Version 11.3.2

Geant4 Tutorial Course

Jefferson Lab, Newport News, VA, USA

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Upgrading Your Geant4 Release

Maurizio Ungaro

Jefferson Lab

Jefferson Lab
Thomas Jefferson National Accelerator Facility

U.S. DEPARTMENT OF ENERGY | Office of Science

JSA

Introduction

- Major versus Minor releases
- What to look for in the release notes
- How to upgrade
- In case of trouble

Geant4 Releases on geant4.org

Download

Geant4 source code and installers are available for download, with source code under an open source license.

Latest: 11.3.2

Docs

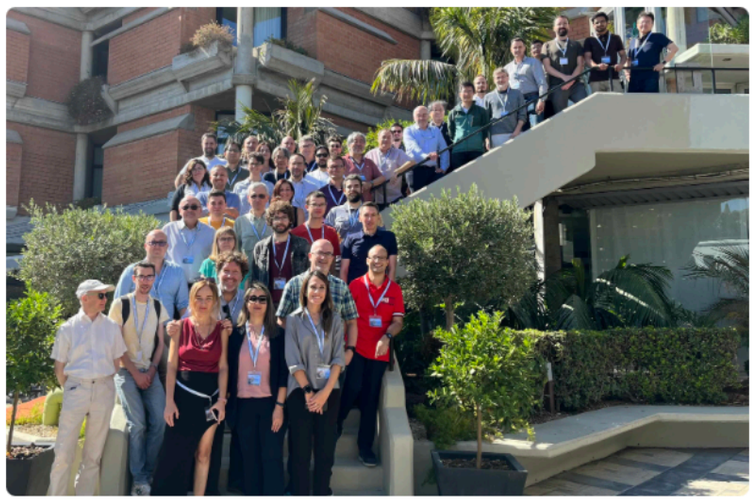
Documentation for Geant4, along with tutorials and guides, are available online.

Read documentation

News

26 Jun 2025
Release 11.4.beta
25 Apr 2025
Release 11.3.2
21 Mar 2025
Release 11.3.1
11 Mar 2025
2025 Planned Feat
06 Dec 2024
Release 11.3

» More



```
template <typename T>
struct G4TaskSingletonEvaluator
{
  using key_type  = typename G4Traits::TaskSingletonKey<T>::type;
  using data_type = G4TaskSingletonData<T>;

  template <typename... Args>
  G4TaskSingletonEvaluator(key_type&, Args&&...)
  {
    throw std::runtime_error("Not specialized!");
  }
};

//---------------------------------------------------------------------------//

template <typename T>
class G4TaskSingletonDelegator
{
public:
  using pointer        = T*;
  using evaluator_type = G4TaskSingletonEvaluator<T>;
  using data_type      = G4TaskSingletonData<T>;
  using key_type       = typename G4Traits::TaskSingletonKey<T>;

  template <typename... Args>
  static void Configure(Args&&... args)
  {
```

News

- **Release 11.4.beta** 26 Jun 2025
  Release 11.4-BETA is available from the BETA Downloac
- **Release 11.3.2** 25 Apr 2025
  Patch release 11.3.2 of Geant4 is now available.
  Source code - Download area
  List of fixes introduced since release...
- **Release 11.3.1** 21 Mar 2025
  Patch release 11.3.1 of Geant4 is now available.
  Source code - Download area
  List of fixes introduced since release...
- **2025 Planned Features** 11 Mar 2025
  Items in this list are related to developments scheduled

Minor/Major releases in December

Major versus Minor Releases

Geant4 release numbers are of the form X.Y

- **X** is the Major release number
- **Y** is the Minor release number

11.0 was a **Major** release

11.1, 11.3 are **Minor** release

- Minor releases **ARE NOT ALLOWED** to break user code.
  - So, for example, moving from release 11.0 to 11.2, you will not need to change your user code
  - You may get slightly different results in the new minor release
  - And you may have access to **additional new features**
  - But nothing in your code should break as a result of the upgrade

- Major releases **ARE ALLOWED** to break user code.
  - Going from release 10.X to 11.X, you may need to change your user code.
  - The release notes will tell you what you might need to change.

Patch Releases

- A Patch adds a 3rd number **Z** to the release number: **X.Y.Z**
  - For example, **11.2.1,** the version used in this tutorial, is a patch release

Release 11.3.2

Patch release 11.3.2 of Geant4 is now available.

Source code - Download area

List of fixes introduced since release 11.3.1 of last March: Notes

- A Patch contains **only bug fixes**
  - No new features

- It is always advisable to download the latest patch
  - The patch release notes will tell you exactly what has changed, so you can decide whether you absolutely need to upgrade

*__NOTE__: In previous releases the patches were named ‘p01’, ‘p02’ etc. This change makes the archived files, datasets, and source code and installation directories naming consistent with each other.

Beta Releases

- A Beta release introduces new features before they have been deemed sufficiently tested for general users
  - Release number ends in **.beta**
  - For example **11.4.beta**
  - A chance for a thorough user test of many of the changes intended for the December release

- Not intended for general users but only for those who are willing to take the risk inherent in a beta

- Users should move to this release only if they really love testing things, or if a Geant4 collaborator informs them that this Beta will solve their specific problem

Release Notes

Click on the desired release on geant4.org

Download Geant4-11.3.2

First released 28 Apr 2025 **Old releases**

License

See the license conditions.

RELEASE NOTES

See:
Main Release Notes - Patch-1 - Patch-2 -

Source code

Source code is freely available from CERN GitLab or through GitHub.
Source code can also be browsed through the LXR source code browser.

Download zip | Download tar.gz | Download tar.bz2 | Download tar

Binary releases

Download tar.gz	MacOS Sequoia, clang-17.0.0
Download tar.gz	Linux Alma9, g++-11.5.0
Download exe	Windows 11, Visual Studio Code-17.10.3
Download zip	Windows 11, Visual Studio Code-17.10.3

Datasets

G4NDL	G4EMLOW	PhotonEvaporation	RadioactiveDecay	G4PARTICLEXS
G4PII	RealSurface	G4SAIDDATA	G4ABLA	G4INCL
G4ENSDFSTATE	G4CHANNELING	G4TENDL	G4NUDEXLIB	G4URRPT

Geant4 11.3 Release Notes

The code and binary libraries for the supported systems are available through our Source Code Web page.

We are grateful for the efforts of Geant4 users who have provided detailed feedback or comprehensive reports of i particular those who have contributed corrections, improvements or developments included in this release.

Please refer to the Geant4 User Documentation for further information about using Geant4.

Contents

Supported Platforms, Compilers

- May change at Major or Minor release
- If your platform and compiler are no longer in the supported list, either upgrade them or just try with what you have:
  - If Geant4 still builds and starts OK, don't worry
  - If there are problems with build or startup, try upgrading to the new supported platform or compiler

1. Supported and Tested Platforms

Platforms:

- Linux, gcc-14.2.0.
  Tested on 64 bit architectures (Intel or AMD) with Alma Linux 9 (based on RedHat Linux Enterprise 9).
- macOS 15.1 Sequoia with Apple LLVM/Clang-16.
  Tested on 64 bit architectures (Intel or Apple Silicon).
- Windows-11 with Visual C++ 14.4 (Visual Studio 2022), 64 bits.

More verified and tested configurations (64 bits):

- Linux, gcc-9.4/10.3/11.3/12.1/13.2, clang-16/17/19
- Linux, Intel-icx 2024.2
- macOS 13.6 Ventura with Apple LLVM/clang-15
- macOS 14.7 Sonoma with Apple LLVM/clang-15
- Windows/10 with Visual C++ 14.36 (Visual Studio 2022)

CLHEP Version

- May change at Major or Minor release
- We don’t change CLHEP versions very often, but when we do change it is for a good reason
- If you use the wrong CLHEP version, your code may still link and run but your results may not be correct.
- If you follow default installation procedure, you’ll use the internal CLHEP version and so won’t have to pay attention to this issue at all.

2. Supported CLHEP, VecGeom and PTL versions

This release of Geant4 has been verified with CLHEP, release **2.4.7.1**. Use of a different CLHEP version may cause incorrect simulation results.
NOTE: an internal module of the relevant CLHEP classes is provided and can be used as alternative to an external CLHEP library installation.

Items for Migration of the User Code

- For a Major release, pay careful attention to this section (but read all). Example for 11.3:

3. Items for migration of the user code

Listed here is some relevant information on developments included in this release. Note that for all users a full re-installation of libraries (or a full re-compilation) and a re-compilation of user applications is required.

General

- Fixed spurious compilation warnings on gcc when LTO settings are enabled.
- Set default for GEANT4_INSTALL_PACKAGE_CACHE to be OFF. This file is highly unstable on macOS and Spack installs, causing problems for most users. Retain the ability to install this file if really wanted, but change the default to NOT install it; in general this will not change anything for users provided they have a reproducible build environment setup.
- Removed configuration/setup of no longer supported TiMemory profiling.

Analysis

- The G4Accumulable class was renamed in G4AccValue including the related functions in G4AccumulableManager; the old class name is still available via using.
- The following G4AccumulableManager functions are deprecated (a warning will be issued in compilation if present in user code):
  - `CreateAccumulable<T>()` [new name: `CreateAccValue<T>()`]
  - `GetAccumulable<T>()` [new name: `GetAccValue<T>()`]
  - `RegisterAccumulable<T>()` [new name: `Register<T>()`]
- Newly added function `Print(G4PrintOption)` in the accumulable base class G4VAccumulable requires to adapt user classes which implement the `Print()` function without or with different arguments.

Electromagnetic and optical physics

- New dataset G4EMLOW8.6.1 is required and should be used.

Hadronic physics

- New hadronic datasets `G4ENSDFSTATE-3.0, G4PhotonEvaporation-6.1, G4RadioactiveDecay-6.1.2, G4PARTICLEXS-4.1` are required and should be used.
- Since Geant4 version 11.2, the physics list QGSP_BERT_HP has a treatment of low energy (< `20 MeV`) neutrons which is not the same as for the other HP-based reference physics list (FTFP_BERT_HP, QGSP_BIC_HP, Shielding, etc.). QGSP_BERT_HP is still under validation, therefore it is not recommended for physics studies, but users are welcome to try out and provide feedback.
- Renamed G4RadioactiveDecay to G4VRadioactiveDecay and G4Radioactivation to G4RadioactiveDecay. The header for G4Radioactivation is preserved to provide backwards compatibility.

Expected effects on physics and computing performance

- This section tells you what to expect in terms of changed results, changed running time and changed memory. Example for 11.3.2:

5. Expected effects on physics and computing performance

Electromagnetic physics

- Electromagnetic shower shapes will be affected on level of per mille if 3-gamma annihilation is enabled. For low energy positively charged particles the agreement of simulation versus data will be improved.

Hadronic physics

- Due to the improvement in the angular emission of >= 4 particles in the final-state of the BERT model, the hadronic showers for most of the reference physics lists, including FTFP_BERT and QGSP_BERT, have few per-cent higher energy response and narrower lateral shower shapes with respect to the previous version, Geant4 11.2. In other words, the hadronic string models (FTF and QGS) and the intranuclear cascade model BERT become closer to each other in this Geant4 release.
- The new hadronic dataset G4PhotonEvaporation-6.1 produces some visible differences in the final-state of the photo-evaporation model in Tungsten, with respect to the previous version. This has an impact, at the per-cent level, on hadronic showers in Tungsten calorimeters only for the physics lists QGSP_BIC and QGSP_INCLXX (whereas those that are based on BERT model, e.g. FTFP_BERT and QGSP_BERT, are not affected because BERT has its own internal nuclear de-excitation model that does not use the G4PhotonEvaporation-6.1 dataset).

How to Upgrade

- Check release notes to see if your existing OS and Compiler are still OK
  - Minor release upgrades generally do not require changes to any of these, but check the notes
  - Just because your versions are no longer “supported” doesn’t mean they won’t work. It only means we are not testing them any more. So if your versions are not supported and it is not convenient for you to update, go ahead and try building with your old setup.
  - Upgrade your OS or Compiler if you need to

- If you’ve followed the recommended installation instructions, you will have your user code in a work area that is NOT inside your Geant4 installation directory
  - **Good:**
    - Geant4 Installation `~/mydir/geant4.11.2.1`
    - Your code / Examples: `~/mydir/myUserCode`
  - **Not so Good:**
    - Geant4 Installation `~/mydir/geant4.11.2.1`
    - Your code / Examples: `~/mydir/geant4.11.2.1/myUserCode`

- The point of keeping your user code separate from the Geant4 installation is that your user code may work with several different Geant4 versions, and if you decide later to delete a particular Geant4 version, you won’t accidentally delete your user code

Advise: Upgrade with Full Install

- If you are getting a patch version, take the full new Geant4
  - If you instead just take the minimal patch and try to overlay it on your Geant4, you are more likely to have problems

- Unpack the new Geant4 version to a new place.
  - For example: `~/mydir/geant4/11.3.2/source`

- You do not need to delete your old Geant4 version unless you really want to. It is perfectly fine to have multiple Geant4 versions. For example **install destinations** could:
  - `~/mydir/geant4/10.7.4`
  - `~/mydir/geant4/11.2.1`
  - `~/mydir/geant4/11.3.4`

- Make sure you do not have any left over G4 environment variables
  - printenv | grep “G4”
  - Get a new session, clean up your .login or .cshrc, or do whatever is necessary

- Make a fresh geant4-build directory and do a fresh cmake and make from there

In Case of Trouble

- Did you review the release notes?
- Did you remember to remove all pre-existing G4 environment variables?
  - Otherwise you may be pointing to some mix of old and new releases
- Did you remember to do your new build in a new build area?
  - Otherwise you may have part of your code compiled against one Geant4 release and part compiled against another G4 release
- Check the Geant4 "Getting Started" **User Forum**
  - past issues for Installation and Configuration can be found there
  - **very good search function** at the top of that page
  - someone might have had the same issue and the solution may already be there
  - if it's something new, post it there