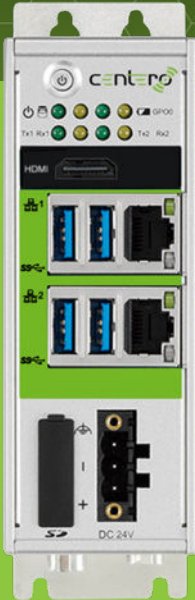# UNISON ISA100 Wireless Field Network Manager Product Brief

PRODUCT OVERVIEW – Centero's UNISON Wireless Field Network Manager (WFNM) is an ISA100 Wireless (IEC62734) compliant Gateway. It provides wireless connectivity, network and security management to ISA100 Wireless mesh field instrument networks. It is suitable for installation in control rooms or cabinets, but also includes multiple remote antenna options for field wireless connectivity in both non-hazardous and hazardous areas. The ISA100 Wireless (IEC 62734) industrial IoT standard provides a robust wireless protocol for the full range of process measurement, control, safety and asset management applications. Deploy highly scalable networks that cover large geographic areas due to the market leading wireless range of Centero's WISA2 embedded wireless transceiver. Monitor, configure and manage field instruments via an intuitive web-based application and access both process values and diagnostics through MODBUS/TCP, OPC UA and GSAP/GCI plant network interfaces.

PRODUCT HIGHLIGHTS

| FEATURE	BENEFIT
Wireless Field Network Manager (WFNM)	Provides wireless field connectivity, network and security management to ISA100 Wireless instruments.
Wireless Field Connectivity	Wireless field network connectivity with remote antenna options for both non-hazardous and hazardous areas.
Form Factor	Compact, suitable for installation in control rooms or cabinets.
Highly Scalable ISA10 Wireless Deployments	Reduce CAPEX through highly scalable deployments of up to 200 field instruments per Gateway.
Wide Range of Process Burst Rates	Process data burst rates ranging from 500 ms to several hours meet the requirements for a wide variety of use cases for field instruments engaged in both control and monitoring.
UNISON Application	Minimum training for plant personnel due to intuitive and user-friendly UNISON application structured after field device lifecycle with clear functional segregation.
Monitoring and Control	Native support for ISA100 Wireless monitoring as well as advanced control features.

FEATURE	BENEFIT
MODBUS/TCP, OPC UA and GSAP/GCI Plant Connectivity	Monitor, configure and control field instruments via the Gateway from a wide gamut of plant network or cloud-hosted applications such as Distributed Control Systems, historians or vendor specific client applications.
Advanced Diagnostics	Native support for monitoring and trending field instrument diagnostics such as NAMUR diagnostics and advanced field instrument health diagnostics.
Over-the-Air Provisioning	Significantly reduced field instrument deployment duration and complexity through wireless provisioning capability supported by advanced security features.
Support for DD/CF Files	Full field instrument capabilities are exposed in the UNISON application and available to users through native support for loading and parsing of DD/CF files.
Network Profiles	Optimal network profile results in optimized field instrument battery life, data latency, network deployment time and bandwidth allocation.
Mesh Networking Rules	Users can enforce and lock mesh network topologies and routes for highly predictable communications needed in safety and mission critical applications.
Security	Supports two-layered ISA100 Wireless authentication and AES-128 encryption, SSL/HTTPS certificate-based Gateway access and advanced OTA provisioning security mechanisms.
Over-the-Air Upgrades	Supports secured Over-the-Air upgrades for field instruments.
Remote Upgrade Capability	All Gateway software and firmware entities can be upgraded remotely via a secure encrypted and authenticated process.

Meet the UNISON Family of Products

The UNISON ISA100 Wireless product family includes various Field Gateway and Wireless Field Network Manager (WFNM) models depending on the wireless connectivity desired (ISA100 Wireless and Wi-Fi MESH+) and type of area where the equipment will be installed (hazardous or non-hazardous areas).

MODEL	DESCRIPTION
NIO200IAG Line	Field Wireless Gateways – certified for operation in C1D2/ATEX rated hazardous areas or non-hazardous areas, optional Wi-Fi MESH+ wireless connectivity.
WFNM Line	Field Wireless Network Managers – small form factor appliances, wireless field connectivity for hazardous and non-hazardous areas.
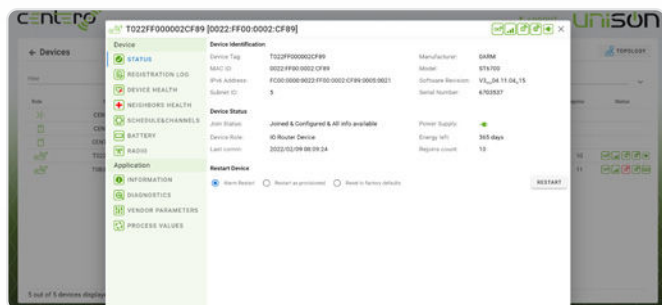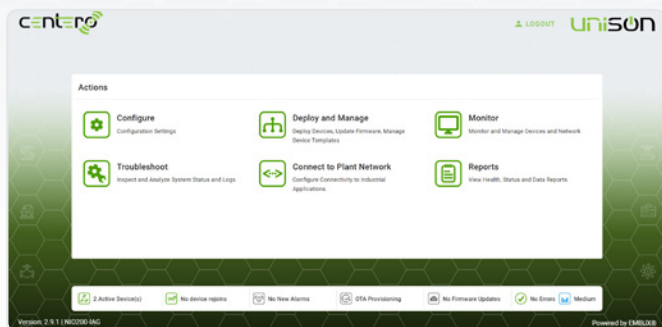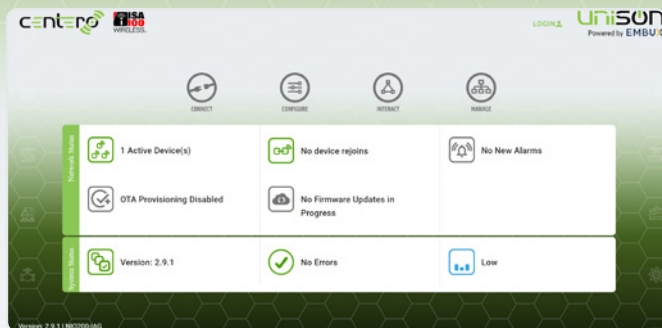
UNISON Management and Control Application

The UNISON application is structured as a suite of "apps and wizards" modeled based on the field instrument's lifecycle with clear functional segregation requiring minim training for plant personnel. A Network Status banner that is continuously displayed at the bottom of the application gives the user real-time insights into what is currently happing in the ISA100 Wireless network and provides actionable shortcut icons that direct the user to the appropriate page. It displays actionable data such as the number of field instruments active, device rejoins, alarms, state of the Over-the-Air and firmware upgrade processes as well as error notifications.

The UNISON Field Gateway hosts a feature rich, user friendly and intuitive application. The UNISON Management and Control application is web-based and allows users to easily connect, control, manage, and monitor ISA100 Wireless field instruments engaged in various applications such as process automation monitoring and control, condition monitoring, steam trap and relief valve monitoring, gas detection and safety applications, valve control and monitoring, predictive maintenance, corrosion monitoring and many other. The UNISON application allows users to visualize process data, alerts and alarms as well as manage and configure all aspects of the ISA100 Wireless field instruments and network.

Configure – Centralized configuration settings for the ISA100 Wireless networks, the UNISON Gateway as well as various user preferences. It also includes an interactive Configuration Wizard that provides a guided step-by-step process for configuring the UNISON Gateway and the ISA100 Wireless network.

Deploy and Manage – Used during the deployment phase of the ISA100 Wireless network. Allows users to provision field instruments over-the-air, monitor the join process, load DD/CF field instrument files and upgrade the field instruments over-the-air.

Monitor – Monitoring of the field instruments during their normal operation. Includes an actionable device list of all ISA100 network devices, process values and health diagnostics data and various topology views of all assets deployed.

Troubleshoot – Displays all alerts, alarms and events generated by the ISA100 Wireless field instruments. Also includes detailed logging capabilities for various device and network level events, alarms, and alerts.

Connect to Plant Network – Configure and manage Gateway high-side interfaces for connectivity to the plant network.

Reports – View, analyze and export various field instrument and network level reports.

ISA100 Wireless Field Connectivity Options

The UNISON WFNM provides wireless field connectivity to ISA100 Wireless instruments. It is offered with various wireless connectivity options for both hazardous and non-hazardous areas. The UNISON WFNM can be installed in control rooms or cabinets. Wireless field connectivity is provided through remote antennas that are connected via RF extension cables of various lengths.

Antenna	Field Wireless Connectivity	Area Type
	Direct mount omni-directional antenna suitable for indoor deployments. This is the default antenna shipped with the UNISON WFNM.	Non-hazardous – indoor antenna.
	Remote, rugged, omni-directional antenna suitable for deployments in hazardous areas. Can be wall or pole mounted.	Hazardous ATEX Zone 1 or Zone 2 areas – outdoor antenna.
	Remote, rugged, high-gain, omni-directional antenna suitable for deployments in harsh locations. Can be wall or pole mounted.	Harsh locations – outdoor antenna.

ISA100 Wireless System Management

The UNISON WFNM hosts the ISA100 Wireless system manager entity. The ISA100 Wireless system manager is responsible for managing and ensuring the proper functioning of all ISA100 Wireless field instruments and backbone routers that are part of the ISA100 network. It manages all aspects of these devices throughout their entire lifecycle including the provisioning and joining phases as well as the operational and decommissioning phases.

OVER-THE-AIR AND OOB PROVISIONING

All ISA100 Wireless field devices including field instruments as well as Backbone Routers need to be provided the appropriate security credentials that will allows them to securely join an ISA100 Wireless network. These security credentials are provided during the provisioning phase. The UNISON Gateway supports ISA100 Wireless compliant Over-the-Air (OTA) as well as out-of-band (OOB) provisioning.

Over-the-air provisioning is an advanced feature supported by the ISA100 Wireless standard that allows the system and security manager to inject the credentials needed to join the network wirelessly. The UNISON Gateway supports various OTA provisioning flows all augmented by additional, robust security mechanisms that ensure that only authorized devices will have access to these security credentials.

JOIN AND NETWORK FORMATION

The system manager is also responsible for discovery of the field instruments and backbone routers that want to join the ISA100 Wireless network, and jointly with the security manager also responsible for the join process. Once devices have joined, the system manager will configure the field instruments to form mesh subnets that are optimized to ensure the highest level of reliability for the wireless communications as well as prolonging the battery life of these instruments. Reliability of wireless communications is ensured through path diversity (mesh topologies), frequency diversity (frequency hopping) and time diversity (TDMA) as well as optimal wireless media contention/access. All these mechanisms are managed by the system manager that collects health diagnostics and continuously improves the reliability of communications of field instruments as well as the entire mesh network.

OPERATIONAL MANAGEMENT

Once the field instruments have joined the ISA100 Wireless network, the system manager is responsible for managing the day-to-day operation of these instruments according to their intended needs. This includes allocating network resources to meet the instrument's requirements. The UNISON ISA100 Wireless system manager accommodates

field instruments that are engaged in both monitoring as well as control applications and use cases.

It will allocate network resources to allow the instruments to periodically publish process values and health diagnostics based on their requirements. It will also allocate network resources to allow these instruments to have bi-directional communications with the Gateway as well as send alerts/alarms as needed.

OVER-THE-AIR FIRMWARE AND SOFTWARE UPGRADES
The UNISON WFNM boasts remote upgrade capabilities of all firmware/software entities that are operational in the ISA100 Wireless network. This includes native support for Over-the-air firmware upgrades for all field instruments, including their wireless communication stacks and vendor specific firmware running on the application processor. It also hosts remote upgrade capabilities for all software and firmware entities running on the backbone routers as well as the Gateway itself via an AES-256 encrypted and authenticated, secure process.

Wireless Networking

ROUTING AND TOPOLOGY RULES
ISA100 Wireless field mesh networks consist of field instruments that route data on behalf of each other in a multi-hop topology. Routing decisions are continuously optimized by the System Manager that resides in the Gateway. Hence, mesh networks form self-healing, dynamic topologies with multiple routing options optimized to minimize hop count and maximize reliability and battery life.

Safety applications have strict requirements for data availability, timeliness, reliability, and latency which can only be met by restricting the inherent dynamic nature of self-healing, mesh topologies.
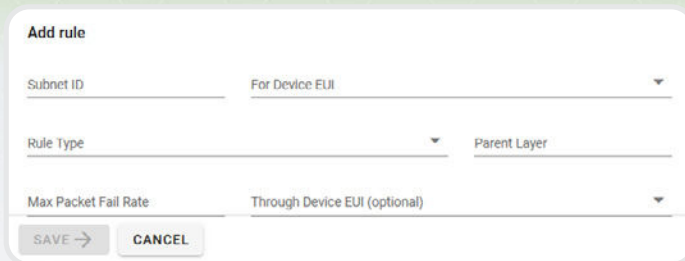
The UNISON WFNM includes a Mesh Topology

Configuration console that allows users to enforce or lock in specific, pre-determined mesh routes (source routing) to where reliability and latency are predictable.

These allow users to control the stability of the mesh routes and the overall topology of the mesh network. For example, the settings can force a field instrument to communicate only with the Field Wireless Access Point or a single mesh parent. Users can also restrict the depth of the mesh network (hop count) or enforce rules that ensure that various communication reliability and bandwidth requirements are met.

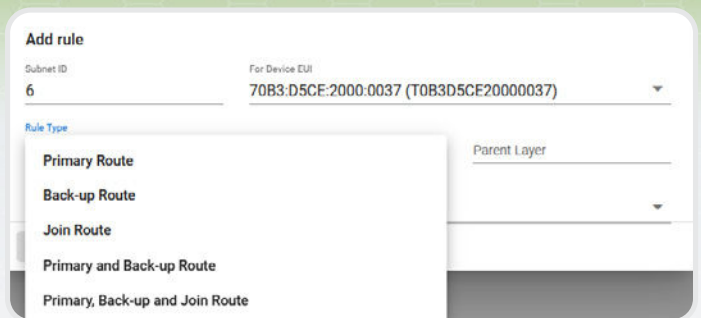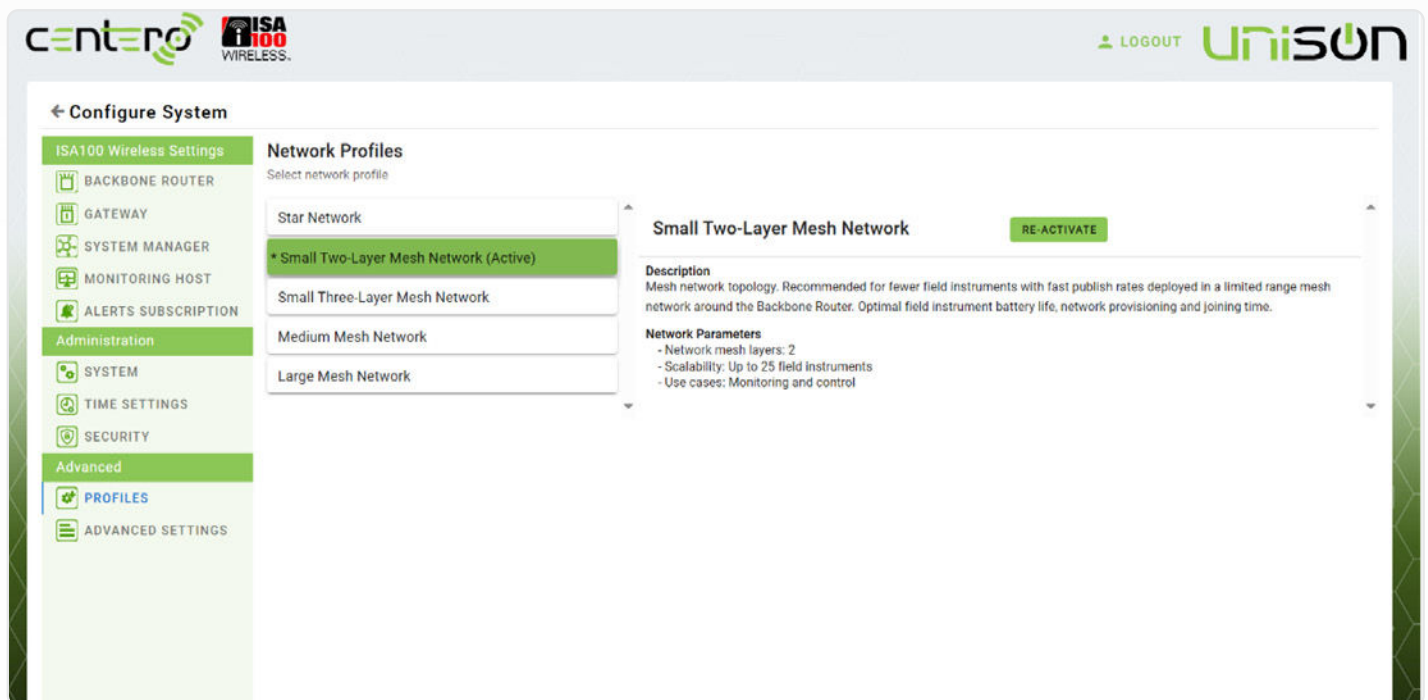Multiple rules can be set in parallel depending on the safety use case and the performance targets.
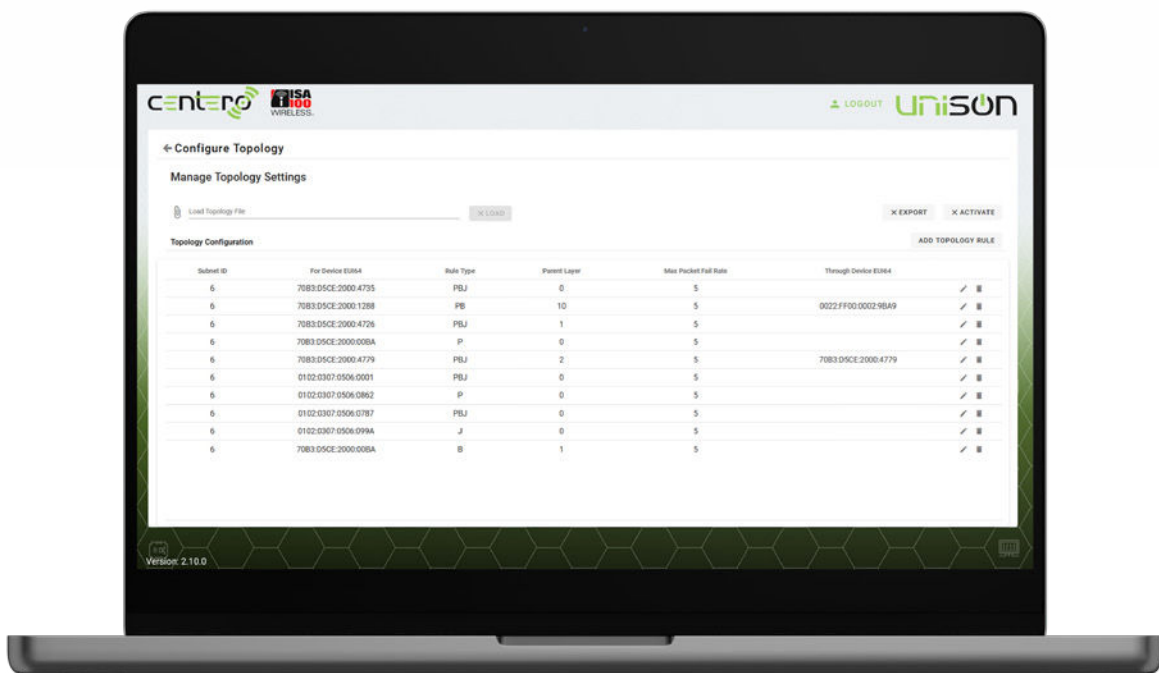
NETWORK PROFILES

The UNISON WFNM supports network profiles that are tailored to networks of various sizes and use cases. It includes five pre-defined network profiles. Users can also define their own network profile that is customized to their needs. Parameters that are customizable include the number of field instruments that will be deployed (scalability), mesh topology and mesh depth (hop count).

Choosing the optimal network profile will result in optimized field instrument battery life, data latency, network deployment time and bandwidth allocation.

Security Features

The UNISON WFNM includes advanced security features and mechanism that ensure data confidentiality, authenticity, integrity, and availability for the ISA100 Wireless connectivity.

ISA100 WIRELESS SECURITY

The UNISON WFNM hosts the ISA100 Wireless security manager entity that is responsible for managing all security facets of the ISA100 Wireless field devices and network. This includes the join and provisioning process for all ISA100 Wireless field devices and backbone routers. Once the ISA100 Wireless field devices have joined the network the security manager oversees all security aspects during the operational life of the field device.

Network Provisioning Phase

When an OOB provisioning method is used, an OOB provisioning tool is needed to inject the security credentials generated by the security manager into the field instrument. The UNISON WFNM includes various access control mechanisms that only allow accredited field instruments to join the ISA100 Wireless network.

When OTA provisioning is used, the UNISON Gateway will inject the security credentials into the field instrument wirelessly. The OTA provisioning mechanism supported by the UNISON WFNM also includes additional security mechanisms that allow for full control of the process via manual or automatic approval as well as access control lists that ensure that only pre-approved field instrument are allowed to be provisioned.

Network Join Phase

The security manager is also responsible for managing the network join phase. The UNISON WFNM also includes additional access control security features that ensure that only authorized field instruments are allowed to join the network. Following the successful completion of the join phase, the security manager hands out the appropriate cryptographic materials needed for the operational phase of the field instrument.

Operational Phase

ISA100 Wireless networks use a two layered security construct that consists of link-layer (hop-to-hop) and transport layer (end-to-end) security relationships. All data transactions are authenticated and optionally encrypted using AES-128 at the link-layer. Link-layer security (hop-to-hop) secures data transactions within the scope of the ISA100 mesh network and terminates at the Backbone Router. All data transactions are authenticated and encrypted using AES-128 at the transport layer. Transport layer security secures transactions within the scope of the entire ISA100 Wireless network and terminates in the Gateway. The security manager is responsible for security key management, including periodic key renewal and key revocation. Security alerts are also received and managed by the security manager and displayed in the UNISON WFNM.

Gateway Access

Gateway access from the plant network is secured using SSL/HTTPS certificates. An airgap between the ISA100 Wireless network and data accesses from the plant network ensures that the two networks are segregated from a security standpoint. All ISA100 Wireless data transactions terminate in the Gateway, are buffered or stored and are accessible via various standards based high-side protocol such as MODBUS, GSAP/GCI or OPC UA. This adds to the robustness of the security construct by protecting the ISA100 Wireless network from cybersecurity attacks that could potentially be initiated via the plant network.

ISA100 Wireless Gateway Features

The ISA100 Wireless Gateway software entity is responsible for the application layer connectivity between the ISA100 Wireless field instruments and the plant network. It is responsible for receiving and sending as well as buffering, caching and storing application payloads. The Gateway also provides plant network connectivity via various standard based high-side interfaces.

The Gateway supports various data flows including published data that is periodically sent by the field instruments (monitoring) or Gateway (control). It also supports bi-directional client/server data exchanges between the field instruments and the Gateway as well as alarms and alerts.

Device Description (DD) and Capability Files (CF)

The UNISON Gateway boasts native support for ISA100 Wireless DD/CF files. DD and CF files contain a full description of the field instrument's capabilities including ISA100 Wireless standard based as well as vendor specific capabilities.

The DD/CF files allow vendors to easily integrate their field instruments with Distributed Control Systems or other software entities running on the plant network. These files also enable and greatly simplify configuration and/or commissioning of the device. The UNISON Gateway allows users to upload DD/CF files that are then automatically associated with the field instruments that operate in the ISA100 Wireless network. The DD/CF files are parsed, and the field instrument's capabilities are exposed in the UNISON application and available to users.

Control Features

The UNISON Gateway supports a set of features specifically intended for wireless process control use cases and field instruments such as valve positioners, valve controllers, switches, or relays. The UNISON Gateway includes control capabilities that allow it to periodically publish control values to the field instrument. Field instruments can subscribe to these output data channels that are periodically published by the Gateway. These control values can be mapped into the Gateway via the MODBUS high-side interface.

Advanced Diagnostics

The UNISON Gateway boasts native support for various advanced field instrument diagnostics. If the field

instrument supports these diagnostics the Gateway will allow users to proactively receive, observe and clear various advanced diagnostics.

DEVICE SELF-DIAGNOSIS NAMUR 107 DIAGNOSTICS

Device diagnostics that are based on the NAMUR NE107 "Self-Monitoring and Diagnosis of Field Devices" standard are natively supported by the UNISON Gateway. These diagnostic flags give a lot of insight into the health of the field instrument including proper hardware and firmware operation. All four categories (types) of diagnostics are supported including Failure, Function Check, Maintenance Required and Out-of-Specification NAMUR diagnostics.

ADVANCED BATTERY LIFE DIAGNOSTICS

The UNISON Gateway supports various advanced real-time battery life diagnostics that allow for accurate and precise battery life prediction. These diagnostics also allow users to troubleshoot battery life issues in real-time and are useful when auditing the field instrument's battery life in field deployments.

ADVANCED WIRELESS HEALTH DIAGNOSTICS

Advanced wireless real-time health diagnostics are exposed in the UNISON Gateway assuming the field instrument reports these diagnostics. Advanced wireless health diagnostics are useful when doing real-time troubleshooting of wireless mesh connectivity issues in field deployments.

Reports

Advanced reporting capabilities allow users to easily assess the real-time health of assets deployed by accessing both field instrument and network level reports. The Network Health Report gives the user insights into the overall functioning of the entire ISA100 Wireless network. The Devices Health Report provides insights into the health of each ISA100 Wireless device operating in the network. The Battery Life Status Report gives a centralized view of the battery life status of all operational ISA100 Wireless field instruments. The Device Readings Report collects and lists the process values and parameters reported by all operational ISA100 Wireless field instruments.

Plant Network Connectivity Interfaces

The UNISON Gateway provides connectivity to the plant network through various standards-based interfaces.

MODBUS TCP

The UNISON Gateway hosts a MODBUS TCP server that allows software entities running on the plant network to extract data reported by the ISA100 Wireless field instruments. Any of the data parameters reported by the field devices can be mapped into MODBUS registers including process data as well as health and diagnostics data. Gateway and Wireless Access Point diagnostics can also be mapped into MODBUS registers. It also supports control use cases by allowing users to map process values into holding registers that are then periodically published to the field instruments.

Mapping parameters into the MODBUS TCP server is done via a user-friendly, drag-and drop interface.

OPC UA

OPC is the interoperability standard for the secure and reliable exchange of data and information in the industrial automation space and in other industries. It is platform independent and ensures the seamless flow of information among devices from multiple vendors. OPC UA is a platform independent, service-oriented, secure, and extensible framework that allows for information modelling for various protocols and technologies.

The UNISON Gateway hosts an OPC UA server that is compliant to the ISA100 Wireless information model standardized jointly by the OPC Foundation and the WCI (Wireless Compliance Institute). It includes comprehensive information models for ISA100 Wireless field instruments, backbone routers and networks. The ISA100 Wireless information models allows OPC UA client applications to extract rich data sets from ISA100 Wireless field instruments, backbone routers and networks that cover all functional facets.

GCI/GSAP

The GCI (Gateway General Client Interface) is a standard based, feature rich, high-side interface specifically developed for ISA100 Wireless field instruments and networks. The General Client Interface provides an open and interoperable multi-vendor interface between a GCI server residing on the UNISON Gateway and a GCI client running on the plant network. It is compliant to Wireless Compliance Institute (WCI) standard specification and promotes easier integration of information from the ISA100 Wireless field instruments with higher level monitoring and control applications, enterprise wide as well as vendor specific applications.

TARGET VERTICAL MARKETS AND APPLICATIONS

Verticals
- Oil and Gas
- Petrochemical
- Paper and Pulp
- Mining
- Factory Automation
- Power Generation
- Power Distribution

Applications and Use Cases
- Process Automation
- Temperature and Pressure Monitoring
- Condition Monitoring
- Valve Positioning and Control
- Steam Trap and Relief Valve Monitoring
- Predictive Maintenance
- Gas Monitoring
- Safety applications
- Corrosion Monitoring
- Tank Level Monitoring

It allows plant network client applications to configure field instruments and receive/send process data as well as health diagnostics to/from the ISA100 Wireless field instruments. The ISA100 protocol also supports tunneling of other protocols at the application layer. Tunneling and encapsulation of other standard based or proprietary application layer protocols is supported by the GCI interface.

The GSAP (Gateway Service Access Point) is the legacy precursor of the GCI interface. It is supported by the UNISON Gateway for legacy connectivity to client applications that predate the GCI specification and interface.

Specifications

ISA100 WIRELESS SPECIFICATIONS		
Wireless Communication		Standard: IEEE 802.15.4 Data Rate: 250 kbps Modulation: Q-PSK Spread Spectrum: DSSS RF Output Power: Max +16 dBm Sensitivity: -104 dBm Link budget: 120 dB Communication Range: 0.75 miles (1200 meters LoS) Connector: SMA female
Antenna Options	Antenna 1	Direct mount, 2 dBi, omni-directional whip antenna, SMA male connector.
	Antenna 2	Remote mount, 4 dBi, omni-directional antenna for ATEX Zone 1 and 2 area classifications, SMA-male connector, with L-mount bracket for wall or pipe installations.
	Antenna 3	Remote mount, 8 dBi, omni-directional antenna for, N-male connector, with L-mount bracket for wall or pipe installations.
Scalability		Up to 200 ISA100 Wireless field instruments
Mesh Network Depth		Configurable, up to 3 hops
Publish Report Rates		Configurable: 0.5s, 1s, 2s, 5s, 10s, 30s, 1m, 5m, 15m, 30m and 60m
Scalability for Publish Rates Supported		Publish Rate

Scalability for Publish Rates Supported	Publish Rate	Number of Field Instruments
	0.5 seconds	25 field instruments[1,2]
	1 second	50 field instruments[1,2]
	2 seconds	100 field instruments
	5 seconds	150 field instruments
	10s, 15s, 20s, 1m, 30 m, 60 m	200 field instruments
	[1] Client/server (bidirectional) communication rate at max 7 seconds for each field instrument	
	[2] Number of concurrent wireless firmware upgrades - 3 field instruments	

| MODBUS-TCP Interface	MODBUS/TCP, OPC UA, GCI/GSAP
CERTIFICATIONS AND COMPLIANCE	
Wireless Certifications	FCC/ISED Part 15.247, 15.407 ETSI EN 300 328 V2.2.2 (2019-07) per RED 2014/53/EU
Safety, EMI/ESD and Immunity	EN 301 489-1 V2.1.1 and EN 301 489-17 V3.1.1 • Emissions per EN5503 • IEC 61000-4-2 level 4 ESD immunity • IEC 61000-4-3 - RFI • EMC Immunity per EN 61000-6-2 and EN 61000-6-4
RoHS Compliance	Compliant to directive 2015/863/EU - RoHS 3.

HARDWARE SPECIFICATIONS	
Dimensions	Imperial: 1.82" (W) x 3.94" (D) x 4.72" (H) Metric: 46.2 mm (W) x 100 mm (D) x 120 mm (H)
Power	24 VDC ±20%
Installation	DIN rail or wall
Environment Protection	Operating temperature: -20 to 70°C (per IEC60068-2-1, IEC60068-2-2, IEC60068-2-14) Storage temperature: -20 to 75°C Humidity: 10% to 93% maximum (non-condensing) Vibration: Random: 2Grms @ 5~500 Hz, IEC60068-2-64, Sinusoidal: 2Grms @ 5~500 Hz, IEC60068-2-6 Shock protection: 50G, half-sine, 11 ms (per IEC60068-27) Altitude: up to 2000 m
WARRANTY AND LICENSING	
Warranty	2 years
Licensing	No recurring license fees

Dimensional Drawings

Units: mm
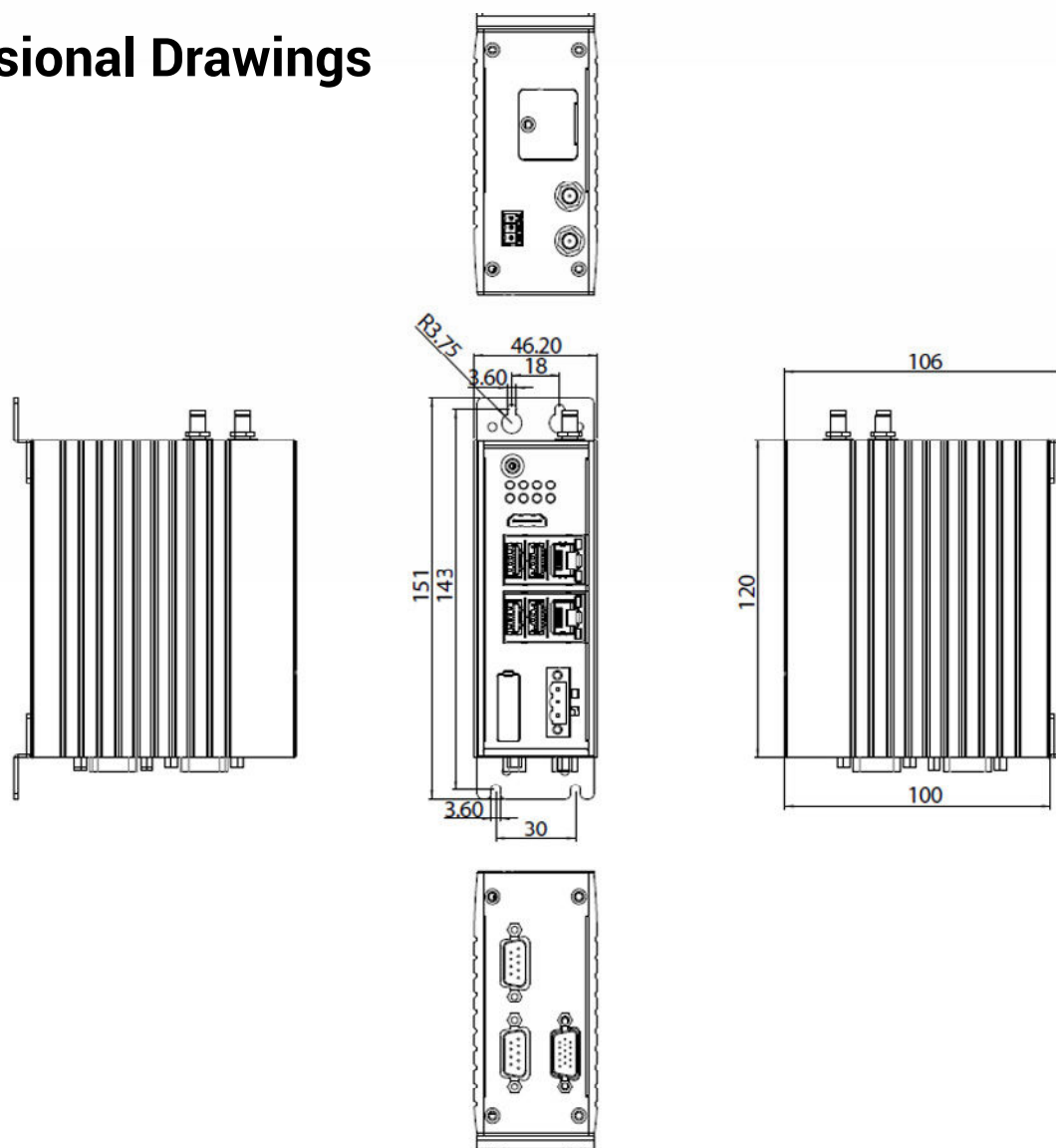
ORDERING INFORMATION

| Model	Part Number	Description
UNISON WFNM	WFNM-LBA-ISA	UNISON ISA100 Wireless Field Network Manager – supports up to 50 field devices
	WFNM-LA-ISA	UNISON ISA100 Wireless Field Network Manager – supports up to 200 field devices

RELATED PRODUCTS

Model	Part Number	Description
UNISON NIO200IAG	NIO200IAG-C1D2	UNISON ISA100 Wireless Field Gateway, WiFi Mesh+ connectivity, UL C1D2 certified
UNISON NIO200IAG	NIO200IAG-ATEX	UNISON ISA100 Wireless Field Gateway, WiFi Mesh+ connectivity, ATEX certified
UNISON NIO200IRDK	NIO200IRDK	UNISON ISA100 Wireless Field Gateway, No WiFi
UNISON NIO200IDR	NIO200IDR-C1D2	UNISON ISA100 Wireless Field Gateway, WiFi Mesh+ connectivity, UL C1D2 certified
UNISON NIO200IDR	NIO200IDR-ATEX	UNISON ISA100 Wireless Field Gateway, WiFi Mesh+ connectivity, ATEX certified
WCI ISA100 Wireless Rapid Development Kit	ISA100RDKEN	ISA100 Wireless Rapid Development Kit

ACCESSORIES

Part Number	Description
ANT-WFNM1	Omnidirectional 2.4 GHz, 2 dBi gain antenna, swivel, SMA male connector.
ANT-WFNM2	Omnidirectional 2.4 GHz, 2 dBi gain antenna, swivel, SMA male connector – suitable deployments in ATEX Zone 1 and 2 rated areas.
ANT-WFNM3	High-gain, omnidirectional 2.4 GHz, 8 dBi gain antenna, N-male connector.
7A00000066X00	RF lightning arrester N-MALE to N-FEMALE
3M	RF cable – N-connectors – 3 meters length
6M	RF cable – N-connectors – 6 meters length
9M	RF cable – N-connectors – 9 meters length

Centero is a provider of wireless technologies, products and services for the Internet of Things.
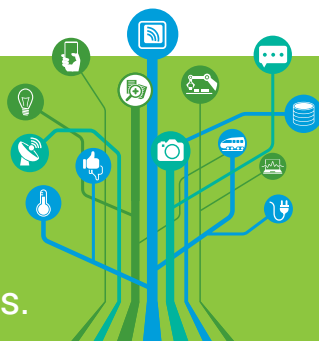
Centero is a privately owned technology company headquartered in Atlanta, Georgia. We are the forefront of the Industrial Internet of Things revolution which is transforming a wide array of vertical markets. Centero offers standards-based products and solutions for wireless Industrial IoT connectivity.

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