

Intelligent Manufacturing Solution

— Smart Machine Tool



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Technical Background

The Fourth Industrial Revolution, or Industry 4.0, brings digital technology and physical technology together through data, contributing to the generation of interconnected enterprise operating modes featuring quick response to customer needs. From supply chain to intelligent factory, enterprises are using AI, robotics, edge computing technology, and cloud to make smarter and more timely decisions.

Industrial Internet of Things (IIoT) solutions often involve interconnected sensors and other edge devices to help enterprises improve product quality and enhance operational efficiency. Digital solutions combining data collection and analysis can effectively take advantage of IIoT for data analysis in almost real time, working loads integration, production optimization, and predictive maintenance, which together facilitate the automation process. Such solutions benefit enterprises in many ways such as reduced cost, accelerated time-to-market, improved production security and efficiency, and prolonged operating time.

Industry Overview

In the context of the development of Industry 4.0, with the rise of flexible manufacturing, new production and management modes have put forward higher requirements for the machine tool industry. Known as the "industrial mother machine" and the "the most important weapon of the country", the intelligence degree of machine tools plays a significant role on the realization of intelligent manufacturing. Accelerating the development of machine tools in a more intelligent manner and improving the intelligence degree of machine tools not only constitutes an urgent demand that the machine tool industry is facing for transformation and upgrading, but also an inevitable stage to achieve intelligent manufacturing and transform China to a manufacturer of quality.

With the concerted development of the IoT and CNC machine tools, IoT and intelligent sensing technology are frequently applied to the remote service, status monitoring, fault diagnosis, and maintenance management of CNC machine tools for real-time feedback of the working state of machine tools, automatic detection of tool wear, intelligent management of device life, etc. Equipment networking is the basis of industrial IoT, and the market prospect of machine tool IoT platform is immeasurable.

According to a report issued by Foresight Industry Research Institute, China has now become the world's largest machine tool market, and CNC machine tools have become the mainstream of machine tool consumption. In 2020, the total profit of China's machine tool industry increased by 20.6% year on year, and the market size of China's CNC machine tools is expected to exceed RMB 620 billion Yuan by 2026. In general, the market concentration of China's CNC machine tool industry is gradually increasing.

Common Pain Points

According to statistics from China Industrial Development Institute, China's low-end CNC systems and accessories are basically homemade. Yet mid-to-high end machine tools still lag behind the competitors in terms of stability, machining efficiency, and lifespan. National brands have to fight for a market share.

At present, the output value of China's machine tool concentrates in the mid-low-end industry chain and machine tool manufacturers make very low profit from mere equipment sales. It is urgent for the manufactures to seek for new profit growth points. Moreover, China's high-grade CNC systems have long been dominated by Fanuc, Mitsubishi, Siemens, Heidenhain and other controller manufacturers, therefore it is costly for custom development. The maintenance of machine tools costs too much yet with very low efficiency, resulting in low reliability of machine tools. The mean time between failures (MTBF) of China's CNC machine tools is below 300 hours, far less than the global average of 500 hours and superior machine tools of 1200 hours.

With the advent of Industry 4.0, machine tools have transformed from single point control of individual devices to collaborative operation of multiple devices to support the evolution of smart factories.

Solution

Vantron builds a predictive maintenance featured pilot project for machine tools based on edge computing to facilitate the digital transformation of machine tool manufacturers to equipment service providers, and create new profit growth points for enterprises. With the popularization of remote maintenance, the maintenance efficiency is improved and maintenance cost is reduced, therefore, machine tool manufacturers can ultimately reduce the operating expenses (OPEX).

Once the zero-base pilot project is recognized by the market players in the industry, the solution could be applied on a large scale in subsequent projects. Given that machine tools are an important element of a factory, the solution focuses on the machine tools and are expandable to peripheral manipulators, conveyors and other devices to promote the development of intelligent manufacturing and smart factory.

Add Channel
✕

* Channel Name:

* Description:

* Enable:

* Protocol:

Iec104 Protocol
 Fanuc Focas Protocol
 Mitsubishi Fx Collection Protocol
 Mitsubishi Q Series MC Protocol
 Modbus Collection Protocol
 OPC UA Collection Protocol
 SIEMENS PPI Protocol
 S7 Protocol

OK

Add
✕

Device Name	Device type	Enable or not	Channel	Slave
PLC-1	Data Collect Device	enabled	test	

OK

Variable Name	Variable Value	Assigned Device
temp		S7
blade		S7

* Device Type:

* Device Name:

* Enabled:

* Interval_ms:

* Ip Address:

* Port:

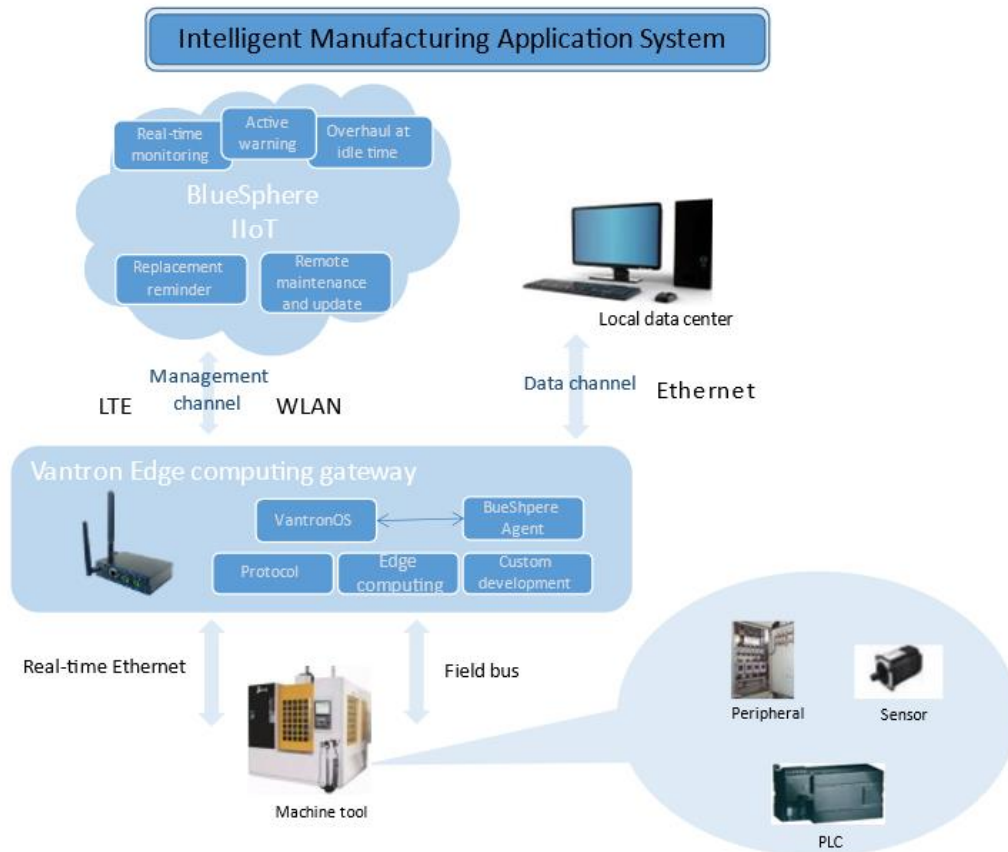
* rack:

* slot:

Cancel
OK

Application Scenario

The solution employs an edge computing platform for intelligent manufacturing, which integrates advanced sensing technology, network technology, computing technology, control technology and other intelligent technologies to comprehensively monitor and track machine tools and to realize huge volume data interaction across a wide range of devices. Thus, the full cycle of a smart factory is controlled with such functions as automatic fault diagnosis and predictive maintenance to reduce energy consumption and ensure smooth operation of the system. The overall architecture of the solution is shown below:



Device monitoring

- Data collection and analysis
- Failure diagnosis, predictive maintenance
- Downtime reduction, productivity enhancement

Remote operation and maintenance

- Remote upload and upgrade of applications
- Timely warning, maintenance remainder
- Reduced maintenance frequency and cost

Benefits and Advantages

With the acceleration of China’s transformation to a manufacturer of quality, the demographic dividend advantage gradually diminishes, and intelligent manufacturing and digital factory have become the mainstream. IoT for machine tools gives rejuvenates the machine tool industry, improves the reliability and business flexibility of machine tools, and promotes the development of machine tools from single point control of individual devices to collaborative operation of multiple devices to support the evolution of smart factories.

Our edge computing solution improves device reliability through predictable maintenance, and enhances fault response efficiency and reduces maintenance costs through remote monitoring and timely warning.

In addition, the solution can provide the R&D department with real-time core parameters of the devices, which helps manufacturers upgrade the products more efficiently and differentiate the products for different applications. Eventually, the entire industry will develop with focus on digitalization, integration, modularization, and intelligence to enhance the core competitiveness of products.

About Vantron

Since 2002 established by two Silicon Valley entrepreneurs, Vantron Technology has been a pioneer in connected IoT devices and IoT platform solutions. Today, Vantron serves countless customers all over the world, some of them are Fortune 500 companies. Products lines cover edge intelligent hardware, IoT communication devices, industrial displays and BlueSphere device management cloud platform.

Vantron has over 20 years of experience in R&D of embedded edge intelligent hardware like SOMboard and motherboard, and provided users with various embedded solutions with ARM and X86 architecture, from Linux to Windows, from embedded to desktop level, from gateway to server. At the same time, we provide our users with system clipping, driver transplantation and other services.

Vantron industrial display systems, ARM and X86 series, are equipped with Rockchip, NXP, MediaTek, Intel and other high-performance processors. It supports various operating systems such as Windows, Linux, and Android. Diverse wireless communications keep your device online all the time. Multiple installation methods make it suitable for a variety of application scenarios. Features like waterproof, dustproof, shatter resistant guarantee the best performance in any environment.

Vantron has been a solution provider of IoT Gateways for many years, having accumulated very rich experience in this field. The products support both wired and wireless communication access to make remote operation and maintenance possible. From electricity and transportation to smart retail, medical and warehousing, Vantron IoT communication device can be deployed anywhere in any business section. Up to now, Vantron's IoT Gateway solutions have helped many companies finish their digital transformation, significantly improved efficiency of manufacturing and productivities.

Vantron BlueSphere device management platform, a software product, is playing a big role in Vantron overall IoT solution. Today, Vantron puts more focus on offering complete cost effective, leading-edge yet reliable solutions to help customers carry out their visions.