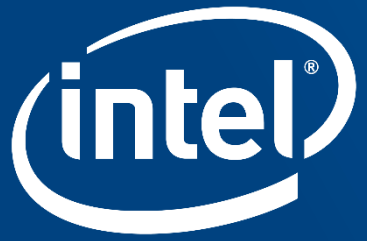

INTEL® OPTIMIZED CAFFE PERFORMANCE AND CONVERGENCE

Daisy Deng <daisy.deng@intel.com>

March 2018

Notices and Disclaimers

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.

For more complete information about performance and benchmark results, visit www.intel.com/benchmarks.

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.

The cost reduction scenarios described are intended to enable you to get a better understanding of how the purchase of a given Intel based product, combined with a number of situation-specific variables, might affect future costs and savings. Circumstances will vary and there may be unaccounted-for costs related to the use and deployment of a given product. Nothing in this document should be interpreted as either a promise of or contract for a given level of costs or cost reduction.

Optimization Notice: Intel's compilers may or may not optimize to the same degree for non-Intel microprocessors for optimizations that are not unique to Intel microprocessors. These optimizations include SSE2, SSE3, and SSSE3 instruction sets and other optimizations. Intel does not guarantee the availability, functionality, or effectiveness of any optimization on microprocessors not manufactured by Intel. Microprocessor-dependent optimizations in this product are intended for use with Intel microprocessors. Certain optimizations not specific to Intel microarchitecture are reserved for Intel microprocessors. Please refer to the applicable product User and Reference Guides for more information regarding the specific instruction sets covered by this notice.

Performance estimates were obtained prior to implementation of recent software patches and firmware updates intended to address exploits referred to as "Spectre" and "Meltdown." Implementation of these updates may make these results inapplicable to your device or system

No computer system can be absolutely secure.

Intel® Advanced Vector Extensions (Intel® AVX)* provides higher throughput to certain processor operations. Due to varying processor power characteristics, utilizing AVX instructions may cause a) some parts to operate at less than the rated frequency and b) some parts with Intel® Turbo Boost Technology 2.0 to not achieve any or maximum turbo frequencies. Performance varies depending on hardware, software, and system configuration and you can learn more at http://www.intel.com/go/turbo.

Intel processors of the same SKU may vary in frequency or power as a result of natural variability in the production process.

Results have been estimated or simulated using internal Intel analysis or architecture simulation or modeling, and provided to you for informational purposes. Any differences in your system hardware, software or configuration may affect your actual performance.

Intel® Optimized Caffe Training Performance

Topology	Batch Size	Images/s
Default_Resnet50	512	135
SSD/VGG16	32	18

* The data is an average result of 3 tests based on dummy data layer.
* Please find the configuration at page 6.

Performance estimates were obtained prior to implementation of recent software patches and firmware updates intended to address exploits referred to as "Spectre" and "Meltdown." Implementation of these updates may make these results inapplicable to your device or system.

Optimization Notice: Intel's compilers may or may not optimize to the same degree for non-Intel microprocessors for optimizations that are not unique to Intel microprocessors. These optimizations include SSE2, SSE3, and SSSE3 instruction sets and other optimizations. Intel does not guarantee the availability, functionality, or effectiveness of any optimization on microprocessors not manufactured by Intel. Microprocessor-dependent optimizations in this product are intended for use with Intel microprocessors. Certain optimizations not specific to Intel microarchitecture are reserved for Intel microprocessors. Please refer to the applicable product User and Reference Guides for more information regarding the specific instruction sets covered by this notice.

Intel® Optimized Caffe Inference Performance

FP32 Inference: 1 instance on 1 sockets		
Topology	Batch Size	Images/s
Default_Resnet50	448	368
SSD/VGG16	448	29

FP32 Inference: 2 instance , 1 on each socket		
Topology	Batch Size	Images/s
Default_Resnet50	448	733
SSD/VGG16	448	59

Int8 Inference: 1 instance on 1 socket		
Topology	Batch Size	Images/s
Default_Resnet50	448	517
SSD/VGG16	448	46

Int8 Inference: 2 instances, 1 on each socket		
Topology	Batch Size	Images/s
Default_Resnet50	448	1035
SSD/VGG16	448	92

* The data is an average result of 3 tests based on dummy data layer.

* Please find the configuration at page 6.

Intel® Optimized Caffe Convergence and Time To Train

Topology	Node Number	Batch Size	Time To Train in Hours	Accuracy
Default_Resnet50	16	16*128=2048	28	Top-1=75.7% Top-5=92.7%
SSD/VGG16	1	1*32	64	detection_eval = 77.5%

* The data is an average result of 3 tests based on dummy data layer.
* Please find the configuration at page 6.

Configurations

Benchmark Metric	Training images/s [1]	Inference images/s [2]	Time To Train
Framework	Intel® Optimized Caffe	Intel ® Optimized Caffe	Intel® Optimized Caffe
# of Nodes	1	1,	As table in P5
Platform	8180	8180	6148
Sockets	2	1, 2	2
Processor	Intel(R) Xeon(R) Platinum 8180 CPU @ 2.50GHz	Intel(R) Xeon(R) Platinum 8180 CPU @ 2.50GHz	Intel(R) Xeon(R) Gold 6148 CPU @ 2.40GHz
BIOS	SE5C620.86B.0X.01.0076.101320171718	SE5C620.86B.0X.01.0076.101320171718	SE5C620.86B.00.01.0009.101920170742
QDF (Indicate QS / ES2)	QS	QS	QS
Enabled Cores	56	28,56	40
Slots	12 / 24	12 / 24	12
Total Memory	192 GiB	192 GiB	192 GiB
Memory Configuration	12 slots / 16 GiB / DDR4 /2666 MHz	12 slots / 16 GiB / DDR4 /2666 MHz	12 slots / 16 GiB/DDR4/ 2666MHz
Memory Comments	Kingston/Micron/Sumsang	Kingston/Micron/Sumsang	Micron
SSD	480GB SSD	480GB SSD	800GB SSD
OS	CentOS Linux-7.3.1611-Core	CentOS Linux-7.3.1611-Core	Oracle Linux Server release 7.4
HT	ON	ON	ON
Turbo	ON	ON	ON
Computer Type	Server	Server	Server
Framework Version	f6d01efbe93f70726ea3796a4b89c612365a6341	f6d01efbe93f70726ea3796a4b89c612365a6341	f6d01efbe93f70726ea3796a4b89c612365a6341
Topology Version, BATCHSIZE	as in table	as in table	as in table
Dataset, version	Dummy data layer	Dummy data layer	default_resnet50: raw lmdb; others: 256x256 resized lmdb
Performance command	caffe time --model [model].prototxt -iterations 100 -engine= MKLDNN	caffe time --model [model].prototxt -iterations 100 -engine= MKLDNN --forward_only --phase TEST	scripts/run_intelcaffe.sh --hostfile hosts.current --mode train --debug off --network opa --num_mlsl_servers -1 --engine MKLDNN --num_omp_threads 0 --priority_queue off --solver solver.prototxt --output intelcaffe_workspace --benchmark none
Compiler	icpc version 18.0.1	icpc version 18.0.1	icpc version 18.0.1
MKL Library version	version: mklml_lnx_2018.0.1.20171227	version: mklml_lnx_2018.0.1.20171227	version: mklml_lnx_2018.0.1.20171227
MKL DNN Library Version	ae00102be506ed0fe2099c6557df2aa88ad57ec1	ae00102be506ed0fe2099c6557df2aa88ad57ec1	ae00102be506ed0fe2099c6557df2aa88ad57ec1
Performance Measurement Knobs	/	1 instance on 1 sockets: OMP_NUM_THREADS=28 KMP_AFFINITY=granularity=fine,compact taskset -c 0-27 <command> 2 instances on 2 sockets: OMP_NUM_THREADS=28 KMP_AFFINITY=granularity=fine,compact taskset 0-27 <command> & taskset 28-55 <command> & Wait	As in scripts/run_intelcaffe.sh
Memory knobs	numactl –l	numactl –l	numactl –l

[1,2]: Performance estimates were obtained prior to implementation of recent software patches and firmware updates intended to address exploits referred to as "Spectre" and "Meltdown." Implementation of these updates may make these results inapplicable to your device or system.

Optimization Notice: Intel's compilers may or may not optimize to the same degree for non-Intel microprocessors for optimizations that are not unique to Intel microprocessors. These optimizations include SSE2, SSE3, and SSSE3 instruction sets and other optimizations. Intel does not guarantee the availability, functionality, or effectiveness of any optimization on microprocessors not manufactured by Intel. Microprocessor-dependent optimizations in this product are intended for use with Intel microprocessors. Certain optimizations not specific to Intel microarchitecture are reserved for Intel microprocessors. Please refer to the applicable product User and Reference Guides for more information regarding the specific instruction sets covered by this notice.


intel
experience
what's inside™