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## **first\_ram\_14-09-2020**

Intel Core 2 Quad Q6600 testing with a TYAN S5191 (6.00 BIOS) and XGI on Ubuntu 16.04 via the Phoronix Test Suite.

### **Automated Executive Summary**

*Intel Xeon Gold 6132 - Microsoft Hyper-V virtual VGA had the most wins, coming in first place for 80% of the tests.*

*Based on the geometric mean of all complete results, the fastest (Intel Xeon Gold 6132 - Microsoft Hyper-V virtual VGA) was 5.794x the speed of the slowest (4 x 512 MB DDR-133MHz). 7168 MB RAM QEMU was 0.918x the speed of Intel Xeon Gold 6132 - Microsoft Hyper-V virtual VGA, 2 x 8192 MB DDR3-1333MHz Kingston was 0.752x the speed of 7168 MB RAM QEMU, 4 x 2048 MB DDR3-1333MHz Kingston was 0.996x the speed of 2 x 8192 MB DDR3-1333MHz Kingston, Intel Xeon E5405 - AMD ES1000 128MB - IBM Planar was 0.262x the speed of 4 x 2048 MB DDR3-1333MHz Kingston, 4 x 512 MB DDR-133MHz was 0.957x the speed of Intel Xeon E5405 - AMD ES1000 128MB - IBM Planar.*

### **Test Systems:**

**4 x 512 MB DDR-133MHz**

Processor: Intel Core 2 Quad Q6600 @ 0.90GHz (4 Cores), Motherboard: TYAN S5191 (6.00 BIOS), Chipset: Intel E7230/3000/3010 + ICH7, Memory: 4 x 512 MB DDR-133MHz, Disk: 500GB Western Digital WD5003AZEX-0, Graphics: XGI, Network: 2 x Intel 82573V + Intel 82557/8/9/0/1

OS: Ubuntu 16.04, Kernel: 4.4.0-186-generic (x86\_64), Compiler: GCC 5.4.0 20160609, File-System: ext4, Screen Resolution: 640x480

Compiler Notes: --build=x86\_64-linux-gnu --disable-browser-plugin --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-gnu-unique-object --enable-gtk-cairo --enable-java-awt=gtk --enable-java-home --enable-languages=c,ada,c++,java,go,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc --enable-plugin --enable-shared --enable-threads=posix --host=x86\_64-linux-gnu --target=x86\_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-arch-directory=amd64 --with-default-libstdcxx-abi=new --with-multilib-list=m32,m64,mx32 --with-tune=generic -v

Processor Notes: Scaling Governor: acpi-cpufreq ondemand - CPU Microcode: 0xba

Security Notes: itlb\_multihit: KVM: Vulnerable + l1tf: Mitigation of PTE Inversion + mds: Vulnerable: Clear buffers attempted no microcode; SMT disabled + meltdown: Mitigation of PTI + spec\_store\_bypass: Vulnerable + spectre\_v1: Mitigation of usercopy/swaps barriers and \_\_user pointer sanitization + spectre\_v2: Mitigation of Full generic retpoline IBPB: kernel-off STIBP: disabled RSB filling + srbs: Not affected + tsx\_async\_abort: Not affected

## 4 x 2048 MB DDR3-1333MHz Kingston

Processor: Intel Xeon E3-1240 V2 @ 3.80GHz (4 Cores / 8 Threads), Motherboard: Supermicro X9SCL/X9SCM (2.10 BIOS), Chipset: Intel Xeon E3-1200 v2/Ivy, Memory: 4 x 2048 MB DDR3-1333MHz Kingston, Disk: 500GB Western Digital WD5003AZEX-0, Graphics: Matrox MGA G200eW WPCM450, Network: Intel 82579LM + Intel 82574L

OS: Ubuntu 16.04, Kernel: 4.4.0-186-generic (x86\_64), Compiler: GCC 5.4.0 20160609, File-System: ext4, Screen Resolution: 640x480

Compiler Notes: --build=x86\_64-linux-gnu --disable-browser-plugin --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-gnu-unique-object --enable-gtk-cairo --enable-java-awt=gtk --enable-java-home --enable-languages=c,ada,c++,java,go,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc --enable-plugin --enable-shared --enable-threads=posix --host=x86\_64-linux-gnu --target=x86\_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-arch-directory=amd64 --with-default-libstdcxx-abi=new --with-multilib-list=m32,m64,mx32 --with-tune=generic -v

Processor Notes: Scaling Governor: intel\_pstate powersave - CPU Microcode: 0x21

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 + srbs: Vulnerable: No microcode + tsx\_async\_abort: Not affected

## 2 x 8192 MB DDR3-1333MHz Kingston

Processor: Intel Xeon E5-2620 0 @ 2.50GHz (6 Cores / 12 Threads), Motherboard: Supermicro X9DRW v0123456789 (3.0a BIOS), Chipset: Intel Xeon E5/Core, Memory: 2 x 8192 MB DDR3-1333MHz Kingston, Disk: 500GB Western Digital WD5003AZEX-0, Graphics: Matrox G200eR2, Network: 2 x Intel I350

OS: Ubuntu 16.04, Kernel: 4.4.0-186-generic (x86\_64), Compiler: GCC 5.4.0 20160609, File-System: ext4, Screen Resolution: 800x600

Compiler Notes: --build=x86\_64-linux-gnu --disable-browser-plugin --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-gnu-unique-object --enable-gtk-cairo --enable-java-awt=gtk --enable-java-home --enable-languages=c,ada,c++,java,go,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc --enable-plugin --enable-shared --enable-threads=posix --host=x86\_64-linux-gnu --target=x86\_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-arch-directory=amd64 --with-default-libstdcxx-abi=new --with-multilib-list=m32,m64,mx32 --with-tune=generic -v

Processor Notes: Scaling Governor: intel\_pstate powersave - CPU Microcode: 0x71a

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 + srbs: Not affected + tsx\_async\_abort: Not affected

## Intel Xeon E5405 - AMD ES1000 128MB - IBM Planar

Processor: Intel Xeon E5405 @ 2.00GHz (4 Cores), Motherboard: IBM Planar (-[GFE136BUS-1.09] BIOS), Chipset: Intel 5000X MCH, Memory: 16GB, Disk: 256GB ssd, Graphics: AMD ES1000 128MB, Monitor: IBM RSA2 +

SyncMaster, Network: 2 x Broadcom NetXtreme II BCM5708

OS: Ubuntu 16.04, Kernel: 4.4.0-142-generic (i686), Compiler: GCC 5.4.0 20160609, File-System: ext4, Screen Resolution: 1024x768

Compiler Notes: --build=i686-linux-gnu --disable-browser-plugin --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-gnu-unique-object --enable-gtk-cairo --enable-java-awt=gtk --enable-java-home --enable-languages=c,ada,c++,java,go,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc --enable-plugin --enable-shared --enable-targets=all --enable-threads=posix --host=i686-linux-gnu --target=i686-linux-gnu --with-arch-32=i686 --with-arch-directory=i386 --with-default-libstdcxx-abi=new --with-multilib-list=m32,m64,mx32 --with-tune=generic -v

Processor Notes: CPU Microcode: 0x60f

Security Notes: I1tf: Mitigation of PTE Inversion; VMX: EPT disabled + meltdown: Vulnerable + spec\_store\_bypass: Vulnerable + spectre\_v1: Mitigation of \_\_user pointer sanitization + spectre\_v2: Mitigation of Full generic retrpoline

## Intel Xeon Gold 6132 - Microsoft Hyper-V virtual VGA

Processor: Intel Xeon Gold 6132 (4 Cores), Motherboard: Microsoft Virtual Machine v7.0 (090006 BIOS), Chipset: Intel 440BX/ZX/DX, Memory: 3968 MB + 8320 MB, Disk: 21GB Virtual Disk, Graphics: Microsoft Hyper-V virtual VGA

OS: Ubuntu 20.04, Kernel: 5.4.0-42-generic (x86\_64), Compiler: GCC 9.3.0, File-System: ext4, Screen Resolution: 1152x864, System Layer: Microsoft Hyper-V Server

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++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none,hsa --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=auto --with-tune=generic --without-cuda-driver -v

Processor Notes: CPU Microcode: 0xffffffff

Security Notes: itlb\_multihit: KVM: Vulnerable + I1tf: Mitigation of PTE Inversion + mds: Vulnerable: Clear buffers attempted no microcode; SMT Host state unknown + 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 retrpoline IBPB: conditional IBRS\_FW STIBP: disabled RSB filling + srbs: Not affected + tsx\_async\_abort: Vulnerable: Clear buffers attempted no microcode; SMT Host state unknown

## 7168 MB RAM QEMU

Processor: 6 x Intel Xeon E5-2670 0 @ 2.60GHz (6 Cores), Motherboard: QEMU Standard PC (i440FX + PIIX 1996), Chipset: Intel 440FX- 82441FX PMC, Memory: 1 x 7168 MB RAM QEMU, Disk: 20GB, Graphics: Cirrus Logic GD 5446, Network: Red Hat Virtio device

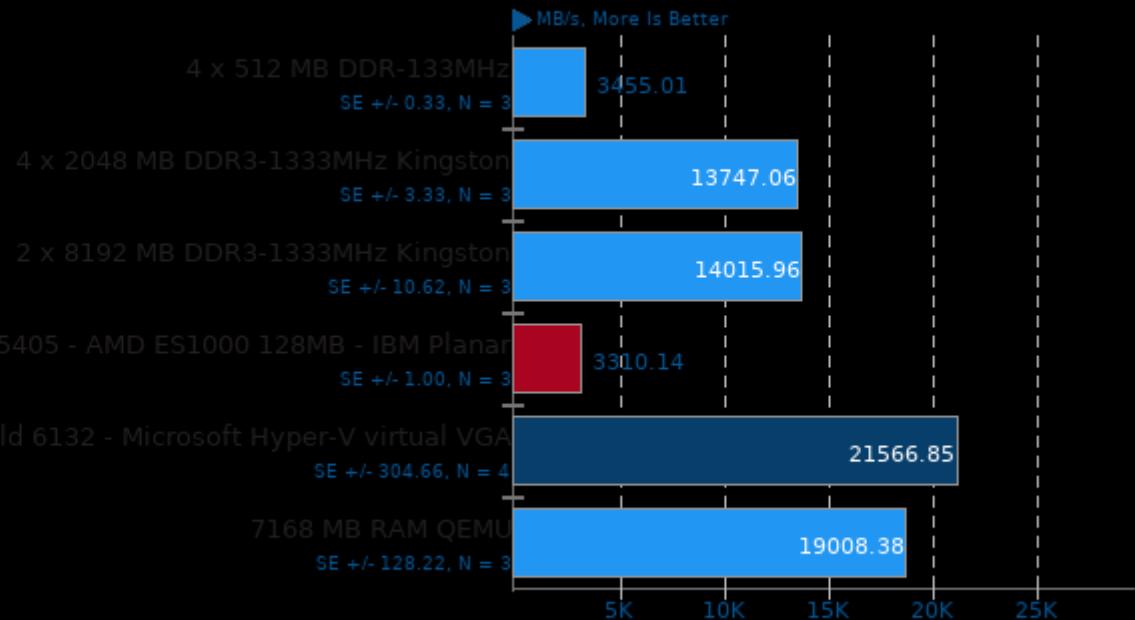
OS: Ubuntu 18.04, Kernel: 4.15.0-117-generic (x86\_64), File-System: ext4, Screen Resolution: 1024x768, System Layer: qemu

Compiler Notes: --build=x86\_64-linux-gnu --disable-vtable-verify --disable-werror --enable-bootstrap --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

	4 x 512 MB DDR-133MHz	4 x 2048 MB DDR3-1333M Hz Kingston	2 x 8192 MB DDR3-1333M Hz Kingston	Intel Xeon E5405 - AMD ES1000 128MB - IBM Planar	Intel Xeon Gold 6132 - Microsoft Hyper-V	7168 MB RAM QEMU virtual VGA
<b>RAMspeed SMP - Add - Integer (MB/s)</b>	3455	13747	14016	<b>3310</b>	<b>21567</b>	19008
Normalized	16.02%	63.74%	64.99%	15.35%	100%	88.14%
Standard Deviation	0%	0%	0.1%	0.1%	2.8%	1.2%
<b>RAMspeed SMP - Copy - Integer (MB/s)</b>	<b>3028</b>	12137	12071	3421	<b>19228</b>	16287
Normalized	15.75%	63.12%	62.78%	17.79%	100%	84.71%
Standard Deviation	0%	0%	0%	0.1%	0.8%	3.1%
<b>RAMspeed SMP - Scale - Integer (MB/s)</b>	<b>3014</b>	12136	12039	3376	16301	<b>16475</b>
Normalized	18.29%	73.66%	73.08%	20.49%	98.94%	100%
Standard Deviation	0%	0.3%	0%	0%	2.6%	1.6%
<b>RAMspeed SMP - Triad - Integer (MB/s)</b>	3468	13637	13793	<b>3282</b>	<b>20760</b>	18337
Normalized	16.71%	65.69%	66.44%	15.81%	100%	88.33%
Standard Deviation	0%	0.1%	0%	0%	1.2%	1.4%
<b>RAMspeed SMP - Average - Integer (MB/s)</b>	<b>3241</b>	12955	13025	3348	<b>19237</b>	17357
Normalized	16.85%	67.34%	67.7%	17.41%	100%	90.22%
Standard Deviation	0%	0.3%	0.2%	0%	0.6%	0.9%
<b>RAMspeed SMP - Add - Floating Point (MB/s)</b>	3462	13654	13858	<b>3415</b>	<b>18429</b>	17161
Normalized	18.79%	74.09%	75.2%	18.53%	100%	93.12%
Standard Deviation	0%	0%	0.3%	0.1%	1%	0.7%
<b>RAMspeed SMP - Copy - Floating Point (MB/s)</b>	<b>3028</b>	12149	12086	3438	<b>18929</b>	16490
Normalized	16%	64.18%	63.85%	18.16%	100%	87.12%
Standard Deviation	0%	0.1%	0%	0%	2.7%	3.2%
<b>RAMspeed SMP - Scale - Floating Point (MB/s)</b>	<b>3026</b>	12123	12047	3417	14925	<b>16655</b>
Normalized	18.17%	72.79%	72.33%	20.52%	89.61%	100%
Standard Deviation	0%	0.3%	0%	0%	0.9%	2.2%
<b>RAMspeed SMP - Triad - Floating Point (MB/s)</b>	3438	13672	13809	<b>3376</b>	<b>21054</b>	17440
Normalized	16.33%	64.94%	65.59%	16.03%	100%	82.84%
Standard Deviation	0.1%	0.3%	0.1%	0.1%	1.7%	2.2%
<b>RAMspeed SMP - Average - Floating Point (MB/s)</b>	<b>3238</b>	12910	12943	3412	<b>18040</b>	17005
Normalized	17.95%	71.57%	71.74%	18.91%	100%	94.26%
Standard Deviation	0%	0.3%	0%	0%	2.8%	1%

## RAMspeed SMP 3.5.0

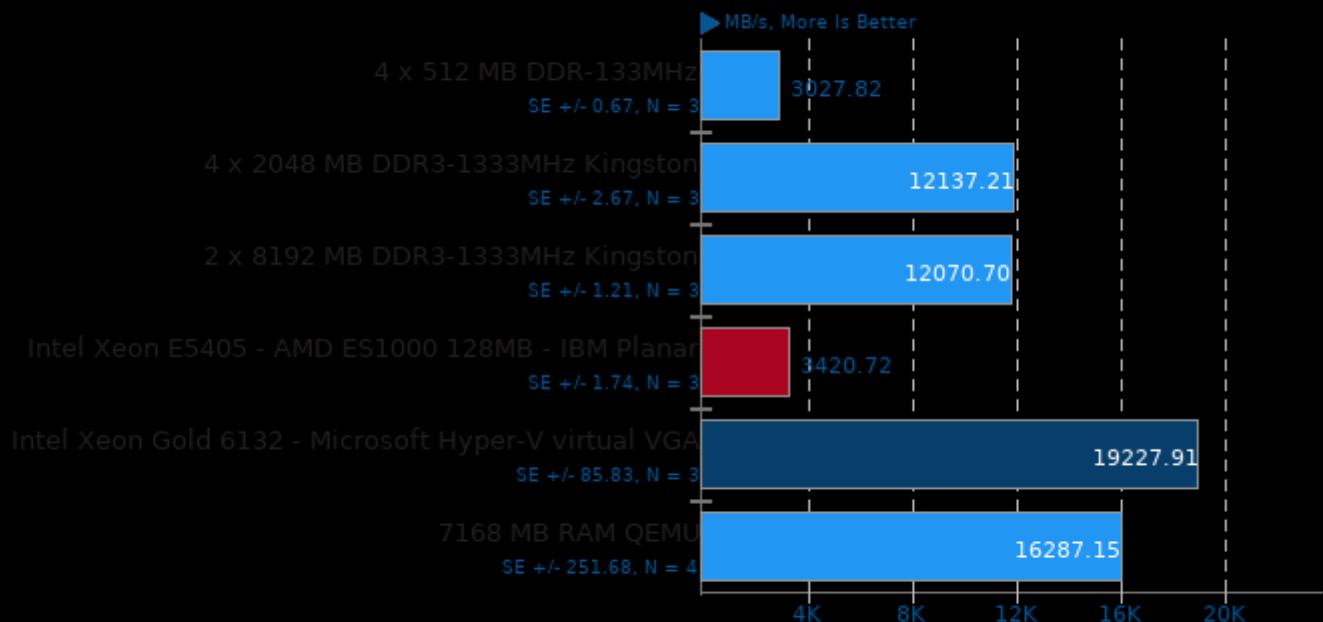
Type: Add - Benchmark: Integer



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

## RAMspeed SMP 3.5.0

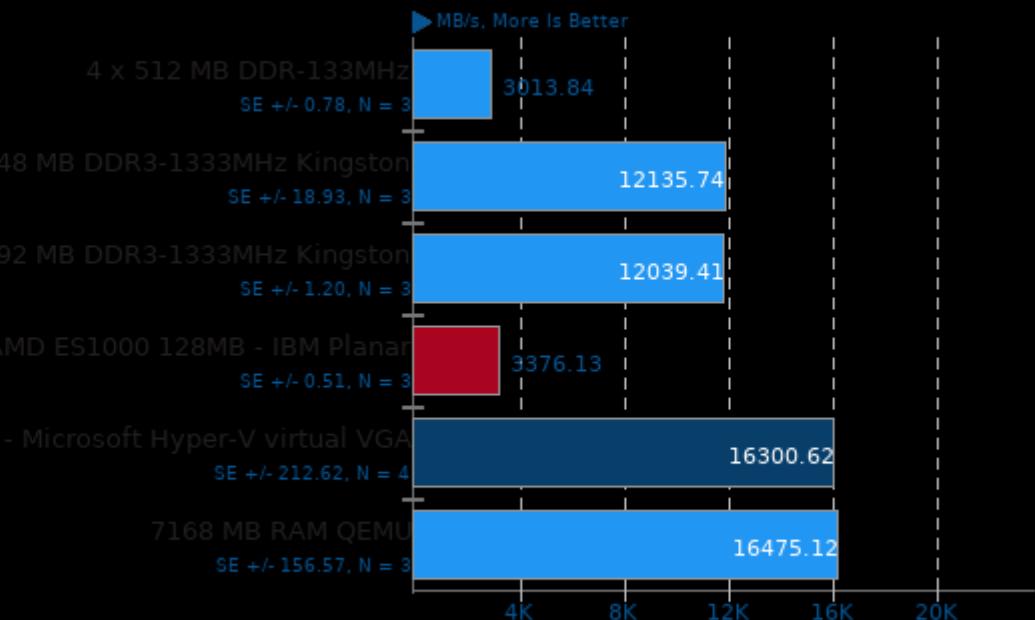
Type: Copy - Benchmark: Integer



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

## RAMspeed SMP 3.5.0

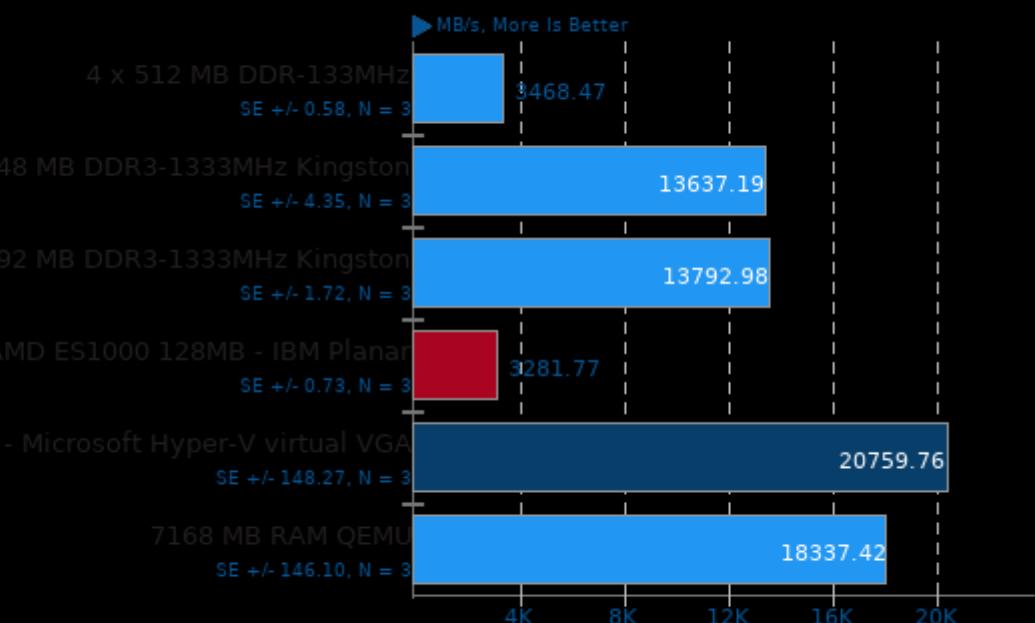
Type: Scale - Benchmark: Integer



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

## RAMspeed SMP 3.5.0

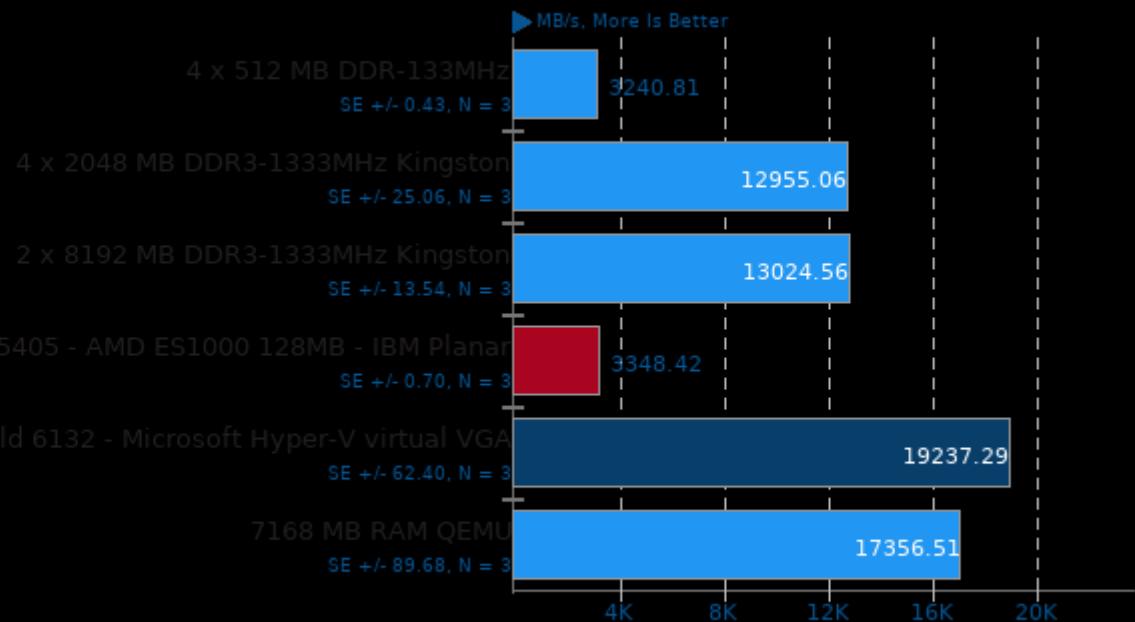
Type: Triad - Benchmark: Integer



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

## RAMspeed SMP 3.5.0

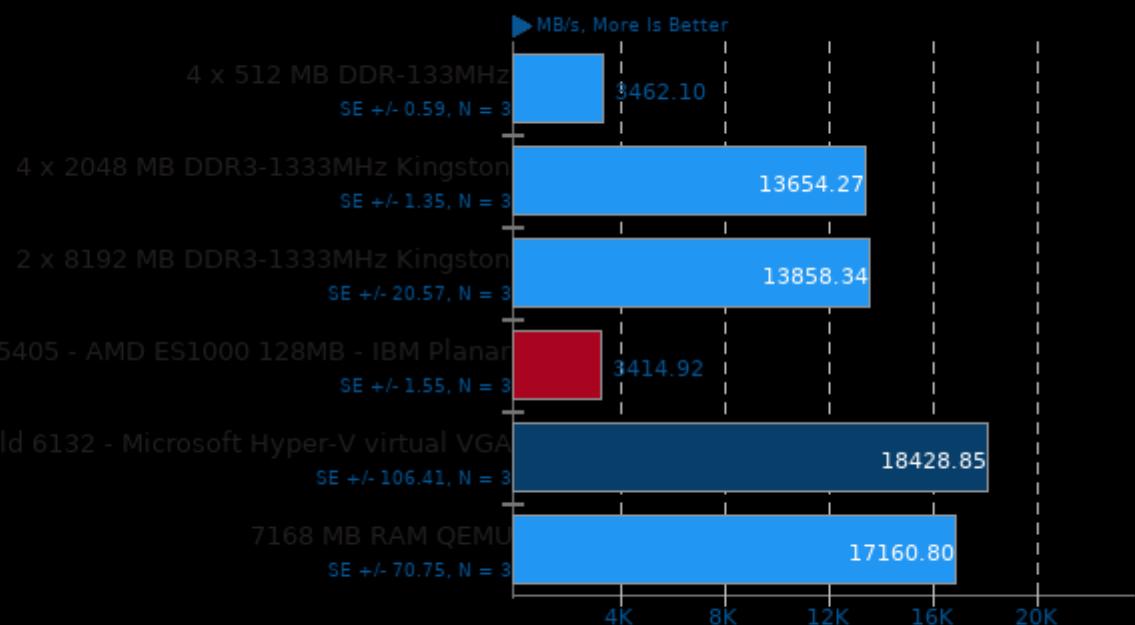
Type: Average - Benchmark: Integer



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

## RAMspeed SMP 3.5.0

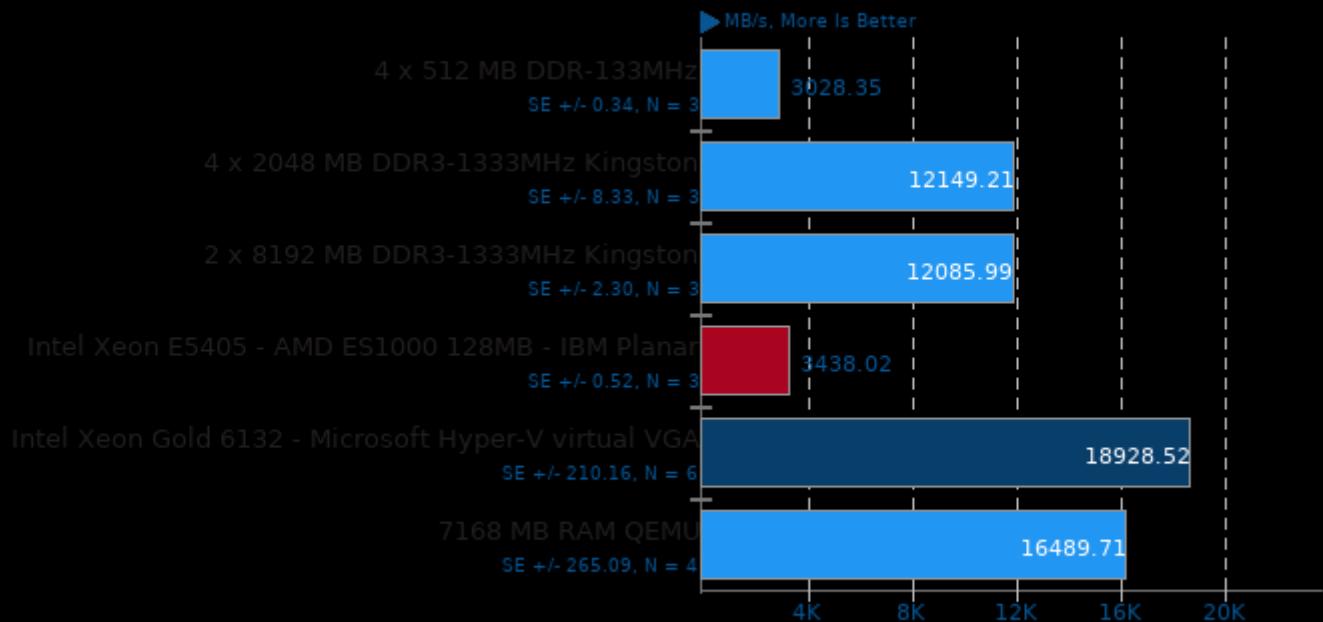
Type: Add - Benchmark: Floating Point



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

## RAMspeed SMP 3.5.0

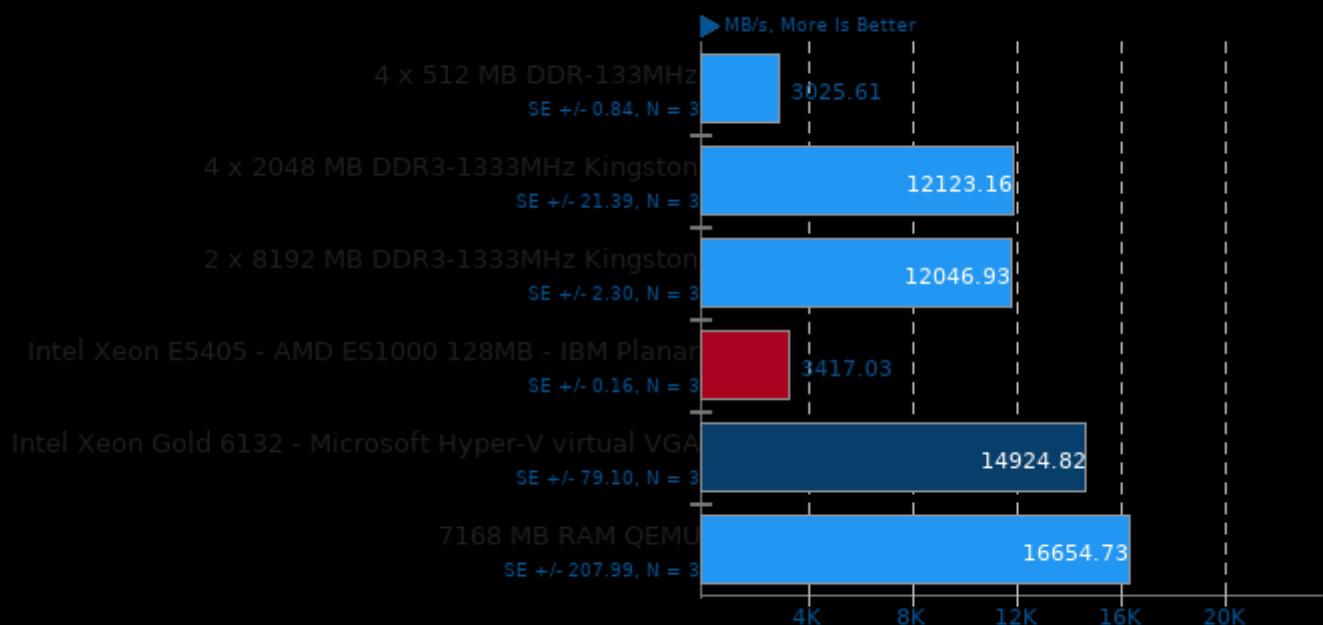
Type: Copy - Benchmark: Floating Point



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

## RAMspeed SMP 3.5.0

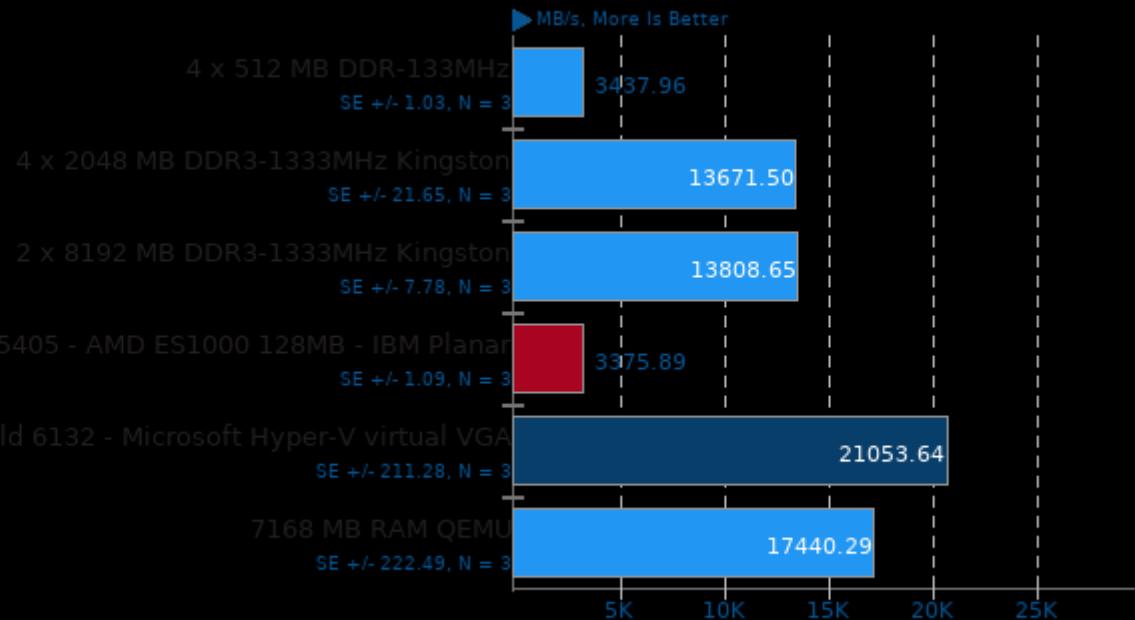
Type: Scale - Benchmark: Floating Point



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

## RAMspeed SMP 3.5.0

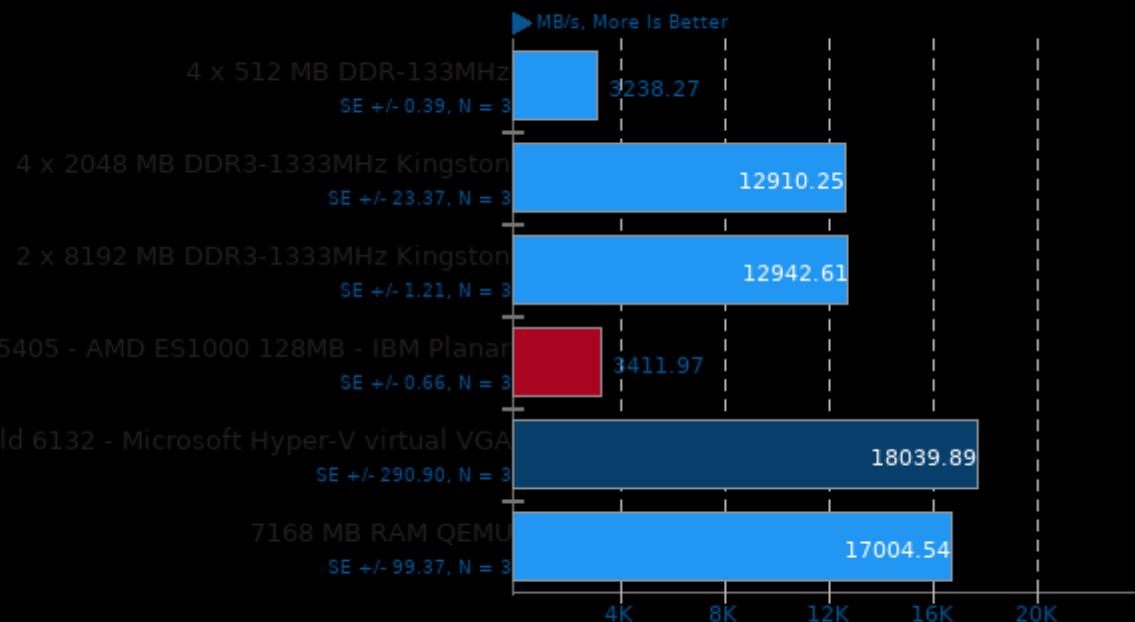
Type: Triad - Benchmark: Floating Point



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

## RAMspeed SMP 3.5.0

Type: Average - Benchmark: Floating Point



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

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