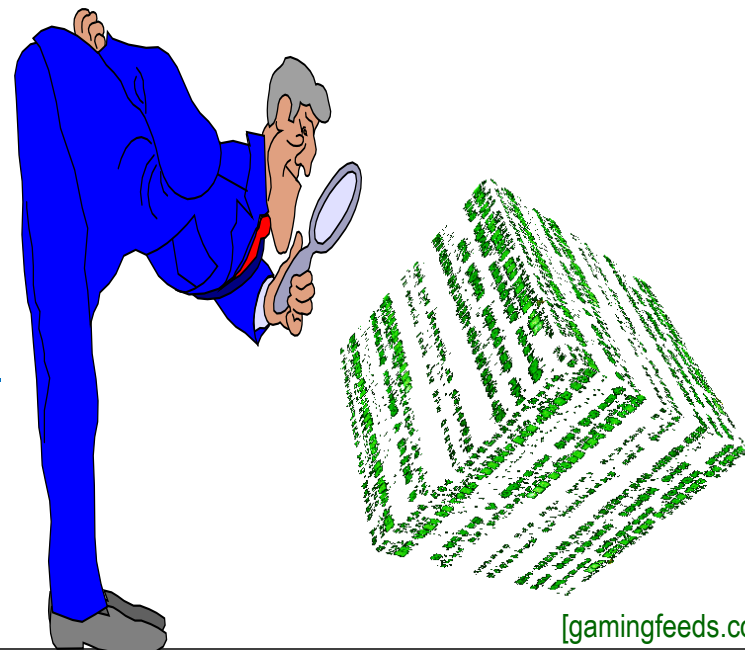


OGC/ISO Coverage Implementation Schema

the rasdaman team

Jacobs University | rasdaman GmbH

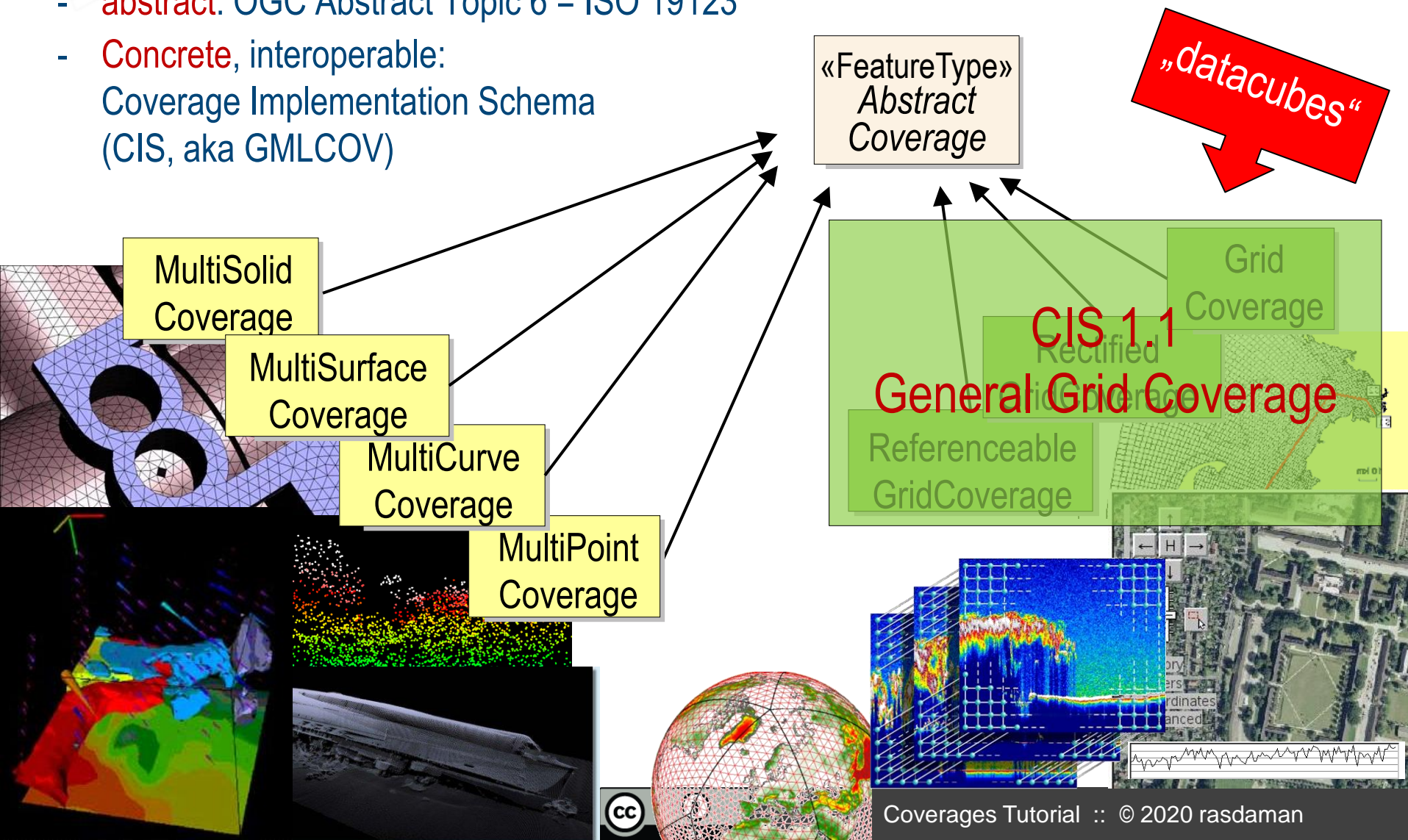
www.jacobs-university.de/isis | www.rasdaman.com



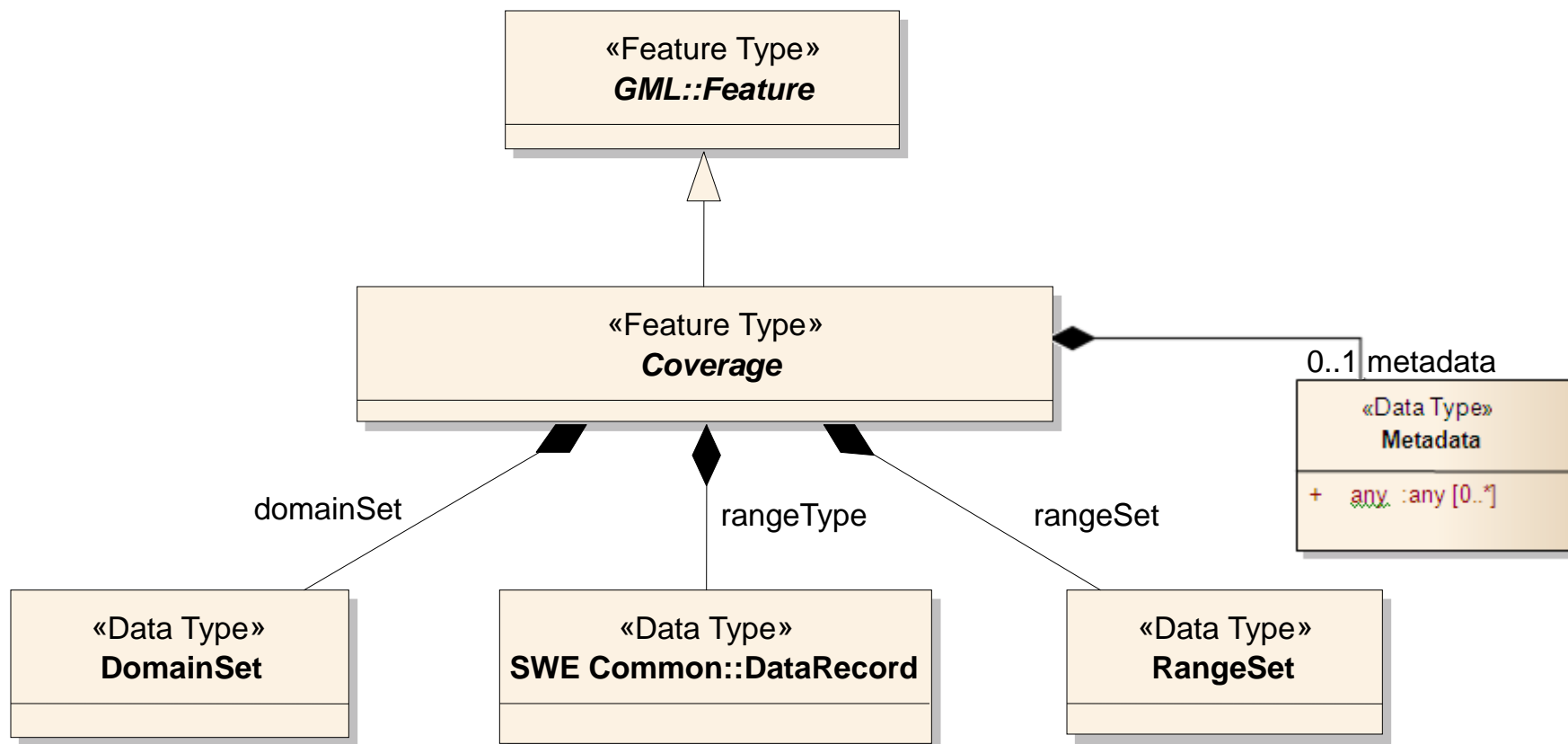
[gamingfeeds.com]

Coverages= Grids, Point Clouds, Meshes

- **abstract**: OGC Abstract Topic 6 = ISO 19123
- **Concrete**, interoperable:
Coverage Implementation Schema
(CIS, aka GMLCOV)



Coverage Definition



A Simple Coverage, in GML

```

<generalGridCoverage ... gml:id="CIS_001">
  <domainSet>
    <generalGrid srsName="http://www.opengis.net/def/crs-compound?
      1=http://www.opengis.net/def/crs/EPSG/0/4979
      &2=http://www.opengis.net/def/crs/OGC/0/AnsiDate"
      axisLabels="Lat Long h date">
      <regularAxis axisLabel="Lat" uomLabel="deg" lowerBound="40" upperBound="60" resolution="10"/>
      <regularAxis axisLabel="Long" uomLabel="deg" lowerBound="-10" upperBound="10" resolution="10"/>
      <irregularAxis axisLabel="h" uomLabel="m">
        <c> 0</c>
        <c>100</c>
      </irregularAxis>
      <irregularAxis axisLabel="date" uomLabel="d">
        <c>2015-12-01</c>
        <c>2015-12-02</c>
      </irregularAxis>
      <gridLimits srsName="http://www.opengis.net/def/crs/OGC/0/Index4D" axisLabels="i j k l">
        <indexAxis axisLabel="i" lowerBound="0" upperBound="2"/>
        <indexAxis axisLabel="j" lowerBound="0" upperBound="2"/>
        <indexAxis axisLabel="k" lowerBound="0" upperBound="1"/>
        <indexAxis axisLabel="l" lowerBound="0" upperBound="1"/>
      </gridLimits>
    </generalGrid>
  </domainSet>

  <rangeSet>
    <dataBlock>
      <v>01</v> <v>02</v> <v>03</v> <v>04</v> <v>05</v> <v>06</v> <v>07</v> <v>08</v> <v>09</v>
      <v>01</v> <v>02</v> <v>03</v> <v>04</v> <v>05</v> <v>06</v> <v>07</v> <v>08</v> <v>09</v>
      <v>01</v> <v>02</v> <v>03</v> <v>04</v> <v>05</v> <v>06</v> <v>07</v> <v>08</v> <v>09</v>
      <v>01</v> <v>02</v> <v>03</v> <v>04</v> <v>05</v> <v>06</v> <v>07</v> <v>08</v> <v>09</v>
    </dataBlock>
  </rangeSet>

  <rangeType>
    <swe:DataRecord>
      <swe:field name="panchromatic">
        <swe:Quantity definition="http://opengis.net/def/property/OGC/0/Radiance">
          <swe:uom code="W.m-2.sr-1.nm-1"/>
        </swe:Quantity>
      </swe:field>
    </swe:DataRecord>
  </rangeType>
</generalGridCoverage>

```

A Simple Coverage, in GML

```
<generalGridCoverage ... gml:id="CIS_001">
  <domainSet>
    <generalGrid srsName="http://www.opengis.net/def/crs-compound?
      1=http://www.opengis.net/def/crs/EPSG/0/4979
      &2=http://www.opengis.net/def/crs/OGC/0/AnsiDate"
      axisLabels="Lat Long h date">
      <regularAxis axisLabel="Lat" uomLabel="deg" lowerBound="40" upperBound="60" resolution="10"/>
      <regularAxis axisLabel="Long" uomLabel="deg" lowerBound="-10" upperBound="10" resolution="10"/>
      <irregularAxis axisLabel="h" uomLabel="m">
        <c> 0</c>
        <c>100</c>
      </irregularAxis>
      <irregularAxis axisLabel="date" uomLabel="d">
        <c>2015-12-01</c>
        <c>2015-12-02</c>
      </irregularAxis>
      <gridLimits srsName="http://www.opengis.net/def/crs/OGC/0/Index4D" axisLabels="i j k l">
        <indexAxis axisLabel="i" lowerBound="0" upperBound="2"/>
        <indexAxis axisLabel="j" lowerBound="0" upperBound="2"/>
        <indexAxis axisLabel="k" lowerBound="0" upperBound="1"/>
        <indexAxis axisLabel="l" lowerBound="0" upperBound="1"/>
      </gridLimits>
    </generalGrid>
  </domainSet>

  <rangeSet>
    <dataBlock>
      <v>01</v> <v>02</v> <v>03</v> <v>04</v> <v>05</v> <v>06</v> <v>07</v> <v>08</v> <v>09</v>
      <v>01</v> <v>02</v> <v>03</v> <v>04</v> <v>05</v> <v>06</v> <v>07</v> <v>08</v> <v>09</v>
      <v>01</v> <v>02</v> <v>03</v> <v>04</v> <v>05</v> <v>06</v> <v>07</v> <v>08</v> <v>09</v>
      <v>01</v> <v>02</v> <v>03</v> <v>04</v> <v>05</v> <v>06</v> <v>07</v> <v>08</v> <v>09</v>
    </dataBlock>
  </rangeSet>

  <rangeType>
    <swe:DataRecord>
      <swe:field name="panchromatic">
        <swe:Quantity definition="http://opengis.net/def/property/OGC/0/Radiance">
          <swe:uom code="W.m-2.sr-1.nm-1"/>
        </swe:Quantity>
      </swe:field>
    </swe:DataRecord>
  </rangeType>
</generalGridCoverage>
```

A Simple Coverage, in JSON

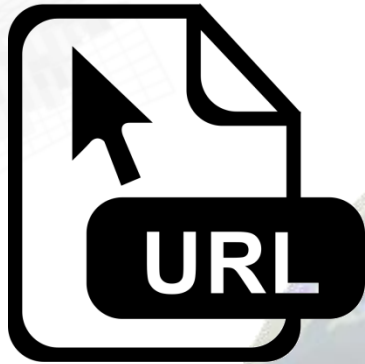
```
{ "type": "CoverageByDomainAndRangeType",
  "domainSet": {
    "type": "DomainSetType",
    "generalGrid": {
      "type": "GeneralGridCoverageType",
      "srsName": "http://www.opengis.net/def/crs/OGC/0/Index2D",
      "axisLabels": ["i", "j"],
      "axis": [ { "type": "IndexAxisType", "axisLabel": "i", "lowerBound": 0, "upperBound": 2 },
                { "type": "IndexAxisType", "axisLabel": "j", "lowerBound": 0, "upperBound": 2 } ]
    }
  },
  "rangeSet": { "type": "RangeSetType",
                "dataBlock": { "type": "VDataBlockType", "values": [1,2,3,4,5,6,7,8,9] } },
  "rangeType": { "type": "DataRecordType",
                 "field": { "type": "QuantityType",
                           "definition": "ogcType:unsignedInt",
                           "uom": { "type": "UnitReference", "code": "10^0" } } }
}
```

A Simple Coverage, in RDF

```

<http://www.opengis.net/cis/1.1/examples/CIS_05_2D>
  <http://www.w3.org/1999/02/22-rdf-syntax-ns#type>
  <http://www.opengis.net/cis/1.1/CoverageByDomainAndRangeType> .

<http://www.opengis.net/cis/1.1/examples/CIS_05_2D>
  <http://www.opengis.net/cis/1.1/domainSet>
  <http://www.opengis.net/cis/1.1/examples/CIS_DS_05_2D> .
<http://www.opengis.net/cis/1.1/examples/CIS_DS_05_2D>
  <http://www.opengis.net/cis/1.1/generalGrid>
  <http://www.opengis.net/cis/1.1/examples/CIS_DS_GG_05_2D> .
<http://www.opengis.net/cis/1.1/examples/CIS_DS_05_2D>
  <http://www.w3.org/1999/02/22-rdf-syntax-ns#type>
  <http://www.opengis.net/cis/1.1/DomainSetType> .
<http://www.opengis.net/cis/1.1/examples/CIS_DS_GG_05_2D>
  <http://www.opengis.net/cis/1.1/axis>
  <http://www.opengis.net/cis/1.1/examples/CIS_DS_GG_I_05_2D> .
<http://www.opengis.net/cis/1.1/examples/CIS_DS_GG_05_2D>
  <http://www.opengis.net/cis/1.1/axis>
  <http://www.opengis.net/cis/1.1/examples/CIS_DS_GG_J_05_2D> .
<http://www.opengis.net/cis/1.1/examples/CIS_DS_GG_05_2D>
  <http://www.opengis.net/cis/1.1/axisLabels>
  <http://www.opengis.net/cis/1.1/axisLabels0> .
<http://www.opengis.net/cis/1.1/axisLabels0> <http://www.w3.org/1999/02/22-rdf-syntax-ns#first> "i" .
<http://www.opengis.net/cis/1.1/axisLabels0> <http://www.w3.org/1999/02/22-rdf-syntax-ns#rest> <http://www.opengis.net/cis/1.1/axisLabels1> .
<http://www.opengis.net/cis/1.1/axisLabels1> <http://www.w3.org/1999/02/22-rdf-syntax-ns#first> "j" .
<http://www.opengis.net/cis/1.1/axisLabels1> <http://www.w3.org/1999/02/22-rdf-syntax-ns#rest> <http://www.w3.org/1999/02/22-rdf-syntax-ns#first> "k" .
  
```



schemas.opengis.net/cis

Metadata

- Burnt into coverage: Technical metadata (required for understanding):

- Domain set: *where are the data?*
- Range type: *what do these data mean?*

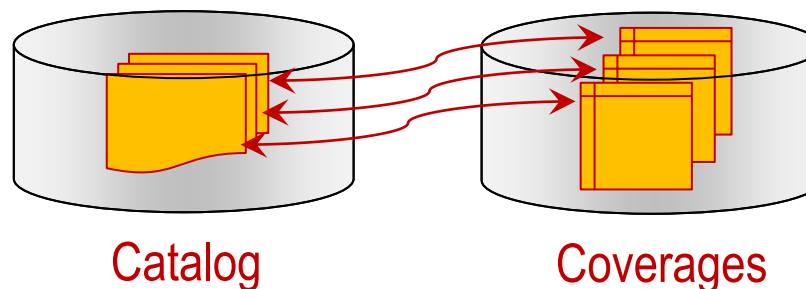
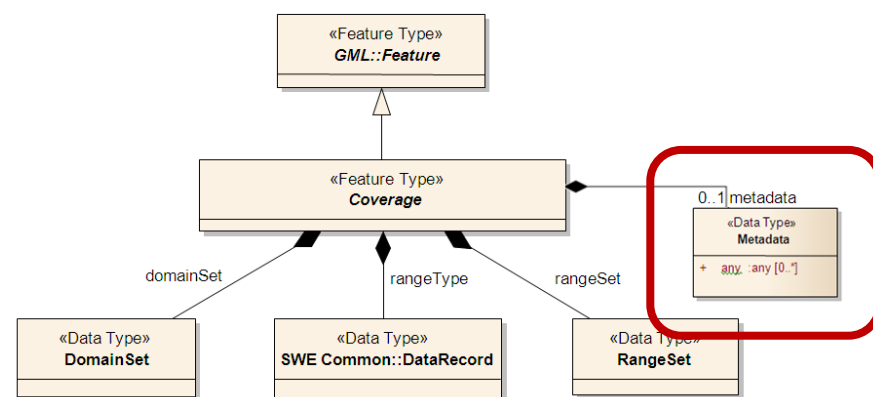
- Optional: any additional metadata

- Ex: INSPIRE metadata

- Cf. <https://inspire.rasdaman.org>

- Options:

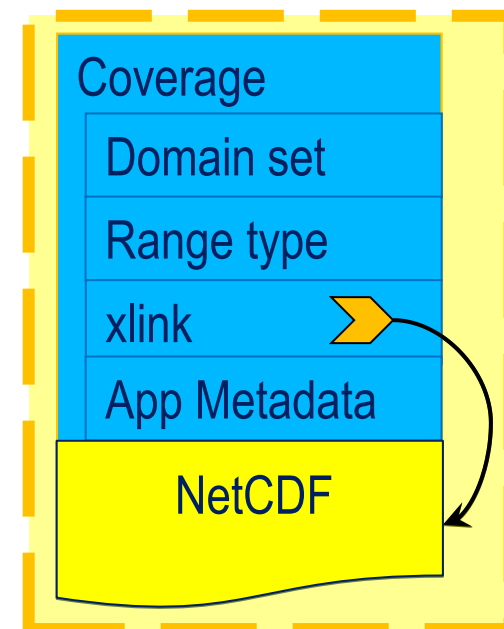
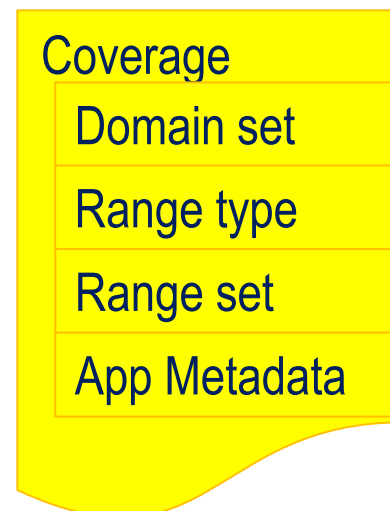
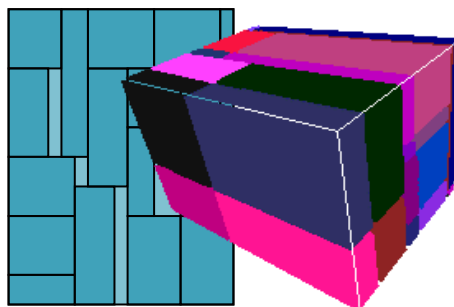
- within coverage
- reference to catalog



Encoding Coverages

- **Single file** encoding:
 - Informationally complete: GML, JSON, RDF, ...
 - *Caveat: GeoJSON, CovJSON does **not** work*
 - Further formats: GeoTIFF, NetCDF, JPEG2000, GRIB, ...

- **Multipart**: container("header" + file1 + file2 + ...)
 - Multipart/MIME, zip, GMLJP2, SAFE, GeoPackage, ...
 - Built-in collections / tiling



Summary

datacubes

- **Coverage** = regular & irregular **grids**, point clouds, meshes
- OGC Coverage Implementation Schema **1.1**
= compatible evolution of CIS (GMLCOV) **1.0**
 - GeneralGridCoverage: unified, simplified grids
 - Interpolation → discrete & continuous coverages
- The **accepted way to do coverages**
 - OGC CIS = ISO 19123-2; OGC AT6 = ISO 19123-1
 - OAPI-Coverages based on CIS
 - WCS, WCPS, WMS, WFS, WPS, SOS, ...
- Caveat, **incompatible**: GeoJSON, CoverageJSON
 - use CIS JSON

