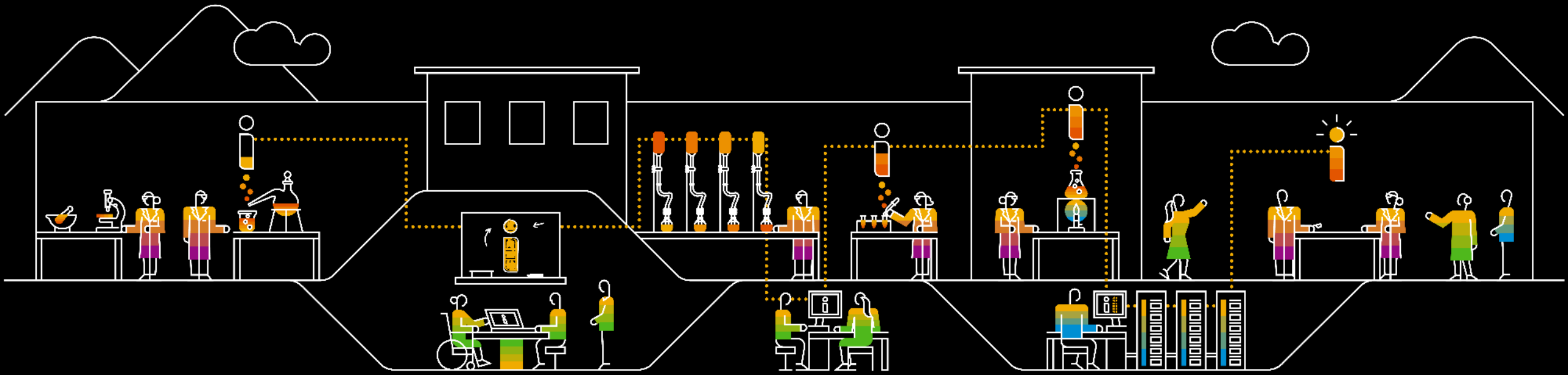

SAP Innovation Awards 2021

SAP Innovation Awards 2021 Entry Pitch Deck

The city becomes cleaner by smart waste disposal

Administration of Krasnodar City

PUBLIC

THE BEST RUN SAP

Company Information

Headquarters	Administration of Krasnodar City
Industry	Public Sector
Web site	https://en.krd.ru/

The city was founded by Cossacks in 1793. The city of Krasnodar is administrative center of Krasnodar Region. It is the largest industrial, transport, trade, scientific and cultural center of Southern Russia.

The city stands on the Kuban River in Southern Russia, with a population of 932,629 residents, and more than 1 million residents in the urban agglomeration.

Krasnodar, among the pilot cities, participates in the Smart City program of the Russian Ministry of Construction, Housing and Utilities. Krasnodar entered the international Smart Cities club to exchange experience with those who are already applying similar technologies.

A significant amount of smart city activities in Krasnodar were implemented in 2018–2019. The most significant is the formation of a traffic management center (this includes an intelligent traffic monitoring system, "smart" traffic lights, public transport monitoring, automated parking system, etc).

The initial Krasnodar Smart City program was adopted in 2019, and now it is strengthened by projects aimed to create a comfortable, eco-friendly, favorable urban environment.

The city becomes cleaner by smart waste disposal

Administration of Krasnodar City

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The importance of digitalization of the urban environment is driven by the rapid development of information technology and the demand for greater safety and comfort of city residents.

Andrey Doroshev. Deputy head of the Krasnodar city

Challenge

The schedule for waste removal in city doesn’t account the volume of accumulated waste at the collection sites; there are no tools for operational control and optimization. Overfilled waste collection areas caused discontent among citizens. The waste removal operator's services were paid according to the established fixed rates, rather than the actual volume of removed waste.

Solution

Together with telco operator ER-Telecom we created a prototype of system for monitoring waste collection in real time. It uses SAP Internet of Things (IoT) and SAP HANA to collect and analyze data, and SAP Analytics Cloud to provide insights and real-time visibility to decision makers in city administration.

Outcome

Accurate, objective and reasonable calculation of the volume of removed waste for each waste container using IoT technologies. Prediction analytics for overfilling prevention of waste collection sites. Efficiency of accounting of waste volumes "on the fly", optimization of routes of garbage trucks.

50% Reduction in municipal payments for excessive volume of waste over agreed fixed rates.

30% Growth of the IQ index of cities due to the implementation of IoT scenarios in various areas of housing and communal services and urban economy

Participating Partner Information

ER-Telecom Holding JSC

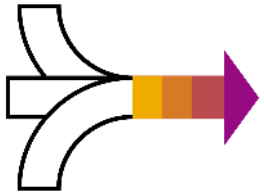
ER-Telecom provides services of broadband Internet access, telephony, digital TV, access to Wi-Fi, VPN, LoRaWAN networks, video surveillance and integrated solutions based on technologies of the industrial Internet of things (IoT).

ER Telecom is interested in developing added value services that utilize LoRaWAN network capabilities.

IoT solutions support the development of the digital economy in the region through fundamentally new tools for industrial production, energy and utilities, business, city services and the "Smart City".

Ilya Vasketsov. Deputy Director for B2G ER-Telecom Holding JSC

ER·TELECOM



Business Challenges and Objectives

For the municipality and the waste handling provider: The waste volumes are calculated based on the rates and do not correspond to the actual volumes:

- The actual volumes of waste are not accounted for each waste collection site
- There are significant differences in the estimates of "excess" waste between the operator and the administration

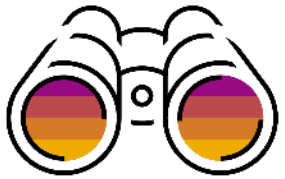
For residents: Untimely and delayed waste removal:

- Waste removal schedule does not depend on the volume of accumulated waste at collection sites
- Waste removal works are organized based on estimations according to standards, which does not correspond to the fact and leads to the accumulation of waste at the sites

Regional / municipal authorities and regional waste handling operators need a tool to quickly and reliably measure the actual volume of collected and removed waste.

The satisfaction of residents with the quality of waste collection services depends on the maintenance of waste collection sites. Separate waste collection will make it more difficult to ensure that pickups are made on time.

The SAP partner is ready to act as the operator of the platform for monitoring the waste volumes, equips collection sites with volume measurement devices and provide access to the service for measurement of waste volumes and monitoring the timeliness of waste removal.



Project or Use Case Details

Project scope included development of analytical and business services based on IoT technologies.

IoT infrared sensors were installed in municipal waste containers.

SAP Partner ER-Telecom provided IoT-devices and used it LoRaWAN network to collect data from sensors.

SAP IoT was used here to onboard and centrally manage IoT devices.

SAP HANA stored and provided analytical and machine learning (ML) processing to cleanse and enrich collected IoT data

SAP Analytics Cloud was used to visualize processed data and provide reports to end users

SAP Transportation Management to be used to optimize seasonal and weekly routes of waste trucks based on actual data (planned extension)

Benefits and Outcomes

Business or Social

Optimization of:
- the waste removal schedule,
- the number of containers on a collection site,
- the location of sites.

Control directly on sites of waste accumulation, accounting time, volume of removed waste, accumulation dynamics.

Increased accuracy due to the absence of disputes regarding the volumes of removed waste in excess of those calculated according to the rates.

IT (optional)

Leverage the Internet of Things as the driving force to protect city environment and to help stop climate change.

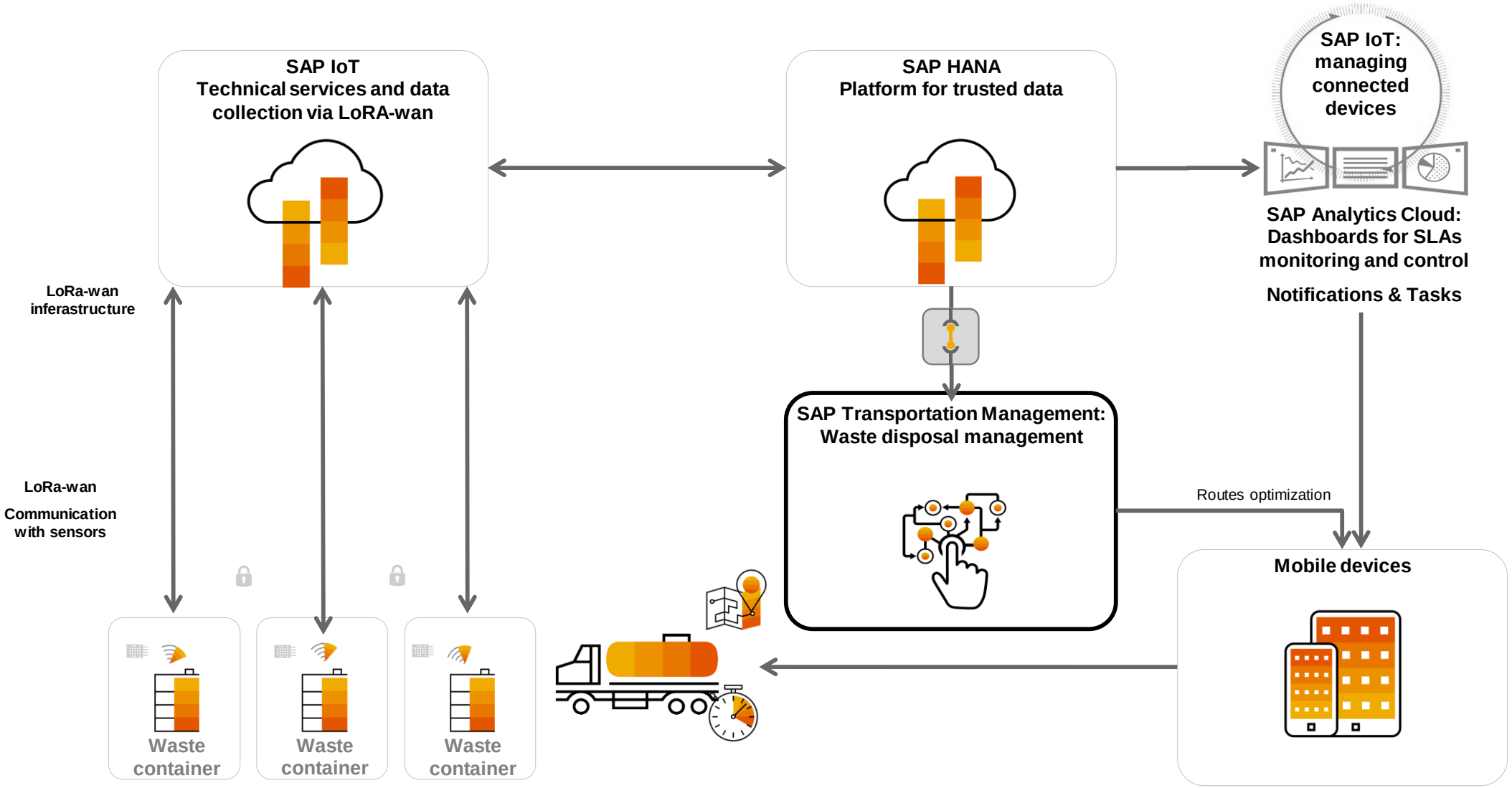
Human Empowerment

Convenient and comprehensive consumer services for ordering waste collection.

Improving the quality of the urban environment by improving the maintenance of waste collection sites

Increased satisfaction and engagement through new opportunities for control the quality of services of waste handling provider.

Architecture



Deployment

Deployment status PoC

Date 26/01/2021 **Number of users** 25

SAP® technologies used:

	SAP product	Deployment status (live or proof of concept [POC])	Contribution to project
1	SAP Business Application Studio	POC	System administration and development
2	SAP Cloud Platform, Cloud Foundry tools runtime	Live	Computation capacity for data processing
3	SAP HANA Cloud	Live	Data storage and ML processing
4	SAP Internet of Things	POC	Onboarding and management of IoT devices
5	SAP Analytics Cloud for business intelligent (BI), predictive edition	POC	BI

If you have used one or more of the services or support offerings from SAP Services and Support during the implementation or deployment phase, please indicate which one(s) below with an X

- ☐ SAP MaxAttention™
- ☐ SAP ActiveAttention™
- ☐ SAP Advanced Deployment
- ☐ SAP Value Assurance
- ☐ SAP Model Company
- ☐ Others:
- ☐ SAP Innovation Services
- ☐ SAP Innovative Business Solutions

Advanced Technologies (1 of 2)

The following **advanced technologies** were part of the project.

	Technology or use case	Product used*	Contribution to project and how product used integrates with SAP products
1	**Machine learning or artificial intelligence** **Robotic process automation**, conversational AI, AI-based knowledge graph	SAP HANA, predictive option	For the sake of cost very simple and cheap sensors are installed in waste containers. Raw data from these devices with infrared sensors contains many errors and gaps. SAP HANA, predictive option is used to cleanse and enrich data.
2	**Intelligent data management** Multi-cloud, data virtualization and governance, smart data tiering, persistent memory, data privacy		
3	**Advanced and augmented analytics** • Real-time and streaming analytics, spatial analytics • Natural language query and generation • AutoML to identify trends, patterns, outliers • Predictive analytics (time series analysis and forecasting, regression, classification)	HANA, predictive option	Predictive model is developed to make predictions of the level of waste in containers depending on individual parameters of containers and random influence of false responses.
4	**Data and analytics solutions in the cloud** • Unified data and analytics cloud platforms by SAP • Modern/self-service data to analytics	SAP IOT Cloud Foundry SAP HANA Enterprise Cloud SAP Analytics Cloud	The solution is completely cloud based. All components are located in SAP Data Custodian. Customer pays subscription in a Business-Process-as-a-Service model

*If this is not an SAP product, explain how it integrates with SAP products.

Advanced Technologies (2 of 2)

The following **advanced technologies** were part of the project.

Technology or use case	Product used*	Contribution to project and how product used integrates with SAP products
5 Advanced cloud integration • API economy (monetization and API marketplaces) • AI-based or crowdsourced integration • High throughput, low-latency digital integration hub		
6 Industry cloud platform		
7 Blockchain		
8 Internet of Things	SAP IoT	SAP IoT provides onboarding and management of IoT devices installed in waste containers
9 3D printing		

*If this is not an SAP product, explain how it integrates with SAP products.

Additional Information

IoT service for waste management is a pilot service for comprehensive city platform of trusted data. The concept of “city platform of trusted data” is to use IoT technologies in different areas of city management (traffic, utilities, development etc.). For these purposes, one platform is proposed to collect and process data, and one operator provides maintenance and provisioning of services based on such platform. Municipal authorities, suppliers and contractors use this platform as a source of trusted data.