A VO Archive for the DSS-63 antenna at Robledo

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Abstract In this contribution we describe the development of a VO Archive for the DSS-63 antenna of the NASA Deep Space Communication Complex in Robledo de Chavela (Madrid). In an initial step the archive includes observations in the K-band (18–26 GHz) of the mentioned antenna with a future extension to other ranges, in particular the Q-band (40–50 GHz) and the Ka-band (32 GHz). A first version of the archive will be available from the LAEFF Scientific Data Centre[1] by the end of 2008. This work is the result of a collaboration between the AMIGA group of the IAA-CSIC and the SVO and Radioastronomy groups at LAEFF and forms part of a pioneering initiative to integrate radio astronomical data and services in the Virtual Observatory.

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[1] http://sdc.laeff.inta.es

1 The Antenna

The NASA Deep Space Network (DSN) is an international network of antennas that supports interplanetary spacecraft missions and radio and radar astronomy observations for the exploration of the Solar System and the universe. The DSN currently consists of three deep-space communications facilities placed approximately 120 degrees apart around the world: Canberra, California and Robledo de Chavela (MDSCC, Madrid Deep Space Communication Complex).

The DSS-63 (70 meters diameter) is the biggest antenna in the MDSCC (Fig.1). Due to international agreements 5 % of its operation time is used for radio astronomical observations in K-band (from 18 to 26 GHz). This band includes very interesting features like H_2O masers, metastable NH_3 lines, methanol lines and CCS among others (Fig. 2).
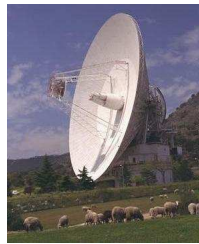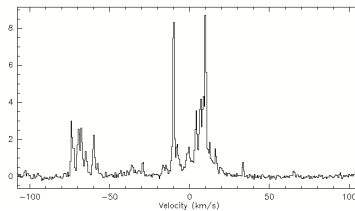

Fig. 1 DSS-63 Antenna of Robledo.

Fig. 2 Spectrum obtained with the antenna DSS-63 in the line of 22 GHz of water. This maser emission comes from a star similar to the Sun but in the final stages of its life. It is though that in this evolutionary stage mass loss stops being spherical generating these "water sources" to speeds larger than 100 kms^{-1}.

2 The Archive

Two applications will be implemented in the archive: a web interface and a VO service developed following the IVOA standards and requirements. Both services will provide access to reduced, science-ready data. The applications will be built according the following schema:

- Database design and implementation. The architecture of the database is based on RADAMS[2], the VO Data Model for radioastronomical data created by the AMIGA group.
- Data ingestion. The database will be populated with information from the FITS headers as well as from the observing logs. Data will be ingested in the database using Python scripts (*Datafillers*). At present, the database contains information from the observations made in 2006 and 2007.
- Design and implementation of a web interface. The system design was driven by the concept of delivering science-ready data to the user in a simple and efficient way. In the present configuration the archive can be queried by object name or coordinates, spectral band, velocity range or observing date (Fig. 3).
- Design and implementation of a VO service. A VO service is defined as any element that can be invoked by a user or other service to perform some action on their behalf. In addition to the RADAMS Data Model (Fig. 4) it is our aim to implement in the archive the SSA protocol, the VO standard access protocol for 1D data. The service will be subsequently registered in the VO registry. This will allow the access to the archive from other VO services in an easy and transparent way.

Fig. 3 Archive web interface.
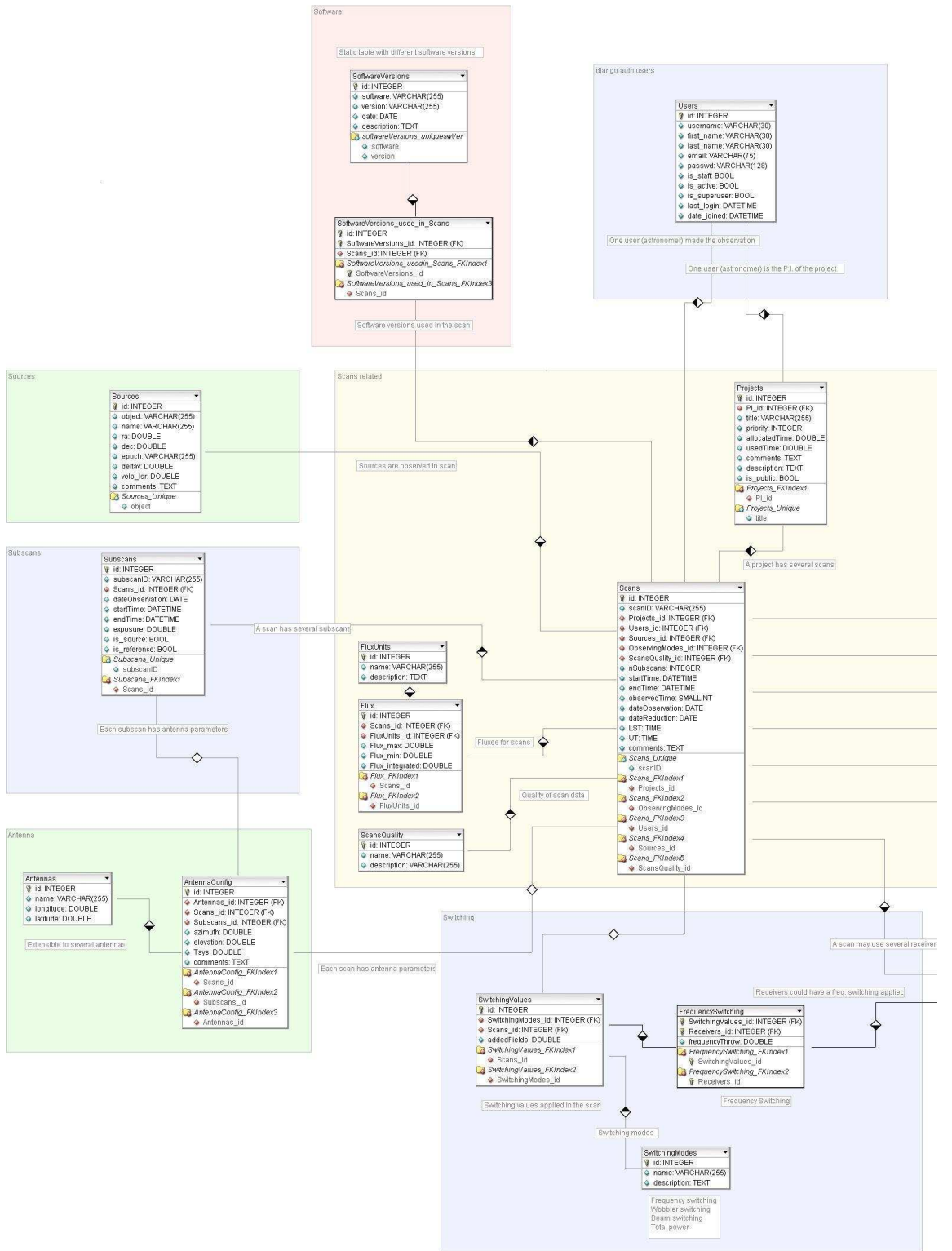
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[2] http: // www.ivoa.net/cgi-bin/twiki/bin/view/IVOA/RADAMS

Fig. 4 Database architecture based on the RADAMS Data Model.