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Educated decision making

Université Montpellier 2 turns to Intel and IBM for future-proof, high-performance, energy-efficient computing

The history of France's Université Montpellier 2 can be traced back to 1809. In fact, the wider university is one of the oldest in Europe with a faculty that was established in 1222. Today, Université Montpellier 2 is a multi-discipline institute where intensive research is led, in collaboration with leading research organizations (CNRS, INSERM, INRA, IRD, CIRAD), and where all scientific and technological subjects are addressed. It has approximately 15,000 students in several teaching departments and three institutes of technology offering two-year vocational courses. It includes a faculty of science, a business administration institute and an engineering school. The university was building a new computer center and wanted to ensure state-of-the-art computing technology for researchers, students, and commercial partners.

![Université Montpellier 2 logo - um2 UNIVERSITÉ MONTPELLIER 2 SCIENCES ET TECHNIQUES]

"In developing a new computing cluster, we are looking into the future to assess the direction of computing technologies and ensure we are keeping pace with new developments. The Intel® Xeon® processor 5600 series and IBM iDataPlex* platform certainly helps us achieve this."

Anne Laurent,
Associate Professor, Université Montpellier 2
(LIRMM-Polytech'Montpellier),
Director of the HPC@LR Center

CHALLENGES

- **The best:** Université Montpellier 2 wanted to implement the most advanced technology available to ensure it had a state-of-the-art high-performance computing (HPC) center
- **Future performance:** The university needed to ensure high memory throughput to enable parallel programming and future software optimization
- **Efficient:** Relatively low power consumption was also a priority

SOLUTIONS

- **Explore the options:** It sought technology advice from other European high-performance data centers
- **The top:** Comparative benchmark tests showed higher performance and energy-efficiency for the Intel® Xeon® processor 5600 series than for rival processors
- **CPUs and platform:** The university implemented an 84-node computing cluster on the specially developed IBM iDataplex dx360 M3* server platform, powered by more than 160 Intel Xeon processors 5600 series

IMPACT

- **Future-proof:** It now has an HPC system that ensures it can keep pace with new technology advancements such as cloud computing
- **Software view:** High memory bandwidth ensures software optimization, particularly parallel programming, which will maximize potential
- **Leading platform:** The IBM iDataplex dx360 M3 server platform enables powerful performance without compromising on power consumption

Local and national importance

Université Montpellier 2 is a leading scientific and technological university. It works in partnership with commercial and academic organizations, providing high-performance computing (HPC) services across a wide number of areas including healthcare, physics, business intelligence, and the environment. Even computer game developers will make use of its HPC resources.

The university receives funding for its computing activities from the local government in the Languedoc-Roussillon region, and also from the European Union. The funding reflects the importance of the work it carries out and also the value of the commercial partnerships it has, from both large, global companies to relatively small but hi-tech local companies.

For example, HPC work with business intelligence is relatively rare in academic environments. However, within Université Montpellier 2 it is highly valued because it attracts large commercial partners and equips students with a high degree of HPC business intelligence knowledge before they enter the world of enterprises.

Similarly, research work in areas such as physics, the environment, water management, and healthcare can potentially lead to significant breakthroughs, producing wide-ranging benefits for society at large.

Intel® Xeon® processor 5600 series delivers automatic energy-efficient performance

Finding a direction

Anne Laurent, associate professor at Université Montpellier 2 and director of the HPC@LR center, said: "We are not a huge computing center; our capacity is measured in teraflops. That said, with the new computer center we built, we wanted to ensure that researchers, companies, teachers, and students had access to a state-of-the-art computing cluster."

The university is aiming to provide the different users with concurrent access to processing power so they can run many applications at the same time, thereby ensuring users have full access to computing resources. With the old system it was sometimes difficult to provide access to all competing groups of users.

Anne Laurent adds: "Another important aim was to provide our wider research community with enough computing power for them to optimize software for parallel processing and use the cluster to test and run this software. With these objectives in mind, we wanted to use the best CPUs—those used in other European HPC centers—and also the best platform."

Feedback from the European research community strongly suggested choosing the IBM iDataPlex dx360 M3* server platform powered by the Intel® Xeon® processor 5600 series. The IBM iDataPlex dx360 M3 server platform has been specifically developed for organizations that require high performance but are constrained in terms of floor space or power and cooling.

IBM and Intel have carried out extensive testing on the combination of Intel processors with the IBM iDataPlex dx360 M3 platform to establish energy and performance gains. For example, they proved that the Intel Xeon processor 5600 series increased performance within a reduced energy envelope compared to other systems.

As a result, the university ran benchmarking tests using LINPACK*, a software library for performing numerical linear algebra. The Intel Xeon processor 5600 series was compared to several competitors' processors and came out on top in terms of both LINPACK performance and energy-efficiency.

Anne Laurent added: "Of course we want to be as economic and ecological as possible. Within an HPC environment, this can be difficult just because of the very nature of HPC. But the Intel® Xeon® processors certainly consumed less power than other processors we compared them to."

Automatically intelligent

The Intel Xeon processor 5600 series – the next generation of intelligent server processors – automatically regulates power consumption to combine industry-leading energy efficiency with intelligent performance that adapts to workloads.

It achieves this through Intel® Intelligent Power Technology, which reduces costs over single-core servers by automatically shifting the CPU and memory into the lowest available power state, while delivering the performance the university needed.

Another key feature was memory bandwidth. The Intel Xeon processor 5600 series has an integrated memory controller in each core and each memory controller has three memory channels. These are connected through Intel® QuickPath Interconnect (Intel® QPI), which maintains memory coherence. This was vitally important to the university, given that it has placed firm emphasis on developing parallel programs that can use the full processing potential of multi-core processors but need good memory bandwidth to do so.

Higher performance, memory bandwidth, and efficient power draw in the Intel Xeon processor 5600 series is consistent with the IBM iDataPlex value of performance-per-watt density. As a result, using the Intel Xeon processor 5600 series to power the IBM iDataplex platform was a compelling option for the university.

Implementation

Université Montpellier 2 implemented 84 nodes in its cluster, with each node powered by two Intel Xeon processors 5600 series. In total, it now has over 1,000 processing cores. It runs a LINUX* operating system on the cluster, using a number of different bespoke applications, each one relating to a different research area.

The cluster has now become central to the university's computing facilities. It does have other computing elements powered by different processers because, as Anne Laurent explains: "We wanted to provide researchers with all technologies." However, the IBM iDataPlex dx360 M3 server platform, powered by the Intel Xeon processor 5600 series, is the central and by far the largest cluster.

Anne Laurent adds: "In developing a new computing cluster, we are looking into the future, to assess the future direction of computing technologies and ensure we are running parallel with new developments. The Intel Xeon processor 5600 series and IBM iDataPlex platform certainly helps us achieve this."

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