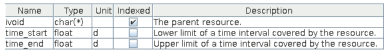
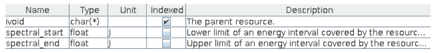
Fig. 1



Name	Type	Unit	Indexed	Description
ivoid	char(*)		✓	The parent resource.
time_start	float	d	☐	Lower limit of a time interval covered by the resource.
time_end	float	d	☐	Upper limit of a time interval covered by the resource.

Fig. 2



Name	Type	Unit	Indexed	Description
ivoid	char(*)		✓	The parent resource.
spectral_start	float	J	☐	Lower limit of an energy interval covered by the resourc...
spectral_end	float	J	☐	Upper limit of an energy interval covered by the resourc...

Fig. 3

1. RegTAP after VODataService 1.2

Markus Demleitner
msdemlei@ari.uni-heidelberg.de

VODataService 1.2 defines `<coverage>`.

To make it useful, it needs to be reflected in RegTAP.

Proposal: `stc_temporal`, `stc_spectral`, `stc_spatial`.

(cf. Fig. 1)

2. Simple Intervals

Time and spectrum would be in two tables (from TOPCAT on http://dc.g-vo.org/tap):

(cf. Fig. 2)

– i.e., 0 or more rows of MJD limits per resource.

(cf. Fig. 3)

– i.e., 0 or more rows of energy limits in J per resource.

3. A UDF to Match Intervals

I keep forgetting the right signs to check for the overlap of intervals ("Resources covering data from ... to ...").

Let's have a UDF helping out there:

```
ivo_interval_overlaps(l1 NUMERIC, h1 NUMERIC, l2 NUMERIC, h2 NUMERIC)
   -> INTEGER

The function returns 1 if the interval [l1...h1] overlaps with the
interval [l2...h2]. For the purposes of this function, the case l1=h2 or
l2=h1 is treated as overlap. The function returns 0 for non-overlapping
intervals.
```

Alternative: We *could* define a proper INTERVAL type as envisioned by ADQL.

4. Joules are Painful

Having the spectral limits in energy is painful for everyone redward of X-ray, having them in Joules is painful for all.

Make writing queries against spectral nice using something like the prototype UDFs:

```
gavo_specconv(expr NUMERIC, expr_unit TEXT dest_unit TEXT) -> NUMERIC
gavo_specconv(expr DOUBLE PRECISION, dest_unit TEXT) -> DOUBLE PRECISION
```

For instance ("daerg" is of course not meant seriously):

```
SELECT gavo_specconv(
  (spectral_start+spectral_end)/2, 'daerg')
  AS energy
FROM rr.stc_spectral
WHERE gavo_specconv(2000, 'Angstrom', 'J')
  BETWEEN spectral_start AND spectral_end
```

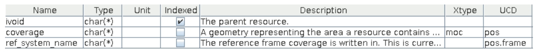
More on this: https://blog.g-vo.org/spectral-units-in-adql/

To make things feasible when people do not have a full implementation of VOUnits, I suppose we should only require spectral units of m, nm, Angstrom, MHz, keV, and MeV – plus anything in the tables the service serves.

5. Mandatory UDFs?

We should probably require the interval comparison (which is simple) and the specconv (which is hard) UDFs for RegTAP-STC services.

We're already requiring `ivo_string_agg`, `ivo_nocasematch`, `ivo_hasword`, and `ivo_hashlist_has` in RegTAP – but specconv of course requires unit calculus to some extent...



Name	Type	Unit	Indexed	Description	Xtype	UCD
ivoid	char(*)		✓	The parent resource.		
coverage	char(*)		☐	A geometry representing the area a resource contains ...	moc	pos
ref_system_name	char(*)		☐	The reference frame coverage is written in. This is curre...		pos.frame

Fig. 4

6. Spatial Coverage

VODataService 1.2 expresses coverage in MOCs. I *think* we have to require them in the table `rr.stc_spatial`:

(cf. Fig. 4)

That's a bit of an implementation hurdle. Should

```
...WHERE 1=INTERSECTS(coverage, CIRCLE(30, 20, 1))
```

work? Or even:

```
SELECT SUM(coverage) FROM stc_spatial
WHERE ivoid LIKE 'ivo://myauthority/%'
```

pgsphere can do that – but perhaps restrict legal operations for ease of implementation?

7. Oh: Frames

VODataService 1.2 defaults to ICRS MOCs, and MOC 1 restricts itself to ICRS.

Hence, `ref_system_name` currently is always NULL, and clients should always add a

```
WHERE ref_system_name IS NULL
```

Make this more explicit and have "no frame" map to `'ICRS'` in RegTAP?

8. Closing Question

This *has* a few hard parts (specconv, in-DB MOC).

To lower the barrier for RegTAP implementors, the STC extension could be made optional.

On the other hand, we have 3 RegTAP operators, and it's not terribly likely we'll grow many more. And for clients, having guaranteed STC is a nice thing.
Opinions? Thanks!