Package Development

with devtools Cheat Sheet

RStudio

Package Structure

A package is a convention for organizing files into directories.

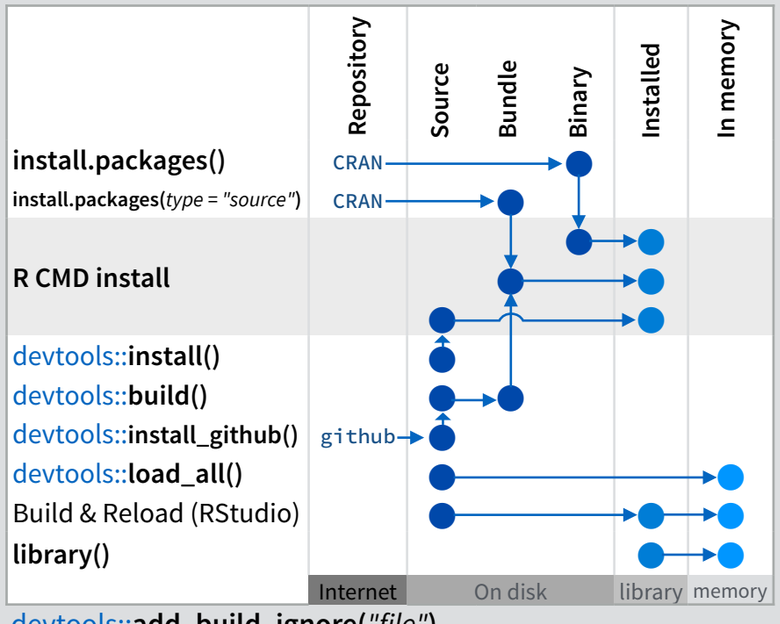
This sheet shows how to work with the 7 most common parts of an R package:

```
Package
  DESCRIPTION   Setup
  R/            Write code
  tests/        Test
  man/          Document
  vignettes/    Teach
  data/         Add data
  NAMESPACE     Organize
```

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::**add_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 and sets up how your package will work with other packages.

- You must have a DESCRIPTION file
- Add the packages that yours relies on with

devtools::**use_package()**

Adds a package to the Imports field (or Suggests field (if second argument is "Suggests").

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.

```
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.

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**
- Click on a function and press **F2** to open its definition
- Search for a function with **Ctrl + .**

Visit **r-pkgs.had.co.nz** for more

Learn more at http://r-pkgs.had.co.nz • devtools 1.6.1 • Updated: 1/15

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Test (tests/)

Use tests/ to store unit tests that will inform you if your code ever breaks.

- Add a **tests/** directory and import **testthat** with

devtools::**use_testthat()**

Sets up package to use automated tests with testthat

- Write tests with **context()**, **test()**, and expectations
- 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 *saved* 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_equal()	is equal within small numerical tolerance?
expect_identical()	is exactly equal?
expect_match()	matches specified string or regular expression?
expect_output()	prints specified output?
expect_message()	displays specified message?
expect_warning()	displays specified warning?
expect_error()	throws specified error?
expect_is()	output inherits from certain class?
expect_false()	returns FALSE?
expect_true()	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

```
\emph{italic text}
\strong{bold text}
\code{function(args)}
\pkg{package}

\dontrun{code}
\dontshow{code}
\donttest{code}

\deqn{a + b (block)}
\eqn{a + b (inline)}

\email{name@@foo.com}
\href{url}{display}
\url{url}

\link[=dest]{display}
\linkS4class{class}
\code{\link{function}}
\code{\link[package]{function}}

\tabular{lcr}{
  left \tab centered \tab right \cr
  cell \tab cell     \tab cell  \cr
}
```

The **roxygen** package

roxygen lets you write documentation inline in your .R files with a shorthand syntax.

- 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

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)

```
---
title: "Vignette Title"
author: "Vignette Author"
date: "`r Sys.Date()`"
output: rmarkdown::html_vignette
vignette: >
  %\VignetteIndexEntry{Vignette Title}
  %\VignetteEngine{knitr::rmarkdown}
  \usepackage[utf8]{inputenc}
---
```

Add data (data/)

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

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

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