TIBCO® Enterprise Runtime for R Release Notes

Software Release 5.0.0
February 2019

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The TIBCO Product Documentation website is updated frequently and is more current than any other documentation included with the product. To access the latest documentation, visit https://docs.tibco.com.

System Requirements for Spotfire Products

For information about the system requirements for Spotfire products, visit http://spotfi.re/sr.

TIBCO Enterprise Runtime for R documentation

You can find the following documents for TIBCO Enterprise Runtime for R in the TIBCO Documentation Library.

- *TIBCO® Enterprise Runtime for R Technical Documentation*
- *Language Reference* (HTML)
- *Differences Between TIBCO® Enterprise Runtime for R and Open-Source R* (HTML)
- *Release Notes* (PDF)
- *License Agreement* (PDF)

You can also find links to CRAN package compatibility reports for this release on TIBCO Cloud™ Spotfire®.

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- For an overview of TIBCO Support, visit http://www.tibco.com/services/support.
- For accessing the Support Knowledge Base and getting personalized content about products you are interested in, visit the TIBCO Support portal at https://support.tibco.com.
- For creating a Support case, you must have a valid maintenance or support contract with TIBCO. You also need a user name and password to log in to https://support.tibco.com. If you do not have a user name, you can request one by clicking Register on the website.

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For quick access to the TIBCO® Enterprise Runtime for R content, see https://community.tibco.com/products/terr

TIBCO Enterprise Runtime for R Release Notes

The Release Notes for this product version are provided to inform you of new features, known issues, and issues from previous releases that have been closed.

These release notes are for TIBCO® Enterprise Runtime for R (TERR™) version 5.0. They cover Linux®, Apple macOS®, and Microsoft Windows® installations.

TERR™ is a high-performance statistical engine, which is compatible with open-source R. It can be embedded into a wide range of applications as an enterprise-grade alternative to open-source R, and can run a wide array of packages from CRAN.

This release of TERR focuses on changes for compatibility with open-source R version 3.5.2. See Changes in functionality, features, and compatibility on page 8 for important details.

Open-source R is available under separate open source software license terms and is not part of TERR. As such, open-source R is not within the scope of your license for TERR. Open-source R is not supported, maintained, or warranted in any way by TIBCO Software Inc. Download and use of open-source R is solely at your own discretion and subject to the free open source license terms applicable to open-source R.

New features

The following features have been added to version 5.0.0 of TERR.

Compatibility with open-source R version 3.5.2

TERR 5.0.0 has changed to accommodate the changes made to open-source R version 3.5.2. These changes include the following.

- TERR 5.0.0 has been changed to support the new R object header layout, introduced in R 3.5.0. It can load packages with C code built with open-source R 3.5.0 and later. Like open-source R 3.5.0, it cannot load packages with C code built with R 3.4.4 or older.
- Like open-source R 3.5.2, TERR 5.0.0 fully supports ALTREP objects. Matching open-source R 3.5.2, TERR defines a set of built-in ALTREP classes.

For more information about these changes, see Changes in functionality, features, and compatibility on page 8.

Remember that changes for compatibility with open-source R 3.5.2 mean that packages compiled to work with R 3.4.4 or older no longer work with TERR 5.0.0.

Support for building packages that include C/C++ source code

TERR has made many significant improvements to building packages with C/C++ code, with bug fixes, new functions, and Rapi supported functions. Additionally, we have provided on the TRAN site (https://tran.tibco.com/) a version of the Rinclude package for package building support.

New functions

The following functions have been added to packages that are provided in this installation of TERR.

Package	Name	Details
base	`.getNamespace`	This function, `.getNamespace("name")` returns the namespace environment named *"name"* if such a namespace is already loaded (otherwise it returns `NULL`). Unlike `getNamespace("name")`, it does not try to load the namespace.
base	`.mapply`	This function is a simplified version of `mapply`, which a few CRAN packages require.
base	`warningCondition` `errorCondition`	These functions supply a standard way to create specialized classes of warnings and errors.
base	`addTaskCallback`, `removeTaskCallback`, `getTaskCallbackNames`, and `taskCallbackManager`	These functions manage a list of functions that are called after each top-level expression.
base	`nullfile`	This function returns the platform-specific name of the "null file": `nul` on Windows and `/dev/null` on Unix-like operating systems.
base	`asplit`	This function splits an array into a list of its subarrays.
base	`.row(dim)`, `.col(dim)`	These new functions return the same things that the dot-less `row()` and `col()` functions do for `array(1,dim=dim)`.
base	`isFALSE`	Tests for a logical object of length of one with the value of `FALSE`. (Returns `TRUE` if `x` has a value of `FALSE`.)
methods	`languageEl`	This function is required by the CRAN package spatstat.
methods	`setLoadAction`, `evalqOnLoad`, and related functions.	These new functions are required by many packages dependent on the Rcpp package.
Sdatasets	`airquality`	This new dataset has all the measurements that the Sdatasets::air dataset was based on (including the missing values). In addition, it has Day and Month columns which the original data source included.
stats	`expand.model.frame`	This function evaluates a model frame with extra variables and the same `data`, `subset` and `na.action` arguments.
tools	`dependsOnPkgs`	This function finds reverse-dependency packages.

Package	Name	Details
tools	`package_dependencies`	This function replaces the deprecated function `tools::pkgDepends`.
utils	`warnErrList`	lme4 and nlme require this function. (Previously, it was defined in the lme4 package.)

New R C API functions

The following R C API functions are implemented to improve package loading and compatibility. Additionally, over 100 Rapi entries have been implemented to support altrep compatibility. For more information, see Changes in functionality, features, and compatibility on page 8. To see a complete listing of the Rapi C API functions implemented in TERR so far, run the following code.

```
library(terrUtils)
implementedRapiEntries()
```

R C API function	Description
`ENVFLAGS` and `SET_ENVFLAGS`	Supports the undocumented-in-R and unsanctioned environment unlocking usage that is used in the R6 and rlang packages.
`IS_LONG_VEC`	Required by the CRAN package RProtoBuf.
`R_ClosureExpr`	Required by newer versions of the dplyr package.
`R_EnvironmentIsLocked`	Returns the value of the environment's `IsLocked()` method.
`R_isForkedChild`, `Rf_KillAllDevices`, and `R_curErrorBuf`	Placeholder functions. Required to load the latest sys package.
`R_TrueValue`, `R_FalseValue`, `R_LogicalNAValue`	Required by the CRAN package pkgload.
`Rf_GetArrayDimnames`	Required by the CRAN package bsts.
`XTRUELENGTH` and `XLENGTH_EX`	Needed for R compatibility.

Changes in functionality, features, and compatibility

From release to release, we might change the functionality, deprecate, or remove features. In cases where product changes require migration procedures, we provide information for that purpose. The following changes have been made to TERR version 5.0.

Changes in functionality and compatibility

Version 5.0 of TERR has been changed to be compatible with open-source R version 3.5.2.

Between R version 3.4.4 and R version 3.5.0, R changed the memory layout of objects, requiring rebuilding packages with compiled C code. Thus, packages with compiled code built with R before R 3.5.0 cannot be loaded into R 3.5.0, and vice versa. Thus, you must rebuild all packages built with an R version previous to version 3.5.0 that you intend to use with this version of TERR.

TERR 4.5 was compatible with open-source R 3.4.4 and could load packages with compiled C code built with open-source R 3.4.4. It cannot load packages built with open-source R 3.5.0. TERR 5.0 has been changed to support the new open-source R object header layout, and can load packages with C code built with R 3.5.0 and later. Like open-source R 3.5.0, it cannot load packages with C code built with R 3.4.4 or older.

Trying to load packages with C code built with R 3.4.4 or older gives an error such as the following:

```
package 'packagename' was built by an R engine with different internals
```

Another major change introduced with open-source R 3.5.0 is support for "ALTREP" objects, which define custom code for representing and accessing integer, numeric, and string vectors. TERR 5.0 fully supports ALTREP objects. Matching open-source R, TERR defines a set of built-in ALTREP classes, including compact integer sequences and string vectors derived from integer or double vectors. TERR uses these built-in ALTREP classes in place of internal sequence objects provided by older versions of TERR. New ALTREP classes can also be defined in external packages, though this facility is not yet used in many packages.

ALTREP objects can be directly serialized and unserialized with R serialization version 3. Serializing an ALTREP object with R serialization format version 2 (currently the default) serializes the object as a normal integer, or numeric or string vector (which can be much larger).

To support packages creating and using ALTREP objects, we have implemented over 100 Rapi entries in TERR, including the following.

Rapi entry	Description
`R_make_altinteger_class`	Defines an ALTREP class.
`R_set_altrep_Length_method`	Sets the `length` method for an ALTREP class.
`R_new_altrep`	Creates an ALTREP object from an ALTREP class.
`R_altrep_data1` and `R_altrep_data2`	Directly accesses the fields of an ALTREP object.
`INTEGER_GET_REGION`	Reads multiple elements of an integer vector, possibly calling an ALTREP method.

The function `splusTimeSeries::as.char.rect` now correctly handles factor columns and character columns from a list input.

Other version updates

Version updates and version compatibility testing include the following.

- OpenSSL updated to version 1.1.1 (Included with TERR).
- Tested with JAVA version 11; however, any compatible version of Java can be used.
- open-source R version 3.5.2.
- KNIME 3.7.0 (with CRAN package Rserve 1.7.3-0, for Windows 64-bit only).

TERR version 5.0 was changed to be compatible with open-source R version 3.5.0 and later by supporting ALTREP objects. This change results in the following warning when you use the Rserver package with KNIME: `R Version 3.5.0 and Rserve <= 1.8-6 currently have issues preventing their full use in KNIME. A future release of R and/or Rserve may fix these issues.`

For more information, see *Configure KNIME to use TIBCO® Enterprise Runtime for R* in the TERR documentation.

- Spark/SparkR 2.4.0 . For more information, see *Configure SparkR to use TIBCO® Enterprise Runtime for R* in the TERR documentation.
- RStudio Desktop and Server version 1.1.463 . For more information, see *Configure RStudio to use TIBCO® Enterprise Runtime for R* in the TERR documentation.
- Apache Hadoop 3.1.1.

The following packages included with TERR require a bit-matching 32-bit or 64-bit version Java.

- parallel
- sjdbc
- terrJava

Additionally, if you want to use the rJava package, or any other CRAN package that requires access to `JAVA_HOME`, this information applies.

To use these packages, you must set the `JAVA_HOME` environment variable to a valid Java installation before you load the packages. You can set `JAVA_HOME` using TERR by calling the following in the console:

```
Sys.setenv(JAVA_HOME="path_to_your_JRE_installation")
```

To check if the environment variable is set, call the following in the console:

```
Sys.getenv("JAVA_HOME")
```

As of TERR version 4.1, for Windows and Mac installations, if the `JAVA_HOME` environment variable is not set, TERR uses system info to identify and load the latest Java installed on the system. TERR also alerts you to this detection and setting.

Update or reinstall a version of TERR

When you update to a more recent version of TERR, remove the previous version, and follow the guidelines to protect your installed packages.

Installing TERR over a previous TERR installation without removing it can cause unexpected failures. To remove TERR, follow the instructions for your operating system.

For a list of operating systems that TERR is supported on, see the TIBCO Enterprise Runtime for R system requirements.

When you update to a new version of TERR, follow the guidance in "Package installation locations and recommendations for updating" in the Package Management section of the *TIBCO® Enterprise Runtime for R Technical Documentation*.

On Linux

- From the command line, run the command `rm -rf <TERR_HOME>`, where *TERR_HOME* is the installation directory.

On Mac

- At the Terminal command prompt, run the following commands.

```
sudo rm -rf /Library/Frameworks/TERR.framework /usr/local/bin/TERR /usr/
local/bin/TERRscript /usr/local/bin/RStudio-TERR
```

If you are prompted to supply a password, provide the administrator password for the computer.

The following three specified items are removed.

- The TERR framework package.

- Scripts for running TERR.
- A script to launch RStudio running TERR.

On Windows

- From the Settings app, click **Apps**, and then from the **Apps & features** list, double-click run the listing **TIBCO Enterprise Runtime for R <*version#*>**.

After uninstalling TERR, run the installer for the version of TERR you want to install.

Package compatibility

As a standard part of each TERR release, we run all help examples provided in packages in the Comprehensive R Archive Network (CRAN) in the TERR engine from the Windows, Linux, and Mac platforms.

Package loading improvements

- To see a list of issues fixed to improve package loading and performance, see Closed Issues.
- To see a list of Rapi C API functions and TERR functions implemented in this release to improve package loading and performance, see New features.
- To see a complete listing of the Rapi C API functions implemented in TERR so far, run the following code.

```
library(terrUtils)
implementedRapiEntries()
```

Package compatibility analysis in Spotfire

We report the results of these CRAN tests in visualizations that are available on TIBCO Cloud™ Spotfire® at the following links, where you can browse and review the results for the packages you want to use and their CRAN Task Views. You can review the results run for every expression in every help file for every CRAN package for the following platforms.

- http://spotfi.re/CRANonTERR-Win-5-0-0
- http://spotfi.re/CRANonTERR-Linux-5-0-0
- http://spotfi.re/CRANonTERR-Mac-5-0-0

The tests run against code examples in the help provide some guidance for determining rates of success. The accuracy of information collected depends on the number and quality of examples in the package reference topics. These analyses are not meant to be the definitive determination of exact compatibility.

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Package compatibility summary in TERR

Alternatively, we provide a summary of our testing results on the TIBCO documentation site in the following CSV-formatted files.

- `CRANonTERR-Linux.csv`
- `CRANonTERR-Win.csv`
- `CRANonTERR-Mac.csv`

You can use the TERR console to quickly access a summary of the information, as follows. (Remove the comment markers for the CSV file name to match your platform, and substitute the package name you want to query.)

```
# tests compatibility with this version of TERR
#
#packageCompat <- read.csv("https://docs.tibco.com/pub/enterprise-runtime-for-R/
5.0.0/doc/csv/CRANonTERR-Linux.csv",
#   stringsAsFactors=FALSE)
#
#packageCompat <- read.csv("https://docs.tibco.com/pub/enterprise-runtime-for-R/
5.0.0/doc/csv/CRANonTERR-Win.csv",
#   stringsAsFactors=FALSE)
#
#packageCompat <- read.csv("https://docs.tibco.com/pub/enterprise-runtime-for-R/
5.0.0/doc/csv/CRANonTERR-Mac.csv",
#   stringsAsFactors=FALSE)
#
subset(packageCompat, Package.Name=="caret")
## (update)
```

The returned results resemble the following for the above example.

```
    Package.Name Version            Status Percent.Successful Total.Executed
770        caret  6.0-80 Mostly successful               94%            289
    Passed Failed Graphics Random.Numbers
770    273     16       17             13
```

This table shows how to read the results for this example. (Shows results for running the example on Windows. Results for Linux and Mac can vary slightly.)

Column name	Result
Package.Name	caret
Version	6.0-80
Status	Mostly successful
Percent.Successful	94%
Total.Executed	289
Passed	273
Failed	16
Graphics	17
Random.Numbers	13

Closed issues

This table lists closed issues in version 5.0.0 of TERR. It reflects fixes for issues with package compatibiliy, open-source R compatibility, and general issues with TERR.

Issue	Description
TERR-4234	`splusTimeSeries::as.char.rect` now correctly handles factor columns and character columns (from a list input).
TERR-6906	TERR now supports the new open-source R serialization format (v3) introduced in open-source R 3.5.2. Specifically, TERR supports serializing and unserializing data with `RFormat=TRUE, version=3`.
TERR-7042	On Windows, the executables `bin/R.exe`, `bin/Rscript.exe`, and `bin/r_arch/R.exe` now invoke `TERR.exe` using `cmd /c TERR ...` instead of invoking TERR directly. Thus, the `sh/cmd` output redirection operators `>` and `2>` work when called from `system()`. The inline package depends on this behavior.
TERR-7053	Installing the `data` directory of a source package could cause problems, especially if the data files required code from the package `R` directory. Now, you can install source packages with `data` directories with no problems.
TERR-7075	Implemented dummy versions of R internal functions (such as `parallel:::recvOneData`), allowing the raster package to be build from source in TERR.
TERR-7079	Due to a change in RStudio for Windows for versions later than 1.1.336, using TERR to print (for example, `print(1:1000)`) ran extremely slowly.
TERR-7084	An issue in the function `setMethod` has been fixed, so that now the CRAN package git2r (version 0.21.0) can be built from source in TERR.
TERR-7093	The Rapi entries `XTRUELENGTH` and `XLENGTH_EX` have been implemented. The Rapi entries `TRUELENGTH`, `Rf_length`, `SETLENGTH`, `SET_TRUELENGTH` have been modified to change argument and return types from `int` to `R_xlen_t`, matching a change open-source R made between open-source R version 3.4.4 and version 3.5.2.
TERR-7101	`install.packages()` now checks that a newly-built package can be loaded before installing it in the library. This check can be suppressed with `INSTALL_opts="--no-test-load"`.
TERR-7107	`install.packages()` previously could not build standalone executables in some packages because the location of `libR.so` was not correct on Linux. This problem has been fixed.
TERR-7112	`install.packages(type="source","pkg")` now processes the platform-specific R-code files in `pkg/R/unix/` or `pkg/R/windows/`.
TERR-7113	Previously, printing a vector sometimes printed a blank line after printing the vector, depending on `options("width")` and the nature of the vector. Now, it does not print a blank line.

Issue	Description
TERR-7118	Issues in S4 lead to errors when installing from source and then using the planor package, and installing the crmPack package.
TERR-7119	`setLoadActions` now has a help file.
TERR-7124	The Rapi entries `Rf_cons/CAR/CDR/etc` now correctly handle 'improper' pairlists not ending in NULL. This change avoids errors printing `quosure` objects in the rlang package.
TERR-7126	TERR can now parse `"aFunction('='(x,y))"`. Previously, it gave a parse error.
TERR-7143	The `setMethod` function caused an error if the method's generic function had an argument with a default value of `NULL`.
TERR-7155	In a package `NAMESPACE` file, the `except` entries in an `import` clause no longer require quotation marks (unless they are not a syntactic name, such as `levels<-`).
TERR-7157	The R API function `R_has_slot(object, name)` now returns `TRUE` when `R_do_slot(object, name)` does not give an error. Previously, it did not work properly when `name` named an attribute, breaking some code in the RcppArmadillo package.
TERR-7158	The row names on the `cmdscale` output now are NULL instead of `c("1","2",...)` when the input `dist` object has no labels.
TERR-7159	The assertionTest package now contains the functions `sourcePackageToList` and `listToSourcePackage`, which make test package installation easier.
TERR-7160	`setGeneric(<native generic>, signature=<sig>)` now succeeds if `<sig>` matches the native generic's signature, rather than giving an error. This allows TERR to build the BiocGenerics package from source with `install.packages`.
TERR-7161	`anyNA` now has the `recursive=FALSE` argument, to match R.
TERR-7164	`norm(x, type="E")` now returns `NA` when `x` contains `NA`s. Previously, it returned the norm of `x` after the columns containing `NA`s were removed.
TERR-7166	`parallel::stopCluster` is now defined as an S3 generic, calling `parallel:::stopCluster.default`. This change allows building the package BiocParallel from source (which references `parallel:::stopCluster.default`).
TERR-7167	The parser now parses more than 1000 nested if-else statements, rather than giving an error with more than 64 nested if-else statements.
TERR-7168	When running TERR in a Windows command window, typing Control-C interrupts the current execution and returns to the TERR top-level prompt. Previously, this would terminate the TERR process and leave a child TERR console process running in the background.

Issue	Description
TERR-7169	`install.packages(type="source","pkg")` now attaches all packages listed in the "Depends" list of "pkg" and loads the namespaces of all packages listed in the "Imports" list of "pkg" before running the R code in `pkg/R`. It does this in a subprocess so the current TERR process is not affected by the loading of the packages required by "pkg".
TERR-7171	Packages with C, C++, or Fortran code whose `DESCRIPTION` file contains a `LinkingTo` line with no content can now be installed from source. Previously, the linker gave an error recommending the code be recompiled with the `-fPIC` option.
TERR-7172	Source packages using the `CXX1X<blah>` macros now can be installed. Previously the `CXX1X<blah>` macros were undefined; now they are equivalent to the `CXX11<blah>` macros.
TERR-7173	`install.packages` evaluates code in `R/*.R` files while in top level package directory, not in the `R` directory, so relative paths used in `R/*.R` files work.
TERR-7180	Previously, `setRefClass("className", fields=c(A="classA", B="classB"))` set the field names to `"classA"` and `"classB"`, with classes `"ANY"`--the same as it does for `c("classA","classB")`. Now, if a character-valued `'fields'` argument has names, they are used as the field names.
TERR-7182	`install.packages(type="source")` would fail on Windows if the package had a `configure.win` script starting with `"#! /usr/bin/env sh"`. That shebang line is now ignored so such packages can be installed from source.
TERR-7184	`setClass` now allows its `contains` argument to be a list of strings and/or `classRepresentation` objects. This change fixes problems building the packages crmPack and copula from source.
TERR-7185	The `method` argument has been added to the `order()` function, but it is ignored.
TERR-7186	`setClassUnion` now allows its `members` argument to be a list of single strings. This change fixes a problem building the dcmodify package from source.
TERR-7187	`install.packages("aPackage")` no longer gives an error if a package's R code calls `findPackage("aPackage")` or `getNamespace("aPackage")`.
TERR-7189	`setMethod` now handles a method function with no arguments correctly, rather than giving an error.
TERR-7197	`.Internal(Sys.time())` now works as it does in open-source R. (This is deprecated in open-source R and is supported now only so certain packages can work until they are updated. Do not use this idiom.)
TERR-7203	`RinR::REvaluate` and related functions contain a new argument, `showTextOutput=FALSE`. If it is `TRUE`, then printed output from the subprocess that `REvaluate` invokes is printed as it is produced. Otherwise, it is discarded (which is the prior behavior).

Issue	Description
TERR-7205	`'TERR CMD config CPPFLAGS'` and `'TERR CMD config CXXCPP'` now return the appropriate C-preprocessor flags and C-preprocessor command, respectively. Previously they returned blanks.
TERR-7209	Source packages containing files named `src/all.c`, `src/all.f`, or `src/all.cpp` can now be installed.
TERR-7214	In the modeling functions, like `lm()` and `model.frame()`, `na.action=NULL` now means the same as `na.action=na.pass`, not the previous `na.action=na.fail`.
TERR-7221	• `RinR::REvaluate()` now works if the child process redefines objects or functions in the base package, such as `'version'`, `'load'`, or `'list'`. • `package_version(numeric_version(x))` now gives the same result as `package_version(x)`. Previously, it would give an invalid `R_system_version` object.
TERR-7225	When the TERR engine runs on Windows, sometimes the engine can print out a warning `"OMP: Warning #215: Cannot determine machine load balance - Using KMP_DYNAMIC_MODE=thread limit"`. When TERR on Windows starts, it now prevents this warning message by setting the environment variable `KMP_WARNINGS` to `'false'`, if it is not already set. These warnings can be shown by setting the environment variable `KMP_WARNINGS` to `'true'` before starting TERR.
TERR-7228	`read.dcf` now strips the initial `"\n"` from the `DESCRIPTION` file entries of the form `"Tag:\n` value of tag, giving "value of tag" instead of "\nvalue of tag". This had prevented the installation of some packages with this syntax in the Depends or Imports parts of their `DESCRIPTION` files.
TERR-7232	`stopifnot` now supports the `exprs` and `local` arguments that open-source R 3.5.2 added to it.
TERR-7233	`on.exit` now supports the `after=FALSE` argument. If used, this argument must be the third argument (it makes sense only when `add=TRUE` is also used).
TERR-7236	`model.frame` and replications now convert character columns to factors without issuing a warning.
TERR-7241	Previously, TERR could not read xz- or bz-compressed files containing garbage bytes after the logical end of file. Now such garbage bytes are ignored.
TERR-7258	`sys.parents` and `sys.parent` called under `eval()` now return results matching open-source R. This change fixes a problem with the rlang package when printing an `rlang_trace` object.
TERR-7261	Previously, `fisher.test(tbl)` caused the TERR session to close unexpectedly if `tbl` contained data with `storage.mode "integer"`. Integer data no longer cause this problem.
TERR-7265	Trying to print the value of `coin::kuskal_test` would result in an error.

Issue	Description
TERR-7266	The `new` function no longer coerces input slot values to the declared slot classes if they are subclasses of the slot classes.
TERR-7269	SHLIB now uses the `MAKEVARS` files specified by the environment variables `R_MAKEVARS_SITE` and `R_MAKEVARS_USER`, as open-source R does.
TERR-7270	The assertionTest package has a new function, `atWithEnvVars()`, that makes it easier to test expressions that depend on certain settings of environment variables.
TERR-7274	Previously, if the global environment contained an object with the same name as an object in package:base, then `save.image` would save the object in package:base. Now, it saves the object in the global environment.
TERR-7276	Previously, `all.equal()` gave an error when comparing a single number with a function. Now it gives a description of the difference.
TERR-7277	Multiline \alias, \concept, and \keyword entries (with unneeded newlines) no longer cause warnings in `rbind()` during source package installation.
TERR-7278	When `setMethod("ordinaryFunction", ...)` converts an ordinary function to a generic function, it no longer displays a warning.
TERR-7279	When `setMethod()` is given a signature with undefined classes, it emits a message about the issue, instead of the previous warning.
TERR-7282	Previously, a TERR data function that returned a vector of zero raw vectors to Spotfire would give an error from `.cleanDataForExport`. Now, it returns an empty list, which is converted to a zero-long Binary column in Spotfire.
TERR-7284	Code signing for SPKs now works on Windows 7.
TERR-7285	TERR now supports the delayed registration of S3 methods that was introduced in open-source R 3.5.2. A NAMESPACE file entry in any package of the form *`S3method(genericPackage::genericName, className)`* causes the function *`genericName.className`* to be registered as method of *`genericPackage::genericName`* when *`genericPackage`* is loaded.
TERR-7286	`qr.qty(qr(X), Y)` and `qr.qt(qr(X), Y)` now return `Y` when `X` is a zero-column matrix. Previously, it gave the error `'Invalid parameter 12 in a call to DORMQR'`. This change allows the `gam` function in recent versions of the mgcv package to work.
TERR-7287, TERR-7290	On Windows, DLLs requiring the LAPACK Cholesky decomposition function `dpstrf` can now be loaded. This allows for loading of packages such as mgcv 1.8-26.
TERR-7291	The functions `readBin` and `writeBin` now work in restricted mode if the connection argument is an existing connection, such as the output of `rawConnection`.

Issue	Description
TERR-7296	`slice.array(x,MARGIN)` now accepts a vector of indices into `dim(x)`, not just one index, for the `MARGIN` argument.
TERR-7298	The `trimws` function has a new argument, `whitespace`. You can use it to specify which characters are considered to be whitespace.
TERR-7299	`dQuote()` and `sQuote()` have a new argument, `q=getOption("useFancyQuotes")`, which you can use to override the global option for the quoting style.
TERR-7301	The `formals()` function has a new argument, `envir=parent.frame()`, used for lookup when the `fun` argument is a character string naming a function.
TERR-7302	The return value for `diag(vector)` now has the storage mode of the input vector (previously, it was at least numeric). `diag(matrix)` now has a `names` argument, which can be used to suppress adding names to the return value.
TERR-7303	The `order` function's `decreasing` argument can now be a vector with one element per vector argument to order, indicating where each vector should be in increasing or decreasing order.
TERR-7307	TERR now includes the `nullfile` function. It returns the platform-specific name of the "null file": `nul` on Windows and `/dev/null` on Unix-like operating systems.
TERR-7308	All of the Lapack routines available to open-source R version 3.5.1 can now be used in packages loaded by TERR.
TERR-7311	Packages with C code referencing the Linpack subroutine `dqrls_` can now be loaded on Windows.
TERR-7316	`setMethod` now works when passed an unexported generic function from another package. This change allows building the package IRanges from source.
TERR-7319	`unzip(exdir="p1/p2/p3", zipfile)` now makes the entire directory path, *"p1/p2/p3"*, if possible, before extracting files from *zipfile*. Previously, it would make only the first component, *"p1"*, of the path and then report an error.
TERR-7327	Previously, issues with `setClass` and `setOldClass` prevented installing the Biobase and lme4 packages from source. These issues have been resolved.
TERR-7328	`TERR config --cppflags` now works when the rinclude package is installed and open-source R is not installed. Previously, this option would fail when open-source R was not installed and `package:rinclude` was installed but not loaded.
TERR-7333	`setClass` gave an error `"inconsistent inherited classes"` when building the GenomicRanges package from source.

Issue	Description
TERR-7335	When run under a call to `Call`, `sys.calls()` and `sys.function()` no longer return `NULL` for any frames. This change fixes some problems with the rlang package.
TERR-7339	On macOS, `install.packages(INSTALL_opts="--build",...)` now makes a tar archive of the built package with the correct file extension `.tgz`, instead of the previous `.tar.gz`.
TERR-7342	`nchar(list(1,c(2,3,5)) (similarly, nzchar)` no longer generates an error `cannot coerce non-scalar...`. This change fixes some problems using the data.table package (version 1.20.0).
TERR-7348	`requireNamespace(quietly=TRUE,...)` now prints nothing. Previously, it printed `"Loading required namespace: <packageName>"` but did not print the error message if the package could not be loaded. Using `quietly=TRUE` prints both messages.

Known issues

This section lists known issues in version 5.0.0 of TERR.

In this release, some open-source R functionality is not available, including graphics devices, and some functions from the base and stats packages. Likewise, S4 is not entirely compatible. The following table lists additional known issues.

Issue	Description
TERR-4993	On Linux, you cannot save TERR Command History to a file.
TERR-5488	If you receive the message `"SSL certificate problem: unable to get local issuer certificate"` when accessing SSL protected URLs (for example, `https://`), make sure that your system has the latest version of the certificate authority database for your system. On RedHat 5, this should be `` `yum update openssl` ``. On RedHat 6, this should be `` `yum update ca-certificates` ``.
TERR-5876	When you call `terrUtils::implementedRapiEntries`, the returned list does not include embedding R APIs. To work around this issue, look at the exported symbols in `R.dll` (using the "depends" app on Windows) or `R.so` (using the `"nm"` command on Linux).
TERR-6422	Setting breakpoints in RStudio 0.99.903 with TERR on Windows can cause it to crash. When a script is sourced, and if it has breakpoints set, RStudio for Windows can crash. This crash does not occur when breakpoints are set inside a function and the function is called.
TERR-6576	If you try to use an RStudio feature that requires the rmarkdown package or the shiny package, and the required package is not already installed, then this process currently fails if RStudio is configured with the TERR engine. To work around this problem, at the command prompt, call `install.packages()` to install the rmarkdown and shiny packages.

Issue	Description
TERR-7077	Certain packages, such as rJava, cannot be installed with TERR from source under Centos. If you encounter a package that does not install with TERR from source, then you can build the package using open-source R, and then install the binary package in TERR.
TERR-6812	Due to changes in open-source R version 3.5 and resulting compatibility changes in TERR 5.0, packages that are built with a version of TERR prior to 5.0 must be rebuilt. • To install a binary package from a repository, always call `install.packages(`*`pkgname`*`)` from TERR. The `install.packages` function finds the correct binary version in the repository for your version of TERR. Manually downloading the binary package from CRAN can result in errors when you use it with TERR. • To install a package from source, try installing it first with TERR (with `install.packages` in TERR or with `TERR CMD INSTALL` from a command line). • To install a package from source that you cannot build with TERR, install the package with the version of open-source R tested with TERR.
TERR-7358	We have encountered problems using TERR 5.0 and RStudio when sourcing and debugging R scripts, including displaying unexpected error messages.

Custom package builds

The binary package builds provided on the TERR Archive Network (TRAN) repository and described in the *TIBCO® Enterprise Runtime for R Technical Documentation* were built and tested with specific supported platform versions. For some Linux binary packages, different versions of required shared libraries may prevent the package from properly loading and executing. If you download one of our Linux binary packages from TRAN, and you encounter problems, contact TIBCO Spotfire support for guidance.

```
## Example:
##  Wrong version of the system Postgres libpq.so shared library:

> library(RPostgreSQL)
## Loading required package: DBI
## Warning message:
## In library.dynam(chname = chname, package = package, lib.loc... :
## Problem loading foreign binary .../library/RPostgreSQL/libs/RPostgreSQL.so:
libpq.so.4:
## cannot open shared object file: No such file or directory
## Error in .loadNamespaceImpl(package, path, keep.source, partial) :
## error executing useDynLib for dynamic library 'RPostgreSQL' from package
'RPostgreSQL'
## loaded from .../library : Error in library.dynam(chname = chname, package =
package, lib.loc = ... :
## Foreign binary RPostgreSQL could not be loaded
```

Package search order

When you install a package using TERR, by default, TERR first checks for the package on TRAN, and then checks on CRAN. TERR installs the first version it finds. This is different than open-source R, which installs packages according to the newest version number available on CRAN. This difference is by design, because occasionally a CRAN package update causes a break with TERR compatibility, so we make available a tested version of the package on TRAN.

If you need to install one of these packages using open-source R (for example, to get source code on Linux), you can install the CRAN package, and then set `options()$repos` to install from only TRAN before reinstalling the package.

See "Specifying an older package on TRAN" in the *TIBCO® Enterprise Runtime for R Technical Documentation* for more information.

When running on RedHat Linux, TIBCO Enterprise Runtime for R processes spawned by the parallel package may immediately crash

We have seen a problem when running TERR on RedHat Linux with versions of Java earlier than 1.7.0_40. If you call the `makeCluster` function in the parallel package to spawn new TERR processes, these processes may immediately crash with a fatal Java error. To test if this problem is occurring, try the following:

```
library(parallel)
c1 <- makeCluster(1, outfile="")
# create cluster with one spawned process
# specifying outfile="" to print all output
c1 <- makeCluster(1, outfile="")
clusterEvalQ(c1, 123)
```

If this problem is occurring, you see an error such as the following:

```
> library(parallel)
> # create cluster with one spawned process
> # specifying outfile="" to print all output from the process
> c1 <- makeCluster(1, outfile="")
Creating 1 TERR cluster nodes at Mon Jan 14 15:16:11 2019
> clusterEvalQ(c1, 123)
1: #
1: # A fatal error has been detected by the Java Runtime Environment:
1: #
1: # SIGSEGV (0xb) at pc=0x0000003ac2cbbfa5, pid=12649, tid=1075054912
1: #1: # JRE version: 7.0_13-b20
1: # Java VM: Java HotSpot(TM) 64-Bit Server VM (23.7-b01 mixed mode linux-amd64
compressed oops)
1: # Problematic frame:
1: # C [libstdc++.so.6+0xbbfa5) __cxa_allocate_exception+0x55
1: #
1: # Failed to write core dump. Core dumps have been disabled. To enable core
dumping, try "ulimit -c unlimited" before starting Java again
1: #
1: # An error report file with more information is saved as:
1: # /a/seafiler01.na.tibco.com/vol/vol2/users/jdoe/hs_err_pid12649.log
1: #
1: # If you would like to submit a bug report, please visit:
1: # http://bugreport.sun.com/bugreport/crash.jsp
1: #
Error in waitForClusterReady(cl) : some cluster nodes have crashed or stopped: all
crashed
```

The workaround for this problem is to set the `LD_PRELOAD` environment variable to `libstdc++.so.6`. This can be done before TERR is started, or within TERR, before the parallel library has been loaded:

```
> Sys.setenv("LD_PRELOAD"="libstdc++.so.6")
> library(parallel)
Loading required package: terrJava
> c1 <- makeCluster(1, outfile="")
Creating 1 TERR cluster nodes at Mon Jan 14 15:16:11 2019
> # create cluster with one spawned process
> # specifying outfile="" to print all output
> c1 <- makeCluster(1, outfile="")
Creating 1 TERR cluster nodes at Mon Jan 14 15:16:11 2019
> clusterEvalQ(c1, 123)
1: TIBCO Software Inc. Confidential Information
1: Copyright (C) 2011-2019 TIBCO Software Inc. ALL RIGHTS RESERVED
1: TIBCO Enterprise Runtime for R version 5.0.0 for Linux 64-bit
1:
1: Type 'help()' for help.
```

```
1: Type 'q()' to quit.
1: started engine node pid==12828 at Mon Jan 14 15:16:11 2019
[[1]]
[1] 123
>
```