White Paper

PC-Based Automation Systems Empower the All IP-based Factory

With the advent of Industry 4.0 – the push to drive a fourth industrial revolution based on the intelligent factory – PC-based automation systems are a critical piece for enabling all IP-based Factory-of-Things. However, building PC-based automation systems requires computers with high reliability, as well as communication and computing capabilities specifically designed for factory automation applications.

To this end, NEXCOM offers a unique solution, the NISE 105 fanless computer based on the Intel® Atom™ processor E3800 product family. Designed to empower the all IP-based factory and help manufacturers realize the vision of smart production, green production and urban production, the NISE 105 encompasses fieldbus

control and internet connectivity, computing and graphical capabilities, small form factor and low power design.

In this white paper, NEXCOM will explain how the NISE 105 compact fanless computer provides a fieldbus control interface and leverages the Intel® Atom™ Processor E3826, Intel® Gen 7 Graphics, and low power consumption, to help streamline factory data collection and management, and facilitate production processes, manufacturing operations, and quality control. Furthermore, we will show how the processor's power efficiency enables the small footprint and fanless design of NISE 105, allowing it to achieve high reliability in harsh factory automation environments.

NISE 105 + Fieldbus + SoftPLC = Ready for Smart Factory Controller
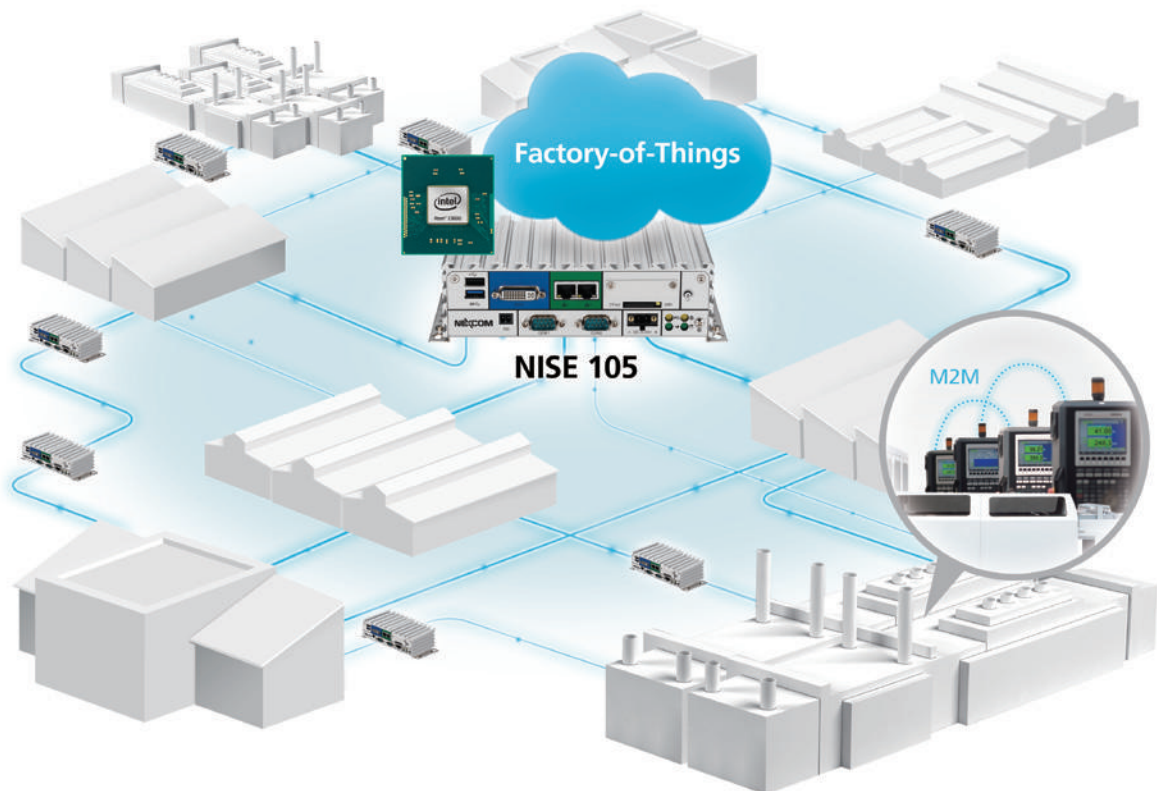

Figure 1. Designed to empower the all IP-based factory, NEXCOM NISE 105 helps manufacturers realize the value of M2M communication for Factory-of-Things.

Let's use the petrochemical industry as an example for how the NISE 105 can help enable the intelligent factory. A petrochemical plant may cover several dozen hectares of space, requiring operators to gather large amounts of monitoring and control parameters from dozens of facilities throughout the plant or multiple plants. Facilities built at different construction periods may also use different industrial control systems and may be responsible for different upstream and downstream processes.

controls such as SQC (Statistical Quality Control) and SPC (Statistical Process Control).

Petrochemical plants are often located in harsh environments with extreme temperatures. Other process automation use models, such as wastewater treatment, electric utilities, and steel factories, are also associated with harsh environment conditions. Therefore, the PC-based automation systems used in these applications must support wide operating temperature
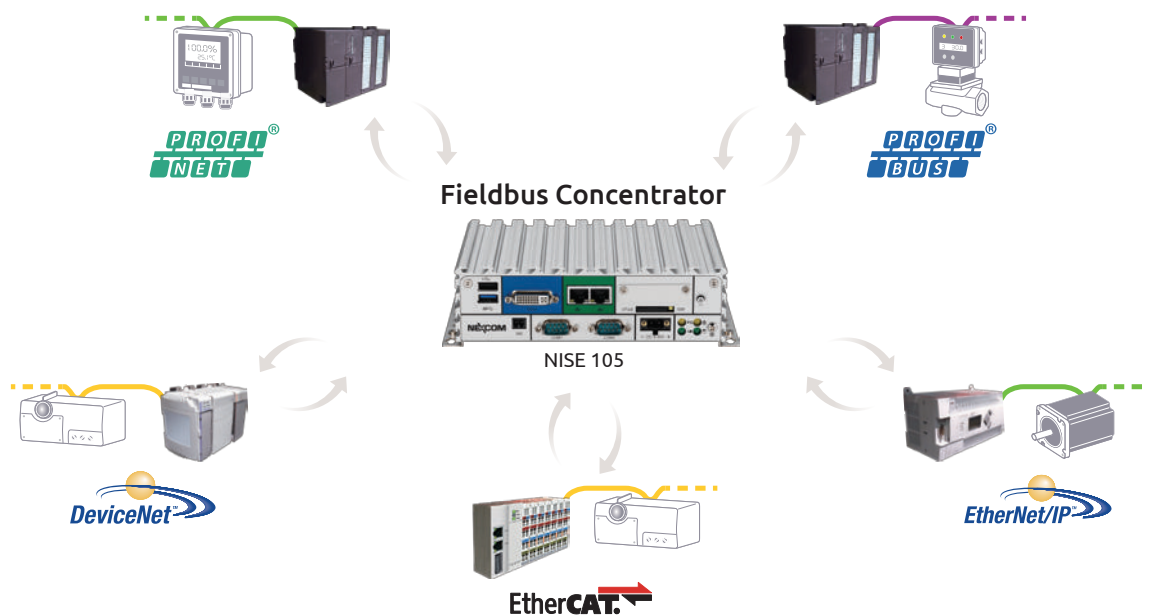

Figure 2. The NISE 105 can provide bi-directional data communication and acquisition of different-branded field devices with integrated fieldbus technology.

Through strong support for widely-used fieldbus protocols – including PROFIBUS, PROFINET, DeviceNet, EtherNet/IP and EtherCAT – the NISE 105 can provide bi-directional data communication and acquisition of different-branded field devices and PLCs. With an internet connection, the acquired data can be uploaded to higher levels of the network for advanced

ranges, fanless design, anti-vibration, and signal and power isolation technology.

The NISE 105 based on Intel Atom Processor E3826 can provide high level of system reliability. Thanks to the new 22nm manufacturing technology, the processor offers up to 3x the peak performance at up to 5x lower power

consumption over previous generation processors. These enhancements, along with fieldbus and SoftPLC technology, enable the NISE 105 to reliably execute control schemes, display HMI graphics, and provide M2M communication for Factory-of-Things.

The processor's low power consumption and extended temperature capabilities allow NEXCOM to develop PC-based systems like the NISE 105 that deliver non-stop reliability within wide temperature ranges (-20 to 70 degrees Celsius). With its fanless design and support for SSDs (Solid State Drive), the NISE 105 can offer higher reliability in environments with shock and vibration. Based on its power efficient Intel® Atom™ processor, the NISE 105 is also a green product designed for green production.

Designed to Enhance Product Traceability

In many industries, such as the food and beverage industry, manufacturers require product traceability systems to track, trace, and ensure the production quality of goods produced throughout the supply chain. Since much of the food and beverage industry is a highly automated one, the manufacturing of food and beverage goods needs to be monitored in real-time to ensure food safety. The origin of problems such as contaminated foods or inferior ingredients must be readily identified and isolated. Furthermore, to ensure quality of the end product, the production line also requires AOI (Automated Optical Inspection) systems to inspect such parameters as food packaging and quantity per serving.
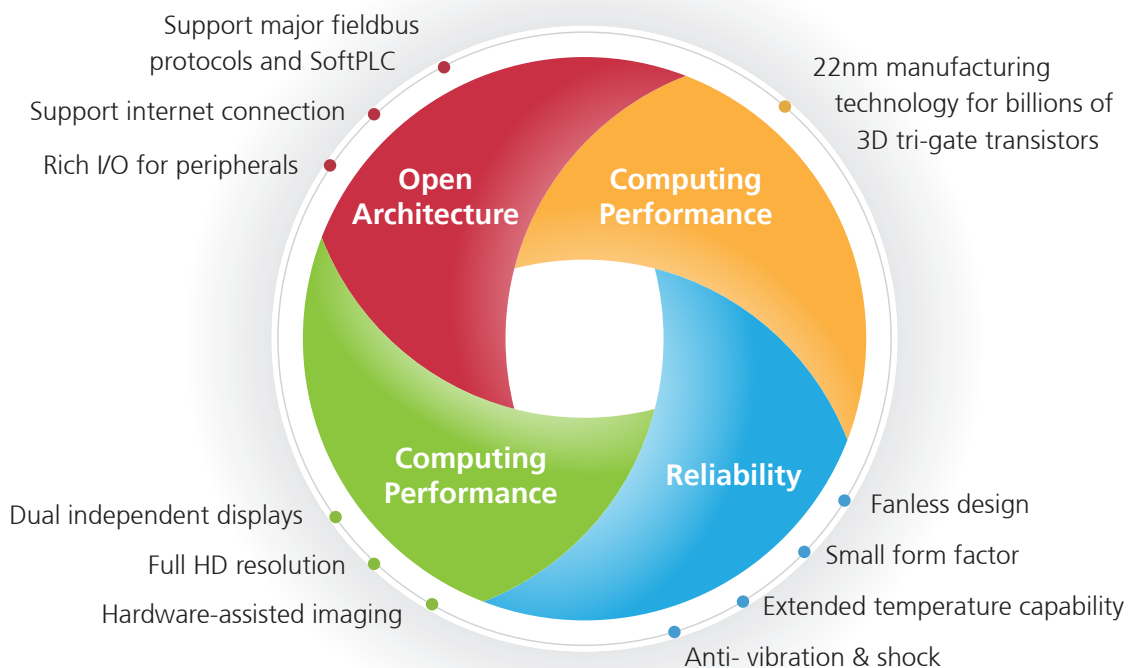

Figure 3. The NISE 105 based on Intel® Atom™ Processor E3826 provides open architecture, reliability, computing, and graphics needed for a PC-based controller.

The NISE 105 features a multitude of I/O connectivity to support the peripherals and equipment used for product traceability, such as barcodes, QR codes, RFID tags, mega-pixel IP cameras and USB 3.0 cameras. Using its network capability, the NISE 105 can scan, store and share production data labeled and tagged by these traceability devices at all levels of the supply chain for a holistic view of manufacturing processes.

To provide image processing and data acquisition of AOI system, the Intel Atom processor E3826 features Intel Gen 7 Graphics. The processor's dedicated hardware image signal processor can help AOI systems process images captured by high definition cameras at a faster rate. The built-in image signal processor supports multiple processing of up to two 1080p cameras and one 720p camera.

Increasing Flexibility in the Production Line

Batch manufacturing used in producing products having a short product lifecycle and a high feature mix such as smartphones, requires a flexible production line that can adapt to customized orders. PC-based controllers like the NISE 105 can provide this high level of flexibility. With the Intel Atom processor E3826, the NISE 105 offers an open architecture platform for running the applications necessary to identify incoming production work orders, download the
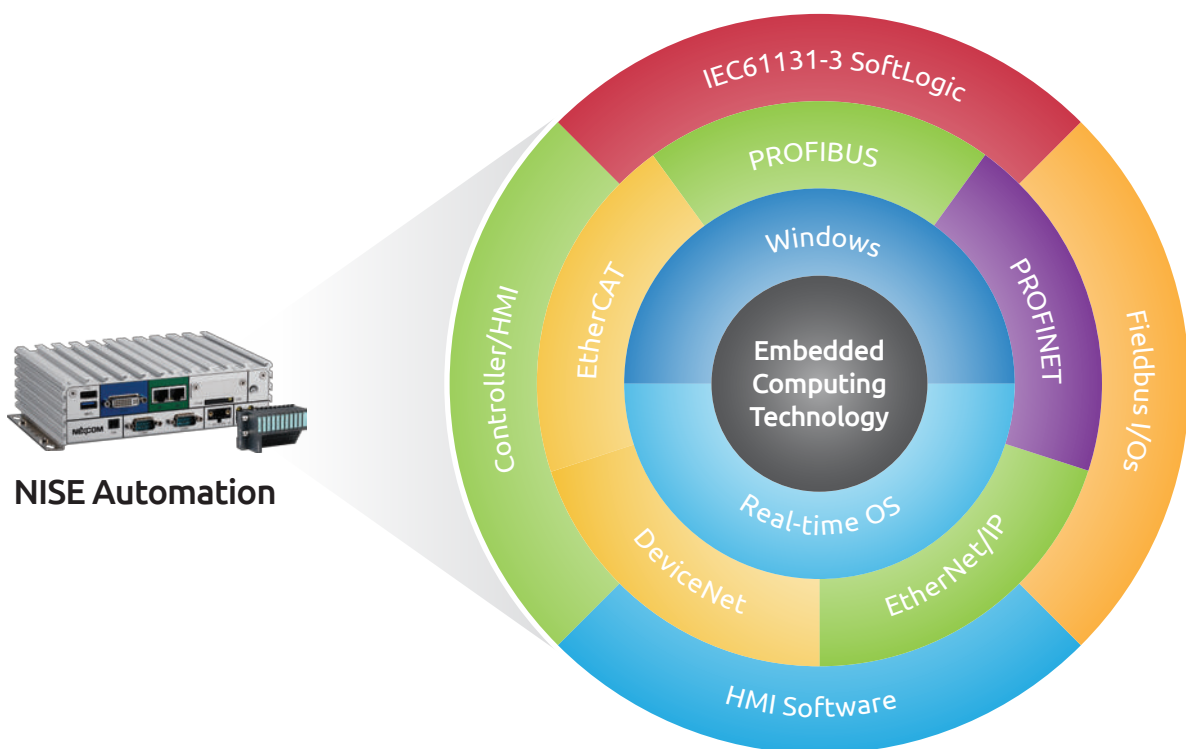
NISE Automation

Figure 4. Ready for the smart factory: The NISE 105 is equipped with all the essential pieces to enable the Factory-of-Things

related control procedure and instructions through cloud server, and then create the relevant operations for order picking and production. In contrast, traditional special purpose machine tools with fixed functionality are unable to provide this flexible openness.

Bringing Standard Operating Procedures Online

Assembly lines that rely on traditional paper-based SOP (Standard Operating Procedures) to carry out production are not eco-friendly and effective. For instance, when there are process changes in the SOP or a new work order that requires a complete new SOP, changing to the new one can be time-consuming. PC-based automation systems with computing, graphic and network capabilities can provide eSOP (Electronic Standard Operating Procedures) to overcome the shortcomings of traditional SOP. For example, with the NISE 105, eSOP changes can be remotely updated over the network in an instant and cause minimal interruption.

Furthermore, the integrated Intel Gen 7 Graphics enables the NISE 105 to handle DirectX® 11, stereoscopic 3D, and full HD video playback, as well as provide hardware video acceleration and dual-display support. Using the NISE 105, eSOP systems can provide digital instructions with 2D/3D visuals and animations, offering factory floor operators clearer, more effective instructions.

Conclusion

To fulfill the vision of an all IP-based factory requires a smart PC-based system. Using the Intel Atom Processor E3826, NEXCOM has packed high computing and graphics performance and energy-efficient features into a compact and robust system: the NISE 105. Using all these features, the NISE 105 can help transform traditional factories into an all IP-based factory with minimal cost and engineering effort. Without having to upgrade the legacy systems, NISE 105 can be an important component in enabling the Factory-of-Things and its new efficiencies.

About NEXCOM

Founded in 1992, NEXCOM has five business units which focus on vertical markets across industrial computer, in-vehicle computer, multimedia, network and communication, and intelligent digital security industries. NEXCOM serves its customers worldwide through its subsidiaries in five major industrial countries. NEXCOM gains stronghold in vertical markets with its industry-leading products including the rugged fanless computer NISE series, the in-vehicle computer VTC series, the network and security appliance NSA series and the digital signage player NDiS series. www.nexcom.com

About the Intel® Intelligent Systems Alliance

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