

CitySys – Smart City IoT open system just based on standards, interoperability, scalable, AI ubiquitous, seamless HW connection, sustainable, Data-driven system



Technology benefits and differentiators

1. Requirement - management of physical devices

- a. the platform must be able to create, manage, and delete devices directly from the application's user interface
- b. device management must be subject to a separate authorization that can be set up for each user
- c. created devices on the platform can be interpreted as:
 - i. **point**
 - ii. **polygon**
 - iii. **object without coordinates** (e.g. part of the superior device - the electricity meter is part of the superior switchboard)
- d. Possibility to define the type of device and methods of creating devices in the platform (including the possibility to automate the creation)
- e. defining attributes according to their nature, i. telemetry, static or dynamic device information
- f. the ability to define the color of the device on the platform depending on the value of the attribute
- g. the ability to define color dependencies for each attribute of the device and allow them to be switched by the user according to the value of the attribute and the need for their color visualization
- h. the ability to adjust color dependencies for each attribute of a given device without recreating the device and without losing data history
- i. monitoring and control of equipment by securing it in a way (with the possibility of two-way communication)
- j. possibility of time synchronization with time on IoT platform (automatic and at the level of EDGE device it is necessary to force manual synchronization)

Benefits

- The municipality will be able to have the management of all the city's intelligent devices in one place, regardless of whether they belong to lighting or have been connecting via an EDGE device. This will allow the integration of any additional systems into the platform and their central management. In the platform is able to extend the devices with any types and their characteristics (i.e. also with third-party devices). Data attributes of the type: measurement (telemetry data, data in time series), device data (device data, mostly also stored in the device, ala meter status), central data about the device and its deployment (GPS deployment), as well as shared data between the device and the platform. Communication between the platform and the devices is encrypting.
- It is equally important that the devices synchronize time with each other so that the control of the end devices is synchronizing in terms of time

Device and digital point management

2. Requirement - modeling of the real world and its equipment

- The ability to user-define digital points and map real devices to digital points on the platform at the time of their connection
- Digital points must be created on a map with the ability to specify the GPS coordinates of the device
- The possibility of creating a logical structure of devices (subordinate, superior) with their unambiguous visualization and with the possibility to switch between individual levels (subordinate, superior)
- Possibility of selective monitoring based on user-selected device, device tree (logical structure) or with individual selection of several devices
- Possibility of selective reporting (also ad-hoc) in the form of visualization of graphs based on user-selected device, device tree (logical structure) or with individual selection of several devices

Benefits

- In addition to the management of physical facilities and their groups, the city needs to model the real world of its perspective, taking into account all the dependencies of the interconnection of objects with the possibility of effective monitoring.
- Ring the logical structure of objects is essential for efficient management and for reports that can be adapted to change the settings and classification of objects in the logical structure. If a part of the devices is physically connected, e.g. lighting on a different line, so there is no need to rework reports that work with logical partitions.

3. Requirement - extension of data structures by special objects

- possibility of storing and reading special objects for the needs of business applications (e.g. lighting profile) centrally in the platform
- the possibility to create data structures depending on the method of data acquisition, at least as follows:
 - static** - the value of the attribute is statically set by the user
 - telemetry** - the value of the attribute is updated by automatic data collection as telemetry
 - calculated** - the value of the attribute is the result of the evaluation of the expression (formula). The definition object must contain the evaluation "static context" as context, "dynamic context" as entity_ids and expression. The context object of the entity is added automatically and represents the current instance of the entity.
- Possibility to connect as a data source for telemetry also devices that are not directly connected and are part of a third-party application in such a way that the user can work equally with all objects when using the system, regardless of the data source

Benefits

- Each SmartCity area has special requirements and definitions for its own and connected controls, and it is a dynamic system that changes and adjusts according to needs. Therefore, even at the data level, it is necessary to create sufficient freedom to adapt to the legitimate requirements of the user. It must also include the ability to interpret and manage devices (including third parties) in such a way as to be comfortable and understandable to the user. From this point of view, the system must be able to interpret the data obtained in the form that the user best understands or will assist him in further processing. E.g. electricity consumption energy through tariffs to an amount in local currency that is more understandable to all.

Requirement - monitoring the status of the values of individual devices

- a. The ability to create a definition of the state of the object through the value of its attribute, to which the system will respond if the condition is met
- b. The user according to his needs must interpret information on the fulfillment of the condition. Therefore, the system must include at least the following notification options:
 - a. Popup window directly in the application
 - b. Visibility of alarm filling regardless of where the user is in the application
 - c. By email
 - d. SMS message

Benefits

- The system must be able to notify the user of the fulfillment of the criteria defined by him, so that it is possible to respond promptly to critical expected scenarios.



1. Requirement – Digital Twin

- a. Digital Twin or in translation Digital Twin is a concept of digitization, where all facilities or significant objects within a city or municipality should be digitized into separate objects and placed on a geographical map
- b. These objects must be digitized with as much data / parameters as possible, but at least: type, categorization, name, GPS, status, technical parameters belonging to the object and in the case of connected equipment also its status
- c. Each device in the field must have a GPS location and its representation on a map for a better overview of the location
- d. The dashboard must allow you to create your own classification of devices and digital objects for each tenant, thus allowing users to visualize only the area they choose. The system must allow at least a four-level classification.
- e. Must allow to display devices based on the selection from the area of classification (infrastructure, energy, property, etc.) menu and thus better orientate only in a selected part
- f. Possibility to use so-called virtual objects, ie. objects that do not actually exist at the site, but are planned for the future, for example
- g. Display the defined logical structure of the municipality and its parts created during the management of devices and digital points. The structure must be able to contain at least 4 logical levels.
- h. The dashboard must be sensitive to combined selections from both the object classification part and the logical structure part

Benefits

- Due to the fact that in the city / municipality there are standardly installed equipment / objects from different suppliers, it is necessary to have them combined in one place
- For the needs of a comprehensive view of the city / municipality as a whole, it is necessary to have a unified overview of all objects
- A comprehensive view of the city / municipality is one of the ultimate tools for achieving efficiency
- For the needs of service of individual objects, it is necessary to clearly see their status on the map and in reports
- Cities / municipalities have been creating passports of various objects for several years, but as a standard without the possibility of digitizing them in one common place, which would also allow work with this data
- The ability to work with virtual points allows for more efficient planning
- Enable selective selections of displayed devices and digital points according to the user's choice

2. Requirement – data visualization and work with them

- a. The data must be online or regularly updated for all devices that allow it
- b. All data must be historically stored without an initial time limit, ie. Unless the administrator specifies otherwise
- c. KPI performance indicators - there must be a possibility to define an unlimited number of different performance indicators for all devices, digital objects
- d. KPIs - it must be possible to define an unlimited number of different performance indicators related to one or more logical partitions selected by the user, regardless of the number and devices contained in it.
- e. KPI performance indicators and logical part - after adding a new device, the logical part contained in the report automatically works with another data source, without the need to interfere in any way with the KPI definition
- f. KPI performance indicators - there must be a possibility to display KPI indicators not only in text but also graphically in various forms: graphs, progress bar, status bar and more

Benefits

- In cities / municipalities there is a growing demand for up-to-date and accurate data that help save costs, the environment and often human lives in the long run
- It is important to have the longest possible data history in order to be able to evaluate different statistics or, for example, anomalies or typical / periodic situations
- Following the last years of development in the field of data analysis, it is proving to be highly beneficial to store data that do not have an obvious use at the time of their storage. It may be possible to use them later in a new application or in cross-domain analytics
- Cities lack a comprehensive tool for simple evaluation of key parameters (KPIs) from individual areas, for example: compliance with minimum requirements for public lighting, air quality parameters, the level of services provided by the company responsible for waste collection and much more.

3. Requirement – integration with other parts of the platform and third party applications

- a. The dashboard must be connectable to other parts of the platform or third party applications

Requirement – support for multiple levels of logging

- a. The system must support at least the following types of messages that are displayed in the logging tool:
 - a. Emergency
 - b. Alert
 - c. Critical
 - d. Error
 - e. Warning
 - f. Notice
 - g. Information
 - h. Debug
- b. Each message must contain at least the following information
 - a. Date and time of the report
 - b. Message type
 - c. Source of the message
 - d. Text
 - e. Detail and data of the message

Benefits

- Due to the overall complexity of the digitization process and the importance of the data used for the management itself, it is necessary to competently identify and record all worthy changes in the system. Therefore, the system must register at least 7 types of different messages and allow individual access to them. From Emergency errors, Alert, immediate action, through Critical, Error, Warning, Notice, to Information and Debug messages to help easily integrate local peripherals and systems, but centralize reports from them in one place. An advanced but not complex reporting system is a significant cube in the SmartCity solution puzzle.

System administration and attributes

Requirement – Cloud solution and multi-tenant support

- The solution is cloud-based, with the option to order it as SaaS
- Support for multi-tenant schemes, i. the ability to operate platform tenants with separate device management within a single IoT platform instance

Benefits

- For a given municipality, it will allow, if necessary, the division of the report to several organizations
- This feature allows you to delegate the management of different types of devices to different organizations as intended.

Scalability, performance and system maintenance

Requirement - robustness, scalability and deployment of the platform, in particular:

- support for horizontal scaling
- the possibility of deploying the platform in the cloud and locally in the IT infrastructure
- the solution should not generate additional licensing requirements that are directly related to the platform itself
- the solution must be installable in the VPS environment

Benefits

- Horizontal scaling will enable the drawing of IT resources according to the current needs of the city and the load of the SmartCity system, in the form of dynamic management of the creation and termination of instances of system components. At the same time, as the solution expands, it should not be necessary to change the solution, just scale it by allocating more IT resources.
- The city should have the choice of operating the system as a service or in its own or leased infrastructure. This decision should be available on an ongoing basis.



Thank you for
your attention