Dissert-final-exp

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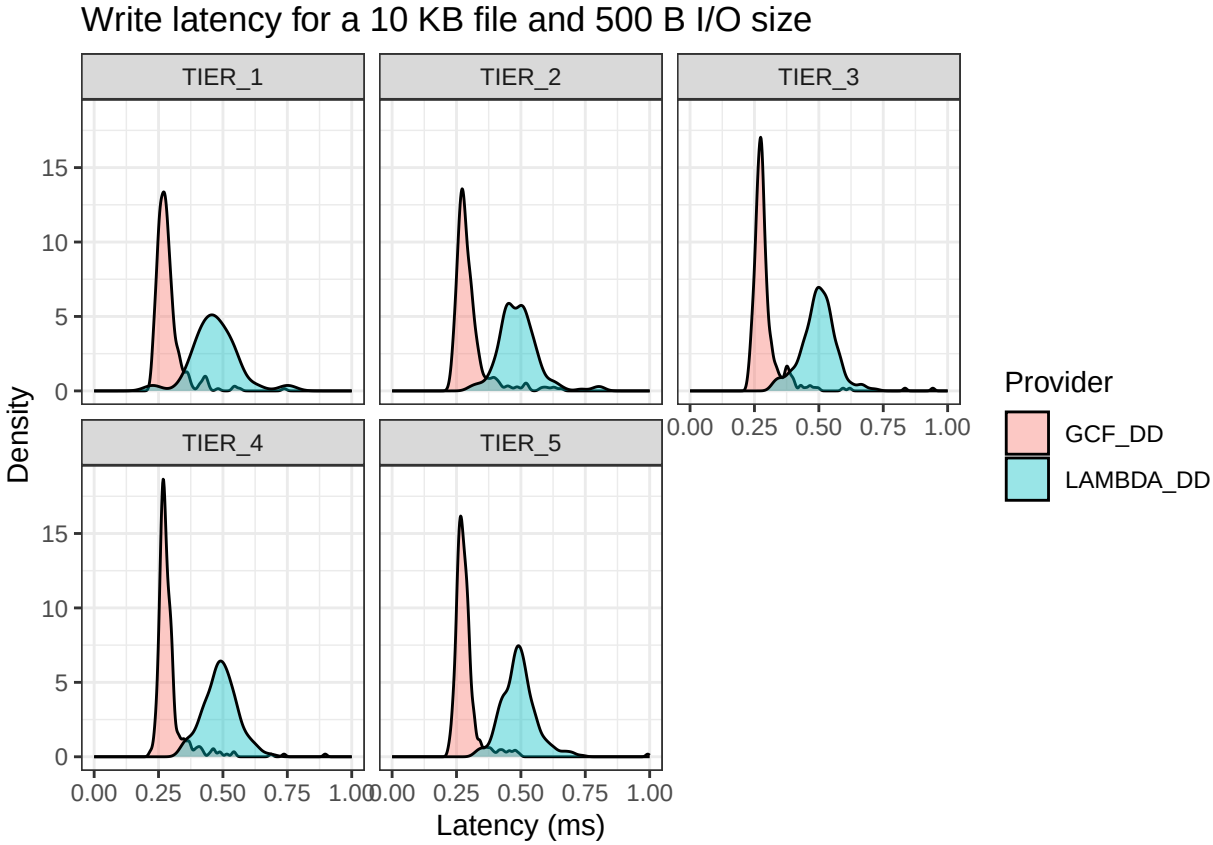
Dissert experiments

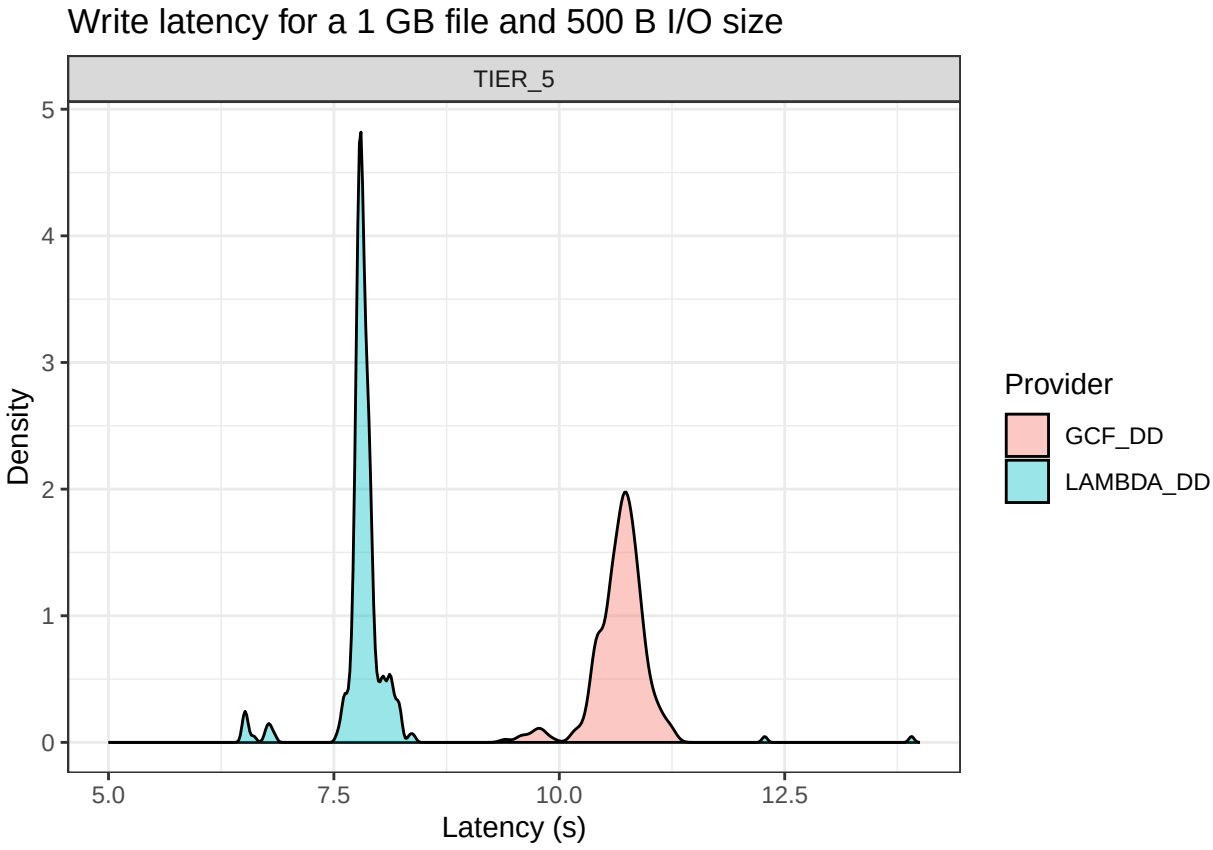
These are the experiments!

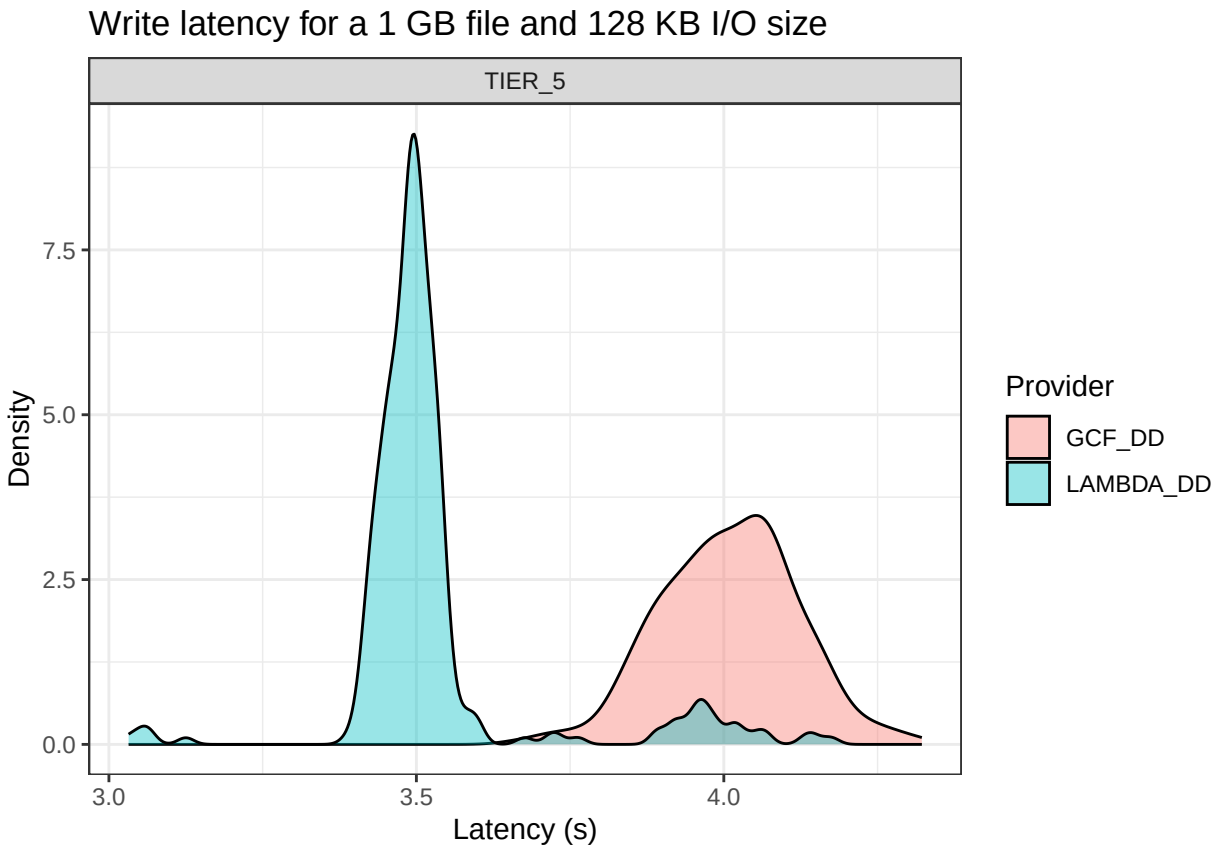
Density plots

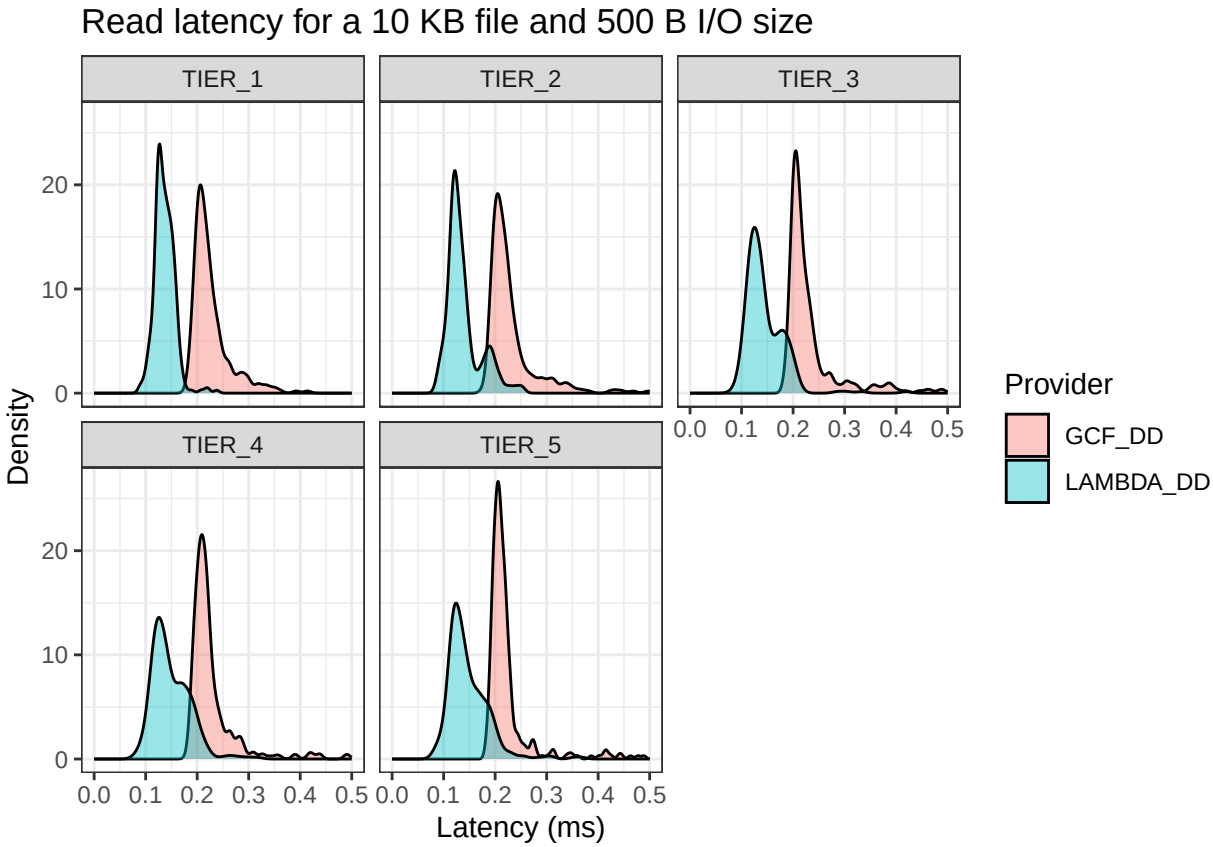
The following are density plots for experiments ran between 02/25/2024 and 03/20/2024.

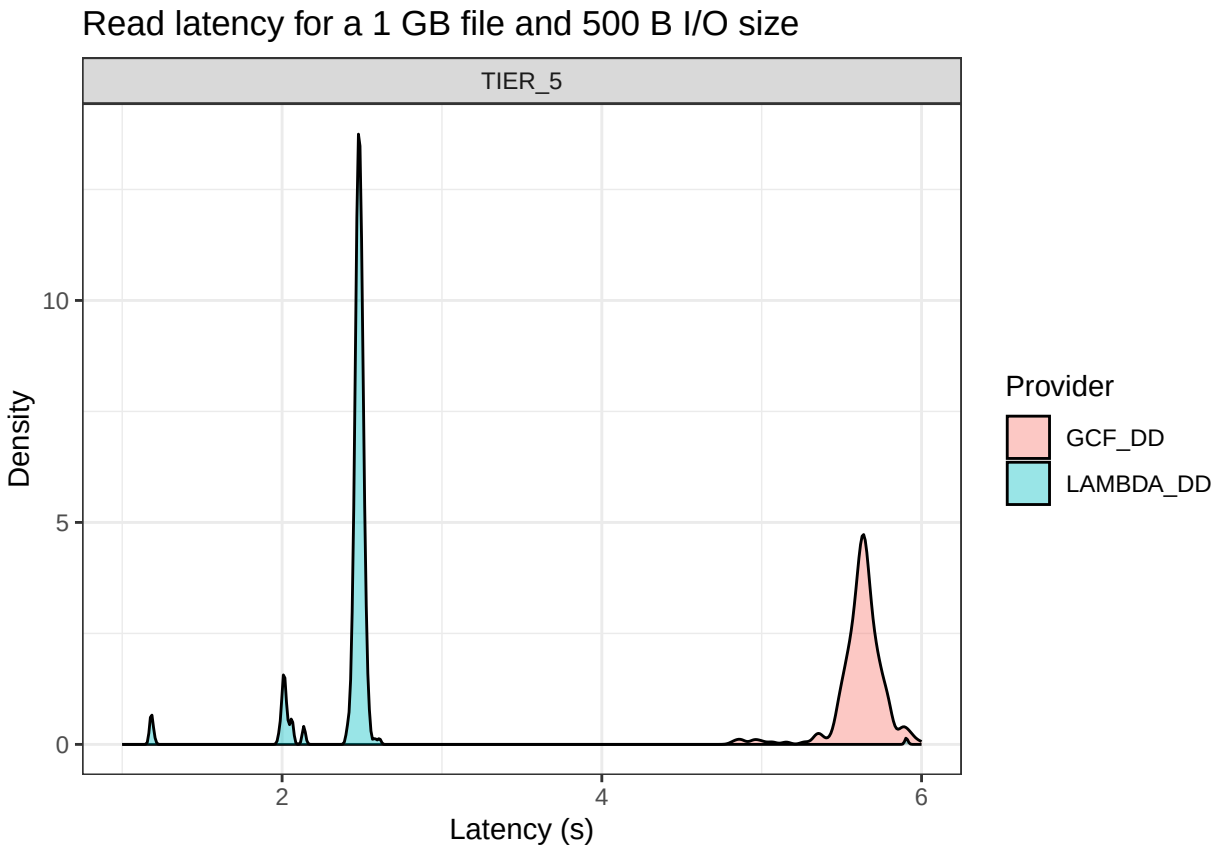
On the first density plot, it is limited between 0 and 1. Its hiding a mode for Lambda_DD on Tier 1 that happens after 25 and 50 ms.

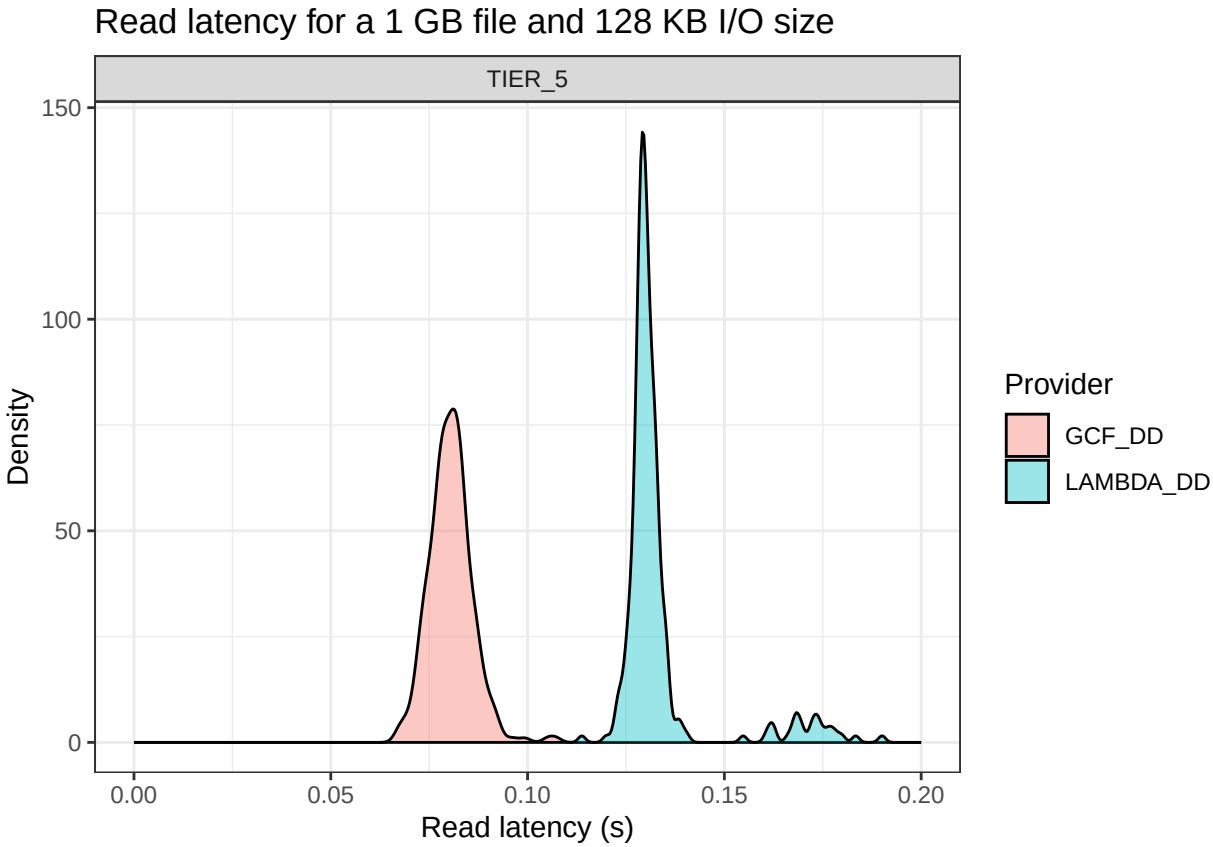



Write latency for a 1 GB file and 500 B I/O size
TIER_5
Density
Latency (s)
5.0
7.5
10.0
12.5
0
1
2
3
4
5
Provider
GCF_DD
LAMBDA_DD

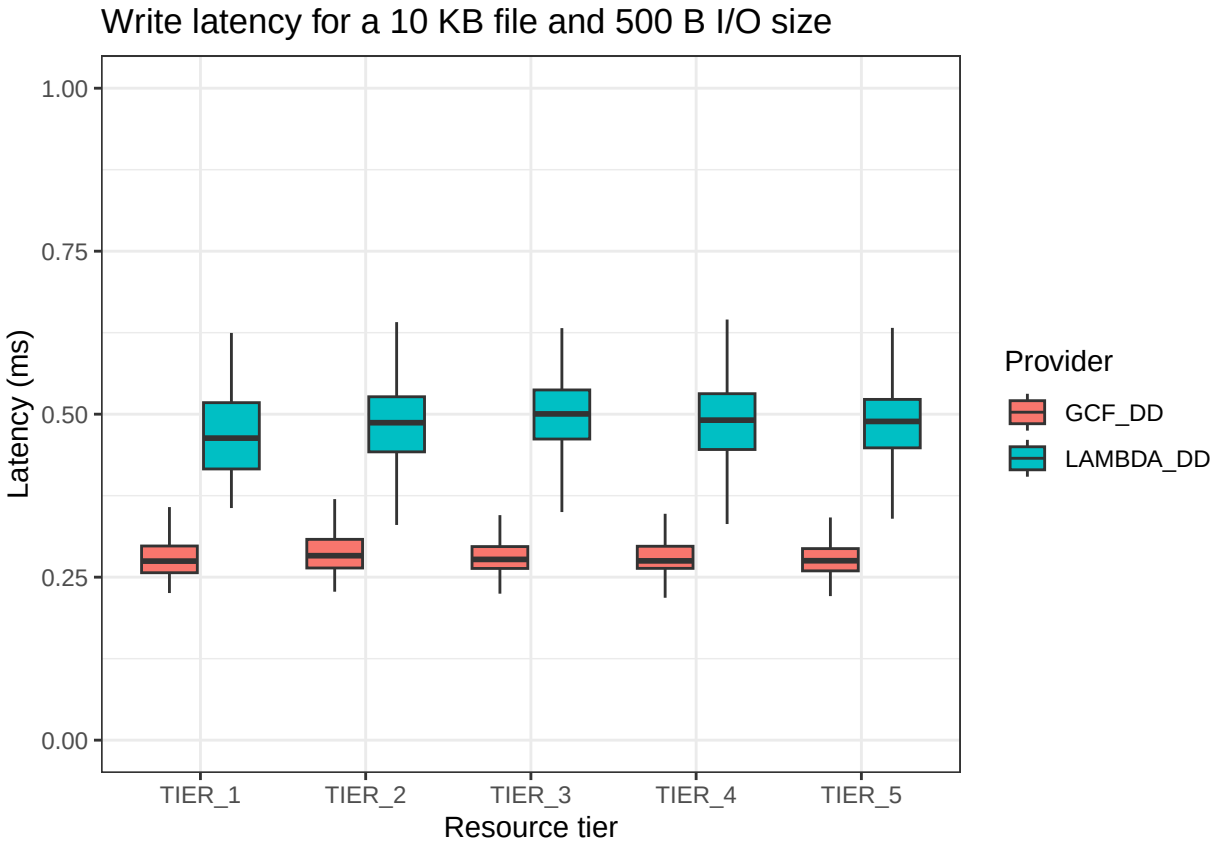

Write latency for a 1 GB file and 128 KB I/O size
TIER_5
Density
7.5
5.0
2.5
0.0
3.0
3.5
4.0
Latency (s)
Provider
GCF_DD
LAMBDA_DD

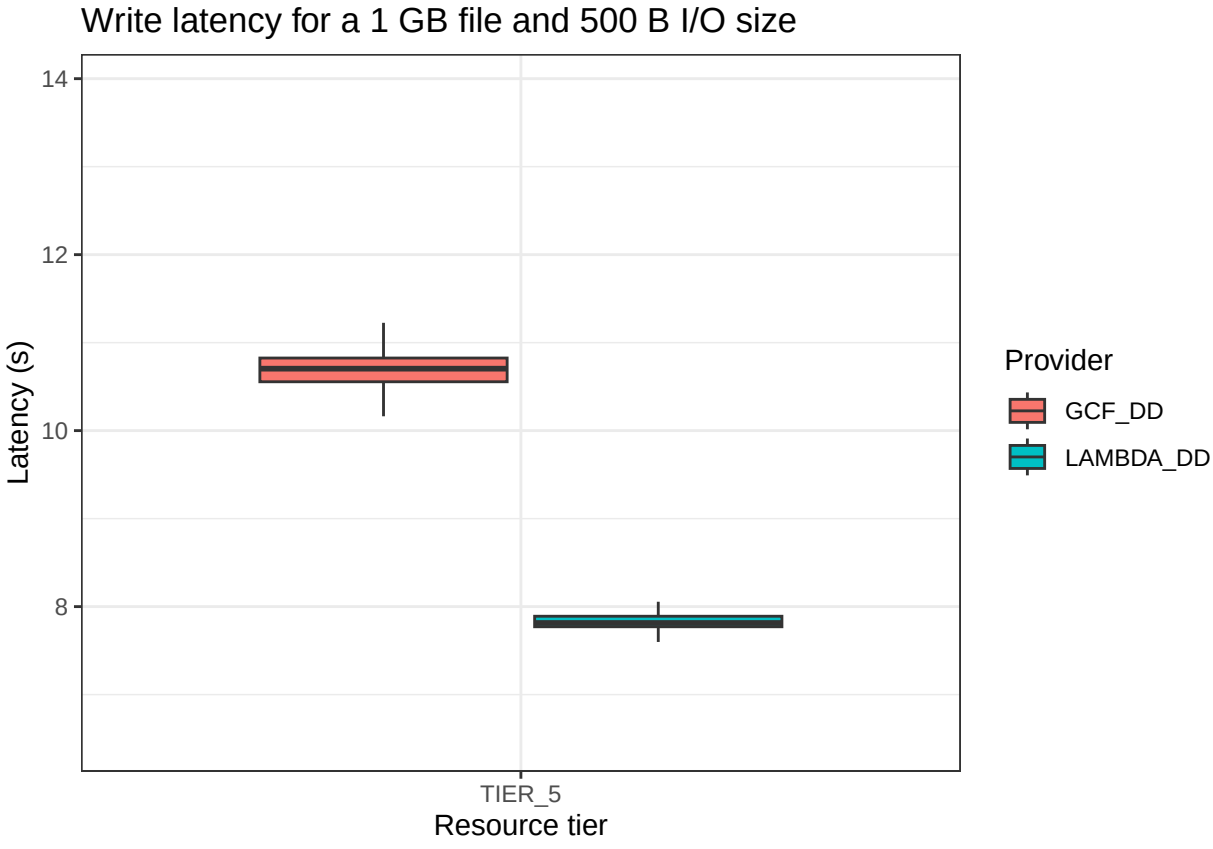

Read latency for a 10 KB file and 500 B I/O size
TIER_1
TIER_2
TIER_3
TIER_4
TIER_5
Density
Latency (ms)
0
10
20
0.0
0.1
0.2
0.3
0.4
0.5
Provider
GCF_DD
LAMBDA_DD

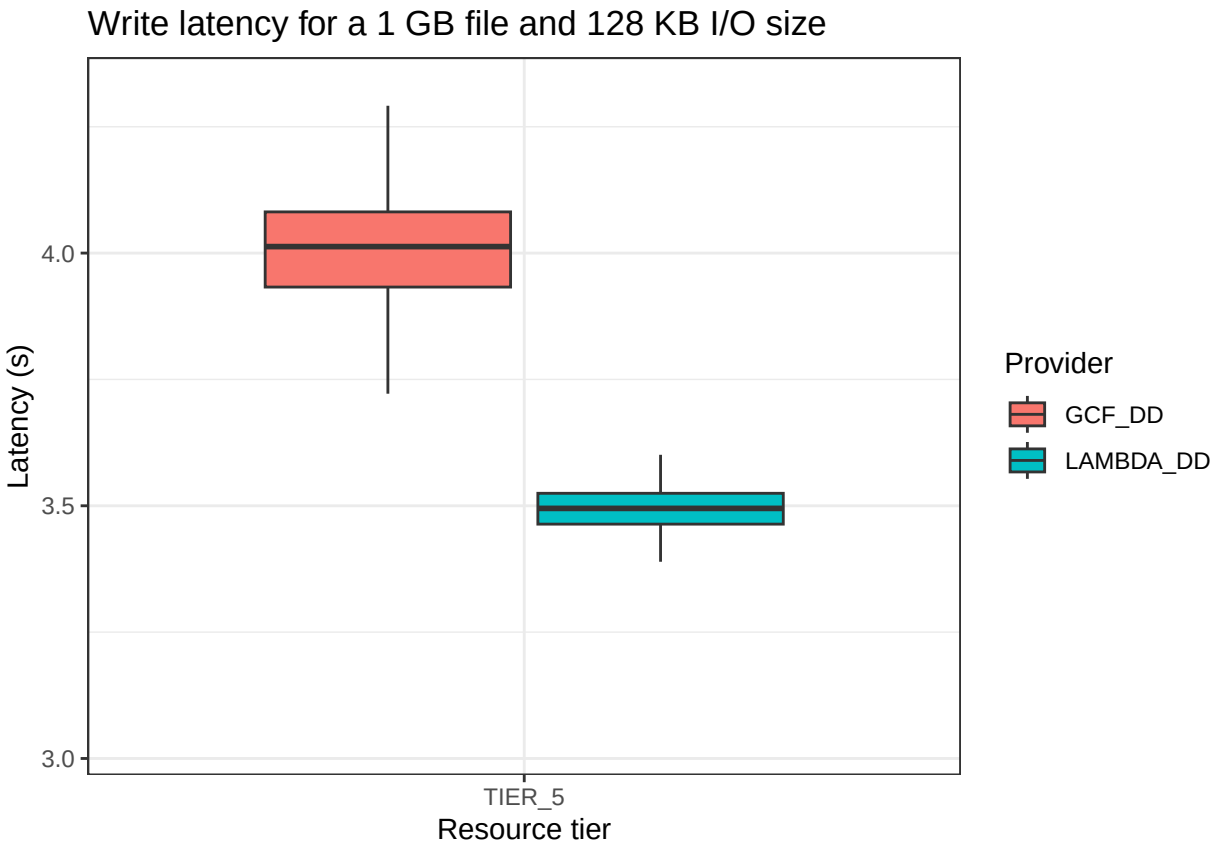

Read latency for a 1 GB file and 500 B I/O size
TIER_5
Density
10
5
0
2
4
6
Latency (s)
Provider
GCF_DD
LAMBDA_DD

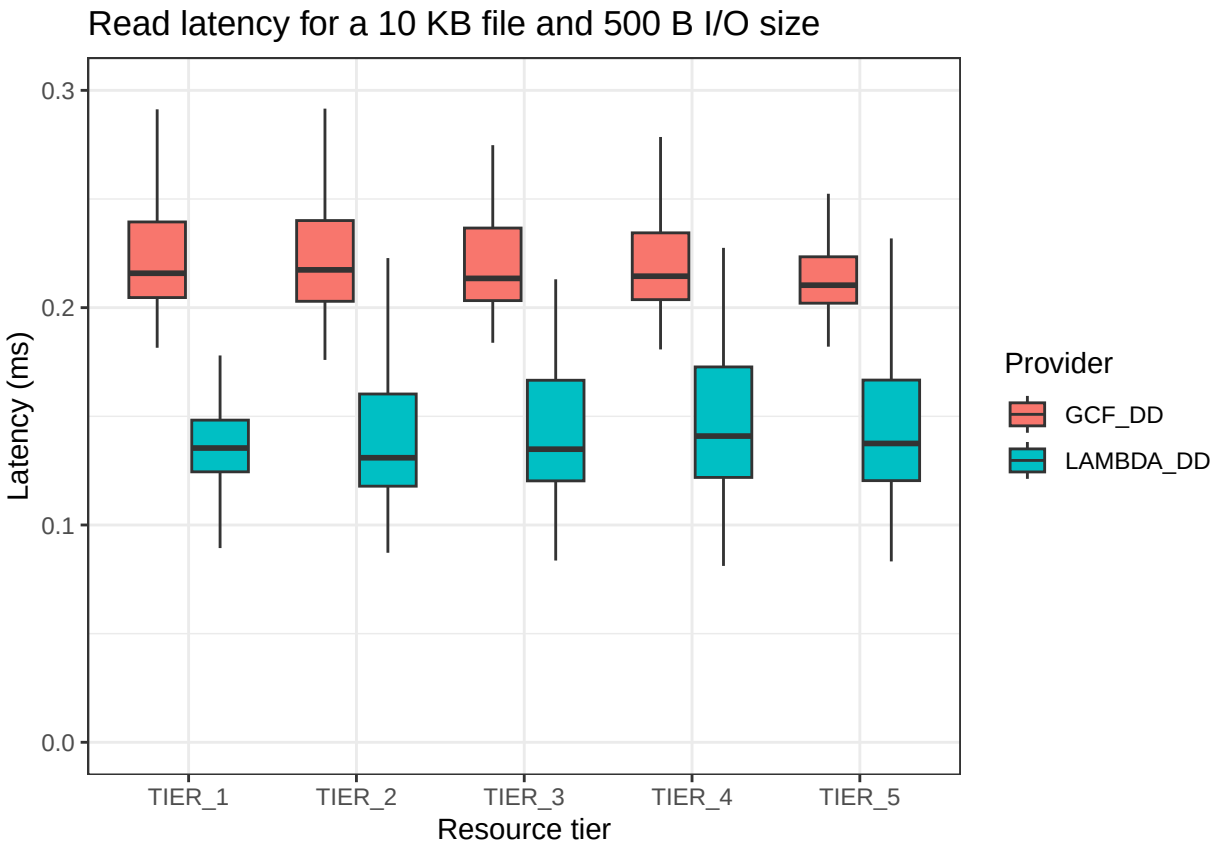

Read latency for a 1 GB file and 128 KB I/O size
TIER_5
150
100
50
0
Density
0.00
0.05
0.10
0.15
0.20
Read latency (s)
Provider
GCF_DD
LAMBDA_DD

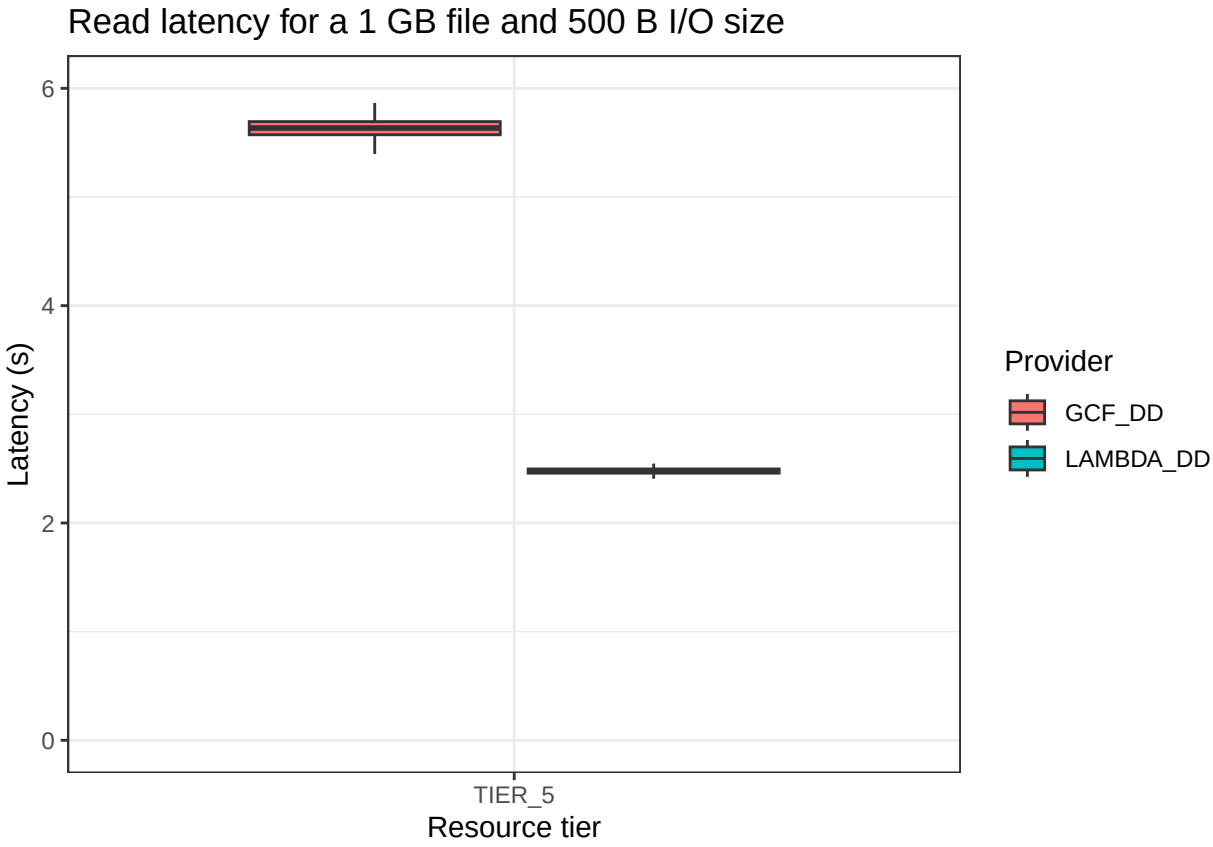
Box plots

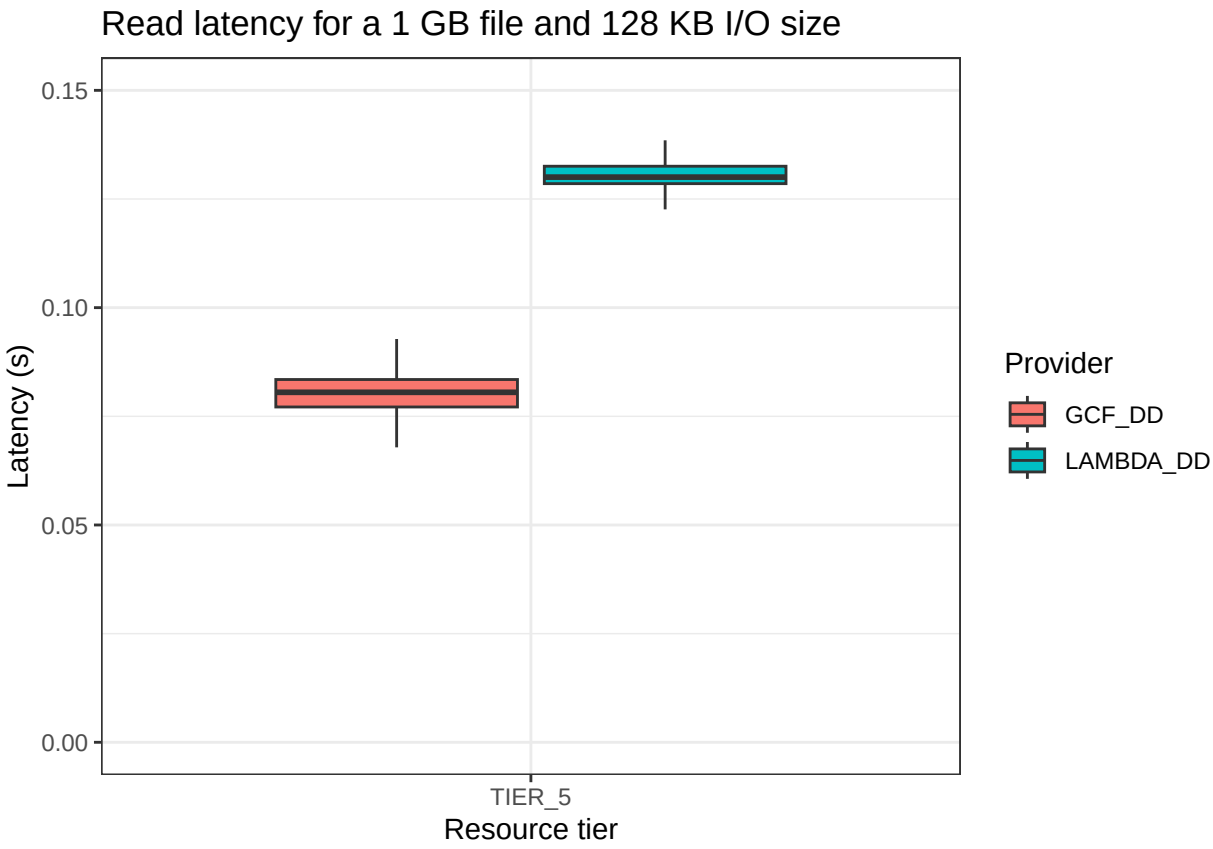

Write latency for a 10 KB file and 500 B I/O size
Latency (ms)
1.00
0.75
0.50
0.25
0.00
TIER_1
TIER_2
TIER_3
TIER_4
TIER_5
Resource tier
Provider
GCF_DD
LAMBDA_DD


Write latency for a 1 GB file and 500 B I/O size
Latency (s)
14
12
10
8
TIER_5
Resource tier
Provider
GCF_DD
LAMBDA_DD


Write latency for a 1 GB file and 128 KB I/O size
Latency (s)
4.0
3.5
3.0
TIER_5
Resource tier
Provider
GCF_DD
LAMBDA_DD


Read latency for a 10 KB file and 500 B I/O size
Latency (ms)
0.3
0.2
0.1
0.0
TIER_1
TIER_2
TIER_3
TIER_4
TIER_5
Resource tier
Provider
GCF_DD
LAMBDA_DD

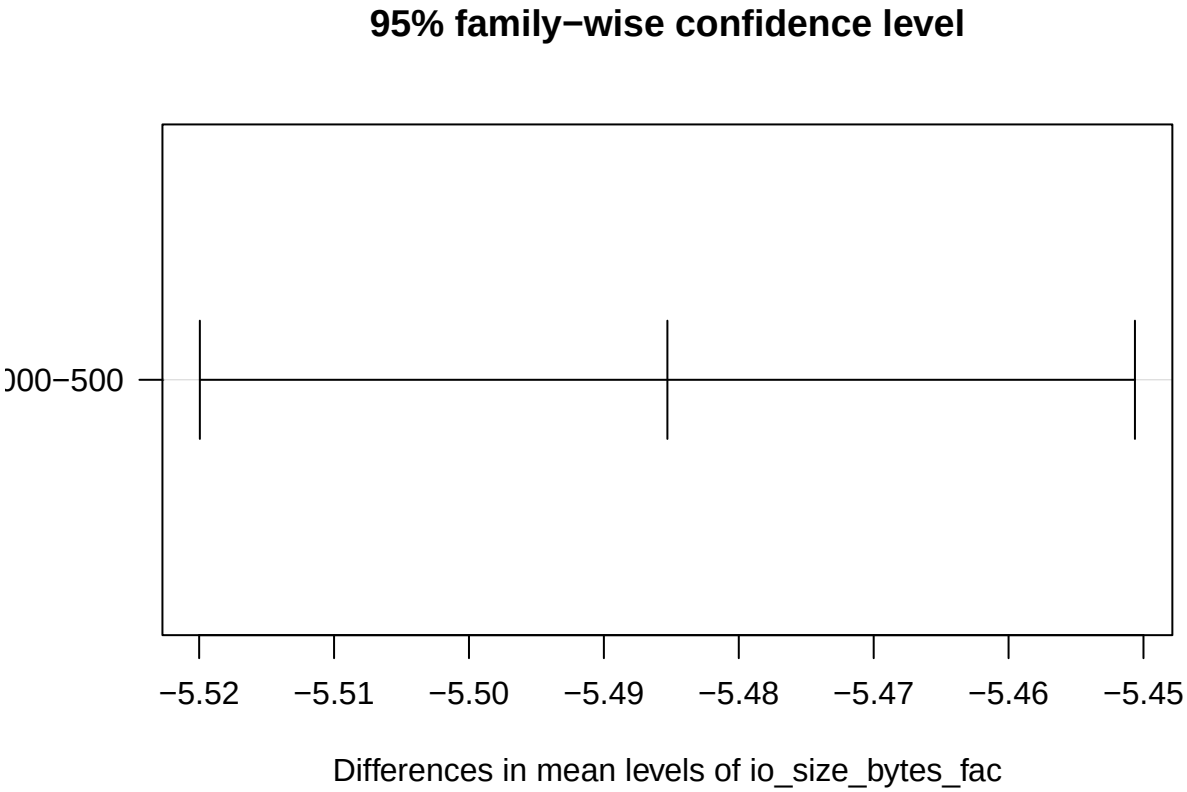

Read latency for a 1 GB file and 500 B I/O size
Latency (s)
6
4
2
0
TIER_5
Resource tier
Provider
GCF_DD
LAMBDA_DD

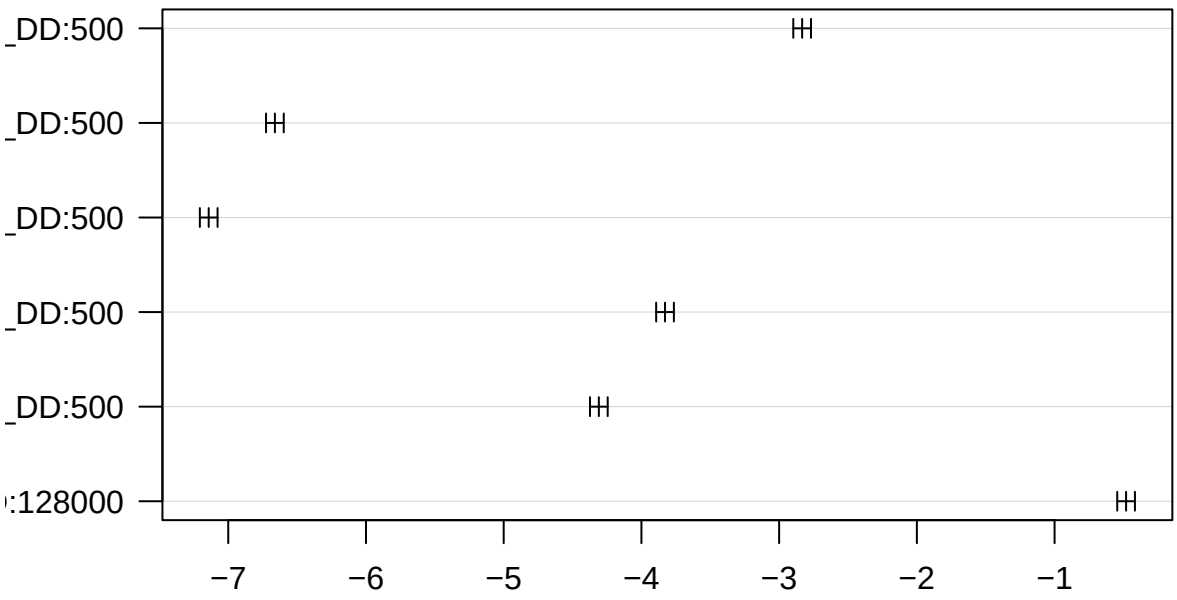


Anovas

```
## [1] "1 GB file for WRITE operations"
##                                  Df Sum Sq Mean Sq F value Pr(>F)
## system_name                       1    829     829    8796 <2e-16 ***
## io_size_bytes_fac                 1   9087    9087   96416 <2e-16 ***
## system_name:io_size_bytes_fac     1    418     418    4433 <2e-16 ***
## Residuals                      1204    113       0
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##   Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = latency_seconds ~ system_name * io_size_bytes_fac, data = res)
##
## $system_name
##                        diff      lwr       upr p adj
## LAMBDA_DD-GCF_DD -1.656781 -1.69144 -1.622123     0
##
## $io_size_bytes_fac
##                  diff      lwr       upr p adj
## 128000-500 -5.485291 -5.51995 -5.450633     0
##
## $`system_name:io_size_bytes_fac`
##                                       diff        lwr        upr p adj
```

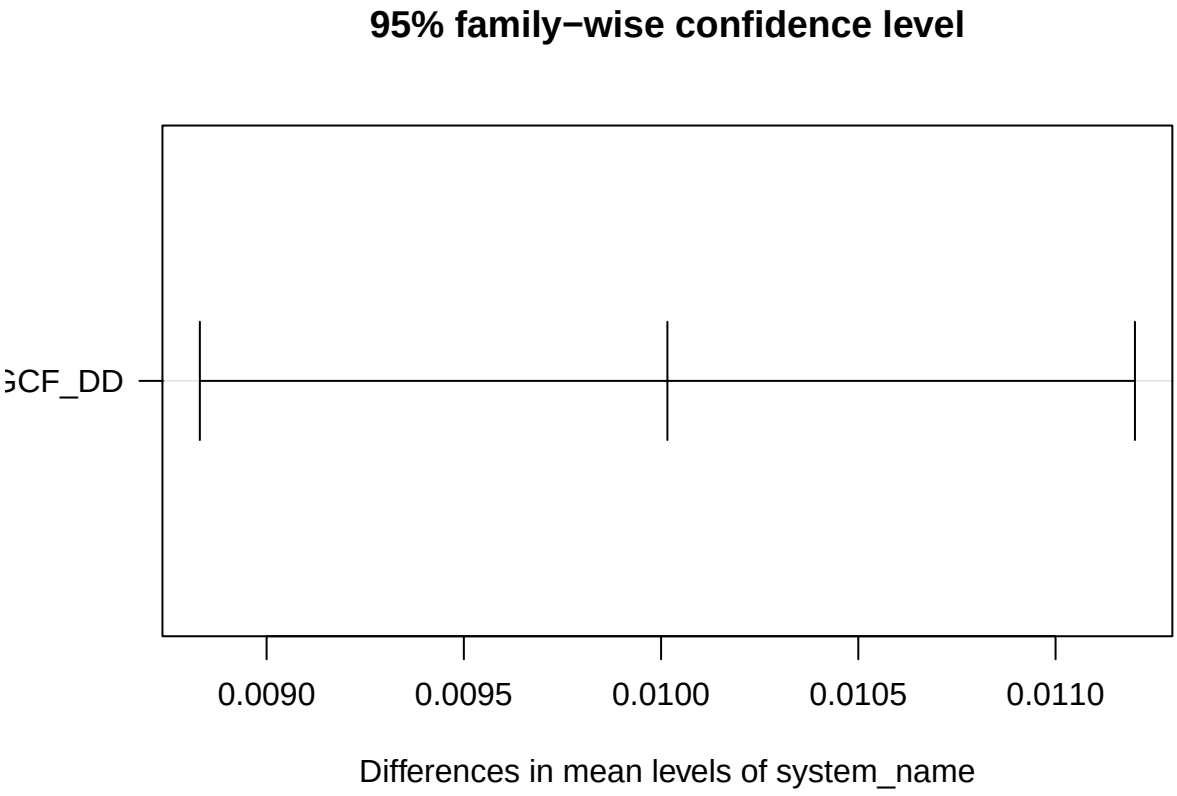
```
## LAMBDA_DD:500-GCF_DD:500       -2.8329259 -2.8971970 -2.7686548     0
## GCF_DD:128000-GCF_DD:500       -6.6614356 -6.7257067 -6.5971644     0
## LAMBDA_DD:128000-GCF_DD:500    -7.1420726 -7.2063437 -7.0778015     0
## GCF_DD:128000-LAMBDA_DD:500    -3.8285097 -3.8927808 -3.7642385     0
## LAMBDA_DD:128000-LAMBDA_DD:500 -4.3091467 -4.3734178 -4.2448756     0
## LAMBDA_DD:128000-GCF_DD:128000 -0.4806371 -0.5449082 -0.4163659     0
```

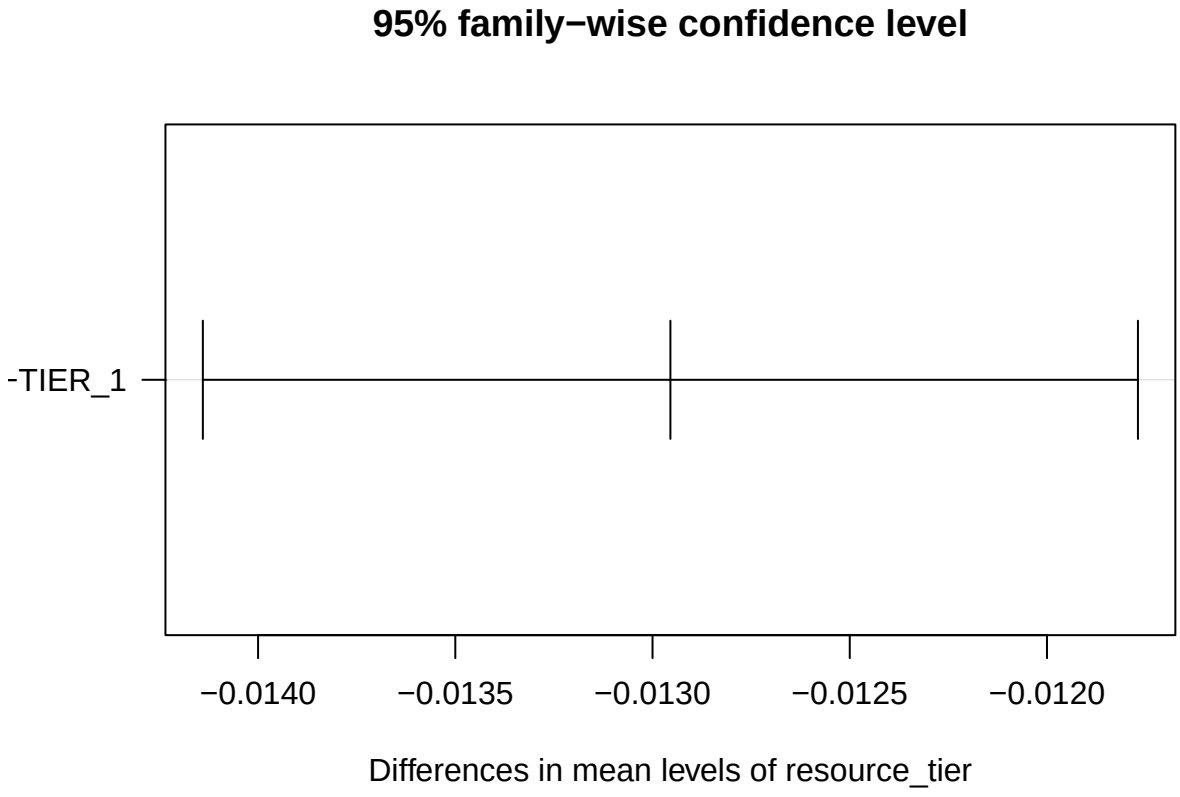

95% family−wise confidence level
000−500
−5.52
−5.51
−5.50
−5.49
−5.48
−5.47
−5.46
−5.45
Differences in mean levels of io_size_bytes_fac

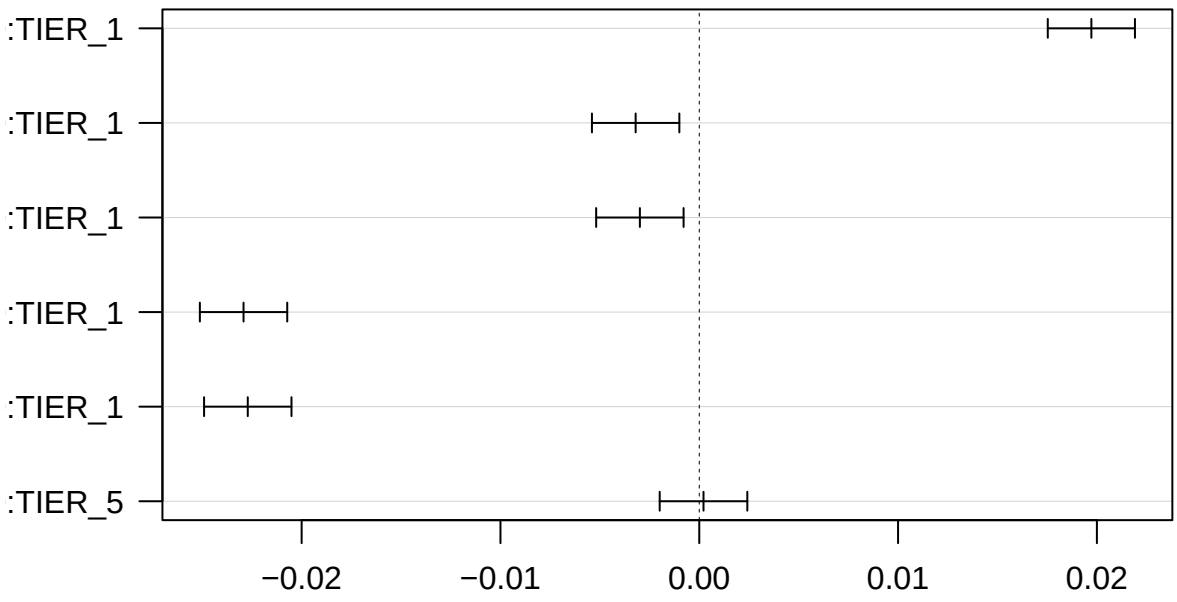



```
## [1] "10 KB file for WRITE operations"
##                             Df  Sum Sq Mean Sq F value Pr(>F)
## system_name                  1 0.03045 0.03045   274.9 <2e-16 ***
## resource_tier                1 0.05093 0.05093   459.8 <2e-16 ***
## system_name:resource_tier    1 0.02888 0.02888   260.7 <2e-16 ***
## Residuals                 1210 0.13404 0.00011
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##   Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = latency_seconds ~ system_name * resource_tier, data = res)
##
## $system_name
##                         diff         lwr       upr p adj
## LAMBDA_DD-GCF_DD 0.01001602 0.008830746 0.0112013     0
##
## $resource_tier
##                       diff      lwr         upr p adj
## TIER_5-TIER_1 -0.01295471 -0.01414 -0.01176942     0
##
## $`system_name:resource_tier`
##                                             diff          lwr           upr
## LAMBDA_DD:TIER_1-GCF_DD:TIER_1     0.0197223233  0.017529744  0.0219149028
## GCF_DD:TIER_5-GCF_DD:TIER_1       -0.0032002004 -0.005398218 -0.0010021826
## LAMBDA_DD:TIER_5-GCF_DD:TIER_1    -0.0029868945 -0.005184912 -0.0007888766
```

```
## GCF_DD:TIER_5-LAMBDA_DD:TIER_1    -0.0229225237 -0.025120542 -0.0207245058
## LAMBDA_DD:TIER_5-LAMBDA_DD:TIER_1 -0.0227092178 -0.024907236 -0.0205111999
## LAMBDA_DD:TIER_5-GCF_DD:TIER_5     0.0002133059 -0.001990137  0.0024167488
##                                       p adj
## LAMBDA_DD:TIER_1-GCF_DD:TIER_1    0.0000000
## GCF_DD:TIER_5-GCF_DD:TIER_1       0.0010799
## LAMBDA_DD:TIER_5-GCF_DD:TIER_1    0.0027526
## GCF_DD:TIER_5-LAMBDA_DD:TIER_1    0.0000000
## LAMBDA_DD:TIER_5-LAMBDA_DD:TIER_1 0.0000000
## LAMBDA_DD:TIER_5-GCF_DD:TIER_5    0.9945763
```

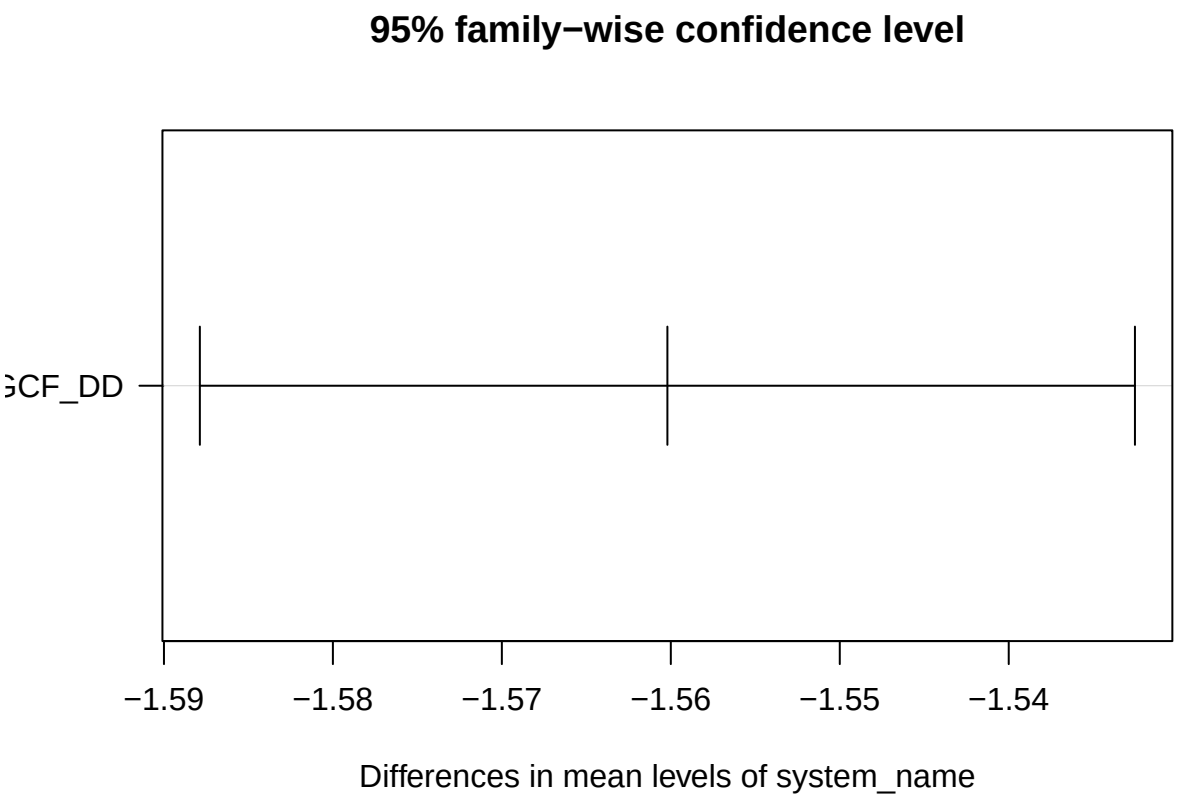


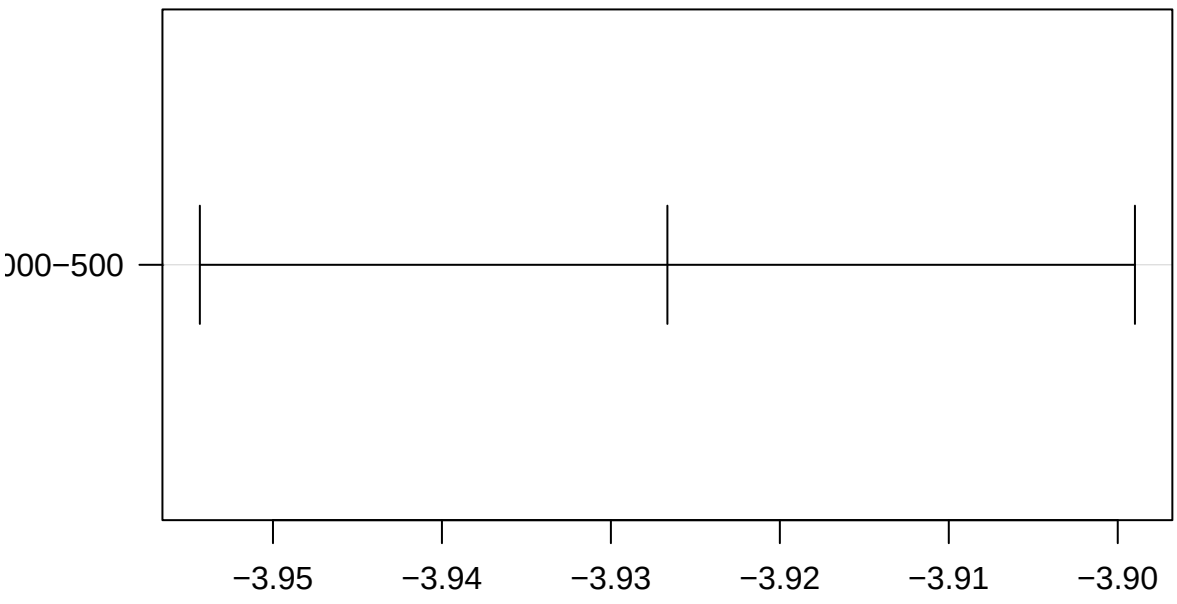

95% family−wise confidence level
-TIER_1
−0.0140
−0.0135
−0.0130
−0.0125
−0.0120
Differences in mean levels of resource_tier

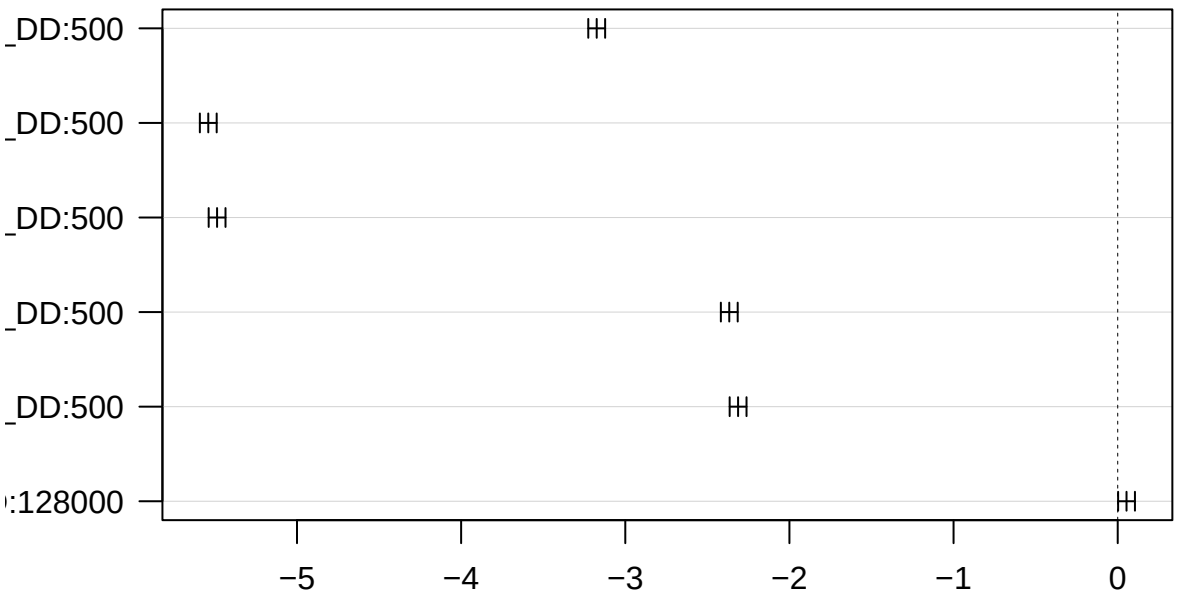



```
## [1] "1 GB file for READ operations"
##                                Df Sum Sq Mean Sq F value Pr(>F)
## system_name                     1    701     701   12237 <2e-16 ***
## io_size_bytes_fac               1   4441    4441   77507 <2e-16 ***
## system_name:io_size_bytes_fac   1    750     750   13094 <2e-16 ***
## Residuals                    1148     66       0
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##   Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = latency_seconds ~ system_name * io_size_bytes_fac, data = res)
##
## $system_name
##                       diff       lwr       upr p adj
## LAMBDA_DD-GCF_DD -1.560202 -1.587875 -1.532529     0
##
## $io_size_bytes_fac
##                 diff       lwr       upr p adj
## 128000-500 -3.926655 -3.954328 -3.898982     0
##
## $`system_name:io_size_bytes_fac`
##                                       diff          lwr        upr     p adj
## LAMBDA_DD:500-GCF_DD:500       -3.17415458 -3.225472964 -3.1228362 0.0000000
## GCF_DD:128000-GCF_DD:500       -5.54060728 -5.591925663 -5.4892889 0.0000000
## LAMBDA_DD:128000-GCF_DD:500    -5.48685724 -5.538175624 -5.4355389 0.0000000
```

```
## GCF_DD:128000-LAMBDA_DD:500    -2.36645270 -2.417771080 -2.3151343 0.0000000
## LAMBDA_DD:128000-LAMBDA_DD:500 -2.31270266 -2.364021041 -2.2613843 0.0000000
## LAMBDA_DD:128000-GCF_DD:128000  0.05375004  0.002431658  0.1050684 0.0359337
```

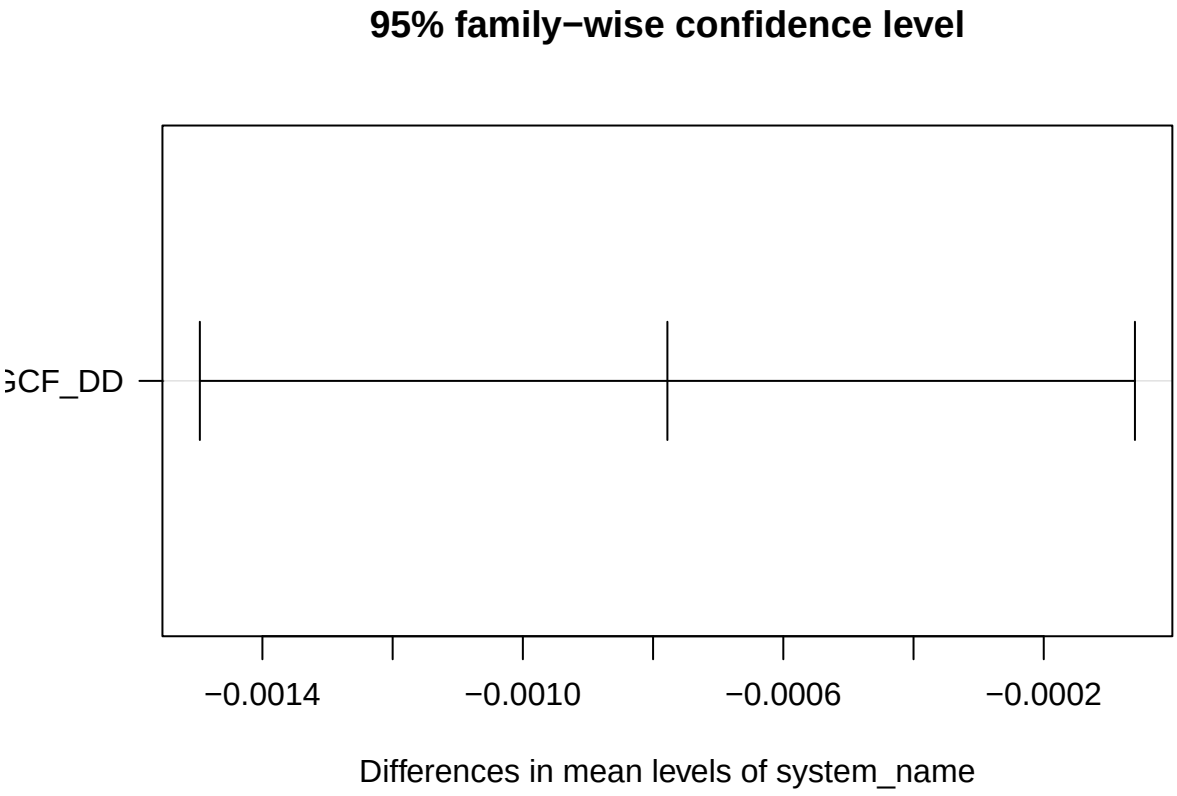


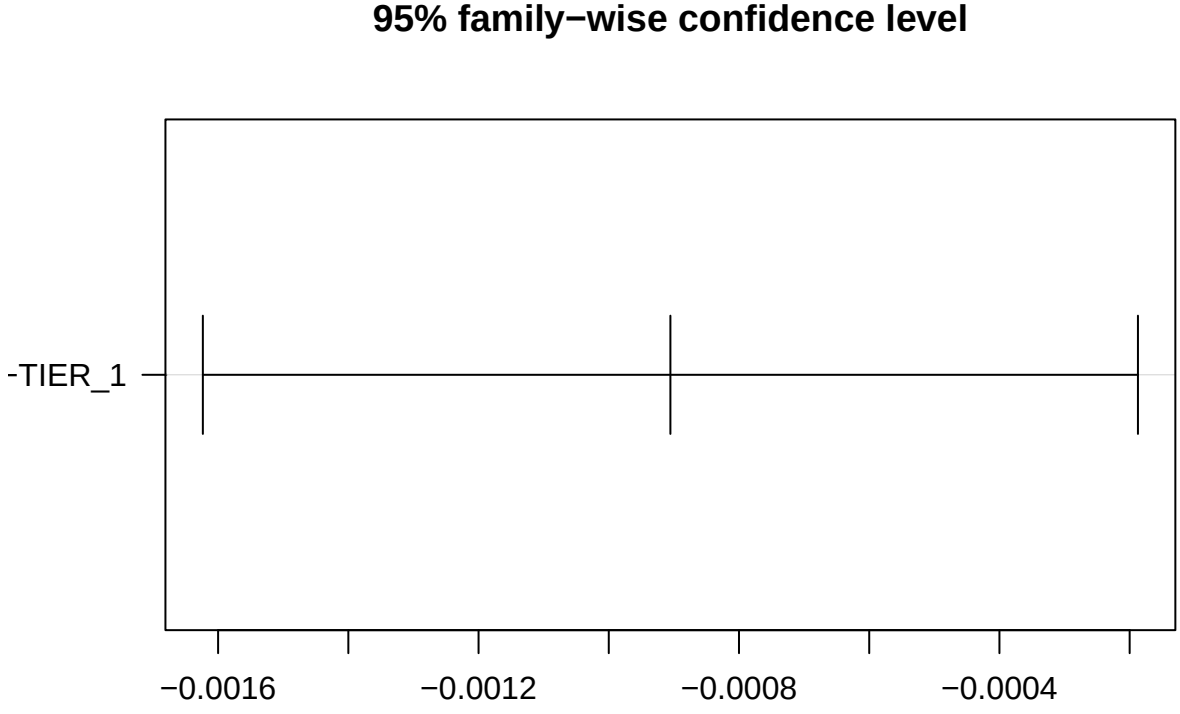

95% family−wise confidence level
000−500
−3.95
−3.94
−3.93
−3.92
−3.91
−3.90
Differences in mean levels of io_size_bytes_fac

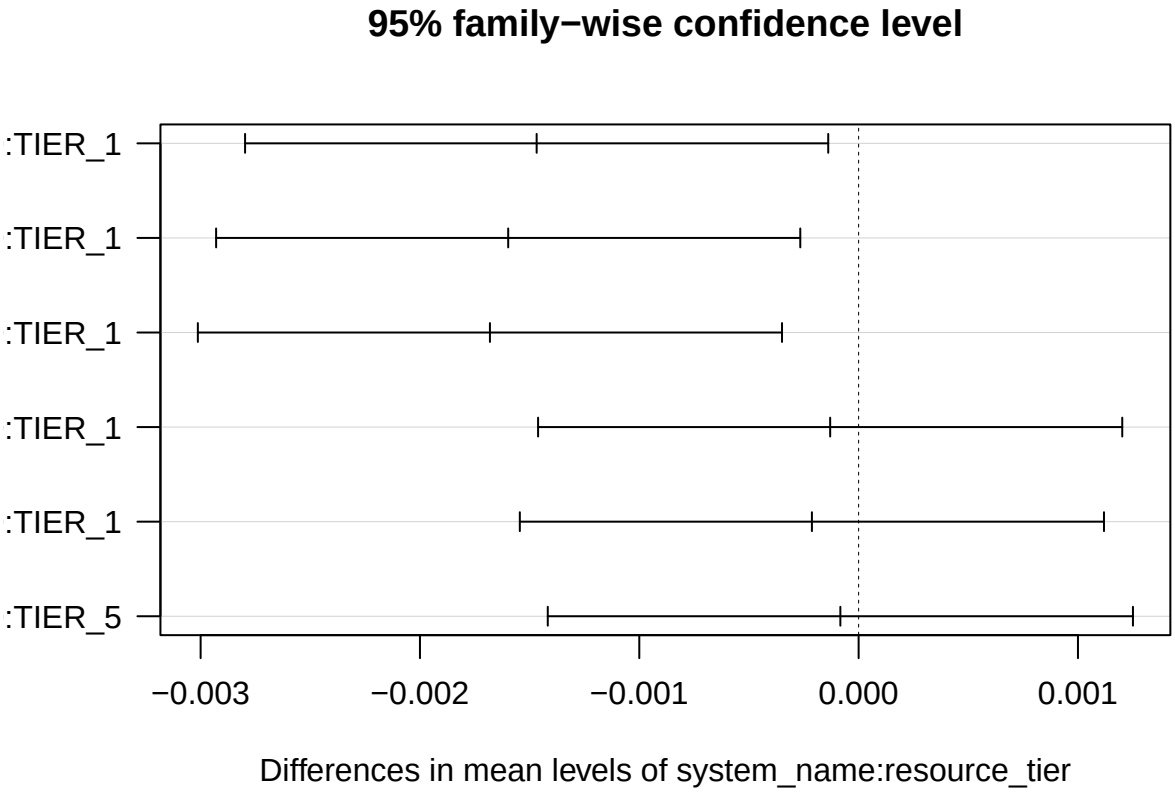



```
## [1] "10 KB file for READ operations"
##                             Df  Sum Sq   Mean Sq F value Pr(>F)
## system_name                  1 0.00017 1.749e-04   4.519 0.0337 *
## resource_tier                1 0.00024 2.369e-04   6.119 0.0135 *
## system_name:resource_tier    1 0.00014 1.385e-04   3.579 0.0588 .
## Residuals                 1152 0.04460 3.871e-05
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##   Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = latency_seconds ~ system_name * resource_tier, data = res)
##
## $system_name
##                            diff          lwr           upr     p adj
## LAMBDA_DD-GCF_DD -0.0007780162 -0.001496105 -5.992737e-05 0.0337351
##
## $resource_tier
##                         diff         lwr           upr     p adj
## TIER_5-TIER_1 -0.0009053573 -0.00162345 -0.0001872642 0.0135162
##
## $`system_name:resource_tier`
##                                             diff          lwr           upr
## LAMBDA_DD:TIER_1-GCF_DD:TIER_1    -1.467972e-03 -0.002797331 -0.0001386144
## GCF_DD:TIER_5-GCF_DD:TIER_1       -1.597709e-03 -0.002929373 -0.0002660453
## LAMBDA_DD:TIER_5-GCF_DD:TIER_1    -1.680978e-03 -0.003012642 -0.0003493139
```

```
## GCF_DD:TIER_5-LAMBDA_DD:TIER_1    -1.297368e-04 -0.001461401  0.0012019272
## LAMBDA_DD:TIER_5-LAMBDA_DD:TIER_1 -2.130054e-04 -0.001544669  0.0011186586
## LAMBDA_DD:TIER_5-GCF_DD:TIER_5    -8.326861e-05 -0.001417235  0.0012506973
##                                         p adj
## LAMBDA_DD:TIER_1-GCF_DD:TIER_1    0.0236542
## GCF_DD:TIER_5-GCF_DD:TIER_1       0.0111304
## LAMBDA_DD:TIER_5-GCF_DD:TIER_1    0.0065641
## GCF_DD:TIER_5-LAMBDA_DD:TIER_1    0.9944720
## LAMBDA_DD:TIER_5-LAMBDA_DD:TIER_1 0.9764861
## LAMBDA_DD:TIER_5-GCF_DD:TIER_5    0.9985256
```




95% family−wise confidence level
-TIER_1
−0.0016
−0.0012
−0.0008
−0.0004
Differences in mean levels of resource_tier


95% family−wise confidence level
:TIER_1
:TIER_1
:TIER_1
:TIER_1
:TIER_1
:TIER_5
−0.003
−0.002
−0.001
0.000
0.001
Differences in mean levels of system_name:resource_tier