

ANSYS 6.0 Running on Next Generation Itanium-based hp-ux: An Insider's View

Don Mize

Hewlett-Packard Company

Abstract

The Itanium processor family, with its exceptional floating point performance, allows HP to offer next-generation processor technology to computationally demanding CAE users. Early adopters benefit from the cost effectiveness and speed of Intel's microprocessors combined with the robustness and stability of hp-ux. This paper will detail the benefits of ANSYS running on Itanium-based hp-ux servers and workstations. Price/performance and benchmarking results will be detailed along with an insider's view of the engineering teamwork involved in porting ANSYS 6.0 to Itanium. ANSYS was the first CEA code released on IA-64 and thus helped refine the hp-ux development environment for Itanium.

Introduction

In our highly competitive world, everyone is looking for an advantage. This is especially true for engineers. Whether the product is a racing car, an airplane or even an earthquake-proof building, engineers know that the ability to accurately analyze complex products is their competitive advantage. Unfortunately, in recent years the analysis part of the design process has become a bottleneck – mostly due to limitations in computer speed and capacity.

According to IDC, computer-aided engineering (CAE) applications will require larger memory sizes and increases in performance of 10 to 1,000 times today's levels in order to achieve major breakthroughs. IDC has identified the following as the most critical requirements:

1. more real addressable memory and memory architecture bandwidth,
2. increased floating point performance,
3. overall system architecture performance and scaling, and
4. economically viable high performance computing options. (1)

As a co-inventor of the Intel® Itanium™ Processor Family (IPF), HP is one of the first computer companies to offer the next-generation processor technology. Users benefit from the cost effectiveness and speed of Intel's newest and most powerful microprocessor, combined with the robustness and stability of HP's hp-ux operating system (OS). HP and ANSYS, Inc. have worked together to make ANSYS® design analysis and optimization software the first CAE software available on 64-bit Itanium (IA-64), introducing the industry to next-generation technology with unprecedented price and performance.

Itanium -- price/performance gains

With 64-bit addressing, excellent floating-point performance, massive instruction level parallelism, large cache/memory support and multiprocessor scalability, the Itanium architecture delivers the advanced capabilities that CAE users need. Based on a new, explicitly parallel instruction set (EPIC) architecture, the Itanium family incorporates both hardware and software advances focused on enabling, enhancing, expressing, and exploiting parallelism by both the hardware and the software compiler.

And because the Itanium architecture is more cost effective than RISC, HP can offer high-performance Itanium systems at a very attractive price. Companies with shrinking budgets can now choose a technology that will give them the highest floating-point performance and most scalable architecture in the industry, at a price point lower than competing RISC-based systems.

CAE users achieve unparalleled price/performance benefits by running ANSYS 6.0 on Itanium-based hp-ux. Running ANSYS 6.0, HP's standard benchmark tests compare the entry-level HP Server rx4610 (four 800MHz Itanium processors) to the HP L3000 Server (four 550MHz PA-RISC processors.) The overall results from these tests demonstrate that performance between the two machines is comparable. (See figure Relative Benchmark Results)

Although performance numbers are about equal, the real benefit to ANSYS users becomes vividly clear when the price of the two systems is compared. The HP Server rx4610 is priced approximately twenty percent less than the HP L-Class Server. That means that customers achieve a price/performance advantage running ANSYS 6.0 on the entry-level Itanium-based hp-ux system. When comparing these benchmark results, keep in mind that the L-Class Server is an industry-leading machine – well known for its outstanding price/performance.

Although the current price/performance of ANSYS running on Itanium-based hp-ux is attractive, the story gets even better. The HP Server rx4610 is HP's first entry-level Itanium system. When computers using the second generation of Itanium are released, performance is expected to increase dramatically. ANSYS users receive an immediate price/performance improvement today, and the assurance of remarkable performance improvements in the future.

hp-ux -- the only enterprise-level UNIX OS for Itanium

Once ANSYS users decide to take advantage of the price/performance gains offered by Itanium, their next decision involves choosing an OS. Three features -- compatibility, performance, and reliability -- make hp-ux 11 the only enterprise-level UNIX for Itanium. Enterprise-level means, scalable UNIX OS, which has features to run on large compute servers. The only other UNIX for Itanium, Linux, does not have this capability.

Compatibility

Unlike other vendors who require customers to abandon the UNIX they use today in order to move to 64-bit Itanium, HP allows customers to maintain their investment. Tools, scripts, middleware, and system administration all have a seamless migration from RISC-based hp-ux to Itanium. In addition, all PA-RISC-based hp-ux applications will run under Itanium-based hp-ux, thereby ensuring that all CAE applications will run on these systems.

Performance

Linux continues to grow in popularity and is offered by HP on Itanium-based systems. Eventually, ANSYS will also be available for Itanium-based Linux. However, HP's unique experience with both hp-ux and Linux on Itanium shows that applications running on Itanium-based hp-ux tend to achieve significantly better performance when compared with the same applications running on Itanium-based Linux. As of October 2001, HP has measured performance advantages of 1.3X to 1.5X on all CAE applications tested head-to-head, hp-ux vs. Linux.

Relative Benchmark Results

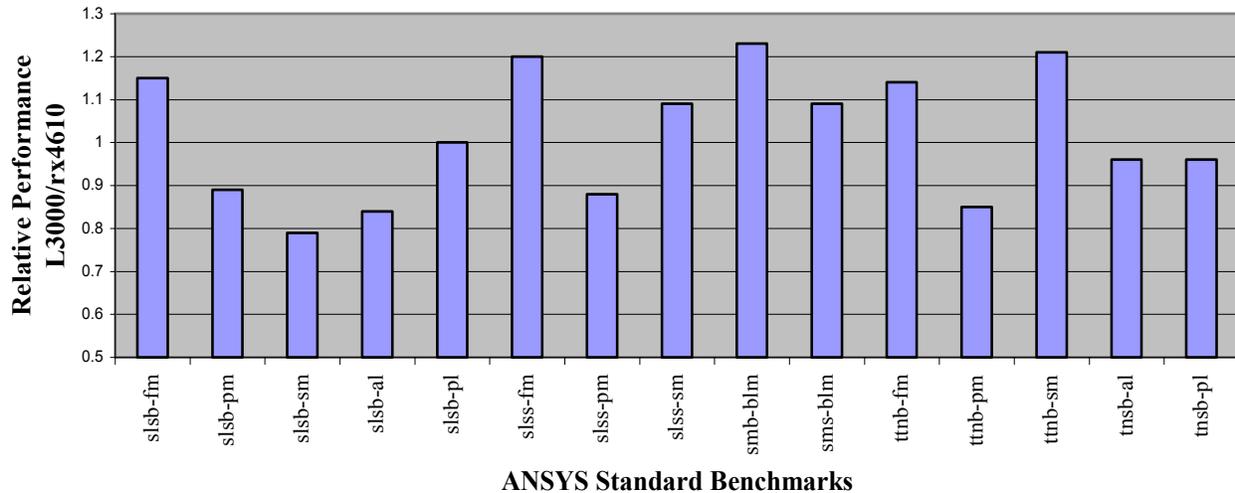


Figure 1 - Relative Benchmark Results

Reliability

hp-ux is the industry's leading enterprise-class UNIX® operating environment, providing a highly reliable, standards-based foundation for companies to run and manage business-critical solutions. In comparison to other UNIX operating systems, the reliability of hp-ux has historically ranked as one of the highest in the industry.

HP and ANSYS, Inc. -- an insider's view

HP and ANSYS, Inc. have a long history of working together to provide the CAE industry with the best hardware and software tools available. More ANSYS users of both UNIX and Windows systems choose HP over any other hardware platform. Consequently, HP will continue to work with ANSYS, Inc. to the benefit of the rapidly growing ANSYS software community. The two companies enjoy a committed partnership, working together to offer a total collaborative engineering solution for joint customers, including ongoing technical support and continued optimization efforts for the ANSYS software.

The effort to port ANSYS software to Itanium began in January of 2000 by the Technical Computing Division at HP, of which I am a member. My group is responsible for the porting of technical computing applications to the HP UNIX servers. We have a tremendous amount of experience, having the longest continuous Independent Software Vendor (ISV) application program of any computer manufacturer. Using compiler flags, source code changes, and hand-tuned routines, we port and optimize applications for optimal performance.

In March of 2000, we received our first Itanium system running hp-ux and by the end of April, we had a rough version of ANSYS running, but it was still missing some high performance elements. From April through August of that year, the HP software labs sent us various high performance and development software components that are routinely used to develop and tune technical applications such as ANSYS. These software pieces include high performance math kernels (MLIB), parallelism using both threads and Message Passing Interface (MPI), large virtual pages in hp-ux, indirect prefetching from the compilers, 3D graphics OpenGL, and HP's WDB (gdb) debugger. By using all of these elements, we were able to complete development on the ANSYS application.

During the summer of 2000, we also started meeting with developers from ANSYS, Inc. to brainstorm and take part in numerous technical discussions to help facilitate the port. This marked the beginning of a concentrated effort by both HP and ANSYS, Inc. to successfully port ANSYS to Itanium. In July of 2000 during one of the technical exchanges, HP demonstrated ANSYS running on the Itanium system. ANSYS

developers, very impressed with the results, eagerly agreed to ANSYS software becoming the first CAE application released on HP's Itanium systems.

Over the next several months, the porting progressed rapidly with teams working diligently both at ANSYS, Inc. and HP. We gave presentations at several HP high performance user group meetings to demonstrate that Itanium was real and that applications would be available on the revolutionary platform.

ANSYS, Inc. and HP also were able to demonstrate ANSYS running on Itanium-based hp-ux on several occasions, including the Intel Developer Forum, the ANSYS 2000 Worldwide Users' Conference, and the Intel Exchange. During the Intel Exchange conference, ANSYS, Inc marketing executives worked along side HP technical engineers to successfully demonstrate ANSYS running on Itanium to Intel customers. These presentations successfully showed the user community that Itanium was a viable platform and that ANSYS was leading Itanium effort in the CAE software industry.

In January of 2001, ANSYS Inc. began active work on an Itanium system HP had shipped to them. In June of 2001, HP and ANSYS, Inc. began porting the latest release of ANSYS 6.0. At this point, the collaboration between the two companies became intense, as the official release was scheduled for only a few months away. Since ANSYS 5.7 had been running for some time on Itanium systems in the labs at both HP and ANSYS, Inc., HP leveraged the work we had done on the earlier version to get the latest version up and tested quickly. A beta release was announced on August 6 and then in October of 2001, the final version of ANSYS 6.0 was officially released on Itanium-based hp-ux. ANSYS 6.0 was successfully ported to IPF, highlighting a decade of successful collaboration between HP and ANSYS, Inc.

Conclusion

Sam Murgie, Technical Fellow at ANSYS, Inc., sums up the benefits of running the latest version of ANSYS on Itanium-based hp-ux. "We are pleased that our extraordinary partnership with HP has led to the timely availability of ANSYS software on next generation Itanium. Our user community will benefit greatly from the cost effectiveness and speed of Itanium combined with the robustness and stability of hp-ux."

References

1. IDC, "Itanium-based Solutions in the Manufacturing Market", 2000.