ADVANTECH

Enabling an Intelligent Planet

Driving Evolution in the Internet of Things (IoT):

ADVANTECH'S SELF-SENSING INTELLIGENT SYSTEMS

▶ Foreword

The Internet of Things is the basis for connecting intelligent devices with cloud computing. Advantech's new generation of ARK fanless embedded systems is capable of self-management, seamless communication, and self-protection. It is also able to implement real-time monitoring and control over connected peripherals, automatically collecting data from them and reporting abnormal situations. In various application environments, ARK is able to initiate its "self-sensing" mechanism through advanced soft-and-hardware designs that help users quickly implement IoT applications and maximize their benefits.

To actually reap the benefits of the IoT, one must understand it. Advantech's ARK fanless embedded system, a self-sensing and intelligent system integrating advanced technologies, has played a key role in helping our customers realize IoT applications.

▶ Putting IoT Concepts into practice: ARK Self-sensing System

Talking about the values of the IoT and the so called "big data" that is collected by IoT, Louis Lu, senior software manager of Advantech Embedded Computing Group, pointed out that with the prevalence of wired and wireless networking, the accumulation and analysis of data acquired from networked devices—be it via the network of a closed intranet within an enterprise or the open internet, or via any kind of communication protocol—can be considered an IoT practice in the broader definition. And the functions and values of the "big data" accumulated from end-devices depend upon how it is analyzed, utilized, and eventually transformed into the most effective commercial values. The results not only help to create maximum benefits for client users but also encourage continual progress on the part of product providers.

Lu took Advantech as an example. Advantech provides devices and solutions that help its customers complete applications in various vertical markets, and the data gathered from the applications can also provide valuable reference to users when it comes to making decisions such as purchases. On the other hand, through analyzing the big data collected from various application areas, Advantech also has better understanding of end-users' responses and OEM customers' requirements in their particular vertical markets, which in turn directs us to improve our soft-and hard-ware designs in the future and likely to bring changes to the whole supply chain—from product designs, to planning, to

production scheduling.

▶ Production Line Smart Monitoring

The internet of things will not only bring a competitive edge to its users, but it will also influence manufacturers. Chen pointed out the most important value of the internet of things lie in the re-utilization of analyzed big data, which helps deal with existing errors and prevents the occurrence of errors in the future; analyzed data helps to predict future behavior modes so as to work out solutions that can be applied now and in the future.

Application

An intelligent automatic production system implemented with other information systems such as a Manufacturing Execution System (MES), a Warehouse Management System (WMS) or an Enterprise Resource Planning (ERP) system to streamline production operations.

Advantech's ARK fanless embedded system, a hard-and soft-ware integrated product with self-sensing capabilities achieves self-sensing and management functions—vital to preventing errors, analyzing data, and working out solutions.

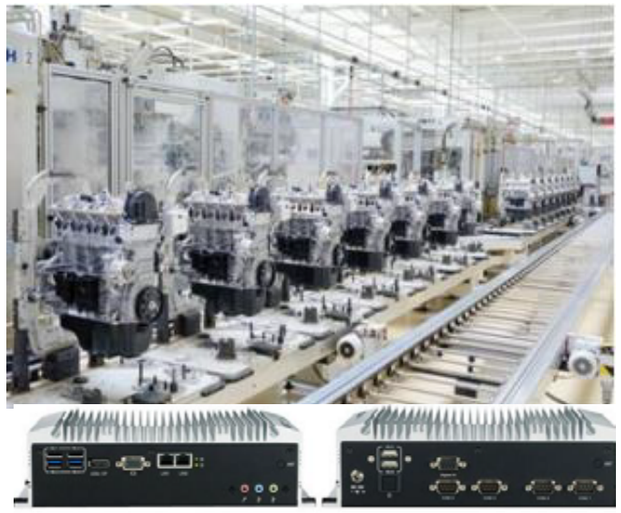

Figure1. Compact Embedded Fanless PC (ARK series)

▶ New Generation ARK Series- a Self-sensing, Intelligent System Plays Key Role for IoT

The Advantech ARK series is distinguished from other embedded systems in the market by its self-sensing and management capabilities. This new-generation, fanless embedded system family will not only be engaged in data computing but it is also capable of self-diagnosis, reaction, and alarms. It detects and monitors its own system status for temperature, voltage, system loading, networking, etc., as well as the status of connected peripherals—for example, hard disk read/write cycles and screen health status; when the system or peripheral parameters reach thresholds indicating they

are facing End of Life status, the system alerts a user to implement preventive replacement. It also can detect whether OS and applications are operating normally, and automatically make dynamic adjustments according to the user's settings.

Network security is also an important IoT issue. To deal with this, the ARK self-sensing system provides three layers of protection. The first is McAfee white-list screening, which allows only pre-authorized programs to run in the system, and when countering repetitive attacks by unauthorized programs it issues email or SMS alerts to system administrators. Secondly, it has a built-in software Security ID, which is an encryption lock that prevents copycats so that our customers can safeguard the yields on their self-developed programs; even if a hard disk is stolen, protected programs will not run in other machines. Thirdly, it uses open SSL cryptographic protocols for data transport to ensure security over the internet.

Figure2. Self-Sensing Intelligent Systems

The Advantech ARK self-sensing intelligent system is not limited to the traditional embedded system functions of computing and linking peripherals. Now it can implement primary

data processing, and send processed data to a backend server instead of merely forwarding raw data collected from the field. In addition, by recording user behaviors, such as system loads, performance efficiency and time of usage, the system can provide important reference to optimize future equipment purchases.

Advantech's Intelligent ARK Embedded System

Chen said that from the Advantech customer viewpoint, the ARK embedded system is different from other traditional controllers in that it offers intelligent management and information feedback. The role that it ultimately plays in the IoT depends on how OEM customers construct their application architecture. In any case, the self-sensing design of ARK helps expand IoT benefits to the maximum.

Lu stated that when ARK is used on a large scale or in an open architecture, there are upper layer units such as MIS or servers on top of it, in this case ARK simply plays a self-monitoring and data transmission role and hands over the jobs of policy-making to the upper control layers; but when the ARK is embedded in a small, closed system that does not have an upper control mechanism, it can take full advantage of Advantech's software-hardware integrated designs to implement management policy and at the same time notify responsible persons of the results. This helps to eliminate unnecessary expenditures and reduce human resource requirements. Therefore, the new generation ARK is an ideal IoT solution for small and medium enterprises that only need small-scale systems; it is also suitable for field deployment in remote areas with limited human support.

The new-generation ARK embedded system can manage, adjust and protect itself in a dynamic situation and is able to implement real time monitoring and control over peripherals. In addition to modular designs and rich peripheral supports, ARK fanless embedded systems also feature a high degree of integration with Advantech's software products such as WisePaas/RMM. The WISE-PaaS/RMM serves as an IoT device management platform that manages connected devices remotely, providing centralized management features, including HW/SW status monitoring, remote control, system backup/recovery, etc. Lu explained that all Advantech products, and some third-party peripherals, are provided with an advanced controller chip which takes advantage of Advantech's software resources to construct a complete IoT platform, from the front end to the back end; this allows users to obtain more detailed information about the system and its components and thus

make more accurate assessments. If the system incorporates non-Advantech products or modules without a similar control chip, it can merely collect basic data via standard interfaces.

Lu emphasized that what Advantech is endeavoring to do is to assist its product users to realize IoT applications and maximize their benefits. The main purpose of the new-generation ARK series is to create an IoT implementing environment based on well-rounded sensing and management together with seamless linkage from upper layers to the field. The technologies Advantech uses to meet these purposes form the core of our competiveness. Looking to the future, Advantech will continue to develop hard- and soft-ware integrated products in order to provide comprehensive support and service for Big Data and IoT applications.

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