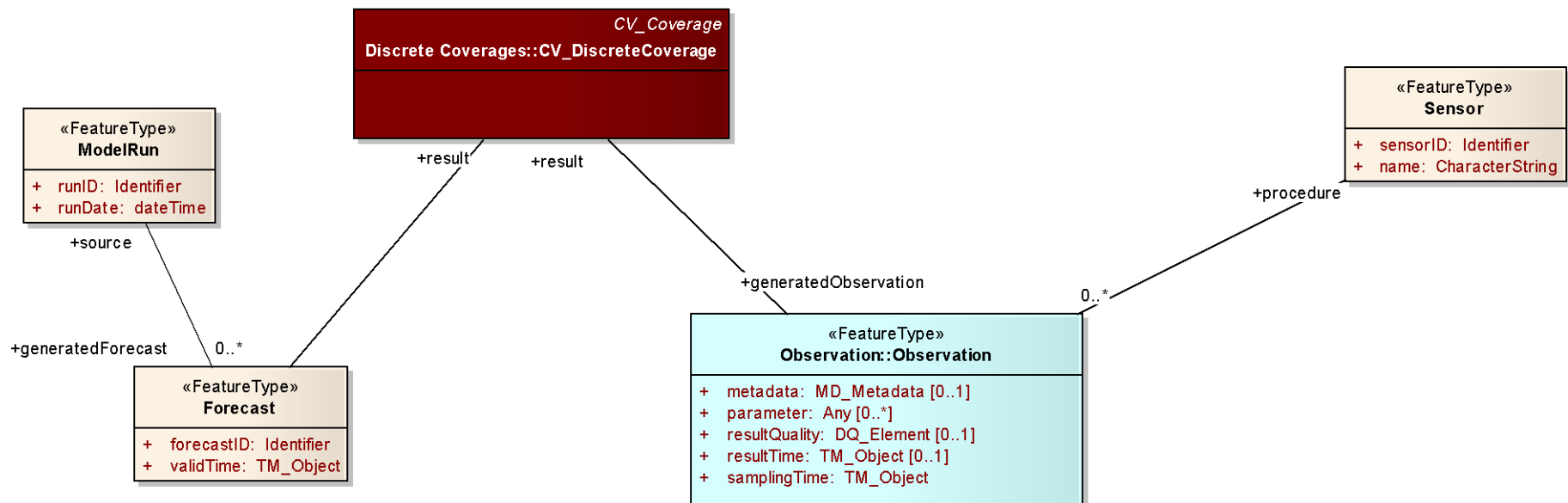# Re-useable, compact discrete coverage model for encoding forecast and observation data within WFS
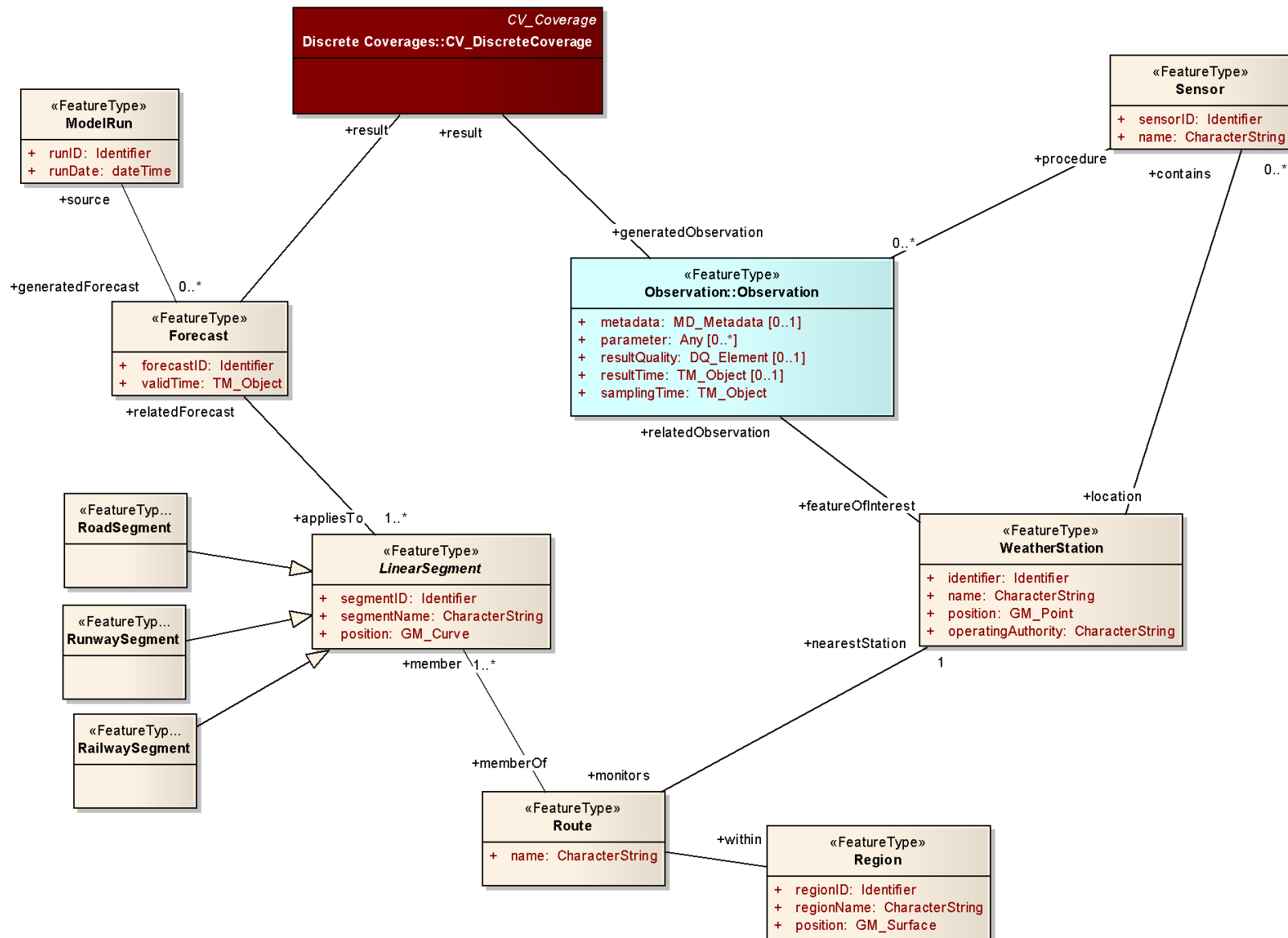
Debbie Wilson

2nd workshop on the use of GIS/OGC standards in meteorology

23rd-25th November 2009, Toulouse

Modelling meteorological data as discrete coverage

- Most meteorological data can be encoded using a discrete coverage within a feature model

CV_Coverage
Discrete Coverages::CV_DiscreteCoverage

+result   +result

«FeatureType»
ModelRun

+   runID: Identifier
+   runDate: dateTime

+source

«FeatureType»
Sensor

+   sensorID: Identifier
+   name: CharacterString

+procedure   +contains   0..*

+generatedForecast   0..*

+generatedObservation   0..*

«FeatureType»
Forecast

+   forecastID: Identifier
+   validTime: TM_Object

«FeatureType»
Observation::Observation

+   metadata: MD_Metadata [0..1]
+   parameter: Any [0..*]
+   resultQuality: DQ_Element [0..1]
+   resultTime: TM_Object [0..1]
+   samplingTime: TM_Object

+relatedForecast

+relatedObservation

+appliesTo   1..*

«FeatureType»
RoadSegment

«FeatureType»
LinearSegment

+   segmentID: Identifier
+   segmentName: CharacterString
+   position: GM_Curve

+featureOfInterest

«FeatureType»
RunwaySegment

«FeatureType»
WeatherStation

+   identifier: Identifier
+   name: CharacterString
+   position: GM_Point
+   operatingAuthority: CharacterString

+location

«FeatureType»
RailwaySegment

+member   1..*

+nearestStation   1

+memberOf   +monitors

«FeatureType»
Route

+   name: CharacterString

+within

«FeatureType»
Region

+   regionID: Identifier
+   regionName: CharacterString
+   position: GM_Surface

Aims & objectives

- Provide an efficient and compact encoding for transmitting meteorological data

- Be re-usable across a wide range of Met Office services

- Be compatible with data translation capabilities of GO Publisher Desktop

- Be compatible with query and selection principles of GO Publisher WFS

Query & selection patterns

- Use cases:

  - **Bulk data download:**

    Select all 36hr forecasts for sites for a user-defined AOI

  - **Public use of forecast data**

    What will the temperature be for Toulouse between 12pm and 5pm tomorrow and will it rain?

  - **Operation decision support for highways management**

    Identify all road segments within a management area where temperature will drop below 2°C overnight?

Increasing query complexity

Options for compact, discrete coverage encodings

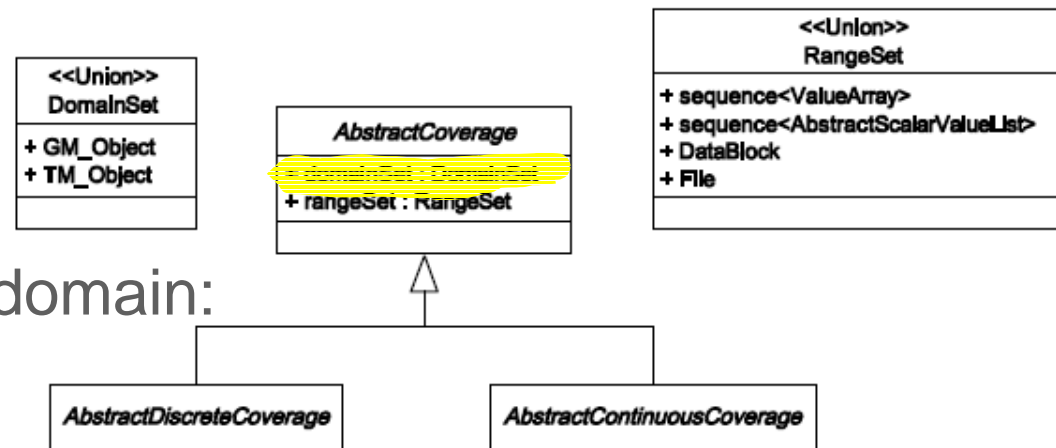- Discrete coverage model contains two components:
  - Domain
  - Range
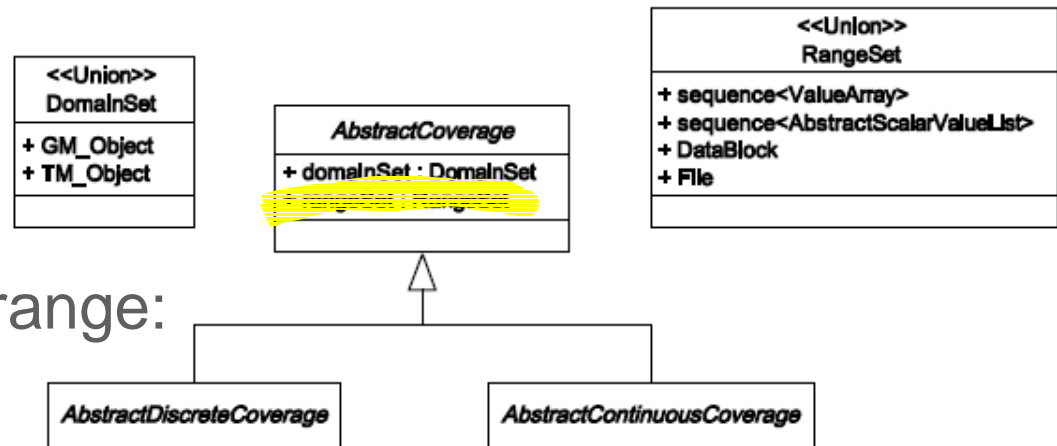
- 4 options for encoding range:
  - Data block
  - Scalar value list
  - Value Array
  - Individual parameter value

Verbose

Options for compact, discrete coverage encodings

- The domain can either be:
  - Spatial
  - Temporal

- 4 options for encoding domain:
  - Grid
  - List
  - Array (e.g. MultiGeometry, MultiCurve ....)
  - Individual

Verbose

Parent Feature	Discrete Coverage		Query & Selection Function			
	Domain	Range	Spatial	Temporal	Parameter	Value
Spatial Object (e.g. Road segment, runway, region, weather station)	Temporal Grid	Data Block	✔	✘	✘	✘
		Scalar Value List	✔	✘	✔	✔
	Temporal List	Data Block	✔	✔	✘	✘
		Scalar Value List	✔	✔	✔	✔
	Individual Time	Scalar Value List	✔	✔	✔	✔
Observation/ Forecast (containing a time attribute)	Spatial Grid	Data Block	✘	✔	✘	✘
		Scalar Value List	✘	✔	✔	✔
	MultiGeometry	Data Block	✔	✔	✘	✘
		Scalar Value List	✔	✔	✔	✔
	Individual Geometry	Scalar Value List	✔	✔	✔	✔

Conclusion

- Snowflake developed a re-usable schema for discrete coverage model
- GO Publisher Desktop successfully translated data into all discrete coverage models
- GO Publisher WFS was capable of serving all types of discrete coverage:
  - Compact encodings
    - Suitable where large volumes of data are requested
    - User wants all the meteorological data
  - Verbose encodings support all types of query
    - Suitable where small volumes of data are requested
    - User needs to access specific parts of data contained within forecast