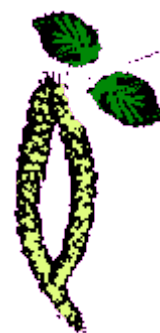


## **docoll collating and indexing scripts developer's guide**



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# 1 Introduction

This is the developer's guide for the collating and indexing component of the docoll system.

There is an overview of the docoll system in related document "docoll system introduction".

## 1.1 Related docoll documentation

In descending order of likely usefulness to a new reader:

- "docoll system introduction"
- "docoll directories and files"
- "docoll Ruby coding standards"
- "docoll interactive search developer's guide"
- "docoll sysadmin guide"
- "docoll packager's guide"
- "docoll rsync server sysadmin guide"
- "docoll GNU-Linux rsync client sysadmin guide"
- "docoll Windows rsync client sysadmin guide"

## 1.2 Xapian resources

- Xapian home page: <http://xapian.org/>
- Xapian documentation: <http://xapian.org/docs/>
- Xapian omega overview (includes omindex): <http://xapian.org/docs/omega/overview.html>
- Xapian WIKI: <http://trac.xapian.org/wiki>
- Xapian user mailing list archives: <http://lists.xapian.org/pipermail/xapian-discuss/> (search via [http://www.google.co.in/advanced\\_search?hl=en&num=30&lr=lang\\_en&ft=i&as\\_sitesearch=lists.xapian.org/%2Fpipermail%2Fxapian-discuss&as\\_qdr=all&as\\_occt=any](http://www.google.co.in/advanced_search?hl=en&num=30&lr=lang_en&ft=i&as_sitesearch=lists.xapian.org/%2Fpipermail%2Fxapian-discuss&as_qdr=all&as_occt=any))
- Xapian devel mailing list archives: <http://lists.xapian.org/pipermail/xapian-devel/> (search via [http://www.google.co.in/advanced\\_search?hl=en&num=30&lr=lang\\_en&ft=i&as\\_sitesearch=lists.xapian.org/pipermail/xapian-devel&as\\_qdr=all&as\\_occt=any](http://www.google.co.in/advanced_search?hl=en&num=30&lr=lang_en&ft=i&as_sitesearch=lists.xapian.org/pipermail/xapian-devel&as_qdr=all&as_occt=any))

## 2 Data files' directories

General information about directories is in related document "docoll directories and files".

## 2.1 Sources

As configured by the SourceRootDirs parameter. There may be several sources, for example /srv/rsync/docoll/<instance> and /var/opt/docoll/<instance>/sources.

## 2.2 Collation

As configured by the CollationRootDir parameter. There can be only one, for example /srv/docoll/<instance>.

## 3 Databases

There are two databases in a docoll system.

### 3.1 PostgreSQL

This database has three purposes:

1. To accelerate the process of "finger printing" files by recording their expensive-to-generate checksums (md5 and sha1). As the scripts find source files suitable for the collation, they lookup the file in the database by path and check the mtime. If the mtime has not changed there is no need to re-compute the md5 and sha1 sums.
2. To identify any file in the collation which is identical (same checksums) to a source file.
3. To record the paths for each file in the collation.

There are three tables/relations in the docoll PostgreSQL database:

List of relations			
Schema	Name	Type	Owner
public	collated_files	table	superuser
public	collated_paths	table	superuser
public	source_files	table	superuser

(3 rows)

Table "public.collated_files"		
Column	Type	Modifiers
inode	integer	not null
md5	character(32)	not null
mime_type	text	not null
mtime	timestamp without time zone	not null
sha1	character(40)	not null

Indexes:

"collated\_files\_md5\_key" UNIQUE, btree (md5, sha1)

Table "public.collated\_paths"

Column	Type	Modifiers
inode	integer	not null
path	text	

Indexes:

"collated\_paths\_path\_key" UNIQUE, btree (path)

Table "public.source_files"		
Column	Type	Modifiers
inode	integer	not null
md5	character(32)	not null
mime_type	text	not null
mtime	timestamp without time zone	not null
path	text	
sha1	character(40)	not null

Indexes:

"source\_files\_path\_key" UNIQUE, btree (path)

### 3.2 Xapian

The Xapian database is generated by Xapian's omindex utility and used by Xapian's omega CGI script to service interactive text searches of the documents in the collation.

The Xapian database is in directory `/var/opt/docoll/<instance>/xapian_db/`. This is configured by `/etc/opt/docoll/<instance>/omega.conf` on the `database_dir` line. Omega looks for the database in a subdirectory of `database_dir`, named on the CGI query string's `DB` parameter. This is serviced by a symlink in `/var/opt/docoll/<instance>/xapian_db/` called `<instance>` and pointing to its containing directory:

```
docoll@CW8vDS:/var/opt/docoll/default/xapian_db$ ll default
lrwxrwxrwx 1 docoll docoll 1 Dec 10 19:32 default -> .
```

## 4 Scripts

The scripts are installed in `/opt/docoll/<version>/bin`, symbolically linked as `/opt/docoll/<instance>`:

```
docoll@CW8vDS:~$ ll /opt/docoll
total 0
drwxr-xr-x 4 docoll docoll 48 Dec  8 03:50 0.7.3
lrwxrwxrwx 1 docoll docoll 21 Dec  8 03:57 default -> /opt/docoll/0.7.3/bin
```

They are written in bash (\*.sh) and Ruby (\*.rb):

```
docoll@CW8vDS:~$ ll /opt/docoll/0.7.3/bin/*[bh]
-r-xr-xr-x 1 docoll docoll 2.5K Oct 27 12:43 /opt/docoll/0.7.3/bin/CollatedFile.rb
-r-xr-xr-x 1 docoll docoll 2.3K Oct  9 16:34 /opt/docoll/0.7.3/bin/Log.rb
-r-xr-xr-x 1 docoll docoll 3.1K Oct  9 12:03 /opt/docoll/0.7.3/bin/SourceFile.rb
-r-xr-xr-x 1 docoll docoll 9.3K Nov 17 17:09 /opt/docoll/0.7.3/bin/analyse_omindex_log.sh
-r-xr-xr-x 1 docoll docoll 11K Nov 17 17:32 /opt/docoll/0.7.3/bin/backup_db.sh
-r--r--r-- 1 docoll docoll 12K Dec  8 01:49 /opt/docoll/0.7.3/bin/bash_lib.sh
-r-xr-xr-x 1 docoll docoll 12K Oct 13 18:35 /opt/docoll/0.7.3/bin/clean.rb
-r-xr-xr-x 1 docoll docoll 13K Nov 18 10:48 /opt/docoll/0.7.3/bin/collate.rb
-r--r--r-- 1 docoll docoll 18K Oct  9 11:56 /opt/docoll/0.7.3/bin/docoll_db_lib.rb
-r--r--r-- 1 docoll docoll 16K Nov 17 16:45 /opt/docoll/0.7.3/bin/docoll_lib.rb
-r-xr-xr-x 1 docoll docoll 13K Dec  8 06:22 /opt/docoll/0.7.3/bin/omindex.sh
-r-xr-xr-x 1 docoll docoll 7.0K Oct 15 18:26 /opt/docoll/0.7.3/bin/parse_cfg_for_bash.rb
-r-xr-xr-x 1 docoll docoll 1.1K Oct 28 16:05 /opt/docoll/0.7.3/bin/pdf2text_wrapper.sh
-r-xr-xr-x 1 docoll docoll 16K Dec  8 03:07 /opt/docoll/0.7.3/bin/run_scripts.sh
-r-xr-xr-x 1 docoll docoll 9.6K Dec  9 22:36 /opt/docoll/0.7.3/bin/unoconv_wrapper.sh
-r-xr-xr-x 1 docoll docoll 1.2K Dec  8 07:12 /opt/docoll/0.7.3/bin/unrtf_wrapper.sh
```

### 4.1 Library files

`bash_lib.sh` is a library for the bash scripts.

`docoll_db_lib.rb` is a database library for the Ruby scripts.

`docoll_lib.rb` is a general library for the Ruby scripts.

### 4.2 Ruby file naming and coding standards

The format of the \*.rb file names is explained in related document "docoll Ruby coding standards".

### 4.3 Ruby configuration file parsing scripts

Configuration files for Ruby scripts are parsed by Ruby library `docoll_lib.rb`, specifically by `ParseConfigFile`.

Ruby script `parse_cfg_for_bash.rb` allows bash scripts to parse the same config files.

### Historical note

Existing Ruby configuration file parsing utilities were studied:

- YAML (example at <http://stackoverflow.com/questions/4375530/ruby-configuration-file-parser-combined-with-optionparser>).
- drks' ParseConfig (<http://www.5dollarwhitebox.org/drupal/?q=node/21>).
- Hans' parse\_config (<http://otype.de/index.php?id=151>).

None of the above gave both an easily legible configuration file syntax and the power to load hashes as well as arrays.

## 4.4 Log.rb – Ruby logging

### Historical note

Existing utility Logger was examined but found wanting. Log.rb was written with the required functionality.

## 4.5 run\_scripts.sh

run\_scripts.sh is the master script that runs all the others. It is intended to be run as a cron job but may be run manually, for example when testing.

run\_scripts.sh' log contains sufficient excerpts of logs from the scripts it runs to be used to determine whether individual logs need to be examined.

The remaining scripts are described in the order that run\_scripts.sh runs them.

## 4.6 collate.rb

1. Initialise: initialise configuration parameters, parse any configuration file, parse remaining command line items, set up logging, set signal traps, connect to database and initialise database if empty.
2. For each file in the configured sources ...
  - a) Iterate loop if file is excluded for any reason (directory, symlink, not a file, too small, not an included extension, an excluded MIME type or extension).

TODO: remove exclusion by MIME type or extension; add inclusion by MIME type.

- b) Instantiate a SourceFile object from the path and file (path, inode, mtime). Lookup path in database. Delete from database if path's file has changed. If path is in database, get checksums (md5 and sha1) and MIME type from database, else get from the file and write to database.
- c) Iterate loop if MIME type or extension are excluded. Note: this is redundant because done already.
- d) Strip any leading directory configured in LeadingDirsToStrip. This normally includes the source top level directory.
- e) Determine the "equivalent path" by prefixing the path with CollationRootDir.
- f) Instantiate a CollatedFile object. Look in the database for a collated file with same checksums (md5 and sha1) as the SourceFile. If found, get inode, MIME type and mtime from the database. Otherwise get them from the source file.

- g) If there is no identical file in the collation, copy the source file into the collation at the equivalent path. Otherwise, if the equivalent path does not exist, create it by hard linking.
  - h) Write any changes in the collation (new file or new path) to the database.
  - i) If the source file has an earlier mtime than the collated file, set the collated file's mtime to the source file's and update the database. Note: this is required because interactive users can search for files by date. In case the sources contain duplicates of a file with a variety of mtimes (the result of copying files without preserving the mtimes) the best we can do is set the collated file to the earliest.
- 3. Delete old log files.
  - 4. Finalise: close the database connection, write summary messages to the log.

## 4.7 backup\_db.sh

- 1. Initialise: source the bash library (includes setting signal traps), parse command line, set up redirection and logging, parse the configuration file (using `parse_cfg_for_bash.rb`). The configuration file is normally the same one used by `collate.rb`.
- 2. Use PostgreSQL utility `pg_dump` to dump the PostgreSQL database to the configured directory, in the production system `/var/opt/docoll/backup`.
- 3. Delete old database dump files.
- 4. Finalise: write summary messages to the log.

## 4.8 omindex.sh and analyse\_omindex\_failure\_rates.sh

- 1. Initialise: source the bash library (includes setting signal traps), parse command line, set up redirection and logging, parse the configuration file (using `parse_cfg_for_bash.rb`). The configuration file is normally the same one used by `collate.rb`.
- 2. Use Xapian utility `omindex` to index the collation. TODO: make filters configurable.
- 3. Analyse the failure rates for each file type (using `analyse_omindex_failure_rates.sh`).
- 4. Finalise: write summary messages to the log.

### 4.8.1 omindex filters

The choice of filter executables for use with the `omindex` command is critical. The script `analyse_omindex_failure_rates.sh` was written to help choose the best filters. Filter research is logged in "Development notes - Xapian, Omega and Apache" in section "Filters for use with `omindex`".

TODO: use MIME types instead of extensions

## 4.9 clean.rb

- 1. Initialise: initialise configuration parameters, parse any configuration file, parse remaining command line items, set up logging, set signal traps, connect to database and initialise database if empty.
- 2. For each path in the file system under the collation directory ...
  - a) If the path is an empty directory, remove it.
  - b) Iterate the loop if the path is not for a file (as defined by Ruby's `File.file` method) or a symlink.

- c) If the path is excluded for any reason (its file is too small, a symlink, not an included extension, an excluded MIME type or extension) remove it and iterate the loop. This would be effective if the configuration's minimum file size, included extensions or excluded types or extensions were changed.
- d) If the path is not already in the database:
  - i. If the database has a collated file with same checksums (md5 and sha1), get its inode otherwise insert the collated file in the database using the path to get its inode and other properties.
  - ii. Add the path to the database with the file's inode.
- 3. For each collated file in the database ...
  - a) For each of its paths in the database (matching inode), if the path does not exist in the file system, then delete the path from the database.
  - b) If there are no paths left, delete the collated file from the database.
- 4. For each source path in the database, delete it from the database if it does not exist in the file system.
- 5. Finalise: close the database connection, write summary messages to the log.

## 4.10 List of Ruby methods

Method name and arguments	File name
CheckDir( dir, perm )	docoll_lib.rb
CheckFileSystemCollatedPathsAreInDB( )	clean.rb
CheckParameters( )	docoll_lib.rb
CollateFiles( paths )	collate.rb
ConnectToDB( )	docoll_db_lib.rb
CopyFile( source_path, target_path )	docoll_lib.rb
CreateHardLink( original_path, new_path )	docoll_lib.rb
CreateTables	docoll_db_lib.rb
CreateTable( tableName, sql )	docoll_db_lib.rb
DeleteCollatedFileFromDB( inode )	docoll_db_lib.rb
DeleteCollatedFilePathsFromDbIfGone( inode )	docoll_db_lib.rb
DeleteCollatedPathFromDB( path )	docoll_db_lib.rb
DeleteSourceFileFromDB( path )	docoll_db_lib.rb
EnsureDirExists( dir )	docoll_lib.rb
ExistsTable?( tablename )	docoll_db_lib.rb
Finalise( exitcode, *msg )	clean.rb
Finalise( exitcode, *msg )	collate.rb
Finalise( exitcode, *msg )	parse_cfg_for_bash.rb
GetAnyFileTypeExclusionReason( path )	docoll_lib.rb
GetChecksums( path )	docoll_lib.rb



Method name and arguments	File name
GetCollationPathsFromTree( dir )	clean.rb
GetConfigFileData( fd )	docoll_lib.rb
GetFilePathsFromSources( )	collate.rb
GetFilePathsFromTree( root_dirs )	docoll_lib.rb
GetInodeAndMtime( path )	docoll_lib.rb
GetMIMEtype( path )	docoll_lib.rb
Initialise	clean.rb
Initialise	collate.rb
Initialise	parse_cfg_for_bash.rb
InitialiseParameters	docoll_lib.rb
InsertCollatedFileIntoDB( inode, md5, mime_type, mtime, sha1 )	docoll_db_lib.rb
InsertCollatedPathIntoDB( inode, path )	docoll_db_lib.rb
InsertSourceFileIntoDB( inode, md5, mime_type, mtime, path, sha1 )	docoll_db_lib.rb
IsCollatedPathInDB( path )	docoll_db_lib.rb
LogParameters( )	docoll_lib.rb
LookupAllCollatedFileInodes( )	docoll_db_lib.rb
LookupCollatedFileByChecksums( md5, sha1 )	docoll_db_lib.rb
LookupCollatedFileByInode( inode )	docoll_db_lib.rb
LookupCollatedPathByInode( inode )	docoll_db_lib.rb
LookupCollatedPathsByInode( inode )	docoll_db_lib.rb
LookupSourceFileByPath( path )	docoll_db_lib.rb
LookupSourcePaths( )	docoll_db_lib.rb
NormaliseDir( dir )	docoll_lib.rb
NormaliseParameters( )	docoll_lib.rb
NormalisePath( path )	docoll_lib.rb
ParseCommandLine( )	clean.rb
ParseCommandLine( )	collate.rb
ParseCommandLine( )	parse_cfg_for_bash.rb
ParseConfigFile( config_path, *valid_keywords )	docoll_lib.rb
ShellEscape( str )	docoll_lib.rb
StrToTime( str )	docoll_lib.rb
UpdateCollatedFileInDB( inode, md5, mime_type, mtime, sha1 )	docoll_db_lib.rb
UpdateSourceFileInDB( inode, md5, mime_type, mtime, path, sha1 )	docoll_db_lib.rb
Usage( verbosity )	clean.rb
Usage( verbosity )	collate.rb

Method name and arguments	File name
Usage( verbosity )	parse_cfg_for_bash.rb
WriteParametersForBash( )	parse_cfg_for_bash.rb

Note: the raw data for the table was generated by:

```
grep '^def' *.rb | awk -F: '{print $2 "\t" $1}' | sed 's/^def //' | sort
```

## 4.11 MIME types

As at docoll scripts 0.7.2, file MIME types are determined and recorded in the database but not used. This vestigial coding was left in the scripts in anticipation of Xapian Omega's oindex utility starting to use MIME types instead of file name extensions for some file types. This change was being discussed in the Xapian mailing list at the time 0.7.2 was being developed.

## 5 Configuration files

Configuration files are in the /etc/opt/docoll/<instance> directories, for example:

```
docoll@CW8vDS:~$ ll /etc/opt/docoll/default/*.cfg
-rw-r--r-- 1 docoll docoll 263 Sep 24 16:12 /etc/opt/docoll/default/backup_db.cfg
-rw-r--r-- 1 docoll docoll 1.8K Dec  8 06:10 /etc/opt/docoll/default/collate.cfg
-rw-r--r-- 1 docoll docoll 4.5K Dec  9 21:02 /etc/opt/docoll/default/oindex.sh.cfg
-rw-r--r-- 1 docoll docoll 1.7K Dec  8 05:22 /etc/opt/docoll/default/run_scripts.cfg
```

The example listing above shows:

- **backup\_db.cfg**, the configuration file to set backup retention time for script backup\_db.sh.
- **collate.cfg**, the configuration file used by scripts backup\_db.sh, clean.rb, collate.rb and oindex.sh.
- **oindex.sh.cfg**, used by script oindex.sh (it uses two configuration files).
- **run\_scripts.cfg**, the configuration file used by run\_scripts.sh.

## 6 Logs

run\_scripts.sh' configuration file includes its output directory. It writes its log in the output directory's log subdirectory.

The other scripts have a mandatory command line option giving their log file name. oindex.sh also makes the Xapian utility oindex log to a separate file in the same directory as its own log (because oindex output is huge).

When the scripts are run in the normal way by run\_scripts.sh, run\_scripts.sh runs each of them to log to a file name in the same directory as its own log.

Errors detected by bash or the Ruby interpreter are written to stderr. In the normal case (run\_scripts.sh being run by cron and the bash error not in run\_scripts.sh) they appear in the run\_scripts.sh log.

## 7 Development, test etc.

Development, test etc. docoll instances may be set up just like any other instance. Details in related document "docoll sysadmin guide".

## 8 Packaging

Packaging is described in related document "docoll packagers guide".

## 9 Appendix – GNU Free Documentation License

Version 1.3, 3 November 2008

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