



KOREA HYDRO AND NUCLEAR POWER SELECTS SUPERMICRO SUPERBLADE TO CREATE DIGITAL TWINS OF ENTIRE POWER PLANTS

Reliable and Scalable Solution Enables KHNP to Simulate Nuclear Power Plants



Introduction

Korea Hydro and Nuclear Power (KHNP) operates several nuclear power plants in South Korea. Because of the complexity of managing a power plant, many processes, people, and a significant amount of training are all required. Hence, there is a need for a digital twin, which allows for the training and simulation of many scenarios. The Korean MMIS digital twin research project aims to create a virtual environment where the entire actual power plant becomes a virtual model. In contrast, as many scenarios and operations as possible can be simulated.

Challenge

The goal of a virtual digital twin system was to build a virtual environment of all the systems of an actual power plant with the same functions and performance found in the physical data center.

Powerful servers with the computing and I/O capacity to model the actual nuclear power plant were needed to accomplish this goal. Rather than rely on older technology and architecture, KHNP decided to implement a new, modern system based on Supermicro technology. The main challenge was to find the right combination of hardware and software that would be able to mimic the entire operation of the power plan through full virtualization, which is more advanced than existing object-based twins.

KHNP needed to put everything into one rack to minimize the data center space. This includes servers, storage, a 21-inch monitor, a keyboard tray, and two Ethernet switches. KHNP also needed a central management tool to monitor all the server statuses. Another hard requirement was that the system must be able to support approximately 450 virtual machines to monitor all the critical systems in a power plant.

INDUSTRY

Nuclear Power Plant Design and Operation

CHALLENGES

Compact System Design

Low Maintenance

Single Rack

Solution

ACETEC (partner of KHNP) chose the 4U Supermicro SuperBlade® as the primary computing server for this digital twin system. Each 4U enclosure contains 14 blade servers, two 10GbE switches, four 2200W Titanium level (96% efficiency), redundant power supplies, and a chassis management module. In turn, each blade server contains dual Intel Xeon 4314 CPUs. ACETEC decided to use two 4U SuperBlade enclosures, where 28 blade servers would be installed in one rack. All 28 blade servers also contained 256 GB of DDR4-3200 memory, 10GbE LOM connectivity, and a 960GB M.2 NVMe SSD. ACETEC integrated the solution and sent it to Doosan for testing and validation. Once evaluated and validated by Doosan, the systems were installed at each of KHNR's power plant sites to begin the operation of the digital twin systems.

SOLUTION

SBE-414J-422

- 4U SuperBlade Enclosure
- Fourteen Blade Servers
- Two 10GbE Switches
- One Chassis Management Module
- Four Redundant, 2200W Power Supplies

SBI-4429P-T2N

- 2-socket Blade Server
- Two Intel® Xeon® 4314 Processors
- 256GB Memory
- 2-port 10G LOM
- 960GB NVMe SSD



A key feature of this was the chassis management module (CMM), which is a centralized management system designed to remotely manage and monitor blade servers, power supplies, fans, and switches within a SuperBlade® enclosure. Its key features include remote management, hardware health monitoring, alarm notification, and system power capping. The CMM simplifies the management of SuperBlade® systems by providing a single platform to oversee all enclosure functions, thus enhancing overall efficiency and manageability.



Benefits

BENEFITS

- Simple Administration
- Cost Optimized
- Lower Power Usage

By using the SuperBlade® system, physical space is significantly reduced compared to standard 1U rackmount systems. With the integrated switches into the SuperBlade® enclosure, cable reductions of up to 95% can be realized. This can also lead to increased airflow and lower fan speeds, reducing the overall power consumption in a data center. Other benefits of SuperBlade® are the redundant power supplies, blade servers, chassis management module, and switches, which are all part of the overall system, ensuring continuous operation.

"This research project required high-performance and density servers. Supermicro SuperBlade has the best technology and ease of maintenance design. The Supermicro SuperBlade is a fantastic choice for the Digital Twin project."

By Hyun Kyu, Kim (Director of Engineering, ACETEC)

For More Information:

Supermicro SuperBlades: <https://www.supermicro.com/en/products/superblade>

SUPERMICRO

Supermicro is a global leader in high performance, green computing server technology and innovation. We provide our global customers with application-optimized servers and workstations customized with blade servers, storage, and GPU solutions. Our products offer proven reliability, superior design, and one of the industry's broadest array of product configurations, to fit all computational need.

For more information, visit
<https://www.supermicro.com>

ACETEC

ACETEC is a solution company in Korea, devoted to integrating world-class technology to factory automation for 30 years.

For more information, visit:
<http://www.acetronix.co.kr/eng>

KHNP

Korea Hydro & Nuclear Power (KHNP) is a South Korean power company that generates electricity, owns and operates nuclear and hydroelectric plants, and provides technical services:

For more information, visit:
<https://www.khnp.co.kr/main/index.do>

DOOSAN GROUP

Doosan Group is a South Korean multinational conglomerate corporation, ranked as one of the world's top 10 largest heavy equipment manufactures in 2018.

For more information, visit:
<https://www.doosan.com/kr>