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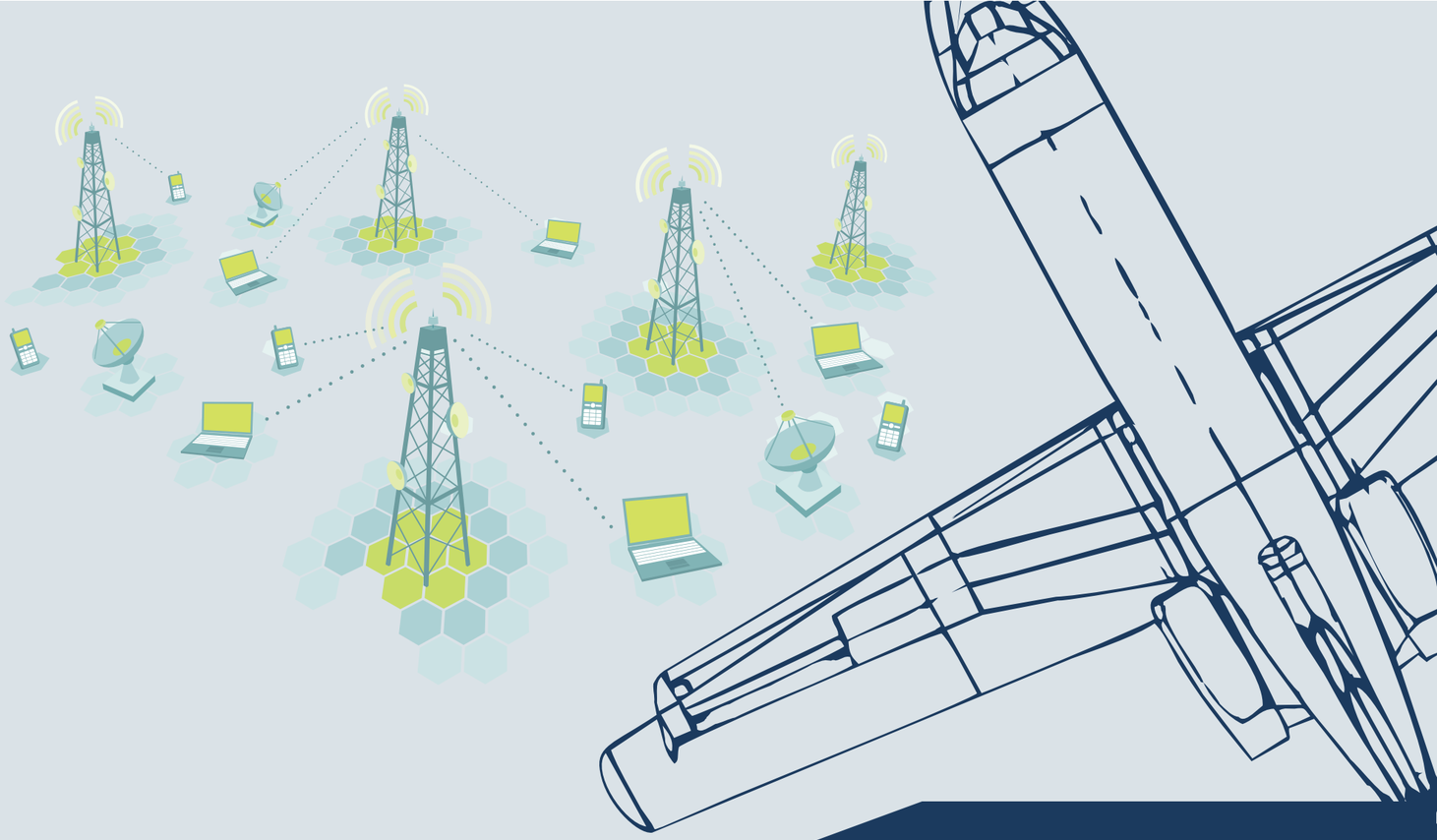

Joint Stock Company
National
RadioTechnical Bureau

Joint Stock Company
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Member of the Radio Sector (ITU-R)
of the International Telecommunication Union -
UN specialized agency


Corporate Member
of Russian Academy
of Natural Sciences


Member of the Association
"Financial and Business Association of
Euro-Asian Cooperation»


Federal security service
(FSB) License
for holding activities related
to the use of information
constituting state secret


FSTEC License for activities
and/or services in the field
of state secret protection


License of the Ministry of Industry
and Trade of Russia
for development,
production, testing,
Installation, repair, disposal, sale
and sale of weapons
and military equipment


License of the Ministry
of Industry and Trade
of the Russian Federation
for the development,
production, testing and repair
of aeronautical equipment


Certificate of Conformity
management systems
quality requirements:
GOST R ISO 9001-2015,
SRPP VT,
GOST 0015-002-2012

**The National RadioTechnical Bureau (NRTB)** was established in 2000 to conduct work to ensure electromagnetic compatibility (EMC) of cellular networks of GSM standard and navigation systems of state aviation.

Today NRTB is a multi-profile enterprise, developer and supplier of complex solutions in the field of development of cellular networks of the third, fourth and fifth generations, radio relay communication, digital television and optimization of radio frequency resource use. The enterprise actively participates in works on creation of means of air navigation, the automated control systems, complex systems test support complexes, IT-projects of various orientation.

NRTB is a member of the Radiocommunication Sector of the International Telecommunication Union (ITU-R), Financial and Business Association of Euro-Asian Cooperation, has the status of a Collective Member of the Russian Academy of Natural Sciences.

The company has all necessary licenses to carry out the work. There is a scientific and technical council, a system of advanced training, quality management system operates in accordance with the requirements of GOST R ISO 9001-2015.

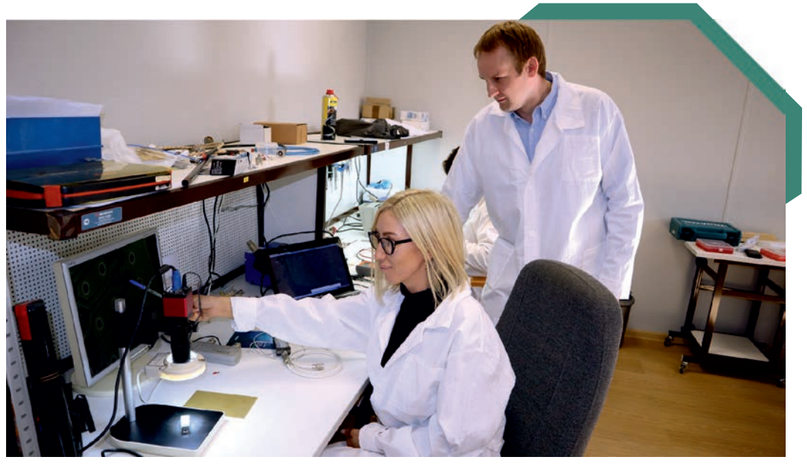
# PARTNERS

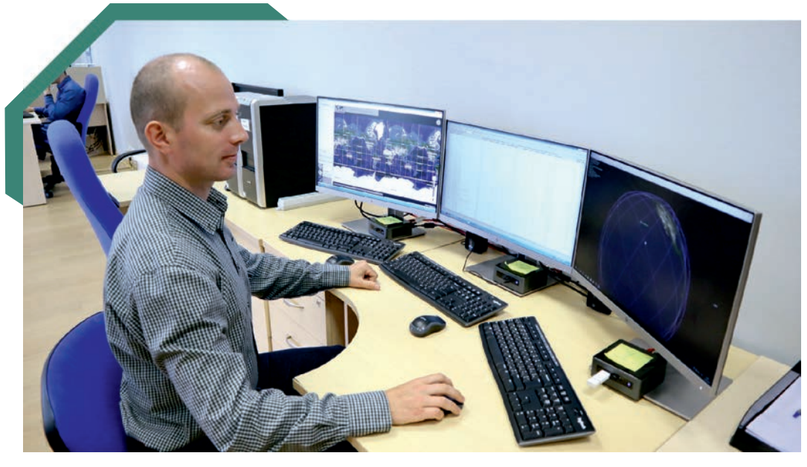
Operators of cellular and radio relay communication, public authorities, state corporations, large industrial enterprises, scientific organizations and business communities.

# TEAM

The basis of the NRTB team is highly qualified scientific and engineering personnel in the field of telecommunications, radio engineering systems, information technology, aviation equipment.

Our specialists have many years of experience in research and development, implementation of their results in production, as well as the operation of radio electronic equipment. Among the employees of the company there is a significant number of people with technical degree.





# EQUIPMENT

## Flying test bench

It was created on the basis of Yakovlev-40 aircraft for the purpose of flight checks performance of communication facilities and radio engineering support of aviation flights in accordance with ICAO recommendations. The aircraft is equipped with an automated flight control system ASLK-75-NU and automated electromagnetic environment control system.

## Mobile measuring complexes

Unified mobile measuring complexes of own design based on Volkswagen and Mercedes-Benz vans are used for field research and electromagnetic compatibility tests. Complexes provide the analysis of electromagnetic environment, including search, measurement of parameters, direction finding, recording, technical analysis of signals of modern communication systems, as well as determining the location of sources of radiation signals.
To assess EMC at altitudes up to 1000 m, an unmanned aerial vehicle is used.

# PRODUCTION

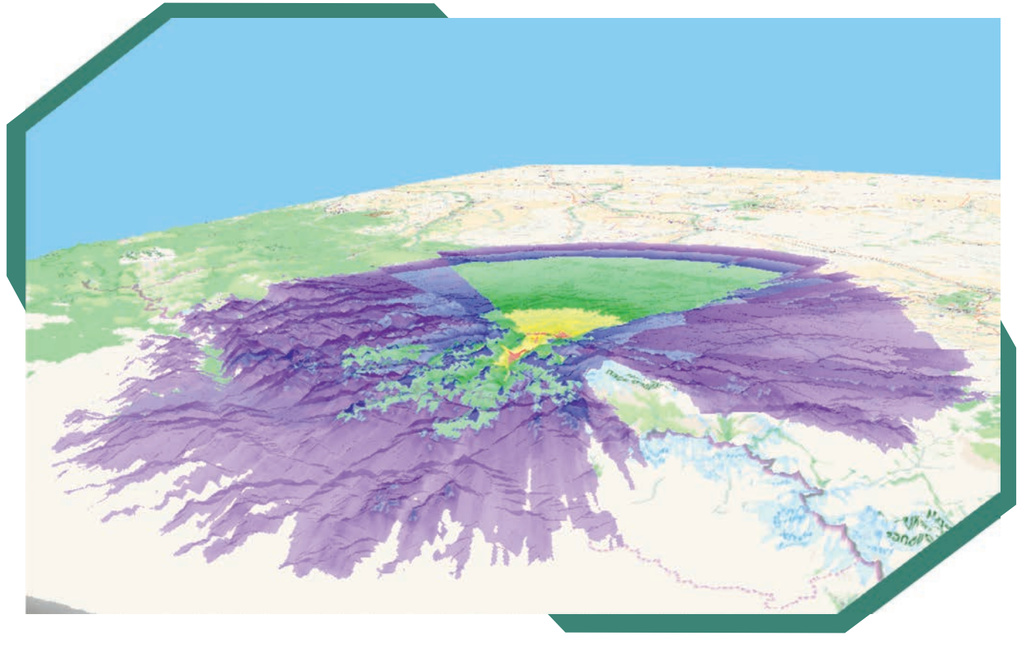
We organized production of high quality components for radar and radio-navigation systems, as well as communication systems for various purposes.

1. Working Range temperatures - -55°C …+60°C
2. Working in conditions of high humidity (100% humidity +35°C)
3. Vibration resistance
4. Shock resistance (20,000 strokes) with acceleration 15 g)

# NETWORK PLANNING

The company has created a multifunctional computing complex (MCC), including a network of high-performance computers, servers, data display and documentation tools. MCC, equipped with special software developed on the basis of modern GIS-technologies, allows to estimate EMC with high speed, calculate coverage areas, optimize frequency-territorial plans of radio communication networks of different standards for any application area.

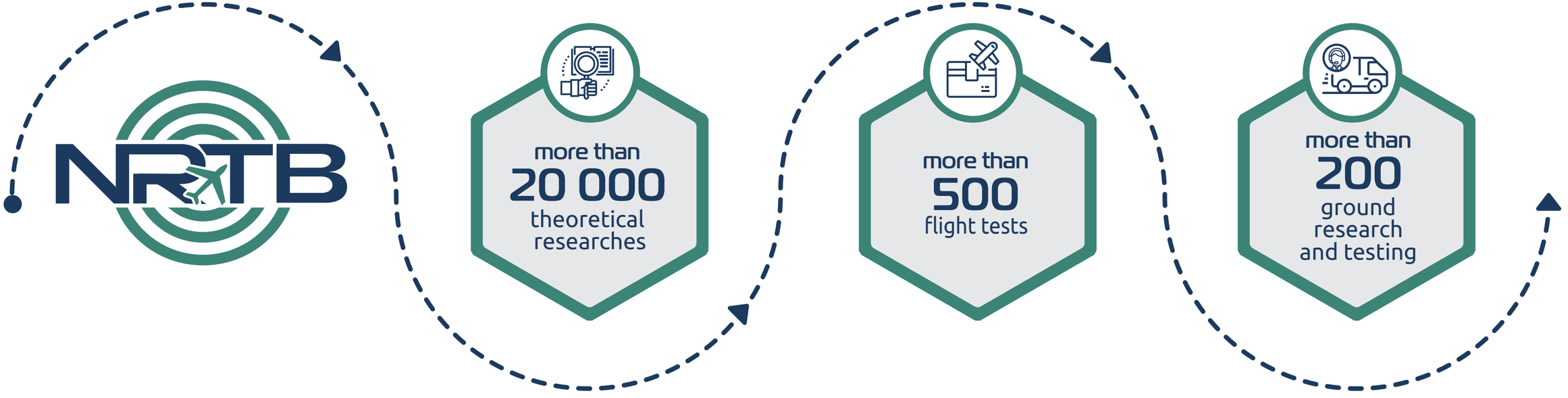
MCC provides a remote web-interface to connect with the customers, including an ability to perform online calculations using cloud technologies. The company's employees are constantly improving mathematical models, calculation methods, means of presentation and data transfer.



# RESULTS

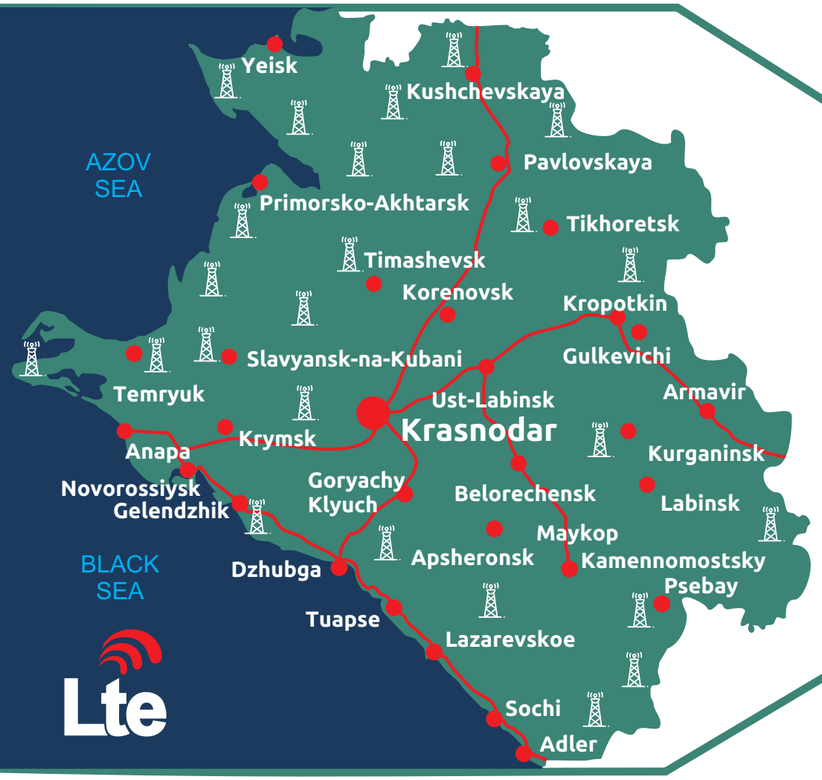
Since its foundation, the company has been continuously developing and implementing measures to improve the availability and efficiency of radio frequency resource of cellular networks by ensuring their electromagnetic compatibility with existing and planned for use radioelectronic means of various purposes.

Technical equipment of the company, flexibility of interaction with customers and partners provide a wide range of work in all regions of the Russian Federation, in the near and far abroad.



# RESULTS - SOCHI 2014

As a general contractor in preparation for the Winter Olympic Games of 2014 in Sochi, a set of works was carried out to ensure electromagnetic compatibility of cellular communication systems and state radio electronic means.




**Theoretical and practical research of conditions of electromagnetic compatibility of cellular communication networks with radio electronic means of special purpose**

**Flight experimental studies**

**Ground research**

**Consolidation and Results Processing**

In the frequency band 791-862 MHz - released by . 2x7.5 MHz

In the frequency band 2.5-2.7 GHz - released by . 2x10 MHz

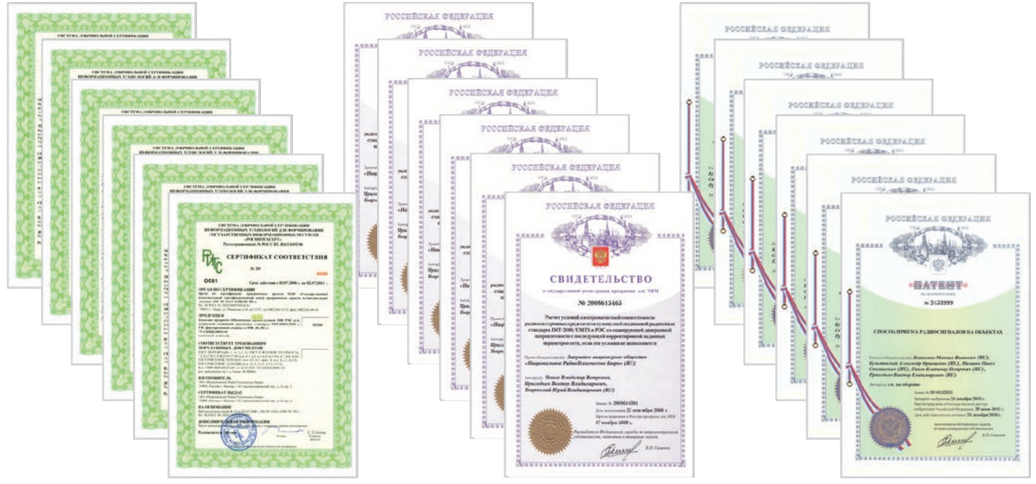
**Full operation of cellular communication networks**

# RESULTS

In 33 regions of the Russian Federation, organizational and technical measures were taken to free up the radio frequency spectrum for IMT-2000 / UMTS networks. Restrictions on operation of LTE-2600 network base stations in 10 subjects were removed. More than 40 digital radio relay lines were built to replace radio relay stations of the outdated park and release radio frequency resource.

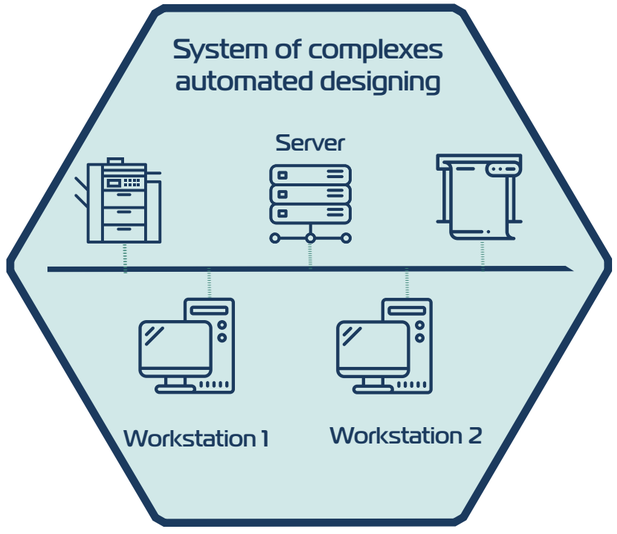
The company modernized the ground beacons of PRMG-76U aircraft instrumental landing systems and performed the modernization of the transceiver link of the approach radar DRL-6M2 for improving its frequency-selective properties and increasing of the radio-frequency resource available for cellar networks.
The mobile radio altimeter PRV-13 has been modified to suppress side reception channels.

By conclusion of public contracts with the Ministry of Industry and Trade, the Ministry of Defense, the Main Directorate of Special Programs of the President of the Russian Federation and leading industrial enterprises, including those in the field of development of air navigation systems, automated control systems, test support facilities and EMC, NRTB performed over 40 research and development projects. The company owns more than 70 invention patents of the Russian Federation. More than 40 certificates of state registration of computer programs have been received. 12 complexes of programs for EMC evaluation have passed certification tests in the Voluntary Certification System of information technologies "RUSINTECHSERT".

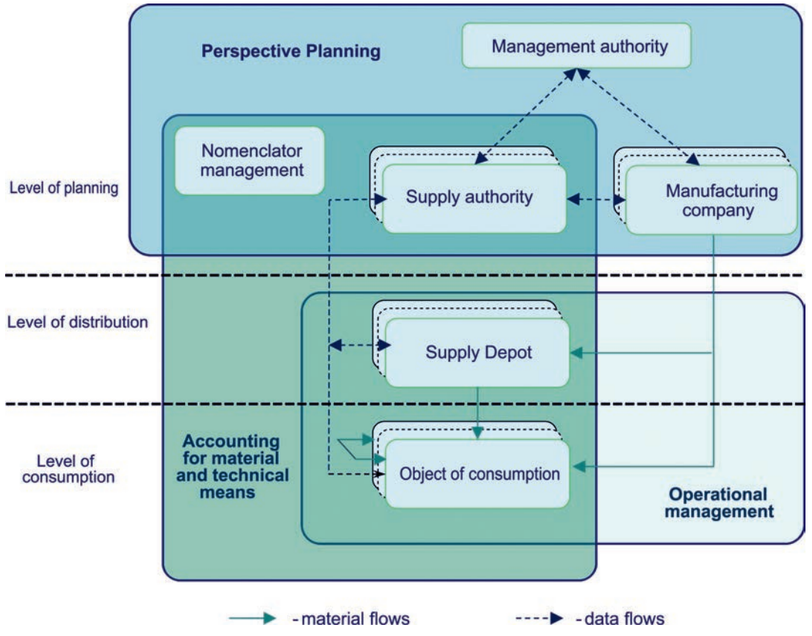


# DEVELOPMENTS

The system of complexes automated designing for information-management system means of automation in performing of research and development works. This system is based on structural parametrical design technology and provides for reduction of the timeframes of development in improvement of the working-design documentation quality and increasement of durability of the designed products.

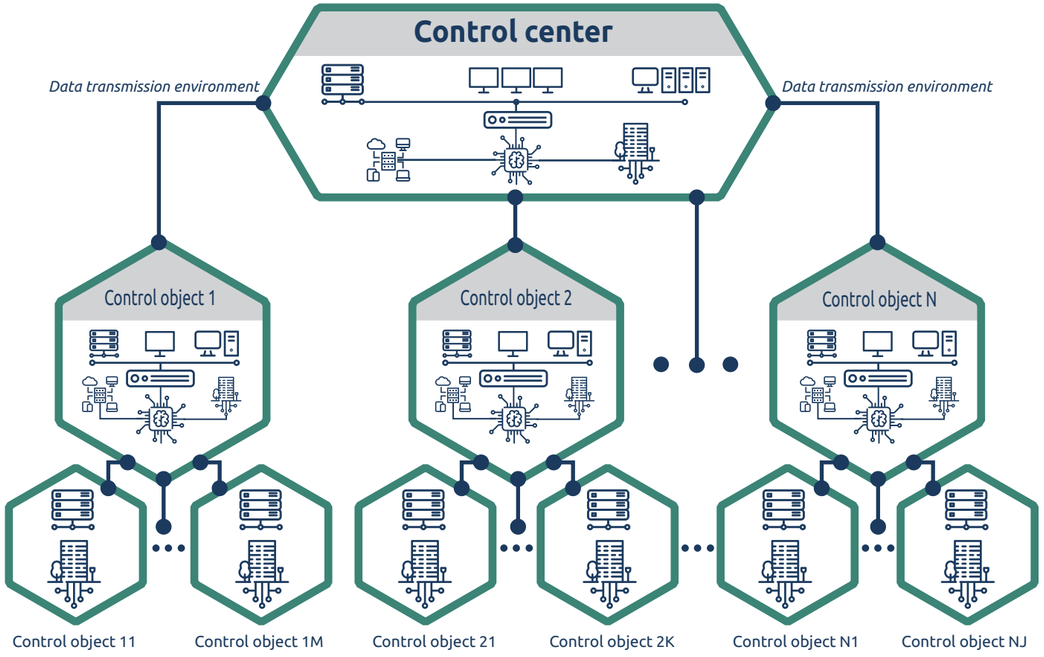



Industrial technology of creation of automated control systems of material and technical support of large industrial enterprises, associations, ministries and departments on the basis of service-oriented architecture of information environment.

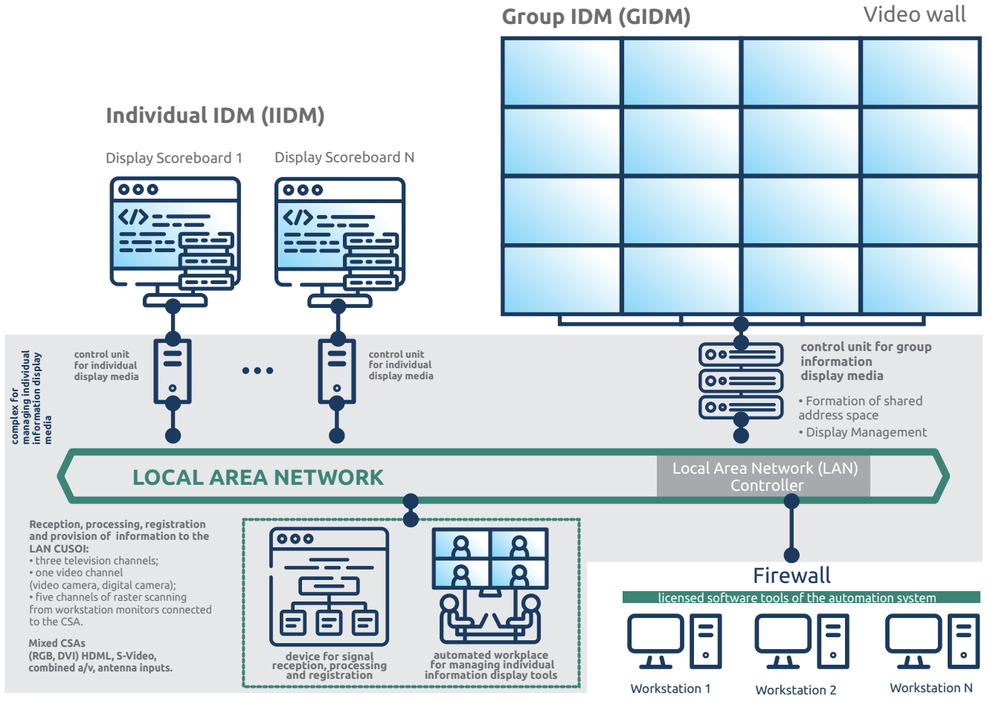


# DEVELOPMENTS

Systems of functional control of geographically distributed hierarchical automated control systems for various purposes, including system and object levels of control and management.
The objects of control are complexes of automation of control points, engineering systems and other objects.




Control complexes for group and individual information display media (IDM) for control centers of different purposes. They are used to solve tasks of visualization of large volumes of data in the presence of a significant number of display facilities (video walls, scoreboards, monitors, etc.).



# PROJECTS

NRTB offers system solutions and platform approach for projects under the programs Digital Economy and Smart City.

1. Applied digital platform for implementation of intellectual network of social support.

The platform provides effective and legally significant electronic connection of population, business and state bodies in implementation of the state social programs.

2. Environmental monitoring system based on distributed wireless sensor network.

It provides collection and analysis of information about the current environmental situation in the region with the possibility of prompt transfer of results to interested consumers.

3. High level «Enterprise service bus».

Integration of multi-layer data from different environments and data transfer protocols, optimization of the use of hardware.