

GEOSS Workshop XLIII: Sharing Climate Information & Knowledge

NCAR Center Green, Boulder Colorado,
23 Sept 2011, 8:00am – 5:30pm



WCS 2.0 Extension for netCDF-CF; CSW and THREDDS Interoperability

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(CNR – IIA ESSI-lab)



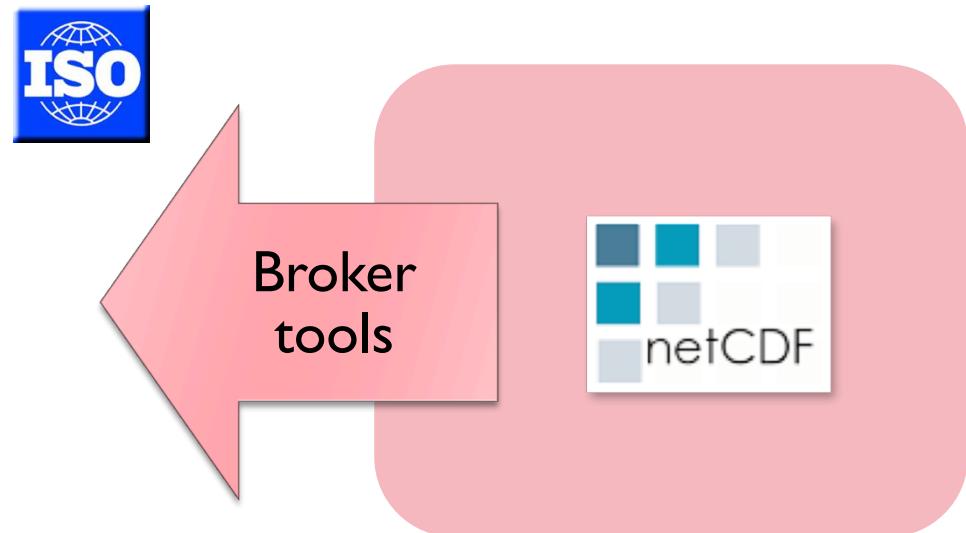
Rationale

- ▶ Improve interoperability to share Climate information
 - ▶ Extend well-adopted **Geospatial standards** to support climate datasets
 - ▶ Broker well-adopted **Climate data tools** and make them interoperable

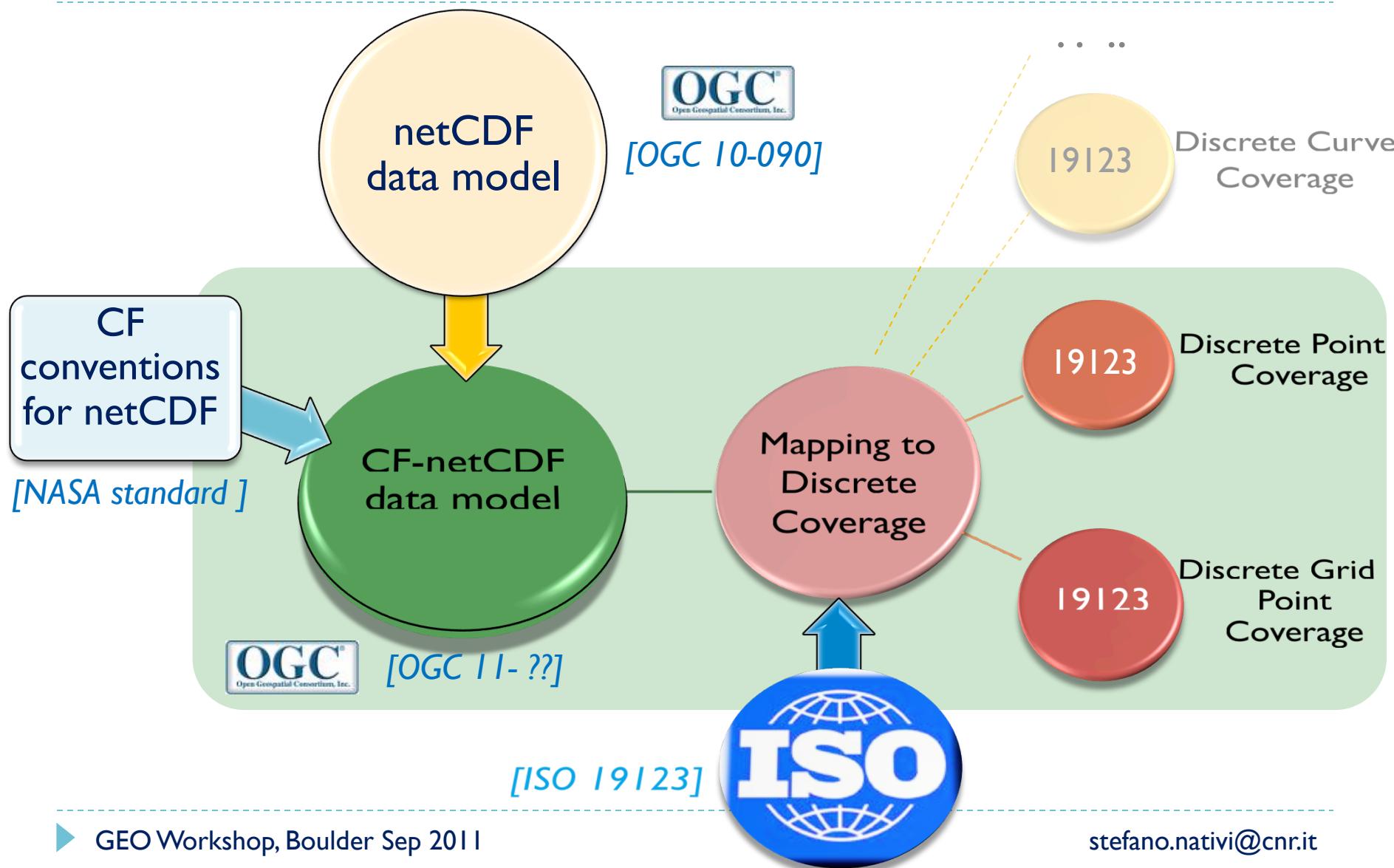


CF-netCDF extension for WCS 2.0

- ▶ Mapped **CF-netCDF** to **ISO** data model
- ▶ Extended **OGC standards** to support **CF-netCDF**
 - ▶ **WCS 2.0**
 - ▶ **WFS**
 - ▶ **SOS**
 - ▶ ...



Approach



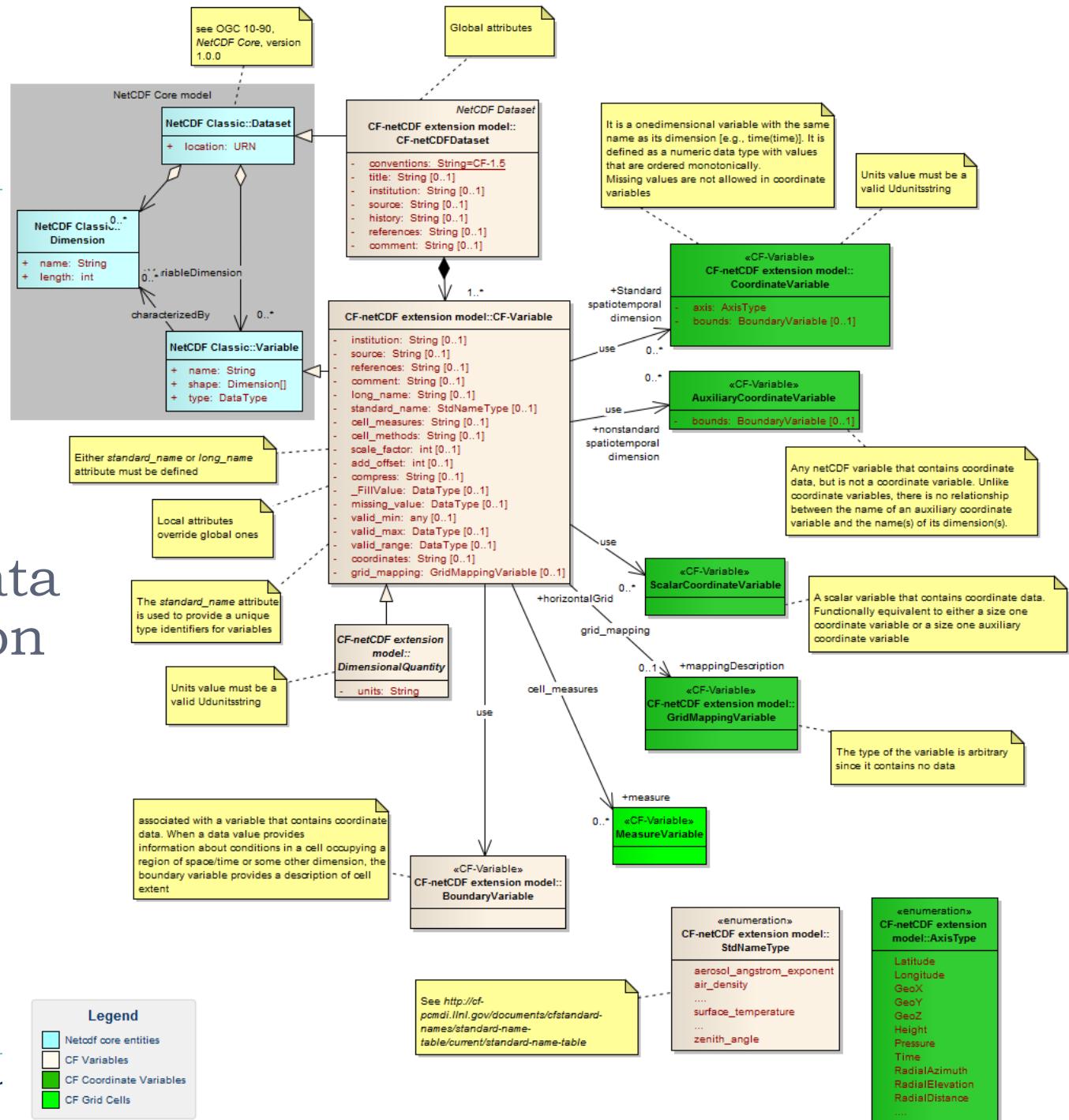
OGC CF-netCDF specification

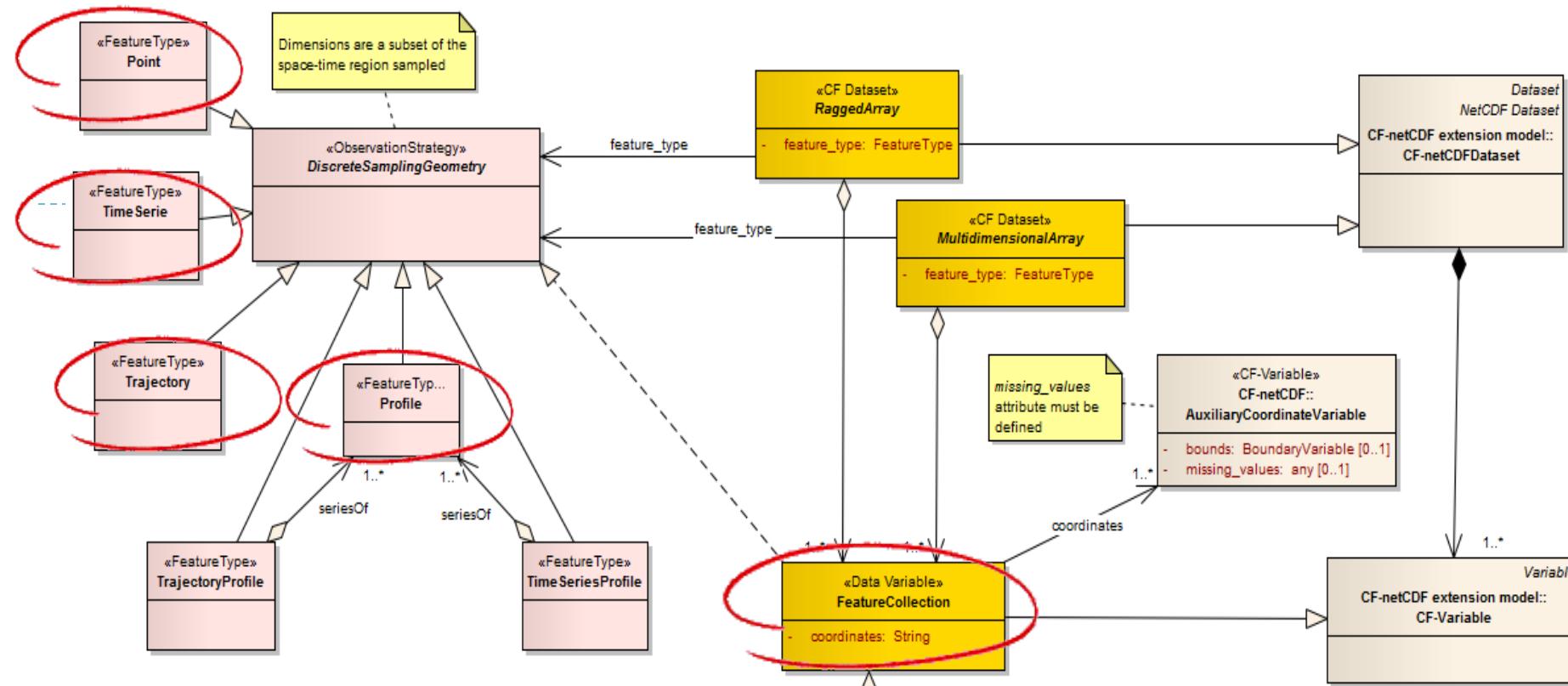
- ▶ Extend netCDF data model adopting the **Climate and Forecast (CF) conventions**
 - ▶ **netCDF** (network Common Data Form) **ver. 3.0** file format
 - ▶ **CF** (Climate and Forecast) conventions **ver. 1.6**
 - ▶ *multi-dimensional* **Discrete Sampling Geometries** (i.e. *CF Sampling Geometries* types)



CF-netCDF Data Model extension

CF Variable and Standard Attributes





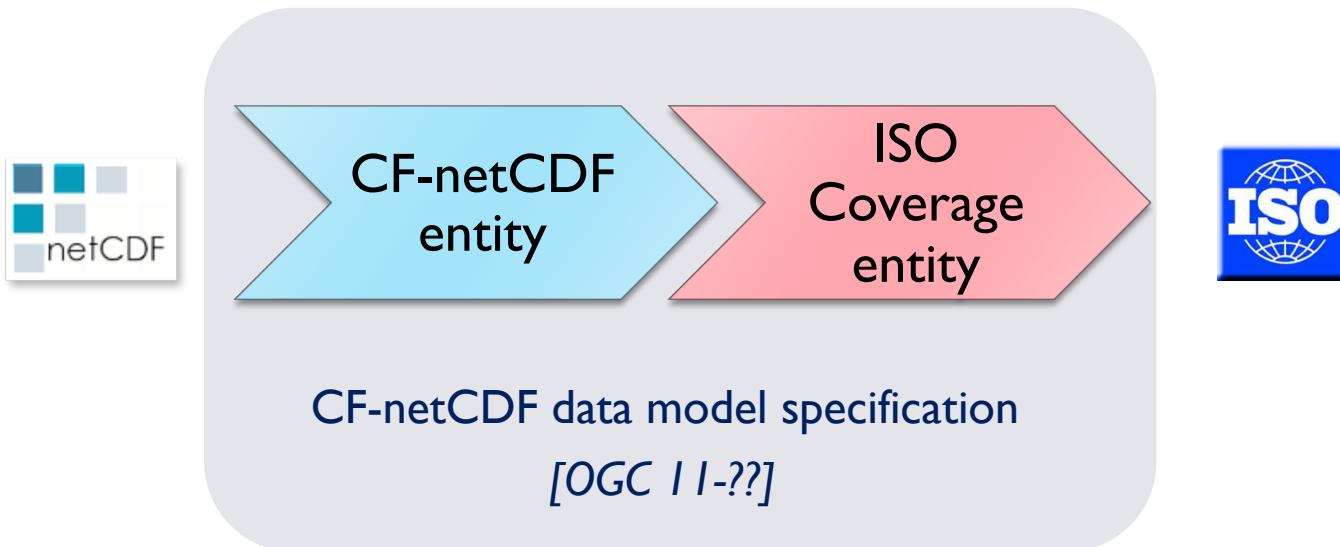
Sampling Geometries (Feature Collections)

Context



«enumeration» FeatureType
Point
TimeSeries
Trajectory
Profile
TrajectoryProfile
TimeSeriesProfile

Mapping Rules

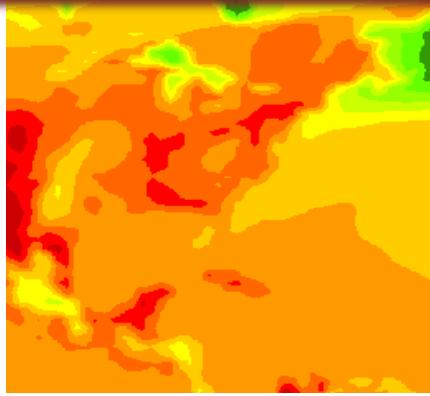


A unique Data Model for three Views

WCS

CF

MULTIDIMENSIONAL ARRAYS
ELEMENT DIMENSION
VARIABLES



“field” or “coverage”

“observation” or
“specimen”

WFS

CF

MULTIDIMENSIONAL ARRAYS
INSTANCE DIMENSION
INSTANCE VARIABLES



“feature” or “boundary data”

SOS

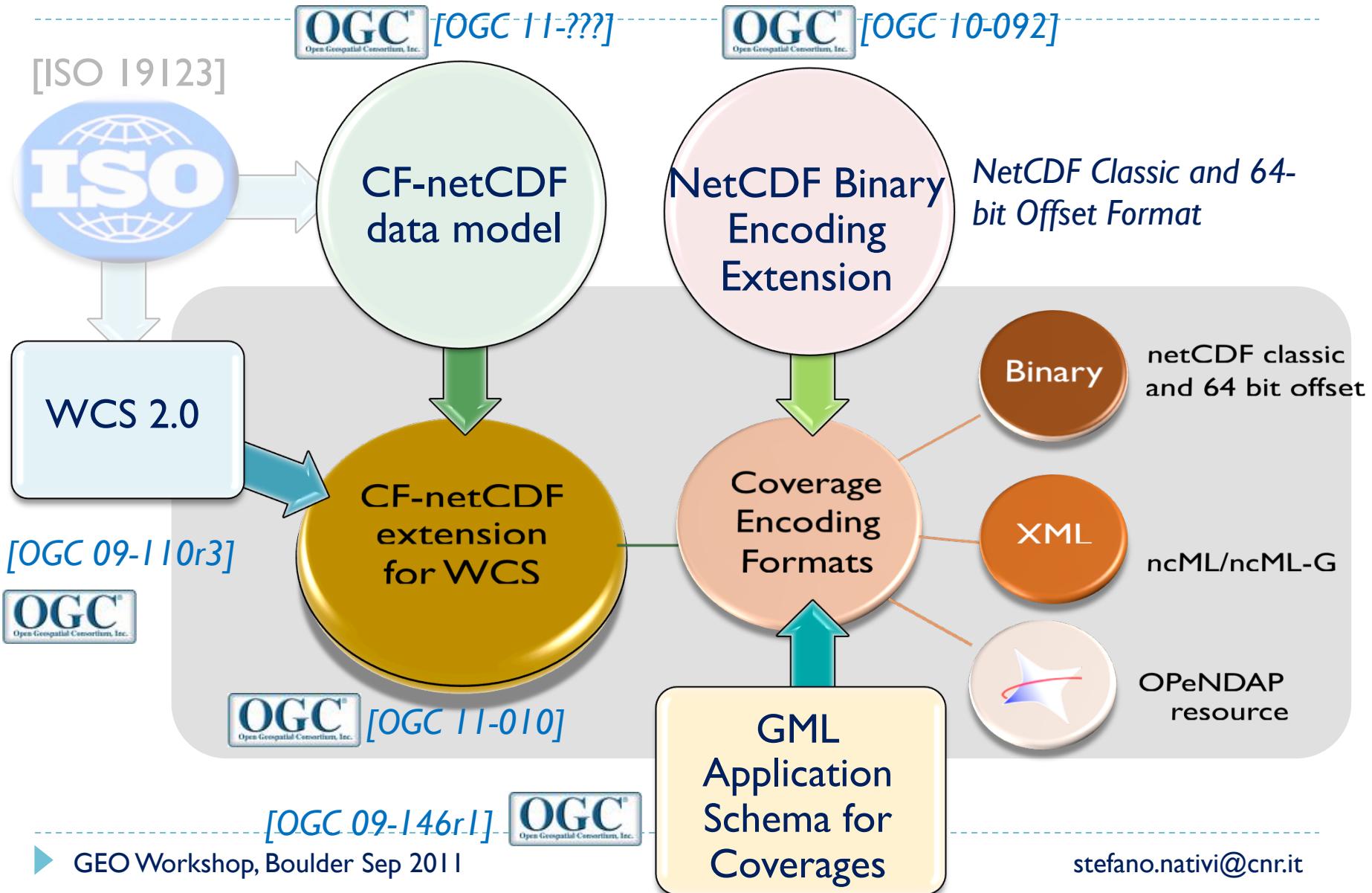
CF
RAGGED ARRAYS
SAMPLE DIMENSION
INDEX/COUNT VARIABLES

Specimen	Au (ppm)	Cu-a (%)	Cu-b (%)	As (ppm)	Sb (ppm)
1	100	10	10	10	10
2	100	10	10	10	10
3	100	10	10	10	10
4	100	10	10	10	10

- A Row gives properties of one feature

- A Column = variation of a single property across a domain (i.e. set of locations)

Approach



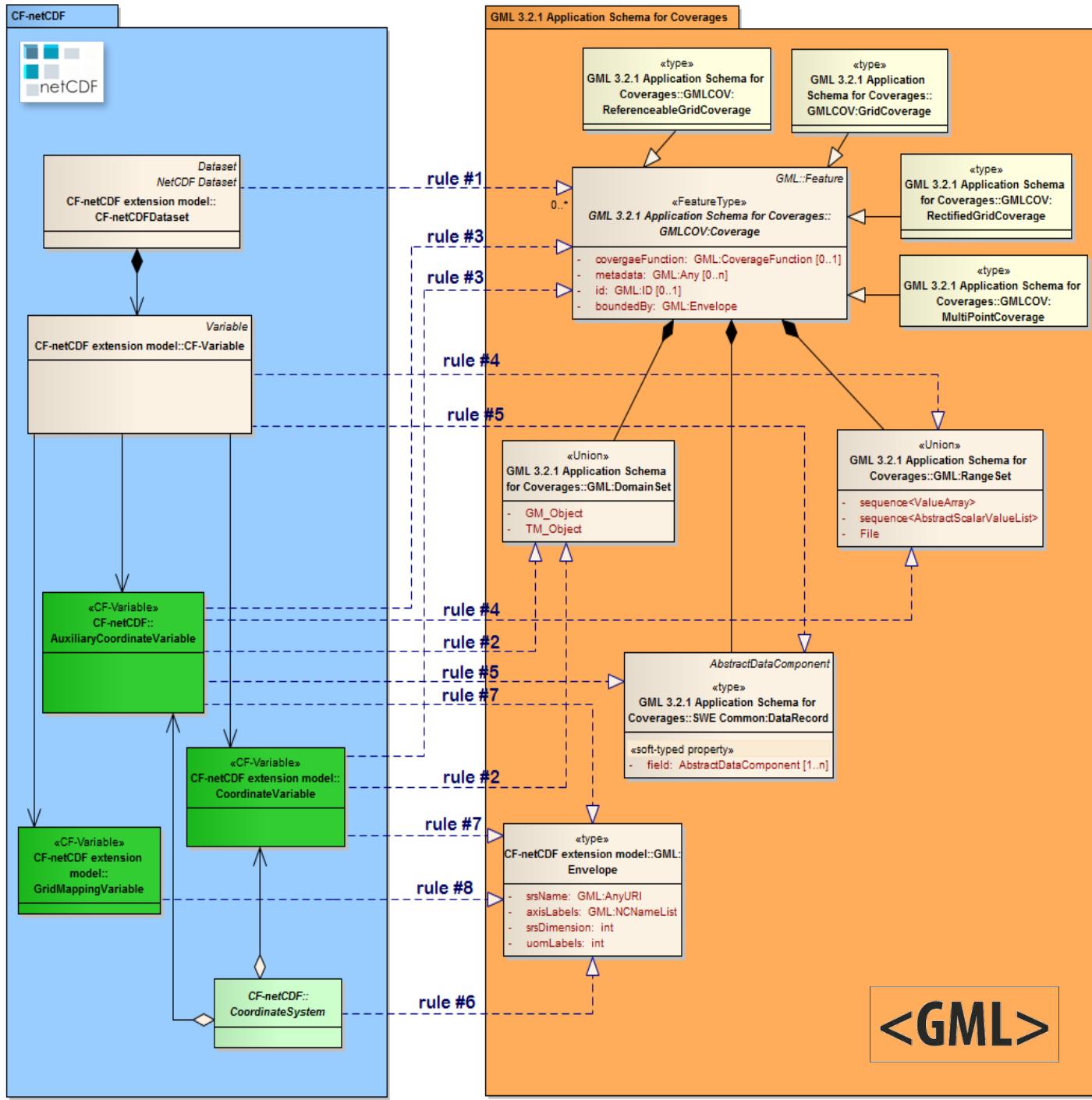
Content

- ▶ CF-netCDF data model **mapping onto the WCS 2.0 data model**
- ▶ **WCS 2.0 service model extensions** for CF-netCDF encoding
- ▶ Possible **binary** and **XML-based encoding formats** returned by a `getCoverage` request

Mapping Rules



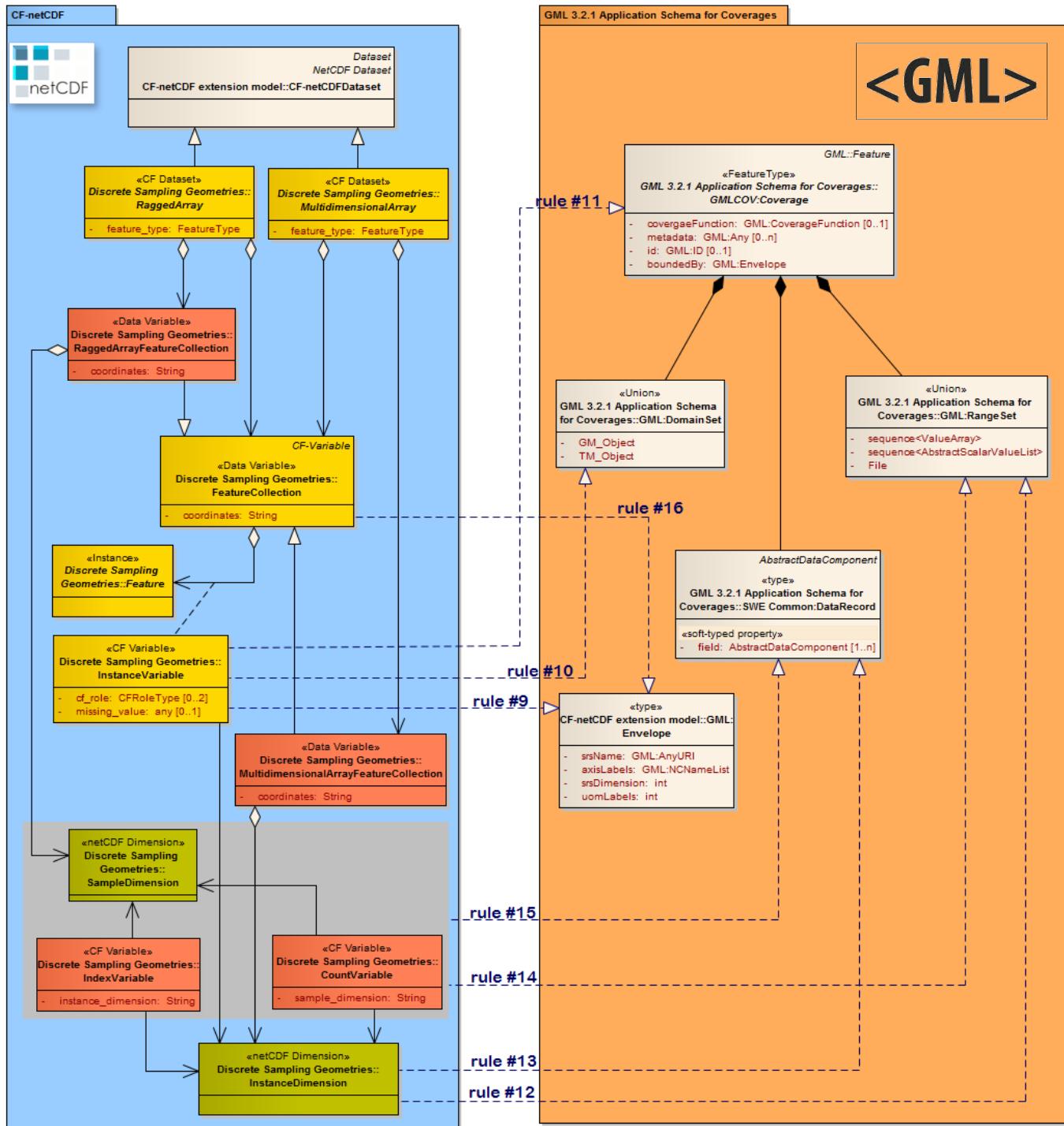
Dataset Mapping



Feature Collection Mapping

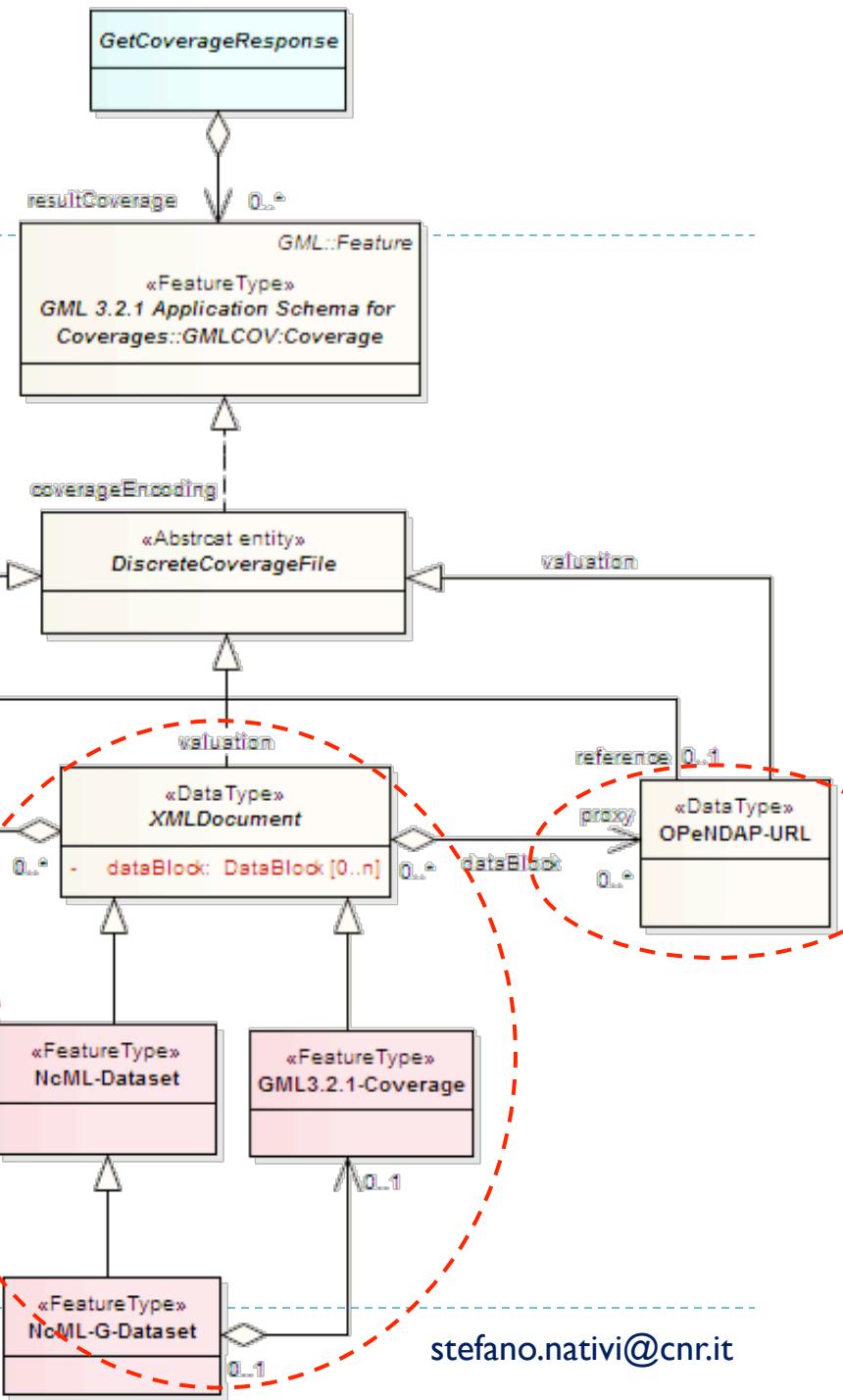


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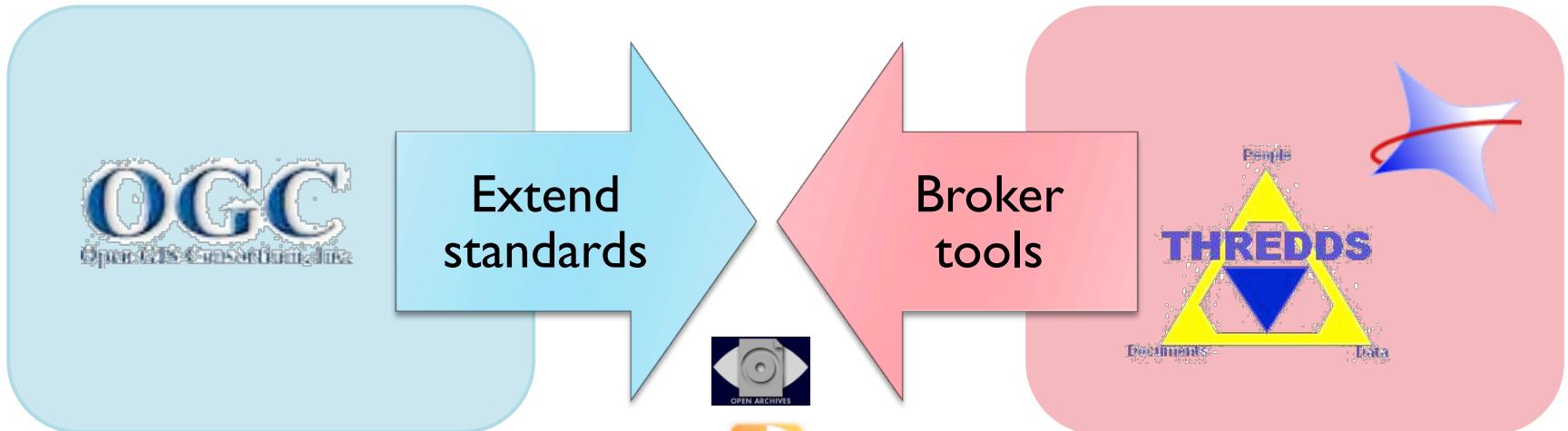
GetCoverage response

- CF-netCDF data encoding structure returned by a successful request shall implement a “Discrete Coverage File” realized according to this specific model



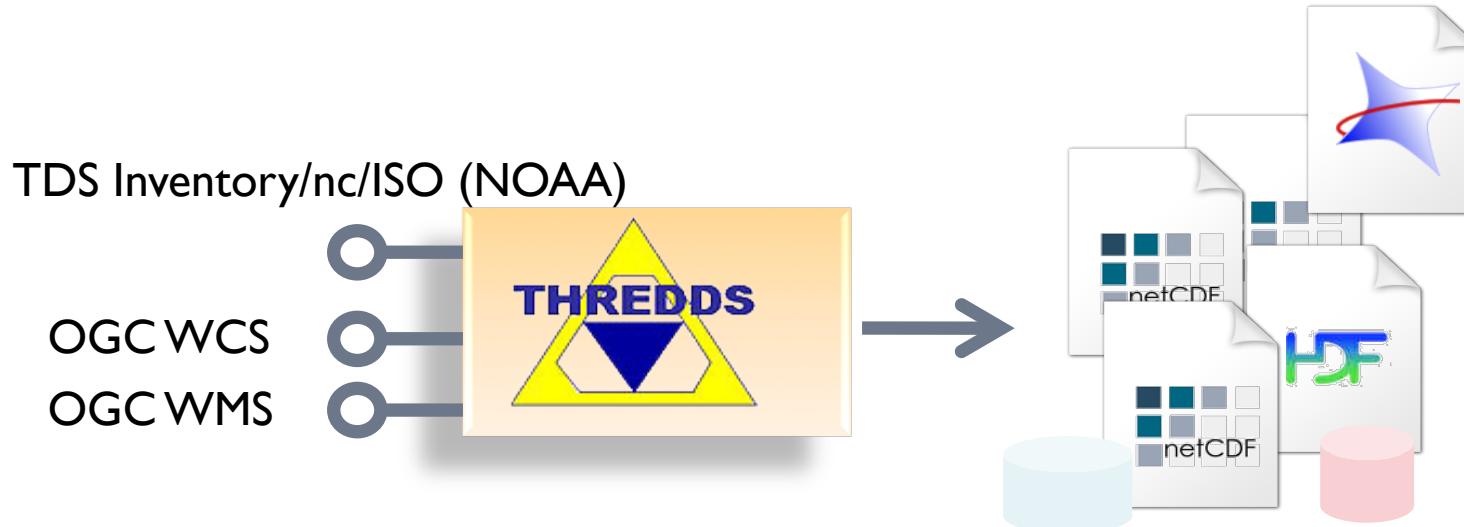
Broker Climate data tools

- ▶ Extended the **CSW** by adding distribution and mediation
- ▶ Broker **THREDDS/OPeNDAP** and make it accessible through **OGC CSW (OpenSearch-GEO and OAI-PMH)**



TDS: an Inventory and Access services

- ▶ **TDS published services:**
 - ▶ TDS inventory service
 - ▶ WCS,WMS, ...
- ▶ **TDS accessed resources:**
 - ▶ NetCDF files and folders
 - ▶ GRIB2, HDF, ...
 - ▶ OPeNDAP resources



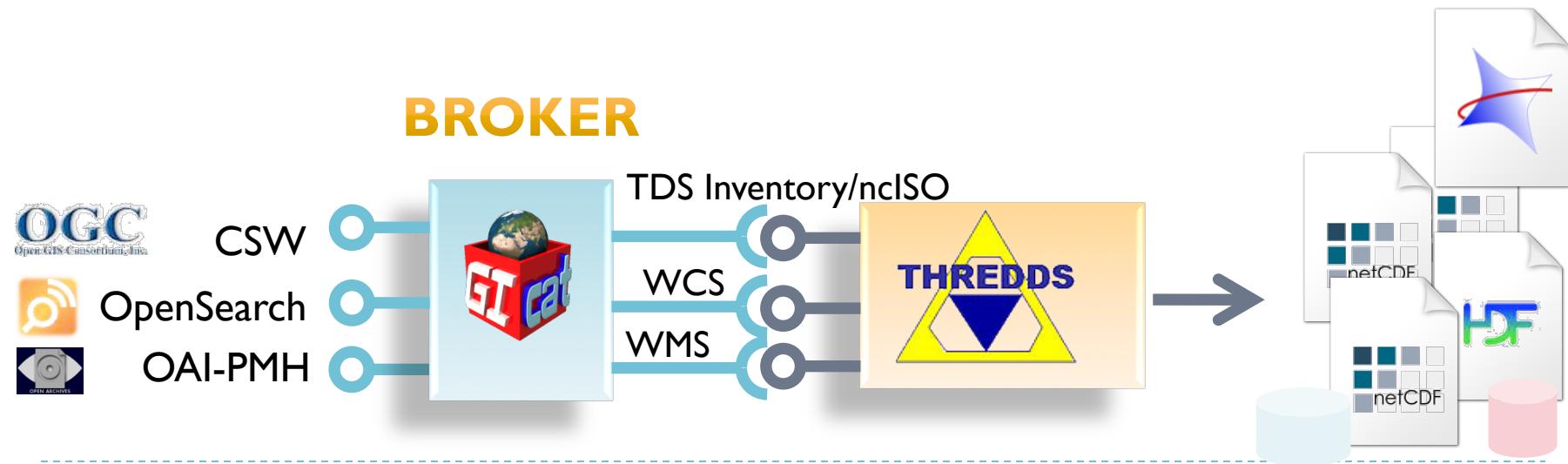
From Inventory/Access to Catalog service

► GI-cat published services

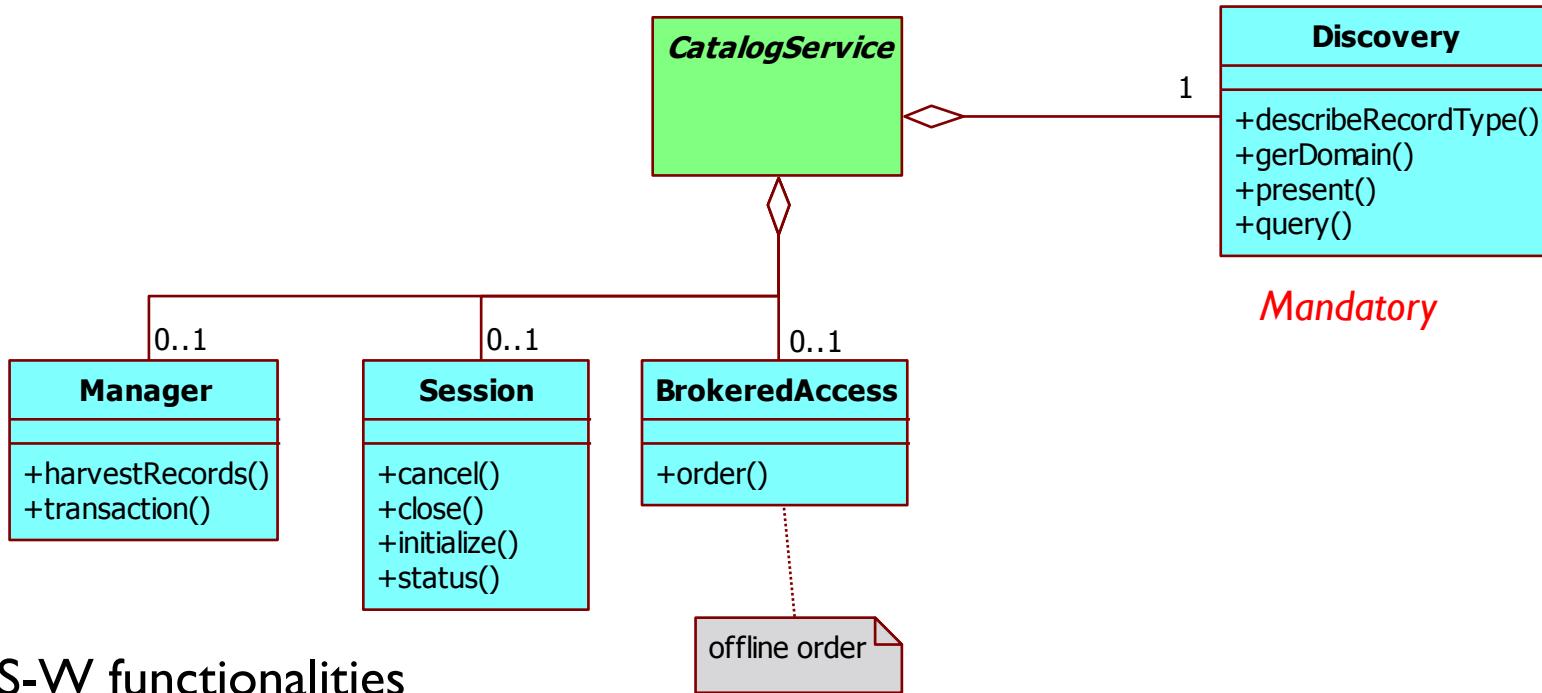
- ▶ CSW
- ▶ OpenSearch
- ▶ OAI-PMH
- ▶ ...

► GI-cat accessed resources:

- ▶ THREDDS inventory service
- ▶ WCS, WMS (WFS, WPS, SOS)
- ▶ NetCDF, ncML
- ▶ ...



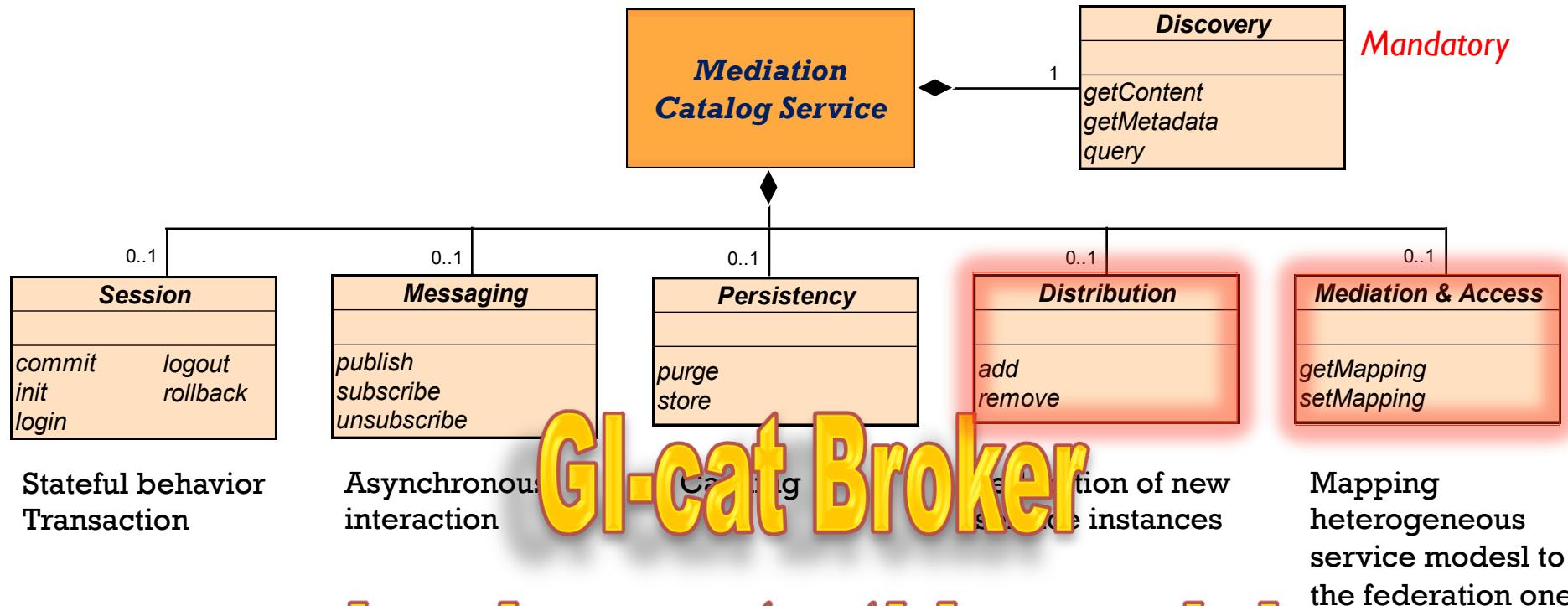
OGC CS-W General Functional Model

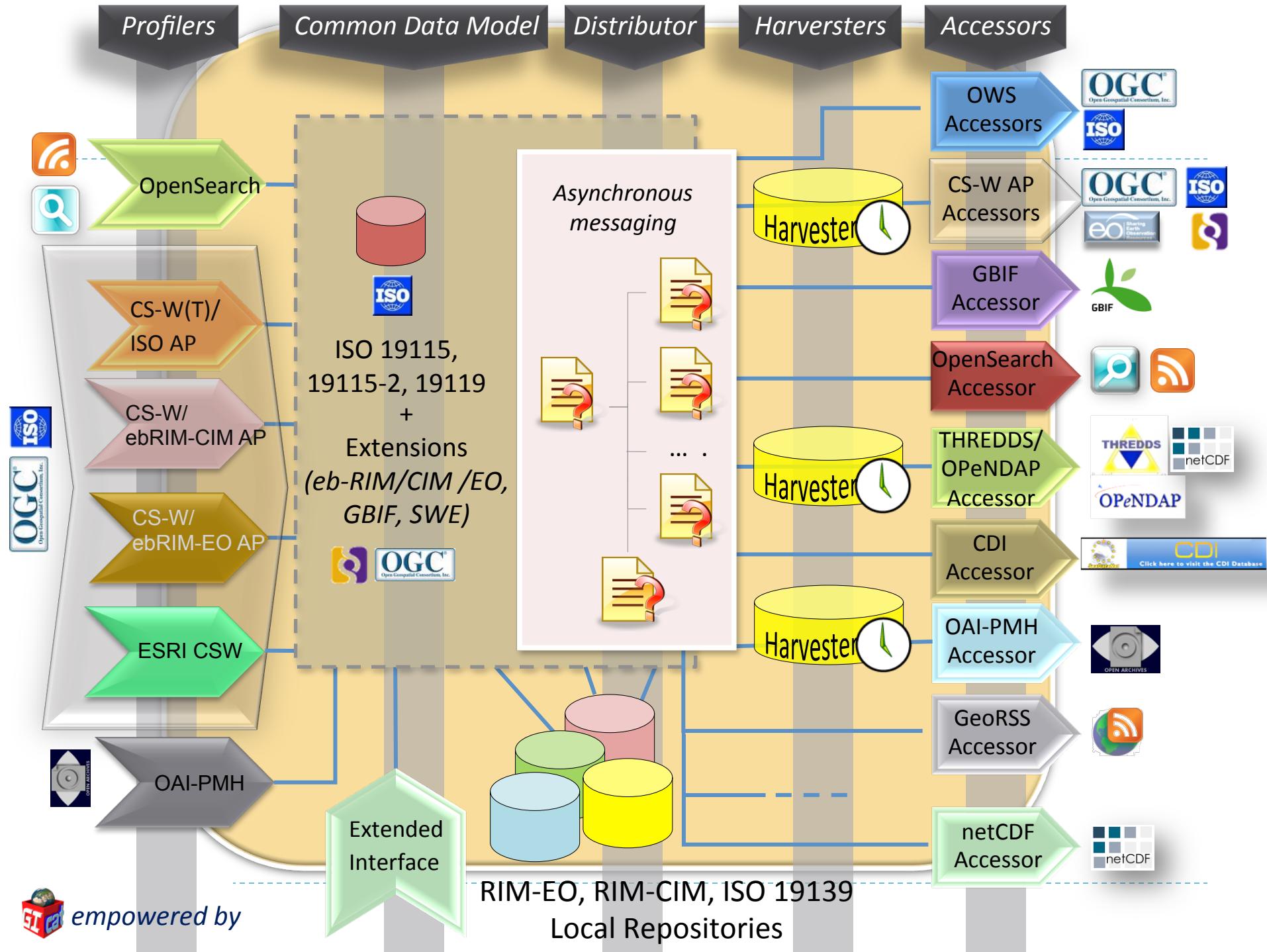


- ▶ CS-W functionalities
 - ▶ Mandatory
 - ▶ Discovery
 - Metadata Query & Present (e.g. getRecords, getRecordsByID, describeRecord)
 - ▶ Optional
 - ▶ Session (e.g. initialize, close, status)
 - ▶ Management (e.g. harvest, transaction)
 - ▶ GEO Workspaces, Brokered Access
- ✓ **to enhance the Distribution functionality**
- ✓ **to add the Mediation functionality**
- ✓ **To extend the Messaging functionalities**

Extended Functional Model introducing Distribution & Mediation

- Extended model for a Mediation Catalog service (**Catalog Broker**)
 - ▶ Extended functionalities



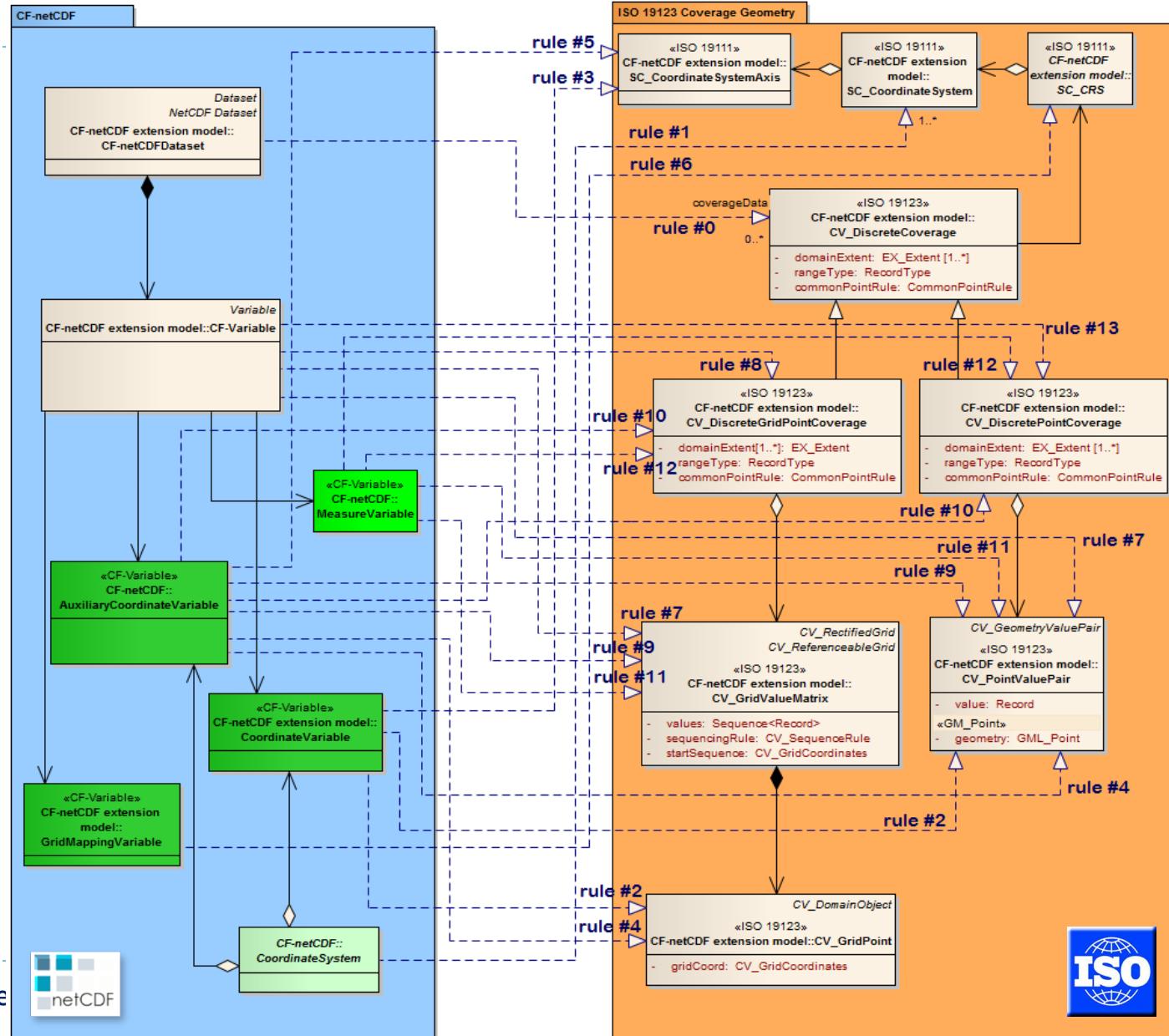


Thank you for your attention !

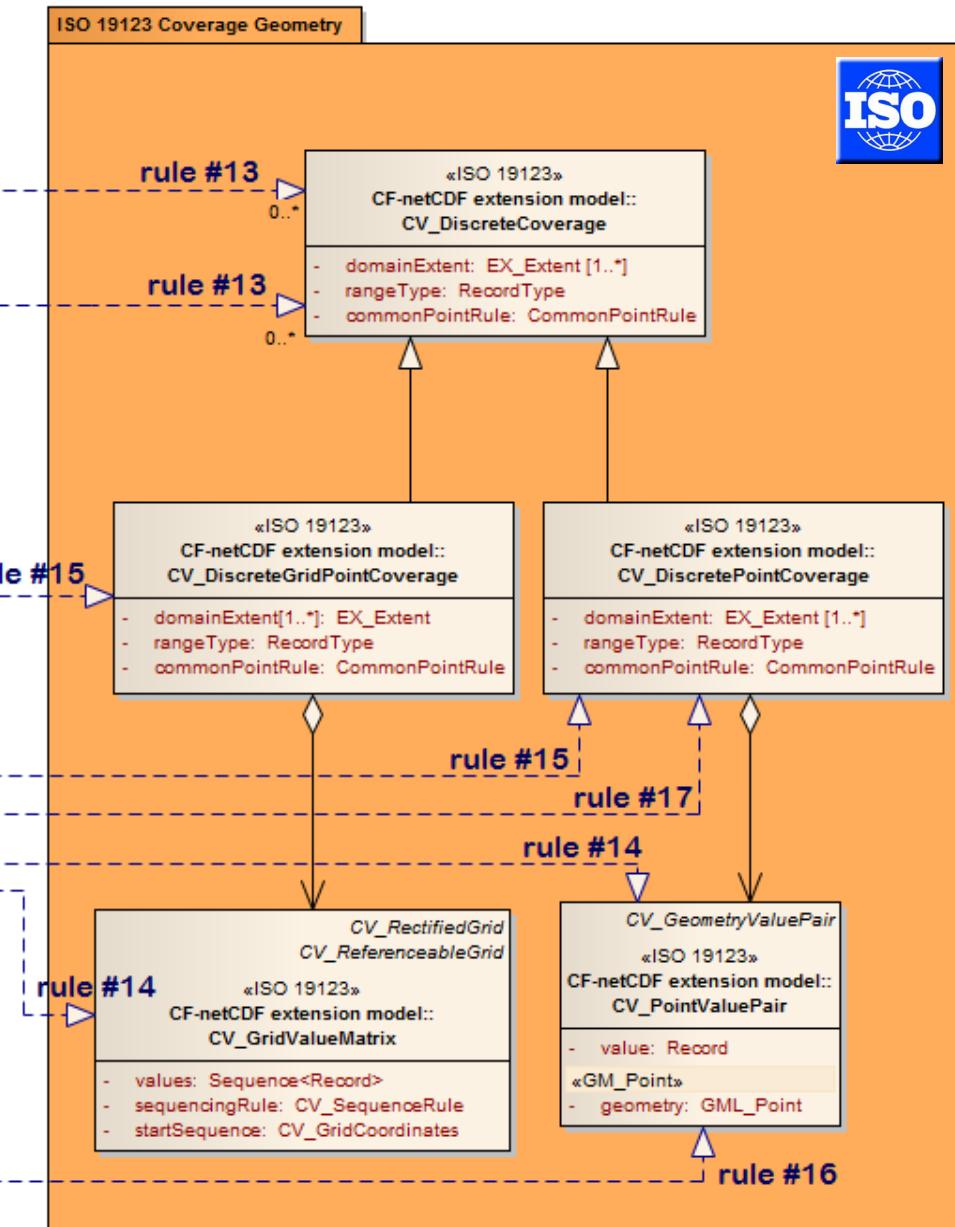
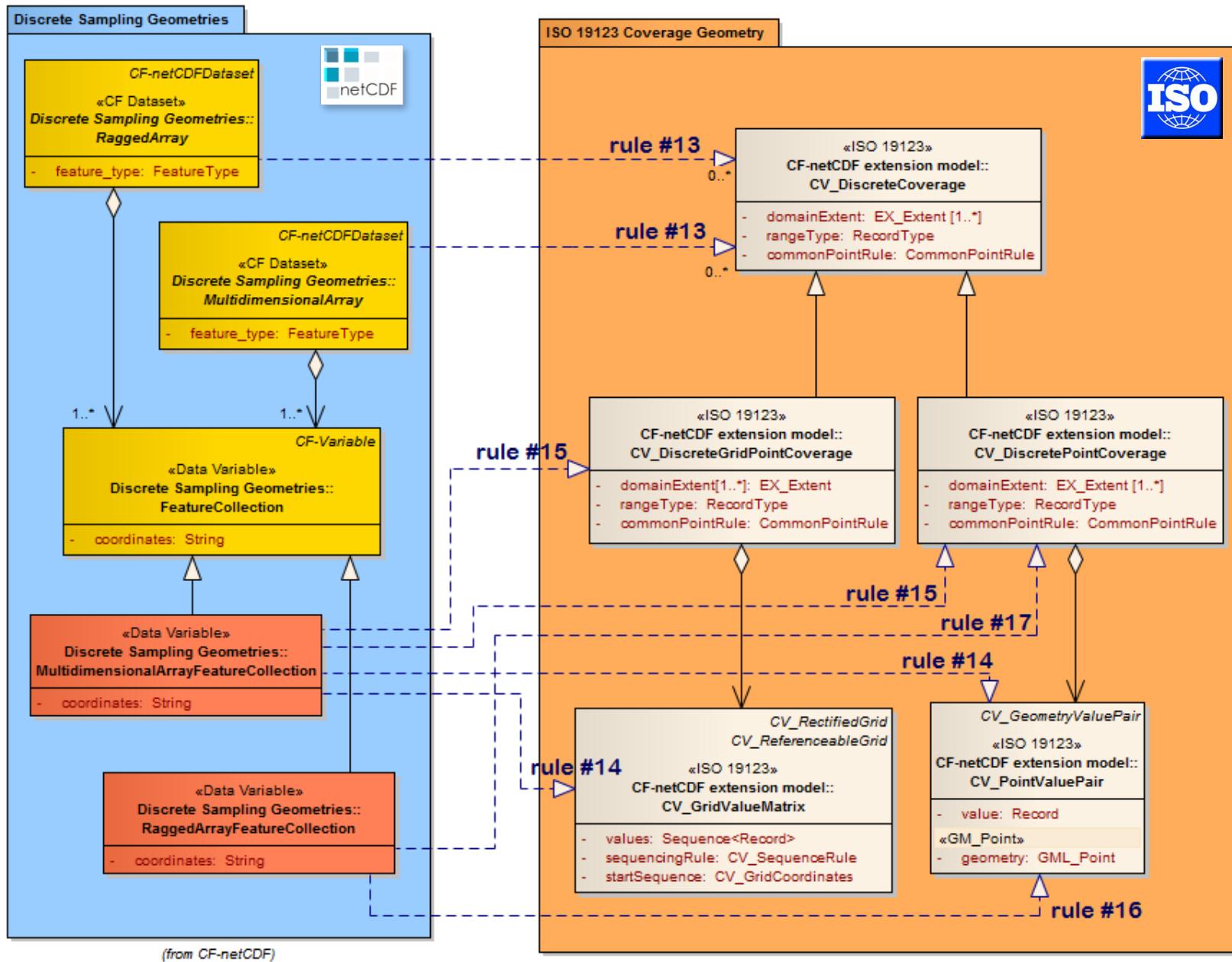


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CF-netCDF Dataset Mapping to ISO19123:CV_DiscreteCoverage



CF-netCDF SamplingGeometries Mapping to ISO19123:CV_DiscreteCoverage



Serve CF-netCDF datasets

- ▶ Mapping **CF-netCDF** data model to the **ISO Coverage model**
 - ▶ The **CF** extension to the **netCDF** core model
- ▶ Extend **WCS 2.0** Standard Interface to serve **CF-NetCDF** datasets
 - ▶ The **CF-netCDF** encoding format extension to **II-010 OGC®WCS 2.0**

