BAWT - Build Automation With Tcl

1 Introduction

BAWT is a configurable framework written in ***Tcl*** for building ***C/C++*** based software libraries from source code without user interaction. Its main usage is for the ***Windows*** operating system, where heterogeneous build environments and compilers are needed (or wanted) to build these libraries:

- `configure/make` (via MSYS / MinGW)
- `nmake`
- `CMake`
- `Visual Studio Solutions`

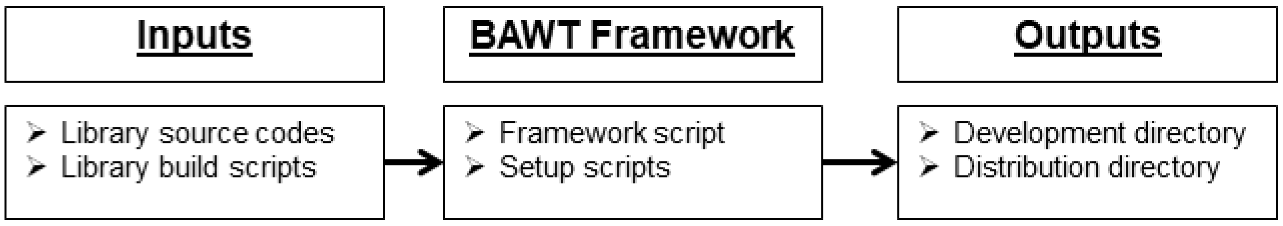
- `gcc` (via MSYS / MinGW)
- `Visual Studio`

Due to the portable nature of ***Tcl*** the framework can be used on ***Linux*** and ***Darwin*** as well using the `configure/make/gcc` build chain.

The libraries currently supported by ***BAWT*** are mainly from the ***Tcl*** and ***OpenSceneGraph*** domain. For these two domains the framework supports creating installation executables on Windows based on ***InnoSetup*** and simple shell-based installation programs for Linux and Darwin.

See chapter *8 Supported Libraries* for a list of currently supported libraries.

The framework itself is just one plain Tcl file *Bawt.tcl*, which reads a *Setup* file containing all the libraries to be built. Each library must have an accompanying *Build* file, which contains the details on how to extract, configure, compile and distribute the library. The library itself is stored as one or more zipped source code files, which may contain different versions of the library. The generated shared or static libraries, programs and header files are finally copied into ready-to-use directory structures for use by developers or for software distribution.



The ***BAWT*** framework (including *Bootstrap* and *Setup* files) as well as the needed MSYS/MinGW files (if running on Windows) must be downloaded manually. You do not need to have Tcl installed to execute the framework. ***BAWT*** comes with Tclkits (single-file Tcl interpreter) for Windows, Linux and Darwin. The library *Build* and source files can be downloaded automatically on demand.

The ***BAWT*** homepage is at https://www.tcl3d.org/bawt.
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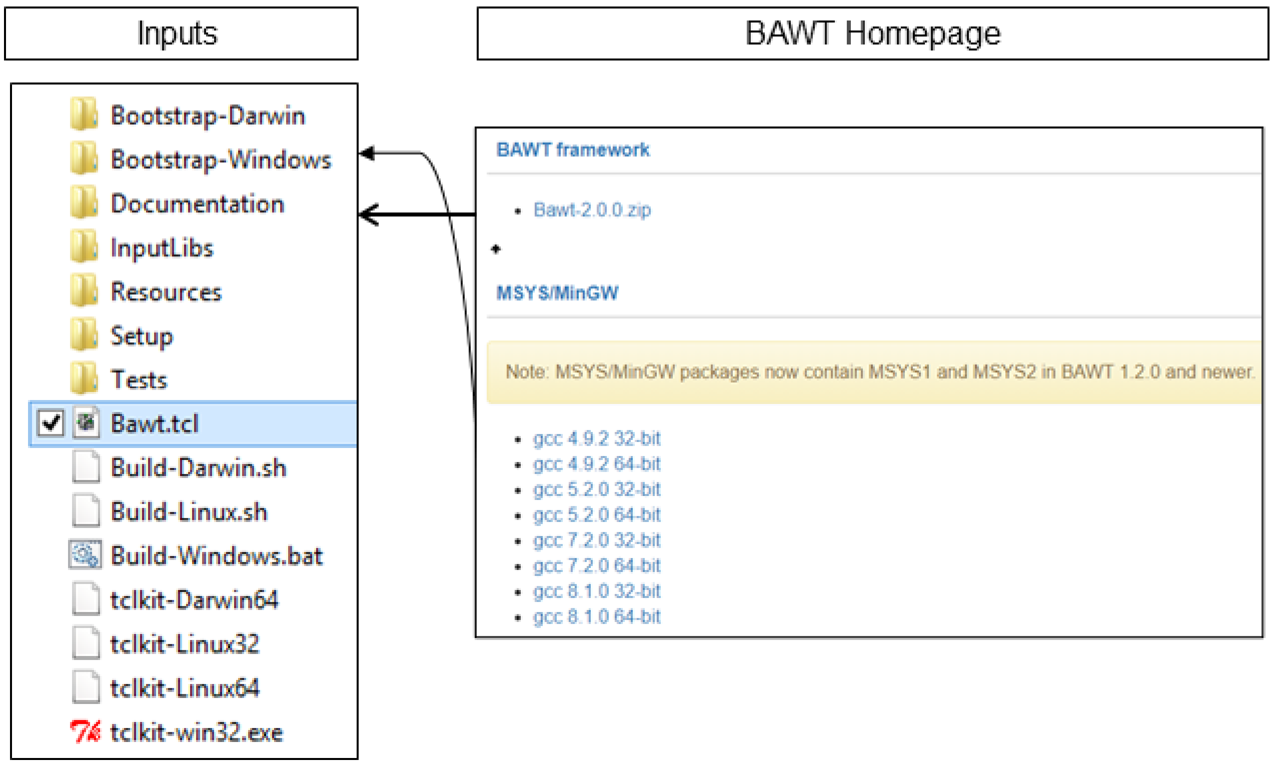
2 Installation and Usage Examples

This chapter explains the installation of the ***BAWT*** framework and gives first simple use cases.
BAWT related downloads are available at https://www.tcl3d.org/bawt/download.html.



2.1 Installation on Windows

Prerequisites:

- None for building libraries supporting MSYS / MinGW.
- Otherwise, Visual Studio (Express, Community or Professional).
    - Visual Studio Versions 2008, 2010, 2013, 2015, 2017, 2019 and 2022 are currently supported.
    - If Visual Studio is not installed in the standard location, you have to use procedure `SetVcvarsProg` with the absolute path to batch script *vcvarsall.bat*.

Downloads:

- ***BAWT*** framework *Bawt-2.3.1.zip*
- MSYS / MinGW distribution file(s), ex. *gcc7.2.0_x86_64-w64-mingw32.7z*

Installation:

- Extract ***BAWT*** framework *Bawt-2.3.1.zip* in a directory of choice, ex. *C:\Bawt*
- Copy MSYS / MinGW distribution file(s) into *C:\Bawt\Bawt-2.3.1\Bootstrap-Windows*
- Open command shell window and go into directory *C:\Bawt\Bawt-2.3.1*

Usage examples:

- Create basic Tcl packages for 32-bit (using only MSYS / MinGW):

```
> Build-Windows.bat x86 gcc Setup\Tcl_Basic.bawt update
```

- Create basic Tcl packages for 64-bit (using only MSYS / MinGW):

```
> Build-Windows.bat x64 gcc Setup\Tcl_Basic.bawt update
```

- Create extended Tcl packages including InnoSetup installation executable for 64-bit (using Visual Studio 2019 to build Tcl packages supporting Visual Studio like *Mpexpr* and *tkdnd*):

```
> Build-Windows.bat x64 vs2019+gcc Setup\Tcl_Distribution.bawt update
```

2.2 Installation on Linux

Prerequisites:

- Required: `C/C++` development package, `curl, p7zip`
- Optional: Dependent on the libraries. See below for distribution specific examples.

Downloads:

- ***BAWT*** framework *Bawt-2.3.1.zip*

Installation:

- Extract ***BAWT*** framework *Bawt-2.3.1.zip* in a directory of choice, ex. */opt/Bawt*
- Open shell (Terminal window), go into created directory */opt/Bawt Bawt-2.3.1* and execute:

```
> chmod u+x Build*.sh

> chmod u+x tclkit*
```

Usage examples:

- Create basic Tcl packages for 32-bit:

```
> ./Build-Linux.sh x86 Setup/Tcl_Basic.bawt update
```

- Create extended Tcl packages including simple shell-based installation script for 64-bit:

```
> ./Build-Linux.sh x64 Setup/Tcl_Distribution.bawt update
```

Distribution specific prerequisites:

See chapter 3.2 Setup Files for a list of available Setup files and the dependencies between Setup files. If you want to build ex. *Tcl_Extended.bawt*, you must not only install the prerequisites of this Setup file, but also the prerequisites of the dependent Setup file *Tcl_Basic.bawt*.

Debian 11.6 Bullseye (gcc 10.2.1)

- Install default Debian 11.6 desktop distribution (ex. *debian-11.6.0-amd64-DVD-1.iso*)
- Use `Synaptic` to install further packages:

Setup file	Debian package	Needed by library
All	`build-essential`	All C/C++ based libraries.
	`curl`	BAWT framework.
	`p7zip`	
Tcl_Basic.bawt	`libx11-dev`	`Tk`
	`libcairo2-dev`	`tkpath`
	`libglx-dev`	`Canvas`
	`libglu1-mesa-dev`	
	`libasound2-dev`	`Snack`
Tcl_Extended.bawt	`libxrandr-dev`	`tcl3dBasic`
	`libpython3.9-dev`	`tclpy`

	python3-numpy	
	libxcursor-dev	tkdnd
Tcl3D.bawt	libxi-dev libxinerama-dev	glfw
OSG_Extended.bawt	freeglut3-dev	Cal3D
MiscLibs.bawt	bison flex	CERTI

Ubuntu 22.04 (gcc 11.3.0)

- Install default Ubuntu 22.04 desktop distribution (ex. *ubuntu-22.04.1-desktop-amd64.iso*)
- Use `Synaptic` to install further packages:

Setup file	Ubuntu package	Needed by library
All	build-essential	All C/C++ based libraries.
	curl p7zip	BAWT framework.
Tcl_Basic.bawt	libx11-dev	Tk
	libcairo2-dev	tkpath
	libglx-dev libglu1-mesa-dev	Canvas
	libasound2-dev	Snack
Tcl_Extended.bawt	libxrandr-dev	tcl3dBasic
	libpython3.10-dev python3-numpy	tclpy
	libxcursor-dev	tkdnd
Tcl3D.bawt	libxi-dev libxinerama-dev	glfw
OSG_Extended.bawt	freeglut3-dev	Cal3D

SUSE 15.4 (gcc 7.5.0)

- Install default SUSE 15.4 desktop distribution (ex. *openSUSE-Leap-15.4-CR-DVD-x86_64-Build31.38-Media.iso*)
- Use `Yast` to install further packages:

Setup file	SUSE schema	Needed by library
All	General development C++ development	All C/C++ based libraries.
Setup file	**SUSE package**	**Needed by library**
Tcl_Basic.bawt	libx11-devel	Tk
	cairo-devel	tkpath
	alsa-devel	Snack
Tcl_Extended.bawt	glu-devel libxrandr-devel	tcl3dBasic

	python3-devel python3-numpy	tclpy
	libxcursor-devel	tkdnd
Tcl3D.bawt	libxi-devel libxinerama-devel	glfw
OSG_Extended.bawt	freeglut3-devel	Cal3D

2.3 Installation on Darwin

Prerequisites:

- `XCode`
- `curl` (should be available by default on Darwin)

Downloads:

- ***BAWT*** framework *Bawt-2.3.1.zip*

Installation:

- Extract ***BAWT*** framework *Bawt-2.3.1.zip* in a directory of choice, ex. */opt/Bawt*
- Open shell (Terminal window), go into created directory */opt/Bawt Bawt-2.3.1* and execute:

```
> chmod u+x Build*.sh
> chmod u+x tclkit*
```

Usage examples:

Note, that Darwin does not support 32-bit programs.
Replace `Build-Darwin.sh` with `Build-Darwin-arm64.sh` when using an ARM based system.

- Create basic Tcl packages for 64-bit:

```
> ./Build-Darwin.sh Setup/Tcl_Basic.bawt update
```

- Create extended Tcl packages including simple shell-based installation script for 64-bit:

```
> ./Build-Darwin.sh Setup/Tcl_Distribution.bawt update
```

2.4 Use of Batch Scripts

As the ***BAWT*** framework is generic and has lots of command line options (see chapter *7 Command Line Options*), a batch or shell script for each supported platform is included in the distribution for ease of usage in the most common use cases:

- `Build-Windows.bat`
- `Build-Linux.sh`
- `Build-Darwin.sh`

These batch scripts have been used in the examples of the previous chapters and may serve as starting point for your own batch scripts suited exactly to your needs.

Batch script *Build-Windows.bat*

```
@echo off
setlocal

rem Default values for some often used options.
```

```
set OUTROOTDIR=../BawtBuild
set TCLKIT=tclkit-win32.exe
set NUMJOBS=%NUMBER_OF_PROCESSORS%

rem First 4 parameters are mandatory.
if "%1" == "" goto ERROR
if "%2" == "" goto ERROR
if "%3" == "" goto ERROR
if "%4" == "" goto ERROR

set ARCH=%1
set COMPILER=%2
set SETUPFILE=%3
set ACTION=%4
shift
shift
shift
shift

rem If no target is given, use target "all".
if "%1"=="" goto BUILDALL

rem Loop through the rest of the parameter list for targets.
set TARGETS=
:PARAMLOOP
rem There is a trailing space in the next line. It's there for formatting.
set TARGETS=%TARGETS%%1
shift
if not "%1"=="" goto PARAMLOOP
goto BUILD

:BUILDALL
if "%ACTION%"=="clean"    goto WARNING
if "%ACTION%"=="complete" goto WARNING

set TARGETS=all

:BUILD

set ACTION=--%ACTION%
set BAWTOPTS=--rootdir %OUTROOTDIR% ^
             --architecture %ARCH% ^
             --compiler %COMPILER% ^
             --numjobs %NUMJOBS% ^
             --logviewer

rem Build all libraries as listed in Setup file.
CALL %TCLKIT% Bawt.tcl %BAWTOPTS% %ACTION% %SETUPFILE% %TARGETS%

goto EOF

:WARNING
echo Warning: This may clean or rebuild everything.
echo Use "clean all" or "complete all" to allow this operation.

:ERROR
echo.
echo Usage: %0 Architecture Compiler SetupFile Action [Target1] [TargetN]
echo   Architecture    : x86 x64
echo   Compiler        : gcc vs2008 vs2010 vs2013 vs2015 vs2017 vs2019 vs2022
echo                     gcc+vs20XX vs20XX+gcc
echo   Actions         : clean extract configure compile distribute finalize
echo                     list complete update simulate touch
echo   Default target  : all
echo   Output directory: %OUTROOTDIR%
```

```
echo.

:EOF
```

See also chapter *5.5 Advanced Batch Scripts* for examples of more complex batch scripts.

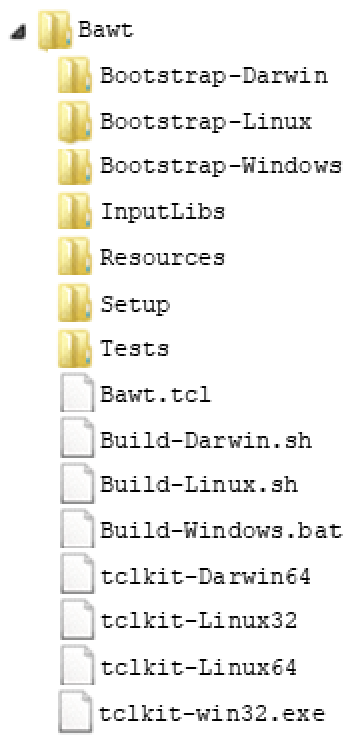
3 Directory and File Structure

This chapter explains the directory structure of the input and output files as well as the contents and structure of the *Setup* and *Build* files.

3.1 Directory Structure

3.1.1 Structure of the input directories

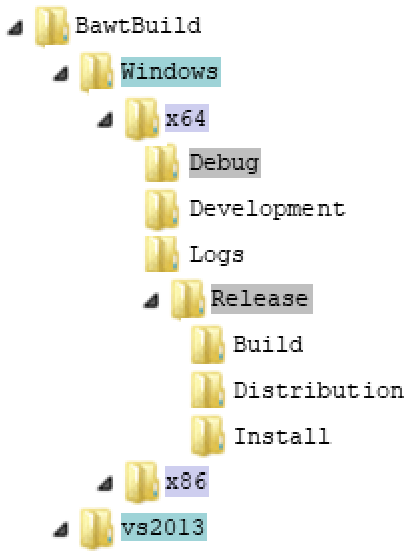
If ***BAWT*** was downloaded and installed according to the instructions in chapter *2 Installation and Usage*, the following directory structure should exist.



```
Bawt
    Bootstrap-Darwin
    Bootstrap-Linux
    Bootstrap-Windows
    InputLibs
    Resources
    Setup
    Tests
    Bawt.tcl
    Build-Darwin.sh
    Build-Linux.sh
    Build-Windows.bat
    tclkit-Darwin64
    tclkit-Linux32
    tclkit-Linux64
    tclkit-win32.exe
```

The *Bootstrap* directories contain zipped versions of the `7-zip` program for Windows and Darwin and zipped versions of the `zip` program for Windows and Linux.
In directory *Bootstrap-Windows* there should be at least one version of the MSYS/MinGW distributions, which you must have downloaded manually.
Directory *InputLibs* contains the zipped source code versions of the libraries and the associated *Build* files, see chapter *3.3 Build Files* for a detailed description of *Build* files. Note, that this directory is empty after a fresh installation of ***BAWT***, because the corresponding files are downloaded on demand at the first start of a ***BAWT*** build by default. See chapter *5 Build Process* on how to avoid automatic downloads and updates.
The *Setup* files (see chapter *3.2 Setup Files*) supplied with ***BAWT*** are located in directory *Setup*.
Directory *Tests* contains several simple test scripts for checking correct compilation and installation of Tcl related packages.
For each supported platform there is also a Tclkit executable supplied, which is needed to run the ***BAWT*** framework, if no Tcl interpreter is available on your machine (Bootstrapping). A Tclkit is a single-file Tcl interpreter executable.

3.1.2 Structure of the output directories



The root directory of the output files of a ***BAWT*** build (*BawtBuild* in the above example) can be specified with command line option `--rootdir`. In a *Build* script this directory can be queried with Tcl procedure *`GetOutputRootDir`*.
Beneath the root build directory there can be several directories named according to the build environment used: *Windows*, *Linux*, *Darwin* for builds with *gcc* or *vs2008, vs2010, vs2013*, *vs2015, vs2017, vs2019 or vs2022*, if a Visual Studio version was used for building.

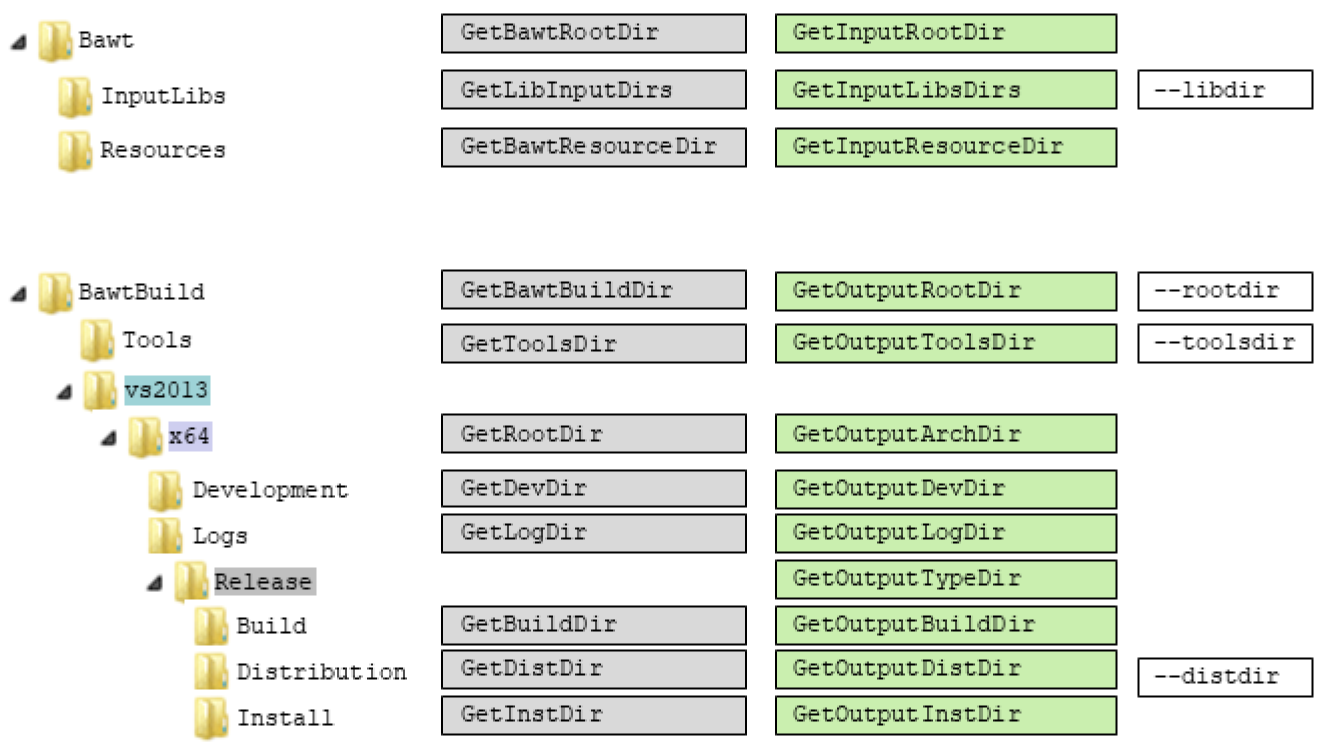
Beneath these environment specific directories two directory names can appear, depending on the build architecture: *x86* for 32-bit or *x64* for 64-bit builds.
In these architecture specific directories 3 to 4 subdirectories are contained.

The *Logs* directory contains the overall build log file *_BawtBuild.log* as well as the library specific build log files. See chapter *6 Logging* for an in-depth explanation of ***BAWT*** logging functionality.

The *Development* directory contains all the files needed for a developer using the built libraries.
Depending on the specified build types, directories called *Release* and *Debug* will be created. These directories contain the *Build* and *Install* subdirectories, where the actual sources are extracted and built as well as a *Distribution* subdirectory, which will contain all files needed for a software distribution of the compiled libraries.
The *Distribution* and *Development* directories contain mostly identical content. The *Development* directory typically contains additional library include files and import files (**.lib*). It is the task of the library specific *Build* file to copy the needed files into the *Distribution* and *Development* directories.

3.1.3 Directory access

The next figure shows the input and output directory hierarchy together with the procedures which can be used to get the path to the corresponding directory. The first procedure column (grey boxes) shows the names used in BAWT versions prior to 1.0, the second column (green boxes) shows the names as used by BAWT 1.0 and newer.
The last column shows the available command line options to change the location of a specific input or output directory.



The library search paths, which can be obtained with procedure *`GetInputLibsDirs`* are set at BAWT start-up to the following values:

- `file join [GetInputRootDir] "InputLibs"`
- `file join [pwd] "InputLibs"`

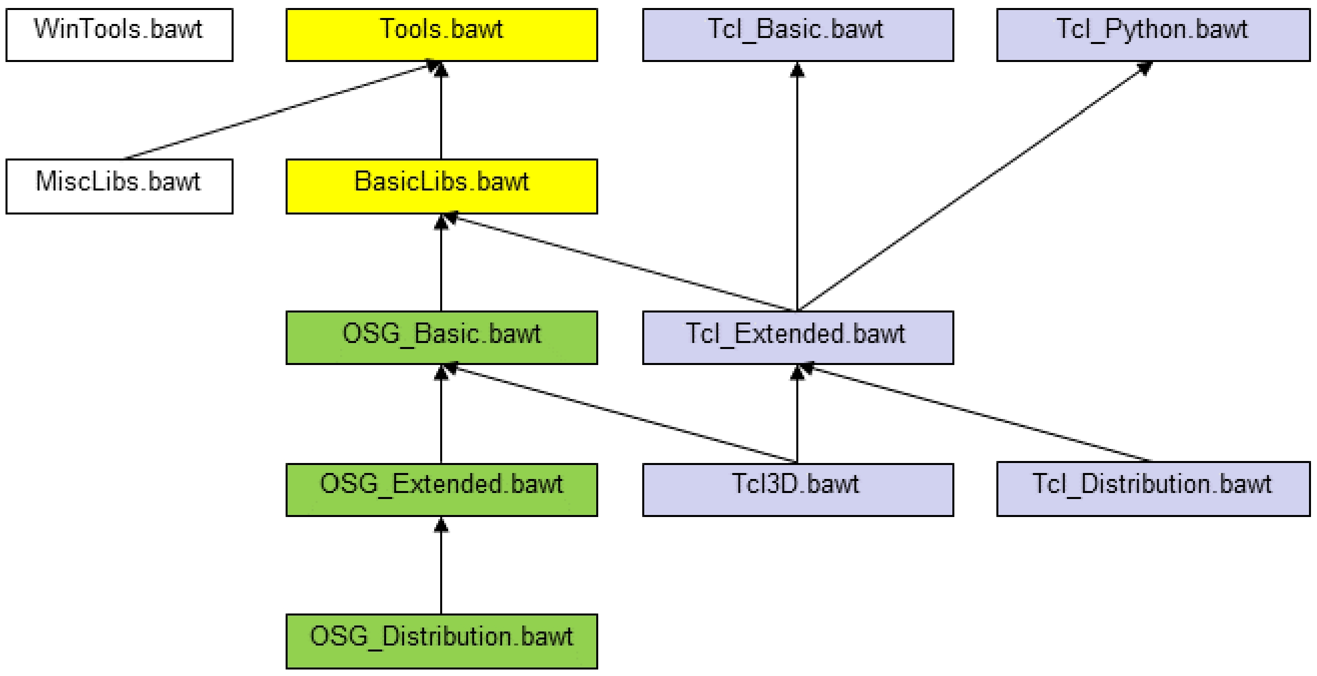
This list can be extended by using command line option --libdir.

If command line option --nosubdirs is specified, procedures *`GetOutputArchDir`* and *`GetOutputRootDir`* return the same directory path.

See chapter *4 Build Stages* for an in-depth tour through the directory structure of ***BAWT*** in conjunction with the different build stages.

3.2 Setup Files

The following figure shows all available *Setup* files and their dependencies.



For the ***Tcl*** ecosystem the following *Setup* files are currently supported.

Tcl_MinimalDist.bawt	Builds Tcl, Tk and creates an InnoSetup based setup file on Windows or an installation shell script on Unix.
Tcl_Basic.bawt	Builds Tcl, Tk, Tclkit and Tcl/Tk packages, which do not depend on 3rd party libraries. On Windows all libraries can be compiled with MSYS/MinGW.
Tcl_Python.bawt	Extracts the binary Python distribution on Windows and builds the tclpy package.
Tcl_Extended.bawt	Builds all libraries of *Tcl_Basic.bawt, Tcl_Python.bawt* and Tcl/Tk packages which depend on 3rd party libraries, like SWIG, CMake, libressl or image libraries. On Windows all libraries can be compiled with MSYS/MinGW.
Tcl3D.bawt	Builds all libraries of *Tcl_Extended.bawt* and the extended version of Tcl3D, which depends on 3rd party libraries like OpenSceneGraph, SDL, FTGL.
Tcl_Distribution.bawt	Builds all libraries of *Tcl_Extended.bawt* and creates an InnoSetup based setup file on Windows or an installation shell script on Unix.

For the ***OpenSceneGraph*** ecosystem the following *Setup* files are currently supported.

OSG_Basic.bawt	Builds OpenSceneGraph with basic plugin libraries as needed by Tcl3D. On Windows all libraries can be compiled with MSYS/MinGW.
OSG_Extended.bawt	Builds all libraries of *OSG_Basic.bawt* and builds OpenSceneGraph with extended plugin libraries, as well as libraries depending on OpenSceneGraph like osgEarth.
OSG_Distribution.bawt	Builds all libraries of *OSG_Extended.bawt* and creates an InnoSetup based setup file on Windows or an installation shell script on Unix.

Both the ***OpenSceneGraph*** ecosystem as well as the extended ***Tcl*** versions need special tools for building or basic libraries they depend upon.

Tools.bawt	Builds tools needed for building of libraries, like CMake or SWIG.
BasicLibs.bawt	Builds basic libraries needed by other libraries like several image libraries, zlib, freetype, ffmpeg and libressl.

There are two other *Setup* files not directly related to one of the above-mentioned ecosystems.

WinTools.bawt	Convenience tools for Windows supplied as precompiled binaries like Vim or Doxygen.
MiscLibs.bawt	Builds miscellaneous libraries not directly related to Tcl or OpenSceneGraph like mathematical, geographical or XML libraries.

See the tables at the end of this chapter for the detailed content of the *Setup* files.

Setup files are standard Tcl script files. They must have one or more calls to the ***BAWT*** *`Setup`* procedure for each library being built. Optionally one or more calls to the ***BAWT*** *`Include`* procedure can be specified to add dependent libraries.

The *`Setup`* procedure has the following signature:

```
proc Setup { libName zipFile buildFile args }
```

The following 3 mandatory parameters must be specified:
- `libName:` Library name.
- `zipFile:` Zipped library source file or library source directory.
- `buildFile:` File containing build script for the library (see next chapter).

The following optional build parameters are currently supported:

`Release`	Build the Release version of the library. This is the default.
`Debug`	Build the Debug version of the library. Note, that not all libraries may support Debug mode.
`NoWindows`	Do not build the library on Windows.
`NoLinux`	Do not build the library on Linux.
`NoDarwin`	Do not build the library on Darwin.
`NoDarwin-arm`	Do not build the library on ARM based Darwin.
`NoDarwin-intel`	Do not build the library on Intel based Darwin.
`WinCompiler=winCompiler`	Specify the Windows compiler to use. Valid Windows compiler names are: `gcc`, `vs`. Note, that the *Build* file must have support for both Visual Studio and MSYS/MinGW instructions.
`ForceVS (Deprecated)`	Force using Visual Studio instead of using MSYS/MinGW. Note, that the *Build* file must have support for both Visual Studio and MSYS/MinGW instructions.
`Version=X.Y.Z`	Specify or override a version string for the library. Use this option, if building a library from a directory (ex. your repository workspace), which does not have a version number included in the directory name.
`MaxParallel=Platform:NumJobs`	Specify the number of parallel build jobs for a specific platform. Some build systems do not work correctly with lots of parallel builds. Valid platform names are: `Windows`, `Linux`, `Darwin`. The platform name may be optionally appended by the compiler type `vs` or `gcc`. Example: `MaxParallel=Windows-gcc:2`
`NoParallel=Platforms (Deprecated)`	Specify platforms as comma separated list for which parallel builds should be disabled. Valid platform names are: `Windows`, `Linux`, `Darwin`.

`All other strings`	Strings not matching any of the above patterns are interpreted as a user configuration string. User configuration strings are either appended to the `CMake` or `configure` commands of the library or can be evaluated by the Build script. See chapter *3.3.2 User configurable build files* for a description of user configuration strings.

The next tables list the contents of the currently available *Setup* files.

Setup file Tools.bawt

```
# Builds tools needed for building of libraries, like CMake or SWIG.

# Setup LibName  ZipFile                  BuildFile        BuildOptions

Setup CMake      CMake-3.21.4.7z          CMake.bawt
Setup pkgconfig  pkgconfig-0.29.2.7z      pkgconfig.bawt
Setup SWIG       SWIG-4.1.1.7z            SWIG.bawt
Setup yasm       yasm-1.3.0.7z            yasm.bawt
```

Setup file BasicLibs.bawt

```
# Builds basic libraries needed by several other libraries.

Include "Tools.bawt"

# All of the following libraries can be compiled on Linux or Darwin,
# but it is better to use the system provided libraries.

# Setup LibName ZipFile            BuildFile       BuildOptions

# Basic library needed by most other libraries.
Setup ZLib      ZLib-1.2.13.7z     ZLib.bawt       NoLinux NoDarwin
Setup xz        xz-5.2.7.7z        xz.bawt         NoLinux NoDarwin

# Basic Image libraries.
Setup giflib    giflib-5.2.1.7z    giflib.bawt     NoLinux
Setup libwebp   libwebp-1.2.4.7z   libwebp.bawt    NoLinux
Setup JPEG      JPEG-9.e.7z        JPEG.bawt       NoLinux NoDarwin
Setup openjpeg  openjpeg-2.5.0.7z  openjpeg.bawt
Setup PNG       PNG-1.6.38.7z      PNG.bawt        NoLinux MaxParallel=Windows-gcc:1
Setup TIFF      TIFF-4.4.0.7z      TIFF.bawt       NoLinux NoDarwin

Setup ffmpeg    ffmpeg-4.4.1.7z    ffmpeg.bawt

Setup Freetype  Freetype-2.10.4.7z Freetype.bawt   NoLinux NoDarwin
Setup libressl  libressl-2.9.2.7z  libressl.bawt

if { [UseVisualStudio "primary"] && [GetVisualStudioVersion] <= 2008 } {
    # Visual Studio 2008
    Setup SDL   SDL-2.0.4.7z       SDL.bawt
} elseif { [UseVisualStudio "primary"] && [GetVisualStudioVersion] == 2010 } {
    # Visual Studio 2010
    Setup SDL   SDL-2.0.8.7z       SDL.bawt
} else {
    Setup SDL   SDL-2.26.1.7z      SDL.bawt
}
```

Setup file Tcl_MinimalDist.bawt

```
# Builds just Tcl and Tk and creates a distribution setup file.

# Setup LibName  ZipFile                  BuildFile  BuildOptions

# Tcl and Tk.
Setup Tcl        Tcl-[GetTclVersion].7z   Tcl.bawt
Setup Tk         Tk-[GetTkVersion].7z    Tk.bawt

# Tcl/Tk distribution as InnoSetup installer.
Setup InnoSetup  InnoSetup-6.2.0.7z      InnoSetup.bawt
Setup SetupTcl   SetupTcl.7z             SetupTcl.bawt
```

Setup file Tcl_Basic.bawt

```
# Builds Tcl, Tk, Starkit and Tcl/Tk packages, which do not depend on 3rd party libraries.
# On Windows all libraries can be compiled with MSys/MinGW.

# Setup LibName         ZipFile                        BuildFile           BuildOptions

# Tcl/Tk, stubs and manual.
Setup Tcl               Tcl-[GetTclVersion].7z         Tcl.bawt
Setup TclStubs          Tcl-[GetTclVersion].7z         TclStubs.bawt
Setup Tk                Tk-[GetTkVersion].7z           Tk.bawt
Setup TkStubs           Tk-[GetTkVersion].7z           TkStubs.bawt
Setup TclTkManual       TclTkManual.7z                 TclTkManual.bawt

# Compiled Tcl packages.
Setup critcl            critcl-3.2.7z                  critcl.bawt
Setup expect            expect-5.45.4.7z               expect.bawt
Setup DiffUtil          DiffUtil-0.4.2.7z              DiffUtil.bawt
Setup memchan           memchan-2.3.7z                 memchan.bawt
Setup Mpexpr            Mpexpr-1.2.7z                  Mpexpr.bawt
Setup nacl              nacl-1.1.7z                    nacl.bawt
Setup nsf               nsf-2.4.0.7z                   nsf.bawt
Setup oratcl            oratcl-4.6.7z                  oratcl.bawt
Setup parse_args        parse_args-0.3.3.7z            parse_args.bawt
Setup rl_json           rl_json-0.11.5.7z              rl_json.bawt
Setup tbcload           tbcload-1.7.1.7z               tbcload.bawt
Setup tclcompiler       tclcompiler-1.7.3.7z           tclcompiler.bawt
Setup tclcsv            tclcsv-2.3.7z                  tclcsv.bawt
Setup tclparser         tclparser-1.8.7z               tclparser.bawt
Setup tclvfs            tclvfs-1.4.2.7z                tclvfs.bawt
Setup tclx              tclx-8.4.4.7z                  tclx.bawt
Setup tdom              tdom-0.9.3.7z                  tdom.bawt
Setup trofs             trofs-0.4.9.7z                 trofs.bawt
Setup tserialport       tserialport-1.1.7z             tserialport.bawt
MaxParallel=Windows-gcc:1
Setup udp               udp-1.0.11.7z                  udp.bawt
Setup vectcl            vectcl-0.2.7z                  vectcl.bawt

# Compiled Tk packages.
Setup Canvas3d          Canvas3d-1.2.2.7z              Canvas3d.bawt
Setup Img               Img-[GetImgVersion].7z         Img.bawt
Setup imgtools          imgtools-0.3.7z                imgtools.bawt
Setup itk               itk-4.1.0.7z                   itk.bawt
Setup iwidgets          iwidgets-4.1.1.7z              iwidgets.bawt
Setup photoresize       photoresize-0.2.7z             photoresize.bawt
Setup poImg             poImg-2.0.2.7z                 poImg.bawt
Setup Snack             Snack-2.2.11.7z                Snack.bawt
Setup Tix               Tix-8.4.3.7z                   Tix.bawt            NoDarwin
Setup Tkhtml            Tkhtml-3.0.1.7z                Tkhtml.bawt
Setup tkpath            tkpath-0.3.3.7z                tkpath.bawt         NoDarwin
Setup tksvg             tksvg-0.12.7z                  tksvg.bawt
Setup Tktable           Tktable-2.11.7z                Tktable.bawt
Setup treectrl          treectrl-2.4.1.7z              treectrl.bawt

# Compiled Tcl and Tk packages. Windows only.
Setup iocp              iocp-1.1.0.7z                  iocp.bawt
Setup rbc               rbc-0.2.7z                     rbc.bawt
Setup shellicon         shellicon-0.1.7z               shellicon.bawt
Setup twapi             twapi-4.7.2.7z                 twapi.bawt
Setup winhelp           winhelp-1.1.7z                 winhelp.bawt

# Compiled Tcl packages. Darwin only.
Setup Tcladdressbook    Tcladdressbook-1.2.4.7z        Tcladdressbook.bawt
Setup Tclapplescript    Tclapplescript-2.2.7z          Tclapplescript.bawt
Setup tclAE             tclAE-2.0.7.7z                 tclAE.bawt

# Pure Tcl/Tk packages.
Setup apave             apave-3.4.8.7z                 apave.bawt
Setup awthemes          awthemes-10.4.0.7z             awthemes.bawt
Setup BWidget           BWidget-1.9.16.7z              BWidget.bawt
Setup cawt              cawt-2.9.2.7z                  cawt.bawt
Setup materialicons     materialicons-0.2.7z           materialicons.bawt
Setup mentry            mentry-3.16.7z                 mentry.bawt
Setup mqtt              mqtt-3.1.7z                    mqtt.bawt
Setup ooxml             ooxml-1.6.1.7z                 ooxml.bawt
Setup pdf4tcl           pdf4tcl-0.9.4.7z               pdf4tcl.bawt
Setup pgintcl           pgintcl-3.5.1.7z               pgintcl.bawt
Setup puppyicons        puppyicons-0.1.7z              puppyicons.bawt
Setup ruff              ruff-2.3.0.7z                  ruff.bawt
Setup scrollutil        scrollutil-1.17.7z             scrollutil.bawt
Setup shtmlview         shtmlview-1.0.0.7z             shtmlview.bawt
Setup tablelist         tablelist-6.20.7z              tablelist.bawt
Setup tclargp           tclargp-0.2.7z                 tclargp.bawt
Setup tclfpdf           tclfpdf-1.5.7z                 tclfpdf.bawt
Setup tcllib            tcllib-1.21.7z                 tcllib.bawt
Setup tclws             tclws-3.4.0.7z                 tclws.bawt
Setup tkcon             tkcon-2.7.10.7z                tkcon.bawt
Setup tklib             tklib-0.7.7z                   tklib.bawt
Setup ukaz              ukaz-2.0a3.7z                  ukaz.bawt
Setup wcb               wcb-3.8.7z                     wcb.bawt
Setup windetect         windetect-1.0.0.7z             windetect.bawt
Setup tkwintrack        tkwintrack-2.0.1.7z            tkwintrack.bawt

# Tclkits.
Setup Tclkit            Tclkit.7z                      Tclkit.bawt

# Tcl programs wrapped as starpacks.
Setup gorilla           gorilla-1.6.0.7z               gorilla.bawt
Setup tclssg            tclssg-2.2.1.7z                tclssg.bawt
Setup tkchat            tkchat-1.482.7z                tkchat.bawt
Setup tksqlite          tksqlite-0.5.13.7z             tksqlite.bawt
```

Setup file Tcl_Python.bawt

```
# Builds binary Python distribution for Windows and tclpy package.

Include "Tcl_Basic.bawt"

# Setup LibName  ZipFile                    BuildFile        BuildOptions

Setup Python     Python-3.7.7-[GetBits].7z  Python.bawt      Version=3.7.7
Setup tclpy      tclpy-0.4.7z               tclpy.bawt
```

Setup file Tcl_Extended.bawt

```
# Builds Tcl/Tk packages which depend on 3rd party libraries,
# like SWIG, CMake, libressl or image libraries.

Include "Tools.bawt"
Include "BasicLibs.bawt"
Include "Tcl_Basic.bawt"
Include "Tcl_Python.bawt"

# Setup LibName          ZipFile                        BuildFile          BuildOptions
Setup   mawt             mawt-0.4.1.7z                  mawt.bawt
Setup   tcl3dBasic       tcl3d-0.9.5.7z                 tcl3dBasic.bawt
Setup   OglInfo          tcl3d-0.9.5.7z                 OglInfo.bawt

Setup   tkdnd            tkdnd-2.9.3.7z                 tkdnd.bawt
Setup   tkribbon         tkribbon-1.1.7z                tkribbon.bawt

Setup   tcltls           tcltls-1.7.22.7z               tcltls.bawt
Setup   Trf              Trf-2.1.4.7z                   Trf.bawt           NoDarwin
Setup   imgjp2           imgjp2-0.1.7z                imgjp2.bawt
Setup   tzint            tzint-1.1.7z                 tzint.bawt

Setup   libgd            libgd-2.3.2.7z               libgd.bawt
Setup   tclgd            tclgd-1.4.7z                 tclgd.bawt

Setup   cfitsio          cfitsio-4.1.0.7z             cfitsio.bawt
Setup   fitsTcl          fitsTcl-2.5.7z               fitsTcl.bawt
Setup   pawt             pawt-1.1.0.7z                pawt.bawt

Setup   libffi           libffi-3.4.2.7z              libffi.bawt
Setup   cffi             cffi-1.2.0.7z                cffi.bawt
Setup   Ffidl            Ffidl-0.9.0.7z               Ffidl.bawt

# MuPDF (and therefore dependent libraries tclMuPdf and MuPDFWidget)
# are not available with VisualStudio < 2017.
if { ( [UseVisualStudio "primary"] && [GetVisualStudioVersion] < 2017 ) || \
       ! [IsGccCompilerNewer "4.8.5"] } {
    Setup   mupdf        mupdf-1.18.2.7z              mupdf.bawt
} else {
    Setup   mupdf        mupdf-1.21.1.7z              mupdf.bawt
}
Setup   tclMuPdf         tclMuPdf-2.1.1.7z            tclMuPdf.bawt
Setup   MuPDFWidget      MuPDFWidget-2.2.7z           MuPDFWidget.bawt

Setup   hdc              hdc-0.2.0.1.7z               hdc.bawt
Setup   gdi              gdi-0.9.9.15.7z              gdi.bawt
Setup   printer          printer-0.9.6.15.7z          printer.bawt

# Tcl programs wrapped as starpacks.
Setup   BawtLogViewer    BawtLogViewer-[GetVersion].7z  BawtLogViewer.bawt
Setup   poApps           poApps-2.11.0.7z             poApps.bawt
```

Setup file Tcl3D.bawt

```
# Builds the extended version of Tcl3D, which depends on
# 3rd party libraries (OpenSceneGraph, SDL, FTGL).

Include "Tools.bawt"
Include "BasicLibs.bawt"
Include "Tcl_Extended.bawt"
Include "OSG_Basic.bawt"

# Setup LibName  ZipFile         BuildFile       BuildOptions

Setup glfw       glfw-3.3.2.7z   glfw.bawt
Setup FTGL       FTGL-2.1.3.7z   FTGL.bawt       NoDarwin
Setup tcl3dFull  tcl3d-0.9.5.7z  tcl3dFull.bawt
```

Setup file Tcl_Distribution.bawt

```
# Use this Setup file to create a Tcl/Tk distribution.

# Builds Tcl/Tk with basic package libraries.
# Include "Tcl_Basic.bawt"

# Builds Tcl/Tk with extended package libraries including Tcl3D.
# Include "Tcl3D.bawt"

# Builds Tcl/Tk with extended package libraries.
Include "Tcl_Extended.bawt"

# Setup LibName          ZipFile              BuildFile              BuildOptions

# Tcl/Tk distribution as InnoSetup installer.
Setup InnoSetup          InnoSetup-6.2.0.7z   InnoSetup.bawt
Setup Redistributables   Redistributables.7z  Redistributables.bawt
Setup SetupTcl           SetupTcl.7z          SetupTcl.bawt
Setup SetupPython       SetupPython.7z       SetupPython.bawt
```

Setup file OSG_Basic.bawt

```
# Builds OpenSceneGraph with basic plugin libraries as needed by Tcl3D.

Include "Tools.bawt"
Include "BasicLibs.bawt"

# Setup LibName           ZipFile                           BuildFile
BuildOptions

# The following libraries can be compiled on Linux, but for OpenSceneGraph
# we use the librarries installed by the Linux distribution.
Setup freeglut            freeglut-3.2.2.7z                 freeglut.bawt          NoLinux
NoDarwin
if { [UseVisualStudio "primary"] && [GetVisualStudioVersion] <= 2010 } {
    Setup jasper          jasper-2.0.14.7z                  jasper.bawt            NoLinux
NoDarwin
} else {
    Setup jasper          jasper-2.0.25.7z                  jasper.bawt            NoLinux
NoDarwin
}

# OpenSceneGraph 3rd party libraries.
Setup curl                curl-7.70.0.7z                    curl.bawt

# OpenSceneGraph
Setup OpenSceneGraph      OpenSceneGraph-[GetOsgVersion].7z OpenSceneGraph.bawt     ; #
Possible deadlock: MaxParallel=Windows-gcc:1
Setup OpenSceneGraphData  OpenSceneGraphData-3.4.0.7z       OpenSceneGraphData.bawt
```

Setup file OSG_Extended.bawt

```
# Builds OpenSceneGraph with extended plugin libraries, as
# well as libraries depending on OpenSceneGraph like osgEarth.

Include "Tools.bawt"
Include "BasicLibs.bawt"
Include "OSG_Basic.bawt"

# Setup LibName ZipFile          BuildFile      BuildOptions

# Extended OpenSceneGraph 3rd party libraries.
Setup Cal3D     Cal3D-0.120.7z   Cal3D.bawt
if { [UseVisualStudio "primary"] && [GetVisualStudioVersion] <= 2013 } {
    Setup gdal  gdal-2.2.0.7z    gdal.bawt      ; # Possible deadlock: MaxParallel=Windows-
gcc:1
    Setup geos  geos-3.6.3.7z    geos.bawt      ; # Possible deadlock: MaxParallel=Windows-
gcc:1
} else {
    Setup gdal  gdal-2.4.4.7z    gdal.bawt      ; # Possible deadlock: MaxParallel=Windows-
gcc:1
    Setup geos  geos-3.7.2.7z    geos.bawt      ; # Possible deadlock: MaxParallel=Windows-
gcc:1
}
Setup GLEW      GLEW-2.2.0.7z    GLEW.bawt
Setup Gl2ps     Gl2ps-1.4.2.7z   Gl2ps.bawt

# Libraries based on OpenSceneGraph.
Setup osgcal    osgcal-0.2.1.7z  osgcal.bawt    MaxParallel=Linux:1 MaxParallel=Windows-
gcc:1

if { [UseVisualStudio "primary"] && [GetVisualStudioVersion] <= 2008 } {
    Setup osgearth  osgearth-2.8.7z     osgearth.bawt  ; # Possible deadlock:
MaxParallel=Windows-gcc:1
} else {
    Setup osgearth  osgearth-2.10.1.7z  osgearth.bawt  ; # Possible deadlock:
MaxParallel=Windows-gcc:1
}
```

Setup file OSG_Distribution.bawt

```
# Use this Setup file to create an OpenSceneGraph distribution.

# Builds OpenSceneGraph with basic plugin libraries.
# Include "OSG_Basic.bawt"

# Builds OpenSceneGraph with extended plugin libraries, as
# well as libraries depending on OpenSceneGraph like osgEarth.
Include "OSG_Extended.bawt"

# Setup LibName         ZipFile              BuildFile              BuildOptions

# OpenSceneGraph distribution as InnoSetup installer.
Setup InnoSetup         InnoSetup-6.2.0.7z   InnoSetup.bawt
Setup Redistributables  Redistributables.7z  Redistributables.bawt
Setup SetupOsg          SetupOsg.7z          SetupOsg.bawt
```

Setup file MiscLibs.bawt

```
# Builds miscellaneous libraries not related to Tcl or OpenSceneGraph.

Include "Tools.bawt"
Include "BasicLibs.bawt"

# Setup LibName          ZipFile                  BuildFile               BuildOptions

if { ( [UseVisualStudio "primary"] && [GetVisualStudioVersion] >= 2022 ) } {
    Setup Boost          Boost-1.78.0.7z          Boost.bawt
} elseif { ( [UseVisualStudio "primary"] && [GetVisualStudioVersion] >= 2015 ) || \
     ( ! [UseVisualStudio "primary"] && [IsWindows] ) || \
     ( ! [IsWindows] && [IsGccCompilerNewer "4.9.0"] ) } {
    # This boost version can only be compiled with
    # Windows: VS 2015 or newer.
    # Unix   : gcc 4.9.0 or newer
    Setup Boost          Boost-1.75.0.7z          Boost.bawt
} else {
    # This boost version cannot be compiled with MinGW gcc.
    Setup Boost          Boost-1.58.0.7z          Boost.bawt
}

Setup ccl                ccl-4.0.6.7z             ccl.bawt
Setup CERTI              CERTI-3.5.1.7z           CERTI.bawt
MaxParallel=Windows-gcc:1 NoLinux
Setup Eigen              Eigen-3.3.9.7z           Eigen.bawt
Setup fftw               fftw-3.3.9.7z            fftw.bawt
if { [UseVisualStudio "primary"] && [GetVisualStudioVersion] <= 2013 } {
    Setup GeographicLib  GeographicLib-1.50.1.7z  GeographicLib.bawt
} else {
    Setup GeographicLib  GeographicLib-1.52.7z    GeographicLib.bawt
}
Setup GeographicLibData  GeographicLibData.7z     GeographicLibData.bawt
Setup KDIS               KDIS-2.9.0.7z            KDIS.bawt
Setup libxml2            libxml2-2.9.14.7z        libxml2.bawt
Setup sqlite3            sqlite3-3.39.4.7z        sqlite3.bawt
Setup tinyxml2           tinyxml2-8.0.0.7z        tinyxml2.bawt
Setup Xerces             Xerces-3.2.4.7z          Xerces.bawt
```

Setup file WinTools.bawt

```
# Builds miscellaneous tools for Windows.

# Setup LibName          ZipFile                BuildFile        BuildOptions
Setup Blender            Blender-3.0.0.7z       Blender.bawt
Setup DirectXTex         DirectXTex-2021_11.7z  DirectXTex.bawt
Setup Doxygen            Doxygen-1.8.15.7z      Doxygen.bawt
Setup Vim                Vim-9.0.0.7z           Vim.bawt
```

3.3 Build Files

Build files include the logic needed to extract, configure, compile and distribute a library. They must define the following two procedures, where `libName` is replaced with the name of the library as specified as first parameter of the *`Setup`* procedure:

- *`Init_libName  { libName libVersion }`*
- *`Build_libName { libName libVersion buildDir instDir devDir distDir }`*

The parameter values for these procedures are supplied by the ***BAWT*** framework.

libName	Library name as supplied with first parameter of procedure *`Setup`*.
libVersion	Library version extracted from source file name as supplied with second parameter of procedure *`Setup`*.
buildDir	*[file join [GetOutputBuildDir] $libName]*
instDir	*[file join [GetOutputInstDir] $libName]*
devDir	*[GetOutputDevDir]*
distDir	*[GetOutputDistDir]*

The logic of a *Build* file will be explained with the following excerpt of the *Build* file of Tcl package ***udp***:

Build file udp.bawt

```
# Copyright: 2016-2023 Paul Obermeier (obermeier@tcl3d.org)
# Distributed under BSD license.
#
# BuildType: MSys / gcc

proc Init_udp { libName libVersion } {
    SetScriptAuthor    $libName "Paul Obermeier" "obermeier@tcl3d.org"
    SetLibHomepage     $libName "https://sourceforge.net/projects/tcludp/"
    SetLibDependencies $libName "Tcl"
    SetPlatforms       $libName "All"
    SetWinCompilers    $libName "gcc"
}

proc Build_udp { libName libVersion buildDir instDir devDir distDir } {
    if { [UseStage "Extract" $libName] } {
        ExtractLibrary $libName $buildDir
    }

    if { [UseStage "Configure" $libName] } {
        TeaConfig $libName $buildDir $instDir
    }

    if { [UseStage "Compile" $libName] } {
        MSysBuild $libName $buildDir "install-binaries"
    }

    if { [UseStage "Distribute" $libName] } {
        StripLibraries "$instDir"
        LibFileCopy "$instDir"  "$devDir/[GetTclDir]"   "*"  true
        LibFileCopy "$instDir"  "$distDir/[GetTclDir]"  "*"  true
    }
    return true
}
```

The *`Init_libName`* procedure must call the following ***BAWT*** framework procedures:

SetScriptAuthor	Specify name and mail address of the build script author. This information is used for command line option `--authors`.

SetLibHomepage	Specify the homepage of the library. This information is used for command line option `--homepages`.
SetLibDependencies	Specify the dependencies of the library. If the library has no dependencies, specify *"None"* as parameter. Otherwise, a variable number of library names can be given. This information is used for command line option `--dependencies`.
SetPlatforms	Specify the supported platforms. Valid keywords are: *"Windows" "Linux" "Darwin" "All".* This information is used for command line option `--platforms`.
SetWinCompilers	Specify the supported compilers on Windows. Optional. The first specified compiler is used as default. Valid keywords are: *"gcc" "vs".* This information is used for command line option `--wincompilers`.

The *Build_libName* procedure must check, which stage or stages should be executed (using procedure *UseStage*) and supply appropriate Tcl commands for each stage.
The following four stages can be handled in a build file:

- `Extract`
- `Configure`
- `Compile`
- `Distribute`

See chapter *4 Build Stages* for details on these stages and typical commands executed for each stage.

Errors can be indicated by calling the ***BAWT*** procedure *SetErrorMessage* and returning *false*.

Optionally a procedure named *Env_libName* may be specified in a build file. This procedure has the same signature as the *Build_libName* procedure and may be used to specify library specific environment variables (using ***BAWT*** procedure *SetEnvVar*) or to add a value to the system environment variable `Path` (using ***BAWT*** procedure *AddToPathEnv*).

The following excerpt from the `Tcl` build file shows a usage example:

```
proc Env_Tcl { libName libVersion buildDir instDir devDir distDir } {
    SetEnvVar    "TCLLIBPATH" "$devDir/[GetTclDir]/lib"
    AddToPathEnv "$devDir/opt/$libName/bin"
}
```

3.3.1 User supplied build files

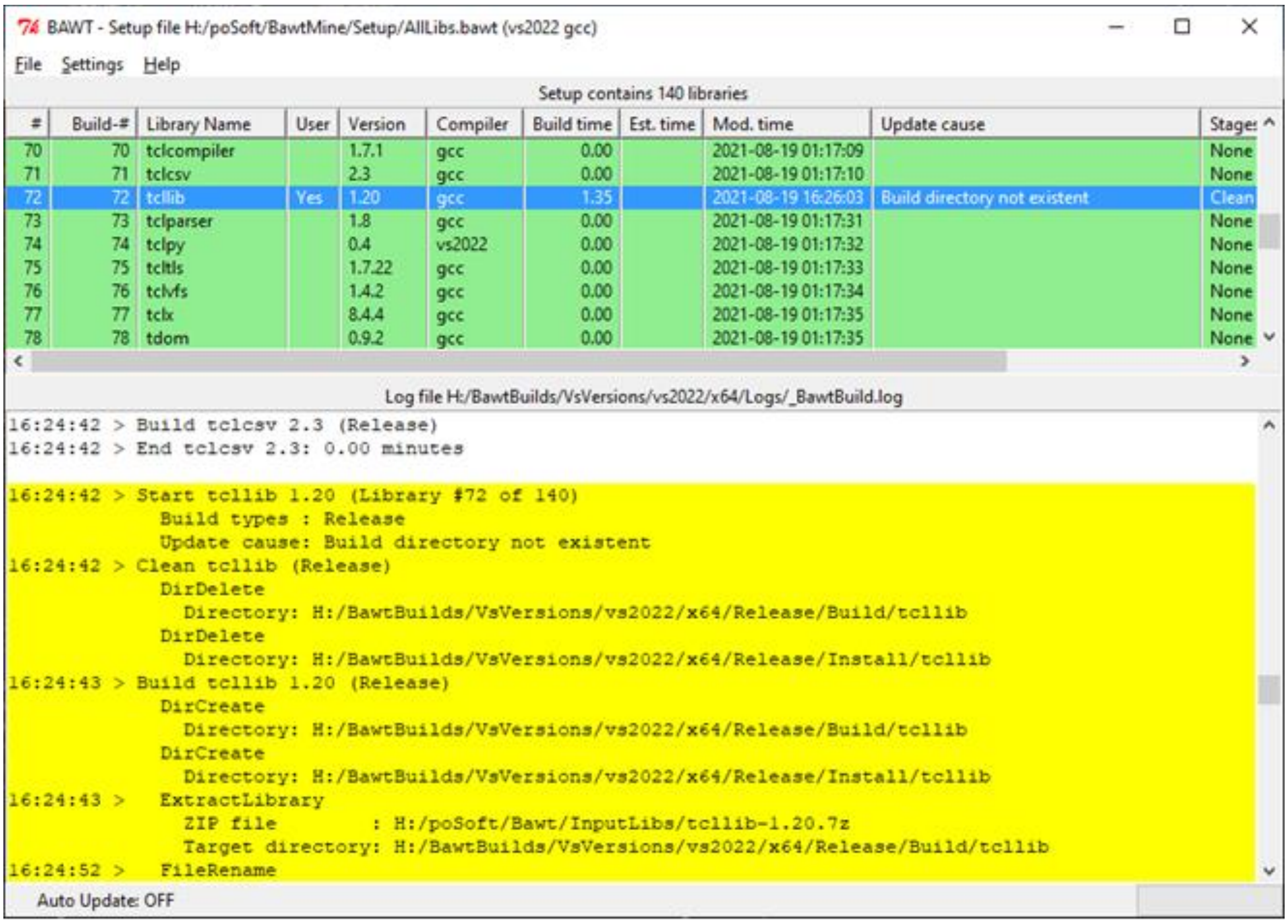
BAWT version 2.0 introduced the functionality of user supplied build files, which allows to add custom build files for existing libraries without the need to change the default build files.
To create a user supplied build file, make a copy of the build file (ex. *tcllib.bawt*) and give the copied file the name *tcllib_User.bawt*. By appending the string *_User* to the root file name, BAWT automatically detects the file as a user supplied build file and uses this file instead of the original build file.
You can then edit the user supplied build file according to your needs, ex. do not create the `critcl` based modules for `tcllib`.
The user supplied build scripts must be located in directories from the library search paths, see chapter *3.1.3 Directory access.*

Note, that user supplied build scripts are not considered in action `--update`, see chapter *5 Build Process*.

You may also give the user supplied build file any name you like. Then you have to notify BAWT to use that file for a specific library by using command line option `--user`.

If you do not want to use the user supplied files, there is no need to delete or rename them. Specify command line option `--nouserbuilds` to disable all user build files.

If using the graphical log viewer, the application of a user supplied build file is indicated in the corresponding column, see next figure.


BAWT - Setup file H:/poSoft/BawtMine/Setup/AllLibs.bawt (vs2022 gcc)
File
Settings
Help
Auto Update: OFF

Setup contains 140 libraries

#	Build-#	Library Name	User	Version	Compiler	Build time	Est. time	Mod. time	Update cause	Stages
70	70	tclcompiler		1.7.1	gcc	0.00		2021-08-19 01:17:09		None
71	71	tclcsv		2.3	gcc	0.00		2021-08-19 01:17:10		None
72	72	tcllib	Yes	1.20	gcc	1.35		2021-08-19 16:26:03	Build directory not existent	Clean
73	73	tclparser		1.8	gcc	0.00		2021-08-19 01:17:31		None
74	74	tclpy		0.4	vs2022	0.00		2021-08-19 01:17:32		None
75	75	tcltls		1.7.22	gcc	0.00		2021-08-19 01:17:33		None
76	76	tclvfs		1.4.2	gcc	0.00		2021-08-19 01:17:34		None
77	77	tclx		8.4.4	gcc	0.00		2021-08-19 01:17:35		None
78	78	tdom		0.9.2	gcc	0.00		2021-08-19 01:17:35		None

Log file H:/BawtBuilds/VsVersions/vs2022/x64/Logs/_BawtBuild.log

```
16:24:42 > Build tclcsv 2.3 (Release)
16:24:42 > End tclcsv 2.3: 0.00 minutes

16:24:42 > Start tcllib 1.20 (Library #72 of 140)
             Build types : Release
             Update cause: Build directory not existent
16:24:42 > Clean tcllib (Release)
             DirDelete
               Directory: H:/BawtBuilds/VsVersions/vs2022/x64/Release/Build/tcllib
             DirDelete
               Directory: H:/BawtBuilds/VsVersions/vs2022/x64/Release/Install/tcllib
16:24:43 > Build tcllib 1.20 (Release)
             DirCreate
               Directory: H:/BawtBuilds/VsVersions/vs2022/x64/Release/Build/tcllib
             DirCreate
               Directory: H:/BawtBuilds/VsVersions/vs2022/x64/Release/Install/tcllib
16:24:43 >   ExtractLibrary
               ZIP file        : H:/poSoft/Bawt/InputLibs/tcllib-1.20.7z
               Target directory: H:/BawtBuilds/VsVersions/vs2022/x64/Release/Build/tcllib
16:24:52 >   FileRename
```

3.3.2 User configurable build files

Some of the library build files are already setup to supply user configuration options. These configuration options can be supplied using the following methods:

As command line option `--copt`
As option string of the `Setup` procedure, see chapter *3.2 Setup Files*

The following build scripts currently support user configuration options:

Build script	User options
`Img.bawt`	Any `-DXXX` option usable for `CFLAGS` environment variable
`poImg.bawt`	
`Tclkit.bawt`	
`Tk.bawt`	

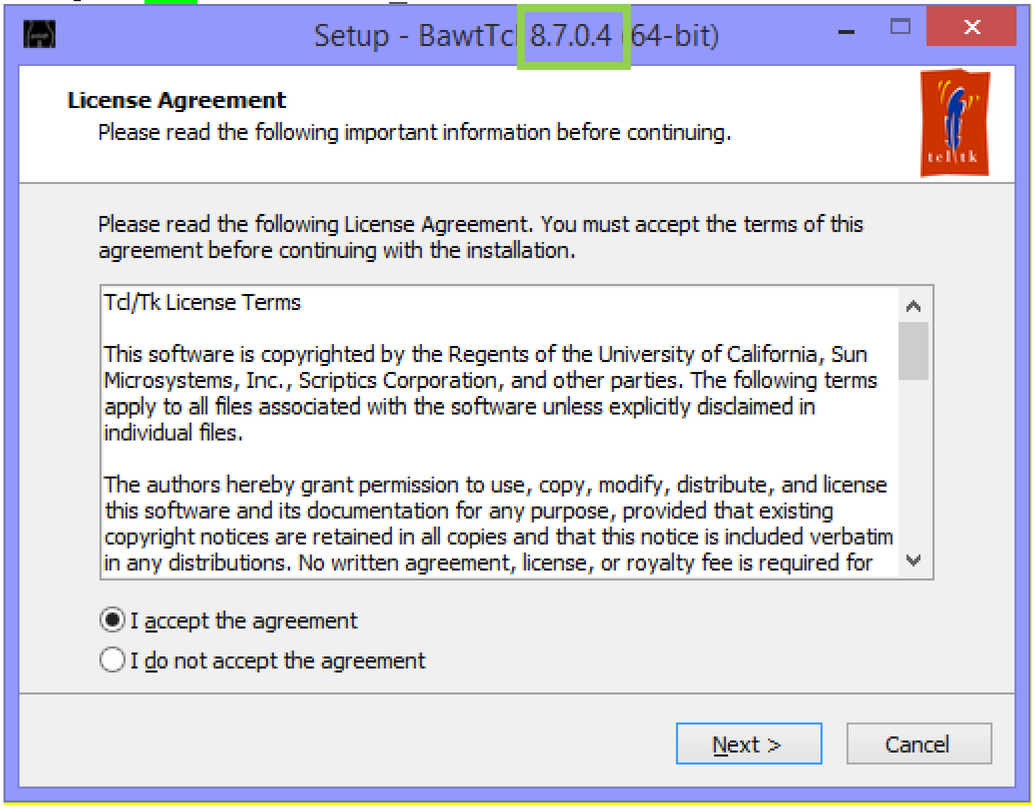
Build script	User options
`SetupOsg.bawt`	Tag string for generated Setup file name: *`Tag=XXX`* Version string used for `InnoSetup`: *`Version=XXX`*
`SetupPython.bawt`	
`SetupTcl.bawt`	

The following example using Tcl version 8.7.a4

```
--copt SetupTcl 'Tag=-BI' --copt SetupTcl 'Version=8.7.0.4'
```

generates an InnoSetup file with the following name:

SetupTcl-BI-8.7.a4-x64_Bawt-2.3.1.exe



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I do not accept the agreement

Build script	User options
`tcl3dFull.bawt`	Use static SDL library: `StaticSDL=ON|OFF`. Default: `OFF`. Currently only supported for Visual Studio builds.

Example:
```
--copt tcl3dFull 'StaticSDL=ON'
```

Build script	User options
`tcllib.bawt`	Toggle `critcl` based compilation: `Critcl=ON|OFF`. Default: `ON`.

Example:
```
--copt tcllib 'Critcl=OFF'
```

Build script	User options
`tcltls.bawt`	Toggle hardening: `Hardening=ON|OFF`. Default: `ON`.

Example:
```
--copt tcltls 'Hardening=OFF'
```

If `tcltls` is compiled with hardening set to ON, it is compiled with option `-fstack-protector-all`, which needs the `libssp-0.dll` library. That library is automatically copied into the *Tcl/bin* directory. If hardening is set to OFF, `tcltls` does not need this external dependency.

Build script	User options

`OpenSceneGraph.bawt`	Toggle example compilation: `-DBUILD_OSG_EXAMPLES=ON|OFF`. Default: `OFF`. Keep the plugin directory structure: `KeepPluginFolder=ON|OFF`. Default: `OFF`.

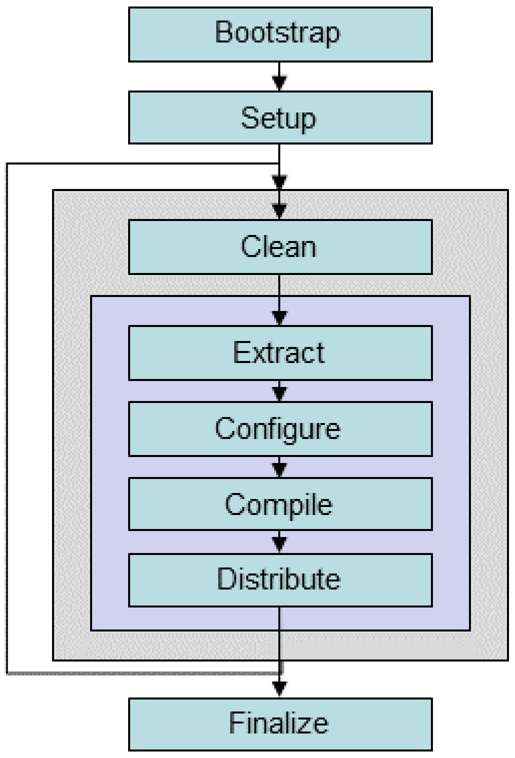
Example:
`--copt OpenSceneGraph '-DBUILD_OSG_EXAMPLES=ON'`

Build script	User options
`osgearth.bawt`	Toggle example compilation: `-DBUILD_OSGEARTH_EXAMPLES=ON|OFF`. Default: `OFF`.

Example:
`--copt osgearth '-DBUILD_OSGEARTH_EXAMPLES=ON'`

4 Build Stages

This chapter describes the stages used in the ***BAWT*** framework to build the libraries specified in a *Setup* file.



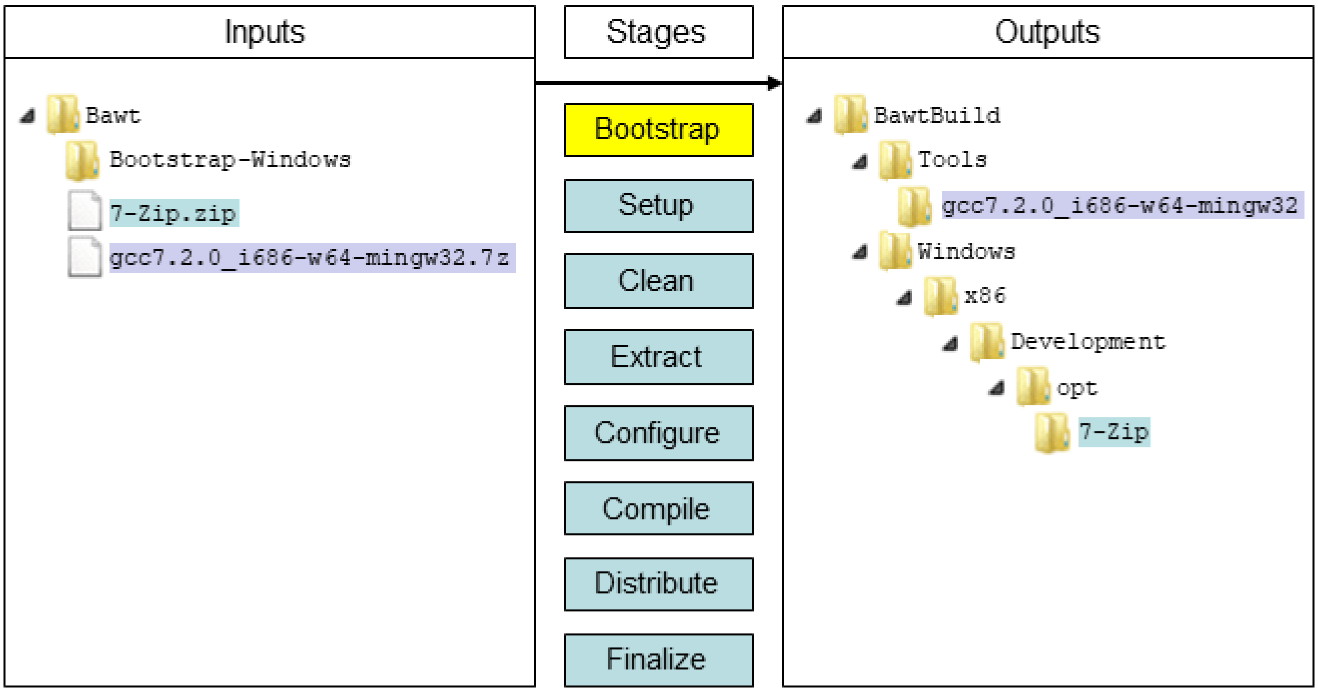
The stages are grouped into global and library specific ones. The global stages `Bootstrap`, `Setup` and `Finalize` are called only once per ***BAWT*** execution, the library specific stages are called once for each library.
Four of the library specific stages (`Extract`, `Configure`, `Compile`, `Distribute`) are user configurable. Actions for these stages must be specified in the library *Build* files.

4.1 Stage Bootstrap

Extract and copy bootstrap tools.
This stage is executed automatically on each invocation of *Bawt.tcl*.
It is not executed, if command line option `--list` is specified.

BAWT needs the ***7-Zip*** program to extract the library source distributions. For Windows and Darwin, a version of the ***7-Zip*** program is included in the ***BAWT*** framework. On Linux ***7-Zip*** is typically already available with the operating system or can be installed as Linux package p7zip or p7zip-full.

On Windows lots of the libraries are built with the MSYS/MinGW suite. Different versions of MSYS/MinGW are available on the ***BAWT*** download site.



Command line options influencing this stage:
--gccversion
--architecture
--toolsdir

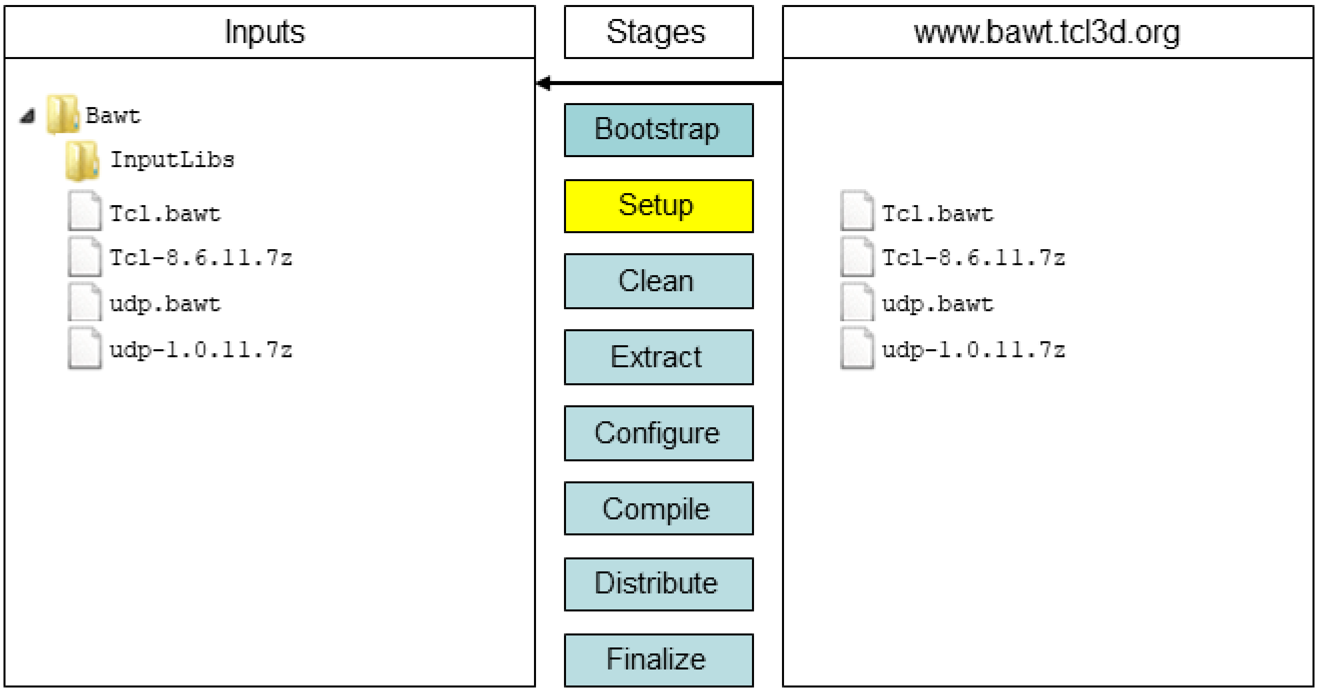
The 7-Zip distribution itself must be compressed with standard ZIP, so that it can be extracted with the vfs::zip package contained in the tclkit. All other tools and libraries are compressed in 7-Zip format because of better compression rates (Example: MSYS/MinGW is 2 times smaller with 7z).

4.2 Stage Setup

Read and execute the specified *Setup* file.
This stage is executed automatically on each invocation of *Bawt.tcl*.

Check for existence of the library source code (either as a 7z file or directory) as well as the according *Build* file. If these do not exist in the library directory *InputLibs* of the current working directory (additional directories can be added with command line option `--libdir`) or are older than those available on the ***BAWT*** website, they are downloaded from the ***BAWT*** website.
If this fails, a fatal error is thrown and the build process is stopped.
The version number of the library is extracted from the file or directory name of the library.
If build action is set to *`Update`*, the necessary build stages are determined according to the existence of the library source and *Build* files as well as to the modification times of the corresponding build and install directories.

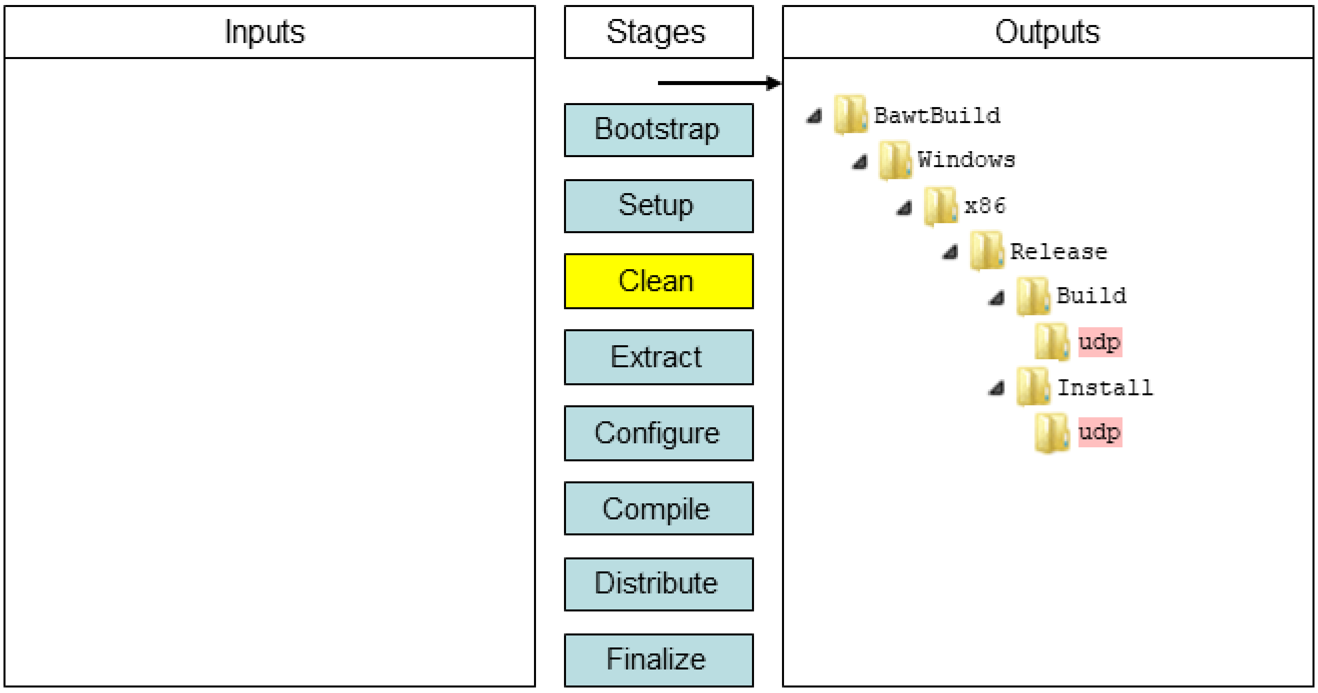
Checking for newer versions and automatic downloading may be skipped by specifying command line option `--noonline`.



Command line options influencing this stage:
`--noonline`
`--norecursive`
`--sort`
`--url`

4.3 Stage Clean

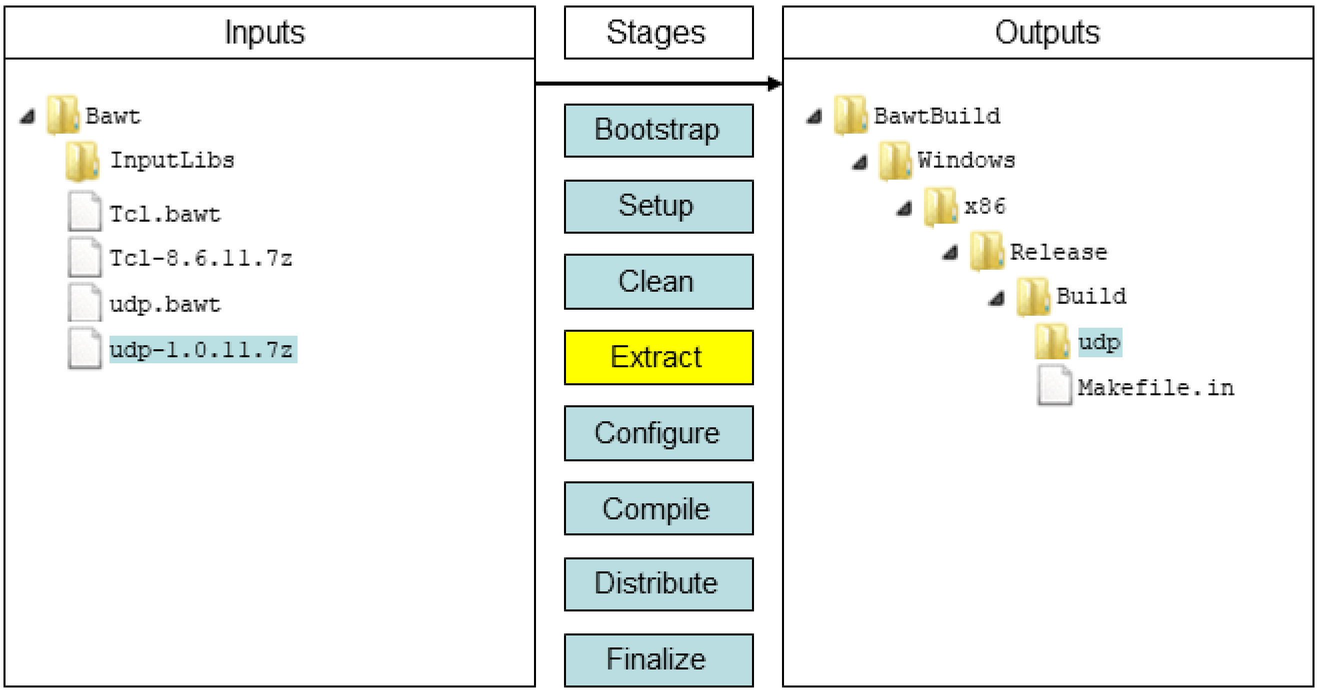
Remove library specific build and install directory.



Command line options influencing this stage:
`--clean`
`--timeout`

4.4 Stage Extract

Extract library source code into build directory.



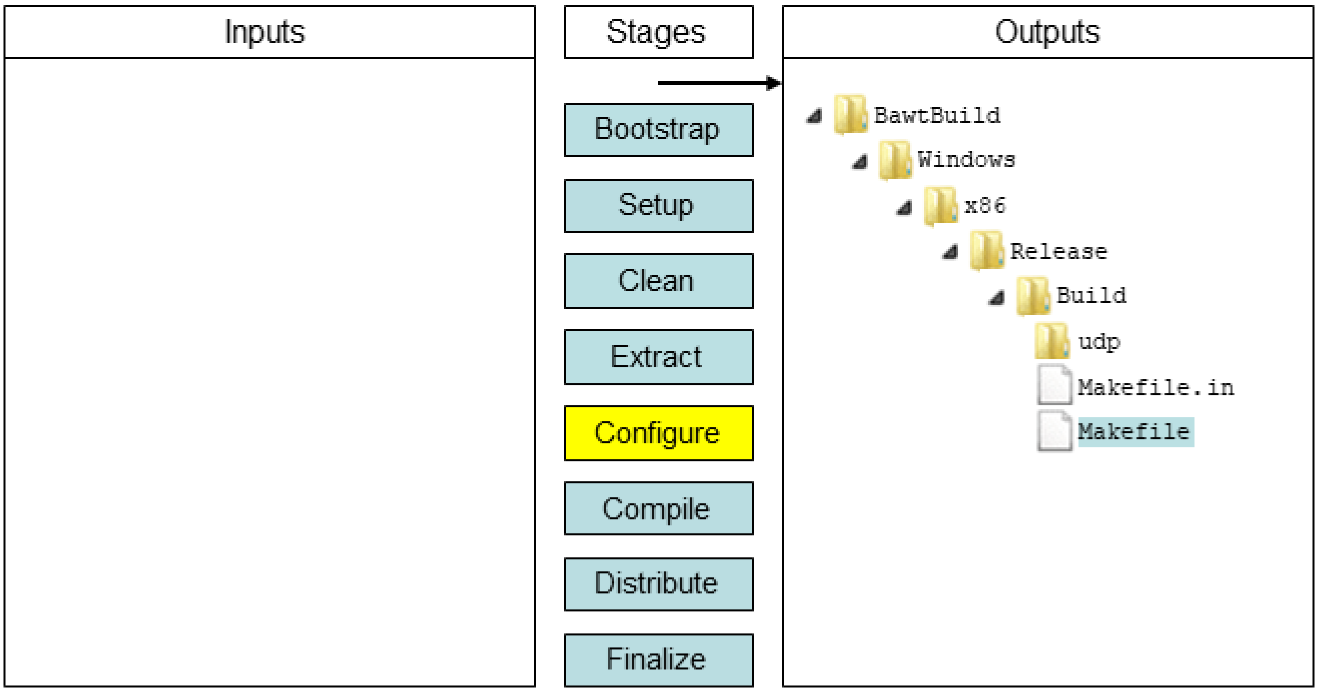
In stage `Extract` the library source code will be extracted and copied into the build directory. This is achieved by calling the ***BAWT*** procedure *`ExtractLibrary`*, which cares about having either a source directory or a compressed source file.
Ideally the source code can be compiled without any changes. If changes have to be done, it is preferred not to edit the source code manually, but make the changes in the build script after extraction.
BAWT has two utility procedures for this purpose:

- *`ReplaceLine`*
- *`ReplaceKeywords`*

Command line options influencing this stage:
`--extract`

4.5 Stage Configure

Configure library for compilation.



In stage `Configure` the library will be configured, which generates the appropriate make files for the chosen compiler and platform.
The following high-level ***BAWT*** procedures are available for configuration tasks:

- *`CMakeConfig`* when using the CMake build infrastructure.
- *`MSysConfig`* when using a configure script with "standard" options.
- *`TeaConfig`* when using the Tcl Extension Architecture for Tcl packages.

See the source code of *Bawt.tcl* to get the default options set by these procedures.

If the build infrastructure does not fit any of the mentioned one above, the configuration command must be built up as a Tcl string and executed with the generic ***BAWT*** procedure *`MSysRun`*.
See the miscellaneous build scripts for usage examples.

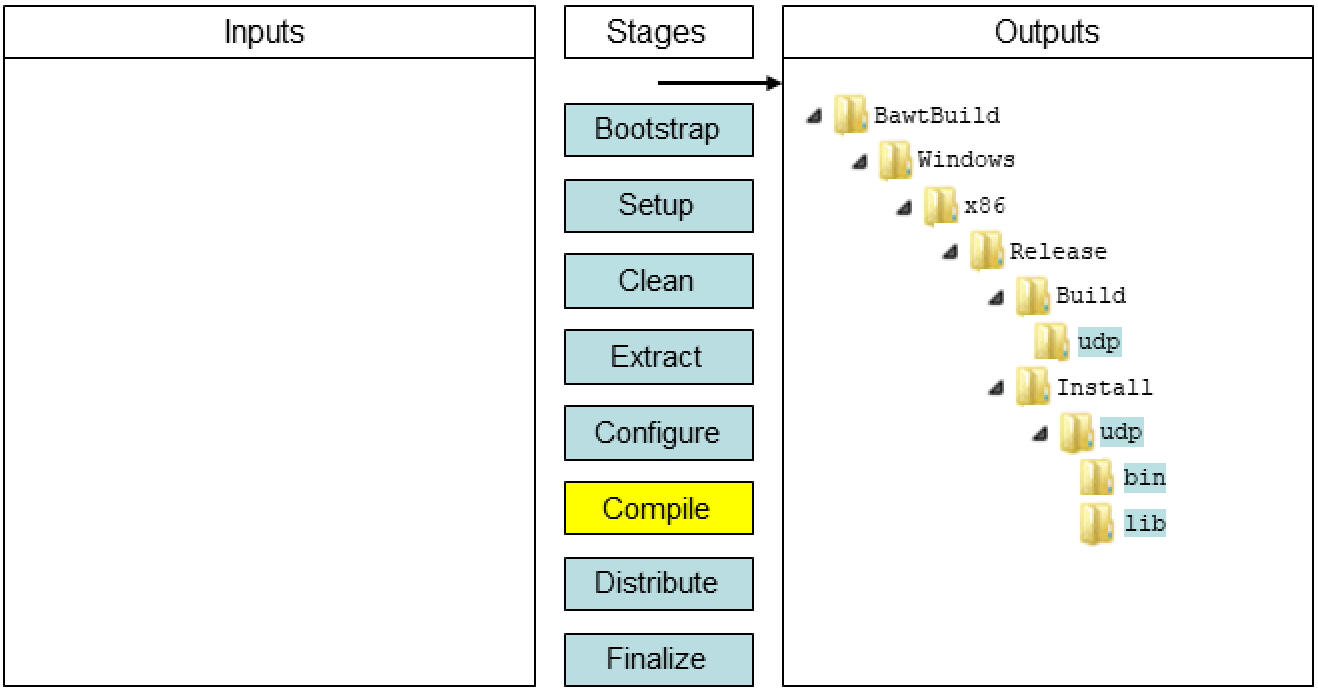
The following ***BAWT*** procedures are typically used for configuration tasks:

- *`IsIntel`*
- *`IsArm`*
- *`IsDebugBuild`*
- *`IsReleaseBuild`*
- *`IsWindows`*
- *`IsLinux`*
- *`IsDarwin`*
- *`IsUnix`*

Command line options influencing this stage:
`--configure`
`--architecture`
`--compiler`
`--gccversion`
`--buildtype`
`--copt`

4.6 Stage Compile

Compile and install library.



In stage `Compile` the library will be compiled and installed.
The following high-level ***BAWT*** procedures are available for compilation tasks:

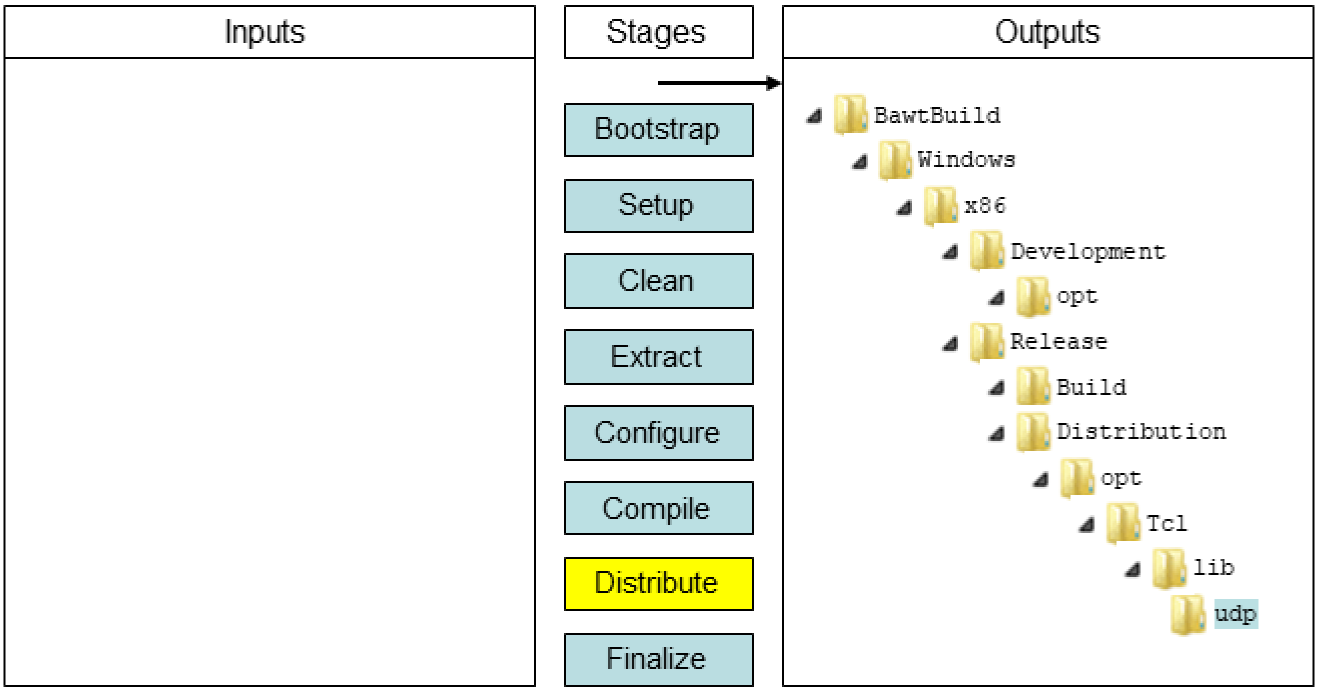
- *`CMakeBuild`* when using the CMake build infrastructure.
- *`MSysBuild`* when using the Tcl Extension Architecture for Tcl packages.

If the build infrastructure does not fit any of the two mentioned above, the compilation command must be built up as a Tcl string and executed with either ***BAWT*** procedure *`MSysRun`* or *`DosRun`*.

Command line options influencing this stage:
`--compile`
`--numjobs`
`--nostrip`
`--noimportlibs`

4.7 Stage Distribute

Copy relevant files into developer and user distribution directories.



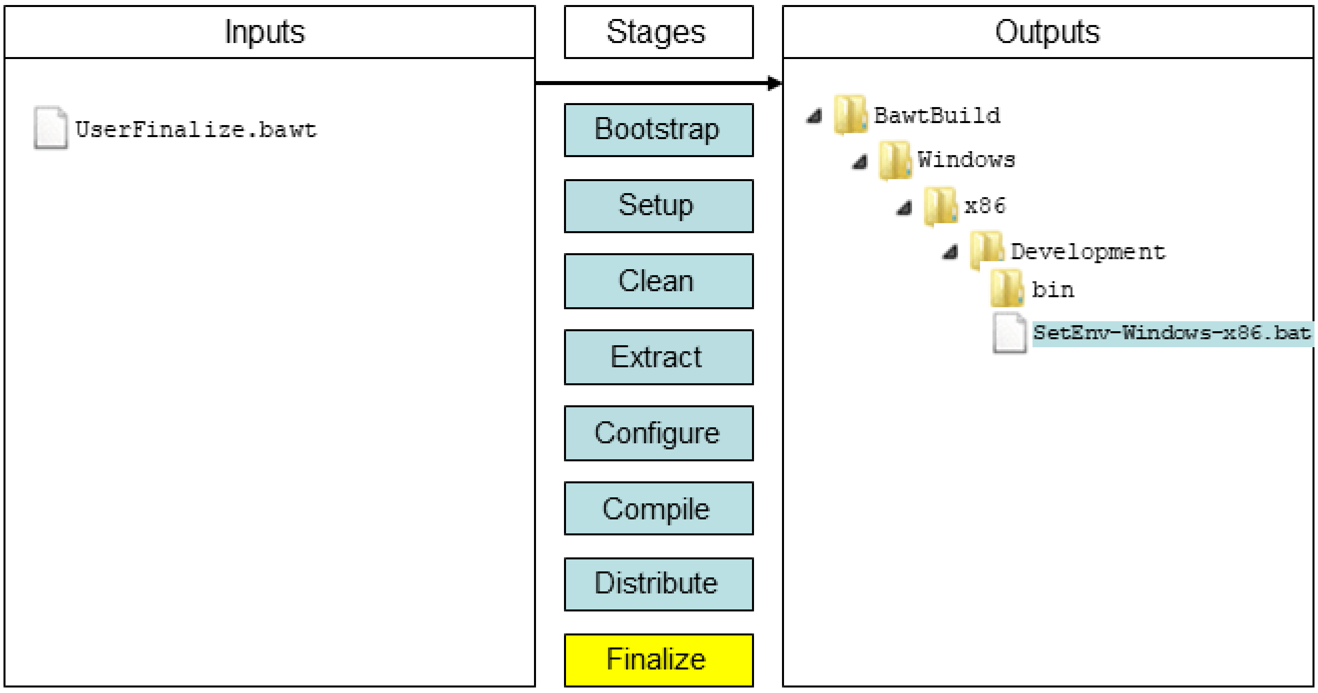
In stage `Distribute` the library will be copied into the distribution and development directories.
The following ***BAWT*** procedures are typically used for distribution tasks:

- *`SingleFileCopy`*
- *`MultiFileCopy`*
- *`LibFileCopy`*
- *`FileRename`*
- *`UseTclPkgVersion`*
- *`IsDebugBuild`*
- *`IsReleaseBuild`*
- *`IsWindows`*
- *`IsLinux`*
- *`IsDarwin`*
- *`IsUnix`*
- *`ErrorAppend`*

Command line options influencing this stage:
`--distribute`
`--noversion`

4.8 Stage Finalize

Perform final actions, optionally call user supplied *`Finalize`* procedure and print summary.



The Finalize stage is performed automatically at the end of the build process or can be manually selected with command line option `--finalize`.

The Finalize stage creates an environment file in the *Development/bin* directory called *SetEnv-*.bat* or *SetEnv-*.sh*. It contains all the environment variables set by the `Env_libName` procedures of the libraries.

If running on Windows with Visual Studio it also copies the appropriate Visual Studio runtime libraries into the *Development/bin* directory. If you do not want to copy these runtime libraries, use command line option `--noruntimelibs`.

To supply a user defined finalize action to ***BAWT***, create a file containing a procedure named `Finalize`. See the file *UserFinalize.tcl* in ***BAWT*** directory *Setup* as an example.
You can use any standard Tcl procedure or one of the ***BAWT*** procedures like `Log` or `MultiFileCopy` in the `Finalize` procedure.
To make the file containing your Finalize procedure available for the ***BAWT*** build process, use command line option `--finalizefile`.

Command line options influencing this stage:
`--finalize`
`--finalizefile`
`--noruntimelibs`

5 Build Process

This chapter gives insight into the BAWT build process from the perspective of a user of BAWT as well as from the perspective of a developer, who wants to extend BAWT with new libraries.

5.1 User Perspective

As described in the previous chapter a specific stage can be executed with one of the following command line action options. These specific action options are typically only used when integrating a new library into BAWT.

```
--clean      : Clean library specific build and install directories.
--extract    : Extract library source from a ZIP file or a directory.
--configure  : Perform the configure stage of the build process.
--compile    : Perform the compile stage of the build process.
--distribute : Perform the distribution stage of the build process.
--finalize   : Generate environment file and call user supplied Finalize procedure.
```

The following global command line action options are typically used for building or updating the BAWT libraries.

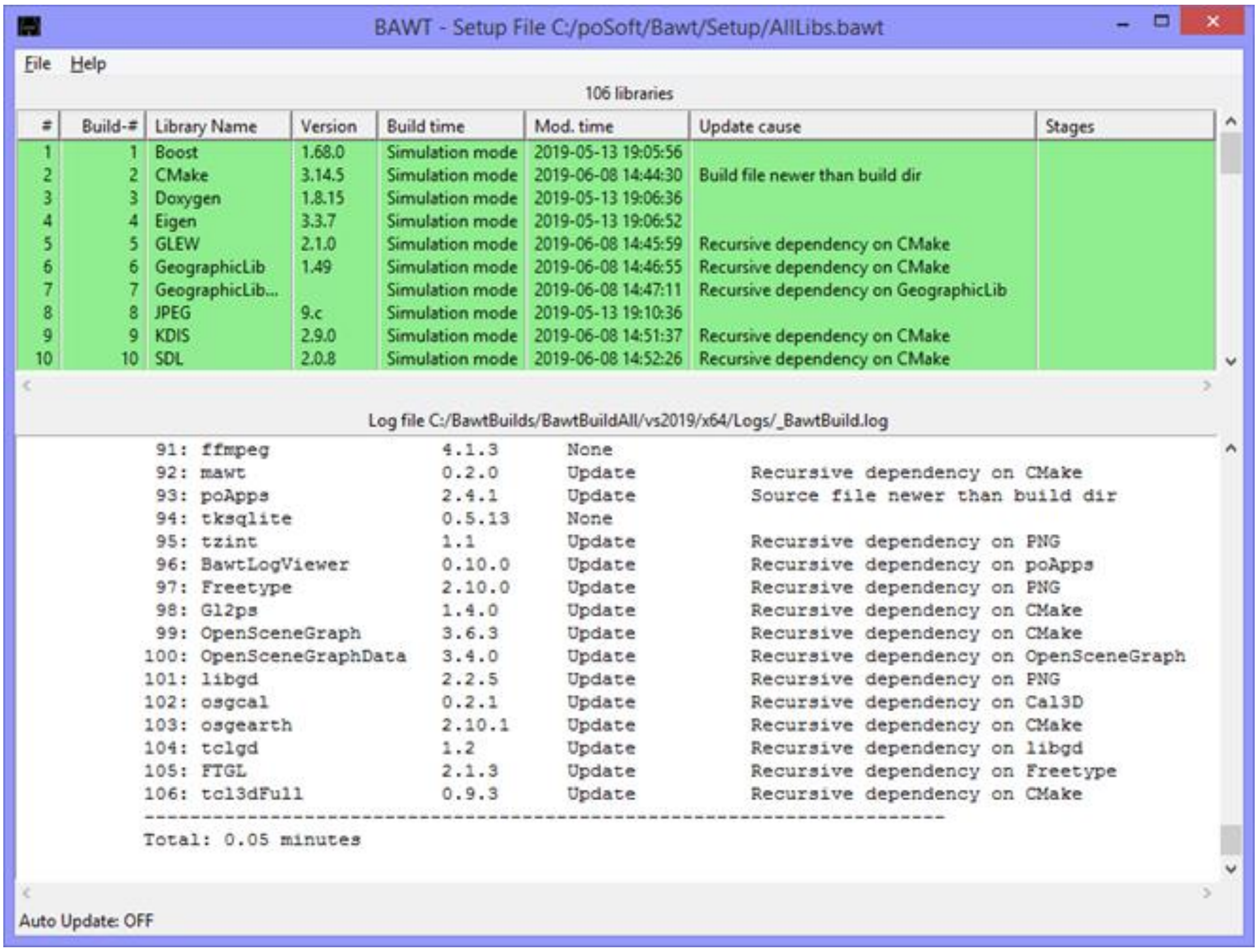
```
--complete   : Perform the following stages in order:
               clean, extract, configure, compile, distribute, finalize.
--update     : Perform necessary stages depending on modification times.
               Note: Global stage finalize is always executed.
--simulate   : Simulate update action without actually building libraries.
--touch      : Set modification times of library build directories to current time.
```

Option `--complete` makes a complete rebuild of the specified libraries, while `--update` checks, which libraries have to be rebuilt.
The necessary build stages are determined according to the existence of the library source and *Build* files as well as to the modification times of the corresponding build directories.
It is also checked, if the build of a library has been cancelled or stopped by checking for the existence of a so-called *Progress File*, which is created in the *Logs* directory at the start of a library build and deleted after a successful library build.
Additionally, a check is performed, if a library is dependent of another library, which has been rebuilt. This recursive dependency checking can be switched off with command line option `--norecursive`.

The `--simulate` option performs the same actions as the `--update` option, but does not build anything. It just prints out, which libraries would be rebuilt, if you would execute the `--update` command line option.
It often happens, that only cosmetic changes are done to a Build file, which would cause this library (and all dependent libraries) to be rebuilt. To avoid rebuilding of these libraries, specify the option `--touch`, which sets the modification times of the build directories to the current date and time.

5.1.1 Use Case: Cosmetic change of Build file CMake.bawt

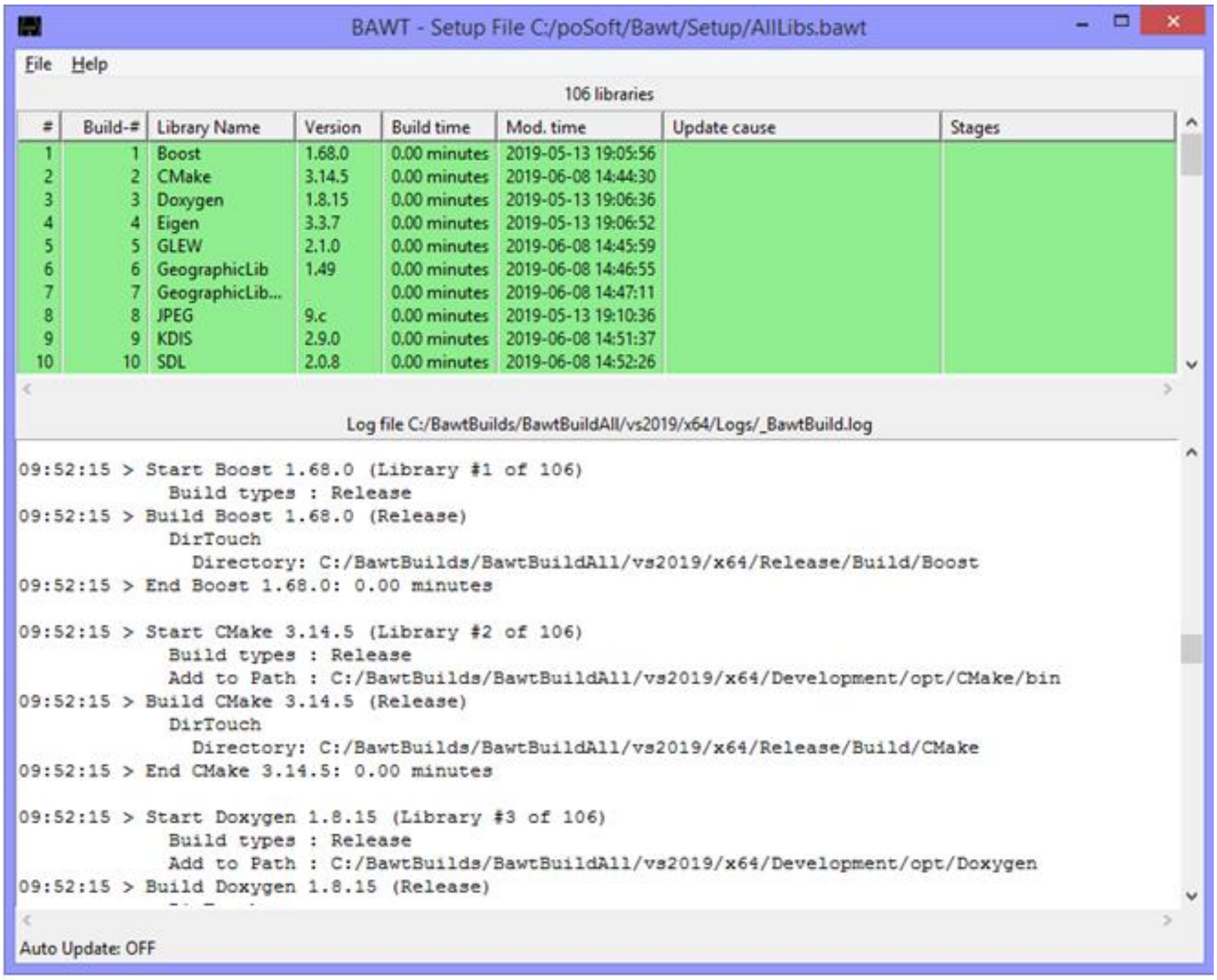
Due to the number of dependencies, a change of Build file *CMake.bawt* would cause a lot of libraries to be rebuilt, as the next screenshot of the ***BawtLogViewer*** shows, when executing a `--simulate` run.


BAWT - Setup File C:/poSoft/Bawt/Setup/AllLibs.bawt
File Help
106 libraries
Log file C:/BawtBuilds/BawtBuildAll/vs2019/x64/Logs/_BawtBuild.log
Auto Update: OFF

#	Build-#	Library Name	Version	Build time	Mod. time	Update cause	Stages
1	1	Boost	1.68.0	Simulation mode	2019-05-13 19:05:56		
2	2	CMake	3.14.5	Simulation mode	2019-06-08 14:44:30	Build file newer than build dir	
3	3	Doxygen	1.8.15	Simulation mode	2019-05-13 19:06:36		
4	4	Eigen	3.3.7	Simulation mode	2019-05-13 19:06:52		
5	5	GLEW	2.1.0	Simulation mode	2019-06-08 14:45:59	Recursive dependency on CMake	
6	6	GeographicLib	1.49	Simulation mode	2019-06-08 14:46:55	Recursive dependency on CMake	
7	7	GeographicLib...		Simulation mode	2019-06-08 14:47:11	Recursive dependency on GeographicLib	
8	8	JPEG	9.c	Simulation mode	2019-05-13 19:10:36		
9	9	KDIS	2.9.0	Simulation mode	2019-06-08 14:51:37	Recursive dependency on CMake	
10	10	SDL	2.0.8	Simulation mode	2019-06-08 14:52:26	Recursive dependency on CMake	

```
 91: ffmpeg                4.1.3     None
 92: mawt                  0.2.0     Update          Recursive dependency on CMake
 93: poApps                2.4.1     Update          Source file newer than build dir
 94: tksqlite              0.5.13    None
 95: tzint                 1.1       Update          Recursive dependency on PNG
 96: BawtLogViewer         0.10.0    Update          Recursive dependency on poApps
 97: Freetype              2.10.0    Update          Recursive dependency on PNG
 98: Gl2ps                 1.4.0     Update          Recursive dependency on CMake
 99: OpenSceneGraph        3.6.3     Update          Recursive dependency on CMake
100: OpenSceneGraphData    3.4.0     Update          Recursive dependency on OpenSceneGraph
101: libgd                 2.2.5     Update          Recursive dependency on PNG
102: osgcal                0.2.1     Update          Recursive dependency on Cal3D
103: osgearth              2.10.1    Update          Recursive dependency on CMake
104: tclgd                 1.2       Update          Recursive dependency on libgd
105: FTGL                  2.1.3     Update          Recursive dependency on Freetype
106: tcl3dFull             0.9.3     Update          Recursive dependency on CMake
----------------------------------------------------------------------
Total: 0.05 minutes
```

To avoid the rebuild of all of these libraries, which may take a lot of time, we execute a `--touch` run. Note the execution of the *`DirTouch`* procedure of the BAWT framework shown in the text widget in the lower half of the window.

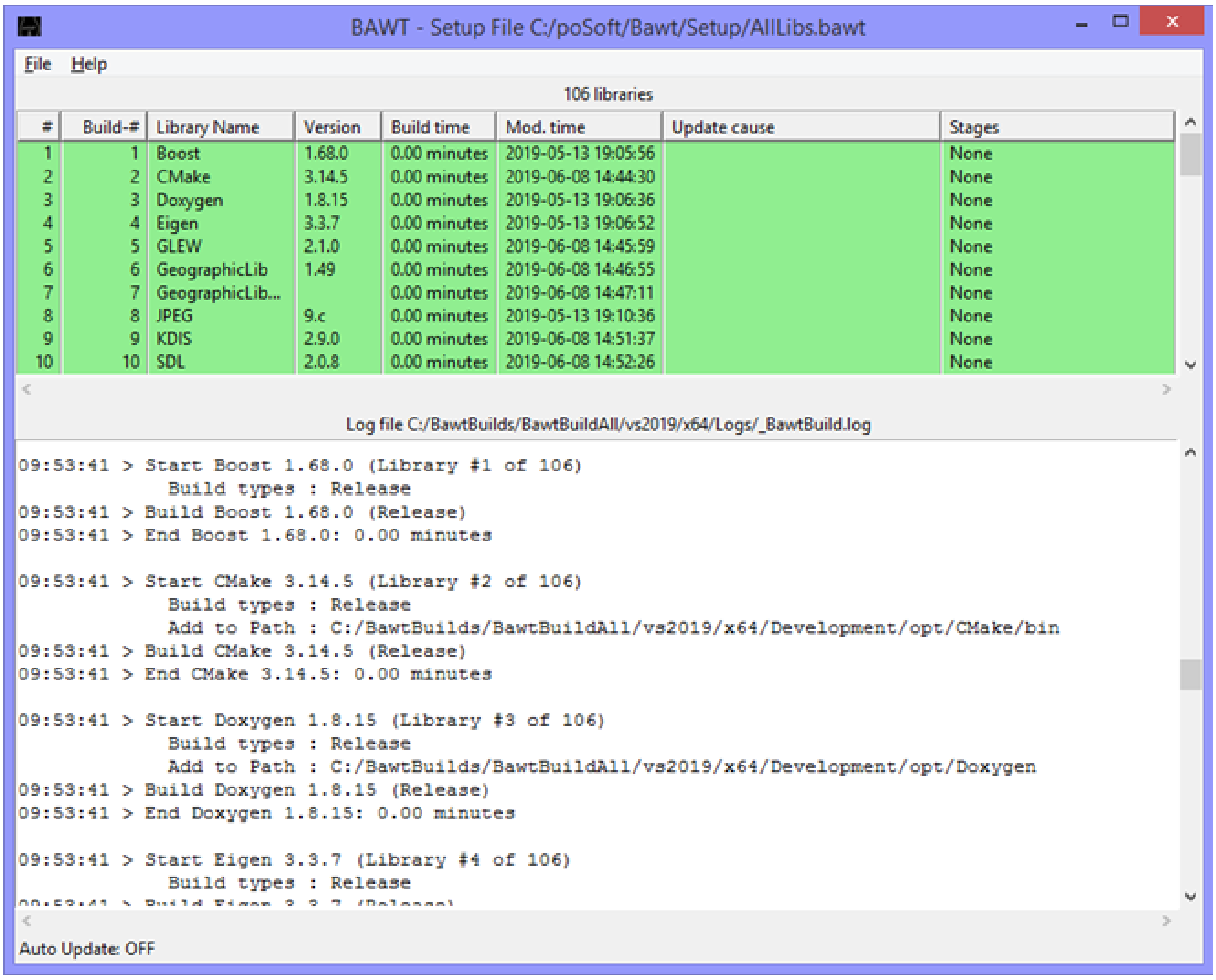


#	Build-#	Library Name	Version	Build time	Mod. time	Update cause	Stages
1	1	Boost	1.68.0	0.00 minutes	2019-05-13 19:05:56		
2	2	CMake	3.14.5	0.00 minutes	2019-06-08 14:44:30		
3	3	Doxygen	1.8.15	0.00 minutes	2019-05-13 19:06:36		
4	4	Eigen	3.3.7	0.00 minutes	2019-05-13 19:06:52		
5	5	GLEW	2.1.0	0.00 minutes	2019-06-08 14:45:59		
6	6	GeographicLib	1.49	0.00 minutes	2019-06-08 14:46:55		
7	7	GeographicLib...		0.00 minutes	2019-06-08 14:47:11		
8	8	JPEG	9.c	0.00 minutes	2019-05-13 19:10:36		
9	9	KDIS	2.9.0	0.00 minutes	2019-06-08 14:51:37		
10	10	SDL	2.0.8	0.00 minutes	2019-06-08 14:52:26		

Log file C:/BawtBuilds/BawtBuildAll/vs2019/x64/Logs/_BawtBuild.log

```
09:52:15 > Start Boost 1.68.0 (Library #1 of 106)
             Build types : Release
09:52:15 > Build Boost 1.68.0 (Release)
             DirTouch
               Directory: C:/BawtBuilds/BawtBuildAll/vs2019/x64/Release/Build/Boost
09:52:15 > End Boost 1.68.0: 0.00 minutes

09:52:15 > Start CMake 3.14.5 (Library #2 of 106)
             Build types : Release
             Add to Path : C:/BawtBuilds/BawtBuildAll/vs2019/x64/Development/opt/CMake/bin
09:52:15 > Build CMake 3.14.5 (Release)
             DirTouch
               Directory: C:/BawtBuilds/BawtBuildAll/vs2019/x64/Release/Build/CMake
09:52:15 > End CMake 3.14.5: 0.00 minutes

09:52:15 > Start Doxygen 1.8.15 (Library #3 of 106)
             Build types : Release
             Add to Path : C:/BawtBuilds/BawtBuildAll/vs2019/x64/Development/opt/Doxygen
09:52:15 > Build Doxygen 1.8.15 (Release)
```

If we now perform an `--update` run, none of the libraries are rebuilt.



106 libraries

#	Build-#	Library Name	Version	Build time	Mod. time	Update cause	Stages
1	1	Boost	1.68.0	0.00 minutes	2019-05-13 19:05:56		None
2	2	CMake	3.14.5	0.00 minutes	2019-06-08 14:44:30		None
3	3	Doxygen	1.8.15	0.00 minutes	2019-05-13 19:06:36		None
4	4	Eigen	3.3.7	0.00 minutes	2019-05-13 19:06:52		None
5	5	GLEW	2.1.0	0.00 minutes	2019-06-08 14:45:59		None
6	6	GeographicLib	1.49	0.00 minutes	2019-06-08 14:46:55		None
7	7	GeographicLib...		0.00 minutes	2019-06-08 14:47:11		None
8	8	JPEG	9.c	0.00 minutes	2019-05-13 19:10:36		None
9	9	KDIS	2.9.0	0.00 minutes	2019-06-08 14:51:37		None
10	10	SDL	2.0.8	0.00 minutes	2019-06-08 14:52:26		None

Log file C:/BawtBuilds/BawtBuildAll/vs2019/x64/Logs/_BawtBuild.log

```
09:53:41 > Start Boost 1.68.0 (Library #1 of 106)
             Build types : Release
09:53:41 > Build Boost 1.68.0 (Release)
09:53:41 > End Boost 1.68.0: 0.00 minutes

09:53:41 > Start CMake 3.14.5 (Library #2 of 106)
             Build types : Release
             Add to Path : C:/BawtBuilds/BawtBuildAll/vs2019/x64/Development/opt/CMake/bin
09:53:41 > Build CMake 3.14.5 (Release)
09:53:41 > End CMake 3.14.5: 0.00 minutes

09:53:41 > Start Doxygen 1.8.15 (Library #3 of 106)
             Build types : Release
             Add to Path : C:/BawtBuilds/BawtBuildAll/vs2019/x64/Development/opt/Doxygen
09:53:41 > Build Doxygen 1.8.15 (Release)
09:53:41 > End Doxygen 1.8.15: 0.00 minutes

09:53:41 > Start Eigen 3.3.7 (Library #4 of 106)
             Build types : Release
```

Auto Update: OFF

5.1.2 Compiler selection on Windows

On Linux and Darwin only the gcc compiler suite is supported.
On Windows gcc and Visual Studio are supported. Some packages can be compiled only with gcc or only with Visual Studio. More and more libraries can be compiled with either gcc or Visual Studio.

Starting with version 2.0, ***BAWT*** supports the notion of primary and secondary compilers on Windows. Which compilers are supported by a build script is indicated with BAWT procedure *`SetWinCompilers`*.

```
proc Init_tkdnd { libName libVersion } {
    SetScriptAuthor     $libName "Paul Obermeier" "obermeier@tcl3d.org"
    SetLibHomepage      $libName "https://github.com/petasis/tkdnd"
    SetLibDependencies  $libName "CMake" "Tk"
    SetPlatforms        $libName "All"
    SetWinCompilers     $libName "gcc" "vs"
}
```

The above call of *`SetWinCompilers`* indicates, that the library can be compiled by both Visual Studio and gcc.
To see, which Windows compilers are supported, use the `--wincompilers` command line option or look for that information in the corresponding build files.

To determine, which compiler should be used in an actual compilation, there is the possibility to specify the compiler using command line option `--compiler`.

This option has been extended to not only accept `gcc` or `vs20XX` as arguments, but also a combination of both using a plus sign as separator, ex. `gcc+vs2019`.

If a library does not support the Windows compiler selected when calling BAWT, then that library is excluded from the build. The log file contains a message like the following:

```
15:02:30 > Start Boost 1.58.0 (Library #2 of 137)
             Build types : Release
15:02:30 > End Boost: Excluded from build (Compiler gcc not supported)
```

Behaviour before BAWT version 2.0:

If the chosen Windows compiler is Visual Studio, but the package only supports gcc, the gcc compiler was automatically chosen as secondary compiler, as the MSYS/MinGW suite is part of BAWT and therefore always available. The other way is not supported, as a Visual Studio compiler may not be available.
The following 3 options of choosing a compiler on Windows were available up to BAWT version 1.3.0.

BAWT 1.3.0	**Command line option --compiler**	**SetWinCompilers**		
		gcc	**vs**	**gcc vs**
Option 1	`Not specified`	gcc	Excluded	gcc
Option 2	`--compiler gcc`	gcc	Excluded	gcc
Option 3	`--compiler vs20XX`	gcc	vs	vs

Behaviour since BAWT version 2.0:

With BAWT 2.0 two new options have been added, which specify the primary and secondary compiler.

BAWT 2.0.0	**Command line option --compiler**	**SetWinCompilers**		
		gcc	**vs**	**gcc vs**
Option 1	`Not specified`	gcc	Excluded	gcc
Option 2	`--compiler gcc`	gcc	Excluded	gcc
Option 3	`--compiler vs20XX`	Excluded	vs	vs
Option 4	`--compiler gcc+vs20XX`	gcc	vs	gcc
Option 5	`--compiler vs20XX+gcc`	gcc	vs	vs

Options 1 and 2 work the same way as they did in BAWT versions before 2.0. Option 3 now does not compile packages supporting only gcc. This behaviour can now be achieved by specifying Option 4 (vs20XX+gcc).

To support this new functionality, several incompatible changes had to be implemented:

New procedures	**Removed procedures**
`SetCompilerVersions`	*`GetVSCompilerVersionNumber`*
`GetCompilerVersions`	*`IsVSCompilerNewer`*
`UseVisualStudio`	*`IsVSCompiler`*
`GetVisualStudioVersion`	*`SetForceVSCompiler`*
`NeedDll2Lib`	*`ForceVSCompiler`*

Procedure *`GetCompilerVersion`* now has a changed and extended signature.

Compilation of ***Tcl/Tk*** and all supported Tcl packages (everything included in *Setup* files *Tcl_Basic.bawt* and *Tcl_Extended.bawt*) is possible without using Visual Studio with the exception of building Visual

Studio compatible Tcl and Tk stub libraries. Those stub libraries can only be compiled using Visual Studio.

To generate Visual Studio compatible Tcl and Tk import libraries (*.lib) the ***BAWT*** procedure *`Dll2Lib`* is used. It creates the import library from the DLL by using the ***link.exe*** program, which is part of Visual Studio.

If Visual Studio is not available, a warning message like the following is issued:

```
Warning > Dll2Lib tk86.lib: Creating import libraries needs VisualStudio
```

To avoid these warnings, add command line option `--noimportlibs`, if Visual Studio is not available or import libraries are not needed.

5.1.3 Online updates of libraries

If using the online update functionality, it is recommended that the local BAWT version is identical to the remote version on the BAWT server. If the local major or minor version is older than the remote version, a fatal error is generated:

```
FATAL > Remote major version 2.0.0 different to major local version 1.3.0
```

If only the patch version differs, a warning is issued.

You are able to download with different local and remote versions by specifying the `--noexit` command line option, but this is not recommended.

To have a consistent set of library versions or if using ***BAWT*** on a computer without internet connection, use the command line option `--noonline` to avoid checking for updates and automatic downloading of new libraries.

5.1.4 Use the generated libraries

To use the generated libraries, the following possibilities exist:

1. Manually copy the appropriate directory.
2. Use the *`Finalize`* procedure.
3. Create a software distribution setup file

Manually copy the appropriate directories

Copy the appropriate directories from either the *Distribution* or *Development* directory to a suitable location on your computer.
For example, after executing the Setup file *Tcl_Basic.bawt* to generate a ***Tcl*** distribution for Windows, copy output directory *Development\opt\Tcl* to *C:\Tcl* and set the environment variables `PATH` and `TCLLIBPATH`.

Note, that the entries of the `PATH` variable on Windows are separated by semicolons (;). The entries of variable `TCLLIBPATH` are separated by spaces and directory paths must use slashes (/) instead of backslashes (\).

On Unix the environment variables are typically set in the shell resource file, ex. .bashrc:

Use the Finalize procedure

Instead of doing the copy manually, it is easier and faster to do the copying in the Finalize stage. The ***BAWT*** framework contains a template Finalize file *Setup/UserFinalize.bawt*, which is shown below.

Adapt the installation paths according to your local needs.

```
# Example script for user supplied Finalize procedure.
#
# The procedure copies the generated Tcl distribution
# from the Development folder into a folder specified
# in your Path environment variable.
#
# You have to adapt the installation paths (tclRootDir)
# according to your needs.
#
# To execute the Finalize procedure, the name of this file
# must be specified on the BAWT command line with option
# "--finalizefile".

proc Finalize {} {
    Log "Finalize (User defined)"

    # For safety reasons this is just a dummy mode.
    # Remove the next lines to enable functionality.
    if { 1 } {
        Log "Finalize Dummy mode" 2 false
        return
    }

    if { [IsWindows] } {
        set tclRootDir "C:/opt"
    } elseif { [IsLinux] } {
        set tclRootDir "~/opt"
    } elseif { [IsDarwin] } {
        set tclRootDir "~/opt"
    } else {
        ErrorAppend "Finalize: Cannot determine operating system" "FATAL"
    }

    set tclInstDir [file join $tclRootDir "Tcl"]

    Log "Installing Tcl into $tclInstDir" 2 false
    DirDelete $tclInstDir

    MultiFileCopy [file join [GetOutputDevDir] [GetTclDir]] $tclInstDir "*" true
}
```

Create a software distribution setup file

There are currently two *Build* files to create software distribution setup files:

- *SetupTcl.bawt* to create a ***Tcl*** Batteries-Included software distribution
- *SetupOsg.bawt* to create an ***OpenSceneGraph*** software distribution

These scripts take all contents of the *Release/Distribution* directory and create a software distribution setup file. This setup file is created with ***InnoSetup*** for Windows platforms and as a simple, self-extracting shell script for Unix platforms.

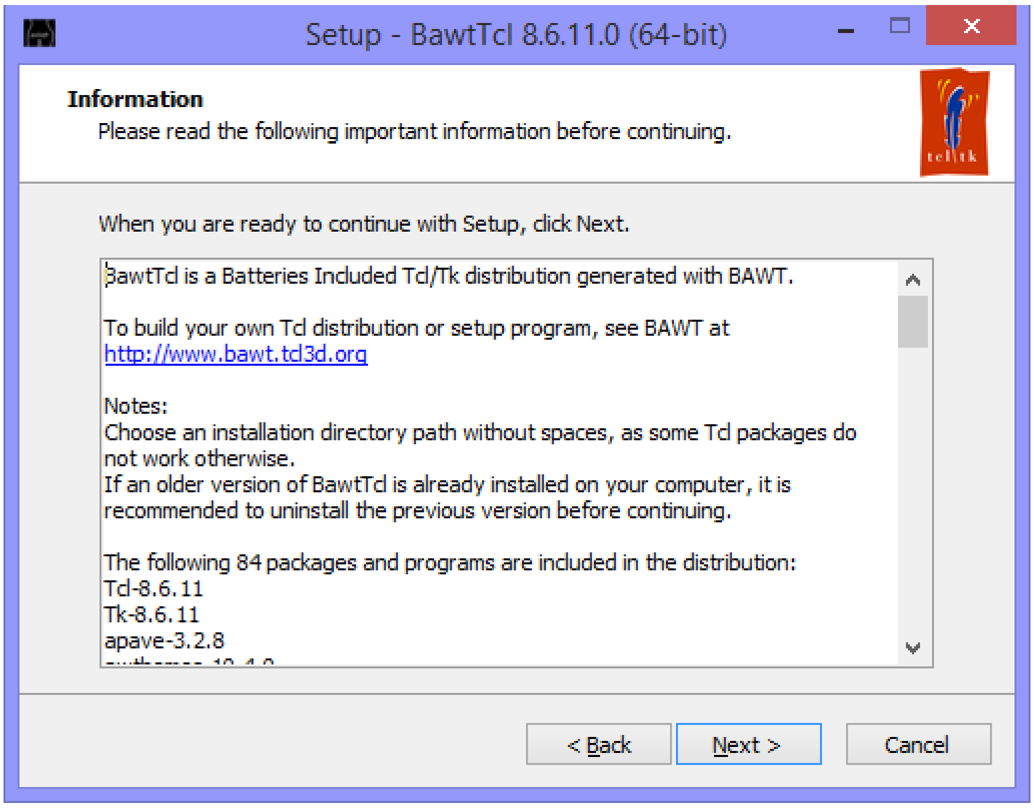
The software distribution setup file itself is generated in the *Release/Distribution* directory.

The software distribution setup file name for ***Tcl/Tk*** has the Tcl version, the architecture and the BAWT version used to build the distribution encoded into the file name.
Example: `SetupTcl-BI-8.6.12-x64_Bawt-2.3.1.exe`

The software distribution setup file name for ***OpenSceneGraph*** has the OSG version, the compiler version, the architecture and the BAWT version used to build the distribution encoded into the file name. Example: `SetupOsg-3.4.1-vs2013-x64_Bawt-2.3.1.exe`

In the same directory as the distribution setup files, text files named *SetupTcl-8.6.12.txt* resp. *SetupOsg-3.4.1.txt* are created, which list the contents of the software distribution setup file.

This list is used to display the contents of the ***InnoSetup*** based distribution setup file, see the following screenshot for an example.



Information

Please read the following important information before continuing.

When you are ready to continue with Setup, click Next.

BawtTcl is a Batteries Included Tcl/Tk distribution generated with BAWT.

To build your own Tcl distribution or setup program, see BAWT at
http://www.bawt.tcl3d.org

Notes:
Choose an installation directory path without spaces, as some Tcl packages do not work otherwise.
If an older version of BawtTcl is already installed on your computer, it is recommended to uninstall the previous version before continuing.

The following 84 packages and programs are included in the distribution:
Tcl-8.6.11
Tk-8.6.11
apave-3.2.8

For Unix (Linux and Darwin) a simple shell script-based distribution setup file is generated. If called without arguments, a simple usage message is displayed.

```
> ./SetupTcl-BI-8.6.12-x64_Bawt-2.3.1.sh

Usage: SetupTcl-BI-8.6.12-x64_Bawt-2.3.1.sh InstallationDirectory
Install folder Tcl into specified installation directory
```

If called with a not existing installation directory path, an error message is printed onto standard output.

```
> ./SetupTcl-BI-8.6.12-x64_Bawt-2.3.1.sh asdf

Installation directory asdf does not exist.
Check name or create manually.
```

If called with a valid installation directory, the contents are extracted into that directory and a message on how to set the needed environment variables is printed onto standard output.

```
> ./SetupTcl-BI-8.6.12-x64_Bawt-2.3.1.sh ~/bin
Extracting Tcl into /home/obermeier/bin ...

Add the following lines to your shell resource file (ex. ~/.bashrc):
```

```
export PATH="/home/obermeier/bin/Tcl/bin:$PATH"
export TCLLIBPATH="/home/obermeier/bin/Tcl/lib $TCLLIBPATH"
```

5.1.5 Change icons of executables

To change the icon of the generated `tclkits` and `starpacks` as well as the information shown about an executable on Windows (Resource), two command line options exist in the ***BAWT*** framework:

- `--iconfile`
- `--resourcefile`

The user supplied icon and resource files can be either located in the `Resources` *directory. Then it is sufficient to just specify the name of the files. If the files are located at other places, the path name of the files must be absolute.*

Use the icon file *poSoft.ico* and resource file *poSoft.rc* supplied by ***BAWT*** in directory *Resources* as starting point for your adapted ones.

If specifying your own resource file, do not change the name of the icon file in the following line of your resource file:

```
tk ICON DISCARDABLE "tclkit.ico"
```

The name must always be *tclkit.ico*.

If specifying a user supplied icon file with command line option `--iconfile`, the icon file will be copied into the build directory *Tclkit/kbskit/win* and renamed to *tclkit.ico*, so that it is possible to only specify an icon file without specifying a resource file.

Changes to the used icon and resource file are not considered by the BAWT update check process, so if using these options, it is necessary to at least rebuild package tclkit and its dependencies.

5.1.6 Parallel builds

All build environments used by BAWT support parallel compilation. The number of parallel build jobs can be specified globally for all libraries with command line option `--numjobs.`
Alternatively, the number of parallel build jobs can be restricted for specific libraries as additional parameter `MaxParallel` in the Setup procedure. See chapter *3.2 Setup Files* for a description of the Setup procedure and its parameters.

The following libraries consistently produce deadlocks when executed in parallel, so the number of parallel jobs is already limited in the corresponding BAWT Setup files by specifying option `MaxParallel=Windows-gcc:1.`

- `CERTI`
- `PNG`
- `osgcal`
- `tserialport`

Other libraries which occasionally tend to deadlock are the following:

- `freeglut`
- `gdal`
- `geos`
- `openjpeg`

- `OpenSceneGraph`
- `osgearth`
- `SDL`

Deadlocks have occurred until now only on Windows using the gcc compiler.

As reference point, the next table shows typical build times on my laptop for libraries needing 2 minutes or more. The laptop is equipped with an Intel QuadCore i7-4700 2.4Ghz with HyperThreading. 8 parallel compile jobs have been used.

Estimated build time	Libraries
~ 2 minutes	ccl libgd libwebp SetupTcl xz
~ 3 minutes	geos kdis TIFF
~ 4 minutes	SWIG tcltls tcl3dFull
~ 5 minutes	gdal Tclkit Xerces
~ 6 minutes	curl gdal libressl Tcl
~ 7 minutes	boost ffmpeg Img
~ 9 minutes	fftw
~ 25 minutes	osgearth
~ 35 minutes	OpenSceneGraph

5.2 Developer Perspective

5.2.1 Upgrade a library

If you want to use a new version of a library already supported by ***BAWT***, chances are high, that the existing build scripts still work with the new version.
So just pack the sources of the new version into a 7z file and edit the corresponding entry in the *Setup* file. Also check the comments of the library build script regarding manual changes to the source code.

If the library is a ***Tcl*** package, you might get warnings from the ***Starpack*** build scripts. This indicates, that you will have 2 different versions in the ***Tcl*** library directory, which might lead to troubles.
The following warnings are issued, when upgrading library tablelist 6.10 to tablelist 6.11:

```
MakeStarpack: Found more than 1 package with prefix tablelist*:
  TclBasic-8.6.12/vs2013/x64/Development/opt/Tcl/lib/tablelist6.10
  TclBasic-8.6.12/vs2013/x64/Development/opt/Tcl/lib/tablelist6.11
```

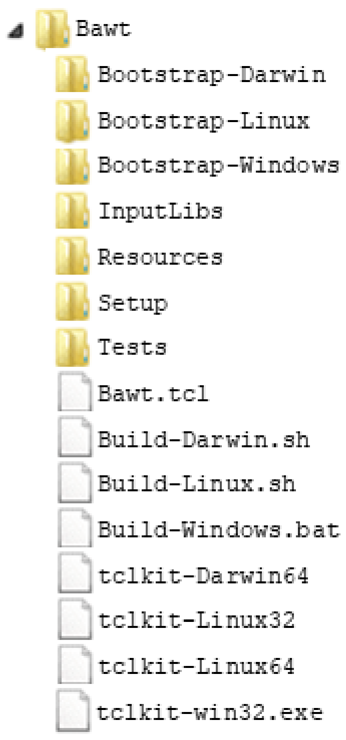
So, when upgrading one or more libraries, you should either remove the development and distribution directories and do a fresh rebuild. The other possibility is to search for the directories of the old version (*tablelist6.10* in the above example) and just remove these directories from the development and distribution directory.
Another option is to use command line option --noversion, which strips the version number from the names of Tcl package directories.

5.2.2 Add a library

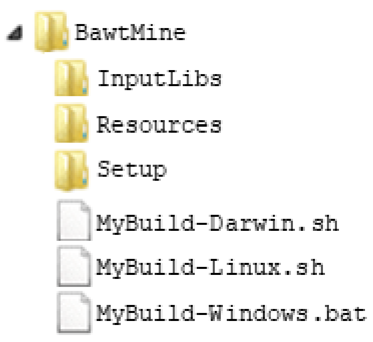
Library sources should be specified either as a directory named *$libName-$libVersion* or as a compressed file named *$libName-$libVersion.7z*.

libName must not contain a “-“ character, because this character is used to separate the library name from the version string.

It is easily possible to extend the libraries compiled by ***BAWT*** with COTS software, ex. company specific libraries. One possibility is to just add these libraries into the *InputLibs* directory of the standard ***BAWT*** distribution. The better solution is to create a separate directory (ex. *BawtMine*), which holds your libraries in a similar structure like ***BAWT*** does. In this directory you create adapted versions of the batch scripts (ex. *MyBuild-Windows.bat*) and add *Setup* files, which reference your libraries as well as libraries of the standard BAWT distribution.



```
Bawt
    Bootstrap-Darwin
    Bootstrap-Linux
    Bootstrap-Windows
    InputLibs
    Resources
    Setup
    Tests
    Bawt.tcl
    Build-Darwin.sh
    Build-Linux.sh
    Build-Windows.bat
    tclkit-Darwin64
    tclkit-Linux32
    tclkit-Linux64
    tclkit-win32.exe
```



```
BawtMine
    InputLibs
    Resources
    Setup
    MyBuild-Darwin.sh
    MyBuild-Linux.sh
    MyBuild-Windows.bat
```

If you want to use a library, which is currently under development, it is possible to add the directory containing the local checkout of the library.

The following example shows the *Setup* file *mawtSvn.bawt* used to compile the current version of ***MAWT*** from my local SVN checkout.

```
Include "Tools.bawt"
Include "BasicLibs.bawt"
Include "Tcl_Basic.bawt"

if { [IsWindows] } {
    set dirName C:/poSoft/Mawt
} elseif { [IsLinux] } {
    set dirName /home/obermeier/poSoft/Mawt
} else {
    set dirName /Users/obermeier/poSoft/Mawt
}
Setup mawt $dirName mawt.bawt Version=0.4.0
```

Note, that the checkout directory typically has no version number in it, so the version number is specified as optional argument of the Setup procedure.

5.2.3 Add a Tcl program

Adding a Tcl program is similar to adding a library, i.e. the sources must be supplied as a compressed file as well as a corresponding *Build* script.

The Tcl program will be created as as starpack, i.e. a standalone executable containing the Tcl interpreter (tclkit), the program scripts as well as needed Tcl packages.

To ease the generation of starpacks, the BAWT framework offers procedures `MakeStarpackTcl` and `MakeStarpackTk` for this purpose. Use `MakeStarpackTcl`, if you want to create a console program, and `MakeStarpackTk`, if you want to create a program with a graphical Tk user interface.

```
proc MakeStarpackTcl { appScript appName starpackName buildDir args }
```

`appScript`	Full path to the startup script of the Tcl program.
`appName`	The name of the application. Typically `$libName`.
`starpackName`	The name of the starpack executable. Typically `$libName[GetExeSuffix]`.
`buildDir`	The name of the output directory. Typically `$instDir`.
`args`	A list of files and directories to be included in the starpack. The path names of the files and directories must be absolute pathes. The files of the Tcl program are typically located in `$buildDir`. Needed Tcl packages are located in `[GetDevTclLibDir]`.

Example Build files using these procedures are:

- *BawtLogViewer.bawt*
- *gorilla.bawt*
- *poApps.bawt*
- *tclssg.bawt*
- *tksqlite.bawt*

The signature of procedure `MakeStarpackTk` *is identical to procedure* `MakeStarpackTcl`*.*

A starpack on Darwin is a directory using the extension .app*.*

5.2.4 Manually compile a library

To configure and compile a library, the ***BAWT*** framework uses shell (**.sh*) or batch files (**.bat*). These batch files are created in the `Configure` and `Compile` phases and stored in the *Build* directory (or a suitable subdirectory like eg. *win*) of the library.

You can use these batch files to configure or compile a library manually. This is especially useful while developing the build file for a new ***BAWT*** library.

Before running one of the shell or batch files on the command line, you have to remove the last line of the script containing the `exit` *command or replace the* `exit` *command with an* `echo` *command.*

You can easily open a library specific DOS or MSys shell window via the context menu of the BawtLogViewer, see chapter 6.1 Graphical Log Viewer.

The first part of the file name defines the configure and compile environment and corresponds to the general ***BAWT*** procedures for executing commands with the same name:

_Bawt_DosRun:

- The commands will be executed in a standard Windows command line environment.
- If running the command manually on Windows, it must be executed from a DOS command shell.
- Example: `> _Bawt_DosRun_CMakeBuild.bat`

_Bawt_MSysRun:

- The commands will be executed in the MSYS/MinGW environment or a standard shell environment on Unix systems.

- If running the command manually on Windows, it must be executed from a MSYS/MinGW shell.
- Note, that on Unix systems all files are prefixed with *_Bawt_MSys*.
- Example: `> sh _Bawt_MSysRun_MSysBuild.bat`

The second part specifies the caller of the *DosRun* or *MSysRun* command. This is typically one of the following standard BAWT procedures:

- `NMakeBuild`
- `MsBuild`
- `CMakeConfig`
- `CMakeBuild`
- `MSysConfig`
- `TeaConfig`
- `MSysBuild`

For libraries, which cannot be built with one of the above standard procedures, it is common usage to specify the caller in the form:

- `_Bawt_LibName_Configure`
- `_Bawt_LibName_Compile`

One example is the Boost library, which has special configure and compile commands:

- `_Bawt_DosRun_Boost_Configure.bat`
- `_Bawt_DosRun_Boost_Compile.bat`

When using `NMakeBuild` or `MsBuild`, there is no need to specify commands for the configuration phase.

- `_Bawt_DosRun_MsBuild.bat`
- `_Bawt_DosRun_NMakeBuild.bat`

All other commands typically come in pairs, so you will see the following combination of configure and compile batch scripts:

- `_Bawt_DosRun_CMakeConfig.bat`
- `_Bawt_DosRun_CMakeBuild.bat`

- `_Bawt_MSysRun_TeaConfig.bat`
- `_Bawt_MSysRun_MSysBuild.bat`

- `_Bawt_MSysRun_MSysConfig.bat`
- `_Bawt_MSysRun_MSysBuild.bat`

- `_Bawt_MSysRun_CMakeBuild.bat`
- `_Bawt_MSysRun_CMakeConfig.bat`

5.3 Known issues

5.3.1 Build deadlock

Problem:
The build process does not continue with specific libraries.

Workaround or solution:
This is due to errors in the build infrastructure of the corresponding library in conjunction with parallel builds. See chapter *5.1.6 Parallel builds* for details.

5.3.2 BawtLogViewer shows incorrect build time

Problem:
If the build of a library starts before midnight and extends over midnight, the build time of this package will be negative in the BawtLogViewer table display, as the log file only stores time values as HH:MM:SS.

Workaround or solution:
None.

5.3.3 Package SWIG

Problem:
SWIG build fails occasionally on Windows due to problems renaming files.
This behavior was noticed on systems running Sophos AntiVirus only.

Workaround or solution:
No real solution, other than retrying the build until it succeeds.

5.3.4 Package Trf

Problem:
The CRC module of Tcl package `Trf` crashes when compiled in x86 mode on Windows.

Workaround or solution:
None.

5.3.5 Package tcllib/crc32

Problem:
The crc32 module of Tcl package `tcllib` crashes when compiled in x86 mode on Windows.

Workaround or solution:
The crash is not the fault of module crc32 itself, but of the CRC module of package `Trf`, which gets called, if the `Trf` extension is available.

Either remove package `Trf` or remove loading of accelerator `trf` in file *crc32.tcl*

```
foreach e {trf critcl} {
    if {[LoadAccelerator $e]} break
}
```

5.4 Tips and Tricks

5.4.1 Tips for Windows

Check generated library

To check the architecture of a generated dynamic library, execute the following command in a Visual Studio developer command prompt:

```
> dumpbin /headers XXX.dll | more
```

The architecture of the library is contained in the file header section of the output:

```
FILE HEADER VALUES
```

```
machine (x64)
```

5.4.2 Tips for Linux

Check generated library

To check, if a library has been stripped, the commands `nm` or `file` can be used. To check the architecture of a generated library, the command `file` can be used.

A library built for Release should have no symbols and thus should generate the following outputs:

```
> nm libjpeg.so.9.1.0
nm: libjpeg.so.9.1.0: no symbols

> file libjpeg.so.9.1.0
libjpeg.so.9.1.0: ELF 32-bit LSB shared object, Intel 80386, version 1 (SYSV),
dynamically linked, stripped
```

A Debug build should have symbols and thus should generate the following outputs:

```
> nm libjpeg.so.9.1.0 | more
0002ffa0 r aanscalefactor.4133
0002fa60 r aanscalefactor.4178
0002ffe0 r aanscales.4125

> file libjpeg.so.9.1.0
libjpeg.so.9.1.0: ELF 32-bit LSB shared object, Intel 80386, version 1 (SYSV),
dynamically linked, not stripped
```

5.5 Advanced Batch Scripts

This section contains the batch scripts, which are used to generate the ***Tcl-Pure*** (minimal Tcl/Tk distribution) as well as the ***Tcl-BI*** (Batteries Included Tcl/Tk distribution) distributions.

5.5.1 Build Tcl-Pure distributions

The following batch scripts are used to create the ***Tcl-Pure*** distributions for all supported Tcl versions. A separate directory (*C:/BawtBuilds/TclMinimal/TclMinimal-%TCLVERS%*) is created for each Tcl version containing both the x86 and x64 versions.
The needed MSYS/MinGW versions are located in directory *C:/BawtBuildTools* (using option `--toolsdir`) to avoid extracting these for each Tcl version.

Batch script *UpdateTclMinimal.bat*

```
@echo off
setlocal

rem Architecture, TclVersion, TclString and Finalize flag are mandatory parameters
if "%1" == "" goto ERROR
if "%2" == "" goto ERROR
if "%3" == "" goto ERROR
if "%4" == "" goto ERROR

set ARCH=%1
set TCLVERS=%2
set TCLSTRING=%3
set FINALIZE=%4
shift
```

```
shift
shift
shift

rem If no target is given, use target "all".
if "%1"=="" goto BUILDALL

rem Loop through the rest of the parameter list for targets.
set TARGETS=
:PARAMLOOP
rem There is a trailing space in the next line. It's there for formatting.
set TARGETS=%TARGETS%%1
shift
if not "%1"=="" goto PARAMLOOP
goto BUILD

:BUILDALL
set TARGETS=all

:BUILD

set BAWTROOT=..\Bawt
set SETUPFILE=%BAWTROOT%\Setup\Tcl_MinimalDist.bawt
set FINALIZEFILE=Setup\UserFinalize.bawt
set OUTROOTDIR=C:/BawtBuilds/TclMinimal/TclMinimal-%TCLVERS%
set TOOLSDIR=C:/BawtBuildTools
set TCLKIT=%BAWTROOT%\tclkit-win32.exe
set NUMJOBS=%NUMBER_OF_PROCESSORS%
set ACTION=--update

set BAWTOPTS=--rootdir %OUTROOTDIR% ^
             --toolsdir %TOOLSDIR% ^
             --architecture %ARCH% ^
             --compiler gcc+vs2019 ^
             --numjobs %NUMJOBS% ^
             --noonline ^
             --nouserbuilds ^
             --iconfile poSoft.ico ^
             --resourcefile poSoft.rc ^
             --certfile poSoft.cer ^
             --tclversion %TCLVERS% ^
             --copt SetupTcl "Version=%TCLSTRING%"

set FINALIZEOPT=--logviewer
if "%FINALIZE%"=="0" goto NOFINALIZE
set FINALIZEOPT=--finalizefile %FINALIZEFILE%
:NOFINALIZE

rem Build all libraries as listed in build configuration file.
CALL %TCLKIT% %BAWTROOT%\Bawt.tcl %USEGCC% %BAWTOPTS% %FINALIZEOPT% %ACTION% %SETUPFILE%
%TARGETS%

goto EOF

:ERROR
echo.
echo Usage: %0 Architecture TclVersion TclString UseFinalizeScript [Target1] [TargetN]
echo   Architecture     : x86 x64
echo   TclVersion       : 8.6.12   8.6.13   8.7.a5
echo   TclString        : 8.6.12.0 8.6.13.0 8.7.0.5
echo   UseFinalizeScript: 0 1
echo   Default target   : all
echo.

:EOF
```

You might need to adapt the pathes specified in `OUTROOTDIR` and `TOOLSDIR` as well as the used Visual Studio version specified in command line option `--compiler`.

Batch script *UpdateTclMinimals.bat*

```
@echo off
setlocal

REM  Architecture TclVersion TclString UseFinalizeScript

CALL UpdateTclMinimal x64 8.6.12 8.6.12.0 0
CALL UpdateTclMinimal x64 8.6.13 8.6.13.0 0
CALL UpdateTclMinimal x64 8.7.a5 8.7.0.5  0

CALL UpdateTclMinimal x86 8.6.12 8.6.12.0 0
CALL UpdateTclMinimal x86 8.6.13 8.6.13.0 0
CALL UpdateTclMinimal x86 8.7.a5 8.7.0.5  0
```

5.5.2 Build Tcl-BI distributions

The following batch scripts are used to create the ***Tcl-BI*** distributions for all supported Tcl versions. A separate directory (*C:/BawtBuilds/TclDistribution/TclDistribution-%TCLVERS%*) is created for each Tcl version containing both the x86 and x64 versions.
The needed MSYS/MinGW versions are located in directory *C:/BawtBuildTools* (using option `--toolsdir`) to avoid extracting these for each Tcl version.

Batch script *UpdateTclDistribution.bat*

```
@echo off
setlocal

rem Architecture, TclVersion, TclString and Finalize flag are mandatory parameters
if "%1" == "" goto ERROR
if "%2" == "" goto ERROR
if "%3" == "" goto ERROR
if "%4" == "" goto ERROR

set ARCH=%1
set TCLVERS=%2
set TCLSTRING=%3
set FINALIZE=%4
shift
shift
shift
shift

rem If no target is given, use target "all".
if "%1"=="" goto BUILDALL

rem Loop through the rest of the parameter list for targets.
set TARGETS=
:PARAMLOOP
rem There is a trailing space in the next line. It's there for formatting.
set TARGETS=%TARGETS%%1
shift
if not "%1"=="" goto PARAMLOOP
goto BUILD

:BUILDALL
set TARGETS=all

:BUILD
```

```
set BAWTROOT=..\Bawt
set SETUPFILE=%BAWTROOT%\Setup\Tcl_Distribution.bawt
set FINALIZEFILE=Setup\UserFinalize.bawt
set OUTROOTDIR=C:/BawtBuilds/TclDistribution/TclDistribution-%TCLVERS%
set TOOLSDIR=C:/BawtBuildTools
set TCLKIT=%BAWTROOT%\tclkit-win32.exe
set NUMJOBS=%NUMBER_OF_PROCESSORS%
set ACTION=--update

set BAWTOPTS=--rootdir %OUTROOTDIR% ^
             --toolsdir %TOOLSDIR% ^
             --architecture %ARCH% ^
             --compiler gcc+vs2019 ^
             --numjobs %NUMJOBS% ^
             --noonline ^
             --nouserbuilds ^
             --iconfile poSoft.ico ^
             --resourcefile poSoft.rc ^
             --certfile poSoft.cer ^
             --tclversion %TCLVERS% ^
             --copt SetupTcl "Tag=-BI" ^
             --copt SetupTcl "Version=%TCLSTRING%"

set FINALIZEOPT=--logviewer
if "%FINALIZE%"=="0" goto NOFINALIZE
set FINALIZEOPT=--finalizefile %FINALIZEFILE%
:NOFINALIZE

rem Build all libraries as listed in build configuration file.
CALL %TCLKIT% %BAWTROOT%\Bawt.tcl %BAWTOPTS% %FINALIZEOPT% %ACTION% %SETUPFILE%
%TARGETS%

goto EOF

:ERROR
echo.
echo Usage: %0 Architecture TclVersion TclString UseFinalizeScript [Target1] [TargetN]
echo   Architecture     : x86 x64
echo   TclVersion       : 8.6.12   8.6.13   8.7.a5
echo   TclString        : 8.6.12.0 8.6.13.0 8.7.0.5
echo   UseFinalizeScript: 0 1
echo   Default target   : all
echo.

:EOF
```

You might need to adapt the pathes specified in `OUTROOTDIR` and `TOOLSDIR` as well as the used Visual Studio version specified in command line option `--compiler`.

Batch script *UpdateTclDistributions.bat*

```
@echo off
setlocal

REM  Architecture TclVersion TclString UseFinalizeScript

CALL UpdateTclDistribution x64 8.6.12 8.6.12.0 0
CALL UpdateTclDistribution x86 8.6.12 8.6.12.0 0

CALL UpdateTclDistribution x64 8.6.13 8.6.13.0 0
CALL UpdateTclDistribution x86 8.6.13 8.6.13.0 0

CALL UpdateTclDistribution x64 8.7.a5 8.7.0.5  0
CALL UpdateTclDistribution x86 8.7.a5 8.7.0.5  0
```

6 Logging

The *Logs* output directory contains the overall build log file *_BawtBuild.log* as well as the library specific build log files.
Library specific log files contain the output of the configuration and compile process. They also contain the error messages, if the build of a library does not succeed.
The overall log file contains the messages, which are printed onto standard output during the BAWT build process. The amount of log messages can be set by specifying the log level with command line option `--loglevel`. Level 0 does not produce any log messages, while level 4 produces lots of log messages. The default value for the log level is 3.
Each stage or executed command is prefixed with a time code like shown in the next line:

```
21:35:30 > Build tclcompiler 1.7.1 (Release)
```

If log files of different configurations should be compared, these time codes may be disturbing. BAWT therefore allows to remove the time codes from the log messages by specifying command line option --nologtime.

When rerunning a build, existing log files are renamed by appending *.bak* to the corresponding files before creating the new log files.

To view the build process online in a graphical window, the command line option --logviewer can be specified. See the next chapter for a detailed description of the graphical log file viewer ***BawtLogViewe***r.

Logging functionality is realized in namespace `BawtLog`. The most important procedure is `Log`, which may be used in build scripts, too.

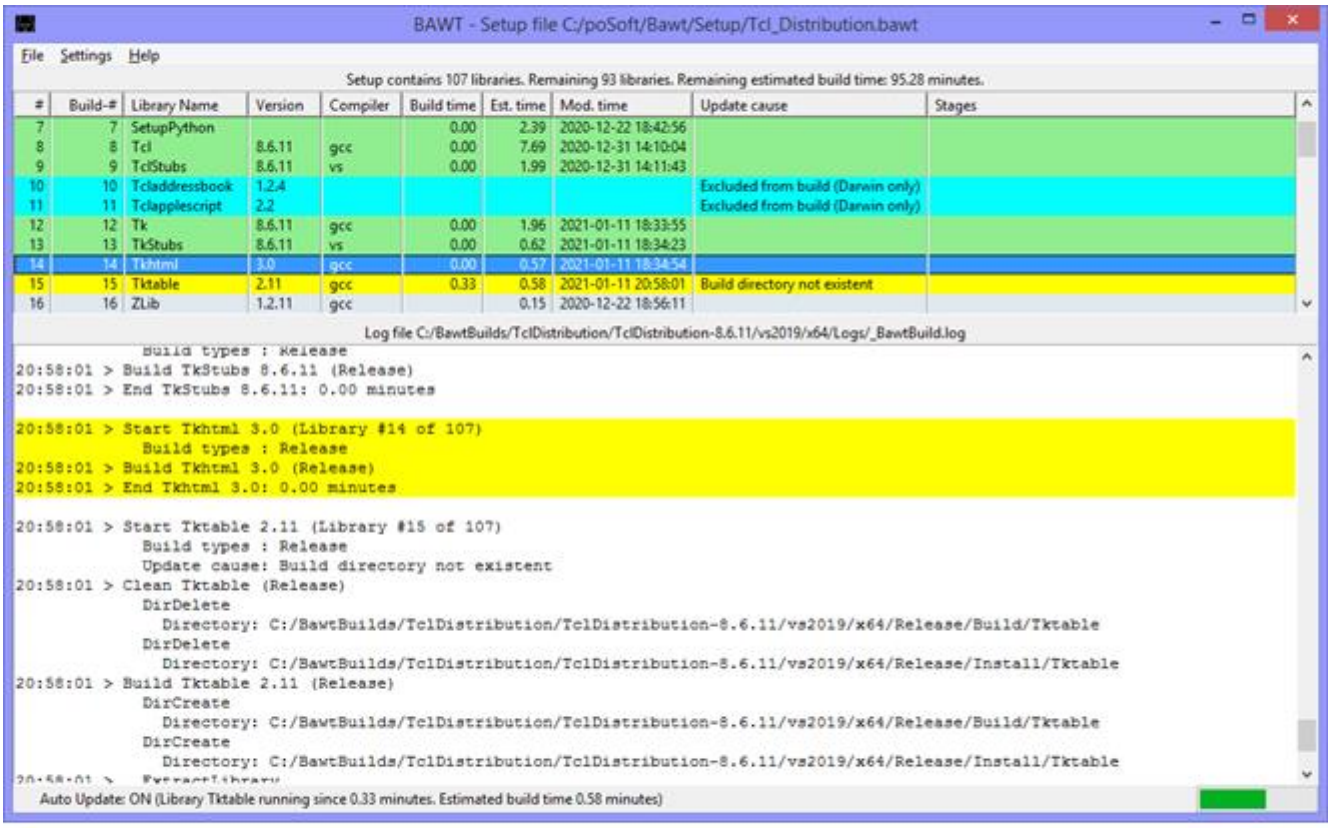
Command line options influencing logging:
--loglevel
--nologtime
--logviewer

6.1 Graphical Log Viewer

The ***BawtLogViewer*** is a separate program to view and analyse the log output of BAWT. It is a Tcl script, which is wrapped as a Starpack and is included as a Windows executable in directory *Bootstrap-Windows*. For other platforms it can be built with BAWT.

The graphical log viewer can either be used to analyse log files after a build process has finished (offline mode) or it can be used to interactively view the build process (online mode). Viewing the log messages online can be done by either using command line option --logviewer when starting the BAWT build process or by opening the log file *_BawtBuild.log* anytime during the build process.
Log files can be opened by using the `File` menu or by dragging and dropping the icon of the log file onto the ***BawtLogViewer*** window.

The following figure shows the layout of the log viewer window, which has 2 main parts. In the upper part all libraries of the Setup file are listed in a scrollable table, while in the lower part the log messages of the build process are displayed in a scrollable text widget.


BAWT - Setup file C:/poSoft/Bawt/Setup/Tcl_Distribution.bawt
File
Settings
Help

Setup contains 107 libraries. Remaining 93 libraries. Remaining estimated build time: 95.28 minutes.

#	Build-#	Library Name	Version	Compiler	Build time	Est. time	Mod. time	Update cause	Stages
7	7	SetupPython			0.00	2.39	2020-12-22 18:42:56		
8	8	Tcl	8.6.11	gcc	0.00	7.69	2020-12-31 14:10:04		
9	9	TclStubs	8.6.11	vs	0.00	1.99	2020-12-31 14:11:43		
10	10	Tcladdressbook	1.2.4					Excluded from build (Darwin only)	
11	11	Tclapplescript	2.2					Excluded from build (Darwin only)	
12	12	Tk	8.6.11	gcc	0.00	1.96	2021-01-11 18:33:55		
13	13	TkStubs	8.6.11	vs	0.00	0.62	2021-01-11 18:34:23		
14	14	Tkhtml	3.0	gcc	0.00	0.57	2021-01-11 18:34:54		
15	15	Tktable	2.11	gcc	0.33	0.58	2021-01-11 20:58:01	Build directory not existent	
16	16	ZLib	1.2.11	gcc		0.15	2020-12-22 18:56:11		

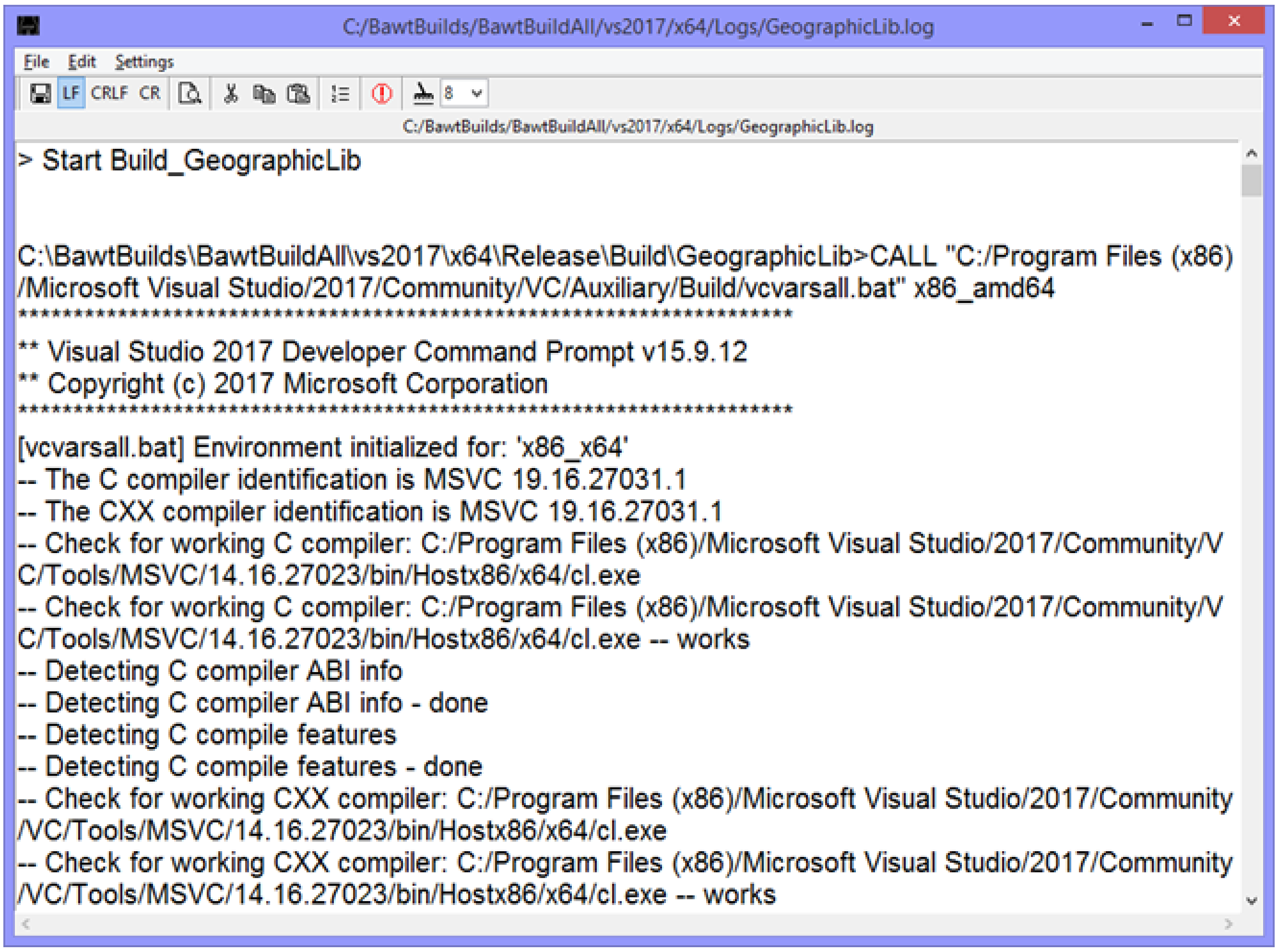
Log file C:/BawtBuilds/TclDistribution/TclDistribution-8.6.11/vs2019/x64/Logs/_BawtBuild.log

```
             Build types : Release
20:58:01 > Build TkStubs 8.6.11 (Release)
20:58:01 > End TkStubs 8.6.11: 0.00 minutes

20:58:01 > Start Tkhtml 3.0 (Library #14 of 107)
             Build types : Release
20:58:01 > Build Tkhtml 3.0 (Release)
20:58:01 > End Tkhtml 3.0: 0.00 minutes

20:58:01 > Start Tktable 2.11 (Library #15 of 107)
             Build types : Release
             Update cause: Build directory not existent
20:58:01 > Clean Tktable (Release)
             DirDelete
               Directory: C:/BawtBuilds/TclDistribution/TclDistribution-8.6.11/vs2019/x64/Release/Build/Tktable
             DirDelete
               Directory: C:/BawtBuilds/TclDistribution/TclDistribution-8.6.11/vs2019/x64/Release/Install/Tktable
20:58:01 > Build Tktable 2.11 (Release)
             DirCreate
               Directory: C:/BawtBuilds/TclDistribution/TclDistribution-8.6.11/vs2019/x64/Release/Build/Tktable
             DirCreate
               Directory: C:/BawtBuilds/TclDistribution/TclDistribution-8.6.11/vs2019/x64/Release/Install/Tktable
20:58:01 >   ExtractLibrary
```

Auto Update: ON (Library Tktable running since 0.33 minutes. Estimated build time 0.58 minutes)

Different row background colors indicate the build status of a library. A green background indicates a successful build of a library, a blue background indicates an excluded library, a yellow background shows the library currently under build and an orange background indicates a library, where the current build time is greater than the estimated build time. See below for an explanation of estimated build times for deadlock detection.
A red text color is displayed for libraries which issued a warning during the build process.

The table can be sorted by any of the columns except the first one, which just shows the row number. For example, you may want to view the libraries sorted by library names instead of the build number.
Selecting a table row scrolls to the beginning of the corresponding section in the text widget. The section is also marked with a yellow background.
By double clicking onto a table row, a simple editor window is opened showing the contents of the library specific build log file, see next figure for an example. Your favourite editor may be specified by setting the environment variable `EDITOR`.


C:/BawtBuilds/BawtBuildAll/vs2017/x64/Logs/GeographicLib.log
File Edit Settings
LF CRLF CR
8
C:/BawtBuilds/BawtBuildAll/vs2017/x64/Logs/GeographicLib.log

```
> Start Build_GeographicLib


C:\BawtBuilds\BawtBuildAll\vs2017\x64\Release\Build\GeographicLib>CALL "C:/Program Files (x86)
/Microsoft Visual Studio/2017/Community/VC/Auxiliary/Build/vcvarsall.bat" x86_amd64
**********************************************************************
** Visual Studio 2017 Developer Command Prompt v15.9.12
** Copyright (c) 2017 Microsoft Corporation
**********************************************************************
[vcvarsall.bat] Environment initialized for: 'x86_x64'
-- The C compiler identification is MSVC 19.16.27031.1
-- The CXX compiler identification is MSVC 19.16.27031.1
-- Check for working C compiler: C:/Program Files (x86)/Microsoft Visual Studio/2017/Community/V
C/Tools/MSVC/14.16.27023/bin/Hostx86/x64/cl.exe
-- Check for working C compiler: C:/Program Files (x86)/Microsoft Visual Studio/2017/Community/V
C/Tools/MSVC/14.16.27023/bin/Hostx86/x64/cl.exe -- works
-- Detecting C compiler ABI info
-- Detecting C compiler ABI info - done
-- Detecting C compile features
-- Detecting C compile features - done
-- Check for working CXX compiler: C:/Program Files (x86)/Microsoft Visual Studio/2017/Community
/VC/Tools/MSVC/14.16.27023/bin/Hostx86/x64/cl.exe
-- Check for working CXX compiler: C:/Program Files (x86)/Microsoft Visual Studio/2017/Community
/VC/Tools/MSVC/14.16.27023/bin/Hostx86/x64/cl.exe -- works
```

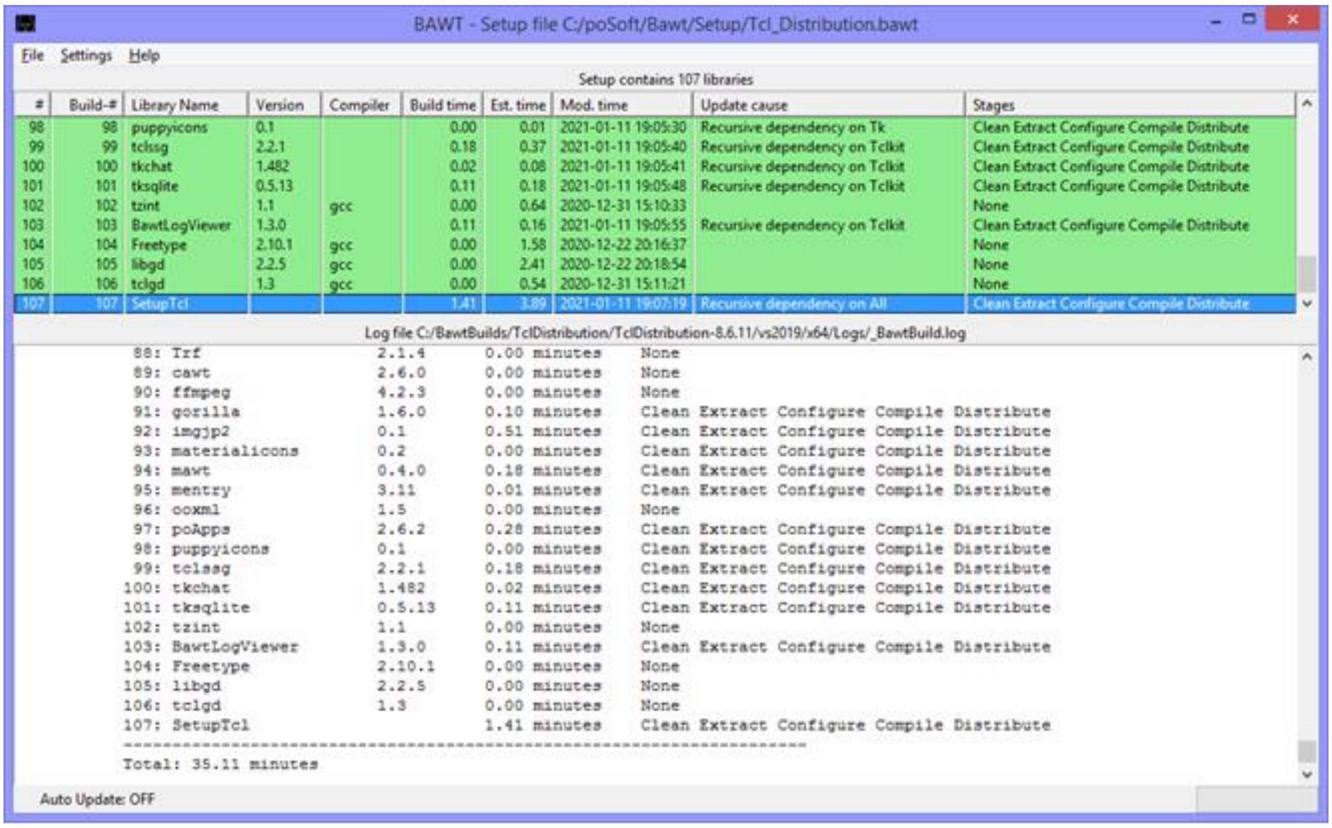
Pressing the right mouse button opens a context menu with the following functionalities:

- Open library specific directories in an Explorer window.
- Open library specific Log, Setup or Build file.
- Open library specific DOS or MSYS shell window.

Pressing a key while the table has focus, selects the next library, which has this key as its first letter. Pressing other keys within the `Key Repeat Time` extends the search string similar to the behaviour of the Windows Explorer. The `Key Repeat Time` can be specified in the `Settings` menu.
Pressing the Return key selects the library currently under build.

Note the following features, which are only available in online mode:

- ***BawtLogViewer*** starts in `Auto Update` mode, where it reloads the log file every 3 seconds. The `Auto Update` mode is automatically switched off when the end of the build process is detected in the log file or it can be switched on or off by selecting the appropriate entry in the `File` menu.
- When reloading the log file, the table row order is always reset to the library build order.
- The accumulated time of the library currently being built is displayed in the status bar of the viewer window and in the corresponding table cell.
- Column Stages is not filled before the end of the build process, see next figure.


BAWT - Setup file C:/poSoft/Bawt/Setup/Tcl_Distribution.bawt
File Settings Help

Setup contains 107 libraries

#	Build-#	Library Name	Version	Compiler	Build time	Est. time	Mod. time	Update cause	Stages
98	98	puppyicons	0.1		0.00	0.01	2021-01-11 19:05:30	Recursive dependency on Tk	Clean Extract Configure Compile Distribute
99	99	tclssg	2.2.1		0.18	0.37	2021-01-11 19:05:40	Recursive dependency on Tclkit	Clean Extract Configure Compile Distribute
100	100	tkchat	1.482		0.02	0.08	2021-01-11 19:05:41	Recursive dependency on Tclkit	Clean Extract Configure Compile Distribute
101	101	tksqlite	0.5.13		0.11	0.18	2021-01-11 19:05:48	Recursive dependency on Tclkit	Clean Extract Configure Compile Distribute
102	102	tzint	1.1	gcc	0.00	0.64	2020-12-31 15:10:33		None
103	103	BawtLogViewer	1.3.0		0.11	0.16	2021-01-11 19:05:55	Recursive dependency on Tclkit	Clean Extract Configure Compile Distribute
104	104	Freetype	2.10.1	gcc	0.00	1.58	2020-12-22 20:16:37		None
105	105	libgd	2.2.5	gcc	0.00	2.41	2020-12-22 20:18:54		None
106	106	tclgd	1.3	gcc	0.00	0.54	2020-12-31 15:11:21		None
107	107	SetupTcl			1.41	3.89	2021-01-11 19:07:19	Recursive dependency on All	Clean Extract Configure Compile Distribute

Log file C:/BawtBuilds/TclDistribution/TclDistribution-8.6.11/vs2019/x64/Logs/_BawtBuild.log

```
 88: Trf                2.1.4     0.00 minutes    None
 89: cawt               2.6.0     0.00 minutes    None
 90: ffmpeg             4.2.3     0.00 minutes    None
 91: gorilla            1.6.0     0.10 minutes    Clean Extract Configure Compile Distribute
 92: imgjp2             0.1       0.51 minutes    Clean Extract Configure Compile Distribute
 93: materialicons      0.2       0.00 minutes    Clean Extract Configure Compile Distribute
 94: mawt               0.4.0     0.18 minutes    Clean Extract Configure Compile Distribute
 95: mentry             3.11      0.01 minutes    Clean Extract Configure Compile Distribute
 96: ooxml              1.5       0.00 minutes    None
 97: poApps             2.6.2     0.28 minutes    Clean Extract Configure Compile Distribute
 98: puppyicons         0.1       0.00 minutes    Clean Extract Configure Compile Distribute
 99: tclssg             2.2.1     0.18 minutes    Clean Extract Configure Compile Distribute
100: tkchat             1.482     0.02 minutes    Clean Extract Configure Compile Distribute
101: tksqlite           0.5.13    0.11 minutes    Clean Extract Configure Compile Distribute
102: tzint              1.1       0.00 minutes    None
103: BawtLogViewer      1.3.0     0.11 minutes    Clean Extract Configure Compile Distribute
104: Freetype           2.10.1    0.00 minutes    None
105: libgd              2.2.5     0.00 minutes    None
106: tclgd              1.3       0.00 minutes    None
107: SetupTcl                     1.41 minutes    Clean Extract Configure Compile Distribute
----------------------------------------------------------------------
Total: 35.11 minutes
```

Auto Update: OFF

The program can be used to detect library build deadlocks by comparing the current build time against an estimated build time. To generate estimated build times, at least one BAWT build has to be performed. After loading the corresponding log files, the build times of this run can be saved in the settings file by selecting `File` menu entry `Save build times`.
These build times are then used as estimated build times in future BAWT builds to compare the current build time of a library against these estimated build times. If the current build time exceeds the estimated time by a specific threshold value (which can be specified in the `Settings` menu), both a visual warning (corresponding row background is set to orange) as well as an acoustic warning (beep) is issued. The acoustic warning can be disabled in the `Settings` menu.

Estimated build times, deadlock parameters and other values like window size and position are stored in the settings files *~/.BawtLogViewer/BawtLogViewer.cfg*.

7 Command Line Options

Calling the ***BAWT*** framework script with command line option *--help* prints the following help message:

```
Usage: Bawt.tcl [Options] SetupFile LibraryName [LibraryNameN]

Start the BAWT automatic library build process.
When using "all" as library name, all libraries specified
in the setup file are built.
It is also possible to specify the numbers of the libraries as printed
by option "--list" or specify a range of numbers (ex: 2-5).
Note, that at least either a list or build action option must be specified.
```

7.1 General Options

Option	Description
`--help`	Print this help message and exit.
`--version`	Print BAWT version and copyright and exit. Use in combination with *--loglevel 0* to just print the version number.
`--procs`	Print all available procedures and exit.
`--proc <string>`	Print documentation of specified procedure and exit.
`--loglevel <int>`	Specify log message verbosity. Choices: 0 - 4. Default: 3.
`--nologtime`	Do not write time strings with log messages. Default: Write time strings. Use this option when comparing log files to have less differences.
`--logviewer`	Start graphical log viewer program ***BawtLogViewer***. Only valid, if log level is greater than 1. Default: No.

7.2 List Action Options

Option	Description
`--list`	Print all available library names and versions and exit.
`--platforms`	Print library names, versions and supported platforms.
`--wincompilers`	Print library names, versions and supported Windows compilers.
`--authors`	Print library names, versions and script authors.
`--homepages`	Print library names, versions and homepages.
`--dependencies`	Print library names, versions and dependencies.
`--dependency`	Print dependencies of specified target libraries.

The list action options may be accumulated to print several library informations at once.

7.3 Build Action Options

Option	Description
`--clean`	Clean library specific build and install directories.
`--extract`	Extract library source from a ZIP file or a directory.
`--configure`	Perform the configure stage of the build process.
`--compile`	Perform the compile stage of the build process.
`--distribute`	Perform the distribution stage of the build process.
`--finalize`	Generate environment file and call user supplied Finalize procedure.

`--complete`	Perform the following stages in order: clean, extract, configure, compile, distribute, finalize.
`--update`	Perform necessary stages depending on modification times. Note: Global stage finalize is always executed.
`--simulate`	Simulate update action without actually building libraries.
`--touch`	Set modification times of library build directories to current time.

7.4 Build Configuration Options

Option	Description
`--architecture <string>`	Build for specified processor architecture. Choices: x86 x64. Default: Architecture of the calling tclkit or tclsh.
`--compiler <string>`	Build with specified compiler version. Choices: gcc vs2008 vs2010 vs2013 vs2015 vs2017 vs2019 vs2022. Specify primary and secondary compiler by adding a plus sign in between. Example: gcc+vs2013. Default: gcc.
`--gccversion <string>`	Build with specified MinGW gcc version. Windows only. Choices: 4.9.2 5.2.0 7.2.0 8.1.0 11.2.0. Default: 7.2.0.
`--msysversion <string>`	Build with specified MSYS version. Windows only. Choices: 1 2. Default: Version 2 if available, otherwise version 1.
`--tclversion <string>`	Build Tcl, Tk and Tclkit for specified version. Choices: 8.6.7 - 8.6.13, 8.7.a5. Default: 8.6.13.
`--tkversion <string>`	Build Tk and Tclkit for specified version. Choices: 8.6.7 - 8.6.13, 8.7.a5. Default: 8.6.13.
`--imgversion <string>`	Build Img for specified version. Choices: 1.4.9 1.4.10 1.4.11 1.4.13 1.4.14 1.5.0. Default: 1.4.14.
`--osgversion <string>`	Build OpenSceneGraph for specified version. Choices: 3.4.1 3.6.5. Default: 3.6.5.
`--buildtype <string>`	Use specified build type. Choices: Release Debug. Default: Release or as specified in setup file.
`--exclude <lib>`	Force exclusion of build for specified library name.
`--wincc <lib> <string>`	Use specified Windows compiler, if supported by build script. Choices: gcc vs.
`--sdk <lib> <string>`	Use specified Microsoft SDK version. To use the SDK version for all libraries, specify "all" as library name.
`--copt <lib> <string>`	Specify library specific user configuration option.
`--user <lib> <string>`	Specify library specific user build file.
`--url <string>`	Specify BAWT download server. Default: https://www.tcl3d.org/bawt/download
`--toolsdir <string>`	Specify directory containing MSYS/MinGW. Default: [GetOutputToolsDir]
`--rootdir <string>`	Specify build output root directory. Default: [GetOutputRootDir]

`--libdir <string>`	Add a directory containing library source and build files. This option can be called multiple times and adds the new directory to the beginning of the directory list. Default search list: [file join [pwd] “InputLibs”] [file join [GetInputRootDir] “InputLibs”]
`--distdir <string>`	Specify distribution root directory. Default: [file join [GetOutputTypeDir] "Distribution"]
`--finalizefile <string>`	Specify file with user supplied Finalize procedure. Default: None.
`--sort <string>`	Sort libraries according to specified sorting mode. Choices: dependencies dictionary none. Default: dependencies
`--noversion`	Do not use version number for Tcl package directories. Default: Library name and version number.
`--noexit`	Do not exit build process after fatal error, but try to continue. Default: Exit build process after a fatal error.
`--noimportlibs`	Do not create import libraries on Windows. Default: Create import libraries. Needs VisualStudio.
`--noruntimelibs`	Do not copy VisualStudio runtime libraries. Default: Copy runtime libraries. Needs VisualStudio.
`--nostrip`	Do not strip libraries in distribution directory. Default: Strip libraries.
`--noonline`	Do not check or download from online repository. Default: Use https://www.tcl3d.org/bawt/download
`--norecursive`	Do not check recursive dependencies. Default: Use recursive dependencies.
`--nosubdirs`	Do not create compiler and architecture sub directories. Default: Create compiler and architecture sub directories.
`--nouserbuilds`	Do not consider user build files. Default: Consider user build files named *LibraryName_User.bawt*.
`--iconfile <string>`	Use specified icon file for tclkits and starpacks. Default: Standard tclkit icon. Windows only.
`--resourcefile <string>`	Use specified resource file for tclkits and starpacks. Default: Standard tclkit resource file. Windows only.
`--certfile <string>`	Use specified certification file for code signing starpacks. Default: No code signing. Windows only.
`--timestampurl <string>`	Use specified timestamp server for code signing starpacks. Default: http://timestamp.comodoca.com/authenticode. Use empty string to add no timestamp. Windows only.
`--numjobs <int>`	Number of parallel compile jobs. Default: 1
`--timeout <float>`	Number of seconds to try renaming or deleting directories. Default: 30.0

8 Supported Libraries

List of all libraries (using command line option `--platforms`)

```
  #: Name                 Version  Platforms
----------------------------------------------------
  1: apave                3.4.8    Windows Linux Darwin
  2: awthemes             10.4.0   Windows Linux Darwin
  3: BawtLogViewer        2.3.1    Windows Linux Darwin
  4: Blender              3.0.0    Windows
  5: Boost                1.75.0   Windows Linux Darwin
  6: BWidget              1.9.16   Windows Linux Darwin
  7: Cal3D                0.120    Windows Linux
  8: Canvas3d             1.2.2    Windows Linux
  9: cawt                 2.9.2    Windows
 10: ccl                  4.0.6    Windows Linux
 11: CERTI                3.5.1    Windows Linux
 12: cffi                 1.2.0    Windows Linux Darwin
 13: cfitsio              4.1.0    Windows Linux Darwin
 14: CMake                3.21.4   Windows Linux Darwin
 15: critcl               3.2      Windows Linux Darwin
 16: curl                 7.70.0   Windows Linux Darwin
 17: DiffUtil             0.4.2    Windows Linux Darwin
 18: DirectXTex           2021_11  Windows
 19: Doxygen              1.8.15   Windows
 20: Eigen                3.3.9    Windows Linux Darwin
 21: expect               5.45.4   Linux Darwin
 22: Ffidl                0.9.0    Windows Linux Darwin
 23: ffmpeg               4.4.1    Windows Linux Darwin
 24: fftw                 3.3.9    Windows Linux Darwin
 25: fitsTcl              2.5      Windows Linux Darwin
 26: freeglut             3.2.2    Windows Linux Darwin
 27: Freetype             2.10.4   Windows Linux Darwin
 28: FTGL                 2.1.3    Windows Linux Darwin
 29: gdal                 2.4.4    Windows Linux Darwin
 30: gdi                  0.9.9.15 Windows
 31: GeographicLib        1.52     Windows Linux Darwin
 32: GeographicLibData             Windows Linux Darwin
 33: geos                 3.7.2    Windows Linux Darwin
 34: giflib               5.2.1    Windows Linux Darwin
 35: Gl2ps                1.4.2    Windows Linux Darwin
 36: GLEW                 2.2.0    Windows Linux Darwin
 37: glfw                 3.3.2    Windows Linux Darwin
 38: gorilla              1.6.0    Windows Linux Darwin
 39: hdc                  0.2.0.1  Windows
 40: Img                  1.4.14   Windows Linux Darwin
 41: imgjp2               0.1      Windows Linux Darwin
 42: imgtools             0.3      Windows Linux Darwin
 43: InnoSetup            6.2.0    Windows
 44: iocp                 1.1.0    Windows
 45: itk                  4.1.0    Windows Linux Darwin
 46: iwidgets             4.1.1    Windows Linux Darwin
 47: jasper               2.0.25   Windows Linux Darwin
 48: JPEG                 9.e      Windows Linux Darwin
 49: KDIS                 2.9.0    Windows Linux Darwin
 50: libffi               3.4.2    Windows Linux Darwin
 51: libgd                2.3.2    Windows Linux Darwin
 52: libressl             2.9.2    Windows Linux Darwin
 53: libwebp              1.2.4    Windows Linux Darwin
 54: libxml2              2.9.14   Windows Linux Darwin
 55: materialicons        0.2      Windows Linux Darwin
 56: mawt                 0.4.1    Windows Linux Darwin
 57: memchan              2.3      Windows Linux Darwin
 58: mentry               3.16     Windows Linux Darwin
 59: Mpexpr               1.2      Windows Linux Darwin
 60: mqtt                 3.1      Windows Linux Darwin
 61: mupdf                1.21.1   Windows Linux Darwin
 62: MuPDFWidget          2.2      Windows Linux Darwin
 63: nacl                 1.1      Windows Linux Darwin
 64: nsf                 2.4.0    Windows Linux Darwin
 65: OglInfo             0.9.5    Windows Linux
 66: ooxml               1.6.1    Windows Linux Darwin
 67: openjpeg            2.5.0    Windows Linux Darwin
 68: OpenSceneGraph      3.6.5    Windows Linux Darwin
 69: OpenSceneGraphData  3.4.0    Windows Linux Darwin
 70: oratcl              4.6      Windows Linux Darwin
 71: osgcal              0.2.1    Windows Linux
 72: osgearth            2.10.1   Windows Linux Darwin
 73: parse_args          0.3.3    Windows Linux Darwin
 74: pawt                1.1.0    Windows Linux Darwin
 75: pdf4tcl             0.9.4    Windows Linux Darwin
 76: pgintcl             3.5.1    Windows Linux Darwin
 77: photoresize         0.2      Windows Linux Darwin
 78: pkgconfig           0.29.2   Darwin
 79: PNG                 1.6.38   Windows Linux Darwin
 80: poApps              2.11.0   Windows Linux Darwin
 81: poImg               2.0.2    Windows Linux Darwin
 82: printer             0.9.6.15 Windows
 83: puppyicons          0.1      Windows Linux Darwin
 84: Python              3.7.7    Windows
 85: rbc                 0.2      Windows Linux
 86: Redistributables             Windows
 87: rl_json             0.11.5   Windows Linux Darwin
 88: ruff                2.3.0    Windows Linux Darwin
 89: scrollutil          1.17     Windows Linux Darwin
 90: SDL                 2.26.1   Windows Linux Darwin
 91: SetupOsg                     Windows Linux Darwin
 92: SetupPython                  Windows
 93: SetupTcl                     Windows Linux Darwin
 94: shellicon           0.1      Windows
 95: shtmlview           1.0.0    Windows Linux Darwin
 96: Snack               2.2.11   Windows Linux
 97: sqlite3             3.39.4   Windows Linux Darwin
 98: SWIG                4.1.1    Windows Linux Darwin
 99: tablelist           6.20     Windows Linux Darwin
100: tbcload             1.7.1    Windows Linux Darwin
101: Tcl                 8.6.13   Windows Linux Darwin
102: tcl3dBasic          0.9.5    Windows Linux
103: tcl3dFull           0.9.5    Windows Linux
104: Tcladdressbook      1.2.4    Darwin
105: tclAE               2.0.7    Darwin
106: Tclapplescript      2.2      Darwin
107: tclargp             0.2      Windows Linux Darwin
108: tclcompiler         1.7.3    Windows Linux Darwin
109: tclcsv              2.3      Windows Linux Darwin
110: tclfpdf             1.5      Windows Linux Darwin
111: tclgd               1.4      Windows Linux Darwin
112: Tclkit                       Windows Linux Darwin
113: tcllib              1.21     Windows Linux Darwin
114: tclMuPdf            2.1.1    Windows Linux Darwin
115: tclparser           1.8      Windows Linux Darwin
116: tclpy               0.4      Windows Linux
117: tclssg              2.2.1    Windows Linux Darwin
118: TclStubs            8.6.13   Windows
119: TclTkManual                  Windows Linux Darwin
120: tcltls              1.7.22   Windows Linux Darwin
121: tclvfs              1.4.2    Windows Linux Darwin
122: tclws               3.4.0    Windows Linux Darwin
123: tclx                8.4.4    Windows Linux Darwin
124: tdom                0.9.3    Windows Linux Darwin
125: TIFF                4.4.0    Windows Linux Darwin
126: tinyxml2            8.0.0    Windows Linux Darwin
127: Tix                 8.4.3    Windows Linux Darwin
128: Tk                  8.6.13   Windows Linux Darwin
129: tkchat              1.482    Windows Linux Darwin
130: tkcon               2.7.10   Windows Linux Darwin
131: tkdnd               2.9.3    Windows Linux Darwin
132: Tkhtml              3.0.1    Windows Linux Darwin
133: tklib               0.7      Windows Linux Darwin
134: tkpath              0.3.3    Windows Linux Darwin
```

```
135: tkribbon            1.1      Windows
136: tksqlite            0.5.13   Windows Linux Darwin
137: TkStubs             8.6.13   Windows
138: tksvg               0.12     Windows Linux Darwin
139: Tktable             2.11     Windows Linux Darwin
140: tkwintrack          2.0.1    Windows Linux
141: treectrl            2.4.1    Windows Linux Darwin
142: Trf                 2.1.4    Windows Linux Darwin
143: trofs               0.4.9    Windows Linux Darwin
144: tserialport         1.1      Windows Linux Darwin
145: twapi               4.7.2    Windows
146: tzint               1.1      Windows Linux Darwin
147: udp                 1.0.11   Windows Linux Darwin
148: ukaz                2.0a3    Windows Linux Darwin
149: vectcl              0.2      Windows Linux Darwin
150: Vim                 9.0.0    Windows
151: wcb                 3.8      Windows Linux Darwin
152: windetect           1.0.0    Windows Linux
153: winhelp             1.1      Windows
154: Xerces              3.2.4    Windows Linux Darwin
155: xz                  5.2.7    Windows Linux Darwin
156: yasm                1.3.0    Windows
157: ZLib                1.2.13   Windows Linux Darwin
```

List of all libraries (using command line option --dependencies)

```
  #: Name                 Version  Dependencies
----------------------------------------------------------------------------------------------------
------------------------
  1: apave                3.4.8    Tk
  2: awthemes             10.4.0   Tk
  3: BawtLogViewer        2.3.1    Tclkit tablelist tkdnd poApps scrollutil
  4: Blender              3.0.0
  5: Boost                1.75.0
  6: BWidget              1.9.16   Tk
  7: Cal3D                0.120    CMake freeglut
  8: Canvas3d             1.2.2    Tk
  9: cawt                 2.9.2    Tcl twapi
 10: ccl                  4.0.6    CMake
 11: CERTI                3.5.1    CMake
 12: cffi                 1.2.0    Tcl libffi
 13: cfitsio              4.1.0
 14: CMake                3.21.4
 15: critcl               3.2      Tcl
 16: curl                 7.70.0   libressl
 17: DiffUtil             0.4.2    Tcl
 18: DirectXTex           2021_11
 19: Doxygen              1.8.15
 20: Eigen                3.3.9
 21: expect               5.45.4   Tcl
 22: Ffidl                0.9.0    Tcl libffi
 23: ffmpeg               4.4.1    yasm SDL
 24: fftw                 3.3.9
 25: fitsTcl              2.5      Tcl cfitsio
 26: freeglut             3.2.2    CMake
 27: Freetype             2.10.4   PNG
 28: FTGL                 2.1.3    Freetype
 29: gdal                 2.4.4    openjpeg
 30: gdi                  0.9.9.15 Tk TkStubs
 31: GeographicLib        1.52     CMake
 32: GeographicLibData             GeographicLib
 33: geos                 3.7.2    CMake
 34: giflib               5.2.1
 35: Gl2ps                1.4.2    CMake freeglut PNG ZLib
 36: GLEW                 2.2.0    CMake
 37: glfw                 3.3.2    CMake
 38: gorilla              1.6.0    Tcl Tclkit
 39: hdc                  0.2.0.1  Tk TkStubs
 40: Img                  1.4.14   Tk TkStubs
 41: imgjp2               0.1      Tk openjpeg
 42: imgtools             0.3      Tcl Tk
 43: InnoSetup            6.2.0
 44: iocp                 1.1.0    Tcl
 45: itk                  4.1.0    Tk
 46: iwidgets           4.1.1    Tk
 47: jasper             2.0.25   CMake JPEG
 48: JPEG               9.e
 49: KDIS               2.9.0    CMake
 50: libffi             3.4.2
 51: libgd              2.3.2    ZLib TIFF JPEG PNG libwebp Freetype
 52: libressl           2.9.2
 53: libwebp            1.2.4
 54: libxml2            2.9.14   CMake Zlib
 55: materialicons      0.2      Tk tdom tksvg
 56: mawt               0.4.1    Tk TkStubs SWIG CMake Img ffmpeg
 57: memchan            2.3      Tcl
 58: mentry             3.16     Tk wcb
 59: Mpexpr             1.2      Tcl
 60: mqtt               3.1      Tcl
 61: mupdf              1.21.1
 62: MuPDFWidget        2.2      Tk tclMuPdf
 63: nacl               1.1      Tcl
 64: nsf                2.4.0    Tcl
 65: OglInfo            0.9.5    Tclkit tcl3dBasic
 66: ooxml              1.6.1    Tcl tclvfs tdom
 67: openjpeg           2.5.0    CMake
 68: OpenSceneGraph     3.6.5    CMake ZLib TIFF JPEG jasper giflib PNG curl Freetype ffmpeg
 69: OpenSceneGraphData 3.4.0    OpenSceneGraph
 70: oratcl             4.6      Tcl
 71: osgcal             0.2.1    Cal3D OpenSceneGraph
 72: osgearth           2.10.1   CMake curl gdal geos OpenSceneGraph
 73: parse_args         0.3.3    Tcl
 74: pawt               1.1.0    Tcl fitstcl Img
 75: pdf4tcl            0.9.4    Tk
 76: pgintcl            3.5.1    Tcl
 77: photoresize        0.2      Tcl Tk
 78: pkgconfig          0.29.2
 79: PNG                1.6.38   CMake ZLib
 80: poApps             2.11.0   Tclkit tcllib tablelist Img tdom tclMuPdf fitsTcl poImg cawt pawt
twapi tkdnd tksvg scrollutil
 81: poImg              2.0.2    Tk
 82: printer            0.9.6.15 Tk TkStubs
 83: puppyicons         0.1      Tk tksvg
 84: Python             3.7.7
 85: rbc                0.2      Tk
 86: Redistributables
 87: rl_json            0.11.5   Tcl
 88: ruff               2.3.0    Tcl
 89: scrollutil         1.17     Tk
 90: SDL                2.26.1   CMake
 91: SetupOsg                    All
 92: SetupPython                 Python
 93: SetupTcl                    All
 94: shellicon          0.1      Tk TkStubs
 95: shtmlview          1.0.0    Tk
 96: Snack              2.2.11   Tk TkStubs
 97: sqlite3            3.39.4
 98: SWIG               4.1.1
 99: tablelist          6.20     Tk
100: tbcload            1.7.1    Tcl
101: Tcl                8.6.13
102: tcl3dBasic         0.9.5    CMake Tk TkStubs SWIG
103: tcl3dFull          0.9.5    CMake Tk TkStubs SWIG Freetype FTGL SDL OpenSceneGraph
104: Tcladdressbook     1.2.4    Tcl
105: tclAE              2.0.7    Tcl
106: Tclapplescript     2.2      Tcl
107: tclargp            0.2      Tcl
108: tclcompiler        1.7.3    Tcl
109: tclcsv             2.3      Tcl
110: tclfpdf            1.5      Tk
111: tclgd              1.4      Tcl libgd
112: Tclkit                      Tcl Tk
113: tcllib             1.21     Tcl critcl
114: tclMuPdf           2.1.1    Tk TkStubs mupdf
115: tclparser          1.8      Tcl
116: tclpy              0.4      Tk TkStubs Python
117: tclssg             2.2.1    Tcl Tclkit tcllib
118: TclStubs           8.6.13
119: TclTkManual                 Tcl Tk
120: tcltls             1.7.22   Tcl libressl
121: tclvfs             1.4.2    Tcl
122: tclws              3.4.0    Tcl tdom tcllib
123: tclx               8.4.4    Tcl
124: tdom               0.9.3    Tcl
```

```
125: TIFF            4.4.0    JPEG ZLib xz
126: tinyxml2        8.0.0    CMake
127: Tix             8.4.3    Tk
128: Tk              8.6.13   Tcl
129: tkchat          1.482    Tclkit
130: tkcon           2.7.10   Tk
131: tkdnd           2.9.3    CMake Tk TkStubs
132: Tkhtml          3.0.1    Tcl Tk
133: tklib           0.7      Tk
134: tkpath          0.3.3    Tk
135: tkribbon        1.1      Tk TkStubs
136: tksqlite        0.5.13   Tcl Tclkit tablelist Tktable treectrl Img
137: TkStubs         8.6.13   TclStubs
138: tksvg           0.12     Tk
139: Tktable         2.11     Tk
140: tkwintrack      2.0.1    Tk
141: treectrl        2.4.1    Tk
142: Trf             2.1.4    Tcl Zlib
143: trofs           0.4.9    Tk
144: tserialport     1.1      Tcl
145: twapi           4.7.2    Tcl
146: tzint           1.1      Tcl PNG
147: udp             1.0.11   Tcl
148: ukaz            2.0a3    Tk
149: vectcl          0.2      Tcl
150: Vim             9.0.0
151: wcb             3.8      Tk
152: windetect       1.0.0    Tk
153: winhelp         1.1      Tcl Tk
154: Xerces          3.2.4    CMake
155: xz              5.2.7
156: yasm            1.3.0
157: ZLib            1.2.13
```

List of all libraries (using command line option `--authors`)

```
  #: Name                 Version  ScriptAuthor
-------------------------------------------------
  1: apave                3.4.8    Paul Obermeier
  2: awthemes             10.4.0   Paul Obermeier
  3: BawtLogViewer        2.3.1    Paul Obermeier
  4: Blender              3.0.0    Paul Obermeier
  5: Boost                1.75.0   Paul Obermeier
  6: BWidget              1.9.16   Paul Obermeier
  7: Cal3D                0.120    Paul Obermeier
  8: Canvas3d             1.2.2    Paul Obermeier
  9: cawt                 2.9.2    Paul Obermeier
 10: ccl                  4.0.6    Paul Obermeier
 11: CERTI                3.5.1    Paul Obermeier
 12: cffi                 1.2.0    Paul Obermeier
 13: cfitsio              4.1.0    Paul Obermeier
 14: CMake                3.21.4   Paul Obermeier
 15: critcl               3.2      Paul Obermeier
 16: curl                 7.70.0   Paul Obermeier
 17: DiffUtil             0.4.2    Paul Obermeier
 18: DirectXTex           2021_11  Paul Obermeier
 19: Doxygen              1.8.15   Paul Obermeier
 20: Eigen                3.3.9    Paul Obermeier
 21: expect               5.45.4   Paul Obermeier
 22: Ffidl                0.9.0    Paul Obermeier
 23: ffmpeg               4.4.1    Paul Obermeier
 24: fftw                 3.3.9    Paul Obermeier
 25: fitsTcl              2.5      Paul Obermeier
 26: freeglut             3.2.2    Paul Obermeier
 27: Freetype             2.10.4   Paul Obermeier
 28: FTGL                 2.1.3    Paul Obermeier
 29: gdal                 2.4.4    Paul Obermeier
 30: gdi                  0.9.9.15 Paul Obermeier
 31: GeographicLib        1.52     Paul Obermeier
 32: GeographicLibData             Paul Obermeier
 33: geos                 3.7.2    Paul Obermeier
 34: giflib               5.2.1    Paul Obermeier
 35: Gl2ps              1.4.2    Paul Obermeier
 36: GLEW               2.2.0    Paul Obermeier
 37: glfw               3.3.2    Paul Obermeier
 38: gorilla            1.6.0    Paul Obermeier
 39: hdc                0.2.0.1  Paul Obermeier
 40: Img                1.4.14   Paul Obermeier
 41: imgjp2             0.1      Paul Obermeier
 42: imgtools           0.3      Paul Obermeier
 43: InnoSetup          6.2.0    Paul Obermeier
 44: iocp               1.1.0    Paul Obermeier
 45: itk                4.1.0    Paul Obermeier
 46: iwidgets           4.1.1    Paul Obermeier
 47: jasper             2.0.25   Paul Obermeier
 48: JPEG               9.e      Paul Obermeier
 49: KDIS               2.9.0    Paul Obermeier
 50: libffi             3.4.2    Paul Obermeier
 51: libgd              2.3.2    Alexander Schoepe
 52: libressl           2.9.2    Paul Obermeier
 53: libwebp            1.2.4    Paul Obermeier
 54: libxml2            2.9.14   Paul Obermeier
 55: materialicons      0.2      Paul Obermeier
 56: mawt               0.4.1    Paul Obermeier
 57: memchan            2.3      Alexander Schoepe
 58: mentry             3.16     Paul Obermeier
 59: Mpexpr             1.2      Paul Obermeier
 60: mqtt               3.1      Paul Obermeier
 61: mupdf              1.21.1   Paul Obermeier
 62: MuPDFWidget        2.2      Paul Obermeier
 63: nacl               1.1      Paul Obermeier
 64: nsf                2.4.0    Paul Obermeier
 65: OglInfo            0.9.5    Paul Obermeier
 66: ooxml              1.6.1    Paul Obermeier
 67: openjpeg           2.5.0    Paul Obermeier
 68: OpenSceneGraph     3.6.5    Paul Obermeier
 69: OpenSceneGraphData 3.4.0    Paul Obermeier
 70: oratcl             4.6      Alexander Schoepe
 71: osgcal             0.2.1    Paul Obermeier
 72: osgearth           2.10.1   Paul Obermeier
 73: parse_args         0.3.3    Paul Obermeier
 74: pawt               1.1.0    Paul Obermeier
 75: pdf4tcl            0.9.4    Paul Obermeier
 76: pgintcl            3.5.1    Paul Obermeier
 77: photoresize        0.2      Paul Obermeier
 78: pkgconfig          0.29.2   Paul Obermeier
 79: PNG                1.6.38   Paul Obermeier
 80: poApps             2.11.0   Paul Obermeier
 81: poImg              2.0.2    Paul Obermeier
 82: printer            0.9.6.15 Paul Obermeier
 83: puppyicons         0.1      Paul Obermeier
 84: Python             3.7.7    Paul Obermeier
 85: rbc                0.2      Alexander Schoepe
 86: Redistributables            Paul Obermeier
 87: rl_json            0.11.5   Paul Obermeier
 88: ruff               2.3.0    Paul Obermeier
 89: scrollutil         1.17     Paul Obermeier
 90: SDL                2.26.1   Paul Obermeier
 91: SetupOsg                    Paul Obermeier
 92: SetupPython                 Paul Obermeier
 93: SetupTcl                    Paul Obermeier
 94: shellicon          0.1      Paul Obermeier
 95: shtmlview          1.0.0    Paul Obermeier
 96: Snack              2.2.11   Paul Obermeier
 97: sqlite3            3.39.4   Paul Obermeier
 98: SWIG               4.1.1    Paul Obermeier
 99: tablelist          6.20     Paul Obermeier
100: tbcload            1.7.1    Alexander Schoepe
101: Tcl                8.6.13   Paul Obermeier
102: tcl3dBasic         0.9.5    Paul Obermeier
103: tcl3dFull          0.9.5    Paul Obermeier
104: Tcladdressbook     1.2.4    Alexander Schoepe
105: tclAE              2.0.7    Alexander Schoepe
```

```
106: Tclapplescript     2.2      Alexander Schoepe
107: tclargp            0.2      Paul Obermeier
108: tclcompiler        1.7.3    Alexander Schoepe
109: tclcsv             2.3      Paul Obermeier
110: tclfpdf            1.5      Paul Obermeier
111: tclgd              1.4      Alexander Schoepe
112: Tclkit                      Paul Obermeier
113: tcllib             1.21     Paul Obermeier
114: tclMuPdf           2.1.1    Paul Obermeier
115: tclparser          1.8      Alexander Schoepe
116: tclpy              0.4      Paul Obermeier
117: tclssg             2.2.1    Paul Obermeier
118: TclStubs           8.6.13   Paul Obermeier
119: TclTkManual                 Paul Obermeier
120: tcltls             1.7.22   Alexander Schoepe
121: tclvfs             1.4.2    Paul Obermeier
122: tclws              3.4.0    Paul Obermeier
123: tclx               8.4.4    Paul Obermeier
124: tdom               0.9.3    Paul Obermeier
125: TIFF               4.4.0    Paul Obermeier
126: tinyxml2           8.0.0    Paul Obermeier
127: Tix                8.4.3    Paul Obermeier
128: Tk                 8.6.13   Paul Obermeier
129: tkchat             1.482    Paul Obermeier
130: tkcon              2.7.10   Paul Obermeier
131: tkdnd              2.9.3    Paul Obermeier
132: Tkhtml             3.0.1    Paul Obermeier
133: tklib              0.7      Paul Obermeier
134: tkpath             0.3.3    Paul Obermeier
135: tkribbon           1.1      Paul Obermeier
136: tksqlite           0.5.13   Paul Obermeier
137: TkStubs            8.6.13   Paul Obermeier
138: tksvg              0.12     Paul Obermeier
139: Tktable            2.11     Paul Obermeier
140: tkwintrack         2.0.1    Paul Obermeier
141: treectrl           2.4.1    Paul Obermeier
142: Trf                2.1.4    Paul Obermeier
143: trofs              0.4.9    Paul Obermeier
144: tserialport        1.1      Alexander Schoepe
145: twapi              4.7.2    Paul Obermeier
146: tzint              1.1      Alexander Schoepe
147: udp                1.0.11   Paul Obermeier
148: ukaz               2.0a3    Paul Obermeier
149: vectcl             0.2      Paul Obermeier
150: Vim                9.0.0    Paul Obermeier
151: wcb                3.8      Paul Obermeier
152: windetect          1.0.0    Paul Obermeier
153: winhelp            1.1      Paul Obermeier
154: Xerces             3.2.4    Paul Obermeier
155: xz                 5.2.7    Paul Obermeier
156: yasm               1.3.0    Paul Obermeier
157: ZLib               1.2.13   Paul Obermeier
```

List of all libraries (using command line option `--homepages`)

```
  #: Name                 Version   Homepage
-----------------------------------------------------------------------------------------------
-
  1: apave                3.4.8     https://aplsimple.github.io/en/tcl/pave/index.html
  2: awthemes             10.4.0    https://sourceforge.net/projects/tcl-awthemes/
  3: BawtLogViewer        2.3.1     http://www.bawt.tcl3d.org
  4: Blender              3.0.0     https://www.blender.org/
  5: Boost                1.75.0    https://www.boost.org/
  6: BWidget              1.9.16    https://core.tcl-lang.org/bwidget/
  7: Cal3D                0.120     https://github.com/mp3butcher/Cal3D
  8: Canvas3d             1.2.2     http://3dcanvas.tcl-lang.org/
  9: cawt                 2.9.2     http://www.cawt.tcl3d.org/
 10: ccl                  4.0.6     https://sourceforge.net/projects/cigi/
 11: CERTI                3.5.1     https://savannah.nongnu.org/projects/certi/
 12: cffi                 1.2.0     https://github.com/apnadkarni/tcl-cffi
 13: cfitsio            4.1.0    https://heasarc.gsfc.nasa.gov/fitsio/
 14: CMake              3.21.4   https://www.cmake.org/
 15: critcl             3.2      https://andreas-kupries.github.io/critcl/
 16: curl               7.70.0   https://curl.haxx.se/libcurl/
 17: DiffUtil           0.4.2    https://github.com/pspjuth/DiffUtilTcl/
 18: DirectXTex         2021_11  https://github.com/microsoft/DirectXTex/
 19: Doxygen            1.8.15   http://www.doxygen.org/
 20: Eigen              3.3.9    http://eigen.tuxfamily.org/
 21: expect             5.45.4   https://sourceforge.net/projects/expect/
 22: Ffidl              0.9.0    https://github.com/prs-de/ffidl
 23: ffmpeg             4.4.1    https://www.ffmpeg.org/
 24: fftw               3.3.9    http://www.fftw.org/
 25: fitsTcl            2.5
https://heasarc.gsfc.nasa.gov/docs/software/ftools/fv/fitsTcl_home.html
 26: freeglut           3.2.2    https://sourceforge.net/projects/freeglut/
 27: Freetype           2.10.4   http://www.freetype.org/
 28: FTGL               2.1.3    https://sourceforge.net/projects/ftgl/
 29: gdal               2.4.4    https://www.gdal.org/
 30: gdi                0.9.9.15 http://www.schwartzcomputer.com/tcl-tk/tcl-tk.html
 31: GeographicLib      1.52     https://geographiclib.sourceforge.io/
 32: GeographicLibData           https://geographiclib.sourceforge.io/
 33: geos               3.7.2    http://trac.osgeo.org/geos/
 34: giflib             5.2.1    http://giflib.sourceforge.net/
 35: Gl2ps              1.4.2    http://www.geuz.org/gl2ps/
 36: GLEW               2.2.0    https://github.com/nigels-com/glew/
 37: glfw               3.3.2    https://www.glfw.org/
 38: gorilla            1.6.0    https://github.com/zdia/gorilla/wiki
 39: hdc                0.2.0.1  http://www.schwartzcomputer.com/tcl-tk/tcl-tk.html
 40: Img                1.4.14   https://sourceforge.net/projects/tkimg/
 41: imgjp2             0.1      https://www.androwish.org/home/dir?name=jni/imgjp2
 42: imgtools           0.3      http://tkimgtools.sourceforge.net/
 43: InnoSetup          6.2.0    http://www.jrsoftware.org/isinfo.php
 44: iocp               1.1.0    https://github.com/apnadkarni/iocp/
 45: itk                4.1.0    https://sourceforge.net/projects/incrtcl/
 46: iwidgets           4.1.1    https://sourceforge.net/projects/incrtcl/
 47: jasper             2.0.25   https://github.com/jasper-software/jasper/
 48: JPEG               9.e      http://www.ijg.org/
 49: KDIS               2.9.0    https://sourceforge.net/projects/kdis/
 50: libffi             3.4.2    https://github.com/libffi/libffi
 51: libgd              2.3.2    https://libgd.github.io
 52: libressl           2.9.2    https://www.libressl.org/
 53: libwebp            1.2.4    https://developers.google.com/speed/webp/
 54: libxml2            2.9.14   https://gitlab.gnome.org/GNOME/libxml2
 55: materialicons      0.2      https://www.androwish.org/
 56: mawt               0.4.1    http://www.mawt.tcl3d.org/
 57: memchan            2.3      http://memchan.sourceforge.net/
 58: mentry             3.16     http://www.nemethi.de/
 59: Mpexpr             1.2      https://sourceforge.net/projects/mpexpr/
 60: mqtt               3.1      https://chiselapp.com/user/schelte/repository/mqtt/home
 61: mupdf              1.21.1   https://mupdf.com/
 62: MuPDFWidget        2.2      https://sourceforge.net/projects/irrational-numbers/
 63: nacl               1.1      https://tcl.sowaswie.de/repos/fossil/nacl/home
 64: nsf                2.4.0    https://next-scripting.org
 65: OglInfo            0.9.5    http://www.tcl3d.org/
 66: ooxml              1.6.1    https://tcl.sowaswie.de/repos/fossil/ooxml/home
 67: openjpeg           2.5.0    http://www.openjpeg.org/
 68: OpenSceneGraph     3.6.5    http://www.openscenegraph.org/
 69: OpenSceneGraphData 3.4.0    http://www.openscenegraph.org/
 70: oratcl             4.6      http://oratcl.sourceforge.net
 71: osgcal             0.2.1    https://sourceforge.net/projects/osgcal/
 72: osgearth           2.10.1   http://osgearth.org/
 73: parse_args         0.3.3    https://github.com/RubyLane/parse_args
 74: pawt               1.1.0    http://www.pawt.tcl3d.org/
 75: pdf4tcl            0.9.4    https://sourceforge.net/projects/pdf4tcl/
 76: pgintcl            3.5.1    https://sourceforge.net/projects/pgintcl/
 77: photoresize        0.2      https://github.com/auriocus/PhotoResize
 78: pkgconfig          0.29.2   https://www.freedesktop.org/wiki/Software/pkg-config/
 79: PNG                1.6.38   http://www.libpng.org/pub/png/
 80: poApps             2.11.0   http://www.poSoft.de/html/poTools.html
 81: poImg              2.0.2    http://www.poSoft.de/
 82: printer            0.9.6.15 http://www.schwartzcomputer.com/tcl-tk/tcl-tk.html
 83: puppyicons         0.1      https://www.androwish.org/
 84: Python             3.7.7    http://www.python.org/
 85: rbc                0.2      http://www.sourceforge.net/projects/rbctoolkit/
 86: Redistributables            https://support.microsoft.com/en-us/kb/2977003
 87: rl_json            0.11.5   https://github.com/RubyLane/rl_json
 88: ruff               2.3.0    https://ruff.magicsplat.com/
 89: scrollutil         1.17     http://www.nemethi.de/
 90: SDL                2.26.1   https://www.libsdl.org/
 91: SetupOsg                    http://www.bawt.tcl3d.org/
 92: SetupPython                   http://www.bawt.tcl3d.org/
 93: SetupTcl                      http://www.bawt.tcl3d.org/
 94: shellicon           0.1       http://wiki.tcl-lang.org/17859
 95: shtmlview           1.0.0     https://github.com/mittelmark/shtmlview/
 96: Snack               2.2.11    https://github.com/scottypitcher/tcl-snack
 97: sqlite3             3.39.4    https://www.sqlite.org/
 98: SWIG                4.1.1     http://www.swig.org/
 99: tablelist           6.20      http://www.nemethi.de/
100: tbcload             1.7.1     https://github.com/ActiveState/teapot/tree/master/lib/tbcload
101: Tcl                 8.6.13    http://www.tcl-lang.org/
102: tcl3dBasic          0.9.5     http://www.tcl3d.org/
103: tcl3dFull           0.9.5     http://www.tcl3d.org/
104: Tcladdressbook      1.2.4     https://sourceforge.net/projects/tcladdressbook/
105: tclAE               2.0.7     https://sourceforge.net/projects/tclae/
106: Tclapplescript      2.2       https://sourceforge.net/projects/tclapplescript/
107: tclargp             0.2       http://www.chevreux.org/projects_tcl.html
108: tclcompiler         1.7.3     https://github.com/ActiveState/teapot/tree/master/lib/tclcompiler
109: tclcsv              2.3       https://sourceforge.net/projects/tclcsv
110: tclfpdf             1.5       https://github.com/lamuzzachiodi/tclfpdf
111: tclgd               1.4       https://github.com/flightaware/tcl.gd
112: Tclkit                        https://sourceforge.net/projects/kbskit/
113: tcllib              1.21      https://core.tcl-lang.org/tcllib
114: tclMuPdf            2.1.1     https://sourceforge.net/projects/irrational-numbers/
115: tclparser           1.8       https://github.com/flightaware/TclProDebug/tree/master/lib/tclparser
116: tclpy               0.4       https://github.com/aidanhs/libtclpy
117: tclssg              2.2.1     https://github.com/tclssg/tclssg
118: TclStubs            8.6.13    http://www.tcl-lang.org/
119: TclTkManual                   http://www.tcl-lang.org
120: tcltls              1.7.22    http://core.tcl-lang.org/tcltls/
121: tclvfs              1.4.2     https://sourceforge.net/projects/tclvfs/
122: tclws               3.4.0     https://core.tcl-lang.org/tclws/
123: tclx                8.4.4     https://github.com/flightaware/tclx/
124: tdom                0.9.3     http://tdom.org/
125: TIFF                4.4.0     http://www.simplesystems.org/libtiff/
126: tinyxml2            8.0.0     https://github.com/leethomason/tinyxml2
127: Tix                 8.4.3     http://tix.sourceforge.net/
128: Tk                  8.6.13    http://www.tcl-lang.org/
129: tkchat              1.482     http://tkchat.tcl-lang.org/
130: tkcon               2.7.10    https://github.com/wjoye/tkcon/
131: tkdnd               2.9.3     https://github.com/petasis/tkdnd
132: Tkhtml              3.0.1     http://tkhtml.tcl.tk/index.html
133: tklib               0.7       https://core.tcl-lang.org/tklib
134: tkpath              0.3.3     http://chiselapp.com/user/rene/repository/tkpath/
135: tkribbon            1.1       https://github.com/petasis/tkribbon
136: tksqlite            0.5.13    http://reddog.s35.xrea.com/wiki/TkSQLite.html
137: TkStubs             8.6.13    http://www.tcl-lang.org/
138: tksvg               0.12      https://github.com/oehhar/tksvg/
139: Tktable             2.11      http://tktable.sourceforge.net/
140: tkwintrack          2.0.1     https://sourceforge.net/projects/tkwintrack/
141: treectrl            2.4.1     https://sourceforge.net/projects/tktreectrl/
142: Trf                 2.1.4     http://tcltrf.sourceforge.net/
143: trofs               0.4.9     https://math.nist.gov/~DPorter/tcltk/trofs/
144: tserialport         1.1       https://tcl.sowaswie.de/repos/fossil/tserialport/home
145: twapi               4.7.2     https://twapi.magicsplat.com/
146: tzint               1.1       https://tcl.sowaswie.de/repos/fossil/tzint/home
147: udp                 1.0.11    https://sourceforge.net/projects/tcludp/
148: ukaz                2.0a3     https://github.com/auriocus/ukaz
149: vectcl              0.2       http://auriocus.github.io/VecTcl/
150: Vim                 9.0.0     https://www.vim.org/
151: wcb                 3.8       http://www.nemethi.de/
152: windetect           1.0.0     https://sourceforge.net/projects/tkwintrack/
153: winhelp             1.1       https://www.androwish.org/index.html/dir?name=undroid/winhelp
154: Xerces              3.2.4     http://xerces.apache.org/
155: xz                  5.2.7     https://sourceforge.net/projects/lzmautils/
156: yasm                1.3.0     https://yasm.tortall.net/
157: ZLib                1.2.13    http://www.zlib.net/
```

9 MSYS / MinGW Information

This chapter describes the development environments `MSYS` and `MinGW`. These packages provide an environment using the GNU compiler collection (`gcc`) to build typical Open Source projects like ***Tcl/Tk*** under Windows.

9.1 Introduction

9.1.1 MSYS

Short description from the homepage of MSYS: http://www.mingw.org/

MSYS, a contraction of "Minimal SYStem", is a Bourne Shell command line interpreter system. Offered as an alternative to Microsoft's cmd.exe, this provides a general purpose command line environment, which is particularly suited to use with MinGW, for porting of many Open Source applications to the MS-Windows platform.

MSYS is a collection of Unix tools for Windows. It contains all tools which are needed for the typical build process using the `configure / make` toolset.

Examples: `autogen, cp, rm, mv, mkdir, m4, make`

`MSYS` is available as 32-bit version only. This version can be used in conjunction with both the 32-bit and 64-bit version of `MinGW`.

9.1.2 MSYS2

MSYS2 is a newer version of MSYS. It is available from https://www.msys2.org/.
Download the newest 32-bit installer and execute it. After installation perform the following commands to update the packages and add additional packages needed for BAWT.

- Start the MSYS2 shell and execute command:

```
> pacman -Syu
```

- Close the MSYS2 shell by closing the window.
- Start the MSYS2 shell again and perform the following commands:

```
> pacman -Su
> pacman -S make
> pacman -S autoconf
> pacman -S pkg-config
```

9.1.3 MinGW

Short description from the homepage of MinGW-w64: http://sourceforge.net/projects/mingw-w64/

MinGW, a contraction of "Minimalist GNU for Windows", is a minimalist development environment for native Microsoft Windows applications.

MinGW provides a complete Open Source programming tool set which is suitable for the development of native MS-Windows applications, and which do not depend on any 3rd-party C-Runtime DLLs. (It does depend on a number of DLLs provided by Microsoft themselves, as components of the operating system; most notable among these is MSVCRT.DLL, the Microsoft C runtime library. Additionally, threaded applications must ship with a freely distributable thread support DLL, provided as part of MinGW itself).

MinGW compilers provide access to the functionality of the Microsoft C runtime and some language-specific runtimes. MinGW, being Minimalist, does not, and never will, attempt to provide a POSIX runtime environment for POSIX application deployment on MS-Windows.

`MinGW` provides the GNU Compiler Collection `gcc` for Windows. The SourceForge project `MinGW-w64` supplies 32-bit and 64-bit versions of `gcc`.

The `MinGW-w64` project also supplies an extended version of `MSYS` (see chapter *9.2 Installation* below for details).

9.2 Installation

9.2.1 Download MSYS

Entry page:
http://sourceforge.net/projects/mingwbuilds/files/external-binary-packages/

File: *msys+7za+wget+svn+git+mercurial+cvs-rev13.7z*

Link:
http://sourceforge.net/projects/mingwbuilds/files/external-binary-packages/msys%2B7za%2Bwget%2Bsvn%2Bgit%2Bmercurial%2Bcvs-rev13.7z/download

9.2.2 Download MinGW

Entry page for 32-bit version:
http://sourceforge.net/projects/mingw-w64/files/Toolchains%20targetting%20Win32/Personal%20Builds/mingw-builds/

Entry page for 64-bit version:
http://sourceforge.net/projects/mingw-w64/files/Toolchains%20targetting%20Win64/Personal%20Builds/mingw-builds/

32-bit gcc 4.9.2
File: *i686-4.9.2-release-posix-dwarf-rt_v4-rev4.7z*

Link:
http://sourceforge.net/projects/mingw-w64/files/Toolchains%20targetting%20Win32/Personal%20Builds/mingw-builds/4.9.2/threads-posix/dwarf/i686-4.9.2-release-posix-dwarf-rt_v4-rev4.7z/download

32-bit gcc 5.2.0
File: *i686-5.2.0-release-posix-dwarf-rt_v4-rev0.7z*

Link:
http://sourceforge.net/projects/mingw-w64/files/Toolchains%20targetting%20Win32/Personal%20Builds/mingw-builds/5.2.0/threads-posix/dwarf/i686-5.2.0-release-posix-dwarf-rt_v4-rev0.7z/download

32-bit gcc 7.2.0
File: *i686-7.2.0-release-posix-dwarf-rt_v5-rev1.7z*

Link:
https://sourceforge.net/projects/mingw-w64/files/Toolchains%20targetting%20Win32/Personal%20Builds/mingw-builds/7.2.0/threads-posix/dwarf/i686-7.2.0-release-posix-dwarf-rt_v5-rev1.7z/download

32-bit gcc 8.1.0
File: *i686-8.1.0-release-posix-dwarf-rt_v6-rev0.7z*

Link:
https://sourceforge.net/projects/mingw-w64/files/Toolchains%20targetting%20Win32/Personal%20Builds/mingw-builds/8.1.0/threads-posix/dwarf/i686-8.1.0-release-posix-dwarf-rt_v6-rev0.7z/download

64-bit gcc 4.9.2
File: *x86_64-4.9.2-release-posix-seh-rt_v4-rev4.7z*

Link:
http://sourceforge.net/projects/mingw-w64/files/Toolchains%20targetting%20Win64/Personal%20Builds/mingw-builds/4.9.2/threads-posix/seh/x86_64-4.9.2-release-posix-seh-rt_v4-rev4.7z/download

64-bit gcc 5.2.0
File: *x86_64-5.2.0-release-posix-seh-rt_v4-rev0.7z*

Link:
http://sourceforge.net/projects/mingw-w64/files/Toolchains%20targetting%20Win64/Personal%20Builds/mingw-builds/5.2.0/threads-posix/seh/x86_64-5.2.0-release-posix-seh-rt_v4-rev0.7z/download

64-bit gcc 7.2.0
File: *x86_64-7.2.0-release-posix-seh-rt_v5-rev1.7z*

Link:
https://sourceforge.net/projects/mingw-w64/files/Toolchains%20targetting%20Win64/Personal%20Builds/mingw-builds/7.2.0/threads-posix/seh/x86_64-7.2.0-release-posix-seh-rt_v5-rev1.7z/download

64-bit gcc 8.1.0
File: *x86_64-8.1.0-release-posix-seh-rt_v6-rev0.7z*

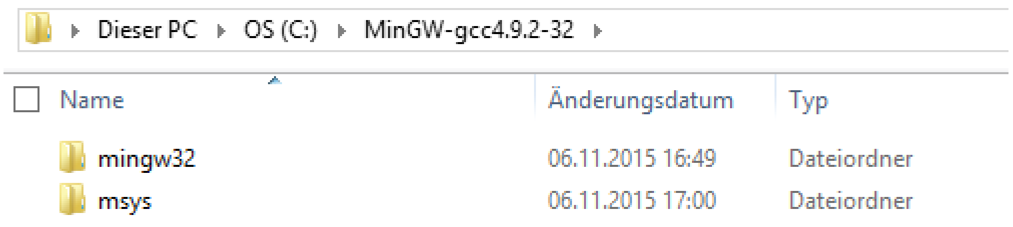
Link:
https://sourceforge.net/projects/mingw-w64/files/Toolchains%20targetting%20Win64/Personal%20Builds/mingw-builds/8.1.0/threads-posix/seh/x86_64-8.1.0-release-posix-seh-rt_v6-rev0.7z/download

9.2.3 Extract

The following instructions use the 32-bit version of gcc 4.9.2. Installation is done on drive C:
Adapt file and directory names accordingly, when using other versions.

- Create directory `C:\MinGW-gcc4.9.2-32`
- Extract downloaded MinGW file in directory `C:\MinGW-gcc4.9.2-32`
- Extract downloaded MSYS file in directory `C:\MinGW-gcc4.9.2-32`

Your directory structure should now look as follows:



Dieser PC ▸ OS (C:) ▸ MinGW-gcc4.9.2-32 ▸

Name	Änderungsdatum	Typ
mingw32	06.11.2015 16:49	Dateiordner
msys	06.11.2015 17:00	Dateiordner

9.2.4 Configuration

Insert the next two lines into file `C:\MinGW-gcc4.9.2-32\msys\etc\fstab`

```
# Win32_Path                      Mount_Point
C:/MinGW-gcc4.9.2-32/mingw32      /mingw
```

9.2.5 Test

Start the MSYS Shell by double-clicking onto file `C:\MinGW-gcc4.9.2-32\msys\msys.bat`
You may create a shortcut of `msys.bat` on your desktop for easier access.

9.3 Further Informations

Source: http://sourceforge.net/p/mingw-w64/wiki2/MSYS/

9.3.1 What is MSYS

MSYS is a Minimal SYStem, providing several crucial unix utilities under a compatibility layer (the msys-1.0.dll file). MSYS should provide everything to make compilation of common GNU software. An outdated description by the makers themselves.

MSYS provided by the mingw-w64/w32 project

This package is not more than a collection of the 50+ packages provided by mingw.org. It was created as a (huge) convenience to our users, to let them be productive instead of downloading every part seperately. The accompanying sources are also provided and can be found in the same download section as mentioned above.

This package is 32-bit, but will run flawlessly on x64 Windows. There will never be a 64-bit native MSYS (is there any need?) because the only compiler capable of building MSYS applications is the outdated gcc 3.4.4, which does not support x64 native Windows targets.

9.3.2 Where to get MSYS

There are three places you can get MSYS:

- The MinGW project, with separate packages of all official MSYS packages. Takes a long time to download and install everything.
- The all-in-one package on the MinGW-w64 download page. It is updated on request (see third option for very up to date collection)
- MinGW-builds provides an ultra-inclusive MSYS package with a bunch of additional useful stuff.

9.3.3 How to use MSYS

Installing MSYS is quite easy.

- You'll need to download the above package.
- Unzip it somewhere, for example C:\msys so that C:\msys\bin contains (among others) bash.exe.
- Doubleclick (or make a handy shortcut and run that) on C:\msys\msys.bat.
- Type sh /postinstall/pi.sh
- Answer the friendly questions and you're all set up.

Mingw-w64/w32 specifics

When running an autotools configure script, these options will come in handy:

- for a 64-bit build: --host=x86_64-w64-mingw32
- for a 32-bit build: --host=i686-w64-mingw32

If you are experiencing problems, you can also set --build to the same value. Some configure scripts also use --target instead of --host. Use configure --help to get all possible options.

--host, --target, and --build explained

--host specifies on what platform/architecture the compiled program is going to run. --target specifies the platform/architecture that the program should be configured for and will be compiled for. This should only have effect when building cross-compilers. --build specifies the platform/architecture the build process is going to be executed.

10 Release history

The following table gives an overview of the release history of ***BAWT***. For detailed release information see the BAWT homepage.

Version	Date	Release notes
0.1.0	2016-06-24	First version introduced at EuroTcl 2016 in Eindhoven.
0.2.0	2016-08-27	Improved build actions. New and updated libraries.
0.3.0	2016-10-23	Improved build actions. New and updated libraries.
0.4.0	2016-12-28	Improved build actions. New and updated libraries.
0.5.0	2017-03-19	Improved build actions. New and updated libraries.
0.6.0	2017-07-20	Improved build actions. New and updated libraries.
0.7.0	2017-08-26	Improved build actions. New and updated libraries.
0.7.1	2017-09-12	Support for Tcl/Tk 8.7.
0.7.2	2017-09-24	Support for Visual Studio 2017.
0.7.3	2018-01-04	Tcl/Tk 8.6.8. New and updated libraries.
0.8.0	2018-07-04	Support for nested Setup files. New and updated libraries.
0.9.0	2018-12-28	Tcl/Tk 8.6.9. New and updated libraries.
0.9.1	2019-03-09	Better support for Debug build mode. New and updated libraries.
1.0.0	2019-06-23	Several incompatible changes. Support for Visual Studio 2019.
1.1.0	2019-12-28	Tcl/Tk 8.6.10. Improved MinGW support for several libraries. New and updated libraries.
1.1.1	2020-01-12	Improved handling of C++ based Tcl extensions.
1.1.2	2020-02-16	Improved BawtLogViewer. New and updated libraries.
1.1.3	2020-03-15	Improved Linux build. Updated libraries.
1.1.4	2020-05-02	Improved MinGW support for several libraries. New and updated libraries.
1.2.0	2020-06-09	Additional MSYS2 support. New and updated libraries.
1.2.1	2020-09-05	Support for Tcl/Tk 8.7a4. New and updated libraries.
1.3.0	2021-01-08	Support for Tcl/Tk 8.6.11. Improved support for Tcl/Tk 8.7.a4. New and updated libraries.
2.0.0	2021-08-22	Support for primary and secondary compiler on Windows. Tcl/Tk 8.7.a5. New and updated libraries.
2.1.0	2021-12-28	Support for Tcl/Tk 8.6.12. New and updated libraries.
2.2.0	2022-04-15	Support for MinGW gcc 11. New and updated libraries.
2.2.1	2022-07-17	Maintenance release. New and updated libraries.
2.3.0	2022-12-18	Support for Tcl/Tk 8.6.13 and Apple Silicon (ARM). New and updated libraries.
2.3.1	2023-01-19	Maintenance release. New and updated libraries.