Summarizing the concepts - Dynamic Data Schema CityGML 3.0

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1. Dynamizer/Modifier is a type of coverages

- Dynamizer is a type of GML Coverages, consisting
  - Temporal domain set
  - Range set (having attribute values)
    - Can be value arrays, scalar value lists, data blocks or external files
  - Coverage Function, which maps the time values in the domain set to the range values according to a function
    - Can be defined according to mapping rule or grid functions.
    - In case of continuous coverages, interpolation methods can also be defined in coverage functions.
- Using XPath mechanism, dynamizer can refer to a specific property of a CityGML feature which value can be then overridden or replaced by the dynamic value specified in the dynamizer feature

2. Timeseries in Coverages

- *"WaterML2.0 defines a timeseries as a coverage whose domain consists of collection of ordered temporal elements and the spatial component relates to the feature of interest of the observation."* – [OGC 10-126 WaterML2.0]
  - The domain sets in coverages can be extended to support timeseries (as defined in WaterML2.0)
  - Timeseries is a type of discrete coverages (and not continuos coverages).
  - The interpolation type is defined per point within the time series as it is possible for this to change mid series

- ISO19123 CV_ContinuousCoverages may allow to define continuous coverages
  - The different types of interpolations can be defined within Coverage Function
  - Under reconsideration and not supported by GML or WaterML

- As discussed in 10th WP6 meeting, we should currently proceed with the WaterML standard by defining the timeseries as discrete coverages and assume that the interpolation type denotes the interpolation function to be used for the derivation of values at unsampled time points.

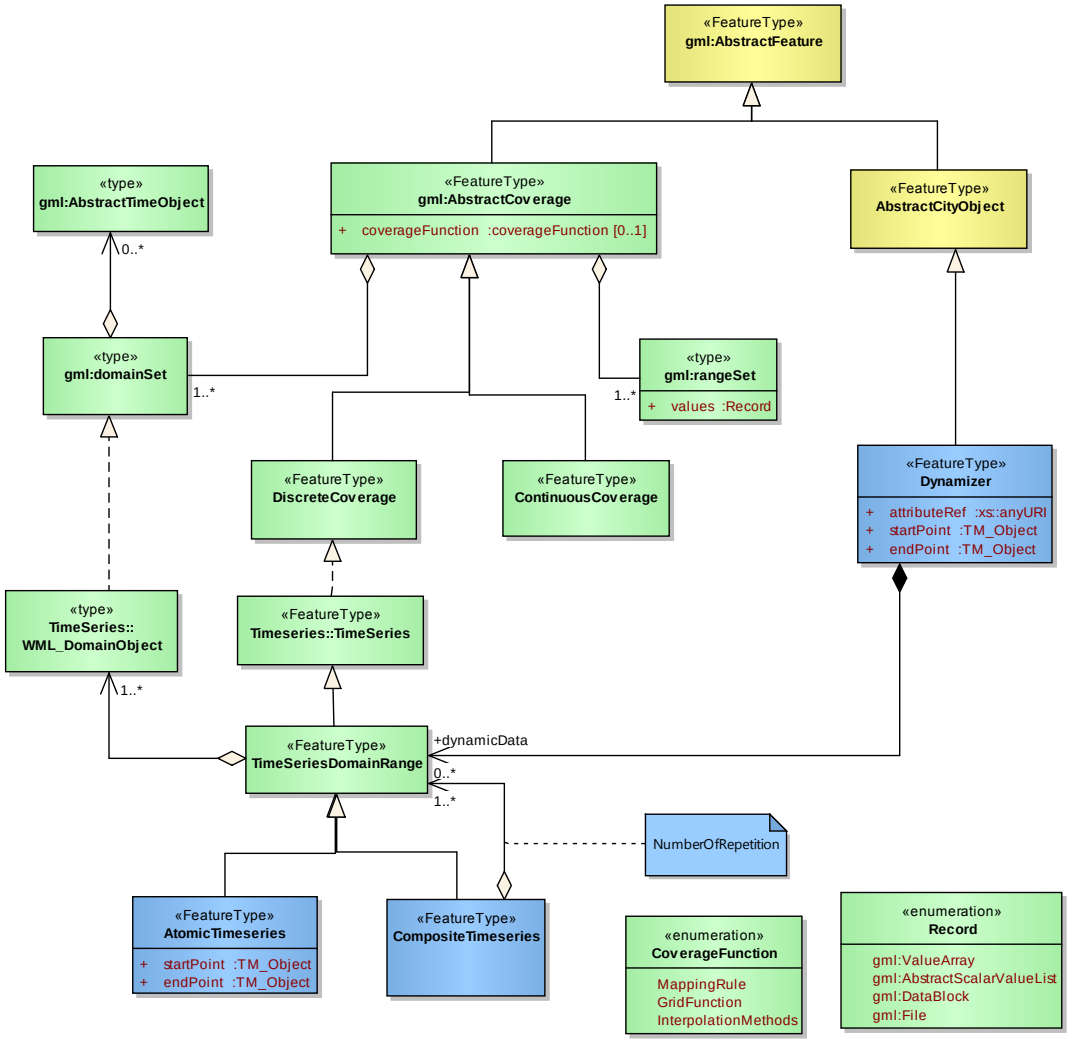
3. Supporting patterns

- Timeseries can be extended to support various kinds of patterns.
- An atomic timeseries consists of a timeseries defined once.
- The composite timeseries allows to define timeseries of arbitrary depths allowing nested patterns.
- Using the coverage approach, these patterns can be defined in the domain range and their values can be defined in the range set.

4. Dynamic extension of CityGML objects

- The AbstractCityObject can be extended to support these dynamic variations in the form of coverages.
- The temporal values (or patterns) and their respective attribute values can be mapped.
- Utilizing the XPath mechanism, the dynamizer feature can refer to a specific property of a CityGML feature which value can be then overridden or replaced by the dynamic value specified in the dynamizer feature

UML Model


«FeatureType»
gml:AbstractFeature
«type»
gml:AbstractTimeObject
«FeatureType»
gml:AbstractCoverage
+ coverageFunction :coverageFunction [0..1]
«FeatureType»
AbstractCityObject
0..*
«type»
gml:domainSet
1..*
«type»
gml:rangeSet
+ values :Record
1..*
«FeatureType»
DiscreteCoverage
«FeatureType»
ContinuousCoverage
«FeatureType»
Dynamizer
+ attributeRef :xs::anyURI
+ startPoint :TM_Object
+ endPoint :TM_Object
«type»
TimeSeries::
WML_DomainObject
«FeatureType»
Timeseries::TimeSeries
1..*
«FeatureType»
TimeSeriesDomainRange
+dynamicData
0..*
1..*
NumberOfRepetition
«FeatureType»
AtomicTimeseries
+ startPoint :TM_Object
+ endPoint :TM_Object
«FeatureType»
CompositeTimeseries
«enumeration»
CoverageFunction
MappingRule
GridFunction
InterpolationMethods
«enumeration»
Record
gml:ValueArray
gml:AbstractScalarValueList
gml:DataBlock
gml:File

Future Work

- First approach to link sensors to a city object