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## Intel Xeon Haswell Mitigation Costs Linux

Tests

### Automated Executive Summary

*mitigations=off* had the most wins, coming in first place for 82% of the tests.

Based on the geometric mean of all complete results, the fastest (*mitigations=off*) was 1.232x the speed of the slowest (*mitigations=auto,nosmt*). *mitigations=auto* was 0.875x the speed of *mitigations=off* and *mitigations=auto,nosmt* was 0.928x the speed of *mitigations=auto*.

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

*ctx\_clock* (Context Switch Time) at 7.362x

*Stress-NG* (Test: System V Message Passing) at 2.419x

*Stress-NG* (Test: Context Switching) at 2.232x

*Hackbench* (Count: 32 - Type: Process) at 2.226x

*Stress-NG* (Test: Socket Activity) at 2.083x

*Sysbench* (Test: CPU) at 1.544x

*IndigoBench* (Scene: Bedroom) at 1.522x

*PostgreSQL pgbench* (Scaling: Buffer Test - Test: Normal Load - Mode: Read Only) at 1.501x

*Stress-NG* (Test: Semaphores) at 1.485x

*IndigoBench (Scene: Supercar) at 1.442x.*

## Test Systems:

### **mitigations=off**

Processor: Intel Xeon E5-1680 v3 @ 3.80GHz (8 Cores / 16 Threads), Motherboard: ASUS X99-A (3902 BIOS), Chipset: Intel Xeon E7 v3/Xeon, Memory: 16384MB, Disk: 60GB Patriot Torch, Graphics: eVGA NVIDIA NVE7 1GB, Audio: Realtek ALC1150, Monitor: VE228, Network: Intel I218-V

OS: Ubuntu 18.04, Kernel: 4.18.0-20-generic (x86\_64), Desktop: GNOME Shell 3.28.3, Display Server: X Server 1.20.1, Display Driver: modesetting 1.20.1, OpenGL: 4.3 Mesa 18.2.8, Compiler: GCC 7.4.0, File-System: ext4, Screen Resolution: 1920x1080

Compiler Notes: --build=x86\_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --enable-plugin --enable-shared --enable-threads=posix --host=x86\_64-linux-gnu --program-prefix=x86\_64-linux-gnu- --target=x86\_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib --with-tune=generic --without-cuda-driver -v

Disk Notes: CFQ / errors=remount-ro,relatime,rw

Processor Notes: Scaling Governor: intel\_pstate powersave

Python Notes: Python 2.7.15rc1 + Python 3.6.7

Security Notes: I1tf: Mitigation of PTE Inversion + mds: Vulnerable; SMT vulnerable + meltdown: Vulnerable + spec\_store\_bypass: Vulnerable + spectre\_v1: Mitigation of \_\_user pointer sanitization + spectre\_v2: Vulnerable IBPB: disabled STIBP: disabled

### **mitigations=auto,nosmt**

Processor: Intel Xeon E5-1680 v3 @ 3.80GHz (8 Cores), Motherboard: ASUS X99-A (3902 BIOS), Chipset: Intel Xeon E7 v3/Xeon, Memory: 16384MB, Disk: 60GB Patriot Torch, Graphics: eVGA NVIDIA NVE7 1GB, Audio: Realtek ALC1150, Monitor: VE228, Network: Intel I218-V

OS: Ubuntu 18.04, Kernel: 4.18.0-20-generic (x86\_64), Desktop: GNOME Shell 3.28.3, Display Server: X Server 1.20.1, Display Driver: modesetting 1.20.1, OpenGL: 4.3 Mesa 18.2.8, Compiler: GCC 7.4.0, File-System: ext4, Screen Resolution: 1920x1080

Compiler Notes: --build=x86\_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --enable-plugin --enable-shared --enable-threads=posix --host=x86\_64-linux-gnu --program-prefix=x86\_64-linux-gnu- --target=x86\_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib --with-tune=generic --without-cuda-driver -v

Disk Notes: CFQ / errors=remount-ro,relatime,rw

Processor Notes: Scaling Governor: intel\_pstate powersave

Python Notes: Python 2.7.15rc1 + Python 3.6.7

Security Notes: KPTI + I1tf: Mitigation of PTE Inversion + mds: Mitigation of Clear buffers; SMT disabled + meltdown: Mitigation of PTI + spec\_store\_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre\_v1: Mitigation of \_\_user pointer sanitization + spectre\_v2: Mitigation of Full generic retpoline IBPB: conditional IBRS\_FW RSB filling

### **mitigations=auto**

Processor: Intel Xeon E5-1680 v3 @ 3.80GHz (8 Cores / 16 Threads), Motherboard: ASUS X99-A (3902 BIOS), Chipset: Intel Xeon E7 v3/Xeon, Memory: 16384MB, Disk: 60GB Patriot Torch, Graphics: eVGA NVIDIA NVE7 1GB, Audio: Realtek ALC1150, Monitor: VE228, Network: Intel I218-V

OS: Ubuntu 18.04, Kernel: 4.18.0-20-generic (x86\_64), Desktop: GNOME Shell 3.28.3, Display Server: X Server 1.20.1,

## Intel Xeon Haswell Mitigation Costs Linux

Display Driver: modesetting 1.20.1, OpenGL: 4.3 Mesa 18.2.8, Compiler: GCC 7.4.0, File-System: ext4, Screen Resolution: 1920x1080

Compiler Notes: --build=x86\_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multilib --enable-mtlib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --enable-plugin --enable-shared --enable-threads=posix --host=x86\_64-linux-gnu --program-prefix=x86\_64-linux-gnu- --target=x86\_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib --with-tune=generic --without-cuda-driver -v

Disk Notes: CFQ / errors=remount-ro,relatime,rw

Processor Notes: Scaling Governor: intel\_pstate powersave

Python Notes: Python 2.7.15rc1 + Python 3.6.7

Security Notes: KPTI + I1tf: Mitigation of PTE Inversion + 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 \_\_user pointer sanitization + spectre\_v2: Mitigation of Full generic retpoline IBPB: conditional IBRS\_FW STIBP: conditional RSB filling

	mitigations=off	mitigations=auto,nos	mitigations=auto
<b>FS-Mark - 1.F.1.S (Files/s)</b>	66.08	<b>63.83</b>	<b>66.27</b>
Normalized	99.71%	96.32%	100%
Standard Deviation	15.1%	1.3%	2.3%
<b>BlogBench - Read (Final Score)</b>	<b>1872460</b>	<b>1244210</b>	1653305
Normalized	100%	66.45%	88.3%
Standard Deviation	23.9%	32.2%	32.2%
<b>BlogBench - Write (Final Score)</b>	5289	<b>5314</b>	<b>5268</b>
Normalized	99.53%	100%	99.13%
Standard Deviation	4.1%	4.9%	3.6%
<b>Compile Bench - Compile (MB/s)</b>	<b>705</b>	<b>648</b>	694
Normalized	100%	91.91%	98.44%
Standard Deviation	2.8%	2.5%	6.9%
<b>Compile Bench - Initial Create (MB/s)</b>	<b>377</b>	<b>328</b>	334
Normalized	100%	87%	88.59%
Standard Deviation	9.8%	9%	8.5%
<b>PostMark - D.T.P (TPS)</b>	<b>6759</b>	5319	<b>5245</b>
Normalized	100%	78.7%	77.6%
Standard Deviation	2.7%		1.2%
<b>t-test1 - 2 (sec)</b>	<b>9.61</b>	11.74	<b>11.97</b>
Normalized	100%	81.86%	80.28%
Standard Deviation	2.6%	1.2%	1%
<b>Sockperf - Throughput (Messages/sec)</b>	<b>561057</b>	<b>427801</b>	429807
Normalized	100%	76.25%	76.61%
Standard Deviation	2.8%	3.9%	1.3%
<b>Sockperf - Latency Ping Pong (usec)</b>	<b>3.86</b>	4.16	<b>4.58</b>
Normalized	100%	92.79%	84.28%
Standard Deviation	11%	1.5%	7.6%
<b>Sockperf - Latency Under Load (usec)</b>	23.35	<b>19.26</b>	<b>24.59</b>
Normalized	82.48%	100%	78.32%
Standard Deviation	13.4%	3.1%	18.3%
<b>Ethr - TCP - Latency - 1 (us)</b>	<b>17.03</b>	<b>20.24</b>	20.12
Normalized	100%	84.14%	84.64%
Standard Deviation	1.6%	0.6%	1.2%
<b>Ethr - TCP - Latency - 32 (us)</b>	<b>17.33</b>	20.36	<b>20.38</b>
Normalized	100%	85.12%	85.03%
Standard Deviation	1.4%	2.1%	0.5%
<b>Ethr - TCP - Latency - 64 (us)</b>	<b>17.76</b>	20.41	<b>20.48</b>
Normalized	100%	87.02%	86.72%

	Standard Deviation	1.3%	0.1%	0.2%
Ethr - HTTP - Bandwidth - 1 (Mbits/s)	567	<b>570</b>	<b>509</b>	
	Normalized	99.47%	100%	89.3%
	Standard Deviation	0.2%	0.3%	0.3%
Ethr - TCP - Bandwidth - 64 (Mbits/s)	<b>160942</b>	<b>133093</b>	152555	
	Normalized	100%	82.7%	94.79%
	Standard Deviation	0.2%	0.3%	0.3%
Ethr - UDP - Bandwidth - 64 (Mbits/s)	<b>276989</b>	<b>218244</b>	273250	
	Normalized	100%	78.79%	98.65%
	Standard Deviation	2.2%	6.7%	2.7%
Ethr - HTTP - Bandwidth - 64 (Mbits/s)	<b>5504</b>	<b>4099</b>	5178	
	Normalized	100%	74.47%	94.08%
	Standard Deviation	1.1%	0.4%	0.8%
Ethr - TCP - Connections/s - 1 (Connections/sec)	<b>8823</b>	<b>7677</b>	7787	
	Normalized	100%	87.01%	88.26%
	Standard Deviation	1.8%	0.6%	1.7%
NAMD - ATPase Simulation - 327,506 Atoms	<b>2.24220</b>	<b>2.74109</b>	2.24899	
	(days/ns)			
	Normalized	100%	81.8%	99.7%
	Standard Deviation	0%	1.1%	0.2%
x264 - H.2.V.E (FPS)	<b>62.03</b>	<b>47.33</b>	61.47	
	Normalized	100%	76.3%	99.1%
	Standard Deviation	2.8%	2.9%	2.9%
7-Zip Compression - C.S.T (MIPS)	<b>40204</b>	<b>32907</b>	39515	
	Normalized	100%	81.85%	98.29%
	Standard Deviation	0.9%	0.3%	0.9%
Timed Linux Kernel Compilation - Time To Compile (sec)	<b>95.07</b>	<b>112.61</b>	97.56	
	Normalized	100%	84.42%	97.45%
	Standard Deviation	2.2%	2%	2.2%
Timed LLVM Compilation - Time To Compile (sec)	<b>556</b>	<b>667</b>	565	
	Normalized	100%	83.36%	98.41%
	Standard Deviation	0.1%	0.1%	0.1%
Y-Cruncher - C.5.P.D (sec)	28.71	<b>33.52</b>	<b>28.70</b>	
	Normalized	99.97%	85.62%	100%
	Standard Deviation	0.1%	0.1%	0.1%
XZ Compression - C.u.1.0.3.s.i.i.C.L.9 (sec)	<b>30.76</b>	<b>42.24</b>	30.86	
	Normalized	100%	72.82%	99.68%
	Standard Deviation	0.4%	0.1%	0.4%
Zstd Compression - C.u.1.0.3.s.i.i.C.L.1 (sec)	<b>19.94</b>	<b>23.33</b>	20.11	
	Normalized	100%	85.47%	99.15%
	Standard Deviation	0.8%	0.5%	0.1%
Hackbench - 32 - Process (sec)	<b>70.09</b>	<b>156.01</b>	123.99	
	Normalized	100%	44.93%	56.53%
	Standard Deviation	0.4%	2.6%	0.3%
Perl Benchmarks - Interpreter (sec)	0.00205956	<b>0.00197524</b>	<b>0.00233209</b>	
	Normalized	95.91%	100%	84.7%
	Standard Deviation	1.5%	0.5%	0.4%
OpenSSL - R.4.b.P (Signs/sec)	<b>1275</b>	<b>1255</b>	<b>1275</b>	
	Normalized	100%	98.43%	100%
	Standard Deviation	0%	0.3%	0.1%
glibc bench - ffs (nanoseconds)	<b>1.71</b>	2.05	<b>2.08</b>	
	Normalized	100%	83.41%	82.21%
	Standard Deviation	0.1%	0.1%	2.4%

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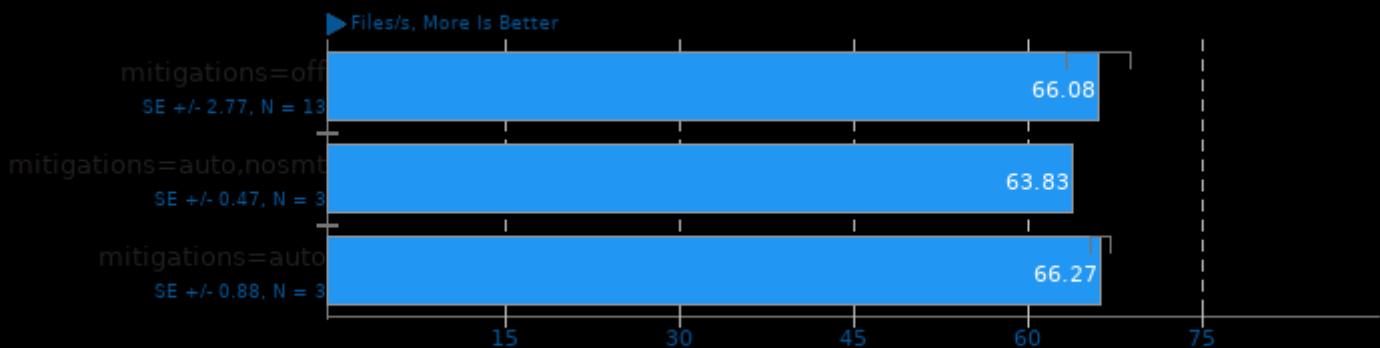
<b>glibc bench - ffsll (nanoseconds)</b>	<b>1.97</b>	<b>2.31</b>	<b>2.31</b>
Normalized	100%	85.28%	85.28%
Standard Deviation	0.1%	0.2%	0.1%
<b>glibc bench - pthread_once (nanoseconds)</b>	<b>1.71</b>	<b>2.05</b>	<b>2.05</b>
Normalized	100%	83.41%	83.41%
Standard Deviation	0%	0.1%	0.1%
<b>libjpeg-turbo tjbench - D.T (Megapixels/sec)</b>	<b>153</b>	<b>152</b>	<b>153</b>
Normalized	100%	99.35%	100%
Standard Deviation	0.5%	1.2%	0.9%
<b>PostgreSQL pgbench - Buffer Test - Normal</b>	<b>168518</b>	<b>112260</b>	157869
Load - Read Only (TPS)			
Normalized	100%	66.62%	93.68%
Standard Deviation	2.8%	0.5%	0.1%
<b>Redis - LPOP (Reqs/sec)</b>	<b>2295251</b>	1570796	<b>1467283</b>
Normalized	100%	68.44%	63.93%
Standard Deviation	10.3%	1.1%	6.1%
<b>Redis - SADD (Reqs/sec)</b>	<b>1983532</b>	1957163	<b>1874816</b>
Normalized	100%	98.67%	94.52%
Standard Deviation	6.5%	1.3%	2.8%
<b>Redis - LPUSH (Reqs/sec)</b>	<b>1487297</b>	<b>1562523</b>	1507584
Normalized	95.19%	100%	96.48%
Standard Deviation	9.2%	0.5%	0.7%
<b>Redis - GET (Reqs/sec)</b>	<b>2214385</b>	2184999	<b>2087360</b>
Normalized	100%	98.67%	94.26%
Standard Deviation	7.8%	0.1%	3.8%
<b>Redis - SET (Reqs/sec)</b>	<b>1683548</b>	1646553	<b>1600933</b>
Normalized	100%	97.8%	95.09%
Standard Deviation	6.3%	3%	3.6%
<b>Stress-NG - Semaphores (Bogo Ops/s)</b>	3630085	<b>5082198</b>	<b>3422465</b>
Normalized	71.43%	100%	67.34%
Standard Deviation	0.7%	0.4%	0.5%
<b>Stress-NG - Socket Activity (Bogo Ops/s)</b>	<b>7984</b>	<b>3833</b>	5023
Normalized	100%	48.01%	62.91%
Standard Deviation	4.6%	0.6%	3.2%
<b>Stress-NG - Context Switching (Bogo Ops/s)</b>	<b>4559788</b>	<b>2043135</b>	3399768
Normalized	100%	44.81%	74.56%
Standard Deviation	2%	0.7%	1.6%
<b>Stress-NG - S.V.M.P (Bogo Ops/s)</b>	<b>9325577</b>	<b>3854803</b>	7076692
Normalized	100%	41.34%	75.88%
Standard Deviation	0.1%	3%	0.2%
<b>ctx_clock - C.S.T (Clocks)</b>	<b>149</b>	1095	<b>1097</b>
Normalized	100%	13.61%	13.58%
Standard Deviation		0.6%	
<b>Sysbench - Memory (Events/sec)</b>	18931194	<b>13157574</b>	<b>18958747</b>
Normalized	99.85%	69.4%	100%
Standard Deviation	0.1%	2.9%	0.1%
<b>Sysbench - CPU (Events/sec)</b>	<b>13869</b>	<b>8984</b>	13866
Normalized	100%	64.78%	99.98%
Standard Deviation	0%	0%	0%
<b>Chaos Group V-RAY - CPU (Ksamples)</b>	<b>10285</b>	<b>8358</b>	10271
Normalized	100%	81.26%	99.86%
Standard Deviation	2%	0.7%	0.6%
<b>IndigoBench - Bedroom (M samples/s)</b>	<b>1.02</b>	<b>0.67</b>	<b>1.02</b>
Normalized	100%	65.69%	100%
Standard Deviation	0.1%	0.1%	0.2%

<b>IndigoBench - Supercar (M samples/s)</b>	<b>2.38</b>	<b>1.65</b>	<b>2.38</b>
Normalized	100%	69.33%	100%
Standard Deviation	0.3%	1.2%	0.2%
<b>Memcached mcperf - Add (Operations/sec)</b>	<b>57963</b>	<b>54002</b>	<b>47515</b>
Normalized	100%	93.17%	81.97%
Standard Deviation	12.8%	9%	10.1%
<b>Memcached mcperf - Get (Operations/sec)</b>	<b>118080</b>	<b>96971</b>	<b>96075</b>
Normalized	100%	82.12%	81.36%
Standard Deviation	0.8%	1.3%	1.1%
<b>Memcached mcperf - Set (Operations/sec)</b>	<b>61553</b>	<b>53387</b>	<b>46825</b>
Normalized	100%	86.73%	76.07%
Standard Deviation	9.9%	7%	8.8%
<b>Memcached mcperf - Append</b>	<b>53997</b>	<b>48752</b>	<b>51707</b>
Normalized	100%	90.29%	95.76%
Standard Deviation	0.6%	1.8%	9.4%
<b>Memcached mcperf - Delete (Operations/sec)</b>	<b>122037</b>	<b>96407</b>	<b>94935</b>
Normalized	100%	79%	77.79%
Standard Deviation	0.6%	0.6%	1.1%
<b>Memcached mcperf - Prepend</b>	<b>54633</b>	<b>48614</b>	<b>54266</b>
Normalized	100%	88.98%	99.33%
Standard Deviation	9.4%	1.7%	8.9%
<b>Memcached mcperf - Replace</b>	<b>55432</b>	<b>48603</b>	<b>58599</b>
Normalized	94.6%	82.94%	100%
Standard Deviation	9.5%	1.6%	0.6%
<b>PyBench - T.F.A.T.T (Milliseconds)</b>	<b>1230</b>	<b>1231</b>	<b>1233</b>
Normalized	100%	99.92%	99.76%
Standard Deviation		0.1%	0.2%
<b>NGINX Benchmark - S.W.P.S (Reqs/sec)</b>	<b>34413</b>	<b>25246</b>	<b>26330</b>
Normalized	100%	73.36%	76.51%
Standard Deviation	1.8%	0.8%	1.8%
<b>Apache Benchmark - S.W.P.S (Reqs/sec)</b>	<b>27213</b>	<b>27414</b>	<b>21655</b>
Normalized	99.27%	100%	78.99%
Standard Deviation	0.8%	1.4%	2%
<b>Apache Siege - 250 (Transactions/sec)</b>		<b>42751</b>	<b>31750</b>
Normalized		100%	74.27%
Standard Deviation		3%	11.2%
<b>PHPBench - P.B.S (Score)</b>	<b>565312</b>	<b>564930</b>	<b>563436</b>
Normalized	100%	99.93%	99.67%
Standard Deviation	0%	0.1%	0.6%
<b>Git - T.T.C.C.G.C (sec)</b>	<b>6.25</b>	<b>6.45</b>	<b>6.31</b>
Normalized	100%	96.9%	99.05%
Standard Deviation	0.3%	3%	2.3%
<b>Scikit-Learn (sec)</b>	<b>13.35</b>	<b>13.81</b>	<b>13.75</b>
Normalized	100%	96.67%	97.09%
Standard Deviation	1.3%	0.8%	1.3%
<b>OSBench - Create Files (us/Event)</b>	<b>12.36</b>	<b>15.75</b>	<b>15.71</b>
Normalized	100%	78.48%	78.68%
Standard Deviation	1.6%	0.3%	1%
<b>OSBench - Create Threads (us/Event)</b>	<b>13.42</b>	<b>15.41</b>	<b>16.65</b>
Normalized	100%	87.09%	80.6%
Standard Deviation	0.8%	2.7%	1.3%
<b>OSBench - Launch Programs (us/Event)</b>	<b>28.59</b>	<b>40.74</b>	<b>32.80</b>
Normalized	100%	70.18%	87.16%
Standard Deviation	0.2%	0.9%	0.7%
<b>OSBench - Memory Allocations (Ns/Event)</b>	<b>79.31</b>	<b>94.99</b>	<b>85.61</b>

	Normalized	100%	83.49%	92.64%
	Standard Deviation	0.3%	0.4%	0.1%
<b>Darktable - Boat - CPU-only (sec)</b>	10.89	<b>10.41</b>	<b>11.00</b>	
	Normalized	95.59%	100%	94.64%
	Standard Deviation	0.4%	0.3%	0.3%
<b>Darktable - Masskrug - CPU-only (sec)</b>	<b>6.46</b>	<b>7.80</b>	6.62	
	Normalized	100%	82.82%	97.58%
	Standard Deviation	0.1%	0.8%	0.3%
<b>Darktable - Server Room - CPU-only (sec)</b>	<b>4.93</b>	<b>5.41</b>	5.00	
	Normalized	100%	91.13%	98.6%
	Standard Deviation	0.2%	0.4%	0.3%
<b>GIMP - resize (sec)</b>	<b>10.46</b>	11.77	<b>11.97</b>	
	Normalized	100%	88.87%	87.39%
	Standard Deviation	2.2%	1.4%	2.1%
<b>GIMP - rotate (sec)</b>	<b>23.44</b>	<b>26.14</b>	26.03	
	Normalized	100%	89.67%	90.05%
	Standard Deviation	0.4%	0.5%	1.1%
<b>GIMP - auto-levels (sec)</b>	<b>20.02</b>	<b>22.61</b>	22.09	
	Normalized	100%	88.54%	90.63%
	Standard Deviation	0.9%	0.6%	0.7%
<b>GIMP - unsharp-mask (sec)</b>	<b>43.59</b>	<b>51.03</b>	49.60	
	Normalized	100%	85.42%	87.88%
	Standard Deviation	0.3%	0.8%	0.7%
<b>Geometric Mean Of All Test Results - Result</b>	<b>808.312</b>	<b>656.206</b>	707.014	
<b>Composite - I.X.H.M.C.L (Geometric Mean)</b>				
	Normalized	100%	81.18%	87.47%

## FS-Mark 3.3

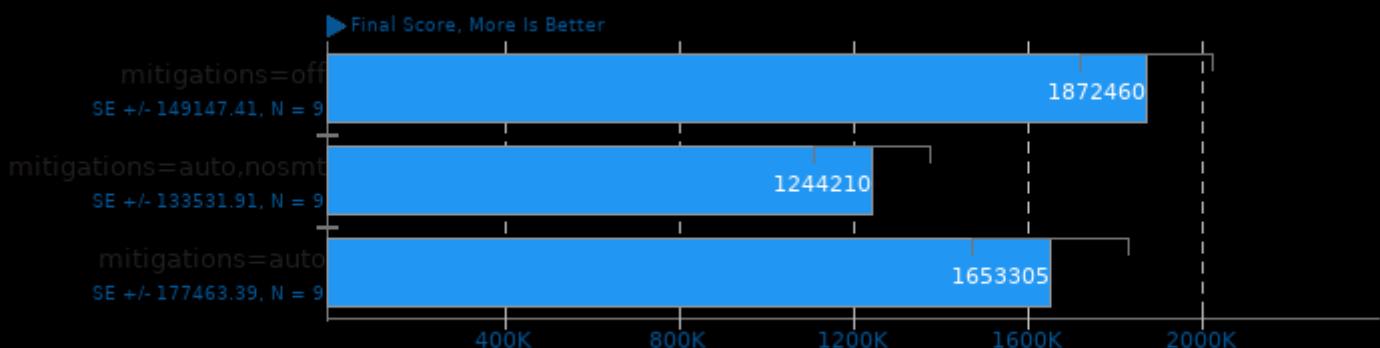
Test: 1000 Files, 1MB Size



1. (CC) gcc options: -static

## BlogBench 1.1

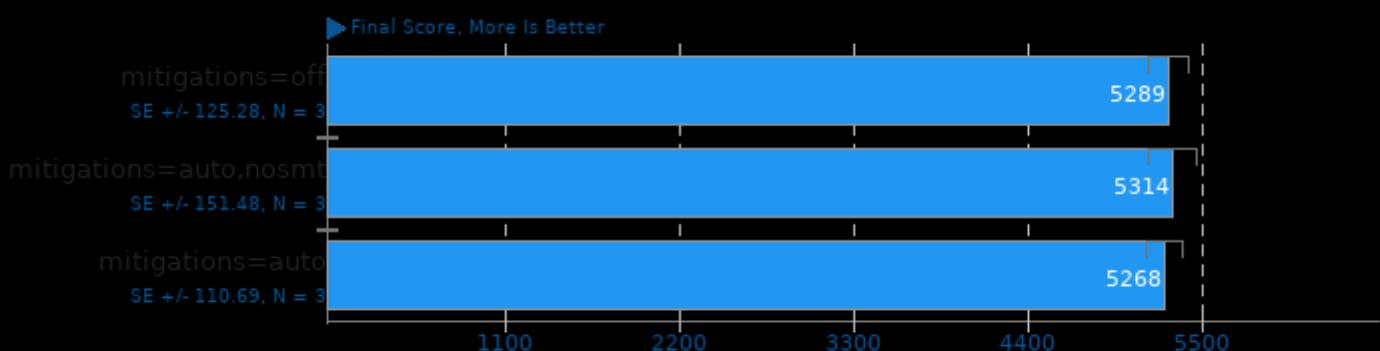
Test: Read



1. (CC) gcc options: -O2 -pthread

## BlogBench 1.1

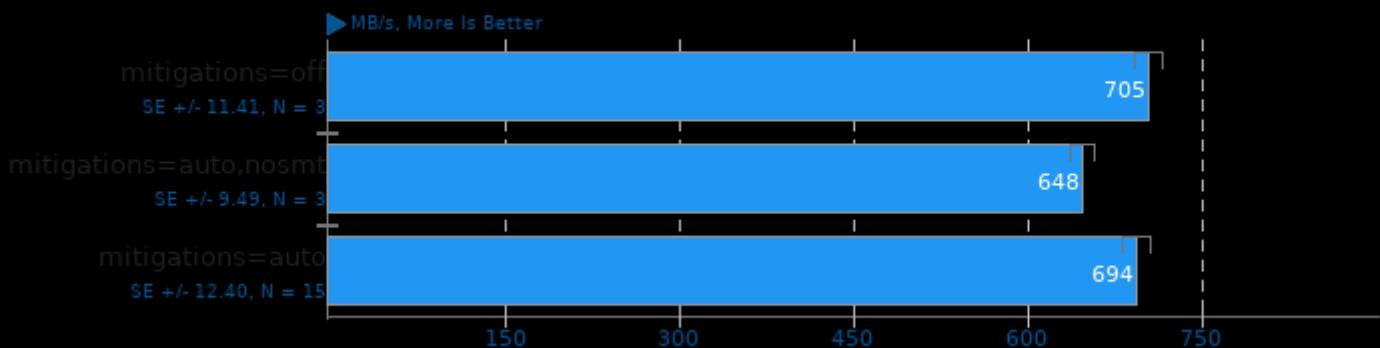
Test: Write



1. (CC) gcc options: -O2 -pthread

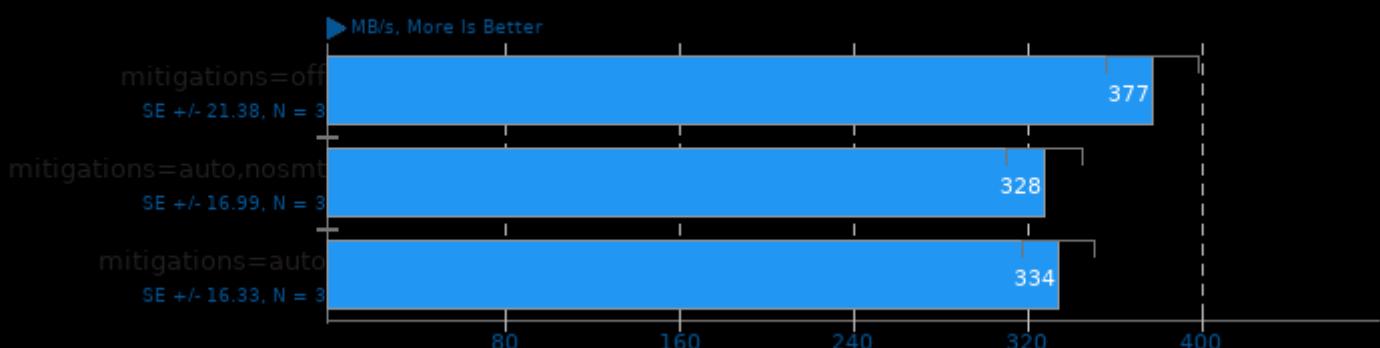
## Compile Bench 0.6

Test: Compile



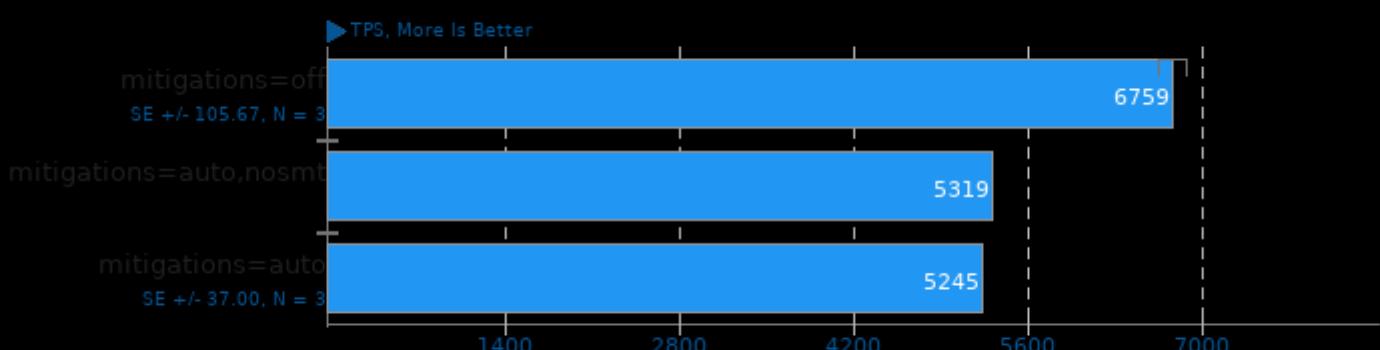
## Compile Bench 0.6

Test: Initial Create



## PostMark 1.51

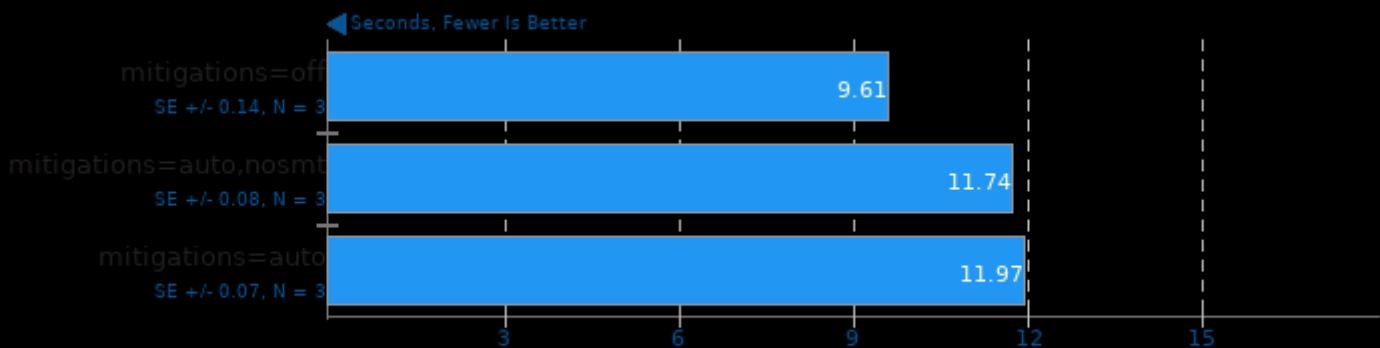
Disk Transaction Performance



1. (CC) gcc options: -O3

t-test1 2017-01-13

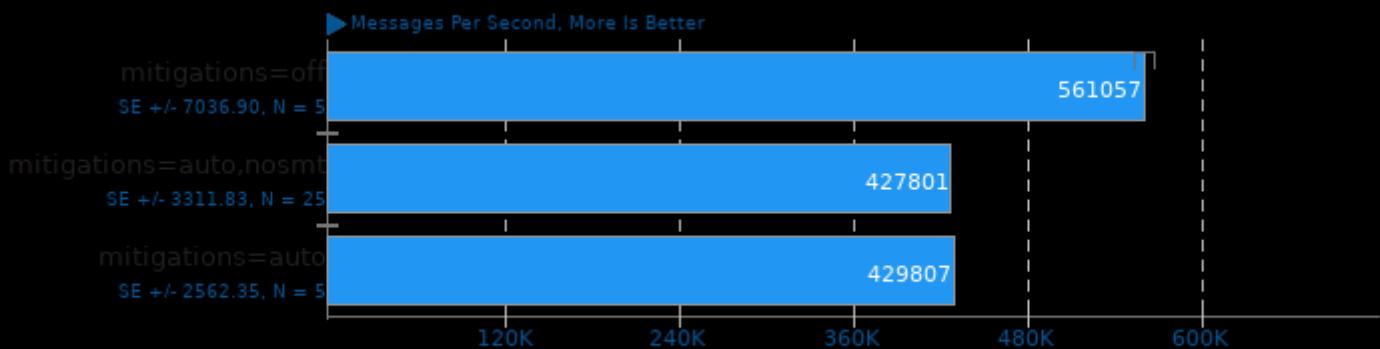
Threads: 2



1. (CC) gcc options: -pthread

## Sockperf 3.4

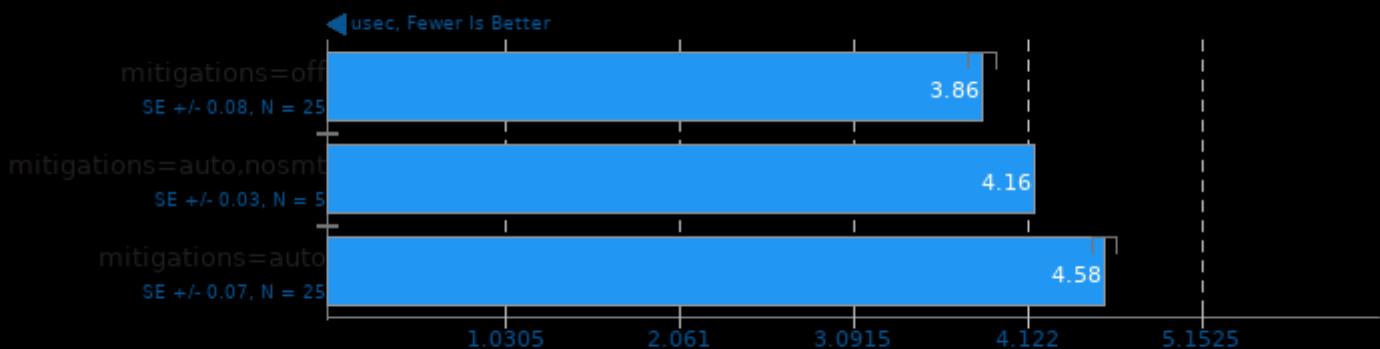
Test: Throughput



1. (CXX) g++ options: --param -O3 -rdynamic -ldl -pthread

## Sockperf 3.4

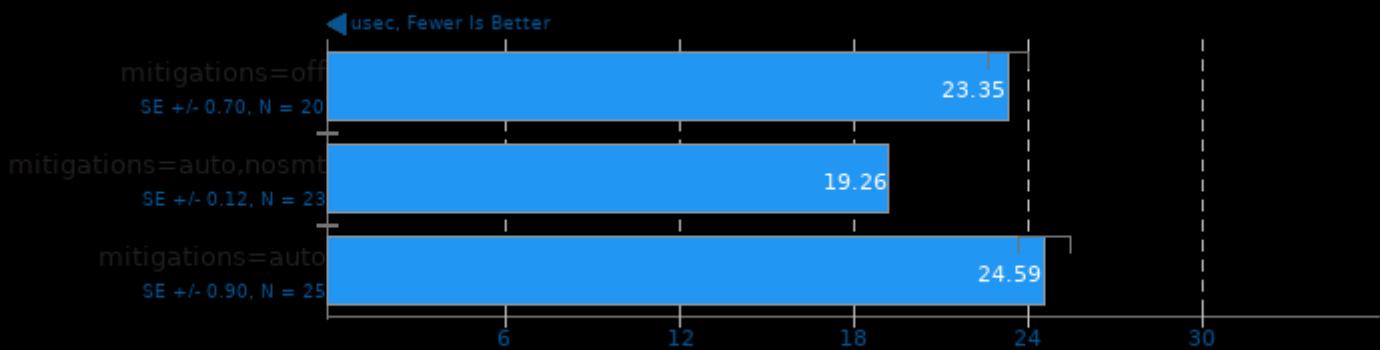
Test: Latency Ping Pong



1. (CXX) g++ options: --param -O3 -rdynamic -ldl -pthread

## Sockperf 3.4

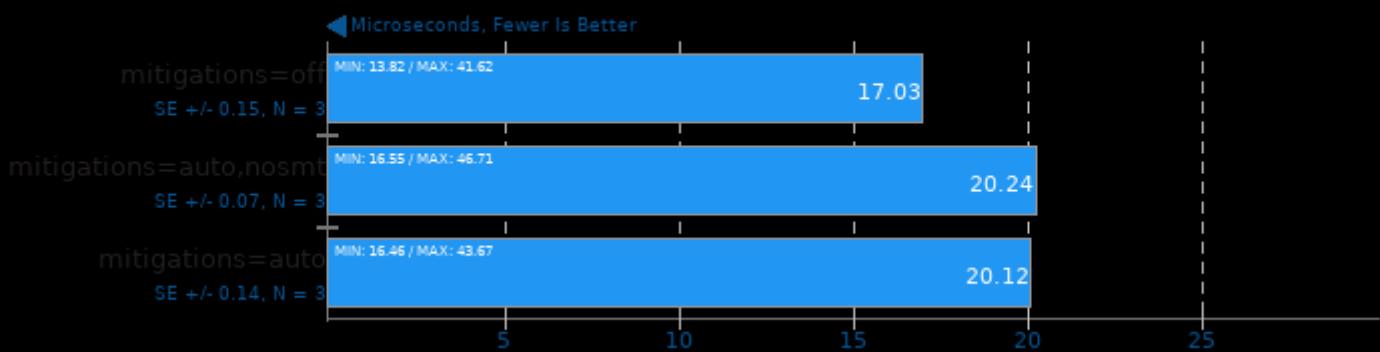
Test: Latency Under Load



1. (CXX) g++ options: -param -O3 -rdynamic -ldl -lpthread

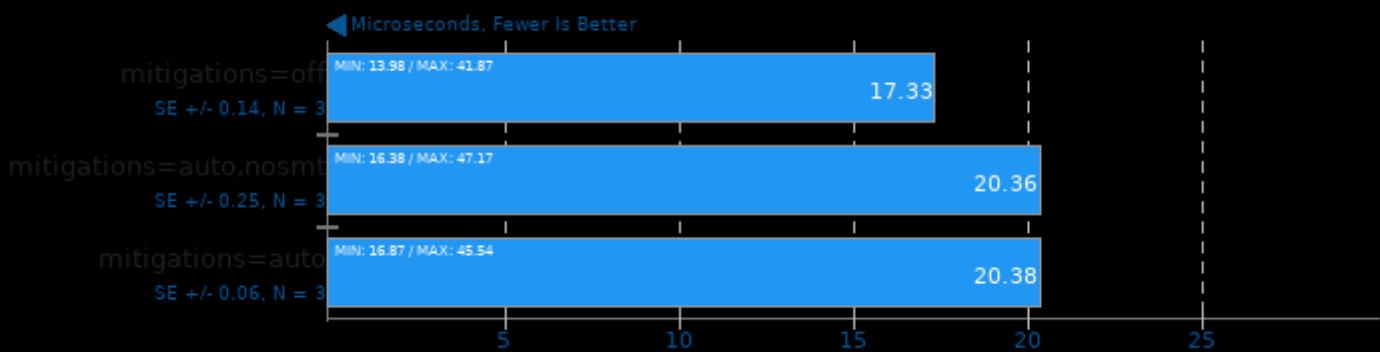
## Ethr 2019-01-02

Server Address: localhost - Protocol: TCP - Test: Latency - Threads: 1



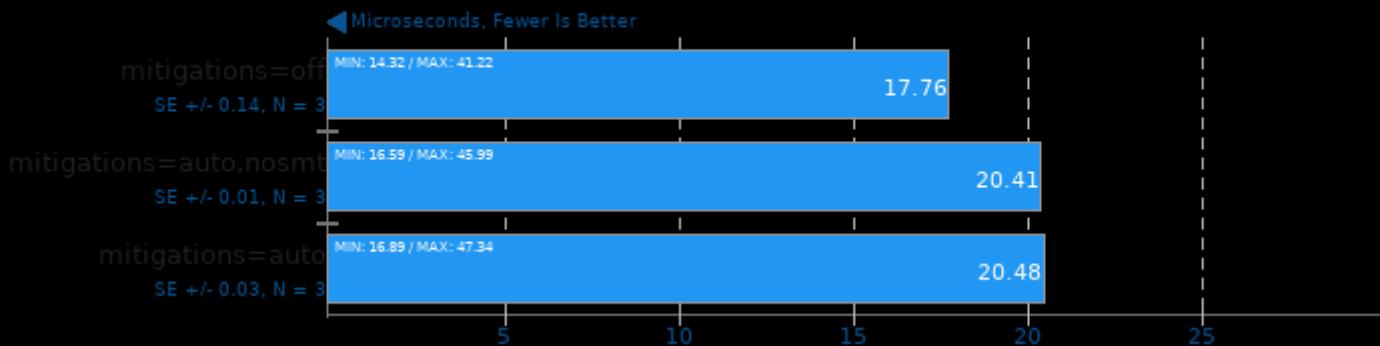
## Ethr 2019-01-02

Server Address: localhost - Protocol: TCP - Test: Latency - Threads: 32



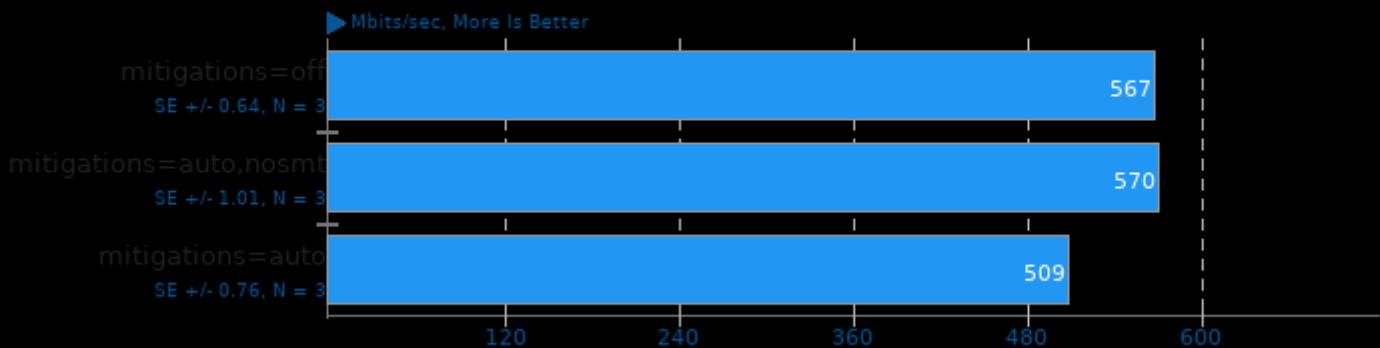
## Ethr 2019-01-02

Server Address: localhost - Protocol: TCP - Test: Latency - Threads: 64



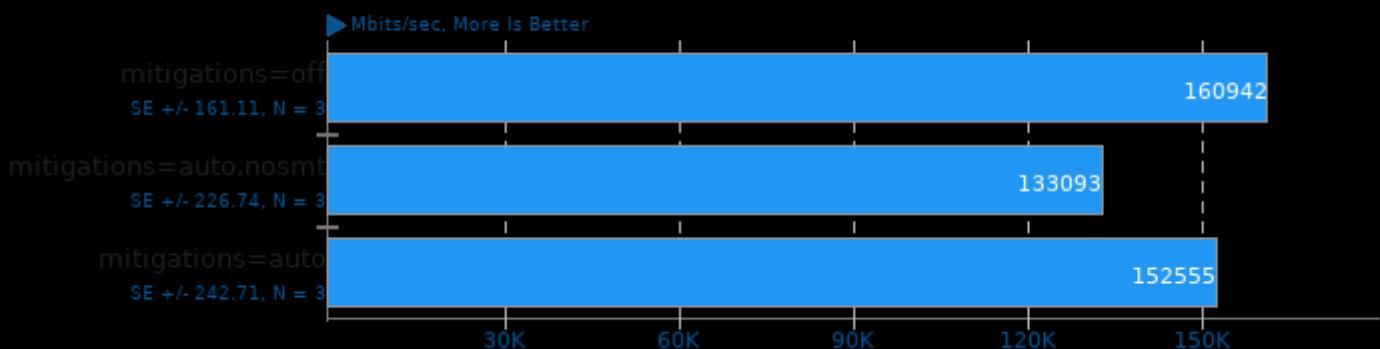
## Ethr 2019-01-02

Server Address: localhost - Protocol: HTTP - Test: Bandwidth - Threads: 1



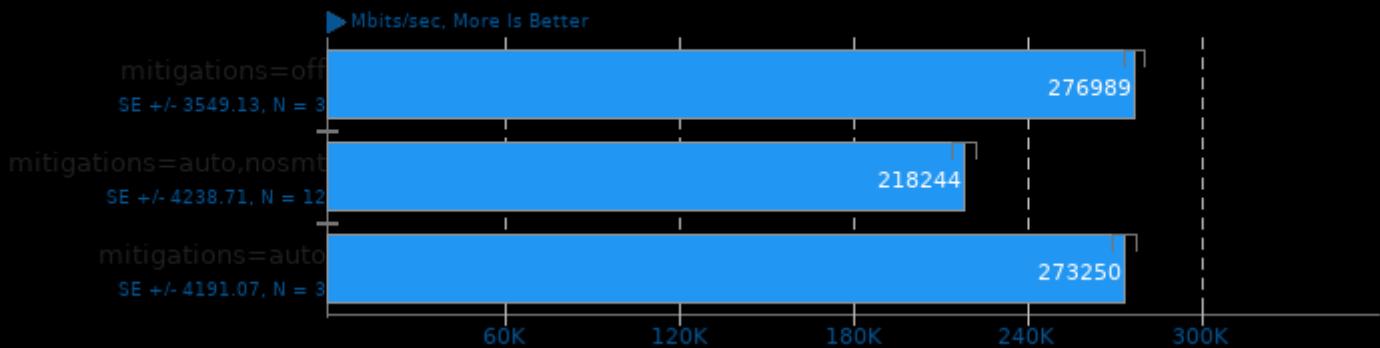
## Ethr 2019-01-02

Server Address: localhost - Protocol: TCP - Test: Bandwidth - Threads: 64

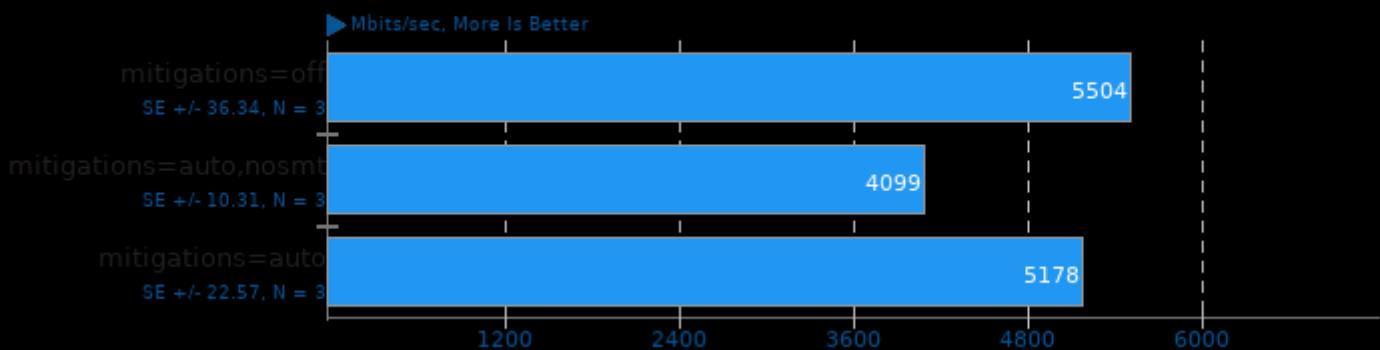


**Ethr 2019-01-02**

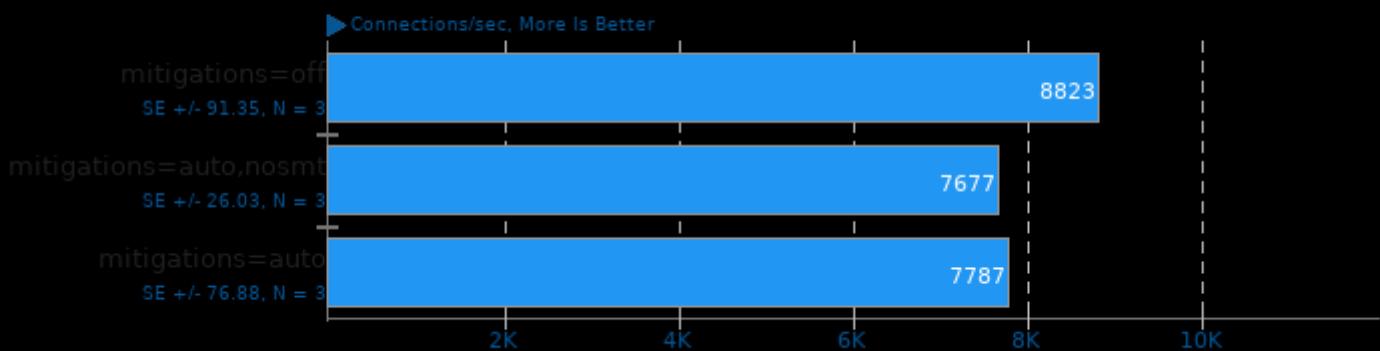
Server Address: localhost - Protocol: UDP - Test: Bandwidth - Threads: 64

**Ethr 2019-01-02**

Server Address: localhost - Protocol: HTTP - Test: Bandwidth - Threads: 64

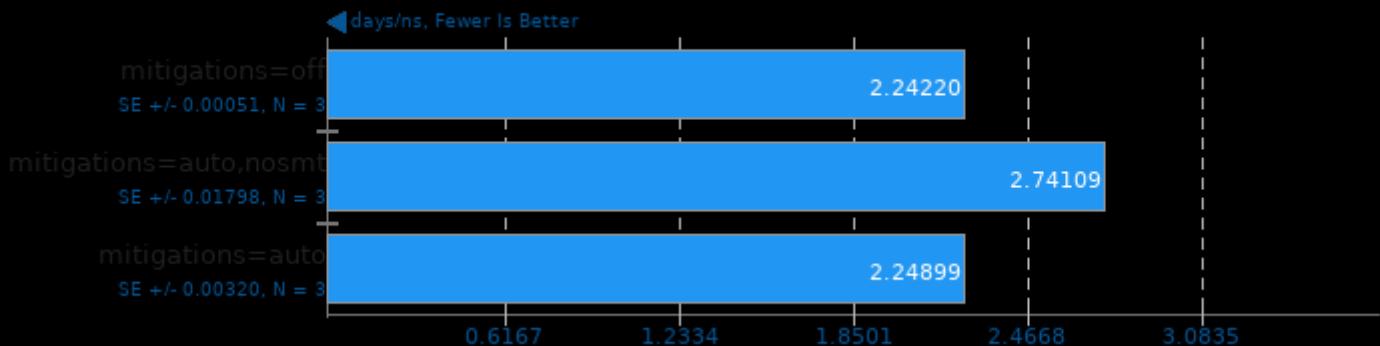
**Ethr 2019-01-02**

Server Address: localhost - Protocol: TCP - Test: Connections/s - Threads: 1



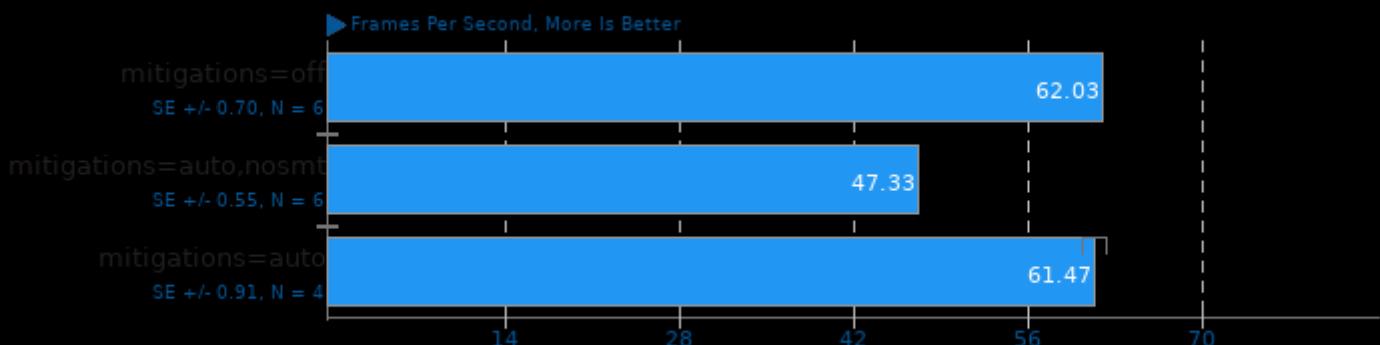
## NAMD 2.13b1

ATPase Simulation - 327,506 Atoms



## x264 2018-09-25

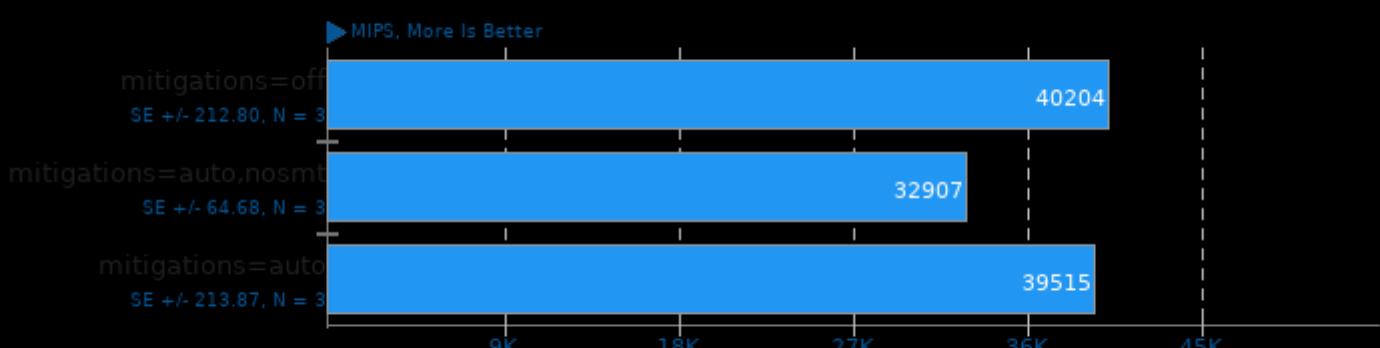
H.264 Video Encoding



1. (CC) gcc options: -fno-omit-frame-pointer -fno-tree-vectorize

## 7-Zip Compression 16.02

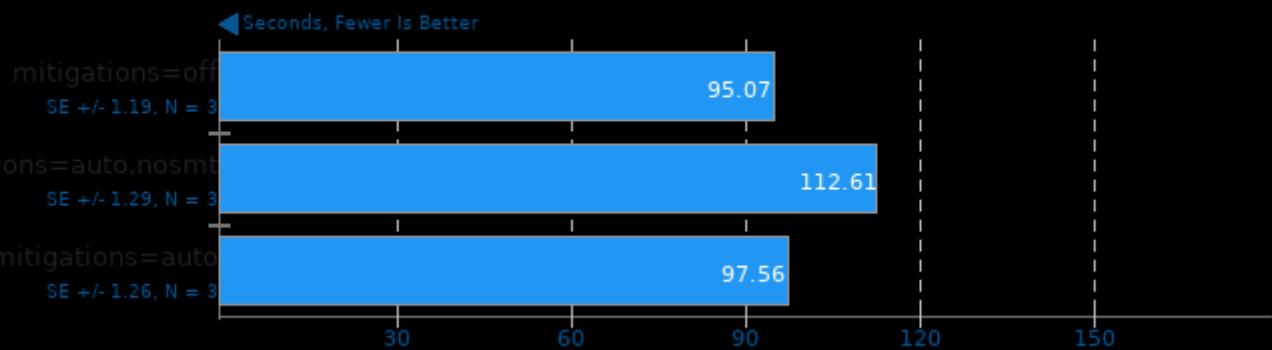
Compress Speed Test



1. (CXX) g++ options: -fno-omit-frame-pointer -fno-tree-vectorize

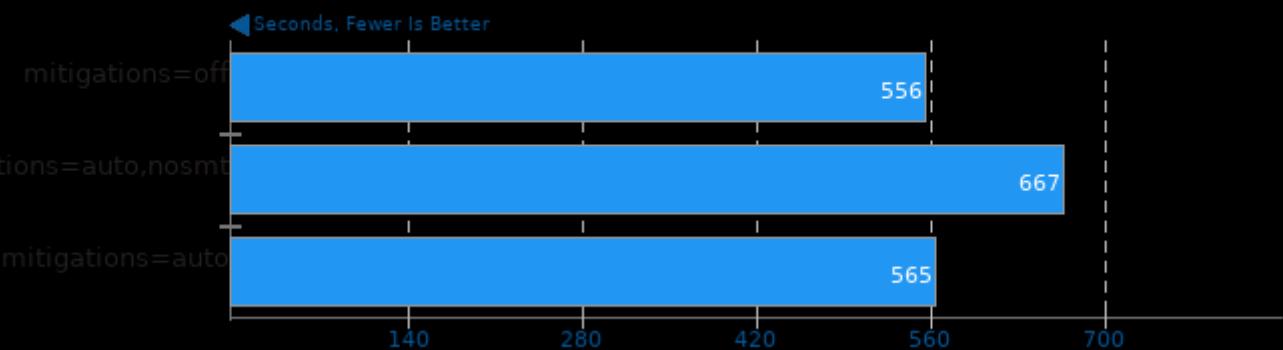
## Timed Linux Kernel Compilation 4.18

Time To Compile



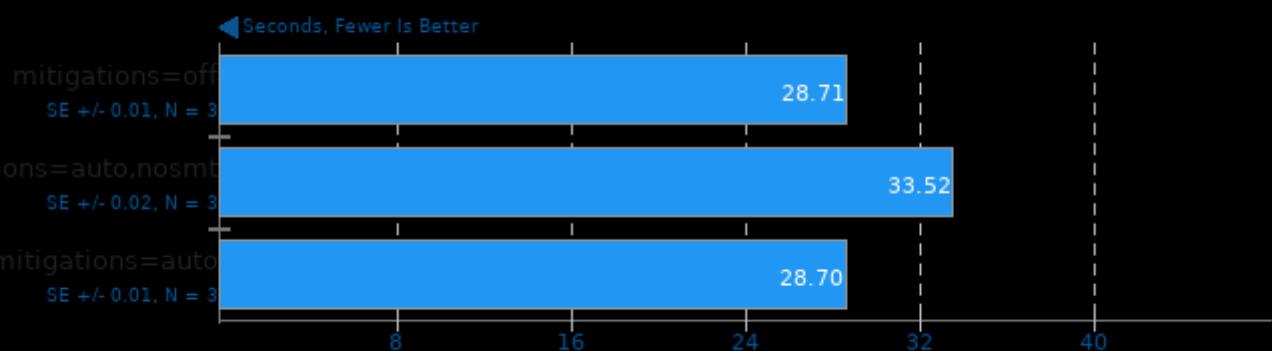
## Timed LLVM Compilation 6.0.1

Time To Compile



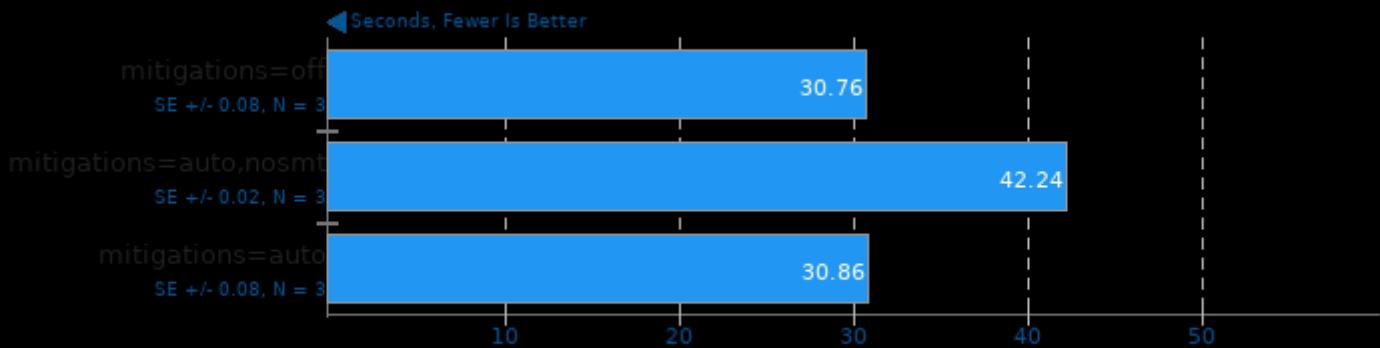
## Y-Cruncher 0.7.7

Calculating 500M Pi Digits



## XZ Compression 5.2.4

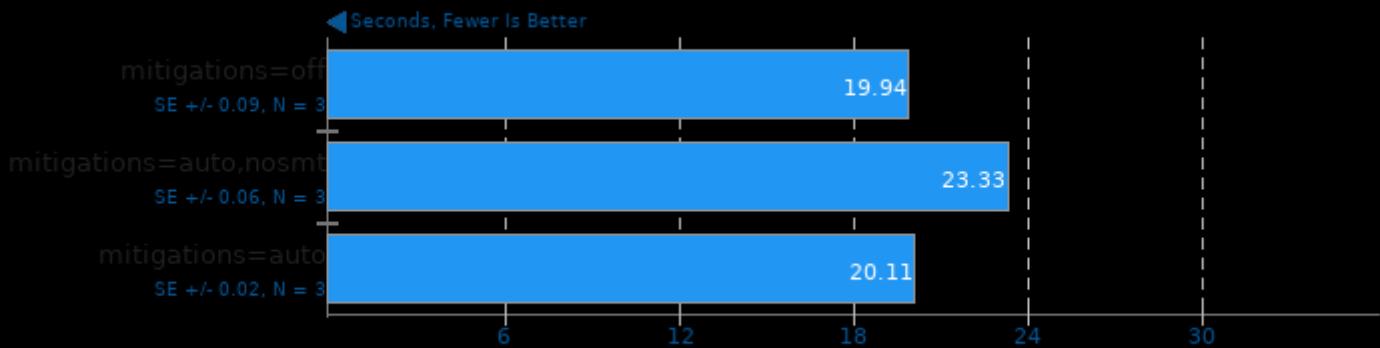
Compressing ubuntu-16.04.3-server-i386.img, Compression Level 9



1. (CC) gcc options: -pthread -fvisibility=hidden -O2

## Zstd Compression 1.3.4

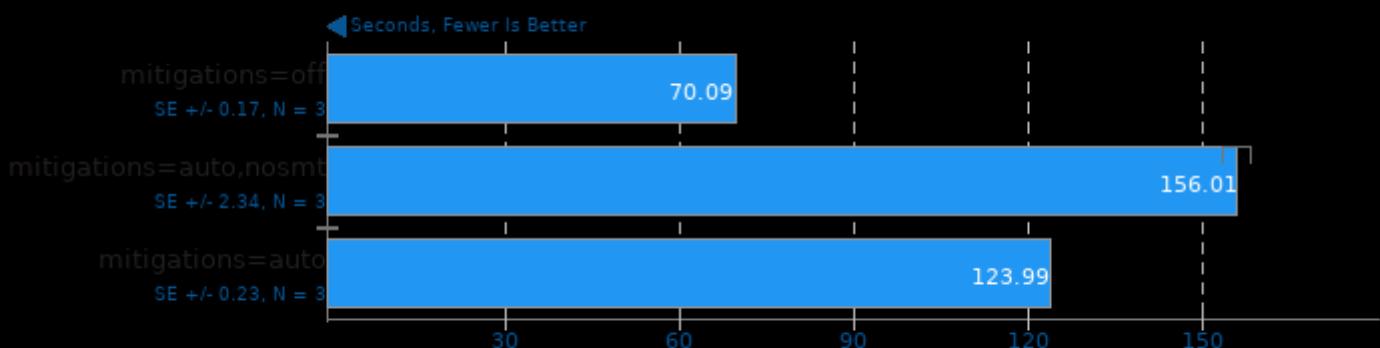
Compressing ubuntu-16.04.3-server-i386.img, Compression Level 19



1. (CC) gcc options: -O3 -pthread -lz

## Hackbench

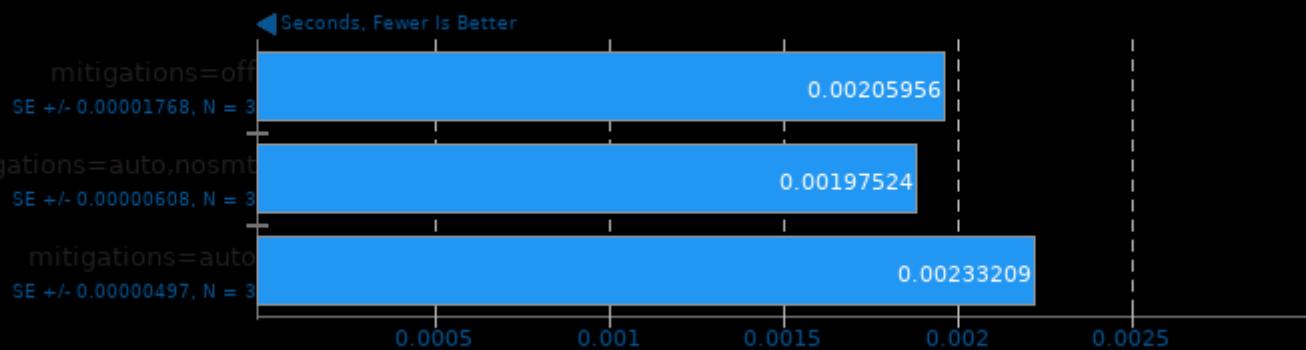
Count: 32 - Type: Process



1. (CC) gcc options: -lpthread

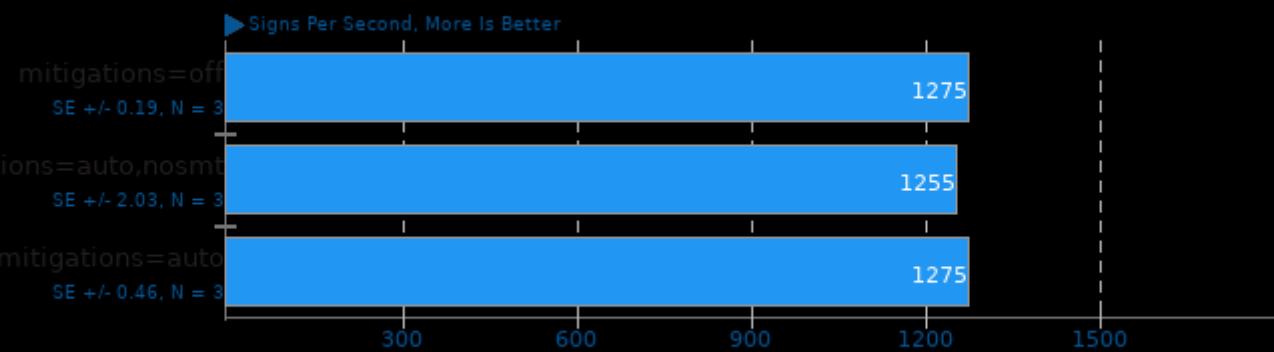
## Perl Benchmarks

Test: Interpreter



## OpenSSL 1.1.1

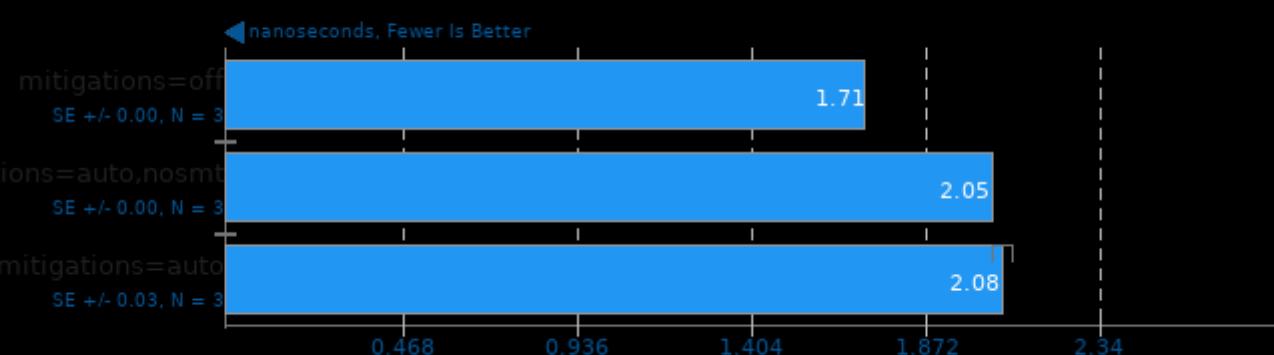
RSA 4096-bit Performance



1. (CC) gcc options: -pthread -m64 -O3 -lssl -lcrypto -ldl

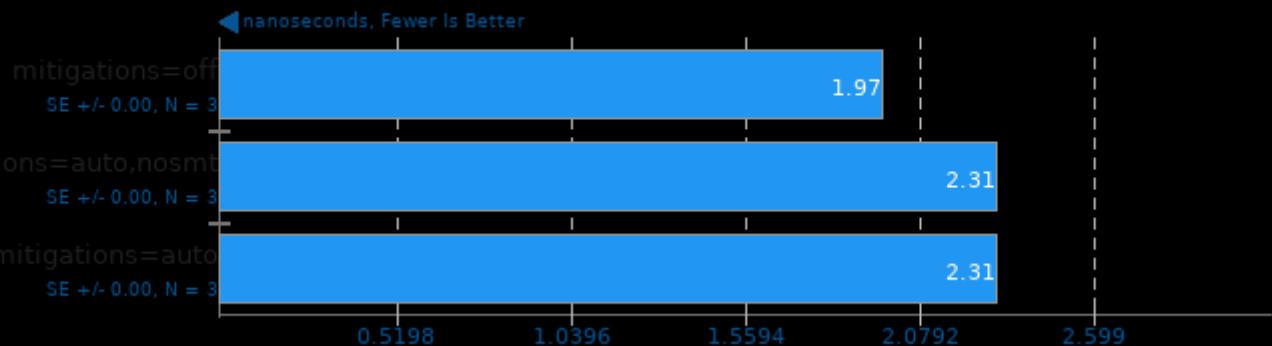
## glibc bench 1.0

Benchmark: ffs



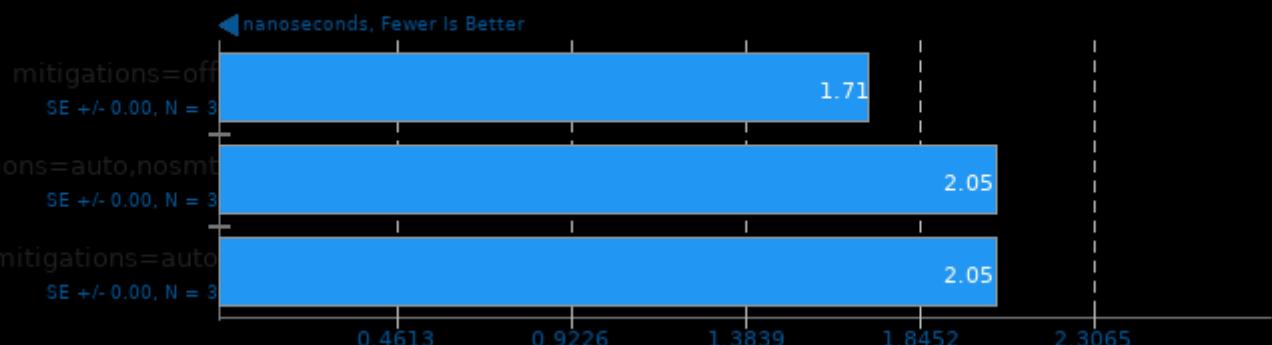
## glibc bench 1.0

Benchmark: ffsll



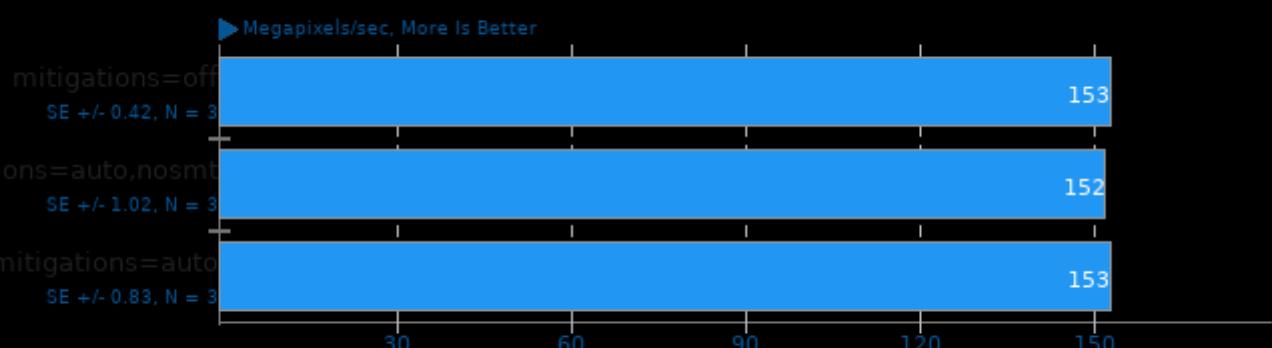
## glibc bench 1.0

Benchmark: pthread\_once



## libjpeg-turbo tjbench 1.5.3

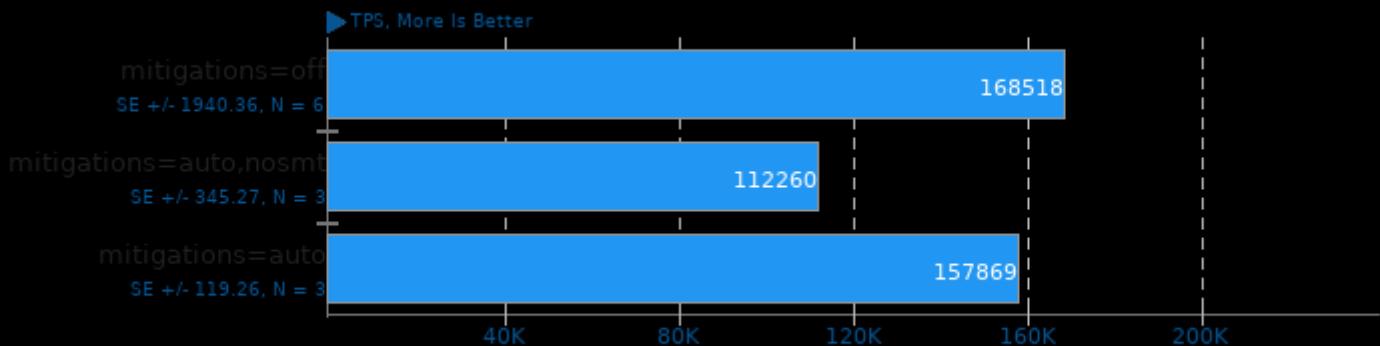
Test: Decompression Throughput



1. (CC) gcc options: -O3 -fno-plt

## PostgreSQL pgbench 10.3

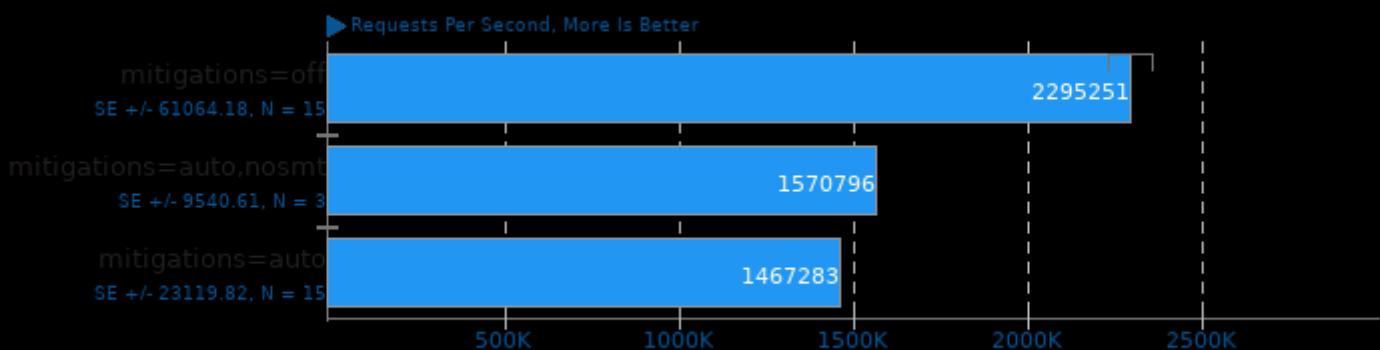
Scaling: Buffer Test - Test: Normal Load - Mode: Read Only



1. (CC) gcc options: -fno-strict-aliasing -fwrapv -O2 -lpgcommon -lpgport -lpq -pthread -lrt -lcrypt -ldl -lm

## Redis 4.0.8

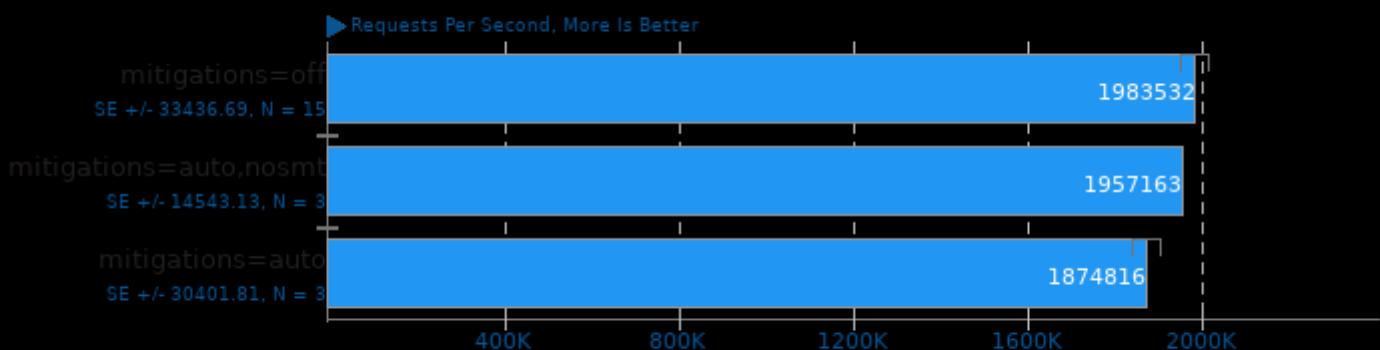
Test: LPOP



1. (CC) gcc options: -ggdb -rdynamic -lm -ldl -pthread

## Redis 4.0.8

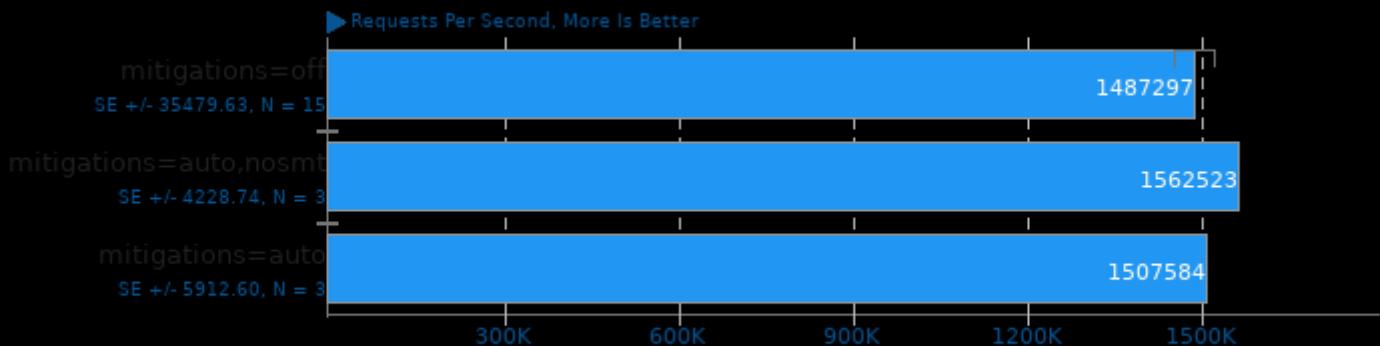
Test: SADD



1. (CC) gcc options: -ggdb -rdynamic -lm -ldl -pthread

## Redis 4.0.8

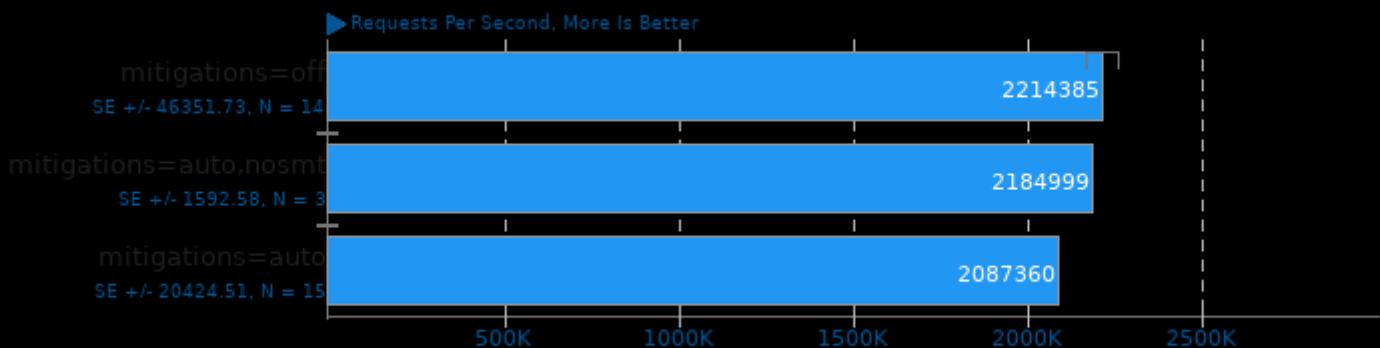
Test: LPUSH



1. (CC) gcc options: -ggdb -rdynamic -lm -ldl -pthread

## Redis 4.0.8

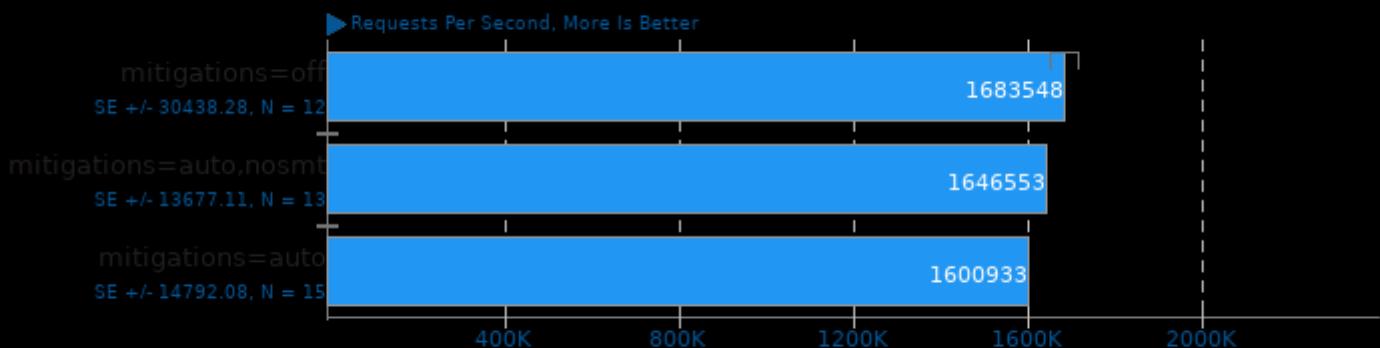
Test: GET



1. (CC) gcc options: -ggdb -rdynamic -lm -ldl -pthread

## Redis 4.0.8

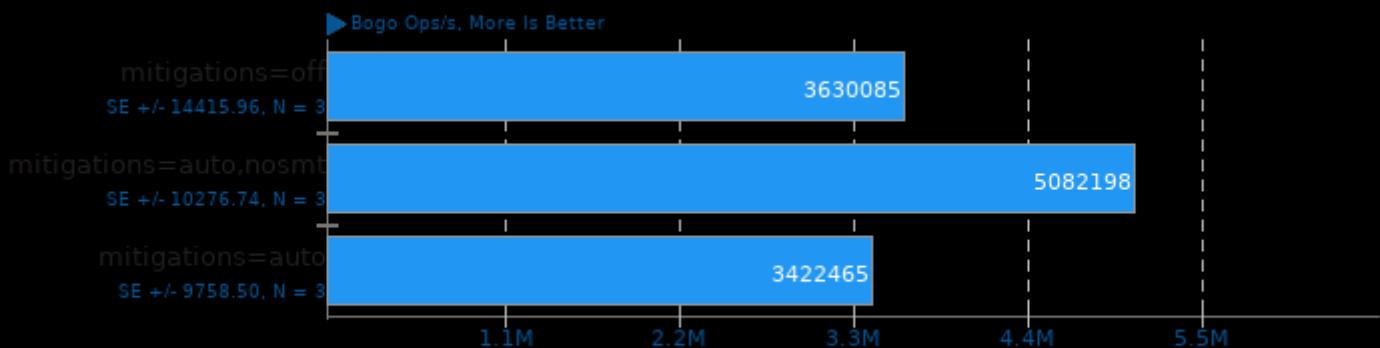
Test: SET



1. (CC) gcc options: -ggdb -rdynamic -lm -ldl -pthread

## Stress-NG 0.07.26

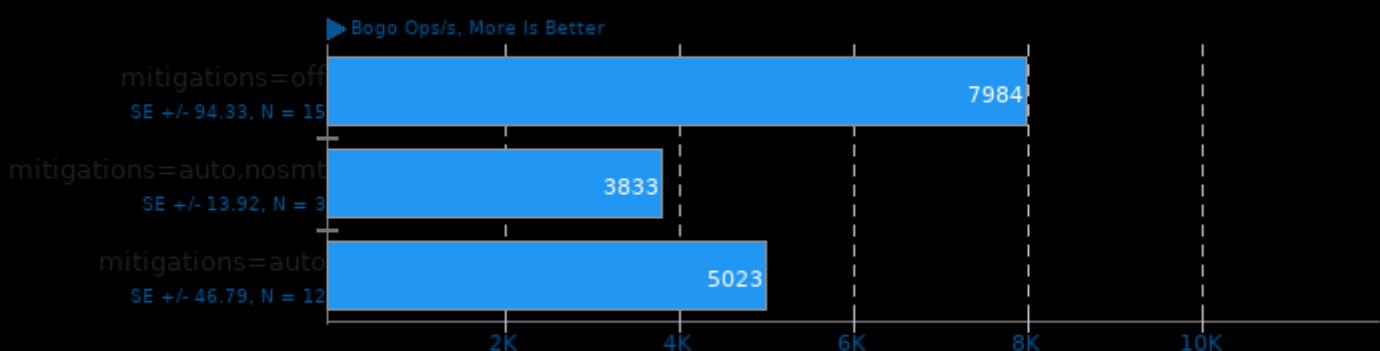
Test: Semaphores



1. (CC) gcc options: -O2 -std=gnu99 -lm -lcrypt -lrt -lpthread -lc

## Stress-NG 0.07.26

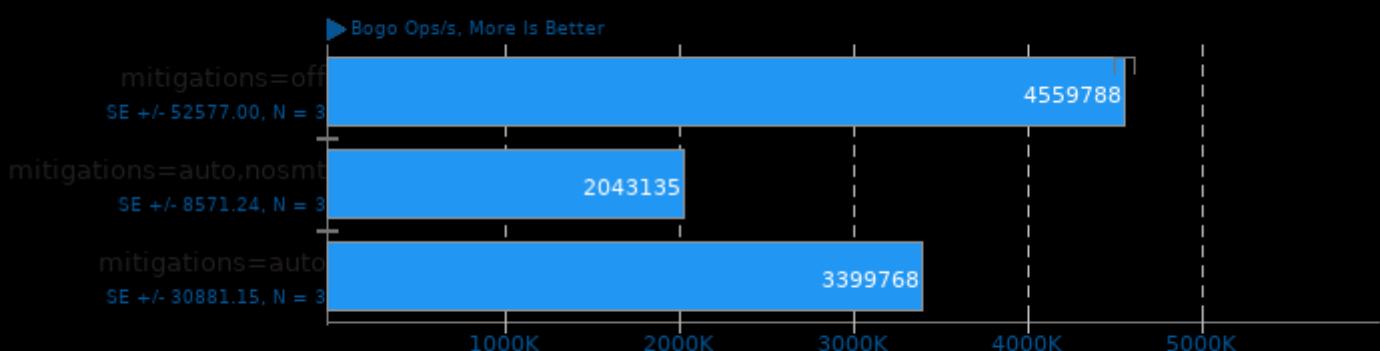
Test: Socket Activity



1. (CC) gcc options: -O2 -std=gnu99 -lm -lcrypt -lrt -lpthread -lc

## Stress-NG 0.07.26

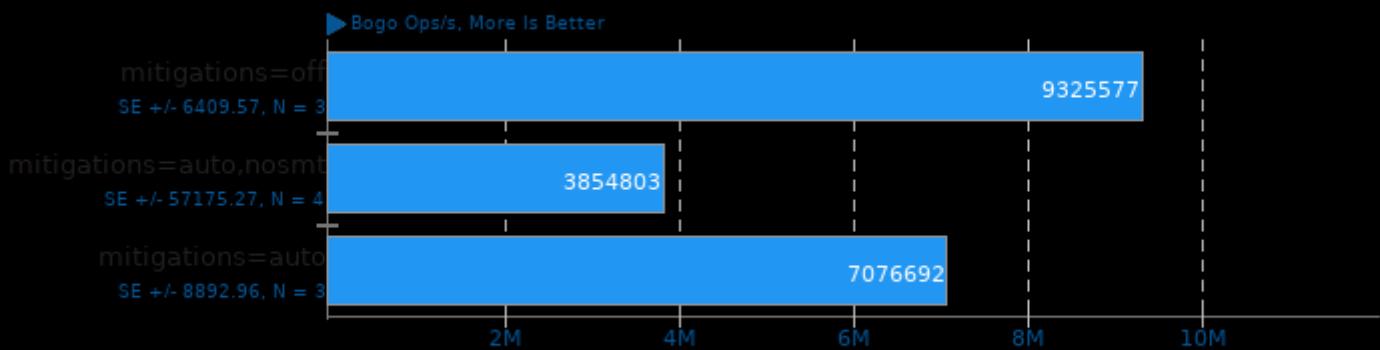
Test: Context Switching



1. (CC) gcc options: -O2 -std=gnu99 -lm -lcrypt -lrt -lpthread -lc

## Stress-NG 0.07.26

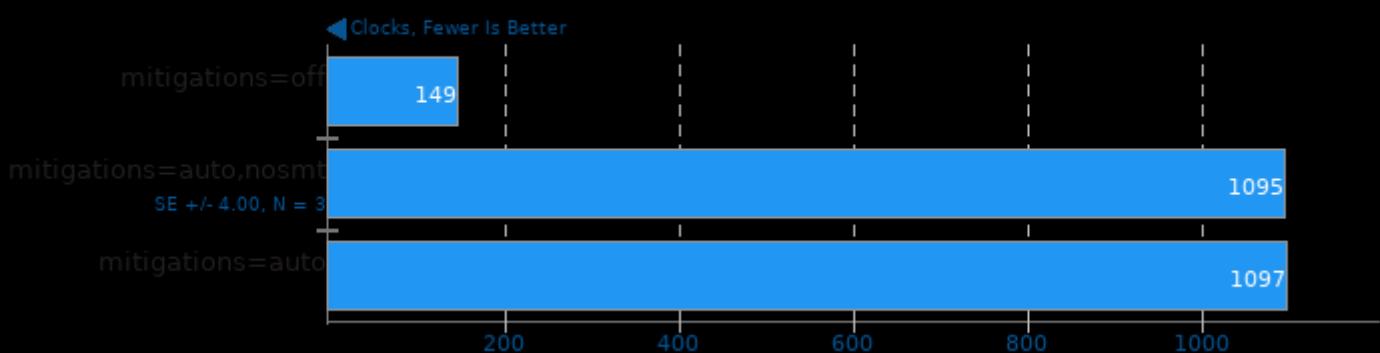
Test: System V Message Passing



1. (CC) gcc options: -O2 -std=gnu99 -lm -lcrypt -lrt -lpthread -lc

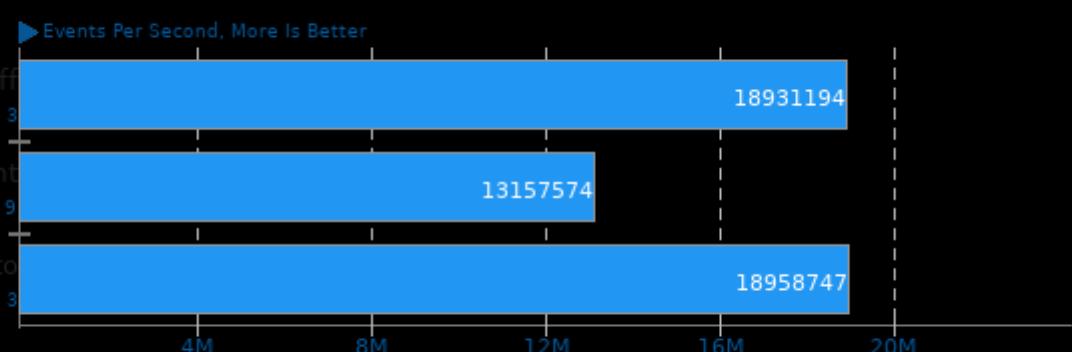
## ctx\_clock

Context Switch Time



## Sysbench 2018-07-28

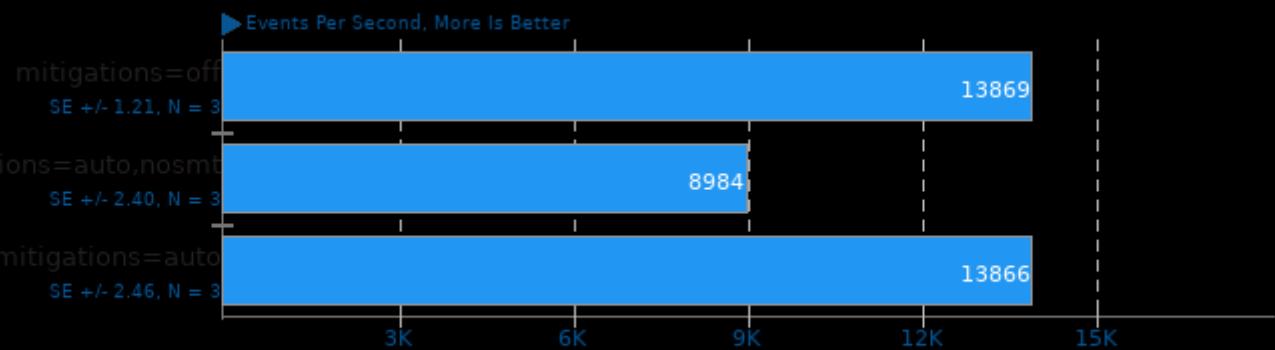
Test: Memory



1. (CC) gcc options: -pthread -O3 -funroll-loops -ggdb3 -march=haswell -rdynamic -ldl -lao -lm

## Sysbench 2018-07-28

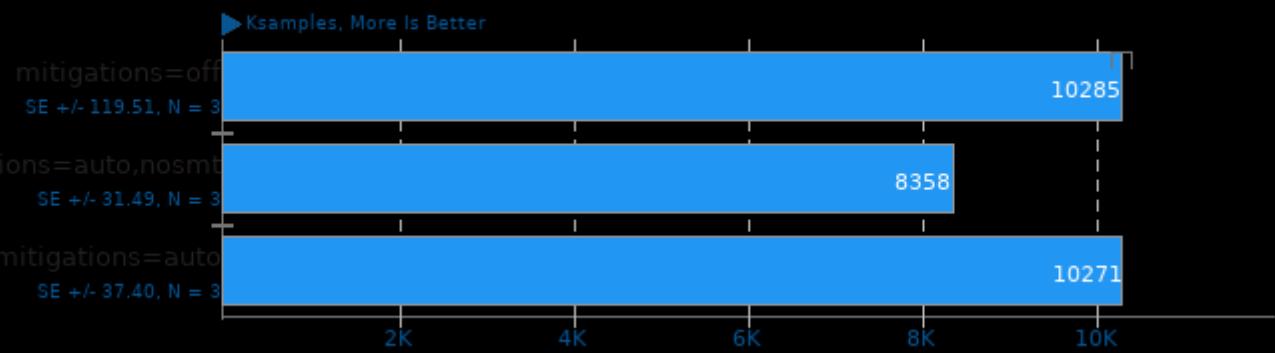
Test: CPU



1. (CC) gcc options: -pthread -O3 -funroll-loops -ggdb3 -march=haswell -rdynamic -ldl -lao -lm

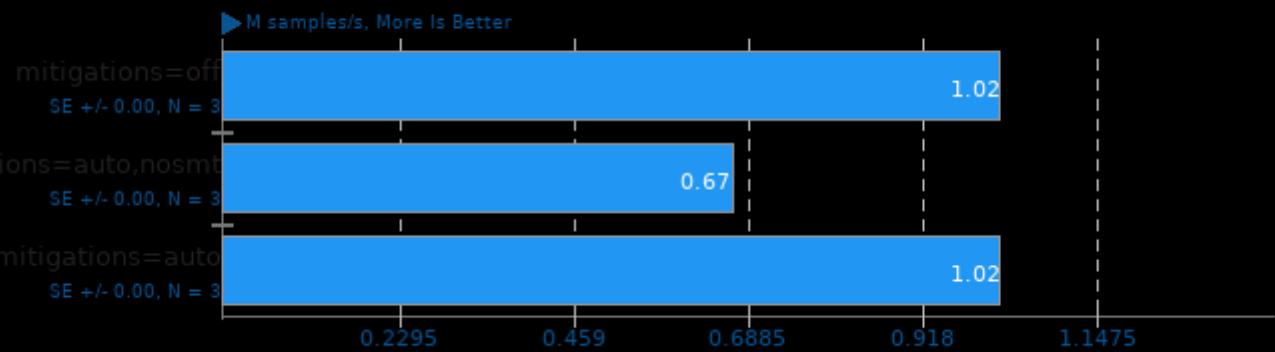
## Chaos Group V-RAY 4.10.03

Mode: CPU



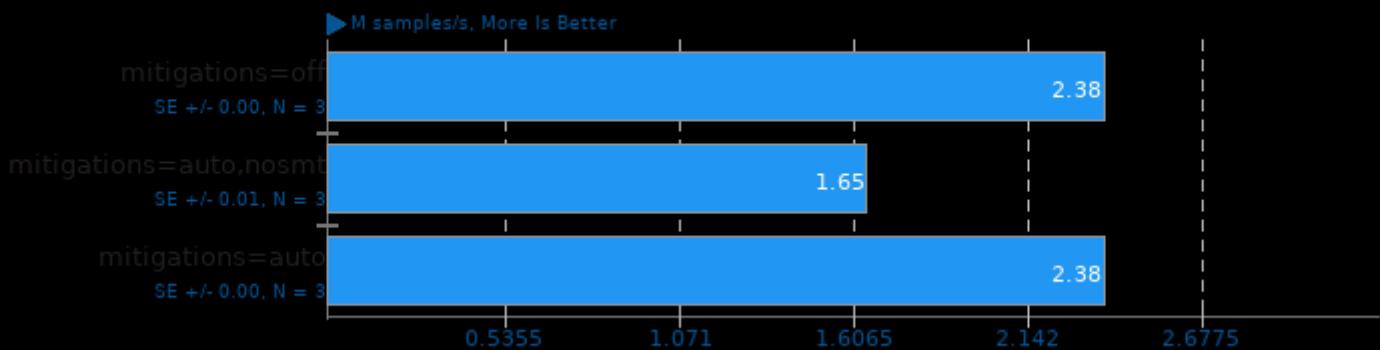
## IndigoBench 4.0.64

Scene: Bedroom



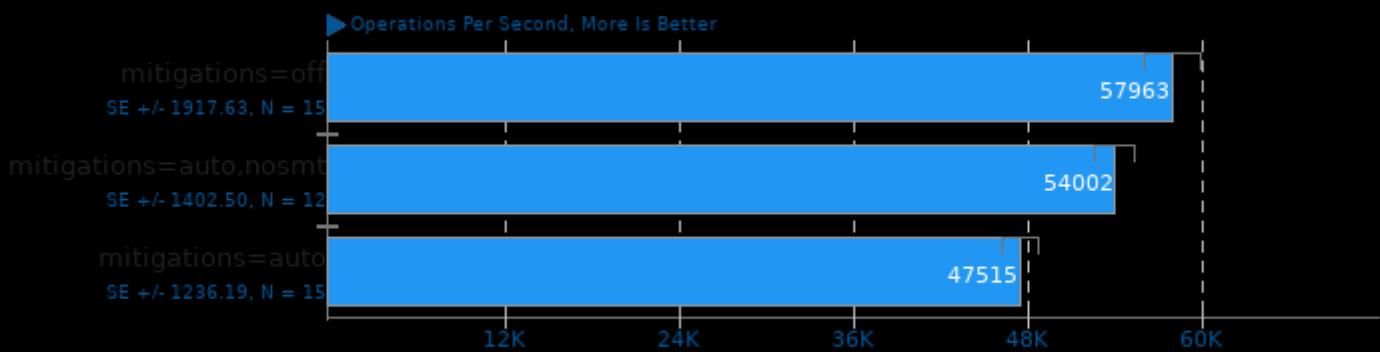
## IndigoBench 4.0.64

Scene: Supercar



## Memcached mcperf 1.5.10

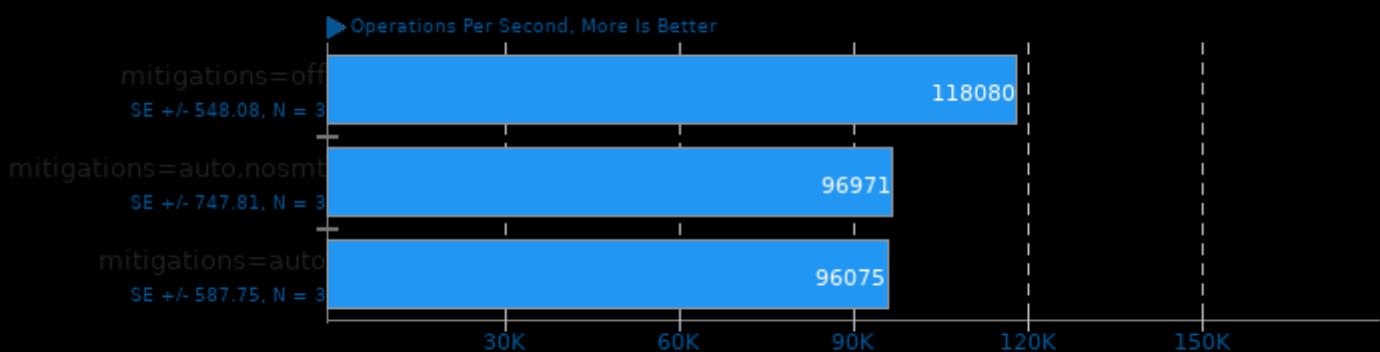
Method: Add



1. (CC) gcc options: -O2 -lm -rdynamic

## Memcached mcperf 1.5.10

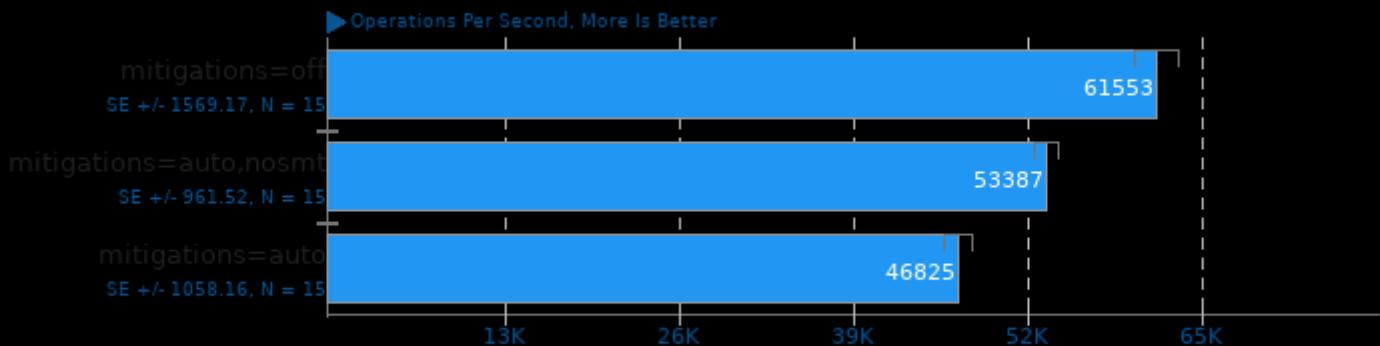
Method: Get



1. (CC) gcc options: -O2 -lm -rdynamic

## Memcached mcperf 1.5.10

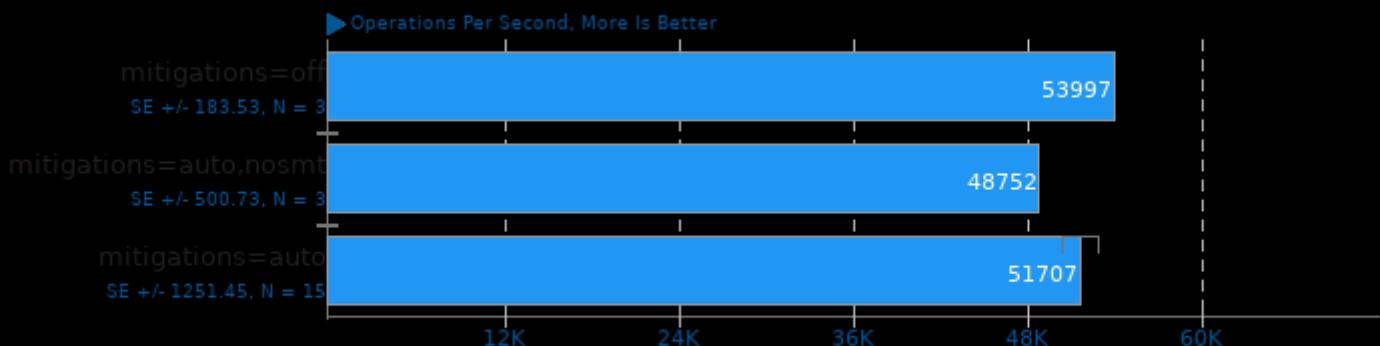
Method: Set



1. (CC) gcc options: -O2 -lm -rdynamic

## Memcached mcperf 1.5.10

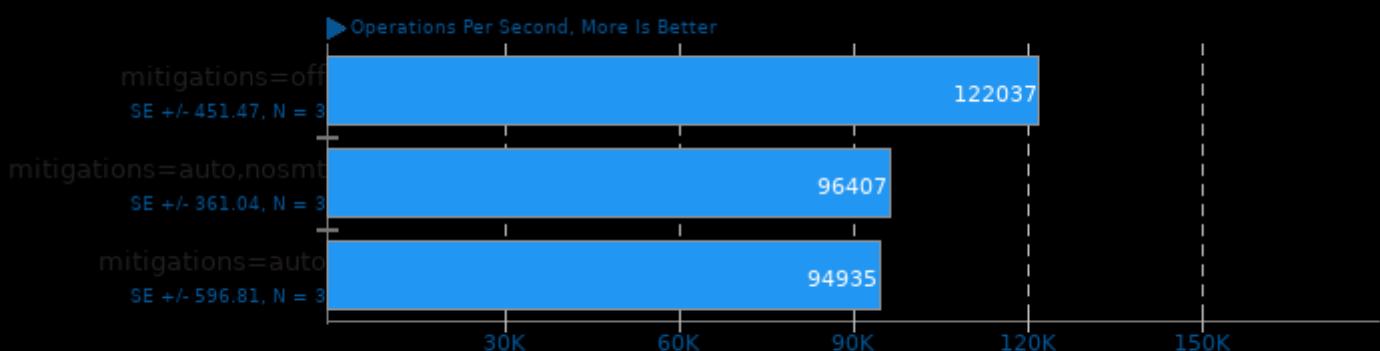
Method: Append



1. (CC) gcc options: -O2 -lm -rdynamic

## Memcached mcperf 1.5.10

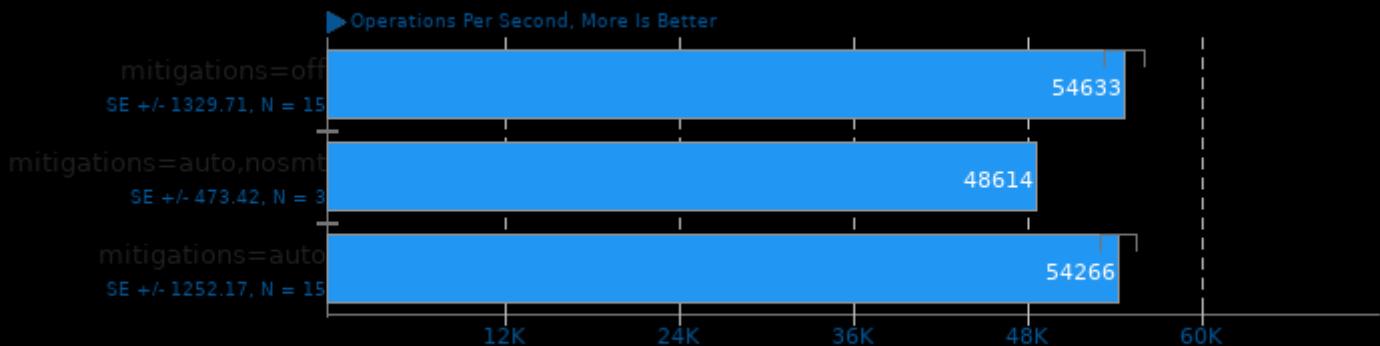
Method: Delete



1. (CC) gcc options: -O2 -lm -rdynamic

## Memcached mcperf 1.5.10

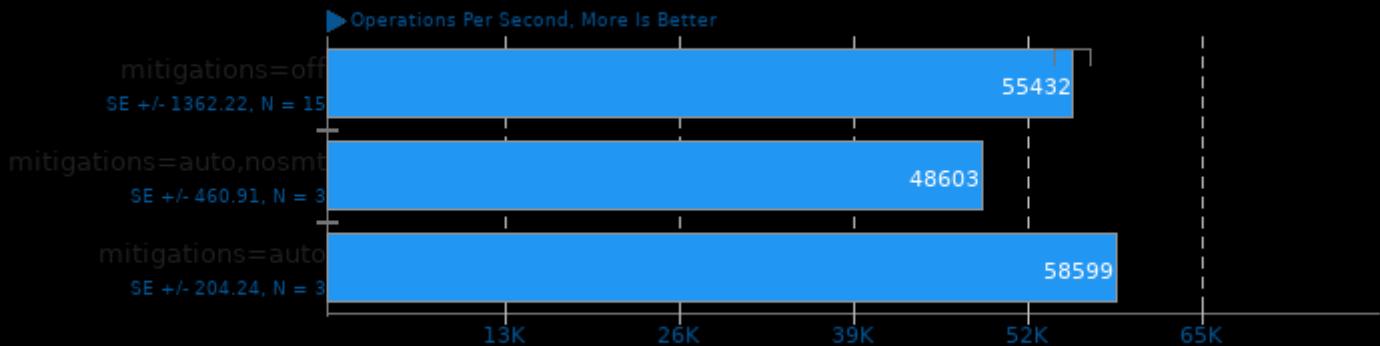
Method: Prepend



1. (CC) gcc options: -O2 -lm -rdynamic

## Memcached mcperf 1.5.10

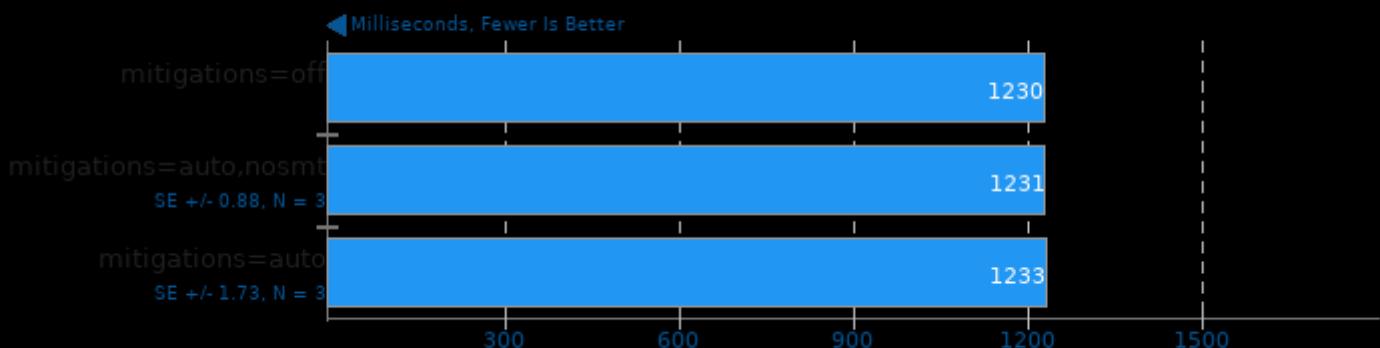
Method: Replace



1. (CC) gcc options: -O2 -lm -rdynamic

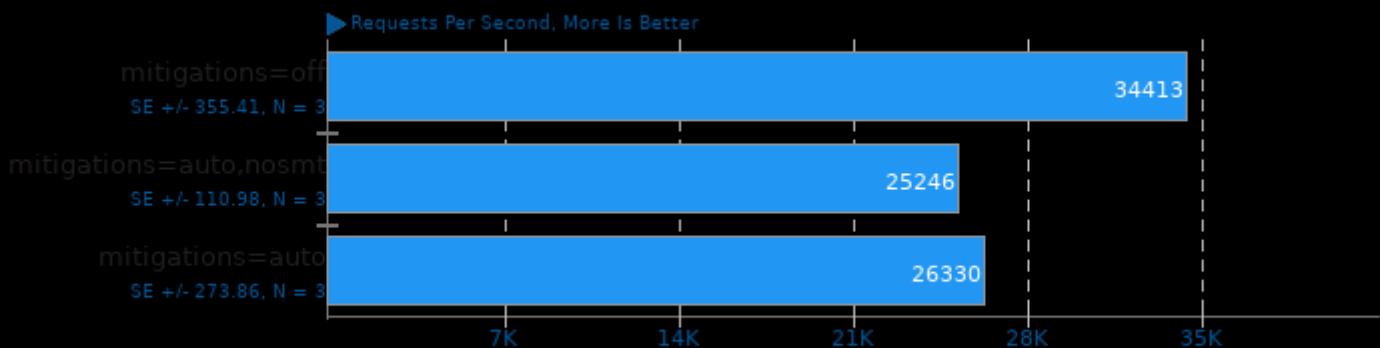
## PyBench 2018-02-16

Total For Average Test Times



## NGINX Benchmark 1.9.9

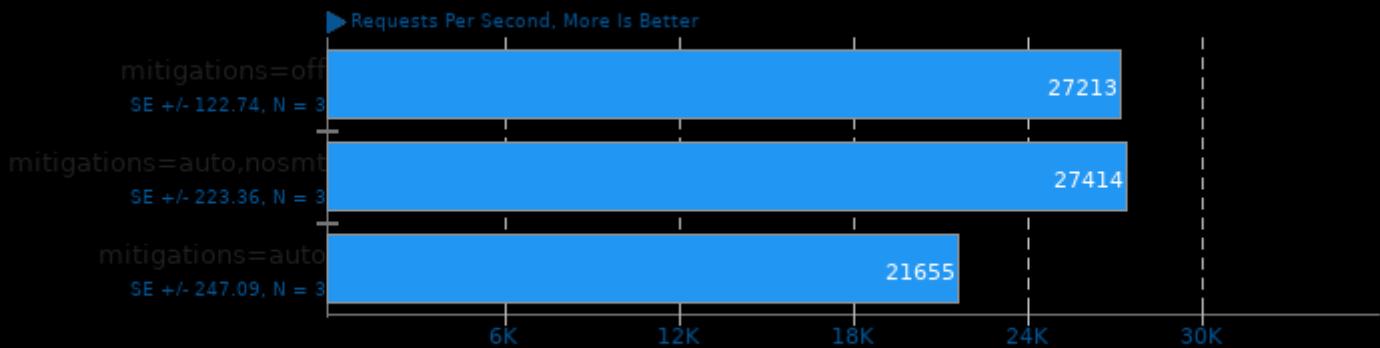
Static Web Page Serving



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

## Apache Benchmark 2.4.29

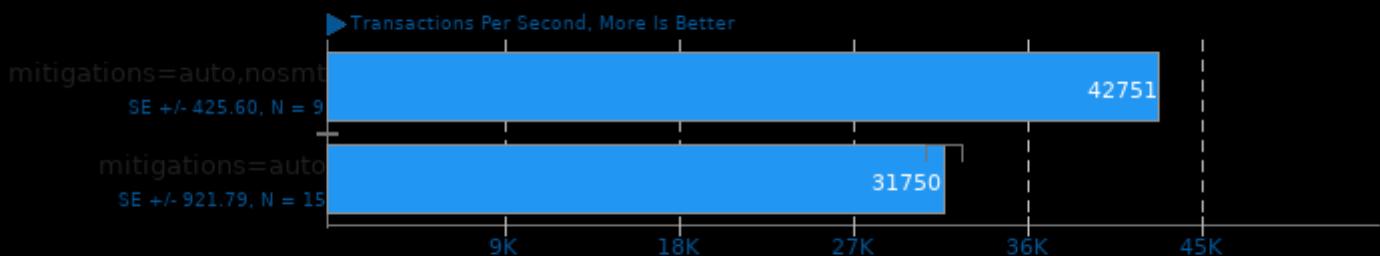
Static Web Page Serving



1. (CC) gcc options: -shared -fPIC -O2 -pthread

## Apache Siege 2.4.29

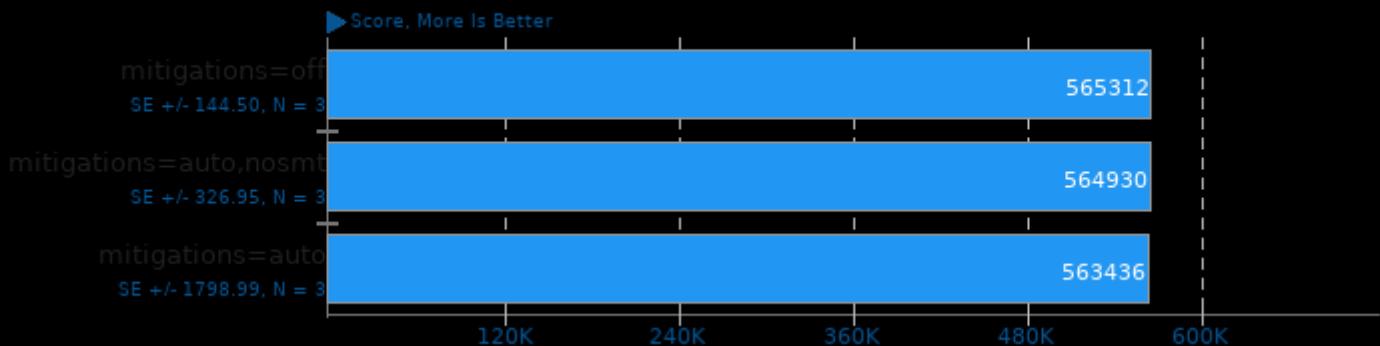
Concurrent Users: 250



1. (CC) gcc options: -O2 -lpthread -ldl -lssl -lcrypto

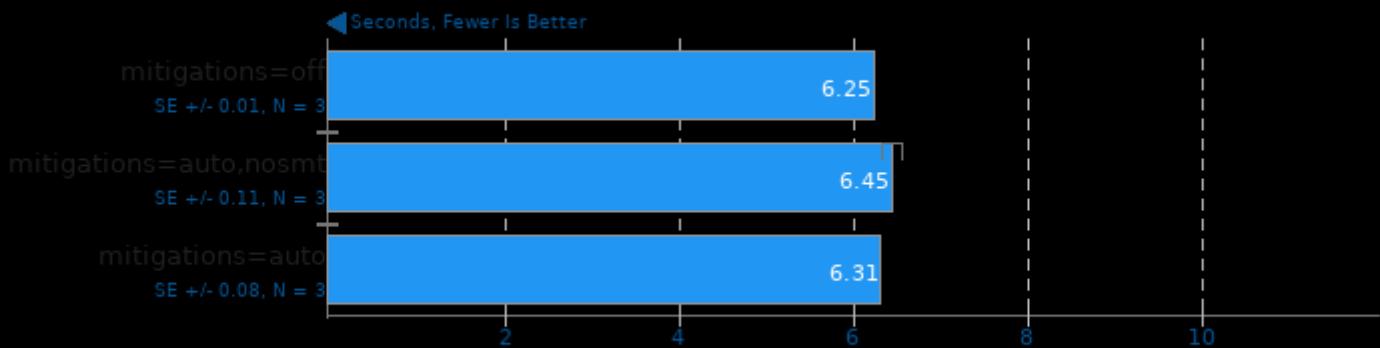
## PHPBench 0.8.1

PHP Benchmark Suite



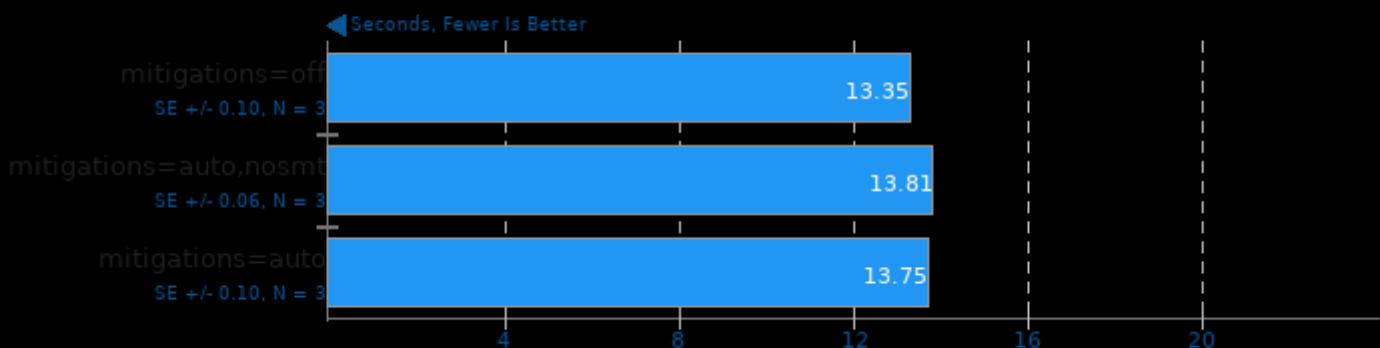
## Git

Time To Complete Common Git Commands



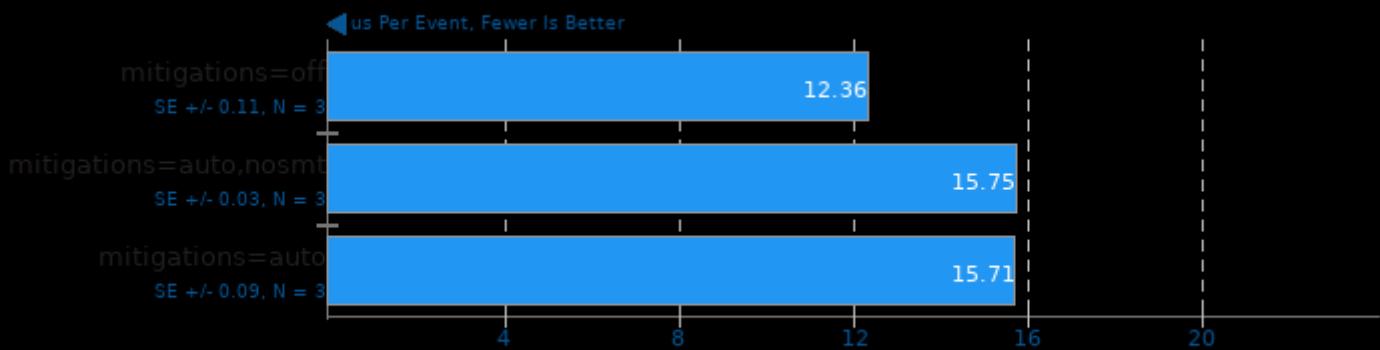
git version 2.17.1

## Scikit-Learn 0.17.1



## OSBench

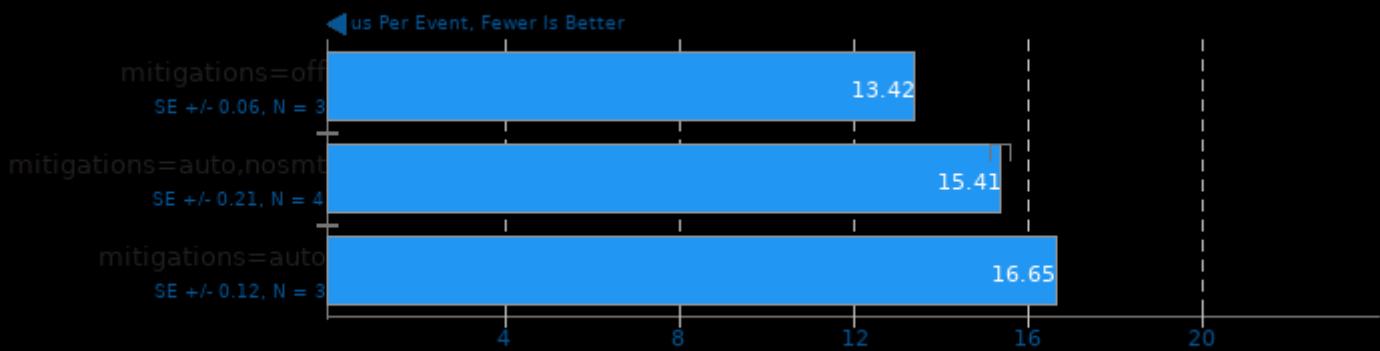
Test: Create Files



1. (CC) gcc options: -lm

## OSBench

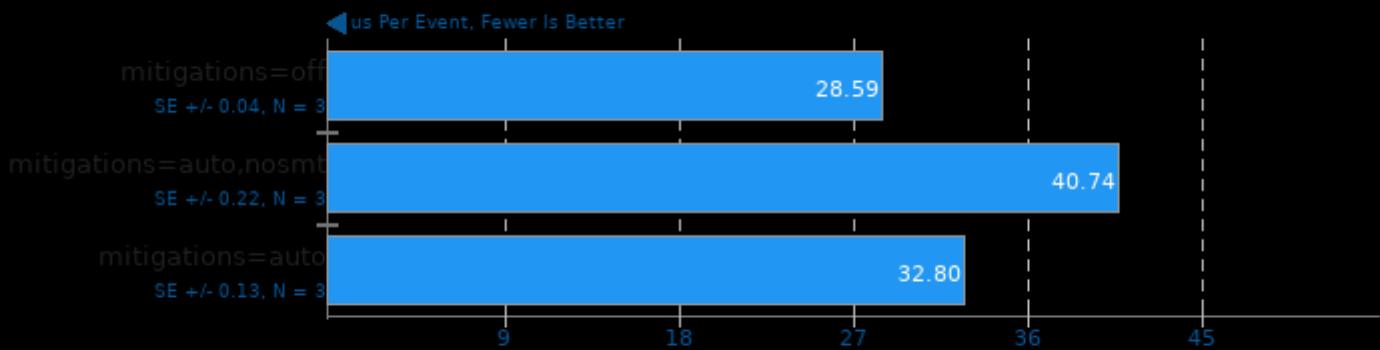
Test: Create Threads



1. (CC) gcc options: -lm

## OSBench

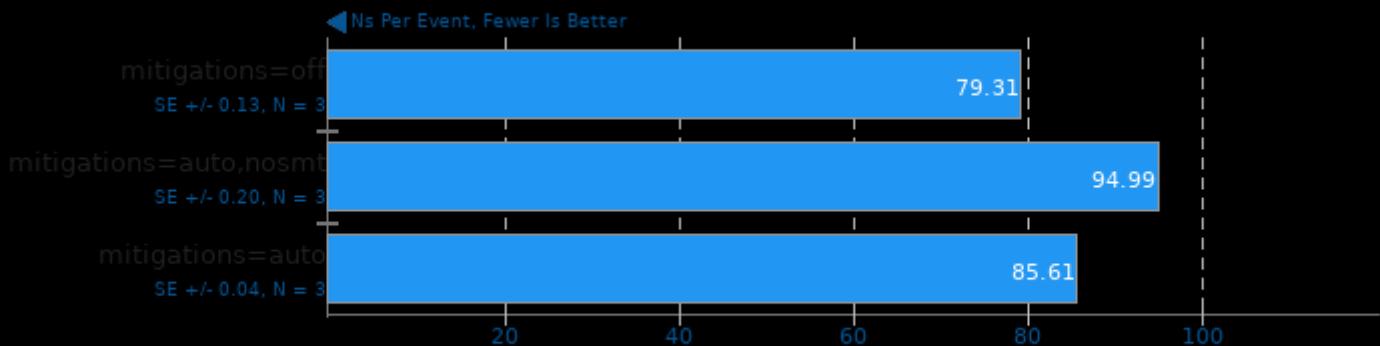
Test: Launch Programs



1. (CC) gcc options: -lm

## OSBench

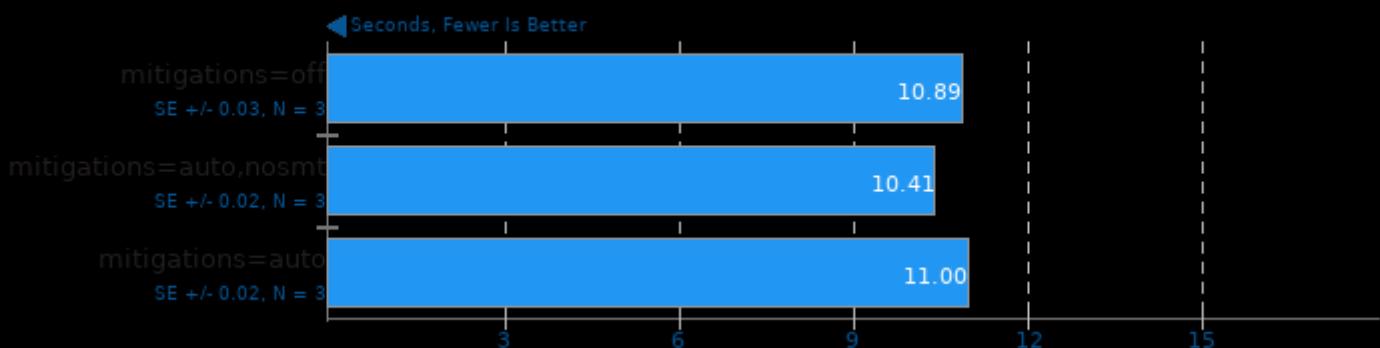
Test: Memory Allocations



1. (CC) gcc options: -lm

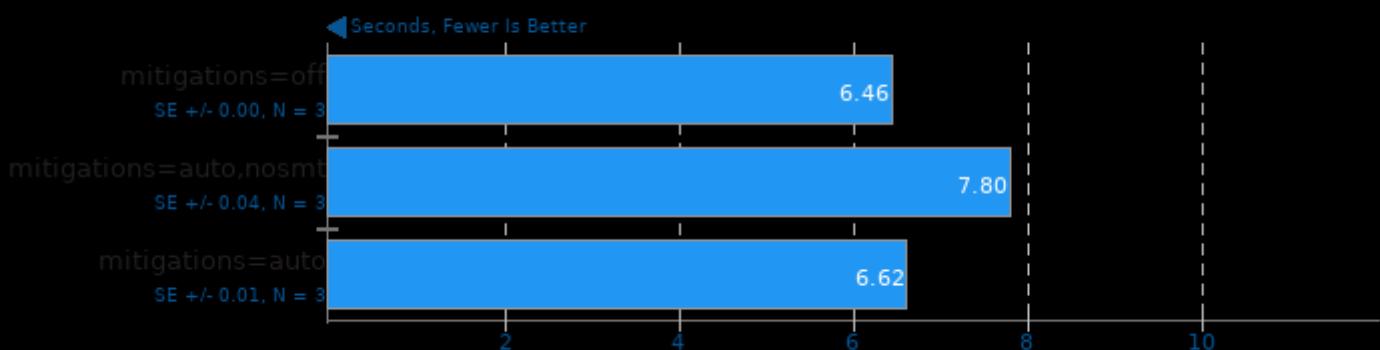
## Darktable 2.4.2

Test: Boat - Acceleration: CPU-only



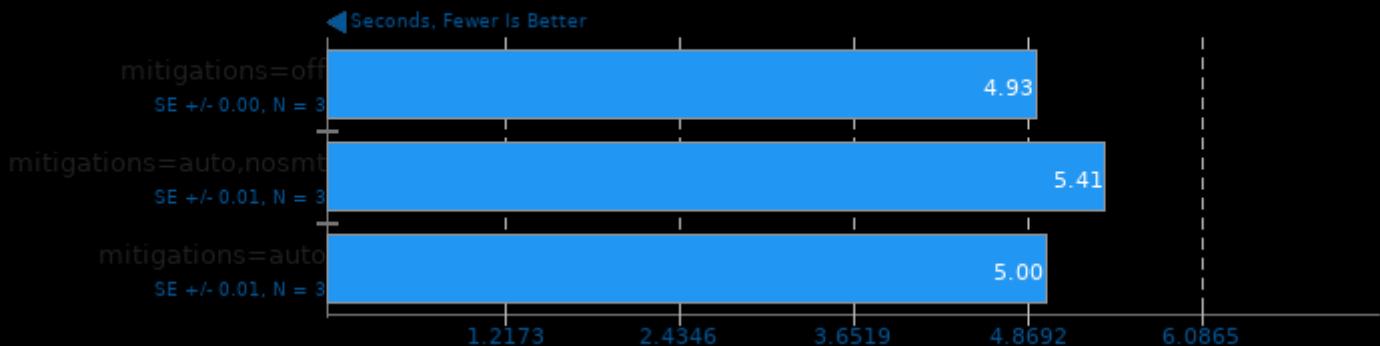
## Darktable 2.4.2

Test: Masskrug - Acceleration: CPU-only



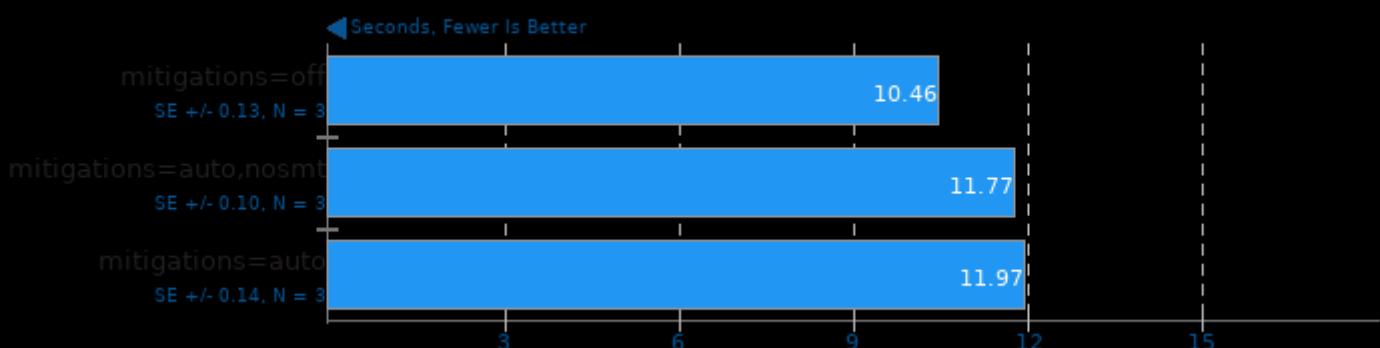
## Darktable 2.4.2

Test: Server Room - Acceleration: CPU-only



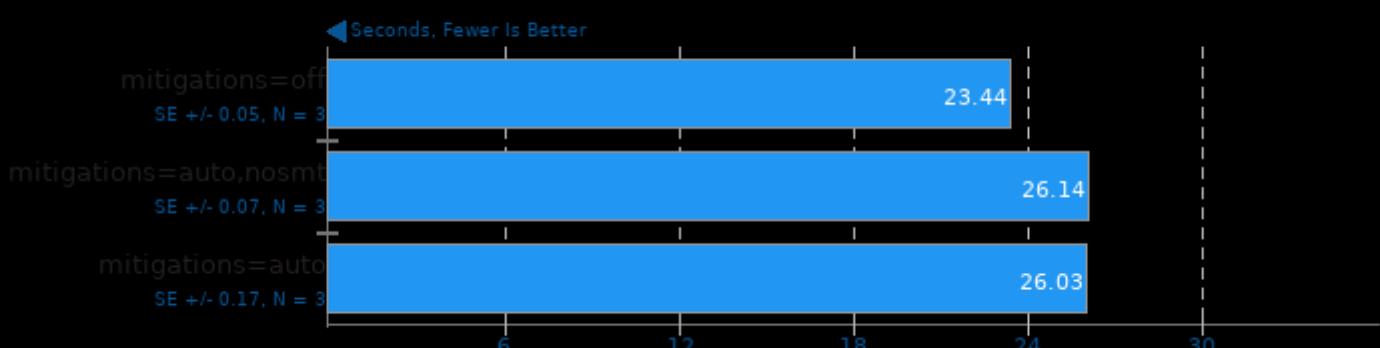
## GIMP 2.8.22

Test: resize



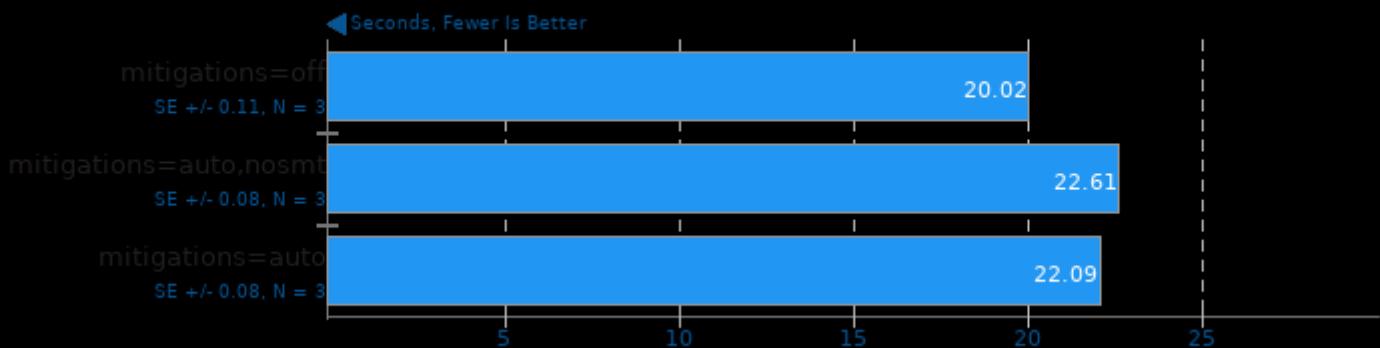
## GIMP 2.8.22

Test: rotate



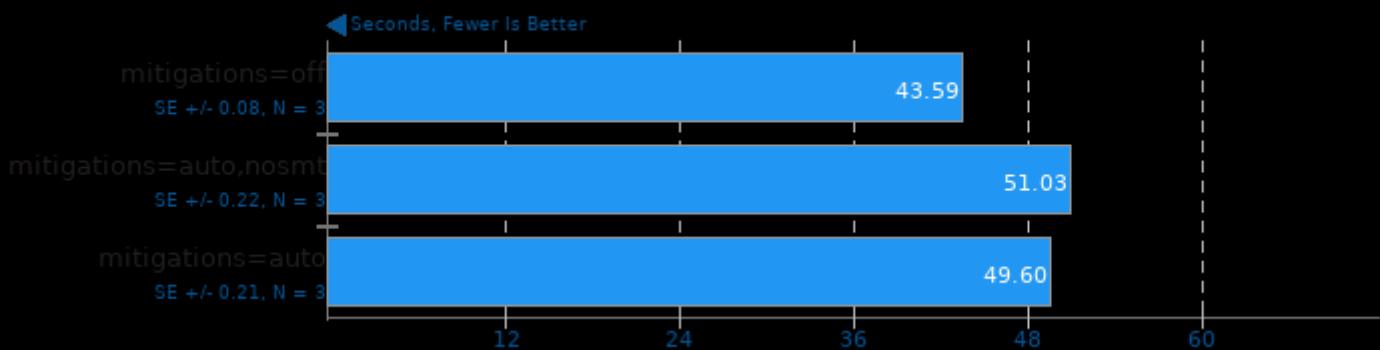
## GIMP 2.8.22

Test: auto-levels



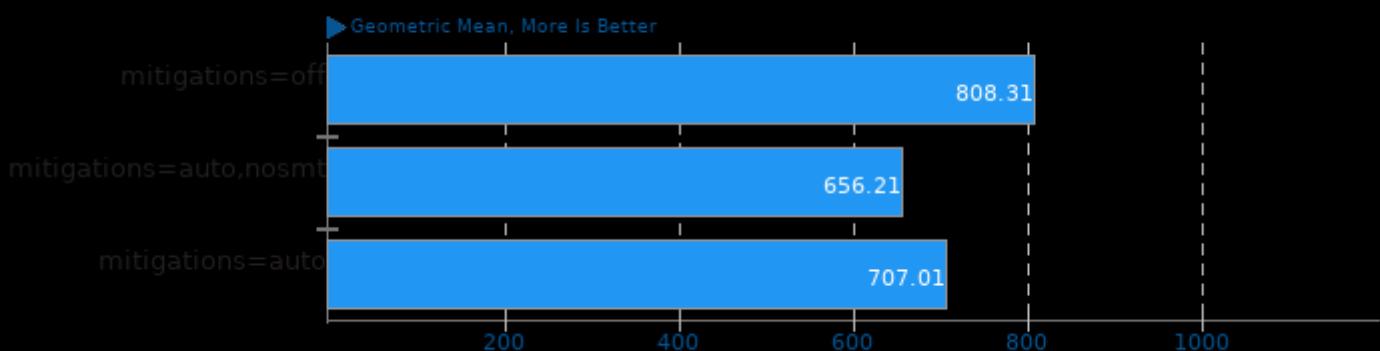
## GIMP 2.8.22

Test: unsharp-mask



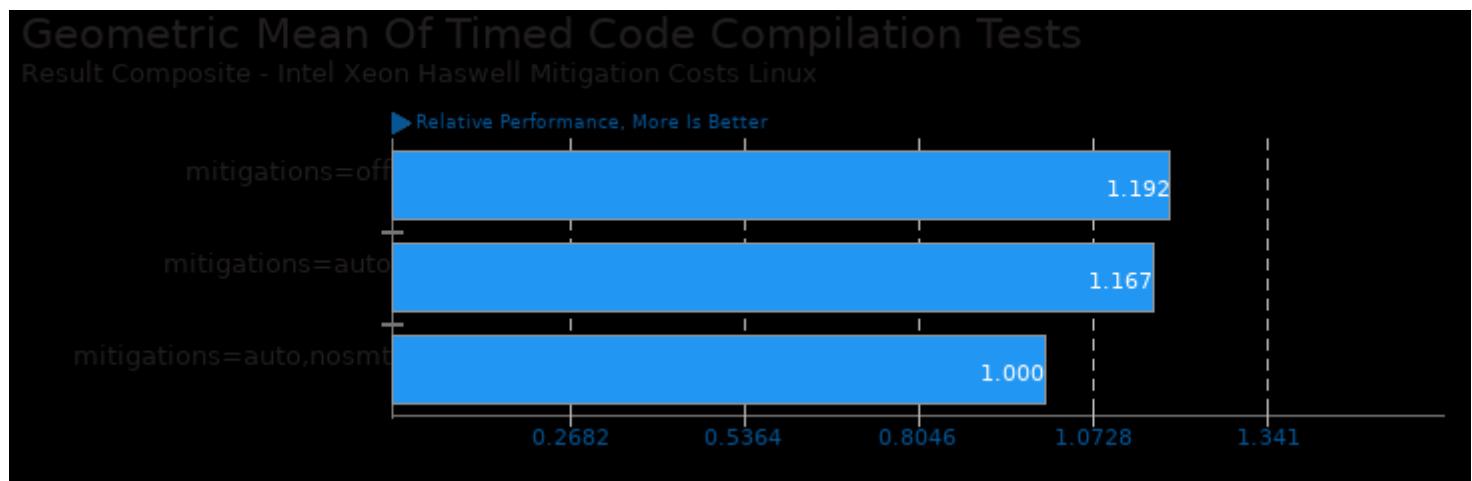
## Geometric Mean Of All Test Results

Result Composite - Intel Xeon Haswell Mitigation Costs Linux

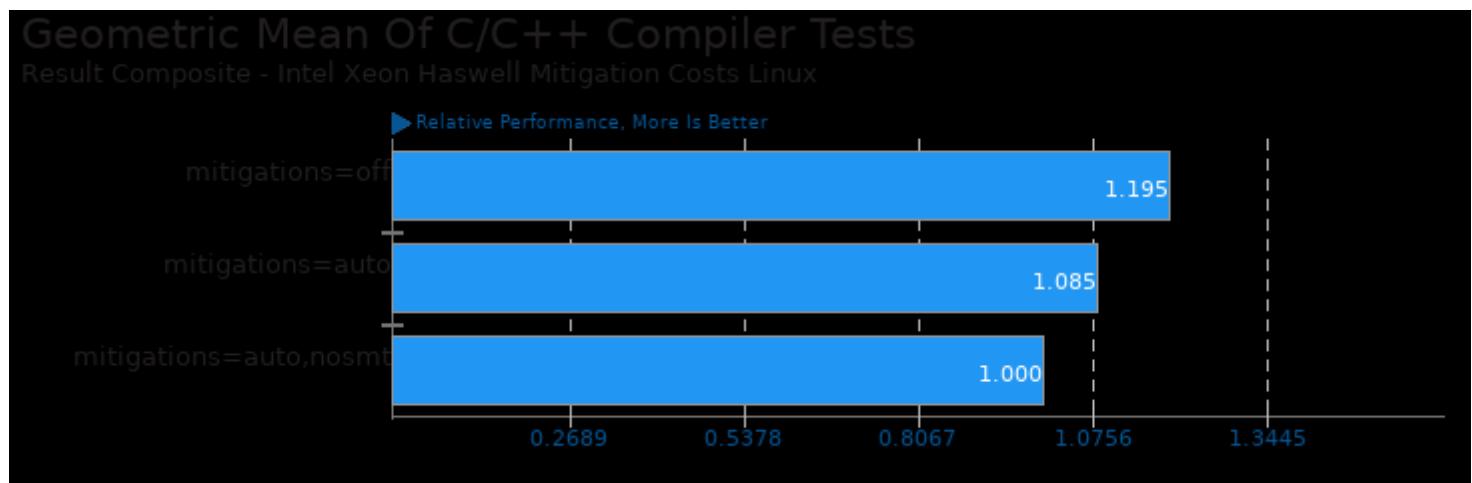


## Intel Xeon Haswell Mitigation Costs Linux

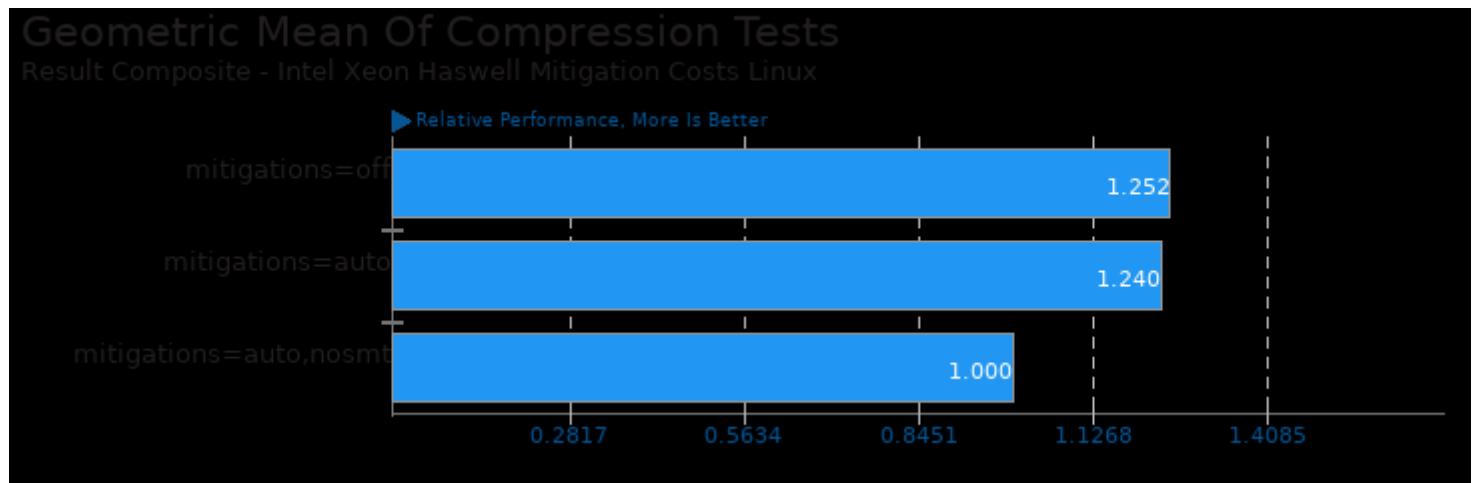
These geometric means are based upon test groupings / test suites for this result file.



Geometric mean based upon tests: pts/build-linux-kernel and pts/build-llvm



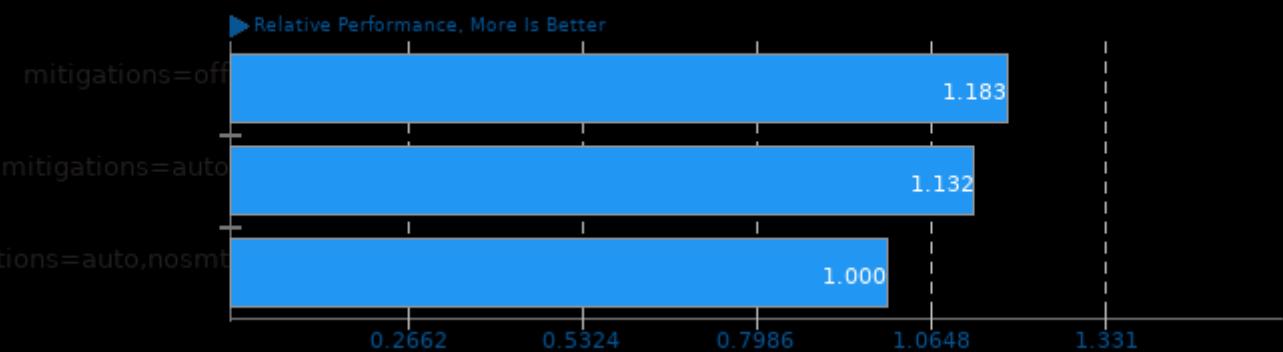
Geometric mean based upon tests: pts/build-llvm, pts/compress-7zip, pts/pgbench, pts/apache, pts/x264, pts/compress-xz, pts/compress-zstd, pts/openssl, pts/nginx and pts/mcperf



Geometric mean based upon tests: pts/compress-7zip, pts/compress-zstd and pts/compress-xz

### Geometric Mean Of Creator Workloads Tests

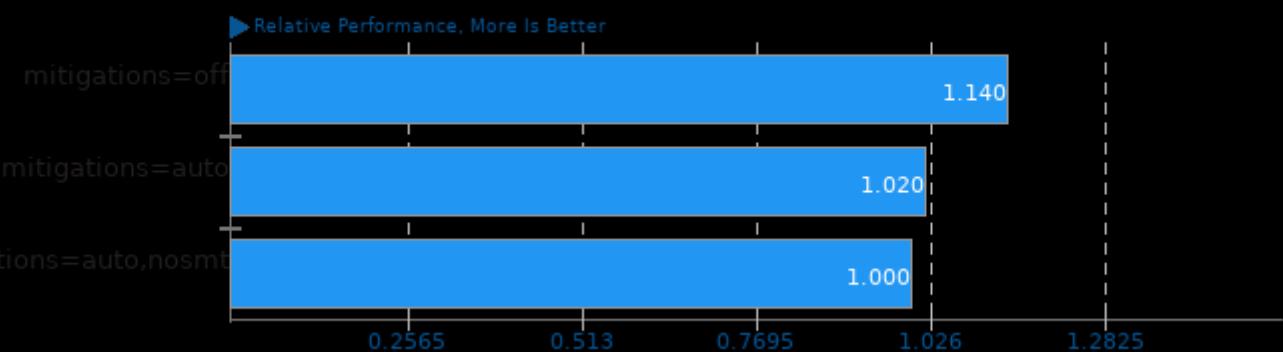
Result Composite - Intel Xeon Haswell Mitigation Costs Linux



Geometric mean based upon tests: pts/v-ray, pts/indigobench, pts/x264, pts/tjbench, system/gimp and system/darktable

### Geometric Mean Of Database Test Suite

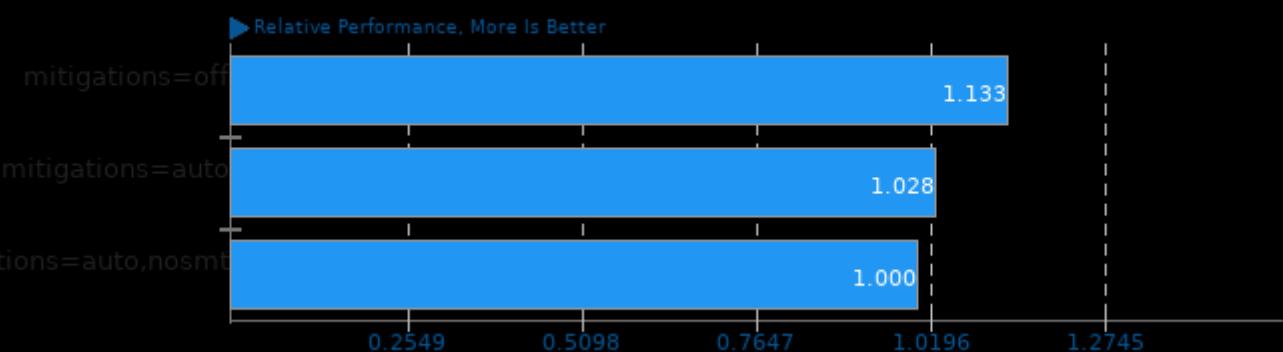
Result Composite - Intel Xeon Haswell Mitigation Costs Linux



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

### Geometric Mean Of Disk Test Suite

Result Composite - Intel Xeon Haswell Mitigation Costs Linux

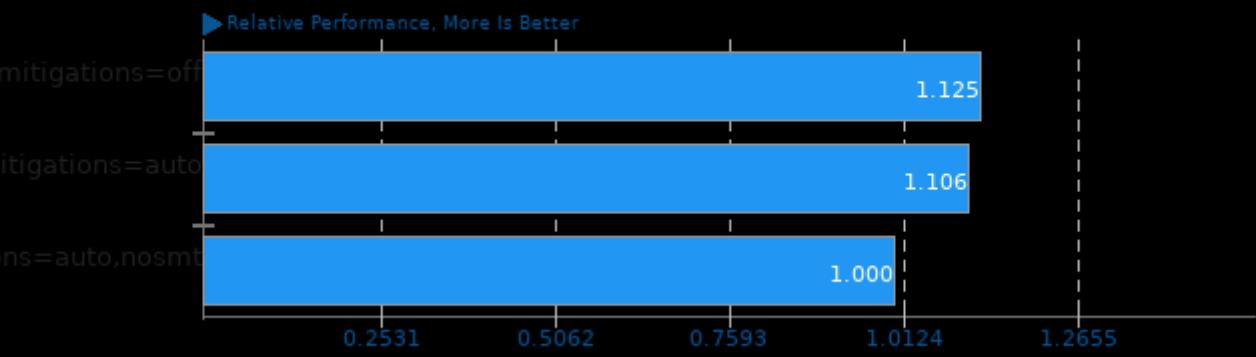


Geometric mean based upon tests: pts/fs-mark, pts/compilebench and pts/postmark

## Intel Xeon Haswell Mitigation Costs Linux

### Geometric Mean Of HPC - High Performance Computing Tests

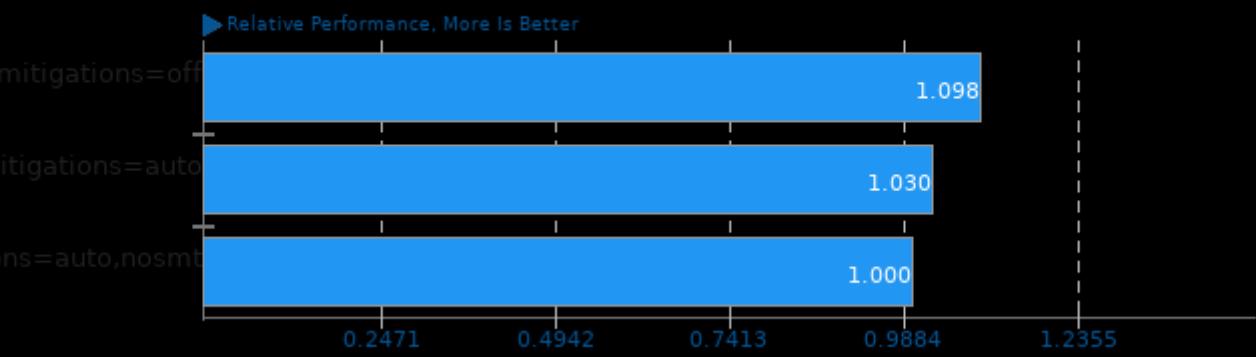
Result Composite - Intel Xeon Haswell Mitigation Costs Linux



Geometric mean based upon tests: pts/namd and pts/scikit-learn

### Geometric Mean Of Imaging Tests

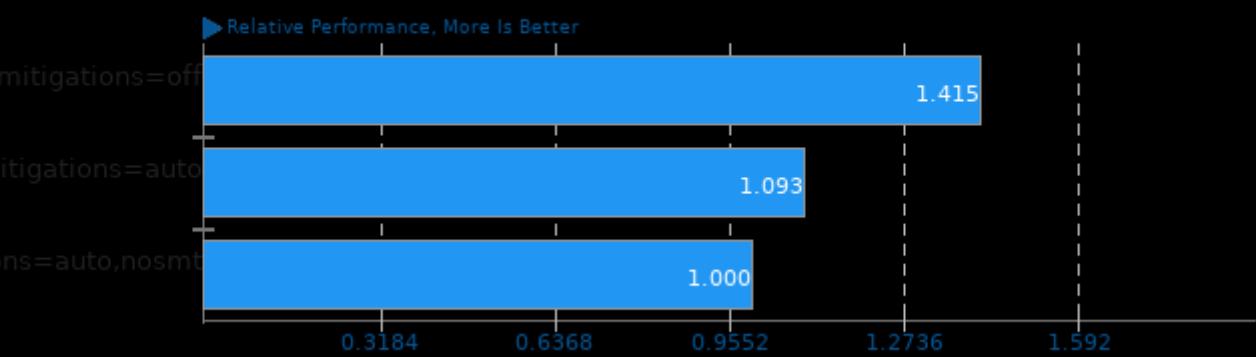
Result Composite - Intel Xeon Haswell Mitigation Costs Linux



Geometric mean based upon tests: pts/tjbench, system/gimp and system/darktable

### Geometric Mean Of Common Kernel Benchmarks Tests

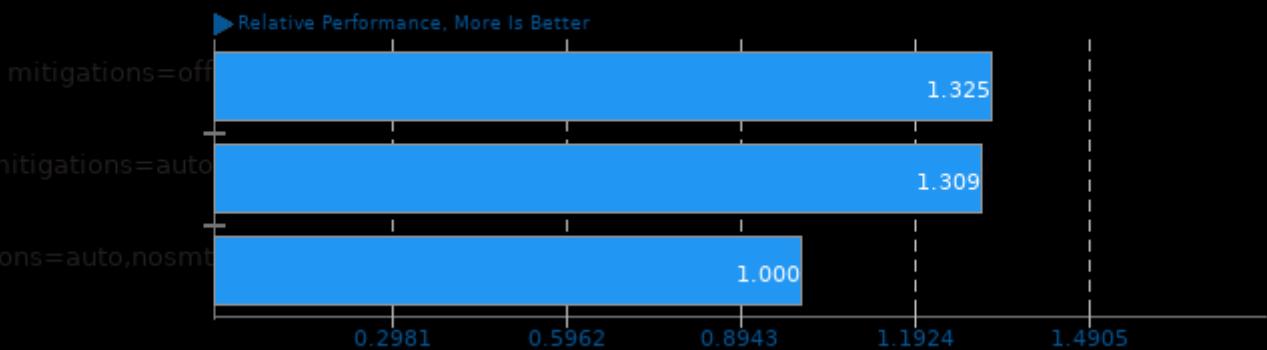
Result Composite - Intel Xeon Haswell Mitigation Costs Linux



Geometric mean based upon tests: pts/apache, pts/postmark, pts/pgbench, pts/t-test1, pts/openssl, pts/ctx-clock, pts/hackbench, pts/stress-ng, pts/osbench and pts/ethr

## Geometric Mean Of Multi-Core Tests

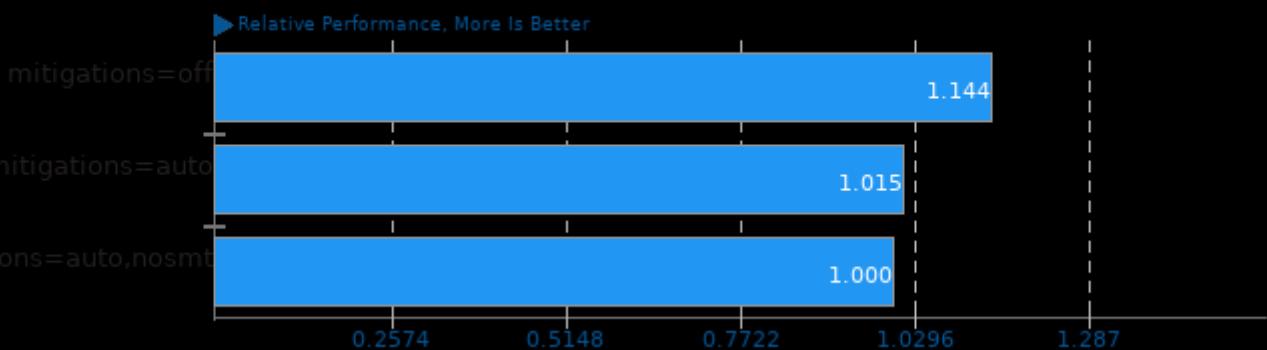
Result Composite - Intel Xeon Haswell Mitigation Costs Linux



Geometric mean based upon tests: pts/sysbench, pts/x264, pts/namd, pts/compress-7zip, pts/compress-zstd, pts/build-linux-kernel, pts/build-llvm, pts/v-ray, pts/indigobench and pts/pgbench

## Geometric Mean Of Networking Test Suite

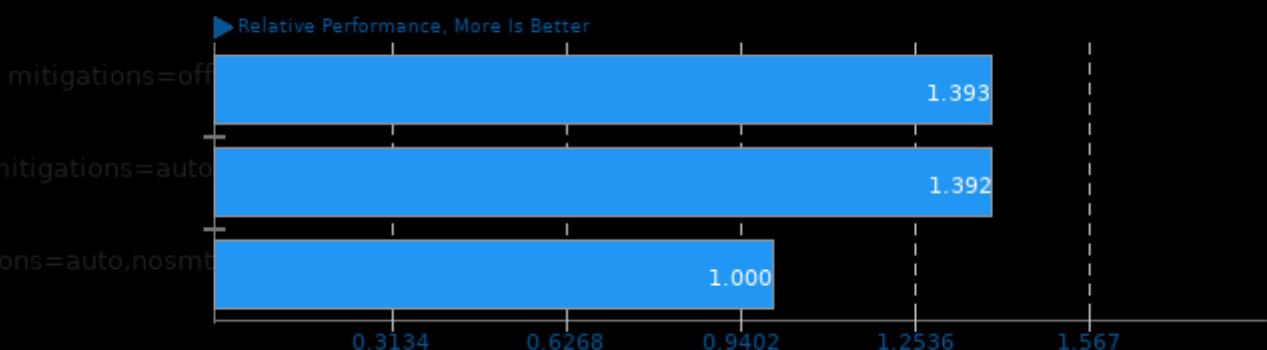
Result Composite - Intel Xeon Haswell Mitigation Costs Linux



Geometric mean based upon tests: pts/sockperf and pts/ethr

## Geometric Mean Of NVIDIA GPU Compute Tests

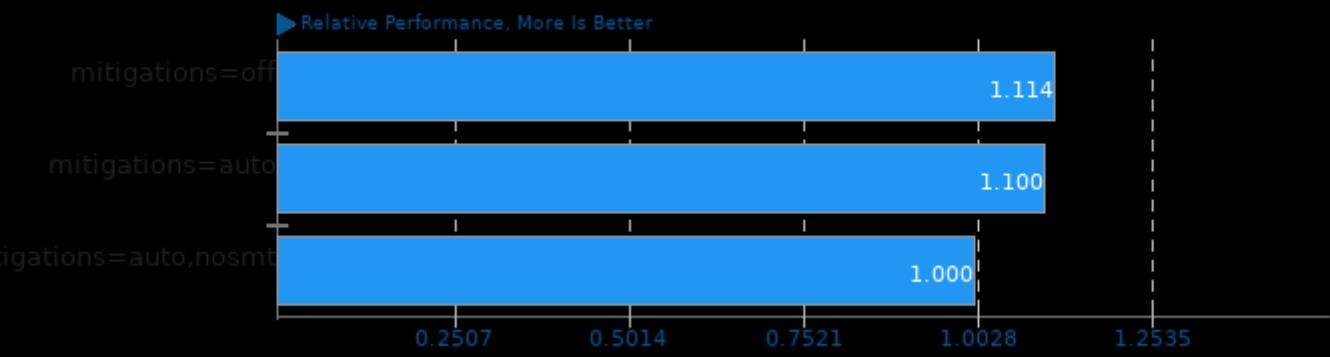
Result Composite - Intel Xeon Haswell Mitigation Costs Linux



Geometric mean based upon tests: pts/indigobench and pts/v-ray

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

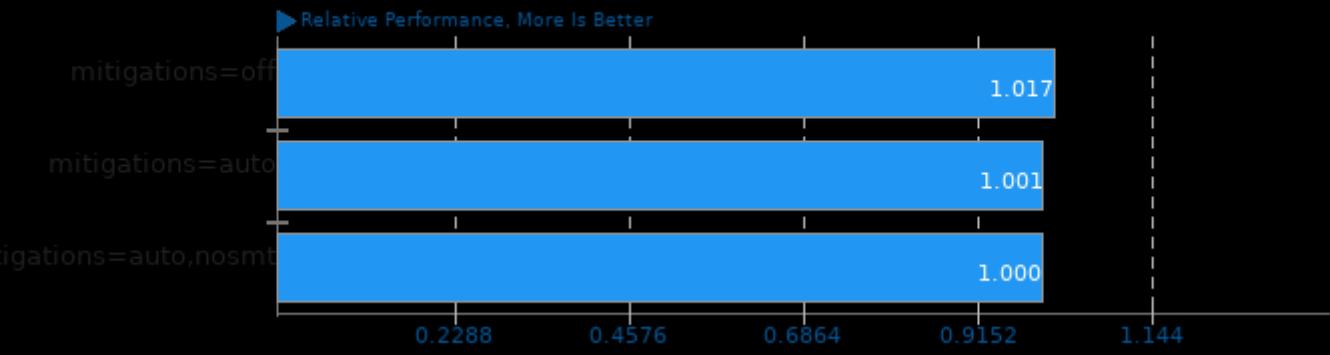
Result Composite - Intel Xeon Haswell Mitigation Costs Linux



Geometric mean based upon tests: pts/git, pts/compress-zstd, pts/pybench, pts/build-linux-kernel and pts/build-llvm

### Geometric Mean Of Python Tests

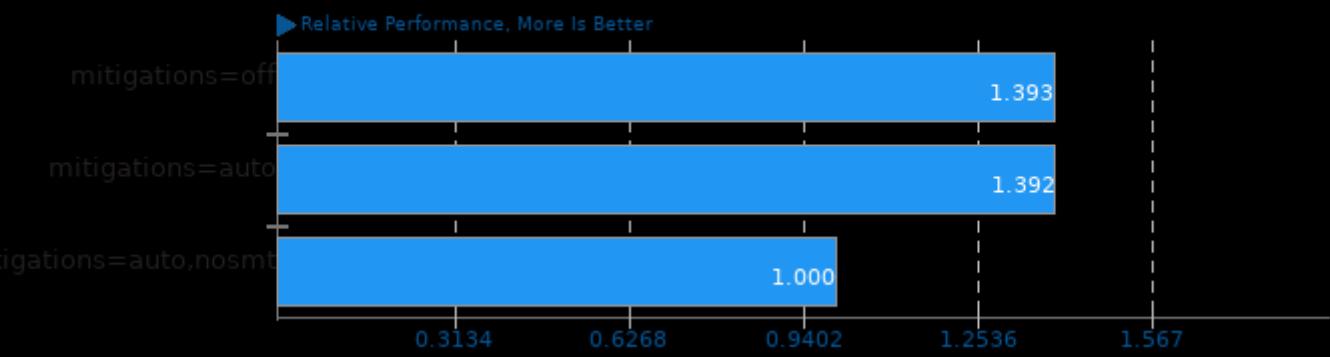
Result Composite - Intel Xeon Haswell Mitigation Costs Linux



Geometric mean based upon tests: pts/pybench and pts/scikit-learn

### Geometric Mean Of Renderers Tests

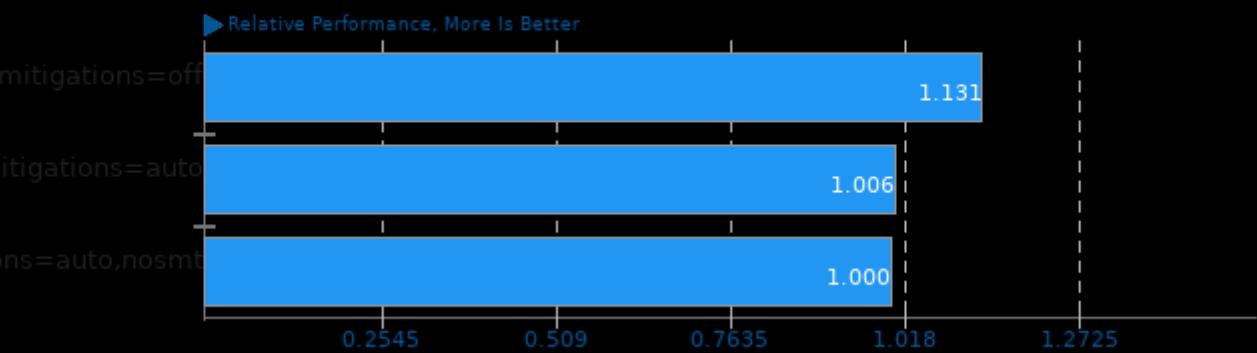
Result Composite - Intel Xeon Haswell Mitigation Costs Linux



Geometric mean based upon tests: pts/v-ray and pts/indigobench

## Geometric Mean Of Server Tests

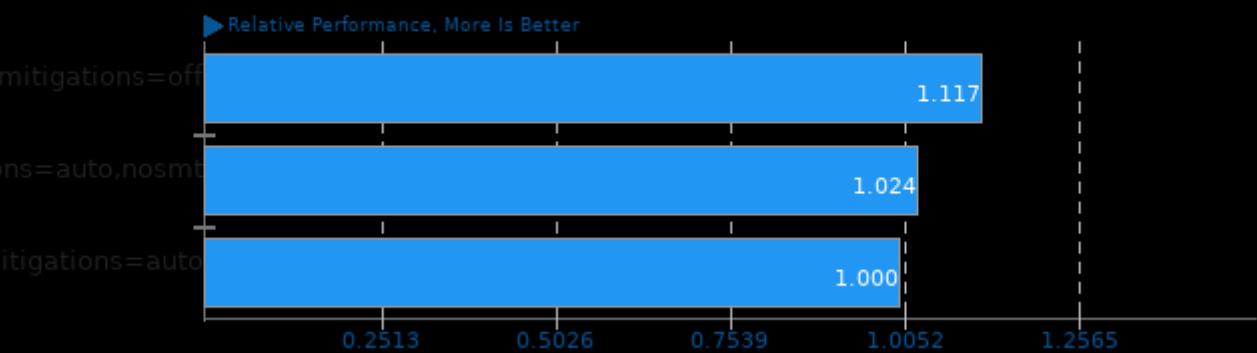
Result Composite - Intel Xeon Haswell Mitigation Costs Linux



Geometric mean based upon tests: pts/apache, pts/nginx, pts/blogbench, pts/apache-siege, pts/pgbench, pts/mcperf, pts/redis, pts/phpbench, pts/openssl and pts/perl-benchmark

## Geometric Mean Of Single-Threaded Tests

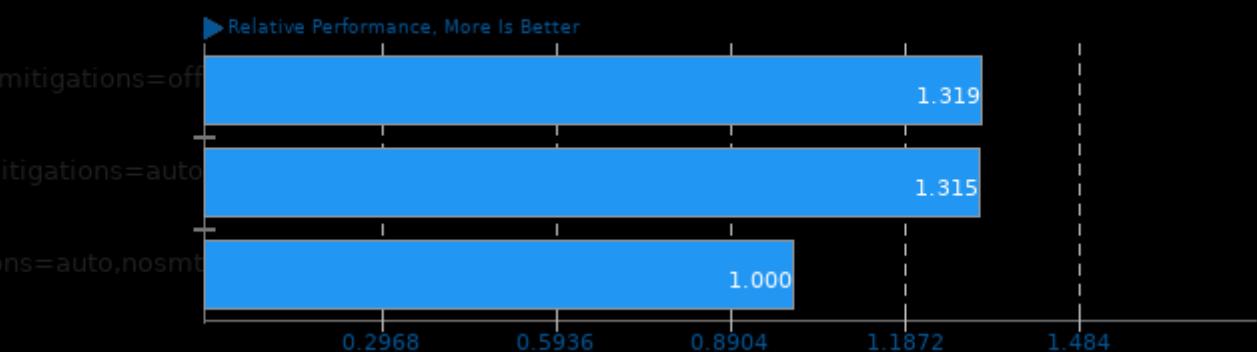
Result Composite - Intel Xeon Haswell Mitigation Costs Linux



Geometric mean based upon tests: pts/perl-benchmark, pts/glibc-bench, pts/tjbench, pts/redis, pts/pybench, pts/phpbench, pts/nginx and pts/git

## Geometric Mean Of Common Workstation Benchmarks Tests

Result Composite - Intel Xeon Haswell Mitigation Costs Linux



Geometric mean based upon tests: pts/sysbench and pts/git

*This file was automatically generated via the Phoronix Test Suite benchmarking software on Friday, 29 March 2024 06:28.*