

# Package ‘ParallelLogger’

January 21, 2019

**Type** Package

**Title** Support for Parallel Computation, Logging, and Function Automation

**Version** 1.1.0

**Date** 2019-01-18

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**Description** Support for parallel computation with progress bar, and option to stop or proceed on errors. Also provides logging to console and disk, and the logging persists in the parallel threads. Additional functions support function call automation with delayed execution (e.g. for executing functions in parallel).

**License** Apache License 2.0

**VignetteBuilder** knitr

**Depends** R (>= 3.1.0)

**Imports** snow, XML, jsonlite, methods, utils

**Suggests** mailR, testthat, shiny, DT, knitr, rmarkdown

**URL** <https://ohdsi.github.io/ParallelLogger>,  
<https://github.com/OHDSI/ParallelLogger>

**BugReports** <https://github.com/OHDSI/ParallelLogger/issues>

**NeedsCompilation** no

**RoxygenNote** 6.1.1

**Encoding** UTF-8

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**Repository** CRAN

**Date/Publication** 2019-01-21 08:40:03 UTC

**R topics documented:**

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---

```
addDefaultConsoleLogger
```

*Add the default console logger*

---

**Description**

Add the default console logger

**Usage**

```
addDefaultConsoleLogger()
```

**Details**

Creates a logger that writes to the console using the "INFO" threshold and the [layoutSimple](#) layout.

**Examples**

```
logger <- addDefaultConsoleLogger()
logTrace("This event is below the threshold (INFO)")
logInfo("Hello world")
unregisterLogger(logger)
```

---

```
addDefaultEmailLogger
```

*Add the default e-mail logger*

---

**Description**

Add the default e-mail logger

**Usage**

```
addDefaultEmailLogger(mailSettings, label = Sys.info()["nodename"],
  test = FALSE)
```

**Arguments**

<code>mailSettings</code>	Arguments to be passed to the <code>send.mail</code> function in the <code>mailR</code> package (except subject and body).
<code>label</code>	A label to be used in the e-mail subject to identify a run. By default the name of the computer is used.
<code>test</code>	If TRUE, a message will be displayed on the console instead of sending an e-mail.

## Details

Creates a logger that writes to e-mail using the "FATAL" threshold and the [layoutEmail](#) layout. This function uses the mailR package. Please make sure your e-mail settings are correct by using the mailR package before using those settings here. ParallelLogger will not display any messages if something goes wrong when sending the e-mail.

## Examples

```
mailSettings <- list(from = "someone@gmail.com",
                    to = c("someone_else@gmail.com"),
                    smtp = list(host.name = "smtp.gmail.com",
                                port = 465,
                                user.name = "someone@gmail.com",
                                passwd = "super_secret!",
                                ssl = TRUE),
                    authenticate = TRUE,
                    send = TRUE)

# Setting test to TRUE in this example so we don't really send an e-mail:
addDefaultEmailLogger(mailSettings, "My R session", test = TRUE)
logFatal("Something bad")

unregisterLogger("DEFAULT")
```

---

addDefaultFileLogger *Add the default file logger*

---

## Description

Add the default file logger

## Usage

```
addDefaultFileLogger(fileName)
```

## Arguments

fileName            The name of the file to write to.

## Details

Creates a logger that writes to a file using the "TRACE" threshold and the [layoutParallel](#) layout. The output can be viewed with the built-in log viewer that can be started using [launchLogViewer](#).

---

clearLoggers	<i>Remove all registered loggers</i>
--------------	--------------------------------------

---

**Description**

Remove all registered loggers

**Usage**

```
clearLoggers()
```

---

clusterApply	<i>Apply a function to a list using the cluster</i>
--------------	---

---

**Description**

Apply a function to a list using the cluster

**Usage**

```
clusterApply(cluster, x, fun, ..., stopOnError = FALSE,
             progressBar = TRUE)
```

**Arguments**

cluster	The cluster of threads to run the function.
x	The list on which the function will be applied.
fun	The function to apply. Note that the context in which the function is specified matters (see details).
...	Additional parameters for the function.
stopOnError	Stop when one of the threads reports an error? If FALSE, all errors will be reported at the end.
progressBar	Show a progress bar?

**Details**

The function will be executed on each element of x in the threads of the cluster. If there are more elements than threads, the elements will be queued. The progress bar will show the number of elements that have been completed. It can sometimes be important to realize that the context in which a function is created is also transmitted to the worker node. If a function is defined inside another function, and that outer function is called with a large argument, that argument will be transmitted to the worker node each time the function is executed. It can therefore make sense to define the function to be called at the package level rather than inside a function, to save overhead.

**Value**

A list with the result of the function on each item in x.

**Examples**

```
fun <- function(x) {  
  return (x^2)  
}  
  
cluster <- makeCluster(numberOfThreads = 3)  
clusterApply(cluster, 1:10, fun)  
stopCluster(cluster)
```

---

clusterRequire	<i>Require a package in the cluster</i>
----------------	---

---

**Description**

Calls the require function in each node of the cluster.

**Usage**

```
clusterRequire(cluster, package)
```

**Arguments**

cluster	The cluster object.
package	The name of the package to load in all nodes.

---

convertJsonToSettings	<i>Converts a JSON string to a settings object</i>
-----------------------	--

---

**Description**

Converts a JSON string to a settings object

**Usage**

```
convertJsonToSettings(json)
```

**Arguments**

json	A JSON string.
------	----------------

**Details**

converts a JSON string generated using the [convertSettingsToJson](#) function to a settings object, restoring object classes and attributes.

**Value**

An R object as specified by the JSON.

---

`convertSettingsToJson` *Convert a settings object to a JSON string*

---

**Description**

Convert a settings object to a JSON string

**Usage**

```
convertSettingsToJson(object)
```

**Arguments**

`object`            R object to be converted.

**Details**

Convert a settings object to a JSON string, using pretty formatting and preserving object classes and attributes.

**Value**

A JSON string representing the R object.

---

`createArgFunction`            *Create an argument function*

---

**Description**

Create an argument function

**Usage**

```
createArgFunction(functionName, excludeArgs = c(), includeArgs = NULL,  
  addArgs = list(), rCode = c(), newName)
```

**Arguments**

functionName	The name of the function for which we want to create an args function.
excludeArgs	Exclude these arguments from appearing in the args function.
includeArgs	Include these arguments in the args function.
addArgs	Add these arguments to the args functions. Defined as a list with format name = default.
rCode	A character vector representing the R code where the new function should be appended to.
newName	The name of the new function. If not specified, the new name will be automatically derived from the old name.

**Details**

This function can be used to create a function that has (almost) the same interface as the specified function, and the output of this function will be a list of argument values.

**Value**

A character vector with the R code including the new function.

**Examples**

```
createArgFunction("read.csv", addArgs = list(exposureId = "exposureId"))
```

---

createConsoleAppender *Create console appender*

---

**Description**

Create console appender

**Usage**

```
createConsoleAppender(layout = layoutSimple)
```

**Arguments**

layout	The layout to be used by the appender.
--------	--

**Details**

Creates an appender that will write to the console.





```
                ssl = TRUE),
                authenticate = TRUE,
                send = TRUE)
# Setting test to TRUE in this example so we don't really send an e-mail:
appender <- createEmailAppender(layout = layoutEmail,
                                mailSettings = mailSettings,
                                label = "My R session",
                                test = TRUE)

logger <- createLogger(name = "EMAIL",
                       threshold = "FATAL",
                       appenders = list(appender))
registerLogger(logger)

logFatal("Something bad")

unregisterLogger("EMAIL")
```

---

createFileAppender      *Create file appender*

---

## Description

Create file appender

## Usage

```
createFileAppender(layout = layoutParallel, fileName)
```

## Arguments

layout	The layout to be used by the appender.
fileName	The name of the file to write to.

## Details

Creates an appender that will write to a file.

---

createLogger	<i>Create a logger</i>
--------------	------------------------

---

## Description

Create a logger

## Usage

```
createLogger(name = "SIMPLE", threshold = "INFO",
             appenders = list(createConsoleAppender()))
```

## Arguments

name	A name for the logger.
threshold	The threshold to be used for reporting.
appenders	A list of one or more appenders as created for example using the <a href="#">createConsoleAppender</a> or <a href="#">createFileAppender</a> function.

## Details

Creates a logger that will log messages to its appenders. The logger will only log messages at a level equal to or higher than its threshold. For example, if the threshold is "INFO" then messages marked "INFO" will be logged, but messages marked "TRACE" will not. The order of levels is "TRACE", "DEBUG", "INFO", "WARN", "ERROR", and "FATAL".

## Value

An object of type `Logger`, to be used with the [registerLogger](#) function.

## Examples

```
appender <- createConsoleAppender(layout = layoutTimestamp)

logger <- createLogger(name = "SIMPLE",
                     threshold = "INFO",
                     appenders = list(appender))

registerLogger(logger)
logTrace("This event is below the threshold (INFO)")
logInfo("Hello world")
unregisterLogger("SIMPLE")
```

---

excludeFromList	<i>Exclude variables from a list of objects of the same type</i>
-----------------	--

---

**Description**

Exclude variables from a list of objects of the same type

**Usage**

```
excludeFromList(x, exclude)
```

**Arguments**

x	A list of objects of the same type.
exclude	A character vector of names of variables to exclude.

---

getLoggers	<i>Get all registered loggers</i>
------------	-----------------------------------

---

**Description**

Get all registered loggers

**Usage**

```
getLoggers()
```

**Value**

Returns all registered loggers.

---

launchLogViewer	<i>Launch the log viewer Shiny app</i>
-----------------	--

---

**Description**

Launch the log viewer Shiny app

**Usage**

```
launchLogViewer(logFileName)
```

**Arguments**

logFileName      Name of the log file to view.

**Details**

Launches a Shiny app that allows the user to view a log file created using the default file logger. Use [addDefaultFileLogger](#) to start the default file logger.

**Examples**

```
# Create a log file:
logFile <- file.path(tempdir(), "log.txt")
addDefaultFileLogger(logFile)
logInfo("Hello world")

# Launch the log file viewer (only if in interactive mode):
if (interactive()) {
  launchLogViewer(logFile)
}

# Delete the log file:
unlink(logFile)
```

---

layoutEmail

*Logging layout for e-mail*

---

**Description**

A layout function to be used with an e-mail appender. This layout adds the thread ID and stack trace to the message.

**Usage**

```
layoutEmail(level, message)
```

**Arguments**

level              The level of the message (e.g. "INFO")  
message            The message to layout.

---

layoutParallel	<i>Logging layout for parallel computing</i>
----------------	--

---

**Description**

A layout function to be used with an appender. This layout adds the time, thread, level, package name, and function name to the message.

**Usage**

```
layoutParallel(level, message)
```

**Arguments**

level	The level of the message (e.g. "INFO")
message	The message to layout.

---

layoutSimple	<i>Simple logging layout</i>
--------------	------------------------------

---

**Description**

A layout function to be used with an appender. This layout simply includes the message itself.

**Usage**

```
layoutSimple(level, message)
```

**Arguments**

level	The level of the message (e.g. "INFO")
message	The message to layout.

---

layoutStackTrace	<i>Logging layout with stacktrace</i>
------------------	---------------------------------------

---

**Description**

A layout function to be used with an appender. This layout adds the stack trace to the message.

**Usage**

```
layoutStackTrace(level, message)
```

**Arguments**

level	The level of the message (e.g. "INFO")
message	The message to layout.

---

layoutTimestamp	<i>Logging layout with timestamp</i>
-----------------	--------------------------------------

---

**Description**

A layout function to be used with an appender. This layout adds the time to the message.

**Usage**

```
layoutTimestamp(level, message)
```

**Arguments**

level	The level of the message (e.g. "INFO")
message	The message to layout.

**Examples**

```
appender <- createConsoleAppender(layout = layoutTimestamp)

logger <- createLogger(name = "SIMPLE",
                      threshold = "INFO",
                      appenders = list(appender))
registerLogger(logger)
logTrace("This event is below the threshold (INFO)")
logInfo("Hello world")
unregisterLogger("SIMPLE")
```

loadSettingsFromJson    *Load a settings object from a JSON file*

---

**Description**

Load a settings object from a JSON file

**Usage**

```
loadSettingsFromJson(fileName)
```

**Arguments**

fileName            Name of the JSON file to load.

**Details**

Load a settings object from a JSON file, restoring object classes and attributes.

**Value**

An R object as specified by the JSON.

---

logDebug            *Log a message at the DEBUG level*

---

**Description**

Log a message at the DEBUG level

**Usage**

```
logDebug(...)
```

**Arguments**

...                Zero or more objects which can be coerced to character (and which are pasted together with no separator).

**Details**

Log a message at the specified level. The message will be sent to all the registered loggers.



---

logError	<i>Log a message at the ERROR level</i>
----------	---

---

**Description**

Log a message at the ERROR level

**Usage**

```
logError(...)
```

**Arguments**

... Zero or more objects which can be coerced to character (and which are pasted together with no separator).

**Details**

Log a message at the specified level. The message will be sent to all the registered loggers.

---

logFatal	<i>Log a message at the FATAL level</i>
----------	---

---

**Description**

Log a message at the FATAL level

**Usage**

```
logFatal(...)
```

**Arguments**

... Zero or more objects which can be coerced to character (and which are pasted together with no separator).

**Details**

Log a message at the specified level. The message will be sent to all the registered loggers. This function is be automatically called when an error occurs, and should not be called directly. Use `stop()` instead.

logInfo *Log a message at the INFO level*

---

**Description**

Log a message at the INFO level

**Usage**

```
logInfo(...)
```

**Arguments**

... Zero or more objects which can be coerced to character (and which are pasted together with no separator).

**Details**

Log a message at the specified level. The message will be sent to all the registered loggers.

**Examples**

```
appender <- createConsoleAppender(layout = layoutTimestamp)

logger <- createLogger(name = "SIMPLE",
                      threshold = "INFO",
                      appenders = list(appender))

registerLogger(logger)
logTrace("This event is below the threshold (INFO)")
logInfo("Hello world")
unregisterLogger("SIMPLE")
```

---

logTrace *Log a message at the TRACE level*

---

**Description**

Log a message at the TRACE level

**Usage**

```
logTrace(...)
```

**Arguments**

... Zero or more objects which can be coerced to character (and which are pasted together with no separator).

## Details

Log a message at the specified level. The message will be sent to all the registered loggers.

## Examples

```
appender <- createConsoleAppender(layout = layoutTimestamp)

logger <- createLogger(name = "SIMPLE",
                      threshold = "INFO",
                      appenders = list(appender))
registerLogger(logger)
logTrace("This event is below the threshold (INFO)")
logInfo("Hello world")
unregisterLogger("SIMPLE")
```

---

logWarn

*Log a message at the WARN level*

---

## Description

Log a message at the WARN level

## Usage

```
logWarn(...)
```

## Arguments

...           Zero or more objects which can be coerced to character (and which are pasted together with no separator).

## Details

Log a message at the specified level. The message will be sent to all the registered loggers. This function is automatically called when a warning is thrown, and should not be called directly. Use `warning()` instead.

---

makeCluster	<i>Create a cluster of nodes for parallel computation</i>
-------------	---

---

**Description**

Create a cluster of nodes for parallel computation

**Usage**

```
makeCluster(numberOfThreads, singleThreadToMain = TRUE,
            divideFfMemory = TRUE, setFfTempDir = TRUE)
```

**Arguments**

numberOfThreads	Number of parallel threads.
singleThreadToMain	If numberOfThreads is 1, should we fall back to running the process in the main thread?
divideFfMemory	When TRUE, the memory available for processing ff and ffd objects will be equally divided over the threads.
setFfTempDir	When TRUE, the ffTempDir option will be copied to each thread.

**Value**

An object representing the cluster.

**Examples**

```
fun <- function(x) {
  return (x^2)
}

cluster <- makeCluster(numberOfThreads = 3)
clusterApply(cluster, 1:10, fun)
stopCluster(cluster)
```

---

matchInList	<i>In a list of object of the same type, find those that match the input</i>
-------------	--

---

**Description**

In a list of object of the same type, find those that match the input

**Usage**

```
matchInList(x, toMatch)
```

**Arguments**

x	A list of objects of the same type.
toMatch	The object to match.

**Details**

Typically, toMatch will contain a subset of the variables that are in the objects in the list. Any object matching all variables in toMatch will be included in the result.

**Value**

A list of objects that match the toMatch object.

**Examples**

```
x <- list(a = list(name = "John", age = 25, gender = "M"),
         b = list(name = "Mary", age = 24, gender = "F"))

matchInList(x, list(name = "Mary"))

# [[1]]
# [[1]]$name
# [1] "Mary"
#
# [[1]]$age
# [1] 24
```

---

ParallelLogger

*ParallelLogger*

---

**Description**

ParallelLogger

registerLogger      *Register a logger*

---

**Description**

Register a logger

**Usage**

```
registerLogger(logger)
```

**Arguments**

logger      An object of type `Logger` as created using the [createLogger](#) function.

**Details**

Registers a logger as created using the [createLogger](#) function to the logging system.

**Examples**

```
appender <- createConsoleAppender(layout = layoutTimestamp)

logger <- createLogger(name = "SIMPLE",
                      threshold = "INFO",
                      appenders = list(appender))
registerLogger(logger)
logTrace("This event is below the threshold (INFO)")
logInfo("Hello world")
unregisterLogger("SIMPLE")
```

---

saveSettingsToJson      *Save a settings object as JSON file*

---

**Description**

Save a settings object as JSON file

**Usage**

```
saveSettingsToJson(object, fileName)
```

**Arguments**

object      R object to be saved.  
fileName      File name where the object should be saved.

## Details

Save a setting object as a JSON file, using pretty formatting and preserving object classes and attributes.

---

selectFromList	<i>Select variables from a list of objects of the same type</i>
----------------	---

---

## Description

Select variables from a list of objects of the same type

## Usage

```
selectFromList(x, select)
```

## Arguments

x	A list of objects of the same type.
select	A character vector of names of variables to select.

## Examples

```
x <- list(a = list(name = "John", age = 25, gender = "M"),
          b = list(name = "Mary", age = 24, gender = "F"))
selectFromList(x, c("name", "age"))

# $a
# $a$name
# [1] "John"
#
# $a$age
# [1] 25
#
#
# $b
# $b$name
# [1] "Mary"
#
# $b$age
# [1] 24
```

stopCluster                      *Stop the cluster*

---

**Description**

Stop the cluster

**Usage**

```
stopCluster(cluster)
```

**Arguments**

cluster                      The cluster to stop

**Examples**

```
fun <- function(x) {  
  return (x^2)  
}  
  
cluster <- makeCluster(numberOfThreads = 3)  
clusterApply(cluster, 1:10, fun)  
stopCluster(cluster)
```

---

unregisterLogger                  *Unregister a logger*

---

**Description**

Unregister a logger

**Usage**

```
unregisterLogger(x)
```

**Arguments**

x                              Can either be an integer (e.g. 2 to remove the second logger), the name of the logger, or the logger object itself.

**Details**

Unregisters a logger from the logging system.



**Value**

Returns TRUE if the logger was removed.

**Examples**

```
appender <- createConsoleAppender(layout = layoutTimestamp)

logger <- createLogger(name = "SIMPLE",
                      threshold = "INFO",
                      appenders = list(appender))
registerLogger(logger)
logTrace("This event is below the threshold (INFO)")
logInfo("Hello world")
unregisterLogger("SIMPLE")
```

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