

# Timings of common tasks using the **data.table** package in R

Matthew Dowle

Revised: January 25, 2012

(A later revision may be available on the [homepage](#))

\* WORK IN PROGRESS \*

This document contains a series of tests, followed by a summary table of various timings and comparisons. Please go straight to the summary table first [<here>](#) in which each row has a link back to the test.

This document is reproducible. Simply run the .Rnw file yourself in your environment to confirm the results. Also see `?vignette`, which says that `edit(vignette("datatable-timings"))` will extract the code from this document so you can easily work with it.

The .Rnw included in the package has  $N=10,000,000$ . This is a small number so that 'R CMD build' completes in a reasonable time (about 5 minutes). We don't want the nightly builds on R-Forge and CRAN to slow down just to run long timing comparisons. We have increased this to  $N=100,000,000$  ourselves, and included the output on the [datatable homepage](#) ([<link>](#)).

## Contents

<b>1</b>	<b>Timing tests</b>	<b>1</b>
1.1	Extraction	1
1.2	Grouping	2
1.3	Test 3	3
1.4	Test 4	3
1.5	Test 5	3
<b>2</b>	<b>Summary table</b>	<b>3</b>

## 1 Timing tests

### 1.1 Extraction

This is a repeat of the test in section 1 of the Introduction vignette. The syntax is explained there. This demonstrates the large difference in speed between vector scans and binary search. Therefore, please avoid using `==` in the `i` expression.

```
> n = ceiling(1e7/26^2) # 10 million rows
> DF = data.frame(x=rep(LETTERS,each=26*n),
+               y=rep(letters,each=n),
+               v=rnorm(n*26^2))
> DT = data.table(DF,key="x,y")
> tables()
```

```
      NAME      NROW MB COLS KEY
[1,] DT    10,000,068 153 x,y,v x,y
Total: 153MB
```

```
> tt=system.time(ans1 <- DF[DF$x=="R" & DF$y=="h",]); tt
```

```

      user  system elapsed
12.529    1.060   13.650

> head(ans1)

      x y          v
6642058 R h -1.0605095
6642059 R h  0.1301666
6642060 R h  1.8875095
6642061 R h -1.1247555
6642062 R h  0.6649649
6642063 R h -0.6971255

> dim(ans1)

[1] 14793      3

> ss=system.time(ans2 <- DT[J("R","h")]); ss

      user  system elapsed
 0.024    0.000   0.025

> head(ans2)

      x y          v
[1,] R h -1.0605095
[2,] R h  0.1301666
[3,] R h  1.8875095
[4,] R h -1.1247555
[5,] R h  0.6649649
[6,] R h -0.6971255

> dim(ans2)

[1] 14793      3

> identical(ans1$v,ans2$v)

[1] TRUE

```

## 1.2 Grouping

This is a repeat of the test in section 2 of the Introduction vignette. The syntax is explained there.

```

> ttt=system.time(ans1 <- tapply(DF$v,DF$x,sum)); ttt

      user  system elapsed
17.521    0.961   18.541

> head(ans1)

      A          B          C          D          E
-1324.42053 -179.93915 -357.25173  966.42083  48.59622
      F
 189.41801

> sss=system.time(ans2 <- DT[,sum(v),by=x]); sss

      user  system elapsed
 0.424    0.168   0.595

```

```
> head(ans2)

      x      V1
[1,] A -1324.42053
[2,] B  -179.93915
[3,] C  -357.25173
[4,] D   966.42083
[5,] E    48.59622
[6,] F   189.41801

> identical(as.vector(ans1), ans2$V1)

[1] TRUE
```

### 1.3 Test 3

### 1.4 Test 4

### 1.5 Test 5

## 2 Summary table

```
> ans

      base data.table times faster
==      13.650      0.025      545
tapply 18.541      0.595      31

> toLatex(sessionInfo())

• R version 2.14.1 (2011-12-22), i686-pc-linux-gnu

• Locale: LC_CTYPE=en_GB.UTF-8, LC_NUMERIC=C, LC_TIME=en_GB.UTF-8, LC_COLLATE=C,
  LC_MONETARY=en_GB.UTF-8, LC_MESSAGES=en_GB.UTF-8, LC_PAPER=C, LC_NAME=C,
  LC_ADDRESS=C, LC_TELEPHONE=C, LC_MEASUREMENT=en_GB.UTF-8, LC_IDENTIFICATION=C

• Base packages: base, datasets, grDevices, graphics, methods, stats, utils

• Other packages: data.table~1.7.8

• Loaded via a namespace (and not attached): tools~2.14.1
```