



STAC Update: Big compute

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STAC-A3: Backtesting

- Overview:
 - Workloads that emulate real-world backtesting jobs
 - Measure speed, scalability, efficiency of any architecture
- Test harness hands the implementation jobs to execute
- Measures the throughput and efficiency of the SUT
- Architectures: scale-up and scale-out, cloud and bare metal
- Languages: Python, C++, Scala
- Hardware: CPU, GPU

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STAC-A3 Basics (cont'd)

- **Scaling dimensions**
 - Time (number of order book messages)
 - Number of symbols
 - Number of simulations
- **Parameter sweep**
 - Each simulation uses different parameters for the signal-generating algorithm
- **MEAN_REVERT operation**
 - Simplistic mean reversion signal
 - As embarrassingly parallel as can be (symbols & simulations are separable)

STAC-A3 / Intel® Parallel Studio XE / Intel® Xeon® Platinum 9242

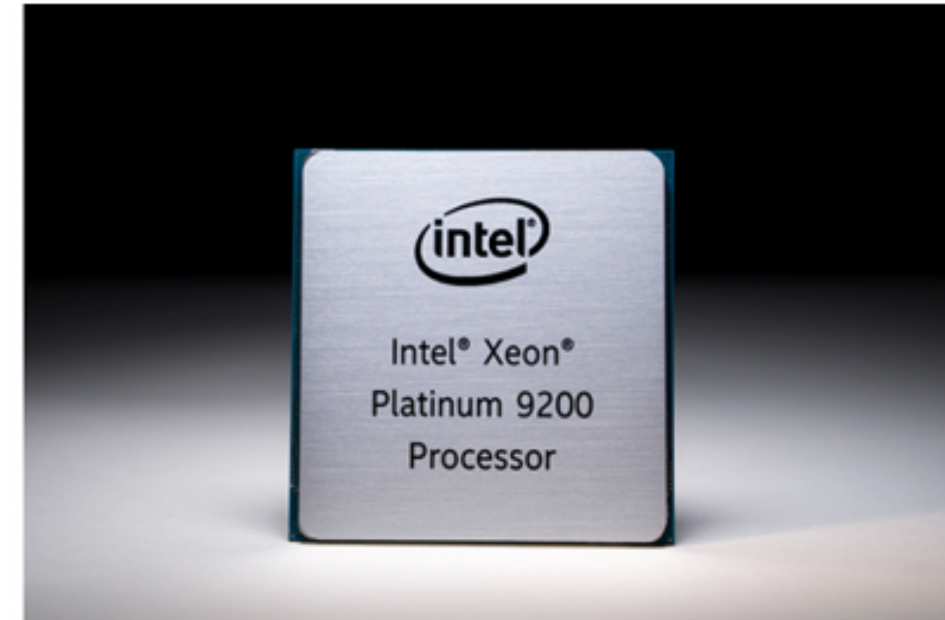
- SUT ID: INTC200514
- Stack:
 - Intel® Parallel Studio XE 2019 Update 5
 - Intel C++ Compiler 19.0 U5
 - Intel Threading Building Blocks 2019 U5
 - Python 3.6.8, Numpy 1.16.2, Pandas 0.24.1
 - Red Hat Enterprise Linux 7.8
 - 2 x Intel® Xeon® Platinum 9242 @ 2.3 GHz
 - S9248WK2HAC Compute Module
 - Occupies half of 2U Chassis
 - Intel® Server System S9200WK
 - 384 GB DRAM: 24 x 16GB DDR4 @ 2933MHz
 - OS disk: 1 x 1TB Intel® DC P4511
 - App data: 2 x 1.6TB Intel® DC P3700 (RAID-0)



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Results vs. a solution involving 16 GPUs (SUT ID NVDA190425)

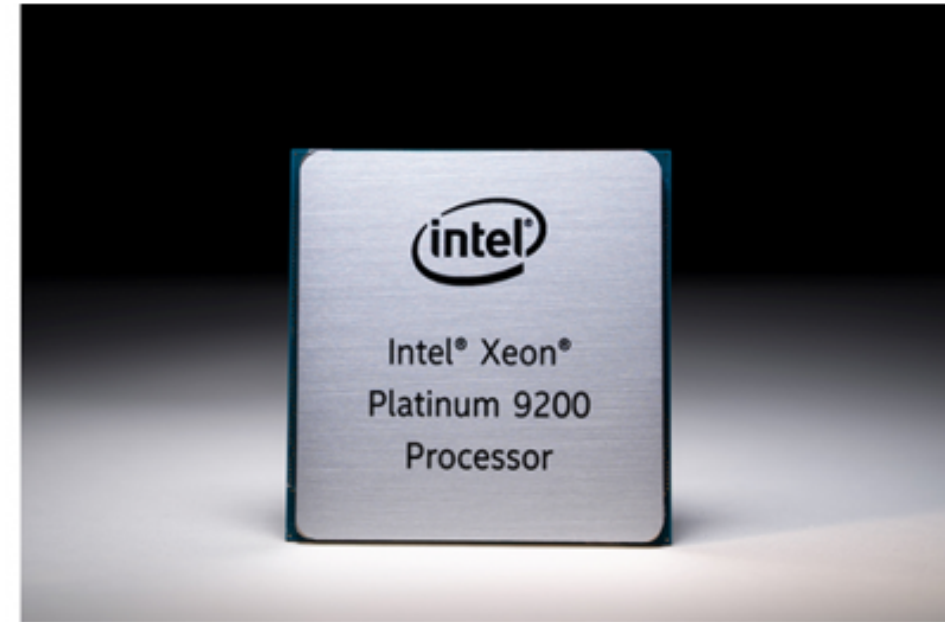
- For 50 instruments*:
 - 11.4x speedup for 1,000 simulations
 - 7.6x speedup for 10,000 simulations
 - Processing of 100,000 simulations on 50 instruments in less time than NVDA190425 processed 10,000 simulations on 48 instruments
- 3.1x the storage efficiency
- Results for over 10x the number of instruments (1,024 vs. 96)



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Versus SUT ID LEVX180608

- Compared to the previous best non-GPU solution with 6 servers & all-flash storage:
 - 4,500x the space efficiency
([STAC-A3.β1.SWEEP.SPACE_EFF](#))
 - 1,563x speedup in max simulations for 60 instruments in 60 minutes
([STAC-A3.β1.SWEEP.MAX60](#))
 - 268x to 752x speedup in every other named throughput benchmark
 - 211x speedup for 500 instruments*
 - 171x speedup for 1,024 instruments*
 - More than 5x the storage efficiency



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*Comparing the 500- and 1,02- instrument results, respectively, from this SUT with the 480- and 960-instrument results from LEVX180608

Linearity of scaling and storage efficiency

- Measure of linearity in throughput (instrument simulations/sec):
 - At 10,000 simulations per instrument, throughput varied by only 11% while increasing the number of instruments by 20x (50 to 1,024)
 - At 100,000 simulations per instrument, throughput varied by only 3% while increasing the number of symbols by 10x, from 50 to 500
- Outperformed all publicly-disclosed results in storage efficiency
([STAC-A3.β1.SWEEP.STORAGE.EFF](#))



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STAC-A2: Risk computation

- Non-trivial Monte Carlo calculations
 - Heston-based Greeks for multi-asset, path-dependent options with early exercise
 - Metrics: Speed, capacity, quality, efficiency
- Numerous reports
 - Some public, some in the STAC Vault
- Premium STAC members get:
 - Reports in STAC Vault
 - Detailed config info on public and private reports
 - Code from vendor implementations of the benchmarks

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Vault Report: STAC-A2 / Vitis 19.2 / 8 x Xilinx Alveo U250

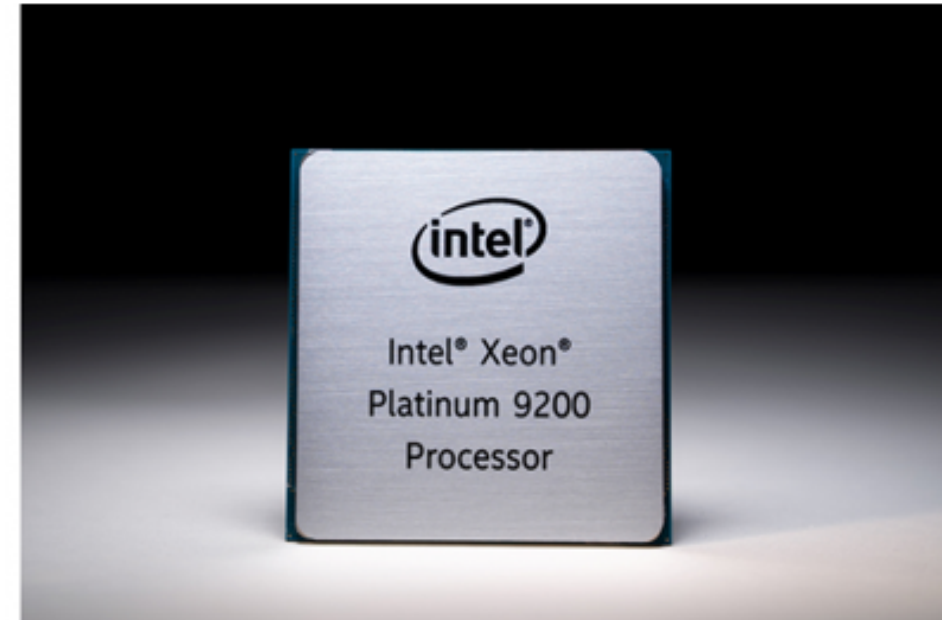
- SUT ID: XLNX200426
- Stack:
 - STAC-A2 Pack for Xilinx Vitis
 - Xilinx Vitis Unified Software Platform
 - Vitis HLS Math and Quantitative Finance Libraries
 - 2 x AMD EPYC 7551 32-core processor
 - 8 x Xilinx Alveo U250
 - 512GB DDR Memory: 4 x 16 GB DDR4 @2.4GHz on single FPGA
 - Ubuntu 16.04 LTS
 - BOXX GX8-M Server



Coming soon to
www.STACresearch.com/XLNX200426

Vault: STAC-A2 / Intel® Parallel Studio / Red Hat OpenShift

- SUT ID: INTC200410
- Stack:
 - STAC-A2 Pack for Intel® Parallel Studio XE (Rev M)
 - Intel® Parallel Studio XE 2018 update 5
 - Intel® Parallel Studio XE 2018 update 6 (runtime only)
 - Red Hat Enterprise Linux 7.8
 - Red Hat OpenShift 4.3
 - 2 x Intel® Xeon® Platinum 9242 CPU @2.3GHz
 - 384GB DRAM: 24 x 16GB DDR4 @2933MHz
 - Intel® Server System S9200WK SDP



Coming soon to
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