STAC Update for STAC-A2

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STAC-A2

- Non-trivial Monte Carlo
  - 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

www.STACresearch.com/**a2**

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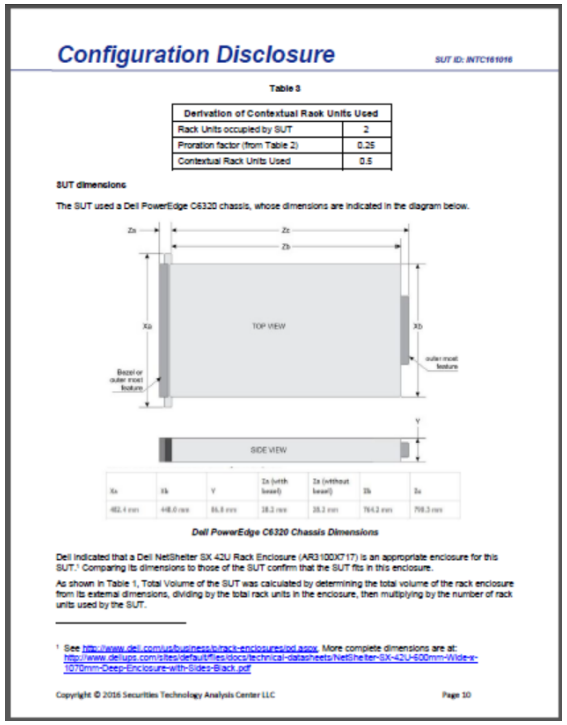
Increasing focus on resource efficiency

- Working group revised numerator to use portfolio metrics rather than single option problem size
- Also revamped space definitions to better reflect full impact on datacenter
- Even more info going into STAC Configuration Disclosure



Configuration Disclosure

SUT ID: INTC161016

Table 3

Derivation of Contextual Rack Units Used	
Rack Units occupied by SUT	2
Proration factor (from Table 2)	0.25
Contextual Rack Units Used	0.5

SUT dimensions

The SUT used a Dell PowerEdge C6320 chassis, whose dimensions are indicated in the diagram below.

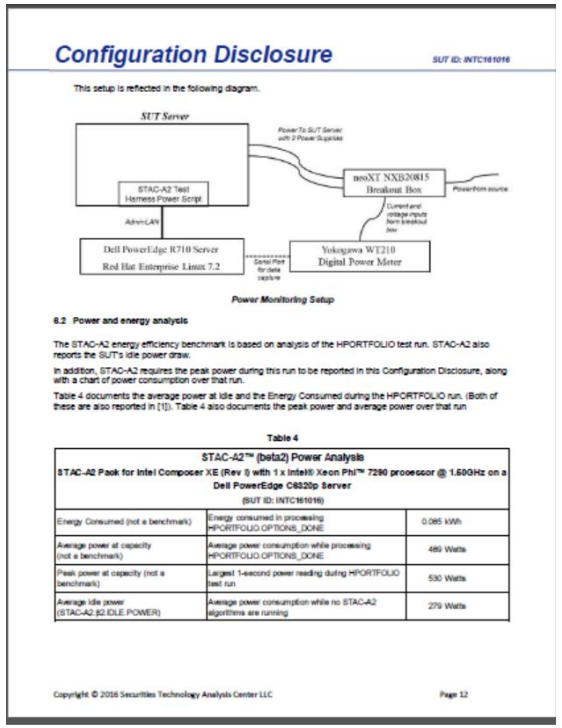
Xa	Xb	Y	Za (with bezel)	Za (without bezel)	Zb	Zc
482.4 mm	448.0 mm	86.8 mm	38.2 mm	35.2 mm	764.2 mm	798.3 mm

Dell PowerEdge C6320 Chassis Dimensions

Dell indicated that a Dell NetShelter SX 42U Rack Enclosure (AR3100X717) is an appropriate enclosure for this SUT.[1] Comparing its dimensions to those of the SUT confirm that the SUT fits in this enclosure.

As shown in Table 1, Total Volume of the SUT was calculated by determining the total volume of the rack enclosure from its external dimensions, dividing by the total rack units in the enclosure, then multiplying by the number of rack units used by the SUT.

[1] See http://www.dell.com/us/business/p/rack-enclosures/pd.aspx. More complete dimensions are at: http://www.dellops.com/sites/default/files/docs/technical-datasheets/NetShelter-SX-42U-600mm-Wide-x-1070mm-Deep-Enclosure-with-Sides-Black.pdf



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This setup is reflected in the following diagram.

Power Monitoring Setup

6.2 Power and energy analysis

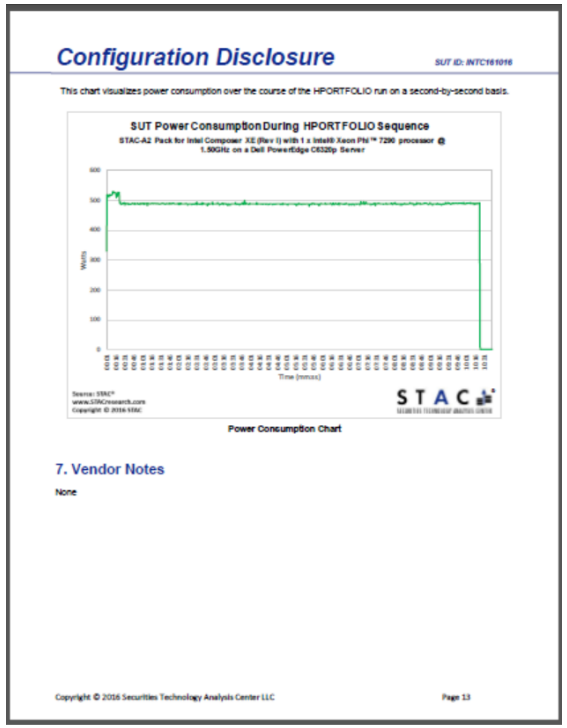
The STAC-A2 energy efficiency benchmark is based on analysis of the HPORTFOLIO test run. STAC-A2 also reports the SUT's idle power draw.

In addition, STAC-A2 requires the peak power during this run to be reported in this Configuration Disclosure, along with a chart of power consumption over that run.

Table 4 documents the average power at idle and the Energy Consumed during the HPORTFOLIO run. (Both of these are also reported in [1]). Table 4 also documents the peak power and average power over that run

Table 4

STAC-A2™ (beta2) Power Analysis STAC-A2 Pack for Intel Composer XE (Rev I) with 1 x Intel® Xeon Phi™ 7290 processor @ 1.50GHz on a Dell PowerEdge C6320p Server (SUT ID: INTC161016)		
Energy Consumed (not a benchmark)	Energy consumed in processing HPORTFOLIO.OPTIONS_DONE	0.085 kWh
Average power at capacity (not a benchmark)	Average power consumption while processing HPORTFOLIO.OPTIONS_DONE	489 Watts
Peak power at capacity (not a benchmark)	Largest 1-second power reading during HPORTFOLIO test run	530 Watts
Average idle power (STAC-A2.β2.IDLE.POWER)	Average power consumption while no STAC-A2 algorithms are running	279 Watts



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This chart visualizes power consumption over the course of the HPORTFOLIO run on a second-by-second basis.

Power Consumption Chart

7. Vendor Notes

None

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Cray XC40 compute node with 1 x Intel Xeon Phi 7250 @ 1.4GHz

- Fastest WARM time in the baseline GREEKS benchmark at time of publication
- 4% faster than the KNL timing reported by Intel (INTC160428)
- 36% faster than the fastest reported GPU-based system (NVDA141116)
- 50% faster than the fastest reported non-Intel CPU-based system (IBM150305)

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Cray XC40 compute node with 1 x Intel Xeon Phi 7250 @ 1.4GHz

- First project to use new volume metric: Effective Volume
  - 1,080 cubic inches
  - Compare to an OCP rack unit = 2,055 cubic inches
- Report uses unofficial energy results due to system scale

Dell PowerEdge C6320p with 1 x Intel Xeon Phi 7290 @ 1.50GHz

- STAC Report released at the end of October
- Fastest WARM time ever in the baseline GREEKS benchmark (5 assets, 25K paths, 252 timesteps) at time of publication
- Fastest WARM time in the large GREEKS benchmark (10 assets, 100K paths, 1260 timesteps) at time of publication
  - *43% faster than a system with 4 x Haswell EX processors (INTC150811)*
  - *7% faster than the best time on a non-Intel Architecture system (IBM150305)*

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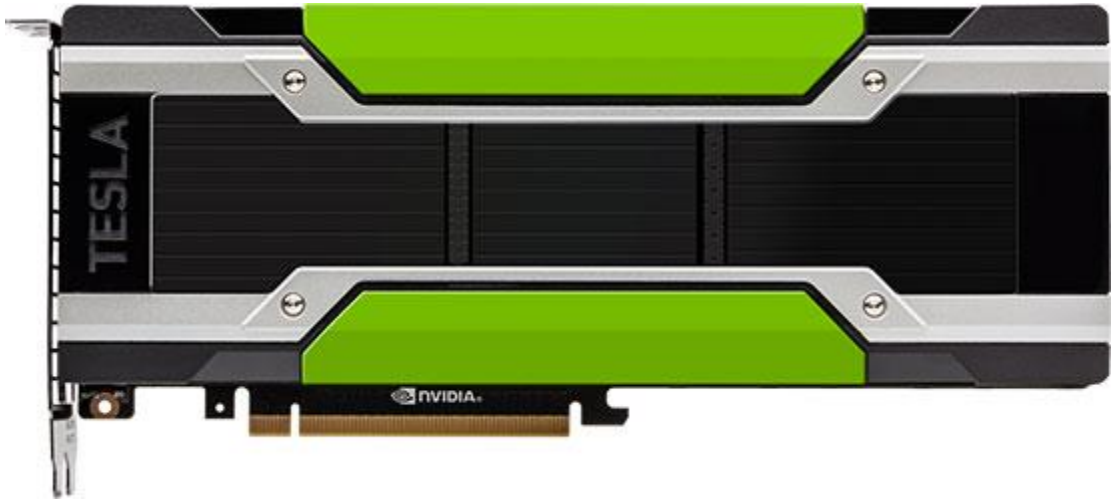
Dell PowerEdge C6320p with 1 x Intel Xeon Phi 7290 @ 1.50GHz

- First system to use new portfolio benchmarks
  - Score: 4.64 options/second
- First system to use new energy- and space-efficiency benchmarks
  - 34,193 options per kWh
  - 18.0 options/hour per cubic inch

Supermicro SYS-2028GR-TRT with 4 x NVIDIA Tesla P100 GPU

- STAC Report to be released this week
- Four PCIe-based Pascal GPUs
- Highest energy efficiency to date
  - 99,793 options/kWh
  - Over 2.9x the next best (INTC161016)
- Highest space efficiency to date
  - 24.7 options/hour per cubic inch
  - 37% more than the next best (INTC161016)
- Highest portfolio throughput to date
  - 25.0 options per second
  - Over 5.3x the next best (INTC161016)



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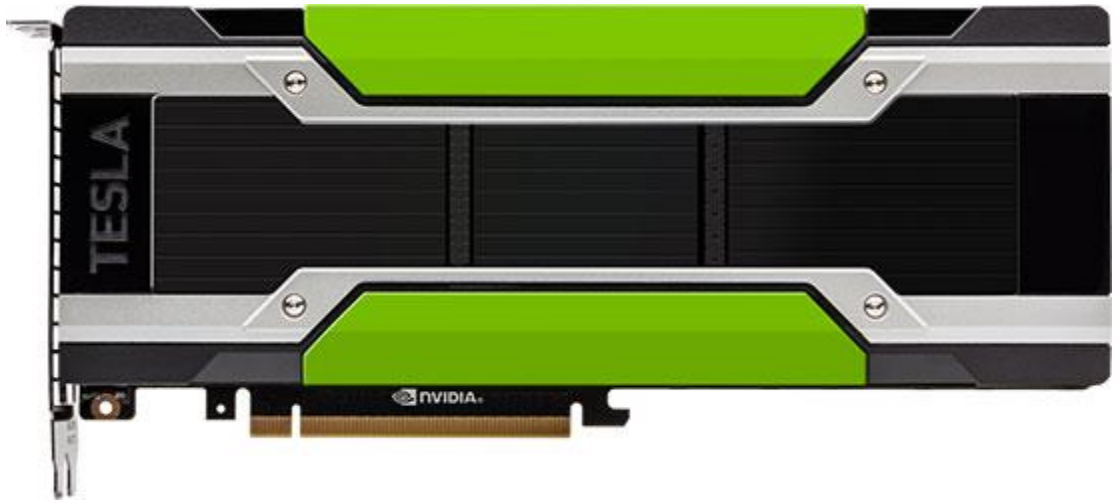
Supermicro SYS-2028GR-TRT with 4 x NVIDIA Tesla P100 GPU

- Fastest times ever in warm runs of the baseline GREEKS benchmark (5 assets, 25K paths, 252 timesteps)
  - 51 milliseconds
  - Over 4x the next best (INTC161016)
- Fastest warm and cold times ever in the large GREEKS benchmark (10 assets, 100K paths, 1260 timesteps)
  - 12.8 seconds
  - Over 2x the next best (INTC161016)
- Highest max assets ever reported
  - 100 assets
  - Next best: 78 (IBM150305)
  - Workload scales ~quadratically with assets



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