ADVANTECH

Enabling an Intelligent Planet

White Paper

Keeping up with Industry Needs: Industrial Automation Devices Evolve to Meet IT, OT, and IoT Challenges

Advancements in Advantech remote I/O, I/O gateways, and controllers address changing industrial automation needs with innovations.

Introduction

In the early days of automation, digital industrial automation systems existed solely in the operational technology (OT) realm. These systems utilized discrete and analog devices and I/O systems with local I/O installed in controller racks. These controllers were typically programmable logic controllers (PLCs) or remote terminal units (RTUs), but they could also be custom controllers of all types.

The introduction of digital links between controllers and remote I/O was a significant step forward. Then, blocks of I/O could be installed close to field devices, all with a single cable connecting them to a rack-mounted controller. However, these interconnections were primarily in the form of proprietary serial communication protocols, which differed from one vendor to the next (and were not compatible with each other). Similarly, proprietary serial communications connected controllers to human machine interface (HMI) terminals, which ran software unique to each vendor.

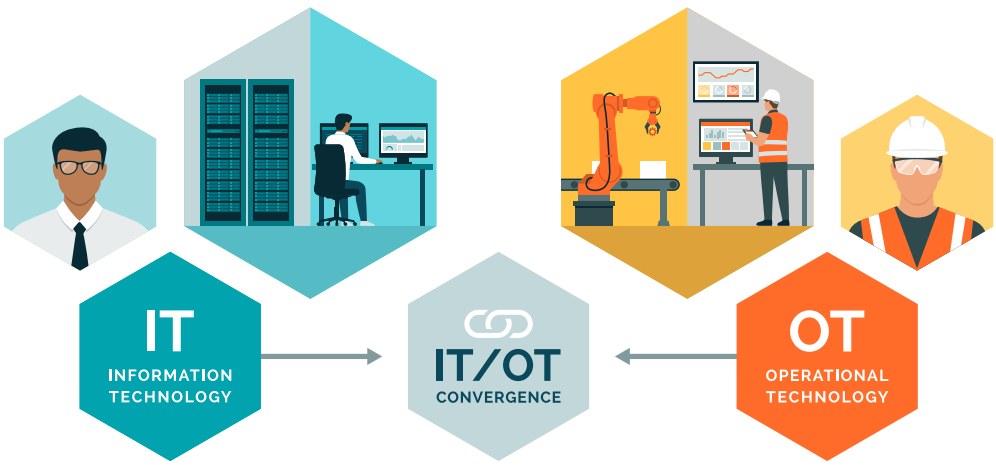
The introduction of the PC in the early 1980s, and its adoption by the industrial automation industry later that decade, was one of the first instances when information technology (IT) entered the OT realm.

HMI software could now run on any PC—first on DOS and then on Windows—freeing users from the walled gardens of proprietary HMI terminals. Ethernet connectivity from PC-based HMIs to controllers eventually became the norm—another instance of IT standards adapted and adopted for OT applications.

Further advances followed, such as open protocols to link controllers with remote I/O and field devices, providing users with choices by breaking the proprietary ties between components. These open protocols also enabled another example of OT/IT integration: PC-based control, first introduced in the late 1980s.

As end users implemented these advances, appetites for additional openness, often whetted by exposure to IT hardware and software, grew rapidly. This demand laid the foundation for Internet of Things (IoT) implementations, which included OT and IT elements by necessity.

In this white paper, we trace the evolution of three of the main building blocks for industrial automation: remote I/O, I/O gateways, and controllers. We'll outline how components and Advantech devices have evolved in each of these areas to meet user demands with respect to OT applications, OT-IT integration, and IoT implementations (*Figure 1*).



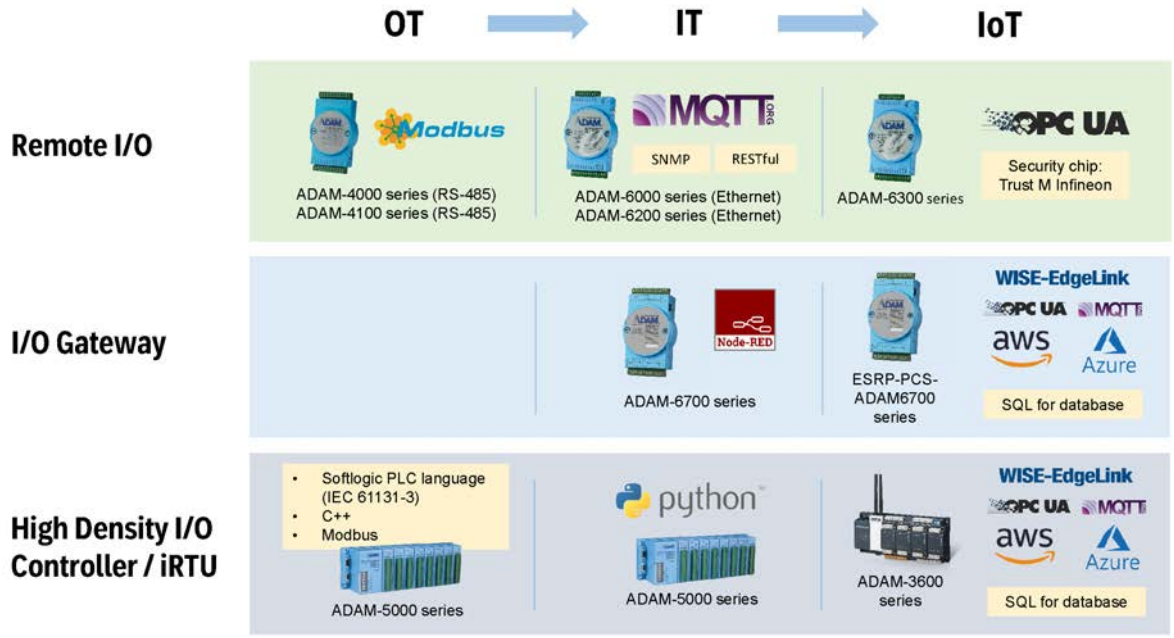


Figure 1: Advantech's ADAM series of remote I/O, I/O gateways, and controllers have continued to evolve over the years to meet changing end user OT, IT, and IoT needs.

The Evolution of Remote I/O

When industrial users deploy OT systems over large physical sites, costs can increase exponentially as equipment and instrumentation are located further from the controller hosts, which must send and receive analog and discrete signals for monitoring and control.

Each component connected via traditional I/O must be hard-wired, and the installation of conduits and cabling over long distances can quickly become expensive, especially in hazardous environments. Sometimes users can work around this limitation by adding more controllers throughout a facility, but this requires additional commissioning and maintenance efforts, as well as significant added expense.

Remote I/O modules, such as the Advantech ADAM-4000 series, solve this issue by providing additional I/O blocks (installed at convenient field locations) for terminating analog, discrete, and specialty I/O (*Figure 2*). These modules send and receive signals directly to and from field components via high-speed digital communication protocols with a host controller.

This also typically alleviates the need to purchase, install, and program multiple controllers. Developers need only to load a program on the central controller, and then configure it to interface with various remote I/O blocks.

LEARN MORE **ADAM-4000 Series**

Proprietary Confinement

While controllers of ages past addressed wiring cost concerns using remote I/O, they commonly communicated using proprietary protocols. Without the ability to mix and match, users were locked into the pricing and capabilities of a single vendor. HMI terminals functioned in the same manner of proprietary protocols, limiting

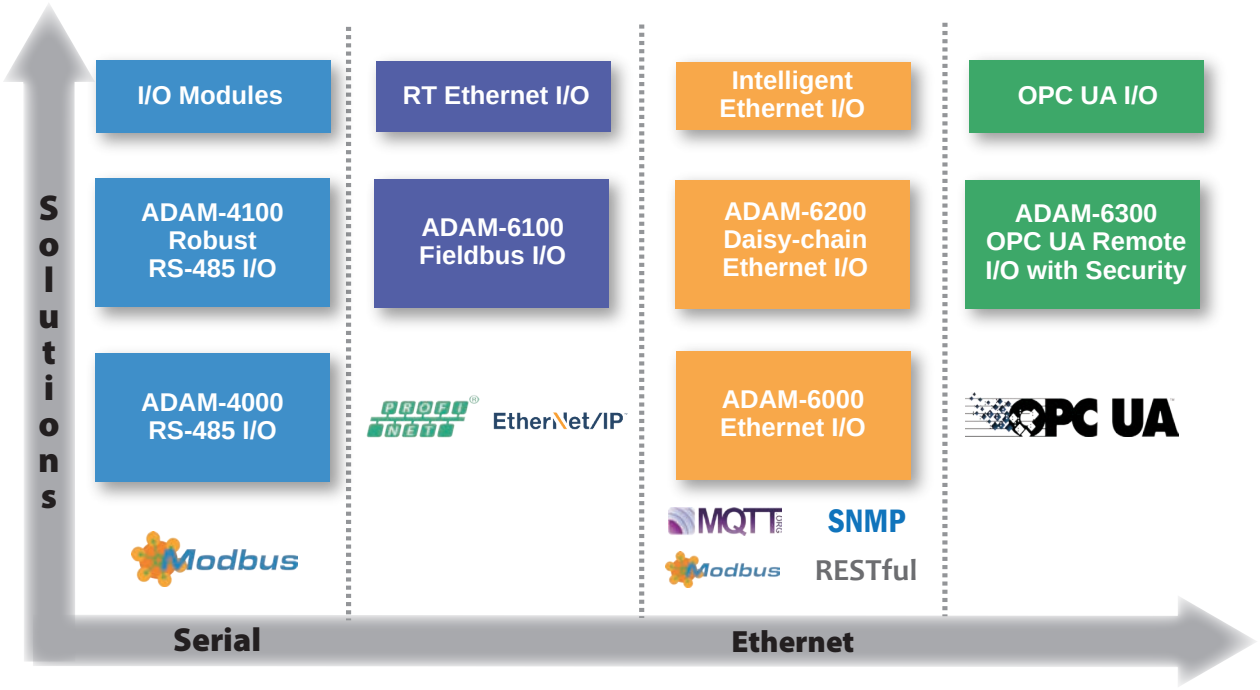


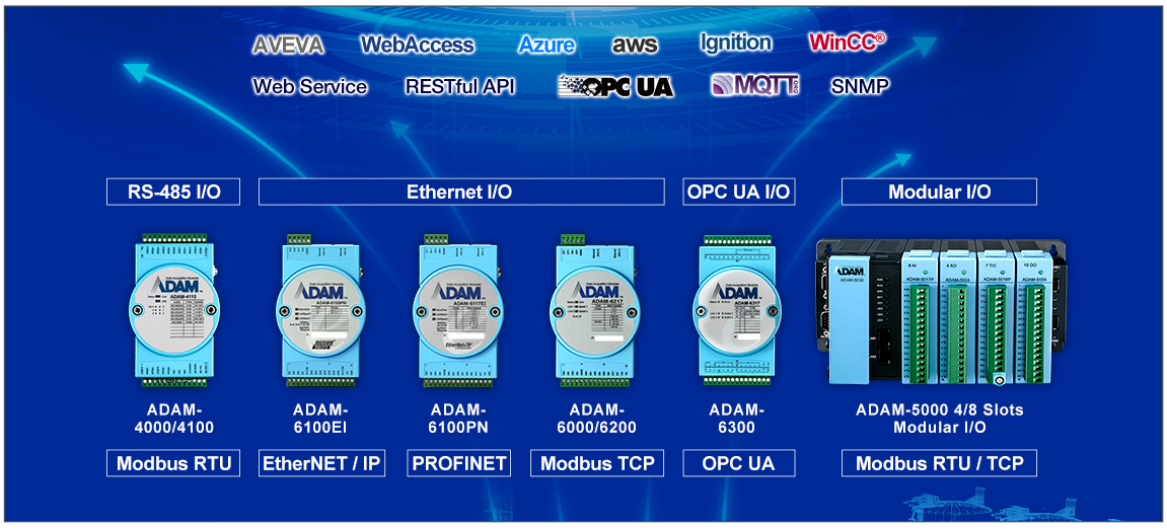
Figure 2: Regardless of the device or protocol, there is an Advantech ADAM remote I/O module with the right connectivity support.

users during implementation and expansion.

Additionally, sophisticated and intelligent field devices, such as scanners and weight controllers, could supply a significant amount of operating data, but with considerable configuration. These devices benefitted from digital connections with controllers, but establishing these communications required creation of custom software drivers to provide links over a serial network.

With controllers, HMIs, and remote I/O, end users were tied to a single vendor and its proprietary communication protocol, resulting in extremely high costs. For example, it was common for PLC vendors to offer remote I/O but only for top-of-the-line models, forcing users to purchase high-end products, no matter the need.

For intelligent field devices, the cost of developing a custom software driver, and maintenance to accommodate changes at either end of the link, was prohibitive. For example, a



firmware update to a controller could render a software driver inoperable, potentially disrupting an entire automation system.

An Industrial Standard

As proprietary industrial serial protocols began to yield to standard versions—such as Modbus RTU—Advantech released its ADAM-4000 series of remote I/O modules (*Figure 3*).

These components gave users the freedom to disperse field devices throughout a plant and far away from a controller, requiring just a few wires within a single cable running from a controller to remote I/O modules in a daisy chain arrangement. This eliminated requirements to purchase the controller and I/O from a single vendor, providing users with cost-saving flexibility.

ADAM-4000 modules contain microprocessors with configurable features, such as analog alarms, watchdog timers, and on-board system diagnostic features, all consumable by controllers supporting RS-485 serial protocols. The modules are rated for operation within a wide temperature range of -14°F to +158°F (-10°C to +70°C)—with the ADAM-4100 series rated from -40°F to +185°F (-40°C to +85°C). They are also highly resistant to noise for reliable signal accuracy (*Figure 4*).

LEARN MORE **ADAM-4100 Series**

Real-Life Use Case: Environmental Monitoring System

A major manufacturer specializing in discharge water monitoring systems sought to add industrial wastewater quality measurements to its operations so it could more accurately detect contaminants and impurities in effluent flow. Due to extremely varied industrial markets and applications, the system needed to be suited for a variety of parameters, all with multiple I/O ports to connect with diverse types of meters and analyzers.

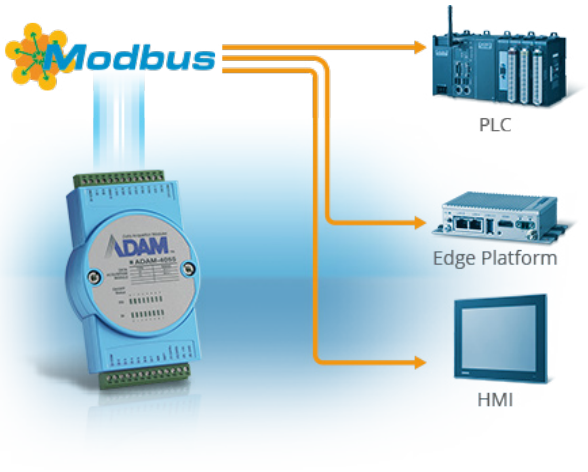


Figure 3: The standardization of communication protocols among vendors empowers users with greater connectivity options. For example, Advantech's ADAM-4000 series remote I/O helps transmit data from dispersed equipment to central locations for processing.

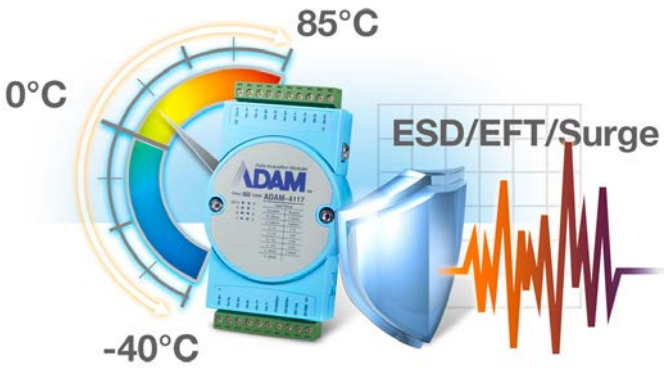


Figure 4: The ADAM-4100 series operates within an extremely wide temperature range and is highly noise resistant, making it ideal for operation in harsh environments.

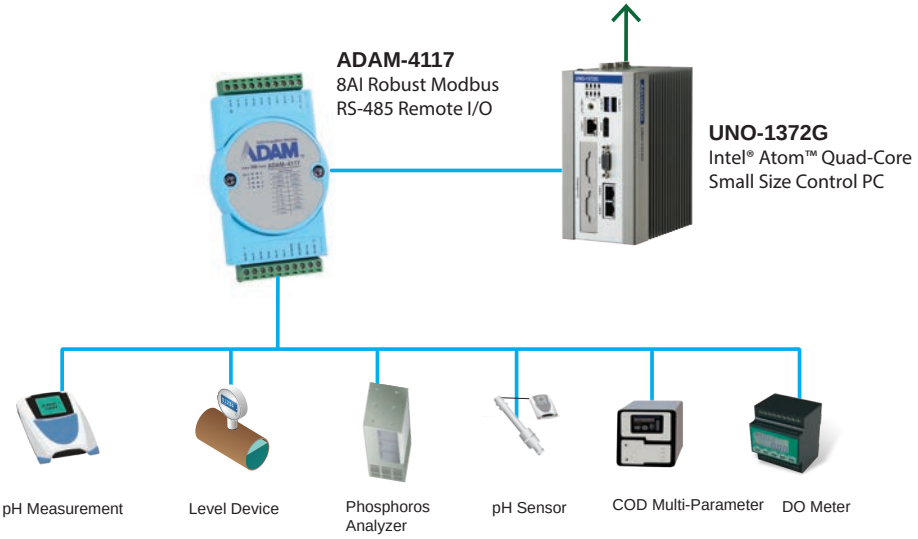


Figure 5: The ADAM-4117 is one of many Advantech remote I/O modules that enables host communications with a controller over a range of serial protocols, most notably Modbus RTU.

ADAM 4000/4100 Series Comparison

		ADAM-4000 Series	ADAM-4100 Series
Operation Temperature		-10 ~ 70°C	-40 ~ 85°C
Power Input		10 ~ 30VDC	10 ~ 48VDC
ESD		8KV Air, 4KV Contact	8KV Air, 6KV Contact
EFT		2KV	4KV
Surge		0.5KV	4KV
Communication Interface	RS-485	V	V
	USB	-	V

Due to the module's durability and the native support for Modbus RTU, the design team specified the ADAM-4117 analog input module for connection with water quality analyzers—such as those used to measure pH, temperature, conductivity, dissolved oxygen, and turbidity—and various meters (*Figure 5*).

Utilizing the new hardware enabled the manufacturer to connect various types of analog transmitters, regardless of location, to the water quality monitoring system with reliable and cost-effective transmission of data to the system controller.

LEARN MORE **ADAM-4117**

OT/IT Integration

The Modbus RTU protocol and its successors, most notably those built on Ethernet, solved OT issues related to remote I/O synchronization with controllers. However, integration between remote I/O and IT systems would require additional communication technologies due to native dissimilarities between OT and IT protocols. One example of these differences are in data packets. Small data packets that require rapid, repetitive, and responsive transport characterize OT traffic. IT traffic, on the other hand, usually occupies more bandwidth, but is intermittent and can withstand some latency.

MQTT and SNMP are communication protocols widely supported by IT-native systems, and these protocols are well suited for industrial use. Previously, MQTT was created for oil and gas industry applications in harsh environments, but the past decade has seen it become a common standard for IoT communications.

The Advantech ADAM-6000 series of remote

I/O modules includes all the capabilities of the serial ADAM-4000 series, but it replaces Modbus RTU and other RS-485 communication protocols in favor of MQTT, SNMP, RESTful APIs, EtherNet/IP, PROFINET, Modbus TCP/IP, and other Ethernet protocols. Additionally, ADAM-6000 remote I/O modules provide standalone logic functionality, so users can avoid a controller completely for simple applications where high processing power is not required.

For these applications, ADAM-6000 modules use graphic condition logic (GCL) to execute logic rules, processing various actions for output according to input conditions (*Figure 6*).

Real-Life Use Case: Hotel Utilities Management

Covering a large area with many buildings, an expansive hotel in Asia experienced monitoring challenges with its utility systems, which included water towers, fire alarms, elevators, pumps, and lighting control systems. Each of these subsystems were located in various and unique areas around the premises, and when maintenance staff needed to check system statuses, they had to travel from location to location. In such a large complex, the constant travel was a waste of time and resources.

The hotel also experienced delays in issue detection because of these logistics challenges.

For example, the water towers on the top floor of one building overflowed on more than one occasion due to broken pipes and joints, causing serious water damage. Without sensors to detect real-time equipment conditions and without an alert system, water flowed freely into electrical areas, creating short circuit conditions. This resulted in serious property damage and financial losses.

By implementing a central monitoring and control system, with connected sensors around the premises and localized ADAM-6200 remote I/O modules, the hotel improved supervisory control and monitoring of its utilities, greatly reducing incident frequency and severity.

The hotel specifically selected ADAM-6250, ADAM-6217, and ADAM-6266 modules due to:

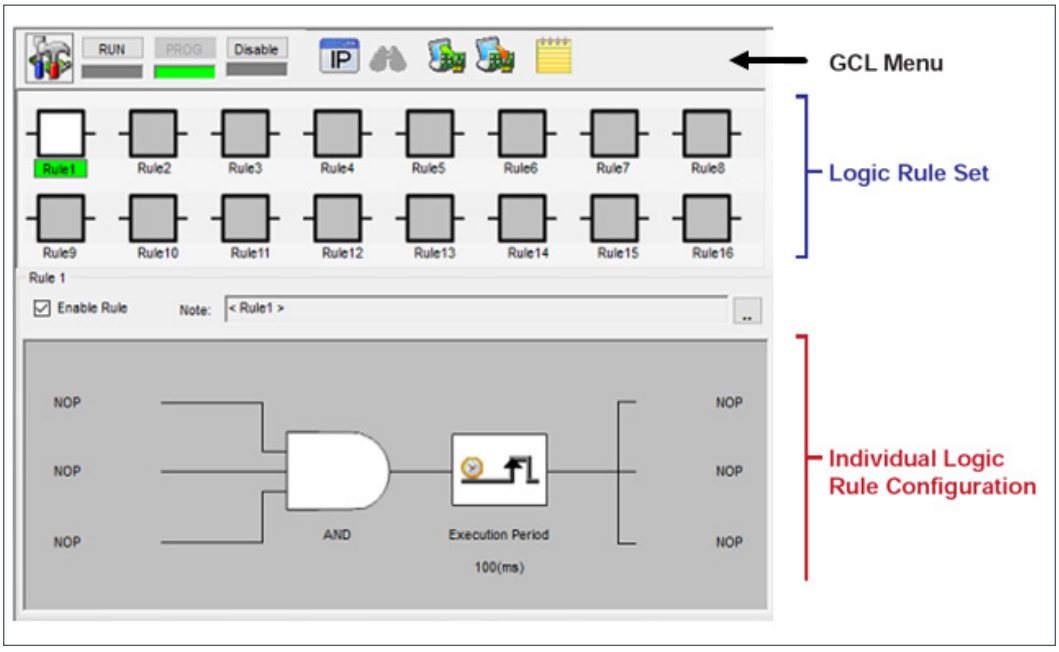


Figure 6: Graphical condition logic, available for ADAM-6000 remote I/O modules, is ideal for meeting local, real-time control needs.

wide temperature tolerance, support for multiple protocols used in on premise IT systems—including Modbus TCP/IP, HTTP, SNMP, and MQTT—and an auto-bypass daisy chain design, enabling handshaking among each module to ensure data transmission integrity.

The combination of these features provides the data aggregation and reliability needed by the hotel to manage utilities more efficiently. Additionally, by deploying an architecture of short cable lengths and low Ethernet switch counts, required capital expenses decreased.

LEARN MORE **ADAM-6000/6200 Series**

Remote I/O IoT Add-On

When moving from local network topologies to the IoT, designers must account for the use of a wide area network (WAN), either the Internet or intranets. In both cases, this creates a need for heightened cybersecurity and more capable communication protocols. Additionally, it can be a challenge to integrate existing devices into an IoT deployment quickly and securely.

Many PC-based supervisory control and data acquisition (SCADA) systems, and other high-level computer systems, support the OPC UA protocol. This is where Advantech ADAM-6300 remote I/O modules can help (*Figure 7*). While these modules are not compatible with the other industrial Ethernet protocols discussed in the previous section, they are compatible out-of-the-box with a host of SCADA and other systems.

Additionally, the ADAM-6300 series is designed with an Infineon OPTIGA Trust M chip to encrypt exchanged data, protecting against facility cyber threats and exploitation so users can safely experience the conveniences of Industry 4.0 connectivity.

LEARN MORE **ADAM-6300 Series**

Figure 7: The Advantech ADAM-6300 series provides secure data transmission of I/O data to SCADA and cloud systems via the OPC UA Protocol.

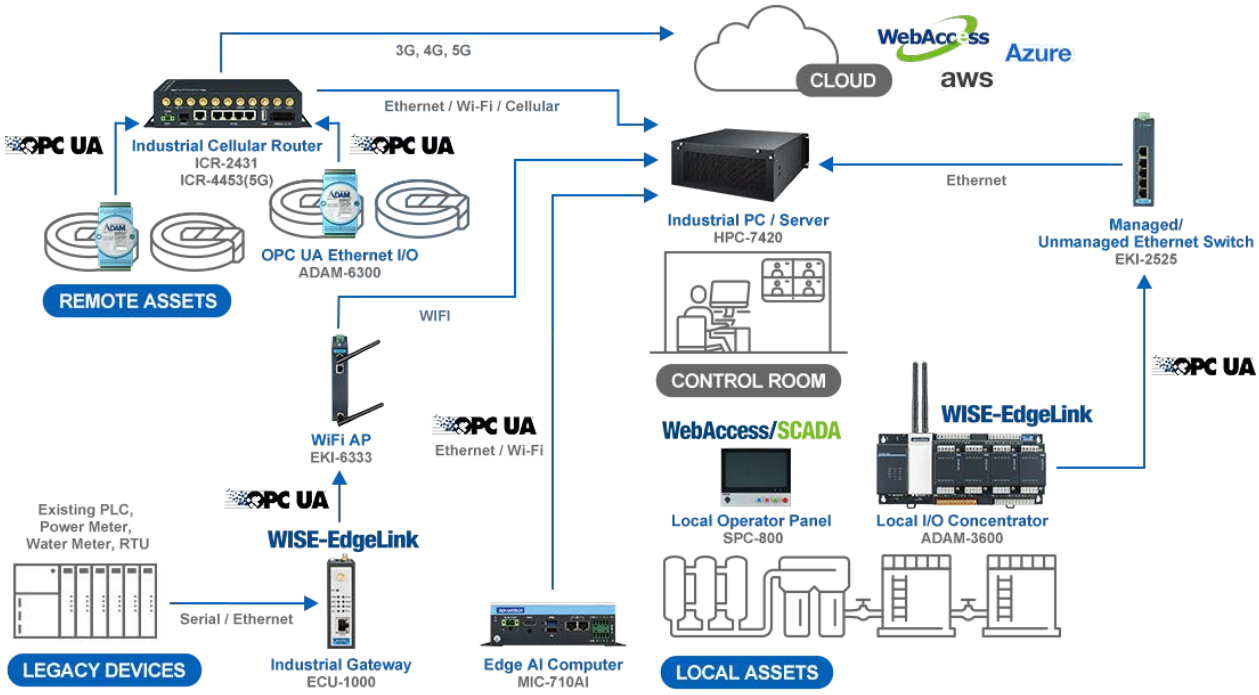


Figure 8: The ADAM-6300 is a remote I/O series that supports the OPC UA protocol and is empowered by Infineon security IC for protection. It is an ideal device for remote monitoring of water management assets.

Real-Life Use Case: IoT-Based Water Treatment

A water agency recently utilized the ADAM-3600 Intelligent RTU to establish remote control and monitoring of a pump station, alleviating the need for daily site visits. The RTU was set up to receive discrete and analog input signals from field equipment and instrumentation, in addition to issuing discrete output commands for running equipment.

The agency installed a third party HMI for local control purposes, which exchanged data with the Advantech RTU via Modbus TCP/IP. For remote monitoring and control from the off-site SCADA system, the agency used the DNP3 communication protocol over 4G cellular connectivity through a private tunnel via the ADAM-3600 OpenVPN (*Figure 8*).

For integration with OPC UA systems, traditional solutions would have required integration of numerous different OPC components and gateways, but the ADAM-3600 and ADAM-6300 series of solutions consolidates all monitoring, control, and communication functionalities needed in OPC UA systems.

LEARN MORE **ADAM-3600 Series**

The Evolution of I/O Gateways

As industrial I/O and computing hardware continues evolving to meet user needs, an increasing number of organizations are leveraging opportunities to transform and upgrade production lines and process equipment with intelligent manufacturing techniques and analysis capabilities provided by connectivity.

Advantech's ADAM series of remote I/O modules, I/O gateways, and controllers has been a staple in the industrial automation space for more than 25 years, freeing users from the limitations and costs of proprietary protocols and complex architectures.

End users, original equipment manufacturers (OEMs), and systems integrators face connectivity and control challenges whether building new, expanding existing, or retrofitting antiquated systems.

The ADAM line of devices empowers streamlined data exchange with almost any industrial device, seamlessly bridging the OT/IT data exchange gap. The series also provides direct connectivity with the cloud—all using standard protocols. These features are simplifying processes for users to create actionable insights for operational efficiency and optimization, while providing additional capabilities.

As technology, cybersecurity, and connectivity continue progressing throughout and beyond the era of Industry 4.0, the ADAM line will continue to evolve, maintaining its tradition of delivering reliable functions and diverse features to support customer who must position themselves competitively in numerous markets.

I/O gateways were designed from the ground up to facilitate OT/IT integration and IoT implementations. Gateways use a variety of technologies to link field I/O, or any intelligent OT device, to higher-level IT-based computing systems and databases, installed on-premises or in the cloud.

With built-in capabilities for computing, coding, and analysis, gateways can perform a multitude of tasks using logic, in addition to passing input and output data between field devices and higher-level processors. For example, a gateway can detect

an out-of-range I/O value, report the event directly to users, and perform calculations to assess the severity of the event.

I/O IoT Add-On: OT/IT Integration Difficulties

There are multiple OT and IT protocols, most of which are incompatible with one another—especially when crossing the divide between these OT and IT realms.

Historically, developers had to undertake the cumbersome process of writing extensive custom code to bridge the divide. Furthermore, a single firmware or software update for any involved device was often all it took to render communication incompatible.

Complicating matters, OT and IT systems have different priorities. While IT systems focus primarily on data confidentiality and permanence of storage, OT systems' highest priority is ensuring availability of reliable, timely, and repeatable operation.

IT systems are not always equipped to handle data with the expediency required by OT systems, making it difficult for integrated systems to combine logical data processing and analysis

with actionable adjustments for operations optimization.

I/O Gateway Benefits

I/O gateways address these and other issues by combining I/O processing and manipulation with data analysis in a single device. They are set up to help seamlessly bridge the OT/IT divide. Unlike simple I/O modules, gateways are more flexible when dealing with data, possessing the ability to apply filters, automatically eliminate outliers, and more. They help generate actionable insights and apply operational adjustments quickly, with results sent to IT systems.

For instance, consider a high temperature input for a machine in operation. The I/O gateway can detect the signal, process it, determine if it is greater than the acceptable range, perform a logic judgement, and then adjust an output to trigger a heat dissipation system to cool the machine. It can also send alerts to an IT-based alarm notification system.

The Advantech ADAM-6700 series provides these capabilities and more with the Node-RED flow graphic programming tool, empowering programmers and nonprogrammers alike the ability to set up condition-based actionable flowcharts in a visual logic software environment (*Figure 9*). As an open-source tool, users can easily load community-built samples and applications, saving hours of development time.

These modules run on a Linux-based open platform, enabling the addition of JavaScript and C programs for advanced applications. A built-in device dashboard, accessed through any web browser, simplifies I/O monitoring and troubleshooting.

Compared to wired systems, the ADAM-6700E device wireless connectivity accessory options make plant-wide data exchange simple. With a space-saving physical profile and low barrier to entry from a programming perspective, these all-in-one intelligent gateways significantly reduce commissioning and operational costs, empowering a multitude of plant personnel to configure and manage highly connected I/O systems.

LEARN MORE **ADAM-6700 Series**

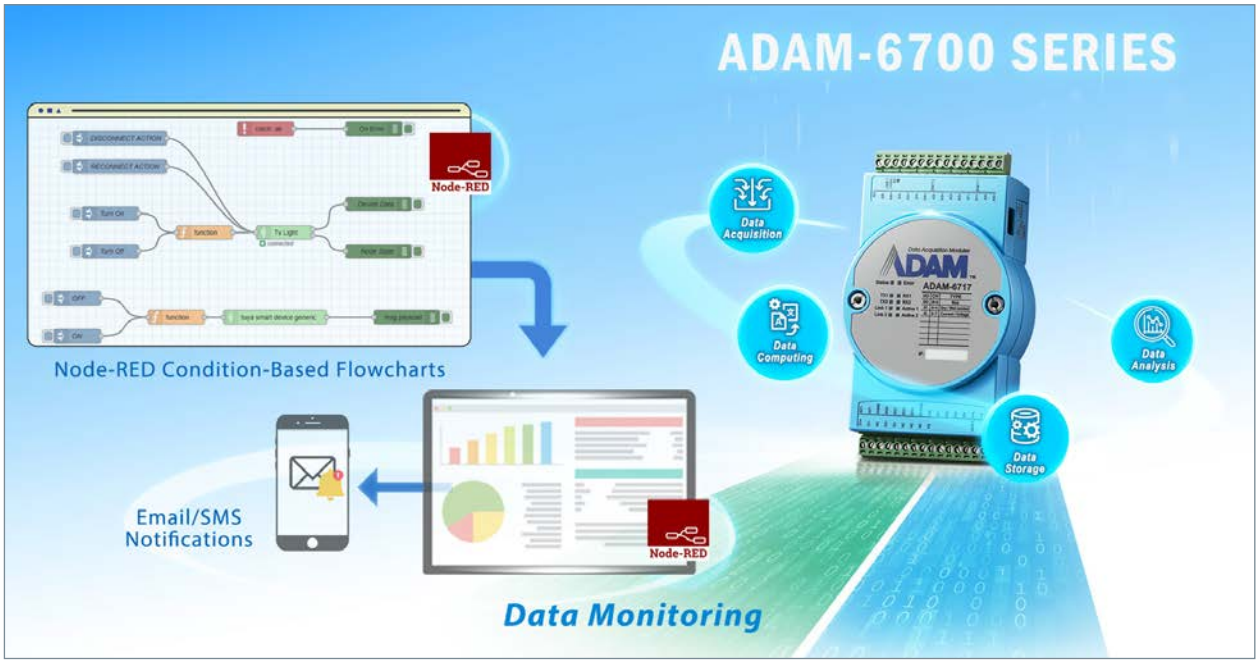


Figure 9: The ADAM-6700 series incorporates Node-RED capabilities, empowering programmers and nonprogrammers alike to set up condition-based actionable flowcharts.

Figure 10: The Advantech solution, ESRP-PCS-ADAM6700, provides native support for OPC UA and MQTT, simplifying data transmission among IT systems, field devices, and the cloud.

Real-life Use Case: Adding Intelligence to Legacy Machines

A manufacturer of motion transmission elements—such as linear motion guides, ball splines, and ball screws—for use in semiconductor, medical equipment, car manufacturing, and high precision industrial machinery recently installed the ADAM-6700 series components to improve data collection from the plant floor and associated analysis. This enabled the manufacturer to achieve IoT functionality even with legacy machinery.

Using the ADAM-6700E module, the manufacturer made legacy machine data available wirelessly for monitoring by a remote database in the facility control room, enabling factory management personnel and engineers to monitor machine conditions more easily. Using data models, experts were able to compare actual conditions against a time-adjusted reference to ensure sufficient operational efficiency.

LEARN MORE **ADAM-6700E**

Leveraging expertise in software development and the Linux-based capabilities of the ADAM-6700, the manufacturer was able to reduce hardware requirements even while deploying remote management capabilities to more than a thousand legacy machines. The resulting machine condition monitoring and predictive maintenance solution increased manufacturing efficiency, and has been adopted in more than 2,000 systems across its global enterprise.

I/O Gateway IoT Additions

To operate effectively in an IoT capacity, I/O gateways must connect to on-premises and cloud-based software platforms to leverage data and generate insights. Sending data back and forth between these platforms and field devices quickly, efficiently, and securely remains a challenge, especially when the Internet is involved.

The Advantech ESRP-PCS-ADAM6700 solution package addresses this and other issues by utilizing native support for OPC UA and MQTT, which simplifies data transmission with IT systems and field devices. Built-in integration for Microsoft Azure, Amazon Web Services, and IBM clouds—in addition to support for Advantech's proprietary WISE-EdgeLink—offers various options for easy cloud and edge data storage and analysis (*Figure 10*).

These modules function like other I/O gateways, acquiring data from I/O sensors and field devices via Modbus, DNP3, BACnet, OPC UA, and other protocols, and support more than 200 PLC drivers. They can transmit information and instructions

via wired Ethernet protocols or with ADAM-6700E accessories for wireless 4G LTE, Wi-Fi, and traditional I/O.

They also provide additional data processing options with an onboard SQL database, enabling in-unit processing or analysis via external devices. Additionally, the ESRP-PCS-ADAM6700 supports the PLC language based on IEC 61131-3 for logic control.

LEARN MORE **ESRP-PCS-ADAM6700**

Real-life Use Case: Distributed Solar Station Monitoring

A solar energy facility seeking to analyze its production efficiency and draw correlations with weather conditions recently implemented the ADAM-6700 WISE-Edgelink solution to collect and process data from multiple sources.

At the field level, it collected temperature, inverter, and power meter data—and then transmitted this data to the cloud for storage it in its internal SQL database for local backup (*Figure 11*).

The solar energy solution acquired field information, creating correlations between power generation and weather conditions based on visibility, sun exposure, temperature, humidity, and more.

Within the Microsoft Azure cloud, a real-time power generation dashboard helps the customer determine peak and off-peak hours, while also predicting power generation potential based on season, time of day, and weather conditions.

LEARN MORE **WISE-Edgelink**

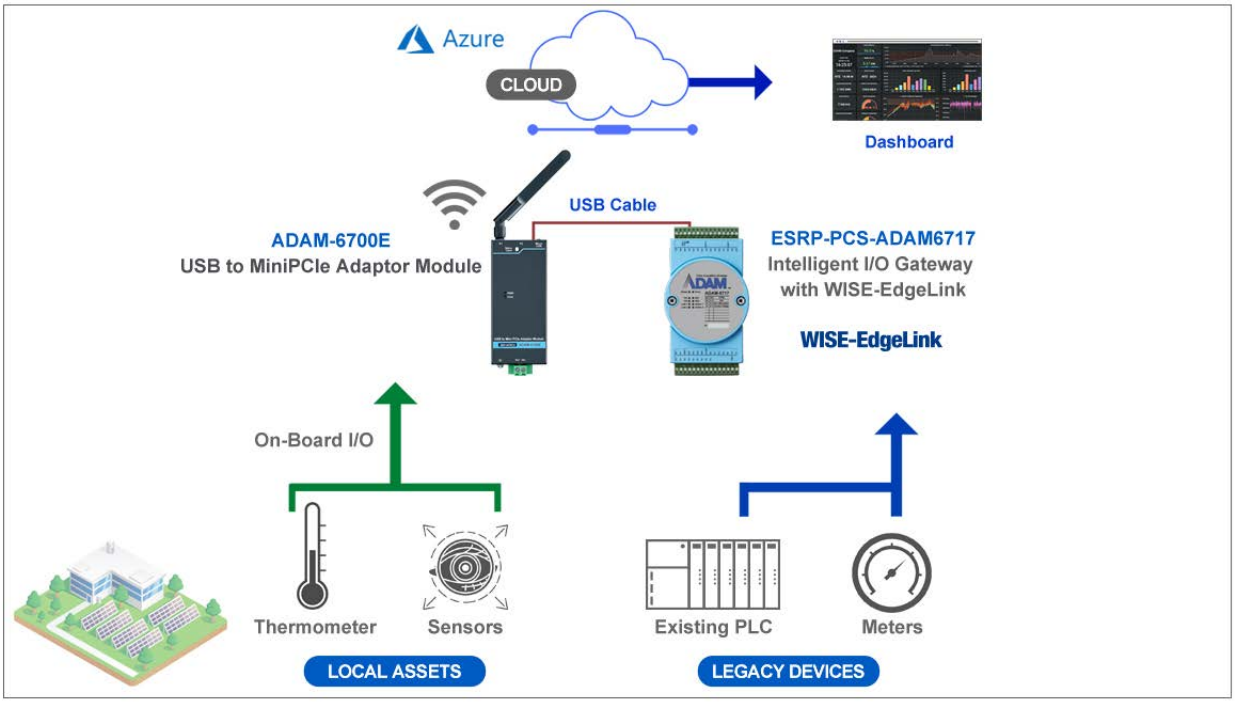


Figure 11: A solar energy facility implemented Advantech's ESRP-PCS-ADAM-6717 solution to transmit field data to Azure Cloud, where a dashboard shows correlations between power generation and weather conditions.

The Evolution of Controllers

Controllers are the brains of any major industrial automation system. Digital versions of these components have been available since the 1960s, but with vast improvements between then and now.

Traditional Controller Pain Points

In the past, most controllers used proprietary programming software and languages, forcing users to learn different techniques and languages when programming devices from different vendors. For industrial applications, ladder logic was widely used, but its implementation varied from vendor to vendor. Other languages were supported, but the differences among them from one vendor to the next were even more significant and prevented code portability. High-level, IT-centric languages, such as C++, were not supported.

I/O was available for local mounting in the same rack as the controller, but it was typically low density and very expensive on a per point basis. It also consumed copious amounts of rack and panel space. Transmitting this data beyond the local controller, especially to any type of IT resource, was difficult due to few supported digital protocols.

A Modular Solution

Users needed a modern industrial control solution addressing these pain points, and Advantech responded with the ADAM-5000 series. The ADAM-5000 series uses highly intuitive SoftLogic PLC

Figure 12: The ADAM-5630 supports SoftLogic PLC programming, incorporating IEC 61131-3, Python, and C++ languages.

programming software, which empowers users to create code using any standard IEC 61131-3 programming language, or with C++ and Python coding (*Figure 12*).

The ADAM-5000 communicates using Modbus TCP/IP and SNMP protocols over Ethernet, providing connectivity with a vast array of industrial devices, including RTUs, remote I/O, other PLCs, HMIs, I/O gateways, and PCs running SCADA and other plant software.

With high-density, local I/O and a modular design, the ADAM-5000 is flexible and economical, making it an ideal fit for various types of applications. It provides capacity for up to eight I/O slots to support up to 256 local I/O monitoring and control points, includes a built-in watchdog timer with auto-reset for fault handling, and remote configuration via Ethernet.

LEARN MORE **ADAM-5000 Series**

IoT Extension

To meet current and evolving demands, I/O is often connected to remote databases, and therefore must support cloud encryption standards for transmitting operational data to the cloud and receiving optimization adjustments. The Advantech ADAM-3600 Intelligent RTU collects sensor data via hardwired or wireless connections, and can communicate with higher-level systems using OPC UA and MQTT.

It can also communicate directly to the cloud and to external databases via encrypted IT protocols. Like the ADAM-5000 series, the ADAM-3600 features high-density I/O, in addition to several flexible I/O combinations. The ADAM-3600 includes two Ethernet ports and three serial ports for additional connectivity (*Figure 13*).

Like the ESRP-PCS-ADAM-6700 solution, ADAM-3600 also supports direct Amazon Web Services, Microsoft Azure, IBM cloud connectivity, an onboard SQL database, MQTT communication, Advantech's WISE-EdgeLink, and more.

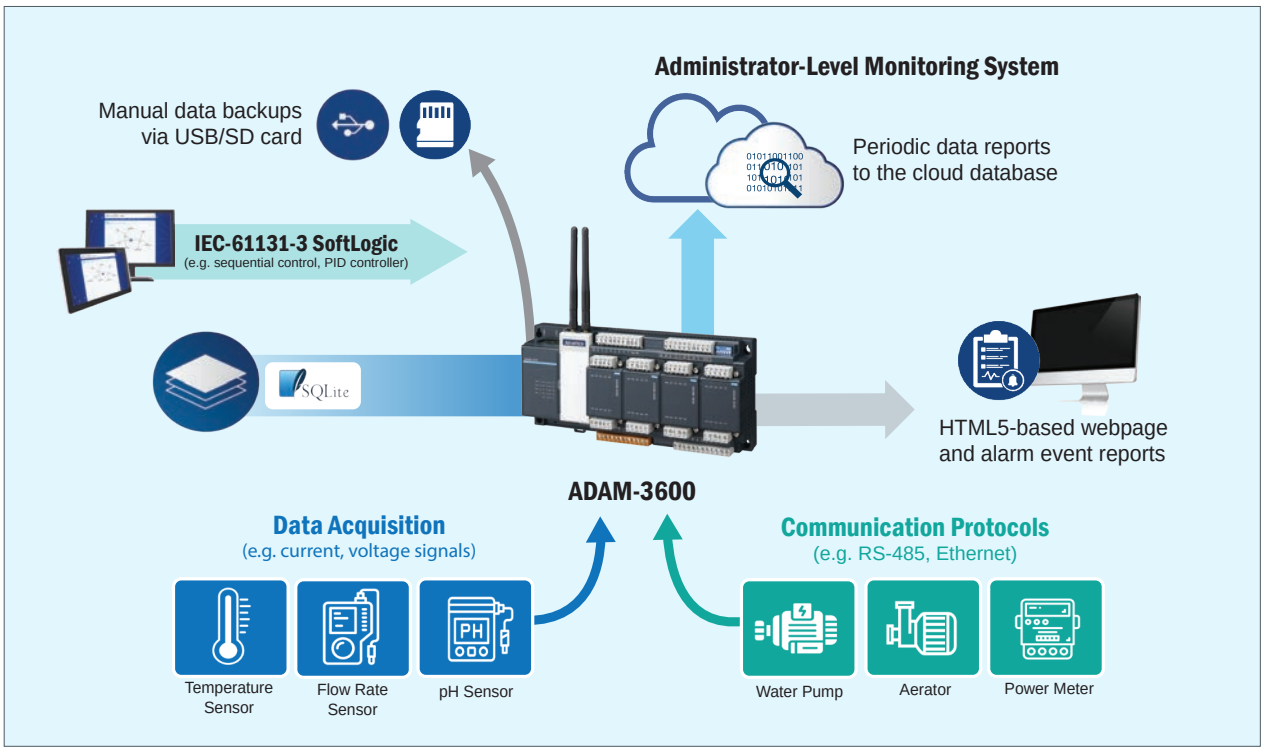


Figure 13: The ADAM-3600 collects sensor data via hardwired or wireless connections. It communicates with higher-level systems using OPC UA and MQTT, and directly with the cloud and external databases via encrypted IT protocols.

Real-Life Use Case: Gas Station OPC UA SCADA Monitoring

Gas station operations incorporate multiple automated sensors and components to reduce the risk of harm to humans and the environment. Many companies are turning to SCADA systems to oversee remote assets and improve management with intelligent computerized features.

A gas station customer recently used ADAM-3600 modules to modernize data transmission and harden system security. Field sensors communicate via RS-232 and RS-485 using the Modbus RTU protocol, so the station needed a method to effectively aggregate data and send it to the SCADA system in an IoT-compliant and security-enhanced format.

Installing an ADAM-3600 at each station allows it to act as an all-in-one RTU and I/O gateway, collecting Modbus I/O data and transmitting it to the central SCADA system via OPC UA. By consolidating field and enterprise communication securely in a single device, the customer minimized deployment costs with an investment in seamless data exchange for future upgrades and expansions (*Figure 14*).

After obtaining I/O data, the ADAM-3600 sends it to remote SCADA servers using encryption and sign-in certification—the innate security features provided by OPC UA.

Additionally, the open platform architecture of OPC UA provides access to an extensive number of cross-platform devices, empowering high scalability. Its timestamp feature provides the ability to mark sequences of data entries clearly and reliably, which is helpful for data analysis.

LEARN MORE **ADAM-3600 Series**

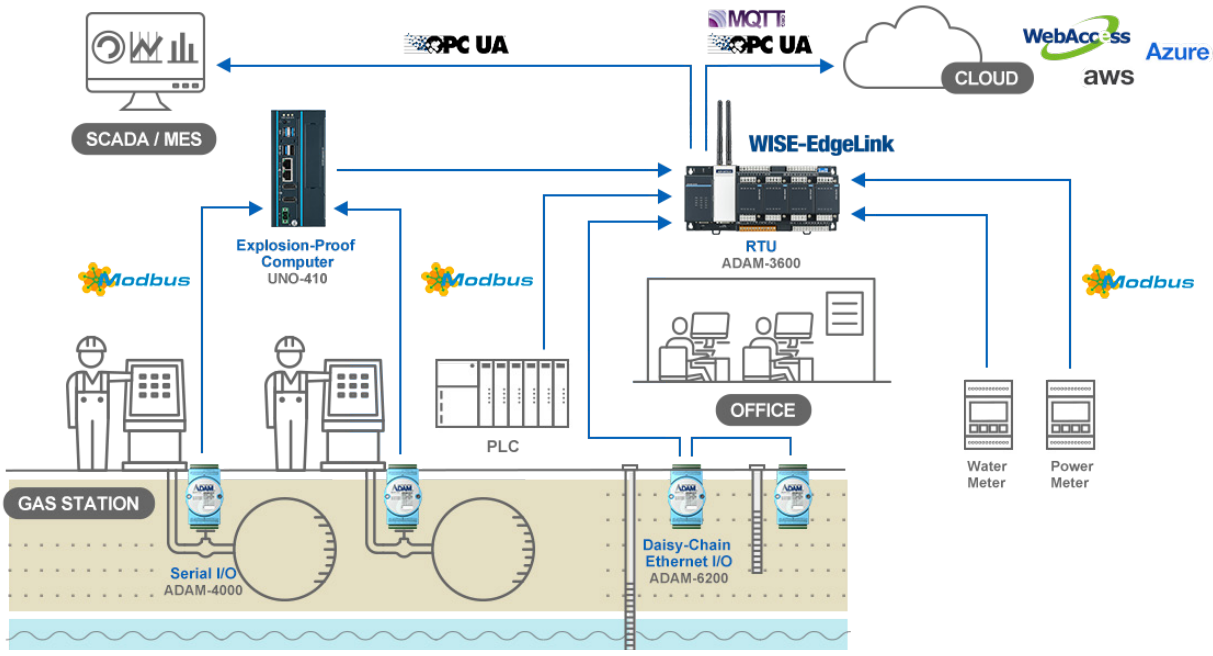


Figure 14: In order to realize a cost-effective solution delivering unparalleled data security, a recent customer used Advantech ADAM data acquisition I/O modules and an all-in-one intelligent remote terminal unit (ADAM-3600) supporting OPC UA.

Support for Technology Advancements

As industrial I/O and computing hardware continues evolving to meet user needs, an increasing number of organizations are leveraging opportunities to transform and upgrade production lines and process equipment with intelligent manufacturing techniques and analysis capabilities provided by connectivity. Advantech's ADAM series of remote I/O modules, I/O gateways, and controllers has been a staple in the industrial automation space for more than 25 years, freeing users from the limitations and costs of proprietary protocols and complex architectures.

End users, OEMs, and systems integrators face connectivity and control challenges whether building new, expanding existing, or retrofitting antiquated systems. The ADAM line of devices empowers streamlined data exchange with almost any industrial device, seamlessly bridging the OT/IT data exchange gap. The series also provides direct connectivity with the cloud—all using standard protocols. These features are simplifying processes for users to create actionable insights for operational efficiency and optimization, while providing additional capabilities.

As technology, cybersecurity, and connectivity continue progressing throughout and beyond the era of Industry 4.0, the ADAM line will continue to evolve, maintaining its tradition of delivering reliable functions and diverse features to support customer who must position themselves competitively in numerous markets.

Further Reading + Watching

- **Video: Cloud-Enabled Data Collection & Sensing Intelligence**
- **Guide: How to Select the Right Remote I/O for Industrial Applications**
- **Guide: OPC UA and IT/OT Convergent Solutions**
- **Video: How Transformative Technologies Digitalize Industrial IoT**

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