SeaBIRD: A Flexible and Intuitive Planetary Datamining Infrastructure

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SeaBIRD

SeaBIRD (Search-able and Brows-able Infrastructure for the Repository of Data) is an infrastructure for the data distribution.
The first version of the infrastructure was delivered in 2010
The Evolution
SaeBIRD 1.0

The first version was delivered in 2010 and it provides the Venus-Express VIRTIS files.

The main feature was:

• performing a selection on the PDS label parameters (PDS3)
• performing a selection on the geometry parameters

Return the data files or part of them
SeaBIRD
E-R Diagram
### Search GUI

#### Mission Parameters
- **Mission:** VENUS EXPRESS  
- **Target Type:** ANY  
- **Target:** ANY

#### Observation Parameters
- **Channel:** ANY  
- **Orbit:** ANY  
- **Cube #:** ANY  
- **Band:** ANY  
- **Sample:** ANY  
- **Line:** ANY  
- **Product Creation time:** ANY  
- **Start Time:** ANY  
- **Stop Time:** ANY  
- **Spacecraft Clock Start Count:** ANY  
- **Spacecraft Clock Stop Count:** ANY  
- **Science Case:** ANY

#### Geometry Parameters
- **Observation Type:** ANY  
- **Spacecraft Orientation X:** ANY  
- **Spacecraft Orientation Y:** ANY  
- **Spacecraft Orientation Z:** ANY  
- **Pointing Mode:** ANY  
- **Declination:** ANY  
- **Right Ascension:** ANY  
- **Maximum Latitude:** ANY  
- **Minimum Latitude:** ANY  
- **Innermost Longitude:** ANY  
- **Westernmost Longitude:** ANY  
- **Slant Distance:** ANY

#### Instrument Parameters
- **Instrument Mode:** ANY  
- **Quality ID:** ANY  
- **Compression Rate:** ANY  
- **Compression Ratio:** ANY  
- **Start X Position:** ANY  
- **Start Y Position:** ANY  
- **Scan Mode:** ANY  
- **Scan Start Angle:** ANY  
- **Scan Stop Angle:** ANY  
- **Scan Step Angle:** ANY  
- **Scan Step Number:** ANY  
- **Exposure:** ANY  
- **Frame Summing:** ANY  
- **External Repetition Time:** ANY  
- **Dark Acquisition Rate:** ANY  
- **Frame Acquisition Rate:** ANY  
- **Internal Repetition Time:** ANY

#### Temperature Parameters
- **Focal Plane Temperature:** ANY  
- **Telescope Temperature:** ANY  
- **Spectrometer Temperature:** ANY  
- **Grating Temperature:** ANY  
- **Prism Temperature:** ANY  
- **Cryocooler Temp:** ANY

**Show Fields ▶**

**Show Query ▶**
SeaBIRD 2.0

Database generalization.

Included data from Rosetta VIRTIS and DAWN VIR
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Included data from **Rosetta VIRTIS** and **DAWN VIR**
SeaBIRD 3.0 The present

We are reengineering the infrastructure.

➢ Changing scope
SeaBIRD 3.0 The present

We are reengineering the infrastructure.

➢ Changing scope

Search ➔ Filter
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- Changing scope

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- Changing language
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  Web Page ➔ webApp/DaaS
From Search Engine to Filter
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“A Search Engine is an information retrieval system designed to help find information stored on a computer system.”
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SeaBIRD, starting from a data collection, create a new dataset available for the download / computation / attach
Changing Language

Why Python?
Changing Language

Why Python?

• Open source
• High versatility
• Efficient code
• Universal
Changing Language

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Using the **django framework** we use the same language for the interface and the processing
The SeaBird Flow

1. Mission datasets
2. SeaBIRD ingestion tool
3. SeaBIRD dataset
The SeaBird Flow

Mission datasets -> SeaBIRD ingestion tool -> SeaBIRD dataset

Mission datasets <-> Python reader -> New Data Model -> NetCDF Writer
Python readers

Are a sub products of the SeaBIRD project.
Could be useful also in other project.
We are testing **VIRTISpy** reader for the instruments VIRTIS (M and H) on board the missions Venus Express and Rosetta.
https://github.com/VIRTIS-VEX/VIRTISpy

Is under develop the reader for instrument VIR on board the mission DAWN.
Why NetCDF

NetCDF is a set of software libraries and self-describing, machine-independent data formats that support the creation, access, and sharing of array-oriented scientific data.
Why NetCDF (1/3)

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The conversion of the VIRTIS-M VEX started for the project PlaNetCDF.  
[http://planetcdf.iaps.inaf.it](http://planetcdf.iaps.inaf.it)

Study of a new data model for the planetary data for the short or medium preservation (working copy)
Why NetCDF (2/3)

In one file all the information.
All the info are linked and structured:
Why NetCDF (2/3)

In one file all the information.
All the info are linked and structured:

dimensions:
  Bands = 432 ;
  Samples = 64 ;
  Lines = 78 ;
Why NetCDF (2/3)

In one file all the information.
All the info are linked and structured:

dimensions:
  Bands = 432 ;
  Samples = 64 ;
  Lines = 78 ;

variables:
  float qube(Lines, Samples, Bands) ;
  qube:long_name = "Radiance" ;
  qube:short_name = "Rad." ;
  qube:valid_range = 0.f, 4.357592f ;
  qube:units = "W/m^2/sr/micron" ;
  qube:_CoordinateSystems = "lat-lon lat-GeoX" ;
  float Latitude(Lines, Samples) ;
    Latitude:long_name = "Latitude" ;
    Latitude:short_name = "Lat." ;
    Latitude:valid_range = -90.f, 90.f ;
    Latitude:units = "degree" ;
    Latitude:_CoordinateAxisType = "Lat" ;
  float Bands(Bands) ;
    Bands:long_name = "Wavelength" ;
    Bands:short_name = "Wave" ;
    Bands:units = "micron" ;
Why NetCDF (3/3)

Possibility to grouping the info/variables

```c

group: Geometric\ Info {
    variables:
        float Surface_Elevation(Lines, Samples) ;
        Surface_Elevation:long_name = "Surface Elevation" ;
        Surface_Elevation:short_name = "SurfElev" ;
        Surface_Elevation:units = "Km" ;
        float Slant_Distance(Lines, Samples) ;
        Slant_Distance:long_name = "Slant Distance" ;
        Slant_Distance:short_name = "SlantDist" ;
        Slant_Distance:units = "Km" ;
```
From Web page to Web App /DaaS

The Web Page perform a selection for the download.

The Web App create a new dataset real or virtual. This dataset could be used by a computation dataset or as DaaS (Data as a Service).

You can mount the dataset as a disk in your computation infrastructure (classical or cloud infrastructure) or attach the DaaS to a SaaS (Software as a Service).
SeaBIRD in the Cloud

From this point of view SeaBIRD move the data to the cloud technology
SeaBIRD in the Cloud

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- Rosetta Dataset
- Vega Dataset
- Vex Dataset
SeaBIRD in the Cloud

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Road Map

• Data Model
  ✓ VIRTIS VEX (M) data model ready – data available in NetCDF on PlaNetCDF
    ➢ http://planetcdf.iaps.inaf.it
  ❑ VIRTIS Rosetta (M) data model under develop
  ❑ Laboratory data data model under develop – examples on Exact web App
    ➢ http://exact.iaps.inaf.it

• Interface
  ❑ Alpha release ready – under debug
  ❑ API for software integration – under debug
Road Map

• Access Policy
  - Access for download – Registration for statistics and data tracing;
  - DaaS – under discussion;

• Integration with other SW
  - VESPA – Integration plug-in under definition;
  - MATISSE – Under definition the parameters for the integration layer.

DELIVERY

Version 1.0RC1 will be delivered in the first half 2019
(after the BepiColombo NE operaions)
Thank You
For the attention