

# Package ‘qs’

March 9, 2024

**Type** Package

**Title** Quick Serialization of R Objects

**Version** 0.26.1

**Date** 2024-03-08

**Maintainer** Travers Ching <traversc@gmail.com>

**Description** Provides functions for quickly writing and reading any R object to and from disk.

**License** GPL-3

**LazyData** true

**Biarch** true

**Depends** R (>= 3.0.2)

**Imports** Rcpp, RApiSerialize (>= 0.1.1), stringfish (>= 0.15.1)

**LinkingTo** Rcpp, RApiSerialize, stringfish, BH

**Encoding** UTF-8

**RoxygenNote** 7.2.3

**Suggests** knitr, rmarkdown, testthat, dplyr, data.table

**VignetteBuilder** knitr

**Copyright** This package includes code from the 'zstd' library owned by Facebook, Inc. and created by Yann Collet; the 'lz4' library created and owned by Yann Collet; xxHash library created and owned by Yann Collet; and code derived from the 'Blosc' library created and owned by Francesc Alted.

**URL** <https://github.com/traversc/qs>

**BugReports** <https://github.com/traversc/qs/issues>

**NeedsCompilation** yes

**Author** Travers Ching [aut, cre, cph],  
Yann Collet [ctb, cph] (Yann Collet is the author of the bundled zstd,  
lz4 and xxHash code),  
Facebook, Inc. [cph] (Facebook is the copyright holder of the bundled  
zstd code),

Reichardt Tino [ctb, cph] (Contributor/copyright holder of zstd bundled code),  
 Skibinski Przemyslaw [ctb, cph] (Contributor/copyright holder of zstd bundled code),  
 Mori Yuta [ctb, cph] (Contributor/copyright holder of zstd bundled code),  
 Romain Francois [ctb, cph] (Derived example/tutorials for ALTREP structures),  
 Francesc Alted [ctb, cph] (Shuffling routines derived from Blosc library),  
 Bryce Chamberlain [ctb] (qsavem and qload functions),  
 Salim Brüggemann [ctb] (<<https://orcid.org/0000-0002-5329-5987>>, documentation)

**Repository** CRAN

**Date/Publication** 2024-03-09 03:30:02 UTC

## R topics documented:

base85_decode . . . . .	3
base85_encode . . . . .	3
base91_decode . . . . .	4
base91_encode . . . . .	5
blosc_shuffle_raw . . . . .	5
blosc_unshuffle_raw . . . . .	6
catquo . . . . .	7
decode_source . . . . .	7
encode_source . . . . .	8
get_altrep_class_info . . . . .	9
is_big_endian . . . . .	9
lz4_compress_bound . . . . .	10
lz4_compress_raw . . . . .	10
lz4_decompress_raw . . . . .	11
qattributes . . . . .	11
qcache . . . . .	13
qdeserialize . . . . .	14
qdump . . . . .	15
qread . . . . .	15
qreadm . . . . .	16
qread_fd . . . . .	18
qread_handle . . . . .	18
qread_ptr . . . . .	19
qread_url . . . . .	19
qsave . . . . .	20
qsavem . . . . .	22
qsave_fd . . . . .	23
qsave_handle . . . . .	25
qserialize . . . . .	26

<i>base85_decode</i>	3
register_altrep_class . . . . .	28
starnames . . . . .	28
unregister_altrep_class . . . . .	29
zstd_compress_bound . . . . .	29
zstd_compress_raw . . . . .	30
zstd_decompress_raw . . . . .	31
<b>Index</b>	<b>32</b>

---

<i>base85_decode</i>	<i>Z85 Decoding</i>
----------------------	---------------------

---

**Description**

Decodes a Z85 encoded string back to binary

**Usage**

`base85_decode(encoded_string)`

**Arguments**

`encoded_string` A string.

**Value**

The original raw vector.

---

<i>base85_encode</i>	<i>Z85 Encoding</i>
----------------------	---------------------

---

**Description**

Encodes binary data (a raw vector) as ASCII text using **Z85 encoding format**.

**Usage**

`base85_encode(rawdata)`

**Arguments**

`rawdata` A raw vector.

## Details

Z85 is a binary to ASCII encoding format created by Pieter Hintjens in 2010 and is part of the ZeroMQ RFC. The encoding has a dictionary using 85 out of 94 printable ASCII characters. There are other base 85 encoding schemes, including Ascii85, which is popularized and used by Adobe. Z85 is distinguished by its choice of dictionary, which is suitable for easier inclusion into source code for many programming languages. The dictionary excludes all quote marks and other control characters, and requires no special treatment in R and most other languages. Note: although the official specification restricts input length to multiples of four bytes, the implementation here works with any input length. The overhead (extra bytes used relative to binary) is 25%. In comparison, base 64 encoding has an overhead of 33.33%.

## Value

A string representation of the raw vector.

## References

<https://rfc.zeromq.org/spec/32/>

---

base91\_decode

*baseE91 Decoding*

---

## Description

Decodes a baseE91 encoded string back to binary

## Usage

```
base91_decode(encoded_string)
```

## Arguments

`encoded_string` A string.

## Value

The original raw vector.

---

base91_encode	<i>baseE91 Encoding</i>
---------------	-------------------------

---

**Description**

Encodes binary data (a raw vector) as ASCII text using **baseE91 encoding format**.

**Usage**

```
base91_encode(rawdata, quote_character = "\"")
```

**Arguments**

rawdata           A raw vector.

quote\_character

The character to use in the encoding, replacing the double quote character. Must be either a single quote (" ' "), a double quote (" \" ") or a dash (" - ").

**Details**

baseE91 (capital E for stylization) is a binary to ASCII encoding format created by Joachim Henke in 2005. The overhead (extra bytes used relative to binary) is 22.97% on average. In comparison, base 64 encoding has an overhead of 33.33%. The original encoding uses a dictionary of 91 out of 94 printable ASCII characters excluding - (dash), \ (backslash) and ' (single quote). The original encoding does include double quote characters, which are less than ideal for strings in R. Therefore, you can use the quote\_character parameter to substitute dash or single quote.

**Value**

A string representation of the raw vector.

**References**

<https://base91.sourceforge.net/>

---

blosc_shuffle_raw	<i>Shuffle a raw vector</i>
-------------------	-----------------------------

---

**Description**

Shuffles a raw vector using BLOSC shuffle routines.

**Usage**

```
blosc_shuffle_raw(x, bytesofsize)
```

**Arguments**

x                    A raw vector.  
bytesofsize        Either 4 or 8.

**Value**

The shuffled vector

**Examples**

```
x <- serialize(1L:1000L, NULL)
xshuf <- blosc_shuffle_raw(x, 4)
xunshuf <- blosc_unshuffle_raw(xshuf, 4)
```

---

blosc\_unshuffle\_raw    *Un-shuffle a raw vector*

---

**Description**

Un-shuffles a raw vector using BLOSC un-shuffle routines.

**Usage**

```
blosc_unshuffle_raw(x, bytesofsize)
```

**Arguments**

x                    A raw vector.  
bytesofsize        Either 4 or 8.

**Value**

The unshuffled vector.

**Examples**

```
x <- serialize(1L:1000L, NULL)
xshuf <- blosc_shuffle_raw(x, 4)
xunshuf <- blosc_unshuffle_raw(xshuf, 4)
```

---

catquo	<i>catquo</i>
--------	---------------

---

**Description**

Prints a string with single quotes on a new line.

**Usage**

```
catquo(...)
```

**Arguments**

... Arguments passed on to [cat\(\)](#).

---

decode_source	<i>Decode a compressed string</i>
---------------	-----------------------------------

---

**Description**

A helper function for encoding and compressing a file or string to ASCII using [base91\\_encode\(\)](#) and [qserialize\(\)](#) with the highest compression level.

**Usage**

```
decode_source(string)
```

**Arguments**

string A string to decode.

**Value**

The original (decoded) object.

**See Also**

[encode\\_source\(\)](#) for more details.

---

encode_source	<i>Encode and compress a file or string</i>
---------------	---

---

## Description

A helper function for encoding and compressing a file or string to ASCII using [base91\\_encode\(\)](#) and [qserialize\(\)](#) with the highest compression level.

## Usage

```
encode_source(x = NULL, file = NULL, width = 120)
```

## Arguments

x	The object to encode (if file is not NULL)
file	The file to encode (if x is not NULL)
width	The output will be broken up into individual strings, with width being the longest allowable string.

## Details

The [encode\\_source\(\)](#) and [decode\\_source\(\)](#) functions are useful for storing small amounts of data or text inline to a .R or .Rmd file.

## Value

A character vector in base91 representing the compressed original file or object.

## Examples

```
set.seed(1); data <- sample(500)
result <- encode_source(data)
# Note: the result string is not guaranteed to be consistent between qs or zstd versions
#       but will always properly decode regardless
print(result)
result <- decode_source(result) # [1] 1 2 3 4 5 6 7 8 9 10
```



---

get\_altrep\_class\_info *Get the class information of an ALTREP object*

---

**Description**

Gets the formal name of the class and package of an ALTREP object

**Usage**

```
get_altrep_class_info(obj)
```

**Arguments**

obj                    The ALTREP class name

**Value**

The class information (class name and package name) of an ALTREP object, a character vector of length two. If the object is not an ALTREP object, returns NULL.

**Examples**

```
get_altrep_class_info(1:5)
```

---

is\_big\_endian            *System Endianness*

---

**Description**

Tests system endianness. Intel and AMD based systems are little endian, and so this function will likely return FALSE. The qs package is not capable of transferring data between systems of different endianness. This should not matter for the large majority of use cases.

**Usage**

```
is_big_endian()
```

**Value**

TRUE if big endian, FALSE if little endian.

**Examples**

```
is_big_endian() # returns FALSE on Intel/AMD systems
```

lz4\_compress\_bound     *lz4 compress bound*

---

**Description**

Exports the compress bound function from the lz4 library. Returns the maximum compressed size of an object of length size.

**Usage**

```
lz4_compress_bound(size)
```

**Arguments**

size                    An integer size.

**Value**

Maximum compressed size.

**Examples**

```
lz4_compress_bound(100000)
#' lz4_compress_bound(1e9)
```

---

lz4\_compress\_raw        *lz4 compression*

---

**Description**

Compresses to a raw vector using the lz4 algorithm. Exports the main lz4 compression function.

**Usage**

```
lz4_compress_raw(x, compress_level)
```

**Arguments**

x                        The object to serialize.  
compress\_level     The compression level used. A number > 1 (higher is less compressed).

**Value**

The compressed data as a raw vector.

**Examples**

```
x <- 1:1e6
xserialized <- serialize(x, connection=NULL)
xcompressed <- lz4_compress_raw(xserialized, compress_level = 1)
xrecovered <- unserialize(lz4_decompress_raw(xcompressed))
```

---

lz4\_decompress\_raw      *lz4 decompression*

---

**Description**

Decompresses an lz4 compressed raw vector.

**Usage**

```
lz4_decompress_raw(x)
```

**Arguments**

x                      A raw vector.

**Value**

The de-serialized object.

**Examples**

```
x <- 1:1e6
xserialized <- serialize(x, connection=NULL)
xcompressed <- lz4_compress_raw(xserialized, compress_level = 1)
xrecovered <- unserialize(lz4_decompress_raw(xcompressed))
```

---

qattributes              *qattributes*

---

**Description**

Reads the attributes of an object serialized to disk.

**Usage**

```
qattributes(file, use_alt_rep=FALSE, strict=FALSE, nthreads=1)
```

## Arguments

<code>file</code>	The file name/path.
<code>use_alt_rep</code>	Use ALTREP when reading in string data (default FALSE). On R versions prior to 3.5.0, this parameter does nothing.
<code>strict</code>	Whether to throw an error or just report a warning (default: FALSE, i.e. report warning).
<code>nthreads</code>	Number of threads to use. Default 1.

## Details

Equivalent to:

```
attributes(qread(file))
```

But more efficient. Attributes are stored towards the end of the file. This function will read through the contents of the file (without de-serializing the object itself), and then de-serializes the attributes only.

Because it is necessary to read through the file, pulling out attributes could take a long time if the file is large. However, it should be much faster than de-serializing the entire object first.

## Value

the attributes fo the serialized object.

## Examples

```
file <- tempfile()
qsave(mtcars, file)

attr1 <- qattributes(file)
attr2 <- attributes(qread(file))

print(attr1)
# $names
# [1] "IAU Name"      "Designation"  "Const." ...

# $row.names
# [1] 1 2 3 4 5
# $class
# [1] "data.frame"

identical(attr1, attr2) # TRUE
```

---

qcache	<i>qcache</i>
--------	---------------

---

## Description

Helper function for caching objects for long running tasks

## Usage

```
qcache(  
  expr,  
  name,  
  envir = parent.frame(),  
  cache_dir = ".cache",  
  clear = FALSE,  
  prompt = TRUE,  
  qsave_params = list(),  
  qread_params = list()  
)
```

## Arguments

<code>expr</code>	The expression to evaluate.
<code>name</code>	The cached expression name (see details).
<code>envir</code>	The environment to evaluate <code>expr</code> in.
<code>cache_dir</code>	The directory to store cached files in.
<code>clear</code>	Set to <code>TRUE</code> to clear the cache (see details).
<code>prompt</code>	Whether to prompt before clearing.
<code>qsave_params</code>	Parameters passed on to <code>qsave</code> .
<code>qread_params</code>	Parameters passed on to <code>qread</code> .

## Details

This is a (very) simple helper function to cache results of long running calculations. There are other packages specializing in caching data that are more feature complete.

The evaluated expression is saved with `qsave()` in `<cache_dir>/<name>.qs`. If the file already exists instead, the expression is not evaluated and the cached result is read using `qread()` and returned.

To clear a cached result, you can manually delete the associated `.qs` file, or you can call `qcache()` with `clear = TRUE`. If `prompt` is also `TRUE` a prompt will be given asking you to confirm deletion. If `name` is not specified, all cached results in `cache_dir` will be removed.

## Examples

```
cache_dir <- tempdir()

a <- 1
b <- 5

# not cached
result <- qcache({a + b},
                 name="aplusb",
                 cache_dir = cache_dir,
                 qsave_params = list(preset="fast"))

# cached
result <- qcache({a + b},
                 name="aplusb",
                 cache_dir = cache_dir,
                 qsave_params = list(preset="fast"))

# clear cached result
qcache(name="aplusb", clear=TRUE, prompt=FALSE, cache_dir = cache_dir)
```

---

qdeserialize

*qdeserialize*

---

## Description

Reads an object from a raw vector.

## Usage

```
qdeserialize(x, use_alt_rep=FALSE, strict=FALSE)
```

## Arguments

<code>x</code>	A raw vector.
<code>use_alt_rep</code>	Use ALTREP when reading in string data (default FALSE). On R versions prior to 3.5.0, this parameter does nothing.
<code>strict</code>	Whether to throw an error or just report a warning (default: FALSE, i.e. report warning).

## Details

See [qserialize\(\)](#) for additional details and examples.

## Value

The de-serialized object.

---

qdump	<i>qdump</i>
-------	--------------

---

**Description**

Exports the uncompressed binary serialization to a list of raw vectors. For testing purposes and exploratory purposes mainly.

**Usage**

```
qdump(file)
```

**Arguments**

file            A file name/path.

**Value**

The uncompressed serialization.

**Examples**

```
x <- data.frame(int = sample(1e3, replace=TRUE),
               num = rnorm(1e3),
               char = sample(starnames$`IAU Name`, 1e3, replace=TRUE),
               stringsAsFactors = FALSE)
myfile <- tempfile()
qsave(x, myfile)
x2 <- qdump(myfile)
```

---

qread	<i>qread</i>
-------	--------------

---

**Description**

Reads an object in a file serialized to disk.

**Usage**

```
qread(file, use_alt_rep=FALSE, strict=FALSE, nthreads=1)
```

**Arguments**

<code>file</code>	The file name/path.
<code>use_alt_rep</code>	Use ALTREP when reading in string data (default FALSE). On R versions prior to 3.5.0, this parameter does nothing.
<code>strict</code>	Whether to throw an error or just report a warning (default: FALSE, i.e. report warning).
<code>nthreads</code>	Number of threads to use. Default 1.

**Value**

The de-serialized object.

**Examples**

```
x <- data.frame(int = sample(1e3, replace=TRUE),
               num = rnorm(1e3),
               char = sample(starnames$`IAU Name`, 1e3, replace=TRUE),
               stringsAsFactors = FALSE)
myfile <- tempfile()
qsave(x, myfile)
x2 <- qread(myfile)
identical(x, x2) # returns true

# qs support multithreading
qsave(x, myfile, nthreads=2)
x2 <- qread(myfile, nthreads=2)
identical(x, x2) # returns true

# Other examples
z <- 1:1e7
myfile <- tempfile()
qsave(z, myfile)
z2 <- qread(myfile)
identical(z, z2) # returns true

w <- as.list(rnorm(1e6))
myfile <- tempfile()
qsave(w, myfile)
w2 <- qread(myfile)
identical(w, w2) # returns true
```

---

qreadm

*qload*


---

**Description**

Reads an object in a file serialized to disk using `qsavem()`.



**Usage**

```
qreadm(file, env = parent.frame(), ...)
```

```
qload(file, env = parent.frame(), ...)
```

**Arguments**

file	The file name/path.
env	The environment where the data should be loaded.
...	additional arguments will be passed to qread.

**Details**

This function extends qread to replicate the functionality of `base::load()` to load multiple saved objects into your workspace. `qload` and `qreadm` are alias of the same function.

**Value**

Nothing is explicitly returned, but the function will load the saved objects into the workspace.

**Examples**

```
x1 <- data.frame(int = sample(1e3, replace=TRUE),
                 num = rnorm(1e3),
                 char = sample(starnames$`IAU Name`, 1e3, replace=TRUE),
                 stringsAsFactors = FALSE)
x2 <- data.frame(int = sample(1e3, replace=TRUE),
                 num = rnorm(1e3),
                 char = sample(starnames$`IAU Name`, 1e3, replace=TRUE),
                 stringsAsFactors = FALSE)
myfile <- tempfile()
qsavem(x1, x2, file=myfile)
rm(x1, x2)
qload(myfile)
exists('x1') && exists('x2') # returns true

# qs support multithreading
qsavem(x1, x2, file=myfile, nthreads=2)
rm(x1, x2)
qload(myfile, nthreads=2)
exists('x1') && exists('x2') # returns true
```

---

qread_fd	<i>qread_fd</i>
----------	-----------------

---

**Description**

Reads an object from a file descriptor.

**Usage**

```
qread_fd(fd, use_alt_rep=FALSE, strict=FALSE)
```

**Arguments**

fd	A file descriptor.
use_alt_rep	Use ALTREP when reading in string data (default FALSE). On R versions prior to 3.5.0, this parameter does nothing.
strict	Whether to throw an error or just report a warning (default: FALSE, i.e. report warning).

**Details**

See [qsave\\_fd\(\)](#) for additional details and examples.

**Value**

The de-serialized object.

---

qread_handle	<i>qread_handle</i>
--------------	---------------------

---

**Description**

Reads an object from a windows handle.

**Usage**

```
qread_handle(handle, use_alt_rep=FALSE, strict=FALSE)
```

**Arguments**

handle	A windows handle external pointer.
use_alt_rep	Use ALTREP when reading in string data (default FALSE). On R versions prior to 3.5.0, this parameter does nothing.
strict	Whether to throw an error or just report a warning (default: FALSE, i.e. report warning).

**Details**

See [qsave\\_handle\(\)](#) for additional details and examples.

**Value**

The de-serialized object.

---

qread_ptr	<i>qread_ptr</i>
-----------	------------------

---

**Description**

Reads an object from an external pointer.

**Usage**

```
qread_ptr(pointer, length, use_alt_rep=FALSE, strict=FALSE)
```

**Arguments**

pointer	An external pointer to memory.
length	The length of the object in memory.
use_alt_rep	Use ALTREP when reading in string data (default FALSE). On R versions prior to 3.5.0, this parameter does nothing.
strict	Whether to throw an error or just report a warning (default: FALSE, i.e. report warning).

**Value**

The de-serialized object.

---

qread_url	<i>qread_url</i>
-----------	------------------

---

**Description**

A helper function that reads data from the internet to memory and deserializes the object with [qdeserialize\(\)](#).

**Usage**

```
qread_url(url, buffer_size, ...)
```

**Arguments**

url	The URL where the object is stored
buffer_size	The buffer size used to read in data (default 16777216L i.e. 16 MB)
...	Arguments passed to <code>qdeserialize()</code>

**Details**

See `qdeserialize()` for additional details.

**Value**

The de-serialized object.

**Examples**

```
## Not run:
x <- qread_url("http://example_url.com/my_file.qs")

## End(Not run)
```

---

qsave

*qsave*


---

**Description**

Saves (serializes) an object to disk.

**Usage**

```
qsave(x, file,
      preset = "high", algorithm = "zstd", compress_level = 4L,
      shuffle_control = 15L, check_hash=TRUE, nthreads = 1)
```

**Arguments**

x	The object to serialize.
file	The file name/path.
preset	One of "fast", "balanced", "high" (default), "archive", "uncompressed" or "custom". See section <i>Presets</i> for details.
algorithm	<b>Ignored unless</b> preset = "custom". Compression algorithm used: "lz4", "zstd", "lz4hc", "zstd_stream" or "uncompressed".
compress_level	<b>Ignored unless</b> preset = "custom". The compression level used. For lz4, this number must be > 1 (higher is less compressed). For zstd, a number between -50 to 22 (higher is more compressed). Due to the format of qs, there is very little benefit to compression levels > 5 or so.

shuffle_control	<b>Ignored unless</b> <code>preset = "custom"</code> . An integer setting the use of byte shuffle compression. A value between 0 and 15 (default 15). See section <i>Byte shuffling</i> for details.
check_hash	Default TRUE, compute a hash which can be used to verify file integrity during serialization.
nthreads	Number of threads to use. Default 1.

## Details

This function serializes and compresses R objects using block compression with the option of byte shuffling.

## Value

The total number of bytes written to the file (returned invisibly).

## Presets

There are lots of possible parameters. To simplify usage, there are four main presets that are performant over a large variety of data:

- "fast" is a shortcut for `algorithm = "lz4"`, `compress_level = 100` and `shuffle_control = 0`.
- "balanced" is a shortcut for `algorithm = "lz4"`, `compress_level = 1` and `shuffle_control = 15`.
- "high" is a shortcut for `algorithm = "zstd"`, `compress_level = 4` and `shuffle_control = 15`.
- "archive" is a shortcut for `algorithm = "zstd_stream"`, `compress_level = 14` and `shuffle_control = 15`. (`zstd_stream` is currently single-threaded only)

To gain more control over compression level and byte shuffling, set `preset = "custom"`, in which case the individual parameters `algorithm`, `compress_level` and `shuffle_control` are actually regarded.

## Byte shuffling

The parameter `shuffle_control` defines which numerical R object types are subject to *byte shuffling*. Generally speaking, the more ordered/sequential an object is (e.g., `1:1e7`), the larger the potential benefit of byte shuffling. It is not uncommon to improve compression ratio or compression speed by several orders of magnitude. The more random an object is (e.g., `rnorm(1e7)`), the less potential benefit there is, even negative benefit is possible. Integer vectors almost always benefit from byte shuffling, whereas the results for numeric vectors are mixed. To control block shuffling, add +1 to the parameter for logical vectors, +2 for integer vectors, +4 for numeric vectors and/or +8 for complex vectors.

**Examples**

```
x <- data.frame(int = sample(1e3, replace=TRUE),
               num = rnorm(1e3),
               char = sample(starnames$`IAU Name`, 1e3, replace=TRUE),
               stringsAsFactors = FALSE)
myfile <- tempfile()
qsave(x, myfile)
x2 <- qread(myfile)
identical(x, x2) # returns true

# qs support multithreading
qsave(x, myfile, nthreads=2)
x2 <- qread(myfile, nthreads=2)
identical(x, x2) # returns true

# Other examples
z <- 1:1e7
myfile <- tempfile()
qsave(z, myfile)
z2 <- qread(myfile)
identical(z, z2) # returns true

w <- as.list(rnorm(1e6))
myfile <- tempfile()
qsave(w, myfile)
w2 <- qread(myfile)
identical(w, w2) # returns true
```

---

 qsavem

*qsavem*


---

**Description**

Saves (serializes) multiple objects to disk.

**Usage**

```
qsavem(...)
```

**Arguments**

... Objects to serialize. Named arguments will be passed to `qsave()` during saving. Un-named arguments will be saved. A named file argument is required.

**Details**

This function extends `qsave()` to replicate the functionality of `base::save()` to save multiple objects. Read them back with `qload()`.

**Examples**

```
x1 <- data.frame(int = sample(1e3, replace=TRUE),
                num = rnorm(1e3),
                char = sample(starnames`IAU Name`, 1e3, replace=TRUE),
                stringsAsFactors = FALSE)
x2 <- data.frame(int = sample(1e3, replace=TRUE),
                num = rnorm(1e3),
                char = sample(starnames`IAU Name`, 1e3, replace=TRUE),
                stringsAsFactors = FALSE)

myfile <- tempfile()
qsavem(x1, x2, file=myfile)
rm(x1, x2)
qload(myfile)
exists('x1') && exists('x2') # returns true

# qs support multithreading
qsavem(x1, x2, file=myfile, nthreads=2)
rm(x1, x2)
qload(myfile, nthreads=2)
exists('x1') && exists('x2') # returns true
```

---

qsave\_fd

*qsave\_fd*


---

**Description**

Saves an object to a file descriptor.

**Usage**

```
qsave_fd(x, fd,
        preset = "high", algorithm = "zstd", compress_level = 4L,
        shuffle_control = 15L, check_hash=TRUE)
```

**Arguments**

x	The object to serialize.
fd	A file descriptor.
preset	One of "fast", "balanced", "high" (default), "archive", "uncompressed" or "custom". See section <i>Presets</i> for details.
algorithm	<b>Ignored unless</b> preset = "custom". Compression algorithm used: "lz4", "zstd", "lz4hc", "zstd_stream" or "uncompressed".
compress_level	<b>Ignored unless</b> preset = "custom". The compression level used. For lz4, this number must be > 1 (higher is less compressed). For zstd, a number between -50 to 22 (higher is more compressed). Due to the format of qs, there is very little benefit to compression levels > 5 or so.

shuffle\_control

**Ignored unless** `preset = "custom"`. An integer setting the use of byte shuffle compression. A value between 0 and 15 (default 15). See section *Byte shuffling* for details.

check\_hash

Default TRUE, compute a hash which can be used to verify file integrity during serialization.

## Details

This function serializes and compresses R objects using block compression with the option of byte shuffling.

## Value

The total number of bytes written to the file (returned invisibly).

## Presets

There are lots of possible parameters. To simplify usage, there are four main presets that are performant over a large variety of data:

- "fast" is a shortcut for `algorithm = "lz4"`, `compress_level = 100` and `shuffle_control = 0`.
- "balanced" is a shortcut for `algorithm = "lz4"`, `compress_level = 1` and `shuffle_control = 15`.
- "high" is a shortcut for `algorithm = "zstd"`, `compress_level = 4` and `shuffle_control = 15`.
- "archive" is a shortcut for `algorithm = "zstd_stream"`, `compress_level = 14` and `shuffle_control = 15`. (`zstd_stream` is currently single-threaded only)

To gain more control over compression level and byte shuffling, set `preset = "custom"`, in which case the individual parameters `algorithm`, `compress_level` and `shuffle_control` are actually regarded.

## Byte shuffling

The parameter `shuffle_control` defines which numerical R object types are subject to *byte shuffling*. Generally speaking, the more ordered/sequential an object is (e.g., `1:1e7`), the larger the potential benefit of byte shuffling. It is not uncommon to improve compression ratio or compression speed by several orders of magnitude. The more random an object is (e.g., `rnorm(1e7)`), the less potential benefit there is, even negative benefit is possible. Integer vectors almost always benefit from byte shuffling, whereas the results for numeric vectors are mixed. To control block shuffling, add +1 to the parameter for logical vectors, +2 for integer vectors, +4 for numeric vectors and/or +8 for complex vectors.



---

qsave_handle	<i>qsave_handle</i>
--------------	---------------------

---

## Description

Saves an object to a windows handle.

## Usage

```
qsave_handle(x, handle,
  preset = "high", algorithm = "zstd", compress_level = 4L,
  shuffle_control = 15L, check_hash=TRUE)
```

## Arguments

x	The object to serialize.
handle	A windows handle external pointer.
preset	One of "fast", "balanced", "high" (default), "archive", "uncompressed" or "custom". See section <i>Presets</i> for details.
algorithm	<b>Ignored unless</b> preset = "custom". Compression algorithm used: "lz4", "zstd", "lz4hc", "zstd_stream" or "uncompressed".
compress_level	<b>Ignored unless</b> preset = "custom". The compression level used. For lz4, this number must be > 1 (higher is less compressed). For zstd, a number between -50 to 22 (higher is more compressed). Due to the format of qs, there is very little benefit to compression levels > 5 or so.
shuffle_control	<b>Ignored unless</b> preset = "custom". An integer setting the use of byte shuffle compression. A value between 0 and 15 (default 15). See section <i>Byte shuffling</i> for details.
check_hash	Default TRUE, compute a hash which can be used to verify file integrity during serialization.

## Details

This function serializes and compresses R objects using block compression with the option of byte shuffling.

## Value

The total number of bytes written to the file (returned invisibly).

## Presets

There are lots of possible parameters. To simplify usage, there are four main presets that are performant over a large variety of data:

- "fast" is a shortcut for `algorithm = "lz4"`, `compress_level = 100` and `shuffle_control = 0`.
- "balanced" is a shortcut for `algorithm = "lz4"`, `compress_level = 1` and `shuffle_control = 15`.
- "high" is a shortcut for `algorithm = "zstd"`, `compress_level = 4` and `shuffle_control = 15`.
- "archive" is a shortcut for `algorithm = "zstd_stream"`, `compress_level = 14` and `shuffle_control = 15`. (`zstd_stream` is currently single-threaded only)

To gain more control over compression level and byte shuffling, set `preset = "custom"`, in which case the individual parameters `algorithm`, `compress_level` and `shuffle_control` are actually regarded.

## Byte shuffling

The parameter `shuffle_control` defines which numerical R object types are subject to *byte shuffling*. Generally speaking, the more ordered/sequential an object is (e.g., `1:1e7`), the larger the potential benefit of byte shuffling. It is not uncommon to improve compression ratio or compression speed by several orders of magnitude. The more random an object is (e.g., `rnorm(1e7)`), the less potential benefit there is, even negative benefit is possible. Integer vectors almost always benefit from byte shuffling, whereas the results for numeric vectors are mixed. To control block shuffling, add +1 to the parameter for logical vectors, +2 for integer vectors, +4 for numeric vectors and/or +8 for complex vectors.

---

qserialize

*qserialize*

---

## Description

Saves an object to a raw vector.

## Usage

```
qserialize(x, preset = "high",
algorithm = "zstd", compress_level = 4L,
shuffle_control = 15L, check_hash=TRUE)
```

## Arguments

x	The object to serialize.
preset	One of "fast", "balanced", "high" (default), "archive", "uncompressed" or "custom". See section <i>Presets</i> for details.
algorithm	<b>Ignored unless</b> preset = "custom". Compression algorithm used: "lz4", "zstd", "lz4hc", "zstd_stream" or "uncompressed".
compress_level	<b>Ignored unless</b> preset = "custom". The compression level used. For lz4, this number must be > 1 (higher is less compressed). For zstd, a number between -50 to 22 (higher is more compressed). Due to the format of qs, there is very little benefit to compression levels > 5 or so.
shuffle_control	<b>Ignored unless</b> preset = "custom". An integer setting the use of byte shuffle compression. A value between 0 and 15 (default 15). See section <i>Byte shuffling</i> for details.
check_hash	Default TRUE, compute a hash which can be used to verify file integrity during serialization.

## Details

This function serializes and compresses R objects using block compression with the option of byte shuffling.

## Value

A raw vector.

## Presets

There are lots of possible parameters. To simplify usage, there are four main presets that are performant over a large variety of data:

- "fast" is a shortcut for algorithm = "lz4", compress\_level = 100 and shuffle\_control = 0.
- "balanced" is a shortcut for algorithm = "lz4", compress\_level = 1 and shuffle\_control = 15.
- "high" is a shortcut for algorithm = "zstd", compress\_level = 4 and shuffle\_control = 15.
- "archive" is a shortcut for algorithm = "zstd\_stream", compress\_level = 14 and shuffle\_control = 15. (zstd\_stream is currently single-threaded only)

To gain more control over compression level and byte shuffling, set preset = "custom", in which case the individual parameters algorithm, compress\_level and shuffle\_control are actually regarded.

**Byte shuffling**

The parameter `shuffle_control` defines which numerical R object types are subject to *byte shuffling*. Generally speaking, the more ordered/sequential an object is (e.g., `1:1e7`), the larger the potential benefit of byte shuffling. It is not uncommon to improve compression ratio or compression speed by several orders of magnitude. The more random an object is (e.g., `rnorm(1e7)`), the less potential benefit there is, even negative benefit is possible. Integer vectors almost always benefit from byte shuffling, whereas the results for numeric vectors are mixed. To control block shuffling, add +1 to the parameter for logical vectors, +2 for integer vectors, +4 for numeric vectors and/or +8 for complex vectors.

---

`register_altrep_class` *Register ALTREP class for serialization*

---

**Description**

Register an ALTREP class to serialize using base R serialization.

**Usage**

```
register_altrep_class(classname, pkgname)
```

**Arguments**

<code>classname</code>	The ALTREP class name
<code>pkgname</code>	The package the ALTREP class comes from

**Examples**

```
register_altrep_class("compact_intseq", "base")
```

---

`starnames` *Official list of IAU Star Names*

---

**Description**

Data from the International Astronomical Union. An official list of the 336 internationally recognized named stars, updated as of June 1, 2018.

**Usage**

```
data(starnames)
```

**Format**

A `data.frame` with official IAU star names and several properties, such as coordinates.

**Source**

[Naming Stars | International Astronomical Union.](#)

**References**

E Mamajek et. al. (2018), *WG Triennial Report (2015-2018) - Star Names*, Reports on Astronomy, 22 Mar 2018.

**Examples**

```
data(starnames)
```

---

```
unregister_altrep_class
```

*Unregister ALTREP class for serialization*

---

**Description**

Unregister an ALTREP class to not use base R serialization.

**Usage**

```
unregister_altrep_class(classname, pkgname)
```

**Arguments**

classname	The ALTREP class name
pkgname	The package the ALTREP class comes from

**Examples**

```
unregister_altrep_class("compact_intseq", "base")
```

---

```
zstd_compress_bound
```

*Zstd compress bound*

---

**Description**

Exports the compress bound function from the zstd library. Returns the maximum compressed size of an object of length size.

**Usage**

```
zstd_compress_bound(size)
```

**Arguments**

size            An integer size

**Value**

maximum compressed size

**Examples**

```
zstd_compress_bound(100000)
zstd_compress_bound(1e9)
```

---

zstd\_compress\_raw     *Zstd compression*

---

**Description**

Compresses to a raw vector using the zstd algorithm. Exports the main zstd compression function.

**Usage**

```
zstd_compress_raw(x, compress_level)
```

**Arguments**

x                The object to serialize.

compress\_level   The compression level used (default 4). A number between -50 to 22 (higher is more compressed). Due to the format of qs, there is very little benefit to compression levels > 5 or so.

**Value**

The compressed data as a raw vector.

**Examples**

```
x <- 1:1e6
xserialized <- serialize(x, connection=NULL)
xcompressed <- zstd_compress_raw(xserialized, compress_level = 1)
xrecovered <- unserialize(zstd_decompress_raw(xcompressed))
```

---

zstd\_decompress\_raw    *Zstd decompression*

---

**Description**

Decompresses a zstd compressed raw vector.

**Usage**

```
zstd_decompress_raw(x)
```

**Arguments**

x                    A raw vector.

**Value**

The de-serialized object.

**Examples**

```
x <- 1:1e6
xserialized <- serialize(x, connection=NULL)
xcompressed <- zstd_compress_raw(xserialized, compress_level = 1)
xrecovered <- unserialize(zstd_decompress_raw(xcompressed))
```

# Index

- \* **datasets**
  - starnames, 28
- base85\_decode, 3
- base85\_encode, 3
- base91\_decode, 4
- base91\_encode, 5
- base91\_encode(), 7, 8
- base::load(), 17
- base::save(), 22
- blosc\_shuffle\_raw, 5
- blosc\_unshuffle\_raw, 6
  
- cat(), 7
- catquo, 7
  
- decode\_source, 7
- decode\_source(), 8
  
- encode\_source, 8
- encode\_source(), 7, 8
  
- get\_altrep\_class\_info, 9
  
- is\_big\_endian, 9
  
- lz4\_compress\_bound, 10
- lz4\_compress\_raw, 10
- lz4\_decompress\_raw, 11
  
- qattributes, 11
- qcache, 13
- qcache(), 13
- qdeserialize, 14
- qdeserialize(), 19, 20
- qdump, 15
- qload(qreadm), 16
- qload(), 22
- qread, 15
- qread(), 13
- qread\_fd, 18
  
- qread\_handle, 18
- qread\_ptr, 19
- qread\_url, 19
- qreadm, 16
- qsave, 20
- qsave(), 13, 22
- qsave\_fd, 23
- qsave\_fd(), 18
- qsave\_handle, 25
- qsave\_handle(), 19
- qsavem, 22
- qsavem(), 16
- qserialize, 26
- qserialize(), 7, 8, 14
  
- register\_altrep\_class, 28
  
- starnames, 28
  
- unregister\_altrep\_class, 29
  
- zstd\_compress\_bound, 29
- zstd\_compress\_raw, 30
- zstd\_decompress\_raw, 31