

## SOLUTION BRIEF

SAS 9.4\*

Intel® Xeon® Scalable Processors

Intel® Optane™ Technology



# Drive up Performance for Analytics and Risk Management Workloads

**Accelerate completion of parallel analytics tasks by up to 2X<sup>1</sup> on SAS 9.4\* applications with the Intel® Xeon® Platinum 8180 processor and Intel® Optane™ technology.**

Running SAS business applications on servers powered by the Intel® Xeon® Scalable processors and an Intel® Optane™ SSD sets the stage for potentially transformative analytics:

- **Run more complex analyses**, putting sophisticated models to work for the business.
- **Embrace larger data sets** without bogging down, including both structured and unstructured data.
- **Gain greater insights**, to better understand the state of the business and how to drive it forward.

Today's businesses are saturated in data, in myriad forms and from sources of every description. Turning it rapidly and effectively into actionable insights that drive timely decisions is a critical key to success. While the sheer volume and complexity of that data can present daunting challenges, the right infrastructure for both batch and real-time analytics can pave the way to opportunity.

SAS 9.4\* is the basis for the company's suite of analytics software, which helps access, manage, analyze, and report on data to aid in decision-making. Ongoing co-engineering by SAS and Intel produces complementary building blocks that combine into powerful analytics solution stacks. Businesses across industries use these solution stacks as the basis for applications that turn massive data sets into insight and competitive advantage.

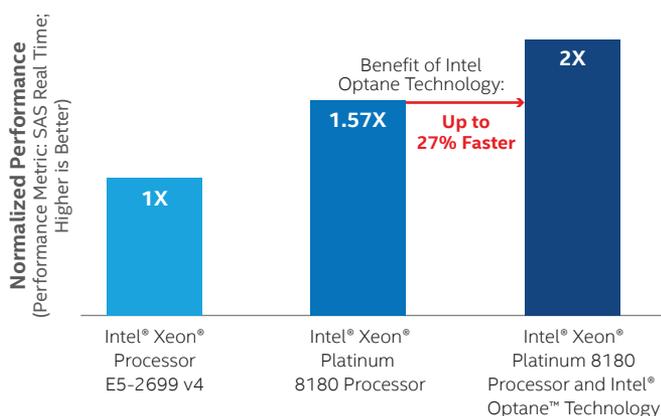
### Accelerate Performance for the Evolving Enterprise

In a test environment, Intel performance engineers produced a generation-to-generation speedup of up to 1.57X on two-socket servers based on the Intel® Xeon® Platinum 8180 processor, as illustrated in Figure 1.<sup>1</sup> Using local storage accelerated using Intel® Optane™ technology increases the benefit by up to an additional 1.27X, for a total performance increase of up to 2X compared to the previous generation of hardware.<sup>1</sup>

This testing uses a SAS Mixed Analytics\* workload, which is designed to simulate a typical customer production SAS analytics environment. This test instance simulates 30 simultaneous users running data intensive and analytics tasks in parallel. It stresses the system by simultaneously generating extremely high, prolonged processor utilization and heavy large-block sequential IO demands in addition to small, random reads and writes.

Running SAS 9.4 on servers based on Intel® Xeon® Scalable processors and Intel Optane SSDs improves throughput for analytics, enabling customers to run more complex analyses in aggregate across larger data sets, with lower time requirements. As a result, workloads can deliver deeper insights, powering improved decision making for critical business actions. For example, companies that use SAS 9.4 for risk management are able to accelerate execution of regulatory and pricing-related scenarios, potentially allowing them to run these workloads more frequently, more effectively mitigating various types of risk.

### Two-Socket Performance Increases from SAS 9.4<sup>1</sup>



**Figure 1.** Increased two-socket performance on the SAS Mixed Analytics workload using SAS 9.4.<sup>1</sup>

### Drive Innovation with Advanced SAS Analytics

Businesses use SAS 9.4 as the basis for predictive analytics in applications that help them identify the clear signal of lucrative opportunities within a noisy universe of data. SAS 9.4 running on Intel® architecture facilitates quick and easy manipulation of data to identify critical relationships that would otherwise remain hidden. An intuitive but powerful drag-and-drop interface allows business users to create models that produce sophisticated results with the efficiency they demand, without the need to write code. At the same time, the software also provides a robust set of comprehensive capabilities for advanced users based on a purpose-built SAS programming language.

“Harnessing the power of Intel innovation, SAS customers are using a modernized analytics platform to quickly turn their data into insights and make confident decisions. The new Intel® Xeon® Scalable processor and Intel® Optane™ technology help make analytics faster, easier, and more powerful in cutting-edge areas such as artificial intelligence, IoT, and machine learning.”

– Craig Rubendall, Vice President of Platform R&D at SAS

The data management and analytics tools built into SAS offer businesses robust ability to manipulate the full range of data at their disposal. For example, powerful linguistic modeling enables text analytics to interpret unstructured big data from sources such as social media. Machine learning and natural language processing capabilities built into SAS help automate and accelerate these processes, optimizing data value. SAS 9.4 running on Intel architecture fosters experimentation with multiple data sources and creates insight that unleashes the true potential of analytics.

To enable innovation on enterprise infrastructure, SAS 9.4 breaks analytics tasks down into discrete pieces that can be spread across hardware resources. This approach takes advantage of the high parallelism inherent in Intel architecture, enhancing both performance and scalability as data sets grow. Intel® software development tools enhance the interactions between software and hardware. For example, SAS uses Intel® Parallel Studio XE to build their products and help optimize performance for each new generation of Intel® platforms. The company also ships custom-built libraries based on Intel® Math Kernel Library as part of their distribution, providing math functions that are highly tuned specifically for Intel® processor silicon.

### Harness Powerful Synergies with Intel® Architecture

Application engineers from Intel work closely with software and data analytics development teams at SAS to ensure that building blocks from the two companies take advantage of each other for the benefit of their mutual customers. The complementary nature of advances between SAS software and Intel® hardware can be instrumental in helping businesses compete more effectively by implementing analytics that drive smarter, faster decisions. As data volumes and accompanying workloads continue to grow, those synergies become even more valuable. With the introduction of new system-level building blocks from Intel, opportunity has come knocking for enterprise-scale applications to transform the landscape with new capabilities.

“More capable analytics are giving businesses the ability to innovate on a foundation of insight. By revealing patterns and significance in data, solutions based on SAS and Intel® architecture help decision makers to better understand the past, fine-tune the present, and anticipate the future.”

– Lisa Davis, Vice President and General Manager, IT Modernization Group, Intel

## The New Intel® Xeon® Scalable Processors

As the foundation for next-generation analytics performance, the Intel Xeon Scalable processors are the most significant platform advancement in a decade. Their redesigned execution cores—based on 14 nanometer process technology—each deliver accelerated performance per hardware thread<sup>2</sup>, while core counts of up to 28 cores per socket increase hardware parallelism as well. For example, the increase from 22 to 28 cores per socket in the Intel Xeon Platinum 8180 processor compared to the baseline system contributes to the performance gain shown in Figure 1.

The entire cache and memory subsystem of the new platform has been redesigned to deliver next-generation support for handling very large data sets from diverse sources. These advances significantly contribute to the overall acceleration of the data-intensive analytics workloads where SAS applications deliver proven business value in the modern enterprise.

- **A new, lower-latency L1/L2 cache hierarchy** improves the efficiency of on-die data handling.
- **Six memory lanes** deliver a 1.5X increase in memory bandwidth compared to the previous generation.<sup>2</sup>
- **High-performance, high-capacity memory** supports up to 24 DIMMs of DDR4-2667 RAM.<sup>2</sup>
- **Increased core frequency**; the average during testing on the new platform was approximately 3.4 GHz, compared to 2.8 GHz on the older hardware.<sup>1</sup>

Data handling by servers based on Intel Xeon Scalable processors is enhanced further by a number of IO innovations. Inter-socket communication between processors is accelerated by the new Intel® Ultra Path Interconnect, which provides greater bandwidth than previous architectures, for enhanced scalability and low-latency operation. The platform also provides up to 48 PCI Express\* lanes per socket, an increase of 20 percent compared to the previous generation.

## Intel® Optane™ Technology

Alongside the processor advances, SAS 9.4 and portfolio of products benefit from high-performance Intel Optane SSDs. These non-volatile memory devices can help business customers overcome the cost limitations that often would prevent them from deploying DRAM at massive scale, while helping eliminate the performance bottlenecks associated with handling extreme data volumes using systems configured with conventional NAND.

In this testing, the 1.27X speedup from Intel Optane technology is facilitated by mapping the scratch space used in the workload to the Intel Optane SSDs. This approach helps to overcome the bottleneck that would otherwise occur with the SATA SSDs, from the large number of small random writes generated by the file system.

Intel Optane technology increases responsiveness for SAS workloads, providing performance similar to system memory. These attributes enable the Intel® Optane™ SSD DC P4800X Series to provide a new data tier, based on a unique combination of 3D XPoint™ memory media with Intel's advanced system memory controller, interface hardware, and software IP. Intel Optane SSDs complement the compute advances of Intel Xeon Scalable processors with the following advantages:

- **High throughput** for breakthrough performance
- **Low latency** for responsiveness under load
- **High endurance** for ongoing data-intensive operations

This combination of Intel® building blocks and SAS software provides breakthrough benefits to businesses as they stretch the boundaries of how data can transform both tactical and strategic operations.

## Conclusion

By deriving better business insights, more easily and with larger data sets, customers are using SAS analytics software and Intel architecture to enable a broad spectrum of innovation. Dramatic performance improvements combine with ease of use tailored to business and technical users alike. This combination is a sophisticated means of embracing vast quantities of data and putting it to work, easily and effectively. Based on mainstream SAS and Intel technologies, analytics are positioned to transform business processes across the board.

## Take the Next Step

Learn more about Intel® Xeon® Scalable processors: [www.intel.com/XeonScalable](http://www.intel.com/XeonScalable)

Learn more about Intel® Optane™ technology: [www.intel.com/optane](http://www.intel.com/optane)

Learn more about SAS 9.4: [www.sas.com/en\\_us/software/sas9.html](http://www.sas.com/en_us/software/sas9.html)

Learn more about joint work by SAS and Intel: [www.sas.com/intel](http://www.sas.com/intel) and [www.intel.com/sas](http://www.intel.com/sas)

### Solution provided by:



<sup>1</sup> SAS 9.4\* application running the 30 session SAS Mixed Analytics workload. OS: CentOS\* 7.2 kernel 3.10.0. Testing by Intel and SAS, May 2017.

**BASELINE:** 2x Intel® Xeon® processor E5-2699 v4 @ 2.2 GHz (22 cores), Intel® Turbo Boost Technology enabled, Intel® Hyper-Threading Technology disabled, BIOS: 275.R01.1603300531, 256 GB total memory (16 slots, 16 GB, 2133 MT/s, DDR4), 7x Intel® SSD Data Center S3700 Series (800 GB), 1x Intel® SSD Data Center P3700 Series (2 TB), CentOS 7.2 kernel 3.10.0.

**NEW:** 2x Intel® Xeon® Platinum 8180 processor @ 2.5 GHz (28 cores), Intel Turbo Boost Technology enabled, Intel Hyper-Threading Technology disabled, BIOS: 01.00.0412.020920172159, 384 GB total memory (24 slots, 16 GB, 2666 MT/s, DDR4), 4x Intel SSD Data Center S3700 Series (800 GB), 1x Intel® SSD Data Center P3700 Series (2 TB), CentOS 7.2 kernel 3.10.0.

**NEW WITH INTEL® OPTANE™ TECHNOLOGY:** 2x Intel® Xeon® Platinum 8180 processor @ 2.5 GHz (28 cores), Intel Turbo Boost Technology enabled, Intel Hyper-Threading Technology disabled, BIOS: 01.00.0412.020920172159, 384 GB total memory (24 slots, 16 GB, 2666 MT/s, DDR4), 4x Intel SSD Data Center S3700 Series (800 GB), 4x Intel® Optane™ SSD Data Center P4800X Series (375 GB), CentOS 7.2 kernel 3.10.0.

<sup>2</sup> [www.intel.com/XeonScalable](http://www.intel.com/XeonScalable).

Software and workloads used in performance tests may have been optimized for performance only on Intel® microprocessors. Performance tests, such as SYSmark\* and MobileMark\*, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more complete information visit <http://www.intel.com/performance/datacenter>.

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