MODERNIZATION OF THE AUTOMATED CONTROL SYSTEM IN THE KURCHATOV SYNCHROTRON RADIATION SOURCE USING SitectSCADA

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Abstract

The running cycle of Kurchatov Synchrotron Radiation Source (KSRS) includes the injection of electrons with energy 80 MeV from the linear accelerator in the booster storage ring Siberia-1, the accumulation of a electron current up to 400 mA and, then, electron energy ramping up to 450 MeV with the subsequent extraction of electrons in the main ring, storage ring Siberia-2, and accumulation there up to 300 mA, and at last the energy ramping up to 2.5 GeV. [1]

Several years ago, a modernization of the current system of automated control systems (ACS) has started. Modernization has affected the most important parts of the system - the system of data collection and monitoring system. Used advanced solutions based on CAN and VME and modular complexes National Instruments. Currently begins implementation of the SCADA system of Sitect.

In this paper the stages of implementation of the SCADA control system. Showing part of the system, which is already widely used, as well as parts of the system, which is scheduled to launch in the near future.

DESCRIPTION AND OPERATION OF ACS

Appointment of ACS

The current system of automated control systems (ACS) accelerating-storage complex (UNK) "Siberia" - a synchrotron radiation source and the center of collective use of NRC "Kurchatov Institute" was created over 20 years ago on the basis of control equipment in the CAMAC standard. [2] It is physically and obsolete and do not meet modern requirements for speed, accuracy of measurements and speed of data transmission.

Control apparatus of the new ACS UNK with embedded processors, as well as to powerful servers with the operator's computer and network equipment has developed software at all levels of the ACS. [3] All of this should be used to create a modern system of ACS ESC "Siberia" which should significantly increase the speed control parameter stability and reliability of the SR source.

Structural diagram of ACS "Siberia"

Hardware complex (TCC) ACS ESC "Siberia" has a hierarchical structure.

The first (lower) level is the level of local systems. At the level of local systems of CCC ACS UNK transferred command of the actuators, and the level of local systems in CCC ACS UNK receives signals from the sensors parameters of field equipment.

The second level is the level of control. The second level includes a cabinet controller and control panels that form the management team of the actuators, as well as receiving signals from the sensors parameters of field equipment.

The third level is a local area network (LAN), combining the second level control cabinets with cupboard fourth server - the server level. Used for data transmission copper and fiber optic cable lines.

The fourth level includes a cabinet server provides storage and management of data communications between the control cabinets belonging to the third layer structure, on the one hand, and data on the LAN of the upper level, on the other hand.

The fifth level is the top-level LAN, server cabinet combines the fourth level and workstations (AWP) of the sixth level. To transfer data to the LAN using copper and fiber optic cable lines and LAN switches.

The sixth layer is a set of workstations, comprising the following ARM professionals:

- Operator workstation CitectSCADA
- ARM Developer CAN
- ARM developers CitectSCADA
- ARM Developer VME

Structural diagram of ACS "Siberia" is shown on Fig.1.

HARDWARE COMPLEX OF ACS

The composition of program-technical complex (PTC) ACS ESC "Siberia" includes the following products:

- cabinets and equipment;
- basic software (SCADA-system, operating systems);
- application software;
- Spare parts for the warranty period of the PTC.

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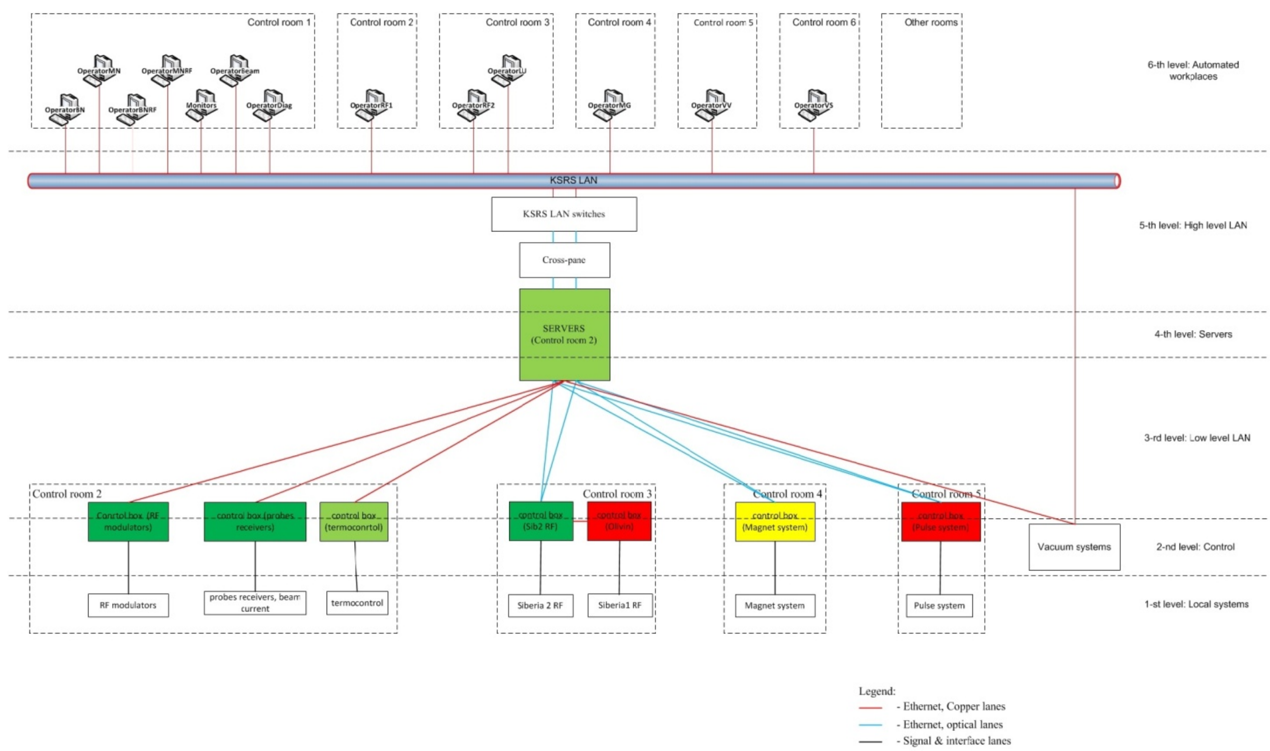

Figure 1: Structural diagram of ACS "Siberia".

ACS is also working with the controllers of local management systems that are part of the following process units:

Controllers of local management systems of Siberia-1:

- RF System;
- Magnetic system;
- Pulse system;
- System synchronization;

Controllers of local management systems of Siberia-2:

- RF System;
- Magnetic system;

Vacuum system Server [4];

- MS SQL Server;

Controllers of local control and local devices:

- System temperature control;
- System diagnostics beam.

SOFTWARE

Software for imaging systems ACS "Siberia", is a series of applications developed in the environment of CitectSCADA 7.2 SP4. These applications are part of the software, as I / O servers and workstation operators control subsystems UNK "Siberia."

The visualization system has the following composition of applications:

- application UNK_Termocontrol;
- application UNK_Magnit;
- application UNK_Vacuum;
- application UNK_VCH;
- application UNK_Diagnostic;
- application UNK_Config;
- application UNKSibir;

Each application contains a graphical information management subsystems UNK "Siberia."

UNK_Config - contains configuration information, as well as variable input / output control on all subsystems. Annex UNK_Config configured redundancy, both servers and I / O devices.

Appendix UNK_Config includes 2 clusters:

- DIAG_TERM_VACUUM;
- Control actuators;

UNK_Termocontrol - contains graphic characters for displaying temperature values on the flanges of the cavity of the linear accelerator, temperature gun linear accelerator, temperature correctors, lenses and bending magnets, small storage, EOC -1 and six superperiod large drive.

UNK_Magnit - contains graphics to display current values TPV power sources, power supply voltage values shunts TPV, setpoint current power sources for TPV bending magnets and large lens drive, as well as the currents of power supplies, the current values of the load, the voltage in the load, temperature transistors, inductors, current setpoint sources of supply for proofreaders large and small storage and EOC - 1.

UNK_Vacuum - contains graphic symbols to display the status of the pumps of the vacuum system, the currents and voltages. Just UNK_Vacuum application keeps a record of currents and voltages in the system vacuum pumps CitectHistorian 4.3 storage history. If

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necessary, it is possible to view the historical data in the form of trends.

UNK_VCH - contains graphics to display the RF system. Current cathodes heated, currents and voltages of screen and control grids, RF voltages on the anodes, and the inputs and outputs of stages generators G1 and G2. Otobrazhaetznacheniya voltages and phase resonators 1,2 and 3, the currents and voltage feeders resonators incident and reflected waves. It is possible to adjust the position of the phase shifters, as well as provisions setting fifth stages generators G1 and G2.Displays the status of locks and keeps a log of alarm and warning messages to the operator.

UNK_Diagnostic - contains graphic characters for displaying states of samplers and receivers diagnostic system is also possible to control the position of probes and receivers.

All applications are included as projects in **UNKSibir** (Fig. 2), which runs on all the workstations and servers for system visualization. UNK_Sibir has access to all the applications included in it and can display any video frame of each subsystem management

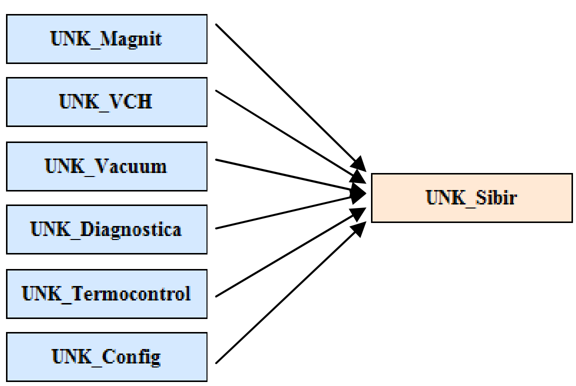

Figure 2: Application Structure CitectSCADA.

CONCLUSION

Currently installed and commissioned rack servers, temperature control, diagnosis, and monitoring of the RF generator. The structure of the database control channels and archive parameters of the complex, debugged software for thermo control and thermal stabilization, vacuum control, control of receivers and SI probes beam position. During the development of the control system is the operating cycle of SRS, which includes server and mainframe systems magnetic RF system.

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