

Standard Query Language for VO

-- Unification of ADQL and SIAP --

!! This is still under preparation !!
contents will change without notice

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In the last IVOA meeting @ Cambridge ...

I have shown that Image query can be described with SQL syntax by introducing virtual column concept.

SIAP Parameters

POS
[mandatory]

SIZE
[mandatory]

FORMAT
[mandatory]

Virtual Columns [option]

Pos	Size	Format	ImageURL
(23,+30)	1.0	fits	http://jvo.nao.ac.jp/Image?id=124214
(23,+23)	0.3	jpeg	http://jvo.nao.ac.jp/Image?id=124215
...

SIAP query by HTTP/Get parameter request

```
http://jvo.nao.ac.jp/Image?  
Pos=34.3,-5.11&Size=0.01&Format=VOTable
```

SIAP parameters and returned metadata are taken as columns of the virtual table.

```
Select imageURL  
From naoj:image  
Where Pos = Point(23,+30)  
and Size = 1.0 and  
Format = 'fits'
```

"Pos" and "Size" columns have infinite number of value, so this table is a virtual table.

Output of Image Query

- According to the current SIAP specification, the following metadata must be included in the output VOTable.

ImageTitle, Coordinate, NAXES, NAXIS, ImageScale, ImageFormat, ImageAccessRef.

- With the SQL specification, however, to get those metadata we must explicitly specify them in the "Select" list.
- I propose not to specify the content of output metadata instead specify that
"Virtual image table must have columns related to ImageTitle, Coordinate,"

Mandatory and Optional Column

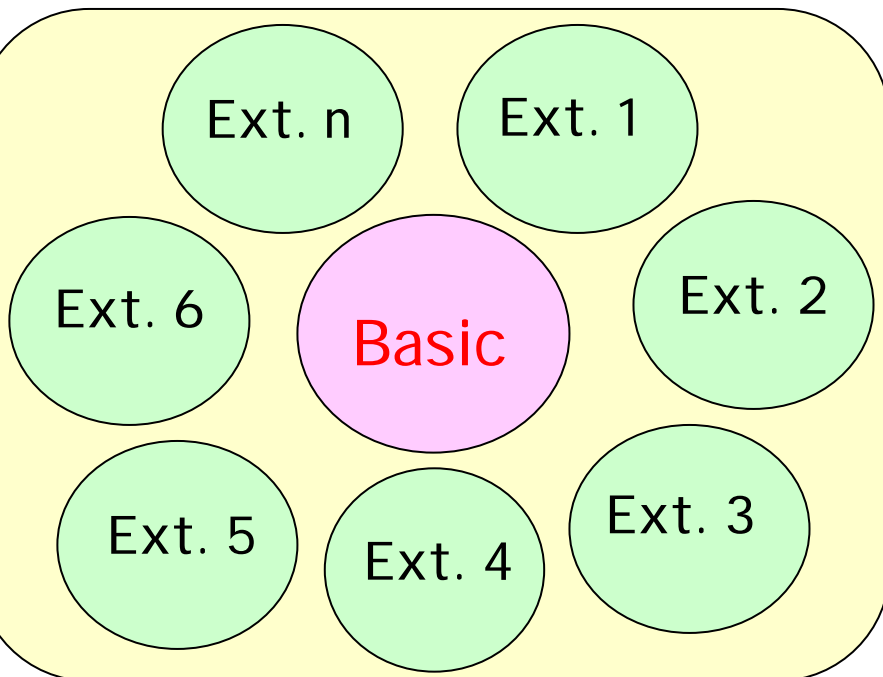
Define "Required", "Recommended" and "Optional" column. This is just an example.

ColumnName	UCD (TBD)	Catalog	Image	Comment
Pos	VOX:POS_EQ	Req	Req	Center coordinate of the search region in RA DEC frame. (degree)
DeltaRa	VOX:POS_EQ_DELTA_RA	Req	Req	Box size of the search region in RA coordinate. (degree)
DeltaDec	VOX:POS_EQ_DELTA_DEC	Req	Req	Box size of the search region in Dec coordinate. (degree)
Radius	VOX:POS_RADIUS	Rec	Rec	Radius of the search region. (degree)
DataFormat	VOX:DATA_FORMAT	X	Req	Data format of the observational data. (e.g. FITS, JPEG, HTML...)
OutputFormat	VOX:OUTPUT_FORMAT	Req	Req	Data format of the search result. (VOTable, CSV, HTML, ...)
Region	VOX:POS_REGION	Rec	Rec	Region of Interest in Sky
SpectrumRange	VOX:SPECTRUM_RANGE	Opt	Opt	Region of Interest in Spectrum
TemporalRange	VOX:TEMPORAL_RANGE	Opt	Opt	Region of Interest in Time

Proposal of Scalable Syntax Specification

- VOQL should have **scalable** syntax:
 - Small size DBs → very simple syntax for easy implementation.
 - Large size DBs → sophisticated syntax for efficient data search.
 - We propose to define **syntax packages** according to the functionality.

hybrid syntax structure



“Basic” package **must** be implemented by all the VO data service.

Any “Extension-n” package **may** be implemented by each VO data service.

Registry will have information which extensions are implemented at each data service, or data service itself returns the information by “voqlSpec” interface.

Basic Specification

```
Select  ColumnName [[AS] AliasName] , ... | *  
From    TableName [[AS] AliasName]  
Where   Condition [AND Condition]
```

- Only column name or "*" is specified in the selection list.
- Don't support an algebraic expression.
- Only one table is specified at "From" part.
- Table name and Column name can have alias name.
- Comparison operators: =, <, >, >=, <=, <>, LIKE, BETWEEN
- Logical operator: AND, NOT (OR is not in basic spec.)
- Region Comparison operator: =, within, contains, overlaps
- Functions: Distance(), Point(), Circle(), Box()

Column Type

A table consists of $n > 0$ columns.

A column is classified into three types:

- Ordinary Column: column of the relation table
- Parameter Column: constant value of the table
- Virtual Column: continuous value of the table

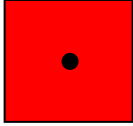
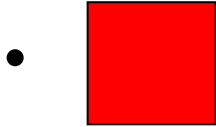
```
Select limitingMagnitude  
From galaxy
```

```
Select imageURL  
From image  
Where region =  
Box((29 +10) 1 0 1 0)
```

Region Comparison Operator

[NOT] <SpacePoint> <RegionCompOper> <SpaceRegion>

[NOT] <SpaceRegion> <RegionCompOper> <SpacePoint>

Region Comparison	Meaning	Figure
A within B	Point A is within Region B.	
B contains A	Region B contains Point A.	
NOT A within B	Point A is outside Region B.	
NOT B contains A	Region B excludes Point A.	

<SpacePoint> ::= [Point](x, y , ['frame'])

e.g. Point(13.2,-34.5), Point(32.1, -12.5, 'I CRS'), (34.7, -26, 'Gala')

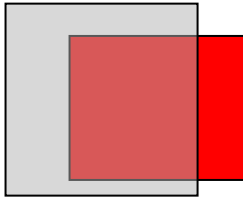
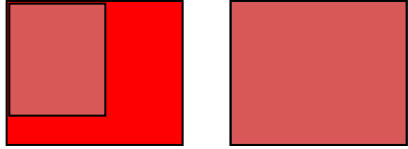
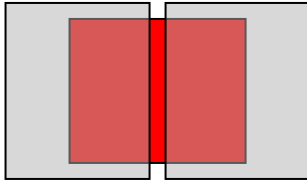
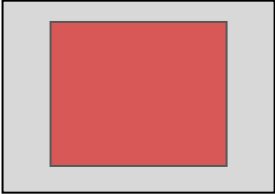

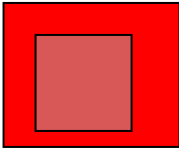
<SpaceRegion> ::= [Circle](<SpacePoint>, radius)

| [Box](<SpacePoint>, xsize, ysize)

e.g. Circle((23.7,-0.3), 2.3), Box((58.3,+1.2), 3.3, 3.3)

Region Comparison

[NOT] <SpaceRegion> <RegionCompOper> <SpaceRegion>

Region Comparison	Meaning	Image Atlas Data Service	Image Cutout Service
A = B	Region A is the smallest region which overlaps the largest part of B.		
A overlaps B	Region A is the smallest region which overlaps B.		Same as A = B
A contains B	Region A is the smallest region which contains B.		
A within B	Region A is the largest region which is contained in B.		Same as A = B

Extension Packages of VOQL

- Ext.1 An algebraic expression at "Select" and "Where" part.
- Ext.2 Multiple table specification at "From" part.
- Ext.3 Join predicate at "From" part.
- Ext.4 Logical operator "OR".
- Ext.5 UCD
- Ext.6 Unit
- Ext.7 Data type ?
- Ext.8 Cross match with an external table
- Ext.9 Use of Identifier for Table name (Portal)
- Ext.10 Omission of From part (Portal)

Use of Identifier for Table Name

`<TableName> ::=`
`[AuthorityName:][CatalogDataPath.]TableName`

e.g. `naoj:subaru.spcam.galaxy`, `jhu:sdss.qso`

Cross match with an external table

Example for basic spec. VOQL

Select catalog data for the specified region.

```
Select  ra, dec, mag_r
From    galaxy
Where   Point(ra, dec) within Circle((24.3, +5.0), 2.0))
        and mag_r < 24
```

can be omitted if it is trivial

Select image of the specified region and the corresponding filter name.

```
Select  filter, imageURL
From    imageData
Where   region = Box((24.3, +5.0), 0.2))
```

"Pos = Point(24.2,5.0) and DeltaRa = 0.2 and DeltaDec = 0.2" is also valid

c.f. <http://jvo.nao.ac.jp/imageData?POS=24.2,5.0&SIZE=0.2>

Example for

Image query using external VOTable file.

```
Select  cat.ra, cat.dec, img.filter, img.ImageURL
```

```
From    galaxyCatalog cat, imageTable img
```

```
Where  img.region = Circle((cat.ra, cat.dec), 30 [arcsec])
```

```
        and Point(cat.ra, cat.dec) within Circle(234, +10, 30 [arcmin])
```

Image query using external VOTable file.

```
Select  img.filter, img.ImageURL
```

```
From    ext1:galaxyCatalog cat, imageTable img
```

```
Where  img.region = Circle(cat.ra, cat.dec)
```

↑
"galaxyCatalog" table in an external file
(VOTable)