

SUCCESS STORY

OPC UA ENABLES KUNYING DIGITAL TECHNOLOGY TO ACHIEVE FLEXIBLE INTELLIGENT MANUFACTURING



The intelligent machining control and management system based on OPC UA helps promote high-quality development of China's manufacturing industry and facilitates the transformation and upgrading of the national industrial ecosystem.

Technology Innovation Research & Development

KUNYING DIGITAL TECHNOLOGY ACHIEVES EFFICIENT INDUSTRIAL COMMUNICATION AND SYSTEM INTEGRATION WITH OPC UA

In the context of Industry 4.0 and smart manufacturing, the standardization and high-efficiency of communication protocols are essential to enable the interconnection of industrial systems. In the use case of flexible intelligent machining for Jiatai Group, Kunying Digital Technology has successfully solved the communication issues of multi-source heterogeneous data by introducing the OPC UA communication standard, enabling efficient information exchange across devices and systems. This has brought significant benefits to the watch manufacturing factory of Jiatai Watch Co., Ltd.

KUNYING DIGITAL TECHNOLOGY INTELLIGENT MANAGEMENT MANUFACTURING THE FUTURE

Beijing Kunying Digital Technology Co., Ltd., a Hong Kong-funded enterprise, was founded in 1991 and is headquartered in Hong Kong. The company is dedicated to advancing enterprise digital intelligence through its specialized R&D centers. The company focuses on the design, implementation, and operation of comprehensive management systems that support digitalization, networking, intelligent automation, customization, and specialization. Its modular solutions are tailored to meet the diverse needs of businesses across various industries and scales, ensuring seamless alignment with operational requirements. By enabling the automated processing of complex business operations, Kunying Digital Technology significantly enhances the efficiency and quality of organizational workflows.

ENTERPRISE DIGITAL INTELLIGENCE R & D BASE A ZERO-CODE DEVELOPMENT PLATFORM FOR REQUIREMENTS ANALYSTS

- A platform product designed to help enterprises implement digital solutions that truly fit their needs.
- Transform enterprise digital solutions into enterprise assets and provide a supporting community ecosystem.
- Explore the value that AI can bring in enterprise digital application scenarios, ensuring that AI-enabled enterprises is not just a concept.
- Enables users with different capabilities and backgrounds to find application development tools suitable for them.



Intuitive and Efficient

The Enterprise Digital R&D Base uses a “no-code” approach to complete application R&D, allowing business personnel to directly participate in system construction. The “what you see is what you get” R&D model truly achieves agile development and reduces project riskst.



Empowering Business Personnel

Business personnel can directly participate in the construction of digital systems, thanks to a single configurator which simultaneously undertakes the job responsibilities of multiple positions, including requirements research and design, function configuration and testing, and the release of the system release while providing modular training.



Flexible and Modular Development

Kunying Digital Technology independently developed the “Component-based Logic Engine” and the “Zero-code front-end Framework”. These two core technologies not only provide the convenience of zero-code development, but also ensure sufficient flexibility.



AI PaaS

In subsequent updates, the Enterprise Digital R&D Base will continuously provide AI basic AI capabilities in the form of logical nodes. ebasic AI capabilities can be easily integrated into previously configured functions, truly achieving the in-depth combination of AI and enterprise digitization.



CAO SHUGUO,
CEO of KYDT Limited

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“The OPC UA information model serves not only as a technical foundation for industrial digitalization, but also as a key engine driving collaborative innovation within the industrial ecosystem. In KYDT's practice, we have deeply experienced how OPC UA, with its capabilities of unified semantics, end-to-end security, and cross-platform interoperability, thoroughly breaks down data silos between devices, systems, and business operations.

It empowers enterprises to transform complex physical entities into standardized digital objects, enabling the cost-effective and efficient implementation of cutting-edge technologies like digital twins and industrial AI. We believe that embracing OPC UA means embracing an open, trustworthy, and sustainably evolving industrial future – it is not merely a technological choice, but a solid guarantee for long-term enterprise investment value.”



KWONG KAIHONG,
CEO of Hong Kong Jiatai Group

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“In the IP-collab fashion line, OPC UA acts like a ‘Data Coordinator.’ Once, inkjet, UV printers, and color lasers worked solo – even ‘true red’ was checked three times by eye. Today the OPC UA information model packages dial color codes, logo offset, and laser depth into semantic nodes with tolerances, flashing them to MES every 0.5 s; a new graphic drops in 15 minutes instead of four hours. Better yet, trending colors, like ‘Hero Red’ and ‘Princess Blue’ are saved as standard palettes – drag-and-drop for the next reorder, $\Delta E \leq 0.6$. OPC UA replaces guesswork with a traceable, repeatable, and endlessly upgradable digital DNA for every Chinese-made fashion watch.”

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“At Jiatai Watch Smart Manufacturing Base, we synchronized ‘IP-collab’ with ‘flexible line’ for the first time. The OPC UA information model encapsulates glue-jet speed, UV-curing temperature, dial color code, and laser focal length into standardized nodes, achieving cross-device handshakes in 0.5 s. Adding a ‘Hero Red’ or ‘Princess Blue’ is as simple as dragging the color tile in the RPAS platform; the system pushes it to every OPC UA client and completes change-over in 15 minutes with $\Delta E \leq 0.6$. Results: batch cycle of the same watch dropped from 120 days to 60 days, annual output jumped from 0.8 million to 2.4 million pieces, defect rate fell from 5 % to below 1 %, and inventory capital occupation decreased by 90 %. OPC UA not only removed the ERP-MES-equipment barrier, but also gave Chinese fashion watches a ‘digital engine’ for continuous iteration and rapid response to global trends.”

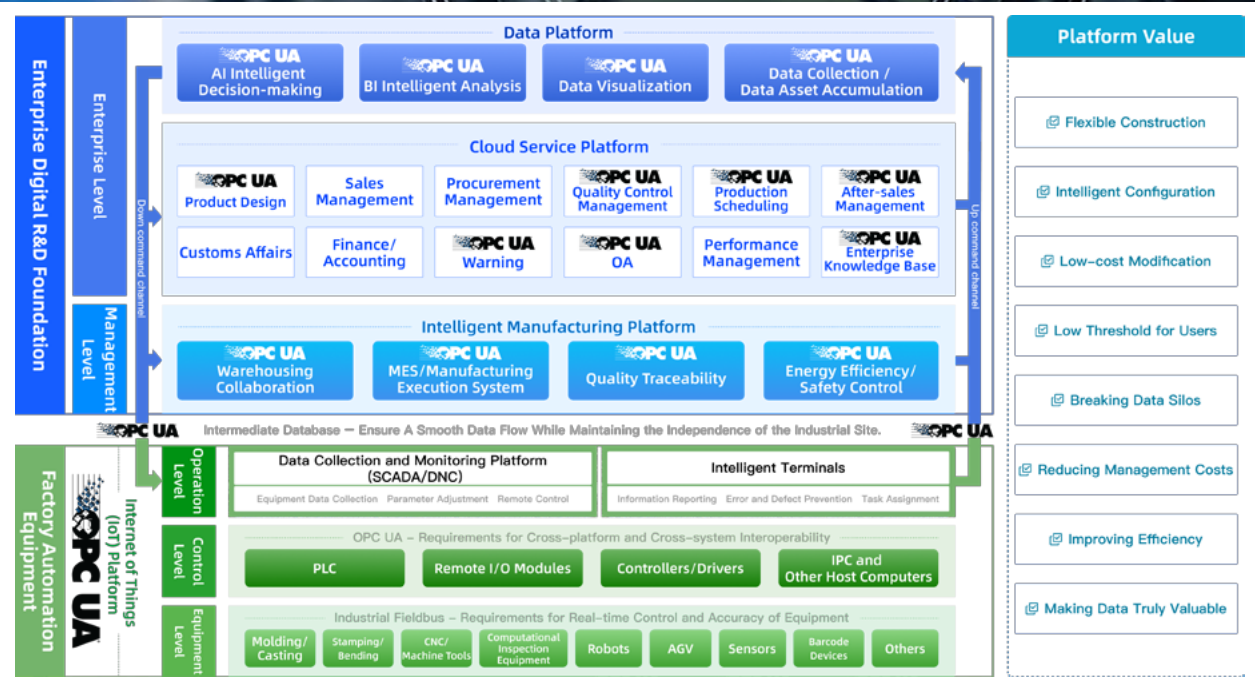


Jiatai Group was founded in 1991 and established a factory in Shenzhen in 2000. After more than 20 years of development in watch design and manufacturing, the company now has a complete industrial chain that integrates the design, R&D, production, assembly, and sales of mid-to-high-end finished watches. Its customers are spread across Europe, America, etc. It is one of the most large-scale, fashionable, and competitive group companies in the watch industry. The factory produces over 6000 watches per day, including many world-renowned brands.

In the watch manufacturing factory of Jiatai Watch Co., Ltd. (Jingzhou Park), a challenge is the equipment being provided by different suppliers with varying automation levels and communication protocols. The data connection between IT systems (such as ERP, MES, WMS, etc.) and OT systems (such as PLC, SCADA, DCS, etc.) is

limited, resulting in a severe information silos. To overcome these barriers and enable flexible production and intelligent management in the factory, Kunying Digital Technology has adopted the OPC UA as one of the core technology for seamless system integration.

PRODUCTION SUPPLY CHAIN SYSTEM SOLUTION FOR MACHINING INDUSTRY



OPC UA Logo indicates the usage of OPC UA for information modeling or information exchange.

Kunying Digital Technology has constructed a unified information model with OPC UA, harmonizing the data exchange between different devices. Enterprise Digital R&D Base in combination with RPAS systemon provides a solution for the automated control and intelligent management in the watch assembly process, featuring flexible manufacturing, precise production, and intelligent management.

IMPLEMENTING AUTOMATION WITH OPC UA

I. CROSS-DEVICE COMMUNICATION PROTOCOL CONVERSION

Kunying Digital Technology has constructed a unified information model using OPC UA, enabling the conversion of communication protocols between different devices. For instance, devices in the factory, such as PLCs, robots, and AGVs, which originally used different communication protocol like ModBus, SDK/API, can now seamlessly exchange data with the upper-layer software robot processes through the OPC UA adaptation layer. This cross-device communication capability allows the production system to quickly adjust the production line configuration according to order requirements, facilitating the simultaneous processing and production of multiple models of watches.

II. SYSTEM INTEGRATION AND DATA COLLABORATION

The OPC UA protocol provides a foundation for connecting different systems such as ERP, MES, and SCADA. Kunying Digital Technology integrates these systems into a unified platform through OPC UA interfaces, achieving real-time data sharing and collaboration. Production order information can be transmitted from the ERP system to the MES system, and then the MES system distributes it to specific production equipment. The operating status and production data of the equipment can be fed back to the upper-level management system in real time. This system integration method not only improves production efficiency but also ensures the stability of product quality.

III. SUPPORT FOR FLEXIBLE PRODUCTION

The system architecture, based on the OPC UA communication standard, features a high degree of flexibility and scalability. When market demands change and there is a need to adjust the production line or add new equipment, thanks to OPC UA, the new equipment can be quickly integrated into the existing system, enabling plug-and-play functionality. For instance, in a watch

manufacturing facility, when new dial assembly stations or watchband processing equipment need to be added, simply ensuring these devices support OPC UA allows them to seamlessly integrate with existing upper-level systems. This eliminates the need for complex modifications, which enables efficient data exchange and rapid deployment of new equipment.

Based on Kunying Digital Technology's Enterprise Digital R&D Base, the project assembles and combines business models to build an enterprise business operation platform – RPAS. RPAS includes functional modules required for enterprise management and decision-making, such as product design, sales management, procurement management, quality control, financial accounting, warehousing collaboration, and customs affairs. With the help of the OPC UA information model, RPAS can directly complete data docking and interoperability with the UAMES manufacturing execution system. It breaks the traditional pyramid-layered structure of smart factories, achieving full interconnection among people, machines, and objects, eliminating information silos, and realizing digital, net-worked, intelligent, and flexible production control.



- Watch styles
before 200 → After 3000
- Defective rate
before 5% → After 0.2%
- Batch cycle
120 days → 60 days
- Annual output
800,000 → 2.4 million watches
- Accessories inventory
100 million → 10,000 pieces

WITH OPC UA

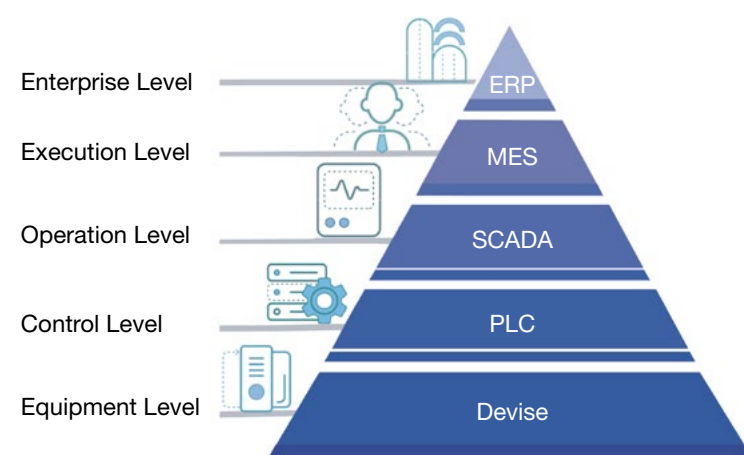
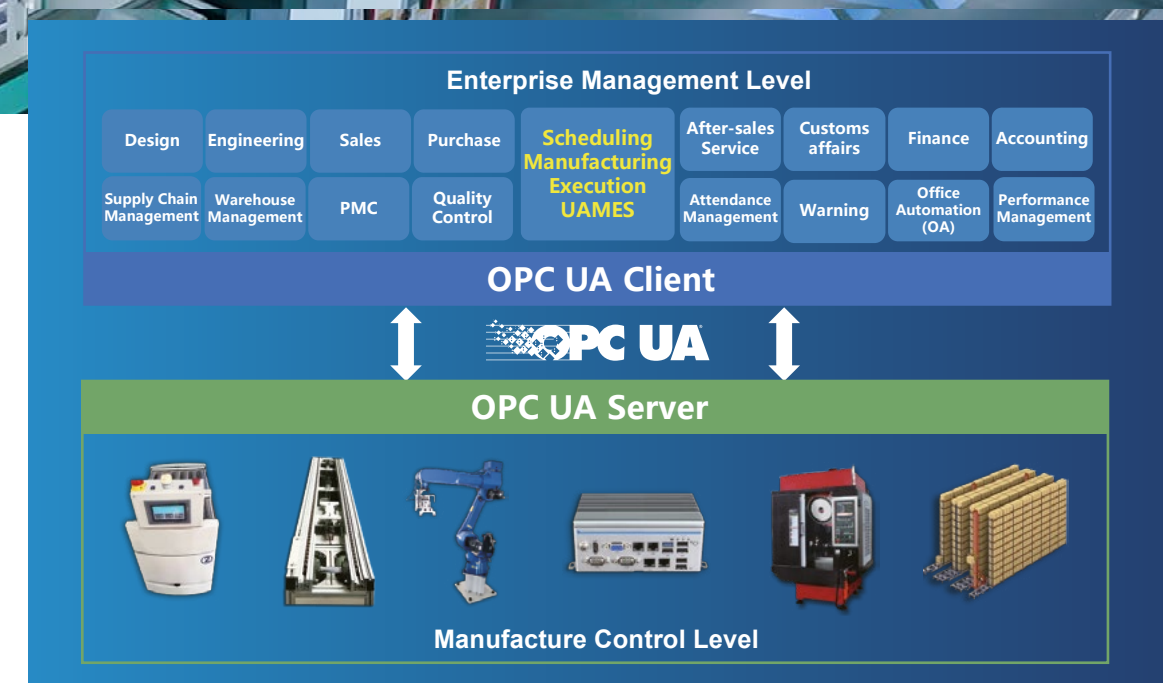


Fig. The traditional smart factory has a pyramid-layered structure

By opening the existing factory system's layered pyramid structure, the system now has the ability to construct information models quickly and at low cost. Through technologies such as dynamic production process configuration and standard equipment interface libraries, the system allows cross-level control and unified collection of heterogeneous data in smart factories. Production instructions are directly sent from the ERP and MES to the equipment layer, enabling flat and flexible production in enterprises.



After integrating OPC UA, the flexibility of the system enables the production system to quickly adapt to market changes and customers' personalized needs.



The new architecture meets the requirements of smart factories for flexible production and automated control. It can break down and reassemble functional modules according to industry, processes, and other system needs, saving the cost of secondary development and realizing intelligent control and decision-making in the enterprise's production and management processes. A review of the project's labor costs revealed that the newly-developed functional components benefited significantly from Kun-

ying Digital Technology's Enterprise Digital R&D Base. By involving end-users directly in the development process, the project avoided the typical communication overhead associated with understanding and transferring requirements. As a result, labor costs were reduced by more than 50%, compared to the original plan. Looking ahead, for a subsequent development, the labor cost is expected to be only one-third of what would be required using traditional development methods.

APPLYING OPC UA MEANS THE MODERNIZATION OF INFORMATION EXCHANGE



In a flexible, intelligent machining use-case, Kunying Digital Technology applied OPC UA to its production and intelligent management. By implementing OPC UA, the watch manufacturing factory overcame key integration challenges, achieving flexible production, higher product quality, and more efficient management. The solution also lowered costs and eased inventory pressure, resulting in notable economic gains. Looking ahead, as the

Industrial Internet of Things (IIoT) and intelligent manufacturing continue to evolve, the OPC UA standard plays an important role across a broader range of industries. Its unique advantages will further empower enterprises in their digital transformation journeys, driving smarter operations and more connected ecosystems.



**OPC FOUNDATION
NORTH AMERICA**

16101 N 82nd Street 3B
Scottsdale, Arizona
AZ 85260-1868
United States
office@opcfoundation.org

**OPC FOUNDATION
EUROPE (HQ)**

OPC Federation AISBL
Cantersteen 47
1000 Brussel
Belgium
office@opcfoundation.org

**OPC FOUNDATION
CHINA**

Room 102-104, 1st Floor
Fengheng Building, Kandan Street
Fengtai District, Beijing 100070
P.R. China
opcchina@opcfoundation.org

**OPC FOUNDATION
JAPAN**

c/o Microsoft Japan Co., Ltd.
2-16-3 Konan, Minato-ku
Tokyo 108-0075
Japan
opcjapan@opcfoundation.org

FRANCE

opcfrance@opcfoundation.org

INDIA

opcindia@opcfoundation.org

ASEAN

opcasean@opcfoundation.org

KOREA

opcukorea@opcfoundation.org

www.opcfoundation.org