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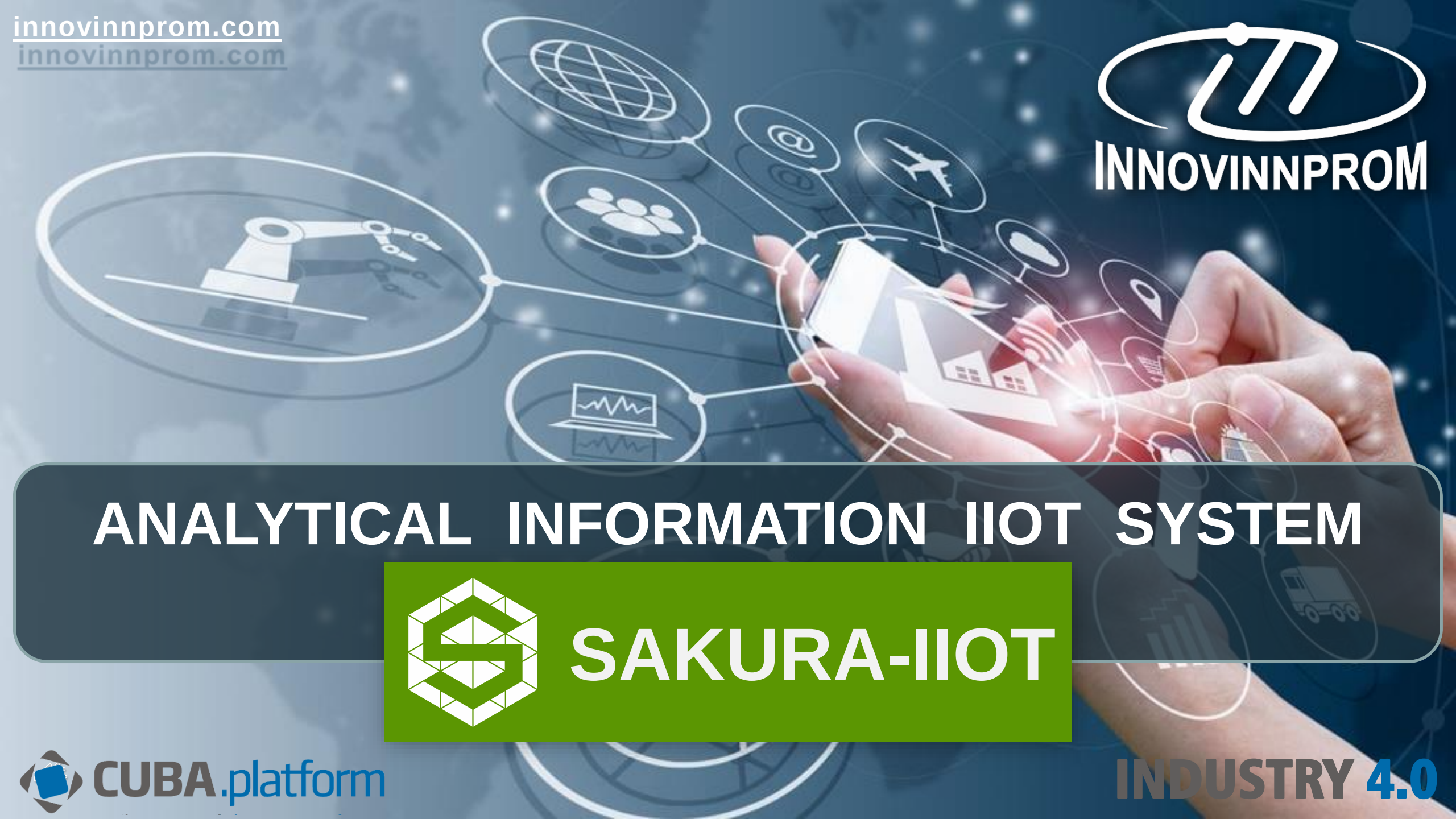


INNOVINNPROM

ANALYTICAL INFORMATION IIOT SYSTEM

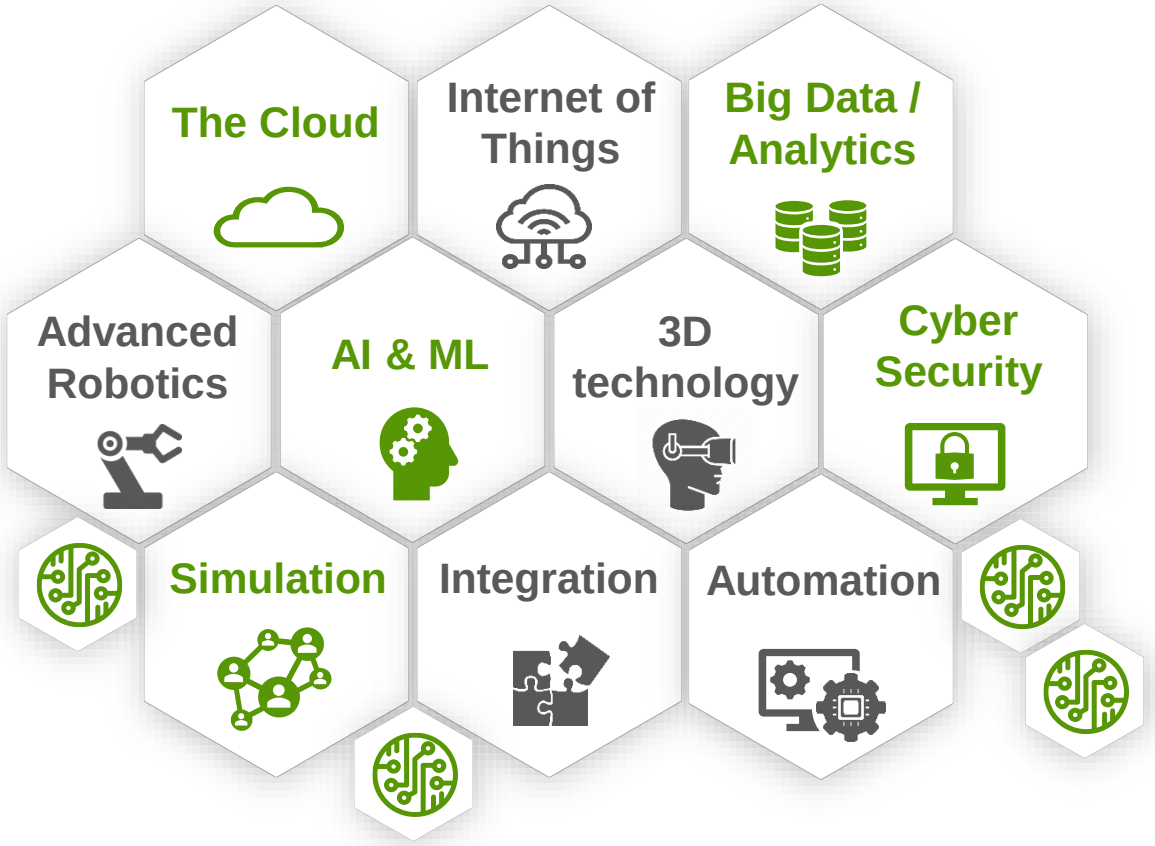
SAKURA-IIOT

CUBA.platform

INDUSTRY 4.0

INDUSTRY 4.0

- ✓ Industry 4.0 is an urgent need of today, which guarantees financial success, development of technologies, real growth of production
- ✓ Industry 4.0 provides development and combination of automated production, data exchange and production technologies into a single self-regulatory system with minimal human intervention in production processes



Main directions of development:

- ✓ Implementation of the Digital Double of the product creation
- ✓ Horizontal integration of productions and suppliers into a single information space
- ✓ Vertical integration of production systems

- ✓ A new level of organization and control of production processes at all stages of product creation
- ✓ Products (from semi-finished product to finished product) contain all information about the technology of its production
- ✓ Manufacturing of products is carried out by a network of cyber-physical systems, based on data extracted from a semi-finished product

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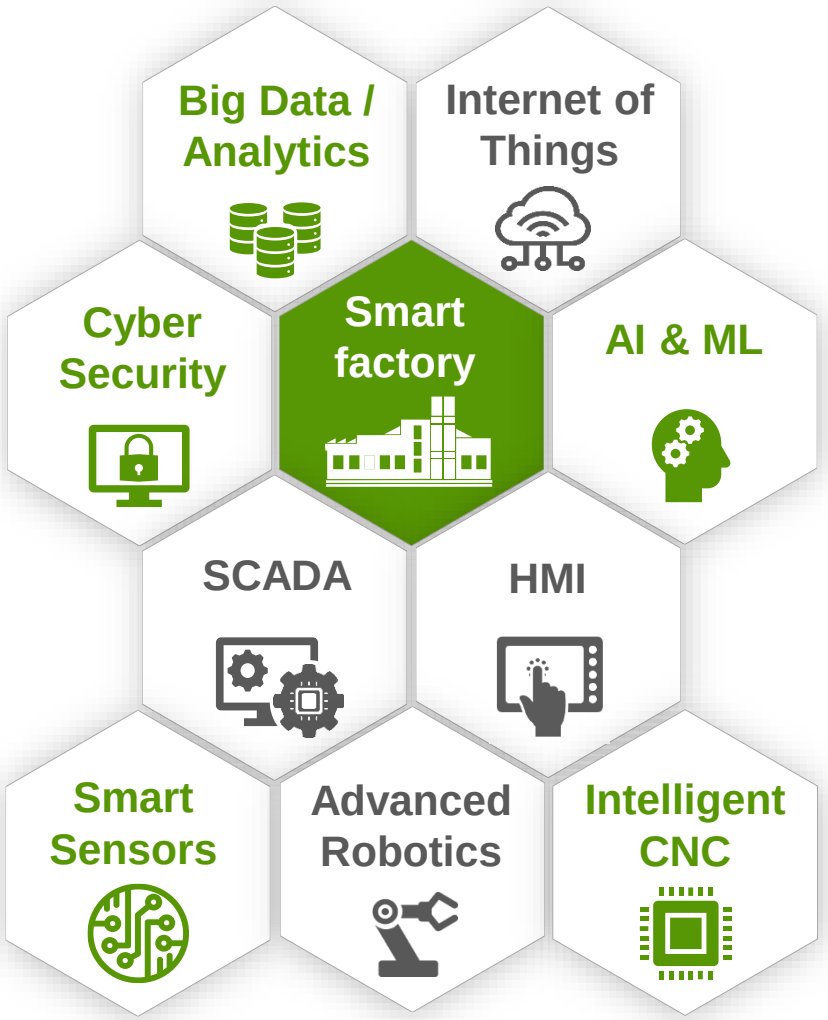


Industry 4.0 is transforming businesses and should be part of the CEO's daily agenda

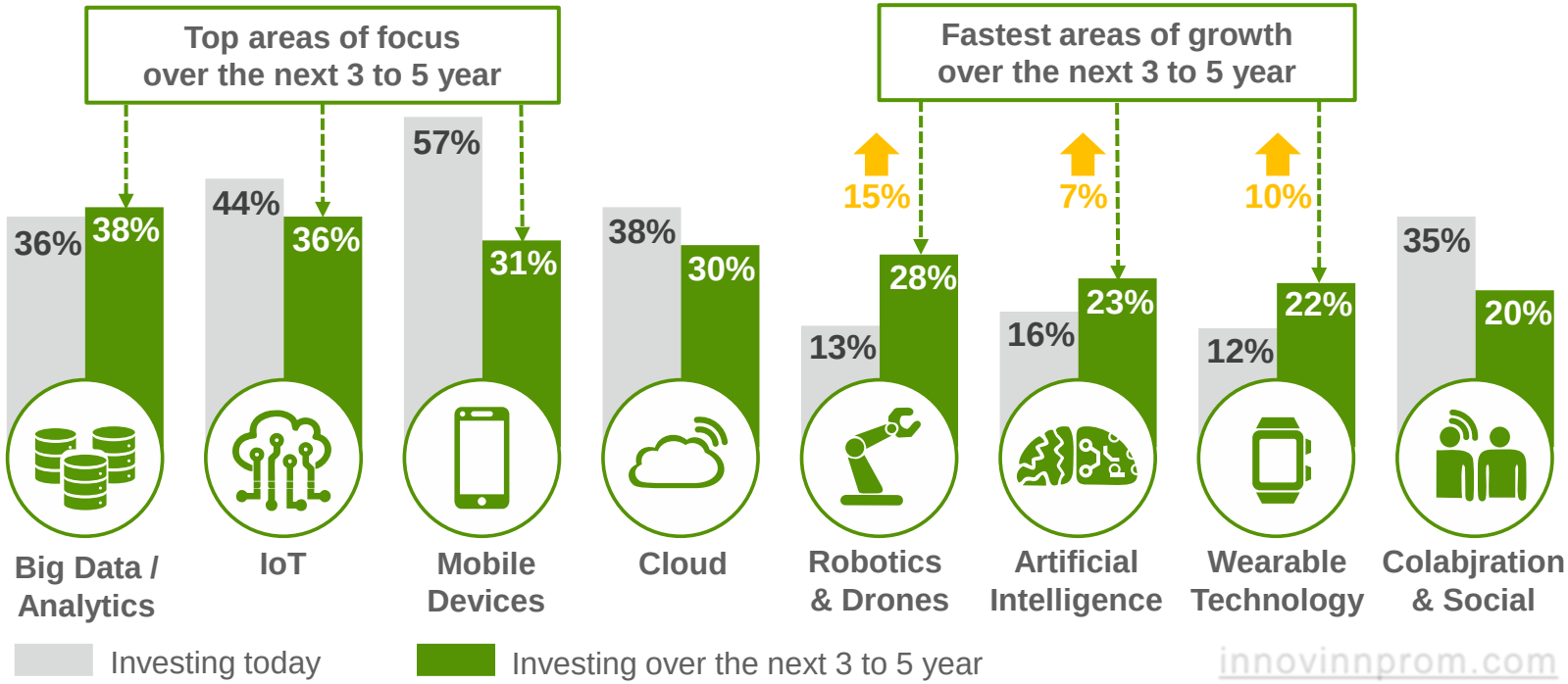
The results of research network of companies in the field of consulting and auditing PriceWaterhouseCooper (PWC):

Until 2025, European industry will invest around **€ 140 billion** in Industry 4.0 annually

More than **80%** of enterprises, within 5 years, will digitize the entire product chain, including suppliers

By 2025, an **18%** increase in labor productivity is expected due to the introduction of the Industry 4.0 concept

Digital products and services generate around **€ 110 billion** in additional revenue for European industry annually



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PRINCIPLES OF CREATING

1 **Creating an alternative open source IIOT system**

that does not require licensing, works freely with a variety of databases, has a sufficient number of ready-made tabular and graphical forms for quick configuration of projects to customer needs

2 **Transfer of 30 years of experience of INNOVINNPROM LTD**

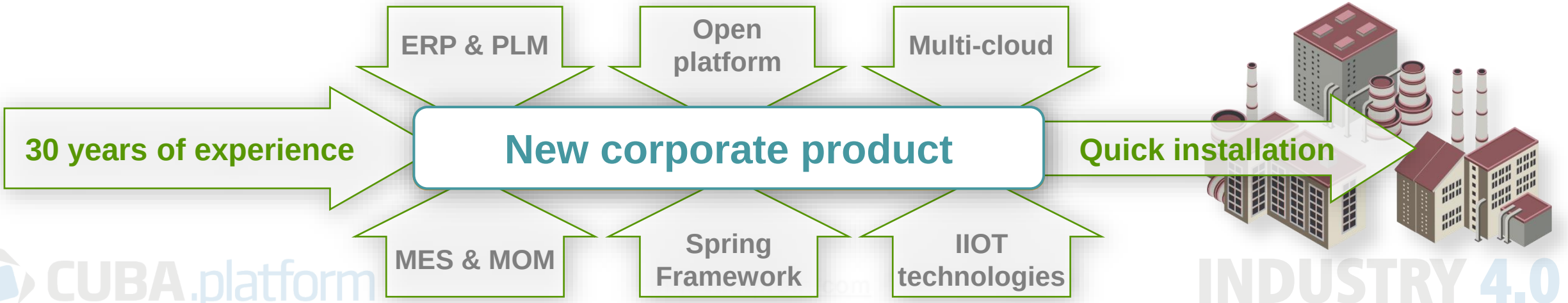
in creating information and analytical ERP and PLM systems and experience in integrated enterprise automation to a modern software base, the use of the most modern databases, computing and cloud solutions

3 **Combining data sets of MES and MOM systems with data sets of ERP and PLM systems**

into a single information space for the formation of analytical information that will provide a qualitative calculation of productivity and energy efficiency of production

4 **Ability to quickly create corporate projects**

by configuring ready-made computing software modules, visualization modules and databases without the involvement and training of highly specialized professionals and programmers



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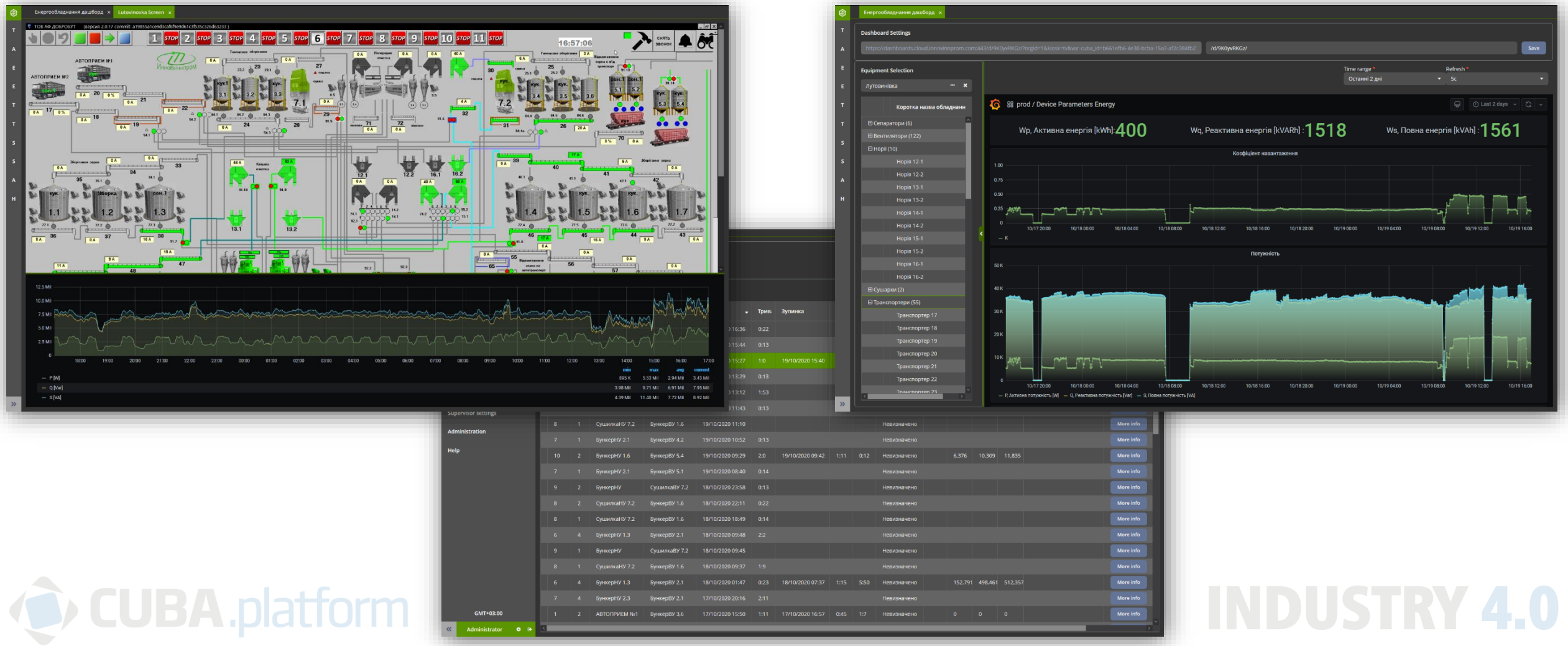
INDUSTRY 4.0

SAKURA-IIOT

Guided by many years of experience in industrial automation and information technology and taking into account the main trends and requirements of the fourth industrial revolution Industry 4.0, INNOVINNPROM has developed **IIOT system SAKURA** - a modern industrial system of control, analysis and management of production and technological processes



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FUNCTION

Industrial Internet of Things (IIOT) system SAKURA-IIOT – industrial analytical processing system that is designed to control and manage all production and technological processes in industrial enterprises

SAKURA-IIOT has built-in elements of artificial intelligence and performs self-regulation functions to optimize the financial costs of the enterprise by optimizing mutually integrated production and technological processes and reducing the role of the human factor. SAKURA-IIOT contains two subsystems :

ERP PLM system of quantitative and qualitative accounting of products SAKURA-Production

SAKURA-P provides horizontal integration of production and suppliers into a single information space and is responsible for obtaining information about the work of enterprises, planning, operational control and management of material resources

Technological cost control system SAKURA-Technology

SAKURA-T provides vertical integration of production systems and is responsible for control of technological processes at the enterprises (enterprise), control and analysis of energy consumption, control and analysis of efficiency of the equipment use by the enterprises and control of production processes' productivity

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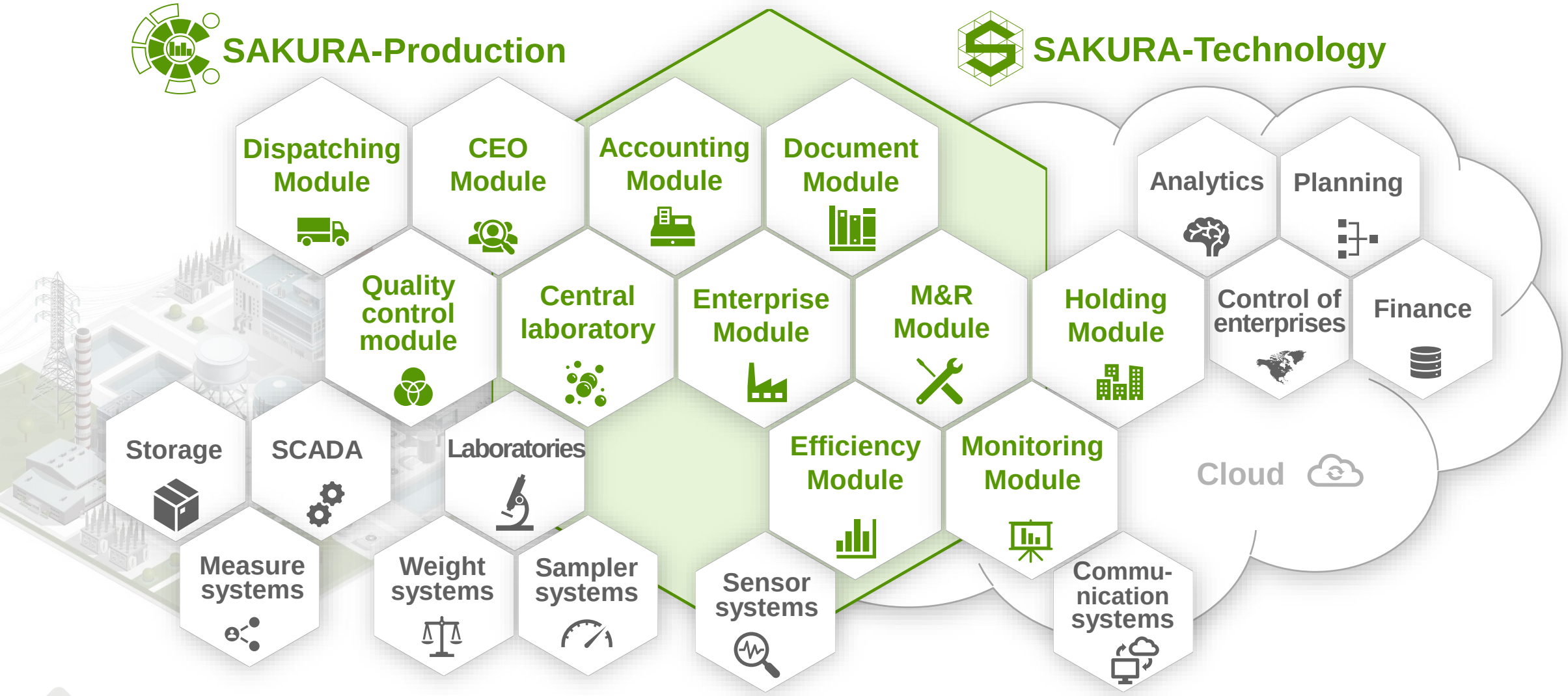
ARCHITECTURE

SAKURA-IIOT has a modular structure. The customer receives the basic modules and modules that he needs. During application, the system architecture can be adjusted.



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STRUCTURE

EMI
Enterprise Manufacturing Intelligence

PLM
Product Lifecycle Management

ERP
Enterprise Resource Planning

MES
Manufacturing Execution System

Cloud

MOM
Manufacturing Operations Management

TIA
Totally Integrated Automation

SAKURA-TECHNOLOGY

Control of enterprises

Analytics

Planning

Maintenance

Energy efficiency

Energy control

IIoT gateways

APS
Advanced Planning & Scheduling

Analytics

Planning

SAKURA-PRODUCTION

Registration

Raw materials laboratory

Technological laboratory

Central laboratory

Silo board

Quantitative & accounting

Accounting

Dispatching department

Automobile weight

Railway weights

Samplers

Raw materials storage

Finished products storage

SCADA

PLC

Measurement

Controllers & Sensors

Sampler systems

Samplers

Weight systems

Weights

CONFIGURATION

SAKURA-IIOT

Configurable on the basis of an open source Java platform

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Packed in clusters of K8s

kubernetes

Clusters are hosted in the cloud service

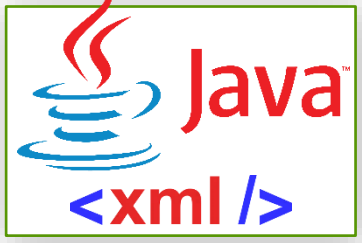
Google Cloud

Microsoft Azure

amazon web services

No licenses

Open languages



Template library

OPEN PLATFORM

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SAKURA-IIOT is implemented on the basis of a high-level open source Java platform for creating corporate information systems, as well as the server part of portals and mobile applications CUBA-platform

SAKURA-IIOT has a scalable modular architecture based on popular frameworks, designed to work in any environment

The SAKURA-IIOT architecture can be integrated into the cloud services of the world's leading providers selected by the customer and effectively use the storage, backup protection, data processing and computing capabilities guaranteed by these services

In addition, SAKURA-IIOT modules such as databases and application databases are arranged in Kubernetes (K8s) clusters

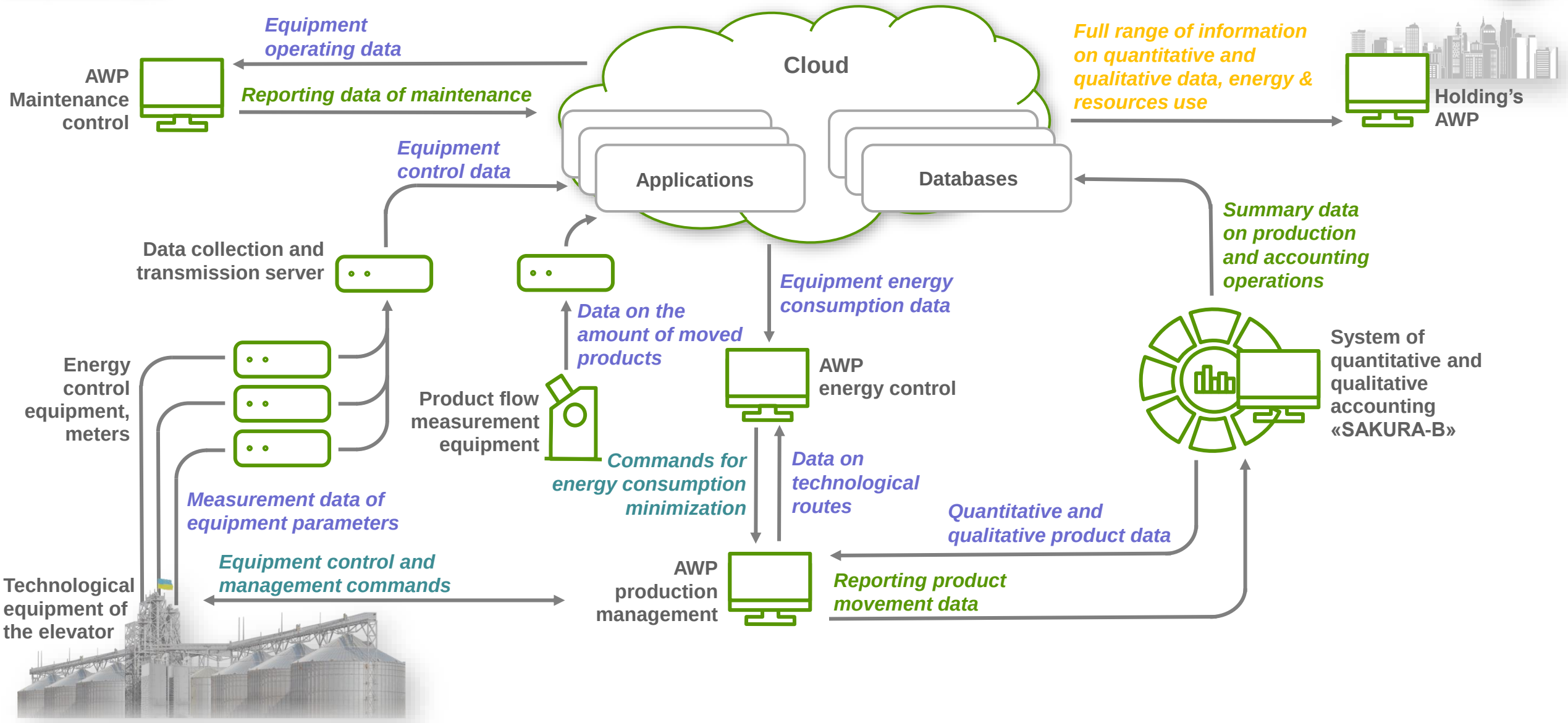
Google Cloud Microsoft Azure amazon web services

SOLUTIONS

The most modern solutions of the world's leading IT companies were used in the development of SAKURA-IIOT

Google Cloud
Microsoft Azure
amazon web services
kubernetes
HAULMONT
CUBA.platform
spring
IntelliJ IDEA
Java
influxdb
chronograf
Grafana Labs
PostgreSQL
HAPROXY
PATRONI
APACHE HTTP SERVER PROJECT
Apache Guacamole™
UltraVNC

INFORMATION EXCHANGE



FUNCTIONALITY

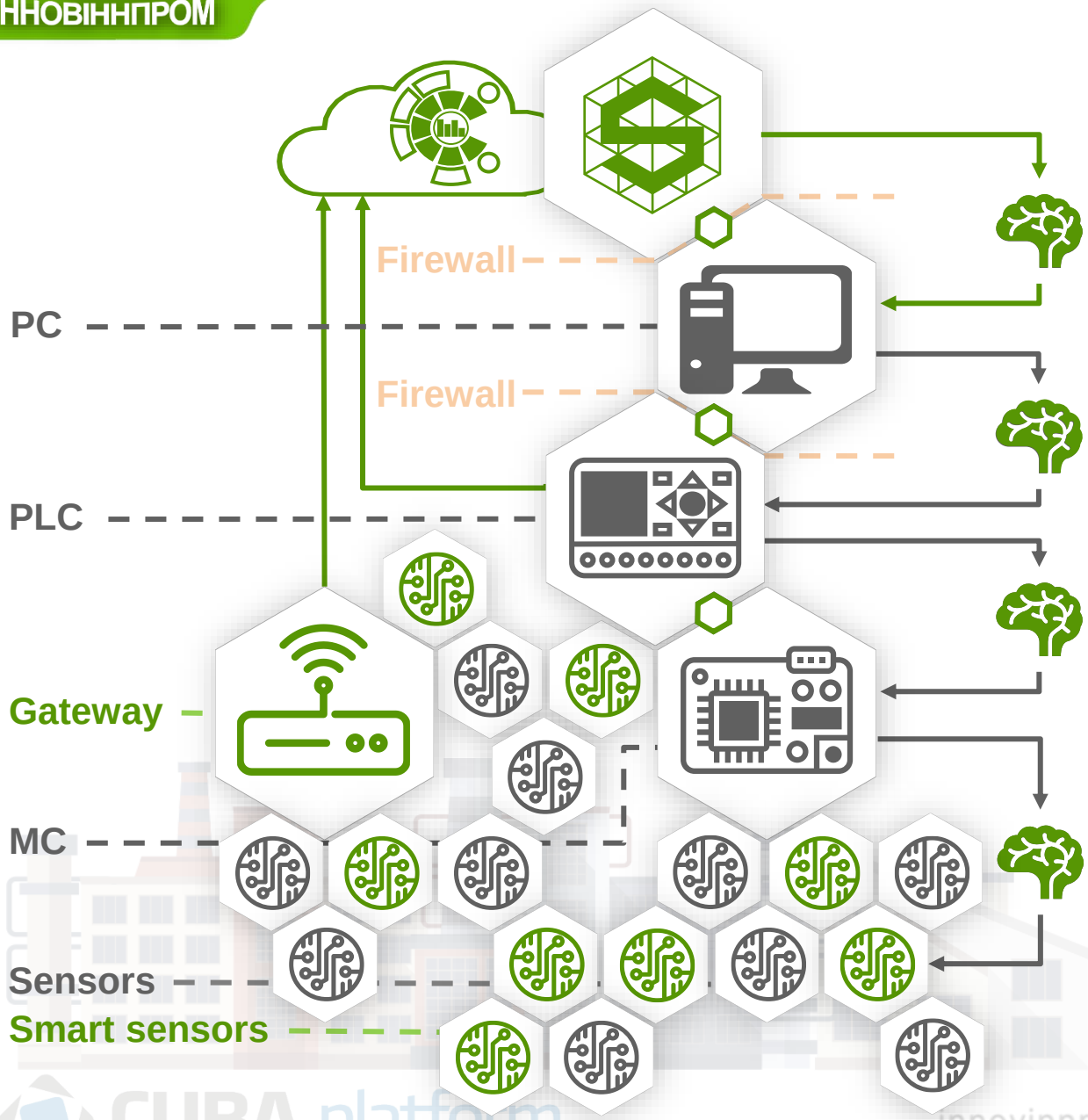
SAKURA-IIOT works in any customer-friendly browser on any operating system. To enter SAKURA-IIOT, simply enter the Internet address in the corresponding browser menu. Access to SAKURA-IIOT is provided on the basis of login and password

The configuration of SAKURA-IIOT windows and pages, access rights, staff roles are determined at the stages of terms of reference and system configuration, but staff are given the opportunity to adapt the display of data in a convenient form for personal perception

SAKURA-IIOT has a large set of ready-made forms, modules, tables, graphs, charts and therefore customizing the system to the needs of the customer is reduced to configuration and adaptation for a specific application and does not take much time and resources

Thanks to the integration of SAKURA-IIOT into cloud services of the world's leading cloud service providers has virtually unlimited resources for storage, processing, analysis and visualization of large amounts of data

AI & ML SOLUTIONS



SAKURA-IIOT supports Artificial Intelligence and Machine Learning technologies.

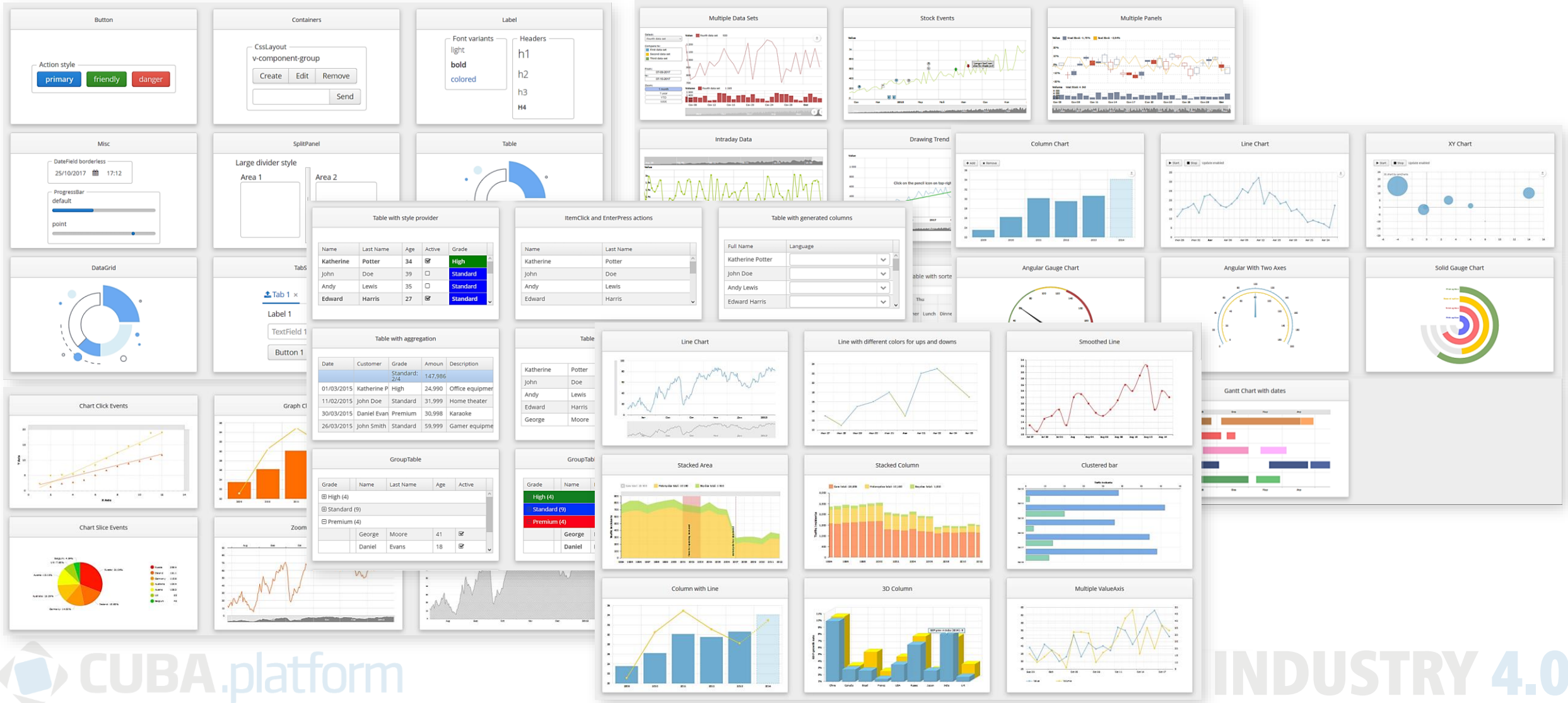
SAKURA-IIOT adjustment principles are based on strict adherence to SCADA's multi-level industrial architecture:

1. Hardware microcontrollers and built-in sensor microcontrollers are responsible for adapting and configuring intelligent sensors;
2. Control and management of equipment microcontrollers is performed by programmable logic controllers (PLC);
3. Control and management of PLC is carried out by SCADA
4. SAKURA-IIOT on the basis of data array processing makes general adjustments at each level of management

Additional sensors and gateways are installed to obtain the most complete information about the system operation. They provide data transfer directly to SAKURA-IIOT cloud services.

VISUALIZATION

SAKURA-IIOT marketplace contains a rich collection of ready-to-use add-ons that cover all typical requirements for business applications and can be enabled with a mouse click – components, containers, dialogs and notifications, charts, pivot tables, maps, predefined styles



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INDUSTRY 4.0

APPLICATION

Real-time control of technological processes in production in any industry. Based on the analysis of large amounts of data, optimization of technological settings and delays in the formation of recommendations for improving production productivity

Calculation and analysis of energy efficiency of equipment, technological operations and production in general, the formation of summary and comparative graphs and tables of energy efficiency for selected periods of time and in different modes of operation

Control of personnel work, blocking and prevention of mistakes and emergency situations. Control and analysis of personnel productivity separately, in shifts. Planning production changes and controlling the placement of personnel in accordance with the level of training

Planning and control of maintenance and repair of equipment.
Accounting for operating and consumption of energy resources by equipment. Accounting and planning the use of spare parts and materials during maintenance and repairs

MODULES

The Holding module provides display of generalized, comparative, concretized and analytical information coming from the holding companies

The main types of information are information on the quantity and quality of products, energy consumption and energy efficiency of technological operations at the holding's enterprises

The Enterprise module provides display of generalized, comparative, concretized and analytical information at the enterprise

The main types of information are information on the quantity and quality of products, energy consumption and energy efficiency of technological operations

The Maintenance and repair module (M&R) provides planning and control of maintenance and repairs at the holding companies

The main types of information are information on the operation of equipment, energy consumption, use of spare parts and materials during maintenance and repairs

The Energy Efficiency module provides measured and analytical information on the consumption of the main types of energy by each unit of equipment, technological group and the enterprise as a whole. Based on the obtained data, the calculation of energy efficiency of equipment and technological operations is performed

HOLDING MODULE

Control of the holding's enterprises

ENTERPRISE MODULE

The Enterprise module provides the collection and display of generalized, comparative, specific and analytical information in the enterprise. The module analyzes the productivity of technological processes and forms commands for its optimization.

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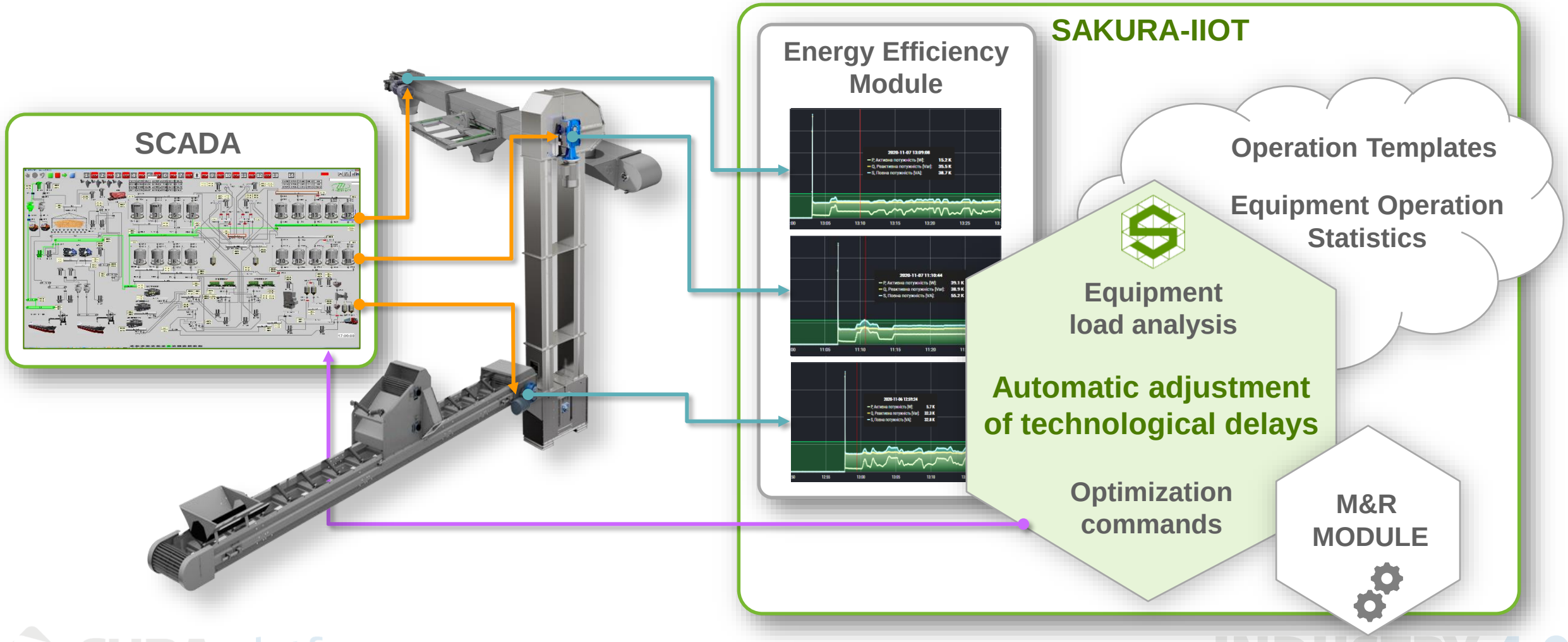
ENTERPRISE MODULE

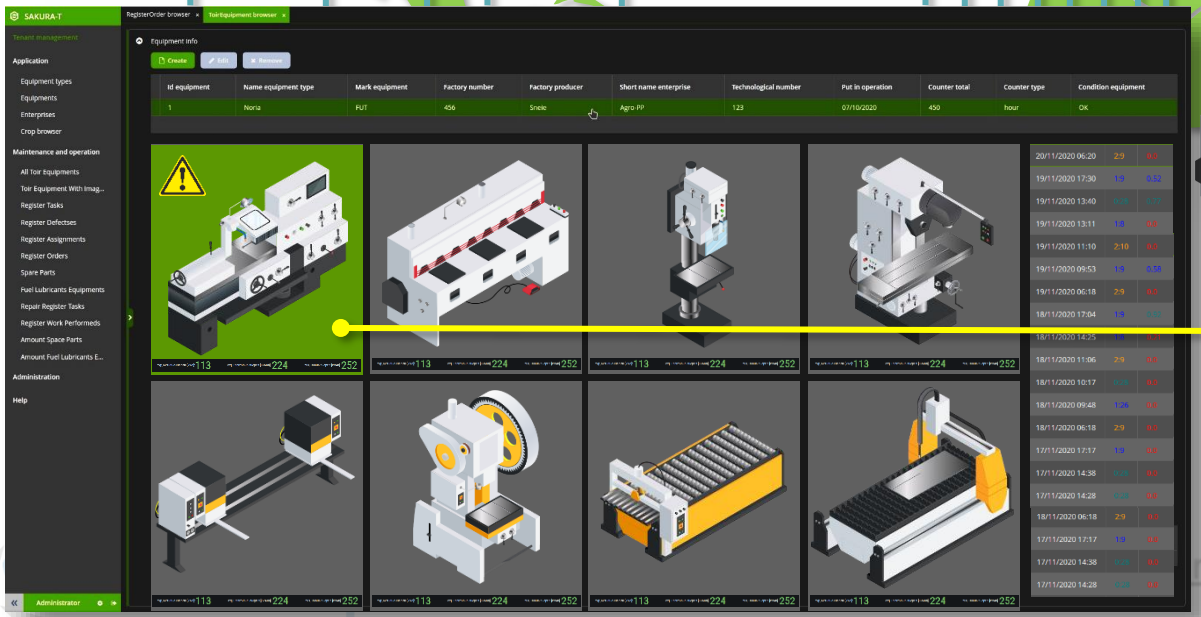
SAKURA-IIOT monitors the equipment load and automatically optimizes technological operations based on an array of statistics.

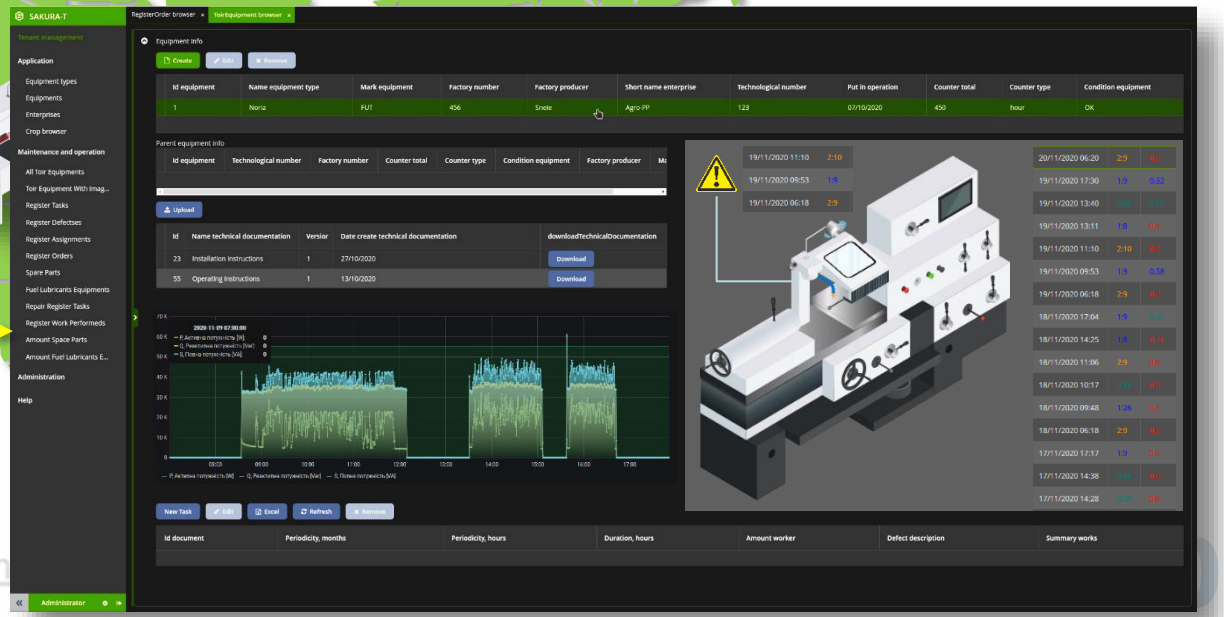
It provides an increase in energy efficiency and productivity.



MANUFACTURER MODULE

Control of machine tools and planning of their maintenance by the manufacturer





ENERGY EFFICIENCY MODULE

The Energy Efficiency module provides measured and analytical information on the consumption of basic energy sources by equipment, technological group, enterprise as a whole and generates data on the efficiency of technological operations

The module provides measurement and analysis of active, reactive and total values of current, voltage, power and energy

The module calculates and analyzes the energy efficiency of technological operations and informs about reaching the limit values

The energy efficiency factor is the amount of energy used to manufacturing and processing a ton of product

M&R MODULE

The Maintenance and Repair (M&R) module provides planning and control of equipment maintenance and repairs. The main types of information are information on the operation of equipment, its energy consumption, use of spare parts and materials during maintenance and repairs

The basis of the module is a schedule of maintenance and repairs, which reflects the planned activities and the results of their implementation

The module operates with equipment cards, which carry information about the assembly and condition of the equipment

The M&R module receives information on the operation of the equipment and its modes of operation from the Energy Efficiency module

DATA COLLECTION EQUIPMENT

SAKURA-IIOT reads data from the equipment and / or software available at the facility, without interfering with the technological process

To ensure maximum data volume, additional IoT gateways are installed directly to cloud services

To measure energy parameters, specialized measuring equipment and energy meters are installed

The larger the volume and completeness of the data that SAKURA-IIOT receives, the better the calculation of processes productivity and efficiency

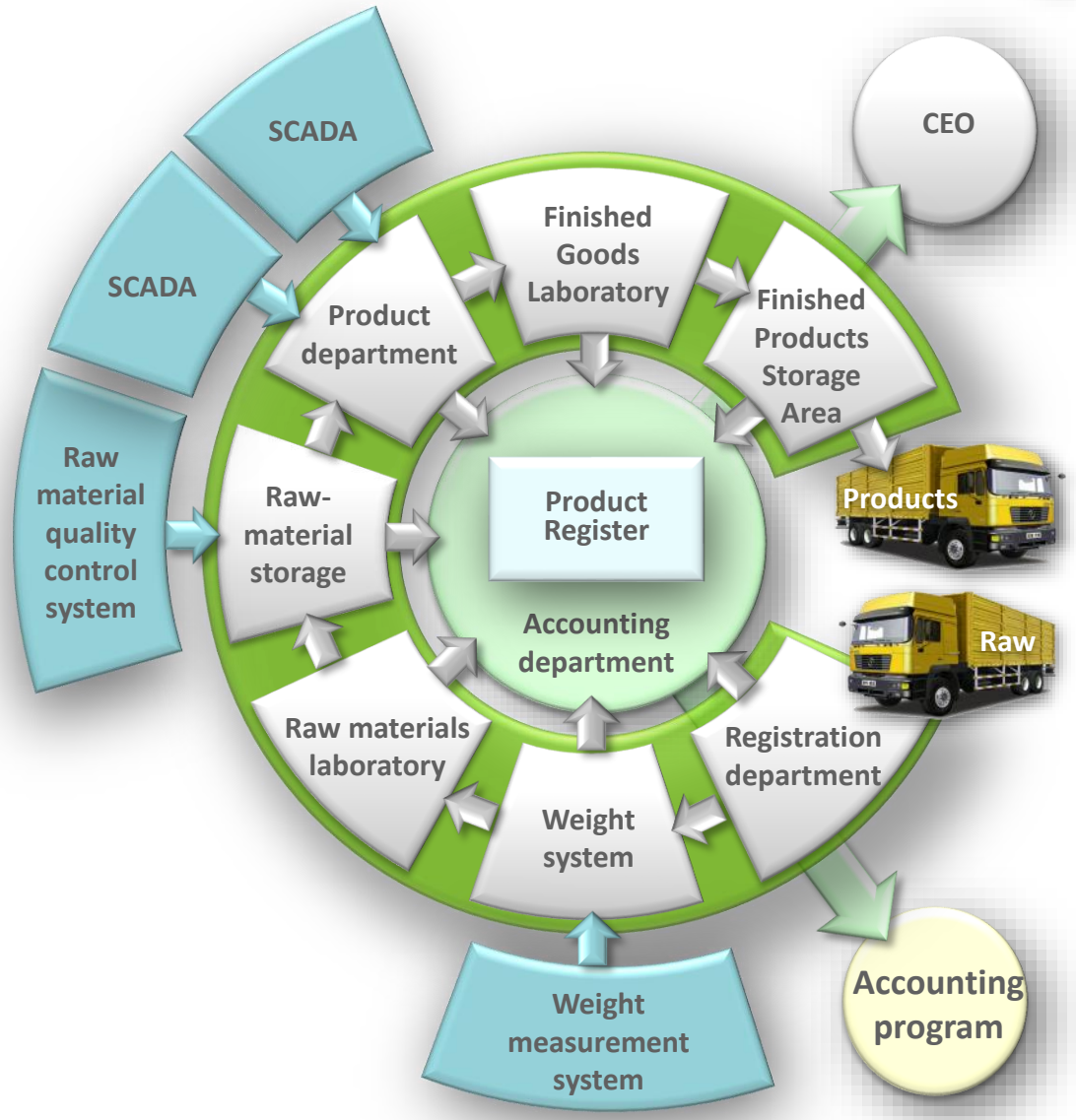
SAKURA-PRODUCTION

SAKURA-Production ERP PLM system of automated quantitative and qualitative accounting of products is designed for comprehensive automation of enterprise management, planning and control of production

The main functions of SAKURA-P:

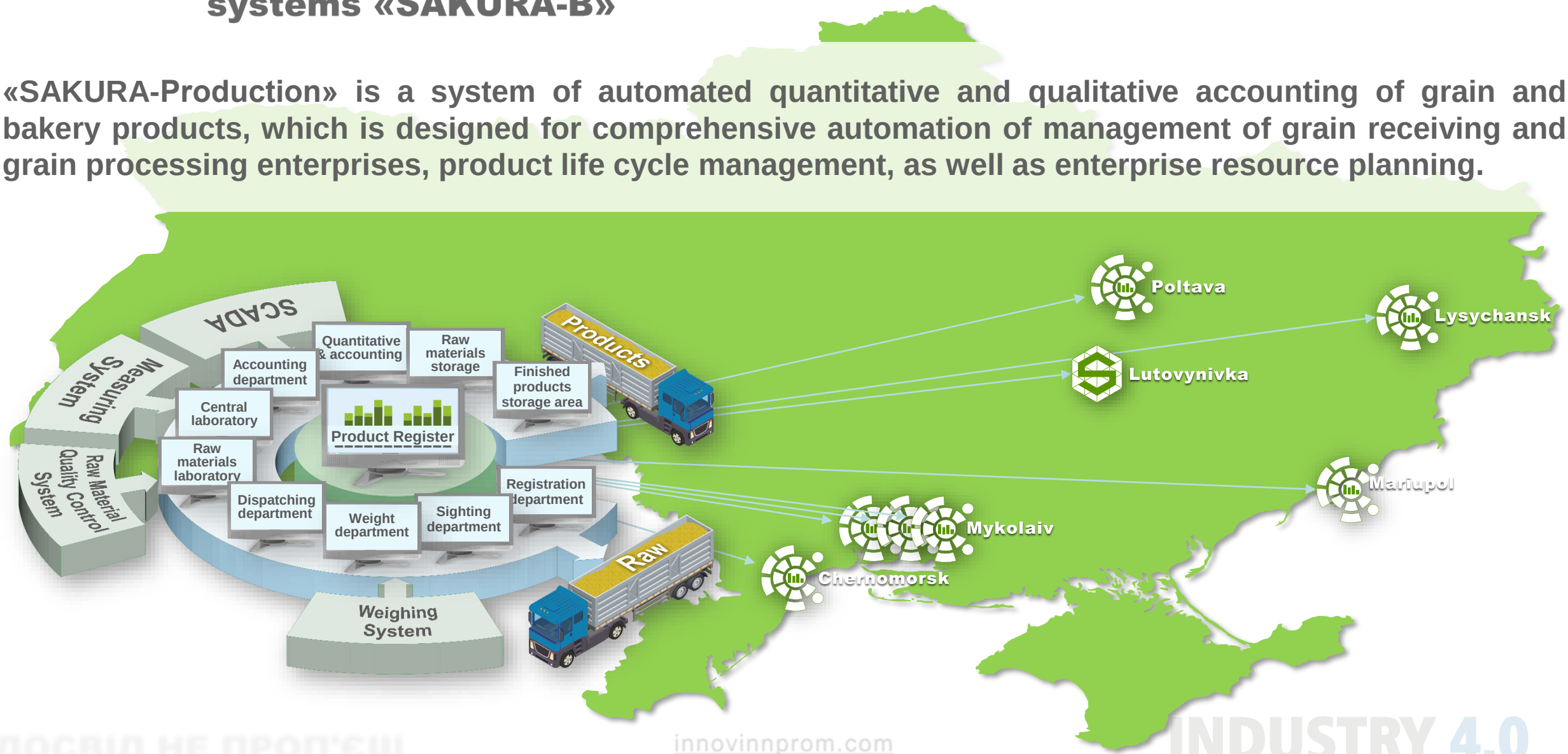
- ✓ Obtaining and analyzing information about the work of the enterprise
- ✓ Formation and control of sound plans based on the analysis of data on available resources
- ✓ Operational control and management of material resources
- ✓ Prevention of loss cases, theft probabilities and fraud in processing and releasing of products
- ✓ Analysis of the enterprise results and formation of the optimal labor organization and production processes
- ✓ Increasing labor productivity through the redistribution of functions, rights and responsibilities of working staff and administration

SAKURA-P combines technological document management of the enterprise with production-warehouse and quantitative & accounting of production



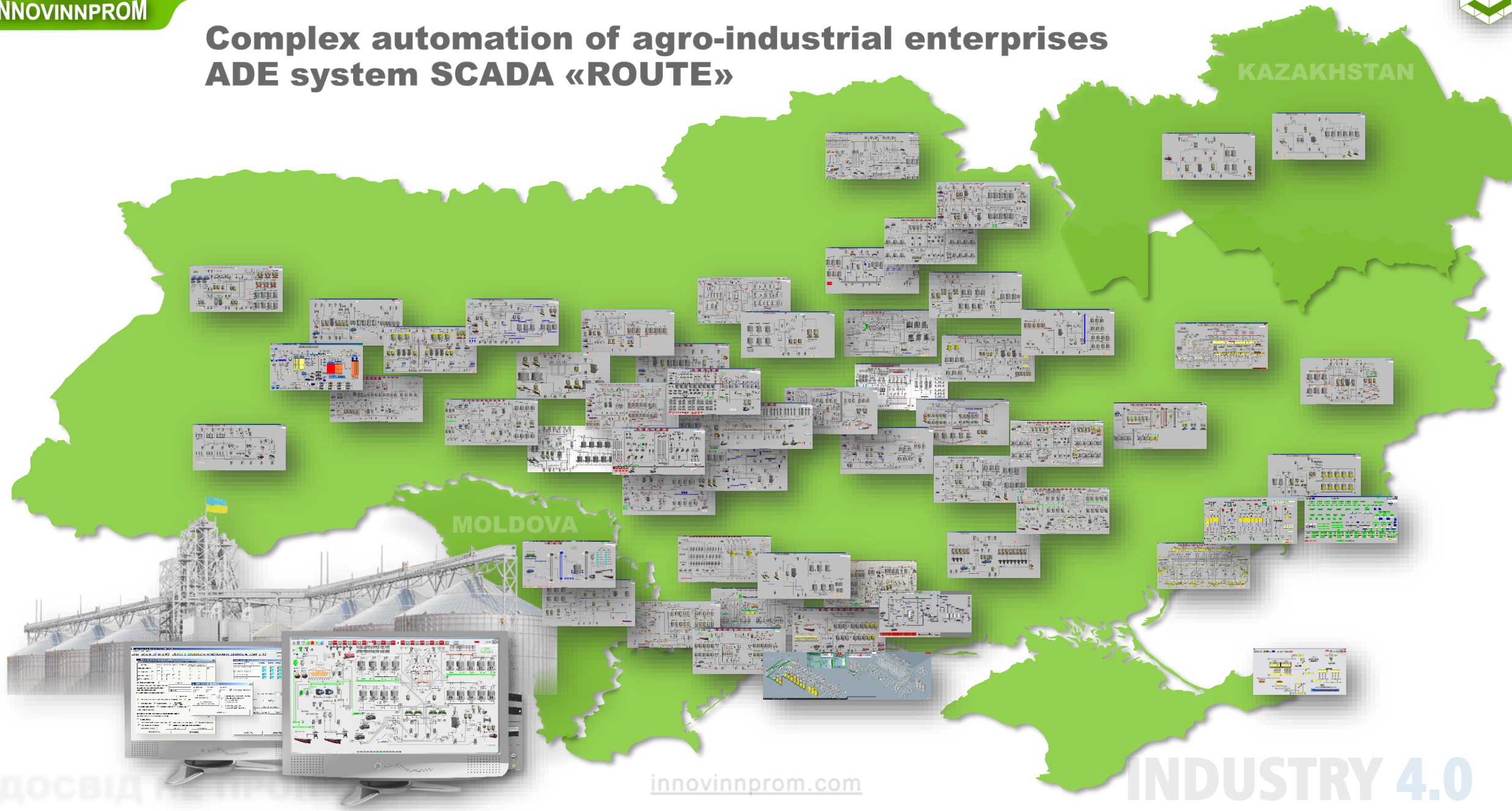
Implementation results of the information and analytical ERP PLM systems «SAKURA-B»

«SAKURA-Production» is a system of automated quantitative and qualitative accounting of grain and bakery products, which is designed for comprehensive automation of management of grain receiving and grain processing enterprises, product life cycle management, as well as enterprise resource planning.



IMPLEMENTATION

Complex automation of agro-industrial enterprises
ADE system SCADA «ROUTE»



IMPLEMENTATION

Development and installation of «DELTA» grain sampling systems

ADVANTAGES

SAKURA-IIOT	Alternative systems
Licensing not required	The need for high-cost licenses
Open programming platform	Proprietary programming platform
Open source code	Closed source code
Popular programming languages	Specific programming languages
Works with any cloud service	Payment for the imposed cloud service
No need for installation	The need to setup installation packages

ECONOMIC ADVANTAGES

Reduction of energy consumption of technological equipment - up to 10%
Achieved by selecting and controlling the most energy-efficient modes of operation of the equipment and optimization of technological delays

Reduction of technological losses - up to 15%
Achieved by preventing violations of established algorithms and standards at all stages of production, continuous monitoring of technological operations and personnel actions

Improving energy efficiency of production - up to 20%
Achieved through continuous monitoring and analysis of energy efficiency of production, control of accuracy and timeliness of completing technological tasks

Increase of the equipment service life - up to 25%
Achieved by planning and monitoring the maintenance and repair of equipment, quality control of spare parts from different manufacturers

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