



Installing Geant4 v9.5 for Windows

A step-by-step guide for Windows XP/Vista/7 using cmake and Visual C++ 2009 / 2010

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0. Introduction and Requirements

This document provides step-by-step instructions on how to build and install the Geant4 particle physics simulation toolkit in a Windows environment, using Visual C++ and CMake. The final step provides instructions on how to compile a Geant4 application using CMake.

Software requirements

Operating system: Windows XP, Windows Vista or Windows 7 Compiler: Visual C++ (Express) 2009, Visual C++ (Express) 2010 Build tools: CMake (v2.8 or higher STRONGLY recommended) Geant4 source code: v9.5.0 or newer (recommended at time of writing v9.5-p01)

If you have one of the listed operating systems but dot not have the required build software, follow the *Preparations* instructions in Step 1. Otherwise skip ahead to Step 2.

All screenshots shown were created using *Visual C++ Express 2010, CMake 2.8.7*



Step 1: Preparations

Obtain Visual C++ compiler

The *Express* editions of *Visual* C++ are available from Microsoft free of charge. Download and install *Visual* C++ 2010 *Express*. At the time of writing, the installer is available at: <u>http://www.microsoft.com/express/Downloads</u> If you need help installing *Visual* C++, detailed instructions are given on the next slide.

Obtain CMake build tool

The CMake build tool is available from <u>www.cmake.org</u>.

From the tabs along the top, select *Download*. Scroll down to *Binary Distributions* and select *Windows (Win32 Installer)* from the list of available platforms. Execute the installer.

Obtain Geant4 source code

Go to the *Geant4* collaboration download site: <u>http://geant4.cern.ch/support/download.shtml</u> Chose *ZIP format*. Ones the files is downloaded (~40 Mb), right click the files and chose *extract files*. Specify the directory to which to extract the files. For example purposes only, we will be using

C:\Users\testUser\Documents\geant4 We will refer to this directory as the *Geant4 source directory*



Step 1: Preparations (cont'd)

How to install Visual C++ Express

- 1. Make sure all other programs are closed.
- 2. Using Internet Explorer, go to http://www.microsoft.com/express/Downloads
- 3. Click the *Visual* C++ 2010 *Express* link at the bottom left
- 4. You are on the *Visual* C++ 2010 *Express* home page. Click the "install now" button.
- A pop-up window may appear trying to get you to install Visual Studio Professional instead – if this happens, click on "…or install Visual C++ 2010 Express (English)" in the bottom right.
- 6. A message should appear at the bottom of your screen asking whether you want to execute "vc_web.exe". Select "Execute".
- 7. Follow the instructions on the screen.
- 8. Following the installation, you will get a message asking to restart your computer. Click "restart now".
- 9. Upon restart there will be a message "setup is loading installation components". Just wait until setup is done.
- 10. Eventually there will be a message "Setup complete". Hit "Exit". You have now installed *Visual C++ 2010 Express*.



Step 3: Set CMake directories

Open the CMake GUI

Click on the *Browse Source*... button in the top right hand corner of the window. Use the file browser popup to locate the Geant4 source directory, and click *OK*.

Below *Browse Source*... click *Browse Build*..., and browse to the location you wish to create the build solution. You can create a new directory in the build path dialog. We are using *C:/Users/testUser/Documents/geant4/gean4.9.5-build*

Where is the source code:	C:/Users/db68/Documents/geant4/geant4_9_5_p01		
Vhere to build the binaries: C:/Users/db68/Documents/geant4/gean4.9.5-build			Browse Build
Search:		🔲 Grouped 🔲 Advanced 🔂 Add Entry	Remove Entry
Name		Value	



Step 4: Configure CMake

Click the *Configure* button on the bottom left of the gui. Select *Visual Studio 2010* or *Visual Studio 2009* from the drop-down menu. Make sure that the *Use default native compilers* radio button is selected.



Click finish.

At this stage CMake will prepare and check your build environment. If you see a couple of warning messages, don't worry. Proceed to the next step.



<u>Step 4: Configure CMake (cont'd)</u>

Add data to intallation

When Cmake was configured in the previous step, there were probably a few warning messages (screenshot).

In order to download necessary data files, click the checkbox next to GEANT4 INSTALL DATA. You will need CMake $v_{2.8}$ or newer + internet connection. To use visualization, you will also need to check GEANT4 USE OPENGL WIN32.

You can also change the installation destination by clicking on the path next to CMAKE INSTALL PREFIX. As an example, we will chose C:/Users/db68/Documents/geant4/gean4.9.5-install CMake 2.8.7 - C:/Users/db68/Documents/geant4/gean4.9.5-build File Tools Options Help Where is the source code: C:/Users/db68/Documents/geant4/geant4_9_5_p01 Browse Source... Where to build the binaries: C:/Users/db68/Documents/geant4/gean4.9.5-build Browse Build... 🔄 Grouped 📃 Advanced 🛛 🕂 Add Entry Search: X Remove Entry Name Value CMAKE_INSTALL_PREFIX C:/Program Files/Geant4 GEANT4 INSTALL DATA GEANT4_USE_GDML GEANT4 USE INVENTOR GEANT4 USE OPENGL WIN32 GEANT4 USE OT GEANT4 USE SYSTEM CLHEP Press Configure to update and display new values in red, then press Generate to generate selected build files. Configure Generate Current Generator: Visual Studio 10 Check for working C compiler using: Visual Studio 10 -- works Detecting C compiler ABI info Detecting C compiler ABI info - done setting default compiler flags for CXX Check for working CXX compiler using: Visual Studio 10 Check for working CXX compiler using: Visual Studio 10 -- works Detecting CXX compiler ABI info Detecting CXX compiler ABI info - done CMake Warning at C:/Program Files/CMake 2.8/share/cmake-2.8/Modules/InstallRequiredS system runtime library file does not exist: 'MSVC10 REDIST DIR-NOTFOUND/x86/Microsoft.VC100.CRT/msvcp100.dll' Call Stack (most recent call first): cmake/Modules/Geant4CPackBase.cmake:9 (include) CMakeLists.txt:140 (include) CMake Warning at C:/Program Files/CMake 2.8/share/cmake-2.8/Modules/InstallRequiredS system runtime library file does not exist: 'MSVC10 REDIST DIR-NOTFOUND/x86/Microsoft.VC100.CRT/msvcr100.dll' Call Stack (most recent call first): cmake/Modules/Geant4CPackBase.cmake:9 (include) CMakeLists.txt:140 (include) The following Geant4 features are enabled:

- - -

Now click *Configure* again.



Step 5: Generate Visual C++ project

Make sure all configuration issues have been resolved

All red items should have turned white. If they haven't, keep clicking *Configure* until they do.

Generate the Visual Studio solution

Click *Generate* at the bottom left of the GUI. When CMake reports "*Configuring Done*. *Generating done*. " in the logging window, you were successful. Close CMake.

ine Tools Obtions The	lp					
Where is the source code:	C:/Users/db68/Documents/geant4/geant4_9_5_p01					Browse Source.
Where to build the binaries:	C:/Users/db68/Documents/geant4/gean4.9.5-build				•	Browse <u>B</u> uild
earch:			C Grouped	Advanced	Add Entry	Remove Entry
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GEANT4_USE_GDML						
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CMakeLists.tx	t:140 (include)	
The following G	eant4 features are enabled:	
Configuring don	2	
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Step 6: Open Visual C++ project

Open the solution file in Visual C++

Start Visual C++ and under the files menu chose *Open>Project/Solution*. Navigate to your build directory (in our example this is *C:\Users\testUser\Documents\geant4\gean4.9.5-build*) and open the *Geant4.sln* solution file. It may take a minute for Visual Studio to read the solutions.

licrosoft Visual C++ 2010 Express	
Loading solution projects	
Loading project 62 of 69 : _G4tracking-archive	



Step 7: Build Geant4

Your project screen should look similar to the screen on the right.

You are now ready to build Geant4.

In order to build Geant4, right-click the INSTALL solution in the solution explorer on the left and blick *Build*.

Depending on your computer, this may take up to a few hours.





Step 7: Build Geant4 (cont'd)

Upon starting the Geant4 build, the Output window should show something similar to the screenshot below:

Outp	ıt ▼	
Shov	v output from: Build 🔹 🚽 🖓 🛛 💭 🐺 🖃	
1>	CMake does not need to re-run because C:/Users/db68/Documents/geant4/gean4.9.5-build/source/visualization/gMocren/CMakeFiles/generate.stamp is up-to-date.	-
1>	CMake does not need to re-run because C:/Users/db68/Documents/geant4/gean4.9.5-build/source/visualization/management/CMakeFiles/generate.stamp is up-to-date	l•
1>	CMake does not need to re-run because C:/Users/db68/Documents/geant4/gean4.9.5-build/source/visualization/modeling/CMakeFiles/generate.stamp is up-to-date.	
2>-	Build started: Project: genwinder, Configuration: Debug win52	
35	Building Custom Rule C:/liser.db68/Documents/geant4/geant4 9 5 n0/source/externals/clben/CMakelists tyt	
2>	Building Custom Rule C:/Users/db68/Documents/geant4/geant4 9 5 p01/CMakeLists.txt	
2>	CMake does not need to re-run because C:\Users\db68\Documents\geant4\gean4.9.5-build\CMakeFiles\generate.stamp is up-to-date.	
3>	CMake does not need to re-run because C:\Users\db68\Documents\geant4\gean4.9.5-build\source\externals\clhep\CMakeFiles\generate.stamp is up-to-date.	
2>	genwindef.cpp	
3>	AxisAngle.cc	
3>	BasicVector3D.cc	
3>	Boost.cc	
3>	BoostX.cc	
3>	BoostY.cc	_
3>	BoostZ.cc	
3>	DoubConv.cc	
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This is a good sign that your build is progressing and you can leave the system to compile. This may take awhile.



Step 7(cont'd): Build Geant4

After the Geant4 compilation is finished, the output window at the bottom of your screen should show a message like

Build: 66 succeeded, 0 failed, 0 up-to-date, 0 skipped

CONGRATULATIONS!!! You have just compiled Geant4. You can now exit Visual Studio.







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Step 8: Set Environment Variables

Add the path to the Geant4 dlls to your PATH environment variable

Go to the Windows Control Panel and open the System item

- 1. Click on Advanced System Settings (in Windows XP chose the Advanced tab)
- 2. In the System Properties window, click the button labeled Environment Variables
- 3. Under User Entries select PATH and click the Edit button
 - ➢ If you are SURE that there is no entry called PATH, create one using New
- 4. In the *"Edit User Variable*" dialog box, add a semicolon behind the last entry and append the path to the Geant4 dlls you built in step 7. In the example, these are located at

C:\Users\testUser\Documents\geant4\gean4.9.5-install\bin Be SURE to APPEND this path to your PATH variable rather than overwriting it, otherwise other software installed on your system may stop working.

- 5. You will also need to add environment variables to point to your data directories. Click "New" and create an environment variable called G4LEDATA. As "value" enter the path to your electromagnetics data. In our example this would be *C:\Users\db68\Documents\geant4\gean4.9.5-install\share\Geant4-9.5.1\data\G4EMLOW6.23*
- 6. Once you are done editing, click *OK*



Step 9: Building an application

The steps for building an application using Geant4 is very similar to building Geant4:

- 1. Open the CMake GUI
- 2. Click on *Browse Source*... and select the directory of the application you wish to build for example *C*:*Users**testUsers**Documents**geant4**geant4*_9_5_*p01**examples**basic**B1*
- **3.** Click on *Browse Build*... and select the target directory to store build files for example C:\Users\testUsers\Documents\geant4\B1-Build
- 4. Click *Configure* and chose *Visual C++ Express 2010*. Change CMAKE_INSTALL_PREFIX to the directory where the binary should be build This directory should exist and you must have write permissions there. for example create *C:\Users\testUsers\Documents\geant4\B1-binary*
- 5. Click *Configure* until all red lines have become white
- 6. Click Generate
- 7. Exit CMake
- 8. Navigate to your build directory and open the solution file with *Visual C++* for example *C:\Users\testUsers\Documents\geant4\B1-Build\B1.sln*
- 9. In the Visual C++ Solution Explorer right-click Install and chose Build

Congratulations. You have just compiled your first Geant4 application.



Step 10: Executing your example

To execute your compiled Geant4 application:

- 1. Navigate to your binary directory In the example this was C:\Users\testUsers\Documents\geant4\B1-binary
- **2. Execute the binary by double clicking it** *In the example, double click C:\Users\testUsers\Documents\geant4\B1-binary\bin\ exampleB1.exe*
- 3. The binary will probably launch in a new terminal window

Congratulations. You have just executed your first Geant4 application.

