

CASE STUDY

Intel® Atom™ Processor-based Platform
Embedded Industrial Personal Computer (IPC)



Developing a Flexible, Compact Industrial PC (IPC)

Intel helps Guangzhou Zhiyuan design a high-performance embedded IPC platform



"Intel® Atom™ processor-based platform allows us to easily integrate our existing technologies by virtue of its features, including low power, high performance, reliability and openness."

Zhou Ligong
General Manager
Guangzhou Zhiyuan Electronics Co., Ltd

The development of a parallel Internet, referred to as the Internet of Things, is well underway. A driving force is machine-to-machine (M2M) interaction and application development. It is forecasted the market value of global embedded devices will reach 10 billion US dollars in 2011, and there will be 15 billion embedded computing devices connected to the Internet by 2015.¹ With this tremendous build out of Internet-enabled devices, embedded computing platforms will undoubtedly play a central role.

A prime example is the embedded industrial PC (IPC), which communicates with a wide variety of factory floor equipment for data acquisition, centralized monitoring, production control and other areas. However, many of today's IPCs are not based on the latest computing technologies, resulting in computing performance and flexibility deficiencies. Moving forward, the Internet of Things will prompt the industry to adopt next-generation embedded platforms capable of delivering higher performance and faster connectivity to overcome these device limitations.

As a provider of embedded IPCs and industrial motherboards, Guangzhou Zhiyuan Electronics Co., Ltd has long been committed to the R&D of embedded system technology. The company provides efficient and stable embedded IPCs to its customers and has significant experience in the design and manufacturing of high-performance embedded systems. Guangzhou Zhiyuan benefits from a close technical relationship with Intel engineers, who provide design consultation. With this assistance, Guangzhou Zhiyuan has successfully designed the Intel® Atom™ processor into its latest IPC, the EPCM-500 featuring high efficiency, flexibility, stability and reliability.

CHALLENGES

Guangzhou Zhiyuan Electronics wanted to develop a next-generation embedded IPC platform with the following characteristics:

- Outstanding computing performance and flexibility to meet the requirements of increasingly complex equipment and machinery.
- Low cost, highly reliable and energy efficient to minimize capital and operating expenditures (OpEX/CapEx).

SOLUTIONS

Starting with an Intel Atom processor-based platform, Guangzhou Zhiyuan designed and built a new generation of embedded IPC:

- The Intel Atom processor provides exceptional performance which enables the EPCM-500 to easily satisfy the large-scale data calculation and algorithm processing requirements of industrial applications.
- The IPC platform provides a high level of flexibility by connecting to Intel® I/O Controller Hubs and/or other devices supporting specialized features and I/O interfaces.
- The cost-effective Intel Atom processor-based platform is highly reliable and has low power consumption.

Guangzhou Zhiyuan designs the EPCM-500 series of embedded IPCs based on the Intel® Atom™ processor

With the help of Intel's team, Guangzhou Zhiyuan developed a new generation of embedded IPCs, called the EPCM-500 series, based on the Intel Atom processor. The IPCs deliver high computing performance at very low power consumption and integrate multiple industry-standard network interfaces. In addition to traditional interfaces, such as Ethernet, RS 232 and RS 485, the EPCM-500 series integrates CAN2.0B, which previously required an expansion card. The EPCM-500 series also provides comprehensive support for industry standard network protocols, such as CANOpen, DeviceNet, J1939 and Profibus to seamlessly

connect with industrial automation equipment. Designed to operate in harsh environments, the EPCM-500 series is fanless and has a solid enclosure that incorporates sophisticated electromagnetic shielding.

"There is a need for higher performance IPCs as the demands on industrial machinery increases," said Zhou Ligong, general manager of Guangzhou Zhiyuan. For instance, an IPC controlling the printing presses for a high-volume, modern newspaper must minimize printing time in order to maximize throughput. Some newspapers distribute millions of daily and evening papers every day, with up to 70 and 80 different layouts. The modern printer must be fast and reliable, including the IPC in the printer control system, which never stops working. The control system constantly collects status information from a large assortment of sensors and checks for the slightest deviation across a large number of operations; then it swiftly sends the execution units control instructions needed to correct any deviation and ensure the newspaper print is high quality.

The EPCM-500 series is the first family of IPCs from Guangzhou Zhiyuan to use embedded Intel® processors. When working at the core of high speed printer, the Intel Atom processor-based platform is 46 percent smaller and delivers 50 percent better graphics performance than the company's prior generation of IPCs. The resulting 2.7 times improvement in performance density makes the IPCs ideal for industrial systems that process large amounts of data, yet are deployed in space constrained environments. "The EPCM-500 series has made the whole printer system faster and more reliable. This IPC, powered by the Intel® Atom™ processor, enables the control system to print as many as 70,000 newspapers per hour," said Zhou Ligong.

Increasing Platform Flexibility

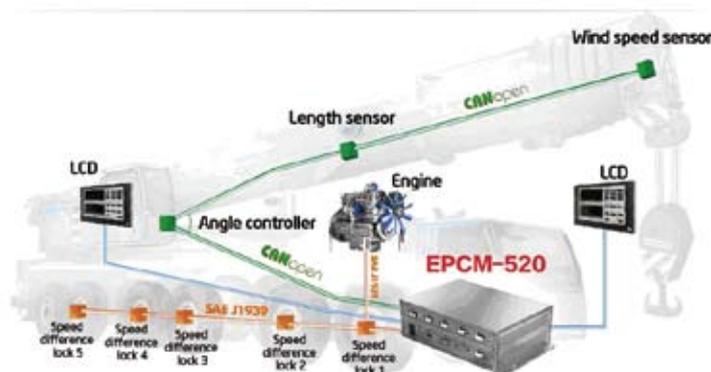
The Intel® Atom™ processor E6xx series is a very low power system-on-chip (SoC) that offers a new level of platform flexibility and scalability. It eliminates proprietary system busses, such as the front-side bus (FSB), and utilizes the open PCI Express* standard for processor-to-chipset interfaces. This allows the processor to be paired with the Intel® Platform Controller Hub EG20T and/or other controller chips supplied by third-party manufacturers; and thus, the platform can be tailored to meet application specific requirements in a compact and energy-saving IPC.

Control Application Example

"Flexibility is an important reason why we introduced an Intel® Atom™ processor-based platform as the core of the EPCM-500 series of embedded IPCs," said Zhou Ligong, "Take the example of a traditional crane, where its safe operation relies on the mechanical device and the experience of operating staff. Given the increasing tonnage handled by cranes, this approach is not sufficient, and electronics are needed to better ensure safety."

Today, a crane has a small IPC that connects subsystems, such as the engine and power transmission systems, via a J1939 network. The IPC executes a complex algorithm to analyze sensor data and precisely control the engine and the transmission to improve the drivability of the crane under all kinds of road conditions.

When the crane lifts an object, a CANOpen network sends the IPC sensor data, such as object weight, boom length and angle, object, engine power, hydraulic pressure, as well as wind force and direction on the top of boom. The IPC evaluates the information and continuously relays safety status to the crane operator. In addition, the operating staff sends instructions for controlling the crane's hydraulic



Highlights: Functional Features of the EPCS-520

- CPU: Intel® Atom™ processor E660T (1.3 GHz operating frequency)
- 512MB DDR2 (800 MT/s)
- CompactFlash card interface
- SATA interface
- 10/100/1000M Ethernet interface
- Four RS-232 serial ports (1 can be set to 485/422)
- Six USB Host interfaces
- Mini PS/2 interfaces
- Video interfaces (dual independent displays)
 - 1-way VGA interface: 1920x1080
 - 1-way LVDS interface: 1280x768
- Audio interface (supports audio output and MIC input)
- Onboard watchdog timer
- Board power consumption: 10W total (fanless design)
- Four analog acquisition with 100KHz sampling rate and 12-bit resolution
- Four pulse acquisition, 16Hz to 8KHz
- Four switching inputs
- Four switching outputs
- Four PWM outputs
- Twelve general purpose I/O (GPIO) interface
- CAN2.0B interface, supporting CANOpen, DeviceNet and J1939 protocols

valves to the IPC to ensure safe and reliable operation of the whole machine. Therefore, the IPC must have multiple interfaces, which are serviced by the Intel Atom processor in the EPCM-500 series. "The excellent performance, high reliability and low power consumption of the Intel® Atom™ processor significantly enhances our EPCM-500 series of IPCs," adds Zhou Ligong.

Find a business solution that is right for your company, contact your Intel representative or visit www.intel.com/go/industrial

¹ Source: John Gantz, The Embedded Internet: Methodology and Findings, IDC, January 2009.

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