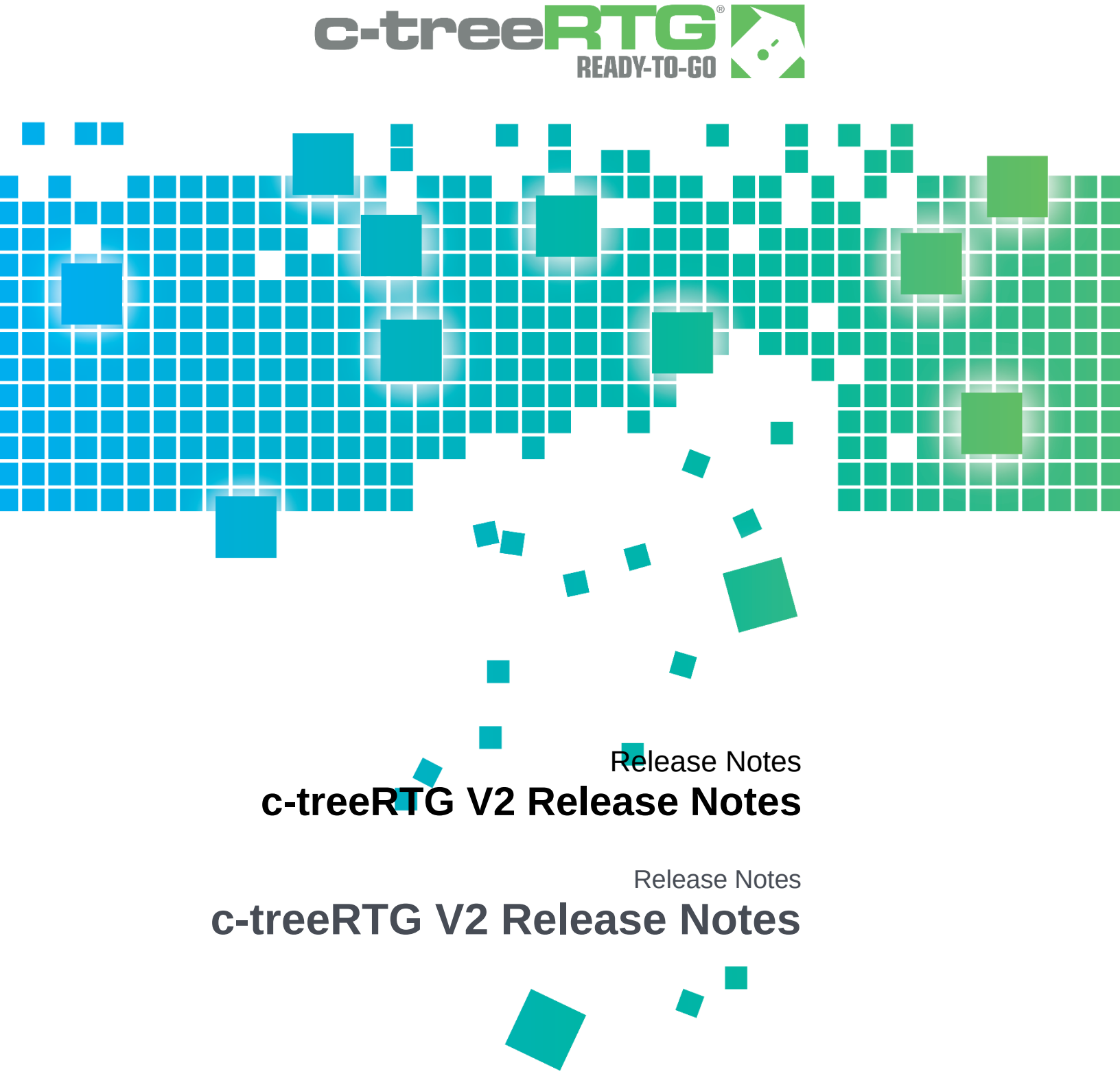

Release Notes

c-treeRTG V2 Release Notes

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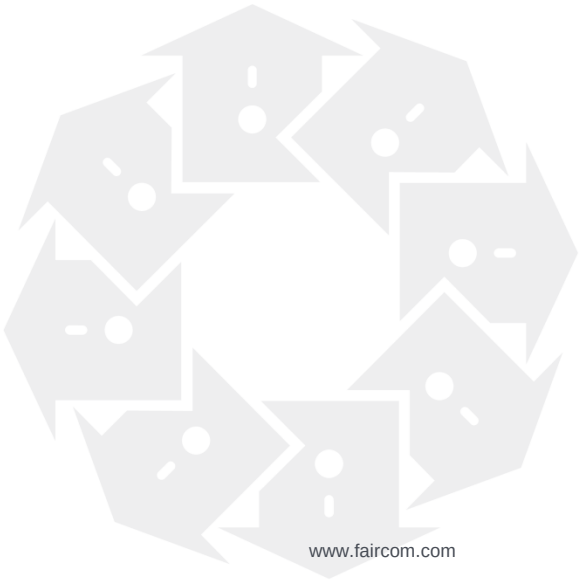
1. c-treeRTG Release Notes

FairCom continuously reviews its c-treeRTG products to identify areas that require attention and swiftly responds with enhancements and changes where necessary. This document lists important changes that have been made to c-treeRTG V2.

Be sure to review the issues listed in this guide to ensure that your application continues to work its best with c-treeRTG.



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2. c-treeRTG V2 Critical Fixes

FairCom has implemented many enhancements and changes in the latest version of c-treeRTG to make this the best release of c-treeRTG ever.

This section lists important changes you will experience when you upgrade to c-treeRTG V2.

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2.1 <batchaddition> issues on files OPEN WITH ROLLBACK

Data loss was reported when using `<batchaddition>` on files OPEN WITH ROLLBACK. In particular, when explicit transactions were not used, the last records may have been lost (the number of records lost depended on the `batchaddition` "records" value).

Internal testing showed other vulnerabilities on files OPEN WITH ROLLBACK when using explicit transactions: the record rolled back may not be removed and the record committed may be removed.

This behavior on files OPEN WITH ROLLBACK has now been fixed by adjusting the logic to properly operate when no transaction has been started at the application level and not permitting addition when transactions are started by the application.

Note: Adding records using `<batchaddition>` on a file OPEN WITH ROLLBACK within transactions started by the application is not supported.

If a file is OPEN WITH ROLLBACK and it is configured for `<batchaddition>`, any WRITE operation that adds a record within an active transaction will fail. To add records to a file with OPEN WITH ROLLBACK and `<batchaddition>` enabled, perform WRITE operations *without* starting a transaction.

Because it is not possible to control the transaction start in ExtFH, adding records using `<batchaddition>` on a file OPEN WITH ROLLBACK is not supported in ExtFH.

2.2 Crash due to NULL pointer

A situation was identified in which the c-treeRTG API was called by the COBOL runtime unexpectedly passing a NULL pointer. The c-treeRTG logic was not properly handling this unexpected situation. The c-treeRTG logic has been modified to correct this and return an invalid parameter error.

2.3 Crash when number of threads was greater than MAX_THREADS

A crash was experienced when the number of active threads was greater than `MAX_THREADS` (typically 128). The logic has been modified to correct this.

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2.4 Invalid configuration caused crash

A memory violation occurred when the c-treeRTG configuration file, *ctree.conf*, included an invalid file section such as:

```
<file>*</file>
```

The logic has been corrected to eliminate this problem.

2.5 URL file was created on ctree.conf default instance server instead of URL Server

When c-treeRTG used a URL to access a file on localhost, it failed if the default *ctree.conf* instance server was set to a remote host. The logic has been modified to correct this.

2.6 Wrong ctree.conf <file> ordering

In certain situations, the ordering of the `<file>` rules was not correct. This ordering is fundamental in determining which one should be matched in the case of conflicting rules. File matching rules were not respected when file tags had the same wildcard usage. The logic has been modified to correct this.

2.7 SQL table open error 4120 (or -21120)

Attempting to sqlize (or open in SQL) tables that had indices on fields mapped to Boolean, date, time, timestamp, or that used UTF string encoding in SQL failed with error **4120** or **-21120**. The logic has been modified to correct this.

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3. Notable Compatibility Changes

This section lists important known compatibility changes from prior releases.

It is important to review these issues and ensure that your application continues to correctly function after upgrading to this latest release, V2.

3.1 Correct error is now returned for orphan files

c-treeRTG returned a different error number than the ACUCOBOL and Micro Focus file systems when you attempted to access an orphan file (missing index or data file).

Using c-treeRTG with Micro Focus:

- attempting to access an orphan file (either data or index file missing) with an OPEN INPUT returned error 35 instead of 9/43
- an OPEN I-O (optional) returned 05 instead of 9/43
- a DELETE FILE returned 9/29 instead of 9/13

Using c-treeRTG with ACUCOBOL:

- attempting to access an orphan data file (missing index file) with an OPEN INPUT or OPEN I-O returned 35 instead of 98

The logic has been modified so the ExtFH, ACUCOBOL, and Veryant interfaces return the appropriate COBOL error when a missing index is detected.

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3.2 ctutil returns syntax error if configuration file does not exist

The **ctutil** utility allows a configuration file to be specified with option *-c*. If the specified file does not exist, an error message is returned. The logic that opens the configuration file has been modified to return a more specific error message if the configuration file does not exist. The old message was:

```
Configuration syntax error. syntax error near - line 1, column 1
```

The new message is:

```
Configuration file does not exist
```

3.3 Delete existing non-ctree files upon file creation and deletion

The c-treeRTG OPEN OUTPUT behaved differently than ACUCOBOL / Micro Focus COBOL native file systems if the existing file format was unknown. The OPEN OUTPUT operation failed with an error if the existing file was non-ctree. The logic has been modified to be compliant with these native file systems: if the existing file is non-ctree, it will be overwritten and OPEN OUTPUT will return success.

Note: This is a Behavior Change in c-treeRTG driver to make it compliant to the OPEN OUTPUT standard behavior.

3.4 Internal error 8983

c-treeACE Server terminated with internal error **8983** in certain situations when a COBOL application using Immediate Independent Commit Transactions (IICT) was updating key values, causing index nodes to be split. The logic has been updated to correct this.

3.5 Improved updates during scans on duplicate index now only updates record once

Unexpected behavior was observed when c-treeRTG scanned a file with an index that allowed duplicates: If a record was changed without updating the key used for scanning, it was possible to encounter the record again during the scanning phase. This caused the same records to be updated multiple times. The logic has been modified to correct this behavior.

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3.6 sqlize operation failed to find XDD file if <sqlize xdd> value was a directory

A **sqlize** operation failed to find the XDD file if a directory was specified in the attribute `<sqlize xdd="directory">`.

The **sqlize** logic has been changed so that, if `<sqlize xdd>` attribute is specified, it looks for a file with *.xdd* file extension. Therefore, `<sqlize xdd>` is no longer a synonym of `<sqlize xfd>`. If both attributes are specified, the logic first looks for an XDD file and if the file is not found, sqlize falls back to looking for an XFD file.

Note: This modification is a Behavior Change because `<sqlize xdd>` is no longer a synonym of `<sqlize xfd>`.

3.7 Unexpected 4113 error (CTDBRET_CALLBACK_5)

Error 4113 (**CTDBRET_CALLBACK_5**) was observed during a c-treeRTG **ctutil** *-sqlize* operation with a XDD having more than 2500 fields. The logic has been changed to correct this.

Note: The error code returned when a blob fields does not specify the field containing its size has been changed from **CTDBRET_CALLBACK_5** to **CTDBRET_CALLBACK_11**. This represents a modification in behavior.

3.8 Unexpected 9D, 160 error during READ NEXT/PREV and REWRITE/DELETE operations

The following sequence of operations causes an error **9D, 160** (in IsCobol):

```
START - DELETE - READ NEXT
```

The START operation finds the record position of a given key but when the READ NEXT attempts to read the record, an error is returned because the record was deleted in the meantime.

Internally (in the driver), the error is expected in this situation but the COBOL user does not expect to see any error. There are other scenarios when the c-tree error 160 (**ITIM_ERR**) could legitimately occur but are not symptoms of an index problem or of multi-user interference caused by the application and, therefore, should be handled by the driver. The driver has been enhanced to handle and solve the error situation.

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4. Internal Changes

c-treeRTG V2 includes substantial improvements that are fundamental to operation. This section lists internal c-treeRTG changes.

4.1 CLOSE operation failed after OPEN with BULK-ADDITION

In c-treeRTG, the CLOSE operation failed after using OPEN OUTPUT BULK-ADDITION. The logic has been modified to correct this.

4.2 "CTDB-Invalid date month" error: Conversions from/to BinaryUnSigned and NativeUnSigned

Testing revealed a situation in which a "CTDB-Invalid date month" error was seen when selecting in SQL a record immediately after it had been inserted if the record had datetime columns mapped into 4-byte BinaryUnsigned. The logic has been modified to correct this.

4.3 Memory leak opening files

Server memory usage was observed to be growing when running c-treeRTG applications. The logic has been modified to correct this problem.

4.4 Error 9D:160 during READ NEXT/PREV

An unexpected error **9D:160** occurred if a DELETE operation removed the record being returned by a READ NEXT following a START operation. The logic has been modified to correct this error.

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4.5 Error 39 logged when opening existing files using latest version

Due to a recent enhancement, c-treeRTG incorrectly logged internal error **39** when opening existing files. The error was caused by an unexpected structure misalignment forced by certain compilers. The logic has been modified to correct this.

4.6 Error 96, "Undefined record position," if <filepool> was enabled

Error 96 was returned from ACUCOBOL and error message "Undefined record position" was logged when `<filepool>` was enabled and a READ NEXT operation was performed on a file that was closed and re-opened after a "record not found" error. The logic has been modified to correct this.

4.7 Error 4125 during sqlize

Error **4125** was experienced during a sqlize operation on a compressed table having a duplicate index on a key on multiple fields. A temporary workaround of removing compression provides a safe workaround for this problem. The logic has been modified to correct this problem, so compression does not cause the issue with this release going forward.

4.8 Unexpected debug log messages "closing file in thread:0 but opened in thread:12345678"

An entry such as "closing file in thread:0 but opened in thread:12345678" was logged every time a file was closed by ACUCOBOL. The logic has been modified to correct this problem.

4.9 Unicode SQL Server error messages for callbacks errors

Error messages displaying a non-ASCII character set were generated for c-treeRTG SQL callback conversion errors when using a Unicode build of c-treeRTG SQL Server on Linux. Internal string handling has been modified to ensure text is correctly defined for proper interpretation on any build or platform.

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4.10 File name missing from log message

When there was a mismatch between the transaction settings in *ctree.conf* and a file being opened, c-treeRTG logged the message that did not include the name of the file involved:

```
transaction configuration mismatch: <transaction logging="...">
```

The message has been modified to include the filename.

4.11 Rewrite unexpectedly failed with duplicate error

On a table with record compression active (or with variable-length size set by the application) and indexes allowing duplicates, the first attempt to rewrite a record succeeded. From that point on, any other attempt to rewrite any record failed with a duplicate key error.

The logic has been modified to correct this problem.

4.12 Unexpected active transaction

A COMMIT or a ROLLBACK call can legitimately be issued when no active transaction is running. However, this caused c-treeRTG driver's internal count of running transactions to be in a wrong state. If c-treeRTG needed to start a new server connection while the transaction count was in the wrong state, this could result in the unintentional start of a transaction on subsequent calls.

4.13 Index with Add Unique Keys First feature may have a record offset of 1 after automatic recovery

After automatic recovery, an index file that used the Add Unique Keys First feature (which includes all c-treeRTG indices) may have a record offset of 1 instead of the actual record offset. This caused an error when trying to read the record. The logic has been corrected to eliminate this problem.

4.14 Avoid collisions between make and copy with files open by the filepool

A call to create a new file overwriting an existing one failed with c-treeACE error 12 (**FNOP_ERR**) and sysiocod -8, indicating a collision, if the existing file had been open in the recent past and *ctree.conf* enabled file pooling on the file. Similar problems could occur during copy affecting both the source and the target files. The logic has been modified to eliminate this problem.

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4.15 File pool issue caused File Open to fail

A file open unexpectedly failed with COBOL error **93** (due to c-tree error **FNOP_ERR** with sysiocod -8) when there was only one runtime running. The logic has been modified to correct this.

4.16 File pool without size generated a pool with 65418 entries

When using `<filepool>yes</filepool>`, the file pool was created with capacity for 65418 entries instead of 10, which is the default value. The logic has been corrected to eliminate this behavior.

4.17 Filepool issues with mapping

In c-treeRTG, file deletion unexpectedly failed with COBOL error **93** (due to c-tree error **FNOP_ERR** with sysiocod -8). The logic has been updated to ensure that these errors do not occur.

4.18 Error looping through records to update/delete them when <filepool> was active

If (and only if) the `<filepool>` configuration option was in use, in some cases, a very simple loop (that scanned the table forward using READ NEXT on the primary key to delete records) failed because the second NEXT call (i.e. the NEXT call immediately after the DELETE) returned the wrong record. The logic has been corrected to eliminate this problem.

4.19 PUTFIL() sometimes failed with error DOTX_ERR (955)

After a recent change, **PUTFIL()** sometimes failed with error **DOTX_ERR** (955). The logic has been modified to prevent this from occurring.

4.20 c-treeRTG error descriptions updated

The descriptions of callback errors have been updated for clarity. Missing error descriptions have been added.

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4.21 c-treeRTG Fixes

Several modifications have been made to the c-treeRTG products to address minor issues:

- Added *CTEXFTH.LIB* to product package so that COBOL programs using old Micro Focus compilers will have the necessary stub library for the *CTEXTFH.DLL* in *Driver\ctree.cobol\extfh*
- The paths in **run.bat** for *sql.stored.procs/tutorials* have been changed from:

```
set ISQL=..\..\..\bin\sql.interactive\isql.exe
```

  to

```
set ISQL=..\..\..\Tools\cmdline\isql.exe
```

- The path to **isql.exe** in **run.bat** (in *FairCom\V10.3.0.RTG\win32\Driver\sql.stored.procs\tutorials*) has been changed from:

```
set ISQL=..\..\..\bin\sql.interactive\isql.exe
```

  to

```
set ISQL=..\..\..\Tools\cmdline\isql.exe
```

- The CLASSPATH to the *ctreeSQLSP.jar* file in *ctsrvr.cfg* has been changed from:

```
SETENV CLASSPATH=../Java/jdk1.6.0_33/rt.jar:../bin/ace/sql/classes/ctreeSQLSP.jar
```

  to

```
SETENV CLASSPATH=../Java/jdk1.6.0_33/rt.jar:../server/sql/classes/ctreeSQLSP.jar
```

Unix Unicode ICU libraries moved to correct locations

The c-treeRTG ICU Unicode libraries were not placed in the correct driver location for Unix/Linux packages (Windows packages were already correct).

These libraries are now present in all required directories:

- server/sql/
- driver/ctree.cobol/acucobol
- driver/ctree.cobol/extfh
- driver/ctree.cobol/cobol
- driver/ctree.cobol/acucobol

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4.22 ExtFH

ExtFH driver forced the numeric convention to 'M'

After running the c-treeRTG **ctutil** *-sqlize* command and setting the numeric convention to ACU, the ExtFH driver refuses to open the file. The driver has been modified to eliminate this problem.

Error 39 when ExtFH interface failed to open a file

Error **39** was seen when opening an existing file when the record key on disk and the record key definition in the SELECT did not exactly match but produce the same key. Specifically the file was created with 1 segment, but a split key was used at open time and the split key exactly covered the 1 segment. Testing with the default Micro Focus file system, it is clear that Micro Focus does not enforce this as long as the definitions (physical vs open time) produce the same key. The logic has been modified so that it does not fail if the definitions, although different, produce the same key.

ExtFH sets file status to 9/69 when attempting to open non-indexed files

With old Micro Focus compilers on Windows there is no way to use different file handlers for different file types so it may happen that an open request for a non-indexed file reached the c-treeRTG file system. In such a case, the open failed but the driver did not properly set the status code to indicate the error. The logic has been modified to set the file status to **9/69** when attempting to open a non-indexed file.

ExtFH used original file name when calling redirinstance function

A c-treeRTG redirinstance function was failing because it was using the wrong file name. c-treeRTG performs the environment variable expansions before looking into *ctree.conf* for matching rules. In case of redirinstance it also applies any applicable <map>. In certain cases this may result in an unexpected file name. The logic has been revised to take this situation into account.

ExtFH redirinstance problem for non-indexed files

c-treeRTG could not successfully open a text file (which is a non-indexed file) if the file was redirected to the original file system and it matched a rule specific to indexed files. The logic has been modified to correct this.

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ExtFH interface placed a lock on "previous with no lock" calls on files opened with automatic locking

An application that performed three "read next with no lock" operations followed by a "read previous with no lock" left the second record locked. The logic has been reorganized to eliminate this problem.

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5. Configuration

This section lists changes to c-treeRTG configuration.

5.1 Support for authorization files (cmdset) in c-treeRTG

c-treeRTG now offers improved security around password handling. The c-treeRTG configuration file specified the user password in the clear, which is not acceptable for the security standards in place at many customers.

It is now possible to specify an authorization file in a new `<instance authfile="file">` attribute.

The **ctcmdset** utility is used to create an encrypted password, or settings, file. The plain text form of the file should be in the following format:

```
; User Id
USERID ADMIN
; User Password
PASSWD <pass>
```

Be sure to secure your plain text file with appropriate file system access permissions.

Any utility or runtime with access to the encrypted file will connect with permissions assigned to that authorization, so this file should also be protected at an appropriate c-treeRTG usage access level.

If both `<instance authfile>` and `<instance user>` are specified, the `<instance authfile>` takes precedence. If the file specified by `<instance authfile>` does not exist or it is not accessible, the operation fails immediately and an error is entered in the log.

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5.2 Rollback failed if <trxholdslocks> was enabled

A ROLLBACK operation failed when `<trxholdslocks>` was enabled and a previous committed transaction still had pending locks. The logic has been modified to successfully return in this situation.

5.3 <smartcopy> tag caused wrong behavior

When *ctree.conf* explicitly turned on smartcopy (`<smartcopy>yes</smartcopy>`), incorrect behavior was occasionally observed:

- **ctutil** *-copy* succeeded (NOTE with fastcopy turned off or not applicable) but the resulting data file was empty and with no index defined.
- **ctutil** *-info* returned that the file has no index.

This behavior has been corrected.

5.4 File matching rule sequence

When a *ctree.conf* had multiple `<instance>` tags, a file that should belong to one instance was identified by the code as belonging to a different instance. This could cause the file to end up on a different server than expected or to have different settings. The logic has been modified to correct this issue. If the servers are all on the same machine (i.e., there is only a single occurrence of each file), then there should be no need for data cleanup.

5.5 <file dir> rule did not work if wildcard was used

The `<file>` rule did not return any matching directories when trying to match multiple directories by using the '`*`' wildcard in the `<file dir="">` attribute. The logic has been modified to correct this.

5.6 COBOL error 9D,160 returned when <prefetch> was enabled

A COBOL error **9d,160** was returned by a READ NEXT operation when `<prefetch>` was enabled and DELETE operations were occurring on the same file. This problem has been solved by ensuring that the prefetched records are discarded when the COBOL operation UNLOCK is requested.

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5.7 <locktype> 0 - Correct behavior

When `<locktype> 0` was used, a READ NEXT operation on a locked record returned an error, which is incorrect. When `<locktype> 0` is set, a READ NEXT operation should always return success if there is a next record.

When `<locktype> 0` was used, a READ KEY operation on a locked record returned an unexpected value of `0`.

The logic has been modified to correct both of these situations.

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6. Interface Support

c-treeRTG includes interfaces for leading COBOL compilers as well as a variety of SQL interfaces. This section lists changes that affect these interfaces.

6.1 I$IO info-function did not return correct number of records

In c-treeRTG, the ACUCOBOL/isCOBOL I$IO INFO-FUNCTION operation did not return the correct number of records if a record had been added since the last file open. The logic has been modified to correct this.

6.2 INSERT and UPDATE operations did not set record position

An INSERT operation was not setting the record position in c-treeRTG. The logic has been modified to correct this.

6.3 GET POSITION after record not found returned invalid position

A GET POSITION operation returned an invalid position error after a read operation failed to find a record. The logic has been modified to correctly handle all cases.

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6.4 Error 401 (and others): OPEN OUTPUT failed on some corrupted files

An OPEN OUTPUT operation from COBOL failed if the existing files were corrupted, such as those that returned error **401** upon opening. The logic has been modified to correctly address this situation.

6.5 Error 42 (undefined record position): READ NEXT/PREV failed after READ returns locked record

In the c-treeRTG products, a READ NEXT/PREVIOUS operation failed with error **42** (Undefined record position) if a previous READ operation failed due to a locked record. The logic has been modified to correct this.

6.6 Updates to php_ctsql.dll for PHP

The *php_ctsql.dll* included with the c-treeRTG products has been updated to work with PHP Version 5.5.11 and 5.2.5:

- *php_5_5_11_ctsql.dll*
- *php_5_2_5_ctsql.dll*

Changes were made to the c-treeRTG files to allow the DLL to be compiled for other versions of PHP.

6.7 Virtual fields set to empty strings

A situation was discovered in which c-treeRTG retrieved CHAR fields as empty strings. This happened on in-lined redefined fields, which are redefined fields that go in the same tables as additional trailing fields. The logic has been modified to correct this.

6.8 SQL insert/updates on signed COMP-2 fields wrote wrong data

After executing an insert into statement which sets a column based on a COBOL signed comp-2 field, a select statement failed to retrieve data with a conversion error. This was mainly noticeable when using the Micro Focus or IBM sign convention. The logic has been modified to properly set the sign byte for the fields.

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6.9 Improved c-treeRTG SQL "long" field mapping and handling

The logic in the c-treeRTG SQL callbacks has been revised to better handle OCCURS DEPENDING ON mapping into longvarchar or longvarbinary fields.

6.10 CTREEACU.C compiler error with Visual Studio C++ 6.0

An error was encountered when compiling *CTREEACU.C* with MS Visual Studio C++ 6.0 "error C2065: 'DWORD_PTR': undeclared identifier." The logic has been corrected to eliminate this error: The DWORD_PTR type is defined as DWORD* if MAXULONG_PTR is not defined (see http://stackoverflow.com/questions/2723284/how-to-detect-if-the-windows-dword-ptr-type-is-supported-using-an-ifdef).

6.11 isCOBOL C$LOCKPID returned locked file error when opening without ADMIN permissions

isCOBOL C$LOCKPID did not work as expected when the c-tree user was GUEST. The logic has been modified to correct this situation.

6.12 Invalid key returned upon "get equal key" operation on a non-duplicate key index

An incorrect key was returned by an RM-COBOL or Btrieve application performing a "get equal key" operation on a non-duplicate key index. The logic has been modified to correct this situation.

6.13 Problem connecting RM/COBOL and Btrieve to c-treeACE Server if <log><debug><config> option was enabled

An RM/COBOL or Btrieve application would fail to connect to the c-treeRTG Server when `<log><debug><config>` option was enabled in the configuration file. The logic has been altered to correctly handle this situation.

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7. c-treeRTG Command-Line Utilities

This release of c-treeRTG includes a more robust set of command-line utilities to help you get your system up and running. The following fixes/enhancements have been made to these tools.

7.1 Configuration Tool now recognizes "priority" and "casesensitivity" attributes

The c-treeRTG RTG Config Configuration Tool has been updated to recognize the `priority` and `casesensitivity` attributes on a <file> tag.

7.2 RTG Migrate Tool fixes

The RTG Migrate tool has been modified to no longer issue the wrong type option when it calls **ctmigra** to perform the migration of Btrieve files. In addition, the drop-down text was changed to show ExtFH as an option.

7.3 RTG Migrate fixes

Minor fixes were made to the c-treeRTG RTG Migrate tool:

1. Fixed suffix filter for Unix and Windows standards
2. Disabled the "Migrate" button while a migration is running
3. Fixed line terminator in the Migrate script

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7.4 Error 9/069: mfconvert sample program now checks source file organization

When trying to convert a sequential file (which is a file organization c-tree does not currently support), an error **9/069** was returned by **mfconvert** while creating the c-tree file. Logic was added to **mfconvert.cbl** program to check that the source file organization is indexed and, if not, error out with the message "unsupported source file organization" without attempting the file creation.

7.5 Multi-line comments at beginning of XDD or ctree.conf file

When the *ctree.conf* or the XDD XML file started with a multi-line comment, the c-treeRTG logic used to identify the file format failed to identify the file as a generic XML file. Depending on the situation, the file was handled as a different file type, leading to errors. The logic has been modified to support multi-line comments at the beginning of the XDD or *ctree.conf* file.

7.6 xddgen error generating XDD

Running **xddgen** against a COBOL program caused it to fail with field-offset calculation error under the following conditions:

- multiple 01 levels for the same FD
- no directives
- key fields used in the SL not belonging to the first 01 level definition

This problem has been fixed by forcing the key identification in first 01 level thus avoiding the output of key fields that do not belong to the proper level.

7.7 "YYY undefined" error: xddgen failed to generate XDD when using RECORD VARYING DEPENDING ON

The **xddgen** utility failed to generate an XDD with the error "YYY undefined" when the record was variable-length and its size depended on a variable that was not part of the FD. The COBOL syntax was:

```
FD ... RECORD VARYING FROM ... TO ... DEPENDING ON YYY.
```

The logic has been modified to correct this.

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7.8 xddgen fixes on redefined keys

The **xddgen** utility errored out with offset calculation problems when using keys on redefines. Two scenarios were addressed:

1. The key is made on a field belonging to a group that gets redefined and the redefined group takes place because of a WHEN directive. In this case **xddgen** generates field entries for the main group since it contains a key field, and then generates fields for the redefines group because of the WHEN directive, but this second field's generation overlaps the previous one, hence the offset calculation errors.
2. The key field is on the redefines of field or belongs to a group that redefines a field (or group). In this case **xddgen** already generated proper XDD but did not properly identify the situation and did not generate a warning or an error.

The logic has been modified to handle these scenarios and, in the second case, generate a warning or an error depending on the setting for redefined keys.

7.9 xddgen key definition warning on wrong schemas

The **xddgen** utility was outputting duplicated warning messages for incomplete keys on schemas they did not apply to. The logic that handles key matching for multiple schema definitions has been modified to correct this.

7.10 xddgen premature exit

The **xddgen** utility prematurely exited leaving an incorrect XDD file on disk when the COBOL program did not have an FD for a SELECT. The logic in this utility now checks for the record information and, if this information is missing, it now signals the problem with a warning instead of exiting.

7.11 "Configuration syntax error": ctutil called with -c option failed

c-treeRTG returned a "Configuration syntax error" when using **ctutil** with the *-c* option and an encrypted configuration file created with **ctutil** *-cryptconf*. The logic has been corrected to eliminate this problem.

7.12 "File locked by another user": ctutil -rebuild did not show error messages on error

The c-treeRTG **ctutil** *-rebuild* command failed on a locked file without printing the error message "File locked by another user." The logic has been modified to properly handle this situation.

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7.13 ctutil -run on Unix failed with error "invalid option" if command list file had EOL in DOS format

An error "Invalid option" was returned by **ctutil** *-run* on Unix/Linux systems if the command list file passed to **ctutil** had end-of-line (EOL) characters in the DOS format (CRLF). the logic has been enhanced to correctly accommodate all line ending formats.

7.14 ctutil -run returned 1 when all commands were successful

The **ctutil** *-run* command returned a value of 1 even though all the commands were successful. The logic has been modified to return 0 (no errors) if all commands were successful and to return the command line number if a command failed.

7.15 ctutil -sqlcheck usage display was incorrect

The **ctutil** command has been modified because it displayed incorrect usage for **ctutil** *-sqlcheck*. The correct usage is:

```
ctutil -sqlcheck file xdd_file [-conv=convention_ID]
```

This does not affect the operation of the command.

7.16 ctutil -sqlize might crash on tables created with old RTG versions

A crash was occasionally experienced when running **ctutil** *-sqlize* on tables created with previous c-treeRTG versions. The logic has been corrected to eliminate this problem.

7.17 ctutil -sqlize no longer fails with error 597 when not using "admin" login

The SQL import logic sometimes failed with error **597** when not using "admin" login. This could occur when running **ctutil** *-sqlize* with the following options:

- Unicode build
- not using the ADMIN password on the command line
- not using admin login in ctree.conf

In this scenario, if the user specified in *ctree.conf* (or guest) did not have resource permission, an error **456** would be expected. If the user has permission, this should succeed. Before this modification, both cases failed with **597**. The logic has been corrected to handle this properly.

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7.18 ctutil -sqlize ERROR 19:4113:0 SQL table linkage failed

The c-treeRTG **ctutil** *-sqlize* command failed on a table that contained a field mapped to a SQL date (using dbtype="date") if an invalid format was specified. The following error was seen:

```
sqlize ERROR 19:4113:0 SQL table linkage failed
```

The above situation succeeded in releases prior to V11.*x*.*x*.15089 by ignoring the "dbtype" directive. The behavior has now been changed so that it will fail when the format is not correct, while taking into consideration the need to keep systems up and running if they already have linked tables with an incorrect XDD. The behavior is now as follows:

1. The server-side behavior has been adjusted so that linked tables with a "bad" data format continue to work as before (i.e., ignoring the "dbtype").
2. The client-side behavior (used during **sqlize**) now fails with error **CTDBRET_CALLBACK_13** in case of a format error so that the dbtype directive is not ignored.

7.19 ctutil -sqlcheck did not permit -conv and -show at the same time

The **ctutil** utility did not allow using the *-conv* and *-show* options at the same time. This problem has now been fixed, allowing these options to be used together.

7.20 ctutil -sqlize without ADMIN password

An issue was encountered when running **ctutil** *-sqlize file xddfile database* without an ADMIN password. The logic has been modified to handle this situation.

7.21 ctSQLImportTable truncated password to 9 chars - possible 451 error (LPWD_ERR)

The **ctSQLImportTable** function truncated the password to 9 chars when validating it, which could cause an unexpected error 451 (**LPWD_ERR**). In c-treeRTG this could be seen in **ctutil** *-sqlize* when specifying the admin password.

7.22 ctSQLImportTable errors unlinking MRT host table

Errors **4022** and **101** were encountered while using **ctutil** *-sqlize* or **ctutil** *-sqlunlink* with Multi-Record Tables (MRT Tables) in the following scenarios:

1. **ctutil** *-sqlize* run twice, second run fails with **4022**
2. **ctutil** *-sqlize*, **ctutil** *-sqlunlink* table (where table is the physical table, so the MRT host) fails with **101**

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3. **ctutil** *-sqlize*, **ctutil** *-sqlunlink* in a loop for all MRT members then **ctutil** *-sqlunlink* table (where table is the physical table, so the MRT host) fails with **101**

The logic has been corrected to eliminate these errors.

Note: This modification is a Behavior Change.

7.23 ctutil -sqlize - Error 4022 on a multi-record table

Error **4022** was returned by **ctutil** *-sqlize* when attempting to sqlize a multi-record table. The logic has been modified to correct this.

7.24 ctaddrtgi utility properly handles on file with transaction support

When **ctutil** was renamed as **ctaddrtgi**, it failed with "Unsupported function" when running on an older file with PREIMG file mode. The utility has now been modified to correct this.

7.25 Enhanced XDDGEN "OCCURS DEPENDING ON" handling

Certain XFD formats, (type 4 and 6 known with certainty) do not provide c-treeRTG enough information to generate a proper SQL mapping of OCCURS DEPENDING ON variable structured data types. c-treeRTG maintains these mappings in a structure termed XDD and provides a utility, **xddgen**, with limited parsing capabilities to generate this information directly from COBOL source. The **xddgen** utility has been updated to better handle additional cases of OCCURS DEPENDING ON.

This variable structure now maps into a SQL LONG field if it is the last field of the FD.

7.26 RENAME operation requested from ACUCOBOL did not replace existing files

The c-treeRTG COBOL driver for ACUCOBOL now correctly overwrites existing files during RENAME operations. The **ctutil** *-rename* command now accepts a new option, *-overwrite*, which indicate that the rename should overwrite existing files instead of failing. The new syntax is as follows:

```
ctutil -rename  source_file dest_file [-overwrite]
```

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7.27 Error 652: ctutil file copy failed

In c-treeRTG 10.4.0.42239 or greater, when using **ctutil** *-copy* on files created with a previous version, the resulting file contained the wrong data and the utility sometimes failed with error **652**. The logic has been modified to correct this problem.

7.28 Error 669 returned by ctutil -tron on old V6 files

The c-treeRTG command `CTUTIL -tron file T` failed with c-tree error **669** ("inconsistent XCREblk") if the file was an old V6 version. The logic has been modified to correctly handle this type of file.

7.29 Error 12 creating a file when iscobol.file.index.data_suffix= is set to a space

Creating a file with no extension by setting the *iscobol.properties* setting *iscobol.file.index.data_suffix*= to a space, failed with error **12**. The problem occurred only when using the *iscobol.properties* setting and not when using the XML *ctree.conf* file. The logic has been modified to correct this.

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8. Introducing Version 2 of c-treeRTG BTRV Edition

c-treeRTG BTRV Edition has undergone substantial improvements in this release to become a more mature product. From SQL support to expanded support for the BTRV API to a more powerful engine, V2 delivers. This section lists important changes that make c-treeRTG BTRV Edition an all new product.

8.1 Opening files with extended key modes caused issue

When opening a table, a check was performed to verify that the segment type made sense. Certain segment types were not considered proper at open time and so the open was denied. the logic has been changed to eliminate this problem.

8.2 BTRV crash on 64-bit platforms

In selected instances, running applications against 64-bit c-treeRTG BTRV Edition resulted in a crash. The logic has been modified to correct this problem.

8.3 BTRV error 3 returned

When c-treeRTG configuration included a `<localinstance>` directive, in rare circumstances it was possible to receive a BTRV error **3**. The logic has been corrected to eliminate this error.

8.4 BTRV returned unexpected errors with <localinstance> or <redirinstance>

When the c-treeRTG *ctree.conf* configuration file included a <localinstance> or <redirinstance> section, passing an invalid file handle resulted in a BTRV error 19

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(**B_UNRECOVERABLE_ERROR**) instead of 3 (**B_FILE_NOT_OPEN**). The logic has been modified to return the correct error in this situation. In addition, c-tree error 53 **FTYP_ERR** has been mapped to BTRV error 88 **B_INCOMPATIBLE_MODE_ERROR**.

8.5 BTRV INSERT and UPDATE operations did not update record position

A GET_POSITION operation after an INSERT operation failed with unexpected error **8**. The logic has been modified to return the record number on write operations when the BTRV *keyNumber* parameter is not -1 (NCC).

8.6 BTRV interface returned wrong error on locked record

The c-treeRTG BTRV interface returned **81** instead of **84** when attempting to read a locked record. As a consequence RM/COBOL programs returned error code **3081** instead of **9900** when attempting to read a locked record.

The c-treeRTG BTRV interface has been fixed to return the proper error code, which also solves the symptom seen in RM/COBOL.

8.7 BTRV next operation failed with error 8 instead of 9

Btrieve Error 8 was returned instead of error 9 when B_GET_NEXT operation was performed after any B_GET_* operation failed to find a record. The logic has been modified to make c-treeRTG BTRV Edition return the expected error.

8.8 BTRV returned empty key when the key buffer overlaps the data buffer

c-treeRTG BTRV Edition returned an empty key when the passed key buffer overlapped the data record buffer. The logic has been revised to eliminate this problem.

8.9 BTRV returned truncated keys

The c-treeRTG BTRV driver returned truncated keys instead of the entire key found. This caused a problem with the RM/COBOL runtime causing issues retrieving records specifying only a part of the key resulting in "not-found" errors or "unexpected" records that did not match the key criteria. This problem has been corrected by increasing an internal communication buffer length so that the entire key can be returned.

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8.10 Possible memory overrun reading variable-length records

c-treeRTG BTRV Edition sometimes experienced a memory overrun when the user passed a record buffer that was not large enough to contain the variable-length record on disk.

This problem occurred only with c-treeRTG BTRV Edition and not with c-treeRTG COBOL Edition.

The logic has been modified to eliminate this problem.

8.11 ctmigra performance improved migrating BTRV files

The performance of **ctmigra** and RTG Migrate have been improved when migrating BTRV files.

8.12 Improved error mapping in BTRV interface

A number of internal c-treeRTG errors that were mapped in the BTRV interface to the generic errors **2** (I/O error) and **19** (unrecoverable error) are now mapped to more precise error codes.

8.13 Return appropriate BTRV error in case of dead lock

c-treeRTG BTRV Edition has been modified to return the appropriate BTRV errors in these situations:

- It returns BTRV error **78** in case of a dead lock.
- It returns BTRV error **130** when there is not enough memory to allocate lock tables.

8.14 Return error when unsupported key flag is passed from BTRV

Enhancements to c-treeRTG BTRV Edition provide support for more BTRV key flags. A "not supported" error is returned if the key flag passed from the application is not supported.

The following key flags are currently supported:

- `DUP`
- `MOD`
- `SEG`
- `ALT`

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- REPEAT_DUPS_KEY
- EXTTYPE_KEY

Support will be added for:

- NUL
- NUMBERED_ACS
- NAMED_ACS
- DESC_KEY
- NOCASE_KEY

8.15 Error 22: ctmigra importing variable-length BTRV files

Error **22** was returned when importing variable-length record files using the c-treeRTG **ctmigra** tool**.** The tool has been updated to detect variable-length records and handle them correctly.

8.16 Error 26 (FACS_ERR) mapped to BTRV error B_FILE_NOT_OPEN

c-treeRTG Error 26, **FACS_ERR**, is now mapped to the BTRV error 3, **B_FILE_NOT_OPEN**.

8.17 Hang occurred when <localinstance> was enabled on Solaris

c-treeRTG BTRV Edition became hung on transaction operations under Solaris (and other versions of Unix) when <localinstance> was enabled. The logic has been modified to correct this.

8.18 c-treeRTG BTRV Edition incorrectly identified index with DUP key as REPEAT_DUPS_KEY

RM/COBOL failed to open a file created with duplicated key index, returning RM/COBOL error **37,39**. c-treeRTG incorrectly identified files with DUP key as REPEAT_DUPS_KEY. The logic has been corrected to prevent this.

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Formatting convention	Type of Information
Bold	Used to emphasize a point or for variable expressions such as parameters
CAPITALS	Names of keys on the keyboard. For example, SHIFT, CTRL, or ALT+F4
FairCom Terminology	FairCom technology term
FunctionName()	c-treeACE Function name
Parameter	c-treeACE Function Parameter
`Code Example`	Code example or Command line usage
utility	c-treeACE executable or utility
filename	c-treeACE file or path name
`CONFIGURATION KEYWORD`	c-treeACE Configuration Keyword
CTREE_ERR	c-treeACE Error Code

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