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Talos II POWER9 vs. AMD / Intel HEDT Benchmarks

POWER9 2x22 Core Talos II system, Fedora 34 with current kernel as of 13OCT2021

Automated Executive Summary

Talos II 2 x 22c POWER 9 - Spec Kernel Only had the most wins, coming in first place for 41% of the tests.

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

PHPBench (PHP Benchmark Suite) at 8.679x
Rust Prime Benchmark (Prime Number Test To 200,000,000) at 8.514x
7-Zip Compression (Compress Speed Test) at 7.893x
7-Zip Compression (System Power Consumption Monitor) at 6.63x
PyBench (Total For Average Test Times) at 6.551x
Timed LLVM Compilation (System Power Consumption Monitor) at 6.465x
PHPBench (PHP Benchmark Suite) at 6.324x
Stockfish (System Power Consumption Monitor) at 6.32x
PostgreSQL pgbench (System Power Consumption Monitor) at 6.1x
C-Ray (System Power Consumption Monitor) at 6.029x.

Test Systems:

Core i9 7900X

Processor: Intel Core i7-7900X @ 4.50GHz (10 Cores / 20 Threads), Motherboard: ASRock X299 Extreme4 (P1.30 BIOS), Chipset: Intel Sky Lake-E DMI3 Registers, Memory: 32768MB, Disk: 525GB 2115, Graphics: AMD Radeon RX Vega 8GB, Audio: Realtek ALC1220, Network: Intel Connection

OS: Ubuntu 18.10, Kernel: 4.19.0-999-generic (x86_64) 20181020, Desktop: GNOME Shell 3.30.1, Display Server: X Server 1.20.1, Display Driver: modesetting 1.20.1, OpenGL: 4.5 Mesa 18.2.2 (LLVM 7.0.0), Compiler: GCC 8.2.0, File-System: ext4, Screen Resolution: 3840x2160

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
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
Processor Notes: Scaling Governor: intel_pstate performance
Python Notes: Python 2.7.15+ + Python 3.6.7rc1
Security Notes: KPTI + __user pointer sanitization + Full generic retpoline IBPB IBRS_FW + SSB disabled via prctl and seccomp + PTE Inversion; VMX: conditional cache flushes SMT vulnerable

Core i9 7960X

Processor: Intel Core i9-7960X @ 4.40GHz (16 Cores / 32 Threads), Motherboard: MSI X299 SLI PLUS (MS-7A93) v1.0 (1.A0 BIOS), Chipset: Intel Sky Lake-E DMI3 Registers, Memory: 32768MB, Disk: 525GB 2115, Graphics: AMD Radeon RX Vega 8GB, Audio: Realtek ALC1220, Network: Intel Connection

OS: Ubuntu 18.10, Kernel: 4.19.0-999-generic (x86_64) 20181020, Desktop: GNOME Shell 3.30.1, Display Server: X Server 1.20.1, Display Driver: modesetting 1.20.1, OpenGL: 4.5 Mesa 18.2.2 (LLVM 7.0.0), Compiler: GCC 8.2.0, File-System: ext4, Screen Resolution: 3840x2160

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
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
Processor Notes: Scaling Governor: intel_pstate performance
Python Notes: Python 2.7.15+ + Python 3.6.7rc1
Security Notes: KPTI + __user pointer sanitization + Full generic retpoline IBPB IBRS_FW + SSB disabled via prctl and seccomp + PTE Inversion; VMX: conditional cache flushes SMT vulnerable

Core i9 7980XE

Processor: Intel Core i9-7980XE @ 4.20GHz (18 Cores / 36 Threads), Motherboard: ASUS PRIME X299-A (1503 BIOS), Chipset: Intel Sky Lake-E DMI3 Registers, Memory: 32768MB, Disk: 525GB 2115, Graphics: AMD Radeon RX Vega 8GB, Audio: Realtek ALC1220, Network: Intel Connection

OS: Ubuntu 18.10, Kernel: 4.19.0-999-generic (x86_64) 20181020, Desktop: GNOME Shell 3.30.1, Display Server: X Server 1.20.1, Display Driver: modesetting 1.20.1, OpenGL: 4.5 Mesa 18.2.2 (LLVM 7.0.0), Compiler: GCC 8.2.0, File-System: ext4, Screen Resolution: 3840x2160

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
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

Processor Notes: Scaling Governor: intel_pstate performance
Python Notes: Python 2.7.15+ + Python 3.6.7rc1
Security Notes: KPTI + __user pointer sanitization + Full generic retpoline IBPB IBRS_FW + SSB disabled via prctl and seccomp + PTE Inversion; VMX: conditional cache flushes SMT vulnerable

Threadripper 2920X

Processor: AMD Ryzen Threadripper 2920X 12-Core @ 3.50GHz (12 Cores / 24 Threads), Motherboard: Gigabyte X399 AORUS Gaming 7 (F11e BIOS), Chipset: AMD Family 17h, Memory: 32768MB, Disk: 525GB 2115, Graphics: AMD Radeon RX Vega 8GB, Audio: Realtek ALC1220, Network: Qualcomm Atheros Killer E2500 Gigabit + Intel Wireless 8265 / 8275

OS: Ubuntu 18.10, Kernel: 4.19.0-999-generic (x86_64) 20181020, Desktop: GNOME Shell 3.30.1, Display Server: X Server 1.20.1, Display Driver: modesetting 1.20.1, OpenGL: 4.5 Mesa 18.2.2 (LLVM 7.0.0), Compiler: GCC 8.2.0, File-System: ext4, Screen Resolution: 3840x2160

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
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
Processor Notes: Scaling Governor: acpi-cpufreq performance
Python Notes: Python 2.7.15+ + Python 3.6.7rc1
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB + SSB disabled via prctl and seccomp

Threadripper 2950X

Processor: AMD Ryzen Threadripper 2950X 16-Core @ 3.50GHz (16 Cores / 32 Threads), Motherboard: MSI MEG X399 CREATION (MS-7B92) v1.0 (1.10 BIOS), Chipset: AMD Family 17h, Memory: 32768MB, Disk: 525GB 2115, Graphics: AMD Radeon RX Vega 8GB, Audio: Realtek ALC1220, Network: Intel I211 Gigabit Connection + Intel Wireless-AC 9260

OS: Ubuntu 18.10, Kernel: 4.19.0-999-generic (x86_64) 20181020, Desktop: GNOME Shell 3.30.1, Display Server: X Server 1.20.1, Display Driver: modesetting 1.20.1, OpenGL: 4.5 Mesa 18.2.2 (LLVM 7.0.0), Compiler: GCC 8.2.0, File-System: ext4, Screen Resolution: 3840x2160

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
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
Processor Notes: Scaling Governor: acpi-cpufreq performance
Python Notes: Python 2.7.15+ + Python 3.6.7rc1
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB + SSB disabled via prctl and seccomp

Threadripper 2970WX

Processor: AMD Ryzen Threadripper 2970WX 24-Core @ 3.00GHz (24 Cores / 48 Threads), Motherboard: Gigabyte X399 AORUS Gaming 7 (F11e BIOS), Chipset: AMD Family 17h, Memory: 32768MB, Disk: 525GB 2115, Graphics: AMD Radeon RX Vega 8GB, Audio: Realtek ALC1220, Network: Qualcomm Atheros Killer E2500 Gigabit + Intel Wireless 8265 / 8275

OS: Ubuntu 18.10, Kernel: 4.19.0-999-generic (x86_64) 20181020, Desktop: GNOME Shell 3.30.1, Display Server: X Server 1.20.1, Display Driver: modesetting 1.20.1, OpenGL: 4.5 Mesa 18.2.2 (LLVM 7.0.0), Compiler: GCC 8.2.0, File-System: ext4, Screen Resolution: 3840x2160

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native

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
Processor Notes: Scaling Governor: acpi-cpufreq performance
Python Notes: Python 2.7.15+ + Python 3.6.7rc1
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB + SSB disabled via prctl and seccomp

Threadripper 2990WX

Processor: AMD Ryzen Threadripper 2990WX 32-Core @ 3.00GHz (32 Cores / 64 Threads), Motherboard: ASUS ROG ZENITH EXTREME (1402 BIOS), Chipset: AMD Family 17h, Memory: 32768MB, Disk: 525GB 2115, Graphics: AMD Radeon RX Vega 8GB, Audio: Realtek ALC1220, Network: Intel I211 Gigabit Connection

OS: Ubuntu 18.10, Kernel: 4.19.0-999-generic (x86_64) 20181020, Desktop: GNOME Shell 3.30.1, Display Server: X Server 1.20.1, Display Driver: modesetting 1.20.1, OpenGL: 4.5 Mesa 18.2.2 (LLVM 7.0.0), Compiler: GCC 8.2.0, File-System: ext4, Screen Resolution: 3840x2160

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
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
Processor Notes: Scaling Governor: acpi-cpufreq performance
Python Notes: Python 2.7.15+ + Python 3.6.7rc1
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB + SSB disabled via prctl and seccomp

Talos II 2 x 22c POWER9

Talos II 2 x 22c POWER 9 - Spec Kernel Only

Processor: POWER9 altivec supported @ 3.80GHz (44 Cores / 176 Threads), Motherboard: PowerNV T2P9D01 REV 1.01, Memory: 65536MB, Disk: Samsung SSD 960 EVO 500GB, Graphics: AMD Radeon RX Vega 8GB, Monitor: VE228, Network: Broadcom NetXtreme BCM5719 Gigabit PCIe

OS: Ubuntu 18.10, Kernel: 4.18.0-10-generic (ppc64le), Compiler: GCC 8.2.0, File-System: ext4, Screen Resolution: 1920x1080

Environment Notes: CXXFLAGS=-O3-mtune=power9-mcpu=power9 CFLAGS=-O3-mtune=power9-mcpu=power9
Compiler Notes: --build=powerpc64le-linux-gnu --disable-libphobos --disable-multilib --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,d,fortran,objc,obj-c++ --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-nls --enable-objc-gc=auto --enable-plugin --enable-secureplt --enable-shared --enable-targets=powerpcle-linux --enable-threads=posix --host=powerpc64le-linux-gnu --program-prefix=powerpc64le-linux-gnu- --target=powerpc64le-linux-gnu --with-cpu=power8 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-long-double-128 -v
Processor Notes: Scaling Governor: powernv-cpufreq performance
Python Notes: Python 2.7.15+ + Python 3.6.7
Security Notes: __user pointer sanitization ori31 speculation barrier enabled + Indirect branch serialisation (kernel only) + Kernel entry/exit barrier (eieio)

2x6386 32G ECC

Processor: 2 x AMD Opteron 6386 SE @ 2.80GHz (16 Cores / 32 Threads), Motherboard: VIKINGS KGPE-D16 v1.0 (4.11-ab8edda14a622ab46bdfd01b877d75c7bd385a4d BIOS), Chipset: AMD RD890 + SB7x0/SB8x0/SB9x0, Memory: 32GB, Disk: 180GB INTEL SSDSC2BF18, Graphics: ASPEED, Audio: AMD SBx00 Azalia, Monitor: B226WL, Network: 2 x Intel 82574L

OS: Debian 10, Kernel: 5.10.0-0.bpo.3-amd64 (x86_64), Display Server: X Server 1.20.4, Display Driver: modesetting 1.20.4, Compiler: GCC 8.3.0, File-System: ext4, Screen Resolution: 800x600

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
Processor Notes: Scaling Governor: acpi-cpufreq schedutil - CPU Microcode: 0x6000852
Python Notes: Python 2.7.16 + Python 3.7.3
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + 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 AMD retpoline IBPB: conditional STIBP: disabled RSB filling + srbds: Not affected + tsx_async_abort: Not affected

6262

Processor: AMD Opteron 6262 HE @ 1.60GHz (8 Cores / 16 Threads), Motherboard: VIKINGS KGPE-D16 v1.0 (4.11-ab8edda14a622ab46bdfd01b877d75c7bd385a4d BIOS), Chipset: AMD RD890 + SB7x0/SB8x0/SB9x0, Memory: 16GB, Disk: 180GB INTEL SSDSC2BF18, Graphics: ASPEED, Audio: AMD SBx00 Azalia, Monitor: B226WL, Network: 2 x Intel 82574L

OS: Debian 10, Kernel: 5.10.0-0.bpo.3-amd64 (x86_64), Display Server: X Server 1.20.4, Display Driver: modesetting 1.20.4, Compiler: GCC 8.3.0, File-System: ext4, Screen Resolution: 800x600

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
Processor Notes: Scaling Governor: acpi-cpufreq schedutil - CPU Microcode: 0x600063e
Python Notes: Python 2.7.16 + Python 3.7.3
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + 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 AMD retpoline IBPB: conditional STIBP: disabled RSB filling + srbds: Not affected + tsx_async_abort: Not affected

test

Processor: 2 x AMD Opteron 6386 SE @ 2.80GHz (16 Cores / 32 Threads), Motherboard: VIKINGS KGPE-D16 v1.0 (4.11-ab8edda14a622ab46bdfd01b877d75c7bd385a4d BIOS), Chipset: AMD RD890 + SB7x0/SB8x0/SB9x0, Memory: 32GB, Disk: 180GB INTEL SSDSC2BF18, Graphics: ASPEED, Audio: AMD SBx00 Azalia, Monitor: B226WL, Network: 2 x Intel 82574L

OS: Debian 10, Kernel: 5.10.0-0.bpo.3-amd64 (x86_64), Display Server: X Server 1.20.4, Display Driver: modesetting 1.20.4, Compiler: GCC 8.3.0, File-System: ext4, Screen Resolution: 800x600

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
Processor Notes: Scaling Governor: acpi-cpufreq schedutil - CPU Microcode: 0x6000852
Python Notes: Python 2.7.16 + Python 3.7.3
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + 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 AMD retpoline IBPB: conditional STIBP: disabled RSB filling + srbds: Not affected + tsx_async_abort: Not affected

RCS 6386

RCS6386

Processor: 2 x AMD Opteron 6386 SE @ 2.80GHz (16 Cores / 32 Threads), Motherboard: ASUS KGPE-D16 v1.0 (4.8-722-g32cdff5f08 BIOS), Chipset: AMD RD890 + SB7x0/SB8x0/SB9x0, Memory: 252GB, Disk: 180GB INTEL SSDSC2BF18 + 4 x 1920GB SAMSUNG MZ7KH1T9, Graphics: ASPEED, Audio: AMD SBx00 Azalia, Monitor: PL2274HD, Network: 2 x Intel 82574L + Mellanox MT27520

OS: Debian 10, Kernel: 5.10.0-0.bpo.3-amd64 (x86_64), Display Server: X Server 1.20.4, Display Driver: modesetting 1.20.4, Compiler: GCC 8.3.0, File-System: ext4, Screen Resolution: 1024x768

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
Processor Notes: Scaling Governor: acpi-cpufreq schedutil - CPU Microcode: 0x6000852
Python Notes: Python 2.7.16 + Python 3.7.3
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + 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 AMD retpoline IBPB: conditional STIBP: disabled RSB filling + srbds: Not affected + tsx_async_abort: Not affected

POWER9

TalosII-DD2.2Stepping

Processor: POWER9 @ 3.80GHz (44 Cores / 176 Threads), Motherboard: PowerNV T2P9S01 REV 1.01, Memory: 256GB, Disk: 1000GB Samsung SSD 970 EVO Plus 1TB, Graphics: AMD Radeon Pro WX 7100 8GB (1243/1750MHz), Audio: AMD Ellesmere HDMI Audio, Monitor: 2 x CB282K, Network: 2 x Broadcom NetXtreme BCM5719 PCIe + 2 x Intel 82599ES 10-Gigabit SFI/SFP+

OS: Fedora 34, Kernel: 5.14.10-200.fc34.ppc64le (ppc64le), Desktop: GNOME Shell 40.4, Display Server: X Server 1.20.11, Compiler: GCC 11.2.1 20210728, File-System: btrfs, Screen Resolution: 3840x2160

Kernel Notes: Transparent Huge Pages: madvise
Compiler Notes: --build=ppc64le-redhat-linux --disable-libunwind-exceptions --disable-multilib --enable-__cxa_atexit --enable-bootstrap --enable-checking=release --enable-gnu-indirect-function --enable-gnu-unique-object --enable-initfini-array --enable-languages=c,c++,fortran,objc,obj-c++,ada,go,lto --enable-offload-targets=nvptx-none --enable-plugin --enable-secureplt --enable-shared --enable-targets=powerpcle-linux --enable-threads=posix --mandir=/usr/share/man --with-cpu-32=power8 --with-cpu-64=power8 --with-gcc-major-version-only --with-linker-hash-style=gnu --with-long-double-128 --with-tune-32=power8 --with-tune-64=power8 --without-cuda-driver
Processor Notes: SMT (threads per core): 4
Python Notes: Python 3.9.7
Security Notes: SELinux + itlb_multihit: Not affected + l1tf: Mitigation of RFI Flush L1D private per thread + mds: Not affected + meltdown: Mitigation of RFI Flush L1D private per thread + spec_store_bypass: Mitigation of Kernel entry/exit barrier (eieio) + spectre_v1: Mitigation of __user pointer sanitization ori31 speculation barrier enabled + spectre_v2: Mitigation of Indirect branch cache disabled Software link stack flush + srbds: Not affected + tsx_async_abort: Not affected

	Core i9 7900X	Core i9 7960X	Core i9 7980XE	Threadripper 2920X	Threadripper 2950X	Threadripper 2970WX	Threadripper 2990WX	Talos II 2 x 22c POWER9	Talos II 2 x 22c POWER 9 - Spec Kernel Only	2x6386 32G ECC	6262 test	RCS6386	RCS6386	POWER9	Talos II-DD2.2Stepping
PHPBench - P.B.S (Score/Watt)		**6137**	5806	4525	4479	3492	3795	**707.13**	1419						
Normalized		100%	94.6%	73.72%	72.99%	56.9%	61.84%	11.52%	23.12%						

Talos II POWER9 vs. AMD / Intel HEDT Benchmarks

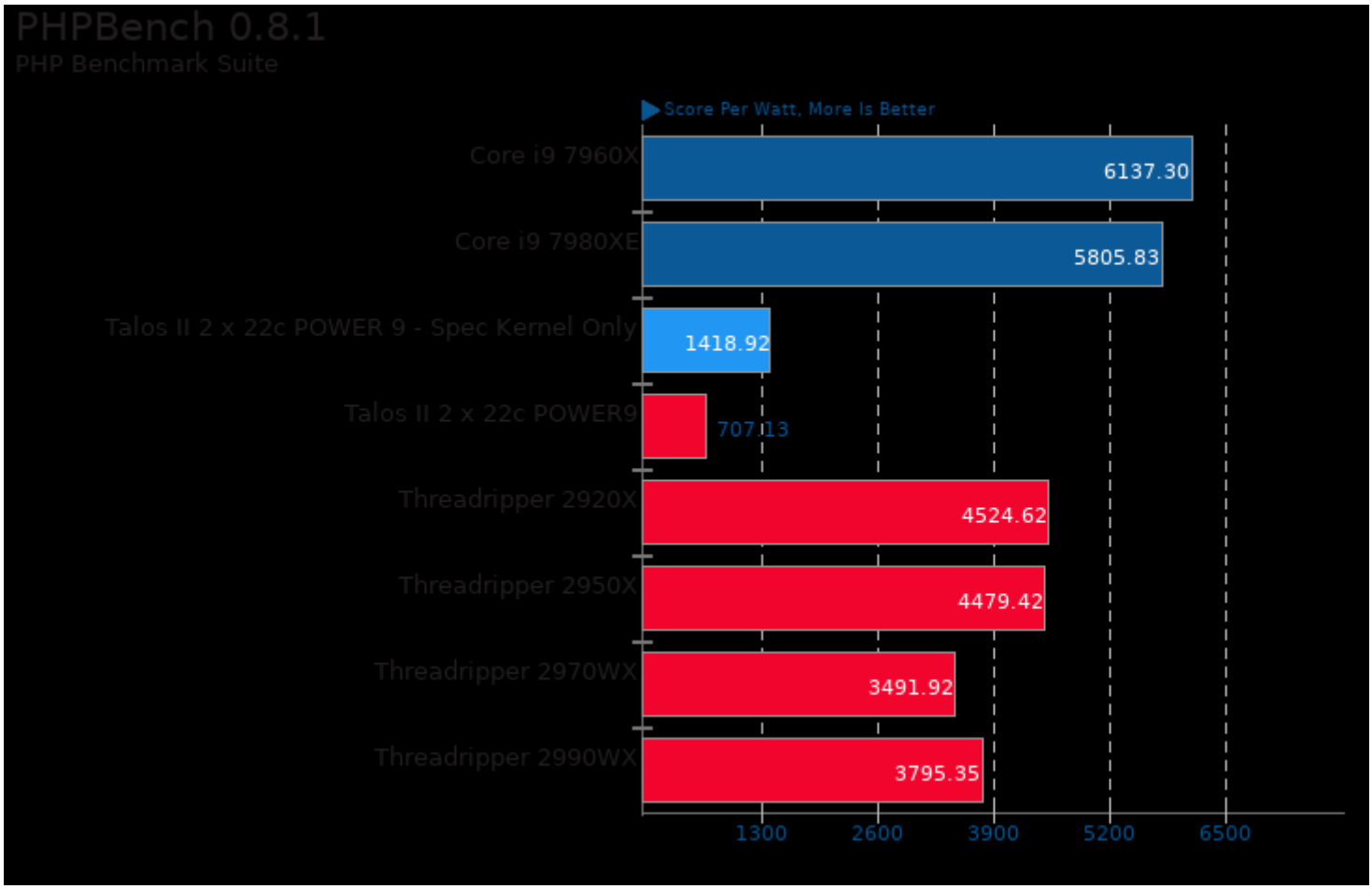
Rust Prime Benchmark - P.N.T.T.2.0.0 (sec)	11.55	6.71	8.18	**30.14**	21.21	17.64	12.49	3.64	**3.54**	16.403	16.428	16.476	4.288
Normalized	30.65%	52.76%	43.28%	11.75%	16.69%	20.07%	28.34%	97.25%	100%	21.58%	21.55%	21.49%	82.56%
Standard Deviation	0%	0.1%	0.2%	0%	0.1%	0.2%	0.1%	12%	4.8%	0%	0.1%	0.7%	2.4%
7-Zip Compression - C.S.T (MIPS)	62788	89432	95662	61894	73967	84493	85484	**162969**	149050	**20646**	20771	28390	
Normalized	38.53%	54.88%	58.7%	37.98%	45.39%	51.85%	52.45%	100%	91.46%	12.67%	12.75%	17.42%	
Standard Deviation	1.3%	0.3%	0.4%	0.7%	0.2%	3.3%	3.1%	2.7%	8.1%	0.5%	0.1%	0.3%	
PyBench - T.F.A.T.T (Millisecond	**942**	960	955	1133	1136	1165	1147	4088	1936	2269	2260	2259	**6171**
Normalized	100%	98.13%	98.64%	83.14%	82.92%	80.86%	82.13%	23.04%	48.66%	41.52%	41.68%	41.7%	15.26%
Standard Deviation	0.6%		0.3%	0.6%	0.3%	0.1%	0.4%	0.3%	0.2%	0.5%	0.5%	0.3%	0.2%
PHPBench - P.B.S	**717281**	701357	703666	535263	537467	520064	525276	161286	328546	323744	327452	323158	**113421**
Normalized	100%	97.78%	98.1%	74.62%	74.93%	72.5%	73.23%	22.49%	45.8%	45.13%	45.65%	45.05%	15.81%
Standard Deviation	0.9%	0.8%	0.1%	0.3%	0.8%	0.1%	0.2%	0.1%	0.6%	1.1%	1.1%	1.3%	0.2%
PostgreSQL pgbench - Buffer Test - Normal Load - Read Only (TPS)	327587	493203	522155	271596	317019	430861	472250	544186	**574403**	**101566**	103743	109602	431471
Normalized	57.03%	85.86%	90.9%	47.28%	55.19%	75.01%	82.22%	94.74%	100%	17.68%	18.06%	19.08%	75.12%
Standard Deviation	1.2%	0.3%	0.4%	0.2%	0.1%	0.3%	2.3%	0.6%	0.2%	2%	1.8%	0.8%	1.1%
Timed LLVM Compilation - Time To Compile	359	248	227	373	303	255	221	183	**172**	916.158	**944.978**	740.446	230.347
Normalized	47.91%	69.35%	75.77%	46.11%	56.77%	67.45%	77.83%	93.99%	100%	18.77%	18.2%	23.23%	74.67%
C-Ray - Total Time - 4.1.R.P.P (sec)	51.28	35.71	33.51	41.30	33.08	23.12	**17.97**	19.14	19.09	76.950	**77.009**	76.994	21.448
Normalized	35.04%	50.32%	53.63%	43.51%	54.32%	77.72%	100%	93.89%	94.13%	23.35%	23.33%	23.34%	83.78%
Standard Deviation	0.1%	0.1%	0.1%	0.7%	0.1%	2%	0.2%	0.5%	1.2%	0%	0.1%	0%	0.3%
OpenSSL - R.4.b.P (Signs/sec)	3059	4421	4686	2566	3287	4561	5821	7356	**7408**	2010	**2010**	2011	6692
Normalized	41.29%	59.68%	63.26%	34.64%	44.37%	61.57%	78.58%	99.3%	100%	27.13%	27.13%	27.14%	90.33%

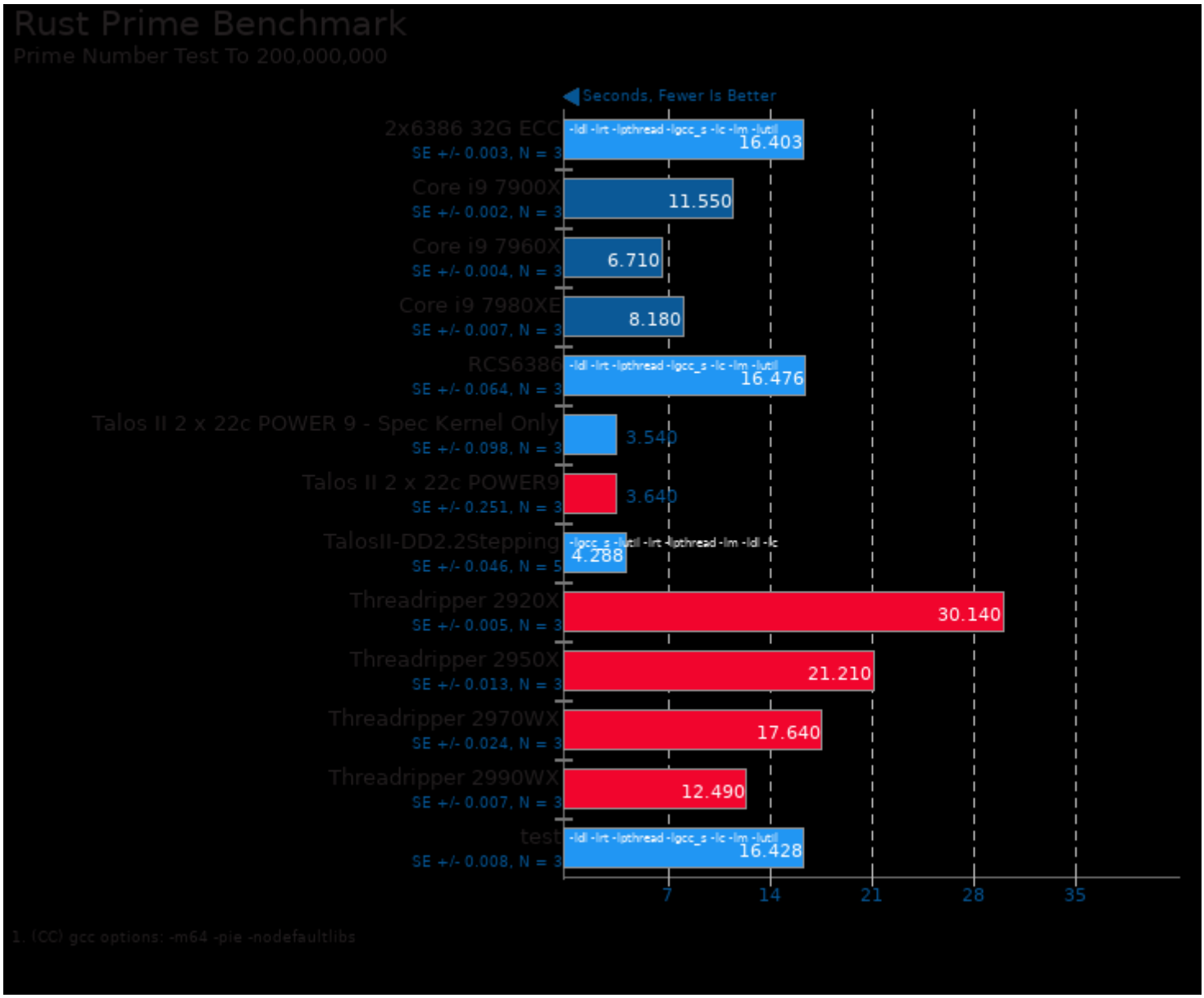
Talos II POWER9 vs. AMD / Intel HEDT Benchmarks

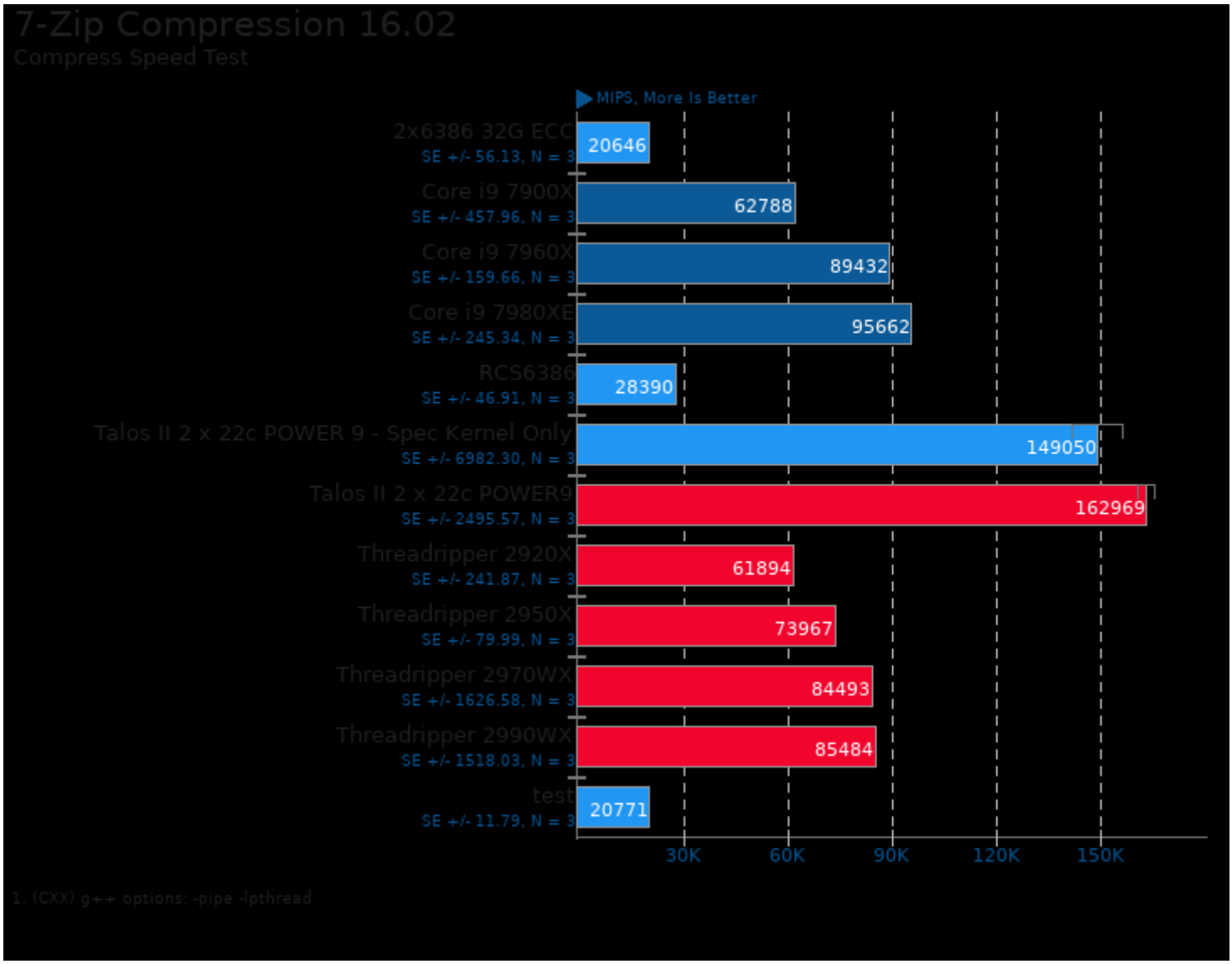
Standard Deviation	0.4%	0.1%	0.3%	0.8%	0.5%	0.1%	0.3%	1.7%	0.7%	0.1%		0.1%		0%		2.2%
Stockfish - Total Time (Nodes/s)	28320368	43638299	46289588	33023827	41553292	54575580	67300757	79137127	80530953	25582390		25930236		27549921	73382195	72568429
Normalized	35.17%	54.19%	57.48%	41.01%	51.6%	67.77%	83.57%	98.27%	100%	31.77%		32.2%		34.21%	91.12%	90.11%
Standard Deviation	1%	0.8%	1%	2%	1.2%	0.2%	1.4%	0.5%	1.9%	1.5%		0.9%		0.8%	2.1%	0.6%
Rodinia - OpenMP LavaMD	31.25	21.47	20.08	25.77	20.74	14.52	11.75	19.74	19.30	32.691		32.640	33.193	33.290	15.966	17.411
Normalized	37.6%	54.73%	58.52%	45.6%	56.65%	80.92%	100%	59.52%	60.88%	35.94%		36%	35.4%	35.3%	73.59%	67.49%
Standard Deviation	0.6%	0.9%	0%	1.8%	0.6%	0.8%	0.2%	5.9%	5.3%	0%		0.1%	2.7%	2.8%	1.3%	3.6%
POV-Ray - Trace Time (sec)	44.22	30.72	28.29	37.92	30.56	22.39	17.92	25.28	23.44	49.394		49.537		49.276		29.701
Normalized	40.52%	58.33%	63.34%	47.26%	58.64%	80.04%	100%	70.89%	76.45%	36.28%		36.17%		36.37%		60.33%
Standard Deviation	0.2%	0.2%	0.3%	0.6%	0.4%	1.8%	0.6%	0.3%	1.3%	0.2%		0.3%		0.3%		0.4%
GNU Octave Benchmark (sec)	17.07	17.57	17.47	16.43	16.64	17.87	16.78	14.92	16.35	37.886		36.421		36.281		
Normalized	87.4%	84.92%	85.4%	90.81%	89.66%	83.49%	88.92%	100%	91.25%	39.38%		40.97%		41.12%		
Standard Deviation	0.6%	0.4%	0.3%	1.4%	0.4%	4.1%	1%	1.1%	1.5%	8.4%		11.8%		1.4%		
PostgreSQL pgbench - Buffer Test - Normal Load - Read Only (TPS/Watt)		2079	1971	1262	1565	1496	1705	1596	1626							
Normalized		100%	94.77%	60.71%	75.24%	71.96%	82.01%	76.75%	78.21%							
7-Zip Compression - C.S.T (MIPS/Watt)		368.12	370.74	281.57	317.27	274.35	272.59	406.82	380.29							
Normalized		90.49%	91.13%	69.21%	77.99%	67.44%	67.01%	100%	93.48%							
OpenSSL - R.4.b.P (Signs/sec/Watt)		17.20	15.88	11.70	13.40	14.64	17.12	17.00	15.90							
Normalized		100%	92.33%	68.02%	77.91%	85.12%	99.53%	98.84%	92.44%							
Stockfish - Total Time (Nodes/s/Watt)		148184	142237	134942	162569	153013	182420	159850	162777							
Normalized		81.23%	77.97%	73.97%	89.12%	83.88%	100%	87.63%	89.23%							

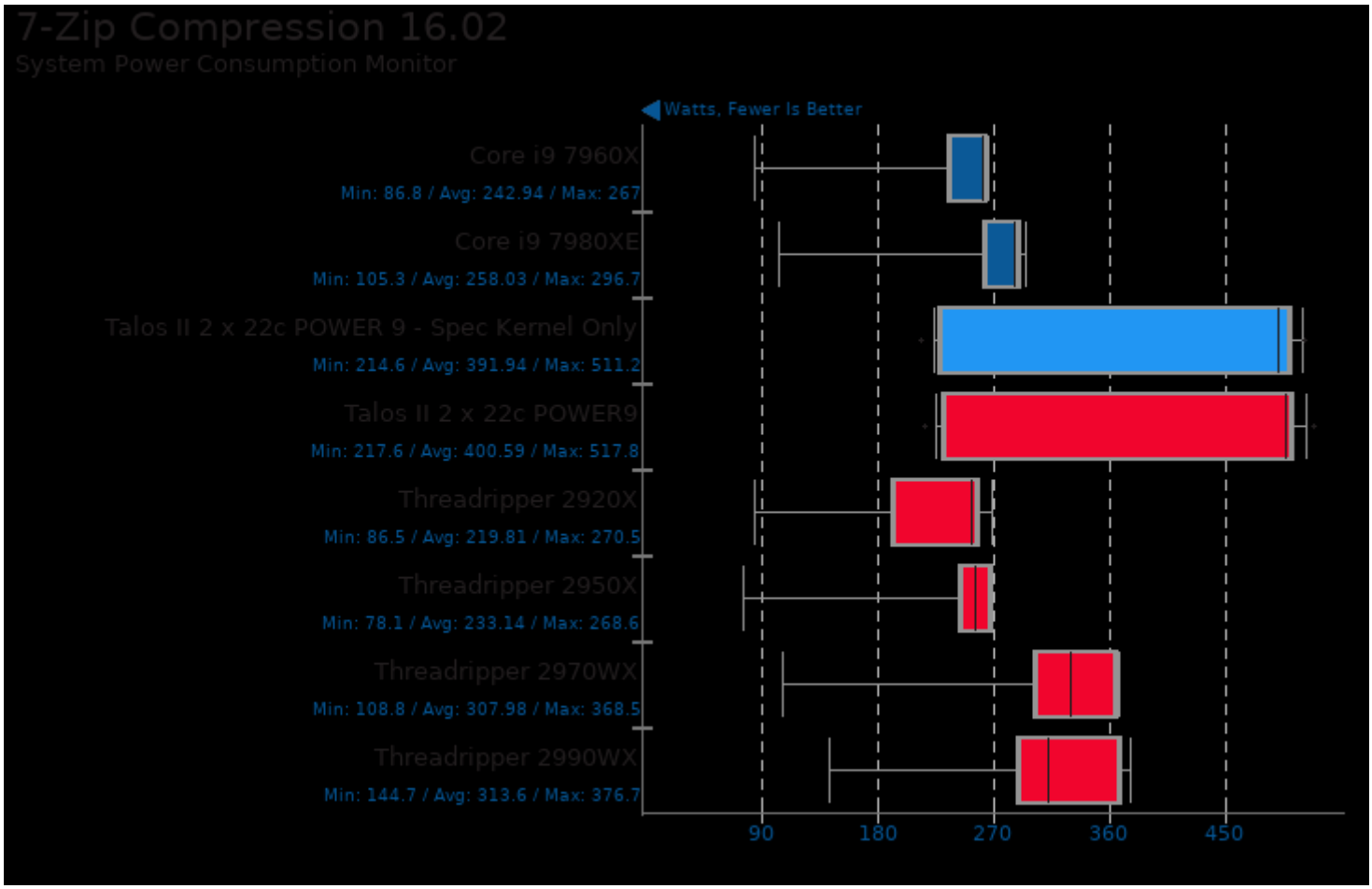
GNU Octave Benchmark (sec)	16.60
	2
Standard Deviation	0.6%

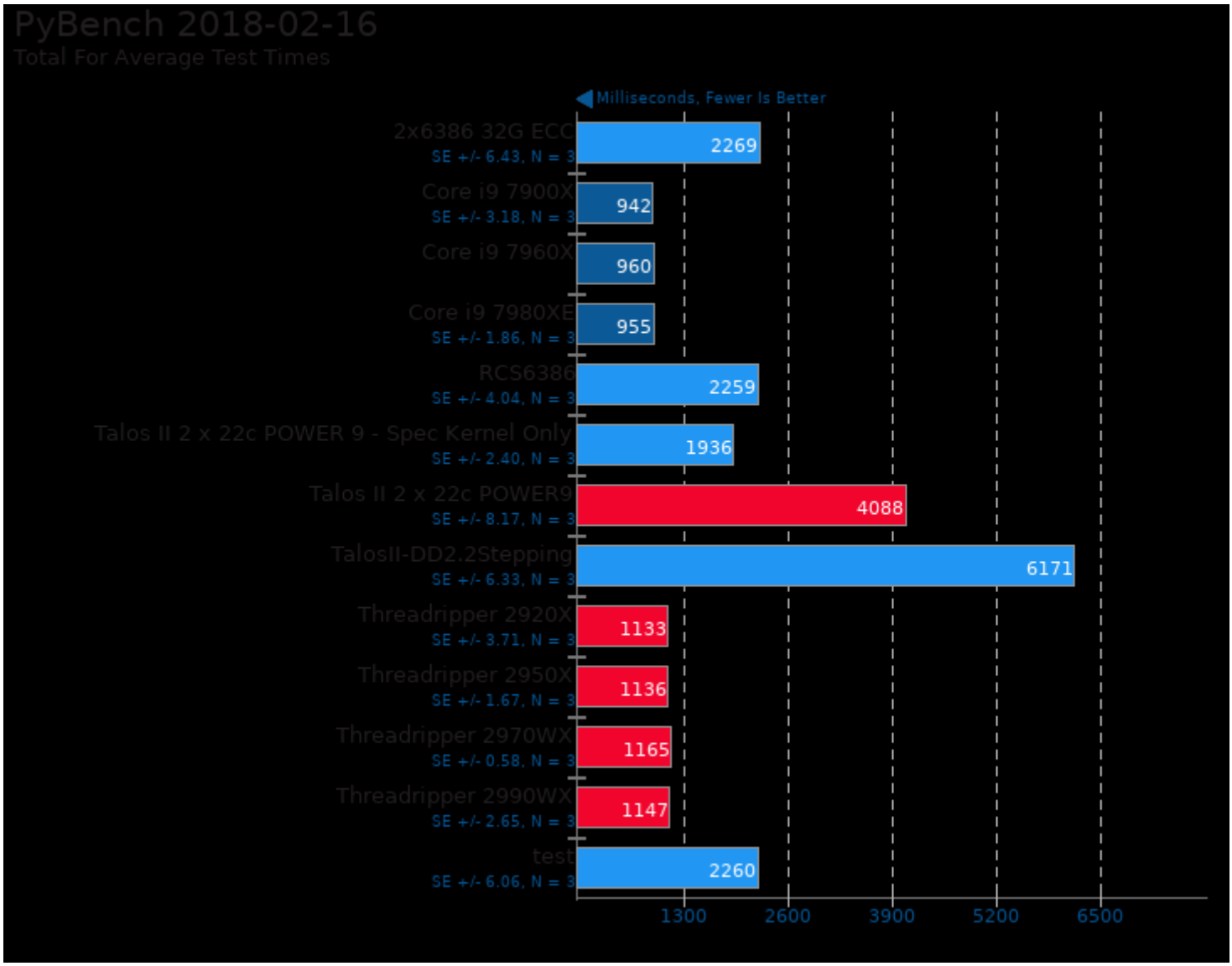
Talos II POWER9 vs. AMD / Intel HEDT Benchmarks

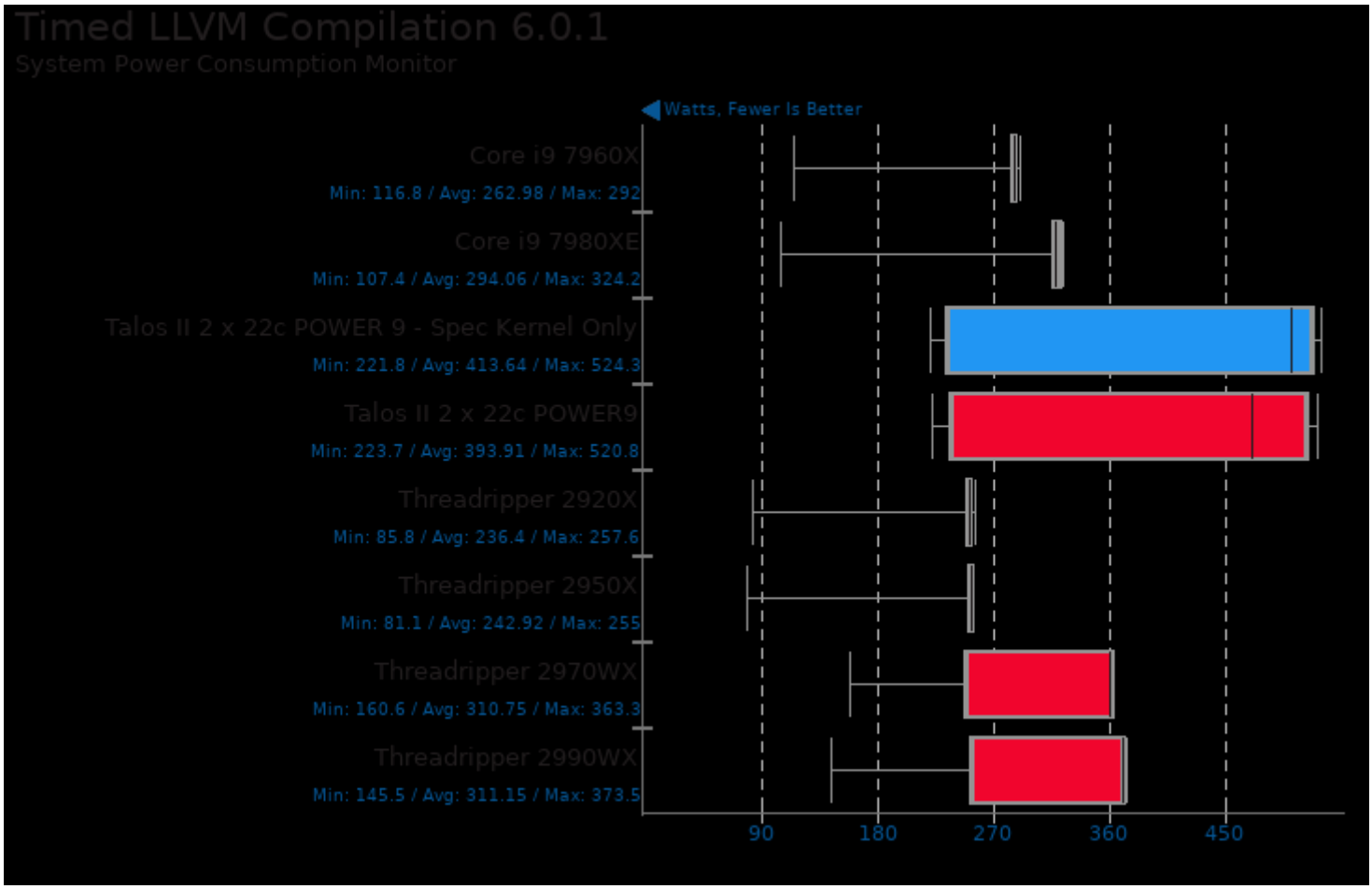


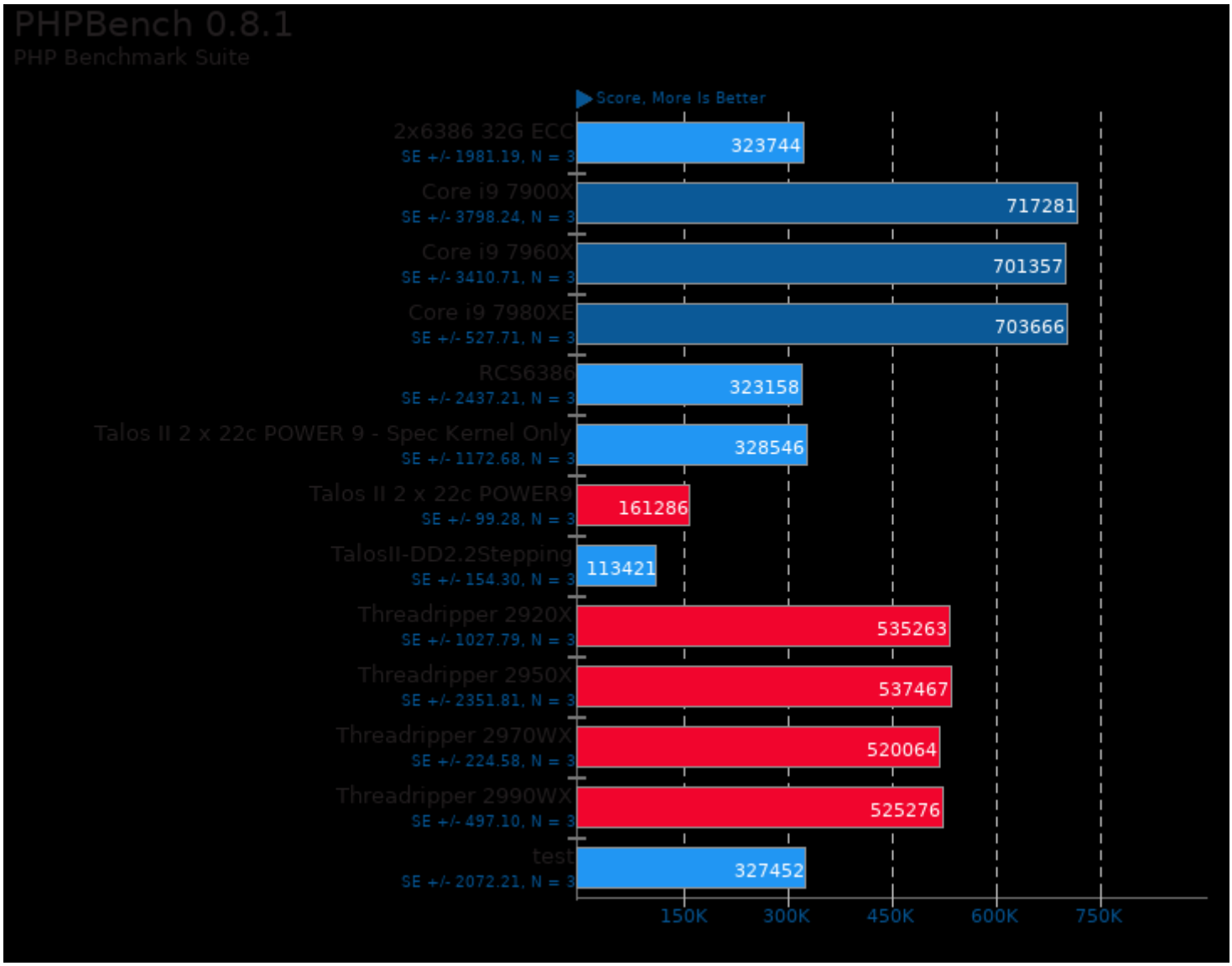

Rust Prime Benchmark
Prime Number Test To 200,000,000
Seconds, Fewer Is Better
2x6386 32G ECC
SE +/- 0.003, N = 3
-ldl -lrt -lpthread -lgcc_s -lc -lm -lutil
16.403
Core i9 7900X
SE +/- 0.002, N = 3
11.550
Core i9 7960X
SE +/- 0.004, N = 3
6.710
Core i9 7980XE
SE +/- 0.007, N = 3
8.180
RCS6386
SE +/- 0.064, N = 3
-ldl -lrt -lpthread -lgcc_s -lc -lm -lutil
16.476
Talos II 2 x 22c POWER 9 - Spec Kernel Only
SE +/- 0.098, N = 3
3.540
Talos II 2 x 22c POWER9
SE +/- 0.251, N = 3
3.640
TalosII-DD2.2Stepping
SE +/- 0.046, N = 5
-lgcc_s -lutil -lrt -lpthread -lm -ldl -lc
4.288
Threadripper 2920X
SE +/- 0.005, N = 3
30.140
Threadripper 2950X
SE +/- 0.013, N = 3
21.210
Threadripper 2970WX
SE +/- 0.024, N = 3
17.640
Threadripper 2990WX
SE +/- 0.007, N = 3
12.490
test
SE +/- 0.008, N = 3
-ldl -lrt -lpthread -lgcc_s -lc -lm -lutil
16.428
7
14
21
28
35
1. (CC) gcc options: -m64 -pie -nodefaultlibs

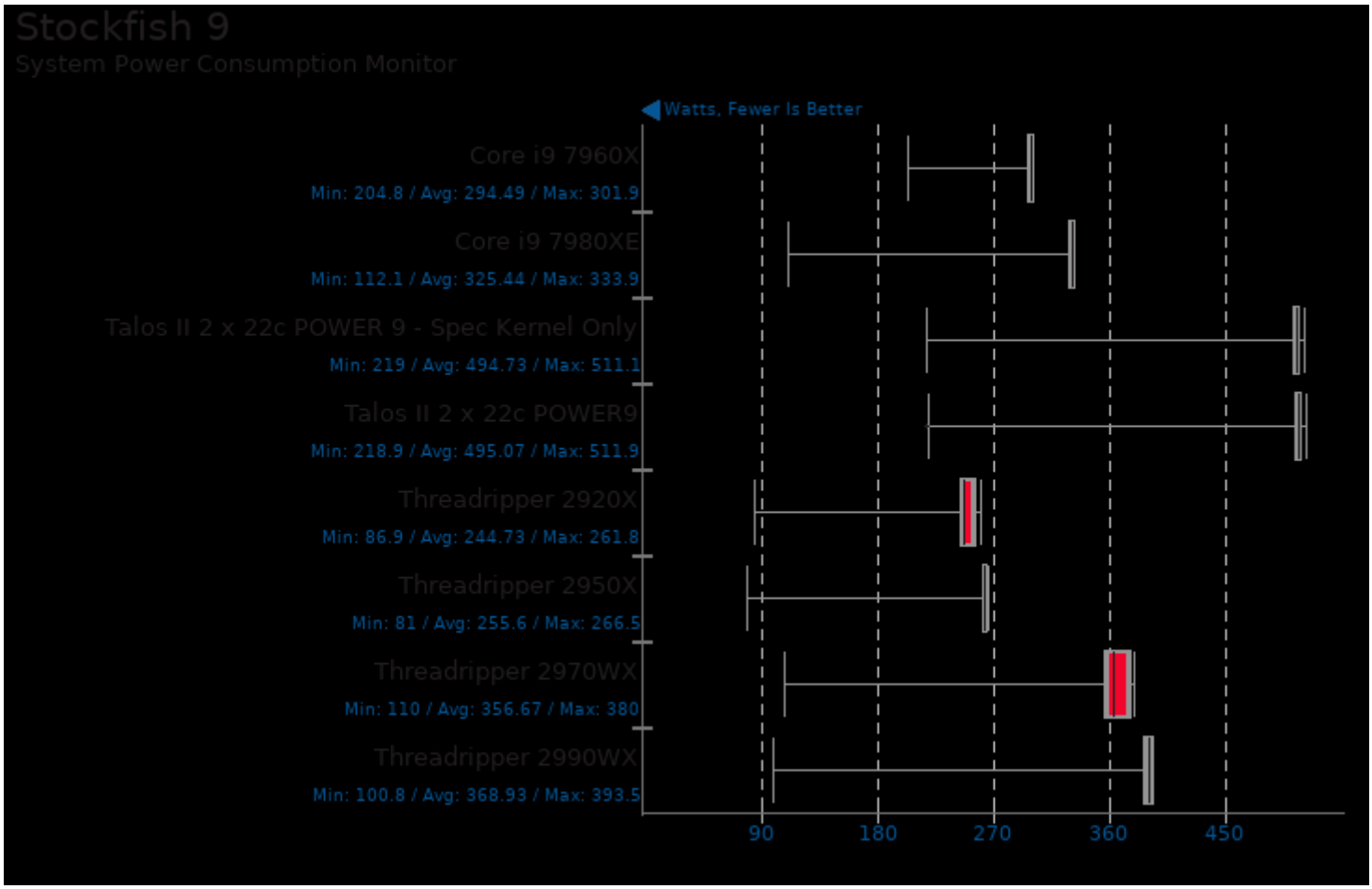

7-Zip Compression 16.02
Compress Speed Test
MIPS, More Is Better
2x6386 32G ECC
SE +/- 56.13, N = 3
20646
Core i9 7900X
SE +/- 457.96, N = 3
62788
Core i9 7960X
SE +/- 159.66, N = 3
89432
Core i9 7980XE
SE +/- 245.34, N = 3
95662
RCS6386
SE +/- 46.91, N = 3
28390
Talos II 2 x 22c POWER 9 - Spec Kernel Only
SE +/- 6982.30, N = 3
149050
Talos II 2 x 22c POWER9
SE +/- 2495.57, N = 3
162969
Threadripper 2920X
SE +/- 241.87, N = 3
61894
Threadripper 2950X
SE +/- 79.99, N = 3
73967
Threadripper 2970WX
SE +/- 1626.58, N = 3
84493
Threadripper 2990WX
SE +/- 1518.03, N = 3
85484
test
SE +/- 11.79, N = 3
20771
30K
60K
90K
120K
150K
1. (CXX) g++ options: -pipe -lpthread

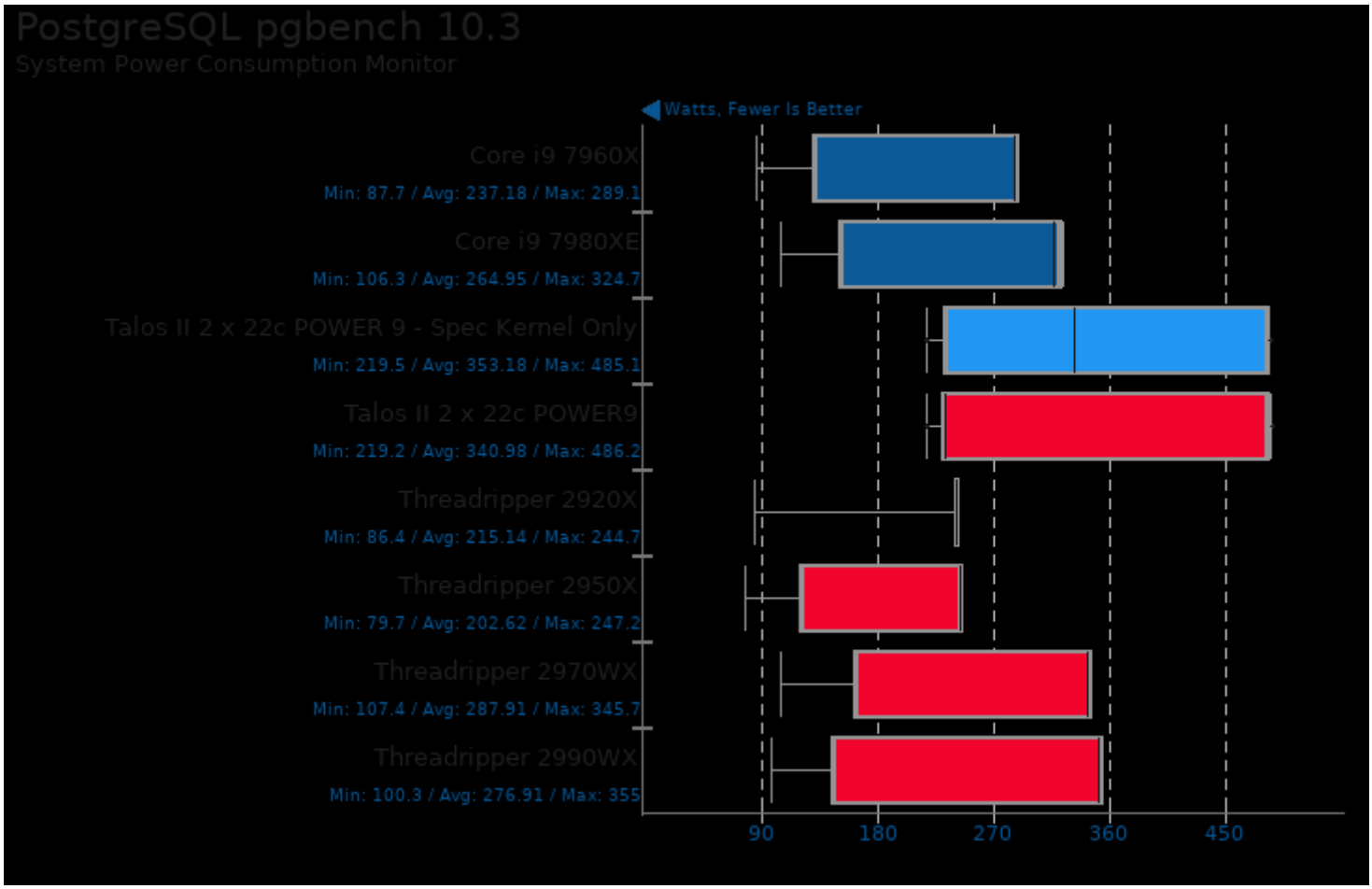

7-Zip Compression 16.02
System Power Consumption Monitor
Watts, Fewer Is Better
Core i9 7960X
Min: 86.8 / Avg: 242.94 / Max: 267
Core i9 7980XE
Min: 105.3 / Avg: 258.03 / Max: 296.7
Talos II 2 x 22c POWER 9 - Spec Kernel Only
Min: 214.6 / Avg: 391.94 / Max: 511.2
Talos II 2 x 22c POWER9
Min: 217.6 / Avg: 400.59 / Max: 517.8
Threadripper 2920X
Min: 86.5 / Avg: 219.81 / Max: 270.5
Threadripper 2950X
Min: 78.1 / Avg: 233.14 / Max: 268.6
Threadripper 2970WX
Min: 108.8 / Avg: 307.98 / Max: 368.5
Threadripper 2990WX
Min: 144.7 / Avg: 313.6 / Max: 376.7
90
180
270
360
450

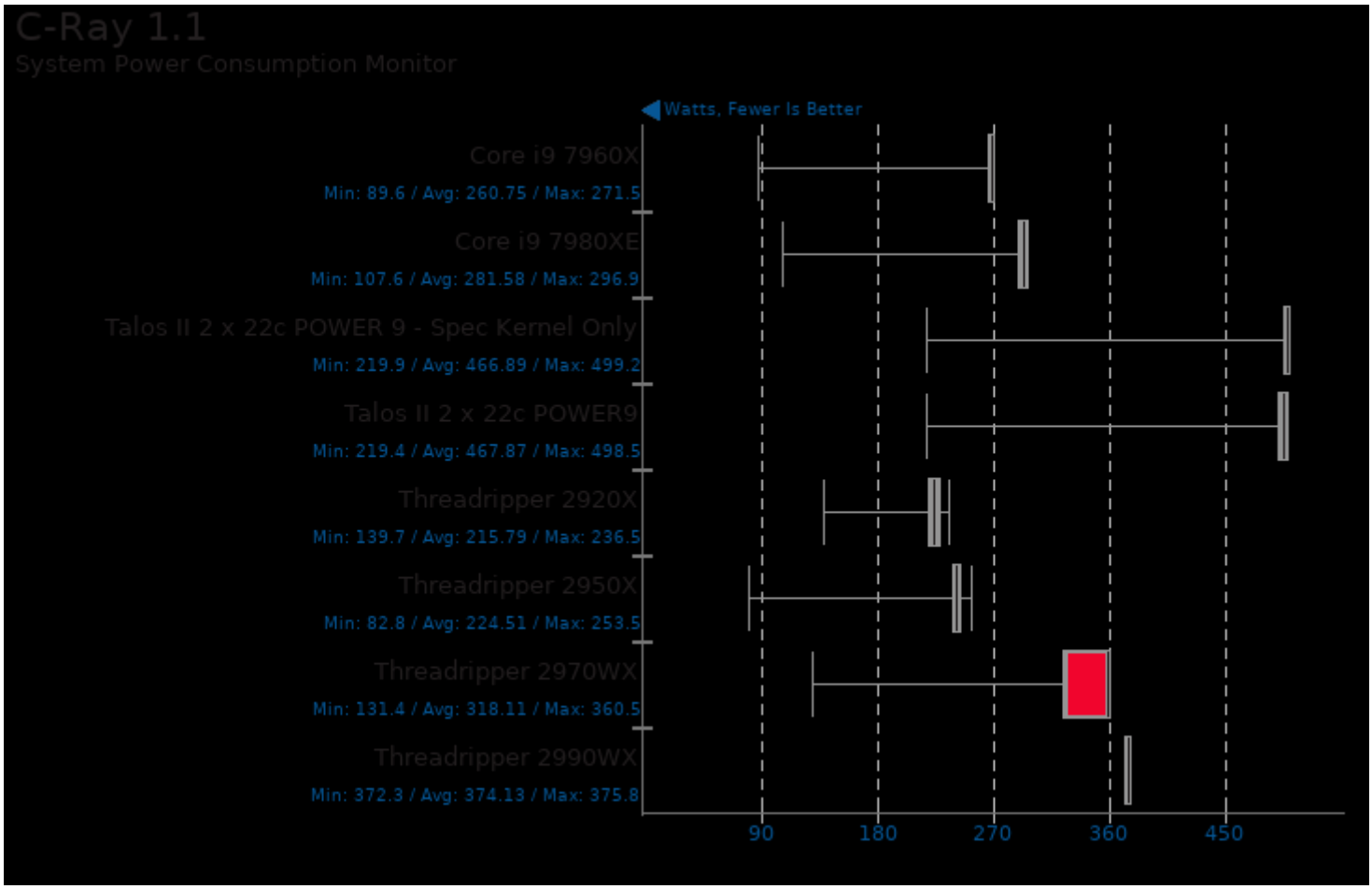

PyBench 2018-02-16
Total For Average Test Times
Milliseconds, Fewer Is Better
2x6386 32G ECC
SE +/- 6.43, N = 3
2269
Core i9 7900X
SE +/- 3.18, N = 3
942
Core i9 7960X
960
Core i9 7980XE
SE +/- 1.86, N = 3
955
RCS6386
SE +/- 4.04, N = 3
2259
Talos II 2 x 22c POWER 9 - Spec Kernel Only
SE +/- 2.40, N = 3
1936
Talos II 2 x 22c POWER9
SE +/- 8.17, N = 3
4088
TalosII-DD2.2Stepping
SE +/- 6.33, N = 3
6171
Threadripper 2920X
SE +/- 3.71, N = 3
1133
Threadripper 2950X
SE +/- 1.67, N = 3
1136
Threadripper 2970WX
SE +/- 0.58, N = 3
1165
Threadripper 2990WX
SE +/- 2.65, N = 3
1147
test
SE +/- 6.06, N = 3
2260
1300
2600
3900
5200
6500

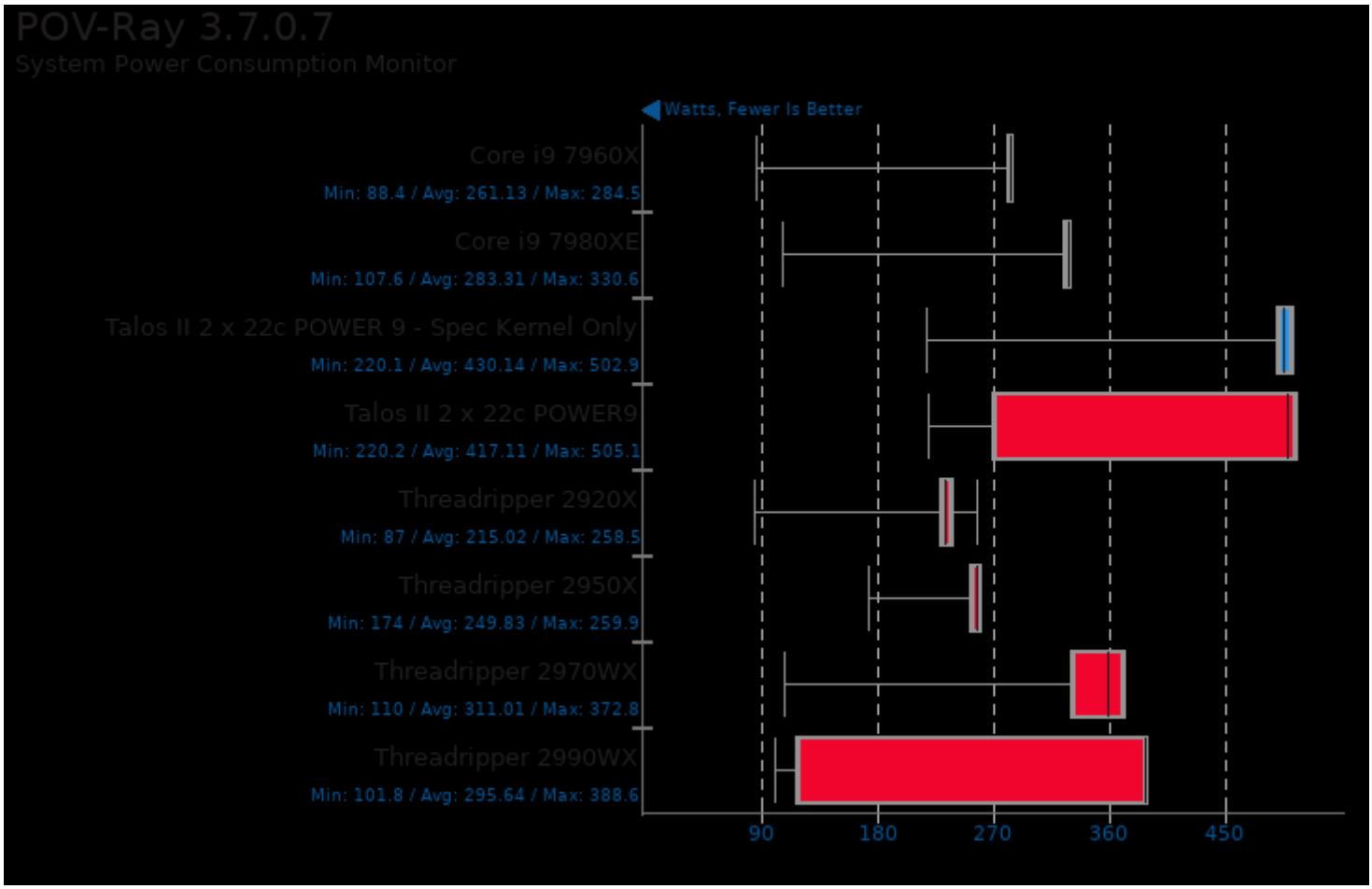

Timed LLVM Compilation 6.0.1
System Power Consumption Monitor
Watts, Fewer Is Better
Core i9 7960X
Min: 116.8 / Avg: 262.98 / Max: 292
Core i9 7980XE
Min: 107.4 / Avg: 294.06 / Max: 324.2
Talos II 2 x 22c POWER 9 - Spec Kernel Only
Min: 221.8 / Avg: 413.64 / Max: 524.3
Talos II 2 x 22c POWER9
Min: 223.7 / Avg: 393.91 / Max: 520.8
Threadripper 2920X
Min: 85.8 / Avg: 236.4 / Max: 257.6
Threadripper 2950X
Min: 81.1 / Avg: 242.92 / Max: 255
Threadripper 2970WX
Min: 160.6 / Avg: 310.75 / Max: 363.3
Threadripper 2990WX
Min: 145.5 / Avg: 311.15 / Max: 373.5
90
180
270
360
450

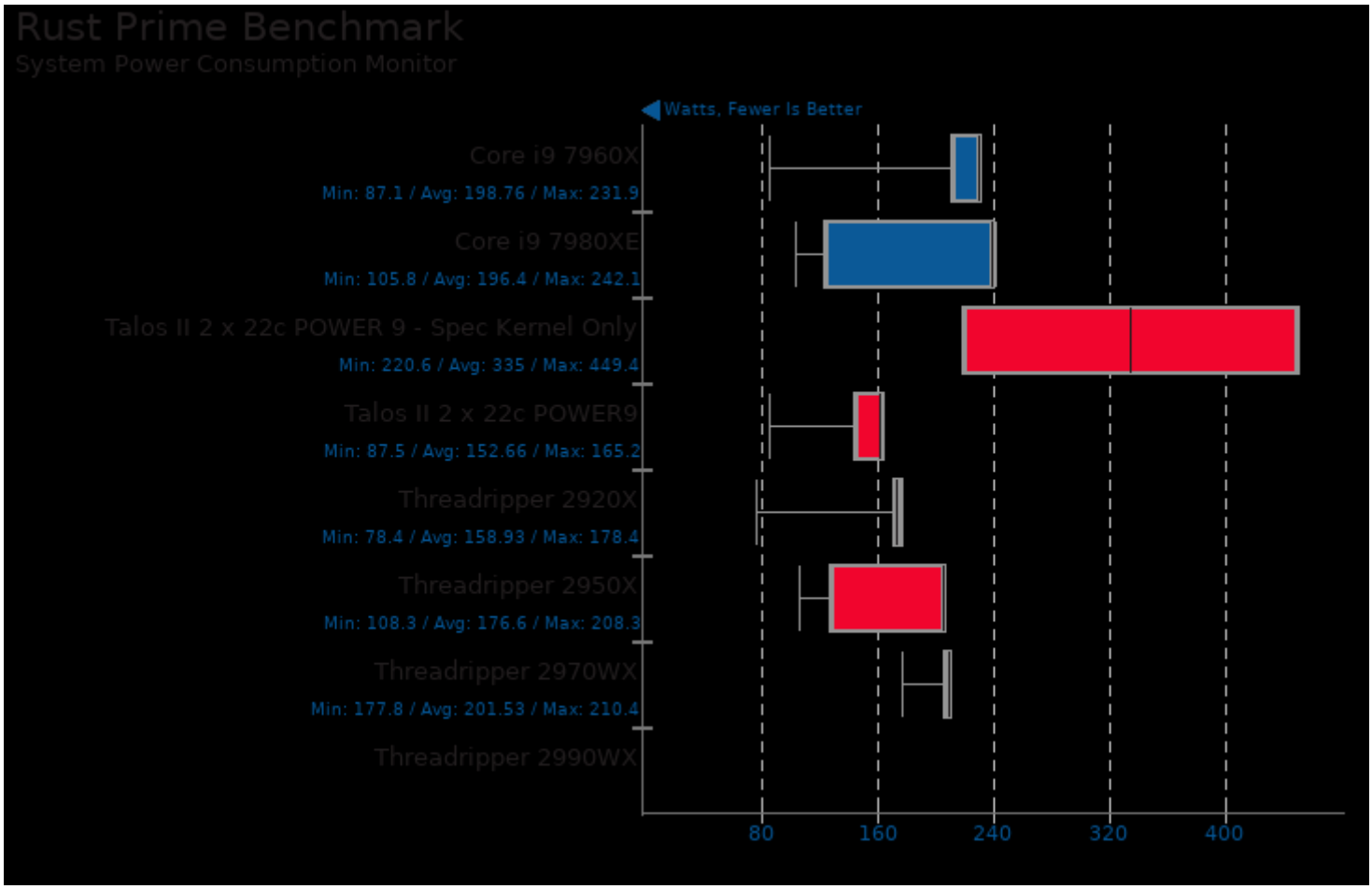

PHPBench 0.8.1
PHP Benchmark Suite
Score, More Is Better
2x6386 32G ECC
SE +/- 1981.19, N = 3
323744
Core i9 7900X
SE +/- 3798.24, N = 3
717281
Core i9 7960X
SE +/- 3410.71, N = 3
701357
Core i9 7980XE
SE +/- 527.71, N = 3
703666
RCS6386
SE +/- 2437.21, N = 3
323158
Talos II 2 x 22c POWER 9 - Spec Kernel Only
SE +/- 1172.68, N = 3
328546
Talos II 2 x 22c POWER9
SE +/- 99.28, N = 3
161286
TalosII-DD2.2Stepping
SE +/- 154.30, N = 3
113421
Threadripper 2920X
SE +/- 1027.79, N = 3
535263
Threadripper 2950X
SE +/- 2351.81, N = 3
537467
Threadripper 2970WX
SE +/- 224.58, N = 3
520064
Threadripper 2990WX
SE +/- 497.10, N = 3
525276
test
SE +/- 2072.21, N = 3
327452
150K
300K
450K
600K
750K

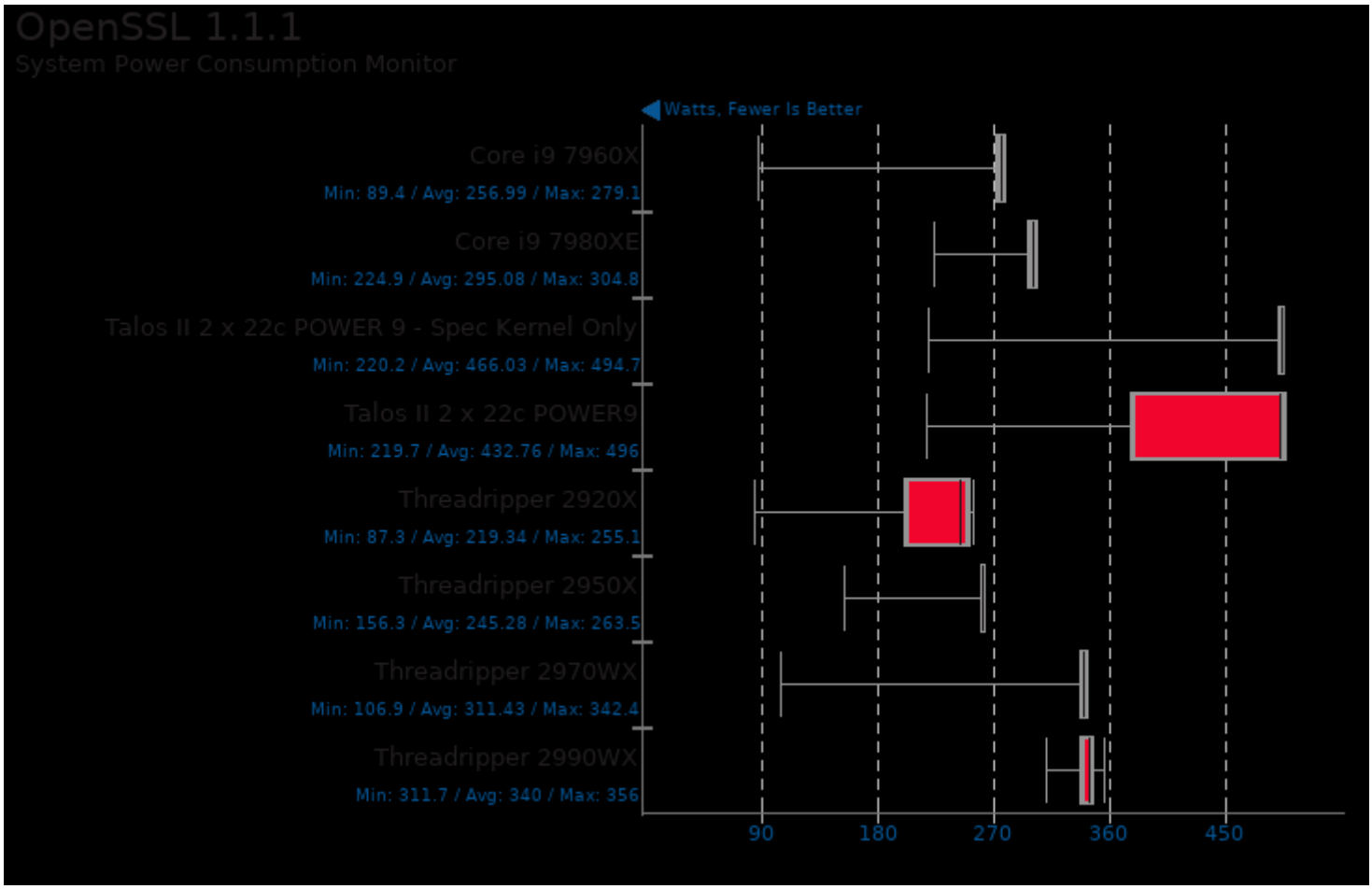

Stockfish 9
System Power Consumption Monitor
Watts, Fewer Is Better
Core i9 7960X
Min: 204.8 / Avg: 294.49 / Max: 301.9
Core i9 7980XE
Min: 112.1 / Avg: 325.44 / Max: 333.9
Talos II 2 x 22c POWER 9 - Spec Kernel Only
Min: 219 / Avg: 494.73 / Max: 511.1
Talos II 2 x 22c POWER9
Min: 218.9 / Avg: 495.07 / Max: 511.9
Threadripper 2920X
Min: 86.9 / Avg: 244.73 / Max: 261.8
Threadripper 2950X
Min: 81 / Avg: 255.6 / Max: 266.5
Threadripper 2970WX
Min: 110 / Avg: 356.67 / Max: 380
Threadripper 2990WX
Min: 100.8 / Avg: 368.93 / Max: 393.5
90
180
270
360
450

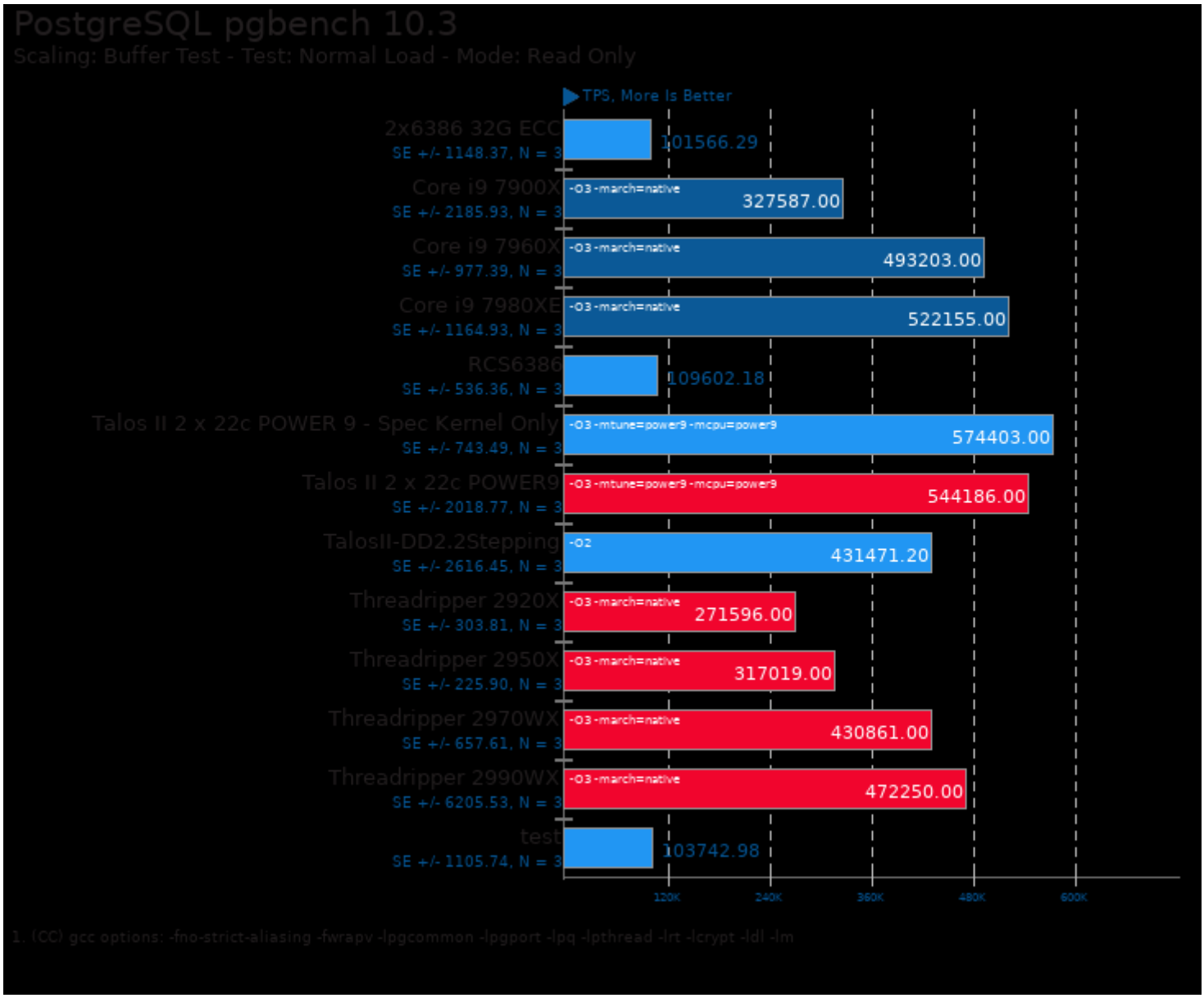

PostgreSQL pgbench 10.3
System Power Consumption Monitor
Watts, Fewer Is Better
Core i9 7960X
Min: 87.7 / Avg: 237.18 / Max: 289.1
Core i9 7980XE
Min: 106.3 / Avg: 264.95 / Max: 324.7
Talos II 2 x 22c POWER 9 - Spec Kernel Only
Min: 219.5 / Avg: 353.18 / Max: 485.1
Talos II 2 x 22c POWER9
Min: 219.2 / Avg: 340.98 / Max: 486.2
Threadripper 2920X
Min: 86.4 / Avg: 215.14 / Max: 244.7
Threadripper 2950X
Min: 79.7 / Avg: 202.62 / Max: 247.2
Threadripper 2970WX
Min: 107.4 / Avg: 287.91 / Max: 345.7
Threadripper 2990WX
Min: 100.3 / Avg: 276.91 / Max: 355
90
180
270
360
450

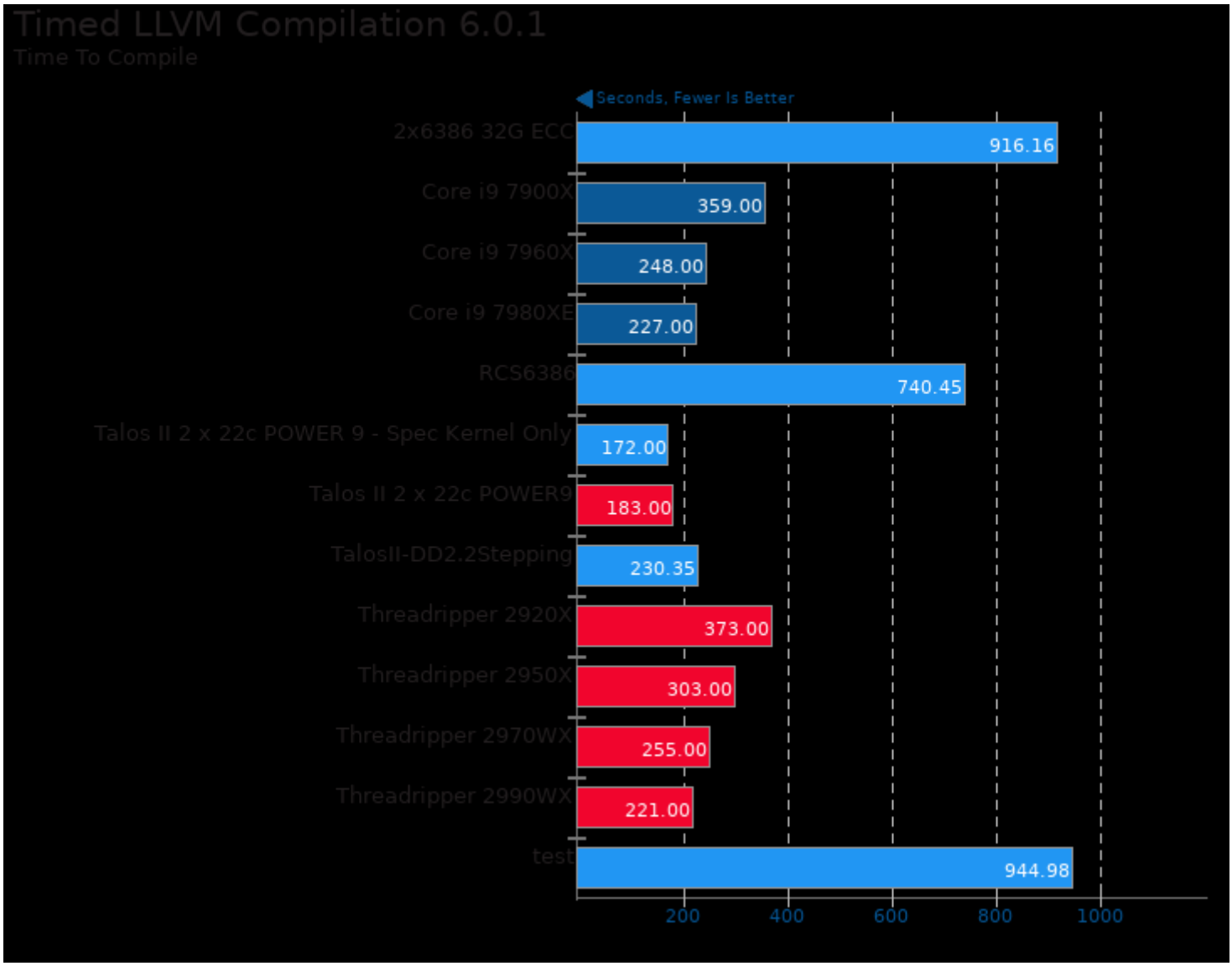

C-Ray 1.1
System Power Consumption Monitor
Watts, Fewer Is Better
Core i9 7960X
Min: 89.6 / Avg: 260.75 / Max: 271.5
Core i9 7980XE
Min: 107.6 / Avg: 281.58 / Max: 296.9
Talos II 2 x 22c POWER 9 - Spec Kernel Only
Min: 219.9 / Avg: 466.89 / Max: 499.2
Talos II 2 x 22c POWER9
Min: 219.4 / Avg: 467.87 / Max: 498.5
Threadripper 2920X
Min: 139.7 / Avg: 215.79 / Max: 236.5
Threadripper 2950X
Min: 82.8 / Avg: 224.51 / Max: 253.5
Threadripper 2970WX
Min: 131.4 / Avg: 318.11 / Max: 360.5
Threadripper 2990WX
Min: 372.3 / Avg: 374.13 / Max: 375.8
90
180
270
360
450

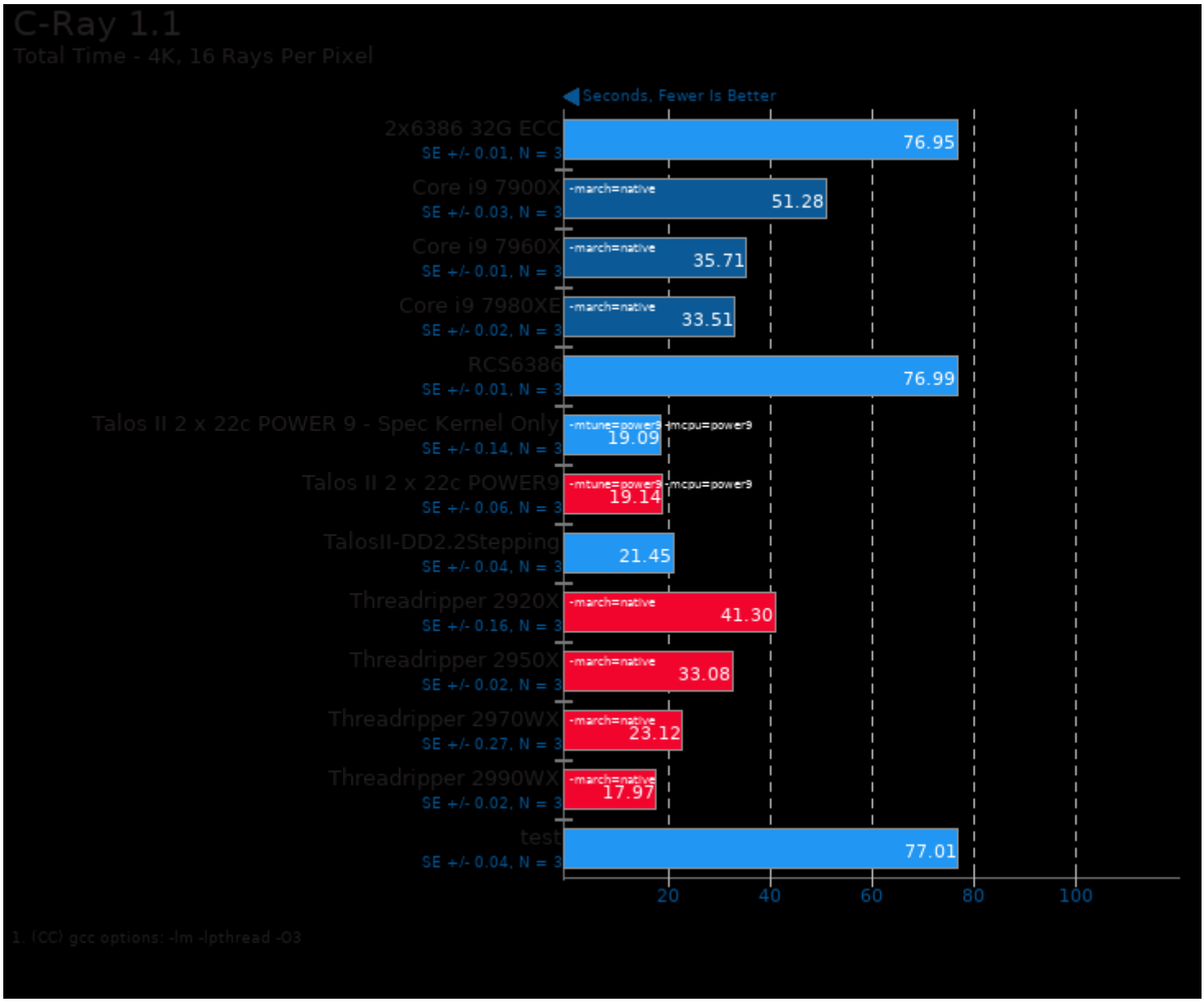

POV-Ray 3.7.0.7
System Power Consumption Monitor
Watts, Fewer Is Better
Core i9 7960X
Min: 88.4 / Avg: 261.13 / Max: 284.5
Core i9 7980XE
Min: 107.6 / Avg: 283.31 / Max: 330.6
Talos II 2 x 22c POWER 9 - Spec Kernel Only
Min: 220.1 / Avg: 430.14 / Max: 502.9
Talos II 2 x 22c POWER9
Min: 220.2 / Avg: 417.11 / Max: 505.1
Threadripper 2920X
Min: 87 / Avg: 215.02 / Max: 258.5
Threadripper 2950X
Min: 174 / Avg: 249.83 / Max: 259.9
Threadripper 2970WX
Min: 110 / Avg: 311.01 / Max: 372.8
Threadripper 2990WX
Min: 101.8 / Avg: 295.64 / Max: 388.6
90
180
270
360
450

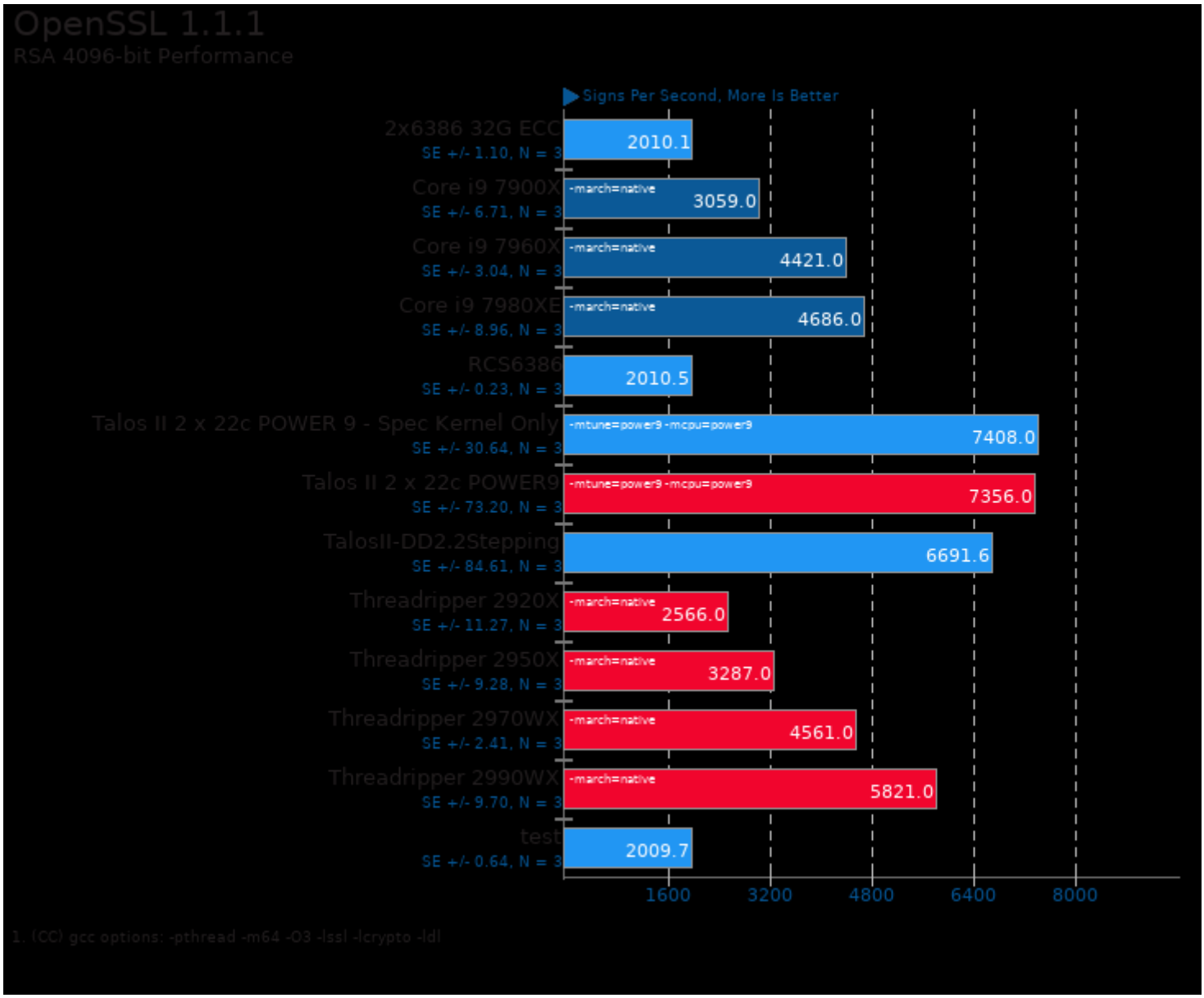

Rust Prime Benchmark
System Power Consumption Monitor
Watts, Fewer Is Better
Core i9 7960X
Min: 87.1 / Avg: 198.76 / Max: 231.9
Core i9 7980XE
Min: 105.8 / Avg: 196.4 / Max: 242.1
Talos II 2 x 22c POWER 9 - Spec Kernel Only
Min: 220.6 / Avg: 335 / Max: 449.4
Talos II 2 x 22c POWER9
Min: 87.5 / Avg: 152.66 / Max: 165.2
Threadripper 2920X
Min: 78.4 / Avg: 158.93 / Max: 178.4
Threadripper 2950X
Min: 108.3 / Avg: 176.6 / Max: 208.3
Threadripper 2970WX
Min: 177.8 / Avg: 201.53 / Max: 210.4
Threadripper 2990WX
80
160
240
320
400

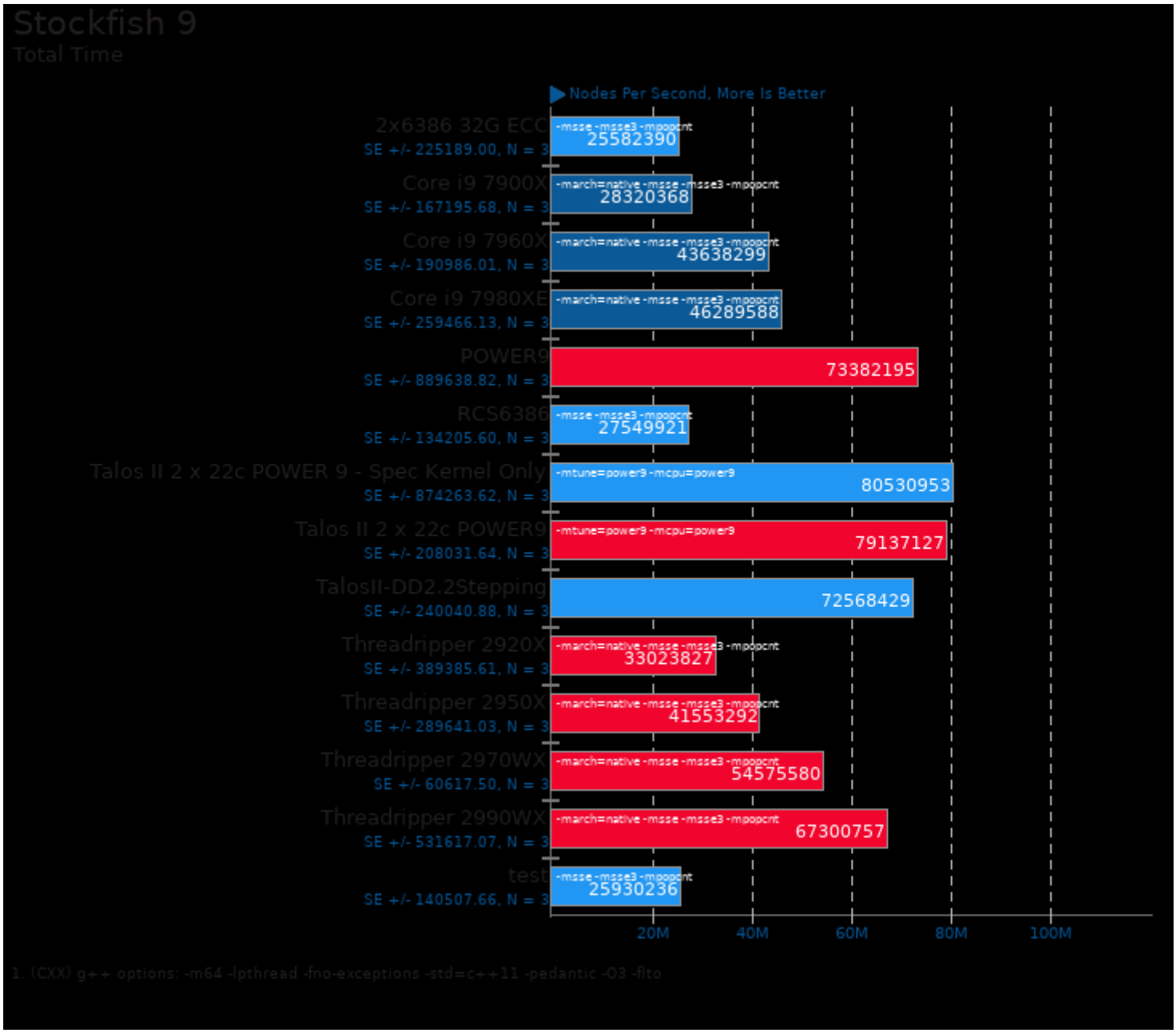

OpenSSL 1.1.1
System Power Consumption Monitor
Watts, Fewer Is Better
Core i9 7960X
Min: 89.4 / Avg: 256.99 / Max: 279.1
Core i9 7980XE
Min: 224.9 / Avg: 295.08 / Max: 304.8
Talos II 2 x 22c POWER 9 - Spec Kernel Only
Min: 220.2 / Avg: 466.03 / Max: 494.7
Talos II 2 x 22c POWER9
Min: 219.7 / Avg: 432.76 / Max: 496
Threadripper 2920X
Min: 87.3 / Avg: 219.34 / Max: 255.1
Threadripper 2950X
Min: 156.3 / Avg: 245.28 / Max: 263.5
Threadripper 2970WX
Min: 106.9 / Avg: 311.43 / Max: 342.4
Threadripper 2990WX
Min: 311.7 / Avg: 340 / Max: 356
90
180
270
360
450

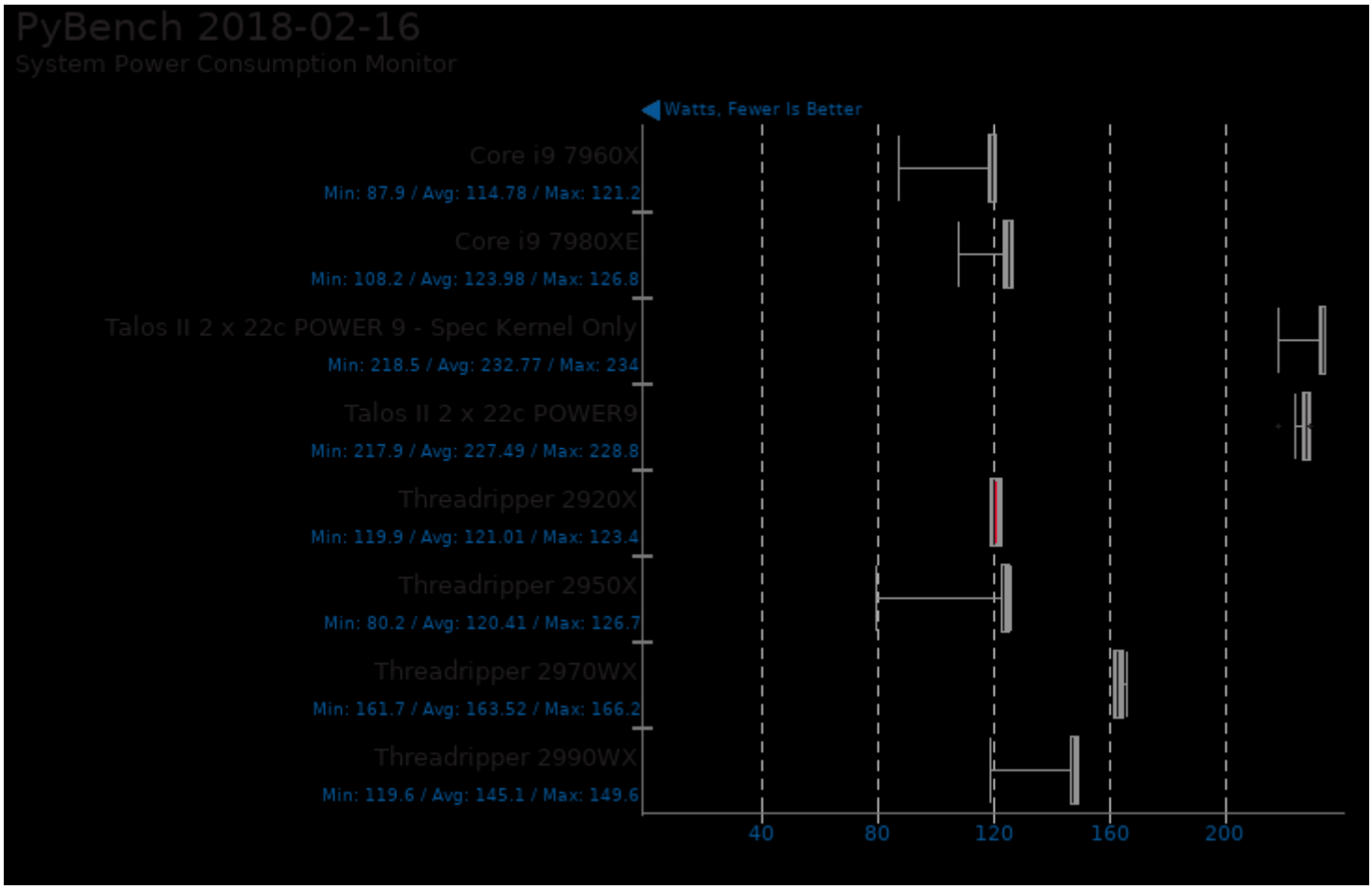

PostgreSQL pgbench 10.3
Scaling: Buffer Test - Test: Normal Load - Mode: Read Only
TPS, More Is Better
2x6386 32G ECC
SE +/- 1148.37, N = 3
101566.29
Core i9 7900X
SE +/- 2185.93, N = 3
-O3 -march=native
327587.00
Core i9 7960X
SE +/- 977.39, N = 3
-O3 -march=native
493203.00
Core i9 7980XE
SE +/- 1164.93, N = 3
-O3 -march=native
522155.00
RCS6386
SE +/- 536.36, N = 3
109602.18
Talos II 2 x 22c POWER 9 - Spec Kernel Only
SE +/- 743.49, N = 3
-O3 -mtune=power9 -mcpu=power9
574403.00
Talos II 2 x 22c POWER9
SE +/- 2018.77, N = 3
-O3 -mtune=power9 -mcpu=power9
544186.00
TalosII-DD2.2Stepping
SE +/- 2616.45, N = 3
-O2
431471.20
Threadripper 2920X
SE +/- 303.81, N = 3
-O3 -march=native
271596.00
Threadripper 2950X
SE +/- 225.90, N = 3
-O3 -march=native
317019.00
Threadripper 2970WX
SE +/- 657.61, N = 3
-O3 -march=native
430861.00
Threadripper 2990WX
SE +/- 6205.53, N = 3
-O3 -march=native
472250.00
test
SE +/- 1105.74, N = 3
103742.98
120K
240K
360K
480K
600K
1. (CC) gcc options: -fno-strict-aliasing -fwrapv -lpgcommon -lpgport -lpq -lpthread -lrt -lcrypt -ldl -lm

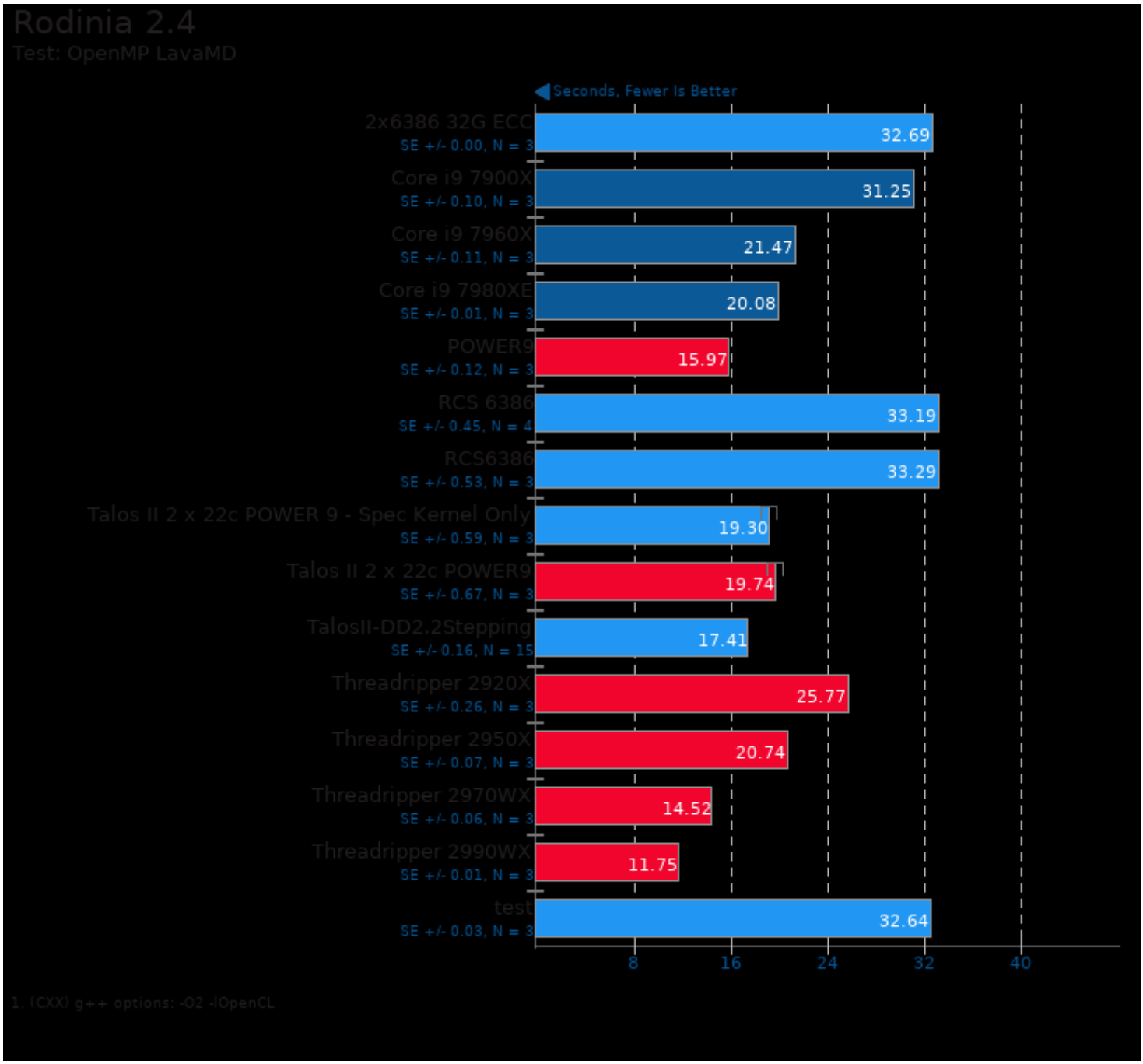

Timed LLVM Compilation 6.0.1
Time To Compile
Seconds, Fewer Is Better
2x6386 32G ECC
916.16
Core i9 7900X
359.00
Core i9 7960X
248.00
Core i9 7980XE
227.00
RCS6386
740.45
Talos II 2 x 22c POWER 9 - Spec Kernel Only
172.00
Talos II 2 x 22c POWER9
183.00
TalosII-DD2.2Stepping
230.35
Threadripper 2920X
373.00
Threadripper 2950X
303.00
Threadripper 2970WX
255.00
Threadripper 2990WX
221.00
test
944.98
200
400
600
800
1000

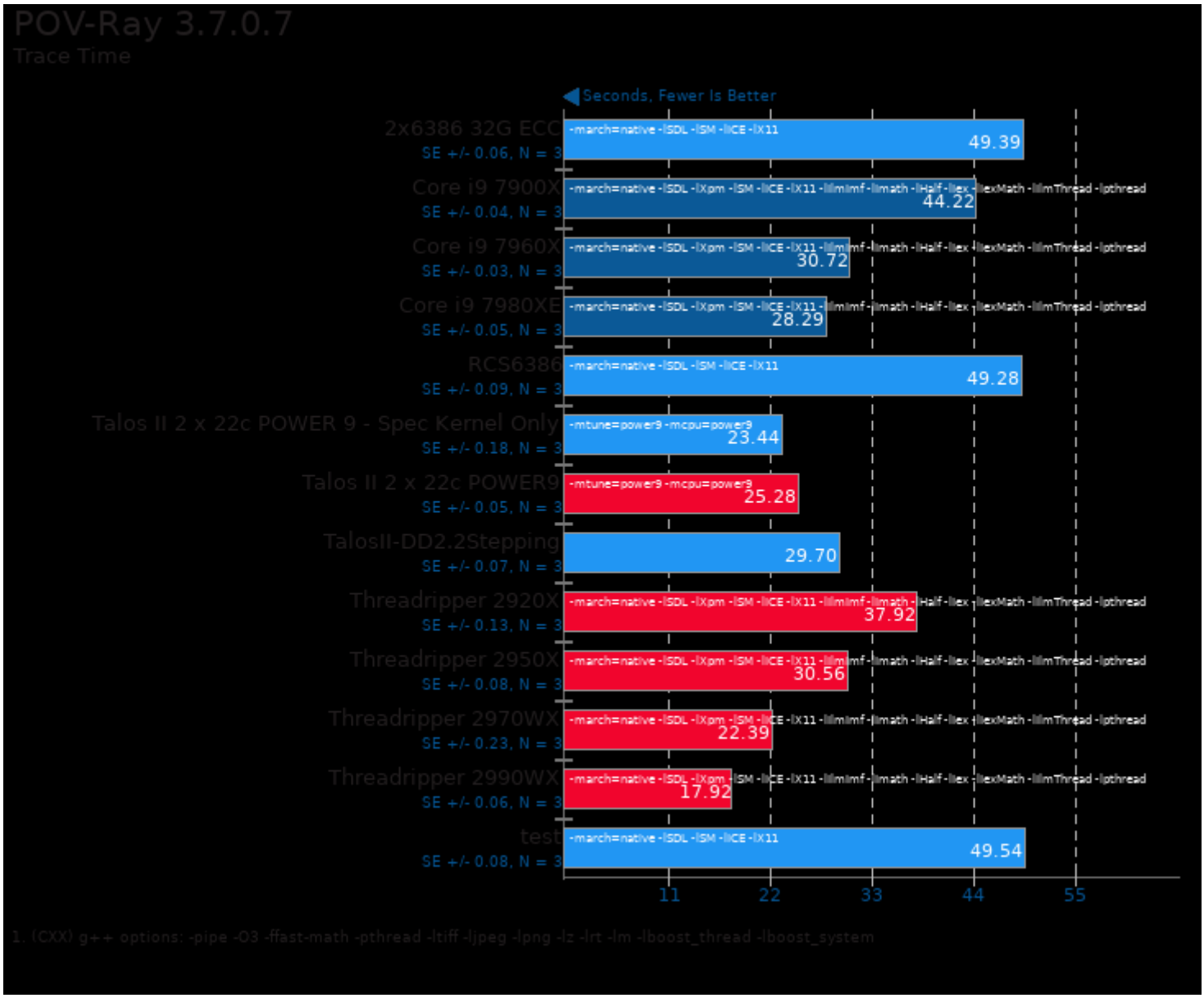

C-Ray 1.1
Total Time - 4K, 16 Rays Per Pixel
Seconds, Fewer Is Better
2x6386 32G ECC
SE +/- 0.01, N = 3
76.95
Core i9 7900X
SE +/- 0.03, N = 3
-march=native
51.28
Core i9 7960X
SE +/- 0.01, N = 3
-march=native
35.71
Core i9 7980XE
SE +/- 0.02, N = 3
-march=native
33.51
RCS6386
SE +/- 0.01, N = 3
76.99
Talos II 2 x 22c POWER 9 - Spec Kernel Only
SE +/- 0.14, N = 3
-mtune=power9 -mcpu=power9
19.09
Talos II 2 x 22c POWER9
SE +/- 0.06, N = 3
-mtune=power9 -mcpu=power9
19.14
TalosII-DD2.2Stepping
SE +/- 0.04, N = 3
21.45
Threadripper 2920X
SE +/- 0.16, N = 3
-march=native
41.30
Threadripper 2950X
SE +/- 0.02, N = 3
-march=native
33.08
Threadripper 2970WX
SE +/- 0.27, N = 3
-march=native
23.12
Threadripper 2990WX
SE +/- 0.02, N = 3
-march=native
17.97
test
SE +/- 0.04, N = 3
77.01
20
40
60
80
100
1. (CC) gcc options: -lm -lpthread -O3

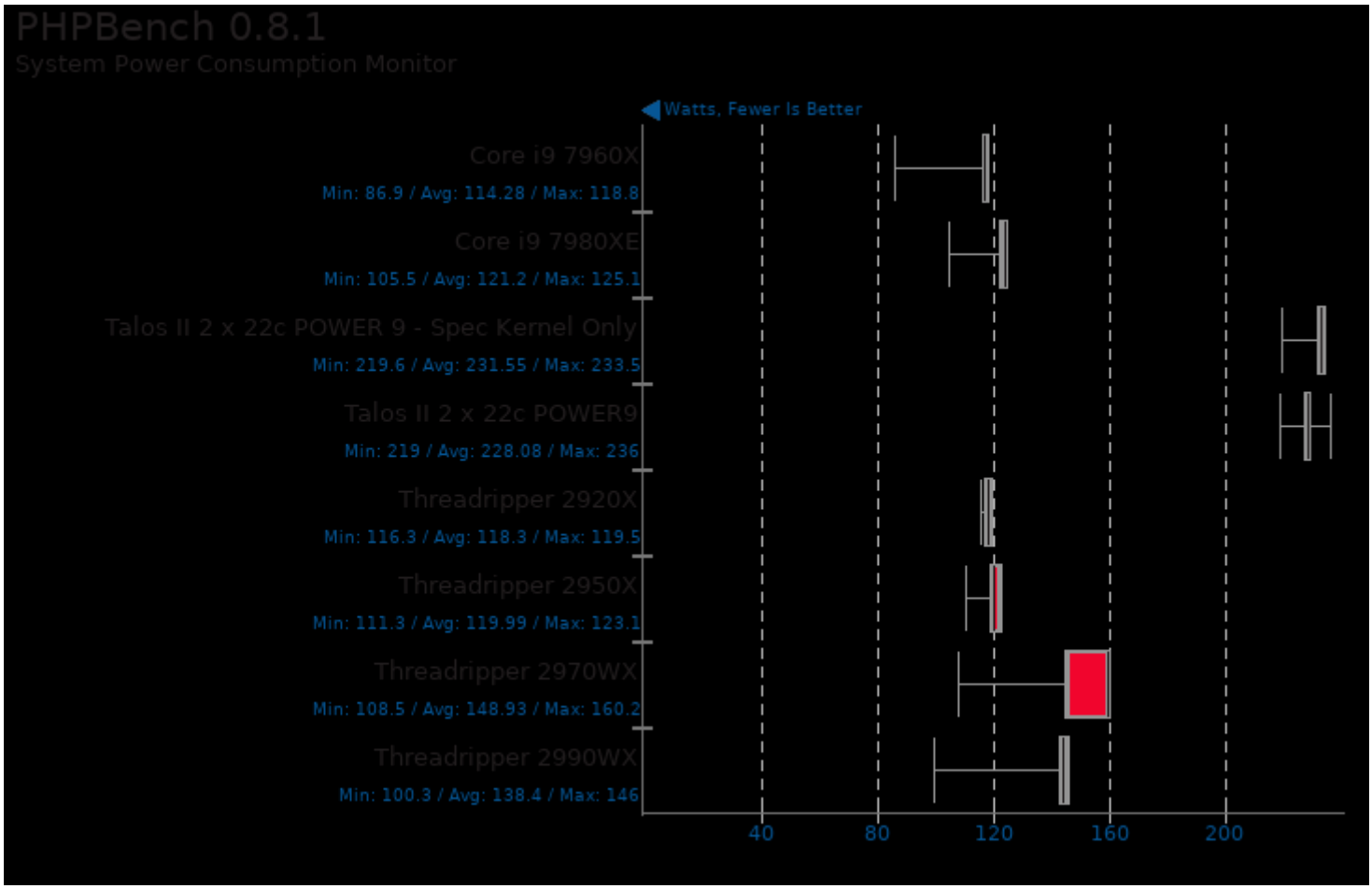

OpenSSL 1.1.1
RSA 4096-bit Performance
Signs Per Second, More Is Better
2x6386 32G ECC
SE +/- 1.10, N = 3
2010.1
Core i9 7900X
SE +/- 6.71, N = 3
-march=native
3059.0
Core i9 7960X
SE +/- 3.04, N = 3
-march=native
4421.0
Core i9 7980XE
SE +/- 8.96, N = 3
-march=native
4686.0
RCS6386
SE +/- 0.23, N = 3
2010.5
Talos II 2 x 22c POWER 9 - Spec Kernel Only
SE +/- 30.64, N = 3
-mtune=power9 -mcpu=power9
7408.0
Talos II 2 x 22c POWER9
SE +/- 73.20, N = 3
-mtune=power9 -mcpu=power9
7356.0
TalosII-DD2.2Stepping
SE +/- 84.61, N = 3
6691.6
Threadripper 2920X
SE +/- 11.27, N = 3
-march=native
2566.0
Threadripper 2950X
SE +/- 9.28, N = 3
-march=native
3287.0
Threadripper 2970WX
SE +/- 2.41, N = 3
-march=native
4561.0
Threadripper 2990WX
SE +/- 9.70, N = 3
-march=native
5821.0
test
SE +/- 0.64, N = 3
2009.7
1600
3200
4800
6400
8000
1. (CC) gcc options: -pthread -m64 -O3 -lssl -lcrypto -ldl

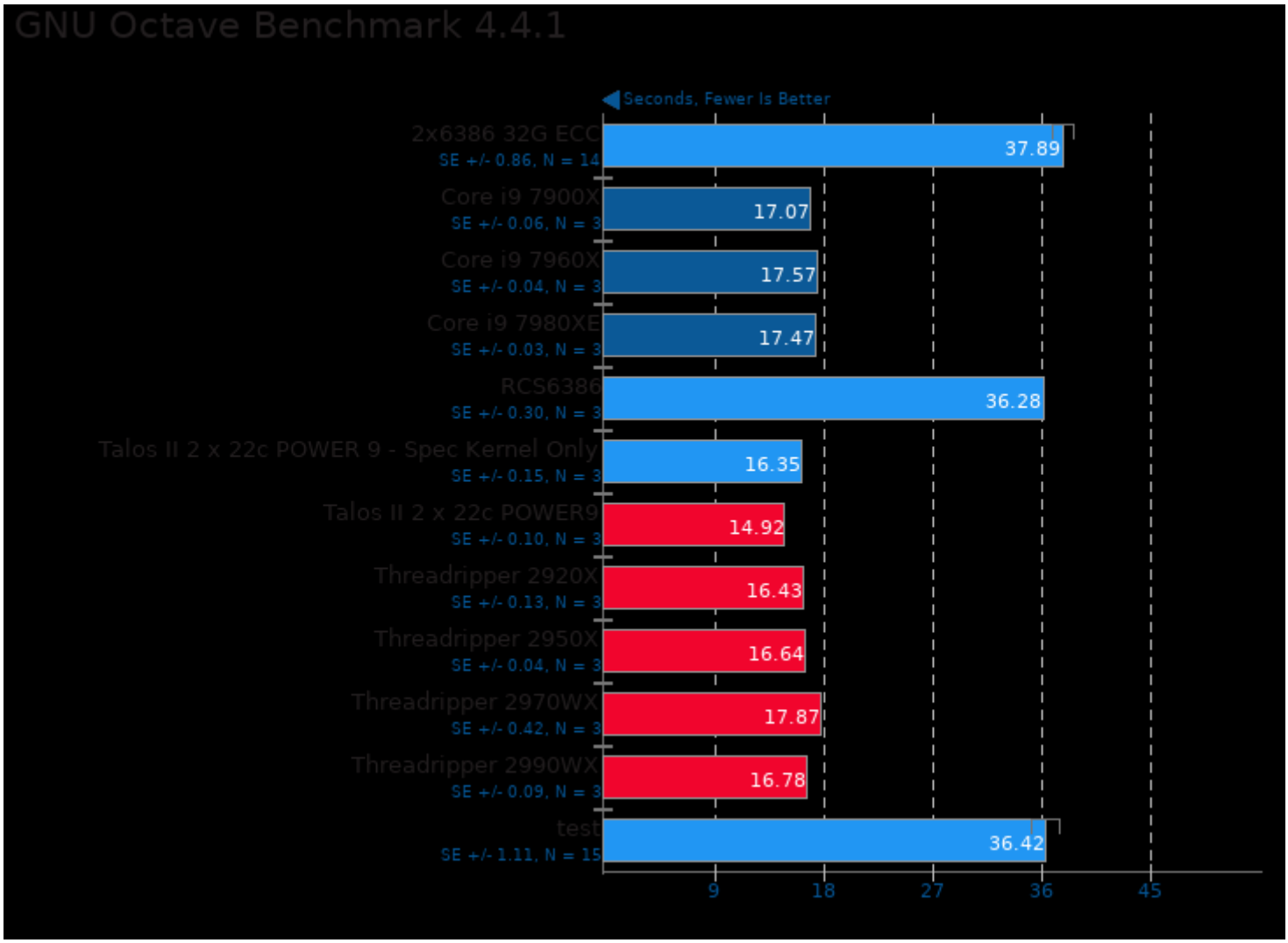

Stockfish 9
Total Time
Nodes Per Second, More Is Better
2x6386 32G ECC
SE +/- 225189.00, N = 3
-msse -msse3 -mpopcnt
25582390
Core i9 7900X
SE +/- 167195.68, N = 3
-march=native -msse -msse3 -mpopcnt
28320368
Core i9 7960X
SE +/- 190986.01, N = 3
-march=native -msse -msse3 -mpopcnt
43638299
Core i9 7980XE
SE +/- 259466.13, N = 3
-march=native -msse -msse3 -mpopcnt
46289588
POWER9
SE +/- 889638.82, N = 3
73382195
RCS6386
SE +/- 134205.60, N = 3
-msse -msse3 -mpopcnt
27549921
Talos II 2 x 22c POWER 9 - Spec Kernel Only
SE +/- 874263.62, N = 3
-mtune=power9 -mcpu=power9
80530953
Talos II 2 x 22c POWER9
SE +/- 208031.64, N = 3
-mtune=power9 -mcpu=power9
79137127
TalosII-DD2.2Stepping
SE +/- 240040.88, N = 3
72568429
Threadripper 2920X
SE +/- 389385.61, N = 3
-march=native -msse -msse3 -mpopcnt
33023827
Threadripper 2950X
SE +/- 289641.03, N = 3
-march=native -msse -msse3 -mpopcnt
41553292
Threadripper 2970WX
SE +/- 60617.50, N = 3
-march=native -msse -msse3 -mpopcnt
54575580
Threadripper 2990WX
SE +/- 531617.07, N = 3
-march=native -msse -msse3 -mpopcnt
67300757
test
SE +/- 140507.66, N = 3
-msse -msse3 -mpopcnt
25930236
20M
40M
60M
80M
100M
1. (CXX) g++ options: -m64 -lpthread -fno-exceptions -std=c++11 -pedantic -O3 -flto

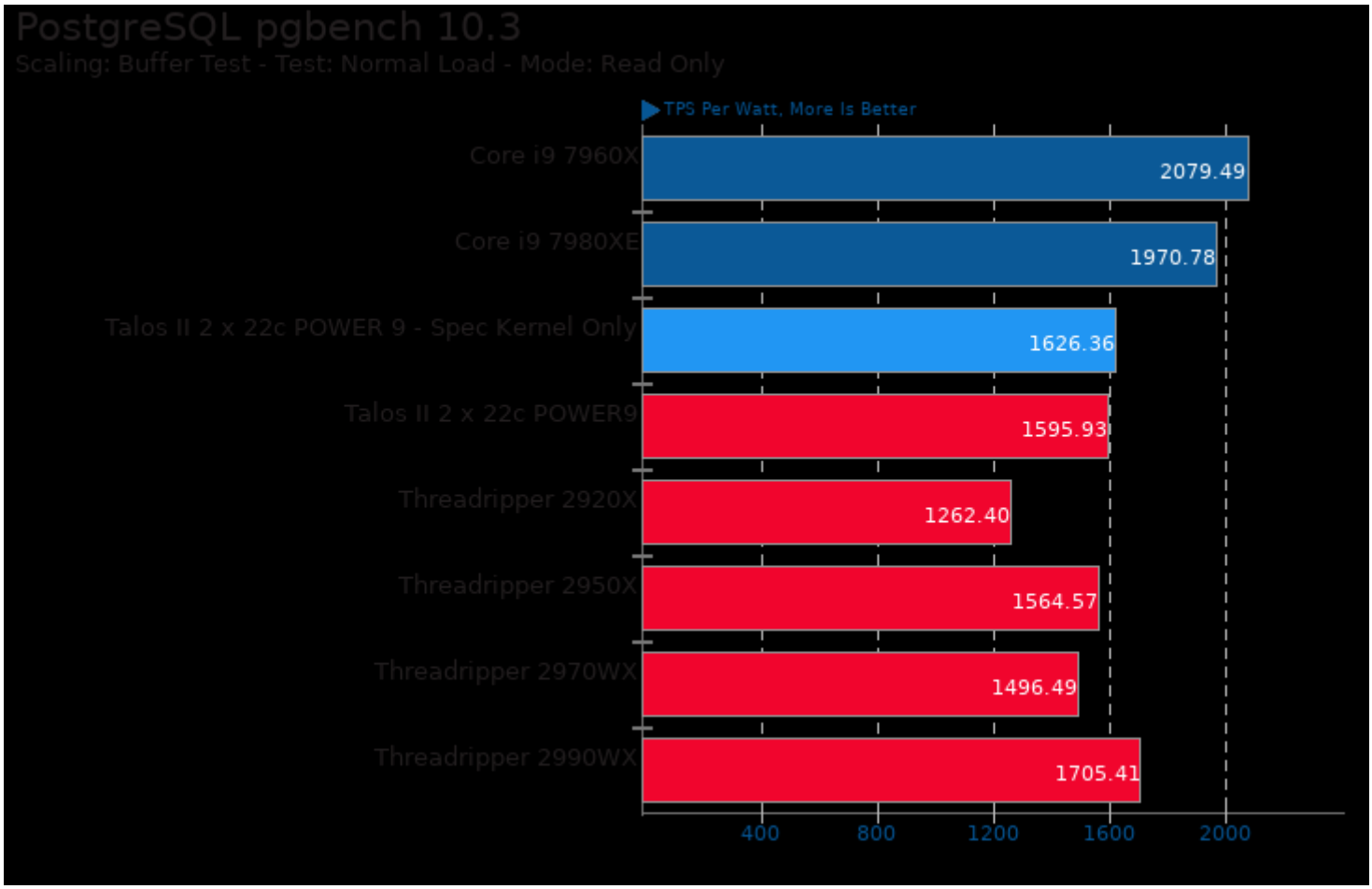

PyBench 2018-02-16
System Power Consumption Monitor
Watts, Fewer Is Better
Core i9 7960X
Min: 87.9 / Avg: 114.78 / Max: 121.2
Core i9 7980XE
Min: 108.2 / Avg: 123.98 / Max: 126.8
Talos II 2 x 22c POWER 9 - Spec Kernel Only
Min: 218.5 / Avg: 232.77 / Max: 234
Talos II 2 x 22c POWER9
Min: 217.9 / Avg: 227.49 / Max: 228.8
Threadripper 2920X
Min: 119.9 / Avg: 121.01 / Max: 123.4
Threadripper 2950X
Min: 80.2 / Avg: 120.41 / Max: 126.7
Threadripper 2970WX
Min: 161.7 / Avg: 163.52 / Max: 166.2
Threadripper 2990WX
Min: 119.6 / Avg: 145.1 / Max: 149.6
40
80
120
160
200

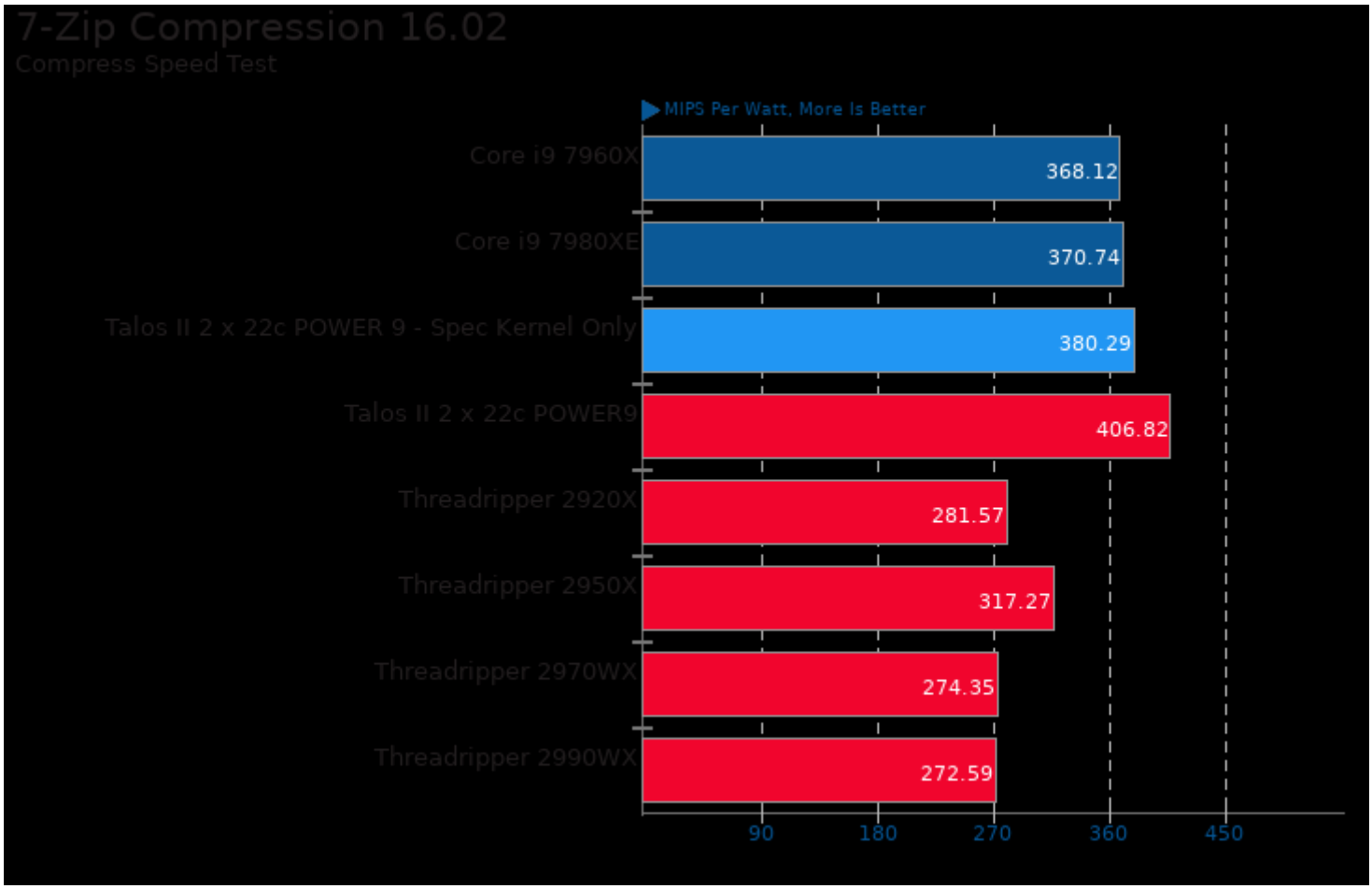

Rodinia 2.4
Test: OpenMP LavaMD
Seconds, Fewer Is Better
2x6386 32G ECC
SE +/- 0.00, N = 3
32.69
Core i9 7900X
SE +/- 0.10, N = 3
31.25
Core i9 7960X
SE +/- 0.11, N = 3
21.47
Core i9 7980XE
SE +/- 0.01, N = 3
20.08
POWER9
SE +/- 0.12, N = 3
15.97
RCS 6386
SE +/- 0.45, N = 4
33.19
RCS6386
SE +/- 0.53, N = 3
33.29
Talos II 2 x 22c POWER 9 - Spec Kernel Only
SE +/- 0.59, N = 3
19.30
Talos II 2 x 22c POWER9
SE +/- 0.67, N = 3
19.74
TalosII-DD2.2Stepping
SE +/- 0.16, N = 15
17.41
Threadripper 2920X
SE +/- 0.26, N = 3
25.77
Threadripper 2950X
SE +/- 0.07, N = 3
20.74
Threadripper 2970WX
SE +/- 0.06, N = 3
14.52
Threadripper 2990WX
SE +/- 0.01, N = 3
11.75
test
SE +/- 0.03, N = 3
32.64
8
16
24
32
40
1. (CXX) g++ options: -O2 -lOpenCL

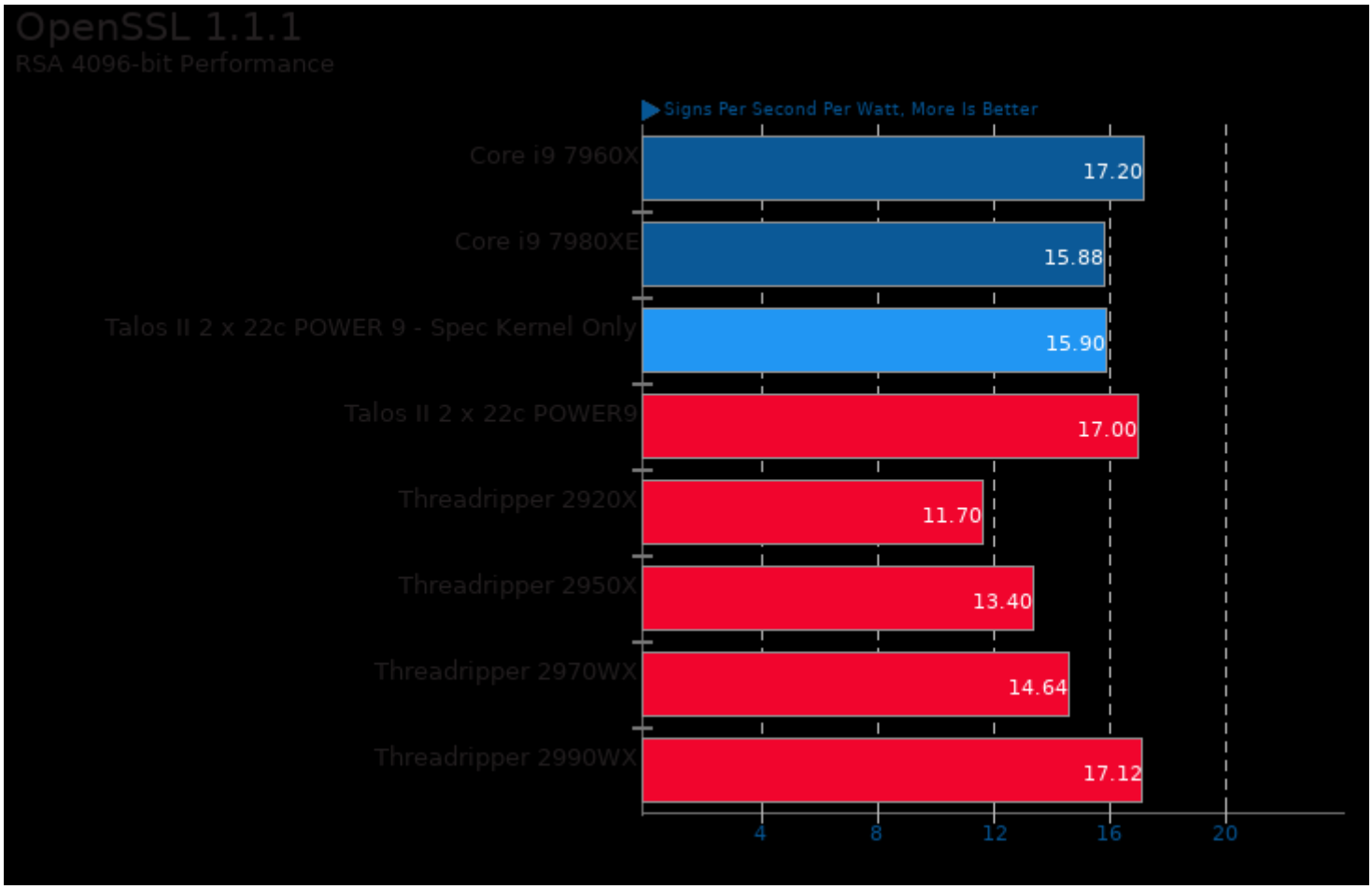

POV-Ray 3.7.0.7
Trace Time
Seconds, Fewer Is Better
2x6386 32G ECC
SE +/- 0.06, N = 3
-march=native -lSDL -lSM -lICE -lX11
49.39
Core i9 7900X
SE +/- 0.04, N = 3
-march=native -lSDL -lXpm -lSM -lICE -lX11 -llimimf -llimath -lHalf -llex -llexMath -llimThread -lpthread
44.22
Core i9 7960X
SE +/- 0.03, N = 3
30.72
Core i9 7980XE
SE +/- 0.05, N = 3
28.29
RCS6386
SE +/- 0.09, N = 3
49.28
Talos II 2 x 22c POWER 9 - Spec Kernel Only
SE +/- 0.18, N = 3
-mtune=power9 -mcpu=power9
23.44
Talos II 2 x 22c POWER9
SE +/- 0.05, N = 3
25.28
TalosII-DD2.2Stepping
SE +/- 0.07, N = 3
29.70
Threadripper 2920X
SE +/- 0.13, N = 3
37.92
Threadripper 2950X
SE +/- 0.08, N = 3
30.56
Threadripper 2970WX
SE +/- 0.23, N = 3
22.39
Threadripper 2990WX
SE +/- 0.06, N = 3
17.92
test
SE +/- 0.08, N = 3
49.54
11
22
33
44
55
1. (CXX) g++ options: -pipe -O3 -ffast-math -pthread -ltiff -ljpeg -lpng -lz -lrt -lm -lboost_thread -lboost_system

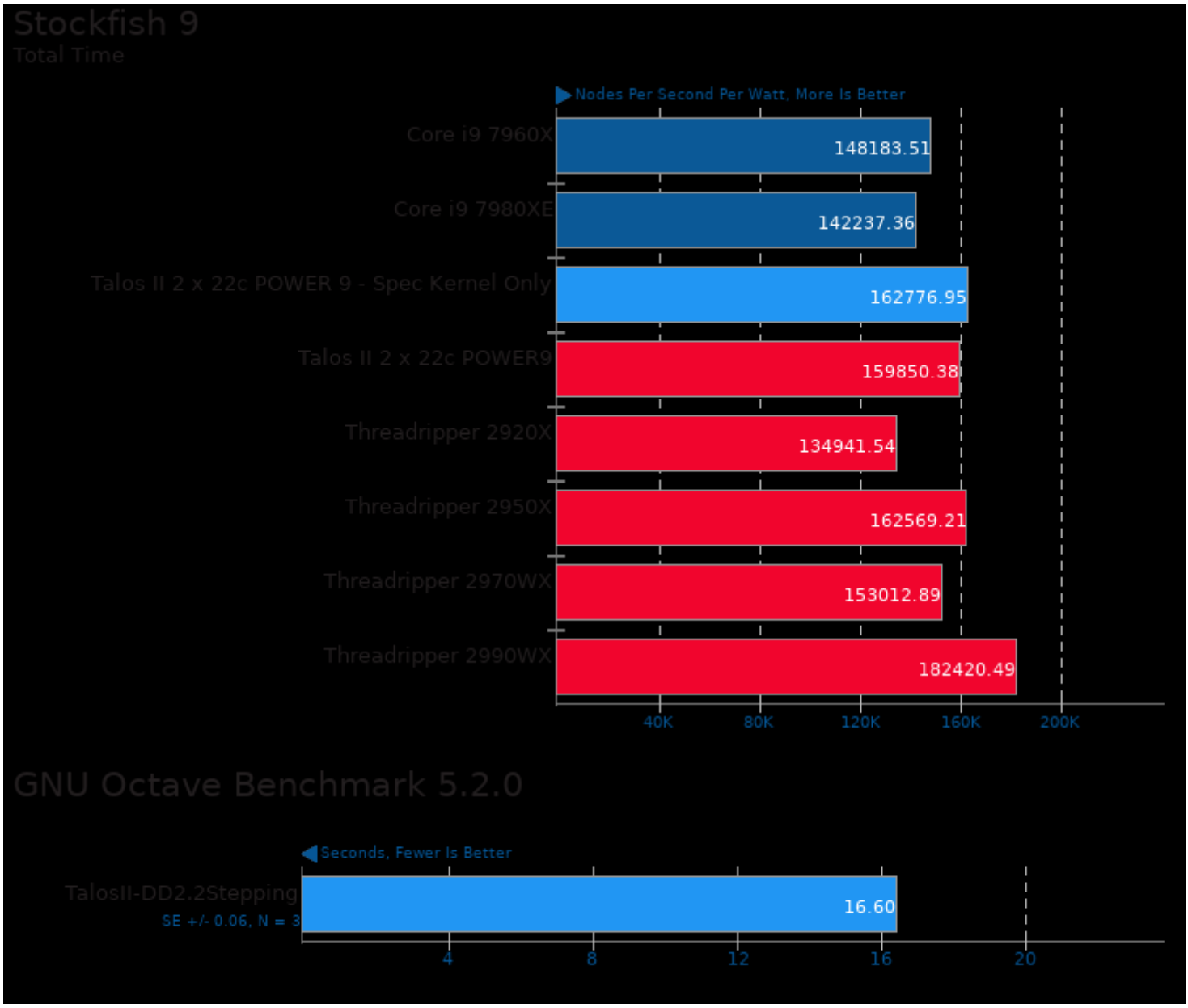

PHPBench 0.8.1
System Power Consumption Monitor
Watts, Fewer Is Better
Core i9 7960X
Min: 86.9 / Avg: 114.28 / Max: 118.8
Core i9 7980XE
Min: 105.5 / Avg: 121.2 / Max: 125.1
Talos II 2 x 22c POWER 9 - Spec Kernel Only
Min: 219.6 / Avg: 231.55 / Max: 233.5
Talos II 2 x 22c POWER9
Min: 219 / Avg: 228.08 / Max: 236
Threadripper 2920X
Min: 116.3 / Avg: 118.3 / Max: 119.5
Threadripper 2950X
Min: 111.3 / Avg: 119.99 / Max: 123.1
Threadripper 2970WX
Min: 108.5 / Avg: 148.93 / Max: 160.2
Threadripper 2990WX
Min: 100.3 / Avg: 138.4 / Max: 146
40
80
120
160
200

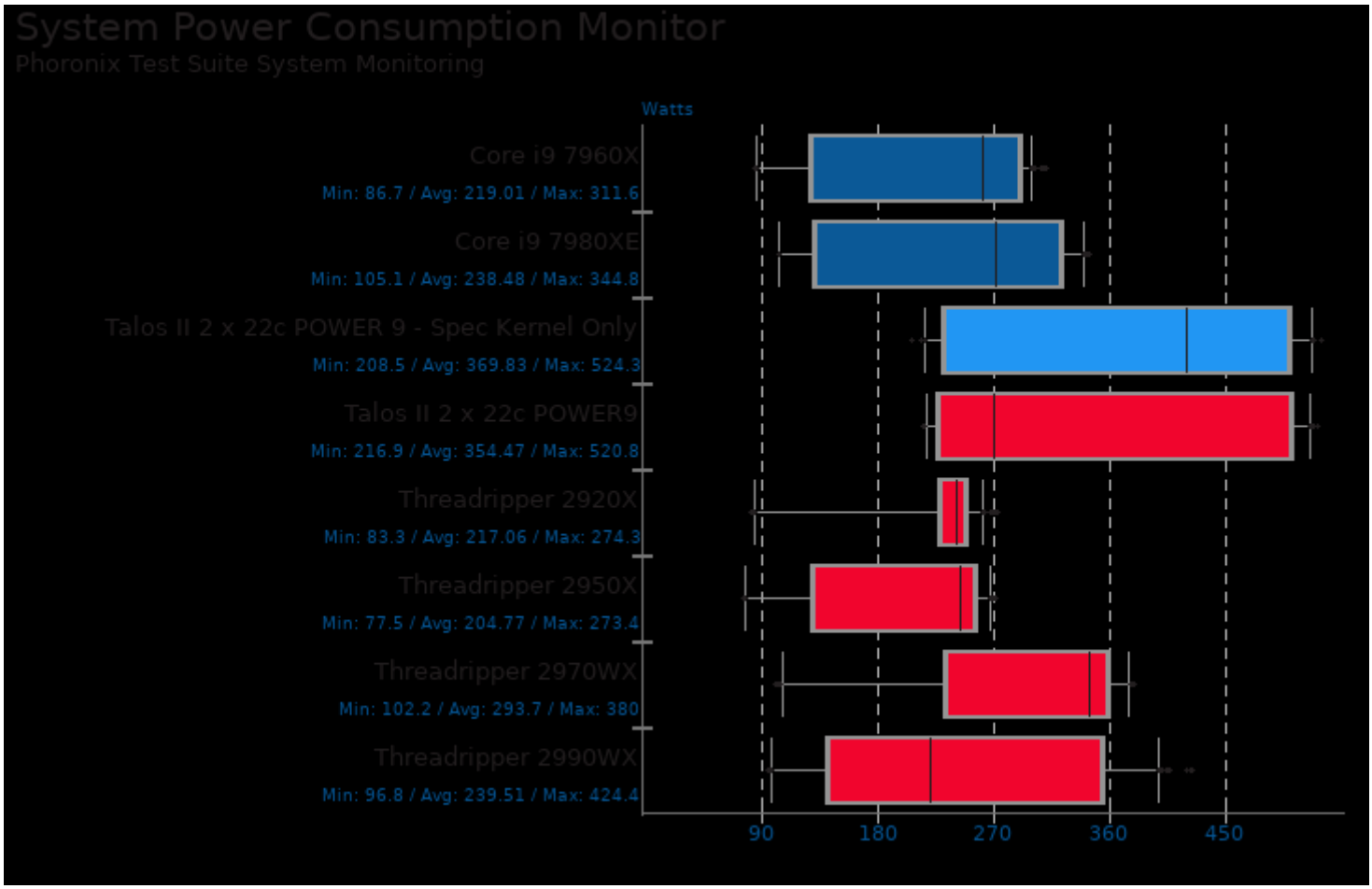

GNU Octave Benchmark 4.4.1
Seconds, Fewer Is Better
2x6386 32G ECC
SE +/- 0.86, N = 14
37.89
Core i9 7900X
SE +/- 0.06, N = 3
17.07
Core i9 7960X
SE +/- 0.04, N = 3
17.57
Core i9 7980XE
SE +/- 0.03, N = 3
17.47
RCS6386
SE +/- 0.30, N = 3
36.28
Talos II 2 x 22c POWER 9 - Spec Kernel Only
SE +/- 0.15, N = 3
16.35
Talos II 2 x 22c POWER9
SE +/- 0.10, N = 3
14.92
Threadripper 2920X
SE +/- 0.13, N = 3
16.43
Threadripper 2950X
SE +/- 0.04, N = 3
16.64
Threadripper 2970WX
SE +/- 0.42, N = 3
17.87
Threadripper 2990WX
SE +/- 0.09, N = 3
16.78
test
SE +/- 1.11, N = 15
36.42
9
18
27
36
45


PostgreSQL pgbench 10.3
Scaling: Buffer Test - Test: Normal Load - Mode: Read Only
TPS Per Watt, More Is Better
Core i9 7960X
2079.49
Core i9 7980XE
1970.78
Talos II 2 x 22c POWER 9 - Spec Kernel Only
1626.36
Talos II 2 x 22c POWER9
1595.93
Threadripper 2920X
1262.40
Threadripper 2950X
1564.57
Threadripper 2970WX
1496.49
Threadripper 2990WX
1705.41
400
800
1200
1600
2000


7-Zip Compression 16.02
Compress Speed Test
MIPS Per Watt, More Is Better
Core i9 7960X
368.12
Core i9 7980XE
370.74
Talos II 2 x 22c POWER 9 - Spec Kernel Only
380.29
Talos II 2 x 22c POWER9
406.82
Threadripper 2920X
281.57
Threadripper 2950X
317.27
Threadripper 2970WX
274.35
Threadripper 2990WX
272.59
90
180
270
360
450


OpenSSL 1.1.1
RSA 4096-bit Performance
Signs Per Second Per Watt, More Is Better
Core i9 7960X
17.20
Core i9 7980XE
15.88
Talos II 2 x 22c POWER 9 - Spec Kernel Only
15.90
Talos II 2 x 22c POWER9
17.00
Threadripper 2920X
11.70
Threadripper 2950X
13.40
Threadripper 2970WX
14.64
Threadripper 2990WX
17.12
4
8
12
16
20


Stockfish 9
Total Time
Nodes Per Second Per Watt, More Is Better
Core i9 7960X
148183.51
Core i9 7980XE
142237.36
Talos II 2 x 22c POWER 9 - Spec Kernel Only
162776.95
Talos II 2 x 22c POWER9
159850.38
Threadripper 2920X
134941.54
Threadripper 2950X
162569.21
Threadripper 2970WX
153012.89
Threadripper 2990WX
182420.49
40K
80K
120K
160K
200K
GNU Octave Benchmark 5.2.0
Seconds, Fewer Is Better
TalosII-DD2.2Stepping
SE +/- 0.06, N = 3
16.60
4
8
12
16
20



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