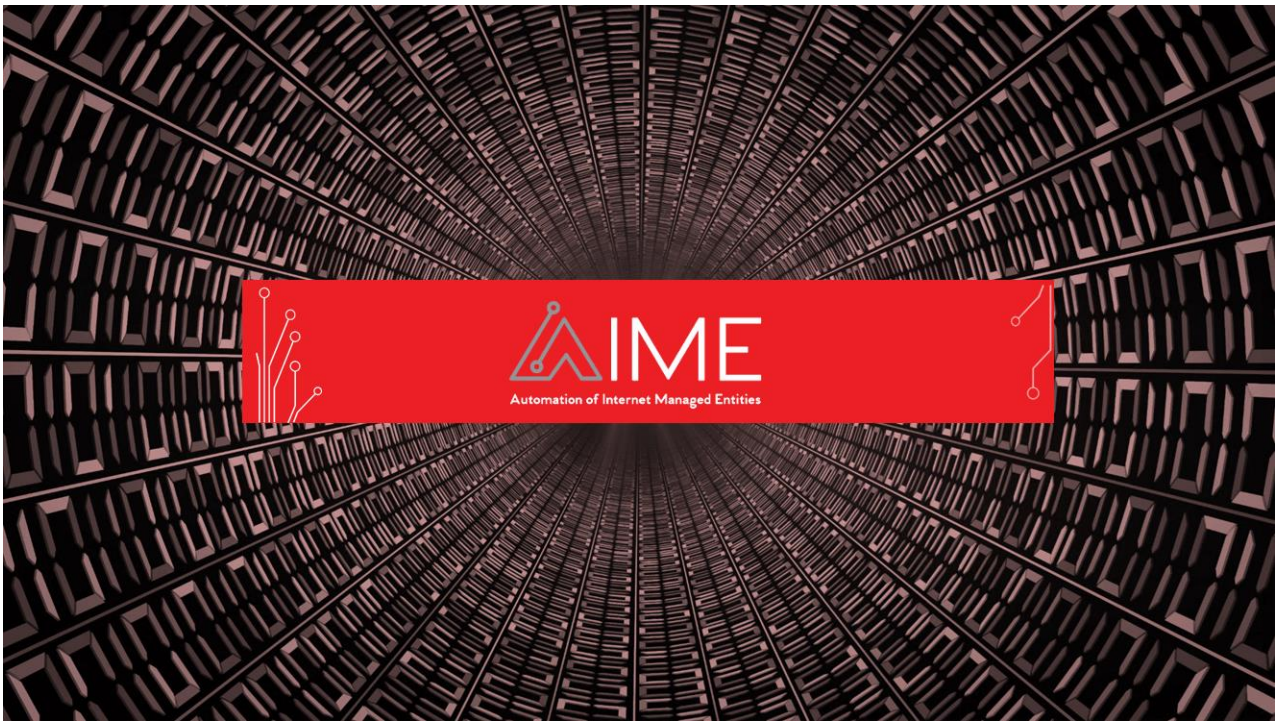
AIME-BASED IOT SYSTEM FOR FACILITY MANAGEMENT



WHITE PAPER

IN THIS DOCUMENT

ABSTRACT

WHAT IS AIME?

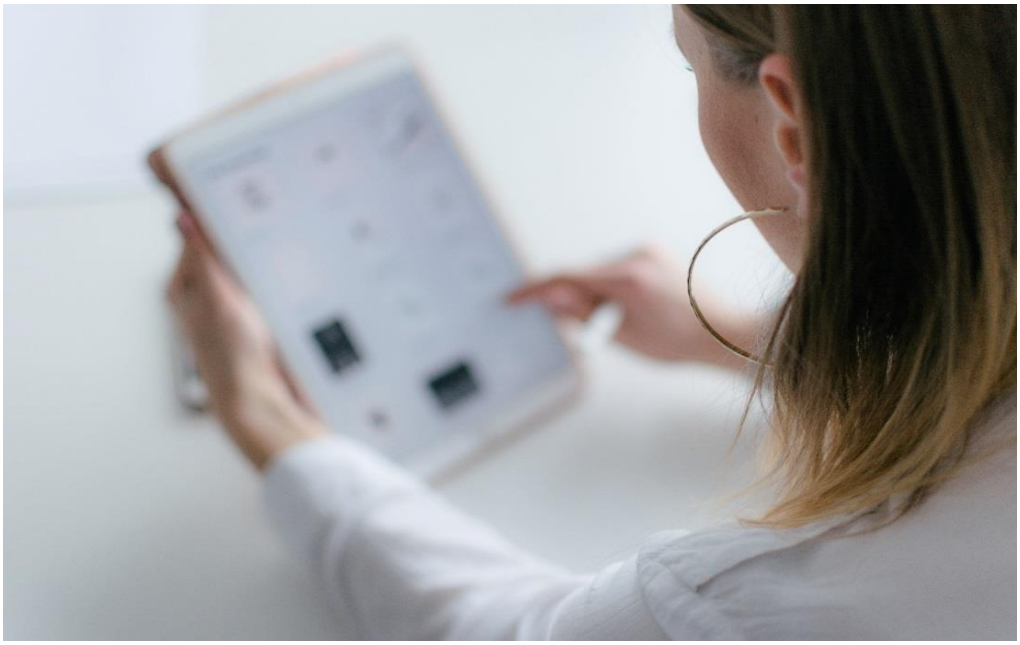
AIME is an Edge & Core IoT application enablement platform (AEP) that helps companies build complete IoT systems, ensuring business and digital transformation. AIME offers a high-level uniform language for data collection, data flow, Edge connectivity, administration and configuration of IoT devices.

We address issues such as energy efficiency, sustainability, resiliency and data security by making smart IoT devices even smarter, keeping operations close to the endpoint as much as possible and significantly reducing data traffic between IoT devices and system Core.

AIME supports system scalability and continuous development of processes, allowing changes on-the-fly with little to no downtime when making reconfigurations.

AIME includes IoT firmware and communication functionality. AIME is an Arduino-based Framework, capable to run on any RTOS.

We use Microcontrollers (MCUs) to manage the underlying IoT Infrastructure. Thanks to AIME's unique flexibility, we are able to orchestrate **unlimited number and types of IoT hardware**, and work even in **areas with no Internet coverage**.



FACILITY MANAGEMENT WITH AIME

The engine behind AIME is available to use in Facility Management and Hospitality industry. Smart IoT sensors can be attached to all kind of assets or equipment, such as doors, lights, windows, open-air areas and whole buildings, and can monitor certain aspects of HVAC or security systems. This allows facility managers to identify and make informed decisions on how to ensure their facilities are operated and maintained to optimal efficiency.

FEATURES

The following features connected to Facility Management are readily available or can be seamlessly added as customizations upon AIME Platform:

24/7 MONITORING

- Every aspect and component of a building can be monitored via IoT-enabled sensors

- Our Platform is sensor-agnostic. By default, we support a number of commonly used sensors, but we can easily incorporate all types of sensors required by Clients.

DEVICES MANAGEMENT / PREDICTIVE MANAGEMENT

AIME's architecture allows seamless **Facility Systems Management** via Actuators. Each actuator is an IoT Device which can convert a control signal into mechanical motion, eventually triggering actions in HVAC, security systems or other types of systems.

- AIME manages Actuators for both switch on/off cases, and voltage regulation
- Signals sent to Actuators can be both **manual** (triggered by an operator) or **automatic** (action gets executed automatically based on real-time Sensor measurements and preset logic). This logic can be built as AIME-based extension on a per-case basis. Examples include:
    - Send warnings in case of specific or critical events, usually upon reaching preset value measured by an IoT Sensor. In this case, an **employee can trigger an action**, either on-site or remotely using our mobile user application.
    - Train the IoT system to **act automatically upon certain events**. For example, a facility management system can be turned on or off automatically right after a measurement has reached specific value (ex. temperature, humidity, human presence, etc.)

All measurement thresholds, other types of events, warning types, and automatic actions are fully customizable as per client/use case in all cases.

The combination between IoT-enabled Sensors and Actuators can be effectively used to implement **Predictive Management** logic for managing facilities and is applicable for multiple use cases.

DATA MANAGEMENT & PROCESSING

AIME provides smart **data processing mainly at Device Level**, eliminating most data traffic and information security threats.

- We use Microcontrollers (MCUs) together with IoT Sensors to incorporate functionality at endpoint level
- We provide initial data processing at Device Level
- We provide smart way of data collection from hardware sensors
- We make MCUs smart enough to make their own decisions based on Clients' business processes
- Processing happens in real-time
- We keep most data locally
- AIME's architecture allows us to design and build **Micro-clouds** or **Swarms of IoT Devices**

DATA TRANSFER

Data transfer happens at the following levels:

- Between IoT devices in a Local Swarm
    - If needed, this communication can happen only using radio signals (LoRa Mesh) in **areas with no Internet coverage**. If the Local Swarm needs to be connected to other parts of the IoT System, one IoT Device at the end of the Swarm must act as a Gate and forward the communication.
- Between IoT devices and local or internet MQTT Server
- Between IoT devices and HTTP Server
- Between MQTT Server and HTTP Server
- We transfer only meaningful data as defined by user, not ANY data
- By avoiding to transfer useless data, AIME helps minimize traffic
- We save data cost for moving data
- We prevent clogging the whole system with dark IoT data
- We provide multiple communication technologies: WiFi, GPRS, WiFi Mesh, LoRa Mesh; integration with NBIoT

INTEGRATION

- We provide integration with other Management Systems of all types
- AIME presents data in normalized and standardized way using compressed and structured format
- We are also flexible at using client-defined formats for exchanging data through API
- AIME's output data can be used by our Clients in Big Data, AI (Artificial Intelligence) and ML (Machine Learning) platforms

SYSTEM UPDATE

We offer changes on-the-fly in configuration for data collection and edge functionalities without the need to flash new firmware:

- Remotely via Internet
- On-site by trained technician. No need to open any physical control panels; operation can be done by Wi-Fi.
- We also offer OTA capabilities for easy firmware upgrade and maintenance

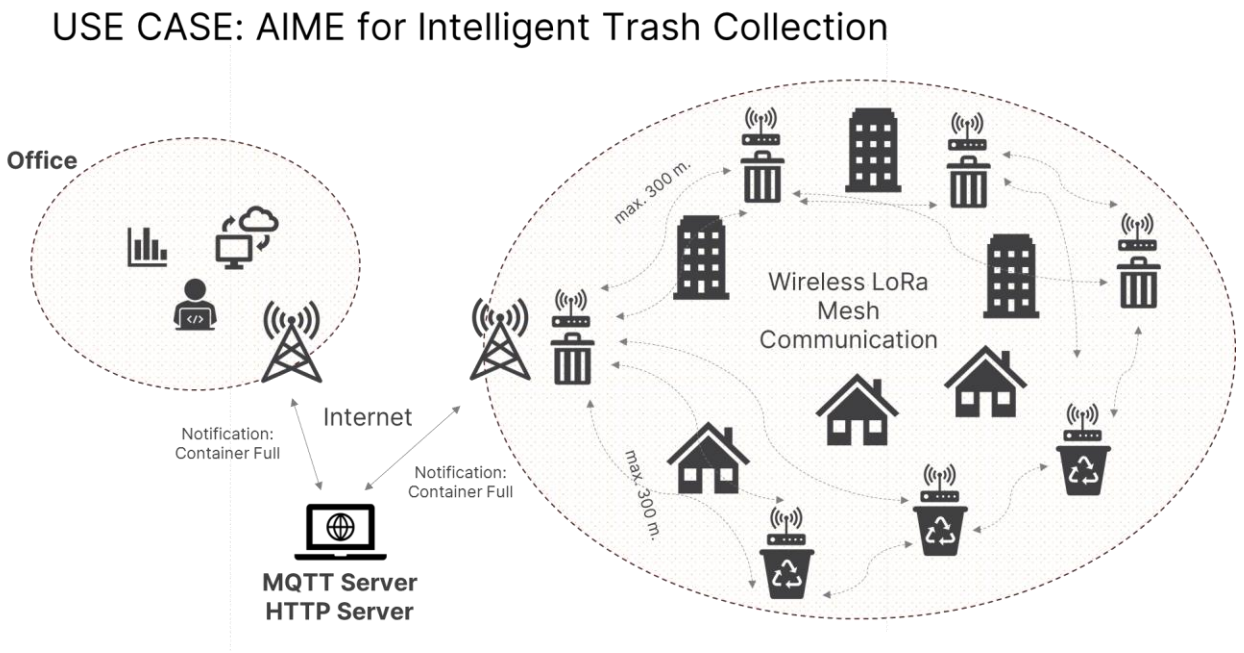
USE CASES & EXAMPLES

The following is a non-comprehensive list of areas where AIME can be used to orchestrate IoT Devices, Swarms or Networks:

	Use Case	**Example**
	Internal and external space monitoring & control	Measuring environment conditions, presence, smoke, etc.; Remote control over HVAC systems; Automatic temperature adjustments, Motion-triggered lighting, and many more
	Transportation Management	Monitoring conditions in transport vehicles to guarantee proper handling of goods

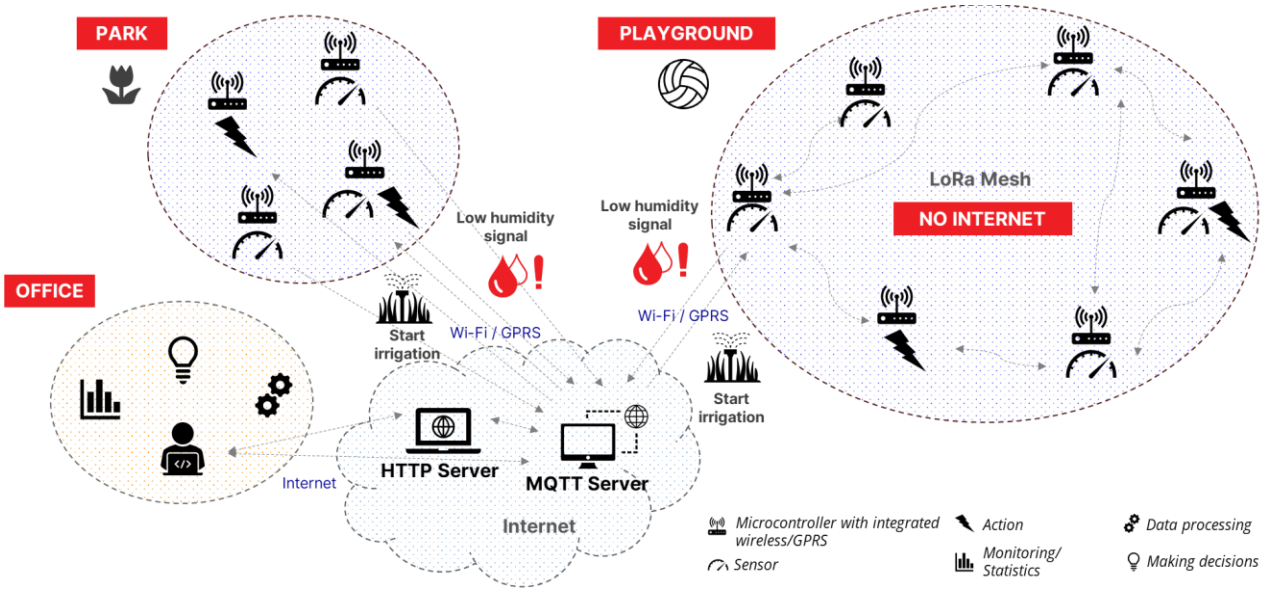
	Health and Safety Management	Identifying risks in environmental elements; Monitoring building occupancy
	Consumables Tracking	Monitoring the quantity of consumables
	Cleaning	Monitoring waste bin levels; Monitoring other parameters in buildings or outdoor spaces
	Security Management	Monitoring for unauthorized personnel in restricted areas; Automated access for authorized personnel; Presence detection
	Well-being and Comfort	Monitoring conditions in building to ensure meeting client's requirements
	Green Spaces Management	Irrigation, misting, temperature control on demand for parks, gardens, playgrounds, etc.

Example 1:



Example 2:

USE CASE: AIME for Intelligent On-Demand Irrigation



OUR ADVANTAGES

- **CUSTOM SOLUTION**: We provide custom solutions based on our flexible AIME Universal IoT Platform, customized and upgraded after client's requirements
- **EASY INTEGRATION**: Integration with existing vertical management and/or CRM solutions, with data required to provide **Predictive Management** and real-time **Data-driven Management**.
- **MAXIMUM SECURITY**: Option for **keeping sensitive data secure locally** at the facility or within the company
- Additional option for **connecting to a public Cloud service**
- **RESILIENCY AND SUSTAINABILITY**: Use cases and IoT devices can be added or changed in system's lifecycle. Sensor or Actuator settings can be changed any time, even after installation. This happens on the fly, with no system downtime.
- **OFFLINE MODE**: Possibility to build **Swarms of IoT Devices** even in areas with no Internet access

- **SELF-SUSTAINED MODE**: The system can be automated to work without human interaction/control and/or without Internet
- **MAINTANENCE**: Continuous support & troubleshooting

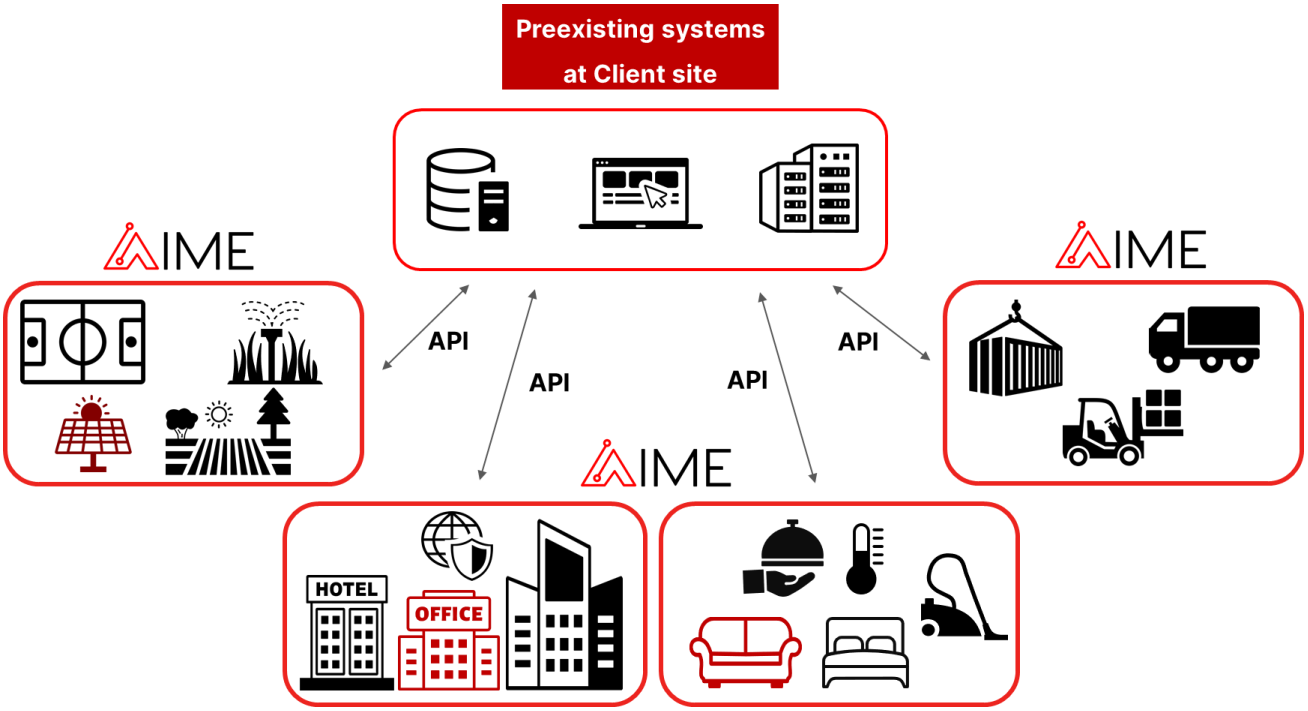
OUR OFFER

We offer AIME on a **PaaS** (Platform as a Service) basis. We build **Networks or Swarms of IoT-enabled Devices** and orchestrate them, and deliver the required hardware.

Our low-level networks/swarms can be integrated with any preexisting Management Systems via APIs. We are able to convert the exchanged data into any format required by the Client.

Our offer is suitable for companies who need to build the processes locally in their own infrastructure and for those who need to transfer data to Data Center/Cloud.

It is also suitable for companies which need to add IoT infrastructure to their business and integrate it with a preexisting Management System.



BENEFITS

- Real-time monitoring and management of all assets where sensors can be attached
- Planning and working with informed decisions
- Energy consumption savings and lower greenhouse emissions due to optimizations
- Improved space management
- Improved transportation
- Better labour management
- Reduction in operational and maintenance costs
- Reduction of operational risks
- Overall improvement in business efficiency
- More reliable business