RE4DY TOOLKIT

Name of the Tool	NOVAAS – NOVA Asset Administration Shell (NOVAAS)
Tool Owner	Industry Commons Foundation
Version	1.0
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Version	V1.0

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1. Component Description

NOVAAS is an open-source implementation of the RAMI4.0 Asset Administration Shell concept. The Asset Administration Shell (AAS) is a key concept within the context of the Industrial Internet of Things (IIoT) and Industry 4.0. It is a standardized framework for describing and managing industrial assets and their digital representations ("data image" of the asset) in a way that enables seamless interoperability between various components and systems in industrial environments. The AAS is used to digitalize any physical asset in order to be integrated seamlessly into and I4.0 compliant system. Briefly, the AAS implements the Digital Twin concept for Industry 4.0. NOVAAS is currently compliant with the V2 specification of the AAS. We are now working on giving support to the newer V3 specification of the AAS. The tool is implemented using the next-generation software development principles i.e. using low/no code platforms, microservices and APIs and containers. In the context of RE4DY the NOVAAS will be used for designing and developing I4.0 compatible Digital Twins. It will be used to provide and harmonized and standardized connection to the physical asset within a manufacturing production system. Moreover, NOVAAS can be used to run AI algorithms at the edge for several applications such as quality inspection, predictive maintenance, dashboarding etc. Finally, the NOVAAS (as an implementation of the AAS concept) will enable the creation of data pipelines for seamless data flows across the production lifecycle (Digital Thread).

2. Input

The tool has a user interface available on ip:port/ui that shows the description of the physical asset in terms of submodels and related properties. The submodels and properties can be used to model both static and dynamic information. Each property can be semantically describe using the concept description class (this is also shown within the UI). The UI also provides plotting capabilities. It allows to plot the real time data extracted from the physical asset.
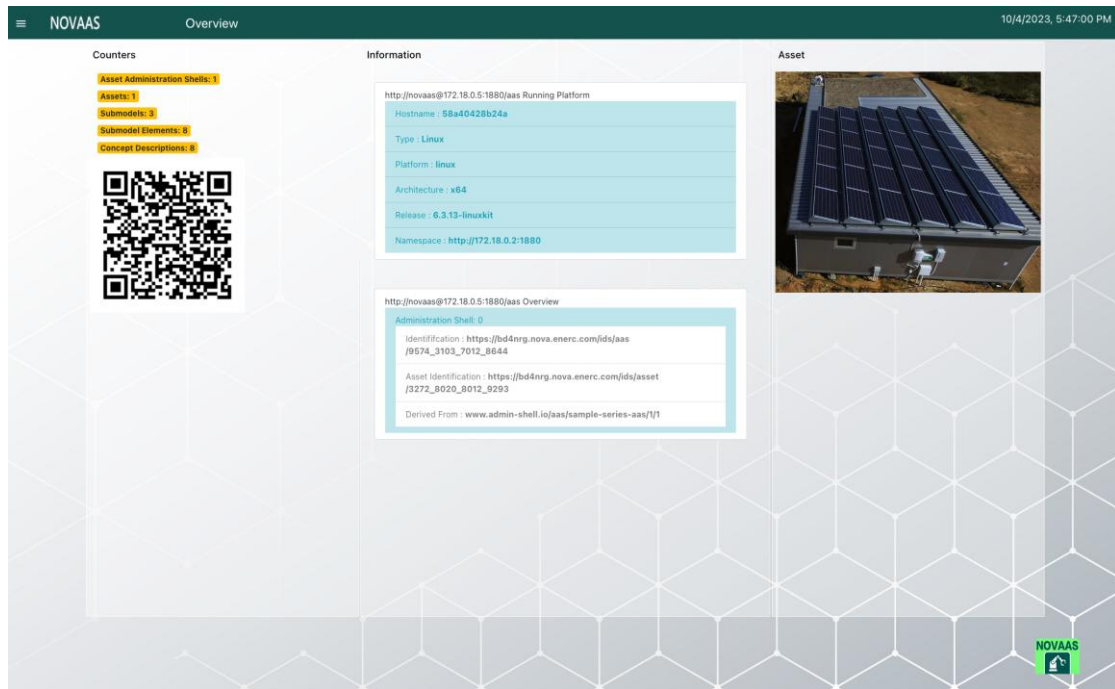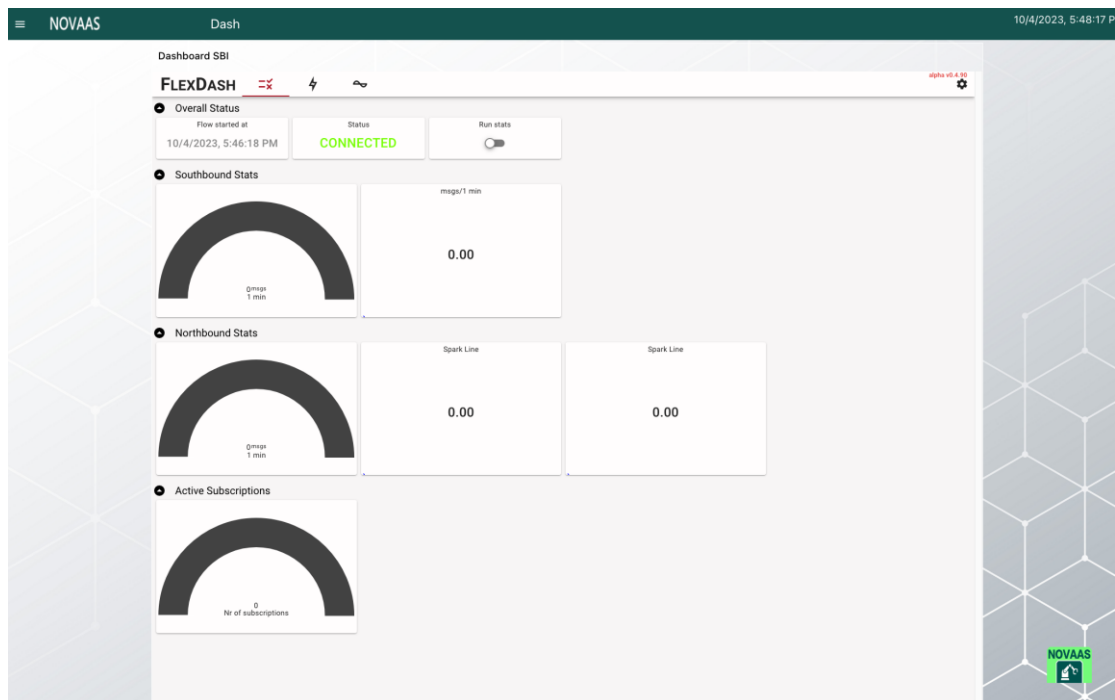
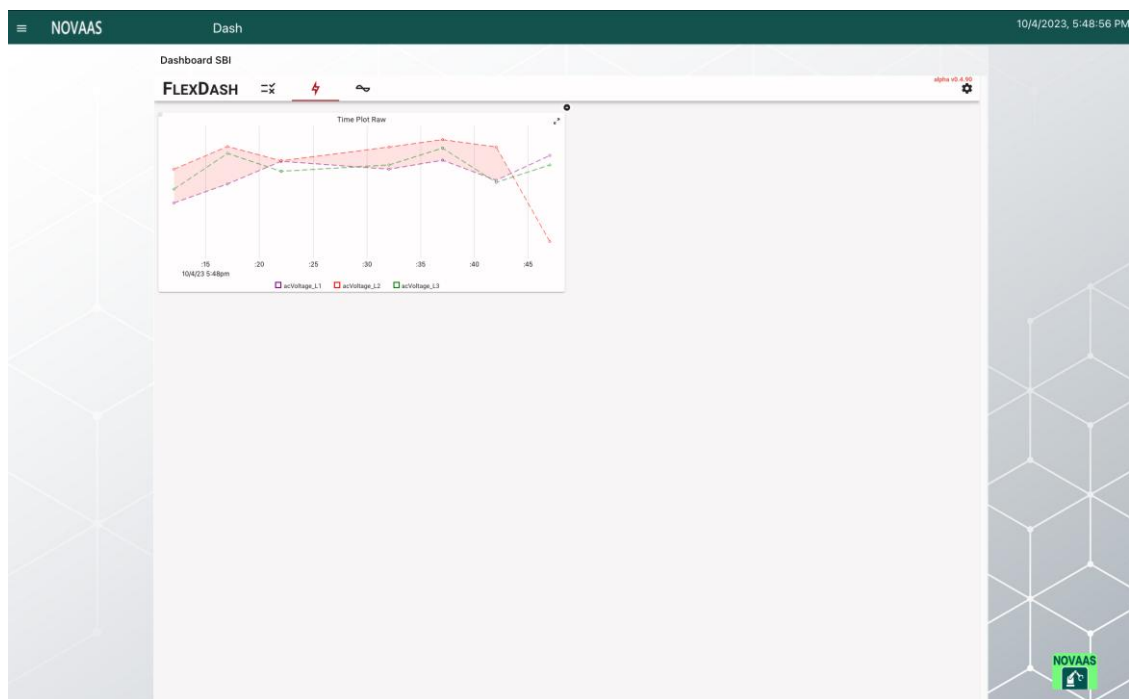*Figure 1 User interface*

Figure 2 User interface

Figure 3 User interface

The backend of the tool is accessible by using the ip:port link (see the image below)


Figure 4 Tool backend

The tool is totally generic; however, it requires the development of a simple connector to enable the connection with the asset. The technology used depends on the asset, however the tool supports a large number of connectors (ROS, Modbus, OPC-UA, MQTT, HTTP, etc) basically the whole ecosystem provided by Node-Red (that is the development platform).

3. Output

- All the data from the asset can be accessed by using the REST API (standardized API)
- Event based communication is also supported. The technology adopted is MQTT and the events are following the V2 AAS specifications.
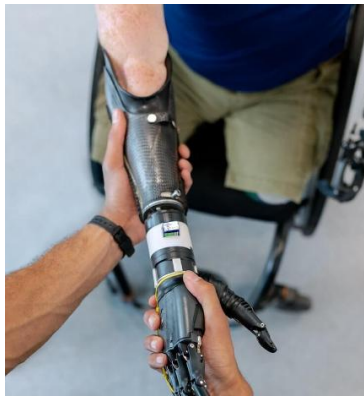
4. Internal Architecture

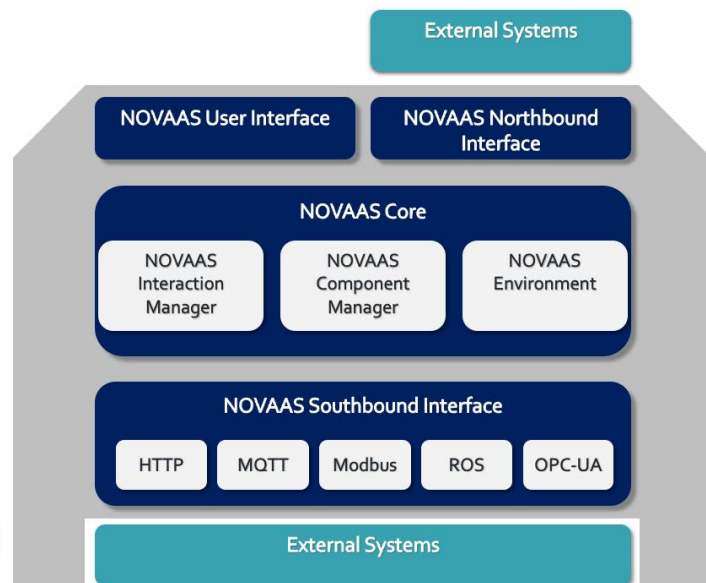*Figure 5 NOVAAS Internal Architecture*

5. API

- The API is documented in V2 AAS specifications that can be retrieved from: https://industrialdigitaltwin.org/en/
- Internally the API is also documented using a swagger plug in

6. Implementation Technology

- Node-RED: Node-RED is an open-source flow-based development tool and runtime environment for connecting hardware devices, APIs, online services, and various software applications. It provides a visual programming interface that allows users, often referred to as "makers" or developers, to create and deploy Internet of Things (IoT) applications and automation tasks without the need for extensive coding. Node-RED is a flow-based, visual development platform and runtime environment that simplifies the creation of IoT applications and automation workflows. It offers a web-based, drag-and-drop interface for building and connecting nodes (blocks) that represent different

functions and devices. These nodes can include data sources, data processors, output actions, and more. Users can create complex workflows by connecting these nodes in a visual manner, and Node-RED handles the underlying logic and communication between components.

- Javascript: most of the more complex logic is implemented using javascript;

Platform:

NOVAAS has been built since the very beginning to be cloud-native.

- Kubernetes
- Docker

7. Comments

No comment.