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

**Motivation**

- Lifecycle control of workloads
- Ease of use: manual and automatic deployment options
- High configurability for tailoring workloads
- Reduction of attack surfaces
- Energy saving features
Design: Components diagram

API

Scheduler

mck8s

Metrics-Server

API database

mangoDB.

Orchestrator

cilium

Open Source MANO
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

<table>
<thead>
<tr>
<th>Policy</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most resources</td>
<td>The clusters are sorted according to the available resources, and the one with the most resources is selected for placement</td>
</tr>
<tr>
<td>Least resources</td>
<td>The cluster with least available resources is selected first</td>
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<tr>
<td>Most traffic</td>
<td>It checks the network activity of clusters to identify and select those working at the edge or closer to it</td>
</tr>
<tr>
<td>TODO</td>
<td>Additional policies are envisioned, e.g., for selecting clusters with acceleration capabilities (GPU)</td>
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</tbody>
</table>
Implementation: Graphical User Interface
Implementation: Video demo
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
Thank you!

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