



## Case Study

Intel® Xeon® processors

Intel® Itanium® processors

Manufacturing

# DuPont Finds the Right Formula

**DuPont projects moving to Intel® architecture-based systems would provide an 8x improvement in price/performance**

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- Challenges**
- Improve the price/performance of the scientific computing infrastructure at DuPont
  - Validate the performance advantages of 64-bit Intel® Xeon® processor-based servers and Intel® Itanium® processor-based servers compared to RISC-based servers
  - Evaluate the potential impact of moving away from the current distributed database model to a centralized and consolidated operation
  - Develop a standard, scalable server platform model that can support a “One DuPont” service-oriented architecture vision

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- Solutions**
- DuPont CR&D and Intel conducted a pilot comparing the performance of an Oracle database on RISC-based systems to 64-bit Intel Xeon processor-based servers and Itanium processor-based servers
  - The Intel consultants, working with in-house CR&D technical resources, developed and reviewed the test plan and constructed a series of metrics based on Six Sigma\* to validate performance, scalability, and overall functionality

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- Benefits**
- Test results showed Intel architecture-based servers produced results 4x-5x faster than existing RISC architecture-based servers
  - DuPont estimates that Intel architecture-based systems would provide an 8x improvement in price/performance
  - Intel consultants advised the DuPont team on migration and best practices for running Red Hat Enterprise Linux\* on Intel architecture-based servers

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Improved price/performance and standardization were the goals when DuPont Central Research & Development (CR&D) chose Intel to help validate a proposed move from RISC servers to Intel® architecture-based servers as the new company computing standard. DuPont and the Intel consultants demonstrated performance advantages as well as a migration process from the UNIX\* operating system to the Linux\* operating system, creating a reusable, scalable, and cost-effective standard platform that could meet the needs of the company’s research and business communities.



# “Though we wanted greater performance, we also had budget considerations.”

—Tim Mueller, Supervisor, DuPont High-Performance Computing and Computation Sciences Groups

**“Intel consultants brought a broad range of expertise and services to validate the potential benefits of standardizing on Intel® architecture-based servers.”**

Tim Mueller  
Supervisor  
DuPont High-Performance  
Computing and  
Computation Sciences  
Groups

## Assessing the Situation

In 2005, DuPont CR&D's Information & Computing Technologies initiated a project to understand and standardize database deployments. Tim Mueller, supervisor of the High-Performance Computing and Computation Sciences Groups within CR&D, felt it was time to review the effectiveness and long-term viability of the current model. Were DuPont researchers getting the best performance possible for their computing budgets?

Corporate IT and CR&D provide services to the company's 27 business units spread across six core business groups. With no Oracle platform standards in place, over time these business units had the freedom to custom design their own database environments to meet their individual needs. As a result, six different architectures were in use.

A joint review was undertaken by the corporate IT and CR&D organizations. “Part of our role is to ensure that our researchers have the tools they need to be productive and conduct world-class research,” said Mueller. “We knew that the current RISC architecture-based environments were not going to scale to meet our long-term growth needs. And though we wanted greater performance, we also had budget considerations.”

## Spotlight: DuPont

DuPont offers a wide range of innovative products and services for agriculture, nutrition, electronics, communications, safety and protection, home and construction, transportation, and apparel. The company employs 60,000 people worldwide and recently posted revenues of USD 27.3 billion.

DuPont operates more than 40 R&D and customer service labs in the United States and more than 35 labs in 11 other countries.

The DuPont team knew standardization would improve the performance obtained from a given level of spending. “To reduce the cost of supporting six different architectures, increase computing capacity, and move to a more attractive price/performance model, we decided to understand and initiate a study to help define a radically different model that could reduce the run and maintain costs for a broad range of database deployments. We wanted to move from proprietary RISC-based systems to cost-effective Intel® architecture-based servers running Red Hat Enterprise Linux\*,” said Mueller.

Intel offers a broad processor line that can match many different computing requirements at DuPont. For example, the Intel® Itanium® processor offers exceptional floating point performance and I/O bandwidth as well as a path to scale up to handle database volume that is projected to grow substantially. For databases not projected to grow significantly, 64-bit Intel® Xeon® processors are known to be very cost-effective compared to RISC architectures.

After establishing this plan, Mueller decided to undertake a project to gain a better understanding of the benefits of Intel architecture-based servers. “We needed to validate their performance and understand the extent of the migration effort to move from our existing servers,” he explained. “By reducing the number of CPUs required for a given amount of performance, we might also be able to reduce software licensing costs.”



Intel was called upon to act as an advisor to provide support for the selection of the new configuration. “I wanted a consulting organization with substantial resources to make sure the testing was sufficiently comprehensive as well as unbiased toward any one system vendor,” said Mueller. “Intel consultants fit that role very nicely—no one knows more about Intel architecture than these folks.” Intel would also help Mueller’s team determine the best way to migrate the company’s current Oracle9<sup>®</sup> Database software onto Linux.

### Delivering the Solution

Intel consultants worked with Hewlett-Packard, EMC, and Oracle to set up a pair of test beds—one 2-way server with 64-bit Intel<sup>®</sup> Xeon<sup>®</sup> processors and one 4-way server with Intel<sup>®</sup> Itanium<sup>®</sup> processors. For the study, DuPont selected an Oracle database as a representative workload. The Intel consultants migrated an existing Oracle9<sup>®</sup> Database from a proprietary RISC-based system onto the two Intel<sup>®</sup> architecture-based servers.

The Intel consultants validated the test plan by reviewing system configurations and metrics for functionality, performance, and scalability as well as DuPont’s plan for data collection. The Intel team then assisted the CR&D team in characterizing essential metrics such as database usage patterns (a series of queries and updates to test tables). After building load generation scripts to drive the testing, the team used multiple iterations of the test scripts to confirm that the results were repeatable.

Two test cycles were conducted, with a total of 1,204,060 records updated per test cycle. The key performance metric for each test was total runtime. Figure 1 shows the results for the single-database scenario, where the Intel Xeon processor-based server cut runtime by over 80 percent.

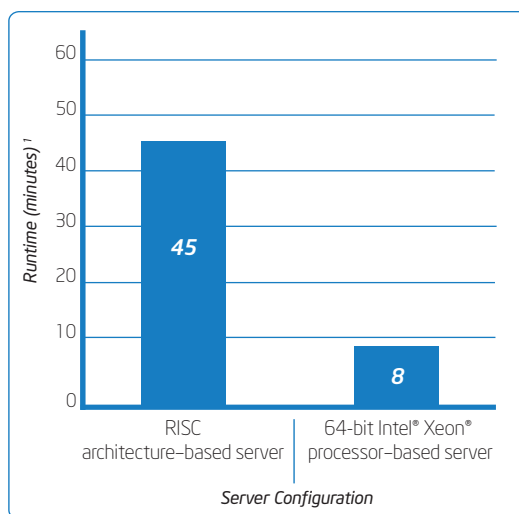


Figure 1. Runtime results for single-database test.

“Not only was the performance of the Intel<sup>®</sup> architecture-based systems impressive, but they cost about half as much as our RISC-based platform.”

Tim Mueller  
Supervisor  
DuPont High-Performance  
Computing and  
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Groups

### Services Provided

- Intel took overall project responsibility, working with Hewlett-Packard, EMC, and Oracle to design and assemble the test systems to evaluate the performance of 64-bit Intel<sup>®</sup> Xeon<sup>®</sup> processor-based servers and Intel<sup>®</sup> Itanium<sup>®</sup> processor-based servers
- Intel consultants validated test procedures and conducted the tests that measured the price/performance metrics for the systems

### Key Technologies

- 64-bit Intel Xeon processor-based servers and Intel Itanium processor-based servers
- Intel consultants’ expertise in evaluating standardization initiatives as well as experience in migrating Oracle databases to Intel<sup>®</sup> architecture-based servers

A second test cycle was conducted using Intel® Itanium® processor-based servers hosting three databases. There, the Itanium processor completed the test in only 14 minutes, demonstrating its ability to handle large databases. As a result, the Intel consultants recommended Itanium servers for DuPont's midsize and large databases—those larger than 100GB in size and with Oracle memory requirements of more than 500MB.

The most telling results were that the Intel architecture-based servers consistently produced results four to five times faster than the RISC architecture-based server. Based on the test results, Mueller estimated that Intel architecture-based systems would provide an 8x improvement in price/performance compared to the existing RISC servers. Says Mueller, "Not only was the performance of the Intel architecture-based systems impressive, but they cost about half as much as the RISC-based platform."

After working side-by-side with Mueller's staff on the migration, the Intel consultants were also able to advise the DuPont team on best practices for running Red Hat Enterprise Linux on Intel architecture-based servers.

When the CR&D IT team saw how easily Intel consultants migrated an Oracle database from a RISC environment to Intel architecture-based servers, they knew the transition would be smooth. "Overall," said Mueller, "the testing will provide increased value and confidence in the value of adopting a standard server architecture based on cost-effective Intel® Xeon® and Itanium processors." With the successful results of the pilot, the CR&D IT team is evaluating Intel architecture for other scientific software that runs on RISC-based platforms at DuPont.

### Return on Investment

- A more than 4x improvement in performance for Intel® architecture-based servers compared to the current RISC-based server
- An up to 8x price/performance improvement after standardizing on Intel architecture-based servers
- Additional cost savings may come from reducing software license costs by reducing the number of CPUs necessary to deliver a given amount of performance



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<sup>1</sup> All test results taken from: "DuPont Oracle9i POC, Final Report," Intel. Sept. 15, 2005.

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