

AUTOMATIC BUILD VERSION NUMBERING

FUN WITH VERSION NUMBERS!

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1

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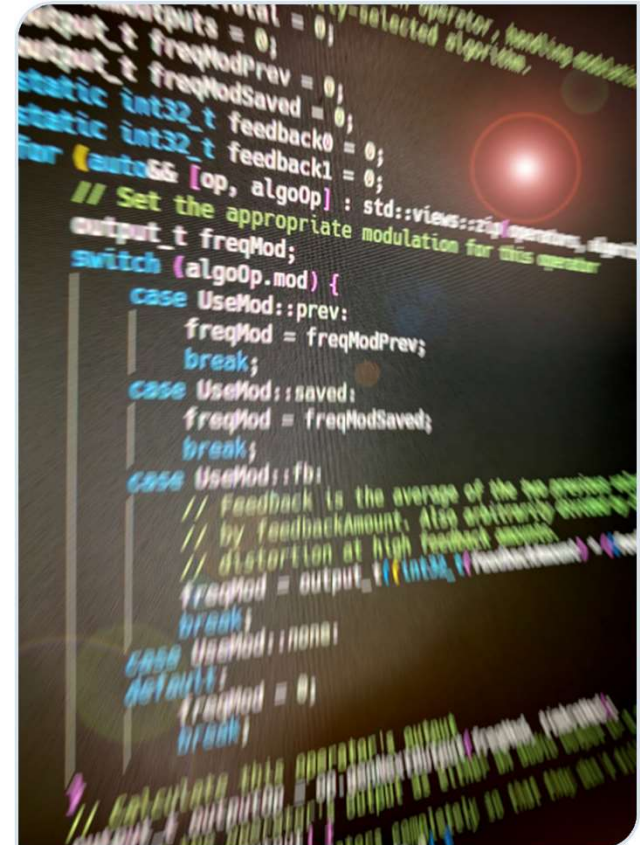
ABOUT ME

Len Popp

Retired Software Guy,
Software & Hardware Hobbyist

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2



AGENDA

- About Version Numbers
- What I Want
- How I Do It
- Questions?

ABOUT VERSION NUMBERS

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4

EXAMPLES

About Microsoft® Word for Microsoft 365

Microsoft® Word for Microsoft 365 MSO (Version 2406 Build 16.0.17726.20078) 64-bit
License ID: Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore
Session ID: Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore

[Third Party Notices](#)

About Mozilla Firefox

Firefox is up to date
127.0.2 (64-bit) [What's new](#)
[Firefox Help](#) [Submit Feedback](#)

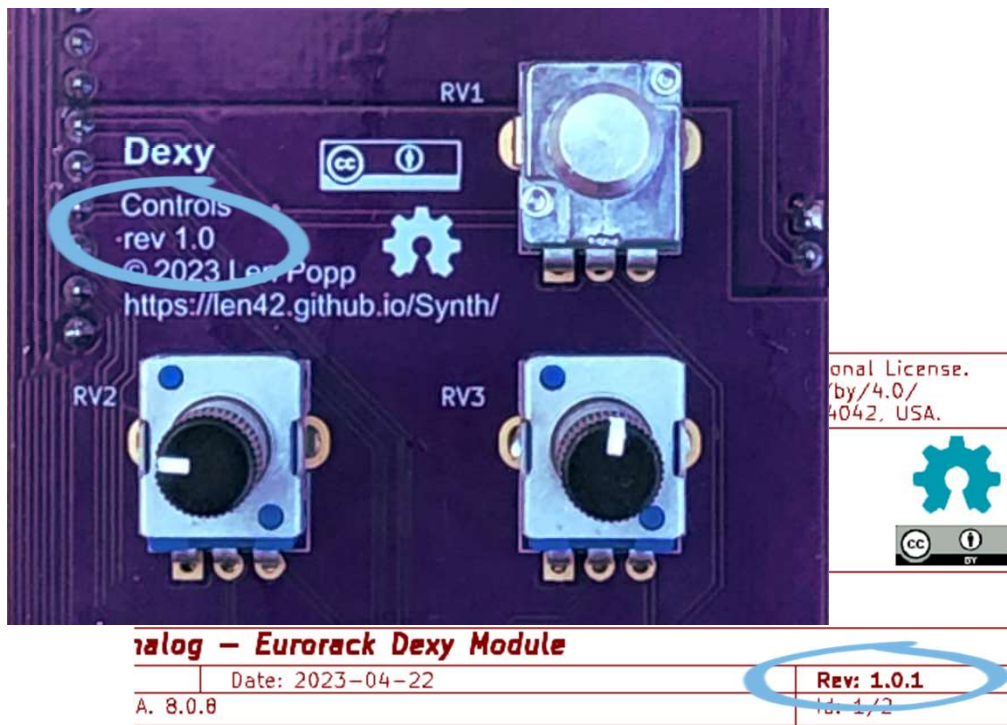
Firefox is designed by Mozilla, a global community working to make the Web open, public and accessible to all.

About KiCad

KiCad
(C) 1992-2024 KiCad Developers Team
Version: 8.0.3, release build
wxWidgets 3.2.4 Unicode and Boost 1.83.0
Platform: Windows 10 (build 19045), 64-bit edition, 64 bit

```
$ git -v  
git version 2.39.2.windows.1
```

EXAMPLES (NOT SOFTWARE)





WHY VERSION NUMBERS?



- Know which version of software you're running
- Dependencies
- Bug reporting/debugging
 - Connect an executable to a particular version of the source code



WHERE VERSION NUMBERS ARE USED

- In the code, for display (“About...”, `git -v`)
- EXE file properties
- Text files (README)
- Installer (Windows Control Panel)
- Documentation (WinHelp, Doxygen)
- Version control system (`git tags`, GitHub releases)
- *These should all match!*



THE EASY WAY

version.h

```
// Update this whenever a new release is built
constexpr unsigned verMajor = 1;
constexpr unsigned verMinor = 0;
constexpr unsigned verRevision = 5;
constexpr char verString[] = "1.0.5";
```



THE END

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10

WHY IS THIS PRESENTATION NOT OVER?

- Can't do everything with version.h
 - Multiple languages (e.g. C++ and C#), text files, installer, help files, git tags, etc.
 - Version info must be duplicated in multiple places
- Every distinguishable build should have a distinct version number, automatically
 - That includes unreleased builds during development and testing, and automated builds
 - That's a pain!
- There must be an easy way



MY SPECIFIC MOTIVATION



- Problems encountered building releases of commercial software
- Version numbers were a pain to maintain properly – error-prone
- Lesson learned: *Every build that is seen by two people needs a version number*
- Needed a correct, streamlined build process
- Similar issues in my open-source hobby projects

WHAT I WANT

MY REQUIREMENTS FOR VERSION NUMBERS

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13



REQUIREMENTS

- The version number is specified in one single place, simply & easily
- It can be used wherever it's needed
- Consistent everywhere
- Automatically append a build number
 - For intermediate “releases” that don't have an explicit version number
 - Auto numbering must be in increasing order
- Efficient to build

MY VERSION NUMBER SCHEMA

- **Format:** [major].[minor].[revision].[build]-[stuff]
- **Example:** 1.2.3.4567-stuff
 - “stuff” will be described later
- Windows-compatible (4 numeric components)
- “Inspired by” *semantic versioning* but not quite the same
- major, minor, revision are set explicitly; build is generated automatically
- **Caveat:** This is just how I do it

HOW I DO IT

MY STREAMLINED PROCESS FOR SETTING VERSION NUMBERS

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16



MY DEVELOPMENT ENVIRONMENT



- C++, C#
- Microsoft Visual Studio
- Git
- Various other tools for software & hardware development
- For other projects I use VS Code with make or CMake (with a few changes)
- It could easily work with other build systems

VERSION NUMBER IS SET BY A GIT TAG

- This is the “one place” where I set the version number
- To increment the version number for a new release, set a git tag
- Examples: 1, 1.2, 1.2.3
 - Minor and revision numbers are optional; build number is omitted
- This connects an executable precisely to its source code
- Again, this is just how I do it.
 - Version number could be defined in a file, for example.

```
$ git tag
0
0.1
0.2
1.0
1.1
1.2
1.3
1.4
1.5
1.5.1
```

MAKEVERSIONINFO PROJECT

- Add this Visual Studio project to the solution
- Main C++ project depends on `MakeVersionInfo`
- `MakeVersionInfo` runs every time you do a build:
 - Gets the version number from git
 - Updates the version number references in any specified files
 - But only if the version number has changed
- Files are only recompiled if the version info has changed since the last build

WHICH FILES?

- Need a list of the files that will contain the up-to-date version number
- `init-version-info.bat` in the Visual Studio solution directory

```
:: Project settings for MakeVersionInfo
set SOLUTIONDIR=%~dp0
set TARGETS="%SolutionDir%version.h" "%SolutionDir%README.txt"
```

TEMPLATE FILES

- Each file listed in `init-version-info.bat` is created from a template file
- Example: `version.h` is defined by `version.htemplate`
- The template contains substitution items where the version numbers are to appear
- There's other info too, e.g. build date
- “{” characters are represented by “{{”
 - Unfortunate compromise

```
namespace Version
```

```
{{
```

```
constexpr unsigned major = {verMajor};  
constexpr unsigned minor = {verMinor};  
constexpr unsigned revision = {verRevision};  
constexpr unsigned build = {verBuild};  
constexpr char commit[] = "{verCommit}";  
constexpr bool isDevBuild = {verIsDevBuild};  
constexpr char name[] = "{verString}";  
constexpr char date[] = "{verDatestamp}";  
constexpr char time[] = "{verTimestamp}";
```

```
}}
```



HOW IT WORKS



- `MakeVersionInfo` is a Visual Studio “Makefile” project (`nmake`)
 - Calls `init-version-info.bat` to get the list of files to be processed
 - Calls `git describe` to get version info from a recent tag
 - Calls a Python script to update `version-info` file, only if the version number changed
 - `nmake` rebuilds output files as required (using `Makefile` and another Python script)
- If any files were written, build targets depending on them will be re-built

AUTOMATIC BUILD NUMBER

- From `git describe`

```
$ git describe --tags --always --dirty
```

3.1.0.5-g8f5bc0e-dirty

tag build commit modified

- Build number is the number of commits past the most recent tag
- Resulting version string:
3.1.0.5-g8f5bc0e-dev
- The extra stuff disambiguates the git branch and marks in-development code



HOW-TO SUMMARY



- Add `MakeVersionInfo` to the Visual Studio solution
- Other projects that use version info depend on `MakeVersionInfo`
- Copy & modify `init-version-info.bat` to specify version-specific files
- Make template files for all those files
- `git tag 0.1`
- Build the solution

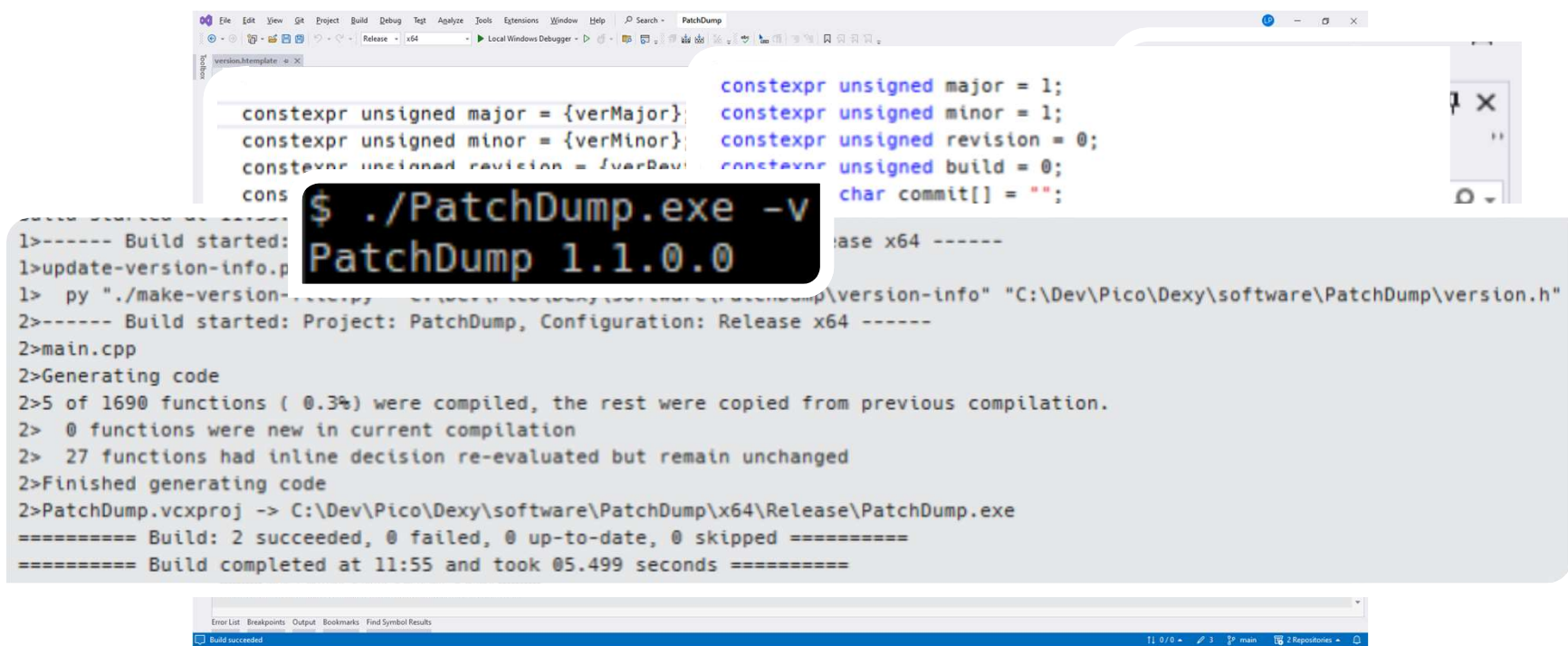


EFFICIENCY



- The `MakeVersionInfo` build step runs on every build
- When version number is unchanged, takes very little time
 - Python is faster than PowerShell
- Minimal rebuild
 - No unnecessary recompilation when version number is unchanged

EXAMPLE



```
version.h
constexpr unsigned major = {verMajor};
constexpr unsigned minor = {verMinor};
constexpr unsigned revision = {verRevision};
constexpr unsigned build = {verBuild};
constexpr unsigned commit[] = "";

PatchDump
constexpr unsigned major = 1;
constexpr unsigned minor = 1;
constexpr unsigned revision = 0;
constexpr unsigned build = 0;
constexpr unsigned commit[] = "";

$ ./PatchDump.exe -v
PatchDump 1.1.0.0

1>----- Build started: Project: PatchDump, Configuration: Release x64 -----
1>update-version-info.py
1> py ".\make-version-info.py" "C:\Dev\Pico\Dexy\software\PatchDump\version-info" "C:\Dev\Pico\Dexy\software\PatchDump\version.h"
2>----- Build started: Project: PatchDump, Configuration: Release x64 -----
2>main.cpp
2>Generating code
2>5 of 1690 functions ( 0.3%) were compiled, the rest were copied from previous compilation.
2> 0 functions were new in current compilation
2> 27 functions had inline decision re-evaluated but remain unchanged
2>Finished generating code
2>PatchDump.vcxproj -> C:\Dev\Pico\Dexy\software\PatchDump\x64\Release\PatchDump.exe
===== Build: 2 succeeded, 0 failed, 0 up-to-date, 0 skipped =====
===== Build completed at 11:55 and took 05.499 seconds =====
```

WHAT'S WRONG WITH THIS?

- Doesn't work with files that are not “built”
 - And that can't easily be post-processed
 - Typically don't support include files
- Examples:
 - Word documents
 - Hardware designs
 - KiCad – Electronics schematic & PCB CAD
- Some version numbers must still be updated manually 🥲



SOURCE CODE



- Visual Studio implementation: <https://github.com/Len42/MakeVersionInfoP>
 - CMake example: <https://github.com/Len42/Dexy/tree/main/firmware>
 - Makefile example: <https://github.com/Len42/dating/tree/main/lib/MakeVersionInfo>
 - Or just lenp.net
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QUESTIONS?