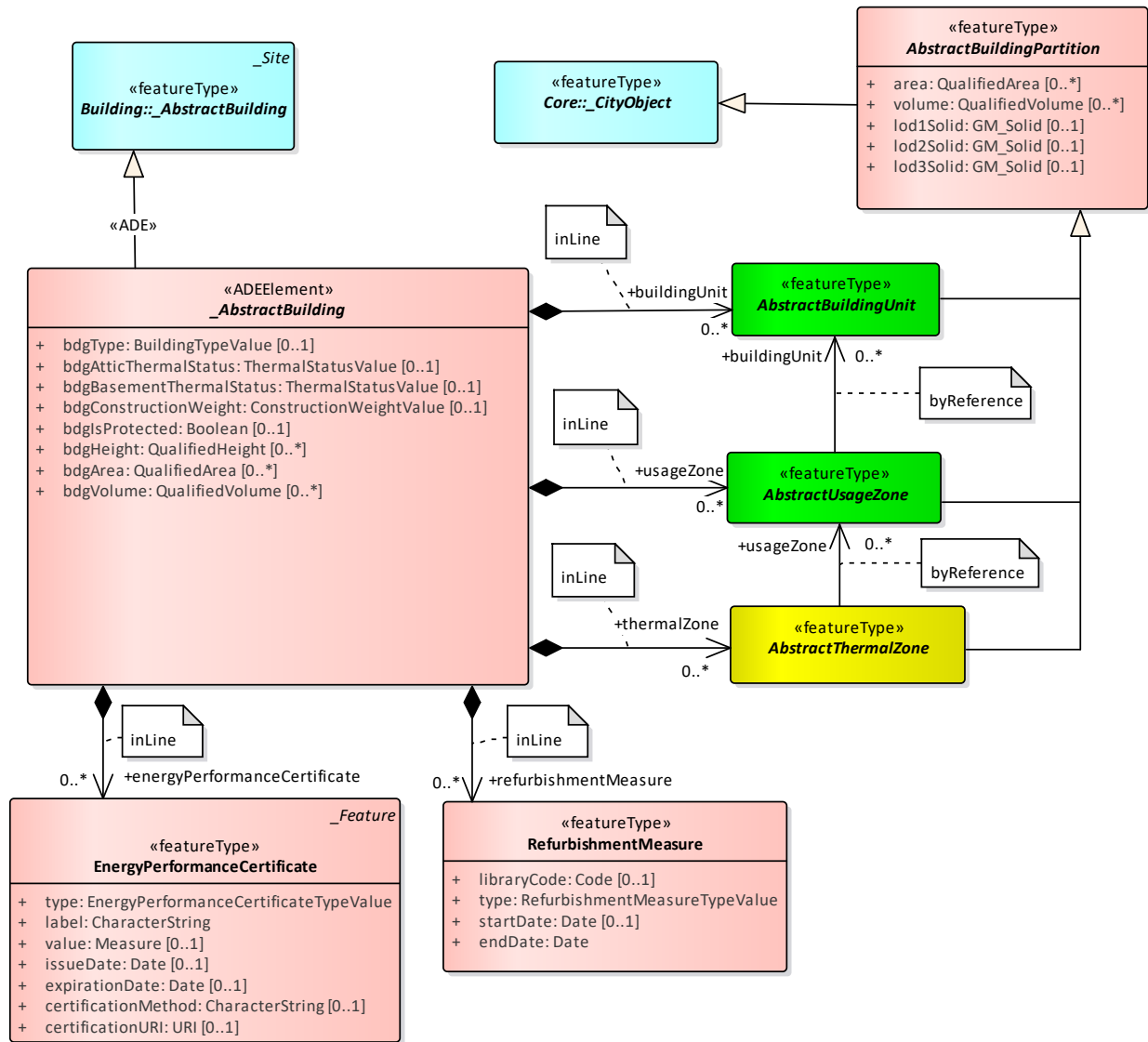
«codeList» CodeLists:: WeatherDataTypeValue
+ airTemperature + humidity + windSpeed + windDirection + cloudiness + globalSolarIrradiance + directSolarIrradiance + diffuseSolarIrradiance + terrestrialEmission + downwardTerrestrialRadiation + daylightIlluminance + shadowingFactor + precipitation

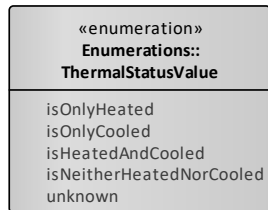
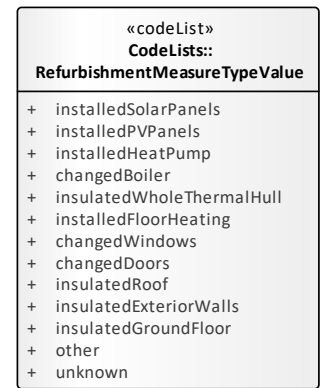
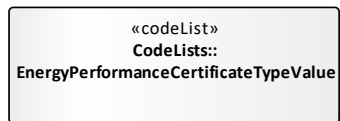
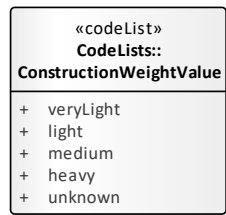
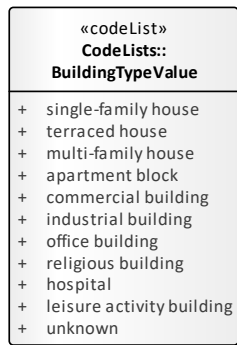
«codeList» CodeLists:: WeatherValueTypeValue
+ absolute maximum + average maximum + average + average minimum + absolute minimum + unknown

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

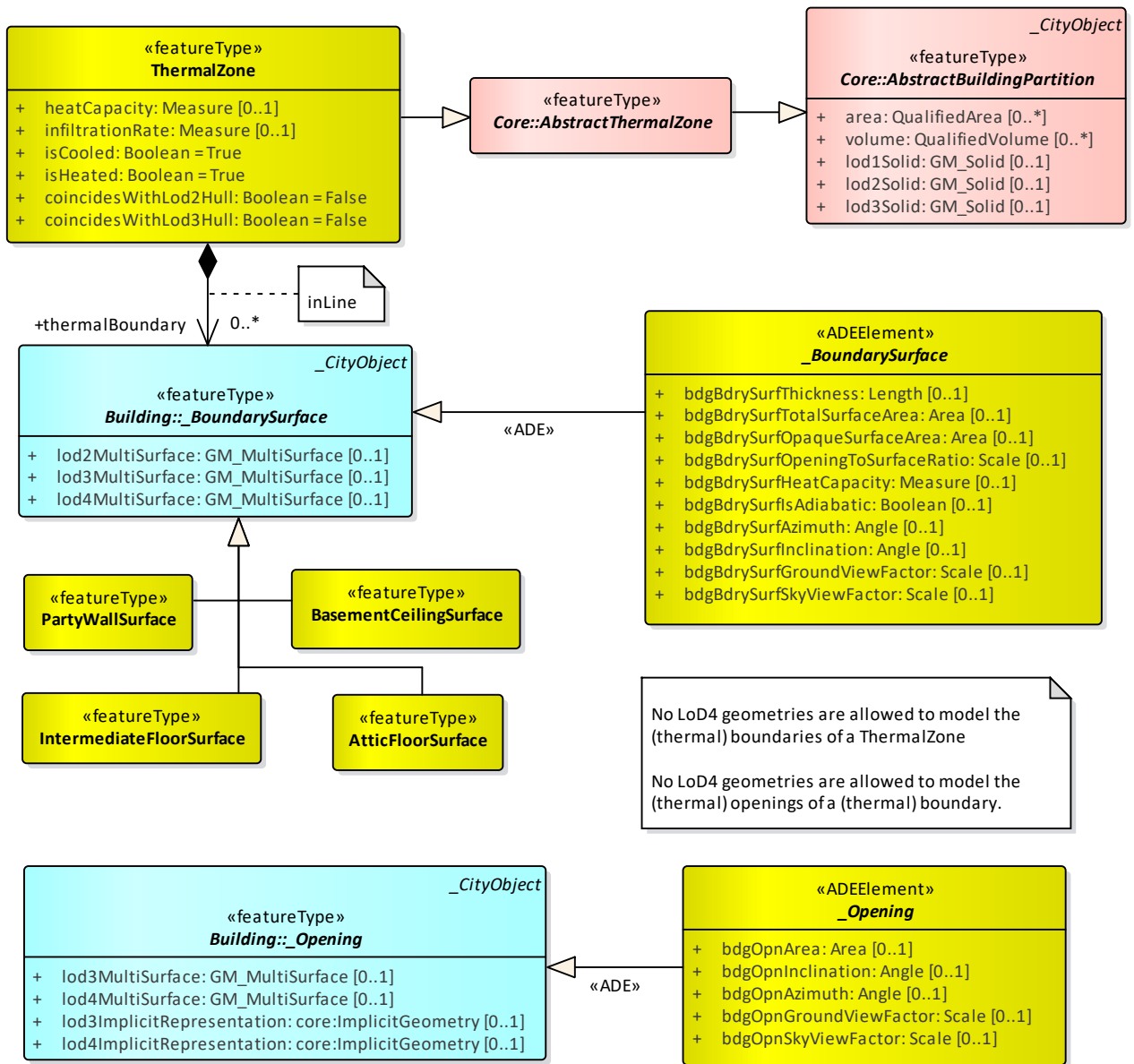
«enumeration» Enumerations:: NetworkConnectionStatusValue
connected disconnectedButConnectable disconnectedAndNotConnectable unknown

«enumeration» Enumerations:: ResourceStatusValue
actual potential unknown

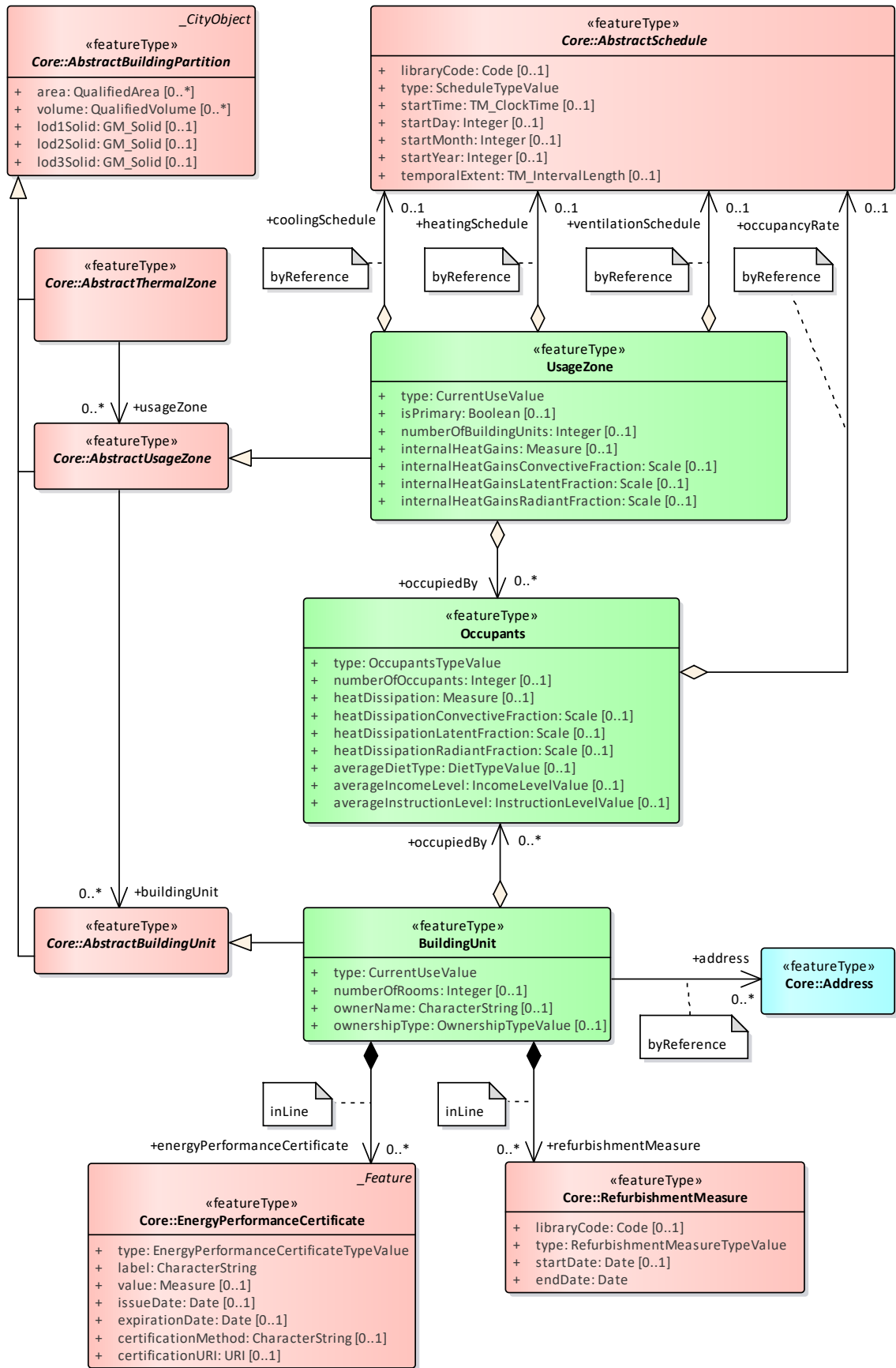


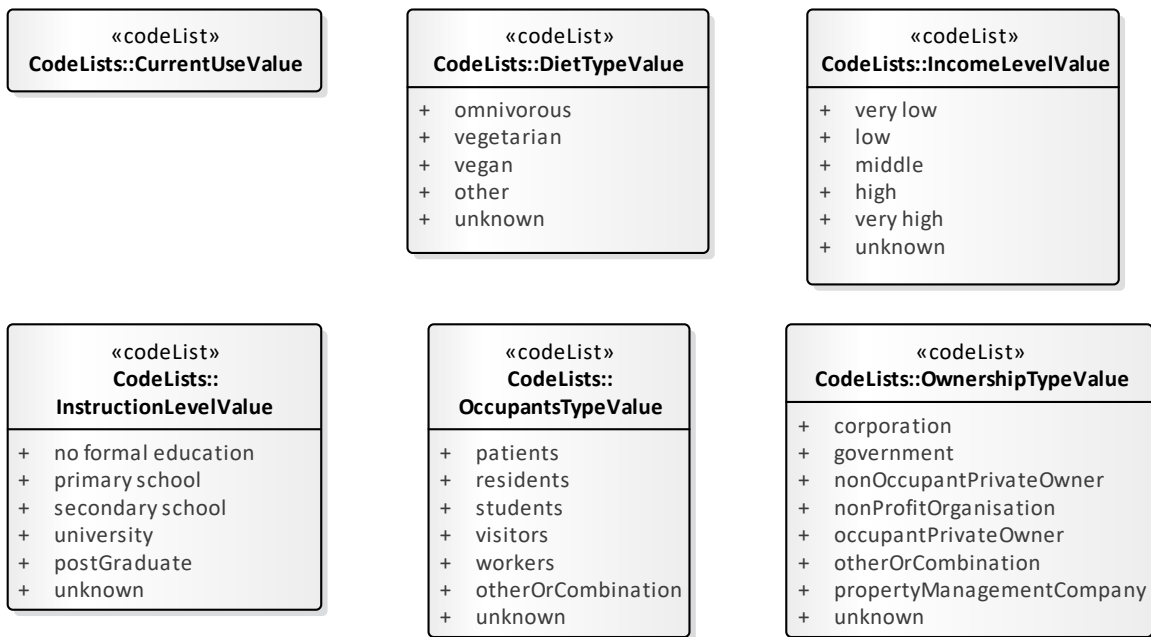


Building physics module

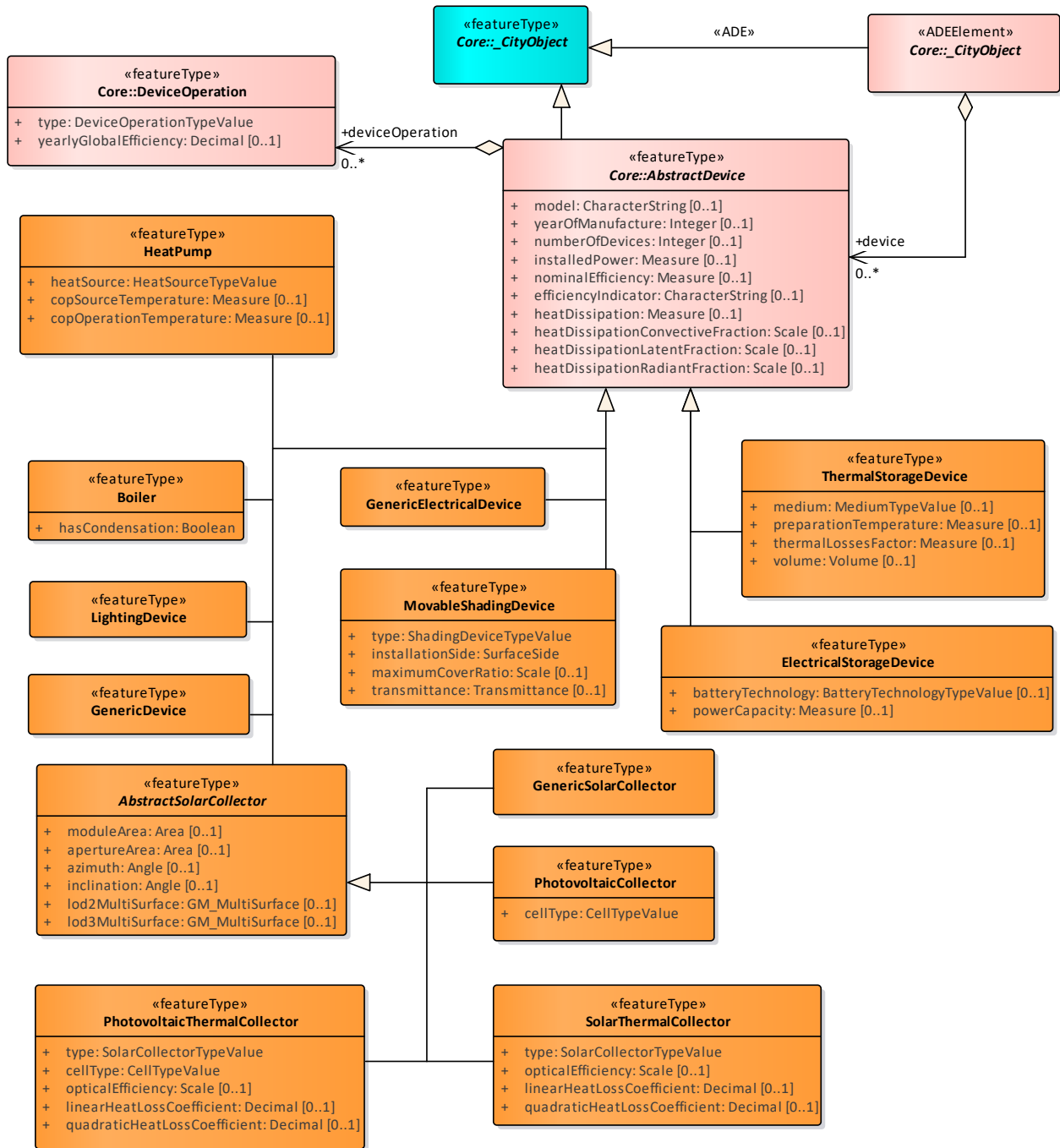


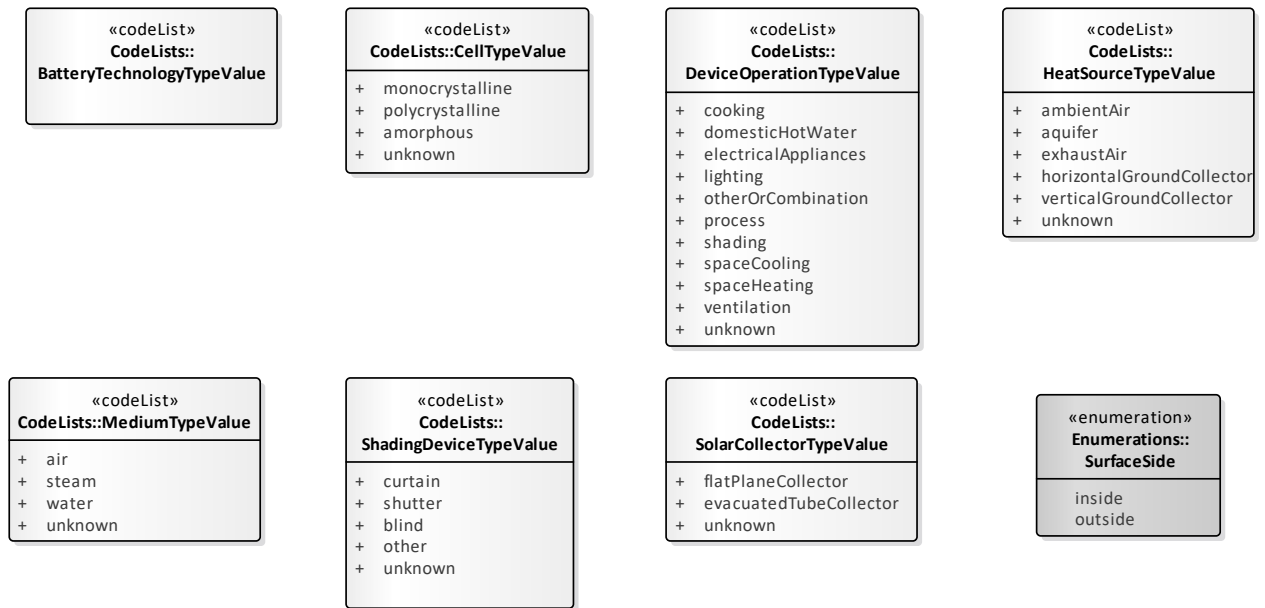
Occupancy module



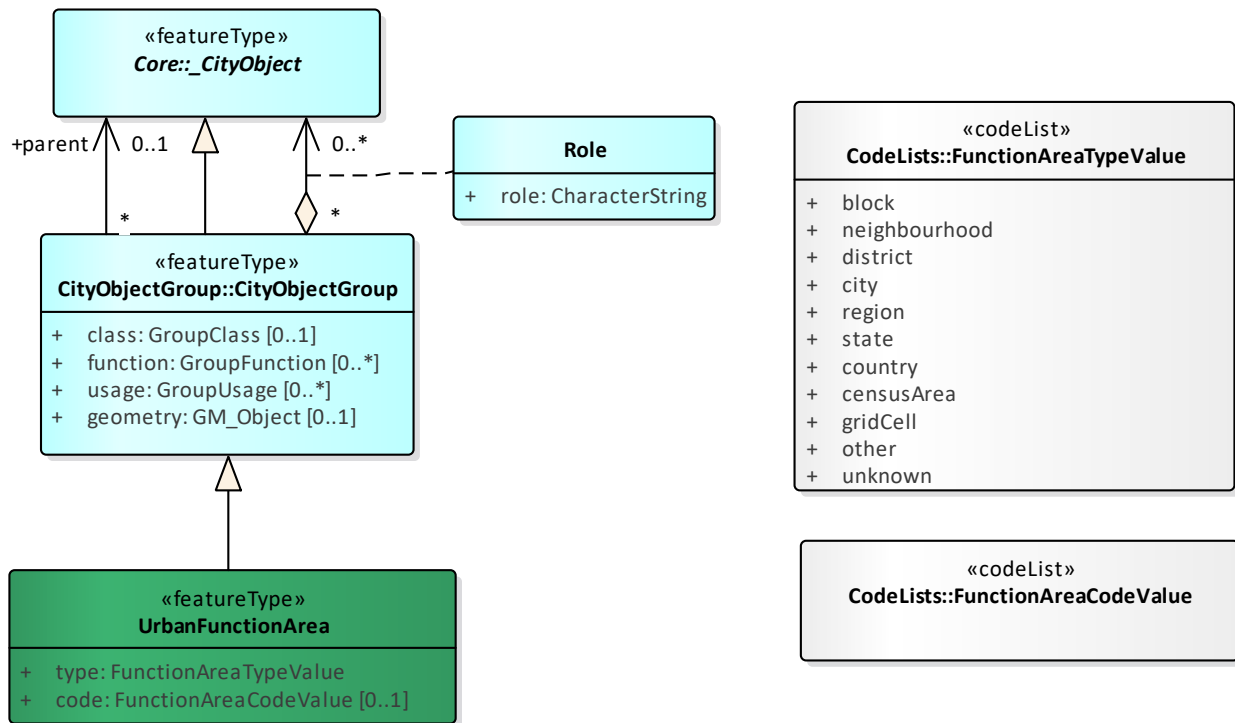


Devices module

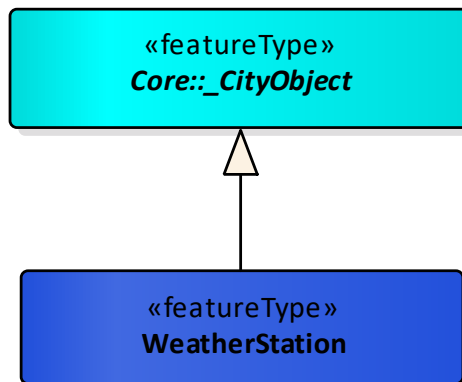




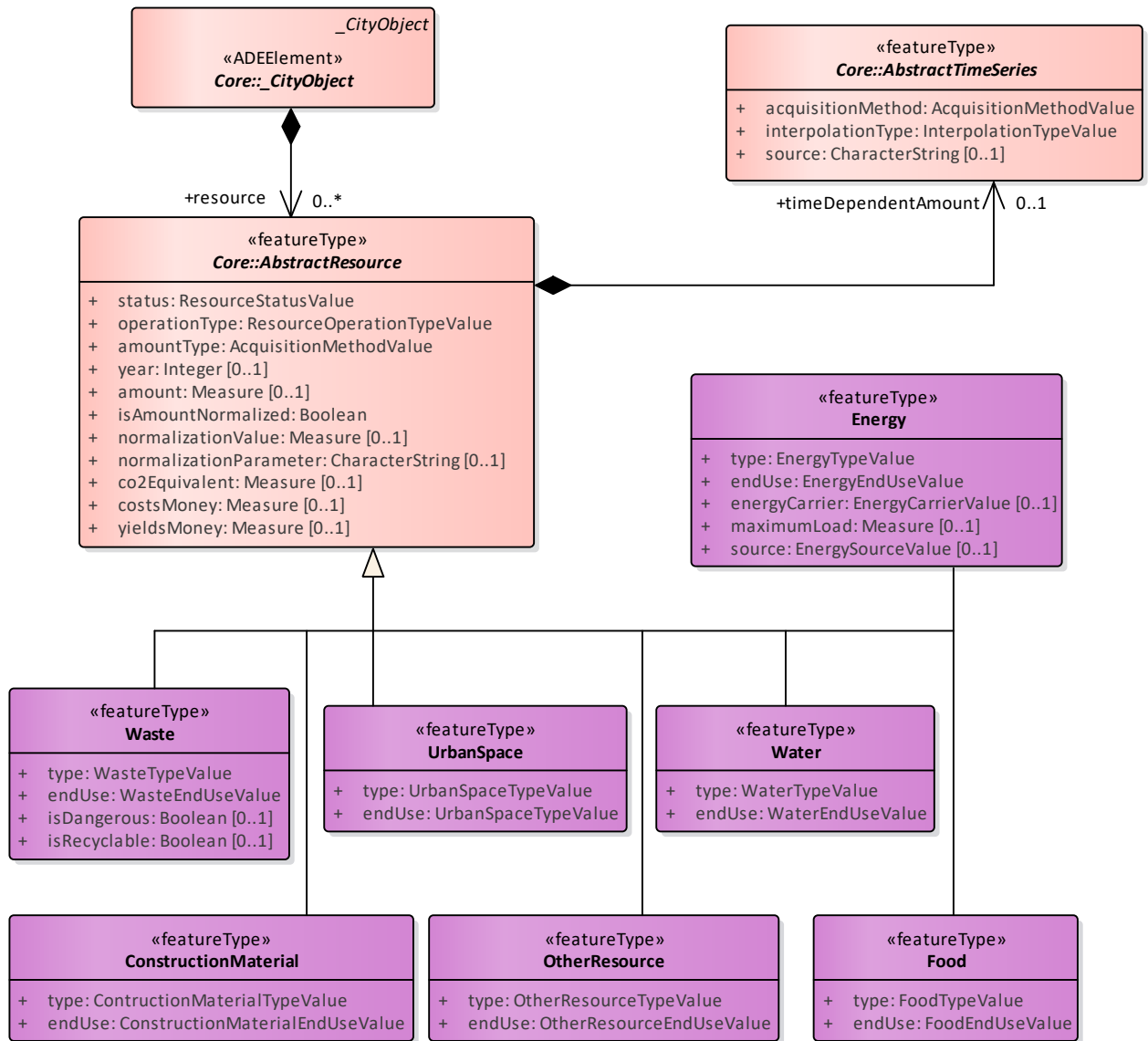
Urban function areas module



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

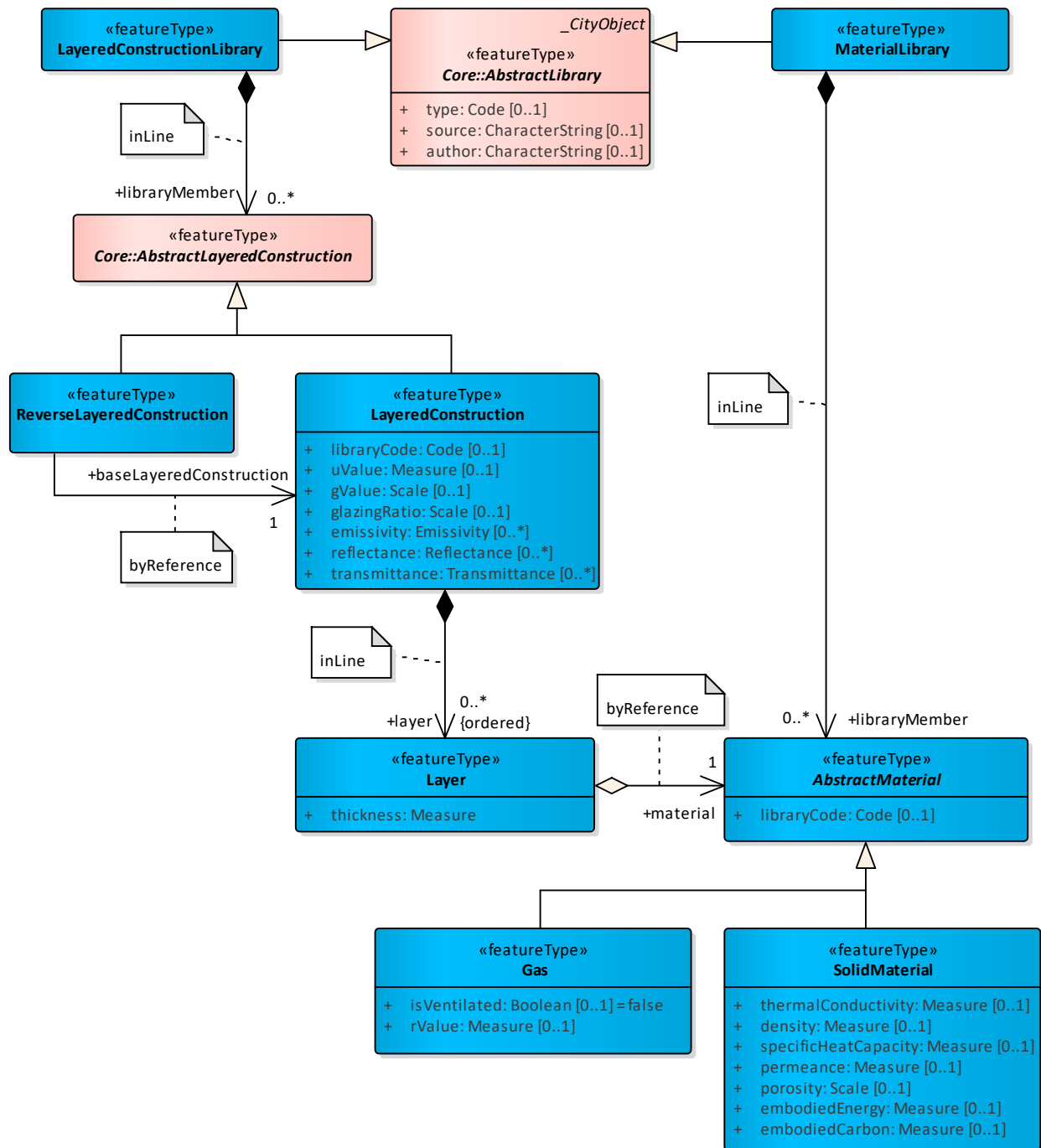
«codeList» CodeLists:: ResourceOperationTypeValue
+ demands + has + hasBalanceOf + produces + stores

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

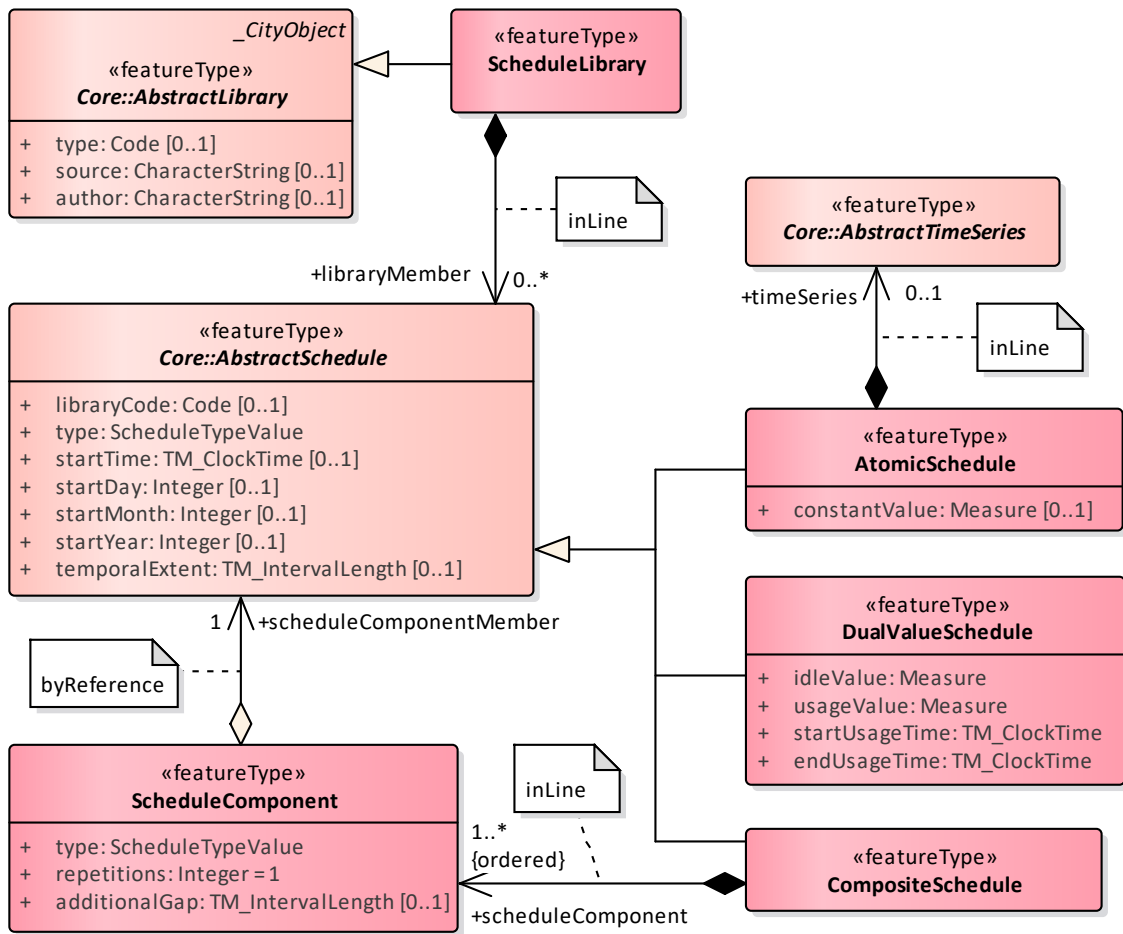
«enumeration» Enumerations:: ResourceStatusValue
actual potential unknown

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

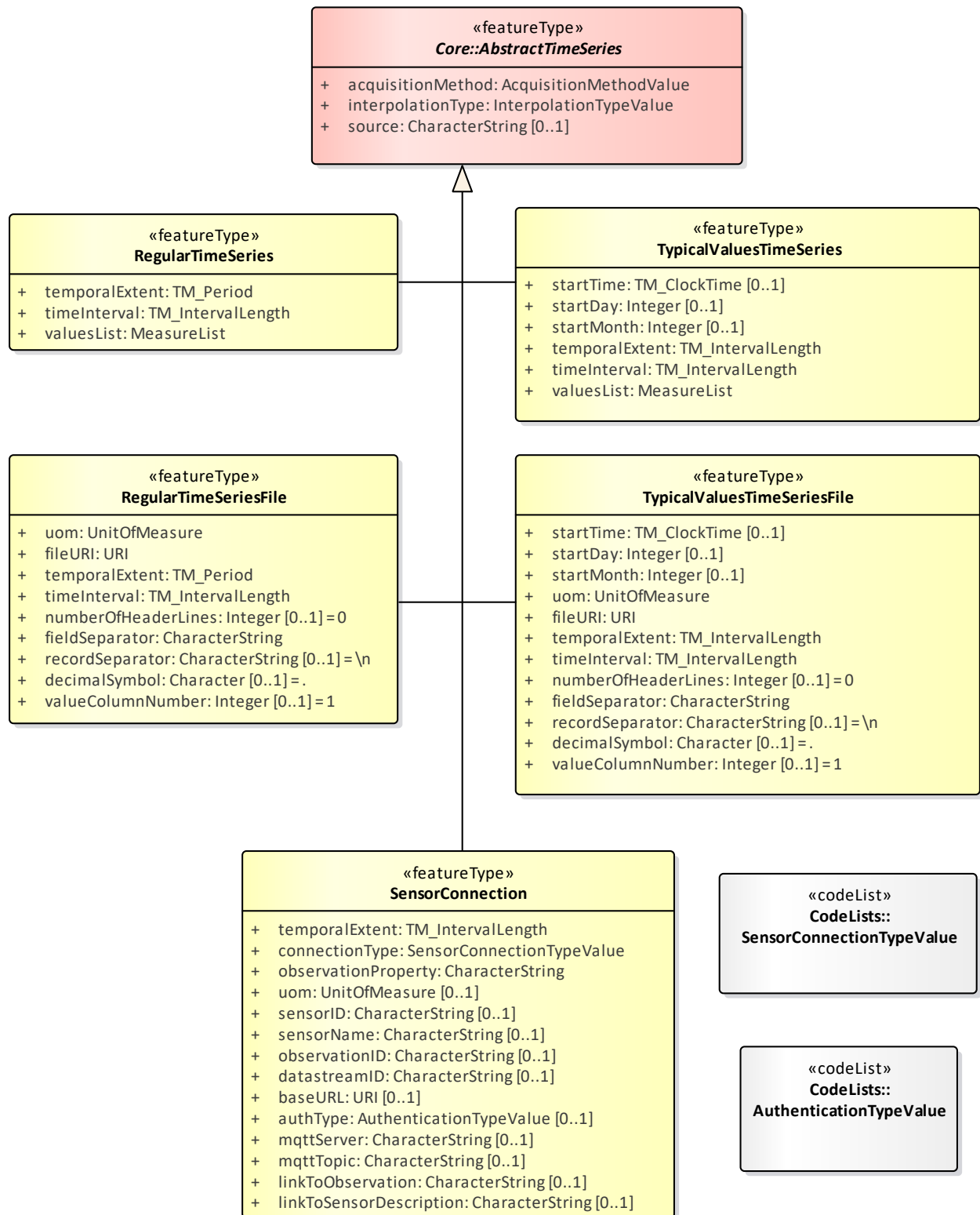
Layered construction module



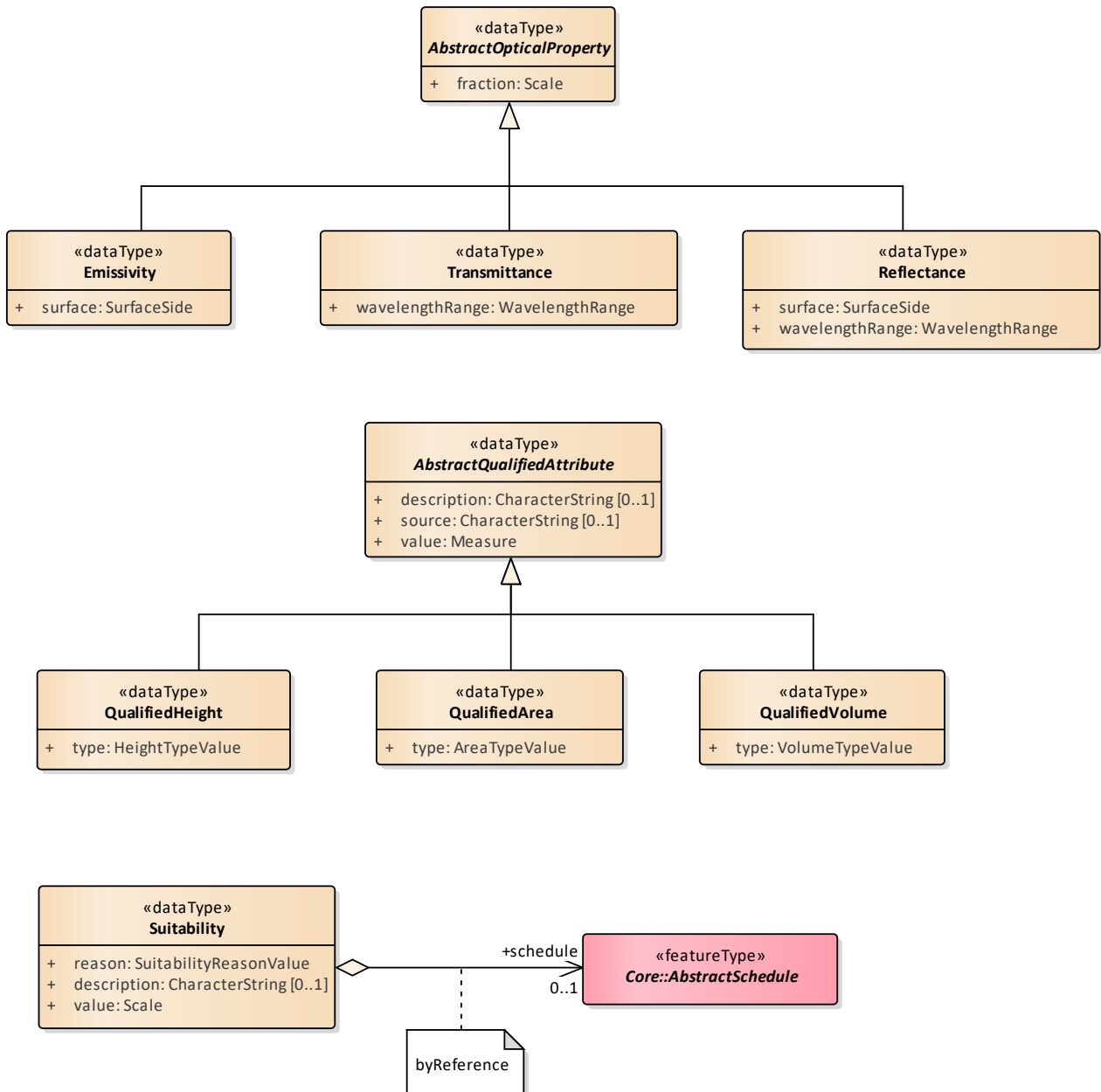
Schedules module



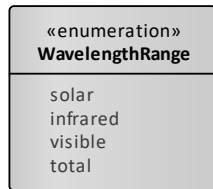
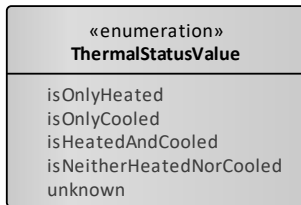
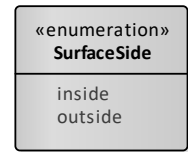
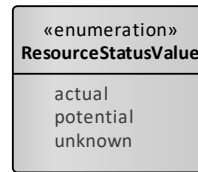
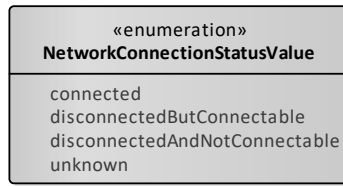
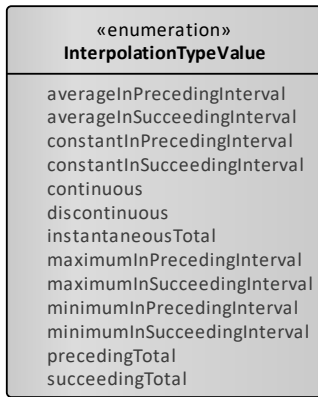
Time series module



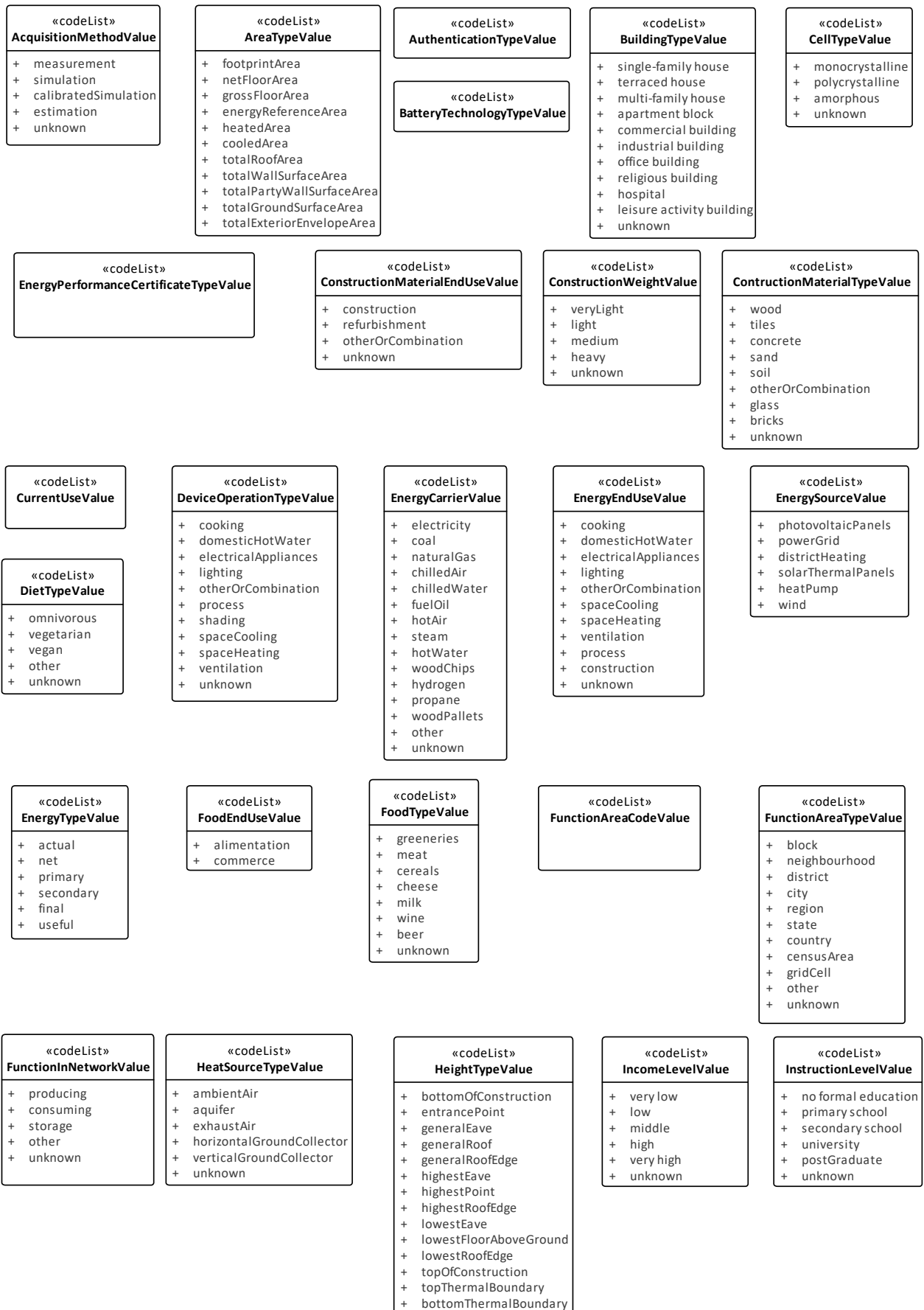
Supporting classes: DataTypes



Supporting classes: Enumerations



Supporting classes: Codelists



«codeList» OccupantsTypeValue
+ patients
+ residents
+ students
+ visitors
+ workers
+ otherOrCombination
+ unknown

«codeList» OtherResourceEndUseValue
--

«codeList» OtherResourceTypeValue

«codeList» MediumTypeValue
+ air
+ steam
+ water
+ unknown

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

«codeList» OwnershipTypeValue
+ corporation
+ government
+ nonOccupantPrivateOwner
+ nonProfitOrganisation
+ occupantPrivateOwner
+ otherOrCombination
+ propertyManagementCompany
+ unknown

«codeList» RefurbishmentMeasureTypeValue
+ installedSolarPanels
+ installedPVPanels
+ installedHeatPump
+ changedBoiler
+ insulatedWholeThermalHull
+ installedFloorHeating
+ changedWindows
+ changedDoors
+ insulatedRoof
+ insulatedExteriorWalls
+ insulatedGroundFloor
+ other
+ unknown

«codeList» RelationTypeValue
+ adjacentTo
+ installedOn
+ sharedWith

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

«codeList» SensorConnectionTypeValue

«codeList» ShadingDeviceTypeValue
+ curtain
+ shutter
+ blind
+ other
+ unknown

«codeList» SolarCollectorTypeValue
+ flatPlaneCollector
+ evacuatedTubeCollector
+ unknown

«codeList» SuitabilityReasonValue

«codeList» UrbanSpaceEndUseValue

«codeList» UrbanSpaceTypeValue

«codeList» VolumeTypeValue
+ netVolume
+ grossVolume
+ energyReferenceVolume
+ heatedVolume
+ cooledVolume

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

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

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

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

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

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

Changelog

Version 2.0 beta 7

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**

Version 2.0 beta 6

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*

Version 2.0 beta 5

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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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]

