Using SyncMetra Deterministic Private 5G for Autonomous Mobile Robots

Understand how SyncMetra supports secure, scalable, and highly reliable networking platforms that enables autonomous mobile robots to operate safely, coordinate efficiently, and scale confidently as organizations embrace the next generation of AI-powered automation.

Using SyncMetra® Deterministic Private 5G for Autonomous Mobile Robots

Introduction

Canoga Perkins's SyncMetra 100 is an advanced, feature rich, 5G TSN Switch purpose built for public and private 5G and beyond mission critical applications that require deterministic and guaranteed data delivery in a specific time window.

SyncMetra 100 guarantees bounded latency with no data loss. It is well suited for deployment of 5G disaggregated networks in Industry 4.0, gaming, XR, autonomous vehicles, and any applications that require guaranteed data delivery in a specific time window.

Private 5G networks are used across several industries. The SyncMetra 100 product is designed to meet and exceed stringent bandwidth, latency, and scalability performance demands of Private 5G now and in the foreseeable future.

SyncMetra 100 is fully programmable, allowing customers to extend connectivity and network capabilities as specifications continue to evolve. SyncMetra 100 simplifies the end-to-end network architecture significantly reducing operating costs. SyncMetra 100 offers AI Fabric technology to enhance Quality of Service (QoS), especially in high traffic or unpredictable network environments. It also features a Lossless Fabric that guarantees ultra-low latency and minimal jitter, which are critical for TSN applications.

In this paper, we will explore how networks that are powered by SyncMetra can support Autonomous Mobile Robots (AMRs) in continuous visual inspections, sophisticated decision making, reduction of response times and much more.

Using SyncMetra for Autonomous Mobile Robots

Autonomous mobile robots are increasingly becoming indispensable across manufacturing, warehousing, logistics, healthcare, and critical infrastructure because they combine mobility, artificial intelligence, and real-time decision making to automate tasks that previously required human judgment.

Industry analysts expect the global AMR market to grow from approximately $2.25 billion in 2025 to more than $4.5 billion by 2030 as organizations invest in automation to improve productivity, address labor shortages, and create more agile operations. Today's AMRs can be deployed quickly, learn new tasks regularly, and adapt to dynamic environments. They have become one of the foundational technologies supporting the modern digital manufacturing environment.

Modern manufacturing and logistics environments demand far greater flexibility. Product lifecycles are shorter, customer demand changes rapidly, and facilities must frequently reconfigure workflows without rebuilding entire production lines. AMRs bring intelligence and mobility to these environments, allowing automation to move beyond fixed workstations and into virtually every operational process.

This evolution has only been possible because several technologies have matured simultaneously. High-resolution cameras provide robots with continuous visual awareness while computer vision enables them to identify objects, understand their surroundings, and safely navigate dynamic environments.

Deep learning and generative AI allow robots to interpret instructions, learn from experience, and make increasingly sophisticated decisions without extensive programming. Edge AI computing processes massive amounts of sensor data locally to reduce response times and improve security.

Autonomous robots constantly exchange data with edge AI platforms, fleet management software, warehouse management systems, and other robots operating throughout the facility. As robots become more intelligent, the ability to deliver deterministic, bounded-latency communications has become a fundamental requirement for safe, reliable, and scalable autonomous operations.

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Source: MarketsandMarkets 2025, "AMR Market Worth"

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Major Categories of Autonomous Mobile Robots

AMRs are not just transforming manufacturing. AMRs are currently thriving in various industries:

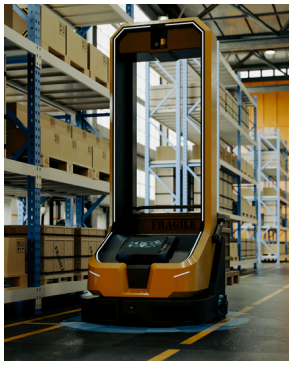
Warehousing and Logistics
Autonomous robots accelerate picking, inventory movement, replenishment, and fulfillment while coordinating hundreds of simultaneous workflows.

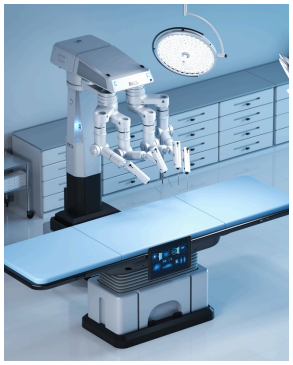
Healthcare
Medical robots automate material transport, pharmacy operations, surgical assistance, and patient services while improving operational efficiency and patient care.

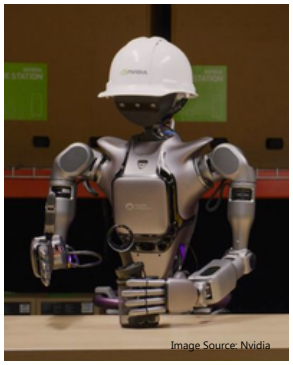
Construction and Industrial Inspection
Ground robots and autonomous drones inspect infrastructure, perform hazardous tasks, and automate maintenance activities in environments that present safety risks for workers.

Defense and Public Safety
Autonomous vehicles provide reconnaissance, surveillance, logistics, and security operations while minimizing human exposure to dangerous situations.

Humanoid Robotics
The newest generation of robots combines AI, computer vision, and human-like dexterity to automate tasks previously considered too complex or unpredictable for machines.







Why AMRs Require Deterministic Networks

Every AMR continuously exchanges navigation data, camera images, sensor information, safety commands, and operational instructions with fleet management software, warehouse management systems (WMS), warehouse execution systems (WES), and edge AI platforms. Hundreds of robots may simultaneously communicate while coordinating movements, avoiding collisions, optimizing routes, and responding to changing operating conditions.

The data packets that make up these communications cannot be delayed or delivered unpredictably. A delayed stop command or interrupted navigation update can reduce productivity or create a safety risk.

Private 5G provides secure, dedicated wireless connectivity. When combined with deterministic networking and bounded-latency communications, private 5G delivers the predictable network performance required for AI-driven robotics.

The Evolution of AMR Networking

Wired Automation

Early industrial robots relied on dedicated control cables while automated guided vehicles (AGVs) followed embedded guide wires or magnetic strips.

Industrial Wi-Fi

Wi-Fi enabled mobile robotics but introduced interference, roaming delays, inconsistent latency, and limited scalability in demanding industrial environments.

Deterministic Private 5G

Modern private 5G networks combined with edge computing and deterministic networking provide the bounded latency, seamless mobility, and predictable performance required for AI-powered autonomous systems.

Addressing the Challenge

Artificial intelligence, computer vision, edge computing, and autonomous decision making are enabling AMRs to perform increasingly sophisticated tasks across manufacturing, logistics, healthcare, utilities, and critical infrastructure. As these systems become more intelligent, the communications network becomes a mission-critical operational asset rather than simply a transport mechanism.

Canoga Perkins SyncMetra addresses this challenge by combining private 5G with deterministic networking and bounded-latency communications to deliver predictable performance for mission-critical automation. The result is a secure, scalable, and highly reliable networking platform that enables autonomous mobile robots to operate safely, coordinate efficiently, and scale confidently as organizations embrace the next generation of AI-powered automation.

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SyncMetra by Canoga Perkins

SyncMetra Delivers Deterministic Networking

Industrial automation requires deterministic communications that guarantee critical traffic receives priority, maintain predictable latency, and continue operating reliably as hundreds of robots compete for network resources. SyncMetra was designed specifically to meet these requirements.

Why Use SyncMetra for AMR Applications?

The SyncMetra platform combines private 5G infrastructure with deterministic networking technologies that deliver the communications foundation required for next-generation industrial automation. Its architecture provides:

- **Deterministic Communications:** SyncMetra guarantees QoS for mission-critical robot communications, ensuring navigation, safety, and control traffic always receive network priority.
- **Low Latency Communications:** Low Latency Communications enables robots to respond immediately to obstacle detection, emergency stop commands, route updates, and fleet coordination instructions.
- **High-Capacity Wireless Connectivity:** Support for high-bandwidth applications allows robots to continuously transmit high-resolution video, computer vision data, LiDAR information, and AI sensor streams without compromising performance.
- **Intelligent Network Orchestration:** SyncMetra Manager™ provides centralized orchestration, monitoring, policy management, and automation across the entire private wireless infrastructure, simplifying deployment while maintaining complete operational visibility.
- **Mission-Critical Security:** Enterprise-class authentication, encryption, and programmable security policies protect robot communications while providing complete network visibility and control.
- **Future-Proof Scalability:** As organizations expand from dozens to hundreds—or thousands—of autonomous devices, SyncMetra scales to support growing fleets without requiring network redesign.

In any AMR application, SyncMetra provides the deterministic networking foundation required for reliable autonomous operations.

About Canoga Perkins

With over five decades of engineering excellence, Canoga Perkins has consistently led the charge in delivering mission-critical network solutions that empower industries to innovate and thrive. Trusted by leading service providers, industrial enterprises, utilities, military branches, and government agencies, Canoga Perkins combines a rich legacy with a relentless drive for innovation. We lead with AI whenever possible, designing intelligent solutions that are not only reliable and secure but also scalable and adaptable, ensuring our clients are always at the forefront of technological advancement.

Learn more at www.canogaperkins.net.

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