Hadron XTORM

RUGGEDNESS FOR POWER DEMANDS

REMOTE TERMINAL UNITS

HADRON XTORM SERIES

MAIN FEATURES

- Superior processing speed and high performance protocols
- Rugged design for operation in critical environments
- Redundancy and special input and output modules

REMOTE TERMINAL UNITS

HADRON XTORM SERIES

- Aggregates DCS’ typical elements
- Integration with most traditional SCADA systems
- Used for control systems in small, medium and high-end applications

RTU AND PLC

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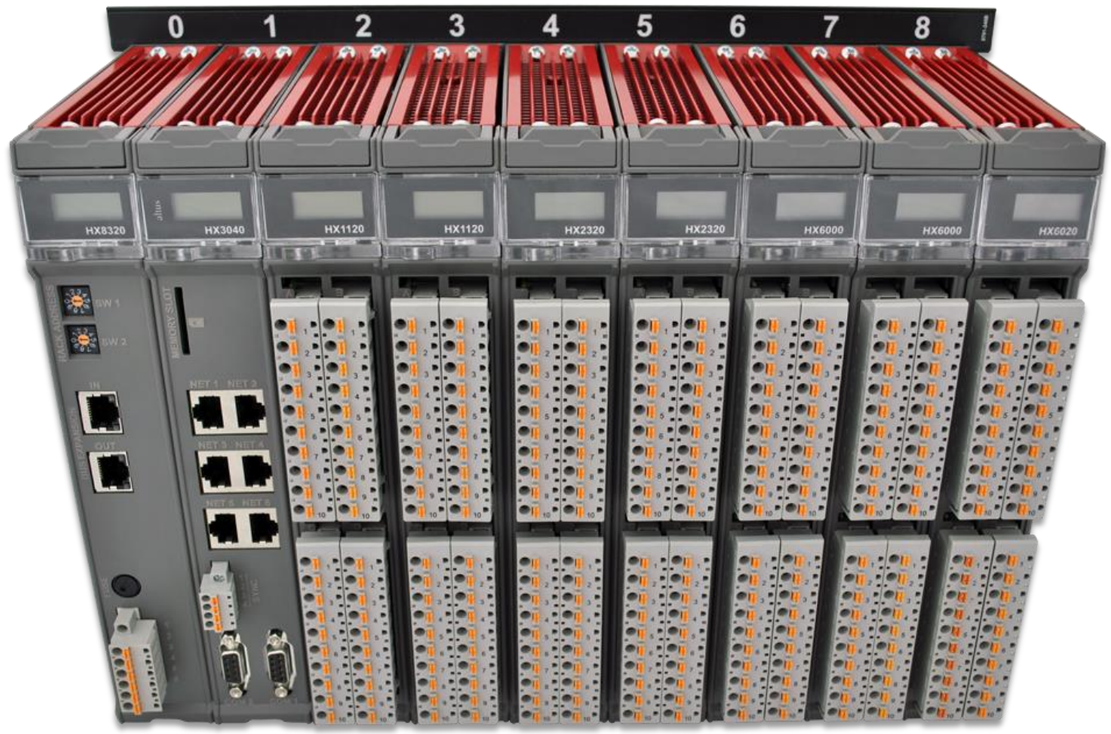
REMOTE TERMINAL UNIT (RTU)

- Supervision and control equipment for power generation, transmission, distribution and monitoring applications

PROGRAMMABLE LOGICAL CONTROLLER (PLC)

- Supervision and control equipment for machines, factories, buildings, infrastructure, industrial processes and other applications



HADRON XTORM SERIES

PRODUCT	RTU	PLC
Area	Wide geographical areas Remote applications	Local control areas More centralized applications
Examples	Power plants, substations, industrial applications, …	Process plants, production lines, machines, buildings, ...
Application	Supervision Telemetry Control (interlocking logic)	Control Supervision
Main Standard(s)	IEC 61850	IEC 61131-3
Protocols	GOOSE, MMS, DNP3, IEC 60870-5-104, MODBUS, …	PROFIBUS-DP, MODBUS, OPC, PROFINET, EtherCAT, Ethernet/IP, …
Special Features	Logical nodes Time synchronism (GPS, SNTP) Check Before Operate (CBO) Time stamping Events (SOE)	PID loops Motion Safety (SIS/SIL) High-speed counters Analog outputs

APPLICATIONS

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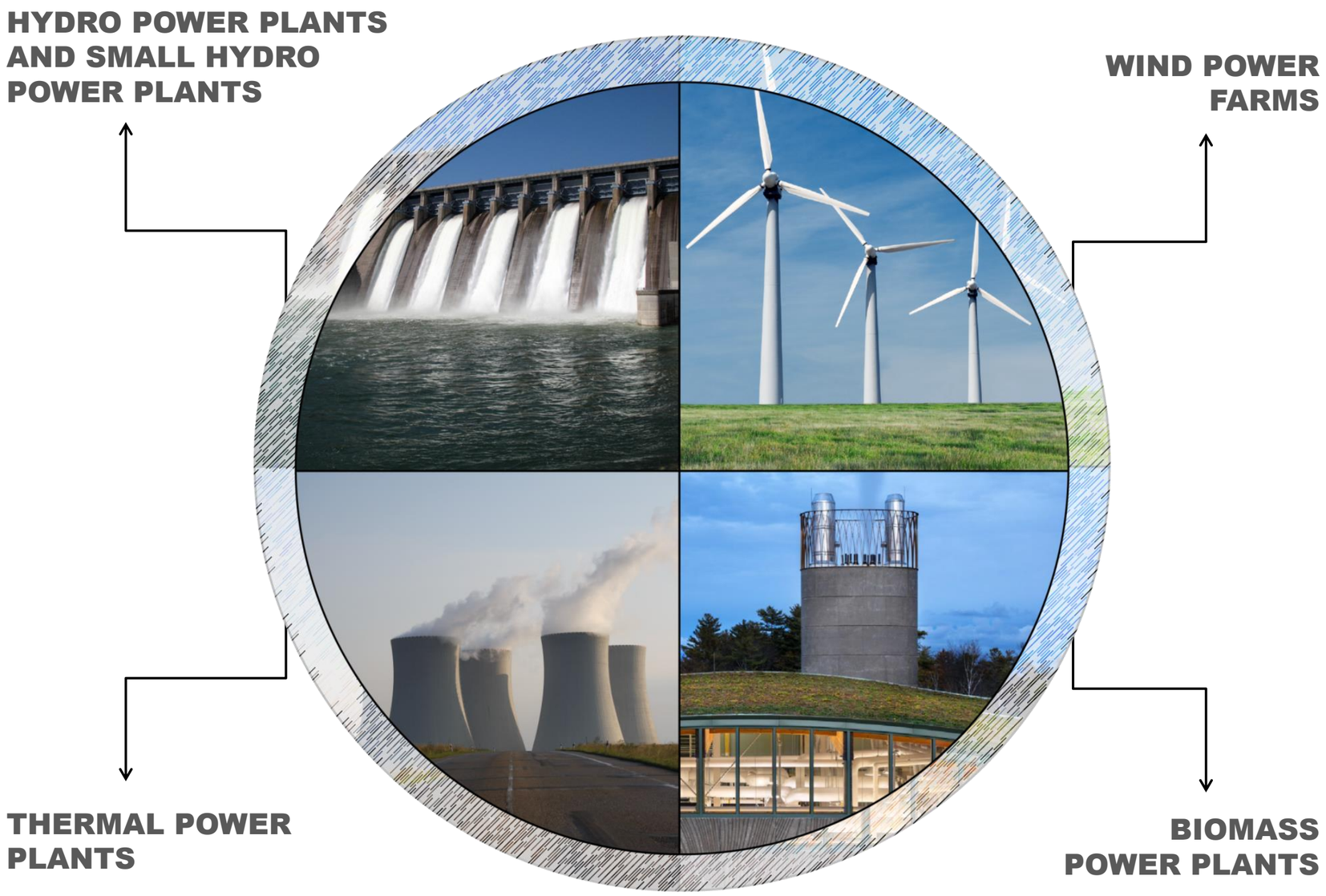

GTD

HADRON XTORM SERIES

INNOVATIVE RTU

- High availability
- High immunity (EMI)
- Fast processing speed
- Rugged design
- Extended temperature range
- High I/O quantity

GENERATION

TRANSMISSION

DISTRIBUTION

GENERATION

HADRON XTORM SERIES

GENERATOR CONTROL

- Start/stop, temperature protection, other related mechanical and electrical controls

EMERGENCY STOP/SHUTDOWN

- Safe plant/generators shutdown in case of failure

AUXILIARY SERVICES (ELECTRICAL OR MECHANICAL)

- Power panels for AC/DC distribution, engines, compressors and water pumps

RESEVOIR/WATER GATES SYSTEM

- Opening/closing of water gates for reservoir level control
- Opening/closing of water intake gates and flow monitoring against obstacles

POWER TRANSMISSION AND DISTRIBUTION

HADRON XTORM SERIES

POWER LINE

- Transmission line circuit breakers

POWER TRANSFORMERS

- Circuit breakers, tap changer and temperature monitoring

BAY CONTROLLER

- IED communication, circuit breakers, power monitoring

CAPACITORS BANK

- Circuit breakers and reactive power control

POWER TRANSMISSION AND DISTRIBUTION

HADRON XTORM SERIES

FEEDER CONTROL

- Circuit breakers control

AUXILIARY SERVICES

- Status monitoring of batteries, rectifiers, circuit breakers positions, others

SUBSTATION CONTROLLER

- IED and SCADA communication

OTHER INDUSTRIES & APPLICATIONS

HADRON XTORM SERIES

COMMUNICATION GATEWAYS

- Control systems to power systems

MOTOR CONTROL CENTER CONTROL/SUPERVISION

- Supervision and control of loads and power inputs

ENERGY EFFICIENCY SYSTEMS

- Reading of multiple IEDs and energy meters

WHY TO USE HADRON XTORM?

HADRON XTORM SERIES

PERFECT FOR POWER SYSTEMS

- Suitable for acquisition and control units of hydro power plants
- 125 Vdc power supply input (no need for external power converters)
- 2,500 Vdc isolated I/O modules, eliminating external galvanic isolators
- Simultaneous communication with up to 04 control centers using different protocols
- Native communication drivers on the CPU
- CPU with 06 Ethernet ports witch allows the creation of multiple simultaneous and redundant communications
- Superior processing speed with Linux operating system
- Buffered time stamping for events, which decreases the chances of avalanche data loss maintaining 1 ms accuracy
- No tag limit for communication licensing, which means no extra costs when increasing the controller tag database

WHY TO USE HADRON XTORM?

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REAL ETHERNET-BASED PROTOCOL

- Not a recast serial RTU protocol
  - Designed specifically for LANs
  - Communications are unaffected when adding devices
- Real object-oriented approach
  - Supports standardized device models using names instead of object/register numbers and indexes (SCL)
  - Device configurations can be exchanged via SCL files
- Data from IEDs available to all network devices
- Tag names can be retrieved from the device automatically (no manual intervention)
- Client configuration is simple: only needs network addressing

WHY TO USE HADRON XTORM?

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ENGINEERING BENEFITS

- Self-describing devices & automatic object discovery save engineering efforts in configuration, setup and maintenance

- Standard configuration file formats and exchange of device configuration save engineering time in design, specification, configuration and commissioning

- High performance multi-cast messaging allows network interlocking, saving investments on wiring and maintenance

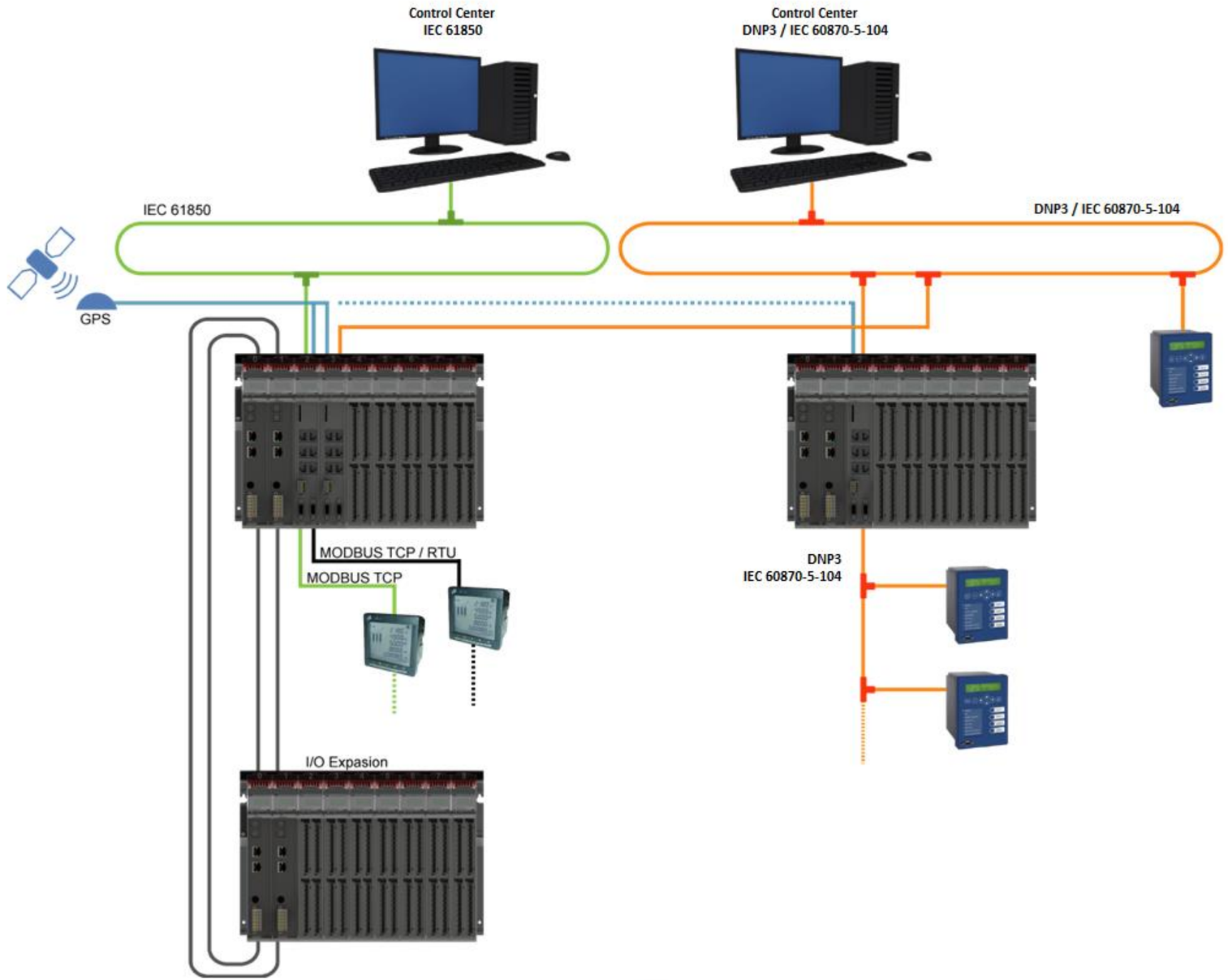
- Multi-cast messaging enables sharing of information

- May reduce the need of several transducers saving investment and maintenance costs

AUTOMATION ARCHITECTURE

HADRON XTORM SERIES

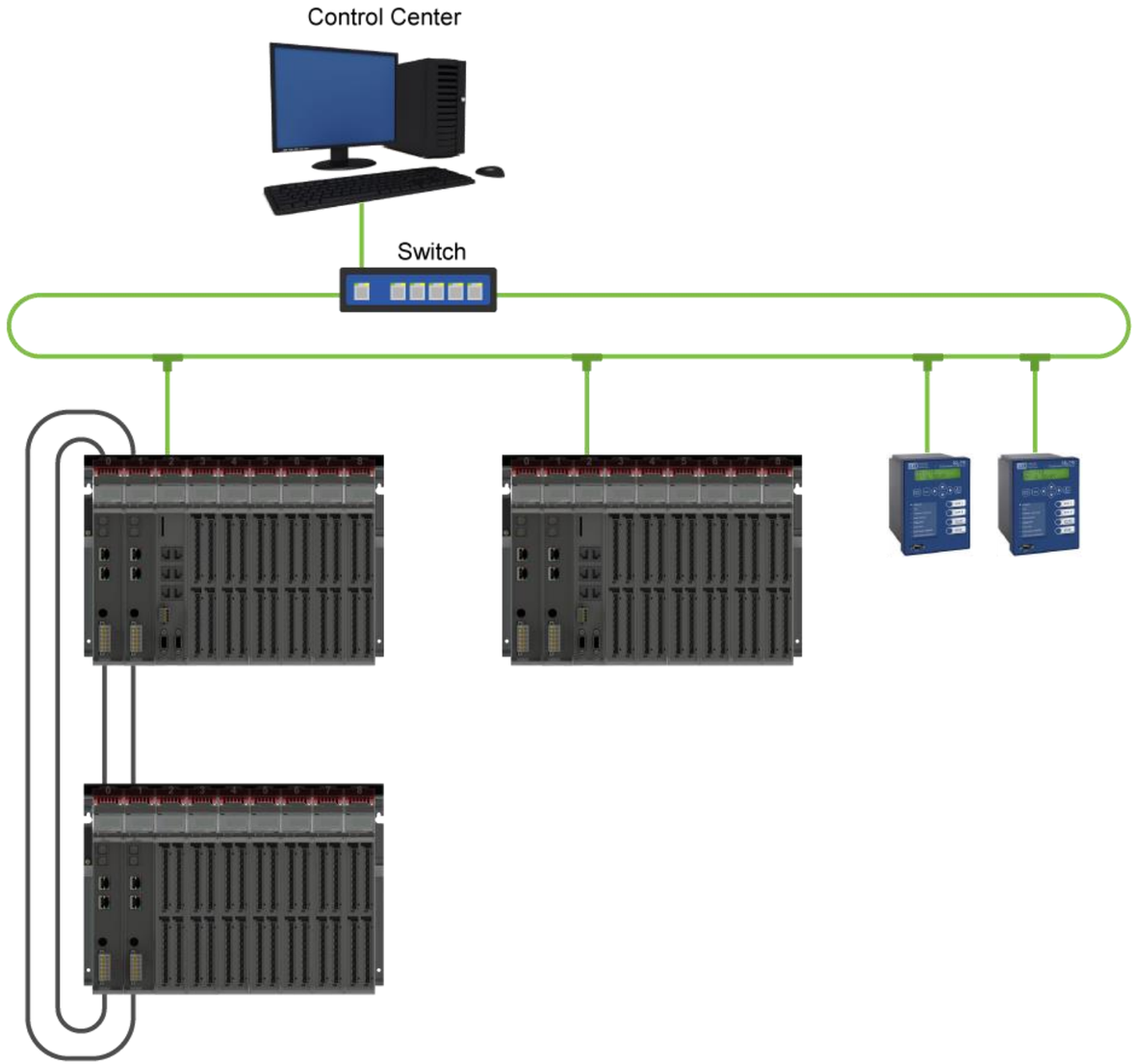
STAR TOPOLOGY



AUTOMATION ARCHITECTURE

HADRON XTORM SERIES

RING TOPOLOGY

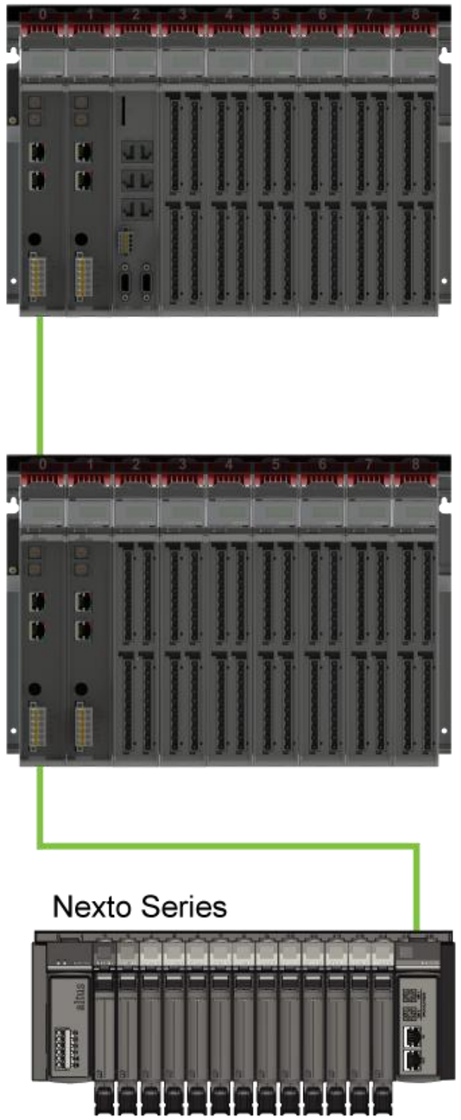


AUTOMATION ARCHITECTURE

HADRON XTORM SERIES

STAR TOPOLOGY

- Nexto I/O system can be used directly with Hadron Xtorm bus expansion



HADRON XTORM SERIES

ONE UNIQUE TOOL

- Configuration
- Programming
- Simulation
- Monitoring
- Debugging
- Smart configuration
- Event and I/O grouping support
- Pre-compiled logic libraries

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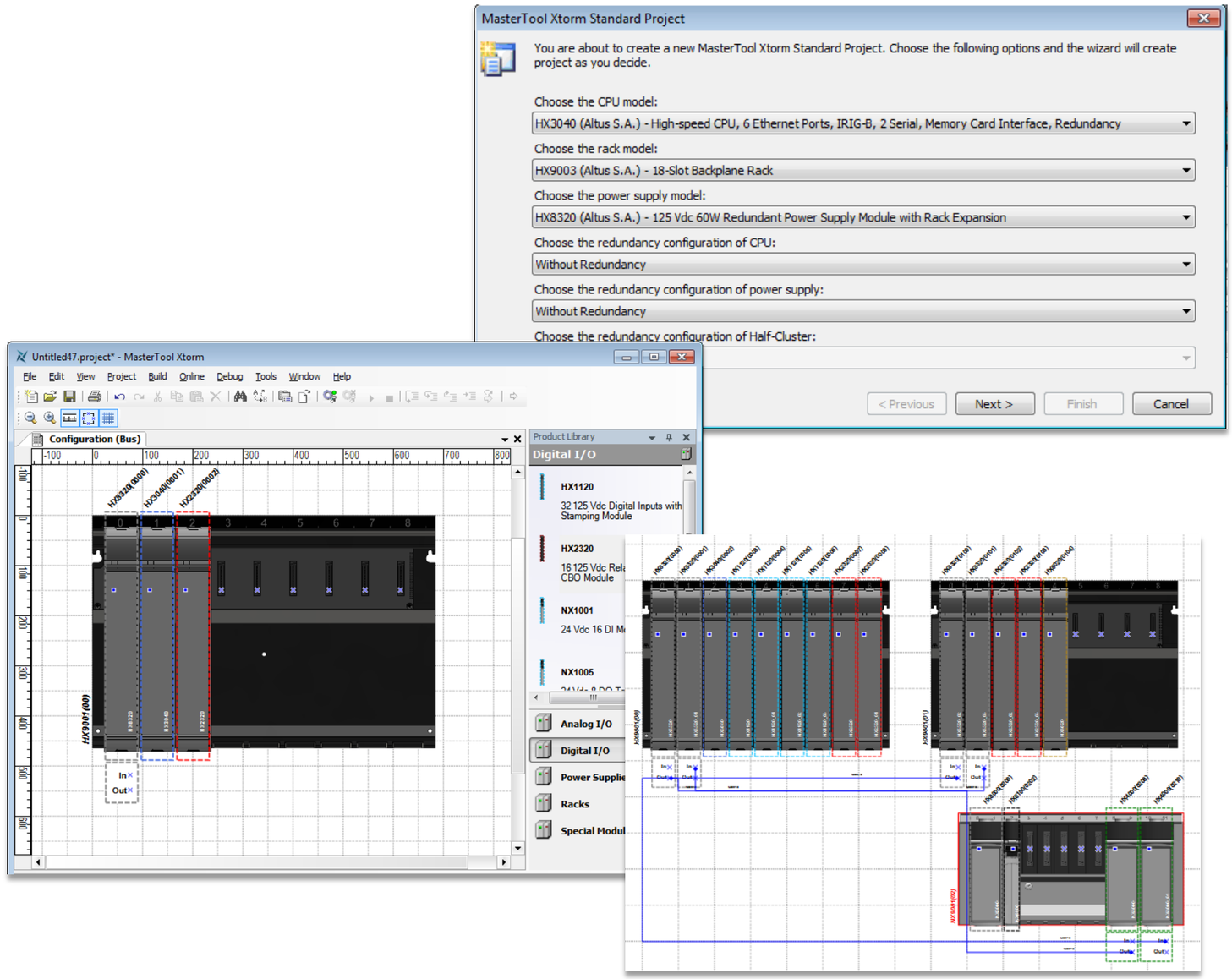
CONFIGURATION WIZARDS

- IEC language selection
- Application profile
- I/O requirements
- Redundancy options

GRAPHICAL ARCHITECTURE BUILDER

- Add / remove modules
- Easy parameters settings
- Remote I/O expansion



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PARAMETER SETTINGS

- Import, export, copy and paste features for parameter settings
- Application comparison and version tracking

Mappings | Settings | DNP3 Server Configuration

	Variable Name	Static Group Variation	Event Group Variation	Index	Size	Range	Event Class
▸	GVL.DoubleBitInput	g10v2 - Binary output with flag.	g32v1 - Analog input event 32-binary inputs without time.	0	1	0..0	Class 1
	GVL_ARRAY.ARRAY_VALUE_3D[6, 5, 2]	g20v1 - Counter 32-binary inputs with flag.	g22v5 - Counter event 32-binary inputs with flag and time.	1	1	1..1	Class 2
	POU_ARRAY.I	g30v3 - Analog input 32-binary without flag.	g22v2 - Counter event 16-binary inputs with flag.	2	1	2..2	Class 0
	GVL.DI2	g3v2 - Double-binary input with flag.	g4v3 - Double-binary input event with relative time.	3	1	3..3	Class 3
	GVL.DoubleBitInput	g20v6 - Counter 16-binary inputs without flag.	g22v5 - Counter event 32-binary inputs with flag and time.	4	1	4..4	Class 1
	GVL_ARRAY.ARRAY_VALUE_2D	g3v1 - Double-binary input packed format.	g23v2 - Frozen counter event 16-binary inputs with flag.	5	100	5..104	Class 0
*							

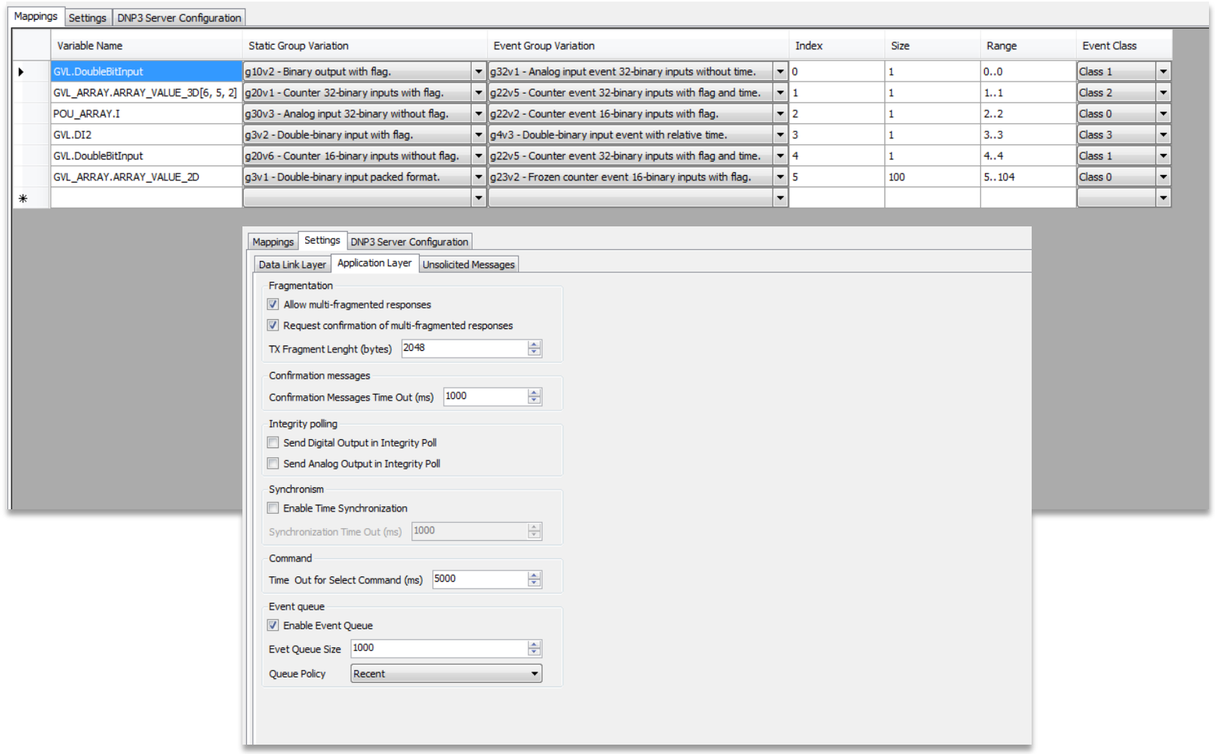
	A	B	C	D	E	F	G	H	I
1	#DnpServer	Parent	Connector	TcpPortNumber	ConnectionMode				
2	DNP3_Server	HX3040	NET 1	20005	Port				
3	#DnpServerClient	Parent	SourceAddress	DestinationAddress	ClientIPAddress	ListenPort	ValidateSourceAddress	EnableSelfAddress	KeepA
4	Local_Client	DNP3_Server	4	3	[0, 0, 0, 0]	65535	False	False	4,29E
5	Remote_Client	DNP3_Server	4	3	[0, 0, 0, 0]	65535	False	False	4,29E
6	#DnpServerClientMapping	VariableName	StaticGroupDefaultVariation	EventGroupDefaultVariation	EventClass	DnpIndex	DeadBand	DeadBandType	
7	Local_Client	Teste_01	3002	3202	Class0	0	DeadBand_01	2	
8	Local_Client	Teste_02	3002	3202	Class1	1	DeadBand_02	1	
9	Local_Client	Teste_03	3002	3202	Class2	2	DeadBand_03	1	
10	Local_Client	Teste_04	3002	3202	Class3	3	DeadBand_04	1	
11	Remote_Client	Event_Group_01	102	0	Class0	10		0	
12	Remote_Client	Event_Group_02	102	0	Class0	11		0	
13	Remote_Client	Event_Group_03	102	0	Class0	12		0	
14	Remote_Client	Event_Group_04	102	0	Class0	13		0	
15	#EventsGrouping	VariableName	Quality	MaximumDelay	Inputs				
16	HX3040	Event_Group_01	Event_Group_01_Q	2	Event_01, Event_02, Event_03				
17	HX3040	Event_Group_02	Event_Group_02_Q	2	Event_04, Event_05, Event_06, Event_07				
18	HX3040	Event_Group_03	Event_Group_03_Q	2	Event_08, Event_09				
19	HX3040	Event_Group_04	Event_Group_04_Q	2	Event_10, Event_11, Event_12				
20	#EventsGroupingAlarm	AlarmExcessiveDelay							
21	HX3040								
22	#ModbusClient	Parent	Connector	Protocol	TaskCycle				
23	MODBUS_Client	HX3040	NET 3	Tcp	100				
24	#ModbusClientDevice	Parent	SlaveAddress	IP	TcpPort	MaximumSimultaneousRequest	CommunicationTimeOut	Mode	Inacti
25	MODBUS_Device_03	MODBUS_Client	1	[192, 168, 20, 155]	502	1	3000	CloseByTime	
26	#ModbusClientDeviceMapping	VariableName	DataType	StartAddress	Quality				
27	MODBUS_Device_03	Teste_03	HoldingRegisterRead	1	Qualities.MODBUS_Device_03_QUALITY_0001				
28	MODBUS_Device_03	Teste_04	HoldingRegisterRead	2	Qualities.MODBUS_Device_03_QUALITY_0002				
29	#ModbusMaster	Parent	Connector	SendDelay	MinimumInterframe	TaskCycle			
30	MODBUS_RTU_Master	HX3040	COM 2	0	3.5	100			
31	#ModbusMasterDevice	Parent	SlaveAddress	CommunicationTimeOut	MaximumNumberOfRetries				

HADRON XTORM SERIES

COMMUNICATION PROTOCOLS SETTINGS

- Easy event grouping without the need of user logic

- Integrated protocols and services:
  - Use of symbolic variables
  - MODBUS RTU
  - MODBUS TCP
  - DNP3
  - IEC 60870-5-104
  - IEC 61850 (MMS Server and GOOSE)
  - Time synchronization



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comprehensive
EPRI-Project UCA 2.0

GOAL
One Internacional Standard

IEC 60870-5-101, -103, -104
European experience

IEC 61850

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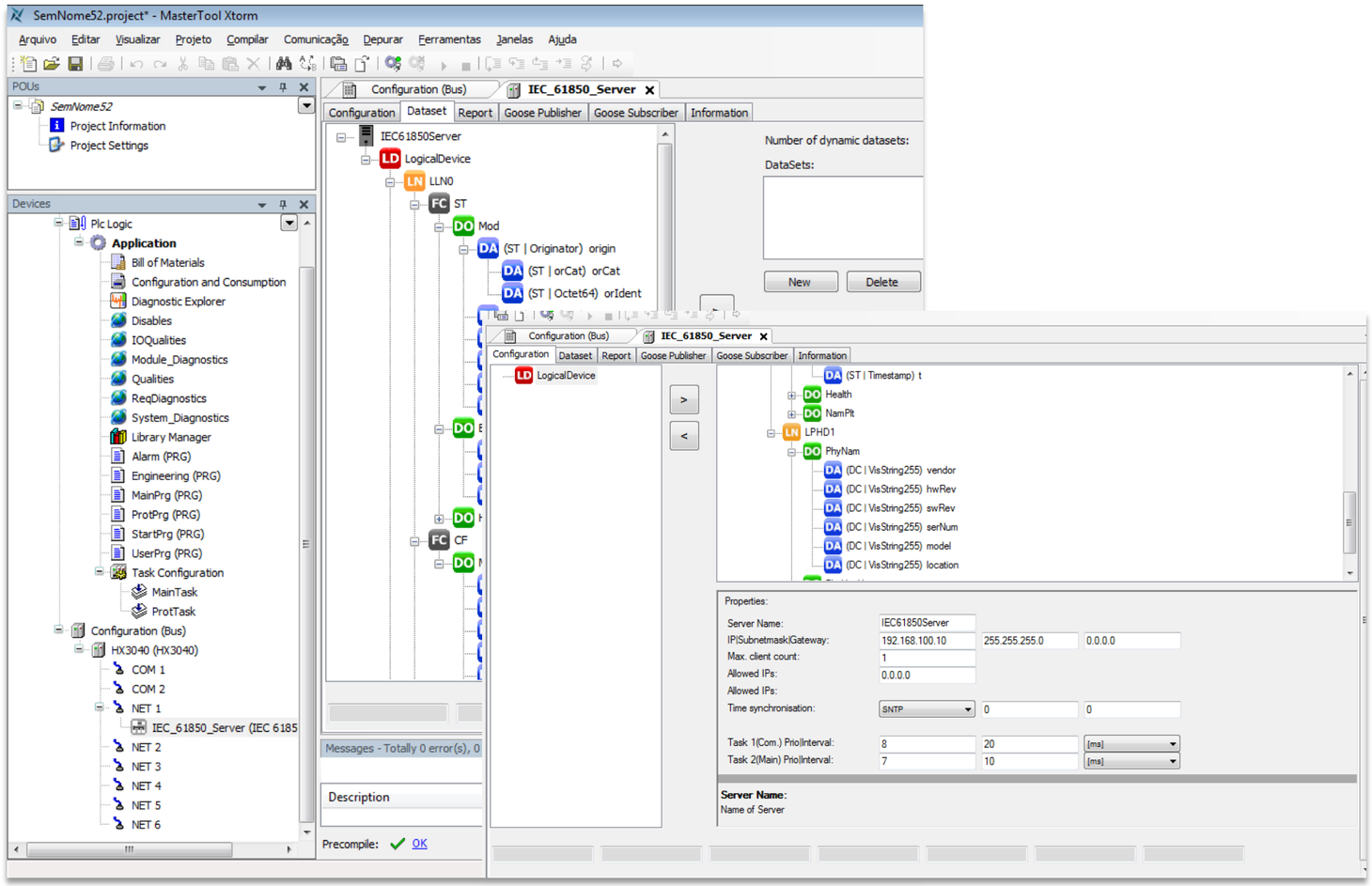
IEC 61850

- MMS Server
- GOOSE Publisher / Subscriber



MASTERTOOL XTORM – CONFIGURATION SOFTWARE

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IEC 61850 – LOGICAL NODES

- Embedded libraries for the most common substation and generator applications
- Some of the Logical Nodes run by the RTU:

- PZSU
- CILO
- CSWI
- GAPC
- GGIO
- XCBR
- XSWI
- ZBAT
- ZGEN
- LPHD
- LLN0
- FXOUT
- FXUT
- HBRG
- HGPI
- HLVL
- HMBR
- HNDL
- HNHD
- HSEQ
- HSPD
- HUNT
- HWCL
- KFAN
- KPMP
- KFIL
- KVLV
- SARC
- SLTC

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IEC 61131-3 – PROGRAMMING LANGUAGES

- Structured Text (ST)
- Sequential Function Chart (SFC)
- Function Block Diagram (FBD)
- Ladder Diagram (LD)
- Instruction List (IL)
- Continuous Function Chart (CFC)
- Using of different languages in the same project

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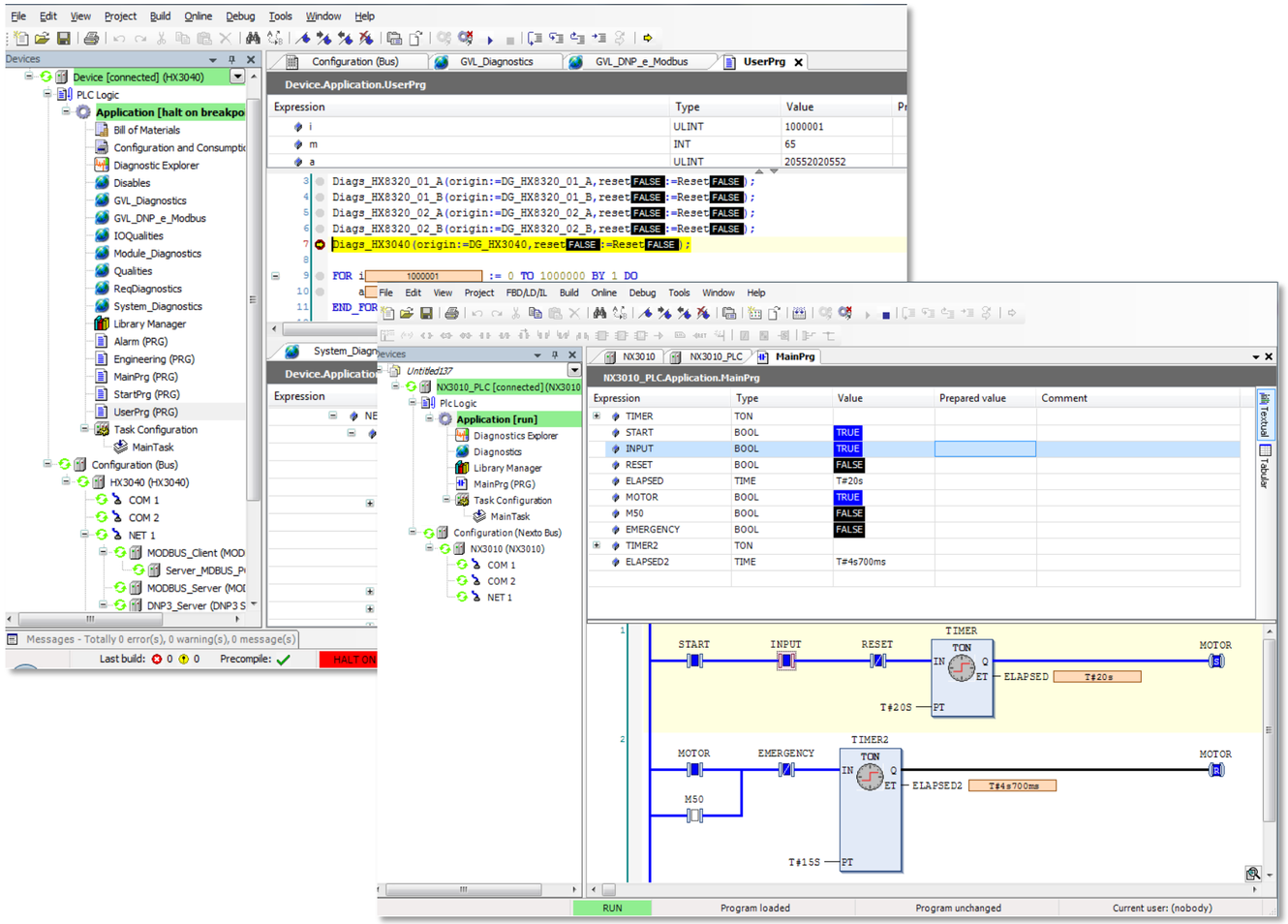
SIMULATION AND DEBUGGING

- Off-line application simulation
- On-line application debugging
- Monitoring of:
  - I/O variables
  - Symbolic variables
  - System diagnostics
  - Module status and diagnostics
- Breakpoint and step-by-step execution options



MODULAR SYSTEM

HADRON XTORM SERIES

- Backplane racks with 9 or 18 slots
- I/O expansion
- High I/O density
- Hot-swapping

BACKPLANE RACK

HADRON XTORM SERIES

RUGGED DESIGN

- Conformal coated
- One-piece aluminum chassis rack (for cabinet assembly)
- Excellent grounding and EMI performance

EASY INSERTION AND REMOVAL

- Easy top slot identification numbers

HOT-SWAPPING SUPPORT

HADRON XTORM SERIES

FULL HOT-SWAPPING SUPPORT

- Any module can be hot-swapped, allowing non-stop maintenance

EASY INSERTION AND REMOVAL

- No screws or tools needed for installing or removing modules

ADVANCED DIAGNOSTICS

HADRON XTORM SERIES

- System diagnostics are available in different ways
- Remote access via web browser
- Firmware update via web browser
- Password protection

ADVANCED DIAGNOSTICS

HADRON XTORM SERIES

CPU INFORMATION

- System status: RUN, STOP, …
- Redundancy status: ACT, SBY, …
- Serial and Ethernet ports data activity
- Active diagnostics, I/O forcing and others
- LCD displays are available in each module

ADVANCED DIAGNOSTICS

HADRON XTORM SERIES

I/O & MODULE INFORMATION

- Current I/O status
- Active diagnostics
- CPU scan and parameters settings

OTD – ONE TOUCH DIAG

- Modules tag and description
- I/Os tag and description
- Module and I/O diagnostics messages

ADVANCED FEATURES

HADRON XTORM SERIES

BATTERY FREE OPERATION

- No internal battery
- Eco-friendly
- Memory retain (up to 20 years)
- RTC retain (up to 15 days)

IP PROTECTION AND SECURITY

- User groups, user rights and passwords management to access application files and controller

HIGH RELIABILITY

- Low power dissipation, consumption
- No moving parts (fanless design)

ON-BOARD FULL DOCUMENTATION

- Application and user files are easy stored inside the controller

MULTIPLE BLOCK STORAGE

- Large memory space
- Several variable types supported:
- %I, %Q, symbolic
- Persistent and retain variables

- Memory for user files storage:
- .PDF, .DOC, .JPG and others

- Memory for user and system log
- SD card support (up to 8 Gb)

HIGH AVAILABILITY

HADRON XTORM SERIES

- CPU redundancy in the same rack
- “Hot-Standby” topology
- Ethernet ports with redundancy support (NIC Teaming)
- Power supply module with redundancy support

- Supported protocols and services:
  - MODBUS TCP
  - MODBUS RTU over TCP
  - MODBUS RTU
  - SNTP
- IEC 61850
  - MMS Server
  - GOOSE (Publisher/Subscriber)
- DNP3
  - Client
  - Server
- IEC 60870-5-104
  - Server
  - Client

HADRON XTORM SERIES

HX3040 – CPU

- 6 Ethernet ports with redundancy support
- Time synchronism via IRIG-B port
- 2 serial ports RS-232 e RS-485
- Web server for diagnostics monitoring
- SD card support

HADRON XTORM SERIES

HX8300 / HX8320 – POWER SUPPLY W/ BUS EXPANSION

- Input voltage of 24 Vdc (HX8300) or 125 Vdc (HX8320)
- Output power of 60 W
- Fanless design
- Redundancy support (by using two modules in the same rack)
- Auxiliary contact for input voltage failure monitoring
- Rotative switches for rack address selection
- Bus expansion ports
- Time synchronism distribution to different racks via expansion ports (no need of extra wiring/cabling)

HADRON XTORM SERIES

HX1120 – DIGITAL INPUT MODULE

- 32 inputs
- 125 Vdc input voltage
- Time-stamping with 1 ms accuracy
- Support of double inputs
- Isolation of 2,500 Vdc

HX1100 – DIGITAL INPUT MODULE

- 32 inputs
- 24 Vdc input voltage
- Time-stamping with 1 ms accuracy
- Support of double inputs
- Isolation of 2,500 Vdc

HADRON XTORM SERIES

HX2200 – DIGITAL RELAY OUTPUT MODULE

- 16 outputs
- Integrated relays (free potential)
- Support to double outputs
- Isolation of 2,500 Vdc

HADRON XTORM SERIES

HX2320 – DIGITAL OUTPUT MODULE (CBO)

- 16 outputs
- Integrated relays
- Support to double outputs
- Isolation of 2,500 Vdc
- 125 Vdc CBO (Check Before Operate, for continuous monitoring of load connection on each output)

HX2300 – DIGITAL OUTPUT MODULE (CBO)

- 16 outputs
- Integrated relays
- Support to double outputs
- Isolation of 2,500 Vdc
- 24 Vdc CBO (Check Before Operate, for continuous monitoring of load connection on each output)

HADRON XTORM SERIES

HX6000 – VOLTAGE/CURRENT ANALOG INPUT MODULE

- 16 inputs
- Ranges and scales are software configurable
- +/- 20 mA, 0-20 mA, 4-20 mA,
- 0-1 V, 0-5 V, 0-10 V, +/- 1 V, +/- 5 V, +/- 10 V
- Filters configurable via software
- Engineering scaling
- Isolation of 2,500 Vdc

HADRON XTORM SERIES

HX6020 – RTD TEMPERATURE ANALOG INPUT MODULE

- 8 inputs
- 3 or 4-wire configuration
- Filters configurable via software
- Isolation of 2,500 Vdc
- Different sensor types supported:
  - Pt100, Pt1000, Ni100
  - Resistance: 0 to 4000 ohms

HADRON XTORM SERIES

HX6065 – MIX MODULE

- 3 AC voltage inputs (300 V) for potential transformers
- 1 AC voltage input (300 V) for timing
- 4 AC current inputs (5 A) for current transformers
- 4 independently configurable outputs in voltage or current at various scales by software
- Short circuit protection for outputs
- Galvanic isolation between inputs, outputs and internal logic
- Protection against surge voltage

CERTIFICATES

HADRON XTORM SERIES

CE MARKING

- RTU in the state of art combining Remote and PLC features in compliance with international standards

ROHS DIRECTIVE

- Hadron Xtorm Series was developed according eco-design requirements including electronics, components and packaging compliant to RoHS European directive
- This is an European directive that prohibits certain hazardous substances from being used in manufacturing processes

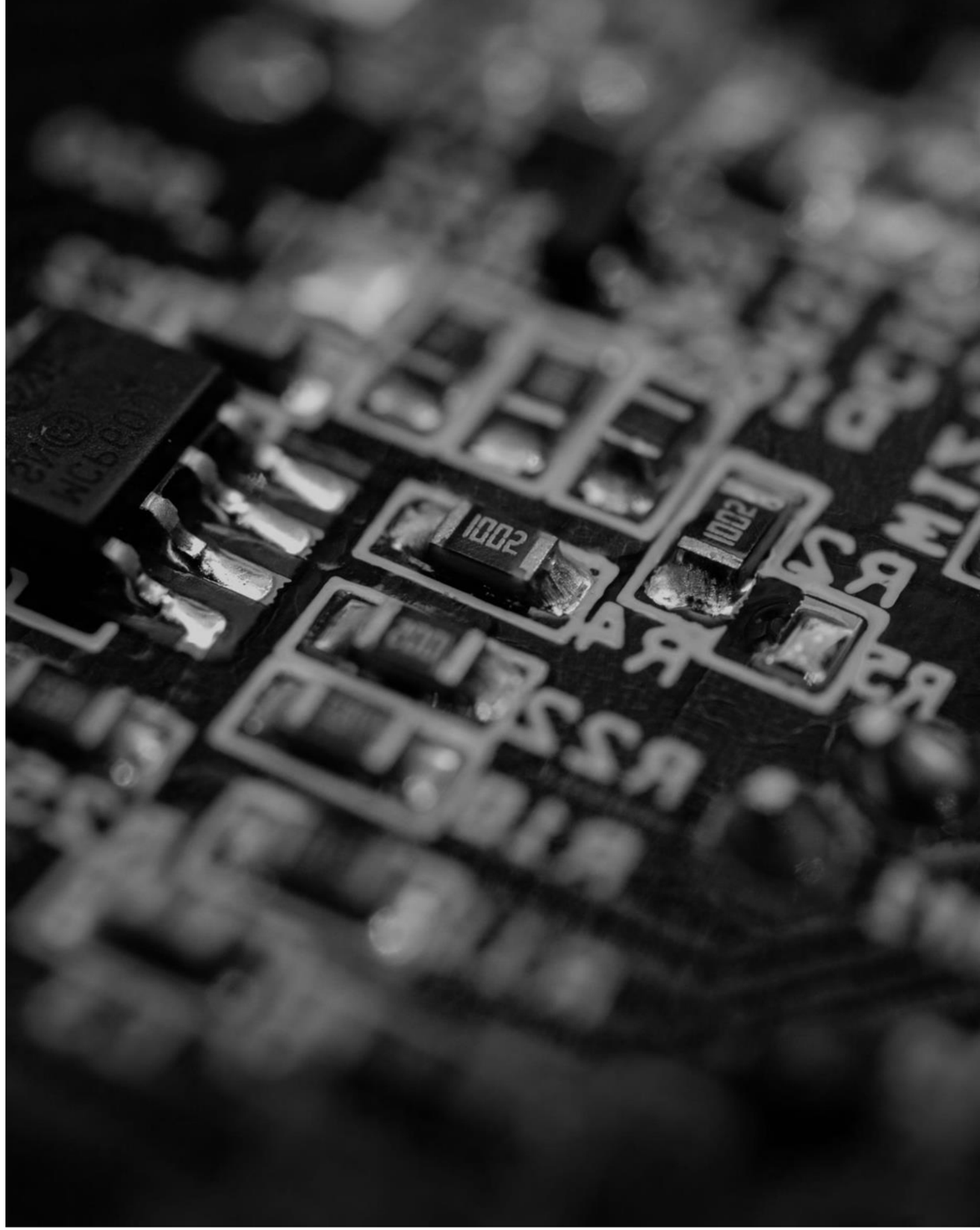
- Cadmium (Cd)
- Mercury (Hg)
- Hexavalent Chromium (Cr6+)
- Polybrominated Biphenyls (PBBs)
- Polybrominated Diphenyl Ethers (PBDEs)
- Lead (Pb)

CONFORMAL COATING

HADRON XTORM SERIES

PROTECTION AGAINST HAZARDOUS SUBSTANCES IN INDUSTRIAL ENVIRONMENTS

- Many industrial environments have hazardous substances on the air for printed circuit boards such as chemical components, air and moisture.
- In the conformal coating process a thin layer of nonconductive material is applied to protect against corrosion, extreme temperatures, sea air, humidity, among others.



USER DOCUMENTATION

HADRON XTORM SERIES

TECHNICAL DATASHEETS

- Every module has a set of technical documentation available in:
  - Portuguese, English and Spanish
- User Manuals
- Extensive technical manuals are available in English and Portuguese
- Hadron Xtorm User Manual
- MasterTool Xtorm User Manual
- IEC 61131-3 Programming Manual
- Software / MasterTool Xtorm (Help Files)
  - Portuguese and English

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