

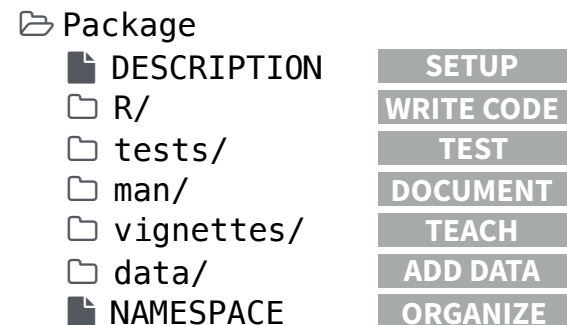
# Package Development: : CHEAT SHEET



## Package Structure

A package is a convention for organizing files into directories.

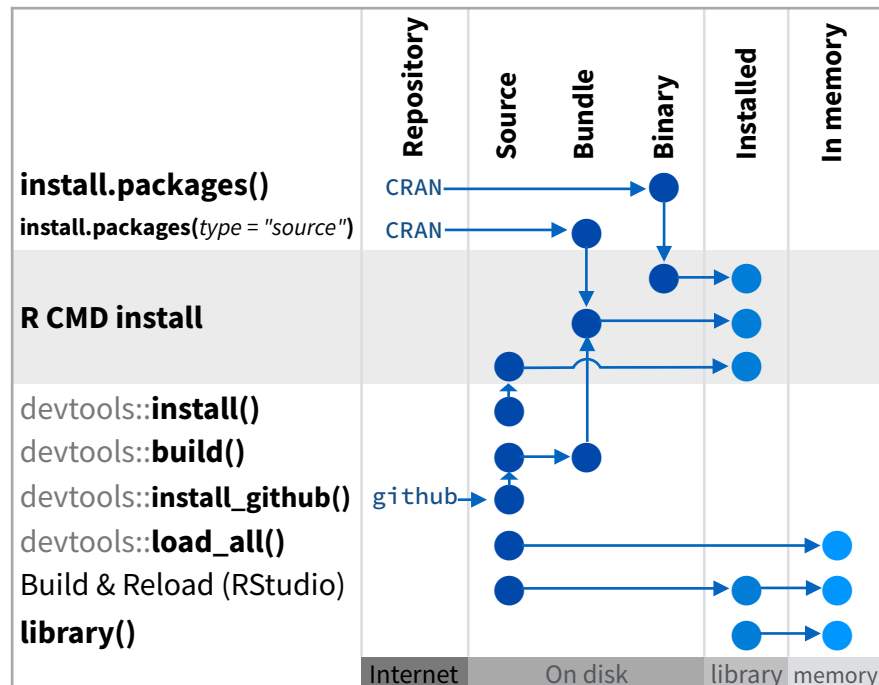
This sheet shows how to work with the 7 most common parts of an R package:



The contents of a package can be stored on disk as a:

- **source** - a directory with sub-directories (as above)
- **bundle** - a single compressed file (.tar.gz)
- **binary** - a single compressed file optimized for a specific OS

Or installed into an R library (loaded into memory during an R session) or archived online in a repository. Use the functions below to move between these states.



`devtools::use_build_ignore("file")`

Adds file to .Rbuildignore, a list of files that will not be included when package is built.



## Setup (DESCRIPTION)

The `DESCRIPTION` file describes your work, sets up how your package will work with other packages, and applies a copyright.

- ✓ You must have a `DESCRIPTION` file
- ✓ Add the packages that yours relies on with `devtools::use_package()`  
Adds a package to the Imports or Suggests field

CC0	MIT	GPL-2
No strings attached.	MIT license applies to your code if re-shared.	GPL-2 license applies to your code, and all code anyone bundles with it, if re-shared.

## Write Code (R/)

All of the R code in your package goes in `R/`. A package with just an `R/` directory is still a very useful package.

- ✓ Create a new package project with `devtools::create("path/to/name")`  
Create a template to develop into a package.
- ✓ Save your code in `R/` as scripts (extension `.R`)

### WORKFLOW

1. Edit your code.
2. Load your code with one of  
`devtools::load_all()`  
Re-loads all saved files in `R/` into memory.  
**Ctrl/Cmd + Shift + L** (keyboard shortcut)  
Saves all open files then calls `load_all()`.
3. Experiment in the console.
4. Repeat.

- Use consistent style with [r-pkgs.had.co.nz/r.html#style](http://r-pkgs.had.co.nz/r.html#style)
- Click on a function and press **F2** to open its definition
- Search for a function with **Ctrl + .**



Visit [r-pkgs.had.co.nz](http://r-pkgs.had.co.nz) to learn much more about writing and publishing packages for R

```
Package: mypackage
Title: Title of Package
Version: 0.1.0
Authors@R: person("Hadley", "Wickham", email = "hadley@me.com", role = c("aut", "cre"))
Description: What the package does (one paragraph)
Depends: R (>= 3.1.0)
License: GPL-2
LazyData: true
Imports:
  dplyr (>= 0.4.0),
  ggvis (>= 0.2)
Suggests:
  knitr (>= 0.1.0)
```

**Import** packages that your package *must have* to work. R will install them when it installs your package.

**Suggest** packages that are not very essential to yours. Users can install them manually, or not, as they like.

## Test (tests/)

Use `tests/` to store tests that will alert you if your code breaks.

- ✓ Add a `tests/` directory
- ✓ Import `testthat` with `devtools::use_testthat()`, which sets up package to use automated tests with `testthat`
- ✓ Write tests with `context()`, `test()`, and expect statements
- ✓ Save your tests as `.R` files in `tests/testthat/`

### WORKFLOW

1. Modify your code or tests.
2. Test your code with one of  
`devtools::test()`  
Runs all tests in `tests/`  
**Ctrl/Cmd + Shift + T** (keyboard shortcut)
3. Repeat until all tests pass

### Example Test

```
context("Arithmetic")
test_that("Math works", {
  expect_equal(1 + 1, 2)
  expect_equal(1 + 2, 3)
  expect_equal(1 + 3, 4)
})
```

Expect statement	Tests
<code>expect_equal()</code>	is equal within small numerical tolerance?
<code>expect_identical()</code>	is exactly equal?
<code>expect_match()</code>	matches specified string or regular
<code>expect_output()</code>	prints specified output?
<code>expect_message()</code>	displays specified message?
<code>expect_warning()</code>	displays specified warning?
<code>expect_error()</code>	throws specified error?
<code>expect_is()</code>	output inherits from certain class?
<code>expect_false()</code>	returns FALSE?
<code>expect_true()</code>	returns TRUE?



## Document (man/)

man/ contains the documentation for your functions, the help pages in your package.

- ✓ Use roxygen comments to document each function beside its definition
- ✓ Document the name of each exported data set
- ✓ Include helpful examples for each function

### WORKFLOW

1. Add roxygen comments in your .R files
2. Convert roxygen comments into documentation with one of:

`devtools::document()`

Converts roxygen comments to .Rd files and places them in man/. Builds NAMESPACE.

**Ctrl/Cmd + Shift + D** (Keyboard Shortcut)

3. Open help pages with ? to preview documentation
4. Repeat

### .Rd FORMATTING TAGS

<code>\emph{italic text}</code>	<code>\email{name@foo.com}</code>
<code>\strong{bold text}</code>	<code>\href{url}{display}</code>
<code>\code{function(args)}</code>	<code>\url{url}</code>
<code>\pkg{package}</code>	
	<code>\link[=dest]{display}</code>
<code>\dontrun{code}</code>	<code>\linkS4class{class}</code>
<code>\dontshow{code}</code>	<code>\code{\link{function}}</code>
<code>\donttest{code}</code>	<code>\code{\link{package}{function}}</code>
<code>\deqn{a + b (block)}</code>	<code>\tabular{lcr}{</code>
<code>\eqn{a + b (inline)}</code>	<code>left \tab centered \tab right \cr</code>
	<code>cell \tab cell \tab cell \cr</code>
	<code>}</code>

## Teach (vignettes/)

vignettes/ holds documents that teach your users how to solve real problems with your tools.

- ✓ Create a vignettes/ directory and a template vignette with `devtools::use_vignette()`  
Adds template vignette as vignettes/my-vignette.Rmd.
- ✓ Append YAML headers to your vignettes (like right)
- ✓ Write the body of your vignettes in R Markdown ([rmarkdown.rstudio.com](http://rmarkdown.rstudio.com))

### ROXYGEN2

The **roxygen2** package lets you write documentation inline in your .R files with a shorthand syntax. devtools implements roxygen2 to make documentation.



- Add roxygen documentation as comment lines that begin with #'.
- Place comment lines directly above the code that defines the object documented.
- Place a roxygen @ tag (right) after #' to supply a specific section of documentation.
- Untagged lines will be used to generate a title, description, and details section (in that order)

```
##' Add together two numbers.
##'
##' @param x A number.
##' @param y A number.
##' @return The sum of \code{x} and \code{y}.
##' @examples
##' add(1, 1)
##' @export
add <- function(x, y) {
  x + y
}
```

### COMMON ROXYGEN TAGS

@aliases	@inheritParams	@seealso	
@concepts	@keywords	@format	
@describeIn	@param	@source	data
@examples	@rdname	@include	
@export	@return	@slot	S4
@family	@section	@field	RC

## Add Data (data/)

The data/ directory allows you to include data with your package.

- ✓ Save data as .Rdata files (suggested)
- ✓ Store data in one of **data/**, **R/Sysdata.rda**, **inst/extdata**
- ✓ Always use **LazyData: true** in your DESCRIPTION file.

`devtools::use_data()`

Adds a data object to data/  
(R/Sysdata.rda if **internal = TRUE**)

`devtools::use_data_raw()`

Adds an R Script used to clean a data set to data-raw/.  
Includes data-raw/ on .Rbuildignore.

Store data in

- **data/** to make data available to package users
- **R/sysdata.rda** to keep data internal for use by your functions.
- **inst/extdata** to make raw data available for loading and parsing examples. Access this data with **system.file()**

## Organize (NAMESPACE)

The NAMESPACE file helps you make your package self-contained: it won't interfere with other packages, and other packages won't interfere with it.

- ✓ Export functions for users by placing **@export** in their roxygen comments
- ✓ Import objects from other packages with **package::object** (recommended) or **@import**, **@importFrom**, **@importClassesFrom**, **@importMethodsFrom** (not always recommended)

### WORKFLOW

1. Modify your code or tests.
2. Document your package (`devtools::document()`)
3. Check NAMESPACE
4. Repeat until NAMESPACE is correct

### SUBMIT YOUR PACKAGE

[r-pkgs.had.co.nz/release.html](http://r-pkgs.had.co.nz/release.html)