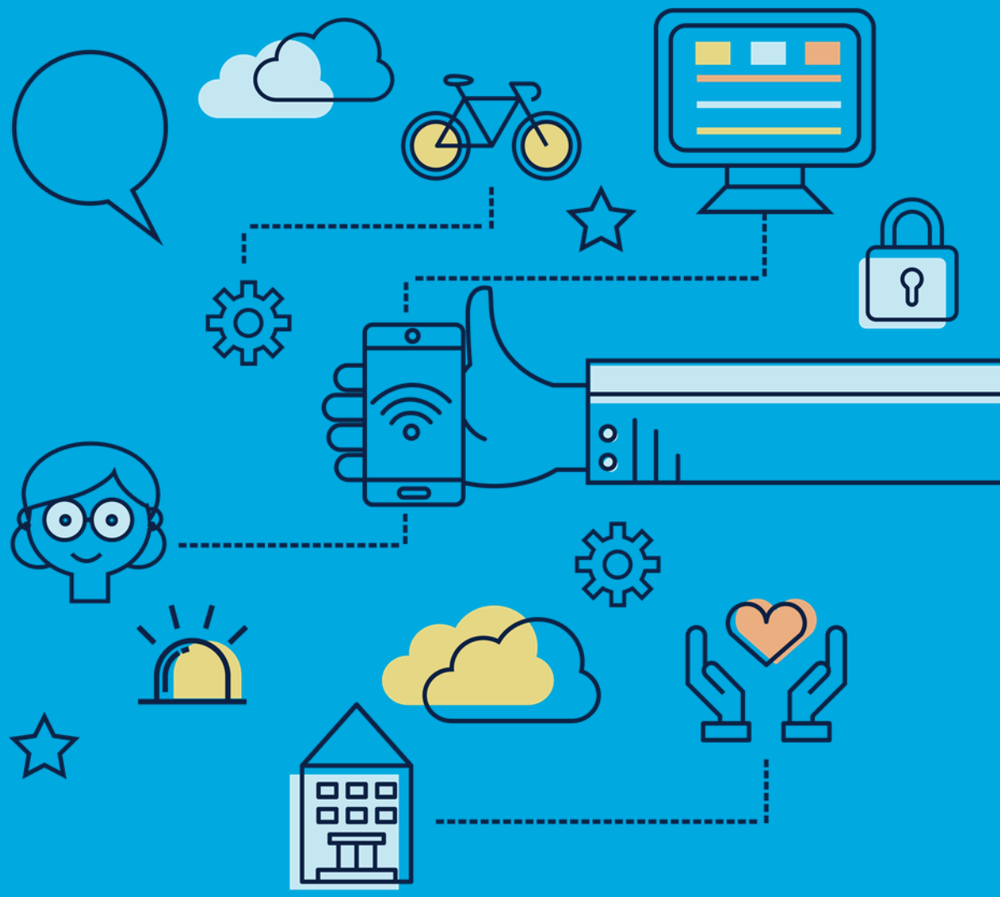
Welcome to ACTIVAGE Project:

Technology breakthrough for IoT for Smart Living Environments (SLE)



Author: Sergio Guillén Barrionuevo

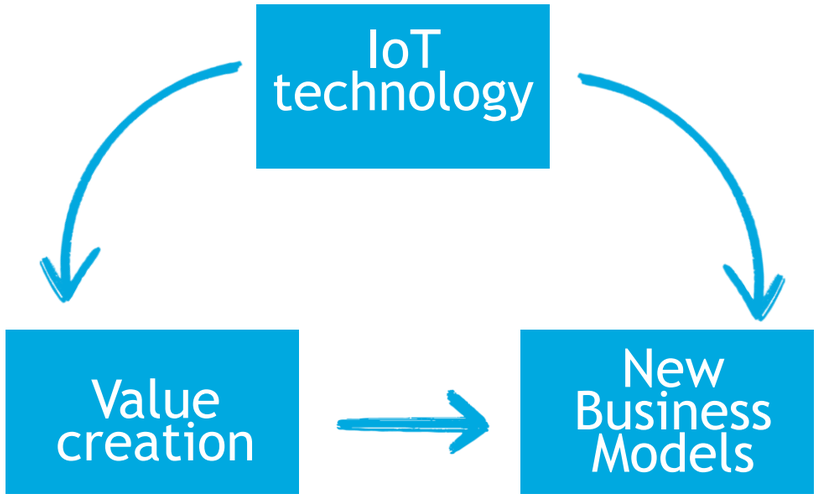
ACTIVAGE Project Coordinator from MYSPHERA

ACTIVAGE PROJECT

Breaking barriers for a sustainable Active and Healthy Ageing through IoT technologies

ACTIVAGE IoT ECOSYSTEM

A single common
interoperable
ACTIVAGE IoT Ecosystem



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ACTIVAGE IN NUMBERS

50 partners

7 countries

9 pilots

>200 ACTIVAGERS

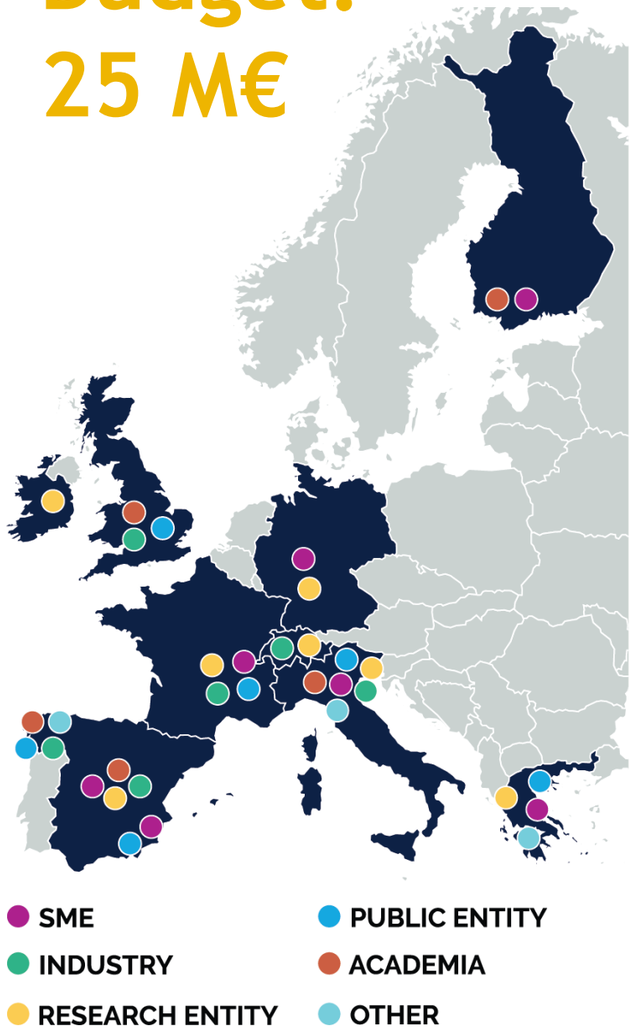
07.00 users

11 Reference Use cases

25 Supply partners

22 Demandp artners

Budget: 25 M€



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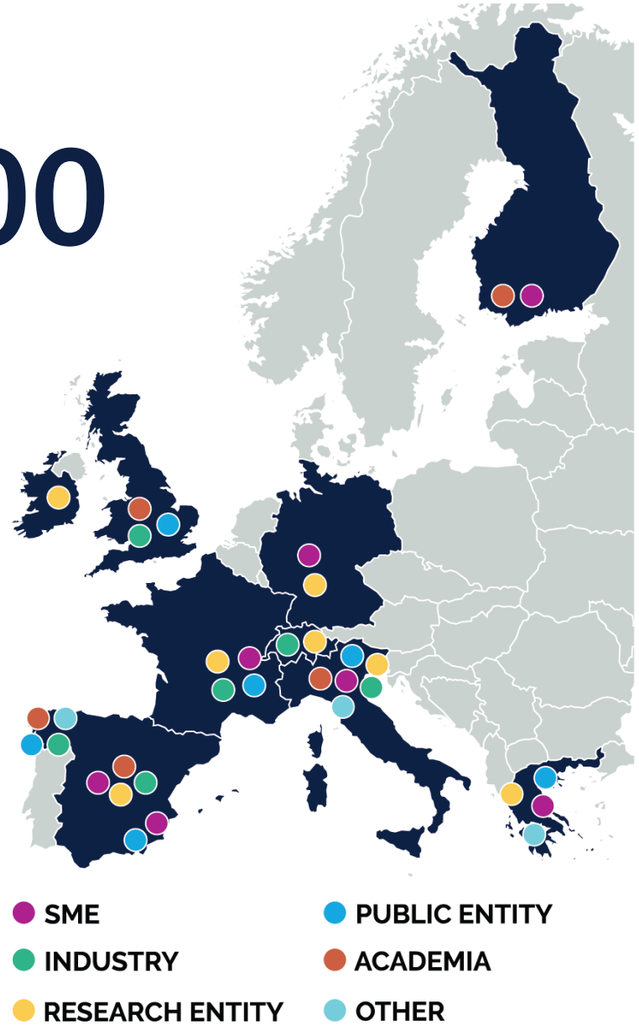
ACTIVAGE IN NUMBERS

5
IoT platforms

> 40.000
devices

One

IoT for SLE Ecosystem



- FIWARE
- universAAL
- SOFIA 2
- SENSINACT
- IoTIVITY

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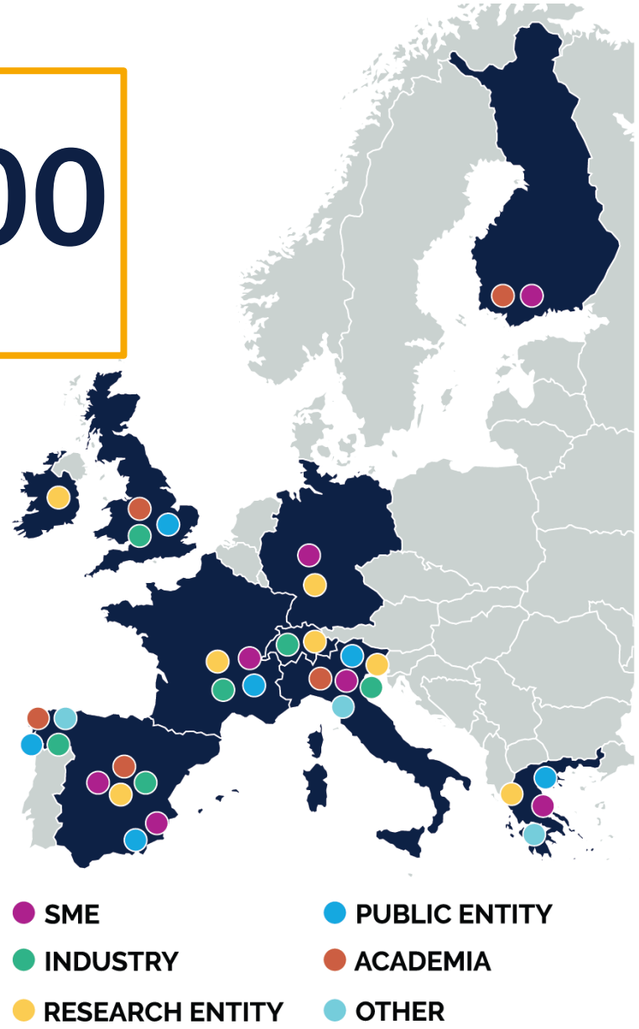

- Ambient Sensors
- Medical devices
- Wearables
- Environment
- Activity

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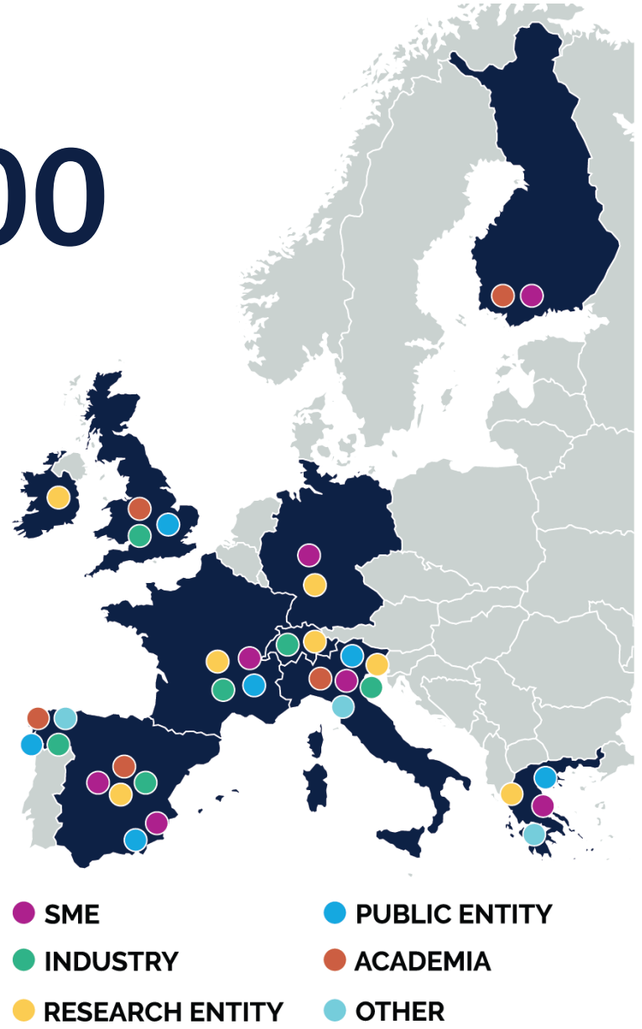

AIOTES

ACTIVAGE IoT ECOSYSTEM SUITE

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PANEL OF ACIVAGE DESIGNERS

ALEJANDRO MEDRANO – POLITECHNIC UNVERSITY OF MADRID

IoT Cluster Coordinator.

ACTIVAGE's reference architecture for semantic interoperability in an IoT for SLE ecosystem

Experience of ACTIVAGE in deploying AIOTES in 9 Deployment Sites in Europe

CLARA VALERO – POLITECHNIC UNVERSITY OF VALENCIA

Interoperability layer design and development

Semantic Interoperability Layer (SIL) implementation

STEFANOS STAVROTHEODOROS - Centre for Research and Technology Hellas (CERTH)

AIOTES Service Layer design and development

Techniques, tools and methodologies supporting the IoT for SLE ecosystem

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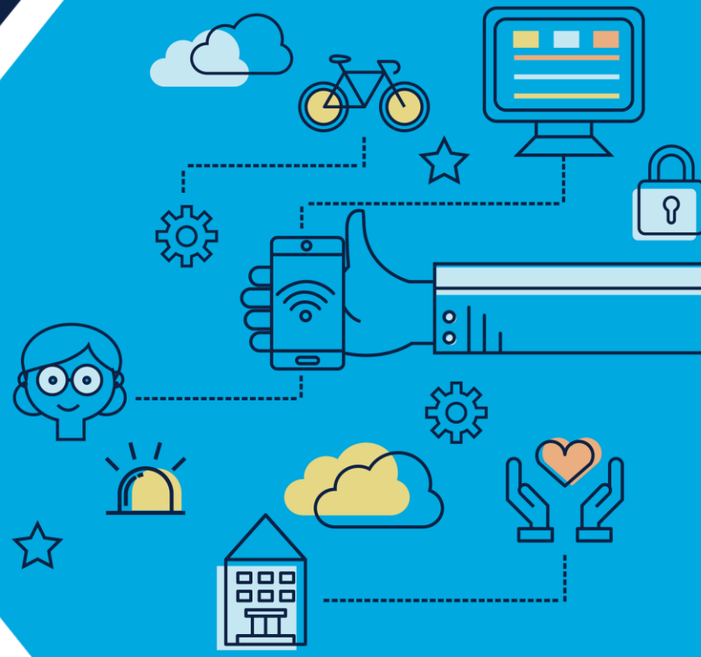
ACTIVAGE's reference architecture for semantic interoperability in an IoT for SLE ecosystem



Alejandro Medrano – UPM

INTEROPERABILITY PROBLEM

- Fundamental barrier of Internet of Things (IoT) ecosystems
  - Lack of interoperability across IoT platforms and things
  - Each IoT platform talk its own “language”

- An common language is needed

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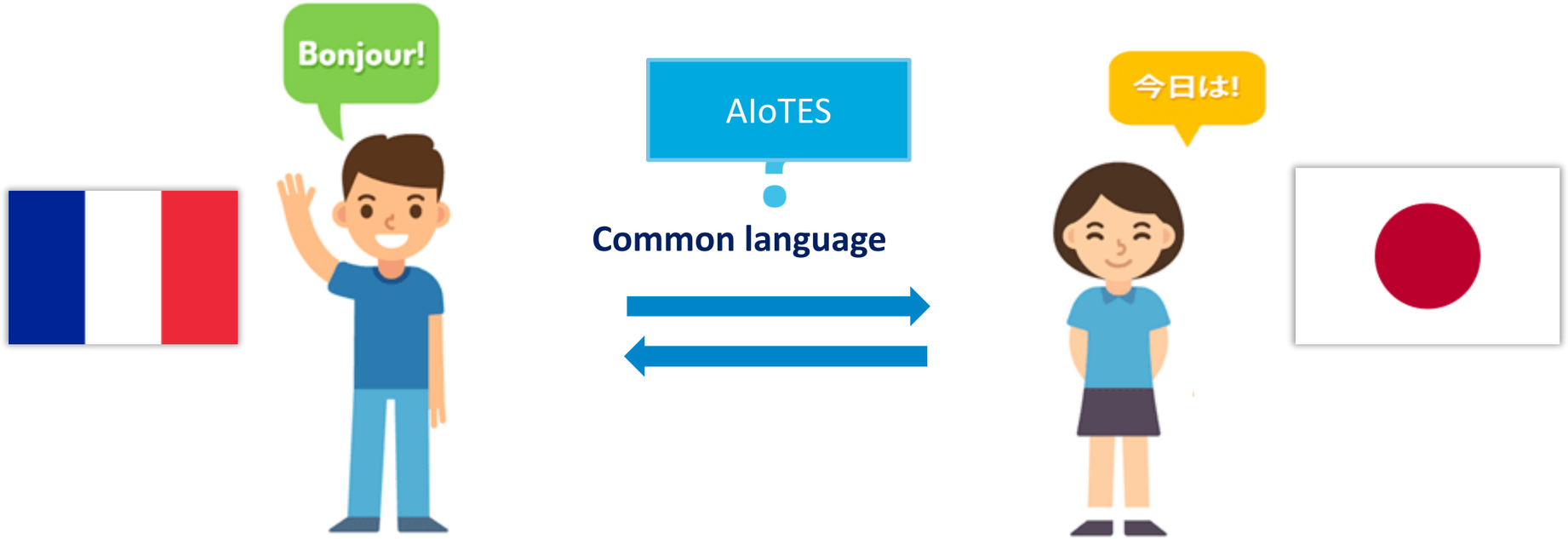
WHAT IS AIoTES?

- ACTIVAGE IoT Ecosystem Suite
- It's a **framework**, a software that allows data sharing from different platforms
- Building IoT solutions upon AIoTES will solve the interoperability problem.



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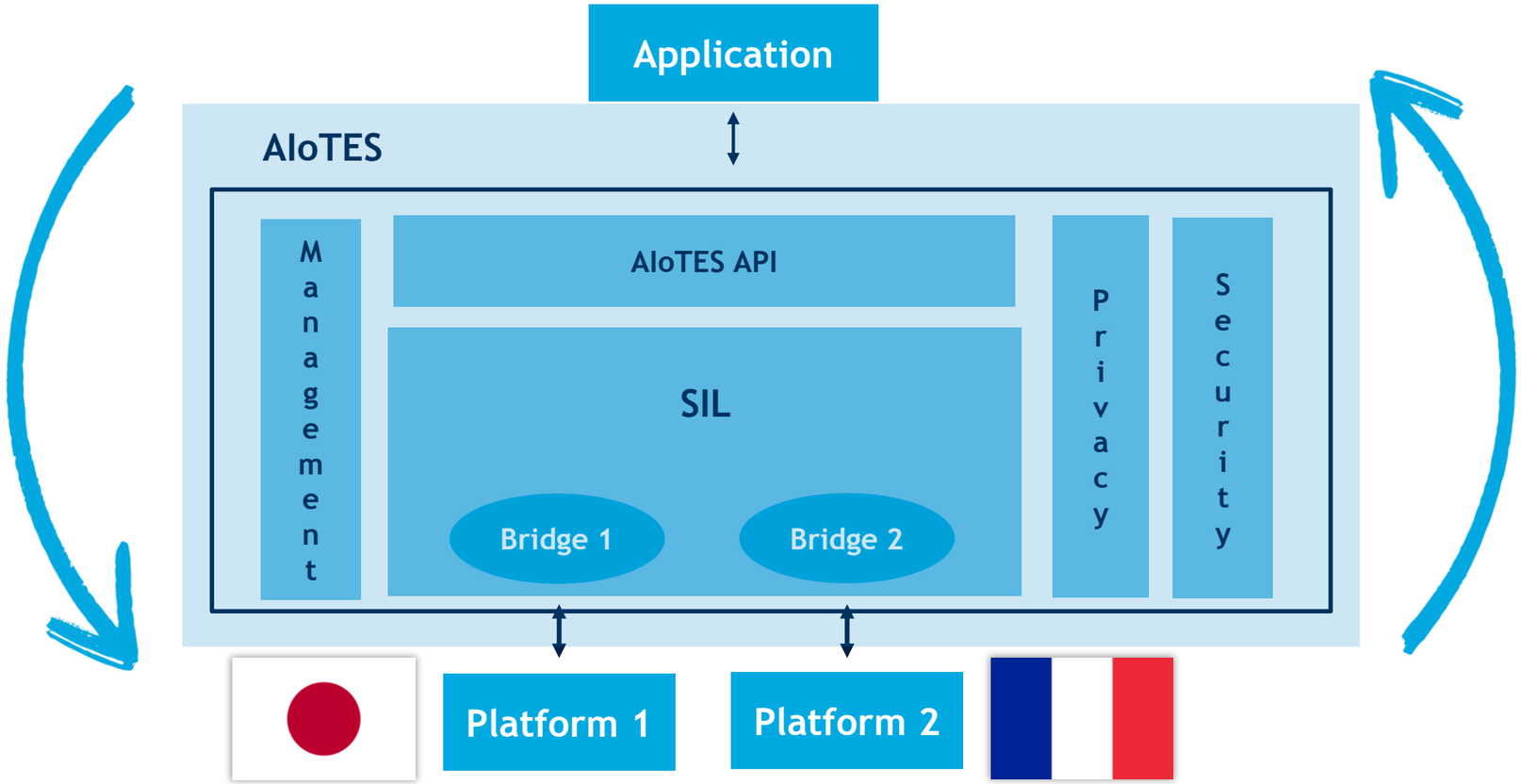
WHAT IS AIoTES?
ARCHITECTURE

- Allows the establishment of an **abstraction layer** between the deployment Sites and the applications.



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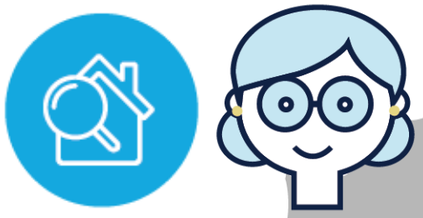
INTEROPERABILITY OF DEPLOYMENT SITES



- Maria lives in Galicia
- She is a dynamic, independent and cheerful person
- She likes to live on her own, at her house, but she needs some health monitoring

ACTIVAGE Smart sensors In her house allow her to stay safely at her home

Galicia Deployment Site uses SOFIA2 and FIWARE

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INTEROPERABILITY OF DEPLOYMENT SITES

- Mario loves tranquility, good memories and pasta.
- He likes to be at home and prepare his own macarroni.
- Monitoring sensors allow him to stay at home alone in a safe way.

The Smart Home and Medical Smart Devices of Mario, in Parma, use UNIVERSAAL and FIWARE

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INTEROPERABILITY OF DEPLOYMENT SITES

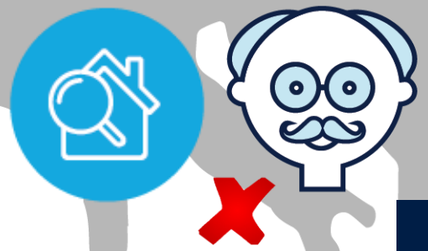
APP RED CROSS

- Red Cross has an application for health emergencies.
- This application was created to work with OpenIoT sensors in Smart homes.
- Unfortunately, it doesn't work with other platforms.

ACTIVAGE PROJECT

- **ACTIVAGE makes it possible to allow AHA applications to work with any platform**
- **The Red Cross emergency application now works for Maria and Mario, through AIoTESc**

Galicia Deployment Site uses SOFIA2 and FIWARE



The Smart Home and Medical Smart Devices of Mario, in Parma, use UNIVERSAAL and FIWARE

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INTEROPERABILITY ILLUSTRATIVE BENEFITS

- For AHA solution deployers

  “I can update my installation, including a new IoT platform, transparently, with no service interruption regarding the already running apps.”

  “I can pick any existing apps used in any of the 8 other deployment sites from the AIOTES marketplace and make it run in my DS”

- For AHA app developers

  “The app I developed for this particular AIOTES compliant IoT platform can operate on the top of the AIOTES framework “

  “So I can propose my application to any AIOTES compliant DSs.”

  “I develop once / I can deploy everywhere”

- For IoT platform developers

  “Other AIOTES ready IoT platforms interoperate mutually with mine, and independently from mine:”

  “My IoT platform eco-system remains”

  “Improvements of your IoT platform improve also mine”

Final benefit => Mutualize efforts / Enlarge the AHA ecosystem

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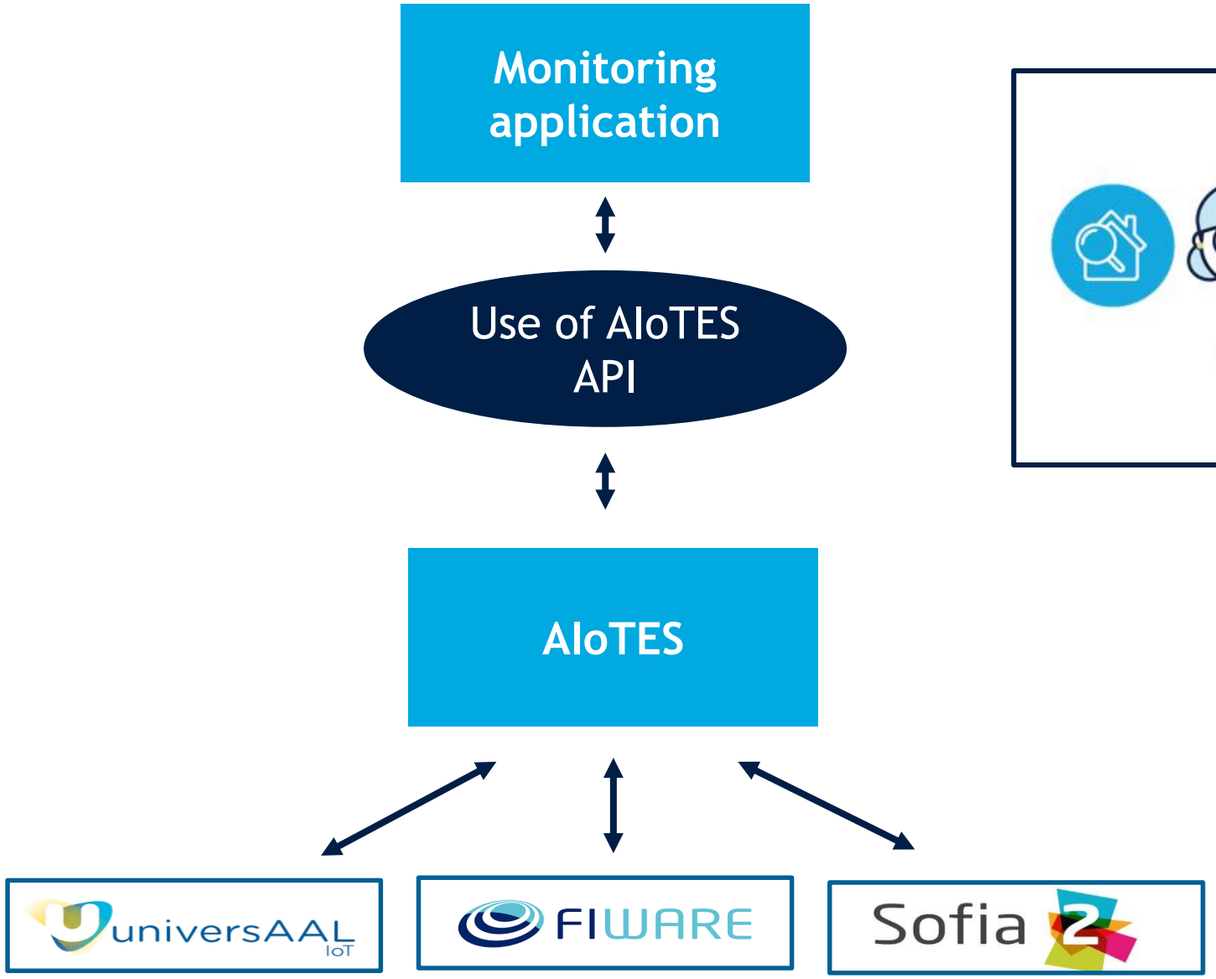
INTEROPERABILITY OF DEPLOYMENT SITES



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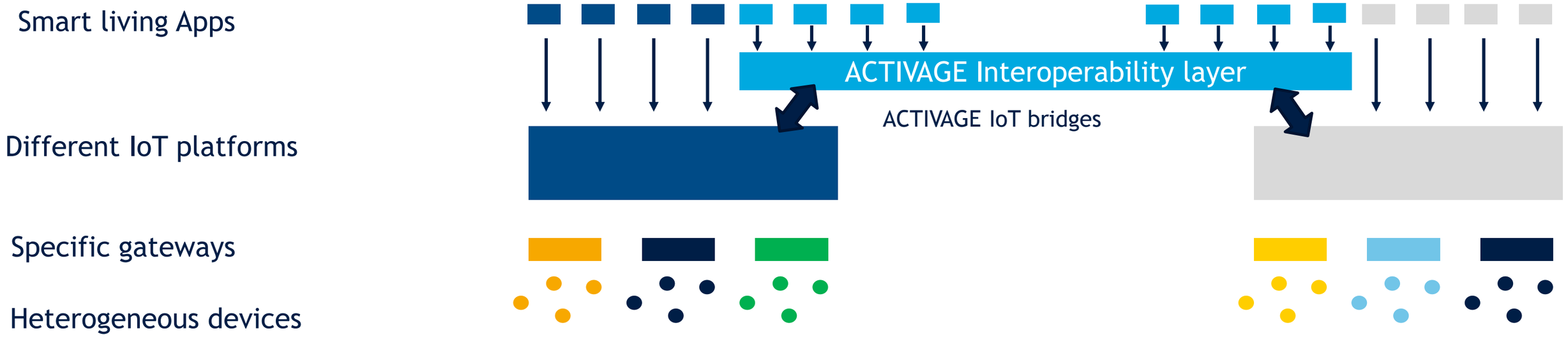
INTEROPERABILITY CONCEPT



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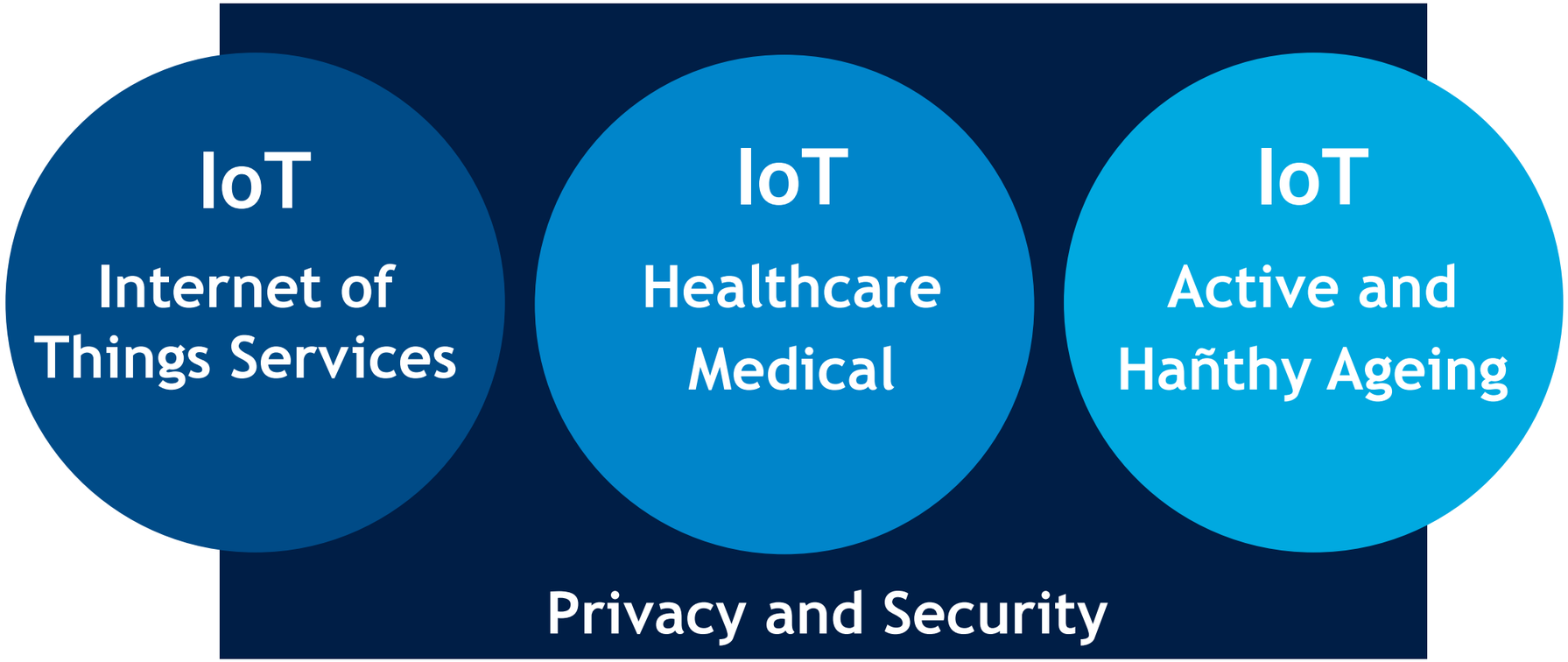
AIOTES DATA MODEL



- ACTIVAGE Core
  - GIoTP,
  - OpenIoT,
  - FIESTA-IoT,
  - BIG-IOT,
  - WGS84,
  - W3C SSN/SOSA,
  - IoT-lite,
  - M3-lite,
  - DUL,
  - Time
- AHA
  - Wearables

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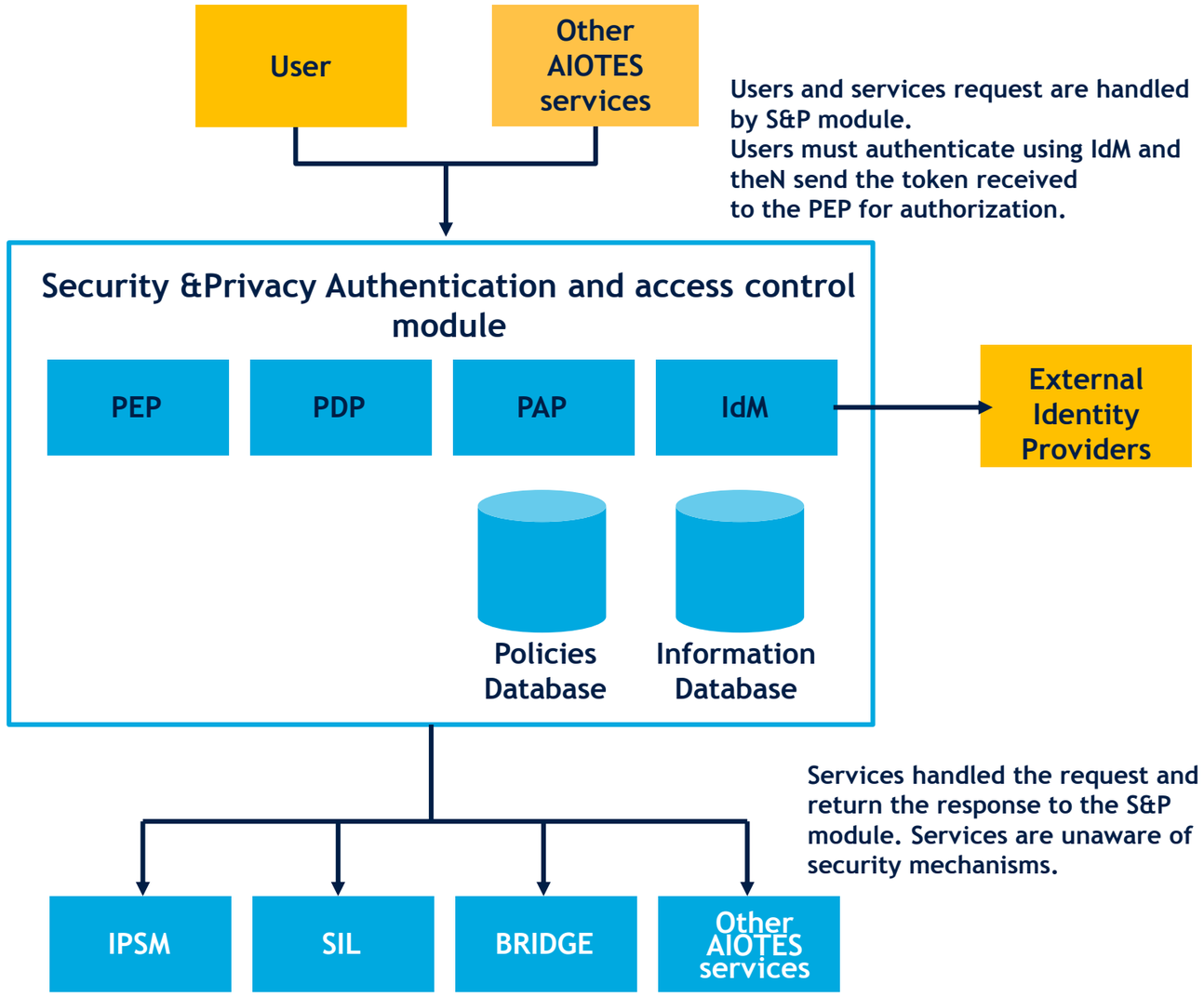
SECURITY



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PRIVACY
GDPR AND REQUIREMENTS

- **GDPR**
  - **Protection of natural persons with regard to the processing of personal data and on the free movement of such data,**

- Requirements: Meet in particular the **principles of data protection by design** and **data protection by default.**

  - **Minimising the processing of personal data,**
  - **Pseudonymising personal data as soon as possible,**
  - **Transparency with regard to the functions and processing of personal data,**
  - **Enabling the data subject to monitor the data processing,**
  - **Enabling the controller to create and improve security features.**

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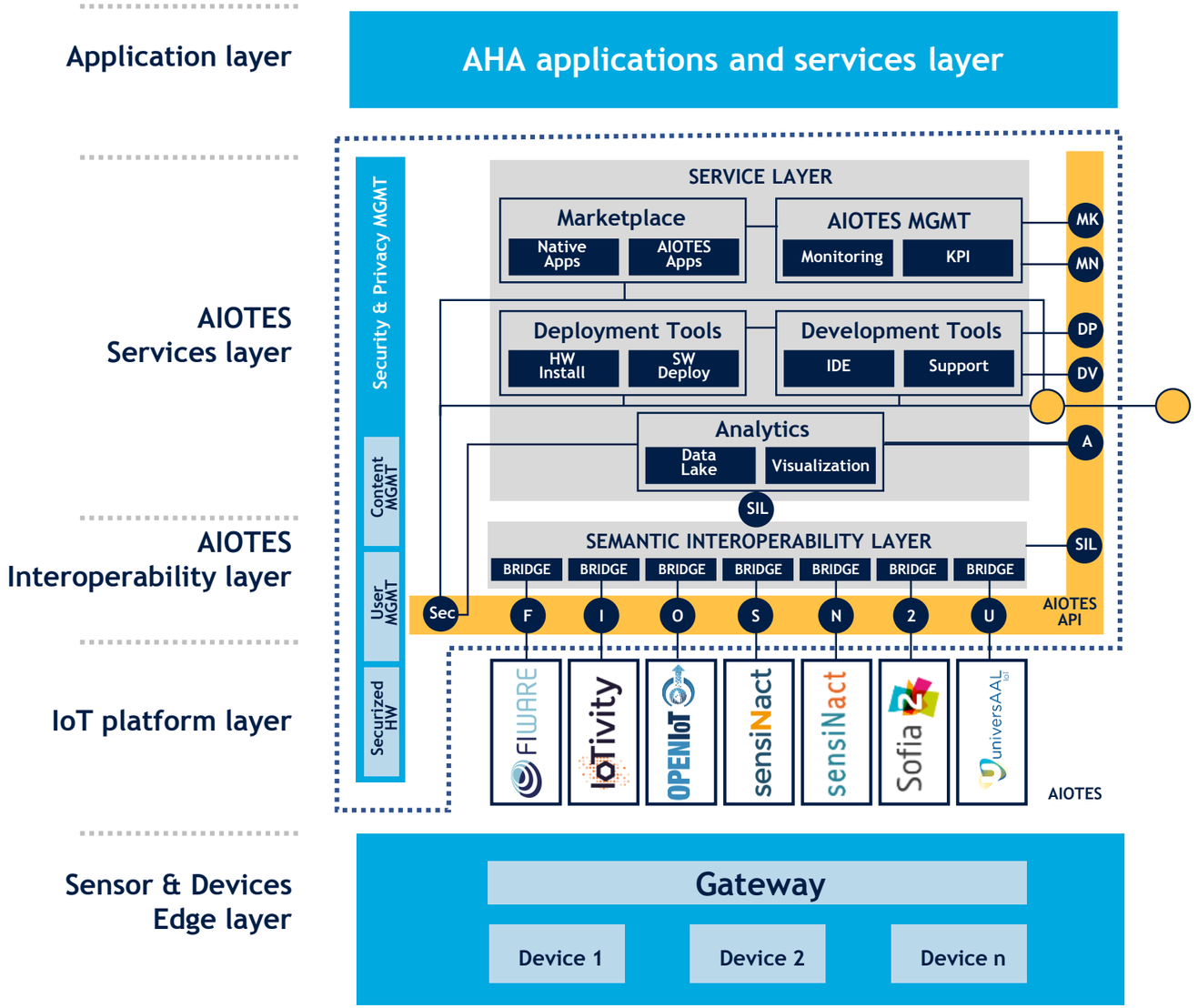
AIoTES ARCHITECTURE



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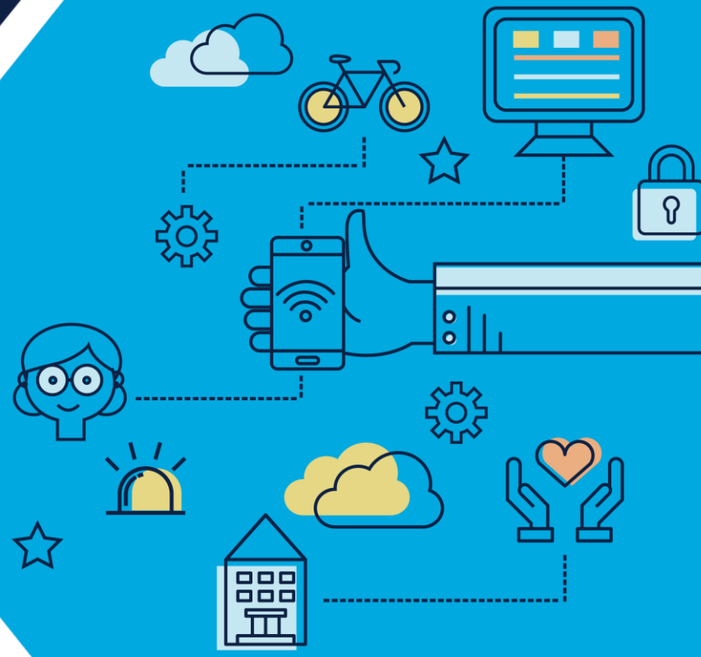
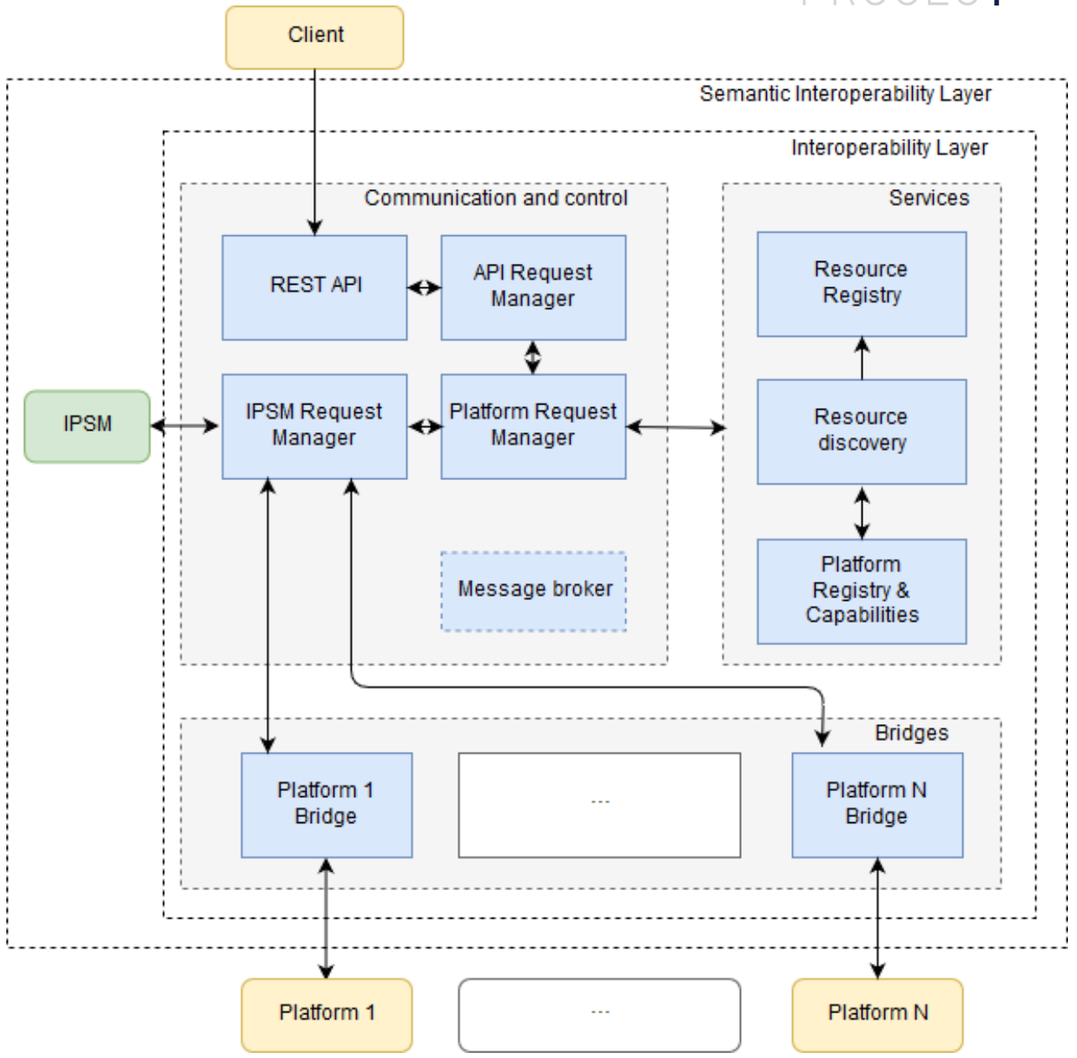
Semantic Interoperability Layer (SIL) implementation



Clara Isabel Valero - UPV

SIL IMPLEMENTATION
ARCHITECTURE

- Provides interoperability among IoT Middleware platforms.
- Scalable architecture.
- Interoperability Layer
  - Communication and control
  - Platform bridges
  - Services
- Semantic Interoperability Layer
  - Interoperability Layer
  - IPSM



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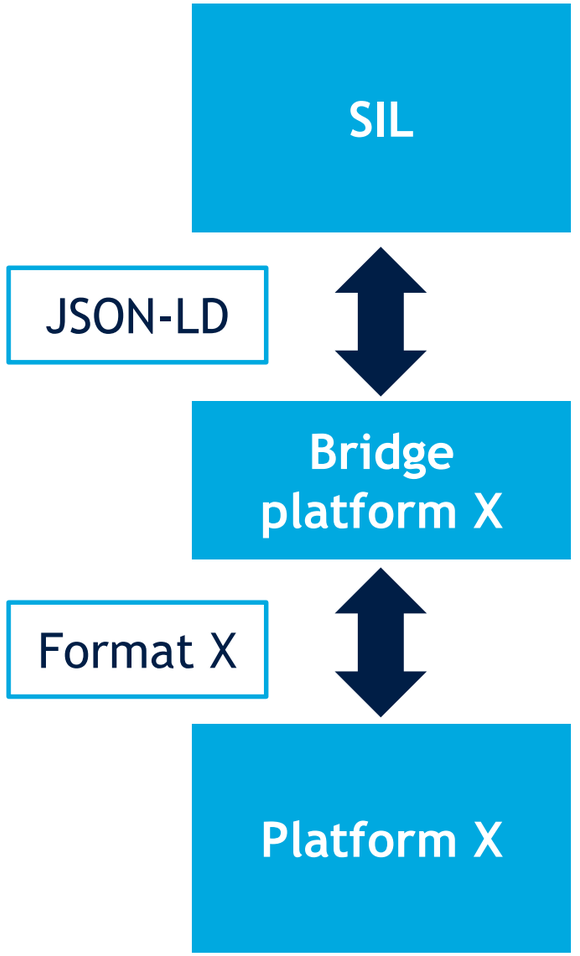
SIL IMPLEMENTATION
SYNTACTIC INTEROPERABILITY: PLATFORM BRIDGES

- Act as a middleman between the SIL and IoT platforms.
- Platform specific.
- Each bridge should implement the a set of common features.
- Allow effective decoupling at both conceptual and implementation level.
  - The addition of a new platform does not require any changes in the implementation of already existing bridges.



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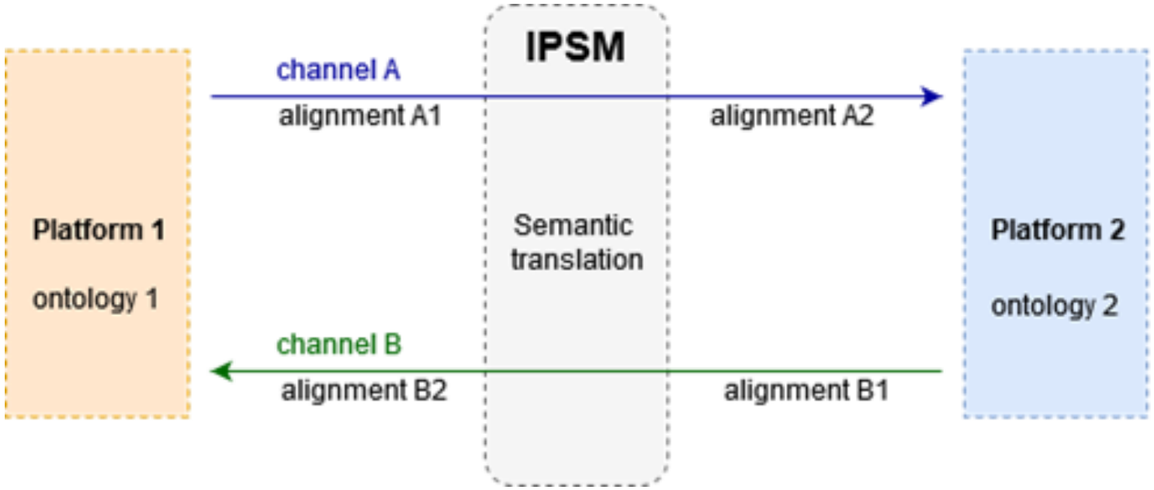
SIL IMPLEMENTATION
SEMANTIC INTEROPERABILITY: IPSM

- Each DS uses its own platform and data model.
  - Syntactic conversion not enough.
  - The meaning of the information from an IoT platform cannot be understood by another platform.

- Semantic translation is performed by IPSM component.

- Configuration: upstream and downstream alignments.



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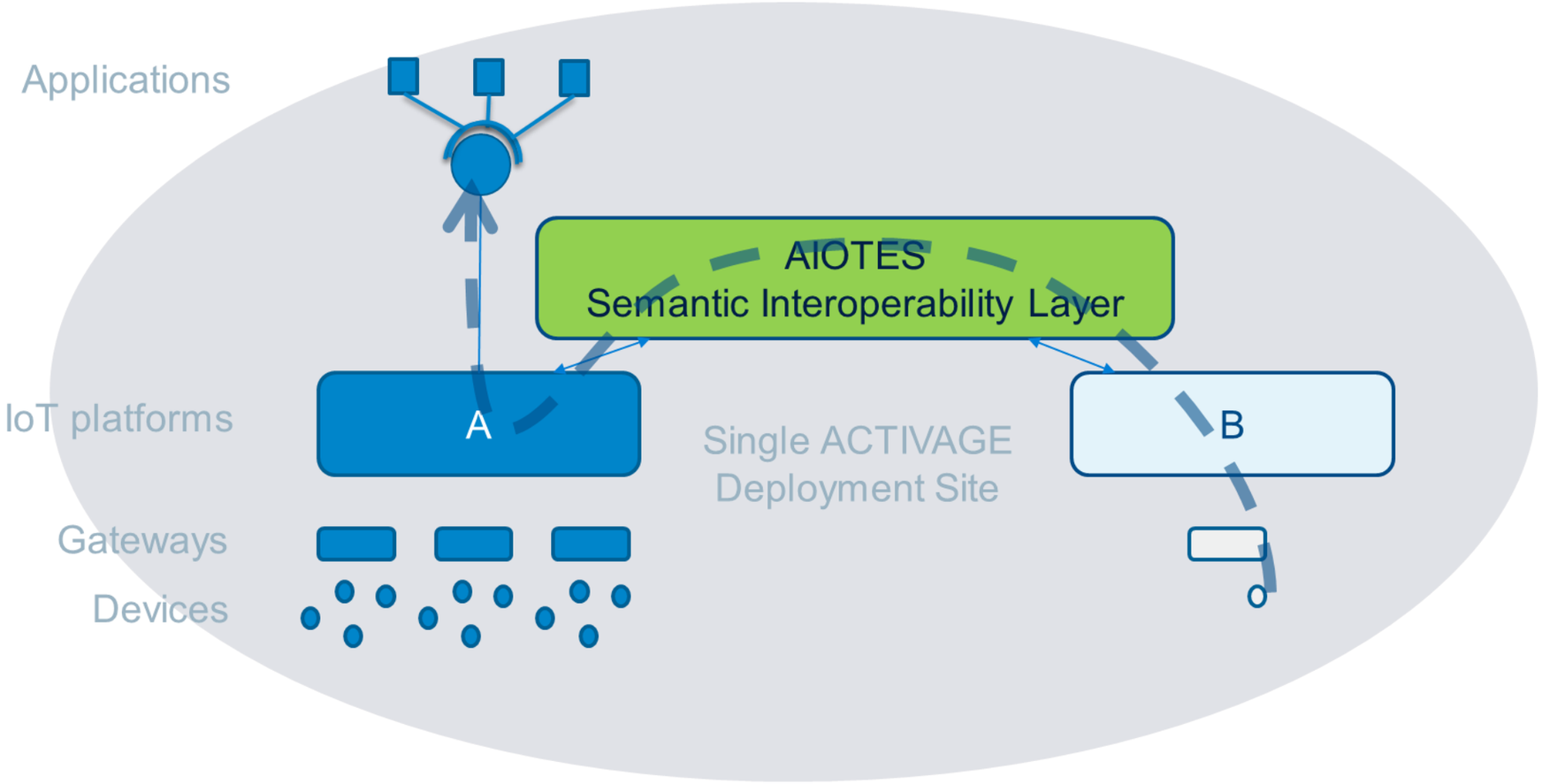
SIL IMPLEMENTATION
INTEROPERABILITY USE CASE 1



Third-party HW devices

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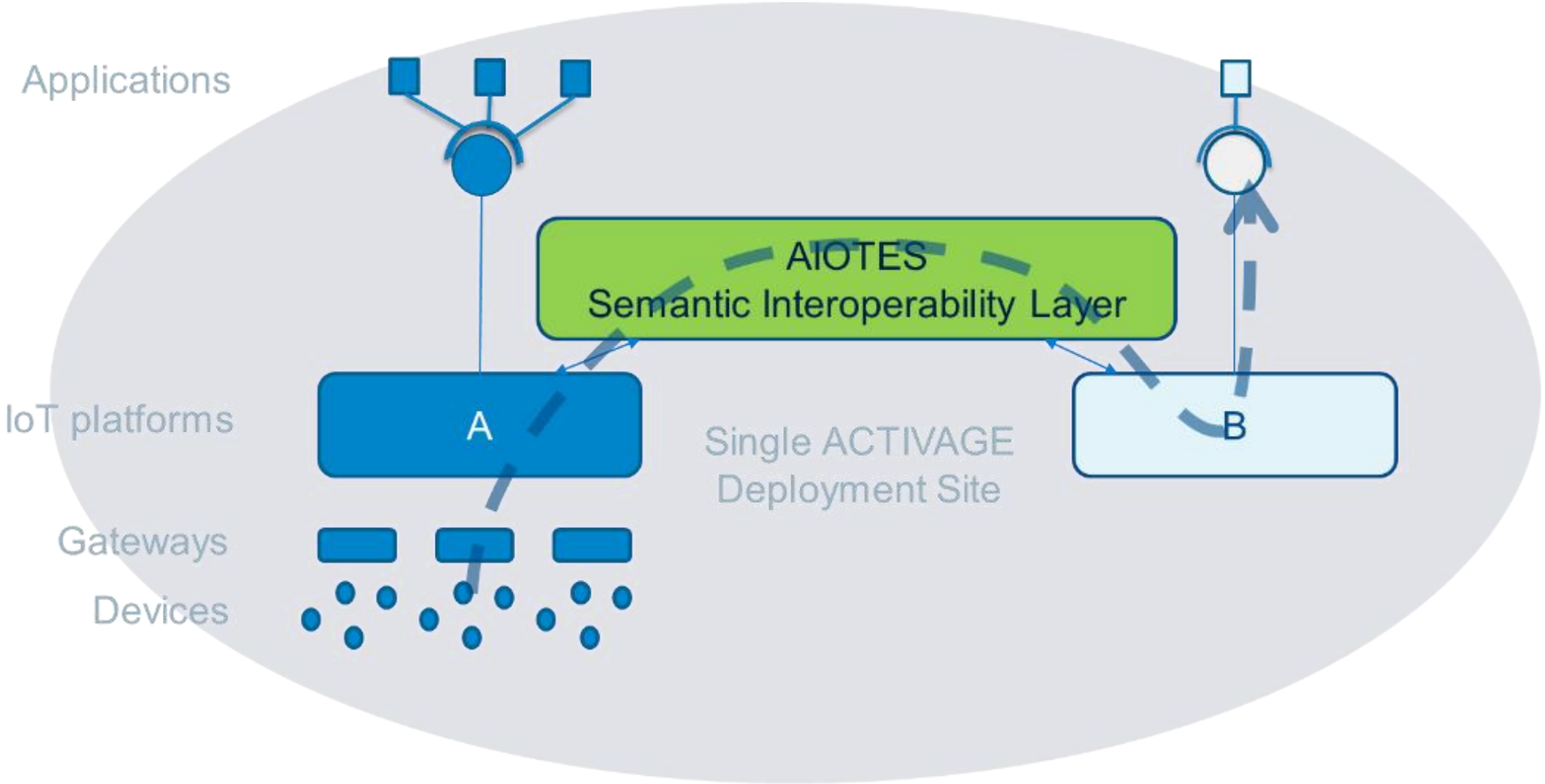
SIL IMPLEMENTATION
INTEROPERABILITY USE CASE 2



Third-party applications

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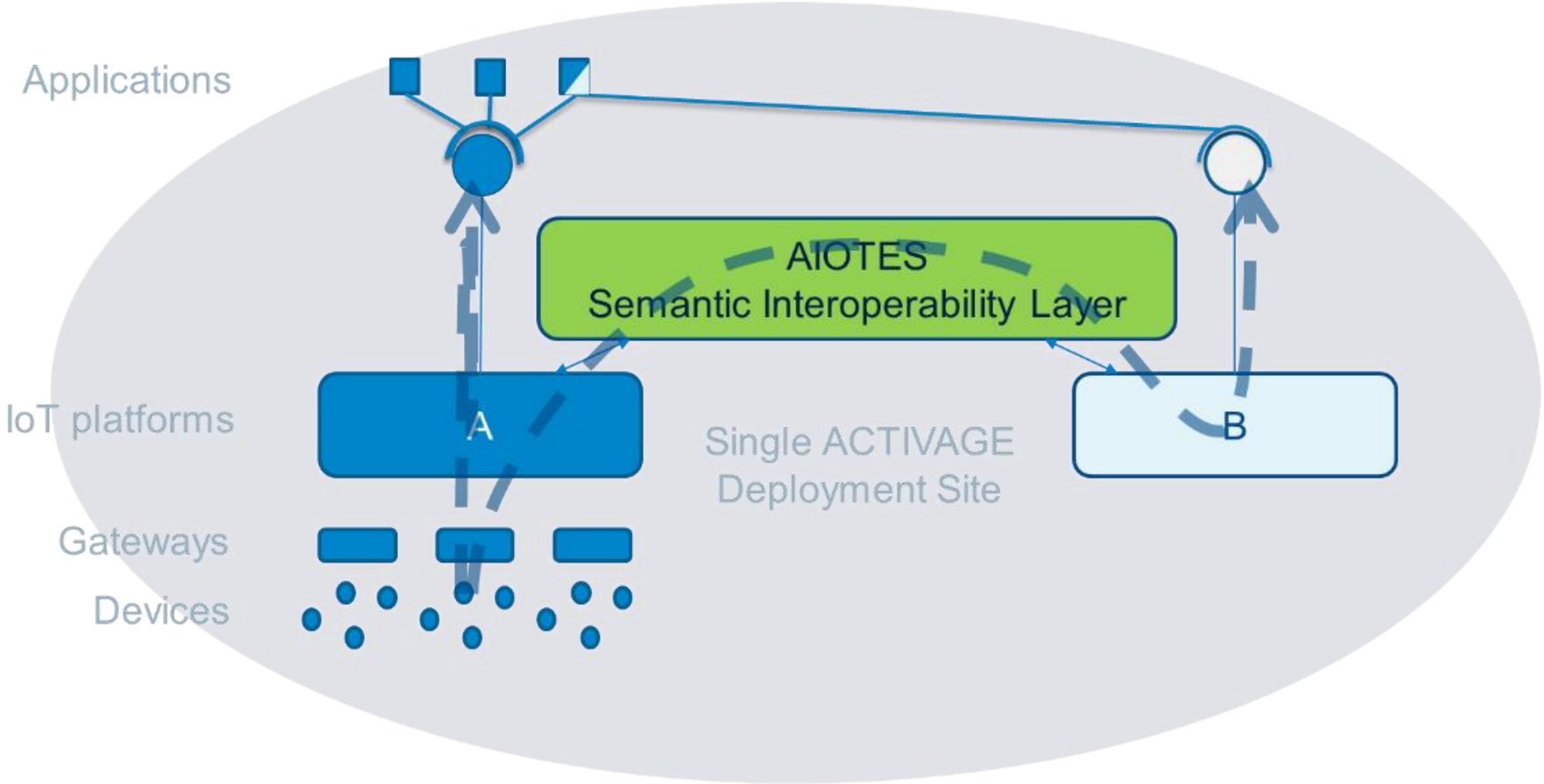
SIL IMPLEMENTATION
INTEROPERABILITY USE CASE 3



Multiplatform applications

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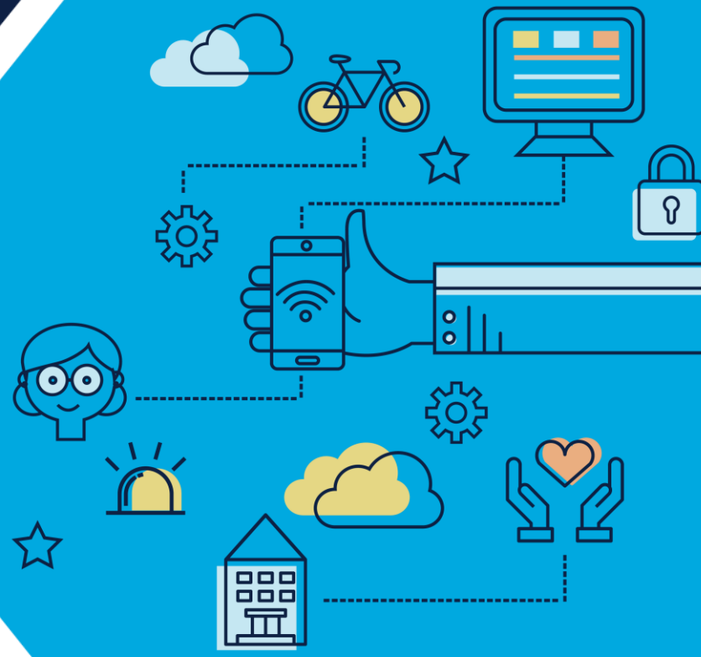
ACTIVAGE PROJECT

Techniques, tools and methodologies supporting the IoT for SLE ecosystem



Stefanos Stavrotheodoros – CERTH

SERVICE LAYER
INTRODUCTION

The **Service Layer** is at the top of the AIoTES architecture, providing functionalities and tools that allow the usage of core components such as the SIL. It consists of the following components:

- **Development tools**, which provide tools to assist the development of applications on top of AIoTES
- **Deployment tools**, which provide tools to assist the deployers and administrators of installations and deployment sites
- **Marketplace**, which provides an access point for new users and developers to discover existing services and applications and advertise their own
- **Data Layer Support** Tools
  - **Data Lake**, which provides access to integrated raw data and stored analytics metadata.
  - **Data Analytics**, which provides methods of data analysis.
  - **Visual Analytics**, which provides methods for data visualization.

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DEVELOPMENT TOOLS
DESCRIPTION

- The ACTIVAGE development tools offer means to facilitate the design, the implementation and test of new AHA IoT applications.

SIL tools	Data Lake tools	Data / visual analytics tools	IDE tools	Support tools
AIOTES SIL tool	Data model workbench	Data analyser	AIOTES IDE	ACTIVAGE wiki
Ontology explorer	Metadata storage explorer	Data manipulator	Code generator	Wiki content
Device semantics editor		Visualization explorer	Service composer	Code samples
Service semantics editor		Feature / result viewer	ClickDigital	
Query translator			Source code templates	

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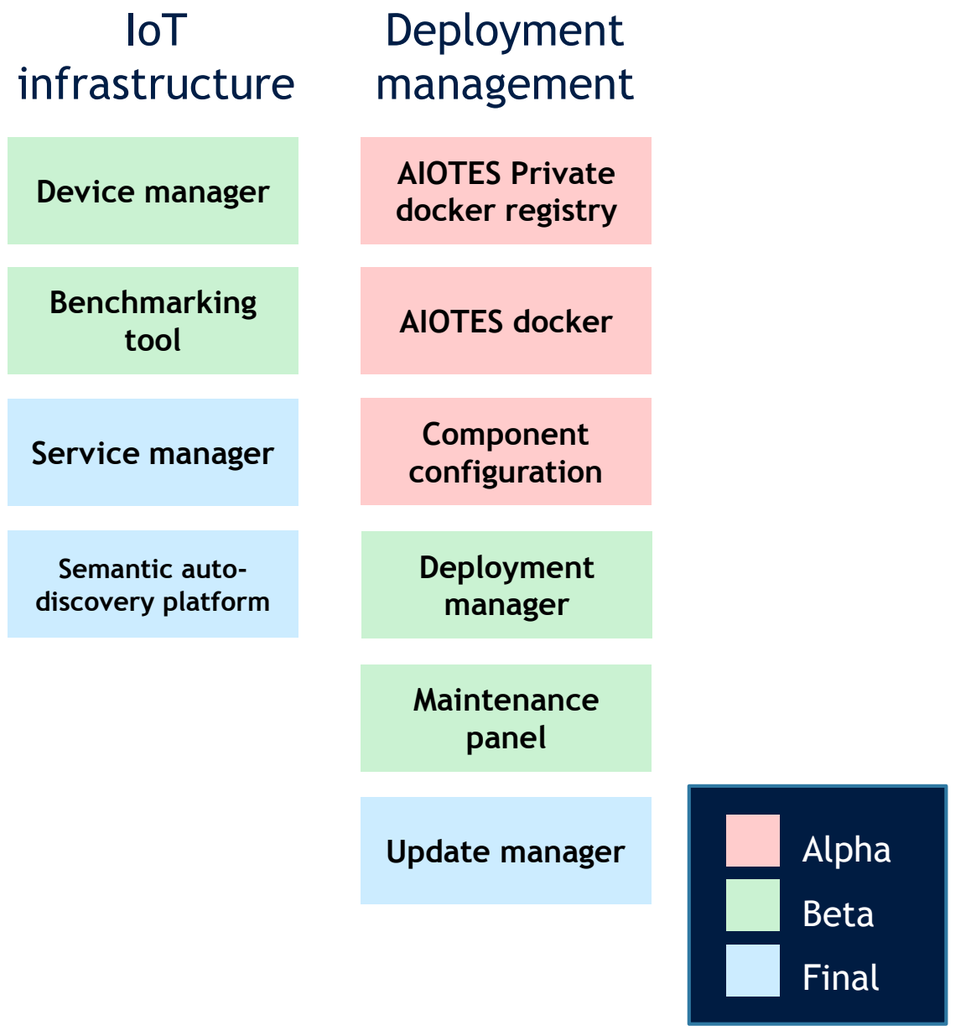
DEPLOYMENT TOOLS
DESCRIPTION

- The deployment tools aim to develop an infrastructure to assist deployers and administrators in setting up and configuring installations in Deployment Sites and deployment units



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MARKETPLACE
INTRODUCTION

- The ACTIVAGE IoT Marketplace is a **one-stop-shop** for all Active and Healthy Ageing (AHA) Applications based on any IoT Platform. Its purpose is to:
  - **Unify platform application ecosystems**
    - Those that have and those who do not have a marketplace
  - **Discover and get new applications, use across sites**
    - Deployment Sites
    - Third-parties
    - Grow the user ecosystem
  - **Attract new developers and publish new applications**
    - Monitor, manage and monetize them
    - Grow the developer ecosystem
    - Post-project sustainability

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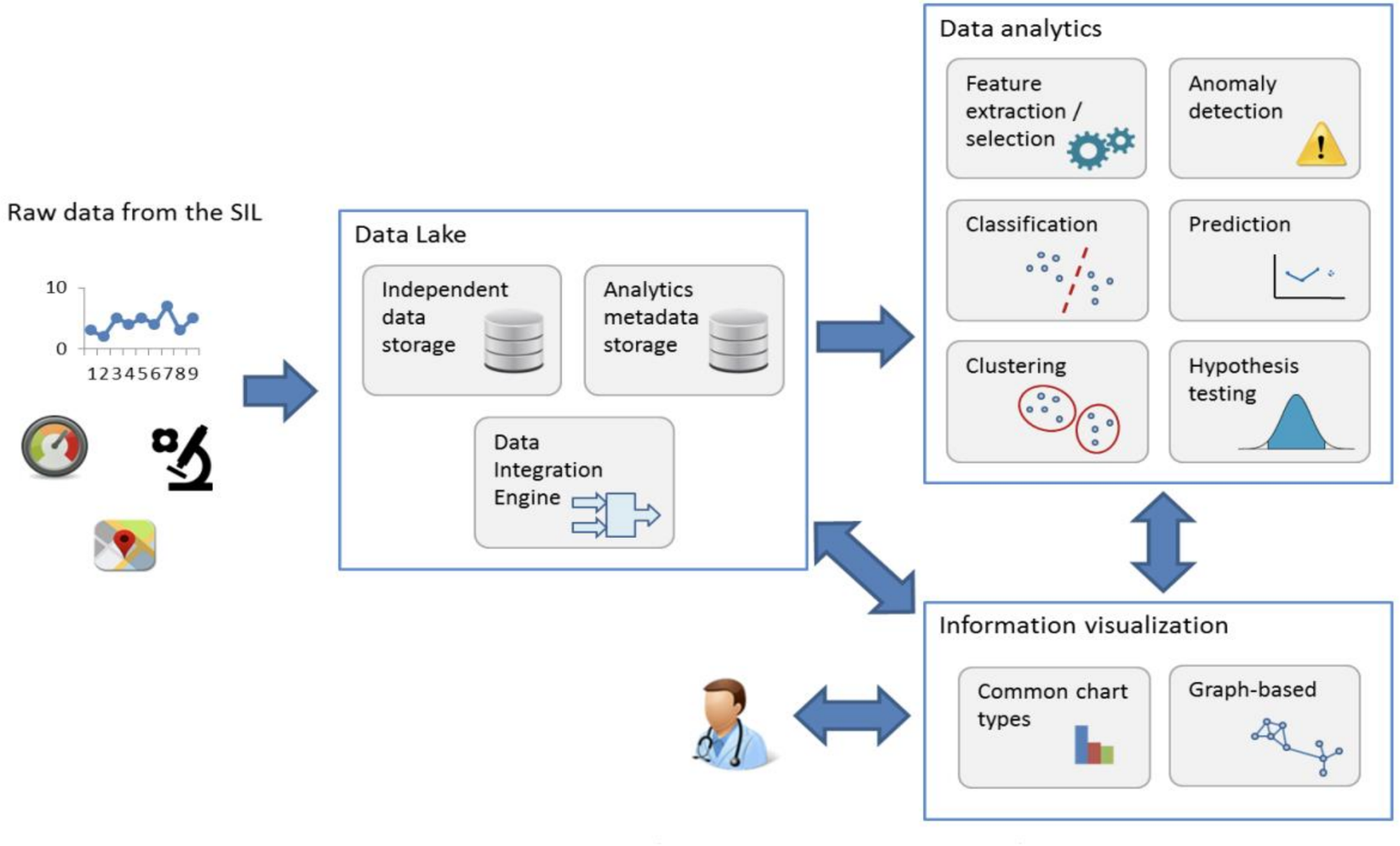
DATA LAYER SUPPORT TOOLS
FLOW



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DATA LAYER SUPPORT TOOLS
DATA LAKE

- The Data Lake provides access to all raw data collected by the IoT platforms, as well as to metadata generated and used by data analytics tools.

- The Data Lake consists of three components:

  - **independent data storage** for IoT platforms not having their own

  - **metadata storage** for trained models produced by the data analytics methods

  - **Data Integration Engine**, for providing access to the data collected in the distributed IoT

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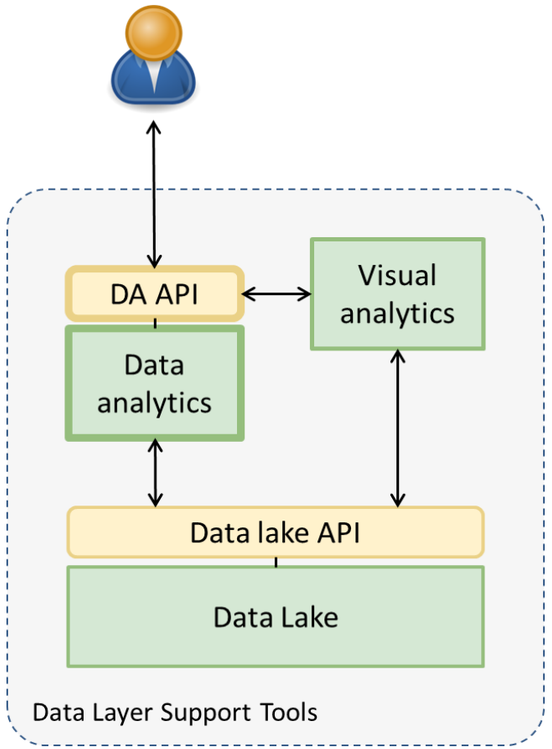
DATA LAYER SUPPORT TOOLS
DATA ANALYTICS

- Data analytics methods are used to automatically detect patterns in the data, and provide the operator with reduced and representative features and analysis results.
- It receives input directly from end-users in order to perform one of the provided types of analysis, selecting which data to use from the Data Lake, or data directly provided through the API.
- It exposes an API, through which the following types of analysis are supported:
  - Feature extraction
  - Feature selection
  - Anomaly detection
  - Prediction
  - Clustering
  - Hypothesis testing



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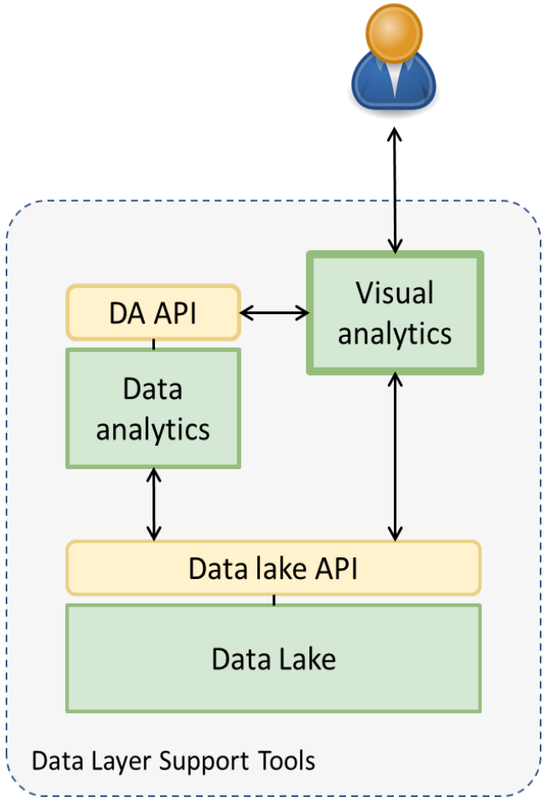
DATA LAYER SUPPORT TOOLS
VISUAL ANALYTICS

- The visual analytics component is a Web-based front-end component, supported by back-end services, offering a set of data visualization types and means for interacting with them.
- The end user communicates with the Visual Analytics component by interacting with its GUI.
- The Visual Analytics component communicates directly with the Data Lake component, in order to visualize the raw sensor data.
- It also communicates with the Data Analytics component, through the latter's API, in order to visualize the results of analyses



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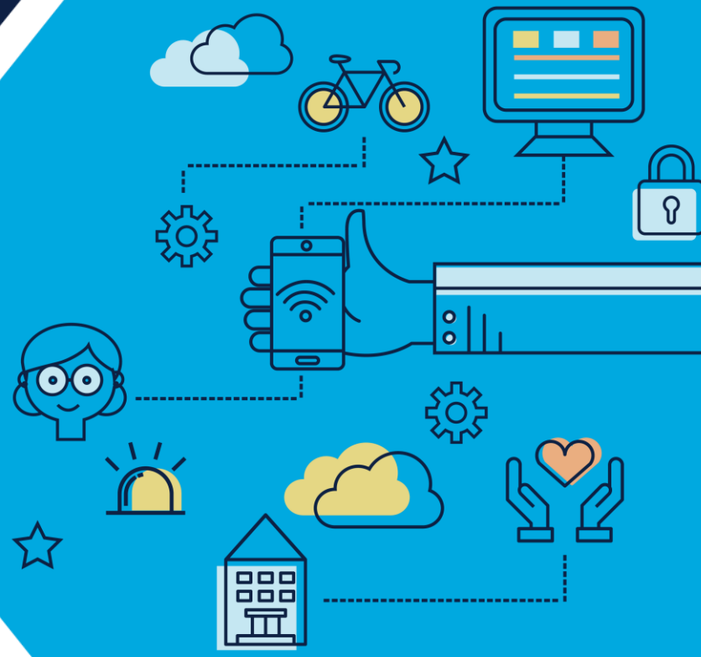
Experience of ACTIVAGE in deploying AIOTES in 9 Deployment Sites in Europe



Alejandro Medrano – UPM

Experience of ACTIVAGE in deploying AIOTES in 9 DS

PILOTS' CHALLENGES (OR HOW TO BUILD BRIDGES)

- **Sintactical Interoperability (AIOTES Bridge)**
  - Work for DS
  - Work for "local" platform
  - Generic enough for any DS
- **Semantic interoperability (AIOTES Data Model)**
  - Platform & Local Model
  - AHA & IoT Model
- **Business Interoperability (UC exchange)**
  - Services
  - Applications
  - Devices

Øresund Bridge

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Experience of ACTIVAGE in deploying AIOTES in 9 DS
PILOT STATUS

- AIOTES V1.5 is installed at least in testing environments
- “Local” Bridges deployed and configured
- Some initial tests with devices
- Ongoing Semantic alignments
  - AIOTES Data Model iterative releases
  - Extensive AHA Domain
  - Semantic interoperability definitions

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Experience of ACTIVAGE in deploying AIOTES in 9 DS

UC EXCHANGE

DS offering / DS testing	1 GAL	2 VAL	3 MAD	4 RER	5 GRE	6 ISE	7 WOQ	8 LEED	9 FIN
1 GAL									
2 VAL				Drugs consumption monitoring		House energy performance tracking, Social service		smartwatch for detection of falling	
3 MAD		Behaviour analysis @ Home							GoodLife TV Trainer
4 RER		*Visualization of behaviour patterns outdoors*						Step count for alert to physical changes	GoodLife TV Trainer
5 GRE	Behaviour analysis @ Home								
6 ISE			Balance Assessment and training				Bedsensor		
7 WOQ						Bedsensor			
8 LEED				Drugs consumption monitoring		House energy performance tracking			
9 FIN			Brain training game						

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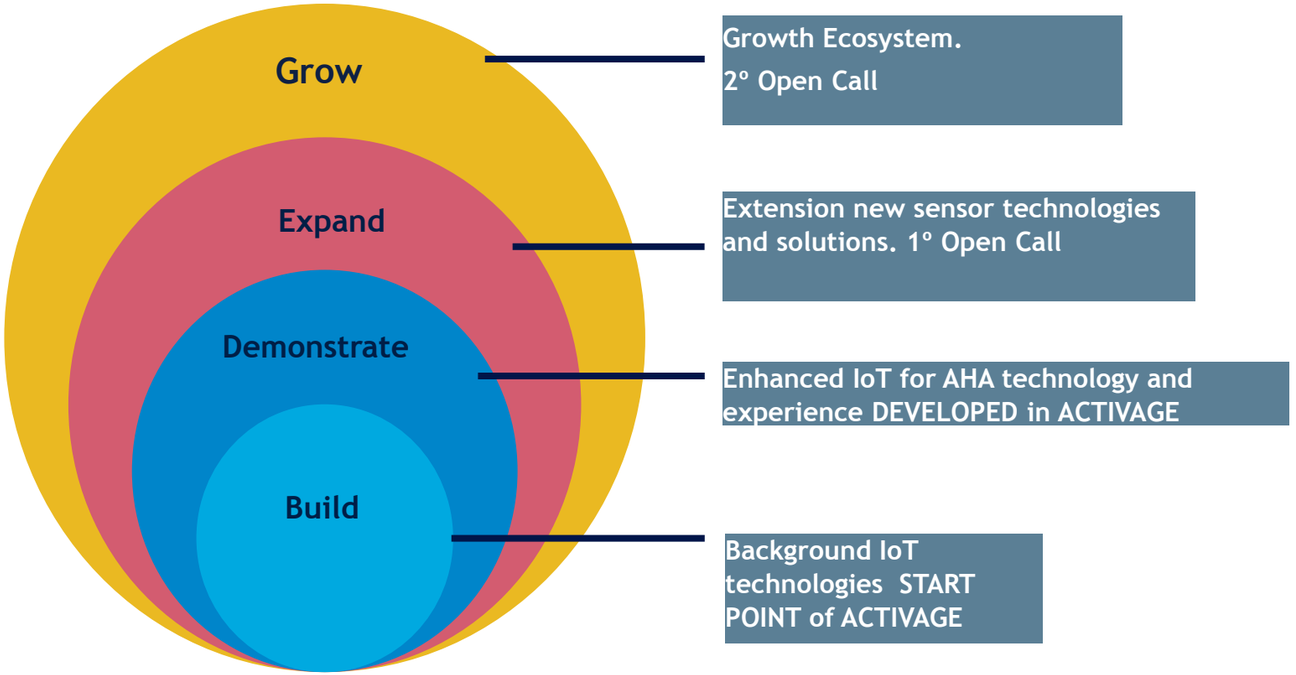
WHAT IS actIVAGE OPEN CALLS PROGRAM?

- First Open Call launched in July 2018, currently under execution, is financing 10 innovative start ups to develop new AHA services and technologies that will be integrated for evaluation in the current DSs.
- Second Open Call, launched in March 2019 is addressed to cities and regions in the EU that are willing and committed to Set Up ACTIVAGE IoT for Active and Healthy Ageing ecosystem framework and services in their local ambit and commit the contribution in the evaluation and evidence creation process of ACTIVAGE as well the sustainability and growth beyond the end of the project.



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ACTIVAGE PROJECT

Thanks for your attention!!