

Building Geant4 with CMake Status and Plans

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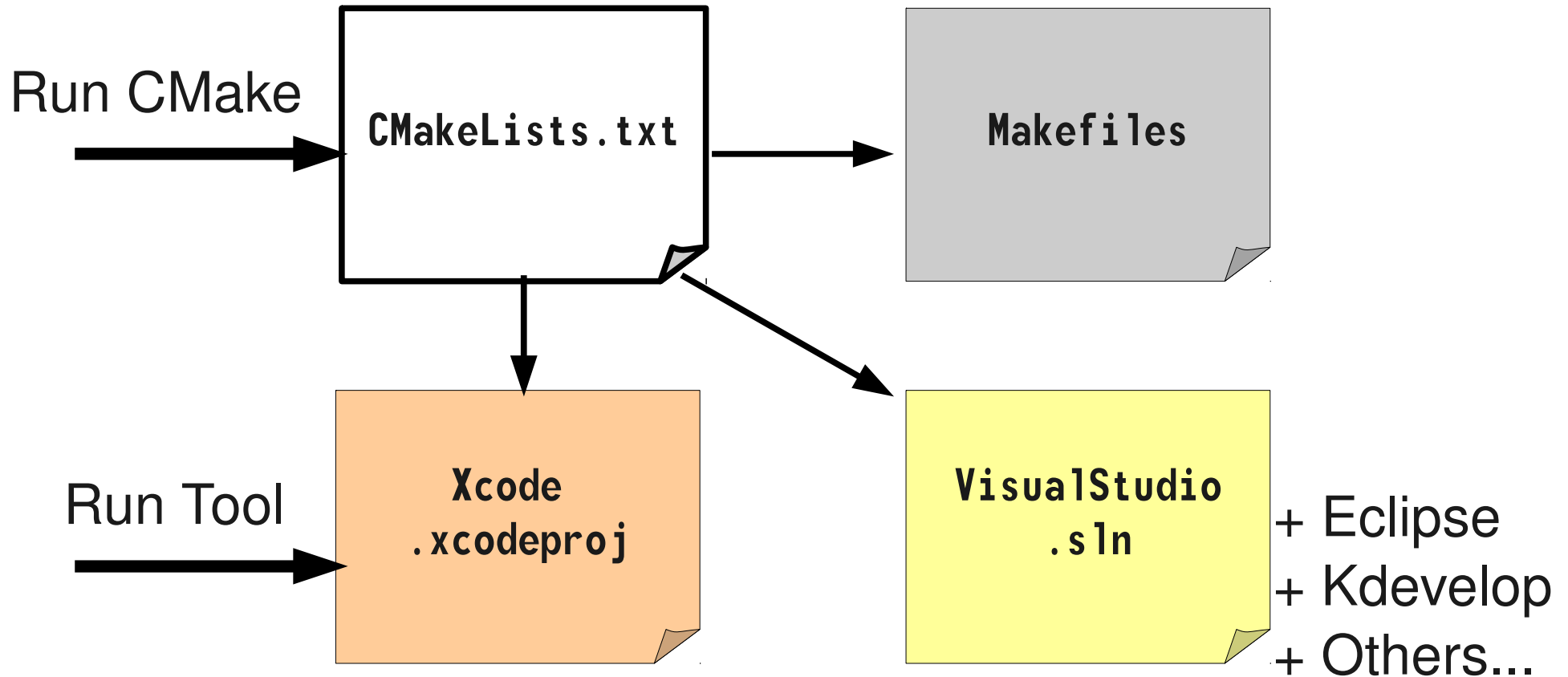
- Give you a picture of **alpha** CMake buildsystem
 - What it does.
 - What it doesn't do (yet!).
 - Issues identified this week.
- Available in 9.3 ref-08 – **PLEASE TRY IT OUT!**
 - **Feedback, bug reports etc welcome!**
- **With that in mind, short demo at the end.**

- Configure/make system **not** maintainable in medium term (see my talk at 2009 workshop)
- CMake evaluated as **best current replacement**.
 - <http://www.cmake.org>
- Consideration of other tools (e.g. Scons) should continue.
 - Build tools continue to evolve.

- Provides many key things needed by Geant4
 - Designed for cross-platform use.
 - Many out-the-box system checks (e.g. Qt).
 - Easy to use interfaces for users/developers
 - Binary packaging possible through CPack.
- There are some disadvantages:
 - It's another tool to install.
 - Slightly different workflow.

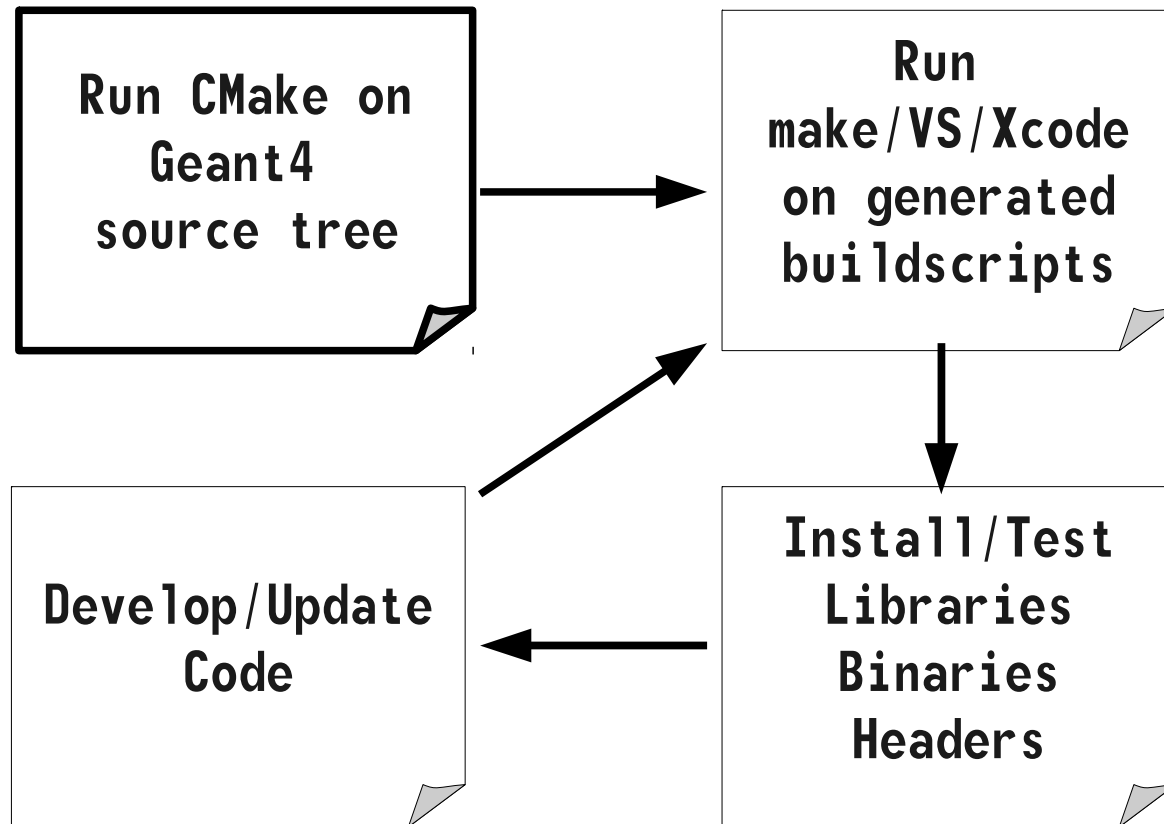
Core CMake Concept

- CMake “builds buildscripts of choice”



CMake workflow in Geant4

- Very simple workflow for users/developers

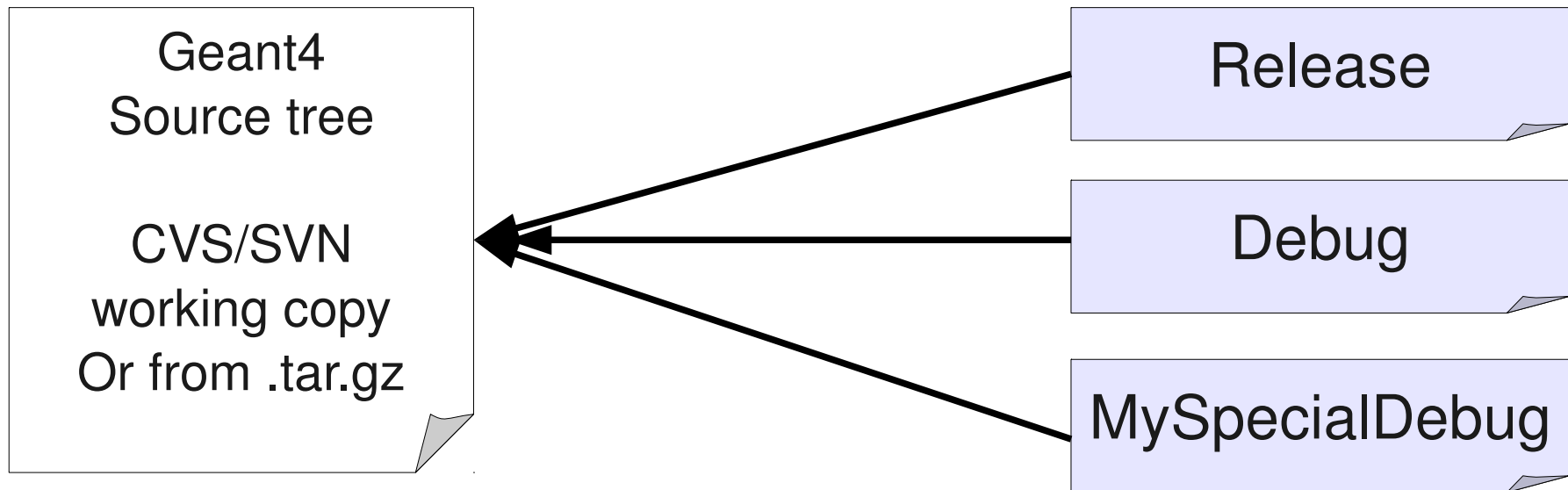


Developer interaction with CMake

- Happens in two key places.
- *When you run CMake*
 - Choose **how** you want Geant4 to be built.
- *Making CMake aware of your code*
 - What does it **provide**, what does it **use**.

Running CMake

- An out-of-source build is **enforced**
- Keeps buildfiles out of repository.
- **KEY CONCEPT:** One source tree, multiple builds

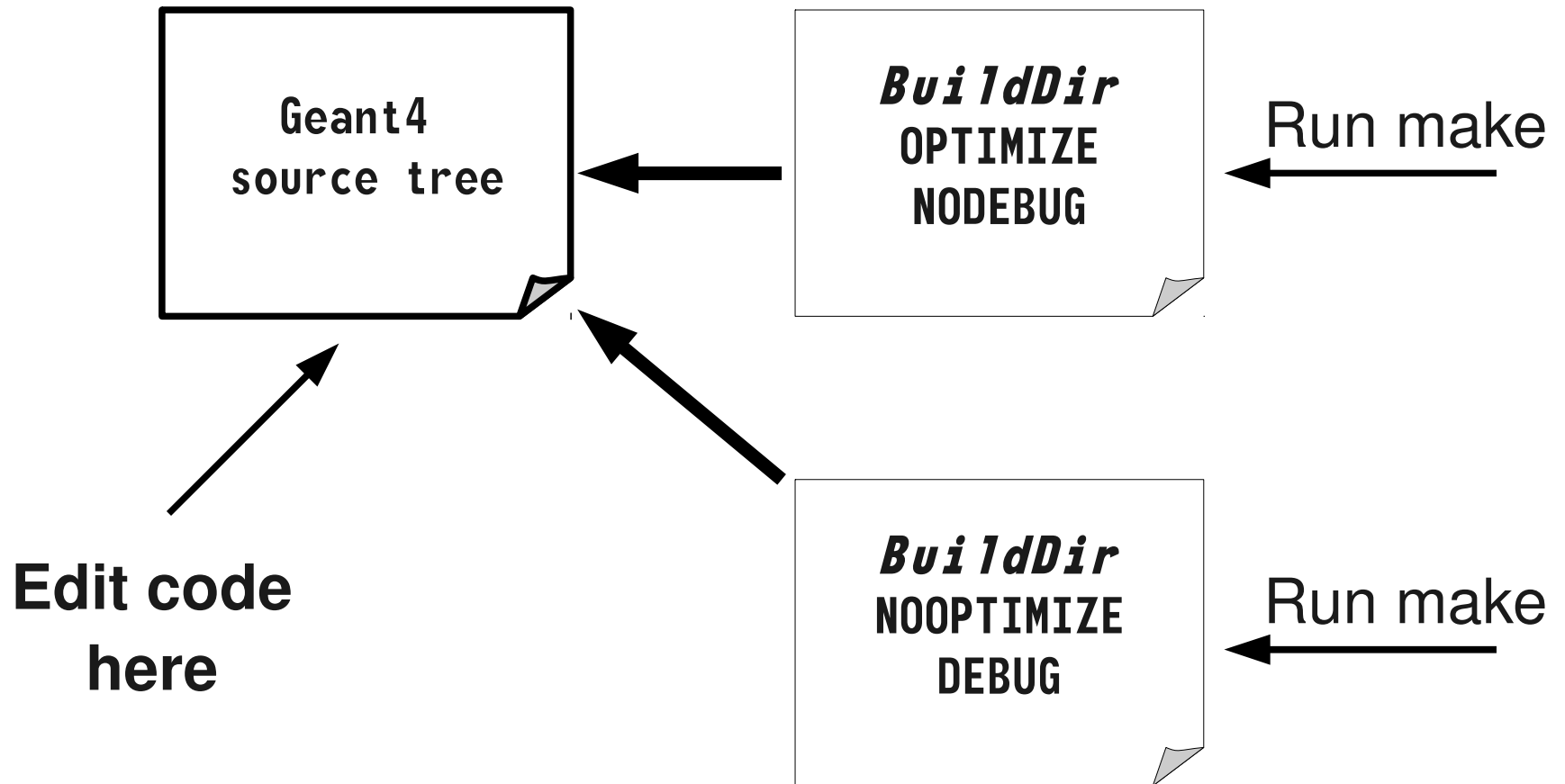


- Say you want to test your code in two ways
 - With optimization, no debug
 - No optimization, debugging.

- You wouldn't run this as, say
 - make OPTIMIZE=1 NODEBUG=1
 - make NOOPTIMIZE=1 DEBUG=1

Build types

- Rather, you'll set up two distinct build directories
 - Flags are set when you run CMake - fixed!



- Granular library smallest unit of code in Geant4.
- Each granular library has a sources.cmake file
 - Tells CMake about your library.
- Behind the scenes, the file is used to create
 - Granular libraries (if requested)
 - Global libraries (from list of sources.cmake)
- **Let's look at an example sources.cmake...**

- **You have to list sources/headers explicitly**
- CMake does have a GLOB function.
 - BUT: re-run of CMake required when you add a new file.
- Buildscripts **depend** on sources.cmake
 - So when you add a file to sources.cmake, **next rebuild will do everything.**
- I think the latter is easier, but please try it and see!

- Dependencies have to be added by hand
- Discussion on Tuesday suggested investigation of some automated system for this.
 - Will start on this – input from GAUDI work?
- However, illustrates a **critical point**
- **You as a developer must know and keep control of what parts of Geant4 your code uses, and what parts of Geant4 it exposes.**

What's implemented

- Dynamic AND archive libraries.
- Global OR granular library build (NOT both!)
 - Due to interlibrary dependencies...
- Default compiler flag setup on supported platforms

- Install of headers, libraries, scripts.
- Optional build of G4gdml, G4g3tog4
- Packaging of sources to .tar.{gz,bz2,Z}

What's not yet implemented

- Vis/UI libraries needing external libraries.
 - No known limitations – WIP.
- Developer debug flags, e.g. -DG4FPE_DEBUG
 - Requires some thought to support VS/Xcode
 - Will implement for Makefiles only for now.
- **Full Win32 builds** (progress by Greg Sharp here!)
- “Tuned” install paths
 - How much choice, or just PREFIX based?

What's not yet implemented

- Tools for building applications, plan is:
 - CMake generates env.(c)sh, installs .gmk
 - Existing GNUmakefiles should work...
- But... Install paths are not backward compatible
 - Special CMake versions of .gmk files
 - More work, but transparent to user.
- Longer term
 - {Find,Use}Geant4.cmake.
 - “geant4-config”, pkg-config scripts.

- Alpha of Geant4 CMake buildsystem in ref-08
- Configure/Make not going away yet, but...
- **PLEASE** try the CMake system
 - It's **critical** that we have user feedback
 - Suggestions, bug reports **welcome!**
 - **Win32/Mac testers especially needed!**