ROSSMA IIOT-AMS

FOR AUTOMATION OF OIL INDUSTRY FACILITIES

www.rossma.ru/en/

ABOUT THE COMPANY

The ROSSMA Company (Perm) is a developer and manufacturer of radio-electronic equipment and software for Internet of Things (IoT) and industrial Internet of Things (IIoT) networks.

LoRaWAN® **NB-IoT™** **LoWPAN**

The ROSSMA company is a participant of international equipment producers community according to the LoRaWAN standard – LoRaAlliance and international IEEE Association.
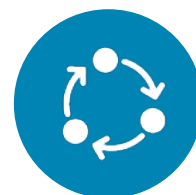
LoRa Alliance™ **◆IEEE**

The ROSSMA company possesses an OUI - unique identifier of the network equipment manufacturer.

Research and development (R&D) of LPWAN solutions

Intelligent oil pipeline, intelligent well, smart drilling site, smart housing and public utilities

Software development and automated systems production

Production of ROSSMA IIOT-AMS "field" equipment, own IIOT platform, development of industry applications

Integration

Integration gateways with platform solutions

Service support

Installation, warranty and post warranty service support

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ROSSMA IIOT-AMS SPHERE OF APPLICATION

AUTOMATIC PROCESS CONTROL SYSTEMS AND MONITORING OF CRITICAL INFRASTRUCTURE OBJECTS

monitoring of production objects, to build telemetry systems and to automate technological processes, creating automated system of electric power technical metering/automatic system for commercial measurement of power consumption.

SYSTEMS OF ELECTRIC POWER METERING

data collection from electric power metering stations, heat energy metering stations, steam metering stations and others.

MONITORING AND CONTROL OF LIFE SUPPORT SYSTEMS

Security functions of house, apartment, office, control of garbage cans filling with automatic application for garbage removal, electrical devices and lighting systems switching on/off, condition of water and air, deviations from specified parameters in engineering structures, etc.

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COMPARISON OF LPWAN TECHNOLOGY STANDARDS*

ПАРАМЕТРЫ/СТАНДАРТ	LoRaWAN	NB-LTE-M (NB-iOT)	NB-FI	LTE-M
RANGE/FREQUENCY (MHz)	Unlicensed (ISM)/868	Licensed, for GSM/791-862 and 1710-1880 networks	Unlicensed (ISM)/868	Licensed, for the existing LTE/1800 network
SUPPORT OF VENDORS	LoRa Alliance (IBM, Cisco, Semtech and other.)	Ericsson, Nokia, Intel, Qualcomm, Alcatel…	VAVIOT (Russia) using ON Semiconductor (USA) chips	Ericsson, Nokia, Intel…
RANGE	15 km	10 km	10 km	10 km
NETWORK SPEED	Up to 15 Kbps	Up to 150 Kbps	Up to 10 Kbps	1 Mbps
SUPPORT OF PRIVATE NETWORKS ENGINEERING	yes	no	no	no
AUTONOMY OF MODULES	10 years	10 years	10 years	Several months
CLASSES OF DEVICES	A,B,C	Analog A,B,C	A (limited control)	Constantly in touch
AVAILABILITY	available	partially available	partially available	partially available
BUILT-IN ENCODING ELEMENTS	AES-128 (AES-CMAC)	no	AES-128 (AES-CMAC)	no
COMMUNICATION MODULE COST **	20 $	20$	40$	50-70$
BASE STATION COST	~ 1000 $	~ 30 000 $	~ 2500 $	~ 30 000$

According to Tadviser.ru   * - LPWAN (англ. Low-Power Wide-area Network — wireless technology of small data transfer on a long distance developed for distributed telemetry networks, intermachine communication and Internet of things

** - Communication module cost is the cost of the connection microchip which is used for end devices production.

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QUESTIONS OF STATUTORY REGULATION

1. LoRaWAN - are there risks of the technology ban for commercial purposes use? (Possible sanctions, regulator/special services ban)?
There are no prohibitions on technology use for commercial projects. Sanctions are not possible, because devices and solutions are developed by thousands of companies around the world and the protocol is open. In addition, the preliminary LoRaWAN GOST is being developed and will be ready by the end of 2019. By the way, it is possible to embed modules of domestic cryptography in the protocol, if clients have such requirements. It is also worth paying attention to the data collection infrastructure. If you create your own LoRaWAN network, the data will not be transmitted anywhere. If the network is public, you need to manage the encryption keys by yourself. *

2. NB IoT - are RPC legislative changes for frequencies use in the licensed spectrum for this technology completed?
Yes. The protocol is regulatory ready to work. *

3. NB Fi - prospects for approval of the Russian protocol as non-alternative in the Russian Federation for FPC (small and large energy)?

No protocol has such prospects. At the expert meeting, the Ministry of Energy postulated "network neutrality" for small and large energy. *

A.Kolesnikov - Director of the Internet of Things Associationhttps://iotas.ru

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SOLUTION FROM ROSSMA

"Universal autonomous wireless measuring and switching device for controllers and sensors with digital and analog outputs " (ROSSMA-IIOT-AMS), using LoRaWan technology.

**ROSSMA IIOT-AMS
has a number of certificates**

Device capability when working with data from sensors and controllers: RS-485, RS-422, RS-232, Modbus, 0-5mA, 0-20mA, 4-20mA, 0-0,01B/0-1B/0-10B, pulse output.

This device allows to perform long-term independent operation of sensors and measuring devices with the above-stated output interfaces using usual batteries (lithium-thionylchloride battery. Shelf life is up to 10 years, self-discharge <1% a year. It is developed for long-term operation with small current consumption

Working temperature (degrees Celsius):-55 ... +85
Rated voltage (V):3,6.
Nominal capacity (mA-h):16500
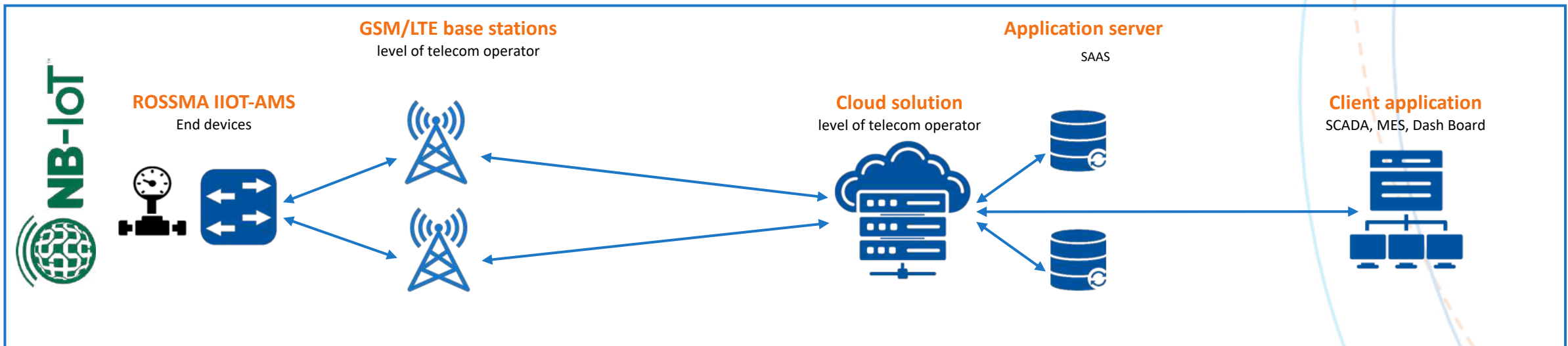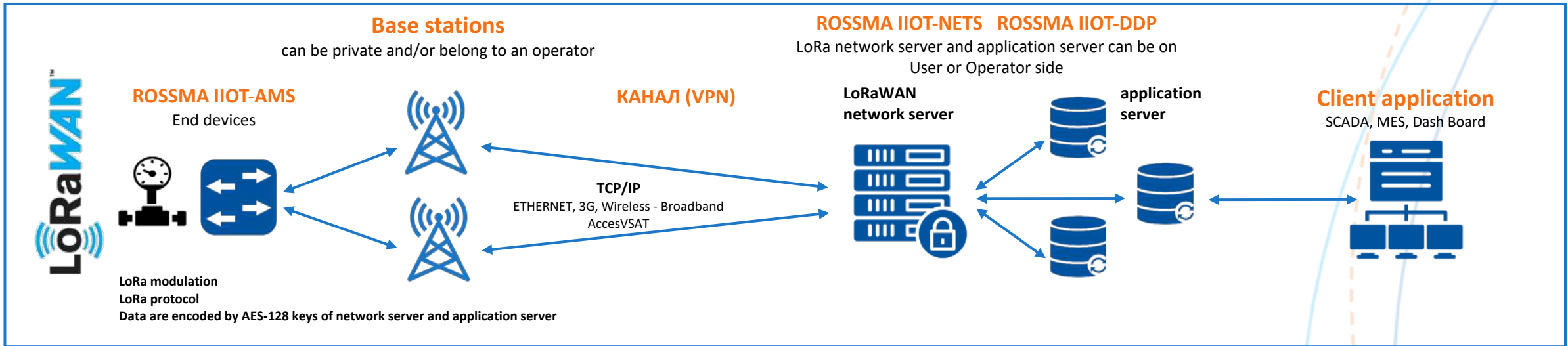**Standard digit current (mA):**5,0 (мах 500)

SOLUTION FEATURES

Features of developed "Universal Autonomous wireless measuring and switching device for controllers and sensors with digital and analog outputs"

- In autonomous mode **(without external power supply)** the device is able to read measurements from sensors and measuring devices with digital and analog outputs.

- One ROSSMA-IIOT-AMS device with standard equipment can be connected with up to 8 measuring devices or controllers and transmit data in LoRaWan network as one package with up to 64 parameters. (Pressure, temperature, consumption, humidity, intensity of illumination, location, battery charge and it can also transmit an alarm signal from security alarm system, fire alarm system, flooding sensor and the access control system).

- **Measurement frequency is adjusted for each parameter individually. (from 1 time a minute and more).**

- Can perform inner clock corrections for synchronization of measurement time.

- **Autonomous operation time** of the controller can reach up to **10 years** depending on the number of parameters, sensor type and measurement frequency.

- While there is no communication with LoRaWan base station, **it is possible to store readings** and transmit them upon resumption of connection.

- It is possible to process emergency and disturbing events and to operate executive elements of an object to prevent accident on the side of ROSSMA-IIOT-AMS.

ROSSMA IIOT-AMS is developed on the basis of patent No. 183764 – the patent holder is LLC ROSSMA

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IoT/IIoT SYSTEM ARCHITECTING

Base stations
can be private and/or belong to an operator

ROSSMA IIOT-NETS   ROSSMA IIOT-DDP
LoRa network server and application server can be on
User or Operator side

ROSSMA IIOT-AMS
End devices

КАНАЛ (VPN)

**LoRaWAN
network server**

**application
server**

Client application
SCADA, MES, Dash Board

TCP/IP
ETHERNET, 3G, Wireless - Broadband
AccesVSAT

**LoRa modulation
LoRa protocol
Data are encoded by AES-128 keys of network server and application server**

GSM/LTE base stations
level of telecom operator

Application server

SAAS

ROSSMA IIOT-AMS
End devices

Cloud solution
level of telecom operator

Client application
SCADA, MES, Dash Board

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ROSSMA IIOT-AMS EQUIPMENT FOR AUTOMATION OF OIL PRODUCTION FACILITIES

ROSSMA IIOT-AMS ANALOG EX

SINGLE/MULTI-CHANNEL

Provides independent operation of control and measuring devices with 4-20 mA current output or with resistive output.

Compatible with pressure, temperature, level, vibration, gas sensors, etc.

Installed in places where there is no power supply.

It has non-volatile memory.

Provides long-term autonomous operation for up to 5 years.

Operate at temperatures from - 55 gr. C

Supports standards:
LoRaWAN®, NBiOT™, 6LoWPAN.

ROSSMA IIOT-AMS MODBUS

It has a built-in power supply,can be connected to 220V network.

Works on the principle of constant polling of the controller with MODBUS and sending packet data according to the specified schedule, by event (rejection).

It has non-volatile memory.

Supports standards:
LoRaWAN®, NBiOT™, 6LoWPAN.

It is equipped with additional pulse inputs and "dry contact."

Pulse inputs are galvanically isolated and maintain frequencies above 300 Hz.

It is configured both by air and using software configuration.

Can be used as a stand-alone process controller.

ROSSMA IIOT-AMS EQUIPMENT FOR ENERGY ACCOUNTING AND TRANSIENT PROCESS MONITORING

ROSSMA IIOT-AMS PULSE

Impulses/frequency counter

It is used for digitalization of data from conventional mechanical meters of energy resources: liquids, steam, gas, as well as for data transmission from oil flow meters and mass meters.

It is equipped with galvanically isolated inputs with support for frequencies above 300 Hz and "dry contacts."

Supports standards:
LoRaWAN®, NBiOT™, 6LoWPAN.

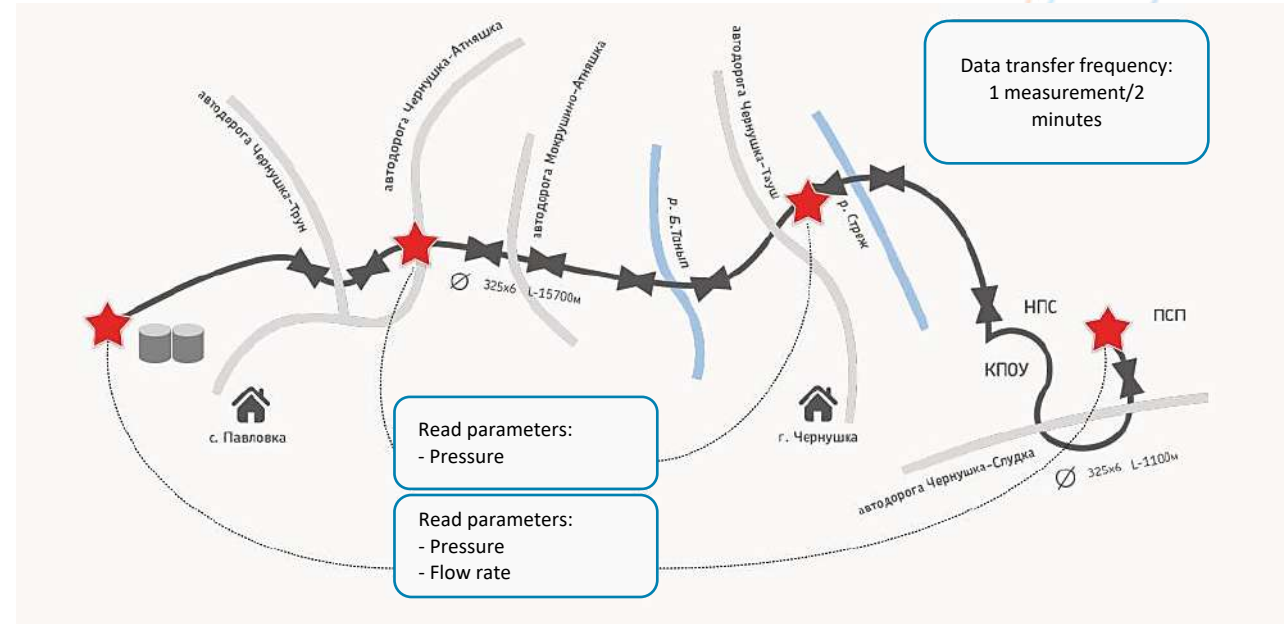**ROSSMA IIOT-AMS DRY CONTACT**

«DRY CONTACT»

Switching device for control of transition processes, opening/closing of doors, shutters, valves, switching off/on of electric devices, detection of sensors operation.

Can be installed in existing metering devices and equipment.

Can be used to control external automation devices.

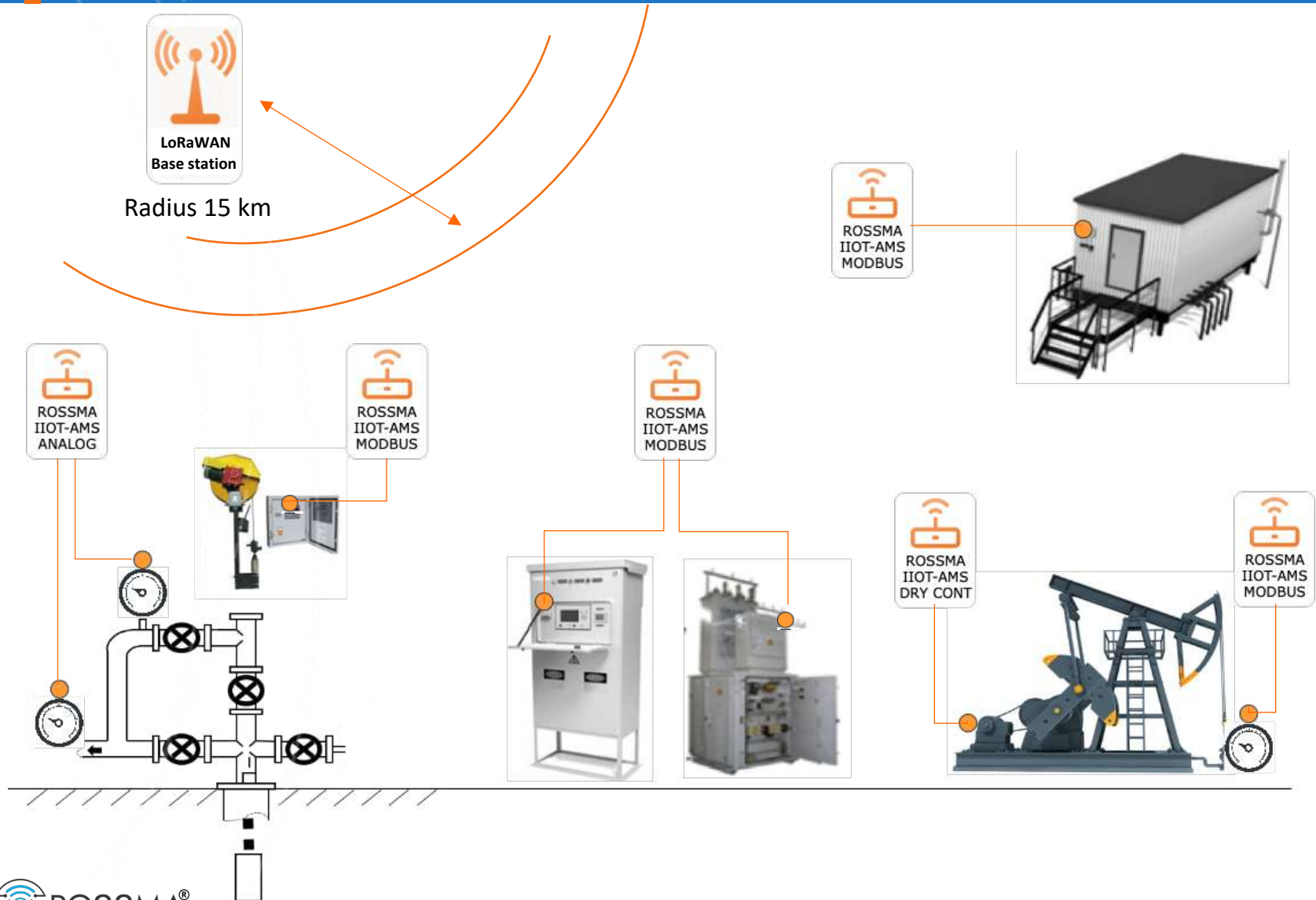Supports standards:
LoRaWAN®, NBiOT™, 6LoWPAN.

DIGITAL PIPELINE

Data transfer frequency:
1 measurement/2 minutes

Read parameters:
- Pressure

Read parameters:
- Pressure
- Flow rate

Online control of illegal taps/leaks

- Online informing about leaks and illegal taps in the oil pipeline with place determination
- Possibility of in field system building in the absence of GSM network and power supply
- Low cost of incorporation (cost is 10 time lower than the existing analogs)

Technological communication in the field

- Connection possibility of existing telemechanics system and protective automatic equipment with data transfer in LoRaWAN network
- Opportunity to refuse using expensive VHF and GSM data transmitting system
- Possibility of wireless productivity (transfer devices, pressure, temperature, gas pollution sensors) using batteries up to10 years.

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DIGITAL WELL

LoRaWAN
Base station

Radius 15 km

ROSSMA
IIOT-AMS
MODBUS

ROSSMA
IIOT-AMS
ANALOG

ROSSMA
IIOT-AMS
MODBUS

ROSSMA
IIOT-AMS
MODBUS

ROSSMA
IIOT-AMS
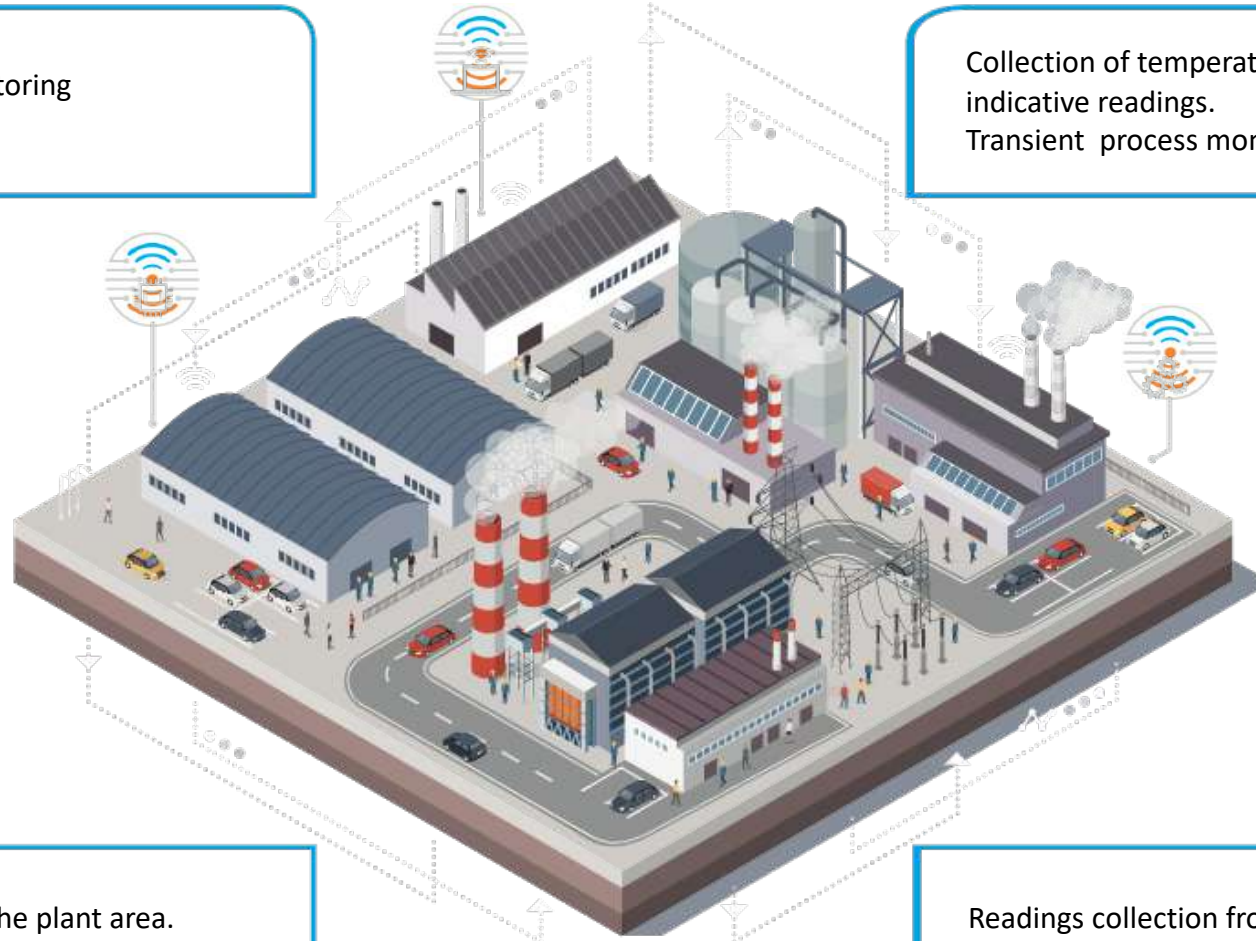DRY CONT

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IIOT-AMS
MODBUS

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DIGITAL PLANT

Harmful emissions monitoring
Pipeline leak monitoring

Collection of temperature, pressure, level indicative readings.
Transient process monitoring

Personnel monitoring in the plant area.
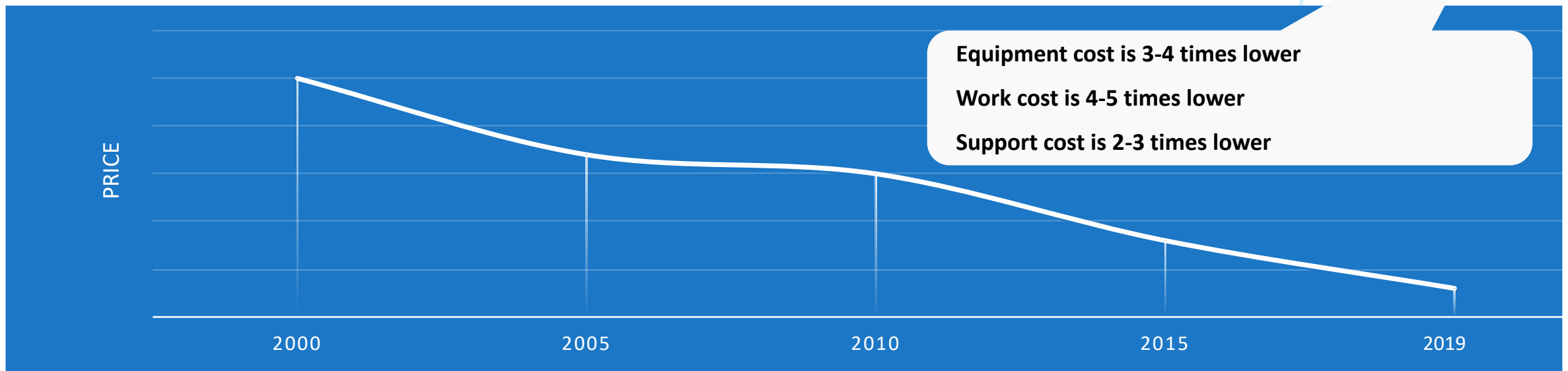Equipment and cargo movement monitoring

Readings collection from heat, steam, water, electricity meters

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EVOLUTION OF AUTOMATION SOLUTIONS

	Wire solutions	GSM(WI-FI) solutions	LoRaWAN solutions
Advantages	— fail-safety	— Incorporation simplicity in presence of GSM network	— Incorporation cost and speed — Can function using self-contained power supply — Independence from network infrastructure
Disadvantages	— Incorporation cost — Operation cost — Aging of copper couples	— fail-safety — Operation cost	— voice communication

Equipment cost is 3-4 times lower

Work cost is 4-5 times lower

Support cost is 2-3 times lower

PRICE

2000   2005   2010   2015   2019

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RESULTS OF LoRaWan TECHNOLOGY IMPLEMENTATION IN OBJECTS OF OIL PRODUCTION

LoRa base stations of various producers (domestic and foreign) were installed. Signal attenuation and signal quality measurements are performed with different heights of antennas and dependence on the producer!
STEADY COVERAGE WITH RADIUS OF 43KM FROM THE BASE STATION IS ACHIEVED!

Measuring and switching devices ROSSMA IIOT-AMS with explosion-proof option are installed in oil production (in picture).

MEASURING AND SWITCHING DEVICE ROSSMA IIOT-AMS INSTALLED IN A WELL MOUTH ENSURES SIMULTANEOUS FUNCTIONING OF TWO PRESSURE SENSORS. MEASUREMENT AND TRANSFER FREQUENCY IS 1 TIME/HOUR, TIME OF AUTONOMOUS WORK IS 3 YEARS.

Autonomous measuring and switching device ROSSMA was installed on the oil pipeline for measuring and transmitting pressure values.

MEASUREMENT RESULTS ARE BEEING READ AND TRANSMITED EACH 2 MINUTES FOR 1 YEAR WITHOUT FAILURES, ALSO AT NEGATIVE AIR TEMPERATURES!

Autonomous measuring and switching device ROSSMA were installed in several tens of wells.
THE SYSTEM TRANSMITTS PARAMETERS 1 TIME AN HOUR AND IF A PARAMETER GOES OUT OF THE PRESETED VALUES WITHOUT FAILURES, CONTROL IS IMPLEMENTED!

Autonomous measuring and switching device ROSSMA was installed on flowmeter of OPPU and pipeline commissioning station for measuring and transmitting pressure and throughflow values.

MEASUREMENT RESULTS ARE BEEING READ AND TRANSMITED EACH 2 MINUTES FOR 1 YEAR WITHOUT FAILURES!

Autonomous measuring and switching devices ROSSMA were installed in treating facility of semiautomatic dewaxing unit and flow string cleaning device.

THE SYSTEM TRANSMITTS PARAMETERS 1 TIME AN HOUR AND IF A PARAMETER GOES OUT OF THE PRESETED VALUES WITHOUT FAILURES!

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IMPLEMENTED PROJECTS

Oil production

- Intellectual oil pipeline – implementation of ROSSMA IIOT-AMS for measurements of pressure and throughflow parameters in the oil pipeline of LUKOIL oil company.

- Intellectual well – implementation of ROSSMA IIOT-AMS for data collection and well, automated group measure unit for gas measuring in oil, complete transformer substation, oil and gas additional separation plant control, security functions of oil production objects in LUKOIL oil company.

Oil processing

- Wireless (LPWAN) monitoring system of maximum allowed concentration of gas in air environment based on ROSSMA IIOT-AMS.

- Wireless (LPWAN) monitoring system of pipelines integrity.

Drilling

- Digital drilling rig system" – drilling rig system digitalization project using ROSSMA IIOT-AMS –data output from controllers, sensors, integration with CAN bus DVS Caterpillar. (Project of Asia-Drilling in GAZPROM NEFT oil company objects).
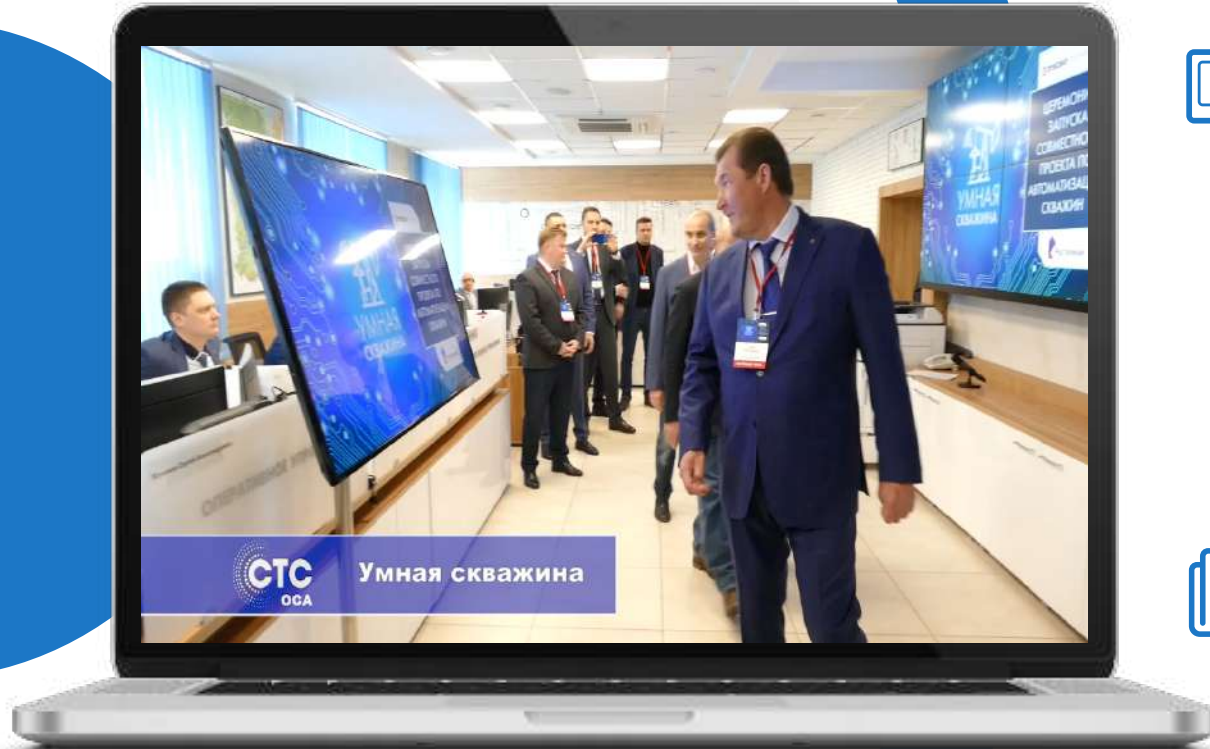
Public energy service

- Wireless (LPWAN) automated system of electric power technical metering for data collection from steam meters, heat meters, water meters, electric meters.

- Wireless security (LPWAN) system based on ROSSMA IIOTAMS (monitoring of smoke, temperature, security and fire safety, leak of water, gas, access, lighting control).

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MEDIA ABOUT US

26.03.2019 /JOINT PROJECT OF LUKOIL PERM,ROSTELECOM AND ROSSMA

The first smart well in the Russian Federation was launched in oil field in Perm region.

Yandex: 307 results found

https://www.youtube.com/watch?v=f4H-akwteoU&feature=youtu.be

https://m.ura.news/news/1052378234

28.11.2018 /DIGITAL OIL: ADVANCED SMART TECHNOLOGY SYSTEMS FOR FPC PRESENTED IN RUSSIA

https://yamobi.ru/posts/smart_oil_production.html

https://www.kommersant.ru/doc/3842979

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Wireless (LPWAN) automation system of cluster facilities and single wells in oil fields in Perm region.
The project is acknowledged as the best in Russia in "Digital Field" nomination.

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ROSSMA® | **THANK YOU FOR YOUR ATTENTION!**