NOJA POWER®

NOJA-5029-00

Smart Grid Automation (SGA)

NOJA Power's Smart Grid Automation (SGA) software is based on the IEC 61499 standard and enables customers to implement and deploy control and automation applications for single or groups of NOJA Power's OSM Automatic Circuit Reclosers (ACRs) increasing distribution automation flexibility for smart grids.

With SGA, engineers have access to advanced logic capability and comprehensive access to the system database which includes analogues and digitals. An easy-to-use interface allows them to intuitively develop complex algorithms which can then be uploaded to NOJA Power's RC10 controller for the OSM series ACR or distributed to group of controllers for simulation and debugging before field implementation.

SGA software uses IEC 61499 Function Blocks (FB) as the basis for constructing the applications. FBs feature event and data inputs and outputs to provide synchronisation for data transfer and program execution in distributed systems. Applications are built by interconnecting these FBs.

SGA uses the IEC 61499 protocol to communicate between devices and it will interact with other standard based devices.

About IEC 61499

IEC 61499 is an open standard for distributed industrial automation systems aiming at portability, reusability, interoperability and reconfiguration of distributed applications. The IEC 61499 model includes processes and communication networks as an environment for embedded devices, resources and applications. Applications are built by networks of Function Blocks which generally provide an Interface for Event I/Os and Data I/Os.

IEC 61499 provides:

- a combination of distributed programming language and PLC programming with IEC 61131-3
- a generic modelling approach for distributed control applications
- Function Block concept
- separation of data and event flow.

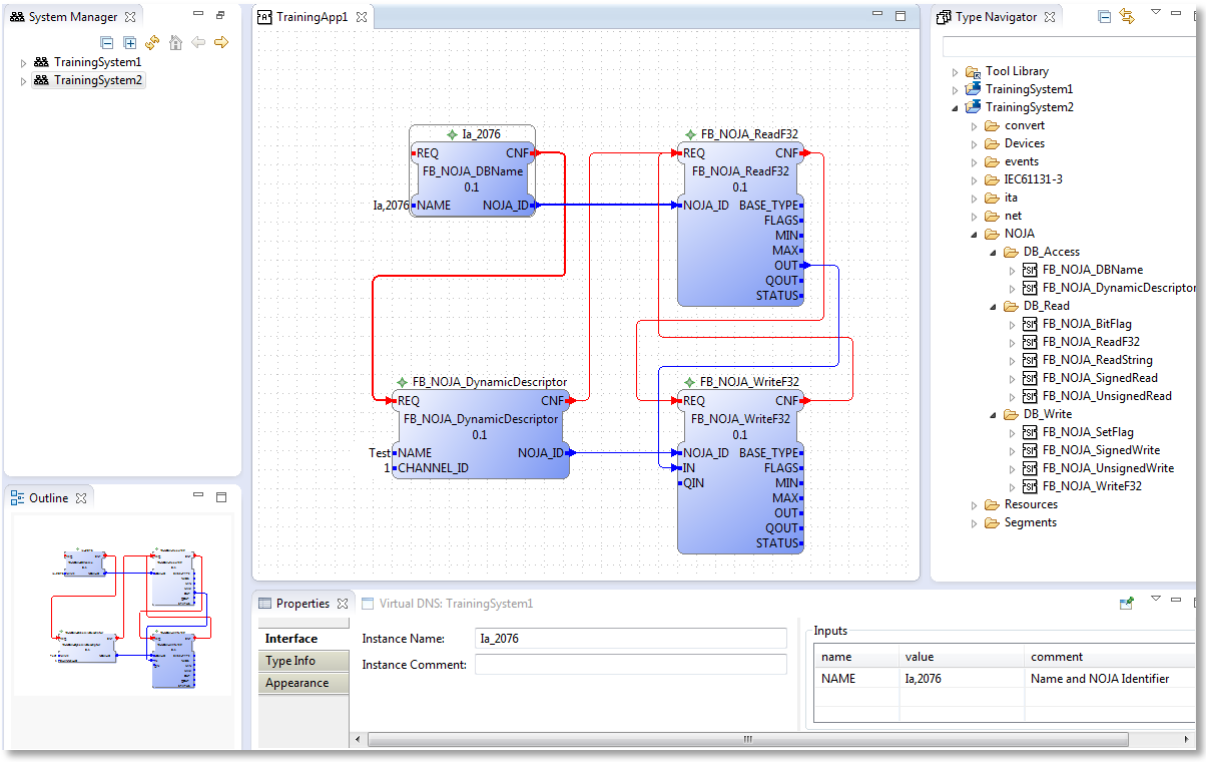

Figure 1: User Interface

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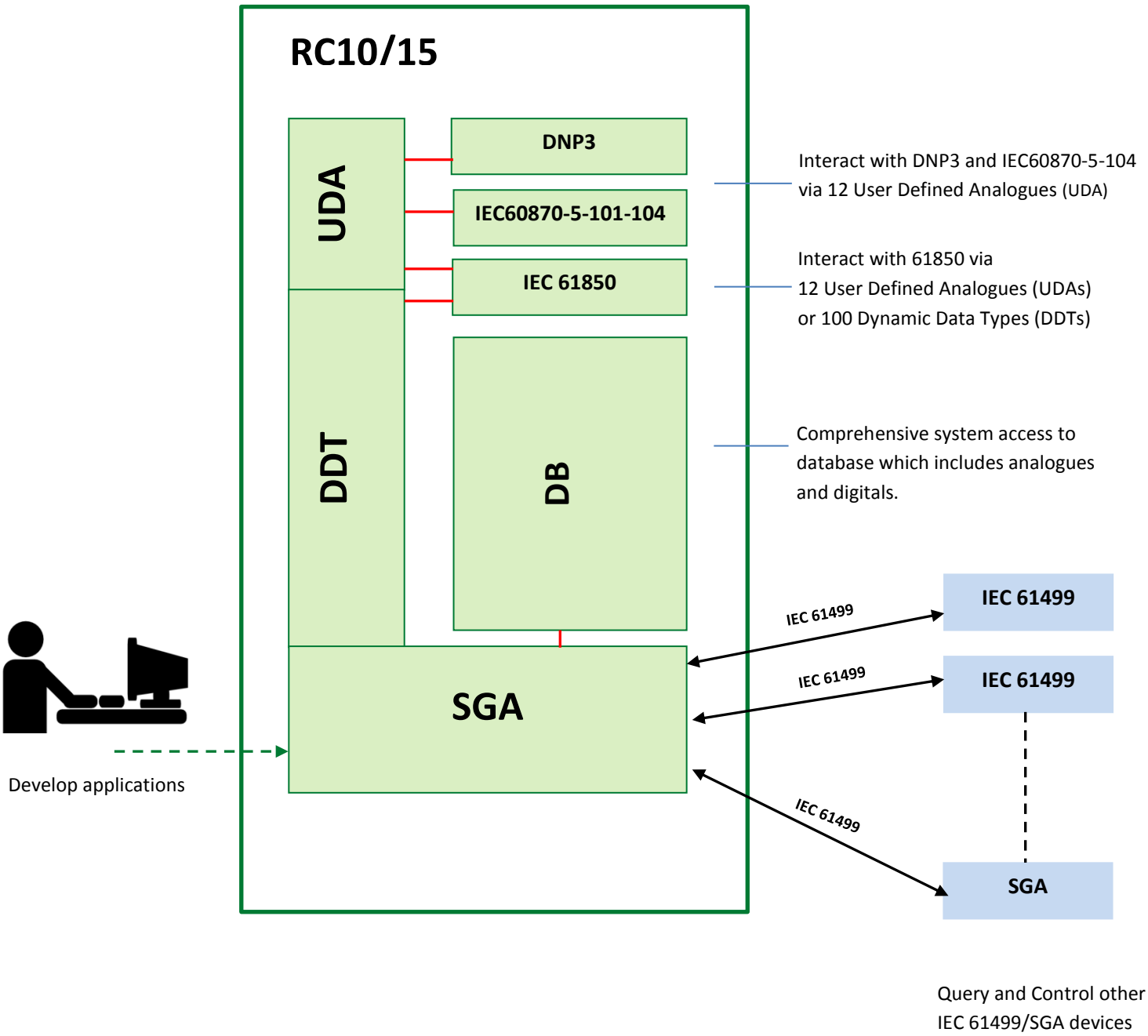


About DDTs
100 Dynamic Data Types (variables) that customers can define (each variable can be any type up to 32 bits in size).

About UDAs
User defined analogues which have customer defined scale and offset and may differ from system default scale and offset.

About IEC 61850, DNP3, IEC 60870
Popular SCADA protocols typically used for Status and Control usually coupled with a master station environment.

Distributed System

Applications can be distributed across multiple devices in a system. A device and its associated function blocks can be easily identified by their colour.

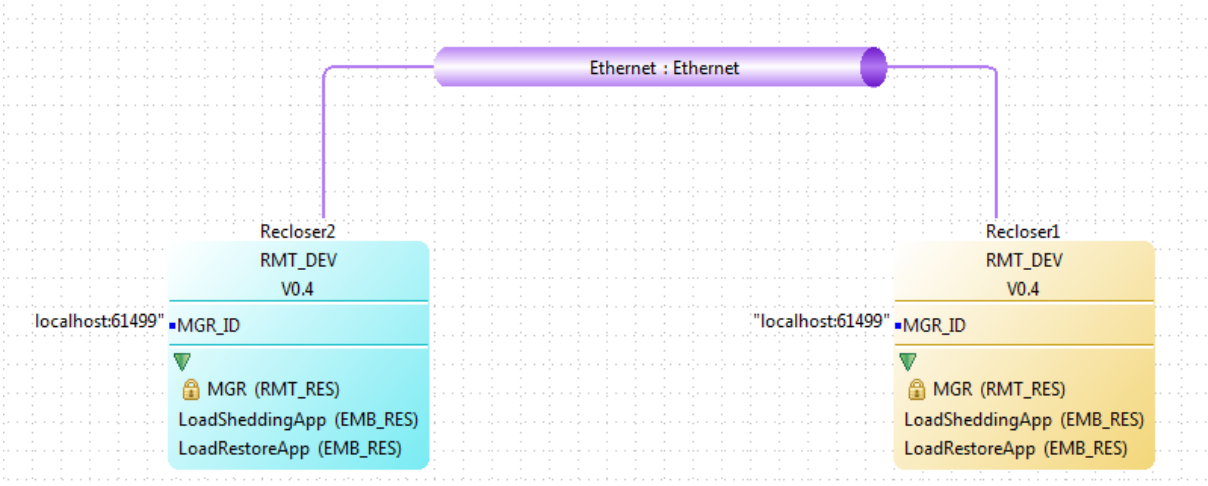


Figure 2: Application distributed across a number of RC10/15 devices

Query and Control of other IEC 61499/SGA devices

SGA allows query and control of other IEC 61499/SGA devices. In the example below part of the application resides on *Recloser 2* (blue function block) allowing the closing of *Recloser 2* when a certain condition is met on *Recloser 1*.

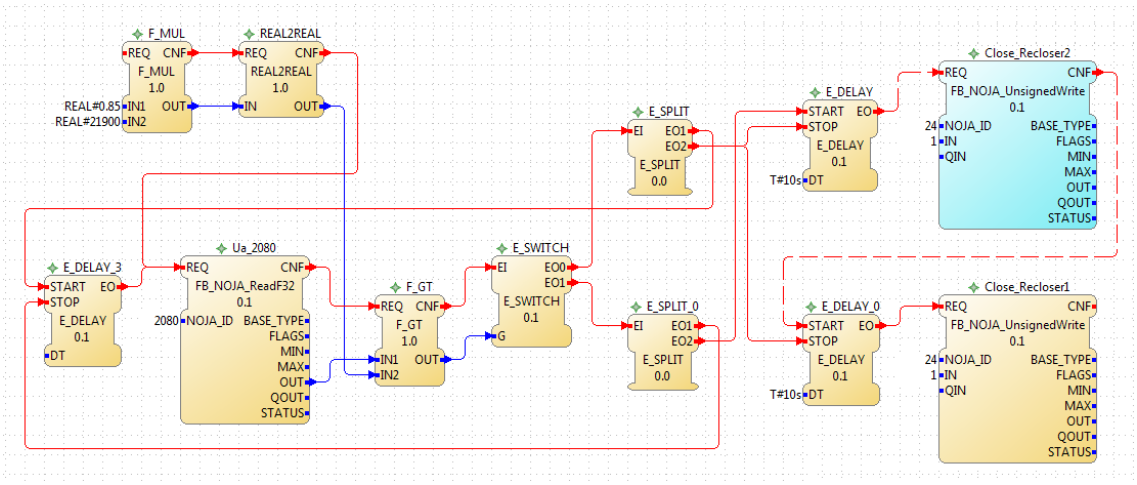


Figure 3: Sample Application

Net function blocks are used to communicate between devices. *Publish/Subscribe* function blocks use the User Datagram Protocol (UDP) and *Client/Server* function blocks use the Transmission Control Protocol (TCP).

Event and Data flow

In SGA, the **red** links indicate the order of execution of the function blocks (event flow) and the **blue** links indicate the data flow.

Placing the mouse pointer on an input or output will display data type and other relevant information. In the example below the *OUT* data output is a REAL value.

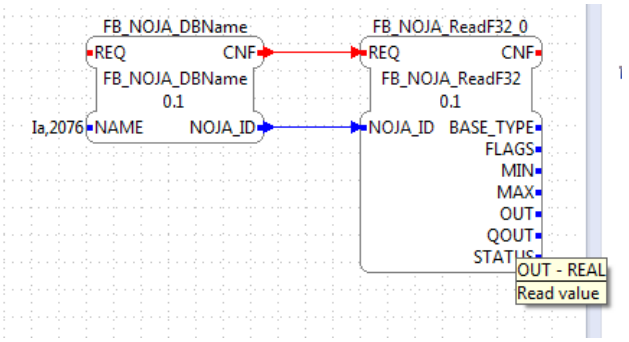
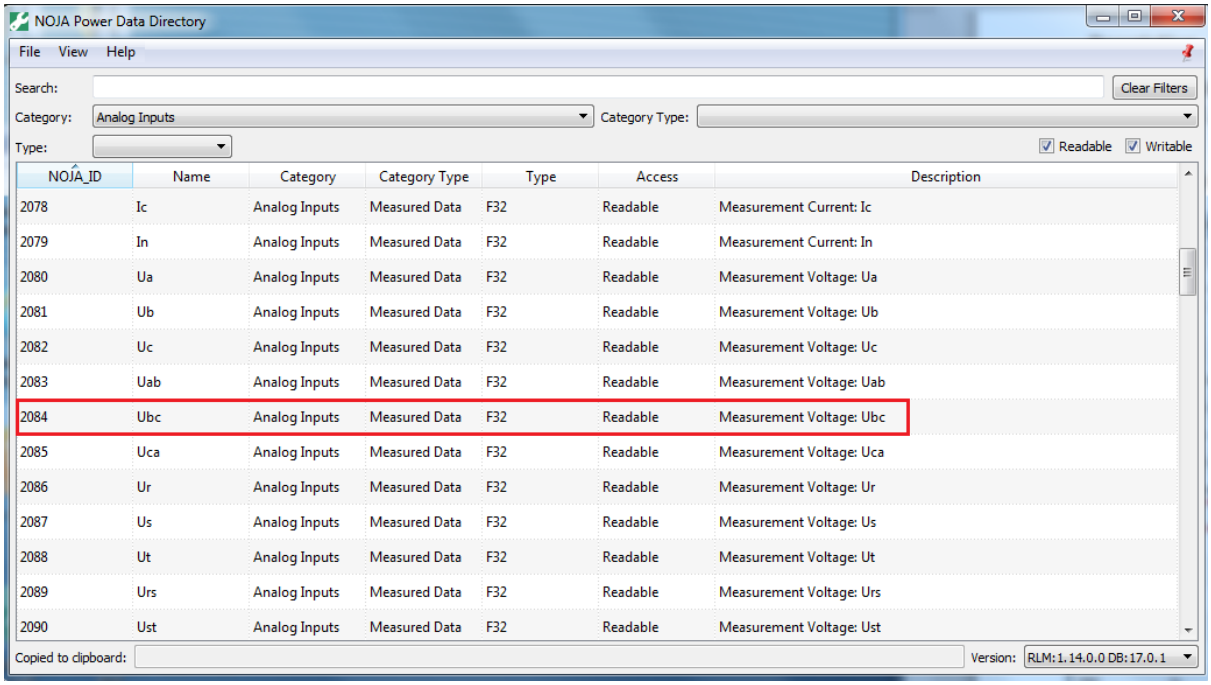


Figure 4: Event and Data Flow

Comprehensive access to system database

SGA comes with a tool called "NOJA Power Data Directory" which provides comprehensive search facilities into the system database which includes logic and measured data points.



NOJA_ID	Name	Category	Category Type	Type	Access	Description
2078	Ic	Analog Inputs	Measured Data	F32	Readable	Measurement Current: Ic
2079	In	Analog Inputs	Measured Data	F32	Readable	Measurement Current: In
2080	Ua	Analog Inputs	Measured Data	F32	Readable	Measurement Voltage: Ua
2081	Ub	Analog Inputs	Measured Data	F32	Readable	Measurement Voltage: Ub
2082	Uc	Analog Inputs	Measured Data	F32	Readable	Measurement Voltage: Uc
2083	Uab	Analog Inputs	Measured Data	F32	Readable	Measurement Voltage: Uab
2084	Ubc	Analog Inputs	Measured Data	F32	Readable	Measurement Voltage: Ubc
2085	Uca	Analog Inputs	Measured Data	F32	Readable	Measurement Voltage: Uca
2086	Ur	Analog Inputs	Measured Data	F32	Readable	Measurement Voltage: Ur
2087	Us	Analog Inputs	Measured Data	F32	Readable	Measurement Voltage: Us
2088	Ut	Analog Inputs	Measured Data	F32	Readable	Measurement Voltage: Ut
2089	Urs	Analog Inputs	Measured Data	F32	Readable	Measurement Voltage: Urs
2090	Ust	Analog Inputs	Measured Data	F32	Readable	Measurement Voltage: Ust

Figure 5: NOJA Power Data Directory