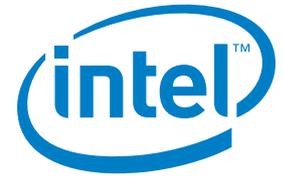


CASE STUDY

Intel® Xeon® Processor E7 Family

High-Performance Computing



Cutting-Edge Tool for Exploring the Earth

Intel® Xeon® processor E7 family helps BGP build a new generation of processing systems



东方地球物理勘探有限责任公司
BGP China National Petroleum Corporation



As information technology has become more closely linked with China's oil industry, it has played an ever-increasing role in the specialty directions the industry takes. One key aspect of the oil industry is oil geophysical surveying, based on the differences in physical properties of underground formations. It studies geological formations, or rock properties, through physical measurements to look for oil and gas. That's why the quality of the oil geophysical survey directly affects the development prospects for China's oil industry.

As the No.1 engineering and technical services company specializing in geophysical exploration, China National Petroleum (BGP) has undertaken China's sacred mission of looking for oil and gas. BGP has found 260 oil and gas fields of different sizes, with more than 80 billion tons of geological oil reserves and two trillion cubic meters of gas reserves. Currently, it ranks No.1 in the global marketplace for land seismic exploration, and in the top three in the geophysical survey industry in terms of comprehensive competitiveness. All these achievements are linked with the high-performance processing systems it has introduced into the geophysical survey.

Challenges

- BGP's powerful processing system has made great contributions to its oil exploration. But with a growing number of data processing and interpretation functions, BGP's existing UNIX*-based processing system can no longer keep up, particularly in terms of performance, cost, software compatibility, and hardware expandability.
- BGP urgently needs to develop a new-generation processing system to handle high-performance processing tasks.

Solution

- Intel developed an Intel® architecture-based platform processing system for BGP.
- After using the new platform, test results show that BGP now has excellent performance in terms of processing, cost, software compatibility, and hardware expandability.

Impact

- With the Intel architecture-based platform successfully added to the BGP processing system, Intel technology has helped BGP improve its computing capability in data processing and interpretation, thereby improving its technological capabilities in oil surveying.
- Test results showed the new system has doubled BGP's data processing and interpretation performance.

As the business continues to grow, BGP's processing systems have also become more powerful. When GeoEast*, a self-developed data processing and interpretation system, was released in 2004, BGP's information system entered a new stage. The GeoEast system is an advanced seismic data analysis system that integrated a number of high-end technologies. It has many applications including seismic geological modeling, pre-stack migration, 3D visualization, improving resolution, and processing seismic data in complex surface or low signal/noise ratio. More data processing and interpretation functions require more processing capacity. To help BGP resolve this issue, Intel helped BGP build a processing system based on Intel architecture. Tests on the new platform show that BGP has performed excellently in terms of processing performance, costs, software compatibility, and hardware expandability, and is winning the approval of personnel.

"With the Intel architecture-based platform replacing the existing UNIX platform, our system can demonstrate more powerful functions in data processing and

interpretation," said Lai Neng-He, the chief engineer of the BGP Processing Center. He added, "Our independently-developed GeoEast system not only needs to meet the domestic demand for oil and gas exploration in China, it also needs to be able to support China National Petroleum to compete in the international marketplace. So it will be a mainstream software program in oil and gas surveying. Currently, the GeoEast system has been upgraded to version 2.4, which contains a wealth of functions including more than 300 data interpretation and processing modules."

Intel architecture-based platform helps BGP build a new-generation processing system

For BGP's next-generation processing system to perform better in data processing and interpretation, BGP introduced an Intel architecture-based platform with the assistance of Intel's technical staff. Specifically, the Intel® Xeon® processor E7 family helps the Intel architecture-based platform deal with BGP's requirements for computing capability.



With the Intel architecture-based platform successfully applied into the BGP processing system, Intel has helped BGP improve its performance significantly in terms of processing, costs, software compatibility, and hardware expandability. Intel technology helps BGP to better carry out oil surveys and make greater contributions to the development of the Chinese oil industry.



COST
New IA-based platforms costs only 1/5 as much as the RISC-based platform



TIME (GeoFrame*)
New IA-based platform completed GeoFrame* benchmark tests in 51% of the time taken by existing RISC-based platform



TIME (LANDMARK2003*)
New IA-based platform completed LANDMARK2003 benchmark tests in 53% of the time taken by existing RISC-based platform

80% ↓

49% ↓

47% ↓

Based on Intel's previous generation of server processors, the Intel Xeon processor E7 family sets a series of new standards for high-end computing applications including business intelligence, real-time data analysis, and virtualization. It supports Intel® Turbo Boost Technology, Intel® Hyper-Threading Technology, and Intel® Virtualization Technology and, at the same time, improves the performance by virtue of its SSE4.2 instruction set. The Intel Xeon processor E7 family-based eight-way servers deliver very strong processing performance, supporting 80 cores and 160 threads. Supported memory capacity can reach as high as 4TB. The processor has become the first choice for geological data analysis systems.

The actual applications in BGP's geological data interpretation system have shown that the Intel architecture-based platform delivers data processing performance that is far superior to the existing UNIX platform. For instance, in the benchmark test running LANDMARK2003* software program, the new Intel architecture-based platform takes only 53 percent as much time as the existing RISC platform. In another benchmark test running the GeoFrame* software program, the new Intel architecture-based platform takes just 51 percent as much time as the RISC platform. All these test results show that with the new Intel architecture-based platform, BGP's data processing and interpretation performance have been improved by 100 percent over the existing RISC platform. While the performance

improved substantially, the new Intel architecture-based platforms cost only one-fifth as much as the old platform, providing a much better performance/cost ratio.¹

Also, deploying the new Intel architecture-based platform significantly improves software compatibility of the BGP processing system. Consider an eight-core Intel Xeon processor E7 platform as an example. Based on Intel Xeon processor E7, the Linux-based system enables BGP's data processing and interpretation system to run on it. However, the existing UNIX platform system limits most software from running on it.

Finally, the new Intel architecture-based platform provides better hardware expandability for BGP's processing system. Compared with the existing UNIX platform, the Intel architecture-based platform can support hardware from IBM, HP, and Inspur. This means BGP's data processing and interpretation system can have more capabilities in the future.

"After transferring to the Intel architecture-based platform from the exiting UNIX platform, our processing systems have significantly improved. We have deployed 22 new Intel architecture-based platforms with Intel Xeon processors E7 family-based eight-way servers. In 2013, we expect all of our interpretation systems to be transferred to the optimized GeoEast system, which is based on Intel architecture. We believe this will help us to improve our oil exploration technology and to

The GeoEast system is an integrated software system with unified data, interface, and development platforms. The system can be dynamically assembled for coordinated seismic data processing and interpretation. It has made several innovative and significant technological breakthroughs in data modeling, data sharing, integrated operation, 3D visualization, interactive application framework, earthquake geological modeling, network operation, and parallel processing. Specifically, it focuses on:

- Standard master control, user interface, and data interface
- Supporting network distributed computing, parallel processing (), and both interactive and batch computing in a single system
- Integration of data processing and interpretation to deliver high-quality outputs
- 3D seismic geological modeling
- Industry leader in high-definition, complex, and low-noise geographical information processing
- Flexible and re-configurable system modules meeting different user requirements

The GeoEast system is a unified data processing and interpretation platform, so it truly realizes the integration of data processing and data interpretation. It enables a tightly integrated operation model for data processing and data interpretation. It provides more than 300 batch and interactive processing seismic application modules in 20 categories. It has the capabilities to support onshore and offshore 2D/3D seismic data processing, as well as advanced 3D seismic visualization.

make greater achievements in our oil survey," said Lai Neng-He, chief engineer for BGP.

¹ All the benchmark tests above are based on servers with an Intel architecture-based platform or RISC platform.

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