COURSE ON INDUSTRY 4.0

Proof of concept on Industry 4.0 using Ignition tools and modules

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Acknowledgment

I would like to thank all the people who helped me to complete my internship in the best conditions and who allowed me to write my internship report.

First, I would like to thank one of my two supervisors, Yan Herrmann, who gave me his time to help me get started on Ignition and who gave me a daily follow-up to be able to accomplish my mission in the most efficient way possible.

I would also like to thank my second tutor Nicolas Navarro for his welcome here in Béziers. He trained me on the industry 4.0 part which was completely unknown to me.

Thank you for these three intense and enriching months.

Introduction and abstract :

As part of my first year at ENSEEIHT, I had the opportunity to do an 11-week internship in the Genvia company with the support of Schlumberger. Schlumberger is an international oil company, so they have many sites across different countries. Here in Béziers, the CEO Luc Mas decided to expand his business area to include new energies. This is where the manufacturing part of Genvia was born. Genvia will be a company producing stacks to produce hydrogen.

It is therefore a great opportunity for me to be able to be part of such a major project which is still in its infancy. Everything is still to be built and each decision will have a consequence on the future of the company. This experience has also made me realise that IT touches on vast fields such as hydrogen and more specifically manufacturing based on Industry 4.0. Moreover, Industry 4.0 is a revolution for today's industries and being able to work on it made me realise how important this area of expertise is for a digital engineer. Today, every company should migrate to this system while respecting the environment, which is what Genvia is trying to do. So, this internship was a godsend for me.

Throughout this internship, I became familiar with the company's environment. As my office was in an "Openspace", I had the opportunity to meet different people working on other projects and I was able to exchange with them about their vision of the company.

I was also able to discover different ways of communicating between software and machine-like http, MQTT and MQTT Sparkplug B. These different ways of communication are very interesting because they are widely used in the industry. I was also able to deepen my knowledge in Python and Java to allow the good realization of the project without mentioning the numerous libraries discovered like Tahu, Paho or JSONSIMPLE. Moreover, through these libraries, I also had to learn how to use Maven projects in Java.

Presentation of the companies :

Schlumberger :

Schlumberger is a multinational company founded in 1926 by the Schlumberger brothers. Its main sector of activity is oil. It creates tools and develops new technologies for offshore and onshore oil drilling.

Genvia :

Genvia is a clean hydrogen technology company, created to enable individual organizations, industries, and nations to achieve their decarbonization goals by accelerating clean and affordable hydrogen production, energy storage and large-scale fuel applications.

By providing cost-effective access to high-performance electrolyze and fuel cell technologies, Genvia will help heavy industry decarbonize processes and meet emissions targets. Genvia also enables energy providers to deliver decarbonized electricity to consumers where and when they need it.
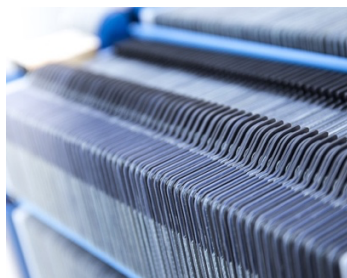

Example of a Stack

Missions within the company

Understanding of the Industry 4.0 principle:

Industry 4.0 has its own language. There are ERP, MES, PLM and other softwares for the smooth running of a company. We will explain the term "Internet of things" because it is central to the concept I am trying to prove.

IOT (Internet of Things):

The term IoT encompasses all the layers, stages, and production chains in the world of connected objects: from the development of physical objects to the collection of data, to the sensors that store and analyze volumes of data, to the transmission of the data, or the platforms made available to analyze them. According to this infographic, by 2020, there will be 80 billion connected objects. The market for IoT solutions will be worth 7.1 trillion dollars, and the main challenge is to analyze the data in Big Data.
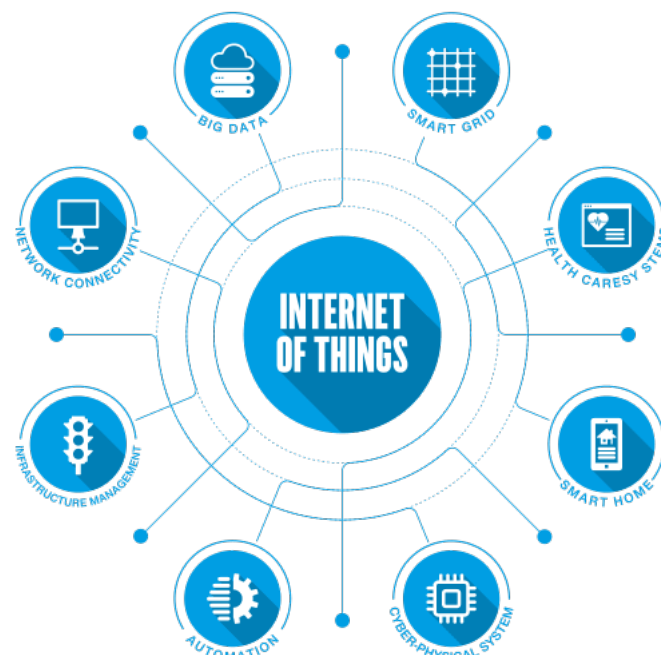
Creation of SysML diagrams :

For the realization of SysML diagrams, I had the chance to be supported by a method engineer. He first showed me an application called Capela which produces diagrams like SysML. Then I made the diagrams in Visual Paradigm. I thus realized 10 SysML diagrams to help the understanding of my work.

Setting up an exchange platform :

To realize my proof of concept I needed an exchange software, so I found a software allowing this. It can create an HMI, or to create a directory that can hold different data. It can of course modify this data between different machines. It can also make machine simulations or even create use cases to simulate the creation of an industrial part thanks to scripts on python. It also has a feature to receive or send HTPP requests in addition to MQTT.
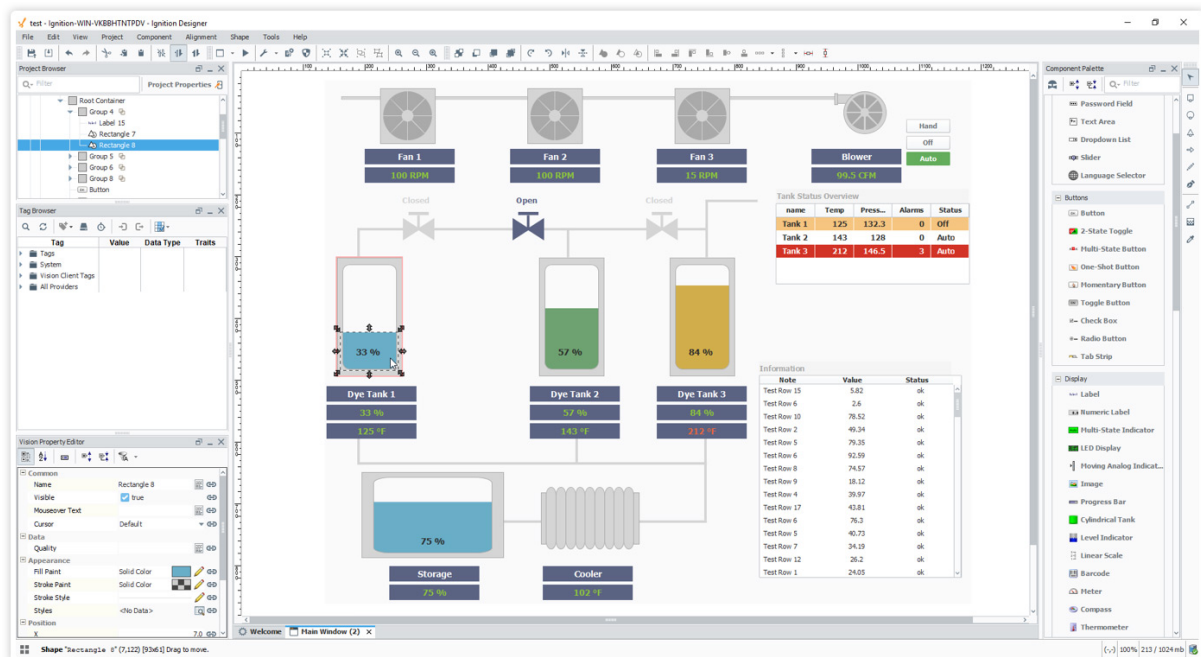
Creating an ERP in Java :

We had to create a fictitious ERP, as the company was not yet operational. My mission was to create a Java-based ERP that could send work orders and add new functionality if necessary. In addition, it had to communicate in http and be able to receive information via http to test the http part on ignition. This ERP has of course a graphic interface allowing to navigate between the various views. To keep the information in memory, I decided to store the data in different json files.