atop Technologies

PROTOCOLS: GATEWAYS and EMBEDDED SOLUTIONS

Engineered and manufactured in Taiwan

Contents

ATOP: your Industrial Automation Solution

Harsh temperature

Atop has vast experience in designing products for environments that require products which can sustain extreme temperature and electrical immunity. **Our range of experience spans over verticals like Power, Oil, Mining** etc., which demonstrates the durability and high level of ruggedness that our products have to harsh surroundings

In-house manufacture

At ATOP, we have both a **R&D design capability** and an **in-house state-of-the-art manufacturing and testing facility.** This combination offers high quality and the capability to design solutions efficiently and effectively and respond to stringent delivery schedules

Industry-specific certification

Our products are designed to meet the special standards for extreme temperature and environmental conditions and has the necessary certifications for safely and industry regulations (EMS Level IV, IEC 61850, IP50/67, EN50155, etc)

Real-time Communication Embedded Modules

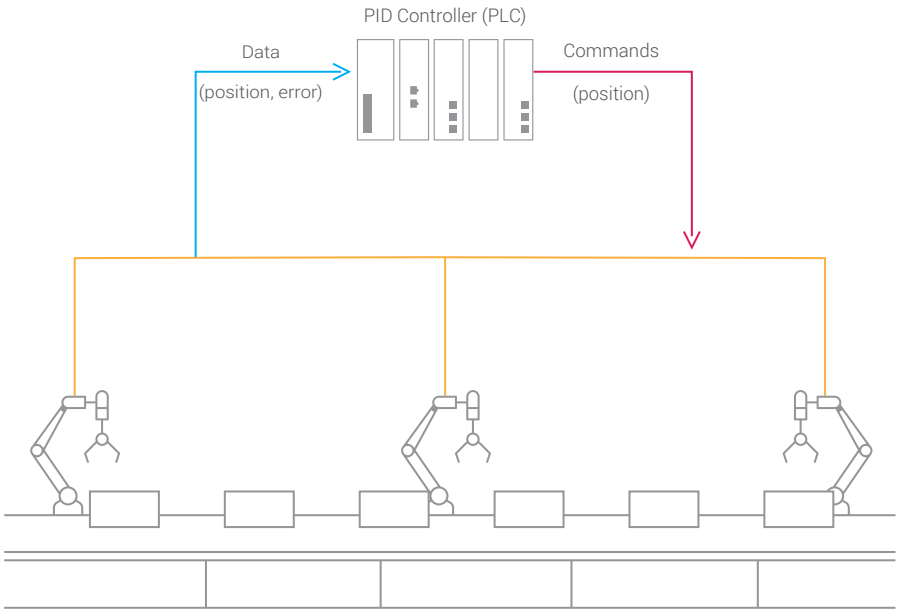
Challenges of Real Time Communication

The Need of Real Time Communication

Real Time environment is when the devices connected in the environment must guarantee that a specific task should be carried out in a pre-determined period of time. This time depends on the protocol used which in turn depends on the type of process that needs to be governed. An application within the real-time environment guarantees that the task is carried out within the pre-determined period of time, without any delays.

While a “one second” time frame is short for applications governed manually, machines require time frames that are much shorter. Some applications, for example the control of a Robotic arm where the position control updates must be very frequent, would require time frames of a few microseconds or even lower..

Different real-time protocols exist, and ATOP is working to enhance the product line with more and more protocols.



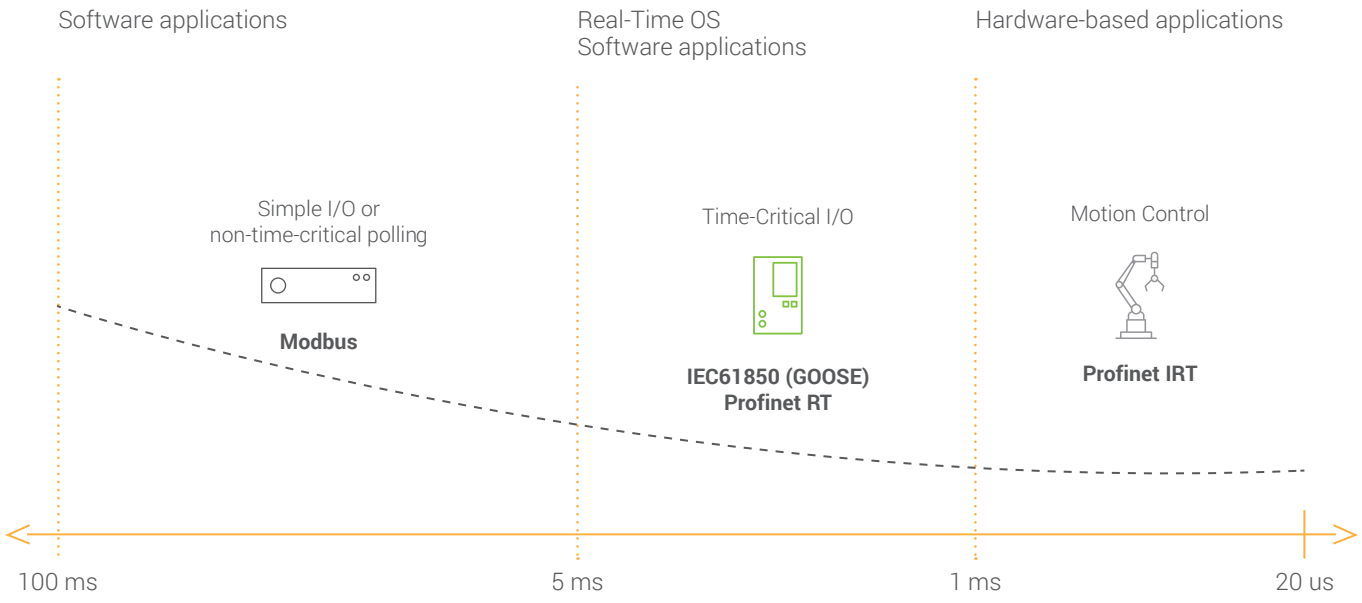
ATOP's offerings for Real Time Communications

ATOP's real-time communication devices will enable your network to satisfy the strict constrains and requirements of real-time protocols such as Profinet IRT and EtherCAT.

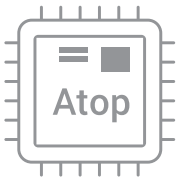
We provide a single hardware and software interface regardless of the protocol in use.

Managing Real Time Communication through Software

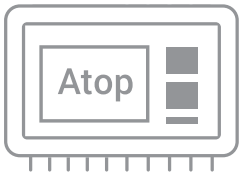
While traditional software and hardware would take longer time, ATOP has developed a dedicated hardware that takes cares of all communication related activities. This ensure that the deadlines of real-time communication are met.



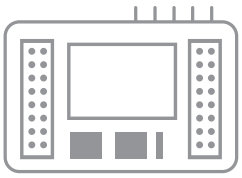
Our Solution



Chip



Module



Development companion board

PG5901-RT
Protocol gateway

Why choose ATOP?

a. We have more than 25 years experience in Industrial networking

b. We have a professional, fast responsive and reliable customer support service. For specific applications we also provide on-site support if necessary

c. We provide royalty-free product licensing

d. We provide design reference boards and step-by-step implementation manuals

e. Using ATOP's product line will allow you, as an equipment manufacturer, to focus your R&D resources on core competences. We will take care of the communication part

f. We have proven experience and successful implementations around the globe

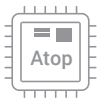
Supported Protocols

ATOP's Embedded Communications Chip and Module are designed to conform to Profinet IRT. **All products developed by ATOP are available in Chip and Module configurations and ATOP provides Design Reference Boards to simplify the integration of our products in your system.**

Features and Advantages

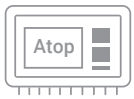
ATOP DI1000 series

The DI1000 series is a robust and reliable interface for your field devices. Since it is available in both a Chip and Module configurations, it is the easiest way to integrate and enhance the performance of your field devices with real time protocols.



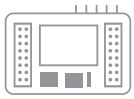
i. DI1000C- Chip

The DI1000C Chip is a high quantity, low cost vibration proof solution. The DI1000C is a single protocol FPGA based solution with additional Memory that can embed on your main board. The communication of the DI1000C with the CPU is through a 8 – 16 bit Parallel Interface, SPI,UART or GPIO interface.



ii. DI1000M- Module

The DI1000M Module provides Protocol exchangeability. The DI1000M is a single protocol communication module that shares the same architecture and SDK among all Industrial Protocols. The form factor is so designed that the module can easily be replaced allowing your device to be capable to interface to a different protocol with a single swap.

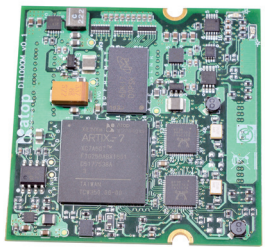


iii. DI1000D- Companion Reference board

DI1000 Overview

Product Description

Simple "All in one bus" connectivity for each field bus in Industrial automation. **Easy to integrate and interface to your CPU** the DI1000 series is the **perfect alternative to existing ASICs.** While the performance is totally comparable the DI1000 ensures any machine manufacturer to be Universally Industrial Protocol Ready **without the need of a dedicated hardware and software team**.

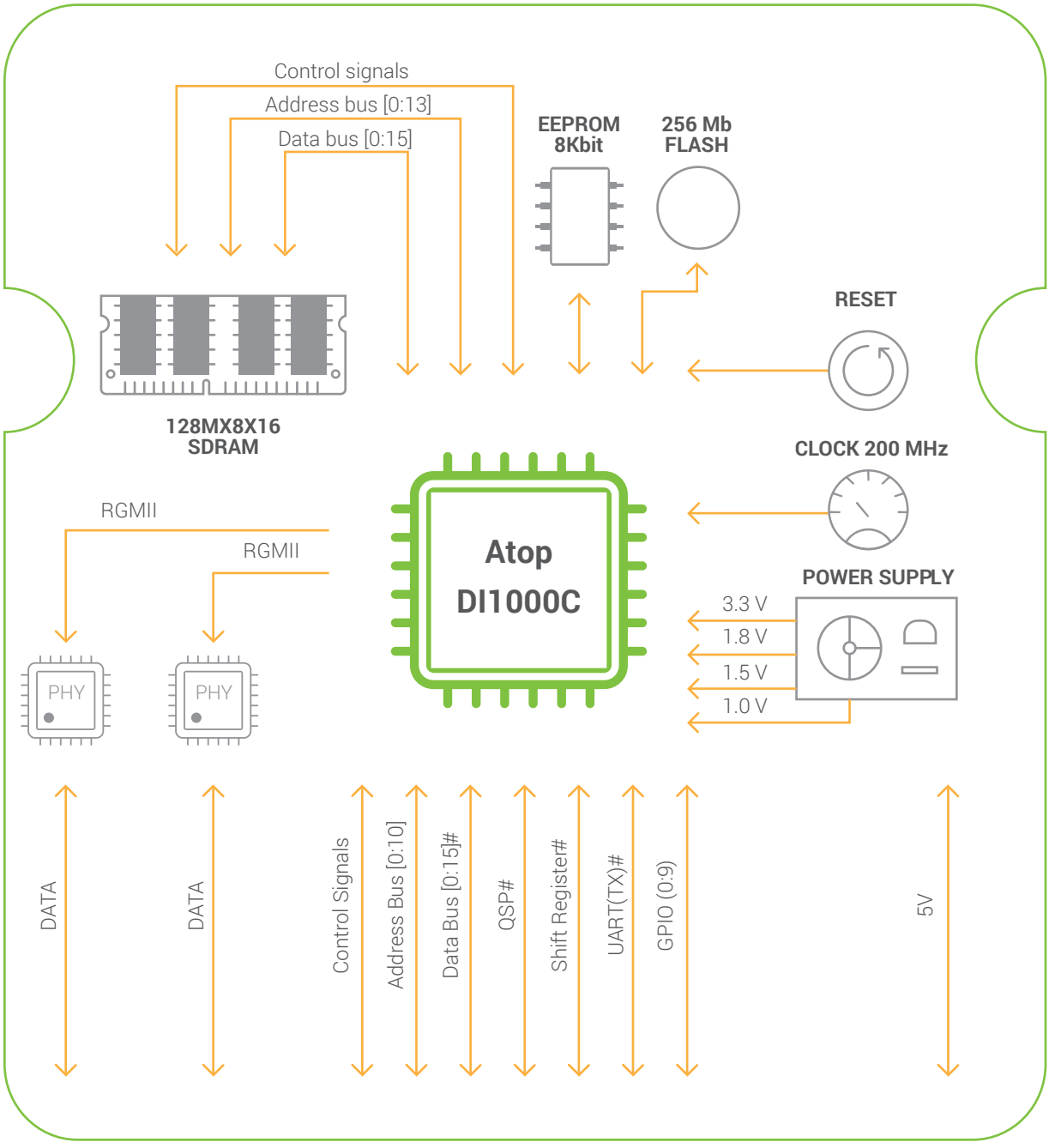


Integrate your own hardware with your own choice of peripherals to a single chip network component

ATOP DI1000C is a low power and high-performance communication solution implemented on chip. This single network communication solution is a composite of an IC and a Memory module loaded with the software necessary for you to connect an industrial device to different fieldbus or Industrial Ethernet network.

For any general and high productivity, high performance demanding applications.

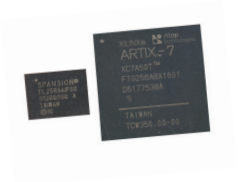
Note: Signals indicated with "#" are not necessary for all host applications.



Specifications	
Dimensions (L x W x H)	50 x 11 x 50 mm or 1,97"x 0,43" x 1,97"
Environmental Limits	• Operating Temperature: -40 to 85°C (-40 to 185°F) • Storage Temperature: --40 to 85°C (-40 to 185°F) • Ambient Relative Humidity: 5 ~ 95%RH, (non-condensing)
Interface Connectors	2 x 56pin male header
Application Interface	• Parallel Interface, 8-bit or 16-bit • SPI • Stand-Alone Shift Register Interface • Serial(UART) • LED Interface
Profinet IO Interface	• 2 external ports, 100 Mbit/s, full duplex • 2 integrated PHYs • Auto negotiation, auto crossover • Integrated IRT switch, 8 priority level • RJ45 or fiber optic interfaces • Fiber optic diagnosis via I2C interface per port • IRT bridge-delay < 3 µs • Hardware support for PROFINET protocols including PTCP and LLD

Regulatory Approvals				
Safety	EN 60950-1			
EMC	FCC Part 15, Subpart B, Class A EN 55032 EN 61000-3-2 EN 61000-3-3 EN 55024			
Test	Item		Value	Level
IEC 61000-4-2	ESD	Contact Discharge Air Discharge	±6KV ±8KV	3 3
IEC 61000-4-3	RS	80-1000MHz	10 V/m	3
IEC 61000-4-4	EFT	AC Power Port Signal Port	±2.0KV ±1.0KV	3 3
IEC 61000-4-5	Surge	AC Power Port AC Power Port Signal Port	Line-to Line±1.0KV Line-to Earth±2.0KV Line-to Earth±2.0KV	3 3 3
IEC 61000-4-6	CS	0.15-80MHz	10 Vrms	3
IEC 61000-4-8	PFMF	Enclosure	10 A/m	3
IEC 61000-4-11	DIP	AC Power Port	1. >95%,Reduction,0.5period 2. 30%, Reduction,25 period >95%,Reduction,250 period	-
Shock	MIL-STD-810F Method 516.5			
Drop	MIL-STD-810F Method 516.5			
Vibration	MIL-STD-810F Method 514.5 C-1 & C-2			
RoHS	Yes			
MTBF	TBD			
Warranty	5 years			

Ordering Information

Protocol	Component		
	Chip	Module	Development board
			
Profinet IRT slave	DI1000C-PN	DI1000M-PN	
Modbus TCP/RTU slave	coming soon	coming soon	
EtherCAT slave	coming soon	coming soon	DI1000D
Ethernet/IP scanner	coming soon	coming soon	
Profibus slave	coming soon	coming soon	

Legacy Systems – Protocol Gateways

Need to integrate different Protocols in one Network? No problem

The Need for Communication between Different Protocols

Serial Communication was the standard followed in Industries and Utilities and most of the investment on PLCs, IEDs etc., followed either Serial or CAN based standards. Upgrading these to newer standards can both a costly, risky and time consuming.

The requirement of data in modern day industry is more and is required faster. Since the standards in newer technologies is not always compatible with the standards that have been evolved, communication between the old and new standards is of paramount importance.

Upgrading stabilized systems because of incompatibility of network or protocol is a time consuming, risky, and costly proposition.

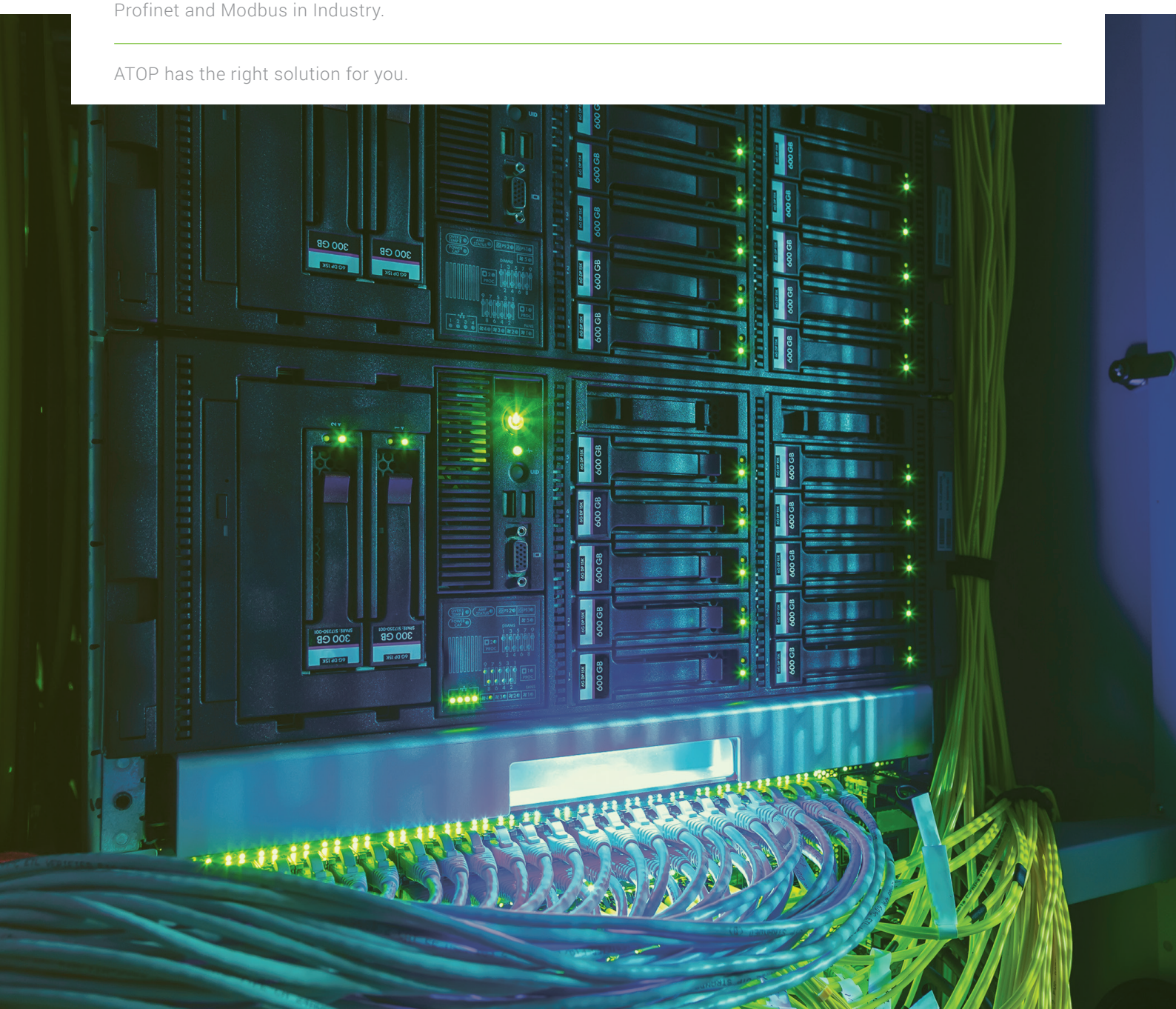
It is also many a times not possible to adapt existing equipment to newer communication / protocol layouts.

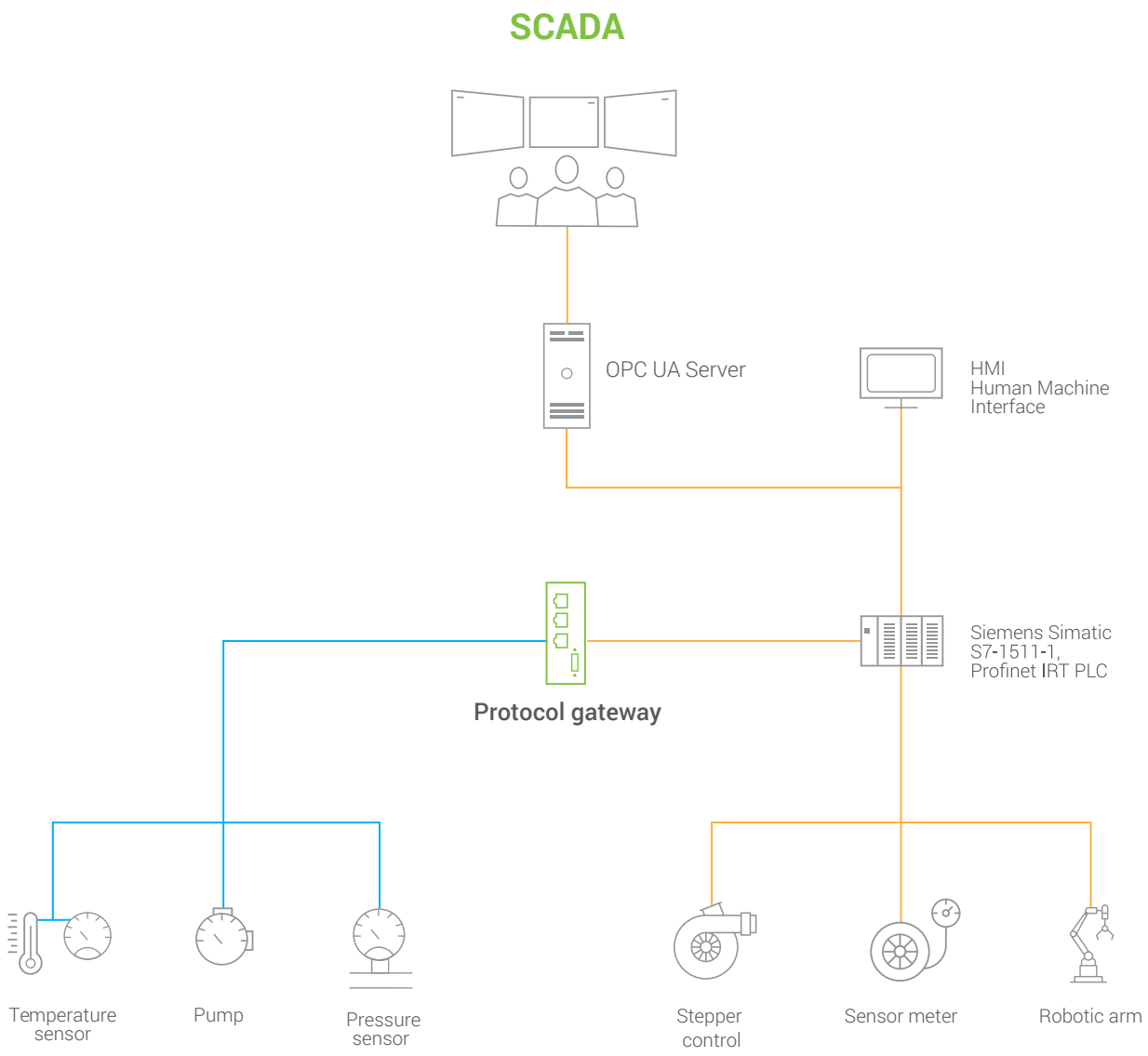
The Protocol Gateway

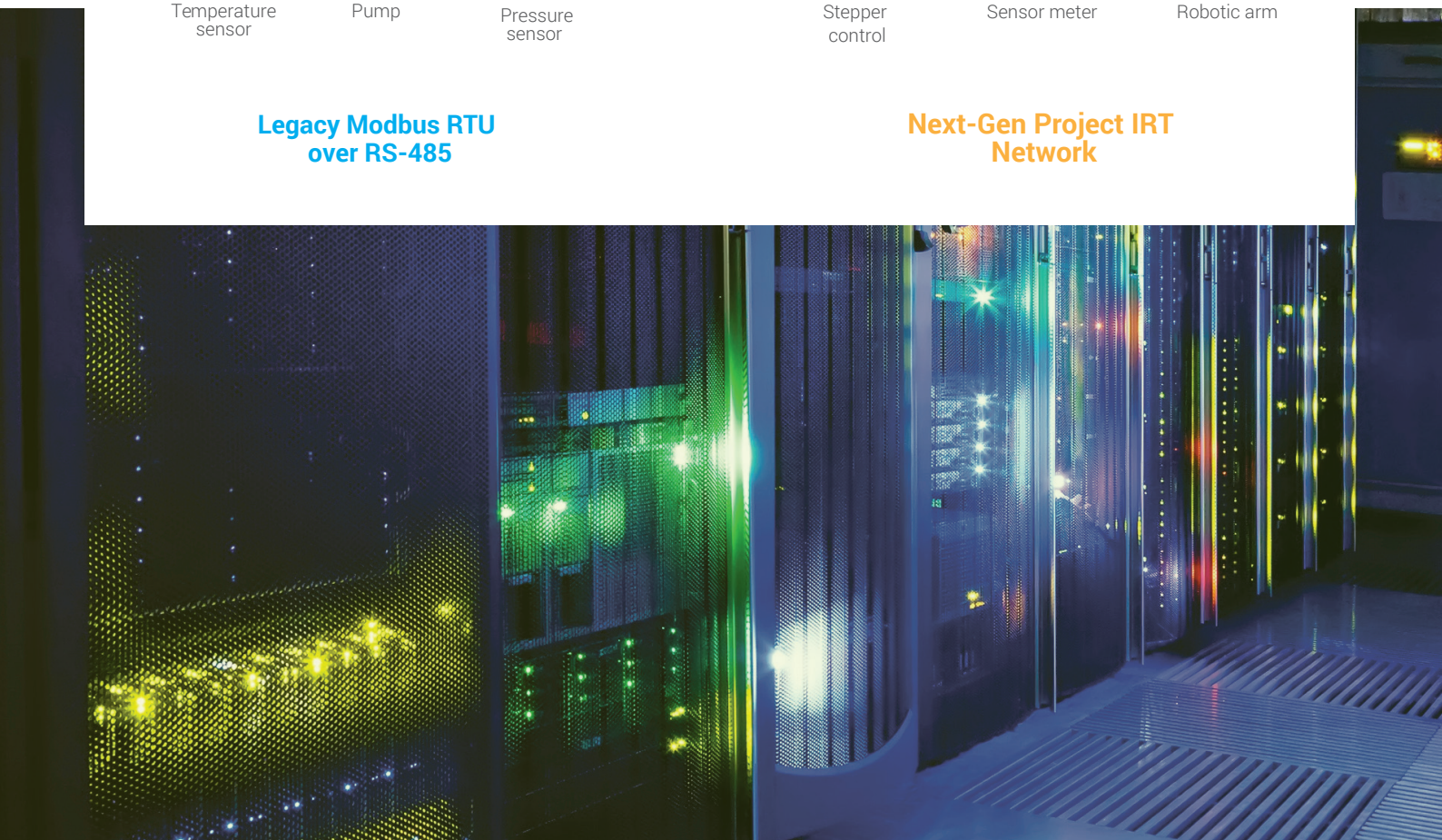
Integration between systems and Inter-operability is the key in the Smart Grid and Industry 4.0.

The Protocol Gateway designed and developed by ATOP bridges the communication between the latest IEC61850 standards and the legacy IEC60870-5-10X in the grid. It bridges the communication between OPC UA, Ethernet/IP, Profinet and Modbus in Industry.

ATOP has the right solution for you.




SCADA
OPC UA Server
HMI
Human Machine
Interface
Siemens Simatic
S7-1511-1,
Profinet IRT PLC
Protocol gateway
Temperature
sensor
Pump
Pressure
sensor
Stepper
control
Sensor meter
Robotic arm
Legacy Modbus RTU
over RS-485
Next-Gen Project IRT
Network



Our Solution

Why Choose ATOP?

ATOP's Protocol Gateway suite has been designed with a powerful hardware and stable and reliable software to make integration between different protocols seamless and easy. The user-friendly configuration tool enables you to map the data points and commands thus enabling the management of changeover, upgrades or integration in a fast and cost-effective manner.

Our products are designed to:

-40°C 85°C a. Withstand the harshest environments with temperatures ranging between -40 and +85 degrees C with up to 95% humidity

b. Have a very long reliability with MTBF exceeding 20 years

Industrial EMC c. Comply with Industrial EMC requirements (selected versions comply with the very strict Hardware specifications set forth in IEC 61850 chapter 3).

d. Provide a secured wireless with embedded security via VPN through IPsec or OpenVPN

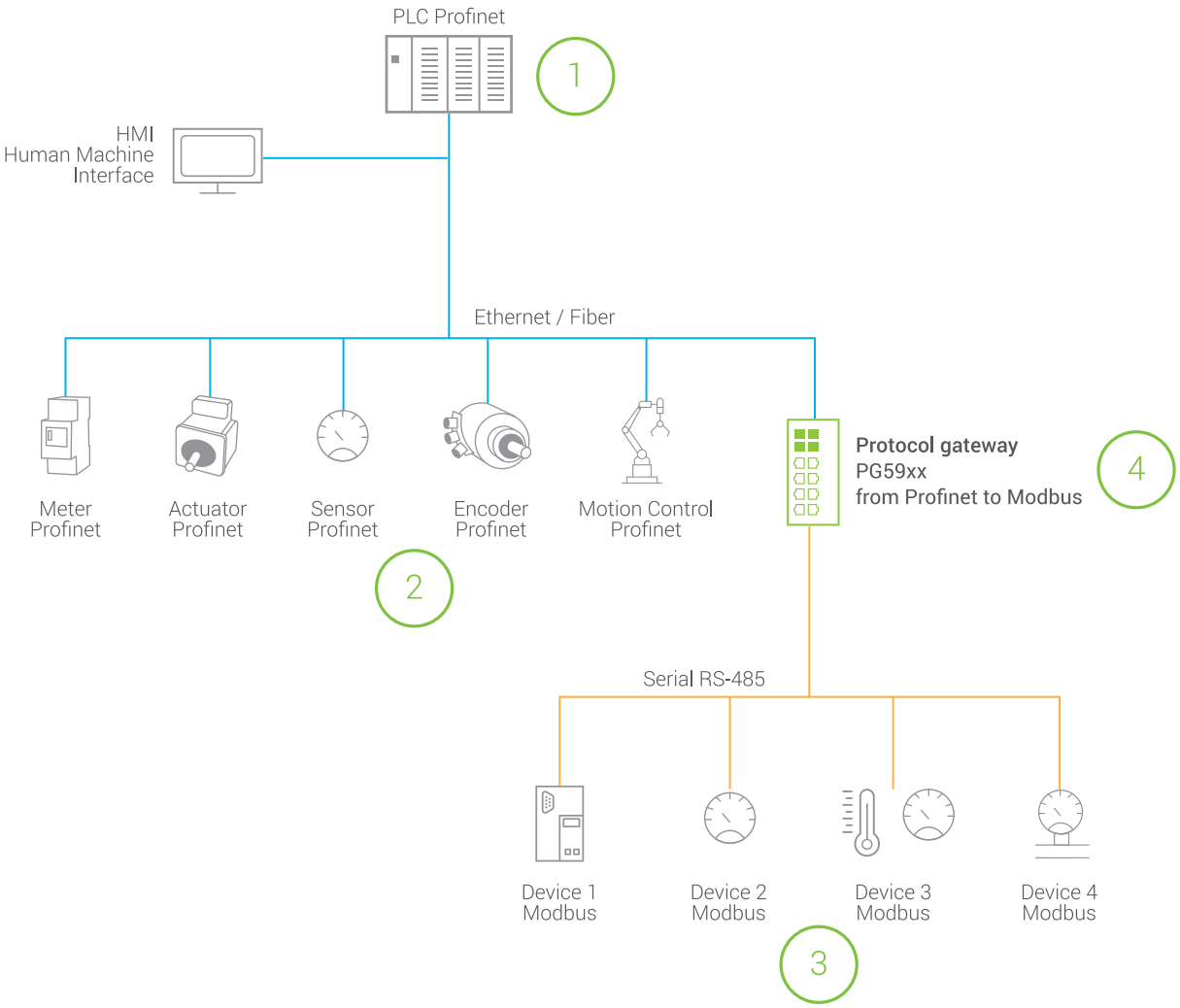
e. Share the same configuration tool, making it possible to easily migrate from one platform to another

All products can be embedded with Security. With this, supporting VPN over IPSec or OpenVPN function on a remote or unmanned site monitoring application can be done easily.

And then, you'll have ATOP's professional support to guide you through the solution deployment

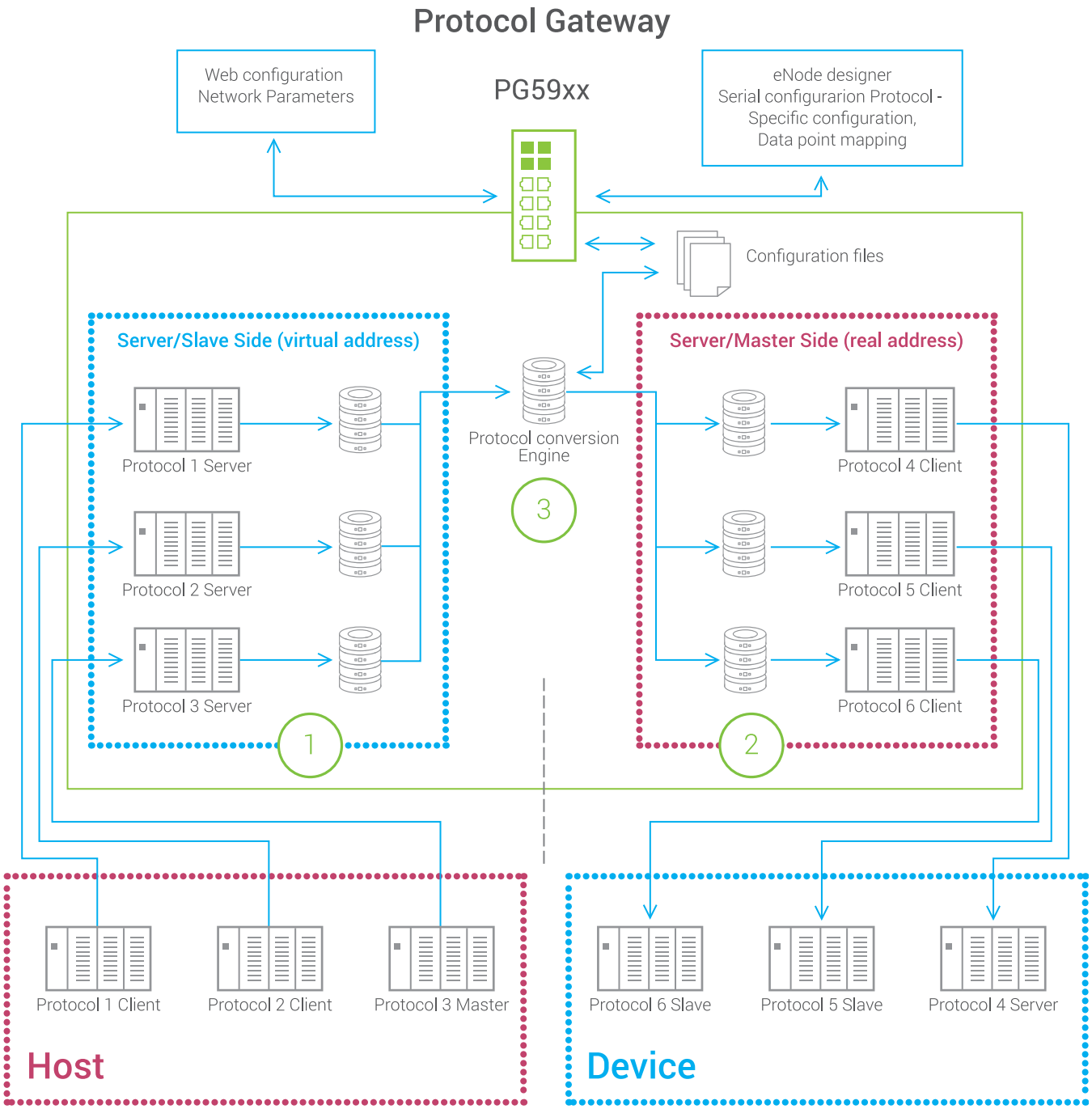
Architectural Concept

ATOP's family of Protocol Gateways are a suite of very powerful Industrial Gateway platforms bundled with different protocol stacks that can run Client/Server – Master/Slave modes simultaneously. A typical application is below.



1. Represents the HOST side that is in control of the application issueing read and write commands and managing events. It can be a PLC, a SCADA (Supervision Control and Data acquisition), an IPC, an HMI (Human / Machine Interface) etc... In this example, the HOST side works with Profinet. This is the Client/Master side.
2. Represents the Device side, connected to the HOST side that receives read/write commands and replies to the HOST. In this example, these devices are connected directly to the host because they run Profinet protocol. This is the Server/Slave side.
3. Represents the Device side. In this example these devices run Modbus RTU protocol on RS-485 and they will receive read/write commands from a Modbus RTU Host only. This is the Server/Slave side. Represents the Device side for the HOST (PLC) and the HOST side for the Modbus RTU Devices.
4. The Protocol Gateway's job is to translate the information from Profinet to Modbus RTU and to let the PLC seamlessly connect to non-Profinet devices. This is the Server/Slave side for PLC and Client/Master side for the Modbus Devices.

Shown in the below figure the general software architecture of the device:



The architecture is made of 3 different parts:

1. Device Server/Slave interface (that is listening to a Master/Client that is outside a device, a PLC for example). This means that Atop's PG will behave towards an external master as a slave device, in the related protocol
2. Device Client/Master interface (that is actively polling or issueing commands to an external Slave/Server)
3. ADH : the core of the unit that moves, translates and maps the data points/commands/events from the client side to the server side and vice-versa

The Protocol Gateway allows mapping of any protocol to any Serial or Ethernet port from the protocol itself. The e-Node Designer allows the user to assign different protocols to different ports; define the serial port settings and define the protocol specific parameters.

Inside eNode designer, the user will define for the Master/Client the real IDs of the devices need to get data/send commands from and will set for the Slave/Server the virtual addresses to be used from the client for data-point or command mapping.

The core of the Gateway is the Protocol Engine where the data/commands/events are stored and mapped to the other protocol.

Supported protocols

Smart Grid - specific protocols:

a. DNP3.0 (Ethernet and Serial)

b. EC 60870-5-101 (Serial)

c. IEC 60870-5-103 (Serial)

d. IEC 60870-5-104 (Ethernet)

e. IEC 61850 (Ethernet)

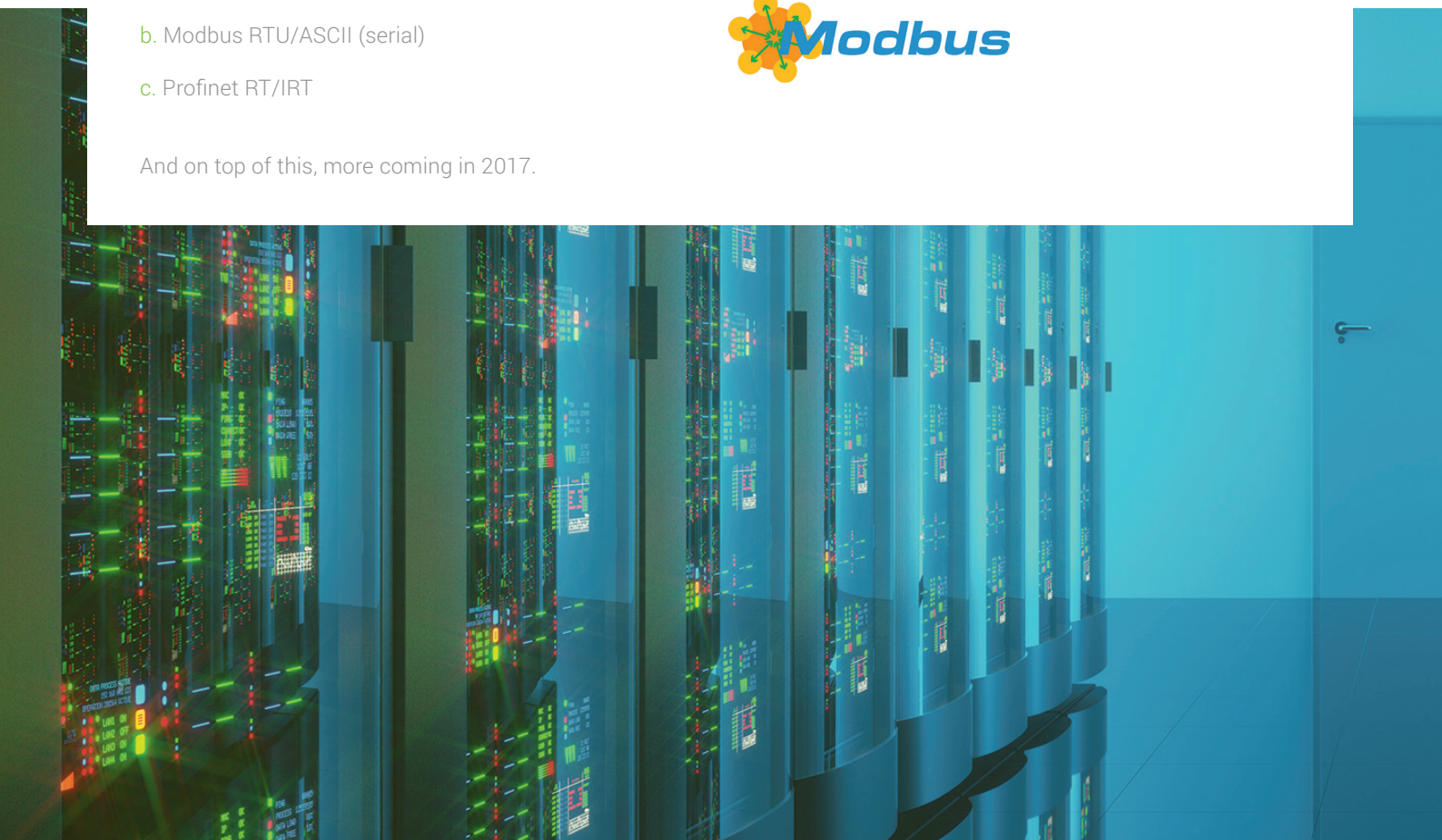
Industrial automation and general purpose protocols:

a. Modbus TCP (Ethernet)

b. Modbus RTU/ASCII (serial)

c. Profinet RT/IRT

And on top of this, more coming in 2017.



Easy Configuration

With a simple, easy to use Java based tool configuration of the gateway is also very simple. This platform independent configuration tool allows the user to manage data points mapping, polling frequencies, debugging and upload of the configuration from one single suite.

The above is independent of the protocol that is to be used. While the basic IP setting, SNMP setting etc., could be done through the Web interface, a separate tool distributes the configuration work across the company.

ATOP's embedded debugging console will allow you to monitor the data-flow and make sure the conversion is carried out as the application requires.

Hardware Flexibility

Based on your specific requirements, the Protocol Gateways have 9 different hardware variants. Each version shall be pre-loaded with the protocol conversion gateway loaded in its firmware.

The Hardware includes variants that have been designed for 16 x RS232/422/485 to maximise connectivity in installations that are serial port based. Others are specifically designed to fit into IEC61850 – 3 certified environments. There are modules specifically designed for reliable, remote monitoring through 3G – 4G connectivity

Spec	PG5901	PG5901B	PG5901-RT	PG5904D
				
Network interface				
RJ45 ports	2	1	(3)	(2)
SFP ports			(3)	(2)
Network Standard Compliance				
IEEE 802.3i 10BaseT	●	●	●	● Std Version
IEEE 802.3u 100BaseTX	●	●	●	● Std Version
IEEE 802.3ab 1000BaseT		●		
IEEE 802.3z 100/1000 BaseX			Only 100	SFP version
Lan Mode	Dual subnets or Redundancy	N/A	Real-time (2) Non-realtime (1)	Dual subnets or Redundancy
Serial Interface				
Number of ports	1	1	1	4
Terminal block ports (TB5)	(1)	(1)	(1)	(4)
D-sub ports (DB9)	(1)	(1)	(1)	(4)
Mode	RS232-422-485			
Baud Rate	110 ~ 921,600 bps			
Parity	None, Odd, Even, Mark, Space			
Data Bits	7,8			
Stop Bits	1,2			
Flow Control	None, Xon/Xoff, RTS/CTS			
Wireless interface				
Wifi	Through USB			
3G	No	●	No	No
4G	No		No	No
GPS		Optional		
Digital I/O	No	Optional (2/2)	No	No
Power Characteristics				
Connector	3-Pin TB	3-Pin TB	3-Pin TB	5-Pin TB
Input Voltage	9~48 VDC	9~48 VDC	9~48 VDC	2x12~48 VDC
Power Consumption	5.85W @9 V	OPEN	OPEN	15 W @12 V
Power Redundancy	No	No	No	Yes
Reverse polarity protection	Yes	Yes	Yes	Yes
Relay Output	No	No	No	1A @30 VDC

PG5908	PG5916	PG5900A	PG5908A	PG5916A
				
2	2	6*	6*	6*
		6*	6*	6*
●	●	● RJ45 version		
●	●	● RJ45 version		
		SFP version only 100		
Dual subnets or Redundancy	Dual subnets or Redundancy	Quad subnets or Redundancy(**)		
8	16	0	8	16
0	0	0	(8)	(16)
0	0	0	(8)	(16)
RS232-422-485		N/A	RS232-422-485	
110 ~ 921,600 bps		N/A	110 ~ 921,600 bps	
None, Odd, Even, Mark, Space		N/A	None, Odd, Even, Mark, Space	
7,8		N/A	7,8	
1,2		N/A	1,2	
None, Xon/Xoff, RTS/CTS		N/A	None, Xon/Xoff, RTS/CTS	
No	No	No		
No	No	No		
No	No	No		
No	No	No		
No	No	No		
AC: 1 x IEC 60320-1 C14; DC: 1 x 3-Pin TB		10-Pin Terminal Block		
AC: 100~240 VAC; DC: 24~48 VDC		AC: 2 x 100~240 VAC; DC: 2 x 24~48 VAC		
AC: 23 W @ 100 VAC; DC: 13 W @ 24 VDC		AC: 16W @ 100 VAC; DC: 18W @24 VDC		
No		Yes		
Yes		Yes		
No		No		

Mechanical properties				
Housing IP Rating	IP30	IP30	IP30	IP30
Dimensions (L-W-H) in mm	32x 90x110	32x92x122	32x92x122	55x113x145
Mount	Din-Rail	Din-Rail	Din-Rail	Din-Rail
Reset button	Yes	Yes	Yes	Yes
Weight	400 g	400 g	400 g	1000 g
Environmental Limits				
Operating temperature	-40°C~85°C	-40°C~75°C	-40°C~85°C	-40°C~85°C
Storage temperature	-40°C~85°C	-40°C~85°C	-40°C~85°C	-40°C~85°C
Humidity (non-condensing)	5~95% RH	5~95% RH	5~95% RH	5~95% RH
Regulatory Approvals				
Safety (UL 60950-1)	● (EN only)	● (EN only)	● (EN only)	
Safety (UL 61010)				●
EMC				
Emission (EN 55032)	●	●	●	●
Emission-Ind. (EN61000-6-4)	●	●	●	●
Immunity (EN 55024)	●	●	●	●
Immunity-Ind. (EN61000-6-2)	●	●	●	●
FCC Part 15,Subpart B, Class A	●	●	●	●
EN61000-3-2	●	●	●	●
EN61000-3-3	●	●	●	●
IEC 61000-4-2 (ESD-cont disc)	±8kV (4)	±8kV (4)	±6kV (3)	±6kV (3)
IEC 61000-4-2 (ESD - air disc)	10 V/m (3)	10 V/m (3)	10 V/m (3)	10 V/m (3)
IEC 61000-4-4(RSD80-1k MHz)	±15kV (4)	±15kV (4)	±8kV (3)	±8kV (3)
IEC 61000-4-4 (EFT-AC Power)	±2kV (3)	±2kV (3)	±2kV (3)	±2kV (3)
IEC 61000-4-4 (EFT-DC Power)			±2kV (3)	±2kV (3)
IEC 61000-4-4 (EFT-Signal)	±2kV (4)	±2kV (4)	±2kV (3)	±1kV (3)
IEC 61000-4-5 (Surge-AC L-L)	±2kV (3)	±2kV (3)	±2kV (3)	±2kV (3)
IEC 61000-4-5 (Surge-AC L-E)	±2kV (3)	±2kV (3)	±2kV (3)	±2kV (3)
IEC 61000-4-5 (Surge-DC L-L)			±1kV (3)	±1kV (3)
IEC 61000-4-5 (Surge-DC L-E)			±2kV (3)	±2kV (3)
IEC 61000-4-5 (Surge-Sig L-L)				±1kV (3)
IEC 61000-4-5 (Surge-Sig L-E)	±2kV (3)	±2kV (3)	±2kV (3)	±2kV (3)
IEC 61000-4-6(CS0.15-80MHz)	10 Vrms (3)	10 Vrms (3)	10 Vrms (3)	10 Vrms (3)
IEC 61000-4-8(PRMF - Encl.)	AC10V/m (3)	AC10V/m (3)	AC10V/m (3)	AC10V/m (3)
Mechanical				
IEC 60068-2-27 (Shock)	●	●	●	●
IEC 60068-2-32 (Drop)	●	●	●	●
IEC 60068-2-64 (Vibration)	●	●	●	●
MTBF	TBD	TBD	TBD	TBD
Warranty	5 years	5 years	5 years	5 years

* : PG5916A offers 2 10/100 Mb/s ports and 4 10/100 Mb/s ports in both RJ45 and SFP versions

IP30	IP30	IP30	IP30	IP30
463x200x44	463x200x44	440x309x44	440x309x44	440x309x44
Rack-mount	Rack-mount	Rack-mount	Rack-mount	Rack-mount
Yes	Yes	Yes	Yes	Yes
3,200 g	3,200 g	4,000 g	4,000 g	4,000 g
-20°C~70°C	-20°C~70°C	-40°C~85°C	-40°C~85°C	-40°C~85°C
-40°C~85°C	-40°C~85°C	-40°C~85°C	-40°C~85°C	-40°C~85°C
5~95% RH	5~95% RH	5~95% RH	5~95% RH	5~95% RH
● (EN only)	● (EN only)			
		● (EN only)	● (EN only)	● (EN only)
●	●	●	●	●
●	●	●	●	●
●	●	●	●	●
●	●	●	●	●
●	●	●	●	●
●	●	●	●	●
●	●	●	●	●
±8kV (4)	±8kV (4)	±8kV (4)	±8kV (4)	±8kV (4)
10 V/m (3)	10 V/m (3)	10 V/m (3)	10 V/m (3)	10 V/m (3)
±15kV (4)	±15kV (4)	±15kV (4)	±15kV (4)	±15kV (4)
±4kV (4)	±4kV (4)	±4kV (4)	±4kV (4)	±4kV (4)
±2kV (3)	±2kV (3)	±2kV (3)	±2kV (3)	±2kV (3)
±2kV (3)	±2kV (3)	±2kV (3)	±2kV (3)	±2kV (3)
±4kV (4)	±4kV (4)	±4kV (4)	±4kV (4)	±4kV (4)
±4kV (4)	±4kV (4)	±4kV (4)	±4kV (4)	±4kV (4)
±1kV (3)	±1kV (3)	±1kV (3)	±1kV (3)	±1kV (3)
±1kV (3)	±1kV (3)	±1kV (3)	±1kV (3)	±1kV (3)
±2kV (4)	±2kV (4)	±2kV (4)	±2kV (4)	±2kV (4)
10 Vrms (3)	10 Vrms (3)	10 Vrms (3)	10 Vrms (3)	10 Vrms (3)
AC10V/m (3)	AC10V/m (3)	AC10V/m (3)	AC10V/m (3)	AC10V/m (3)
●	●	●	●	●
●	●	●	●	●
●	●	●	●	●
TBD	TBD	TBD	TBD	TBD
5 years	5 years	5 years	5 years	5 years

** : 4 ports can operate in 4 subnets or redundancy more. Port 4-5-6 work as Unmanaged switch

Multiple Protocol Gateway

ATOP offers solutions that integrate more than 2 networks at the same time. We have specific licensing plans that allow multiple protocol conversions. There is no change on the type of Hardware, Tool and the configuration pattern.

Configuring your Solution

To configure the solution best fitted to your requirements the following questions should be answered:

1) What protocol is on the Host/Remote end? Is it the same protocol that your PLC/HMI/SCADA is running on? (Profinet; Modbus; IEC 61850, etc..)

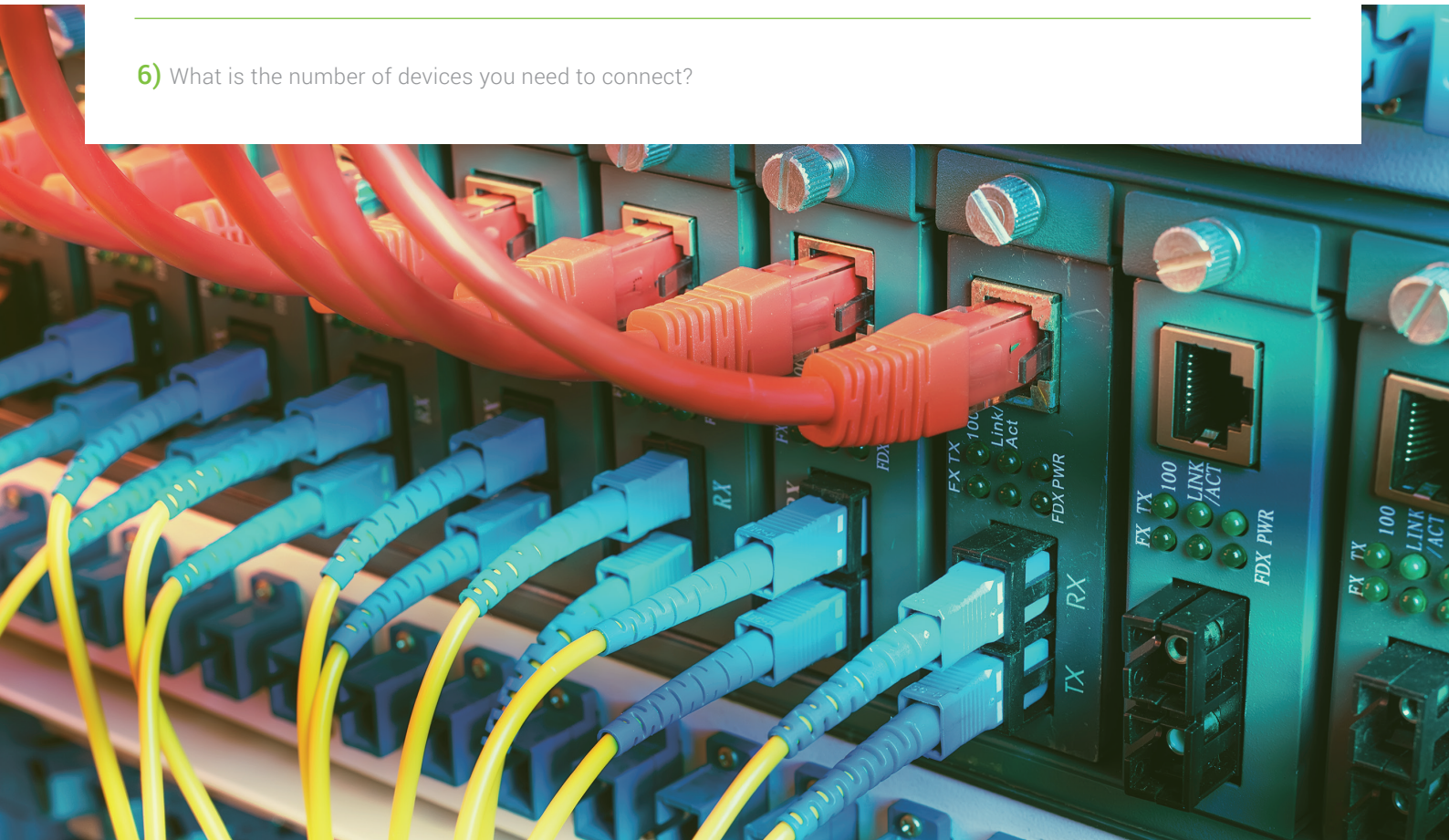
2) What is the physical interface of the remote end [Master/Client]? Copper; Fiber, RS232, etc..

3) What protocol is running on the field slave devices? (DNP3.0, Modbus, etc..)

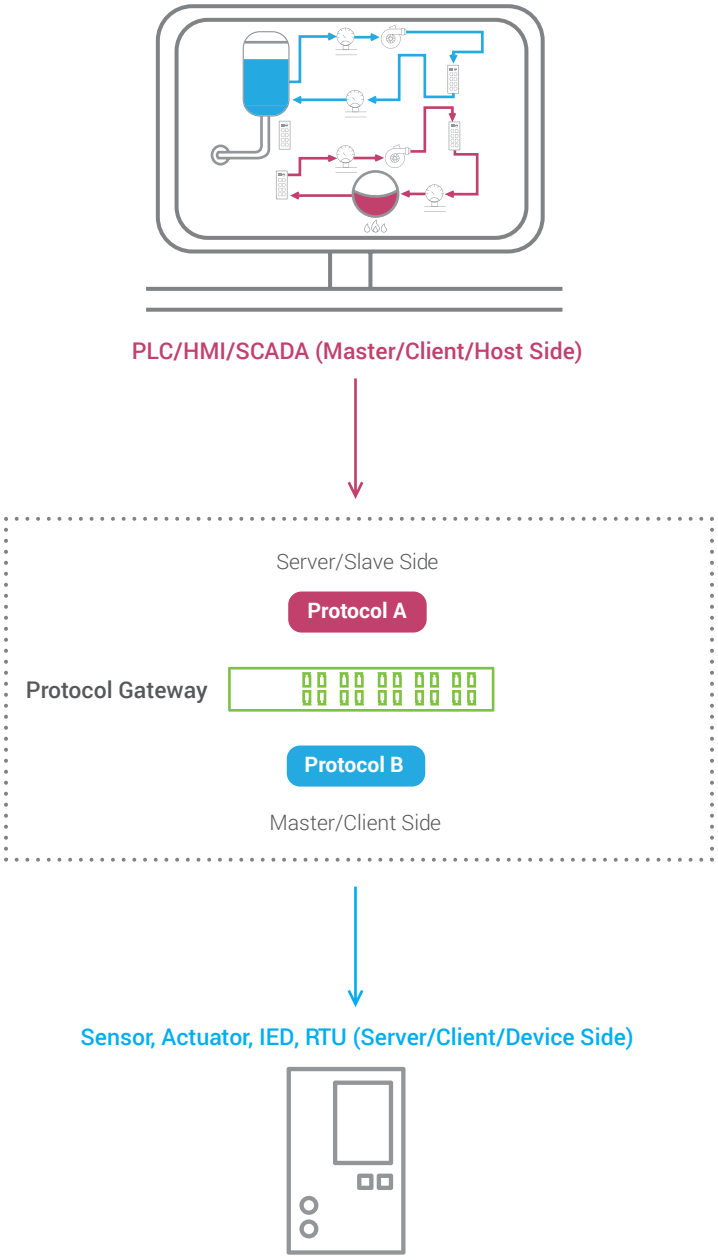
4) What is the physical interface of the field devices (Server/Slave)?

5) Is there any redundancy in your network? If yes, what topology is used and what redundancy protocol is used? (e.g. RSTP; ERPS ring; HSR; PRP etc…)

6) What is the number of devices you need to connect?



When we talk about our device, we call “slave” or “server” the function of the gateway itself when it acts as a slave to a remote master. We call “client” or “master” the function of the gateway itself when acts as a master to field IEDs.



The example shows how to easily connect a Modbus Serial HMI, through ATOP’s Protocol Gateway to a DNP#.0 Ethernet Slave IED. The host HMI takes the role of a Modbus Serial Master while the end device is a DNP3.0 Ethernet Server.

ATOP’s Protocol Gateway acts seamlessly towards the HMI as a Modbus Serial Slave by answering the Poll commands and Write commands as is required by the Host. Meanwhile, the Protocol Gateway acts as a DNP3.0 Ethernet Client with respect to the end-device whose DNP3.0 address is mapped.

All Gateway functions listed in the datasheet refer to the “Gateway” role and not to the “host” or “slave” the Gateway is connected to. In the example, the SKU is shown as MBSS-DNEC (Modbus Serial Slave to DNP3.0 Ethernet Client).

Software Combination list

		Slave/Server								
		Interface	Ethernet					Serial			
		Protocol	IEC 61850	Modbus TCP	Profinet	DNP3.0	60870-5-104	DNP3.0	Modbus RTU/ ASCII	60870-5-101	60870-5-103
Client/ Master	Ethernet	IEC 61850	50-CT	MBES-50EC	PIES-50EC	DNES-50EC	04ES-50EC	DNSS-50EC	MBSS-50EC	01SS-50EC	03SS-50EC
		DNP 3.0	50ES-DNEC	MBES-DNEC	PIES-DNEC	DN-CT	04ES-DNEC	DNSS -DNEC	MBSS-DNEC	01SS-DNEC	03SS-DNEC
		Modbus TCP	50ES-MBEC	MB-CT	PIES-MBEC	DNES-MBEC	04ES-MBEC	DNSS -MBEC	MB-CT	01SS-MBEC	03SS-MBEC
		60870-5-104	50ES-04EC	MBES-04EC	PIES-04EC	DNES-04EC	04-CT	DNSS -04EC	MBSS-04EC	01SS-04EC	03SS-04EC
	Serial	DNP 3.0	50ES-DNSM	MBES-DNSM	PIES-DNSM	DN-CT	04ES-DNSM	DNSS -DNSM	MBSS-DNSM	01SS-DNSM	03SS-DNSM
		Modbus RTU/ASCII	50ES-MBSM	MB-CT	PIES-MBSM	DNES-MBSM	04ES-MBSM	DNSS -MBSM	MB-CT	01SS-MBSM	03SS-MBSM
		60870-5-101	50ES-01SM	MBES-01SM	PIES-01SM	DNES-01SM	04ES-01SM	DNSS -01SM	MBSS-01SM	n/a	03SS-01SM
		60870-5-103	50ES-03SM	MBES-03SM	PIES-03SM	DNES-03SM	04ES-03SM	DNSS -03SM	MBSS-03SM	01SS-03SM	n/a

CT: Physical layer gateway and data concentrator

Software-Hardware compatibility

Slave/ Server	Interface	Master/ Client	Interface	SKU	DIN-rail				Rack-Mount				
					PG5901	PG5901B	PG5901 -RT	PG5904D	PG5908	PG5916	PG5900A	PG5908A	PG5916A
Profinet RT/IRT	Ethernet	Modbus	Ethernet	PIES-MBEC			●						
Profinet RT/IRT	Ethernet	Modbus	Serial	PIES-MBSM			●						
Profinet RT/IRT	Ethernet	IEC 61850	Ethernet	PIES-50EC			●						
Profinet RT/IRT	Ethernet	IEC 60870-5-101	Serial	PIES-01SM			●						
Profinet RT/IRT	Ethernet	IEC 60870-5-103	Serial	PIES-03SM			●						
Profinet RT/IRT	Ethernet	IEC 60870-5-104	Ethernet	PIES-04EC			●						
Profinet RT/IRT	Ethernet	DNP 3.0	Ethernet	PIES-DNEC			●						
Profinet RT/IRT	Ethernet	DNP 3.0	Serial	PIES-DNSM			●						
Modbus	Ethernet	DNP 3.0	Ethernet	MBES-DNEC	●	●					●		
Modbus	Ethernet	DNP 3.0	Serial	MBES-DNSM	●	●		●	●	●		●	●
Modbus	Ethernet	IEC 61850	Ethernet	MBES-50EC	●	●					●		
Modbus	Ethernet	IEC 60870-5-101	Serial	MBES-01SM	●	●		●	●	●		●	●

Slave/ Server	Interface	Master/ Client	Interface	SKU	DIN-rail				Rack-Mount				
					PG5901	PG5901B	PG5901 -RT	PG5904D	PG5908	PG5916	PG5900A	PG5908A	PG5916A
Modbus	Ethernet	IEC 60870-5-103	Serial	MBES-03SM	●	●		●	●	●		●	●
Modbus	Ethernet	IEC 60870-5-104	Ethernet	MBES-04EC	●	●					●		
Modbus	Serial	DNP 3.0	Ethernet	MBSS-DNEC	●	●		●	●	●		●	●
Modbus	Serial	DNP 3.0	Serial	MBSS-DNSM				●	●	●		●	●
Modbus	Serial	IEC 61850	Ethernet	MBSS-50EC	●	●		●	●	●		●	●
Modbus	Serial	IEC 60870-5-101	Serial	MBSS-01SM				●	●	●		●	●
Modbus	Serial	IEC 60870-5-103	Serial	MBSS-03SM				●	●	●		●	●
Modbus	Serial	IEC 60870-5-104	Ethernet	MBSS-04EC	●	●		●	●	●		●	●
DNP 3.0	Ethernet	Modbus	Ethernet	DNES-MBEC	●	●					●		
DNP 3.0	Ethernet	Modbus	Serial	DNES-MBSM	●	●		●	●	●		●	●
DNP 3.0	Ethernet	IEC 61850	Ethernet	DNES-50EC	●	●					●		
DNP 3.0	Ethernet	IEC 60870-5-101	Serial	DNES-01SM	●	●		●	●	●		●	●
DNP 3.0	Ethernet	IEC 60870-5-103	Serial	DNES-03SM	●	●		●	●	●		●	●
DNP 3.0	Ethernet	IEC 60870-5-104	Ethernet	DNES-04EC	●	●					●		
DNP 3.0	Serial	Modbus	Ethernet	DNSS-MBEC	●	●		●	●	●		●	●
DNP 3.0	Serial	Modbus	Serial	DNSS-MBSM				●	●	●		●	●
DNP 3.0	Serial	IEC 61850	Ethernet	DNSS-50EC	●	●		●	●	●		●	●
DNP 3.0	Serial	IEC 60870-5-101	Serial	DNSS-01SM				●	●	●		●	●
DNP 3.0	Serial	IEC 60870-5-103	Serial	DNSS-03SM				●	●	●		●	●
DNP 3.0	Serial	IEC 60870-5-104	Ethernet	DNSS-04EC	●	●		●	●	●		●	●
IEC 61850	Ethernet	DNP 3.0	Ethernet	50ES-DNEC	●	●					●		
IEC 61850	Ethernet	DNP 3.0	Serial	50ES-DNSM	●	●		●	●	●		●	●
IEC 61850	Ethernet	Modbus	Ethernet	50ES-MBEC	●	●					●		
IEC 61850	Ethernet	Modbus	Serial	50ES-MBSM	●	●		●	●	●		●	●
IEC 61850	Ethernet	IEC 60870-5-101	Serial	50ES-01SM	●	●		●	●	●		●	●
IEC 61850	Ethernet	IEC 60870-5-103	Serial	50ES-03SM	●	●		●	●	●		●	●
IEC 61850	Ethernet	IEC 60870-5-104	Ethernet	50ES-04EC	●	●					●		
IEC 60870-5-104	Ethernet	IEC 60870-5-101	Serial	04ES-01SM	●	●		●	●	●		●	●
IEC 60870-5-104	Ethernet	DNP3.0	Serial	04ES-DNSM	●	●		●	●	●		●	●
IEC 60870-5-104	Ethernet	Modbus	Serial	04ES-MBSM	●	●		●	●	●		●	●
IEC 60870-5-104	Ethernet	DNP3.0	Ethernet	04ES-DNEC	●	●					●		
IEC 60870-5-104	Ethernet	Modbus	Ethernet	04ES-MBEC	●	●					●		
IEC 60870-5-104	Ethernet	IEC 60870-5-103	Serial	04ES-03SM	●	●		●	●	●		●	●
IEC 60870-5-104	Ethernet	IEC 61850	Ethernet	04ES-50EC	●	●					●		
IEC 60870-5-101	Serial	DNP3.0	Serial	01SS-DNSM				●	●	●		●	●
IEC 60870-5-101	Serial	Modbus	Serial	01SS-MBSM				●	●	●		●	●
IEC 60870-5-101	Serial	IEC 60870-5-103	Serial	01SS-03SM				●	●	●		●	●
IEC 60870-5-103	Serial	IEC 60870-5-101	Serial	03SS-01SM				●	●	●		●	●
IEC 60870-5-103	Serial	DNP3.0	Serial	03SS-DNSM				●	●	●		●	●
IEC 60870-5-103	Serial	Modbus	Serial	03SS-MBSM				●	●	●		●	●

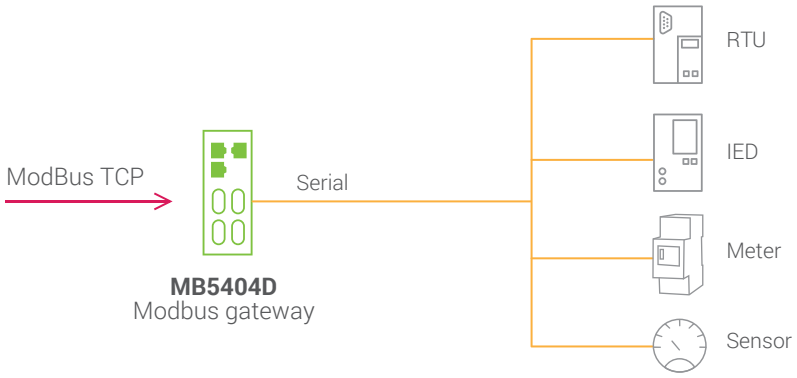
Modbus Gateways

Why Modbus?

Modbus is one of the very popular protocols and Modbus RTU (for serial connection) and Modbus TCP/IP (for Ethernet Networks) are often used as the backbone in Industrial Automation, Substation Automation and Building Automation solutions. To address the slow migration of communication standards from Serial to Ethernet based devices and understanding the requirement of converters, ATOP has a complete range of Modbus Gateway devices.

Product Line Overview

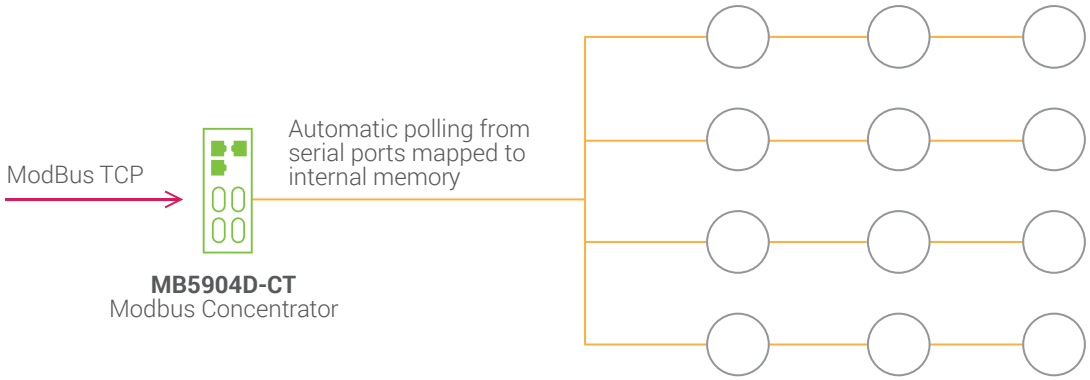
Entry level - Modbus Gateway



FEATURES:

- Low-cost, simple application
- The Modbus Gateway seamlessly converts Modbus TCP into Modbus RTU/ASCII over serial and vice-versa.
- Suitable for data polling that is not so frequent. Frequent pollings may cause long latencies and Modbus TCP Timeouts

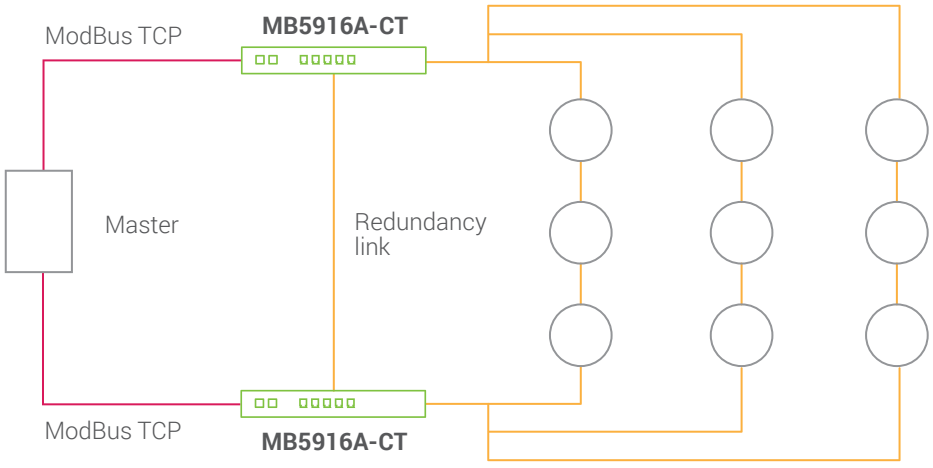
Advanced - Concentrator



FEATURES:

- Intermediate application, suitable for frequent polling requests from multiple devices
- Allows the data to be polled automatically from the slave device. Data will be available for master polling at all times
- Much faster responsiveness, no risk for Modbus TCP timeout
- Customizable/optimized register mapping in case different masters need to access different data structures
- Can support link status and timestamp of data access

Top of the line - Redundant Concentrator



Automatic polling from serial ports with link failure recovery mechanism.

ADVANTAGES:

- All features of the Advanced Concentrator
- Redundant achitecture for the most mission critical applications.Automatic link recovery in case of Ethernet or Serial linkfailure
- Can support link status and timestamp of data access
- High performance, reliability and EMC protection

ATOP has a range of products that supports the Modbus protocol. The range starts from an Entry Level product that provides seamless conversion of Modbus RTU to Modbus TCP/IP to an advanced LTE version that enables wireless high speed communication via Modbus protocol.

Further options enhance our devices with harsh environments operational capability, vibration resistance, power or serial port Isolation for equipment and device protection, redundant power supply and so on. And for the most critical applications, **ATOP provides additional reliability through redundancy and enhanced responsiveness through the concentrator function.**

Category	Model	Ethernet Ports	Serial ports	Mount	Isolation	Concentrator	Redundancy	Power Supply
Entry Level	MB5001C	1	1	Field-Mount	Optional	No	No	DC
Enhanced	MB5404D	2	4	Din-Rail	Optional	No	No	DC
	MB5408/16	2	8~16	Rack-Mount	Optional	No	No	AC/DC
Advanced	MB5904D-CT	2	4	Din-Rail	Optional	Yes	Yes	DC
	MB5908/16-CT	2	8~16	Rack-Mount	Optional	Yes	Yes	AC/DC
Wi-fi	MW5501C/2C	1	1~2	Din-Rail	Optional	No	No	DC
3G cellular	MB5901B-D3G	1	1*	Din-Rail	Optional	No	No	DC
4G cellular	MB5901B-4G	1	1*	Din-Rail	Optional	No	No	DC

* I/O version supports an additional RS485/RS232 port

Data Concentrator

Data concentrator is another unique and advanced feature on ATOP's Advanced Modbus Gateways.

The Data Concentrator, instead of waiting for the request from the Master to poll the IED, autonomously polls these devices at pre-configured time intervals and send the data when the request from the Master is received thus averting any loss of data due to any large polling interval from the Master. The time intervals for polling by the Data Concentrator can be configured by the user.

This has many positive implications on the performance: the master may need just one connection and one query to get all data at once; the response time will be dramatically reduced; and many different data structures can be accessible based on the specific need with additional timestamp and data quality information.

Redundancy Feature

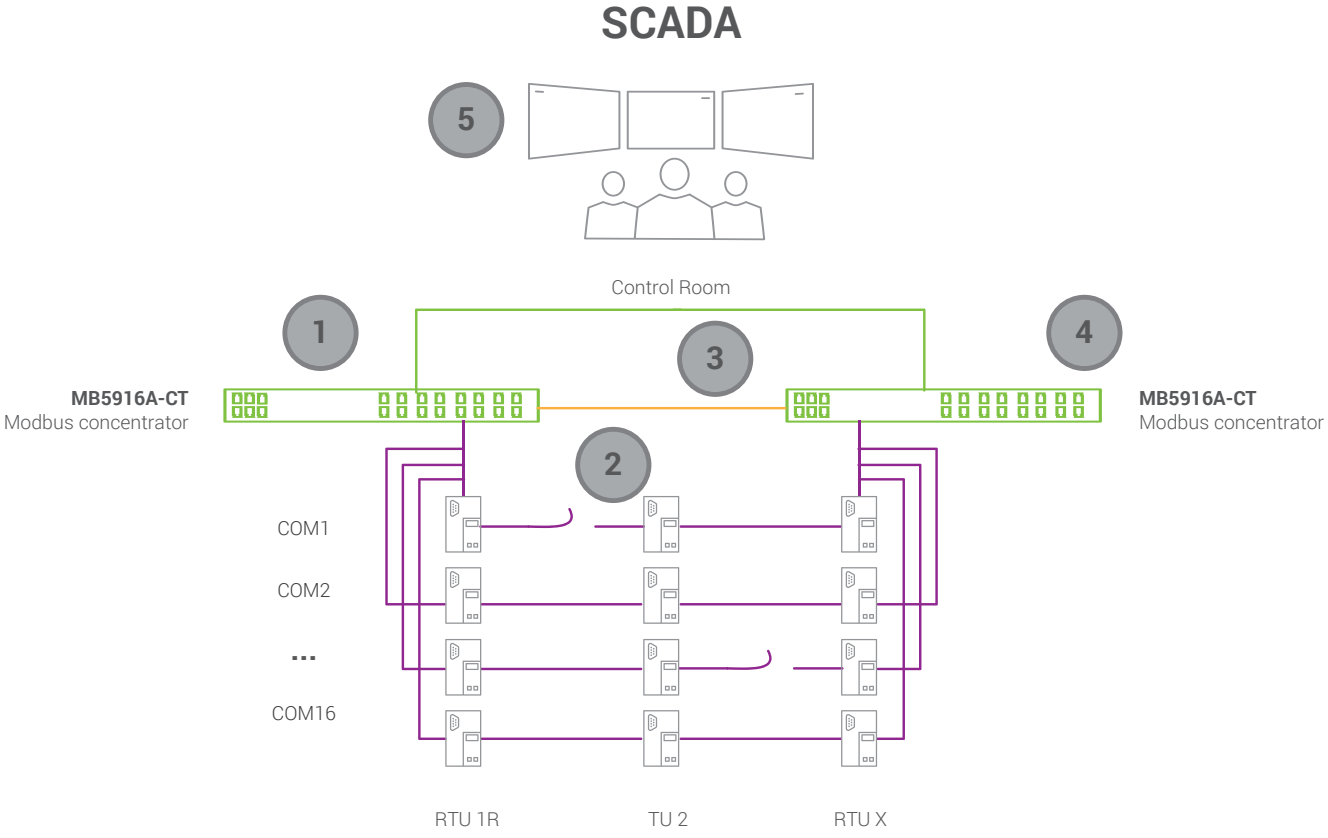
ATOP's Advanced Modbus Concentrators can be embedded with additional redundancy feature implemented through ATOP's proprietary communication protocol. For instance, a number of IEDs can be connected in multiple chains through serial ports where the primary Modbus gateway (1) and the secondary Modbus gateway are connected on different ends of the chains as shown in the figure below. There can be an Ethernet link which could be either fiber or copper connection (3) between the primary gateway (1) and the secondary gateway (4). Both primary and secondary gateways may be further connected to a master through different redundant rings (5).

In normal situation, the secondary gateway (4) will be silent, listening, and recording the data. In the event of a device failure, the one gateway that is still reachable will take over communication with the master and relay back the link requested data to the master together with a link failure notification. One the other hand, if there is a serial link failure (2), the secondary gateway will autonomously poll the missing data and update the primary gateway (1) memory ensuring the data relayed to master is complete.

This feature results in dramatically lower down time and additional safety features of protection from accidental failures or intentional intervention.

PROTOCOLS

- Modbus TCP - Fiber
- Redundancy Link- Fiber
- Modbus RTU - RS-485 serial



FEATURED PRODUCTS

MB5916A – Redundant Modbus Concentrator (-40~85 °C)

- 6 Fast Ethernet RJ45 or SFP ports
- Up to 16 sw-selectable RS-485/232/422 Serial ports
- Modbus TCP/RTU/ASCII, concentration function
- Can be set-up in redundant couples in order to have a fault-proof system

Entry level Modbus Gateways

Field-Mount Modbus TCP/RTU/ASCII Gateway

0°C 60°C IP30 IEC60529

Model		Description	10/100 RJ45 Ethernet Ports	Serial ports	Isolation	Concentrator	Redundancy
	MB5001C	1-Port Serial-to-Ethernet Modbus Gateway compact version, D-Sub 9 connector	1	1 (DB9)	No	No	No
	MB5001C-Sis	1-Port Serial-to-Ethernet Modbus Gateway compact version 2 KV Isolation & 15 KV ESD Protection	1	1 (TB)	2 kV	No	No

DIN-Rail, Wide Temperature Modbus TCP/RTU/ASCII Gateway

-40°C 80°C DIN IP30 IEC60529

Model		Description	10/100 RJ45 Ethernet Ports	Serial ports	Isolation	Concentrator	Redundancy
	MB5404D	Industrial-Grade 4-Port Serial Device Servers D-Sub-(M) RS232/422/485 software selectable Dual power inputs	2	4 (DB9)	No	No	No
	MB5404D-Sis	Industrial-Grade 4-Port Modbus Gateway, R422/485 (TB) sw selectable, Isolation, Dual power inputs, DIN-Rail mount	2	4 (TB)	2 kV	No	No

Advanced Modbus Gateways

Rack-Mount Industrial Modbus TCP/RTU/ASCII Gateway

-20°C 70°C RACK Industrial EMC IP30 IEC60529

Model		Description	10/100 RJ45 Ethernet Ports	RJ45 Serial ports	Isolation	Concentrator	Redundancy
	MB5408A2	8-Port Rack Mountable Modbus Gateway with sw selectable RS-232/422/485 serial RJ45 connectors and 2 Fast-Eth RJ45 ports	2	8	No	No	No
	MB5416A2	16-Port Rack Mountable Modbus Gateway with sw selectable RS-232/422/485 serial RJ45connectors and 2 Fast-Eth RJ45 ports	2	16	No	No	No
	MB5408A	8-Port Rack Mountable Modbus Gateway with RJ45 Serial connectors, 2.5 KV Isolation, 2 Fast-Ethernet RJ45 Ports	2	8	2.5 kV	No	No
	MB5416A	16-Port Rack Mountable Modbus Gateway with RJ45 Serial connectors, 2.5 KV Isolation, 2 Fast-Ethernet RJ45 Ports	2	16	2.5 kV	No	No

WiFi and Cellular Modbus Gateways

DIN-Rail Mount Wireless b/g/n Modbus TCP/RTU/ASCII Gateway

NEW
2017 Q1

-10°C 60°C DIN WDS IP30 IEC60529

Model		Description	Ethernet Ports	Serial ports	Isolation	Concentrator	Redundancy
	MW5501C	Wireless 802.11 b/g/n Modbus Gateway with 1 Combo Serial port, 1 Ethernet, Fast P2P, one antenna	1	1 combo (DB9 or TB5)	No	No	No
	MW5502C	Wireless 802.11 b/g/n Modbus Gateway with 2 Serial port, 1 Ethernet, DB9(M), Fast P2P, one antenna	1	2 (DB9)	No	No	No
	MW5502C-TB	Wireless 802.11 b/g/n Modbus Gateway with 2 Serial ports, 1 Ethernet, Terminal Block, Fast P2P, one antenna	1	2 (TB5)	2.5 kV	No	No

DIN-Rail Mount Industrial Cellular Modbus TCP/RTU/ASCII Gateway

NEW
2016 Q4

-40°C 75°C Industrial EMC DIN IP30 IEC60529

SKU		2G/3G/HSPA	4G	RS-232 RS-485 TB5	RS-232 RS-485 DB9	10/100/1000 RJ45 Ports	Digital Input/Outputs	Additional features
	MB5901B-D3G	X		-	1	1	-	
	MB5901B-IO-D3G	X		1+1*	-	1	2/2	
	MB5901B-IO-D3G-GPS	X		1+1*	-	1	2/2	GPS
	MB5901B-4G	X	X	-	1	1	-	
	MB5901B-IO-4G	X	X	1+1*	-	1	2/2	
	MB5901B-IO-4G-GPS	X	X	1+1*	-	1	2/2	GPS
	MB5901B-4G-B	X	X	-	-	1	-	Battery function
	MB5901B-IO-4G-B	X	X	1+1*	-	1	2/2	Battery function
	MB5901B-IO-4G-GPS-B	X	X	1+1*	-	1	2/2	GPS / Battery function

Modbus Concentrators

Rack-Mount Advanced Modbus TCP/RTU/ASCII Concentrators

-20°C 70°C | RACK | Industrial EMC | IP30 IEC60529

Model		Description	Ethernet Ports	Serial ports	Isolation	Concentrator	Redundancy
	MB5908-CT	8-Port Rackmount Modbus Concentrator with RJ45 serial connectors, RS-232/422/485, 24-48 VDC or 100~240 VAC power input	2	8	No	Yes	Yes
	MB5916-CT	16-Port Rackmount Modbus Concentrator with RJ45 serial connectors, RS-232/422/485, 24-48 VDC or 100~240 VAC power input	2	16	No	Yes	Yes
	MB5908-Sis-CT	8-Port Rackmount Modbus Concentrator with RJ45 serial connectors, RS-422/485, 2.5KV Isolation, 24-48 VDC or 100~240 VAC power input	2	8	2.5 kV	Yes	Yes
	MB5916-Sis-CT	16-Port Rackmount Modbus Concentrator with RJ45 serial connectors, RS-422/485, 2.5KV Isolation, 24-48 VDC or 100~240 VAC power input	2	16	2.5 kV	Yes	Yes

Rack-Mount Industrial Modbus TCP/RTU/ASCII Concentrators

NEW

-40°C 85°C | IEC 61850 | RACK | Industrial EMC | IP30 IEC60529

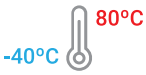
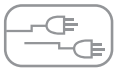
Model		Description	Fast Ethernet Ports	Serial ports	Isolation	Concentrator	Redundancy
	MB5908A-CT	8-Port rackmount Industrial Modbus Concentrator, IEC61850 certified, TB5 or DB9, RJ45 or SFP connector. 24~48 VDC or 100~240 VAC power input	6 RJ45 /SFP	8 DB9 / TB	Optional 2.5 kV	Yes	Yes
	MB5916A-CT	16-Port rackmount Industrial Modbus Concentrator, IEC61850 certified, TB5 or DB9, RJ45 or SFP connector. 24~48 VDC or 100~240 VAC power input	6 RJ45 /SFP	16 DB9 / TB	Optional 2.5 kV	Yes	Yes

Appendix : Protocol Specifications

IEC61850 Server/ Client	
Supported Functions (Read, Write)	• Generic access to the data (Read, Write) • Clock Synchronization • 8 Logical Devices per Port
Supported Control Type of commands	• Direct-with-Normal-Security • Select Before Operate (SBO)-with-Normal-Security • Direct-with-Enhanced Security Select Before Operate (SBO)-with-Enhanced-Security
Implemented Protocol Subsets	• IEC 61850-6 (Substation Configuration Language Description: SCL) • IEC 61850-7-1 (Principles and Models) • IEC 61850-7-2 (Abstract Communication Service Interface: ACSI) • IEC 61850-7-3 (Common Data Classes: CDC) • IEC 61850-7-4 (Logical Nodes and data Object Classes) • IEC 61850-8-1 (Mapping to Manufacturing Message Specification: MMS) • Edition 1 & Edition 2 are both Supported
DNP3 Server/ Client/ Master/ Slave	
General Specifications	• Serial Mode or Ethernet with TCP or UDP Mode • Server side supports serving up to 5 client in TCP Mode • Client side in a single RS-485 port, supports connecting up to 16 IEDs • Client side supports connecting up to 16 IEDs • Maximum Fragment size 2048 octets • Protocol implementation with configurable parameters conforms to IEEE Std 1815-2012 level 2
Supported Functions	• Time Synchronization generic access to the data(Read, Write) • Commands with or without preselection (Select, Operate, Direct Operate) • Transmission of time-tagged events • Counter management (Immediate Freeze, Freeze and Clear) • Self-address
Supported DNP3 Object Library	• Binary Inputs up to 8000 pts • Binary Outputs up to 2000 pts • Double Inputs up to 4000 pts • Analog Inputs up to 250 pts • Analog Outputs up to 250 pts • Counters up to 250 pts
Modbus Server/ Client/ Master/ Slave	
General Specifications	• Support Modbus RTU and ASCII in Serial mode • Support Modbus in TCP mode • For Modbus Client in TCP mode, support connecting up to 64 Modbus servers • For Modbus Server in TCP mode, support serving up to 64 Modbus clients • Support maximum number of data points in read direction: 8000 pts • Support maximum number of commands in write direction: 4000 pts
Supported Function Codes	1: Read Coils 2: Read Discrete Inputs 3: Read Holding Registers 4: Read Input Registers 5: Write Single Coil 6: Write Single Register 15: Write Multiple Coils 16: Write Multiple Registers 43/14: Read Device Identification (server side only)
Supported Exception Codes	1: illegal function 2: illegal data address 3: illegal data value 4: server device failure 6: server device busy

IEC 60870-5-101 Master/ Slave	
General Specifications	• Protocol implementation with configurable parameters conforms to the IEC 60870-5-101 edition 2 specification • Process Information in Monitor and Control Direction • Balanced and Unbalanced Modes • CP24Time2a or CP56Time2a timestamp for monitor direction report
Supported Functions	• Station Initialization • Interrogation • Read Procedure • Cyclic Data and Spontaneous Transmission (Slave Side only) • Clock Synchronization • Transmission of Integrated Totals • Direct and SBO command
Supported Data Types	• Monitors Points: Each supports up to 1000 pts: Single Point, Double Point, Step Position, Bit String, Measured with Normalized Value, Measured with Scaled Value, Measured Short Floating Point Value, Integrated Totals • Control Points: Each supports up to 500 pts: Single Command, Double Command, Regulating Step Command, Set Point Command with Normalized Value, Set Point Command with Scaled Value, Set Point Command Short Floating Point, Bit string
IEC 60870-5-103 Master/ Slave	
General Specifications	• Protocol implementation with configurable parameters conforms to the IEC 60870-5-103:1997 • Master supports connecting up to 16 IEDs • Process Information in Monitor and Control Direction • Unbalanced Modes
Supported Functions	• Station Initialization, Supports reset FCB and CU • General Interrogation • Clock Synchronization • Command Transmission • Test Mode • Blocking of Monitor Direction
Supported Information	• Monitor direction: - Status indications in monitor direction: from <16> to <30> - Supervision indications in monitor direction: <32>, <33>, from <35> to< 39>, <46>, <47> - Earth fault indications in monitor direction: from <48> to <52> - Fault indications in monitor direction: from <64> to <93> - Auto-reclosure indications in monitor direction: from <128> to <130> - Measurands in monitor direction: from <144> to <148> • Control direction: General commands in control direction: from <16> to <19>, from <23> to <26>
IEC 60870-5-104 Server/ Client	
General Specifications	• Server side supports serving up to 5 client • Client side supports connecting up to 10 IEDs • Protocol implementation with configurable parameters conforms to the IEC 60870-5-104 specification edition 2 • Process Information in Monitor and Control Direction • CP56Time2a timestamp for Control Commands
Supported Functions	• Station Initialization • Interrogation • Read Procedure • Cyclic Data and Spontaneous Transmission (Slave Side only) • Clock Synchronization • Transmission of Integrated Totals • Direct and SBO command
Supported Data Types	• Monitors Points: Each supports maximum 1000 pts: Single Point, Double Point, Step Position, Bit String, Measured with Normalized Value, Measured with Scaled Value, Measured Short Floating Points Value, Integrated Totals. • Control Points: Each supports maximum 500 pts: Single Command, Double Command, Regulating Step Command, Set Point Command with Normalized Value, Set Point Command with Scaled Value, Set Point Command Short Floating Point, Bitstring. • Event Logging (Server Side only) Universal Event Buffer up to 20,000 Events

Appendix : How to read the Brochure

	**IP Rating**	The device has the IP30 (Ingress Protection) rating. According to IEC60529, it is the classification of the degree of intrusion protection (the first digit) and water protection (the second digit). The higher the number, the higher the protection. IP30 devices have effective protection against tools and thick wires, but no protection against water. IP67 devices have absolute protection against dust and can be operated under one meter of water.
	**DIN-Rail**	This device can be DIN-Rail mounted. Please check the datasheet to confirm if the DIN-Rail kit is included.
	**Rack-Mount**	This device can be Rack-mounted (1U standard). Please check the datasheet to confirm if the Rack-mount kit is included.
	**Operating Temperature**	This device operates with 95% relative non-condensing humidity, within the maximum and minimum operating temperatures shown (-40 to 80 C here).
	**Redundant Power input**	This device is equipped with redundant power supply (for devices with embedded power supply) or redundant power supply input (for devices requiring external power supply).
	**Relay Output**	This device is embedded with a Relay output feature.
	**Industrial EMC**	This device is certified for being complying with the strictest EMC norms for Heavy Industrial Environments (e.g. EN 61000-6-2/EN 61000-6-4)
	**MIL-STD Ruggedized**	This device is complying with MIL-STD 810F, that which is a strict environmental and shock-vibration standard for military equipment.
	**Railway Certified**	This device is complying with EN50155 and EN50121-4, that define the environmental, vibration, and EMC requirements for devices used on Rolling stock or other Railway applications.
	**Easy**	Share the same configuration tool, making it possible to easily migrate from one platform to another.

	**IEC 61850-3 Certified**	This device is complying with IEC 61850-3. This defines the temperature and EMC isolation standards devices should comply to be used in IEC 61850 Power Grid networks.
	**ATEX Certified**	This device is complying with the latest regulations in matter of Explosive or Potentially Explosive atmospheres (ATEX).
	**Advanced Security**	This device is embedded with advanced security features such as hw-based MACsec Encryption or hw-accelerated VPN Encryption. MACsec protocol guarantees link security protecting you fro packet-sniffing, masquerading, and unauthorized access.
	**PROFINET ready**	This device is Profinet Conformance Class B compatible
	**Layer-3 Switching**	This device is capable of managing fast and reliable Layer-3 switching. This product provides additional advanced features in order to implement advanced security, such as MAC address filtering and IP address filtering. See datasheets for details.
	**Precision Timing**	This device is supports hardware-based IEEE 1588v2 Precision Time Protocol transparent clock and software-based boundary clock. IEEE 1588v2 is the standard for a network synchronization with nanosecond accuracy.
	**Redundant Ring**	This managed switch supports ERPS-RSTP-MRP Ring topologies for network redundancy. ATOP's switches with this icon have a link recovery time less than 20 milliseconds.
	**2 x 2 MIMO Wireless**	This wireless device is using multiple-input-multiple-output in order to exploit multipath wave propagation through two or more antennas. This feature enhances data transmission performance of the device.
	**WDS**	This ATOP wireless AP (Access Point) device supports wireless distribution system (WDS) bridging. This feature allows the AP to act as a signal repeater in a multi-AP network.
	**MTBF**	Have a very long reliability with MTBF exceeding 20 years.
	**New Product**	This is a New ATOP's Product, planned to be released in Q1, 2017.

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