Solution Brief

IoT Technology
Industrial PCs
Intel Atom® x6000E Series Processors

Siemens delivers high-performance industrial PC in a small footprint

The Siemens Nanobox SIMATIC IPC227G and Nanopanel PC SIMATIC IPC277G feature the latest-generation Intel Atom® x6000E Series processors, enhanced for IoT

SIEMENS

"One of today's business challenges is integrating different tasks and devices on one industrial PC to simplify deployment, operation, and maintenance vs. having multiple discrete devices from different vendors"

—Wolfgang Lay, marketing manager, Siemens

Growing complexity and competition in the industrial world

Factories, logistics firms, and other industrial businesses are taking advantage of breakthrough edge IoT and AI solutions to accelerate their production lines and increase global output. But the added complexity of these systems is creating barriers to entry for advanced use cases that can potentially unlock the most-impactful benefits. Businesses need greater connectivity between factory floor devices and their cloud infrastructure to support remote manageability from centralized IT departments. And, greater connectivity will also allow data to flow upstream from the edge to the core for analytics and processing. Given the increase in digital information over the next few years, it's not viable to add more devices indefinitely.

Challenge: Barriers to entry for advanced IoT

To stay competitive, manufacturers and logistics firms need to add more automation to their production lines, assembly verification, defects detection, delivery monitoring, and weighting systems, and the list goes on. More discrete devices added to the network will only increase complexity, cost, and resources spent on testing, validation, deployment, and maintenance. Businesses may also be exposing themselves to heightened security risks, as the increasing number of devices also results in more attack surface and entry points for unauthorized access. And finally, the cumulative footprint of devices directly impacts the availability of floor space.

Solution: Easy-to-integrate industrial PCs

Siemens has developed a flexible and easy-to-integrate solution in the Nanobox SIMATIC IPC227G and Nanopanel PC SIMATIC IPC277G. This solution is built with the Intel Atom® x6000E Series processor, enhanced for IoT to deliver exceptional compute and graphics performance—and advanced connectivity. Using this highly versatile processor, businesses can consolidate workloads, such as applications running programmable logic controllers (PLCs) and analytics, while getting abundant performance on the shop floor. This allows businesses to enable greater automation with graphics performance for machine vision or human-machine interface (HMI) applications and 5G connectivity.

The platform also supports Intel® Time Coordinated Computing (Intel® TCC) and Time-Sensitive Networking (TSN).[1] These ensure both real-time-critical and non-real-time workloads can run simultaneously without competing for compute resources. As a result, users can reduce latency and keep appliances and machinery working with exceptional coordination.

The Siemens SIMATIC IPC227G and IPC277G are compact, maintenance-free industrial PCs (IPCs) designed for flexibility in rugged environments. This small-footprint solution will help empower key use cases including—but not limited to—in-line weighting systems, assembly line control systems, and quality control systems. Although manufacturing is a primary segment, the IPC can be deployed anywhere you need control, visualization, or communication tasks in business or commercial environments.

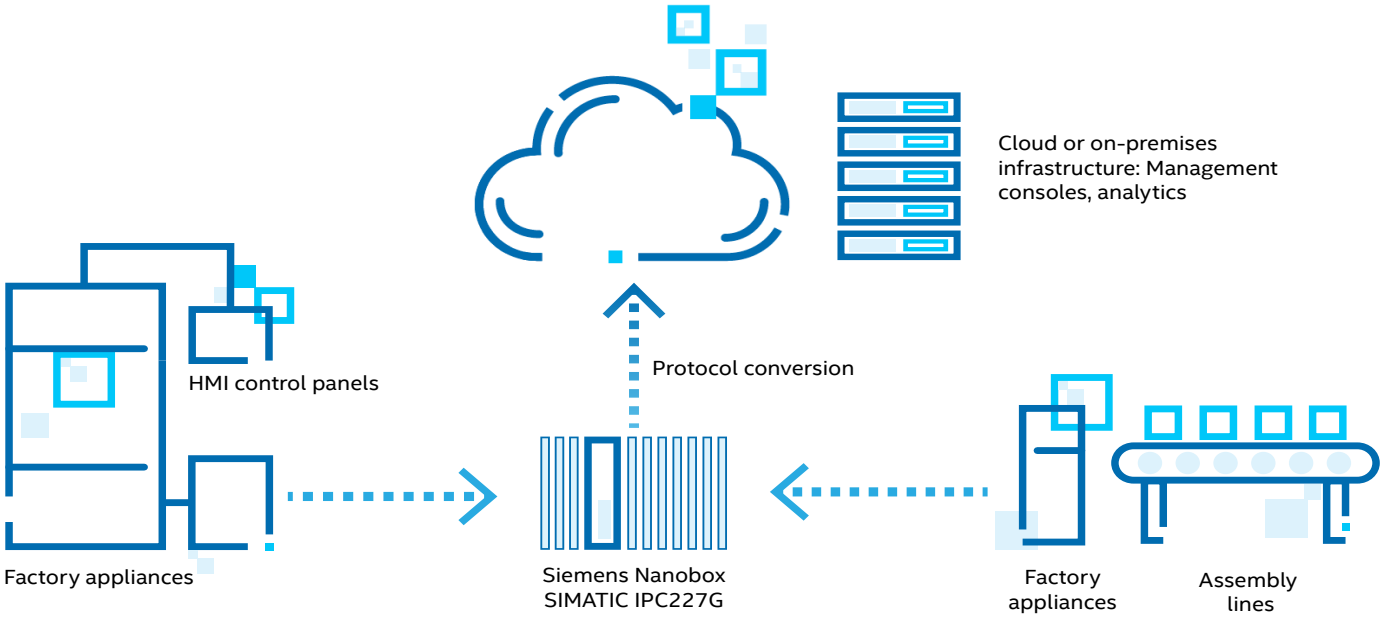


Figure 1: A typical industrial configuration. The IPC connects endpoints to overlaid systems (IT, cloud).

How it works

Deployed as part of a fully integrated solution stack, the SIMATIC IPC227G and IPC277G work in conjunction with your factory appliances and cloud network. These devices offer three TSN-capable LAN interfaces—a significant evolution from the previous generation, which did not support LAN interfaces—that allow you to connect the unit to HMI control panels and factory machines and to your cloud network.

These IPCs are capable of processing data close to the machine and can pass data upstream for further processing while enabling more-secure remote access for IT departments. Enhanced performance enables more field-level applications and parallel workloads in a single device. Wolfgang Lay, marketing manager at Siemens, states, "With our solution, one industrial PC handles multiple tasks including HMI, scanning, PLC, maintenance, setpoint and order management, visualization, and connectivity to higher-level systems. This provides an easy and efficient solution for the control and visualization of assembly stations."

Key benefits of the Intel Atom x6000E Series platform:

- **More power, more possibilities:** Up to a 1.7x improvement in single-thread performance, up to a 1.5x improvement in multi-thread performance, and up to 2x performance improvement in graphics gen over gen[2]
- **Built-in precision for time-sensitive workloads:** Intel Time Coordinated Computing (Intel TCC) and Time-Sensitive Networking (TSN) technologies[1]
- **Easy remote management capabilities:** Integrated device management with in-band and out-of-band (OOB) capability
- **Help prevent attacks with a hardened platform:** Dedicated cryptography accelerators and other hardware-based security features to help protect against firmware attacks

According to Peter Berger, product manager at Siemens, they chose the latest Intel Atom® platform for this application specifically because of the added connectivity and performance for IoT applications. The IPC227G and IPC277G solution features integrated Intel® Wi-Fi and a SIM card slot for 4G/5G cellular access. The IPC227G and IPC277G can connect to multiple independent networks and still deliver high-bandwidth, high-precision I/O. "We have the chance to connect to the plant floor network, the IT network, and also another network for remote control and services. So it's a complete solution, divided into three independent networks. This wasn't possible in the previous generation."

See backup for configuration details. For more complete information about performance and benchmark results, visit www.intel.com/benchmarks.

2. Source: Intel. Claims based on a) SPEC CPU 2006 metric estimates based on Pre-Si projections and b) 3DMark11 estimates based on Pre-Si projections, using Intel® Pentium® J4205 as prior gen.

Synchronized precision for production lines

Intel TCC, included in the Intel Atom x6000E Series processors used in this solution,[1] helps orchestrate precise data processing at the network, CPU, and memory levels. Without Intel TCC, running both real-time and non-real-time workloads in the same system is challenging. In order to consolidate these workloads, Siemens had to spend months to manually tune the system by trial and error to meet their real-time need.

With Intel TCC, the Siemens SIMATIC IPC227G and IPC277G solution can synchronize machine controls in closed-loop IoT systems with minimal latency and jitter. These devices can then direct machinery and appliances to execute specific actions or behaviors in smooth, coordinated patterns, helping to drive efficiency and reduce hiccups on the production floor. Although based on pre-production hardware, Siemens is confident that shorter time loops are possible with production-grade hardware. They anticipate this will enable new use cases that were previously not possible even with high-performance system-on-chip (SoC) hardware.

Graphics extensibility and machine vision

With up to 2x performance improvement in graphics gen over gen,[2] Intel Atom x6000E Series processors support advanced graphics applications. For the IPC227G and IPC277G devices, this means support for up to three industrial monitors to give floor managers and workers visually rich displays and interfaces to work with. The IPC227G and IPC277G devices also include two M.2 expansion slots, allowing for customization and the addition of specialized hardware accelerators.

Berger states, “With the possible integration of AI hardware accelerators, the new IPCs will support new automation concepts and infrastructures like machine vision or inference.” When the enhanced graphics capabilities of the platform are combined with an AI accelerator, for example, this opens the door for machine vision applications. And further optimizations with the Intel® Distribution of OpenVINO™ toolkit can allow the device to support advanced use cases such as AI-powered visual inspection or defects detection.

Built for harsh environments

In part, thanks to the Intel Atom x6000E Series processor’s high resiliency, the IPC is built for continuous operation in rugged industrial environments. The IPC features a sealed enclosure, with multiple bracket configurations for flexible mounting. And there are no moving parts, increasing overall durability and longevity in exposure to high-shock conditions such as heat, movement, bumps, and vibrations.

Siemens IPC227G and IPC277G:

- Fanless
- No moving parts
- Maintenance-free
- Intel Atom® x6000E Series processor

Figure 2: The Siemens SIMATIC IPC227G and IPC277G feature a rugged case for flexible deployments.

See backup for configuration details. For more complete information about performance and benchmark results, visit www.intel.com/benchmarks.

2. Source: Intel. Claims based on a) SPEC CPU 2006 metric estimates based on Pre-Si projections and b) 3DMark11 estimates based on Pre-Si projections, using Intel® Pentium® J4205 as prior gen.

Driving success across key industrial use cases

With enhanced performance from Intel Atom x6000E Series processors and real-time features from Intel TCC,[1] both the Siemens IPC227G and IPC277G can deliver results in precision-sensitive industrial use cases.

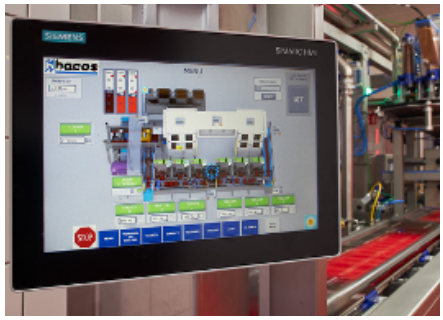
USE CASE 1

High-performance in-line weighting

Challenge: In-line weighting systems for parcel and letter delivery need higher performance, with the ability to send data to higher logistics systems and visualize incorrect measurements.

Solution: The IPC277G offers ruggedness and performance on the parcel conveyor line. Brilliant display capabilities support visualization for managing inaccurate measurements, and multiple Ethernet interfaces support broad connectivity.

Benefit: Clients can support a high volume of letters and parcels and can expand with more IPC devices without worrying about disrupting real-time processing, thanks to Intel TCC.[1]



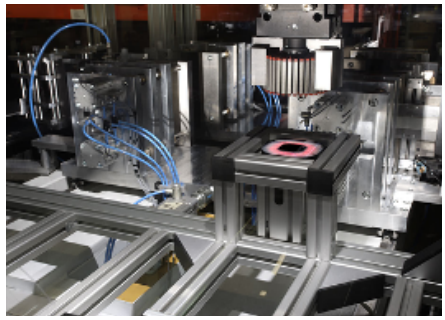
USE CASE 2

All-in-one operating and control systems for assembly lines

Challenge: Assembly lines need to provide workers with fully integrated visualization, software controller, and maintenance systems in an all-in-one HMI device.

Solution: The Siemens IPC227G, together with visualization software SIMATIC WinCC, delivers brilliant HD display on a SIMATIC industrial flat panel, along with multiple interfaces to mesh seamlessly with existing IT networks and support data flow to higher-level systems.

Benefit: Floor managers and workers experience more control and insight on the assembly line. IT departments get an easy-to-deploy solution that supports OOB remote manageability with the option to expand over 5G networks.



USE CASE 3

Quality inspection for electronic components

Challenge: The need to support workers with automated visual inspection systems requires extreme compute performance to support multiple cameras, visual processing, and AI machine inference at the edge.

Solution: IPC227G and IPC277G allow for integration of AI and vision hardware accelerators through the M.2 expansion slot. Combined with optimizations from the Intel Distribution of OpenVINO toolkit, these devices can deliver machine vision and inference to production lines.

Benefit: Clients can implement a fast and easy AI-integrated solution to support visual inspection. More-robust defects detection can help manufacturers improve quality and speed of output while unlocking cost efficiency.

Performance, precision, and connectivity

The Siemens Nanobox SIMATIC IPC227G and Nanopanel PC SIMATIC IPC277G solution, powered by the Intel Atom x6000E Series processor, delivers high versatility in a compact form factor, rugged and suitable to most industrial environments. Intel TCC brings the real-time precision industrial plants need to help ensure synchronization across their production lines.[1] And, with the added connectivity of multiple interfaces, support for Intel Wi-Fi and expansion for 5G, industrial IT departments can seamlessly integrate this solution into their existing infrastructure and prepare for future growth as well.

Learn more

Siemens Nanobox SIMATIC IPC227G and Nanopanel PC SIMATIC IPC277G

Built with three LAN interfaces for connecting to multiple appliances and networks, the Siemens SIMATIC IPC227G and IPC277G deliver high-performance IoT to support precision industrial applications.

Learn more ›

Intel Atom x6000E Series processors

The latest-generation Intel Atom x6000E Series processors are enhanced for IoT and include integrated resources for remote management, functional safety, network synchronization, and real-time computing.[1]

Learn more ›

About Siemens

Siemens is leading innovation in the automation and digitalization of industrial environments all across the world. With long-standing global experience and expertise, Siemens provides state-of-the-art solutions in AI, IoT, and more.

siemens.com

1. Not all features are available on all Intel Atom® x6000E Series SKUs.
2. Source: Intel. Claims based on a) SPEC CPU 2006 metric estimates based on Pre-Si projections and b) 3DMark11 estimates based on Pre-Si projections, using Intel® Pentium® J4205 as prior gen.

Configurations:

Performance results are based on projections as of September 1, 2020
Processor: Intel® Pentium® J6425 PL1=10W TDP, 4C4T Turbo up to 3.0 GHz
Graphics: Intel® Graphics Gen 11 graphics
Memory: 16 GB LPDDR4-3200
OS: Windows 10 Pro
Compiler version: IC18

Processor: Intel® Pentium® J4205 PL1=10W TDP, 4C4T Turbo up to 2.6 GHz
Graphics: Intel® Graphics Gen 9 graphics
Memory: 16 GB LPDDR4-2400
OS: Windows 10 Pro
Compiler version: IC18

Performance numbers are Pre-Si projections and are subject to change. Results reported may need to be revised as additional testing is conducted. The results depend on the specific platform configurations and workloads utilized in the testing, and may not be applicable to any particular user's components, computer system, or workloads. The results are not necessarily representative of other benchmarks.

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