```
/Users/zuzannafurtak/Library/Java/JavaVirtualMachines/
corretto-17.0.8/Contents/Home/bin/java -javaagent:/
Applications/IntelliJ IDEA.app/Contents/lib/idea_rt.
jar=57265:/Applications/IntelliJ IDEA.app/Contents/bin
 -Dfile.encoding=UTF-8 -classpath /Users/zuzannafurtak
/studia/las_palmas/big_data/big-data-tasks/assignment-
3/target/classes:/Users/zuzannafurtak/.m2/repository/
org/openjdk/jmh/jmh-core/1.32/jmh-core-1.32.jar:/Users
/zuzannafurtak/.m2/repository/net/sf/jopt-simple/jopt-
simple/4.6/jopt-simple-4.6.jar:/Users/zuzannafurtak/.
m2/repository/org/apache/commons/commons-math3/3.2/
commons-math3-3.2.jar:/Users/zuzannafurtak/.m2/
repository/org/openjdk/jmh/jmh-generator-annprocess/1.
32/jmh-generator-annprocess-1.32.jar com.matrix.
MultiplicationBenchmark
# JMH version: 1.32
# VM version: JDK 17.0.8, OpenJDK 64-Bit Server VM, 17
.0.8+7-LTS
# VM invoker: /Users/zuzannafurtak/Library/Java/
JavaVirtualMachines/corretto-17.0.8/Contents/Home/bin/
java
# VM options: -javaagent:/Applications/IntelliJ IDEA.
app/Contents/lib/idea_rt.jar=57265:/Applications/
IntelliJ IDEA.app/Contents/bin -Dfile.encoding=UTF-8
# Blackhole mode: full + dont-inline hint
# Warmup: 5 iterations, 1 s each
# Measurement: 10 iterations, 1 s each
# Timeout: 10 min per iteration
# Threads: 1 thread, will synchronize iterations
# Benchmark mode: Sampling time
# Benchmark: com.matrix.MultiplicationBenchmark.
multiplyParallelArrays
# Parameters: (n = 10)

# Run progress: 0.00% complete, ETA 00:02:15
# Fork: 1 of 1
# Warmup Iteration   1: 0.012 ±(99.9%) 0.001 ms/op
# Warmup Iteration   2: 0.010 ±(99.9%) 0.001 ms/op
# Warmup Iteration   3: 0.011 ±(99.9%) 0.001 ms/op
# Warmup Iteration   4: 0.011 ±(99.9%) 0.001 ms/op
# Warmup Iteration   5: 0.011 ±(99.9%) 0.001 ms/op
```

```
Iteration   1: 0.011 ±(99.9%) 0.001 ms/op
                 multiplyParallelArrays·p0.00:   0.001
 ms/op
                 multiplyParallelArrays·p0.50:   0.009
 ms/op
                 multiplyParallelArrays·p0.90:   0.019
 ms/op
                 multiplyParallelArrays·p0.95:   0.025
 ms/op
                 multiplyParallelArrays·p0.99:   0.034
 ms/op
                 multiplyParallelArrays·p0.999:  0.046
 ms/op
                 multiplyParallelArrays·p0.9999: 0.208
 ms/op
                 multiplyParallelArrays·p1.00:   0.755
 ms/op

Iteration   2: 0.011 ±(99.9%) 0.001 ms/op
                 multiplyParallelArrays·p0.00:   0.001
 ms/op
                 multiplyParallelArrays·p0.50:   0.009
 ms/op
                 multiplyParallelArrays·p0.90:   0.020
 ms/op
                 multiplyParallelArrays·p0.95:   0.025
 ms/op
                 multiplyParallelArrays·p0.99:   0.035
 ms/op
                 multiplyParallelArrays·p0.999:  0.051
 ms/op
                 multiplyParallelArrays·p0.9999: 0.206
 ms/op
                 multiplyParallelArrays·p1.00:   0.217
 ms/op

Iteration   3: 0.011 ±(99.9%) 0.001 ms/op
                 multiplyParallelArrays·p0.00:   0.001
 ms/op
                 multiplyParallelArrays·p0.50:   0.009
 ms/op
```

```
                  multiplyParallelArrays·p0.90:   0.020
 ms/op
                  multiplyParallelArrays·p0.95:   0.026
 ms/op
                  multiplyParallelArrays·p0.99:   0.036
 ms/op
                  multiplyParallelArrays·p0.999:  0.049
 ms/op
                  multiplyParallelArrays·p0.9999: 0.202
 ms/op
                  multiplyParallelArrays·p1.00:   0.213
 ms/op

Iteration   4: 0.010 ±(99.9%) 0.001 ms/op
                  multiplyParallelArrays·p0.00:   0.001
 ms/op
                  multiplyParallelArrays·p0.50:   0.008
 ms/op
                  multiplyParallelArrays·p0.90:   0.020
 ms/op
                  multiplyParallelArrays·p0.95:   0.026
 ms/op
                  multiplyParallelArrays·p0.99:   0.037
 ms/op
                  multiplyParallelArrays·p0.999:  0.052
 ms/op
                  multiplyParallelArrays·p0.9999: 0.198
 ms/op
                  multiplyParallelArrays·p1.00:   0.817
 ms/op

Iteration   5: 0.010 ±(99.9%) 0.001 ms/op
                  multiplyParallelArrays·p0.00:   0.001
 ms/op
                  multiplyParallelArrays·p0.50:   0.008
 ms/op
                  multiplyParallelArrays·p0.90:   0.020
 ms/op
                  multiplyParallelArrays·p0.95:   0.026
 ms/op
                  multiplyParallelArrays·p0.99:   0.036
```

```
 ms/op
                 multiplyParallelArrays·p0.999:  0.050
 ms/op
                 multiplyParallelArrays·p0.9999: 0.063
 ms/op
                 multiplyParallelArrays·p1.00:   0.124
 ms/op

Iteration   6: 0.009 ±(99.9%) 0.001 ms/op
                 multiplyParallelArrays·p0.00:   0.001
 ms/op
                 multiplyParallelArrays·p0.50:   0.006
 ms/op
                 multiplyParallelArrays·p0.90:   0.019
 ms/op
                 multiplyParallelArrays·p0.95:   0.026
 ms/op
                 multiplyParallelArrays·p0.99:   0.040
 ms/op
                 multiplyParallelArrays·p0.999:  0.066
 ms/op
                 multiplyParallelArrays·p0.9999: 0.474
 ms/op
                 multiplyParallelArrays·p1.00:   1.571
 ms/op

Iteration   7: 0.011 ±(99.9%) 0.001 ms/op
                 multiplyParallelArrays·p0.00:   0.001
 ms/op
                 multiplyParallelArrays·p0.50:   0.009
 ms/op
                 multiplyParallelArrays·p0.90:   0.021
 ms/op
                 multiplyParallelArrays·p0.95:   0.027
 ms/op
                 multiplyParallelArrays·p0.99:   0.041
 ms/op
                 multiplyParallelArrays·p0.999:  0.056
 ms/op
                 multiplyParallelArrays·p0.9999: 0.170
 ms/op
```

```
                  multiplyParallelArrays·p1.00:   0.198
 ms/op

Iteration   8: 0.011 ±(99.9%) 0.001 ms/op
                  multiplyParallelArrays·p0.00:   0.001
 ms/op
                  multiplyParallelArrays·p0.50:   0.009
 ms/op
                  multiplyParallelArrays·p0.90:   0.021
 ms/op
                  multiplyParallelArrays·p0.95:   0.027
 ms/op
                  multiplyParallelArrays·p0.99:   0.039
 ms/op
                  multiplyParallelArrays·p0.999:  0.065
 ms/op
                  multiplyParallelArrays·p0.9999: 0.200
 ms/op
                  multiplyParallelArrays·p1.00:   0.281
 ms/op

Iteration   9: 0.011 ±(99.9%) 0.001 ms/op
                  multiplyParallelArrays·p0.00:   0.001
 ms/op
                  multiplyParallelArrays·p0.50:   0.009
 ms/op
                  multiplyParallelArrays·p0.90:   0.021
 ms/op
                  multiplyParallelArrays·p0.95:   0.027
 ms/op
                  multiplyParallelArrays·p0.99:   0.041
 ms/op
                  multiplyParallelArrays·p0.999:  0.064
 ms/op
                  multiplyParallelArrays·p0.9999: 0.195
 ms/op
                  multiplyParallelArrays·p1.00:   0.943
 ms/op

Iteration  10: 0.011 ±(99.9%) 0.001 ms/op
                  multiplyParallelArrays·p0.00:   0.001
```

```
 ms/op
                 multiplyParallelArrays·p0.50:   0.009
 ms/op
                 multiplyParallelArrays·p0.90:   0.020
 ms/op
                 multiplyParallelArrays·p0.95:   0.026
 ms/op
                 multiplyParallelArrays·p0.99:   0.039
 ms/op
                 multiplyParallelArrays·p0.999:  0.057
 ms/op
                 multiplyParallelArrays·p0.9999: 0.179
 ms/op
                 multiplyParallelArrays·p1.00:   0.202
 ms/op



Result "com.matrix.MultiplicationBenchmark.
multiplyParallelArrays":
  N = 238976
  mean =      0.010 ±(99.9%) 0.001 ms/op

  Histogram, ms/op:
    [0.000, 0.125) = 238926
    [0.125, 0.250) = 43
    [0.250, 0.375) = 1
    [0.375, 0.500) = 1
    [0.500, 0.625) = 0
    [0.625, 0.750) = 0
    [0.750, 0.875) = 3
    [0.875, 1.000) = 1
    [1.000, 1.125) = 0
    [1.125, 1.250) = 0
    [1.250, 1.375) = 0
    [1.375, 1.500) = 0
    [1.500, 1.625) = 1
    [1.625, 1.750) = 0
    [1.750, 1.875) = 0

  Percentiles, ms/op:
```

```
       p(0.0000) =      0.001 ms/op
      p(50.0000) =      0.008 ms/op
      p(90.0000) =      0.020 ms/op
      p(95.0000) =      0.026 ms/op
      p(99.0000) =      0.038 ms/op
      p(99.9000) =      0.057 ms/op
      p(99.9900) =      0.199 ms/op
      p(99.9990) =      0.894 ms/op
      p(99.9999) =      1.571 ms/op
     p(100.0000) =      1.571 ms/op


# JMH version: 1.32
# VM version: JDK 17.0.8, OpenJDK 64-Bit Server VM, 17
.0.8+7-LTS
# VM invoker: /Users/zuzannafurtak/Library/Java/
JavaVirtualMachines/corretto-17.0.8/Contents/Home/bin/
java
# VM options: -javaagent:/Applications/IntelliJ IDEA.
app/Contents/lib/idea_rt.jar=57265:/Applications/
IntelliJ IDEA.app/Contents/bin -Dfile.encoding=UTF-8
# Blackhole mode: full + dont-inline hint
# Warmup: 5 iterations, 1 s each
# Measurement: 10 iterations, 1 s each
# Timeout: 10 min per iteration
# Threads: 1 thread, will synchronize iterations
# Benchmark mode: Sampling time
# Benchmark: com.matrix.MultiplicationBenchmark.
multiplyParallelArrays
# Parameters: (n = 20)

# Run progress: 11.11% complete, ETA 00:02:05
# Fork: 1 of 1
# Warmup Iteration   1: 0.019 ±(99.9%) 0.001 ms/op
# Warmup Iteration   2: 0.018 ±(99.9%) 0.001 ms/op
# Warmup Iteration   3: 0.018 ±(99.9%) 0.001 ms/op
# Warmup Iteration   4: 0.018 ±(99.9%) 0.001 ms/op
# Warmup Iteration   5: 0.018 ±(99.9%) 0.001 ms/op
Iteration   1: 0.018 ±(99.9%) 0.001 ms/op
                 multiplyParallelArrays·p0.00:   0.003
 ms/op
```

```
                  multiplyParallelArrays·p0.50:   0.016
 ms/op
                  multiplyParallelArrays·p0.90:   0.030
 ms/op
                  multiplyParallelArrays·p0.95:   0.035
 ms/op
                  multiplyParallelArrays·p0.99:   0.046
 ms/op
                  multiplyParallelArrays·p0.999:  0.062
 ms/op
                  multiplyParallelArrays·p0.9999: 0.201
 ms/op
                  multiplyParallelArrays·p1.00:   0.215
 ms/op

Iteration   2: 0.017 ±(99.9%) 0.001 ms/op
                  multiplyParallelArrays·p0.00:   0.003
 ms/op
                  multiplyParallelArrays·p0.50:   0.016
 ms/op
                  multiplyParallelArrays·p0.90:   0.030
 ms/op
                  multiplyParallelArrays·p0.95:   0.035
 ms/op
                  multiplyParallelArrays·p0.99:   0.045
 ms/op
                  multiplyParallelArrays·p0.999:  0.062
 ms/op
                  multiplyParallelArrays·p0.9999: 0.181
 ms/op
                  multiplyParallelArrays·p1.00:   0.759
 ms/op

Iteration   3: 0.019 ±(99.9%) 0.001 ms/op
                  multiplyParallelArrays·p0.00:   0.003
 ms/op
                  multiplyParallelArrays·p0.50:   0.017
 ms/op
                  multiplyParallelArrays·p0.90:   0.033
 ms/op
                  multiplyParallelArrays·p0.95:   0.040
```

```
 ms/op
                 multiplyParallelArrays·p0.99:   0.056
 ms/op
                 multiplyParallelArrays·p0.999:  0.088
 ms/op
                 multiplyParallelArrays·p0.9999: 0.670
 ms/op
                 multiplyParallelArrays·p1.00:   1.176
 ms/op

Iteration   4: 0.018 ±(99.9%) 0.001 ms/op
                 multiplyParallelArrays·p0.00:   0.003
 ms/op
                 multiplyParallelArrays·p0.50:   0.016
 ms/op
                 multiplyParallelArrays·p0.90:   0.030
 ms/op
                 multiplyParallelArrays·p0.95:   0.035
 ms/op
                 multiplyParallelArrays·p0.99:   0.046
 ms/op
                 multiplyParallelArrays·p0.999:  0.061
 ms/op
                 multiplyParallelArrays·p0.9999: 0.111
 ms/op
                 multiplyParallelArrays·p1.00:   0.771
 ms/op

Iteration   5: 0.018 ±(99.9%) 0.001 ms/op
                 multiplyParallelArrays·p0.00:   0.003
 ms/op
                 multiplyParallelArrays·p0.50:   0.016
 ms/op
                 multiplyParallelArrays·p0.90:   0.030
 ms/op
                 multiplyParallelArrays·p0.95:   0.034
 ms/op
                 multiplyParallelArrays·p0.99:   0.045
 ms/op
                 multiplyParallelArrays·p0.999:  0.058
 ms/op
```

```
                  multiplyParallelArrays·p0.9999: 0.204
 ms/op
                  multiplyParallelArrays·p1.00:   0.842
 ms/op

Iteration   6: 0.018 ±(99.9%) 0.001 ms/op
                  multiplyParallelArrays·p0.00:   0.003
 ms/op
                  multiplyParallelArrays·p0.50:   0.016
 ms/op
                  multiplyParallelArrays·p0.90:   0.030
 ms/op
                  multiplyParallelArrays·p0.95:   0.034
 ms/op
                  multiplyParallelArrays·p0.99:   0.044
 ms/op
                  multiplyParallelArrays·p0.999:  0.057
 ms/op
                  multiplyParallelArrays·p0.9999: 0.207
 ms/op
                  multiplyParallelArrays·p1.00:   0.213
 ms/op

Iteration   7: 0.018 ±(99.9%) 0.001 ms/op
                  multiplyParallelArrays·p0.00:   0.003
 ms/op
                  multiplyParallelArrays·p0.50:   0.017
 ms/op
                  multiplyParallelArrays·p0.90:   0.030
 ms/op
                  multiplyParallelArrays·p0.95:   0.034
 ms/op
                  multiplyParallelArrays·p0.99:   0.044
 ms/op
                  multiplyParallelArrays·p0.999:  0.057
 ms/op
                  multiplyParallelArrays·p0.9999: 0.206
 ms/op
                  multiplyParallelArrays·p1.00:   0.208
 ms/op
```

```
Iteration   8: 0.018 ±(99.9%) 0.001 ms/op
                 multiplyParallelArrays·p0.00:   0.003
 ms/op
                 multiplyParallelArrays·p0.50:   0.017
 ms/op
                 multiplyParallelArrays·p0.90:   0.030
 ms/op
                 multiplyParallelArrays·p0.95:   0.034
 ms/op
                 multiplyParallelArrays·p0.99:   0.045
 ms/op
                 multiplyParallelArrays·p0.999:  0.058
 ms/op
                 multiplyParallelArrays·p0.9999: 0.129
 ms/op
                 multiplyParallelArrays·p1.00:   0.934
 ms/op

Iteration   9: 0.018 ±(99.9%) 0.001 ms/op
                 multiplyParallelArrays·p0.00:   0.003
 ms/op
                 multiplyParallelArrays·p0.50:   0.017
 ms/op
                 multiplyParallelArrays·p0.90:   0.030
 ms/op
                 multiplyParallelArrays·p0.95:   0.034
 ms/op
                 multiplyParallelArrays·p0.99:   0.045
 ms/op
                 multiplyParallelArrays·p0.999:  0.060
 ms/op
                 multiplyParallelArrays·p0.9999: 0.213
 ms/op
                 multiplyParallelArrays·p1.00:   0.546
 ms/op

Iteration  10: 0.018 ±(99.9%) 0.001 ms/op
                 multiplyParallelArrays·p0.00:   0.003
 ms/op
                 multiplyParallelArrays·p0.50:   0.016
 ms/op
```

```
                    multiplyParallelArrays·p0.90:   0.030
 ms/op
                    multiplyParallelArrays·p0.95:   0.034
 ms/op
                    multiplyParallelArrays·p0.99:   0.045
 ms/op
                    multiplyParallelArrays·p0.999:  0.059
 ms/op
                    multiplyParallelArrays·p0.9999: 0.154
 ms/op
                    multiplyParallelArrays·p1.00:   0.571
 ms/op



Result "com.matrix.MultiplicationBenchmark.
multiplyParallelArrays":
  N = 276749
  mean =      0.018 ±(99.9%) 0.001 ms/op

  Histogram, ms/op:
    [0.000, 0.125) = 276709
    [0.125, 0.250) = 30
    [0.250, 0.375) = 1
    [0.375, 0.500) = 1
    [0.500, 0.625) = 2
    [0.625, 0.750) = 0
    [0.750, 0.875) = 3
    [0.875, 1.000) = 2
    [1.000, 1.125) = 0
    [1.125, 1.250) = 1
    [1.250, 1.375) = 0
    [1.375, 1.500) = 0
    [1.500, 1.625) = 0
    [1.625, 1.750) = 0
    [1.750, 1.875) = 0

  Percentiles, ms/op:
      p(0.0000) =      0.003 ms/op
     p(50.0000) =      0.016 ms/op
     p(90.0000) =      0.030 ms/op
```

```
     p(95.0000) =      0.035 ms/op
     p(99.0000) =      0.046 ms/op
     p(99.9000) =      0.064 ms/op
     p(99.9900) =      0.202 ms/op
     p(99.9990) =      0.949 ms/op
     p(99.9999) =      1.176 ms/op
    p(100.0000) =      1.176 ms/op


# JMH version: 1.32
# VM version: JDK 17.0.8, OpenJDK 64-Bit Server VM, 17
.0.8+7-LTS
# VM invoker: /Users/zuzannafurtak/Library/Java/
JavaVirtualMachines/corretto-17.0.8/Contents/Home/bin/
java
# VM options: -javaagent:/Applications/IntelliJ IDEA.
app/Contents/lib/idea_rt.jar=57265:/Applications/
IntelliJ IDEA.app/Contents/bin -Dfile.encoding=UTF-8
# Blackhole mode: full + dont-inline hint
# Warmup: 5 iterations, 1 s each
# Measurement: 10 iterations, 1 s each
# Timeout: 10 min per iteration
# Threads: 1 thread, will synchronize iterations
# Benchmark mode: Sampling time
# Benchmark: com.matrix.MultiplicationBenchmark.
multiplyParallelArrays
# Parameters: (n = 50)

# Run progress: 22.22% complete, ETA 00:01:49
# Fork: 1 of 1
# Warmup Iteration   1: 0.042 ±(99.9%) 0.002 ms/op
# Warmup Iteration   2: 0.037 ±(99.9%) 0.001 ms/op
# Warmup Iteration   3: 0.036 ±(99.9%) 0.001 ms/op
# Warmup Iteration   4: 0.034 ±(99.9%) 0.001 ms/op
# Warmup Iteration   5: 0.034 ±(99.9%) 0.001 ms/op
Iteration   1: 0.035 ±(99.9%) 0.001 ms/op
                 multiplyParallelArrays·p0.00:   0.014
 ms/op
                 multiplyParallelArrays·p0.50:   0.034
 ms/op
                 multiplyParallelArrays·p0.90:   0.046
```

```
 ms/op
                 multiplyParallelArrays·p0.95:   0.051
 ms/op
                 multiplyParallelArrays·p0.99:   0.067
 ms/op
                 multiplyParallelArrays·p0.999:  0.098
 ms/op
                 multiplyParallelArrays·p0.9999: 0.818
 ms/op
                 multiplyParallelArrays·p1.00:   0.884
 ms/op

Iteration   2: 0.036 ±(99.9%) 0.001 ms/op
                 multiplyParallelArrays·p0.00:   0.014
 ms/op
                 multiplyParallelArrays·p0.50:   0.035
 ms/op
                 multiplyParallelArrays·p0.90:   0.047
 ms/op
                 multiplyParallelArrays·p0.95:   0.053
 ms/op
                 multiplyParallelArrays·p0.99:   0.075
 ms/op
                 multiplyParallelArrays·p0.999:  0.142
 ms/op
                 multiplyParallelArrays·p0.9999: 0.876
 ms/op
                 multiplyParallelArrays·p1.00:   1.102
 ms/op

Iteration   3: 0.036 ±(99.9%) 0.001 ms/op
                 multiplyParallelArrays·p0.00:   0.015
 ms/op
                 multiplyParallelArrays·p0.50:   0.035
 ms/op
                 multiplyParallelArrays·p0.90:   0.047
 ms/op
                 multiplyParallelArrays·p0.95:   0.052
 ms/op
                 multiplyParallelArrays·p0.99:   0.069
 ms/op
```

```
                  multiplyParallelArrays·p0.999:  0.099
 ms/op
                  multiplyParallelArrays·p0.9999: 0.438
 ms/op
                  multiplyParallelArrays·p1.00:   0.633
 ms/op

Iteration   4: 0.035 ±(99.9%) 0.001 ms/op
                  multiplyParallelArrays·p0.00:   0.014
 ms/op
                  multiplyParallelArrays·p0.50:   0.034
 ms/op
                  multiplyParallelArrays·p0.90:   0.044
 ms/op
                  multiplyParallelArrays·p0.95:   0.048
 ms/op
                  multiplyParallelArrays·p0.99:   0.058
 ms/op
                  multiplyParallelArrays·p0.999:  0.083
 ms/op
                  multiplyParallelArrays·p0.9999: 0.499
 ms/op
                  multiplyParallelArrays·p1.00:   0.521
 ms/op

Iteration   5: 0.035 ±(99.9%) 0.001 ms/op
                  multiplyParallelArrays·p0.00:   0.014
 ms/op
                  multiplyParallelArrays·p0.50:   0.034
 ms/op
                  multiplyParallelArrays·p0.90:   0.044
 ms/op
                  multiplyParallelArrays·p0.95:   0.048
 ms/op
                  multiplyParallelArrays·p0.99:   0.061
 ms/op
                  multiplyParallelArrays·p0.999:  0.090
 ms/op
                  multiplyParallelArrays·p0.9999: 0.478
 ms/op
                  multiplyParallelArrays·p1.00:   0.489
```

```
 ms/op

Iteration   6: 0.035 ±(99.9%) 0.001 ms/op
                 multiplyParallelArrays·p0.00:   0.014
 ms/op
                 multiplyParallelArrays·p0.50:   0.034
 ms/op
                 multiplyParallelArrays·p0.90:   0.044
 ms/op
                 multiplyParallelArrays·p0.95:   0.049
 ms/op
                 multiplyParallelArrays·p0.99:   0.068
 ms/op
                 multiplyParallelArrays·p0.999:  0.132
 ms/op
                 multiplyParallelArrays·p0.9999: 0.500
 ms/op
                 multiplyParallelArrays·p1.00:   0.516
 ms/op

Iteration   7: 0.048 ±(99.9%) 0.007 ms/op
                 multiplyParallelArrays·p0.00:   0.014
 ms/op
                 multiplyParallelArrays·p0.50:   0.035
 ms/op
                 multiplyParallelArrays·p0.90:   0.057
 ms/op
                 multiplyParallelArrays·p0.95:   0.081
 ms/op
                 multiplyParallelArrays·p0.99:   0.241
 ms/op
                 multiplyParallelArrays·p0.999:  1.122
 ms/op
                 multiplyParallelArrays·p0.9999: 18.
244 ms/op
                 multiplyParallelArrays·p1.00:   19.
726 ms/op

Iteration   8: 0.035 ±(99.9%) 0.001 ms/op
                 multiplyParallelArrays·p0.00:   0.014
 ms/op
```

```
                  multiplyParallelArrays·p0.50:   0.033
 ms/op
                  multiplyParallelArrays·p0.90:   0.044
 ms/op
                  multiplyParallelArrays·p0.95:   0.049
 ms/op
                  multiplyParallelArrays·p0.99:   0.064
 ms/op
                  multiplyParallelArrays·p0.999:  0.083
 ms/op
                  multiplyParallelArrays·p0.9999: 0.506
 ms/op
                  multiplyParallelArrays·p1.00:   0.525
 ms/op

Iteration   9: 0.035 ±(99.9%) 0.001 ms/op
                  multiplyParallelArrays·p0.00:   0.014
 ms/op
                  multiplyParallelArrays·p0.50:   0.034
 ms/op
                  multiplyParallelArrays·p0.90:   0.045
 ms/op
                  multiplyParallelArrays·p0.95:   0.049
 ms/op
                  multiplyParallelArrays·p0.99:   0.067
 ms/op
                  multiplyParallelArrays·p0.999:  0.110
 ms/op
                  multiplyParallelArrays·p0.9999: 0.696
 ms/op
                  multiplyParallelArrays·p1.00:   0.847
 ms/op

Iteration  10: 0.034 ±(99.9%) 0.001 ms/op
                  multiplyParallelArrays·p0.00:   0.014
 ms/op
                  multiplyParallelArrays·p0.50:   0.034
 ms/op
                  multiplyParallelArrays·p0.90:   0.043
 ms/op
                  multiplyParallelArrays·p0.95:   0.047
```

```
 ms/op
                 multiplyParallelArrays·p0.99:   0.057
 ms/op
                 multiplyParallelArrays·p0.999:  0.075
 ms/op
                 multiplyParallelArrays·p0.9999: 0.482
 ms/op
                 multiplyParallelArrays·p1.00:   0.489
 ms/op



Result "com.matrix.MultiplicationBenchmark.
multiplyParallelArrays":
  N = 139699
  mean =      0.036 ±(99.9%) 0.001 ms/op

  Histogram, ms/op:
    [ 0.000,  1.250) = 139689
    [ 1.250,  2.500) = 5
    [ 2.500,  3.750) = 0
    [ 3.750,  5.000) = 2
    [ 5.000,  6.250) = 0
    [ 6.250,  7.500) = 0
    [ 7.500,  8.750) = 1
    [ 8.750, 10.000) = 0
    [10.000, 11.250) = 1
    [11.250, 12.500) = 0
    [12.500, 13.750) = 0
    [13.750, 15.000) = 0
    [15.000, 16.250) = 0
    [16.250, 17.500) = 0
    [17.500, 18.750) = 0

  Percentiles, ms/op:
      p(0.0000) =      0.014 ms/op
     p(50.0000) =      0.034 ms/op
     p(90.0000) =      0.045 ms/op
     p(95.0000) =      0.051 ms/op
     p(99.0000) =      0.073 ms/op
     p(99.9000) =      0.239 ms/op
```

```
     p(99.9900) =      1.072 ms/op
     p(99.9990) =     15.882 ms/op
     p(99.9999) =     19.726 ms/op
    p(100.0000) =     19.726 ms/op


# JMH version: 1.32
# VM version: JDK 17.0.8, OpenJDK 64-Bit Server VM, 17
.0.8+7-LTS
# VM invoker: /Users/zuzannafurtak/Library/Java/
JavaVirtualMachines/corretto-17.0.8/Contents/Home/bin/
java
# VM options: -javaagent:/Applications/IntelliJ IDEA.
app/Contents/lib/idea_rt.jar=57265:/Applications/
IntelliJ IDEA.app/Contents/bin -Dfile.encoding=UTF-8
# Blackhole mode: full + dont-inline hint
# Warmup: 5 iterations, 1 s each
# Measurement: 10 iterations, 1 s each
# Timeout: 10 min per iteration
# Threads: 1 thread, will synchronize iterations
# Benchmark mode: Sampling time
# Benchmark: com.matrix.MultiplicationBenchmark.
multiplyParallelArrays
# Parameters: (n = 100)

# Run progress: 33.33% complete, ETA 00:01:33
# Fork: 1 of 1
# Warmup Iteration   1: 0.125 ±(99.9%) 0.007 ms/op
# Warmup Iteration   2: 0.118 ±(99.9%) 0.001 ms/op
# Warmup Iteration   3: 0.121 ±(99.9%) 0.001 ms/op
# Warmup Iteration   4: 0.121 ±(99.9%) 0.001 ms/op
# Warmup Iteration   5: 0.119 ±(99.9%) 0.001 ms/op
Iteration   1: 0.119 ±(99.9%) 0.001 ms/op
                 multiplyParallelArrays·p0.00:   0.089
 ms/op
                 multiplyParallelArrays·p0.50:   0.118
 ms/op
                 multiplyParallelArrays·p0.90:   0.125
 ms/op
                 multiplyParallelArrays·p0.95:   0.128
 ms/op
```

```
                  multiplyParallelArrays·p0.99:   0.136
 ms/op
                  multiplyParallelArrays·p0.999:  0.153
 ms/op
                  multiplyParallelArrays·p0.9999: 1.025
 ms/op
                  multiplyParallelArrays·p1.00:   1.025
 ms/op

Iteration   2: 0.118 ±(99.9%) 0.001 ms/op
                  multiplyParallelArrays·p0.00:   0.088
 ms/op
                  multiplyParallelArrays·p0.50:   0.117
 ms/op
                  multiplyParallelArrays·p0.90:   0.125
 ms/op
                  multiplyParallelArrays·p0.95:   0.129
 ms/op
                  multiplyParallelArrays·p0.99:   0.140
 ms/op
                  multiplyParallelArrays·p0.999:  0.167
 ms/op
                  multiplyParallelArrays·p0.9999: 1.167
 ms/op
                  multiplyParallelArrays·p1.00:   1.167
 ms/op

Iteration   3: 0.118 ±(99.9%) 0.001 ms/op
                  multiplyParallelArrays·p0.00:   0.086
 ms/op
                  multiplyParallelArrays·p0.50:   0.117
 ms/op
                  multiplyParallelArrays·p0.90:   0.126
 ms/op
                  multiplyParallelArrays·p0.95:   0.131
 ms/op
                  multiplyParallelArrays·p0.99:   0.144
 ms/op
                  multiplyParallelArrays·p0.999:  0.180
 ms/op
                  multiplyParallelArrays·p0.9999: 0.618
```

```
 ms/op
                 multiplyParallelArrays·p1.00:   0.618
 ms/op

Iteration   4: 0.118 ±(99.9%) 0.001 ms/op
                 multiplyParallelArrays·p0.00:   0.090
 ms/op
                 multiplyParallelArrays·p0.50:   0.117
 ms/op
                 multiplyParallelArrays·p0.90:   0.126
 ms/op
                 multiplyParallelArrays·p0.95:   0.131
 ms/op
                 multiplyParallelArrays·p0.99:   0.152
 ms/op
                 multiplyParallelArrays·p0.999:  0.197
 ms/op
                 multiplyParallelArrays·p0.9999: 0.534
 ms/op
                 multiplyParallelArrays·p1.00:   0.534
 ms/op

Iteration   5: 0.117 ±(99.9%) 0.001 ms/op
                 multiplyParallelArrays·p0.00:   0.091
 ms/op
                 multiplyParallelArrays·p0.50:   0.116
 ms/op
                 multiplyParallelArrays·p0.90:   0.123
 ms/op
                 multiplyParallelArrays·p0.95:   0.126
 ms/op
                 multiplyParallelArrays·p0.99:   0.138
 ms/op
                 multiplyParallelArrays·p0.999:  0.163
 ms/op
                 multiplyParallelArrays·p0.9999: 0.608
 ms/op
                 multiplyParallelArrays·p1.00:   0.608
 ms/op

Iteration   6: 0.117 ±(99.9%) 0.001 ms/op
```

```
                  multiplyParallelArrays·p0.00:   0.091
 ms/op
                  multiplyParallelArrays·p0.50:   0.116
 ms/op
                  multiplyParallelArrays·p0.90:   0.123
 ms/op
                  multiplyParallelArrays·p0.95:   0.126
 ms/op
                  multiplyParallelArrays·p0.99:   0.135
 ms/op
                  multiplyParallelArrays·p0.999:  0.169
 ms/op
                  multiplyParallelArrays·p0.9999: 0.600
 ms/op
                  multiplyParallelArrays·p1.00:   0.600
 ms/op

Iteration   7: 0.117 ±(99.9%) 0.001 ms/op
                  multiplyParallelArrays·p0.00:   0.092
 ms/op
                  multiplyParallelArrays·p0.50:   0.117
 ms/op
                  multiplyParallelArrays·p0.90:   0.124
 ms/op
                  multiplyParallelArrays·p0.95:   0.127
 ms/op
                  multiplyParallelArrays·p0.99:   0.137
 ms/op
                  multiplyParallelArrays·p0.999:  0.164
 ms/op
                  multiplyParallelArrays·p0.9999: 0.606
 ms/op
                  multiplyParallelArrays·p1.00:   0.606
 ms/op

Iteration   8: 0.118 ±(99.9%) 0.001 ms/op
                  multiplyParallelArrays·p0.00:   0.090
 ms/op
                  multiplyParallelArrays·p0.50:   0.117
 ms/op
                  multiplyParallelArrays·p0.90:   0.127
```

```
 ms/op
                 multiplyParallelArrays·p0.95:   0.133
 ms/op
                 multiplyParallelArrays·p0.99:   0.150
 ms/op
                 multiplyParallelArrays·p0.999:  0.182
 ms/op
                 multiplyParallelArrays·p0.9999: 0.544
 ms/op
                 multiplyParallelArrays·p1.00:   0.544
 ms/op

Iteration   9: 0.119 ±(99.9%) 0.001 ms/op
                 multiplyParallelArrays·p0.00:   0.094
 ms/op
                 multiplyParallelArrays·p0.50:   0.118
 ms/op
                 multiplyParallelArrays·p0.90:   0.127
 ms/op
                 multiplyParallelArrays·p0.95:   0.132
 ms/op
                 multiplyParallelArrays·p0.99:   0.145
 ms/op
                 multiplyParallelArrays·p0.999:  0.165
 ms/op
                 multiplyParallelArrays·p0.9999: 0.609
 ms/op
                 multiplyParallelArrays·p1.00:   0.609
 ms/op

Iteration  10: 0.119 ±(99.9%) 0.001 ms/op
                 multiplyParallelArrays·p0.00:   0.091
 ms/op
                 multiplyParallelArrays·p0.50:   0.118
 ms/op
                 multiplyParallelArrays·p0.90:   0.126
 ms/op
                 multiplyParallelArrays·p0.95:   0.129
 ms/op
                 multiplyParallelArrays·p0.99:   0.140
 ms/op
```

```
                    multiplyParallelArrays·p0.999:  0.170
 ms/op
                    multiplyParallelArrays·p0.9999: 0.578
 ms/op
                    multiplyParallelArrays·p1.00:   0.578
 ms/op



Result "com.matrix.MultiplicationBenchmark.
multiplyParallelArrays":
  N = 85065
  mean =      0.118 ±(99.9%) 0.001 ms/op

  Histogram, ms/op:
    [0.000, 0.125) = 76211
    [0.125, 0.250) = 8830
    [0.250, 0.375) = 1
    [0.375, 0.500) = 2
    [0.500, 0.625) = 17
    [0.625, 0.750) = 0
    [0.750, 0.875) = 0
    [0.875, 1.000) = 1
    [1.000, 1.125) = 2
    [1.125, 1.250) = 1
    [1.250, 1.375) = 0
    [1.375, 1.500) = 0
    [1.500, 1.625) = 0
    [1.625, 1.750) = 0
    [1.750, 1.875) = 0

  Percentiles, ms/op:
      p(0.0000) =      0.086 ms/op
     p(50.0000) =      0.117 ms/op
     p(90.0000) =      0.125 ms/op
     p(95.0000) =      0.129 ms/op
     p(99.0000) =      0.142 ms/op
     p(99.9000) =      0.173 ms/op
     p(99.9900) =      0.603 ms/op
     p(99.9990) =      1.167 ms/op
     p(99.9999) =      1.167 ms/op
```

```
    p(100.0000) =      1.167 ms/op


# JMH version: 1.32
# VM version: JDK 17.0.8, OpenJDK 64-Bit Server VM, 17
.0.8+7-LTS
# VM invoker: /Users/zuzannafurtak/Library/Java/
JavaVirtualMachines/corretto-17.0.8/Contents/Home/bin/
java
# VM options: -javaagent:/Applications/IntelliJ IDEA.
app/Contents/lib/idea_rt.jar=57265:/Applications/
IntelliJ IDEA.app/Contents/bin -Dfile.encoding=UTF-8
# Blackhole mode: full + dont-inline hint
# Warmup: 5 iterations, 1 s each
# Measurement: 10 iterations, 1 s each
# Timeout: 10 min per iteration
# Threads: 1 thread, will synchronize iterations
# Benchmark mode: Sampling time
# Benchmark: com.matrix.MultiplicationBenchmark.
multiplyParallelArrays
# Parameters: (n = 200)

# Run progress: 44.44% complete, ETA 00:01:18
# Fork: 1 of 1
# Warmup Iteration   1: 0.652 ±(99.9%) 0.046 ms/op
# Warmup Iteration   2: 0.595 ±(99.9%) 0.002 ms/op
# Warmup Iteration   3: 0.598 ±(99.9%) 0.003 ms/op
# Warmup Iteration   4: 0.606 ±(99.9%) 0.004 ms/op
# Warmup Iteration   5: 0.598 ±(99.9%) 0.003 ms/op
Iteration   1: 0.594 ±(99.9%) 0.004 ms/op
                 multiplyParallelArrays·p0.00:   0.552
 ms/op
                 multiplyParallelArrays·p0.50:   0.590
 ms/op
                 multiplyParallelArrays·p0.90:   0.607
 ms/op
                 multiplyParallelArrays·p0.95:   0.613
 ms/op
                 multiplyParallelArrays·p0.99:   0.675
 ms/op
                 multiplyParallelArrays·p0.999:  1.734
```

```
 ms/op
                 multiplyParallelArrays·p0.9999: 2.249
 ms/op
                 multiplyParallelArrays·p1.00:   2.249
 ms/op

Iteration   2: 0.594 ±(99.9%) 0.003 ms/op
                 multiplyParallelArrays·p0.00:   0.541
 ms/op
                 multiplyParallelArrays·p0.50:   0.590
 ms/op
                 multiplyParallelArrays·p0.90:   0.620
 ms/op
                 multiplyParallelArrays·p0.95:   0.635
 ms/op
                 multiplyParallelArrays·p0.99:   0.679
 ms/op
                 multiplyParallelArrays·p0.999:  1.477
 ms/op
                 multiplyParallelArrays·p0.9999: 1.524
 ms/op
                 multiplyParallelArrays·p1.00:   1.524
 ms/op

Iteration   3: 0.601 ±(99.9%) 0.003 ms/op
                 multiplyParallelArrays·p0.00:   0.537
 ms/op
                 multiplyParallelArrays·p0.50:   0.599
 ms/op
                 multiplyParallelArrays·p0.90:   0.635
 ms/op
                 multiplyParallelArrays·p0.95:   0.645
 ms/op
                 multiplyParallelArrays·p0.99:   0.700
 ms/op
                 multiplyParallelArrays·p0.999:  0.992
 ms/op
                 multiplyParallelArrays·p0.9999: 1.417
 ms/op
                 multiplyParallelArrays·p1.00:   1.417
 ms/op
```

```
Iteration   4: 0.614 ±(99.9%) 0.004 ms/op
                 multiplyParallelArrays·p0.00:   0.564
 ms/op
                 multiplyParallelArrays·p0.50:   0.607
 ms/op
                 multiplyParallelArrays·p0.90:   0.640
 ms/op
                 multiplyParallelArrays·p0.95:   0.676
 ms/op
                 multiplyParallelArrays·p0.99:   0.722
 ms/op
                 multiplyParallelArrays·p0.999:  1.577
 ms/op
                 multiplyParallelArrays·p0.9999: 1.677
 ms/op
                 multiplyParallelArrays·p1.00:   1.677
 ms/op

Iteration   5: 0.599 ±(99.9%) 0.002 ms/op
                 multiplyParallelArrays·p0.00:   0.559
 ms/op
                 multiplyParallelArrays·p0.50:   0.596
 ms/op
                 multiplyParallelArrays·p0.90:   0.618
 ms/op
                 multiplyParallelArrays·p0.95:   0.631
 ms/op
                 multiplyParallelArrays·p0.99:   0.683
 ms/op
                 multiplyParallelArrays·p0.999:  0.890
 ms/op
                 multiplyParallelArrays·p0.9999: 1.145
 ms/op
                 multiplyParallelArrays·p1.00:   1.145
 ms/op

Iteration   6: 0.612 ±(99.9%) 0.009 ms/op
                 multiplyParallelArrays·p0.00:   0.563
 ms/op
                 multiplyParallelArrays·p0.50:   0.598
```

```
 ms/op
                 multiplyParallelArrays·p0.90:   0.633
 ms/op
                 multiplyParallelArrays·p0.95:   0.672
 ms/op
                 multiplyParallelArrays·p0.99:   0.763
 ms/op
                 multiplyParallelArrays·p0.999:  2.742
 ms/op
                 multiplyParallelArrays·p0.9999: 3.613
 ms/op
                 multiplyParallelArrays·p1.00:   3.613
 ms/op

Iteration   7: 0.606 ±(99.9%) 0.003 ms/op
                 multiplyParallelArrays·p0.00:   0.557
 ms/op
                 multiplyParallelArrays·p0.50:   0.598
 ms/op
                 multiplyParallelArrays·p0.90:   0.632
 ms/op
                 multiplyParallelArrays·p0.95:   0.679
 ms/op
                 multiplyParallelArrays·p0.99:   0.711
 ms/op
                 multiplyParallelArrays·p0.999:  1.060
 ms/op
                 multiplyParallelArrays·p0.9999: 1.087
 ms/op
                 multiplyParallelArrays·p1.00:   1.087
 ms/op

Iteration   8: 0.604 ±(99.9%) 0.002 ms/op
                 multiplyParallelArrays·p0.00:   0.558
 ms/op
                 multiplyParallelArrays·p0.50:   0.598
 ms/op
                 multiplyParallelArrays·p0.90:   0.627
 ms/op
                 multiplyParallelArrays·p0.95:   0.657
 ms/op
```

```
                  multiplyParallelArrays·p0.99:   0.701
 ms/op
                  multiplyParallelArrays·p0.999:  0.849
 ms/op
                  multiplyParallelArrays·p0.9999: 1.098
 ms/op
                  multiplyParallelArrays·p1.00:   1.098
 ms/op

Iteration   9: 0.607 ±(99.9%) 0.003 ms/op
                  multiplyParallelArrays·p0.00:   0.559
 ms/op
                  multiplyParallelArrays·p0.50:   0.600
 ms/op
                  multiplyParallelArrays·p0.90:   0.633
 ms/op
                  multiplyParallelArrays·p0.95:   0.655
 ms/op
                  multiplyParallelArrays·p0.99:   0.756
 ms/op
                  multiplyParallelArrays·p0.999:  1.193
 ms/op
                  multiplyParallelArrays·p0.9999: 1.235
 ms/op
                  multiplyParallelArrays·p1.00:   1.235
 ms/op

Iteration  10: 0.599 ±(99.9%) 0.002 ms/op
                  multiplyParallelArrays·p0.00:   0.560
 ms/op
                  multiplyParallelArrays·p0.50:   0.597
 ms/op
                  multiplyParallelArrays·p0.90:   0.614
 ms/op
                  multiplyParallelArrays·p0.95:   0.625
 ms/op
                  multiplyParallelArrays·p0.99:   0.661
 ms/op
                  multiplyParallelArrays·p0.999:  0.832
 ms/op
                  multiplyParallelArrays·p0.9999: 1.073
```

```
 ms/op
                 multiplyParallelArrays·p1.00:   1.073
 ms/op



Result "com.matrix.MultiplicationBenchmark.
multiplyParallelArrays":
  N = 16653
  mean =      0.603 ±(99.9%) 0.001 ms/op

  Histogram, ms/op:
    [0.000, 0.250) = 0
    [0.250, 0.500) = 0
    [0.500, 0.750) = 16580
    [0.750, 1.000) = 49
    [1.000, 1.250) = 9
    [1.250, 1.500) = 5
    [1.500, 1.750) = 6
    [1.750, 2.000) = 0
    [2.000, 2.250) = 2
    [2.250, 2.500) = 1
    [2.500, 2.750) = 0
    [2.750, 3.000) = 0
    [3.000, 3.250) = 0
    [3.250, 3.500) = 0
    [3.500, 3.750) = 1

  Percentiles, ms/op:
      p(0.0000) =      0.537 ms/op
     p(50.0000) =      0.597 ms/op
     p(90.0000) =      0.628 ms/op
     p(95.0000) =      0.646 ms/op
     p(99.0000) =      0.708 ms/op
     p(99.9000) =      1.209 ms/op
     p(99.9900) =      2.711 ms/op
     p(99.9990) =      3.613 ms/op
     p(99.9999) =      3.613 ms/op
    p(100.0000) =      3.613 ms/op
```

```
# JMH version: 1.32
# VM version: JDK 17.0.8, OpenJDK 64-Bit Server VM, 17
.0.8+7-LTS
# VM invoker: /Users/zuzannafurtak/Library/Java/
JavaVirtualMachines/corretto-17.0.8/Contents/Home/bin/
java
# VM options: -javaagent:/Applications/IntelliJ IDEA.
app/Contents/lib/idea_rt.jar=57265:/Applications/
IntelliJ IDEA.app/Contents/bin -Dfile.encoding=UTF-8
# Blackhole mode: full + dont-inline hint
# Warmup: 5 iterations, 1 s each
# Measurement: 10 iterations, 1 s each
# Timeout: 10 min per iteration
# Threads: 1 thread, will synchronize iterations
# Benchmark mode: Sampling time
# Benchmark: com.matrix.MultiplicationBenchmark.
multiplyParallelArrays
# Parameters: (n = 500)

# Run progress: 55.56% complete, ETA 00:01:02
# Fork: 1 of 1
# Warmup Iteration   1: 12.494 ±(99.9%) 1.360 ms/op
# Warmup Iteration   2: 9.833 ±(99.9%) 0.179 ms/op
# Warmup Iteration   3: 9.723 ±(99.9%) 0.040 ms/op
# Warmup Iteration   4: 9.778 ±(99.9%) 0.086 ms/op
# Warmup Iteration   5: 9.863 ±(99.9%) 0.134 ms/op
Iteration   1: 9.819 ±(99.9%) 0.080 ms/op
                 multiplyParallelArrays·p0.00:   9.585
 ms/op
                 multiplyParallelArrays·p0.50:   9.716
 ms/op
                 multiplyParallelArrays·p0.90:   10.
211 ms/op
                 multiplyParallelArrays·p0.95:   10.
410 ms/op
                 multiplyParallelArrays·p0.99:   10.
728 ms/op
                 multiplyParallelArrays·p0.999:  10.
732 ms/op
                 multiplyParallelArrays·p0.9999: 10.
732 ms/op
```

```
                  multiplyParallelArrays·p1.00:   10.
732 ms/op

Iteration   2: 9.767 ±(99.9%) 0.093 ms/op
                  multiplyParallelArrays·p0.00:   9.486
 ms/op
                  multiplyParallelArrays·p0.50:   9.699
 ms/op
                  multiplyParallelArrays·p0.90:   9.935
 ms/op
                  multiplyParallelArrays·p0.95:   10.
224 ms/op
                  multiplyParallelArrays·p0.99:   11.
530 ms/op
                  multiplyParallelArrays·p0.999:  11.
534 ms/op
                  multiplyParallelArrays·p0.9999: 11.
534 ms/op
                  multiplyParallelArrays·p1.00:   11.
534 ms/op

Iteration   3: 9.821 ±(99.9%) 0.116 ms/op
                  multiplyParallelArrays·p0.00:   9.552
 ms/op
                  multiplyParallelArrays·p0.50:   9.716
 ms/op
                  multiplyParallelArrays·p0.90:   10.
037 ms/op
                  multiplyParallelArrays·p0.95:   10.
315 ms/op
                  multiplyParallelArrays·p0.99:   11.
927 ms/op
                  multiplyParallelArrays·p0.999:  11.
944 ms/op
                  multiplyParallelArrays·p0.9999: 11.
944 ms/op
                  multiplyParallelArrays·p1.00:   11.
944 ms/op

Iteration   4: 9.823 ±(99.9%) 0.073 ms/op
                  multiplyParallelArrays·p0.00:   9.552
```

```
 ms/op
                 multiplyParallelArrays·p0.50:   9.748
 ms/op
                 multiplyParallelArrays·p0.90:   10.
027 ms/op
                 multiplyParallelArrays·p0.95:   10.
178 ms/op
                 multiplyParallelArrays·p0.99:   10.
956 ms/op
                 multiplyParallelArrays·p0.999:  10.
961 ms/op
                 multiplyParallelArrays·p0.9999: 10.
961 ms/op
                 multiplyParallelArrays·p1.00:   10.
961 ms/op

Iteration   5: 9.851 ±(99.9%) 0.080 ms/op
                 multiplyParallelArrays·p0.00:   9.535
 ms/op
                 multiplyParallelArrays·p0.50:   9.822
 ms/op
                 multiplyParallelArrays·p0.90:   10.
038 ms/op
                 multiplyParallelArrays·p0.95:   10.
137 ms/op
                 multiplyParallelArrays·p0.99:   11.
260 ms/op
                 multiplyParallelArrays·p0.999:  11.
272 ms/op
                 multiplyParallelArrays·p0.9999: 11.
272 ms/op
                 multiplyParallelArrays·p1.00:   11.
272 ms/op

Iteration   6: 9.867 ±(99.9%) 0.058 ms/op
                 multiplyParallelArrays·p0.00:   9.617
 ms/op
                 multiplyParallelArrays·p0.50:   9.847
 ms/op
                 multiplyParallelArrays·p0.90:   10.
076 ms/op
```

```
                  multiplyParallelArrays·p0.95:   10.
142 ms/op
                  multiplyParallelArrays·p0.99:   10.
578 ms/op
                  multiplyParallelArrays·p0.999:  10.
584 ms/op
                  multiplyParallelArrays·p0.9999: 10.
584 ms/op
                  multiplyParallelArrays·p1.00:   10.
584 ms/op

Iteration   7: 9.895 ±(99.9%) 0.086 ms/op
                  multiplyParallelArrays·p0.00:   9.585
 ms/op
                  multiplyParallelArrays·p0.50:   9.880
 ms/op
                  multiplyParallelArrays·p0.90:   10.
125 ms/op
                  multiplyParallelArrays·p0.95:   10.
202 ms/op
                  multiplyParallelArrays·p0.99:   11.
698 ms/op
                  multiplyParallelArrays·p0.999:  11.
731 ms/op
                  multiplyParallelArrays·p0.9999: 11.
731 ms/op
                  multiplyParallelArrays·p1.00:   11.
731 ms/op

Iteration   8: 9.945 ±(99.9%) 0.079 ms/op
                  multiplyParallelArrays·p0.00:   9.585
 ms/op
                  multiplyParallelArrays·p0.50:   9.896
 ms/op
                  multiplyParallelArrays·p0.90:   10.
207 ms/op
                  multiplyParallelArrays·p0.95:   10.
319 ms/op
                  multiplyParallelArrays·p0.99:   11.
273 ms/op
                  multiplyParallelArrays·p0.999:  11.
```

```
289 ms/op
                 multiplyParallelArrays·p0.9999: 11.
289 ms/op
                 multiplyParallelArrays·p1.00:   11.
289 ms/op

Iteration   9: 9.952 ±(99.9%) 0.098 ms/op
                 multiplyParallelArrays·p0.00:   9.601
 ms/op
                 multiplyParallelArrays·p0.50:   9.912
 ms/op
                 multiplyParallelArrays·p0.90:   10.
233 ms/op
                 multiplyParallelArrays·p0.95:   10.
317 ms/op
                 multiplyParallelArrays·p0.99:   11.
612 ms/op
                 multiplyParallelArrays·p0.999:  11.
616 ms/op
                 multiplyParallelArrays·p0.9999: 11.
616 ms/op
                 multiplyParallelArrays·p1.00:   11.
616 ms/op

Iteration  10: 10.020 ±(99.9%) 0.088 ms/op
                 multiplyParallelArrays·p0.00:   9.634
 ms/op
                 multiplyParallelArrays·p0.50:   9.978
 ms/op
                 multiplyParallelArrays·p0.90:   10.
269 ms/op
                 multiplyParallelArrays·p0.95:   10.
401 ms/op
                 multiplyParallelArrays·p0.99:   11.
725 ms/op
                 multiplyParallelArrays·p0.999:  11.
747 ms/op
                 multiplyParallelArrays·p0.9999: 11.
747 ms/op
                 multiplyParallelArrays·p1.00:   11.
747 ms/op
```

```
Result "com.matrix.MultiplicationBenchmark.
multiplyParallelArrays":
  N = 1021
  mean =      9.875 ±(99.9%) 0.028 ms/op

  Histogram, ms/op:
    [ 9.000,  9.250) = 0
    [ 9.250,  9.500) = 1
    [ 9.500,  9.750) = 418
    [ 9.750, 10.000) = 387
    [10.000, 10.250) = 152
    [10.250, 10.500) = 40
    [10.500, 10.750) = 9
    [10.750, 11.000) = 3
    [11.000, 11.250) = 0
    [11.250, 11.500) = 5
    [11.500, 11.750) = 5

  Percentiles, ms/op:
      p(0.0000) =      9.486 ms/op
     p(50.0000) =      9.830 ms/op
     p(90.0000) =     10.142 ms/op
     p(95.0000) =     10.273 ms/op
     p(99.0000) =     11.285 ms/op
     p(99.9000) =     11.940 ms/op
     p(99.9900) =     11.944 ms/op
     p(99.9990) =     11.944 ms/op
     p(99.9999) =     11.944 ms/op
    p(100.0000) =     11.944 ms/op


# JMH version: 1.32
# VM version: JDK 17.0.8, OpenJDK 64-Bit Server VM, 17
.0.8+7-LTS
# VM invoker: /Users/zuzannafurtak/Library/Java/
JavaVirtualMachines/corretto-17.0.8/Contents/Home/bin/
java
# VM options: -javaagent:/Applications/IntelliJ IDEA.
```

```
app/Contents/lib/idea_rt.jar=57265:/Applications/
IntelliJ IDEA.app/Contents/bin -Dfile.encoding=UTF-8
# Blackhole mode: full + dont-inline hint
# Warmup: 5 iterations, 1 s each
# Measurement: 10 iterations, 1 s each
# Timeout: 10 min per iteration
# Threads: 1 thread, will synchronize iterations
# Benchmark mode: Sampling time
# Benchmark: com.matrix.MultiplicationBenchmark.
multiplyParallelArrays
# Parameters: (n = 1000)

# Run progress: 66.67% complete, ETA 00:00:46
# Fork: 1 of 1
# Warmup Iteration   1: 149.647 ±(99.9%) 28.504 ms/op
# Warmup Iteration   2: 145.340 ±(99.9%) 6.993 ms/op
# Warmup Iteration   3: 144.516 ±(99.9%) 4.058 ms/op
# Warmup Iteration   4: 154.328 ±(99.9%) 31.616 ms/op
# Warmup Iteration   5: 148.860 ±(99.9%) 13.632 ms/op
Iteration   1: 149.984 ±(99.9%) 15.943 ms/op
                 multiplyParallelArrays·p0.00:   143.
131 ms/op
                 multiplyParallelArrays·p0.50:   148.
898 ms/op
                 multiplyParallelArrays·p0.90:   164.
626 ms/op
                 multiplyParallelArrays·p0.95:   164.
626 ms/op
                 multiplyParallelArrays·p0.99:   164.
626 ms/op
                 multiplyParallelArrays·p0.999:  164.
626 ms/op
                 multiplyParallelArrays·p0.9999: 164.
626 ms/op
                 multiplyParallelArrays·p1.00:   164.
626 ms/op

Iteration   2: 149.347 ±(99.9%) 9.202 ms/op
                 multiplyParallelArrays·p0.00:   143.
393 ms/op
                 multiplyParallelArrays·p0.50:   148.
```

```
898 ms/op
                 multiplyParallelArrays·p0.90:   157.
286 ms/op
                 multiplyParallelArrays·p0.95:   157.
286 ms/op
                 multiplyParallelArrays·p0.99:   157.
286 ms/op
                 multiplyParallelArrays·p0.999:  157.
286 ms/op
                 multiplyParallelArrays·p0.9999: 157.
286 ms/op
                 multiplyParallelArrays·p1.00:   157.
286 ms/op

Iteration   3: 152.006 ±(99.9%) 13.213 ms/op
                 multiplyParallelArrays·p0.00:   143.
917 ms/op
                 multiplyParallelArrays·p0.50:   150.
995 ms/op
                 multiplyParallelArrays·p0.90:   159.
384 ms/op
                 multiplyParallelArrays·p0.95:   159.
384 ms/op
                 multiplyParallelArrays·p0.99:   159.
384 ms/op
                 multiplyParallelArrays·p0.999:  159.
384 ms/op
                 multiplyParallelArrays·p0.9999: 159.
384 ms/op
                 multiplyParallelArrays·p1.00:   159.
384 ms/op

Iteration   4: 197.132 ±(99.9%) 85.052 ms/op
                 multiplyParallelArrays·p0.00:   160.
956 ms/op
                 multiplyParallelArrays·p0.50:   193.
987 ms/op
                 multiplyParallelArrays·p0.90:   241.
435 ms/op
                 multiplyParallelArrays·p0.95:   241.
435 ms/op
```

```
                  multiplyParallelArrays·p0.99:   241.
435 ms/op
                  multiplyParallelArrays·p0.999:  241.
435 ms/op
                  multiplyParallelArrays·p0.9999: 241.
435 ms/op
                  multiplyParallelArrays·p1.00:   241.
435 ms/op

Iteration   5: 192.720 ±(99.9%) 82.880 ms/op
                  multiplyParallelArrays·p0.00:   161.
743 ms/op
                  multiplyParallelArrays·p0.50:   186.
515 ms/op
                  multiplyParallelArrays·p0.90:   245.
367 ms/op
                  multiplyParallelArrays·p0.95:   245.
367 ms/op
                  multiplyParallelArrays·p0.99:   245.
367 ms/op
                  multiplyParallelArrays·p0.999:  245.
367 ms/op
                  multiplyParallelArrays·p0.9999: 245.
367 ms/op
                  multiplyParallelArrays·p1.00:   245.
367 ms/op

Iteration   6: 155.676 ±(99.9%) 17.756 ms/op
                  multiplyParallelArrays·p0.00:   146.
276 ms/op
                  multiplyParallelArrays·p0.50:   155.
976 ms/op
                  multiplyParallelArrays·p0.90:   166.
724 ms/op
                  multiplyParallelArrays·p0.95:   166.
724 ms/op
                  multiplyParallelArrays·p0.99:   166.
724 ms/op
                  multiplyParallelArrays·p0.999:  166.
724 ms/op
                  multiplyParallelArrays·p0.9999: 166.
```

```
724 ms/op
                 multiplyParallelArrays·p1.00:   166.
724 ms/op

Iteration   7: 152.530 ±(99.9%) 17.272 ms/op
                 multiplyParallelArrays·p0.00:   144.
179 ms/op
                 multiplyParallelArrays·p0.50:   151.
781 ms/op
                 multiplyParallelArrays·p0.90:   162.
529 ms/op
                 multiplyParallelArrays·p0.95:   162.
529 ms/op
                 multiplyParallelArrays·p0.99:   162.
529 ms/op
                 multiplyParallelArrays·p0.999:  162.
529 ms/op
                 multiplyParallelArrays·p0.9999: 162.
529 ms/op
                 multiplyParallelArrays·p1.00:   162.
529 ms/op

Iteration   8: 157.361 ±(99.9%) 15.523 ms/op
                 multiplyParallelArrays·p0.00:   146.
014 ms/op
                 multiplyParallelArrays·p0.50:   159.
121 ms/op
                 multiplyParallelArrays·p0.90:   167.
510 ms/op
                 multiplyParallelArrays·p0.95:   167.
510 ms/op
                 multiplyParallelArrays·p0.99:   167.
510 ms/op
                 multiplyParallelArrays·p0.999:  167.
510 ms/op
                 multiplyParallelArrays·p0.9999: 167.
510 ms/op
                 multiplyParallelArrays·p1.00:   167.
510 ms/op

Iteration   9: 167.991 ±(99.9%) 68.703 ms/op
```

```
                  multiplyParallelArrays·p0.00:   151.
519 ms/op
                  multiplyParallelArrays·p0.50:   157.
942 ms/op
                  multiplyParallelArrays·p0.90:   216.
531 ms/op
                  multiplyParallelArrays·p0.95:   216.
531 ms/op
                  multiplyParallelArrays·p0.99:   216.
531 ms/op
                  multiplyParallelArrays·p0.999:  216.
531 ms/op
                  multiplyParallelArrays·p0.9999: 216.
531 ms/op
                  multiplyParallelArrays·p1.00:   216.
531 ms/op

Iteration  10: 155.901 ±(99.9%) 5.365 ms/op
                  multiplyParallelArrays·p0.00:   153.
616 ms/op
                  multiplyParallelArrays·p0.50:   154.
927 ms/op
                  multiplyParallelArrays·p0.90:   160.
694 ms/op
                  multiplyParallelArrays·p0.95:   160.
694 ms/op
                  multiplyParallelArrays·p0.99:   160.
694 ms/op
                  multiplyParallelArrays·p0.999:  160.
694 ms/op
                  multiplyParallelArrays·p0.9999: 160.
694 ms/op
                  multiplyParallelArrays·p1.00:   160.
694 ms/op



Result "com.matrix.MultiplicationBenchmark.
multiplyParallelArrays":
  N = 67
  mean =    162.040 ±(99.9%) 9.127 ms/op
```

```
  Histogram, ms/op:
    [100.000, 112.500) = 0
    [112.500, 125.000) = 0
    [125.000, 137.500) = 0
    [137.500, 150.000) = 21
    [150.000, 162.500) = 29
    [162.500, 175.000) = 7
    [175.000, 187.500) = 2
    [187.500, 200.000) = 3
    [200.000, 212.500) = 1
    [212.500, 225.000) = 2
    [225.000, 237.500) = 0
    [237.500, 250.000) = 2
    [250.000, 262.500) = 0
    [262.500, 275.000) = 0
    [275.000, 287.500) = 0

  Percentiles, ms/op:
      p(0.0000) =    143.131 ms/op
     p(50.0000) =    156.238 ms/op
     p(90.0000) =    196.608 ms/op
     p(95.0000) =    219.519 ms/op
     p(99.0000) =    245.367 ms/op
     p(99.9000) =    245.367 ms/op
     p(99.9900) =    245.367 ms/op
     p(99.9990) =    245.367 ms/op
     p(99.9999) =    245.367 ms/op
    p(100.0000) =    245.367 ms/op


# JMH version: 1.32
# VM version: JDK 17.0.8, OpenJDK 64-Bit Server VM, 17
.0.8+7-LTS
# VM invoker: /Users/zuzannafurtak/Library/Java/
JavaVirtualMachines/corretto-17.0.8/Contents/Home/bin/
java
# VM options: -javaagent:/Applications/IntelliJ IDEA.
app/Contents/lib/idea_rt.jar=57265:/Applications/
IntelliJ IDEA.app/Contents/bin -Dfile.encoding=UTF-8
# Blackhole mode: full + dont-inline hint
```

```
# Warmup: 5 iterations, 1 s each
# Measurement: 10 iterations, 1 s each
# Timeout: 10 min per iteration
# Threads: 1 thread, will synchronize iterations
# Benchmark mode: Sampling time
# Benchmark: com.matrix.MultiplicationBenchmark.
multiplyParallelArrays
# Parameters: (n = 1500)

# Run progress: 77.78% complete, ETA 00:00:31
# Fork: 1 of 1
# Warmup Iteration   1: 576.193 ms/op
# Warmup Iteration   2: 566.231 ms/op
# Warmup Iteration   3: 575.668 ms/op
# Warmup Iteration   4: 633.340 ms/op
# Warmup Iteration   5: 628.097 ms/op
Iteration   1: 791.675 ms/op
                 multiplyParallelArrays·p0.00:   745.
538 ms/op
                 multiplyParallelArrays·p0.50:   791.
675 ms/op
                 multiplyParallelArrays·p0.90:   837.
812 ms/op
                 multiplyParallelArrays·p0.95:   837.
812 ms/op
                 multiplyParallelArrays·p0.99:   837.
812 ms/op
                 multiplyParallelArrays·p0.999:  837.
812 ms/op
                 multiplyParallelArrays·p0.9999: 837.
812 ms/op
                 multiplyParallelArrays·p1.00:   837.
812 ms/op

Iteration   2: 772.801 ms/op
                 multiplyParallelArrays·p0.00:   714.
080 ms/op
                 multiplyParallelArrays·p0.50:   772.
801 ms/op
                 multiplyParallelArrays·p0.90:   831.
521 ms/op
```

```
                  multiplyParallelArrays·p0.95:   831.
521 ms/op
                  multiplyParallelArrays·p0.99:   831.
521 ms/op
                  multiplyParallelArrays·p0.999:  831.
521 ms/op
                  multiplyParallelArrays·p0.9999: 831.
521 ms/op
                  multiplyParallelArrays·p1.00:   831.
521 ms/op

Iteration   3: 1029.702 ms/op
                  multiplyParallelArrays·p0.00:   1029.
702 ms/op
                  multiplyParallelArrays·p0.50:   1029.
702 ms/op
                  multiplyParallelArrays·p0.90:   1029.
702 ms/op
                  multiplyParallelArrays·p0.95:   1029.
702 ms/op
                  multiplyParallelArrays·p0.99:   1029.
702 ms/op
                  multiplyParallelArrays·p0.999:  1029.
702 ms/op
                  multiplyParallelArrays·p0.9999: 1029.
702 ms/op
                  multiplyParallelArrays·p1.00:   1029.
702 ms/op

Iteration   4: 1440.743 ms/op
                  multiplyParallelArrays·p0.00:   1440.
743 ms/op
                  multiplyParallelArrays·p0.50:   1440.
743 ms/op
                  multiplyParallelArrays·p0.90:   1440.
743 ms/op
                  multiplyParallelArrays·p0.95:   1440.
743 ms/op
                  multiplyParallelArrays·p0.99:   1440.
743 ms/op
                  multiplyParallelArrays·p0.999:  1440.
```

```
743 ms/op
                 multiplyParallelArrays·p0.9999: 1440.
743 ms/op
                 multiplyParallelArrays·p1.00:   1440.
743 ms/op

Iteration   5: 1107.296 ms/op
                 multiplyParallelArrays·p0.00:   1107.
296 ms/op
                 multiplyParallelArrays·p0.50:   1107.
296 ms/op
                 multiplyParallelArrays·p0.90:   1107.
296 ms/op
                 multiplyParallelArrays·p0.95:   1107.
296 ms/op
                 multiplyParallelArrays·p0.99:   1107.
296 ms/op
                 multiplyParallelArrays·p0.999:  1107.
296 ms/op
                 multiplyParallelArrays·p0.9999: 1107.
296 ms/op
                 multiplyParallelArrays·p1.00:   1107.
296 ms/op

Iteration   6: 1340.080 ms/op
                 multiplyParallelArrays·p0.00:   1340.
080 ms/op
                 multiplyParallelArrays·p0.50:   1340.
080 ms/op
                 multiplyParallelArrays·p0.90:   1340.
080 ms/op
                 multiplyParallelArrays·p0.95:   1340.
080 ms/op
                 multiplyParallelArrays·p0.99:   1340.
080 ms/op
                 multiplyParallelArrays·p0.999:  1340.
080 ms/op
                 multiplyParallelArrays·p0.9999: 1340.
080 ms/op
                 multiplyParallelArrays·p1.00:   1340.
080 ms/op
```

```
Iteration   7: 773.325 ms/op
                 multiplyParallelArrays·p0.00:   571.
474 ms/op
                 multiplyParallelArrays·p0.50:   773.
325 ms/op
                 multiplyParallelArrays·p0.90:   975.
176 ms/op
                 multiplyParallelArrays·p0.95:   975.
176 ms/op
                 multiplyParallelArrays·p0.99:   975.
176 ms/op
                 multiplyParallelArrays·p0.999:  975.
176 ms/op
                 multiplyParallelArrays·p0.9999: 975.
176 ms/op
                 multiplyParallelArrays·p1.00:   975.
176 ms/op

Iteration   8: 617.611 ms/op
                 multiplyParallelArrays·p0.00:   583.
008 ms/op
                 multiplyParallelArrays·p0.50:   617.
611 ms/op
                 multiplyParallelArrays·p0.90:   652.
214 ms/op
                 multiplyParallelArrays·p0.95:   652.
214 ms/op
                 multiplyParallelArrays·p0.99:   652.
214 ms/op
                 multiplyParallelArrays·p0.999:  652.
214 ms/op
                 multiplyParallelArrays·p0.9999: 652.
214 ms/op
                 multiplyParallelArrays·p1.00:   652.
214 ms/op

Iteration   9: 654.836 ms/op
                 multiplyParallelArrays·p0.00:   637.
534 ms/op
                 multiplyParallelArrays·p0.50:   654.
```

```
836 ms/op
                 multiplyParallelArrays·p0.90:   672.
137 ms/op
                 multiplyParallelArrays·p0.95:   672.
137 ms/op
                 multiplyParallelArrays·p0.99:   672.
137 ms/op
                 multiplyParallelArrays·p0.999:  672.
137 ms/op
                 multiplyParallelArrays·p0.9999: 672.
137 ms/op
                 multiplyParallelArrays·p1.00:   672.
137 ms/op

Iteration  10: 738.198 ms/op
                 multiplyParallelArrays·p0.00:   651.
166 ms/op
                 multiplyParallelArrays·p0.50:   738.
198 ms/op
                 multiplyParallelArrays·p0.90:   825.
229 ms/op
                 multiplyParallelArrays·p0.95:   825.
229 ms/op
                 multiplyParallelArrays·p0.99:   825.
229 ms/op
                 multiplyParallelArrays·p0.999:  825.
229 ms/op
                 multiplyParallelArrays·p0.9999: 825.
229 ms/op
                 multiplyParallelArrays·p1.00:   825.
229 ms/op



Result "com.matrix.MultiplicationBenchmark.
multiplyParallelArrays":
  N = 16
  mean =    850.919 ±(99.9%) 267.856 ms/op

  Histogram, ms/op:
    [ 500.000,  600.000) = 2
```

```
    [ 600.000,  700.000) = 4
    [ 700.000,  800.000) = 2
    [ 800.000,  900.000) = 3
    [ 900.000, 1000.000) = 1
    [1000.000, 1100.000) = 1
    [1100.000, 1200.000) = 1
    [1200.000, 1300.000) = 0
    [1300.000, 1400.000) = 1

  Percentiles, ms/op:
      p(0.0000) =    571.474 ms/op
     p(50.0000) =    785.383 ms/op
     p(90.0000) =   1370.279 ms/op
     p(95.0000) =   1440.743 ms/op
     p(99.0000) =   1440.743 ms/op
     p(99.9000) =   1440.743 ms/op
     p(99.9900) =   1440.743 ms/op
     p(99.9990) =   1440.743 ms/op
     p(99.9999) =   1440.743 ms/op
    p(100.0000) =   1440.743 ms/op


# JMH version: 1.32
# VM version: JDK 17.0.8, OpenJDK 64-Bit Server VM, 17
.0.8+7-LTS
# VM invoker: /Users/zuzannafurtak/Library/Java/
JavaVirtualMachines/corretto-17.0.8/Contents/Home/bin/
java
# VM options: -javaagent:/Applications/IntelliJ IDEA.
app/Contents/lib/idea_rt.jar=57265:/Applications/
IntelliJ IDEA.app/Contents/bin -Dfile.encoding=UTF-8
# Blackhole mode: full + dont-inline hint
# Warmup: 5 iterations, 1 s each
# Measurement: 10 iterations, 1 s each
# Timeout: 10 min per iteration
# Threads: 1 thread, will synchronize iterations
# Benchmark mode: Sampling time
# Benchmark: com.matrix.MultiplicationBenchmark.
multiplyParallelArrays
# Parameters: (n = 2000)
```

```
# Run progress: 88.89% complete, ETA 00:00:16
# Fork: 1 of 1
# Warmup Iteration   1: 2332.033 ms/op
# Warmup Iteration   2: 2017.460 ms/op
# Warmup Iteration   3: 1593.836 ms/op
# Warmup Iteration   4: 1537.212 ms/op
# Warmup Iteration   5: 1518.338 ms/op
Iteration   1: 1505.755 ms/op
                 multiplyParallelArrays·p0.00:   1505.
755 ms/op
                 multiplyParallelArrays·p0.50:   1505.
755 ms/op
                 multiplyParallelArrays·p0.90:   1505.
755 ms/op
                 multiplyParallelArrays·p0.95:   1505.
755 ms/op
                 multiplyParallelArrays·p0.99:   1505.
755 ms/op
                 multiplyParallelArrays·p0.999:  1505.
755 ms/op
                 multiplyParallelArrays·p0.9999: 1505.
755 ms/op
                 multiplyParallelArrays·p1.00:   1505.
755 ms/op

Iteration   2: 1549.795 ms/op
                 multiplyParallelArrays·p0.00:   1549.
795 ms/op
                 multiplyParallelArrays·p0.50:   1549.
795 ms/op
                 multiplyParallelArrays·p0.90:   1549.
795 ms/op
                 multiplyParallelArrays·p0.95:   1549.
795 ms/op
                 multiplyParallelArrays·p0.99:   1549.
795 ms/op
                 multiplyParallelArrays·p0.999:  1549.
795 ms/op
                 multiplyParallelArrays·p0.9999: 1549.
795 ms/op
                 multiplyParallelArrays·p1.00:   1549.
```

```
795 ms/op

Iteration   3: 1526.727 ms/op
                 multiplyParallelArrays·p0.00:   1526.
727 ms/op
                 multiplyParallelArrays·p0.50:   1526.
727 ms/op
                 multiplyParallelArrays·p0.90:   1526.
727 ms/op
                 multiplyParallelArrays·p0.95:   1526.
727 ms/op
                 multiplyParallelArrays·p0.99:   1526.
727 ms/op
                 multiplyParallelArrays·p0.999:  1526.
727 ms/op
                 multiplyParallelArrays·p0.9999: 1526.
727 ms/op
                 multiplyParallelArrays·p1.00:   1526.
727 ms/op

Iteration   4: 1585.447 ms/op
                 multiplyParallelArrays·p0.00:   1585.
447 ms/op
                 multiplyParallelArrays·p0.50:   1585.
447 ms/op
                 multiplyParallelArrays·p0.90:   1585.
447 ms/op
                 multiplyParallelArrays·p0.95:   1585.
447 ms/op
                 multiplyParallelArrays·p0.99:   1585.
447 ms/op
                 multiplyParallelArrays·p0.999:  1585.
447 ms/op
                 multiplyParallelArrays·p0.9999: 1585.
447 ms/op
                 multiplyParallelArrays·p1.00:   1585.
447 ms/op

Iteration   5: 1507.852 ms/op
                 multiplyParallelArrays·p0.00:   1507.
852 ms/op
```

```
                 multiplyParallelArrays·p0.50:   1507.
852 ms/op
                 multiplyParallelArrays·p0.90:   1507.
852 ms/op
                 multiplyParallelArrays·p0.95:   1507.
852 ms/op
                 multiplyParallelArrays·p0.99:   1507.
852 ms/op
                 multiplyParallelArrays·p0.999:  1507.
852 ms/op
                 multiplyParallelArrays·p0.9999: 1507.
852 ms/op
                 multiplyParallelArrays·p1.00:   1507.
852 ms/op

Iteration   6: 1681.916 ms/op
                 multiplyParallelArrays·p0.00:   1681.
916 ms/op
                 multiplyParallelArrays·p0.50:   1681.
916 ms/op
                 multiplyParallelArrays·p0.90:   1681.
916 ms/op
                 multiplyParallelArrays·p0.95:   1681.
916 ms/op
                 multiplyParallelArrays·p0.99:   1681.
916 ms/op
                 multiplyParallelArrays·p0.999:  1681.
916 ms/op
                 multiplyParallelArrays·p0.9999: 1681.
916 ms/op
                 multiplyParallelArrays·p1.00:   1681.
916 ms/op

Iteration   7: 1558.184 ms/op
                 multiplyParallelArrays·p0.00:   1558.
184 ms/op
                 multiplyParallelArrays·p0.50:   1558.
184 ms/op
                 multiplyParallelArrays·p0.90:   1558.
184 ms/op
                 multiplyParallelArrays·p0.95:   1558.
```

```
184 ms/op
                 multiplyParallelArrays·p0.99:   1558.
184 ms/op
                 multiplyParallelArrays·p0.999:  1558.
184 ms/op
                 multiplyParallelArrays·p0.9999: 1558.
184 ms/op
                 multiplyParallelArrays·p1.00:   1558.
184 ms/op

Iteration   8: 1545.601 ms/op
                 multiplyParallelArrays·p0.00:   1545.
601 ms/op
                 multiplyParallelArrays·p0.50:   1545.
601 ms/op
                 multiplyParallelArrays·p0.90:   1545.
601 ms/op
                 multiplyParallelArrays·p0.95:   1545.
601 ms/op
                 multiplyParallelArrays·p0.99:   1545.
601 ms/op
                 multiplyParallelArrays·p0.999:  1545.
601 ms/op
                 multiplyParallelArrays·p0.9999: 1545.
601 ms/op
                 multiplyParallelArrays·p1.00:   1545.
601 ms/op

Iteration   9: 1562.378 ms/op
                 multiplyParallelArrays·p0.00:   1562.
378 ms/op
                 multiplyParallelArrays·p0.50:   1562.
378 ms/op
                 multiplyParallelArrays·p0.90:   1562.
378 ms/op
                 multiplyParallelArrays·p0.95:   1562.
378 ms/op
                 multiplyParallelArrays·p0.99:   1562.
378 ms/op
                 multiplyParallelArrays·p0.999:  1562.
378 ms/op
```

```
                  multiplyParallelArrays·p0.9999: 1562.
378 ms/op
                  multiplyParallelArrays·p1.00:   1562.
378 ms/op

Iteration  10: 1556.087 ms/op
                  multiplyParallelArrays·p0.00:   1556.
087 ms/op
                  multiplyParallelArrays·p0.50:   1556.
087 ms/op
                  multiplyParallelArrays·p0.90:   1556.
087 ms/op
                  multiplyParallelArrays·p0.95:   1556.
087 ms/op
                  multiplyParallelArrays·p0.99:   1556.
087 ms/op
                  multiplyParallelArrays·p0.999:  1556.
087 ms/op
                  multiplyParallelArrays·p0.9999: 1556.
087 ms/op
                  multiplyParallelArrays·p1.00:   1556.
087 ms/op



Result "com.matrix.MultiplicationBenchmark.
multiplyParallelArrays":
  N = 10
  mean =   1557.974 ±(99.9%) 75.718 ms/op

  Histogram, ms/op:
    [1500.000, 1512.500) = 2
    [1512.500, 1525.000) = 0
    [1525.000, 1537.500) = 1
    [1537.500, 1550.000) = 2
    [1550.000, 1562.500) = 3
    [1562.500, 1575.000) = 0
    [1575.000, 1587.500) = 1
    [1587.500, 1600.000) = 0
    [1600.000, 1612.500) = 0
    [1612.500, 1625.000) = 0
```

```
    [1625.000, 1637.500) = 0
    [1637.500, 1650.000) = 0
    [1650.000, 1662.500) = 0
    [1662.500, 1675.000) = 0
    [1675.000, 1687.500) = 1

  Percentiles, ms/op:
      p(0.0000) =   1505.755 ms/op
     p(50.0000) =   1552.941 ms/op
     p(90.0000) =   1672.269 ms/op
     p(95.0000) =   1681.916 ms/op
     p(99.0000) =   1681.916 ms/op
     p(99.9000) =   1681.916 ms/op
     p(99.9900) =   1681.916 ms/op
     p(99.9990) =   1681.916 ms/op
     p(99.9999) =   1681.916 ms/op
    p(100.0000) =   1681.916 ms/op


# Run complete. Total time: 00:02:36

REMEMBER: The numbers below are just data. To gain
reusable insights, you need to follow up on
why the numbers are the way they are. Use profilers (
see -prof, -lprof), design factorial
experiments, perform baseline and negative tests that
provide experimental control, make sure
the benchmarking environment is safe on JVM/OS/HW
level, ask for reviews from the domain experts.
Do not assume the numbers tell you what you want them
to tell.

Benchmark

                 (n)    Mode     Cnt     Score
Error  Units
MultiplicationBenchmark.multiplyParallelArrays
                                   10  sample  238976
     0.010 ±   0.001  ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.00      10  sample
```

```
              0.001            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.50      10  sample
              0.008            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.90      10  sample
              0.020            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.95      10  sample
              0.026            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.99      10  sample
              0.038            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.999     10  sample
              0.057            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.9999    10  sample
              0.199            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p1.00      10  sample
              1.571            ms/op
MultiplicationBenchmark.multiplyParallelArrays
                                    20  sample  276749
     0.018 ±   0.001  ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.00      20  sample
              0.003            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.50      20  sample
              0.016            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.90      20  sample
              0.030            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.95      20  sample
              0.035            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.99      20  sample
              0.046            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
```

```
multiplyParallelArrays·p0.999     20  sample
             0.064            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.9999    20  sample
             0.202            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p1.00      20  sample
             1.176            ms/op
MultiplicationBenchmark.multiplyParallelArrays
                                   50  sample  139699
     0.036 ±   0.001  ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.00      50  sample
             0.014            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.50      50  sample
             0.034            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.90      50  sample
             0.045            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.95      50  sample
             0.051            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.99      50  sample
             0.073            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.999     50  sample
             0.239            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.9999    50  sample
             1.072            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p1.00      50  sample
            19.726            ms/op
MultiplicationBenchmark.multiplyParallelArrays
                                  100  sample   85065
     0.118 ±   0.001  ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.00     100  sample
             0.086            ms/op
```

```
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.50     100  sample
             0.117            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.90     100  sample
             0.125            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.95     100  sample
             0.129            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.99     100  sample
             0.142            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.999    100  sample
             0.173            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.9999   100  sample
             0.603            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p1.00     100  sample
             1.167            ms/op
MultiplicationBenchmark.multiplyParallelArrays
                                  200  sample   16653
     0.603 ±   0.001  ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.00     200  sample
             0.537            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.50     200  sample
             0.597            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.90     200  sample
             0.628            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.95     200  sample
             0.646            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.99     200  sample
             0.708            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.999    200  sample
```

```
              1.209            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.9999   200  sample
              2.711            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p1.00     200  sample
              3.613            ms/op
MultiplicationBenchmark.multiplyParallelArrays
                                  500  sample    1021
     9.875 ±   0.028  ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.00     500  sample
              9.486            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.50     500  sample
              9.830            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.90     500  sample
             10.142            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.95     500  sample
             10.273            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.99     500  sample
             11.285            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.999    500  sample
             11.940            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.9999   500  sample
             11.944            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p1.00     500  sample
             11.944            ms/op
MultiplicationBenchmark.multiplyParallelArrays
                                 1000  sample      67
   162.040 ±   9.127  ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.00    1000  sample
            143.131            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
```

```
multiplyParallelArrays·p0.50    1000  sample
           156.238            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.90    1000  sample
           196.608            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.95    1000  sample
           219.519            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.99    1000  sample
           245.367            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.999   1000  sample
           245.367            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.9999  1000  sample
           245.367            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p1.00    1000  sample
           245.367            ms/op
MultiplicationBenchmark.multiplyParallelArrays
                                  1500  sample      16
   850.919 ± 267.856  ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.00    1500  sample
           571.474            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.50    1500  sample
           785.383            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.90    1500  sample
1370.279            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.95    1500  sample
1440.743            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.99    1500  sample
1440.743            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.999   1500  sample
1440.743            ms/op
```

```
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.9999  1500  sample
1440.743            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p1.00    1500  sample
1440.743            ms/op
MultiplicationBenchmark.multiplyParallelArrays
                                 2000  sample      10
  1557.974 ±  75.718  ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.00    2000  sample
1505.755            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.50    2000  sample
1552.941            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.90    2000  sample
1672.269            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.95    2000  sample
1681.916            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.99    2000  sample
1681.916            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.999   2000  sample
1681.916            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p0.9999  2000  sample
1681.916            ms/op
MultiplicationBenchmark.multiplyParallelArrays:
multiplyParallelArrays·p1.00    2000  sample
1681.916            ms/op

Process finished with exit code 0
```