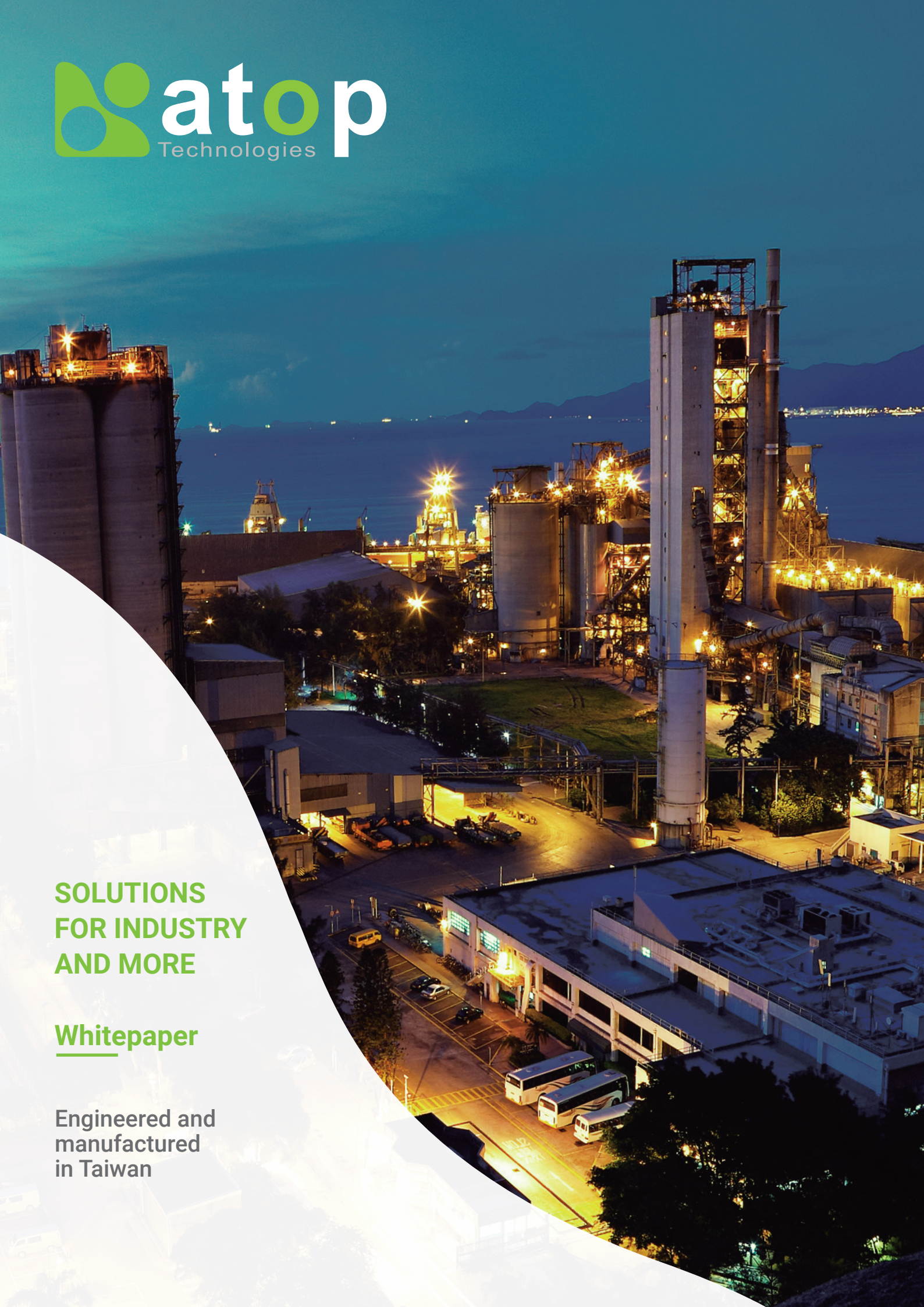
atop Technologies



SOLUTIONS FOR INDUSTRY AND MORE

Whitepaper

Engineered and manufactured in Taiwan

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What is the smart factory?

Manufacturing world changed, and the IT world has already gotten inside the factory decades ago. What is different now? Where is the need to go through a further revolution? Well, in the years the customer has changed too. There is more demand for specific and customized products. The customer also became more demanding in matter of traceability and delivery performance like never before. This made supervision and up-times crucial.

The factory now has to interact in almost real-time with Customer Relationship Management highlighting any deviation from the plan, supply networks should be more and more integrated with the customer demand.
In Industry 4.0, devices, people, machines, sensors, suppliers and customers communicate in a flexible and decentralized way with a main common principle: interoperability. **ATOP's products are designed in order to simplify and standardize the way different protocols and different devices get together on the shop floor.**

What are the challenges in the smart factory?

Interoperability

Success lies in integration. But different manufacturers adopt or sponsor different protocols. How to get them together? **ATOP's Protocol Gateway and industrial communication modules are designed to solve this problem and to make integration seamless. Modbus, Profinet, Profibus, Ethernet/IP, OPC UA and IoT integration are no longer an obstacle in IT architecture, but an opportunity to take the best from each technology.**

Reliability

With MTBF of up to 25 years, ATOP's range of hardware is built to minimize downtime events. Built-in redundancy features such as Ethernet Ring Protection Switching (ERPS), Rapid Spanning Tree Protocol (RSTP) and Media Redundancy Protocol (MRP) ensure ideal upkeep times.

For instance, in the event of a link or device failure, ATOP's Smart-Redundancy Feature detects the failure and relays the cause of the failure to the control center, automatically recovering from the failure to provide continuous operation.

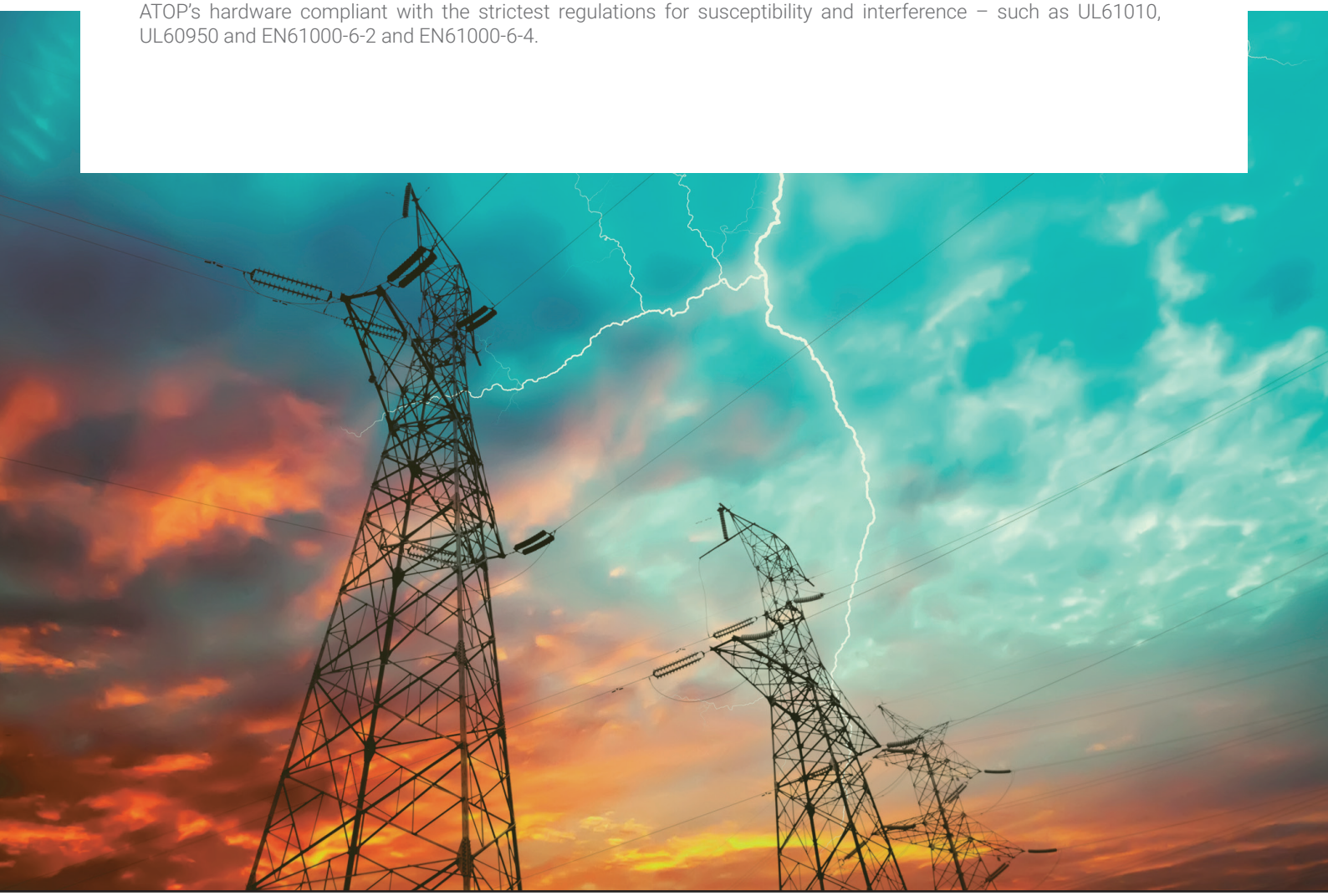
Harsh Environments

From blast furnaces to operating in sub-zero degree environments, ATOP's line of hardware is designed to withstand the harshest of environments. Supporting temperatures range of -40°C to +85°C, our hardware uses industrial-grade materials to guarantee also a long MTBF. And because our devices feature fanless designs to reduce the number of moving parts, breakdowns and failures are reduced, thereby prolonging the operational lifetime of your investment.

Electromagnetic Interference and Susceptibility

High-voltages and electromagnetic interferences in factories can be fatal if installed devices are not properly shielded and isolated from electromagnetic discharges. **Without proper precautions, equipment failures become possible** – for instance, a 2,000-Volt surge applied to a power supply unit can cause severe system damage. Devices should also be also be designed in a way so as to not interfere with their surrounding equipment, as their own radiated emissions can generated noise and interference.

ATOP's hardware conforms with high Electromagnetic Susceptibility (EMS) and Electromagnetic Interference (EMI) standards. And that's in addition to conforming with Level 3 and Level 4 Electromagnetic Compatibility (EMC), making ATOP's hardware compliant with the strictest regulations for susceptibility and interference – such as UL61010, UL60950 and EN61000-6-2 and EN61000-6-4.



Network Security and Data Encryption

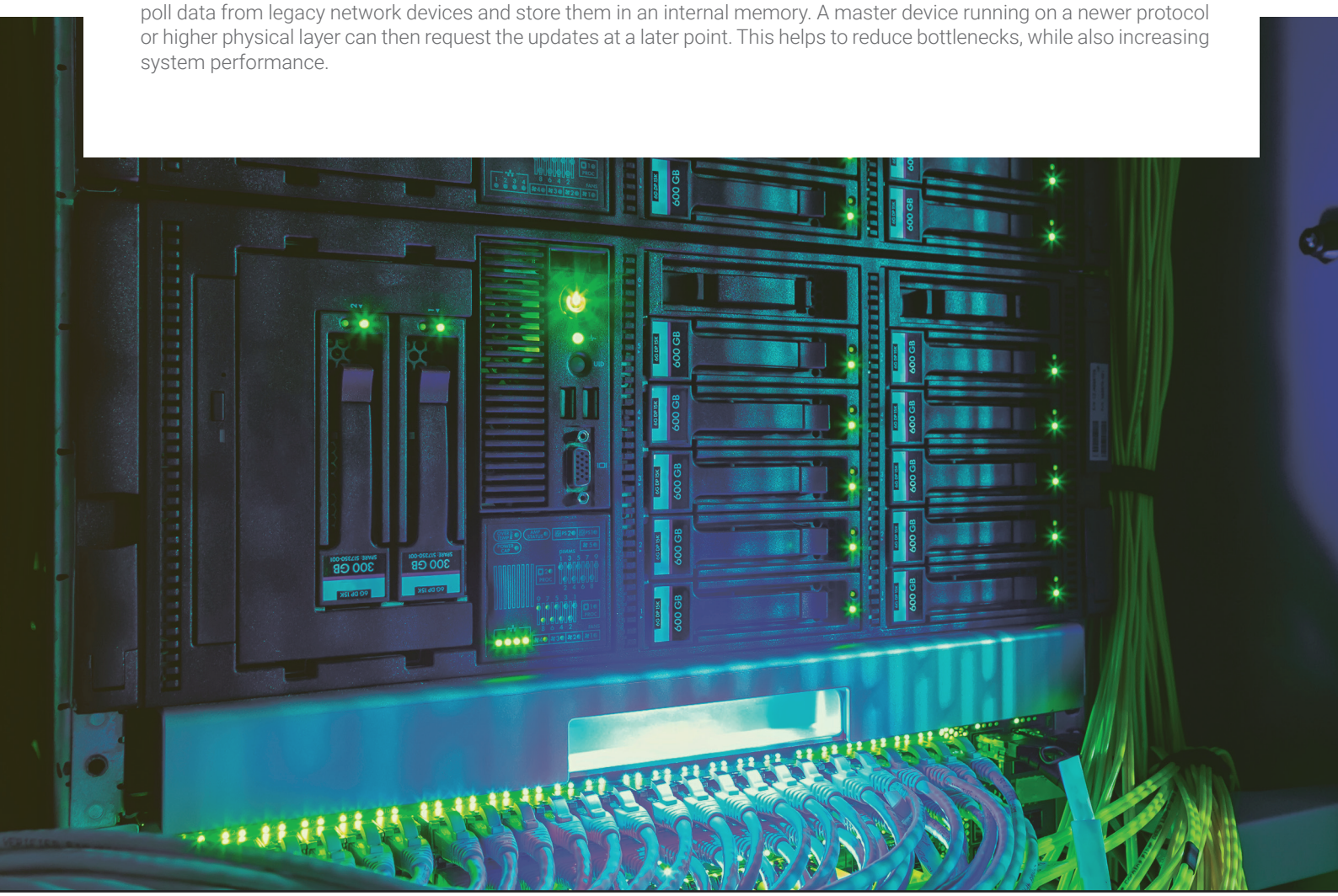
With more and more devices coming online, security for Industry 4.0 and IIoT is a pressing issue. The more devices that can be remotely controlled in smart factories, the more points of entry become susceptible to various threats and malicious activities, such as network penetration, which can disrupt operations or threaten the control of systems themselves.
To combat this, ATOP's hardware features security solutions to provide seamless and cost-effective security and encryption: MACsec for security over LANs; and IPsec and OpenVPN for security over WANs and the Internet.

ATOP is a pioneer in the security of network devices. We have introduced a whole new range of products. This includes, Managed L2 and L3 switches, and a cost-effective unmanaged smart and secure switch. With the 128-bit encryption managed through hardware our solutions provide a seamless experience and unprecedented performance. ATOP's Routers and Serial device servers provide embedded security measures, through VPNs using IPSec encryption, so that all data going in and out of devices can be properly protected from potential attacks.

Performance and Responsiveness

Integrating new network hardware with legacy network equipment can often be difficult. For instance, new technologies offer much wider bandwidths and have stricter performance requirements, so integration can be a slow process when trying to match performance discrepancies, such as differences in speed or data throughput.

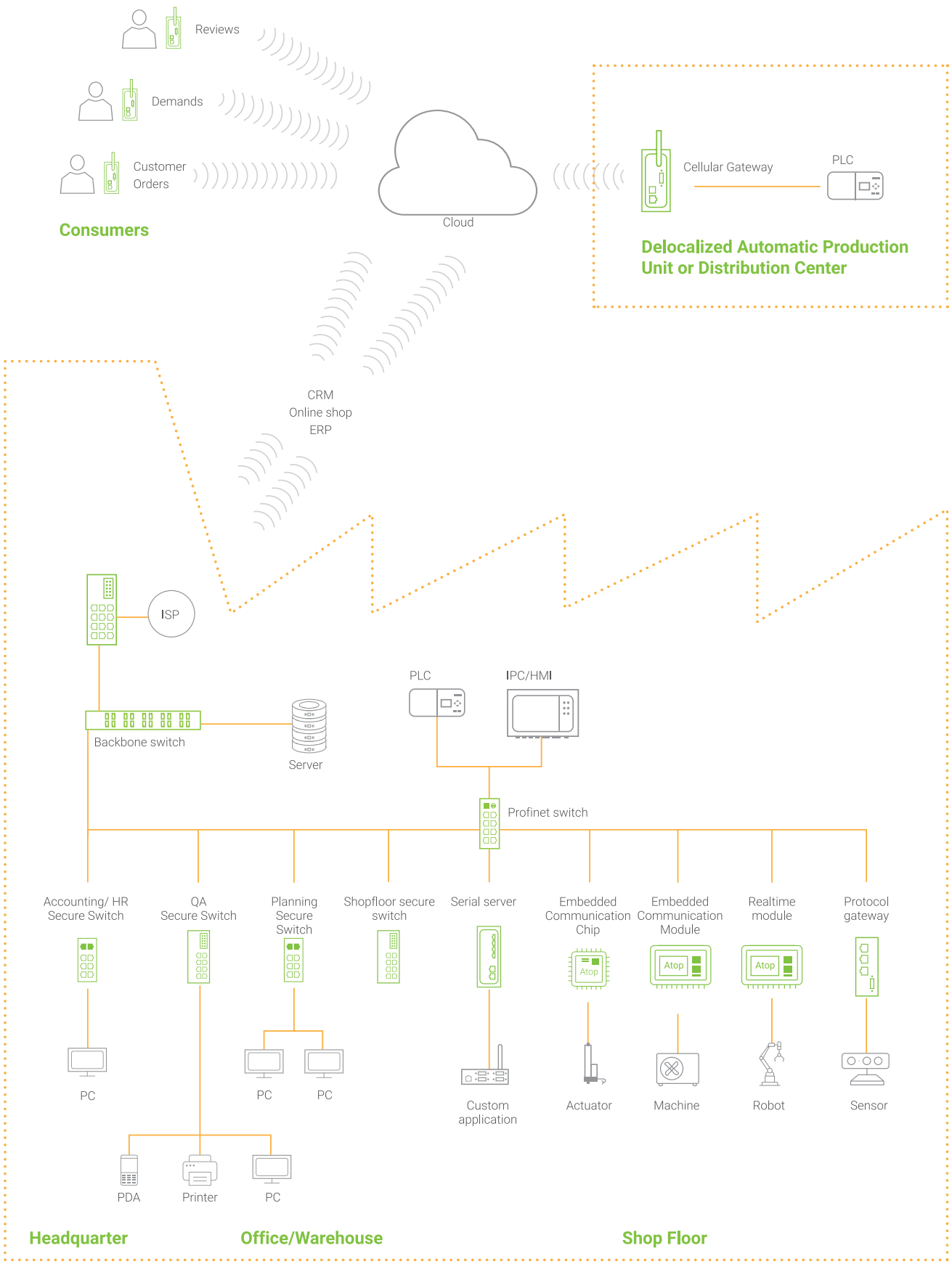
ATOP is able to solve these types of problems in several ways. For example, our new network devices can autonomously poll data from legacy network devices and store them in an internal memory. A master device running on a newer protocol or higher physical layer can then request the updates at a later point. This helps to reduce bottlenecks, while also increasing system performance.



ATOP products: where in the smart factory?

ATOP covers a wide range of industrial communication equipment. For network integration purposes, **ATOP's Protocol Gateways provide easy, reliable and cost-effective solutions for multi-protocol networks.** ATOP's smart communication modules on the other hand enable almost every field device to gain different protocol capability and ATOP's Industrial Computers support the factory with reliable and powerful computation.

In Network Management then, ATOP's leading industrial networking devices provide the backbone through which all information goes, with advanced additional features such as ERPS, RSTP and MRP Ring, QoS management, VLAN management, Link aggregation and port trunking if required as well as Layer-3 static and dynamic routing.


Reviews
Demands
Customer Orders
Consumers
Cloud
Cellular Gateway
PLC
Delocalized Automatic Production Unit or Distribution Center
CRM
Online shop
ERP
ISP
Backbone switch
Server
PLC
IPC/HMI
Profinet switch
Accounting/ HR Secure Switch
QA Secure Switch
Planning Secure Switch
Shopfloor secure switch
Serial server
Embedded Communication Chip
Embedded Communication Module
Realtime module
Protocol gateway
PC
PC
PC
Custom application
Actuator
Machine
Robot
Sensor
PDA
Printer
PC
Headquarter
Office/Warehouse
Shop Floor

Solutions

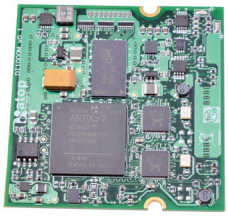
ATOP Industrial Networking

PoE? Profinet? Ring? Industrial EMC? Redundant power supply? Network Redundancy? Serial connectivity? No problem. **ATOP's Industrial Networking brochure covers more than 100 different combinations for all industrial needs.** Unmanaged and Managed switches, Field-Mount, Din-Rail or Rack-Mount serial servers, Wireless access points, Media converters and much more.

ATOP Protocol Gateways

Integrating devices from different manufacturers, supporting different protocols has never been easier! **ATOP's Protocol Gateway product range offers a configurable product that can be built in 9 different hardware versions** and in more than a hundred protocol combinations. Modbus, Profinet RT/IRT, DNP3.0, IEC 60870, IEC 61850 and PLCs can now be seamlessly integrated in a single network. And many more coming in 2017.

ATOP Communication module



Planning to design a new machine and aching about the communication? Difficult to catch up with the continuous innovations in the Automation protocols? Willing to outsource heavy internal investments in non-core activities? Or simply planning to enhance your device making capable to talk different protocols when it's needed? Managing the communication can become a very tedious, labor intensive and expensive task. Not with ATOP. **ATOP's communication modules can provide a simple, cost-effective alternative to internal development.** Let us provide the communication module and the SDK libraries. And they are the same, regardless from which protocol will be used. Our module will do the rest. You'll be able to enable your device to talk Profinet RT/IRT and with many others from 2017 with an extremely small development effort and you'll hit financial and non-financial benefits in a heartbeat

ATOP for Remote sites

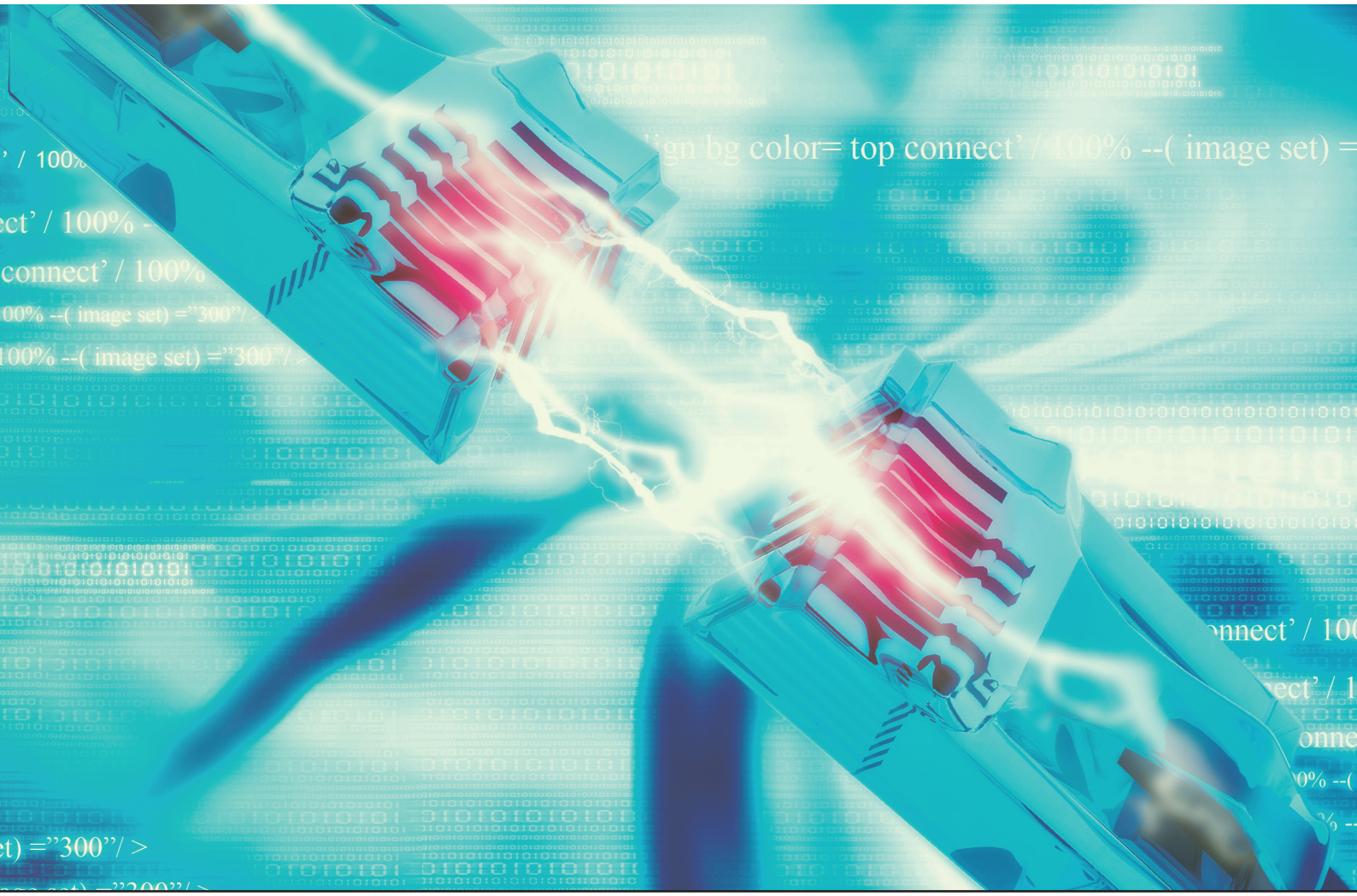
Looking for a remote, autonomous factory integration? **ATOP's LTE Gateway provide stable and reliable network access even in remote or unmanned areas, where a constant supervision is necessary.**

ATOP's Industrial Networking Products

ATOP's Networking's catalogue covers more than 100 different combinations for all industrial needs.
For the most simple applications, ATOP offers Din-Rail Unmanaged Ethernet Switches, available in 10/100 Mbps, 10/100/1000 Mbps with RJ45 or SFP Fiber in Plastic or Aluminum housings that embed packet prioritization based on IEEE 802.1q as defined in the Profinet Specifications.

Our Profinet CC-B compatible Managed Din-Rail or modular Rack-Mount Ethernet Switches will allow you to draw up the most appropriate network topology to support a trouble-free application and a reliable backbone to your network, all of them complying with strictest Industrial EMC standards and suitable for wide temperature operating conditions.

If Serial connectivity is necessary, ATOP's Serial Servers –available in 1 to 16 port versions- provide the right solution you need. And then, Wifi, 3G, 4G…



ATOP's Industrial Switches

Entry Level: ATOP's entry level din-rail mount Unmanaged Switches offer a reliable, robust but cost-effective solution to the most simple network topologies. IP30 rated, all of them are certified for Industrial EMC (EN61000-6-4 and EN61000-6-2). The items have plastic, steel or aluminum housing, all support redundant power-supply for enhanced safety and operate in temperatures ranging from -10 to 70 °C (Plastic Housing products support 0~60 °C operating temperature). Selected products are Prioritizing Profinet Packets and are equipped with the specific Profinet-Plug. Our products range from 4 to 8 Fast Ethernet or Gigabit Ethernet ports and selected versions have single-mode or multi-mode fiber-optic uplink.

ATOP provides an enhanced version of our entry-level products with PoE and SFP support. With operating temperature capability from -10 to 70 °C, they're suitable for simple industrial applications requiring embedded Power over Ethernet capabilities and Gigabit speeds.

Harsh Environments: ATOP's most advanced product line offers around 14 models available in up to 60 different possible configurations. Ranging from **4 up to 20 Fast Ethernet or Gigabit ports**, with minimum supported operating temperatures from -20 to +70 °C, **Relay Output**, **Redundant power input,** Profinet Packet Prioritization (for Unmanaged Switches) and **Profinet CC-B compatibility** (Managed Switches), our Harsh environment switches are the best choice to support high-demanding networks. Selected products offer **MIL-STD** shock, vibration, temperature and humidity performance and operating temperatures **from -45 to + 80 °C**.

ATOP's Managed Switches provide advanced network management features to maximize network performance and minimize down-times.

Want to know more? **Detailed information is available into ATOP's Industrial Networking brochure, ATOP's Switch Product Selection guide** or in the datasheets**.**

ATOP's Access Points

ATOP's Wifi Access points provide a reliable, robust, rugged and cost-effective solutions to Industrial applications that require contactless connection. Our single-radio, high-performance 2x2 MIMO IEEE 802.11 a/b/g/n Access Points provide a built in Din-Rai mount Access point/Bridge/Client capability are designed to be fully operational between -20 and +60°C.

Want to know more? **Detailed information is available into ATOP's Industrial Networking brochure or in the datasheets.**

Serial servers

Available in field-mount, din-rail mount or rack-mount versions from **1 up to 16 ports** and **with different Operation temperature/EMC variants**, ATOP's serial server family covers all the need that you may have in easily converting Ethernet to Serial port (RS-232, RS-485, RS-422). **Using our Serial Manager Software configuration tool will make the set-up job of device easy and immediate.** If your application requires VirtualCOM, we provide a specific suite to make it fully functional within minutes.

Entry level: available in a rugged metal case with an optional 2kV magnetic isolation and operating temperatures ranging from 0 to 60 °C, **ATOP's entry-level serial servers provide the most simple but reliable Ethernet to Serial converter.**

Advanced: ATOP's advanced serial device servers, available in 1 (field mount or DIN-Rail), 4 (DIN-Rail) or 8/16 (rack-mount) serial ports versions, provide the ultimate solution to your needs. Supporting operating temperatures up to -40/85 °C (exceptions apply), they provide Industrial EMC protection, Serial port isolation and high-performance. Selected versions can be PoE powered. If wireless connectivity (either 802.11 a/b/g/n or Cellular 3G/4G LTE) is what you need. Don't worry. ATOP has the solution for you too.

Want to know more? **Detailed information is available into ATOP's Industrial Networking brochure, ATOP's Serial/Modbus/Protocol Gateway Product Selection Guide** or in the datasheets.

Embedded Edge Computers

And **if Serial Server is not your main application**, then consider one thing: **ATOP's Serial Device Servers** (selected versions only) **can also be provided in a Simply Programmable SDK version running Linux.** Atop provides a simple Programming guide that will allow you to develop the application that better suits your needs.

Media converters

Ethernet to Fiber? SFP to Ethernet? No problem. **ATOP's Media Converters and smart media converters provide reliable solutions to all conversion between Single-mode or Multi-mode fiber optics to Ethernet conversion.** Available in different versions according to the cable length, selected versions embed a redundant power supply input for enhanced power fault security.

Want to know more? **Detailed information is available into ATOP's Industrial Networking brochure or in the datasheets.**

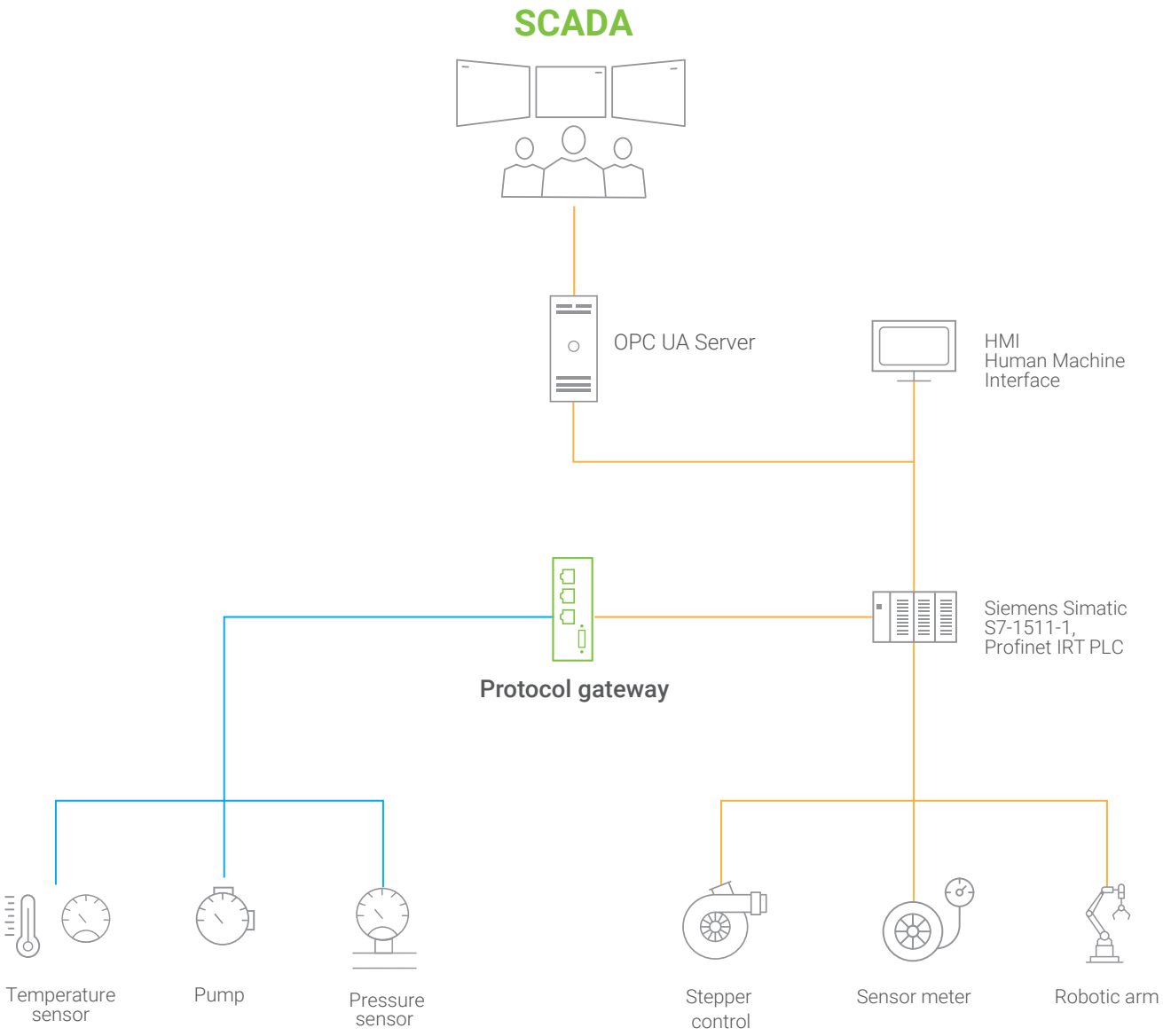
Industrial Protocol Gateways for Legacy Systems Integration

Times change and technologies evolve. Not long time ago, Serial-based communication was the standard inside the Industry. Investments in equipment, machinery, robots, PLCs made earlier than a decade ago were mainly serial or CAN-based. Upgrading or enhancing existing production lines can be very painful nowadays. Since modern industry needs more data, faster, the standards evolved and equipment using new-technologies is not always compatible with older equipment. Upgrading perfectly-running equipment because of network or protocol constrains can be an extremely heavy financial pain. Readapting existing equipment into a new layout can also be almost impossible.

In the Industry 4.0 then, system integration and interoperability makes the difference. How to bring Profinet and Modbus together? How to supervise an Ethernet/IP-based architecture with OPC UA?
ATOP has the right solution for you.

ATOP's Protocol Gateway family has been specifically designed in order to make seamless integration easy. A **powerful hardware platform** with a **stable and reliable software** will manage the translation from protocol to protocol. A user-friendly configuration tool will help the Customer or the System Integrator to map data points and commands within minutes, enabling the customer to manage changeovers, upgrades or integration in a fast and cost-effective way.

Do you want to know more? **Detailed information is available into ATOP's Serial Server/ Modbus Gateways and Protocol Gateways Selection guide**


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

Industrial Protocol Gateways - Supported protocols

ATOP's Protocol gateway product range offers a configurable product that can be built in 9 different hardware versions and in more than a hundred protocol combinations. Modbus RTU, Modbus TCP, Profinet RT/IRT, DNP3.0 Ethernet, DNP3.0 Serial, IEC 60870-5-101, IEC 60870-5-103, IEC 60870-5-104 and IEC 61850 devices and PLCs and PLCs can now be seamlessly integrated in a single network. Many more choices are underway. **Coming 2018.**

All products support remote **VPN over IPSec connection capability**, in order to prevent unauthorized access to process-sensitive data.

Protocol	Interface	Features
Modbus TCP	Ethernet	Client/Server
Modbus RTU/ASCII	Serial	Master/Slave
Profinet RT/IRT	Ethernet	Server
Ethernet/IP	Ethernet	Adapter
DNP3.0	Ethernet	Client/Server
DNP3.0	Serial	Master/Slave
IEC 60870-5-101	Serial	Master/Slave
IEC 60870-5-103	Serial	Master/Slave
IEC 60870-5-104	Ethernet	Client/Server
IEC 61850	Ethernet	Client/Server

Industrial Protocol Gateways
ATOP's Hardware flexibility

To support the customer in flexibly handling this challenge, **ATOP offers** combinations of **all supported protocols on 9 different hardware platforms,** enabling the customer to choose among hundreds of different products! Din-Rail, Rack-mount, SFP, Ethernet, TB5 or DB9 serial connector are available.

All products **can be embedded with Security. Now supporting VPN over IPSec or OpenVPN function.** Through this device, remote or unmanned site monitoring will be set up in a heartbeat.

Do you want to know more? **Datasheets and detailed information available into ATOP's Protocol Gateways brochure. For questions or pricing please contact your local ATOP representative.**

Hardware	Mount	Ethernet Ports	RS-485 RS-232 RS-422 ports	Temperature range	Additional features
PG5901-1P	Din-Rail	2 (RJ45)	1 (TB5 or DB9)	-40/+85 °C	PoE-powered [optional]
PG5901-RT	Din-Rail	3 (RJ45 or SFP)	1 (TB5 or DB9)	-40/+85 °C	
PG5901B	Din-Rail	1 (RJ45)	1 (DB9) or 2 (TB14, IO version only)	-40/+70 °C	4G LTE or 3G connectivity DI/DO [opt], Battery [opt]
PG5904D	Din-Rail	2 (RJ45 or SFP)	4 (TB5 or DB9)	-40/+85 °C	PoE-powered [optional] Serial Isolation [optional]
PG5908	Rack-Mount	2 (RJ45)	8 (RJ45)	-20/+70 °C	Serial Isolation [optional]
PG5916	Rack-Mount	2 (RJ45)	16 (RJ45)	-20/+70 °C	Serial Isolation [optional]
PG5908A	Rack-Mount	6 (SFP or RJ45)	8 (TB5 or DB9)	-40/+85 °C	Serial Isolation [optional] IEC61850-3 certification
PG5916A	Rack-Mount	6 (SFP or RJ45)	16(TB5 or DB9)	-40/+85 °C	Serial Isolation [optional] IEC61850-3 certification
PG5900A	Rack-Mount	6 (SFP or RJ45)	-	-40/+85 °C	IEC61850-3 certification






Where and why do you need Modbus products?

Since its introduction, **Modbus has become one of the most popular protocols used worldwide. Modbus RTU (through serial connection) and Modbus TCP (through Ethernet networks) are often used in the backbone of industrial automation, substation automation, and building automation.** Because of its lightweight and broad market penetration, ATOP creates a specific product line for Modbus devices. The slow migration of the communication standard from serial-based (RS-232, RS-485, and RS-422) devices to Ethernet-based devices introduces the need of smart converters.

Modbus Gateways overview

From simple to complex applications, ATOP has 10 products supporting Modbus in a wide variety of options. ATOP's entry-level products provide seamless conversion of Modbus RTU to Modbus TCP with almost no configuration required. ATOP's devices are available from one to sixteen serial ports and with flexibility in their installation using DIN-rail, Field Mount, or Rack-Mount. An advanced LTE version also enables recent high-speed wireless communication for Modbus protocol. **Our products are enhanced with harsh environment operational capability, vibration resistance, power or serial port isolation for equipment and device protection, redundant power supplies, and many more special options.** For the most critical application, ATOP provides additional reliability through redundancy function and supports enhanced responsiveness through concentrator function

Concentrator function

Data concentrator function is a unique feature on ATOP's Advanced Modbus Gateways. This feature is ATOP's proprietary mechanism for responsiveness enhancement. Generally, a Modbus Gateway is working in the following manners. The Modbus Gateway has to wait for a master device's request, then it has to convert and relay information to a field device. Once a response is returned from the field device, the response is then converted and relayed back to the master device. This has significant negative impact on the responsiveness. Instead, ATOP's Advanced Modbus Gateways with data concentrator function will continuously poll (at an interval specified by the customer) IEDs autonomously and store the data in their internal memory waiting for master device's requests. Once the request arrived, the return data will be retrieved from the internal memory of the Modbus Gateways. This has several positive implications on the system performance: the master device 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 specific need.

• Want to learn more? Datasheets and detailed information are available in ATOP's Industrial Communication brochure.

Redundancy function

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 network breakdown, one of the 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 enables the customer to manage the network with much fewer down-times than before and provides additional safety feature protecting the utility or the substation from accidental or intentional failure coming from the outside of the system.

Modbus Gateaway

Category	Picture	Model	Ethernet Ports	Serial ports	Mount	Isolation	Concentrator	Redundancy	Power Supply	Additional Features
Entry Level		MB5001C	1	1	Field-Mount	Optional	No	No	1xDC	
Enhanced		MB5901	2 RJ45	1	Din-Rail	No	No	No	1xDC	PoE PD version available
		MB5904D	2 RJ45 or 2 SFP	4	Din-Rail	Optional	No	No	2x DC	PoE PD version available
		MB5908/ MB5916	2 RJ45	8~16 RJ45	Rack-Mount	Optional	No	No	AC/DC	
		MB5901B	1 RJ45	1 + 1 (RS-232, IO version only)	Din-Rail	Optional	No	No	DC	3G-4G connectivity
Advanced		MB5904D-CT	2 RJ45 or 2 SFP	4	Din-Rail	Optional	Yes	Yes	2x DC	PoE PD version available
		MB5908-CT/ MB5916-CT	2 RJ45	8~16 RJ45	Rack-Mount	Optional	Yes	Yes	AC/DC	
		MB5908A-CT MB5916A-CT	6 RJ45 or SFP	8~16	Rack-Mount	Optional	Yes	Yes	2x AC/ DC/ HV DC	IEC 61850-3 certification

Embedded Industrial Real-Time Communication solutions

ATOP's embedded real-time protocol interface modules are the right choice to allow easy, cost-effective and standardized protocol support for your field equipment**. Forget about a dedicated and expensive Industrial-Communication team**. With ATOP, being fully up-to-date with the communication standards will be flexible and your company will be allowed to enable your robot, machine or I/O with Profinet RT/IRT, with many other solution coming 2017.

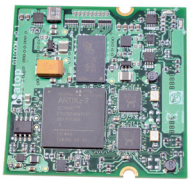
Being a hardware-based solution, **ATOP's chips and modules can provide extremely fast processing speed and guarantee the deadlines set in Real-Time protocols,** making our products an excellent choice for all the applications requiring such performance, such as Motion-Control, High-Frequency sampling, etc.. **We offer**

Chip Solution

For the most advanced and quantity-intentive applications, ATOP's Industrial communication Chips – along with design reference boards and the APIs (provided without additional licensing charge)- can provide your device the communication capability needed.

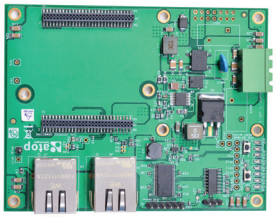
Module Solution

For applications smaller in volume, and if you'd like to be **flexible to change from one protocol to another**, ATOP's modules may be the right choice for you. **Sharing a common hardware and software interface, they can be easily integrated into the device.** And if you'd like to change the communication protocol... simply replaced! No additional software implementation is required.



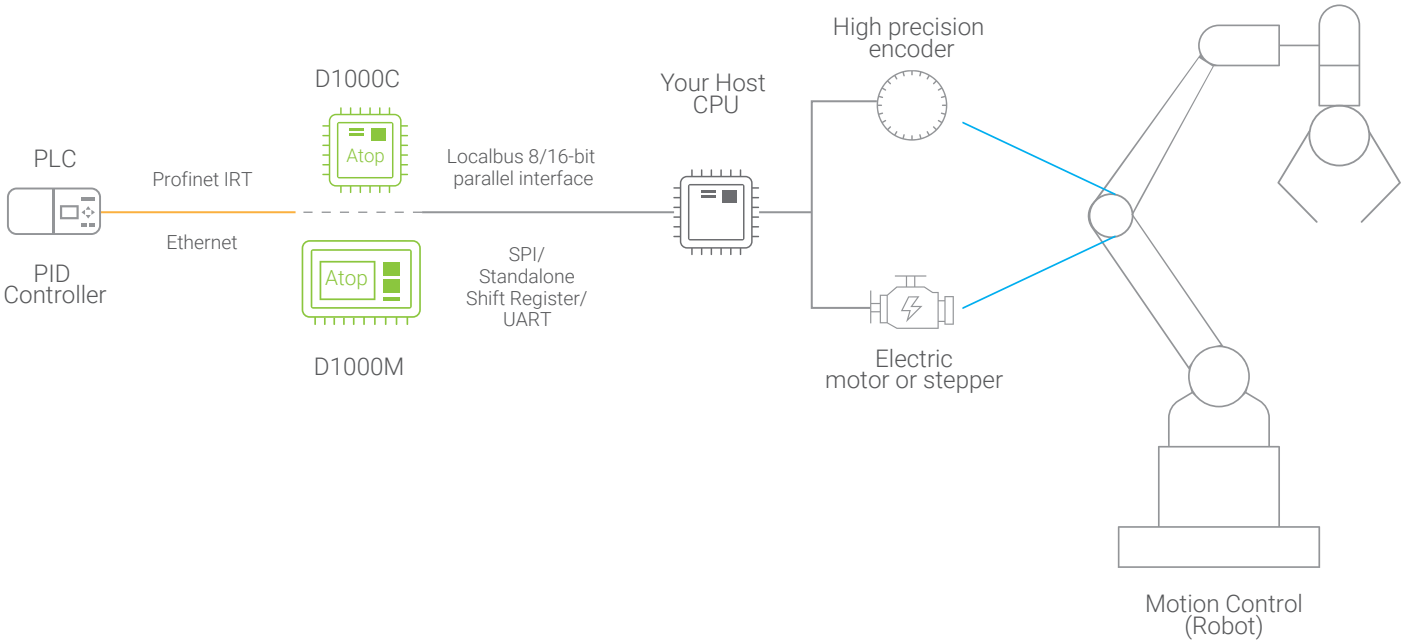
Product Development Board and Support

Crucial for implementation is the support quality. Here at ATOP we're committed in giving you the best service and support in the implementation. This includes hardware reference designs, a Implementation development and testing board,, source code examples and more...

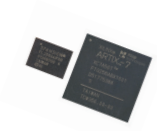


Do you want to know more? **Datasheets and detailed information available. For questions or pricing please contact your local ATOP representative.`**

Application Example



Protocol Interface
Chip / Module / Development Companion Board

Chip	Module	Development Board
		
DI1000C	DI1000M	DI1000D

Please contact our local representative for more detailed information and pricing.

Want to learn more? For more information, please check out our **Embedded Industrial communication Brochure**

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