



Making manufacturing productive again with IoT

Cloud computing, big data, and IoT are ushering in the age of Industry 4.0 – a time when manufacturing is becoming smart and data-driven. Huawei's smart manufacturing solution, developed in collaboration with industry partners, is designed to help manufacturing enterprises carry out digital transformation and build competitive advantages as the fourth industrial revolution begins.

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The growth of traditional industries has slowed almost in parallel with the booming development of the mobile Internet industry. Manufacturers have faced significant growth obstacles, including high manufacturing costs, low efficiency, and the lack of ability

to innovate.

From 2011 to 2015, the annual average growth rate of global industrial productivity dropped from 4 percent, which had stayed constant for 20 years, to just 1 percent. One reason is labor costs: In China, for



example, costs doubled from 2004 to 2014, with productivity growth falling far behind. Innovation has been weak, with traditional manufacturers focusing on extending existing services and product features such as performance indicators.

The fourth industrial revolution

Over the past few years, each of the main global manufacturing powers has introduced new policies to promote digital transformation and stay competitive. Launched in 2013, Germany's Industry 4.0 strategy aims to create smart factories and smart manufacturing innovation centers. France's New Industrial France policy sets out plans for 34 new projects, from next-gen high-speed trains to electric aircraft, smart textiles, and factories of the future. The National Network for Manufacturing Innovation plan in the US will set up 45 innovation centers to develop innovative smart manufacturing technologies. Japan's Society 5.0 is the nation's vision for robots, new energy

vehicles, and 3D printing, among other innovations. Proposed in 2015, China's Made in China 2025 outlines a three-stage plan for developing China's manufacturing industry in 10 priority sectors. And the UK's strategy for manufacturing extends to 2050, aiming to promote manufacturing and service integration and increase the number of skilled workers.

Alliances for the future

Germany, the US, and China have made the most progress in advancing smart manufacturing, with alliances set up in each of the three countries: the Industry 4.0 Alliance in Germany, the Industrial Internet Alliance (IIC) in the US, and the Alliance of Industrial Internet (All) in China.

Germany's Industry 4.0 platform has developed more than 130 innovation projects in areas such as mass customization, adaptive factories, self-organization and adaptive logistics, human-machine interface technology, and smart product development and production. The IIC has set up over 30 testbeds and more than 60 projects to look at innovative applications in sectors such as energy and power, industrial manufacturing, transportation, healthcare, agriculture, and smart cities. China's All, which now boasts 404 members, has launched over 20 testbeds, covering areas such as discrete manufacturing, energy and utilities, port logistics, and basic medical care; 17 industrial Internet use cases; and 8 industrial Internet big data use cases. These use cases include smart production,

mass customization, network coordination, service extension, production process monitoring and optimization, and remote equipment O&M.

IoT facilitates smart manufacturing

To help traditional manufacturers carry out rapid digital transformation, Huawei has leveraged its powerful ICT capabilities and joined forces with industry partners to launch a complete smart manufacturing solution. The solution can help industrial enterprises achieve smart manufacturing in four main areas: terminals and sensors, access and transmission networks, capability opening, and upper-layer applications.

On the terminals and sensors front, Huawei has collaborated with industrial partners to smartify the dumb terminals used in traditional manufacturing so they can upload equipment data and receive commands. There are two methods of smartifying dumb terminals:

Adding wireless chips: An eLTE or NB-IoT chip is added to the manufacturing terminal. The chip can transmit data generated by the terminal via the eLTE or NB-IoT network, enabling manufacturing data to be collected and commands

issued.

LiteOS: Huawei's LiteOS IoT operating system is embedded into manufacturing devices, simplifying the development work of cloud-device interconnections.

For access and transmission networks, Huawei provides a converged wired and wireless network access method to ensure stable access for manufacturing equipment.

Wired access: Huawei's EC-IoT gateways support multiple interfaces and protocols to facilitate access for different types of manufacturing equipment. With the gateways providing edge computing capabilities, applications can be easily developed and deployed, enabling real-time device management and maintenance.

Wireless access: Huawei offers two wireless access methods: eLTE and NB-IoT. For communication within a manufacturing plant, an enterprise can leverage Huawei's solution to build their own eLTE private network, providing unified access for broadband, narrowband, and trunking, enabling functions like scheduling automated guided vehicles (AGV), camera access, collecting production data, asset inventory, monitoring energy

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consumption, monitoring gas, and trunking communications. Manufacturers can implement a multi-functional network to reduce the number of internal networks and cut management and maintenance costs.

For external communications, Huawei's NB-IoT chips can be embedded into devices and enabled to transmit data over a telecom operator's NB-IoT network to report data. On the platform front, Huawei's one-stop cloud services portfolio provides an IoT platform, IaaS, a database, big data analysis, security, and applications. For IoT scenarios, it offers references to typical architectures and optimization features for cloud services in different sectors. One of these services is OceanConnect, which provides connection management, unified access, visual device management, big data analytics, and capability opening for IoT devices.

One-stop connection management: M2M connection management capabilities include device management, operations management, pipe management, fault diagnostics, Dashboard, and automated monitoring for individuals and businesses. The API provides integration capabilities for external applications.

Unified model and quick access for massive numbers of devices: For southbound access to large numbers of devices, the IoT platform provides unified, quick access capabilities, preventing problems with different access protocols and enabling application and device

decoupling. The IoT platform offers a unified model for northbound applications, helping them leverage device data. The IoT platform can adapt to different protocols through cloud gateways, device-side agents, and SDKs.

Visual device management: Provides upgrades, diagnostics, remote operation, and visual management capabilities for IoT devices plus LWM2M-based device management.

Big data analysis: The IoT platform provides secondary development and supports real-time and offline analysis and data sharing for new services. By establishing big data analytics models and collecting industry data, enterprises receive big data and statistical analytics services, including basic information resources use, business data, user behavior, and geographic location.

Capability opening: Network capabilities, connection capabilities, device management, and big data applications are opened up to the enterprise, helping it to quickly build applications.

Huawei has worked with industry partners to build manufacturing industry applications including MES, CAD, CAE, and ERP into Huawei's IoT platform and public cloud, so that manufacturers can build business systems. Huawei has also worked actively with industry ISV and IoT ecosystem partners to build scenario-based IoT solutions that accelerate IoT application innovation in industry verticals.

Real-world smart manufacturing cases

Huawei Songshan Lake Manufacturing Facility

Huawei deployed an eLTE-based smart factory solution at its Songshan Lake factory in Dongguan, China. Services include video surveillance, AGV control, robot status data backhaul, device data collection, device power consumption monitoring, asset inventory, and personnel and key asset location. The device power consumption monitoring and asset inventory functions leverage an eLTE-IoT narrowband solution, while the other functions harness LTE-U broadband technology. After the solution was deployed, productivity went up by 30 percent and OPEX and power consumption fell by 20 percent and 10 percent, respectively.

Automotive manufacturing

Huawei and the robot manufacturer KUKA have jointly tested an eLTE-based smart factory solution for reporting robot status at an automotive manufacturing plant. By enhancing network connectivity, the collaboration will enable more wireless services in the future, including mobile robots, AGV, and edge gateways, so that more LTE-based and 5G-based use cases can be verified. It will also optimize existing production lines,


improve production efficiency, and shorten product release cycles.

Elevator industry

Huawei partnered with the industry giant GE to provide smart after-sales services for an elevator company. The solution harnesses EC-IoT gateways to collect data on elevator operations, providing predictive maintenance for elevators through big data analytics. With the solution, downtime was reduced by 90 percent and operating expenses by 50 percent.

Petrochemical industry

Jiujiang Petrochemical deployed Huawei's eLTE-based smart factory solution to enable the smart inspection of refineries and smart monitoring of hazardous gases. Since the smart factory was built using Huawei's solution, Jiujiang Petrochemical has made new breakthroughs in safety and environmental protection, energy saving and emission reductions, cost reductions and efficiency enhancements, and green/low-carbon manufacturing.

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