



Presentation Brochure

# Modular Data Center

RFNC-VNIITF competences in building of a Data Center  
Advanced development power plants and uninterruptible  
power supplies.





## Contents

Data Centers	3
Mobile Data Centers	7
Containerized Data Centers	9
Compact Supercomputer	15
Advanced Development	17

## Data Centers

Data Center (DC) is a set of hardware and software tools designed to receive, communicate, store, and process data. It is configured as a premise equipped with cooling, air-conditioning, uninterruptible power supply, fire-extinguishing, and safety control systems, as well as other appropriate equipment.

### Typical Dcs:

Features of typical DCs:

- ⊗ Designed in special premises;
- ⊗ Time- and cost-consuming deployment;
- ⊗ Scaling-limited;
- ⊗ DC is stationary facility. Relocation is problematic.



### Modular Data Center

The basis of a modular DC is a versatile multi-use platform which is configured utilizing a containerized storage unit (single or multi-module) of a specific climatic modification including essential life support systems and IT-equipment.

### Advantages:

- ⊗ Simple and fast deployment;
- ⊗ Ready solution with quick start;
- ⊗ Time saving, less risks;
- ⊗ General integration;
- ⊗ Considerable saving of resources;
- ⊗ Scalability;
- ⊗ Energy efficiency;
- ⊗ Saving of property costs;
- ⊗ Flexibility of architecture arrangement;
- ⊗ Mobility.



# RFNC-VNIITF Competences

To cut capital expenditures for building of an average- or high-performance DC, RFNC-VNIITF has developed the patented solutions that can be implemented as modular DCs.

Configuration of a modular DC incorporates full range of computational equipment and engineering infrastructure.

## Principles and Features of Building a Data Center:

- ⊗ Plug-and-produce equipment;
- ⊗ Levels of reliability up to 3rd and 4th as per T1A-942:
  - ⊗ Level 3 (2N) — available in-service DC repair; engineering systems are single-redundant;
  - ⊗ Level 4 (2(N+1)) — any in-service maintenance operation;
- ⊗ Power Usage Effectiveness (PUE) up to 1.2;
- ⊗ Heat removal from any 150-kW IT-equipment per one 52-unit rack;
- ⊗ Configuration for various climatic zones;
- ⊗ Special inspection of foreign-made accessories for spyware;
- ⊗ Customized software with built-in protection system against unauthorized data access and undocumented features;
- ⊗ Issuance of a special inspection certificate.



# Mobile DC (MDC)

Mobile Data Center is designed on a vehicle platform so it can be easily transported either by motor or railroad transport. MDC can house up to ten 15-80 kW computational racks. It is also supplied with all necessary engineering systems.

## Advantages:

- Vandal-proof design;
- Rapid deployment at any place;
- Flexible configuration.



### One of MCD modifications including:

- Four computational racks;
- Uninterruptible power supply system;
- Management and dispatching system;
- Cooling system (cooling machine and conditioners);
- Fire alarm and fire-extinguishing system;
- Combined extract and input ventilation.

### Designation:

1. Entrance air lock;
2. Server room;
3. Mini-chiller compartment.



## Example of DC modification

One of Mobile Data Center (MDC) modifications with computational capacity up to 400 TFlops. MDC is designed in a container (12 m) with 10 racks, each can accommodate IT-equipment with power consumption up to 15 kW.

MDC contains uninterruptible power supply system, air-conditioning and automatic fire alarm systems, automatic fire-extinguishing system, access control system, air ventilation system, dispatching and remote control system.

### Main features:

- Computational capacity – up to 400 TFlops;
- Dimensions – 12x3 m;
- Number of racks – 10;
- Occupied space – 36 sq. m;
- PUE (power usage effectiveness) – 1.4.

Lead time depends on ultimate customer requirements – from 1 to 6 months.  
Mounting, commissioning, and turnkey operation – up to 6 months.





RFNC-VNIITF

ASC  
«ROSATOM»  
company



RUSOFT



BEE PITRON



## Containerized Data Center (CDC)

Accommodates up to 20 computational racks with the height varying from 32 to 52 units, as well as all necessary engineering infrastructure including:

- ⊗ Uninterruptible power supply system;
- ⊗ Ventilation and air-conditioning system (10-150 kW per rack);
- ⊗ Power distribution system inside a rack housing power distribution units provided with remote control and monitoring system;
- ⊗ Access Control System;
- ⊗ Outdoor and indoor video surveillance system;
- ⊗ Fire alarm system;
- ⊗ In-rack automatic fire-extinguishing system, and "dry water" fire-extinguishing system to protect the total volume of a container;
- ⊗ N+1 and higher redundancy scheme for engineering systems.



Containerized Data Center (CDC)



# Design options



## Basic CDC

CDC components are manufactured in the form of special-purpose containers that provide for quick deployment of modules and convenient transportation.

Time of manufacture is from 1 to 8 months. Time of mounting, commissioning and turnkey acceptance is up to 6 months.

### Operation conditions:

- ⊗ Local seismicity up to 6 units of magnitude;
- ⊗ Deployment: at the ground level, above the ground level;
- ⊗ Bed for a container unit: a levelled horizontal pad with a slope ensuring drainage of surface water, on height-adjustable supports;
- ⊗ Snow load up to 150 kg/sq.m.;
- ⊗ Operational temperature: from  $-40^{\circ}\text{C}$  to  $+40^{\circ}\text{C}$ ;
- ⊗ Maximum operational temperature (in extreme service conditions): from  $-50^{\circ}\text{C}$  to  $+45^{\circ}\text{C}$ ;
- ⊗ Relative humidity: up to 98 %;
- ⊗ Wind speed: up to 30 m/s;
- ⊗ Admissible degree of aggressiveness of the environment: medium aggressiveness;
- ⊗ Fire resistance rating: Class IIIa (according to Construction Standards and Regulations 2.01.02);
- ⊗ Number of redeployments: at least 5 (according to State Standard 22853 — resource).

## CDC for Extreme Service Conditions

### Attributes:

- ⊗ Vandal-proof, all-welded design;
- ⊗ Any overall dimensions;
- ⊗ Operability in any climatic zone within temperature range from  $-60^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ ;
- ⊗ Internal walls are made of fire-resistant dielectric materials;
- ⊗ Walls are filled with incombustible sound-proof and heat-insulating material;
- ⊗ The floor in electric compartment is airtight and made of 2 mm thick corrugated plate;
- ⊗ The floor in the equipment compartment is covered with antistatic linoleum or plates.

### The following components are incorporated into the container body:

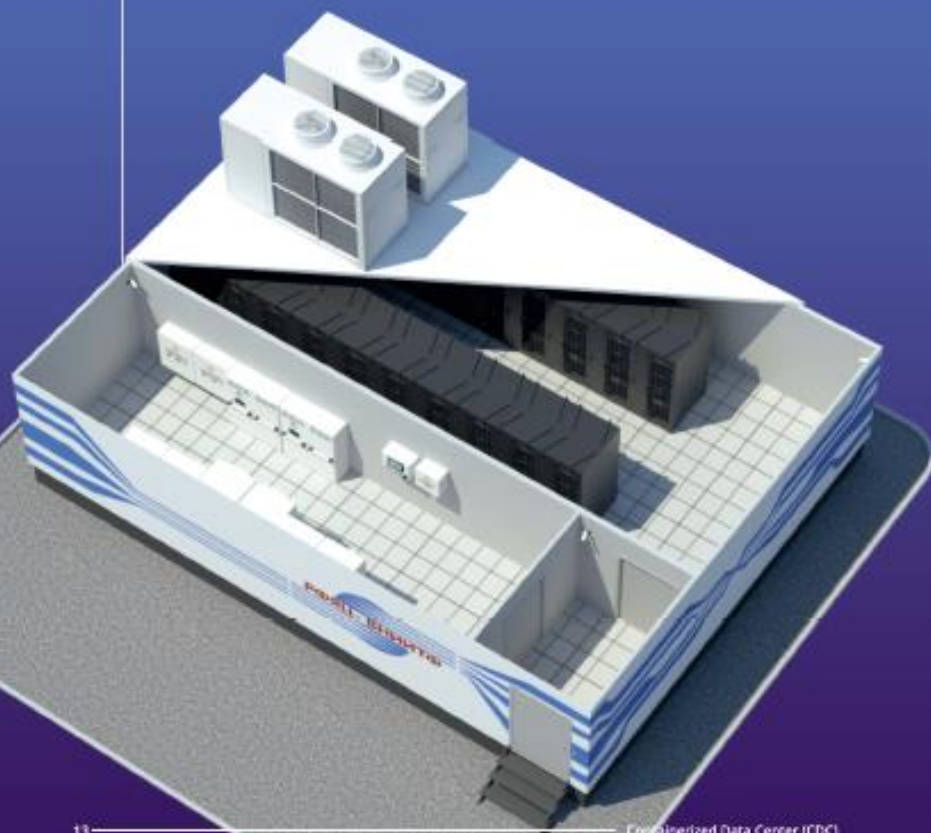
- ⊗ Air valves of supply-and-exhaust ventilation, doors;
- ⊗ Mounting openings for air conditioning systems;
- ⊗ Cable power input with plugs (in side walls or in the floor);
- ⊗ Optical input with plugs.

#### Standard set of equipment includes:

- Independent ventilation systems for compartments;
- Air exchange system;
- Independent heating systems for compartments;
- Air conditioning system according to N + 1 redundancy scheme;
- Independent lighting systems;
- Fire and security alarm system;
- Automatic gas fire extinguishing system;
- Power supply system for all container systems and equipment based on diesel generator plant;
- Power supply system for telecommunication equipment that ensures guaranteed power supply of 48V and 220V (inverting amplifier);
- System of cable trays and cable ladder;
- Automatic two feeders standby activation;
- Switchboard equipment, including a balance-of-needs switchboard and a guaranteed power supply switchboard.



## Example of CDC design



Containerized Data Center (CDC)

RFNC-VNIITF has developed a project on building a basic CDC with computational capacity up to 1.2 PFlops accommodating 20 computer equipment racks.

### Main features:

- ⊗ CDC computational capacity — up to 1.2 PFlops;
- ⊗ Dimensions — 9.1 x 12 m;
- ⊗ Number of racks — 20;
- ⊗ Required space — 109.2 sq.m.;
- ⊗ PUE (DPC power usage effectiveness) — up to 1.1.

Number of container modules — 2 pc.:

- ⊗ Switchboard Compartment module accommodating uninterruptible power supply system, automatic fire alarm system, automatic fire extinguishing system, etc.;
- ⊗ Computer Equipment Compartment module accommodating computer equipment racks, power distribution system, etc.

The proposed design allows increasing of power supply of IT equipment up to 150kW per rack, upon Customer's request.

### Attributes of the project:

- ⊗ High performance;
- ⊗ Saving of capital investments;
- ⊗ No special premises;
- ⊗ Buildup of computational capability without replacement of engineering systems;
- ⊗ Scalability up to several megawatts;
- ⊗ Quick commissioning.



# Compact Supercomputer

A compact supercomputer incorporates full set and integration of all systems required for uninterrupted operation:

- ⊗ IT equipment (server platforms, GPU accelerators, storage systems, switching equipment, as well as any other equipment with form factor 19");
- ⊗ Engineering infrastructure (uninterruptible power supply systems, power distribution systems, cooling and air conditioning systems, fire protection systems, control systems).

## Advantages:

- ⊗ Can be installed in any small unprepared premises;
- ⊗ Does not require construction, installation or commissioning operations;
- ⊗ A possibility of remote control, monitoring and tasking from any point (city, country) with Internet connection;
- ⊗ No heat release in the deployed premises;
- ⊗ Necessary configuration of computational equipment and engineering infrastructure;
- ⊗ No need in DPC life support systems (only connection to a company power system is needed).

The computational capacity of a compact supercomputer ranges from 10 teraflops to several hundreds of teraflops.



Supercomputer with computational capacity ranging from 10 Tflops to 100 Tflops

## A Water-Cooled Modification

A generation of mini-supercomputers with a cooling system architecture designed using water system (water solutions of ethylene glycol) that provides for 40% increase (up to 42kW) of the power of the installed IT equipment and 31% decrease of the area occupied inside a building.

### Various designs of uninterruptible power supply systems.

Design 1:

UPS installed inside a rack: the size of one UPS with power of 10kW is 6U. In case of a 30 kW UPS, housing of IT equipment requires 23U.

Design 2:

UPS installed near a rack: the size of one UPS (W x D x H) is 600x700x1400 at UPS power of 30 KVA. The whole volume of the computational rack (41U) is used to house IT equipment, while 1U is occupied by automatic fire alarm and fire extinguishing system.

### Compact Supercomputer. New Generation.

The block structure includes 2 blocks: a rack inside a premise and a chiller outside a premise:

#### A supercomputer rack includes:

- ⊗ Computer equipment;
- ⊗ Cooling system;
- ⊗ Fire extinguishing system;
- ⊗ Uninterruptible power supply system;
- ⊗ Power distribution system.

#### A chiller includes:

- ⊗ Freon coolant loop;
- ⊗ Hydraulic module;
- ⊗ Automatic control system.



# Advanced Development

RFNC-VNIITF preforms advanced projects within frames of State Import Substitution Program.



## Uninterruptible Power Systems

of up to 6 kVA with "clear" sine curve in form factor 19" for placing into the racks

UPS topology	line-interactive
Energy saving mode	Yes
Input voltage range, V	160-288
Input frequency range, Hz	50/60 ± 3
Battery power-up	Yes
Output power VA	1000-6000
Output power, W	750-4500
Output voltage waveform	clear sine curve
Output voltage, V	230 ± 5%
Output frequency, Hz	50/60 ± 0,1%
Socket type	(8) 1EC 320 C13, (2) 1EC 320 C19, (1) Connector block
Power protection switch time, ms	4
50%-load battery life, min	28 (depends on specific configuration)
100%-load battery life, min	10 (depends on specific configuration)

## Modular Uninterruptible Power Systems 20 - 80 kVA

Power, VA	20 000
Power, W	18 000
Power factor	0,9
Versions	20,30,40,60,80 kVA/3-phase
Noise level, dB	< 55
Parallel connection	4
Input voltage range, V	323 + 460
Input frequency, Hz	40 - 70
Input distortion, THDI	< 3%
Output voltage, V	380, 400, 415 /3-phase
Voltage stability	±1%
Output frequency, Hz	50 ± 0,1
By-pass input	Yes
Battery power-up	Yes



## Modular Packaged Power Units (MPPU)

coupled with external power supply systems provide guaranteed uninterruptible power supply for movable and stationary objects.

MPPU includes isolated diesel generator, uninterruptible power supply system, and panel-board devices that meet up-to-date quality standards.

## Movable Free-Standing Modular Packaged Medium Power Units (MFSMPMPU)

Modular Packaged Power Units (MPPU) coupled with external power supply systems or working independently provide guaranteed uninterruptible power supply for movable and stationary objects.

MFSMPMPU includes isolated diesel generator, uninterruptible power supply system, and panel-board devices that meet up-to-date quality standards.

Movability of MFSMPMPU allows for choosing the location of deployment and quick moving to a different location. It can be deployed from 6 to 10 times faster compared to a commissioning of MPPU since there is no need in external utility connections, besides, as in MPPU, all the systems are preinstalled, adjusted, and tested.

MPPU and MFSMPMPU are mounted into anti-vandal containers, supplied with diesel-generators and uninterruptible guaranteed power systems up to 80 kVA.

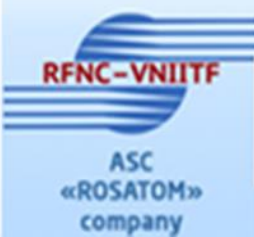
Main technical characteristics of MFSMPMPU and MPPU are the same:

Main power source	External electrical network
Back-up power source	Diesel-generator
Rated power of MPPU equipped with diesel-generator, kW	up to 60
Voltage	230/400 (24 V, 48 B, 110 V DC)
Total energy efficiency factor, %	Not less than 40
Operational lifetime, years	20
Mean time between failures, h	250 000
Voltage stability	±1%
Output frequency, Hz	50 ± 0,1

Upon Customer's request, RFNC-VNIITF can provide additional optional services for power supply system components (UPS systems, power distribution panels), among them:

- Special checking of foreign-manufactured equipment for integrated spyware;
- Automated control system protection using special software with integrated means of protection against unauthorized access to the information and undocumented features control.

The certificate will be issued upon checking results.



# Advantages

- ❑ Simple and fast deployment
- ❑ Ready solution for quick start
- ❑ Time saving, risk reduction
- ❑ Scalability
- ❑ Independent energy source
- ❑ Saving of construction cost
- ❑ Flexible architecture
- ❑ Mobility







# Principles

- ❑ Plug-and-Produce equipment
- ❑ Reliability level 3 and 4 per T1A-942
  - Level 3 (2N) in service|DC repair, single redundant engineering systems
  - Level 4 (2(N+1)) in service maintenance operation
- ❑ Power usage effectiveness (PUE) 1.2
- ❑ Heat removal from any 150 kW IT equipment per one 52-unit rack
- ❑ Configuration for various climatic zones
- ❑ Customized software with build-in protection against unauthorized data access and undocumented features
- ❑ Spyware inspection and spyware free certification





RUS®SOFT



bEE PITRON



# Mobile data center

- ❑ vandal proof design
- ❑ rapid deployment
- ❑ flexible configuration
- ❑ airlift ready
- ❑ 400 Tera Flops
- ❑ 12 x 3 meters size, 36 square meters
- ❑ 10 racks by 15 kW IT equipment
- ❑ Power Usage Effectiveness 1.4
- ❑ -60/+50C temperature range







**India:** 71, FRIENDS COLONY WEST, NEW DELHI, South Delhi, Delhi, 110065

**UK:** 5-9 Eden Street Kingston upon Thames, Surrey, KT1 1BQ

**Russia:** World Trade Center ,Krasnopresenskaya nab-12 , Moscow -123610

[www.akistech.com](http://www.akistech.com)

E-mail: [info@akistech.com](mailto:info@akistech.com)