



# Boosting Internet of Things services with cloud

**RockKontrol builds a cloud computing platform based on the Intel® Xeon® processor E5-2600 and Intel® Node Manager, providing high performance and low power for its data center**

**RockKontrol** 罗克佳华

"Intel has brought us two major advantages. On one hand, the Intel® Xeon® processor E5-2600 provided powerful processing capacity for our servers. On the other hand, Intel® Node Manager has helped us monitor the power of the entire machine/component and air inlet's temperature in real time without additional investment in hardware. Through our power control strategy, we have increased the rack density by 25 percent while guaranteeing the server's standard performance. Accordingly, our data center's operating efficiency has significantly improved."

Wang Chen  
Research Director of RockKontrol

Founded in 2003, RockKontrol is a high-tech enterprise that focuses on research and development, production, engineering, and services through the use and application of the Internet of Things (IoT). It provides top-level design and all-in-one solutions in industries that make an impact in the economy and people's lives such as safe production, energy efficiency, environmental protection, and intelligent logistics. It aims to build a cloud computing center based on the IoT, a data center for industrial enterprises and supervising industries, to realize the perfect combination and use of various data. The company also aims to help different industrial organizations build cloud infrastructures, provide technology and products for cloud technology realization, and manage cloud computing centers, to help enterprises rapidly achieve business innovation and change, optimize processes, reduce costs, integrate the upstream and downstream cooperative company, as well as establish an innovative industrial ecological chain.

## CHALLENGES

- **Improve operational efficiency for IoT.** Keep pace with rapid developments in the IoT by improving operational efficiency.
- **Build massive data center.** Support the IoT platform by building a massive data center, which will resolve problems in performance, energy consumption, and resource utilization.

## SOLUTION

- **Build a cloud computing platform.** Create a platform based on cloud to provide a great number of IoT services for terminal equipment providers, industry application software developers, and users of the services.
- **Deploy servers with Intel® Xeon® processor E5-2600.** Build the cloud computing platform based on Intel Xeon processor E5-2600 to provide powerful processing performance.
- **Utilize Intel® Node Manager.** Ensure flexible resource scheduling for the cloud computing platform by taking advantage of Intel Node Manager, which also provides effective energy management.

## IMPACT

- **High-performance, low-power cloud computing platform for the IoT.** With a cloud computing platform based on the Intel Xeon processor E5-2600 and Intel Node Manager, RockKontrol has improved the data center's rack density by 25 percent, significantly improving the data center's operational efficiency and performance while reducing power consumption.

## Cloud computing platform for the IoT

Forty years since its creation, the Internet has changed our lives dramatically, transforming how we work and communicate every day. With the further development of information technology, the IoT has also continued to develop. As the extension of the Internet, IoT means connecting various objects and equipment into the Internet through network and sensor technologies, thereby enabling people to have better monitoring and management.

Dedicated to researching and developing the IoT, RockKontrol has developed a cloud computing platform to provide better IoT services. Explains Wang Chen, research director of RockKontrol: "Our IoT platform can be seen as a bridge. On one end are the terminal equipment providers and industry application software developers, and on the other end are the enterprises and private users who consume through the IoT. What we do is connect these two ends through our IoT platform."

In the past, when the terminal equipment providers sell the equipment to the customers, it is the responsibility of the customer to maintain the equipment. Through the value-added services provided by RockKontrol's IoT platform, customers are given better-quality services such as online equipment upgrade, log analysis, and remote operation and maintenance, among others.

This unified IoT platform can allow equipment to be more easily managed. This platform benefits the industry application software developers as it provides industry analysis to help the users resolve problems.

Traditionally, the user can only receive software services through purchase or customization, but through this platform, RockKontrol can provide rich platform as a service (PaaS) services and data models, and samples

# Intel® Xeon® processor E5-2600 and Intel® Node Manager allow RockControl to build a high-performance, low-power data center for its IoT platform

for industry application software developers, as well as allow users to directly purchase their own software services from developers that suit their specific needs. Users can easily obtain various IoT-related services and applications.

## Improving the IoT platform

To provide support for all these applications under the IoT cloud computing platform, RockControl wanted to build a powerful data center, virtualized technology resource service platform, and massive data service platform, which will be strongly supported by an integrated development and management service team. The building of the data center was of utmost importance, since it will have a direct impact on the service efficiency of RockControl's IoT platform.

Currently, RockControl has already built three cloud computing data centers across the country, focused on data computing, storage, and mining for the users in the IoT industry. The number of servers in these three cloud computing data centers is estimated at about 20,000.

Managing such a high number of servers has been a big concern for RockControl. It wanted to make sure that the cloud computing data centers will work to their fullest without sacrificing any of the following important requirements:

- That the data center provides strong processing performance
- That it will provide flexible resource scheduling ability
- That this data center allows efficient power management

Obviously, with the high number of servers it needed to manage and maintain, RockControl aimed to build a new cloud computing data center that will provide the highest performance with the lowest possible power consumption.

## The heart of the IoT data center

RockControl has three requirements that should be met during deployment of its new IoT platform data center. First, it should have a very high computing performance to meet the large amount of data which have reached PB scale from various sensors. Such a vast quantity of structured or semi-structured data would enable the cloud platform to store and process. Second, it should provide a high I/O performance to meet the massive data exchange that requires strong I/O channels. Finally, the data center should be able to provide efficient power and resource management.

To provide the processing capability its users want, RockControl knew its IoT platform needed powerful processing performance. To achieve this,

RockControl chose the Intel Xeon processor E5-2600 for its servers.

Intel Xeon processor E5-2600 integrates up to eight kernels and supports up to 768 GB in system memory. It also supports Intel® Advanced Vector Extensions (Intel® AVX), which increases the performance of compute-intensive applications like data analysis by two times. Using Intel® Integrated I/O and Intel® Data Direct I/O Technology (Intel® DDI) allows the data center to effectively deal with massive data flow, providing data for data-hungry applications and expanding the bandwidth of the massive data center. In addition, the Intel Xeon processor E5-2600 integrates an I/O controller that supports PCI Express® 3 standard in the microprocessor. This function reduces the I/O delay by 30 percent and, in combination with the PCI Express 3.9, increases throughput by over three times.

RockControl also employed virtualization technology that allowed the physical server that previously needed deployment in 20 nodes to be easily deployed in only seven to eight servers.

"The powerful processing capability of the Intel Xeon processor E5-2600 has allowed us to improve the efficiency of our data center. The I/O performance of our data center has improved by 5 to 10 percent," says Zhu Xiaojun, maintenance manager of the cloud computing center.

## An energy-efficient, cloud-based data center

Besides gaining high-performance processing, RockControl also benefited from Intel's intelligent power-saving technology, Intel Node Manager. This technology helped the massive data center obtain flexible resource scheduling capability and power efficiency management.

Intel Node Manager is a one-of-a-kind power consumption and monitoring technology embedded in the server's hardware platform. By more effectively controlling performance and power of the data center's server, Intel Node Manager can better use the rack's power consumption and optimize the server's density. As an out-of-band (OOB) power management strategy engine, it can use all different Intel Xeon processors. On one hand, it supports power adjustment (power control) through adjusting the power of processor and memory subsystem. On the other hand, it can coordinate with basic input/output system (BIOS) and operating system power management (OSPM) to manage and dynamically adjust the platform's power, improving performance to the fullest within the set power range of the single node.

As a power management solution based 100 percent on the hardware, Intel Node Manager

does not need to install a software agent in the operating system of the managed server, thus avoiding operations between application, operating system and the hardware. Meanwhile, inside the Manageability Engine of Intel Node Manager's hardware module is the embedded input current conversion algorithm, which can accurately reflect the actual power with less error. With the aid of other data center management tools, Intel Node Manager helps the data center manager set power budget for the servers.

Upon deployment of Intel Node Manager in RockControl's data center, the engineers, using the data center's monitoring platform and virtual resource management platform, were able to monitor the actual workload such as power and temperature of the physical machine when the server was used in the data center. In addition, they can set a certain strategy to dynamically adjust the data center's virtual resource on the basis of the power and temperature of the server.

"With Intel Node Manager, we can make reasonable, flexible scheduling of the server resources. For example, when the IoT platform receives a request from a user, we can choose the least-loaded server to load this user's task. The user would also be able to get the optimal resource allocation and, in the process, we are able to reach a balanced load," shares Chen JunFeng, research engineer at RockControl.

"Apart from this benefit, Intel Node Manager can effectively help our servers reduce power and have our data center's power significantly controlled. It helps our data center transfer the power and temperature of the server via IPMI data acquisition protocol. Processed by the data center's monitoring platform and the virtual resource management platform, the data center can automatically control the ventilation floor to adjust the wind direction and the valve's opening degree, automatically controlling the conditioning fans to adjust the speed of the frequency conversion fan. This ultimately lowers the operating efficiency of the data center," adds Zhu Xiaojun, maintenance manager of cloud computing center.

With the help of Intel Node Manager, RockControl's data center rack density has improved by 25 percent while allowing it to maintain its services' standard performance. Accordingly, the operating efficiency of RockControl's data center has been substantially improved.

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Intel® Node Manager technology requires a system with an Intel® Xeon® processor, supported Intel® Enterprise chipset, BIOS, and other requirements documented in the applicable Platform Design Guideline documentation and applications enabled for virtualization technology. Functionality, performance or other power capping technology benefits will vary depending on hardware and software configurations. For more information, visit <http://www.intel.com/content/www/us/en/data-center/data-center-management/techrefresh-info-nodemanagerfull.html>

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