

# Package ‘RestRserve’

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**Type** Package

**Title** A Framework for Building HTTP API

**Description** Allows to easily create high-performance full featured HTTP APIs from R functions. Provides high-level classes such as 'Request', 'Response', 'Application', 'Middleware' in order to streamline server side application development. Out of the box allows to serve requests using 'Rserve' package, but flexible enough to integrate with other HTTP servers such as 'httpuv'.

**Version** 1.2.3

**URL** <https://restrserve.org>, <https://github.com/rexyai/RestRserve>

**BugReports** <https://github.com/rexyai/RestRserve/issues>

**License** GPL (>= 2)

**Depends** R (>= 3.6.0)

**Imports** methods, parallel, Rserve (>= 1.7.3), Rcpp (>= 1.0.3), R6 (>= 2.4.0), uuid (>= 0.1-2), checkmate (>= 1.9.4), mime (>= 0.7), jsonlite (>= 1.6), digest (>= 0.6.29)

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**ByteCompile** true

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## Contents

|                                  |           |
|----------------------------------|-----------|
| Application . . . . .            | 2         |
| ApplicationProcess . . . . .     | 8         |
| AuthBackendBasic . . . . .       | 9         |
| AuthBackendBearer . . . . .      | 10        |
| AuthMiddleware . . . . .         | 12        |
| BackendRserve . . . . .          | 13        |
| CORSMiddleware . . . . .         | 15        |
| EncodeDecodeMiddleware . . . . . | 16        |
| ETagMiddleware . . . . .         | 17        |
| HTTPDate-class . . . . .         | 21        |
| IDE-hints . . . . .              | 22        |
| Logger . . . . .                 | 23        |
| Middleware . . . . .             | 25        |
| raise . . . . .                  | 27        |
| Request . . . . .                | 27        |
| Response . . . . .               | 31        |
| to_json . . . . .                | 36        |
| <b>Index</b>                     | <b>38</b> |

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|-------------|--|
| Application | <i>Creates application - RestRserve usage starts from here</i> |
|-------------|--|

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## Description

Creates Application object. Application provides an interface for building high-performance REST API by registering R functions as handlers http requests.

## Details

There are several advanced options to control how HTTP headers are processed:

- `options("RestRserve.headers.server")` controls response "Server" header
- `options("RestRserve.headers.split")` controls which header values split by comma during parsing. See [https://en.wikipedia.org/wiki/List\\_of\\_HTTP\\_header\\_fields](https://en.wikipedia.org/wiki/List_of_HTTP_header_fields), <https://stackoverflow.com/a/29550711/3048453>

There is also an option to switch-off runtime types validation in the Request/Response handlers. This might provide some performance gains, but ultimately leads to less robust applications. Use at your own risk! See `options("RestRserve.runtime.asserts")`

**Public fields**

`logger` Logger object which records events during request processing. Alternatively user can use loggers from `lgr` package as a drop-in replacement - Logger methods and loggers created by `lgr` share function signatures.

`content_type` Default response body content type.

`HTTPError` Class which raises HTTP errors. Global `HTTPError` is used by default. In theory user can replace it with his own class (see `RestRserve:::HTTPErrorFactory`). However we believe in the majority of the cases using `HTTPError` will be enough.

**Active bindings**

`endpoints` Prints all the registered routes with allowed methods.

**Methods****Public methods:**

- `Application$new()`
- `Application$add_route()`
- `Application$add_get()`
- `Application$add_post()`
- `Application$add_static()`
- `Application$add_openapi()`
- `Application$add_swagger_ui()`
- `Application$append_middleware()`
- `Application$process_request()`
- `Application$print()`
- `Application$clone()`

**Method** `new()`: Creates Application object.

*Usage:*

```
Application$new(
  middleware = list(EncodeDecodeMiddleware$new()),
  content_type = "text/plain",
  ...
)
```

*Arguments:*

`middleware` List of `Middleware` objects.

`content_type` Default response body content (media) type. "text/plain" by default.

... Not used at the moment.

**Method** `add_route()`: Adds endpoint and register user-supplied R function as a handler.

*Usage:*

```
Application$add_route(
  path,
  method,
  FUN,
  match = c("exact", "partial", "regex"),
  ...
)
```

*Arguments:*

path Endpoint path.

method HTTP method. Allowed methods at the moment: GET, HEAD, POST, PUT, DELETE, OPTIONS, PATCH.

FUN User function to handle requests. FUN **must** take two arguments: first is request ([Request](#)) and second is response ([Response](#)).

The goal of the user function is to **modify** response or throw exception (call [raise\(\)](#) or [stop\(\)](#)).

Both response and request objects modified in-place and internally passed further to RestRserve execution pipeline.

match Defines how route will be processed. Allowed values:

- exact - match route as is. Returns 404 if route is not matched.
- partial - match route as prefix. Returns 404 if prefix are not matched.
- regex - match route as template. Returns 404 if template pattern not matched.

... Not used.

**Method** `add_get()`: Shorthand to `Application$add_route()` with GET method.

*Usage:*

```
Application$add_get(
  path,
  FUN,
  match = c("exact", "partial", "regex"),
  ...,
  add_head = TRUE
)
```

*Arguments:*

path Endpoint path.

FUN User function to handle requests. FUN **must** take two arguments: first is request ([Request](#)) and second is response ([Response](#)).

The goal of the user function is to **modify** response or throw exception (call [raise\(\)](#) or [stop\(\)](#)).

Both response and request objects modified in-place and internally passed further to RestRserve execution pipeline.

match Defines how route will be processed. Allowed values:

- exact - match route as is. Returns 404 if route is not matched.
- partial - match route as prefix. Returns 404 if prefix are not matched.
- regex - match route as template. Returns 404 if template pattern not matched.

... Not used.

`add_head` Adds HEAD method.

**Method** `add_post()`: Shorthand to `Application$add_route()` with POST method.

*Usage:*

```
Application$add_post(path, FUN, match = c("exact", "partial", "regex"), ...)
```

*Arguments:*

`path` Endpoint path.

`FUN` User function to handle requests. `FUN` **must** take two arguments: first is request ([Request](#)) and second is response ([Response](#)).

The goal of the user function is to **modify** response or throw exception (call `raise()` or `stop()`).

Both response and request objects modified in-place and internally passed further to RestRserve execution pipeline.

`match` Defines how route will be processed. Allowed values:

- `exact` - match route as is. Returns 404 if route is not matched.
- `partial` - match route as prefix. Returns 404 if prefix are not matched.
- `regex` - match route as template. Returns 404 if template pattern not matched.

... Not used.

**Method** `add_static()`: Adds GET method to serve file or directory at `file_path`.

*Usage:*

```
Application$add_static(path, file_path, content_type = NULL, ...)
```

*Arguments:*

`path` Endpoint path.

`file_path` Path file or directory.

`content_type` MIME-type for the content.

If `content_type = NULL` then MIME code `content_type` will be inferred automatically (from file extension).

If it will be impossible to guess about file type then `content_type` will be set to `application/octet-stream`.

... Not used.

**Method** `add_openapi()`: Adds endpoint to serve [OpenAPI](#) description of available methods.

*Usage:*

```
Application$add_openapi(path = "/openapi.yaml", file_path = "openapi.yaml")
```

*Arguments:*

`path` path Endpoint path.

`file_path` Path to the OpenAPI specification file.

**Method** `add_swagger_ui()`: Adds endpoint to show [Swagger UI](#).

*Usage:*

```
Application$add_swagger_ui(
  path = "/swagger",
  path_openapi = "/openapi.yaml",
  use_cdn = TRUE,
  path_swagger_assets = "/__swagger__/",
  file_path = "swagger-ui.html"
)
```

*Arguments:*

path path Endpoint path.  
 path\_openapi Path to the OpenAPI specification file.  
 use\_cdn Use CDN to load Swagger UI libraries.  
 path\_swagger\_assets Swagger UI assets endpoint.  
 file\_path Path to Swagger UI HTML file.

**Method** `append_middleware()`: Appends middleware to handlers pipeline.

*Usage:*

```
Application$append_middleware(mw)
```

*Arguments:*

mw [Middleware](#) object.

**Method** `process_request()`: Process incoming request and generate [Response](#) object.

*Usage:*

```
Application$process_request(request = NULL)
```

*Arguments:*

request [Request](#) object.

Useful for tests your handlers before deploy application.

**Method** `print()`: Prints application details.

*Usage:*

```
Application$print()
```

**Method** `clone()`: The objects of this class are cloneable with this method.

*Usage:*

```
Application$clone(deep = FALSE)
```

*Arguments:*

deep Whether to make a deep clone.

**See Also**

[HTTPError Middleware Request Response](#)

**Examples**

```
# init logger
app_logger = Logger$new()
# set log level for the middleware
app_logger$set_log_level("debug")
# set logger name
app_logger$set_name("MW Logger")
# init middleware to logging
mw = Middleware$new(
  process_request = function(rq, rs) {
    app_logger$info(sprintf("Incoming request (id %s): %s", rq$id, rq$path))
```

```
    },
    process_response = function(rq, rs) {
        app_logger$info(sprintf("Outgoing response (id %s): %s", rq$id, rs$status))
    },
    id = "awesome-app-logger"
)

# init application
app = Application$new(middleware = list(mw))

# set internal log level
app$logger$set_log_level("error")

# define simply request handler
status_handler = function(rq, rs) {
    rs$set_body("OK")
    rs$set_content_type("text/plain")
    rs$set_status_code(200L)
}
# add route
app$add_get("/status", status_handler, "exact")

# add static file handler
desc_file = system.file("DESCRIPTION", package = "RestRserve")
# add route
app$add_static("/desc", desc_file, "text/plain")

# define say message handler
say_handler = function(rq, rs) {
    who = rq$parameters_path[["user"]]
    msg = rq$parameters_query[["message"]]
    if (is.null(msg)) msg = "Hello"
    rs$set_body(paste(who, "say", dQuote(msg)))
    rs$set_content_type("text/plain")
    rs$set_status_code(200L)
}
# add route
app$add_get("/say/{user}", say_handler, "regex")

# print application info
app

# test app
# simulate requests
not_found_rq = Request$new(path = "/no")
status_rq = Request$new(path = "/status")
desc_rq = Request$new(path = "/desc")
say_rq = Request$new(path = "/say/anonym", parameters_query = list("message" = "Hola"))
# process prepared requests
app$process_request(not_found_rq)
app$process_request(status_rq)
app$process_request(desc_rq)
app$process_request(say_rq)
```

```
# run app
backend = BackendRserve$new()

if (interactive()) {
  backend$start(app, 8080)
}
```

---

ApplicationProcess      *Creates ApplicationProcess object*

---

### Description

Creates ApplicationProcess to hold PID of the running application.

### Public fields

pid Process identificator.

### Methods

#### Public methods:

- [ApplicationProcess\\$new\(\)](#)
- [ApplicationProcess\\$kill\(\)](#)
- [ApplicationProcess\\$clone\(\)](#)

**Method new():** Creates ApplicationProcess object

*Usage:*

```
ApplicationProcess$new(pid)
```

*Arguments:*

pid Process identificator.

**Method kill():** Send signal to process.

*Usage:*

```
ApplicationProcess$kill(signal = 15L)
```

*Arguments:*

signal Signal code.

**Method clone():** The objects of this class are cloneable with this method.

*Usage:*

```
ApplicationProcess$clone(deep = FALSE)
```

*Arguments:*

deep Whether to make a deep clone.



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|                  |                                    |
|------------------|------------------------------------|
| AuthBackendBasic | <i>Basic authorization backend</i> |
|------------------|------------------------------------|

---

## Description

Creates AuthBackendBasic class object.

## Super class

[RestRserve::AuthBackend](#) -> AuthBackendBasic

## Methods

### Public methods:

- [AuthBackendBasic\\$new\(\)](#)
- [AuthBackendBasic\\$authenticate\(\)](#)
- [AuthBackendBasic\\$clone\(\)](#)

**Method** `new()`: Creates AuthBackendBasic class object.

*Usage:*

```
AuthBackendBasic$new(FUN)
```

*Arguments:*

FUN Function to perform authentication which takes two arguments - user and password. Returns boolean - whether access is allowed for a requested user or not.

**Method** `authenticate()`: Provide authentication for the given request.

*Usage:*

```
AuthBackendBasic$authenticate(request, response)
```

*Arguments:*

request [Request](#) object.

response [Response](#) object.

*Returns:* Boolean - whether access is allowed for a requested user or not.

**Method** `clone()`: The objects of this class are cloneable with this method.

*Usage:*

```
AuthBackendBasic$clone(deep = FALSE)
```

*Arguments:*

deep Whether to make a deep clone.

## References

[RFC7617 Wikipedia](#)

**See Also**

[AuthMiddleware Request Response](#)

Other AuthBackend: [AuthBackend](#), [AuthBackendBearer](#), [AuthMiddleware](#)

**Examples**

```
# init users database
user_db = list(
  "user-1" = "password-1",
  "user-2" = "password-2"
)
# define authentication handler
auth_fun = function(user, password) {
  if (is.null(user_db[[user]])) return(FALSE) # not found
  if (!identical(user_db[[user]], password)) return(FALSE) # incorrect
  return(TRUE)
}
# init backend
auth_backend = AuthBackendBasic$new(FUN = auth_fun)

# test backend
# define credentials (see RFC)
creds = jsonlite::base64_enc("user-1:password-1")
# generate request headers
h = list("Authorization" = sprintf("Basic %s", creds))
# simulate request
rq = Request$new(path = "/", headers = h)
# init response object
rs = Response$new()
# perform authentication
auth_backend$authenticate(rq, rs) # TRUE
```

---

AuthBackendBearer

*Bearer token authorization backend*

---

**Description**

Creates AuthBackendBearer class object.

**Super class**

[RestRserve::AuthBackend](#) -> AuthBackendBearer

**Methods****Public methods:**

- [AuthBackendBearer\\$new\(\)](#)

- [AuthBackendBearer\\$authenticate\(\)](#)
- [AuthBackendBearer\\$clone\(\)](#)

**Method** `new()`: Creates AuthBackendBearer class object.

*Usage:*

```
AuthBackendBearer$new(FUN)
```

*Arguments:*

FUN Function to perform authentication which takes one arguments - token. Returns boolean - whether access is allowed for a requested token or not.

**Method** `authenticate()`: Provide authentication for the given request.

*Usage:*

```
AuthBackendBearer$authenticate(request, response)
```

*Arguments:*

request [Request](#) object.

response [Response](#) object.

*Returns:* Boolean - whether access is allowed for a requested user or not.

**Method** `clone()`: The objects of this class are cloneable with this method.

*Usage:*

```
AuthBackendBearer$clone(deep = FALSE)
```

*Arguments:*

deep Whether to make a deep clone.

## References

[RFC6750 Specification](#)

## See Also

[AuthMiddleware Request Response](#)

Other AuthBackend: [AuthBackend](#), [AuthBackendBasic](#), [AuthMiddleware](#)

## Examples

```
token_db = list(
  "valid-token" = as.POSIXct("2099-12-31", tz = "GMT"),
  "expired-token" = as.POSIXct("1900-01-01", tz = "GMT")
)
auth_fun = function(token) {
  if (is.null(token_db[[token]])) return(FALSE) # not found
  if (Sys.time() > token_db[[token]]) return(FALSE) # expired
  return(TRUE)
}
# init backend
auth_backend = AuthBackendBearer$new(FUN = auth_fun)
```

```

# test backend
# define credentials (see RFC)
token = "valid-token"
# generate request headers
h = list("Authorization" = sprintf("Bearer %s", token))
# simulate request
rq = Request$new(path = "/", headers = h)
# init response object
rs = Response$new()
# perform authentication
auth_backend$authenticate(rq, rs) # TRUE

```

---

|                |  |
|----------------|--|
| AuthMiddleware | <i>Creates authorization middleware object</i> |
|----------------|--|

---

## Description

Adds various authorizations to [Application](#).

## Super class

[RestRserve::Middleware](#) -> AuthMiddleware

## Methods

### Public methods:

- [AuthMiddleware\\$new\(\)](#)
- [AuthMiddleware\\$clone\(\)](#)

**Method** `new()`: Creates AuthMiddleware object.

*Usage:*

```
AuthMiddleware$new(
  auth_backend,
  routes,
  match = "exact",
  id = "AuthMiddleware"
)
```

*Arguments:*

`auth_backend` Authentication backend.

`routes` Routes paths to protect.

`match` How routes will be matched: "exact" or "partial" (as prefix).

`id` Middleware id.

**Method** `clone()`: The objects of this class are cloneable with this method.

*Usage:*

```
AuthMiddleware$clone(deep = FALSE)
```

*Arguments:*

`deep` Whether to make a deep clone.

**See Also**

[Middleware Application](#)

Other AuthBackend: [AuthBackend](#), [AuthBackendBasic](#), [AuthBackendBearer](#)

---

|               |  |
|---------------|--|
| BackendRserve | <i>Creates Rserve backend for processing HTTP requests</i> |
|---------------|--|

---

**Description**

Creates BackendRserve object which can start [Application](#) using Rserve backend.

**Super class**

[RestRserve::Backend](#) -> BackendRserve

**Methods****Public methods:**

- [BackendRserve\\$new\(\)](#)
- [BackendRserve\\$start\(\)](#)
- [BackendRserve\\$set\\_request\(\)](#)
- [BackendRserve\\$convert\\_response\(\)](#)
- [BackendRserve\\$clone\(\)](#)

**Method** `new()`: Creates BackendRserve object.

*Usage:*

```
BackendRserve$new(..., jit_level = 0L, precompile = FALSE)
```

*Arguments:*

... Not used at the moment.

`jit_level` changes R's byte compiler level to this value before app start.

`precompile` try to use R's byte compiler to pre-compile

**Method** `start()`: Starts RestRserve application from current R session.

*Usage:*

```
BackendRserve$start(app, http_port = 8080, ..., background = FALSE)
```

*Arguments:*

`app` [Application](#) object.

`http_port` HTTP port for application. Negative values (such as -1) means not to expose plain http.

... Key-value pairs of the Rserve configuration. If contains "http.port" then `http_port` will be silently replaced with its value.

`background` Whether to try to launch in background process on UNIX.

*Returns:* [ApplicationProcess](#) object when background = TRUE.

**Method** `set_request()`: Parse request and set to it fields.

*Usage:*

```
BackendRserve$set_request(
  request,
  path = "/",
  parameters_query = NULL,
  headers = NULL,
  body = NULL
)
```

*Arguments:*

request [Request](#) object.

path Character with requested path. Always starts with /.

parameters\_query A named character vector with URL decoded query parameters.

headers Request HTTP headers.

body Request body. Can be NULL, raw vector or named character vector for the URL encoded form (like a parameters\_query parameter).

*Returns:* request modified object.

**Method** `convert_response()`: Convert self object to Rserve compatible structure.

*Usage:*

```
BackendRserve$convert_response(response)
```

*Arguments:*

response [Response](#) object.

*Returns:* List with the following structure:

- body: can be a character vector of length one or a raw vector. if the character vector is named "file" then the content of a file of that name is the body. If the character vector is named "tmpfile" then the content of a temporary file of that name is the body.
- content-type: must be a character vector of length one or NULL (if present, else default is "text/plain").
- headers: must be a character vector - the elements will have CRLF appended and neither Content-type nor Content-length may be used.
- status-code: must be an integer if present (default is 200).

**Method** `clone()`: The objects of this class are cloneable with this method.

*Usage:*

```
BackendRserve$clone(deep = FALSE)
```

*Arguments:*

deep Whether to make a deep clone.

## References

See [http.c](#) in Rserve

---

|                |                                       |
|----------------|---------------------------------------|
| CORSMiddleware | <i>Creates CORS middleware object</i> |
|----------------|---------------------------------------|

---

### Description

Adds CORS to [Application](#). CORS Middleware out of the box in RestRserve to turn on/off the CORS Headers on preflight validation from the browser.

Cross Origin Resource Sharing is an additional security check done by modern browsers to avoid request between different domains. To allow it RestRserve has easy way to enable your CORS policies. By default CORS policies are disabled. So if any request is coming from a different domain will be blocked by the browser as default because RestRserve will not send the headers required by the browser to allow cross site resource sharing. You can change this easily just by providing CORSMiddleware as middleware to the [Application](#).

### Super class

[RestRserve::Middleware](#) -> CORSMiddleware

### Methods

#### Public methods:

- [CORSMiddleware\\$new\(\)](#)
- [CORSMiddleware\\$clone\(\)](#)

**Method new():** Creates CORS middleware object

*Usage:*

```
CORSMiddleware$new(routes = "/", match = "partial", id = "CORSMiddleware")
```

*Arguments:*

routes Routes paths to protect.

match How routes will be matched: exact or partial (as prefix).

id Middleware id.

**Method clone():** The objects of this class are cloneable with this method.

*Usage:*

```
CORSMiddleware$clone(deep = FALSE)
```

*Arguments:*

deep Whether to make a deep clone.

### References

[MDN](#)

**See Also**

[Middleware Application](#)

**Examples**

```
app = Application$new(middleware = list(CORSMiddleware$new()))
app$add_post(path = "/hello", FUN = function(req, res) {
  res$set_body("Hello from RestRserve!")
})
app$add_route("/hello", method = "OPTIONS", FUN = function(req, res) {
  res$set_header("Allow", "POST, OPTIONS")
})
req = Request$new(
  path = "/hello",
  headers = list("Access-Control-Request-Method" = "POST"),
  method = "OPTIONS"
)
app$process_request(req)
```

---

EncodeDecodeMiddleware

*Creates EncodeDecodeMiddleware middleware object*

---

**Description**

Controls how RestRserve encodes and decodes different content types. **This middleware is passed by default to the [Application](#) constructor.**

**Super class**

[RestRserve::Middleware](#) -> EncodeDecodeMiddleware

**Public fields**

`ContentHandlers` Class which controls how RestRserve encodes and decodes different content types. See [ContentHandlers](#) for documentation. User can add new encoding and decoding methods for new content types using `set_encode` and `set_decode` methods. In theory user can replace it with his own class (see `RestRserve:::ContentHandlersFactory`). However we believe that in the majority of the cases using [ContentHandlers](#) will be enough.

**Methods****Public methods:**

- [EncodeDecodeMiddleware\\$new\(\)](#)
- [EncodeDecodeMiddleware\\$clone\(\)](#)

**Method** `new()`: Creates EncodeDecodeMiddleware middleware object.



*Usage:*

```
EncodeDecodeMiddleware$new(id = "EncodeDecodeMiddleware")
```

*Arguments:*

id Middleware id.

**Method** clone(): The objects of this class are cloneable with this method.

*Usage:*

```
EncodeDecodeMiddleware$clone(deep = FALSE)
```

*Arguments:*

deep Whether to make a deep clone.

**See Also**

[Middleware Application ContentHandlers](#)

---

|                |                                       |
|----------------|---------------------------------------|
| ETagMiddleware | <i>Creates ETag middleware object</i> |
|----------------|---------------------------------------|

---

**Description**

Adds ETag to an [Application](#).

ETags are header information that enable the caching of content. If enabled, RestRserve will return an ETag (eg a hash of a file) alongside the last time it was modified. When a request is sent, additional headers such as *If-None-Match*, *If-Match*, *If-Modified-Since*, and *If-Unmodified-Since*, can be passed to the server as well.

If the conditions are met (different hash in case of a *If-None-Match* header or a later file modification in case of a given *If-Modified-Since* header), the server does not send the requested file but returns a *304* status code, indicating, that the data on the requesting device is up-to-date.

Note that if both headers are provided, the *If-None-Match* header takes precedence.

Furthermore, the middleware also supports the headers *If-Match*, which returns the object if the hash matches (it also supports "\*" to always return the file), as well as *If-Unmodified-Since*, which returns the object if it has not been modified since a certain time. If the conditions are not met, a *412* status code is returned (Precondition Failed). See examples below.

**Super class**

[RestRserve::Middleware](#) -> EtagMiddleware

**Public fields**

hash\_function Function that takes an object or file and computes the hash of it

last\_modified\_function Function that takes an object or file and computes the last time it was modified

**Methods****Public methods:**

- [ETagMiddleware\\$new\(\)](#)
- [ETagMiddleware\\$clone\(\)](#)

**Method** `new()`: Creates ETag middleware object

*Usage:*

```
ETagMiddleware$new(
  routes = "/",
  match = "partial",
  id = "ETagMiddleware",
  hash_function = function(body) {
    if ("file" %in% names(body)) {

      digest::digest(file = body[["file"]], algo = "crc32")
    }
    else {

      digest::digest(body, algo = "crc32")
    }
  },
  last_modified_function = function(body) {
    if ("file" %in% names(body)) {

      as.POSIXlt(file.info(body[["file"]])[["mtime"]], tz = "GMT")
    }
    else {

      as.POSIXlt(Sys.time(), tz = "GMT")
    }
  }
)
```

*Arguments:*

`routes` Routes paths to protect.

`match` How routes will be matched: exact or partial (as prefix).

`id` Middleware id.

`hash_function` a function that generates the ETag hash. The function takes the body of the response and returns a single character. Default is `crc32` using [digest::digest](#).

`last_modified_function` a function that takes the body of the response and returns the last time this was changed. The default is to take the `mtime` (last time the file was modified) if it's a file, if the body does not contain a file, the current time is returned (resulting in no caching)

**Method** `clone()`: The objects of this class are cloneable with this method.

*Usage:*

```
ETagMiddleware$clone(deep = FALSE)
```

*Arguments:*

deep Whether to make a deep clone.

**References**

[MDN](#)

**See Also**

[Middleware Application](#)

**Examples**

```
#####
# setup a static directory with ETag caching

static_dir = file.path(tempdir(), "static")
if (!dir.exists(static_dir)) dir.create(static_dir)

file_path = file.path(static_dir, "example.txt")
writeLines("Hello World", file_path)

# get the time the file was last modified in UTC time
last_modified = as.POSIXlt(file.info(file_path)[["mtime"]], tz = "UTC")
file_hash = digest::digest(file = file_path, algo = "crc32")

time_fmt = "%a, %d %b %Y %H:%M:%S GMT"

#####
# setup the Application with the ETag Middleware
app = Application$new()
app$append_middleware(ETagMiddleware$new())
app$add_static(path = "/", static_dir)

#####
# Example Requests

# Request the file returns the file with ETag headers
req = Request$new(path = "/example.txt")
# note that it also returns the Last-Modified and ETag headers
app$process_request(req)

# provide matching hash of the file in the If-None-Match header to check Etag
# => 304 Not Modified (Can be cached)
req = Request$new(path = "/example.txt",
                  headers = list("If-None-Match" = file_hash))
# note status_code 304 Not Modified
```

```

app$process_request(req)

# provide a wrong hash, returns the file normally
req = Request$new(path = "/example.txt",
                  headers = list("If-None-Match" = "WRONG HASH"))
app$process_request(req)

# alternatively, you can provide a timestamp in the If-Modified-Since header
# => 304 Not Modified (Can be cached)
modified_since = format(last_modified + 1, time_fmt)
req = Request$new(path = "/example.txt",
                  headers = list("If-Modified-Since" = modified_since))
app$process_request(req)

# provide both headers: If-None-Match takes precedence
# in this case:
# - if none match => modified (No cache)
# - if modified since => NOT MODIFIED (cached)
# => Overall: modified = no cache
modified_since = format(last_modified + 1, time_fmt)
req = Request$new(path = "/example.txt",
                  headers = list("If-None-Match" = "CLEARLY WRONG",
                                "If-Modified-Since" = modified_since))
app$process_request(req)

# provide matching hash of the file in the If-Match header to check Etag
# => 412 Precondition Failed
req = Request$new(path = "/example.txt",
                  headers = list("If-Match" = "OTHER HASH"))
# note status_code 412 Precondition Failed
app$process_request(req)

# Use If-Unmodified-Since
unmodified_since = format(last_modified - 1, time_fmt)
req = Request$new(path = "/example.txt",
                  headers = list("If-Unmodified-Since" = unmodified_since)
)
# note status_code 412 Precondition Failed
app$process_request(req)

#####

# use an alternative hash function (use name of the file)
hash_on_filename = function(x) x
# also use an alternate last_modified time function
always_1900 = function(x) as.POSIXlt("1900-01-01 12:34:56", tz = "GMT")

```

```
# setup the app again
app = Application$new(middleware = list(
  ETagMiddleware$new(hash_function = hash_on_filename,
                    last_modified_function = always_1900)
))
app$add_static(path = "/", file_path = static_dir)

# test the requests
req = Request$new(path = "/example.txt")
(res = app$process_request(req))

filename = res$body[["file"]]
req = Request$new(path = "/example.txt",
                  headers = list("If-None-Match" = filename))
app$process_request(req)
```

---

HTTPDate-class

*HTTP Date class*

---

## Description

Conversions between POSIXct to HTTP Date objects.

## Arguments

from                    numeric, POSIXct or HTTPDate object.

## References

[RFC7231 MDN](#)

## Examples

```
# convert POSIXct to HTTP date string
as(0, "HTTPDate") # Thu, 01 Jan 1970 00:00:00 GMT
as(Sys.time(), "HTTPDate")
# parse HTTP date string to POSIXct
dt = "Thu, 01 Jan 1970 00:00:00 GMT"
class(dt) = "HTTPDate"
as(dt, "POSIXct")
```

**Description**

request and reponse placeholders for IDE hints

**Usage**

.req

.res

**Format**

An object of class Request (inherits from R6) of length 28.

An object of class Response (inherits from R6) of length 26.

**See Also**

[Request Response](#)

**Examples**

```
library(RestRserve)

app = Application$new()

app$add_get("/foo", FUN = function(.req, .res) {
  # since .res is a dummy instance of Response class
  # exported by RestRserve
  # IDE facilitates with autocompletion!
  .res$set_body("bar")
  # in the same time all the modifications happen with local objects
  # so you get right results in the end
})

response = app$process_request(Request$new(path = "/foo"))
response$body
```

---

Logger

*Simple logging utility*

---

## Description

Creates Logger object which can be used for logging with different level of verbosity. Log messages are in JSON format.

## Methods

### Public methods:

- [Logger\\$new\(\)](#)
- [Logger\\$set\\_name\(\)](#)
- [Logger\\$set\\_log\\_level\(\)](#)
- [Logger\\$set\\_printer\(\)](#)
- [Logger\\$trace\(\)](#)
- [Logger\\$debug\(\)](#)
- [Logger\\$info\(\)](#)
- [Logger\\$warn\(\)](#)
- [Logger\\$error\(\)](#)
- [Logger\\$fatal\(\)](#)
- [Logger\\$clone\(\)](#)

**Method new():** Creates Logger object.

*Usage:*

```
Logger$new(  
  level = c("info", "fatal", "error", "warn", "debug", "trace", "off", "all"),  
  name = "ROOT",  
  printer = NULL  
)
```

*Arguments:*

level Log level. Allowed values: info, fatal, error, warn, debug, trace, off, all.

name Logger name.

printer Logger with sink defined by printer function. It should have signature `function(timestamp, level, logge`  
By default when printer = NULL logger writes message in JSON format to stdout.

**Method set\_name():** Sets logger name.

*Usage:*

```
Logger$set_name(name = "ROOT")
```

*Arguments:*

name Logger name.

**Method set\_log\_level():** Sets log level.

*Usage:*

```
Logger$set_log_level(  
  level = c("info", "fatal", "error", "warn", "debug", "trace", "off", "all")  
)
```

*Arguments:*

level Log level. Allowed values: info, fatal, error, warn, debug, trace, off, all.

**Method** set\_printer(): Sets function which defines how to print logs.

*Usage:*

```
Logger$set_printer(FUN = NULL)
```

*Arguments:*

FUN Printer function. Should be a function with 6 formal arguments: timestamp, level, logger\_name, pid, message.

**Method** trace(): Write trace message.

*Usage:*

```
Logger$trace(msg, ...)
```

*Arguments:*

msg Log message.  
... Additional params.

**Method** debug(): Write debug message.

*Usage:*

```
Logger$debug(msg, ...)
```

*Arguments:*

msg Log message.  
... Additional params.

**Method** info(): Write information message.

*Usage:*

```
Logger$info(msg, ...)
```

*Arguments:*

msg Log message.  
... Additional params.

**Method** warn(): Write warning message.

*Usage:*

```
Logger$warn(msg, ...)
```

*Arguments:*

msg Log message.  
... Additional params.

**Method** error(): Write error message.



*Usage:*`Logger$error(msg, ...)`*Arguments:*

`msg` Log message.  
... Additional params.

**Method** `fatal()`: Write fatal error message.

*Usage:*`Logger$fatal(msg, ...)`*Arguments:*

`msg` Log message.  
... Additional params.

**Method** `clone()`: The objects of this class are cloneable with this method.

*Usage:*`Logger$clone(deep = FALSE)`*Arguments:*

`deep` Whether to make a deep clone.

**See Also**

[lgr::Logger](#)

**Examples**

```
# init logger
logger = Logger$new("info")
# write info message
logger$info("hello world")
# write extended log entry
logger$info("", context = list(message = "hello world", code = 0L))
```

---

Middleware

*Creates middleware object*

---

**Description**

Creates Middleware object.

Middleware is a very useful concept which allows to perform preprocessing of requests and post-processing of responses. Middleware has an access to both request and response objects and can modify them. This way each request can be checked/modified before passing handler and response can be post processed (for example this way we developer can set up custom error messages).

**Public fields**

`process_request` Function which takes 2 arguments - request and response objects (class [Request](#) and [Response](#) correspondingly) and modify request and response or throw exception using [HTTPError](#) helper.

Function is called before request is routed to handler.

Usually `process_request` is used to perform logging, check authorization, etc.

`process_response` Function which takes 2 arguments - request and response objects (class [Request](#) and [Response](#) correspondingly) and modify request and response or throw exception using [HTTPError](#) helper.

Function is called after request is processed by handler. Usually `process_response` is used to perform logging, custom error handling, etc.

`id` Middleware id.

**Methods****Public methods:**

- [Middleware\\$new\(\)](#)
- [Middleware\\$clone\(\)](#)

**Method** `new()`: Creates middleware object

*Usage:*

```
Middleware$new(
  process_request = function(request, response) TRUE,
  process_response = function(request, response) TRUE,
  id = "Middleware"
)
```

*Arguments:*

`process_request` Modify request or response objects or throw exception using [\[HTTPError\]](#) helper. This function evaluate before router handler called.

`process_response` Modify request or response objects or throw exception using [\[HTTPError\]](#) helper. This function evaluate after router handler called.

`id` Middleware id.

**Method** `clone()`: The objects of this class are cloneable with this method.

*Usage:*

```
Middleware$clone(deep = FALSE)
```

*Arguments:*

`deep` Whether to make a deep clone.

**See Also**

[Request Response Application](#)

---

|       |                                      |
|-------|--------------------------------------|
| raise | <i>Interrupts request processing</i> |
|-------|--------------------------------------|

---

### Description

Interrupts request processing and signals RestRserve to return HTTPError

### Usage

```
raise(x)
```

### Arguments

x instance of [Response](#). Can be created using [HTTPError](#). see examples.

### Value

None - stops execution of the current expression and executes an error action.

### See Also

[HTTPError Application](#)

### Examples

```
# catch exception
res = try(raise(HTTPError$bad_request()), silent = TRUE)
cond = attr(res, "condition")
# response is a valid Response instace
identical(cond$response$body$error, "400 Bad Request")
```

---

|         |                               |
|---------|-------------------------------|
| Request | <i>Creates Request object</i> |
|---------|-------------------------------|

---

### Description

Called internally for handling incoming requests from Rserve side. Also useful for testing.

### Public fields

path Request path.

method Request HTTP method.

headers Request headers.

cookies Request cookies.

context Environment to store any data. Can be used in middlewares.

content\_type Request body content type.

body Request body.

parameters\_query Request query parameters.

parameters\_body Request body parameters.

parameters\_path List of parameters extracted from templated path after routing. For example if we have some handler listening at `/job/{job_id}` and we are receiving request at `/job/1` then `parameters_path` will be `list(job_id = "1")`.

It is important to understand that `parameters_path` will be available (not empty) only after request will reach handler.

This effectively means that `parameters_path` can be used inside handler and response middleware (but not request middleware!).

files Structure which contains positions and lengths of files for the multipart body.

decode Function to decode body for the specific content type.

### Active bindings

id Automatically generated UUID for each request. Read only.

date Request Date header converted to POSIXct.

accept Splitted Accept request header.

accept\_json Request accepts JSON response.

accept\_xml Request accepts XML response.

### Methods

#### Public methods:

- [Request\\$new\(\)](#)
- [Request\\$set\\_id\(\)](#)
- [Request\\$reset\(\)](#)
- [Request\\$get\\_header\(\)](#)
- [Request\\$get\\_param\\_query\(\)](#)
- [Request\\$get\\_param\\_body\(\)](#)
- [Request\\$get\\_param\\_path\(\)](#)
- [Request\\$get\\_file\(\)](#)
- [Request\\$print\(\)](#)
- [Request\\$clone\(\)](#)

**Method** `new()`: Creates Request object

*Usage:*

```
Request$new(
  path = "/",
  method = c("GET", "HEAD", "POST", "PUT", "DELETE", "CONNECT", "OPTIONS", "TRACE",
    "PATCH"),
  parameters_query = list(),
  parameters_body = list(),
  headers = list(),
  body = NULL,
  cookies = list(),
  content_type = NULL,
  decode = NULL,
  ...
)
```

*Arguments:*

`path` Character with requested path. Always starts with `/`.

`method` Request HTTP method.

`parameters_query` A named list with URL decoded query parameters.

`parameters_body` A named list with URL decoded body parameters. This field is helpful when request is a urlencoded form or a multipart form.

`headers` Request HTTP headers represented as named list.

`body` Request body. Can be anything and in conjunction with `content_type` defines how HTTP body will be represented.

`cookies` Cookies represented as named list. **Note** that cookies should be provided explicitly - they won't be derived from headers.

`content_type` HTTP content type. **Note** that `content_type` should be provided explicitly - it won't be derived from headers.

`decode` Function to decode body for the specific content type.

... Not used at this moment.

**Method** `set_id()`: Set request id.

*Usage:*

```
Request$set_id(id = uuid::UUIDgenerate(TRUE))
```

*Arguments:*

`id` Request id.

**Method** `reset()`: Resets request object. This is not useful for end user, but useful for RestRserve internals - resetting R6 class is much faster than initialize it.

*Usage:*

```
Request$reset()
```

**Method** `get_header()`: Get HTTP response header value. If requested header is empty returns default.

*Usage:*

```
Request$get_header(name, default = NULL)
```

*Arguments:*

name Header field name.

default Default value if header does not exists.

*Returns:* Header field values (character string).

**Method** `get_param_query()`: Get request query parameter by name.

*Usage:*

```
Request$get_param_query(name)
```

*Arguments:*

name Query parameter name.

*Returns:* Query parameter value (character string).

**Method** `get_param_body()`: Get request body parameter by name.

*Usage:*

```
Request$get_param_body(name)
```

*Arguments:*

name Body field name.

*Returns:* Body field value.

**Method** `get_param_path()`: Get templated path parameter by name.

*Usage:*

```
Request$get_param_path(name)
```

*Arguments:*

name Path parameter name.

*Returns:* Path parameter value.

**Method** `get_file()`: Extract specific file from multipart body.

*Usage:*

```
Request$get_file(name)
```

*Arguments:*

name Body file name.

*Returns:* Raw vector with `filename` and `content-type` attributes.

**Method** `print()`: Print method.

*Usage:*

```
Request$print()
```

**Method** `clone()`: The objects of this class are cloneable with this method.

*Usage:*

```
Request$clone(deep = FALSE)
```

*Arguments:*

deep Whether to make a deep clone.

**See Also**[Response Application](#)**Examples**

```

# init simply request
rq = Request$new(
  path = "/",
  parameters_query = list(
    "param1" = "value1",
    "param2" = "value2"
  ),
  headers = list(
    "Content-encoding" = "identity",
    "Custom-field" = "value"
  ),
  cookies = list(
    "sessionId" = "1"
  )
)
# get request UUID
rq$id
# get content accept
rq$accept
# get request content type
rq$content_type
# get header by name (lower case)
rq$get_header("custom-field")
# get query param by name
rq$get_param_query("param1")
# print request
rq

```

Response

*Creates Response object***Description**

Creates response object.

**Public fields**

body Response body.

If it is a named character with a name `file` or `tmpfile` then the value is considered as a path to a file and content of this file is served as body. The latter will be deleted once served.

content\_type Response body content (media) type. Will be translated to Content-type header.

headers Response headers.

status\_code Response HTTP status code.  
 cookies Response cookies. Will be translated to Set-Cookie headers.  
 context Environment to store any data. Can be used in middlewares.  
 encode Function to encode body for specific content.

### Active bindings

status Paste together status code and description.

### Methods

#### Public methods:

- [Response\\$new\(\)](#)
- [Response\\$reset\(\)](#)
- [Response\\$set\\_content\\_type\(\)](#)
- [Response\\$set\\_status\\_code\(\)](#)
- [Response\\$has\\_header\(\)](#)
- [Response\\$get\\_header\(\)](#)
- [Response\\$set\\_header\(\)](#)
- [Response\\$delete\\_header\(\)](#)
- [Response\\$append\\_header\(\)](#)
- [Response\\$set\\_date\(\)](#)
- [Response\\$unset\\_date\(\)](#)
- [Response\\$set\\_cookie\(\)](#)
- [Response\\$unset\\_cookie\(\)](#)
- [Response\\$set\\_body\(\)](#)
- [Response\\$set\\_response\(\)](#)
- [Response\\$print\(\)](#)
- [Response\\$clone\(\)](#)

**Method new():** Creates Response object

*Usage:*

```
Response$new(
  body = NULL,
  content_type = "text/plain",
  headers = list(Server = getOption("RestRserve.headers.server")),
  status_code = 200L,
  encode = NULL,
  ...
)
```

*Arguments:*

body Response body.  
 content\_type Response body content (media) type.  
 headers Response headers.



`status_code` Response status code.  
`encode` Function to encode body for specific content.  
... Not used at this moment.

**Method** `reset()`: Resets response object. This is not useful for end user, but useful for RestRserve internals - resetting R6 class is much faster then initialize it.

*Usage:*

```
Response$reset()
```

**Method** `set_content_type()`: Set content type for response body.

*Usage:*

```
Response$set_content_type(content_type = "text/plain")
```

*Arguments:*

`content_type` Response body content (media) type.

**Method** `set_status_code()`: Set HTTP status code for response. See [docs on MDN](#).

*Usage:*

```
Response$set_status_code(code)
```

*Arguments:*

`code` Status code as integer number.

**Method** `has_header()`: Determine whether or not the response header exists.

*Usage:*

```
Response$has_header(name)
```

*Arguments:*

`name` Header field name.

*Returns:* Logical value.

**Method** `get_header()`: Get HTTP response header value. If requested header is empty returns default.

*Usage:*

```
Response$get_header(name, default = NULL)
```

*Arguments:*

`name` Header field name.

`default` Default value if header does not exists.

*Returns:* Header field values (character string).

**Method** `set_header()`: Set HTTP response header. Content-type and Content-length headers not allowed (use `content_type` field instead).

*Usage:*

```
Response$set_header(name, value)
```

*Arguments:*

`name` Header field name.

value Header field value.

**Method** `delete_header()`: Unset HTTP response header.

*Usage:*

```
Response$delete_header(name)
```

*Arguments:*

name Header field name.

*Returns:* Logical value.

**Method** `append_header()`: Append HTTP response header. If header exists , separator will be used. Don't use this method to set cookie (use `set_cookie` method instead).

*Usage:*

```
Response$append_header(name, value)
```

*Arguments:*

name Header field name.

value Header field value.

**Method** `set_date()`: Set Date HTTP header. See [docs on MDN](#).

*Usage:*

```
Response$set_date(dtm = Sys.time())
```

*Arguments:*

dtm POSIXct value.

**Method** `unset_date()`: Unset Date HTTP header.

*Usage:*

```
Response$unset_date()
```

*Returns:* Logical value.

**Method** `set_cookie()`: Set cookie. See [docs on MDN](#).

*Usage:*

```
Response$set_cookie(  
  name,  
  value,  
  expires = NULL,  
  max_age = NULL,  
  domain = NULL,  
  path = NULL,  
  secure = NULL,  
  http_only = NULL  
)
```

*Arguments:*

name Cookie name.

value Cookie value.

expires Cookie expires date and time (POSIXct).

max\_age Max cookie age (integer).  
domain Cookie domain.  
path Cookie path.  
secure Cookie secure flag.  
http\_only Cookie HTTP only flag.

**Method** unset\_cookie(): Unset cookie with given name.

*Usage:*

```
Response$unset_cookie(name)
```

*Arguments:*

name Cookie name.

*Returns:* Logical value.

**Method** set\_body(): Set response body.

*Usage:*

```
Response$set_body(body)
```

*Arguments:*

body Response body.

**Method** set\_response(): Set response fields.

*Usage:*

```
Response$set_response(  
  status_code,  
  body = NULL,  
  content_type = self$content_type  
)
```

*Arguments:*

status\_code Response HTTP status code.

body Response body.

content\_type content\_type Response body content (media) type.

**Method** print(): Print method.

*Usage:*

```
Response$print()
```

**Method** clone(): The objects of this class are cloneable with this method.

*Usage:*

```
Response$clone(deep = FALSE)
```

*Arguments:*

deep Whether to make a deep clone.

## See Also

[Request Application](#)

**Examples**

```

# init response
rs = Response$new()
# set body media type
rs$set_content_type("text/plain")
# set body content
rs$set_body("OK")
# set response status code
rs$set_status_code(200L)
# print response
rs

# init response
rs = Response$new()
# static file path
file_path = system.file("DESCRIPTION", package = "RestRserve")
# get last file modification timestamp
file_mtime = file.mtime(file_path)
# set body
rs$set_body(c("file" = file_path))
# set content type
rs$set_content_type("text/plain")
# set current timestamp
rs$set_date()
# set 'last-modified' header
rs$set_header("Last-Modified", as(file_mtime, "HTTPDate"))
# print response
rs

```

---

to\_json

*Simple JSON encoder*


---

**Description**

Encode R objects as JSON. Wrapper around `jsonlite::toJSON` with default parameters set to following values: `dataframe = 'columns'`, `auto_unbox = unbox`, `null = 'null'`, `na = 'null'`.

**Usage**

```
to_json(x, unbox = TRUE)
```

**Arguments**

|                    |  |
|--------------------|--|
| <code>x</code>     | the object to be encoded   |
| <code>unbox</code> | TRUE by default. Whether to unbox (simplify) arrays consists of a single element |

**Value**

JSON string

**Examples**

```
to_json(NULL)
to_json(list(name = "value"))
```

# Index

- \* **AuthBackend**
  - AuthBackendBasic, [9](#)
  - AuthBackendBearer, [10](#)
  - AuthMiddleware, [12](#)
- \* **datasets**
  - IDE-hints, [22](#)
  - .req (IDE-hints), [22](#)
  - .res (IDE-hints), [22](#)
- Application, [2](#), [12](#), [13](#), [15–17](#), [19](#), [26](#), [27](#), [31](#), [35](#)
- ApplicationProcess, [8](#), [14](#)
- AuthBackend, [10](#), [11](#), [13](#)
- AuthBackendBasic, [9](#), [11](#), [13](#)
- AuthBackendBearer, [10](#), [10](#), [13](#)
- AuthMiddleware, [10](#), [11](#), [12](#)
- BackendRserve, [13](#)
- ContentHandlers, [16](#), [17](#)
- CORSMiddleware, [15](#)
- digest::digest, [18](#)
- EncodeDecodeMiddleware, [16](#)
- ETagMiddleware, [17](#)
- HTTPDate-class, [21](#)
- HTTPError, [3](#), [6](#), [26](#), [27](#)
- IDE-hints, [22](#)
- lgr::Logger, [25](#)
- Logger, [23](#)
- Middleware, [3](#), [6](#), [13](#), [16](#), [17](#), [19](#), [25](#)
- raise, [27](#)
- raise(), [4](#), [5](#)
- Request, [4–6](#), [9–11](#), [14](#), [22](#), [26](#), [27](#), [35](#)
- Response, [4–6](#), [9–11](#), [14](#), [22](#), [26](#), [27](#), [31](#), [31](#)
- RestRserve::AuthBackend, [9](#), [10](#)
- RestRserve::Backend, [13](#)
- RestRserve::Middleware, [12](#), [15–17](#)
- stop(), [4](#), [5](#)
- to\_json, [36](#)