Dublin — June 20-23, 2022

## Design and implementation of a smart orchestrator for deploying enablers in NGIoT environments

Dr. Alejandro Fornés (UPV) Mr. Francisco Mahedero (Developer, UPV) Mr. Rafael Vañó (Developer, UPV)

**GLOBAL VISION:** 

IoT TODAY AND BEYOND



## Motivation



#### **NGIOT** is the natural evolution of IoT:

- It involves key enablers, such as Edge computing, 5G, AI and analytics, AR and Tactile Internet and DLT, among others
- It focuses on more advanced data processing architectures, enabling real-time actions
- It brings the human in the loop
- It promotes smart autonomy + context & location awareness of IoT solutions
- It prioritizes security and trust
- It needs to meet privacy and ethical principles

#### More nodes, more applications, more services, more data

### Motivation



# The ASSIST-IoT Smart Orchestrator aims at facilitating the deployment of NGIoT services and applications in decentralized environments



#### **Design: Technologies**





#### **Design: Components diagram**





## **Implementation: API**





#### API

The enabler has a management API that provides a flash-based REST interface that can be interacted with to configure certain values.

#### **4 API calls groups**

- K8s Clusters
- Repositories
- Enabler (workloads)
- Login

### **Implementation: Scheduling policies**



	Most resources	The clusters are sorted according to the available resources, and the one with the most resources is selected for placement
	Least resources	The cluster with least available resources is selected first
	Most traffic	It checks the network activity of clusters to identify and select those working at the edge or closer to it
Y.	TODO	Additional policies are envisioned, e.g., for selecting clusters with acceleration capabilities (GPU)





<ul> <li>8</li> <li></li> </ul>	<ul> <li>Enablers management</li> <li>Helm Charts repositories</li> </ul>	Enablers management / Enabler list Enabler list ID Name K8s cluster Operational status Detailed status Created Actions											
<b>W</b>	Enabler list	bc59f83b-c37c-4d40-a184-20979925882c		vpn		running	Done	6/16/2022 11:18:25 AM		• •			
````` →- ×	Add a new enabler					Add a new enabler		Filas por página:	10 👻	1-1 de 1	< >	>	
Name test	2		Helm chart repository iotweek-repotest	•		iw cluster							
Enabler		1											
dasl	hboard		Placement policy										
ltse openIdap		Worst fit	•										
pror	netheus-federate												
prue	ba												
				<u>hi</u>	Save	Cancel							



### **Pending features & conclusions**



- Some internal components still communicate with the outside without following the project encapsulation principles
- Re-scheduling of enablers
- Additional policies for automatic scheduling
- Refinement of the API
- The Smart Orchestrator is a Cloud-Native tool that ease the deployment of workloads and:
  - Can select a cluster autonomously based on policies, or fully manual
  - Can reduce attack surfaces by applying networking rules
  - Facilitates the configuration of workloads
  - Allows the execution of jobs for saving energy consumption



Dublin — June 20-23, 2022

# Thank you!

Find more: https://assist-iot.eu



in

@Assistlot

<u>/assistiot</u>

/assistiot

ASSIST-IoT Project

ASSIST-IoT H2020 Project

#### iotweek.org



This Communication is part of a project that has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement Nº957258