1. Product Description

The **Simutool** is a solution for simulating Nexto family Programmable Logic Controllers (PLCs) in a virtual environment, developed to meet the demands of digitalization in industry. The platform allows the reproduction of the behavior of automation systems in complex industrial scenarios, enabling the early validation of control logic, operational sequences, and interlocks. Its application is directly associated with integration with *MPDS* (Multipurpose Dynamic Simulator) systems and *Change Management* practices, elements that provide the engineering context and ensure the traceability, consistency, and governance of information throughout the entire project lifecycle.

Its architecture enables the simulation of multiple automation processes and topologies, acting as an enabler for technical standardization and structured application validation. The **Simutool** covers the central stages of an automation application lifecycle, from defining the architecture and developing the control logic to simulation, testing, and behavior analysis, allowing the system to be validated before physical deployment. This contributes to reducing commissioning time, mitigating operational risks, and enabling early identification of failures, with direct impacts on productivity and efficiency.

Integrated into a broader digital transformation approach, the simulator supports the construction and evolution of Digital Twins and OTS (Operator Training System) applications by providing a virtual environment consistent with engineering models and the expected plant behavior. This environment allows for the execution of tests, simulation of operational scenarios, and support for operator training without interfering with the real system, in addition to supporting analyses and decision-making based on greater predictability and operational control.

Fundamental Concepts

- **Nexto Controllers**: The Nexto family represents a line of Programmable Logic Controllers (PLCs) with a modular architecture, designed to meet the needs of applications ranging from smaller scale to more complex systems. With diagnostic capabilities and configuration flexibility, these controllers support diverse performance demands in industrial automation.
- **Digital Twins**: Virtual representation of physical assets, processes, or systems that uses data and models to accurately reflect their behavior and performance over time. Enables simulation, analysis, and decision support throughout the entire operational lifecycle.
- **Change Management**: A set of practices for structured control of modifications to systems, equipment, and processes, ensuring traceability, impact assessment, and safe implementation of changes.
- **OTS(Operator Training System)**: Simulation-based training systems that allow operators to be trained in a virtual environment, including the reproduction of operational conditions and abnormal situations, without risks to the real plant.

2. Technical Description

2.1. Data for Purchase

2.1.1. Included Items

The software Simutool is sold as a service, with the contract and corresponding license sent digitally to the client. Please contact the Altus sales department if a physical copy of the product is required.

2.1.2. Product Code

The following codes should be used to purchase the product:

Code	Description
ST9000/NX/ADV	Simutool

Table 1: Product Code

3. Product Overview

3.1. Product Features

The **Simutool** consists of two parts: **Simulated PLC** and the **Simutool API**.

The **Simulated PLC** is a simulator capable of running a program created for a Nexto series PLC. This program is modified in Mastertool so that the Input and Output data (Data) are sent not via PROFIBUS DP but via OPC UA. This data is received and sent to the dynamic process simulator. The rest of the PLC communication remains unchanged. In other words, the architecture, the data server, and the SCADA screens operate in the same way as in the real environment, with the Simulated PLC communicating via MODBUS TCP protocol.

The **Simutool API** is a library that sends commands to the Simulated PLC, according to the demands of the process simulator, through a proprietary protocol of the Altus. In this way, the control and execution of the PLC logic is orchestrated by the process simulator, which can send commands that are useful in the context of test execution, simulations of operational scenarios, and operator training, supporting analysis and decision-making, such as:

- **Start**: Sends a Run command;
- **Stop**: Sends a Stop command;
- **Execute a Step**: Executes a PLC cycle;
- **Accelerate**: Accelerates the PLC execution time, and should be able to accelerate the PLC execution time by up to 5 times;
- **Decelerate**: Decelerates the PLC execution time, and should be able to decelerate the PLC execution time by up to 10 times;
- **Save Snapshot**: Make a complete memory copy including block internal variables. There is no time requirement for it to execute;
- **Load Snapshot**: Restore a complete memory copy including block internal variables. There is no time requirement for it to execute;
- **Save Backtrace**: Save a quick memory image;
- **Load Backtrace**: Load a quick memory image.

Controller functionalities are supported with limitations. The main unsupported functionalities are:

- Simulate PLC redundancy;
- Simulate Coprocessor signals;
- Simulate LCD;
- Simulate Button;
- Simulate redundancy interfaces;
- Simulate Serial interfaces;
- Simulate memory card;

- Simulate LEDs;
- Simulate CPU bus with input/output cards;
- Simulate NX5000 interfaces added to the bus;
- Simulate NX5001 interfaces added to the bus and PROFIBUS network;
- Simulate general hardware-related diagnostics;
- Simulate any functions/libraries that depend on unsupported hardware simulated.

More information can be found at *SimuTool User Manual*.

3.2. Architecture

The architecture of the **Simutool** is detailed in the figure below:

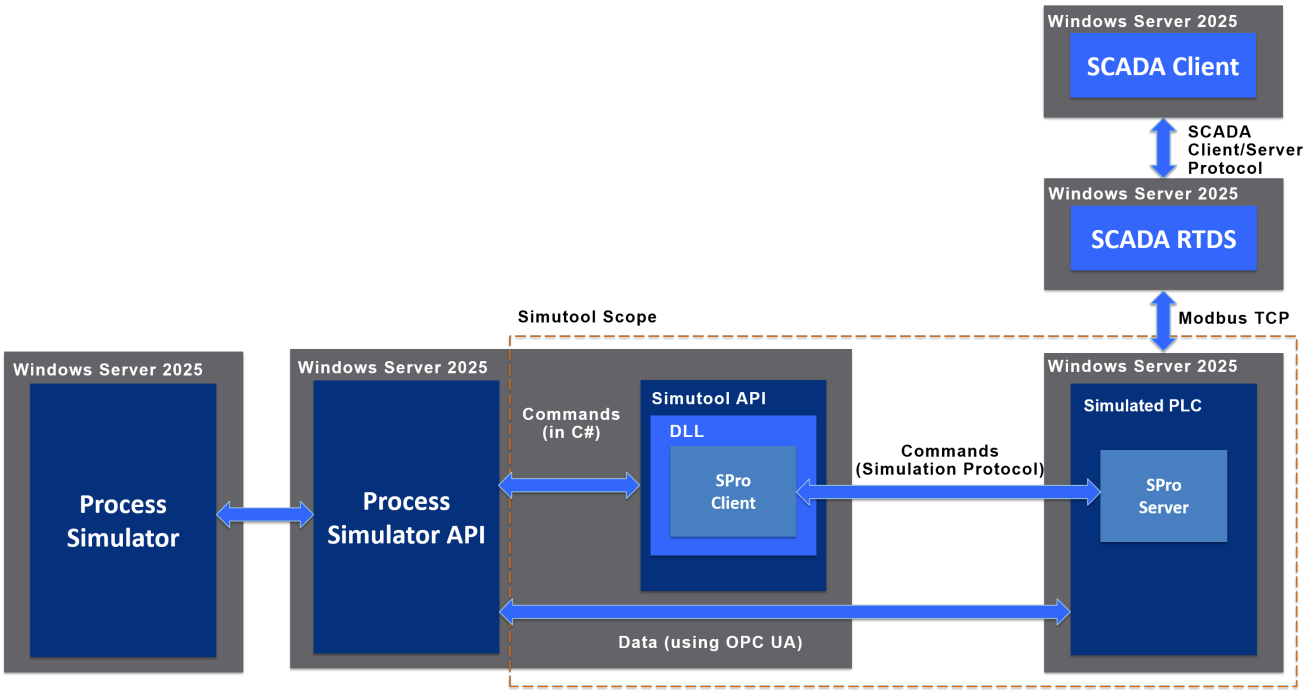

Figure 1: Product Archiitecture

Caption:

- **Process Simulator:** Multipurpose Dynamic Simulation System (MPDS);
- **Process Simulator API:** Proprietary programming interface of the simulator, exposes its states and internal variables for integration with the Process Simulator;
- **Simulated PLC:** is a simulator that has the ability to run a program created for a Nexto series PLC;
- **Simutool API:** is a DLL that sends commands to the Simulated PLC;
- **SCADA RTDS:** Real-time dynamic simulator integrated into the SCADA environment, replicates the behavior of the closed-loop supervisory system with the process simulator;
- **SCADA Client:** Software component that consumes data provided by the SCADA server, providing the operator with an interface for monitoring and controlling the process.

3.3. Languages

Simutool is available in english and portuguese.

3.4. System Requirements

The Simutool is distributed as a virtual machine image for execution in a Microsoft Hyper-V environment. The requirements described below refer to the minimum and recommended resources to be allocated to the virtual machine hosting the product, and not to the guest operating system requirements. The host environment must be compatible with Hyper-V virtualization and support the execution of the virtual machine with the specified resources.

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	Simutool
Plataform	Windows 11 Pro (64 bits) or Windows Server 2025 (64 bits) or later
Processor (vCPU)	4 cores on a host CPU of 2.0 GHz or higher
Disk Storage	32 Gbytes
RAM	4 Gbytes

Table 2: Minimum System Requirements

3.5. Compatibility with Other Product

The Simutool only supports the following versions of the Altus controllers:

Code	**Description**
NX3035	High-speed CPU, 6 Ethernet ports, 2 SFP ports, 1 serial channel, memory card interface, remote rack expansion and redundancy support

Table 3: Supported Products

More information can be found at *SimuTool User Manual*.

4. Installation

The necessary information regarding the installation of Simutool can be found at *SimuTool User Manual*.

5. Manuals

For further technical details, configuration, installation and programming, the table below should be consulted.

The table below is only a guide of some relevant documents that can be useful during the use, maintenance, and programming of this product.

Code	Description	Language
MU214600	Nexto Series User Manual	English
MU214000	Manual de Utilização Série Nexto	Portuguese
MU214619	NX3035 CPU User Manual	English
MU214107	Manual de Utilização UCP NX3035	Portuguese
MP399609	IEC 61131 Programming Manual	English
MP399048	Manual de Programação IEC 61131	Portuguese
MU299611	Mastertool X User Manual	English
MU299049	Manual de Utilização Mastertool X	Portuguese
MU299613	SimuTool User Manual	English
MU299050	Manual de Utilização SimuTool	Portuguese

Table 4: Related Documents