

Geant4 Virtual Machine

geant4-dna.org

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Introduction

- We are providing since 2004 a **Geant4 Virtual Machine** (VM) for Geant4 users, which emulates a **AlmaLinux 9 machine**
 - Geant4 and many other software are already installed
 - **Regularly updated** with Geant4 releases (major, minor, patches, BETA)
 - Linux version: see CERN's policy: <https://linux.web.cern.ch/which/>
- Many **advantages**
 - No Geant4 installation needed
 - Accessible fully through download
 - Fully free
 - Can run with
 - **VMware Workstation** for **Windows & Linux**
 - **VMware Fusion** for **macOS**
- We use it regularly for Geant4 **tutorials**
 - All our hands-ons will be demonstrated on this virtual machine
 - Alternatively, advanced users may install Geant4 themselves following the **Geant4 Installation guide** <https://geant4-userdoc.web.cern.ch/UsersGuides/InstallationGuide/html/index.html>

Step-by-step installation

Step 1: install VMware Fusion or Workstation

- Download virtualization software from <https://www.vmware.com>
 - **Products** → **SEE DESKTOP HYPERVISORS** → **DESKTOP HYPERVISOR** → **DOWNLOAD FUSION OR WORKSTATION**
 - **Fusion is** for **macOS**, **Workstation is** for **Windows & Linux**
 - Redirected to Broadcom : **register...** (First Name, Last Name, E-mail)
 - Go to **My Downloads** (left hand side menu)
 - Select **VMware Fusion** for **macOS** or **VMware Workstation Pro** for **Windows or Linux**
 - Select **VMware Fusion 13.*** for **macOS** or **VMware Workstation Pro 17.*** for **Windows or Linux**

VMware Fusion 13

Release	Release Level Info	Language
13.6.2	526671	English
13.6.1	524469	English
13.6	522386	English
13.5.2	520443	English
13.5.1	208578	English
13.5	208577	English
13.0.1	208575	English
13.0.0	208574	English

Version 13.6.2

VMware Workstation Pro 17.0 for Windows

Release	Release Level Info	Language
17.6.2	526672	English
17.6.1	524543	English
17.6	522389	English
17.5.2	520398	English
17.5.1	208710	English
17.5	208708	English
17.0.2	208706	English
17.0.1	208704	English
17.0.0	208702	English

Version 17.6.2

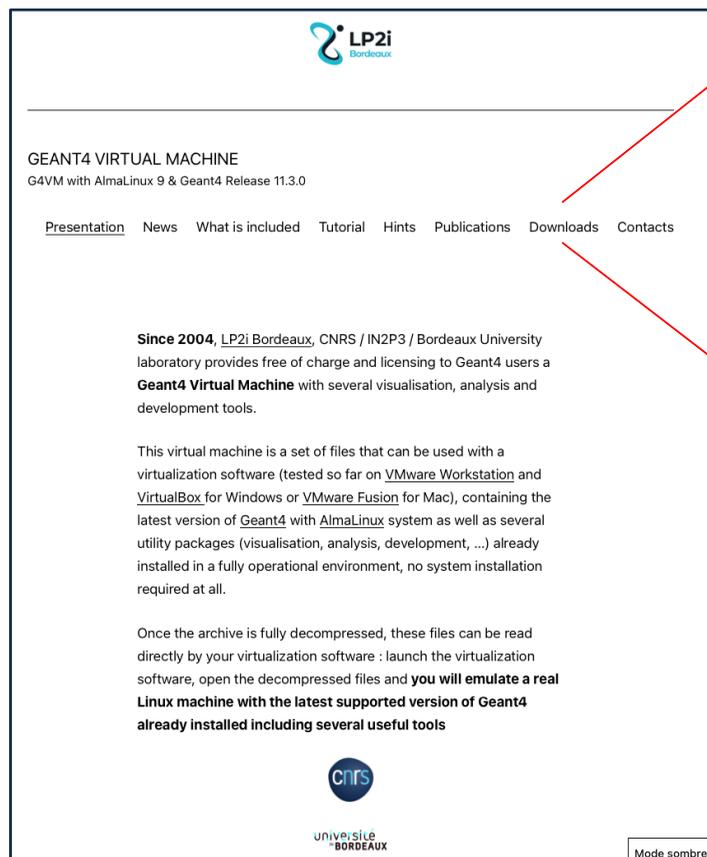
Chat if needed (after registration)

<https://support.broadcom.com/group/ecx/productdownloads?subfamily=VMware%20Fusion>

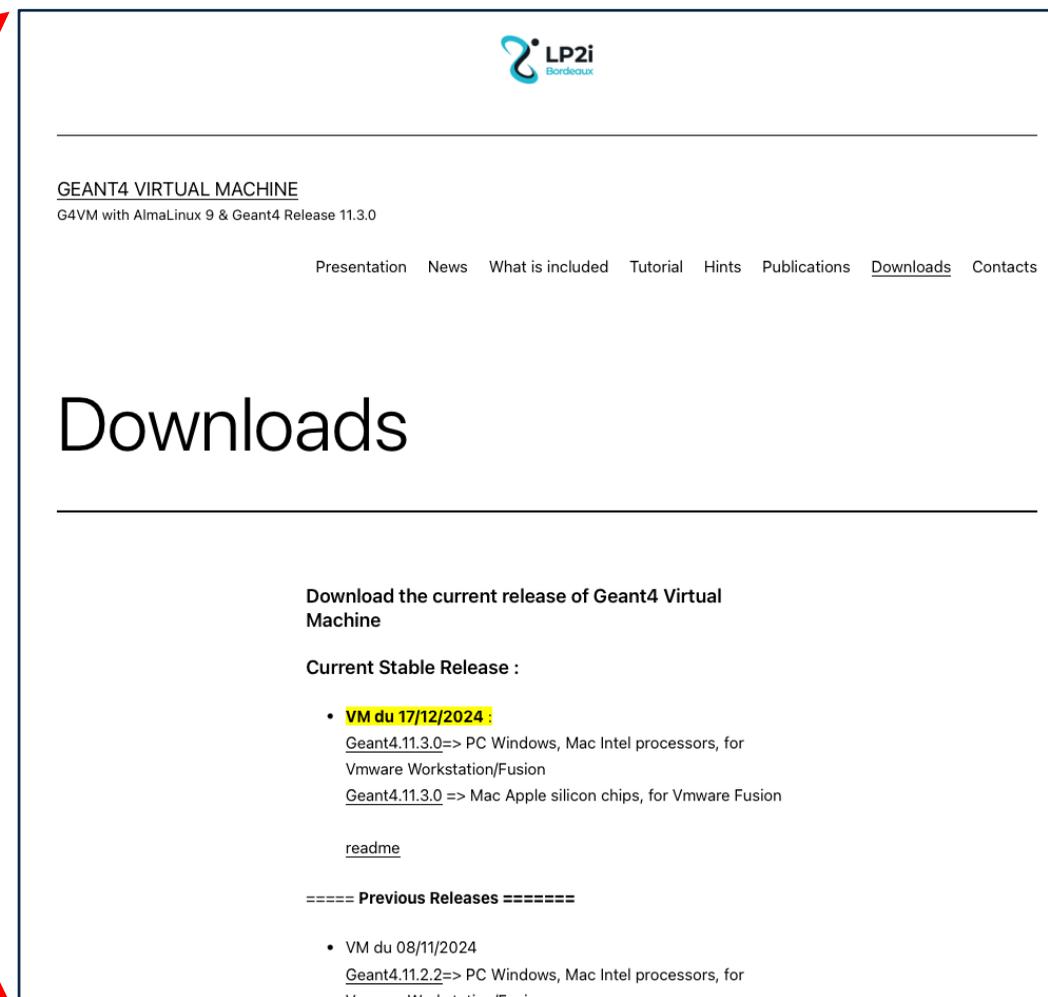
<https://support.broadcom.com/group/ecx/productdownloads?subfamily=VMware+Workstation+Pro>

Step 2: download the virtual machine

- Go to <https://geant4.lp2ib.in2p3.fr>
 - Go to **Downloads** section
 - Select the virtual machine you need
 - Geant4 11.3.0**
 - A few 20 Go to download...
 - You may also check the [README](#) file



The screenshot shows the homepage of the Geant4 website. At the top right is the LP2i Bordeaux logo. Below it, the text reads "GEANT4 VIRTUAL MACHINE" and "G4VM with AlmaLinux 9 & Geant4 Release 11.3.0". A navigation menu includes "Presentation", "News", "What is included", "Tutorial", "Hints", "Publications", "Downloads", and "Contacts". The main content area contains a paragraph starting with "Since 2004, LP2i Bordeaux, CNRS / IN2P3 / Bordeaux University laboratory provides free of charge and licensing to Geant4 users a Geant4 Virtual Machine with several visualisation, analysis and development tools." Below this is another paragraph describing the virtual machine as a set of files for use with VMware Workstation, VirtualBox, or VMware Fusion. At the bottom, there is a paragraph about decompressing the archive and emulating a real Linux machine. Logos for CNRS and Université de Bordeaux are visible at the bottom, along with a "Mode sombre" button.



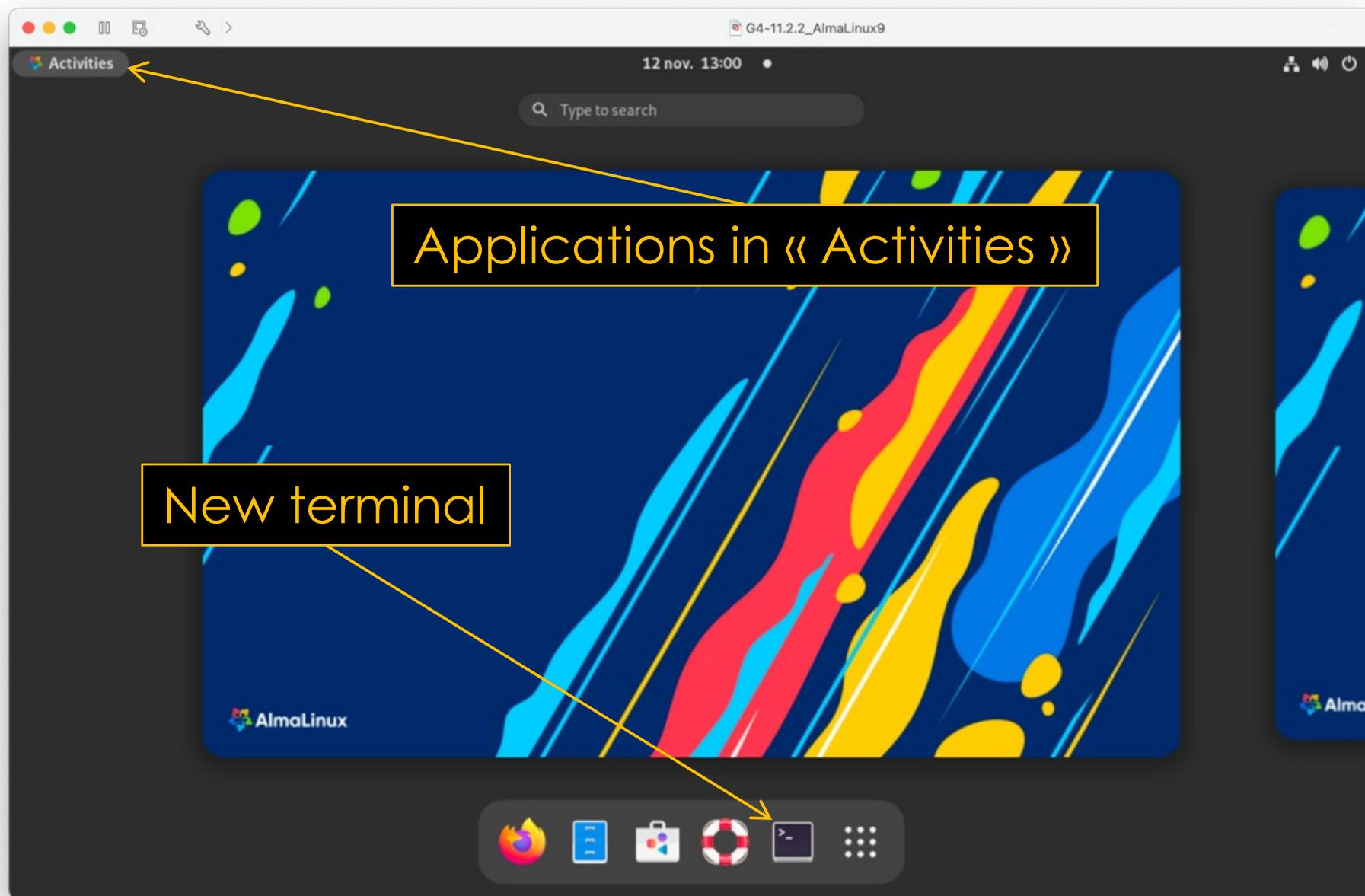
The screenshot shows the "Downloads" page on the Geant4 website. It features the LP2i Bordeaux logo at the top. The page title is "GEANT4 VIRTUAL MACHINE" with the subtitle "G4VM with AlmaLinux 9 & Geant4 Release 11.3.0". The navigation menu is identical to the homepage. The main heading is "Downloads". Below this, there is a section titled "Download the current release of Geant4 Virtual Machine" and "Current Stable Release :". A list of releases is shown, with the most recent one highlighted in yellow: "VM du 17/12/2024 : Geant4.11.3.0=> PC Windows, Mac Intel processors, for Vmware Workstation/Fusion" and "Geant4.11.3.0 => Mac Apple silicon chips, for Vmware Fusion". A link to "readme" is provided. Below this is a section for "Previous Releases" with a list of older versions, including "VM du 08/11/2024" and "Geant4.11.2.2=> PC Windows, Mac Intel processors, for Vmware Workstation/Fusion".

Step 3: uncompress the virtual machine

- Uncompress the downloaded archive
- Start VMware Fusion or VMware Workstation Pro
- Open the ***.vmx** file located in the uncompressed archive (Mac: directly double click on the uncompressed file)
- The virtual machine will start
- You may customize the VM properties according to your PC/Mac
 - e.g. amount of memory to allocate, number of processors...
- **Important**
 - Read carefully the following [README](#) file containing information about requirements and how to proceed.
 - You may also find interesting information in the [History](#) file.
 - If asked, declare that the virtual machine **has been copied** (and not moved).
 - On **macOS**, you may encounter download troubles if you use **Safari** (your downloaded archive may have a too small size and you will not be able to uncompress it); in that case, we suggest to use **Chrome** or **Firefox** instead.
 - On **macOS**, you may uncompress your archive using the [Unarchiver](#) application, freely available in the App Store. On **Windows**, you may uncompress your archive using the [7-Zip](#) application, freely available.
 - **Windows** users may need to check that virtualization has been activated in the BIOS.
 - The total compressed file size is about 20 Go and reaches 30 Go when fully decompressed.

Your virtual machine

Your local account *username* and *password* are
local1
local1



Hints on virtual machine usage

Some hints (1/5)

- Depending on your country, you may need to change your **keyboard settings**. By default, a **french (FR) or american (US) keyboard** is configured.
 - You can switch from FR to US on the top right corner of the main window (Settings → Keyboard)



- The **default account username** is `local1` and it has the **same password**.
- You can configure entirely by your own your Virtual Linux Machine as root. The **root password** is mentioned in the [README](#) file.
- On macOS, switch from VM to macOS using control & command key combination.

Some hints (2/5)

- You can increase the **memory size** of your Virtual Machine, especially if your PC has a large memory size available; for example, simply go to the Virtual Machine menu, select Virtual Machine Settings, Hardware and select the memory size you need.
- If your machine is equipped with **more than two processors**, you may choose the number of processors in the Virtual Machine menu, select Virtual Machine Settings, Hardware.
- You may **create a new disk** in your virtual machine in case you need more space for your data. All instructions are given in the [README](#) file.
- Your **personal environment** is defined in the `/home/local1/.cshrc` file.
- You may change **user environment variables** by adding a `.ucshrc` file also located in the directory `/home/local1`

Some hints (3/5)

- You may need to define an **exchange directory** between your host (Windows for example) and the Linux virtual machine containing Geant4.
- To do that, in the VM menu of the VMware software, do as follows:
 - Go to the Player menu
 - Select Virtual Machine Settings/Options/Shared Folders
 - Make sure the « Always enabled » option is selected
 - Select Add to chose a host path for a folder and give it a name like « shared »
 - Click Finish, then you should see the name of this directory appear in the « Host Path »
 - Click OK
- Under your Linux session, your **exchange directory** is located at `/mnt/hgfs/name_of_exchange_directory`
- If this does not work, you may need to **reinstall VMware tools** from the Virtual Machine menu...

Some hints (4/5)

- Make sure to always use the **latest version** of the virtualization software.
- Under Windows, you may encounter problems if the disks (internal & external hard drives, USB keys...) where you uncompress your files have been formatted in the FAT32 format. **Use NTFS formatted disks only** (same remark for USB keys).
- If you **do not have network access** on your virtual machine or the `/mnt/hgfs` folder is not present, you probably need to reinstall VMware tools.
- If you are using an **old version of the VM with a recent version of VMware Workstation** (17.x), you probably need to change the value of the virtual machine hardware version. To do that, edit the `.vmx` file and change the value with the correct version:
`virtualHW.version = "16"`

Some hints (5/5)

- **Environment** variables
 - **\$G4INSTALL**
 - **\$G4COMP**: Library directory for Geant4 compilation
`/usr/local/geant4.version/lib64/Geant4`
 - **\$G4SRC**: Geant4 sources
 - **\$G4EXAMPLES**: all examples
 - **\$G4UI_USE_TCSH**: User Interface (set to 1)
 - **\$G4UI_USE_QT**: Qt interface (set to 1)
 - **\$G4VIS_USE_OPENGLX**: Visualization using OpenGL (set to 1)
- Most of the environment variables are defined in the environment module files:
`/usr/share/Modules/modulefiles/geant4/version`
- The software is installed in the `/usr/local` directory, with RPM packages of the Rocky Linux distribution.

Testing of your VM

Let's check that the VM works fine...

- Type the following sequence in a **Terminal**

```
cd
cp -R $G4EXAMPLES/basic/B3 .
mkdir build
cd build
cmake ../B3
make
cd B3a
./exampleB3a
```

- The Qt interface will show up, then enter in « Session » window the command:

```
/control/execute run1.mac
```

Useful software provided with the VM (version dep.)

- Operating System [AlmaLinux 9](#)
- [Geant4](#) with all sets of data files
- [Boost](#)
- [CLHEP](#)
- [Firefox](#)
- [GDB](#)
- [Geany](#)
- [gedit](#) ★
- [Grace](#)
- [Gnuplot](#)
- [ImageMagick](#)
- [Jupyter](#)
- [LibreOffice](#)
- [Python3](#) with [Jupyter](#), [Matplotlib](#), [NumPy](#), [SciPy](#) and [Sphinx](#)
- [Qt6](#)
- [ROOT](#) ★
- [Eclipse IDE](#)
- [Tex Live](#)
- [Thunderbird](#)
- [Valgrind](#)
- [XercesC](#)
- [CMake](#), [make](#) ★

Useful Linux commands

Linux (1): navigation in directories, env. variables

- The default shell is `tcsh`
- `pwd` : display current directory
- `cd directory` : go into *directory*
- `cd` : go home directory (~)
- `cd ..` : go to parent directory
- `ls` : list files
- `ls -a` : list files, including hidden files
- `echo $VAR` : display environment variable *VAR*
- `setenv VAR value` : set *value* of environment variable *VAR* (tcsh shell)
- Add `&` after command name to keep control

Linux (2): move, copy, create, delete...

- `mv source target` : move and / or rename a file
- `cp source target` : copy a file
- `cp -R source target` : copy a directory
- `mkdir directory` : create a directory
- `rmdir directory` : remove an **empty** directory
- `du -ks directory` : give the size of a directory (in ko)
- `rm file` : delete a file
- `rm -f file` : deleted a write-protected file
- `rm -R directory` : delete a directory

- To copy / paste in macOS VM
 - select your text with pad or mouse, then go to paste location, press '**command**' key, and click pad or mouse simultaneously

Thank you for your attention

Questions?



@Geant4VM

If you use the VM, please kindly cite

Int. J. Model. Simul. Sci. Comput. 1 (2010) 157–178 ([link](#))

Hint: for manual installation on macOS, see <http://geant4-dna.org>

