

# Case Study

Financial Services  
Intel® Xeon® Scalable Processors



# Improve Financial Services Software Performance in the Cloud

**A leader in the Asian banking industry achieves impressive speedup in code performance with optimizations and built-in hardware acceleration on Intel®-based Amazon EC2 instances.**



DBS Bank is a leading financial services group in Asia and the largest bank in Southeast Asia, as measured by assets totaling more than 739 Singapore dollars (546 billion USD) as of 2023.<sup>1</sup> It is headquartered and listed in Singapore with a presence in 19 markets across the three key Asian axes of growth: Greater China, Southeast Asia, and South Asia. DBS provides a full range of services in consumer, small and medium-size enterprise (SME) and corporate banking, and financial markets.

DBS uses complex models to price exotic derivative products. Asian options, a type of derivative whose payoff is based on the average price of the underlying asset over a specified period, are used by DBS to test and benchmark software application performance. Asian options are different from standard American and European options, where the payoff depends on the price of the asset at a specific time/maturity. As a result, Asian options introduce additional complexities compared to standard options. These complexities include the ability to accurately estimate an option's volatility, due to its average price calculation; the wide variety of methods for calculating average prices; and the computational intensity and time-consuming nature of pricing methods, especially those involving simulations.

In 2022, DBS worked with Intel to improve the performance of its exotic derivative pricing engines. Led by Gengpu Liu, Executive Director, and Wenhuan Shi, Assistant Vice President of Quant and Tech Modelling in DBS' Global Financial Markets, the bank and Intel sought ways to improve the performance of its in-house C++ software on a Linux operating system (OS). The software runs Monte Carlo simulations to determine how much its Asian options should cost according to current market conditions.

By upgrading its environment to use Amazon Elastic Compute Cloud (Amazon EC2) instances with 3rd Gen Intel® Xeon® Scalable processors featuring Intel® Advanced Vector Extensions 512 (Intel® AVX-512) and optimizations based on Intel® software tools, DBS was able to accelerate the company's time to insights and improve the accuracy of its derivatives pricing. With this upgrade, DBS was also able to reduce costs by making use of fewer compute instances.

## Intel® AVX-512

Code and models can take advantage of powerful Intel AVX-512 for the most demanding computational workloads. On Amazon EC2 instances powered by Intel® Xeon® Scalable processors with Intel AVX-512, developers can efficiently build and optimize high-performance financial applications and analyze performance, memory, and storage usage using Intel® oneAPI compilers, libraries, and analysis tools.

Built-in Intel® Accelerator Engines, including Intel AVX-512, improve performance in the cloud across AI, data analytics, networking, storage, and high-performance computing (HPC) workloads. By making the best use of CPU core resources, built-in accelerators can result in more efficient utilization and power-efficiency advantages, helping businesses achieve their sustainability goals.

4th Gen Intel® Xeon® Scalable processors have advanced, hardware-enabled security technologies to help protect data while unlocking new opportunities for business collaboration and insights. No matter the deployment path, these processors enable solutions that help businesses scale infrastructure and quickly achieve value.

“By utilizing Intel’s AVX-512 accelerators and DPC++ libraries, along with their consultancy services, our organization has realized an impressive performance increase of 10% to 30%. Intel’s advanced solutions have not only improved processing power and energy efficiency but also enabled us to acquire technical expertise. This strategic partnership positions us for continued growth and provides the bank a competitive edge in an ever-evolving business environment.”

—Gengpu Liu, Executive Director,  
DBS Bank

## New Intel-based instances speed up performance

DBS was previously using C5.large and C5.8xlarge Amazon EC2 instances with 2nd Gen Intel® Xeon® Scalable processors. For this upgrade, DBS switched to C6i.large and C6i.8xlarge Amazon EC2 instances with 3rd Gen Intel Xeon Scalable processors, which provide up to 7,200 cores at peak workloads and 8 vCPUs per virtual machine (VM).

The Intel team worked with DBS to complete two phases of optimization. In the first phase, Intel engineers performed a critical loop transformation that allowed for vectorization of a previously unvectorizable loop using Intel AVX2 first, and then Intel AVX-512 acceleration. This optimization resulted in overall application performance speeding up 10 percent to 30 percent, according to DBS.

“Our organization has realized an impressive performance increase of 10% to 30%.”

— Gengpu Liu, Executive Director, DBS Bank

## Squeezing out more performance with Intel® software tools

In the second phase of optimization, DBS was able to achieve even more performance with Intel software tools for debugging, troubleshooting, memory management, and performance measurement. Optimizing code using the oneAPI DPC++/C++ compiler provided additional benefits compared to using the third-party compilers and quant libraries that DBS had been using.

The DBS team made use of Intel® VTune™ Profiler to tune performance, helping its engineers find and fix performance bottlenecks quickly. Intel VTune Profiler offers algorithm optimization and locates hot spots, or the most time-consuming parts of code, and examines how efficiently code is threaded.

Intel® Advisor is another software tool that helps engineers optimize code in several ways. For example, it helps find unvectorized and under-vectorized loops and functions in an application, and it then provides code-specific recommendations for improving performance with vectorization, such as applying Intel AVX-512. It can also provide offload modeling to identify the most advantageous offload opportunities and potential bottlenecks for applications built using C, C++, Fortran, and other code languages.

## Lower operating costs and faster insights

With these improvements, DBS can substantially reduce its computing infrastructure costs. The company is currently incorporating these optimizations into its largest pricing/risk assessment engines, which will be in production soon.

## Learn more about how financial services companies can improve application performance.

Read about [Intel AVX-512](#) and [Intel VTune Profiler](#).

Learn how [FSI workloads consistently win with Intel HPC systems](#).



<sup>1</sup> DBS. About Us webpage. [dbs.com/about-us/default.page](https://www.dbs.com/about-us/default.page). Total assets based on the conversion rate of 1 SGD = 0.74 USD in May 2024. Note that currency exchange rates can fluctuate and may vary between financial institutions.

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Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. See configuration disclosure for additional details.

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