Package ‘qs’

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**base85_decode**

Z85 Decoding

Description

Decodes a Z85 encoded string back to binary

Usage

`base85_decode(encoded_string)`

Arguments

- `encoded_string` A string.

Value

The original raw vector.

---

**base85_encode**

Z85 Encoding

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/

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**base91_decode**  
**base91 Decoding**

Description

Decodes a basE91 encoded string back to binary

Usage

```r
base91_decode(encoded_string)
```

Arguments

- `encoded_string`  A string.

Value

The original raw vector.
base91_encode

Description

Encodes binary data (a raw vector) as ASCII text using basE91 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

basE91 (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

Shuffle a raw vector

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)
Description

Prints a string with single quotes on a new line.

Usage

catquo(...)

Arguments

... Arguments passed on to cat().

decode_source

Decode a compressed string

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

A helper function for encoding and compressing a file or string to ASCII using `base91_encode()` and `qserialize()` with the highest compression level.

Usage

```r
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

```r
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
```
**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**

```python
is_big_endian()
```

**Value**

TRUE if big endian, FALSE if little endian.

**Examples**

```python
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**

```python
lz4_compress_bound(size)
```

**Arguments**

- `size` An integer size.

**Value**

Maximum compressed size.

**Examples**

```python
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

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

Description

Reads the attributes of an object serialized to disk.

Usage

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

Arguments

- `file`: The file name/path.
- `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).
- `nthreads`: Number of threads to use. Default 1.

Details

Equivalent to:

```r
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

```r
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
```

Description

Helper function for caching objects for long running tasks

Usage

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

Arguments

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

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

```r
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)
```

qdeserialze

qdeserialze

Description

Reads an object from a raw vector.

Usage

```r
qdeserialze(x, use_alt_rep=FALSE, strict=FALSE)
```
Arguments

x A raw vector.
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 qserialize() for additional details and examples.

Value

The de-serialized object.

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()
qusave(x, myfile)
x2 <- qdump(myfile)
qread

qread

Description

Reads an object in a file serialized to disk.

Usage

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

Arguments

file
The file name/path.

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).

nthreads
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

---

**Description**

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

**Usage**

```r
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**

```r
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
qsave(x1, x2, file=myfile, nthreads=2)
rm(x1, x2)
qload(myfile, nthreads=2)
exists('x1') && exists('x2') # returns true

qread_fd

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

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.

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

**Description**

A helper function that reads data from the internet to memory and deserializes the object with `qdeserialized()`. 

**Usage**

```r
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 `qdeserialized()`

**Details**

See `qdeserialized()` for additional details.

**Value**

The de-serialized object.

**Examples**

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

### qsave

**Description**

Saves (serializes) an object to disk.

**Usage**

```r
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 Presets for details.
- `algorithm`: *Ignored unless* preset = "custom". Compression algorithm used: "lz4", "zstd", "lz4hc", "zstd_stream" or "uncompressed".
- `compress_level`: *Ignored unless* 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.
- `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

```r
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
```

Description

Saves (serializes) multiple objects to disk.

Usage

`qsave(m)`
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

```r
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
```

Description

Saves an object to a file descriptor.

Usage

```r
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 Presets for details.
algorithm  Ignored unless preset = "custom". Compression algorithm used: "lz4", "zstd", "lz4hc", "zstd_stream" or "uncompressed".
compress_level  Ignored unless 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.

Description
Saves an object to a windows handle.

Usage

```r
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 Presets for details.
- `algorithm` Ignored unless preset = "custom". Compression algorithm used: "lz4", "zstd", "lz4hc", "zstd_stream" or "uncompressed".
- `compress_level` Ignored unless 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.

---

**qserialize**

Description

Saves an object to a raw vector.

Usage

```r
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 **Presets** for details.

- **algorithm**  
  **Ignored unless** preset = "custom". Compression algorithm used: "lz4", "zstd", "lz4hc", "zstd_stream" or "uncompressed".

- **compress_level**  
  **Ignored unless** 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

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.

---

**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**

```r
data(starnames)
```

**Format**

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

**Source**

Naming Stars | International Astronomical Union.

**References**


**Examples**

```r
data(starnames)
```
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

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

Description

Decompresses a zstd compressed raw vector.

Usage

```r
zstd_decompress_raw(x)
```

Arguments

- `x`: A raw vector.

Value

The de-serialized object.

Examples

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