A Work-In-Progress report
by Paul Obermeier

BAWT

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- **BAWT Introduction**
  - Intention
  - Requirements
  - Workflow Overview
- **BAWT Examples**
  - Build Tcl BI and Tclkits
  - Build libraries for Tcl3D
- **BAWT Status**
  - Overview of supported procedures
  - Build on Windows and Unix
  - What‘s on the TODO list?
- **BAWT Summary**

BAWT Introduction – Intention

Heterogeneous environments on Windows for bulding 3rd party libraries and tools

- configure / make via MSYS / MinGW
- nmake
- cmake
- Visual Studio Solutions

I want to automatically build all needed C/C++ libraries without user interaction.

- gcc via MSYS / MinGW
- Visual Studio versions 2008, 2010, 2012, 2013, 2015

Tcl	Tcl3D	OpenSceneGraph	KDIS
Tk	SDL	ZLib	Xerces
Tclkit	FTGL	TIFF	Boost
Img	GL2PS	PNG	Freetype
Twapi	GLEW	JPEG	GeographicLib
…	…	…	…

BAWT Introduction – Requirements

Requirement	Why and How
Support Windows, Linux and Mac.	Get rid of existing shell scripts for Unix platforms. No redundant build information.
Support multiple Visual Studio versions.	Check and test before upgrading to a new version.
Support DOS and MSys build environment from 1 command shell.	Necessary for automated builds (ex. nightly bulds).
Make build and distribution process flexible.	Adapt to individual needs (private, work) using Tcl. Generate ready-to-use directories both for a developer and a user.
Keep library source code in compressed files.	Easy and fast download from webspace or repository

BAWT Introduction – Workflow

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Source directory

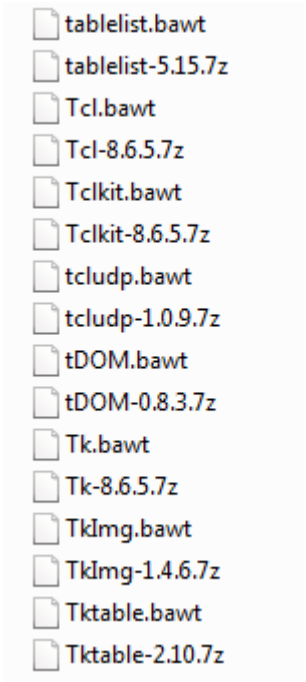
- Library source codes
- Library build scripts

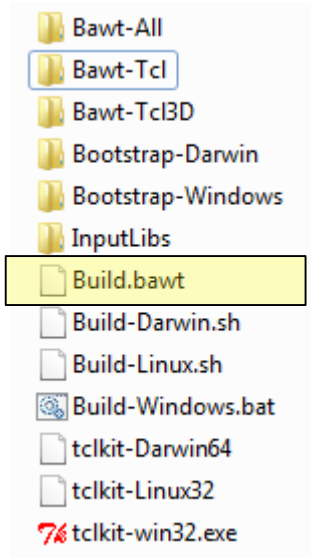
BAWT Framework

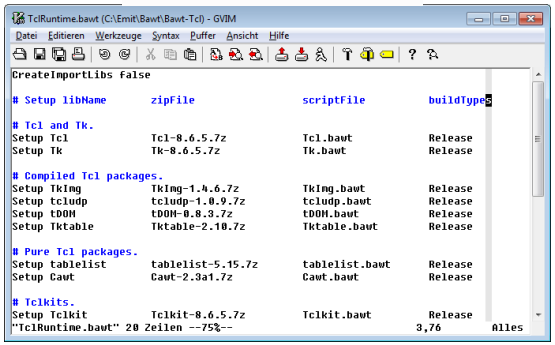
- BAWT build script
- Configuration scripts

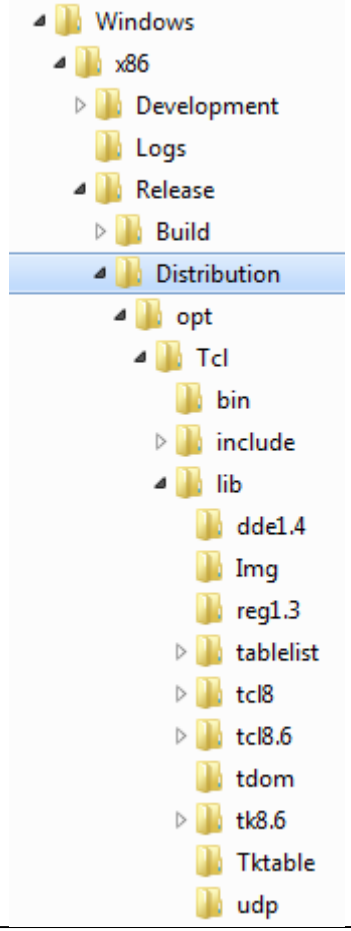
Build directory

- Development folder
- Distribution folder



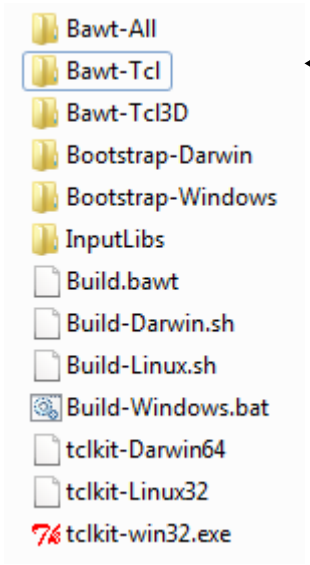


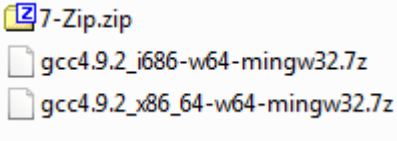


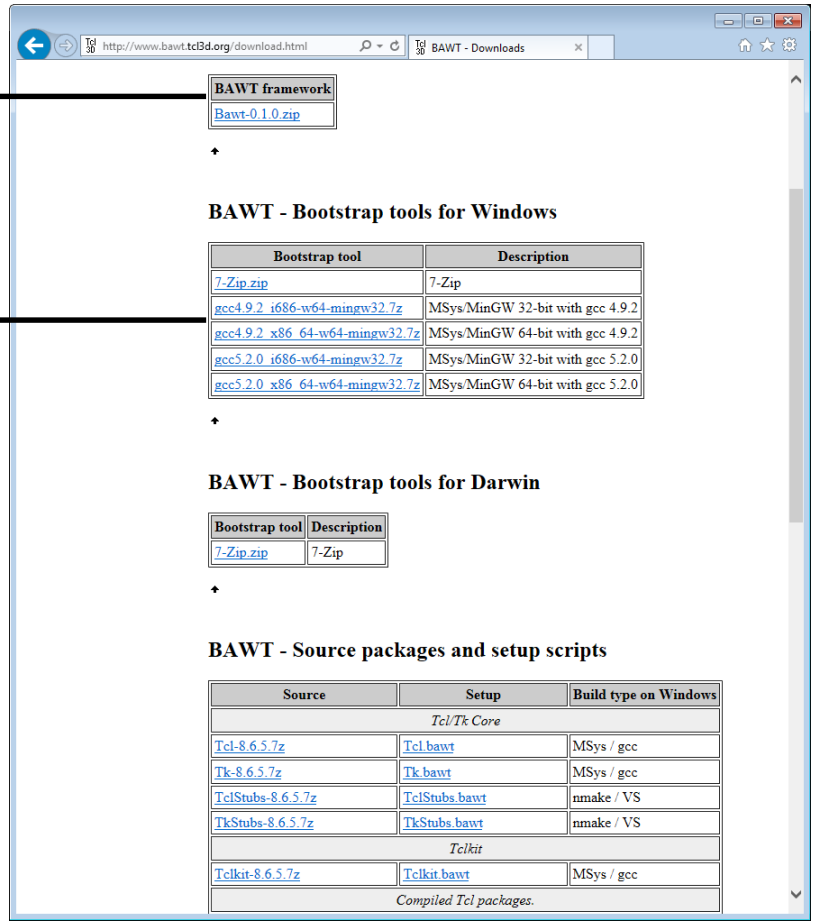


BAWT Examples – Build Tcl BI and Tclkits

Source directory | BAWT Stages | Build directory



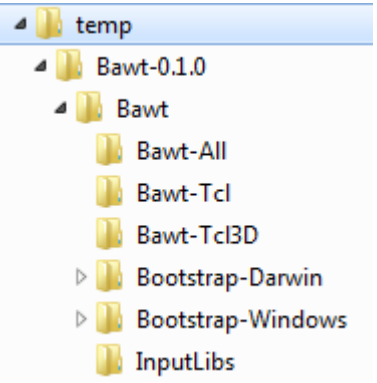




Manual work: Download BAWT framework and appr. bootstrap files from www.bawt.tcl3d.org

BAWT Examples – Build Tcl BI and Tclkits

Example: Build Tcl BI and Tclkits for 32-bit Windows

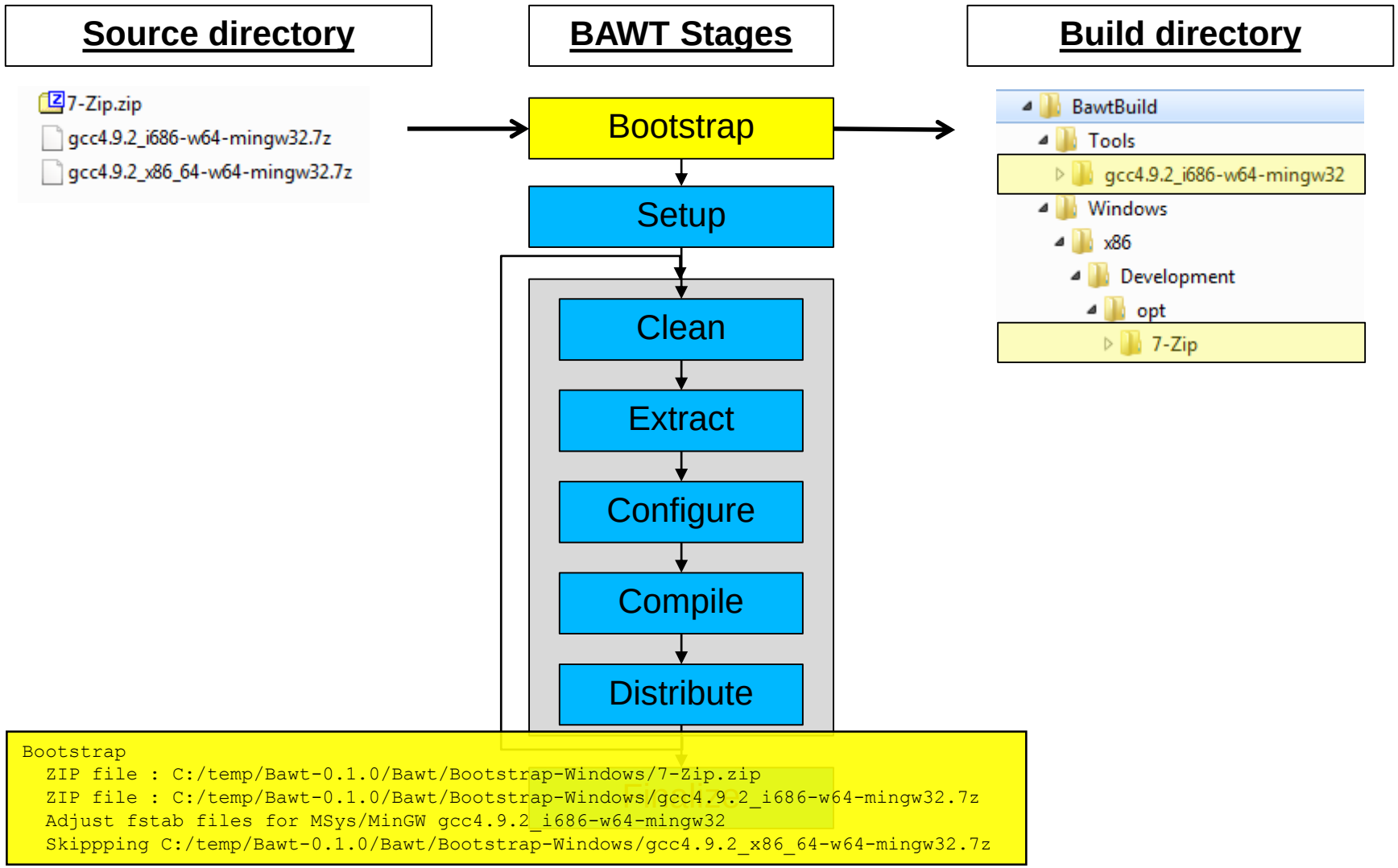


- `cd \temp\Bawt-0.10\Bawt`
- `Build-Windows.bat x86 Windows Bawt-Tcl\TclRuntime.tcl`

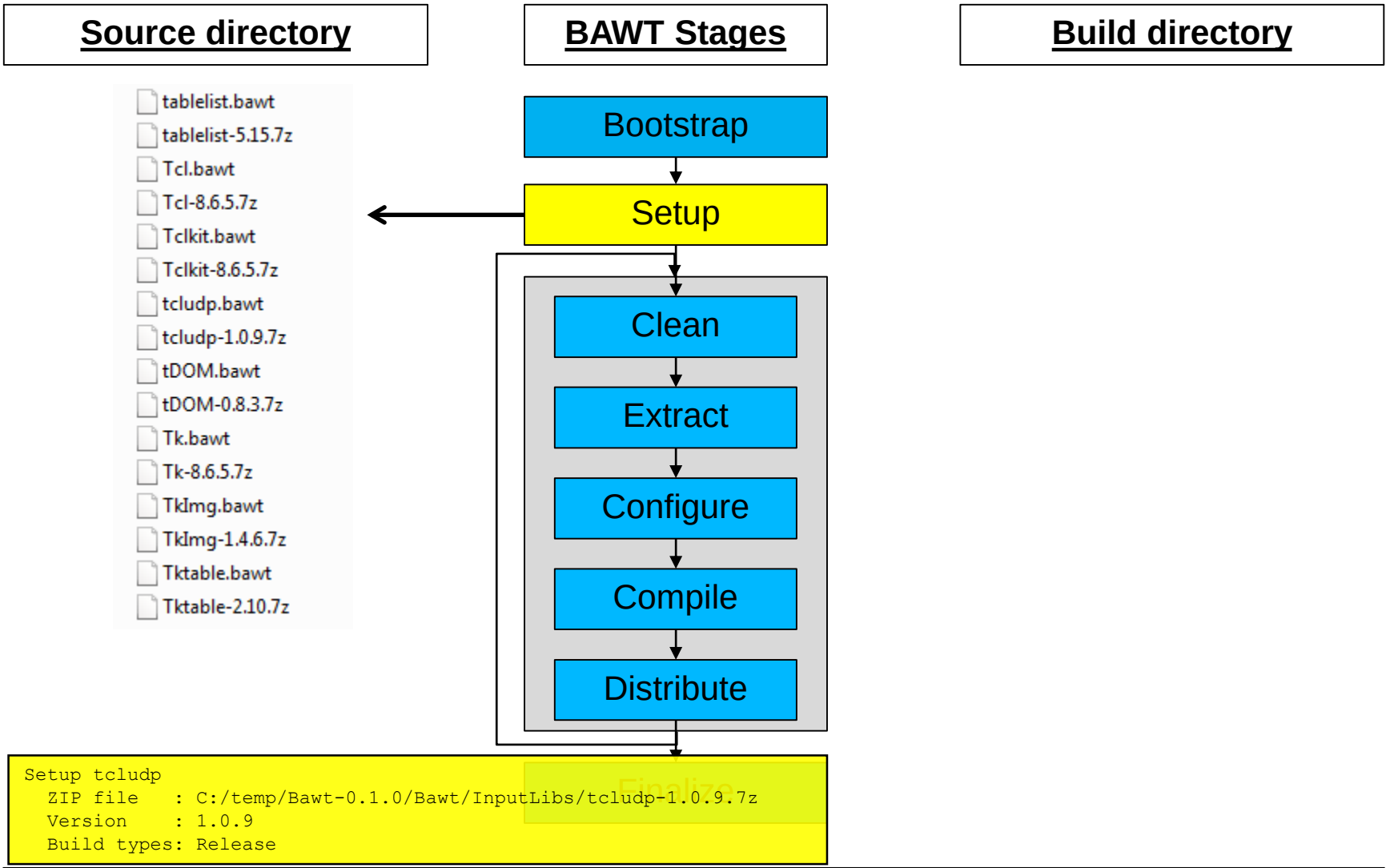
```
CreateImportLibs false

# Setup libName       zipFile                scriptFile          buildTypes

# Tcl and Tk.
Setup Tcl             Tcl-8.6.5.7z           Tcl.bawt            Release
Setup Tk              Tk-8.6.5.7z            Tk.bawt             Release

# Compiled Tcl packages.
Setup TkImg           TkImg-1.4.6.7z         TkImg.bawt          Release
Setup tcludp          tcludp-1.0.9.7z        tcludp.bawt         Release
Setup tDOM            tDOM-0.8.3.7z          tDOM.bawt           Release
Setup Tktable         Tktable-2.10.7z        Tktable.bawt        Release

# Pure Tcl packages.
Setup tablelist       tablelist-5.15.7z      tablelist.bawt      Release

# Tclkits.
Setup Tclkit          Tclkit-8.6.5.7z        Tclkit.bawt         Release
```

Configuration file: `TclRuntime.tcl`

BAWT Examples – Build Tcl Bl and Tclkits



BAWT Examples – Build Tcl Bl and Tclkits



Action: Check existence of source and setup files and download, if not existent.

BAWT Examples – Build Tcl Bl and Tclkits

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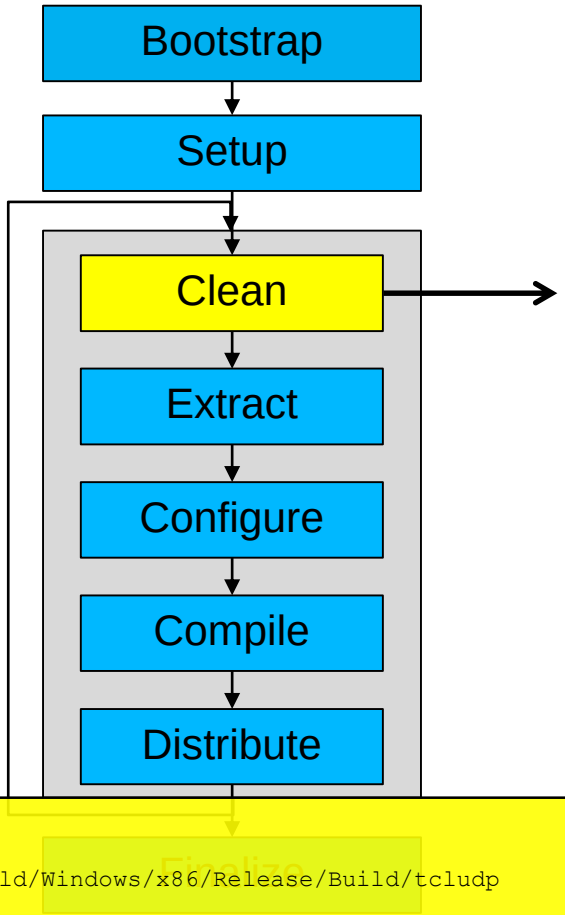
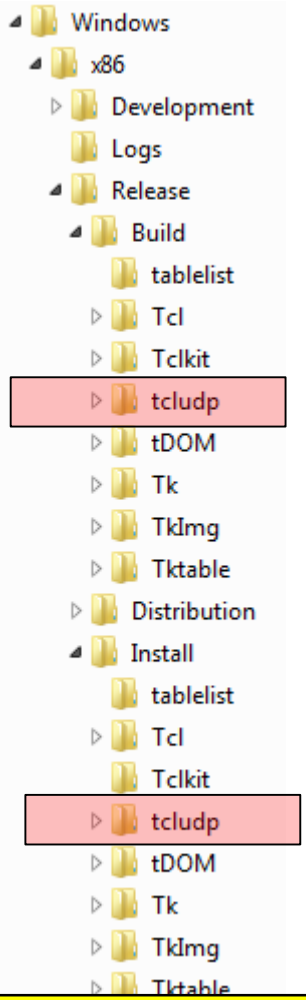
Source directory

BAWT Stages



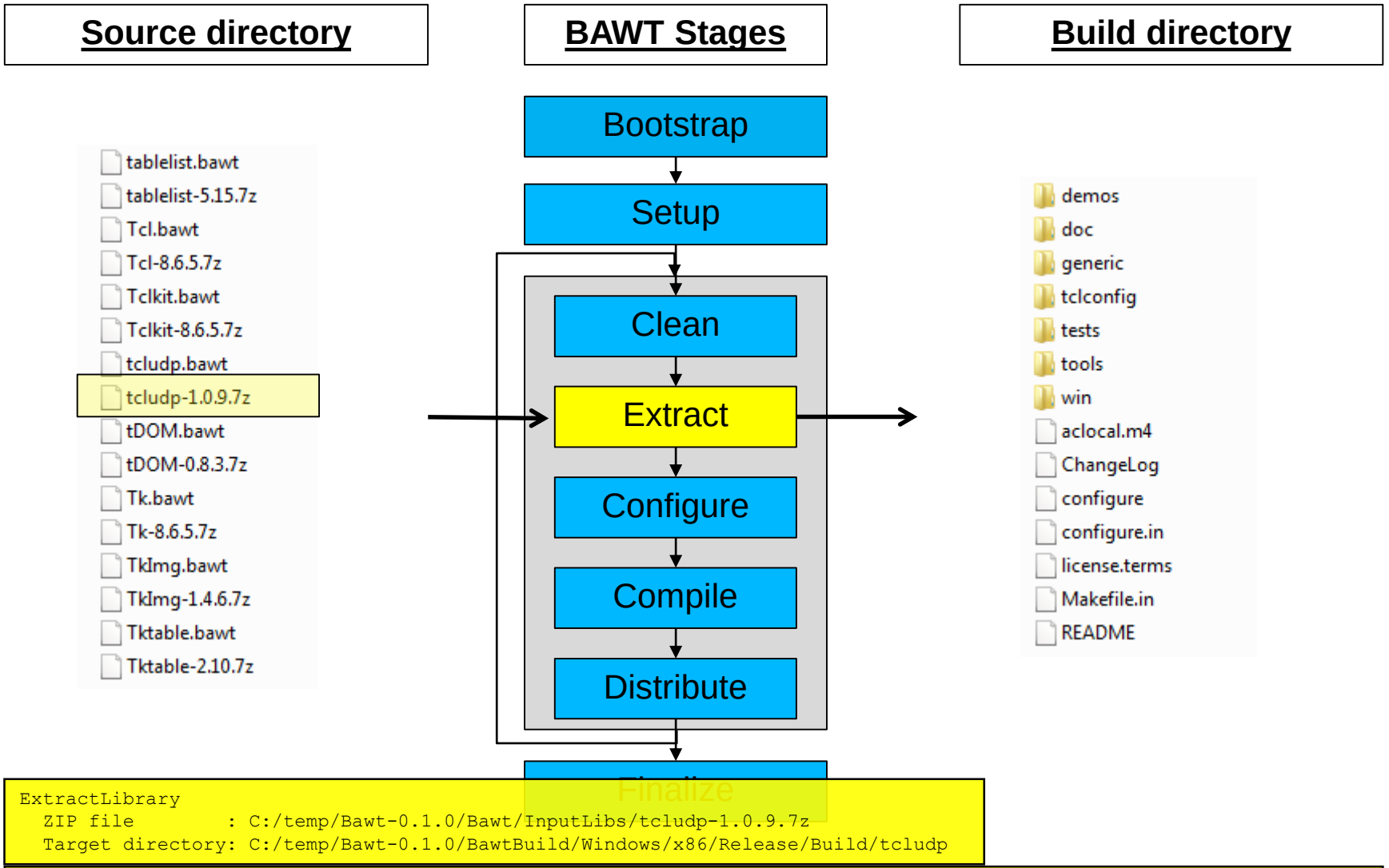
Build directory




```
Clean tcludp (Release)
  DirDelete
    Directory: C:/temp/Bawt-0.1.0/BawtBuild/Windows/x86/Release/Build/tcludp
  DirDelete
    Directory: C:/temp/Bawt-0.1.0/BawtBuild/Windows/x86/Release/Install/tcludp
```

Action: Remove library specific build and install directory.

BAWT Examples – Build Tcl Bl and Tclkits



BAWT Examples – Build Tcl Bl and Tclkits

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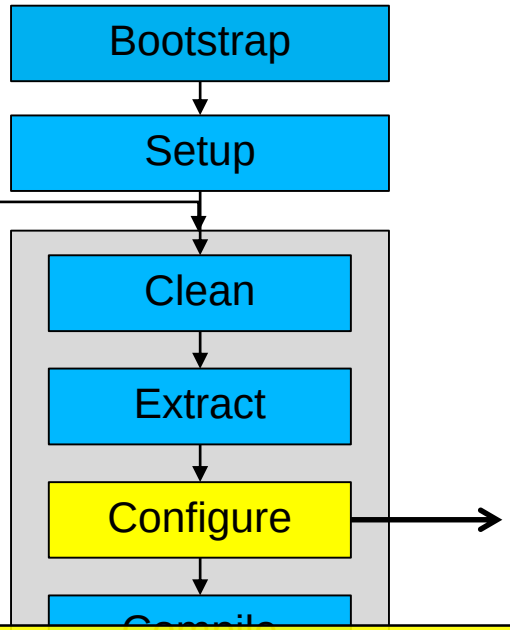
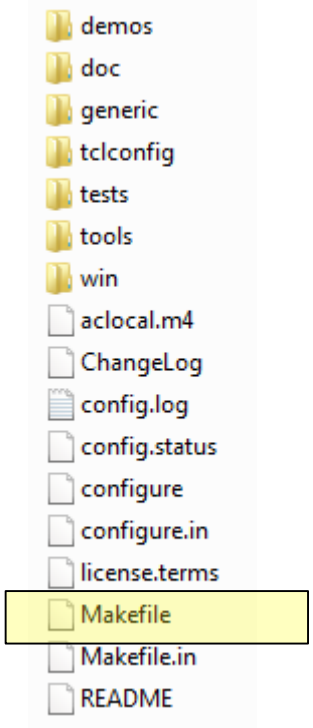
Source directory | **BAWT Stages** | **Build directory**





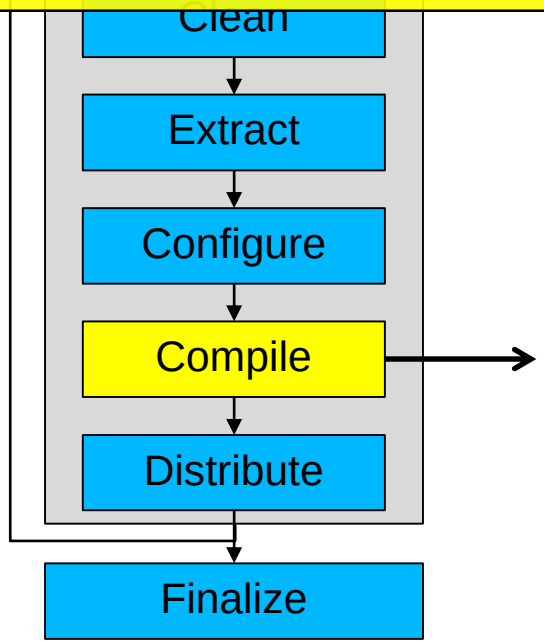

```
MSysRun
  Shell: C:/temp/Bawt-0.1.0/BawtBuild/Tools/gcc4.9.2_i686-w64-mingw32/msys/bin/sh.exe
  > cd /C/temp/Bawt-0.1.0/BawtBuild/Windows/x86/Release/Build/tcludp
  > /C/temp/Bawt-0.1.0/BawtBuild/Windows/x86/Release/Build/tcludp/configure
    --enable-shared
    --build=i686-w64-mingw32
    --prefix=/C/temp/Bawt-0.1.0/BawtBuild/Windows/x86/Release/Install/tcludp
    --exec-prefix=/C/temp/Bawt-0.1.0/BawtBuild/Windows/x86/Release/Install/tcludp
    --with-tcl=/C/temp/Bawt-0.1.0/BawtBuild/Windows/x86/Release/Build/Tcl
    --disable-symbols
  Status: OK
```

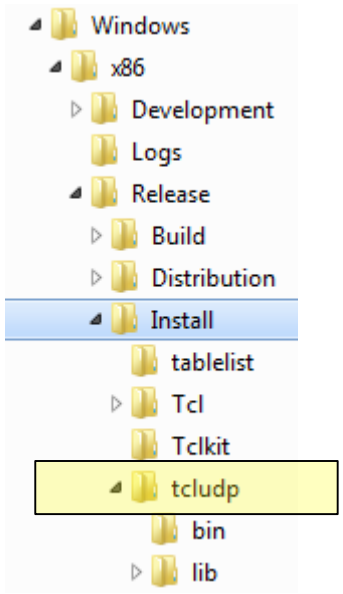
Action: Configure library for compilation.

BAWT Examples – Build Tcl Bl and Tclkits

Source directory | **BAWT Stages** | **Build directory**

```
MSysBuild
  Build directory : /C/temp/Bawt-0.1.0/BawtBuild/Windows/x86/Release/Build/tcludp
  Build target    : install-binaries
  MSysRun
    Shell: C:/temp/Bawt-0.1.0/BawtBuild/Tools/gcc4.9.2_i686-w64-mingw32/msys/bin/sh.exe
    > cd /C/temp/Bawt-0.1.0/BawtBuild/Windows/x86/Release/Build/tcludp
    > make -j 4
    > make install-binaries
    Status: OK (Messages have been written to stderr)
```



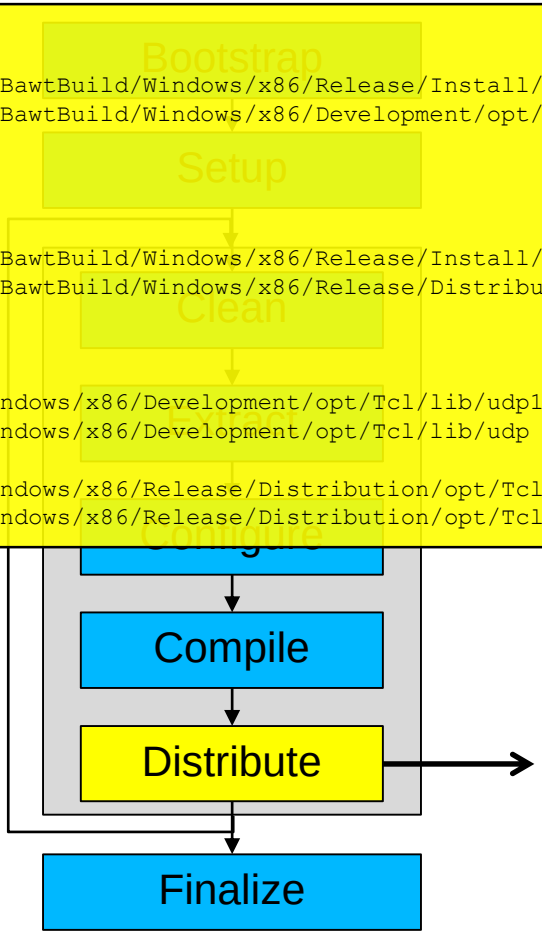


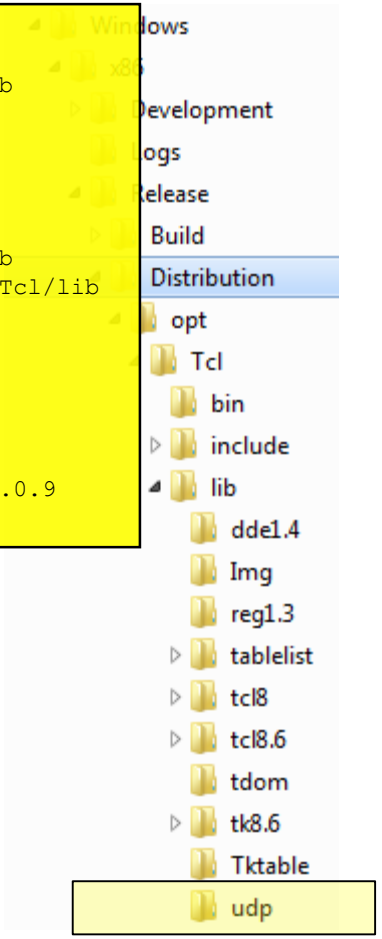
Action: Compile and install library.

BAWT Examples – Build Tcl Bl and Tclkits

Source directory	BAWT Stages	Build directory

```
LibFileCopy
  MultiFileCopy
    Source directory: C:/temp/Bawt-0.1.0/BawtBuild/Windows/x86/Release/Install/tcludp/lib
    Target directory: C:/temp/Bawt-0.1.0/BawtBuild/Windows/x86/Development/opt/Tcl/lib
    File pattern    : *
    Number of copied files: 2
LibFileCopy
  MultiFileCopy
    Source directory: C:/temp/Bawt-0.1.0/BawtBuild/Windows/x86/Release/Install/tcludp/lib
    Target directory: C:/temp/Bawt-0.1.0/BawtBuild/Windows/x86/Release/Distribution/opt/Tcl/lib
    File pattern    : *
    Number of copied files: 2
FileRename
  Source: C:/temp/Bawt-0.1.0/BawtBuild/Windows/x86/Development/opt/Tcl/lib/udp1.0.9
  Target: C:/temp/Bawt-0.1.0/BawtBuild/Windows/x86/Development/opt/Tcl/lib/udp
FileRename
  Source: C:/temp/Bawt-0.1.0/BawtBuild/Windows/x86/Release/Distribution/opt/Tcl/lib/udp1.0.9
  Target: C:/temp/Bawt-0.1.0/BawtBuild/Windows/x86/Release/Distribution/opt/Tcl/lib/udp
```



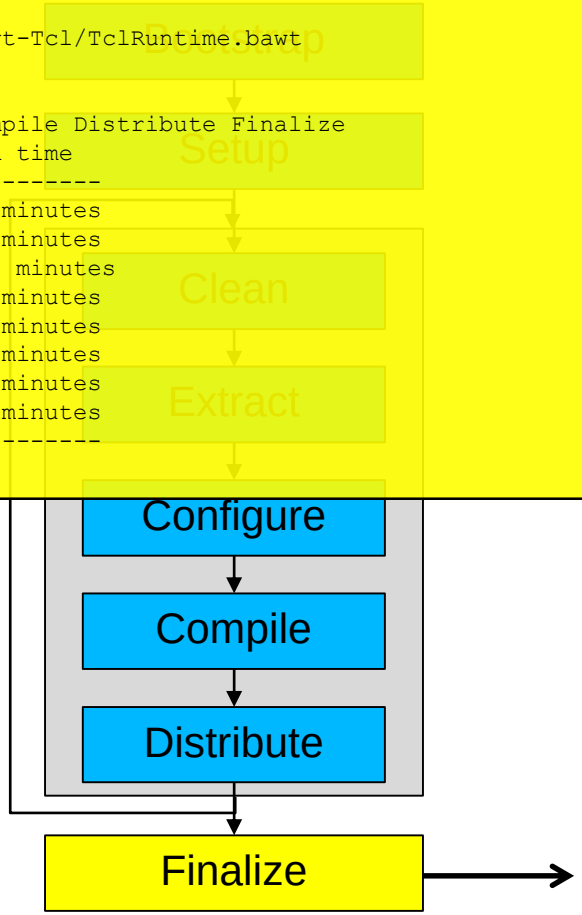


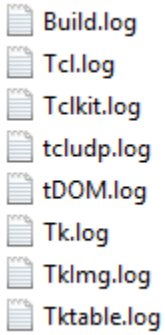
Action: Copy relevant files into developer and user distribution directories.

BAWT Examples – Build Tcl Bl and Tclkits

Source directory | **BAWT Stages** | **Build directory**

```
Summary
Build file   : C:/temp/Bawt-0.1.0/Bawt/Bawt-Tcl/TclRuntime.bawt
Architecture: x86
Compiler     : Windows
Stages       : Clean Extract Configure Compile Distribute Finalize
# : Library Name          Version    Build time
-----------------------------------------------
 0: Tcl                   8.6.5      2.09 minutes
 1: Tk                    8.6.5      2.50 minutes
 2: TkImg                 1.4.6      16.62 minutes
 3: tcludp                1.0.9      0.66 minutes
 4: tDOM                  0.8.3      0.93 minutes
 5: Tktable               2.10       0.91 minutes
 6: tablelist             5.15       0.04 minutes
 7: Tclkit                8.6.5      8.57 minutes
-----------------------------------------------
Total: 32.33 minutes
```





Action: Call user supplied `Finalize` procedure and print summary.

BAWT Examples – Build Tcl Bl and Tclkits

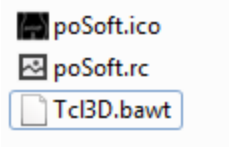
```
proc Build_tcludp { libName libVersion buildDir instDir devDir distDir } {
    set buildDirMSys     [MSysPath $buildDir]
    set instDirMSys      [MSysPath $instDir]
    set rootBuildDirMSys [MSysPath [GetBuildDir]]

    if { [UseStage "Extract"] } {
        ExtractLibrary $libName $buildDir
    }
    if { [UseStage "Configure"] } {
        set cmd ""
        append cmd "cd $buildDirMSys ; "
        append cmd "$buildDirMSys/configure "
        append cmd     "--enable-shared "
        append cmd     "--build=[GetMingwVersion] "
        append cmd     "--prefix=$instDirMSys --exec-prefix=$instDirMSys "
        append cmd     "--with-tcl=$rootBuildDirMSys/Tcl "
        if { [Is64Bit] } {
            append cmd "--enable-64bit "
        }
        if { [IsDebugBuild] } {
            append cmd "--enable-symbols "
        } else {
            append cmd "--disable-symbols "
        }

        MSysRun $libName "$cmd"
    }
    if { [UseStage "Compile"] } {
        MSysBuild $libName $buildDir "install-binaries"
    }
    if { [UseStage "Distribute"] } {
        LibFileCopy "$instDir"  "$devDir/[GetTclDir]"   "*"  true
        LibFileCopy "$instDir"  "$distDir/[GetTclDir]"  "*"  true

        FileRename "$devDir/[GetTclDir]/lib/udp$libVersion"  "$devDir/[GetTclDir]/lib/udp"
        FileRename "$distDir/[GetTclDir]/lib/udp$libVersion"  "$distDir/[GetTclDir]/lib/udp"
    }
}
```

BAWT Examples – Build libraries for Tcl3D




```
# Specify poSoft specific icon and resource file.
set thisDir [file dirname [GetBuildFile]]
SetTclkitIconFile     [file join $thisDir "poSoft.ico"]
SetTclkitResourceFile [file join $thisDir "poSoft.rc"]

# Setup libName               zipFile                    scriptFile             buildTypes

# Tools needed for compilation of libraries.
if { [IsWindows] } {
  Setup CMakeWin32            CMakeWin32-3.5.2.7z        CMakeWin32.bawt        Release
} else {
  Setup CMake                 CMake-3.5.2.7z             CMake.bawt             Release
}

# Basic library needed by most other libraries.
Setup ZLib                    ZLib-1.2.8.7z              ZLib.bawt              Release

# Image libraries needed by OpenSceneGraph.
Setup GIF                     GIF-4.2.3.7z               GIF.bawt               Release
Setup JPEG                    JPEG-9.a.7z                JPEG.bawt              Release
Setup TIFF                    TIFF-4.0.3.7z              TIFF.bawt              Release
Setup PNG                     PNG-1.6.17.7z              PNG.bawt               Release

# Tcl and Tk.
Setup Tcl                     Tcl-8.6.5.7z               Tcl.bawt               Release
Setup TclStubs                TclStubs-8.6.5.7z          TclStubs.bawt          Release
Setup Tk                      Tk-8.6.5.7z                Tk.bawt                Release
Setup TkStubs                 TkStubs-8.6.5.7z           TkStubs.bawt           Release

# Compiled Tcl packages.
...
```

BAWT Examples – Build libraries for Tcl3D

```
# Compiled Tcl packages. Windows only.
Setup Twapi                    Twapi-4.2a3.7z                 Twapi.bawt              Release

# Pure Tcl packages.
Setup tablelist                tablelist-5.15.7z              tablelist.bawt          Release
Setup Cawt                     Cawt-2.3a1.7z                  Cawt.bawt               Release

# Tclkits.
Setup Tclkit                   Tclkit-8.6.5.7z                Tclkit.bawt             Release

# Tools needed for compilation of libraries.
Setup SWIG                     SWIG-3.0.5.7z                  SWIG.bawt               Release

# Tcl3D 3rd party libraries.
Setup GLEW                     GLEW-1.13.0.7z                 GLEW.bawt               Release
Setup Freetype                 Freetype-2.4.4.7z              Freetype.bawt           Release
Setup SDL                      SDL-2.0.3.7z                   SDL.bawt                Release
Setup FTGL                     FTGL-2.1.3.7z                  FTGL.bawt               Release
Setup Gl2ps                    Gl2ps-1.3.9.7z                 Gl2ps.bawt              Release

# OpenSceneGraph 3.0.1 does not compile on Darwin.
if { ! [IsDarwin] } {
    Setup OpenSceneGraph       OpenSceneGraph-3.0.1.7z        OpenSceneGraph.bawt     Release
    Setup OpenSceneGraphData   OpenSceneGraphData-3.0.1.7z    OpenSceneGraphData.bawt Release
}
```

BAWT Status – Overview of supported procedures

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Configuration	`CMakeConfig, MSysRun, DosRun`
Compilation	`CMakeBuild, NMakeBuild, MSBuild, MSysBuild, Dll2Lib`
File handling	`SingleFileCopy, MultiFileCopy, LibFileCopy, FileRename, DirCopy, DirDelete, MSysPath`
Zip handling	`Get7ZipProg, Unzip, ExtractLibrary`
Build handling	`UseStage, Setup, IsReleaseBuild, IsDebugBuild`
Platform	`IsWindows, IsLinux, IsDarwin, Is32Bit, Is64Bit`
Environment variables	`SetEnvVar, AddEnvVar, AddToPathEnv`

BAWT Status – Build configuration

```
Usage: Build.bawt [Options] LibraryName [LibraryNameN]

General options:
--help          : Print this help message and exit.
--loglevel <int>: Specify log message verbosity.
                  Choices: 0 - 4. Default: 3.
--check         : Print all available library names and exit.

Build action options:
--clean     : Clean library specific build and install directories.
--extract   : Extract library sources from ZIP files or sub-directories.

--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, distribution, finalize.

Build configuration options:
--architecture <string>: Build for specified processor architecture.
                         Choices: x86, x64.
                         Default: x86.
--compiler <string>    : Build with specified compiler version.
                         Choices: vs2008, vs2010, vs2012, vs2013, vs2015.
                         Default: Windows.
--gcc <string>         : Build with specified gcc version.
                         Choices: 4.9.2, 5.2.0.
                         Default: 4.9.2.
--buildtype <string>   : Use specified build type.
                         Choices: Release, Debug.
                         Default: Specified in build configuration file.

--buildfile <string>   : Specify build configuration file.
--numjobs <int>        : Number of parallel compile jobs.
                         Default: 1
```

BAWT Status – Build on Windows

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Prerequisites:

- None for building Tcl/Tk, TEA compliant packages or Tclkits.
- Otherwise Visual Studio or Visual Studio Express.
  - Versions 2008, 2010, 2012, 2013, 2015 supported.
  - If VS is not installed in the standard location, you have to adapt procedure GetVcvarsProg.

Downloads:

- `Bawt-0.1.0.zip` (BAWT framework, appr. 5 MB)
- `7-zip.zip` (Portable 7-Zip program, appr. 2 MB)
- MSys/MinGW distribution(s) (appr. 110 MB per distribution)

Actions:

- Extract BAWT-Framework `Bawt-0.1.0.zip` in a folder of choice, ex. `C:\Bawt`
- Copy `7-Zip.zip` and MSys/MinGW distribution(s) into `C:\Bawt\Bawt-0.1.0\Boostrap-Windows`
- Open command shell window and go into folder `C:\Bawt\Bawt-0.1.0`
- Create Tcl runtime distribution for 32-bit by typing:
  - `Build-Windows.bat x86 vs2008 Bawt-Tcl\TclRuntime.bawt`
- Create Tcl runtime distribution for 64-bit by typing:
  - `Build-Windows.bat x86 vs2008 Bawt-Tcl\TclRuntime.bawt`

BAWT Status – Build on Unix

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Prerequisites Darwin:

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

Prerequisites Linux:

- C/C++ development
- Package `p7zip` (for 7z program)
- Package `glu-devel` (Optional: Needed by library Gl2ps)

Downloads:

- `Bawt-0.1.0.zip` (BAWT framework, appr. 5 MB)

Downloads Darwin:

- `7-zip.zip` (command line version of 7-Zip, appr. 2 MB)

Actions:

- Extract BAWT-Framework `Bawt-0.1.0.zip` in a folder of choice.
- Open shell (Terminal window), go into created folder Bawt-0.1.0 and execute:
  - `chmod u+x Build*`
  - `chmod u+x tclkit*`
- Create Tcl runtime distribution for Darwin (only 64-bit) by typing:
  - `./Build-Darwin.sh Bawt-Tcl/TclRuntime.bawt`
- Create Tcl runtime distribution for Linux (32-bit or 64-bit) by typing:
  - `./Build-Linux.sh x86 Bawt-Tcl/TclRuntime.bawt`
  - `./Build-Linux.sh x64 Bawt-Tcl/TclRuntime.bawt`

BAWT Status – What‘s on the TODO list

- Improve error checking and handling.
- Strip generated dynamic libraries in Release mode.
- Improve generation of debug libraries.
- More flexibility regarding source libraries (handling multiple versions).
- More flexibility regarding output directory structure.
- Add documentation.
- Add more Tcl extension packages.
- Add Tcl3D to BAWT build process.

Questions to the Tcl experts

- How to generate Tcl/Tk stubs libraries without using Visual Studio?
  - *Currently using nmake/VS to compile Tcl/Tk source.*
- How to generate sqlite3 and Co. without using Visual Studio?
  - *There is a `rm -Rf pkgs` statement in configure script.*
- How to generate import libs (*.lib) without using Visual Studio?
  - *Currently using `lib.exe` from Visual Studio.*

BAWT Summary

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- BAWT allows the automatic building of C/C++ libraries and tools on Windows, Linux and Mac.
  - Works for my private Open Source projects.
  - Works for my projects at work.

- BAWT allows the automatic building of Tcl/Tk, Tcl extensions and Tclkits on Windows, Linux and Mac.
  - When using TEA compliant extensions, this is possible without the installation of a build environment.

Make your own Tcl Batteries Included

BAWT is available for testing at

http://www.bawt.tcl3d.org

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