`raco`: Racket Command-Line Tools

Version 7.9

November 1, 2020

The `raco` program supports various Racket tasks from a command line. The first argument to `raco` is always a specific command name. For example, `raco make` starts a command to compile a Racket source module to bytecode format.

The set of commands available through `raco` is extensible. Use `raco help` to get a complete list of available commands for your installation. This manual covers the commands that are available in a typical Racket installation.

Contents

1 `raco make`: Compiling Source to Bytecode

The `raco make` command accept filenames for Racket modules to be compiled to bytecode format. Modules are re-compiled only if the source Racket file is newer than the bytecode file and has a different SHA-1 hash, or if any imported module is recompiled or has a different SHA-1 hash for its compiled form plus dependencies.

1.1 Running `raco make`

The `raco make` command accepts a few flags:

- `-l` ⟨*path*⟩ — Compiles ⟨*path*⟩ interpreted as a collection-based module path, as for `require`.

- `-j` ⟨*n*⟩ — Compiles argument modules in parallel, using up to ⟨*n*⟩ parallel tasks.

- `--disable-inline` — Disables function inlining while compiling (but does not re-compile files that are already up-to-date). This flag is often useful to simplify generated code before decompiling, and it corresponds to setting `compile-context-preservation-enabled` to `#t`.

- `--disable-constant` — Disables inference of definitions within a module as constant (but does not re-compile files that are already up-to-date). The value associated with a non-constant definition is never inlined or constant-propagated, either within its own module or an importing module. This flag corresponds to setting `compile-enforce-module-constants` to `#f`.

- `--no-deps` — Compiles a non-module file (i.e., one that is run via `load` instead of `require`). See §1.9 "Compiling to Raw Bytecode" for more information.

- `-p` ⟨*file*⟩ or `--prefix` ⟨*file*⟩ — For use with `--no-deps`; see §1.9 "Compiling to Raw Bytecode".

- `-no-prim` — For use with `--no-deps`; see §1.9 "Compiling to Raw Bytecode".

- `-v` — Verbose mode, which shows which files are compiled.

- `--vv` — Very verbose mode, which implies `-v` and also shows every dependency that is checked.

1.2 Bytecode Files

A file "⟨*name*⟩.⟨*ext*⟩" is compiled to bytecode that is saved as "compiled/⟨*name*⟩_⟨*ext*⟩.zo" relative to the file. As a result, the bytecode file is normally

used automatically when "⟨*name*⟩.⟨*ext*⟩" is required as a module, since the underlying `load/use-compiled` operation detects such a bytecode file.

For example, in a directory that contains the following files:

- "a.rkt":

  ```
  #lang racket
  (require "b.rkt" "c.rkt")
  (+ b c)
  ```

- "b.rkt":

  ```
  #lang racket
  (provide b)
  (define b 1)
  ```

- "c.rkt":

  ```
  #lang racket
  (provide c)
  (define c 1)
  ```

then

```
raco make a.rkt
```

triggers the creation of "compiled/a_rkt.zo", "compiled/b_rkt.zo", and "compiled/c_rkt.zo". A subsequent

```
racket a.rkt
```

loads bytecode from the generated ".zo" files, paying attention to the ".rkt" sources only to confirm that each ".zo" file has a later timestamp (unless the `PLT_COMPILED_FILE_CHECK` environment variable is set to `exists`, in which case the compiled file is used without a timestamp check).

In contrast,

```
raco make b.rkt c.rkt
```

would create only "compiled/b_rkt.zo" and "compiled/c_rkt.zo", since neither "b.rkt" nor "c.rkt" imports "a.rkt".

1.3 Dependency Files

In addition to a bytecode file, `raco make` creates a file "compiled/⟨*name*⟩_⟨*ext*⟩.dep" that records dependencies of the compiled module on other module files and the source file's SHA-1 hash. Using this dependency information, a re-compilation request via `raco make` can consult both the source file's timestamp/hash and the timestamps/hashes for the bytecode of imported modules. Furthermore, imported modules are themselves compiled as necessary, including updating the bytecode and dependency files for the imported modules, transitively.

Continuing the `raco make a.rkt` example from the previous section, the `raco make` command creates "compiled/a_rkt.dep", "compiled/b_rkt.dep", and "compiled/c_rkt.dep" at the same time as the ".zo" files. The "compiled/a_rkt.dep" file records the dependency of "a.rkt" on "b.rkt", "c.rkt" and the `racket` library. If the "b.rkt" file is modified (so that its SHA-1 hash changes), then running

```
raco make a.rkt
```

again rebuilds "compiled/a_rkt.zo" and "compiled/b_rkt.zo".

For module files that are within library collections, `raco setup` uses the same ".zo" and ".dep" conventions and files as `raco make`, so the two tools can be used together.

As long as the `PLT_COMPILED_FILE_CHECK` environment variable is not set or is set to `modify`, then `raco make` updates the timestamp on a compiled bytecode file if it is older than the source, even if the file does not need to be recompiled.

1.4 API for Making Bytecode

  (require compiler/cm)   package: base

The `compiler/cm` module implements the compilation and dependency management used by `raco make` and `raco setup`.

```
(make-compilation-manager-load/use-compiled-handler
 [delete-zos-when-rkt-file-does-not-exist?
  #:security-guard security-guard])
→ (path? (or/c symbol? false/c) . -> . any)
 delete-zos-when-rkt-file-does-not-exist? : any/c = #f
 security-guard : (or/c security-guard? #f) = #f
```

Returns a procedure suitable as a value for the `current-load/use-compiled` parameter. The returned procedure passes its arguments on to the `current-load/use-compiled`

procedure that is installed when `make-compilation-manager-load/use-compiled-handler` is called, but first it automatically compiles a source file to a `".zo"` file if

- the file is expected to contain a module (i.e., the second argument to the handler is a symbol);

- the value of each of `(current-eval)`, `(current-load)`, and `(namespace-module-registry (current-namespace))` is the same as when `make-compilation-manager-load/use-compiled-handler` was called;

- the value of `use-compiled-file-paths` contains the first path that was present when `make-compilation-manager-load/use-compiled-handler` was called;

- the value of `current-load/use-compiled` is the result of this procedure; and

- one of the following holds:

  - the source file is newer than the `".zo"` file in the first sub-directory listed in `use-compiled-file-paths` (at the time that `make-compilation-manager-load/use-compiled-handler` was called), and either no `".dep"` file exists or it records a source-file SHA-1 hash that differs from the current version and source-file SHA-1 hash;

  - no `".dep"` file exists next to the `".zo"` file;

  - the version recorded in the `".dep"` file does not match the result of `(version)`;

  - the target machine recorded in the `".dep"` file does not match the result of `(current-compile-target-machine)`;

  - the source hash recorded in the `".dep"` file does not match the current source hash;

  - one of the files listed in the `".dep"` file has a `".zo"` timestamp newer than the target `".zo"` and `use-compiled-file-check` is set to `'modify-seconds`;

  - the combined hashes of the dependencies recorded in the `".dep"` file does not match the combined hash recorded in the `".dep"` file.

If SHA-1 hashes override a timestamp-based decision to recompile the file, then the target `".zo"` file's timestamp is updated to the current time, unless the `use-compiled-file-check` parameter is not set to `'modify-seconds`.

After the handler procedure compiles a `".zo"` file, it creates a corresponding `".dep"` file that lists the current version and the identification of every file that is directly `required` by the module in the compiled file. Additional dependencies can be installed during compilation via `compiler/cm-accomplice`. The `".dep"` file also records the SHA-1 hash of the module's source, and it records a combined SHA-1 hash of all of the dependencies that includes their recursive dependencies. If a bytecode file is generated by recompiling a bytecode file that was formerly compiled as machine-independent, then the `".dep"` file also records the SHA-1 hash of the machine-independent form, since the recompiled module's behavior should be exactly the same.

The special combination of `(cross-installation?)` as `#t`, `(current-compile-target-machine)` as `#f`, and `(current-compiled-file-roots)` having two or more elements triggers a special compilation mode. Bytecode specific to the running Racket is written to the directory determined by the first element of `(current-compiled-file-roots)`. Bytecode specific to the cross-compilation target is written to the directory determined by the first element of `(current-compiled-file-roots)`. By configuring `(current-compiled-file-roots)` so that the first element is outside a build tree and the second element is inside the build tree, cross-compilation can create a build tree suitable for the target machine while building and loading bytecode (for macro expansion, etc.) that is usable on the current machine. This mode works correctly for a build directory that starts with only source code and machine-independent bytecode.

The handler caches timestamps when it checks `".dep"` files, and the cache is maintained across calls to the same handler. The cache is not consulted to compare the immediate source file to its `".zo"` file, which means that the caching behavior is consistent with the caching of the default module name resolver (see `current-module-name-resolver`).

If `use-compiled-file-paths` contains an empty list when `make-compilation-manager-load/use-compiled-handler` is called, then an `exn:fail:contract` exception is raised.

If the *delete-zos-when-rkt-file-does-not-exist?* argument is a true value, then the returned handler will delete `".zo"` files when there is no corresponding original source file.

If the *security-guard* argument is supplied, it is used when creating `".zo"` files, `".dep"` files, and `"compiled/"` directories, and when it adjusts the timestamps for existing files. If it is `#f`, then the security guard in the `current-security-guard` when the files are created is used (not the security guard at the point `make-compilation-manager-load/use-compiled-handler` is called).

The continuation of the compilation of a module is marked with a `managed-compiled-context-key` and the module's source path.

Do not install the result of `make-compilation-manager-load/use-compiled-handler` when the current namespace contains already-loaded versions of modules that may need to be recompiled—unless the already-loaded modules are never referenced by not-yet-loaded modules. References to already-loaded modules may produce compiled files with inconsistent timestamps and/or `".dep"` files with incorrect information.

The handler logs messages to the topic `'compiler/cm` at the level `'info`. These messages are instances of a `compile-event` prefab structure:

```
(struct compile-event (timestamp path type) #:prefab)
```

The `timestamp` field is the time at which the event occurred in milliseconds since the epoch. The `path` field is the path of a file being compiled for which the event is about. The `type` field is a symbol which describes the action the event corresponds to. The currently logged

9

values are `'locking`, `'start-compile`, `'finish-compile`, and `'already-done`.

Changed in version 6.1.1.8 of package `base`: Added identification of the compilation context via `managed-compiled-context-key`.

Changed in version 6.6.0.3: added check on a source's SHA1 hash to complement the timestamp check, where the latter can be disabled via `use-compile-file-check`.

```
(managed-compile-zo  file
                     [read-src-syntax
                      #:security-guard security-guard]) → void?
  file : path-string?
  read-src-syntax : (any/c input-port? . -> . syntax?)
                  = read-syntax
  security-guard : (or/c security-guard? #f) = #f
```

Compiles the given module source file to a `".zo"`, installing a compilation-manager handler while the file is compiled (so that required modules are also compiled), and creating a `".dep"` file to record the timestamps of immediate files used to compile the source (i.e., files `required` in the source).

If `file` is compiled from source, then `read-src-syntax` is used in the same way as `read-syntax` to read the source module. The normal `read-syntax` is used for any required files, however.

If `security-guard` is not `#f`, then the provided security guard is used when creating the `"compiled/"` directories, `".dep"` and `".zo"` files, and when it adjusts the timestamps of existing files. If it is `#f`, then the security guard in the `current-security-guard` when the files are created is used (not the security guard at the point `managed-compile-zo` is called).

While compiling `file`, the `error-display-handler` parameter is set to `(make-compilation-context-error-display-handler (error-display-handler))`, so that errors from uncaught exceptions will report the compilation context.

Changed in version 6.1.1.8 of package `base`: Added `error-display-handler` configuration.

```
managed-compiled-context-key : any/c
```

A key used as a continuation mark key by `make-compilation-manager-load/use-compiled-handler` for the continuation of a module compilation. The associated value is a path to the module's source.

Added in version 6.1.1.8 of package `base`.

```
(make-compilation-context-error-display-handler orig-handlers)
 → (string? any/c . -> . void?)
  orig-handlers : (string? any/c . -> . void?)
```

Produces a handler suitable for use as an `error-display-handler` value, given an existing such value. The generated handler shows information about the compilation context when the handler's second argument is an exception whose continuation marks include `managed-compiled-context-key` keys.

Added in version 6.1.1.8 of package `base`.

```
(trust-existing-zos) → boolean?
(trust-existing-zos trust?) → void?
  trust? : any/c
```

A parameter that is intended for use by `raco setup` when installing with pre-built `".zo"` files. It causes a compilation-manager `load/use-compiled` handler to "touch" out-of-date `".zo"` files instead of re-compiling from source.

```
 (make-caching-managed-compile-zo
  [read-src-syntax
   #:security-guard security-guard])
→ (path-string? . -> . void?)
  read-src-syntax : (any/c input-port? . -> . syntax?)
                  = read-syntax
  security-guard : (or/c security-guard? #f) = #f
```

Returns a procedure that behaves like `managed-compile-zo` (providing the same *read-src-syntax* each time), but a cache of timestamp information is preserved across calls to the procedure.

```
(manager-compile-notify-handler) → (path? . -> . any)
(manager-compile-notify-handler notify) → void?
  notify : (path? . -> . any)
```

A parameter for a procedure of one argument that is called whenever a compilation starts. The argument to the procedure is the file's path.

```
(manager-trace-handler) → (string? . -> . any)
(manager-trace-handler notify) → void?
  notify : (string? . -> . any)
```

A parameter for a procedure of one argument that is called to report compilation-manager actions, such as checking a file. The argument to the procedure is a string.

The default value of the parameter logs the argument, along with `current-inexact-milliseconds`, to a logger named `'compiler/cm` at the `'debug` level.

```
(manager-skip-file-handler)
 → (-> path? (or/c (cons/c number? promise?) #f))
(manager-skip-file-handler proc) → void?
  proc : (-> path? (or/c (cons/c number? promise?) #f))
```

A parameter whose value is called for each file that is loaded and needs recompilation. If the procedure returns a pair, then the file is skipped (i.e., not compiled); the number in the pair is used as the timestamp for the file's bytecode, and the promise may be `force`d to obtain a string that is used as hash of the compiled file plus its dependencies. If the procedure returns `#f`, then the file is compiled as usual. The default is `(lambda (x) #f)`.

```
(current-path->mode)
 → (or/c #f (-> path? (and/c path? relative-path?)))
(current-path->mode path->mode) → void?
  path->mode : (or/c #f (-> path? (and/c path? relative-path?)))
 = #f
```

Used by `make-compilation-manager-load/use-compiled-handler` and `make-caching-managed-compile-zo` to override `use-compiled-file-paths` for deciding where to write compiled `".zo"` files. If it is `#f`, then the first element of `use-compiled-file-paths` is used. If it isn't `#f`, then it is called with the original source file's location and its result is treated the same as if it had been the first element of `use-compiled-file-paths`.

Note that this parameter is not used by `current-load/use-compiled`. So if the parameter causes `".zo"` files to be placed in different directories, then the correct `".zo"` file must still be communicated via `use-compiled-file-paths`, and one way to do that is to override `current-load/use-compiled` to delete `".zo"` files that would cause the wrong one to be chosen right before they are loaded.

Added in version 6.4.0.14 of package `base`.

```
(file-stamp-in-collection p)
 → (or/c (cons/c number? promise?) #f)
  p : path?
```

Calls `file-stamp-in-paths` with *p* and `(current-library-collection-paths)`.

```
(file-stamp-in-paths p paths)
 → (or/c (cons/c number? promise?) #f)
  p : path?
  paths : (listof path?)
```

Returns the file-modification date and `delayed` hash of *p* or its bytecode form (i.e., `".zo"` file), whichever exists and is newer, if *p* is an extension of any path in *paths* (i.e., exists in the directory, a subdirectory, etc.). Otherwise, the result is `#f`.

This function is intended for use with `manager-skip-file-handler`.

```
(get-file-sha1 p) → (or/c string? #f)
  p : path?
```

12

Computes a SHA-1 hash for the file p; the result is `#f` if p cannot be opened.

```
(get-compiled-file-sha1 p) → (or/c string? #f)
  p : path?
```

Computes a SHA-1 hash for the bytecode file p, appending any dependency-describing hash available from a ".dep" file when available (i.e., the suffix on p is replaced by ".dep" to locate dependency information). The result is `#f` if p cannot be opened.

```
(with-compile-output p proc) → any
  p : path-string?
  proc : ([port input-port?] [tmp-path path?] . -> . any)
```

A wrapper on `call-with-atomic-output-file` that passes along any security guard put in place by `make-compilation-manager-load/use-compiled-handler`, etc.

```
(parallel-lock-client)
 → (or/c #f
         (->i ([command (or/c 'lock 'unlock)]
               [file bytes?])
              [res (command) (if (eq? command 'lock)
                                 boolean?
                                 void?)]))
(parallel-lock-client proc) → void?
  proc : (or/c #f
               (->i ([command (or/c 'lock 'unlock)]
                     [file bytes?])
                    [res (command) (if (eq? command 'lock)
                                       boolean?
                                       void?)]))
```

Holds the parallel compilation lock client, which is used by the result of `make-compilation-manager-load/use-compiled-handler` to prevent compilation races between parallel builders.

When *proc* is `#f` (the default), no checking for parallel compilation is done (and thus multiple threads or places running compilations via `make-compilation-manager-load/use-compiled-handler` will potentially corrupt each other's ".zo" files).

When *proc* is a function, its first argument is a command, indicating if it wants to lock or unlock the path specified in the second argument.

When the *proc* `'lock` command returns `#t`, the current builder has obtained the lock for `zo-path`. Once compilation of `zo-path` is complete, the builder process must release the lock by calling *proc* `'unlock` with the exact same `zo-path`.

When the *proc* 'lock command returns #f, another parallel builder obtained the lock first and has already compiled the zo. The parallel builder should continue without compiling zo-path. (In this case, make-compilation-manager-load/use-compiled-handler's result will not call *proc* with 'unlock.)

Example:

```
> (let* ([lc (parallel-lock-client)]
         [zo-name  #"collects/racket/compiled/draw_rkt.zo"]
         [locked? (and lc (lc 'lock zo-name))]
         [ok-to-compile? (or (not lc) locked?)])
    (dynamic-wind
      (lambda () (void))
      (lambda ()
        (when ok-to-compile?
          (printf "Do compile here ...\n")))
      (lambda ()
        (when locked?
          (lc 'unlock zo-name)))))
Do compile here ...
```

(compile-lock->parallel-lock-client *pc*
                                     [*cust*])
 → (-> (or/c 'lock 'unlock) bytes? boolean?)
  pc : place-channel?
  cust : (or/c #f custodian?) = #f

Returns a function that follows the parallel-lock-client by communicating over *pc*. The argument must be the result of make-compile-lock.

This communication protocol implementation is not kill safe. To make it kill safe, it needs a sufficiently powerful custodian, i.e., one that is not subject to termination (unless all of the participants in the compilation are also terminated). It uses this custodian to create a thread that monitors the threads that are doing the compilation. If one of them is terminated, the presence of the custodian lets another one continue. (The custodian is also used to create a thread that manages a thread safe table.)

(make-compile-lock) → place-channel?

Creates a place-channel? that can be used with compile-lock->parallel-lock-client to avoid concurrent compilations of the same Racket source files in multiple places.

(install-module-hashes! *bstr* [*start* *end*]) → void?
  bstr : bytes?
  start : exact-nonnegative-integer? = 0
  end : exact-nonnegative-integer? = (bytes-length *bstr*)

Adjusts the bytecode representation in *bstr* (from bytes *start* to *end*) to install a hash code, including any submodules within the region. The existing representation should have zero bytes in place of each hash string, which is what `write` produces for a compiled form.

Added in version 6.3 of package `base`.

1.5 API for Parallel Builds

(require setup/parallel-build)   package: `base`

The `setup/parallel-build` library provides the parallel-compilation functionality of `raco setup` and `raco make`.

Both `parallel-compile-files` and `parallel-compile` log messages to the topic `'setup/parallel-build` at the level `'info`. These messages are instances of a `parallel-compile-event` prefab structure:

```
(struct parallel-compile-event (worker event) #:prefab)
```

The worker field is the index of the worker that the created the event. The event field is a `compile-event` as documented in `make-compilation-manager-load/use-compiled-handler`.

```
(parallel-compile-files  list-of-files
                         [#:worker-count worker-count
                          #:use-places? use-places?
                          #:handler handler])
 → (or/c void? #f)
  list-of-files : (listof path-string?)
  worker-count : exact-positive-integer? = (processor-count)
  use-places? : any/c = #t
  handler : (->i ([worker-id exact-integer?] = void
                  [handler-type symbol?]
                  [path path-string?]
                  [msg string?]
                  [out string?]
                  [err string?])
             void?)
```

The `parallel-compile-files` utility function is used by `raco make` to compile a list of paths in parallel. The optional `#:worker-count` argument specifies the number of compile workers to spawn during parallel compilation. The compile workers are implemented as Racket places if *use-places?* is true, otherwise the compile workers are implemented as separate Racket processes. The callback, *handler*, is called with the symbol `'done` as the *handler-type* argument for each successfully compiled file, `'output` when a successful

compilation produces stdout/stderr output, `'error` when a compilation error has occurred, or `'fatal-error` when a unrecoverable error occurs. The other arguments give more information for each status update. The return value is `(void)` if it was successful, or `#f` if there was an error.

```
(parallel-compile-files
  source-files
  #:worker-count 4
  #:handler (lambda (type work msg out err)
    (match type
      ['done (when (verbose) (printf " Made ~a\n" work))]
      ['output (printf " Output from: ~a\n~a~a" work out err)]
      [else (printf " Error compiling ~a\n~a\n~a~a"
                    work
                    msg
                    out
                    err)]))))
```

Changed in version 7.0.0.19 of package base: Added the `#:use-places?` argument.

```
(parallel-compile  worker-count
                   setup-fprintf
                   append-error
                   collects-tree
                  [#:use-places? use-places?]) → (void)
  worker-count : non-negative-integer?
  setup-fprintf : (->i ([stage string?] [format string?])
                       ()
                       #:rest (listof any/c) void)
  append-error : (->i ([cc cc?]
                       [prefix string?]
                       [exn (or/c exn? (cons/c string? string?) #f)]
                       [out string?]
                       [err string?]
                       [message string?])
                      void?)
  collects-tree : (listof any/c)
  use-places? : any/c = #t
```

The `parallel-compile` function is used by `raco setup` to compile collections in parallel. The *worker-count* argument specifies the number of compilation workers to spawn during parallel compilation. The *use-places?* argument specified whether to use places, otherwise separate processes are used. The *setup-fprintf* and *append-error* functions communicate intermediate compilation results and errors. The *collects-tree* argument is a compound data structure containing an in-memory tree representation of the collects directory.

16

When the `exn` argument to `append-error` is a pair of strings, the first string is a long form of the error message, and the second string is a short form (omitting evaluation context information, for example).

Changed in version 6.1.1.8 of package `base`: Changed `append-error` to allow a pair of error strings.
Changed in version 7.0.0.19: Added the `#:use-places?` argument.

1.6 Compilation Manager Hook for Syntax Transformers

```
(require compiler/cm-accomplice)        package: base
```

```
(register-external-file  file
                             [#:indirect? indirect?]) → void?
  file : (and path? complete-path?)
  indirect? : any/c = #f
```

Logs a message (see `log-message`) at level `'info` to a logger named `'cm-accomplice`. The message data is a `file-dependency` prefab structure type with two fields; the first field's value is `file` and the second field's value is `#f` (to indicate a non-module dependency). If the `indirect?` argument is true, the data is more specifically an instance of a `file-dependency/options` prefab structure type that is a subtype of `file-dependency` with one extra field: a hash table mapping `'indirect` to `#t`.

A compilation manager implemented by `compiler/cm` looks for such messages to register an external dependency. In response, the compilation manager records (in a `".dep"` file) the path as contributing to the implementation of the module currently being compiled. Afterward, if the registered file is modified, the compilation manager will know to recompile the module. An indirect dependency has no effect on recompilation, but it can signal to other tools, such as a package-dependency checker, that the dependency is indirect (and should not imply a direct package dependency).

The `include` macro, for example, calls this procedure with the path of an included file as it expands an `include` form.

```
(register-external-module  file
                             [#:indirect? indirect?]) → void?
  file : (and path? complete-path?)
  indirect? : any/c = #f
```

Like `register-external-file`, but logs a message with a `file-dependency` prefab structure type whose second field is `#t`.

A compilation manager implemented by `compiler/cm` recognizes the message to register a dependency on a module (which implies a dependency on all of that module's dependencies, etc.).

1.7   API for Simple Bytecode Creation

```
(require compiler/compile-file)        package: base
```

```
(compile-file src [dest filter]) → path?
  src : path-string?
  dest : path-string?
       = (let-values ([(base name dir?) (split-path src)])
           (build-path base "compiled"
                       (path-add-suffix name #".zo")))
  filter : (any/c . -> . any/c) = values
```

Compiles the Racket file *src* and saves the compiled code to *dest*. If *dest* is not provided and the `"compiled"` subdirectory does not already exist, the subdirectory is created. The result of `compile-file` is the destination file's path.

If the *filter* procedure is provided, it is applied to each source expression, and the result is compiled.

Beware that `compile-file` uses the current reader parameterization to read *src*. Typically, `compile-file` should be called from a thunk passed to `with-module-reading-parameterization` so that the source program is parsed in a consistent way and allowing `#lang`.

Each expression in *src* is compiled independently. If *src* does not contain a single `module` expression, then earlier expressions can affect the compilation of later expressions when *src* is loaded directly. An appropriate *filter* can make compilation behave like evaluation, but the problem is also solved (as much as possible) by the `compile-zos` procedure.

See also `managed-compile-zo`.

1.8   API for Bytecode Paths

```
(require compiler/compilation-path)        package: base
```

Added in version 6.0.1.10 of package `base`.

```
(get-compilation-dir+name  path
                           [#:modes modes
                            #:roots roots
                            #:default-root default-root])
 → path? path?
  path : path-string?
  modes : (non-empty-listof (and/c path-string? relative-path?))
        = (use-compiled-file-paths)
```

18

```
  roots : (non-empty-listof (or/c path-string? 'same))
        = (current-compiled-file-roots)
  default-root : (or/c path-string? 'same) = (car roots)
```

Determines the directory that holds the bytecode form of *path* plus the base name of *path*.

The directory is determined by checking *roots* in order, and for each element of *roots* checking *modes* in order. The first such directory that contains a file whose name matches *path* with ".zo" added (in the sense of `path-add-suffix`) is reported as the return directory path. If no such file is found, the result corresponds to the first element of *modes* combined with *default-root*.

Changed in version 7.1.0.9 of package `base`: Added the `#:default-root` argument.

```
(get-compilation-dir  path
                      [#:modes modes
                       #:roots roots
                       #:default-root default-root]) → path?
  path : path-string?
  modes : (non-empty-listof (and/c path-string? relative-path?))
        = (use-compiled-file-paths)
  roots : (non-empty-listof (or/c path-string? 'same))
        = (current-compiled-file-roots)
  default-root : (or/c path-string? 'same) = (car roots)
```

The same as `get-compilation-dir+name`, but returning only the first result.

Changed in version 7.1.0.9 of package `base`: Added the `#:default-root` argument.

```
(get-compilation-bytecode-file  path
                                [#:modes modes
                                 #:roots roots
                                 #:default-root default-root])
 → path?
  path : path-string?
  modes : (non-empty-listof (and/c path-string? relative-path?))
        = (use-compiled-file-paths)
  roots : (non-empty-listof (or/c path-string? 'same))
        = (current-compiled-file-roots)
  default-root : (or/c path-string? 'same) = (car roots)
```

The same as `get-compilation-dir+name`, but combines the results and adds a ".zo" suffix to arrive at a bytecode file path.

Changed in version 7.1.0.9 of package `base`: Added the `#:default-root` argument.

1.9   Compiling to Raw Bytecode

The `--no-deps` mode for `raco make` is an improverished form of the compilation, because it does not track import dependencies. It does, however, support compilation of non-module source in a namespace that initially imports `scheme`.

Outside of a module, top-level `define-syntaxes`, `module`, `#%require`, `define-values-for-syntax`, and `begin` expressions are handled specially by `raco make --no-deps`: the compile-time portion of the expression is evaluated, because it might affect later expressions.

For example, when compiling the file containing

```
(require racket/class)
(define f (class object% (super-new)))
```

the `class` form from the `racket/class` library must be bound in the compilation namespace at compile time. Thus, the `require` expression is both compiled (to appear in the output code) and evaluated (for further computation).

Many definition forms expand to `define-syntaxes`. For example, `define-signature` expands to `define-syntaxes`. In `--no-deps` mode, `raco make --no-deps` detects `define-syntaxes` and other expressions after expansion, so top-level `define-signature` expressions affect the compilation of later expressions, as a programmer would expect.

In contrast, a `load` or `eval` expression in a source file is compiled—but *not evaluated!*—as the source file is compiled. Even if the `load` expression loads syntax or signature definitions, these will not be loaded as the file is compiled. The same is true of application expressions that affect the reader, such as `(read-case-sensitive #t)`. The `-p` or `--prefix` flag for `raco make` takes a file and loads it before compiling the source files specified on the command line.

By default, the namespace for compilation is initialized by a `require` of `scheme`. If the `--no-prim` flag is specified, the namespace is instead initialized with `namespace-require/copy`, which allows mutation and redefinition of all initial bindings (other than syntactic forms, in the case of mutation).

In general, a better solution is to put all code to compile into a module and use `raco make` in its default mode.

1.10   API for Raw Compilation

 `(require compiler/compiler)`   package: `base`

The `compiler/compiler` library provides the functionality of `raco make` for compilation to bytecode, but through a Racket API.

1.10.1 Bytecode Compilation

```
((compile-zos  expr
               [#:module? module?
                #:verbose? verbose?])
               racket-files
               dest-dir)                    → void?
  expr : any/c
  module? : any/c = #f
  verbose? : any/c = #f
  racket-files : (listof path-string?)
  dest-dir : (or/c path-string? false/c (one-of/c 'auto))
```

Supplying just *expr* returns a compiler that is initialized with the expression *expr*, as described below.

The compiler takes a list of Racket files and compiles each of them to bytecode, placing the resulting bytecode in a ".zo" file within the directory specified by *dest-dir*. If *dest-dir* is #f, each bytecode result is placed in the same directory as its source file. If *dest-dir* is 'auto, each bytecode file is placed in a "compiled" subdirectory relative to the source; the directory is created if necessary.

If *expr* is anything other than #f, then a namespace is created for compiling the files that are supplied later, and *expr* is evaluated to initialize the created namespace. For example, *expr* might load a set of macros. In addition, the expansion-time part of each expression later compiled is evaluated in the namespace before being compiled, so that the effects are visible when compiling later expressions.

If *expr* is #f, then no compilation namespace is created (the current namespace is used), and expressions in the files are assumed to compile independently (so there's no need to evaluate the expansion-time part of an expression to compile).

Typically, *expr* is #f for compiling module files, and it is (void) for compiling files with top-level definitions and expressions.

If *module?* is #t, then the given files are read and compiled as modules (so there is no dependency on the current namespace's top-level environment).

If *verbose?* is #t, the output file for each given file is reported through the current output port.

```
(compile-collection-zos
  collection  ...+
 [#:skip-path skip-path
  #:skip-paths skip-paths
  #:skip-doc-sources? skip-docs?
  #:managed-compile-zo managed-compile-zo])
```

```
→ void?
  collection : string?
  skip-path : (or/c path-string? #f) = #f
  skip-paths : (listof path-string?) = null
  skip-docs? : any/c = #f
  managed-compile-zo : (path-string? . -> . void?)
                     = (make-caching-managed-compile-zo)
```

Compiles the specified collection's files to ".zo" files by using *managed-compile-zo* on each source file. The ".zo" files are placed into the collection's "compiled" directory.

By default, all files with the extension ".rkt", ".ss", or ".scm" in a collection are compiled, as are all such files within subdirectories; the set of such suffixes is extensible globally as described in `get-module-suffixes`, and `compile-collection-zos` recognizes suffixes from the `'libs` group. However, any file or directory whose path starts with *skip-path* or an element of *skip-paths* is skipped. ("Starts with" means that the simplified complete path *p*'s byte-string form after (`simplify-path` *p* #f) starts with the byte-string form of (`simplify-path` *skip-path* #f); not that each *skip-path* should normally be a complete path.)

The collection compiler reads the collection's "info.rkt" file (see §6.4 ""info.rkt" File Format") to obtain further instructions for compiling the collection. The following fields are used:

- `name` : The name of the collection as a string, used only for status and error reporting.

- `compile-omit-paths` : A list of immediate file and directory paths that should not be compiled. Alternatively, this field's value is `'all`, which is equivalent to specifying all files and directories in the collection (to effectively ignore the collection for compilation). Automatically omitted files and directories are "compiled", "doc", and those whose names start with `..`.

  Files that are required by other files, however, are always compiled in the process of compiling the requiring file—even when the required file is listed with this field or when the field's value is `'all`.

- `compile-omit-files` : A list of filenames (without directory paths) that are not compiled, in addition to the contents of `compile-omit-paths`. Do not use this field; it is for backward compatibility.

- `scribblings` : A list of lists, each of which starts with a path for documentation source. See §6.3 "Controlling `raco setup` with "info.rkt" Files" for more information. The sources (and the files that they require) are compiled in the same way as other module files, unless *skip-docs?* is a true value.

- `compile-include-files` : A list of filenames (without directory paths) to be compiled, in addition to files that are compiled based on the file's extension, being in `scribblings`, or being `required` by other compiled files.

- `module-suffixes` and `doc-module-suffixes` : Used indirectly via `get-module-suffixes`.

Changed in version 6.3 of package `base`: Added support for `compile-include-files`.

Changed in version 7.8.0.8: Changed "starts with" for *skip-path* to include an exact match.

```
(compile-directory-zos
  path
  info
 [#:verbose verbose?
  #:skip-path skip-path
  #:skip-paths skip-paths
  #:skip-doc-sources? skip-docs?
  #:managed-compile-zo managed-compile-zo])
→ void?
 path : path-string?
 info : procedure?
 verbose? : any/c = #f
 skip-path : (or/c path-string? #f) = #f
 skip-paths : (listof path-string?) = null
 skip-docs? : any/c = #f
 managed-compile-zo : (path-string? . -> . void?)
                    = (make-caching-managed-compile-zo)
```

Like `compile-collection-zos`, but compiles the given directory rather than a collection. The *info* function behaves like the result of `get-info` to supply `"info.rkt"` fields, instead of using an `"info.rkt"` file (if any) in the directory.

Changed in version 7.8.0.8 of package `base`: Changed *info* handling to use *info* for `'compile-omit-paths`, ignoring any `"info.rkt"` files in parent and child directories.

1.10.2 Recognizing Module Suffixes

```
(require compiler/module-suffix)          package: base
```

The `compiler/module-suffix` library provides functions for recognizing file suffixes that correspond to Racket modules for the purposes of compiling files in a directory, running tests for files in a directory, and so on. The set of suffixes always includes `".rkt"`, `".ss"`, and `".scm"`, but it can be extended globally by `"info.rkt"` configurations in collections.

Added in version 6.3 of package `base`.

```
(get-module-suffixes [#:group group
                       #:mode mode
                       #:namespace namespace]) → (listof bytes?)
```

```
  group : (or/c 'all 'libs 'docs) = 'all
  mode : (or/c 'preferred 'all-available 'no-planet 'no-user)
       = 'preferred
  namespace : (or/c #f namespace?) = #f
```

Inspects "info.rkt" files (see §6.4 ""info.rkt" File Format") of installed collections to produce a list of file suffixes that should be recognized as Racket modules. Each suffix is reported as a byte string that does not include the `.` that precedes a suffix.

The *mode* and *namespace* arguments are propagated to `find-relevant-directories` to determine which collection directories might configure the set of suffixes. Consequently, suffix registrations are found reliably only if `raco setup` (or package installations or updates that trigger `raco setup`) is run.

The *group* argument determines whether the result includes all registered suffixes, only those that are registered as general library suffixes, or only those that are registered as documentation suffixes. The set of general-library suffixes always includes ".rkt", ".ss", and ".scm". The set of documentation suffixes always includes ".scrbl".

The following fields in an "info.rkt" file extend the set of suffixes:

- `module-suffixes` : A list of byte strings that correspond to general-library module suffixes (without the `.` that must appear before the suffix). Non-lists or non-byte-string elements of the list are ignored.

- `doc-module-suffixes` : A list of byte strings as for `module-suffixes`, but for documentation modules.

```
(get-module-suffix-regexp [#:group group
                           #:mode mode
                           #:namespace namespace]) → byte-regexp?
  group : (or/c 'all 'libs 'docs) = 'all
  mode : (or/c 'preferred 'all-available 'no-planet 'no-user)
       = 'preferred
  namespace : (or/c #f namespace?) = #f
```

Returns a regexp value that matches paths ending with a suffix as reported by `get-module-suffixes`. The pattern includes a subpatterns for the suffix without its leading `.`

1.10.3   Loading Compiler Support

The compiler unit loads certain tools on demand via `dynamic-require` and `get-info`. If the namespace used during compilation is different from the namespace used to load the compiler, or if other load-related parameters are set, then the following parameter can be used to restore settings for `dynamic-require`.

```
(current-compiler-dynamic-require-wrapper)
  → ((-> any) . -> . any)
(current-compiler-dynamic-require-wrapper proc) → void?
  proc : ((-> any) . -> . any)
```

A parameter whose value is a procedure that takes a thunk to apply. The default wrapper sets the current namespace (via `parameterize`) before calling the thunk, using the namespace in which the `compiler/compiler` library was originally instantiated.

1.10.4   Options for the Compiler

```
(require compiler/option)        package: base
```

The `compiler/option` module provides options (in the form of parameters) that control the compiler's behaviors.

More options are defined by the `dynext/compile` and `dynext/link` libraries, which control the actual C compiler and linker that are used for compilation via C.

```
(somewhat-verbose) → boolean?
(somewhat-verbose on?) → void?
  on? : any/c
```

A `#t` value for the parameter causes the compiler to print the files that it compiles and produces. The default is `#f`.

```
(verbose) → boolean?
(verbose on?) → void?
  on? : any/c
```

A `#t` value for the parameter causes the compiler to print verbose messages about its operations. The default is `#f`.

```
(compile-subcollections) → (one-of/c #t #f)
(compile-subcollections cols) → void?
  cols : (one-of/c #t #f)
```

A parameter that specifies whether sub-collections are compiled by `compile-collection-zos`. The default is `#t`.

1.10.5   The Compiler as a Unit

Signatures

```
(require compiler/sig)        package: compiler-lib
```

▎`compiler^ : signature`

Includes all of the names exported by `compiler/compiler`.

▎`compiler:option^ : signature`

Includes all of the names exported by `compiler/option`.

Main Compiler Unit

```
(require compiler/compiler-unit)        package: compiler-lib
```

▎`compiler@ : unit?`

Provides the exports of `compiler/compiler` in unit form, where C-compiler operations are imports to the unit, although they are not used.

The unit imports `compiler:option^`, `dynext:compile^`, `dynext:link^`, and `dynext:file^`. It exports `compiler^`.

Options Unit

```
(require compiler/option-unit)        package: compiler-lib
```

▎`compiler:option@ : unit?`

Provides the exports of `compiler/option` in unit form. It imports no signatures, and exports `compiler:option^`.

1.11 API for Reading Compilation Dependencies

```
(require compiler/depend)        package: base
```

The `compiler/depend` module provides a function to inspect and traverse the dependency information generated by `raco make`, `raco setup`, or `compiler/cm`.

Added in version 6.90.0.13 of package base.

```
(module-recorded-dependencies module-file)
 → (listof (and path? (complete-path? path?)))
  module-file : path?
```

Given a *module-file* for a file that has been compiled with `raco make`, `raco setup`, or `compiler/cm`, returns a list of dependencies for *module-file* by reading and traversing dependency-information files left behind by compilation.

2 `raco exe`: **Creating Stand-Alone Executables**

Compiled code produced by `raco make` relies on Racket executables to provide run-time support to the compiled code. However, `raco exe` can package code together with its run-time support to form an executable, and `raco distribute` can package the executable into a distribution that works on other machines. Running an executable produced by `raco exe` will not improve performance over `raco make`.

The `raco exe` command embeds a module, from source or byte code, into a copy of the `racket` executable. (On Unix, the embedding executable is actually a copy of a wrapper executable.) The created executable invokes the embedded module on startup. The `--gui` flag causes the program to be embedded in a copy of the `gracket` executable. If the embedded module refers to other modules via `require`, then the other modules are also included in the embedding executable.

For example, the command

```
raco exe --gui hello.rkt
```

produces either `"hello.exe"` (Windows), `"hello.app"` (Mac OS), or `"hello"` (Unix), which runs the same as running the `"hello.rkt"` module in `gracket`.

Library modules or other files that are referenced dynamically—through `eval`, `load`, or `dynamic-require`—are not automatically embedded into the created executable. Such modules can be explicitly included using the `++lib` flag to `raco exe`. Alternately, use `define-runtime-path` to embed references to the run-time files in the executable; the files are then copied and packaged together with the executable when creating a distribution (as described in §3 "`raco distribute`: Sharing Stand-Alone Executables"). A submodule is included if its enclosing module is included and the submodule contains a sub-submodule named `declare-preserve-for-embedding` (where the implementation of the sub-submodule is ignored).

Language reader modules that are used only via `#lang` are also not automatically embedded. To support dynamic use of `#lang` with a language specification, supply the `++lang` flag to `raco exe`. The argument after `++lang` can be a language name, but more generally it can be text to appear just after `#lang`. For example, `at-exp racket/base` makes sense as an argument to `++lang` to allow `at-exp` combined with `racket/base` as a language for dynamically loaded modules.

Modules that are implemented directly by extensions—i.e., extensions that are automatically loaded from `(build-path "compiled" "native" (system-library-subpath))` to satisfy a `require`—are treated like other run-time files: a generated executable uses them from their original location, and they are copied and packaged together when creating a distribution.

When a module is embedded in an executable, it gets a symbolic name instead of its original

filesystem-based name. The module-name resolver is configured in the embedding executable to map collection-based module paths to the embedded symbolic name, but no such mapping is created for filesystem paths. By default, a module's symbolic name is generated in an unspecified but deterministic way where the name starts with `#%embedded:`, except that the main module is prefixed with `#%mzc:`. The relative lack of specification for module names can be be a problem for language constructs that are sensitive to module names, such as serialization. To take more control over a module's symbolic name, use the `++named-lib` or `++named-file` argument to specify a prefix that is appended before the module's base name to generate a symbolic name.

The `raco exe` command works only with module-based programs. The `compiler/embed` library provides a more general interface to the embedding mechanism.

A stand-alone executable is "stand-alone" in the sense that you can run it without starting `racket`, `gracket`, or DrRacket. However, the executable may depend on Racket shared libraries and possibly other run-time files declared via `define-runtime-path`. Using `--embed-dlls` on Windows or `--orig-exe` on Unix may produce an executable that is more stand-alone than otherwise. Options used when building Racket itself affect the degree to which executables are stand-alone. In any case, the executable can be packaged with support libraries to create a self-contained distribution using `raco distribute`, as described in §3 "`raco distribute`: Sharing Stand-Alone Executables".

The `raco exe` command accepts the following command-line flags:

- `-o` ⟨*file*⟩ — create the executable as ⟨*file*⟩, adding a suffix to ⟨*file*⟩ as appropriate for the platform and executable type. On Mac OS in `--gui` mode, ⟨*file*⟩ is actually a bundle directory, but it appears as a file within Finder.

- `--gui` — create a graphical executable based on `gracket` instead of `racket`.

- `-l` or `--launcher` — create a launcher (see §2.2 "Installation-Specific Launchers"), instead of a stand-alone executable. Flags such as `--config-path`, `--collects-path`, and `--lib` have no effect on launchers. Beware that the default command-line flags to build into the launcher prevent access to packages that are installed in user scope; use `--exf  -U` to enable access to user-scope packages from the launcher.

- `--embed-dlls` — On Windows, for a stand-alone executable, copies any needed DLLs into the executable. Embedding DLLs makes the resulting executable truly stand-alone if it does not depend on other external files. Not all DLLs work with embedding, and limitations are mostly related to thread-local storage and resources, but all DLLs within the main Racket distribution work with `--embed-dlls`.

- `--config-path` ⟨*path*⟩ — set ⟨*path*⟩ within the executable as the path to the configuration directory; if the path is relative, it will be treated as relative to the executable. The default path is `"etc"`, with the expectation that no such directory will exist at run time.

Then standard distribution uses options that make executables as stand-alone as possible. For a Unix build, configuring with `--enable-shared` makes executables less stand-alone. For a Mac OS build, configuring without `--enable-embedfw` makes non-GUI executables less stand-alone.

28

- `--collects-path` ⟨*path*⟩ — set ⟨*path*⟩ within the executable as the path to the main collection directory; if the path is relative, it will be treated as relative to the executable. The default is to have no path, which means that the `current-library-collection-paths` and `current-library-collection-links` parameters are initialized as `null` when the executable starts. Beware that various other directories are located relative to the main collection directory by default (see §19 "Installation Configuration and Search Paths"), so that installing ⟨*path*⟩ may allow other directories to be found—intentional or not.

- `--collects-dest` ⟨*path*⟩ — write modules to be included with the executable into ⟨*path*⟩ (relative to the current directory), instead of embedded within the executable. The `--collects-dest` flag normally makes sense only in combination with `--collects-path`. This mode currently does not prune unreferenced submodules (and it pulls along any dependencies of submodules).

- `--ico` ⟨*.ico-path*⟩ — on Windows, set the icons for the generated executable to ones extracted from ⟨*.ico-path*⟩; see `create-embedding-executable`'s use of the `'ico` auxiliary association for more information about expected icon sizes and transformations.

- `--icns` ⟨*.icns-path*⟩ — on Mac OS, set the icons for the generated executable to be the content of ⟨*.icns-path*⟩.

- `--orig-exe` — on Unix, generate an executable based on the original `racket` or `gracket` executable, instead of a wrapper executable that redirects to the original. If the original executable is statically linked to the Racket runtime library, then the resulting executable is similarly stand-alone. Beware that if the original executable links to Racket as a shared library, however, then `raco distribute` cannot work with executables that are created with `--orig-exe` (because the wrapper executable normally takes care of finding the shared libraries when the executable is distributed to a different machine).

- `--3m` — generate an executable based on the 3m variant of Racket, which is the default unless running a `raco exe` that is based on the CGC or CS variant.

- `--cgc` — generate an executable based on the CGC variant of Racket, which is the default only when running a `raco exe` that is based on the CGC variant.

- `--cs` — generate an executable based on the CS variant of Racket, which is the default only when running a `raco exe` that is based on the CS variant.

- `++aux` ⟨*file*⟩ — attach information to the executable based on ⟨*file*⟩'s suffix; see `extract-aux-from-path` for a list of recognized suffixes and meanings, and see `create-embedding-executable`'s use of auxiliary association for more specific information about how each kind of file is used.

- `++lib` ⟨*module-path*⟩ — include ⟨*module-path*⟩ in the executable, even if it is not referenced by the main program, so that it is available via `dynamic-require`.

- ++lang ⟨*lang*⟩ — include modules needed to load modules starting #lang ⟨*lang*⟩ dynamically. The ⟨*lang*⟩ does not have to be a plain language or module name; it might be a more general text sequence, such as `at-exp racket/base` to support language constructors like `at-exp`. The initial `require` for a `module` read as ⟨*lang*⟩ must be available though the language reader's `get-info` function and the `'module-language` key; languages implemented with `syntax/module-reader` support that key automatically.

- ++named-lib ⟨*prefix*⟩ ⟨*module-path*⟩ — like ++lib, but the embedded module's symbolic name is specified to be ⟨*prefix*⟩ appended before the library file's base name. Specifying a module's symbolic name can be useful with language constructs that depend reflexively on a module name, such as a serialization format (where a module name is record so that a function can be found later for deserialization).

- ++named-file ⟨*prefix*⟩ ⟨*file-path*⟩ — include ⟨*file-path*⟩ in the executable, even if it is not referenced by the main program, and use ⟨*prefix*⟩ before the file's base name as the embedded module's symbolic name. Since the embedded module's symbolic name is predictable, the module might be accessed at run time via `dynamic-require`. A predictable module name can also help with serialized data in the same way as ++named-lib.

- ++exf ⟨*flag*⟩ — provide the ⟨*flag*⟩ command-line argument on startup to the embedded `racket` or `gracket`.

- --exf ⟨*flag*⟩ — remove ⟨*flag*⟩ from the command-line arguments to be provided on startup to the embedded `racket` or `gracket`.

- --exf-clear — remove all command-line arguments to be provided on startup to the embedded `racket` or `gracket`.

- --exf-show — show (without changing) the command-line arguments to be provided on startup to the embedded `racket` or `gracket`.

- -v — report progress verbosely.

- --vv — report progress more verbosely than -v.

Changed in version 6.3.0.11: Added support for `declare-preserve-for-embedding`.

Changed in version 6.90.0.23: Added --embed-dlls.

Changed in version 7.0.0.17: Added ++lang.

Changed in version 7.3.0.6: Added ++named-lib and ++named-file, and changed generation of symbolic names for embedded modules to make it deterministic.

2.1   API for Creating Executables

 (require compiler/embed)   package: base

The `compiler/embed` library provides a function to embed Racket code into a copy of Racket or GRacket, thus creating a stand-alone Racket executable. To package the executable into a distribution that is independent of your Racket installation, use `assemble-distribution` from `compiler/distribute`.

Embedding walks the module dependency graph to find all modules needed by some initial set of top-level modules, compiling them if needed, and combining them into a "module bundle." In addition to the module code, the bundle extends the module name resolver, so that modules can be `require`d with their original names, and they will be retrieved from the bundle instead of the filesystem.

The `create-embedding-executable` function combines the bundle with an executable (Racket or GRacket). The `write-module-bundle` function prints the bundle to the current output port, instead; this stream can be `load`ed directly by a running program, as long as the `read-accept-compiled` parameter is true.

```
(create-embedding-executable
  dest
  #:modules mod-list
 [#:early-literal-expressions early-literal-sexps
  #:configure-via-first-module? config-via-first?
  #:literal-files literal-files
  #:literal-expression literal-sexp
  #:literal-expressions literal-sexps
  #:cmdline cmdline
  #:gracket? gracket?
  #:mred? mred?
  #:variant variant
  #:aux aux
  #:collects-path collects-path
  #:collects-dest collects-dest
  #:launcher? launcher?
  #:verbose? verbose?
  #:expand-namespace expand-namespace
  #:compiler compile-proc
  #:src-filter src-filter
  #:on-extension ext-proc
  #:get-extra-imports extras-proc])
 → void?
  dest : path-string?
  mod-list : (listof (or/c (list/c (or/c symbol? (one-of/c #t #f))
                                    (or/c module-path? path?))
                            (list/c (or/c symbol? (one-of/c #t #f))
                                    (or/c module-path? path?)
                                    (listof symbol?))))
  early-literal-sexps : list? = null
  config-via-first? : any/c = #f
```

31

```
literal-files : (listof path-string?) = null
literal-sexp : any/c = #f
literal-sexps : list? = (if literal-sexp
                             (list literal-sexp)
                             null)
cmdline : (listof string?) = null
gracket? : any/c = #f
mred? : any/c = #f
variant : (or/c 'cgc '3m 'cs) = (system-type 'gc)
aux : (listof (cons/c symbol? any/c)) = null
collects-path : (or/c #f                       = #f
                       path-string?
                       (listof path-string?))
collects-dest : (or/c #f path-string?) = #f
launcher? : any/c = #f
verbose? : any/c = #f
expand-namespace : namespace? = (current-namespace)
compile-proc : (any/c . -> . compiled-expression?)
            = (lambda (e)
                  (parameterize ([current-namespace
                                      expand-namespace])
                    (compile e)))
src-filter : (path? . -> . any) = (lambda (p) #t)
ext-proc : (or/c #f (path-string? boolean? . -> . any)) = #f
extras-proc : (path? compiled-module-expression?
                  . -> . (listof module-path?))
            = (lambda (p m) null)
```

Copies the Racket (if *gracket?* and *mred?* are #f) or GRacket (otherwise) binary, embedding code into the copied executable to be loaded on startup. On Unix, the binary is actually a wrapper executable that execs the original; see also the 'original-exe? tag for *aux*.

The embedding executable is written to *dest*, which is overwritten if it exists already (as a file or directory).

The embedded code consists of module declarations followed by additional (arbitrary) code. When a module is embedded, every module that it imports is also embedded. Library modules are embedded so that they are accessible via their lib paths in the initial namespace.

The #:modules argument *mod-list* designates modules to be embedded, as described below. The #:early-literal-expressions, #:literal-files, and #:literal-expressions arguments specify literal code to be copied into the executable: each element of *early-literal-sexps* is copied in order, then the content of each file in *literal-files* in order (with no intervening spaces), and then each element of *literal-sexps*. The *literal-files* files or *early-literal-sexps* or *literal-sexps* lists can contain compiled bytecode, and it's possible that the content of the *literal-files* files only

parse when concatenated; the files and expression are not compiled or inspected in any way during the embedding process. Beware that the initial namespace contains no bindings; use compiled expressions to bootstrap the namespace. The `#:literal-expression` (singular) argument is for backward compatibility.

If the `#:configure-via-first-module?` argument is specified as true, then the language of the first module in `mod-list` is used to configure the run-time environment before the expressions added by `#:literal-files` and `#:literal-expressions` are evaluated, but after the expressions of `#:early-literal-expressions`. See also §18.1.5 "Language Run-Time Configuration".

The `#:cmdline` argument `cmdline` contains command-line strings that are prefixed onto any actual command-line arguments that are provided to the embedding executable. A command-line argument that evaluates an expression or loads a file will be executed after the embedded code is loaded.

Each element of the `#:modules` argument `mod-list` is a two- or three-item list, where the first item is a prefix for the module name, and the second item is a module path datum (that's in the format understood by the default module name resolver), and the third is a list of submodule names to be included if they are available. The prefix can be a symbol, `#f` to indicate no prefix, or `#t` to indicate an auto-generated prefix. For example,

```
'((#f "m.rkt"))
```

embeds the module `m` from the file `"m.rkt"`, without prefixing the name of the module; the `literal-sexpr` argument to go with the above might be `'(require m)`. When submodules are available and included, the submodule is given a name by symbol-appending the `write` form of the submodule path to the enclosing module's name.

When an embedded module is not listed in the `#:modules` argument or not given a prefix there, a symbolic name for the embedded module is generated automatically. The names are generated in a deterministic but unspecified way, so that they are not conveniently accessible. The generated names may depend on the path of the first element of `mod-list`. Modules that were included via a collection-based path remain accessible at run time through their collection-based paths (via a module name resolver that is installed for the embedding executable).

Modules are normally compiled before they are embedded into the target executable; see also `#:compiler` and `#:src-filter` below. When a module declares run-time paths via `define-runtime-path`, the generated executable records the path (for use both by immediate execution and for creating a distribution that contains the executable).

If `collects-dest` is a path instead of `#f`, then instead of embedding collection-based modules into the executable, the modules (in compiled form, only) are copied into collections in the `collects-dest` directory.

The optional `#:aux` argument is an association list for platform-specific options (i.e., it is a

list of pairs where the first element of the pair is a key symbol and the second element is the value for that key). See also `build-aux-from-path`. The currently supported keys are as follows:

- `'icns` (Mac OS) : An icon file path (suffix `".icns"`) to use for the executable's desktop icon.

- `'ico` (Windows) : An icon file path (suffix `".ico"`) to use for the executable's desktop icon.

  Changed in version 6.3 of package `base`: All icons in the executable are replaced with icons from the file, instead of setting only certain sizes and depths.

- `'creator` (Mac OS) : Provides a 4-character string to use as the application signature.

- `'file-types` (Mac OS) : Provides a list of association lists, one for each type of file handled by the application; each association is a two-element list, where the first (key) element is a string recognized by Finder, and the second element is a plist value (see `xml/plist`). See `"drracket.filetypes"` in the `"drracket"` collection for an example.

- `'uti-exports` (Mac OS) : Provides a list of association lists, one for each Uniform Type Identifier (UTI) exported by the executable; each association is a two-element list, where the first (key) element is a string recognized in a UTI declaration, and the second element is a plist value (see `xml/plist`). See `"drracket.utiexports"` in the `"drracket"` collection for an example.

- `'resource-files` (Mac OS) : extra files to copy into the `"Resources"` directory of the generated executable.

- `'config-dir` : A string/path to a directory that contains configuration information, such as `"config.rtkd"` (see §19 "Installation Configuration and Search Paths"). If no value is supplied, the path is left as-is and converted to absolute form as needed. If `#f` is supplied, the path is left as-is (in potentially relative form). Note that if `collects-path` is provided as an empty list, then the configuration-directory path is not used by Racket's start up process (in contrast to a normal Racket start-up, where the configuration directory is consulted for information about collection link files).

- `'framework-root` (Mac OS) : A string to prefix the executable's path to the Racket and GRacket frameworks (including a separating slash); note that when the prefix start `"@executable_path/"` works for a Racket-based application, the corresponding prefix start for a GRacket-based application is `"@executable_path/../../../"`; if `#f` is supplied, the executable's framework path is left as-is, otherwise the original executable's path to a framework is converted to an absolute path if it was relative.

- `'dll-dir` (Windows) : A string/path to a directory that contains Racket DLLs needed by the executable, such as `"racket⟨version⟩.dll"`, or a boolean; a path can be relative to the executable; if `#f` is supplied, the path is left as-is; if `#t` is supplied, the path is dropped (so that the DLLs must be in the system directory or the user's PATH); if

no value is supplied the original executable's path to DLLs is converted to an absolute path if it was relative.

- `'embed-dlls?` (Windows) : A boolean indicating whether to copy DLLs into the executable, where the default value is `#f`. Embedded DLLs are instantiated by an internal linking step that bypasses some operating system facilities, so it will not work for all Windows DLLs, but typical DLLs will work as embedded.

- `'subsystem` (Windows) : A symbol, either `'console` for a console application or `'windows` for a consoleless application; the default is `'console` for a Racket-based application and `'windows` for a GRacket-based application; see also `'single-instance?`, below.

- `'single-instance?` (Windows) : A boolean for GRacket-based apps; the default is `#t`, which means that the app looks for instances of itself on startup and merely brings the other instance to the front; `#f` means that multiple instances are expected.

- `'forget-exe?` (Windows, Mac OS) : A boolean; `#t` for a launcher (see *launcher?* below) does not preserve the original executable name for `(find-system-path 'exec-file)`; the main consequence is that library collections will be found relative to the launcher instead of the original executable.

- `'original-exe?` (Unix) : A boolean; `#t` means that the embedding uses the original Racket or GRacket executable, instead of a wrapper binary that `execs` the original; the default is `#f`.

- `'relative?` (Unix, Windows, Mac OS) : A boolean; `#t` means that, to the degree that the generated executable must refer to another, it can use a relative path (so the executables can be moved together, but not separately), and it implies `#f` for `'config-dir`, `'framework-dir`, and `'dll-dir`, unless those are explicitly provided; a `#f` value (the default) means that absolute paths should be used (so the generated executable can be moved).

- `'wm-class` (Unix) : A string; used as the default `WM_CLASS` program class for the program's windows.

If the `#:collects-path` argument is `#f`, then the created executable maintains its built-in (relative) path to the main `"collects"` directory—which will be the result of `(find-system-path 'collects-dir)` when the executable is run—plus a potential list of other directories for finding library collections—which are used to initialize the `current-library-collection-paths` list in combination with the `PLTCOLLECTS` environment variable. Otherwise, the argument specifies a replacement; it must be either a path, string, or list of paths and strings. In the last case, the first path or string specifies the main collection directory, and the rest are additional directories for the collection search path (placed, in order, after the user-specific `"collects"` directory, but before the main `"collects"` directory; then the search list is combined with `PLTCOLLECTS`, if it is defined). If the list

is empty, then `(find-system-path 'collects-dir)` will return the directory of the executable, but `current-library-collection-paths` is initialized to an empty list, and `use-collection-link-paths` is set to false to disable the use of collection links files.

If the `#:launcher?` argument is `#t`, then *mod-list* should be null, *literal-files* should be null, *literal-sexp* should be `#f`, and the platform should be Windows or Mac OS. The embedding executable is created in such a way that `(find-system-path 'exec-file)` produces the source Racket or GRacket path instead of the embedding executable (but the result of `(find-system-path 'run-file)` is still the embedding executable).

The `#:variant` argument indicates which variant of the original binary to use for embedding. The default is `(system-type 'gc)`; see also `current-launcher-variant`.

The `#:compiler` argument is used to compile the source of modules to be included in the executable (when a compiled form is not already available). It should accept a single argument that is a syntax object for a `module` form. The default procedure uses `compile` parameterized to set the current namespace to *expand-namespace*.

The `#:expand-namespace` argument selects a namespace for expanding extra modules (and for compiling using the default *compile-proc*). Extra-module expansion is needed to detect run-time path declarations in included modules, so that the path resolutions can be directed to the current locations (and, ultimately, redirected to copies in a distribution).

The `#:src-filter` *src-filter* argument takes a path and returns true if the corresponding file source should be included in the embedding executable in source form (instead of compiled form), `#f` otherwise. The default returns `#f` for all paths. Beware that the current output port may be redirected to the result executable when the filter procedure is called. Each path given to *src-filter* corresponds to the actual file name (e.g., `".ss"`/`".rkt"` conversions have been applied as needed to refer to the existing file).

If the `#:on-extension` argument is a procedure, the procedure is called when the traversal of module dependencies arrives at an extension (i.e., a DLL or shared object). The default, `#f`, causes a reference to a single-module extension (in its current location) to be embedded into the executable. The procedure is called with two arguments: a path for the extension, and a `#f` (for historical reasons).

The `#:get-extra-imports` *extras-proc* argument takes a source pathname and compiled module for each module to be included in the executable. It returns a list of quoted module paths (absolute, as opposed to relative to the module) for extra modules to be included in the executable in addition to the modules that the source module `requires`. For example, these modules might correspond to reader extensions needed to parse a module that will be included as source, as long as the reader is referenced through an absolute module path. Each path given to *extras-proc* corresponds to the actual file name (e.g., `".ss"`/`".rkt"` conversions have been applied as needed to refer to the existing file).

Changed in version 6.90.0.23 of package `base`: Added `embed-dlls?` as an `#:aux` key.

Changed in version 7.3.0.6: Changed generation of symbolic names for embedded modules to make it deterministic.

```
(make-embedding-executable  dest
                            mred?
                            verbose?
                            mod-list
                            literal-files
                            literal-sexp
                            cmdline
                            [aux
                            launcher?
                            variant
                            collects-path]) → void?
  dest : path-string?
  mred? : any/c
  verbose? : any/c
  mod-list : (listof (or/c (list/c (or/c symbol? (one-of/c #t #f))
                                   (or/c module-path? path?))
                           (list/c (or/c symbol? (one-of/c #t #f))
                                   (or/c module-path? path?)
                                   (listof symbol?))))
  literal-files : (listof path-string?)
  literal-sexp : any/c
  cmdline : (listof string?)
  aux : (listof (cons/c symbol? any/c)) = null
  launcher? : any/c = #f
  variant : (one-of/c 'cgc '3m'cs) = (system-type 'gc)
  collects-path : (or/c #f                          = #f
                        path-string?
                        (listof path-string?))
```

Old (keywordless) interface to `create-embedding-executable`.

```
(write-module-bundle verbose?
                     mod-list
                     literal-files
                     literal-sexp) → void?
  verbose? : any/c
  mod-list : (listof (or/c (list/c (or/c symbol? (one-of/c #t #f))
                                   (or/c module-path? path?))
                           (list/c (or/c symbol? (one-of/c #t #f))
                                   (or/c module-path? path?)
                                   (listof symbol?))))
  literal-files : (listof path-string?)
  literal-sexp : any/c
```

Like `make-embedding-executable`, but the module bundle is written to the current output

port instead of being embedded into an executable. The output of this function can be `read` to load and instantiate `mod-list` and its dependencies, adjust the module name resolver to find the newly loaded modules, evaluate the forms included from `literal-files`, and finally evaluate `literal-sexpr`. The `read-accept-compiled` parameter must be true to read the stream.

```
(embedding-executable-is-directory? mred?) → boolean
  mred? : any/c
```

Indicates whether Racket/GRacket executables for the current platform correspond to directories from the user's perspective. The result is currently `#f` for all platforms.

```
(embedding-executable-is-actually-directory? mred?) → boolean?
  mred? : any/c
```

Indicates whether Racket/GRacket executables for the current platform actually correspond to directories. The result is `#t` on Mac OS when `mred?` is `#t`, `#f` otherwise.

```
(embedding-executable-put-file-extension+style+filters mred?)
 → (or/c string? false/c)
    (listof (one-of/c 'packages 'enter-packages))
    (listof (list/c string? string?))
  mred? : any/c
```

Returns three values suitable for use as the `extension`, `style`, and `filters` arguments to `put-file`, respectively.

If Racket/GRacket launchers for the current platform were directories from the user's perspective, the `style` result is suitable for use with `get-directory`, and the `extension` result may be a string indicating a required extension for the directory name.

```
(embedding-executable-add-suffix path
                                 mred?) → path-string?
  path : path-string?
  mred? : any/c
```

Adds a suitable executable suffix, if it's not present already.

2.1.1 Executable Creation Signature

```
(require compiler/embed-sig)        package: compiler-lib
```

```
compiler:embed^ : signature
```

Includes the identifiers provided by `compiler/embed`.

2.1.2 Executable Creation Unit

(require compiler/embed-unit)   package: compiler-lib

compiler:embed@ : unit?

A unit that imports nothing and exports compiler:embed^.

2.1.3 Finding the Racket Executable

(require compiler/find-exe)   package: base

```
(find-exe [#:cross? cross?
           #:untetherd? untethered?
           gracket?
           variant])                    → path?
  cross? : any/c = #f
  untethered? : any/c = #f
  gracket? : any/c = #f
  variant : (or/c 'cgc '3m 'cs) = (if cross?
                                       (cross-system-type 'gc)
                                       (system-type 'gc))
```

Finds the path to the racket or gracket (when *gracket?* is true) executable.

If *cross?* is true, the executable is found for the target platform in cross-installation mode.

If *untethered?* is true, then the original executable is found, instead of an executable that is tethered to a configuration or addon directory via (find-addon-tethered-console-bin-dir) and related functions.

Changed in version 6.2.0.5 of package base: Added the #:untethered? argument.
Changed in version 6.3: Added the #:cross? argument.

2.2 Installation-Specific Launchers

A *launcher* is similar to a stand-alone executable, but a launcher is usually smaller and can be created more quickly, because it depends permanently on the local Racket installation and the program's sources. In the case of Unix, a launcher is simply a shell script that runs racket or gracket. Launchers *cannot* be packaged into a distribution using raco distribute. The raco exe command creates a launcher when the -l or --launcher flag is specified.

```
(require launcher/launcher)        package: base
```

The `launcher/launcher` library provides functions for creating launchers.

2.2.1 Creating Launchers

```
(make-gracket-launcher  args
                        dest
                        [aux
                         #:tether-mode tether-mode]) → void?
  args : (listof string?)
  dest : path-string?
  aux : (listof (cons/c symbol? any/c)) = null
  tether-mode : (or/c 'addon 'config #f) = 'addon
```

Creates the launcher *dest*, which starts GRacket with the command-line arguments specified as strings in *args*. Extra arguments passed to the launcher at run-time are appended (modulo special Unix/X flag handling, as described below) to this list and passed on to GRacket. If *dest* exists already, as either a file or directory, it is replaced.

The optional *aux* argument is an association list for platform-specific options (i.e., it is a list of pairs where the first element of the pair is a key symbol and the second element is the value for that key). See also `build-aux-from-path`. See `create-embedding-executable` for a list that applies to both stand-alone executables and launchers on Windows and Mac OS GRacket; the following additional associations apply to launchers:

- `'independent?` (Windows) — a boolean; `#t` creates an old-style launcher that works with any Racket or GRacket binary, like `raco.exe`. No other *aux* associations are used for an old-style launcher.

- `'exe-name` (Mac OS, `'script-3m`, `'script-cgc` or `'script-cs` variant) — provides the base name for a `'3m`-/`'cgc`-/`'cs`-variant launcher, which the script will call ignoring *args*. If this name is not provided, the script will go through the GRacket executable as usual.

- `'exe-is-gracket` (when `'exe-name` is used) — indicates that `'exe-name` refers to the GRacket executable, which is potentially in a `"lib"` subdirectory instead of with other GUI applications.

- `'relative?` (all platforms) — a boolean, where `#t` means that the generated launcher should find the base GRacket executable through a relative path.

- `'install-mode` (Windows, Unix) — either `'main`, `'user`, `'config-tethered`, or `'addon-tethered`, indicates that the launcher is being installed to an installation-wide place, a user-specific place, an installation-wide place that embeds the configuration path, or a specific place that embeds an addon-directory path; the install

mode, in turn, determines whether and where to record `'start-menu`, `'extension-registry`, and/or `'desktop` information.

- `'start-menu` (Windows) — a boolean or real number; `#t` indicates that the launcher should be in the Start menu by an installer that includes the launcher. A number value is treated like `#t`, but also requests that the installer automatically start the application, where the number determines a precedence relative to other launchers that may request starting. A `'start-menu` value is used only when `'install-mode` is also specified.

- `'extension-register` (Windows) — a list of document types for file-extension registrations to be performed by an installer. Each document type is described by a list of six items:

  - a human-readable string describing the document type, such as `"Racket Document"`;
  - a string to use as a key for the document type, such as `"Racket.Document"`;
  - a list of strings, where each string is a file extension without the dot, such as `'("rkt" "rktl" "rktd")`;
  - a path to a file that supplies the icon, such as `"doc.ico"`;
  - a string to represent the command line to handle a document with a matching extension, such as `"\"%1\""`, where the string will be prefixed with a path to the launcher, and where `%1` will be replaced with the document path

  An `'extension-registry` value is used only when `'install-mode` is also specified.

- `'desktop` (Unix) — a string containing the content of a `".desktop"` file for the launcher, where `Exec` and `Icon` entries are added automatically. If an `Exec` entry exists in the string, and if its value starts with a non-empty sequence of alpha-numeric ASCII characters followed by a space, then the space and remainder of the value is appended to the automatically generated value. The `".desktop"` file is written to the directory produced by `(find-apps-dir)` or `(find-user-apps-dir)`. A `'desktop` value is used only when `'install-mode` is also specified.

- `'png` (Unix) : An icon file path (suffix `".png"`) to be referenced by a `".desktop"` file (if any); a `'png` value takes precedence over a `'ico` value, but neither is used unless a `'desktop` value is also present.

- `'ico` (Unix, in addition to more general Windows use) : An icon file path (suffix `".ico"`) that is used in the same way as `'png` if no `'png` value is available.

For Unix/X, the script created by `make-mred-launcher` detects and handles X Windows flags specially when they appear as the initial arguments to the script. Instead of appending these arguments to the end of *args*, they are spliced in after any X Windows flags already listed in *args*. The remaining arguments (i.e., all script flags and arguments after the last X Windows flag or argument) are then appended after the spliced *args*.

The `tether-mode` argument indicates how much to preserve the current installation's tethering to a configuration directory and/or addon directory based on `(find-addon-tether-console-bin-dir)` and `(find-config-tether-console-bin-dir)`. The `'addon` mode allows full tethering, the `'config` mode allows only configuration-directory tethering, and the `#f` mode disables tethering.

Changed in version 6.5.0.2 of package base: Added the `#:tether-mode` argument.

```
(make-racket-launcher args dest [aux]) → void?
  args : (listof string?)
  dest : path-string?
  aux : (listof (cons/c symbol? any/c)) = null
```

Like `make-gracket-launcher`, but for starting Racket. On Mac OS, the `'exe-name` *aux* association is ignored.

```
(make-gracket-program-launcher file
                               collection
                               dest)      → void?
  file : string?
  collection : string?
  dest : path-string?
```

Calls `make-gracket-launcher` with arguments that start the GRacket program implemented by *file* in *collection*: `(list "-l-" (string-append collection "/" file))`. The *aux* argument to `make-gracket-launcher` is generated by stripping the suffix (if any) from *file*, adding it to the path of *collection*, and passing the result to `build-aux-from-path`.

```
(make-racket-program-launcher file
                              collection
                              dest)      → void?
  file : string?
  collection : string?
  dest : path-string?
```

Like `make-gracket-program-launcher`, but for `make-racket-launcher`.

```
(install-gracket-program-launcher file
                                  collection
                                  name)      → void?
  file : string?
  collection : string?
  name : string?
```

Same as

```
(make-gracket-program-launcher
 file collection
 (gracket-program-launcher-path name))
```

```
(install-racket-program-launcher file
                                  collection
                                  name)        → void?
  file : string?
  collection : string?
  name : string?
```

Same as

```
(make-racket-program-launcher
 file collection
 (racket-program-launcher-path name))
```

```
(make-mred-launcher args dest [aux]) → void?
  args : (listof string?)
  dest : path-string?
  aux : (listof (cons/c symbol? any/c)) = null
(make-mred-program-launcher file
                            collection
                            dest)        → void?
  file : string?
  collection : string?
  dest : path-string?
(install-mred-program-launcher file
                               collection
                               name)        → void?
  file : string?
  collection : string?
  name : string?
```

Backward-compatible version of `make-gracket-launcher`, etc., that adds `"-I"` `"scheme/gui/init"` to the start of the command-line arguments.

```
(make-mzscheme-launcher args dest [aux]) → void?
  args : (listof string?)
  dest : path-string?
  aux : (listof (cons/c symbol? any/c)) = null
(make-mzscheme-program-launcher file
                                collection
                                dest)        → void?
  file : string?
  collection : string?
  dest : path-string?
```

```
(install-mzscheme-program-launcher file
                                   collection
                                   name)        → void?
  file : string?
  collection : string?
  name : string?
```

Backward-compatible version of `make-racket-launcher`, etc., that adds `"-I"` `"scheme/init"` to the start of the command-line arguments.

2.2.2   Launcher Path and Platform Conventions

```
(gracket-program-launcher-path  name
                                [#:user? user?
                                 #:tethered? tethered?
                                 #:console? console?]) → path?
  name : string?
  user? : any/c = #f
  tethered? : any/c = #f
  console? : any/c = #f
```

Returns a pathname for an executable called something like *name* in

- the Racket installation — when *user?* is #f and *tethered?* is #f;

- the user's Racket executable directory — when *user?* is #t and *tethered?* is #f;

- an additional executable directory for executables tethered to a particular configuration directory — when *user?* is #f and *tethered?* is #t; or

- an additional executable directory for executables tethered to a particular addon and configuration directory — when *user?* is #t and *tethered?* is #t.

For Windows, the `".exe"` suffix is automatically appended to *name*. For Unix, *name* is changed to lowercase, whitespace is changed to ⸗, and the path includes the `"bin"` subdirectory of the Racket installation. For Mac OS, the `".app"` suffix is appended to *name*.

If *console?* is true, then the path is in the console executable directory, such as the one reported by (`find-console-bin-dir`), instead of the GUI executable directory, such as the one reported by (`find-gui-bin-dir`).

Changed in version 6.5.0.2 of package `base`: Added the `#:tethered?` argument.
Changed in version 6.8.0.2: Added the `#:console?` argument.

```
(racket-program-launcher-path  name
                               [#:user? user?
                                #:tethered? tethered?
                                #:console? console?])  → path?
  name : string?
  user? : any/c = #f
  tethered? : any/c = #f
  console? : any/c = #f
```

Returns the same path as (gracket-program-launcher-path name #:user? user? #:tethered tethered? #:console? console?).

Changed in version 6.5.0.2 of package base: Added the #:tethered? argument.
Changed in version 6.8.0.2: Added the #:console? argument.

```
(gracket-launcher-is-directory?)  → boolean?
```

Returns #t if GRacket launchers for the current platform are directories from the user's perspective. For all currently supported platforms, the result is #f.

```
(racket-launcher-is-directory?)  → boolean?
```

Like gracket-launcher-is-directory?, but for Racket launchers.

```
(gracket-launcher-is-actually-directory?)  → boolean?
```

Returns #t if GRacket launchers for the current platform are implemented as directories from the filesystem's perspective. The result is #t for Mac OS, #f for all other platforms.

```
(racket-launcher-is-actually-directory?)  → boolean?
```

Like gracket-launcher-is-actually-directory?, but for Racket launchers. The result is #f for all platforms.

```
(gracket-launcher-add-suffix path-string?)  → path?
  path-string? : path
```

Returns a path with a suitable executable suffix added, if it's not present already.

```
(racket-launcher-add-suffix path-string?)  → path?
  path-string? : path
```

Like gracket-launcher-add-suffix, but for Racket launchers.

```
(gracket-launcher-put-file-extension+style+filters)
 → (or/c string? false/c)
    (listof (one-of/c 'packages 'enter-packages))
    (listof (list/c string? string?))
```

Returns three values suitable for use as the `extension`, `style`, and `filters` arguments to `put-file`, respectively.

If GRacket launchers for the current platform were directories from the user's perspective, the `style` result is suitable for use with `get-directory`, and the `extension` result may be a string indicating a required extension for the directory name.

```
(racket-launcher-put-file-extension+style+filters)
 → (or/c string? false/c)
    (listof (one-of/c 'packages 'enter-packages))
    (listof (list/c string? string?))
```

Like `gracket-launcher-get-file-extension+style+filters`, but for Racket launchers.

```
(mred-program-launcher-path  name
                             [#:user? user?
                              #:tethered? tethered?]) → path?
  name : string?
  user? : any/c = #f
  tethered? : any/c = #f
(mred-launcher-is-directory?) → boolean?
(mred-launcher-is-actually-directory?) → boolean?
(mred-launcher-add-suffix path-string?) → path?
  path-string? : path
(mred-launcher-put-file-extension+style+filters)
 → (or/c string? false/c)
    (listof (one-of/c 'packages 'enter-packages))
    (listof (list/c string? string?))
```

Backward-compatible aliases for `gracket-program-launcher-path`, etc.

Changed in version 6.5.0.2 of package base: Added the `#:tethered?` argument.

```
(mzscheme-program-launcher-path  name
                                 [#:user? user?
                                  #:tethered? tethered?]) → path?
  name : string?
  user? : any/c = #f
  tethered? : any/c = #f
```

```
(mzscheme-launcher-is-directory?) → boolean?
(mzscheme-launcher-is-actually-directory?) → boolean?
(mzscheme-launcher-add-suffix path-string?) → path?
  path-string? : path
(mzscheme-launcher-put-file-extension+style+filters)
 → (or/c string? false/c)
    (listof (one-of/c 'packages 'enter-packages))
    (listof (list/c string? string?))
```

Backward-compatible aliases for `racket-program-launcher-path`, etc.

Changed in version 6.5.0.2 of package `base`: Added the `#:tethered?` argument.

```
(installed-executable-path->desktop-path exec-path
                                         user?)
 → (and/c path? complete-path?)
  exec-path : path-string?
  user? : any/c
```

Returns a path for a `".desktop"` file to describe the installed executable at *exec-path*. Only the filename part of *exec-path* is used. The *user?* argument should be true if *exec-path* is installed in a user-specific location (in which case the result path will also be user-specific).

```
(installed-desktop-path->icon-path desktop-path
                                   user?
                                   suffix)
 → (and/c path? complete-path?)
  desktop-path : path-string?
  user? : any/c
  suffix : bytes?
```

Returns a path for an icon file to be referenced by the `"desktop"` file at *desktop-path*. Only the filename part of *desktop-path* is used. The *user?* argument should be true if *desktop-path* is installed in a user-specific location (in which case the result path will also be user-specific). The *suffix* argument provides the icon-file suffix, normally either `#"png"` or `#"ico"`.

2.2.3 Launcher Configuration

```
(gracket-launcher-up-to-date? dest aux) → boolean?
  dest : path-string?
  aux : (listof (cons/c symbol? any/c))
```

Returns #t if the GRacket launcher *dest* does not need to be updated, assuming that *dest* is a launcher and its arguments have not changed.

```
(racket-launcher-up-to-date? dest aux) → boolean?
  dest : path-string?
  aux : (listof (cons/c symbol? any/c))
```

Analogous to `gracket-launcher-up-to-date?`, but for a Racket launcher.

```
(build-aux-from-path path) → (listof (cons/c symbol? any/c))
  path : path-string?
```

Creates an association list suitable for use with `make-gracket-launcher` or `create-embedding-executable`. It builds associations by adding to *path* suffixes, such as ".icns", checking whether such a file exists, and calling `extract-aux-from-path` if so. The results from all recognized suffixes are appended together.

```
(extract-aux-from-path path) → (listof (cons/c symbol? any/c))
  path : path-string?
```

Creates an association list suitable for use with `make-gracket-launcher` or `create-embedding-executable`. It builds associations by recognizing the suffix of *path*, where the recognized suffixes are as follows:

- ".icns" → 'icns file for use on Mac OS

- ".ico" → 'ico file for use on Windows or Unix

- ".png" → 'png file for use on Unix

- ".lch" → 'independent? as #t (the file content is ignored) for use on Windows

- ".creator" → 'creator as the initial four characters in the file for use on Mac OS

- ".filetypes" → 'file-types as read content (a single S-expression), and 'resource-files as a list constructed by finding "CFBundleTypeIconFile" entries in 'file-types (and filtering duplicates); for use on Mac OS

- ".utiexports" → 'uti-exports as read content (a single S-expression); for use on Mac OS

- ".wmclass" → 'wm-class as the literal content, removing a trailing newline if any; for use on Unix

- ".desktop" → 'desktop as the literal content; for use on Unix

- ".startmenu" → 'start-menu as the file content if it reads as a real number, #t otherwise, for use on Windows

- ".extreg" → 'extension-register as read content (a single S-expression), but with relative (to the ".extreg" file) paths converted to absolute paths; for use on Windows

```
(current-launcher-variant) → symbol?
(current-launcher-variant variant) → void?
  variant : symbol?
```

A parameter that indicates a variant of Racket or GRacket to use for launcher creation and for generating launcher names. The default is the result of (system-type 'gc). On Unix and Windows, the possibilities are 'cgc, '3m, and 'cs. On Mac OS, the 'script-cgc, 'script-3m, and 'script-cs variants are also available for GRacket launchers.

```
(available-gracket-variants) → (listof symbol?)
```

Returns a list of symbols corresponding to available variants of GRacket in the current Racket installation. The list normally includes at least one of '3m, 'cgc, or 'cs— whichever is the result of (system-type 'gc)—and may include the others, as well as 'script-3m, 'script-cgc, and/or 'script-cs on Mac OS.

```
(available-racket-variants) → (listof symbol?)
```

Returns a list of symbols corresponding to available variants of Racket in the current Racket installation. The list normally includes at least one of '3m, 'cgc, or 'cs—whichever is the result of (system-type 'gc)—and may include the others.

```
(mred-launcher-up-to-date? dest aux) → boolean?
  dest : path-string?
  aux : (listof (cons/c symbol? any/c))
(mzscheme-launcher-up-to-date? dest aux) → boolean?
  dest : path-string?
  aux : (listof (cons/c symbol? any/c))
(available-mred-variants) → (listof symbol?)
(available-mzscheme-variants) → (listof symbol?)
```

Backward-compatible aliases for gracket-launcher-up-to-date?, etc.

2.2.4 Launcher Creation Signature

```
(require launcher/launcher-sig)          package: compiler-lib
```

launcher^ : signature

Includes the identifiers provided by launcher/launcher.

2.2.5 Launcher Creation Unit

```
(require launcher/launcher-unit)      package: compiler-lib
```

launcher@ : unit?

A unit that imports nothing and exports `launcher^`.

2.3 Mac OS Dynamic Library Paths

```
(require compiler/exe-dylib-path)      package: base
```

The `compiler/exe-dylib-path` library provides functions for reading and adjusting dynamic-library references in a Mac OS executable.

Added in version 6.3 of package `base`.

```
(find-matching-library-path exe-path
                            library-str) → (or/c #f string?)
  exe-path : path-string?
  library-str : string?
```

Searches dynamic-linking information in `exe-path` for a library reference whose name includes `library-str` and returns the executable's path to the library for the first match. If no match is found, the result is `#f`.

```
(update-matching-library-path exe-path
                              library-str
                              library-path-str) → void?
  exe-path : path-string?
  library-str : string?
  library-path-str : string?
```

Searches dynamic-linking information in `exe-path` for each library reference whose name includes `library-str` and replaces the executable's path to that library with `library-path-str`.

A single match is expected, and the update assumes enough space for the new path, perhaps because the executable is linked with `-headerpad_max_install_names`.

3 `raco distribute`: **Sharing Stand-Alone Executables**

The `raco distribute` command combines a stand-alone executable created by `raco exe` with all of the shared libraries that are needed to run it, along with any run-time files declared via `define-runtime-path`. The resulting package can be moved to other machines that run the same operating system.

After the `raco distribute` command, supply a directory to contain the combined files for a distribution. Each command-line argument is an executable to include in the distribution, so multiple executables can be packaged together. For example, on Windows,

```
raco distribute greetings hello.exe goodbye.exe
```

creates a directory `"greetings"` (if the directory doesn't exist already), and it copies the executables `"hello.exe"` and `"goodbye.exe"` into `"greetings"`. It also creates a `"lib"` sub-directory in `"greetings"` if needed to contain DLLs, and in that case it adjusts the copied `"hello.exe"` and `"goodbye.exe"` to use the DLLs in `"lib"`.

The number of needed support files depends in part on the way that executables for a distribution are created. Supplying `--embed-dlls` or `--orig-exe` to `raco exe` reduces the need for support files, but at the expense of making the distribution larger if it contains multiple executables.

The layout of files within a distribution directory is platform-specific:

- On Windows, executables are put directly into the distribution directory, and DLLs and other run-time files go into a `"lib"` sub-directory.

- On Mac OS, GUI executables go into the distribution directory, other executables go into a `"bin"` subdirectory, and frameworks (i.e., shared libraries) go into a `"lib"` sub-directory along with other run-time files. As a special case, if the distribution has a single `--gui-exe` executable, then the `"lib"` directory is hidden inside the application bundle.

- On Unix, executables go into a `"bin"` subdirectory, shared libraries (if any) go into a `"lib"` subdirectory along with other run-time files, and wrapped executables are placed into a `"lib/plt"` subdirectory with version-specific names. This layout is consistent with Unix installation conventions; the version-specific names for shared libraries and wrapped executables means that distributions can be safely unpacked into a standard place on target machines without colliding with an existing Racket installation or other executables created by `raco exe`.

A distribution also has a `"collects"` directory that is used as the main library collection directory for the packaged executables. By default, the directory is empty. Use the `++collects-copy` flag of `raco distribute` to supply a directory whose content is copied

into the distribution's `"collects"` directory. The `++collects-copy` flag can be used multiple times to supply multiple directories.

When multiple executables are distributed together, then separately creating the executables with `raco exe` can generate multiple copies of collection-based libraries that are used by multiple executables. To share the library code, instead, specify a target directory for library copies using the `--collects-dest` flag with `raco exe`, and specify the same directory for each executable (so that the set of libraries used by all executables are pooled together). Finally, when packaging the distribution with `raco distribute`, use the `++collects-copy` flag to include the copied libraries in the distribution.

3.1 API for Distributing Executables

```
(require compiler/distribute)        package: base
```

The `compiler/distribute` library provides a function to perform the same work as `raco distribute`.

```
(assemble-distribution  dest-dir
                        exec-files
                       [#:executables? executables?
                        #:relative-base relative-base
                        #:collects-path path
                        #:copy-collects dirs])          → void?
  dest-dir : path-string?
  exec-files : (listof path-string?)
  executables? : any/c = #t
  relative-base : (or/c path-string? #f) = #f
  path : (or/c false/c (and/c path-string? relative-path?)) = #f
  dirs : (listof path-string?) = null
```

Copies the executables in *exec-files* to the directory *dest-dir*, along with DLLs, frameworks, shared libraries, and/or runtime files that the executables need to run a different machine. If *executables?* is `#f`, then the *exec-files* are treated as plain data files, instead of executables, and they are modified in-place.

The arrangement of the executables and support files in *dest-dir* depends on the platform. In general, `assemble-distribution` tries to do the Right Thing, but a non-`#f` value for *relative-base* specifies a path for reaching the assembled content relative to the executable at run time. When *executables?* is `#f`, then the default access path is *dest-dir*, with its relativeness preserved.

If a `#:collects-path` argument is given, it overrides the default location of the main `"collects"` directory for the packaged executables. It should be relative to the *dest-dir* directory (typically inside it).

The content of each directory in the `#:copy-collects` argument is copied into the main `"collects"` directory for the packaged executables.

Changed in version 6.3 of package `base`: Added the `#:executables?` and `#:relative-base` arguments.

3.2 API for Bundling Distributions

(require compiler/bundle-dist)   package: `compiler-lib`

The `compiler/bundle-dist` library provides a function to pack a directory (usually assembled by `assemble-distribution`) into a distribution file. On Windows, the result is a `".zip"` archive; on Mac OS, it's a `".dmg"` disk image; on Unix, it's a `".tgz"` archive.

```
(bundle-directory dist-file dir [for-exe?]) → void?
  dist-file : file-path?
  dir : file-path?
  for-exe? : any/c = #f
```

Packages *dir* into *dist-file*. If *dist-file* has no extension, a file extension is added automatically (using the first result of `bundle-put-file-extension+style+filters`).

The created archive contains a directory with the same name as *dir*—except on Mac OS when *for-exe?* is true and *dir* contains a single a single file or directory, in which case the created disk image contains just the file or directory. The default for *for-exe?* is #f.

Archive creation fails if *dist-file* exists.

```
(bundle-put-file-extension+style+filters)
 → (or/c string? false/c)
    (listof (one-of/c 'packages 'enter-packages))
    (listof (list/c string? string?))
```

Returns three values suitable for use as the `extension`, `style`, and `filters` arguments to `put-file`, respectively to select a distribution-file name.

4 `raco planet`: **Automatic Package Distribution**

See *PLaneT: Automatic Package Distribution* for information on the `raco planet` command, which is used for managing packages that can be automatically downloaded and installed from the PLaneT server.

5 `raco pkg`: Package Management

See *Package Management in Racket* for information on the `raco pkg` command, which is used for managing external code packages.

6 `raco setup`: Installation Management

The `raco setup` command builds bytecode, documentation, executables, and metadata indexes for all installed collections.

The collections that are built by `raco setup` can be part of the original Racket distribution, installed via the package manager (see *Package Management in Racket*), installed via PLaneT (see *PLaneT: Automatic Package Distribution*), linked via `raco link`, in a directory that is listed in the `PLTCOLLECTS` environment variable, or placed into one of the default collection directories.

The `raco setup` tool itself does not directly support the installation of collections, except through the now-discouraged `-A` flag (see §6.2 "Installing `".plt"` Archives"). The `raco setup` command is used by installation tools such as the package manager or PLaneT. Programmers who modify installed collections may find it useful to run `raco setup` as an alternative to un-installing and re-installing a set of collections.

6.1   Running `raco setup`

With no command-line arguments, `raco setup` finds all of the current collections—see §18.2 "Libraries and Collections"—and compiles libraries in each collection. (Directories that are named `".git"` or `".svn"` are not treated as collections.)

To restrict `raco setup` to a set of collections, provide the collection names as arguments. For example, `raco setup scribblings/raco` would only compile and render the documentation for `raco`, which is implemented in a `"scribblings/raco"` collection.

An optional `"info.rkt"` within the collection can indicate specifically how the collection's files are to be compiled and other actions to take in setting up a collection, such as creating executables or building documentation. See §6.3 "Controlling `raco setup` with `"info.rkt"` Files" for more information.

The `raco setup` command accepts the following command-line flags:

- Constraining to specified collections or PLaneT packages:
    - `--only` — restrict setup to specified collections and PLaneT packages, even if none are specified. This mode is the default if any collection is specified as a command-line argument or through the `-l`, `--pkgs`, or `-P` flag.
    - `-l` ⟨*collection*⟩ `...` — constrain setup actions to the specified ⟨*collection*⟩s (i.e., the same as providing ⟨*collections*⟩s without a flag, but with no possibility that a ⟨*collection*⟩ is interpreted as a flag).
    - `--pkgs` ⟨*pkg*⟩ `...` — constrain setup actions to collections that are within (or partially within) the named ⟨*pkg*⟩s.

- -P ⟨*owner*⟩ ⟨*package-name*⟩ ⟨*maj*⟩ ⟨*min*⟩ — constrain setup actions to the specified PLaneT package, in addition to any other specified PLaneT packages or collections.

- --doc-index — build collections that implement documentation indexes (when documentation building is enabled), in addition to specified collections.

- --tidy — remove metadata cache information and documentation for nonexistent collections or documentation to clean up after removal, even when setup actions are otherwise confined to specified collections. Although tidying is not confined to specified collections, it can be constrained with --avoid-main or --no-user.

- Constraining to specific tasks:

  - --clean or -c — delete existing ".zo" files, thus ensuring a clean build from the source files. The exact set of deleted files can be controlled by "info.rkt"; see clean for more information. Unless --no-info-domain or -d is also specified, the "info.rkt" cache is cleared. Unless --no-docs or -D is also specified, the documentation-index database is reset.

  - --fast-clean — like --clean, but without forcing a bootstrap of raco setup from source (which means that --fast-clean cannot clean corruption that affects raco setup itself).

  - --no-zo or -n — refrain from compiling source files to ".zo" files.

  - --trust-zos — fix timestamps on ".zo" files on the assumption that they are already up-to-date (unless the PLT_COMPILED_FILE_CHECK environment variable is set to exists, in which case timestamps are ignored).

  - --recompile-only — disallow recompilation of modules from source, imposing the constraint that each ".zo" file is up-to-date, needs only a timestamp adjustment, or can be recompiled from an existing ".zo" in machine-independent format (when compiling to a machine-dependent format).

  - --no-launcher or -x — refrain from creating executables or installing man pages (as specified in "info.rkt"; see §6.3 "Controlling raco setup with "info.rkt" Files").

  - --no-foreign-libs or -F — refrain from installing foreign libraries (as specified in "info.rkt"; see §6.3 "Controlling raco setup with "info.rkt" Files").

  - --only-foreign-libs — disable actions other than installing foreign libraries; equivalent to -nxiIdD, except that --only-foreign-libs doesn't reject (redundant) specification of those individual flags.

  - --no-install or -i — refrain from running pre-install actions (as specified in "info.rkt" files; see §6.3 "Controlling raco setup with "info.rkt" Files").

  - --no-post-install or -I — refrain from running post-install actions (as specified in "info.rkt" files; see §6.3 "Controlling raco setup with "info.rkt" Files").

- --no-info-domain or -d — refrain from building a cache of metadata information from "info.rkt" files. This cache is needed by other tools. For example, raco itself uses the cache to locate plug-in tools.

- --no-docs or -D — refrain from building documentation.

- --doc-pdf ⟨*dir*⟩ — in addition to building HTML documentation, render documentation to PDF and place files in ⟨*dir*⟩.

- --no-pkg-deps or -K — refrain from checking whether dependencies among libraries are properly reflected by package-level dependency declarations, whether modules are declared by multiple packages, and whether package version dependencies are satisfied. See §6.5 "Package Dependency Checking" for more information.

- --check-pkg-deps — checks package dependencies (unless explicitly disabled) even when specific collections are provided to raco setup, and even for packages that have no dependency declarations. See §6.5 "Package Dependency Checking" for more information.

- --fix-pkg-deps — attempt to correct dependency mismatches by adjusting package "info.rkt" files (which makes sense only for packages that are installed as links). See §6.5 "Package Dependency Checking" for more information.

- --unused-pkg-deps — attempt to report dependencies that are declared but are unused. Beware that some package dependencies may be intentionally unused (e.g., declared to force installation of other packages as a convenience), and beware that package dependencies may be reported as unused only because compilation of relevant modules has been suppressed. See §6.5 "Package Dependency Checking" for more information.

- Constraining user versus installation setup:

  - --no-user or -U — refrain from any user-specific (as opposed to installation-specific) setup actions.

  - --no-planet — refrain from any setup actions for PLaneT actions; this flag is implied by --no-user.

  - --avoid-main — refrain from any setup actions that affect the installation, as opposed to user-specific actions.

  - --force-user-docs — when building documentation, create a user-specific documentation entry point even if it has the same content as the main installation.

- Selecting parallelism and other build modes:

  - --jobs ⟨*n*⟩, --workers ⟨*n*⟩, or -j ⟨*n*⟩ — use up to ⟨*n*⟩ parallel processes. By default, raco setup uses (processor-count) jobs, which typically uses all of the machine's processing cores.

  - --places — use Racket places for parallel jobs; this mode is the default if Racket places run in parallel.

- **--processes** — use separate processes for parallel jobs; this mode is the default if Racket places cannot run in parallel.

- **--verbose** or **-v** — more verbose output about `raco setup` actions.

- **--make-verbose** or **-m** — more verbose output about dependency checks.

- **--compiler-verbose** or **-r** — even more verbose output about dependency checks and compilation.

- **--mode** ⟨*mode*⟩ — use a ".zo" compiler other than the default compiler, and put the resulting ".zo" files in a subdirectory (of the usual place) named by ⟨*mode*⟩. The compiler is obtained by using ⟨*mode*⟩ as a collection name, finding a "zo-compile.rkt" module in that collection, and extracting its `zo-compile` export. The `zo-compile` export should be a function like `compile`; see the "errortrace" collection for an example.

- **--fail-fast** — attempt to break as soon as any error is discovered.

- **--error-out** ⟨*file*⟩ — handle survivable errors by writing ⟨*file*⟩ and exiting as successful, which facilitates chaining multiple `raco setup` invocations in combination with **--error-in**. If there are no errors and ⟨*file*⟩ already exists, it is deleted.

- **--error-in** ⟨*file*⟩ — treat the existence of ⟨*file*⟩ as a "errors were reported by a previous process" error. Typically, ⟨*file*⟩ is created by previous `raco setup` run using **--error-out**. A file for **--error-in** is detected before creating a file via **--error-out**, so the same file can be used to chain a sequence of `raco setup` steps.

- **--pause** or **-p** — pause for user input if any errors are reported (so that a user has time to inspect output that might otherwise disappear when the `raco setup` process ends).

- Unpacking ".plt" archives:

  - **-A** ⟨*archive*⟩ ... — Install each ⟨*archive*⟩; see §6.2 "Installing ".plt" Archives".

  - **--force** — for use with **-A**, treat version mismatches for archives as mere warnings.

  - **--all-users** or **-a** — for use with **-A**, install archive into the installation instead of a user-specific location.

- Bootstrapping:

  - **--boot** ⟨*module-file*⟩ ⟨*build-dir*⟩ — For use by directly running `setup` instead of through `raco setup`, loads ⟨*module-file*⟩ in the same way that `raco setup` normally loads itself, auto-detecting the need to start from sources and rebuild the compiled files—even for the compilation manager itself. The ⟨*build-dir*⟩ path is installed as the only path in `current-compiled-file-roots`, so all compiled files go there.

59

- `--chain` ⟨*module-file*⟩ ⟨*build-dir*⟩ — Like `--boot`, but adds ⟨*build-dir*⟩ to the start of `current-compiled-file-roots` instead of replacing the current value, which means that libraries already built in the normal location (including the compilation manager itself) will be used instead of rebuilt. This mode makes sense for cross-compilation.

When building `racket`, flags can be provided to `raco setup` as run by `make install` by setting the `PLT_SETUP_OPTIONS` environment variable. For example, the following command line uses a single process to build collections during an install:

```
env PLT_SETUP_OPTIONS="-j 1" make install
```

Running `raco setup` is sensitive to the `PLT_COMPILED_FILE_CHECK` environment variable in the same way as `raco make`. Specifically, if `PLT_COMPILED_FILE_CHECK` is set to `exists`, then `raco make` does not attempt to update a compiled file's timestamp if the file is not recompiled.

Changed in version 6.1: Added the `--pkgs`, `--check-pkg-deps`, and `--fail-fast` flags.

Changed in version 6.1.1: Added the `--force-user-docs` flag.

Changed in version 6.1.1.6: Added the `--only-foreign-libs` flag.

Changed in version 6.6.0.3: Added support for `PLT_COMPILED_FILE_CHECK`.

Changed in version 7.0.0.19: Added `--places` and `--processes`.

Changed in version 7.2.0.7: Added `--error-in` and `--error-out`.

Changed in version 7.2.0.8: Added `--recompile-only`.

6.2   Installing `".plt"` Archives

A `".plt"` file is a platform-independent distribution archive for software based on Racket. A typical `".plt"` file can be installed as a package using `raco pkg` (see *Package Management in Racket*), in which case `raco pkg` supplies facilities for uninstalling the package and managing dependencies.

An older approach is to supply a `".plt"` file to `raco setup` with the `-A` flag; the files contained in the `".plt"` archive are unpacked (according to specifications embedded in the `".plt"` file) and only collections specified by the `".plt"` file are compiled and setup. Archives processed in this way can include arbitrary code that is executed at install time, in addition to any actions triggered by the normal collection-setup part of `raco setup`.

Finally, the `raco unpack` (see §11 "`raco unpack`: Unpacking Library Collections") command can list the content of a `".plt"` archive or unpack the archive without installing it as a package or collection.

6.3 Controlling `raco setup` with `"info.rkt"` Files

To compile a collection's files to bytecode, `raco setup` uses the `compile-collection-zos` procedure. That procedure, in turn, consults the collection's `"info.rkt"` file, if it exists, for specific instructions on compiling the collection. See `compile-collection-zos` for more information on the fields of `"info.rkt"` that it uses, and see §6.4 `""info.rkt"` File Format" for information on the format of an `"info.rkt"` file.

Additional fields are used by the Racket package manager and are documented in §4 "Package Metadata". The `raco test` command also recognizes additional fields, which are documented in §13.2 "Test Configuration by `"info.rkt"`".

Optional `"info.rkt"` fields trigger additional actions by `raco setup`:

- `scribblings` : `(listof (cons/c string? list?))` — A list of documents to build. Each document in the list is itself represented as a list, where each document's list starts with a string that is a collection-relative path to the document's source file. A document name (which is derived from the source module's name by default) is intended to be globally unique in the same way as a package or module name.

    More precisely a `scribblings` entry must be a value that can be generated from an expression matching the following *entry* grammar:

    ```
        entry = (list doc ...)

          doc = (list src-string)
              | (list src-string flags)
              | (list src-string flags category)
              | (list src-string flags category name)
              | (list src-string flags category name out-k)
              | (list src-string flags category name out-k order-n)

        flags = (list mode-symbol ...)

     category = (list category-string-or-symbol)
              | (list category-string-or-symbol sort-number)

         name = string
              | #f
    ```

    A document's list optionally continues with information on how to build the document. If a document's list contains a second item, *flags*, it must be a list of mode symbols (described below). If a document's list contains a third item, *category*, it must be a list that categorizes the document (described further below). If a document's list contains a fourth item, *name*, it is a name to use for the generated documentation, instead of defaulting to the source file's name (sans extension), where `#f` means to use the default; a non-`#f` value for *name* must fit the grammar of a collection-name

61

element as checked by `collection-name-element?`. If a document's list contains a fifth item, `out-k`, it is used a hint for the number of files to use for the document's cross-reference information; see below. If a document's list contains a fourth item, `order-n`, it is used a hint for the order of rendering; see below.

Each mode symbol in `flags` can be one of the following, where only `'multi-page` is commonly used:

- `'multi-page` : Generates multi-page HTML output, instead of the default single-page format.

- `'main-doc` : Indicates that the generated documentation should be written into the main installation directory, instead of to a user-specific directory. This mode is the default for a collection that is itself located in the main installation.

- `'user-doc` : Indicates that the generated documentation should be written a user-specific directory. This mode is the default for a collection that is not itself located in the main installation.

- `'depends-all` : Indicates that the document should be rebuilt if any other document is rebuilt—except for documents that have the `'no-depend-on` flag.

- `'depends-all-main` : Indicates that the document should be rebuilt if any other document is rebuilt that is installed into the main installation—except for documents that have the `'no-depend-on` flag.

- `'depends-all-user` : Indicates that the document should be rebuilt if any other document is rebuilt that is installed into the user's space—except for documents that have the `'no-depend-on` flag.

- `'always-run` : Build the document every time that `raco setup` is run, even if none of its dependencies change.

- `'no-depend-on` : Removes the document for consideration for other dependencies. Furthermore, references from the document to other documents are always direct, instead of potentially indirect (i.e., resolved at document-viewing time and potentially redirected to a remote site).

- `'main-doc-root` : Designates the root document for the main installation. The document that currently has this mode should be the only one with the mode.

- `'user-doc-root` : Designates the root document for the user-specific documentation directory. The document that currently has this mode should be the only one with the mode.

- `'keep-style` : Leave the document's style as-is, instead of imposing the document style for manuals.

- `'no-search` : Build the document without a search box.

The `category` list specifies how to show the document in the root table of contents. The list must start with a category, which determines where the manual appears in the root documentation page. A category is either a string or a symbol. If it is a string, then the string is the category label on the root page. If it is a symbol, then a default category label is used. The available symbols and the order of categories on the root documentation page is as below:

- '`getting-started` : High-level, introductory documentation, typeset at the same level as other category titles.

- '`language` : Documentation for a prominent programming language.

- '`tool` : Documentation for an executable.

- '`gui-library` : Documentation for GUI and graphics libraries.

- '`net-library` : Documentation for networking libraries.

- '`parsing-library` : Documentation for parsing libraries.

- '`tool-library` : Documentation for programming-tool libraries (i.e., not important enough for the more prominent '`tool` category).

- '`interop` : Documentation for interoperability tools and libraries.

- All string categories as ordered by `string<=?`.

- '`library` : Documentation for libraries; this category is the default and used for unrecognized category symbols.

- '`legacy` : Documentation for deprecated libraries, languages, and tools.

- '`experimental` : Documentation for an experimental language or library.

- '`other` : Other documentation.

- '`omit` : Documentation that should not be listed on the root page or indexed for searching.

- '`omit-start` : Documentation that should not be listed on the root page but should be indexed for searching.

If the category list has a second element, it must be a real number that designates the manual's sorting position with the category; manuals with the same sorting position are ordered alphabetically. For a pair of manuals with sorting numbers n and m, the groups for the manuals are separated by space if `(truncate (/ n 10))` and `(truncate (/ m 10))` are different.

The `out-k` specification is a hint on whether to break the document's cross-reference information into multiple parts, which can reduce the time and memory use for resolving a cross-reference into the document. It must be a positive, exact integer, and the default is `1`.

The `order-n` specification is a hint for ordering document builds, since documentation references can be mutually recursive. The order hint can be any real number. A value of `-10` or less disables running the document in parallel to other documents. The main Racket reference is given a value of `-11`, the search page is given a value of `10`, and the default is `0`.

A directory for pre-rendered documentation is computed from the source file name by starting with the directory of the `"info.rkt"` file, adding `"doc"`, and then using the document name (which is usually the source file's name without a suffix); if such a directory exists and does not have a `"synced.rktd"` file, then it is treated as pre-rendered documentation and moved into place, in which case the documentation source file need not be present. Moving documentation into place may require no

movement at all, depending on the way that the enclosing collection is installed, but movement includes adding a "synced.rktd" file to represent the installation.

Changed in version 6.4: Allow a category to be a string instead of a symbol.

- `release-note-files` : `(listof (cons/c string? (cons/c string? list?)))` — A list of release-notes text files to link from the main documentation pages. Each note is itself represented as a list, and the list can specify auxiliary notes that are grouped with the main note.

  A `release-note-files` entry must be a value that can be generated from an expression matching the following *entry* grammar:

  ```
  entry = (list note ...)

    doc = (list label-string note-path)
        | (list label-string note-path order-integer)
        | (list label-string note-path order-integer
                (list sub-note ...))

  sub-note = (list label-string note-path)
  ```

  The *order-integer* is used to order notes and defaults to 0.

- `racket-launcher-names` : `(listof string?)` — A list of executable names to be generated in the installation's executable directory to run Racket-based programs implemented by the collection. A parallel list of library names must be provided by `racket-launcher-libraries` or `racket-launcher-flags`.

  For each name, a launching executable is set up using `make-racket-launcher`. The arguments are `-l-` and ⟨*colls*⟩`/.../`⟨*file*⟩, where ⟨*file*⟩ is the file named by `racket-launcher-libraries` and ⟨*colls*⟩`/...` are the collections (and subcollections) of the "info.rkt" file.

  In addition,

  ```
  (build-aux-from-path
   (build-path (collection-path ⟨colls⟩ ...) ⟨suffixless-file⟩))
  ```

  is provided for the optional `aux` argument (for icons, etc.) to `make-racket-launcher`, where ⟨*suffixless-file*⟩ is ⟨*file*⟩ without its suffix.

  If `racket-launcher-flags` is provided, it is used as a list of command-line arguments passed to `racket` instead of the above default, allowing arbitrary command-line arguments. If `racket-launcher-flags` is specified together with `racket-launcher-libraries`, then the flags will override the libraries, but the libraries can still be used to specify a name for `build-aux-from-path` (to find related information like icon files etc).

- `racket-launcher-libraries` : `(listof path-string?)` — A list of library names in parallel to `racket-launcher-names`.

- `racket-launcher-flags` : (`listof` `string?`) — A list of command-line flag lists, in parallel to `racket-launcher-names`.

- `mzscheme-launcher-names`, `mzscheme-launcher-libraries`, and `mzscheme-launcher-flags` — Backward-compatible variant of `racket-launcher-names`, etc.

- `gracket-launcher-names` : (`listof` `string?`) — Like `racket-launcher-names`, but for GRacket-based executables. The launcher-name list is treated in parallel to `gracket-launcher-libraries` and `gracket-launcher-flags`.

- `gracket-launcher-libraries` : (`listof` `path-string?`) — A list of library names in parallel to `gracket-launcher-names`.

- `gracket-launcher-flags` : (`listof` `string?`) — A list of command-line flag lists, in parallel to `gracket-launcher-names`.

- `mred-launcher-names`, `mred-launcher-libraries`, and `mred-launcher-flags` — Backward-compatible variant of `gracket-launcher-names`, etc.

- `copy-foreign-libs` : (`listof` (`and/c` `path-string?` `relative-path?`)) — Files to copy into a directory where foreign libraries are found by `ffi-lib`. If `install-platform` is defined, then the files are copied only if the current platform matches the definition.

  On Mac OS, when a Mach-O file is copied, if the copied file includes a library reference that starts `@loader_path/`, and if the referenced library exists in a different location among the paths listed by (`get-lib-search-dirs`), then the library reference is updated to an absolute path.

  On Unix, when an ELF file is copied, if the copied file includes an RPATH setting of `$ORIGIN` and the file is being installed to a user-specific location, then the file's RPATH is adjusted to `$ORIGIN:` followed by the path to the main installation's library directory as reported by (`find-lib-dir`).

  On Windows, deleting a previously installed foreign library may be complicated by a lock on the file, if it is in use. To compensate, `raco setup` deletes a foreign-library file by first renaming the file to have the prefix `"raco-setup-delete-"`; it then attempts to delete the renamed file and merely issues a warning on a failure to delete the renamed file. Meanwhile, in modes where `raco setup` removes uninstalled libraries, it attempts to delete any file in the foreign-library directory whose name starts with `"raco-setup-delete-"` (in an attempt to clean up after previous failures).

- `move-foreign-libs` : (`listof` (`and/c` `path-string?` `relative-path?`)) — Like `copy-foreign-libs`, but the original file is removed after it is copied (which makes sense for precompiled packages).

- `copy-shared-files` : (`listof` (`and/c` `path-string?` `relative-path?`)) — Files to copy into a directory where shared files are found. If `install-platform` is defined, then the files are copied only if the current platform matches the definition.

On Windows, uninstalled files are deleted in the same way as for `copy-foreign-libs`, and the name prefix `"raco-setup-delete-"` is similarly special.

- `move-shared-files` : `(listof (and/c path-string? relative-path?))` — Like `copy-shared-files`, but the original file is removed after it is copied (which makes sense for precompiled packages).

- `copy-man-pages` : `(listof (and/c path-string? relative-path? filename-extension))` — Files to copy into a `man` directory. The file suffix determines its category; for example, `.1` should be used for a `man` page describing an executable.

  On Windows, uninstalled files are deleted in the same way as for `copy-foreign-libs`, and the name prefix `"raco-setup-delete-"` is similarly special.

- `move-man-pages` : `(listof (and/c path-string? relative-path? filename-extension))` — Like `copy-man-pages`, but the original file is removed after it is copied (which makes sense for precompiled packages).

- `install-platform` : `platform-spec?` — Determines whether files are copied or moved for `copy-foreign-libs`, `move-foreign-libs`, `copy-shared-files`, or `move-shared-files`. See `matching-platform?` for information on the way that the specification is compared to `(system-type)` and `(system-library-subpath #f)`.

- `install-collection` : `path-string?` — A library module relative to the collection that provides `installer`. The `installer` procedure must accept one, two, three, or four arguments:

  - The first argument is a directory path to the parent of the Racket installation's `"collects"` directory.
  - The second argument, if accepted, is a path to the collection's own directory.
  - The third argument, if accepted, is a boolean indicating whether the collection is installed as user-specific (`#t`) or installation-wide (`#f`).
  - The fourth argument, if accepted, is a boolean indicating whether the collection is installed as installation-wide and should nevertheless avoid modifying the installation; an `installer` procedure that does not accept this argument is never called when the argument would be `#t`. An installer that does accept this argument is called with `#t` to that it can perform user-specific work, even though the collection is installed installation-wide.

- `pre-install-collection` : `path-string?` — Like `install-collection`, except that the corresponding installer procedures are called *before* the normal `".zo"` build, instead of after. The provided procedure is `pre-installer`, so it can be provided by the same file that provides an `installer` procedure.

- `post-install-collection` : `path-string?` — Like `install-collection` for a procedure that is called right after the `install-collection` procedure is executed. The `--no-install` flag can be provided to `raco setup` to disable

`install-collection` and `pre-install-collection`, but not `post-install-collection`. The `post-install-collection` function is therefore expected to perform operations that are always needed, even after an installation that contains pre-compiled files. The provided procedure is `post-installer`, so it can be provided by the same file that provides an `installer` procedure.

- `assume-virtual-sources` : `any/c` — A true value indicates that bytecode files without a corresponding source file should not be removed from `"compiled"` directories, and no files should not be removed when the `--clean` or `-c` flag is passed to `raco setup`.

- `clean` : `(listof path-string?)` — A list of pathnames to be deleted when the `--clean` or `-c` flag is passed to `raco setup`. The pathnames must be relative to the collection. If any path names a directory, each of the files in the directory are deleted, but none of the subdirectories of the directory are checked. If the path names a file, the file is deleted. The default, if this flag is not specified, is to delete all files in the `"compiled"` subdirectory, and all of the files in the platform-specific subdirectory of the compiled directory for the current platform.

  Just as compiling `".zo"` files will compile each module used by a compiled module, deleting a module's compiled image will delete the `".zo"` of each module that is used by the module. More specifically, used modules are determined when deleting a `".dep"` file, which would have been created to accompany a `".zo"` file when the `".zo"` was built by `raco setup` or `raco make` (see §1.3 "Dependency Files"). If the `".dep"` file indicates another module, that module's `".zo"` is deleted only if it also has an accompanying `".dep"` file. In that case, the `".dep"` file is deleted, and additional used modules are deleted based on the used module's `".dep"` file, etc. Supplying a specific list of collections to `raco setup` disables this dependency-based deletion of compiled files.

- `compile-omit-paths`, `compile-omit-files`, and `compile-include-files` — Used indirectly via `compile-collection-zos`.

- `module-suffixes` and `doc-module-suffixes` — Used indirectly via `get-module-suffixes`.

6.4   `"info.rkt"` **File Format**

```
#lang info        package: base
 #lang setup/infotab
```

In each collection, a special module file `"info.rkt"` provides general information about a collection for use by various tools. For example, an `"info.rkt"` file specifies how to build the documentation for a collection, and it lists plug-in tools for DrRacket or commands for `raco` that the collection provides.

Although an `"info.rkt"` file contains a module declaration, the declaration has a highly constrained form. It must match the following grammar of *info-module*:

```
  info-module = (module info info-mod-path
                   decl
                   ...)

info-mod-path = info
              | setup/infotab
              | (lib "info/main.rkt")
              | (lib "setup/infotab.ss")
              | (lib "setup/infotab.rkt")
              | (lib "main.rkt" "info")
              | (lib "infotab.rkt" "setup")
              | (lib "infotab.ss" "setup")

         decl = (define id info-expr)

    info-expr = (quote datum)
              | (quasiquote datum)
              | (if info-expr info-expr info-expr)
              | (info-primitive info-expr ...)
              | id
              | string
              | number
              | boolean

info-primitive = cons
              | car
              | cdr
              | list
              | list*
              | reverse
              | append
              | equal?
              | string-append
              | make-immutable-hash
              | hash
              | hash-set
              | hash-set*
              | hash-remove
              | hash-clear
              | hash-update
              | path->string
              | build-path
              | collection-path
```

```
                  | system-library-subpath
                  | getenv
```

For example, the following declaration could be the `"info.rkt"` library of the `"games"` collection. It contains definitions for three info tags, `name`, `gracket-launcher-libraries`, and `gracket-launcher-names`.

```
#lang info
(define name "Games")
(define gracket-launcher-libraries '("main.rkt"))
(define gracket-launcher-names     '("PLT Games"))
```

As illustrated in this example, an `"info.rkt"` file can use #lang notation, but only with the `info` (or `setup/infotab`) language.

Although `getenv` is allowed in an `info` module, the `get-info` function loads the module with an environment that prunes any variable not listed in the `PLT_INFO_ALLOW_VARS` environment variable, which holds a list of `;`-separated variable names. By default, the set of allowed environment variables is empty.

See also `get-info` from `setup/getinfo`.

Changed in version 6.5.0.2 of package `base`: Added `if`, `equal?`, and `getenv`.

6.5   Package Dependency Checking

When `raco setup` is run with no arguments, after building all collections and documentation, `raco setup` checks package dependencies. Specifically, it inspects compiled files and documentation to check that references across package boundaries are reflected by dependency declarations in each package-level `"info.rkt"` file (see §4 "Package Metadata").

Unless `--check-pkg-deps` is specified, dependency checking is disabled if any collection is specified for `raco setup`.

Dependency checking in `raco setup` is intended as an aid to package developers to help them declare dependencies correctly. The `raco setup` process itself does not depend on package dependency declarations. Similarly, a package with a missing dependency declaration may install successfully for other users, as long as they happen to have the dependencies installed already. A missing dependency creates trouble for others who install a package without having the dependency installed already.

Practically every package depends on the `"base"` package, which includes the collections that are in a minimal variant of Racket. Declaring a dependency on `"base"` may seem unnecessary, since its collections are always installed. In a future version of Racket, however, the minimal collections may change, and the new set of minimal collections will then have a package name, such as `"base2"`. Declaring a dependency on `"base"` ensures forward compatibility, and `raco setup` complains if the declaration is missing.

To accommodate the early stages of package development, missing dependencies are not treated as an error for a package that has no dependency declarations.

6.5.1 Declaring Build-Time Dependencies

A build-time dependency is one that is not present in a package if it is converted to a binary package (see §5 "Source, Binary, and Built Packages"). For example, `"tests"` and `"scrib-blings"` directories are stripped away in a binary package by default, so cross-package references from directories with those names are treated as build dependencies. Similarly, `test` and `doc` submodules are stripped away, so references within those submodules create build dependencies.

Build-time-only dependencies can be listed as `build-deps` instead of `deps` in a package's `"info.rkt"` file. Dependencies listed in `deps`, meanwhile, are treated as both run-time and build-time dependencies. The advantage of using `build-deps`, instead of listing all dependencies in `deps`, is that a binary version of the package can install with fewer dependencies.

6.5.2 How Dependency Checking Works

Dependency checking uses `".zo"` files, associated `".dep"` files (see §1.3 "Dependency Files"), and the documentation index. Dynamic references, such as through `dynamic-require`, are not visible to the dependency checker; only dependencies via `require`, `define-runtime-module-path-index`, and other forms that cooperate with `raco make` are visible for dependency checking.

Dependency checking is sensitive to whether a dependency is needed only as a build-time dependency. If `raco setup` detects that a missing dependency could be added as a build-time dependency, it will suggest the addition, but `raco setup` will not suggest converting a normal dependency to a build-time dependency (since every normal dependency counts as a build-time dependency, too).

6.6 API for Setup

(require setup/setup)   package: base

```
(setup [#:file file
        #:collections collections
        #:pkgs pkgs
        #:planet-specs planet-specs
        #:make-user? make-user?
        #:avoid-main? avoid-main?
        #:make-docs? make-docs?
        #:make-doc-index? make-doc-index?
        #:force-user-docs? force-user-docs?
        #:check-pkg-deps? check-pkg-deps?
        #:fix-pkg-deps? fix-pkg-deps?
        #:unused-pkg-deps? unused-pkg-deps?
        #:clean? clean?
        #:tidy? tidy?
        #:recompile-only? recompile-only?
        #:jobs jobs
        #:fail-fast? fail-fast?
        #:get-target-dir get-target-dir])    → boolean?
  file : (or/c #f path-string?) = #f
  collections : (or/c #f (listof (listof path-string?))) = #f
  pkgs : (or/c #f (listof string?)) = #f
  planet-specs : (or/c #f
                        (listof (list/c string?
                                        string?
                                        exact-nonnegative-integer?
                                        exact-nonnegative-integer?)))
              = #f
  make-user? : any/c = #t
  avoid-main? : any/c = #f
  make-docs? : any/c = #t
  make-doc-index? : any/c = #f
  force-user-docs? : any/c = #f
  check-pkg-deps? : any/c = #f
  fix-pkg-deps? : any/c = #f
  unused-pkg-deps? : any/c = #f
  clean? : any/c = #f
  tidy? : any/c = #f
  recompile-only? : any/c = #f
  jobs : exact-nonnegative-integer? = #f
  fail-fast? : any/c = #f
  get-target-dir : (or/c #f (-> path-string?)) = #f
```

Runs `raco setup` with various options:

- *file* — if not `#f`, installs *file* as a `".plt"` archive.

- *collections* — if not `#f`, constrains setup to the named collections (along with *pkgs* and *planet-specs*, if any)

- *pkgs* — if not `#f`, constrains setup to the named packages (along with *collections* and *planet-specs*, if any)

- `planet-spec` — if not `#f`, constrains setup to the named PLaneT packages (along with *collections* and *pkgs*, if any)

- *make-user?* — if `#f`, disables any user-specific setup actions

- *avoid-main?* — if true, avoids setup actions that affect the main installation, as opposed to user directories

- *make-docs?* — if `#f`, disables any documentation-specific setup actions

- *make-doc-index?* — if true, builds documentation index collections in addition to *collections*, assuming that documentation is built

- *force-user-docs?* — if true, then when building documentation, creates a user-specific documentation entry point even if it has the same content as the installation

- *check-pkg-deps?* — if true, enables package-dependency checking even when *collections*, *pkgs*, or *planet-specs* is non-`#f`.

- *fix-pkg-deps?* — if true, implies *check-pkg-deps?* and attempts to automatically correct discovered package-dependency problems

- *unused-pkg-deps?* — if true, implies *check-pkg-deps?* and also reports dependencies that appear to be unused

- *clean?* — if true, enables cleaning mode instead of setup mode

- *tidy?* — if true, enables global tidying of documentation and metadata indexes even when *collections* or *planet-specs* is non-`#f`

- *recompile-only?* — if true, disallows compilation from source, allowing only timestamp adjustments and recompilation from machine-independent form

- *jobs* — if not `#f`, determines the maximum number of parallel tasks used for setup

- *fail-fast?* — if true, breaks the current thread as soon as an error is discovered

- *get-target-dir* — if not `#f`, treated as a value for `current-target-directory-getter`

The result is `#t` if `raco setup` completes without error, `#f` otherwise.

Instead of using `PLT_COMPILED_FILE_CHECK`, `setup` is sensitive to the `use-compiled-file-check` parameter.

Changed in version 6.1 of package base: Added the *fail-fast?* argument.

Changed in version 6.1.1: Added the *force-user-docs?* argument.

Changed in version 7.2.0.7: Added the *check-pkg-deps?*, *fix-pkg-deps?* , and *unused-pkg-deps?* arguments.

Changed in version 7.2.0.8: Added the *recompile-only?* argument.

6.6.1 `raco setup` Unit

(require setup/setup-unit)   package: compiler-lib

The setup/setup-unit library provides `raco setup` in unit form. The associated setup/option-sig and setup/option-unit libraries provides the interface for setting options for the run of `raco setup`.

For example, to unpack a single ".plt" archive "x.plt", set the archives parameter to (list "x.plt") and leave specific-collections as null.

Link the options and setup units so that your option-setting code is initialized between them, e.g.:

```
(compound-unit
  ...
  (link ...
    [((OPTIONS : setup-option^)) setup:option@]
    [() my-init-options@ OPTIONS]
    [() setup@ OPTIONS ...])
  ...)
```

setup@ : unit?

Imports

- setup-option^

- compiler^

- compiler:option^

- launcher^

- dynext:file^

and exports nothing. Invoking setup@ starts the setup process.

6.6.2 Options Unit

```
(require setup/option-unit)        package: compiler-lib
```

```
setup:option@ : unit?
```

Imports nothing and exports `setup-option^`.

6.6.3 Options Signature

```
(require setup/option-sig)        package: compiler-lib
```

```
setup-option^ : signature
```

Provides parameters used to control `raco setup` in unit form.

```
(setup-program-name) → string?
(setup-program-name name) → void?
  name : string?
```

> The prefix used when printing status messages. The default is `"raco setup"`.

```
(setup-compiled-file-paths)
 → (or/c #f (listof (and/c path? relative-path?)))
(setup-compiled-file-paths paths) → void?
  paths : (or/c #f (listof (and/c path? relative-path?)))
```

> If not `#f`, supplies a value like the one for `use-compiled-file-paths` to
> control operations such as cleaning, where `use-compiled-file-paths` may
> have been set to `null` to avoid loading bytecode.
>
> Added in version 1.7 of package `compiler-lib`.

```
(verbose) → boolean?
(verbose on?) → void?
  on? : any/c
```

> If on, prints messages from `make` to `stderr`. The default is `#f`.

```
(make-verbose) → boolean?
(make-verbose on?) → void?
  on? : any/c
```

> If on, verbose `make`. The default is `#f`.

```
(compiler-verbose) → boolean?
(compiler-verbose on?) → void?
  on? : any/c
```

If on, verbose `compiler`. The default is `#f`.

```
(clean) → boolean?
(clean on?) → void?
  on? : any/c
```

If on, delete `".zo"` and `".so"`/`".dll"`/`".dylib"` files in the specified collections. The default is `#f`.

```
(compile-mode) → (or/c path? #f)
(compile-mode path) → void?
  path : (or/c path? #f)
```

If a `path` is given, use a `".zo"` compiler other than plain `compile`, and build to `(build-path "compiled" (compile-mode))`. The default is `#f`.

```
(make-zo) → boolean?
(make-zo on?) → void?
  on? : any/c
```

If on, compile `".zo"`. The default is `#t`.

```
(make-info-domain) → boolean?
(make-info-domain on?) → void?
  on? : any/c
```

If on, update `"info-domain/compiled/cache.rkt"` for each collection path. The default is `#t`.

```
(make-launchers) → boolean?
(make-launchers on?) → void?
  on? : any/c
```

If on, make collection `"info.rkt"`-specified launchers and `man` pages. The default is `#t`.

```
(make-foreign-lib) → boolean?
(make-foreign-lib on?) → void?
  on? : any/c
```

If on, install collection `"info.rkt"`-specified libraries. The default is `#t`.

```
(make-docs) → boolean?
(make-docs on?) → void?
  on? : any/c
```

If on, build documentation. The default is `#t`.

```
(make-user) → boolean?
(make-user on?) → void?
  on? : any/c
```

If on, build the user-specific collection tree. The default is `#t`.

```
(make-planet) → boolean?
(make-planet on?) → void?
  on? : any/c
```

If on, build the planet cache. The default is `#t`.

```
(avoid-main-installation) → boolean?
(avoid-main-installation on?) → void?
  on? : any/c
```

If on, avoid building bytecode in the main installation tree when building other bytecode (e.g., in a user-specific collection). The default is `#f`.

```
(make-tidy) → boolean?
(make-tidy on?) → void?
  on? : any/c
```

If on, remove metadata cache information and documentation for non-existent collections (to clean up after removal) even when `specific-collections` or `specific-planet-dirs` is non-`'()` or `make-only` is true. The default is `#f`.

```
(call-install) → boolean?
(call-install on?) → void?
  on? : any/c
```

If on, call collection `"info.rkt"`-specified setup code. The default is `#t`.

```
(call-post-install) → boolean?
(call-post-install on?) → void?
  on? : any/c
```

If on, call collection `"info.rkt"`-specified post-install code. The default is `#t`.

```
(pause-on-errors) → boolean?
(pause-on-errors on?) → void?
  on? : any/c
```

If on, in the event of an error, prints a summary error and waits for `stdin` input before terminating. The default is `#f`.

```
(parallel-workers) → exact-nonnegative-integer?
(parallel-workers num) → void?
  num : exact-nonnegative-integer?
```

Determines the number of places to use for compiling bytecode and for building the documentation. The default is `(min (processor-count) 8)`.

```
(fail-fast) → boolean?
(fail-fast on?) → void?
  on? : any/c
```

If on, breaks the original thread as soon as an error is discovered. The default is `#f`.

Added in version 1.2 of package `compiler-lib`.

```
(force-unpacks) → boolean?
(force-unpacks on?) → void?
  on? : any/c
```

If on, ignore version and already-installed errors when unpacking a `".plt"` archive. The default is `#f`.

```
(specific-collections) → (listof (listof path-string?))
(specific-collections colls) → void?
  colls : (listof (listof path-string?))
```

A list of collections to set up; the empty list means set-up all collections if the archives list and `specific-planet-dirs` is also `'()`. The default is `'()`.

```
(specific-planet-dirs)
 → (listof (list/c string?
                   string?
                   exact-nonnegative-integer?
                   exact-nonnegative-integer?))
(specific-planet-dirs dir) → void?
  dir : (listof (list/c string?
                        string?
                        exact-nonnegative-integer?
                        exact-nonnegative-integer?))
```

A list of planet package version specs to set up; the empty list means to set-up all planet collections if the archives list and `specific-collections` is also `'()`. The default is `'()`.

```
(make-only) → boolean?
(make-only on?) → void?
  on? : any/c
```

If true, set up no collections if `specific-collections` and `specific-planet-dirs` are both `'()`.

```
(archives) → (listof path-string?)
(archives arch) → void?
  arch : (listof path-string?)
```

A list of `".plt"` archives to unpack; any collections specified by the archives are set-up in addition to the collections listed in specific-collections. The default is `null`.

```
(archive-implies-reindex) → boolean?
(archive-implies-reindex on?) → void?
  on? : any/c
```

If on, when `archives` has a non-empty list of packages, if any documentation is built, then suitable documentation start pages, search pages, and master index pages are rebuilt. The default is `#t`.

```
(current-target-directory-getter) → (-> path-string?)
(current-target-directory-getter thunk) → void?
  thunk : (-> path-string?)
```

A thunk that returns the target directory for unpacking a relative `".plt"` archive; when unpacking an archive, either this or the procedure in `current-target-plt-directory-getter` will be called. The default is `current-directory`.

```
(current-target-plt-directory-getter)
 → (path-string?
     path-string?
     (listof path-string?) . -> . path-string?)
(current-target-plt-directory-getter proc) → void?
  proc : (path-string?
          path-string?
          (listof path-string?) . -> . path-string?)
```

A procedure that takes a preferred path, a path to the parent of the main `"collects"` directory, and a list of path choices; it returns a path for a "plt-relative" install; when unpacking an archive, either this or the procedure in `current-target-directory-getter` will be called, and in the former case, this procedure may be called multiple times. The default is `(lambda (preferred main-parent-dir choices) preferred)`.

6.6.4 Setup Start Module

```
(require setup)         package: base
```

78

The setup library implements `raco setup`, including the part that bootstraps `raco setup` if its own implementation needs to be compiled.

When running setup via `racket`, supply the `-N raco` to ensure that command-line arguments are parsed the same way as for `raco setup`, as opposed to a legacy command-line mode.

6.7 API for Installing ".plt" Archives

The setup/plt-single-installer module provides a function for installing a single ".plt" file.

6.7.1 Non-GUI Installer

```
(require setup/plt-single-installer)          package: base
```

```
 (run-single-installer
   file
   get-dir-proc
  [#:show-beginning-of-file? show-beginning-of-file?])
 → void?
  file : path-string?
  get-dir-proc : (-> (or/c path-string? #f))
  show-beginning-of-file? : any/c = #f
```

Creates a separate thread and namespace, runs the installer in that thread with the new namespace, and returns when the thread completes or dies. It also creates a custodian (see §14.7 "Custodians") to manage the created thread, sets the exit handler for the thread to shut down the custodian, and explicitly shuts down the custodian when the created thread terminates or dies.

The *get-dir-proc* procedure is called if the installer needs a target directory for installation, and a `#f` result means that the user canceled the installation. Typically, *get-dir-proc* is `current-directory`.

If *show-beginning-of-file?* is a true value and the installation fails, then run-single-installer prints the first 1,000 characters of the file (in an attempt to help debug the cause of failures).

```
(install-planet-package file directory spec) → void?
  file : path-string?
  directory : path-string?
```

```
  spec : (list/c string? string?
                 (listof string?)
                 exact-nonnegative-integer?
                 exact-nonnegative-integer?)
```

Similar to `run-single-installer`, but runs the setup process to install the archive *file* into *directory* as the PLaneT package described by *spec*. The user-specific documentation index is not rebuilt, so `reindex-user-documentation` should be run after a set of PLaneT packages are installed.

```
(reindex-user-documentation) → void?
```

Similar to `run-single-installer`, but runs only the part of the setup process that rebuilds the user-specific documentation start page, search page, and master index.

```
(clean-planet-package directory spec) → void?
  directory : path-string?
  spec : (list/c string? string?
                 (listof string?)
                 exact-nonnegative-integer?
                 exact-nonnegative-integer?)
```

Undoes the work of `install-planet-package`. The user-specific documentation index is not rebuilt, so `reindex-user-documentation` should be run after a set of PLaneT packages are removed.

6.8 API for Finding Installation Directories

```
(require setup/dirs)        package: base
```

The `setup/dirs` library provides several procedures for locating installation directories. Many of these paths can be configured through the configuration directory (see §19 "Installation Configuration and Search Paths").

In cross-platform build mode (see §6.14 "API for Cross-Platform Configuration"), the functions provided by `setup/dirs` generally report target-system paths, instead of current-system paths. The exceptions are `get-lib-search-dirs` and `find-dll-dir`, which report current-system paths while `get-cross-lib-search-dirs` and `find-cross-dll-dir` report target-system paths.

```
(find-collects-dir) → (or/c path? #f)
```

Returns a path to the installation's main `"collects"` directory, or `#f` if none can be found. A `#f` result is likely only in a stand-alone executable that is distributed without libraries.

`(find-user-collects-dir)` → `path?`

Returns a path to the user-specific `"collects"` directory; the directory indicated by the returned path may or may not exist.

`(get-collects-search-dirs)` → `(listof path?)`

Returns the same result as `(current-library-collection-paths)`, which means that this result is not sensitive to the value of the `use-user-specific-search-paths` parameter.

`(get-main-collects-search-dirs)` → `(listof path?)`

Returns a list of paths to installation `"collects"` directories, including the result of `find-collects-dir`. These directories are normally included in the result of `(current-library-collection-paths)`, but a `PLTCOLLECTS` setting or change to the parameter may cause them to be omitted. Any other path in `(current-library-collection-paths)` is treated as user-specific. The directories indicated by the returned paths may or may not exist.

`(find-config-dir)` → `(or/c path? #f)`

Returns a path to the installation's `"etc"` directory, which contains configuration and package information—including configuration of some of the other directories (see §19 "Installation Configuration and Search Paths"). A `#f` result indicates that no configuration directory is available.

`(find-links-file)` → `(or/c path? #f)`

Returns a path to the installation's collection links file. The file indicated by the returned path may or may not exist. A `#f` result indicates that no links file is available.

See also `'links-file` in §19 "Installation Configuration and Search Paths".

`(find-user-links-file [vers])` → `path?`
  `vers` : `string?` = `(get-installation-name)`

Returns a path to the user's collection links file. The file indicated by the returned path may or may not exist.

`(get-links-search-files)` → `(listof path?)`

Returns a list of paths to installation collection links files to search in order. (Normally, the result includes the result of `(find-links-file)`, which is where new installation-wide

81

links are installed by `raco link` or `links`.) The files indicated by the returned paths may or may not exist.

See also `'links-search-files` in §19 "Installation Configuration and Search Paths".

`(find-pkgs-dir) → (or/c path? #f)`

Returns a path to the directory containing packages with installation scope; the directory indicated by the returned path may or may not exist. A `#f` result indicates that no package-installation directory is available.

See also `'pkgs-dir` in §19 "Installation Configuration and Search Paths".

```
(find-user-pkgs-dir [vers]) → path?
  vers : string? = (get-installation-name)
```

Returns a path to the directory containing packages with user-specific scope for installation name *vers*; the directory indicated by the returned path may or may not exist.

`(get-pkgs-search-dirs) → (listof path?)`

Returns a list of paths to the directories containing packages in installation scope. (Normally, the result includes the result of `(find-pkgs-dir)`, which is where new packages are installed by `raco pkg install`.) The directories indicated by the returned paths may or may not exist.

See also `'pkgs-search-dirs` in §19 "Installation Configuration and Search Paths".

`(find-doc-dir) → (or/c path? #f)`

Returns a path to the installation's `"doc"` directory. The result is `#f` if no such directory is available.

See also `'doc-dir` in §19 "Installation Configuration and Search Paths".

`(find-user-doc-dir) → path?`

Returns a path to a user-specific `"doc"` directory. The directory indicated by the returned path may or may not exist.

`(get-doc-search-dirs) → (listof path?)`

Returns a list of paths to search for documentation, not including documentation stored in individual collections. Unless it is configured otherwise, the result includes any non-`#f` result of `(find-doc-dir)` and `(find-user-doc-dir)`—but the latter is included only if the value of the `use-user-specific-search-paths` parameter is `#t`.

See also `'doc-search-dirs` in §19 "Installation Configuration and Search Paths".

`(find-lib-dir)` → `(or/c path? #f)`

Returns a path to the installation's `"lib"` directory, which contains libraries and other build information. The result is `#f` if no such directory is available.

See also `'lib-dir` in §19 "Installation Configuration and Search Paths".

`(find-user-lib-dir)` → `path?`

Returns a path to a user-specific `"lib"` directory; the directory indicated by the returned path may or may not exist.

`(get-lib-search-dirs)` → `(listof path?)`

Returns a list of paths to search for foreign libraries.

Unless it is configured otherwise, and except in cross-platform build mode, the result includes any non-`#f` result of `(find-lib-dir)` and `(find-user-lib-dir)`—but the latter is included only if the value of the `use-user-specific-search-paths` parameter is `#t`.

In cross-platform build mode (see §6.14 "API for Cross-Platform Configuration"), `get-lib-search-dirs` reports a result suitable for the current system, instead of the target system. See also `get-cross-lib-search-dirs`.

See also `'lib-search-dirs` in §19 "Installation Configuration and Search Paths".

Changed in version 6.1.1.4 of package `base`: Dropped `(find-dll-dir)` from the set of paths to explicitly include in the default.
Changed in version 6.9.0.1: Changed behavior in cross-platform build mode.

`(get-cross-lib-search-dirs)` → `(listof path?)`

Like `get-lib-search-dirs`, but in cross-platform build mode, reports directories for the target system (including any non-`#f` result of `(find-lib-dir)`, etc.) instead of the current system.

Added in version 6.9.0.1 of package `base`.

`(find-dll-dir)` → `(or/c path? #f)`

Returns a path to the directory that contains DLLs for use with the current executable (e.g., `"libracket.dll"` on Windows). The result is `#f` if no such directory is available, or if no specific directory is available (i.e., other than the platform's normal search path).

In cross-platform build mode (see §6.14 "API for Cross-Platform Configuration"), `find-dll-dir` reports a result suitable for the current system, instead of the target system. See also `find-cross-dll-dir`.

Changed in version 6.9.0.1 of package `base`: Changed behavior in cross-platform build mode.

`(find-cross-dll-dir)` → `(or/c path? #f)`

Like `find-dll-dir`, but in cross-platform build mode, reports a directory for the target system instead of the current system.

Added in version 6.9.0.1 of package `base`.

`(find-share-dir)` → `(or/c path? #f)`

Returns a path to the installation's `"share"` directory, which contains installed packages and other platform-independent files. The result is `#f` if no such directory is available.

See also `'share-dir` in §19 "Installation Configuration and Search Paths".

`(find-user-share-dir)` → `path?`

Returns a path to a user-specific `"share"` directory; the directory indicated by the returned path may or may not exist.

`(find-include-dir)` → `(or/c path? #f)`

Returns a path to the installation's `"include"` directory, which contains `".h"` files for building Racket extensions and embedding programs. The result is `#f` if no such directory is available.

See also `'include-dir` in §19 "Installation Configuration and Search Paths".

`(find-user-include-dir)` → `path?`

Returns a path to a user-specific `"include"` directory; the directory indicated by the returned path may or may not exist.

`(get-include-search-dirs)` → `(listof path?)`

Returns a list of paths to search for `".h"` files. Unless it is configured otherwise, the result includes any non-`#f` result of `(find-include-dir)` and `(find-user-include-dir)`—but the latter is included only if the value of the `use-user-specific-search-paths` parameter is `#t`.

See also `'include-search-dirs` in §19 "Installation Configuration and Search Paths".

`(find-console-bin-dir)` → `(or/c path? #f)`

Returns a path to the installation's executable directory, where the stand-alone Racket executable resides. The result is `#f` if no such directory is available.

See also `'bin-dir` in §19 "Installation Configuration and Search Paths".

```
(find-gui-bin-dir) → (or/c path? #f)
```

Returns a path to the installation's executable directory, where the stand-alone GRacket executable resides. The result is `#f` if no such directory is available.

See also `'gui-bin-dir` in §19 "Installation Configuration and Search Paths".

```
(find-user-console-bin-dir) → path?
```

Returns a path to the user's executable directory; the directory indicated by the returned path may or may not exist.

```
(find-user-gui-bin-dir) → path?
```

Returns a path to the user's executable directory for graphical programs; the directory indicated by the returned path may or may not exist.

```
(find-apps-dir) → (or/c path? #f)
```

Returns a path to the installation's directory `.desktop` files (for Unix). The result is `#f` if no such directory exists.

See also `'apps-dir` in §19 "Installation Configuration and Search Paths".

```
(find-user-apps-dir) → path?
```

Returns a path to the user's directory for `.desktop` files (for Unix); the directory indicated by the returned path may or may not exist.

```
(find-man-dir) → (or/c path? #f)
```

Returns a path to the installation's man-page directory. The result is `#f` if no such directory exists. See also `'man-dir` in §19 "Installation Configuration and Search Paths".

```
(find-user-man-dir) → path?
```

Returns a path to the user's man-page directory; the directory indicated by the returned path may or may not exist.

```
(get-doc-search-url) → string?
```

Returns a string that is used by the documentation system, augmented with a version and search-key query, for remote documentation links.

See also `'doc-search-url` in §19 "Installation Configuration and Search Paths".

`(get-doc-open-url) → (or/c string? #f)`

Returns `#f` or a string for a root URL to be used as an alternative to opening a local file for documentation. A non-`#f` configuration means that DrRacket, for example, performs keyword searches for documentation via the specified URL instead of from locally installed documentation.

See also `'doc-open-url` in §19 "Installation Configuration and Search Paths".

Added in version 6.0.1.6 of package `base`.

`(get-installation-name) → string?`

Returns the current installation's name, which is often `(version)` but can be configured via `'installation-name` in `"config.rktd"` (see §19 "Installation Configuration and Search Paths").

`(get-build-stamp) → (or/c #f string?)`

Returns a string that identifies an installation build, which can be used to augment the Racket version number to more specifically identify the build. An empty string is normally produced for a release build. The result is `#f` if no build stamp is available.

`(get-absolute-installation?) → boolean?`

Returns `#t` if this installation uses absolute path names for executable and library references, `#f` otherwise.

`(find-addon-tethered-console-bin-dir) → (or/c #f path?)`
`(find-addon-tethered-gui-bin-dir) → (or/c #f path?)`

Returns a path to a user-specific directory to hold an extra copy of each installed executable, where the extra copy is created by `raco setup` and tethered to a particular result for `(find-system-path 'addon-dir)` and `(find-config-dir)`.

Unlike other directories, which are configured via `"config.rktd"` in the `(find-config-dir)` directory (see §19 "Installation Configuration and Search Paths"), these paths are configured via `'addon-tethered-console-bin-dir` and `'addon-tethered-gui-bin-dir` entries in `"config.rktd"` in `(build-path (find-system-path 'addon-dir) "etc")`. If no configuration is present, the result from the corresponding function, `find-addon-tethered-console-bin-dir` or `find-addon-tethered-gui-bin-dir`, is `#f` instead of a path.

The intent of this protocol is to support a kind of sandbox: an installation that is more specific than user-specific, and where copies of executables such as `racket` serve as entry points into the sandbox. Assuming that the addon directory is set to a directory other than the user's default addon directory when `raco setup` creates the executable copies, then further package build and setup operations through the entry points will be confined to the sandbox and not affect a user's default environment.

Added in version 6.5.0.2 of package `base`.

```
(find-config-tethered-console-bin-dir) → (or/c #f path?)
(find-config-tethered-gui-bin-dir) → (or/c #f path?)
```

Similar to `find-addon-tethered-console-bin-dir` and `find-addon-tethered-gui-bin-dir`, but configured via "config.rktd" in the `(find-config-dir)` directory (see §19 "Installation Configuration and Search Paths") and triggers executables that are tethered only to a particular value of `(find-config-dir)`.

Added in version 6.5.0.2 of package `base`.

6.9 API for Reading "info.rkt" Files

```
(require setup/getinfo)          package: base
```

The `setup/getinfo` library provides functions for accessing fields in "info.rkt" files. The file format for "info.rkt" files is documented in §6.4 ""info.rkt" File Format".

```
(get-info  collection-names
           [#:namespace namespace
            #:bootstrap? bootstrap?])
 → (or/c
     (symbol? [(-> any)] . -> . any)
     #f)
  collection-names : (listof string?)
  namespace : (or/c namespace? #f) = #f
  bootstrap? : any/c = #f
```

Accepts a list of strings naming a collection or sub-collection, and calls `get-info/full` with the full path corresponding to the named collection and the *namespace* argument.

```
(get-info/full  path
                [#:namespace namespace
                 #:bootstrap? bootstrap?])
 → (or/c (->* (symbol?) ((-> any)) any)
         #f)
  path : path-string?
```

```
  namespace : (or/c namespace? #f) = #f
  bootstrap? : any/c = #f
```

Accepts a path to a directory. If it finds either a well-formed `"info.rkt"` file or an `"info.ss"` file (with preference for the `"info.rkt"` file), it returns an info procedure that accepts either one or two arguments. The first argument to the info procedure is always a symbolic name, and the result is the value of the name in the `"info.rkt"` file, if the name is defined. The optional second argument, *thunk*, is a procedure that takes no arguments to be called when the name is not defined; the result of the info procedure is the result of the *thunk* in that case. If the name is not defined and no *thunk* is provided, then an exception is raised.

The `get-info/full` function returns `#f` if there is no `"info.rkt"` (or `"info.ss"`) file in the directory. If there is a `"info.rkt"` (or `"info.ss"`) file that has the wrong shape (i.e., not a module using `info` or `setup/infotab`), or if the `"info.rkt"` file fails to load, then an exception is raised. If the `"info.rkt"` file loaded, `get-info/full` returns the `get-info` file. If the `"info.rkt"` file does not exist, then `get-info/full` does the same checks for the `"info.ss"` file, either raising an exception or returning the `get-info` function from the `"info.ss"` file.

The `"info.rkt"` (or `"info.ss"`) module is loaded into *namespace* if it is not `#f`, or a private, weakly-held namespace otherwise.

If *bootstrap?* is true, then `use-compiled-file-paths` is set to `'()` while reading `"info.rkt"` (or `"info.ss"`), in case an existing compiled file is broken. Furthermore, the `info` and `setup/infotab` modules are attached to *namespace* from the namespace of `get-info/full` before attempting to load `"info.rkt"` (or `"info.ss"`).

As the module is loaded, the environment variable set is pruned to contain only environment variables that are listed in the `PLT_INFO_ALLOW_VARS` environment variable, which contains a `;`-separated list of names. By default, the list of allowed variable names is empty.

Changed in version 6.5.0.2 of package `base`: Added environment-variable pruning and `PLT_INFO_ALLOW_VARS` support.

```
(find-relevant-directories syms [mode]) → (listof path?)
  syms : (listof symbol?)
  mode : (or/c 'preferred 'all-available 'no-planet 'no-user)
       = 'preferred
```

Returns a list of paths identifying collections and installed PLaneT packages whose `"info.rkt"` file defines one or more of the given symbols. The result is based on a cache that is computed by `raco setup`.

Note that the cache may be out of date by the time you call `get-info/full`, so do not assume that every returned directory's `"info.rkt"` file will supply one of the requested symbols.

The result is in a canonical order (sorted lexicographically by directory name), and the paths it returns are suitable for providing to `get-info/full`.

If *mode* is specified, it must be either `'preferred` (the default), `'all-available`, `'no-planet`, or `'no-user`. If *mode* is `'all-available`, `find-relevant-directories` returns all installed directories whose info files contain the specified symbols—for instance, all versions of all installed PLaneT packages will be searched if `'all-available` is specified. If *mode* is `'preferred`, then only a subset of "preferred" packages will be searched: only the directory containing the most recent version of any PLaneT package will be returned. If *mode* is `'no-planet`, then PLaneT packages are not included in the search. If *mode* is `'no-user`, then only installation-wide directories are searched, which means omitting PLaneT package directories.

Collection links from the installation-wide collection links file or packages with installation scope are cached with the installation's main `"lib"` directory, and links from the user-specific collection links file and packages are cached with the user-specific directory `(build-path (find-system-path 'addon-dir) "collects")` for all-version cases, and in `(build-path (find-system-path 'addon-dir) (version) "collects")` for version-specific cases.

```
(find-relevant-directory-records syms key)
 → (listof directory-record?)
  syms : (listof symbol?)
  key : (or/c 'preferred 'all-available 'no-planet 'no-user)
```

Like `find-relevant-directories`, but returns `directory-record` structs instead of `path?`s.

```
(struct directory-record (maj min spec path syms)
    #:extra-constructor-name make-directory-record)
  maj : integer?
  min : integer?
  spec : any/c
  path : path?
  syms : (listof symbol?)
```

A struct that records information about a collection or a PLaneT package that has been installed. Collections will have the major version being 1 and the minor version being 0. The `spec` field is a quoted module spec; the `path` field is where the `info.rkt` file for this collection or PLaneT package exists on the filesystem; the `syms` field holds the identifiers defined in that file.

```
(reset-relevant-directories-state!) → void?
```

Resets the cache used by `find-relevant-directories`.

6.10 API for Relative Paths

The Racket installation tree can usually be moved around the filesystem. To support this, care must be taken to avoid absolute paths. The following two APIs cover two aspects of this: a way to convert a path to a value that is relative to the "collects" tree, and a way to display such paths (e.g., in error messages).

6.10.1 Representing Collection-Based Paths

```
(require setup/collects)        package: base
```

```
(path->collects-relative path
                          #:cache cache)
 → (or/c path-string?
         (cons/c 'collects
                 (cons/c bytes? (non-empty-listof bytes?))))
  path : path-string?
  cache : (or/c #f (and/c hash? (not/c immutable?)))
```

Checks whether *path* (normalized by `path->complete-path` and `simplify-path` with `#f` as its second argument) matches the result of `collection-file-path`. If so, the result is a list starting with `'collects` and containing the relevant path elements as byte strings. If not, the path is returned as-is.

The *cache* argument is used with `path->pkg`, if needed.

```
(collects-relative->path rel) → path-string?
  rel : (or/c path-string?
              (cons/c 'collects
                      (cons/c bytes? (non-empty-listof bytes?))))
```

The inverse of `path->collects-relative`: if *rel* is a pair that starts with `'collects`, then it is converted back to a path using `collection-file-path`.

```
(path->module-path path #:cache cache)
 → (or/c path-string? module-path?)
  path : path-string?
  cache : (or/c #f (and/c hash? (not/c immutable?)))
```

Like `path->collects-relative`, but the result is either *path* or a normalized (in the sense of `collapse-module-path`) module path.

6.10.2 Representing Paths Relative to `"collects"`

```
(require setup/main-collects)        package: base
```

```
(path->main-collects-relative path)
 → (or/c path? (cons/c 'collects (non-empty-listof bytes?)))
  path : (or/c bytes? path-string?)
```

Checks whether `path` has a prefix that matches the prefix to the main `"collects"` directory as determined by `(find-collects-dir)`. If so, the result is a list starting with `'collects` and containing the remaining path elements as byte strings. If not, the path is returned as-is.

The `path` argument should be a complete path. Applying `simplify-path` before `path->main-collects-relative` is usually a good idea.

For historical reasons, `path` can be a byte string, which is converted to a path using `bytes->path`.

See also `collects-relative->path`.

```
(main-collects-relative->path rel) → path>
  rel : (or/c bytes?
              path-string?
              (cons/c 'collects (non-empty-listof bytes?)))
```

The inverse of `path->main-collects-relative`: if `rel` is a pair that starts with `'collects`, then it is converted back to a path relative to `(find-collects-dir)`.

6.10.3 Representing Paths Relative to the Documentation

```
(require setup/main-doc)        package: base
```

```
(path->main-doc-relative path)
 → (or/c path? (cons/c 'doc (non-empty-listof bytes?)))
  path : (or/c bytes? path-string?)
```

Like `path->main-collects-relative`, except that it checks for a prefix relative to `(find-doc-dir)` and returns a list starting with `'doc` if so.

```
(main-doc-relative->path rel) → path>
  rel : (or/c bytes?
              path-string?
              (cons/c 'doc (non-empty-listof bytes?)))
```

Like `path->main-collects-relative`, except it is the inverse of `path->main-doc-relative`.

6.10.4 Displaying Paths Relative to a Common Root

```
(require setup/path-to-relative)        package: base
```

```
(path->relative-string/library  path
                                [default
                                 #:cache cache]) → any/c
  path : path-string?
  default : (or/c (-> path-string? any/c) any/c)
          = (lambda (x) (if (path? x) (path->string x) x))
  cache : (or/c #f (and/c hash? (not/c immutable?))) = #f
```

Produces a string suitable for display in error messages. If the path is an absolute one that is inside a package, the result is a string that begins with "`<pkgs>/`". If the path is an absolute one that is inside the "`collects`" tree, the result is a string that begins with "`<collects>/`". Similarly, a path in the user-specific collects results in a prefix of "`<user-collects>/`", a PLaneT path results in "`<planet>/`", and a path into documentation results in "`<doc>/`" or "`<user-doc>/`".

If `cache` is not `#f`, it is used as a cache argument for `pkg->path` to speed up detection and conversion of package paths.

If the path is not absolute, or if it is not in any of these, it is returned as-is (converted to a string if needed). If `default` is given, it specifies the return value instead: it can be a procedure that is applied onto the path to get the result, or the result itself.

Note that this function can return a non-string only if `default` is given and it does not return a string.

```
(path->relative-string/setup  path
                              [default
                               #:cache cache]) → any/c
  path : path-string?
  default : (or/c (-> path-string? any/c) any/c)
          = (lambda (x) (if (path? x) (path->string x) x))
  cache : (or/c #f (and/c hash? (not/c immutable?))) = #f
```

The same as `path->relative-string/library`, for backward compatibility.

```
(make-path->relative-string dirs [default])
 → (path-string? any/c . -> . any)
  dirs : (listof (cons (-> path?) string?))
  default : (or/c (-> path-string? any/c) any/c)
          = (lambda (x) (if (path? x) (path->string x) x))
```

This function produces functions like `path->relative-string/library` and `path->relative-string/setup`.

The *dirs* argument determines the prefix substitutions. It must be an association list mapping a path-producing thunk to a prefix string for paths in the specified path.

default determines the default for the resulting function (which can always be overridden by an additional argument to this function).

6.11   API for Collection Names

```
(require setup/collection-name)        package: base
```

```
(collection-name? v) → boolean?
  v : any/c
```

Returns #t if *v* is a string that is syntactically valid as a collection name, which means that it is one or more /-separated strings for which `collection-name-element?` returns true.

```
(collection-name-element? v) → boolean?
  v : any/c
```

Returns #t if *v* is a string that is syntactically valid as a top-level collection name or as a part of a collection name, which means that it is non-empty and contains only ASCII letters, ASCII digits, -, +, _, and %, where a % is allowed only when followed by two lowercase hexadecimal digits, and the digits must form a number that is not the ASCII value of a letter, digit, -, +, or _.

6.12   API for Collection Searches

```
(require setup/collection-search)        package: base
```

Added in version 6.3 of package base.

```
(collection-search  mod-path
                     [#:init result
                      #:combine combine
                      #:break? break?
                      #:all-possible-roots? all-possible-roots?])
 → any/c
  mod-path : normalized-lib-module-path?
  result : any/c = #f
  combine : (any/c (and/c path? complete-path?) . -> . any/c)
          = (lambda (r v) v)
  break? : (any/c . -> . any/c) = (lambda (r) #f)
  all-possible-roots? : any/c = #f
```

Generalizes `collection-file-path` to support folding over all possible locations of a collection-based file in the current configuration. Unlike `collection-file-path`, `collection-search` takes the file to location in module-path form, but always as a `'lib` path.

Each possible path for the file (not counting a `".ss"` to/from `".rkt"` conversion) is provided as a second argument to the *combine* function, where the first argument is the current result, and the value produced by *combine* becomes the new result. The `#:init` argument provides the initial result.

The *break?* function short-circuits a search based on the current value. For example, it could be used to short-circuit a search after a suitable path is found.

If *all-possible-roots?* is `#f`, then *combine* is called only on paths within `"collects"`-like directories (for the current configuration) where at least a matching collection directory exists.

```
(normalized-lib-module-path? v) → boolean?
  v : any/c
```

Returns `#t` if *v* is a module path (in the sense of `module-path?`) of the form `'(lib str)` where *str* contains at least one slash. The `collapse-module-path` function produces such module paths for collection-based module references.

6.13 API for Platform Specifications

```
(require setup/matching-platform)          package: base
```

Added in version 6.0.1.13 of package `base`.

```
(platform-spec? v) → boolean?
  v : any/c
```

Returns `#t` if *v* is a symbol, string, or regexp value (in the sense of `regexp?`), `#f` otherwise.

```
(matching-platform?  spec
                     [#:cross? cross?
                      #:system-type sys-type
                      #:system-library-subpath sys-lib-subpath])
 → boolean?
  spec : platform-spec?
  cross? : any/c = #f
  sys-type : (or/c #f symbol?) = (if cross?
                                     (cross-system-type)
                                     (system-type))
```

```
sys-lib-subpath : (or/c #f path-for-some-system?)
                = (if cross?
                      (cross-system-library-subpath #f)
                      (system-library-subpath #f))
```

Reports whether *spec* matches *sys-type* or *sys-lib-subpath*, where #f values for the latter are replaced with the default values.

If *spec* is a symbol, then the result is #t if *sys-type* is the same symbol, #f otherwise.

If *spec* is a string, then the result is #t if (path->string *sys-lib-subpath*) is the same string, #f otherwise.

If *spec* is a regexp value, then the result is #t if the regexp matches (path->string *sys-lib-subpath*), #f otherwise.

Changed in version 6.3 of package base: Added #:cross? argument and changed the contract on *sys-lib-subpath* to accept path-for-some-system? instead of just path?.

6.14   API for Cross-Platform Configuration

(require setup/cross-system)   package: base

The setup/cross-system library provides functions for querying the system properties of a destination platform, which can be different than the current platform in cross-installation modes.

A Racket installation includes a "system.rktd" file in the directory reported by (find-lib-dir). When the information in that file does not match the running Racket's information, then the setup/cross-system module infers that Racket is being run in cross-installation mode.

For example, if an in-place Racket installation for a different platform resides at ⟨*cross-dir*⟩, then

```
racket -C -G ⟨cross-dir⟩/etc -X ⟨cross-dir⟩/collects -l- raco pkg
```

runs raco pkg using the current platform's racket executable, but using the collections and other configuration information of ⟨*cross-dir*⟩, as well as modifying the packages of ⟨*cross-dir*⟩. That can work as long as no platform-specific libraries need to run to perform the requested raco pkg action (e.g., when installing built packages), or as long as the current platform's installation already includes those libraries.

Added in version 6.3 of package base.

(cross-system-type [*mode*])

```
→ (or/c symbol? string? bytes? exact-positive-integer? vector?)
  mode : (or/c 'os 'word 'gc 'vm 'link 'machine = 'os
              'so-suffix 'so-mode 'fs-change)
```

Like `system-type`, but for the target platform instead of the current platform in cross-installation mode. When not in cross-installation mode, the results are the same as for `system-type`.

See also `'cross` mode for `system-type`.

```
(cross-system-library-subpath [mode]) → path-for-some-system?
  mode : (or/c 'cgc '3m 'cs #f) = (system-type 'gc)
```

Like `system-library-subpath`, but for the target platform instead of the current platform in cross-installation mode. When not in cross-installation mode, the results are the same as for `system-library-subpath`.

In cross-installation mode, the target platform may have a different path convention than the current platform, so the result is `path-for-some-system?` instead of `path?`.

```
(cross-installation?) → boolean?
```

Returns `#t` if cross-installation mode has been detected, `#f` otherwise.

6.15   API for Cross-References for Installed Manuals

```
(require setup/xref)        package: racket-index
```

```
(load-collections-xref [on-load]) → xref?
  on-load : (-> any/c) = (lambda () (void))
```

Either creates and caches or returns a cached cross-reference record created with `make-collections-xref`. The `on-load` function is called only when a previously cached record is not returned.

```
(make-collections-xref
 [#:no-user? no-user?
  #:no-main? no-main?
  #:doc-db db-path
  #:quiet-fail? quiet-fail?
  #:register-shutdown! register-shutdown!])
→ xref?
 no-user? : any/c = #f
 no-main? : any/c = #f
```

```
  db-path : (or/c #f path?) = #f
  quiet-fail? : any/c = #f
  register-shutdown! : ((-> any) . -> . any) = void
```

Like `load-xref`, but automatically finds all cross-reference files for manuals that have been installed with `raco setup`. The resulting cross-reference record takes advantage of a cross-reference database *db-path*, when support is available, to delay the loading of cross-reference details until needed.

Cross-reference information is skipped when it is installed in the main installation or in a user-specific location, respectively, if *no-main?* or *no-user?* is #t.

If *quiet-fail?* is true, then errors are suppressed while loading cross-reference information.

The *register-shutdown!* callback may be called to register a function that closes database connections when the result of `make-collections-xref` is no longer needed. If *register-shutdown!* is not supplied or if a function sent to *register-shutdown!* is never called, database connections will be closed only though a custodian.

```
(get-rendered-doc-directories no-user?
                              no-main?) → (listof path?)
  no-user? : any/c
  no-main? : any/c
```

Returns a list of directories for all documentation for all installed collections, omitting documentation that is installed in the main installation or in a user-specific location, respectively, if *no-main?* or *no-user?* is #t.

```
(get-current-doc-state) → doc-state?
```

Records the time stamps of files that are touched whenever the documentation is changed.

Added in version 1.2 of package `racket-index`.

```
(doc-state-changed? doc-state) → boolean?
  doc-state : doc-state?
```

Returns #t when the time stamps of the files in *doc-state* changed (or new files appeared) and #f otherwise.

If the result is #t, then the documentation in this installation of Racket has changed and otherwise it hasn't.

Added in version 1.2 of package `racket-index`.

```
(doc-state? v) → boolean?
  v : any/c
```

A predicate to recognize the result of `get-current-doc-state`.

Added in version 1.2 of package `racket-index`.

6.16   API for Materializing User-Specific Documentation

```
(require setup/materialize-user-docs)
                     package: racket-index
```

Added in version 1.1 of package `racket-index`.

```
(materialize-user-docs
 [on-setup
  #:skip-user-doc-check? skip-user-doc-check?])
→ void?
  on-setup : ((-> boolean?) -> any) = (lambda (setup) (setup))
  skip-user-doc-check? : any/c = #f
```

Checks whether a user-specific documentation entry point already exists in `(find-user-doc-dir)`, and if not, runs `raco setup` in a mode that will create the entry point (to have the same content as the installation's documentation entry point.) If `skip-user-doc-check?` is not `#f`, then skips the check for the user-specific documentation entry point.

The run of `raco setup` is packaged in a thunk that is provided to `on-setup`, which can adjust the current output and error ports as appropriate and check the thunk's result for success.

The `on-setup` argument is not called if the documentation entry point already exists in `(find-user-doc-dir)`.

Changed in version 1.1 of package `racket-index`: Added the `skip-user-doc-check?` argument.

7 `raco decompile`: Decompiling Bytecode

The `raco decompile` command takes the path of a bytecode file (which usually has the file extension `".zo"`) or a source file with an associated bytecode file (usually created with `raco make`) and converts the bytecode file's content back to an approximation of Racket code. When the "bytecode" file contains machine code, as for the CS variant of Racket, then it cannot be converted back to an approximation of Racket, but installing the `"disassemble"` package may enable disassembly of the machine code. Decompilation is mostly useful for checking the compiler's transformation and optimization of the source program.

The `raco decompile` command accepts the following command-line flags:

- `--force` — skip modification-date comparison on the given file's path and an associated `".zo"` file (if any)

- `-n` ⟨*n*⟩ or `--columns` ⟨*n*⟩ — format output for a display with ⟨*n*⟩ columns

- `--linklet` — decompile only as far as linklets, instead of decoding linklets to approximate Racket `module` forms

- `--no-disassemble` — show machine code as-is in a byte string, instead of attempting to disassemble

To the degree that it can be converted back to Racket code, many forms in the decompiled code have the same meanings as always, such as `module`, `define`, and `lambda`. Other forms and transformations are specific to the rendering of bytecode, and they reflect a specific execution model:

- Top-level variables, variables defined within the module, and variables imported from other modules are prefixed with `_`, which helps expose the difference between uses of local variables versus other variables. Variables imported from other modules, moreover, have a suffix starting with `@` that indicates the source module. Finally, imported variables with constantness have a midfix: `:c` to indicate constant shape across all instantiations, `:f` to indicate a fixed value after initialization, `:p` to indicate a procedure, `:P` to indicate a procedure that preserves continuation marks on return, `:t` to indicate a structure type, `:mk` to indicate a structure constructor, `:?` to indicate a structure predicate, `:ref` to indicate a structure accessor, or `:set!` to indicate a structure mutator.

  Non-local variables are always accessed indirectly though an implicit `#%globals` or `#%modvars` variable that resides on the value stack (which otherwise contains local variables). Variable accesses are further wrapped with `#%checked` when the compiler cannot prove that the variable will be defined before the access.

  Uses of core primitives are shown without a leading `_`, and they are never wrapped with `#%checked`.

- Local-variable access may be wrapped with `#%sfs-clear`, which indicates that the variable-stack location holding the variable will be cleared to prevent the variable's value from being retained by the garbage collector. Variables whose name starts with `unused` are never actually stored on the stack, and so they never have `#%sfs-clear` annotations. (The bytecode compiler normally eliminates such bindings, but sometimes it cannot, either because it cannot prove that the right-hand side produces the right number of values, or the discovery that the variable is unused happens too late with the compiler.)

  Mutable variables are converted to explicitly boxed values using `#%box`, `#%unbox`, and `#%set-boxes!` (which works on multiple boxes at once). A `set!-rec-values` operation constructs mutually-recursive closures and simultaneously updates the corresponding variable-stack locations that bind the closures. A `set!`, `set!-values`, or `set!-rec-values` form is always used on a local variable before it is captured by a closure; that ordering reflects how closures capture values in variable-stack locations, as opposed to stack locations.

- In a `lambda` form, if the procedure produced by the `lambda` has a name (accessible via `object-name`) and/or source-location information, then it is shown as a quoted constant at the start of the procedure's body. Afterward, if the `lambda` form captures any bindings from its context, those bindings are also shown in a quoted constant. Neither constant corresponds to a computation when the closure is called, though the list of captured bindings corresponds to a closure allocation when the `lambda` form itself is evaluated.

  A `lambda` form that closes over no bindings is wrapped with `#%closed` plus an identifier that is bound to the closure. The binding's scope covers the entire decompiled output, and it may be referenced directly in other parts of the program; the binding corresponds to a constant closure value that is shared, and it may even contain cyclic references to itself or other constant closures.

- A form (`#%apply-values` *proc* *expr*) is equivalent to (`call-with-values` (`lambda` () *expr*) *proc*), but the run-time system avoids allocating a closure for *expr*. Similarly, a `#%call-with-immediate-continuation-mark` call is equivalent to a `call-with-immediate-continuation-mark` call, but avoiding a closure allocation.

- A `define-values` form may have (`begin` `'%%inline-variant%%` *expr1* *expr2*) for its expression, in which case *expr2* is the normal result, but *expr1* may be inlined for calls to the definition from other modules. Definitions of functions without an `'%%inline-variant%%` are never inlined across modules.

- Function arguments and local bindings that are known to have a particular type have names that embed the known type. For example, an argument might have a name that starts `argflonum` or a local binding might have a name that starts `flonum` to indicate a flonum value.

- A `#%decode-syntax` form corresponds to a syntax object.

- A `#%machine-code` form corresponds to machine code that is not disassembled, where the machine code is in a byte string.

- A `#%assembly-code` form corresponds to disassembled machine code, where the assembly code is shown as a sequence of strings.

Changed in version 1.8: Added `--no-disassemble`.

7.1 API for Decompiling

```
(require compiler/decompile)        package: compiler-lib
```

```
(decompile top) → any/c
  top : (or/c linkl-directory? linkl-bundle? linkl?)
```

Consumes the result of parsing bytecode and returns an S-expression (as described above) that represents the compiled code.

7.2 API for Parsing Bytecode

```
(require compiler/zo-parse)      package: zo-lib
```

The `compiler/zo-parse` module re-exports `compiler/zo-structs` in addition to `zo-parse`.

```
(zo-parse [in]) → (or/c linkl-directory? linkl-bundle?)
  in : input-port? = (current-input-port)
```

Parses a port (typically the result of opening a `".zo"` file) containing bytecode. Beware that the structure types used to represent the bytecode are subject to frequent changes across Racket versons.

The parsed bytecode is returned in a `linkl-directory` or `linkl-bundle` structure—the latter only for the compilation of a module that contains no submodules.

Within a linklet, the bytecode representation of an expression is closer to an S-expression than a traditional, flat control string. For example, an if form is represented by a `branch` structure that has three fields: a test expression, a "then" expression, and an "else" expression. Similarly, a function call is represented by an `application` structure that has a list of argument expressions.

Storage for local variables or intermediate values (such as the arguments for a function call) is explicitly specified in terms of a stack. For example, execution of an `application` struc-

ture reserves space on the stack for each argument result. Similarly, when a `let-one` structure (for a simple `let`) is executed, the value obtained by evaluating the right-hand side expression is pushed onto the stack, and then the body is evaluated. Local variables are always accessed as offsets from the current stack position. When a function is called, its arguments are passed on the stack. A closure is created by transferring values from the stack to a flat closure record, and when a closure is applied, the saved values are restored on the stack (though possibly in a different order and likely in a more compact layout than when they were captured).

When a sub-expression produces a value, then the stack pointer is restored to its location from before evaluating the sub-expression. For example, evaluating the right-hand size for a `let-one` structure may temporarily push values onto the stack, but the stack is restored to its pre-`let-one` position before pushing the resulting value and continuing with the body. In addition, a tail call resets the stack pointer to the position that follows the enclosing function's arguments, and then the tail call continues by pushing onto the stack the arguments for the tail-called function.

Values for global and module-level variables are not put directly on the stack, but instead stored in "buckets," and an array of accessible buckets is kept on the stack. When a closure body needs to access a global variable, the closure captures and later restores the bucket array in the same way that it captured and restores a local variable. Mutable local variables are boxed similarly to global variables, but individual boxes are referenced from the stack and closures.

7.3 API for Marshaling Bytecode

```
(require compiler/zo-marshal)      package: zo-lib
```

```
(zo-marshal-to top out) → void?
  top : (or/c linkl-directory? linkl-bundle?)
  out : output-port?
```

Consumes a representation of bytecode and writes it to *out*.

```
(zo-marshal top) → bytes?
  top : (or/c linkl-directory? linkl-bundle?)
```

Consumes a representation of bytecode and generates a byte string for the marshaled bytecode.

7.4 Bytecode Representation

```
(require compiler/zo-structs)      package: zo-lib
```

The `compiler/zo-structs` library defines the bytecode structures that are produced by `zo-parse` and consumed by `decompile` and `zo-marshal`.

> **Warning:** The `compiler/zo-structs` library exposes internals of the Racket bytecode abstraction. Unlike other Racket libraries, `compiler/zo-structs` is subject to incompatible changes across Racket versions.

```
(struct zo ()
    #:extra-constructor-name make-zo
    #:prefab)
```

A supertype for all forms that can appear in compiled code.

7.4.1 Prefix

```
(struct linkl-directory zo (table)
    #:extra-constructor-name make-linkl-directory
    #:prefab)
  table : (hash/c (listof symbol?) linkl-bundle?)
(struct linkl-bundle zo (table)
    #:extra-constructor-name make-linkl-bundle
    #:prefab)
  table : (hash/c (or/c symbol? fixnum?) (or linkl? any/c))
```

Wraps compiled code.

Module and top-level compilation produce one or more linklets that represent independent evaluation in a specific phase. Even a single top-level expression or a module with only runtime code will generate multiple linklets to implement metadata and syntax data. A module with no submodules is represented directly by a `linkl-bundle`, while any other compiled form is represented by a `linkl-directory`.

A linklet bundle maps an integer to a linklet representing forms to evaluate at the integer-indicated phase. Symbols are mapped to metadata, such as a module's name as compiled or a linklet implementing literal syntax objects. A linklet directory normally maps `'()` to the main linklet bundle for a module or a single top-level form; for a linklet directory that corresponds to a sequence of top-level forms, however, there is no "main" linklet bundle, and symbol forms of integers are used to order the linkets.

For a module with submodules, the linklet directory maps submodule paths (as lists of symbols) to linklet bundles for the corresponding submodules.

```
(struct linkl zo (name
                  importss
                  import-shapess
                  exports
                  internals
                  lifts
                  source-names
                  body
                  max-let-depth
                  need-instance-access?)
  #:extra-constructor-name make-linkl
  #:prefab)
name : symbol?
importss : (listof (listof symbol?))
import-shapess : (listof (listof  (or/c #f 'constant 'fixed
                                        function-shape?
                                        struct-shape?)))
exports : (listof symbol?)
internals : (listof (or/c symbol? #f))
lifts : (listof symbol?)
source-names : (hash/c symbol? symbol?)
body : (listof (or/c form? any/c))
max-let-depth : exact-nonnegative-integer?
need-instance-access? : boolean?
```

Represents a linklet, which corresponds to a module body or a top-level sequence at a single phase.

The `name` of a linklet is for debugging purposes, similar to the inferred name of a `lambda` form.

The `importss` list of lists describes the linklet's imports. Each of the elements of the out list corresponds to an import source, and each element of an inner list is the symbolic name of an export from that source. The `import-shapess` list is in parallel to `imports`; it reflects optimization assumptions by the compiler that are used by the bytecode validator and checked when the linklet is instantiated.

The `exports` list describes the linklet's defined names that are exported. The `internals` list describes additional definitions within the linket, but they are not accessible from the outside of a linklet or one of its instances; a `#f` can appear in place of an unreferenced internal definition that has been removed. The `lifts` list is an extension of `internals` for procedures that are lifted by the compiler; these procedures have certain properties that can be checked by the bytecode validator.

Each symbol in `exports`, `internals`, and `lifts` must be distinct from any other symbol in those lists. The `source-names` table maps symbols in `exports`, `internals`, and `lifts`

to other symbols, potentially not distinct, that correspond to original source names for the definition. The `source-names` table is used only for debugging.

When a linklet is instantiated, variables corresponding to the flattening of the lists `importss`, `exports`, `internals`, and `lifts` are placed in an array (in that order) for access via `toplevel` references. The initial slot is reserved for a variable-like reference that strongly retains a connection to an instance of its enclosing linklet.

The `bodys` list is the executable content of the linklet. The value of the last element in `bodys` may be returned when the linklet is instantiated, depending on the way that it's instantiated.

The `max-let-depth` field indicates the maximum size of the stack that will be created by any `body`.

The `need-instance-access?` boolean indicates whether the linklet contains a `toplevel` for position 0. A `#t` is allowed (but suboptimal) if not such reference is present in the linklet body.

```
(struct function-shape (arity preserves-marks?)
    #:extra-constructor-name make-function-shape
    #:prefab)
  arity : procedure-arity?
  preserves-marks? : boolean?
```

Represents the shape of an expected import, which should be a function having the arity specified by `arity`. The `preserves-marks?` field is true if calling the function is expected to leave continuation marks unchanged by the time it returns.

```
(struct struct-shape ()
    #:extra-constructor-name make-struct-shape
    #:prefab)
(struct struct-type-shape struct-shape (field-count authentic?)
    #:extra-constructor-name make-struct-type-shape
    #:prefab)
  field-count : exact-nonnegative-integer?
  authentic? : boolean?
(struct constructor-shape struct-shape (arity)
    #:extra-constructor-name make-constructor-shape
    #:prefab)
  arity : exact-nonnegative-integer?
(struct predicate-shape struct-shape (authentic?)
    #:extra-constructor-name make-predicate-shape
    #:prefab)
  authentic? : boolean?
```

```
(struct accessor-shape struct-shape (field-count authentic?)
    #:extra-constructor-name make-accessor-shape
    #:prefab)
  field-count : exact-nonnegative-integer?
  authentic? : boolean?
(struct mutator-shape struct-shape (field-count authentic?)
    #:extra-constructor-name make-mutator-shape
    #:prefab)
  field-count : exact-nonnegative-integer?
  authentic? : boolean?
(struct struct-type-property-shape struct-shape (has-guard?)
    #:extra-constructor-name make-struct-type-property-shape
    #:prefab)
  has-guard? : boolean?
(struct property-predicate-shape struct-shape ()
    #:extra-constructor-name make-property-predicate-shape
    #:prefab)
(struct property-accessor-shape struct-shape ()
    #:extra-constructor-name make-property-accessor-shape
    #:prefab)
(struct struct-other-shape struct-shape ()
    #:extra-constructor-name make-struct-other-shape
    #:prefab)
```

Represents the shape of an expected import as a structure-type binding, constructor, etc.

7.4.2 Forms and Inline Variants

```
(struct form zo ()
    #:extra-constructor-name make-form
    #:prefab)
```

A supertype for all forms that can appear in a linklet body (including exprs), except for literals that are represented as themselves.

```
(struct def-values form (ids rhs)
    #:extra-constructor-name make-def-values
    #:prefab)
  ids : (listof toplevel?)
  rhs : (or/c expr? seq? inline-variant? any/c)
```

Represents a define-values form. Each element of ids references a defined variable in the enclosing linklet.

After rhs is evaluated, the stack is restored to its depth from before evaluating rhs.

```
(struct inline-variant zo (direct inline)
    #:extra-constructor-name make-inline-variant
    #:prefab)
  direct : expr?
  inline : expr?
```

Represents a function that is bound by `define-values`, where the function has two variants. The first variant is used for normal calls to the function. The second may be used for cross-module inlining of the function.

7.4.3 Expressions

```
(struct expr form ()
    #:extra-constructor-name make-expr
    #:prefab)
```

A supertype for all expression forms that can appear in compiled code, except for literals that are represented as themselves.

```
(struct lam expr (name
                  flags
                  num-params
                  param-types
                  rest?
                  closure-map
                  closure-types
                  toplevel-map
                  max-let-depth
                  body)
    #:extra-constructor-name make-lam
    #:prefab)
  name : (or/c symbol? vector?)
  flags : (listof (or/c 'preserves-marks 'is-method 'single-result
                        'only-rest-arg-not-used 'sfs-clear-rest-args))
  num-params : exact-nonnegative-integer?
  param-types : (listof (or/c 'val 'ref 'flonum 'fixnum 'extflonum))
  rest? : boolean?
  closure-map : (vectorof exact-nonnegative-integer?)
  closure-types : (listof (or/c 'val/ref 'flonum 'fixnum 'extflonum))
  toplevel-map : (or/c #f (set/c exact-nonnegative-integer?))
  max-let-depth : exact-nonnegative-integer?
  body : (or/c expr? seq? any/c)
```

Represents a `lambda` form. The `name` field is a name for debugging purposes. The `num-params` field indicates the number of arguments accepted by the procedure, not counting a rest argument; the `rest?` field indicates whether extra arguments are accepted and collected into a "rest" variable. The `param-types` list contains `num-params` symbols indicating the type of each argumet, either `'val` for a normal argument, `'ref` for a boxed argument (representing a mutable local variable), `'flonum` for a flonum argument, or `'extflonum` for an extflonum argument.

The `closure-map` field is a vector of stack positions that are captured when evaluating the `lambda` form to create a closure. The `closure-types` field provides a corresponding list of types, but no distinction is made between normal values and boxed values; also, this information is redundant, since it can be inferred by the bindings referenced though `closure-map`.

When a closure captures top-level or module-level variables or refers to a syntax-object constant, the variables and constants are represented in the closure by capturing a prefix (in the sense of `prefix`). The `toplevel-map` field indicates which top-level variables (i.e., linklet imports and definitions) are actually used by the closure (so that variables in a prefix can be pruned by the run-time system if they become unused) and whether any syntax objects are used (so that the syntax objects as a group can be similarly pruned). A `#f` value indicates either that no prefix is captured or all variables and syntax objects in the prefix should be considered used. Otherwise, numbers in the set indicate which variables and lifted variables are used. Variables are numbered consecutively by position in the prefix starting from `0`, but the number equal to the number of non-lifted variables corresponds to syntax objects (i.e., the number is include if any syntax-object constant is used). Lifted variables are numbered immediately afterward—which means that, if the prefix contains any syntax objects, lifted-variable numbers are shifted down relative to a `toplevel` by the number of syntax object in the prefix (which makes the `toplevel-map` set more compact).

When the function is called, the rest-argument list (if any) is pushed onto the stack, then the normal arguments in reverse order, then the closure-captured values in reverse order. Thus, when `body` is run, the first value on the stack is the first value captured by the `closure-map` array, and so on.

The `max-let-depth` field indicates the maximum stack depth created by `body` plus the arguments and closure-captured values pushed onto the stack. The `body` field is the expression for the closure's body.

Changed in version 6.1.1.8 of package `zo-lib`: Added a number to `toplevel-map` to indicate whether any syntax object is used, shifting numbers for lifted variables up by one if any syntax object is in the prefix.

```
(struct closure expr (code gen-id)
    #:extra-constructor-name make-closure
    #:prefab)
  code : lam?
  gen-id : symbol?
```

A `lambda` form with an empty closure, which is a procedure constant. The procedure constant can appear multiple times in the graph of expressions for bytecode, and the `code` field can be a cycle for a recursive constant procedure; the `gen-id` is different for each such constant.

```
(struct case-lam expr (name clauses)
    #:extra-constructor-name make-case-lam
    #:prefab)
  name : (or/c symbol? vector?)
  clauses : (listof lam?)
```

Represents a `case-lambda` form as a combination of `lambda` forms that are tried (in order) based on the number of arguments given.

```
(struct let-one expr (rhs body type unused?)
    #:extra-constructor-name make-let-one
    #:prefab)
  rhs : (or/c expr? seq? any/c)
  body : (or/c expr? seq? any/c)
  type : (or/c #f 'flonum 'fixnum 'extflonum)
  unused? : boolean?
```

Pushes an uninitialized slot onto the stack, evaluates `rhs` and puts its value into the slot, and then runs `body`. If `type` is not `#f`, then `rhs` must produce a value of the corresponding type, and the slot must be accessed by `localref`s that expect the type. If `unused?` is `#t`, then the slot must not be used, and the value of `rhs` is not actually pushed onto the stack (but `rhs` is constrained to produce a single value).

After `rhs` is evaluated, the stack is restored to its depth from before evaluating `rhs`. Note that the new slot is created before evaluating `rhs`.

```
(struct let-void expr (count boxes? body)
    #:extra-constructor-name make-let-void
    #:prefab)
  count : exact-nonnegative-integer?
  boxes? : boolean?
  body : (or/c expr? seq? any/c)
```

Pushes `count` uninitialized slots onto the stack and then runs `body`. If `boxes?` is `#t`, then the slots are filled with boxes that contain `#<undefined>`.

```
(struct install-value expr (count pos boxes? rhs body)
    #:extra-constructor-name make-install-value
    #:prefab)
  count : exact-nonnegative-integer?
  pos : exact-nonnegative-integer?
```

```
  boxes? : boolean?
  rhs : (or/c expr? seq? any/c)
  body : (or/c expr? seq? any/c)
```

Runs `rhs` to obtain `count` results, and installs them into existing slots on the stack in order, skipping the first `pos` stack positions. If `boxes?` is `#t`, then the values are put into existing boxes in the stack slots.

After `rhs` is evaluated, the stack is restored to its depth from before evaluating `rhs`.

```
(struct let-rec expr (procs body)
    #:extra-constructor-name make-let-rec
    #:prefab)
  procs : (listof lam?)
  body : (or/c expr? seq? any/c)
```

Represents a `letrec` form with `lambda` bindings. It allocates a closure shell for each `lambda` form in `procs`, installs each onto the stack in previously allocated slots in reverse order (so that the closure shell for the last element of `procs` is installed at stack position `0`), fills out each shell's closure (where each closure normally references some other just-created closures, which is possible because the shells have been installed on the stack), and then evaluates `body`.

```
(struct boxenv expr (pos body)
    #:extra-constructor-name make-boxenv
    #:prefab)
  pos : exact-nonnegative-integer?
  body : (or/c expr? seq? any/c)
```

Skips `pos` elements of the stack, setting the slot afterward to a new box containing the slot's old value, and then runs `body`. This form appears when a `lambda` argument is mutated using `set!` within its body; calling the function initially pushes the value directly on the stack, and this form boxes the value so that it can be mutated later.

```
(struct localref expr (unbox? pos clear? other-clears? type)
    #:extra-constructor-name make-localref
    #:prefab)
  unbox? : boolean?
  pos : exact-nonnegative-integer?
  clear? : boolean?
  other-clears? : boolean?
  type : (or/c #f 'flonum 'fixnum 'extflonum)
```

Represents a local-variable reference; it accesses the value in the stack slot after the first `pos` slots. If `unbox?` is `#t`, the stack slot contains a box, and a value is extracted from the box.

If `clear?` is `#t`, then after the value is obtained, the stack slot is cleared (to avoid retaining a reference that can prevent reclamation of the value as garbage). If `other-clears?` is `#t`, then some later reference to the same stack slot may clear after reading. If `type` is not `#f`, the slot is known to hold a specific type of value.

```
(struct toplevel expr (depth pos const? ready?)
    #:extra-constructor-name make-toplevel
    #:prefab)
  depth : exact-nonnegative-integer?
  pos : exact-nonnegative-integer?
  const? : boolean?
  ready? : boolean?
```

Represents a reference to an imported or defined variable within a linklet. The `depth` field indicates the number of stack slots to skip to reach the prefix array, and `pos` is the offset into the array.

When the `toplevel` is an expression, if both `const?` and `ready?` are `#t`, then the variable definitely will be defined, its value stays constant, and the constant is effectively the same for every module instantiation. If only `const?` is `#t`, then the value is constant, but it may vary across instantiations. If only `ready?` is `#t`, then the variable definitely will be defined, but its value may change. If `const?` and `ready?` are both `#f`, then a check is needed to determine whether the variable is defined.

When the `toplevel` is the left-hand side for `def-values`, then `const?` is `#f`. If `ready?` is `#t`, the variable is marked as immutable after it is defined.

```
(struct application expr (rator rands)
    #:extra-constructor-name make-application
    #:prefab)
  rator : (or/c expr? seq? any/c)
  rands : (listof (or/c expr? seq? any/c))
```

Represents a function call. The `rator` field is the expression for the function, and `rands` are the argument expressions. Before any of the expressions are evaluated, `(length rands)` uninitialized stack slots are created (to be used as temporary space).

```
(struct branch expr (test then else)
    #:extra-constructor-name make-branch
    #:prefab)
  test : (or/c expr? seq? any/c)
  then : (or/c expr? seq? any/c)
  else : (or/c expr? seq? any/c)
```

Represents an `if` form.

After `test` is evaluated, the stack is restored to its depth from before evaluating `test`.

```
(struct with-cont-mark expr (key val body)
    #:extra-constructor-name make-with-cont-mark
    #:prefab)
  key : (or/c expr? seq? any/c)
  val : (or/c expr? seq? any/c)
  body : (or/c expr? seq? any/c)
```

Represents a `with-continuation-mark` expression.

After each of `key` and `val` is evaluated, the stack is restored to its depth from before evaluating `key` or `val`.

```
(struct seq expr (forms)
    #:extra-constructor-name make-seq
    #:prefab)
  forms : (listof (or/c expr? any/c))
```

Represents a `begin` form.

After each form in `forms` is evaluated, the stack is restored to its depth from before evaluating the form.

```
(struct beg0 expr (seq)
    #:extra-constructor-name make-beg0
    #:prefab)
  seq : (listof (or/c expr? seq? any/c))
```

Represents a `begin0` expression.

After each expression in `seq` is evaluated, the stack is restored to its depth from before evaluating the expression.

Unlike the `begin0` source form, the first expression in `seq` is never in tail position, even if it is the only expression in the list.

```
(struct varref expr (toplevel dummy constant? from-unsafe?)
    #:extra-constructor-name make-varref
    #:prefab)
  toplevel : (or/c toplevel? #t #f symbol?)
  dummy : (or/c toplevel? #f)
  constant? : boolean?
  from-unsafe? : boolean?
```

Represents a `#%variable-reference` form. The `toplevel` field is `#t` if the original reference was to a constant local binding, `#f` if the variable reference is for `(#%variable-reference)` and does not refer to a specific variable, or a symbol if the variable reference

refers to a primitive variable. The `dummy` field accesses a variable bucket that strongly references its namespace (as opposed to a normal variable bucket, which only weakly references its namespace); it can be `#f`.

The value of `constant?` is true when the `toplevel` field is not `#t` but the referenced variable is known to be constant. The value of `from-unsafe?` is true when the module that created the reference was compiled in unsafe mode.

```
(struct assign expr (id rhs undef-ok?)
    #:extra-constructor-name make-assign
    #:prefab)
  id : toplevel?
  rhs : (or/c expr? seq? any/c)
  undef-ok? : boolean?
```

Represents a `set!` expression that assigns to a top-level or module-level variable. (Assignments to local variables are represented by `install-value` expressions.) If `undef-ok?` is true, the assignment to `id` succeeds even if `id` was not previously defined (see also `compile-allow-set!-undefined`).

After `rhs` is evaluated, the stack is restored to its depth from before evaluating `rhs`.

```
(struct apply-values expr (proc args-expr)
    #:extra-constructor-name make-apply-values
    #:prefab)
  proc : (or/c expr? seq? any/c)
  args-expr : (or/c expr? seq? any/c)
```

Represents `(call-with-values (lambda () args-expr) proc)`, which is handled specially by the run-time system.

```
(struct with-immed-mark expr (key def-val body)
    #:extra-constructor-name make-with-immed-mark
    #:prefab)
  key : (or/c expr? seq? any/c)
  def-val : (or/c expr? seq? any/c)
  body : (or/c expr? seq? any/c)
```

Represents a `(call-with-immediate-continuation-mark key (lambda (arg) body) val)` expression that is handled specially by the run-time system to avoid a closure allocation. One initialized slot is pushed onto the stack after `expr` and `val` are evaluated and before `body` is evaluated.

After each of `key` and `val` is evaluated, the stack is restored to its depth from before evaluating `key` or `val`.

113

```
(struct primval expr (id)
    #:extra-constructor-name make-primval
    #:prefab)
  id : exact-nonnegative-integer?
```

Represents a direct reference to a variable imported from the run-time kernel.

8 `raco demod`: Demodularizing Programs

The `raco demod` command takes a Racket module and flattens all of its dependencies into a single compiled module. A file "⟨*name*⟩.rkt" is demodularized into "⟨*name*⟩_rkt_merged.zo".

The demodularized zo file can be run by passing it as an argument to the `racket` command-line program.

9 `raco link`: Library Collection Links

The `raco link` command inspects and modifies a collection links file to display, add, or remove mappings from collection names to filesystem directories.

Managing links directly is somewhat discouraged. Instead, use the package manager (see *Package Management in Racket*), which installs and manages links (i.e., it builds on `raco link`) in a way that more gracefully leads to sharing collections with others. Nevertheless, `raco link` is available for direct use.

For example, the command

```
raco link maze
```

installs a user-specific and version-specific link for the `"maze"` collection, mapping it to the `"maze"` subdirectory of the current directory. Supply multiple directory paths to create multiple links at once, especially with a command-shell wildcard:

```
raco link *
```

By default, the linked collection name is the same as each directory's name, but the collection name can be set separately for a single directory with the `--name` flag.

To remove the link created by the first example above, use

```
raco link --remove maze
```

or

```
raco link -r maze
```

Like link-adding mode, removing mode accepts multiple directory paths to remove multiple links, and all links that match any directory are removed. If `--name` is used with `--remove`, then only links matching both the collection name and directory are removed.

Full command-line options:

- `-l` or `--list` — Shows the current link table. If any other command-line arguments are provided that modify the link table, the table is shown after modifications. If no directory arguments are provided, and if none of `-u`, `--user`, `-i`, `--installation`, `-f`, or `--file` are specified, then the link table is shown for all user-specific and installation-wide collection links files.

- `-n` ⟨*name*⟩ or `--name` ⟨*name*⟩ — Sets the collection name for adding a single link or removing matching links. By default, the collection name for an added link is derived from the directory name. When the `-r` or `--remove` flag is also used, only links with a collection name matching ⟨*name*⟩ are removed, and if no directory arguments

are provided, all links with a match to ⟨*name*⟩ are removed. This flag is mutually exclusive with -d and --root.

- -d or --root — Treats each directory as a collection root that contains collection directories, instead of a directory for a specific collection. When the -r or --remove flag is also used, only collection-root links that match a directory are removed. This flag is mutually exclusive with -n and --name.

- -D or --static-root — Like -d or --root, but each directory is assumed to have a constant set of subdirectories (to improve the use of collection-search caches) as long as the links file itself does not change.

- -x ⟨*regexp*⟩ or --version-regexp ⟨*regexp*⟩ — Sets a version regexp that limits the link to use only by Racket versions (as reported by version) matching ⟨*regexp*⟩. This flag is normally used with -u or --user with installations that have different versions but the same installation name. When the -r or --remove flag is also used, only links with a version regexp matching ⟨*regexp*⟩ are removed.

- -r or --remove — Selects remove mode instead of add mode.

- -u or --user — Limits listing and removal of links to the user-specific collection links file and not the installation-wide collection links file. This flag is mutually exclusive with -i, --installation, -f, and --file.

- -i or --installation — Reads and writes links in installation-wide collection links file and not the user-specific collection links file. This flag is mutually exclusive with -u, --user, -f, and --file.

- -f ⟨*file*⟩ or --file ⟨*file*⟩ — Reads and writes links in ⟨*file*⟩ instead of the user-specific collection links file. This flag is mutually exclusive with -u, --user, -s, --shared, -i, and --installation.

- -v ⟨*vers*⟩ or --version ⟨*vers*⟩ — Selects ⟨*vers*⟩ as relevant installation name for operations on the user-specific collection links file.

- --repair — Enables repairs to the existing file content when the content is erroneous. The file is repaired by deleting individual links when possible.

9.1 API for Collection Links

(require setup/link)   package: base

```
(links  dir
        ...
       [#:user? user?
        #:user-version user-version
        #:file file
        #:name name
        #:root? root?
        #:static-root? static-root?
        #:version-regexp version-regexp
        #:error error-proc
        #:remove? remove?
        #:show? show?
        #:repair? repair?
        #:with-path? with-path?])        → list?
  dir : path?
  user? : any/c = #t
  user-version : string? = (get-installation-name)
  file : (or/c path-string? #f) = #f
  name : (or/c string? #f) = #f
  root? : any/c = #f
  static-root? : any/c = #f
  version-regexp : (or/c regexp? #f) = #f
  error-proc : (symbol? string? any/c ... . -> . any) = error
  remove? : any/c = #f
  show? : any/c = #f
  repair? : any/c = #f
  with-path? : any/c = #f
```

A function version of the `raco link` command that always works on a single file—either
file if it is a path string, the user–specific collection links file if *user?* is true, or the
installation-wide collection links file otherwise. If *user?* is true, then *user-version* de-
termines the relevant installation name (defaulting to the current installation's name).

The *static-root?* flag value is ignored unless *root?* is true and *remove?* is false, in which
case each given *dir* is added as a static root if *static-root?* is true.

The *error-proc* argument is called to raise exceptions that would be fatal to the `raco`
`link` command.

If *remove?* is true, the result is a list of entries that were removed from the file. If *remove?*
is #f but *root?* is true, the result is a list of paths for collection roots. If *remove?* and
root? are both #f, the result is a list for top-level collections that are mapped by *file* and
that apply to the running version of Racket; the list is a list of strings for collection names
if *with-path?* is #f, or it is a list of pairs of collection-name strings and complete paths if
with-path? is true.

10 `raco pack`: **Packing Library Collections**

The `raco pack` command creates an archive of files and directories. Formerly, such archives were used directly to distribute library files to Racket users, but the package manager (see *Package Management in Racket*) is now the preferred mechanism for distribution.

A packed archive usually has the suffix `".plt"`. The `raco pkg` command recognizes a `".plt"` archive for installation as a package. The `raco setup` command (see §6 "`raco setup: Installation Management`") also supports `".plt"` unpacking and installation when using the `-A` flag, but such installations do not benefit from the more general management facilities of `raco pkg`, while the `raco unpack` command (see §11 "`raco unpack: Unpacking Library Collections`") unpacks an archive locally without attempting to install it. DrRacket recognizes the `".plt"` and currently treats such an archive in the same way as `raco setup -A`.

An archive contains the following elements:

- A set of files and directories to be unpacked, and flags indicating whether they are to be unpacked relative to the Racket add-ons directory (which is user-specific), the Racket installation directory, or a user-selected directory.

  The files and directories for an archive are provided on the command line to `raco pack`, either directly or in the form of collection names when the `--collect` flag is used.

  The `--at-plt` flag indicates that the files and directories should be unpacked relative to the user's add-ons directory, unless the user specifies the Racket installation directory when unpacking. The `--collection-plt` flag implies `--at-plt`. The `--all-users` flag overrides `--at-plt`, and it indicates that the files and directories should be unpacked relative to the Racket installation directory, always.

- A flag for each file indicating whether it overwrites an existing file when the archive is unpacked; the default is to leave the old file in place, but the `--replace` flag enables replacing for all files in the archive.

- A list of collections to be set-up (via `raco setup`) after the archive is unpacked; the `++setup` flag adds a collection name to the archive's list, but each collection for `--collection-plt` is added automatically.

- A name for the archive, which is reported to the user by the unpacking interface; the `--plt-name` flag sets the archive's name, but a default name is determined automatically when using `--collect`.

- A list of required collections (with associated version numbers) and a list of conflicting collections; the `raco pack` command always names the `"racket"` collection in the required list (using the collection's pack-time version), `raco pack` names each packed collection in the conflict list (so that a collection is not unpacked on top of a

different version of the same collection), and `raco pack` extracts other requirements and conflicts from the `"info.rkt"` files of collections when using `--collect`.

Specify individual directories and files for the archive when not using `--collect`. Each file and directory must be specified with a relative path. By default, if the archive is unpacked with DrRacket, the user will be prompted for a target directory, and if `raco setup` is used to unpack the archive, the files and directories will be unpacked relative to the current directory. If the `--at-plt` flag is provided, the files and directories will be unpacked relative to the user's Racket add-ons directory, instead. Finally, if the `--all-users` flag is provided, the files and directories will be unpacked relative to the Racket installation directory, instead.

Use the `--collect` flag to pack one or more collections; sub-collections can be designated by using a `/` as a path separator on all platforms. In this mode, `raco pack` automatically uses paths relative to the Racket installation or add-ons directory for the archived files, and the collections will be set-up after unpacking. In addition, `raco pack` consults each collection's `"info.rkt"` file, as described below, to determine the set of required and conflicting collections. Finally, `raco pack` consults the first collection's `"info.rkt"` file to obtain a default name for the archive. For example, the following command creates a `"sirmail.plt"` archive for distributing a `"sirmail"` collection:

```
raco pack --collect sirmail.plt sirmail
```

When packing collections, `raco pack` checks the following fields of each collection's `"info.rkt"` file (see §6.4 ""`info.rkt`" File Format"):

- `requires` — A list of the form `(list (list coll vers) ...)` where each `coll` is a non-empty list of relative-path strings, and each `vers` is a (possibly empty) list of exact integers. The indicated collections must be installed at unpacking time, with version sequences that match as much of the version sequence specified in the corresponding `vers`.

  A collection's version is indicated by a `version` field in its `"info.rkt"` file, and the default version is the empty list. The version sequence generalized major and minor version numbers. For example, version `'(2 5 4 7)` of a collection can be used when any of `'()`, `'(2)`, `'(2 5)`, `'(2 5 4)`, or `'(2 5 4 7)` is required.

- `conflicts` — A list of the form `(list coll ...)` where each `coll` is a non-empty list of relative-path strings. The indicated collections must *not* be installed at unpacking time.

For example, the `"info.rkt"` file in the `"sirmail"` collection might contain the following `info` declaration:

```
#lang info
(define name "SirMail")
(define mred-launcher-libraries (list "sirmail.rkt"))
```

120

```
(define mred-launcher-names (list "SirMail"))
(define requires (list (list "mred")))
```

Then, the `"sirmail.plt"` file (created by the command-line example above) will contain the name "SirMail." When the archive is unpacked, the unpacker will check that the `"mred"` collection is installed, and that `"mred"` has the same version as when `"sirmail.plt"` was created.

10.1   Format of `".plt"` Archives

The extension `".plt"` is not required for a distribution archive, but the `".plt"`-extension convention helps users identify the purpose of a distribution file.

The raw format of a distribution file is described below. This format is uncompressed and sensitive to communication modes (text vs. binary), so the distribution format is derived from the raw format by first compressing the file using `gzip`, then encoding the gzipped file with the MIME base64 standard (which relies only the characters `A-Z`, `a-z`, `0-9`, `+`, `/`, and `=`; all other characters are ignored when a base64-encoded file is decoded).

The raw format is

- `PLT` are the first three characters.

- An S-expression matching

  ```
  (lambda (request failure)
    (case request
      [(name) name]
      [(unpacker) (quote mzscheme)]
      [(requires) (quote requires)]
      [(conflicts) (quote conflicts)]
      [(plt-relative?) plt-relative?]
      [(plt-home-relative?) plt-home-relative?]
      [(test-plt-dirs) test-dirs]
      [else (failure)]))
  ```

  where the *name*, *requires*, etc., meta-variables stand for S-expressions as follows:

    - *name* — a human-readable string describing the archive's contents. This name is used only for printing messages to the user during unpacking.
    - *requires* — a list of collections required to be installed before unpacking the archive, which associated versions; see the documentation of `pack` for details.
    - *conflicts* — a list of collections required *not* to be installed before unpacking the archive.

- *plt-relative?* — a boolean; if true, then the archive's content should be unpacked relative to the plt add-ons directory.

- *plt-home-relative?* — a boolean; if true and if `'plt-relative?` is true, then the archive's content should be unpacked relative to the Racket installation.

- *test-plt-dirs* — `#f` or a `'paths` where *paths* is a list of path strings; in the latter case, a true value of *plt-home-relative?* is cancelled if any of the directories in the list (relative to the Racket installation) is unwritable by the user.

The S-expression is extracted from the archive using `read` (and the result is *not* *eval*uated).

- An S-expression matching

```
(unit (import main-collects-parent-dir mzuntar)
      (export)
      (mzuntar void)
      (quote collections))
```

where *collections* is a list of collection paths (where each collection path is a list of strings); once the archive is unpacked, `raco setup` will compile and setup the specified collections.

The S-expression is extracted from the archive using `read` (and the result is *not* *eval*uated).

The archive continues with unpackables. Unpackables are extracted until the end-of-file is found (as indicated by an `=` in the base64-encoded input archive).

An *unpackable* is one of the following:

- The symbol `'dir` followed by a list S-expression. The `build-path` procedure will be applied to the list to obtain a relative path for the directory (and the relative path is combined with the target directory path to get a complete path).

The `'dir` symbol and list are extracted from the archive using `read` (and the result is *not* *eval*uated).

- The symbol `'file`, a list, a number, an asterisk, and the file data. The list specifies the file's relative path, just as for directories. The number indicates the size of the file to be unpacked in bytes. The asterisk indicates the start of the file data; the next n bytes are written to the file, where n is the specified size of the file.

The symbol, list, and number are all extracted from the archive using `read` (and the result is *not* *eval*uated). After the number is read, input characters are discarded until an asterisk is found. The file data must follow this asterisk immediately.

- The symbol `'file-replace` is treated like `'file`, but if the file exists on disk already, the file in the archive replaces the file on disk.

10.2   API for Packing

```
(require setup/pack)        package: base
```

Although the `raco pack` command can be used to create most ".plt" files, the `setup/pack` library provides a more general API for making ".plt" archives.

```
(pack-collections-plt
  dest
  name
  collections
 [#:replace? replace?
  #:at-plt-home? at-home?
  #:test-plt-collects? test?
  #:extra-setup-collections collection-list
  #:file-filter filter-proc])
→ void?
  dest : path-string?
  name : string?
  collections : (listof (listof path-string?))
  replace? : boolean? = #f
  at-home? : boolean? = #f
  test? : boolean? = #t
  collection-list : (listof path-string?) = null
  filter-proc : (path-string? . -> . boolean?) = std-filter
```

Creates the ".plt" file specified by the pathname *dest*, using the *name* as the name reported to `raco setup` as the archive's description.

The archive contains the collections listed in *collections*, which should be a list of collection paths; each collection path is, in turn, a list of relative-path strings.

If the `#:replace?` argument is `#f`, then attempting to unpack the archive will report an error when any of the collections exist already, otherwise unpacking the archive will overwrite an existing collection.

If the `#:at-plt-home?` argument is `#t`, then the archived collections will be installed into the Racket installation directory instead of the user's directory if the main "collects" directory is writable by the user. If the `#:test-plt-collects?` argument is `#f` (the default is `#t`) and the `#:at-plt-home?` argument is `#t`, then installation fails if the main "collects" directory is not writable.

The optional `#:extra-setup-collections` argument is a list of collection paths that are not included in the archive, but are set-up when the archive is unpacked.

The optional `#:file-filter` argument is the same as for `pack-plt`.

```
(pack-collections  dest
                   name
                   collections
                   replace?
                   extra-setup-collections
                   [filter
                   at-plt-home?])                → void?
  dest : path-string?
  name : string?
  collections : (listof (listof path-string?))
  replace? : boolean?
  extra-setup-collections : (listof path-string?)
  filter : (path-string? . -> . boolean?) = std-filter
  at-plt-home? : boolean? = #f
```

Old, keywordless variant of `pack-collections-plt` for backward compatibility.

```
(pack-plt  dest
           name
           paths
           [#:as-paths as-paths
           #:file-filter filter-proc
           #:encode? encode?
           #:file-mode file-mode-sym
           #:unpack-unit unpack-spec
           #:collections collection-list
           #:plt-relative? plt-relative?
           #:at-plt-home? at-plt-home?
           #:test-plt-dirs dirs
           #:requires mod-and-version-list
           #:conflicts mod-list])              → void?
  dest : path-string?
  name : string?
  paths : (listof path-string?)
  as-paths : (listof path-string?) = paths
  filter-proc : (path-string? . -> . boolean?) = std-filter
  encode? : boolean? = #t
  file-mode-sym : symbol? = 'file
  unpack-spec : any/c = #f
  collection-list : (listof path-string?) = null
  plt-relative? : any/c = #f
  at-plt-home? : any/c = #f
  dirs : (or/c (listof path-string?) false/c) = #f
  mod-and-version-list : (listof (listof path-string?)    = null
                                 (listof exact-integer?))
```

```
mod-list : (listof (listof path-string?)) = null
```

Creates the ".plt" file specified by the pathname *dest*, using the string *name* as the name reported to `raco setup` as the archive's description. The *paths* argument must be a list of relative paths for directories and files; the contents of these files and directories will be packed into the archive. The optional *as-paths* list provides the path to be recorded in the archive for each element of *paths* (so that the unpacked paths can be different from the packed paths).

The `#:file-filter` procedure is called with the relative path of each candidate for packing. If it returns `#f` for some path, then that file or directory is omitted from the archive. If it returns `'file` or `'file-replace` for a file, the file is packed with that mode, rather than the default mode. The default is `std-filter`.

If the `#:encode?` argument is `#f`, then the output archive is in raw form, and still must be gzipped and mime-encoded (in that order). The default value is `#t`.

The `#:file-mode` argument must be `'file` or `'file-replace`, indicating the default mode for a file in the archive. The default is `'file`.

The `#:unpack-unit` argument is usually `#f`. Otherwise, it must be an S-expression for the S-expression that describes unpacking; see §10.1 "Format of ".plt" Archives" more information about the unit. If the `#:unpack-unit` argument is `#f`, an appropriate S-expression is generated.

The `#:collections` argument is a list of collection paths to be compiled after the archive is unpacked. The default is the `null`.

If the `#:plt-relative?` argument is true (the default is `#f`), the archive's files and directories are to be unpacked relative to the user's add-ons directory or the Racket installation directories, depending on whether the `#:at-plt-home?` argument is true and whether directories specified by `#:test-plt-dirs` are writable by the user.

If the `#:at-plt-home?` argument is true (the default is `#f`), then `#:plt-relative?` must be true, and the archive is unpacked relative to the Racket installation directory. In that case, a relative path that starts with "collects" is mapped to the installation's main "collects" directory, and so on, for the following the initial directory names:

- "collects"

- "doc"

- "lib"

- "include"

If `#:test-plt-dirs` is a `list`, then `#:at-plt-home?` must be `#t`. In that case, when the archive is unpacked, if any of the relative directories in the `#:test-plt-dirs` list is

unwritable by the current user, then the archive is unpacked in the user's add-ons directory after all.

The `#:requires` argument should have the shape `(list (list coll-path version) ...)` where each *coll-path* is a non-empty list of relative-path strings, and each *version* is a (possibly empty) list of exact integers. The indicated collections must be installed at unpacking time, with version sequences that match as much of the version sequence specified in the corresponding *version*. A collection's version is indicated by the *version* field of its `"info.rkt"` file.

The `#:conflicts` argument should have the shape `(list coll-path ...)` where each *coll-path* is a non-empty list of relative-path strings. The indicated collections must *not* be installed at unpacking time.

```
(pack  dest
       name
       paths
       collections
      [filter
       encode?
       file-mode
       unpack-unit
       plt-relative?
       requires
       conflicts
       at-plt-home?]) → void?
  dest : path-string?
  name : string?
  paths : (listof path-string?)
  collections : (listof path-string?)
  filter : (path-string? . -> . boolean?) = std-filter
  encode? : boolean? = #t
  file-mode : symbol? = 'file
  unpack-unit : any/c = #f
  plt-relative? : boolean? = #t
  requires : (listof (listof path-string?)    = null
                     (listof exact-integer?))
  conflicts : (listof (listof path-string?)) = null
  at-plt-home? : boolean? = #f
```

Old, keywordless variant of `pack-plt` for backward compatibility.

```
(std-filter p) → boolean?
  p : path-string?
```

Returns `#t` unless *p*, after stripping its directory path and converting to a byte string, matches

one of the following regular expressions: `^[.]git`, `^[.]svn$`, `^CVS$`, `^[.]cvsignore`, `^compiled$`, `^doc`, `~$`, `^#.*#$`, `^[.]#`, or `[.]plt$`.

```
(mztar  path
        [#:as-path as-path]
        output
        filter
        file-mode)        → void?
  path : path-string?
  as-path : path-string? = path
  output : output-port?
  filter : (path-string? . -> . boolean?)
  file-mode : (symbols 'file 'file-replace)
```

Called by `pack` to write one directory/file `path` to the output port `output` using the filter procedure `filter` (see `pack` for a description of `filter`). The `path` is recorded in the output as `as-path`, in case the unpacked path should be different from the original path. The `file-mode` argument specifies the default mode for packing a file, either `'file` or `'file-replace`.

11 `raco unpack`: Unpacking Library Collections

The `raco unpack` command unpacks a ".plt" archive (see §10 "`raco pack`: Packing Library Collections") to the current directory without attempting to install any collections. Use `raco pkg` (see *Package Management in Racket*) to install a ".plt" archive as a package, or use `raco setup -A` (see §6 "`raco setup`: Installation Management") to unpack and install collections from a ".plt" archive.

Command-line flags:

- `-l` or `--list` — lists the content of the archive without unpacking it.

- `-c` or `--config` — shows the archive configuration before unpacking or listing the archive content.

- `-f` or `--force` — replace files that exist already; files that the archive says should be replaced will be replaced without this flag.

11.1 Unpacking API

```
(require setup/unpack)          package: base
```

The `setup/unpack` library provides raw support for unpacking a ".plt" file.

```
(unpack  archive
        [main-collects-parent-dir
         print-status
         get-target-directory
         force?
         get-target-plt-directory]) → void?
  archive : path-string?
  main-collects-parent-dir : path-string? = (current-directory)
  print-status : (string? . -> . any)
               = (lambda (x) (printf "~a\n" x))
  get-target-directory : (-> path-string?)
                       = (lambda () (current-directory))
  force? : any/c = #f
  get-target-plt-directory : (path-string?
                               path-string?
                               (listof path-string?)
                               . -> . path-string?)
                           = (lambda (preferred-dir main-dir options)
                               preferred-dir)
```

Unpacks `archive`.

The `main-collects-parent-dir` argument is passed along to `get-target-plt-directory`.

The `print-status` argument is used to report unpacking progress.

The `get-target-directory` argument is used to get the destination directory for unpacking an archive whose content is relative to an arbitrary directory.

If `force?` is true, then version and required-collection mismatches (comparing information in the archive to the current installation) are ignored.

The `get-target-plt-directory` function is called to select a target for installation for an archive whose is relative to the installation. The function should normally return one if its first two arguments; the third argument merely contains the first two, but has only one element if the first two are the same. If the archive does not request installation for all uses, then the first two arguments will be different, and the former will be a user-specific location, while the second will refer to the main installation.

```
(fold-plt-archive archive
                  on-config-fn
                  on-setup-unit
                  on-directory
                  on-file
                  initial-value) → any/c
  archive : path-string?
  on-config-fn : (any/c any/c . -> . any/c)
  on-setup-unit : (any/c input-port? any/c . -> . any/c)
  on-directory : ((or/c path-string?
                        (list/c (or/c 'collects 'doc 'lib 'include)
                                path-string?))
                  any/c
                  . -> . any/c)
  on-file : (or/c ((or/c path-string?
                         (list/c (or/c 'collects 'doc 'lib 'include)
                                 path-string?))
                   input-port?
                   any/c
                   . -> . any/c)
                  ((or/c path-string?
                         (list/c (or/c 'collects 'doc 'lib 'include)
                                 path-string?))
                   input-port?
                   (one-of/c 'file 'file-replace)
                   any/c
                   . -> . any/c))
  initial-value : any/c
```

Traverses the content of `archive`, which must be a `".plt"` archive that is created with the default unpacking unit and configuration expression. The configuration expression is not evaluated, the unpacking unit is not invoked, and files are not unpacked to the filesystem. Instead, the information in the archive is reported back through `on-config`, `on-setup-unit`, `on-directory`, and `on-file`, each of which can build on an accumulated value that starts with `initial-value` and whose final value is returned.

The `on-config-fn` function is called once with an S-expression that represents a function to implement configuration information. The second argument to `on-config` is `initial-value`, and the function's result is passed on as the last argument to `on-setup-unit`.

The `on-setup-unit` function is called with the S-expression representation of the installation unit, an input port that points to the rest of the file, and the accumulated value. This input port is the same port that will be used in the rest of processing, so if `on-setup-unit` consumes any data from the port, then that data will not be consumed by the remaining functions. (This means that on-setup-unit can leave processing in an inconsistent state, which is not checked by anything, and therefore could cause an error.) The result of `on-setup-unit` becomes the new accumulated value.

For each directory that would be created by the archive when unpacking normally, `on-directory` is called with the directory path (described more below) and the accumulated value up to that point, and its result is the new accumulated value.

For each file that would be created by the archive when unpacking normally, `on-file` is called with the file path (described more below), an input port containing the contents of the file, an optional mode symbol indicating whether the file should be replaced, and the accumulated value up to that point; its result is the new accumulated value. The input port can be used or ignored, and parsing of the rest of the file continues the same either way. After `on-file` returns control, however, the input port is drained of its content.

A directory or file path can be a plain path, or it can be a list containing `'collects`, `'doc`, `'lib`, or `'include` and a relative path. The latter case corresponds to a directory or file relative to a target installation's collection directory (in the sense of `find-collects-dir`), documentation directory (in the sense of `find-doc-dir`), library directory (in the sense of `find-lib-dir`), or "include" directory (in the sense of `find-include-dir`).

12 `raco ctool`: Working with C Code

The `raco ctool` command works in various modes (as determined by command-line flags) to support various tasks involving C code.

12.1 Compiling and Linking C Extensions

A *dynamic extension* is a shared library (a.k.a. DLL) that extends Racket using the C API. An extension can be loaded explicitly via `load-extension`, or it can be loaded implicitly through `require` or `load/use-compiled` in place of a source *file* when the extension is located at

```
(build-path "compiled" "native" (system-library-subpath)
            (path-add-suffix file (system-type 'so-suffix)))
```

relative to *file*.

For information on writing extensions, see *Inside: Racket C API*.

Three `raco ctool` modes help for building extensions:

`raco ctool` is provided by the `"cext-lib"` package.

- `--cc` : Runs the host system's C compiler, automatically supplying flags to locate the Racket header files and to compile for inclusion in a shared library.

- `--ld` : Runs the host system's C linker, automatically supplying flags to locate and link to the Racket libraries and to generate a shared library.

- `--xform` : Transforms C code that is written without explicit GC-cooperation hooks to cooperate with Racket's 3m garbage collector; see §8 "Overview" in *Inside: Racket C API*.

Compilation and linking build on the `dynext/compile` and `dynext/link` libraries. The following `raco ctool` flags correspond to setting or accessing parameters for those libraries: `--tool`, `--compiler`, `--ccf`, `--ccf`, `--ccf-clear`, `--ccf-show`, `--linker`, `++ldf`, `--ldf`, `--ldf-clear`, `--ldf-show`, `++ldl`, `--ldl-show`, `++cppf`, `++cppf ++cppf-clear`, and `--cppf-show`.

The `--3m` flag specifies that the extension is to be loaded into the 3m variant of Racket. The `--cgc` flag specifies that the extension is to be used with the CGC. The default depends on `raco`: `--3m` if `raco` itself is running in 3m, `--cgc` if `raco` itself is running in CGC.

12.1.1 API for 3m Transformation

```
(require compiler/xform)       package: cext-lib
```

```
(xform  quiet?
        input-file
        output-file
        include-dirs
       [#:keep-lines? keep-lines?]) → any/c
  quiet? : any/c
  input-file : path-string?
  output-file : path-string?
  include-dirs : (listof path-string?)
  keep-lines? : boolean? = #f
```

Transforms C code that is written without explicit GC-cooperation hooks to cooperate with Racket's 3m garbage collector; see §8 "Overview" in *Inside: Racket C API*.

The arguments are as for `compile-extension`; in addition *keep-lines?* can be `#t` to generate GCC-style annotations to connect the generated C code with the original source locations.

The file generated by `xform` can be compiled via `compile-extension`.

12.2   Embedding Modules via C

The `--c-mods` mode for `raco ctool` takes a set of Racket modules and generates a C source file that can be used as part of program that embeds the Racket runtime system. See §9 "Embedding into a Program" in *Inside: Racket C API* for an explanation of embedding programs. The `--mods` mode is similar, but it generates the raw bytes for the compiled module without encoding the bytes in C declarations.

The generated source or compiled file embeds the specified modules. Generated C source defines a `declare_modules` function that puts the module declarations into a namespace. Thus, using the output of `raco ctool --c-mods`, a program can embed Racket with a set of modules so that it does not need a `"collects"` directory to load modules at run time.

If the embedded modules refer to runtime files, the files can be gathered by supplying the `--runtime` argument to `raco ctool --cmods`, specifying a directory ⟨*dir*⟩ to hold the files. Normally, ⟨*dir*⟩ is a relative path, and files are found at run time in ⟨*dir*⟩ relative to the executable, but a separate path (usually relative) for run time can be specified with `--runtime-access`.

Typically, `raco ctool --c-mods` is used with `++lib` to specify a collection-based module path. For example,

```
raco ctool --c-mods base.c ++lib racket/base
```

generates a "base.c" whose `declare_modules` function makes `racket/base` available for use via the `scheme_namespace_require` or `scheme_dynamic_require` functions within the embedding application.

When a module file is provided to `raco ctool --c-mods`, then `declare_modules` declares a module with the symbolic name of the module file. For example,

```
raco ctool --c-mods base.c hello.rkt
```

creates a `declare_modules` that defines the module `'hello`, which could be required into the current namespace with `(namespace-require ''hello)` or similarly at the C level:

```
p = scheme_make_pair(scheme_intern_symbol("quote"),
                     scheme_make_pair(scheme_intern_symbol("hello"),
                                      scheme_make_null()));
scheme_namespace_require(p);
```

13   `raco test`: **Run tests**

The `raco test` command requires and runs the (by default) `test` submodule associated with each path given on the command line. Command-line flags can control which submodule is run, whether to run the main module if no submodule is found, and whether to run tests directly, in separate processes (the default), or in separate places. The current directory is set to a test file's directory before running the file.

When an argument path refers to a directory, `raco test` recursively discovers and runs all files within the directory that end in a module suffix (see `get-module-suffixes`, but the suffixes always include `".rkt"`, `".scrbl"`, `".ss"`, and `".scm"`) or have a (possibly empty) list of command-line arguments provided by `test-command-line-arguments` in an `"info.rkt"` file, or as directed by `test-include-paths` in an `"info.rkt"` file. At the same time, `raco test` omits files and directories within a directory as directed by `test-omit-paths` in an `"info.rkt"` file.

A test is counted as failing if it logs a failing test code via `test-log!`, causes Racket to exit with a non-zero exit code, or (when `-e` or `--check-stderr` is specified) if it produces output on the error port.

The `raco test` command accepts several flags:

- `-c` or `--collection` — Interprets the arguments as collections whose content should be tested (in the same way as directory content).

- `-p` or `--package` — Interprets the arguments as packages whose contents should be tested (in the same way as directory content). All package scopes are searched for the first, most specific package scope.

- `-l` or `--lib` — Interprets the arguments as libraries that should be tested.

- `-m` or `--modules` — Not only interprets the arguments as paths (which is the default mode), but treats them the same as paths found in a directory, which means ignoring a file argument that does not have a module extension or is not enabled explicitly via `test-command-line-arguments` or `test-include-paths` in an `"info.rkt"` file; meanwhile, paths that are otherwise enabled can be disabled via `test-omit-paths` in an `"info.rkt"` file.

- `--drdr` — Configures defaults to imitate the DrDr continuous testing system: ignore non-modules, run tests in separate processes, use as many jobs as available processors, set the default timeout to 90 seconds, create a fresh `PLTUSERHOME` and `TMPDIR` for each test, count stderr output as a test failure, quiet program output, provide empty program input, and print a table of results.

- `-s` ⟨*name*⟩ or `--submodule` ⟨*name*⟩ — Requires the submodule ⟨*name*⟩ rather than `test`. Supply `-s` or `--submodule` to run multiple submodules, or combine multiple submodules with `--first-avail` to run the first available of the listed modules.

- `-r` or `--run-if-absent` — Requires the top-level module of a file if a relevant sub-module is not present. This is the default mode.

- `-x` or `--no-run-if-absent` — Ignores a file if the relevant submodule is not present.

- `--first-avail` — When multiple submodule names are provided with `-s` or `--submodule`, runs only the first available submodule.

- `--configure-runtime` — Run a `configure-runtime` submodule (if any) of each specified module before the module or a submodule is run. This mode is the default when only a single module is provided or when `--process` or `--place` mode is specified, unless a submodule name is provided via `-s` or `--submodule`.

- `--direct` — Runs each test in a thread. This mode is the default if a single file is specified. Multiple tests can interfere with each other and the overall test run by exiting, unsafe operations that block (and thus prevent timeout), and so on.

- `--process` — Runs each test in a separate operating-system process. This mode is the default if multiple files are specified or if a directory, collection, or package is specified.

- `--place` — Runs each test in a place, instead of in an operating-system process.

- `-j` ⟨*n*⟩ or `--jobs` ⟨*n*⟩ — Runs up to ⟨*n*⟩ tests in parallel.

- `--timeout` ⟨*seconds*⟩ — Sets the default timeout (after which a test counts as failed) to ⟨*seconds*⟩. Use `+inf.0` to allow tests to run without limit but allow `timeout` sub-submodule configuration. If any test fails due to a timeout, the exit status of `raco test` is 2 (as opposed to 1 for only non-timeout failures or 0 for success).

- `--fresh-user` — When running tests in a separate process, creates a fresh directory and sets `PLTUSERHOME` and `TMPDIR`. The `PLTADDONDIR` environment variable is also set so that the add-on directory (which is where packages are installed, for example) does *not* change for each test process.

- `--empty-stdin` — Provide an empty stdin to each test program.

- `-Q` or `--quiet-program` — Suppresses output from each test program.

- `-e` or `--check-stderr` — Count any stderr output as a test failure.

- `--deps` — If considering arguments as packages, also check package dependencies.

- `++ignore-stderr` ⟨*pattern*⟩ — Don't count stderr output as a test failure if it matches ⟨*pattern*⟩. This flag can be used multiple times, and stderr output is treated as success as long as it matches any one ⟨*pattern*⟩.

- `-q` or `--quiet` — Suppresses output of progress information, responsible parties, and varying output (see §13.3 "Responsible-Party and Varying-Output Logging").

- `--heartbeat` — Periodically report that a test is still running after the test has been running at least 5 seconds.

- `--table` or `-t` — Print a summary table after all tests. If a test uses `rackunit`, or if a test at least uses `test-log!` from `rackunit/log` to log successes and failures, the table reports test and failure counts based on the log.

- `++arg` ⟨*argument*⟩ — Adds ⟨*argument*⟩ to the list of arguments to the invoked test module, so that the invoked module sees ⟨*argument*⟩ in its `current-command-line-arguments`. These arguments are combined with any arguments specified in `"info.rkt"` by `test-command-line-arguments`.

- `++args` ⟨*arguments*⟩ — The same as `++arg`, but ⟨*arguments*⟩ is treated as a whitespace-delimited list of arguments to add. To specify multiple arguments using this flag within a typical shell, ⟨*arguments*⟩ must be enclosed in quotation marks.

Changed in version 1.1 of package `compiler-lib`: Added `--heartbeat`.

Changed in version 1.4: Changed recognition of module suffixes to use `get-module-suffixes`, which implies recognizing `".ss"` and `".rkt"`.

Changed in version 1.5: Added `++ignore-stderr`.

Changed in version 1.6: Added `++arg` and `++args`.

13.1   Test Configuration by Submodule

When `raco test` runs a test in a submodule, a `config` sub-submodule can provide additional configuration for running the test. The `config` sub-submodule should use the `info` module language to define the following identifiers:

- `timeout` — a real number to override the default timeout for the test, which applies only when timeouts are enabled.

- `responsible` — a string, symbol, or list of symbols and strings identifying a responsible party that should be notified when the test fails. See §13.3 "Responsible-Party and Varying-Output Logging".

- `lock-name` — a string that names a lock file that is used to serialize tests (i.e., tests that have the same lock name do not run concurrently). The lock file's location is determined by the `PLTLOCKDIR` environment variable or defaults to (`find-system-path` `'temp-dir`). The maximum time to wait on the lock file is determined by the `PLTLOCKTIME` environment variable or defaults to 4 hours.

- `ignore-stderr` — a string, byte string, or regexp value, as a pattern that causes error output to not be treated as a failure if the output matches the pattern.

- `random?` — if true, indicates that the test's output is expected to vary. See §13.3 "Responsible-Party and Varying-Output Logging".

In order to prevent evaluation of a file for testing purposes, it suffices to create a submodule that does not perform any tests and does not trigger the evaluation of the enclosing module. So, for instance, a file might look like this:

```
#lang racket

(/ 1 0)

; don't run this file for testing:
(module test racket/base)
```

Changed in version 1.5 of package `compiler-lib`: Added `ignore-stderr` support.

13.2   Test Configuration by `"info.rkt"`

Submodule-based test configuration is preferred (see §13.1 "Test Configuration by Submodule"). In particular, to prevent `raco test` from running a particular file, normally the file should contain a submodule that takes no action.

In some cases, however, adding a submodule is inconvenient or impossible (e.g., because the file will not always compile). Thus, `raco test` also consults any `"info.rkt"` file in the candidate test file's directory. In the case of a file within a collection, `"info.rkt"` files from any enclosing collection directories are also consulted for `test-omit-paths` and `test-include-paths`. Finally, for a file within a package, the package's `"info.rkt"` is consulted for `pkg-authors` to set the default responsible parties (see §13.3 "Responsible-Party and Varying-Output Logging") for all files in the package.

The following `"info.rkt"` fields are recognized:

- `test-omit-paths` — a list of path strings (relative to the enclosing directory) and regexp values (to omit all files within the enclosing directory matching the expression), or `'all` to omit all files within the enclosing directory. When a path string refers to a directory, all files within the directory are omitted.

- `test-include-paths` — a list of path strings (relative to the enclosing directory) and regexp values (to include all files within the enclosing directory matching the expression), or `'all` to include all files within the enclosing directory. When a path string refers to a directory, all files within the directory are included.

- `test-command-line-arguments` — a list of (`list` *module-path-string* (`list` *argument-path-string* ...)), where `current-command-line-arguments` is set to a vector that contains the *argument-path-string* when running *module-path-string*.

- `test-timeouts` — a list of (`list` *module-path-string* *real-number*) to override the default timeout for *module-path-string*.

137

- `test-responsibles` — a list of (`list` *module-path-string* *party*) or (`list` `'all` *party*) to override the default responsible party for *module-path-string* or all files within the directory (except as overridden), respectively. Each *party* is a string, symbol, or list of symbols and strings. See §13.3 "Responsible-Party and Varying-Output Logging".

- `test-lock-names` — a list of (`list` *module-path-string* *lock-string*) to declare a lock file name for *module-path-string*. See `lock-name` in §13.1 "Test Configuration by Submodule".

- `test-ignore-stderrs` — a list of (`list` *module-path-string* *pattern*) or (`list` `'all` *pattern*) to declare patterns of standard error output that are allowed a non-failures for *module-path-string* or all files within the directory. Each *pattern* must be a string, byte string, or regexp value. See `ignore-stderr` in §13.1 "Test Configuration by Submodule".

- `test-randoms` — a list of path strings (relative to the enclosing directory) for modules whose output varies. See §13.3 "Responsible-Party and Varying-Output Logging".

- `module-suffixes` and `doc-module-suffixes` — Used indirectly via `get-module-suffixes`.

Changed in version 1.5 of package `compiler-lib`: Added `test-ignore-stderrs` support.

13.3   Responsible-Party and Varying-Output Logging

When a test has a declared responsible party, then the test's output is prefixed with a

```
raco test:⟨which⟩ @(test-responsible '⟨responsible⟩)
```

line, where ⟨*which*⟩ is a space followed by an exact non-negative number indicating a parallel task when parallelism is enabled (or empty otherwise), and ⟨*responsible*⟩ is a string, symbol, or list datum.

When a test's output (as written to stdout) is expected to vary across runs—aside from varying output that has the same form as produced by `time`—then it should be declared as varying. In that case, the test's output is prefixed with a

```
raco test:⟨which⟩ @(test-random #t)
```

line.

14 `raco docs`: Documentation Search

The `raco docs` command searches the documentation for the given identifiers or search terms.

Command-line flags:

- `-h` or `--help` — show help information for this command

- `--` — do not treat remaining arguments as switches

15 `raco expand`: **Macro Expansion**

The `raco expand` command macro-expands and pretty-prints the contents of the given source files. See also `expand`.

Command-line flags:

- `-n` ⟨*n*⟩ or `--columns` ⟨*n*⟩ — format output for a display with ⟨*n*⟩ columns

- `-h` or `--help` — show help information for this command

- `--` — do not treat remaining arguments as switches

16 `raco read`: Reading and Pretty-Printing

The `raco read` command read s and pretty-prints the contents of the given files. This command is useful for showing how a `#reader` or `#lang`-based reader extension converts input to an S-expression. It is also useful for pretty-printing a term that is already in S-expression form.

Command-line flags:

- `-n` ⟨*n*⟩ or `--columns` ⟨*n*⟩ — format output for a display with ⟨*n*⟩ columns

- `-h` or `--help` — show help information for this command

- `--` — do not treat remaining arguments as switches

Added in version 1.3 of package `compiler-lib`.

17 `raco scribble`: Building Documentation

See *Scribble: The Racket Documentation Tool* for information on the `raco scribble` command, which is used to run and render a Scribble document.

18 Adding a `raco` **Command**

The set of commands supported by `raco` can be extended by installed packages, PLaneT packages, and other collections. A command is added by defining `raco-commands` in the `"info.rkt"` library of a collection (see §6.4 `""info.rkt"` File Format"), and then `raco setup` (as called directly or as part of a package or PLaneT installation) must index the `"info.rkt"` file.

The value bound to `raco-commands` must be a list of *command specifications*, where each specification is a list of four values:

```
(list command-string
      implementation-module-path
      description-string
      prominence)
```

The *command-string* is the command name. Any unambiguous prefix of a command name can be supplied to `raco` to invoke the command.

The *implementation-module-path* names the implementation though a module path (in the sense of `module-path?`). The module is loaded and invoked through `dynamic-require` to run the command. The module can access command-line arguments through the `current-command-line-arguments` parameter, which is adjusted before loading the command module to include only the arguments to the command. The `current-command-name` parameter is also set to the command name used to load the command. When `raco help` is used on a command, the command is launched with an initial `--help` argument in `current-command-line-arguments`.

The *description-string* is a short string used to describe the command in response to `raco help`. The description should not be capitalized or end with a period.

The *prominence* value should be a real number or `#f`. A `#f` value means that the command should not be included in the short list of "frequently used commands." A number indicates the relative prominence of the command; the `help` command has a value of 110, and probably no command should be more prominent. The `pack` tool, which is currently ranked as the least-prominent of the frequently used commands, has a value of 10.

As an example, the `"info.rkt"` of the `"compiler"` collection might contain the

```
(define raco-commands
  '(("make" compiler/commands/make "compile source to byte-
code" 100)
    ("decompile" compiler/commands/decompile "decompile byte-
code" #f)))
```

so that `make` is treated as a frequently used command, while `decompile` is available as an

infrequently used command.

18.1 Command Argument Parsing

```
(require raco/command-name)          package: base
```

The raco/command-name library provides functions to help a raco command identify itself
to users.

```
(current-command-name) → (or/c string? #f)
(current-command-name name) → void?
  name : (or/c string? #f)
```

The name of the command currently being loaded via dynamic-require, or #f if raco is
not loading any command.

A command implementation can use this parameter to determine whether it was invoked via
raco or through some other means.

```
(short-program+command-name) → string?
```

Returns a string that identifies the current command. When current-command-name is a
string, then the result is the short name of the raco executable followed by a space and the
command name. Otherwise, it is the short name of the current executable, as determined by
stripping the path from the result of (find-system-path 'run-file). In either case, on
Windows, an ".exe" extension is removed from the executable name.

The result of this function is suitable for use with command-line. For example, the decom-
pile tool parses command-line arguments with

```
  (define source-files
    (command-line
     #:program (short-program+command-name)
     #:args source-or-bytecode-file
     source-or-bytecode-file))
```

so that raco decompile --help prints

```
  raco decompile [ <option> ... ] [<source-or-bytecode-file>] ...
  where <option> is one of
   --help, -h : Show this help
   -- : Do not treat any remaining argument as a switch (at this
level)
  Multiple single-letter switches can be combined after one `-'; for
   example: `-h-' is the same as `-h --'
```

```
(program+command-name) → string?
```

Like `short-program+command-name`, but the path (if any) is not stripped from the current executable's name.

18.2   Accessing `raco` Commands

```
(require raco/all-tools)          package: base
```

The `raco/all-tools` library collects the `raco-commands` specifications for installed packages, PLaneT packages, and other collections.

```
(all-tools)
 → (hash/c string? (list/c string? module-path? string? (or/c real? #f)))
```

Returns a hashtable with collection names as keys and command specifications as values. For example, the following program invokes `raco make file.rkt`:

```
(require raco/all-tools)

(define raco-make-spec (hash-ref (all-tools) "make"))

(parameterize ([current-command-line-arguments (vector "file.rkt")])
  (dynamic-require (second raco-make-spec) #f))
```

19 Installation Configuration and Search Paths

A *configuration directory* path is built into the Racket executable as selected at install time, and its location can be changed via the PLTCONFIGDIR directory or `--config`/`-G` command-line flag. Use `find-config-dir` to locate the configuration directory.

Modify the "config.rktd" file in the configuration directory to configure other directories as described below. Use the `setup/dirs` library (which combines information from the configuration files and other sources) to locate configured directories, instead of reading "config.rktd" directly. A "config.rktd" file can also appear in the directory `(build-path (find-system-path 'addon-dir) "etc")`, but it controls only the results of `find-addon-tethered-console-bin-dir` and `find-addon-tethered-gui-bin-dir`.

The path of the *main collection directory* is built into the Racket executable, and it can be changed via the `--collects`/`-X` flag, so it has no entry in "config.rktd". Most paths that are specified in "config.rktd" have default values that are relative to the main collection directory. The paths of the configuration directory and main collection directory thus work together to determine a Racket configuration.

A "config.rktd" file in the configuration directory should contain a `read`able hash table with any of the following symbolic keys, where a relative path is relative to the main collection directory:

- `'installation-name` — a string for the installation name, which is used to determine user- and version-specific paths, such as the initial path produced by `find-library-collection-paths` and the location of packages that are installed in `user` package scope. The default is `(version)`.

- `'lib-dir` — a path, string, or byte string for the *main library directory*. It defaults to a "lib" sibling directory of the main collection directory.

- `'lib-search-dirs` — a list of paths, strings, byte strings, or `#f` representing the search path for directories containing foreign libraries. Each `#f` in the list, if any, is replaced with the default search path, which is the user- and version-specific "lib" directory followed by the main library directory.

- `'dll-dir` — a path, string, or byte string for a directory containing shared libraries for the main executable. It defaults to the main library directory.

- `'share-dir` — a path, string, or byte string for the *main shared-file directory*, which normally includes installed packages. It defaults to a "share" sibling directory of the main collection directory.

- `'links-file` — a path, string, or byte string for the collection links file. It defaults to a "links.rktd" file in the main shared-file directory.

- `'links-search-files` — like `'lib-search-dirs`, but for collection links file.

- `'pkgs-dir` — a path, string, or byte string for packages that have `installation` package scope. It defaults to `"pkgs"` in the main shared-file directory.

- `'pkgs-search-dirs` — similar to `'lib-search-dirs`, but for packages in roughly `installation` package scope. More precisely, a `#f` value in the list is replaced with the directory specified by `'pkgs-dir`, and that point in the search list corresponds to `installation` scope. Paths before or after a `#f` value in the list can be selected as a scopes to start searches at that path's point in the list. Directories listed in `'pkgs-search-dirs` typically oblige a corresponding entry in `'links-search-files`, where the corresponding entry is `"links.rktd"` within the directory.

  Changed in version 7.0.0.19: Adapt the package-search path in a general way for a directory scope.

- `'bin-dir` — a path, string, or byte string for the installation's directory containing executables. It defaults to a `"bin"` sibling directory of the main collection directory.

- `'gui-bin-dir` — a path, string, or byte string for the installation's directory containing GUI executables. It defaults to a the `'bin-dir` value, if configured, or otherwise defaults in a platform-specific way: to the `"bin"` sibling directory of the main collection directory on Unix, and to the parent of the main collection directory on Windows and Mac OS.

  Added in version 6.8.0.2.

- `'apps-dir` — a path, string, or byte string for the installation's directory for `".desktop"` files. It defaults to a `"applications"` subdirectory of the main shared-file directory.

- `'man-dir` — a path, string, or byte string for the installation's man-page directory. It defaults to a `"man"` sibling directory of the main collection directory.

- `'doc-dir` — a path, string, or byte string for the main documentation directory. The value defaults to a `"doc"` sibling directory of the main collection directory.

- `'doc-search-dirs` — like `'lib-search-dirs`, but for directories containing documentation.

- `'doc-search-url` — a URL string that is augmented with version and search-tag queries to form a remote documentation reference.

- `'doc-open-url` — a URL string or `#f`; a string supplies a URL that is used instead of a local path to search and maybe open documentation pages (which normally makes sense only in an environment where opening a local HTML file does not work).

- `'include-dir` — a path, string, or byte string for the main directory containing C header files. It defaults to an `"include"` sibling directory of the main collection directory.

- `'include-search-dirs` — like `doc-search-dirs`, but for directories containing C header files.

- `'catalogs` — a list of URL strings used as the search path for resolving package names. An `#f` in the list is replaced with the default search path. A string that does not start with alphabetic characters followed by `://` is treated as a path, where a relative path is relative to the configuration directory.

- `'default-scope` — either `"user"` or `"installation"`, determining the default package scope for package-management operations.

- `'download-cache-dir` — a path string used as the location for storing downloaded package archives. When not specified, packages are cached in a `"download-cache"` directory in the user's cache directory as reported by (`find-system-path` `'cache-dir`).

- `'download-cache-max-files` and `'download-cache-max-bytes` — real numbers that determine limits on the download cache. When not specified, the cache is allowed to hold up to 1024 files that total up to 64 MB.

- `'build-stamp` — a string that identifies a build, which can be used to augment the Racket version number to more specifically identify the build. An empty string is normally appropriate for a release build.

- `'absolute-installation?` — a boolean that is `#t` if the installation uses absolute path names, `#f` otherwise.

- `'cgc-suffix` — a string used as the suffix (before the actual suffix, such as `".exe"`) for a `"CGC"` executable. Use Windows-style casing, and the string will be downcased as appropriate (e.g., for a Unix binary name). A `#f` value means that if the `racket` binary identifies itself as CGC, then the suffix is `""`, otherwise it is `"CGC"`.

- `'3m-suffix` — analogous to `'cgc-suffix`, but for 3m. A `#f` value means that if the `racket` binary identifies itself as 3m, then the suffix is `""`, otherwise it is `"BC"`.

- `'cs-suffix` — analogous to `'cgc-suffix`, but for CS. A `#f` value means that if the `racket` binary identifies itself as CS, then the suffix is `""`, otherwise it is `"CS"`.

- `'config-tethered-console-bin-dir` and `'config-tethered-gui-bin-dir` — a path for a directory to hold extra copies of executables that are tied to the configuration directory (as reported by `find-config-dir`) that is active at the time the executables are created. See also `find-config-tethered-console-bin-dir` and `find-config-tethered-gui-bin-dir`.

- `'interactive-file` and `'gui-interactive-file` — a module path to the interactive module that runs when the REPL runs on startup, unless the `-q`/`--no-init-file` is provided. Defaults to `'racket/interactive` and `'racket/gui/interactive`.