



apache spark 5800X3D

AMD Ryzen 7 5800X3D 8-Core testing with a ASUS ROG CROSSHAIR VIII HERO (4201 BIOS) and Gigabyte AMD Radeon RX 6600 8GB on Ubuntu 22.04 via the Phoronix Test Suite.

Automated Executive Summary

C had the most wins, coming in first place for 45% of the tests.

Based on the geometric mean of all complete results, the fastest (C) was 1.002x the speed of the slowest (A). B was 0.999x the speed of C and A was 0.999x the speed of B.

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

Apache Spark (Row Count: 1000000 - Partitions: 1000 - Inner Join Test Time) at 1.091x
Apache Spark (Row Count: 1000000 - Partitions: 2000 - Inner Join Test Time) at 1.078x
Apache Spark (Row Count: 20000000 - Partitions: 500 - Inner Join Test Time) at 1.073x
Apache Spark (Row Count: 20000000 - Partitions: 1000 - Broadcast Inner Join Test Time) at 1.061x
Apache Spark (Row Count: 1000000 - Partitions: 2000 - Broadcast Inner Join Test Time) at 1.057x
Apache Spark (Row Count: 40000000 - Partitions: 100 - Inner Join Test Time) at 1.053x
Apache Spark (Row Count: 10000000 - Partitions: 500 - Broadcast Inner Join Test Time) at 1.047x
Apache Spark (Row Count: 10000000 - Partitions: 2000 - Inner Join Test Time) at 1.041x
Apache Spark (Row Count: 40000000 - Partitions: 500 - Group By Test Time) at 1.04x

Apache Spark (Row Count: 1000000 - Partitions: 500 - Group By Test Time) at 1.038x.

Test Systems:

A

B

C

Processor: AMD Ryzen 7 5800X3D 8-Core @ 3.40GHz (8 Cores / 16 Threads), Motherboard: ASUS ROG CROSSHAIR VIII HERO (4201 BIOS), Chipset: AMD Starship/Matisse, Memory: 32GB, Disk: 1000GB Western Digital WDS100T1X0E-00AFY0, Graphics: Gigabyte AMD Radeon RX 6600 8GB (2750/875MHz), Audio: AMD Navi 21 HDMI Audio, Monitor: ASUS MG28U, Network: Realtek RTL8125 2.5GbE + Intel I211

OS: Ubuntu 22.04, Kernel: 5.19.0-rc6-drm-next-28july (x86_64), Desktop: GNOME Shell 42.2, Display Server: X Server 1.21.1.3 + Wayland, OpenGL: 4.6 Mesa 22.2.0-devel (git-c6ded153d1) (LLVM 12.0.0 DRM 3.48), Vulkan: 1.3.211, Compiler: GCC 11.2.0, File-System: ext4, Screen Resolution: 3840x2160

Kernel Notes: Transparent Huge Pages: madvise

Processor Notes: Scaling Governor: acpi-cpufreq schedutil (Boost: Enabled) - CPU Microcode: 0xa20120a

Java Notes: OpenJDK Runtime Environment (build 11.0.15+10-Ubuntu-0ubuntu0.22.04.1)

Python Notes: Python 3.10.4

Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + mmio_stale_data: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl + spectre_v1: Mitigation of usercopy/swaps barriers and __user pointer sanitization + spectre_v2: Mitigation of Retpolines IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

| | A | B | C |
|--|----------------------|---------------|---------------------|
| Apache Spark - 1000000 - 100 - S.5.B.T (sec) | 2.91 | 2.88 | 2.84 |
| Normalized | 97.59% | 98.61% | 100% |
| Standard Deviation | 3% | 2% | |
| Apache Spark - 1000000 - 100 - C.P.B (sec) | 149.348708414 | 148.735383131 | 146.52097559 |
| Normalized | 98.11% | 98.51% | 100% |
| Standard Deviation | 0.5% | 0.5% | |
| Apache Spark - 1000000 - 100 - C.P.B.U.D (sec) | 8.67 | 8.61 | 8.52 |
| Normalized | 98.27% | 98.95% | 100% |
| Standard Deviation | 0.6% | 0.5% | |
| Apache Spark - 1000000 - 100 - Group By Test Time (sec) | 2.89 | 2.88 | 2.88 |
| Normalized | 99.65% | 100% | 100% |
| Standard Deviation | 1.9% | 0.7% | |
| Apache Spark - 1000000 - 100 - R.T.T (sec) | 1.90 | 1.93 | 1.96 |
| Normalized | 100% | 98.45% | 96.94% |
| Standard Deviation | 2% | 2.6% | |

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|--|---------------|---------------|---------------|
| Apache Spark - 1000000 - 100 - I.J.T.T (sec) | 1.45 | 1.40 | 1.44 |
| Normalized | 96.55% | 100% | 97.22% |
| Standard Deviation | 5.4% | 7.9% | |
| Apache Spark - 1000000 - 100 - B.I.J.T.T (sec) | 1.31 | 1.36 | 1.30 |
| Normalized | 99.24% | 95.59% | 100% |
| Standard Deviation | 6% | 9.5% | |
| Apache Spark - 1000000 - 500 - S.5.B.T (sec) | 3.06 | 3.02 | 3.03 |
| Normalized | 98.69% | 100% | 99.67% |
| Standard Deviation | 2.1% | 1.1% | |
| Apache Spark - 1000000 - 500 - C.P.B (sec) | 150.184683924 | 149.134613280 | 148.565766046 |
| Normalized | 98.92% | 99.62% | 100% |
| Standard Deviation | 0.9% | 0.5% | |
| Apache Spark - 1000000 - 500 - C.P.B.U.D (sec) | 8.69 | 8.67 | 8.55 |
| Normalized | 98.39% | 98.62% | 100% |
| Standard Deviation | 0.8% | 0.8% | |
| Apache Spark - 1000000 - 500 - Group By Test Time (sec) | 3.15 | 3.20 | 3.27 |
| Normalized | 100% | 98.44% | 96.33% |
| Standard Deviation | 2.1% | 1.7% | |
| Apache Spark - 1000000 - 500 - R.T.T (sec) | 1.99 | 1.99 | 2.02 |
| Normalized | 100% | 100% | 98.51% |
| Standard Deviation | 1.6% | 1.4% | |
| Apache Spark - 1000000 - 500 - I.J.T.T (sec) | 1.63 | 1.63 | 1.62 |
| Normalized | 99.39% | 99.39% | 100% |
| Standard Deviation | 5.3% | 3.7% | |
| Apache Spark - 1000000 - 500 - B.I.J.T.T (sec) | 1.48 | 1.45 | 1.38 |
| Normalized | 93.24% | 95.17% | 100% |
| Standard Deviation | 9.5% | 2.7% | |
| Apache Spark - 1000000 - 1000 - S.5.B.T | 3.17 | 3.19 | 3.14 |
| Normalized | 99.05% | 98.43% | 100% |
| Standard Deviation | 0.8% | 3.2% | |
| Apache Spark - 1000000 - 1000 - C.P.B (sec) | 150.409490333 | 149.520497364 | 149.529773024 |
| Normalized | 99.41% | 100% | 99.99% |
| Standard Deviation | 0.5% | 0.6% | |
| Apache Spark - 1000000 - 1000 - C.P.B.U.D (sec) | 8.68 | 8.61 | 8.59 |
| Normalized | 98.96% | 99.77% | 100% |
| Standard Deviation | 0.8% | 0.6% | |
| Apache Spark - 1000000 - 1000 - Group By Test Time (sec) | 3.42 | 3.43 | 3.36 |
| Normalized | 98.25% | 97.96% | 100% |
| Standard Deviation | 2.4% | 1.6% | |
| Apache Spark - 1000000 - 1000 - R.T.T (sec) | 2.20 | 2.20 | 2.16 |
| Normalized | 98.18% | 98.18% | 100% |
| Standard Deviation | 1.1% | 1.7% | |
| Apache Spark - 1000000 - 1000 - I.J.T.T (sec) | 1.92 | 1.84 | 1.76 |
| Normalized | 91.67% | 95.65% | 100% |
| Standard Deviation | 1.3% | 4.6% | |
| Apache Spark - 1000000 - 1000 - B.I.J.T.T | 1.58 | 1.66 | 1.74 |
| Normalized | 100% | 95.18% | 90.8% |
| Standard Deviation | 1.9% | 6.2% | |
| Apache Spark - 1000000 - 2000 - S.5.B.T | 3.46 | 3.47 | 3.48 |
| Normalized | 100% | 99.71% | 99.43% |
| Standard Deviation | 1.8% | 1.5% | |

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|--|---------------|---------------|---------------|
| Apache Spark - 1000000 - 2000 - C.P.B (sec) | 150.031645092 | 148.583093415 | 149.71767697 |
| Normalized | 99.03% | 100% | 99.24% |
| Standard Deviation | 1.1% | 0.3% | |
| Apache Spark - 1000000 - 2000 - C.P.B.U.D (sec) | 8.68 | 8.61 | 8.63 |
| Normalized | 99.19% | 100% | 99.77% |
| Standard Deviation | 0.4% | 0.5% | |
| Apache Spark - 1000000 - 2000 - Group By Test Time (sec) | 3.74 | 3.84 | 3.79 |
| Normalized | 100% | 97.4% | 98.68% |
| Standard Deviation | 2% | 1.6% | |
| Apache Spark - 1000000 - 2000 - R.T.T (sec) | 2.50 | 2.46 | 2.54 |
| Normalized | 98.4% | 100% | 96.85% |
| Standard Deviation | 0.5% | 3.4% | |
| Apache Spark - 1000000 - 2000 - I.J.T.T (sec) | 2.32 | 2.36 | 2.50 |
| Normalized | 100% | 98.31% | 92.8% |
| Standard Deviation | 5.4% | 5% | |
| Apache Spark - 1000000 - 2000 - B.I.J.T.T | 2.02 | 2.05 | 1.94 |
| Normalized | 96.04% | 94.63% | 100% |
| Standard Deviation | 3% | 4.4% | |
| Apache Spark - 10000000 - 100 - S.5.B.T | 14.539789898 | 14.60 | 14.47 |
| Normalized | 99.52% | 99.11% | 100% |
| Standard Deviation | 1.1% | 0.6% | |
| Apache Spark - 10000000 - 100 - C.P.B (sec) | 149.758709975 | 149.564826029 | 149.06749502 |
| Normalized | 99.54% | 99.67% | 100% |
| Standard Deviation | 0.8% | 0.5% | |
| Apache Spark - 10000000 - 100 - C.P.B.U.D (sec) | 8.66 | 8.66 | 8.64 |
| Normalized | 99.77% | 99.77% | 100% |
| Standard Deviation | 0.3% | 0.3% | |
| Apache Spark - 10000000 - 100 - Group By Test Time (sec) | 6.60 | 6.64 | 6.55 |
| Normalized | 99.24% | 98.64% | 100% |
| Standard Deviation | 1.2% | 1.7% | |
| Apache Spark - 10000000 - 100 - R.T.T (sec) | 9.16 | 9.15 | 8.95 |
| Normalized | 97.71% | 97.81% | 100% |
| Standard Deviation | 2.3% | 2.1% | |
| Apache Spark - 10000000 - 100 - I.J.T.T (sec) | 11.340071822 | 11.01 | 10.93 |
| Normalized | 96.38% | 99.27% | 100% |
| Standard Deviation | 0.3% | 4.3% | |
| Apache Spark - 10000000 - 100 - B.I.J.T.T | 11.566249356 | 11.28 | 11.54 |
| Normalized | 97.53% | 100% | 97.75% |
| Standard Deviation | 0.7% | 3.4% | |
| Apache Spark - 10000000 - 500 - S.5.B.T | 13.94 | 13.97 | 14.07 |
| Normalized | 100% | 99.79% | 99.08% |
| Standard Deviation | 0.3% | 0.3% | |
| Apache Spark - 10000000 - 500 - C.P.B (sec) | 148.982085231 | 148.915757535 | 148.055891825 |
| Normalized | 99.38% | 99.42% | 100% |
| Standard Deviation | 0.3% | 0.5% | |
| Apache Spark - 10000000 - 500 - C.P.B.U.D (sec) | 8.69 | 8.68 | 8.67 |
| Normalized | 99.77% | 99.88% | 100% |
| Standard Deviation | 0.5% | 0.5% | |

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|---|----------------------|----------------------|---------------------|
| Apache Spark - 10000000 - 500 - Group By | 6.75 | 6.82 | 6.66 |
| Test Time (sec) | | | |
| Normalized | 98.67% | 97.65% | 100% |
| Standard Deviation | 2.1% | 0.8% | |
| Apache Spark - 10000000 - 500 - R.T.T (sec) | 8.94 | 9.03 | 8.83 |
| Normalized | 98.77% | 97.79% | 100% |
| Standard Deviation | 0.6% | 2.2% | |
| Apache Spark - 10000000 - 500 - I.J.T.T (sec) | 10.320102526 | 10.48 | 10.14 |
| Normalized | 98.25% | 96.76% | 100% |
| Standard Deviation | 1.9% | 3.2% | |
| Apache Spark - 10000000 - 500 - B.I.J.T.T | 10.589748727 | 10.11 | 10.24 |
| Normalized | 95.47% | 100% | 98.73% |
| Standard Deviation | 2.6% | 0.7% | |
| Apache Spark - 20000000 - 100 - S.5.B.T | 27.22 | 27.24 | 27.29 |
| Normalized | 100% | 99.93% | 99.74% |
| Standard Deviation | 0.8% | 0.8% | |
| Apache Spark - 20000000 - 100 - C.P.B (sec) | 149.362186051 | 148.786767111 | 149.245823899 |
| Normalized | 99.61% | 100% | 99.69% |
| Standard Deviation | 0.4% | 0.6% | |
| Apache Spark - 20000000 - 100 - C.P.B.U.D | 8.67 | 8.59 | 8.71 |
| (sec) | | | |
| Normalized | 99.08% | 100% | 98.62% |
| Standard Deviation | 0.5% | 0.9% | |
| Apache Spark - 20000000 - 100 - Group By | 10.65 | 10.50 | 10.60 |
| Test Time (sec) | | | |
| Normalized | 98.59% | 100% | 99.06% |
| Standard Deviation | 1% | 1.5% | |
| Apache Spark - 20000000 - 100 - R.T.T (sec) | 17.908074200 | 17.81 | 18.05 |
| Normalized | 99.45% | 100% | 98.67% |
| Standard Deviation | 0.8% | 1.9% | |
| Apache Spark - 20000000 - 100 - I.J.T.T (sec) | 21.82 | 22.08 | 22.09 |
| Normalized | 100% | 98.82% | 98.78% |
| Standard Deviation | 2% | 1.1% | |
| Apache Spark - 20000000 - 100 - B.I.J.T.T | 22.08 | 22.27 | 22.650420462 |
| Normalized | 100% | 99.15% | 97.48% |
| Standard Deviation | 3.8% | 1% | |
| Apache Spark - 20000000 - 500 - S.5.B.T | 25.771477402 | 25.98 | 25.62 |
| Normalized | 99.41% | 98.61% | 100% |
| Standard Deviation | 0.8% | 2.4% | |
| Apache Spark - 20000000 - 500 - C.P.B (sec) | 148.224458268 | 149.139980735 | 148.939367323 |
| Normalized | 100% | 99.39% | 99.52% |
| Standard Deviation | 0.3% | 0.7% | |
| Apache Spark - 20000000 - 500 - C.P.B.U.D | 8.60 | 8.60 | 8.57 |
| (sec) | | | |
| Normalized | 99.65% | 99.65% | 100% |
| Standard Deviation | 0.5% | 0.8% | |
| Apache Spark - 20000000 - 500 - Group By | 10.118608339 | 10.05 | 10.04 |
| Test Time (sec) | | | |
| Normalized | 99.22% | 99.9% | 100% |
| Standard Deviation | 1.3% | 1.2% | |
| Apache Spark - 20000000 - 500 - R.T.T (sec) | 16.94 | 17.02 | 17.493210745 |
| Normalized | 100% | 99.53% | 96.84% |
| Standard Deviation | 1.1% | 0.8% | |
| Apache Spark - 20000000 - 500 - I.J.T.T (sec) | 20.035527670 | 19.77 | 21.21 |

| | | | | |
|--|--------------------|----------------------|----------------------|----------------------|
| | Normalized | 98.67% | 100% | 93.21% |
| | Standard Deviation | 1.8% | 1.8% | |
| Apache Spark - 20000000 - 500 - B.I.J.T.T | | 20.35 | 20.05 | 19.94 |
| | Normalized | 97.99% | 99.45% | 100% |
| | Standard Deviation | 0.9% | 2.2% | |
| Apache Spark - 40000000 - 100 - S.5.B.T | | 49.41 | 49.28 | 49.53 |
| | Normalized | 99.74% | 100% | 99.5% |
| | Standard Deviation | 0.9% | 0.8% | |
| Apache Spark - 40000000 - 100 - C.P.B (sec) | | 149.227508787 | 148.597175671 | 149.610888179 |
| | Normalized | 99.58% | 100% | 99.32% |
| | Standard Deviation | 0.7% | 0.9% | |
| Apache Spark - 40000000 - 100 - C.P.B.U.D (sec) | | 8.63 | 8.63 | 8.65 |
| | Normalized | 100% | 100% | 99.77% |
| | Standard Deviation | 0.5% | 0.1% | |
| Apache Spark - 40000000 - 100 - Group By Test Time (sec) | | 27.362051435 | 27.28 | 27.382169172 |
| | Normalized | 99.7% | 100% | 99.63% |
| | Standard Deviation | 0.8% | 1.1% | |
| Apache Spark - 40000000 - 100 - R.T.T (sec) | | 33.933058393 | 34.41 | 34.74 |
| | Normalized | 100% | 98.61% | 97.68% |
| | Standard Deviation | 1.9% | 1% | |
| Apache Spark - 40000000 - 100 - I.J.T.T (sec) | | 40.00 | 39.87 | 41.98 |
| | Normalized | 99.68% | 100% | 94.97% |
| | Standard Deviation | 1.1% | 1.8% | |
| Apache Spark - 40000000 - 100 - B.I.J.T.T | | 40.78 | 40.14 | 39.621362405 |
| | Normalized | 97.16% | 98.71% | 100% |
| | Standard Deviation | 2.2% | 1% | |
| Apache Spark - 40000000 - 500 - S.5.B.T | | 50.13 | 49.86 | 48.84 |
| | Normalized | 97.43% | 97.95% | 100% |
| | Standard Deviation | 1.1% | 0.8% | |
| Apache Spark - 40000000 - 500 - C.P.B (sec) | | 151.330983793 | 149.128695060 | 147.715180363 |
| | Normalized | 97.61% | 99.05% | 100% |
| | Standard Deviation | 2.5% | 0.5% | |
| Apache Spark - 40000000 - 500 - C.P.B.U.D (sec) | | 8.59 | 8.61 | 8.58 |
| | Normalized | 99.88% | 99.65% | 100% |
| | Standard Deviation | 0.6% | 1.1% | |
| Apache Spark - 40000000 - 500 - Group By Test Time (sec) | | 23.97 | 23.49 | 23.04 |
| | Normalized | 96.12% | 98.08% | 100% |
| | Standard Deviation | 0.8% | 1.1% | |
| Apache Spark - 40000000 - 500 - R.T.T (sec) | | 33.546966500 | 33.85 | 34.11 |
| | Normalized | 100% | 99.1% | 98.35% |
| | Standard Deviation | 1.9% | 1.4% | |
| Apache Spark - 40000000 - 500 - I.J.T.T (sec) | | 39.55 | 40.14 | 40.17 |
| | Normalized | 100% | 98.53% | 98.46% |
| | Standard Deviation | 2.6% | 0.6% | |
| Apache Spark - 40000000 - 500 - B.I.J.T.T | | 40.32 | 40.760680072 | 40.291389364 |
| | Normalized | 99.93% | 98.85% | 100% |
| | Standard Deviation | 1.7% | 2.3% | |
| Apache Spark - 10000000 - 1000 - S.5.B.T (sec) | | 13.97 | 13.89 | 14.07 |
| | Normalized | 99.43% | 100% | 98.72% |
| | Standard Deviation | 1.1% | 1.3% | |

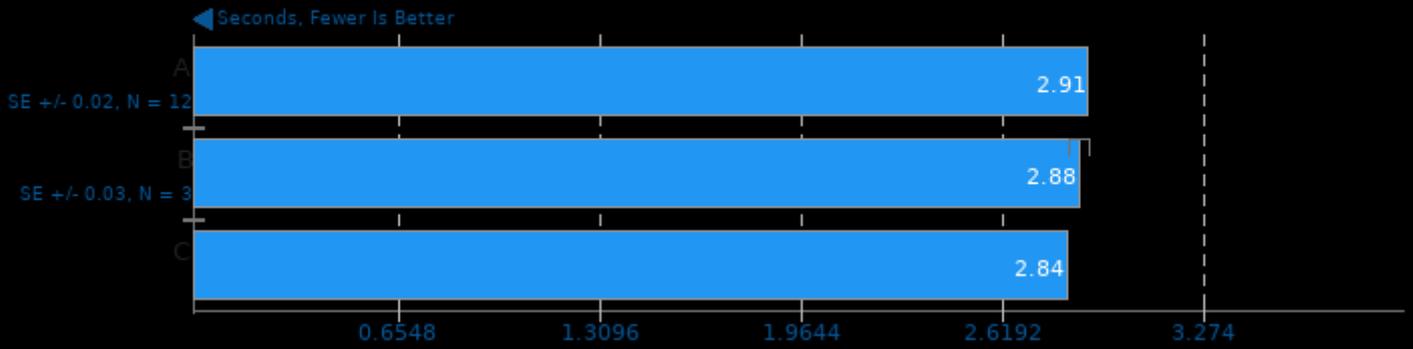
| | | | |
|---|----------------------|----------------------|----------------------|
| Apache Spark - 10000000 - 1000 - C.P.B (sec) | 148.548472344 | 148.532731450 | 148.988566083 |
| Normalized | 99.99% | 100% | 99.69% |
| Standard Deviation | 0.6% | 1% | |
| Apache Spark - 10000000 - 1000 - C.P.B.U.D (sec) | 8.49 | 8.54 | 8.61 |
| Normalized | 100% | 99.41% | 98.61% |
| Standard Deviation | 0.6% | 0.2% | |
| Apache Spark - 10000000 - 1000 - Group By Test Time (sec) | 6.89 | 6.77 | 6.86 |
| Normalized | 98.26% | 100% | 98.69% |
| Standard Deviation | 1.2% | 2.2% | |
| Apache Spark - 10000000 - 1000 - R.T.T (sec) | 9.05 | 9.01 | 8.90 |
| Normalized | 98.34% | 98.78% | 100% |
| Standard Deviation | 1.5% | 2.3% | |
| Apache Spark - 10000000 - 1000 - I.J.T.T | 10.79 | 11.02 | 10.51 |
| Normalized | 97.41% | 95.37% | 100% |
| Standard Deviation | 6.5% | 2.7% | |
| Apache Spark - 10000000 - 1000 - B.I.J.T.T (sec) | 10.65 | 10.60 | 10.08 |
| Normalized | 94.65% | 95.09% | 100% |
| Standard Deviation | 6.9% | 6.7% | |
| Apache Spark - 10000000 - 2000 - S.5.B.T (sec) | 14.15 | 14.12 | 14.14 |
| Normalized | 99.79% | 100% | 99.86% |
| Standard Deviation | 0.7% | 1.2% | |
| Apache Spark - 10000000 - 2000 - C.P.B (sec) | 148.548505705 | 149.183387153 | 150.275810804 |
| Normalized | 100% | 99.57% | 98.85% |
| Standard Deviation | 0.3% | 0.7% | |
| Apache Spark - 10000000 - 2000 - C.P.B.U.D (sec) | 8.58 | 8.57 | 8.687892725 |
| Normalized | 99.88% | 100% | 98.64% |
| Standard Deviation | 0.7% | 0.7% | |
| Apache Spark - 10000000 - 2000 - Group By Test Time (sec) | 7.03 | 7.14 | 7.04 |
| Normalized | 100% | 98.46% | 99.86% |
| Standard Deviation | 2% | 0.4% | |
| Apache Spark - 10000000 - 2000 - R.T.T (sec) | 9.34 | 9.22 | 9.24 |
| Normalized | 98.72% | 100% | 99.78% |
| Standard Deviation | 1.3% | 0.6% | |
| Apache Spark - 10000000 - 2000 - I.J.T.T | 11.20 | 11.21 | 11.66 |
| Normalized | 100% | 99.91% | 96.05% |
| Standard Deviation | 2.8% | 2.5% | |
| Apache Spark - 10000000 - 2000 - B.I.J.T.T (sec) | 10.60 | 10.56 | 10.411906333 |
| Normalized | 98.23% | 98.6% | 100% |
| Standard Deviation | 5% | 2.4% | |
| Apache Spark - 20000000 - 1000 - S.5.B.T (sec) | 25.55 | 25.53 | 25.60 |
| Normalized | 99.92% | 100% | 99.73% |
| Standard Deviation | 0.2% | 0.6% | |
| Apache Spark - 20000000 - 1000 - C.P.B (sec) | 149.230168484 | 147.914605982 | 149.292751295 |
| Normalized | 99.12% | 100% | 99.08% |
| Standard Deviation | 0.6% | 0.4% | |

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|---|---------------|---------------|---------------|
| Apache Spark - 20000000 - 1000 - C.P.B.U.D (sec) | 8.62 | 8.58 | 8.54 |
| Normalized | 99.07% | 99.53% | 100% |
| Standard Deviation | 0.2% | 0.7% | |
| Apache Spark - 20000000 - 1000 - Group By Test Time (sec) | 10.25 | 10.16 | 10.03 |
| Normalized | 97.85% | 98.72% | 100% |
| Standard Deviation | 1.6% | 0.7% | |
| Apache Spark - 20000000 - 1000 - R.T.T (sec) | 17.03 | 17.09 | 17.01 |
| Normalized | 99.88% | 99.53% | 100% |
| Standard Deviation | 0.8% | 0.4% | |
| Apache Spark - 20000000 - 1000 - I.J.T.T | 19.97 | 20.33 | 20.49 |
| Normalized | 100% | 98.23% | 97.46% |
| Standard Deviation | 1.7% | 0.9% | |
| Apache Spark - 20000000 - 1000 - B.I.J.T.T (sec) | 19.87 | 20.66 | 21.08 |
| Normalized | 100% | 96.18% | 94.26% |
| Standard Deviation | 2% | 3.1% | |
| Apache Spark - 20000000 - 2000 - S.5.B.T (sec) | 25.70 | 25.76 | 25.72 |
| Normalized | 100% | 99.77% | 99.92% |
| Standard Deviation | 0.1% | 0.1% | |
| Apache Spark - 20000000 - 2000 - C.P.B (sec) | 148.853580559 | 148.300590012 | 149.847002868 |
| Normalized | 99.63% | 100% | 98.97% |
| Standard Deviation | 0.6% | 0.3% | |
| Apache Spark - 20000000 - 2000 - C.P.B.U.D (sec) | 8.64 | 8.60 | 8.59 |
| Normalized | 99.42% | 99.88% | 100% |
| Standard Deviation | 0.4% | 0.7% | |
| Apache Spark - 20000000 - 2000 - Group By Test Time (sec) | 10.25 | 10.32 | 10.41 |
| Normalized | 100% | 99.32% | 98.46% |
| Standard Deviation | 1.3% | 0.6% | |
| Apache Spark - 20000000 - 2000 - R.T.T (sec) | 17.52 | 17.81 | 17.44 |
| Normalized | 99.54% | 97.92% | 100% |
| Standard Deviation | 2.3% | 2.8% | |
| Apache Spark - 20000000 - 2000 - I.J.T.T | 20.79 | 20.72 | 20.50 |
| Normalized | 98.61% | 98.94% | 100% |
| Standard Deviation | 3% | 1.5% | |
| Apache Spark - 20000000 - 2000 - B.I.J.T.T (sec) | 20.01 | 19.87 | 19.31 |
| Normalized | 96.5% | 97.18% | 100% |
| Standard Deviation | 2.6% | 1.6% | |
| Apache Spark - 40000000 - 1000 - S.5.B.T (sec) | 49.63 | 49.95 | 49.84 |
| Normalized | 100% | 99.36% | 99.58% |
| Standard Deviation | 0.2% | 1% | |
| Apache Spark - 40000000 - 1000 - C.P.B (sec) | 149.450658423 | 148.664434137 | 151.941134869 |
| Normalized | 99.47% | 100% | 97.84% |
| Standard Deviation | 0.5% | 0.3% | |
| Apache Spark - 40000000 - 1000 - C.P.B.U.D (sec) | 8.61 | 8.62 | 8.56 |
| Normalized | 99.42% | 99.3% | 100% |
| Standard Deviation | 0.5% | 0.6% | |

| | | | |
|--|---------------|---------------|---------------|
| Apache Spark - 40000000 - 1000 - Group By | 22.89 | 23.24 | 23.18 |
| Test Time (sec) | | | |
| Normalized | 100% | 98.49% | 98.75% |
| Standard Deviation | 1.5% | 1.7% | |
| Apache Spark - 40000000 - 1000 - R.T.T (sec) | 34.50 | 34.09 | 34.62 |
| Normalized | 98.81% | 100% | 98.47% |
| Standard Deviation | 1.4% | 2.2% | |
| Apache Spark - 40000000 - 1000 - I.J.T.T | 39.60 | 40.50 | 39.899100315 |
| Normalized | 100% | 97.78% | 99.25% |
| Standard Deviation | 2.5% | 1.2% | |
| Apache Spark - 40000000 - 1000 - B.I.J.T.T (sec) | 40.993090142 | 41.01 | 41.20 |
| Normalized | 100% | 99.96% | 99.5% |
| Standard Deviation | 0.4% | 4.7% | |
| Apache Spark - 40000000 - 2000 - S.5.B.T (sec) | 50.33 | 51.35 | 50.12 |
| Normalized | 99.58% | 97.6% | 100% |
| Standard Deviation | 0.6% | 2.3% | |
| Apache Spark - 40000000 - 2000 - C.P.B (sec) | 148.601893741 | 148.502716195 | 147.981380284 |
| Normalized | 99.58% | 99.65% | 100% |
| Standard Deviation | 0.5% | 0.5% | |
| Apache Spark - 40000000 - 2000 - C.P.B.U.D (sec) | 8.59 | 8.57 | 8.50 |
| Normalized | 98.95% | 99.18% | 100% |
| Standard Deviation | 0.5% | 0.9% | |
| Apache Spark - 40000000 - 2000 - Group By | 23.26 | 22.94 | 23.170788559 |
| Test Time (sec) | | | |
| Normalized | 98.62% | 100% | 99% |
| Standard Deviation | 1.5% | 0.5% | |
| Apache Spark - 40000000 - 2000 - R.T.T (sec) | 34.56 | 33.98 | 33.96 |
| Normalized | 98.26% | 99.94% | 100% |
| Standard Deviation | 1.1% | 2.1% | |
| Apache Spark - 40000000 - 2000 - I.J.T.T | 40.60 | 39.58 | 39.848198836 |
| Normalized | 97.49% | 100% | 99.33% |
| Standard Deviation | 2.8% | 2.1% | |
| Apache Spark - 40000000 - 2000 - B.I.J.T.T (sec) | 41.55 | 40.71 | 41.18 |
| Normalized | 97.98% | 100% | 98.86% |
| Standard Deviation | 2.8% | 1.6% | |

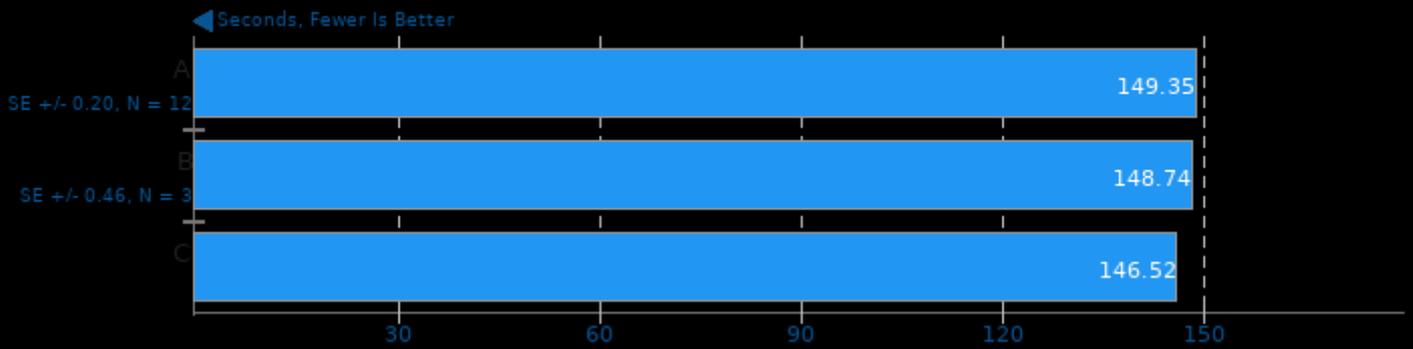
Apache Spark 3.3

Row Count: 1000000 - Partitions: 100 - SHA-512 Benchmark Time



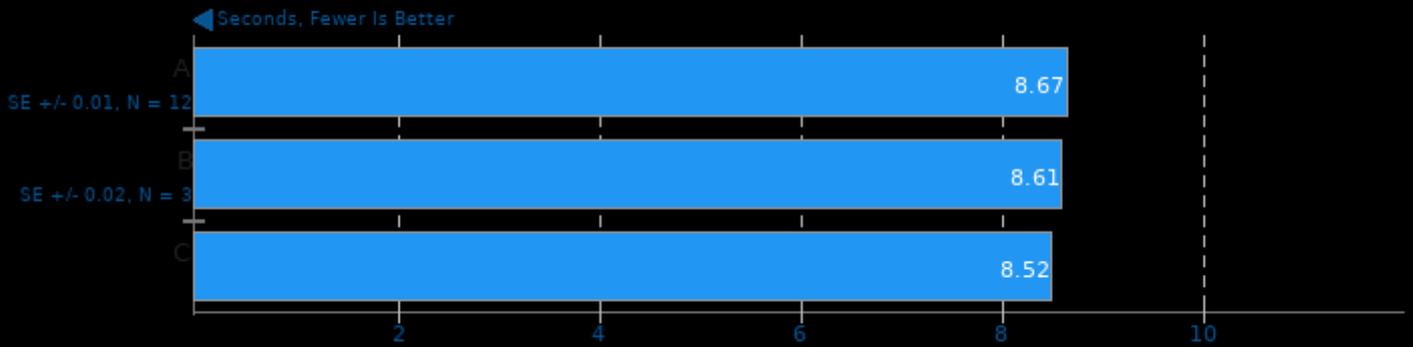
Apache Spark 3.3

Row Count: 1000000 - Partitions: 100 - Calculate Pi Benchmark



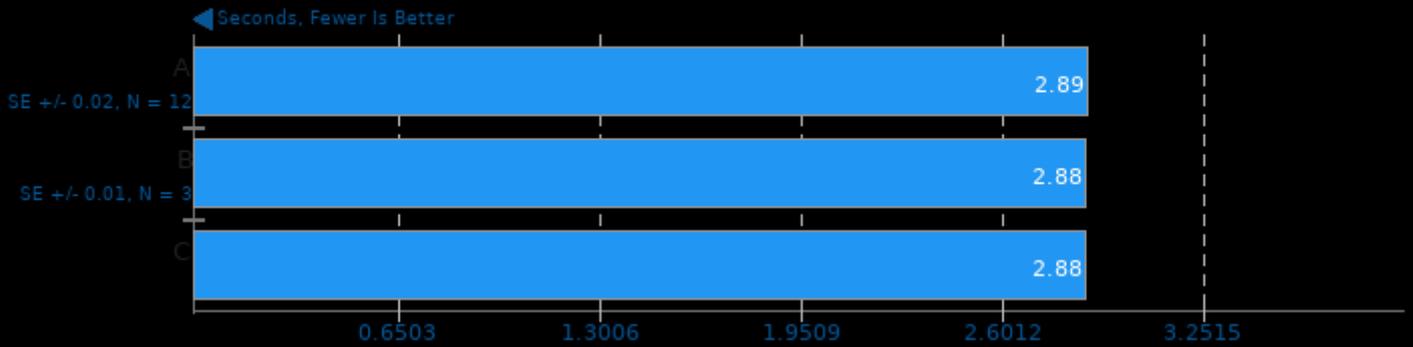
Apache Spark 3.3

Row Count: 1000000 - Partitions: 100 - Calculate Pi Benchmark Using Dataframe



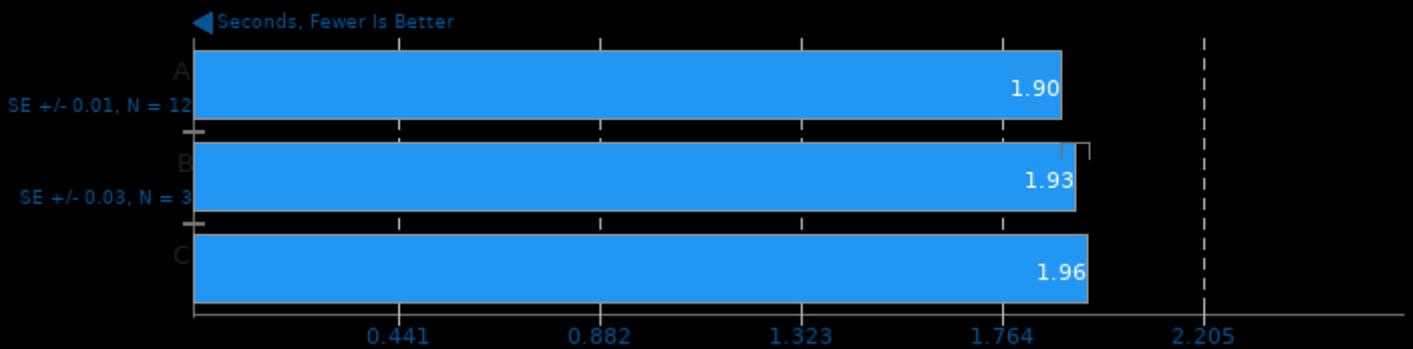
Apache Spark 3.3

Row Count: 1000000 - Partitions: 100 - Group By Test Time



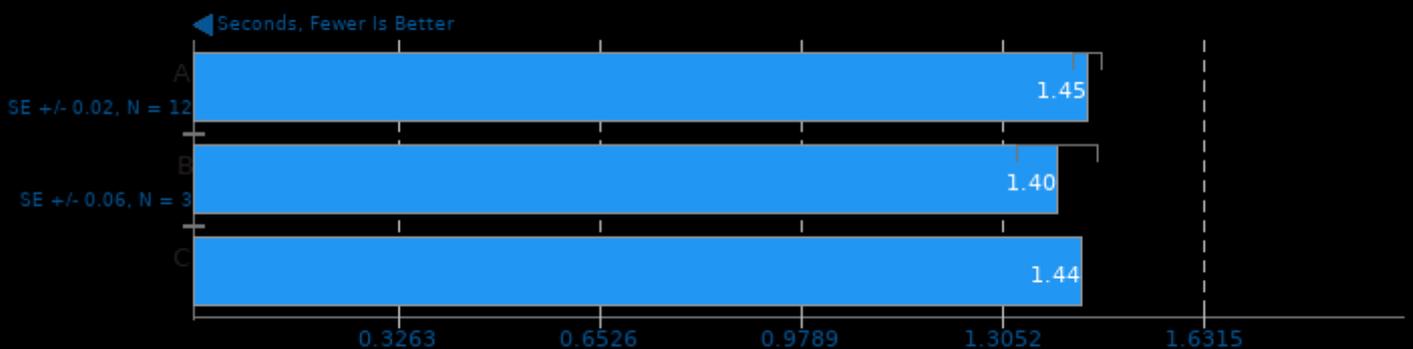
Apache Spark 3.3

Row Count: 1000000 - Partitions: 100 - Repartition Test Time



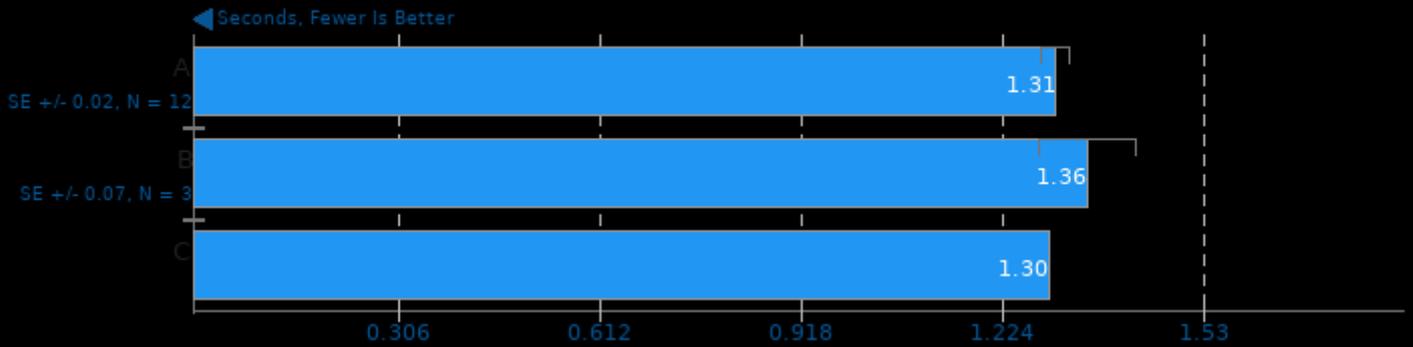
Apache Spark 3.3

Row Count: 1000000 - Partitions: 100 - Inner Join Test Time



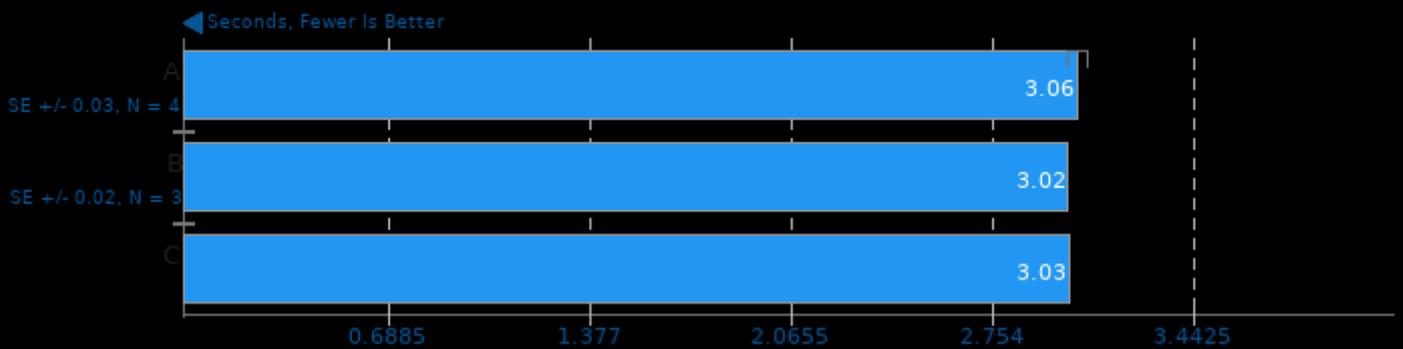
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Row Count: 1000000 - Partitions: 100 - Broadcast Inner Join Test Time



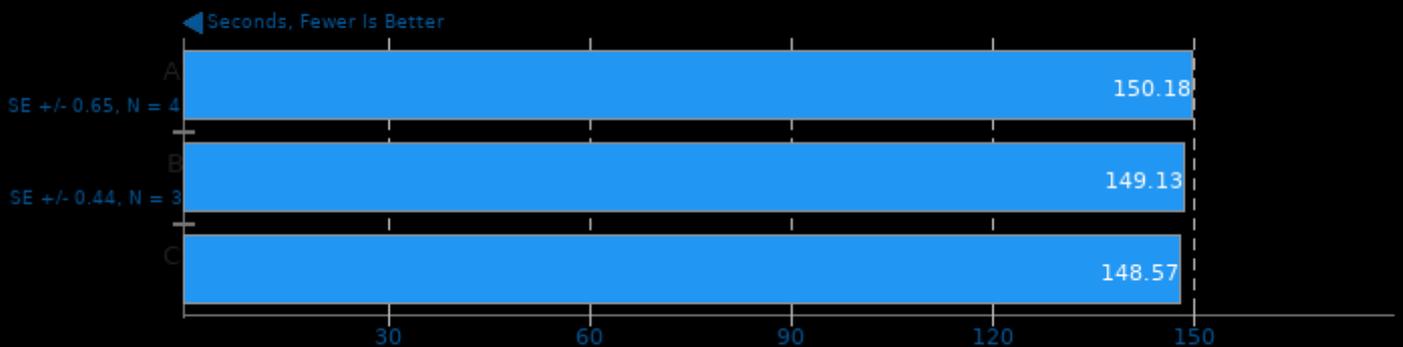
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Row Count: 1000000 - Partitions: 500 - SHA-512 Benchmark Time



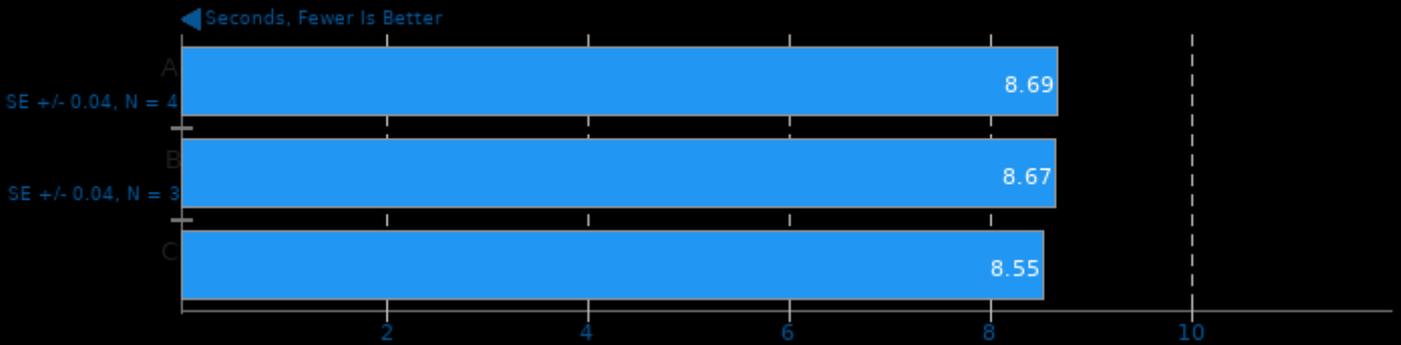
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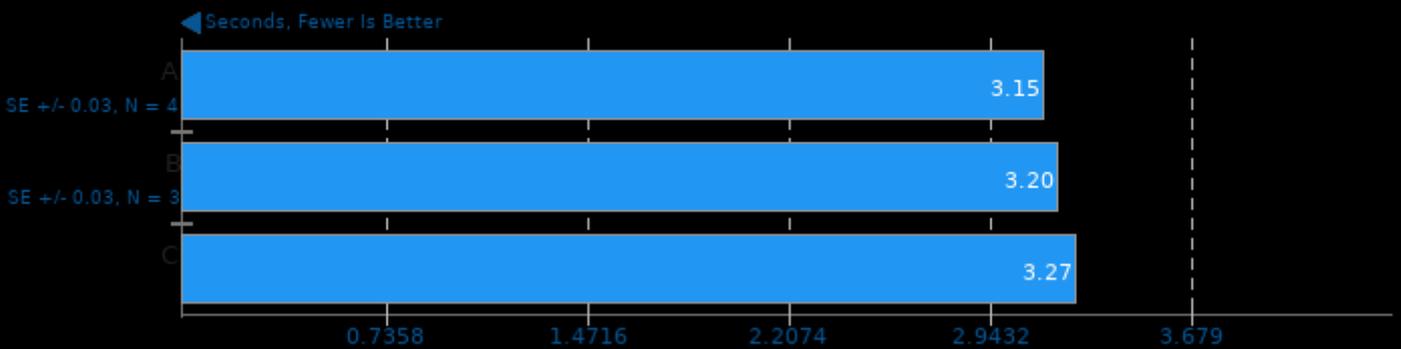
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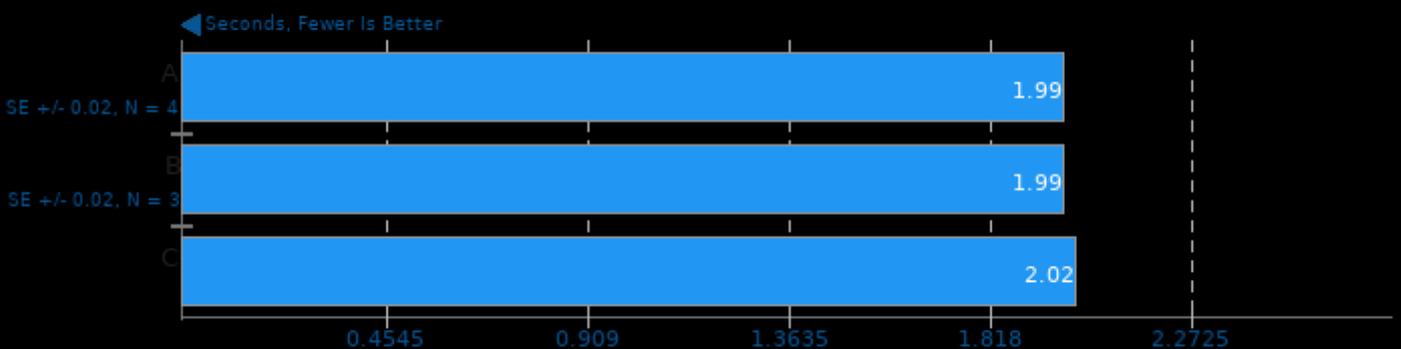
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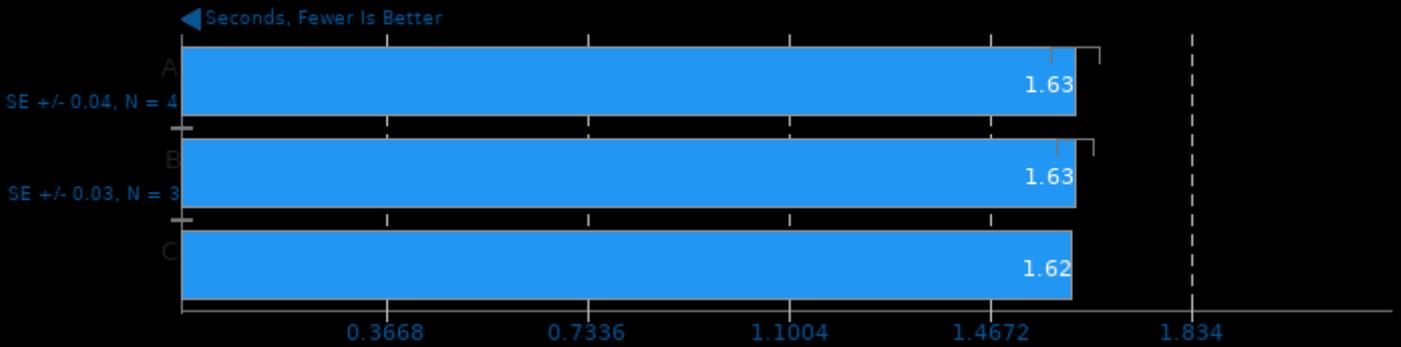
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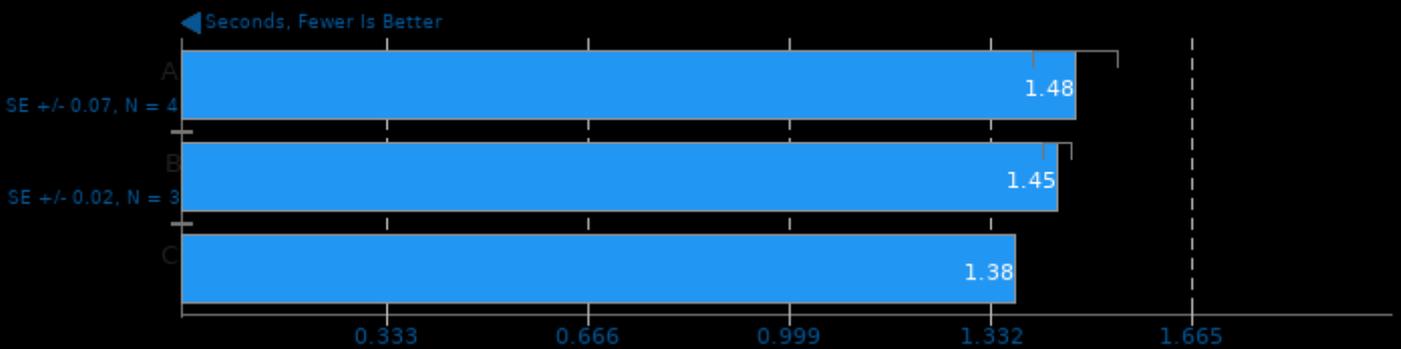
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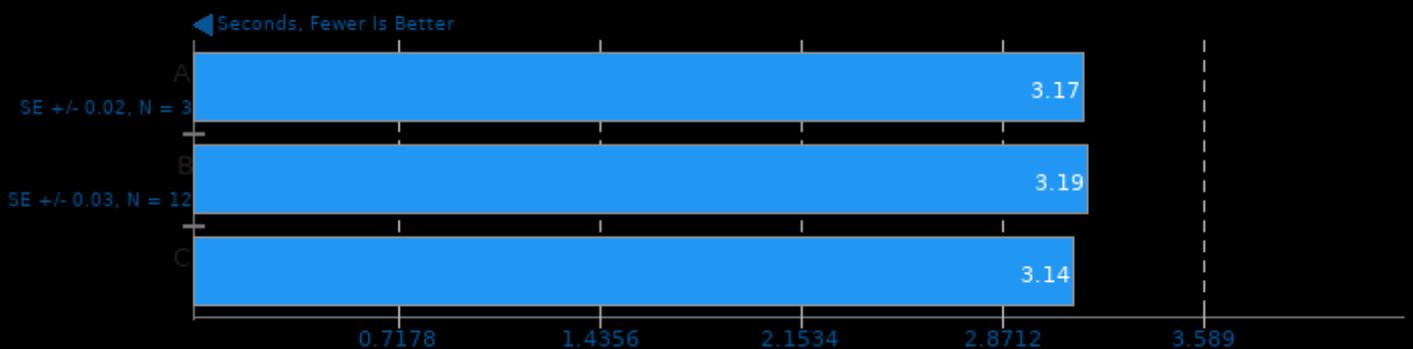
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Row Count: 1000000 - Partitions: 500 - Broadcast Inner Join Test Time



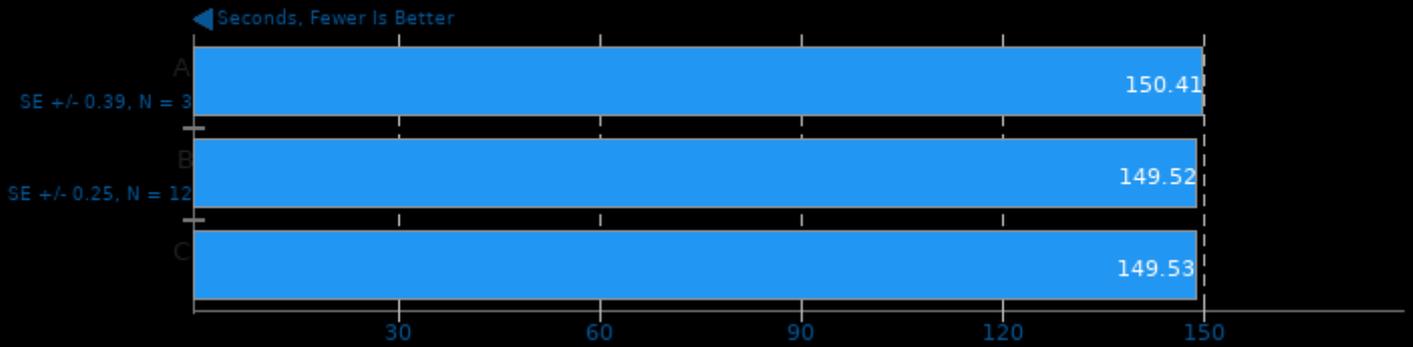
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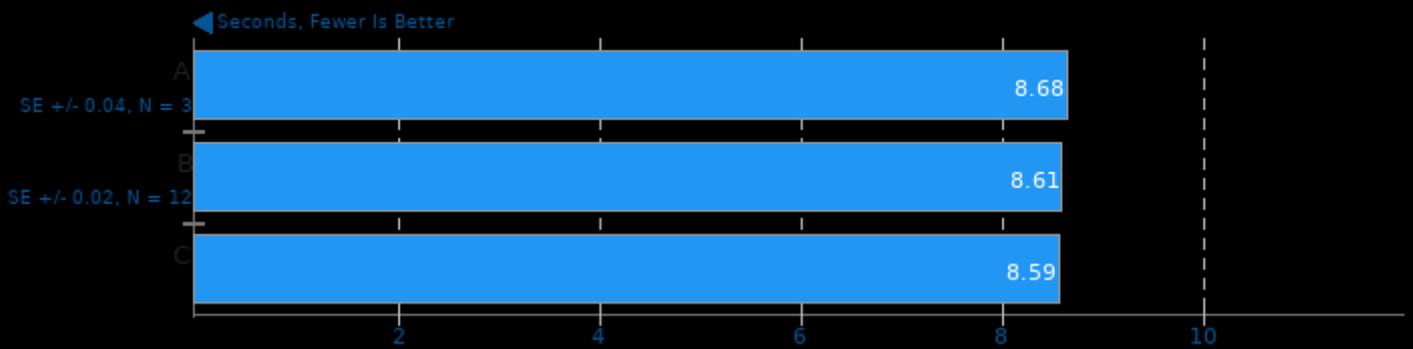
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Row Count: 1000000 - Partitions: 1000 - Calculate Pi Benchmark



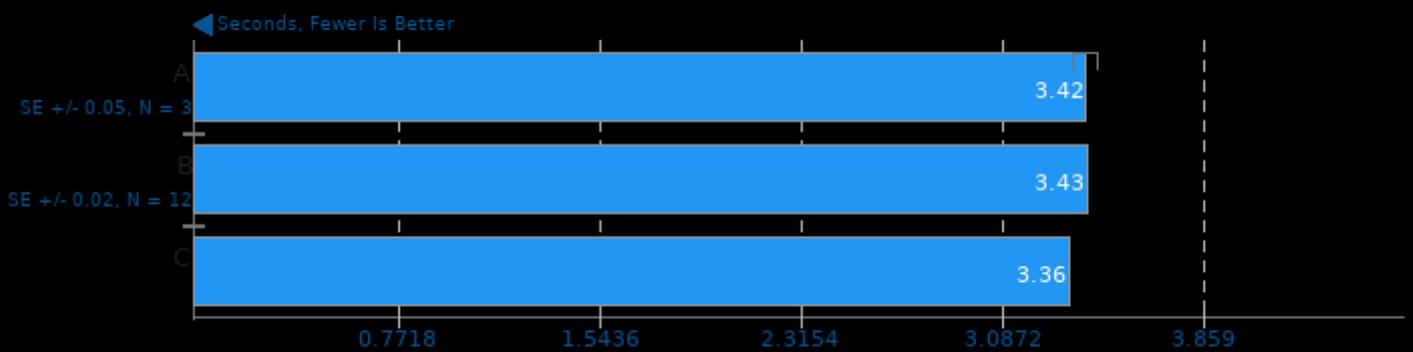
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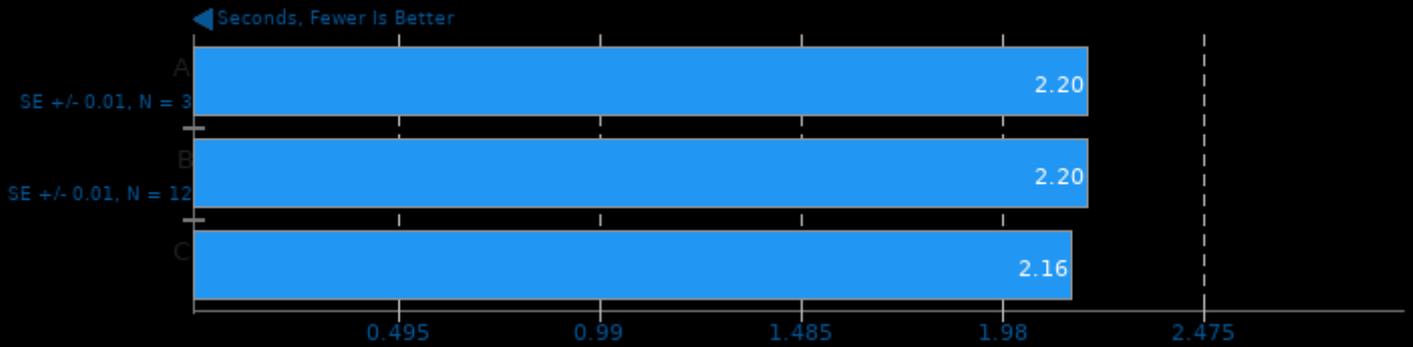
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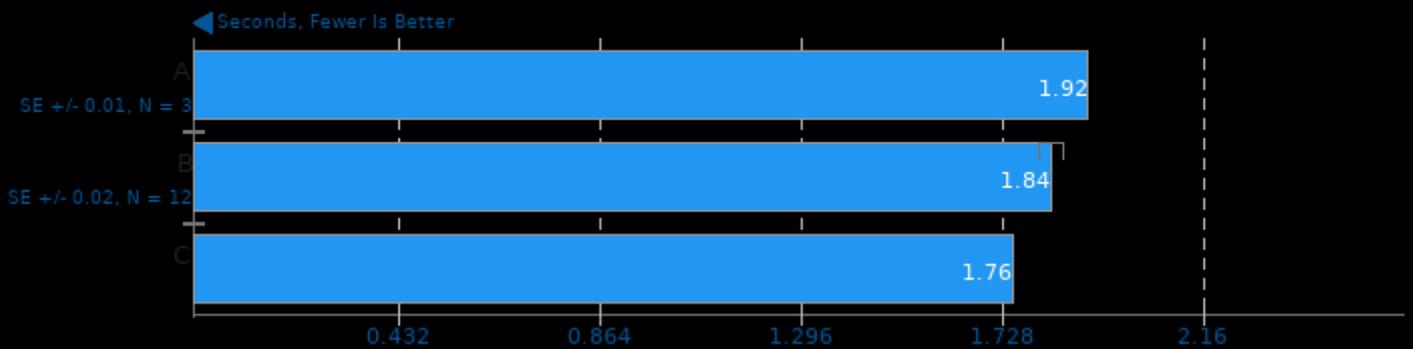
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Row Count: 1000000 - Partitions: 1000 - Repartition Test Time



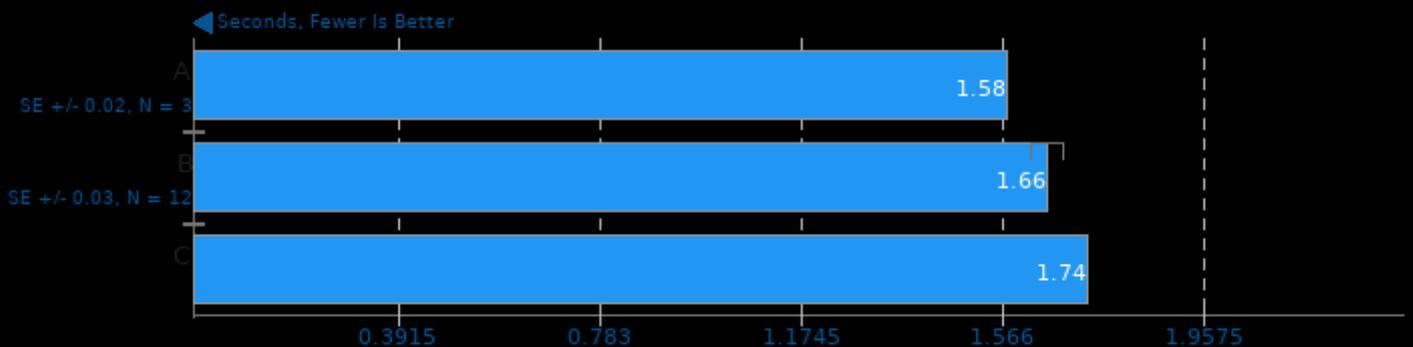
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Row Count: 1000000 - Partitions: 1000 - Inner Join Test Time



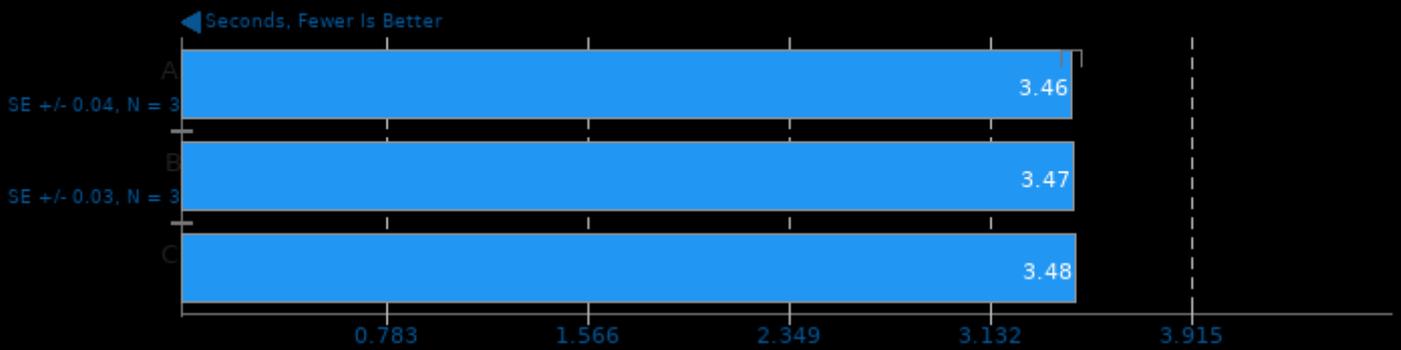
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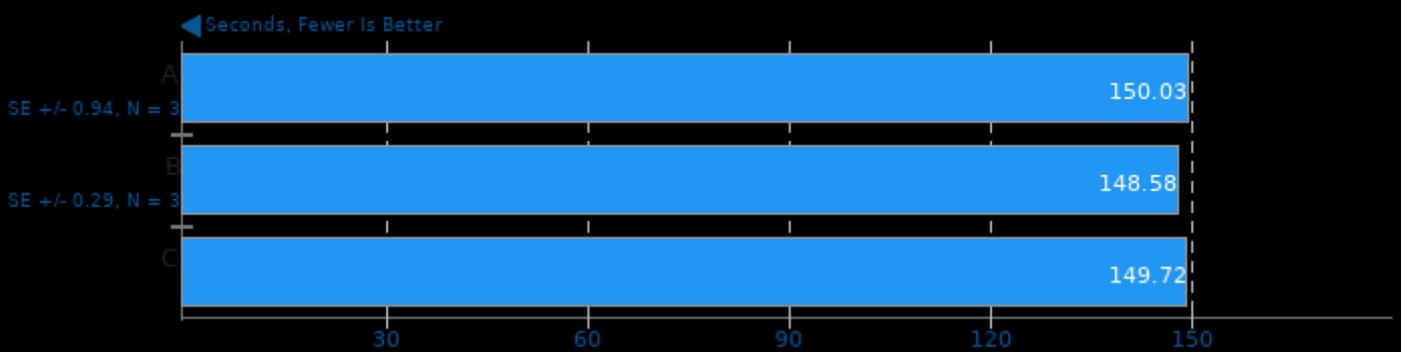
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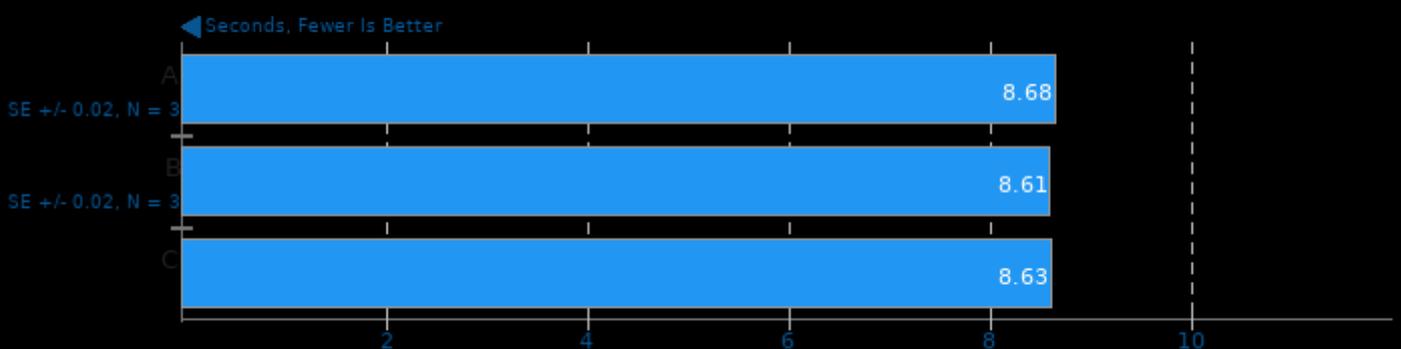
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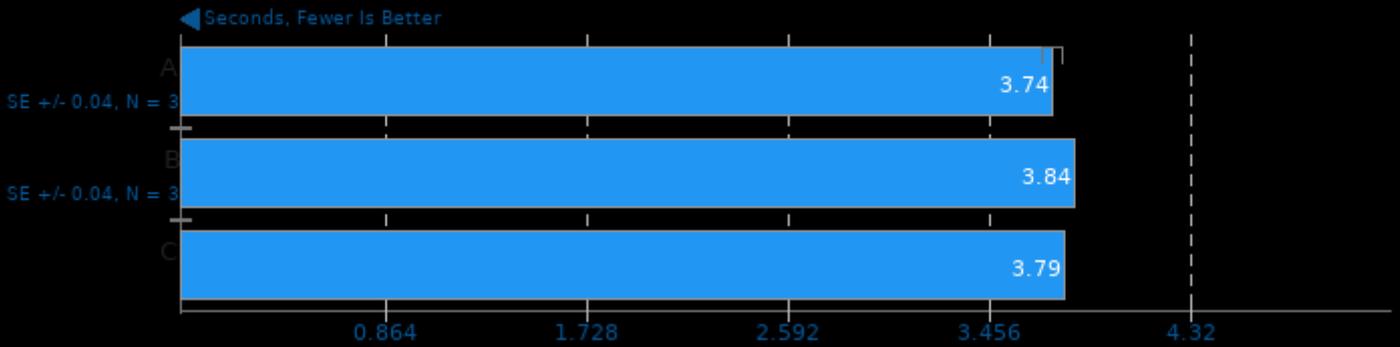
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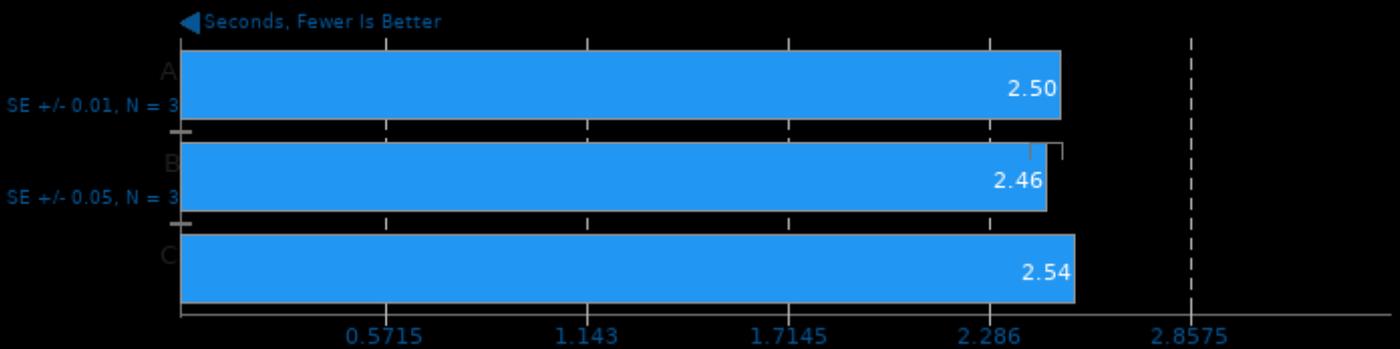
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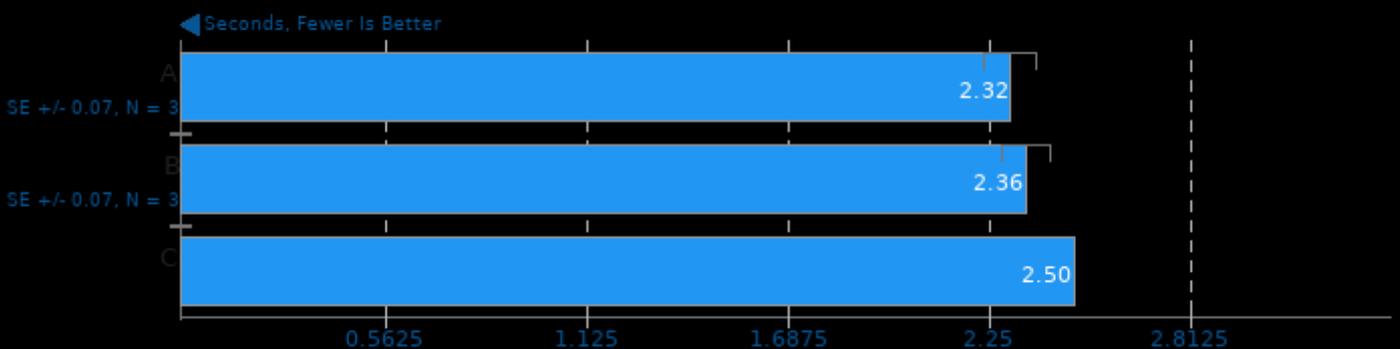
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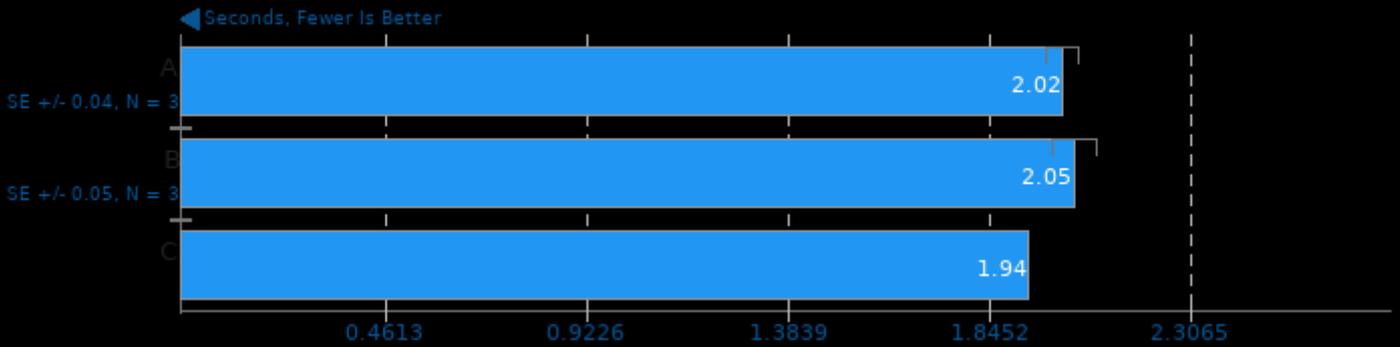
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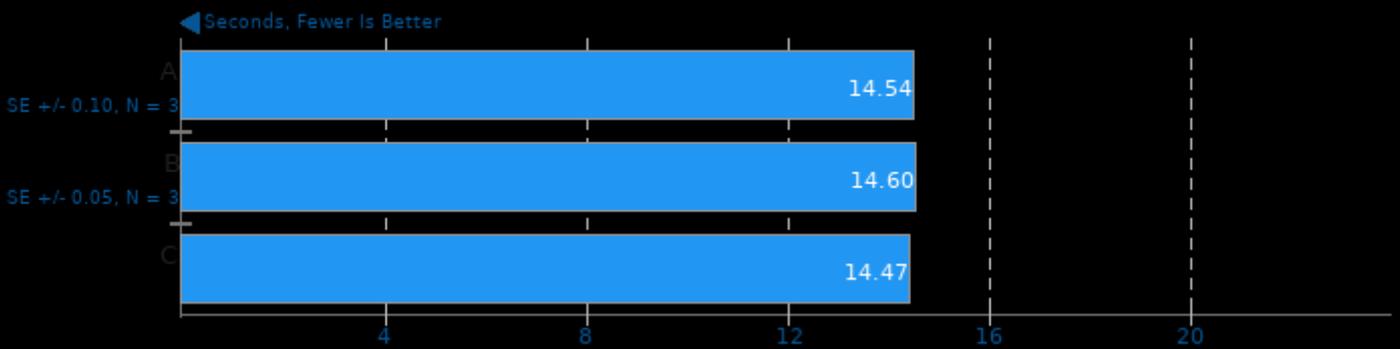
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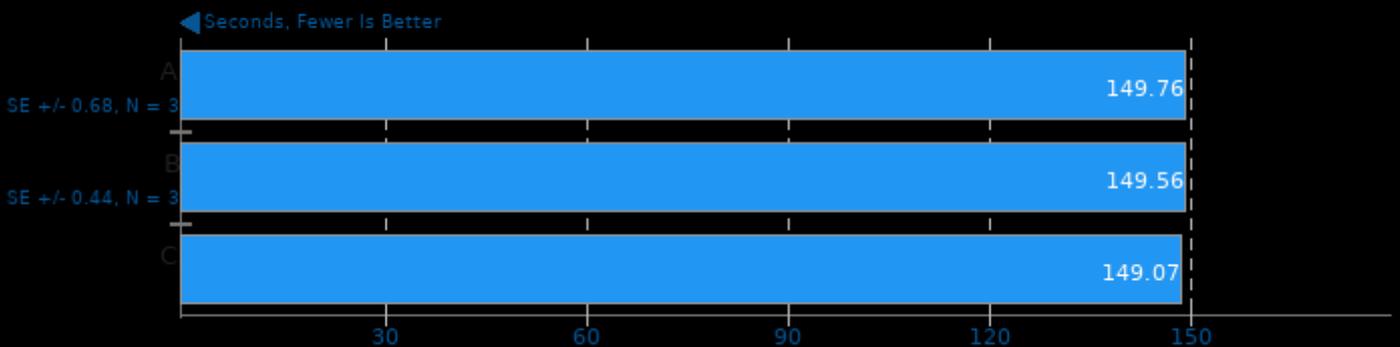
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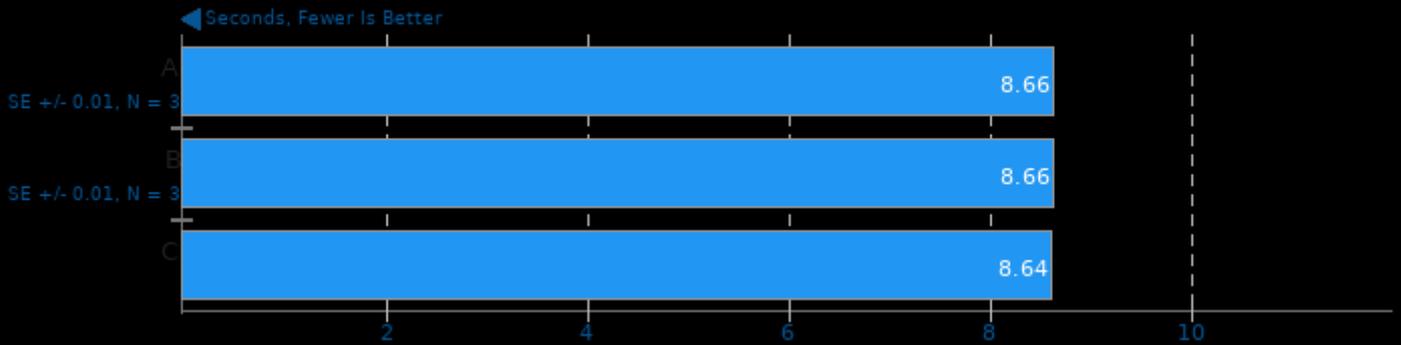
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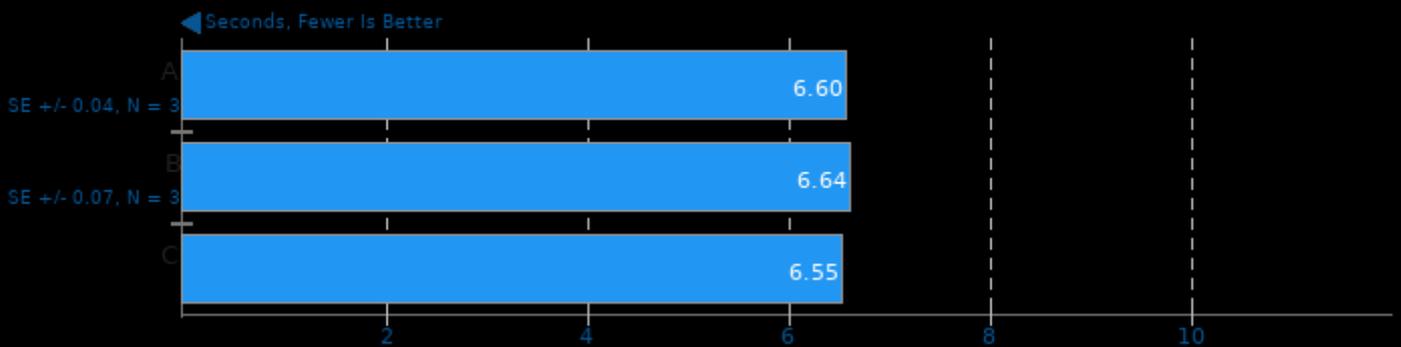
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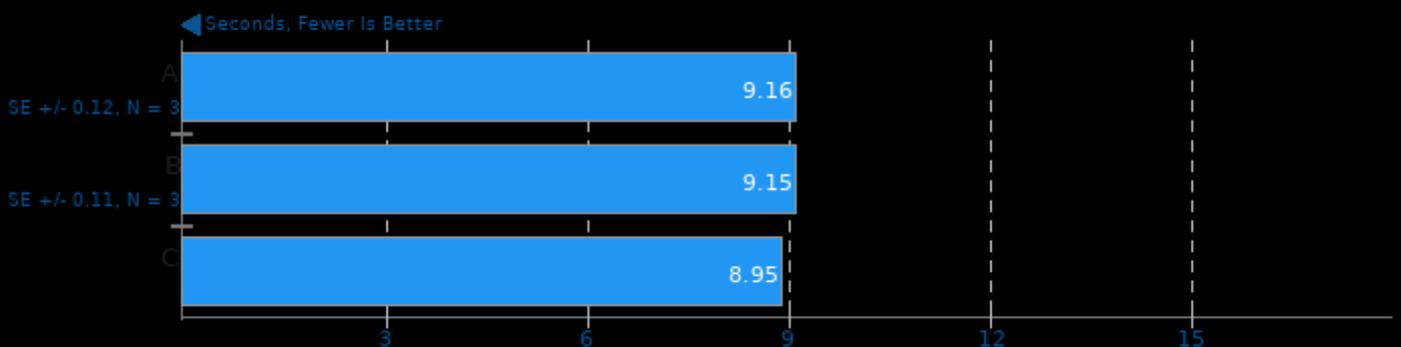
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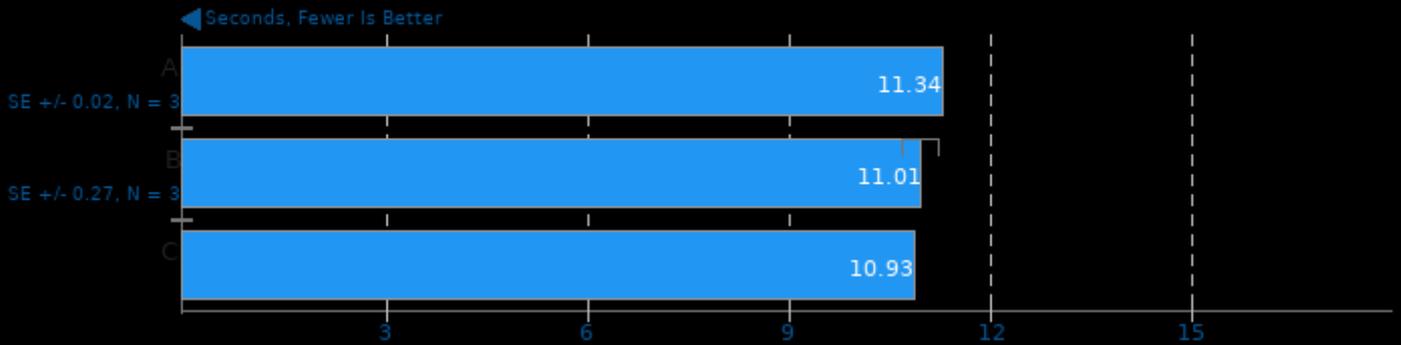
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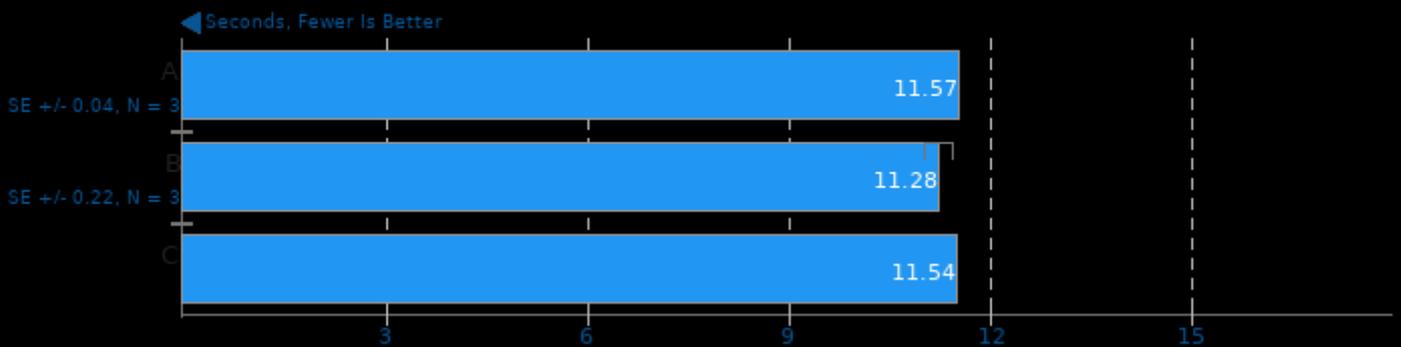
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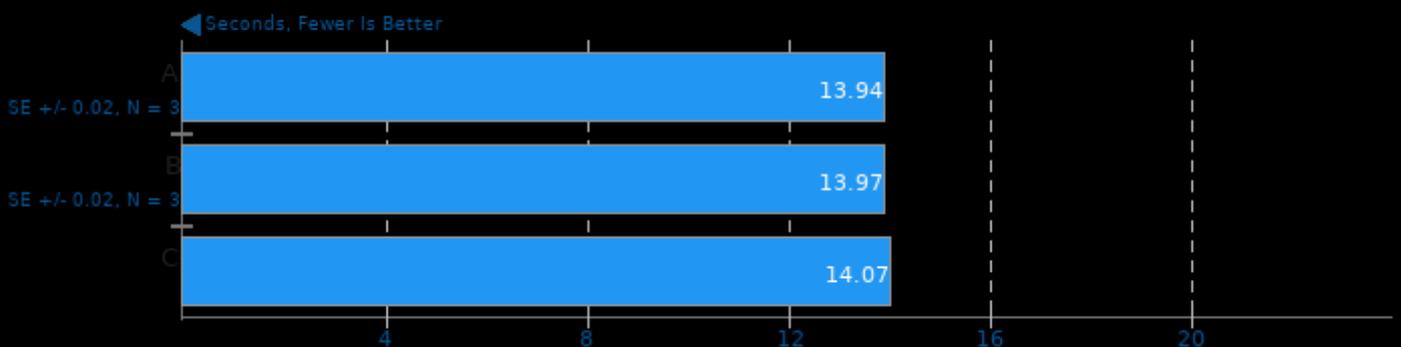
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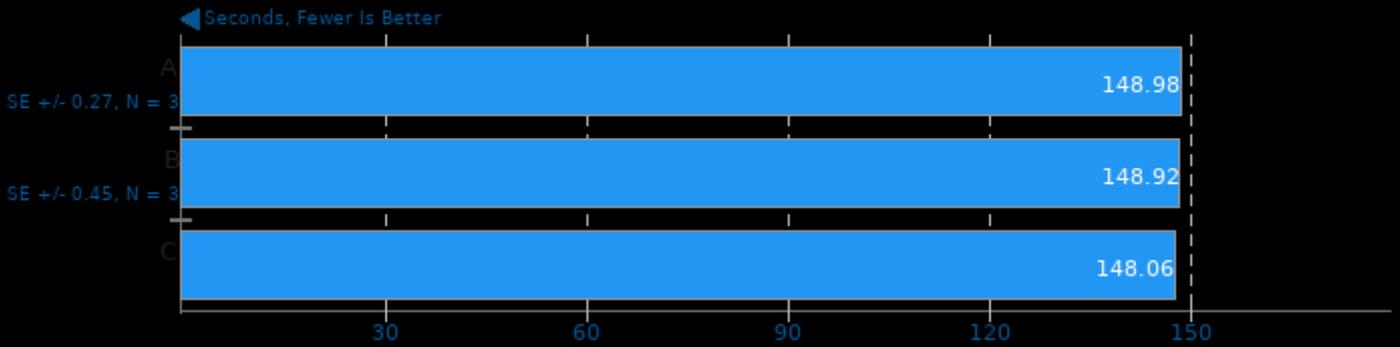
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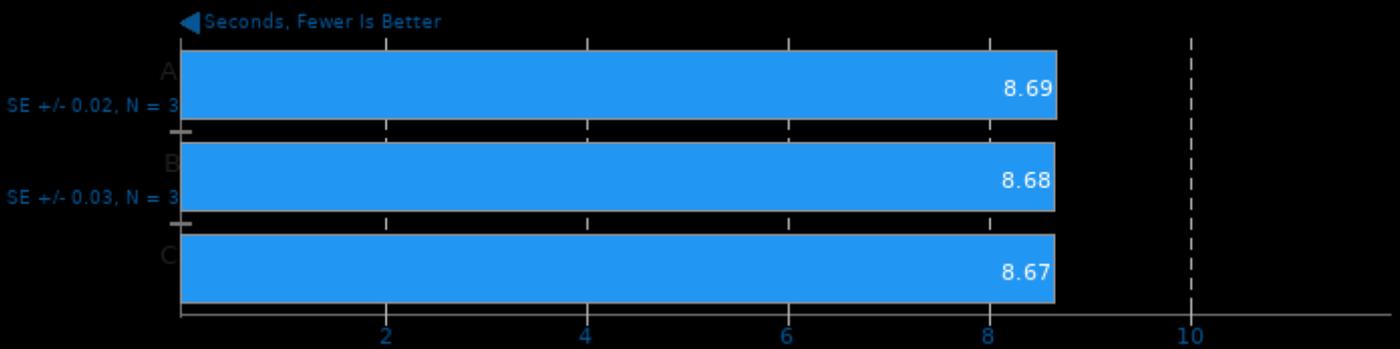
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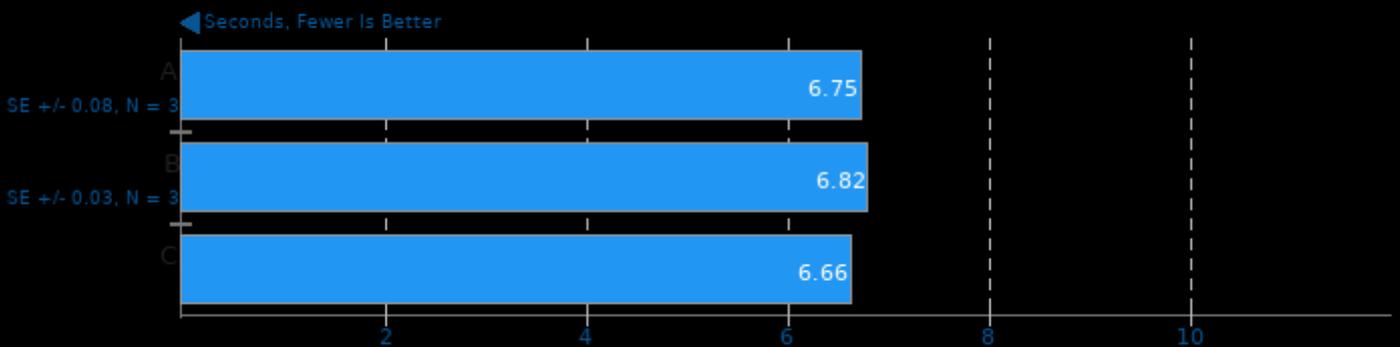
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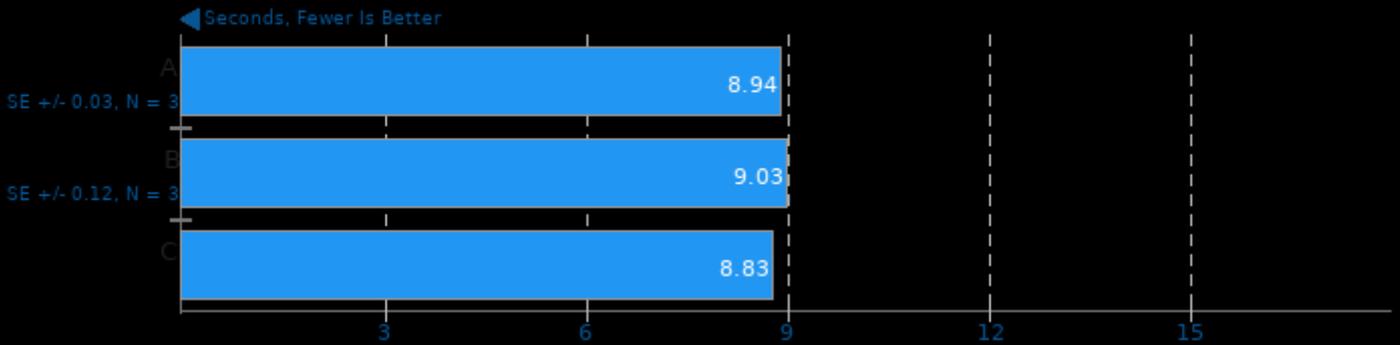
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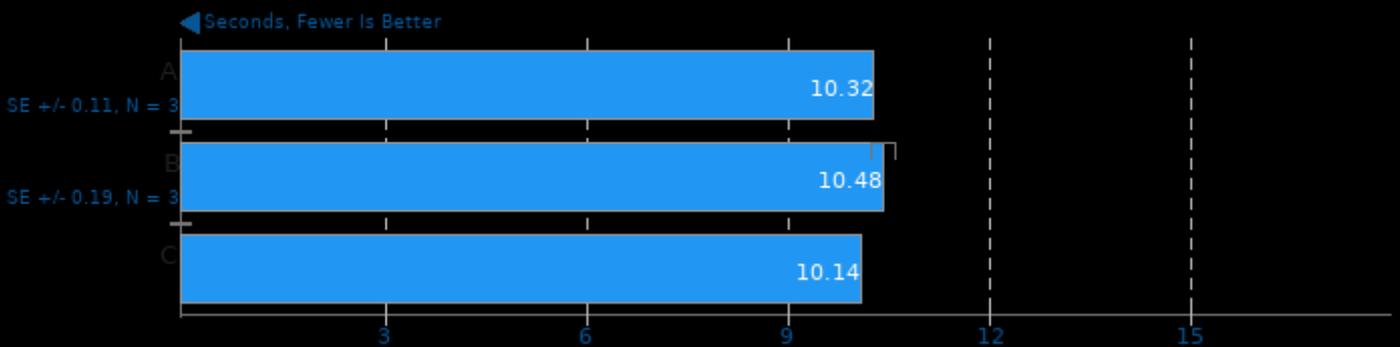
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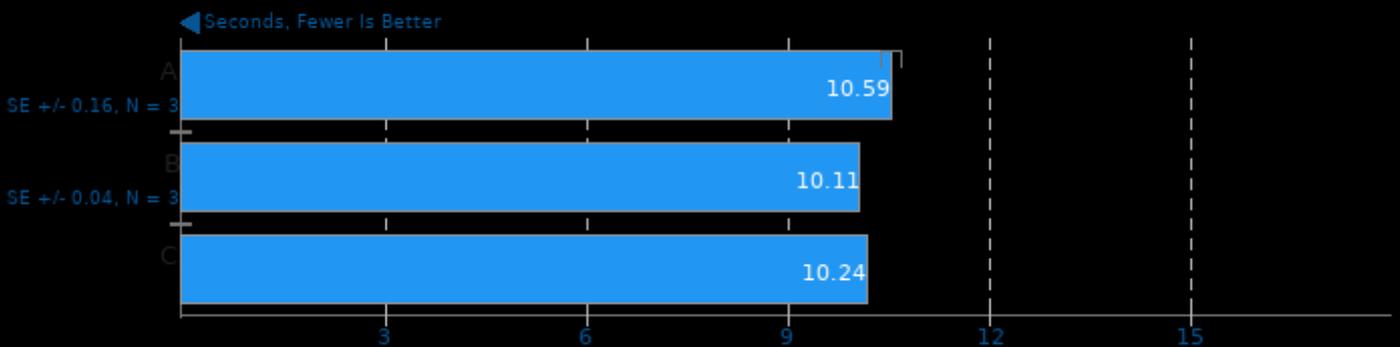
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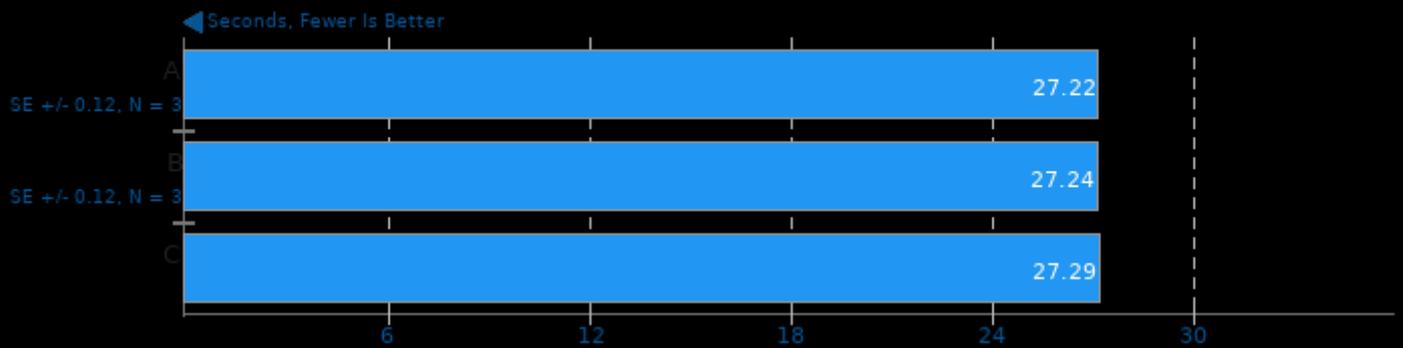
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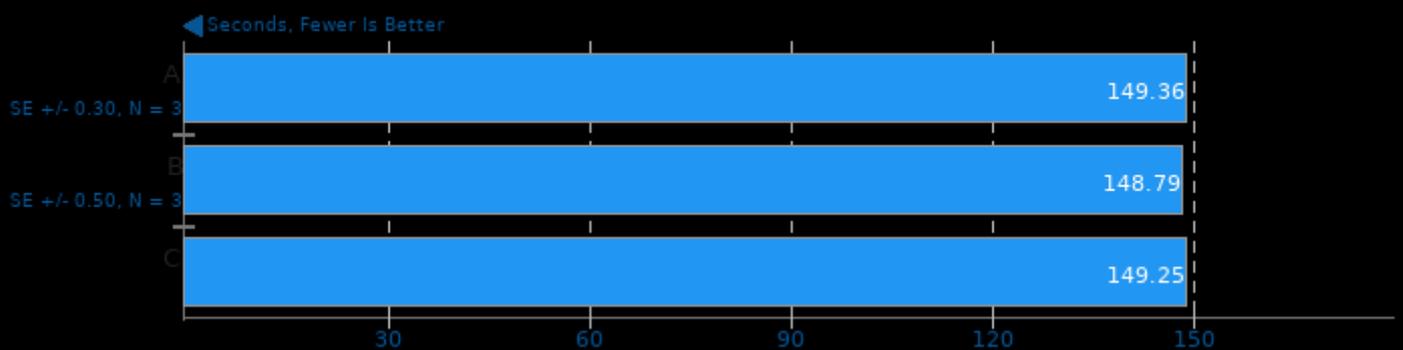
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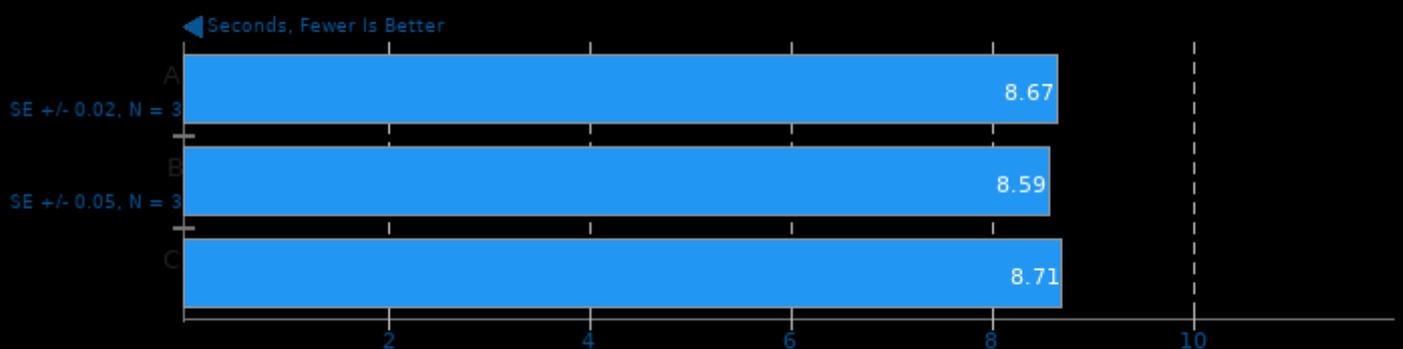
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Row Count: 20000000 - Partitions: 100 - Calculate Pi Benchmark



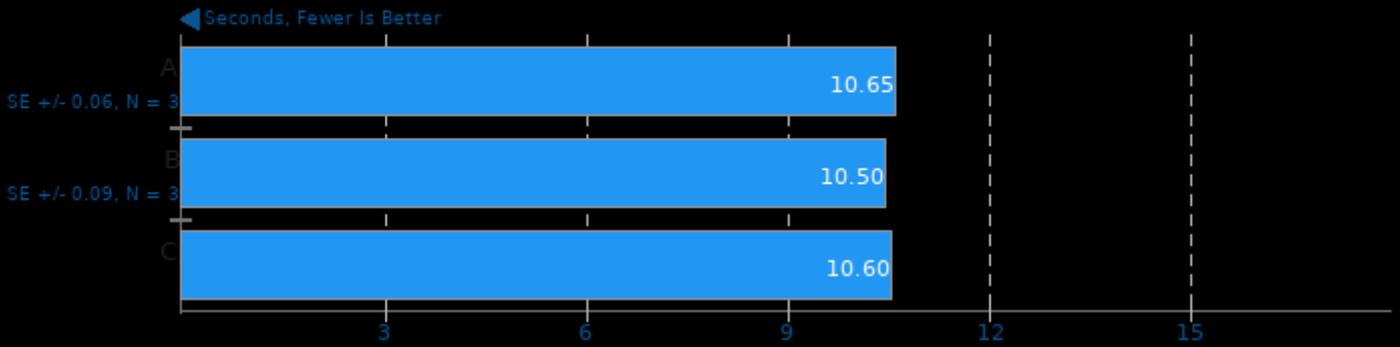
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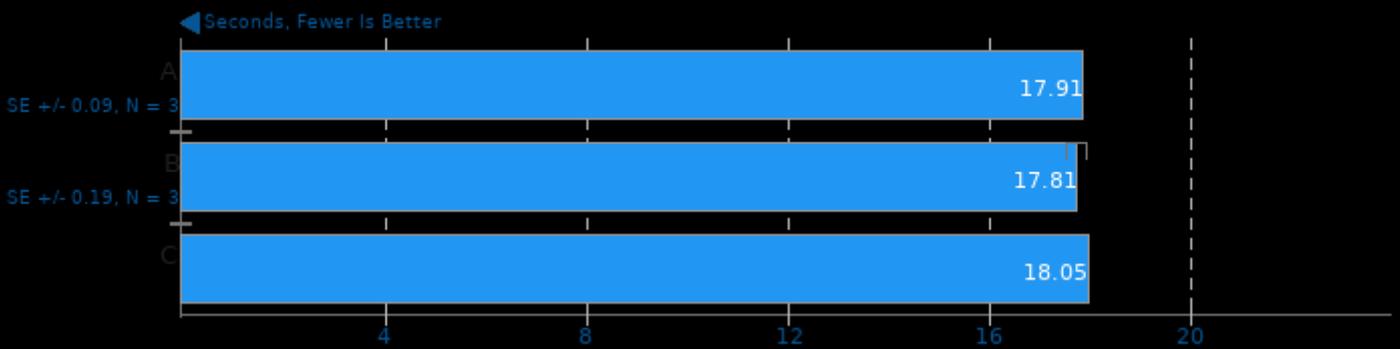
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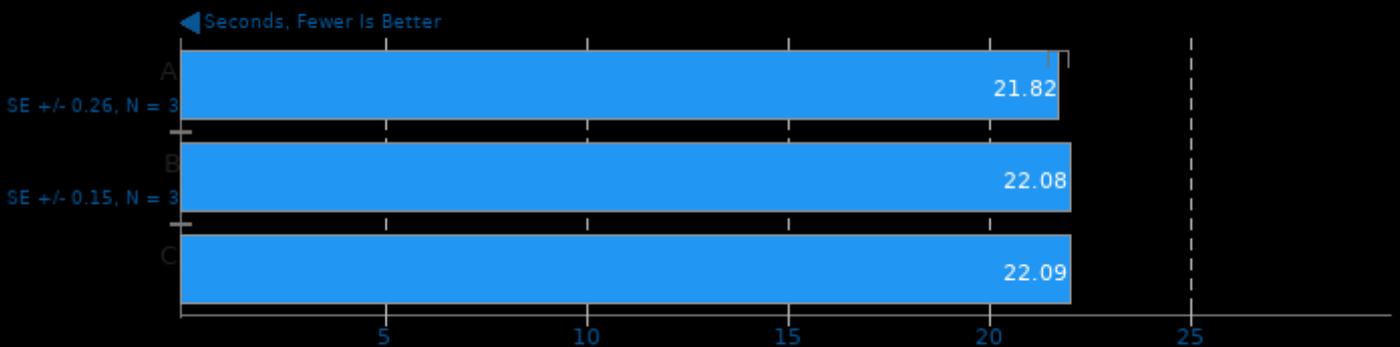
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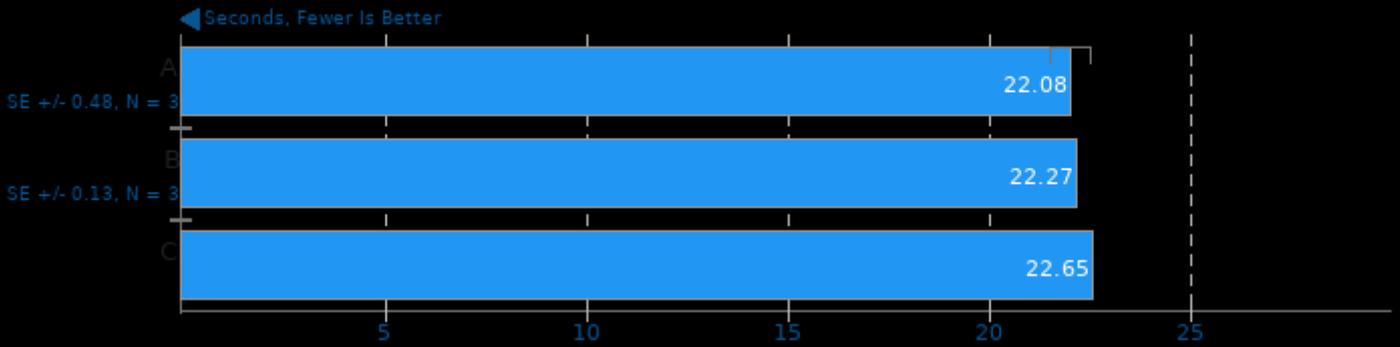
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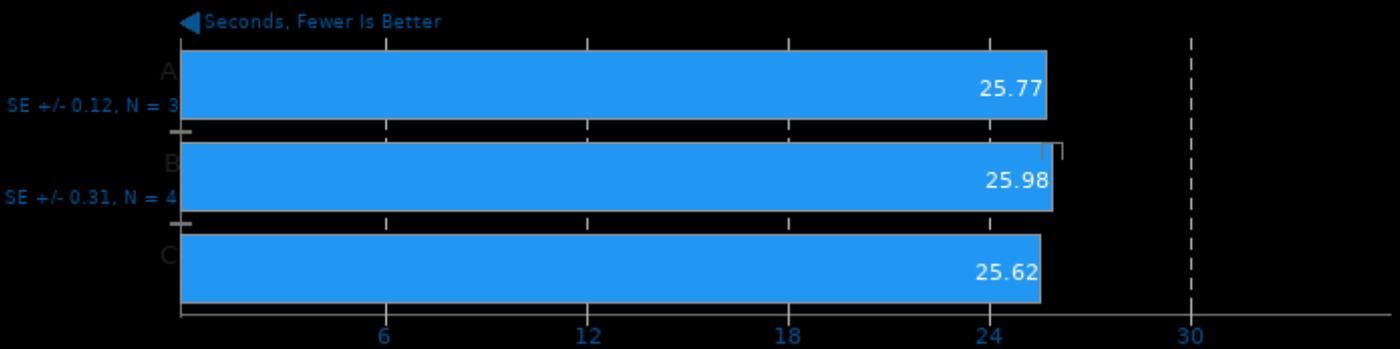
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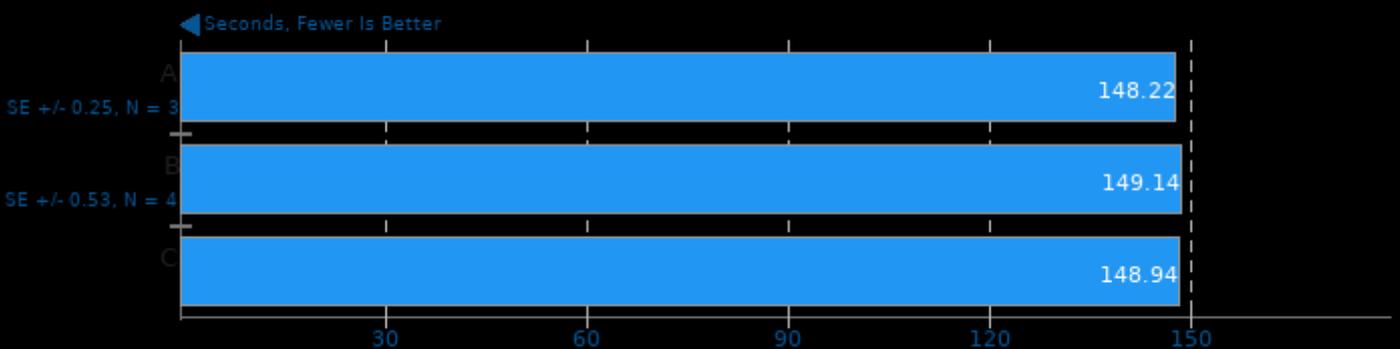
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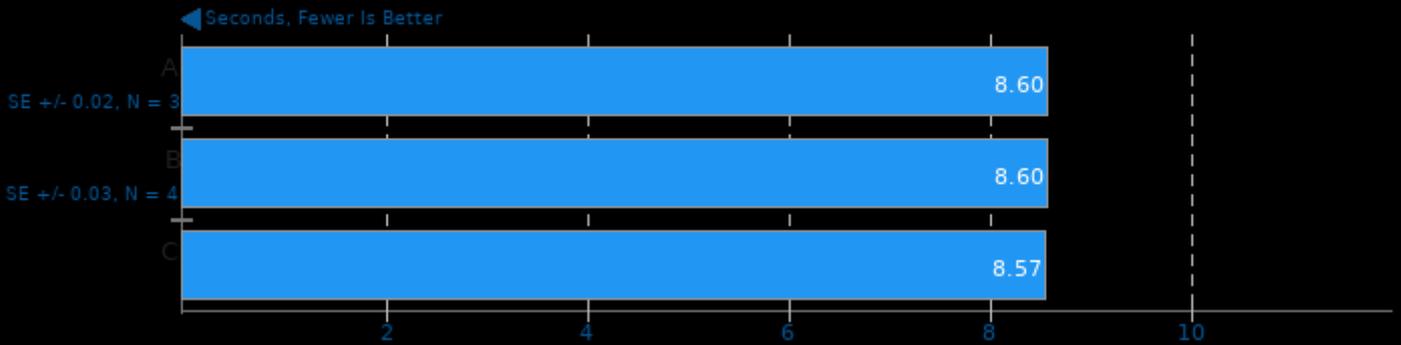
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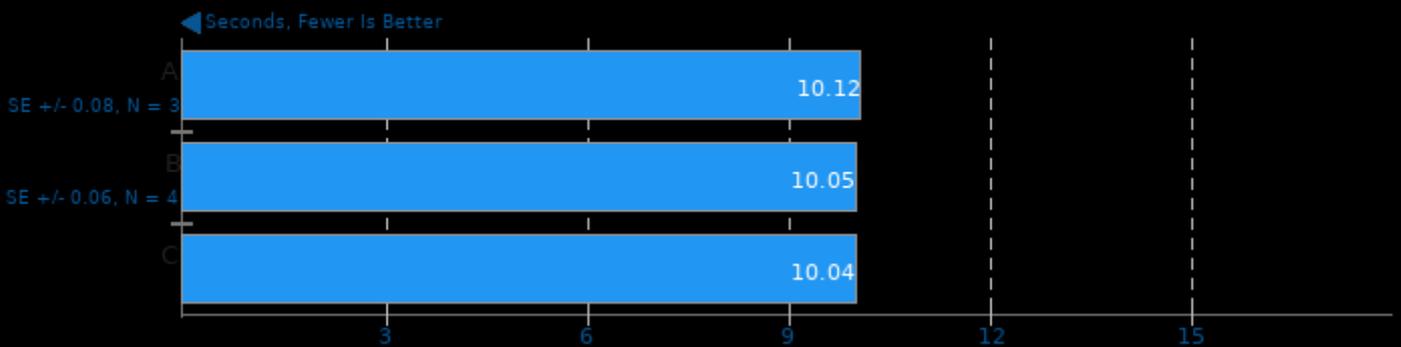
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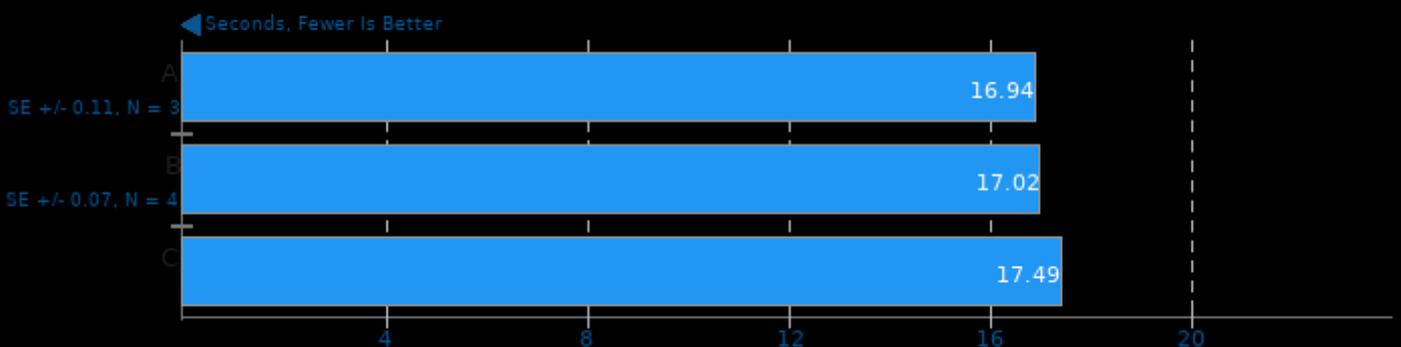
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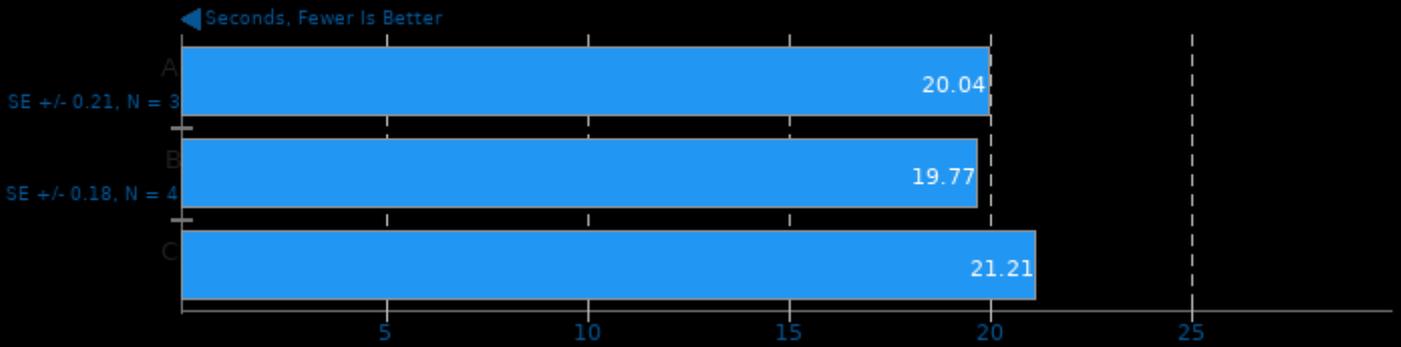
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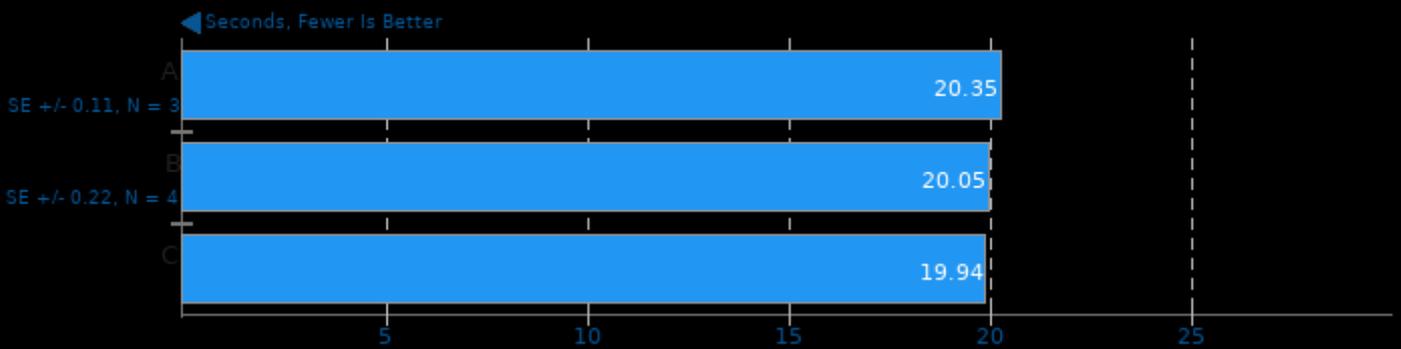
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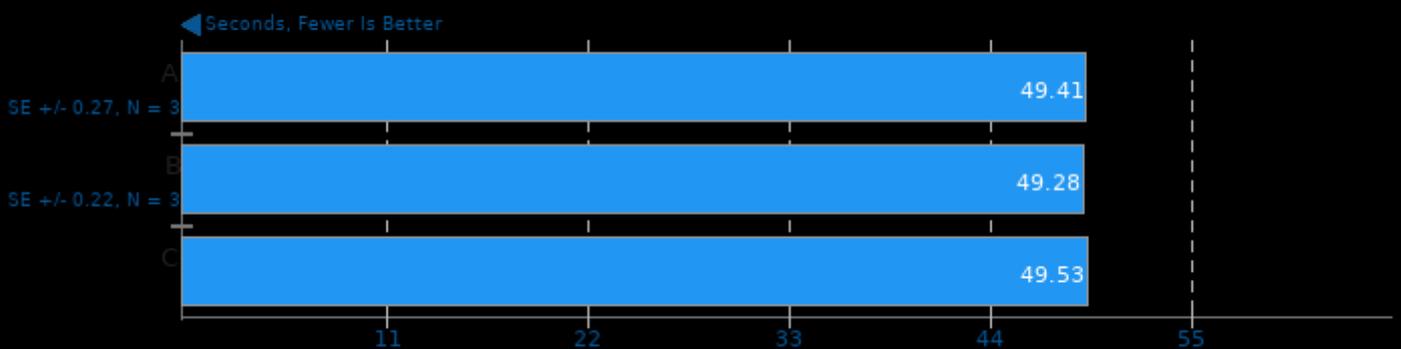
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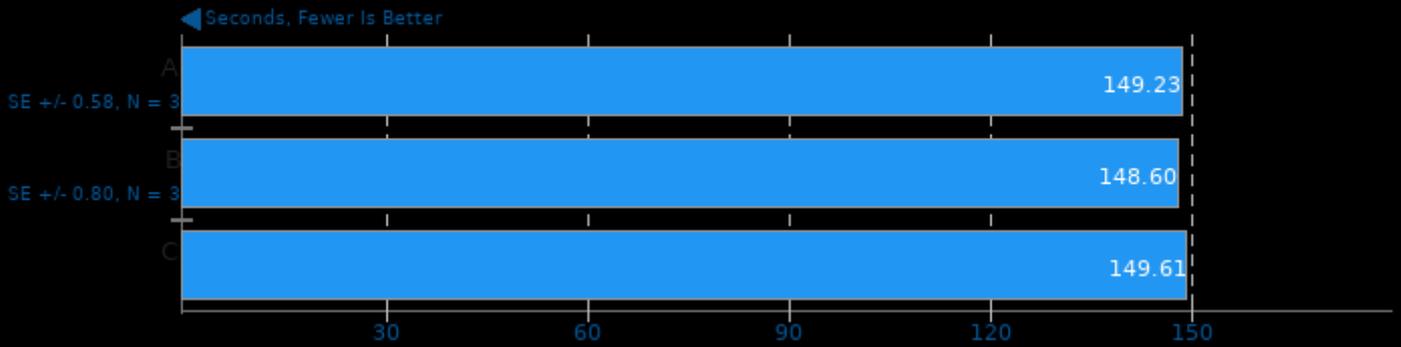
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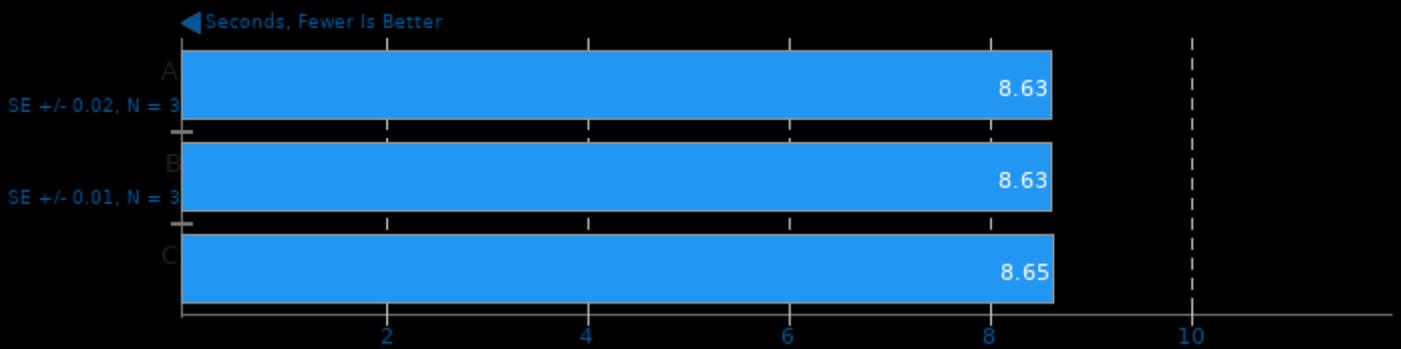
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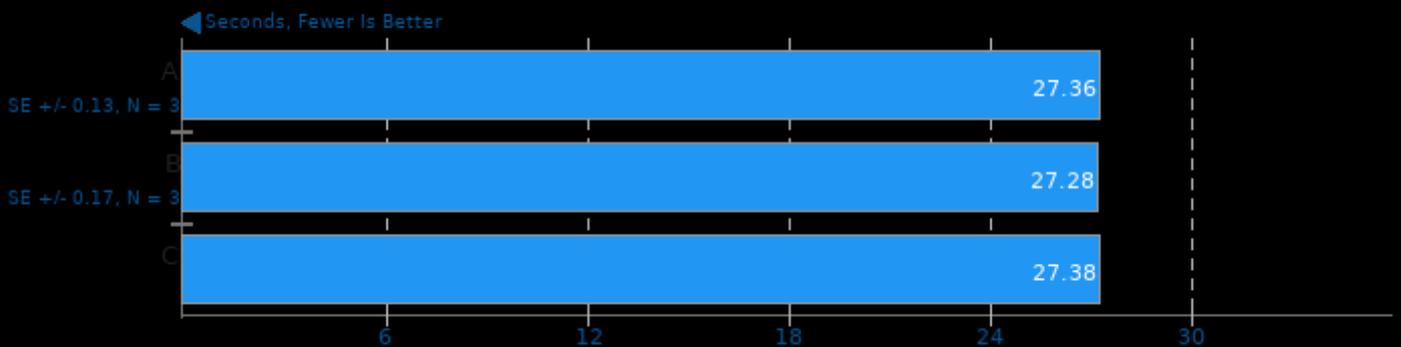
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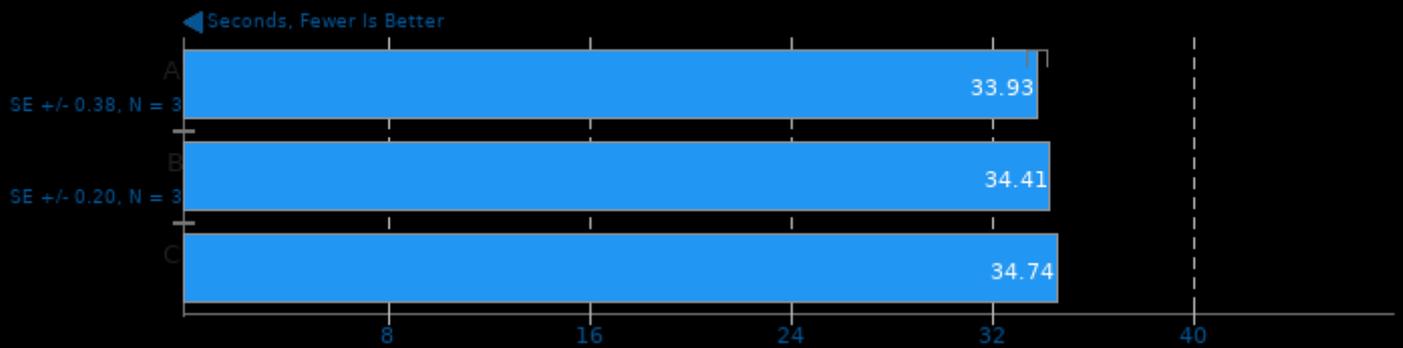
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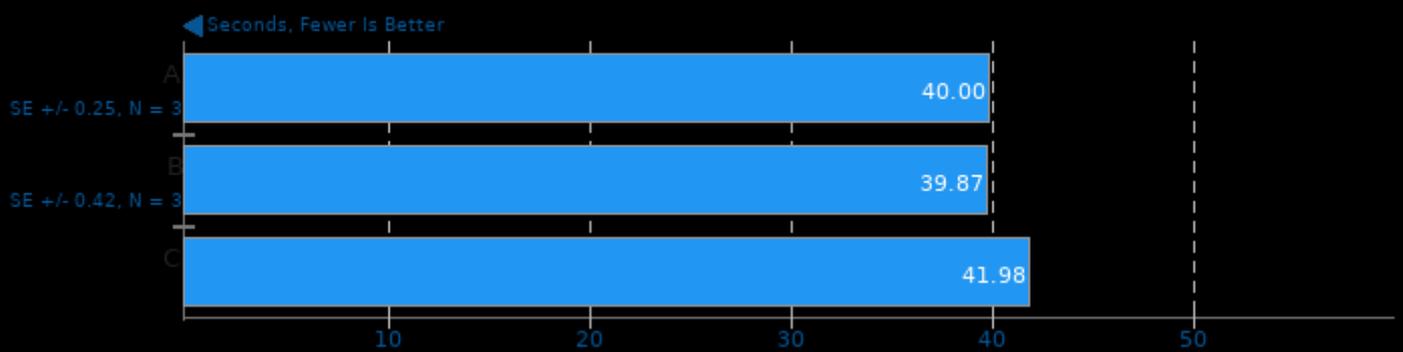
Apache Spark 3.3

Row Count: 40000000 - Partitions: 100 - Repartition Test Time



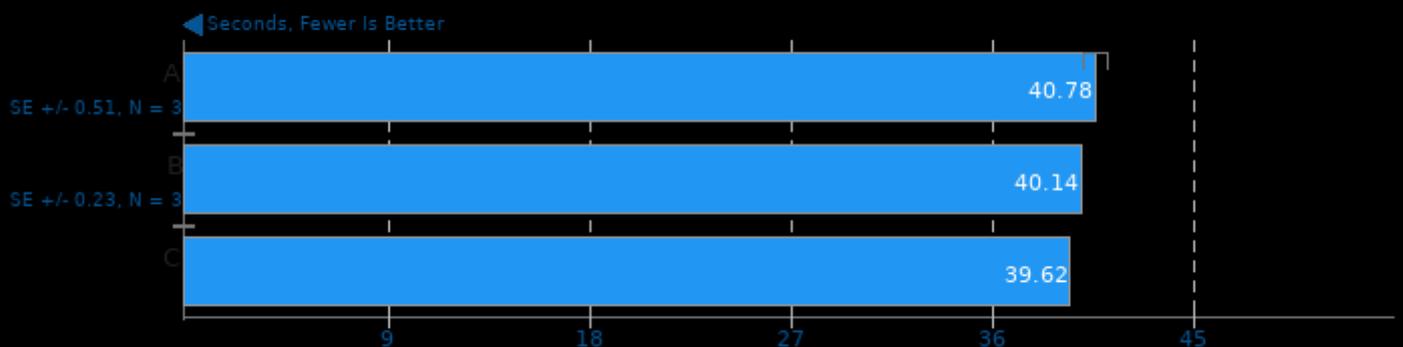
Apache Spark 3.3

Row Count: 40000000 - Partitions: 100 - Inner Join Test Time



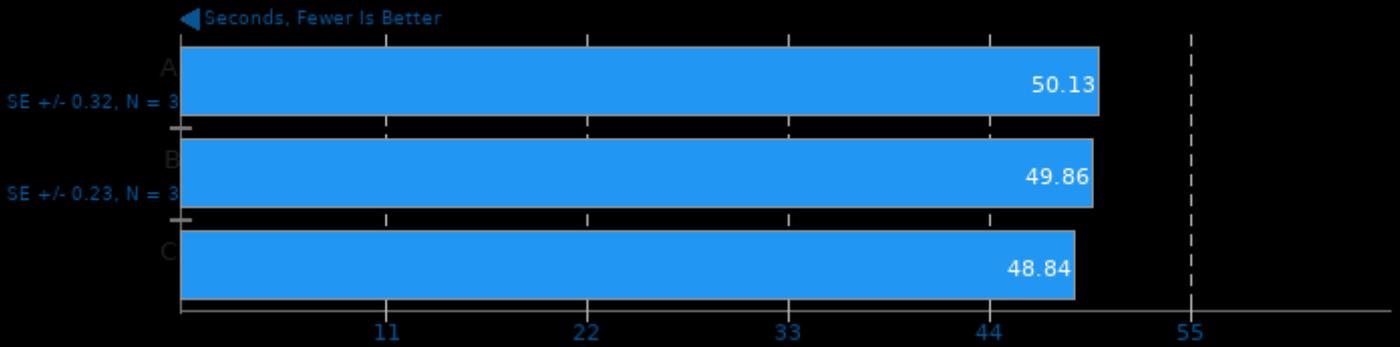
Apache Spark 3.3

Row Count: 40000000 - Partitions: 100 - Broadcast Inner Join Test Time



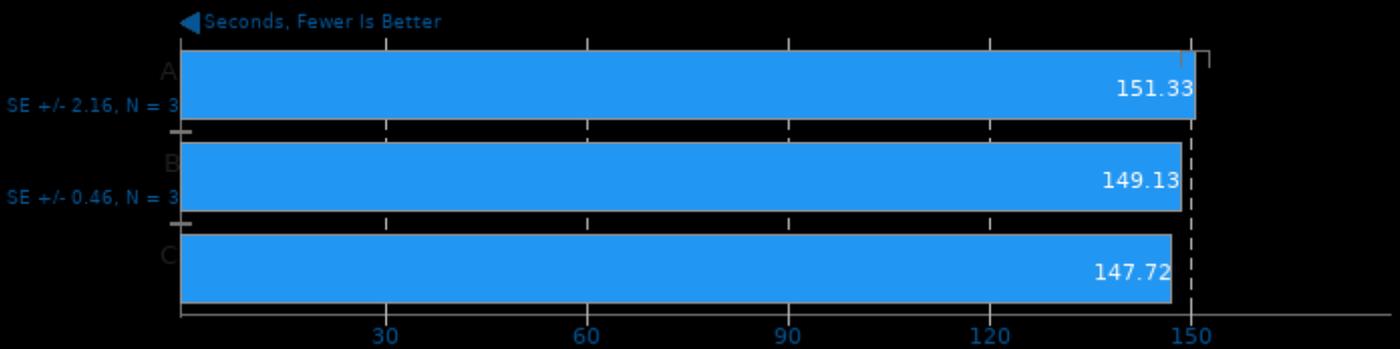
Apache Spark 3.3

Row Count: 40000000 - Partitions: 500 - SHA-512 Benchmark Time



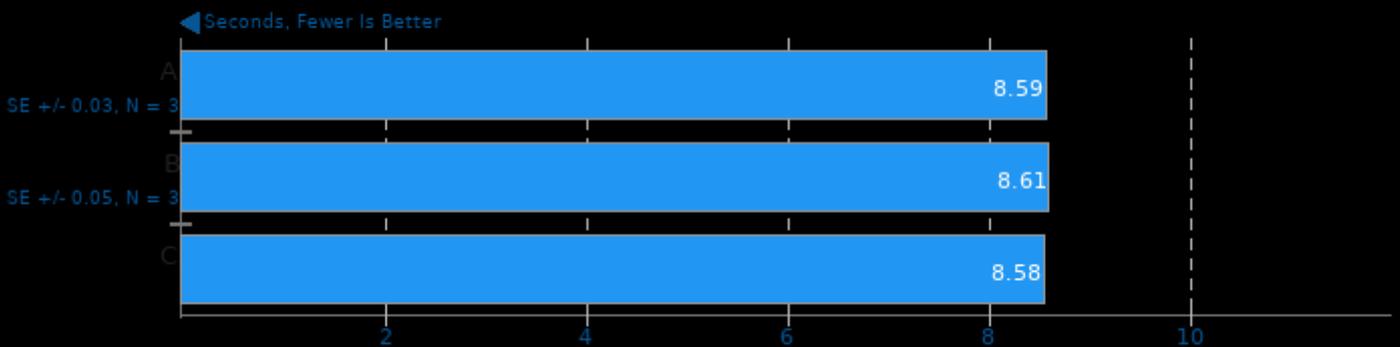
Apache Spark 3.3

Row Count: 40000000 - Partitions: 500 - Calculate Pi Benchmark



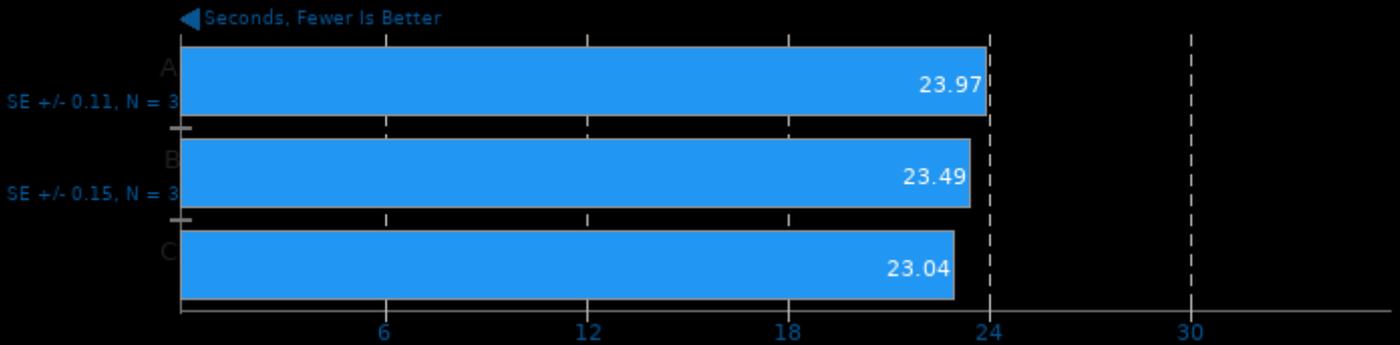
Apache Spark 3.3

Row Count: 40000000 - Partitions: 500 - Calculate Pi Benchmark Using Dataframe



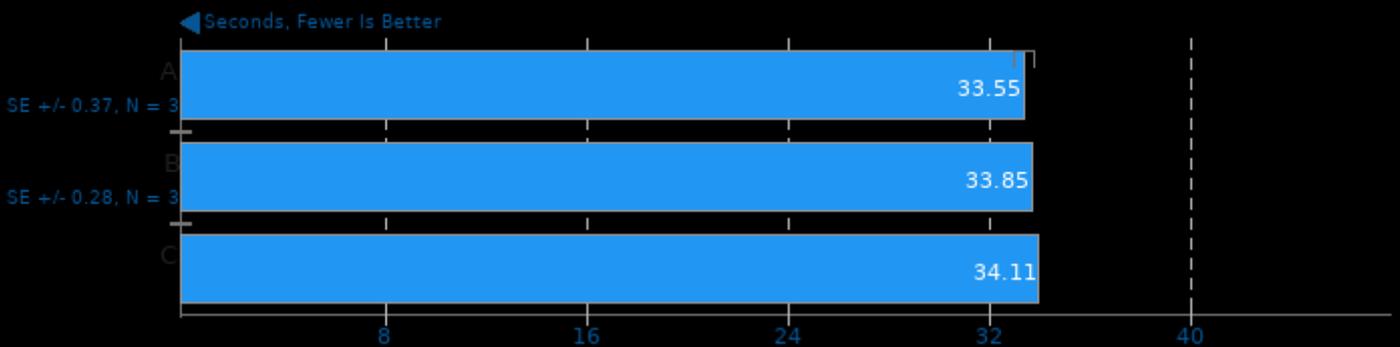
Apache Spark 3.3

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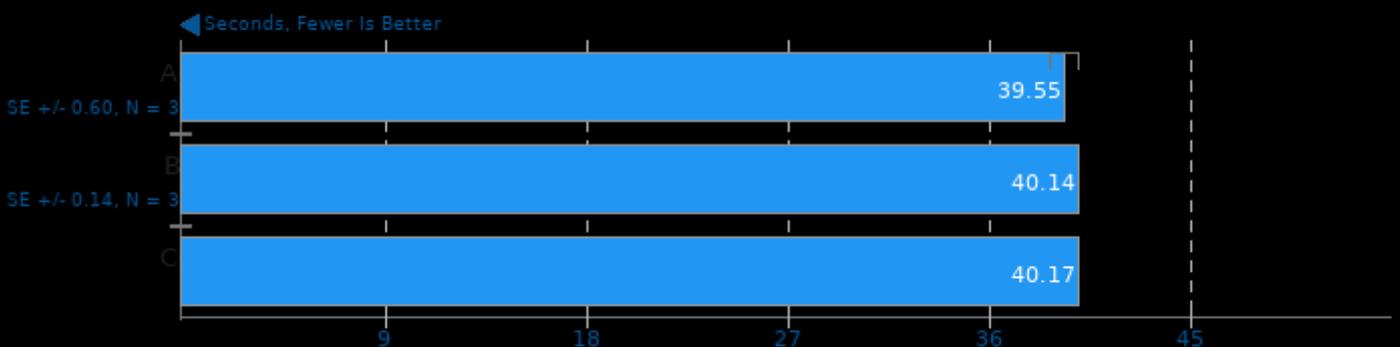
Apache Spark 3.3

Row Count: 40000000 - Partitions: 500 - Repartition Test Time



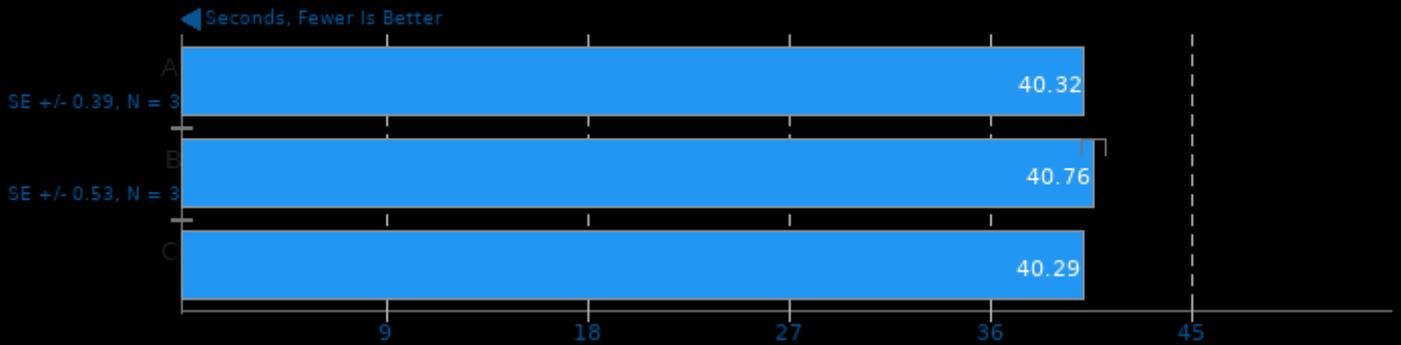
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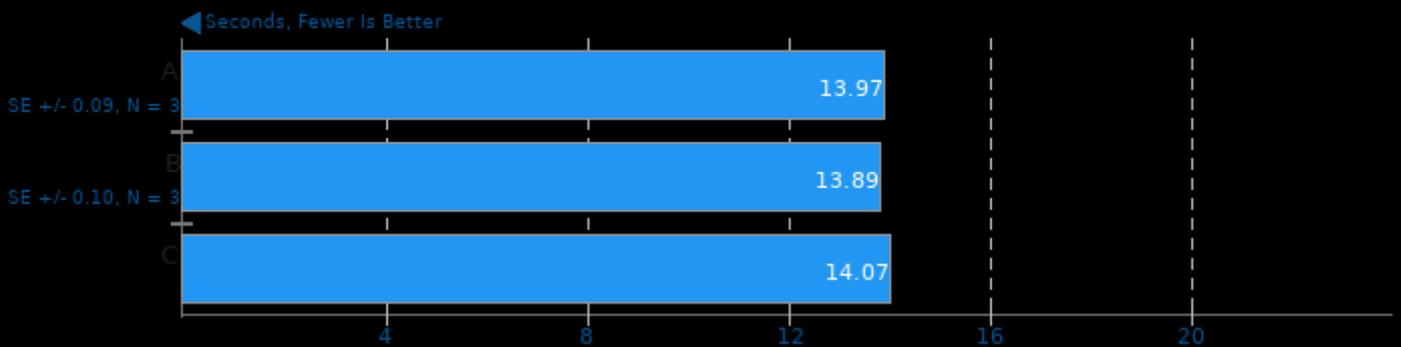
Apache Spark 3.3

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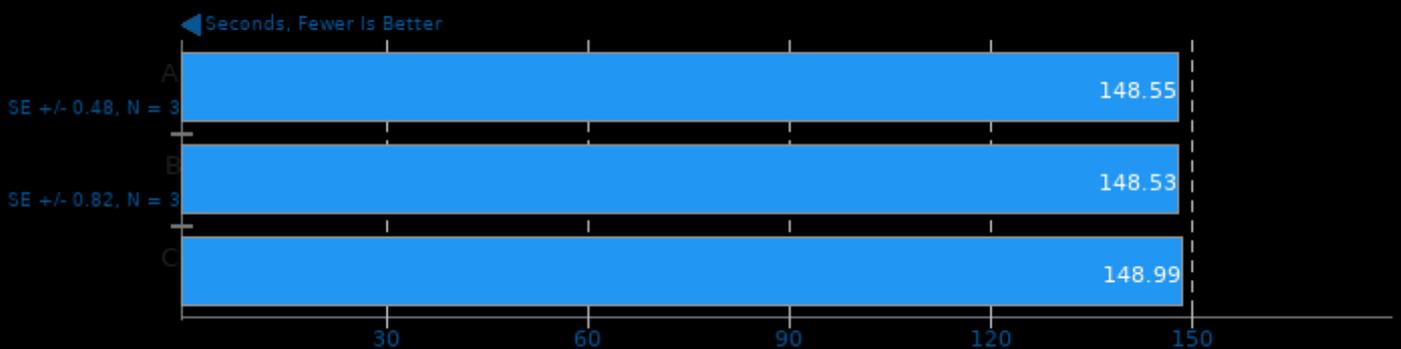
Apache Spark 3.3

Row Count: 100000000 - Partitions: 1000 - SHA-512 Benchmark Time



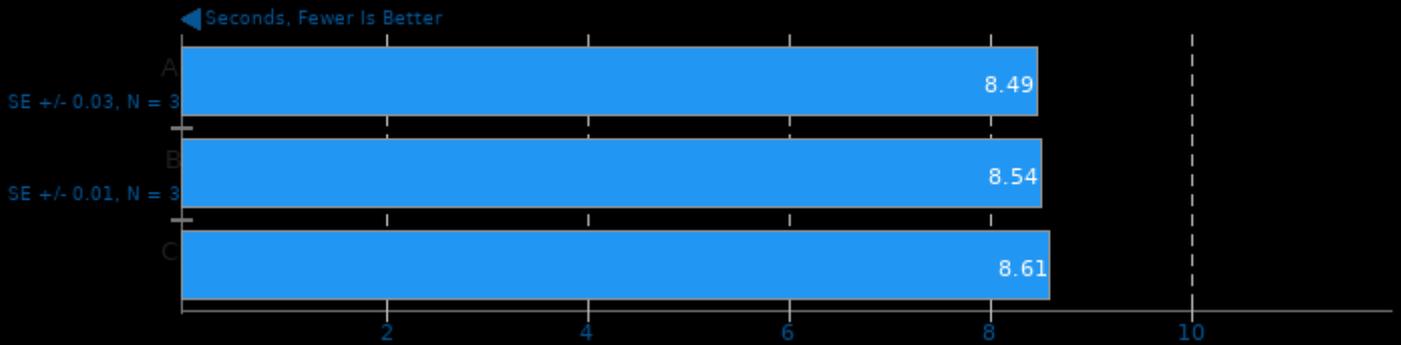
Apache Spark 3.3

Row Count: 100000000 - Partitions: 1000 - Calculate Pi Benchmark



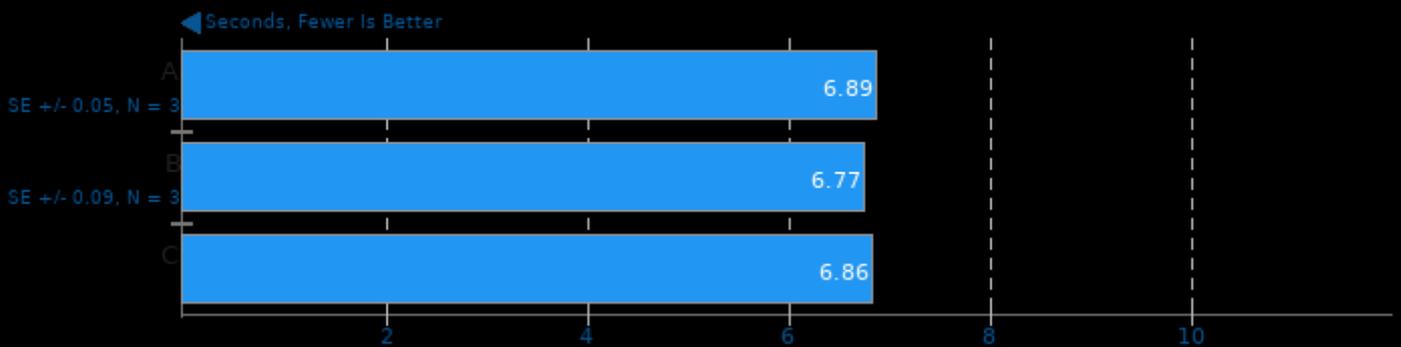
Apache Spark 3.3

Row Count: 10000000 - Partitions: 1000 - Calculate Pi Benchmark Using Dataframe



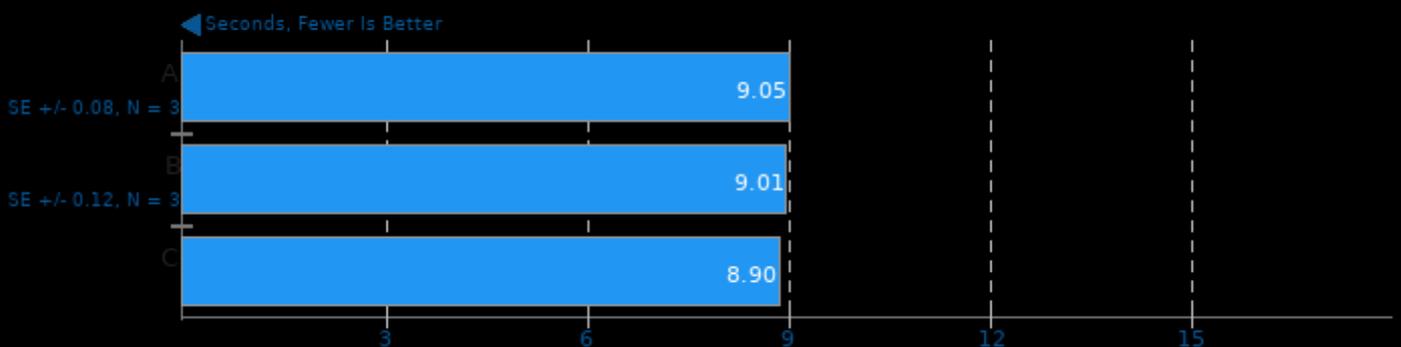
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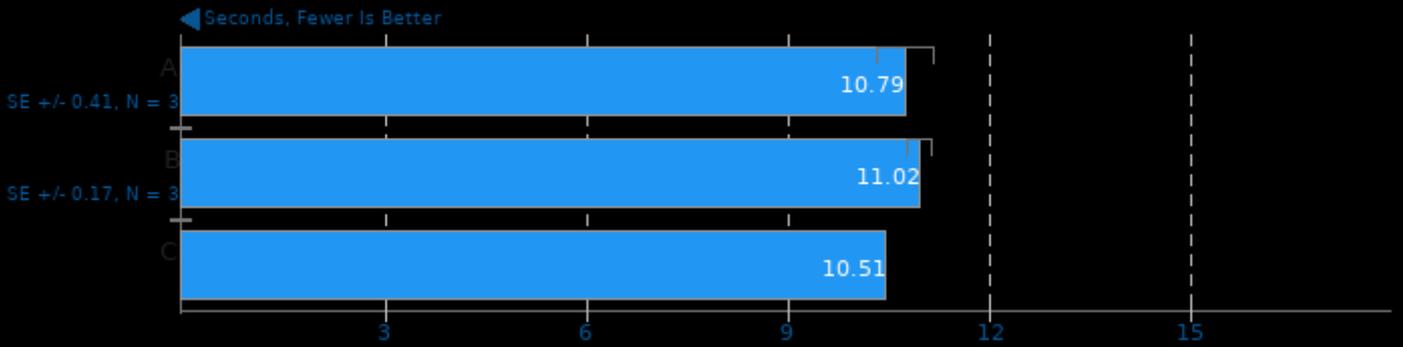
Apache Spark 3.3

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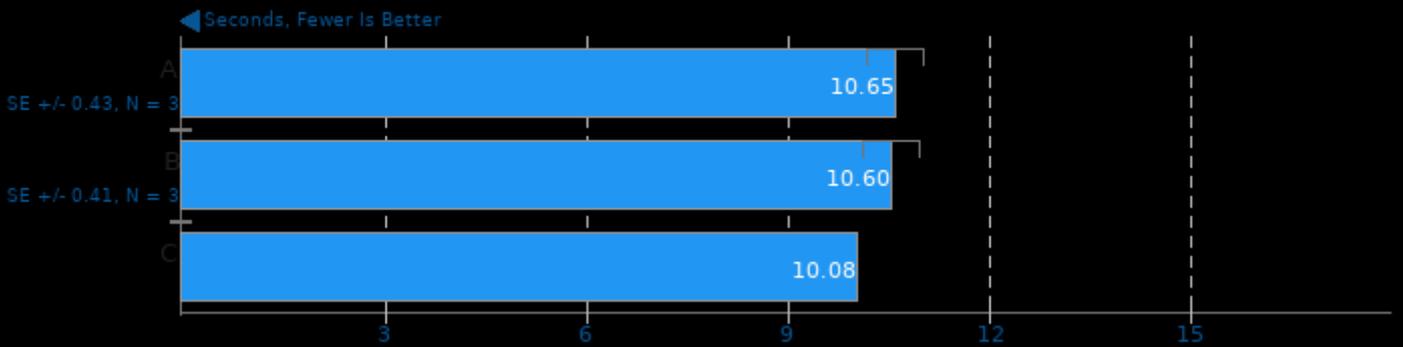
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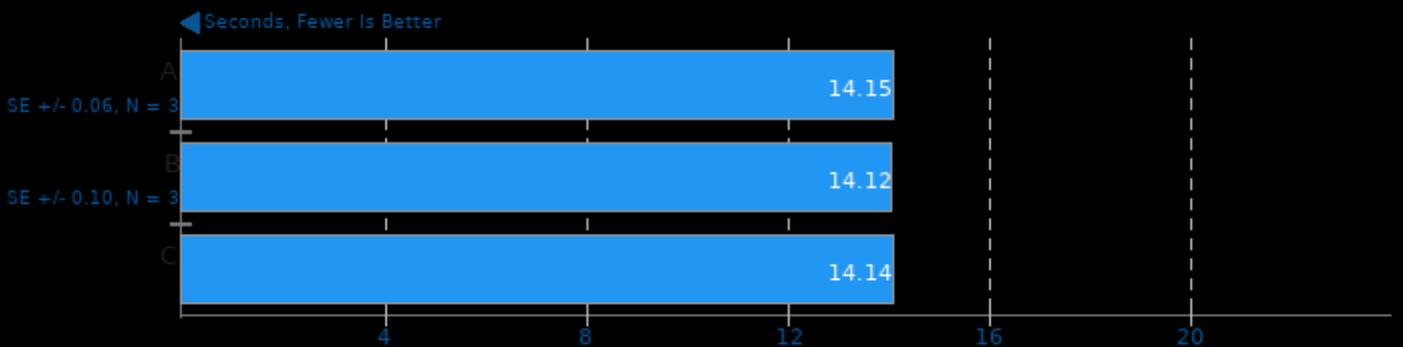
Apache Spark 3.3

Row Count: 10000000 - Partitions: 1000 - Broadcast Inner Join Test Time



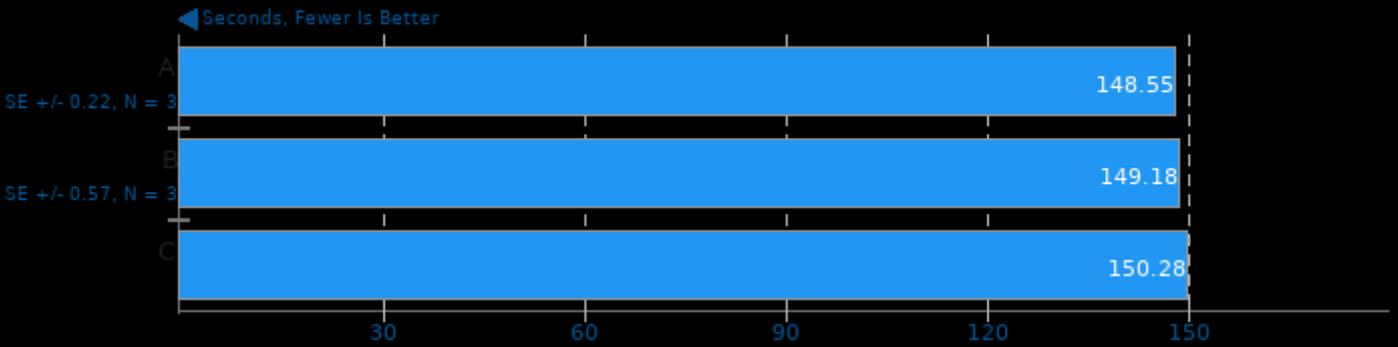
Apache Spark 3.3

Row Count: 10000000 - Partitions: 2000 - SHA-512 Benchmark Time



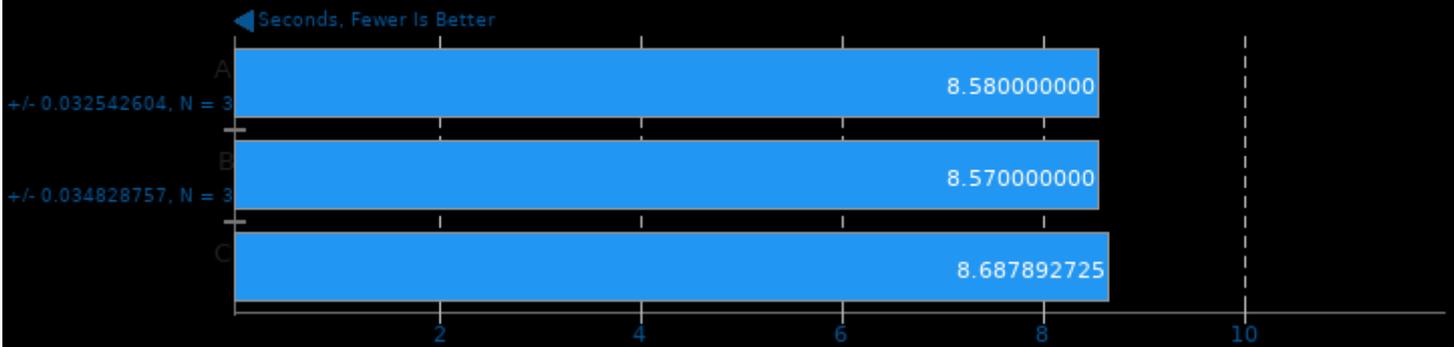
Apache Spark 3.3

Row Count: 10000000 - Partitions: 2000 - Calculate Pi Benchmark



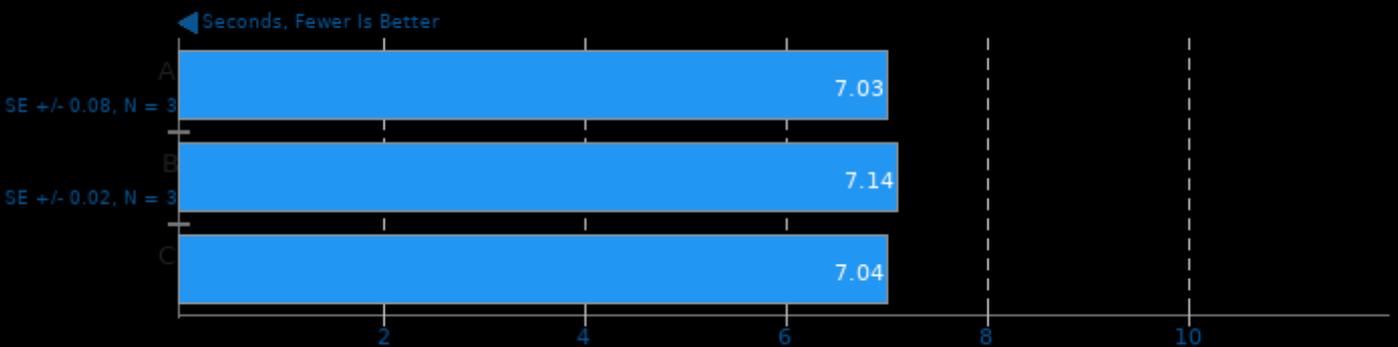
Apache Spark 3.3

Row Count: 10000000 - Partitions: 2000 - Calculate Pi Benchmark Using Dataframe



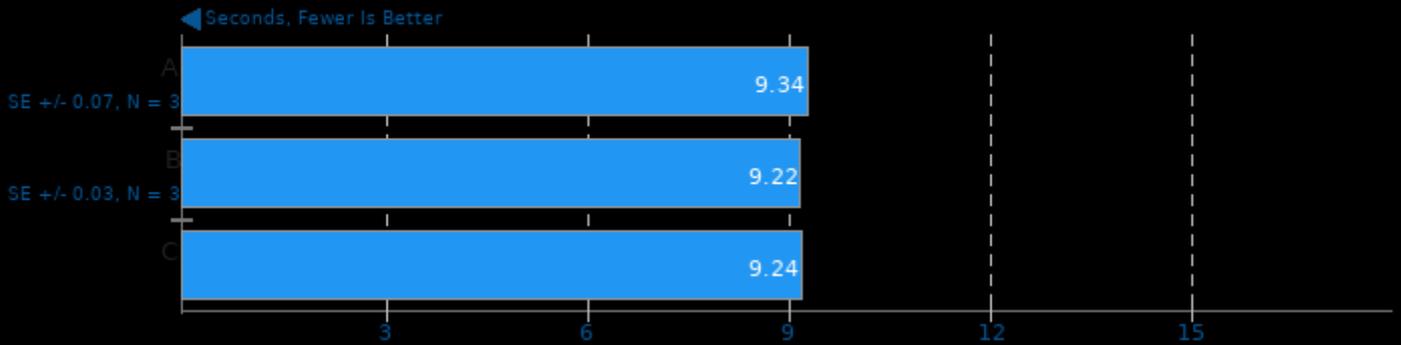
Apache Spark 3.3

Row Count: 10000000 - Partitions: 2000 - Group By Test Time



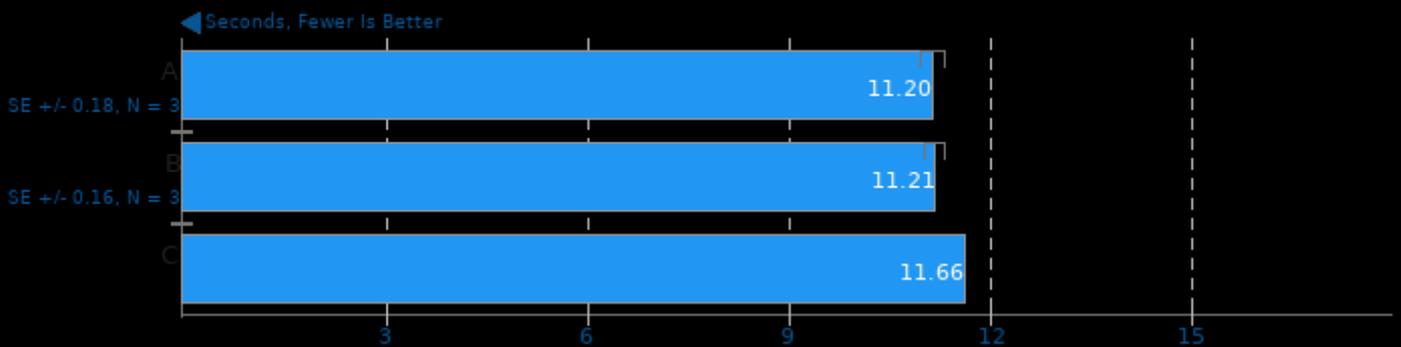
Apache Spark 3.3

Row Count: 10000000 - Partitions: 2000 - Repartition Test Time



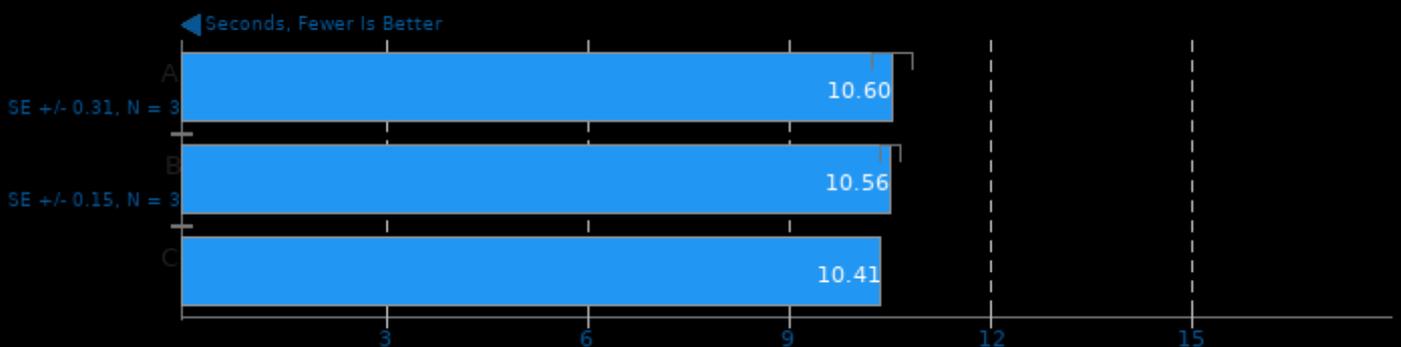
Apache Spark 3.3

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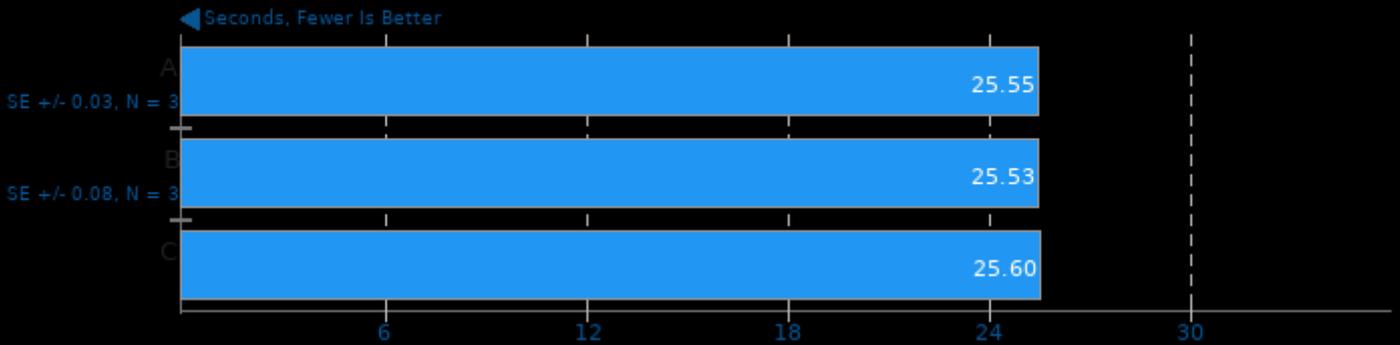
Apache Spark 3.3

Row Count: 10000000 - Partitions: 2000 - Broadcast Inner Join Test Time



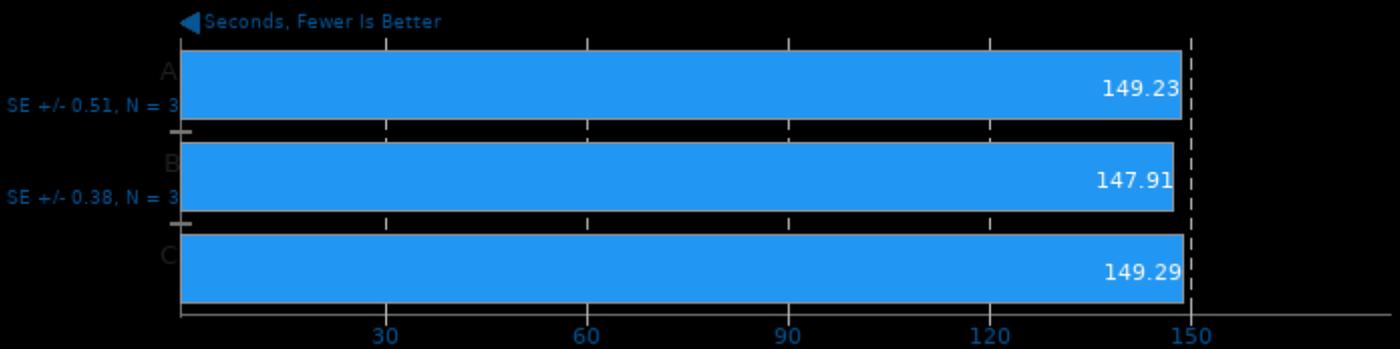
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Row Count: 20000000 - Partitions: 1000 - SHA-512 Benchmark Time



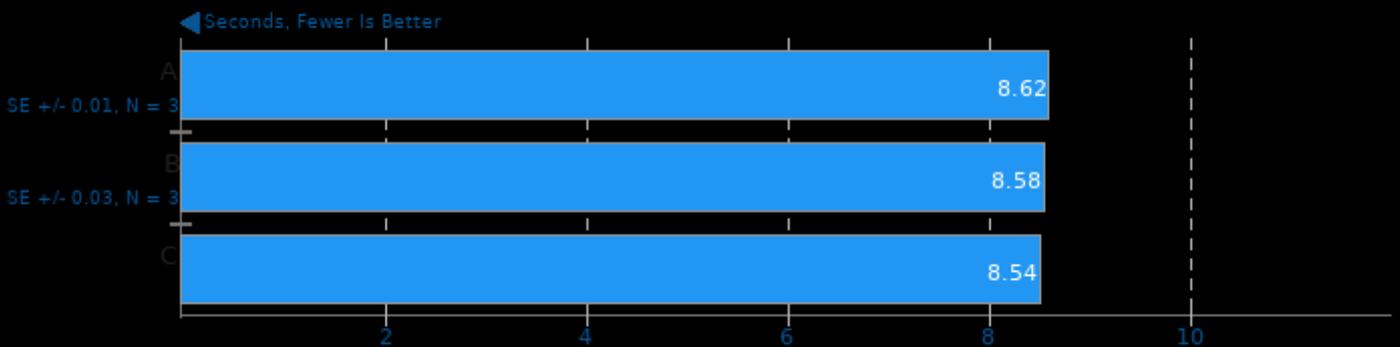
Apache Spark 3.3

Row Count: 20000000 - Partitions: 1000 - Calculate Pi Benchmark



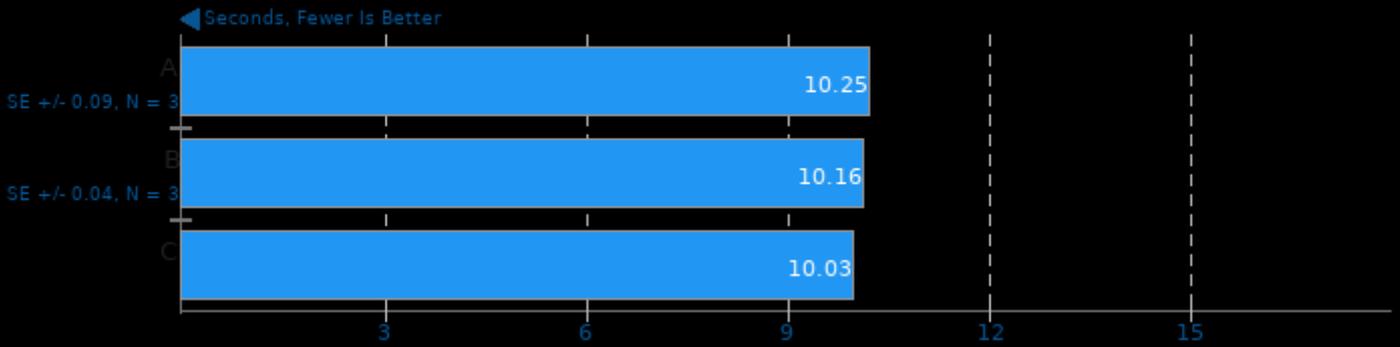
Apache Spark 3.3

Row Count: 20000000 - Partitions: 1000 - Calculate Pi Benchmark Using Dataframe



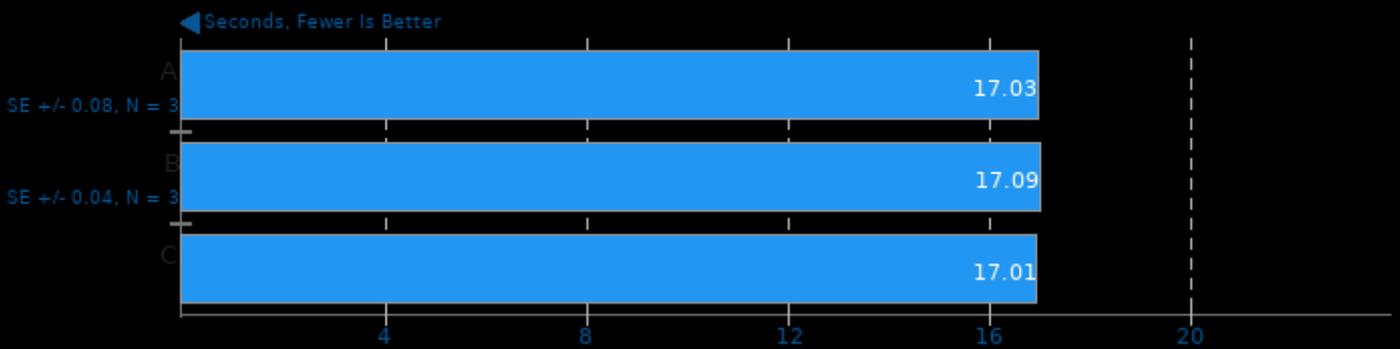
Apache Spark 3.3

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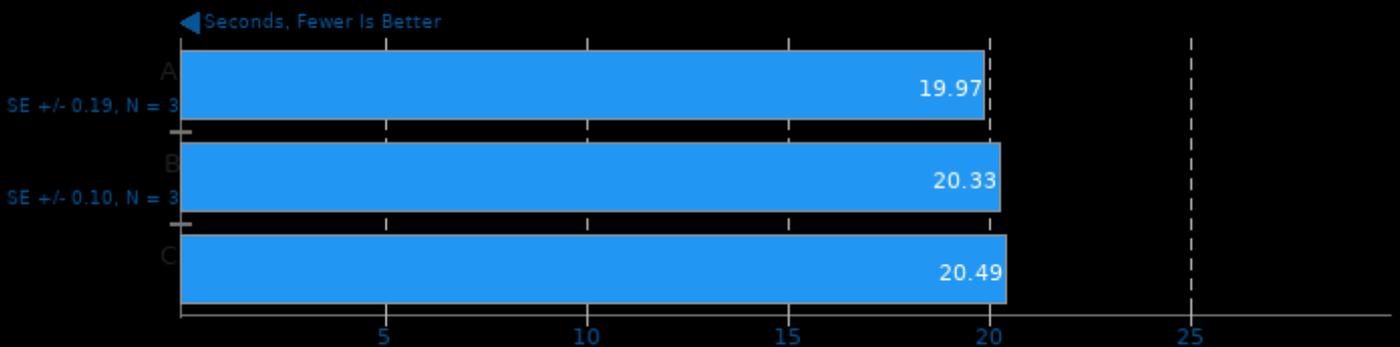
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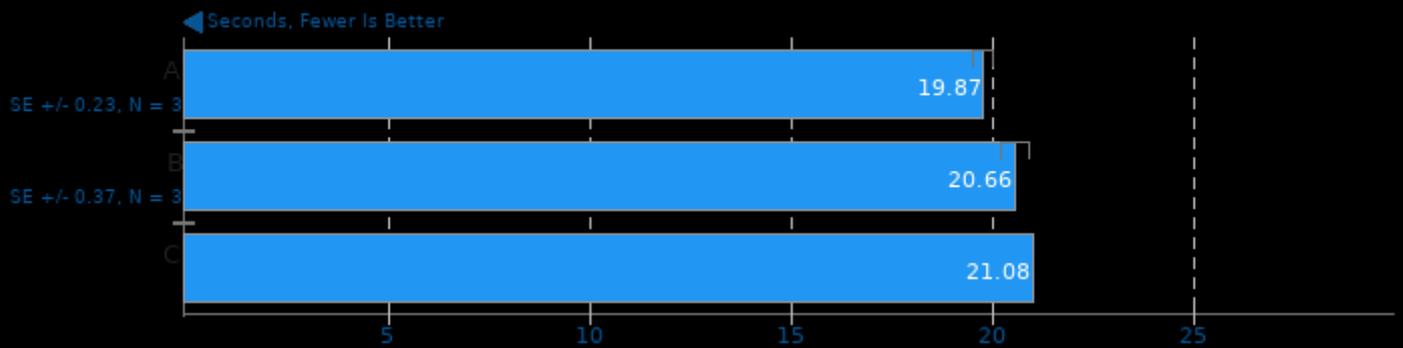
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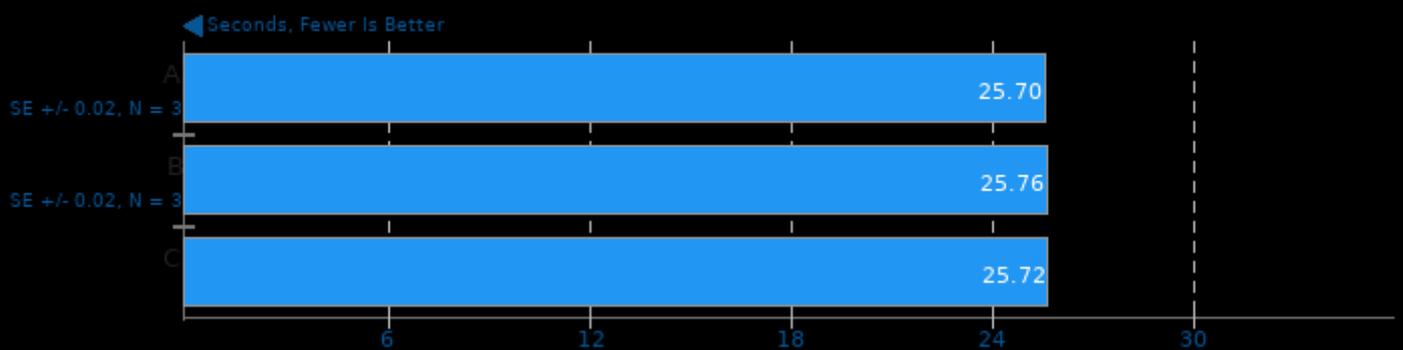
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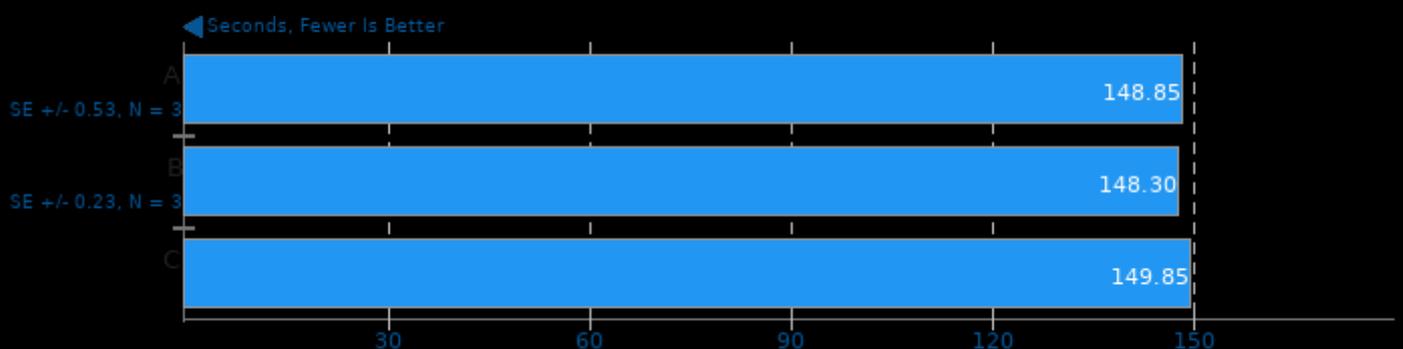
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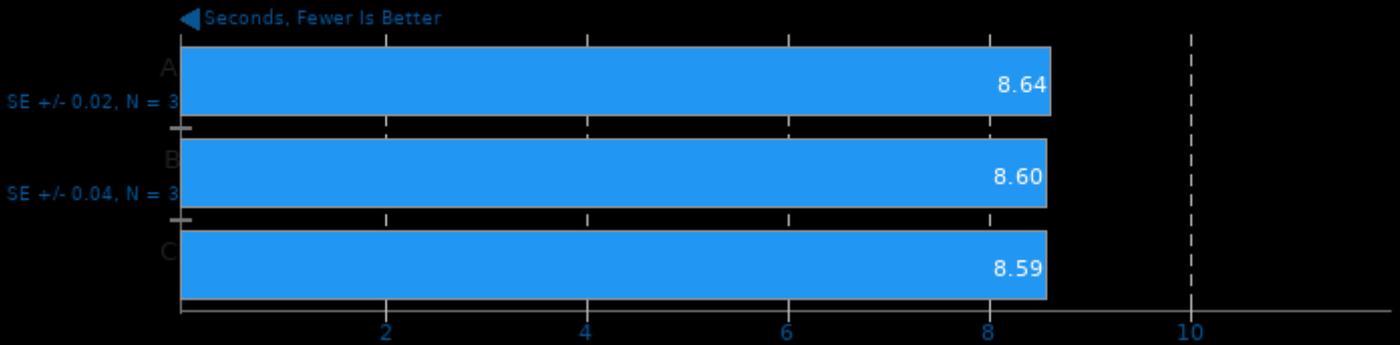
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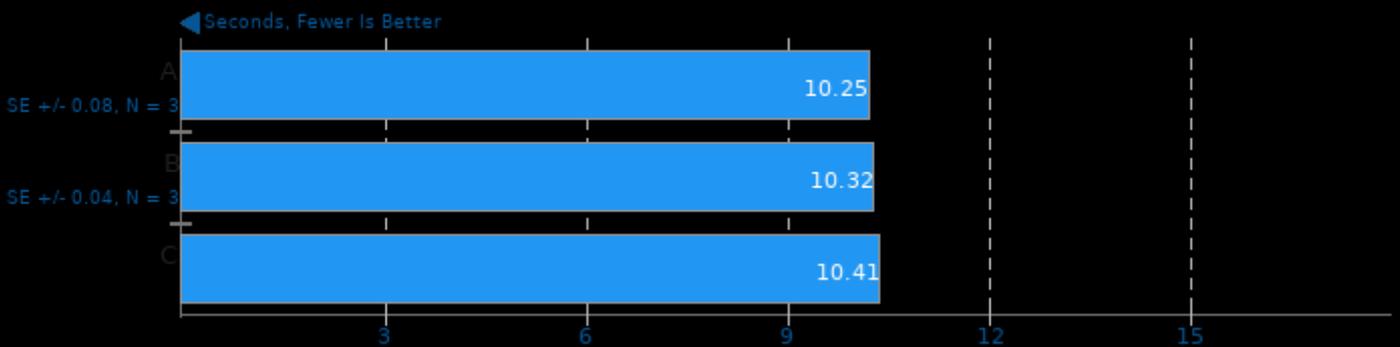
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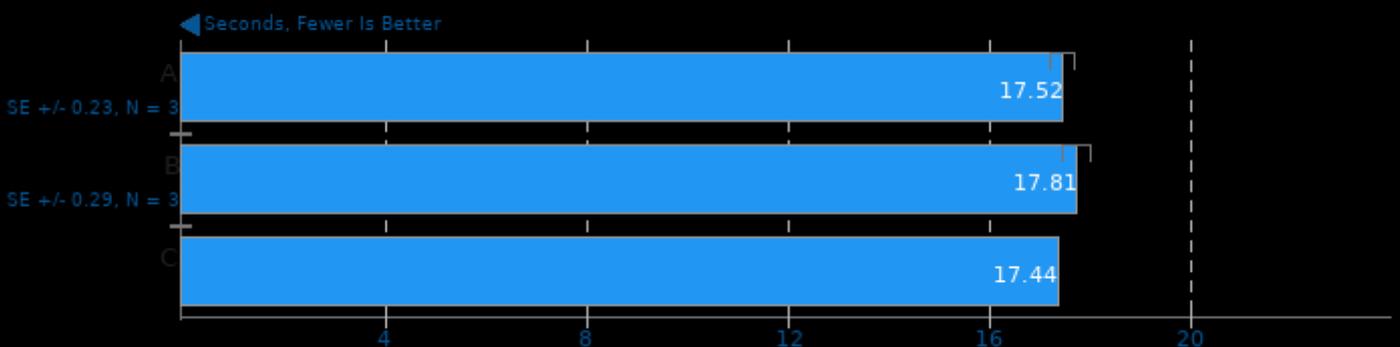
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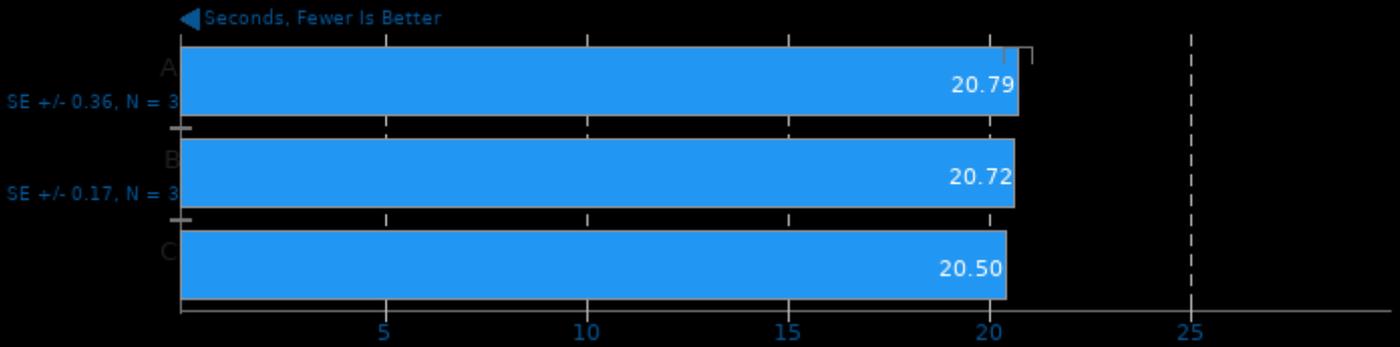
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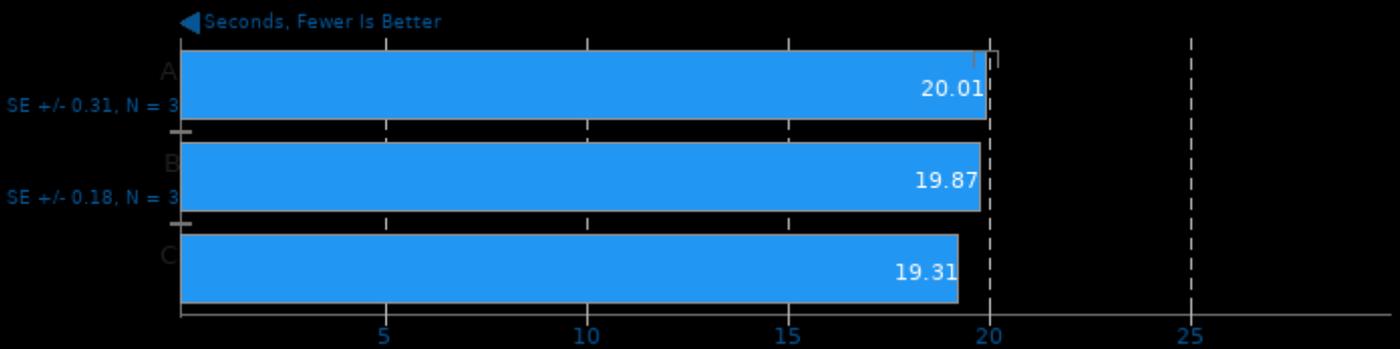
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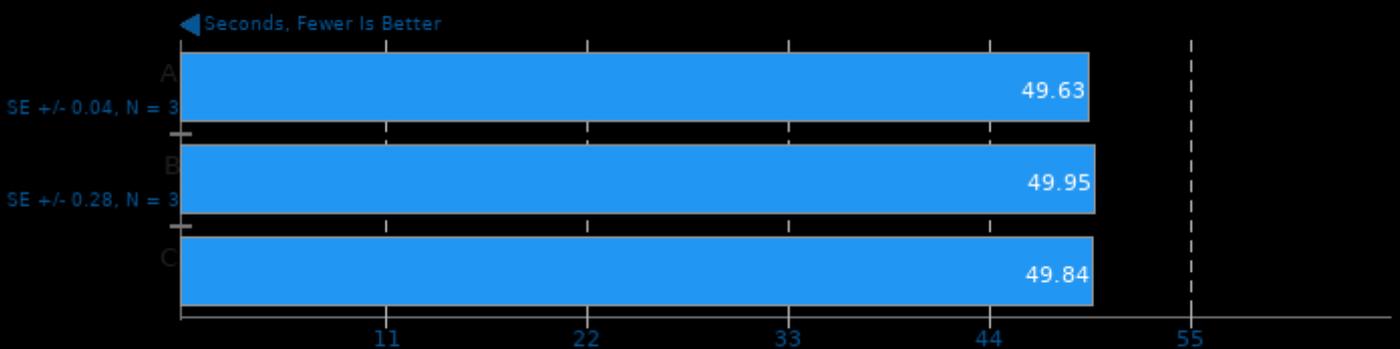
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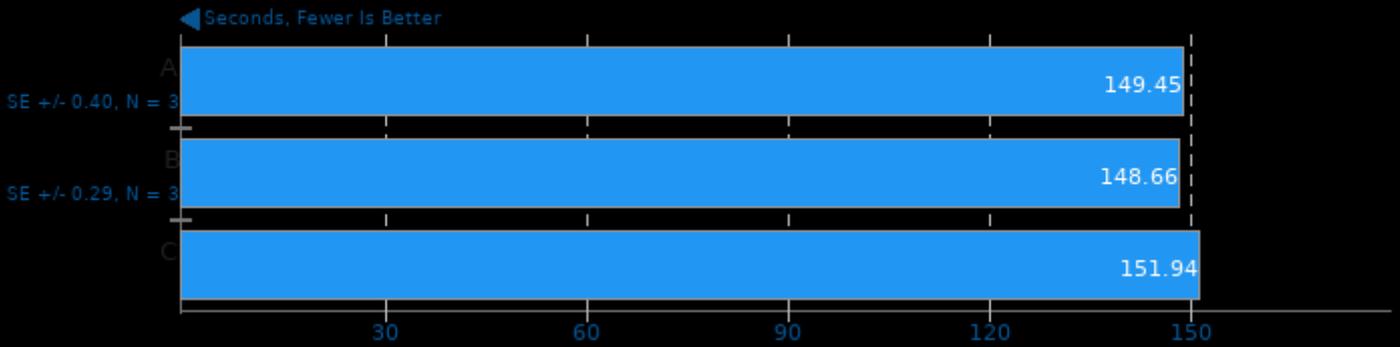
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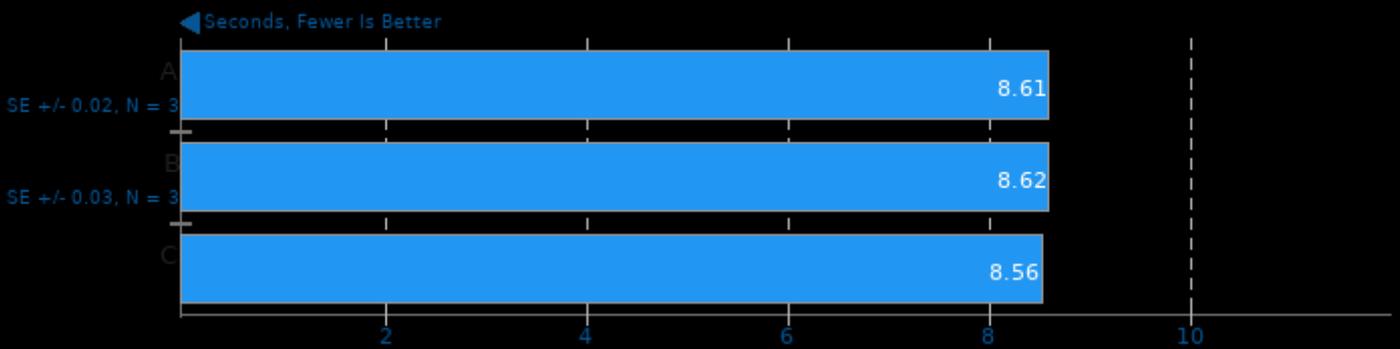
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Row Count: 40000000 - Partitions: 1000 - Calculate Pi Benchmark



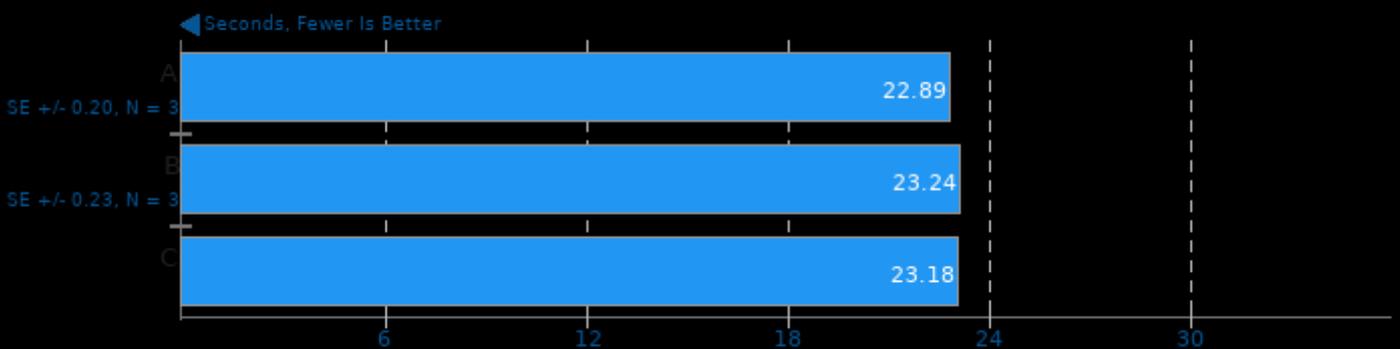
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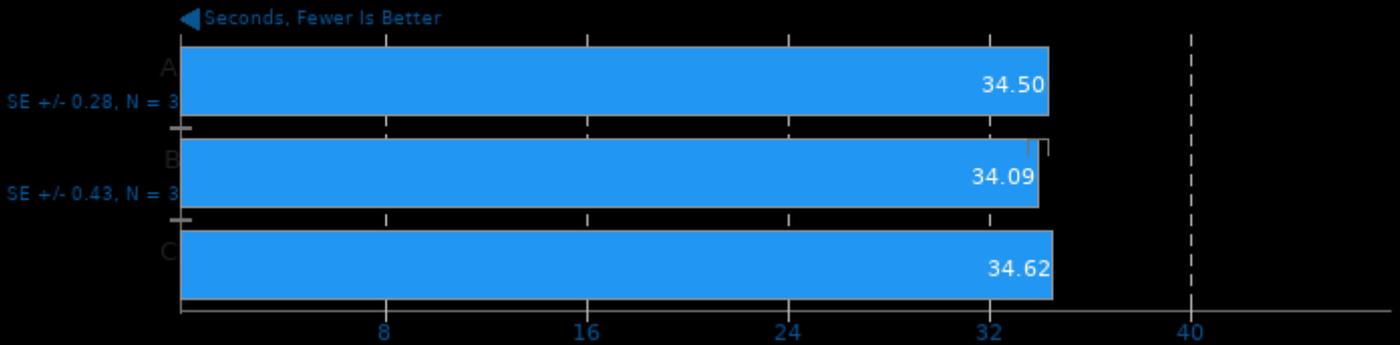
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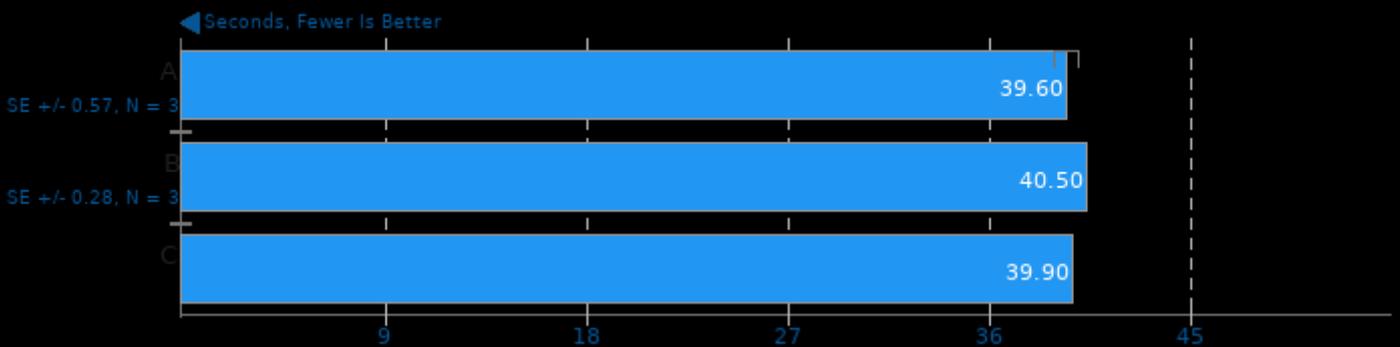
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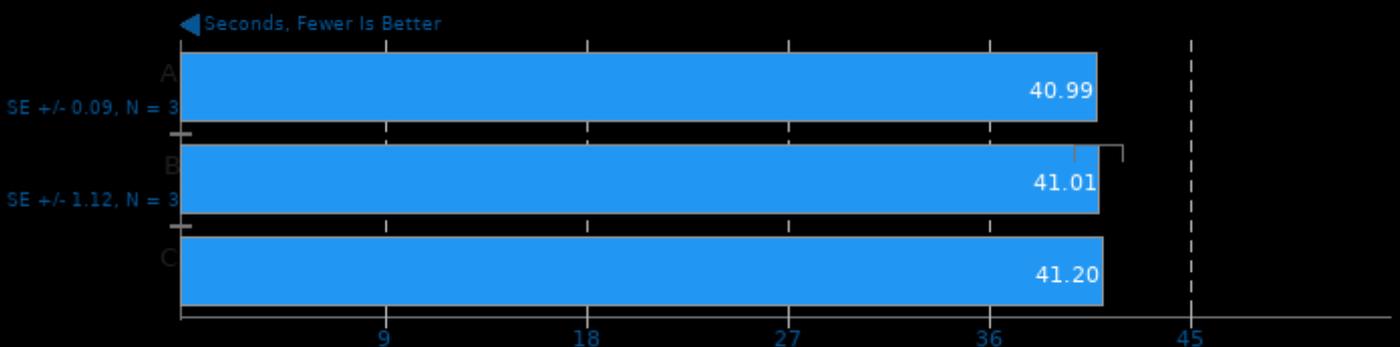
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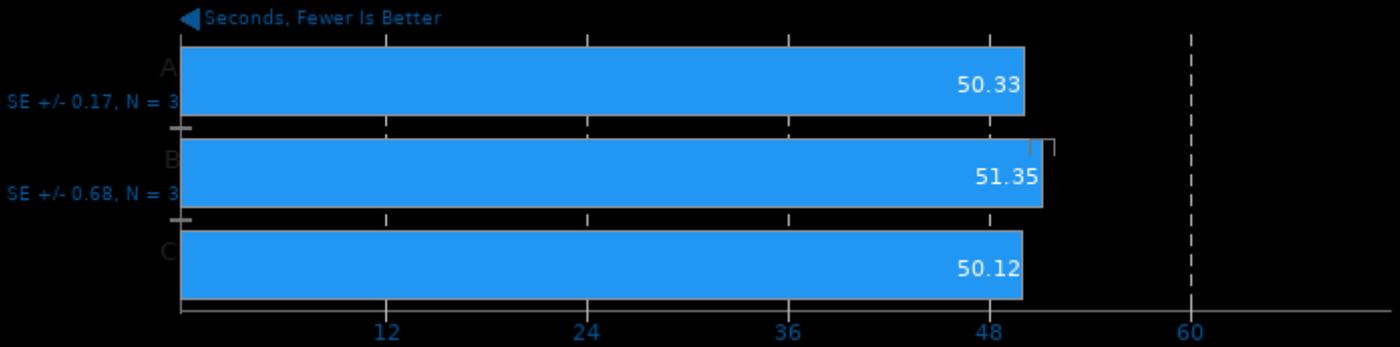
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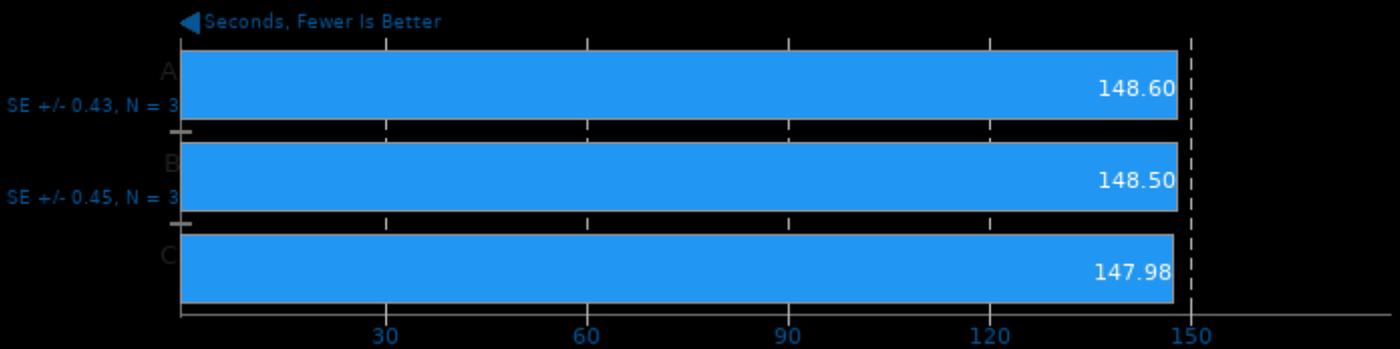
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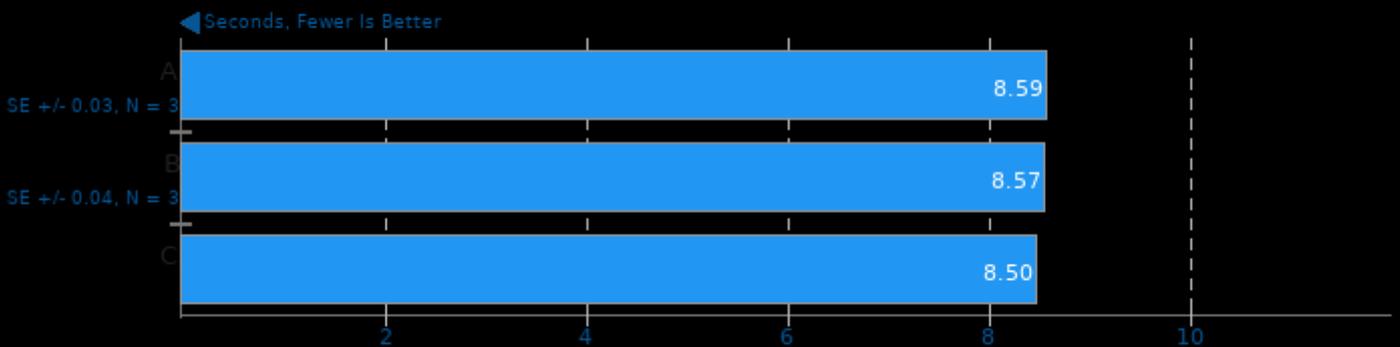
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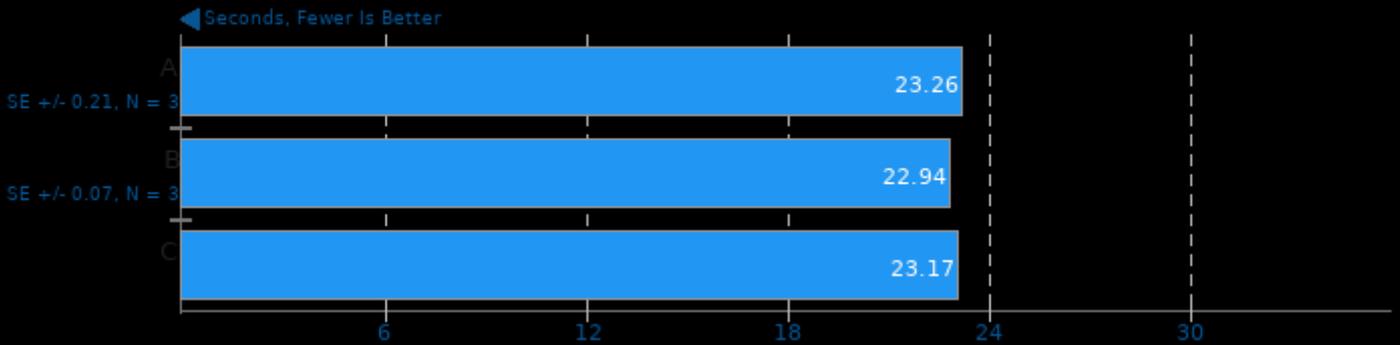
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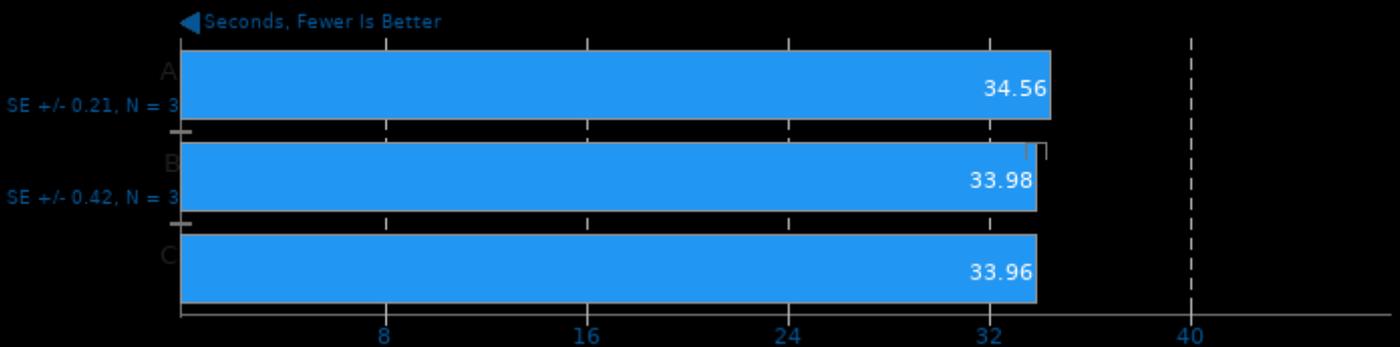
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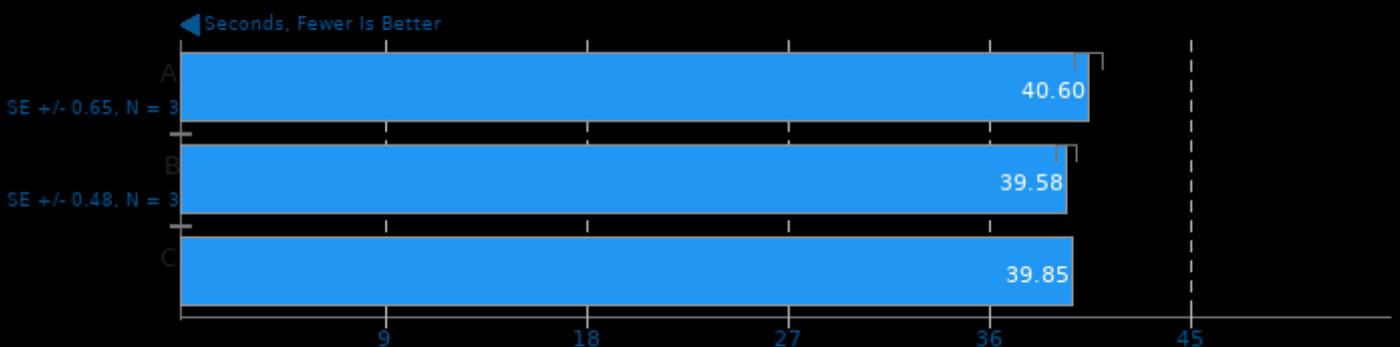
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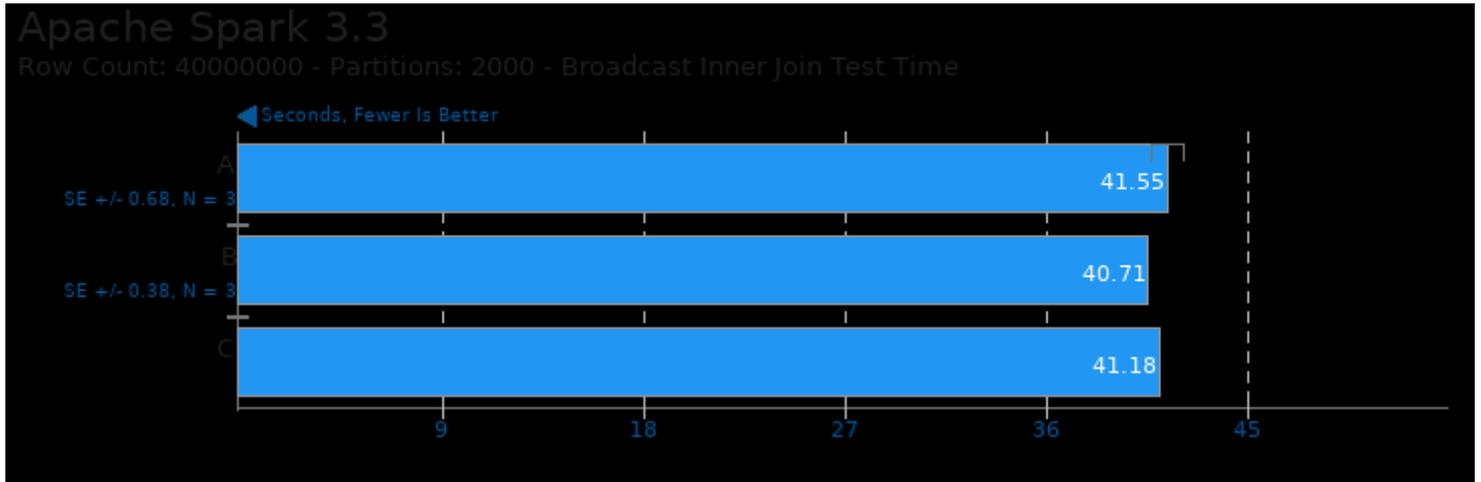
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Apache Spark 3.3

Row Count: 40000000 - Partitions: 2000 - Inner Join Test Time





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