

USING LABVIEW TO BUILD DISTRIBUTED CONTROL SYSTEM OF A PARTICLE ACCELERATOR

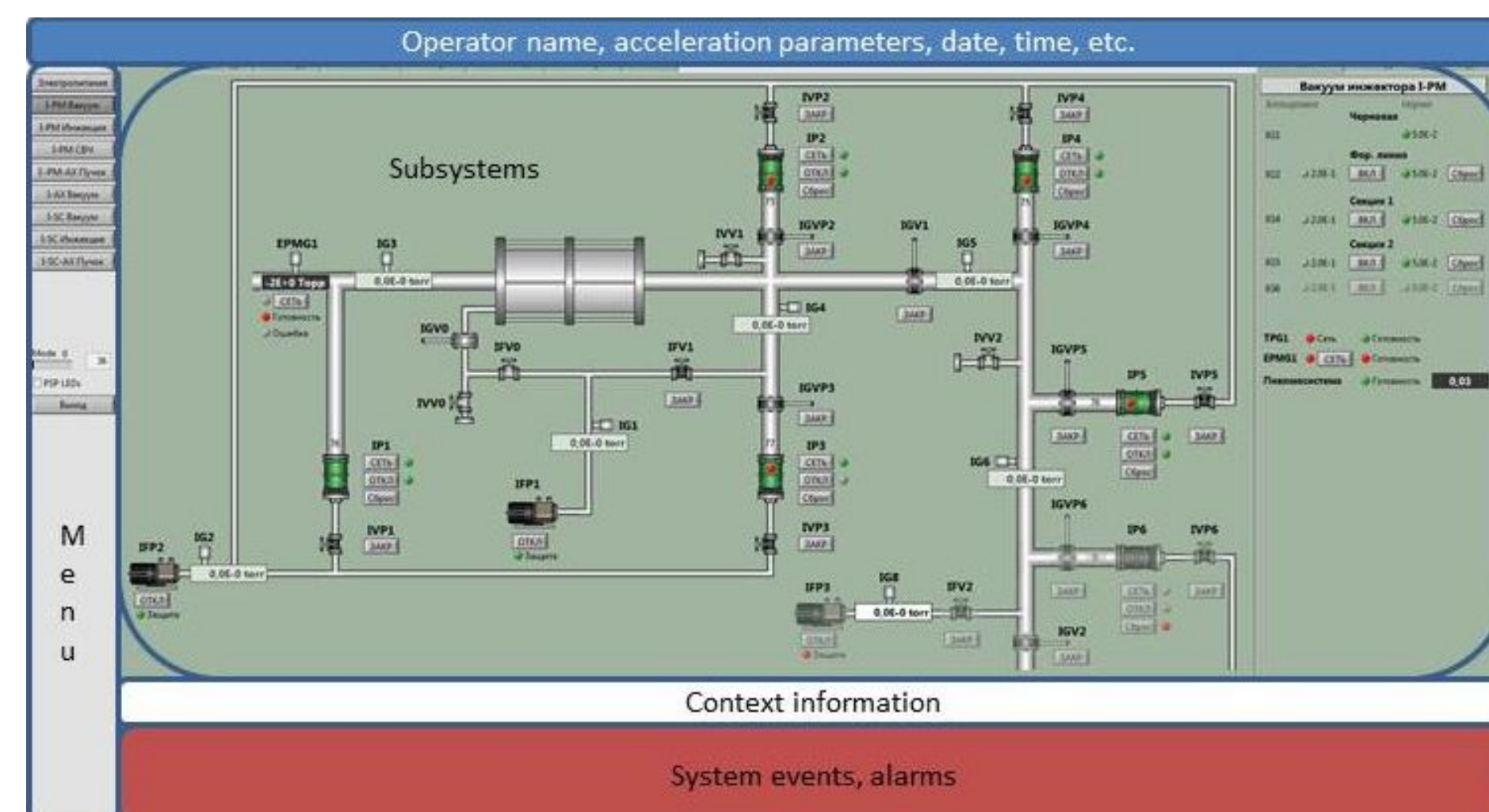
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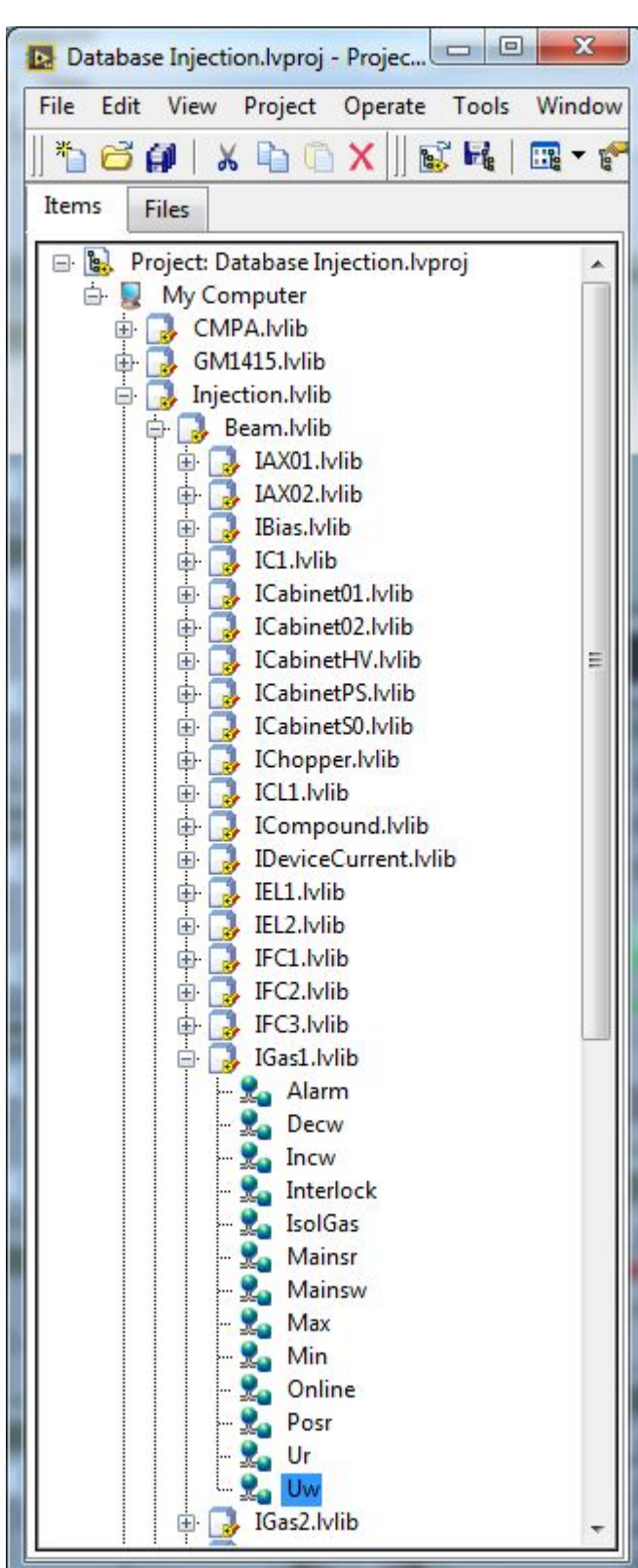
DC-280 is the basic facility of the Super Heavy Element Factory

Abstract

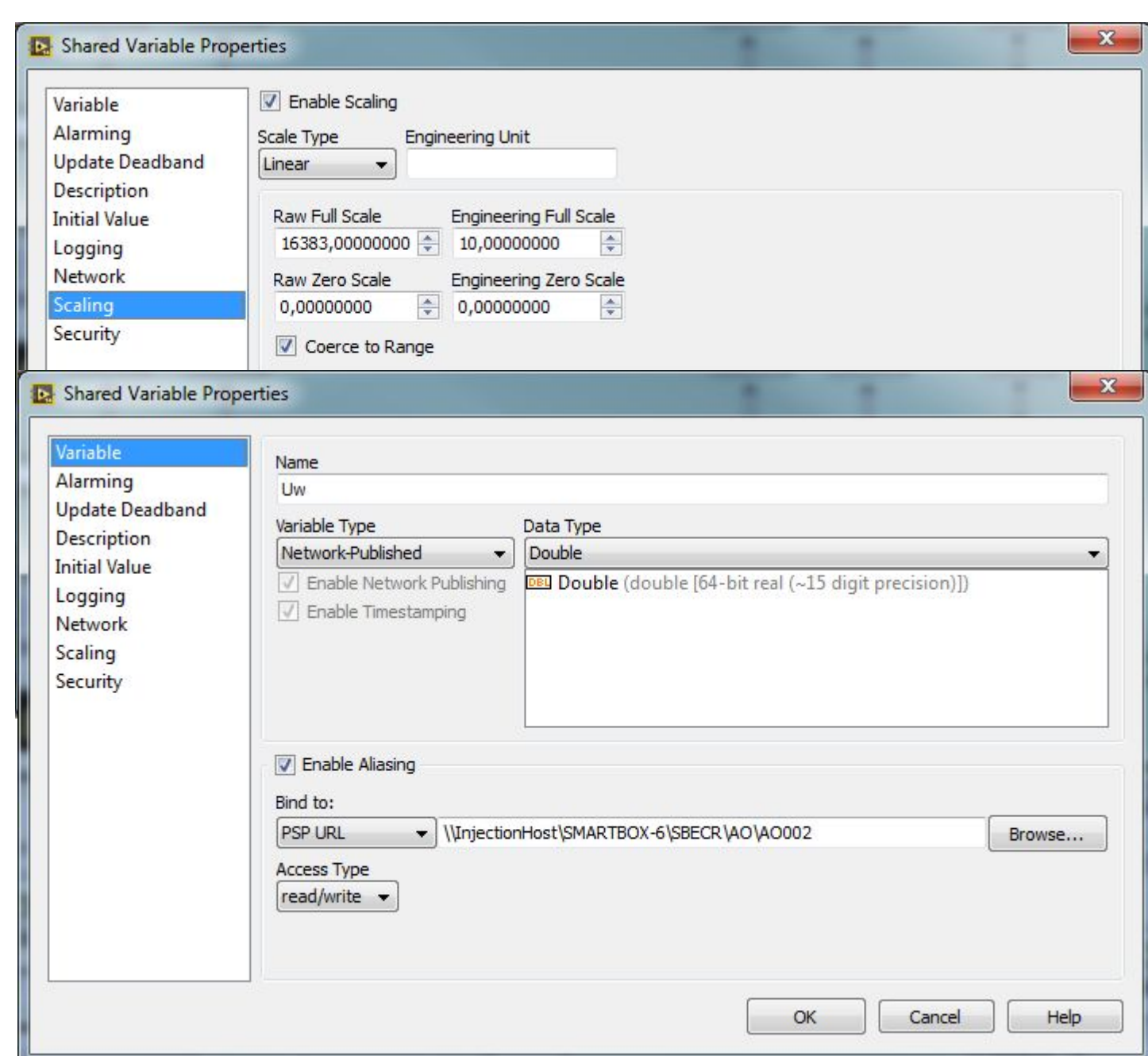
New isochronous cyclotron DC-280 is being created at the FLNR, JINR. Total amount of the process variables is about 4000. The variety of field devices of different types is 20. This paper describes architecture and basic principles of the distributed control system using LabVIEW DSC module.



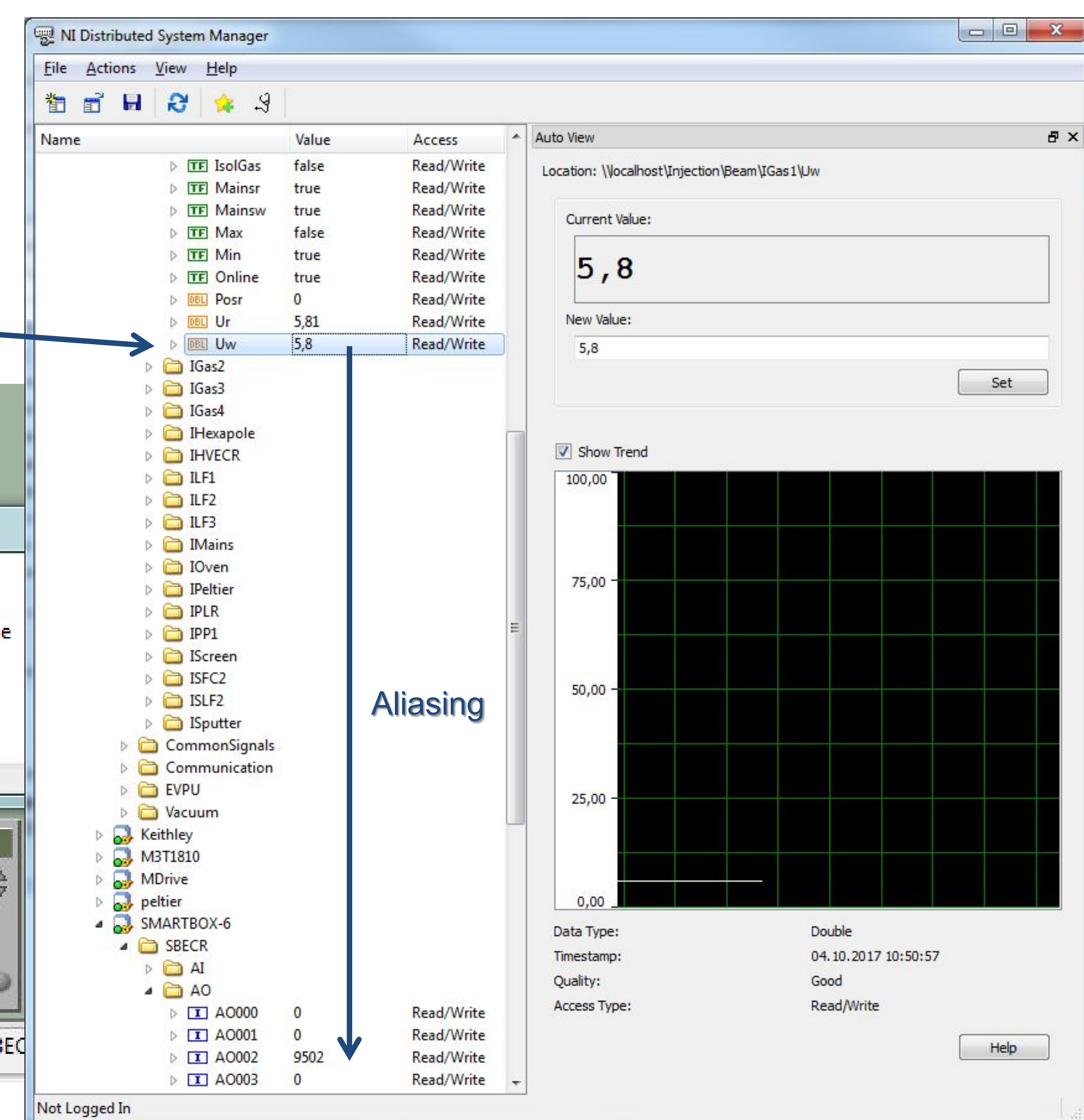
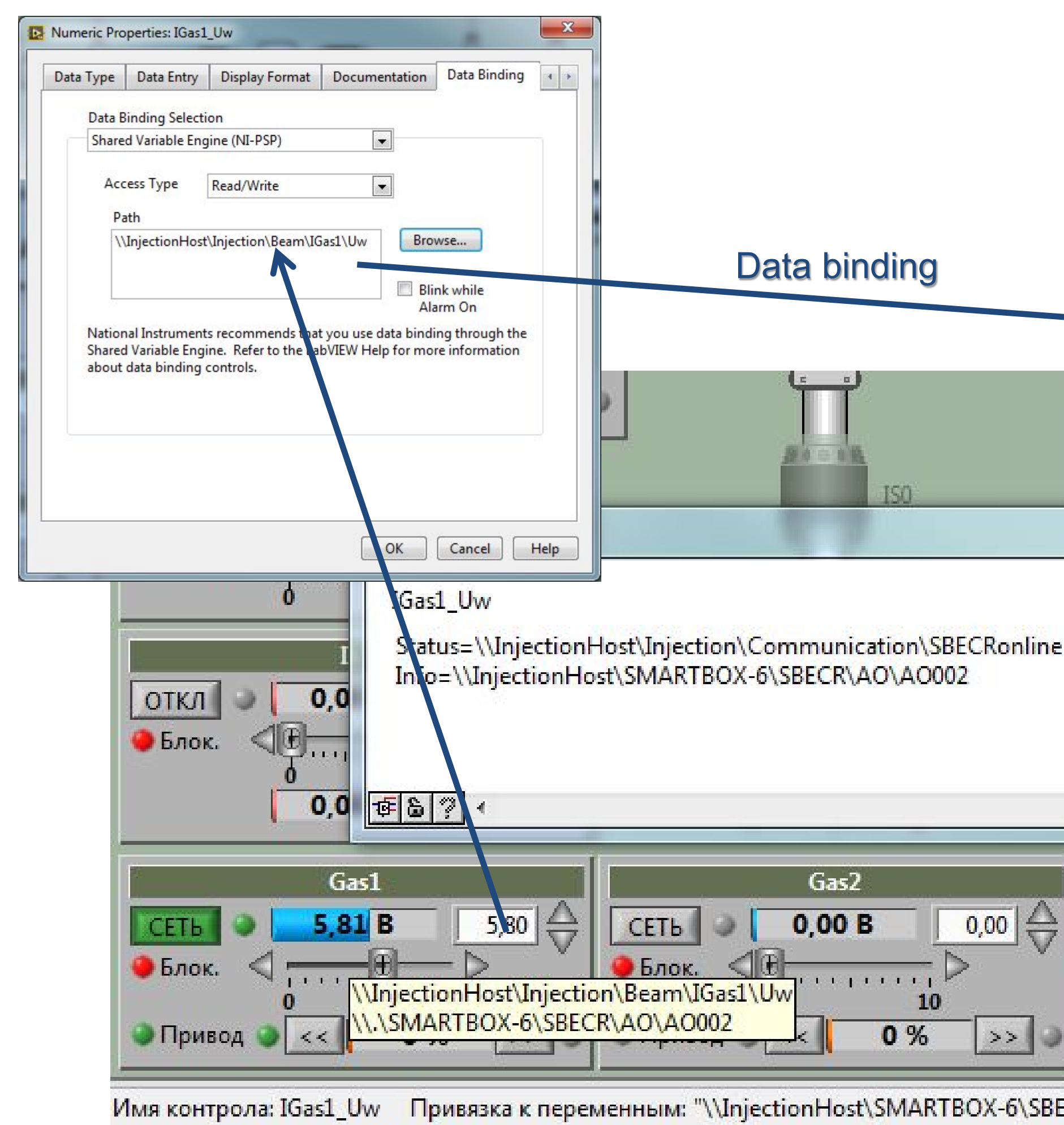
Layout of the DC-280



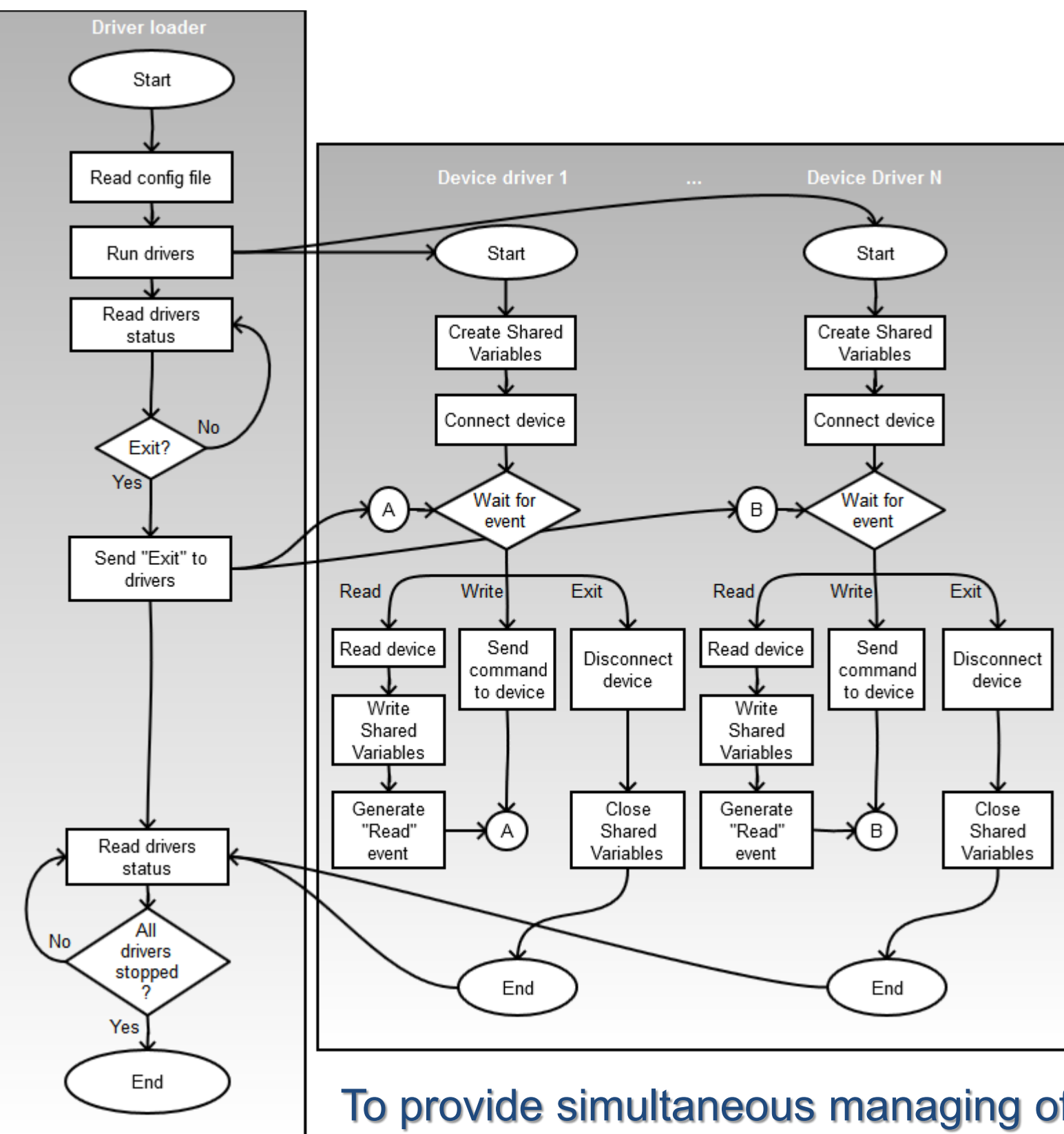
Scaling and Aliasing properties



User interface areas

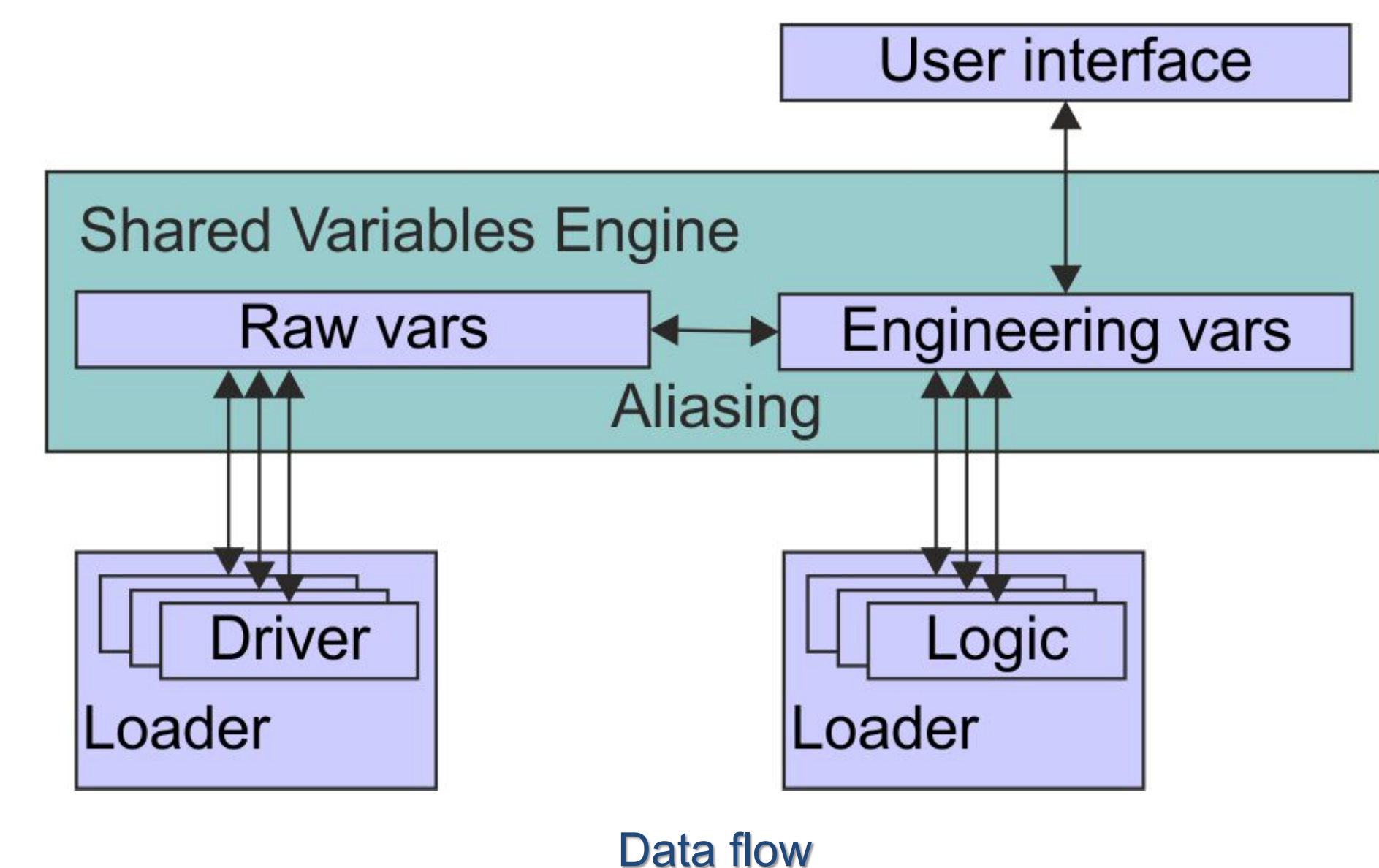


The Datalogging and Supervisory Control (DSC) module made LabVIEW full featured SCADA. It includes tools for logging data to a networked historical database, tracking real-time and historical trends, managing alarms and events, and adding security to user interfaces.



To provide simultaneous managing of many devices of the same type or manufacturer we use Driver Loaders.

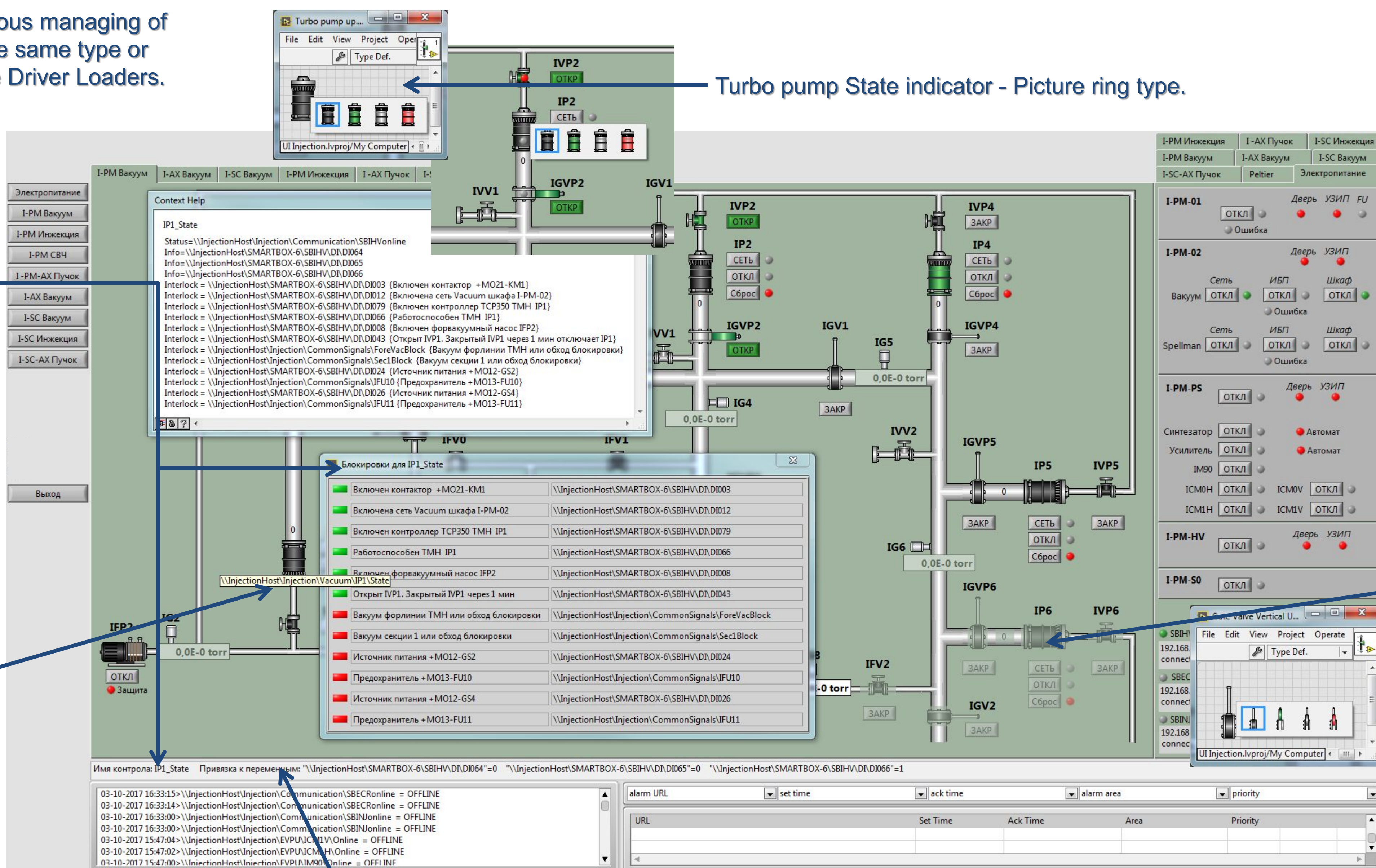
The control system of DC-280 is a project that is distributed over a network. Its essence (all signals) can be described by means of process variables. Every subsystem consists of variables which are deployed on the dedicated host. To share data across the network or between applications, LabVIEW offers NI Publish-Subscribe Protocol (NI-PSP). NI-PSP is a proprietary technology that is optimized to be the transport for network shared variables and provides fast and reliable data transmission for large and small applications. It is installed as a service on the computer when you install LabVIEW. At start up every device driver creates network-published shared variables for supported hardware. These raw variables are connected to engineering process variables by means of alias mechanism. After connection to the device is established the driver cyclically reads its status and writes it to the corresponding *input* shared variables. It also receives notifications of the value change of the *output* variables, which causes the driver to send commands to the device respectively with communication protocol.



Data flow

UI uses data from Description property of the shared variable to monitor its Status, Raw variables, Interlocks, etc.

IP1_State control is connected to the shared variable \\InjectionHost\\Injection\\IP1\\State



Turbo pump State indicator - Picture ring type.

When a driver loses connection to its device, all controls and indicators that represent this device become disabled and grayed out

If the operator position mouse cursor over an object, the context string displays actual values of raw variables on which that object depends, for example, DI state or ADC code.

