```
/Users/zuzannafurtak/Library/Java/JavaVirtualMachines/
corretto-17.0.8/Contents/Home/bin/java -javaagent:/
Applications/IntelliJ IDEA.app/Contents/lib/idea_rt.
jar=60634:/Applications/IntelliJ IDEA.app/Contents/bin
 -Dfile.encoding=UTF-8 -classpath /Users/zuzannafurtak
/studia/las_palmas/big_data/big-data-tasks/assignment-
2/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:/Users/
zuzannafurtak/.m2/repository/org/tallison/jmatio/1.5/
jmatio-1.5.jar:/Users/zuzannafurtak/.m2/repository/org
/slf4j/slf4j-api/1.7.25/slf4j-api-1.7.25.jar com.
matrix.MatrixMultiplicationBenchmark
# 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=60634:/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.MatrixMultiplicationBenchmark.
multiplyMatricesBlocking
# Parameters: (n = 10)

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

```
# Warmup Iteration   3: 0.001 ±(99.9%) 0.001 ms/op
# Warmup Iteration   4: 0.001 ±(99.9%) 0.001 ms/op
# Warmup Iteration   5: 0.001 ±(99.9%) 0.001 ms/op
Iteration   1: 0.001 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
005 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
014 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
015 ms/op

Iteration   2: 0.001 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
005 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
013 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
013 ms/op

Iteration   3: 0.001 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
```

```
001 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
005 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
014 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
015 ms/op

Iteration   4: 0.001 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
005 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
013 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
014 ms/op

Iteration   5: 0.001 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
001 ms/op
```

```
                  multiplyMatricesBlocking·p0.95:   0.
001 ms/op
                  multiplyMatricesBlocking·p0.99:   0.
001 ms/op
                  multiplyMatricesBlocking·p0.999:  0.
005 ms/op
                  multiplyMatricesBlocking·p0.9999: 0.
013 ms/op
                  multiplyMatricesBlocking·p1.00:   0.
014 ms/op

Iteration   6: 0.001 ±(99.9%) 0.001 ms/op
                  multiplyMatricesBlocking·p0.00:   0.
001 ms/op
                  multiplyMatricesBlocking·p0.50:   0.
001 ms/op
                  multiplyMatricesBlocking·p0.90:   0.
001 ms/op
                  multiplyMatricesBlocking·p0.95:   0.
001 ms/op
                  multiplyMatricesBlocking·p0.99:   0.
001 ms/op
                  multiplyMatricesBlocking·p0.999:  0.
005 ms/op
                  multiplyMatricesBlocking·p0.9999: 0.
011 ms/op
                  multiplyMatricesBlocking·p1.00:   0.
013 ms/op

Iteration   7: 0.001 ±(99.9%) 0.001 ms/op
                  multiplyMatricesBlocking·p0.00:   0.
001 ms/op
                  multiplyMatricesBlocking·p0.50:   0.
001 ms/op
                  multiplyMatricesBlocking·p0.90:   0.
001 ms/op
                  multiplyMatricesBlocking·p0.95:   0.
001 ms/op
                  multiplyMatricesBlocking·p0.99:   0.
001 ms/op
                  multiplyMatricesBlocking·p0.999:  0.
```

```
003 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
011 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
014 ms/op

Iteration   8: 0.001 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
005 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
012 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
013 ms/op

Iteration   9: 0.001 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
003 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
013 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
014 ms/op
```

```
Iteration  10: 0.001 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
001 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
006 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
010 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
013 ms/op



Result "com.matrix.MatrixMultiplicationBenchmark.
multiplyMatricesBlocking":
  N = 213816
  mean =      0.001 ±(99.9%) 0.001 ms/op

  Histogram, ms/op:
    [0.000, 0.001) = 213493
    [0.001, 0.003) = 54
    [0.003, 0.004) = 27
    [0.004, 0.005) = 33
    [0.005, 0.006) = 80
    [0.006, 0.008) = 26
    [0.008, 0.009) = 27
    [0.009, 0.010) = 35
    [0.010, 0.011) = 13
    [0.011, 0.013) = 4
    [0.013, 0.014) = 15
    [0.014, 0.015) = 9
    [0.015, 0.016) = 0
    [0.016, 0.018) = 0
```

```
    [0.018, 0.019) = 0

  Percentiles, ms/op:
      p(0.0000) =      0.001 ms/op
     p(50.0000) =      0.001 ms/op
     p(90.0000) =      0.001 ms/op
     p(95.0000) =      0.001 ms/op
     p(99.0000) =      0.001 ms/op
     p(99.9000) =      0.005 ms/op
     p(99.9900) =      0.013 ms/op
     p(99.9990) =      0.015 ms/op
     p(99.9999) =      0.015 ms/op
    p(100.0000) =      0.015 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=60634:/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.MatrixMultiplicationBenchmark.
multiplyMatricesBlocking
# Parameters: (n = 20)

# Run progress: 11.11% complete, ETA 00:02:05
# Fork: 1 of 1
# Warmup Iteration   1: 0.005 ±(99.9%) 0.001 ms/op
# Warmup Iteration   2: 0.005 ±(99.9%) 0.001 ms/op
# Warmup Iteration   3: 0.005 ±(99.9%) 0.001 ms/op
# Warmup Iteration   4: 0.005 ±(99.9%) 0.001 ms/op
# Warmup Iteration   5: 0.005 ±(99.9%) 0.001 ms/op
```

```
Iteration   1: 0.005 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
006 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
014 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
020 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
022 ms/op

Iteration   2: 0.005 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
004 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
006 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
013 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
017 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
017 ms/op

Iteration   3: 0.005 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
004 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
005 ms/op
```

```
                 multiplyMatricesBlocking·p0.90:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
006 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
013 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
018 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
021 ms/op

Iteration   4: 0.005 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
004 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
006 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
014 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
018 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
026 ms/op

Iteration   5: 0.005 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
004 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
```

```
006 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
014 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
019 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
019 ms/op

Iteration   6: 0.005 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
004 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
006 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
013 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
037 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
040 ms/op

Iteration   7: 0.005 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
004 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
006 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
013 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
018 ms/op
```

```
                  multiplyMatricesBlocking·p1.00:   0.
059 ms/op

Iteration   8: 0.005 ±(99.9%) 0.001 ms/op
                  multiplyMatricesBlocking·p0.00:   0.
005 ms/op
                  multiplyMatricesBlocking·p0.50:   0.
005 ms/op
                  multiplyMatricesBlocking·p0.90:   0.
005 ms/op
                  multiplyMatricesBlocking·p0.95:   0.
005 ms/op
                  multiplyMatricesBlocking·p0.99:   0.
006 ms/op
                  multiplyMatricesBlocking·p0.999:  0.
013 ms/op
                  multiplyMatricesBlocking·p0.9999: 0.
019 ms/op
                  multiplyMatricesBlocking·p1.00:   0.
020 ms/op

Iteration   9: 0.005 ±(99.9%) 0.001 ms/op
                  multiplyMatricesBlocking·p0.00:   0.
004 ms/op
                  multiplyMatricesBlocking·p0.50:   0.
005 ms/op
                  multiplyMatricesBlocking·p0.90:   0.
005 ms/op
                  multiplyMatricesBlocking·p0.95:   0.
005 ms/op
                  multiplyMatricesBlocking·p0.99:   0.
006 ms/op
                  multiplyMatricesBlocking·p0.999:  0.
013 ms/op
                  multiplyMatricesBlocking·p0.9999: 0.
018 ms/op
                  multiplyMatricesBlocking·p1.00:   0.
018 ms/op

Iteration  10: 0.005 ±(99.9%) 0.001 ms/op
                  multiplyMatricesBlocking·p0.00:   0.
```

```
004 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
005 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
006 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
013 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
018 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
019 ms/op



Result "com.matrix.MatrixMultiplicationBenchmark.
multiplyMatricesBlocking":
  N = 269560
  mean =      0.005 ±(99.9%) 0.001 ms/op

  Histogram, ms/op:
    [0.000, 0.005) = 262020
    [0.005, 0.010) = 6942
    [0.010, 0.015) = 455
    [0.015, 0.020) = 131
    [0.020, 0.025) = 4
    [0.025, 0.030) = 2
    [0.030, 0.035) = 1
    [0.035, 0.040) = 4
    [0.040, 0.045) = 0
    [0.045, 0.050) = 0
    [0.050, 0.055) = 0

  Percentiles, ms/op:
      p(0.0000) =      0.004 ms/op
     p(50.0000) =      0.005 ms/op
     p(90.0000) =      0.005 ms/op
     p(95.0000) =      0.005 ms/op
```

```
     p(99.0000) =      0.006 ms/op
     p(99.9000) =      0.013 ms/op
     p(99.9900) =      0.018 ms/op
     p(99.9990) =      0.038 ms/op
     p(99.9999) =      0.059 ms/op
    p(100.0000) =      0.059 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=60634:/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.MatrixMultiplicationBenchmark.
multiplyMatricesBlocking
# Parameters: (n = 50)

# Run progress: 22.22% complete, ETA 00:01:49
# Fork: 1 of 1
# Warmup Iteration   1: 0.046 ±(99.9%) 0.001 ms/op
# Warmup Iteration   2: 0.045 ±(99.9%) 0.001 ms/op
# Warmup Iteration   3: 0.046 ±(99.9%) 0.001 ms/op
# Warmup Iteration   4: 0.048 ±(99.9%) 0.001 ms/op
# Warmup Iteration   5: 0.048 ±(99.9%) 0.001 ms/op
Iteration   1: 0.048 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
047 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
047 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
048 ms/op
```

```
                 multiplyMatricesBlocking·p0.95:   0.
050 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
058 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
069 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
280 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
283 ms/op

Iteration   2: 0.048 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
045 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
047 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
048 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
051 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
058 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
063 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
068 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
068 ms/op

Iteration   3: 0.048 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
044 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
047 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
048 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
051 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
058 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
```

```
063 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
070 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
070 ms/op

Iteration   4: 0.048 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
044 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
047 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
048 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
051 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
058 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
062 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
100 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
101 ms/op

Iteration   5: 0.048 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
044 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
047 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
048 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
052 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
057 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
062 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
099 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
100 ms/op
```

```
Iteration   6: 0.048 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
044 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
047 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
049 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
051 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
059 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
065 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
071 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
071 ms/op

Iteration   7: 0.048 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
044 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
047 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
048 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
051 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
058 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
065 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
096 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
097 ms/op

Iteration   8: 0.048 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
047 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
```

```
047 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
048 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
051 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
058 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
063 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
066 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
066 ms/op

Iteration   9: 0.048 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
044 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
047 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
048 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
051 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
058 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
062 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
130 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
133 ms/op

Iteration  10: 0.048 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
044 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
047 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
048 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
052 ms/op
```

```
                  multiplyMatricesBlocking·p0.99:   0.
058 ms/op
                  multiplyMatricesBlocking·p0.999:  0.
063 ms/op
                  multiplyMatricesBlocking·p0.9999: 0.
069 ms/op
                  multiplyMatricesBlocking·p1.00:   0.
069 ms/op



Result "com.matrix.MatrixMultiplicationBenchmark.
multiplyMatricesBlocking":
  N = 104432
  mean =      0.048 ±(99.9%) 0.001 ms/op

  Histogram, ms/op:
    [0.000, 0.025) = 0
    [0.025, 0.050) = 96983
    [0.050, 0.075) = 7438
    [0.075, 0.100) = 5
    [0.100, 0.125) = 2
    [0.125, 0.150) = 1
    [0.150, 0.175) = 1
    [0.175, 0.200) = 0
    [0.200, 0.225) = 1
    [0.225, 0.250) = 0
    [0.250, 0.275) = 0
    [0.275, 0.300) = 1

  Percentiles, ms/op:
      p(0.0000) =      0.044 ms/op
     p(50.0000) =      0.047 ms/op
     p(90.0000) =      0.048 ms/op
     p(95.0000) =      0.051 ms/op
     p(99.0000) =      0.058 ms/op
     p(99.9000) =      0.063 ms/op
     p(99.9900) =      0.084 ms/op
     p(99.9990) =      0.280 ms/op
     p(99.9999) =      0.283 ms/op
    p(100.0000) =      0.283 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=60634:/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.MatrixMultiplicationBenchmark.
multiplyMatricesBlocking
# Parameters: (n = 100)

# Run progress: 33.33% complete, ETA 00:01:33
# Fork: 1 of 1
# Warmup Iteration   1: 0.341 ±(99.9%) 0.008 ms/op
# Warmup Iteration   2: 0.336 ±(99.9%) 0.001 ms/op
# Warmup Iteration   3: 0.334 ±(99.9%) 0.001 ms/op
# Warmup Iteration   4: 0.334 ±(99.9%) 0.001 ms/op
# Warmup Iteration   5: 0.334 ±(99.9%) 0.001 ms/op
Iteration   1: 0.334 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
316 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
331 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
340 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
344 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
364 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
417 ms/op
```

```
                 multiplyMatricesBlocking·p0.9999: 0.
419 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
419 ms/op

Iteration   2: 0.334 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
330 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
331 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
343 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
348 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
370 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
414 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
419 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
419 ms/op

Iteration   3: 0.335 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
309 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
331 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
343 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
349 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
373 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
419 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
428 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
428 ms/op
```

```
Iteration   4: 0.334 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
330 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
331 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
343 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
349 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
369 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
422 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
423 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
423 ms/op

Iteration   5: 0.334 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
330 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
331 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
343 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
348 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
370 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
417 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
418 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
418 ms/op

Iteration   6: 0.335 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
312 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
332 ms/op
```

```
                 multiplyMatricesBlocking·p0.90:   0.
344 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
351 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
379 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
434 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
445 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
445 ms/op

Iteration   7: 0.336 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
331 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
332 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
345 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
351 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
373 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
417 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
423 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
423 ms/op

Iteration   8: 0.336 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
331 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
332 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
344 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
350 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
```

```
376 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
422 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
423 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
423 ms/op

Iteration   9: 0.336 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
309 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
332 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
344 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
351 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
373 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
416 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
424 ms/op
                 multiplyMatricesBlocking·p1.00:   0.
424 ms/op

Iteration  10: 0.336 ±(99.9%) 0.001 ms/op
                 multiplyMatricesBlocking·p0.00:   0.
331 ms/op
                 multiplyMatricesBlocking·p0.50:   0.
332 ms/op
                 multiplyMatricesBlocking·p0.90:   0.
344 ms/op
                 multiplyMatricesBlocking·p0.95:   0.
350 ms/op
                 multiplyMatricesBlocking·p0.99:   0.
373 ms/op
                 multiplyMatricesBlocking·p0.999:  0.
415 ms/op
                 multiplyMatricesBlocking·p0.9999: 0.
419 ms/op
```

```
                    multiplyMatricesBlocking·p1.00:   0.
419 ms/op



Result "com.matrix.MatrixMultiplicationBenchmark.
multiplyMatricesBlocking":
  N = 29951
  mean =      0.335 ±(99.9%) 0.001 ms/op

  Histogram, ms/op:
    [0.300, 0.313) = 5
    [0.313, 0.325) = 4
    [0.325, 0.338) = 24764
    [0.338, 0.350) = 3782
    [0.350, 0.363) = 861
    [0.363, 0.375) = 292
    [0.375, 0.388) = 134
    [0.388, 0.400) = 37
    [0.400, 0.413) = 23
    [0.413, 0.425) = 43
    [0.425, 0.438) = 4
    [0.438, 0.450) = 2
    [0.450, 0.463) = 0
    [0.463, 0.475) = 0
    [0.475, 0.488) = 0

  Percentiles, ms/op:
      p(0.0000) =      0.309 ms/op
     p(50.0000) =      0.332 ms/op
     p(90.0000) =      0.343 ms/op
     p(95.0000) =      0.349 ms/op
     p(99.0000) =      0.372 ms/op
     p(99.9000) =      0.417 ms/op
     p(99.9900) =      0.434 ms/op
     p(99.9990) =      0.445 ms/op
     p(99.9999) =      0.445 ms/op
    p(100.0000) =      0.445 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=60634:/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.MatrixMultiplicationBenchmark.
multiplyMatricesBlocking
# Parameters: (n = 200)

# Run progress: 44.44% complete, ETA 00:01:18
# Fork: 1 of 1
# Warmup Iteration   1: 2.649 ±(99.9%) 0.083 ms/op
# Warmup Iteration   2: 2.617 ±(99.9%) 0.006 ms/op
# Warmup Iteration   3: 2.614 ±(99.9%) 0.007 ms/op
# Warmup Iteration   4: 2.611 ±(99.9%) 0.006 ms/op
# Warmup Iteration   5: 2.620 ±(99.9%) 0.008 ms/op
Iteration   1: 2.619 ±(99.9%) 0.005 ms/op
                 multiplyMatricesBlocking·p0.00:   2.
548 ms/op
                 multiplyMatricesBlocking·p0.50:   2.
613 ms/op
                 multiplyMatricesBlocking·p0.90:   2.
640 ms/op
                 multiplyMatricesBlocking·p0.95:   2.
650 ms/op
                 multiplyMatricesBlocking·p0.99:   2.
750 ms/op
                 multiplyMatricesBlocking·p0.999:  3.
027 ms/op
                 multiplyMatricesBlocking·p0.9999: 3.
027 ms/op
                 multiplyMatricesBlocking·p1.00:   3.
```

```
027 ms/op

Iteration   2: 2.626 ±(99.9%) 0.007 ms/op
                 multiplyMatricesBlocking·p0.00:   2.
535 ms/op
                 multiplyMatricesBlocking·p0.50:   2.
617 ms/op
                 multiplyMatricesBlocking·p0.90:   2.
671 ms/op
                 multiplyMatricesBlocking·p0.95:   2.
687 ms/op
                 multiplyMatricesBlocking·p0.99:   2.
805 ms/op
                 multiplyMatricesBlocking·p0.999:  2.
994 ms/op
                 multiplyMatricesBlocking·p0.9999: 2.
994 ms/op
                 multiplyMatricesBlocking·p1.00:   2.
994 ms/op

Iteration   3: 2.625 ±(99.9%) 0.006 ms/op
                 multiplyMatricesBlocking·p0.00:   2.
560 ms/op
                 multiplyMatricesBlocking·p0.50:   2.
613 ms/op
                 multiplyMatricesBlocking·p0.90:   2.
665 ms/op
                 multiplyMatricesBlocking·p0.95:   2.
691 ms/op
                 multiplyMatricesBlocking·p0.99:   2.
761 ms/op
                 multiplyMatricesBlocking·p0.999:  2.
982 ms/op
                 multiplyMatricesBlocking·p0.9999: 2.
982 ms/op
                 multiplyMatricesBlocking·p1.00:   2.
982 ms/op

Iteration   4: 2.624 ±(99.9%) 0.007 ms/op
                 multiplyMatricesBlocking·p0.00:   2.
572 ms/op
```

```
                 multiplyMatricesBlocking·p0.50:   2.
613 ms/op
                 multiplyMatricesBlocking·p0.90:   2.
665 ms/op
                 multiplyMatricesBlocking·p0.95:   2.
694 ms/op
                 multiplyMatricesBlocking·p0.99:   2.
757 ms/op
                 multiplyMatricesBlocking·p0.999:  2.
994 ms/op
                 multiplyMatricesBlocking·p0.9999: 2.
994 ms/op
                 multiplyMatricesBlocking·p1.00:   2.
994 ms/op

Iteration   5: 2.621 ±(99.9%) 0.007 ms/op
                 multiplyMatricesBlocking·p0.00:   2.
552 ms/op
                 multiplyMatricesBlocking·p0.50:   2.
613 ms/op
                 multiplyMatricesBlocking·p0.90:   2.
654 ms/op
                 multiplyMatricesBlocking·p0.95:   2.
690 ms/op
                 multiplyMatricesBlocking·p0.99:   2.
758 ms/op
                 multiplyMatricesBlocking·p0.999:  3.
138 ms/op
                 multiplyMatricesBlocking·p0.9999: 3.
138 ms/op
                 multiplyMatricesBlocking·p1.00:   3.
138 ms/op

Iteration   6: 2.619 ±(99.9%) 0.007 ms/op
                 multiplyMatricesBlocking·p0.00:   2.
531 ms/op
                 multiplyMatricesBlocking·p0.50:   2.
613 ms/op
                 multiplyMatricesBlocking·p0.90:   2.
652 ms/op
                 multiplyMatricesBlocking·p0.95:   2.
```

```
698 ms/op
                 multiplyMatricesBlocking·p0.99:   2.
752 ms/op
                 multiplyMatricesBlocking·p0.999:  3.
097 ms/op
                 multiplyMatricesBlocking·p0.9999: 3.
097 ms/op
                 multiplyMatricesBlocking·p1.00:   3.
097 ms/op

Iteration   7: 2.621 ±(99.9%) 0.006 ms/op
                 multiplyMatricesBlocking·p0.00:   2.
548 ms/op
                 multiplyMatricesBlocking·p0.50:   2.
609 ms/op
                 multiplyMatricesBlocking·p0.90:   2.
661 ms/op
                 multiplyMatricesBlocking·p0.95:   2.
695 ms/op
                 multiplyMatricesBlocking·p0.99:   2.
782 ms/op
                 multiplyMatricesBlocking·p0.999:  2.
904 ms/op
                 multiplyMatricesBlocking·p0.9999: 2.
904 ms/op
                 multiplyMatricesBlocking·p1.00:   2.
904 ms/op

Iteration   8: 2.623 ±(99.9%) 0.007 ms/op
                 multiplyMatricesBlocking·p0.00:   2.
535 ms/op
                 multiplyMatricesBlocking·p0.50:   2.
613 ms/op
                 multiplyMatricesBlocking·p0.90:   2.
658 ms/op
                 multiplyMatricesBlocking·p0.95:   2.
679 ms/op
                 multiplyMatricesBlocking·p0.99:   2.
763 ms/op
                 multiplyMatricesBlocking·p0.999:  3.
154 ms/op
```

```
                 multiplyMatricesBlocking·p0.9999: 3.
154 ms/op
                 multiplyMatricesBlocking·p1.00:   3.
154 ms/op

Iteration   9: 2.619 ±(99.9%) 0.006 ms/op
                 multiplyMatricesBlocking·p0.00:   2.
556 ms/op
                 multiplyMatricesBlocking·p0.50:   2.
609 ms/op
                 multiplyMatricesBlocking·p0.90:   2.
654 ms/op
                 multiplyMatricesBlocking·p0.95:   2.
679 ms/op
                 multiplyMatricesBlocking·p0.99:   2.
797 ms/op
                 multiplyMatricesBlocking·p0.999:  3.
015 ms/op
                 multiplyMatricesBlocking·p0.9999: 3.
015 ms/op
                 multiplyMatricesBlocking·p1.00:   3.
015 ms/op

Iteration  10: 2.591 ±(99.9%) 0.007 ms/op
                 multiplyMatricesBlocking·p0.00:   2.
527 ms/op
                 multiplyMatricesBlocking·p0.50:   2.
589 ms/op
                 multiplyMatricesBlocking·p0.90:   2.
634 ms/op
                 multiplyMatricesBlocking·p0.95:   2.
666 ms/op
                 multiplyMatricesBlocking·p0.99:   2.
729 ms/op
                 multiplyMatricesBlocking·p0.999:  2.
855 ms/op
                 multiplyMatricesBlocking·p0.9999: 2.
855 ms/op
                 multiplyMatricesBlocking·p1.00:   2.
855 ms/op
```

```
Result "com.matrix.MatrixMultiplicationBenchmark.
multiplyMatricesBlocking":
  N = 3835
  mean =      2.619 ±(99.9%) 0.002 ms/op

  Histogram, ms/op:
    [2.500, 2.550) = 66
    [2.550, 2.600) = 674
    [2.600, 2.650) = 2628
    [2.650, 2.700) = 354
    [2.700, 2.750) = 77
    [2.750, 2.800) = 11
    [2.800, 2.850) = 8
    [2.850, 2.900) = 8
    [2.900, 2.950) = 1
    [2.950, 3.000) = 3
    [3.000, 3.050) = 2
    [3.050, 3.100) = 1
    [3.100, 3.150) = 1
    [3.150, 3.200) = 1

  Percentiles, ms/op:
      p(0.0000) =      2.527 ms/op
     p(50.0000) =      2.613 ms/op
     p(90.0000) =      2.654 ms/op
     p(95.0000) =      2.683 ms/op
     p(99.0000) =      2.744 ms/op
     p(99.9000) =      3.038 ms/op
     p(99.9900) =      3.154 ms/op
     p(99.9990) =      3.154 ms/op
     p(99.9999) =      3.154 ms/op
    p(100.0000) =      3.154 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=60634:/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.MatrixMultiplicationBenchmark.
multiplyMatricesBlocking
# Parameters: (n = 500)

# Run progress: 55.56% complete, ETA 00:01:02
# Fork: 1 of 1
# Warmup Iteration   1: 39.148 ±(99.9%) 2.150 ms/op
# Warmup Iteration   2: 38.470 ±(99.9%) 0.151 ms/op
# Warmup Iteration   3: 38.474 ±(99.9%) 0.144 ms/op
# Warmup Iteration   4: 38.484 ±(99.9%) 0.168 ms/op
# Warmup Iteration   5: 38.479 ±(99.9%) 0.154 ms/op
Iteration   1: 38.550 ±(99.9%) 0.259 ms/op
                 multiplyMatricesBlocking·p0.00:   38.
273 ms/op
                 multiplyMatricesBlocking·p0.50:   38.
404 ms/op
                 multiplyMatricesBlocking·p0.90:   39.
059 ms/op
                 multiplyMatricesBlocking·p0.95:   39.
636 ms/op
                 multiplyMatricesBlocking·p0.99:   39.
846 ms/op
                 multiplyMatricesBlocking·p0.999:  39.
846 ms/op
                 multiplyMatricesBlocking·p0.9999: 39.
846 ms/op
                 multiplyMatricesBlocking·p1.00:   39.
846 ms/op

Iteration   2: 38.583 ±(99.9%) 0.263 ms/op
                 multiplyMatricesBlocking·p0.00:   38.
```

```
273 ms/op
                 multiplyMatricesBlocking·p0.50:   38.
404 ms/op
                 multiplyMatricesBlocking·p0.90:   39.
276 ms/op
                 multiplyMatricesBlocking·p0.95:   39.
449 ms/op
                 multiplyMatricesBlocking·p0.99:   39.
518 ms/op
                 multiplyMatricesBlocking·p0.999:  39.
518 ms/op
                 multiplyMatricesBlocking·p0.9999: 39.
518 ms/op
                 multiplyMatricesBlocking·p1.00:   39.
518 ms/op

Iteration   3: 38.552 ±(99.9%) 0.220 ms/op
                 multiplyMatricesBlocking·p0.00:   38.
273 ms/op
                 multiplyMatricesBlocking·p0.50:   38.
404 ms/op
                 multiplyMatricesBlocking·p0.90:   39.
007 ms/op
                 multiplyMatricesBlocking·p0.95:   39.
295 ms/op
                 multiplyMatricesBlocking·p0.99:   39.
453 ms/op
                 multiplyMatricesBlocking·p0.999:  39.
453 ms/op
                 multiplyMatricesBlocking·p0.9999: 39.
453 ms/op
                 multiplyMatricesBlocking·p1.00:   39.
453 ms/op

Iteration   4: 38.516 ±(99.9%) 0.263 ms/op
                 multiplyMatricesBlocking·p0.00:   38.
273 ms/op
                 multiplyMatricesBlocking·p0.50:   38.
339 ms/op
                 multiplyMatricesBlocking·p0.90:   39.
400 ms/op
```

```
                  multiplyMatricesBlocking·p0.95:   39.
453 ms/op
                  multiplyMatricesBlocking·p0.99:   39.
453 ms/op
                  multiplyMatricesBlocking·p0.999:  39.
453 ms/op
                  multiplyMatricesBlocking·p0.9999: 39.
453 ms/op
                  multiplyMatricesBlocking·p1.00:   39.
453 ms/op

Iteration   5: 38.562 ±(99.9%) 0.305 ms/op
                  multiplyMatricesBlocking·p0.00:   38.
273 ms/op
                  multiplyMatricesBlocking·p0.50:   38.
404 ms/op
                  multiplyMatricesBlocking·p0.90:   39.
505 ms/op
                  multiplyMatricesBlocking·p0.95:   39.
715 ms/op
                  multiplyMatricesBlocking·p0.99:   39.
715 ms/op
                  multiplyMatricesBlocking·p0.999:  39.
715 ms/op
                  multiplyMatricesBlocking·p0.9999: 39.
715 ms/op
                  multiplyMatricesBlocking·p1.00:   39.
715 ms/op

Iteration   6: 38.504 ±(99.9%) 0.279 ms/op
                  multiplyMatricesBlocking·p0.00:   38.
273 ms/op
                  multiplyMatricesBlocking·p0.50:   38.
339 ms/op
                  multiplyMatricesBlocking·p0.90:   39.
243 ms/op
                  multiplyMatricesBlocking·p0.95:   39.
649 ms/op
                  multiplyMatricesBlocking·p0.99:   39.
780 ms/op
                  multiplyMatricesBlocking·p0.999:  39.
```

```
780 ms/op
                 multiplyMatricesBlocking·p0.9999: 39.
780 ms/op
                 multiplyMatricesBlocking·p1.00:   39.
780 ms/op

Iteration   7: 38.533 ±(99.9%) 0.247 ms/op
                 multiplyMatricesBlocking·p0.00:   38.
273 ms/op
                 multiplyMatricesBlocking·p0.50:   38.
339 ms/op
                 multiplyMatricesBlocking·p0.90:   39.
322 ms/op
                 multiplyMatricesBlocking·p0.95:   39.
361 ms/op
                 multiplyMatricesBlocking·p0.99:   39.
387 ms/op
                 multiplyMatricesBlocking·p0.999:  39.
387 ms/op
                 multiplyMatricesBlocking·p0.9999: 39.
387 ms/op
                 multiplyMatricesBlocking·p1.00:   39.
387 ms/op

Iteration   8: 38.520 ±(99.9%) 0.244 ms/op
                 multiplyMatricesBlocking·p0.00:   38.
273 ms/op
                 multiplyMatricesBlocking·p0.50:   38.
339 ms/op
                 multiplyMatricesBlocking·p0.90:   39.
210 ms/op
                 multiplyMatricesBlocking·p0.95:   39.
299 ms/op
                 multiplyMatricesBlocking·p0.99:   39.
322 ms/op
                 multiplyMatricesBlocking·p0.999:  39.
322 ms/op
                 multiplyMatricesBlocking·p0.9999: 39.
322 ms/op
                 multiplyMatricesBlocking·p1.00:   39.
322 ms/op
```

```
Iteration   9: 38.535 ±(99.9%) 0.242 ms/op
                 multiplyMatricesBlocking·p0.00:   38.
273 ms/op
                 multiplyMatricesBlocking·p0.50:   38.
371 ms/op
                 multiplyMatricesBlocking·p0.90:   39.
210 ms/op
                 multiplyMatricesBlocking·p0.95:   39.
341 ms/op
                 multiplyMatricesBlocking·p0.99:   39.
387 ms/op
                 multiplyMatricesBlocking·p0.999:  39.
387 ms/op
                 multiplyMatricesBlocking·p0.9999: 39.
387 ms/op
                 multiplyMatricesBlocking·p1.00:   39.
387 ms/op

Iteration  10: 38.523 ±(99.9%) 0.241 ms/op
                 multiplyMatricesBlocking·p0.00:   38.
273 ms/op
                 multiplyMatricesBlocking·p0.50:   38.
339 ms/op
                 multiplyMatricesBlocking·p0.90:   39.
184 ms/op
                 multiplyMatricesBlocking·p0.95:   39.
364 ms/op
                 multiplyMatricesBlocking·p0.99:   39.
387 ms/op
                 multiplyMatricesBlocking·p0.999:  39.
387 ms/op
                 multiplyMatricesBlocking·p0.9999: 39.
387 ms/op
                 multiplyMatricesBlocking·p1.00:   39.
387 ms/op



Result "com.matrix.MatrixMultiplicationBenchmark.
multiplyMatricesBlocking":
```

```
  N = 266
  mean =     38.538 ±(99.9%) 0.072 ms/op

  Histogram, ms/op:
    [38.000, 38.125) = 0
    [38.125, 38.250) = 0
    [38.250, 38.375) = 140
    [38.375, 38.500) = 44
    [38.500, 38.625) = 15
    [38.625, 38.750) = 21
    [38.750, 38.875) = 5
    [38.875, 39.000) = 6
    [39.000, 39.125) = 8
    [39.125, 39.250) = 4
    [39.250, 39.375) = 9
    [39.375, 39.500) = 9
    [39.500, 39.625) = 1
    [39.625, 39.750) = 2
    [39.750, 39.875) = 2

  Percentiles, ms/op:
      p(0.0000) =     38.273 ms/op
     p(50.0000) =     38.339 ms/op
     p(90.0000) =     39.191 ms/op
     p(95.0000) =     39.387 ms/op
     p(99.0000) =     39.736 ms/op
     p(99.9000) =     39.846 ms/op
     p(99.9900) =     39.846 ms/op
     p(99.9990) =     39.846 ms/op
     p(99.9999) =     39.846 ms/op
    p(100.0000) =     39.846 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=60634:/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.MatrixMultiplicationBenchmark.
multiplyMatricesBlocking
# Parameters: (n = 1000)

# Run progress: 66.67% complete, ETA 00:00:47
# Fork: 1 of 1
# Warmup Iteration   1: 299.762 ±(99.9%) 45.988 ms/op
# Warmup Iteration   2: 307.233 ±(99.9%) 8.748 ms/op
# Warmup Iteration   3: 307.888 ±(99.9%) 18.427 ms/op
# Warmup Iteration   4: 311.427 ±(99.9%) 43.121 ms/op
# Warmup Iteration   5: 307.364 ±(99.9%) 8.910 ms/op
Iteration   1: 307.233 ±(99.9%) 9.974 ms/op
                 multiplyMatricesBlocking·p0.00:   305
.660 ms/op
                 multiplyMatricesBlocking·p0.50:   306
.971 ms/op
                 multiplyMatricesBlocking·p0.90:   309
.330 ms/op
                 multiplyMatricesBlocking·p0.95:   309
.330 ms/op
                 multiplyMatricesBlocking·p0.99:   309
.330 ms/op
                 multiplyMatricesBlocking·p0.999:  309
.330 ms/op
                 multiplyMatricesBlocking·p0.9999: 309
.330 ms/op
                 multiplyMatricesBlocking·p1.00:   309
.330 ms/op

Iteration   2: 307.626 ±(99.9%) 11.858 ms/op
                 multiplyMatricesBlocking·p0.00:   306
.708 ms/op
                 multiplyMatricesBlocking·p0.50:   306
.708 ms/op
```

```
                  multiplyMatricesBlocking·p0.90:   310
.378 ms/op
                  multiplyMatricesBlocking·p0.95:   310
.378 ms/op
                  multiplyMatricesBlocking·p0.99:   310
.378 ms/op
                  multiplyMatricesBlocking·p0.999:  310
.378 ms/op
                  multiplyMatricesBlocking·p0.9999: 310
.378 ms/op
                  multiplyMatricesBlocking·p1.00:   310
.378 ms/op

Iteration   3: 307.757 ±(99.9%) 13.831 ms/op
                  multiplyMatricesBlocking·p0.00:   306
.184 ms/op
                  multiplyMatricesBlocking·p0.50:   306
.971 ms/op
                  multiplyMatricesBlocking·p0.90:   310
.903 ms/op
                  multiplyMatricesBlocking·p0.95:   310
.903 ms/op
                  multiplyMatricesBlocking·p0.99:   310
.903 ms/op
                  multiplyMatricesBlocking·p0.999:  310
.903 ms/op
                  multiplyMatricesBlocking·p0.9999: 310
.903 ms/op
                  multiplyMatricesBlocking·p1.00:   310
.903 ms/op

Iteration   4: 307.495 ±(99.9%) 12.827 ms/op
                  multiplyMatricesBlocking·p0.00:   306
.184 ms/op
                  multiplyMatricesBlocking·p0.50:   306
.708 ms/op
                  multiplyMatricesBlocking·p0.90:   310
.378 ms/op
                  multiplyMatricesBlocking·p0.95:   310
.378 ms/op
                  multiplyMatricesBlocking·p0.99:   310
```

```
.378 ms/op
                 multiplyMatricesBlocking·p0.999:  310
.378 ms/op
                 multiplyMatricesBlocking·p0.9999: 310
.378 ms/op
                 multiplyMatricesBlocking·p1.00:   310
.378 ms/op

Iteration   5: 307.626 ±(99.9%) 14.473 ms/op
                 multiplyMatricesBlocking·p0.00:   306
.184 ms/op
                 multiplyMatricesBlocking·p0.50:   306
.708 ms/op
                 multiplyMatricesBlocking·p0.90:   310
.903 ms/op
                 multiplyMatricesBlocking·p0.95:   310
.903 ms/op
                 multiplyMatricesBlocking·p0.99:   310
.903 ms/op
                 multiplyMatricesBlocking·p0.999:  310
.903 ms/op
                 multiplyMatricesBlocking·p0.9999: 310
.903 ms/op
                 multiplyMatricesBlocking·p1.00:   310
.903 ms/op

Iteration   6: 307.626 ±(99.9%) 14.735 ms/op
                 multiplyMatricesBlocking·p0.00:   305
.660 ms/op
                 multiplyMatricesBlocking·p0.50:   306
.971 ms/op
                 multiplyMatricesBlocking·p0.90:   310
.903 ms/op
                 multiplyMatricesBlocking·p0.95:   310
.903 ms/op
                 multiplyMatricesBlocking·p0.99:   310
.903 ms/op
                 multiplyMatricesBlocking·p0.999:  310
.903 ms/op
                 multiplyMatricesBlocking·p0.9999: 310
.903 ms/op
```

```
                  multiplyMatricesBlocking·p1.00:   310
.903 ms/op

Iteration   7: 307.626 ±(99.9%) 14.473 ms/op
                  multiplyMatricesBlocking·p0.00:   306
.184 ms/op
                  multiplyMatricesBlocking·p0.50:   306
.708 ms/op
                  multiplyMatricesBlocking·p0.90:   310
.903 ms/op
                  multiplyMatricesBlocking·p0.95:   310
.903 ms/op
                  multiplyMatricesBlocking·p0.99:   310
.903 ms/op
                  multiplyMatricesBlocking·p0.999:  310
.903 ms/op
                  multiplyMatricesBlocking·p0.9999: 310
.903 ms/op
                  multiplyMatricesBlocking·p1.00:   310
.903 ms/op

Iteration   8: 307.888 ±(99.9%) 13.374 ms/op
                  multiplyMatricesBlocking·p0.00:   306
.184 ms/op
                  multiplyMatricesBlocking·p0.50:   307
.233 ms/op
                  multiplyMatricesBlocking·p0.90:   310
.903 ms/op
                  multiplyMatricesBlocking·p0.95:   310
.903 ms/op
                  multiplyMatricesBlocking·p0.99:   310
.903 ms/op
                  multiplyMatricesBlocking·p0.999:  310
.903 ms/op
                  multiplyMatricesBlocking·p0.9999: 310
.903 ms/op
                  multiplyMatricesBlocking·p1.00:   310
.903 ms/op

Iteration   9: 307.495 ±(99.9%) 14.768 ms/op
                  multiplyMatricesBlocking·p0.00:   306
```

```
.184 ms/op
                 multiplyMatricesBlocking·p0.50:   306
.446 ms/op
                 multiplyMatricesBlocking·p0.90:   310
.903 ms/op
                 multiplyMatricesBlocking·p0.95:   310
.903 ms/op
                 multiplyMatricesBlocking·p0.99:   310
.903 ms/op
                 multiplyMatricesBlocking·p0.999:  310
.903 ms/op
                 multiplyMatricesBlocking·p0.9999: 310
.903 ms/op
                 multiplyMatricesBlocking·p1.00:   310
.903 ms/op

Iteration  10: 307.757 ±(99.9%) 16.365 ms/op
                 multiplyMatricesBlocking·p0.00:   305
.660 ms/op
                 multiplyMatricesBlocking·p0.50:   306
.971 ms/op
                 multiplyMatricesBlocking·p0.90:   311
.427 ms/op
                 multiplyMatricesBlocking·p0.95:   311
.427 ms/op
                 multiplyMatricesBlocking·p0.99:   311
.427 ms/op
                 multiplyMatricesBlocking·p0.999:  311
.427 ms/op
                 multiplyMatricesBlocking·p0.9999: 311
.427 ms/op
                 multiplyMatricesBlocking·p1.00:   311
.427 ms/op



Result "com.matrix.MatrixMultiplicationBenchmark.
multiplyMatricesBlocking":
  N = 40
  mean =    307.613 ±(99.9%) 1.056 ms/op
```

```
  Histogram, ms/op:
    [305.000, 305.500) = 0
    [305.500, 306.000) = 3
    [306.000, 306.500) = 10
    [306.500, 307.000) = 8
    [307.000, 307.500) = 9
    [307.500, 308.000) = 0
    [308.000, 308.500) = 0
    [308.500, 309.000) = 0
    [309.000, 309.500) = 1
    [309.500, 310.000) = 0
    [310.000, 310.500) = 2
    [310.500, 311.000) = 6
    [311.000, 311.500) = 1

  Percentiles, ms/op:
      p(0.0000) =    305.660 ms/op
     p(50.0000) =    306.708 ms/op
     p(90.0000) =    310.903 ms/op
     p(95.0000) =    310.903 ms/op
     p(99.0000) =    311.427 ms/op
     p(99.9000) =    311.427 ms/op
     p(99.9900) =    311.427 ms/op
     p(99.9990) =    311.427 ms/op
     p(99.9999) =    311.427 ms/op
    p(100.0000) =    311.427 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=60634:/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.MatrixMultiplicationBenchmark.
multiplyMatricesBlocking
# Parameters: (n = 1500)

# Run progress: 77.78% complete, ETA 00:00:32
# Fork: 1 of 1
# Warmup Iteration   1: 1105.199 ms/op
# Warmup Iteration   2: 1082.130 ms/op
# Warmup Iteration   3: 1077.936 ms/op
# Warmup Iteration   4: 1080.033 ms/op
# Warmup Iteration   5: 1077.936 ms/op
Iteration   1: 1080.033 ms/op
                 multiplyMatricesBlocking·p0.00:
1080.033 ms/op
                 multiplyMatricesBlocking·p0.50:
1080.033 ms/op
                 multiplyMatricesBlocking·p0.90:
1080.033 ms/op
                 multiplyMatricesBlocking·p0.95:
1080.033 ms/op
                 multiplyMatricesBlocking·p0.99:
1080.033 ms/op
                 multiplyMatricesBlocking·p0.999:
1080.033 ms/op
                 multiplyMatricesBlocking·p0.9999:
1080.033 ms/op
                 multiplyMatricesBlocking·p1.00:
1080.033 ms/op

Iteration   2: 1092.616 ms/op
                 multiplyMatricesBlocking·p0.00:
1092.616 ms/op
                 multiplyMatricesBlocking·p0.50:
1092.616 ms/op
                 multiplyMatricesBlocking·p0.90:
1092.616 ms/op
                 multiplyMatricesBlocking·p0.95:
1092.616 ms/op
                 multiplyMatricesBlocking·p0.99:
```

```
1092.616 ms/op
                 multiplyMatricesBlocking·p0.999:
1092.616 ms/op
                 multiplyMatricesBlocking·p0.9999:
1092.616 ms/op
                 multiplyMatricesBlocking·p1.00:
1092.616 ms/op

Iteration   3: 1086.325 ms/op
                 multiplyMatricesBlocking·p0.00:
1086.325 ms/op
                 multiplyMatricesBlocking·p0.50:
1086.325 ms/op
                 multiplyMatricesBlocking·p0.90:
1086.325 ms/op
                 multiplyMatricesBlocking·p0.95:
1086.325 ms/op
                 multiplyMatricesBlocking·p0.99:
1086.325 ms/op
                 multiplyMatricesBlocking·p0.999:
1086.325 ms/op
                 multiplyMatricesBlocking·p0.9999:
1086.325 ms/op
                 multiplyMatricesBlocking·p1.00:
1086.325 ms/op

Iteration   4: 1082.130 ms/op
                 multiplyMatricesBlocking·p0.00:
1082.130 ms/op
                 multiplyMatricesBlocking·p0.50:
1082.130 ms/op
                 multiplyMatricesBlocking·p0.90:
1082.130 ms/op
                 multiplyMatricesBlocking·p0.95:
1082.130 ms/op
                 multiplyMatricesBlocking·p0.99:
1082.130 ms/op
                 multiplyMatricesBlocking·p0.999:
1082.130 ms/op
                 multiplyMatricesBlocking·p0.9999:
1082.130 ms/op
```

```
                  multiplyMatricesBlocking·p1.00:
1082.130 ms/op

Iteration   5: 1082.130 ms/op
                  multiplyMatricesBlocking·p0.00:
1082.130 ms/op
                  multiplyMatricesBlocking·p0.50:
1082.130 ms/op
                  multiplyMatricesBlocking·p0.90:
1082.130 ms/op
                  multiplyMatricesBlocking·p0.95:
1082.130 ms/op
                  multiplyMatricesBlocking·p0.99:
1082.130 ms/op
                  multiplyMatricesBlocking·p0.999:
1082.130 ms/op
                  multiplyMatricesBlocking·p0.9999:
1082.130 ms/op
                  multiplyMatricesBlocking·p1.00:
1082.130 ms/op

Iteration   6: 1082.130 ms/op
                  multiplyMatricesBlocking·p0.00:
1082.130 ms/op
                  multiplyMatricesBlocking·p0.50:
1082.130 ms/op
                  multiplyMatricesBlocking·p0.90:
1082.130 ms/op
                  multiplyMatricesBlocking·p0.95:
1082.130 ms/op
                  multiplyMatricesBlocking·p0.99:
1082.130 ms/op
                  multiplyMatricesBlocking·p0.999:
1082.130 ms/op
                  multiplyMatricesBlocking·p0.9999:
1082.130 ms/op
                  multiplyMatricesBlocking·p1.00:
1082.130 ms/op

Iteration   7: 1082.130 ms/op
                  multiplyMatricesBlocking·p0.00:
```

```
1082.130 ms/op
                 multiplyMatricesBlocking·p0.50:
1082.130 ms/op
                 multiplyMatricesBlocking·p0.90:
1082.130 ms/op
                 multiplyMatricesBlocking·p0.95:
1082.130 ms/op
                 multiplyMatricesBlocking·p0.99:
1082.130 ms/op
                 multiplyMatricesBlocking·p0.999:
1082.130 ms/op
                 multiplyMatricesBlocking·p0.9999:
1082.130 ms/op
                 multiplyMatricesBlocking·p1.00:
1082.130 ms/op

Iteration   8: 1088.422 ms/op
                 multiplyMatricesBlocking·p0.00:
1088.422 ms/op
                 multiplyMatricesBlocking·p0.50:
1088.422 ms/op
                 multiplyMatricesBlocking·p0.90:
1088.422 ms/op
                 multiplyMatricesBlocking·p0.95:
1088.422 ms/op
                 multiplyMatricesBlocking·p0.99:
1088.422 ms/op
                 multiplyMatricesBlocking·p0.999:
1088.422 ms/op
                 multiplyMatricesBlocking·p0.9999:
1088.422 ms/op
                 multiplyMatricesBlocking·p1.00:
1088.422 ms/op

Iteration   9: 1080.033 ms/op
                 multiplyMatricesBlocking·p0.00:
1080.033 ms/op
                 multiplyMatricesBlocking·p0.50:
1080.033 ms/op
                 multiplyMatricesBlocking·p0.90:
1080.033 ms/op
```

```
                  multiplyMatricesBlocking·p0.95:
1080.033 ms/op
                  multiplyMatricesBlocking·p0.99:
1080.033 ms/op
                  multiplyMatricesBlocking·p0.999:
1080.033 ms/op
                  multiplyMatricesBlocking·p0.9999:
1080.033 ms/op
                  multiplyMatricesBlocking·p1.00:
1080.033 ms/op

Iteration  10: 1084.228 ms/op
                  multiplyMatricesBlocking·p0.00:
1084.228 ms/op
                  multiplyMatricesBlocking·p0.50:
1084.228 ms/op
                  multiplyMatricesBlocking·p0.90:
1084.228 ms/op
                  multiplyMatricesBlocking·p0.95:
1084.228 ms/op
                  multiplyMatricesBlocking·p0.99:
1084.228 ms/op
                  multiplyMatricesBlocking·p0.999:
1084.228 ms/op
                  multiplyMatricesBlocking·p0.9999:
1084.228 ms/op
                  multiplyMatricesBlocking·p1.00:
1084.228 ms/op



Result "com.matrix.MatrixMultiplicationBenchmark.
multiplyMatricesBlocking":
  N = 10
  mean =   1084.018 ±(99.9%) 6.062 ms/op

  Histogram, ms/op:
    [1080.000, 1081.250) = 2
    [1081.250, 1082.500) = 4
    [1082.500, 1083.750) = 0
    [1083.750, 1085.000) = 1
```

```
    [1085.000, 1086.250) = 0
    [1086.250, 1087.500) = 1
    [1087.500, 1088.750) = 1
    [1088.750, 1090.000) = 0
    [1090.000, 1091.250) = 0
    [1091.250, 1092.500) = 0
    [1092.500, 1093.750) = 1
    [1093.750, 1095.000) = 0
    [1095.000, 1096.250) = 0
    [1096.250, 1097.500) = 0
    [1097.500, 1098.750) = 0

  Percentiles, ms/op:
      p(0.0000) =   1080.033 ms/op
     p(50.0000) =   1082.130 ms/op
     p(90.0000) =   1092.197 ms/op
     p(95.0000) =   1092.616 ms/op
     p(99.0000) =   1092.616 ms/op
     p(99.9000) =   1092.616 ms/op
     p(99.9900) =   1092.616 ms/op
     p(99.9990) =   1092.616 ms/op
     p(99.9999) =   1092.616 ms/op
    p(100.0000) =   1092.616 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=60634:/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.MatrixMultiplicationBenchmark.
```

```
multiplyMatricesBlocking
# Parameters: (n = 2000)

# Run progress: 88.89% complete, ETA 00:00:16
# Fork: 1 of 1
# Warmup Iteration   1: 2646.606 ms/op
# Warmup Iteration   2: 2642.412 ms/op
# Warmup Iteration   3: 2617.246 ms/op
# Warmup Iteration   4: 2634.023 ms/op
# Warmup Iteration   5: 2608.857 ms/op
Iteration   1: 2617.246 ms/op
                 multiplyMatricesBlocking·p0.00:
2617.246 ms/op
                 multiplyMatricesBlocking·p0.50:
2617.246 ms/op
                 multiplyMatricesBlocking·p0.90:
2617.246 ms/op
                 multiplyMatricesBlocking·p0.95:
2617.246 ms/op
                 multiplyMatricesBlocking·p0.99:
2617.246 ms/op
                 multiplyMatricesBlocking·p0.999:
2617.246 ms/op
                 multiplyMatricesBlocking·p0.9999:
2617.246 ms/op
                 multiplyMatricesBlocking·p1.00:
2617.246 ms/op

Iteration   2: 2650.800 ms/op
                 multiplyMatricesBlocking·p0.00:
2650.800 ms/op
                 multiplyMatricesBlocking·p0.50:
2650.800 ms/op
                 multiplyMatricesBlocking·p0.90:
2650.800 ms/op
                 multiplyMatricesBlocking·p0.95:
2650.800 ms/op
                 multiplyMatricesBlocking·p0.99:
2650.800 ms/op
                 multiplyMatricesBlocking·p0.999:
2650.800 ms/op
```

```
                  multiplyMatricesBlocking·p0.9999:
2650.800 ms/op
                  multiplyMatricesBlocking·p1.00:
2650.800 ms/op

Iteration   3: 2634.023 ms/op
                  multiplyMatricesBlocking·p0.00:
2634.023 ms/op
                  multiplyMatricesBlocking·p0.50:
2634.023 ms/op
                  multiplyMatricesBlocking·p0.90:
2634.023 ms/op
                  multiplyMatricesBlocking·p0.95:
2634.023 ms/op
                  multiplyMatricesBlocking·p0.99:
2634.023 ms/op
                  multiplyMatricesBlocking·p0.999:
2634.023 ms/op
                  multiplyMatricesBlocking·p0.9999:
2634.023 ms/op
                  multiplyMatricesBlocking·p1.00:
2634.023 ms/op

Iteration   4: 2776.629 ms/op
                  multiplyMatricesBlocking·p0.00:
2776.629 ms/op
                  multiplyMatricesBlocking·p0.50:
2776.629 ms/op
                  multiplyMatricesBlocking·p0.90:
2776.629 ms/op
                  multiplyMatricesBlocking·p0.95:
2776.629 ms/op
                  multiplyMatricesBlocking·p0.99:
2776.629 ms/op
                  multiplyMatricesBlocking·p0.999:
2776.629 ms/op
                  multiplyMatricesBlocking·p0.9999:
2776.629 ms/op
                  multiplyMatricesBlocking·p1.00:
2776.629 ms/op
```

```
Iteration   5: 2659.189 ms/op
                 multiplyMatricesBlocking·p0.00:
2659.189 ms/op
                 multiplyMatricesBlocking·p0.50:
2659.189 ms/op
                 multiplyMatricesBlocking·p0.90:
2659.189 ms/op
                 multiplyMatricesBlocking·p0.95:
2659.189 ms/op
                 multiplyMatricesBlocking·p0.99:
2659.189 ms/op
                 multiplyMatricesBlocking·p0.999:
2659.189 ms/op
                 multiplyMatricesBlocking·p0.9999:
2659.189 ms/op
                 multiplyMatricesBlocking·p1.00:
2659.189 ms/op

Iteration   6: 2634.023 ms/op
                 multiplyMatricesBlocking·p0.00:
2634.023 ms/op
                 multiplyMatricesBlocking·p0.50:
2634.023 ms/op
                 multiplyMatricesBlocking·p0.90:
2634.023 ms/op
                 multiplyMatricesBlocking·p0.95:
2634.023 ms/op
                 multiplyMatricesBlocking·p0.99:
2634.023 ms/op
                 multiplyMatricesBlocking·p0.999:
2634.023 ms/op
                 multiplyMatricesBlocking·p0.9999:
2634.023 ms/op
                 multiplyMatricesBlocking·p1.00:
2634.023 ms/op

Iteration   7: 2629.829 ms/op
                 multiplyMatricesBlocking·p0.00:
2629.829 ms/op
                 multiplyMatricesBlocking·p0.50:
2629.829 ms/op
```

```
                  multiplyMatricesBlocking·p0.90:
2629.829 ms/op
                  multiplyMatricesBlocking·p0.95:
2629.829 ms/op
                  multiplyMatricesBlocking·p0.99:
2629.829 ms/op
                  multiplyMatricesBlocking·p0.999:
2629.829 ms/op
                  multiplyMatricesBlocking·p0.9999:
2629.829 ms/op
                  multiplyMatricesBlocking·p1.00:
2629.829 ms/op

Iteration   8: 2634.023 ms/op
                  multiplyMatricesBlocking·p0.00:
2634.023 ms/op
                  multiplyMatricesBlocking·p0.50:
2634.023 ms/op
                  multiplyMatricesBlocking·p0.90:
2634.023 ms/op
                  multiplyMatricesBlocking·p0.95:
2634.023 ms/op
                  multiplyMatricesBlocking·p0.99:
2634.023 ms/op
                  multiplyMatricesBlocking·p0.999:
2634.023 ms/op
                  multiplyMatricesBlocking·p0.9999:
2634.023 ms/op
                  multiplyMatricesBlocking·p1.00:
2634.023 ms/op

Iteration   9: 2642.412 ms/op
                  multiplyMatricesBlocking·p0.00:
2642.412 ms/op
                  multiplyMatricesBlocking·p0.50:
2642.412 ms/op
                  multiplyMatricesBlocking·p0.90:
2642.412 ms/op
                  multiplyMatricesBlocking·p0.95:
2642.412 ms/op
                  multiplyMatricesBlocking·p0.99:
```

```
2642.412 ms/op
                 multiplyMatricesBlocking·p0.999:
2642.412 ms/op
                 multiplyMatricesBlocking·p0.9999:
2642.412 ms/op
                 multiplyMatricesBlocking·p1.00:
2642.412 ms/op

Iteration  10: 2642.412 ms/op
                 multiplyMatricesBlocking·p0.00:
2642.412 ms/op
                 multiplyMatricesBlocking·p0.50:
2642.412 ms/op
                 multiplyMatricesBlocking·p0.90:
2642.412 ms/op
                 multiplyMatricesBlocking·p0.95:
2642.412 ms/op
                 multiplyMatricesBlocking·p0.99:
2642.412 ms/op
                 multiplyMatricesBlocking·p0.999:
2642.412 ms/op
                 multiplyMatricesBlocking·p0.9999:
2642.412 ms/op
                 multiplyMatricesBlocking·p1.00:
2642.412 ms/op



Result "com.matrix.MatrixMultiplicationBenchmark.
multiplyMatricesBlocking":
  N = 10
  mean =   2652.058 ±(99.9%) 68.431 ms/op

  Histogram, ms/op:
    [2600.000, 2612.500) = 0
    [2612.500, 2625.000) = 1
    [2625.000, 2637.500) = 4
    [2637.500, 2650.000) = 2
    [2650.000, 2662.500) = 2
    [2662.500, 2675.000) = 0
    [2675.000, 2687.500) = 0
```

```
    [2687.500, 2700.000) = 0
    [2700.000, 2712.500) = 0
    [2712.500, 2725.000) = 0
    [2725.000, 2737.500) = 0
    [2737.500, 2750.000) = 0
    [2750.000, 2762.500) = 0
    [2762.500, 2775.000) = 0
    [2775.000, 2787.500) = 1

  Percentiles, ms/op:
      p(0.0000) =   2617.246 ms/op
     p(50.0000) =   2638.217 ms/op
     p(90.0000) =   2764.885 ms/op
     p(95.0000) =   2776.629 ms/op
     p(99.0000) =   2776.629 ms/op
     p(99.9000) =   2776.629 ms/op
     p(99.9900) =   2776.629 ms/op
     p(99.9990) =   2776.629 ms/op
     p(99.9999) =   2776.629 ms/op
    p(100.0000) =   2776.629 ms/op


# Run complete. Total time: 00:02:50

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
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
                                       10  sample
```

```
213816     0.001 ±  0.001  ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.00      10  sample
             0.001           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.50      10  sample
             0.001           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.90      10  sample
             0.001           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.95      10  sample
             0.001           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.99      10  sample
             0.001           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.999     10  sample
             0.005           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.9999    10  sample
             0.013           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p1.00      10  sample
             0.015           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
                                     20  sample
269560     0.005 ±  0.001  ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.00      20  sample
             0.004           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.50      20  sample
             0.005           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.90      20  sample
             0.005           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.95      20  sample
             0.005           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
```

```
:multiplyMatricesBlocking·p0.99      20  sample
             0.006           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.999     20  sample
             0.013           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.9999    20  sample
             0.018           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p1.00      20  sample
             0.059           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
                                     50  sample
104432     0.048 ±  0.001  ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.00      50  sample
             0.044           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.50      50  sample
             0.047           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.90      50  sample
             0.048           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.95      50  sample
             0.051           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.99      50  sample
             0.058           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.999     50  sample
             0.063           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.9999    50  sample
             0.084           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p1.00      50  sample
             0.283           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
                                    100  sample
29951     0.335 ±  0.001  ms/op
```

```
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.00     100  sample
             0.309           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.50     100  sample
             0.332           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.90     100  sample
             0.343           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.95     100  sample
             0.349           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.99     100  sample
             0.372           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.999    100  sample
             0.417           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.9999   100  sample
             0.434           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p1.00     100  sample
             0.445           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
                                    200  sample
3835     2.619 ±  0.002  ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.00     200  sample
             2.527           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.50     200  sample
             2.613           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.90     200  sample
             2.654           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.95     200  sample
             2.683           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.99     200  sample
```

```
              2.744           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.999    200  sample
              3.038           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.9999   200  sample
              3.154           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p1.00     200  sample
              3.154           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
                                    500  sample
266    38.538 ±  0.072  ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.00     500  sample
             38.273           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.50     500  sample
             38.339           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.90     500  sample
             39.191           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.95     500  sample
             39.387           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.99     500  sample
             39.736           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.999    500  sample
             39.846           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.9999   500  sample
             39.846           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p1.00     500  sample
             39.846           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
                                   1000  sample
40   307.613 ±  1.056  ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
```

```
:multiplyMatricesBlocking·p0.00    1000  sample
           305.660           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.50    1000  sample
           306.708           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.90    1000  sample
           310.903           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.95    1000  sample
           310.903           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.99    1000  sample
           311.427           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.999   1000  sample
           311.427           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.9999  1000  sample
           311.427           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p1.00    1000  sample
           311.427           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
                                      1500  sample
10  1084.018 ±  6.062  ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.00    1500  sample
          1080.033           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.50    1500  sample
          1082.130           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.90    1500  sample
          1092.197           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.95    1500  sample
          1092.616           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.99    1500  sample
          1092.616           ms/op
```

```
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.999   1500  sample
          1092.616           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.9999  1500  sample
          1092.616           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p1.00    1500  sample
          1092.616           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
                                      2000  sample
10  2652.058 ± 68.431  ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.00    2000  sample
          2617.246           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.50    2000  sample
          2638.217           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.90    2000  sample
          2764.885           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.95    2000  sample
          2776.629           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.99    2000  sample
          2776.629           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.999   2000  sample
          2776.629           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p0.9999  2000  sample
          2776.629           ms/op
MatrixMultiplicationBenchmark.multiplyMatricesBlocking
:multiplyMatricesBlocking·p1.00    2000  sample
          2776.629           ms/op

Process finished with exit code 0
```