

# Evaluate All the Things with `benchkit`

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29th of January, 2025 – FOSDEM BOF Track C

Multicore & Concurrency:  
Algorithms, Performance, Correctness



# Example use case: evaluating locks



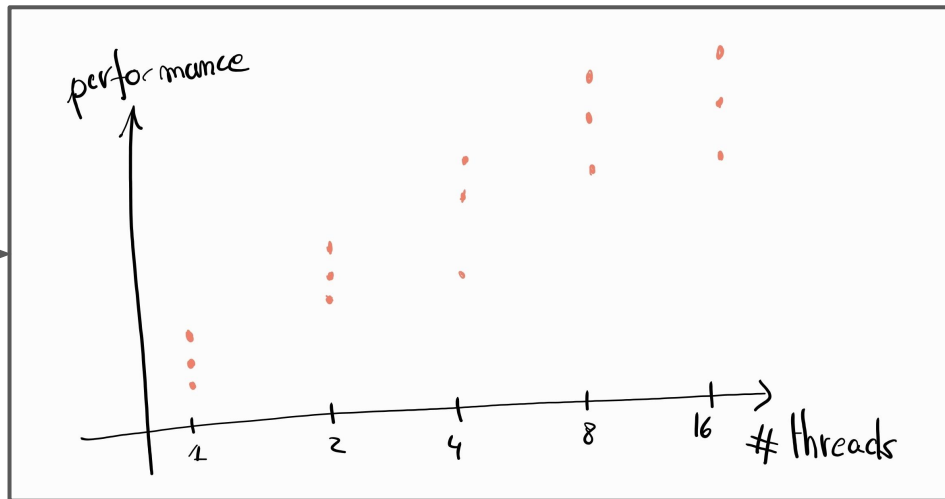
lock.c

use case

automate.sh

Ubuntu Linux 18.04

Kunpeng 920  
(128 cores)



# Locks implementation are plenty

e.g. [libvsync](#)

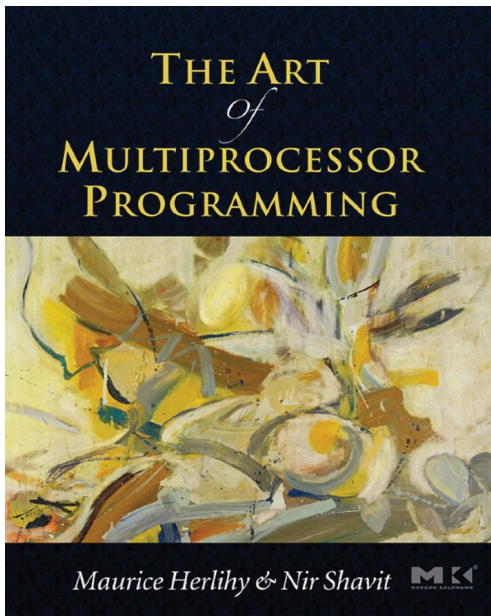
lock.c

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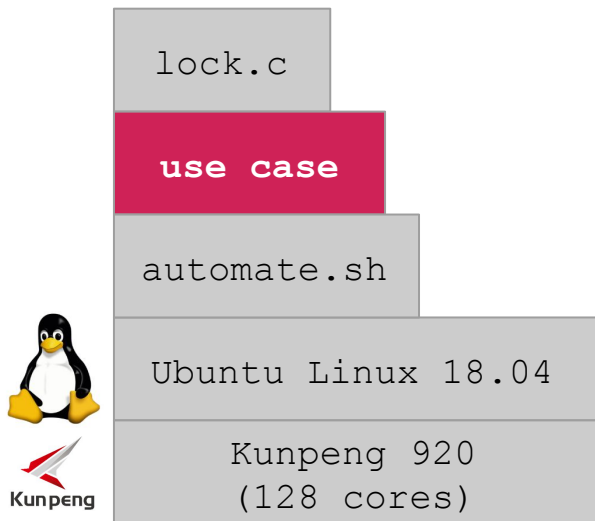
Ubuntu Linux 18.04

Kunpeng 920  
(128 cores)



| libvsync / include / vsync / spinlock / |  |
|-----------------------------------------|--|
| lilith218 Release v3.6.0 (#12)          |  |
| Name                                    |  |
| ..                                      |  |
| arraylock.h                             |  |
| caslock.h                               |  |
| clhlock.h                               |  |
| cnacllock.h                             |  |
| hclhlock.h                              |  |
| hemlock.h                               |  |
| hmcslock.h                              |  |
| mcslock.h                               |  |
| rec_mcslock.h                           |  |
| rec_seqlock.h                           |  |
| rec_spinlock.h                          |  |
| rec_ticketlock.h                        |  |
| rwlock.h                                |  |
| semaphore.h                             |  |
| seqcount.h                              |  |
| seqlock.h                               |  |
| ticketlock.h                            |  |
| ttaslock.h                              |  |
| twalock.h                               |  |

# Benchmarking locks in many use cases



MariaDB



PostgreSQL



RocksDB



levelDB

I ♥  
TKRZW



# Writing shell script to evaluate locks?

lock.c

use case

**automate.sh**

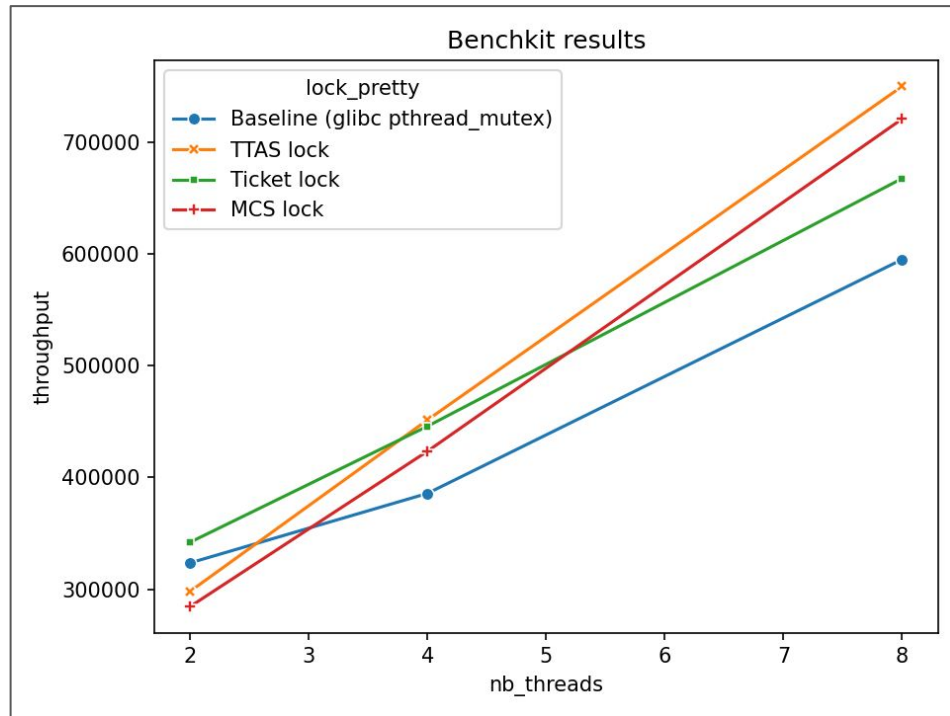
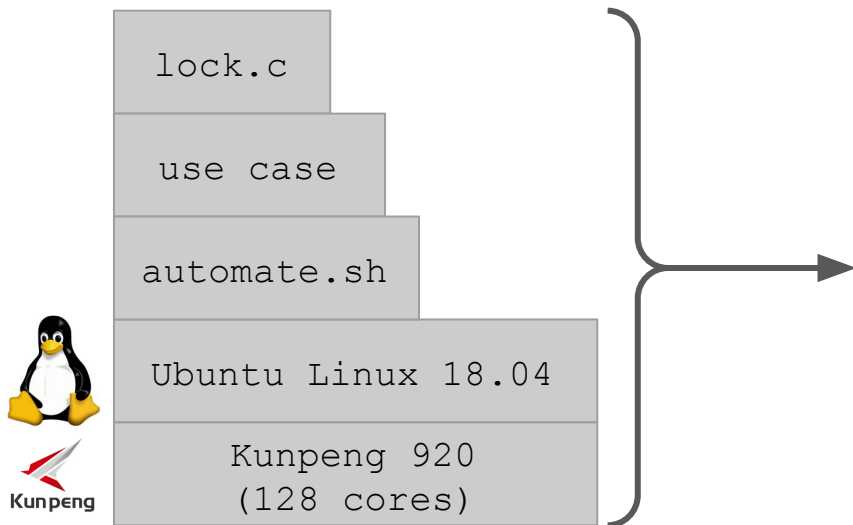
Ubuntu Linux 18.04

Kunpeng 920  
(128 cores)



```
nb_threads="1 2 4 8"
bench_name=readrandom
locks="spin mcs ticket clh"
lses="on off"
echo "bench_name;lock;lse;nb_thread;microsop" | tee /tmp/results.csv
for lse in ${lses}
do
  for lock in ${locks}
  do
    make -C ../tilt ${lock} LSE=${lse}
    for nb_thread in ${nb_threads}
    do
      taskset --cpu-list 0 env LD_PRELOAD="../tilt/${lock}.so" ./db_bench
      --benchmarks=${bench_name} --threads=${nb_thread} \
        > /tmp/leveldb_results.txt
      results=$(cat /tmp/leveldb_results.txt | tail -n 1 | grep -o "[0-9.]\+ micros/op" |
        cut -d ' ' -f 1)
      echo "${bench_name};${nb_thread};${results}" | tee -a /tmp/results.csv
    done
  done
done
```

# Getting some results...



# Shell scripts are getting complex quickly



lock.c

use case

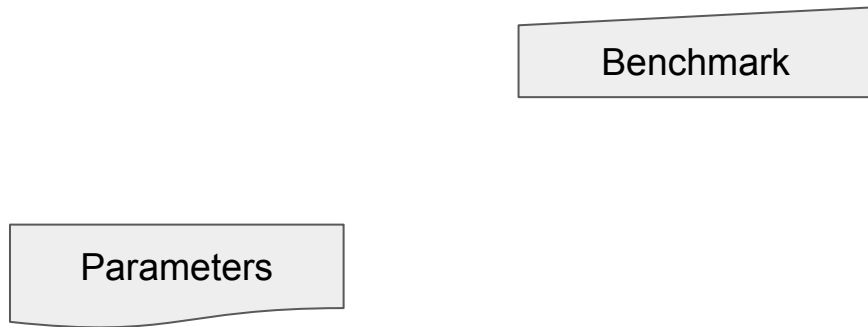
~~auto test sh~~

Ubuntu Linux 18.04

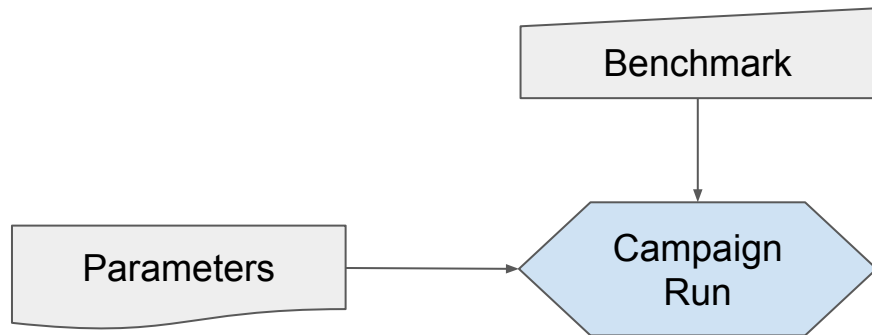
Kunpeng 920  
(128 cores)

```
nb_threads="1 2 4 8"
bench_name=readrandom
locks="spin mcs mcs_h"
lses="on off"
echo "bench_name=$bench_name read;mcsop" | tee /dev/null
for lse in $lses
do
  for lock in $locks
  do
    make -C ../tilt ${lock}_${bench_name}
    for nb_thread in $nb_threads
    do
      taskset --cpu-list 0-127 ./tilt ${lock}_${bench_name}
      --benchmarks=${lock}_${bench_name}
      results=$(cat results.txt | tail -n 1 | sed 's/micros/op/' |
      cut -d ' ' -f 2)
      echo "${lock}_${bench_name}_${nb_thread};${results}" | tee -a results.csv
    done
  done
done
```

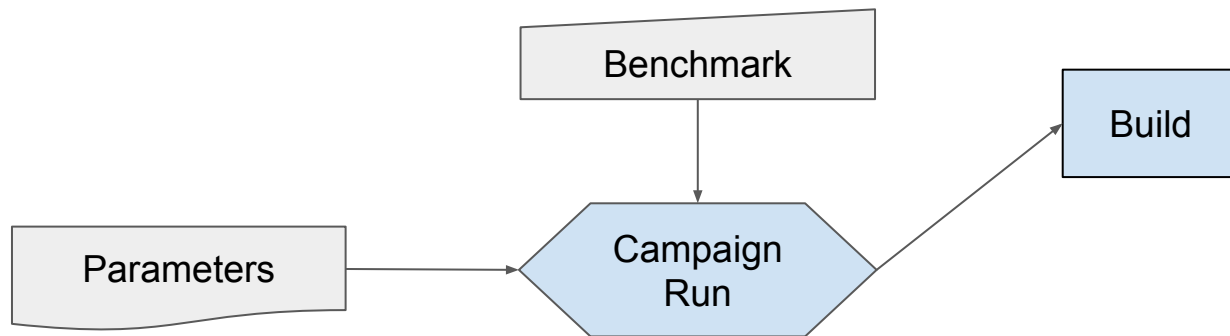
# Benchkit flow



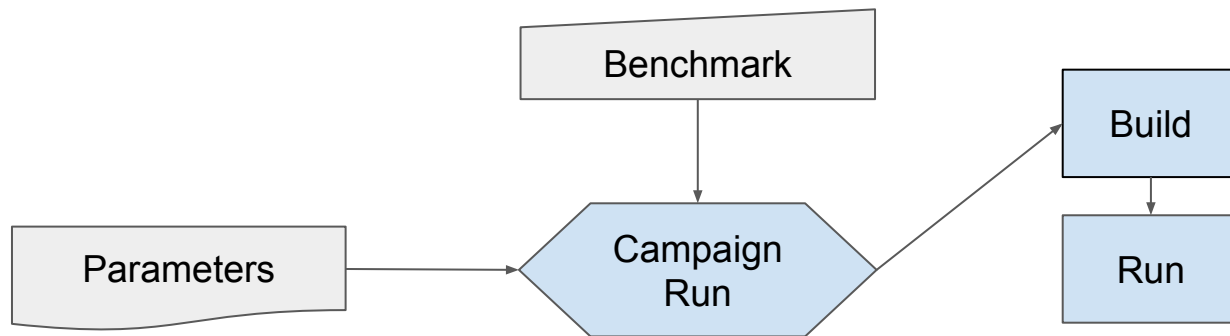
# Benchkit flow



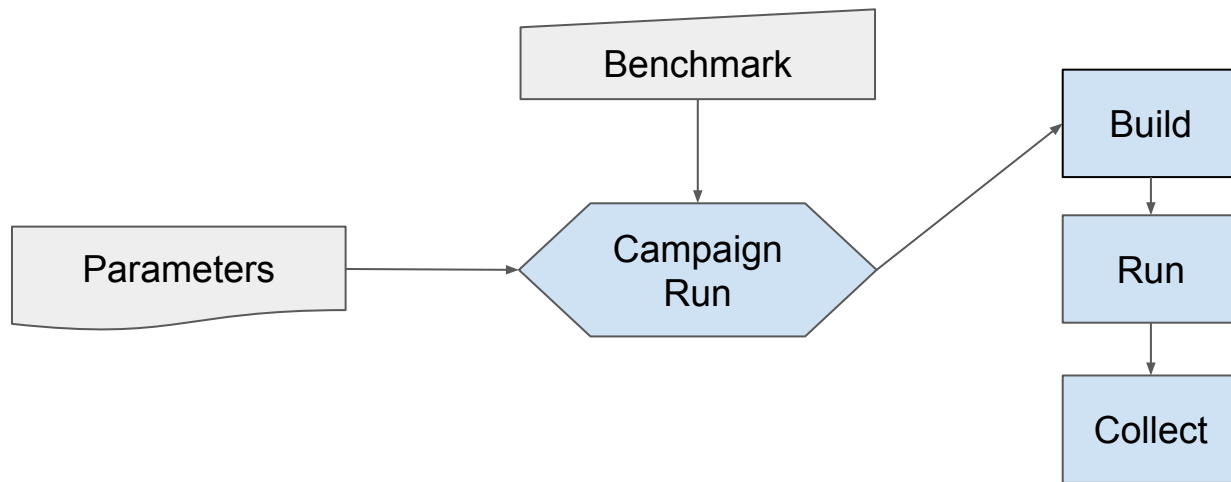
# Benchkit flow



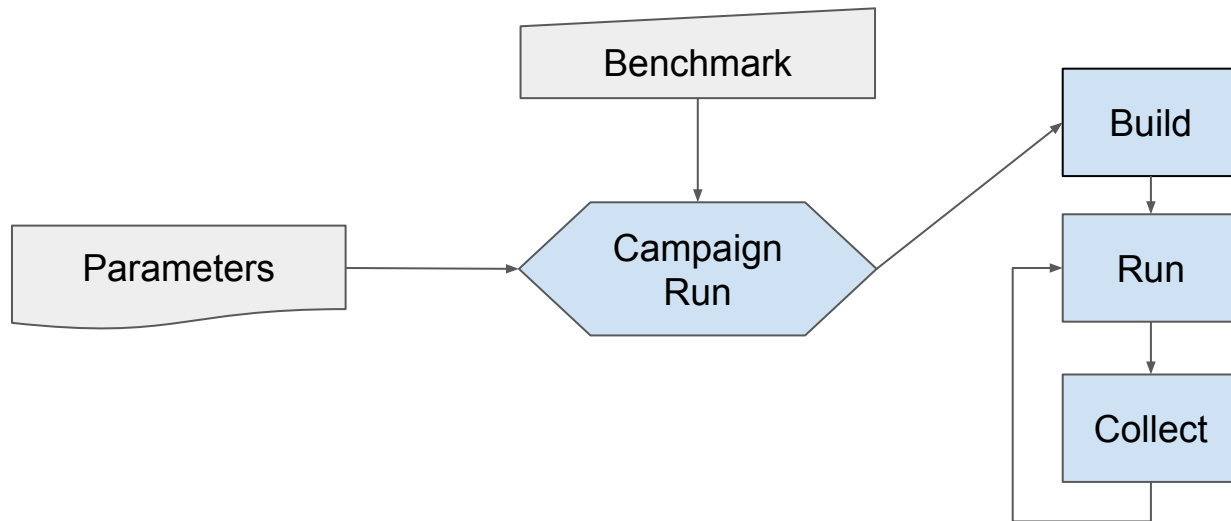
# Benchkit flow



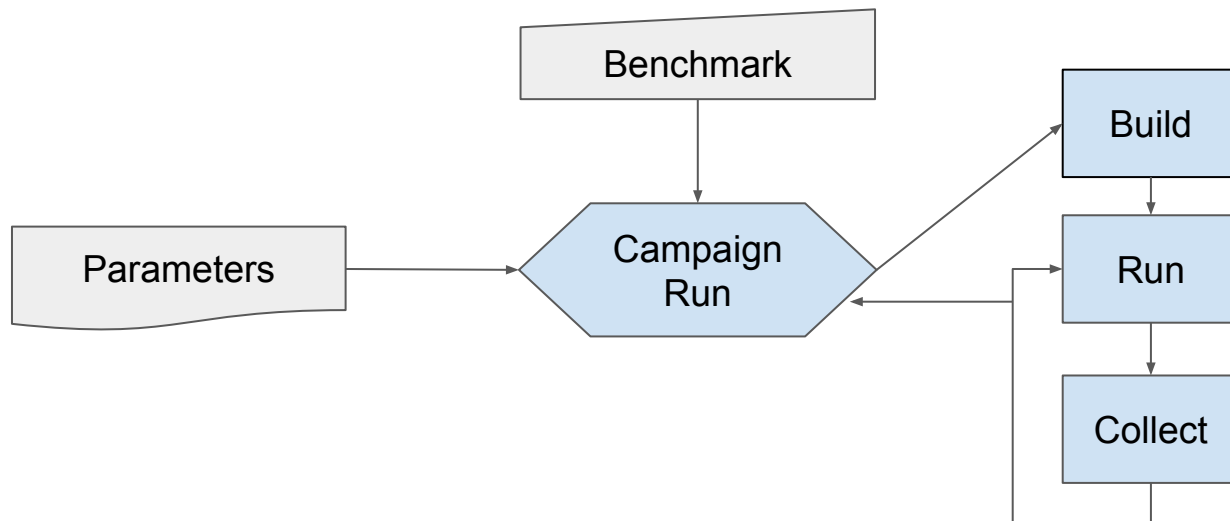
# Benchkit flow



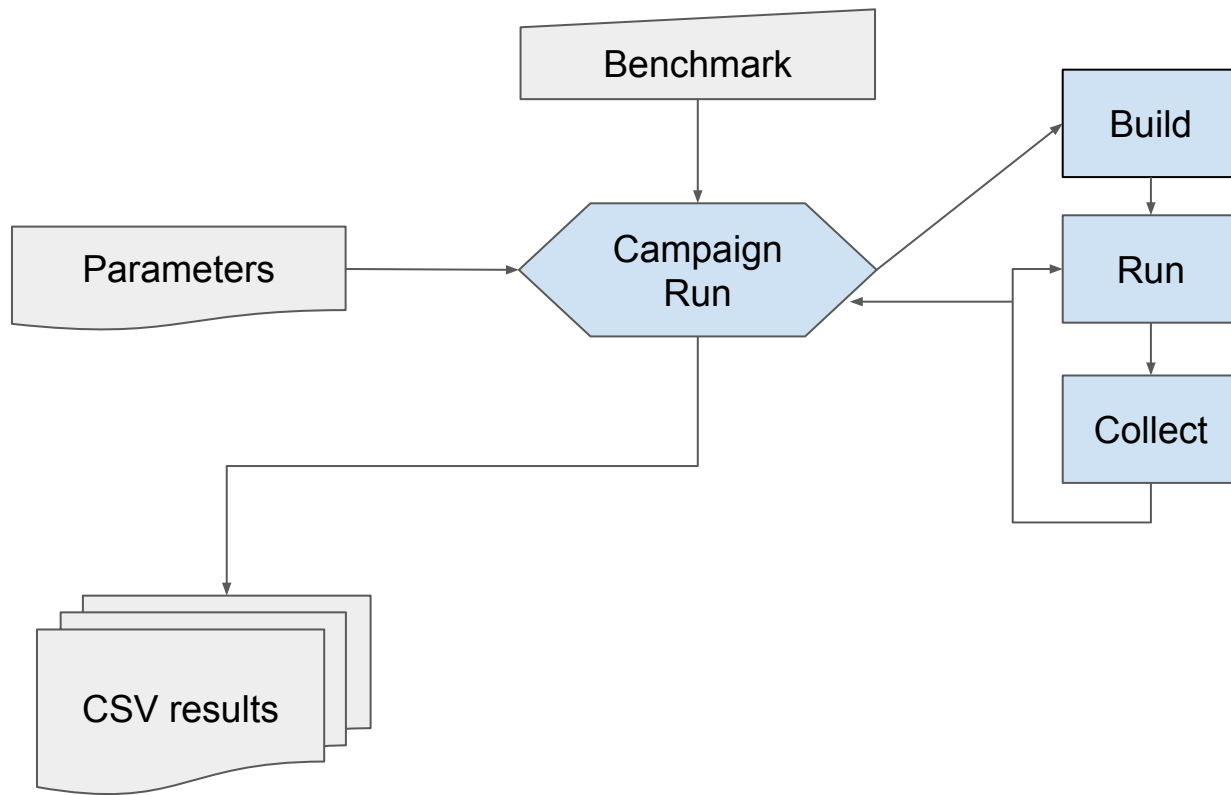
# Benchkit flow



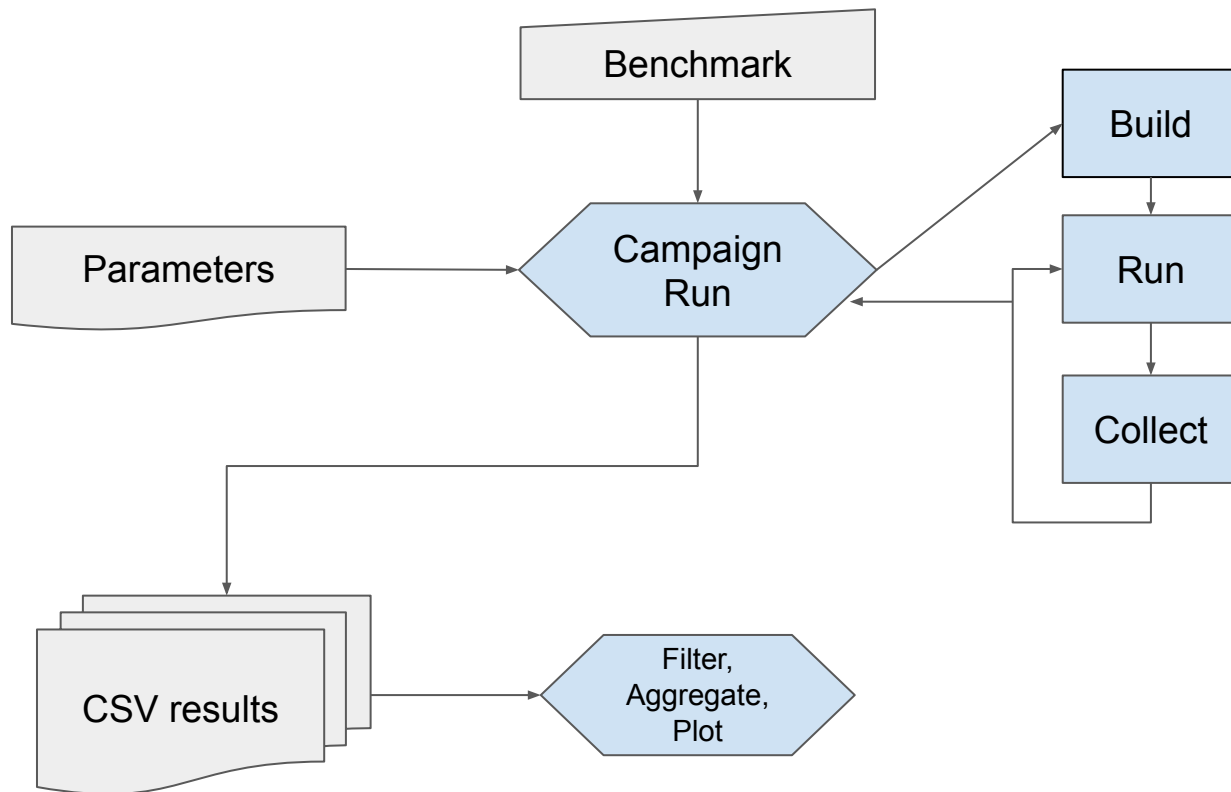
# Benchkit flow



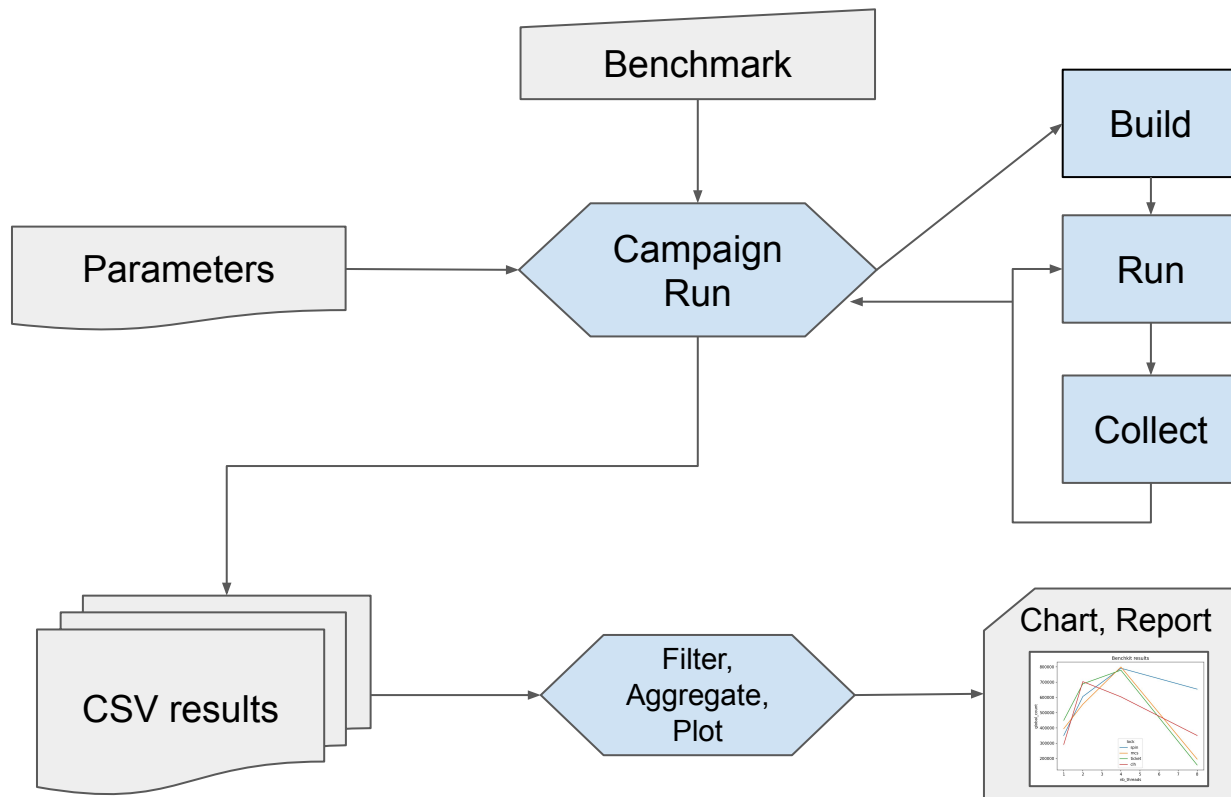
# Benchkit flow



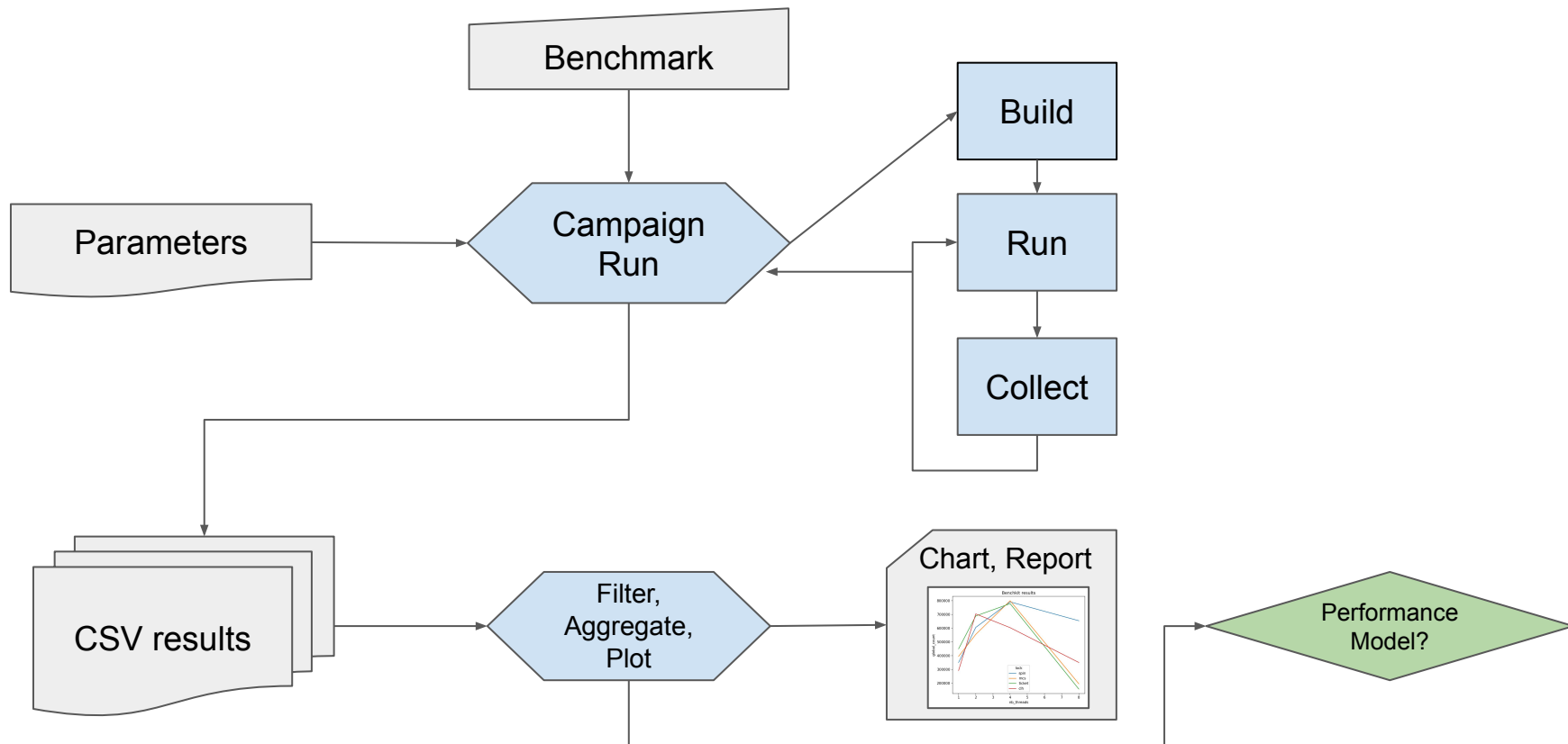
# Benchkit flow



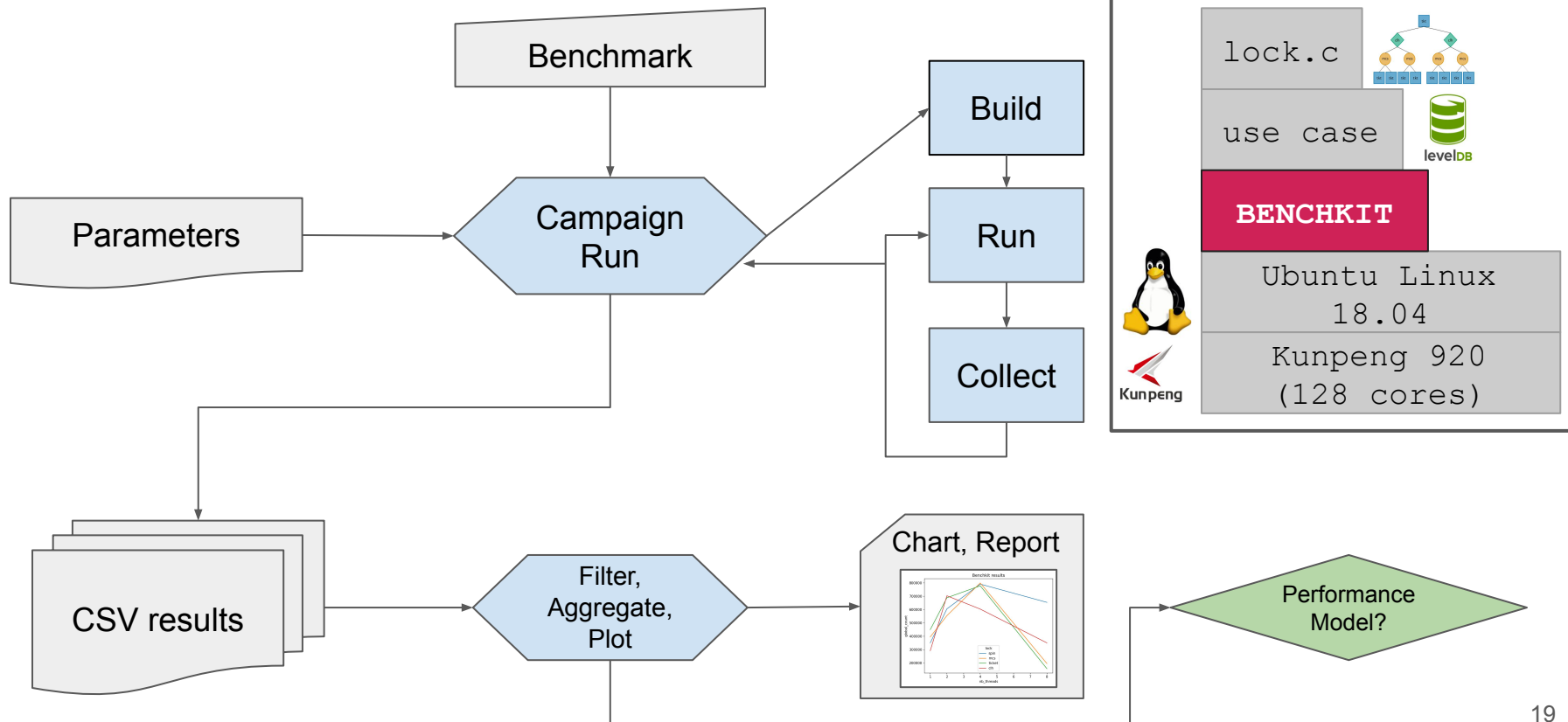
# Benchmark flow



# Benchmark flow



# Benchmark flow



# benchkit provides an alternative



lock.c

use case

**BENCHKIT**

Ubuntu Linux 18.04

Kunpeng 920  
(128 cores)

```
nb_threads="1 2 4 8"
bench_name=readrandom
locks="spin mcs ticket clh"
lses="on off"
echo "bench_name;lock;lse;r"
for lse in ${lses}
do
  for lock in ${locks}
  do
    make -C ../tilt ${lock}
    for nb_thread in ${nb_threads}
    do
      taskset --cpu-list 0 63 \
        --threads=${nb_thread} \
        > /tmp/leveldb_res
      results=$(cat /tmp/leveldb_res)
      echo "${bench_name};${lock};${lse};${nb_thread};${results}"
    done
  done
done
```

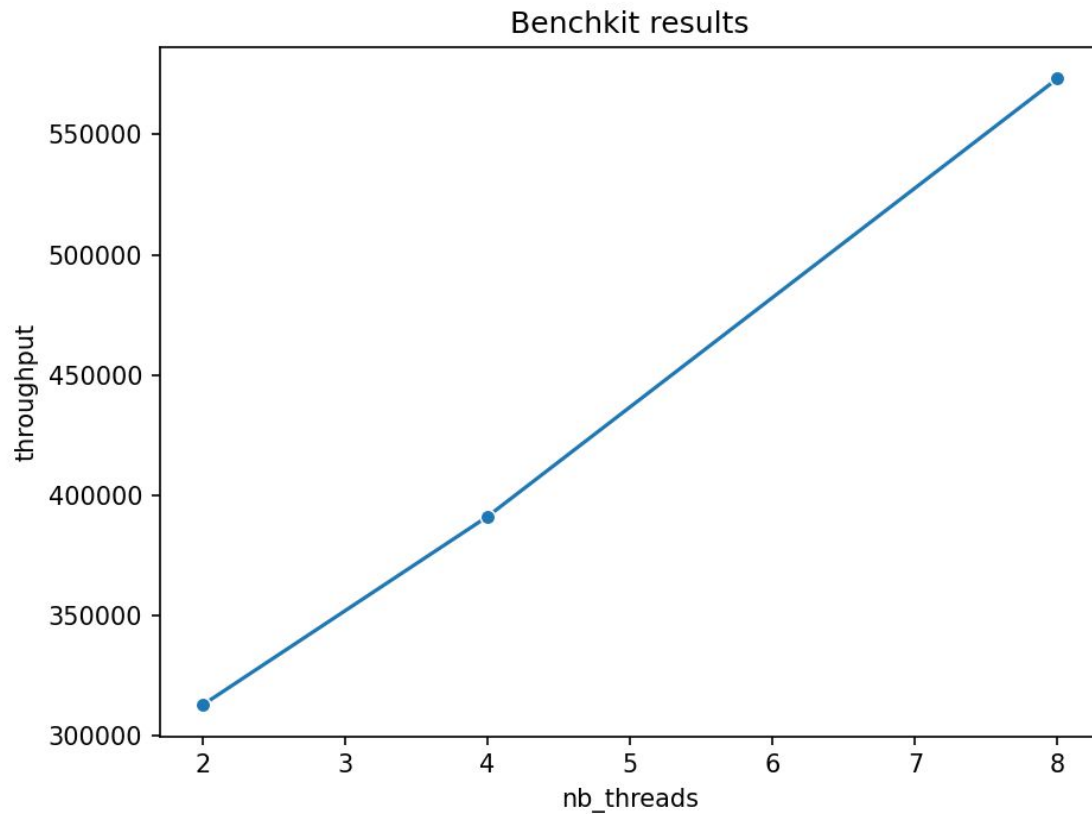
```
ipython3 < EOF
df = pd.read_csv('/tmp/results.csv')
ax = sns.lineplot(data=df,
                  x='nb_threads',
                  y='microseconds',
                  hue='bench_name')
plt.show()
EOF
```

```
if __name__ == '__main__':
    campaign = leveldb_campaign(
        nb_runs=5,
        bench_name=['readrandom', 'fillseq', 'fillrandom'],
        locks=['spin', 'mcs', 'ticket', 'clh'],
        cpu_order=('desc',),
        use_lse=[False, True],
        atomics=('a64', 'blt'),
        nb_threads=[1, 2, 4, 8],
        shared_libs=[get_assignlib(),
                     get_fledgedtilt()],
        command_wrappers=[TasksetWrap()],
    )

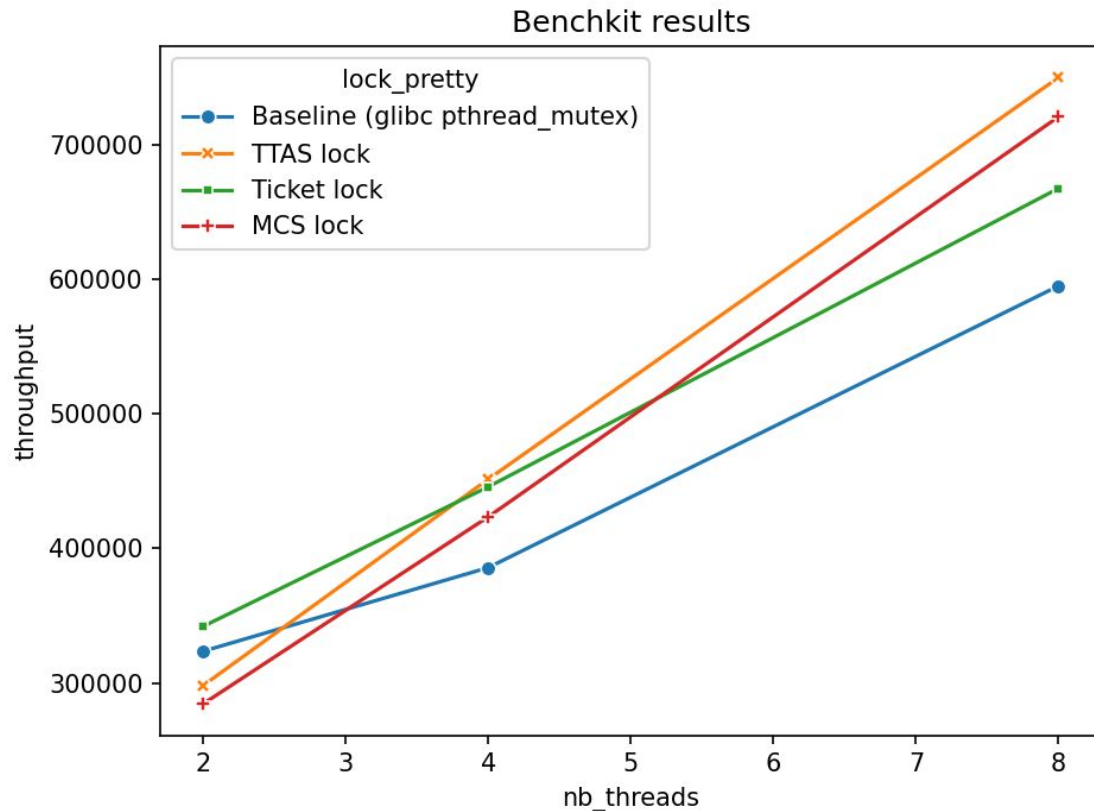
    campaign.run()
    campaign.generate_graph(plot_name='lineplot',
                           x='nb_threads',
                           y='global_count',
                           hue='lock')
```

**demo**

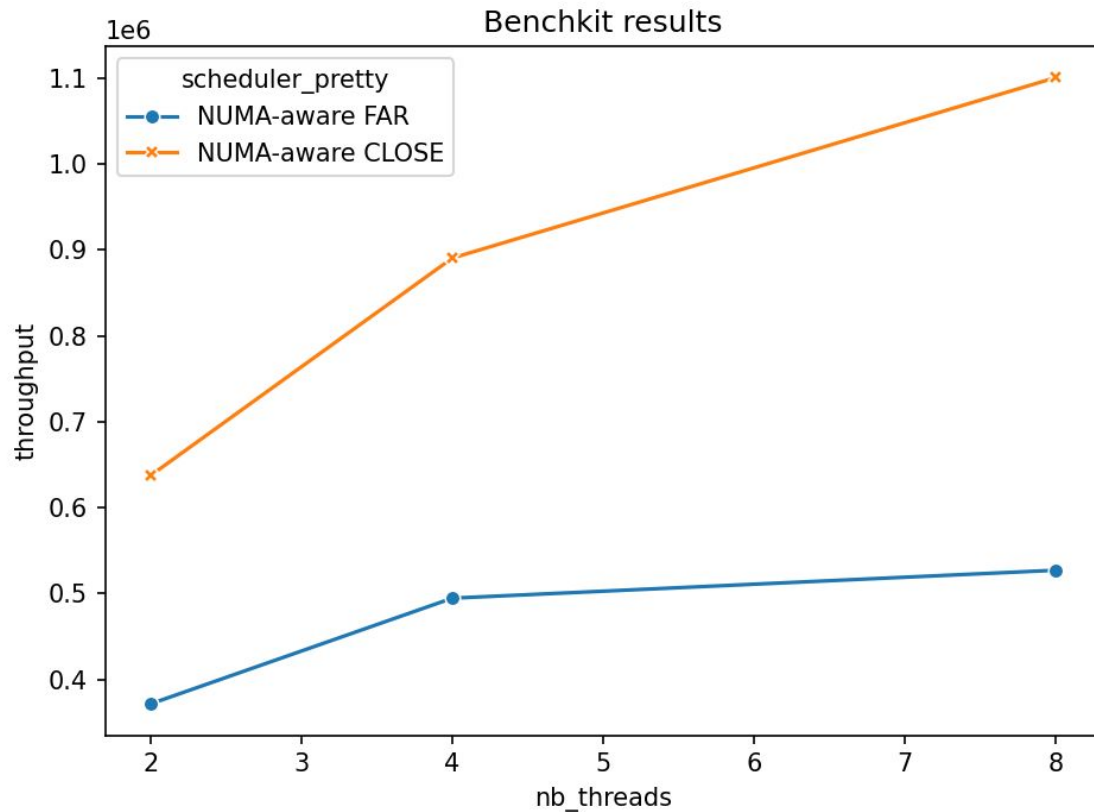
# 00 - LevelDB



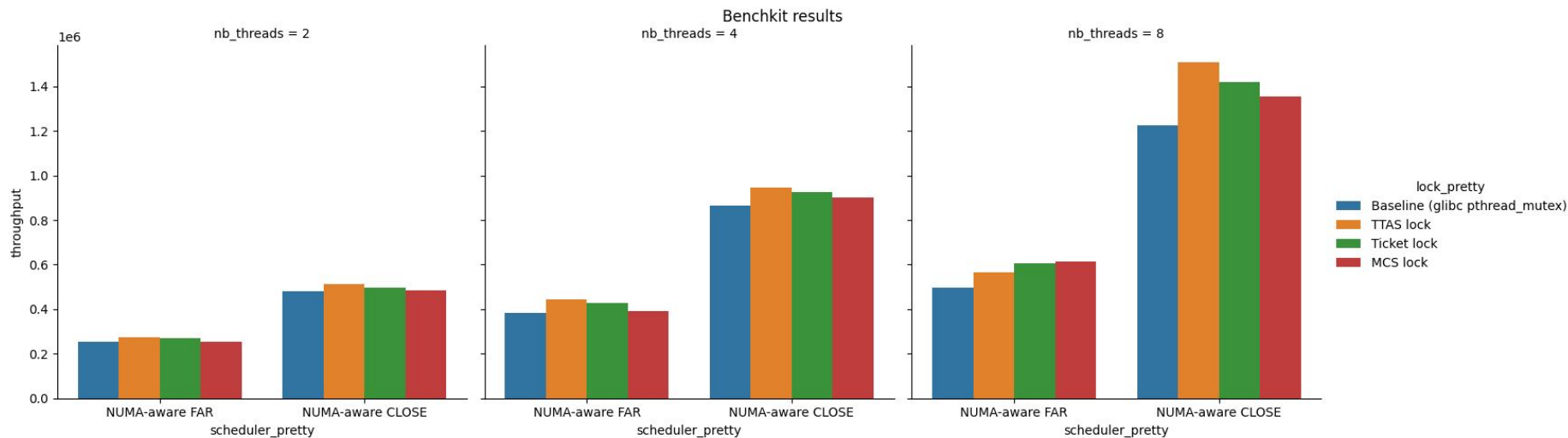
# 01 - LevelDB - various locks



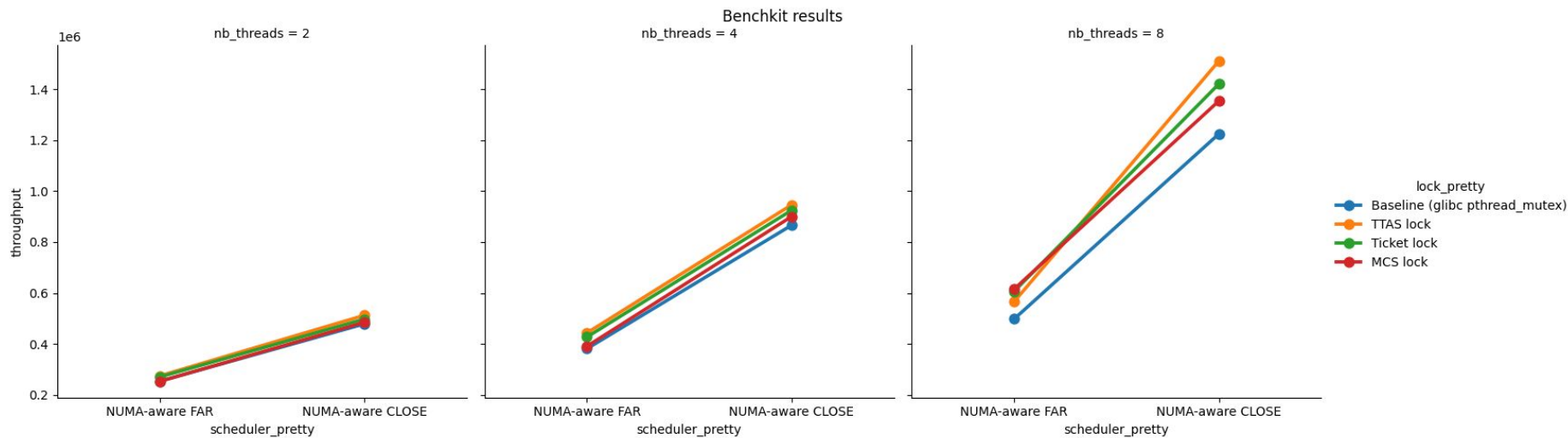
## 02 - LevelDB - various schedulers



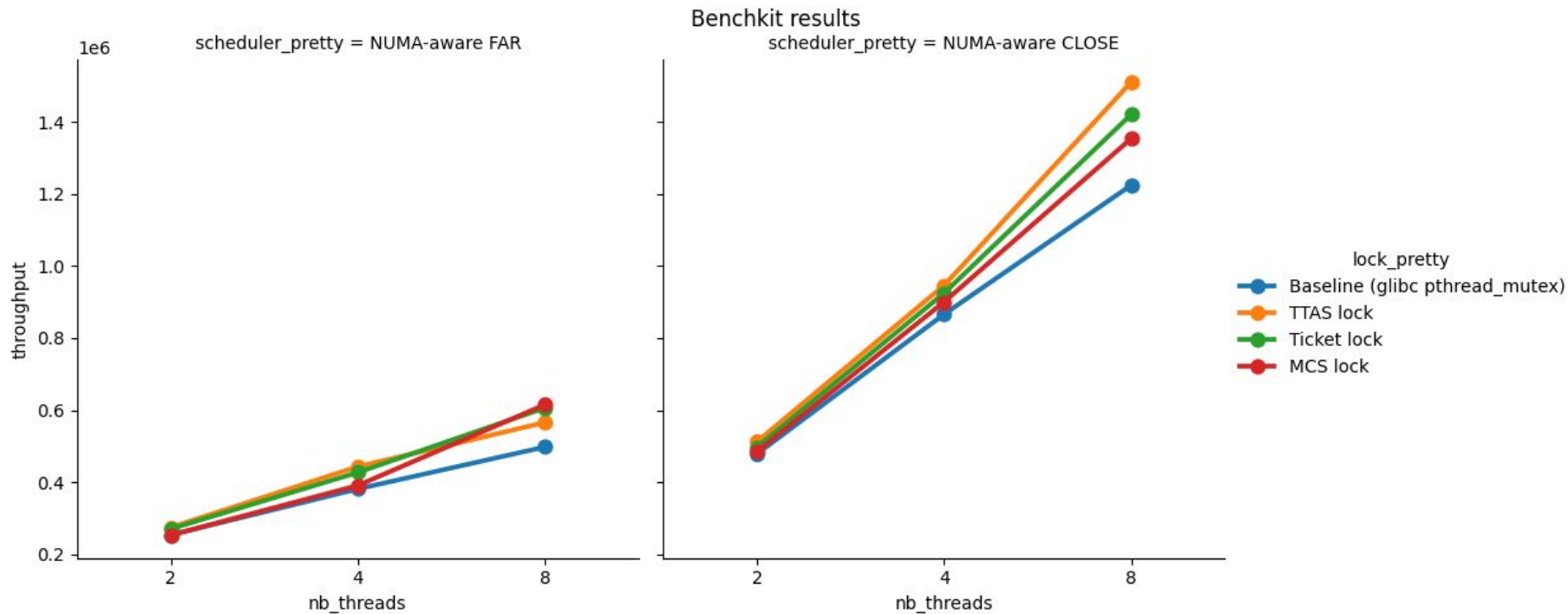
# 03a - LevelDB - various schedulers & locks



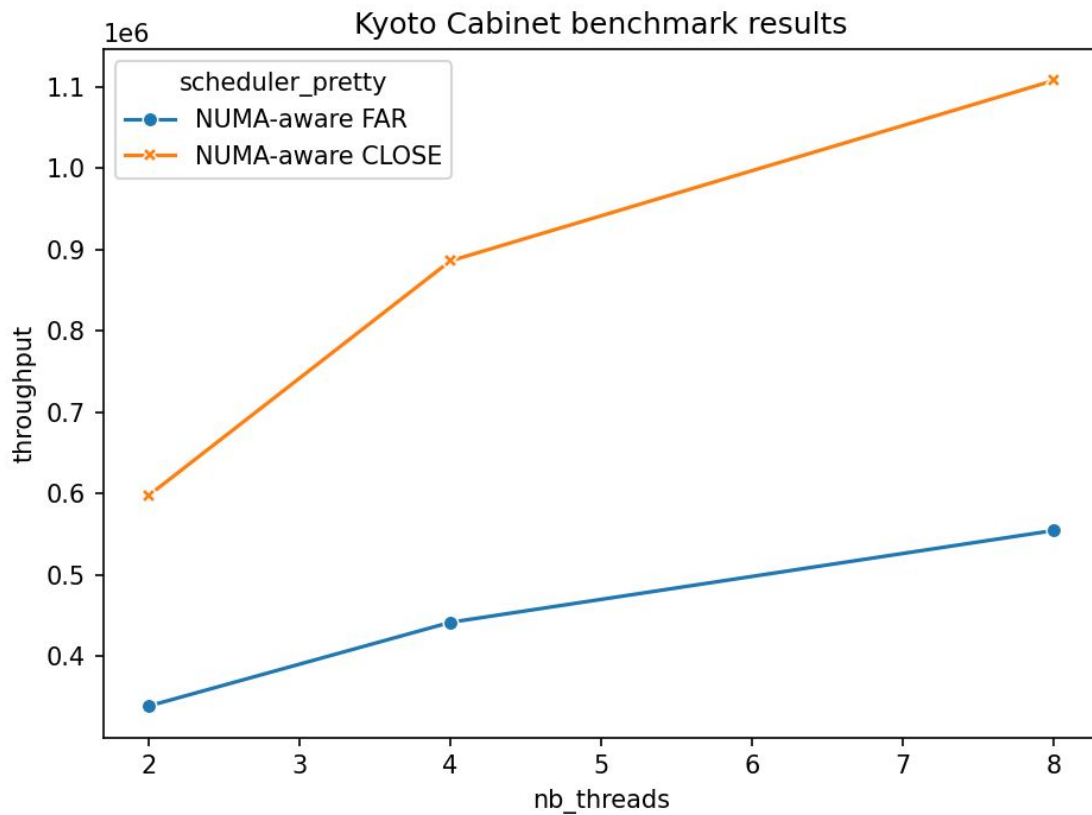
## 03b - LevelDB - various schedulers & locks



# 03c - LevelDB - various schedulers & locks



## 04 - Kyoto Cabinet - various schedulers



Try it! → <https://github.com/open-s4c/benchmark>



On GitHub



MIT license

| File           | Commit Message                                  | Time         |
|----------------|-------------------------------------------------|--------------|
| LICENSE        | Update license to reflect VUB & personal con... | 4 months ago |
| MAINTAINERS    | Initial public release                          | last year    |
| README.md      | README: Add shields (#135)                      | 2 months ago |
| ROADMAP.md     | Roadmap: add viz tool of firefox (#168)         | last month   |
| pyproject.toml | Package information for v0.0.1 (#121)           | 4 months ago |

README

MIT license

## benchmark: Performance Evaluation Framework

pypi

v0.0.1

license

MIT

downloads

164/month

`benchmark` provides a push-button end-to-end performance evaluation pipeline, which includes platform stabilization, benchmark configuration & build, and an execution engine capable of exploring the specified parameter space of the problem.

Around a given benchmark, the user can define a set of experiments called a **campaign**. Running the campaign within `benchmark` allows to run the defined experiments, collect results, aggregate them, and visualize the different variables and how they affect the overall system performance. `benchmark` provides additional tools for fine grain performance debugging and monitoring.

### Main principles

The project was born from the need to apply a systematic method to evaluate computer systems. Indeed, the landscape of benchmarks is really heterogeneous: each benchmark

Contributors 17

+ 3 contributors

Languages

Python 98.2%

Other 1.8%

# Interested in *Multicore & Concurrency*?

Contact us!

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