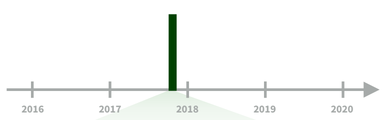
Dates and times with lubridate : : CHEAT SHEET

lubridate

Date-times



2017-11-28 12:00:00

2017-11-28 12:00:00
A **date-time** is a point on the timeline, stored as the number of seconds since 1970-01-01 00:00:00 UTC

*dt <- **as_datetime**(1511870400)*
"2017-11-28 12:00:00 UTC"

2017-11-28
A **date** is a day stored as the number of days since 1970-01-01

*d <- **as_date**(17498)*
"2017-11-28"

12:00:00
An hms is a **time** stored as the number of seconds since 00:00:00

*t <- hms::**as.hms**(85)*
00:01:25

PARSE DATE-TIMES (Convert strings or numbers to date-times)

1. Identify the order of the year (**y**), month (**m**), day (**d**), hour (**h**), minute (**m**) and second (**s**) elements in your data.
2. Use the function below whose name replicates the order. Each accepts a wide variety of input formats.

2017-11-28T14:02:00	**ymd_hms**(), **ymd_hm**(), **ymd_h**(). *ymd_hms("2017-11-28T14:02:00")*
2017-22-12 10:00:00	**ydm_hms**(), **ydm_hm**(), **ydm_h**(). *ydm_hms("2017-22-12 10:00:00")*
11/28/2017 1:02:03	**mdy_hms**(), **mdy_hm**(), **mdy_h**(). *mdy_hms("11/28/2017 1:02:03")*
1 Jan 2017 23:59:59	**dmy_hms**(), **dmy_hm**(), **dmy_h**(). *dmy_hms("1 Jan 2017 23:59:59")*
20170131	**ymd**(), **ydm**(). *ymd(20170131)*
July 4th, 2000	**mdy**(), **myd**(). *mdy("July 4th, 2000")*
4th of July '99	**dmy**(), **dym**(). *dmy("4th of July '99")*
2001: Q3	**yq**() Q for quarter. *yq("2001: Q3")*
2:01	hms::**hms**() Also lubridate::**hms**(), **hm**() and **ms**(), which return periods.* *hms::hms(sec = 0, min= 1, hours = 2)*

2017.5	**date_decimal**(decimal, tz = "UTC") *date_decimal(2017.5)*
	now(tzone = "") Current time in tz (defaults to system tz). *now()*
January	**today**(tzone = "") Current date in a tz (defaults to system tz). *today()*
	fast_strptime() Faster strptime. *fast_strptime('9/1/01', '%y/%m/%d')*
	parse_date_time() Easier strptime. *parse_date_time("9/1/01", "ymd")*

GET AND SET COMPONENTS

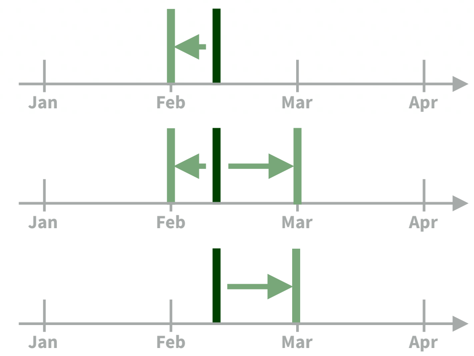
Use an accessor function to get a component.

Assign into an accessor function to change a component in place.

d ## "2017-11-28"
day(d) ## 28
day(d) <- 1
d ## "2017-11-01"

2018-01-31 11:59:59	**date**(x) Date component. *date(dt)*
2018-01-31 11:59:59	**year**(x) Year. *year(dt)* **isoyear**(x) The ISO 8601 year. **epiyear**(x) Epidemiological year.
2018-**01**-31 11:59:59	**month**(x, label, abbr) Month. *month(dt)*
2018-01-**31** 11:59:59	**day**(x) Day of month. *day(dt)* **wday**(x,label,abbr) Day of week. **qday**(x) Day of quarter.
2018-01-31 **11**:59:59	**hour**(x) Hour. *hour(dt)*
2018-01-31 11:**59**:59	**minute**(x) Minutes. *minute(dt)*
2018-01-31 11:59:**59**	**second**(x) Seconds. *second(dt)*
J F M A M J / J A S O N D	**week**(x) Week of the year. *week(dt)* **isoweek**() ISO 8601 week. **epiweek**() Epidemiological week.
J F M A M J / J A S O N D	**quarter**(x, with_year = FALSE) Quarter. *quarter(dt)*
J F M A M J / J A S O N D	**semester**(x, with_year = FALSE) Semester. *semester(dt)*
	am(x) Is it in the am? *am(dt)* **pm**(x) Is it in the pm? *pm(dt)*
	dst(x) Is it daylight savings? *dst(d)*
	leap_year(x) Is it a leap year? *leap_year(d)*
	update(object, ..., simple = FALSE) *update(dt, mday = 2, hour = 1)*

Round Date-times



floor_date(x, unit = "second")
Round down to nearest unit.
floor_date(dt, unit = "month")

round_date(x, unit = "second")
Round to nearest unit.
round_date(dt, unit = "month")

ceiling_date(x, unit = "second", change_on_boundary = NULL)
Round up to nearest unit.
ceiling_date(dt, unit = "month")

rollback(dates, roll_to_first = FALSE, preserve_hms = TRUE)
Roll back to last day of previous month. *rollback(dt)*

Stamp Date-times

stamp() Derive a template from an example string and return a new function that will apply the template to date-times. Also **stamp_date**() and **stamp_time**().

1. Derive a template, create a function
   sf <- stamp("Created Sunday, Jan 17, 1999 3:34")
2. Apply the template to dates
   sf(ymd("2010-04-05"))
   ## [1] "Created Monday, Apr 05, 2010 00:00"

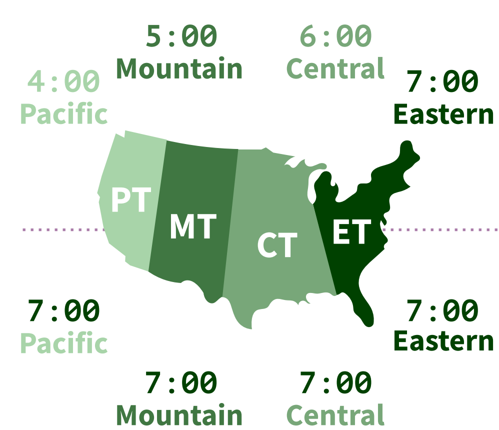
Tip: use a date with day > 12

Time Zones

R recognizes ~600 time zones. Each encodes the time zone, Daylight Savings Time, and historical calendar variations for an area. R assigns *one* time zone per vector.

Use the **UTC** time zone to avoid Daylight Savings.

OlsonNames() Returns a list of valid time zone names. *OlsonNames()*



with_tz(time, tzone = "") Get the **same date-time** in a new time zone (a new clock time). *with_tz(dt, "US/Pacific")*

force_tz(time, tzone = "") Get the **same clock time** in a new time zone (a new date-time). *force_tz(dt, "US/Pacific")*

RStudio

Math with Date-times — Lubridate provides three classes of timespans to facilitate math with dates and date-times

Math with date-times relies on the **timeline**, which behaves inconsistently. Consider how the timeline behaves during:

Periods track changes in clock times, which ignore time line irregularities.

Durations track the passage of physical time, which deviates from clock time when irregularities occur.

Intervals represent specific intervals of the timeline, bounded by start and end date-times.

A normal day
nor <- ymd_hms("2018-01-01 01:30:00",tz="US/Eastern")

nor + minutes(90)

nor + dminutes(90)

interval(nor, nor + minutes(90))

The start of daylight savings (spring forward)
gap <- ymd_hms("2018-03-11 01:30:00",tz="US/Eastern")

gap + minutes(90)

gap + dminutes(90)

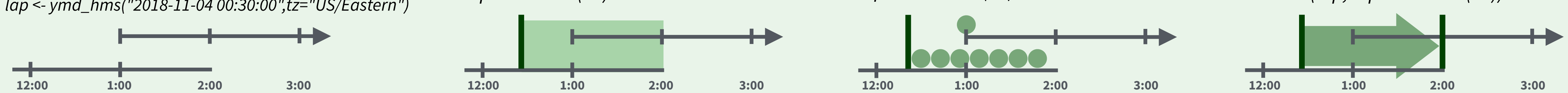
interval(gap, gap + minutes(90))

The end of daylight savings (fall back)
lap <- ymd_hms("2018-11-04 00:30:00",tz="US/Eastern")

lap + minutes(90)

lap + dminutes(90)

interval(lap, lap + minutes(90))

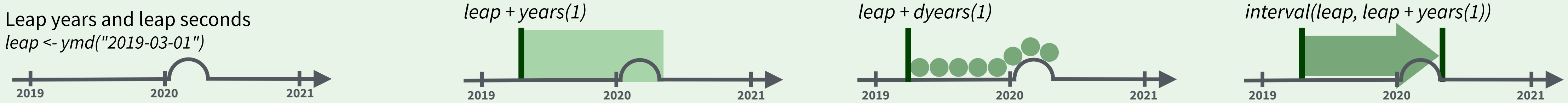


Leap years and leap seconds
leap <- ymd("2019-03-01")

leap + years(1)

leap + dyears(1)

interval(leap, leap + years(1))



Not all years are 365 days due to **leap days**.

Not all minutes are 60 seconds due to **leap seconds**.

It is possible to create an imaginary date by adding **months**, e.g. February 31st

jan31 <- ymd(20180131)
jan31 + months(1)
NA

%m+% and **%m-%** will roll imaginary dates to the last day of the previous month.

jan31 %m+% months(1)
"2018-02-28"

add_with_rollback(e1, e2, roll_to_first = TRUE) will roll imaginary dates to the first day of the new month.

add_with_rollback(jan31, months(1), roll_to_first = TRUE)
"2018-03-01"

PERIODS

Add or subtract periods to model events that happen at specific clock times, like the NYSE opening bell.

Make a period with the name of a time unit ***pluralized***, e.g.

p <- months(3) + days(12)
p
"3m 12d 0H 0M 0S"

Number of months | Number of days | etc.

years(x = 1) x years.
months(x) x months.
weeks(x = 1) x weeks.
days(x = 1) x days.
hours(x = 1) x hours.
minutes(x = 1) x minutes.
seconds(x = 1) x seconds.
milliseconds(x = 1) x milliseconds.
microseconds(x = 1) x microseconds
nanoseconds(x = 1) x nanoseconds.
picoseconds(x = 1) x picoseconds.

period(num = NULL, units = "second", ...) An automation friendly period constructor. *period(5, unit = "years")*

as.period(x, unit) Coerce a timespan to a period, optionally in the specified units. Also **is.period**(). *as.period(i)*

period_to_seconds(x) Convert a period to the "standard" number of seconds implied by the period. Also **seconds_to_period**(). *period_to_seconds(p)*

DURATIONS

Add or subtract durations to model physical processes, like battery life. Durations are stored as seconds, the only time unit with a consistent length. **Difftimes** are a class of durations found in base R.

Make a duration with the name of a period prefixed with a ***d***, e.g.

dd <- ddays(14)
dd
"1209600s (~2 weeks)"

Exact length in seconds | Equivalent in common units

dyears(x = 1) 31536000x seconds.
dweeks(x = 1) 604800x seconds.
ddays(x = 1) 86400x seconds.
dhours(x = 1) 3600x seconds.
dminutes(x = 1) 60x seconds.
dseconds(x = 1) x seconds.
dmilliseconds(x = 1) x × 10^{-3} seconds.
dmicroseconds(x = 1) x × 10^{-6} seconds.
dnanoseconds(x = 1) x × 10^{-9} seconds.
dpicoseconds(x = 1) x × 10^{-12} seconds.

duration(num = NULL, units = "second", ...) An automation friendly duration constructor. *duration(5, unit = "years")*

as.duration(x, …) Coerce a timespan to a duration. Also **is.duration**(), **is.difftime**(). *as.duration(i)*

make_difftime(x) Make difftime with the specified number of units. *make_difftime(99999)*

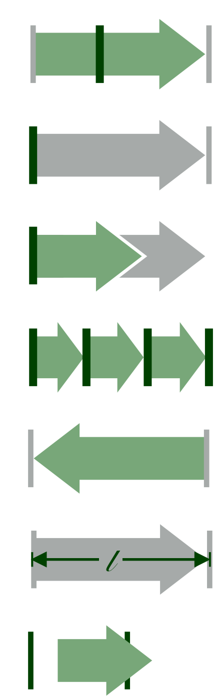
INTERVALS

Divide an interval by a duration to determine its physical length, divide an interval by a period to determine its implied length in clock time.

Make an interval with **interval**() or **%--%**, e.g.

Start Date | End Date

i <- ***interval***(ymd("2017-01-01"), d) *## 2017-01-01 UTC--2017-11-28 UTC*
j <- d **%--%** ymd("2017-12-31") *## 2017-11-28 UTC--2017-12-31 UTC*



a **%within%** b Does interval or date-time *a* fall within interval *b*? *now() %within% i*

int_start(int) Access/set the start date-time of an interval. Also **int_end**(). *int_start(i) <- now(); int_start(i)*

int_aligns(int1, int2) Do two intervals share a boundary? Also **int_overlaps**(). *int_aligns(i, j)*

int_diff(times) Make the intervals that occur between the date-times in a vector. *v <-c(dt, dt + 100, dt + 1000); int_diff(v)*

int_flip(int) Reverse the direction of an interval. Also **int_standardize**(). *int_flip(i)*

int_length(int) Length in seconds. *int_length(i)*

int_shift(int, by) Shifts an interval up or down the timeline by a timespan. *int_shift(i, days(-1))*

as.interval(x, start, …) Coerce a timespans to an interval with the start date-time. Also **is.interval**(). *as.interval(days(1), start = now())*