2021

SEADEV Presentation

RESOURCES, PROJECTS & SERVICES

GILBERT BRAULT

Contents

Context

Sea Dev was created in 2020 by Gilbert Brault (LinkedIn).

The purpose of Sea Dev is to develop applications with a significant business impact using the Jupyter development framework, transforming company data into business knowledge, implementing daily tools for business users. The core technology of applications is software.

In 2021, Sea Dev has developed multiple projects for the following companies

- Vink Chemicals GmbH
  - An audit and management framework (delivered)
  - A product selector application (delivered)
- Ajanla Farms Ltd
  - Poultry Flock management reports (in-development)

And has started the following R&D developments

- ARUCO based asset tracking management

Resources and Knowledge

People

	Gilbert Brault • 30-year experience in R&D, Marketing and Strategy at Schneider Electric • PhD in Industrial Automation
gbresume.pdf	Resume: Double Click on the icon right to open the pdf document or Right click and “Acrobat Document Object” -> Open

Technology

The technology know-how of Sea Dev is based upon

- Data modeling and algorithm research impacting company business process (data driven company – Digital age)
- Widely reusing existing technology (Jupyter project, open-source software, cloud computing)
- Practical experience to design
  - Business process
  - Implement them using leading edge computer tools
- Computer technology
  - Communication: digital radio, network, IP technology, W3C technologies (HTTP…)
  - Data modeling (including SQL database)
  - Processing languages (Python, Java, C#, C…)
  - IoT (Internet of Things)
  - Virtualization and cloud computing
- Designing specification, documentation, and training

Project briefs

Vink Chemicals Audit & management framework

Vink Chemical (100 people, 50M€ turnover), based in Germany, is a fast-growing company, created in 2011, providing biocides to various markets segments including Paint & Coating, Oil & Gas, Personal Care...

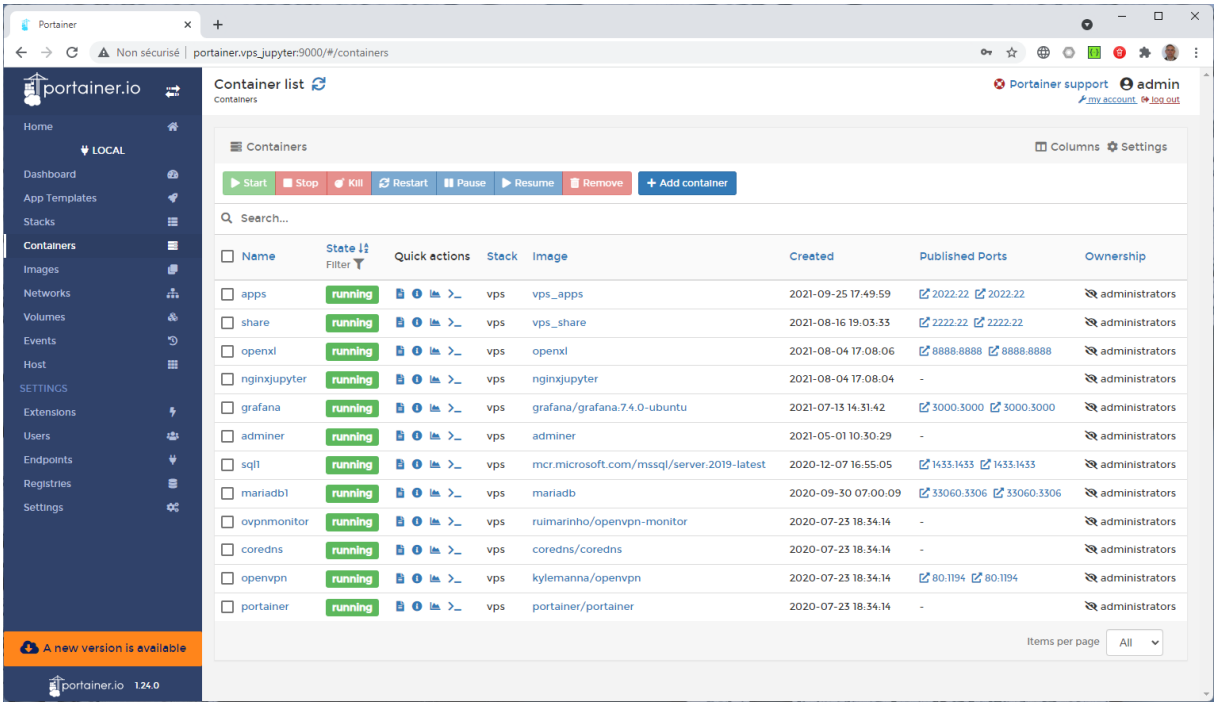


Figure 1: Portainer Docker Stack deployment and monitoring

The problem to solve

The company is using an ERP tool (Enterprise Resources Planning) and at the same time, line managers are using a lot of excel intermediate files.

The issue is then the duplication of information which provides business problems as there are many versions of the truth.

The solution

1. Identify the usage of the most relevant excel files per business center
2. Makes the ERP data accessible
3. Design and implement a process running daily which
    a. Use the data from the ERP
    b. Creates excel files in line with the business practices
    c. Deliver them in a SharePoint to be easily accessible by the business users

Benefits

1. Using excel to infuse the company with ERP data to close the multiple versions of the truth gaps
2. Excel is an easy-to-use tool, compared to the ERP and more company employee have access to data guiding their daily work.
3. Special Processing functions take care of issues which where not supported by the ERP (e.g.: product cost calculation per batch)

4. As the company data is now ‘open’, the capability to generate on demand analysis is possible (for example sales forecasting based on historical invoicing).

Technology

1. A Docker enabled VPS (Virtual private server) including
    a. A Jupyter notebook server executing a daily processing (cron[1])
    b. A database server which replicates the ERP database
    c. A management server to monitor the virtual stack (Portainer)
2. A windows 2019 Server supporting
    a. The database import scripts as the ERP technology impose windows
    b. The excel pivot generation (as excel just runs on windows)
3. A SharePoint space collecting the generated excels
    a. Generated pivots are emailed to Office 365 SharePoint

This stack is accessible via a VPN, implementing the application protection layer and which guaranty that only selected users have access to the resource.

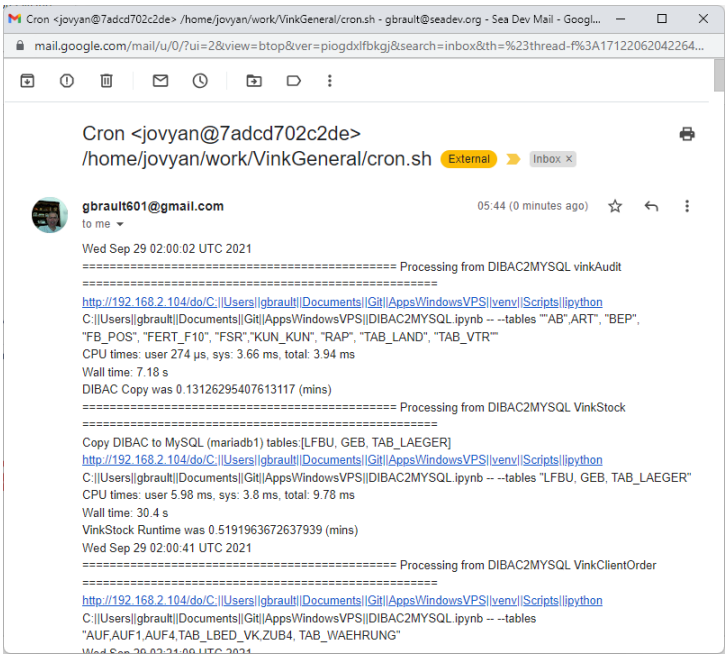


Figure 2: Daily cron execution report

[1] A cron is a Linux daemon which execute task according to a specified schedule

Vink Chemical Product Selector

Biocide's usages depend on multiple factors and the company must guide users, selecting the product corresponding to their requirements.

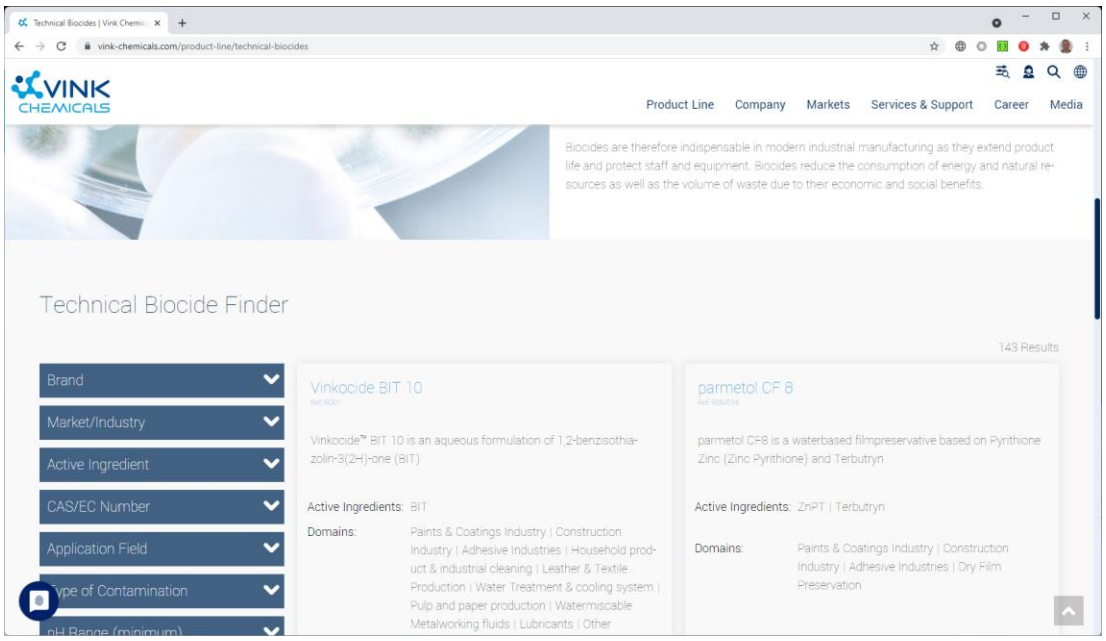


Figure 3: Parametric Product Selection

The problem to solve

Help sales and communication department accurately define the main descriptors for biocides, considering the stakeholders from customer organization and inside Vink chemicals.

Clean the product portfolio to propose an Up-To-Date catalog including Vink Chemical legacy and the new acquired line of products.

Get this data accessible from Vink Chemical corporate website as a first milestone.

The solution

1. Creation with Vink Chemical project owner of a unique excel file, defining all the catalog clustering data, and providing products main specifications, identification, and presentation
2. The excel file content is driving the data clustering and the User Interface content (clusters)
3. Define a standard interface (REST API) to ease the integration into the corporate website done by an IT partner.
4. Monitor the implementation regularly to get the goal achieved

Benefits

1. The sales and communication department are the owner of the data and the way it is distributed and presented thanks to this governing excel file which is automatically uploaded
2. An easy to search product catalog, based on the product definition content

Technology

1. The REST API is based on python Flask technology
2. "OpenAPI" browser, generated from the code definition to help IT partner integrate the product selector into the corporate website
3. A virtual stack, used to deploy and manage the application deployed on a VPS (Virtual Private Server)

Poultry Flock management reports

Ajanla Farms Ltd, based in Nigeria, is breeding poultry for eggs or meat markets.

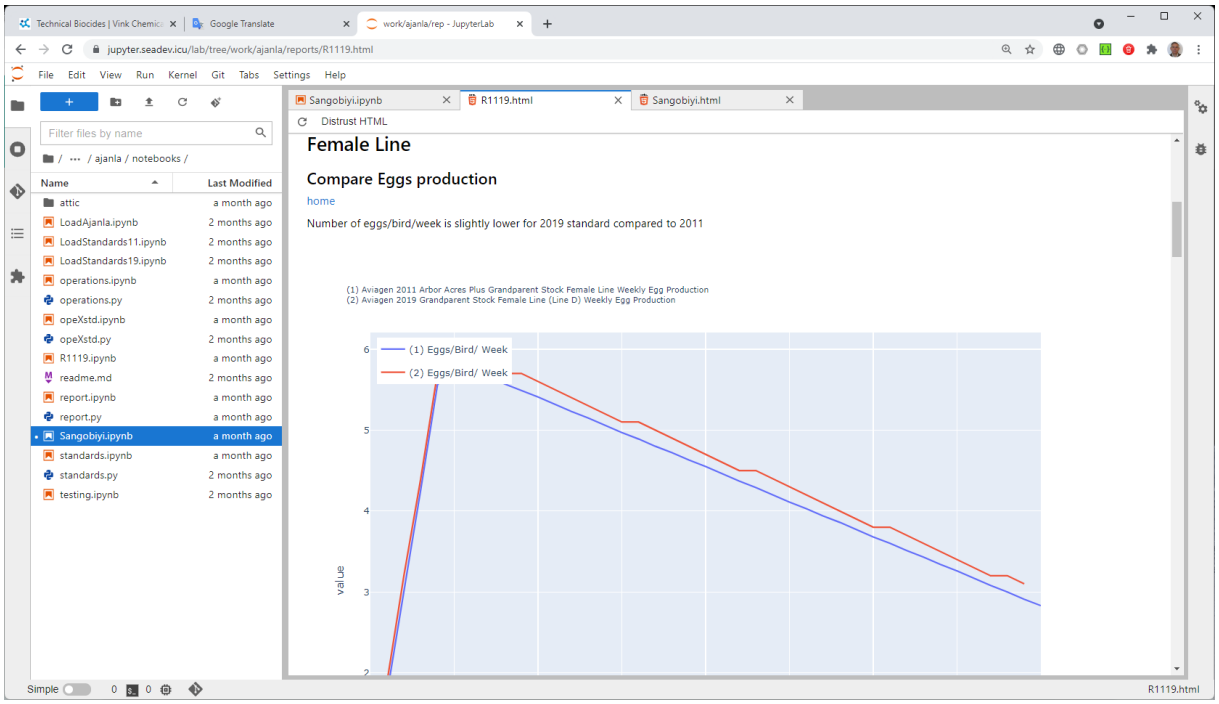


Figure 4: Compare Standards with Operation

The problem to solve

Management today receives excel files which are pure tables of numbers. It is cumbersome to read and difficult to find any insights from this raw data. The process of data collection and reports needs also to be improved.

The solution

Design a process to transform the current situation into a live data collection and processing practice.

1. The first step is to model the data to be able to compare performance with goals set by the upstream producers.
2. Then propose periodical reports which are designed to highlight issue or performance KPIs, using graphic representation for instant understanding of data
3. To achieve this level of report, a good data capture must be designed and agreed, plus a full defined business process must be agreed among the company stakeholders.

Benefits

The main expected benefit is to enable management taking decision based on factual data interpretation and in a timely manner.

Technology

The mockup is based on a VPS stack, the user interface is based on Jupyter framework

ARUCO based asset tracking

In many industrial cases, asset automated identification and location is a problem.

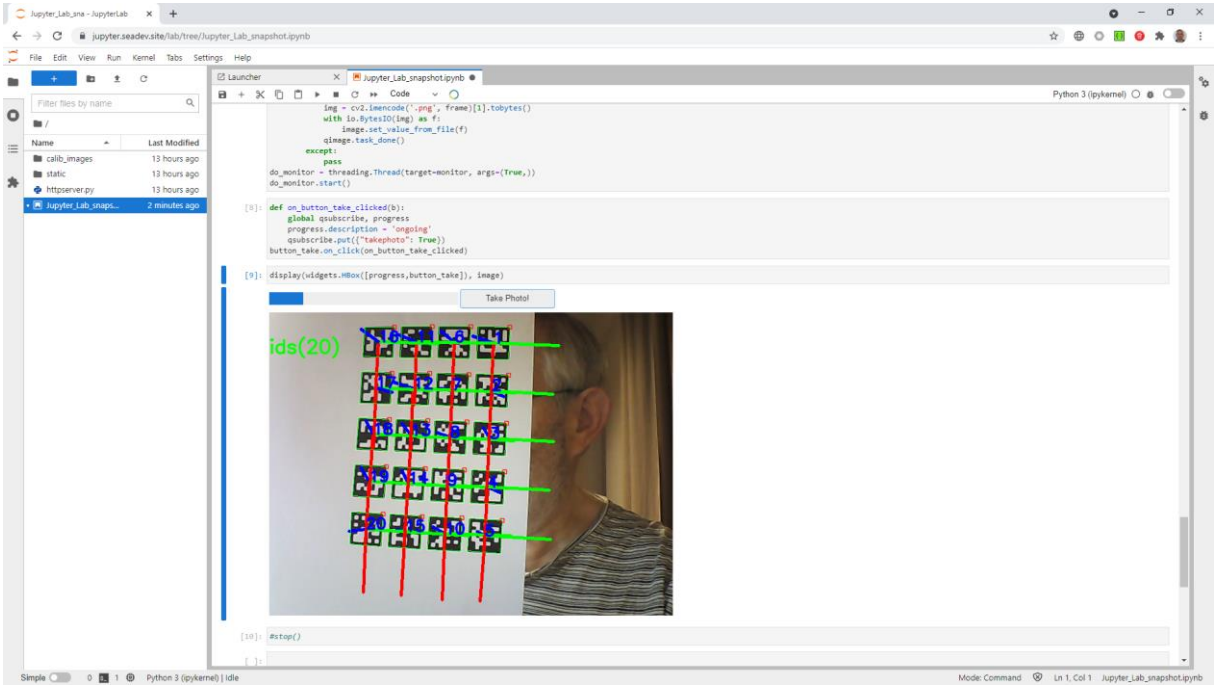


Figure 5: ARUCo, many markers can be detected simultaneously

The problem to solve

Two use cases are central for this development

- Maintenance team 'augmented reality' (production equipment tracking)
- Material asset tracking (production goods tracking)

Maintenance use case:

- A technician in field operation needs to quickly find the documentation about a piece of equipment
    - Having a camera that scans the scene, ARUCO markers are gathered
    - Transformed into messages
    - Messages are used to identify assets and get their position
    - Identifiers are used to search database to find documentation

Production use case

- Packing material is decorated with ARUCO signs
- A camera (or many cameras) scans the scene
- Position and identification of material is then carried
- According to the task, the derived information enables to track the production process or locate material or facilitate stock and storage management

The solution

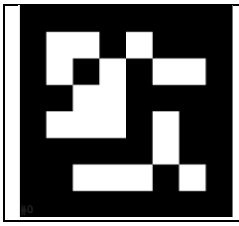
We are at the specification and experimentation phase for this project, but we believe ARUCO technology can be a good solution in this field

ARUCO signs have been developed in the last decade and stands for “Augmented Reality University of Cordoba”:

"Speeded up detection of squared fiducial markers", Francisco J.Romero-Ramirez, Rafael Muñoz-Salinas, Rafael Medina-Carnicer, Image and Vision Computing, vol 76, pages 38-47, year 2018

OpenCV library implements ARUCO processing.

Here is an ARUCO marker

	Depending upon the selected ‘dictionary’, markers can represent up to 1000 different ‘Ideograms’. When searching for Ideograms from a given dictionary, other ideograms from other dictionaries are ignored. Recognition speed of ARUCO markers is very fast. ARUCO markers are used for drone missions.

The idea is to compose messages with ARUCO markers and develop a library based upon OpenCV to extend the use of ARUCO to identification.

Benefits

- ARUCO markers can be read in multiple positions
- ARUCO markers are detected in parallel (many ARUCO markers in the scene)
- ARUCO markers have redundant definition to avoid errors
- ARUCO markers can be used to find the position of assets
- A handful of identifiers can be scanned with relatively cheap equipment covering a large scene
- Contactless scanning technology which can be remotely operated

Technology

- Open CV (ARUCo)
- Jupyter framework

Annex

Jupyter

Jupyter IPython Project (2014) [Software] jupyter.org: https://jupyter.org/

Project Jupyter is a project of a community of academics and companies whose objective is to "Develop open-source software, open standards and services for interactive computing in dozens of programming languages".

Among its languages, we can mention R and Python but also Julia, C++, C#, Java...

It was derived from IPython in 2014 by Fernando Pérez (Berkeley Institute for Data Science).

One of the objectives of the community is to support scientific publication reproducibility[2] thanks to "notebooks".

The IPython notebook, now known as the Jupyter notebook is an interactive computing environment, where it is possible to combine code execution, rich text, math, plots, and rich media.

It is therefore possible to communicate in clear language, and at the same time, to propose the algorithmic resolution of the problem exposed, which can be "executed" step by step.

It is also possible to reuse many code libraries to facilitate the study of specialized scientific fields.

Thanks to web technologies, it is also possible to access shared data, which simplifies their reuse, avoids errors, and allows their distribution.

This project has received the support of many donor organizations in recent years and has benefited from the injection of tens of millions of dollars to improve its design.

Jupyter Institutional partners

- Amazon Web Services (Brian Granger, Steven Silvester)
- Bloomberg (Jason Grout, Paul Ivanov)
- Cal Poly (Ana Ruvalcaba)
- Netflix (Kyle Kelley, M Pacer)
- QuantStack (Sylvain Corlay)
- QuanSight (Matthias Bussonnier, Carol Willing)
- Two Sigma (Afshin Darian)
- UC Berkeley (Fernando Perez)
- University of Michigan (Damian Avila)
- Thorn (Peter Parente)

Sponsors

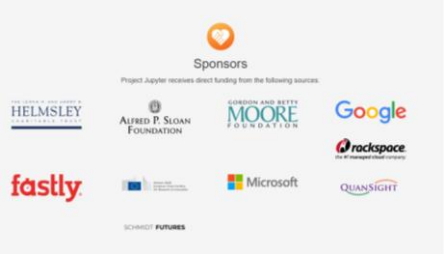


Figure 6: Jupyter project donors

[2] Reproducible science is when anyone (including others and your future self) can understand and replicate the steps of an analysis, applied to the same or even new data.