# Package 'Strategus'

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**Type** Package

**Title** Coordinating and Executing Analytics Using HADES Modules

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**Description** An R package for coordinating and executing analytics using HADES modules.

**License** Apache License 2.0

**URL** https://ohdsi.github.io/Strategus, https://github.com/OHDSI/Strategus

**BugReports** https://github.com/OHDSI/Strategus/issues

**Depends** R (>= 4.2.0),
CohortGenerator (>= 0.8.0),
DatabaseConnector (>= 6.2.3)

**Imports** targets,
renv (>= 1.0.0),
ParallelLogger (>= 3.1.0),
dplyr,
checkmate,
keyring,
rlang,
utils,
R.utils,
digest,
methods,
tibble,
ResultModelManager (>= 0.3.0),
SqlRender (>= 1.11.0),
semver

**Suggests** testthat (>= 3.0.0),
fs,
knitr,
rmarkdown,
Eunomia,
withr

**Remotes** ohdsi/CohortGenerator,
ohdsi/ResultModelManager,
ohdsi/Eunomia

**VignetteBuilder** knitr

**NeedsCompilation** no

**RoxygenNote** 7.2.3

**Roxygen** list(markdown = TRUE)

**Encoding** UTF-8

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# R topics documented:



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`addModuleSpecifications` *Add module specifications to analysis specifications*

---

## Description

Add module specifications to analysis specifications

## Usage

```
addModuleSpecifications(analysisSpecifications, moduleSpecifications)
```

## Arguments

`analysisSpecifications`
: An object of type `AnalysisSpecifications` as created by `createEmptyAnalysisSpecificiations`

`moduleSpecifications`
: An object of type `ModuleSpecifications`.

### Value

Returns the `analysisSpecifications` object with the module specifications added.

---

`addSharedResources` *Add shared resources to analysis specifications*

---

### Description

Add shared resources to analysis specifications

### Usage

```
addSharedResources(analysisSpecifications, sharedResources)
```

### Arguments

| | |
|---|---|
| `analysisSpecifications` | An object of type `AnalysisSpecifications` as created by `createEmptyAnalysisSpecificiations` |
| `sharedResources` | An object of type `SharedResources`. |

### Value

Returns the `analysisSpecifications` object with the module specifications added.

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`compareLockFiles` *Compare two renv.lock files*

---

### Description

Used to compare renv.lock files and return the results in a data.frame. The return value will include a "full join" representation of the packages across the two lock files.

### Usage

```
compareLockFiles(filename1, filename2)
```

### Arguments

| | |
|---|---|
| `filename1` | The first renv.lock file name |
| `filename2` | The second renv.lock file name |

### Value

A data.frame with the comparison of the rev.lock files

createCdmExecutionSettings *Create CDM execution settings*

## Description

Create CDM execution settings

## Usage

```
createCdmExecutionSettings(
  connectionDetailsReference,
  workDatabaseSchema,
  cdmDatabaseSchema,
  cohortTableNames = CohortGenerator::getCohortTableNames(cohortTable = "cohort"),
  tempEmulationSchema = getOption("sqlRenderTempEmulationSchema"),
  workFolder,
  resultsFolder,
  minCellCount = 5,
  integerAsNumeric = getOption("databaseConnectorIntegerAsNumeric", default = TRUE),
  integer64AsNumeric = getOption("databaseConnectorInteger64AsNumeric", default = TRUE),
  resultsConnectionDetailsReference = NULL,
  resultsDatabaseSchema = NULL
)
```

## Arguments

| | |
|---|---|
| connectionDetailsReference | A string that can be used to retrieve database connection details from a secure local store. |
| workDatabaseSchema | A database schema where intermediate data can be stored. The user (as identified in the connection details) will need to have write access to this database schema. |
| cdmDatabaseSchema | The database schema containing the data in CDM format. The user (as identified in the connection details) will need to have read access to this database schema. |
| cohortTableNames | An object identifying the various cohort table names that will be created in the workDatabaseSchema. This object can be created using the CohortGenerator::getCohortTableNa function. |
| tempEmulationSchema | Some database platforms like Oracle and Impala do not truly support temp tables. To emulate temp tables, provide a schema with write privileges where temp tables can be created. |
| workFolder | A folder in the local file system where intermediate results can be written. |
| resultsFolder | A folder in the local file system where the module output will be written. |
| minCellCount | The minimum number of subjects contributing to a count before it can be included in results. |

integerAsNumeric
: Logical: should 32-bit integers be converted to numeric (double) values? If FALSE 32-bit integers will be represented using R's native Integer class. Default is TRUE

integer64AsNumeric
: Logical: should 64-bit integers be converted to numeric (double) values? If FALSE 64-bit integers will be represented using bit64::integer64. Default is TRUE

resultsConnectionDetailsReference
: A string that can be used to retrieve the results database connection details from a secure local store.

resultsDatabaseSchema
: A schema where the results tables are stored

## Value

An object of type ExecutionSettings.

---

# createEmptyAnalysisSpecificiations

*Create an empty analysis specifications object.*

---

## Description

Create an empty analysis specifications object.

## Usage

```
createEmptyAnalysisSpecificiations()
```

## Value

An object of type AnalysisSpecifications.

---

# createResultDataModels

*Create Result Data Models*

---

## Description

Use this at the study design stage to create data models for modules This functions loads modules and executes any custom code to create schemas in a results database If recreate is set to TRUE all existing data will be removed, otherwise

## Usage

```
createResultDataModels(
  analysisSpecifications,
  executionSettings,
  executionScriptFolder = NULL,
  keyringName = NULL,
  restart = FALSE
)
```

### Arguments

| | |
|---|---|
| analysisSpecifications | An object of type AnalysisSpecifications as created by createEmptyAnalysisSpecificiations |
| executionSettings | An object of type ExecutionSettings as created by createCdmExecutionSettings() or createResultsExecutionSettings(). |
| executionScriptFolder | Optional: the path to use for storing the execution script. when NULL, this function will use a temporary file location to create the script to execute. |
| keyringName | The name of the keyring to operate on. This function assumes you have created the keyring before calling this function. It defaults to NULL to select the default keyring. If the keyring is password protected, the password must be stored in the environment variable STRATEGUS_KEYRING_PASSWORD so it is retrieved using the command Sys.getenv("STRATEGUS_KEYRING_PASSWORD") |
| restart | Restart run? Requires executionScriptFolder to be specified, and be the same as the executionScriptFolder used in the run to restart. |

---

## createResultsExecutionSettings

*Create Results execution settings*

---

### Description

Create Results execution settings

### Usage

```
createResultsExecutionSettings(
  resultsConnectionDetailsReference,
  resultsDatabaseSchema,
  workFolder,
  resultsFolder,
  minCellCount = 5,
 integerAsNumeric = getOption("databaseConnectorIntegerAsNumeric", default = TRUE),
 integer64AsNumeric = getOption("databaseConnectorInteger64AsNumeric", default = TRUE)
)
```

### Arguments

| | |
|---|---|
| resultsConnectionDetailsReference | A string that can be used to retrieve the results database connection details from a secure local store. |
| resultsDatabaseSchema | A schema where the results tables are stored |
| workFolder | A folder in the local file system where intermediate results can be written. |
| resultsFolder | A folder in the local file system where the module output will be written. |
| minCellCount | The minimum number of subjects contributing to a count before it can be included in results. |

integerAsNumeric
: Logical: should 32-bit integers be converted to numeric (double) values? If FALSE 32-bit integers will be represented using R's native Integer class. Default is TRUE

integer64AsNumeric
: Logical: should 64-bit integers be converted to numeric (double) values? If FALSE 64-bit integers will be represented using bit64::integer64. Default is TRUE

## Value

An object of type ExecutionSettings.

---

# ensureAllModulesInstantiated

*Ensure all modules are instantiated*

---

## Description

Ensure that all modules referenced in the analysis specifications are instantiated locally in the folder specified in the INSTANTIATED_MODULES_FOLDER environmental variable.

Missing modules will be fetched from remote repositories.

This function will also check whether there are different versions of the same module specified, which is not allowed, and whether all modules required by the specified modules are also instantiated.

## Usage

```
ensureAllModulesInstantiated(analysisSpecifications, forceVerification = FALSE)
```

## Arguments

analysisSpecifications
: An object of type AnalysisSpecifications as created by createEmptyAnalysisSpecificiations

forceVerification
: When set to TRUE, the verification process is forced to re-evaluate if a module is properly installed. The default is FALSE since if a module is successfully validated, the module will contain the hash value of the module's renv.lock file in the file system so it can by-pass running this check every time.

## Value

A list containing the install status of all modules (TRUE if all are installed properly) and a tibble listing the instantiated modules.

## execute *Execute analysis specifications.*

### Description

Execute analysis specifications.

### Usage

```
execute(
  analysisSpecifications,
  executionSettings,
  executionScriptFolder = NULL,
  keyringName = NULL,
  restart = FALSE
)
```

### Arguments

| | |
|---|---|
| analysisSpecifications | An object of type AnalysisSpecifications as created by createEmptyAnalysisSpecificiations |
| executionSettings | An object of type ExecutionSettings as created by createCdmExecutionSettings() or createResultsExecutionSettings(). |
| executionScriptFolder | Optional: the path to use for storing the execution script. when NULL, this function will use a temporary file location to create the script to execute. |
| keyringName | The name of the keyring to operate on. This function assumes you have created the keyring before calling this function. It defaults to NULL to select the default keyring. If the keyring is password protected, the password must be stored in the environment variable STRATEGUS_KEYRING_PASSWORD so it is retrieved using the command Sys.getenv("STRATEGUS_KEYRING_PASSWORD") |
| restart | Restart run? Requires executionScriptFolder to be specified, and be the same as the executionScriptFolder used in the run to restart. |

### Value

Does not return anything. Is called for the side-effect of executing the specified analyses.

## getModuleList *Provides a list of HADES modules to run through Strategus*

### Description

This function provides a list of modules and their locations that may be used with Strategus.

### Usage

```
getModuleList()
```

### Value

A data.frame() of modules that work with Strategus. This will contain: module = The name of the module version = The version of the module remote_repo = The remote location of the module (i.e. github.com) remote_username = The organization of the module (i.e. OHDSI) module_type = 'cdm' or 'results'. 'cdm' refers to modules that are designed to work against patient level data in the OMOP CDM format. 'results' refers to modules that are designed to work against a results database containing output from a 'cdm' module.

---

## retrieveConnectionDetails *Retrieve connection details from the secure location*

---

### Description

Retrieve connection details from the secure location

### Usage

```
retrieveConnectionDetails(connectionDetailsReference, keyringName = NULL)
```

### Arguments

| | |
|---|---|
| connectionDetailsReference | A string that can be used to retrieve the settings from the secure store. |
| keyringName | The name of the keyring to operate on. This function assumes you have created the keyring before calling this function. It defaults to NULL to select the default keyring. If the keyring is password protected, the password must be stored in the environment variable STRATEGUS_KEYRING_PASSWORD so it is retrieved using the command Sys.getenv("STRATEGUS_KEYRING_PASSWORD") |

### Value

Returns an object of type connectionDetails.

### See Also

storeConnectionDetails()

---

## runSchemaCreation *Create module(s) result data model*

---

### Description

This function will create the results data model for the modules in the analysisSpecifications. A module can implement its own results data model creation function by implementing the function createDataModelSchema in its Main.R. The default behavior is to use the ResultsModelManager to create the results data model based on the resultsDataModelSpecification.csv in the module's results folder.

### Usage

```
runSchemaCreation(
  analysisSpecifications,
  keyringSettings,
  moduleIndex,
  executionSettings,
  ...
)
```

### Arguments

| | |
|---|---|
| analysisSpecifications | An object of type AnalysisSpecifications as created by createEmptyAnalysisSpecificiations |
| keyringSettings | The keyringSettings from the executionSettings context |
| moduleIndex | The index of the module in the analysis specification |
| executionSettings | An object of type ExecutionSettings as created by createCdmExecutionSettings() or createResultsExecutionSettings(). |
| ... | For future expansion |

---

## storeConnectionDetails

*Store connection details in a secure location*

---

### Description

Store connection details in a secure location

### Usage

```
storeConnectionDetails(
  connectionDetails,
  connectionDetailsReference,
  keyringName = NULL
)
```

### Arguments

| | |
|---|---|
| connectionDetails | An object of type connectionDetails as created by the DatabaseConnector::createConnectionD function. |
| connectionDetailsReference | A string that can be used to retrieve the settings from the secure store. |
| keyringName | The name of the keyring to operate on. This function assumes you have created the keyring before calling this function. It defaults to NULL to select the default keyring. If the keyring is password protected, the password must be stored in the environment variable STRATEGUS_KEYRING_PASSWORD so it is retrieved using the command Sys.getenv("STRATEGUS_KEYRING_PASSWORD") |

## Value

Does not return anything. Is called for the side effect of having the connection details stored.

## See Also

`retrieveConnectionDetails()`

---

`syncLockFile` *Synchronize renv.lock files and overwrite the target file (read the description)*

---

## Description

Used to synchronize the values from the "source of truth" renv.lock file to the target renv.lock file. Packages are compared (by name) and if the version of the package in the "source of truth" is greater the one found in the target, the target renv.lock file will be updated. This function will automatically update the target file.

Version comparison is handled by the `semver` package and since most packages use semantic versioning. When a package does not use semantic versioning, a warning is provided so the user can review.

## Usage

```
syncLockFile(sourceOfTruthLockFileName, targetLockFileName)
```

## Arguments

`sourceOfTruthLockFileName`
: The renv.lock file to use as the source of truth

`targetLockFileName`
: The target renv.lock file that will be synced with the source of truth

## Value

A data.frame containing the different packages and their version that were involved in the synchronization process

---

`unlockKeyring` *Helper function to unlock a keyring*

---

## Description

This helper function is used to unlock a keyring by using the password stored in Sys.getenv("STRATEGUS_KEYRING_P
It will alert the user if the environment variable with the password is not set.

## Usage

```
unlockKeyring(keyringName)
```

### Arguments

| | |
|---|---|
| keyringName | The name of the keyring to operate on. This function assumes you have created the keyring before calling this function. It defaults to NULL to select the default keyring. If the keyring is password protected, the password must be stored in the environment variable STRATEGUS_KEYRING_PASSWORD so it is retrieved using the command Sys.getenv("STRATEGUS_KEYRING_PASSWORD") |

### Value

Returns TRUE if the keyring was unlocked using the password otherwise it returns FALSE

---

## validateLockFile *Validate an renv.lock file to ensure it is ready for use by Strategus*

---

### Description

Will check an renv.lock file for a module to verify that it only references tagged packages and includes the packages required by Strategus.

### Usage

```
validateLockFile(filename)
```

### Arguments

| | |
|---|---|
| filename | The renv.lock file to validate |

---

## verifyModuleInstallation *Verify a module is properly installed*

---

### Description

In some instances a module may fail to instantiate and install due to problems when calling renv::restore for the module's renv.lock file. This function will allow you to surface inconsistencies between the module renv.lock file and the module's renv project library. This function will check to that a module has been properly installed using internal functions of the `renv` package. If a module is verified to work via this function, the hash of the module's renv.lock file will be written to a text file in the module directory to indicate that it is ready for use. This will allow subsequent calls to work faster since the initial verification process can take some time.It is possible to re-run the verification of a module by using the `forceVerification` parameter.

To fix issues with a module, you will need to open the module's .Rproj in RStudio instance and debug the issues when calling renv::restore().

### Usage

```
verifyModuleInstallation(
  module,
  version,
  silent = FALSE,
  forceVerification = FALSE
)
```

### Arguments

| | |
|---|---|
| module | The name of the module to verify (i.e. "CohortGeneratorModule") |
| version | The version of the module to verify (i.e. "0.2.1") |
| silent | When TRUE output of this verification process is suppressed |
| forceVerification | When set to TRUE, the verification process is forced to re-evaluate if a module is properly installed. The default is FALSE since if a module is successfully validated, the module will contain the hash value of the module's renv.lock file in the file system so it can by-pass running this check every time. |

### Value

A list with the output of the consistency check

---

## withModuleRenv *Load module execution space inside and renv inspired by targets::tar_script but allowing custom variable execution*

---

### Description

Designed to allow more human readable code that is executed inside a module as well as simple variable substituion for injecting constants (e.g. simple parameters or file paths used inside and outside of modules)

### Usage

```
withModuleRenv(
  code,
  moduleFolder,
  injectVars = list(),
  tempScriptFile = tempfile(fileext = ".R"),
  job = FALSE,
  processName = paste(moduleFolder, "_renv_run")
)
```

### Arguments

| | |
|---|---|
| code | code block to execute |
| moduleFolder | Instantiated Strategus module folder |

| | |
|---|---|
| injectVars | list of var names list(name=value) to replace (e.g. replace list(foo = "some string") will find the pattern foo and replace it with the string some string - be careful! |
| tempScriptFile | tempFile to write script to |
| job | run as rstudio job |
| processName | String name for process |

## Details

This pattern also allows dependency injection which could be used if you don't want to use and renv and (instead) would like to use docker images or just execution in the base environment for testing/debugging

## Value

NULL invisibly

# Index