vf-OS IO Toolkit

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- Drivers and API connectors in vf-OS – the IO component
  - A perspective from app developers
  - A perspective from manufacturing and logistic users
  - A perspective from drivers and API connector developers
- Security concerns
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vf-OS is an operating system that will permit applications to use existing manufacturing resources (devices and business applications)
Context of manufacturing apps(devices)

- Wide range of existing devices in manufacturing
  - Temperature
  - Humidity
  - Speed
  - Pressure
  - Flow Rate
  - Speed etc

- Many protocols
Context of manufacturing apps (legacy)

- Siloed legacy system.

- Any with specific languages, APIs and environments to develop
  - COM objects
  - DLL
  - JAR / RMI
  - REST
  - C/C++
  - XML
vf-OS input and output

- Provide tools to **app developers** for:
- Developing apps abstracting from complexity of different protocols
- Developing apps that coexist and profit from existing business applications
Solution - vf-OS IO component

- Black-box abstraction

IO component
(driver or API connector)

Devices
- OPC UA
- MQTT
- MODBUS
- GPIO
- MTCONNECT

Systems
- MS EXCEL
- STEP
- ODBC
- ODATA
- SAP
- NAV ERP
Using drivers and API connectors

Manufacturing and logistic companies

REST API
OPC UA driver
Web Server

Proximity sensor
Flow sensor

API Connector
Web Server

SAP
SQL
Developing new IO components

- Driver and API connector developers

Abstraction Layer

IO Components
- Security
- Top Interfaces
- Logic
- Bottom Interfaces

Proprietary code

Devices
- OPC UA
- MQTT
- MODBUS
- GPIO
- MTCONNECT

Systems
- MS EXCEL
- STEP
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- ODATA
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Solution - vf-OS IO component

- Generate a unified abstraction

```
Other vf-OS Components

IO Components
- Security

Top Interfaces
- Logic

Bottom Interfaces

Vf-OS API

Agnostic logic

Top interfaces
- REST
- Messaging Pub/Sub
- Registration
- Logging

logic
- Computing
- Internal storage
- Access Control
- Lifecycle

vApp
```
- Command-line prompt tool to generate skeleton of IO components.

```bash
PS E:\workspace\nodejs\vfos\tests\driver-demo> yo vfos-io --loopback

Welcome to the vf-os IO Toolkit generator!

Your project name: driver-demo
What IO Component would you like to generate? (Use arrow keys)
  Device Driver
  API Connector
What template would you like to choose? (Use arrow keys)
  Empty-driver (no configured M2M protocol or datasource)
  OPC UA (Driver skeleton with OPC UA support)
I'm all done. Running npm install && bower install for you to install the required dependencies. If this fails, try running the command yourself.
```
IO toolkit generator

Prompts

Swagger Definitions

REST API

Yeoman

Templates

Drivers

APIs

Driver project skeleton

Asset development working copy
IO components on the marketplace

- **IO Component Development**
  - IO Toolkit
  - Publish IO Component

- **MarketPlace**
  - IO Component
  - Manifest
  - Use IO Component
  - Publish vApp

- **vApp Development**
  - OAK
  - Install vApp

- **Manufacturing and Logistic Users**
  - Manufacturing Assets
    - Exchange data
    - Installed vApp
    - Installed IO Component
    - vf-MW
    - vf-SK

- **vApp**
  - Manifest

- **vApp Development**
  - OAK
  - Install vApp
Deployment example

vApp 1
vApp 2
vApp 3

Vf-OS

REST API
OPC UA driver

REST API
MT Connect

REST API
API server
Security Concerns

- **External services**
  - REST alignment with OWASP

- **Internal services**
  - ISA 99/IEC 62443 secure network architecture, service encapsulation

- **Asset development**
  - ISA 99 / IEC 62443 component development, digital signatures

- **Privacy and Personal information**
  - Security Control Centre, cryptographic recommendations

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**OWASP**  
Open Web Application Security Project

**IEC 62443**  
Security Standard for Industry
Conclusions

- **IO component** is the component in charge of **wrapping and integrating** devices and legacy applications in vf-OS apps.
- **IO components** are self-hosted, secured, server-based, **docker components**.
- Out of the box vf-OS plans to provide up to 20 drivers / API connectors.
- IO toolkit is the easy-to-use tool to extend vf-OS with new IO capabilities.
Thanks you

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