intel
Look Inside.™

Reduce Energy Consumption with Intel® Data Center Manager

Intel Data Center Manager helps Sinopec Geophysical Research Institute improve data center efficiency and reduce energy consumption in the data center

"Using Intel® Data Center Manager, our data center has significantly reduced its energy consumption while ensuring operational efficiency and security, which not only meets our need to build green data centers but also cuts down our daily costs."

Wang Yongbo
Information Center Vice Director
Sinopec Geophysical Research Institute

Sinopec Geophysical Research Institute (SGRI) is Sinopec's research and development (R&D) center for high, new and core technologies on geophysics. Its main responsibilities are: conducting basic and prospective R&D on key technologies, scientific and technological breakthroughs in oil geophysics for the nation and Sinopec, and providing Sinopec with reliable resource for its sustainable development. Currently, SGRI possesses a wide range of advanced and practical facilities and equipment, including China's leading and internationally advanced all-digital facilities for geophysical simulation experiments, large-scale high-performance computing and fully-equipped seismic data processing and interpretation.

CHALLENGES

- **Energy consumption management in data centers needs urgent attention.**
  Energy cost is becoming a key running cost for IT departments and one of the top concerns for data center owners. SGRI has been looking for a way to help reduce energy consumption in their data centers.

SOLUTION

- **SGRI deploys Intel® Data Center Manager.** Intel Data Center Manager (Intel® DCM) is a software and technology product which monitors, manages and optimizes the energy consumption and temperature of data center servers. it helps SGRI manage of energy consumption of servers inside data center efficiently.

IMPACT

- **Effectively reduce energy consumption while maintain business performance.**
  The successful use of Intel DCM in SGRI marks a rewarding attempt to explore the way in which to build an energy-efficient and environmentally-friendly data center. Using Intel DCM, SGRI estimates it will to achieve a 10 percent reduction in its overall data center energy consumption while effectively improving its operational efficiency.

Helping SGRI with efficient management of its data center

Modern data centers maintain a stable and suitable operating environment for servers with strict temperature control and security measures, which also makes it possible to apply various energy-saving and environmentally-friendly measures in a centralized manner.

However, the way to strike a balance between low energy consumption and high computing capability and operational security is not only a challenge that operation and maintenance personnel of data centers are faced with, but is also a subject that is directly related to the Total Cost of Ownership (TCO) of data centers. When SGRI looked for a solution to reduce the TCO of their data centers, they considered Intel DCM and eventually adopted it. Intel DCM is a data center management solution that can conduct real-time out of band monitoring and management of the overall energy consumption of servers, without affecting the operation of the systems, and provide

reasonable energy-saving measures according to actual environment and server operations based on historical data.

A data center is generally deployed with thousands of servers, but not every server runs at full capacity continually. Senior energy analyst Eric Woods once said, "Servers use 60 percent of their maximum power, while doing nothing at all. [1]" The data center of SGRI was facing the same problem. According to Director of SGRI Data Center Wang Yongbo, when the workload of the data center is at a low period, about 40 to 50 percent of the servers do not have any workload running on them and can be shut down temporarily.

Intel DCM provides a simple but smart strategy for addressing such a situation: Intel DCM can automatically monitor real-time energy consumption and inlet temperature of each server in the data center of SGRI, record this data and store it in a database. After a period of time, such as a month, Intel DCM can be used to analyze the energy consumption data and implement energy

SGRI adopted Intel® Data Center Manager in their data center with 2,000 servers in order to improve server operating efficiency, conserve energy and reduce total cost of ownership.


Intel® DCM Interface

saving strategies accordingly. For example, energy consumption data may show that some servers with SGRI are not functioning at night and 40%-50% of them do not run with an effective application load. Using Intel DCM, data center administrators can develop appropriate strategies to enable servers that are not in service to enter hibernation or power-off status and reawaken or start them up again the next morning before workload increases again. Intel DCM's intelligent node power on/off scheduling can be used in connection with the task scheduling system to boot up servers that have been shut down for energy conservation before high-performance computing operations, and return the servers to hibernation or shut them down after completion. In doing so, it can greatly reduce energy consumption of the data center while ensuring normal business operation. As an example, when using 1,000 server nodes, if 20% of the servers on average are at idle or low load, with the idle energy consumption being about 90 W, the supposed PUE being 1.8 and the electricity cost being 0.9 RMB/kWh, then RMB 260,000 (USD 42,000) of electricity costs can be saved for the 1,000 servers annually after using Intel DCM for scheduled power on/off management.

While air conditioning and temperature control facilities are required to maintain data centers at an appropriate operating temperature, they lead to huge energy consumption when ventilating and cooling the data centers. Generally, the appropriate working temperatures of a server range from 18 °C to 27 °C. The temperature of SGRI's data center was previously maintained at 20 °C. It gives an opportunity to increase to the operating temperature of the data center to reduce

energy consumption. However, it needs to be handled with care in order not to create hot spots in the center data resulting in damage of equipment and downtime of services. SGRI uses Intel DCM to collect temperature data and acquire the inlet environment temperature of each server in a real-time, which acts as an intelligent thermometer added to each server. The temperature information is gathered at the management interface so data center administrators can set air conditioning systems accordingly to avoid wasting resources as a result of excessive cooling and prevent generation of possible hot spots due to inadequate cooling. Using Intel DCM's real-time monitoring function, SGRI found that there was a 5 °C temperature difference among server air inlets in the data center. The large difference in temperature could lead to hot spots in the data center and reduce operational reliability. A reduction in the air inlet temperature difference can help eliminate hotspots as well as allowing an increase of air temperature at cool air outlets. It further contributes to improving cooling efficiency of the data center. Data analyses and statistics showed that a decrease in temperature at outlets of the air conditioners by every 4 °C at the SGRI data center would represent a 32% saving in power consumption for cooling.
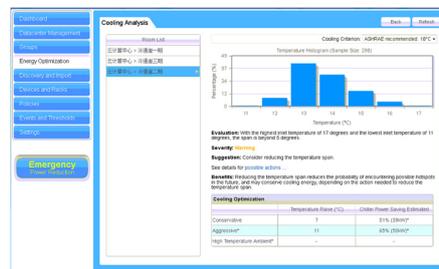
Data center server inlet temperature distribution and analysis

In addition to the management of energy consumption, Intel DCM also provides a variety of emergency mechanisms to support continual operation of data centers. For example, in the event of heavy rains and other emergency situations, data centers are subject to failures in the normal power supply, requiring startup of UPS. Also, cooling systems may fail requiring data center administrations shut down and

LESSONS LEARNED

- Intel® Data Center Manager (Intel® DCM) is an effective tool in managing data center efficiency and reducing total cost of ownership.

- In the SGRI project Intel DCM builds a unified platform for effective management of server energy consumption, through the monitoring of data center servers and automatic adjustment of temperatures in computer rooms of the data center.

- Using Intel DCM for strategic switch management, SGRI estimates a saving of RMB 260,000 (USD 42,000) per year in electricity costs for each 1,000 servers.

- With Intel DCM for temperature regulation in computer rooms in the data center, SGRI is expecting it will save 32% on power consumption for cooling.

protect the computing systems, resulting in interruption of business operations. Intel DCM can respond to such situations by shutting down the low priority server nodes automatically, putting the servers with medium priority into low power consumption state and allowing the high priority servers run normally. Under this emergency mode, normal operations for high-priority services can be maintained for an extended period.

In the future, Intel expects to work with SGRI to greatly improve the management level of the latter's data center with more new technologies.

Find a solution that's right for your organization. Contact your Intel representative, visit Intel's Business Success Stories for IT Managers (**www.intel.com/itcasestudies**) or explore the Intel.com IT Center (**www.intel.com/itcenter**).