

Co:Z® Co-Processing Toolkit for z/OS

# Co:Z Toolkit Installation and Release Notes

V 4.5.0 Edition

Published July, 2017

Copyright © 2017 Dovetailed Technologies, LLC

---

# Table of Contents

Release Notes .....	iii
1. Introduction .....	29
1.1. Packaging .....	29
Co:Z Toolkit for z/OS .....	29
Co:Z Target System Toolkits .....	31
2. Installation .....	32
2.1. Co:Z Toolkit for z/OS .....	32
2.2. Co:Z Target System Toolkits .....	34
Configure and test sshd .....	34
Install Co:Z target executables .....	35
2.3. Windows Target System Installation .....	37
Install Cygwin and OpenSSH on Windows .....	37
Configure and test sshd .....	37
Install Co:Z target executables .....	40
A. Compiling the Co:Z target system sources .....	41
B. Windows Desktop Target System Installation .....	42
B.1. Install Cygwin and OpenSSH on Windows .....	42
B.2. Configure and test sshd .....	42
B.3. Install Co:Z target executables .....	44
C. Setting up a test OpenSSH system on z/OS .....	45
D. License .....	47

---

# Release Notes

## Co:Z Toolkit 4.5.0 - July 26, 2017

### Co:Z Launcher enhancements:

- Enhanced the Co:Z Launcher and Co:Z Dataset Pipes server to allow the execution of **cozclient** commands that must run in a separate OMVS address space.

### Co:Z SFTP enhancements:

- Added a `cozsftp append` command which uploads a local-path and appends it to the end of a remote file on the remote machine. See *cozsftp append* in the *Command Reference* section of the User's Guide for more information.
- Updated the Co:Z SFTP Server to support clients that send/receive multiple concurrent files.
- Updated the **chkcmd\_homdir** and **chkcmd\_dsonly** optional user exits to address several issues. See the README files in `<COZ_INST>/bin/exits` for more information.
- Added a template `cozsftp_server_user_config` file to the samples.
- Added support for: *Using SMF type/subtype specific permissions*.

### Co:Z Dataset Pipes:

- Significant enhancements have been made in this release to Co:Z Dataset Pipes when used as a z/OS Remote Service. See *Co:Z Toolkit Installation and Release Notes*, the *Co:Z Launcher User's Guide*, and the *Co:Z Dataset Pipes User's Guide*.
- Added a new client command, *cozcontrol*, to start and stop a durable connection to the Dataset Pipes subsystem on a z/OS server.
- Enhanced logging for the dspipes subsystem to be similar to Co:Z SFTP logging. Additionally, the `/etc/ssh/sshd_config` subsystem has been changed to use a shell script, `dspipes.sh`. See *z/OS Remote Services Configuration* in the *Co:Z Dataset Pipes User's Guide* for more information.
- In order to use the new Co:Z Remote Service functions, remote systems must be upgraded to Co:Z Target System Toolkit 1.3.0.

## Co:Z Target System Toolkit 1.3.0 - July 24, 2017

- Added z/OS Remote Services durable sessions with the new *cozcontrol* command. In order to use this new function, the Co:Z Toolkit must be release 4.5.0 or later. Older versions of the Target System Toolkit will continue to work with Co:Z Toolkit 4.5.0.
- 32 bit executables are no longer available on the website download page. If needed, they can be built from Co:Z Target System Toolkit source code.

## Co:Z Toolkit 4.2.0 - January 10, 2017

### Co:Z Launcher enhancements and fixes:

- Fixed a problem in the way data set `amrc` was being collected. In some cases, useful error information was being lost prior to logging.

Co:Z SFTP enhancements:

- Added support for the BPXWDYN keywords `EXPDL` and `EXPDT`
- Enhanced the `sftp mkdir` command so that if it is issued in the data set space it will create a PDS (or PDSE if `dsntype=library`). The `mkdir` command will fail if a dataset already exists with the specified name.
- Fixed the `chkcmt_homdir` exit so that the Co:Z SFTP `error.log` can be retrieved.

### Co:Z Toolkit 4.1.0 - October 4, 2016

Co:Z SFTP enhancements:

- A new Co:Z SFTP Server logging option may optionally be configured, enabling redirection of Co:Z SFTP logging output to a SYSOUT spool file. For additional information, see [Co:Z SFTP Server logging](#) in the Co:Z SFTP - User's Guide.
- Two optional CZCHKCMD exit modules have been added:
  - `chkcmt_dsonly` - restricts remote SFTP clients from accessing posix files. Access to the z/OS dataset and JES space is permitted.
  - `chkcmt_homedir` - restricts remote SFTP clients to only access files within the user's home directory. Access to the z/OS dataset and JES space is permitted.
 For additional information, see `chkcmt_homedir.README` and `chkcmt_dsonly.README` in the install directory (`<COZ_HOME>/bin/exits`).
- A change was made to allow the `jesincsysin` option to be set with a pattern matching `//-jes/nnnnn/ALL`. Additionally, the sample `cozsftp_server_config` file has been updated to define this pattern as follows:

```
# The following pattern is recommended to ensure a job log is transferred with the
# correct options. The pattern matches the following command:
#     get //-jes/nnnnn/ALL joblog.txt
# The special ALL file name is used to transfer all spool files to a concatenated output
# The jesincsysin option includes SYSIN spool files to the concatenated spool files down.
# This option is a convenient way to download all job input and output.
pattern: //-JES.*.ALL
mode=text,jesincsysin
```

### Co:Z Toolkit 4.0.0 - July 14, 2016



#### Note

Our product support covers the newest release of the Co:Z toolkit software, plus the prior release for nine (9) months after general availability of the next major release. This will be extended for this release by an additional 7 months. This means that **support for 2.x.x releases will end on November 14, 2017**. The Co:Z release 3.0.0 has been available since November 2014.

Co:Z SFTP enhancements:

- A new Co:Z SFTP Server timeout option, `servertimeout`, may optionally be specified to limit how long an inactive client remains connected. See the *Co:Z SFTP options* Appendix in the Co:Z SFTP - User's Guide for more information.

Co:Z Launcher enhancements:

- The default values for two key Co:Z Launcher options are changed with this release:
  - `server-ports` is no longer a required option.
  - `ssh-forward-dynamic-port` defaults to true.

The intent of this change is to enable an ephemeral port to be used on z/OS by default, eliminating the need for reserved port ranges. Refer to the documentation in the COZCFGD parmlib member for additional documentation. In order to use this default:

- the `ssh-tunnel` option must be set to true (the default)
- IBM Ported Tools OpenSSH v1.3 or later is required
- The target ssh server must support dynamic reverse port forwarding (e.g. OpenSSH version 5.3 or later)

**Note:** Existing configurations using the `server-ports` option will continue to function without changes; however, we recommend enabling dynamic port forwarding when tunneling, if possible.

For additional information, see *Co:Z Launcher Properties* and *Configuration Best Practices*.

- Two new environment variables have been added to enable long running Co:Z Launcher jobs to continue without termination due to inactivity:
  - `COZ_SERVER_TCP_KEEPALIVE` - If set, interval in seconds Co:Z Server sets the `TCP_KEEPALIVE` socket option. Note that this setting must be lower than the time that any firewall(s) may time out the connection.
  - `COZ_SERVER_KEEPALIVE` - If set, interval in seconds Co:Z Server sends a NOOP packet. This option sends out actual data packets at the application level for situations where `TCP_KEEPALIVE` does not work due to firewall configuration.

Dataset Pipes enhancements and fixes:

- A new option, `-f` has been added to the **`todsn`** and **`tofile`** commands. With the option set, the command will not wait until receiving an entire buffer before writing data to the output data set. This is the default if used with a tunneled socket or if the output is a SYSOUT data set.

Co:Z Batch enhancements:

- A set of "ssh" sample scripts and a JCL PROC have been added, similar to the "sftp" samples shipped with Co:Z. The **`ssh_connect.sh`** script connects an ssh client to a remote system running sshd and prepares it to run commands. The **`ssh_pubkey.sh`** sample script connects to a remote system and appends a public key to a user's `authorized_keys` file.

### Co:Z Target System Toolkit 1.2.2 - July 14, 2016

- Supports the NOOP command sent when the COZ\_SERVER\_KEEPALIVE environment variable is set on the server. Messages similar to the following are no longer written to the log: todsn-client(nnnnn)[W]: unknown command packet->code=8, len=nnn ignored.

### Co:Z Target System Toolkit 1.2.1 - May 20, 2016

- Fixed a problem where a Co:Z client program (fromsdn, todsn, fromfile, tofile, etc...) could fail to work correctly if one of the standard handles (stdin/stdout/stderr) was closed by the target system prior to its invocation.
- Improved SIGPIPE error handling and diagnostics in CoZAgent and CoZClient.

### Co:Z Toolkit 3.6.3 - May 15, 2016

Co:Z Launcher enhancements and fixes:

- Added a new property to the Co:Z Launcher: `ssh-forward-dynamic-port-wait` which can be used to change the amount of time the Launcher will wait for a dynamic port assignment from the target system. The default is 30 seconds, which has been increased from the original wait time of 10 seconds.
- Increased the time to wait for the Co:Z Launcher to establish the saf-ssh-agent from 5 to 30 seconds. The original wait time was sometimes not sufficient on heavily loaded z/OS systems.
- Fixed a problem in the way the Co:Z Launcher parsed `/etc/init.options`, which could in some cases result in an incorrect setting of the timezone used for message timestamps.

### Co:Z Toolkit 3.6.2 - (not released - items below are included in all subsequent releases)

Co:Z SFTP enhancements and fixes:

- Fixed a problem with the Co:Z sftp-server's implementation of `posix-rename` which could result in an SFTP packet ID mismatch.

Co:Z Launcher enhancements and fixes:

- Modified the saf-ssh-agent termination process to shutdown more cleanly. This change eliminates unsightly but harmless BPXP023I messages in the job log.

### Co:Z Toolkit 3.6.1 - January 25, 2016

Co:Z SFTP enhancements and fixes:

- In order to prevent a potential recursive logging error, the console notifications function has been updated to disable WTO messages when the Co:Z SFTP server log file has been redirected to `/dev/console`. Setting `SFTP_LOGFILE=/dev/console` is not recommended. Refer to [Co:Z SFTP Server logging](#) in the Co:Z SFTP User's Guide for additional information.

Co:Z Launcher enhancements and fixes:

- Fixed a problem with the `ssh-forward-dynamic-port` option. In the previous release, if this option was not specified, or explicitly set to `false`, an ephemeral port on z/OS was allocated and this port number was also sent to the target system for its reverse port forwarding port. This release ensures that a port from the supplied port range is used if `ssh-forward-dynamic-port=false`

Dataset Pipes enhancements and fixes:

- In order to prevent a potential recursive logging error, the **wto** command will not write a message when logging has been redirected to `/dev/console`.

### Co:Z Toolkit 3.6.0 - December 8, 2015

Co:Z SFTP enhancements and fixes:

- Added a feature to optionally write console notifications on command completion. Notifications are written following the call to the Post Processing Exit, if one exists, for the following commands: **put**, **get**, **rm** and **rename**. Notifications are supported for the Co:Z SFTP client and server. The message format is configured in the sitewide server and client configuration. See the *Session config files* Appendix in the Co:Z SFTP - User's Guide for more information. Once configured, the notification feature is enabled using the Co:Z SFTP option, `notify`. See the *Co:Z SFTP options* Appendix in the Co:Z SFTP - User's Guide for more information. This option can be set globally for all users in the site-wide configuration or can be enabled on a per user basis. This option can also be enabled using file patterns in either the sitewide server/client configuration or user configuration.
- Enhanced the **saf-ssh-agent** utility to support more ssh multiple authentication combinations. The `saf-ssh-agent` utility is used when the `-k` option is specified on the **cozsftp** command. This fix also applies to the Co:Z Launcher when the **saf-cert** property is specified.
- Fixed a problem where the specification of BPXWDYN keywords on Dataset Allocation might not be built correctly and in some cases, could cause an 0C4 ABEND. This fix also applies to Dataset Pipes.
- Changed the behavior of the Co:Z Translator when a codepage user `technique` option is specified (0-9), but the associated custom table is not found. Previously, an Informational level message was written, but this was possible to overlook. The Translator now throws an exception. This fix also applies to Dataset Pipes.

Co:Z Launcher enhancements and fixes:

- Enhanced the `ssh-forward-dynamic-port` option to use an ephemeral port on z/OS. Now, when this option is set to true, reserved port ranges on z/OS are no longer required.
- Modified the Co:Z Launcher to work around a race condition in the z/OS Unix System Services socket `listen()` call. Under this race condition, two Co:Z Server processes could to bind and listen on the same `localhost:port` pair.

### Co:Z Toolkit 3.5.1 - October 9, 2015

This release makes the following minor changes to the 3.5.0 (Beta) release, and is no longer considered "Beta".

Co:Z SFTP enhancements and fixes:

- Changed a dataset write seek error message to warning
- Fixed a problem in the `cozsftp` client preventing the listing of a symbolic link for a directory target.
- Fixed a problem where log messages generated by setting the `interimlogging` option were incorrectly written on completion of commands that did not result in a transfer.

### Co:Z Toolkit 3.5.0 (Beta) - July 7, 2015

**Note:** We recommend that you use this release if you are evaluating or testing Co:Z outside of a production

environment. We expect to provide production support for this release level within 60 days. If you are a commercial customer and have specific support requirements, please contact us.

Co:Z SFTP enhancements and fixes:

- SFTP base upgraded from OpenSSH 5.0p1 to 6.4p1 adding the following:
  - recursive file transfer in a directory tree (get/put -r)
  - sftp server read-only mode
  - sftp “df” command - displays file system attributes
  - improved performance of directory listings
  - “ls -h” option - human readable file attribute units
- OpenSSH 6.4 changes sftp so that non-error messages are not printed to stdout if running a batch file (-b). In effect, the -q (quiet mode) option is turned on with -b and cannot be turned off. This has been changed so that -b does not force -q. The -q option can be specified in addition to -b.
- Fixed rename and remove to write an SMF record when the check command exit rejects the user's request.
- Fixed the status code reported when "no file or directory" was the cause of error. Status code 552 is now reported rather than 550 in these cases.
- Added manpages for the **cozsftp** and **sftp-server** commands. See the *Command Reference* in the Co:Z SFTP User's Guide.

### Co:Z Toolkit 3.1.2 - August 13, 2015

Co:Z Launcher fixes:

- Fixed a problem occurring with ssh-forward-dynamic-port set to true. There were some scenarios where pthread\_cond\_timedwait was called with an invalid time argument.

### Co:Z Toolkit 3.1.1 - July 6, 2015

Co:Z SFTP enhancements and fixes:

- Fixed a problem where an **ls** command issued from cozsftp could encounter an error, but not cause a non-zero return code to be set.
- Changed the logging level of the message that reports a failure to read a Co:Z SFTP config file (either cozsftp\_config or cozsftp\_server\_config) from warning to informational.

### Co:Z Toolkit 3.1.0 - May 1, 2015

Co:Z SFTP enhancements and fixes:

- Added "false" statements to the beginning of **sftp-server.sh** and **cozsftp** shell scripts. This is a workaround suggested by IBM so that shell scripts do not silently fail with exitCode=0 when a fork/spawn error occurs.

Co:Z Launcher enhancements and fixes:

- Fixed a problem where a Co:Z Dataset Pipes command from the target system caused a network reset during very large transfers. Both the Co:Z server version 3.1.0 and the target system toolkit version 1.2.0 updates are



required for this fix. These can be installed and run in any order, but both need to be installed in order to see the fix.

### Co:Z Target System Toolkit 1.2.0 - May 1, 2015

- Fixed a problem where a Co:Z Dataset Pipes command from the target system caused a network reset during very large transfers. Both the Co:Z server version 3.1.0 and the target system toolkit version 1.2.0 updates are required for this fix. These can be installed and run in any order, but both need to be installed in order to see the fix.

### Co:Z Toolkit 3.0.1 - March 16, 2015

Co:Z SFTP enhancements and fixes:

- Fixed a problem where a system symbol in the VOLSER of a data set's catalog entry failed to be resolved, causing the data set to not be usable by Co:Z.
- Fixed a problem where the number of bytes transferred was incorrectly reported in SMF records on an unsuccessful file transfer. This error only occurred when a write error was detected on the first write to a dataset
- Added a new informational log message listing the options in effect for a transfer. While this information was available with debug logging in prior releases, many customers do not have debug logging enabled in production. This new message will improve our ability to address common transfer questions. The following is an example message (note that the asterisk indicates a setting from a matching pattern that overrides a current setting):

```
ZosSettings[ I ]:                               Transfer                               options:
clientcp=ISO8859-1,*conddisp=catlg[catlg],*lrecl=62,*mode=text[binary],
*recfm=fb,servercp=IBM-1047,trim
```

- Added support to automatically convert ISO-8859-*nn* to ISO8859-*nn* because z/OS does not support the format, ISO-8859-*nn*, which contains two dash characters.
- Several Translate Exception error log messages have been updated to report reason codes as hex rather than decimal.
- Added HEAP= , , ANYWHERE to the Co:Z SFTP client option **ssh-le-options** in the sample cozsfcp\_config. 'ANYWHERE' is the IBM default, and this setting will prevent failures if a customer were to override this default in PARMLIB.

Co:Z Launcher enhancements and fixes:

- Added a new optional property, `ssh-forward-dynamic-port`, that allows the target ssh server to dynamically assign the target port. In order to enable this option, IBM Ported Tools OpenSSH v1.3 or higher is required and the `ssh-tunnel` option must be set to `true`.
- Updated the sample COZCFGD member, setting an additional environment variable: `server-env-COZ_TRSUB_ANSI_X3.4-1968=ISO8859-1`. This eliminates **cozagent** warnings stating that "ANSI\_X3.4-1968" is not a codepage recognized by z/OS.
- Added HEAP= , , ANYWHERE to the sample COZCFGD **ssh-le-options** setting. 'ANYWHERE' is the IBM default, and this setting will prevent failures if a customer were to override this default in PARMLIB.

- Fixed a problem where an 0C4 ABEND could occur when using the properties exit to set a new property rather than overriding an existing property.

#### Co:Z Target System Toolkit 1.1.4 - March 16, 2015

- Minor changes to package structure.

#### Co:Z Target System Toolkit 1.1.3 - November 14, 2014 (not released - items below are included in all subsequent releases)

- Added a new **cozagent** option, `-n`, which runs the `target-command` without a shell.

#### Co:Z Toolkit 3.0.0 - December 12, 2014 - Correction

- The original release notes incorrectly listed the minimum machine architecture. This has been corrected in the original 3.0.0 release notes below. Community license users running machine architectures lower than z9 or a z/OS release lower than 1.12 should use release 2.4.5. See the [Co:Z downloads page](#) to download this older release. Commercial support customers that do not meet these requirements should contact us for custom build information.

#### Co:Z Toolkit 3.0.0 - November 12, 2014



### Note

Our product support covers the newest release of the Co:Z toolkit software, plus the prior release for nine (9) months after general availability of the next major release. This means that **support for 1.x.x releases will end on September 12, 2015**. The Co:Z release 2.0.1 has been available since January 2012.

Co:Z SFTP enhancements and fixes:

- Modernized compiler TARGET, ARCHITECTURE and TUNE settings. In order to run this release of Co:Z, a minimum z/OS release 1.12 is required, along with a minimum machine architecture of z9 and above. Commercial support customers that do not meet these requirements should contact us for custom build information.
- The `sftp-server` binary is now built with the `AC=1` link option in order to make it easier for customers that require the Co:Z server to be APF-authorized for their exits. In order to run APF-authorized, the `extattr +a sftp-server` command must be executed after installing this release.
- Enhanced the `smf` option to support an optional parameter that identifies which user exit is called when an SMF record is written: IEFU84 or IEFU83. If no parameter is provided the default is IEFU84 (as in the prior release).



### Note

Migration consideration: If the customer has modified Co:Z SFTP server to be APF-authorized, then the IEFU83 exit is required. The site wide configuration must be updated to include `smf=u83`.

- Added a new `linerule` option, `L4`. When transferring binary files with this option, each record is delimited (preceded) by a four byte length of the record that follows. See the [Co:Z SFTP options](#) Appendix in

the Co:Z SFTP - User's Guide for more information.

- Enhanced error logging for the TranslateException message capturing the offset of the last successfully translated byte.

The following is an example message showing that an error occurred writing a text file to a dataset with different client and server code pages:

```
ZosDataset[E]: TranslateException: Exception occurred during translation,
RC=4, Reason=0xc, input offset=10250005
```

The following is a variant of this message reported by the **fromdsn** command:

```
fromdsn(HLQ.TEST.DATA)[E]: caught TranslateException: Exception occurred
during translation, RC=4, Reason=0xc, record/offset=13/7
```

- Added support for logging interim (in-flight) file transfer records to the Co:Z log and/or real-time SMF Interface (only). Co:Z SFTP supports real-time SMF type 119 records that are compatible with the following IBM FTP records:
  - Subtype 100 - FTP server transfer initialization record
  - Subtype 101 - FTP client transfer initialization record

In addition to the standard real-time FTP initialization records, Co:Z SFTP creates the following real-time SMF 119 record subtypes:

- Subtype 194 - Co:Z SFTP server interim transfer record
- Subtype 195 - Co:Z SFTP client interim transfer record

This feature is enabled by the new `interimlogging` option.

See the *Co:Z SFTP options* Appendix and the *SMF Information* Appendix in the Co:Z SFTP - User's Guide for more information.

- Updated the sample C++ program, `CoZSmfServer.C`, to output a text summary of each SMF record received on a Unix datagram socket. This sample demonstrates how to use the Real-Time Co:Z SMF Interface. See the *SMF Information* Appendix in the Co:Z SFTP - User's Guide for more information.
- Corrected the following two environment variables in documentation and the sample site `cozsftp_client.rc` file:
  - `COZ_SFTP_USER_CLIENT_CONFIG` -> `COZ_SFTP_USER_CONFIG`
  - `COZ_SFTP_USER_CLIENT_RC` -> `COZ_SFTP_USER_RC`

See *Configuring the Co:Z SFTP Client* in the Co:Z SFTP - User's Guide for more information.

Co:Z Launcher enhancements and fixes:

- Added additional debugging information to the `saf-ssh-agent`.

## Co:Z Toolkit 2.4.5 - May 29, 2014



## Note

This is planned to be the last 2.x release of the Co:Z Toolkit. Barring any high severity defect fixes, the next release of the toolkit will be labeled 3.0.0

Co:Z SFTP enhancements and fixes:

- Fixed a bug introduced in 2.4.0 by a new feature enabling wild-card uploading to new generations of a GDG when the **gdgnt** option is enabled. Co:Z server was responding to realpath with the GDG base filename only, dropping the new version indicator of (+1). Some clients, such as PSFTP, require the returned path to contain (+1) in order for the subsequent open request to work.

Co:Z Launcher enhancements and fixes:

- Fixed a timing issue that was causing port forwarding failures in scenarios where several Co:Z Launcher jobs were running concurrently (or close together).

### Co:Z Toolkit 2.4.4 - March 18, 2014

Co:Z Installation:

- A new IBM Ported Tools OpenSSH - Quick Install Guide is available. This guide will help you ensure your IBM Ported Tools OpenSSH installation is configured and tuned properly. For more information see: [\*IBM Ported Tools OpenSSH - Quick Install Guide\*](#).

Co:Z SFTP enhancements and fixes:

- Added an informational message to cozsftp and sftp-server to record the remote and local IP addresses. This message is emitted once per session.
- Modified read\_password\_dsn.sh to ignore new password prompts like "user@host's new password: " This is to prevent an endless loop calling this script for old/new password changes. To disable this filter, export SSH\_ASKPASS\_PROMPT\_IGNORE=false
- Added the SFTP\_LOGDIR environment variable which allows configuration of the directory name (without trailing slash) where log files will be created, rather than /tmp or \$TMPDIR. This variable is ignored if SFTP\_LOGFILE is set.
- Fixed GDGNT support to pass the BPXWDYN GDGNT keyword on all allocations for read and write operations. In prior releases, GDGNT was only passed when creating new generations. This had the potential to cause some read operations to retrieve the wrong generation when GDGNT was set.
- Fixed a problem with translate table support where multiple simultaneous access to the translate table dataset might result in a DATA SET <dsn> ALREADY IN USE error.
- Fixed the FTP command passed to the CHKCMD exit when ls /+nogdgnt is executed. In prior releases, SITE SFTP-GDGNT was passed rather than SITE SFTP-NOGDGNT. Refer to the [\*Co:Z SFTP Exits Guide\*](#) for additional corrections to the documentation.
- Fixed a problem where the exit status code was not set correctly when a dataset write error occurred getting a very small file using the Co:Z SFTP client. This change addresses an issue running **cozsftp** from COZBATCH where the exitcode was not set to 1 when a dataset write error occurred.

- Changed SFTP Server to always treat a dataset name with a trailing slash (/) as a directory.
- Fixed a problem that occurs when using GUI clients to put a file C in directory (folder) //HLQ.A.B when //HLQ.A.B is an existing sequential dataset. The GUI client sends //HLQ.A.B/C causing the Co:Z SFTP Server to overwrite the existing sequential dataset //HLQ.A.B with the contents of file C. This problem was occurring due to a misinterpretation of the slash (/) in the path by the Co:Z SFTP Server. The error does not occur when the path contains a period (.) in place of the slash (/). This problem was originally reported with release 2.3.2.
- Added a Microsoft Windows 64 bit version of the Co:Z Target System Toolkit. This is for use with the Cygwin 64 bit version.

Dataset Pipes enhancements and fixes:

- Changed **todsn** behavior: if -b is specified with -l (except -l none), then -w wrap is made the default. This allows commands such as **todsn -b -l rdw** to work as generally expected.

### Co:Z Toolkit 2.4.3 - December 2, 2013

Co:Z SFTP enhancements and fixes:

- Fixed the server-path passed to the CZCHKCMD exit on a wild-card put to a GDG with the **gdgnt** option enabled.

Co:Z Batch enhancements and fixes:

- For z/OS 2.1 or later, JES Symbols are automatically exported as environment variables to the target shell or program with JES\_ prefixes on the symbol names. See an *example* in the Co:Z Batch User's Guide.

Dataset Pipes enhancements and fixes:

- For z/OS 2.1 or later, the **jessym** command is available, a command line interface to the JES Symbol Service. See the *jessym* section of the Co:Z Dataset Pipes Command Reference for more information.
- Added a new option, **-i jobid**, to the **lsjes** command which displays a single line listing for the specified job. See the *lsjes* section of the Co:Z Dataset Pipes Command Reference for more information.
- Modified **todsn** to add support for the special dataset-name //INTRDR. If specified, the system internal reader is automatically allocated with a default RECFM=F and LRECL=80. Additionally, the new pseudo BPXWDYN option **symlist()** may be specified in order to pass one, or more JES system symbols to the internal reader. See the *example* in the Co:Z Dataset Pipes Command Reference.

Co:Z Launcher enhancements and fixes:

- Fixed a bug in the automatic buffer size increase feature introduced in version 2.3.1. Larger send and receive buffers will now be used in all cases unless otherwise specified.

### Co:Z Toolkit 2.4.2 - July 12, 2013 (not released - items below are included in all subsequent releases)

Co:Z SFTP enhancements and fixes:

- Added a feature to allow the user versions of **cozsftp\_config** and **cozsftp\_server\_config** files to have a **default:** section. In prior versions, the **default:** section was only allowed in the site versions of these files. If the same option *name* is specified in both the site and user config files, then the option *value* in

the user config file has precedence.

Co:Z Launcher enhancements and fixes:

- Added a feature where code page translation exceptions are relaxed when writing to a printer, terminal or DUMMY DD. Prior to this release, if the source codepage had an invalid sequence, a translation exception would be thrown terminating the Launcher process. Now a substitution character is written and the process continues. The behavior is unchanged when writing to anything other than a printer, terminal or DUMMY dd (e.g. regular datasets).
- Fixed a problem with code page translation via `iconv` where some Unicode Services error codes were being ignored.

### Co:Z Toolkit 2.4.1 - June 24, 2013

Co:Z SFTP enhancements and fixes:

- Fixed a problem where an OC4 ABEND could occur after issuing an "ls" command in the dataset space that returned more than 512 entries. This is an issue that was introduced in release 2.2.0.

### Co:Z Toolkit 2.4.0 - June 10, 2013

Co:Z SFTP enhancements and fixes:

- Added a feature to override the location of the user level Co:Z configuration files `sftp-server.rc`, `cozsftp_client.rc`, `cozsftp_server_config` and `cozsftp_config`. This feature is particularly useful if individual SFTP users do not have Unix System Services home directories. For details please refer to the following sections of the SFTP User's Guide:
  - *[Sitewide server defaults](#)*
  - *[Sitewide client defaults](#)*
- Enhancements to improve the ability to distinguish whether a non-existent data set name is to refer to a new data set or an existing (pseudo) directory. As before and by default, a non-existent data set name is reported as a "directory" if other data sets exist at lower levels.
  - Added a new option: **maxdsndirlevels**, which can be used to specify the maximum number of levels that a data set name can have before it is always considered as a new file rather than a (pseudo) directory.
  - The '!' character may now be specified anywhere in a data set name to force a non-existent data set name to be considered as a file rather than a directory.

See: *[Dataset Name Determination](#)* Co:Z SFTP - User's Guide for more information.

- When downloading compressed datasets on EAV volumes with a remote SFTP client, Co:Z SFTP server will now use catalog information to provide a better estimate of the uncompressed data set size. In some cases this may significantly improve the performance of downloading these data sets, since many SFTP clients will only queue one read at a time after the estimated file size has been reached. This feature is only available on z/OS 1.12 or later systems
- Corrected error handling for an invalid sequence detected during conversion from UTF-8 to IBM-1047 on a put to a data set.

- **cozsftp** client **get** command wild-card enhancements:
  - Allow **get \* //DD:MYDD** if the given DD was allocated with DISP=MOD.
  - Allow **get \* //HLQ.GDG.BASE(+1)** if the **gdnt** option is enabled.
  - As with all wild-card get commands, filtering of source files (e.g. **get abc\***) is supported.
- **cozsftp** client **put** command wild-card enhancements and fixes:
  - Allow **put //HLQ.GDG.BASE(\*) <dir>** - to upload all generations to a remote directory. For compatibility, **put //HLQ.GDG.BASE.\*** is also supported.
  - Allow **put //HLQ.PDS(\*) <dir>** - to upload all members of a PDS to a remote directory.  
**Note:** Previously, the command: **put //HLQ.PDS <dir>** would also work, but the target directory was ignored and all files were written to the current working directory. This has been corrected. The preferred syntax is: **put //HLQ.PDS(\*) <dir>**
  - Fixed an problem where **put //HLQ.DSN targetdir** failed. The put command will now upload the data set to "targetdir/hlq.dsn". If the target is a z/OS data set name, then that data set name will be used as the target.
  - Filtering of members is not currently supported when uploading a PDS or GDG. Only a single member or the "\*" pattern is allowed.
- Co:Z SFTP server enhancements and fixes:
  - Allow wild-card uploading to new generations of a GDG. If the **gdnt** option is enabled, then a remote client may upload multiple files/generations with: **put abc\* //HLQ.GDG(+1)**
  - Fixed an issue where download of a specific GDG G000V00 failed with error: "Cannot download non-regular file".
- Addendum to Co:Z Toolkit 2.3.2 release notes:
  - In release 2.3.2, fixed a timing issue causing occasional failures when retrieving spool files for a job submitted using Co:Z. These failures were occurring even with the **jesjobwait** option set which ensures that Co:Z SFTP server wait until the job completes before listing or transferring the jobs spool files.

#### SFTP Sample Scripts enhancements:

- Changed scripts to ensure that a zero exit code does not result if the z/OS UNIX shell is unable to fork a new process.

#### Co:Z Launcher enhancements and fixes:

- Fixed a zero-return code bug from launcher if the agent process failed to run.
- Fixed (again) ssh process time message to appear only as a debug level message. Addresses unwanted ICH408I audit messages for some installations.

### Co:Z Toolkit 2.3.2 - March 21, 2013

Co:Z SFTP enhancements and fixes:

- A new option, **jesincsysin**, is available for transferring JES spool files. When this option is enabled, spool file listings and concatenated output will contain SYSIN spool files, including JESJCLIN. Refer to *Transferring JES spool files* in the Co:Z SFTP - User's Guide for an example.
- Added an appendix, *Creating a Custom Unicode Table from the IBM FTP Translate Table*, to the Co:Z SFTP User's Guide. The appendix provides condensed instructions for creating a custom unicode table which can be used by the Co:Z SFTP **clientcp**, **servercp** and **technique** transfer options. Refer to IBM's Unicode Services User's Guide and Reference (SA22-7649) for complete information on the IBM supported method for adding new conversion tables to Unicode Services.
- Increased the saf-ssh-agent wait time to a maximum of 5 seconds (from 2 seconds). This wait time is related to the **cozsftp -k** option (SAF key authentication)
- Fixed a problem where the **cozsftp** put command could fail but not set the exit code appropriately.
- Fixed a problem where the `default:` section of `cozsftp_server_config` could be ignored if the final `pattern:` section in the file was skipped.
- Fixed a timing issue causing occasional failures when retrieving spool files for a job submitted using Co:Z. These failures were occurring even with the **jesjobwait** option set which ensures that Co:Z SFTP server wait until the job completes before listing or transferring the jobs spool files.

Dataset Pipes enhancements and fixes:

- A new option, **-S**, is available on the **lsjes** command. The **lsjes** command is used to display JES job and spool file status. When the **-S** option is specified, the listing of spool files will also include SYSIN files, including JESJCLIN. Refer to the *Command Reference* for additional information.

### Co:Z Target System Toolkit 1.1.2 - March 21, 2013

- Fixed an issue in a build from source for Solaris. On Solaris, the Co:Z Agent was terminating early resulting in a SIGINT when using **fromdsn/todsn** and **fromfile/tofile**. This issue was related to the way Solaris handles timer signals.

### Co:Z Target System Toolkit 1.1.1 - January 24, 2013 (not released - items below are included in all subsequent releases)

- Fixed an issue with the LSB package for s390x (System z Linux) where an installation error could occur if attempting to install on an earlier generation distribution than the one used to build the LSB RPM.

### Co:Z Toolkit 2.3.1 - January 3, 2013 (not released - items below are included in all subsequent releases)

Co:Z Launcher enhancements and fixes:

- Changed the default send and receive buffers from 16K to 180K. These default values can be modified in COZCFG DD as follows:

```
server-env-COZ_SERVER_SNDBUF=184320
```

```
server-env-COZ_SERVER_RCVBUF=184320
```

The SNDBUF is used when **fromdsn/fromfile** is called from the target system; the RCVBUF is used when **todsn/tofile** is called.



Additional performance improvement may be achieved on z/OS r1.13 or later by using IBM's INET\_FASTPATH feature. To activate this, add the following to your COZCFG DD:

```
server-env-_BPXK_INET_FASTPATH=*
```

### Co:Z Toolkit 2.3.0 - December 18, 2012

Co:Z SFTP enhancements and fixes:

- Added option `unixls`. When enabled, Co:Z SFTP server returns a Unix format listing of data sets to the client. Many clients incorrectly depend on this listing format in order to function correctly. This option is not enabled by default. Refer to the following sections of the Co:Z SFTP User's Guide for additional information:
  - *Client Compatibility* for general client information
  - *Miscellaneous Options* for `unixls` information
- Updated support for the `SFTP_ZOS_INITIAL_DIR` environment variable which can be used to override the home directory on the server. When set to `//`, the user's z/OS top level qualifier is used. As part of the enhancements in this release related to SFTP client compatibility, the string `/-/` is also recognized, setting the initial directory to the user's z/OS top level qualifier prefixed with `/-/`.
- Fixed a problem where the directory attribute was not set correctly when listing `//-JES` output. This change improves the usability of SFTP GUI clients when navigating JES spool files.
- Fixed a problem in PDS directory listings (issued by the `pdsdir` command and Co:Z SFTP PDS 'ls' commands) where the modified date was incorrectly displayed when the date was equal to the last day of the month.
- Fixed a problem in the `sftp_connect.sh` shell script (used by `sftp_get.sh` and `sftp_put.sh`) where userids beginning with a "\$" were not being used correctly. These scripts are located in `$COZ_HOME/samples/sftp_batch`.
- Changed the level of the child SSH process times log message from (I)info to (D)ebug.
- Added support for FTP style translate tables when transferring files. The new option `trtab` can be specified in lieu of `servercp` and `clientcp`. See the *Co:Z SFTP General Transfer Options* for details.

Dataset Pipes enhancements and fixes:

- Added support for FTP style translate tables to **fromdsn**, **fromfile**, **todsn** and **tofile**. A translate table is specified via the `-T` option on these commands in lieu of the `-s` (source code page) and `-t` (target code page) options. See the *Dataset Pipes Command Reference* for details.

Co:Z Launcher enhancements and fixes:

- Changed the level of the child SSH process times log message from (I)info to (D)ebug.

### Co:Z Toolkit 2.2.1 - October 16, 2012

Co:Z SFTP enhancements and fixes:

- Updated the sample `sftp_connect` script to export the following two variables: `_BPX_SHAREAS=YES` and `_BPX_SPAWN_SCRIPT=YES`. This avoids problems that can happen when a user or installation login

profile sets `_BPX_SHAREAS=NO`. Please update scripts that have been modeled after the sample Co:Z Batch SFTP scripts distributed with the Co:Z Toolkit.

- Fixed an error (0C4 abend) occurring with SMF enabled and Co:Z SFTP encountering an error writing SMF records. The error was occurring when Co:Z SFTP logged an error message about the SMF write failure.
- Improved the storage allocation algorithm to better support listing (ls) of very big directories (several hundred thousand files). Depending on the configuration of LE HEAP runtime options, Co:Z SFTP was running out of LE HEAP storage with a "xrealloc() error".
- Fixed a problem where SFTP readlink processing was failing when working with the z/OS settings directory.
- Fixed a problem where the Co:Z SFTP server error.log could not be transferred in some cases.
- Updated initial directory processing to support a high level data set qualifier with no allocated data sets. This change provides a fix for some SFTP clients that failed to connect when the initial remote directory was //userid and the userid did not have any data sets.
- Updated the *Using the Co:Z SFTP client in batch* section of the Co:Z SFTP User's Guide. The changes describe the recommend way of using Co:Z SFTP with Co:Z Batch. The SFTPPROC and batch scripts, provided as samples with Co:Z SFTP, simplify and improve the maintainability of Co:Z SFTP batch jobs.

Co:Z Launcher enhancements and fixes:

- Cleaned up authorization token generation and fixed a problem where the generated authorization token was not being properly verified in some cases.

Co:Z Batch enhancements and fixes:

- Fixed a problem where an 0C4 abend occurred when the SAVEARGS DD was defined as a DUMMY device and environment variables were also defined as parameters to Co:Z Batch.

### Co:Z Toolkit 2.2.0 - September 1, 2012

Co:Z SFTP enhancements and fixes:

- Fixed a problem where MicroFocus style RDW record lengths (fromdsn and todsn "mfrdw" line separator option) were being calculated incorrectly.
- Fixed a problem where submitting a job to the internal reader failed if the lrecl and/or recfm options were set. Job submission relies solely on the values (or default settings) of jeslrecl, jesrecfm and jesblksize (which is a new option added in this release). All other BPXWDYN options are ignored.
- Fixed a problem where the values accepted for dataclas, mgmtclas and storclas were too restrictive. The change allows any alpha or national as the first character and any alphanumeric or national as characters 2-8.
- Fixed a problem where a member might not be selected on a get command when the current directory is a PDS and another dataset exists whose name is pdsname.member.
- Increased the performance of dataset name lookups in some cases.
- Updated the following section of the Co:Z SFTP User's Guide: *Client Authentication Mechanisms*.

Co:Z Launcher User's Guide significant updates:

- Updated the *Client Authentication Mechanisms* section.
- Updated the *Windows Target System Installation* section.

**Co:Z Toolkit 2.1.3 - July 20, 2012 (not released - items below are included in all subsequent releases)**

Co:Z SFTP enhancements and fixes:

- Changed the cozsftp client to report an error if it is run in batch mode (via the -b switch) and no commands are found on STDIN. This fix is intended to work around an issue with IBM's handling of shell "here documents" when no temp space is available.
- Changed log message to report the actual, rather than relative name when a GDG is written.
- Added z/OS support for the SFTP fstat and fsetstat functions. Previously, only stat/lstat and setstat were supported.

**Co:Z Toolkit 2.1.2 - July 12, 2012 (not released - items below are included in all subsequent releases)**

Co:Z SFTP enhancements and fixes:

- Added the option maxcsent to provide a way to increase/decrease the number of CatalogSearch entries returned for a given dataset level search. The default is 2000.
- Fixed a problem in file pattern matching related to data set names: The DSN pattern is now automatically folded to uppercase and patterns without a // prefix are ignored.
- Added an informational level message to report the amount of time spent in the child SSH process.

**Co:Z Toolkit 2.1.1 - March 16, 2012**

This release makes the following enhancements and fixes:

- Added two new dspipes commands **fromfile** and **tofile**. See the *Co:Z user's guide for more information*.
- Added the -x option to the **catsearch** which sets the exit code based on the number of entries found: (0=no entries, 1=one entry, 2=more than one entry).
- Changed the saf-ssh-agent utility to respect digital certificate expiration. Note that this change may cause existing Co:Z programs to fail if the certificates used for authentication have expired. The old behavior can be retained by setting the environment variable COZ\_STRICT\_CERT\_CHECK=false. The default is true.
- Added a man page has been added for the **cozclient** command.
- Extended the use of the technique option (for Unicode Services codepage translation) to the dataset pipes commands **fromdsn**, **fromfile**, **todsn**, and **tofile**. The technique option was added to Co:Z SFTP in release 1.10.0
- Added pattern-get: and pattern-put: sections to the config files to provide directional control over file transfer.
- Fixed a problem where **ssh-socket-info** might not run correctly when called from COZBATCH. A workaround (for the previous release) is to export \_BPX\_SHAREAS=YES to your script or profile.

- Fixed a problem where config file patterns were not always matching PDS member names correctly.
- Modified the Co:Z SFTP server subsystem `sftp-server.sh` script to export `_BPXK_JOBLOG=STDERR` which provides additional logging information when certain errors occur.
- Changed the `sftp_batch` sample scripts (`sftp_connect.sh`, `sftp_get.sh`, `sftp_put.sh`, etc.) to export `LC_ALL=C` to ensure proper shell script and C runtime library behavior. Please note that this change will cause the default client code page (for `cozsftp`) and server code page (for `sftp-server`) to the z/OS platform default of IBM-1047. To set a different default codepage for file transfers, place the desired codepage in the `default:` section of `cozsftp_config` and/or `cozsftp_server_config` files respectively. See the *"Session Config Files" appendix of the SFTP user's guide* for more information.
- Changed the `sftp_opts` settings in the `SFTPIND` sample JCL member to set defaults for `ConnectTimeout` and `ServerAliveInterval`

### Co:Z Target System Toolkit 1.1.0 - March 16, 2012

This release makes the following enhancements and fixes:

- Added remote support for the new `dspipes` **fromfile** and **tofile** commands. *Note:* To use these commands, the Co:Z Toolkit for z/OS version 2.1.1 or later must be installed.
- Added new local command **toasa** which converts POSIX files to ASA carriage control format. This command is useful for converting files with ASCII form feed characters into a dataset `RECFM=A` format.
- Fixed a problem where logging is not properly set up when using the `COZ_SSH_OPTS` environment variable in place of the `-ssh` command line option.

### Co:Z Toolkit 2.1.0 - January 24, 2012

This release makes the following enhancements and fixes:

- Added two new `dspipes` commands **fromfile** and **tofile**. See the user's guide for more information.
- Changed the Co:Z Launcher to allow different DD names for `SYSOUT` (Co:Z Log messages) and `SYSPRINT` (Co:Z Agent output). In the new sample JCL (`COZPROC`), these are now named `COZLOG` and `COZOUT` respectively.

### Co:Z Toolkit 2.0.1 - January 14, 2012

This release makes the following minor changes to the 2.0.0 (Beta) release, and is no longer considered "Beta".

- Fixed a problem in Co:Z SFTP JES support - jobs submitted to `//-JES.INTRDR` may now be listed after they are submitted.
- Corrected an issue in Co:Z SFTP where writing to a z/OS dataset using a source file with a line longer than 128K would fail with an error "InputBuffer will not hold xxxxx bytes of new data".
- Enhanced the sample `sftp_batch` scripts to support SAF keyrings with private keys stored in hardware. See the comments in `sample/scripts/sftp_batch/sftp_connect.sh` for more information.

### Co:Z Toolkit 2.0.0 (Beta) - December 1, 2011

**Note:** We recommend that you use this release if you are evaluating or testing Co:Z outside of a production environment. We expect to provide production support for this release level within 60 days. If you are a commercial customer and have specific support requirements, please contact us. This release makes the

following enhancements and fixes:

- Extended Access Volume (EAV) support has been added to Co:Z SFTP.
- Enhanced the Co:Z SFTP client and server to write log message records (INFO level and above) to SMF 119, using new subtypes 192 (client) and 193 (server).
- Added a utility program `ssh-socket-info` which is invoked by the Co:Z SFTP client to get more accurate socket information for SMF records. This program uses the IBM EZBNMIFR network management API, which requires the `ssh-socket-info` program to be APF authorized. The Co:Z installer will attempt to set the "+a" extattr bit on this program, but will only succeed if the installing userid has READ access to the BPX.FILEATTR.APF SAF resource. If for some reason, this program is not APF authorized, Co:Z SFTP will operate properly, but the SMF socket information is not guaranteed to be accurate.
- Support for hex pad characters has been added to Co:Z SFTP.
- Changed the `catsearch` utility to automatically show user catalog entries. Added an option (`-e`) to allow for a custom selection of entry types.

### **Co:Z Toolkit 1.10.1 - November 7, 2011**

This release makes the following enhancements and fixes:

- The Co:Z Launcher now makes the SYSIN DD available for application use.
- Added several sample shell scripts and JCL to simplify the use of `cozsftp` in batch jobs. See the `$COZHOME/sample/scripts/sftp_batch` and the new `SFTPPROC`, `SFTPIND`, and `SFTPSAMP` JCL members in the installation's `SAMPJCL` PDS.
- Changed the Co:Z SFTP server to provide FTP style confidence indicator in the `CZPOSTPR` exit.
- Fixed a problem in the `cozsftp` shell script where command line arguments were not being transparently passed to the Co:Z SFTP client. This problem could affect the use of the `-oIdentityKeyRingLabel` option, which requires quoting. This bug was introduced in release 1.9.0. Contact us if you would like a local fix for releases 1.9.0 through 1.10.0.
- Fixed a problem where `BPXWDYN` dataset options were not being properly overridden when associated with a file pattern.
- Fixed a problem in dataset code where a read error might not be detected.
- The `LOGNAME` feature introduced in the previous release was not working properly. This has been fixed.

### **Co:Z Toolkit 1.10.0 - September 15, 2011**

This release makes the following enhancements and fixes:

- Added a feature to Co:Z SFTP that allows file transfer settings to be associated with POSIX filename and z/OS Dataset patterns. See the updated Co:Z SFTP documentation for details
- Added the `technique` option to Co:Z SFTP. This option is used to specify the Unicode System Services Technique used when translating between the client and server codepages
- Co:Z Batch now automatically sets the `LOGNAME` environment variable to the current z/OS userid. This is in addition to the existing behavior of setting the `HOME` environment variable to the current user's home

directory.

- Co:Z Launcher now automatically sets the LOGNAME and HOME environment variables.
- The **pdsdir** command has been enhanced (via the -n option) to display only member names.
- Fixed a problem with dataset pipes handling of hex character line terminators (0xnnnn).
- Fixed a problem with **cozsftp** where a non latin locale caused the client to not work properly.
- Added the sample program `CoZSmfServer` which demonstrates how SMF records may be received in real time from Co:Z client and server. See the documentation and build instructions in `$COZ_HOME/samples/smfapi/CoZSmfServer.C`

### Co:Z Target System Toolkit 1.0.14 - June 7, 2011

Enhanced Co:Z Agent to track the parent sshd process and detect if it has terminated abnormally (e.g. due to the Job Step being cancelled by the operator). If this condition is detected, the Co:Z Agent will terminate its process group, which will prevent orphaned processes from continuing to run on the target system.

### Co:Z Toolkit 1.9.0 - May 16, 2011

This release makes the following enhancements and fixes:

- Co:Z SFTP now returns the "last referred date" (midnight) from the VTOC for datasets as last changed time. While not accurate, this is a reasonable substitute and better than the base UNIX epoch date of 1969-12-31
- The `cozsftp` command is now a shell script. The executable has been renamed to `cozsftp_cmd`. This should be a transparent change to existing jobs. However, it adds a new capability to allow customization of the **cozsftp** command line arguments. See [cozsftp\\_client.rc](#) for more information.
- Fixed a problem with long (>256) character unix file paths in Co:Z SFTP
- Cleaned up formatting of long dataset name listings in Co:Z SFTP
- Fixed a problem where `disp=mod` was incorrectly being added to `bpxwdyn` allocations of new datasets in Co:Z SFTP
- Fixed a problem with the `-p` option on the **get** subcommand of **cozsftp**.
- Added subcommands **ascii** and **binary** to **cozsftp**. These operate as synonyms to the option settings **lzopts mode=text** and **lzopts mode=binary** respectively.
- Added a new option `-N` to COZBATCH to respect digits in columns 73-80 in STDIN rather than stripping them out, which is the default behavior.

### Co:Z Toolkit 1.8.0 - February 3, 2011

This release makes the following enhancements and fixes:

- A new Co:Z SFTP client option **ssh-le-options** can be used to set LE options for IBM Ported Tools OpenSSH. This option can be set in `/etc/ssh/cozsftp_config` to simplify the process of implementing IBM APAR [QA34819](#).
- The **ssh-le-options** settings in the sample configuration files for both Co:Z Launcher and the Co:Z SFTP

client were updated to reflect IBM APAR OA34819.

- A new configuration option **properties-exit** was added to the Co:Z Launcher which allows properties to be dynamically provided by a user-supplied exit program or script.T
- Fixed a bug in Co:Z SFTP that can cause an OC4 when querying JES spool jobs using a jobname or owner longer than 8 characters.
- Fixed a bug in Co:Z SFTP that caused the "mode=text" setting to be treated as binary if "mode=TEXT" was given.

#### **Co:Z Toolkit 1.7.8 - January 17, 2011**

This release fixes a potential OC4 exception when the 'noreplace' option is used.

#### **Co:Z Toolkit 1.7.7 - January 14, 2011**

This release fixes several problems:

- In Co:Z SFTP, listing dataset levels that contain GDGs may cause a loop/hang condition.
- An OC4 exception can occur in Co:Z SFTP if there is an open error on a z/OS dataset.
- In Co:Z SFTP, a z/OS-formatted dataset listing displays January "Last Referred" dates with a day that is one less than the actual LastReferred date.
- A debug-level log message was added to Co:Z SFTP client and server to print out the requested and actual REGION size.

#### **Co:Z Toolkit 1.7.5 - December 13, 2010**

In addition to the changes made in the 1.7.4 beta release, the following enhancements and minor fixes are included in this production release:

- A memory leak was fixed in Co:Z SFTP that caused out-of-memory errors if many Unix files were transferred using a small REGION size.
- A fix to Co:Z SFTP job submission which sometimes prevented the display of job handles if multiple jobs were submitted in the same session.
- The **read\_passwd\_dsn\_sh** script was changed to allocate the dataset with DISP=SHR.
- The **lsjes** z/OS Unix command was added to Dataset Pipes to support listing the status of jobs and spool files. Thanks to John McKown for the utility name and the idea of offering this feature as a standalone utility.
- The Dataset Pipes **fromdsn** command was enhanced to support reading JES spool files.
- The Co:Z **safauth** has been enhanced to add DSA key support.
- Some of the JCL members in the SAMPJCL PDS have been renamed for clarity. See the @@README member for details.

#### **Co:Z Target System Toolkit 1.0.11 - December 13, 2010**

Production version of the previous (beta) 1.0.9 release. This version has a minor change to the target program child I/O process wait / cleanup.

### Co:Z Target System Toolkit 1.0.9 - September 30,2010 (Beta Release)

**Note:** This release of the Co:Z Target System Toolkit should only be used with version 1.7.4 or later of the z/OS Co:Z Launcher. Previous versions are still compatible with Co:Z Launcher 1.7.4.

- CoZAgent changed to emit a "Waiting for completion..." message every five minutes. This may be helpful to keep the ssh session alive in some environments where the connection may otherwise timeout.
- CoZAgent changed to detect cleanup errors with the stdin/stdout/stderr handlers and to exit with RC=103 if one of these child processes did not complete successfully.
- CoZClient and the fromdsn/todsn clients changed to support a new environment variable: **COZ\_SSH\_OPTS**. This environment variable can be set in a client-initiated ssh connection to set `user@host` and any other ssh option defaults. This variable should not be set when running under the Co:Z Launcher.

### Co:Z Toolkit 1.7.4 - September 28, 2010 (Beta Release)

- Co:Z SFTP - significant enhancements to JES support:
  - Support for submitting jobs to internal reader A handle/name can be used to refer to submitted jobs. New settings **jesrecfm** and **jeslrecl** can be used to control format of internal reader dataset.
  - A new setting **jesjobwait** allows for waiting for job completion before listing or downloading spool files.
  - Support for downloading concatenated spool files for a job.
  - Selection of spool files by either dsid or [step.[procstep.]]ddname.
  - New setting **jesstatus** can be used to filter job listing by status.
  - `sftp-server.sh` changed to remove empty log files on completion.
  - Fixed bug where fixed options could be overridden.
- Co:Z Launcher
  - Added `ssh-le-options` to property to allow setting of RUNOPTS for ssh child process. Set the default in COZCFGD so to set the initial HEAP size for Ported Tools OpenSSH to avoid storage allocation problem.
  - Fixed a timing bug that sometimes results in not cleaning up child processes. Before this fix, target fromdsn/todsn commands occasionally do not get cleaned up properly.
- Enhanced to **safauth** command to allow **volser** option.
- Fixed bug in **genlines** command in processing **-l rdw** option.

### 1.7.2 - July 23, 2010

- Made the Co:Z toolkit compatible with IBM Ported Tools for z/OS version 1.2. Specifically, components in the toolkit that spawn the ssh client have been changed to spawn with a default setting of `_BPX_SHAREAS=YES` (the old default value was `MUST`). This accomodates IBM's change to ssh that requires it to run in a separate address space.



- Added `create-symlinks.sh` script in the Co:Z install directory. This script can be used to add or replace the symbolic links to the commonly used Co:Z executables.

#### **1.7.1 - <not released - items below are included in all subsequent releases>**

- Added new option `(no)replace`.
- Changed the way the `sftp-server` log filenames are calculated to eliminate a potential race condition on the name.

#### **1.7.0 - June 8, 2010**

- Added support for new `/etc/ssh/cozsftp_config` and `/etc/ssh/cozsftp_server_config` site configuration files.
- Fixed a problem traversing from `/+` to its parent (root).
- Enhanced `sftp-server.sh` to write a message to the console if the log file or `/tmp` is full.
- Sample configuration and `.rc` files are now packaged in a `samples` directory.
- Changed product to use a more corporate-friendly free [\*Community License\*](#) and made Co:Z FTP-SSH Proxy an add-on component. See the licensing [\*FAQ\*](#) for more information.

#### **1.6.1 - April 16, 2010**

- Fixed a problem in Co:Z SFTP server where certain options set via the `SFTP_ZOS_OPTIONS` environment variable can cause a loop.
- Fixed a problem in Co:Z SFTP client and server where SMF records were not being cut for transfers to SYSOUT datasets.

#### **1.6.0 - March 30, 2010**

- Fixed a problem in the Co:Z SFTP where dataset write errors might not be reported correctly.
- Fixed a problem in the Co:Z SFTP server where no error was being reported if too many catalog search entries were being read during a client listing request. The client will now report a directory read error and the error log will contain a message.
- Fixed a problem in the Co:Z SFTP server which can prevent uploading to a SYSOUT dataset.
- Fixed `saf-ssh-agent` so that it reports the exit code of the command run under the `-c` option. Also fixed a potential race condition where the agent might not start in time for the `ssh` client to use it.
- Changed `cozsftp` and `CozClient` to `retry fork()` when receiving `EAGAIN` on `z/OS`. This is in response to IBM USS DOC APAR OA30943 (Problem #1).
- Added a new `z/OS` shell command `"safauth"` which can be used to check the current user's authorization for a SAF resource.

#### **1.5.3 - January 19, 2010**

- Enhanced saf-ssh-agent with a new option (-c) that accepts a command (such as ssh) to run as a child process so that it can authenticate via SAF RACDCERT digital certificates.
- Enhanced Co:Z SFTP to provide an interface to z/OS JES job status and spool files. Future releases of Co:Z will also support enhanced job submit, cancel, and purge facilities

### 1.5.2 - December 8, 2009

- Minor fix to Co:Z SFTP for the `space=blk` setting. This will cause the BPXWDYN keyword `block(n)` to be used, where `n` is either the value on the `blksize` keyword or 0 if the `blksize` keyword is not set.

### 1.5.1 - December 2, 2009

- Minor fix to Co:Z SFTP FTP-compatible user exit support so that check-command exits are properly called when setting the `unit` and `ucount` options.

### 1.5.0 - November 2009

- Support added to enable the use of RACF RSA Digital Certificates for OpenSSH client authentication. This feature can be exploited by both the Co:Z Launcher and the z/OS SFTP client (`cozsftp`).
- Co:Z Launcher MVS console communication has been enhanced to automatically fold input to lower case. The underscore ('\_') escape character can be used to force the character that follows to upper case.
- The `todsname -x` option has been enhanced to allow the BPXWDYN DD or FI keyword to allow the user to specify a specific DD name to dynamically allocate rather than using a default system-assigned DD name.
- Fixed a problem in `cozsftp` with large buffers (-B option) that was causing hangs and or poor throughput.
- Fixed a problem in Co:Z SFTP so that when processing HFS/zFS files, ASCII linefeed characters (x'0a) are properly substituted for ASCII NEL characters (x'85'). This problem had affected some users who requested `linerule=crlf` with codepages that by default converted EBCDIC linefeed to ASCII NEL (x'85').

### 1.4.1 - October 2009

This release includes the following changes to Co:Z SFTP from the prior GA release:

- Support for IBM FTP compatible user exits.
- minor bug fixes to several fields in SMF 119 records that were not produced the same as IBM FTP.
- the `CONDDISP=DELETE` option will now delete MVS datasets or HFS/zFS files that are being written to by either the SFTP client or server in the case of an incomplete or interrupted file exchange.
- Corrected MVS dataset name handling with respect to `"/` and `"/` appearing in file names.
- Corrected an OC7 that occurred when processing PDS directories with old SPF format statistics

### 1.3.2 - July 2009

- Reworked Target System Toolkit to build on more \*nix platforms, including FreeBSD.
- Added a new dataset prefix `///!xxx.yyy` which forces the dataset `xxx.yyy` to be treated as a dataset rather than a

"directory" even if datasets xxx.yyy.zzz exist.

- Fixed dataset estimated size calculation so as to avoid under estimating, which could cause performance problems with some SFTP clients.
- The file permissions for non-resident datasets were being reported as 000. This has been fixed so that these datasets have a mode of 0666.

### **1.3.0 - June 2009**

- Co:Z SFTP has been enhanced to allow for an initial directory (or dataset qualifier) to be configured.
- SMF 119 records with failure codes are written when cozsftp or sftp-server terminates unexpectedly during file transfer.
- The software license has been simplified. The Co:Z components available in source form are now distributed under a more permissive license (no longer GPL).
- In some cases, dataset estimated size was not being properly estimated. This has been corrected.
- The allowmount keyword has been renamed mount to be consistent with current BPXWDYN implementations.

### **1.2.5 - April 2009**

- Co:Z SFTP has been enhanced to allow for the recall of migrated datasets.
- DTLSPAWN has been improved and renamed COZBATCH.

### **1.2.4 - March 2009**

- The Co:Z Launcher can now launch process on not only Windows, \*nix, etc, but also another z/OS machine. The target z/OS must also have the z/OS toolkit installed. A new "-local" option is available on the z/OS fromdsn and todsn commands that allows a remotely launches z/OS process to use local dataset I/O.
- Co:Z SFTP has been corrected to allow group and generic unit names on the BPXWDYN "unit=" setting.

### **1.2.1 - January 2009**

This release has some minor fixes to Co:Z SFTP.

- Navigating alias dataset levels as a "directory" now works better.
- SMF recording can be completely disabled by setting the "nosmf" option in the SFTP\_ZOS\_OPTIONS environment variable.
- fixed a problem with date formatting in long directory listings while using certain locales.

### **1.2.0 - December 2008**

- Co:Z SFTP added to the Co:Z Toolkit.
- A Beta release of Co:Z FTP-SSH Proxy has been added.

### **1.0.8 - June 2008**

- Changed todsn command so that binary or unterminated source lines properly flow to fill up output records to their maximum size. Previously, short records could result on 128kb boundaries when the output records were variable length.
- Change the todsn command so that the fopen() option "recfm=\*" is added if recfm is not specified. This causes the DCB parameters on existing output datasets to be used if not explicitly overridden.

### **1.0.7 - May 2008**

- Changed CoZLauncher to terminate app when STOP command received.
- Changed todsn and fromdsn to honor switches that override -b.
- Changed CoZLauncher and DTLSPAWN to report region size with DEBUG level logging.
- Added the ssh-shareas property to allow the ssh client to be spawned in a separate address space if desired.

### **1.0.6 - March 2008**

- Added the server environment variable COZ\_FORCE\_ICONV to force the use of iconv for translation, even if Unicode System Services is available.
- Increased performance of single byte character set translations.

### **1.0.5 - February 2008**

Changed the -b option on fromdsn/todsn to disable all translation, even if a source or target codepage was specified.

### **1.0.0 - December 2007**

Co:Z Toolkit initial release

---

# 1. Introduction

The Co:Z Co-Processing Toolkit for z/OS consists of the following components:

- **Co:Z SFTP:** OpenSSH SFTP extended to support Datasets, SMF logging, FTP compatible user exits, and SAF/RACF Digital Certificate authentication. See the *[Co:Z SFTP User's Guide](#)*.
- **Co:Z Launcher and Dataset Pipes:**
  - The Launcher is a batch utility which remotely launches a process on a distributed system, redirecting input and output from that process to traditional z/OS datasets or spool files. Remote processes are securely launched using proven SSH (Secure Shell) technology to the target platform, which may be Linux, Windows, or other Unix/POSIX environments.
  - Dataset Pipes are utilities that convert datasets to/from files. These commands may be used locally or over an ssh connection.

See the *[Co:Z Launcher and Dataset Pipes User's Guide](#)*.

- **Co:Z COZBATCH:** An improved replacement for BPXBATCH. This utility is often used in conjunction with Dataset Pipes or Co:Z SFTP. See the *[Co:Z COZBATCH User's Guide](#)*

## 1.1 Packaging

The Co:Z Toolkit consists of two packages:

### Co:Z Toolkit for z/OS

- **Package contents:**
  - Co:Z Launcher
  - Co:Z Dataset Pipes
  - Co:Z SFTP (client and server)
  - Co:Z Batch
  - Sample JCL
- **z/OS Host requirements:**
  - V1R12 or later, with a minimum machine architecture of z9 and above



#### Note

Users running machine architectures lower than z9 or a z/OS release lower than V1R12 should use Co:Z release 2.4.5.

- *[z/OS OpenSSH](#)* or *[IBM Ported Tools OpenSSH](#)*

z/OS V2R2 includes OpenSSH. Earlier versions of z/OS require IBM Ported Tools OpenSSH v1.2 (or later) to be installed. See the version of our [\*Quick Install Guides\*](#) matching your z/OS OpenSSH version for additional information.

## Co:Z Target System Toolkits



### Note

Target system toolkits are only required by the Co:Z Launcher and / or remote Dataset Pipes components. All other toolkit components (e.g. Co:Z SFTP) run on z/OS and do not require target system toolkit installation.

The Co:Z Toolkit for Target Systems are supported on a wide variety of distributed platforms, including Linux, Windows, or other Unix/Posix platforms. The Co:Z Launcher is a particularly good fit for organizations that run both z/OS and Linux for System z connected via HiperSockets.

- **Package Contents:**

- Co:Z Launcher Agent
- Co:Z Dataset Pipes client commands

- **Windows Target System Toolkit requirements:**

- Supports the following Windows environments: Windows 7, Windows 8.1, and Windows Server
- Requires the *Cygwin* environment.
- OpenSSH sshd (installed via Cygwin)
- `sshd_config AllowTcpForwarding=yes` for target userid

- **Unix/Linux/Posix Target System Toolkit requirements:**

- OpenSSH sshd
- `sshd_config AllowTcpForwarding=yes` for target userid
- Pre-built binary packages are available for many Linux distributions.
- Source code is also available for the traditional `configure`, `make`, `make install` process.

---

## 2. Installation

### 2.1 Co:Z Toolkit for z/OS

This section explains how to install the Co:Z Toolkit on z/OS. Once the toolkit is installed, individual components can be configured for use. For component configuration details, consult the user's guides (referenced in [Chapter 1, Introduction](#)).

For questions, please visit the [Dovetailed Technologies Co:Z Forum](#)

1. Download the Co:Z z/OS self-extracting installer file (download available from [dovetail.com](#)).
2. Upload **coz-vv.rr.mm.bin** file to the z/OS zFS file system. Make sure you transfer the file with a binary mode transfer option.
3. Verify that the cksum command (cksum coz-vv.rr.mm.bin) results match the checksum values published on the website download page.
4. The installation script requires a small amount of temporary space to run successfully. Ensure that your /tmp file system is not full.
5. The installing userid should be either UID=0 or have BPX.SUPERUSER authority or have both BPX.FILEATTR.APF and BPX.FILEATTR.PROGCTL authority. These permissions are required in order to enable APF authorization on the ssh-socket-info utility and to mark Co:Z SFTP programs as **program controlled**. If these permissions are not available during installation, the product will still install but may not work properly if SMF recording is enabled. See the [Enabling SMF recording](#) section in the Co:Z SFTP User's Guide for additional information.
6. Make the installer file executable:

```
$ chmod +x coz-vv.rr.mm.bin
```

7. Run the installer:

```
$ ./coz-vv.rr.mm.bin

This software is licensed under the Co:Z Community License Agreement available
for review at http://dovetail.com/docs/coz/licenses.html or as part of this
install package in file LICENSE (the "License").
...

Do you agree to the above license terms? [yes or no]
yes
Enter home directory [/usr/local/coz] : ⓪
(Enter)
/usr/local/coz is not an existing directory, create it? [y/n] :
y
Enter new or existing target PDSE load module library name [SYS1.COZ.LOADLIB]: ⓪
(Enter)
The PDSE load module library 'SYS1.COZ.LOADLIB' does not exist, create it? [y]:
y
```



```

/usr/local/coz/loadmodules/COZBATCH -> //'SYS1.COZ.LOADLIB(COZBATCH)': executable
/usr/local/coz/loadmodules/COZLNCH -> //'SYS1.COZ.LOADLIB(COZLNCH)': executable

Enter new or existing PDS for Co:Z Sample JCL and PROCs [SYS1.COZ.SAMPJCL]: ❸
(Enter)
The PDS 'SYS1.COZ.SAMPJCL' does not exist, create it? [y]:
y
/usr/local/coz/sampjcl/@@README -> //'SYS1.COZ.SAMPJCL(@@README)': text
/usr/local/coz/sampjcl/COZCFGD -> //'SYS1.COZ.SAMPJCL(COZCFGD)': text
/usr/local/coz/sampjcl/COZPROC -> //'SYS1.COZ.SAMPJCL(COZPROC)': text
...

Enter PATH directory in which to create command symlinks
or 'none' [/usr/local/bin]: ❹
(Enter)
created symlink /usr/local/bin/catsearch -> /usr/local/coz/bin/catsearch
created symlink /usr/local/bin/cozserver -> /usr/local/coz/bin/cozserver
created symlink /usr/local/bin/cozsftp -> /usr/local/coz/bin/cozsftp
created symlink /usr/local/bin/fromdsn -> /usr/local/coz/bin/fromdsn
created symlink /usr/local/bin/pdsdir -> /usr/local/coz/bin/pdsdir
created symlink /usr/local/bin/read_passwd_dsn.sh
-> /usr/local/coz/bin/read_passwd_dsn.sh
created symlink /usr/local/bin/saf-ssh-agent -> /usr/local/coz/bin/saf-ssh-agent
created symlink /usr/local/bin/safauth -> /usr/local/coz/bin/safauth
created symlink /usr/local/bin/todsn -> /usr/local/coz/bin/todsn
created symlink /usr/local/bin/zsym -> /usr/local/coz/bin/zsym

FOMF0303I /usr/local/bin/ssh-socket-info: chattr() error: rv=-1, errno=8B, rsn=0924041A ❺
***
Unable to set extended attributes for program bin/ssh-socket-info
- see installation guide for more information
***

You should update user profiles so that MANPATH contains: /usr/local/coz/doc/man

*** Co:Z Installation complete ****
(see README and LICENSE in install root directory for more information)

```

- ❶ Enter the name of a new or existing zFS or HFS directory that will become the top-level "home" directory for the Co:Z Toolkit installation. This directory must be in a filesystem that is writable by the installing user and contains 12MB of free space. If you supply the name of an existing directory that is not empty, you will be prompted to continue, as it is not generally advisable to overlay an existing installation with a new version.
- ❷ The fully-qualified name of the PDSE library to contain the Co:Z Launcher and Co:Z Batch program objects. If this dataset exists, it must be a PDSE and existing Co:Z load modules will be replaced.
- ❸ The fully-qualified name of the PDS library to contain sample JCL for the Co:Z Toolkit. If this dataset exists, it must be RECFM=FB,LRECL=80 and existing members with the same names will be replaced.
- ❹ Several Co:Z Toolkit Unix commands, such as **cozsftp**, **fromdsn**, **todsn**, etc. should be made available in user's PATH. One option is to customize /etc/profile to add <COZ\_HOME>/bin to the PATH, but an alternative is to create symbolic links in an existing PATH directory to the Co:Z user commands in <COZ\_HOME>/bin.

To have the installation script create symbolic links, enter the name of the existing directory in which to create the links, or none to skip. When creating symlinks, this script will prompt you before replacing existing symlinks or files.

The <COZ\_HOME>/install/create-symlinks.sh script can be used to create these links at a

later time, or to replace links to one Co:Z home directory (version) with links to another. See the comments in this script for more information and example usage.

- ⑥ These messages will appear if the installing userid does not have READ access to the BPX.FILEATTR.APF SAF resource. Co:Z will install properly and can be used, but the SMF socket information is not guaranteed to be accurate. A similar error will occur if BPX.FILEATTR.PROGCTL permission is not available to mark Co:Z SFTP programs as "program controlled"
8. z/OS OpenSSH must be available either as a component of z/OS (V2R2 or higher) or by installing *IBM Ported Tools OpenSSH* on older z/OS versions.

Proper configuration and tuning of z/OS OpenSSH can greatly improve overall performance, specifically for z/OS ssh client startup times. See the version of our *Quick Install Guides* matching your z/OS OpenSSH version for additional information.

9. Review the @@README member of the PDS containing Co:Z Sample JCL and PROCS. Tailor the following component specific members:
- **Co:Z Launcher and Dataset Pipes:** COZPROC and COZCFGD
    - The RUNLNCH, RUNLNCHK, and RUNLNCHP are basic Co:Z Launcher samples using different authentication methods. Additional *examples* can be found in the User's Guide.
  - **Co:Z SFTP:** SFTPPROC and SFTPIND
    - While other samples are provided, the SFTPSAMP member contains sample JCL for the preferred method of using the Co:Z SFTP client in batch. These samples use the Co:Z SFTP batch scripts installed in <COZ\_HOME>/samples/sftp\_batch. See *Using the Co:Z SFTP client in batch* in the User's Guide for additional information.
10. For additional configuration and usage information, refer to the individual component User's Guides:
- *Co:Z SFTP User's Guide*
  - *Co:Z Launcher User's Guide*
  - *Dataset Pipes User's Guide*
  - *Co:Z Batch User's Guide*

## 2.2 Co:Z Target System Toolkits



### Note

These steps are required only if you wish to use \*nix as a Target system for the Co:Z Launcher or the Dataset Pipes commands remotely. *You do not need to install Co:Z on a remote system in order to use Co:Z SFTP.*

## Configure and test sshd

Most Linux and Unix distributions include *OpenSSH*. Follow the instructions for your operating system for

installing and configuring the OpenSSH server (sshd) on your system.

### 1. Test logging into ssh locally

```
linux$ ssh <userid>@localhost
The authenticity of host 'localhost (127.0.0.1)' can't be established.
RSA key fingerprint is cc:7c:3d:b5:3e:43:5a:6f:12:e2:1a:af:80:45:ae:fa.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'localhost' (RSA) to the list of known hosts.
<userid>@localhost's password: *****

linux$ logout
Connection to localhost closed.
```

### 2. Test Linux ssh from z/OS:

Repeat the above test from your z/OS userid to confirm that there are no firewall issues.

```
ZOS$ ssh -p <port> <userid>@linux_host
```

## Install Co:Z target executables

Co:Z is distributed as a binary LSB compliant RPM for many linux distributions, including Linux for System Z. If you have an LSB 3.0 compliant distribution, installation is very simple and does not require re-compilation.

If a pre-built binary package is **not** available for your operating system, build and install the required Co:Z binaries on your target server as described in [Appendix A, Compiling the Co:Z target system sources](#).

To install an RPM on an RPM based disto, download the appropriate Co:Z LSB from the [downloads](#) page and issue the following command:

```
$ sudo rpm -i coz-toolkit-n.n-m.rpm
```

It is possible to install an LSB RPM on a Debian based distro that is LSB 3.0+ compliant (e.g. Ubuntu Dapper) as well, but it first needs to be converted to a .deb file via alien:

```
$ sudo alien coz-toolkit-n.n-m.rpm
$ sudo dpkg -i coz-toolkit-n.n-n.deb
```

The package will be installed at `/opt/dovetail/coz`. **Note:** `/opt/dovetail/coz/bin` must be in the default PATH used when logging into sshd.

On some some distros, you may need to update `/etc/profile` to add binaries to `PATH`

## 2.3 Windows Target System Installation

The instructions that follow are for a Windows Server 2003 system, with the installation performed via the Remote Desktop.

For Windows desktop (non-server) environments, see [Appendix B, Windows Desktop Target System Installation](#)

The distribution .zip file for Co:Z includes pre-built binaries for 32-bit Windows systems. The Windows machine must also have OpenSSH installed, which is available as part of the free [Cygwin](#) environment.

**Note:** Exercise caution when editing text files in the Cygwin distribution, especially shell scripts. Make sure that you use an editor that recognizes and preserves the unix line end characters. Wordpad will work in a pinch, but Notepad will not. If you are comfortable with Unix editors, you can include the vim (vi) package when you install Cygwin.

### Install Cygwin and OpenSSH on Windows

If you are installing in a Windows Domain environment, [this Cygwin/OpenSSH installation guide](#) from IBM developerWorks may be helpful.

These instructions supplement the information available on the [Cygwin website](#), and must be run under a Windows user with administrator privileges. The dialogs that follow are taken from the 1.7.x version of Cygwin.

1. The instructions that follow assume that you have a functional Remote Desktop Connection to the Windows installation, and that the Windows system itself has Internet access.
2. Download and excute the Cygwin [setup.exe](#) installation wizard
3. Select the option to install from Internet, then accept the default wizard selections except where changes are necessary (e.g. "Select Your Internet Connection")
4. After choosing a Download Site, the available packages are listed. Expand the Net node in the package list and click on the Skip: icon next to the package **openssh**. This will cause the openssh and openssl packages to be selected for installation.
5. (Optional) Expand the "Editors" node in the package list and select the vim package if you would like to be able to edit with vi.
6. Wait for the installation to complete. This may take some time depending on the speed of your internet connection.

### Configure and test sshd

1. Open a shell: Start+Programs+Cygwin+Cygwin Bash Shell. **NOTE:** This shell must be run as Administrator.

Issue the **ssh-host-config** command. In the dialog that follows, user responses are highlighted in **bold**.

```
$ ssh-host-config
*** Info: Generating /etc/ssh_host_key
```

```
*** Info: Generating /etc/ssh_host_rsa_key
*** Info: Generating /etc/ssh_host_dsa_key
*** Info: Generating /etc/ssh_host_ecdsa_key
*** Info: Creating default /etc/ssh_config file
*** Info: Creating default /etc/sshd_config file
*** Info: Privilege separation is set to yes by default since OpenSSH 3.3.
*** Info: However, this requires a non-privileged account called 'sshd'.
*** Info: For more info on privilege separation read /usr/share/doc/openssh/README.privsep.
*** Query: Should privilege separation be used? (yes/no) yes
*** Info: Note that creating a new user requires that the current account have
*** Info: Administrator privileges. Should this script attempt to create a
*** Query: new local account 'sshd'? (yes/no) yes
*** Info: Updating /etc/sshd_config file

*** Query: Do you want to install sshd as a service?
*** Query: (Say "no" if it is already installed as a service) (yes/no) yes
*** Query: Enter the value of CYGWIN for the daemon: [] <enter>
*** Info: On Windows Server 2003, Windows Vista, and above, the
*** Info: SYSTEM account cannot setuid to other users -- a capability
*** Info: sshd requires. You need to have or to create a privileged
*** Info: account. This script will help you do so.

*** Info: You appear to be running Windows XP 64bit, Windows 2003 Server,
*** Info: or later. On these systems, it's not possible to use the LocalSystem
*** Info: account for services that can change the user id without an
*** Info: explicit password (such as passwordless logins [e.g. public key
*** Info: authentication] via sshd).

*** Info: If you want to enable that functionality, it's required to create
*** Info: a new account with special privileges (unless a similar account
*** Info: already exists). This account is then used to run these special
*** Info: servers.

*** Info: Note that creating a new user requires that the current account
*** Info: have Administrator privileges itself.

*** Info: No privileged account could be found.

*** Info: This script plans to use 'cyg_server'.
*** Info: 'cyg_server' will only be used by registered services.
*** Query: Do you want to use a different name? (yes/no) no
*** Query: Create new privileged user account 'cyg_server'? (yes/no) yes
*** Info: Please enter a password for new user cyg_server. Please be sure
*** Info: that this password matches the password rules given on your system.
*** Info: Entering no password will exit the configuration.
*** Query: Please enter the password: <password>
*** Query: Reenter: <password>

*** Info: User 'cyg_server' has been created with password 'cyg_server'.
*** Info: If you change the password, please remember also to change the
*** Info: password for the installed services which use (or will soon use)
*** Info: the 'cyg_server' account.

*** Info: Also keep in mind that the user 'cyg_server' needs read permissions
*** Info: on all users' relevant files for the services running as 'cyg_server'.
*** Info: In particular, for the sshd server all users' .ssh/authorized_keys
*** Info: files must have appropriate permissions to allow public key
*** Info: authentication. (Re-)running ssh-user-config for each user will set
*** Info: these permissions correctly. [Similar restrictions apply, for
*** Info: instance, for .rhosts files if the rshd server is running, etc].

*** Info: The sshd service has been installed under the 'cyg_server'
*** Info: account. To start the service now, call `net start sshd' or
*** Info: `cygrunsrv -S sshd'. Otherwise, it will start automatically
*** Info: after the next reboot.
```

```
*** Info: Host configuration finished. Have fun!
```

**Note:** If you wish to have **sshd** listen on a port other than the default (22) edit the file `/etc/sshd_config` and change the `Port 22` line to reflect the desired port.

2. Start **sshd** with **netstart**:

```
$ net start sshd
The CYGWIN sshd service is starting.
The CYGWIN sshd service was started successfully.
```

3. Test Cygwin ssh locally:



### Note

When you supply the Windows userid, it **must** match the case of the actual id on your Windows system.

```
$ ssh Administrator@localhost
The authenticity of host 'localhost (:::1)' can't be established.
ECDSA key fingerprint is 4d:7c:7e:b5:f6:43:ae:6f:12:e2:1a:af:80:45:ae:fa.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'localhost' (ECDSA) to the list of known hosts.
Administrator@localhost's password:

$ logout
Connection to localhost closed.
```

4. Create required userid(s)

As Administrator, create the userid(s) you plan to use to carry out any Co:Z related work, and create appropriate passwords. **Note:** if you are using the Remote Desktop to administer this system, you will need to authorize these userids for remote access via `Start+Control Panel+System+Remote settings+Select Users...`

5. Update `/etc/passwd` and `/etc/group`

To allow for proper authentication under Cygwin/OpenSSH, the userid(s) created in the previous step need to be added to the Cygwin environment:

```
$ $ mkpasswd -l > /etc/passwd
$ $ mkgroup -l > /etc/group
```

6. Configure userid(s) for ssh:

Log out from the Administrator id and login to each of the created userid(s), and run a bash shell: `Start+Programs+Cygwin+Cygwin Bash Shell`. At the prompt, run the **ssh-user-config**. There is no

need to create local identities for use with Co:Z, but feel free to create them if needed/desired for other purposes.

```
$ ssh-user-config
*** Query: Shall I create a SSH2 RSA identity file for you? (yes/no) no
*** Query: Shall I create a SSH2 DSA identity file for you? (yes/no) no
*** Query: Shall I create a SSH2 ECDSA identity file for you? (yes/no) no
*** Query: Shall I create a (deprecated) SSH1 RSA identity file for you? (yes/no) no

*** Info: Configuration finished. Have fun!
```

## 7. Test Cygwin/OpenSSH from z/OS:

Connect to the Windows Server from z/OS via ssh to capture the Windows OpenSSH server identity and to confirm that there are no firewall issues:

```
ZOS$ ssh -p <port> <userid>@windows_server
```

If this connection hangs, or is otherwise unsuccessful it is probably a Windows firewall issue. To test, disable the firewall temporarily and try again. If the connection works this time, you will need to add a firewall rule to allow the program `c:\cygwin\usr\sbin\sshd.exe` or add an inbound rule to allow the port that sshd listens on (usually 22).

## Install Co:Z target executables

1. Log back in as Administrator.
2. Download Co:Z Target System Toolkit for Windows/Cygwin from the [downloads](#) page.
3. From a Cygwin bash shell, create the directory `/opt` if it doesn't exist.
4. Extract the contents of the distribution .zip file to the `/opt` directory.
5. Ensure that the files in `/opt/dovetail/coz/bin` are marked executable:

```
$ cd /opt/dovetail/coz/bin
$ chmod +x cozagent cozclient fromdsn todsn
```

6. Add `{CYGWIN_HOME}\bin` **and** `{CYGWIN_HOME}\opt\dovetail\coz\bin` to your Windows PATH environment variable.



---

# Appendix A. Compiling the Co:Z target system sources

**Note:** These sources have been built on a variety of POSIX systems, but we offer no guarantees for your particular system. If you have difficulty building, please feel free to contact us regarding our testing and certification schedule.

1. Transfer (in binary) the `coz.v.r.m-src.tar.gz` file included in the Co:Z distribution to your target system.
2. Unpack the source:

```
$ mkdir cozbuild
$ cd cozbuild
$ tar xzvf ../coz.v.r.m-src.tar.gz
```

3. Build and install:

AIX Note: If you wish to build with x1C, you will need to export `CXX=x1C` prior to the following steps.

```
$ ./configure
$ make
$ make install
```

**Note:** the installation directory must be in the default `PATH` used when logging into `sshd`.

On some some distros, you may need to update `/etc/profile` to add binaries to `PATH`

---

# Appendix B. Windows Desktop Target System Installation

These installation instructions are for Windows Desktop (e.g. non server) environments. They are written for Windows 7, but should work with minor variations on other recent versions.

The distribution .zip file for Co:Z includes pre-built binaries for 32-bit Windows systems. The Windows machine must also have OpenSSH installed, which is available as part of the free [Cygwin](#) environment.

**Note:** Exercise caution when editing text files in the Cygwin distribution, especially shell scripts. Make sure that you use an editor that recognizes and preserves the unix line end characters. Wordpad will work in a pinch, but Notepad will not. If you are comfortable with Unix editors, you can include the vim (vi) package when you install Cygwin.

## B.1 Install Cygwin and OpenSSH on Windows

These instructions supplement the information available on the [Cygwin website](#), and must be run under a Windows user with administrator privileges.

1. Download and excute the Cygwin [setup.exe](#) installation wizard
2. Accept the default wizard selections, except where changes are necessary (e.g. "Select Your Internet Connection")
3. After choosing a Download Site, the available packages are listed. Expand the Net node in the package list and click on the Skip: icon next to the package **openssh**. This will cause the openssh and openssl packages to be selected for installation.
4. (Optional) Expand the "Editors" node in the package list and select the vim package if you would like to edit with vi.
5. Wait for the installation to complete. This may take some time depending on the speed of your internet connection.
6. Open a shell: Start+Programs+Cygwin+Cygwin Bash Shell. **NOTE:** This shell must be run as Administrator.

## B.2 Configure and test sshd

1. Once Cygwin is installed, setting up sshd is simply the matter of running the script **ssh-host-config** from the shell opened in the previous step. Recommended user responses are included below:

```
win$ ssh-host-config
Generating /etc/ssh_host_key
Generating /etc/ssh_host_rsa_key
Generating /etc/ssh_host_dsa_key
```

```

Generating /etc/ssh_config file
Privilege separation is set to yes by default since OpenSSH 3.3.
However, this requires a non-privileged account called 'sshd'.
For more info on privilege separation read
/usr/share/doc/openssh/README.privsep.

Should privilege separation be used? (yes/no) yes
Warning: The following function requires administrator privileges!
Should this script create a local user 'sshd' on this machine? (yes/no) yes
Generating /etc/sshd_config file

Warning: The following functions require administrator privileges!

Do you want to install sshd as service?
(Say "no" if it's already installed as service) (yes/no) yes

Which value should the environment variable CYGWIN have when
sshd starts? It's recommended to set at least "ntsec" to be
able to change user context without password.
Default is "ntsec". CYGWIN=(Enter)

The service has been installed under LocalSystem account.
To start the service, call `net start sshd' or `cygrunsrv -S sshd'.

Host configuration finished. Have fun!

```

More information on setting up OpenSSH under Cygwin are available in the `/usr/share/doc/openssh/README` file under the Cygwin home directory.

**Note:** If you wish to have **sshd** listen on a port other than the default (22) edit the file `/etc/sshd_config` and change the `Port 22` line to reflect the desired port. With Vista, you will need to change the file permissions to do this as the file is owned by a different user id. Be sure to revert the permissions after editing.

2. Start sshd by running cygrunsrv:

```

win$ cygrunsrv -S sshd
win$ ps -eaf

```

UID	PID	PPID	TTY	STIME	COMMAND
sgoetze	2644	1	con	16:28:32	/usr/bin/bash
SYSTEM	4012	1	?	16:30:53	/usr/bin/cygrunsrv
SYSTEM	868	4012	?	16:30:53	/usr/sbin/sshd
sgoetze	1664	2644	con	16:30:58	/usr/bin/ps

3. Test Cygwin ssh locally:



## Note

When you supply the Windows userid, it *must* match the case of the actual id on your Windows system.

```
win$ ssh <userid>@localhost
The authenticity of host 'localhost (127.0.0.1)' can't be established.
RSA key fingerprint is cc:7c:3d:b5:3e:43:5a:6f:12:e2:1a:af:80:45:ae:fa.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'localhost' (RSA) to the list of known hosts.
<userid>@localhost's password:

win$ logout
Connection to localhost closed.
```

4. Test Cygwin ssh from z/OS:

Repeat the above test from your z/OS userid to confirm that there are no firewall issues.

```
ZOS$ ssh -p <port> <userid>@windows_host
```

## B.3 Install Co:Z target executables

1. Download Co:Z for Windows from the [downloads](#) page.
2. From a Cygwin bash shell, create the directory /opt if it doesn't exist.
3. Extract the contents of the distribution .zip file to the /opt directory.
4. Ensure that the files in /opt/dovetail/coz/bin are marked executable:

```
$ cd /opt/dovetail/coz/bin
$ chmod +x cozagent cozclient fromdsn todsn
```

5. Add {CYGWIN\_HOME}/opt/dovetail/coz/bin to your Windows PATH environment variable and ensure that {CYGWIN\_HOME}/bin is also present.

---

# Appendix C. Setting up a test OpenSSH system on z/OS

It's sometimes convenient to create your own z/OS SSHD server on an alternate port for testing purposes. You can do this without any special privileges, and the SSHD server will run fine, except that it will only allow logins for the userid that it is running under.

This is especially handy if your Systems Programmer doesn't understand immediately that adding an SSH user subsystem doesn't introduce any new security risks.

*Procedure C.1. General outline for adding a test SSHD server*

1. Create your own ssh directory, say ~/sshd, and copy the file /etc/ssh/sshd\_config into it:

```
zos$ mkdir ~/sshd
zos$ cp /etc/ssh/sshd_config ~/sshd
```

2. In this directory, generate your DSA and RSA host keys, as directed in the [z/OS OpenSSH User's Guide](#).

If you can copy the keys in /etc/ssh directory, then you will avoid "host key" mismatch problems if you switch your SSH client from the production to the test server. If you do copy the production host keys, make sure that you change the file permissions to 600 so that they can't be read by others.

3. Edit your copy of sshd\_config:
  - a. Find the line "Subsystem" which defines the sftp subsystem
  - b. Add a new line after this line:

```
Subsystem dspipes <COZ_INST>/bin/dspipes
```

(where <COZ\_INST> is the directory where Co:Z Toolkit is installed).

- c. Uncomment the Port line and set it to an available port
- d. Uncomment / add the following lines (to use the private keys generated in the previous step):

```
HostKey ./ssh_host_rsa_key
HostKey ./ssh_host_dsa_key
```

(where <COZ\_INST> is the directory where Co:Z Toolkit is installed).

4. From a z/OS shell, change to the directory that you created and start your copy of SSHD:

```
/usr/sbin/sshd -e -D -f ./sshd_config
```

*Note:* If you are unable to execute `/usr/sbin/sshd`, you may be able to copy it to your local directory, add the execute bit (`chmod +x ~/sshd/sshd`) and run the above command using this local copy.

5. To connect to your test SSHD server from a client, don't forget to use the `-ssh -p port` SSH option on your `ssh`, **fromdsn** or **todsn** commands.

---

# Appendix D. License

The Co:Z Co-Processing Toolkit for z/OS, comprised of Co:Z Launcher, Co:Z Dataset Pipes, Co:Z SFTP, Co:Z Batch, Co:Z ssh-proxyc and Co:Z Target System Toolkit (in object code form only) is distributed under the Co:Z Community License Agreement (see below). *Note:* This community license is superseded for Co:Z Toolkit Enterprise License and Support customers. All components are distributed in binary form.

## Co:Z COMMUNITY LICENSE AGREEMENT

PLEASE READ THIS COMMUNITY LICENSE AGREEMENT (THIS "AGREEMENT") CAREFULLY. THIS AGREEMENT SETS FORTH THE TERMS ON WHICH DOVETAILED TECHNOLOGIES, LLC ("DOVETAIL"), A MISSOURI LIMITED LIABILITY COMPANY, MAKES AVAILABLE THE CO:Z CO-PROCESSING TOOLKIT FOR z/OS AT NO CHARGE FOR DOWNLOAD, INSTALLATION AND USE BY THE COMMUNITY. BY DOWNLOADING, INSTALLING, OR USING THE SOFTWARE, YOU ACKNOWLEDGE THAT YOU HAVE READ, UNDERSTAND, AND AGREE TO BE LEGALLY BOUND BY THIS AGREEMENT.

1. DEFINITIONS. As used in this Agreement, the following capitalized terms shall have the following meanings:

"Documentation" means Dovetail's accompanying user documentation for the Software, as may be updated by Dovetail from time to time, in print or electronic form.

"Software" means the Co:Z Co-Processing Toolkit for z/OS, comprised of Co:Z Launcher, Co:Z Dataset Pipes, Co:Z SFTP, Co:Z Batch, Co:Z ssh-proxyc and Co:Z Target System Toolkit in object code form only, together with certain sample code and scripts in source form.

"Update" means any bug fix, enhancement, or other modification to or update for the Software issued by Dovetail for general release to the Software community.

"You" means the person or entity downloading, installing or using the Software. If you are downloading, installing or using the Software on behalf of a company or organization, the term "You" refers to both you and your company or organization, and you represent and warrant that you have authority to bind your company or organization to the provisions hereof.

2. SOFTWARE LICENSE. During the term of this Agreement, and subject to the provisions hereof, Dovetail hereby grants to You, and You hereby accept, an enterprise-wide, non-exclusive, non-transferable, royalty-free and fully paid-up license to install and use the Software on an unlimited number of Your servers, solely for Your internal business purposes, in accordance with the Documentation, and in compliance with all applicable laws and regulations.

3. LICENSE RESTRICTIONS. You shall not, nor shall You authorize any other person or entity to: (a) distribute, rent, lease, lend, sell, sublicense or otherwise make the Software available to any third party; (b) modify, adapt, alter, translate, or create derivative works of the Software; (c) use the Software in or as part of a service bureau, timesharing or outsourcing capacity; (d) develop an alternative to the Software that is based on or derived from, in whole or in part, the Software or Documentation; (e) remove or obscure any copyright, trademark or other proprietary rights notices or designations on the Software, the Documentation or any copies thereof; or (f) reverse engineer, decompile, disassemble, or otherwise attempt to derive the

source code for the Software, except where such reverse engineering is expressly permitted under applicable law, but then only to the extent that Dovetail is not entitled to limit such rights by contract.

4. UPDATES. From time to time, Dovetail may make available Updates for the Software as a general release to the Software community. All such Updates (whether posted by Dovetail on the Dovetail website or included with the Software) shall be deemed part of the Software, and are licensed to You under the license and other provisions of this Agreement, together with any supplementary license terms that Dovetail may provide for such Updates.

5. YOUR RESPONSIBILITIES. You are responsible for: (i) installation of the Software and any Updates; (ii) selecting and maintaining all third party hardware, software, peripherals and connectivity necessary to meet the system requirements for the Software; (iii) creating a restore point for Your systems and backing up and verifying all data; and (iv) adopting reasonable measures to ensure the safety, security, accuracy and integrity of Your facilities, systems, networks and data. Dovetail shall have no responsibility or liability arising out of or resulting in whole or in part from Your failure or delay to perform any such responsibilities, or for acts or omissions of third parties, Internet or telecommunications failures, or force majeure or other events beyond Dovetail's reasonable control.

6. SUPPORT. This Agreement does not include, and Dovetail shall have no obligation under this Agreement to provide, any technical support or other professional services for the Software. If you are interested in purchasing a support plan for the Software, You should visit the Dovetail website to review Dovetail's then current offerings.

7. TERM; TERMINATION. This Agreement and Your license rights hereunder shall continue unless and until terminated as set forth herein. You may terminate this Agreement for convenience at any time by uninstalling, erasing all copies of, and ceasing all use of the Software and Documentation. This Agreement shall terminate immediately and automatically if You violate the license terms or restrictions for the Software, or materially breach any other provision of this Agreement and fail to cure such breach within ten (10) days after receiving notice thereof from Dovetail. Upon the expiration or termination of this Agreement for any reason: (i) Your license to the Software shall automatically and immediately terminate; and (ii) You shall discontinue use of the Software, promptly (within 5 days) uninstall and remove any remnants of the Software and Documentation from Your computers, network and systems, and destroy (or return to Dovetail) all tangible copies of the Software and Documentation in Your possession. Sections 1, 3, 5, 7, 8, 9, 10 and 11 of this Agreement shall survive the expiration or termination of this Agreement for any reason, and shall be binding on and inure to the benefit of the parties and their permitted successors and assigns.

8. DISCLAIMER. THE SOFTWARE AND DOCUMENTATION ARE PROVIDED TO YOU UNDER THIS AGREEMENT "AS IS" WITHOUT REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, AND ALL USE IS AT YOUR OWN RISK. WITHOUT LIMITING THE FOREGOING, DOVETAIL AND ITS SUPPLIERS HEREBY disclaim any IMPLIED OR STATUTORY warranties of MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE OR NON-INFRINGEMENT. THE SOFTWARE IS NOT INTENDED OR LICENSED FOR USE IN ANY HAZARDOUS OR HIGH RISK ACTIVITY. DOVETAIL DOES NOT WARRANT THAT THE SOFTWARE WILL OPERATE UNINTERRUPTED OR ERROR-FREE, OR MEET YOUR BUSINESS, TECHNICAL OR OTHER REQUIREMENTS. No employee or agent has authority to bind DOVETAIL to any representations or warranties NOT EXPRESSLY SET FORTH IN THIS AGREEMENT.

9. PROPRIETARY RIGHTS. Dovetail and its suppliers shall retain exclusive



right, title and interest in and to the Software, including the object code, source code, program architecture, design, coding methodology, Documentation, screen shots, and "look and feel" therefor, all Updates thereto, all goodwill associated therewith, and all present and future copyrights, trademarks, trade secrets, patent rights and other intellectual property rights of any nature throughout the world embodied therein and appurtenant thereto. All rights and licenses to the Software not expressly granted to You in this Agreement are reserved by Dovetail and its suppliers. From time to time, You may submit suggestions, requests or other feedback for the Software. Dovetail shall be free to commercialize and use such feedback, including for developing improvements to its products and services, free of any claims, payment obligations, or proprietary, confidentiality or other restrictions of any kind.

10. LIMITATIONS ON LIABILITY. IN NO EVENT SHALL DOVETAIL BE LIABLE FOR ANY INDIRECT, INCIDENTAL, CONSEQUENTIAL, EXEMPLARY, SPECIAL, PUNITIVE OR SIMILAR DAMAGES ARISING OUT OF OR RELATED TO THE SOFTWARE OR THIS AGREEMENT, INCLUDING LOSS OF BUSINESS, PROFITS OR REVENUE, LOSS OR DESTRUCTION OF DATA, BUSINESS INTERRUPTION OR DOWNTIME. THE TOTAL CUMULATIVE LIABILITY OF DOVETAIL ARISING OUT OF AND RELATED TO THE SOFTWARE AND THIS AGREEMENT SHALL NOT, REGARDLESS OF THE NUMBER OF INCIDENTS OR CAUSES GIVING RISE TO ANY SUCH LIABILITY, EXCEED TEN U.S. DOLLARS (\$10). THE LIMITATIONS ON LIABILITY IN THIS SECTION SHALL APPLY TO THE MAXIMUM EXTENT PERMITTED UNDER APPLICABLE LAW, REGARDLESS OF THE CAUSE OF ACTION OR BASIS OF LIABILITY (WHETHER IN CONTRACT, TORT OR OTHERWISE), AND EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. THESE LIMITATIONS ON LIABILITY ARE AN ESSENTIAL PART OF THIS AGREEMENT, AND SHALL BE VALID AND BINDING EVEN IF ANY REMEDY IS DEEMED TO FAIL OF ITS ESSENTIAL PURPOSE.

#### 11. MISCELLANEOUS

**Governing Law.** This Agreement shall be governed and interpreted for all purposes by the laws of the State of Missouri, U.S.A., without reference to any conflict of laws principles that would require the application of the laws of a different jurisdiction. The United Nations Convention on Contracts for the International Sale of Goods and the Uniform Computer Information Transactions Act (as enacted in any jurisdiction) do not and shall not apply to this Agreement, and are hereby specifically excluded.

**Jurisdiction; Venue.** Any dispute, action or proceeding arising out of or related to the Software or this Agreement shall be commenced in the state courts of St. Louis County, Missouri or, where proper subject matter jurisdiction exists, the United States District Court for the Eastern District of Missouri. Each party irrevocably submits and waives any objections to the exclusive personal jurisdiction and venue of such courts, including any objection based on forum non conveniens.

**Notices.** All notices under this Agreement shall be in writing, and shall be delivered personally or by postage prepaid certified mail or express courier service, return receipt requested. Notices to You may be delivered to the most current address on file. Notices to Dovetail shall be directed to the following address, unless Dovetail has provided an alternative notice address:

Dovetailed Technologies, LLC  
305 Willowpointe Drive  
St. Charles, MO 63304

**Assignments.** You may not assign or transfer this Agreement, or any rights or duties hereunder, in whole or in part, whether by operation of law or otherwise, without the prior written consent of Dovetail. Any attempted

assignment or transfer in violation of the foregoing shall be null and void from the beginning and without effect. Dovetail may freely assign or transfer this Agreement, including to a successor in interest upon Dovetail's merger, acquisition, corporate reorganization, or sale or other transfer of all or substantially all of its business or assets to which this Agreement relates.

Relationship; Third Party Beneficiaries. The parties hereto are independent contractors. Nothing in this Agreement shall be deemed to create any agency, employment, partnership, fiduciary or joint venture relationship between the parties, or to give any third party any rights or remedies under or by reason of this Agreement; provided, however, the disclaimers and limitations on liability in this Agreement shall extend to Dovetail and its directors, officers, shareholders, employees, agents and affiliates. All references to Dovetail in connection therewith shall be deemed to include the foregoing persons and entities, who shall be third party beneficiaries of such contractual disclaimers and limitations and entitled to accept all benefits afforded thereby.

Equitable Relief. The Software comprises the confidential and proprietary information of Dovetail and its suppliers, and constitutes a valuable trade secret. You acknowledge that Your breach of the license or ownership provisions of this Agreement would cause irreparable harm to Dovetail, the extent of which would be difficult and impracticable to assess, and that money damages would not be an adequate remedy for such breach. Accordingly, in addition to all other remedies available at law or in equity, and as an express exception to the jurisdiction and venue requirements of this Agreement, Dovetail shall be entitled to seek injunctive or other equitable relief in any court of competent jurisdiction.

U.S. Government Restricted Rights. The Software and Documentation are licensed with RESTRICTED RIGHTS as "Commercial Items," as that term is defined at 48 C.F.R. §2.101, consisting of "Commercial Computer Software" and "Commercial Computer Software Documentation," as such terms are used in 48 C.F.R. §12.212 or 48 C.F.R. §227.7202, as applicable. Consistent with 48 C.F.R. §12.212 or 48 C.F.R. §227.7202-1 through 227.7202-4, as applicable, the Commercial Computer Software and Commercial Computer Software Documentation is licensed (if at all) to U.S. Government end users only as Commercial Items, and with only those rights as are granted to other licensees pursuant to this Agreement.

Export Control. The Software and underlying information and technology may not be accessed or used except as authorized by United States and other applicable law, and further subject to compliance with this Agreement. The Software may not be exported or re-exported into any U.S. embargoed countries, or to anyone on the U.S. Treasury Department's list of Specially Designated Nationals or the U.S. Department of Commerce Denied Person's List or Entity List. You represent and warrant that You and Your end users are not located in, under the control of, or a national or resident of any country or on any such list.

Amendment; Waiver. This Agreement may be amended only by a written instrument signed by an authorized representative of Dovetail. No rights shall be waived by any act, omission or knowledge of a party, except by an instrument in writing expressly waiving such rights and signed by an authorized representative of the waiving party. Any waiver on one occasion shall not constitute a waiver on subsequent occasions.

Severability; Construction. If any provision of this Agreement is determined to be invalid or unenforceable under applicable law, such provision shall be amended by a court of competent jurisdiction to accomplish the objectives of such provision to the greatest extent possible, or severed from this Agreement

if such amendment is not possible, and the remaining provisions of this Agreement shall continue in full force and effect. The captions and section headings in this Agreement are for reference purposes only and shall not affect the meaning or interpretation of this Agreement. The term "including" as used herein means "including without limitation." The terms "herein," "hereto," "hereof," and similar variations refer to this Agreement as a whole, rather than to any particular section.

Entire Agreement. This Agreement sets forth the entire agreement of the parties and supersedes all prior agreements and understandings, whether written or oral, with regard to the subject matter hereof. Any additional or conflicting terms proposed by You in any purchase order, request for proposal, acknowledgement, or other writing shall not be binding, and are hereby objected to and expressly rejected.