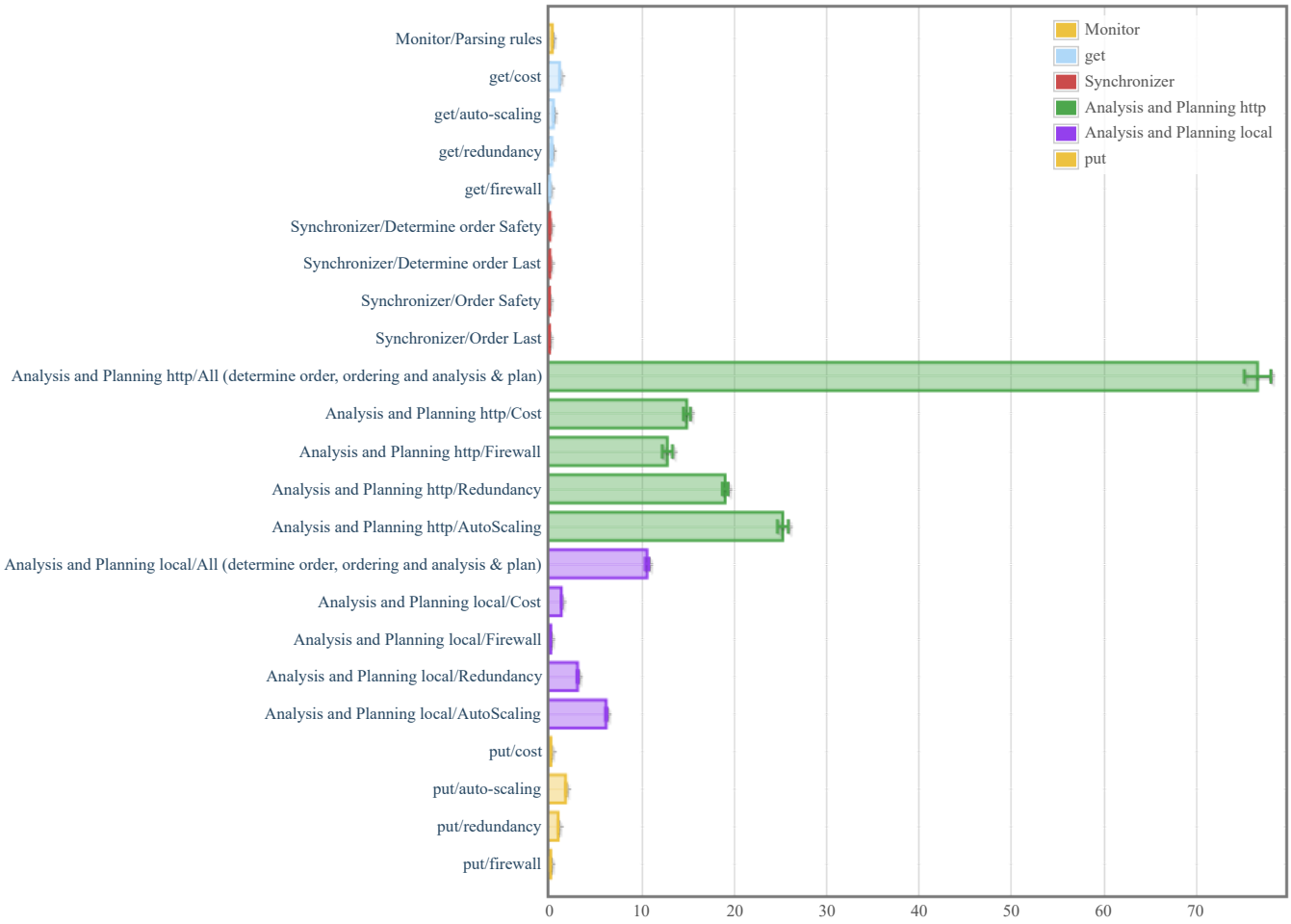
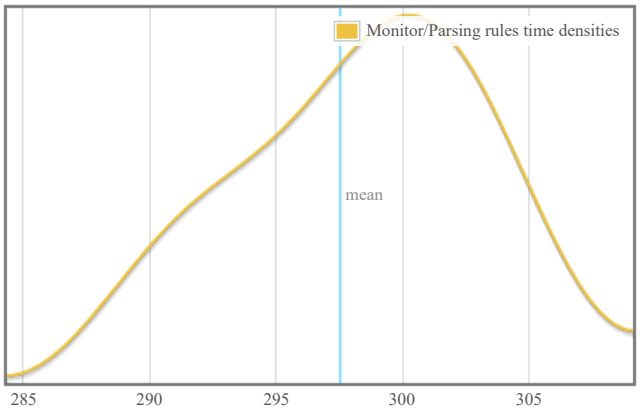
criterion performance measurements

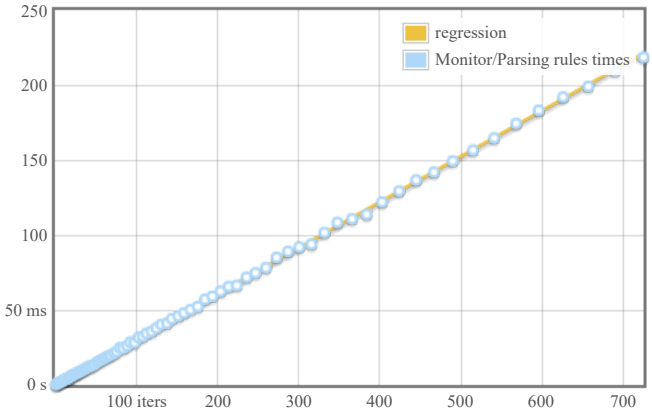
overview

want to understand this report?



Monitor/Parsing rules

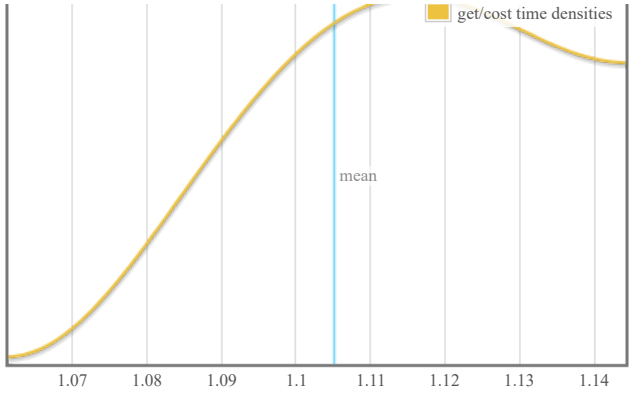


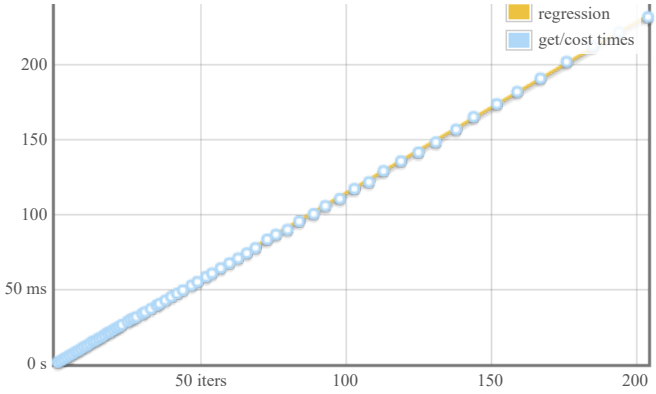


	lower bound	estimate	upper bound
OLS regression	304 µs	305 µs	306 µs
R² goodness-of-fit	1.000	1.000	1.000
Mean execution time	296 µs	298 µs	299 µs
Standard deviation	4.77 µs	5.62 µs	6.64 µs

Outlying measurements have moderate (11.2%) effect on estimated standard deviation.

get/cost

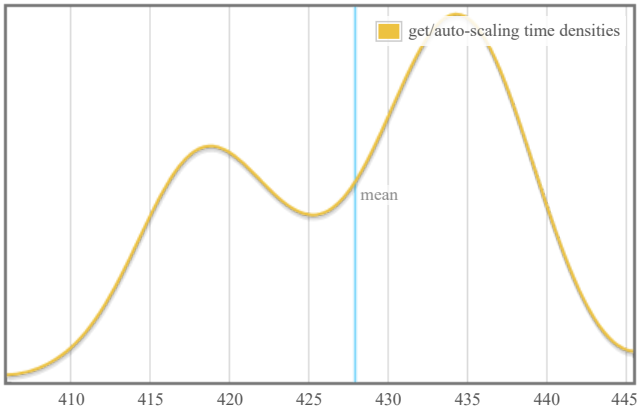


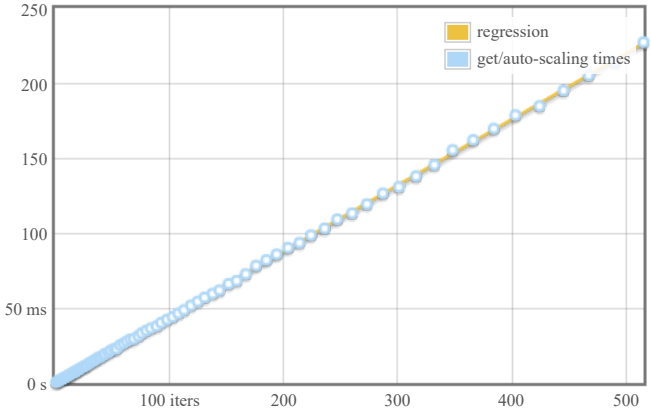


	lower bound	estimate	upper bound
OLS regression	1.13 ms	1.14 ms	1.14 ms
R² goodness-of-fit	1.000	1.000	1.000
Mean execution time	1.10 ms	1.11 ms	1.11 ms
Standard deviation	18.7 µs	21.3 µs	24.6 µs

Outlying measurements have slight (8.4%) effect on estimated standard deviation.

get/auto-scaling

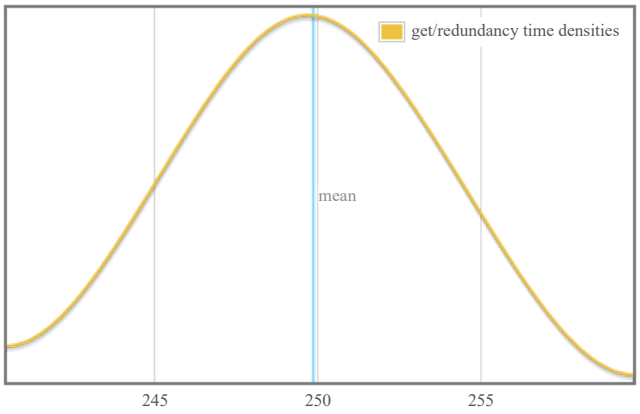


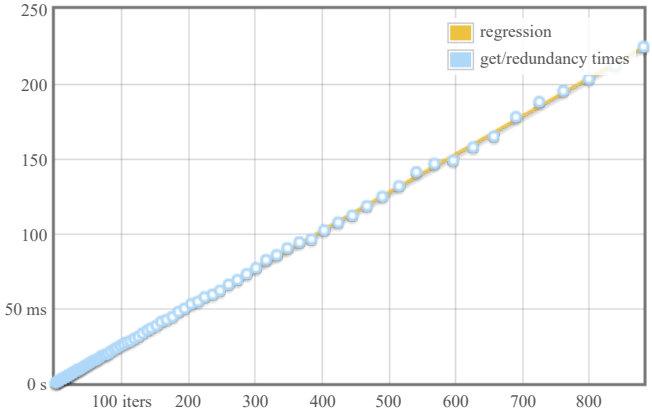


	lower bound	estimate	upper bound
OLS regression	438 µs	440 µs	441 µs
R² goodness-of-fit	1.000	1.000	1.000
Mean execution time	425 µs	428 µs	431 µs
Standard deviation	7.58 µs	8.63 µs	10.1 µs

Outlying measurements have moderate (12.1%) effect on estimated standard deviation.

get/redundancy

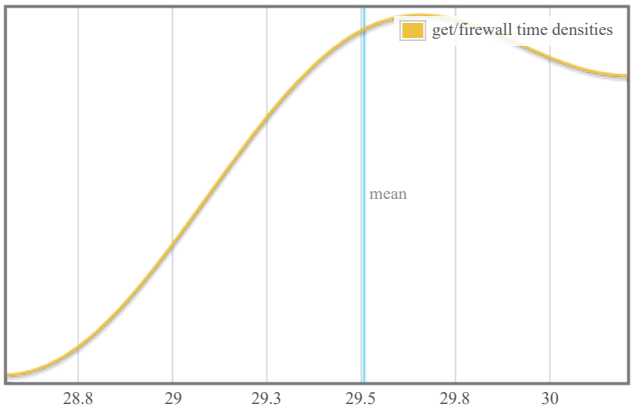


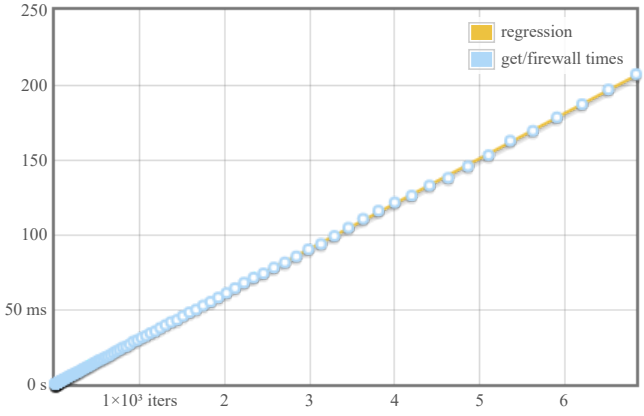


	lower bound	estimate	upper bound
OLS regression	254 µs	255 µs	257 µs
R² goodness-of-fit	1.000	1.000	1.000
Mean execution time	249 µs	250 µs	251 µs
Standard deviation	3.45 µs	4.14 µs	4.88 µs

Outlying measurements have slight (8.8%) effect on estimated standard deviation.

get/firewall

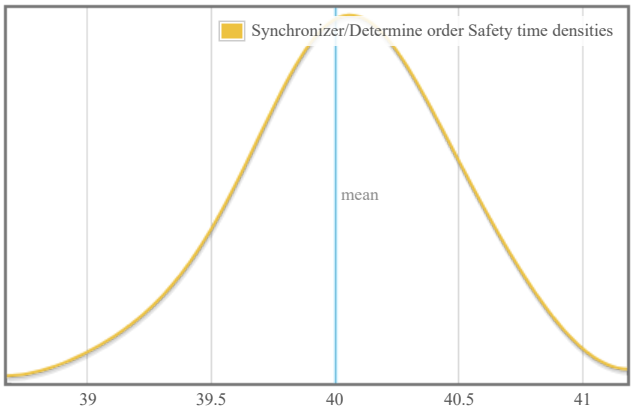


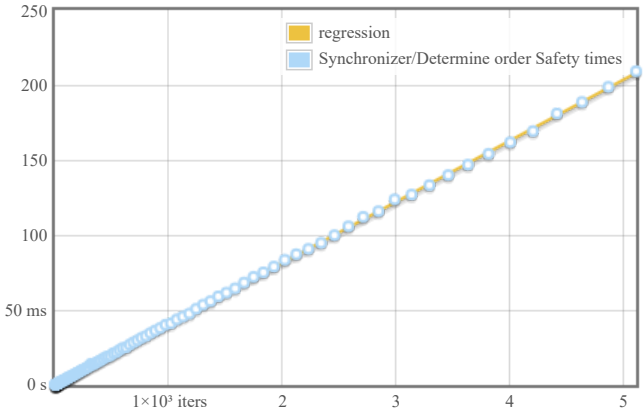


	lower bound	estimate	upper bound
OLS regression	30.1 µs	30.1 µs	30.2 µs
R² goodness-of-fit	1.000	1.000	1.000
Mean execution time	29.4 µs	29.5 µs	29.6 µs
Standard deviation	314 ns	377 ns	458 ns

Outlying measurements have slight (7.5%) effect on estimated standard deviation.

Synchronizer/Determine order Safety

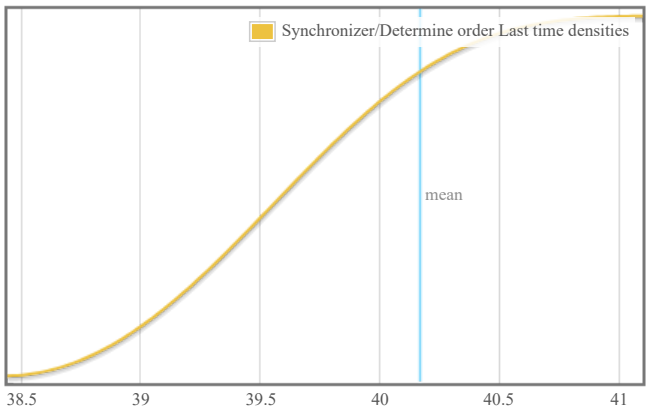


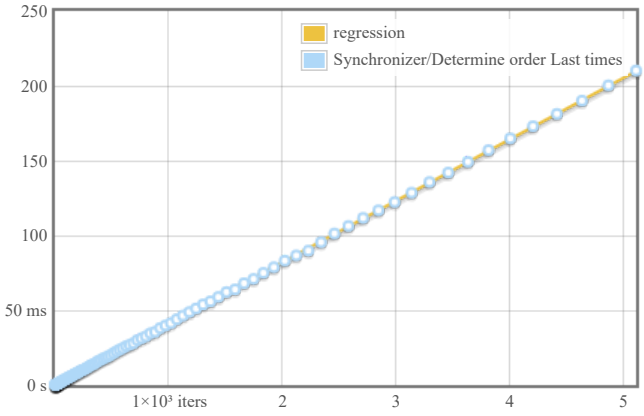


	lower bound	estimate	upper bound
OLS regression	40.6 µs	40.7 µs	40.9 µs
R² goodness-of-fit	1.000	1.000	1.000
Mean execution time	39.8 µs	40.0 µs	40.1 µs
Standard deviation	389 ns	497 ns	604 ns

Outlying measurements have slight (7.1%) effect on estimated standard deviation.

Synchronizer/Determine order Last

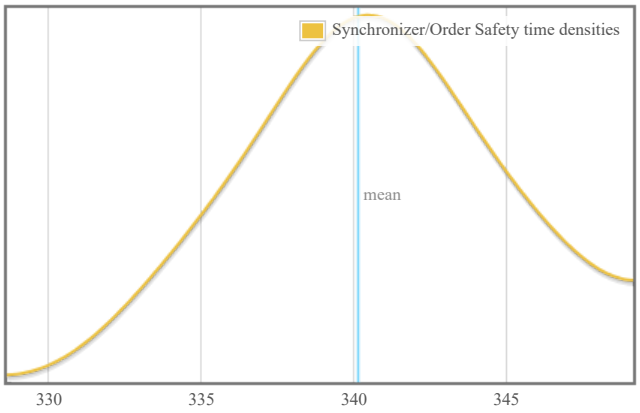


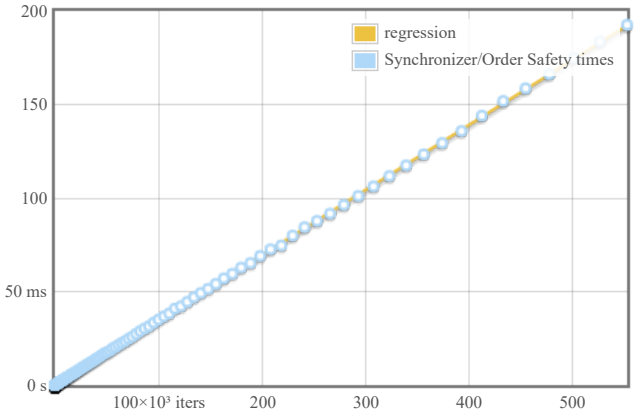


	lower bound	estimate	upper bound
OLS regression	41.0 µs	41.1 µs	41.1 µs
R² goodness-of-fit	1.000	1.000	1.000
Mean execution time	40.0 µs	40.2 µs	40.4 µs
Standard deviation	478 ns	580 ns	753 ns

Outlying measurements have slight (9.2%) effect on estimated standard deviation.

Synchronizer/Order Safety

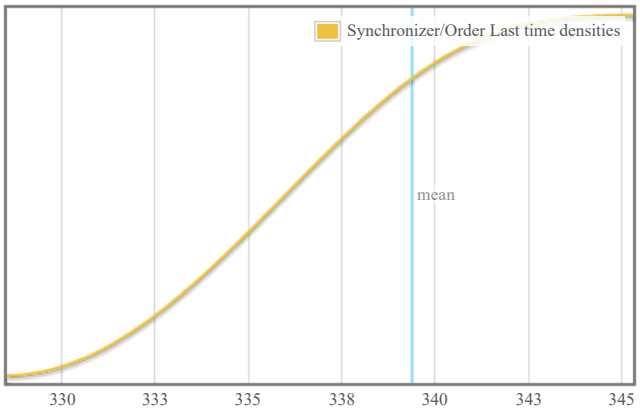


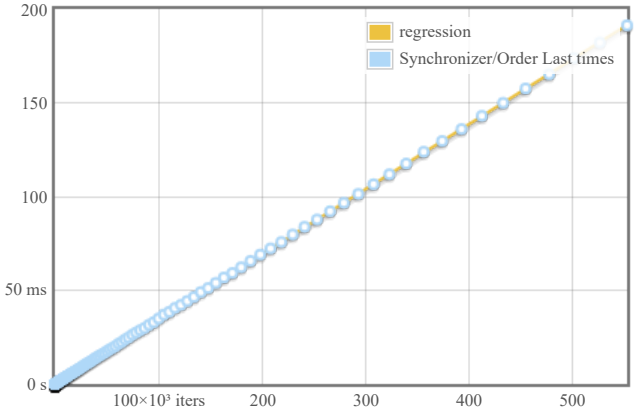


	lower bound	estimate	upper bound
OLS regression	347 ns	348 ns	348 ns
R² goodness-of-fit	1.000	1.000	1.000
Mean execution time	339 ns	340 ns	341 ns
Standard deviation	3.39 ns	4.06 ns	5.04 ns

Outlying measurements have moderate (10.7%) effect on estimated standard deviation.

Synchronizer/Order Last

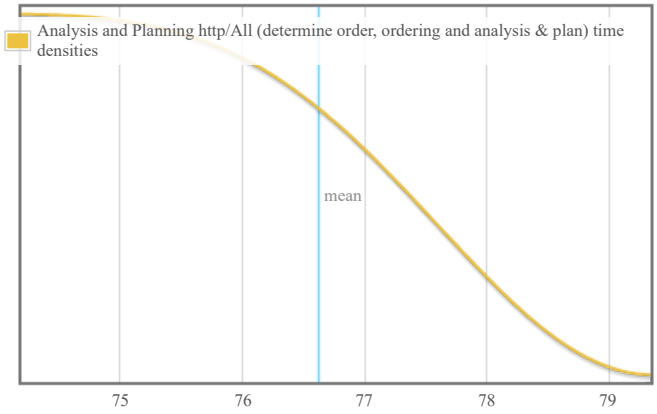


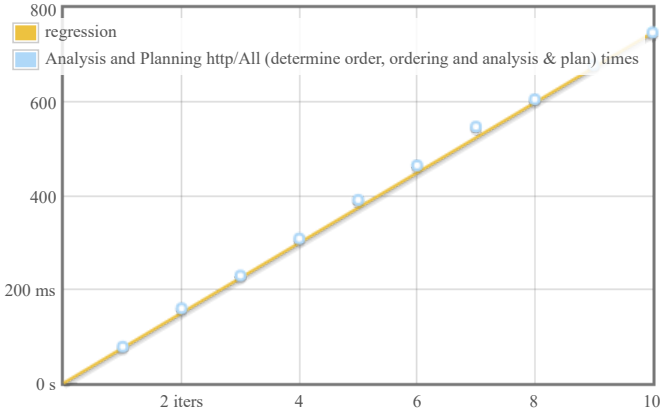


	lower bound	estimate	upper bound
OLS regression	346 ns	347 ns	347 ns
R² goodness-of-fit	1.000	1.000	1.000
Mean execution time	338 ns	339 ns	341 ns
Standard deviation	3.02 ns	3.67 ns	4.61 ns

Outlying measurements have slight (9.1%) effect on estimated standard deviation.

Analysis and Planning http/All (determine order, ordering and analysis & plan)



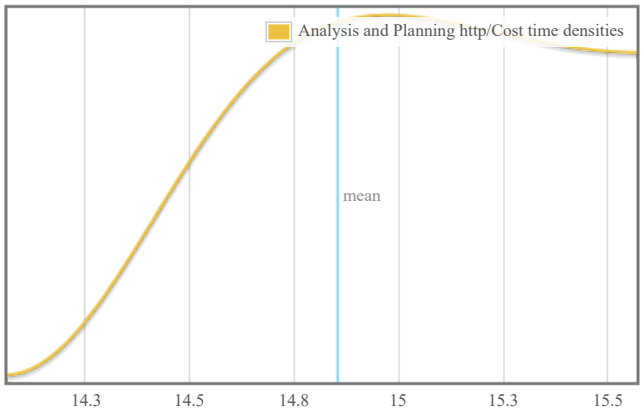


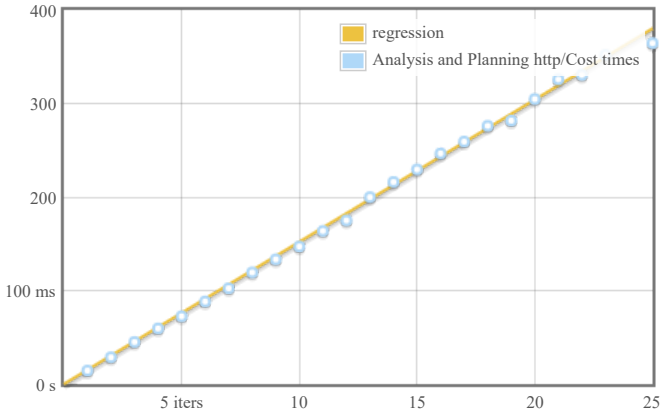
	lower bound	estimate	upper bound
OLS regression	72.8 ms	74.7 ms	77.4 ms
R² goodness-of-fit	0.998	0.999	1.000

Mean execution time	75.8 ms	76.6 ms	77.6 ms
Standard deviation	1.08 ms	1.44 ms	2.04 ms

Outlying measurements have slight (9.0%) effect on estimated standard deviation.

Analysis and Planning http/Cost

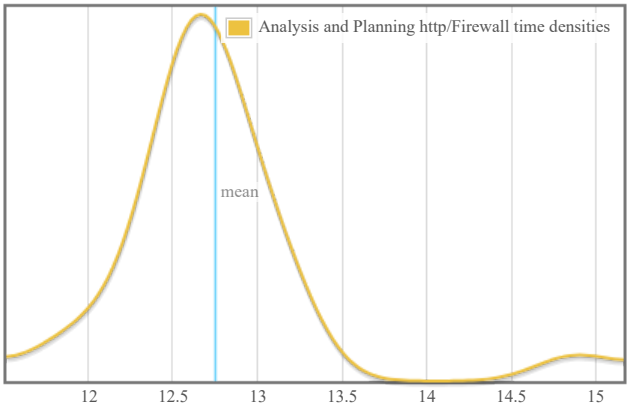


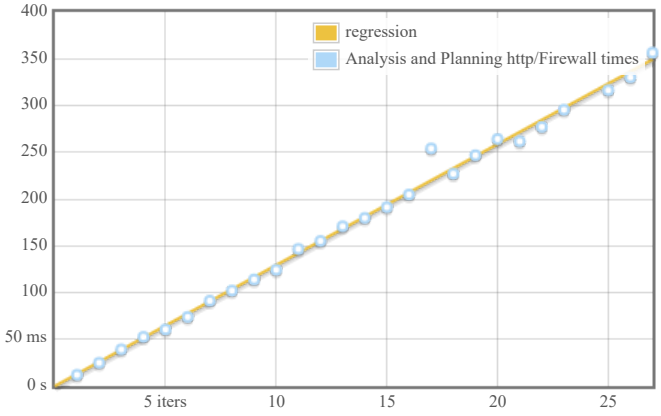


	lower bound	estimate	upper bound
OLS regression	14.9 ms	15.2 ms	15.6 ms
R² goodness-of-fit	0.997	0.998	0.999
Mean execution time	14.7 ms	14.9 ms	15.0 ms
Standard deviation	331 µs	381 µs	462 µs

Outlying measurements have slight (4.8%) effect on estimated standard deviation.

Analysis and Planning http/Firewall

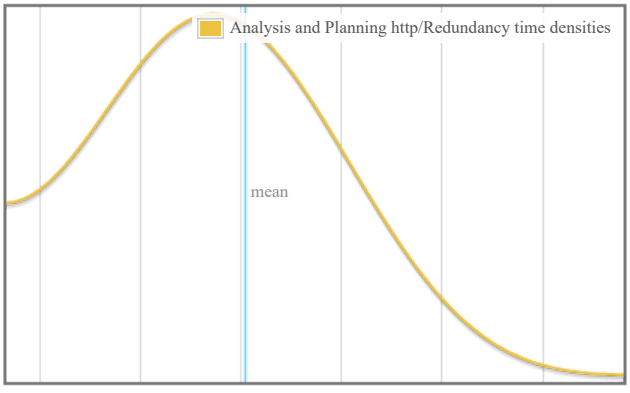


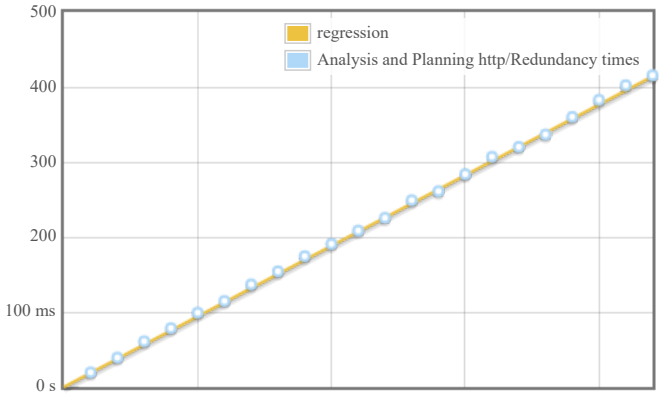


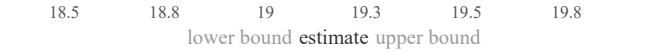
	lower bound	estimate	upper bound
OLS regression	12.7 ms	12.9 ms	13.3 ms
R² goodness-of-fit	0.982	0.994	0.999
Mean execution time	12.6 ms	12.8 ms	13.1 ms
Standard deviation	288 µs	551 µs	991 µs

Outlying measurements have moderate (18.0%) effect on estimated standard deviation.

Analysis and Planning http/Redundancy



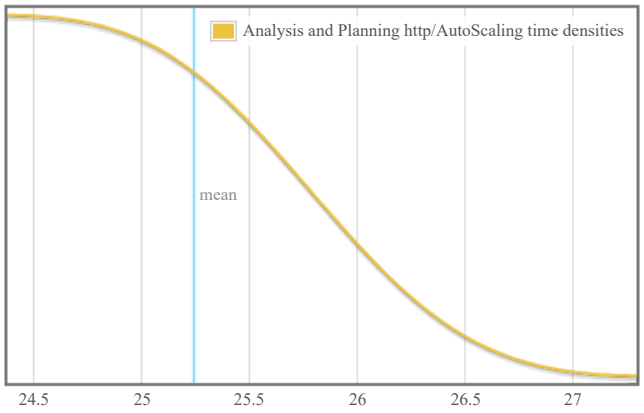


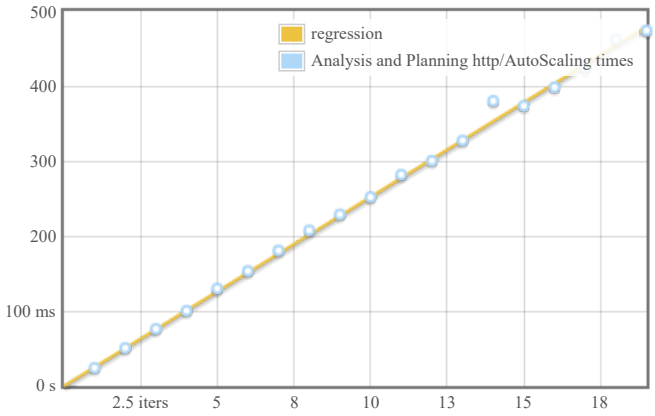


	lower bound	estimate	upper bound
OLS regression	18.6 ms	18.8 ms	19.0 ms
R² goodness-of-fit	0.999	1.000	1.000
Mean execution time	18.9 ms	19.0 ms	19.2 ms
Standard deviation	219 µs	305 µs	471 µs

Outlying measurements have slight (4.3%) effect on estimated standard deviation.

Analysis and Planning http/AutoScaling

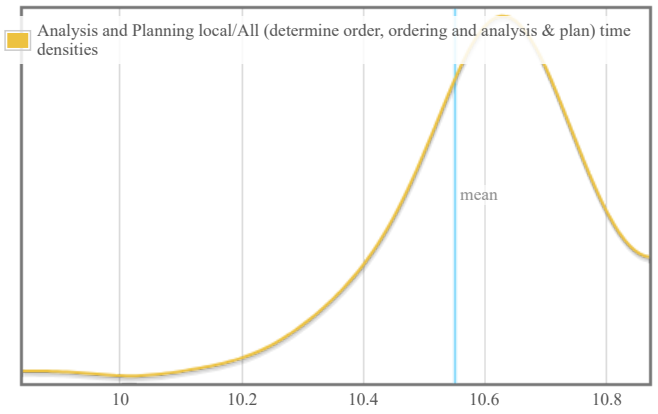


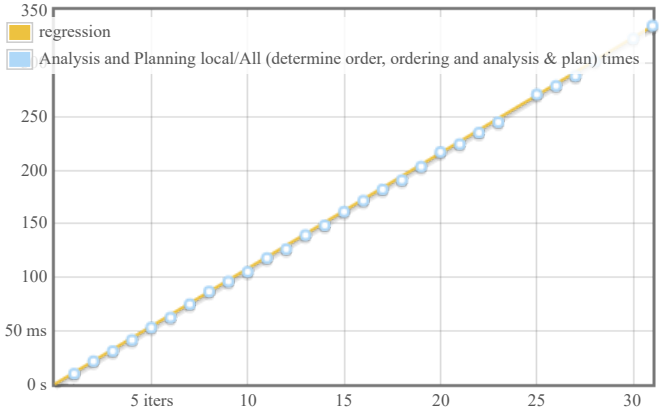


	lower bound	estimate	upper bound
OLS regression	24.7 ms	25.2 ms	25.9 ms
R² goodness-of-fit	0.993	0.997	1.000
Mean execution time	25.0 ms	25.2 ms	25.6 ms
Standard deviation	348 µs	578 µs	1.02 ms

Outlying measurements have slight (5.0%) effect on estimated standard deviation.

Analysis and Planning local/All (determine order, ordering and analysis & plan)

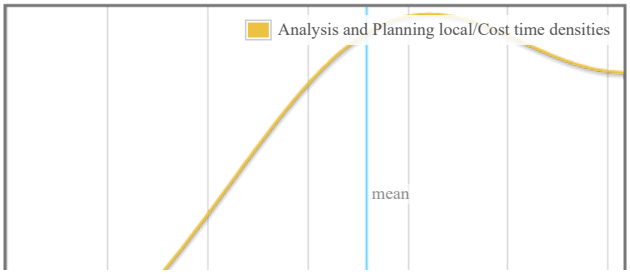


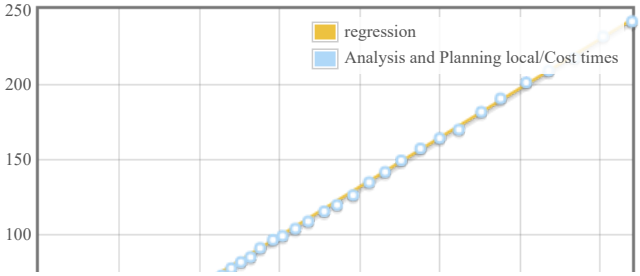


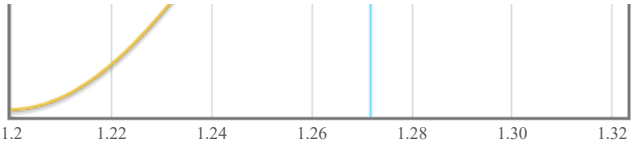
	lower bound	estimate	upper bound
OLS regression	10.8 ms	10.8 ms	10.9 ms
R² goodness-of-fit	1.000	1.000	1.000
Mean execution time	10.5 ms	10.6 ms	10.6 ms
Standard deviation	134 µs	201 µs	316 µs

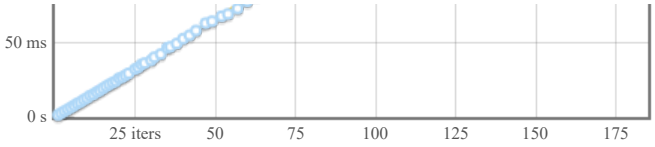
Outlying measurements have slight (3.3%) effect on estimated standard deviation.

Analysis and Planning local/Cost





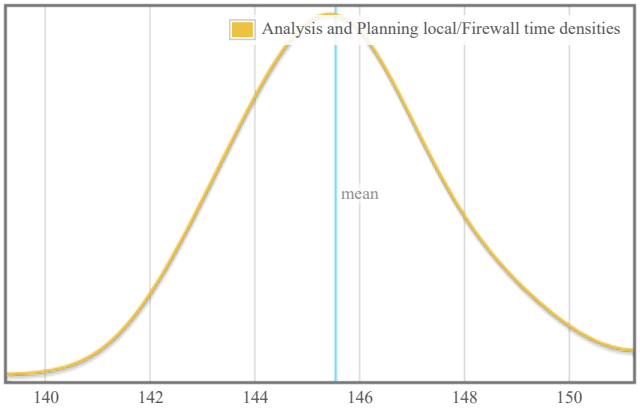


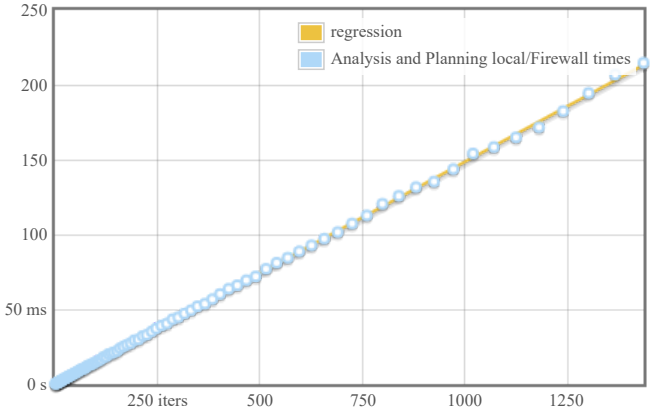


	lower bound	estimate	upper bound
OLS regression	1.31 ms	1.31 ms	1.32 ms
R² goodness-of-fit	1.000	1.000	1.000
Mean execution time	1.26 ms	1.27 ms	1.28 ms
Standard deviation	23.6 µs	28.3 µs	33.8 µs

Outlying measurements have moderate (11.6%) effect on estimated standard deviation.

Analysis and Planning local/Firewall

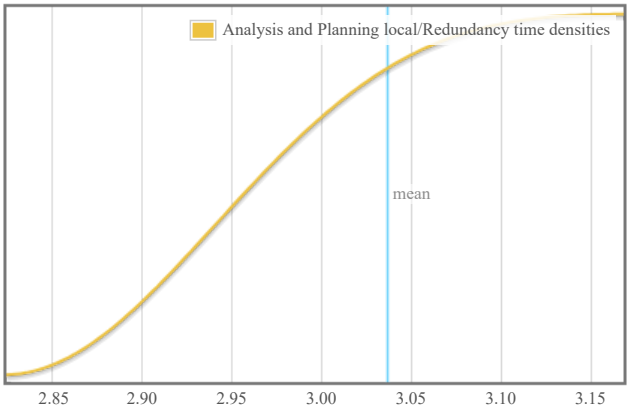


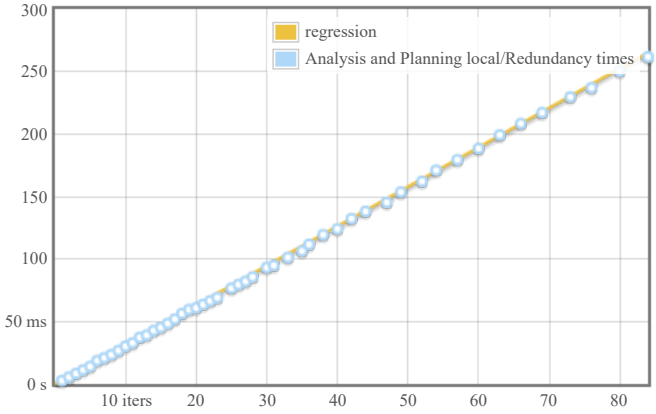


	lower bound	estimate	upper bound
OLS regression	148 µs	149 µs	150 µs
R² goodness-of-fit	1.000	1.000	1.000
Mean execution time	145 µs	146 µs	146 µs
Standard deviation	1.66 µs	2.04 µs	2.63 µs

Outlying measurements have slight (7.1%) effect on estimated standard deviation.

Analysis and Planning local/Redundancy

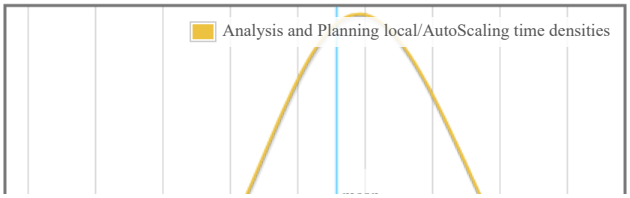


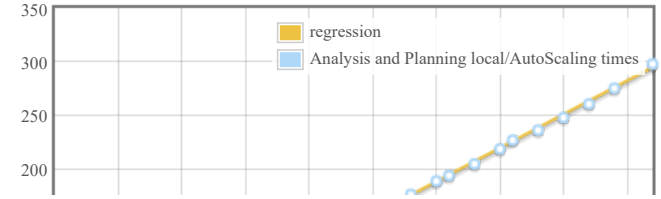


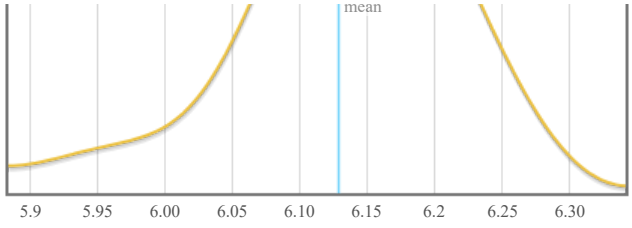
	lower bound	estimate	upper bound
OLS regression	3.14 ms	3.16 ms	3.17 ms
R² goodness-of-fit	1.000	1.000	1.000
Mean execution time	3.01 ms	3.04 ms	3.06 ms
Standard deviation	66.4 µs	77.0 µs	94.7 µs

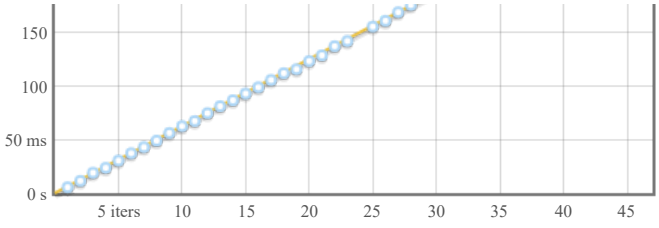
Outlying measurements have moderate (11.5%) effect on estimated standard deviation.

Analysis and Planning local/AutoScaling





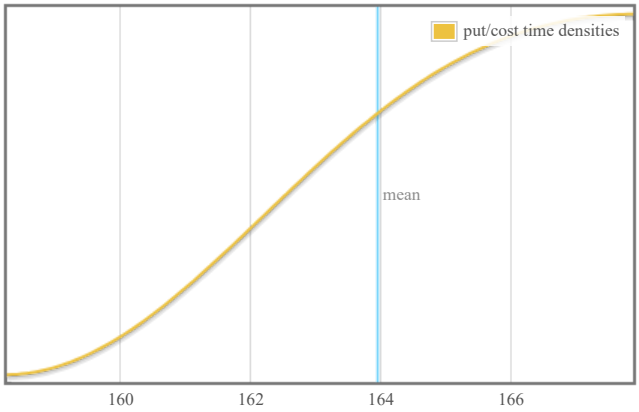


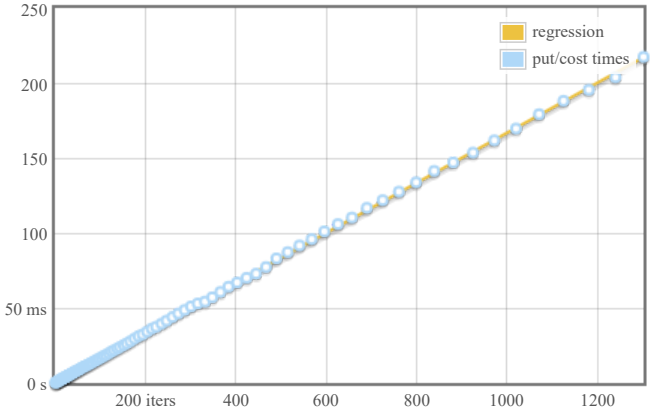


	lower bound	estimate	upper bound
OLS regression	6.23 ms	6.27 ms	6.32 ms
R² goodness-of-fit	1.000	1.000	1.000
Mean execution time	6.10 ms	6.13 ms	6.16 ms
Standard deviation	69.1 µs	89.5 µs	115 µs

Outlying measurements have slight (2.6%) effect on estimated standard deviation.

put/cost

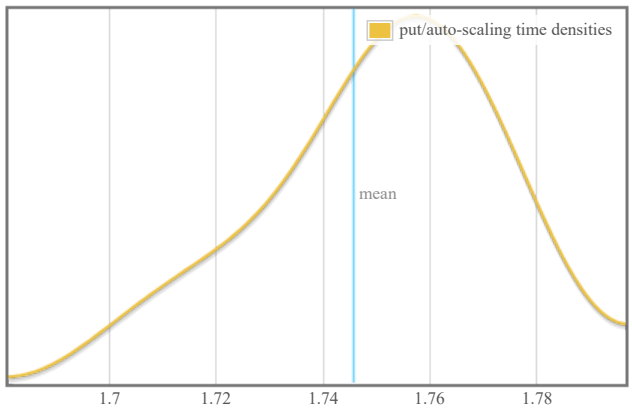


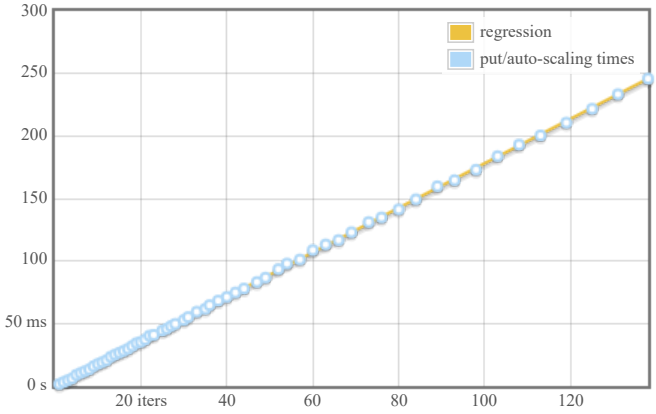


	lower bound	estimate	upper bound
OLS regression	166 µs	167 µs	167 µs
R² goodness-of-fit	1.000	1.000	1.000
Mean execution time	163 µs	164 µs	165 µs
Standard deviation	2.03 µs	2.35 µs	2.77 µs

Outlying measurements have slight (7.2%) effect on estimated standard deviation.

put/auto-scaling

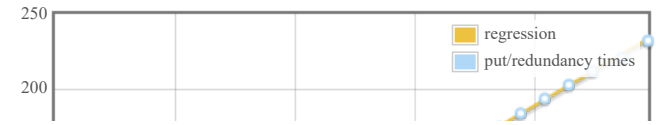


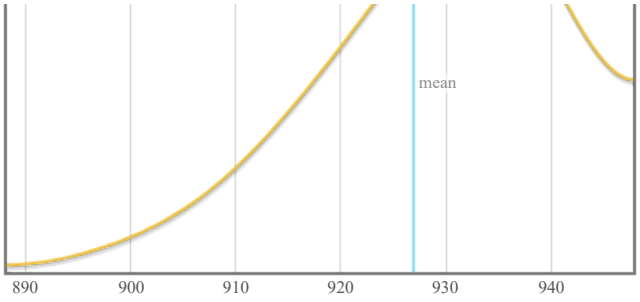


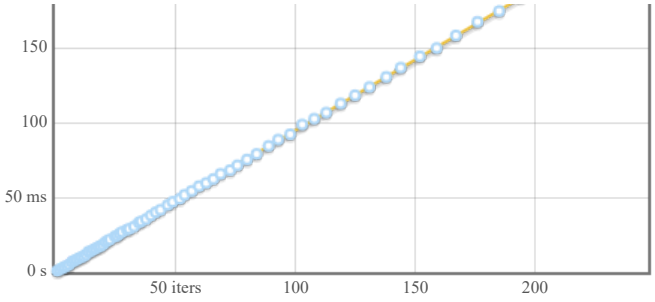
	lower bound	estimate	upper bound
OLS regression	1.78 ms	1.78 ms	1.79 ms
R² goodness-of-fit	1.000	1.000	1.000
Mean execution time	1.74 ms	1.75 ms	1.75 ms
Standard deviation	21.3 µs	25.7 µs	30.5 µs

Outlying measurements have slight (1.7%) effect on estimated standard deviation.

put/redundancy



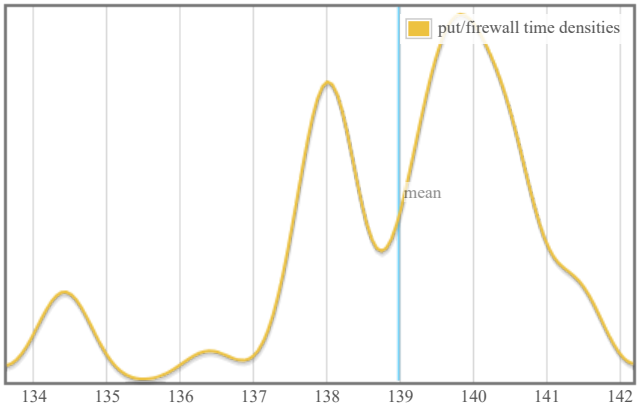


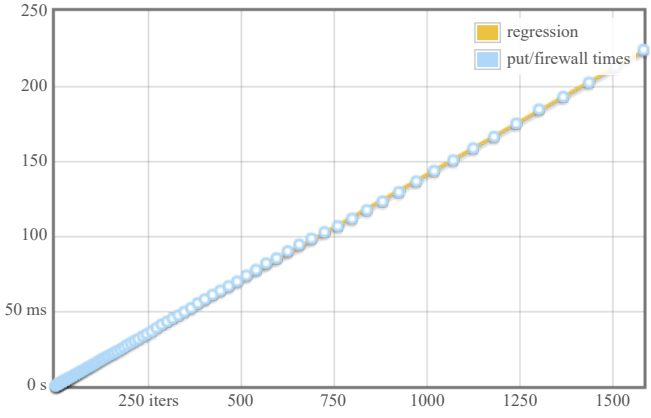


	lower bound	estimate	upper bound
OLS regression	943 µs	945 µs	949 µs
R² goodness-of-fit	1.000	1.000	1.000
Mean execution time	923 µs	927 µs	930 µs
Standard deviation	9.85 µs	12.0 µs	16.5 µs

Outlying measurements have slight (1.4%) effect on estimated standard deviation.

put/firewall





	lower bound	estimate	upper bound
OLS regression	141 µs	141 µs	142 µs
R² goodness-of-fit	1.000	1.000	1.000
Mean execution time	138 µs	139 µs	139 µs
Standard deviation	1.32 µs	1.75 µs	2.30 µs

Outlying measurements have slight (6.1%) effect on estimated standard deviation.

understanding this report

In this report, each function benchmarked by criterion is assigned a section of its own. The charts in each section are active; if you hover your mouse over data points and annotations, you will see more details.

- The chart on the left is a kernel density estimate (also known as a KDE) of time measurements. This graphs the probability of any given time measurement occurring. A spike indicates that a measurement of a particular time occurred; its height indicates how often that measurement was repeated.
- The chart on the right is the raw data from which the kernel density estimate is built. The *x* axis indicates the number of loop iterations, while the *y* axis shows measured execution time for the given number of loop iterations. The line behind the values is the linear regression prediction of execution time for a given number of iterations. Ideally, all measurements will be on (or very near) this line.

Under the charts is a small table. The first two rows are the results of a linear regression run on the measurements displayed in the right-hand chart.

- *OLS regression* indicates the time estimated for a single loop iteration using an ordinary least-squares regression model. This number is more accurate than the *mean* estimate below it, as it more effectively eliminates measurement overhead and other constant factors.
- *R² goodness-of-fit* is a measure of how accurately the linear regression model fits the observed measurements. If the measurements are not too noisy, R² should lie between 0.99 and 1, indicating an excellent fit. If the number is below 0.99, something is confounding the accuracy of the linear model.
- *Mean execution time* and *standard deviation* are statistics calculated from execution time divided by number of iterations.

We use a statistical technique called the bootstrap to provide confidence intervals on our estimates. The bootstrap-derived upper and lower bounds on estimates let you see how accurate we believe those estimates to be. (Hover the mouse over the table headers to see the confidence levels.)

A noisy benchmarking environment can cause some or many measurements to fall far from the mean. These outlying measurements can have a significant inflationary effect on the estimate of the standard deviation. We calculate and display an estimate of the extent to which the standard deviation has been inflated by outliers.

colophon

This report was created using the criterion benchmark execution and performance analysis tool.

Criterion is developed and maintained by Bryan O'Sullivan.