Automation & Control
IOT & Analytics

Smart Proximity
An Integrated Platform

v. 1.0

ENGINEERING

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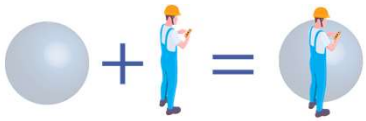
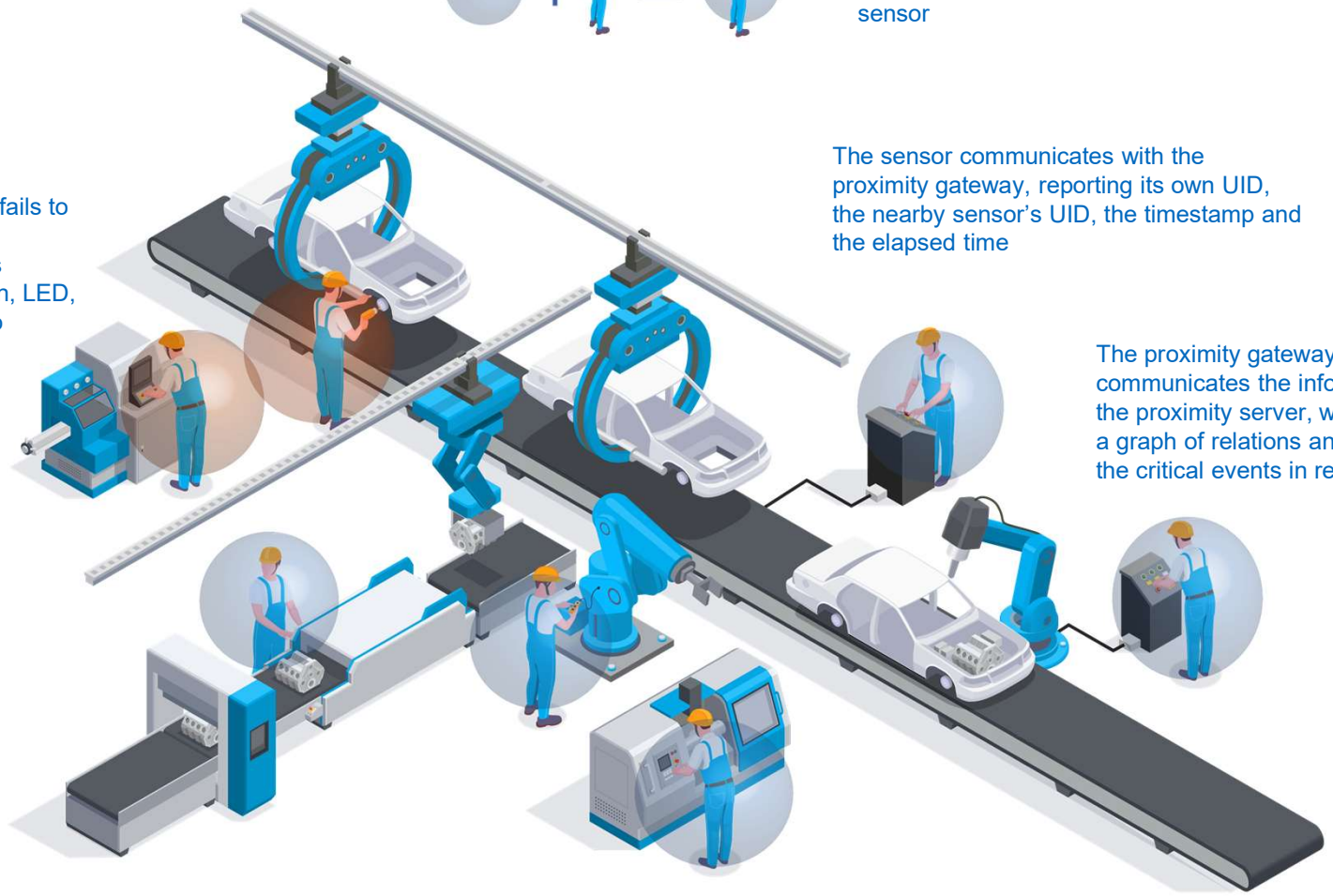
Smart Proximity
Concept



Each operator has a proximity sensor

The sensor communicates with the proximity gateway, reporting its own UID, the nearby sensor's UID, the timestamp and the elapsed time

As soon as one of the operators fails to keep a proper safe distance in a specific time frame, both sensors provide warning signals (vibration, LED, sound), notifying the operators to increase the safe distance



The proximity gateway communicates the information to the proximity server, which creates a graph of relations and monitors the critical events in real time

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Each operator works according the safe distance

Each external will receive a sensor before to enter in the office area

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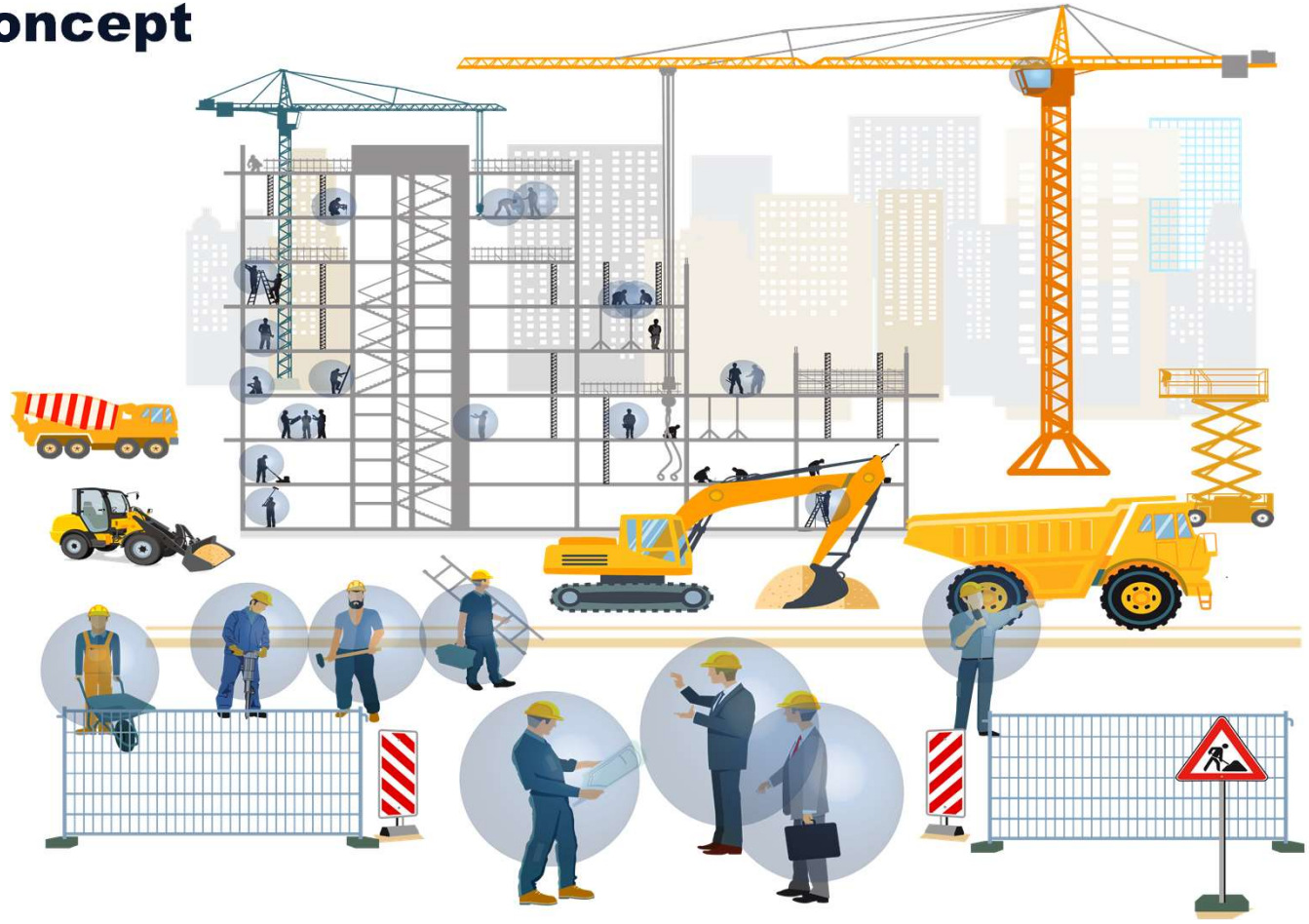

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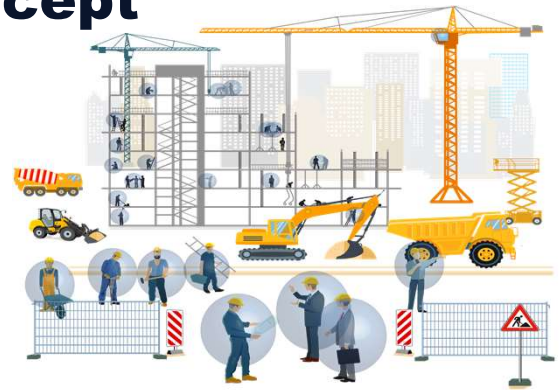

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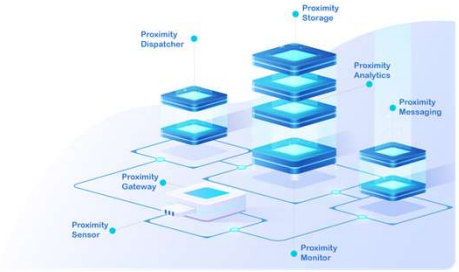

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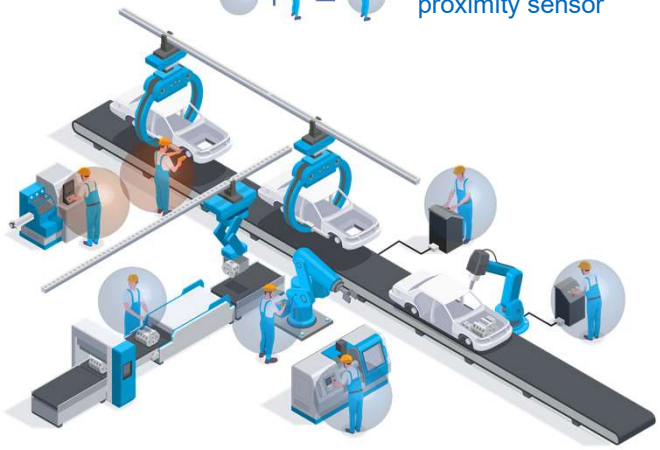

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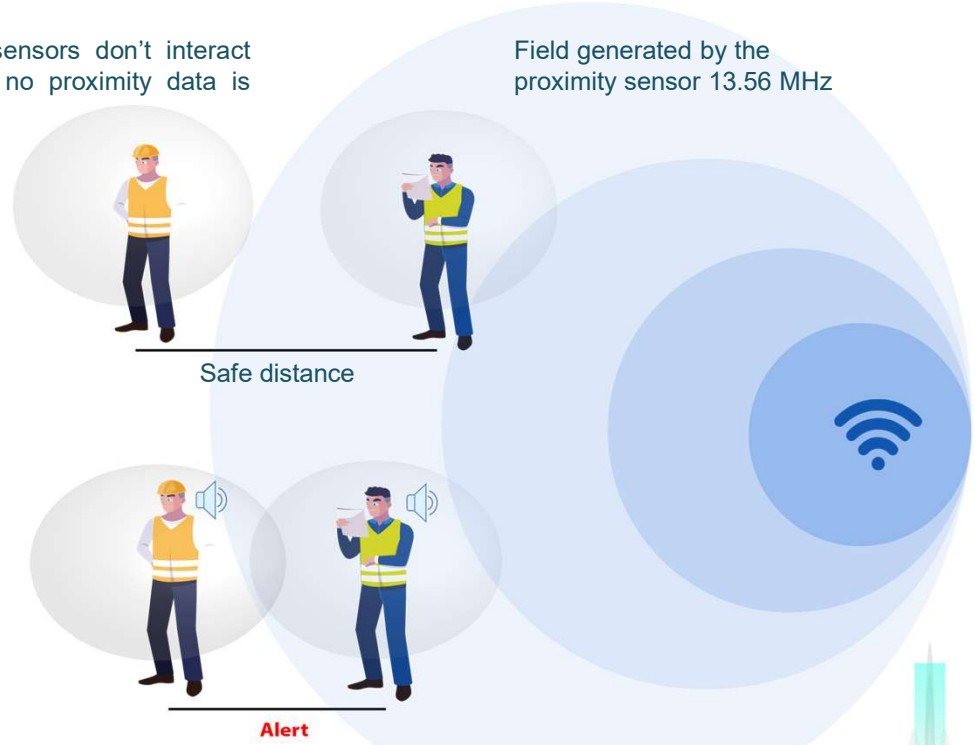
Use case

If the proximity sensors don't interact with each other, no proximity data is recorded

Field generated by the proximity sensor 13.56 MHz



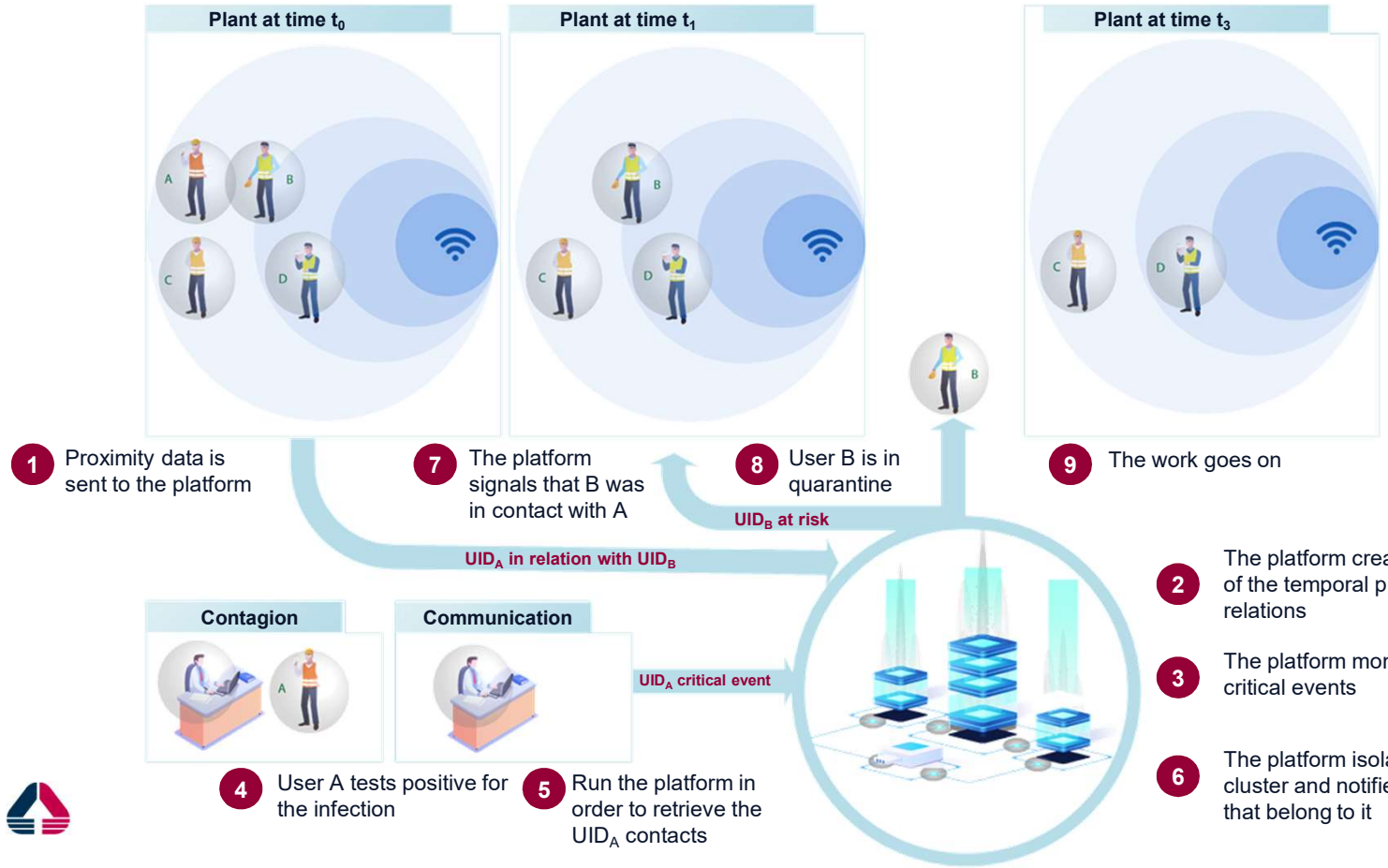
Each user is provided with a proximity sensor

The proximity sensor communicates the proximity data to the proximity gateway via WiFi or alternatively via Bluetooth LE 2.4 GHz

If the distance between the proximity sensors is below the safe distance, the proximity sensors emit a sound, record and send the proximity data

The proximity server anonymously stores and processes the proximity data

Smart Proximity
How It Works



No sensitive information is stored in the platform. Only the unique identifiers and the relations between them are stored.

The unique identifiers on the smart sensor are encrypted

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Smart Proximity
Technology

The proposed technology is suitable for industrial environments, making it unaffected by infrastructure noise and critical operating conditions.

Proximity Gateway. Identifies an industrial grade IoT ready Edge device that supports various communication protocols. BLE or WiFi have been assumed in this specific solution. The coverage of the area is limited to the communication technology used and the type of antenna.

Proximity Sensor. The wearable sensor, engineered in a bracelet or such, identifies a system able to interact with one or more sensors located nearby. The sensors interact with each other by sending and receiving proximity information. When two devices are visible to each other, they provide real-time warning indicators (sound/led), asking the operators to maintain a safe distance. The alert function does not need to interact with the center, since it is autonomously activated by the device.

By means of the WiFi network or BLE (depending on the device model), the information collected by the device is sent to the proximity gateway, which forwards it to the platform.

The device contains an ISO 15693 receiver/transmitter and uses a 13.56 MHz carrier with low power consumption.

The device sends diagnostic information to the platform, such as the battery level.

The device is equipped with a button battery, whose life varies from 3 to 5 days. The device can be recharged via USB or induction.

The device is able to detect other nearby devices within a range of 1.5 meters with a +/-10 cm margin of error.

The device features a memory that stores data and information in case of communication failure with the proximity gateway.

The device does not require any anchorage points, significantly reducing the infrastructure costs.

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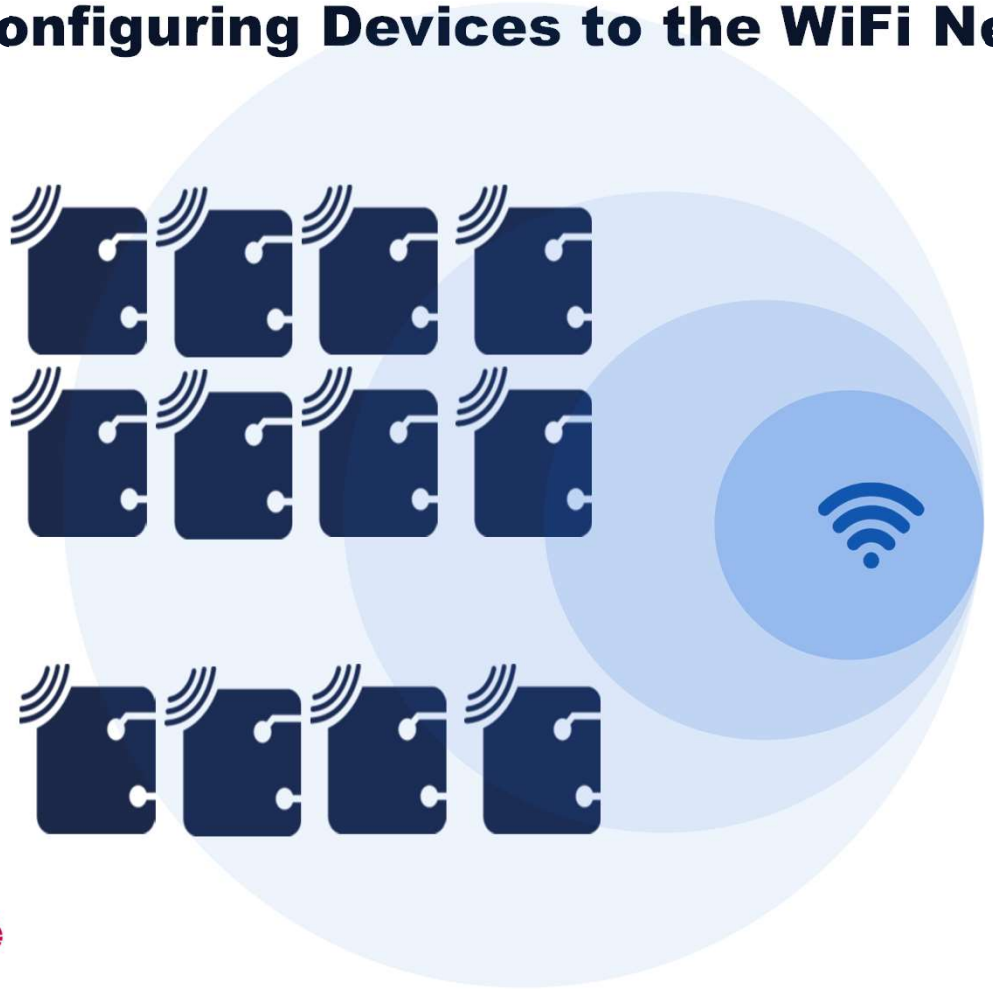
Configuring Devices to the WiFi Network



Proximity Sensor Configuration

The configuration to the plant WiFi network takes place on entire batches of devices using the ISO 15693 proximity antenna of such devices (reception).

The WiFi network configuration parameters are transmitted by means of a desktop application in the Smart Proximity Platform and an appropriate ISO 15693 (transmitting) antenna with adequate power connected to the computer's USB port.

The solution allows to configure thousands of devices in minutes.

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Monitoring
Real-time monitoring of critical events that can impact the clusters, notifying the involved persons of the actions that need to be taken

Storage
Maintaining a graph of proximity relations on time windows

Loop Anonymous Identification
Ensuring personal data protection, no sensitive information is stored in the platform. The sensitive information is external to the platform and falls within the normal company procedure management

Who
With whom
When
How long

Analytics
Analysis of behaviors that can put the company's future at risk, allowing to preventively and proactively intervene on the habits of the employees with appropriate warning messages

Security
Data verification, validation and security

Analytics
Identifying and isolating clusters of relations in real time

Dispatching
High reliability and high availability of data on distributed architecture

Gateway
Integrating with external systems through standard communication protocols

Monitoring
Monitoring dashboards to identify possible gatherings in real time and proactively intervene by reporting the detected anomalies directly to the people involved

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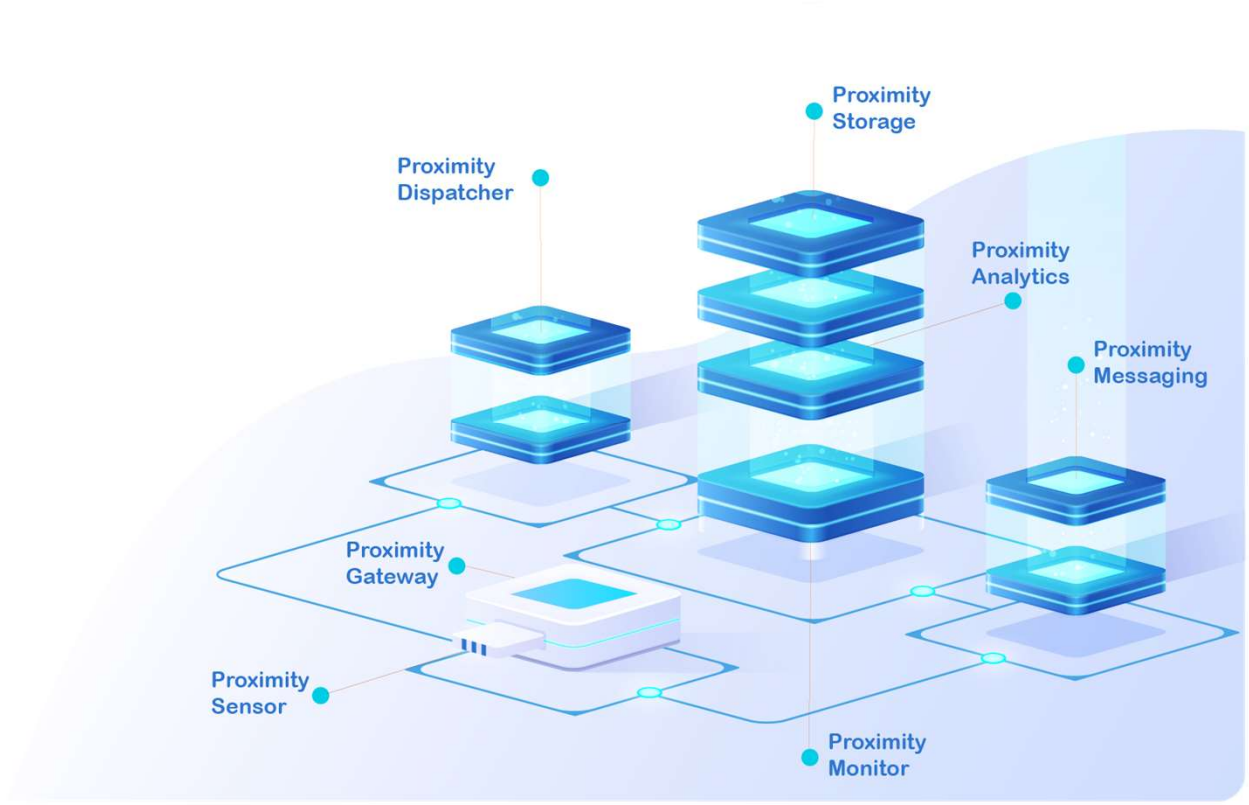
Proximity Sensor. Identifies sensors capable of sending proximity information.

Proximity Gateway. Identifies smart devices (IoT Edge gateway, smartphone) able to communicate the proximity information received from the proximity sensors to the proximity dispatcher. The minimum information sent is: $UUID_p$, $UUID_s$, timestamp, distance. It also sends the information received from the proximity messaging to the proximity sensor.

Proximity Dispatcher. Identifies a software module that keeps track of the information received from the gateway and forwards it to the proximity monitor and the proximity storage

Proximity Monitor. Identifies a software module that processes the data streaming in real time, detecting the critical events it is configured for. The critical events are sent to the proximity analytics.



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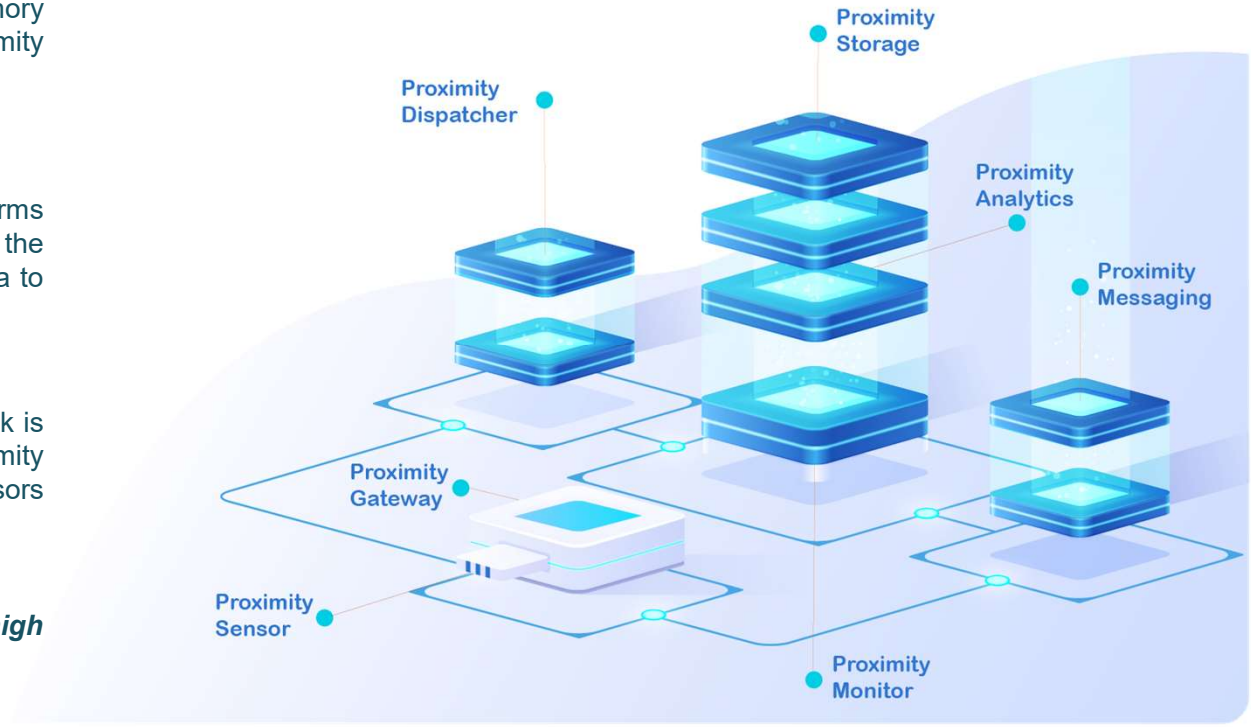
Proximity Storage. Identifies a properly partitioned in-memory data grid, that anonymously keeps record of the received proximity information for an appositely configured period of time.

Proximity Analytics. Identifies a software module that performs several ‘smart’ functions, such as identifying and isolating the cluster of relations over time. In critical conditions, it sends data to the proximity messaging.

Proximity Messaging. Identifies a software module, whose task is to send appropriately configured messages to the proximity gateways, which in turn forward them to the proximity sensors when connected.

Horizontally scalable platform in high availability and high reliability



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Smart Proximity Sensor

Form Factor	Bracelet or Smart Card
Dimensions	105 x 85 mm
Weight	TBD
Compliant Standard	Bluetooth 4.2, NFC, WiFi
Modulation Mode	ISO 15693
Internal Memory	512 Kb
RF Power	TBD dBm
Sensitivity	Noise Suppression Receiver (NSR)
Antenna	Wired antenna
User Interface	Battery led, Data Communication led, Proximity led, buzzer
Protection	TBD (depending on the casing)
Temperature Operative Range	TBD
Connector	Micro USB
Battery charge	Power supply or induction
Battery	4500 mAh, 5 day average battery life
MTBF	10 years (except for the battery)