

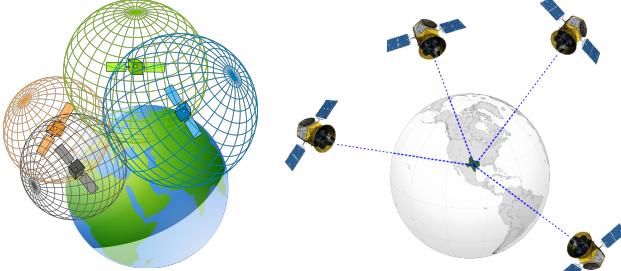


High Rate Tracking Receiver (HRTR) Inventory Database With Real-Time Updates

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Introduction

GPS: Wherever an object is on the Earth, at least four GPS satellites are available at all times which transmit information such as position and current time. The GPS receivers can calculate how far away a satellite is based on how long the message takes to arrive. Using these distances, each satellite has a sphere of possible locations, and where the spheres of each satellite intersect is the location of the object in question.



Objective: As the software defined radio (SDR) team has deployed an increasing number of SDRs for multiple sponsors, tracking the configuration of the systems on wikis and/or spreadsheets has become cumbersome if not impossible. We propose to design a database that will track all configuration aspects of the SDRs from assembly to end-of-life. Wherever possible, this database should be updated based on real-time telemetry.



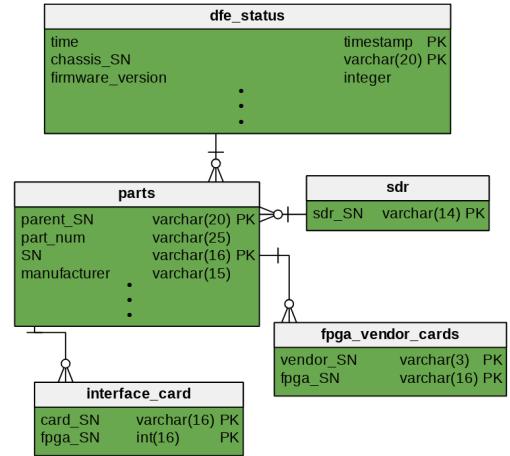
Approach

Parsing Log Files:

- Digitizing Front End (DFE) status messages are used to populate database
- Log files in hdf5 file format
 - Allows metadata to be transferred along with telemetry itself
- Using h5py python library, log files were parsed and information was passed to database

Database Creation:

- First idea was formulated looking at SGL wiki and technician spreadsheets
- In order to get familiar with SQL, python library sqlite3 was used to create a simple database all contained in one '.db' file
- Next a PostgreSQL database was created using the python library psycopg2, which is the final implementation of the database as well



Database Design

Typical Database vs Minimizing Internal State:

- Initial approach was to create a database shaped around the DFEs using normalization
 - Typical in inventory style databases.
- However, state of the SDR inventory is DFE log files.
 - Design should avoid adding to the state and account for future uses of the database
 - Design was reshaped to model the log files.

Data Analysis:

- New design has database with messages and associated timestamps.
- In order to gain additional information SQL "views" and queries are created
 - Can use 'tsrange' datatype which shows time duration.

Results/Outcomes

Final Database:

- Uses PostgreSQL for database structure and h5py to populate database
 - Structure resembles log files and data analysis is done through views and queries
- Design will eventually be absorbed into the SDR team's analysis database

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