TAP Implementations by VOParis

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Context and Goals

Context

- Baltimore (oct 08): we presented 3 TAP services as prototypes =
  - exoplanet
  - two atmospheric profiles on Titan (Cassini) and Mars (Phobos)
- Name resolver proved compulsory for planetary topics where cone search was not available

Goals

- Provide TAP services for other topics
- Europlanet demonstrator compliant with IVOA
- Test bench for TAP strengths and weaknesses

Europlanet

- **Paris Data Center participates actively to Europlanet VO projects**
  - IDIS = Integrated and Distributed Information Service (in one node)
  - JRA4 = « from IDIS to VO » (involved)
- **Participation to Definition of interoperability standards**
  - (JRA4-Task2) lead by CDPP
- **Within VO-Paris node, we aim for a demonstrator using IVOA standards, protocols, and applets**
  - http://voparis-srv.obspm.fr/portal/
  - http://voparis-europlanet.obspm.fr

TAP - examples

- **We've built a new TAP service on the cometary database from the Nançay Radio-Telescope**
  - www.lesia.obspm.fr/planeto/cometes/basecom/
  - => vodev.obspm.fr/~mhirtzig/

Crovisier Cometary Database Service at ObsPM

TARGETNAME:	halley	Name of the target object
TIME:		If a single value is specified it matches any spectrum for which the time coverage includes the specified value. If a range is specified it matches any spectrum which contains any data in the specified range. Dates are expected in ISO 8601 UTC format. E.g. 1998-05-21/1999-01-01 will search for all spectra taken in the time period starting 21st May, 1998 and ending Jan 1st, 1999 inclusive.
STATUS:	any	Processing state of the data."Cleaned" stands for individual data acquired at various wavelength and polarisations [status code 1]."Set average" corresponds to the average spectrum of all data acquired in the same day (overwrites any INPUT:BAND or INPUT:POLARISATION keyword) [status code 2]."Final" correspond to the average of several sets of data [status code 3]."Any" does not force any choice.
BAND:		Spectral coverage: The wavelength can be given in meters or as a range
POLARISATION:	any	Polarisation of the filter
GEODISTANCE:		Geocentric distance of the target. Ranges can be given with the '/' separator.
HELIODISTANCE:		Heliocentric distance of the target. Ranges can be given with the '/' separator.
HELIORADIALVELOCITY:		Heliocentric radial velocity of the target. Ranges can be given with the '/' separator.
RA_OFFSET:		Offset in right ascension from the target. Ranges can be given with the '/' separator.
DEC_OFFSET:		Offset in declination from the target. Ranges can be given with the '/' separator.
MTIME:		Time when new or updated data are uploaded. You can specify a time range in ISO 8601 UTC format. E.g. 2007-08-21/ will search for all spectra uploaded since August 21st, 2007.
FORMAT:	VOTABLE	Format of the ouput : as a HTML webpage or as a VOTABLE.
VERSION:	1.02	SSA protocol versions supported by this service

Query

TAP - examples

One simple user-friendly query result


```
<VOTABLE version="1.1" xsi:noNamespaceschemaLocation="xmlns=http://www.ivoa.net/xml/VOTable/v1.1">
  <COOSYS equinox="J2000" system="eq_FK5"/>
  <INFO name="QUERY_STATUS" value="OK"/>
  <DESCRIPTION name="DESCRIPTION" value="The Crovisier Cometary Database"/>
- <RESOURCE name="comets">
  - <TABLE>
    - <FIELD ID="nameC" name="Comet_Name" ucd="meta.id" datatype="char" unit="--">
        <DESCRIPTION>New-style designation of comet</DESCRIPTION>
      </FIELD>
    - <FIELD ID="Tepoch" name="Observation_Date" ucd="time.epoch" datatype="char" unit="UT">
        <DESCRIPTION>observation date/time (YYMMDD.dd; dd=day fraction)</DESCRIPTION>
      </FIELD>
    - <FIELD ID="Tstart" name="Start_Date" ucd="time.start" datatype="char" unit="UT">
        <DESCRIPTION> Start date of long-term averaged data (status #3)</DESCRIPTION>
      </FIELD>
    - <FIELD ID="Tend" name="End_Date" ucd="time.end." datatype="char" unit="UT">
        <DESCRIPTION> End date of long-term averaged data (status #3)</DESCRIPTION>
      </FIELD>
    - <FIELD ID="dGeo" name="Geo_Distance" ucd="pos.distance;pos.geocentric" datatype="double" unit="AU">
        <DESCRIPTION>geocentric distance</DESCRIPTION>
      </FIELD>
    - <FIELD ID="dSun" name="Sun_Distance" ucd="pos.distance;pos.heliocentric" datatype="double" unit="AU">
        <DESCRIPTION>heliocentric distance</DESCRIPTION>
      </FIELD>
    - <FIELD ID="inv1" name="Maser_Inversion1" ucd="arith" datatype="double" unit="--">
      - <DESCRIPTION>
          theoretical inversion of the OH maser according to Despois et al 1981; inv=(Pu-Pl)/(Pu+Pl) where Pu=population state up, Pl=population state low, for the corresponding transition (here the doublet of the lower rotational level)
        </DESCRIPTION>
      </FIELD>
    - <FIELD ID="Q1OH" name="OH_Prod_Rate1" ucd="arith.rate;phys.mass.loss" datatype="double" unit="10**28 s-1">
      - <DESCRIPTION>
          OH production rate (number of OH molecules created per second) or 3sigma upper limit if SNR worse than 3, using the Haser-equivalent model with Quenching and the Despois81 maser inversion; null if algorithm did not converge
        </DESCRIPTION>
      </FIELD>
    - <FIELD ID="inv2" name="Maser_Inversion2" ucd="arith" datatype="double" unit="--">
      - <DESCRIPTION>
          theoretical inversion of the OH maser according to Schleicher & A Hearn 1988
        </DESCRIPTION>
      </FIELD>
    - <FIELD ID="Q2OH" name="OH_Prod_Rate2" ucd="arith.rate;phys.mass.loss" datatype="double" unit="10**28 s-1">
      - <DESCRIPTION>
          OH production rate (or 3sigma upper limit if SNR worse than 3) using the 1986A model in Crovisier02
        </DESCRIPTION>
      </FIELD>
    - <FIELD ID="status" name="Status" ucd="meta.code.status" datatype="int" unit="--">
      - <DESCRIPTION>
          Status: 0=off-target, 1=initial data, 2=average data of all the sets in the run (2-4 wavelengths, 2 polarisations), 3=average of all data within a given time period (as in Crovisier et al 2002)
        </DESCRIPTION>
      </FIELD>
    - <FIELD ID="pola" name="Polarisation" ucd="phys.polarization.circular" datatype="char" unit="--">
```

TAP - examples

One simple user-friendly query result

VO-Paris - Crovisier Cometary Database

Comet_Name	Observation_Date	Start_Date	End_Date	Geo_Distance	Sun_Distance	Maser_Inversion1	OH_Prod_Rate1	Maser_Inversion2	OH_Prod_Rate2	Status	Polarisation	Frequency	Figure_Reference
--	UT	UT	UT	AU	AU	--	10**28 s-1	--	10**28 s-1	--	--	Hz	--
1P/1982 U1 Halley	1985-01-26 20:52:48			4.32	5.04	0.35	12.6	0.29	14.5	2			A11.e
1P/1982 U1 Halley	1985-01-27 20:38:23			4.33	5.03	0.35	9	0.29	11.9	2			A11.e
1P/1982 U1 Halley	1985-01-28 20:38:23			4.33	5.02	0.35	10.2	0.29	11.8	2			A11.e
1P/1982 U1 Halley	1985-01-29 20:38:23			4.34	5.01	0.35	10	0.29	13	2			A11.e
1P/1982 U1 Halley	1985-01-30 20:24:00			4.34	5	0.35	12.4	0.29	14.4	2			A11.e
1P/1982 U1 Halley	1985-01-31 20:24:00			4.35	4.99	0.35	12.5	0.29	14.4	2			A11.e
1P/1982 U1 Halley	1985-02-01 20:24:00			4.35	4.98	0.36	10.4	0.3	12.8	2			A11.f
1P/1982 U1 Halley	1985-02-11 19:26:24			4.41	4.89	0.36	12.6	0.31	14.5	2			A11.f
1P/1982 U1 Halley	1985-02-12 19:26:24			4.42	4.88	0.36	8.6	0.31	9.9	2			A11.f
1P/1982 U1 Halley	1985-02-13 19:26:24			4.42	4.87	0.36	10.6	0.31	12.2	2			A11.f
1P/1982 U1 Halley	1985-02-16 19:12:00			4.45	4.84	0.37	9.9	0.32	11.4	2			A11.f
1P/1982 U1 Halley	1985-02-17 18:57:36			4.45	4.83	0.37	9	0.32	10.3	2			A11.f
1P/1982 U1 Halley	1985-02-18 18:57:36			4.46	4.82	0.37	10	0.32	11.1	2			A11.g
1P/1982 U1 Halley	1985-02-22 18:43:11			4.49	4.79	0.37	8.8	0.32	10.2	2			A11.g
1P/1982 U1 Halley	1985-02-23 18:43:11			4.5	4.78	0.37	10.2	0.33	11.8	2			A11.g
1P/1982 U1 Halley	1985-02-24 18:28:47			4.51	4.77	0.37	8.9	0.33	10.3	2			A11.g
1P/1982 U1 Halley	1985-02-25 18:28:47			4.52	4.76	0.37	11.1	0.33	11.5	2			A11.g
1P/1982 U1 Halley	1985-02-26 18:28:47			4.53	4.75	0.37	9.9	0.33	11.4	2			A11.g
1P/1982 U1 Halley	1985-02-27 18:14:23			4.54	4.74	0.37	12	0.33	13.9	2			A11.h
1P/1982 U1 Halley	1985-02-28 18:14:23			4.54	4.73	0.37	9.7	0.33	11.2	2			A11.h
1P/1982 U1 Halley	1985-03-02 18:14:23			4.56	4.71	0.38	9.4	0.34	10.9	2			A11.h
1P/1982 U1 Halley	1985-03-03 18:00:00			4.57	4.7	0.38	21.3	0.34	20.6	2			A11.h
1P/1982 U1 Halley	1985-03-31 16:04:47			4.79	4.42	0.4	7.6	0.38	9.1	2			A11.h
1P/1982 U1 Halley	1985-04-01 16:04:47			4.79	4.41	0.4	16.2	0.38	19.9	2			A11.h
1P/1982 U1 Halley	1985-04-02 16:04:47			4.8	4.4	0.4	10	0.38	11.5	2			A11.i
1P/1982 U1 Halley	1985-04-03 15:50:24			4.8	4.39	0.4	9	0.39	10.3	2			A11.i
1P/1982 U1 Halley	1985-04-04 15:50:24			4.81	4.38	0.4	9.9	0.39	11.4	2			A11.i
1P/1982 U1 Halley	1985-04-05 15:50:24			4.81	4.37	0.4	9.5	0.39	11.1	2			A11.i
1P/1982 U1 Halley	1985-04-09 15:35:59			4.84	4.33	0.41	9.6	0.4	11	2			A11.i
1P/1982 U1 Halley	1985-04-10 15:35:59			4.84	4.32	0.41	7.7	0.4	8.8	2			A11.i
1P/1982 U1 Halley	1985-04-11 15:21:35			4.85	4.31	0.41	8.7	0.4	11.1	2			A11.j
1P/1982 U1 Halley	1985-04-12 15:21:35			4.85	4.3	0.41	9.7	0.4	11.2	2			A11.j
1P/1982 U1 Halley	1985-04-13 15:21:35			4.85	4.29	0.41	9.2	0.4	10.5	2			A11.j
1P/1982 U1 Halley	1985-04-14 15:21:35			4.86	4.28	0.41	7.1	0.41	8.8	2			A11.j
1P/1982 U1 Halley	1985-04-15 15:07:11			4.86	4.27	0.41	9.2	0.41	10.5	2			A11.j
1P/1982 U1 Halley	1985-06-01 12:28:47			4.78	3.78	0.46	10.2	0.48	11.6	2			A11.j
1P/1982 U1 Halley	1985-06-03 12:14:23			4.76	3.76	0.46	8.8	0.48	10	2			A11.k
1P/1982 U1 Halley	1985-06-04 12:14:23			4.75	3.75	0.46	12	0.48	13.7	2			A11.k
1P/1982 U1 Halley	1985-06-05 12:14:23			4.74	3.74	0.46	8.4	0.48	8.9	2			A11.k
1P/1982 U1 Halley	1985-06-06 12:14:23			4.73	3.73	0.46	10	0.48	11.4	2			A11.k
1P/1982 U1 Halley	1985-06-07 12:14:23			4.72	3.72	0.47	9.6	0.49	10.9	2			A11.k
1P/1982 U1 Halley	1985-06-08 12:00:00			4.71	3.71	0.47	8.2	0.49	9.3	2			A11.k
1P/1982 U1 Halley	1985-06-09 12:00:00			4.7	3.7	0.47	11.1	0.49	11.7	2			A11.l

TAP - examples

But! with a « SELECT all » query :


```
<vot:VOTABLE version="1.1" xsi:schemaLocation="http://www.ivoa.net/xml/VOTable http://www.ivoa.net/xml/VOTable/VOTable-1.1.xsd">
  <vot:COOSYS equinox="J2000" system="eq_FK5"/>
  <vot:INFO name="QUERY_STATUS" value="OK"/>
 − <vot:RESOURCE name="Comet" type="results">
  − <vot:TABLE>
    + <vot:FIELD ID="id" name="id" ucd="meta.id" datatype="integer" unit="--"></vot:FIELD>
    + <vot:FIELD ID="name" name="Name" ucd="meta.id" datatype="char" unit="--"></vot:FIELD>
    + <vot:FIELD ID="Tperihelion" name="Date_Perihelion" ucd="time.epoch" datatype="double" unit="UT"></vot:FIELD>
    + <vot:FIELD ID="dSun0" name="Sun_Distance_Perihelion" ucd="pos.distance;pos.heliocentric" datatype="double" unit="AU"></vot:FIELD>
    + <vot:FIELD ID="cometType" name="Comet_Type" ucd="meta.code.class" datatype="char" unit="--"></vot:FIELD>
    + <vot:FIELD ID="ObsQual" name="Observation_Quality" ucd="meta.code.qual" datatype="char" unit="--"></vot:FIELD>
    + <vot:FIELD ID="status" name="Status" ucd="meta.code.status" datatype="int" unit="--"></vot:FIELD>
    + <vot:FIELD ID="Tepoch" name="Observation_Date" ucd="time.epoch" datatype="char" unit="UT"></vot:FIELD>
    + <vot:FIELD ID="Tstart" name="Start_Date" ucd="time.start" datatype="char" unit="UT"></vot:FIELD>
    + <vot:FIELD ID="Tend" name="End_Date" ucd="time.end." datatype="char" unit="UT"></vot:FIELD>
    + <vot:FIELD ID="Jstart" name="Start_Date" ucd="time.start" datatype="double" unit="UT"></vot:FIELD>
    + <vot:FIELD ID="Jend" name="End_Date" ucd="time.end." datatype="double" unit="UT"></vot:FIELD>
    + <vot:FIELD ID="freq" name="Frequency" ucd="em.freq" datatype="double" unit="Hz"></vot:FIELD>
    + <vot:FIELD ID="pola" name="Polarisation" ucd="phys.polarization.circular" datatype="char" unit="--"></vot:FIELD>
    + <vot:FIELD ID="dGeo" name="Geo_Distance" ucd="pos.distance;pos.geocentric" datatype="double" unit="AU"></vot:FIELD>
    + <vot:FIELD ID="dSun" name="Sun_Distance" ucd="pos.distance;pos.heliocentric" datatype="double" unit="AU"></vot:FIELD>
    + <vot:FIELD ID="rdot" name="Radial_Velocity" ucd="phys.veloc.orbital;pos.heliocentric" datatype="double" unit="km/s"></vot:FIELD>
    + <vot:FIELD ID="inv1" name="Maser_Inversion1" ucd="arith" datatype="double" unit="--"></vot:FIELD>
    + <vot:FIELD ID="inv2" name="Maser_Inversion2" ucd="arith" datatype="double" unit="--"></vot:FIELD>
    + <vot:FIELD ID="Tbg" name="BackG_Temperature" ucd="instr.skyTemp" datatype="double" unit="K"></vot:FIELD>
    + <vot:FIELD ID="Area" name="Line_Area" ucd="phys.area;spect.line" datatype="double" unit="mJy km/s"></vot:FIELD>
    + <vot:FIELD ID="Aerr" name="Line_Area_err" ucd="phys.area;spect.line;stat.error" datatype="double" unit="mJy km/s"></vot:FIELD>
    + <vot:FIELD ID="Slin" name="Line_Strength" ucd="spect.line.strength" datatype="double" unit="mJy"></vot:FIELD>
    + <vot:FIELD ID="Serr" name="Line_Strength_err" ucd="spect.line.strength;stat.error" datatype="double" unit="mJy"></vot:FIELD>
    + <vot:FIELD ID="V0" name="Velocity" ucd="spect.dopplerVeloc" datatype="double" unit="km/s"></vot:FIELD>
    + <vot:FIELD ID="V0err" name="Velocity_err" ucd="spect.dopplerVeloc;stat.error" datatype="double" unit="km/s"></vot:FIELD>
    + <vot:FIELD ID="dV0" name="FWHM" ucd="spect.line.width" datatype="double" unit="km/s"></vot:FIELD>
    + <vot:FIELD ID="dV0err" name="FWHM_err" ucd="spect.line.width ;stat.error" datatype="double" unit="km/s"></vot:FIELD>
    + <vot:FIELD ID="Q1OH" name="OH_Prod_Rate1" ucd="arith.rate;phys.mass.loss" datatype="double" unit="10**28 s-1"></vot:FIELD>
    + <vot:FIELD ID="Q1err" name="OH_Prod_Rate1_err" ucd="arith.rate;phys.mass.loss;stat.error" datatype="double" unit="10**28 s-1"></vot:FIELD>
    + <vot:FIELD ID="Q2OH" name="OH_Prod_Rate2" ucd="arith.rate;phys.mass.loss" datatype="double" unit="10**28 s-1"></vot:FIELD>
    + <vot:FIELD ID="Q2err" name="OH_Prod_Rate2_err" ucd="arith.rate;phys.mass.loss;stat.error" datatype="double" unit="10**28 s-1"></vot:FIELD>
    + <vot:FIELD ID="Ref" name="Figure_Reference" ucd="meta.ref" datatype="char" unit="--"></vot:FIELD>
    + <vot:FIELD ID="RA" name="RA" ucd="pos.eq.ra" datatype="double" unit="arcmin"></vot:FIELD>
```

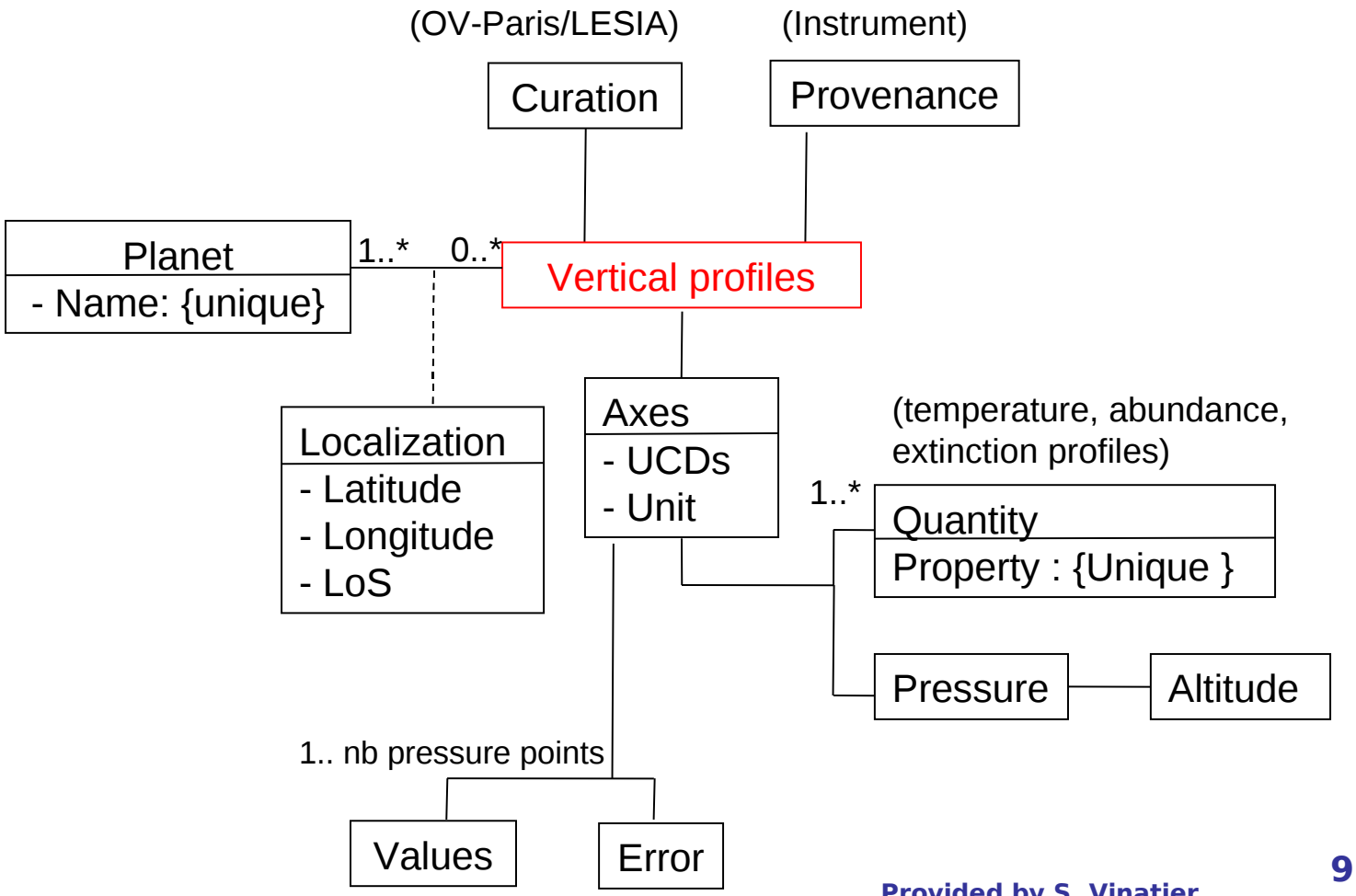
TAP - examples

- **Indeed TAP allows the user to first query for the very structure of the database**
  - Interoperability does not seem possible if the fields names are left to the discretion of the data provider
- **We feel it is important to ponder the providing of templates of data models that would correspond to the types of data considered.**
  - S. Vinatier used the IVOA Spectral Data Model to create another model for atmospheric profiles

Atmosphere Profile Data Model

Inspiration : IVOA Spectral Data Model

- One vertical profile= 2 dimensions



Provided by S. Vinatier

Conclusions

- **TAP allows the user/client to query on the structure of the database**
  - => forces the user/client to
    1. write a 1st query to retrieve the metadata
    2. understand the structure from the UCD given
    3. guess the keywords he/she needs to query
    4. THEN write a 2nd query to fetch the data
  - TAP requires some non trivial work from the user/client
- **We must simplify the queries, for instance by encouraging a wide use of data models**

Conclusions

- **We must also improve the pertinence of the results**
  - Amongst all the services available, focus the discovery of services only on the pertinent ones
  - Normalize the names to ease up the access to the data (aka Data Model)
  - Allow a 2-step query (like SIA, SSA):
    1. Ask the databases what is available and pertinent
    2. Return a VOTable with the metadata and links towards the data themselves
- **As a conclusion, TAP is very rich, but in order to facilitate the provider/user dialogue, it should be based on data models.**