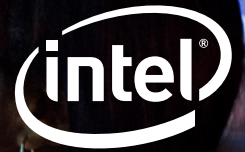


SOLUTION BRIEF

Public Sector
Analytics for Government Agencies

Future-Ready Analytics for Government



Intel® Xeon® Scalable processors empower advanced analytics for modern government

Why Intel® Xeon® Scalable Processors for Advanced Analytics?

1. You'll reduce time-to-insight with fast, powerful processing for all types of analytics workloads
2. You'll boost security and reliability with fast encryption and a wide range of enhanced reliability, availability and serviceability capabilities
3. You'll create a future-ready analytics platform that offers flexibility, scalability and ROI to support future development and investment



In today's data-dependent world, government agencies must work smarter and faster to keep up with the needs and expectations of citizens. Regardless of whether the agency is local, state, or federal, now is the time to consider what is needed from collected data in order to succeed in this new landscape, and what you must do to ensure these needs are met.

Data-Driven Decision Making

The notion of "time-to-insight" has become a critical metric for business leaders. For government officials, this capability matters as well—they need answers faster, delivered with greater efficiency and more flexibility, all while ensuring citizen data privacy and the staunch security of mission-critical data.

A 2017 Gartner survey of more than 2,500 CIOs found that spending on "business intelligence and analytics" was the top investment priority in all types of organizations. The analyst house has indicated that it expects advanced analytics will be a USD 76 billion business by 2020.¹

It's clear that every business is becoming a data business, and government is no different. Yet the challenge is no longer about acquiring data or building infrastructure to contain it. Instead, it is about extracting insight, and doing it fast enough to matter.

Like business leaders, who are increasingly focused on time to insight, government officials are also looking to data to help them make rapid and accurate decisions. In doing so, they are demanding far more from their analytics infrastructure. They need answers faster, with greater efficiency and more flexibility, all while ensuring citizen data privacy and the staunch security of mission-critical data. Being unable to meet these needs will quickly reduce a government's ability to adapt and meet citizens' expectations, potentially creating disruption.

Intel's Continued Commitment to Analytics

Government agencies that wish to deploy analytics or further their current analytics investment demand increased performance and agility in the data center to support diverse analytics workloads. Technology must be scalable and versatile enough to keep up with demanding changes in these workloads, and with evolving expectations of government.

The new Intel® Xeon® Scalable processors build upon the exceptional performance, efficiency, and value of previous Intel® Xeon® processors which have been the workhorse of the data center for nearly two decades. These technology gains, coupled with the innovation of system and solution vendors, have enabled incredible advantage for government agencies pursuing analytics. For example, IT can replace four four- to five-year-old servers with only one Intel Xeon Scalable processor-based server,² lowering four-year total cost of ownership (TCO) by up to

65 percent.³ This ultimately allows an agency to invest more in its analytics strategy and support more advanced analytics use cases. Intel's dedication to delivering unmatched enterprise-ready platforms represents our commitment to underpinning our customers' success.

The new Intel Xeon Scalable processors have been designed to accelerate analytics as well as artificial intelligence, providing a more scalable, agile, and efficient platform with increased security features for all use cases.

Analytics workloads can range from in-memory computing ("scale-up"), to highly distributed workloads like Hadoop* ("scale-out"), to the synthesis of these models such as streaming analytics. Previously, the conventional wisdom has been that agencies requiring scale-up solutions would select systems based on the Intel Xeon processor E7 family for massive memory and high reliability. For agencies seeking scale-out solutions, the Intel Xeon processor E5 family was the choice with its dual-socket configuration more suited to massive clusters. However, the new Intel Xeon Scalable processors bring the value of these two platforms into one, scaling from two-socket to eight-socket and beyond while still offering all the rich capabilities and software compatibility that government customers have come to expect from previous Intel Xeon processor generations.

Accelerate Insight from Data

Perhaps the most important attribute for analytics infrastructure is that it is fast. In some cases – such as medical diagnostics or air traffic control—seconds matter and human lives are at risk. In other cases—such as financial trading data—microseconds can be worth millions of dollars. Real-time insight is fast becoming a necessity.

For large in-memory and distributed analytics workloads, Intel Xeon Scalable processors deliver impressive gains due to significantly increased cores, memory bandwidth, and I/O. For example, SAP HANA* running on the new Intel Xeon Scalable processor achieved 1.5 times more queries per hour,⁴ meaning faster time to insights for business-critical applications, while IBM* also announced similar gains on its

Advanced Analytics Results with Intel® Xeon® Scalable Processors

Reduce 4 year TCO by up to

65%

1.5X

more queries / hour with SAP HANA*

1.4X

faster response times with IBM DB2*

4.6X

more operations per second with Cassandra* NoSQL databases

UP TO 2X FASTER

insights based in SAS Business Analytics

DB2* software, with 1.4 times faster response time⁵—both when compared to previous generation Intel Xeon processor performance.

Intel Xeon Scalable processors also deliver gains for distributed scale-out analytics. For instance, on Big Data queries, the new Intel Xeon Scalable processor performed 1.4 times faster batch analytics on average compared to the previous generation Intel Xeon processor.⁶ Additionally, deploying the Cassandra* NoSQL database, particularly to older installed-base servers, can lead to up to 4.6 times the number of operations per second and support five times



the number of clients when using new Intel Xeon Scalable processors.⁷

When combined with Intel® Optane™ Technology and Intel® Solid State Drives (Intel® SSDs), further analytics advantages are evident. With SAS*, the gain for this combination was two times faster than the Intel best-of-breed platform only one year ago.⁸

Enhance Security and Reliability

One of the major concerns in building analytics infrastructures is securing the data both in transit and stored across the environment. With micro-architecture improvements, Intel Xeon Scalable processors vastly increase the speed at which government agencies can encrypt their data with negligible impact on overall performance, allowing IT to maintain fast analytics while protecting information. Furthermore, Intel has taken all of the reliability, availability and serviceability (RAS) features of the Intel Xeon processor E7 family and enabled them on the new processor, including the expanded Intel® Run Sure Technology. This provides IT with additional peace of mind for the analytics infrastructure they rely upon.

Prove Analytics ROI and Ensure Future Flexibility

For governments eager to utilize data in the digital age and wondering whether their technology can be flexible enough for the future, the answer is in solutions based on Intel Xeon Scalable processors. With the choice of scaling from two sockets to eight sockets and beyond, and increased memory bandwidth to power both in-memory

and distributed solutions, IT teams have the flexibility and scalability to support increasingly complex and demanding analytics workloads. At the same time, agencies can choose from a wide range of advanced analytics tools and software developed by leading ecosystem players and optimized for Intel Xeon Scalable processors. With the faster, more targeted analytics that these solutions enable, ROI can be expected quickly.

By increasing the speed, complexity and scalability of your advanced analytics capabilities, you'll be taking a critical step in ensuring you're well placed to deliver rapid and needed services to citizens. You'll also equip your organization with the technology infrastructure to drive ongoing innovation and success in the future.

Advanced Analytics Results with Intel® Xeon® Scalable Processors

- Reduce 4-year TCO by up to 65 percent
- 1.5x more queries / hour with SAP HANA*
- 1.4x faster response times with IBM DB2*
- 4.6x more operations per second with Cassandra* NoSQL databases
- Up to 2x faster insights based in SAS Business Analytics

Find the solution that's right for your organization. Explore intel.com/analytics



¹ 2017 Gartner CIO Survey: Top 3 tech areas for new/discretionary funding in 2016 (US, n=892)

² Up to 4.28x more VMs claims based on server virtualization consolidation workload: Based on Intel® internal estimates. Comparing 1-Node, 2 x Intel® Xeon® Processor E5-2690 on Romley-EP with 256 GB Total Memory on VMware ESXi® 6.0 GA using Guest OS RHEL6.4, glassfish3.1.2.2, postgres9.2. Data Source: Request Number: 1718, Benchmark: server virtualization consolidation, Score: 377.6 @ 21 VMs to 1-Node, 2 x Intel® Xeon® Platinum 8180 Processor on Wolf Pass SKX with 768 GB Total Memory on VMware ESXi6.0 U3 GA using Guest OS RHEL 6 64bit. Data Source: Request Number: 2563, Benchmark: server virtualization consolidation, Score: 1580 @ 90 VMs.

³ Up to 65 percent lower four-year TCO estimate example based on equivalent rack performance using VMware ESXi® virtualized consolidation workload comparing 20 installed 2-socket servers with Intel Xeon processor E5-2690 (formerly "Sandy Bridge-EP") running VMware ESXi® 6.0 GA using Guest OS RHEL6.4 compared at a total cost of \$919,362 to five 2-socket servers with Intel® Xeon® Platinum 8180 Processor running VMware ESXi6.0 U3 GA using Guest OS RHEL 6 64bit at a total cost of \$320,879 including basic acquisition. Server pricing assumptions based on current OEM retail published pricing for 2-socket server with Intel Xeon processor E5-2690 v4 and 2 CPUs in 4-socket server using E7-8890 v4 – subject to change based on actual pricing of systems offered.

⁴ Up to 1.59x claim based on SAP HANA* internal S-OLTP workload: Up to 1.59x higher OLTP performance (SAP HANA internal S-OLTP workload) vs. Intel® Xeon® processor E7 v4. Baseline config: 1-Node, 4S Intel® Xeon® Processor E7-8890 v4 on Brickland-EX-based platform with 1024 GB Total Memory on SLES12SP1 vs. estimates based on internal testing on 1-Node, 4S Intel® Xeon® Platinum 8180 Processor

⁵ Up to 1.47x claim based on IBM® BDInsights (3TB, 12 users, intermediate & complex queries). Testing conducted on IBM DB2* software comparing Intel® Xeon® Platinum 8180 processor to 4S Intel® Xeon® Processor E7-4890 v2 and E7-8890 v4. Testing performed by Intel® and IBM®, April/May 2017. BASELINE: 4S Intel® Xeon® processor E7-4890 v2, 2.8GHz, 15 cores, turbo on, HT on, BIOS 38.R02, 1.5TB total memory, 96 slots / 16GB / 1066 MT/s / DDR3 DIMM, IBM XIV Storage (132 10K RPM disks), SuSE Enterprise Linux* 11.3 kernel 3.0.101-0.47.71. NEXT GEN: 4S Intel® Xeon® processor E7-8890 v4, 2.2GHz, 24 cores, turbo on, HT on, BIOS 335.R00, 1.5TB total memory, 96 slots / 16GB / 1600 MT/s / DDR4 LRDIMM, 1 x 800GB, Intel® SSD DC S3700, Red Hat Enterprise Linux* 7.3 kernel 3.10.0-514.16.1.el7.x86_64. NEW: Intel® Xeon® Platinum 8180 processor, 2.5GHz, 28 cores, turbo on, HT on, BIOS 119.R05, 1.5TB total memory, 48 slots / 32GB / 2677 MT/s / DDR4 LRDIMM, 1 x 800GB, Intel® SSD DC S3700, Red Hat Enterprise Linux* 7.3 kernel 3.10.0-514.16.1.el7.x86_64.

⁶ Average 1.44x gains claim based on Big Data Batch Analytics: Based on Intel internal estimates. Comparing Intel® Xeon® processor E5-2697 v4: Nodes 8, Number of Sockets 2, Number of Cores / Socket 18 Cores/ 36 Threads, Clock 2.3 GHz, Cache 45MB, Memory: 24 Samsung DDR4 DIMMs of 32GB each at 2400 MHz, Storage 2x2TB + 1x1TB SATA3 SSD, Network 10 Gigabit Single Port to estimates based on internal testing on Intel® Xeon Platinum 8168: Nodes 8, Number of Sockets 2, Number of Cores / Socket: 24 Cores/ 48 Threads, clock: 2.7 GHz, Cache 33MB, Memory: 12 Micron DDR4 DIMMs of 64GB each at 2400 MHz, Storage 2x2TB + 1x1TB SATA3 SSD, Network 10 Gigabit Single Port. Software configuration: OS CentOS release 6.8, Kernel 2.6.32-642.el6.x86_64, Java 1.8.0_111, Python 2.6.6, Hadoop 2.7.3, File System HDFS, Hive 1.2.1, Apache Spark 1.6.2

⁷ Up to 4.6x more OPS and up to 5x more clients based on Cassandra* Stress Test. Comparing 1-Node, 2 x Intel® Xeon® Processor E5-2697 v2 on Romley-EP with 128 GB Total Memory on CentOS7.3 kernel 4.10.1.x86_64 using Apache-Cassandra-3.10, Oracle JDK1.8.0_121 (1.7TB compressed dataset, LZ4 compression) vs. 1-Node, 2 x Intel® Xeon® Platinum 8180 Processor on Wolf Pass with 192 GB Total Memory on CentOS7.3 kernel 4.10.1.x86_64 using Apache-Cassandra-3.10, Oracle JDK1.8.0_121 (1.7TB compressed dataset, LZ4 compression)

⁸ Up to 2x faster insights based in SAS Business Analytics*: SAS 9.4 m4 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: 2 Intel® Xeon® processor E5-2699 v4 @ 2.2GHz, 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 LRDIMM), 7x Intel® SSD Data Center S3700 Series (800GB), 1x Intel® SSD Data Center P3700 Series (2 TB), CentOS 7.2 kernel 3.10.0. NEW: 2x Intel® Xeon® Platinum 8180 processor @ 2.5GHz, Intel Turbo Boost Technology enabled, Intel Hyper-Threading Technology disabled, BIOS: 01.00.0412.020920172159, 384 GB total memory (24 slots, 16GB, 2666 MT/s, DDR4 LRDIMM), 4x Intel SSD Data Center S3700 Series (800GB), 4x Intel® Optane™ SSD Data Center P4800X Series (375GB), CentOS 7.2 kernel 3.10.0.

Solution Brief | Future-Ready Analytics for Government

Intel technologies' features and benefits depend on system configuration and may require enabled hardware, software or service activation. Performance varies depending on system configuration. No computer system can be absolutely secure. Check with your system manufacturer or retailer or learn more at intel.com/analytics.

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