

FEATURE BRIEF

Wireless Process Automation with PROFINET

New 5G LAN technology from Celona now uniquely enables support for critical time-sensitive protocols such as PROFINET as well as other layer 2 protocols such as PROFIBUS, EtherNet/IP, EtherCAT, and Modbus TCP.

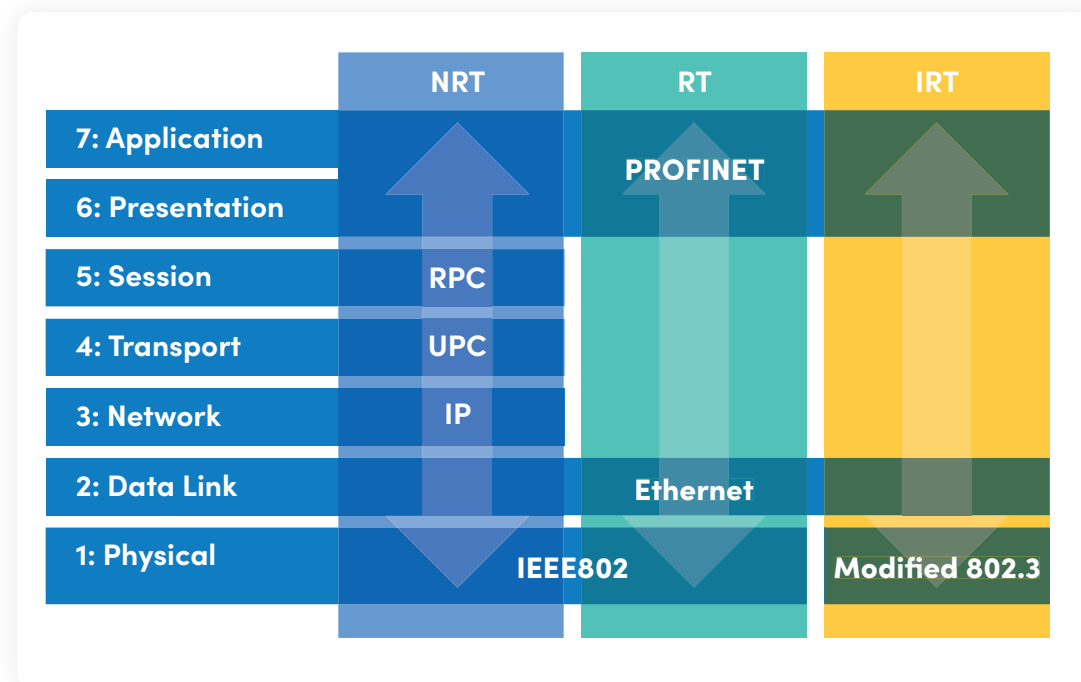
Originally conceived to operate over a wired network connection, PROFINET is a real-time industrial ethernet protocol used for communication between industrial automation systems, such as programmable logic controllers (PLCs) and other devices in industrial environments. While it lives at layer seven of the ISO/OSI model, it is typically transported over the data link layer using the 802.2 TCP/IP Ethernet standard.

TOP CHALLENGES RUNNING PROFINET OVER CONVENTIONAL WIRELESS

- Latency / Jitter
- Packet loss
- Retransmissions
- Connectivity interruptions

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PROFINET is employed in manufacturing, oil and gas, chemical, and pharmaceutical environments, such as assembly lines, robotic systems, and machine tools. It is used for process control, monitoring, and data acquisition – facilitating communication between different field devices, sensors, and control systems. This allows for seamless integration and coordination between different machines, robots, and control systems by enabling efficient coordination and synchronization of production processes.



Modern manufacturing facilities today are developing re-configurable tooling to provide flexibility to manufacture multiple widgets on the same assembly line. Re-configuring equipment using wired networks takes significant time and financial resources and offers limited flexibility for any future changes. In addition, Automated Mobile Robots (AMR) and Automated Guided Vehicles (AGV) require untethered access to existing control systems on the factory floor. These use cases are driving the need to “cut the cord” using wireless PROFINET based controls.

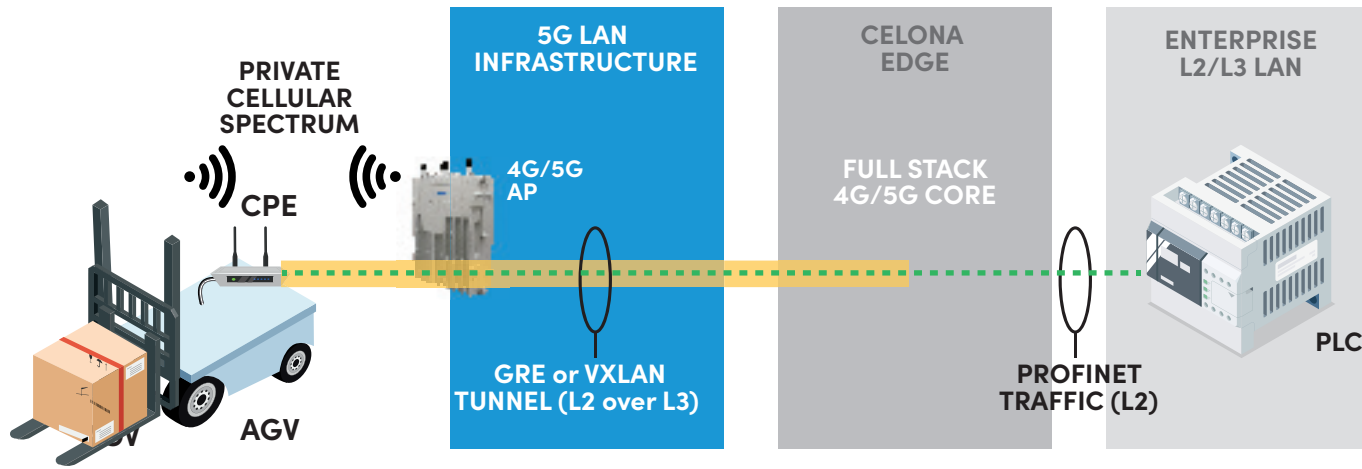
Overcoming PROFINET problems

Because the PROFINET protocol is extremely time-sensitive, any packet loss, re-transmissions, jitter, or latency can interrupt communication between end systems. This includes automated robots, and the programmable logic control (PLC) systems that control them. The inherent challenges with best effort wireless technology, such as Wi-Fi, can effectively render critical process production systems inoperable.

Highly reliable wireless connectivity

Celona 5G LANs are based on the use of new shared mid-band cellular spectrum. Operating within the 3.3-4.9 GHz range around the world, this shared spectrum is effectively interference free with media access strictly scheduled and centrally managed by the network. This enables the deterministic connectivity required to support PROFINET over a wireless infrastructure.

SUPPORTING PROFINET OVER 5G LANS



Dynamic L2 tunneling over 5G LANs

Celona 5G LANs uniquely employ Layer 2 GRE (general routing encapsulation) or VXLAN (virtual extensible LAN) tunneling techniques to carry PROFINET traffic over the 5G LAN. These tunnels are dynamically established from the Celona Edge and terminated on customer premise equipment (CPE), based on specific QoS policies and device groups defined within the Celona Orchestrator platform. PROFINET traffic is effectively transmitted in Layer 2 Ethernet frames and encapsulated within Layer 3 packets, which allows them to traverse network boundaries.

Intuitive point and click administration

Within a centralized 5G LAN orchestration system, IT or OT administrators easily enable PROFINET traffic management by simply defining a device group and designating a single network-wide policy that is automatically applied to traffic for that device group. This Microslicing™ policy enforces strict latency, jitter, packet loss and throughput thresholds for discrete device groups or applications.

The screenshot shows the 'Advanced Network Config' page for a device group named 'PROFINET - AGV'. The configuration includes:

- Name: PROFINET - AGV
- Bridge: Enable (selected), Disable
- GRE: VXLAN (selected), GRE
- VLAN ID: 101
- IP Multicasting: Enable, Disable
- Supernetting: Enable, Disable
- Subnet: (empty field)

Valid Format: 173.162.160.0/255.255.255.0, 173.162.160.0/255.255.255.0

CANCEL UPDATE

Defining network policy on Celona Edge cluster to enable GRE or VXLAN tunnel to support PROFINET

The screenshot shows the 'Device Groups < Edit' page for a device group named 'GRP-AGV'. The configuration includes:

- Name: GRP-AGV
- Devices: ADD DEVICES
- IP Domain: EXT-IOT (External)
- Choose Edge Cluster: hqbeta_cluster
- Advanced Network Configuration: PROFINET - AGV

CANCEL UPDATE

Applying advanced networking policy to specific device group

Zero touch experience

Since Layer 2 communication now takes place over the 5G LAN, a central controller can wirelessly communicate with decentralized I/O modules across the factory floor, without additional wiring and also with mobile devices such as AGVs via PROFINET. Due to 5G LAN's policy-based framework, IT/OT administrators can configure the policy on Celona Orchestrator and apply it to hundreds of sites and thousands of devices with a single policy definition. This saves costs, reduces maintenance, and radically streamlines the operational burden for IT/OT staff who would otherwise be forced to manually configure individual tunnels for each system.

Robust wireless security

From a security perspective, Celona 5G LANs offer enhanced security features essential to ensuring protected communications between PLCs and the end systems they are controlling. This includes L1-L7 data encryption, secure SIM-based device authentication, traffic segmentation and advanced access controls that provide industrial systems a higher level of security compared to conventional wireless alternatives.

TANGIBLE BENEFITS MAXIMIZING PRODUCTIVITY AND ROI

- Wireless PROFINET allows flexibility in moving machinery within the factory to support reconfigurable assembly lines to improve productivity and ROI.
- It allows for existing PROFINET infrastructure to be mobility enabled to connect to equipment such as autonomous AGV and AMRs used on the factory floor.
- Single network-wide policy automatically applied to hundreds of sites and thousands of devices reduces tedious network configuration
- Reduction in wireless network interruptions that cause process automation failures.
- Increased flexibility and agility for process automation systems
- Streamlined operational burdens for IT and OT staff



Use Case studies

celona.io/case-studies



Proof of Concept

celona.io/journey



Custom demo

celona.io/custom-demo

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