

A futuristic network diagram with a central globe containing the text 'IIOT'. The globe is connected to several smaller nodes, some of which contain icons like a gear, a lightbulb, and a server. The background is a blurred image of a factory floor with blue and pink lighting.

IIOT

INDUSTRY 4.0: AUTOMATION, MACHINE BUILDING & IIOT

Solutions for enabling
the smart factory

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WELCOME TO SMART FACTORIES

Industry 4.0 is about the strategic transformation taking place in the way goods are produced and delivered, moving toward industrial automation and the flexible smart factory. The traditional manufacturing industry has undergone a faster digital transformation that is accelerated by exponentially growing technologies (e.g. intelligent robots, autonomous drones, sensors, 3D printing).

To stay competitive, factories must leverage the IIoT and digitalization to become more efficient and productive to face challenges and become resilient in the ever-changing world.



CHALLENGES AND SOLUTIONS

In manufacturing, Industry 4.0 is used to leverage operational efficiency, refine demand forecasting, break down data silos, engage in predictive maintenance, offer workers boosts to safety and virtual training, and more. Industry 4.0 spans manufacturing from planning to delivery, with solutions for deep analytics, shop floor data sensors, smart warehouses, simulated changes, plus product and asset tracking.

The traditional approach was based on separate operational technology (OT) and company information (IT) systems. Over time and thanks to technological advances, these areas grew closer until they finally fused together.

Industry 4.0 technologies help to bridge the gap between what were once separate processes to a new era. However, along with many conveniences and new possibilities, it has also created new challenges to overcome. Cybersecurity, for example, is now an important issue since IT and connected OT are exposed to much more risks than traditional OT. The reliability of connectivity and system elements themselves have also greater consequences—a single broken link can mean downtime for the whole process line. And finally, implementing Industry 4.0 does have its costs, so any solution that helps conserve money and work are valuable indeed.

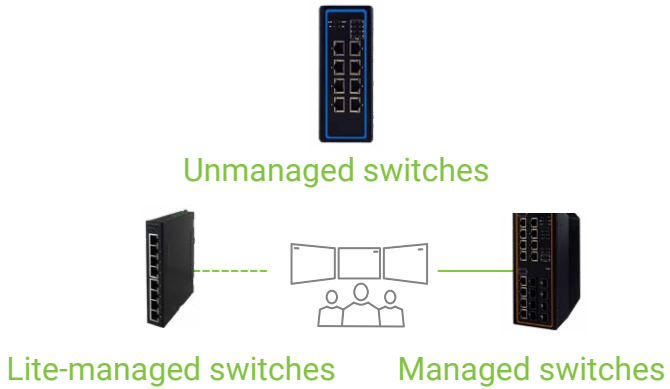
MACHINE BUILDING

ATOP’s solutions for automation are the right choice to maximize your machine building performance, making you more competitive and more profitable.



Easy to select

Our tailor-made and scalable devices can fully match your machinery needs. Especially designed to improve your efficiency and to optimize the costs of your manufacturing experience by minimizing risks, our solutions allow you to react quickly to market changes.



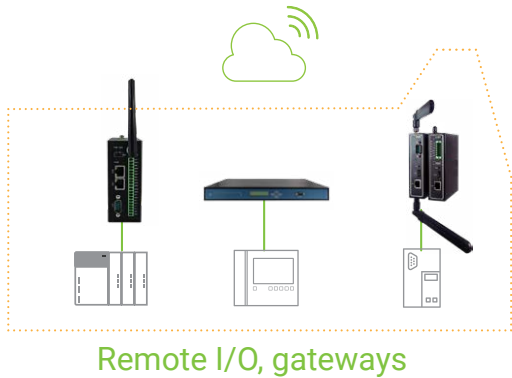
Easy to connect

Efficient and flexible, our solutions assure reliable interconnection with all your industrial network components like sensors, PLCs, CNCs, motor controls, as well as surveillance systems and internet.



Easy to control

Our solutions facilitate your monitoring, collecting and processing data from remote devices. Ensuring secure remote access and seamless integration connectivity helps to optimize maintenance planning, troubleshooting and support services.



AUTOMATION & IIOT

Automation and IIoT are exciting concepts of Industry 4.0 that promote strategic transformation in the way goods are produced and delivered. To enable these concepts, a company's infrastructure must be fully interconnected. Configured correctly, this interconnection brings companies advantages in terms of time and money saved. But if certain points are not addressed, it also presents risks and new challenges:

Cybersecurity

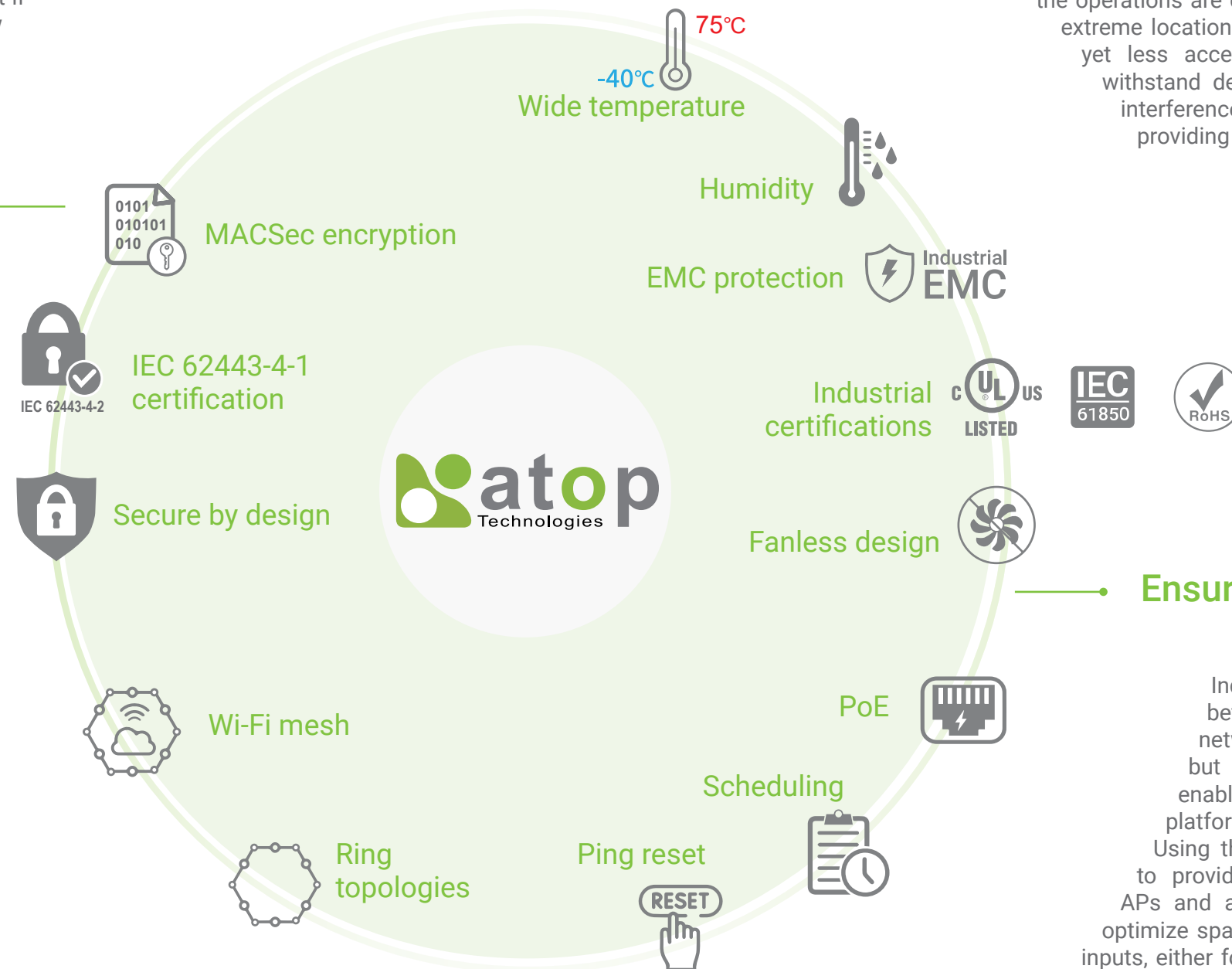
Data must be secured against direct, external hacking attacks and also unintentional data leaks. ATOP is committed to add and guarantee a high security level, especially for applications that are critical for a functional state as well as infrastructures with a risk of environmental and health hazard accidents. We consider risks and their mitigation in every step of development, undergoing strict testing and certification processes by third parties to ensure true protection.

Fault tolerance & self-healing capabilities

Critical processes need self-healing abilities in order to avoid network failures and to preserve up-time and increase overall equipment effectiveness. Even when faced with multiple points of failure, ATOP devices can be configured to maintain nonstop communications and sustain multiple transmission paths. This not only makes the system more efficient and reliable, but also relieves workload for troubleshooting.

EMC robustness & harsh environments

Since industrial Ethernet networks are becoming an integral part of machines and industrial plants, the close proximity of power electronics and network lines may cause problems that can only be solved by robust communication technology. Oftentimes, the operations are decentralized and located in remote or extreme locations, where maintenance is more needed yet less accessible. ATOP specific solutions can withstand demanding environments such as high interference and extreme temperatures, while providing high reliability and low down-times.



Ensure power supply, leveraging network infrastructure

Industry 4.0 changed the legacy concept between machines and enterprise networks, as they are no longer separate but completely connected. ATOP devices enable users to create a strong network platform thanks to industrial PoE application. Using the machine-side 24VDC power supply to provide PoE to power up cameras, Wi-Fi APs and all connected devices, allows also to optimize spaces and save costs. Redundant power inputs, either for PoE or for DC, further ensure power backup to minimize downtime in case of any accidents.

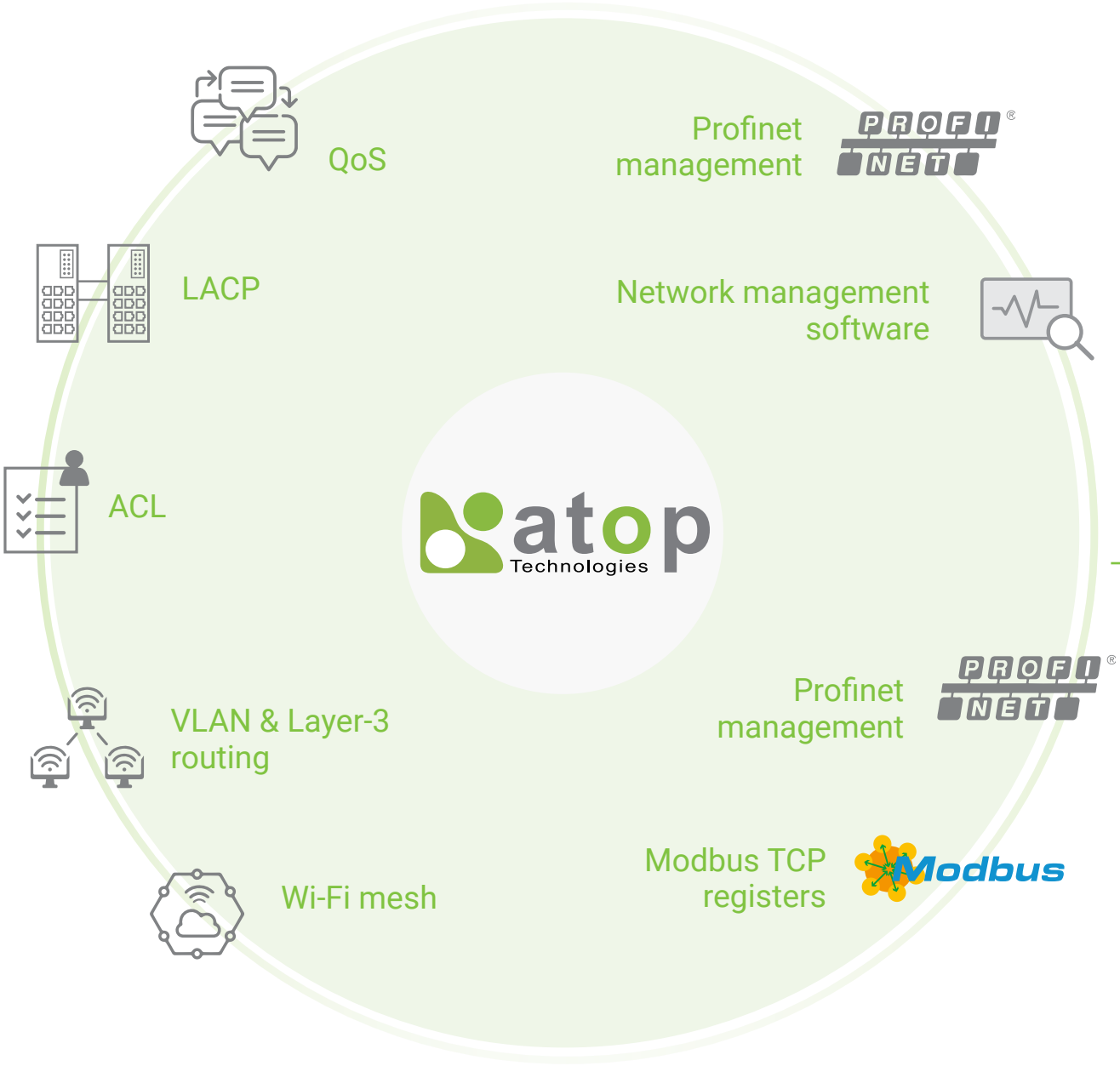
Enable machine to enterprise communication

Enterprises need communication solutions that improve growth, efficiency, and business agility. ATOP solutions help you improve the ecosystem of enterprise communication, reducing its complexity but ensuring throughput:

- Avoiding interference with machines: Prioritizing communication flow to avoid traffic that will jeopardize the machine working pattern, e.g. when merging surveillance or other IT-related traffic in the machine or factory network, the network routing must be carefully designed and configured.
- Access control: Certain network components would only need to communicate with specific equipment in order to avoid mistaken configurations.
- Network segmentation: Even in the same network infrastructure, security is preserved thanks to the definition of which components are allowed to talk to each other.
- Wireless connectivity: Leverage the industrial network infrastructure to provide additional services throughout the plant floor while preserving process functionality.

Network management

Transparent and real-time updates on the network status and alarms are crucial for fast and effective corrective actions. ATOP solutions are designed to enable users of different levels at different locations to monitor and optimize the industrial network, gaining full visibility of network and automation devices. Operators can easily identify issues or implement authorized actions, while supervisors can analyze health and risks, and remotely update configurations as needed.



Integration with industrial OT devices

Modbus and Profinet are common protocols in automation and machine building applications. ATOP solutions help users integrate industrial networking with OT devices, so no additional effort on programming is needed. With Modbus integration and Profinet connectivity, users can easily deploy ATOP products to fit in existing systems. Interoperability saves financial costs by extending lifetime of legacy equipment, and labor by eliminating the need for additional configuration and learning curves.

SOLUTION INSIGHTS

ATOP's wide portfolio of features can be overwhelming. Below we will take a deeper look into some useful and advanced solutions, as well as the specific challenges they help solve.

FLEXIBLE AND EASY NETWORK SETUP

Network Address Translation (NAT) is the process of mapping an internet protocol (IP) address to another, by changing the header of IP packets. This helps conserve the number of globally valid IP addresses needed, and simplifies setup procedures. It also offers the opportunity to qualify or authenticate all data traffic and ensure security.

While NAT is normally implemented in transit through network routing, ATOP's NSG3308/NSG3309 Series Gigabit Ethernet switch comes with built-in NAT functions. Each port can be configured as a LAN or WAN port, needing no extra router for access between interior and exterior networks.

1:1 NAT enables communication initiating from either the LAN or WAN side by allocating a dedicated external IP to each LAN device. And to retain the benefits of IP conservation, virtual NAT combines 1:1 NAT and virtual routing mechanisms, mapping each external IP to a virtual IP.



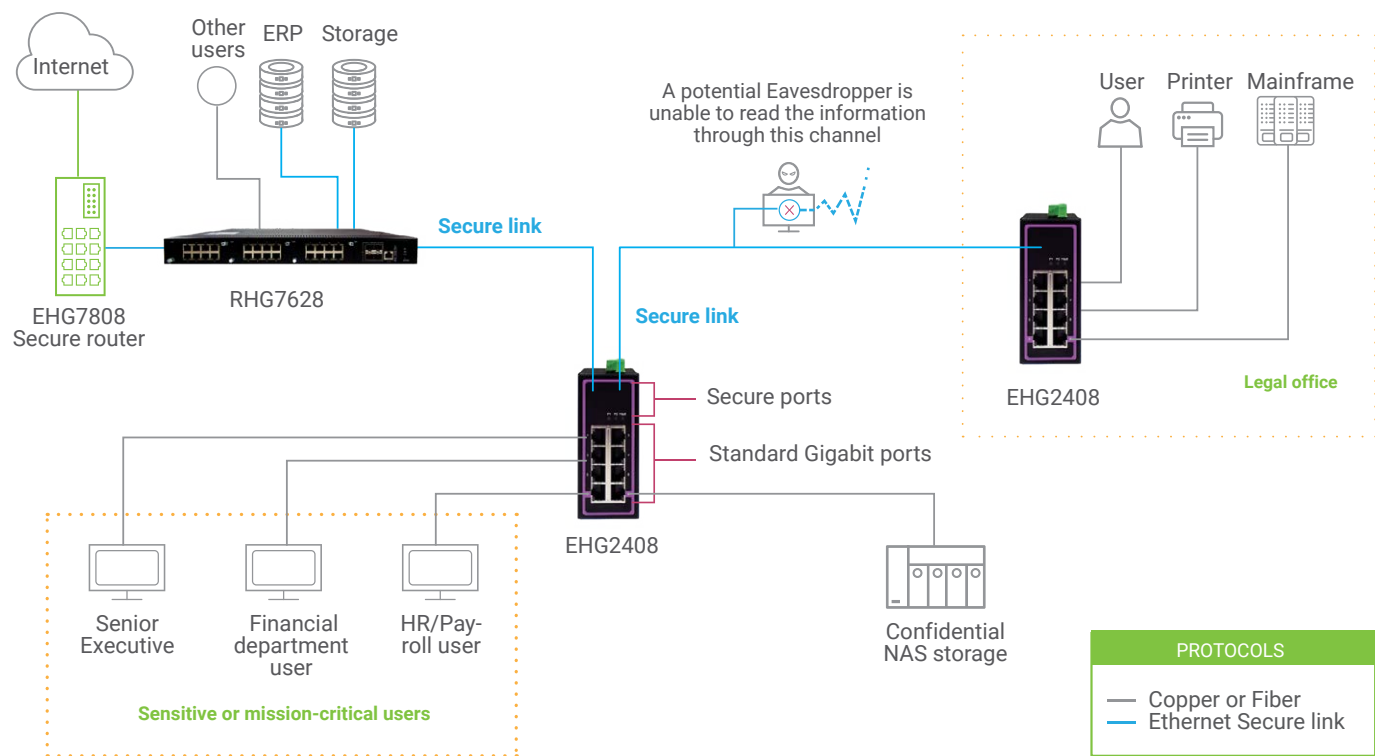
NAT Switch - NSG3308/3309

- Secured NAT Switch with 1:1 NAT, virtual NAT, IP masquerade , and DMZ
- Industrial certifications
- Secure industrial network design based on IEC62443
- Access control with IPv4/MAC ACL
- Network monitoring with port mirroring
- SD card slot for configuration backup/restore and syslog recording
- 12-48 VDC dual input

SECURE NETWORK WITH DATA ENCRYPTION

Highly connected systems make work easier, but are also under greater risk to cyber incidents or attacks. IEEE 802.1AE protocol (MACsec) uses strong crypto (AES-128 bit) to provide authentication, integrity and confidentiality to supported components. The communication is encrypted from hop-to-hop, so, decrypted upon receipt and encrypted again with a different key before forwarding, it can protect your network from wiretapping, masquerading, man-in-the-middle attacks and denial-of-service, as well as from impersonation and replay attacks.

While longer encryption keys are safer, they generally take longer to execute and to decipher. But MACsec encryption is carried out by hardware, so the full Gigabit Bandwidth is preserved and no additional latency is added to the network, ensuring that you maintain both efficiency and security.



RHG7628

- Flexible modular configuration with 2 MACsec security modules and 4 power input versions
- Maximum 128Gbps switching capacity, 95.24Mpps throughput
- Rugged industrial design for -40 to +75°C operation
- Ring protocols for redundancy
- RIP, OSPF, Static Routing, PIM supported Layer-3 switching



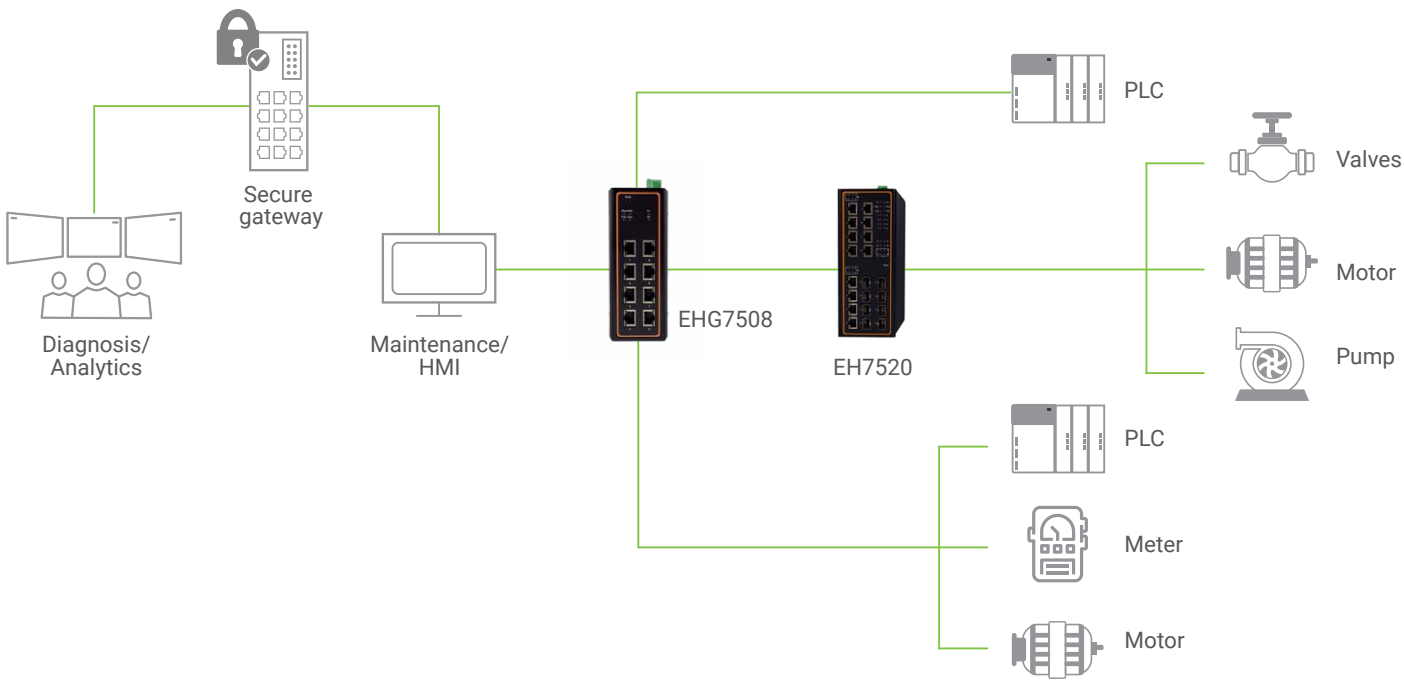
EHG2408

- Embedded MACsec Key Agreement offers high-protection with no need for configuration.
- 99% of throughput guaranteed no additional latency
- Prioritizes Profinet Packets according to 802.1P

PROFINET CERTIFIED SWITCHES

PROFINET is an industry standard for data communication over Industrial Ethernet. It is especially suited for process automation, meeting most industrial automation timing requirements, while wired and wireless connectivity options provide a more effective backbone for automation operations. OPC UA integration allows openness for industry 4.0 applications.

PROFINET functions are divided into conformance classes which define device functionality. CC-A network switches enable real-time data exchange, alarm and diagnostics, and network topology information, while CC-B ones further include functions for additional network diagnostics and for topology detection, therefore requiring managed switches with advanced features. CC-A functions do not require certification and are supported by most ATOP devices. PROFINET-certified devices, such as ATOP’s EH75xx and EH75xx series, have undergone extensive, world-wide consistent testing, so ensure optimal quality and interoperability.



EHG7508

- Profinet CC-B v2.33 certified and GSDML file provided
- Up to 8 10/100/1000 BASE-T(X) RJ45 ports or 1000 BASE-X SFP slots
- Up to 8 Power over Ethernet ports, with maximum 30W PoE power per port
- Powerful switching platform, supporting advanced redundancy protocols
- IEEE 1588v2 Precision Time Protocol
- Hw-based transparent clock
- Security features based on IEC62443-4-2



EH7520

- Profinet CC-B v2.33 certified and GSDML file provided
- Up to 16 10/100 RJ45 ports and 4 10/100/1000 BASE-T(X)/FX Combo ports
- Up to 8 Power over Ethernet ports, with maximum 30W PoE power per port
- Ring protocols for redundancy
- Wide temperature operations, from -20°C to +70°C
- Security features based on IEC62443-4-2

Some more requirements and how we face them

Focusing on

ATOP solution

Flexible mounting options for limited installation space



EHG3005 EH3305 EH3005

Compact, robust, easy unmanaged switches

Manageable and customized industrial wireless infrastructure



CWR5805 AWR5805

Wireless routers with load balancing and high degrees of security, high speeds and advanced configuration options

Reduce redundant devices and enable IIoT on reality



IO5202

Industrial IoT Remote I/O that is compact, cost effective and supports numerous configurations options

Optimize the balance between manageability and simplicity. Getting performance, reliability and security of your network, withholding necessary key features.



EH3408

Lite-managed smart switches

IN APPLICATION

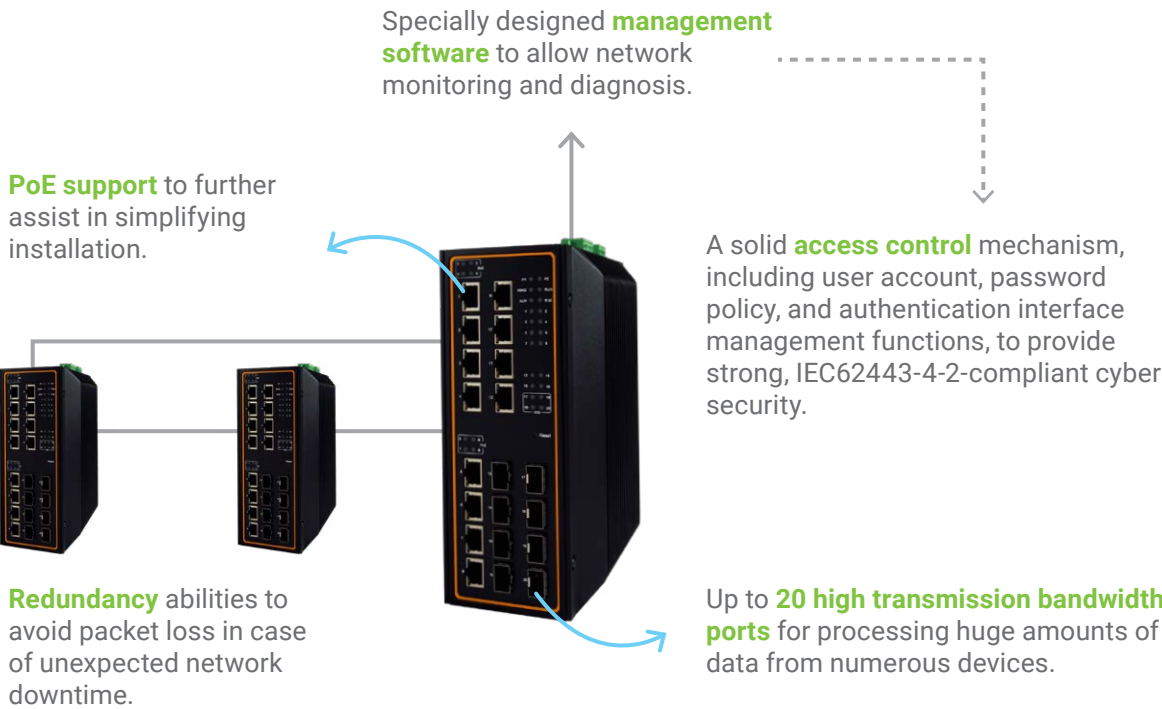
Industry 4.0 OT networks can be divided into the control and field bus level, where controllers like PLCs communicate with end-devices like meters and IEDs, and the supervision monitoring level, where they link to higher authorities like SCADA. Further up, SCADA passes information through IT networks to the Internet.

Below we share some real cases to help understand more about the networking requirements in each level. Many businesses encounter similar challenges while moving towards Industry 4.0, but each case is unique in its specific requirements. ATOP networking devices have proven successful in different applications and industrial networking levels. Let us help you find and implement the solutions that fit your needs.

SUCCESS STORIES



One of our end users is an automaker giant who required a large interconnected network for its factory equipment. With high numbers of devices across wide areas, network reliability is a basic must. Compact ports and easy installation help conserve labor and costs, while consolidated management functions enable overall remote control and security. Here the **EHG7520 High-Bandwidth Industrial Managed Gigabit PoE Switch** features:



On another level, a shoe manufacturer requested a solution to monitor machinery managed by PLCs. Since machinery is often not Ethernet-based, the **PG5901B Industrial M2M Cellular Protocol Gateway** converts different protocols to give managers OT visibility through SCADA and IT systems. Various connectivity options allow flexibility and reliability in harsh and decentralized factory environments.

Converts PLC information into supported formats before passing it to the local **SCADA**.

Flexible connectivity and rugged hardware to ensure reliable operations in **harsh site conditions**.

Designed specifically for industrial applications, the gateway's **user-friendly web utility** offers easy configuration for decentralized field operation.



Another route, also with protocol conversion, sends data to the cloud, where the customer's **central office can access site data** for analysis.



In the same field but a different scenario, a manufacturer needs to monitor its oven status to avoid overheating. For this kind of direct needs, the oven can be connected to the **SE5901B 3G/4G LTE Cellular to Ethernet and Serial Secure Industrial Gateway/Router**, for simple, stable data access.

While many factors will affect wireless connection quality, the device's **extensive bandwidth support** provides more opportunities for maximal uptime.



NB-IoT connectivity to send status data directly through the customer's core network to the cloud.

AWS qualification, for achieving IoT and cloud connection stress-free.



OFFICAL WEBSITE



LITERATURE LIBRARY



ATOP Technologies | by BlackBear TechHive

2F, No. 146, Sec. 1, Dongxing Rd., Zhubei City, Hsinchu County, Taiwan

☎ +886-3-550-8137

📠 +886-3-550-8131

✉ info@atop.com.tw