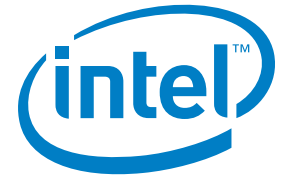


CASE STUDY

Intel® Xeon® Processor

Enterprise Server

Cloud Computing, Virtualization and Energy Efficiency



Virtual Computing in the Cloud Gets a Boost with Energy-Efficient Technology

Teamsun's IVCS* elevates cloud computing with Intel® Virtualization Technology, improving server efficiency and power savings



"Intelligent Virtualization Computing System (IVCS*) is a virtualization software program Chinese designers independently developed to suit the needs of small and medium-sized enterprises. As one of the important supporting technologies in cloud computing, IVCS adheres to the concept of quantify resources and deliver on-demand, providing resources refining services for Teamsun's customers. Technical support from Intel proved to be essential in ensuring that IVCS operates with higher performance efficiency, optimized virtualization capabilities, and excellent energy efficiency."

Deng Yi

Vice President

Beijing Teamsun Technology Co., Ltd.

A leading integrated IT service provider, Beijing Teamsun Technology Co., Ltd. (Teamsun) is China's first service network covering Greater China and parts of Southeast Asia. Since its listing in 2004, the company has been steadily growing, with a compound annual growth rate of over 30 percent and turnover of more than RMB 5 billion. First to introduce the concept of IT services transition, Teamsun offers a wide range of services including cloud computing, mobile Internet, Internet of Things and information security, as well as IT products, application software development, system integration and value-added distribution.

CHALLENGES

- **Improve hardware efficiency.** Enhance server resource utilization ratio to allow hardware to work more efficiently while reducing maintenance costs.
- **Increase scalability.** Improve server performance through a linear increase in the number of servers.
- **Lower energy consumption.** Reduce run-time energy consumption of the servers to promote energy efficiency and save power.

SOLUTIONS

- **Harness Intel Virtualization Technology.** Improve virtual computing capacity by increasing I/O performance of the servers.
- **Use Intel® Intelligent Power Node Manager.** Effectively control energy consumption with this technology that enables energy efficiency and power savings.

IMPACT

- **Improved server efficiency.** Intel's virtual computing technologies allow IVCS to construct an Intel® architecture-based platform, improving server efficiency by more than four times while reducing hardware investment by more than 50 percent.
- **More energy-efficient virtual computing system.** Intelligent power-saving technology significantly reduced expenditures on electric consumption and refrigeration, further promoting environment-friendly operations.

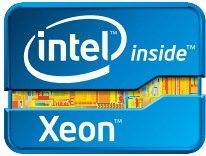
From using the Internet to getting in touch via telecommunications networks, from doing business via e-commerce to office automation, cloud computing is playing an increasingly important role in our daily lives. With virtualization at the heart of cloud computing, IT service providers continue to develop services that enhance the virtual computing experience of users.

As China's leading IT service provider, Teamsun takes to heart the importance of an excellent virtual computing system for building a complete cloud computing program.

"Cloud computing is designed to take advantage of the Internet and make resources useful and interaction faster and more efficient. Virtualization is one of the key supporting technologies to build an excellent cloud computing program," said Deng Yi, vice president of Teamsun.

However, building a good cloud computing program proved to be a challenge for Teamsun and its traditional server infrastructure. While the cost of the server hardware has been very high, individual server utilization is low when running a single application. While server operation and cooling of the physical computer center are consuming a lot of power, the number of servers increases at a regular pace.

With these challenges, operation and maintenance of a cloud computing system proved to be too complicated and expensive for Teamsun. To be able to develop a high-performing yet cost-efficient cloud computing system, Teamsun set its sights on creating a new virtual computing system that effectively addresses all these challenges.



Benefiting from Intel technologies such as Intel® Virtualization Technology and Intel® Intelligent Power Node Manager, Teamsun has improved the performance and energy-saving capacity of the Intelligent Virtualization Computing System (IVCS*)

Providing enhanced cloud computing solution

To enhance its market segment competitiveness and achieve broader recognition for its cloud computing solution, Teamsun created the IVCS, which runs on Intel Xeon processors, drawing on Intel's rich experience to integrate Intel's unique technologies such as Intel Virtualization Technology and Intel Intelligent Power Node Manager into Teamsun's virtual computing solutions. This also constructs a brand-new IVCS based on Intel architecture.

Since the introduction of Intel virtualization technology, Intel's Software and Services Group has explored cloud computing and accumulated rich experience and code samples in architecture designs and module implementations. With Intel's help, Teamsun has effectively combined Intel's technology with the IVCS virtual computing system.

Increasing server performance with virtualization

The IVCS has features not found in traditional server solutions: partition, isolation, encapsulation, and relative independence from hardware. Partition refers to several virtual machines running in a single physical server; isolation is the separation between the virtual machines on the same server; encapsulation refers to the entire virtual machine that can be copied, moved, and saved in a file; and relative independence from hardware is running the virtual machine on any server without a need to modify.

In a developed virtual computing system based on these features, the virtual machine is located in the server's file. Hence, both the running of the virtual machine and the information exchange between the virtual machine and the outside world produce massive I/O throughput. To ensure high performance from the IVCS, performance of the I/O should be therefore enhanced.

To equip the IVCS with powerful I/O throughput performance, Teamsun used the Intel Xeon processor E5 family to reinforce the computing power of the system. Then, with help from

Intel's Software Group, Teamsun's engineers combined Intel Virtualization Technology with its own virtual computing solutions. This process eliminated bottlenecks in I/O performance.

Using Intel Virtualization Technology has effectively improved I/O throughput. Teamsun greatly improve IVCS IO performance by enabling Single Root I/O Virtualization (SR-IOV) technology in its IVCS product.

SR-IOV provides a standard mechanism for devices to advertise their ability to be simultaneously shared among multiple virtual machines. SR-IOV allows for the partitioning of a PCI function into many virtual interfaces for the purpose of sharing the resources of a PCI Express* (PCIe*) device in a virtual environment. Intel supports the SR-IOV specification in its networking devices.

Introducing Intel Virtualization Technology to the IVCS helped manage VMM's I/O traffic. By assigning specific I/O device security through VMM to a specific customer's operating system, each device has a dedicated area within the system memory which is only accessible by the operating system of this device and its assigned customers. This speeds up data transmission while reducing system performance expenditures.

By using Intel Virtualization Technology, the IVCS combines with the server, improving server hardware efficiency. Teamsun's test result data showed that the server's efficiency has increased by four times while saving over 50 percent on hardware investment. Users also benefited from improved server performance, gaining an optimized cloud computing experience.

Energy-efficient virtual computing in the cloud

As cloud computing becomes more widespread, the number of servers deployed in data centers and server rooms has grown. Both energy consumption and cooling needs have increased, making it harder for Teamsun to adhere to its green power policy.

To make the cloud computing program meet its energy-saving and environmental protection goals, with the help from Intel's Software Group, Teamsun's engineers used Intel Intelligent Power Node Manager, combining it with its own virtual computing solutions. This equipped the IVCS with powerful energy-saving and environmental-protection features.

Intel Intelligent Power Node Manager is power consumption and monitoring technology embedded into the server's hardware platform. Its open interface enables administrators to monitor the energy consumption of the view platform. This makes it possible to configure a strategy to plan the power consumption budget in a platform. The administrator can also adjust the subsystem to accomplish the strategy instructions.

With Intel Intelligent Power Node Manager, the IVCS can now monitor in real time the energy consumption of the system's server and maximize the performance of each server by setting a limit on energy consumption. Also, the administrator can design the system according to the actual peak energy consumption of the data center, reducing energy consumption and cooling costs. Intel Intelligent Power Node Manager also allows Teamsun to set the system's temperature limit threshold according to the temperature events when the system is running, which also helps reduce power consumption.

After building the IVCS running on Intel technology, Teamsun can now support more applications under the same computer room conditions and expenditures, while helping the company achieve significant power savings and energy efficiency.

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).

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Intel® Virtualization Technology requires a computer system with an enabled Intel® processor, BIOS, and virtual machine monitor (VMM). Functionality, performance, or other benefits will vary depending on hardware and software configurations. Software applications may not be compatible with all operating systems. Consult your system manufacturer. For more information, visit <http://www.intel.com/go/virtualization>

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