

# BENCHMARKING PARALLELISM IN UNIKERNELS

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## Abstract

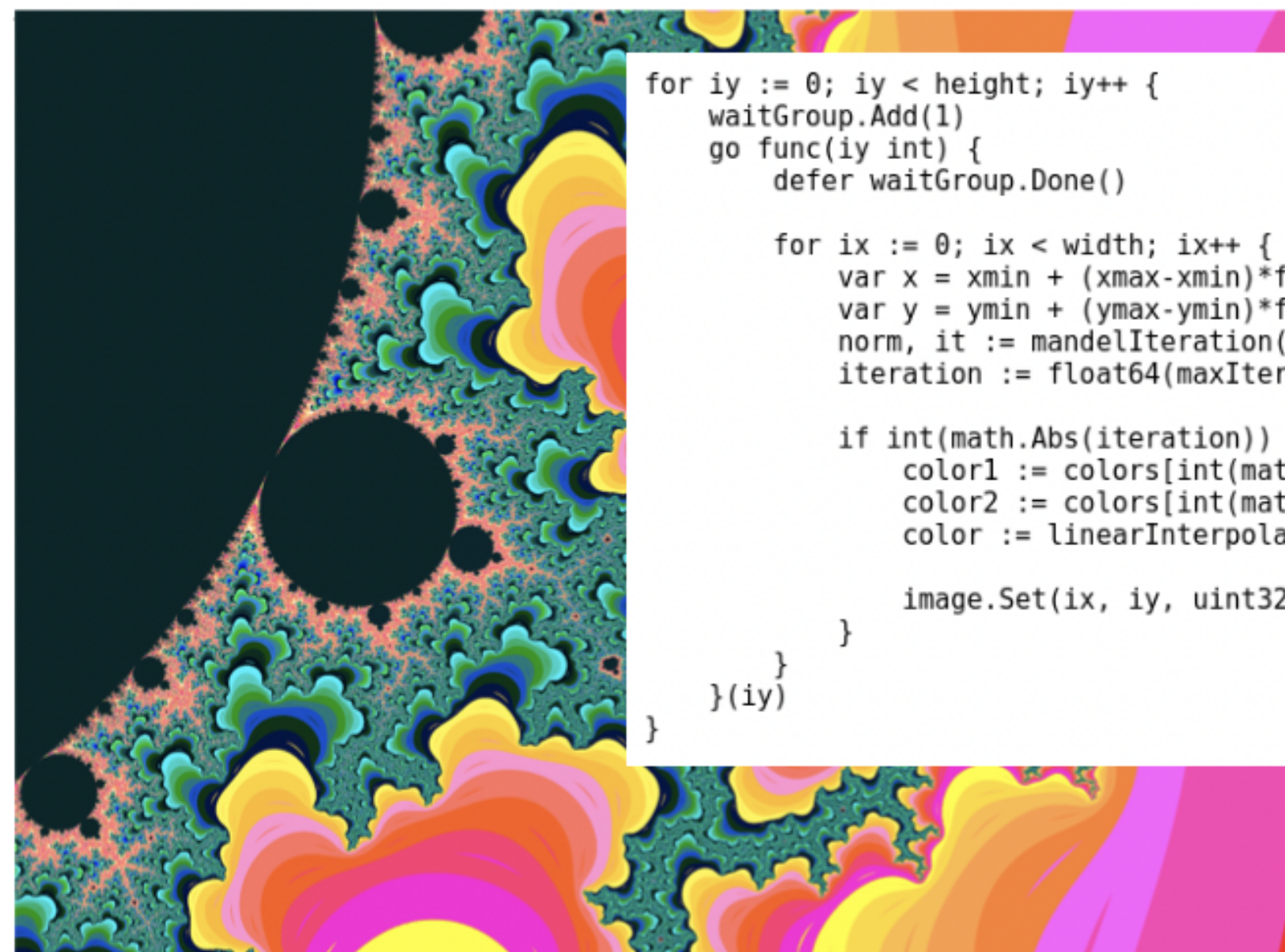
Unikernels are an interesting approach to improve performance by using a slimmed down kernel for a specific task. The following paper benchmarks the parallel performance of unikernels, i.e in a cloud based scenario. The results will be compared against the same application running on a docker container and a monolithic OS as well

## Research Questions and Goals

### Research Questions:

- (RQ1) Can unikernels be specialised for parallel programs?
- (RQ2) Would Unikernels running parallel programs out-perform cloud based environment monolithic OS or containers in terms of wall-clock runtimes, CPU profiling and memory profiling?

## Research Methods



### • Benchmark application

– *Mandelbrot*: The Mandelbrot Go implementation was used to benchmark parallelised applications on Uni-kernels. The implementation uses Go routines to spawn multiple threads. The parts parallelised of the Mandelbrot implementation was the render part ,particularly the Mandelbrot iteration and Linear interpolation.

### • Comparators

- Unikernel
- Monolithic OS
- Docker Container

### • Benchmark Metrics

- Boot-up time
- Wall clock run times
- Parallel Speed ups
- Parallel efficiency

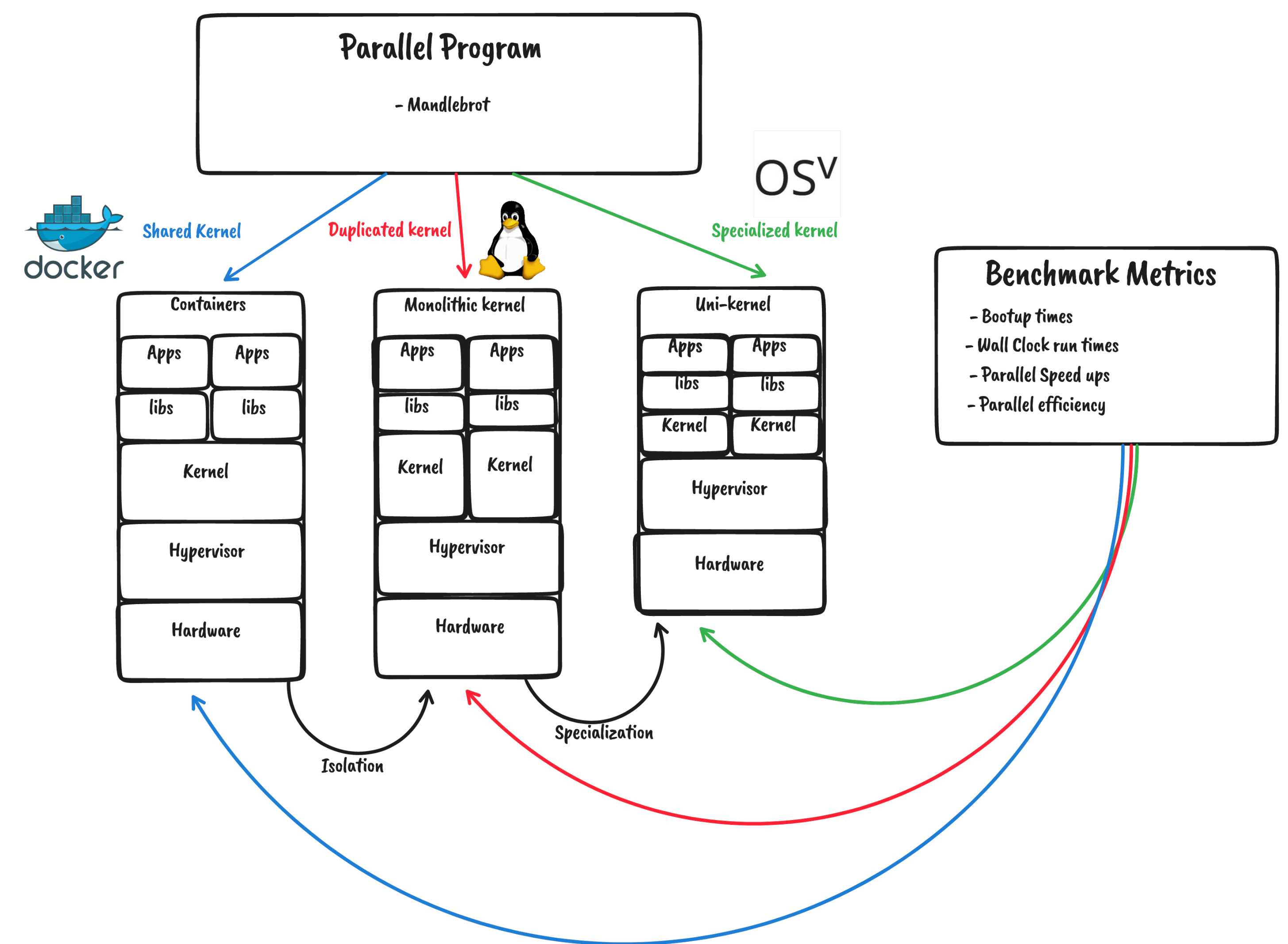
## Bootup times

OSv	310ms
Docker	715ms
Ubuntu	32 seconds

## Future Work

- Building a parallel benchmark suite for Unikernels.
- Analysing the metrics provided by the Go compiler such as Heap usage, Number OS threads created by run time etc. . .
- Benchmarking other Unikernel implementation using the benchmark suite (1)

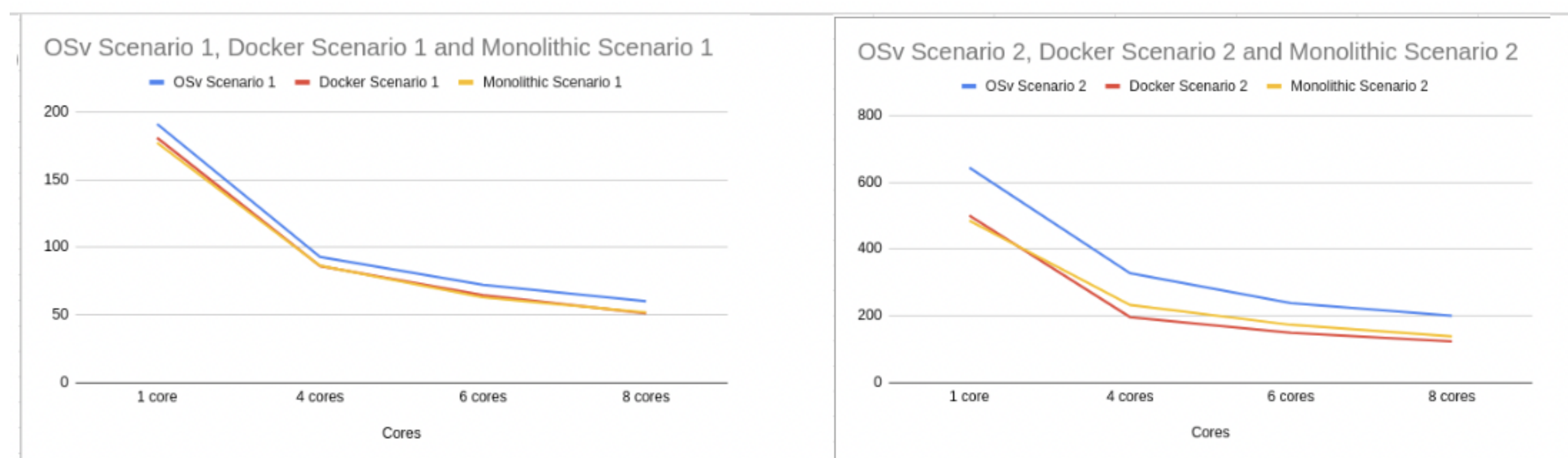
## Experimental Setup (Mandelbrot program)



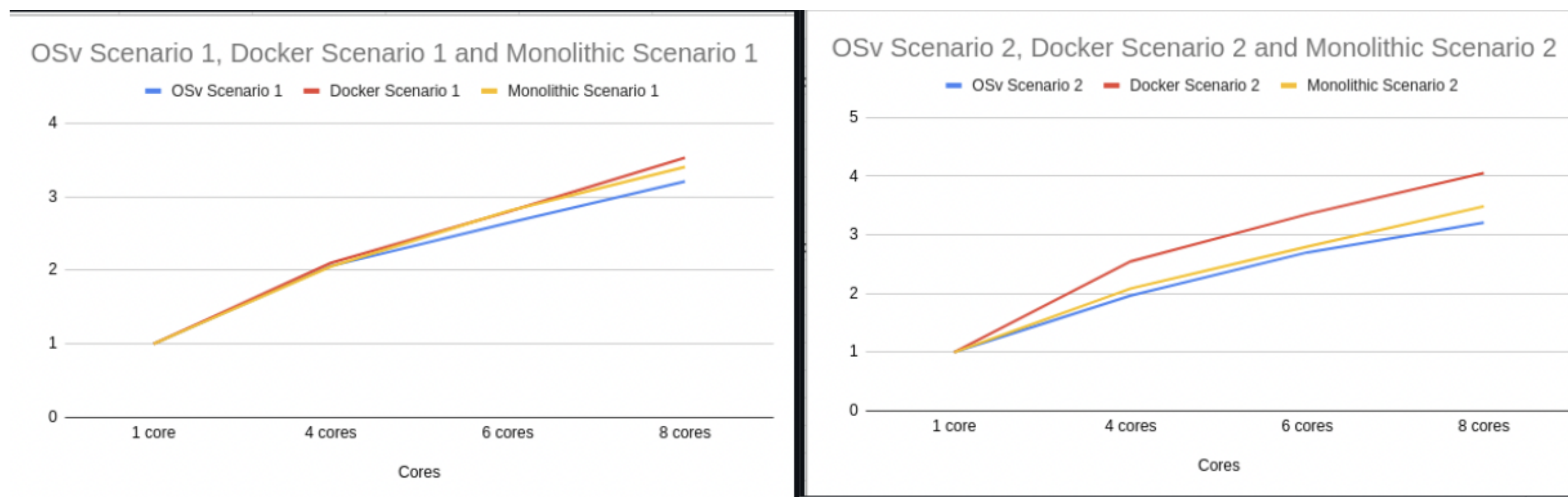
- *Scenario 1*: Height of 1000 and 3000 iterations.
- *Scenario 2*: Height of 2000 and 6000 iterations.

## Results

### Wall clock run times



### Parallel Speedups



### Parallel Efficiency

