LineTAP

A Proposal for a Relational Model for Spectral Lines

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LineTAP proposal

First time presented at the November 2020 Interop, restarting work after one year break

- Motivation and Goal
- Use cases
- Current state
- Some open questions
- short demo if time permits

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- What we have now:
  - VO SLAP/SSLDM, very few services, and few clients.
  - VAMDC/XSAMS, very detailed data model, very complex.

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  - VO SLAP/SSLDM, very few services, and few clients.
  - VAMDC/XSAMS, very detailed data model, very complex.
- We propose a relational data model can be used via TAP
  - TAP/ADQL is already well known, no need to learn a new protocol $\rightarrow$ existing libraries, implementations
  - parameters selected from the VAMDC data model
  - if possible, keep a simple one-table data model
  - keep only parameters that are needed by most common use-cases

Use cases

Main use case that drove the development so far:

"A user with a rough idea of the kind of physics in an emitting or absorbing region wants to identify a line in a spectrum."

Examples:

- Identifying a single line
- Getting properties of well-known lines
- Retrieving spectral lines for cross-identification
- Finding spectral lines for specific species

Current state

What has been/is being done up to now:

- Some use cases collected (more use cases are welcome!)
- Selected relevant quantities from the VAMDC data model, mapping to LineTAP
- Draft of IVOA Note being written (first working draft probably by June 2022)
- Prototype service implementation on GAVO-Dachs
- Prototype client being implemented in SPLAT-VO
- Adapting data model with experience from implementations and feedback from specialists $\rightarrow$ still need feedback!

Spectral Line quantities

Name [Unit]	Type	Description
`title`	**text**	Human-readable line designation.
`vacuum_wavelength` [Å]	**float**	Vacuum wavelength of the transition
vacuum_wavelength_error [Å]	float	Total error in vacuum_wavelength
`method`	text	Method the wavelength was obtained with
`ion_charge`	integer	Total charge (ionisation level) of the emitting particle.
`mass_number`	integer	Number of nucleons in the atom or molecule
`upper_energy` [J]	float	Energy of the upper state
`lower_energy` [J]	float	Energy of the lower state
`inchi`	**text**	International Chemical Identifier InChI.
`inchikey`	**text**	The InChi key (hash) generated from InChi
`einstein_a`	float	Einstein A coefficient of the radiative transition.
`oscillator_strength`	float	Oscillator strength of the radiative transition.
`weighted_oscillator_strength`	float	Weighted oscillator strength of the radiative transition
`line_strength`	float	Total absorption by a spectra line
`xsams_uri`	text	A URI for a full XSAMS description of this line.
`line_reference`	text	Reference to the source of the line data; this could be a bibcode, a DOI, or a plain URI.

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- How to refer to a molecule in a query?
  - InCHI/InChiKey are unique, not practical/human readable
  - Name, Formula - not always unique.
  - probably need extra columns for names/formulas, or use external service to convert to InCHI

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- Method - more detailed descriptions or just theory/experiment?
- do we need so many transition probabilities?
  - einstein A, oscillator strength, weighted oscillator strength, line strength
  - would einstein A coefficient be enough?

The IVOA Note draft

- Please take a look: https://github.com/mmpcn/slapvamdc
- LineTAP services at http://dc.zah.uni-heidelberg.de/tap
- Document is still full of "TO DO"s
- Comments and contributions are welcome
- Working draft probably in June 2022

Thank you!