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## 2019 Intel LLVM Clang Compiler Comparison

Tests for a future article by Michael Larabel.

### Automated Executive Summary

*LLVM Clang 9.0.1 had the most wins, coming in first place for 32% of the tests.*

*Based on the geometric mean of all complete results, the fastest (LLVM Clang 10 20191217) was 1.009x the speed of the slowest (LLVM Clang 6.0.1). LLVM Clang 8.0.1 was 0.997x the speed of LLVM Clang 10 20191217, LLVM Clang 9.0.1 was 1x the speed of LLVM Clang 8.0.1, LLVM Clang 7.1.0 was 0.997x the speed of LLVM Clang 9.0.1, LLVM Clang 6.0.1 was 0.997x the speed of LLVM Clang 7.1.0.*

*The results with the greatest spread from best to worst included:*

*GraphicsMagick (Operation: HWB Color Space) at 1.294x  
Timed PHP Compilation (Time To Compile) at 1.277x  
CppPerformanceBenchmarks (Test: Ctype) at 1.148x  
Apache Benchmark (Static Web Page Serving) at 1.11x  
GraphicsMagick (Operation: Noise-Gaussian) at 1.1x  
GraphicsMagick (Operation: Swirl) at 1.086x  
Himeno Benchmark (Poisson Pressure Solver) at 1.08x  
Coremark (CoreMark Size 666 - Iterations Per Second) at 1.076x*

C-Ray (Total Time - 4K, 16 Rays Per Pixel) at 1.067x

Zstd Compression (Compressing `ubuntu-16.04.3-server-i386.img`, Compression Level 19) at 1.048x.

## Test Systems:

### LLVM Clang 6.0.1

Processor: Intel Core i7-5960X @ 3.50GHz (8 Cores / 16 Threads), Motherboard: ASRock X99 Extreme3 (P3.70 BIOS), Chipset: Intel Xeon E7 v3/Xeon, Memory: 16384MB, Disk: 120GB INTEL SSDSC2BW12, Graphics: AMD FirePro V7900 2GB, Audio: Realtek ALC1150, Monitor: VA2431, Network: Intel I218-V

OS: Ubuntu 19.10, Kernel: 5.3.0-24-generic (x86\_64), Desktop: GNOME Shell 3.34.1, Display Server: X Server 1.20.5, Display Driver: modesetting 1.20.5, Compiler: Clang 6.0.1 + LLVM 6.0.1, File-System: ext4, Screen Resolution: 1920x1080

Environment Notes: CXXFLAGS="-O3 -march=native" CFLAGS="-O3 -march=native"  
Compiler Notes: Optimized build; Default target: x86\_64-unknown-linux-gnu; Host CPU: haswell  
Processor Notes: Scaling Governor: intel\_pstate powersave - CPU Microcode: 0x43  
Security Notes: itlb\_multihit: KVM: Mitigation of Split huge pages + l1tf: Mitigation of PTE Inversion; VMX: conditional cache flushes SMT vulnerable + mds: Mitigation of Clear buffers; SMT vulnerable + meltdown: Mitigation of PTI + spec\_store\_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre\_v1: Mitigation of usercopy/swapgs barriers and \_\_user pointer sanitization + spectre\_v2: Mitigation of Full generic retpoline IBPB: conditional IBRS\_FW STIBP: conditional RSB filling + tsx\_async\_abort: Not affected

### LLVM Clang 7.1.0

Processor: Intel Core i7-5960X @ 3.50GHz (8 Cores / 16 Threads), Motherboard: ASRock X99 Extreme3 (P3.70 BIOS), Chipset: Intel Xeon E7 v3/Xeon, Memory: 16384MB, Disk: 120GB INTEL SSDSC2BW12, Graphics: AMD FirePro V7900 2GB, Audio: Realtek ALC1150, Monitor: VA2431, Network: Intel I218-V

OS: Ubuntu 19.10, Kernel: 5.3.0-24-generic (x86\_64), Desktop: GNOME Shell 3.34.1, Display Server: X Server 1.20.5, Display Driver: modesetting 1.20.5, Compiler: Clang 7.1.0 + LLVM 7.1.0, File-System: ext4, Screen Resolution: 1920x1080

Environment Notes: CXXFLAGS="-O3 -march=native" CFLAGS="-O3 -march=native"  
Compiler Notes: Optimized build; Default target: x86\_64-unknown-linux-gnu; Host CPU: haswell  
Processor Notes: Scaling Governor: intel\_pstate powersave - CPU Microcode: 0x43  
Security Notes: itlb\_multihit: KVM: Mitigation of Split huge pages + l1tf: Mitigation of PTE Inversion; VMX: conditional cache flushes SMT vulnerable + mds: Mitigation of Clear buffers; SMT vulnerable + meltdown: Mitigation of PTI + spec\_store\_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre\_v1: Mitigation of usercopy/swapgs barriers and \_\_user pointer sanitization + spectre\_v2: Mitigation of Full generic retpoline IBPB: conditional IBRS\_FW STIBP: conditional RSB filling + tsx\_async\_abort: Not affected

### LLVM Clang 8.0.1

Processor: Intel Core i7-5960X @ 3.50GHz (8 Cores / 16 Threads), Motherboard: ASRock X99 Extreme3 (P3.70 BIOS), Chipset: Intel Xeon E7 v3/Xeon, Memory: 16384MB, Disk: 120GB INTEL SSDSC2BW12, Graphics: AMD FirePro V7900 2GB, Audio: Realtek ALC1150, Monitor: VA2431, Network: Intel I218-V

OS: Ubuntu 19.10, Kernel: 5.3.0-24-generic (x86\_64), Desktop: GNOME Shell 3.34.1, Display Server: X Server 1.20.5, Display Driver: modesetting 1.20.5, Compiler: Clang 8.0.1 + LLVM 8.0.1, File-System: ext4, Screen Resolution: 1920x1080

Environment Notes: CXXFLAGS="-O3 -march=native" CFLAGS="-O3 -march=native"  
 Compiler Notes: Optimized build; Default target: x86\_64-unknown-linux-gnu; Host CPU: haswell  
 Processor Notes: Scaling Governor: intel\_pstate powersave - CPU Microcode: 0x43  
 Security Notes: itlb\_multihit: KVM: Mitigation of Split huge pages + l1tf: Mitigation of PTE Inversion; VMX: conditional cache flushes SMT vulnerable + mds: Mitigation of Clear buffers; SMT vulnerable + meltdown: Mitigation of PTI + spec\_store\_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre\_v1: Mitigation of usercopy/swaps barriers and \_\_user pointer sanitization + spectre\_v2: Mitigation of Full generic retpoline IBPB: conditional IBRS\_FW STIBP: conditional RSB filling + tsx\_async\_abort: Not affected

## LLVM Clang 9.0.1

Processor: Intel Core i7-5960X @ 3.50GHz (8 Cores / 16 Threads), Motherboard: ASRock X99 Extreme3 (P3.70 BIOS), Chipset: Intel Xeon E7 v3/Xeon, Memory: 16384MB, Disk: 120GB INTEL SSDSC2BW12, Graphics: AMD FirePro V7900 2GB, Audio: Realtek ALC1150, Monitor: VA2431, Network: Intel I218-V

OS: Ubuntu 19.10, Kernel: 5.3.0-24-generic (x86\_64), Desktop: GNOME Shell 3.34.1, Display Server: X Server 1.20.5, Display Driver: modesetting 1.20.5, Compiler: Clang 9.0.1 + LLVM 9.0.1, File-System: ext4, Screen Resolution: 1920x1080

Environment Notes: CXXFLAGS="-O3 -march=native" CFLAGS="-O3 -march=native"  
 Compiler Notes: Optimized build; Default target: x86\_64-unknown-linux-gnu; Host CPU: haswell  
 Processor Notes: Scaling Governor: intel\_pstate powersave - CPU Microcode: 0x43  
 Security Notes: itlb\_multihit: KVM: Mitigation of Split huge pages + l1tf: Mitigation of PTE Inversion; VMX: conditional cache flushes SMT vulnerable + mds: Mitigation of Clear buffers; SMT vulnerable + meltdown: Mitigation of PTI + spec\_store\_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre\_v1: Mitigation of usercopy/swaps barriers and \_\_user pointer sanitization + spectre\_v2: Mitigation of Full generic retpoline IBPB: conditional IBRS\_FW STIBP: conditional RSB filling + tsx\_async\_abort: Not affected

## LLVM Clang 10 20191217

Processor: Intel Core i7-5960X @ 3.50GHz (8 Cores / 16 Threads), Motherboard: ASRock X99 Extreme3 (P3.70 BIOS), Chipset: Intel Xeon E7 v3/Xeon, Memory: 16384MB, Disk: 120GB INTEL SSDSC2BW12, Graphics: AMD FirePro V7900 2GB, Audio: Realtek ALC1150, Monitor: VA2431, Network: Intel I218-V

OS: Ubuntu 19.10, Kernel: 5.3.0-24-generic (x86\_64), Desktop: GNOME Shell 3.34.1, Display Server: X Server 1.20.5, Display Driver: modesetting 1.20.5, Compiler: Clang 10.0.0, File-System: ext4, Screen Resolution: 1920x1080

Environment Notes: CXXFLAGS="-O3 -march=native" CFLAGS="-O3 -march=native"  
 Compiler Notes: Optimized build; Default target: x86\_64-unknown-linux-gnu; Host CPU: haswell  
 Processor Notes: Scaling Governor: intel\_pstate powersave - CPU Microcode: 0x43  
 Python Notes: Python 2.7.17rc1 + Python 3.7.5  
 Security Notes: itlb\_multihit: KVM: Mitigation of Split huge pages + l1tf: Mitigation of PTE Inversion; VMX: conditional cache flushes SMT vulnerable + mds: Mitigation of Clear buffers; SMT vulnerable + meltdown: Mitigation of PTI + spec\_store\_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre\_v1: Mitigation of usercopy/swaps barriers and \_\_user pointer sanitization + spectre\_v2: Mitigation of Full generic retpoline IBPB: conditional IBRS\_FW STIBP: conditional RSB filling + tsx\_async\_abort: Not affected

	LLVM Clang 6.0.1	LLVM Clang 7.1.0	LLVM Clang 8.0.1	LLVM Clang 9.0.1	LLVM Clang 10 20191217
<b>GraphicsMagick - HWB Color Space (Iterations/min)</b>	<b>109</b>	<b>109</b>	111	112	<b>141</b>
Normalized	77.3%	77.3%	78.72%	79.43%	100%
Standard Deviation	0.5%			2.4%	
<b>Timed PHP Compilation - Time To Compile (sec)</b>	<b>99.443</b>	110.278	112.170	115.967	<b>127.013</b>
Normalized	100%	90.17%	88.65%	85.75%	78.29%
Standard Deviation	0.1%	0%	0.4%	0.1%	0.2%

## 2019 Intel LLVM Clang Compiler Comparison

<b>CppPerformanceBenchmarks -</b>	35.312	<b>35.698</b>	<b>31.093</b>	34.939	32.959
<b>Ctype (sec)</b>					
Normalized	88.05%	87.1%	100%	88.99%	94.34%
Standard Deviation	0%	0%	0%	0%	0.1%
<b>Apache Benchmark - S.W.P.S</b>	19278	19825	20225	<b>20345</b>	<b>18326</b>
<b>(Req/s/sec)</b>					
Normalized	94.76%	97.44%	99.41%	100%	90.08%
Standard Deviation	2.2%	2.5%	1.9%	0.9%	3.2%
<b>GraphicsMagick -</b>	<b>20</b>	21	<b>22</b>	<b>22</b>	<b>22</b>
<b>Noise-Gaussian (Iterations/min)</b>					
Normalized	90.91%	95.45%	100%	100%	100%
<b>GraphicsMagick - Swirl (Iterations/min)</b>	<b>35</b>	<b>35</b>	36	<b>35</b>	<b>38</b>
Normalized	92.11%	92.11%	94.74%	92.11%	100%
Standard Deviation			1.6%		
<b>Himeno Benchmark - P.P.S</b>	<b>2915</b>	3099	3086	<b>3148</b>	3145
<b>(MFLOPS)</b>					
Normalized	92.6%	98.44%	98.02%	100%	99.91%
Standard Deviation	0.2%	0.2%	0.3%	0.2%	0.1%
<b>Coremark - CoreMark Size 666 -</b>	222703	<b>228736</b>	222924	215757	<b>212568</b>
<b>I.P.S (Iterations/Sec)</b>					
Normalized	97.36%	100%	97.46%	94.33%	92.93%
Standard Deviation	0%	0.3%	0.1%	0.2%	0.1%
<b>C-Ray - Total Time - 4.1.R.P.P</b>	<b>133.539</b>	127.178	127.086	<b>125.180</b>	127.246
<b>(sec)</b>					
Normalized	93.74%	98.43%	98.5%	100%	98.38%
Standard Deviation	0.1%	0%	0.1%	0%	0.1%
<b>Zstd Compression -</b>	20.938	20.953	<b>21.339</b>	20.829	<b>20.364</b>
<b>C.u.1.0.3.s.i.i.C.L.1 (sec)</b>					
Normalized	97.26%	97.19%	95.43%	97.77%	100%
Standard Deviation	0.6%	0.3%	0.5%	0.9%	1.3%
<b>ebizzy (Records/s)</b>	284282	278134	<b>285846</b>	278849	<b>272998</b>
Normalized	99.45%	97.3%	100%	97.55%	95.51%
Standard Deviation	2.9%	3%	2.9%	2%	3%
<b>TSCP - A.C.P (Nodes/s)</b>	1305161	1312628	<b>1295948</b>	<b>1351272</b>	1345331
Normalized	96.59%	97.14%	95.91%	100%	99.56%
Standard Deviation		0.1%		0.1%	0.1%
<b>libjpeg-turbo tbench - D.T</b>	<b>172.995715</b>	169.256304	167.204583	<b>166.392078</b>	168.245614
<b>(Megapixels/sec)</b>					
Normalized	100%	97.84%	96.65%	96.18%	97.25%
Standard Deviation	0.3%	0.5%	0.7%	0.7%	0.2%
<b>John The Ripper - Blowfish (Real C/S)</b>	1337	<b>1343</b>	<b>1293</b>	<b>1293</b>	<b>1293</b>
Normalized	99.55%	100%	96.28%	96.28%	96.28%
Standard Deviation			0%		
<b>Minion - Quasigroup (sec)</b>	140.385022	141.394096	<b>139.842752</b>	141.484902	<b>144.574132</b>
Normalized	99.61%	98.9%	100%	98.84%	96.73%
Standard Deviation	0.1%	0.2%	0.2%	0.2%	2.7%
<b>SciMark - S.M.M (Mflops)</b>	<b>2739</b>	2772	2754	2808	<b>2829</b>
Normalized	96.84%	97.99%	97.38%	99.27%	100%
Standard Deviation	0.4%	0.2%	0.1%	0.4%	0.6%
<b>x264 - H.V.E (FPS)</b>	<b>56.26</b>	56.95	57.60	57.37	<b>57.84</b>
Normalized	97.27%	98.46%	99.59%	99.19%	100%
Standard Deviation	3%	2.7%	2.9%	2.4%	2.7%

<b>GraphicsMagick - Resizing (Iterations/min)</b>	<b>79</b>	<b>79</b>	80	<b>81</b>	80
Normalized	97.53%	97.53%	98.77%	100%	98.77%
Standard Deviation	1.5%			0.7%	
<b>GraphicsMagick - Rotate (Iterations/min)</b>	<b>577</b>	578	578	<b>584</b>	<b>591</b>
Normalized	97.63%	97.8%	97.8%	98.82%	100%
<b>SVT-HEVC - 1.8.b.Y.T.H.V.E (FPS)</b>	<b>35.06</b>	35.11	35.48	35.88	<b>35.90</b>
Normalized	97.66%	97.8%	98.83%	99.94%	100%
Standard Deviation	0.8%	0.9%	0.8%	0.9%	0.9%
<b>Tungsten Renderer - Hair (sec)</b>	35.2842	35.2485	<b>35.6346</b>	34.9660	<b>34.9000</b>
Normalized	98.91%	99.01%	97.94%	99.81%	100%
Standard Deviation	0.2%	0.1%	0.1%	0%	0%
<b>Minion - Graceful (sec)</b>	64.306260	<b>64.366640</b>	63.472231	<b>63.040103</b>	63.623649
Normalized	98.03%	97.94%	99.32%	100%	99.08%
Standard Deviation	0.2%	0.1%	0.1%	0.1%	0.4%
<b>x265 - H.2.1.V.E (FPS)</b>	<b>34.45</b>	34.59	34.52	<b>35.10</b>	34.52
Normalized	98.15%	98.55%	98.35%	100%	98.35%
Standard Deviation	0.7%	1.5%	0.5%	1.6%	0.6%
<b>XZ Compression -</b>	32.170	32.111	<b>32.191</b>	<b>31.595</b>	32.128
<b>C.u.1.0.3.s.i.i.C.L.9 (sec)</b>					
Normalized	98.21%	98.39%	98.15%	100%	98.34%
Standard Deviation	0.3%	0.3%	0.3%	0.8%	0.6%
<b>asmFish - 1.H.M.2.D (Nodes/s)</b>	21773169	22113202	<b>21716998</b>	<b>22125493</b>	21917065
Normalized	98.41%	99.94%	98.15%	100%	99.06%
Standard Deviation	1.1%	0.8%	1.2%	1.1%	1.9%
<b>NGINX Benchmark - S.W.P.S (Req/sec)</b>	<b>25228</b>	25579	25504	<b>25695</b>	25528
Normalized	98.18%	99.55%	99.25%	100%	99.35%
Standard Deviation	1.3%	0.5%	1.1%	0.3%	2%
<b>Timed HMMer Search - P.D.S (sec)</b>	7.307	<b>7.181</b>	7.302	<b>7.311</b>	7.201
Normalized	98.28%	100%	98.34%	98.22%	99.72%
Standard Deviation	2%	1.3%	2.6%	2.1%	1.8%
<b>Tungsten Renderer -</b>	9.97024	9.93175	9.95480	<b>10.00685</b>	<b>9.83032</b>
<b>Non-Exponential (sec)</b>					
Normalized	98.6%	98.98%	98.75%	98.24%	100%
Standard Deviation	0.7%	0.2%	0.1%	0.7%	0.7%
<b>libgav1 - S.N.1 (FPS)</b>	51.30	50.94	<b>50.88</b>	51.18	<b>51.73</b>
Normalized	99.17%	98.47%	98.36%	98.94%	100%
Standard Deviation	0.3%	0.1%	0.3%	0.3%	0.2%
<b>SVT-VP9 - V.Q.O - Bosphorus 1080p (FPS)</b>	81.14	<b>80.23</b>	<b>81.50</b>	80.82	81.14
Normalized	99.56%	98.44%	100%	99.17%	99.56%
Standard Deviation	0.2%	0.4%	0.7%	0.7%	0.6%
<b>AOBench - 2048 x 2048 - Total Time (sec)</b>	<b>41.549</b>	<b>42.200</b>	41.604	42.109	41.799
Normalized	100%	98.46%	99.87%	98.67%	99.4%
Standard Deviation	0.2%	2.4%	0.3%	2.9%	1.2%
<b>dav1d - Summer Nature 4K (FPS)</b>	<b>105.51</b>	<b>107.13</b>	106.57	106.53	106.56
Normalized	98.49%	100%	99.48%	99.44%	99.47%
Standard Deviation	0.8%	0.3%	0.3%	0.2%	0.2%

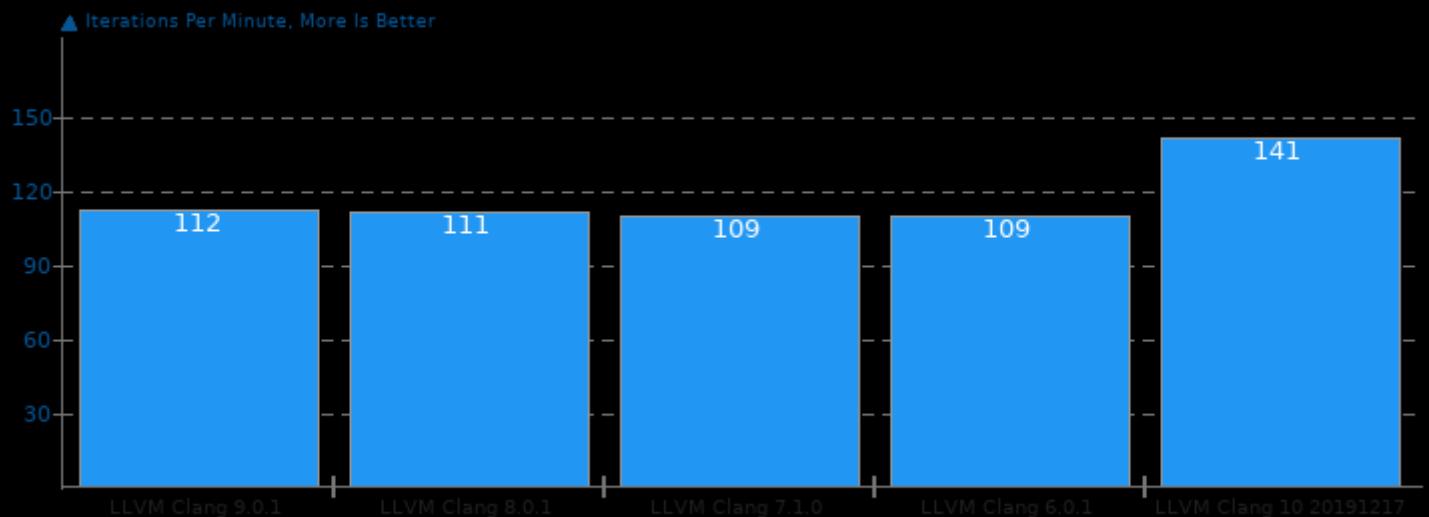
## 2019 Intel LLVM Clang Compiler Comparison

Tungsten Renderer - Water Caustic (sec)	31.1509	<b>31.4654</b>	31.1359	<b>31.0105</b>	31.1667
Normalized	99.55%	98.55%	99.6%	100%	99.5%
Standard Deviation	0.2%	0.2%	0.4%	0.2%	0.2%
dav1d - S.N.1 (FPS)	<b>300.97</b>	303.93	<b>305.15</b>	304.73	305.08
Normalized	98.63%	99.6%	100%	99.86%	99.98%
Standard Deviation	0.4%	0.4%	0.3%	0.3%	0.2%
SciMark - F.F.T (Mflops)	<b>453.81</b>	<b>459.85</b>	455.34	455.31	455.49
Normalized	98.69%	100%	99.02%	99.01%	99.05%
Standard Deviation	0.1%	0.4%	0.3%	0.7%	0.2%
John The Ripper - MD5 (Real)	<b>76421</b>	76487	76623	76627	<b>77384</b>
Normalized	98.76%	98.84%	99.02%	99.02%	100%
Standard Deviation	0.2%	0.4%	0.1%	0.1%	0.2%
CppPerformanceBenchmarks - Function Objects (sec)	16.134	<b>16.139</b>	15.998	16.135	<b>15.939</b>
Normalized	98.79%	98.76%	99.63%	98.79%	100%
Standard Deviation	0.6%	0.6%	0.6%	0.6%	0.6%
Tungsten Renderer - Volumetric Caustic (sec)	<b>12.3110</b>	12.1987	12.2350	12.2433	<b>12.1656</b>
Normalized	98.82%	99.73%	99.43%	99.37%	100%
Standard Deviation	0.8%	0.2%	0.3%	0.9%	0.8%
PostgreSQL pgbench - Buffer	<b>147464</b>	147812	148727	<b>149135</b>	148891
Test - Normal Load - Read Only					
Normalized	98.88%	99.11%	99.73%	100%	99.84%
Standard Deviation	0%	0.1%	0.2%	0.1%	0.4%
SVT-VP9 - VMAF Optimized - Bosphorus 1080p (FPS)	102.84	102.26	<b>101.77</b>	<b>102.90</b>	102.66
Normalized	99.94%	99.38%	98.9%	100%	99.77%
Standard Deviation	2.8%	2.8%	3%	3%	2.9%
libgav1 - Summer Nature 4K	15.83	<b>15.72</b>	15.76	15.74	<b>15.89</b>
Normalized	99.62%	98.93%	99.18%	99.06%	100%
Standard Deviation	0%	0.1%	0.1%	0.2%	0.1%
SVT-AV1 - Enc Mode 8 - 1080p (FPS)	23.283	<b>23.208</b>	23.419	<b>23.451</b>	23.395
Normalized	99.28%	98.96%	99.86%	100%	99.76%
Standard Deviation	0.6%	0.4%	0.6%	0.6%	0.2%
SVT-VP9 - P.S.O - Bosphorus 1080p (FPS)	<b>110.61</b>	110.17	110.09	<b>109.56</b>	110.25
Normalized	100%	99.6%	99.53%	99.05%	99.67%
Standard Deviation	1.3%	1.7%	1.1%	1%	1.1%
dav1d - Chimera 1080p (FPS)	352.92	354.12	353.14	<b>354.96</b>	<b>351.63</b>
Normalized	99.43%	99.76%	99.49%	100%	99.06%
Standard Deviation	0.4%	0.2%	1.2%	0.9%	1.3%
Timed MrBayes Analysis - P.P.A (sec)	<b>109.252</b>	108.759	108.616	109.030	<b>108.448</b>
Normalized	99.26%	99.71%	99.85%	99.47%	100%
Standard Deviation	0.3%	0.2%	0.5%	0.3%	0.4%
SciMark - Composite (Mflops)	2100	2104	<b>2100</b>	<b>2115</b>	2114
Normalized	99.32%	99.48%	99.31%	100%	99.97%
Standard Deviation	0.2%	0%	0.3%	0.2%	0.2%
SciMark - D.L.M.F (Mflops)	5240	<b>5218</b>	5222	<b>5243</b>	5220
Normalized	99.93%	99.52%	99.59%	100%	99.54%
Standard Deviation	0.4%	0.1%	0.6%	0.5%	0%
libgav1 - Chimera 1080p (FPS)	36.32	<b>36.21</b>	36.25	36.23	<b>36.38</b>

	Normalized	99.84%	99.53%	99.64%	99.59%	100%
	Standard Deviation	0.1%	0%	0.1%	0.1%	0.1%
<b>Minion - Solitaire (sec)</b>	<b>86.677773</b>	86.975667	86.960693	<b>87.056188</b>	86.850014	
	Normalized	100%	99.66%	99.67%	99.57%	99.8%
	Standard Deviation	0.1%	0.3%	0.3%	0.3%	0.3%
<b>CppPerformanceBenchmarks - 407.300</b>		<b>406.432</b>	406.927	408.076	<b>408.082</b>	
	<b>Math Library (sec)</b>					
	Normalized	99.79%	100%	99.88%	99.6%	99.6%
	Standard Deviation	0.5%	0.1%	0.1%	0.6%	0.5%
<b>SciMark - Monte Carlo (Mflops)</b>	<b>557.24</b>	557.10	557.09	<b>555.78</b>	<b>555.76</b>	
	Normalized	100%	99.97%	99.97%	99.74%	99.73%
	Standard Deviation	0%	0%	0%	0%	0%
<b>GraphicsMagick - Sharpen (Iterations/min)</b>	<b>12</b>	12	12	12	12	12
<b>VP9 libvpx Encoding - v.V.1.V.E (FPS)</b>	<b>110.24</b>	110.78	<b>111.71</b>	111.05	110.98	
	Normalized	98.68%	99.17%	100%	99.41%	99.35%
	Standard Deviation	8.9%	8.9%	8.7%	8.9%	8.9%
<b>Geometric Mean Of All Test Results - Result Composite - 2.I.L.C.C.C (Geometric Mean)</b>	<b>119.966</b>	120.269	120.729	120.686	<b>121.085</b>	
	Normalized	99.08%	99.33%	99.71%	99.67%	100%

## GraphicsMagick 1.3.33

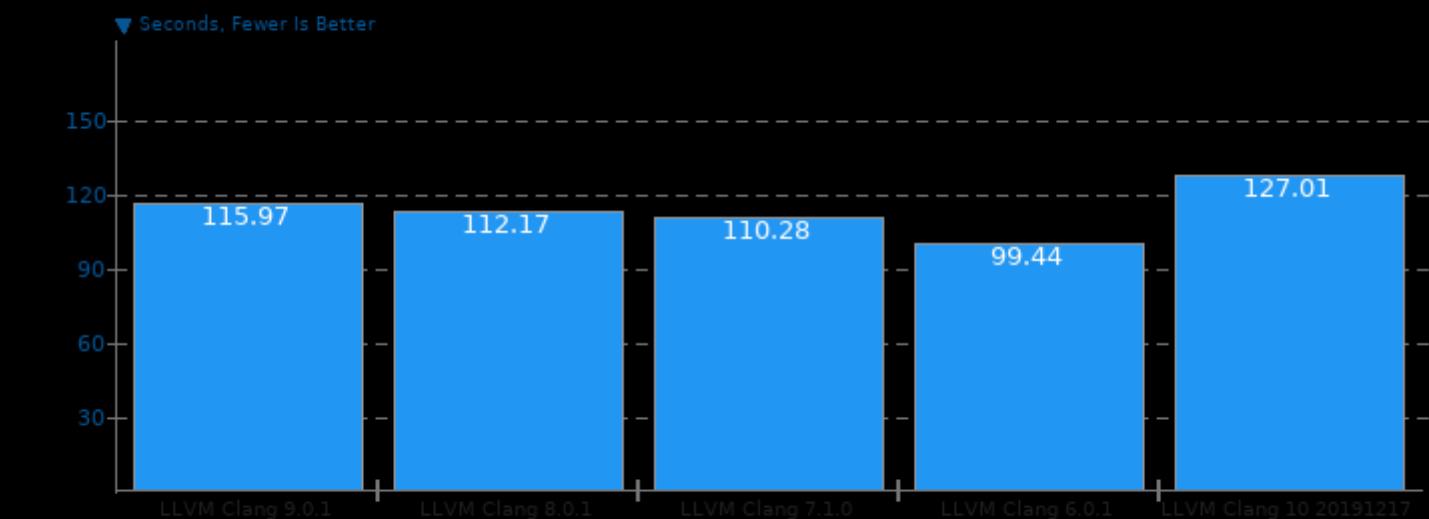
Operation: HWB Color Space



1. (CC) gcc options: -O3 -march=native -pthread -lfreetype -ljpeg -lXext -lSM -ICE -lX11 -bz2 -xml2 -lz -lm -pthread

## Timed PHP Compilation 7.1.9

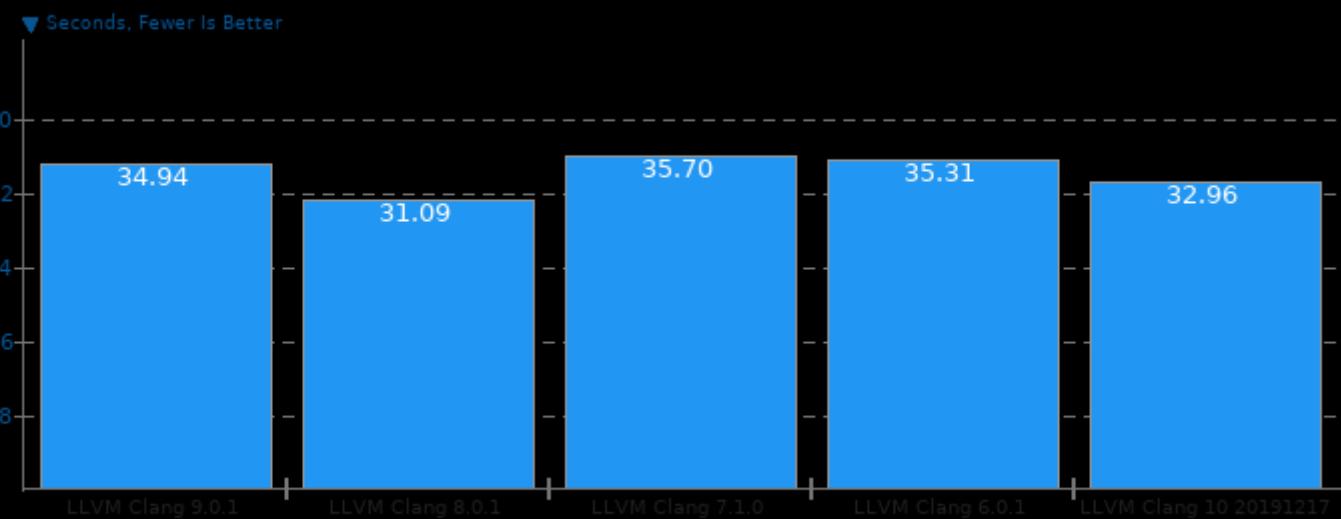
Time To Compile



1. (CC) gcc options: -O3 -march=native -pedantic -ldl -lz -lm

## CppPerformanceBenchmarks 9

Test: Ctype

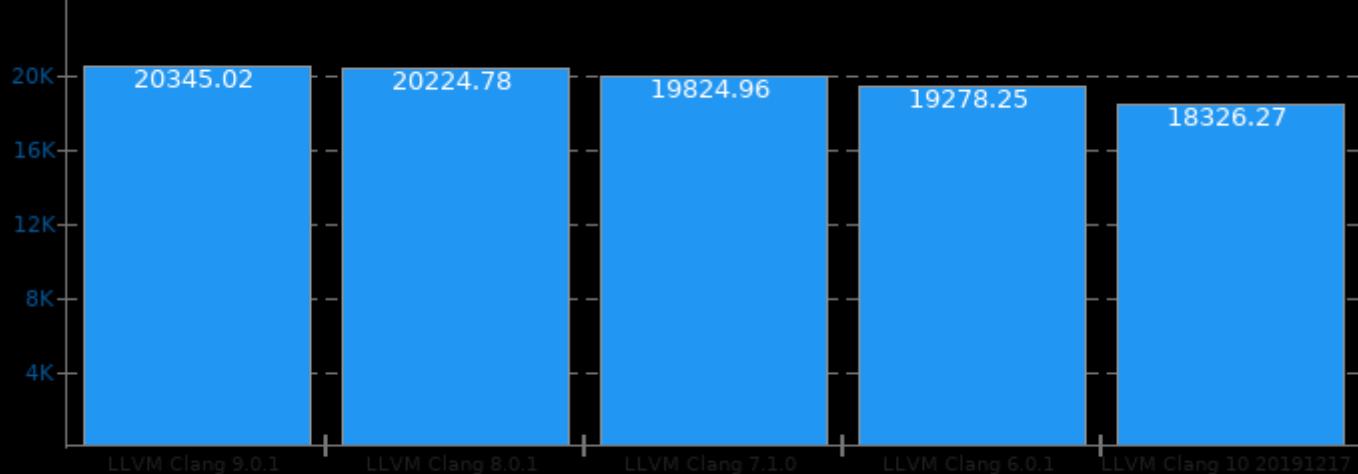


1. (CXX) g++ options: -O3 -march=native -std=c++11

## Apache Benchmark 2.4.29

Static Web Page Serving

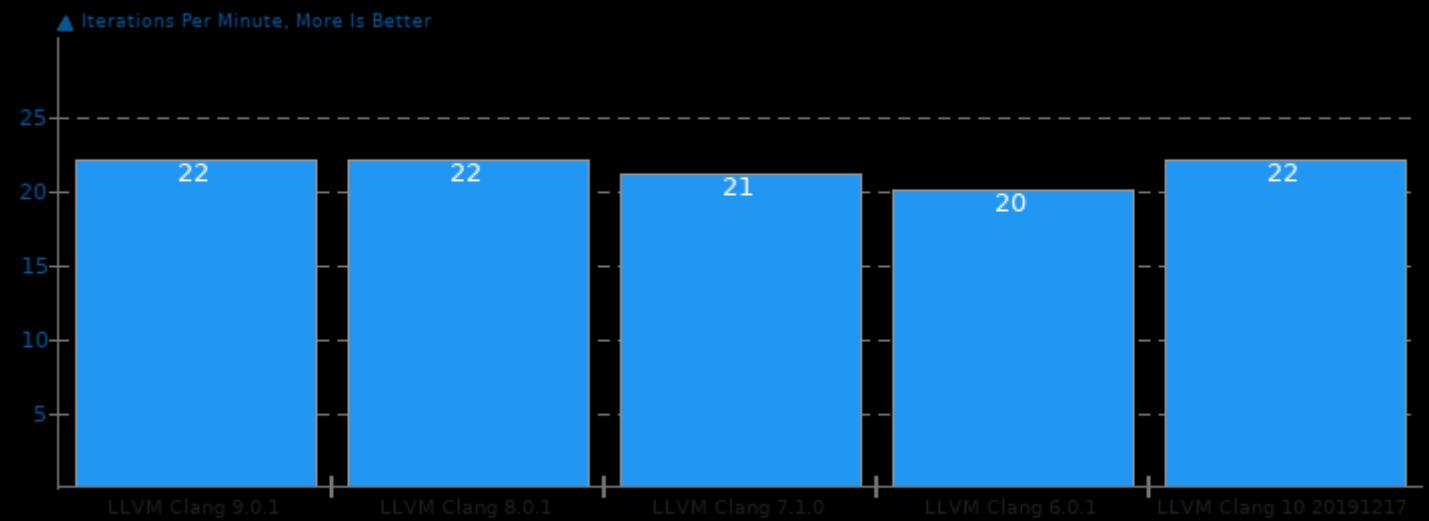
▲ Requests Per Second, More Is Better



1. (CC) gcc options: -shared -fPIC -pthread -O3 -march=native

## GraphicsMagick 1.3.33

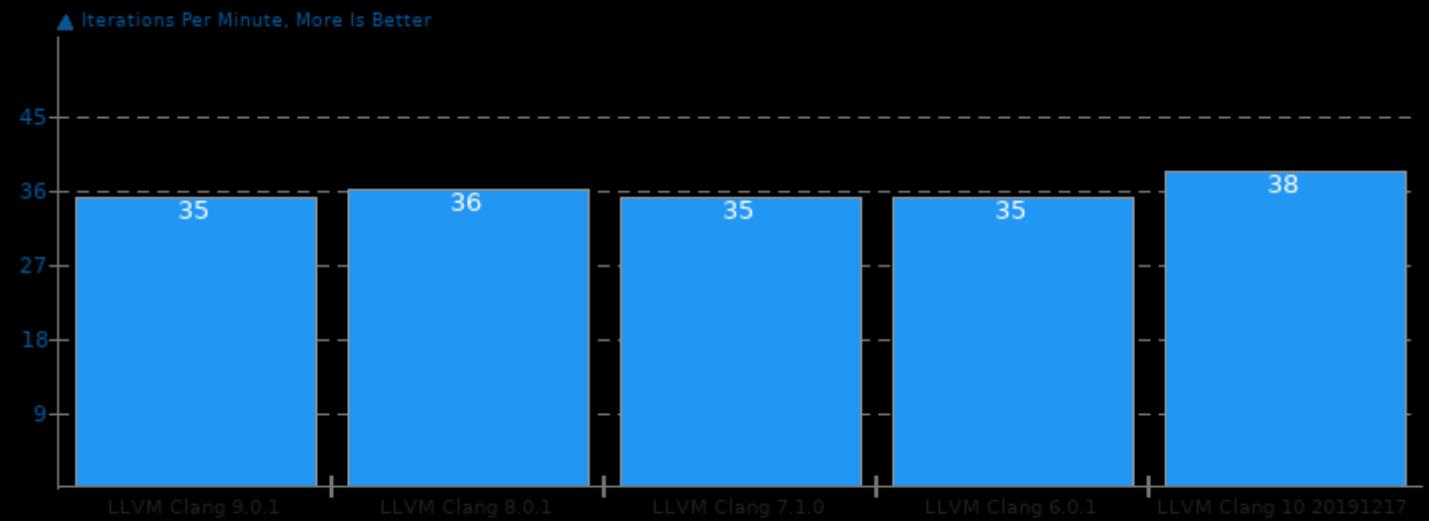
Operation: Noise-Gaussian



1. (CC) gcc options: -O3 -march=native -pthread -lfreetype -ljpeg -lXext -lSM -ICE -lX11 -lbz2 -lxml2 -lz -lm -lpthread

## GraphicsMagick 1.3.33

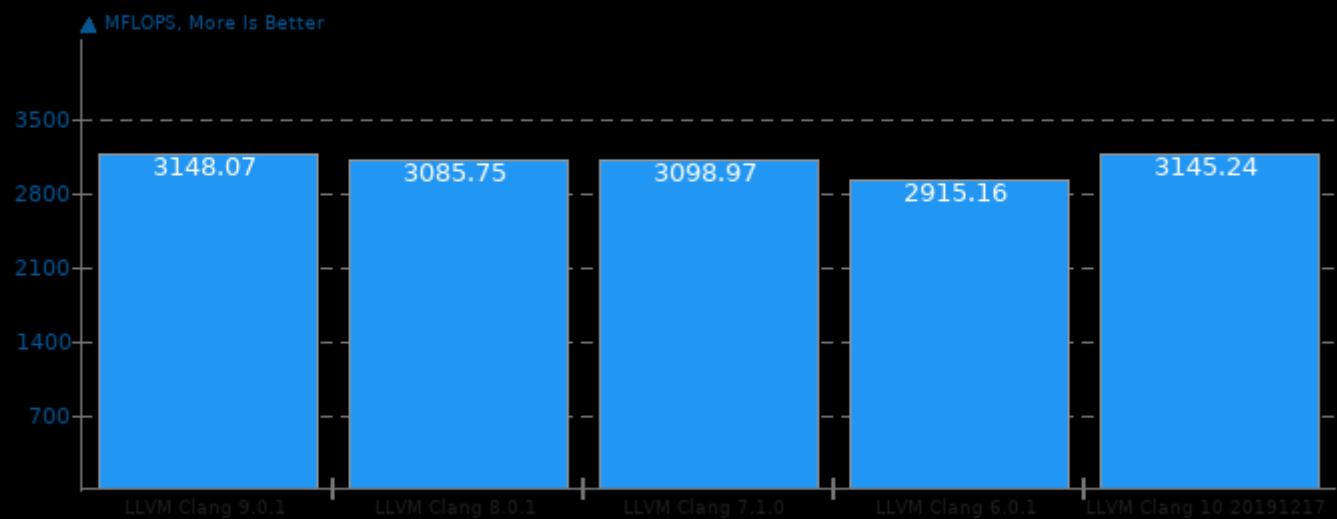
Operation: Swirl



1. (CC) gcc options: -O3 -march=native -pthread -lfreetype -ljpeg -lXext -lSM -ICE -lX11 -lbz2 -lxml2 -lz -lm -lpthread

## Himeno Benchmark 3.0

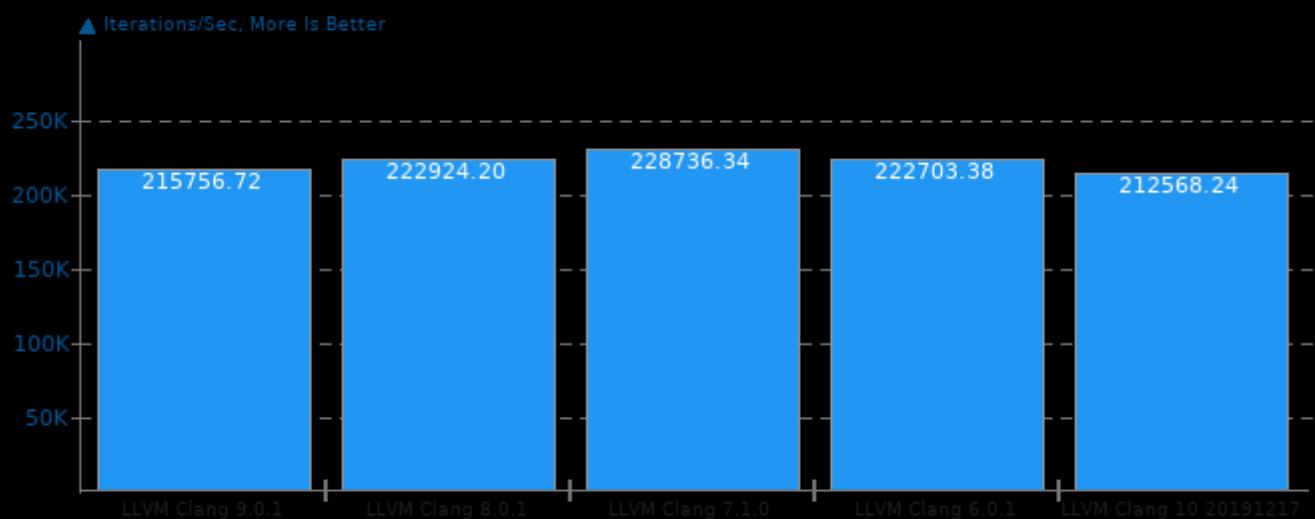
Poisson Pressure Solver



1. (CC) gcc options: -O3 -march=native -mavx2

## Coremark 1.0

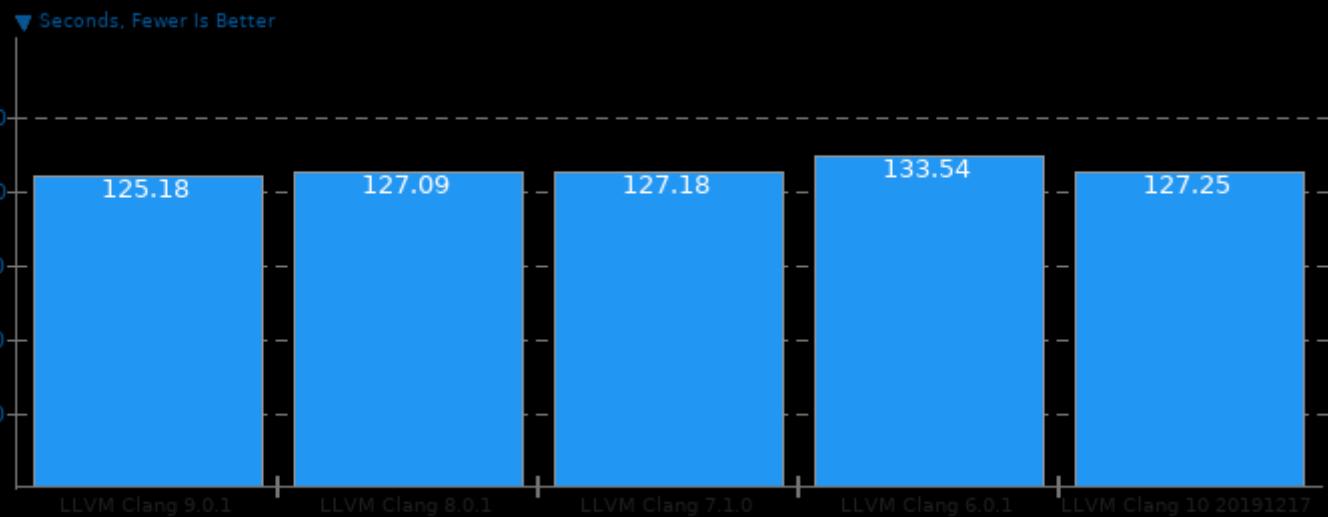
CoreMark Size 666 - Iterations Per Second



1. (CC) gcc options: -O2 -O3 -march=native -lrt -lrt

## C-Ray 1.1

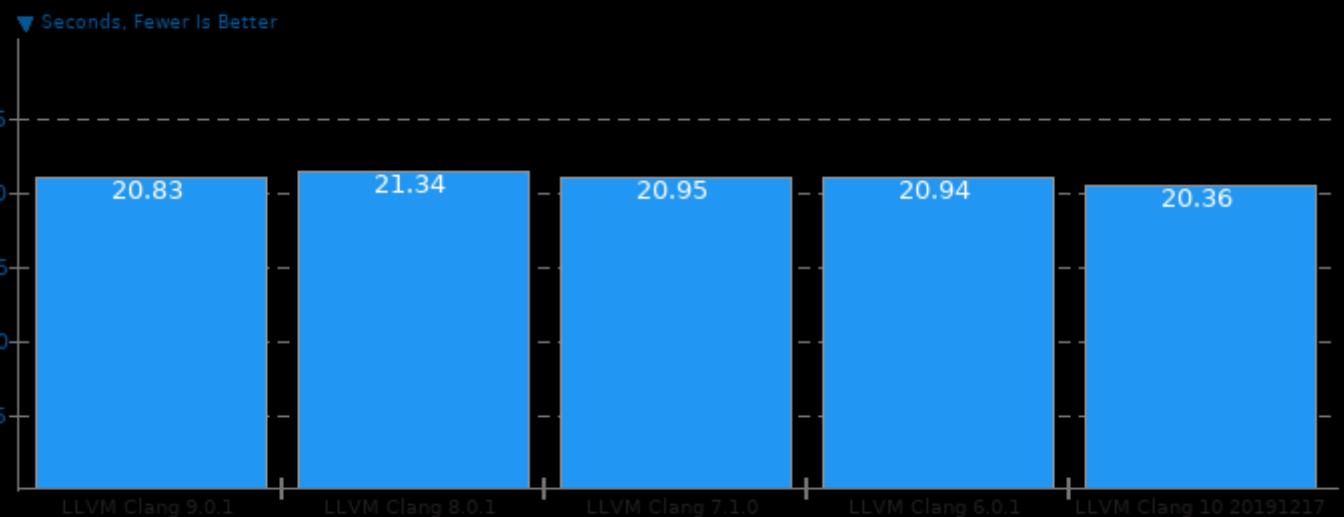
Total Time - 4K, 16 Rays Per Pixel



1. (CC) gcc options: -lm -lpthread -O3 -march=native

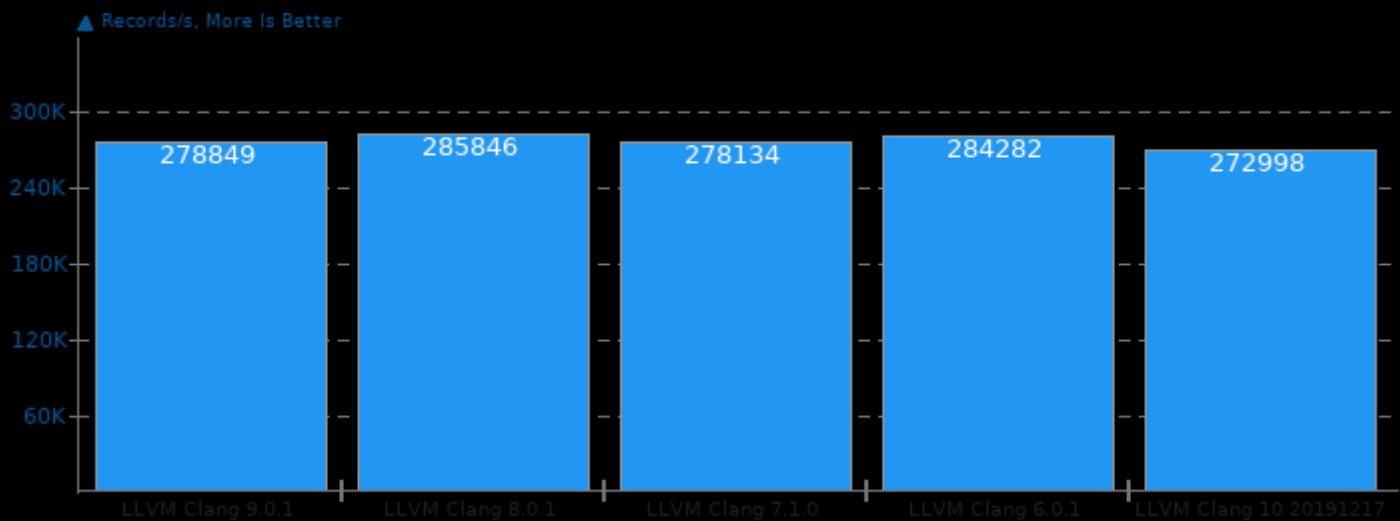
## Zstd Compression 1.3.4

Compressing ubuntu-16.04.3-server-i386.img, Compression Level 19



1. (CC) gcc options: -O3 -march=native -lpthread -lz

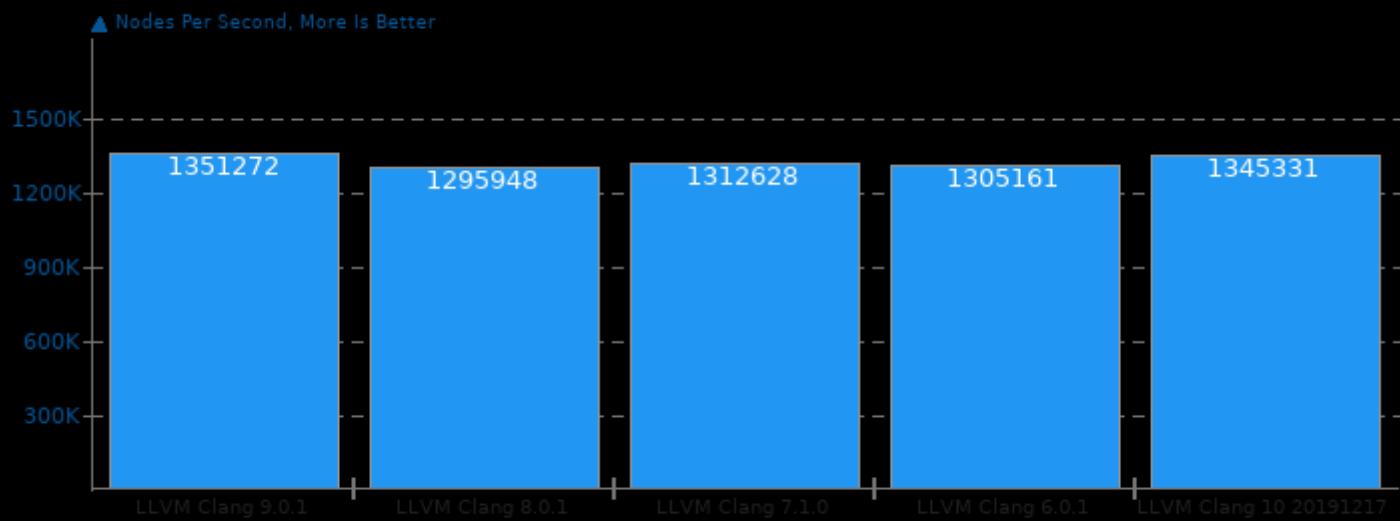
## ebizzy 0.3



1. (CC) gcc options: -pthread -lpthread -O3 -march=native

## TSCP 1.81

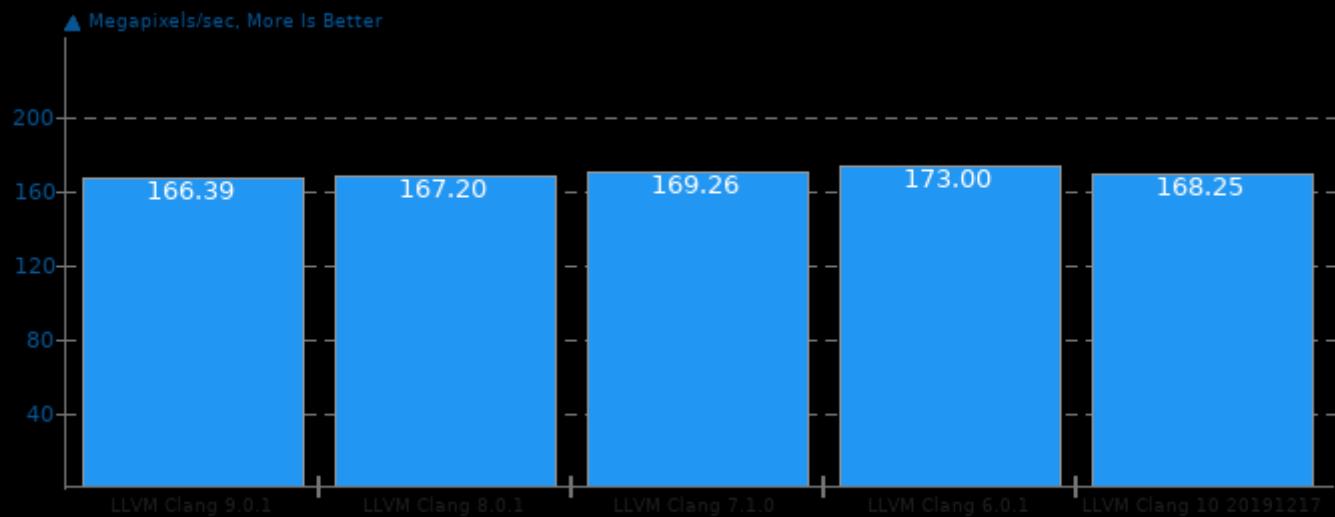
AI Chess Performance



1. (CC) gcc options: -O3 -march=native

**libjpeg-turbo tbench 2.0.2**

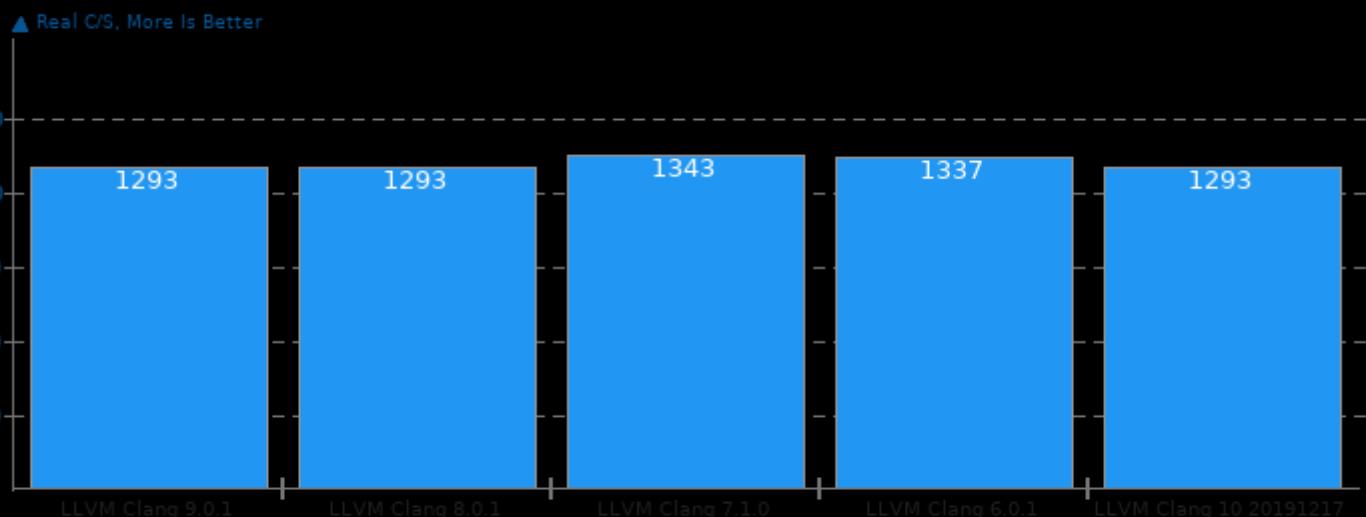
Test: Decompression Throughput



1. (CC) gcc options: -O3 -march=native -rdynamic

**John The Ripper 1.9.0-jumbo-1**

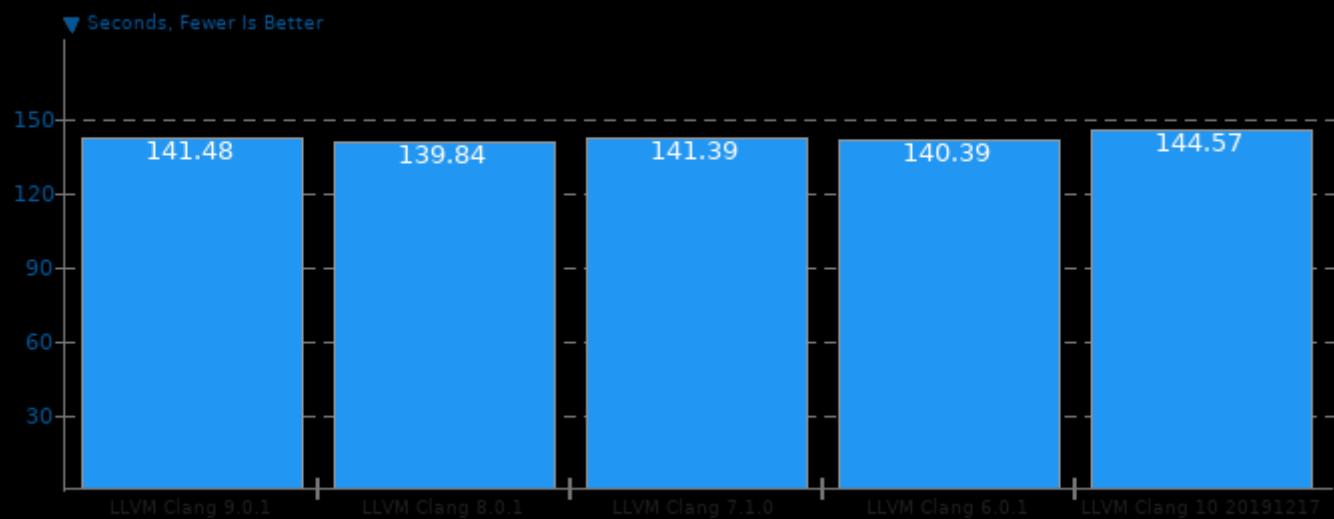
Test: Blowfish



1. (CC) gcc options: -m64 -lssl -lcrypto -lgmp -pthread -lm -lz -ldl -lcrypt -lbz2 -mavx2 -O3 -march=native -std=gnu89 -fno-strict-aliasing -fno-unroll-loops

## Minion 1.8

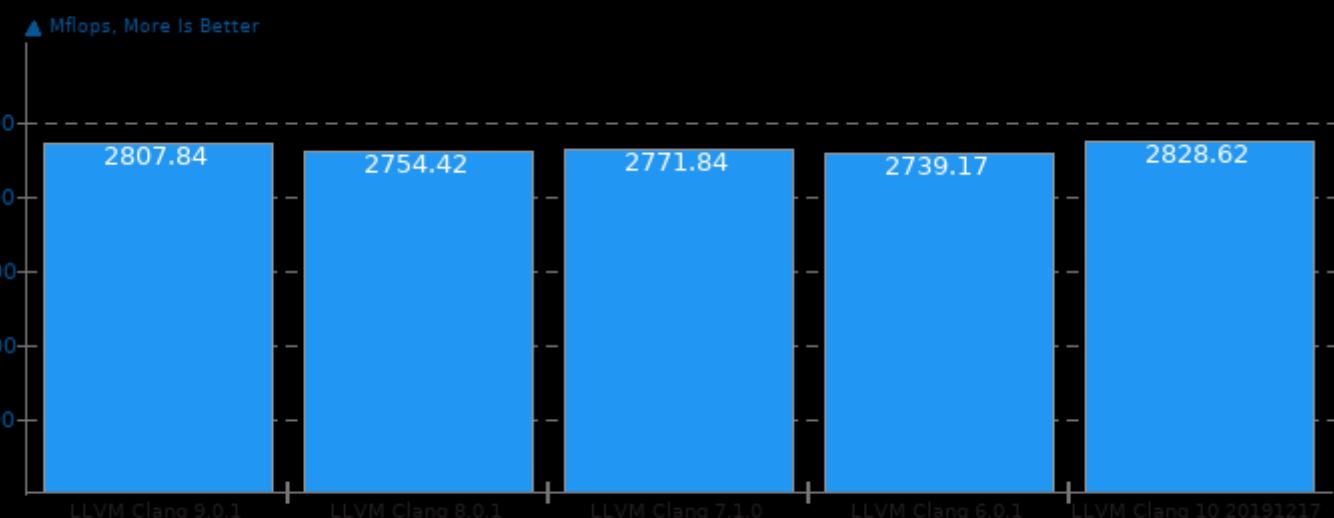
Benchmark: Quasigroup



1. (CXX) g++ options: -std=gnu++11 -O3 -fomit-frame-pointer -rdynamic

## SciMark 2.0

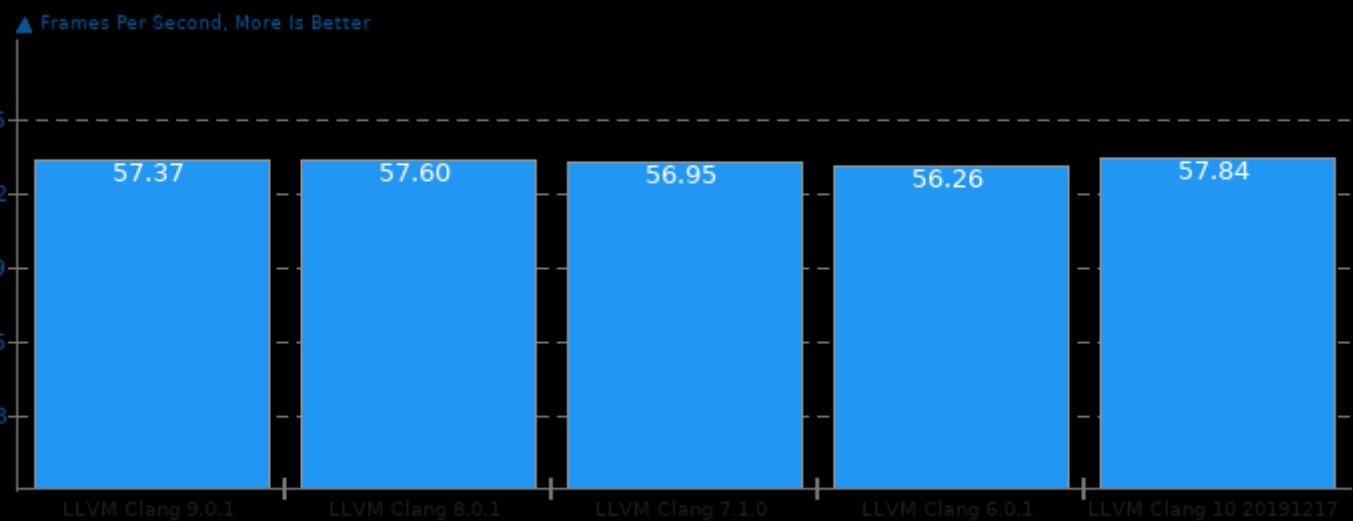
Computational Test: Sparse Matrix Multiply



1. (CC) gcc options: -O3 -march=native -lm

## x264 2018-09-25

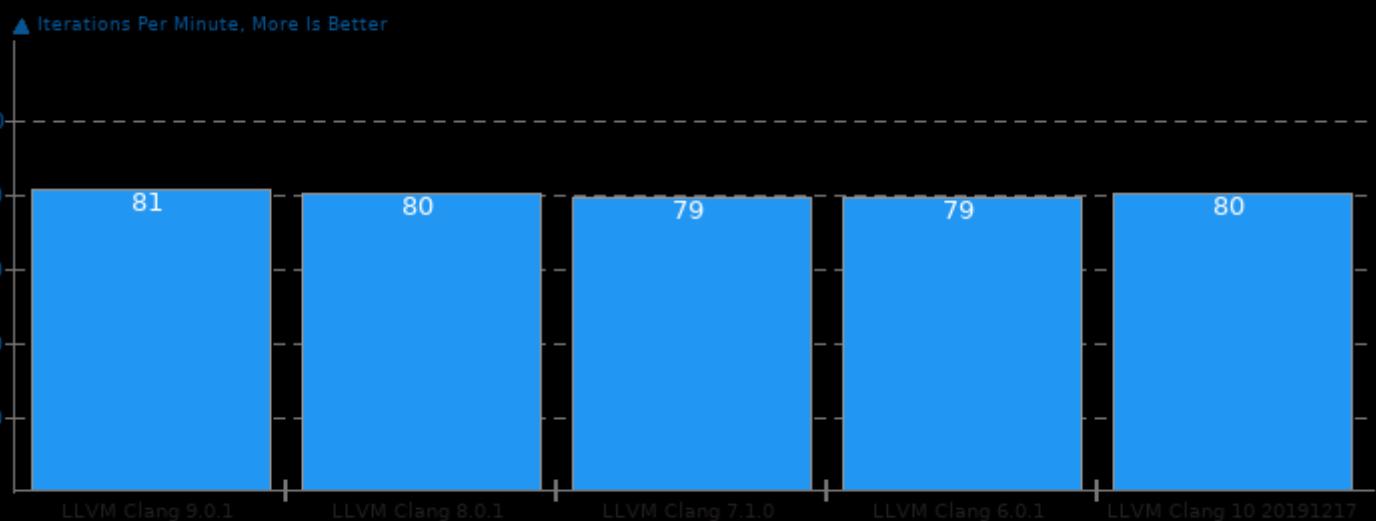
H.264 Video Encoding



1. (CC) gcc options: -fno-omit-frame-pointer -fno-tree-vectorize -O3 -march=native -fstack-alignment=64 -fPIC -fno-tree-vectorize

## GraphicsMagick 1.3.33

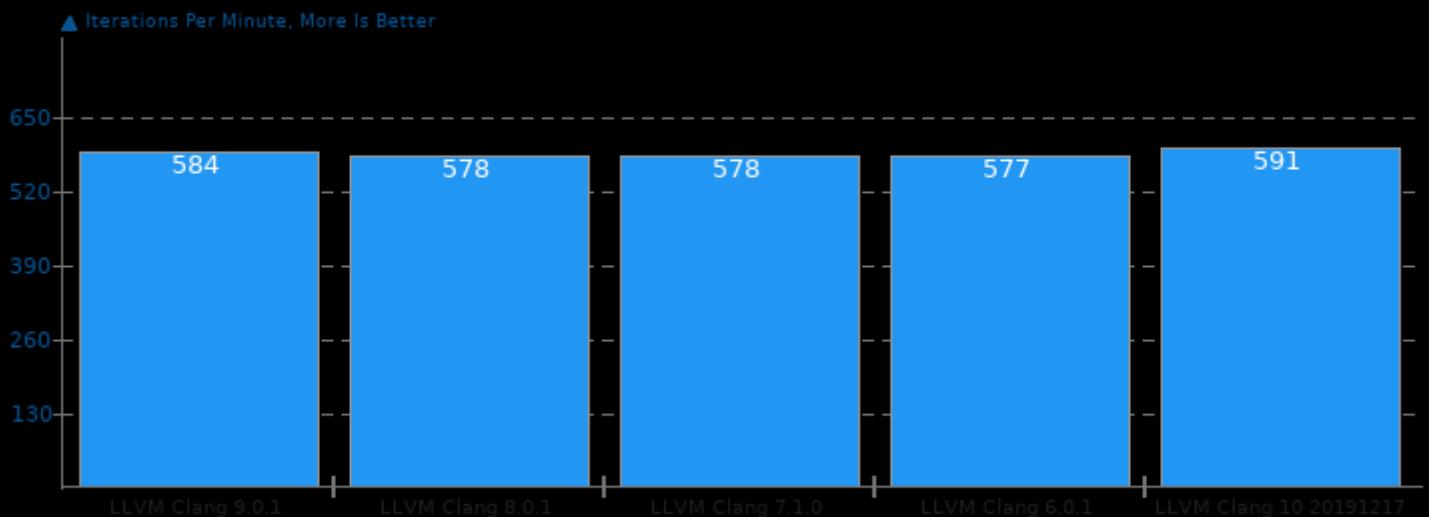
Operation: Resizing



1. (CC) gcc options: -O3 -fno-omit-frame-pointer -fno-tree-vectorize -fstack-alignment=64 -fPIC -fno-tree-vectorize

## GraphicsMagick 1.3.33

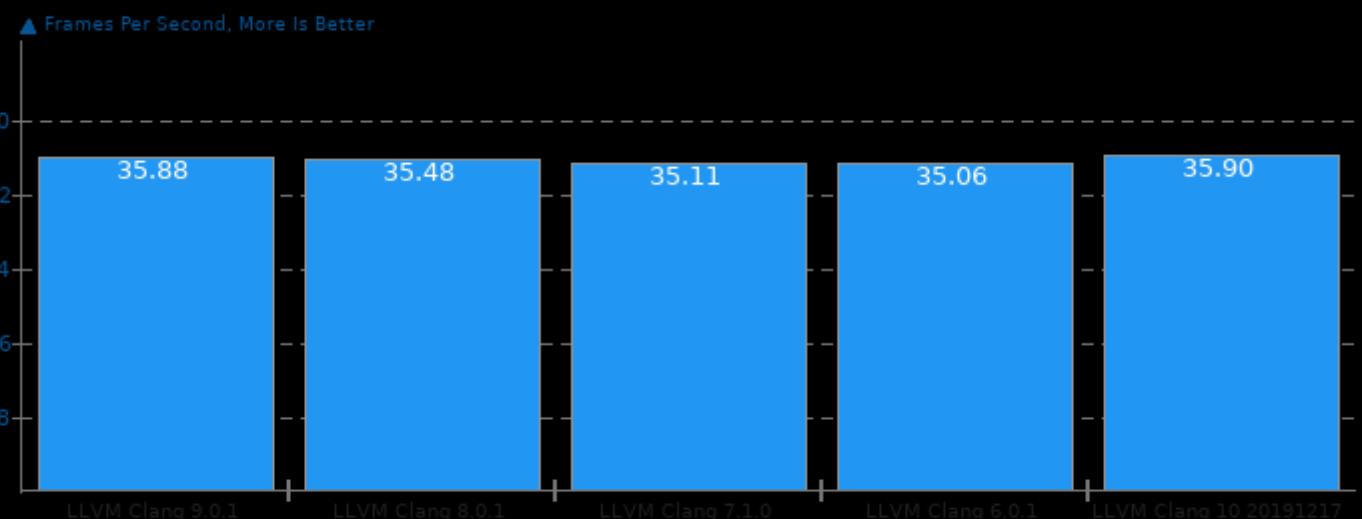
Operation: Rotate



1. (CC) gcc options: -O3 -march=native -pthread -lfreetype -ljpeg -lXext -lSM -lICE -lX11 -lbz2 -lxml2 -lz -lm -lpthread

## SVT-HEVC 1.4.1

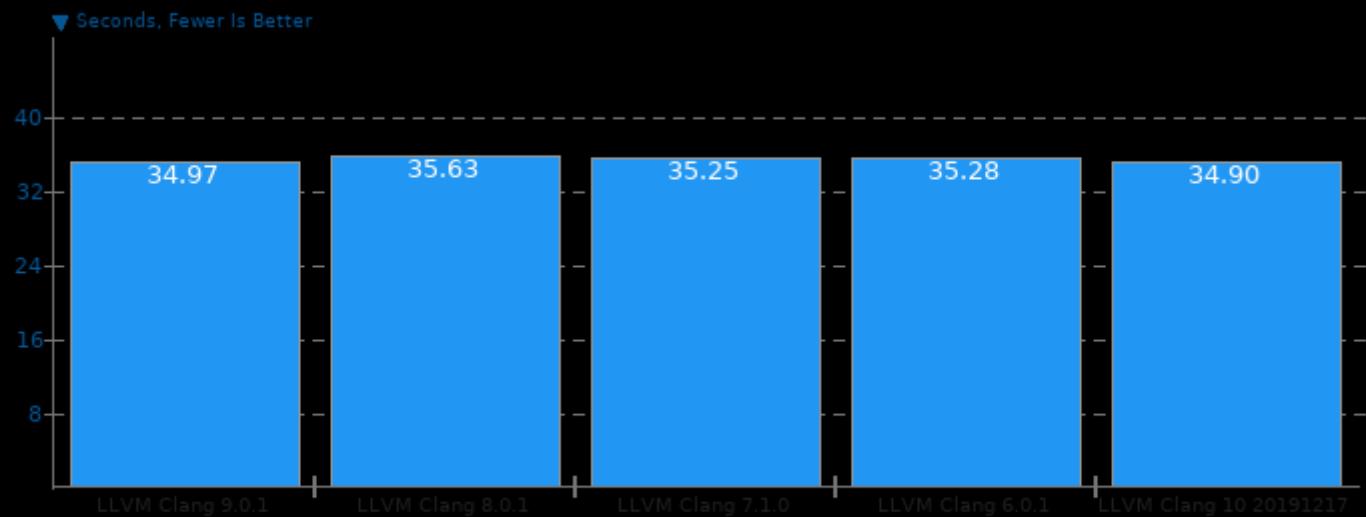
1080p 8-bit YUV To HEVC Video Encode



1. (CC) gcc options: -O3 -march=native -fPIE -fPIC -O2 -pie -rdynamic -lpthread -lrt

## Tungsten Renderer 0.2.2

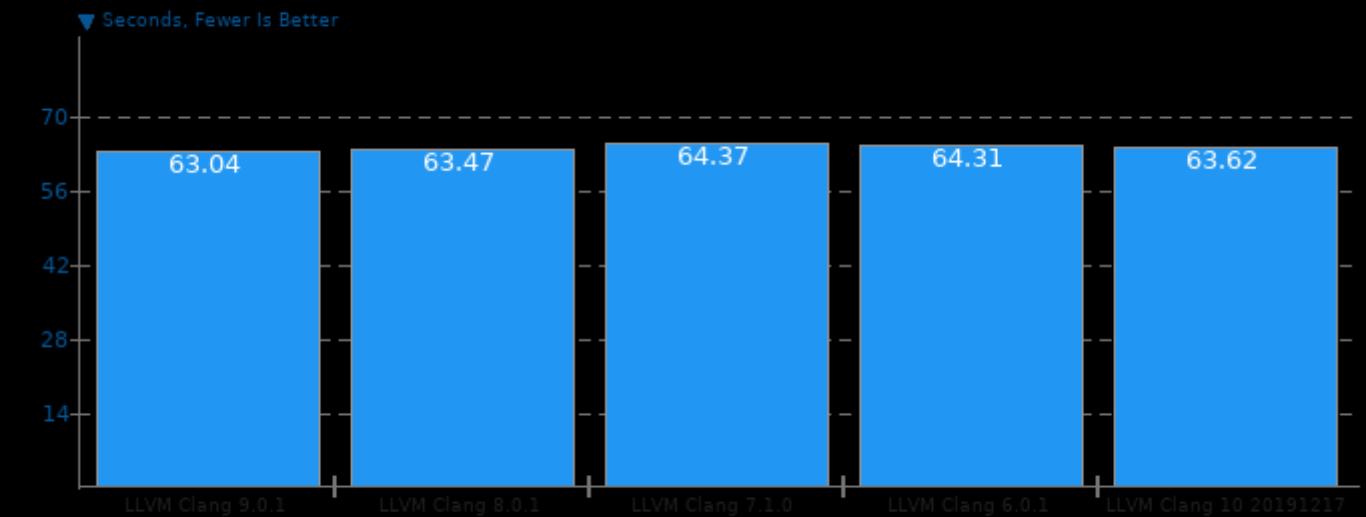
Scene: Hair



```
l. (CXX) g++ options: -O3 -march=native -std=c++0x -march=haswell -msse2 -msse3 -mssse3 -msse4.1 -msse4.2 -mfma -mbmi2 -mno-sse4a -mno-avx
```

## Minion 1.8

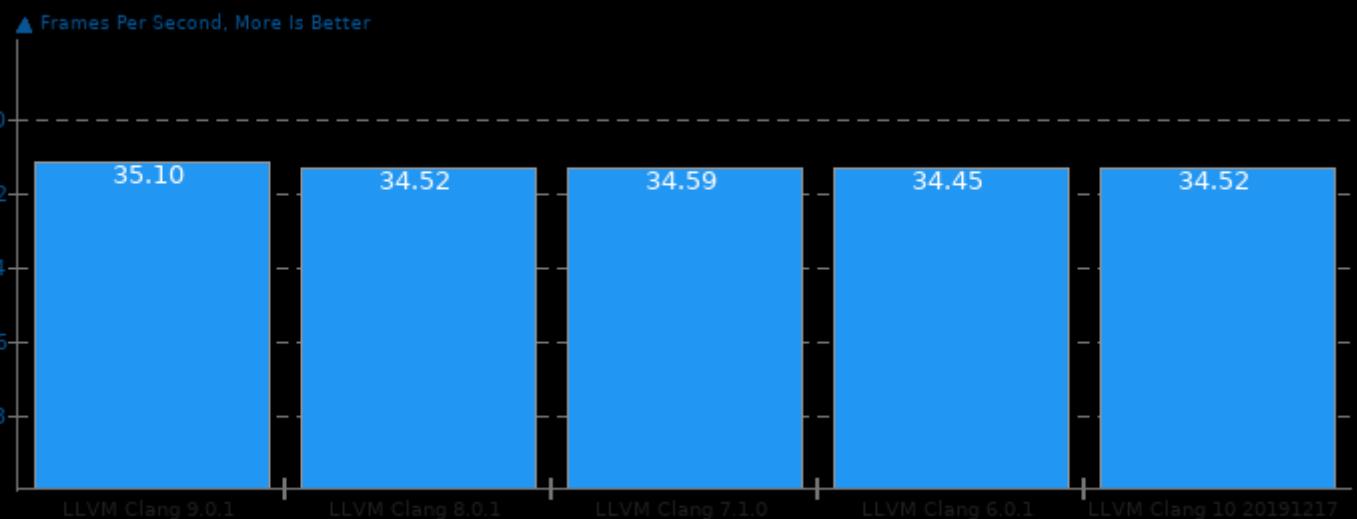
Benchmark: Graceful



```
l. (CXX) g++ options: -std=gnu++11 -O3 -fomit-frame-pointer -rdynamic
```

## x265 3.1.2

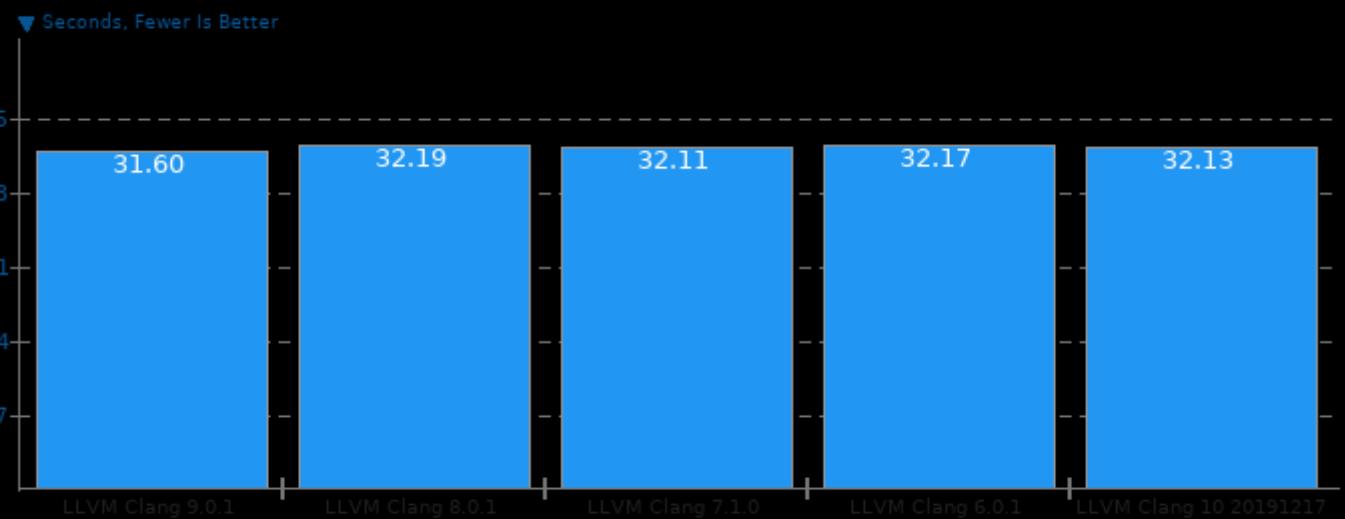
H.265 1080p Video Encoding



1. (CXX) g++ options: -O3 -march=native -rdynamic -lpthread -lrt -ldl -fnuma

## XZ Compression 5.2.4

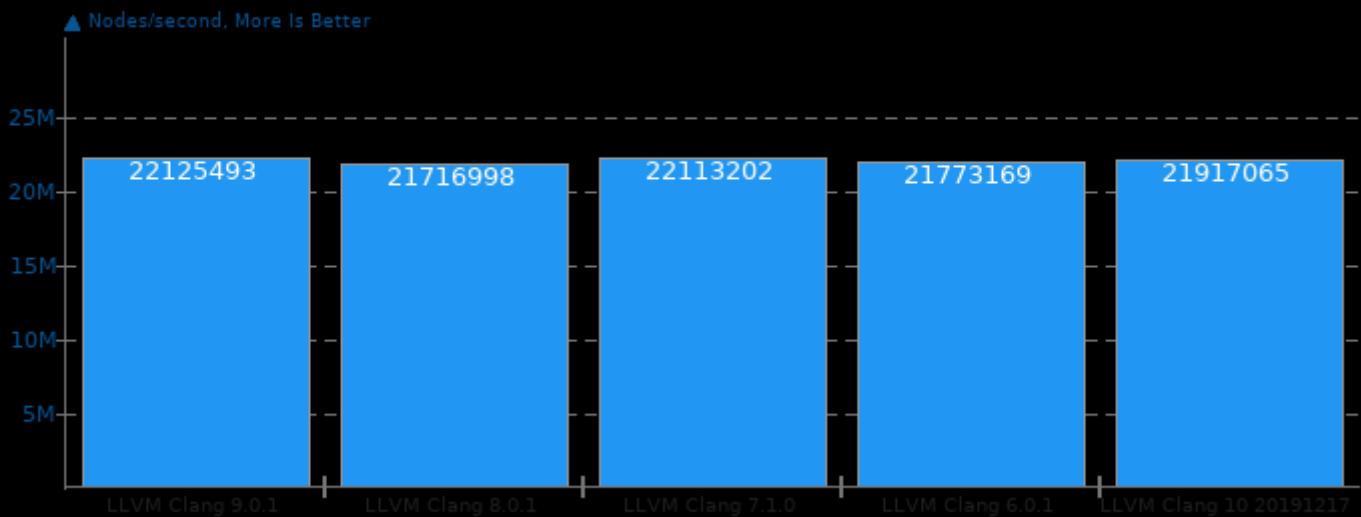
Compressing ubuntu-16.04.3-server-i386.img, Compression Level 9



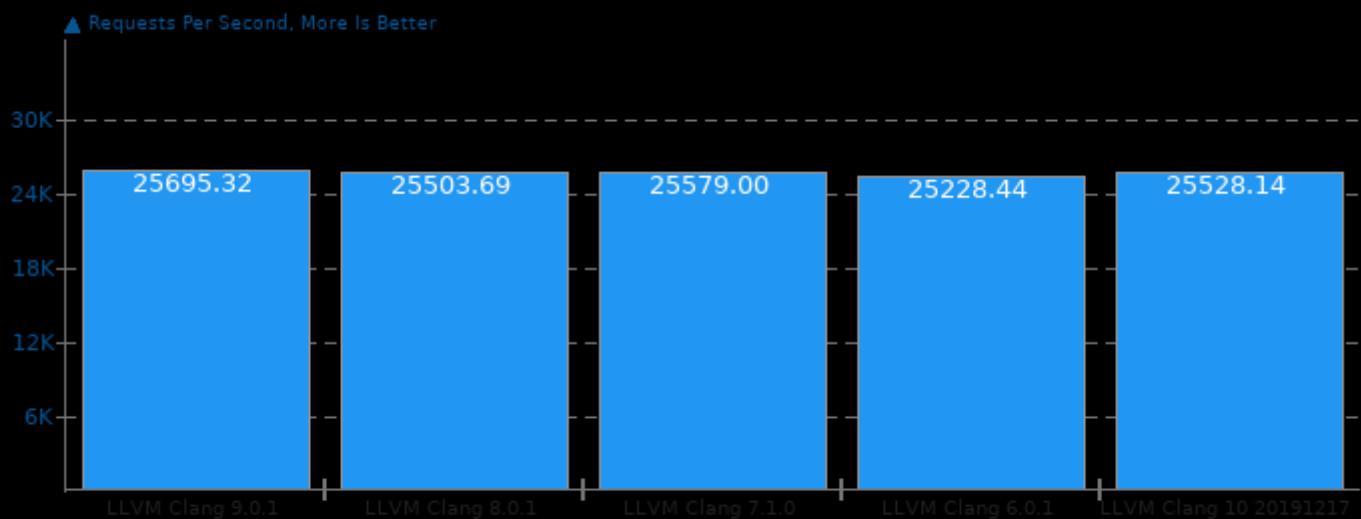
1. (CC) gcc options: -pthread -fvisibility=hidden -O3 -march=native

**asmFish 2017-09-19**

1024 Hash Memory, 26 Depth

**NGINX Benchmark 1.9.9**

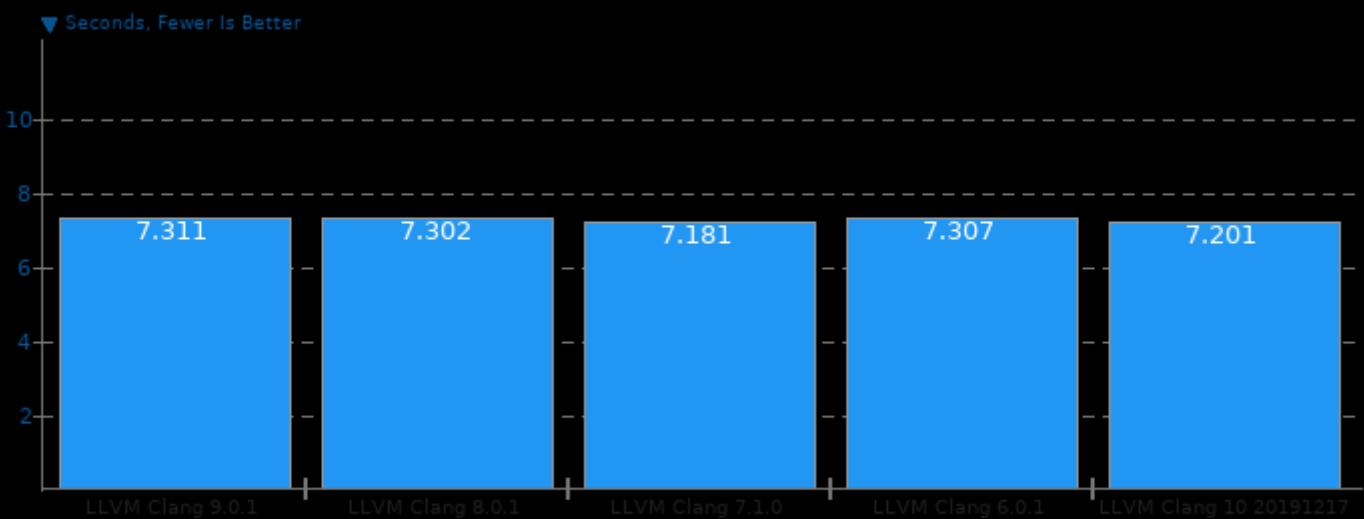
Static Web Page Serving



1. (CC) gcc options: -fthread -lcrypt -lcrypto -lz -O3 -march=native

## Timed HMMer Search 2.3.2

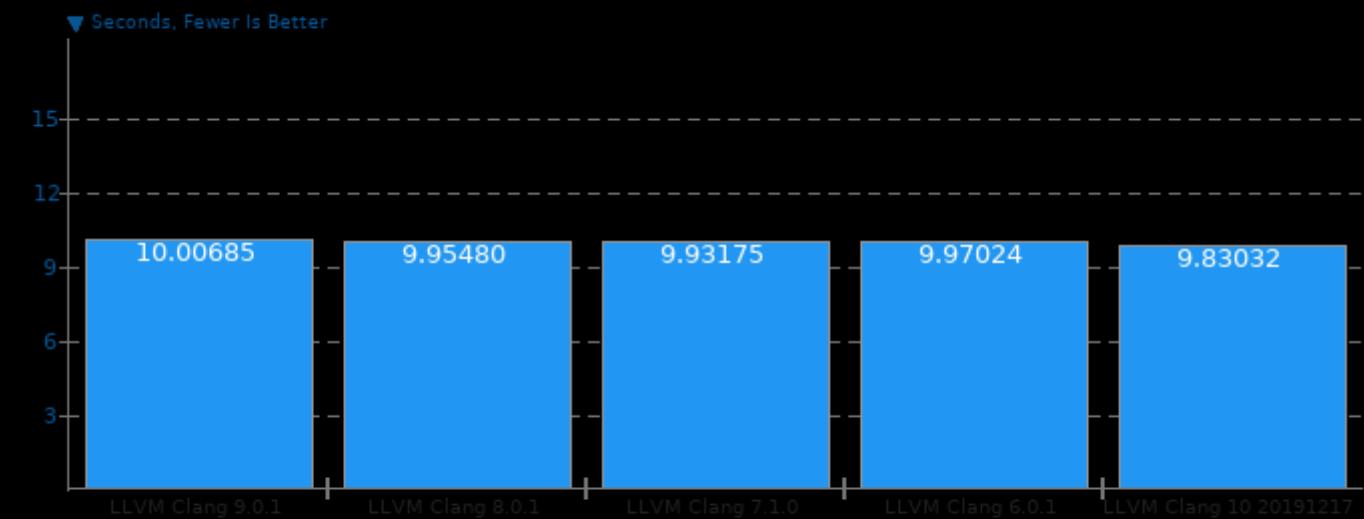
Pfam Database Search



1. (CC) gcc options: -O3 -march=native -pthread -lhmmer -lsquid -lm

## Tungsten Renderer 0.2.2

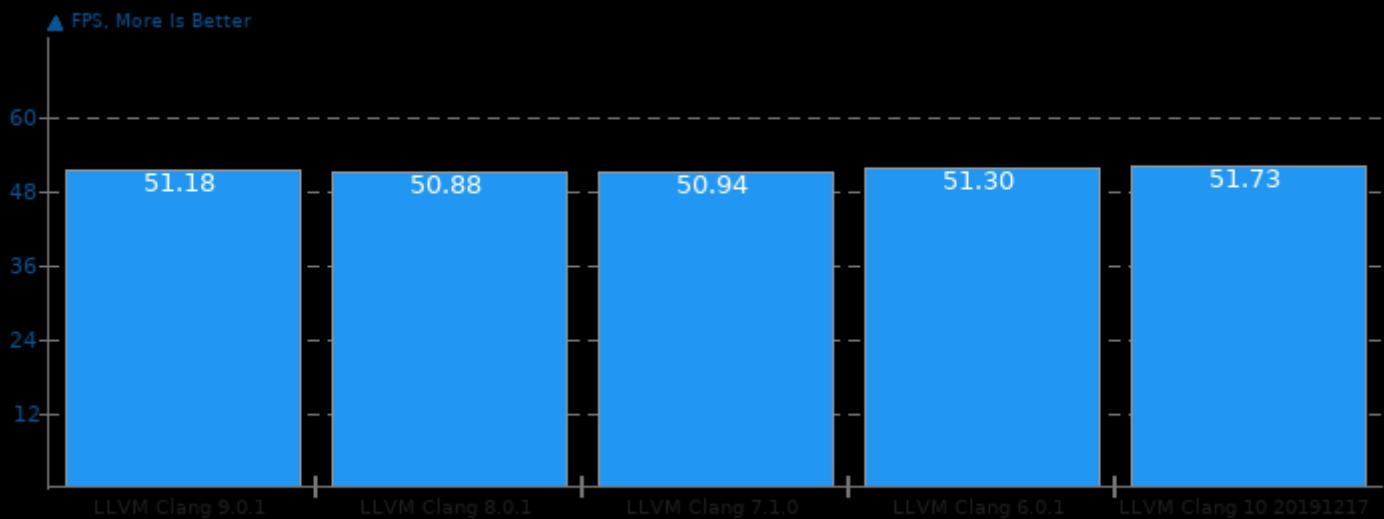
Scene: Non-Exponential



1. (CXX) g++ options: -O3 -march=native -std=c++0x -march=haswell -msse2 -msse3 -mssse3 -msse4.1 -msse4.2 -mfma -mbmi2 -mno-sse4a -mno-avx

## libgav1 2019-10-05

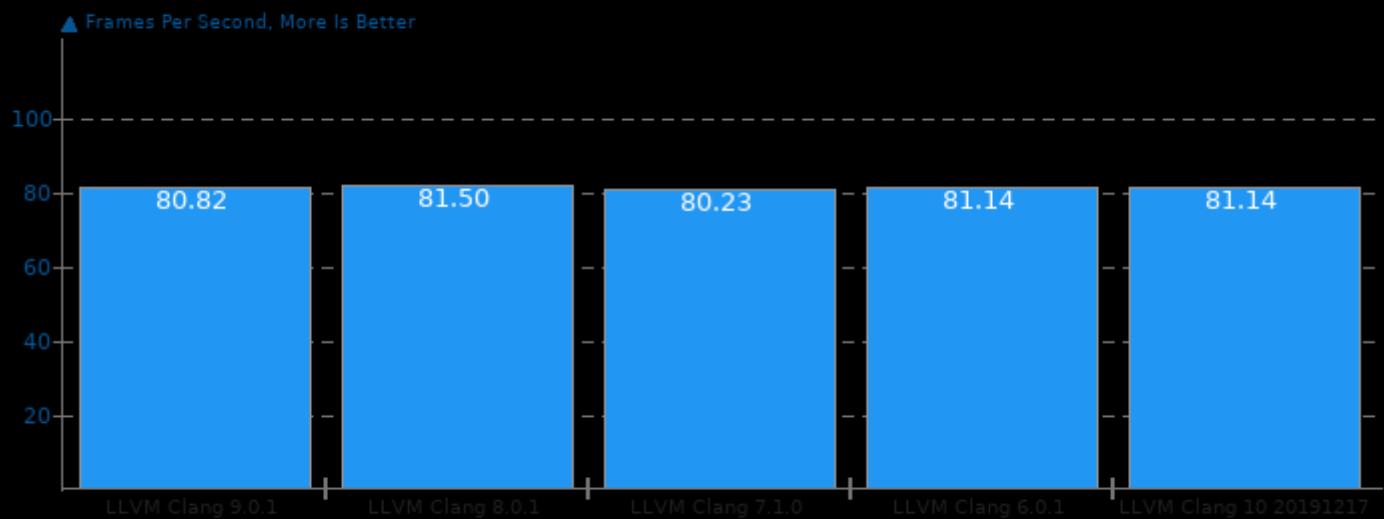
Video Input: Summer Nature 1080p



1. (CXX) g++ options: -O3 -march=native -lpthread

## SVT-VP9 0.1

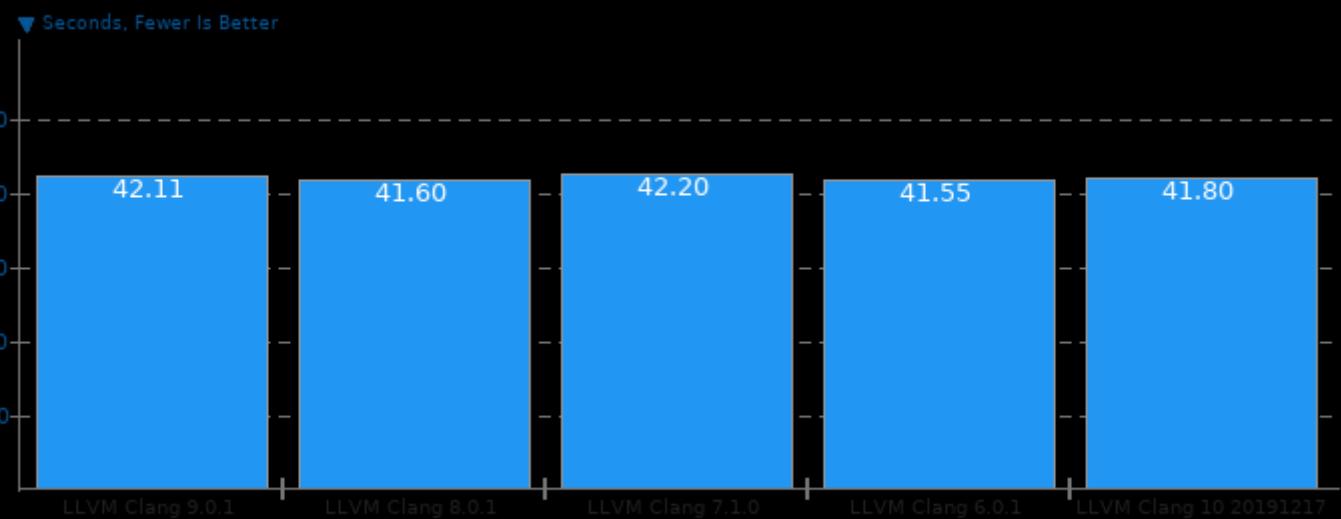
Tuning: Visual Quality Optimized - Input: Bosphorus 1080p



1. (CC) gcc options: -O3 -march=native -fPIE -fPIC -fvisibility=hidden -pie -rdynamic -lpthread -lrt -lm

## AOBench

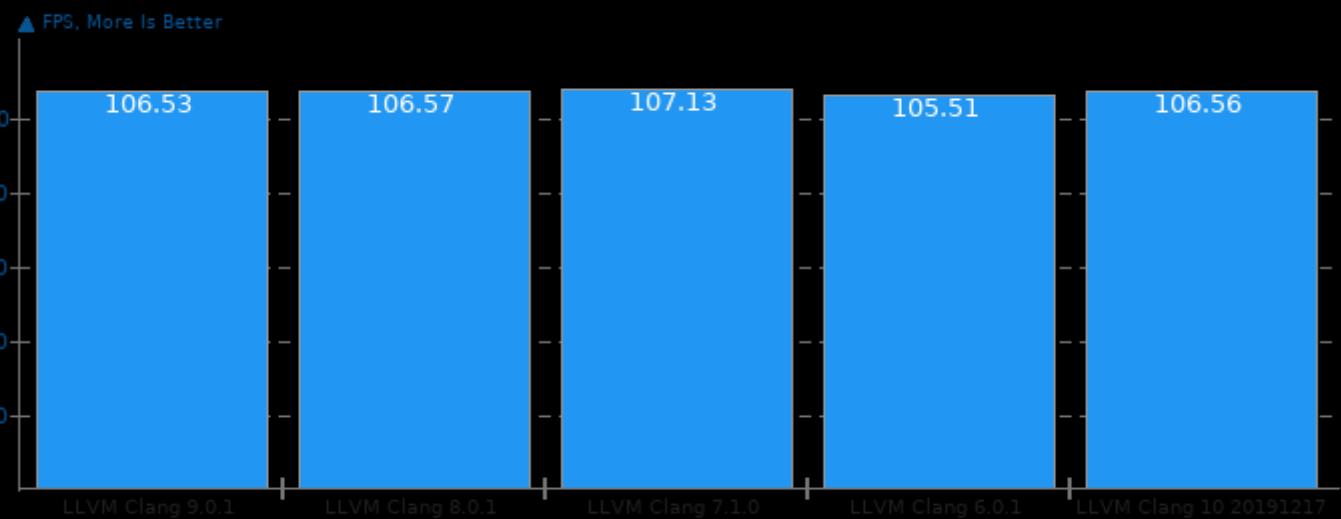
Size: 2048 x 2048 - Total Time



1. (CC) gcc options: -fno-strict-aliasing -O3 -march=native

## dav1d 0.5.0

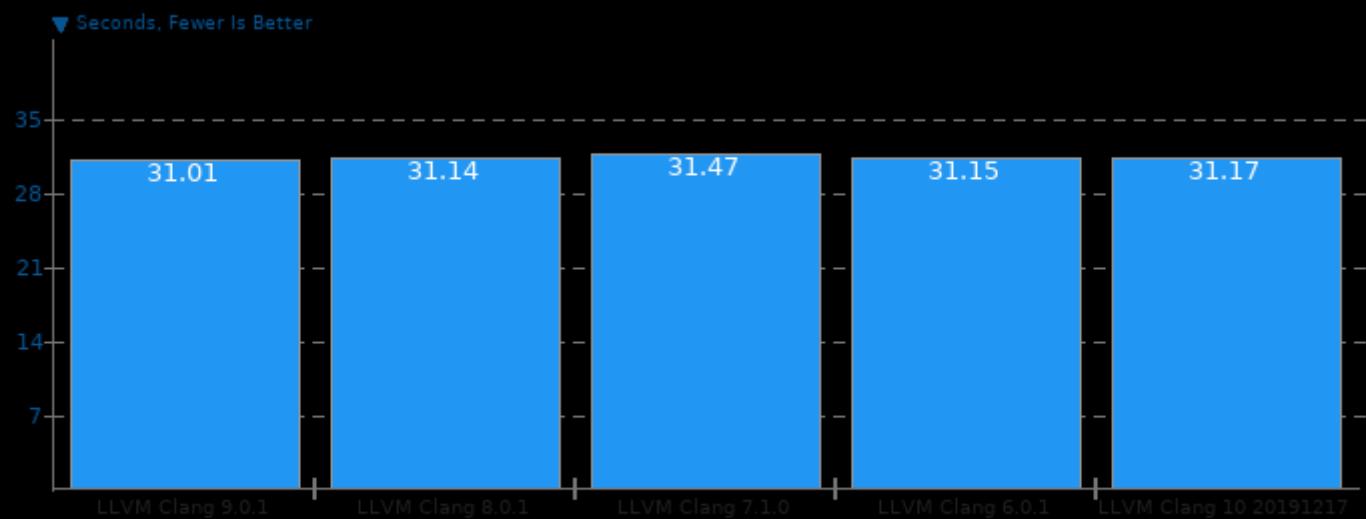
Video Input: Summer Nature 4K



1. (CC) gcc options: -O3 -march=native -pthread

## Tungsten Renderer 0.2.2

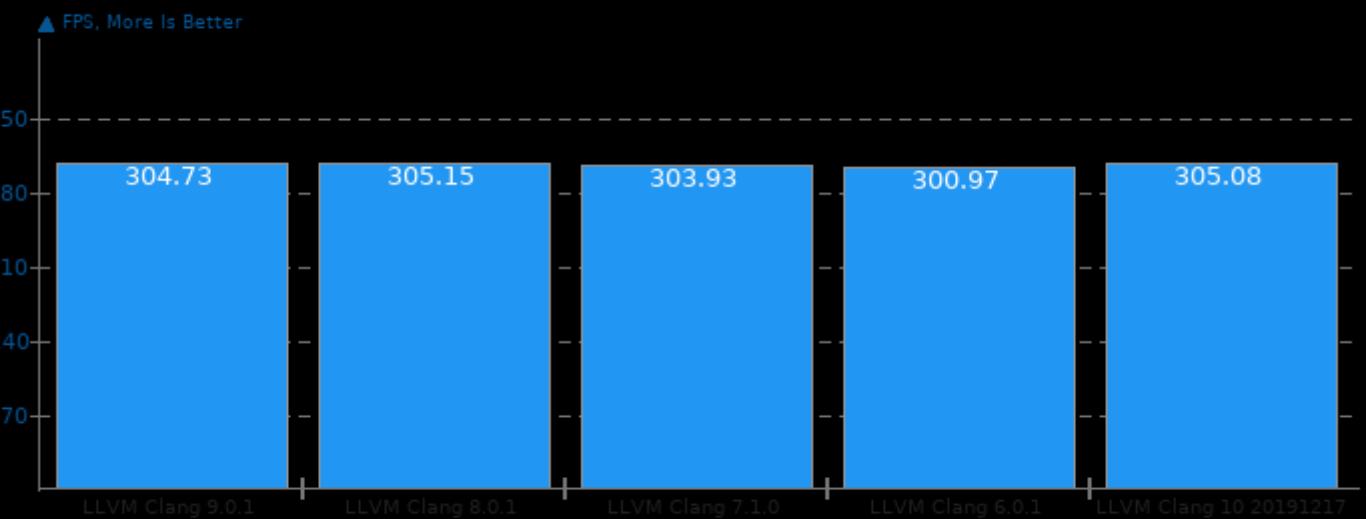
Scene: Water Caustic



```
1. (CXX) g++ options: -O3 -march=native -std=c++0x -march=haswell -msse2 -msse3 -mssse3 -msse4.1 -msse4.2 -mfma -mbmi2 -mno-sse4a -mno-avx
```

## dav1d 0.5.0

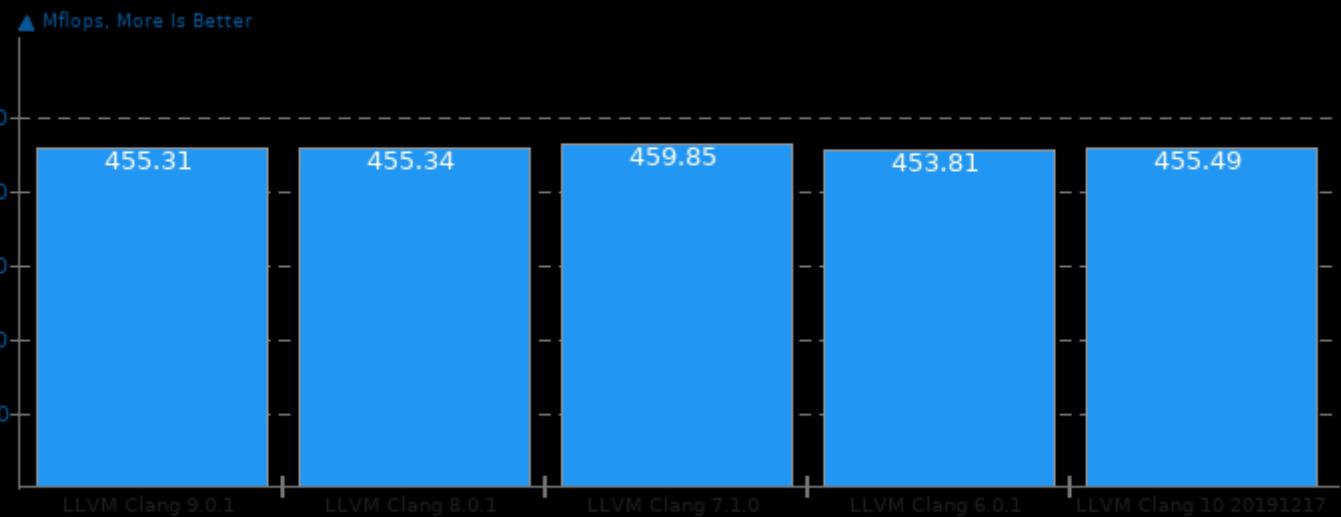
Video Input: Summer Nature 1080p



```
1. (CC) gcc options: -O3 -march=native -pthread
```

## SciMark 2.0

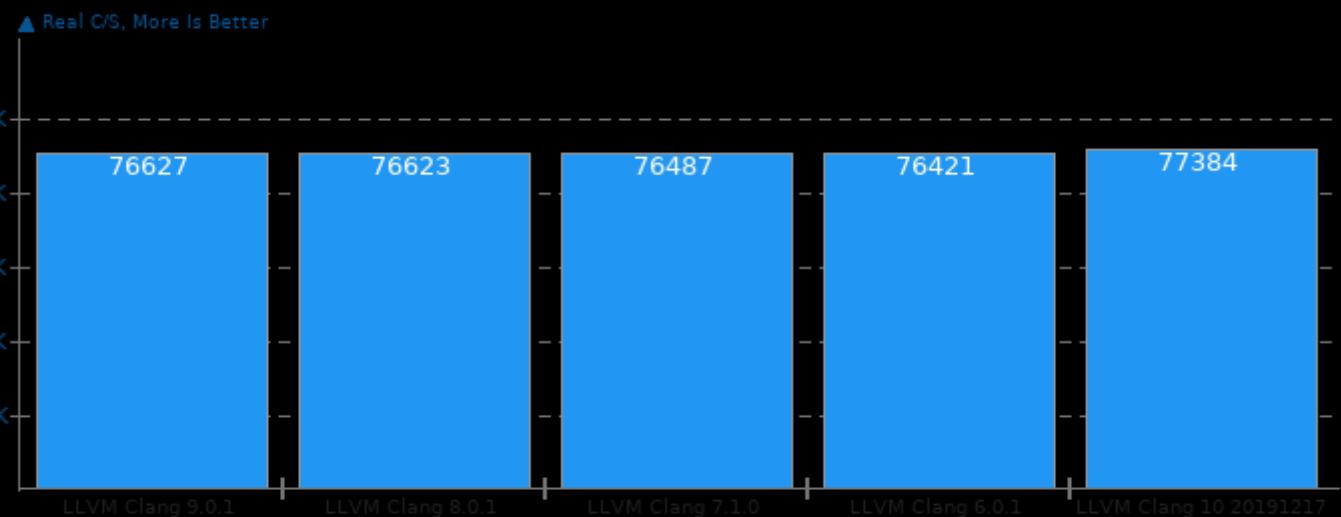
Computational Test: Fast Fourier Transform



1. (CC) gcc options: -O3 -march=native -lm

## John The Ripper 1.9.0-jumbo-1

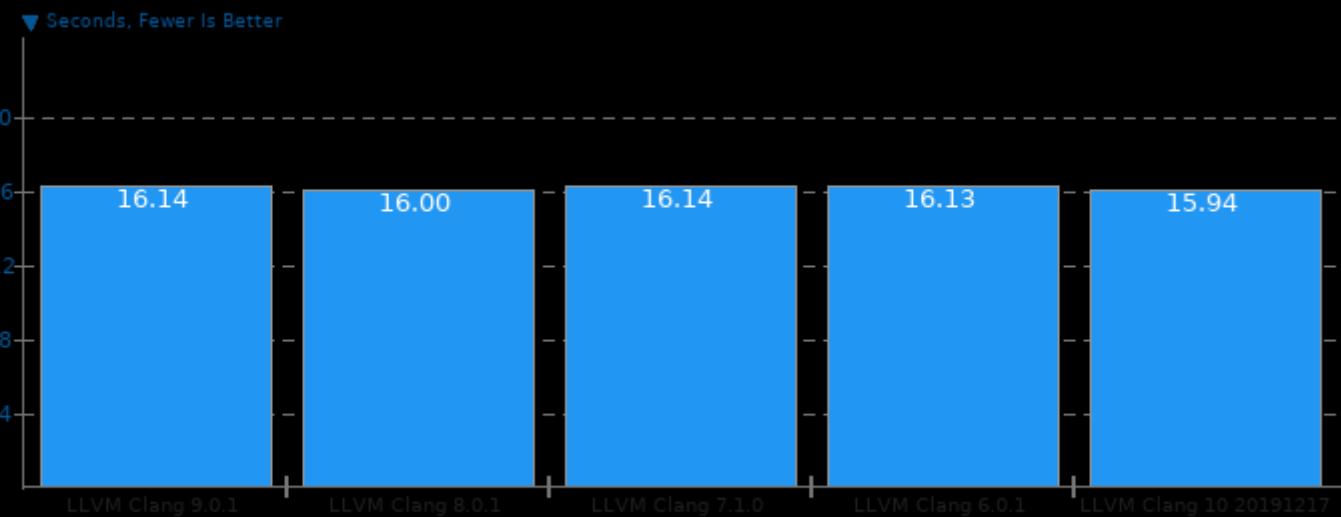
Test: MD5



1. (CC) gcc options: -m64 -lssl -lcrypto -lgmp -pthread -lm -lz -ldl -lcrypt -lbz2 -mavx2 -O3 -march=native -std=gnu89 -fno-strict-aliasing -fno-unroll-loops

## CppPerformanceBenchmarks 9

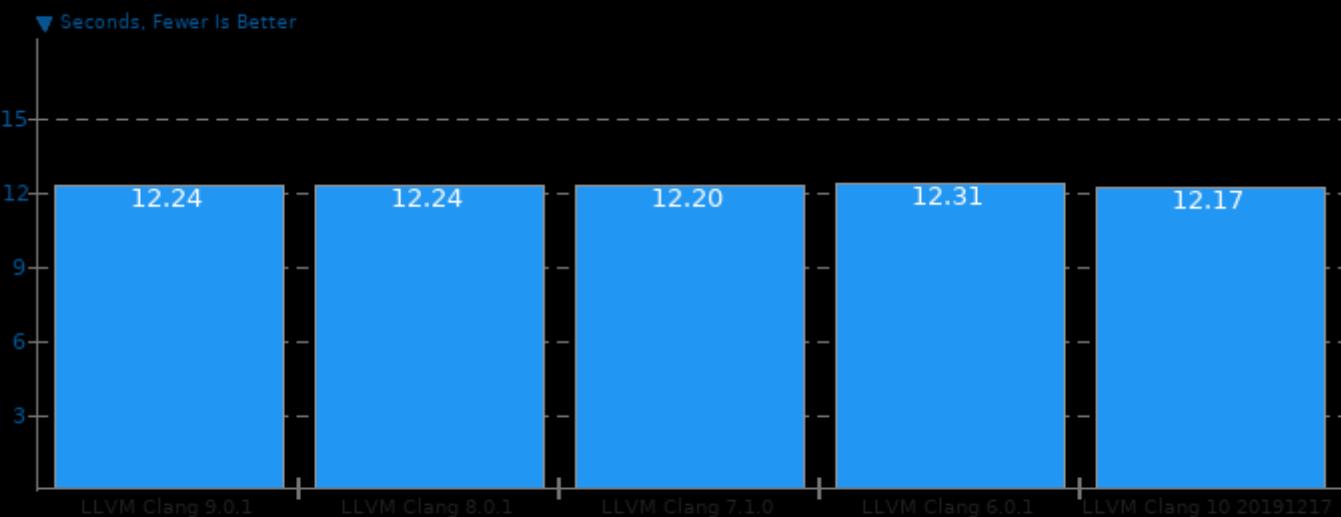
Test: Function Objects



1. (CXX) g++ options: -O3 -march=native -std=c++11

## Tungsten Renderer 0.2.2

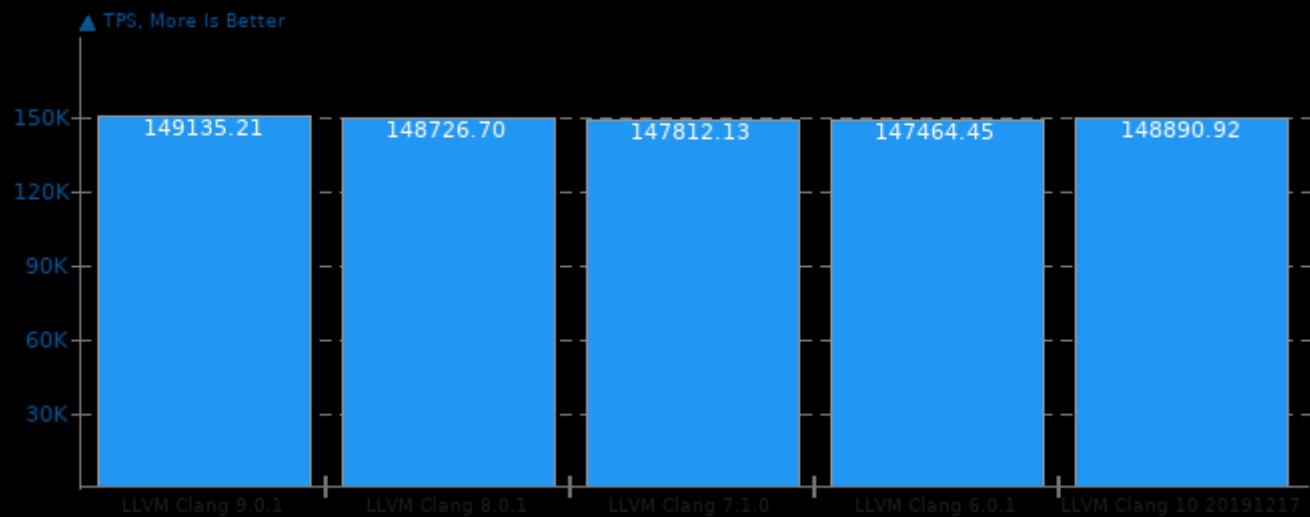
Scene: Volumetric Caustic



1. (CXX) g++ options: -O3 -march=native -std=c++0x -march=haswell -msse2 -msse3 -mssse3 -msse4.1 -msse4.2 -mfma -mbmi2 -mno-sse4a -mno-avx

### PostgreSQL pgbench 12.0

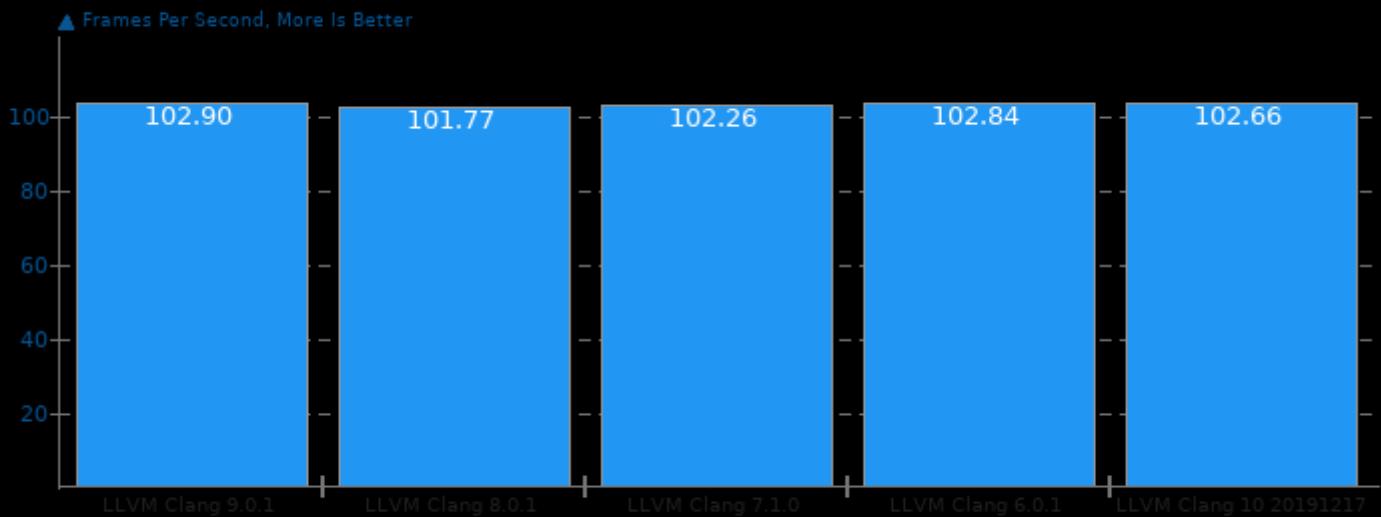
Scaling: Buffer Test - Test: Normal Load - Mode: Read Only



1. (CC) gcc options: -fno-strict-aliasing -fwrapv -O3 -march=native -lgcccommon -lgccport -lpq -lpthread -lrt -lcrypt -ldl -lm

### SVT-VP9 0.1

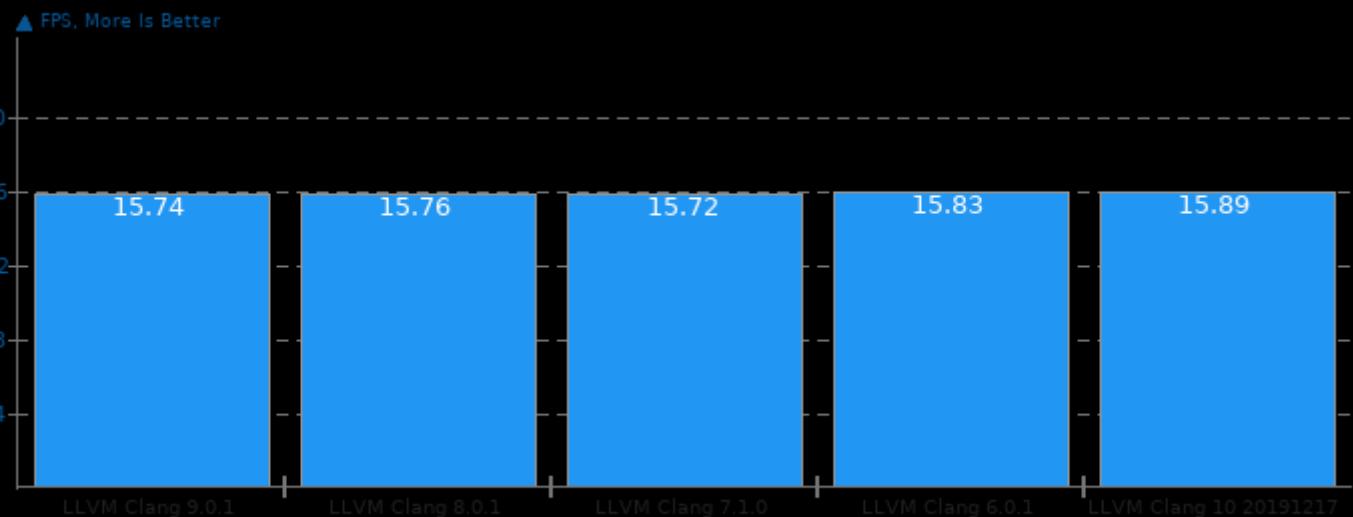
Tuning: VMAF Optimized - Input: Bosphorus 1080p



1. (CC) gcc options: -O3 -march=native -fPIE -fPIC -fvisibility=hidden -pie -rdynamic -lpthread -lrt -lm

**libgav1 2019-10-05**

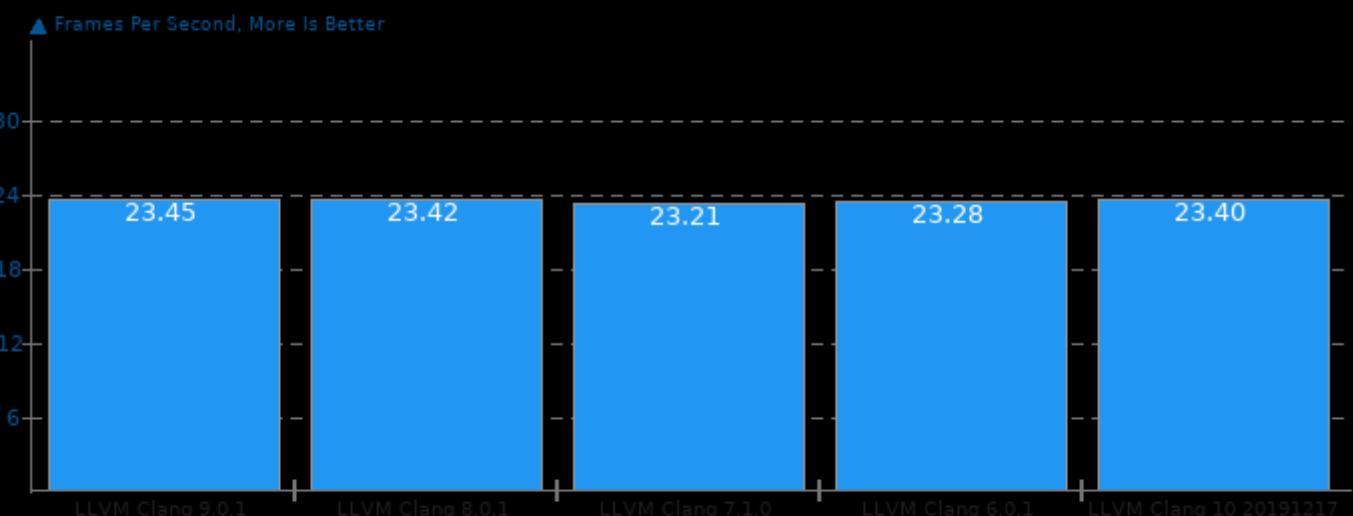
Video Input: Summer Nature 4K



1. (CXX) g++ options: -O3 -march=native -lpthread

**SVT-AV1 0.7**

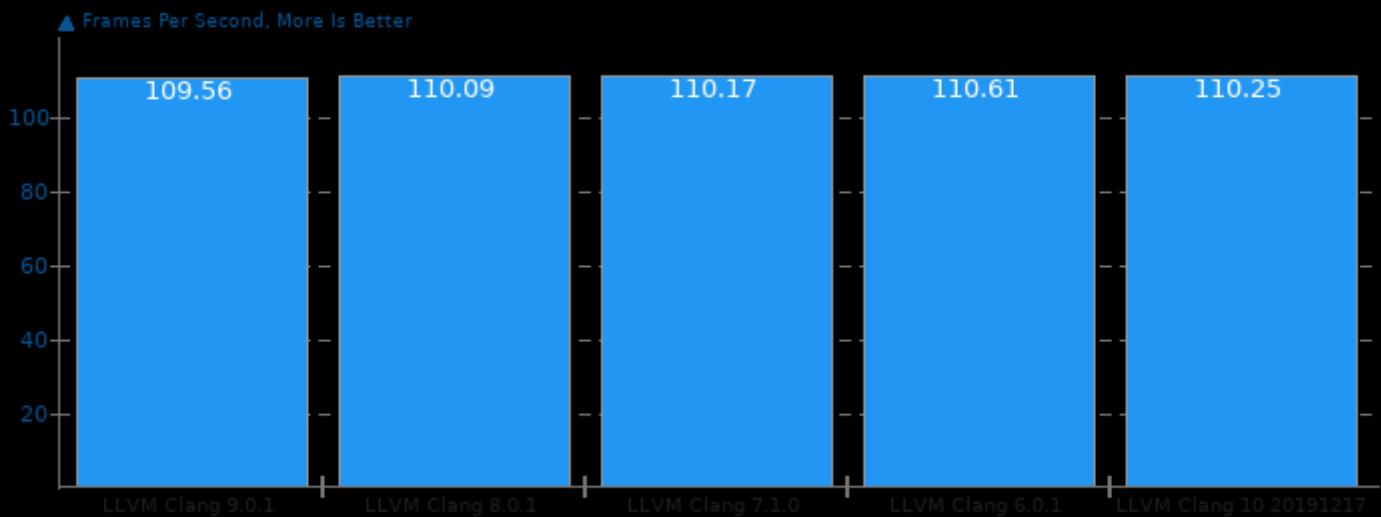
Encoder Mode: Enc Mode 8 - Input: 1080p



1. (CXX) g++ options: -O3 -march=native -fPIE -fPIC -pie

## SVT-VP9 0.1

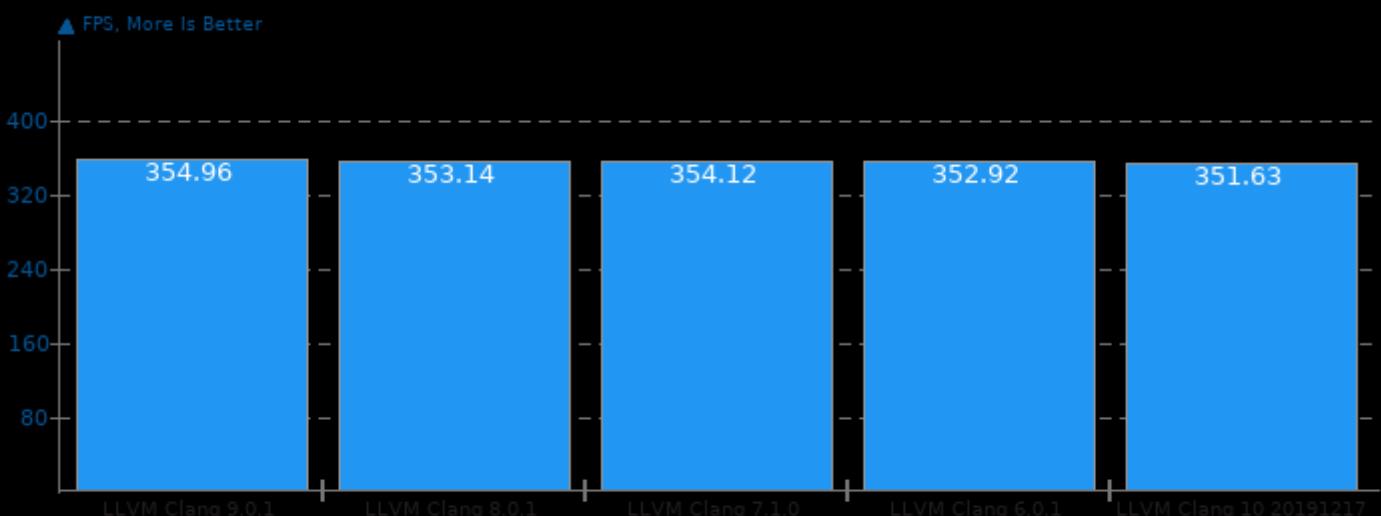
Tuning: PSNR/SSIM Optimized - Input: Bosphorus 1080p



1. (CC) gcc options: -O3 -march=native -fPIE -fPIC -fvisibility=hidden -pie -rdynamic -lpthread -lrt -lm

## dav1d 0.5.0

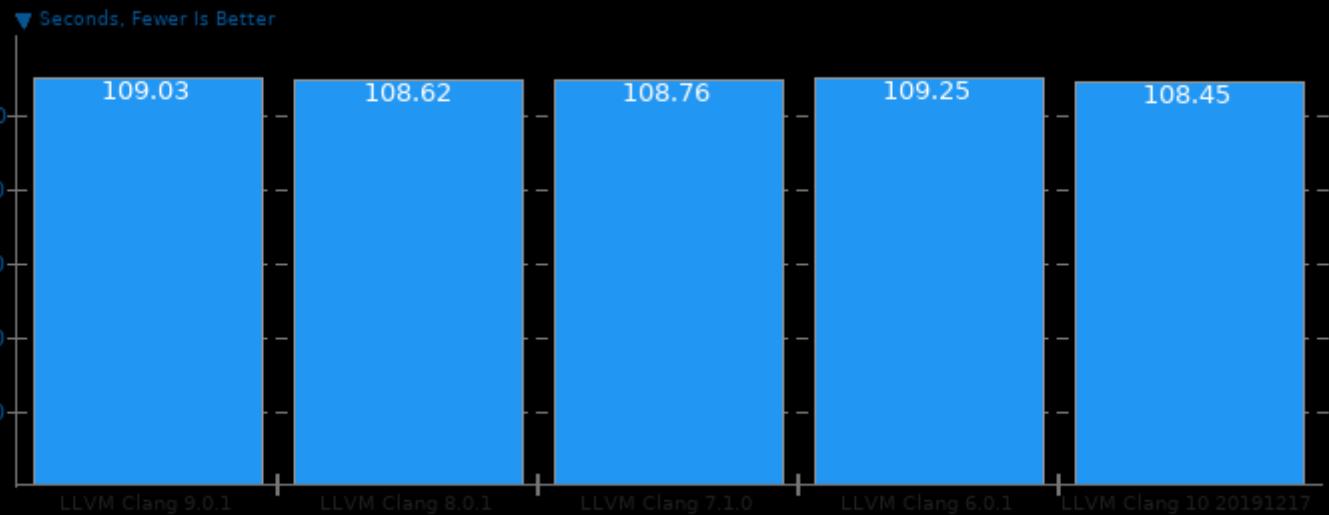
Video Input: Chimera 1080p



1. (CC) gcc options: -O3 -march=native -pthread

## Timed MrBayes Analysis 3.2.7

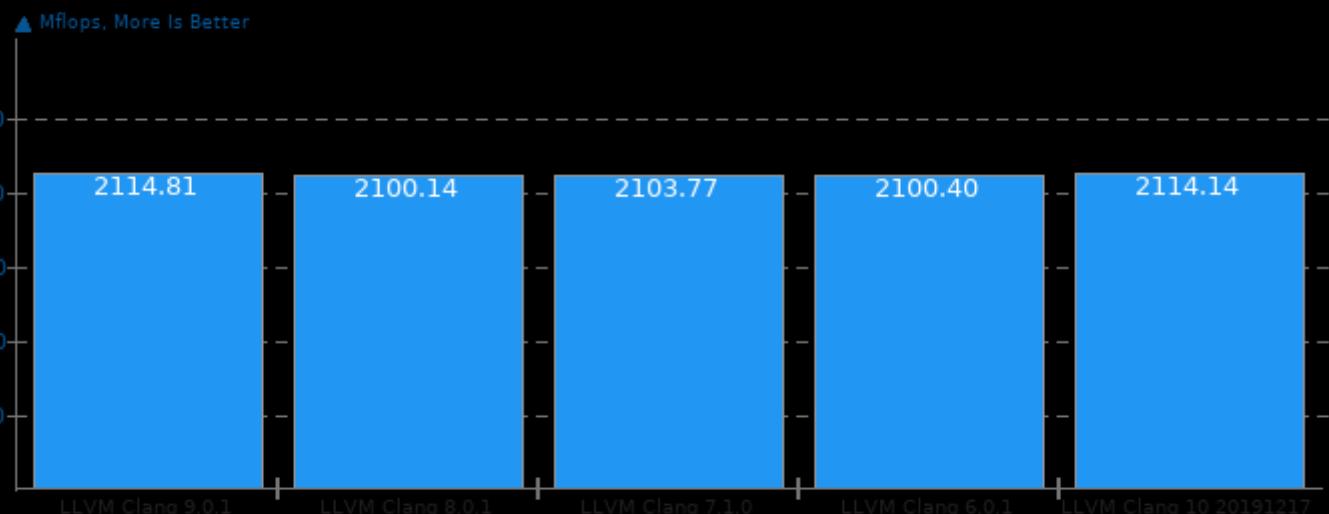
Primate Phylogeny Analysis



1. (CC) gcc options: -mavx -msse -msse2 -msse3 -msse3 -msse4.1 -msse4.2 -maes -mavx -mfma -mavx2 -mrdrnd -mbmi -mbmi2 -O3 -std=c99 -pedantic

## SciMark 2.0

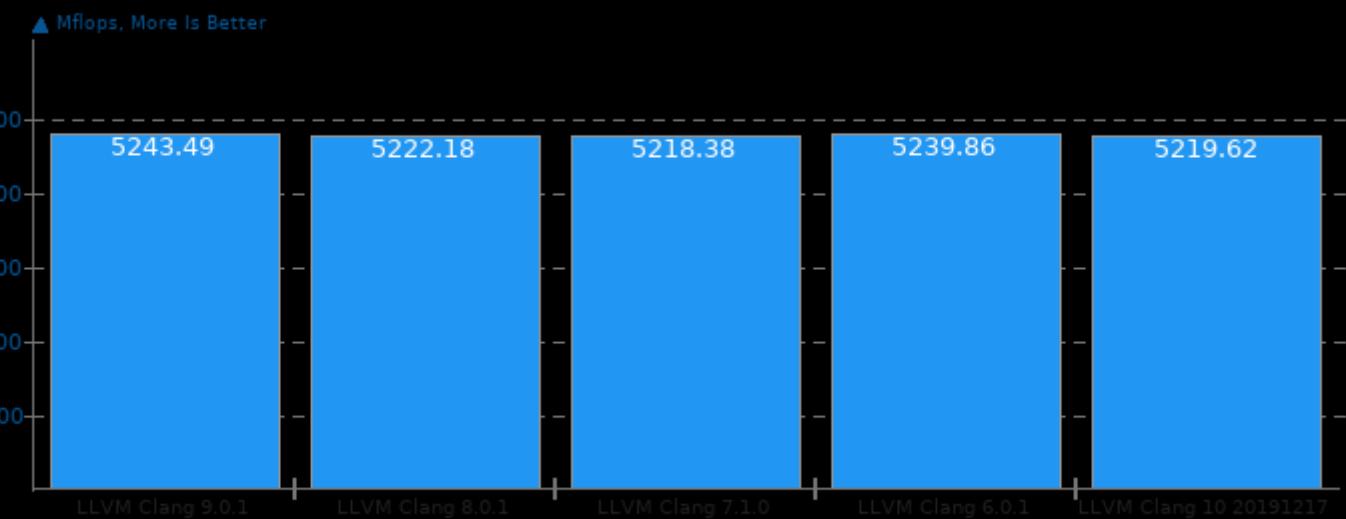
Computational Test: Composite



1. (CC) gcc options: -O3 -march=native -lm

## SciMark 2.0

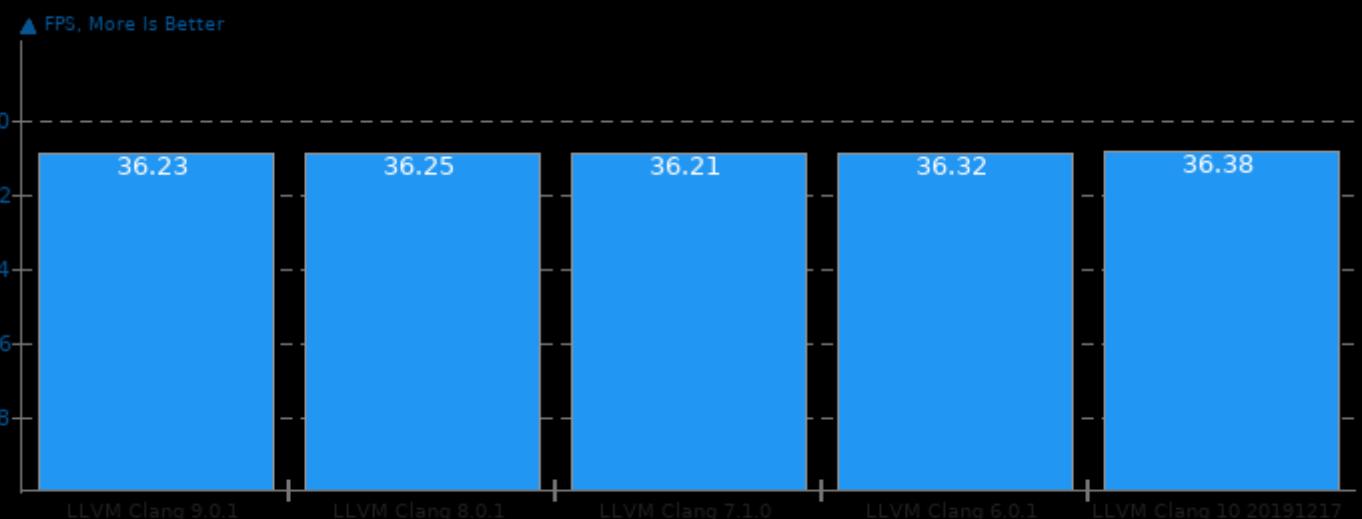
Computational Test: Dense LU Matrix Factorization



1. (CC) gcc options: -O3 -march=native -lm

## libgav1 2019-10-05

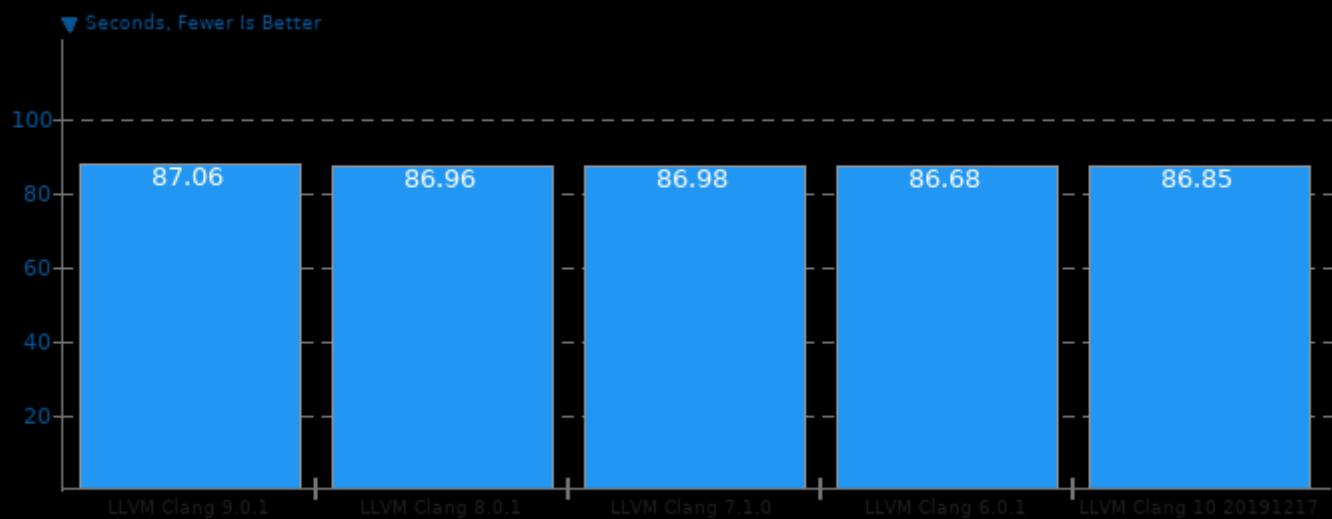
Video Input: Chimera 1080p



1. (CXX) g++ options: -O3 -march=native -lpthread

## Minion 1.8

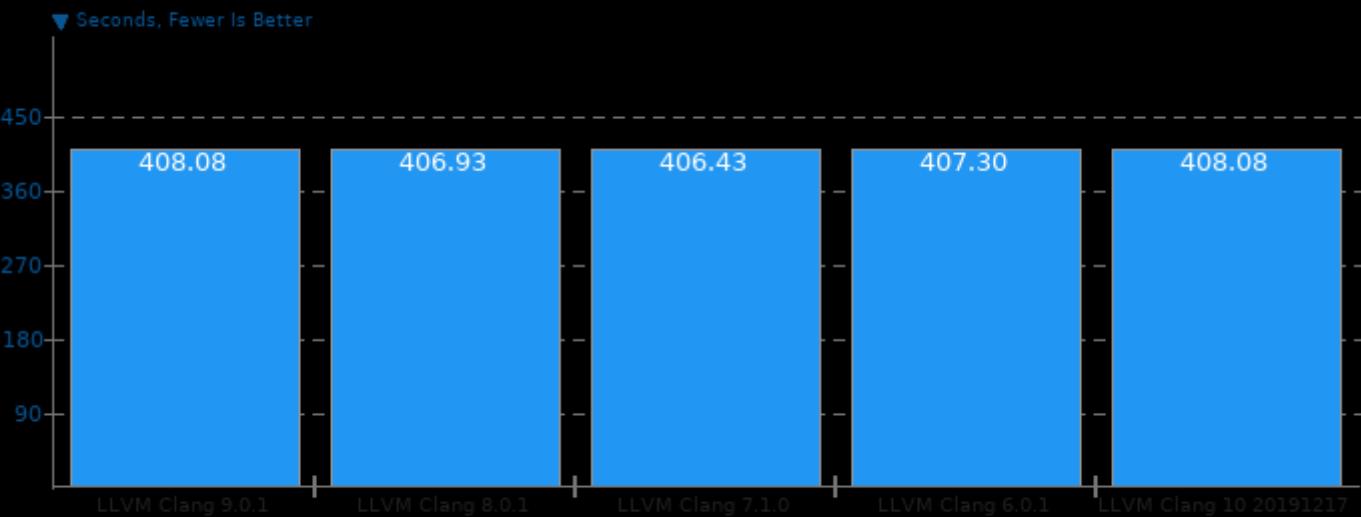
Benchmark: Solitaire



1. (CXX) g++ options: -std=gnu++11 -O3 -fomit-frame-pointer -rdynamic

## CppPerformanceBenchmarks 9

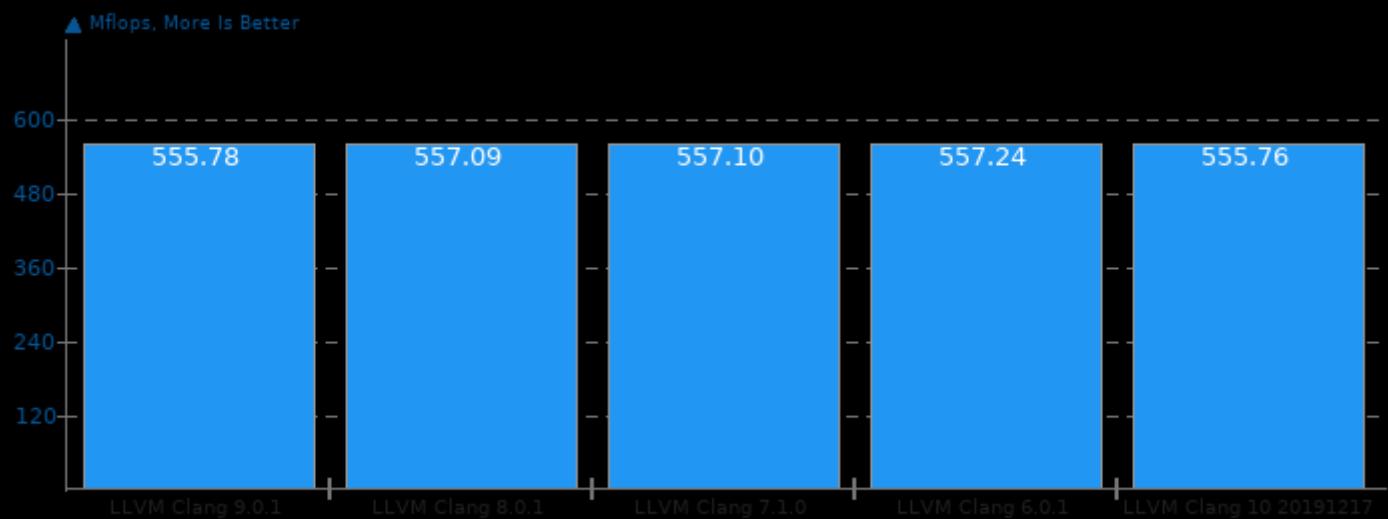
Test: Math Library



1. (CXX) g++ options: -O3 -march=native -std=c++11

## SciMark 2.0

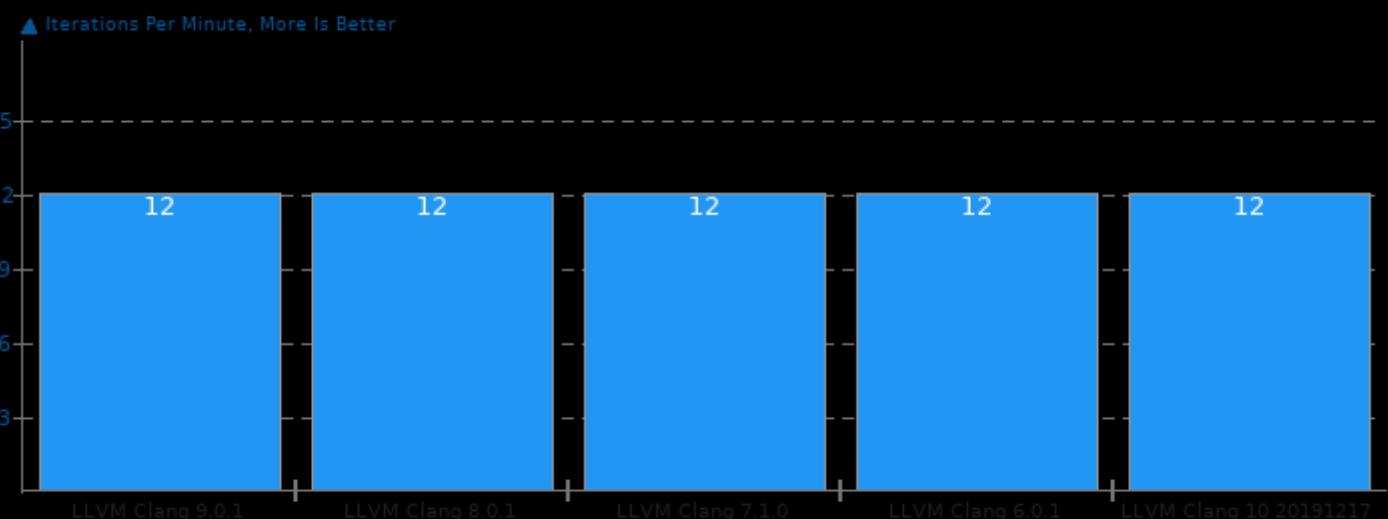
Computational Test: Monte Carlo



1. (CC) gcc options: -O3 -march=native -lm

## GraphicsMagick 1.3.33

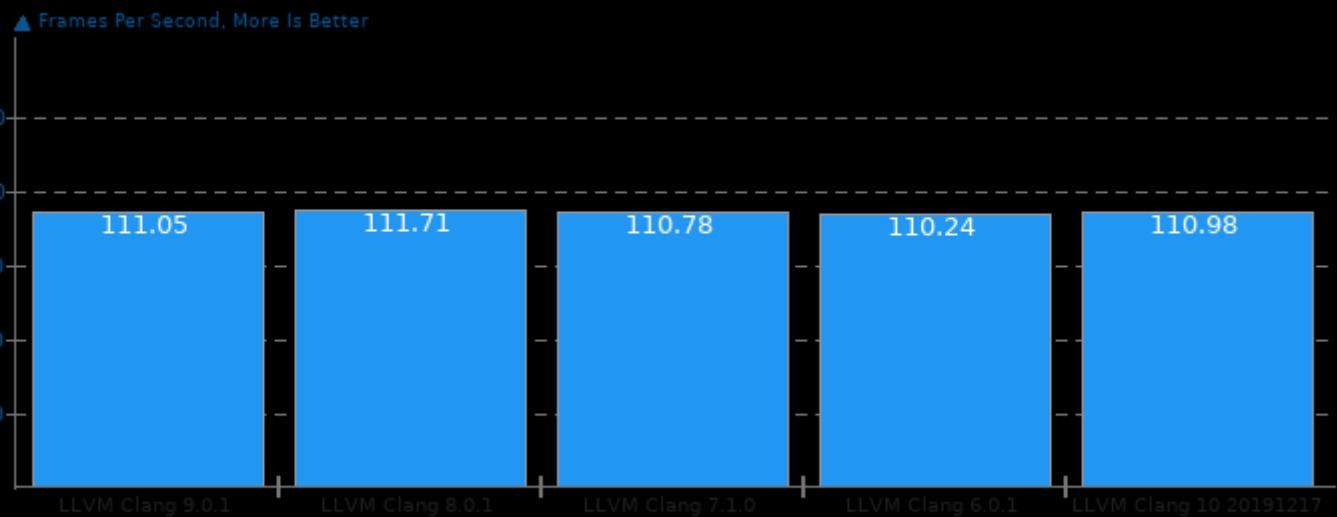
Operation: Sharpen



1. (CC) gcc options: -O3 -march=native -pthread -lfreetype -ljpeg -lXext -lSM -lICE -lX11 -lbz2 -lxml2 -lz -lm -lpthread

## VP9 libvpx Encoding 1.8.1

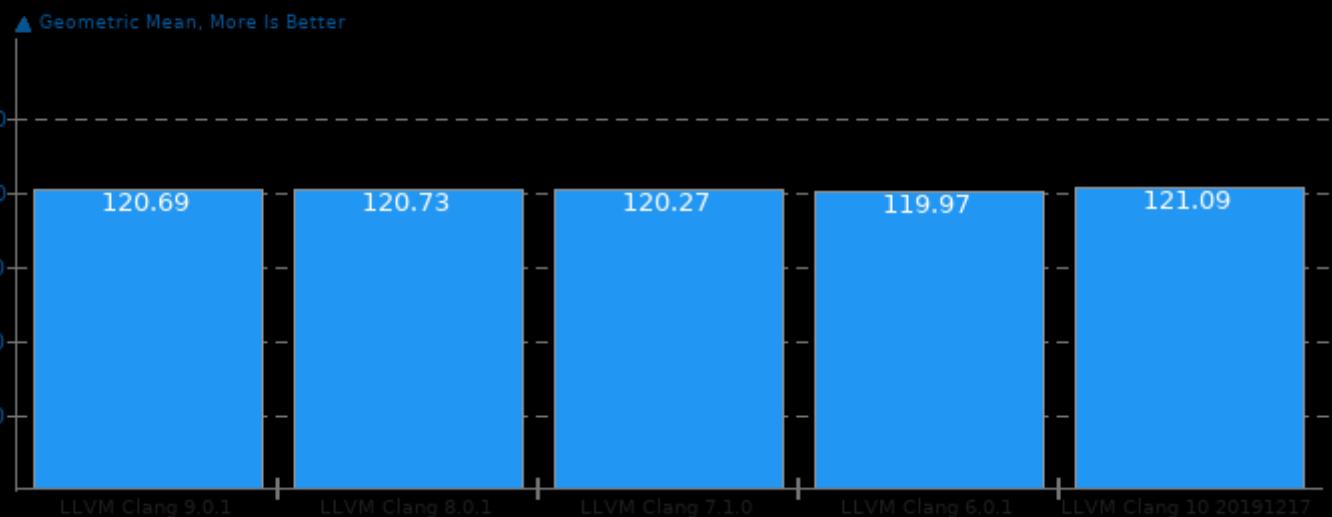
vpxenc VP9 1080p Video Encode



1. (CXX) g++ options: -m64 -lm -lpthread -O3 -march=native -fPIC -U\_FORTIFY\_SOURCE -std=c++11

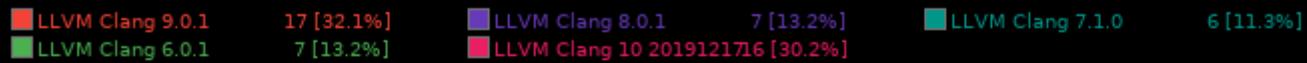
## Geometric Mean Of All Test Results

Result Composite - 2019 Intel LLVM Clang Compiler Comparison



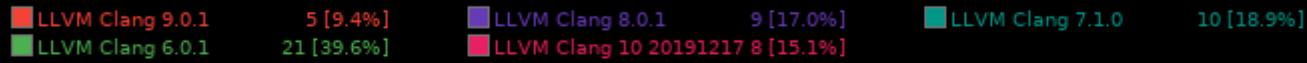
## Number Of First Place Finishes

Wins - 53 Tests

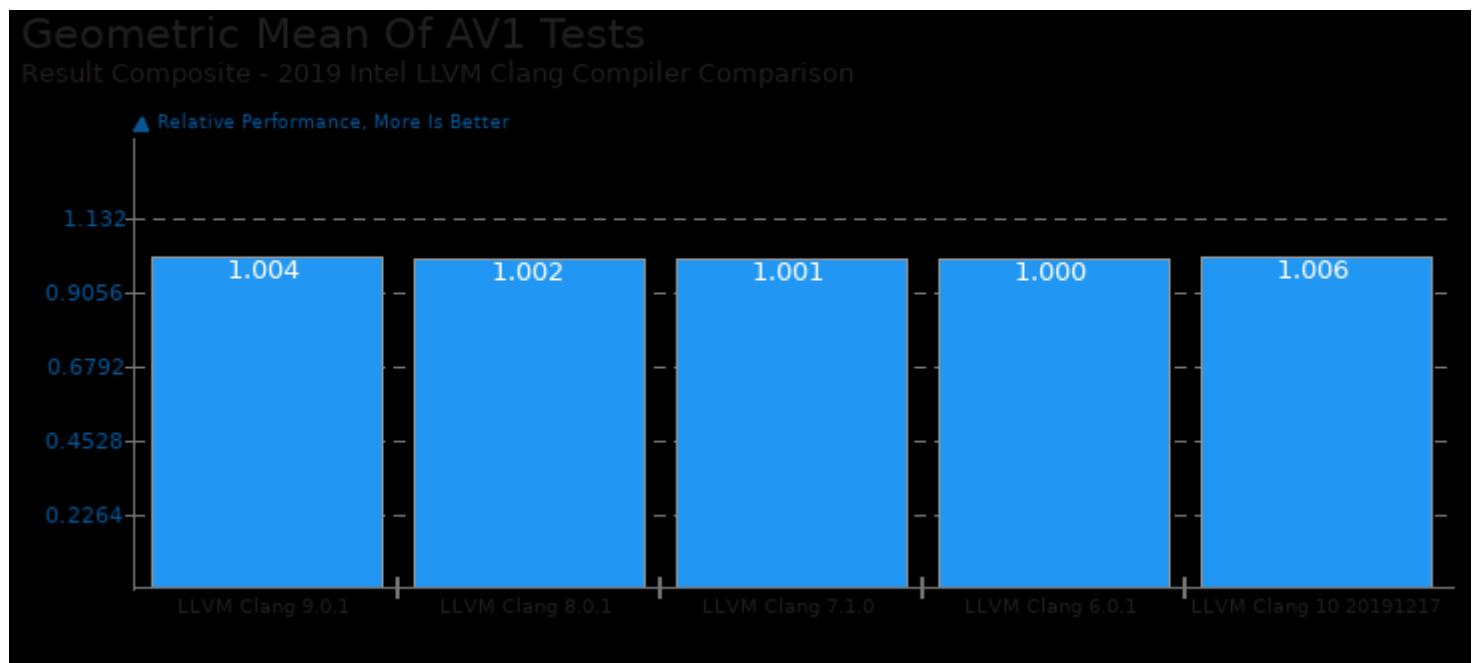
[OpenBenchmarking.org](https://OpenBenchmarking.org)

## Number Of Last Place Finishes

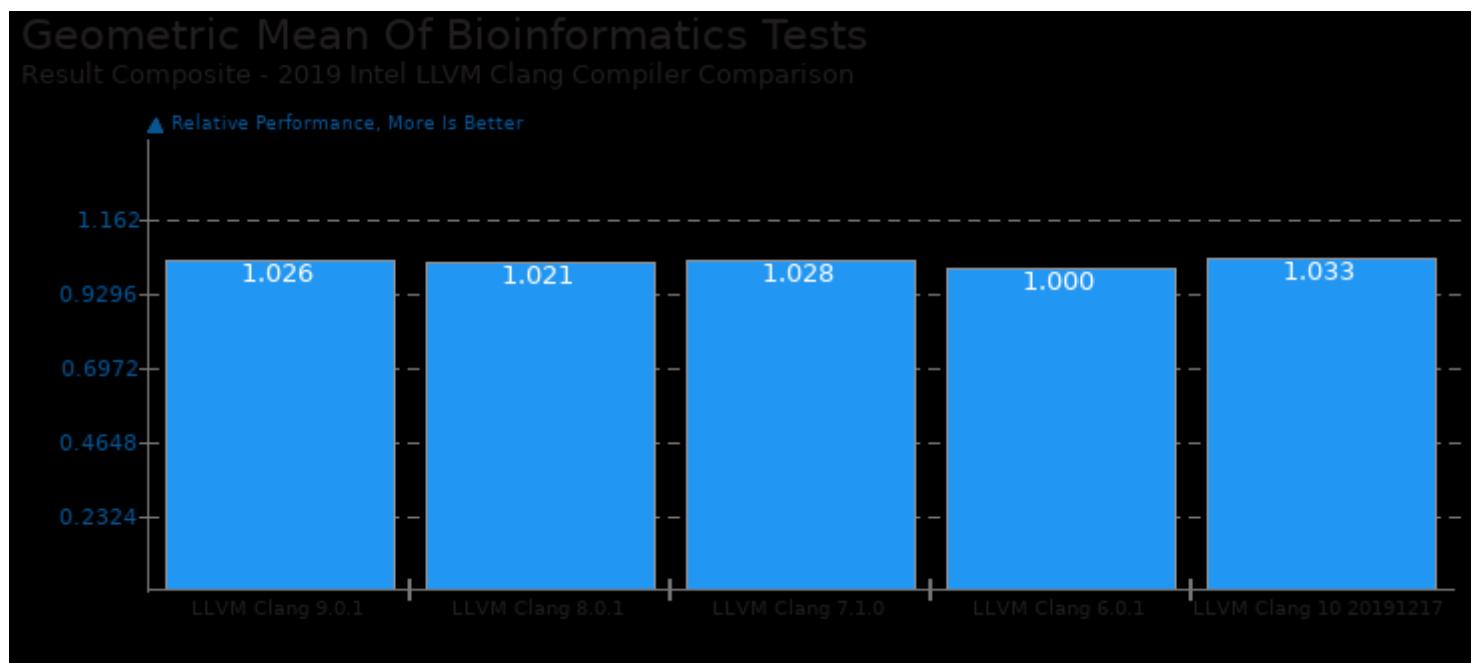
Losses - 53 Tests

[OpenBenchmarking.org](https://OpenBenchmarking.org)

These geometric means are based upon test groupings / test suites for this result file.



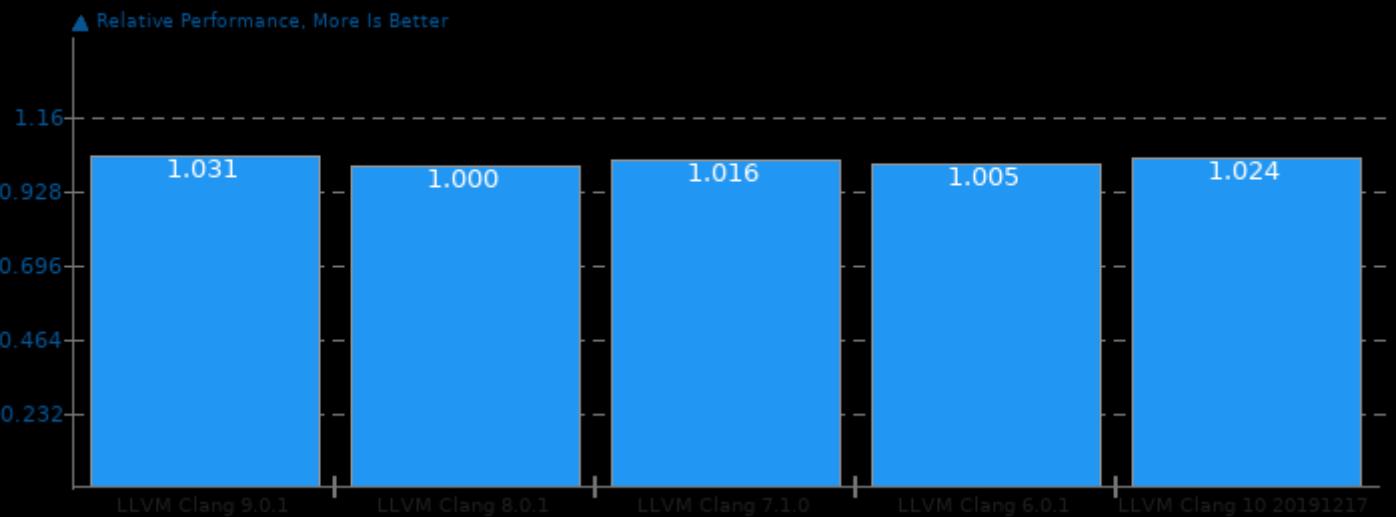
Geometric mean based upon tests: pts/dav1d, pts/svt-av1 and pts/libgav1



Geometric mean based upon tests: pts/himeno, pts/mrbayes and pts/hmmer

## Geometric Mean Of Chess Test Suite

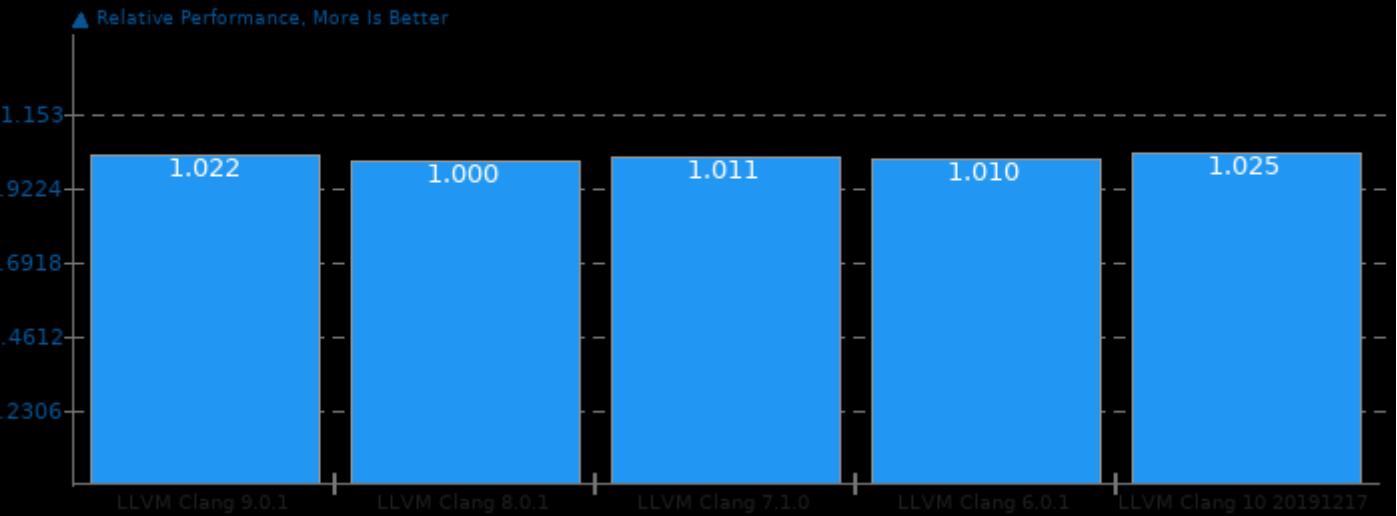
Result Composite - 2019 Intel LLVM Clang Compiler Comparison



Geometric mean based upon tests: pts/tscp and pts/asmfish

## Geometric Mean Of Compression Tests

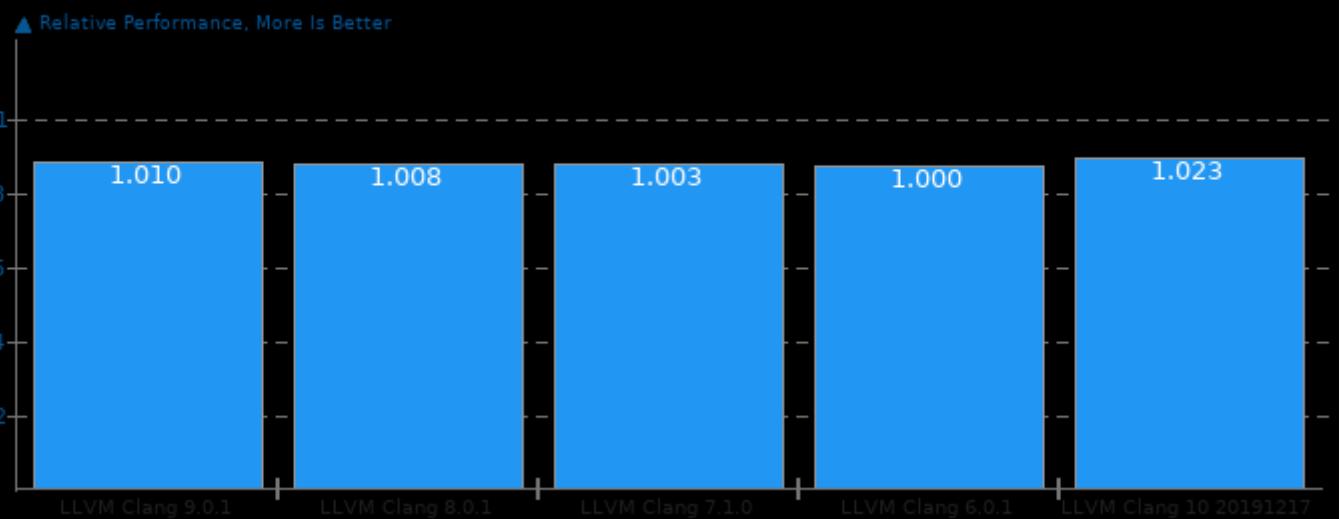
Result Composite - 2019 Intel LLVM Clang Compiler Comparison



Geometric mean based upon tests: pts/compress-zstd and pts/compress-xz

## Geometric Mean Of Creator Workloads Tests

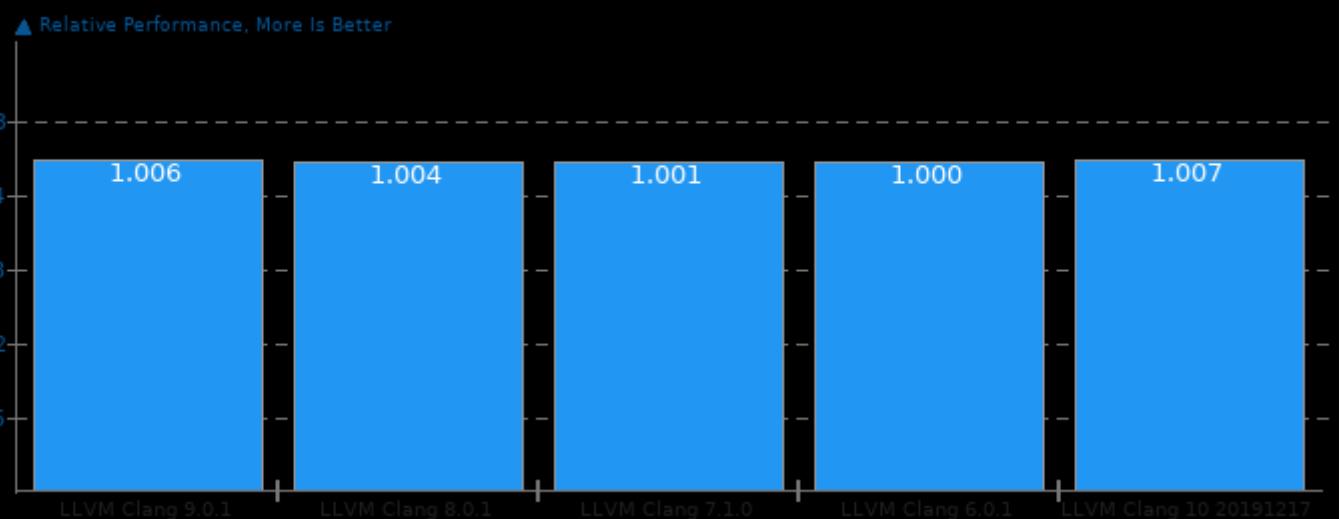
Result Composite - 2019 Intel LLVM Clang Compiler Comparison



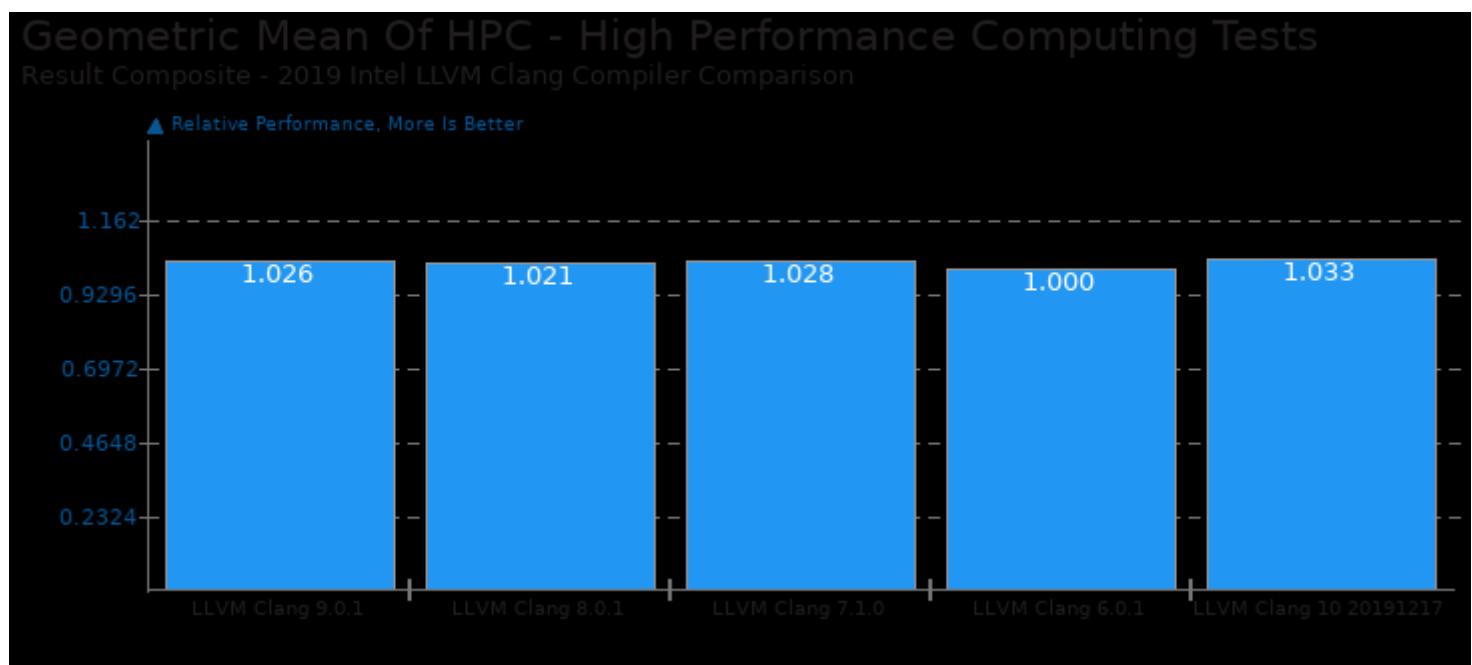
Geometric mean based upon tests: pts/c-ray, pts/tungsten, pts/aobench, pts/svt-vp9, pts/svt-hevc, pts/x264, pts/x265, pts/vpxenc, pts/dav1d, pts/svt-av1, pts/libgav1, pts/graphics-magick and pts/tjbench

## Geometric Mean Of Encoding Tests

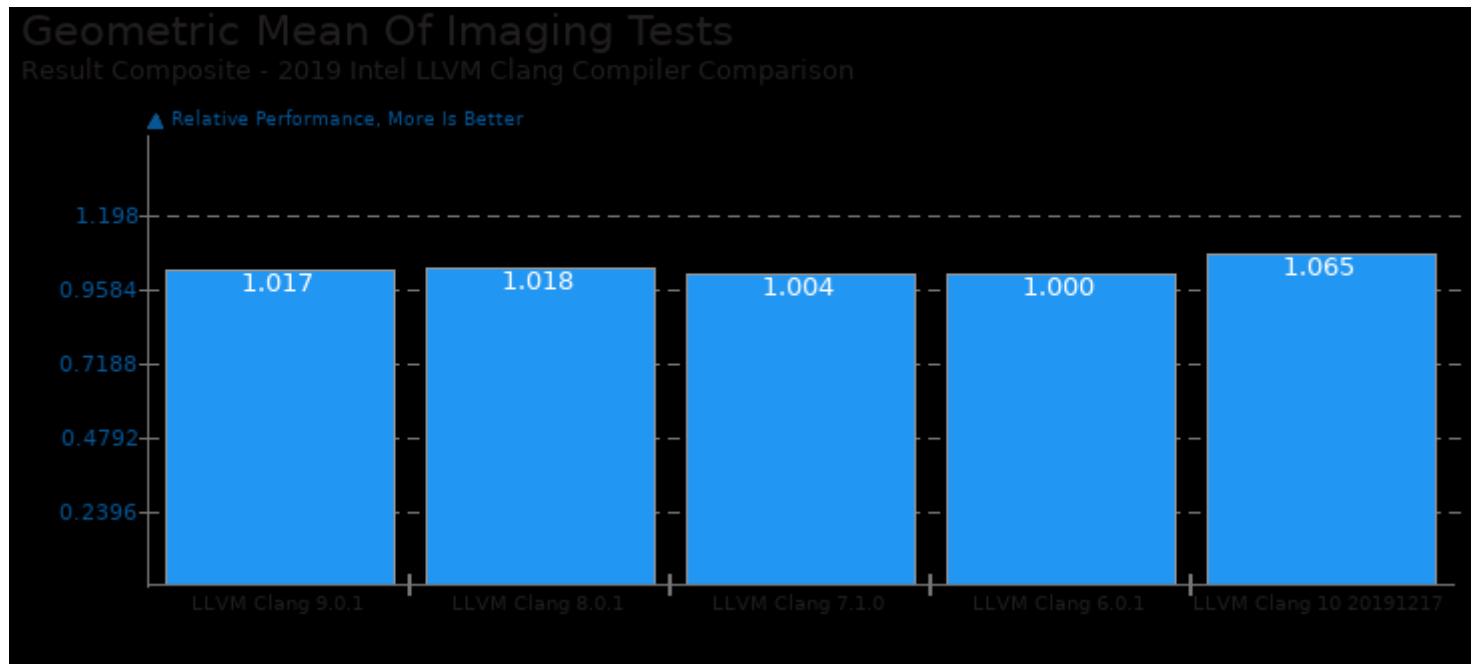
Result Composite - 2019 Intel LLVM Clang Compiler Comparison



Geometric mean based upon tests: pts/svt-vp9, pts/svt-hevc, pts/x264, pts/x265, pts/vpxenc, pts/dav1d, pts/svt-av1 and pts/libgav1



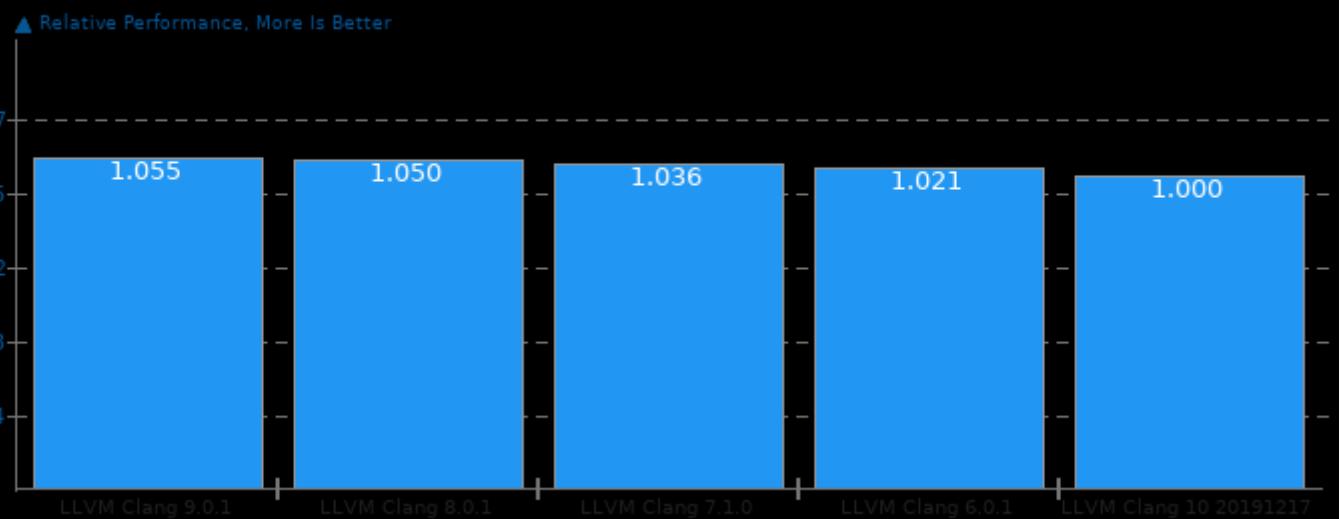
Geometric mean based upon tests: pts/himeno, pts/mrbayes and pts/hmmer



Geometric mean based upon tests: pts/graphics-magick and pts/tjbench

**Geometric Mean Of Common Kernel Benchmarks Tests**

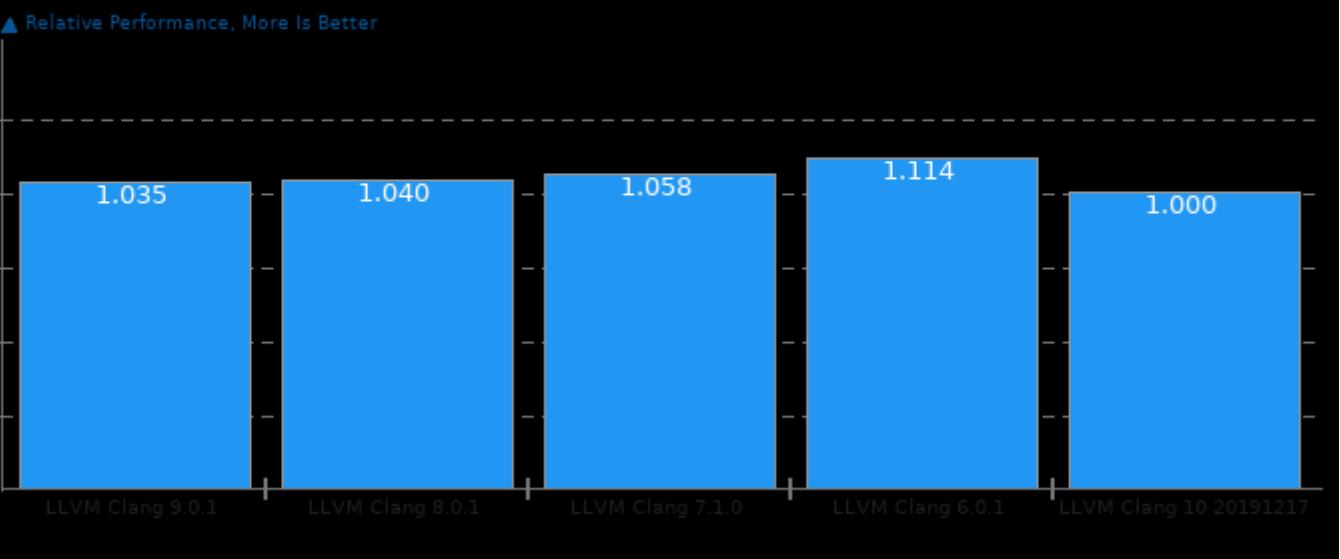
Result Composite - 2019 Intel LLVM Clang Compiler Comparison



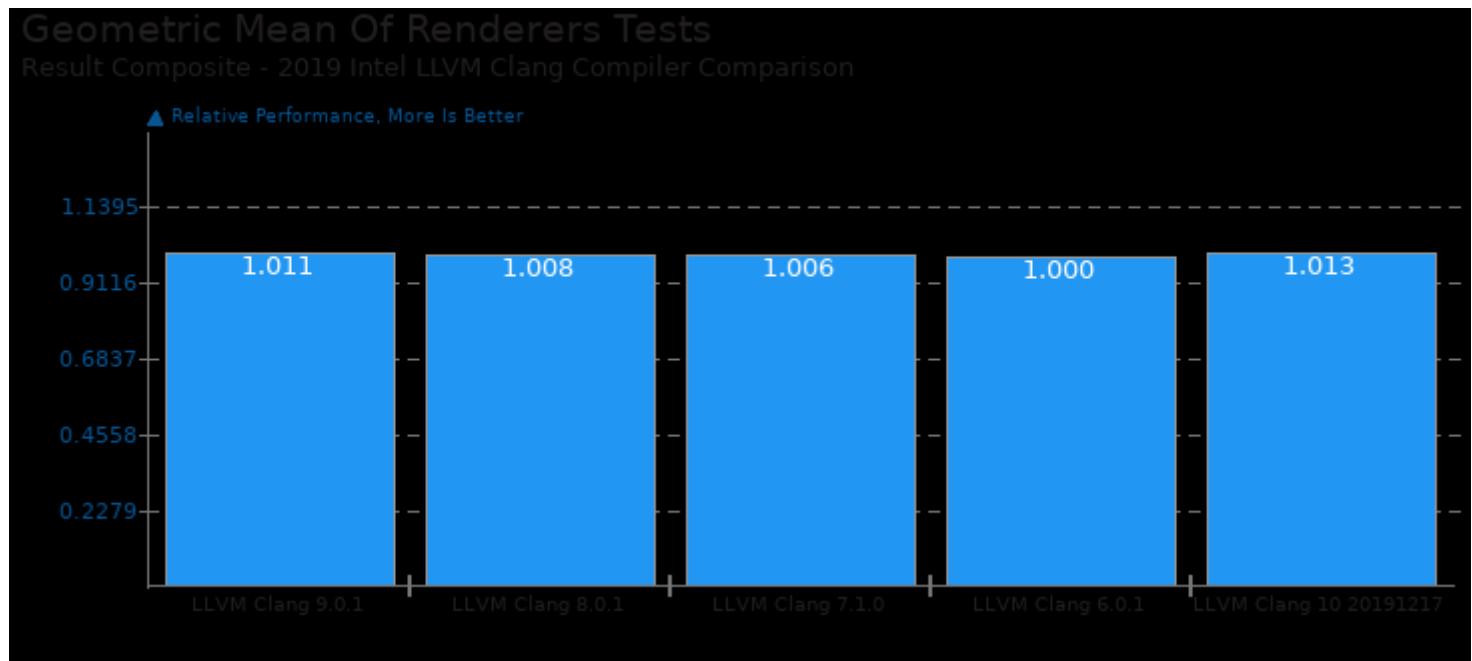
Geometric mean based upon tests: pts/apache and pts/pgbench

**Geometric Mean Of Programmer / Developer System Benchmarks Tests**

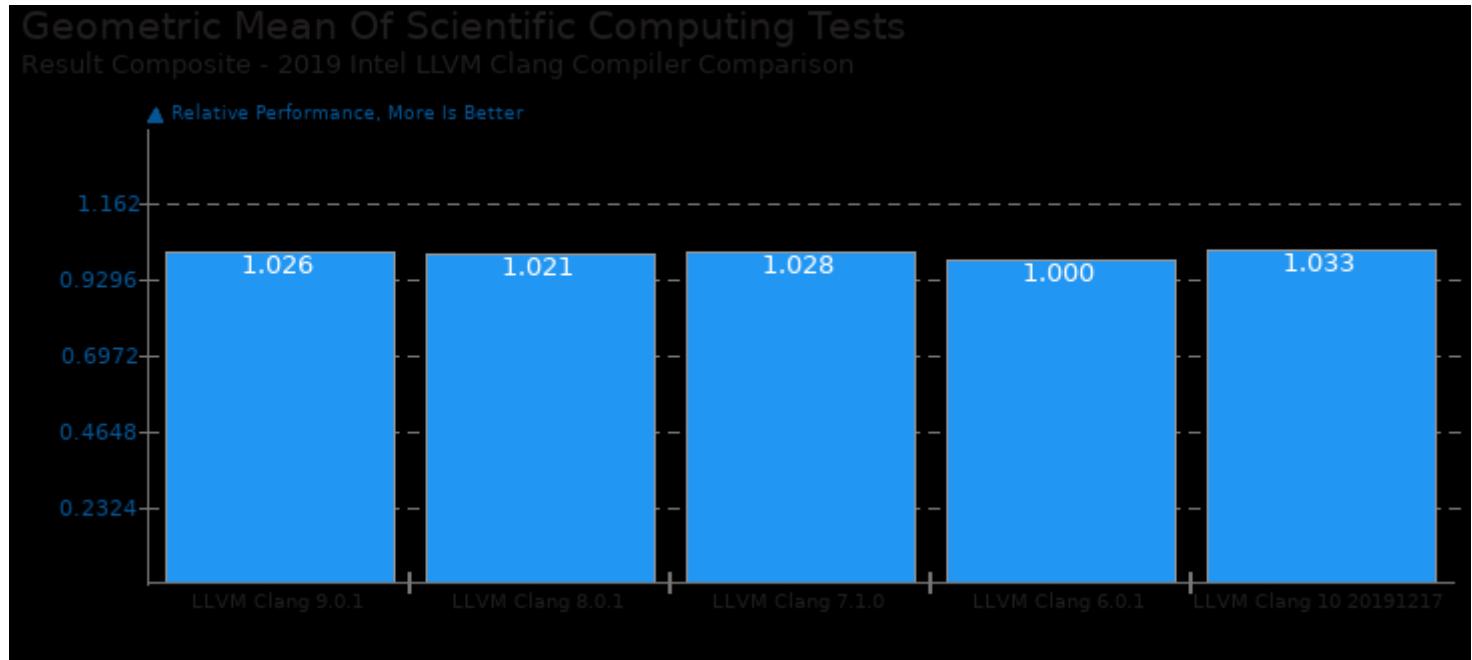
Result Composite - 2019 Intel LLVM Clang Compiler Comparison



Geometric mean based upon tests: pts/compress-zstd and pts/build-php



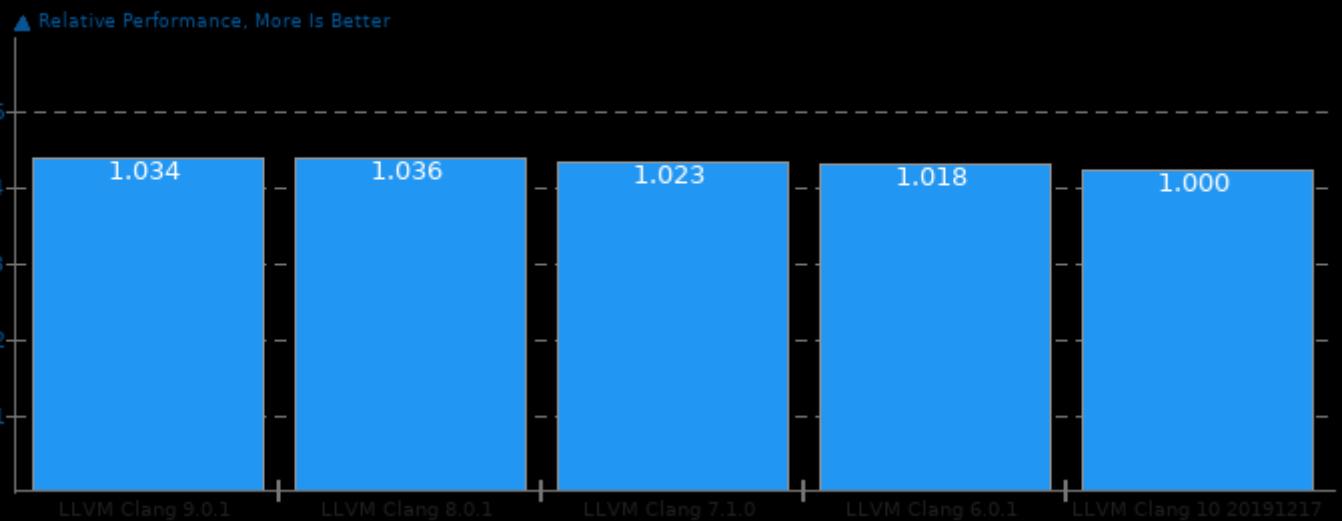
Geometric mean based upon tests: pts/c-ray, pts/tungsten and pts/aobench



Geometric mean based upon tests: pts/himeno, pts/mrbayes and pts/hmmer

## Geometric Mean Of Server Tests

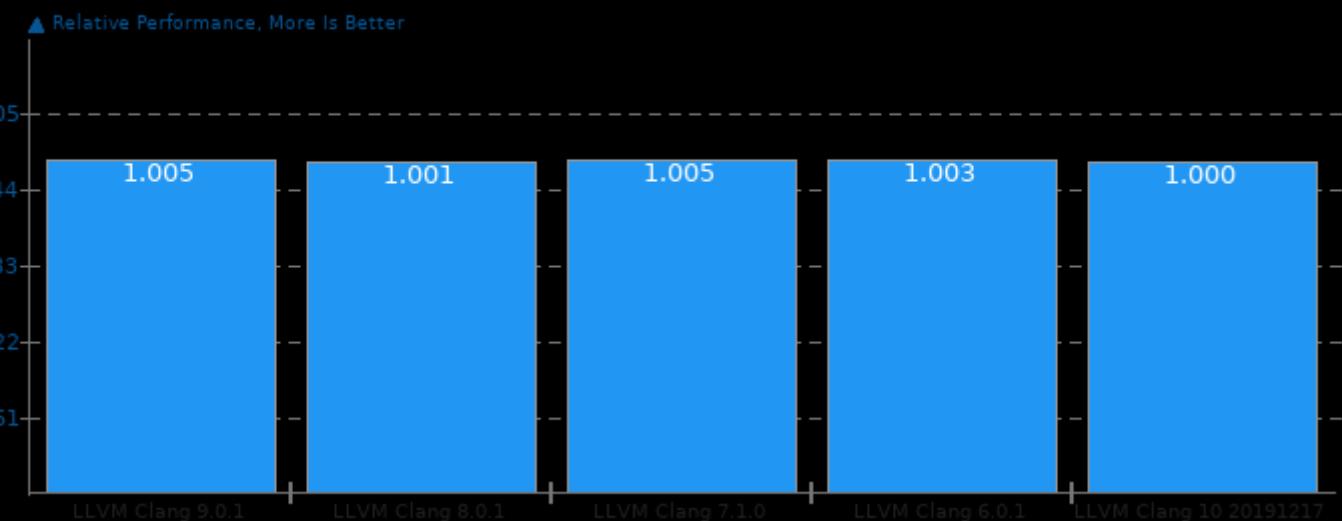
Result Composite - 2019 Intel LLVM Clang Compiler Comparison



Geometric mean based upon tests: pts/apache, pts/nginx, pts/ebizzy and pts/pgbench

## Geometric Mean Of Server CPU Tests

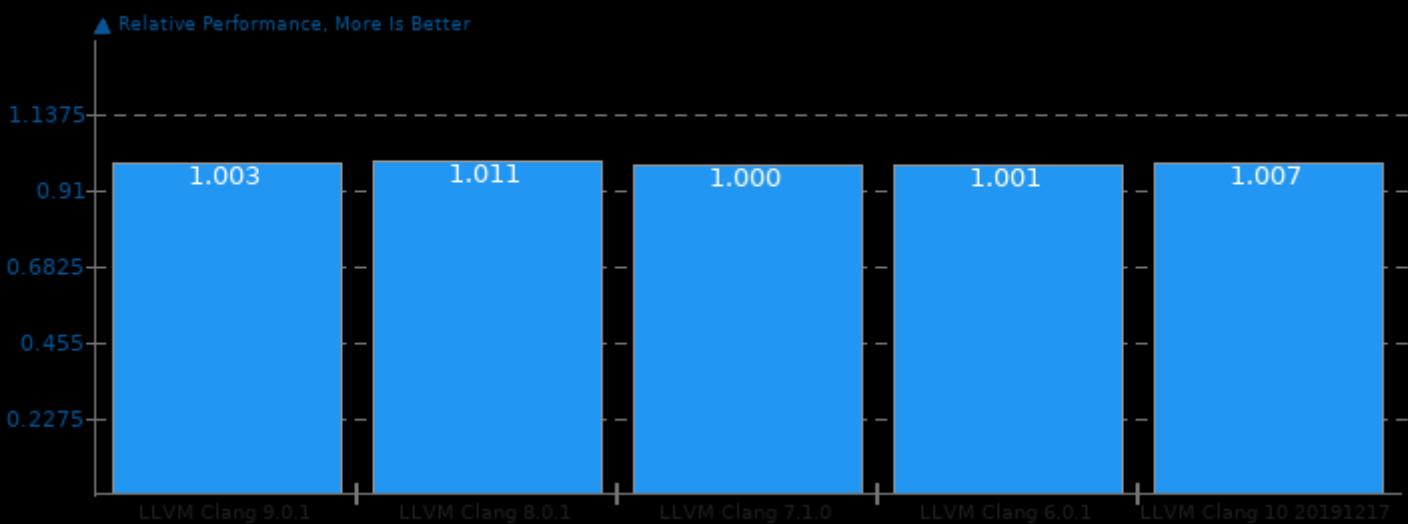
Result Composite - 2019 Intel LLVM Clang Compiler Comparison



Geometric mean based upon tests: pts/john-the-ripper, pts/svt-av1, pts/svt-hevc, pts/svt-vp9, pts/x264, pts/x265, pts/dav1d, pts/himeno, pts/asmfish, pts/build-php, pts/c-ray, pts/compress-zstd and pts/tjbench

### Geometric Mean Of Single-Threaded Tests

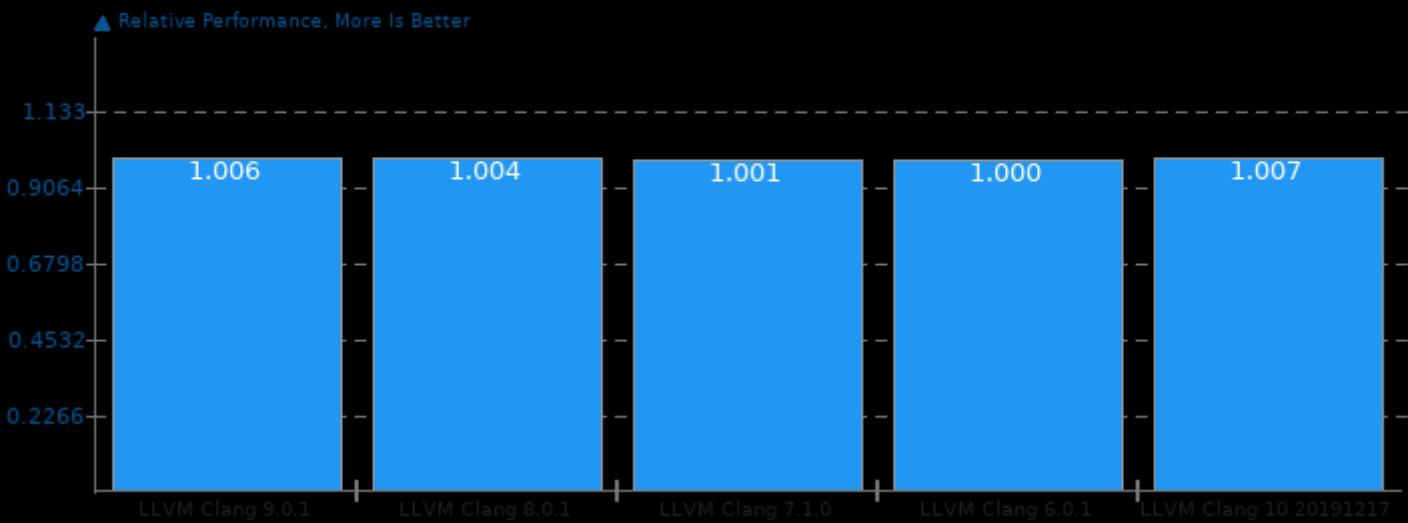
Result Composite - 2019 Intel LLVM Clang Compiler Comparison



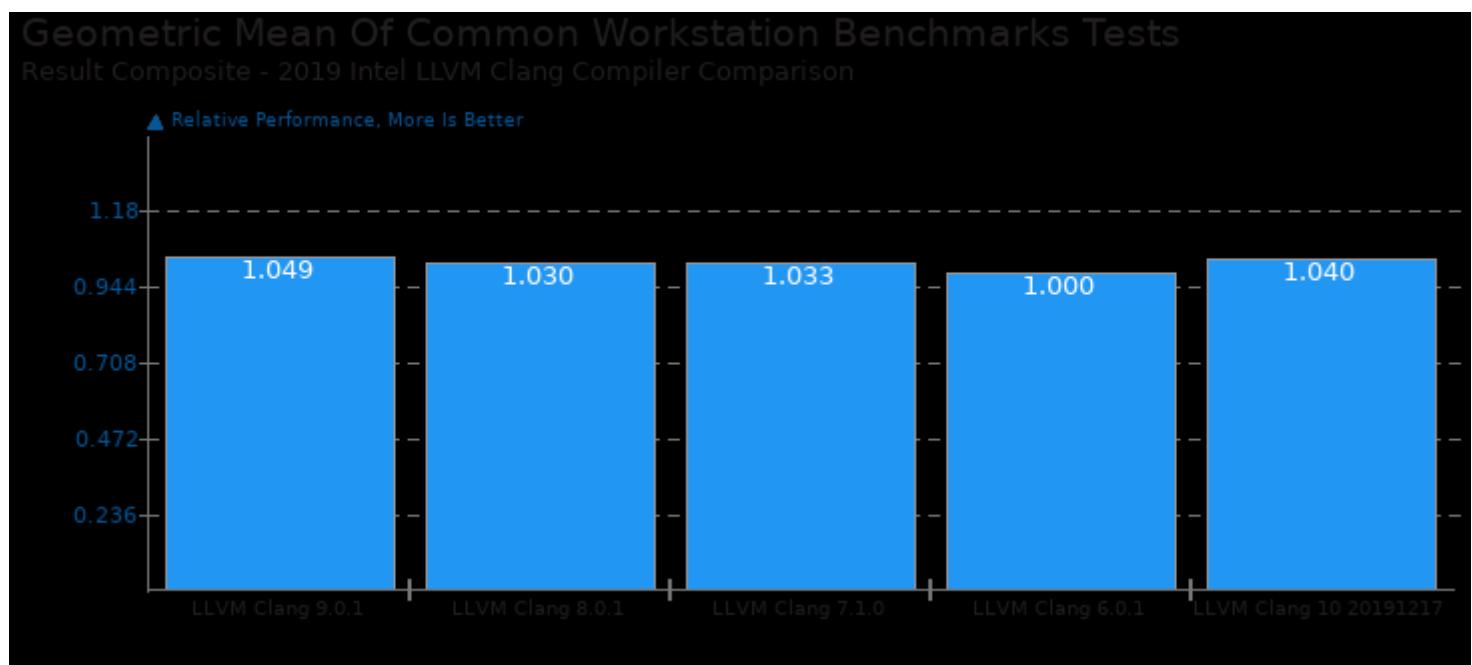
Geometric mean based upon tests: pts/scimark2, pts/minion, pts/tjbench, pts/cpp-perf-bench and pts/nginx

### Geometric Mean Of Video Encoding Tests

Result Composite - 2019 Intel LLVM Clang Compiler Comparison



Geometric mean based upon tests: pts/svt-vp9, pts/svt-hevc, pts/x264, pts/x265, pts/vpxenc, pts/dav1d, pts/svt-av1 and pts/libgav1



Geometric mean based upon tests: pts/himeno and pts/x265

*This file was automatically generated via the Phoronix Test Suite benchmarking software on Thursday, 28 March 2024 16:53.*