Scenic Overview

My Project--SmallSat Relational Database
SSmallSat Database

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SmallSat Database Research

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Research of Small Sat Hardware, development of database schema, and integration with future SCENIC Capabilities.

Task Activities

Week 1-3  SmallSat Research
Week 4-6  Database Development
Week 7-10 Refinement of Database Schema
Since miniature Satellite Technology is advancing quickly, there is a need to create an state of the art database and it’s tools, which could cross reference small satellites and model them.

1. Research SmallSats
2. Develop a Schema to store smallSat data
3. Work with local subject matter experts to refine the database schema
4. Start data gathering on satellites
Important SmallSat Data
2. St. Louis Univ. Prof. Swartout database: https://sites.google.com/a/slu.edu/swartwout/home/cubesat-database
3. Earth Observation Portal: https://directory.eoportal.org/web/eaoportal/home
10. SSC12-VI-9_presentation.pdf
12. Example_radio_set.xlsx
13. ATT00001.htm
14. ATT00002.htm
plus Much More
# Small Sat Radio Catalog

## Transmitter

- **Bisseq-1**: 17 to 40 GHz K-band TX and RX frequency coverage in multiple sub-bands. Arbitrary waveform modulation/coding.
- **NSAT-1**: 2.4 GHz frequency hopping spread spectrum modem, which can be optimized for long distance communication over 38 miles (60km).
- **NOVA-5**: 17.50 GHz, supports up to 4 antennas for redundancy and advanced features. Extra visible mode and attitude determination, etc.

## SmallSat Radio Catalog

<table>
<thead>
<tr>
<th>Mission Supplied</th>
<th>Quantity</th>
<th>Encoding</th>
<th>Number Antennas</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALSAT-1, UK-DMC-1, BISSAT-1, NigeriaSat-1, L TOPSAT, Beijing-1, CRESAT, GIOVE-A (EISA), RapidEye (XS), DEMOS-1, UK DMIC-2, Nigeria Sat-2, Nigeria Sat-3, Saphire, exactEarth-1, KaESat-2 (2014), TenDemSat-1 (2014), DMC3</td>
<td>3</td>
<td>Convolutional</td>
<td>50 ohm antenna interface (SMA)</td>
</tr>
<tr>
<td>NovaSAR-5 (2015)</td>
<td>1</td>
<td>Convolutional</td>
<td>Multiple antennas (1-4) for redundancy and advanced features. Extra visible mode and attitude determination, etc.</td>
</tr>
<tr>
<td>PAM-SAT</td>
<td>1</td>
<td>On-board AX.25 command decoding</td>
<td>On-board AX.25 command decoding</td>
</tr>
</tbody>
</table>

## Frequency

- **Frequency**: 2.2 to 2.25 GHz < 120 ppm, 2.1 to 2.3 GHz < 120 ppm, 2.3 to 2.9 GHz < 120 ppm, 2.3 to 2.9 GHz < ±50 ppm, Up to 4 W RF power using 38 V unregulated supply, < 38 W

## Output

- **PPS Outputs**: GPS, GPS, GPS
- **GEO**: 18.3/18.3 D (10/20 (SAR, sensing))
Why Small Satellites:
Low priced, highly utilized for research and development

SmallSat Concerns:
Could additional communication links stress current SCaN network capacity?

Small Satellite Information Required for SCENIC Modeling:
- What type of hardware is available for communication?
- What type of missions / how many missions are utilizing this hardware?

My Project: **Small Satellite Database Development**
Store all information required to model a small satellite communication link

Transmitter Data

- Data Rate
- Antenna
- Frequency
- Life Time
- Mass
- Power
- Optical

Antenna Type
Effective Aperture
Field of View
Mechanical Characteristics
SmallSat Tables
Approach

1. **Research** smallSats, their parts and their Companies

2. **Construct** a smallSat database which can cross reference all parts in the smallSat industry

3. **Future** Use...
Future Use

Use it...

✓ To Populate, verify and validate smallSat Database
✓ To Construct the tools to attach it to the SCENIC system
✓ To Integrate the SCAN interns SCENIC Simulation modeling system
✓ To keep up with smallSats currently in orbit and in future orbit
✓ To build and model smallSats by their parts and systems
✓ To Establish the costs of a smallSat
✓ In a similar way as the Enhanced SCMM Database is being used in SCENIC, but for the smallSats.
✓ And for....
Possible Future Development

the SCENIC Emulation of SmallSats

The End