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## spark rembrandt

AMD Ryzen 7 PRO 6850U testing with a LENOVO 21CM0001US (R22ET46W 1.16 BIOS) and AMD Rembrandt 1GB on Ubuntu 22.04 via the Phoronix Test Suite.

### Automated Executive Summary

*B had the most wins, coming in first place for 59% of the tests.*

*Based on the geometric mean of all complete results, the fastest (B) was 1.013x the speed of the slowest (A).*

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

*Apache Spark (Row Count: 1000000 - Partitions: 1000 - Broadcast Inner Join Test Time) at 1.225x*

*Apache Spark (Row Count: 40000000 - Partitions: 500 - Broadcast Inner Join Test Time) at 1.092x*

*Apache Spark (Row Count: 40000000 - Partitions: 100 - Inner Join Test Time) at 1.087x*

*Apache Spark (Row Count: 10000000 - Partitions: 100 - Broadcast Inner Join Test Time) at 1.072x*

*Apache Spark (Row Count: 40000000 - Partitions: 500 - Inner Join Test Time) at 1.068x*

*Apache Spark (Row Count: 10000000 - Partitions: 100 - Inner Join Test Time) at 1.06x*

*Apache Spark (Row Count: 20000000 - Partitions: 1000 - Broadcast Inner Join Test Time) at 1.053x*

*Apache Spark (Row Count: 20000000 - Partitions: 1000 - Repartition Test Time) at 1.052x*

*Apache Spark (Row Count: 40000000 - Partitions: 100 - Repartition Test Time) at 1.052x*

*Apache Spark (Row Count: 1000000 - Partitions: 500 - Inner Join Test Time) at 1.047x.*

## Test Systems:

**A**

**B**

Processor: AMD Ryzen 7 PRO 6850U @ 4.77GHz (8 Cores / 16 Threads), Motherboard: LENOVO 21CM0001US (R22ET46W 1.16 BIOS), Chipset: AMD Device 14b5, Memory: 16GB, Disk: 512GB Micron MTFDKBA512TFK, Graphics: AMD Rembrandt 1GB, Audio: AMD Rembrandt Radeon HD Audio, Network: Qualcomm Atheros QCNFA765

OS: Ubuntu 22.04, Kernel: 5.15.0-41-generic (x86\_64), Desktop: GNOME Shell 42.2, Display Server: X Server + Wayland, OpenGL: 4.6 Mesa 22.2.0-devel (git-ba461f8 2022-07-26 jammy-oibaf-ppa) (LLVM 14.0.6 DRM 3.42), Vulkan: 1.3.219, Compiler: GCC 11.2.0, File-System: ext4, Screen Resolution: 1920x1200

Kernel Notes: Transparent Huge Pages: madvise

Processor Notes: Scaling Governor: amd-pstate schedutil (Boost: Enabled) - Platform Profile: balanced - CPU Microcode: 0xa404102 - ACPI Profile: balanced  
Java Notes: OpenJDK Runtime Environment (build 11.0.15+10-Ubuntu0.22.04.1)

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 and seccomp + spectre\_v1: Mitigation of usercopy/swapgs barriers and \_\_user pointer sanitization + spectre\_v2: Mitigation of Retpolines IPB: conditional IBRS\_FW STIBP: always-on RSB filling + srbd: Not affected + tsx\_async\_abort: Not affected

	<b>A</b>	<b>B</b>
Apache Spark - 1000000 - 100 - S.5.B.T (sec)	<b>4.54</b>	<b>4.60</b>
Normalized	100%	98.7%
Standard Deviation	4.8%	
Apache Spark - 1000000 - 100 - C.P.B (sec)	<b>241.05</b>	<b>241.024138854</b>
Normalized	99.99%	100%
Standard Deviation	1%	
Apache Spark - 1000000 - 100 - C.P.B.U.D (sec)	<b>13.62</b>	<b>13.49</b>
Normalized	99.05%	100%
Standard Deviation	0.6%	
Apache Spark - 1000000 - 100 - Group By Test Time (sec)	<b>4.57</b>	<b>4.48</b>
Normalized	98.03%	100%
Standard Deviation	3.3%	
Apache Spark - 1000000 - 100 - R.T.T (sec)	<b>3.37</b>	<b>3.24</b>
Normalized	96.14%	100%
Standard Deviation	3.1%	
Apache Spark - 1000000 - 100 - I.J.T.T (sec)	<b>2.44</b>	<b>2.39</b>
Normalized	97.95%	100%
Standard Deviation	3%	
Apache Spark - 1000000 - 100 - B.I.J.T.T (sec)	<b>2.14</b>	<b>1.89</b>
Normalized	88.32%	100%
Standard Deviation	11.6%	
Apache Spark - 1000000 - 500 - S.5.B.T (sec)	<b>4.75</b>	<b>4.74</b>
Normalized	99.79%	100%
Standard Deviation	2.1%	
Apache Spark - 1000000 - 500 - C.P.B (sec)	<b>240.04</b>	<b>245.15</b>
Normalized	100%	97.92%
Standard Deviation	0.2%	

Apache Spark - 1000000 - 500 - C.P.B.U.D (sec)	<b>13.66</b>	<b>13.44</b>
Normalized	98.39%	100%
Standard Deviation	0.3%	
Apache Spark - 1000000 - 500 - Group By Test Time (sec)	<b>4.92</b>	<b>5.03</b>
Normalized	100%	97.81%
Standard Deviation	3.1%	
Apache Spark - 1000000 - 500 - R.T.T (sec)	<b>3.40</b>	<b>3.43</b>
Normalized	100%	99.13%
Standard Deviation	0.9%	
Apache Spark - 1000000 - 500 - I.J.T.T (sec)	<b>2.65</b>	<b>2.53</b>
Normalized	95.47%	100%
Standard Deviation	0.6%	
Apache Spark - 1000000 - 500 - B.I.J.T.T (sec)	<b>3.08</b>	<b>2.29</b>
Normalized	74.35%	100%
Standard Deviation	36%	
Apache Spark - 1000000 - 1000 - S.5.B.T (sec)	<b>5.11</b>	<b>5.08</b>
Normalized	99.41%	100%
Standard Deviation	2.4%	
Apache Spark - 1000000 - 1000 - C.P.B (sec)	<b>239.97</b>	<b>239.65</b>
Normalized	99.87%	100%
Standard Deviation	0.6%	
Apache Spark - 1000000 - 1000 - C.P.B.U.D (sec)	<b>13.50</b>	<b>13.46</b>
Normalized	99.7%	100%
Standard Deviation	0.7%	
Apache Spark - 1000000 - 1000 - Group By Test Time (sec)	<b>5.32</b>	<b>5.55</b>
Normalized	100%	95.86%
Standard Deviation	0.6%	
Apache Spark - 1000000 - 1000 - R.T.T (sec)	<b>3.68</b>	<b>3.70</b>
Normalized	100%	99.46%
Standard Deviation	2.2%	
Apache Spark - 1000000 - 1000 - I.J.T.T (sec)	3.17	3.17
Standard Deviation	3%	
Apache Spark - 1000000 - 1000 - B.I.J.T.T (sec)	<b>3.21</b>	<b>2.62</b>
Normalized	81.62%	100%
Standard Deviation	5.1%	
Apache Spark - 1000000 - 2000 - S.5.B.T (sec)	<b>5.63</b>	<b>5.46</b>
Normalized	96.98%	100%
Standard Deviation	2.2%	
Apache Spark - 1000000 - 2000 - C.P.B (sec)	<b>241.47</b>	<b>242.20</b>
Normalized	100%	99.7%
Standard Deviation	0.7%	
Apache Spark - 1000000 - 2000 - C.P.B.U.D (sec)	<b>13.59</b>	<b>13.54</b>
Normalized	99.63%	100%
Standard Deviation	0.8%	
Apache Spark - 1000000 - 2000 - Group By Test Time (sec)	<b>6.09</b>	<b>6.10</b>
Normalized	100%	99.84%
Standard Deviation	2.5%	
Apache Spark - 1000000 - 2000 - R.T.T (sec)	<b>4.15</b>	<b>4.09</b>
Normalized	98.55%	100%
Standard Deviation	2%	
Apache Spark - 1000000 - 2000 - I.J.T.T (sec)	<b>4.01</b>	<b>3.93</b>
Normalized	98%	100%

	Standard Deviation	2.3%
Apache Spark - 1000000 - 2000 - B.I.J.T.T (sec)	3.31	3.04
	Normalized	91.84%
	Standard Deviation	6.9%
Apache Spark - 10000000 - 100 - S.5.B.T (sec)	19.58	19.62
	Normalized	100%
	Standard Deviation	0.9%
Apache Spark - 10000000 - 100 - C.P.B (sec)	238.65	240.01
	Normalized	100%
	Standard Deviation	0.2%
Apache Spark - 10000000 - 100 - C.P.B.U.D (sec)	13.60	13.54
	Normalized	99.56%
	Standard Deviation	0.5%
Apache Spark - 10000000 - 100 - Group By Test Time (sec)	10.00	9.72
	Normalized	97.2%
	Standard Deviation	1.9%
Apache Spark - 10000000 - 100 - R.T.T (sec)	14.45	14.63
	Normalized	100%
	Standard Deviation	2%
Apache Spark - 10000000 - 100 - I.J.T.T (sec)	16.71	15.76
	Normalized	94.31%
	Standard Deviation	3%
Apache Spark - 10000000 - 100 - B.I.J.T.T (sec)	16.22	15.13
	Normalized	93.28%
	Standard Deviation	5.4%
Apache Spark - 10000000 - 500 - S.5.B.T (sec)	19.70	19.79
	Normalized	100%
	Standard Deviation	0.5%
Apache Spark - 10000000 - 500 - C.P.B (sec)	239.05	240.25
	Normalized	100%
	Standard Deviation	0.3%
Apache Spark - 10000000 - 500 - C.P.B.U.D (sec)	13.56	13.47
	Normalized	99.34%
	Standard Deviation	0.6%
Apache Spark - 10000000 - 500 - Group By Test Time (sec)	9.86	10.02
	Normalized	100%
	Standard Deviation	1.1%
Apache Spark - 10000000 - 500 - R.T.T (sec)	14.07	13.94
	Normalized	99.08%
	Standard Deviation	1.4%
Apache Spark - 10000000 - 500 - I.J.T.T (sec)	15.11	15.41
	Normalized	100%
	Standard Deviation	1.4%
Apache Spark - 10000000 - 500 - B.I.J.T.T (sec)	15.05	15.17
	Normalized	100%
	Standard Deviation	0.7%
Apache Spark - 20000000 - 100 - S.5.B.T (sec)	36.52	36.48
	Normalized	99.89%
	Standard Deviation	0.9%
Apache Spark - 20000000 - 100 - C.P.B (sec)	239.84	240.03
	Normalized	100%
	Standard Deviation	0.5%
Apache Spark - 20000000 - 100 - C.P.B.U.D (sec)	13.51	13.67

	Normalized Standard Deviation	100% 0.2%	98.83%
<b>Apache Spark - 20000000 - 100 - Group By Test Time (sec)</b>	<b>15.37</b>	<b>14.90</b>	
	Normalized Standard Deviation	96.94% 2.4%	100%
<b>Apache Spark - 20000000 - 100 - R.T.T (sec)</b>	<b>27.45</b>	<b>27.02</b>	
	Normalized Standard Deviation	98.43% 0.9%	100%
<b>Apache Spark - 20000000 - 100 - I.J.T.T (sec)</b>	<b>32.48</b>	<b>31.13</b>	
	Normalized Standard Deviation	95.84% 0.7%	100%
<b>Apache Spark - 20000000 - 100 - B.I.J.T.T (sec)</b>	<b>32.10</b>	<b>31.82</b>	
	Normalized Standard Deviation	99.13% 1.6%	100%
<b>Apache Spark - 20000000 - 500 - S.5.B.T (sec)</b>	<b>35.00</b>	<b>34.98</b>	
	Normalized Standard Deviation	99.94% 0.9%	100%
<b>Apache Spark - 20000000 - 500 - C.P.B (sec)</b>	<b>241.40</b>	<b>239.40</b>	
	Normalized Standard Deviation	99.17% 0.5%	100%
<b>Apache Spark - 20000000 - 500 - C.P.B.U.D (sec)</b>	<b>13.50</b>	<b>13.45</b>	
	Normalized Standard Deviation	99.63% 0.8%	100%
<b>Apache Spark - 20000000 - 500 - Group By Test Time (sec)</b>	<b>14.92</b>	<b>14.84</b>	
	Normalized Standard Deviation	99.46% 1.2%	100%
<b>Apache Spark - 20000000 - 500 - R.T.T (sec)</b>	<b>26.27</b>	<b>25.55</b>	
	Normalized Standard Deviation	97.26% 2.9%	100%
<b>Apache Spark - 20000000 - 500 - I.J.T.T (sec)</b>	<b>30.27</b>	<b>29.12</b>	
	Normalized Standard Deviation	96.2% 5.4%	100%
<b>Apache Spark - 20000000 - 500 - B.I.J.T.T (sec)</b>	<b>28.64</b>	<b>28.30</b>	
	Normalized Standard Deviation	98.81% 1.5%	100%
<b>Apache Spark - 40000000 - 100 - S.5.B.T (sec)</b>	<b>69.06</b>	<b>66.03</b>	
	Normalized Standard Deviation	95.61% 1.9%	100%
<b>Apache Spark - 40000000 - 100 - C.P.B (sec)</b>	<b>249.74</b>	<b>240.99</b>	
	Normalized Standard Deviation	96.5% 0.6%	100%
<b>Apache Spark - 40000000 - 100 - C.P.B.U.D (sec)</b>	<b>13.83</b>	<b>13.70</b>	
	Normalized Standard Deviation	99.06% 0.6%	100%
<b>Apache Spark - 40000000 - 100 - Group By Test Time (sec)</b>	<b>40.60</b>	<b>40.43</b>	
	Normalized Standard Deviation	99.58% 1.1%	100%
<b>Apache Spark - 40000000 - 100 - R.T.T (sec)</b>	<b>52.39</b>	<b>49.82</b>	
	Normalized Standard Deviation	95.09% 4.5%	100%
<b>Apache Spark - 40000000 - 100 - I.J.T.T (sec)</b>	<b>61.59</b>	<b>56.68</b>	
	Normalized	92.03%	100%

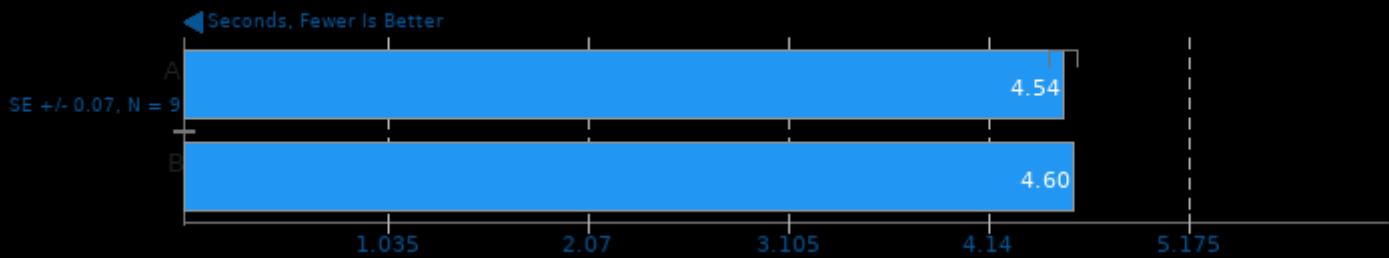
	Standard Deviation	5%
Apache Spark - 40000000 - 100 - B.I.J.T.T (sec)	60.30	58.25
	Normalized	96.6%
	Standard Deviation	4.1%
Apache Spark - 40000000 - 500 - S.5.B.T (sec)	69.51	68.08
	Normalized	97.94%
	Standard Deviation	0.9%
Apache Spark - 40000000 - 500 - C.P.B (sec)	249.44	244.74
	Normalized	98.12%
	Standard Deviation	2.4%
Apache Spark - 40000000 - 500 - C.P.B.U.D (sec)	13.66	13.43
	Normalized	98.32%
	Standard Deviation	0.8%
Apache Spark - 40000000 - 500 - Group By Test Time (sec)	35.35	35.64
	Normalized	100%
	Standard Deviation	2.1%
Apache Spark - 40000000 - 500 - R.T.T (sec)	50.68	49.20
	Normalized	97.08%
	Standard Deviation	0.8%
Apache Spark - 40000000 - 500 - I.J.T.T (sec)	61.35	57.43
	Normalized	93.61%
	Standard Deviation	4.5%
Apache Spark - 40000000 - 500 - B.I.J.T.T (sec)	64.33	58.92
	Normalized	91.59%
	Standard Deviation	4.5%
Apache Spark - 10000000 - 1000 - S.5.B.T (sec)	19.99	20.05
	Normalized	100%
	Standard Deviation	0.7%
Apache Spark - 10000000 - 1000 - C.P.B (sec)	241.82	239.84
	Normalized	99.18%
	Standard Deviation	0.9%
Apache Spark - 10000000 - 1000 - C.P.B.U.D (sec)	13.56	13.58
	Normalized	100%
	Standard Deviation	0.4%
Apache Spark - 10000000 - 1000 - Group By Test Time (sec)	10.44	10.65
	Normalized	98.03%
	Standard Deviation	2%
Apache Spark - 10000000 - 1000 - R.T.T (sec)	13.96	14.12
	Normalized	100%
	Standard Deviation	0.9%
Apache Spark - 10000000 - 1000 - I.J.T.T (sec)	15.58	15.67
	Normalized	100%
	Standard Deviation	0.7%
Apache Spark - 10000000 - 1000 - B.I.J.T.T (sec)	14.92	15.03
	Normalized	99.27%
	Standard Deviation	1.3%
Apache Spark - 10000000 - 2000 - S.5.B.T (sec)	20.40	20.11
	Normalized	98.58%
	Standard Deviation	0.7%
Apache Spark - 10000000 - 2000 - C.P.B (sec)	241.94	241.11
	Normalized	99.66%
	Standard Deviation	0.6%
Apache Spark - 10000000 - 2000 - C.P.B.U.D (sec)	13.54	13.60

	Normalized	100%	99.56%
	Standard Deviation	0.5%	
Apache Spark - 10000000 - 2000 - Group By Test Time	<b>10.94</b>	<b>10.50</b>	
(sec)			
	Normalized	95.98%	100%
	Standard Deviation	2%	
Apache Spark - 10000000 - 2000 - R.T.T (sec)	<b>14.44</b>	<b>14.17</b>	
	Normalized	98.13%	100%
	Standard Deviation	0.2%	
Apache Spark - 10000000 - 2000 - I.J.T.T (sec)	<b>16.80</b>	<b>16.17</b>	
	Normalized	96.25%	100%
	Standard Deviation	1.7%	
Apache Spark - 10000000 - 2000 - B.I.J.T.T (sec)	<b>15.63</b>	<b>15.34</b>	
	Normalized	98.14%	100%
	Standard Deviation	1.2%	
Apache Spark - 20000000 - 1000 - S.5.B.T (sec)	<b>35.73</b>	<b>36.03</b>	
	Normalized	100%	99.17%
	Standard Deviation	2.1%	
Apache Spark - 20000000 - 1000 - C.P.B (sec)	<b>241.00</b>	<b>244.01</b>	
	Normalized	100%	98.77%
	Standard Deviation	0.5%	
Apache Spark - 20000000 - 1000 - C.P.B.U.D (sec)	<b>13.60</b>	<b>13.53</b>	
	Normalized	99.49%	100%
	Standard Deviation	0.1%	
Apache Spark - 20000000 - 1000 - Group By Test Time	<b>14.95</b>	<b>15.58</b>	
(sec)			
	Normalized	100%	95.96%
	Standard Deviation	0.8%	
Apache Spark - 20000000 - 1000 - R.T.T (sec)	<b>25.65</b>	<b>26.99</b>	
	Normalized	100%	95.04%
	Standard Deviation	0.8%	
Apache Spark - 20000000 - 1000 - I.J.T.T (sec)	<b>30.15</b>	<b>30.55</b>	
	Normalized	100%	98.69%
	Standard Deviation	2.4%	
Apache Spark - 20000000 - 1000 - B.I.J.T.T (sec)	<b>28.77</b>	<b>30.29</b>	
	Normalized	100%	94.98%
	Standard Deviation	0.7%	
Apache Spark - 20000000 - 2000 - S.5.B.T (sec)	<b>36.28</b>	<b>36.36</b>	
	Normalized	100%	99.78%
	Standard Deviation	1.1%	
Apache Spark - 20000000 - 2000 - C.P.B (sec)	<b>242.09</b>	<b>243.77</b>	
	Normalized	100%	99.31%
	Standard Deviation	0.7%	
Apache Spark - 20000000 - 2000 - C.P.B.U.D (sec)	<b>13.58</b>	<b>13.48</b>	
	Normalized	99.26%	100%
	Standard Deviation	0.6%	
Apache Spark - 20000000 - 2000 - Group By Test Time	<b>15.78</b>	<b>15.79</b>	
(sec)			
	Normalized	100%	99.94%
	Standard Deviation	2.1%	
Apache Spark - 20000000 - 2000 - R.T.T (sec)	<b>26.46</b>	<b>26.54</b>	
	Normalized	100%	99.7%
	Standard Deviation	3.2%	
Apache Spark - 20000000 - 2000 - I.J.T.T (sec)	<b>30.36</b>	<b>30.83</b>	
	Normalized	100%	98.48%

	Standard Deviation	0.4%
Apache Spark - 20000000 - 2000 - B.I.J.T.T (sec)	29.44	29.56
	Normalized	100%
	Standard Deviation	1%
Apache Spark - 40000000 - 1000 - S.5.B.T (sec)	69.98	69.51
	Normalized	99.33%
	Standard Deviation	1.3%
Apache Spark - 40000000 - 1000 - C.P.B (sec)	247.40	246.28
	Normalized	99.55%
	Standard Deviation	0.3%
Apache Spark - 40000000 - 1000 - C.P.B.U.D (sec)	13.58	13.65
	Normalized	100%
	Standard Deviation	0.6%
Apache Spark - 40000000 - 1000 - Group By Test Time (sec)	33.95	34.84
	Normalized	97.45%
	Standard Deviation	1.4%
Apache Spark - 40000000 - 1000 - R.T.T (sec)	50.05	50.27
	Normalized	100%
	Standard Deviation	2.1%
Apache Spark - 40000000 - 1000 - I.J.T.T (sec)	59.25	59.74
	Normalized	100%
	Standard Deviation	2.5%
Apache Spark - 40000000 - 1000 - B.I.J.T.T (sec)	59.41	59.06
	Normalized	99.41%
	Standard Deviation	2.1%
Apache Spark - 40000000 - 2000 - S.5.B.T (sec)	70.44	70.43
	Normalized	99.99%
	Standard Deviation	0.3%
Apache Spark - 40000000 - 2000 - C.P.B (sec)	246.54	250.15
	Normalized	100%
	Standard Deviation	0.5%
Apache Spark - 40000000 - 2000 - C.P.B.U.D (sec)	13.83	13.73
	Normalized	99.28%
	Standard Deviation	0.2%
Apache Spark - 40000000 - 2000 - Group By Test Time (sec)	34.71	34.91
	Normalized	99.43%
	Standard Deviation	2.2%
Apache Spark - 40000000 - 2000 - R.T.T (sec)	50.81	50.24
	Normalized	98.88%
	Standard Deviation	1.3%
Apache Spark - 40000000 - 2000 - I.J.T.T (sec)	61.61	61.55
	Normalized	99.9%
	Standard Deviation	1.3%
Apache Spark - 40000000 - 2000 - B.I.J.T.T (sec)	61.85	61.79
	Normalized	99.9%
	Standard Deviation	2.4%

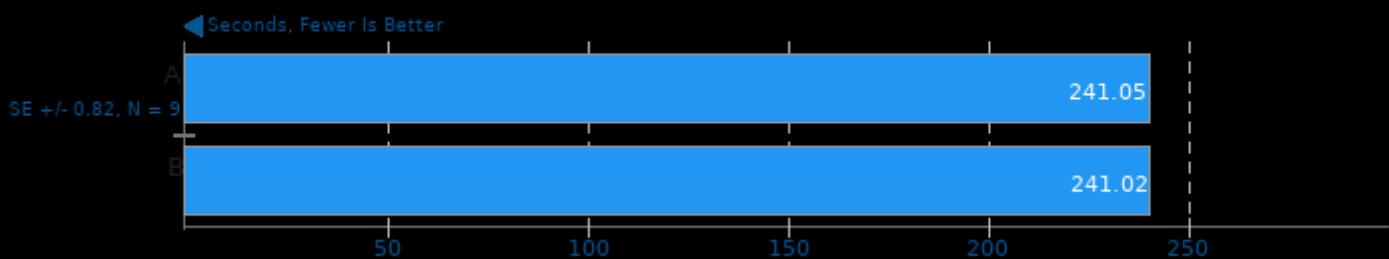
## Apache Spark 3.3

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



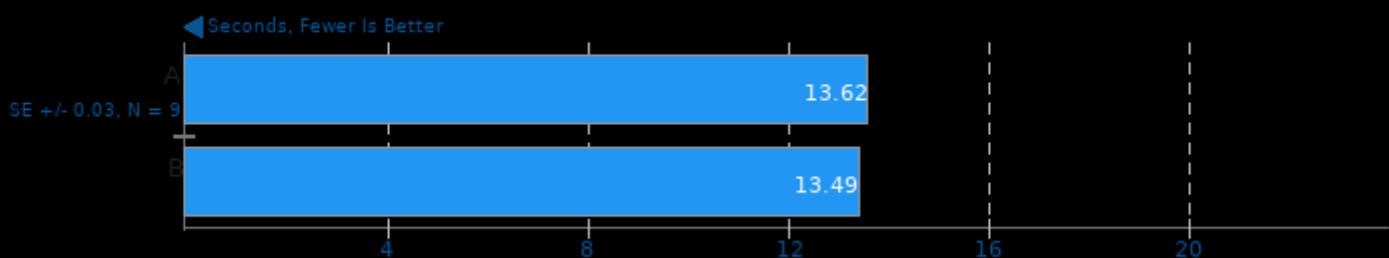
## Apache Spark 3.3

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



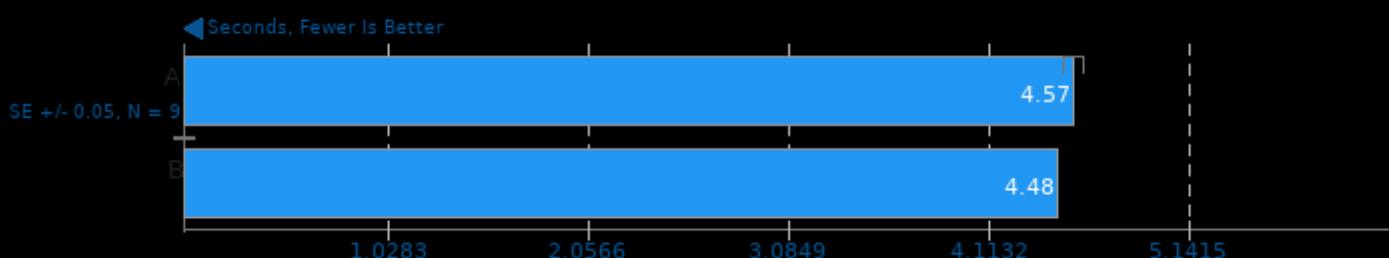
## Apache Spark 3.3

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



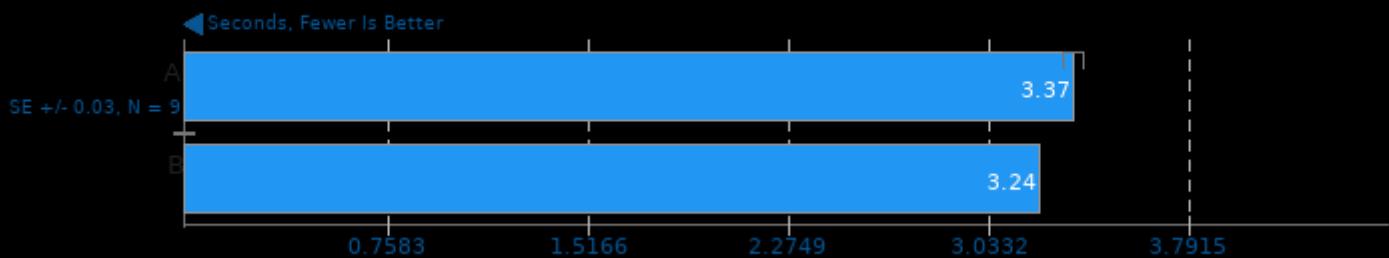
## Apache Spark 3.3

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



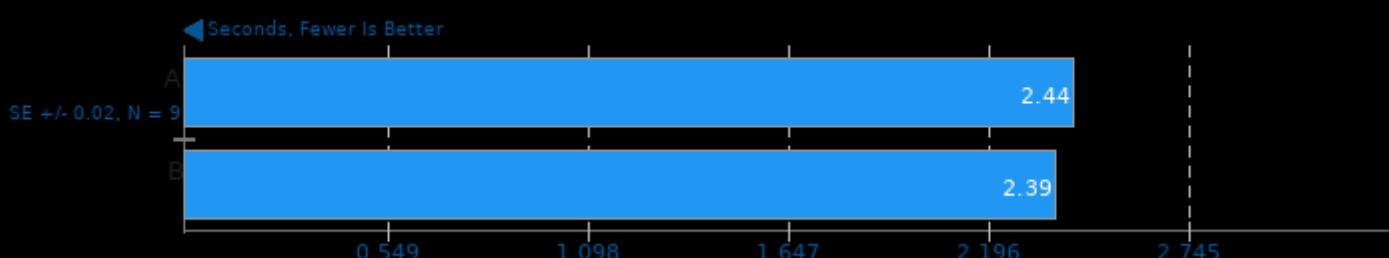
## Apache Spark 3.3

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



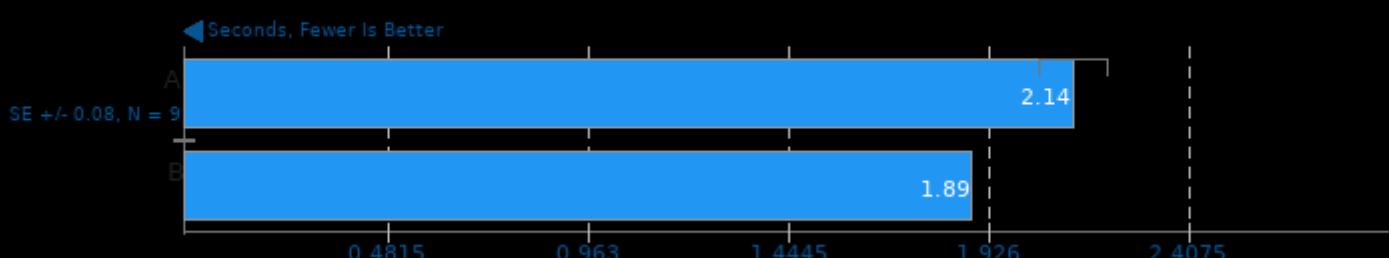
## Apache Spark 3.3

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



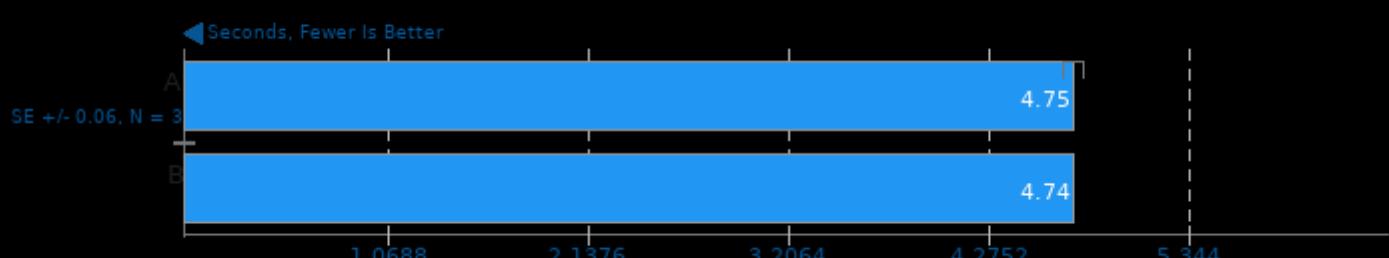
## Apache Spark 3.3

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



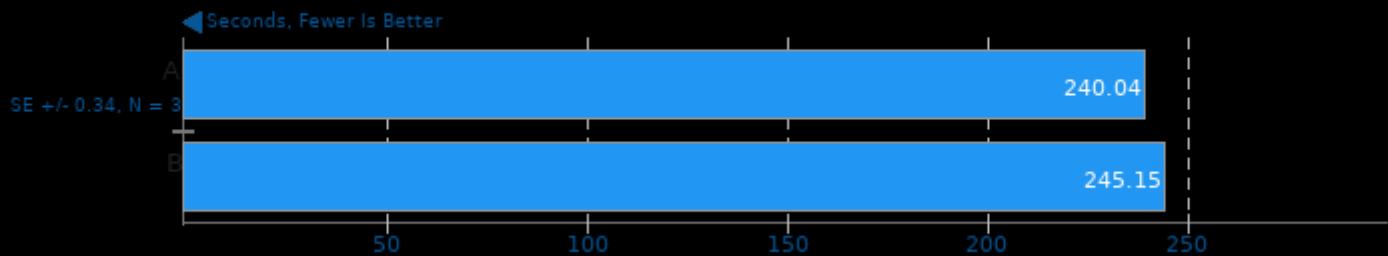
## Apache Spark 3.3

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



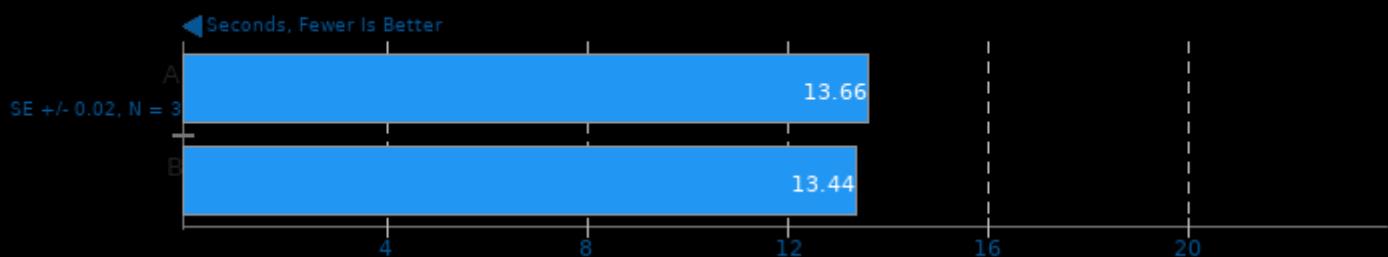
## Apache Spark 3.3

Row Count: 1000000 - Partitions: 500 - Calculate Pi Benchmark



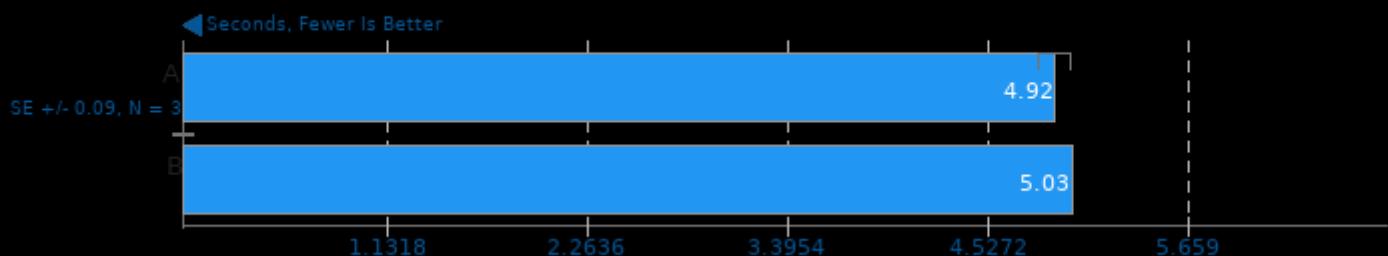
## Apache Spark 3.3

Row Count: 1000000 - Partitions: 500 - Calculate Pi Benchmark Using Dataframe



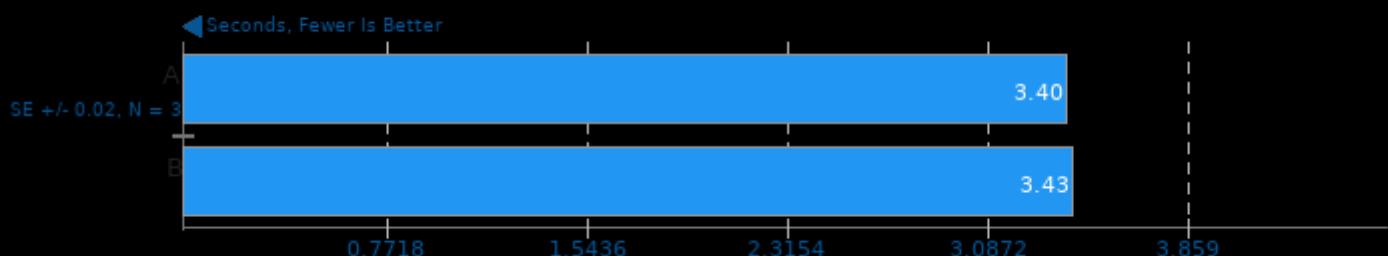
## Apache Spark 3.3

Row Count: 1000000 - Partitions: 500 - Group By Test Time



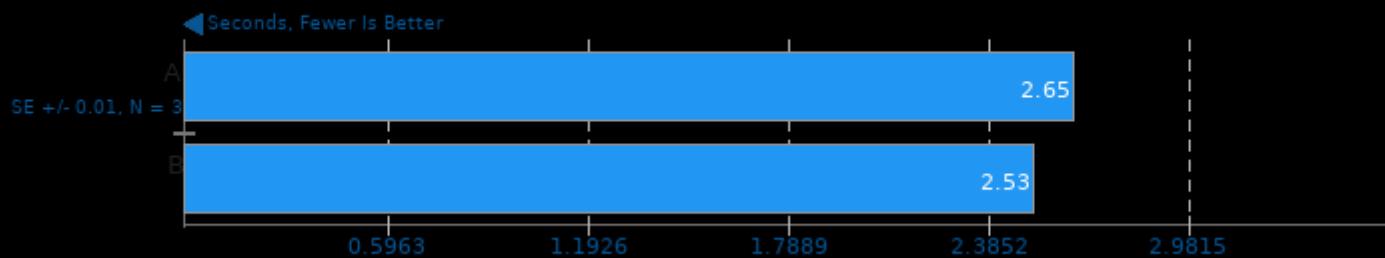
## Apache Spark 3.3

Row Count: 1000000 - Partitions: 500 - Repartition Test Time



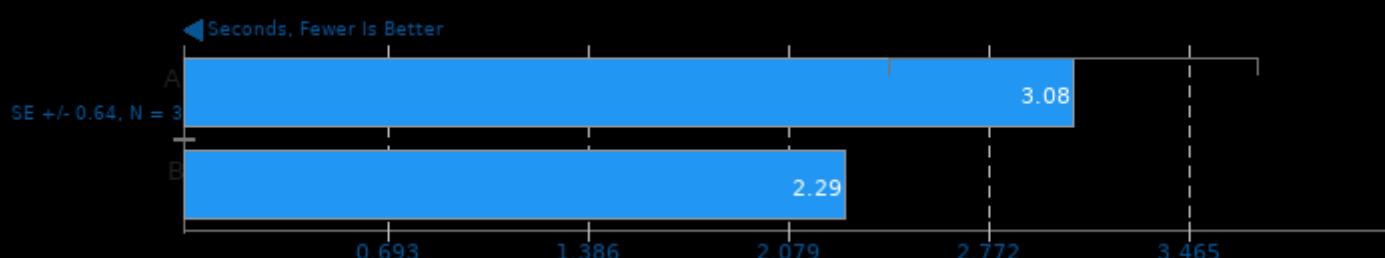
## Apache Spark 3.3

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



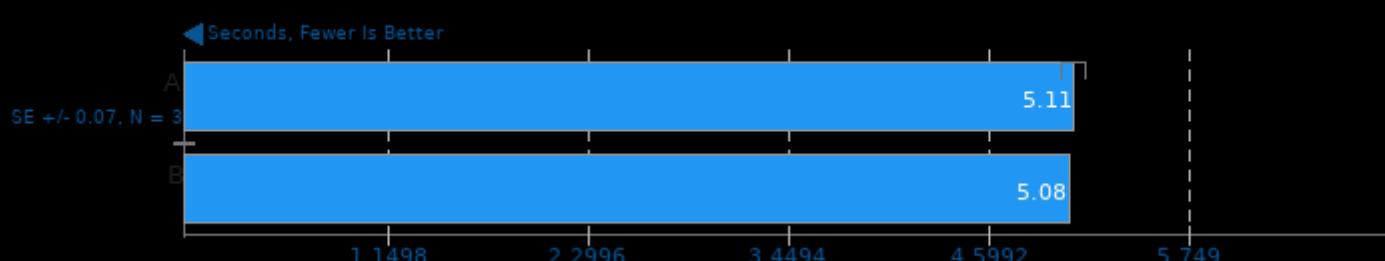
## Apache Spark 3.3

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



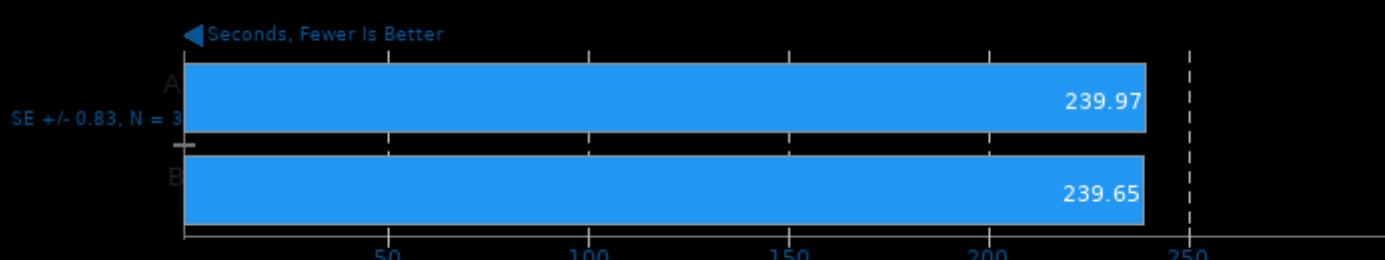
## Apache Spark 3.3

Row Count: 1000000 - Partitions: 1000 - SHA-512 Benchmark Time



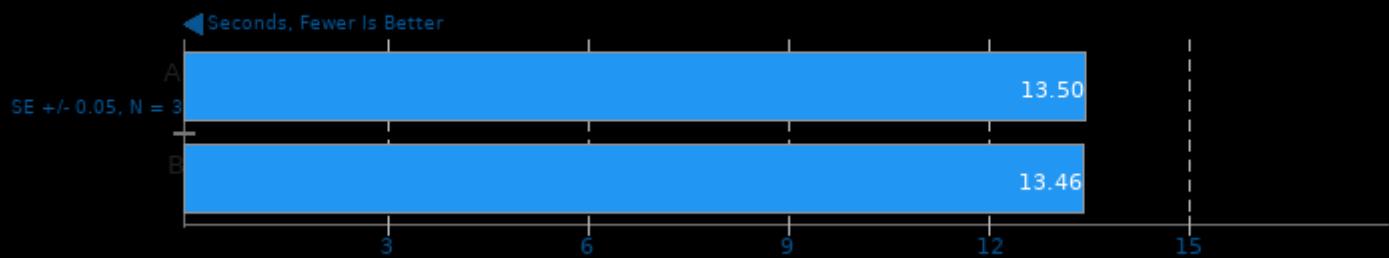
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Row Count: 1000000 - Partitions: 1000 - Calculate Pi Benchmark



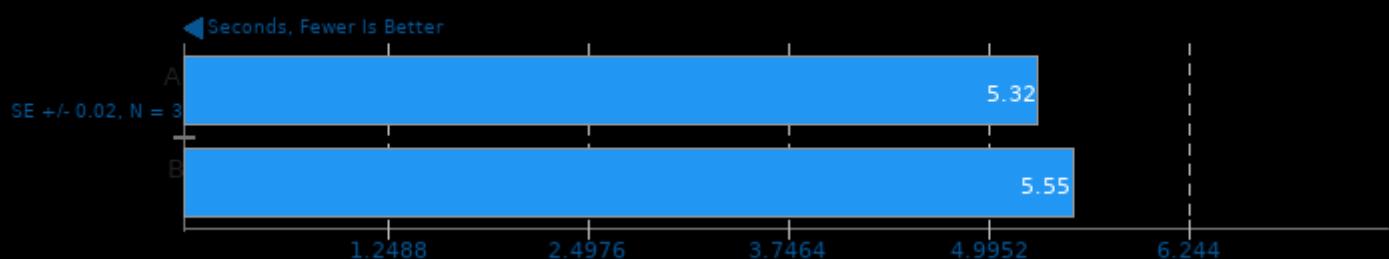
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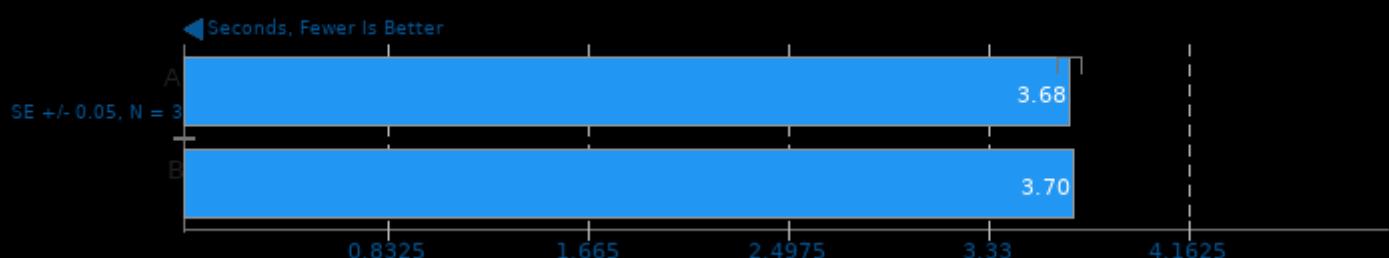
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Row Count: 1000000 - Partitions: 1000 - Group By Test Time



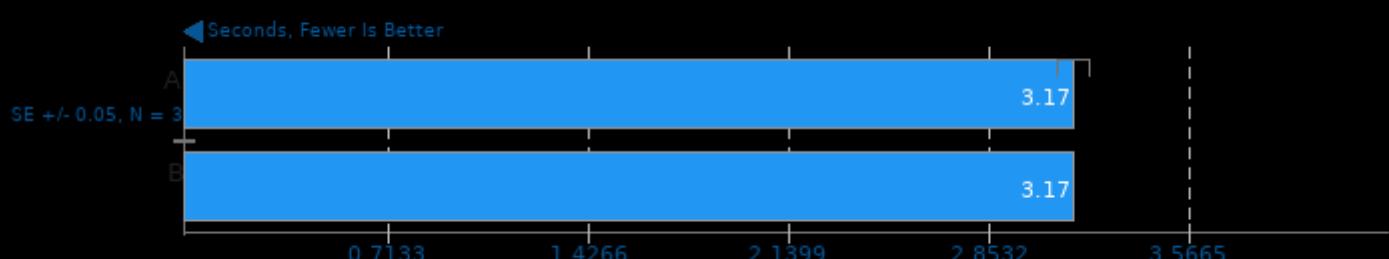
## Apache Spark 3.3

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



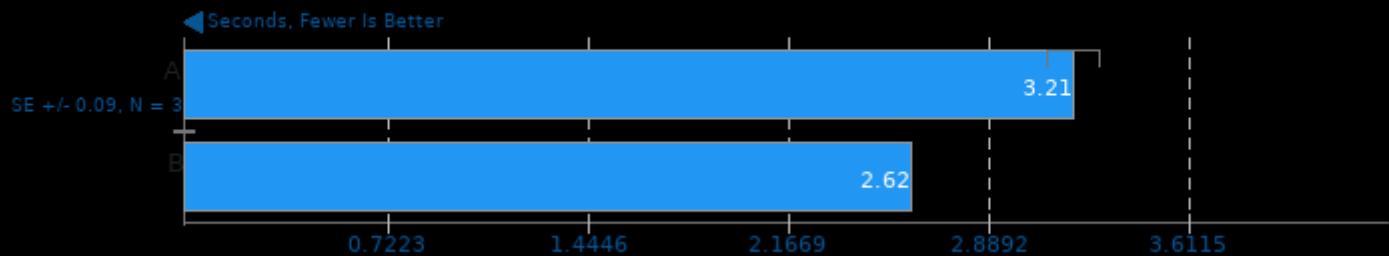
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Row Count: 1000000 - Partitions: 1000 - Inner Join Test Time



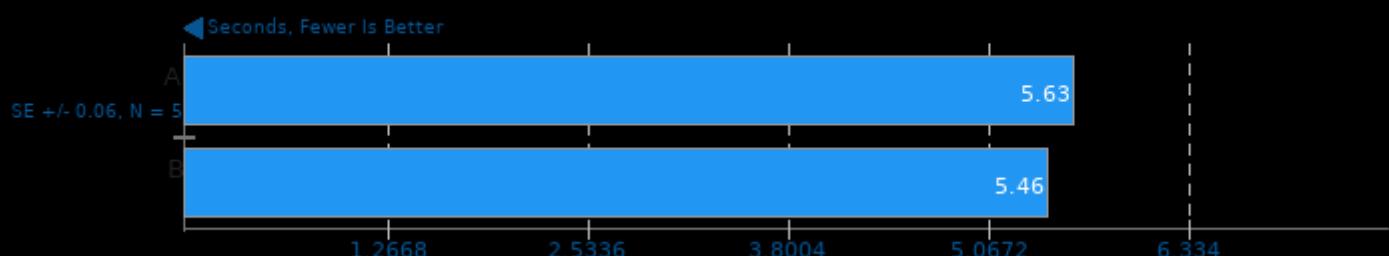
## Apache Spark 3.3

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



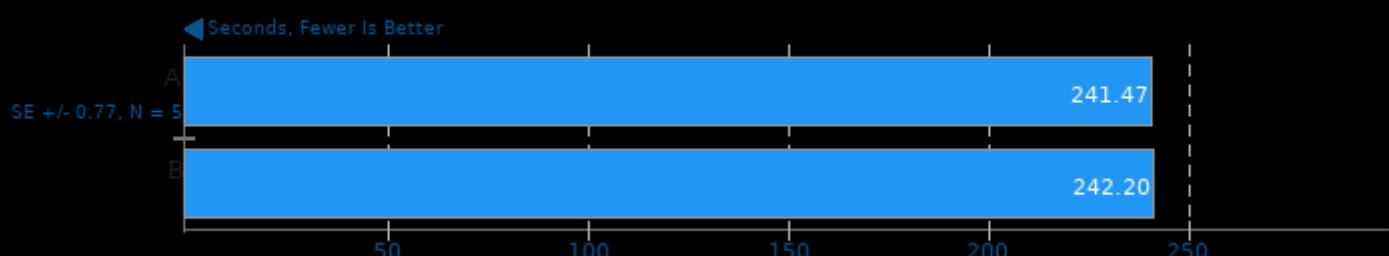
## Apache Spark 3.3

Row Count: 1000000 - Partitions: 2000 - SHA-512 Benchmark Time



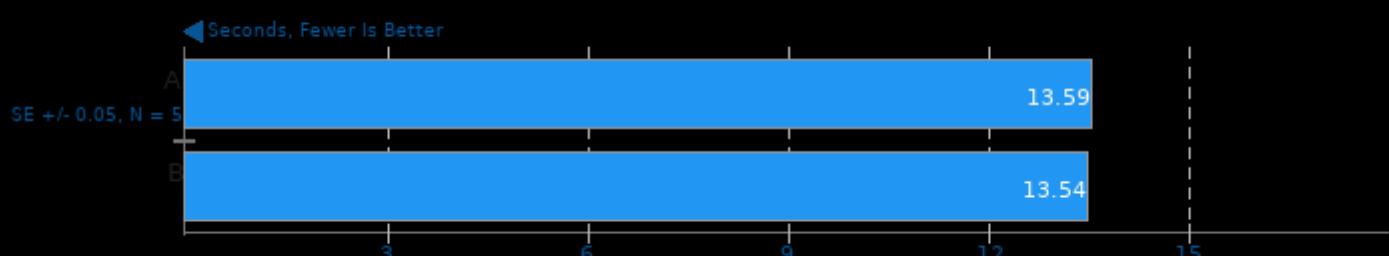
## Apache Spark 3.3

Row Count: 1000000 - Partitions: 2000 - Calculate Pi Benchmark



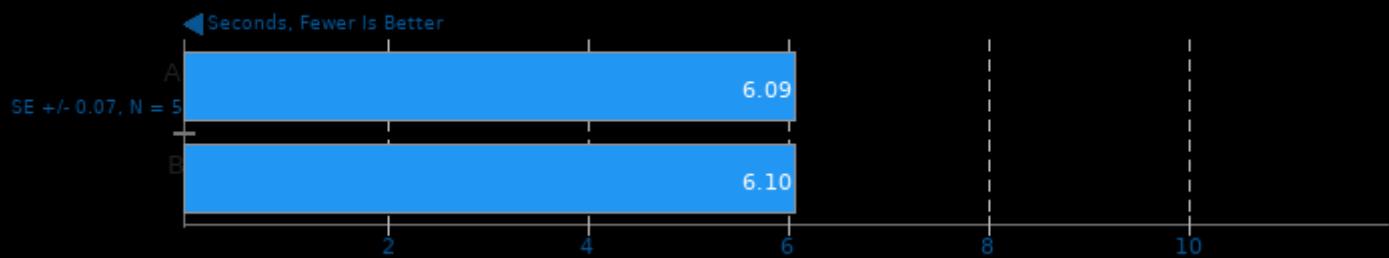
## Apache Spark 3.3

Row Count: 1000000 - Partitions: 2000 - Calculate Pi Benchmark Using Dataframe



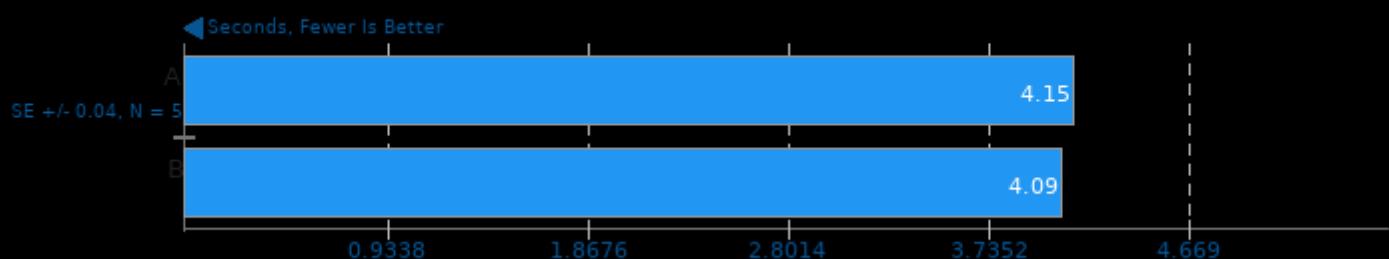
## Apache Spark 3.3

Row Count: 1000000 - Partitions: 2000 - Group By Test Time



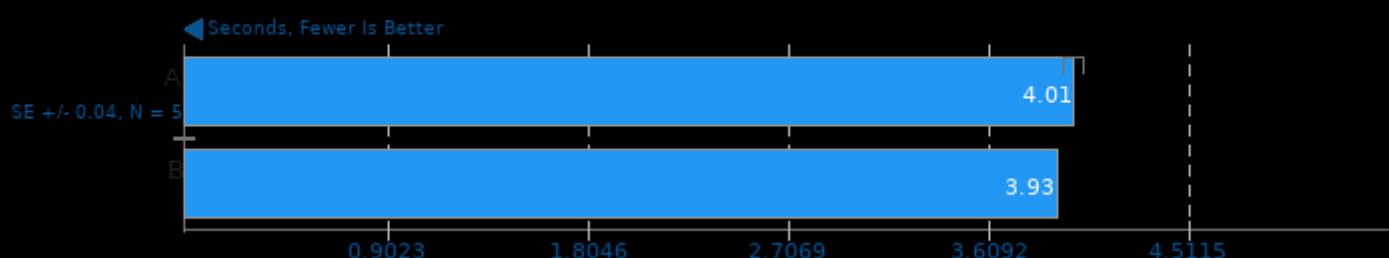
## Apache Spark 3.3

Row Count: 1000000 - Partitions: 2000 - Repartition Test Time



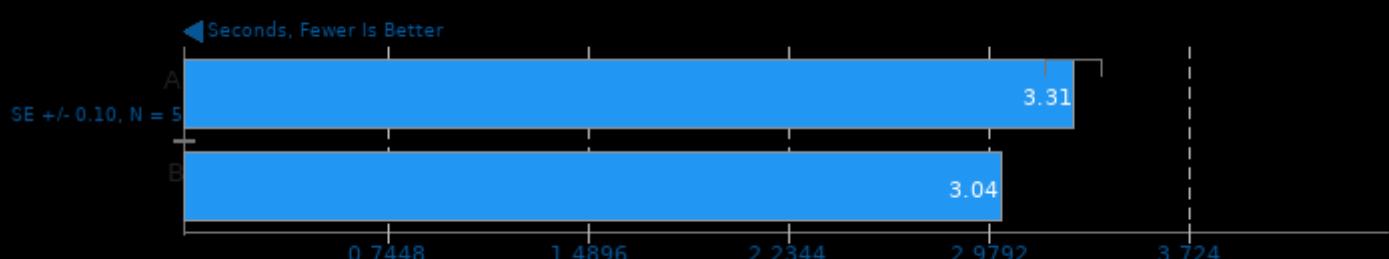
## Apache Spark 3.3

Row Count: 1000000 - Partitions: 2000 - Inner Join Test Time



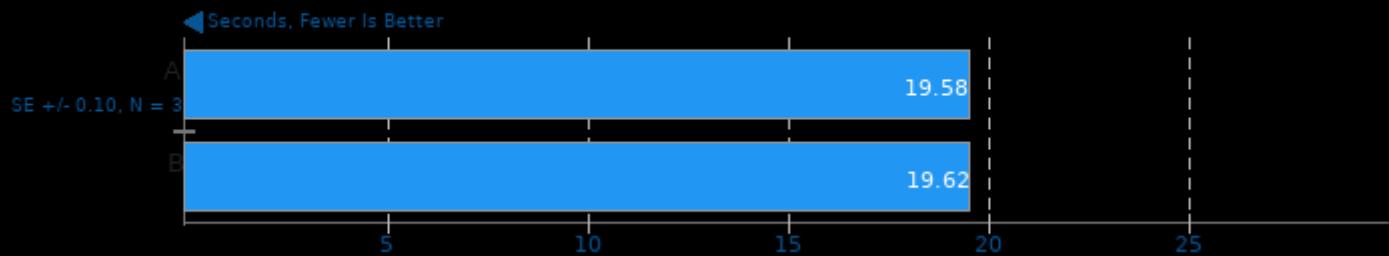
## Apache Spark 3.3

Row Count: 1000000 - Partitions: 2000 - Broadcast Inner Join Test Time



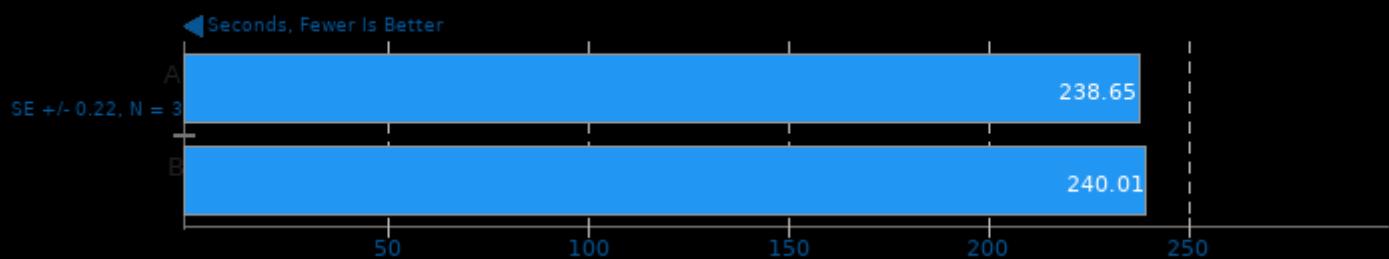
## Apache Spark 3.3

Row Count: 10000000 - Partitions: 100 - SHA-512 Benchmark Time



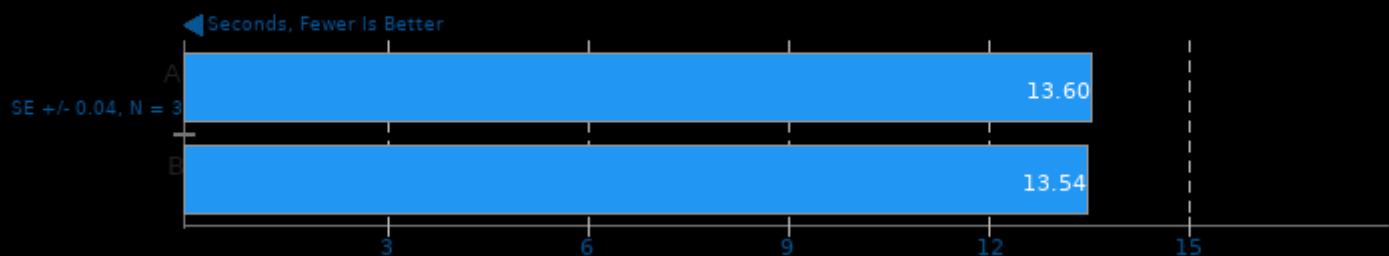
## Apache Spark 3.3

Row Count: 10000000 - Partitions: 100 - Calculate Pi Benchmark



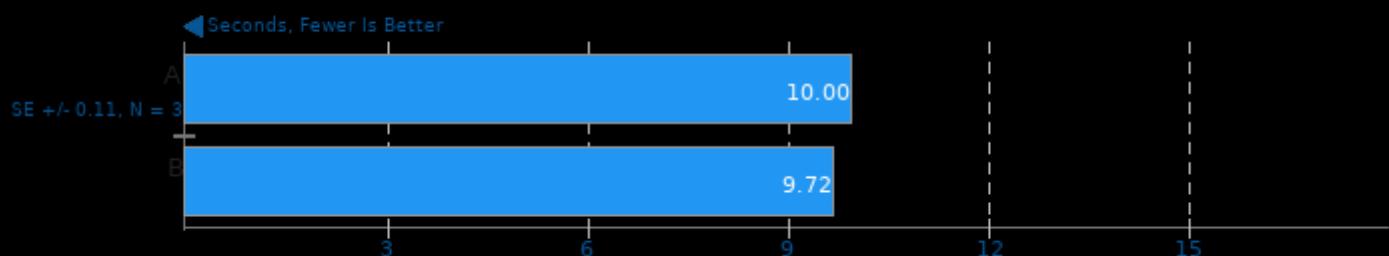
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Row Count: 10000000 - Partitions: 100 - Calculate Pi Benchmark Using Dataframe



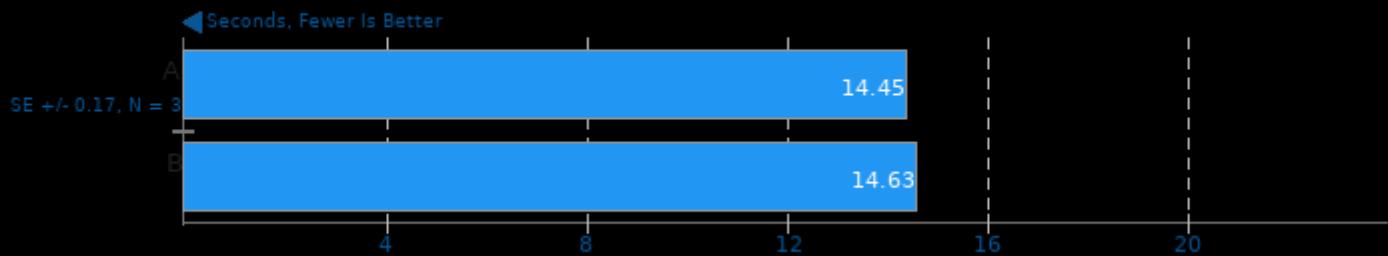
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Row Count: 10000000 - Partitions: 100 - Group By Test Time



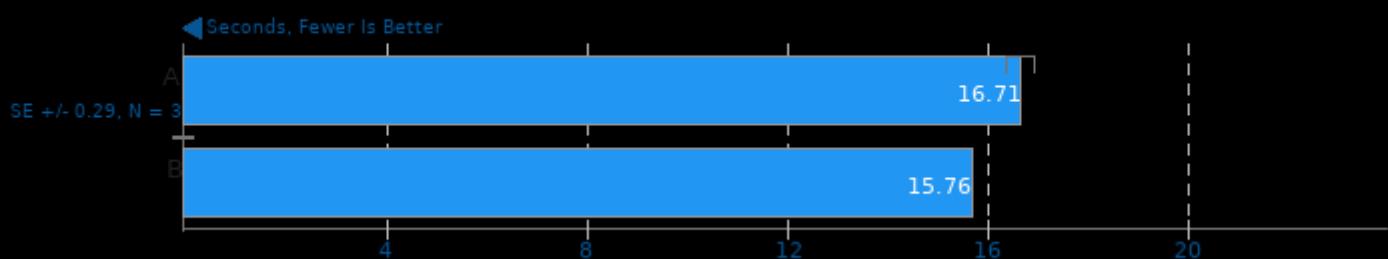
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Row Count: 10000000 - Partitions: 100 - Repartition Test Time



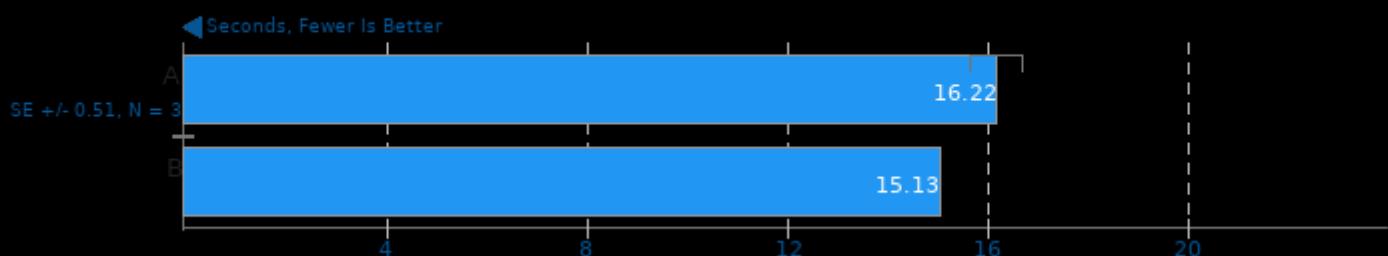
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Row Count: 10000000 - Partitions: 100 - Inner Join Test Time



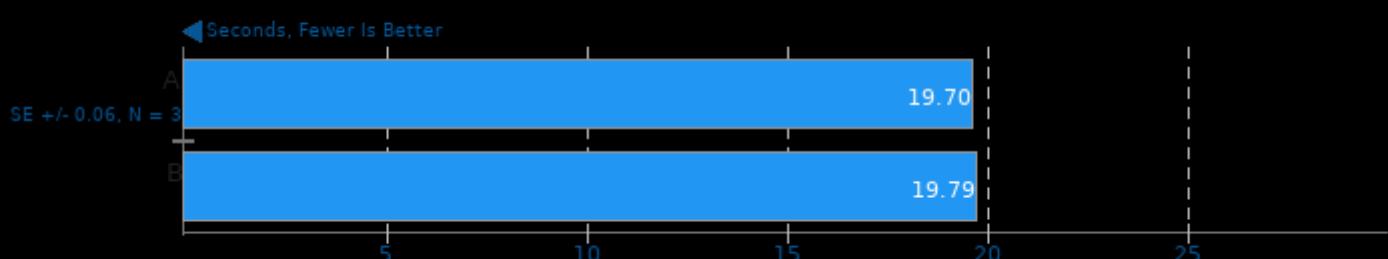
## Apache Spark 3.3

Row Count: 10000000 - Partitions: 100 - Broadcast Inner Join Test Time



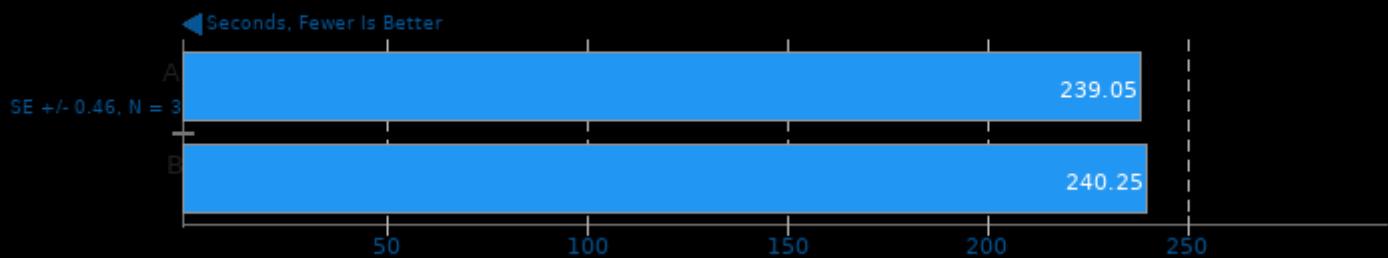
## Apache Spark 3.3

Row Count: 10000000 - Partitions: 500 - SHA-512 Benchmark Time



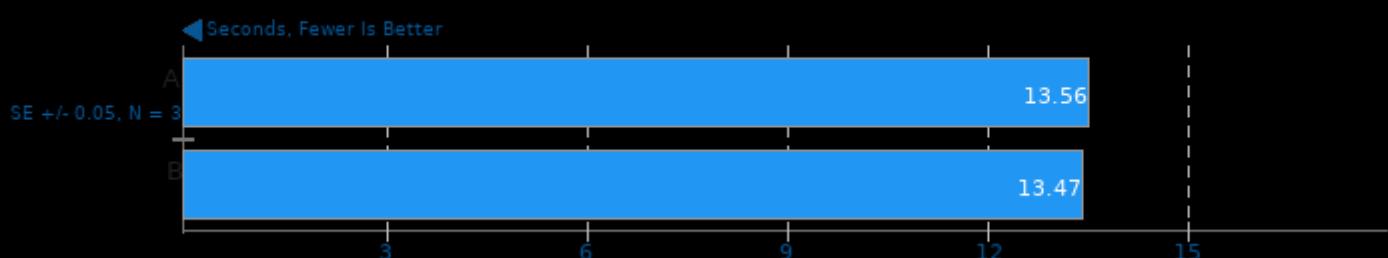
## Apache Spark 3.3

Row Count: 10000000 - Partitions: 500 - Calculate Pi Benchmark



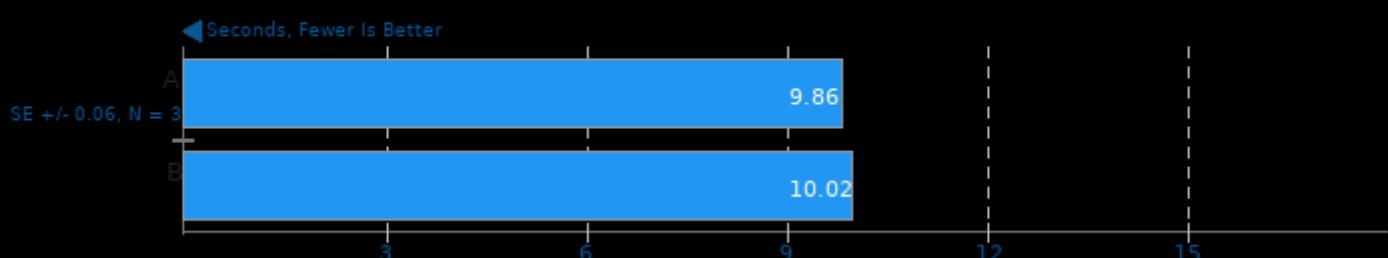
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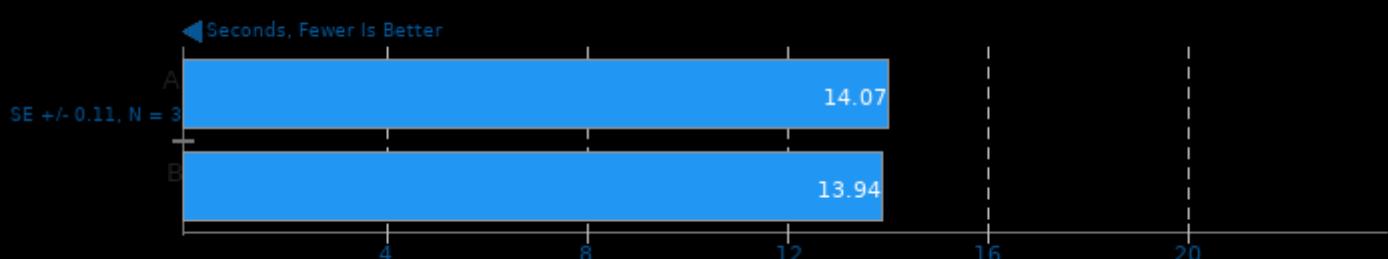
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Row Count: 10000000 - Partitions: 500 - Group By Test Time



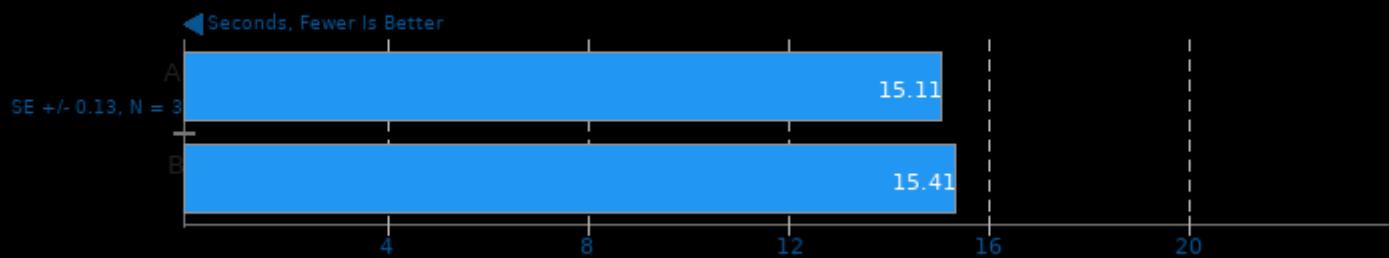
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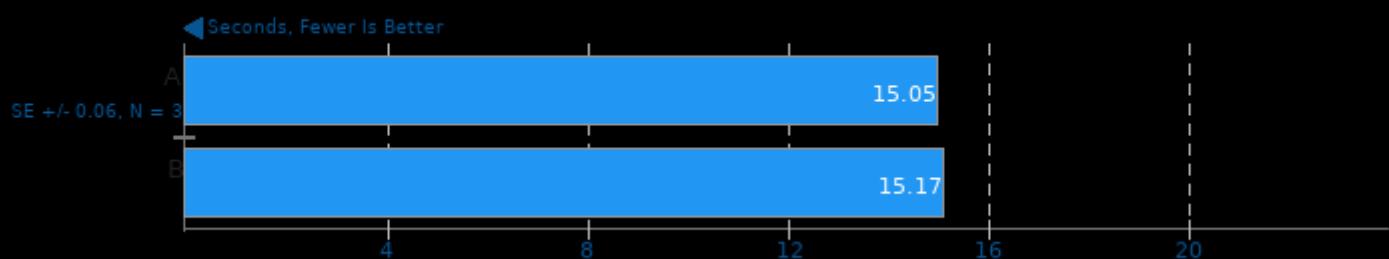
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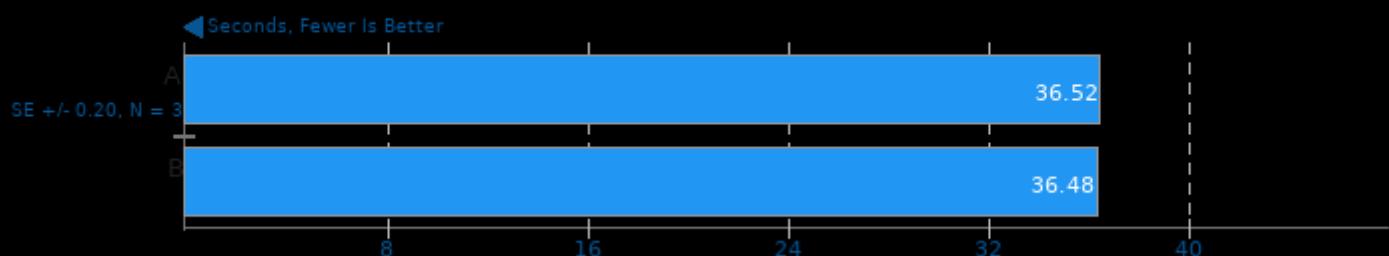
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Row Count: 10000000 - Partitions: 500 - Broadcast Inner Join Test Time



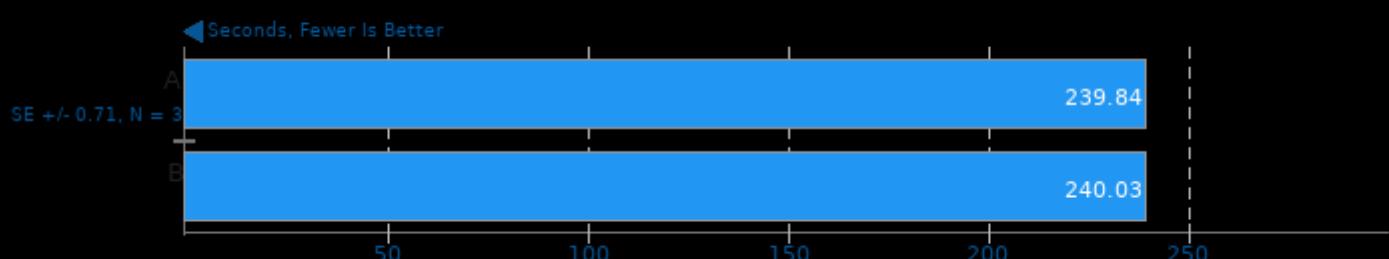
## Apache Spark 3.3

Row Count: 20000000 - Partitions: 100 - SHA-512 Benchmark Time



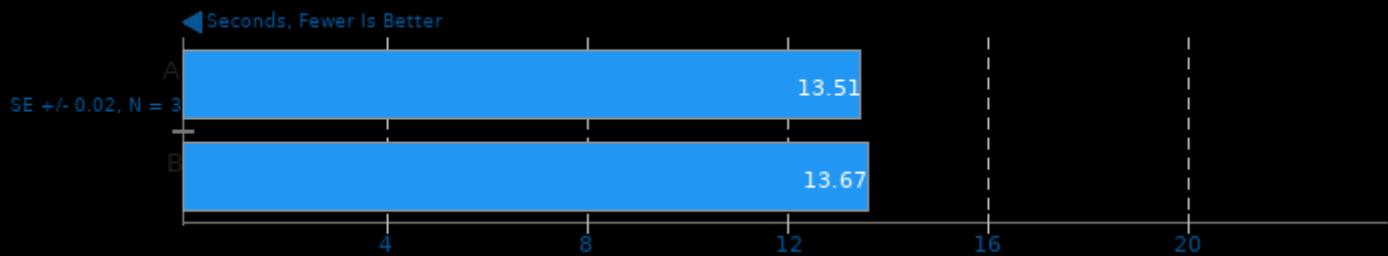
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Row Count: 20000000 - Partitions: 100 - Calculate Pi Benchmark



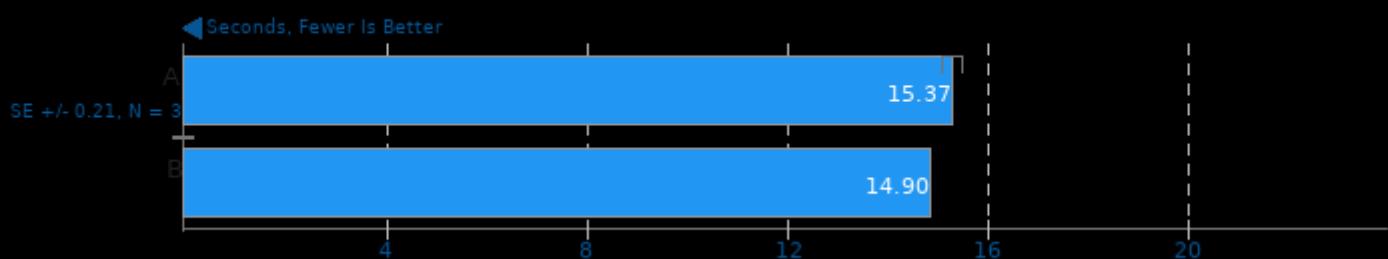
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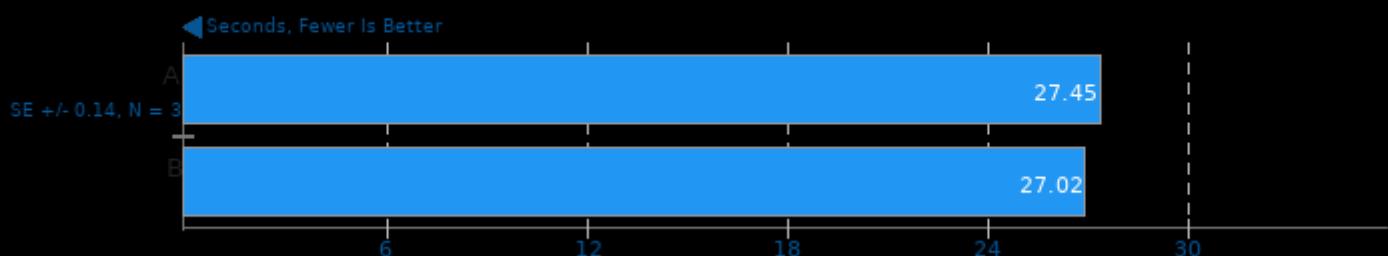
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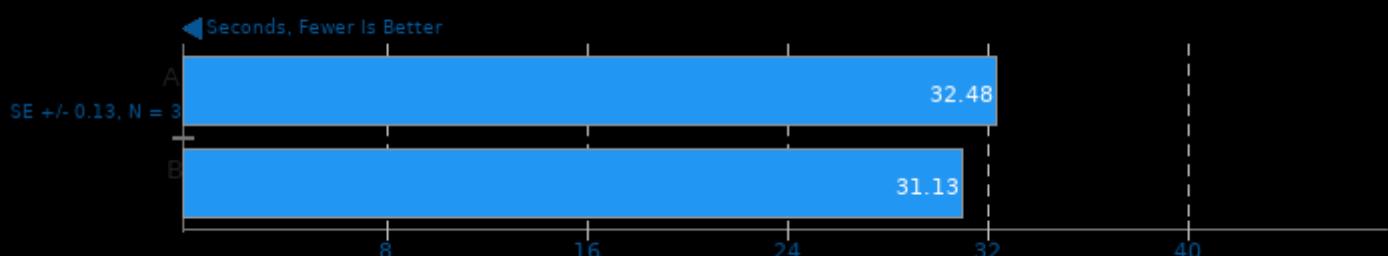
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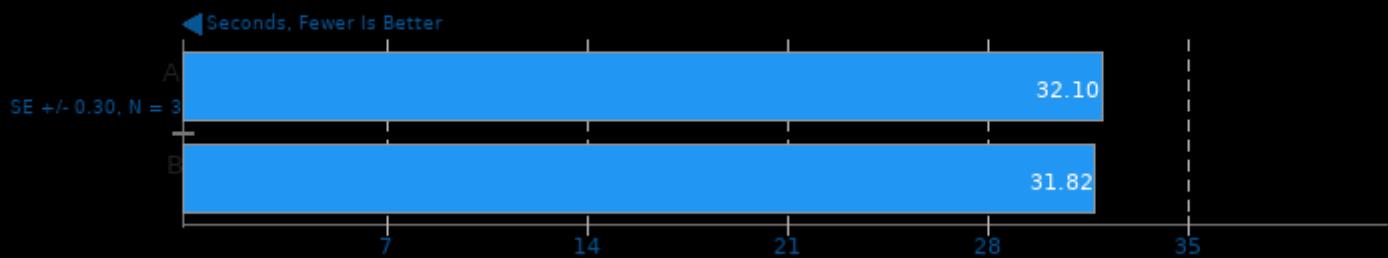
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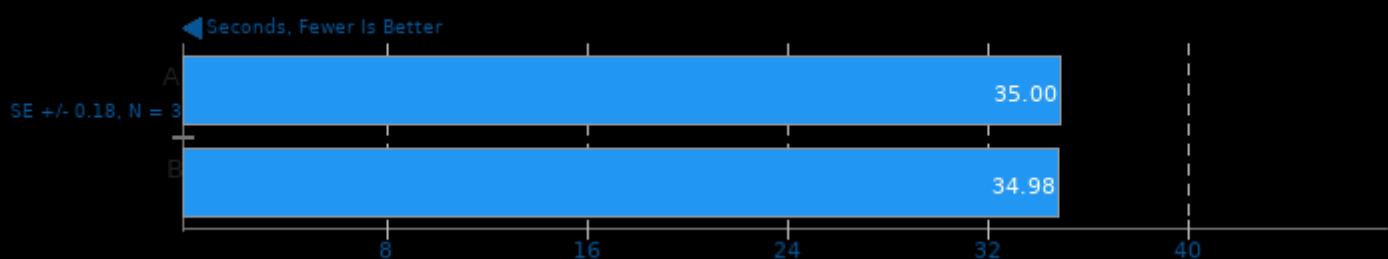
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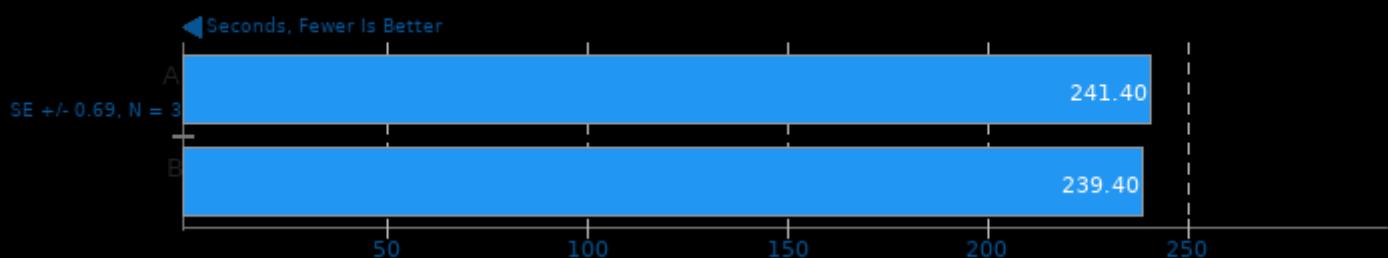
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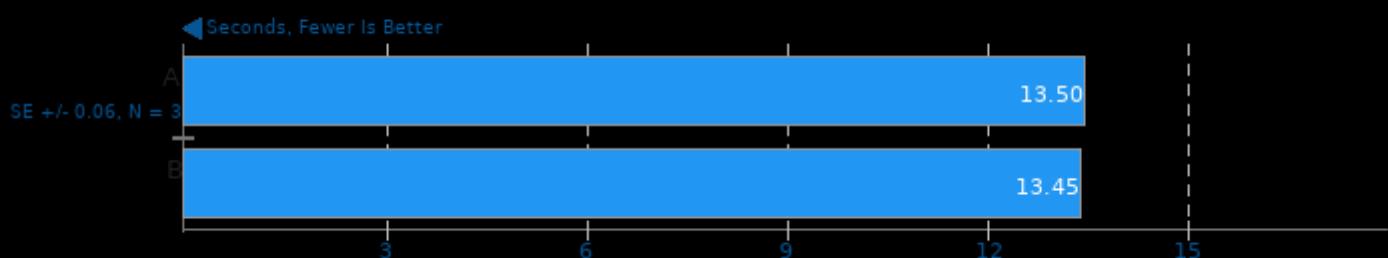
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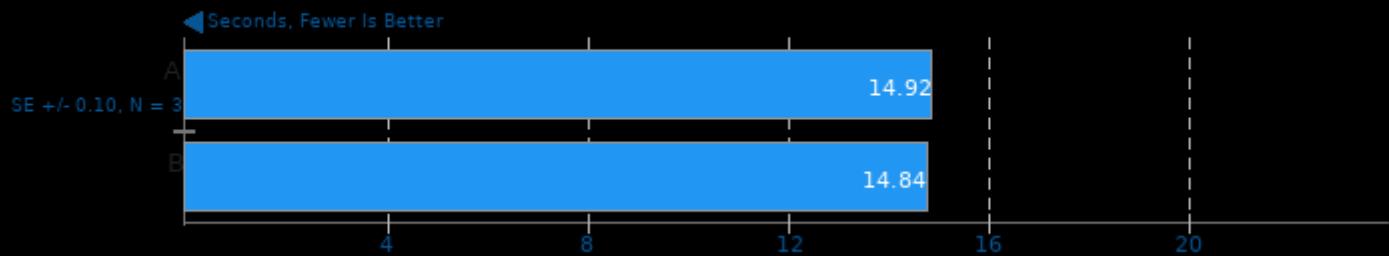
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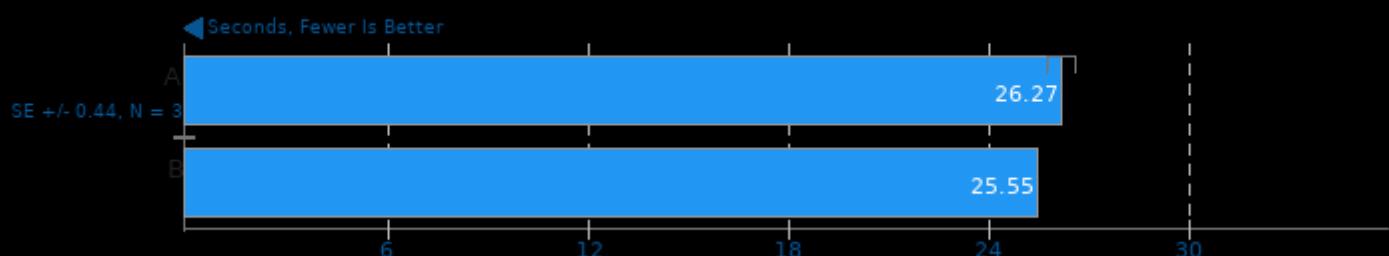
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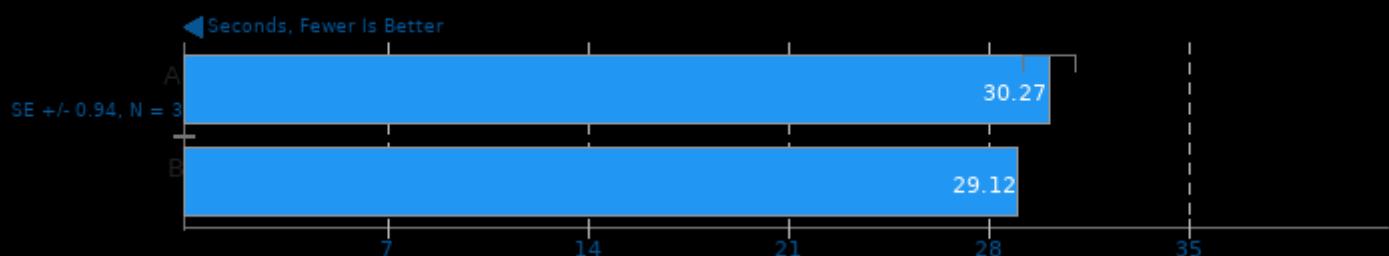
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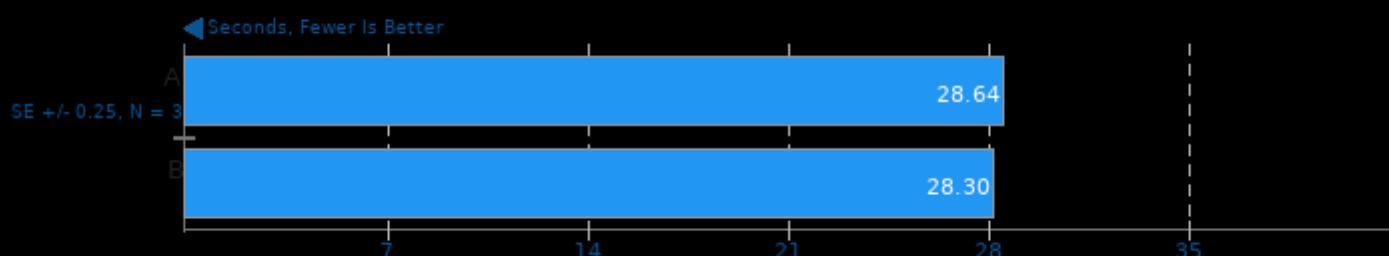
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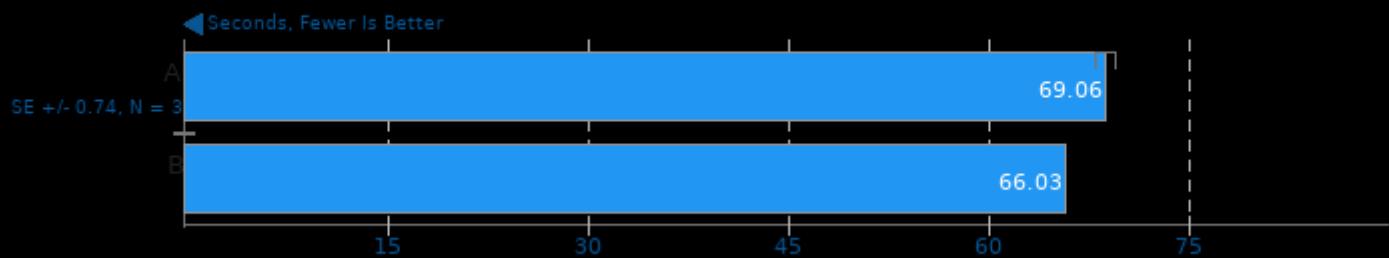
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Row Count: 20000000 - Partitions: 500 - Broadcast Inner Join Test Time



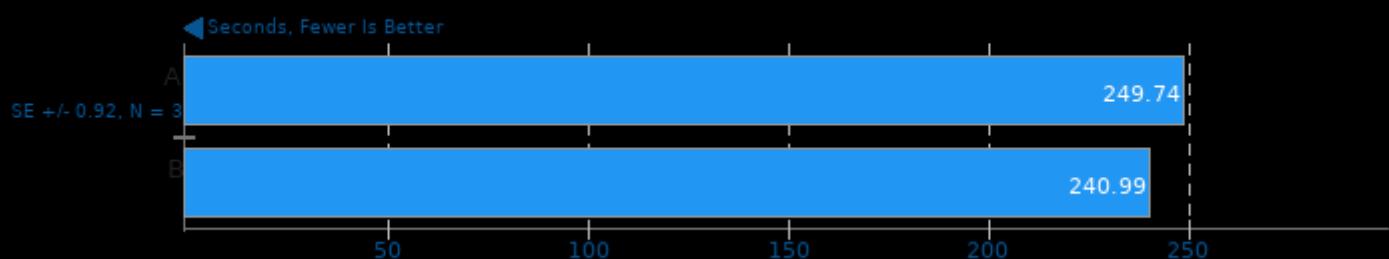
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Row Count: 40000000 - Partitions: 100 - SHA-512 Benchmark Time



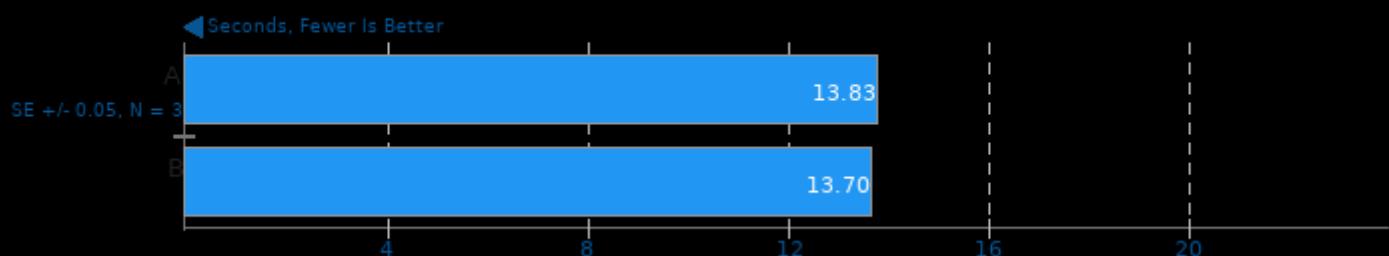
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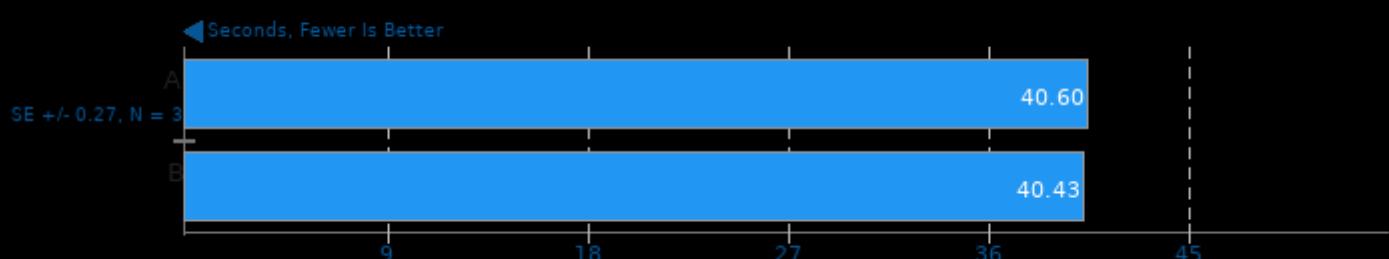
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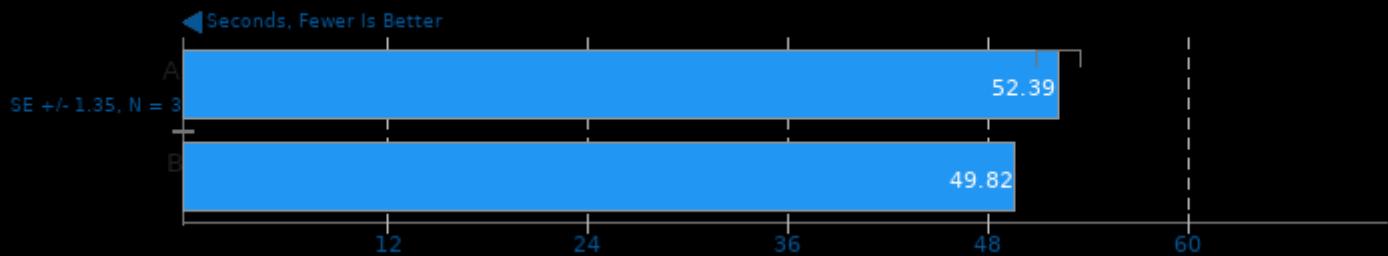
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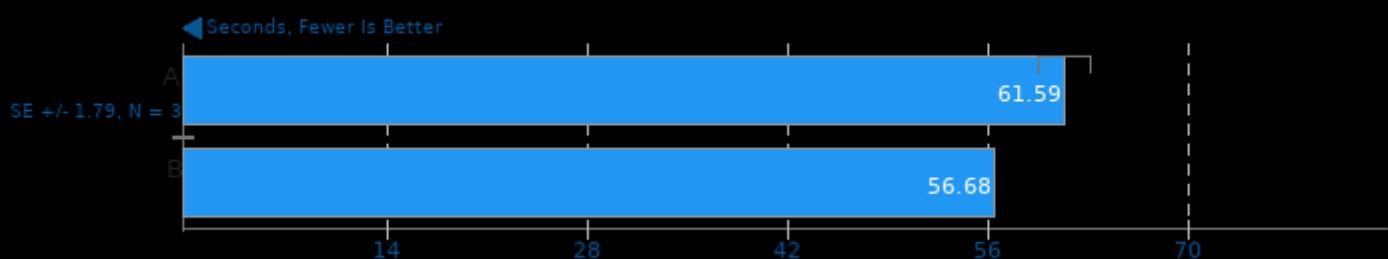
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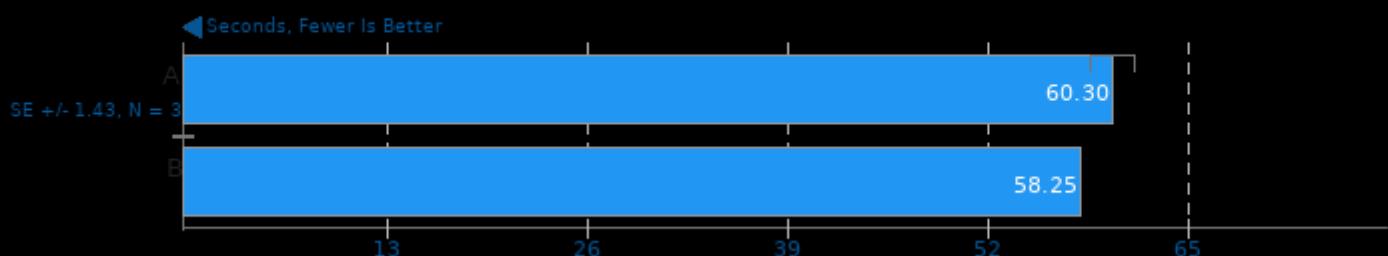
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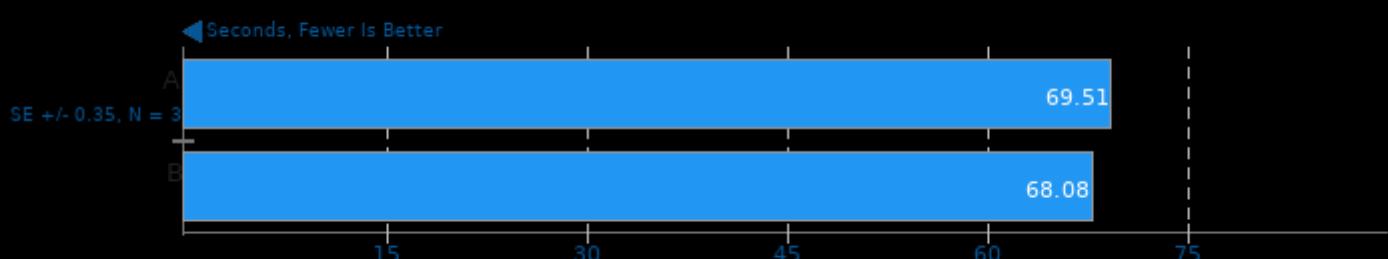
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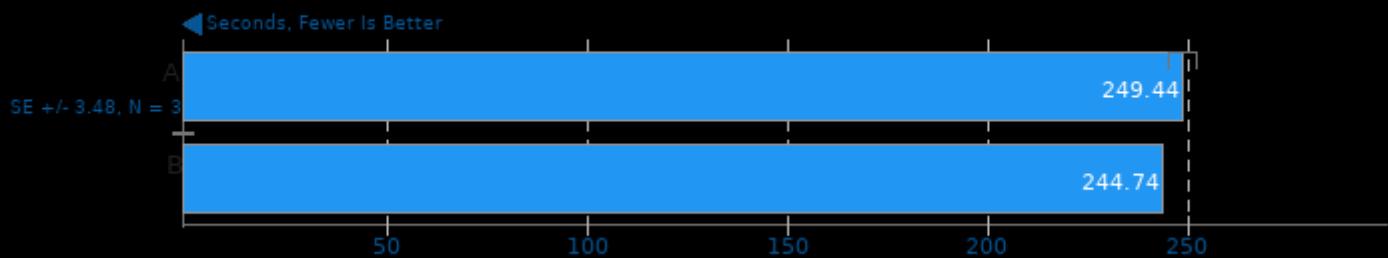
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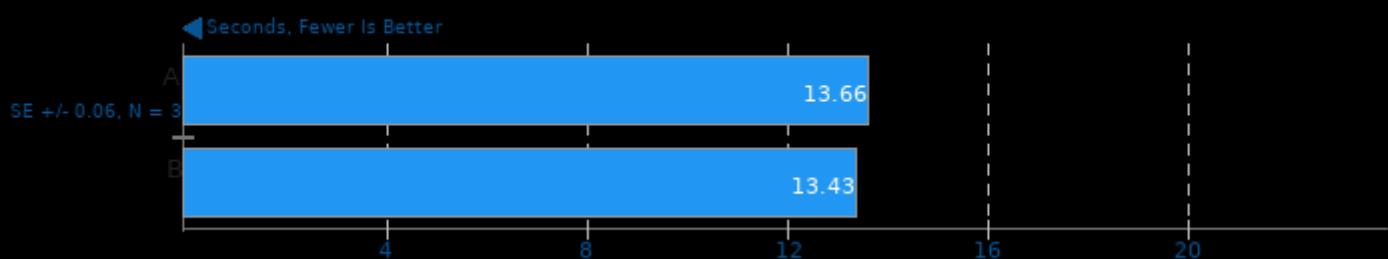
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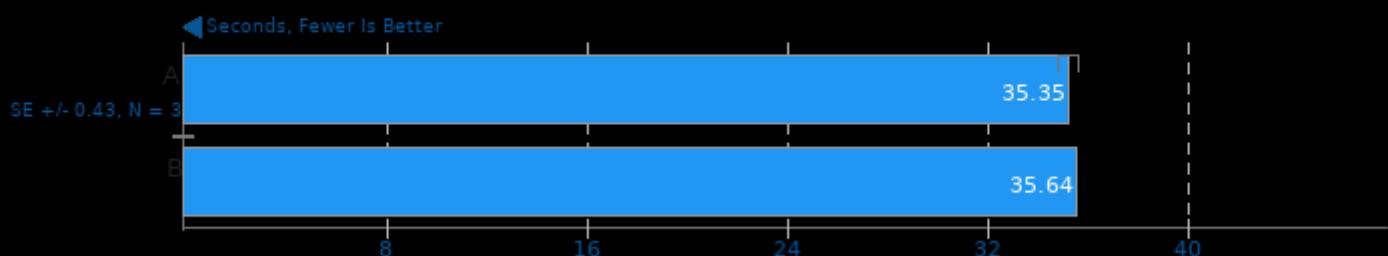
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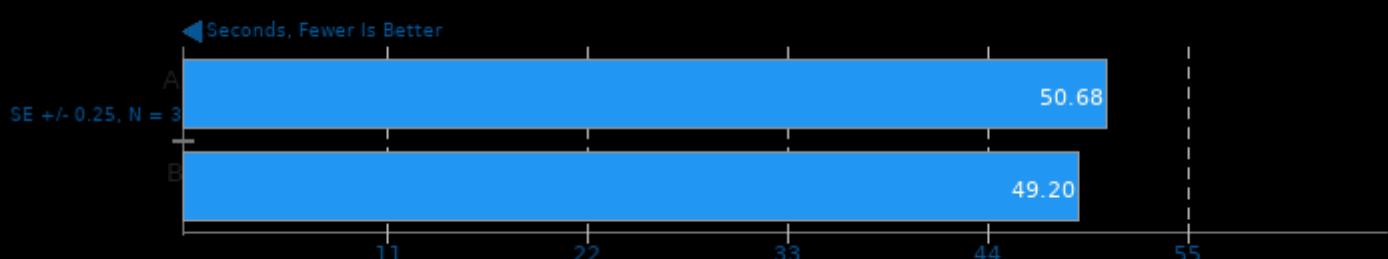
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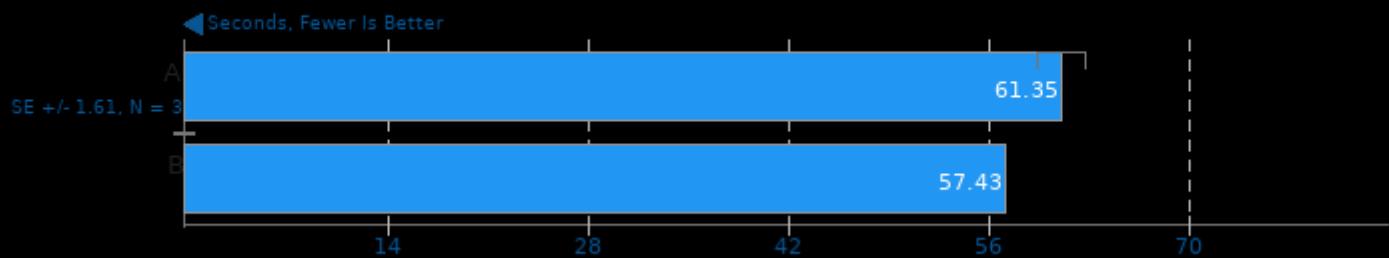
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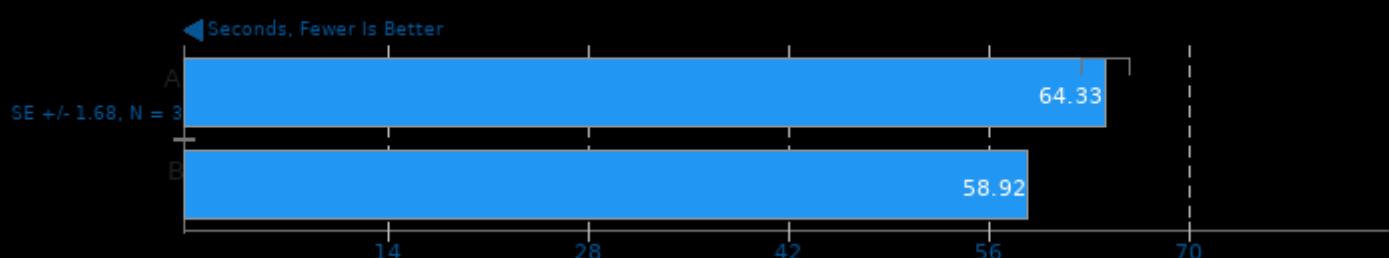
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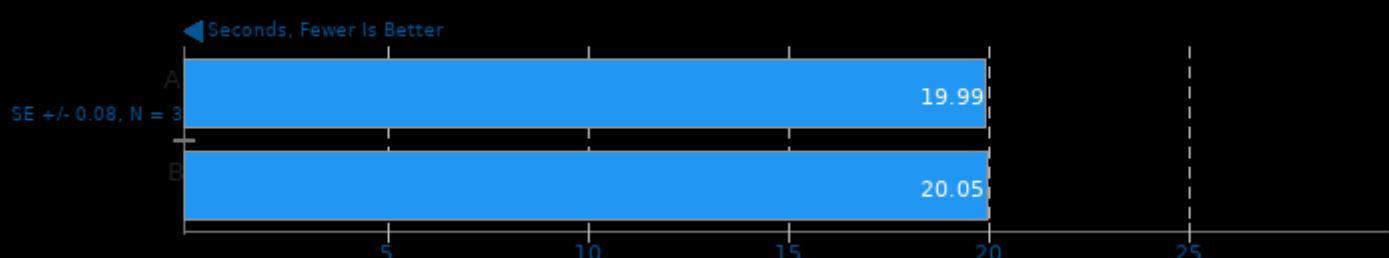
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Row Count: 40000000 - Partitions: 500 - Broadcast Inner Join Test Time



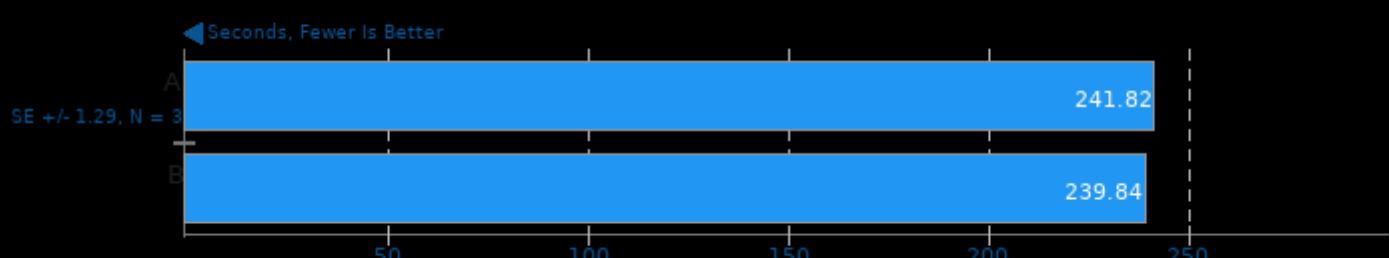
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Row Count: 10000000 - Partitions: 1000 - SHA-512 Benchmark Time



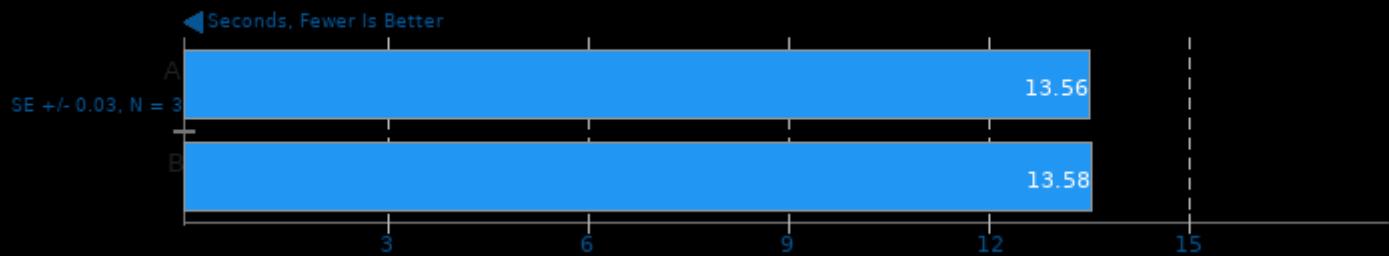
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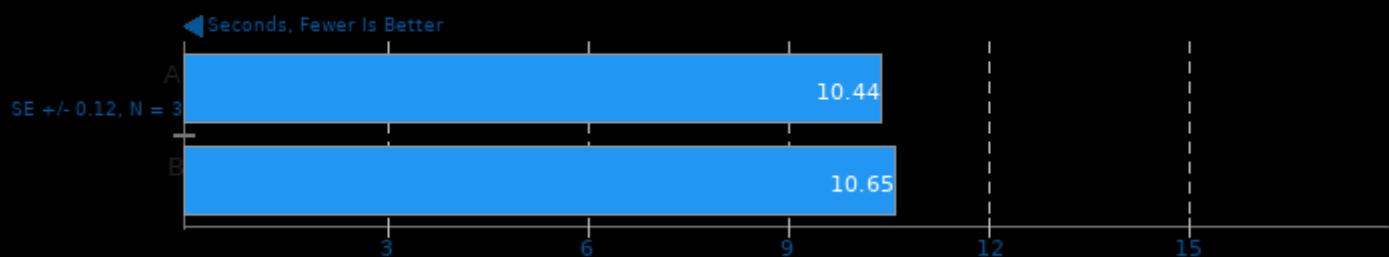
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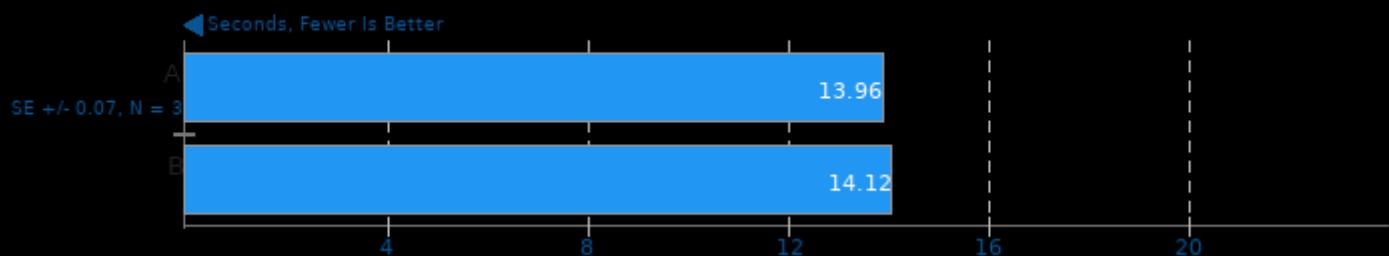
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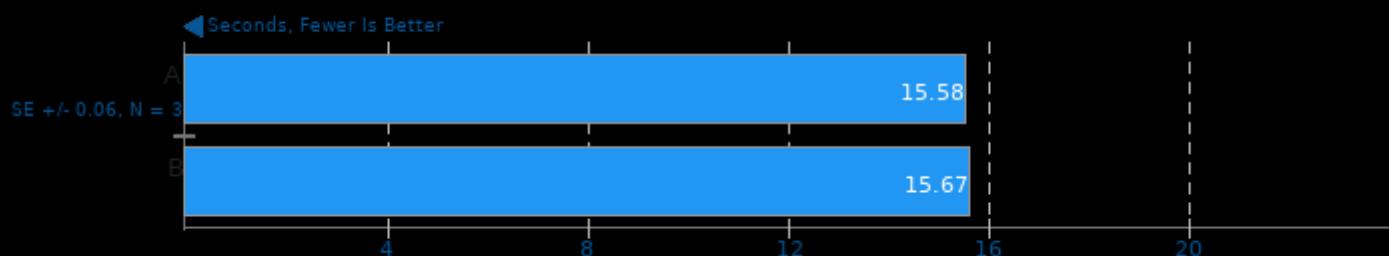
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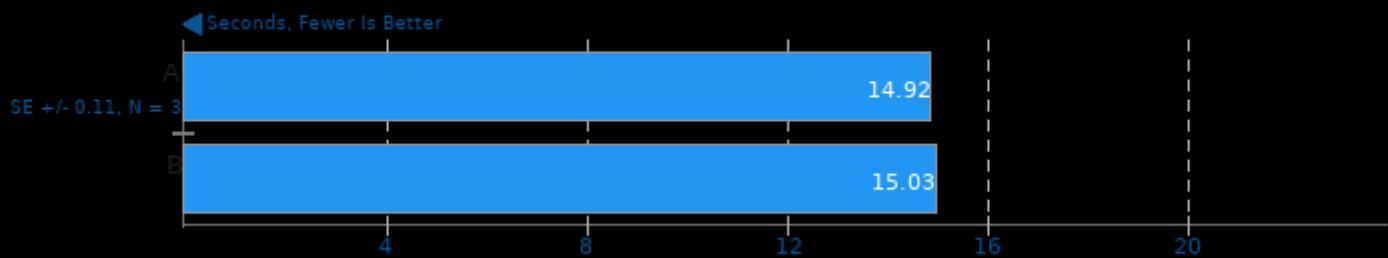
## Apache Spark 3.3

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



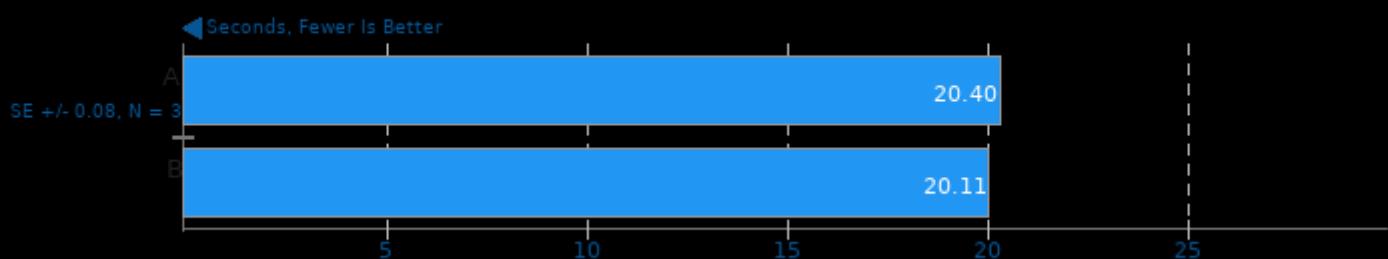
## Apache Spark 3.3

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



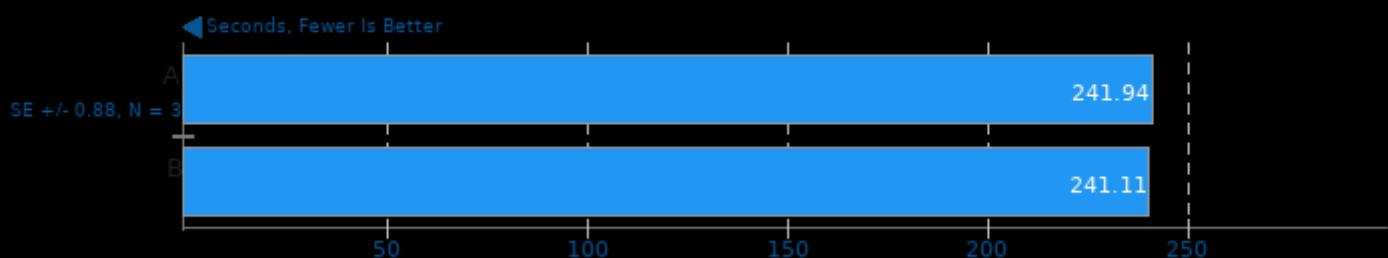
## Apache Spark 3.3

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



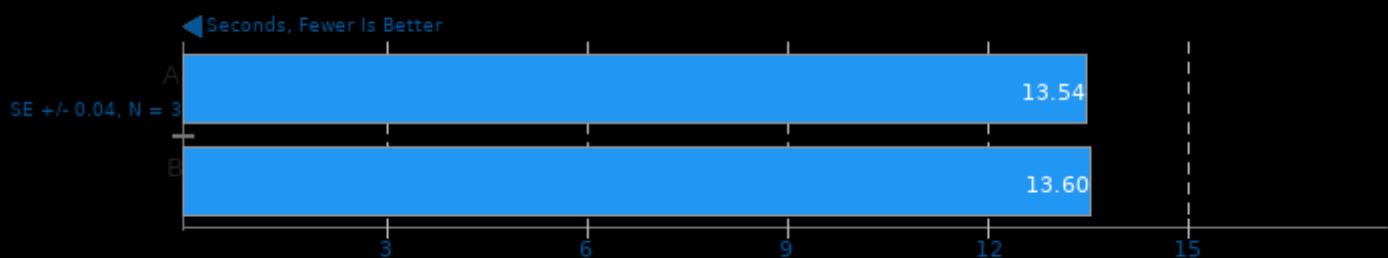
## Apache Spark 3.3

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



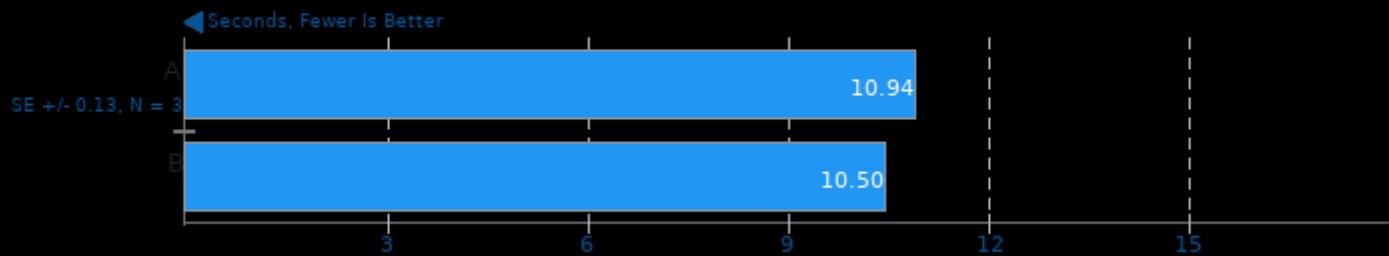
## Apache Spark 3.3

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



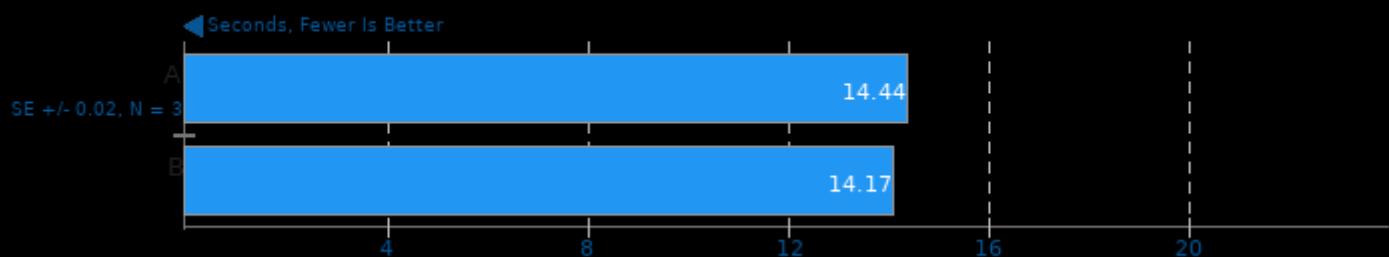
## Apache Spark 3.3

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



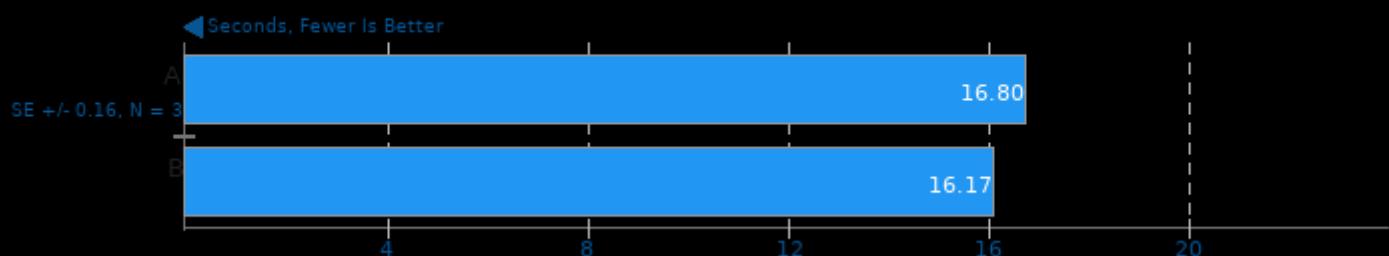
## Apache Spark 3.3

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



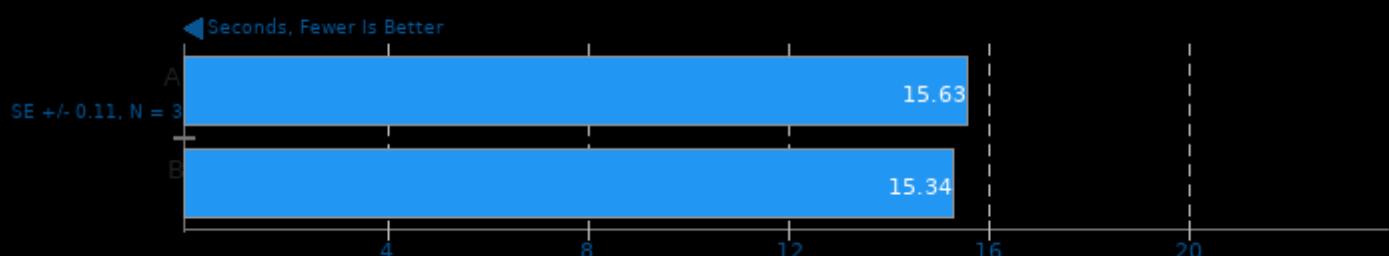
## Apache Spark 3.3

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



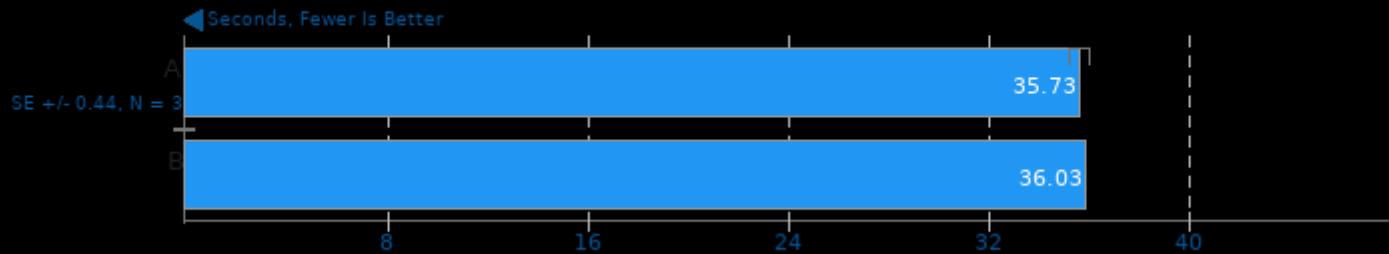
## Apache Spark 3.3

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



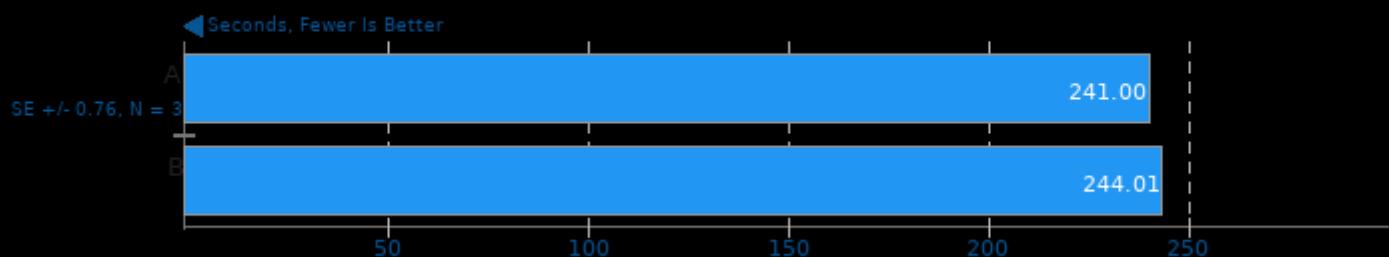
## Apache Spark 3.3

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



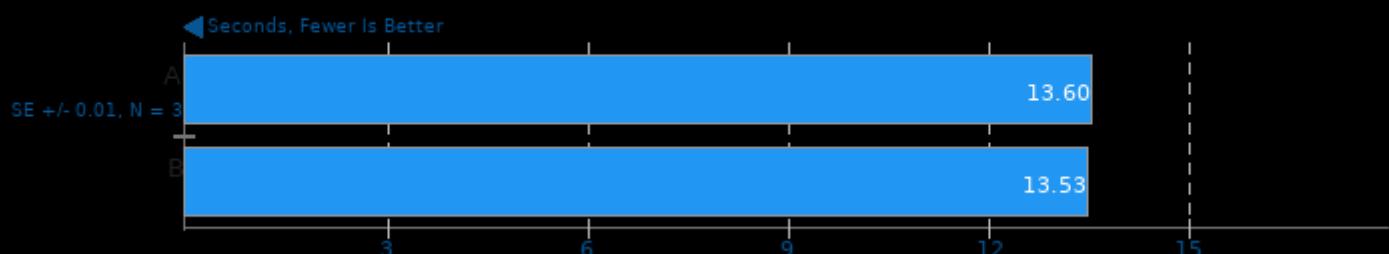
## Apache Spark 3.3

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



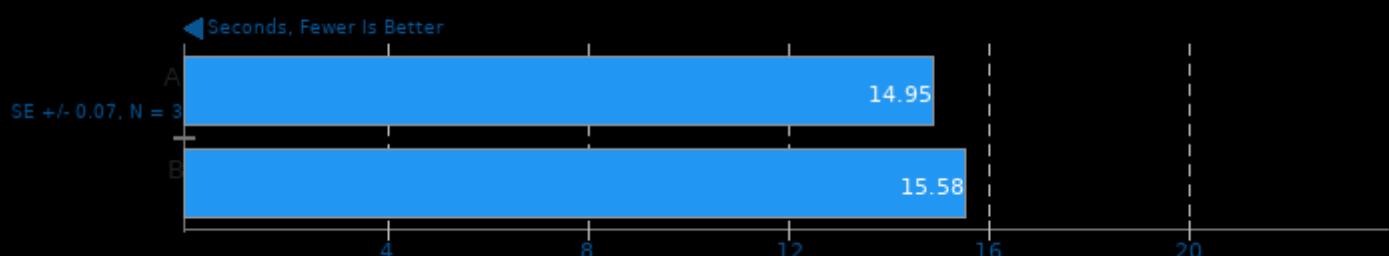
## Apache Spark 3.3

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



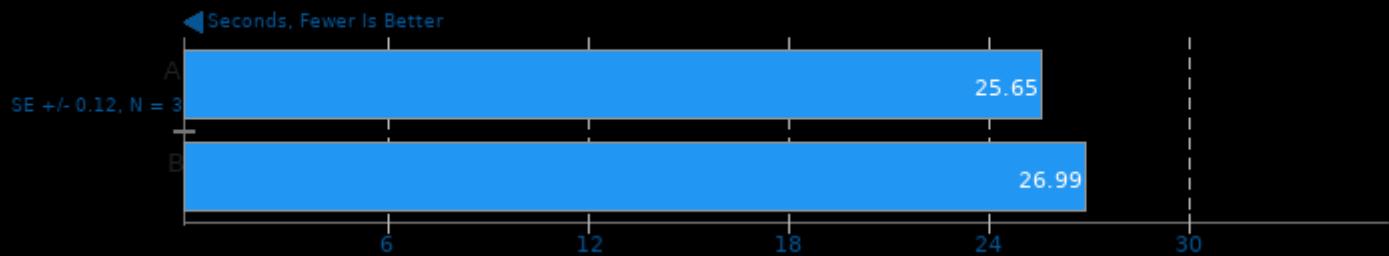
## Apache Spark 3.3

Row Count: 20000000 - Partitions: 1000 - Group By Test Time



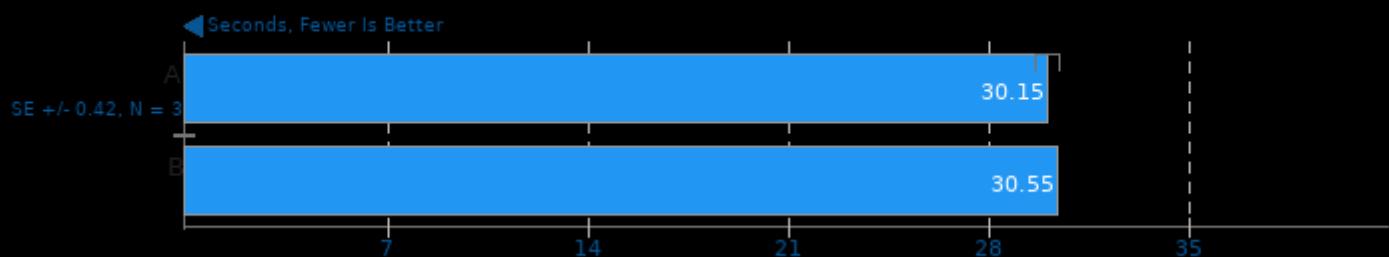
## Apache Spark 3.3

Row Count: 20000000 - Partitions: 1000 - Repartition Test Time



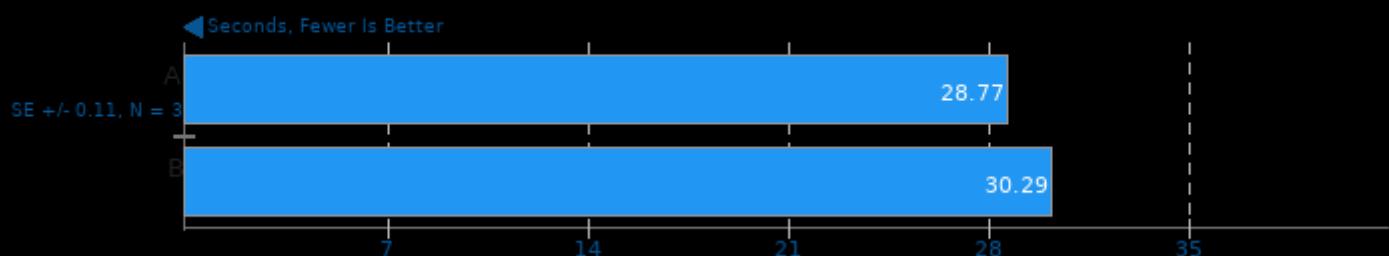
## Apache Spark 3.3

Row Count: 20000000 - Partitions: 1000 - Inner Join Test Time



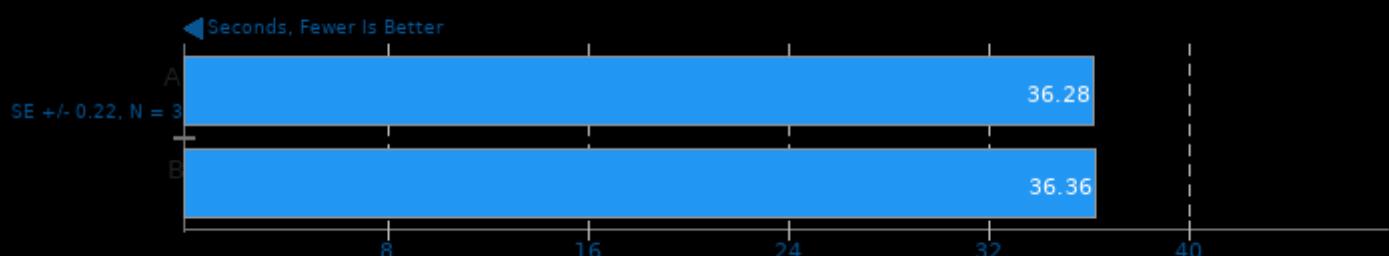
## Apache Spark 3.3

Row Count: 20000000 - Partitions: 1000 - Broadcast Inner Join Test Time



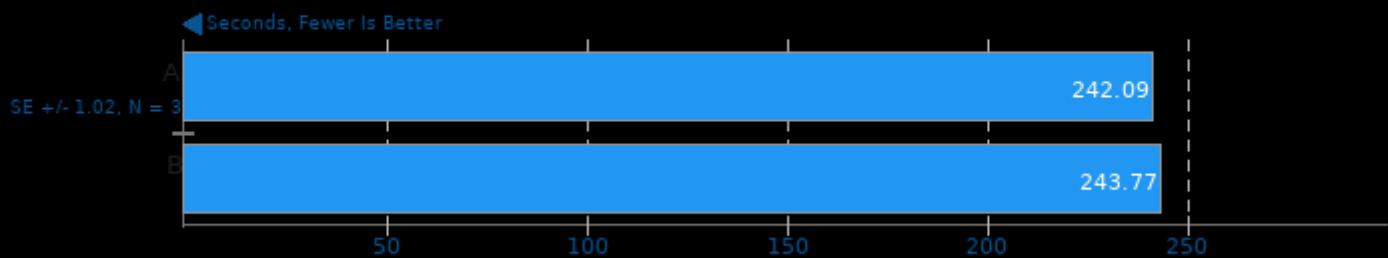
## Apache Spark 3.3

Row Count: 20000000 - Partitions: 2000 - SHA-512 Benchmark Time



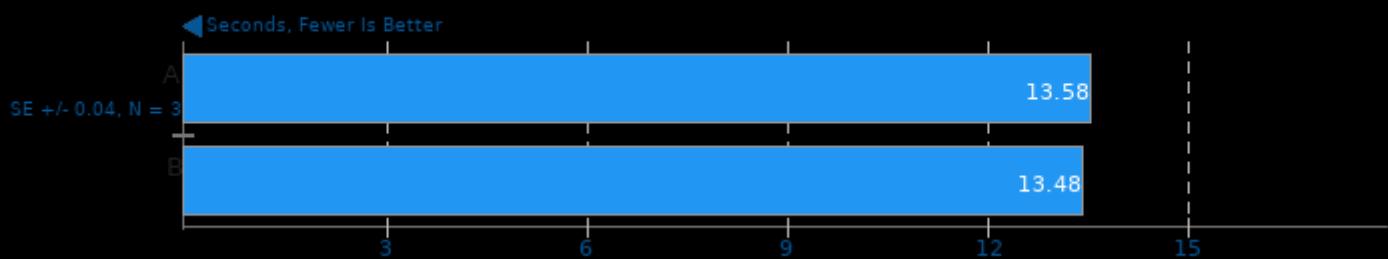
## Apache Spark 3.3

Row Count: 20000000 - Partitions: 2000 - Calculate Pi Benchmark



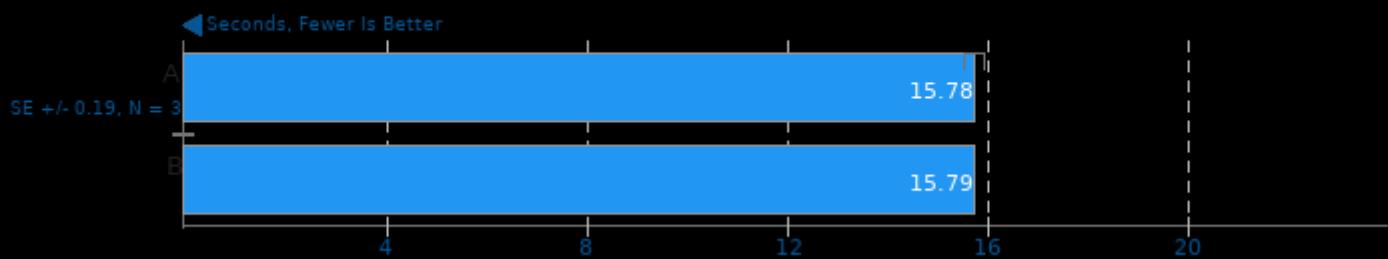
## Apache Spark 3.3

Row Count: 20000000 - Partitions: 2000 - Calculate Pi Benchmark Using Dataframe



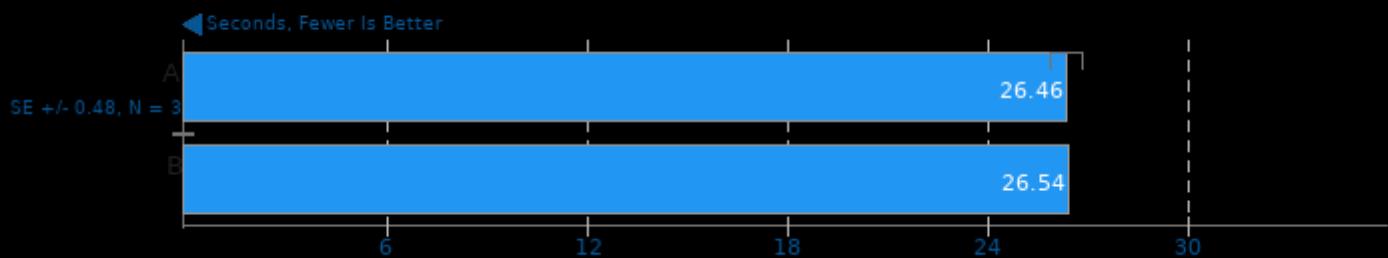
## Apache Spark 3.3

Row Count: 20000000 - Partitions: 2000 - Group By Test Time



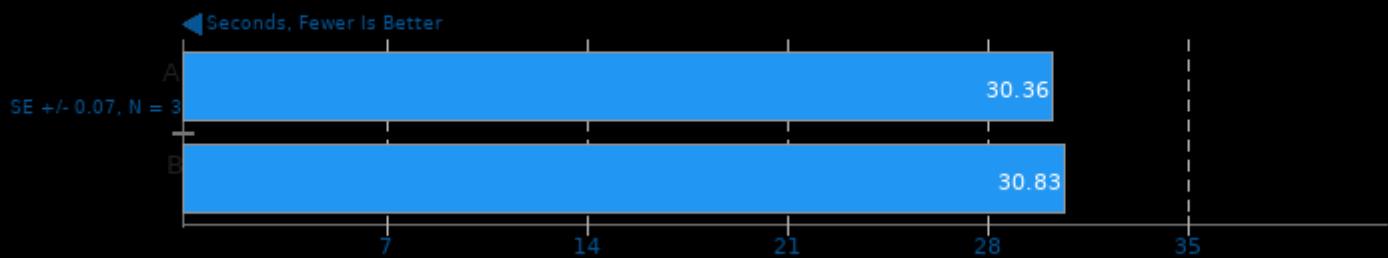
## Apache Spark 3.3

Row Count: 20000000 - Partitions: 2000 - Repartition Test Time



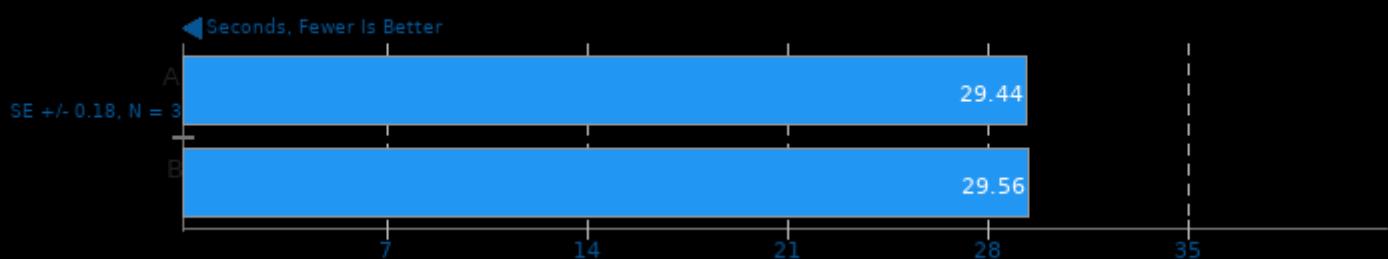
## Apache Spark 3.3

Row Count: 20000000 - Partitions: 2000 - Inner Join Test Time



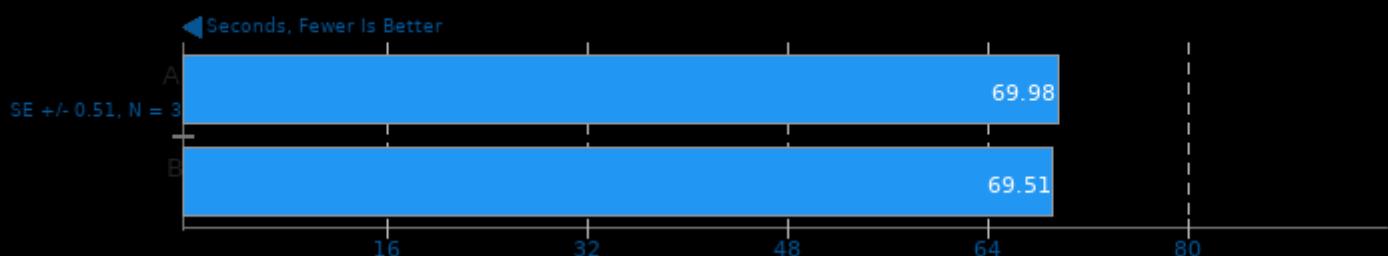
## Apache Spark 3.3

Row Count: 20000000 - Partitions: 2000 - Broadcast Inner Join Test Time



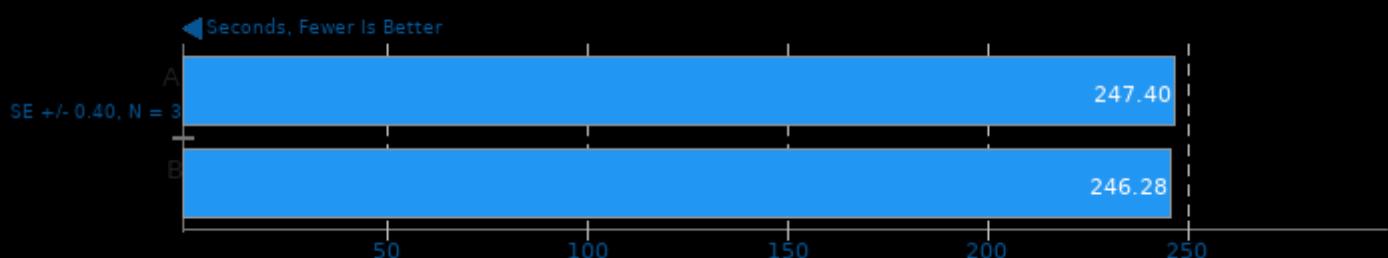
## Apache Spark 3.3

Row Count: 40000000 - Partitions: 1000 - SHA-512 Benchmark Time



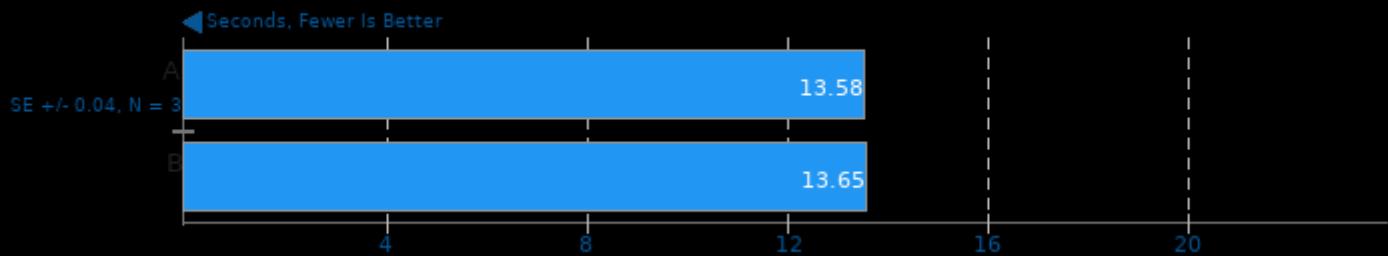
## Apache Spark 3.3

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



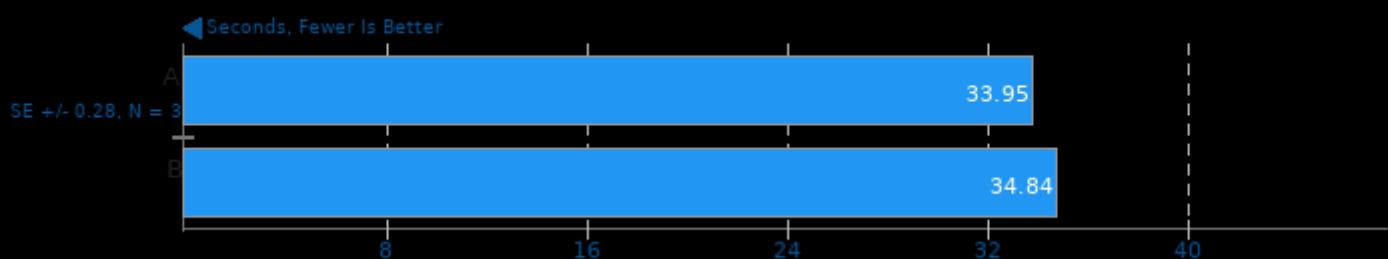
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Row Count: 40000000 - Partitions: 1000 - Calculate Pi Benchmark Using Dataframe



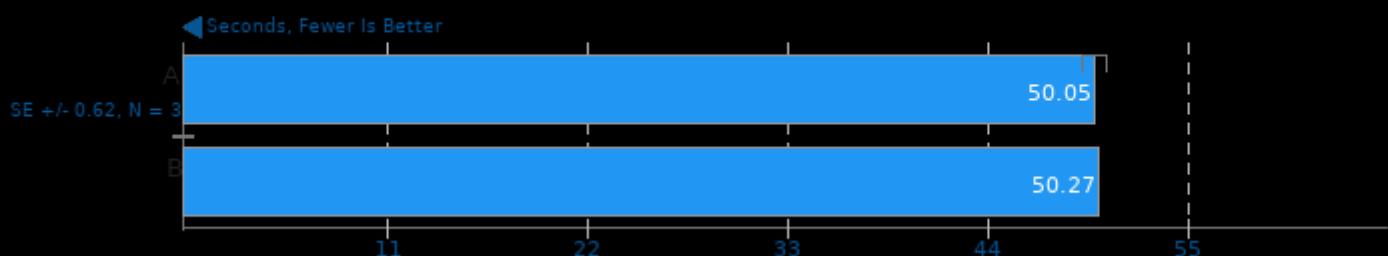
## Apache Spark 3.3

Row Count: 40000000 - Partitions: 1000 - Group By Test Time



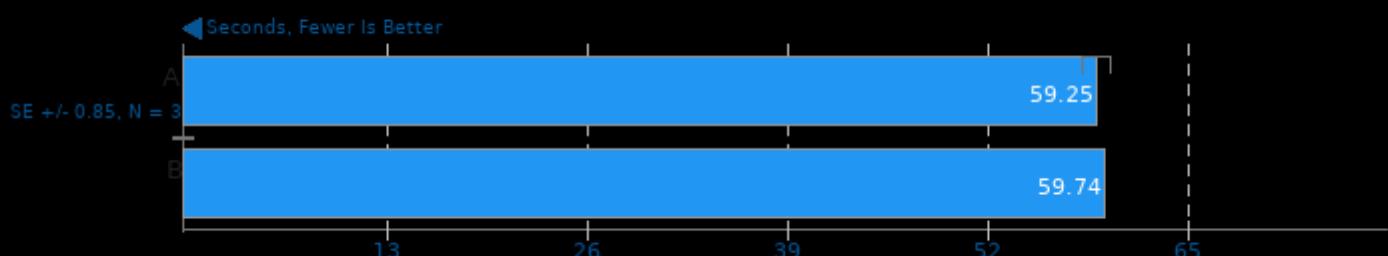
## Apache Spark 3.3

Row Count: 40000000 - Partitions: 1000 - Repartition Test Time



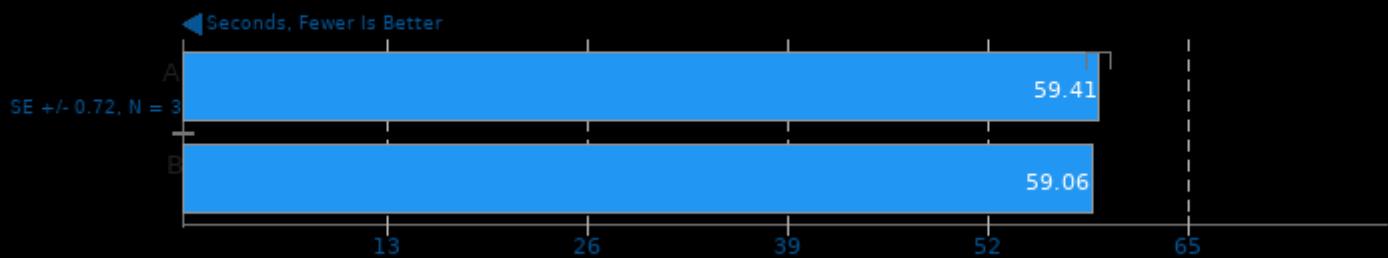
## Apache Spark 3.3

Row Count: 40000000 - Partitions: 1000 - Inner Join Test Time



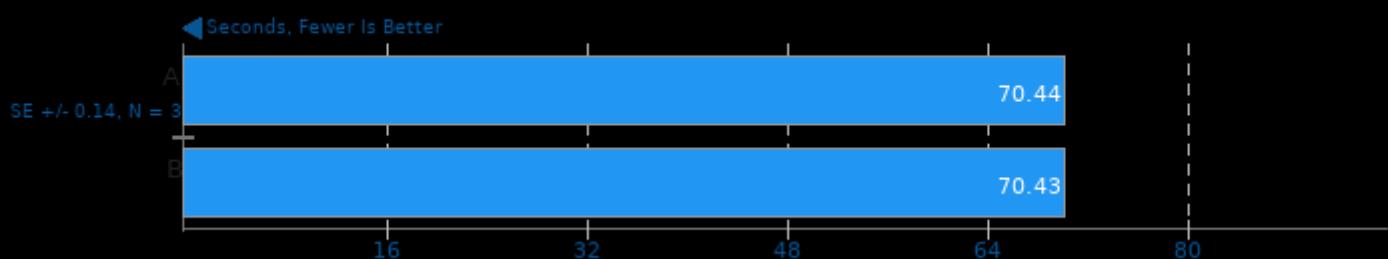
## Apache Spark 3.3

Row Count: 40000000 - Partitions: 1000 - Broadcast Inner Join Test Time



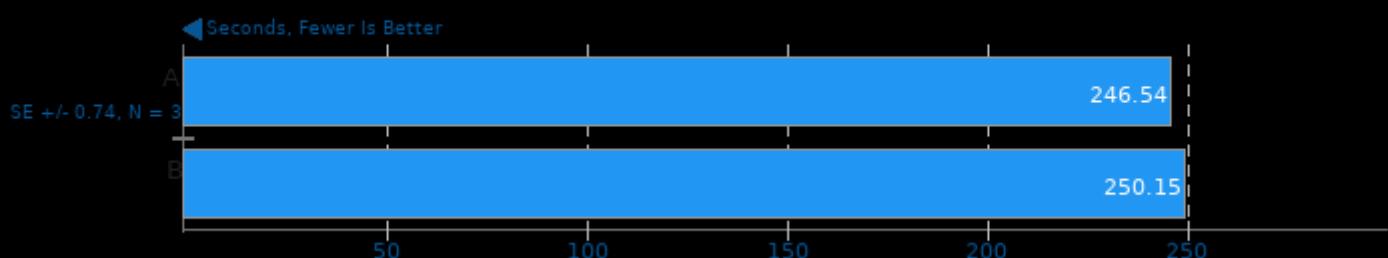
## Apache Spark 3.3

Row Count: 40000000 - Partitions: 2000 - SHA-512 Benchmark Time



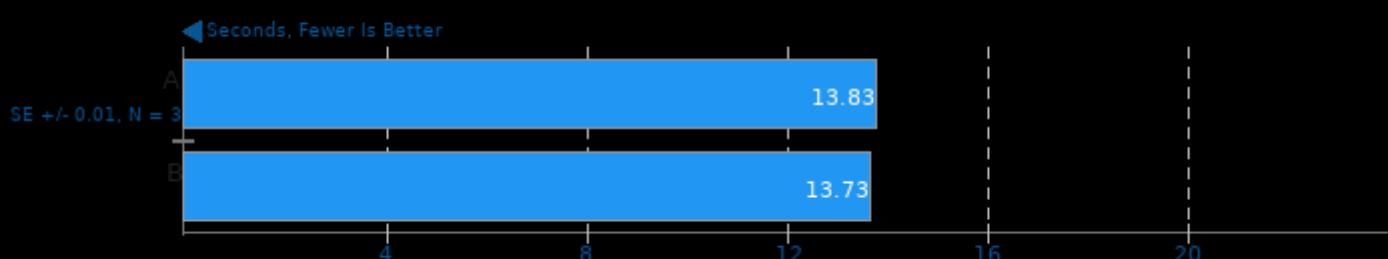
## Apache Spark 3.3

Row Count: 40000000 - Partitions: 2000 - Calculate Pi Benchmark



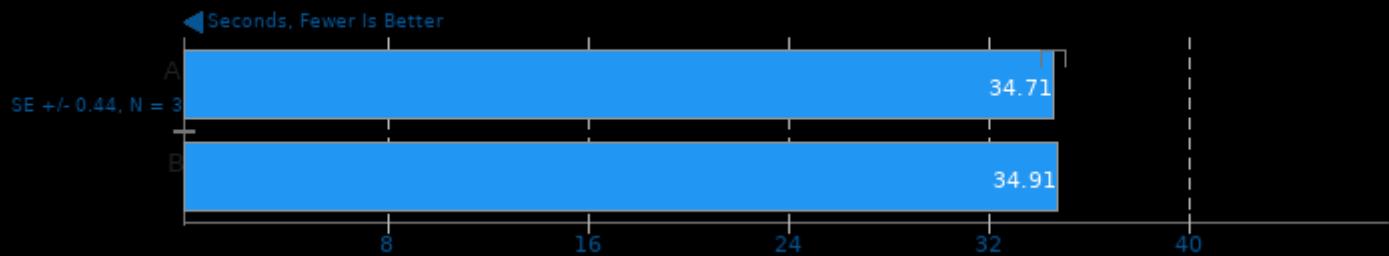
## Apache Spark 3.3

Row Count: 40000000 - Partitions: 2000 - Calculate Pi Benchmark Using Dataframe



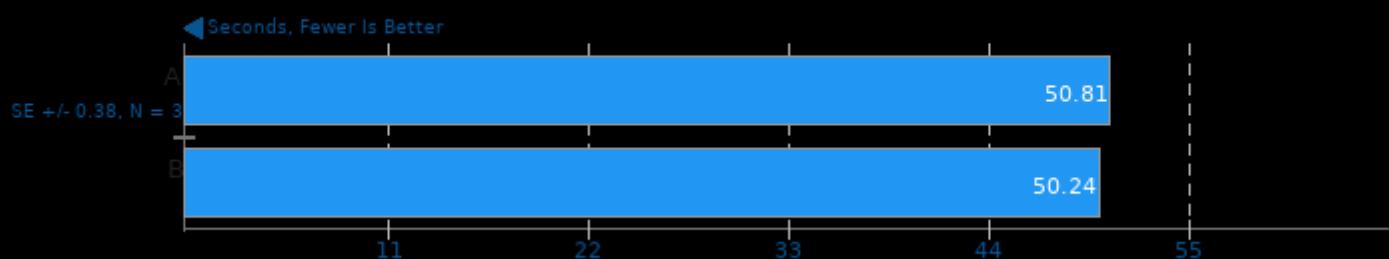
## Apache Spark 3.3

Row Count: 40000000 - Partitions: 2000 - Group By Test Time



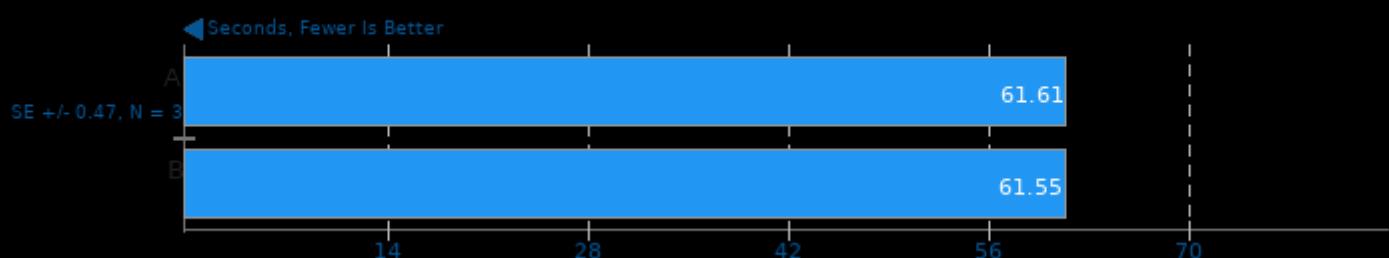
## Apache Spark 3.3

Row Count: 40000000 - Partitions: 2000 - Repartition Test Time



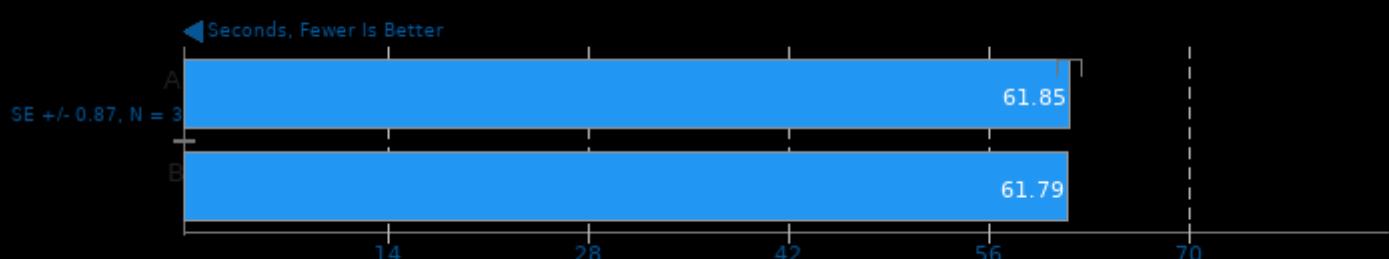
## Apache Spark 3.3

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



## Apache Spark 3.3

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



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