

# ***CASE STUDY***

## ***How Santa Claus Used Digital Transformation with Automation & Edge AI at the North Pole***





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# Overview

With the advancements in AI and IoT, Santa is in need of an Industry 4.0 digital transformation! He found [Premio Inc.](#), a leader in Edge Computing Hardware Solutions, to help him understand the Edge Continuum to craft a wish list. Here's what he learned:

- ❄️ Insights on key Industry 4.0 trends (Industrial 5G, Edge AI, IT/OT Convergence)
- ❄️ Pitfalls of utilizing commercial hardware for industrial solutions
- ❄️ Understanding that there is no 'one-size-fits-all' solution in edge computing



# Santa's Challenges



1. Assembly



2. Logistics



3. Workshop Safety



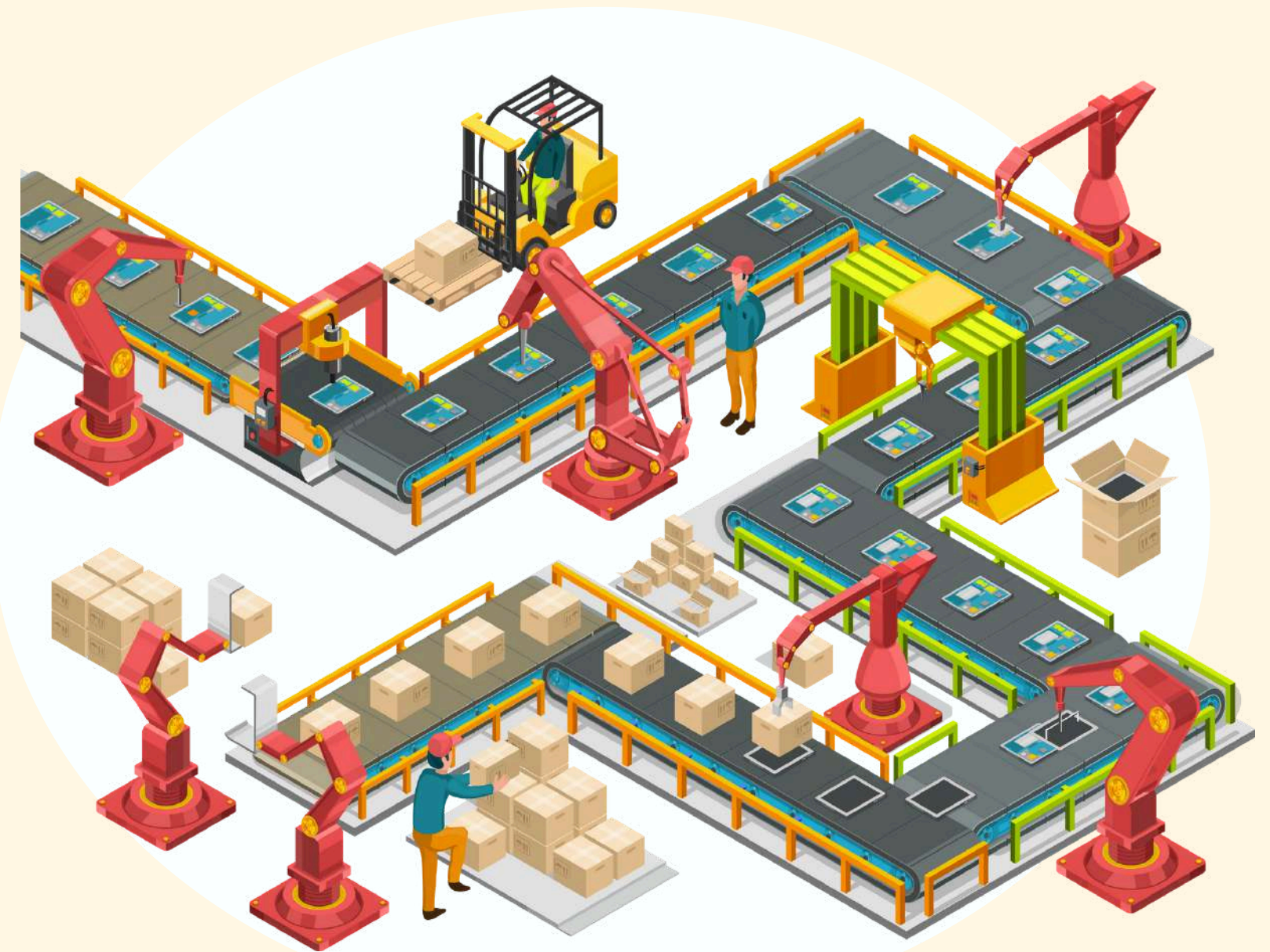
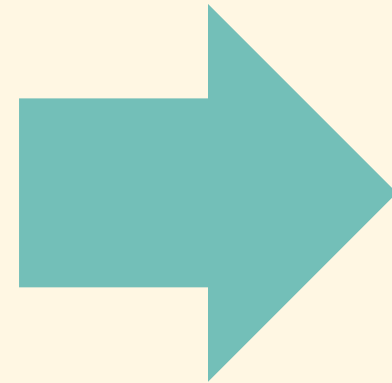
4. Command Center

- ★ Maintaining constant demand upkeep of toys with automation and robotics
- ★ Enhancing bottlenecked quality control process with machine vision
- ★ Increasing efficiency and data visualization with HMIs
- ★ Developing effective communications for factory floor machines using Private 5G





# Preface: A Before & After







# Santa's Digital Transformation Wishlist

Santa wants to share his wish list he created to help  
others their push their factories to Industry 4.0!

Check it out







## Santa's Digital Transformation Wishlist

1. Smart Robotics
2. AGV/AMRs & Automated Forklifts
3. Machine Vision
4. IoT Telematic Gateways
5. Smart Security & Surveillance
6. EMIs (Elf-Machine Interface)
7. Power Redundancy
8. Private 5G





# Challenge #1: Toy Assembly

Santa's toy assembly is struggling to keep up with demand, as slow production, quality control bottlenecks, and a lack of visibility into the toy-making machinery are slowing down the entire process. Elves are stretched thin, making it harder to deliver toys on time.



**Slow Production:** Toy assembly is taking too long to keep up with demand.



**Quality Control Bottleneck:** Excessive strain on elves due to inefficient quality checks.



**No Production Visibility:** Lack of status reports on toy-making machinery hampers workflow.





# Smart Robotics

## AI-Powered Precision for Toy Production

Robotic assembly lines helped modernize Santa's workshop. A fleet of AI-powered robotic arms enabled **high-speed, precision toy assembly** without sacrificing handcrafted quality.



Modernized Santa's workshop with AI-powered robotic arms



Increased productivity and efficiency of toy manufacturing



Scalable to meet growing toy demands





# RCO-6000 Series

## x86 Super-Rugged AI Edge Inference Computer

The RCO-6000 Series maximizes performance and flexibility by leveraging modular EDGEBoost technologies. It can seamlessly be configured to meet both high-specification I/O and edge AI deployment requirements. [Learn more >>](#)

- 13th Gen Intel Core Processor (35W TDP)
- Comprehensive IoT Connectivity
- EDGEBoost I/O (PoE Support, 10GbE, M12)
- EDGEBoost Node (GPU Acceleration, NVMe Storage, PCIe Expansion)



Smart Robotics



AGV/AMR



Automated Forklifts



NVR Surveillance





# BCO-6000 Series

## x86 Semi-Rugged Industrial Computer

The BCO-6000 Series features a slim low-profile design with plentiful IoT connectivity readily available on-board. It also includes PCIe expansion, enabling support for a low-profile GPU to accelerate AI tasks or accommodate additional add-on cards. [Learn more >>](#)

- 13th Gen Intel Core Processor (35W TDP)
- Comprehensive IoT Connectivity
- PCIe Expansion for GPU Acceleration
- Slim, Low-Profile, and Short-Depth Chassis



Smart Robotics



NVR Surveillance





# Machine Vision

## Metrology & Quality Inspection

Manual inspection of toys for both time-consuming and prone to elf error. By implementing machine vision metrology, Santa's workshop has revolutionized quality control, **enabling automated inspection systems to detect even the smallest flaws with unprecedented accuracy and speed.**



Streamlined a strenuous bottleneck in workshop automation

Increased defect detection accuracy and toy quality

Continuous performance alleviates elf-prone errors and fatigue



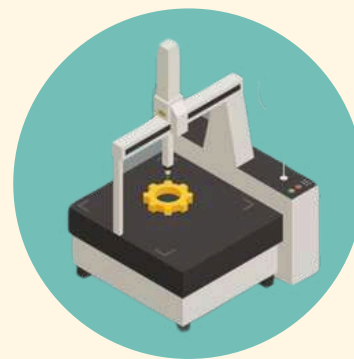


# VCO-6000 Series

## x86 Machine Vision Computer

Capable of supporting dual full-height, full-length GPU configurations, the VCO-6000 Series provides maximum edge AI performance and PCIe expandability. It provides IoT connectivity for high fidelity vision cameras. [Learn more >>](#)

- 13th Gen Intel Core Processor (35W TDP)
- Dual FHFL GPU Supported
- PCIe Gen 4 Expansion
- Hot-swappable NVMe SSD Bays



Metrology & Quality Inspection





# EMI (Elf-Machine Interface) Machine Telematics & Controls

Similar to HMIs (Human Machine Interfaces), these EMIs allow workshop elves to easily **process, analyze, and visualize real-time data from across the operation**, enabling seamless control, monitoring, and make data-driven decisions.



Displays real-time data telematics

Accessibility to machinery controls and analytics

Improves status awareness of machinery



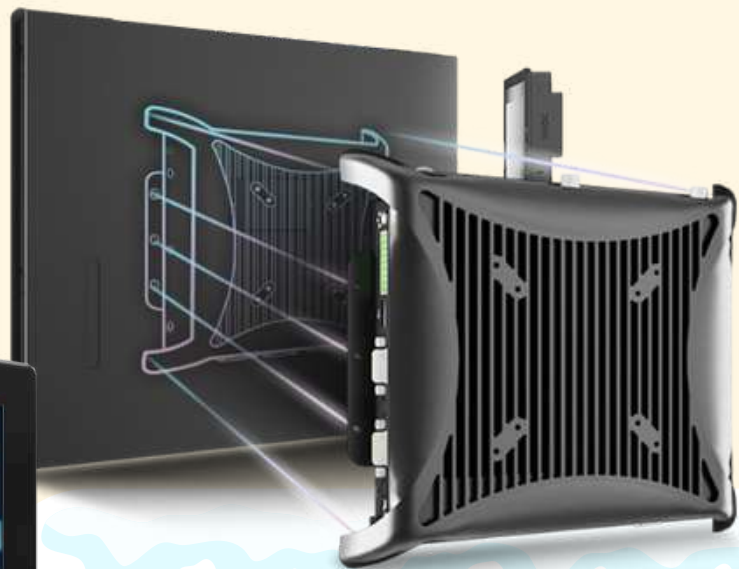


# Industrial Touch Panel PCs



HMI (Human-Machine Interface)

Industrial Touch Panel PCs are HMI/EMI solutions that allow factory personnel to interact, control, and access real-time data insights with machinery and SCADA systems. These HMIs feature PCAP/resistive touch options, wireless connectivity, IoT-centric connectivity, and industrial-grade reliability with IP-Rated displays and enclosures. [Learn more >>](#)



## VIO Series

### IP65 Modular Panel PC

Intel Celeron & Core Processors  
IoT-Centric Connectivity  
MDM Modular Technology



## SIO Series

### IP66/IP69K Washdown Panel PC

Intel Celeron & Core Processors  
Type 316 Stainless Steel Enclosure  
M12 Connection Types





# Industrial Touch Panel PCs



## HIO Series

### IP65 Open-Frame Touchscreen PC

Intel N97 Processor  
Seamless OEM System Integration  
Open-Frame Panel Mount

## AIO Series

### IP65 All-In-One Touchscreen PC

Intel N97 Processor  
Simple All-in-One Solution  
IoT-Centric Connectivity





# Challenge #2: Logistics

Santa's sleigh may be magical, but even he can't escape the growing logistics challenges of modern gift delivery. With an ever-expanding list of wishers, he's facing some serious pain points:



**Gift Overload:** The variety of gifts makes organizing shipments a logistical nightmare



**Lack of Traceability:** Difficulty tracking gifts and optimizing delivery routes leads to inefficiencies



**Shortage of Elves:** The overwhelming demand outpaces the available workforce








# AGV & AMR

## Empowering Factory Floor Automation

When faced with the burden of manual toy production and logistics at Santa's workshop, Santa integrated both AGVs, AMRs, and automated forklifts into his workshop. These automated robotic vehicles **streamlined material handling and warehousing with 24/7 operations.**

-  Alleviate major warehousing bottlenecks
-  Heightened logistical efficiency and effectiveness
-  Increased overall workshop safety





# JCO-6000 Series NVIDIA Jetson Edge AI Computer

Powered an NVIDIA Jetson AGX Orin, the JCO-6000 delivers high-performance for edge AI workloads, plentiful IoT connectivity with EDGEBoost I/O, and support for GMSL vision cameras all within a fanless construction. [Learn more >>](#)

- NVIDIA Jetson AGX Orin (32GB/64GB)
- Up to 4x EDGEBoost I/O (PoE Support, 10GbE, USB 3.2)
- 8x Mini-Fakra connectors for GMSL Cameras
- Out-of-Band (OOB) Management



AGV/AMR



Automated Forklifts



NVR Surveillance





# Challenge #3: Workshop Safety

Santa's workshop at the North Pole is facing safety challenges, struggling with power outages that disrupt production and put elf safety at risk. The lack of effective monitoring and backup systems is creating uncertainty in keeping the workshop running smoothly.



**Power outages at the North Pole:** Disrupting operations and causing delays



**Elf safety concerns:** Lack of adequate workshop surveillance to ensure a secure environment



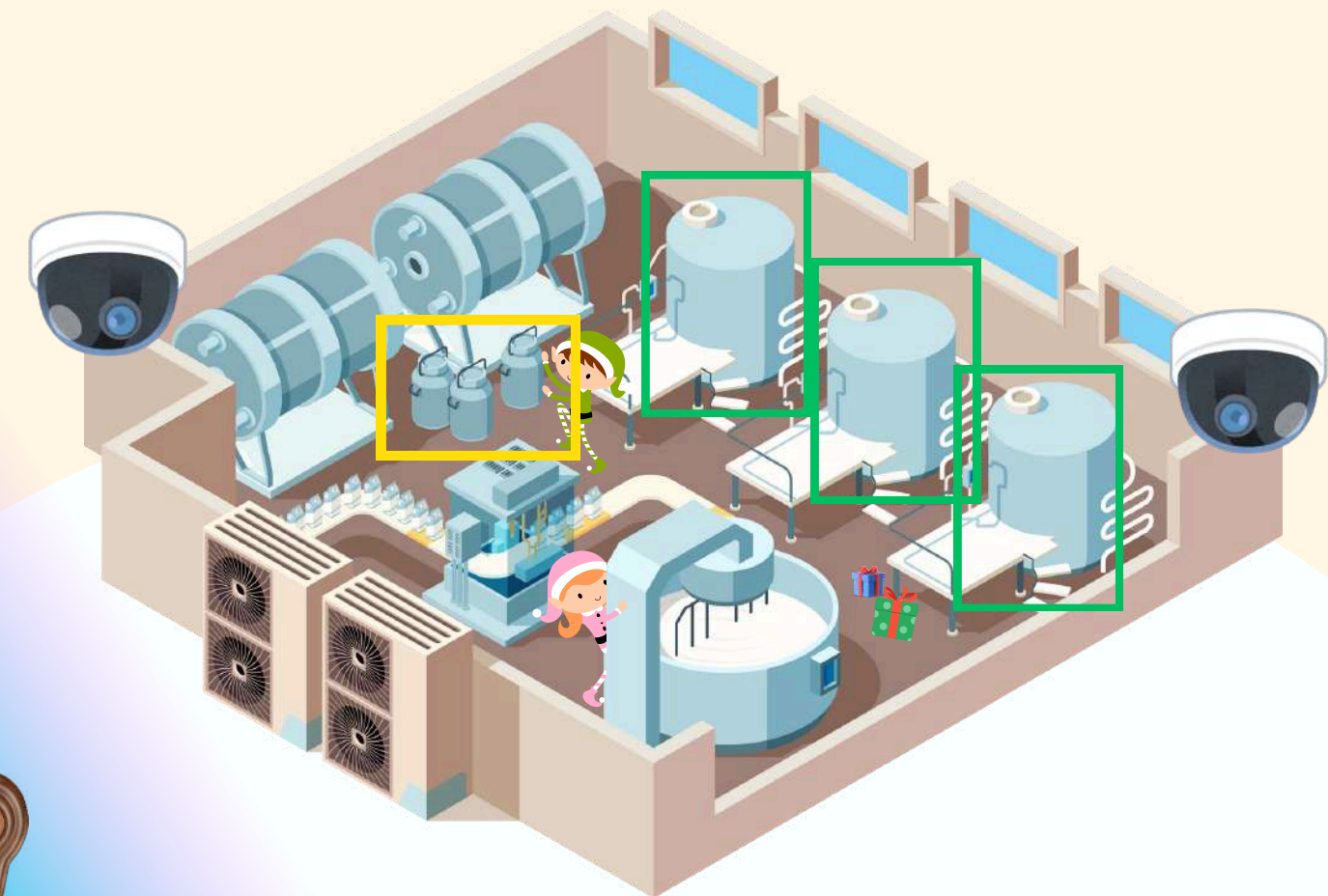


# Smart Security & Surveillance

## AI-Powered Workshop Monitoring

Safety is a top priority in Santa's workshop. By integrating an AI-powered NVR surveillance system onto the workshop floor, his command team gains an early warning system that takes a **proactive approach to deescalating severity of accidental damages, and protect sensitive workshop assets.**

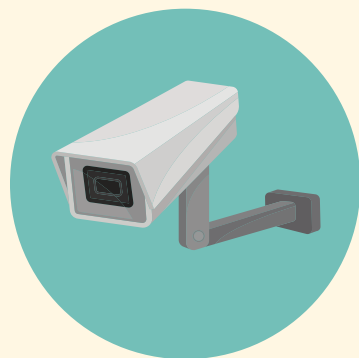
- 🎄 Early detection and warning of workshop and personnel distress
- 🎄 Proactive monitoring and protection of assets
- 🎄 Enhancing operational efficiency with AI





# JCO Series

NVIDIA Jetson Edge AI Computers



NVR Surveillance

The JCO Series leverages NVIDIA Jetson Orin that combines the CPU, RAM, and GPU into a SoM design for a ruggedized and energy-efficient solution to streamline edge AI workloads. It provides unique features including support for GSML cameras, out-of-band management, and modular EDGEBoost I/O technology. [Learn more >>](#)

## JCO-1000 Series



- NVIDIA Jetson Orin Nano (4GB/8GB)
- 40 TOPS of AI Performance
- Ultra-compact form factor

## JCO-3000 Series



- NVIDIA Jetson Orin NX (8GB/16GB)
- 100 TOPS of AI Performance
- Comprehensive IoT Connectivity

## JCO-6000 Series



- NVIDIA Jetson AGX Orin (32GB/64GB)
- 275 TOPS of AI Performance
- Up to 4x EDGEBoost I/O
- 8x GSML Cameras



# SuperCap Power Protection Mission-Critical Redundancy

The harsh North Pole environment poses significant power challenges for Santa's mission-critical workshop operations. To safeguard against sudden outages and fluctuations, Supercapacitor UPSs is a purpose-built industrial-grade redundant power solution that provides **sustainable power to ensure machine and data integrity.**



Ensures power reliability in extreme industrial environments

Preserves critical data and system integrity during outages

Prevents abrupt shutdowns that can lead to system failure



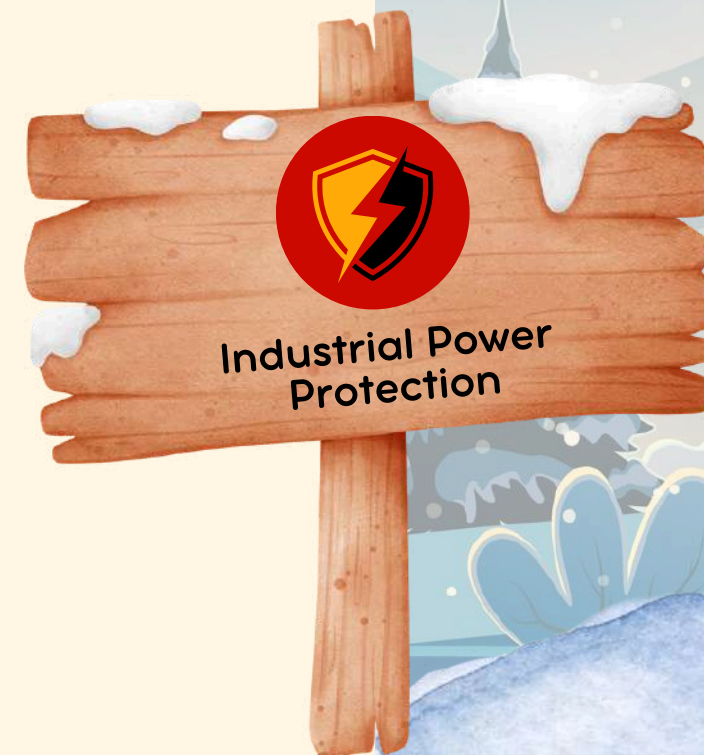


# ECO-1000 Series

## EDGEBoost EnergyPack

The ECO-1000 Series is an industrial-grade utilizing supercapacitor technology to effectively provide power sustainability in industrial deployments. It features high power density and an extensive lifecycle for reliable power safety in mission-critical operations. [Learn more >>](#)

- Instantaneous Power Backup
- Configurable Smart Power Management Modes
- 10-Year Operating Lifecycle Longevity
- World-Class Safety Certifications (UL Listed, FCC, CE)





# Challenge #4: Command Center

Santa's workshop is facing challenges with tracking overall production progress due to the lack of real-time status visibility. Additionally, the absence of a connected network to communicate with all machinery is hindering efficient operations and coordination.



**Overall workshop status visibility:** Lack of real-time monitoring to track production progress



**Machinery communication network:** No efficient system to connect and manage all workshop machinery





# IoT Gateways

## Real-Time Data Telematics

With Santa's growth in workshop machinery, equipment, and IoT devices, he needed to be able to oversee his toy manufacturing operations in his command center. IoT gateways **relay mission-critical telematics on the workshop floor to central command for actionable insights.**



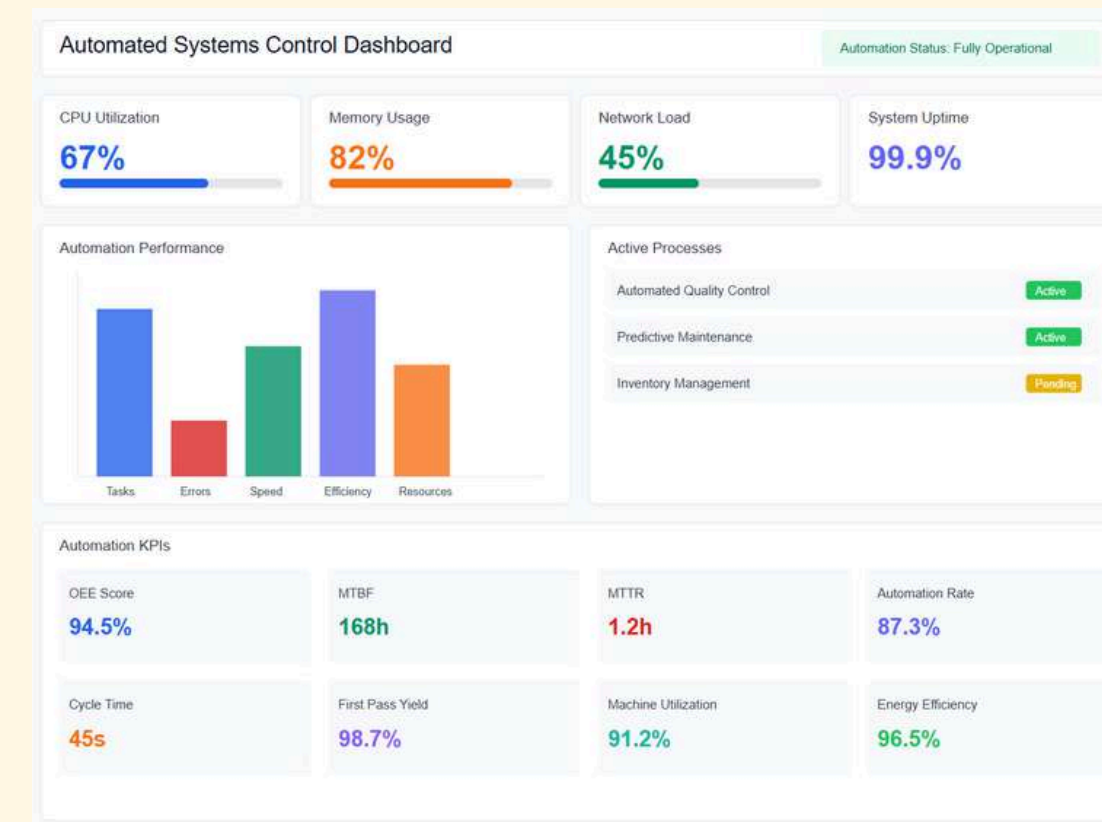
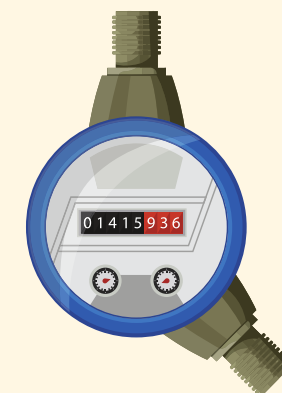
Real-time telematics for workshop monitoring and transparency



Gain data insights and analytics through a centralized system



Establish a homogenous dataflow ecosystem





# Fanless Mini Computers



IoT Gateway

These fanless mini computers serve as industrial NUC alternatives by providing IoT-centric connectivity and real-time performance with embedded Intel processors. Its ultra-compact size and power-efficiency make them ideal for space-constrained deployments. [Learn more >>](#)

## RCO-1000 Series



- Intel Atom x6425E Processor (12W TDP)
- EDGEBoost I/O (USB, COM, DIO, HDMI)
- Super-Rugged Durability

## BCO-1000 Series



- Intel N97 Processor (12W TDP)
- IoT-Centric Connectivity On-Board
- Semi-Rugged Durability

## JCO-1000 Series



- NVIDIA Jetson Orin Nano (4GB/8GB)
- 40 TOPS of AI Performance
- Super-Rugged Durability



# Private 5G

## Low-Latency Wireless Communications

With the renovated Industry 4.0 ready workshop, Santa needed to connect all of his technologies together through a wireless network. Due to the circumstance of the North Pole, a private 5G network ensures **ultra-reliable, low-latency connectivity for real-time communications.**



- Real-time communication between Industry 4.0 solutions
- Fully optimized network and bandwidth utilization
- Scalable network infrastructure for future developments





# The Benefits







# Santa's Industry 4.0 Workshop Success Story

Santa has seamlessly integrated Industry 4.0 into his workshop, leveraging key technologies to boost operational efficiency and productivity. This transformation has allowed him to focus more on fostering creativity with his elves, free from the stress of meeting the Christmas deadline. [Read full case study >>](#)

## Impact:

- 🧝 Significant boost in productivity to meet growing toy demands
- ❄️ Enhanced inspection to deliver only the most quality of gifts
- 🧝 Addressed major bottlenecks with advanced robotics and automation
- ❄️ Enabled full workshop visibility with real-time analytics