Exploring LOFAR with the VO

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March 25, 2021

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Outline

What is the VO?

The challenge

The VO solution

Demo

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What is the VO?

A historical view: The Virtual Observatory (VO) is (or will be), a

comprehensive set of
data and **services**
relevant to **astronomy**
accessible from **clients** of **your choice**
regardless of where you are and
preserving products of digital astronomy.

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What it's (actually) not:

A bundle of software used to work with data in astronomy.

But of course you will find and use VO-client implementations in lots of software like TOPCAT, Aladin, Splat-VO or PyVO.

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"FAIR"

There's tens of thousands of data collections somewhere online,
and more should be.
To unlock the treasures hidden there, the data has to be

- ▶ **F**indable
- ▶ **A**ccesible
- ▶ **I**nteroperable
- ▶ **R**eusable

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Finding data: the VO registry

The entry point for finding data published on VO-compliant services is the **VO-registry**. Services register their data with rich metadata to the registry. User can query the registry to find data of their interest.

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Finding data: the VO registry

The **registry** enables you to issue queries like

▶ Where do I find images specialized in radio ?

▶ What data sets exists which provide x-ray fluxes and proper motions ?

▶ What services provide data associated to a paper ?
You will find an entry point to the registry in most client software. Also: **WIRR**

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Accessing the data: standards...

Standards are very useful when it comes to data access: instead of learning how to access data from a specific service and learn a new way for the next service, you learn a single set of skill to access them all. Some standards are intuitive learned (the typed interfaces of SCS and SIAP and SSAP), others require some efforts to master (ADQL, VO-Table).

Good news: most of the standards do their magic in the background, similar to like you don't need to know about HTML to browse web pages.

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Accessing the data: ...and protocols

Protocols are the connection between client software and servers.
The VO defines typed interfaces so that you will see similarities
between some of the protocols.
The VO-protocols depend on the kind of data you want to access.
Some of these are: **Simple Cone Search Protocol** (SCS), **Simple
Image Acces Protocol** (SIAP), **Simple Spectral Access
Protocol** (SIAP) and the **Table Access Protocol** (TAP/ADQL).

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Accessing the data: ...and protocols

The usage of protocols enables clients to access the service in accordance to the data they are capable of processing. TOPCAT is a software to analyze, visualise and manipulate tabular data and as such provides the protocols SCS and TAP/ADQL. Aladin makes use of SIAP and TAP/ADQL. Splat-VO uses SSAP and ObsTAP.

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Interoperating: VO-Table

Interoperability demands well defined standards of data formats so that clients are able to read the data, and protocols to move data between machines or software. Within the VO you will often hear of VO-Table as the central data format. Most VO-clients are capable of dealing with VO-Tables, so you don't have to worry about it.

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Interoperating: SAMP

A special protocol for interoperability between VO-clients is the
Simple Application Messaging Protocol (SAMP). It enables
you to easily sent data between applications, but also let's you
make a selection in one application that immediately is visible in
another. Check it out! It's very useful, and a bit fun to figure out.

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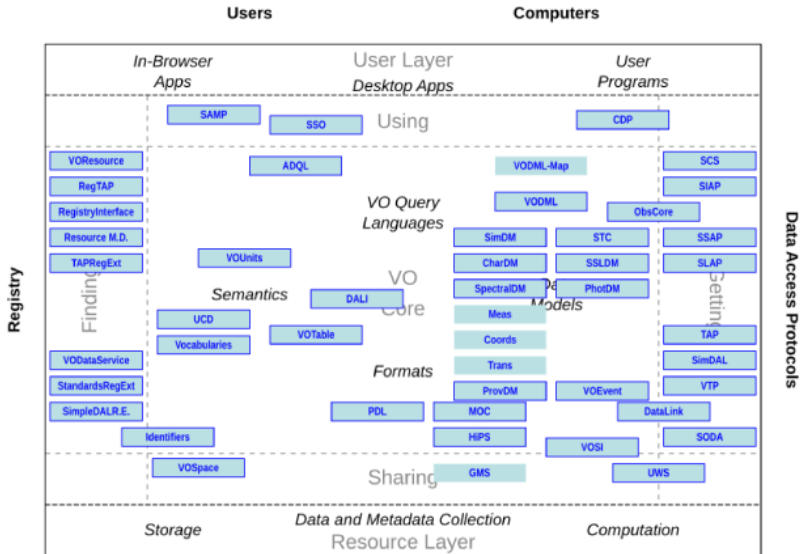
Reusing data: meta data

To make data reusable, a surprising lot of things has to be taken into account. Crucial is rich meta data to describe what is found in the actual data. A lot of the VO-standards deal with this kind of meta data and to keep it close to the data (e.g. VO-Table, utypes, UCDs, VOUnits). Read a bit into them and add it to your data – your future 2-years-from-now-you will be very thankful!

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Reusing data: provenance

Quite a bit of effort of the recent years was spent to develop a VO data provenance model, and a lot of effort still is going into improving it.

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All at one glance:

Demo time

Let' see how all this works together by exploring services with
LOFAR data

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