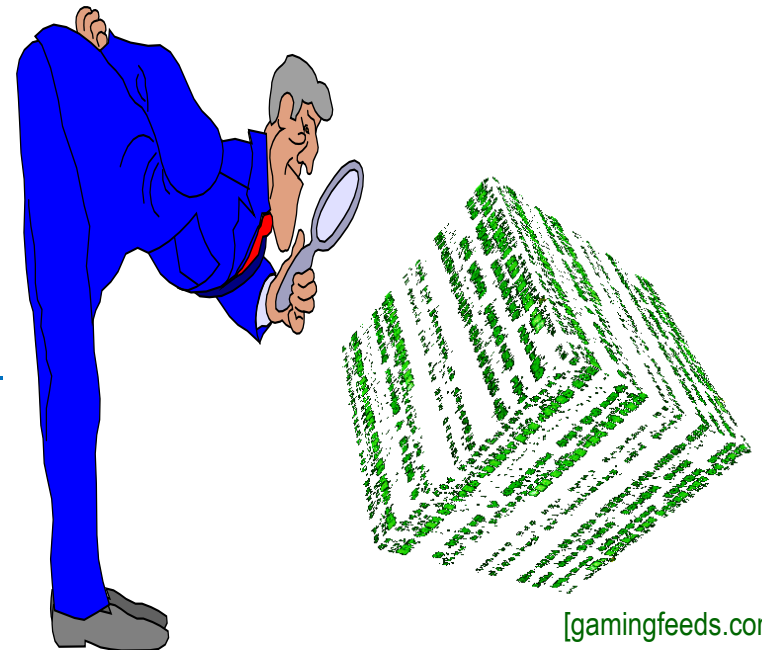


OGC Web Coverage Service (WCS)

the rasdaman team

Jacobs University | rasdaman GmbH

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

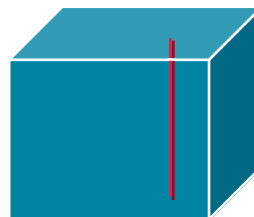
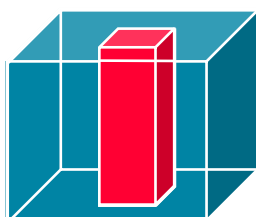
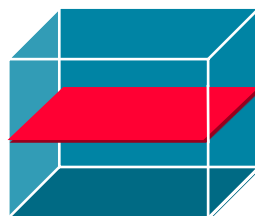


OGC Web Coverage Service (WCS)

- **WCS Core**: access to spatio-temporal coverages & subsets

- Encoding on the fly

- subset = **trim** | **slice**



- **WCS Extensions**: optional functionality facets

- *rasdaman implements WCS Core & all Extensions*

- *reference implementation*

WCS Core *GetCoverage*

- Download a coverage (or a subset thereof), values **guaranteed unchanged**

- Ex: „*download coverage c001*“

```
http://www.acme.com/wcs ? SERVICE=WCS & VERSION=2.0  
& REQUEST=GetCoverage & COVERAGEID=c001
```

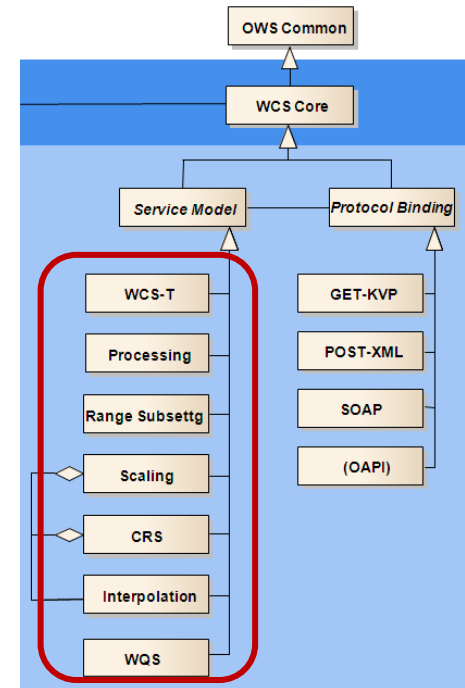
- Ex: „*coverage c001, lat/long cutout, time slice t=2009-11-06T23:20:52*“

```
http://www.acme.com/wcs ? SERVICE=WCS & VERSION=2.0  
& REQUEST=GetCoverage & COVERAGEID=c001  
& SUBSET=Long(100,120) & SUBSET=Lat(50,60)  
& SUBSET=time("2009-11-06T23:20:52")
```



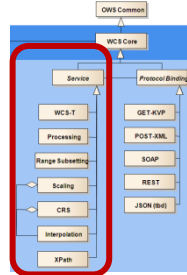
- Ex: “*coverage c001, in GeoTIFF*”

```
http://www.acme.com/wcs ? SERVICE=WCS & VERSION=2.0  
& REQUEST=GetCoverage & COVERAGEID=c001 & FORMAT="image/tiff"
```



WCS Extensions (selected)

WCS Range Subsetting [OGC 12-039]



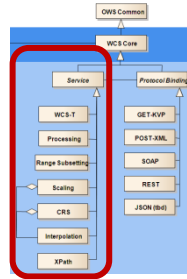
- Extract range components

- „bands“, „variables“

- Request: `http://www.acme.com/wcs ? SERVICE=WCS & VERSION=2.0 & REQUEST=GetCoverage & COVERAGEID=c001 & RANGESUBSET=red`

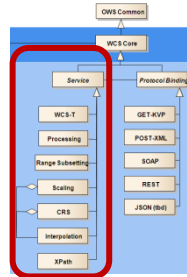
- or: `...& RANGESUBSET=nir,red,green &...`
- or: `...& RANGESUBSET=green,red,blue &...`
- or: `...& RANGESUBSET=nir:green &...`
- or: `...& RANGESUBSET=band01,band03:band05,band19:band21 &...`

WCS CRS [OGC 11-053]



- Express coordinates in CRSs different from Native CRS
 - Result coverage
 - Subsetting coordinates
- Request: `http://www.acme.com/wcs ? SERVICE=WCS & VERSION=2.0 & REQUEST=GetCoverage & COVERAGEID=c001 & SUBSETTINGCRS=http://www.opengis.net/def/crs/EPSG/0/4326 & OUTPUTCRS=http://www.opengis.net/def/crs/EPSG/0/4326`
- CRS definitions as URLs → OGC resolver
 - EPSG + many more CRSs
- CRSs supported → Capabilities document

WCS Transaction [OGC 13-057]



= **WCS-T**: Modify coverage offerings on a server via Web

- New request types:

InsertCoverage + *DeleteCoverage* + *UpdateCoverage* (incl. partial replacement)

■ Core design goal: *GetCoverage* → *InsertCoverage*

■ Ex: <http://www.acme.com/wcs>
? SERVICE=WCS & VERSION = 2.0
& **REQUEST=InsertCoverage**
& **COVERAGEREF=http://bcme.com/archive/hurricane.nc**
& **USEID=new**

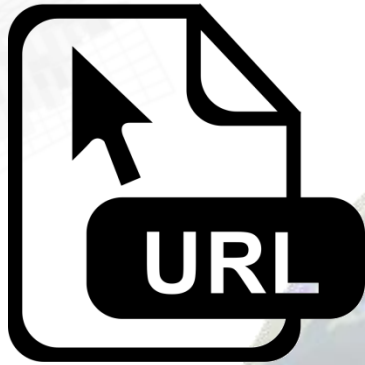
WCS Processing Extension (WCPS)

- **Web Coverage Processing Service (WCPS) [08-068r2]**
 - = spatio-temporal datacube analytics language,
regular & irregular grids



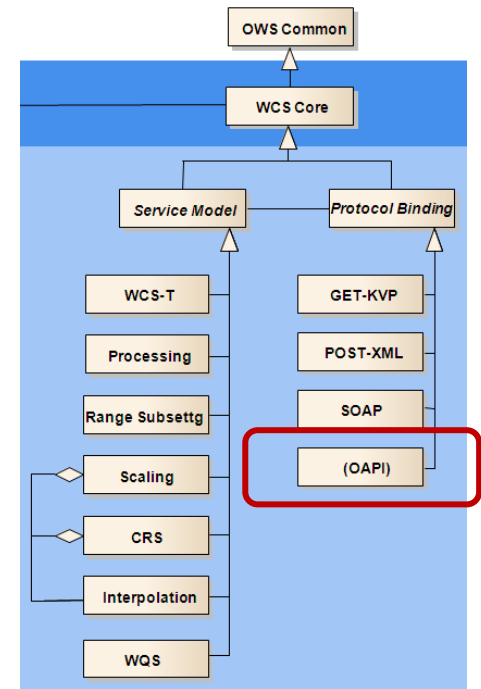
- "From MODIS scenes M1, M2, M3: **difference red & nir**, as TIFF"
 - "...but only those where nir exceeds 127 somewhere"

```
for $c in ( M1, M2, M3 )  
where some( $c.nir > 127 )  
return encode( $c.red - $c.nir, "image/tiff" )
```

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OAPI-Coverages



OAPI - Coverages

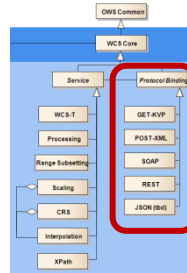
- OAPI = Recent OGC activity towards unified W*S interfaces
 - Start: „improve OWS Common“, later: „go REST“
 - Catalog, WFS, WCS, WMS, WMTS, WPS → OAPI-Common, -Features, -Coverages,
- OAPI-Coverages: based on CIS 1.1
 - https://github.com/opengeospatial/ogc_api_coverages
- Issues:
 - No clear definitions - only through examples and loose text
 - OAPI driven by Features group, results not always useable for coverages
 - *Subsetting, CRS, ...*
 - Currently small subset of WCS
 - Main goal: simple servers, in places complex, less efficient clients
- Under active discussion
 - work in progress, 200+ open issues, „some users might prefer sth else than OAPI“

OAPI – Coverages: Overview

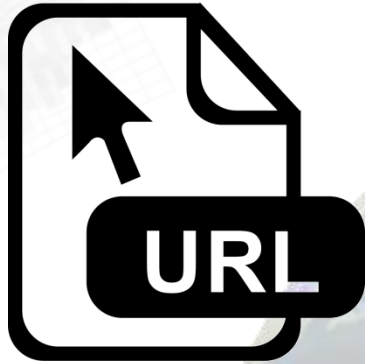
- <http://acme.com/oapi/collections/{collectionid}/coverage> - coverage = GetCov
- <http://acme.com/oapi/collections/{collectionid}/coverage/all> - coverage = GetCov
- <http://acme.com/oapi/collections/{collectionid}/coverage/domainset> - domain set
- <http://acme.com/oapi/collections/{collectionid}/coverage/rangetype> - range type
- <http://acme.com/oapi/collections/{collectionid}/coverage/metadata> - coverage metadata
- <http://acme.com/oapi/collections/{collectionid}/coverage/rangeset> - range set (no coords etc!)
- <http://acme.com/oapi/collections/{collectionid}/coverage/description> - coverage description

*under work,
~~may~~ will change*

OAPI – Coverages: Subsetting



- OAPI-Common style, from OAPI-Features:
 - `http://acme.com/oapi/collections/{collectionid}/coverages?bbox=160.6,-55.95,-170,-25.89`
- OAPI-Coverages style (cf WCS GetCoverage):
 - `http://acme.com/oapi/collections/{collectionid}/coverages/{coverageid}?SUBSET=time("2019-03-27")`
 - *coverage slice @ timestamp*
 - `http://acme.com/oapi/collections/{collectionid}/coverages?SUBSET=Lat(160.6,-55.95) & SUBSET=Lon(-170,-25.89) &SUBSET=time("2019-03-27")`
 - `http://acme.com/oapi/collections?q=for $c in (Landsat8) return encode($c.red - $c.nir, "image/tiff")`



<http://oapi.rasdaman.org/rasdaman/collections>

Summary

- OGC WCS **Core**
 - Coverage subsetting, formatting
- OGC WCS **Extensions**
 - Various bespoke functionality
- OGC **WCPS**
 - Spatio-temporal datacube analytics language
- pixel-level conformance tests for interoperability
- robust, scalable, mature
 - proven on multi-Petabytes in EarthServer

