



Security Isolation Gateway Enables Truly Controllable IoT Environment

RockControl RK-EMSG Series Security Isolation Gateway:
A Truly Controllable IoT Environment Based on Intel Atom Processor

WHEN IT MATTERS, IT RUNS ON WIND RIVER

EXECUTIVE SUMMARY

While people's lives have changed dramatically as a result of the Internet over the past decade, the Internet of Things (IoT), based on the exchange of information directly between intelligent connected devices, is poised to bring about another wave of transformational change for people's lives in the future.

In February 2013, the Chinese State Council issued its Guidance Opinion about Pushing Forward the Orderly and Healthy Development of IoT. Following that opinion, other ministries and departments, including the Ministry of Industry and Information Technology, NDRC, Ministry of Science and Technology, and Ministry of Education and Standardization Administration of P.R.C., jointly stipulated 10 Special Action Plans for IoT Development, as well as 47 national standards plans. Stimulated by a series of favorable policies, the industrial scale of IoT has been climbing rapidly. According to IDC's latest data, by 2020 the market value of IoT and its technology ecosystem will reach \$8.9 trillion, and the number of connected devices will reach 212 billion units.

Security is a foremost concern in IoT. When previously separated enterprise IT and industrial control networks are connected to each other or to the public Internet, they become vulnerable to intrusions that can disrupt operations, threaten safety, and result in the theft of sensitive data. China's RockControl Industry Co., Ltd. collaborated with Intel® and Wind River® to develop a solution to this challenge. The result of that effort is the RK-EMSG Security Isolation Gateway, which enables different enterprise systems to exchange data with each other or with external systems while preserving their physical separation. This white paper provides an overview of the RK-EMSG and the companies behind it, as well as some case studies of practical applications of the solution.

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Developer Tools

- Optional processor: Intel Quark™ SoC X1000 series and Intel Atom™ processor E3826
- Wind River Intelligent Device Platform XT developer environment
- McAfee Embedded Control Security Technology

INTEL: ACCELERATING THE DEVELOPMENT AND DEPLOYMENT OF IOT

The global leader in computing innovation, Intel has designed and created key technologies, laying a solid foundation for global computing devices. In response to ever-expanding computing demands, Intel's IoT Solutions Group is speeding up innovations in the areas of technology R&D, product architecture design, service and support, and partnerships. By constructing a "continuum of computing," the company has been actively promoting Intel architecture-based smart networking devices in multiple sectors, including retail, transportation, communication, security, and energy, in order to help customers have familiar, unified, and customized application experiences from brand-new connected devices.

By developing smart devices, providing end-to-end analysis capability, and connecting traditional devices to the cloud, the Intel IoT Solutions Group has been expediting the development and deployment of IoT, enabling formerly isolated systems to transform into networked devices, communicate among themselves and with the cloud, and share data, providing enterprises with access to critical information and driving business transformation.

More than 85% of devices today are based on traditional, existing systems. As enterprises move toward IoT, therefore, they are in urgent need of transitional solutions for interoperability. It is not a simple matter of replacing the existing infrastructures. To address this challenge, Intel has joined with McAfee and Wind River to put forward Intel Gateway Solutions for IoT, which makes possible seamless communication between devices and the cloud by constructing the basic module to connect the traditional systems and new systems, and providing the general interfaces.

Intel Gateway Solutions for IoT provides pre-tested and integrated hardware and software (including McAfee's Embedded Control and Wind River Intelligent Device Platform XT) that can help enterprise customers develop, create, and deploy the relevant application services more rapidly, and help focus their efforts on creating new value-added services. With these solutions, users can adopt more reliable approaches to collecting and filtering data, and to sharing it between edge devices and the cloud, for a variety of tasks, including monitoring high-value industrial assets, manufacturing automation, power grid automation, commercial vehicles, and more.

ROCKONTROL: TAKING IOT INTO THE CLOUD

RockKontrol is a high-tech enterprise dedicated to providing solutions for IoT, cloud computing, and Big Data applications. In addition to its traditional coal mine safety monitoring service, it is also expanding its service to power plant operation and environmental monitoring, aiming to become a leading IT conglomerate encompassing top-notch design, software development, intelligent products, and system integration and operation services.

Since it started to build up a base in Taiyuan High-Tech Park in 2004, RockKontrol has undergone several transformations. Today, RockKontrol owns a total of 200,000 square meters of industrial sites in Beijing, Shanghai, Taiyuan, Jinan, Erdos, and other locations, housing more than 1,000 technology developers. Its core technology team includes experts from overseas. The company also hosts three invited experts from the Organization Department of the Central Committee of the CPC's 1000-elite plan, several state-level experts, and experts authorized by the State Foreign Experts Bureau, as well as a technical team comprising several hundred doctoral candidates. It has set up academic workstations and postdoctoral workstations. It is the mecca of the national IoT, cloud computing, and Big Data technology R&D and talent.

RockKontrol has been pursuing a strategy of "cloud + client"—that is, delivering a perfect combination of IoT application, cloud computing, and Big Data in a bid to help users forge integrated solutions and services and ensure the technical application of IoT through a unified professional platform, all while reducing the costs of building and maintaining the platform. To that end, RockKontrol has established a Big Data center with 50,000 high-end servers and 500,000 cloud hosts, as well as the first public IoT in the world, setting up industrial clusters and pushing forward the overall development of the industry. Li Wei, president of RockKontrol, has witnessed the birth and development of IoT. In his words, the early-stage IoT has many problems, such as the integrity of data and real-time transmission. Only by collecting genuine and real-time

information on a large scale can a true IoT be developed and used to create a more intelligent world. "The development of IoT needs to be closely linked with computing capability and data analysis," he says. "When new information is collected, what is presented at last is the data value. The whole process is in special need of technical support such as cloud computing. As an IoT enterprise, establishing an IoT service platform based on cloud computing is our emphatic development orientation."

ROCKONTROL SECURITY ISOLATION GATEWAY FEATURES

With industrial enterprises facing higher requirements for "informatization," meaning using information to drive development, they have an increasing need for in-depth mining and utilization of production data. This is especially true as production and management techniques become more sophisticated. Many key decisions are based on an enterprise's production data analysis. This requires enterprises to connect their DCS, SCADA production control systems, and corporate information systems, or to connect their corporate information systems to the public service network. Currently, enterprises generally purchase common communication gateways or firewalls to achieve connectivity between different systems. These methods eliminate physical system isolation, which raises significant Internet security risks. What's more, users have to develop or purchase the associated protocol data collection and forwarding software when adopting these methods, which increases the complexity and cost of implementing the solutions.

To address this issue, RockKontrol introduced the RK-EMSG Security Isolation Gateway in November 2013. It is designed to create secure physical isolation between data switching systems and information systems. It is mainly used in heavy industries such as power generation, steel, and petrochemical. The first product is based on the Intel Atom D525 platform, which provides powerful computing capabilities and high-speed, rich peripheral bus interfaces to connect protocol data to information networks in a more reliable way.

Qualifications

- GB/T 20279-2006 Technical requirements for information security technical network and terminal device isolation parts
- GB/T 20277-2006 Testing and evaluation methods of information security technical network and terminal device isolation parts
- GB/T 17626.2-2006 Electro-Static Discharge test
- GB/T 17626.3-1998 Electromagnetic compatibility test
- GB/T 17626.4-1998 Electrical fast transient immunity test
- GB/T 17626.5-1998 Surge (Impact) Immunity Test
- GB 6587.4-1986 Electronic measurement instrument vibration test
- GB/T 17214.1-1998 Industrial-process measurement and control environmental test

Table 1: Device Selection List

| Criteria | | RK-EMSG-P18A |
|------------------------|------------------------|-------------------------------|
| Hardware spec. | System architecture | Dual-host, "2+1" architecture |
| | CPU | Intel Atom x 2 |
| | RAM | 2GB x 2 |
| | Control interface | 10/100M RJ45 x 4 |
| | Information interface | 10/100M RJ45 x 4 |
| | Console | Yes, at control end |
| Power | Input | AC 100V~240V, 50-60Hz |
| | Power | <120W |
| | Backup | Yes, redundant hot swap power |
| Product installation | Method | 2U, standard 19" rack mount |
| | Size | 650 x 430 x 88mm (L x W x H) |
| Performance parameters | Nodes | 10,000 |
| | Latency | <1ms |
| | Concurrent connections | >10,000 |
| | Configuration tools | Yes |
| | Monitoring tools | Yes |
| Operation environment | Operation temp. | -20°C ~ +50°C |
| | Storage temp. | -40°C ~ +80°C |
| | Humidity | 10%~95%, non-condensed |
| | MTBF | 30,000 hours |

The RK-EMSG Security Isolation Gateway features 2+1 physical isolation system architecture with two independent hosts to two networks. The two hosts are connected with dedicated hardware isolation devices for switching of specific application data. Without a network connection, there will be no channel for attacks, physically isolating networks from direct connection. While ensuring secure network isolation, the RK-EMSG's built-in data collection and forwarding functions support common data access protocols such as PC, Modbus, DL/

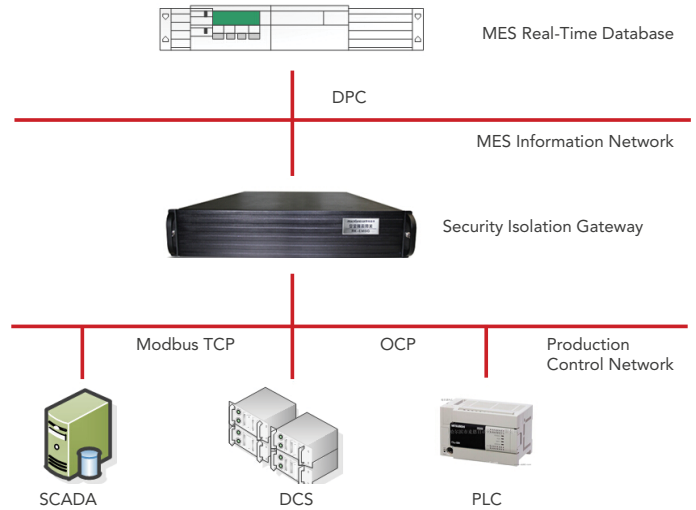
T645, CJ/T188, and SQL database interfaces. With support for rich protocols and easy scaling, it is designed to meet customers' demands and lower implementation barriers. Along with the Intel Atom hardware platform, RocControl RK-EMSG secure isolation gateway also features the Wind River commercial edition of Linux, Wind River Linux, and Wind River Intelligent Device Platform XT for improved stability and security.

ROCKCONTROL SECURITY ISOLATION GATEWAY APPLICATION CASES

A typical industrial enterprise network includes a management information system (connected to the corporate information network), production control system (connected to the corporate control network) and field data collection instruments. If collected information needs to be uploaded to the management platform, the systems need to be connected to a WAN. How to achieve information security isolation and protect the enterprise's information network from outside attacks, while keeping control network devices running stably, is a challenge enterprises face in configuring their systems.

Case Study: Manufacturing Execution System

With the ongoing trend of corporate informatization, the manufacturing execution system (MES) has gradually become a standard component of the enterprise information system. MES is pivotal for an enterprise's CIMS information integration, and the technical foundation for achieving an agile manufacturing and production strategy. During the process of building the MES, the system needs all the enterprise's real-time data. This requires the enterprise to connect its distributed control system (DCS), supervisory control and data acquisition (SCADA) production control system, and MES. The production control system is directly related to an enterprise's production uptime and safety, so security must be ensured. The RK-EMSG Security Isolation Gateway ensures not only that real-time production data is safely and accurately transmitted to the MES, but also that the MES does not have any negative impact on the production control system.



The RK-EMSG Security Isolation Gateway's typical application in MES system is as follows:

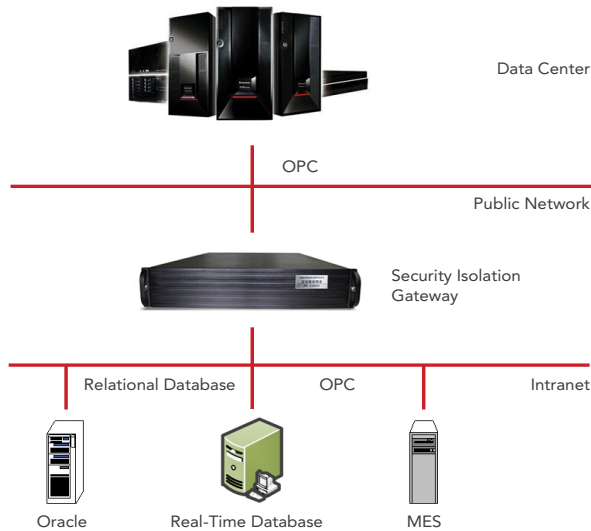
The security isolation gateway is an independent double-host structure, consisting of a control terminal and an information terminal. The interface of the control terminal is connected to the devices or systems of the enterprise's production control network. The gateway is embedded with various bus protocols on the production control site, which can collect all real-time production data from the field devices. The information terminal of the security isolation gateway is connected to the information network of the MES system. The gateway can utilize its internal isolation mechanism and transmit the data acquired at the control terminal to the information terminal safely. The information terminal can then utilize the embedded communication protocol and transmit the data to the real-time database of the MES system. As a result, it can both realize the transmission of data in two networks, and ensure the safe isolation of each network. The system needs only one device-security isolation gateway to meet the functional requirements, which simplifies the systematic structure and facilitates onsite execution.

Case Study: Online Monitoring System

An online monitoring system for energy consumption enables the government to collectively monitor, manage, and decide on all enterprises’ energy consumption. The implementation of online monitoring for energy consumption can provide different levels of service for all levels of energy reduction management authorities, industries, and enterprise users, and create a benign social effect. At the same time, the enterprises being monitored can learn their energy consumption analysis results and receive suggestions for improvement, resulting in direct or indirect economic benefits.

In the online monitoring system for energy consumption, enterprises must provide a variety of energy consumption data to the system’s data center server. Because an enterprise’s energy consumption data is valuable information, it generally resides in a high-level network that ensures absolute security, while the data center server is generally inside the public Internet. The enterprise, therefore, must consider the issue of network security, ensuring that its internal network is protected from attack or adverse impact when the data is being transmitted.

The RK-EMSG Security Isolation Gateway’s typical application in an online monitoring system for energy consumption is as follows:



The security isolation gateway is an independent double-host structure, consisting of a control terminal and an information terminal. The interface of the control terminal is connected to an enterprise’s internal network. The enterprise’s energy consumption data is generally stored in its various relational databases, real-time databases, and MES. The protocols embedded in the gateway support all kinds of databases and information systems, which directly collect all energy consumption data from the enterprise’s internal network. The information terminal of the security isolation gateway is connected to the public network of the online monitoring system for energy consumption. The gateway can utilize its internal isolation mechanism and transmit the data acquired at the control terminal to the information terminal safely. The information terminal can then utilize the embedded professional energy consumption communication protocol and transmit the data to the real-time database of the monitoring system. As a result, it can achieve the transmission of data in two networks, and ensure the safe isolation of each network. The security isolation gateway has several independent physical interfaces. If an enterprise’s internal data servers are all inside one network, only one security isolation gateway is needed to complete systematic construction, which can greatly facilitate onsite execution.

CONCLUSION

The Internet of Things can deliver on its promise of business transformation only if the systems connected to it are protected from outside intrusion. Supported by the technologies and expertise of Intel and Wind River, RockControl has made the secure exchange of data among IoT-connected systems a reality, enabling industrial enterprises to drive efficiency gains and optimize the value of the wealth of data housed in their systems.

