



Success Brief

Intel® Xeon® processor
5400 series
Healthcare



“Our Brilliance Workspace workstations show an almost perfect linear improvement in performance when running on the latest Intel® Xeon® processor 5400 series.”

Baruch Sabbah,
Workstation Program Manager,
CT Engineering,
Philips Healthcare

High speed, leading position

Intel® Xeon® processor 5400 series with 45nm Hi-k next-generation Intel® Core™ microarchitecture doubles the performance of Philips’ Brilliance Workspace

Company: Part of Royal Philips Electronics, Philips Healthcare develops best-in-class imaging technologies for the healthcare sector to aid physicians in diagnosis and treatment of acute and chronic diseases

Product evaluated: Intel® Xeon® processor 5400 series

Challenge: To improve the simultaneous visualization and pre-processing capability of the Philips’ Brilliance Workspace computed tomography (CT) workstations, enabling them to process even larger amounts of CT data in a shorter timeframe with higher performance

Results: The Brilliance Workspace products (EBW workstations and Portal thin-client system) shows a 100% increase in performance running on the Intel Xeon processor 5400 series with 45nm Hi-k technology compared to the Intel® Xeon® processor 5100 series. Multi-core technology means the Philips CT workstations can perform heavy computation pre-processing in the background, whilst the user views another patient’s data with almost no performance degradation

Impact: Improved workstation throughput means the Philips CT workstations can produce higher-quality 3D images in a shorter timeframe, enabling physicians to make more accurate and speedy diagnoses. The ability to produce even better diagnostic aids for physicians enables Philips to maintain its leading market position

Next steps: Philips has migrated its EBW and Portal workstations to the Intel Xeon processor 5400 series platform and continues to work closely with Intel, aligning its product development to the Intel® roadmap

Challenge

Philips Healthcare is a leading provider of advanced computed tomography (CT) scanners to hospitals around the world. Its range of multidetector CT (MDCT) systems, known as Brilliance* CT, enables clinicians to carry out routine clinical exams, as well as advanced cardiology, oncology and CT/positron emission tomography (PET) imaging.

Brilliance CT solutions consist of complex medical hardware that scans the patient, producing up to 1,000 pictures, or slices, per second. Software running on either a server or workstation then processes this vast amount of data to generate detailed 3D images of the body’s internal structure that can be used and interpreted by medical staff. Recent advancements in scanning technology have resulted in an explosion in MDCT data, generating large datasets that take time to process.

To maintain its leading market position, Philips is continually investigating ways to improve the performance of its Extended Brilliance Workspace (EBW) and Brilliance Workspace Portal – the number one CT user environment for advanced visualization. If the EBW workstation can process more high-resolution CT data, it can generate even higher quality images. What’s more, if the workstation can process patient data in the background whilst the user simultaneously views another patient’s data in the foreground, throughput will increase and physicians will be able to make faster, as well as more informed, diagnoses.

Deployment Example

The Extended Brilliance Workspace (EBW) is currently powered by the Intel® Xeon® processor 5100 series. In an effort to further improve the workstation's image rendering capability, Philips was keen to investigate the performance benefits of switching to Intel® quad-core technology.

The development sites for Philips Healthcare and Intel are both located in Haifa, Israel, which has enabled a vast interchange of technological knowledge. For many years the companies have worked closely together to align Philips' software development to the Intel® roadmap to reap maximum benefit from Intel's technical advances.

The current EBW software is multi-threaded, meaning that tasks can be executed in parallel on individual processor cores. In theory, multi-threaded software should show significant performance improvements when running on four rather than two cores.

Working in cooperation with Intel application engineers, Philips set out to prove this hypothesis.

Results

Philips tested its Extended Brilliance Workspace (EBW) software running on the Intel® Xeon® processor 5300 series and the second-generation Intel® Xeon® processor 5400 series. The EBW performed 18% faster on the Intel Xeon processor 5400 series with 45nm Hi-k technology than on the previous-generation Intel Xeon processor 5300 series with 65nm quad-core technology.

Intel application engineers then translated the Philips software code to the streaming SIMD extensions (SSE4) instruction set, optimizing it to run on the Intel Xeon processor 5400 series. After this modification, performance increased a further 10-12% – showing an overall improvement of 20-30% against the Intel Xeon processor 5300 series.

Compared to the Intel Xeon processor 5100 series, the second-generation Intel Xeon processor 5400 series with 45nm Hi-k technology showed an impressive 100% performance increase – proving Philips' multi-threaded software runs twice as fast on four cores than it does on two cores.

Impact

The two-fold performance increase means that the Brilliance Workspace systems (EBW and Portal) can process data more quickly. Doctors and clinicians can make more rapid and informed diagnoses, improving the overall level of patient care in key areas like cardiology and oncology.

In addition to processing algorithms for image rendering, the EBW also processes large algorithms for segmentation and automatic analysis. An increase in cores from two to four means that these too can be processed in parallel, further speeding up the diagnosis process.

Another major benefit to Philips of the second-generation Intel® Xeon® processor 5400 series is that it allows the image rendering to take place within the CPU, eliminating the need for a graphics card. This means that the performance of the Brilliance Workspace systems are not restricted by the memory available within a graphics card, and are not slowed down by the transfer of data between the CPU and a graphics card. It also means that it is much simpler for Philips to make ongoing enhancements to its software that can now run on multiple platforms rather than just those compatible with certain graphics cards.

Together, all of these improvements mean that Philips can offer physicians all over the world leading-edge computed tomography solutions, helping it to retain its leading position in a highly-competitive market.



Multi-core technology also enabled the EBW to perform heavy computation pre-processing in the background, whilst the user simultaneously viewed another patient's data in the foreground – with almost no performance degradation.

Future

As a result of the evaluation, Philips has made the decision to migrate its Extended Brilliance Workspace (EBW) workstation to the Intel Xeon processor 5400 series with 45nm Hi-k technology. The Brilliance Workspace Portal migrated to the 5400-series processor already in May 2008.

It continues to work closely with Intel, aligning the development of its Brilliance* CT systems to the latest Intel® multi-core technology.

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