AUTOMATIC BUILD VERSION NUMBERING

VERSION NUMBERS ARE FUN!

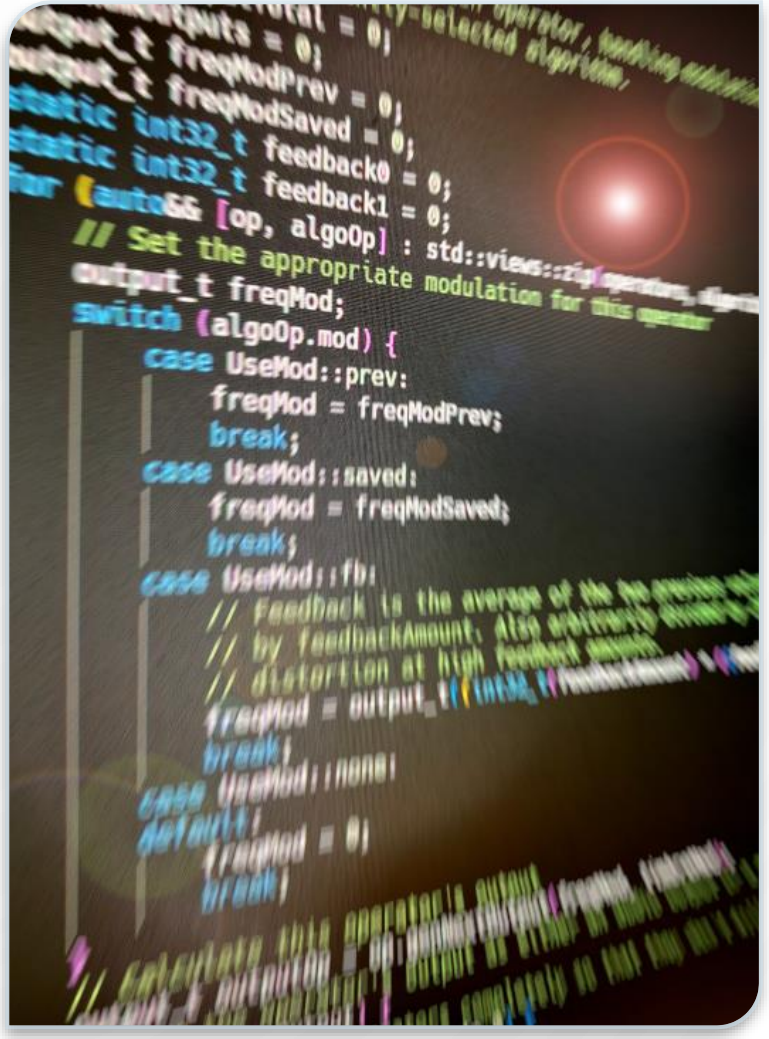
ABOUT ME

Len Popp

Retired Software Guy,

Software & Hardware Hobbyist

https://lenp.net/

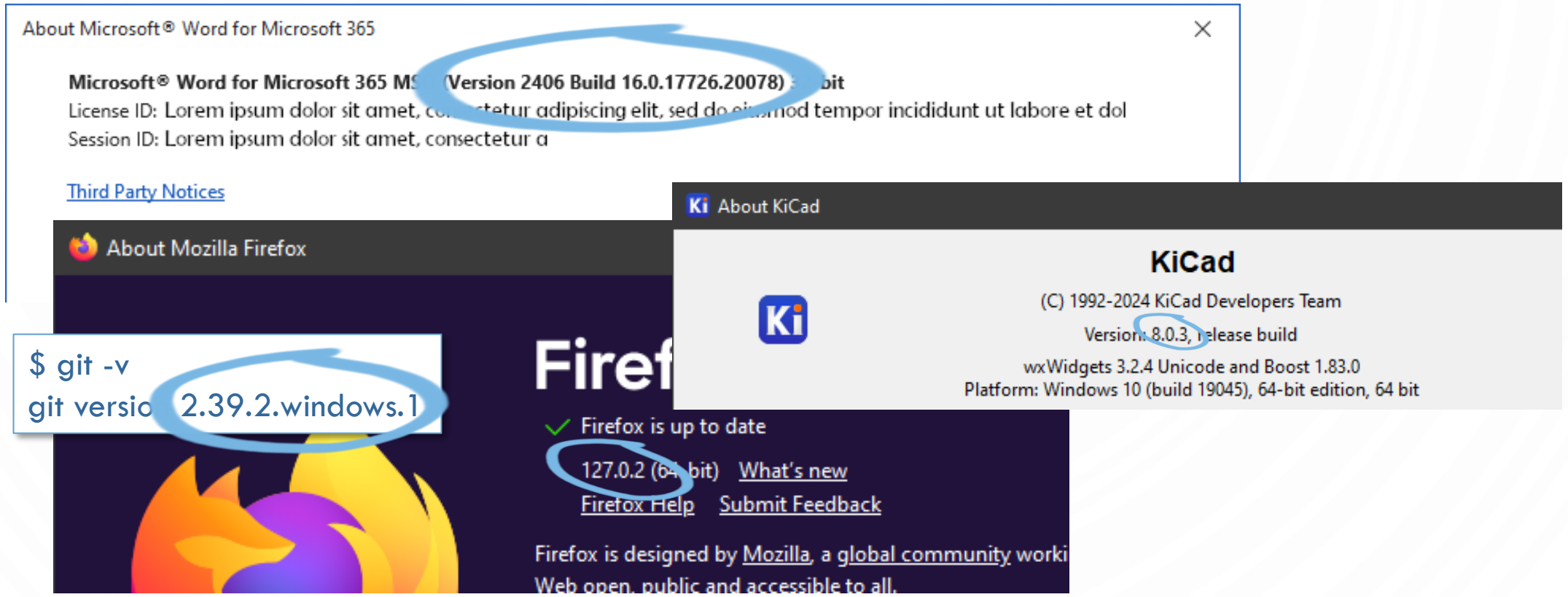


AGENDA

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

ABOUT VERSION NUMBERS

EXAMPLES


About Microsoft® Word for Microsoft 365
Microsoft® Word for Microsoft 365 MS (Version 2406 Build 16.0.17726.20078) bit
License ID: Lorem ipsum dolor sit amet, co tetur adipiscing elit, sed do mod tempor incididunt ut labore et dol
Session ID: Lorem ipsum dolor sit amet, consectetur a
Third Party Notices
About Mozilla Firefox
Firef
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 worki
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 versio 2.39.2.windows.1

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

WHY IS THIS PRESENTATION NOT OVER?

- Can't do everything with version.h
  - Specific problems: 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

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

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 mino     = {verMinor};
    constexpr unsigned revi     on = {verRevision}
    constexpr unsigned bui      = {verBuild};
    constexpr char commit[      = "{verCommit}";
    constexpr bool isDevBu      d = {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
3.1-5-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

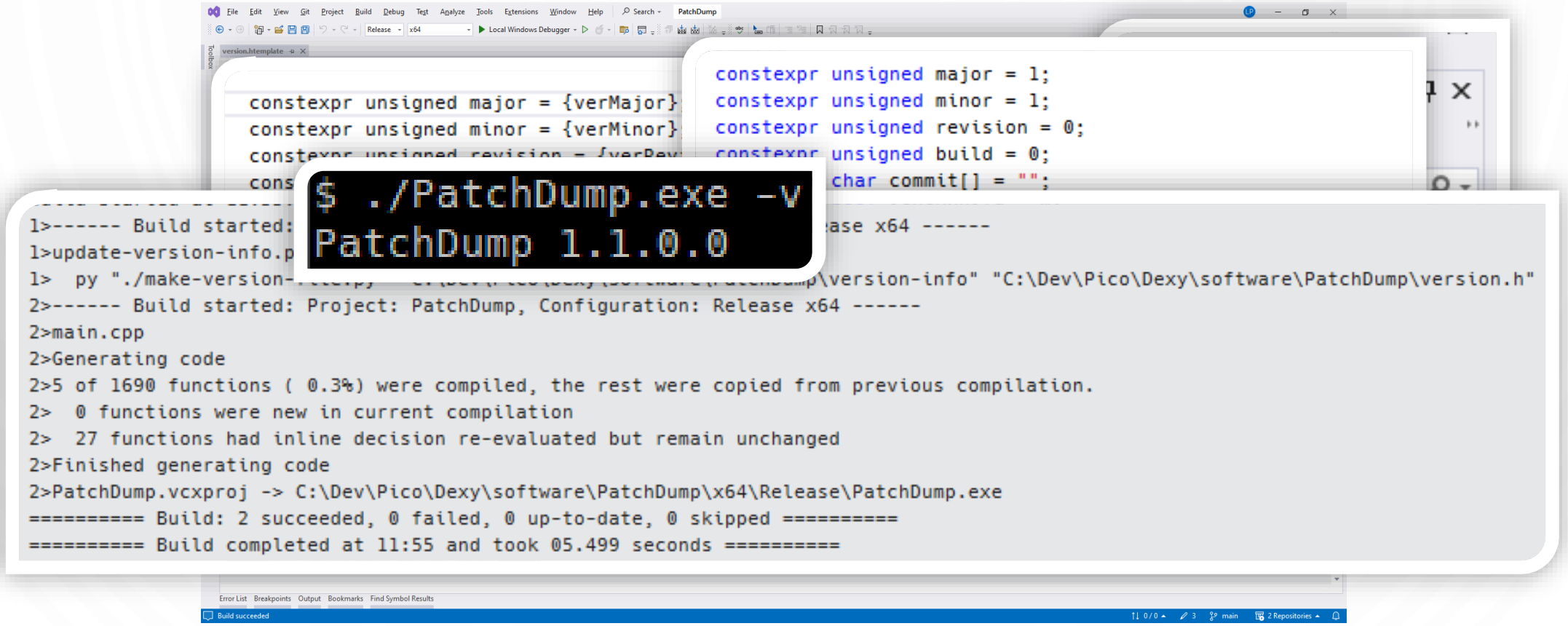
HOW-TO SUMMARY

- 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


constexpr unsigned major = {verMajor};
constexpr unsigned minor = {verMinor};
constexpr unsigned major = 1;
constexpr unsigned minor = 1;
constexpr unsigned revision = 0;
constexpr unsigned build = 0;
char commit[] = "";
$ ./PatchDump.exe -v
PatchDump 1.1.0.0
1>------ Build started:
ase x64 ------
1>update-version-info.p
1> py "./make-version-
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 ==========
Build succeeded

SOURCE CODE

- https://github.com/Len42/MakeVersionInfoP
- CMake implementation: https://github.com/Len42/Dexy/tree/main/firmware
- Or just lenp.net

FIN

QUESTIONS?