

Cereon

CDS 1.0
Librarian reference

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Authors:

Andrei Kapustin

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2 Introduction

This document is a definitive guide into the Cereon Librarian (henceforth referred to simply as an “librarian”).

The Cereon Librarian is a tool that creates and maintains object libraries, which can then be used by linker to resolve external references.

Cereon Librarian uses NGOLF (Next Generation Object Library Format) as its primary library format.

3 Invoking the librarian

The general form of librarian invocation is:

```
cerlib [ -<option> ... ] [--] <filename>...
```

where:

- `cerlib` is the name of the librarian executable. Depending on the host OS the actual name of the librarian executable file may be different (for example, on Windows it is `cerlib.exe`).
- Each `-<option>` specifies a command line option that adjusts some facet of the librarian behaviour.
- Each `<filename>` must be a name of an object library file (the recommended filename extension for object library files is `.stl`, an abbreviation from “Static Library”).
- An option terminator (two consecutive dashes `--`), if present in the command line as an independent option, marks the end of the options list; all subsequent parameters are treated as object library file names even if they start with a dash.

Typically there will be only one source file name specified in the librarian’s command line – the name of the object library file to modify. However, it is possible to invoke a librarian without any source file names (if, for example, a new library is assembled from scratch), or multiple source file names (if, for example, a given object module must be added to multiple libraries).

3.1 Environment variables

During operation, librarian uses a number of OS environment variables, all of which are described below.

3.1.1 CDS_1_0_LIBRARIAN_OPTIONS

If this environment variable is defined, its value must be a list of librarian options in the same format as used in the librarian command line during librarian invocation.

When a librarian processes the command line, all options specified by the `CDS_1_0_LIBRARIAN_OPTIONS` environment variable are processed as if they were explicitly specified in the librarian’s command line; the only exception to that rule is in that if some option defined by the `CDS_1_0_LIBRARIAN_OPTIONS` environment variable conflicts with another option explicitly specified in the librarian command line, the former is ignored. This behaviour allows using the `CDS_1_0_LIBRARIAN_OPTIONS` environment variable to set the most commonly needed librarian options, which can be overridden in each particular case if necessary.

For example, if the value of the `CDS_1_0_LIBRARIAN_OPTIONS` environment variable is “`-Endian:Big`”, librarian will always product big-endian libraries unless invoked with an option “`-Endian:Little`”.

3.2 Options

A librarian option has one of the following forms:

```
-<option keyword>  
-<option keyword>:<option parameters>
```

Where `<option keyword>` is a keyword identifying the option and `<option parameters>`, if present, specifies additional information for the option.

Both option keywords and option parameters are generally case-insensitive except where character case matters (for example, when specifying file or directory names as option parameters on a Unix host, where file system is case-sensitive).

For some options both forms (i.e. with and without option parameters) are permitted; for example the “`-Listing:<listing file name>`” option, which tells the librarian to produce a library listing into the specified file, can also be written as simply “`-Listing`”, in which case the listing file name is derived from the library file name by replacing its `.stl` filename extension with `.lst`.

3.3 Option files

Quite frequently a need arises to specify the same set of options for a large number of librarian invocations. If these options are specific to a given librarian project, the facilities provided by the `CDS_1_0_LIBRARIAN_OPTIONS` environment variable and related variables are insufficient (as they affect all librarian invocations); instead, option files can be set up and used.

An option file is a text file that contains one or more librarian options. To improve readability, line breaks and extra spaces are allowed between options in an arbitrary manner.

When invoking the librarian, a dedicated `-Via:<option file name>` option is used to tell the librarian to read an option file, treating all librarian options specified therein as if they occurred in the librarian command line. For example, if an option file is named `options` and contains the following lines:

```
-Endian:Big  
-WarningsAsErrors
```

then invoking the librarian with the following command line:

```
cerlib -Listing -Via:options library.stl
```

has the same effect as:

```
cerlib -Listing -Endian:Big -WarningsAsErrors library.stl
```

Any number of option files can be specified; the maximum length of an option file is not limited except by available memory.

A special case is an option file including other option files (the `-Via:<option file name>` command line option can, like any other option, occur within an option file). Such inclusion is permitted as long as option file dependencies do not cause an inclusion cycle.

3.4 Option conflicts

Unlike most existing librarians, the Cereon librarian is very strict about its command line. In particular, it is not permitted to specify two conflicting options in the same librarian invocation, so the following will cause a command-line error:

```
cerlib -Listing -Endian:Big -Endian:Little library.stl
```

Most existing librarians will allow similar invocations (i.e. with conflicting options), automatically resolving these conflicts in an arbitrary manner (e.g. some librarians may choose the 1st definition of a conflicting option, while other librarians will use the last definition), sometimes with a warning. It is, however, a firm belief of the Cereon librarian authors that conflicting command line options shall not be permitted at all, as any strategy used for automatic conflict resolution makes the invocation result dependent upon the order in which librarian options are specified.

The only situation where option conflicts are resolved automatically is when options explicitly specified in the librarian command line (or in option files included by a `-via` option that occurs in the librarian command line) are in conflict with options specified by the `CDS_1_0_LIBRARIAN_OPTIONS` environment variable (or in option files included by a `-Via` option that occurs in one of these environment variables). In this case, options specified in the librarian command line are always chosen; this behaviour permits explicit overriding of any implicit librarian options.

3.5 Character encoding

Normally, librarian produces all textual output (i.e. listing files) using the “native” character encoding of the host OS. The definition of a “native” encoding is specific to a given OS (for example, on Linux hosts the “native” encoding is selected when a host is configured).

It is, however, possible to specify that a different encoding shall be used on a per-text-type basis (i.e. “an encoding for listing files”, “an encoding for error and warning messages”, etc.)

3.6 Message files

All messages issued by the librarian (i.e. banners, statistics, warnings, errors, etc.) are stored in a textual message file. In the minimum configuration the librarian can operate entirely without message files, in which case built-in English Neutral messages are issued. Additional message files can also be provided in a particular librarian installation, containing the librarian messages localized for a specific culture.

When invoking a librarian, a dedicated command line option `-Locale:<locale ID>` can be used to specify the culture for which librarian messages shall be tailored. For example, invoking librarian with an option `-Locale:de` will cause all librarian

messages, including diagnostics, to be issued in German (provided, of course, that the corresponding message file is available).

Message files always use UTF-8 encoding.

4 Librarian options

This section contains a complete description of each librarian option.

The following notation is used when describing librarian options:

- [*x*] – The element *x* is optional.
- [*x* ...] – The element *x* can be repeated 0 or more times.
- { *x* | *y* } – Either *x* or *y* can be chosen.

4.1 -Add

This option has the following format:

```
-Add:<filename>
```

Where <filename> is a name of an object file or an object library file. The type of the file designated by <filename> is inferred from the file's contents, *not* the filename extension.

If <filename> refers to an object file, the object file is added to the created object library. All path information is stripped (i.e. only file name is retained as a library member name). If the library already contains a member with the same name, an error occurs.

If <filename> refers to an object library, all members of that library are added to the created object library. If the destination library already contains a member with the same name as one of the members of the added library, an error occurs.

If <filename> refers to some other type of file (i.e. neither object file nor object library), that file is added to the library just like an object file would. However, not being an object file, the corresponding library member will not export any global symbols.

4.2 -Banner

This option has the following format:

```
-Banner[ : {On|Off} ]
```

When used, this option turns on (-Banner:On) or off (-Banner:Off) the printing of the version and copyright banner when the librarian is invoked; a default form -Banner is equivalent to -Banner:On, which is also the default librarian behaviour.

4.3 -DisableWarning

This option has the following format:

```
-DisableWarning:<warning ID>[,<warning ID> ...]
```

When used, this option causes warnings with the specified ID not to be issued. Any number of comma-separated warning IDs can be specified in the same `-DisableWarning` option; similarly, it is permitted to have more than one `-DisableWarning` option in the same command line.

4.4 -EnableWarning

This option has the following format:

```
-EnableWarning:<warning ID>[,<warning ID> ...]
```

When used, this option causes warnings with the specified ID to be issued. Any number of comma-separated warning IDs can be specified in the same `-EnableWarning` option; similarly, it is permitted to have more than one `-EnableWarning` option in the same command line.

4.5 -Endian

This option has the following format:

```
-Endian:{Big|Little}
```

When used, this option causes the librarian to create a big-endian (`-Endian:Big`) or little-endian (`-Endian:Little`) library, correspondingly. Note that library endianness applies only to the library itself, not to object modules it contains (therefore, it is possible to have a big-endian library containing object modules for a little-endian target and vice versa). If the endianness for an existing library is not specified, that currently used by the library is kept. If the endianness for a newly created library is not specified, that used by the host machine is used.

4.6 -Extract

This option has the following format:

```
-Extract:<member name>
```

Where `<member name>` is a name of an object library's member. The specified member is extracted from the object library and placed into a file with the same name in the current working directory. If the object library does not contain a member with the specified name, an error occurs.

4.7 -Format

This option has the following format:

```
-Format:<output format>
```

When used, this option instructs the librarian to emit the output (i.e. the object library) in the specified format. Use the `cerlib -Help:Formats` command to list supported formats.

4.8 -FullMessagePaths

This option has the following format:

```
-FullMessagePaths [ : { On | Off } ]
```

When used, this option specifies whether source file names where error and warning messages are anchored shall be printed in fully qualified (`-FullMessagePaths:On`) or relative (`-FullMessagePaths:Off`) form; a default form `-FullMessagePaths` is equivalent to `-FullMessagePaths:On`. The default librarian behaviour (when this option is not specified) is to print anchor file names in a short (relative) form.

4.9 -Help

This option has the following format:

```
-Help [ : <subject> ]
```

When used, it causes the help on the specific subject to be printed. Possible `<subject>` choices are:

- `-Help` (no subject) – prints the librarian command line & options reference.
- `-Help:Targets` – prints the list of supported target platforms.
- `-Help:Formats` – prints the list of supported output formats.
- `-Help:Encodings` – prints the list of supported character sets.
- `-Help:Locales` – prints the list of supported message locales.

4.10 -Listing

This option has the following format:

```
-Listing [ : <destination> ]
```

When used, this option causes a textual file containing the listing of a generated object library to be written.

Library listing files are emitted in the “native” character set for the host OS unless another character set is selected with `-ListingEncoding` option.

Depending on the exact form of the option’s parameter, the library listing file may be written to several different locations:

- If the `<destination>` parameter is not specified, the name of the library listing file is derived from the name of the object library by replacing the filename extension (typically `.stl`) with `.lst`. The library listing file is written into the same directory where the corresponding object library resides.
- If the `<destination>` parameter is specified and ends with a path component separator, it is assumed to refer to a directory where the library listing file shall be written; the name of the library listing file is derived from

the name of the object library by replacing the filename extension (typically `.stl`) with `.lst`. The destination directory is created automatically if it does not already exist. Non-absolute directory names are considered to be relative to the current working directory, not to the source file's location.

- If the `<destination>` parameter is specified and does not end with a path component separator, it is assumed to refer to a file where the library listing shall be written. Non-absolute file names are considered to be relative to the current working directory, not to the object library's location.
- If the `<destination>` parameter is a single dash `'-'`, the library listing is written to the standard output; in this case the character set used for the dependencies output is that selected for the standard output with the `-StdoutEncoding` option.

4.11 -ListingEncoding

This option has the following format:

```
-ListingEncoding:<encoding>
```

When used, this option causes library listing files to be written using the specified encoding (character set). The `<encoding>` parameter must be one of the encoding names supported by the librarian, use the `"cerlib -Help:Encodings"` command to list supported encodings.

If this option is not specified, library listing files are written using the "native" character set of the host OS. The same effect can be achieved by using this option with a special `native` parameter, as in

```
-ListingEncoding:Native
```

4.12 -Locale

This option has the following format:

```
-Locale:<locale ID>
```

When used, this option causes all librarian messages and diagnostics to be written using the specified locale instead of the default locale. The `<locale ID>` can have one of the following forms:

- `-Locale:<language>`, where `<language>` is a 2-letter ISO-639 language code – causes librarian messages to be written using the neutral locale for the specified language.
- `-Locale:<language>_<country>`, where `<language>` is a 2-letter ISO-639 language code and `<country>` is a 2-letter ISO-3166 country code – causes librarian messages to be written using the culture locale for the specified language and country.
- `-Locale:<language>_<country>_<variant>`, where `<language>` is a 2-letter ISO-639 language code, `<country>` is a 2-letter ISO-3166 country code and `<variant>` is an arbitrary locale variant string –

causes librarian messages to be written using the full locale for the specified language, country and variant.

- `-Locale:Native` – causes librarian messages to be written using the “native” locale of the host OS.
- `-Locale:Invariant` – causes librarian messages to be written using an invariant (culture-independent) locale.

If this option is not specified, the `-Locale:Invariant` is assumed. An attempt to instruct the librarian to produce output and messages using a locale for which the librarian message file is not available causes the locale’s parent to be used; if there is no message file for that parent locale, then its parent is used in turn, etc; if all else fails, an invariant locale is used for librarian output and messages.

4.13 -Output

This option has the following format:

```
-Output: <destination>
```

When used, this option causes the resulting object library to be written to the specified destination.

Depending on the exact form of the option’s parameter, the output file may be written to several different locations:

- If the `<destination>` parameter is not specified, the name of the output file is the same as the name of the input file, i.e. each object library is overwritten with the result of its modification.
- If the `<destination>` parameter is specified and ends with a path component separator, it is assumed to refer to a directory where the output file shall be written; the name of the output file is the same as the name of each input file. Non-absolute directory names are considered to be relative to the current working directory, not to the librarian source file’s location.
- If the `<destination>` parameter is specified and does not end with a path component separator, it is assumed to refer to an output file itself. Non-absolute file names are considered to be relative to the current working directory, not to the librarian source file’s location.

4.14 -Progress

This option has the following format:

```
-Progress[ : {On|Off} ]
```

When used, this option turns on (`-Progress:On`) or off (`-Progress:Off`) the printing of object module names as they are processed; a default form `-Progress` is equivalent to `-Progress:On`, while the default librarian behaviour is not to emit progress messages.

4.15 -Quiet

This option has the following format:

```
-Quiet[:{On|Off}]
```

The `-Quiet:On` option is a shortcut for the `-Banner:Off -Progress:Off` and `-Statistics:Off` option combination. Similarly, the `-Quiet:Off` option is a shortcut for the `-Banner:On -Progress:On` and `-Statistics:On` option combination.

4.16 -Remove

This option has the following format:

```
-Remove:<member name>
```

Where `<member name>` is a name of an object library's member. The specified member is removed from the object library. If the object library does not contain a member with the specified name, a warning is issued.

4.17 -Replace

This option has the following format:

```
-Replace:<filename>
```

Where `<filename>` is a name of an object file or an object library file. The type of the file designated by `<filename>` is inferred from the file's contents, *not* the filename extension.

If `<filename>` refers to an object file, the object file is added to the created object library. All path information is stripped (i.e. only file name is retained as a library member name). If the library already contains a member with the same name, it is replaced with the newly added object file.

If `<filename>` refers to an object library, all members of that library are added to the created object library. If the destination library already contains members with the same names as members of the added library, those members are replaced.

If `<filename>` refers to some other type of file (i.e. neither object file nor object library), that file is added to the library just like an object file would. However, not being an object file, the corresponding library member will not export any global symbols.

4.18 -Statistics

This option has the following format:

```
-Statistics[:{On|Off}]
```

When used, this option turns on (`-Statistics:On`) or off (`-Statistics:Off`) the printing of processing statistics at the end of librarian invocation; a default form `-Statistics` is equivalent to `-Statistics:On`, which is also the default librarian behaviour.

4.19 -StderrEncoding

This option has the following format:

```
-StderrEncoding:<encoding>
```

When used, this option causes librarian to issue all error and warning messages using the specified encoding (character set). The `<encoding>` parameter must be one of the encoding names supported by the librarian, use the `“cerlib -Help:Encodings”` command to list supported encodings.

If this option is not specified, all error and warning messages are written using the “native” character set of the host OS. The same effect can be achieved by using this option with a special `native` parameter, as in

```
-StderrEncoding:Native
```

4.20 -StdoutEncoding

This option has the following format:

```
-StdoutEncoding:<encoding>
```

When used, this option causes librarian to issue all standard output using the specified encoding (character set). The `<encoding>` parameter must be one of the encoding names supported by the librarian, use the `“cerlib -Help:Encodings”` command to list supported encodings.

If this option is not specified, all standard output written by the librarian uses the “native” character set of the host OS. The same effect can be achieved by using this option with a special `native` parameter, as in

```
-StdoutEncoding:Native
```

4.21 -Target

This option has the following format:

```
-Target:<target platform>
```

When used, this option instructs the librarian to produce a library for the specified target. Use the `“cerlib -Help:Targets”` command to list supported targets.

If the target is not explicitly specified from the command line, the librarian assumes the most permissive target (i.e. all features enabled).

4.22 -Update

This option has the following format:

```
-Update:<filename>
```

Where <filename> is a name of an object file or an object library file. The type of the file designated by <filename> is inferred from the file's contents, *not* the filename extension.

The -Update option is similar to the -Replace option, except existing library members are not replaced unless the <filename> has newer time stamp than the corresponding library member.

If <filename> refers to an object file, the object file is added to the created object library. All path information is stripped (i.e. only file name is retained as a library member name). If the library already contains a member with the same name, it is replaced with the newly added object file.

If <filename> refers to an object library, all members of that library are added to the created object library. If the destination library already contains members with the same names as members of the added library, those members are replaced.

If <filename> refers to some other type of file (i.e. neither object file nor object library), that file is added to the library just like an object file would. However, not being an object file, the corresponding library member will not export any global symbols.

4.23 -Via

This option has the following format:

```
-Via:<option file name>
```

When used, this option instructs the librarian to read the specified option file and process all command line options contained therein as if they were specified directly in the librarian's command line in place of a -Via option.

Option files are assumed to be text files that use a "native" character set of the host OS; however, it is possible to instruct the librarian to use a different encoding for option files with the -ViaEncoding option.

Option files can contain within them references to other option files (i.e. -Via options are permitted within option files) as long as option file references do not form a cycle.

4.24 -ViaEncoding

This option has the following format:

```
-ViaEncoding:<encoding>
```


When used, this option causes librarian to assume that all option files use the specified encoding (character set). The `<encoding>` parameter must be one of the encoding names supported by the librarian, use the “`cerlib - Help:Encodings`” command to list supported encodings.

If this option is not specified, all option files are assumed to be using the “native” character set of the host OS. The same effect can be achieved by using this option with a special `native` parameter, as in

```
-ViaEncoding:Native
```

4.25 -WarningAsError

This option has the following format:

```
-WarningAsError:<warning ID>[,<warning ID> ...]
```

When used, this option causes warnings with the specified ID to be treated as errors. Any number of comma-separated warning IDs can be specified in the same `-WarningAsError` option; similarly, it is permitted to have more than one `-WarningAsError` option in the same command line. In particular, a warning issued as an error causes the librarian to exit with a nonzero exit code, signalling a processing error.

Note that treatment of certain (or all) warnings as errors does not affect warning filtering – a warning message simply becomes an error message *if* it is decided that a warning message must be issued.

4.26 -WarningAsWarning

This option has the following format:

```
-WarningAsWarning:<warning ID>[,<warning ID> ...]
```

When used, this option causes warnings with the specified ID to *not* be treated as errors. Any number of comma-separated warning IDs can be specified in the same `-WarningAsWarning` option; similarly, it is permitted to have more than one `-WarningAsWarning` option in the same command line.

Note that treatment of certain (or all) warnings as errors does not affect warning filtering – a warning message simply becomes an error message *if* it is decided that a warning message must be issued.

4.27 -WarningLevel

This option has the following format:

```
-WarningLevel:{0|1|2|3|4}
```

When used, this option selects the specified warning level. Generally, the higher the warning level the more warnings are issued; warning level 0 causes all warnings to be suppressed, while warning level 4 causes all warnings to be reported.

If the option is not specified, the default warning level is 2.

4.28 -WarningsAsErrors

This option has the following format:

```
-WarningsAsErrors[ : {On|Off} ]
```

When used, this option turns on (`-WarningsAsErrors:On`) or off (`-WarningsAsErrors:Off`) the treatment of all warnings as errors; a default form `-WarningsAsErrors` is equivalent to `-WarningsAsErrors:On`, while `-WarningsAsErrors:Off` is the librarian default. In particular, a warning issued as an error causes the librarian to exit with a nonzero exit code, signalling a processing error.

Note that treatment of certain (or all) warnings as errors does not affect warning filtering – a warning message simply becomes an error message *if* it is decided that a warning message must be issued.

5 Appendix A: GNU Free Documentation License

Version 1.2, November 2002

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