World-Leading Performance Advancing Real-Time Analytics
June 5, 2016 - Several OEM companies have introduced new platforms based on the Intel Xeon processor E7-8800/4800 v4 product families and have achieved remarkable performance improvements scoring 27 new benchmark world records with improved economics from Cisco*, Dell*, Fujitsu*, Hewlett-Packard Enterprise (HPE)*, Huawei*, Lenovo* and SGI*.

Based on Intel internal analysis, using the new Intel Xeon processor E7-8890 v4 (60M Cache, 2.20 GHz) delivers more capabilities, larger memory capacity and microarchitecture enhancements for VM enter/exit latency reduction in a virtualized environment compared to prior generations.

- Up to double the queries per hour answered enabling smarter decisions for businesses analyzing their sales and customer data\(^1\)
  - up to 1.3x average performance across key industry-standard workloads\(^2\)
- Up to 35% more virtual machines (VMs) and infrastructure applications throughput supported with same service-level agreement level to help IT grow line-of-business (LOB) heterogeneous needs\(^3\)
- Ad-hoc cost per query has dropped from $21 to just $0.38 in just the past six-years — a 98% cost reduction, while queries per hour capability has increased by 19x\(^4\)
- Use 1/3\(^{rd}\) the servers for equivalent performance to lower operational expenses by replacing 4-5 year old installed platforms\(^5\), savings include lower:
  - Network and server maintenance costs by up to 92%
  - Utilities costs by up to 73%
  - Annual software licensing fees by up to 67%

Maximum Scalability to Meet the Most Demanding Needs
With industry-leading up to 3TB of memory per socket support\(^15\), the Intel Xeon processor E7-8800/4800 v4 product families are capable of holding multi-terabyte and petabyte-scale datasets that can be accessed in memory for fast time-to-insight and decision making. The processor also includes up to 60 MB last-level cache to support high-density, hardware-assisted virtualization with reduced latency. Further details show servers with Intel Xeon processor E7-8890 v4:

- Based on Intel internal analysis, compared to previous generation Intel Xeon processor E7-8890 v3 (45M Cache, 2.5 GHz, formerly codenamed “Haswell-EX”) using the same platform delivers up to:
  - 33% more benchmark users supported with SAP SD* 2-tier ERP workload\(^6\)
  - 30% more On-Line Transaction Processing (OLTP) database transactions to support peak demands on supply chain\(^7\)
  - 24% more query navigation steps using in-memory analytics with SAP HANA* through the new SAP Business Warehouse-Advanced Mixed Load (BW-AML) benchmark\(^8\)
• Over the previous two generations Intel Xeon processor E7-4890 v2 (37.5M Cache, 2.8 GHz, formerly codenamed “Ivy Bridge-EX”) using the same platform demonstrates, based on Intel internal analysis, up to:
  o 4.6x faster ad-hoc queries for more insight into supporting business decisions
  o 2.9x financial risk insights generational speedup with STAC-M3* theoretical profit and loss workload using 6TB of DDR4 memory
  o Double the number of VMs for higher rack density
• Versus the broadest installed base of Intel Xeon processor E7 servers (formerly codenamed “Westmere-EX”) provides, based on Intel internal analysis, up to:
  o 3.7x more VMs for improving utilization while maintaining SLAs
  o 2.9x more benchmark users supported with SAP SD* 2-tier ERP using SQL Server
  o 2.8x more OLTP database transactions to support peak demands on supply chain

See http://www.intel.com/E7v4Records for the complete list of world records.

Configurations and Disclaimers
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 information go to http://www.intel.com/performance/datacenter and http://www.intel.com/E7v4records.

Claim configurations as of 5 June 2016:

1. Up to 2.1x faster ad-hoc queries claim based on TPC-H @ 3000GB scale factor comparing HPE ProLiant* DL580 Gen9 with Intel Xeon processors E7-8890 v4 (4P, 96C, 192T), Actian* Vector 5.0 database scoring 2,140,307 QphH@3000GB, $0.38/QphH@3000GB available 6/6/2016 (source: http://www.tpc.org/3323) vs. next best published result Intel Xeon processor E7-8890 v3 (4P, 72C/144T), 1,071,018 QphH@3000GB, $0.60/QphH@3000GB available 6/1/2016 (source: http://www.tpc.org/3322)
2. Up to 1.3x average performance across key industry benchmarks (SPECjbb*2015 Multi-JVM Critical and Max JOPS, SPECint*_rate_base2006, SAP SD* 2-tier, SPECvirt_sc*2013, and TPC-E*) comparing best 4-socket OEM server publications on SPEC.org, SAP.com/benchmarks and TPC.org. See www.intel.com/E7v4Record for more information.
3. Up to 1.35x VMs claim based on SPECvirt_sc*2013 benchmark comparing 1-Node, 4 x Intel® Xeon® Processor E7-8890 v3 with 2 TB Total Memory on Red Hat Enterprise Linux 6.6 using Red Hat Enterprise Linux 6.6 (KVM). Data Source: http://www.spec.org/virt_sc2013/results/res2016q1/virt_sc2013-20160126-00041-perf.html, Benchmark: SPECvirt_sc*_2013, Score: 3118 @ 174 VMs to 1-Node, 4 x Intel® Xeon® Processor E7-8890 v4 on Hewlett Packard Enterprise ProLiant* DL580 Gen 9 with 2048 GB Total Memory on Red Hat Enterprise Linux* 7.2-kernel 3.10.0-327. Data Source: Request Number: 2222, 20160126, SPECvirt_sc*_2013, Score: 4231 @ 237 VMs Higher is better
4. Up to 19x queries per hour at 98% lower cost per query claim comparing HPE ProLiant* DL580 Gen9 server with Intel Xeon processors E7-8890 v4 (4P, 96C, 192T), Actian* database scoring 2,140,307 QphH@3000GB, $0.38/QphH@3000GB available 6/6/2016 (source: http://www.tpc.org/3323) vs. Xeon X7460 (16P, 96C, 96T), SQL Server* 2008 Datacenter Edition R2 database scoring 102,778QphH@3000GB, $21.05/QphH@3000GB available 5/6/2010 (historical source: http://www.tpc.org/3245)
5. Up to 1/3rd fewer servers deployed with operational expenses reduction claim based on assumptions and estimates from the Server Refresh Savings Estimator (http://estimator.intel.com/serverroi/) comparing four-socket servers with 8x GB ports per server, $1399 software support cost per server per year, $1000 software validation cost per server, $0.10/kWh with 10% average utilization, 50% lower labor costs, $2399 server maintenance per server per year, and $15 network maintenance per server per year:
  o 100x Intel Xeon processor E7-4870 (30M Cache, 2.40 GHz, formerly codenamed “Westmere-EX”), estimated SPECint*_rate_base2006 score 1100 with Intel Compiler 12.1, estimated power 392W idle/692W active
  o to 33x E7-8890 v4 (60M Cache, 2.20 GHz, codenamed “Broadwell-EX”), estimated SPECint*_rate_base2006 score 3380 with Intel Compiler 14.1, estimated power 250W idle/1200W active
6. Up to 1.33x benchmark SD ERP users claim based on SAP* SD Standard Application Benchmark Results, Two-Tier Internet Configuration benchmark Linux results comparing 1-Node, 4 x Intel® Xeon® Processor E7-8890 v3 with 1048576 Total Memory on Red Hat Enterprise Linux 6.7 using SAP enhancement package 5 for SAP ERP 6.0. Data Source: http://download.sap.com/download.epd?context=40E2D9D5E00EE7EFC2455D066964A9E7704F91078B51E484F6E755FAFFEB6, Benchmark: SAP* SD 2-Tier enhancement package 5 for SAP ERP 6.0, Score: 31000 benchmark users to 1-Node, 4 x Intel® Xeon® Processor E7-8890 v4 on Dell Inc. PowerEdge* R930 with 1024 GB Total Memory on Red Hat Enterprise Linux* 7.2-kernel 3.10.0-327 using SAP Enhancement Package 5 for SAP ERP 6.0, SAP NetWeaver 7.20 p510. Data Source: The SAP certification number was not available at press time and can be found at the following Web page: www.sap.com/benchmark. Score: 41450 benchmark users higher is better
9. Up to 2.8x portfolio P&L and generational speed-up claim based on STAC-M3 Shastra in-memory suite 81.10% THEOPL TIME benchmark comparing 45% Intel® Xeon® Processor E7-8890 v4 with 6TB SK Hynix® DDR4 memory, Intel SSD DC P3700, Kx Systems® db+ 3.3, Red Hat® Enterprise Linux 7.2 scoring 16 ms (Source: https://www.stacresearch.com/KOB140116). Lower is better.

10. Up to 2.3% VMware users based on internal virtualized consolidation workload (similar to SPECvirt_sc* 2013) benchmark comparing 1-Node, 4 x Intel® Xeon® Processor E7-8890 v4 with 1024 GB Total Memory on VMware ESXi® 6.0 Update 1. Data Source: Request Number: 2150, Score: 131, Source: 573 @ 32 VMs Higher is better. NOTE: the IT application virtualized consolidation workload is derived from the SPECvirt_sc* 2013 benchmark and as such is not comparable to published SPEC Benchmark results.

11. Up to 2.9x benchmark SD users claim based on SAP® SD Standard Application Benchmark Results, Two-Tier Internet Configuration benchmark comparing 1-Node, 4 x Intel® Xeon® Processor E7-8890 v4 on Microsoft Windows Server 2008 R2 with 2TB Total Memory using SAP enhancement package 4 for SAP ERP 6.0. Data Source: http://download.sap.com/download.epd?context=40E2D095E00EEF7C2E1EC28E7230522B95B57108CEC9650B8F4D8BF4628A8, Score: 14000 benchmark users to 1-Node, 4 x Intel® Xeon® Processor E7-8890 v4 on Dell Inc. PowerEdge® R930 with 1024 GB Total Memory on Red Hat Enterprise Linux® 7.2-kernel 3.10.0-327 using SAP Enhancement Package 5 for SAP ERP 6.0, SAP NetWeaver 7.20.50150. Data Source: The SAP certification number was not available at press time and can be found at the following Web page: www.sap.com/benchmark. Benchmark: SAP® SD 2-Tier enhancement package 5 for SAP ERP 6.0, Score: 14150 benchmark users Higher is better.

Intel technologies’ features and benefits depend on system configuration and may require enabled hardware, software or service activation. Learn more at Intel.com, or from the OEM or retailer.

Intel processors of the same SKU may vary in frequency or power as a result of natural variability in the production process. Cost reduction scenarios described are intended as examples of how a given Intel-based product, in the specified circumstances and configurations, may affect future costs and provide cost savings. Circumstances will vary. Intel does not guarantee any costs or cost reduction. Intel does not control or audit third-party benchmark data or the web sites referenced in this document. You should visit the referenced web site and confirm whether referenced data are accurate.

Features and benefits may require an enabled system and third party hardware, software or services. Performance varies depending up your specific configuration. Consult your system provider.

Intel, the Intel logo, Xeon and Xeon logo are trademarks of Intel Corporation in the U.S. and/or other countries.

*Other names and brands may be claimed as the property of others.

© 2016 Intel Corporation