Newsletter

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Welcome, to the 2nd newsletter of the ***vf-OS*** project (723710) - ***v***irtual ***f***actory ***O***perating ***S***ystem

The World is facing a 4th industrial revolution based on ICT, where traditional factories will be increasingly digitalised and transformed into smart connected environments. These will integrate new platforms and services that help them become more efficient. However, factories are complex systems and European SMEs' needs around Manufacturing ICT solutions are far from being satisfied in an affordable way, leading to diverse and non-interoperable systems. ***vf-OS*** addresses such needs. It offers a **manufacturing orientated cloud platform** supporting a **market ecosystem** that provides a **wide range of services** to achieve the **connected factory of the future**.

As a multi-sided business, ***vf-OS*** facilitates interactions that create value between external stakeholders. Envisaging to match providers and consumers and to facilitate the exchange of goods and services, it enables value creation throughout the entire digital landscape. The ***vf-OS*** platform exploits advanced ICT, delivering different solutions such as the Open Applications Development Kit (OAK) to allow manufacturing companies a fast way to develop and deploy smart solutions (vApps) for manufacturing and logistics processes.

If you want to create applications for Android phones, you require an Android SDK and an Android Marketplace.

*If you want to create applications for Factories, you require the **vf-OS** OAK and the **vf-OS** platform to exploit them.*

vf-OS aims to become the **reference system** software for managing factory related hardware and software resources and providing common services for Smart Factories. This second project newsletter provides the latest developments on the integrated technical vision, on the piloting activities, and some ***vf-OS*** future initiatives.

vf-OS Integrated Technical Vision

vf-OS´ main purpose is to provide an environment for developing and executing Smart Applications, with a current focus on those within the Manufacturing domain. These vApps are applications specially developed for solving particular industrial needs and are akin to Android mobile apps but in an industrial setting. They are supported by user scenarios covering three different industrial activities, namely: Manufacturing & logistics automation, document management at construction sites, and manufacturing assembly collaboration. The Platform components are aligned to the ***vf-OS*** Architectural view and are:

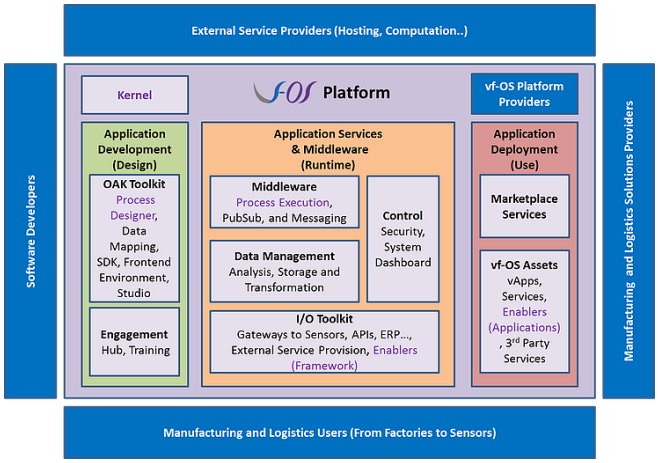
- ***vf-OS*** **Platform**
- ***vf-OS*** **Design Time components**
- ***vf-OS*** **Runtime components**
- ***vf-OS*** **Use Time components**.

Developing, deploying, and using a vApp consists of a series of actions, in particular: *Re-use* of existing libraries; *Developing* new functionality; *Assembly* of these functionalities; *Executing* the vApp, *Routing* messages, *Monitoring* performance, as well as *Storing* intermediary and final results

vf-OS *Platform*

This is the master block of the ***vf-OS*** architecture, which is currently in the early development phase. It is the outer component that manages the execution of all the features and functionalities, i.e., other ***vf-OS*** components and/or ***vf-OS*** Assets/vApps.

The ***vf-OS*** platform encapsulates and acts as the interface between the components, connectors, OAK SDK functions, marketplace, the service framework and the end-user applications/developers. Depending on the user's needs, it is able to run locally and in cloud environments.



vf-OS *Design Time Components*

The Design time block comprises of the OAK Toolkit that will be used for developing vApps and the Developer Engagement functionality, to facilitate interaction with other developers. A vApp is created by means of the ***vf-OS*** Studio. It will combine all of the Design time components of ***vf-OS***, namely pre-compiled libraries (SDK), UI guidelines and Frontend components, while granting access to the Assets registry (vf-Store). Linked to the ***vf-OS*** Studio, the Process Designer will help to generate and coordinate the internal structure of the vApp. As a way to promote the interaction with the development community, any ***vf-OS*** developer can make use of the Engagement Hub and the Training facilities for accessing further knowledge about ***vf-OS*** and its benefits, as well as interacting with other developers and users.

The Design Time components are currently at different development stages. The Process Designer and Data Mapping are in an advance status, whilst development on the ***vf-OS*** Studio, the SDK, and the Hub has been started.

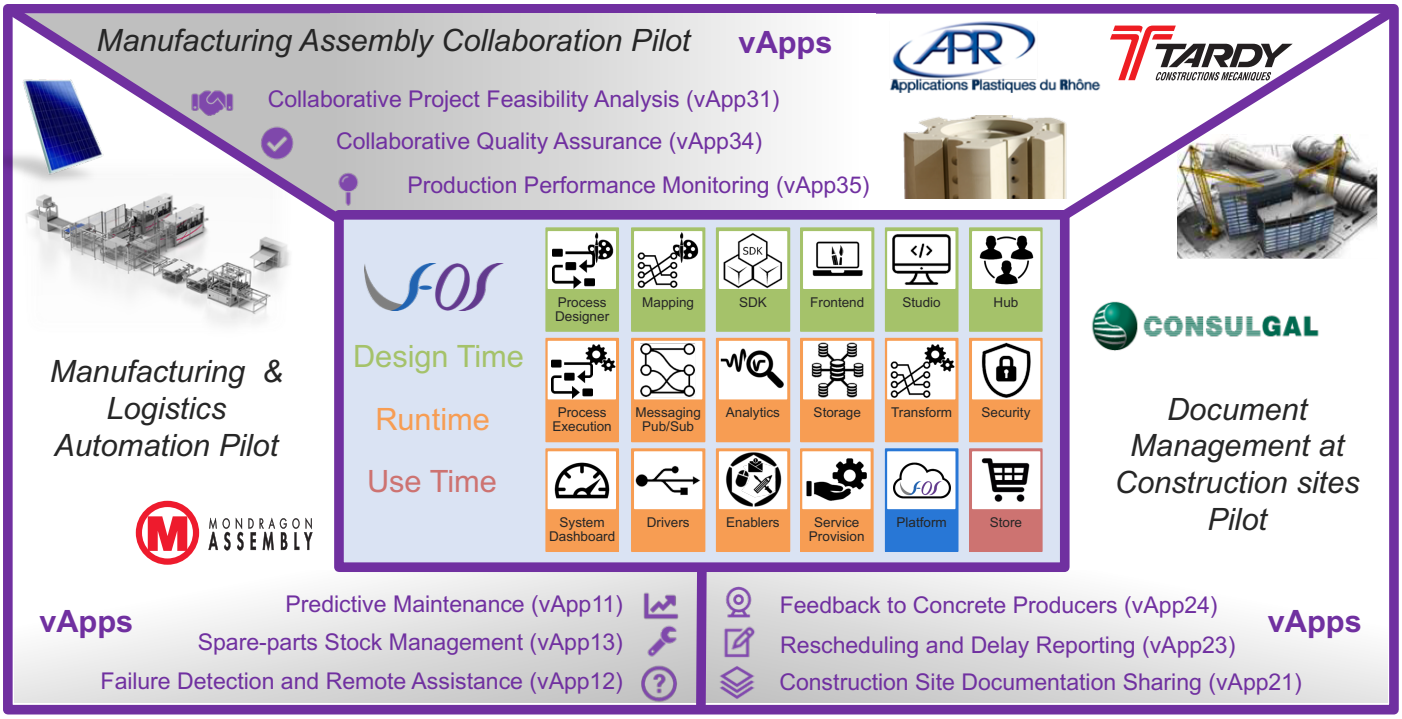
vf-OS *Runtime Components*

This block includes the ***vf-OS*** components that will be used by the vApps when they are being executed or when they are trying to execute some of the ***vf-OS*** resources. It is possible to distinguish four different modules depending on their functionality: Middleware, Data Management, I/O Toolkit, and Control modules.

vApps will most likely need to have access to data for executing their internal routines. This data needs to be transported from its source, transformed to accommodate to the needs of the vApp, stored for later access, and analysed to extract knowledge from it. All this is achieved through the Data Management and Middleware components.

A vApp may need to interoperate with machines and/or other software (e.g., ERP or CRM) within the industrial environment to implement the required functionality. These interoperable interfaces can be supplied through the IO Toolkit. Other external functionality within the manufacturing environment are so-called Enablers which are a set of packaged functionalities allowing advanced computation routines. The enablers are accessed through the Enablers Framework which is also a part of the IO Toolkit. Finally, vApps will need to be monitored and accessed through a secure environment (Security component and System Dashboard).

Practically all components within the Runtime block are available as a first prototype release.



vf-OS Use Time Components

This block is composed of those ***vf-OS*** components that will be taken into consideration when the ***vf-OS*** environment is going to be in use. Two primary asèct can be distinguished: Marketplace Services, and the ***vf-OS*** Assets. vApps may need to rely on other pre-developed vApps or other 3rd party services. As such, the vf-Store will be incorporated to serve as a bridge when developing a vApp. Regarding development status, the vf-Store development has recently begun.

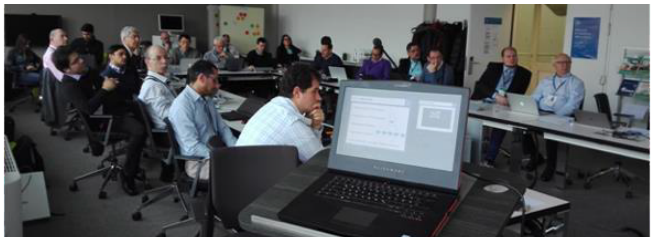
vf-OS Smart Application Piloting

As indicated in the table bellow, each ***vf-OS*** industrial pilot has detailed their main objectives, fully aligned with the business needs of each company. Different vApps are tailored for each case which will allow the companies to act as the experimental base of ***vf-OS*** assets. All piloting activities are ongoing on the initial stages.

Pilot	Main Objectives
MONDRAGON ASSEMBLY vApps: vApp11, vApp12, vApp13, vApp14, vApp15	Designs and manufactures systems and equipment for process automation and cutting-edge photovoltaic (PV) modules. With ***vf-OS*** it envisages to: • Reduce by half the costs of each technical support provided during failure diagnostics • Decrease by 4% direct labour costs per module for the customer • Increase the margin on sales (Selling-cost) per worked hours regarding industrial maintenance services, including materials, labour and other expenses.
CONSULGAL vApps: vApp21, vApp22, vApp23, vApp24, vApp25	Provides a wide range of multi-disciplinary services in engineering fields, particularly related to project management and supervision. With ***vf-OS*** it envisages to: • Cut operational costs of the engineering services provided by the Supervisor • Cut the overhead expenses of supervisory team in initialising a new project • Reduce the average time for a supervisor to decide on a specific action.
APR Applications Plastiques du Rhône TARDY vApps: vApp31, vApp32, vApp33, vApp34, vApp35	Specialists in plastic manufacturing (APR) and metal parts transformation (TARDY), they expect to: • Save 25% the costs of the administrative effort provided by APR during the whole project quotation process per project • Reduce time spent on non-adding value tasks such as: technical data validation, production data validation, disruptive event treatment on production line, etc • Reduce by half the costs generated by nonconformity events after the production and transport fees.

vf-OS Collaboration & Workshops

The project is actively engaged in different European Factories of the Future Research Association (EFFRA) working groups, where the team is managing the one on SDKs. Following this work, ***vf-OS*** will join the COMPOSITION, DIGICOR, NIMBLE and other projects at the "Connected Smart Factories" workshop held together with the IEEE Intelligent Systems 2018 conference (www.ieee-is2018.com), in September. The workshop is joining industrial representatives from the digital manufacturing, FIWARE and IoT domain, alongside researchers from diverse areas of smart manufacturing, enterprise information systems, cloud computing, big data, and more, to discuss the ongoing developments in the broad area of Connected Smart Factories.



As an outcome of the scientific workshop held together with the I-ESA'18 conference, the research performed during the first half of the project was validated, discussed among peers, and ***vf-OS*** has been invited to the National Institute of Standards and Technology (NIST) to share its findings. A workshop is being prepared for the end of 2018, in Gaithersburg, Maryland, USA to enable the possibility for further reserachers to become aware of ***vf-OS*** and exchange experiences in the development of such industry-driven solutions.

vf-OS will also be present at the ICT 2018 event "Imagine Digital", in December. The entire ***vf-OS*** portfolio will be exhibited and validated with different stakeholders. It will use live demonstrations, videos, use cases to provide insight from student to executive. Of particular attraction is the live factory (goo.gl/djtbPb) to interact with the visitors.

Thank you very much for your interest in vf-OS project (H2020-723710)!

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