



Geant4 Virtual Machine

geant4.org

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Geant4 & Geant4-DNA Tutorial
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Geant4 version 11.4.2
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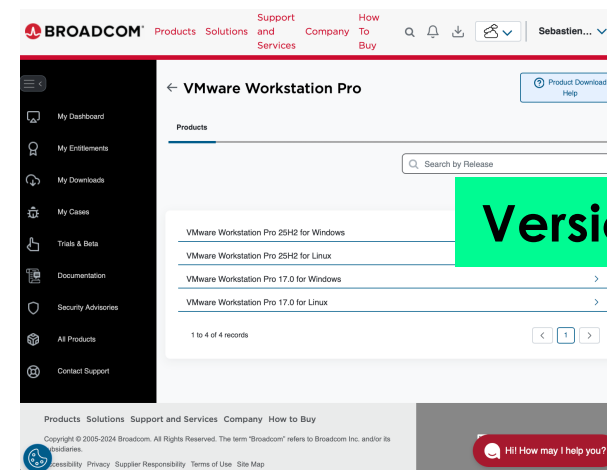
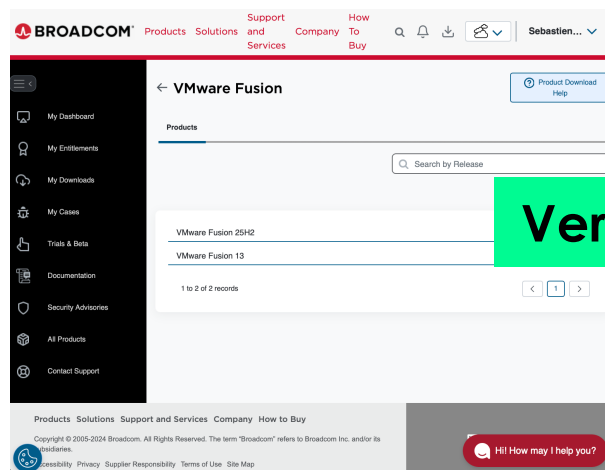
Introduction

- We are providing since 2004 a **Geant4 Virtual Machine** (VM) for Geant4 users, which emulates a **AlmaLinux 9 machine** including
 - 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>
 - We also maintain a special installation page for **macOS** users <https://geant4-dna.in2p3.fr/styled-6/styled-12/index.html>

Step-by-step installation

Step 1: download and install VMware Fusion or Workstation

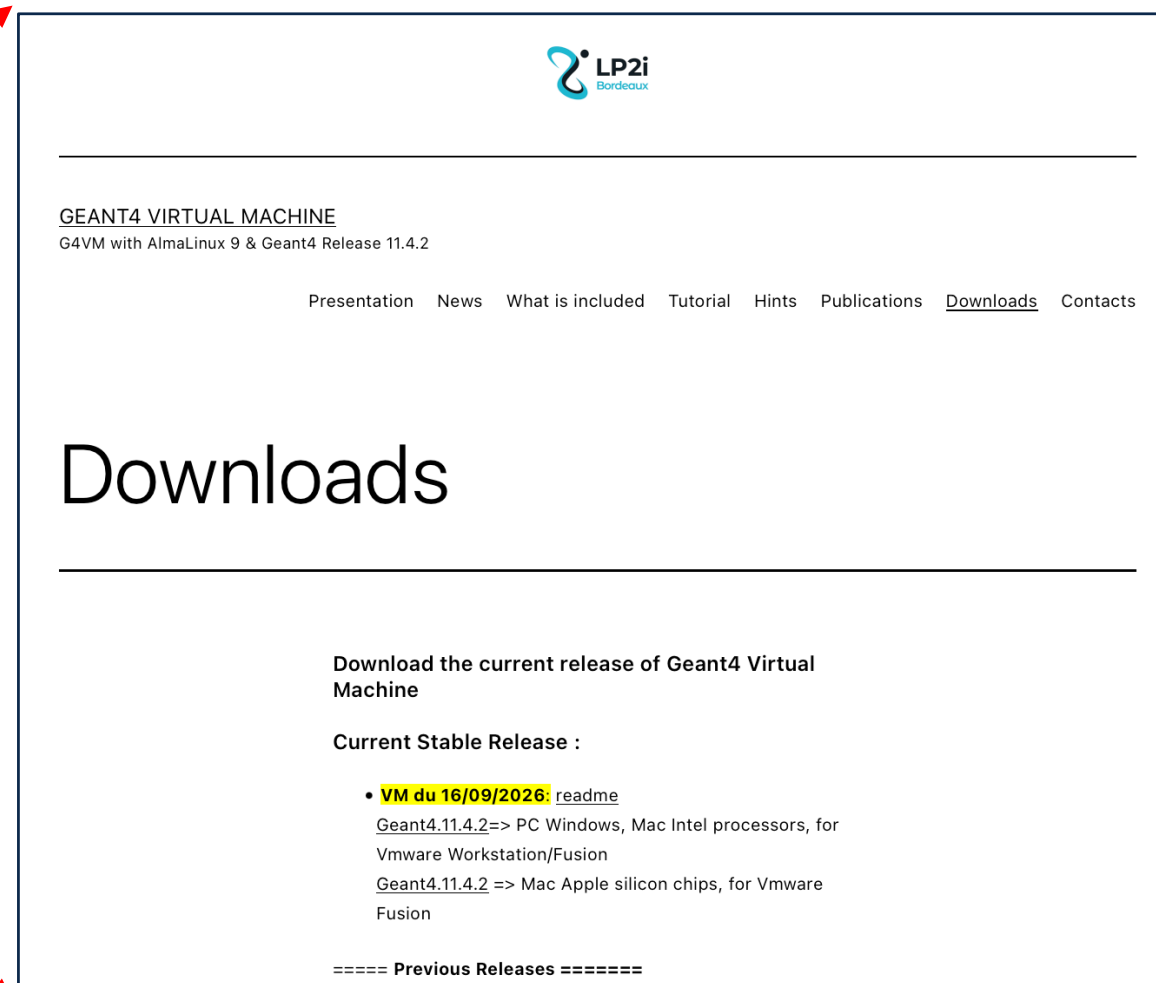
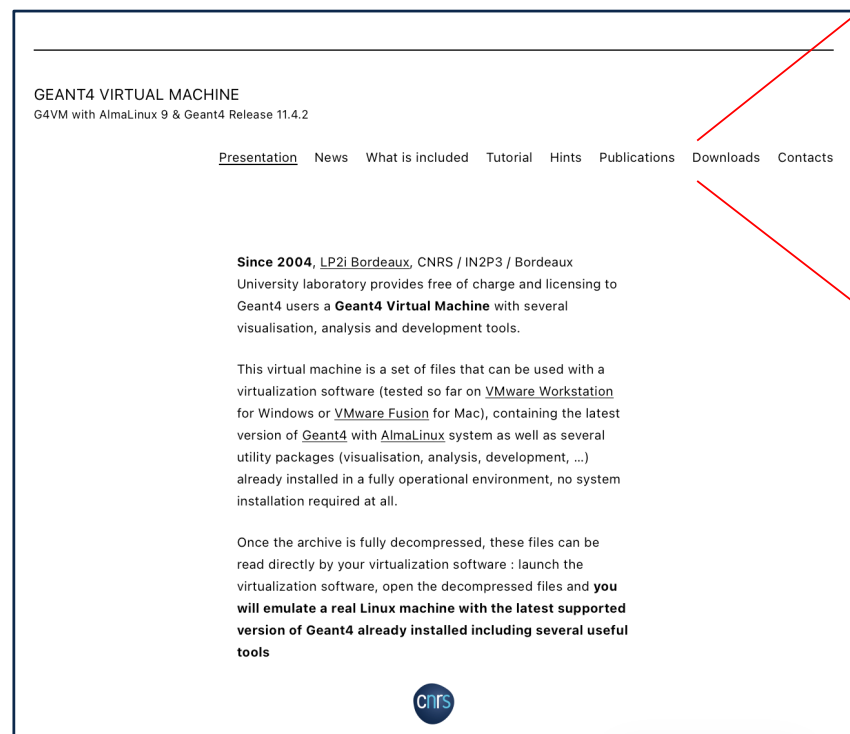
- Download virtualization software from [VMware by Broadcom](#): → **DOWNLOAD NOW**
 - Redirected to Broadcom : **register**... (First Name, Last Name, E-mail, Institution...)
 - Go to **My Downloads** (left hand side menu)
 - Click on **Free Software Downloads available HERE**
 - Search **VMware Fusion** (for **macOS**) or **VMware Workstation Pro** (for **Windows or Linux**)
 - Select **VMware Fusion 26H1u1** for **macOS** or **VMware Workstation Pro 26H1u1** for **Windows or Linux**
 - Open « **Terms and conditions** » and then click « **I agree** »
 - Download and install
 - Even if you already have an existing working version of WMware (it will be upgraded automatically)



Chat if
needed
(after
registration)

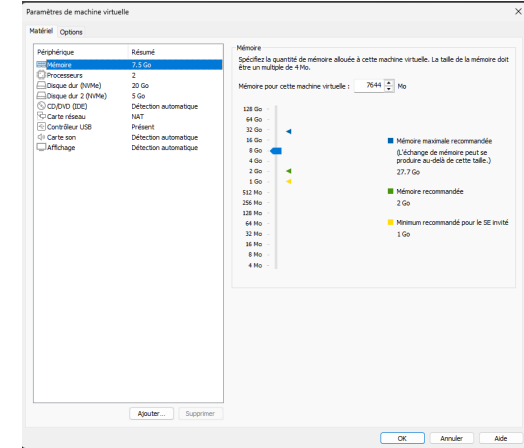
Step 2: download the virtual machine

- From <https://geant4.lp2i.b.in2p3.fr>
 - Go to **Downloads** section
 - Select the virtual machine you need
 - **Geant4 11.4.2**
 - Just a file less than 10 Go to download...
 - You may also check the [README](#) file



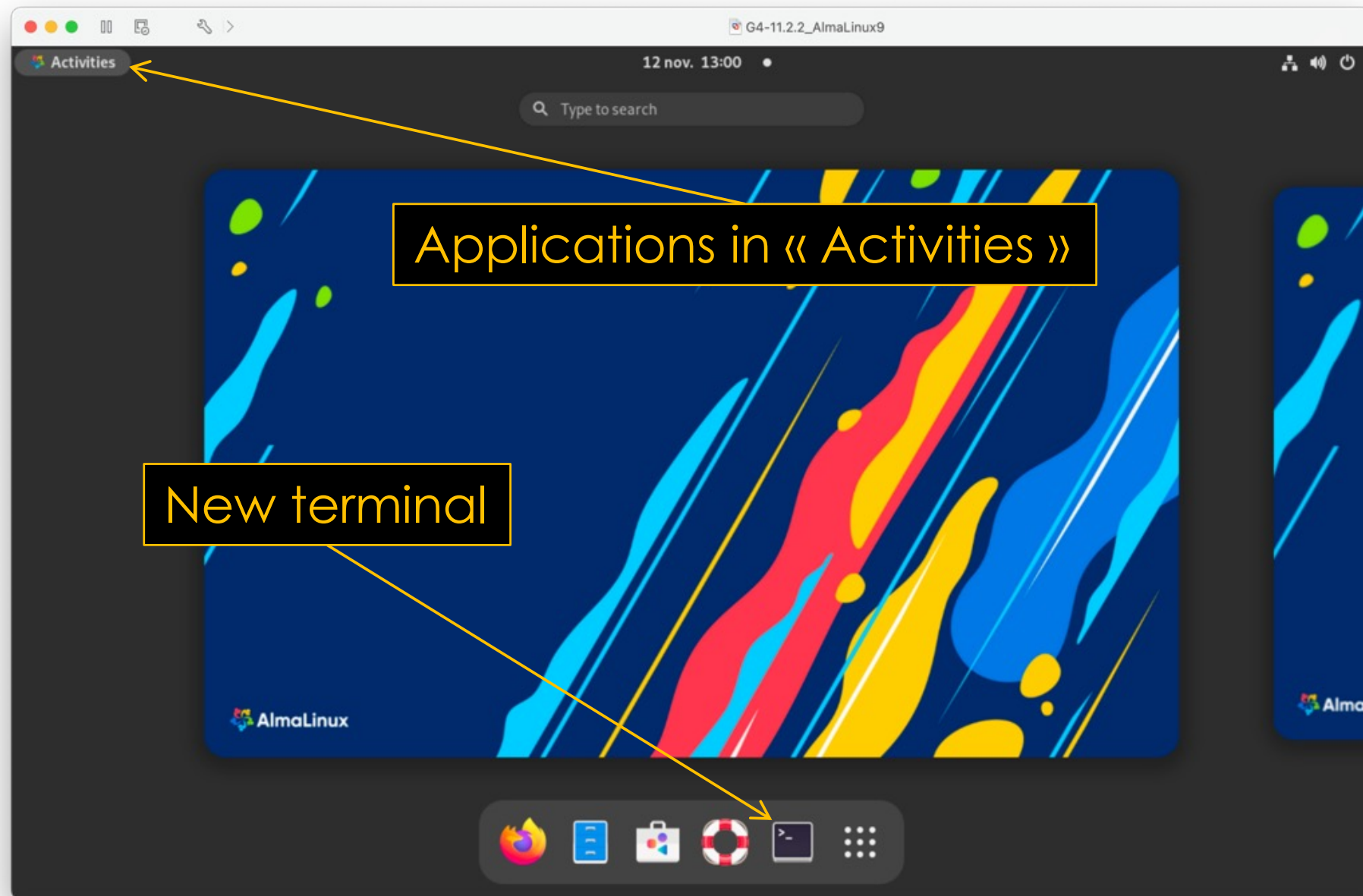
Step 3: uncompress the virtual machine

- **Uncompress the downloaded Virtual Machine** (if compressed)
- **Start VMware Fusion or VMware Workstation Pro**
- **Open the Virtual Machine using Fusion or Workstation Pro** in the **Geant4.11.4.2-AlmaLinux9** folder
 - the [Geant4.11.4.2-AlmaLinux9](#) file for Mac,
 - or the [Geant4.11.4.2-AlmaLinux 9.vmx](#) file for Windows
- The virtual machine will start
- You may **customize** the VM properties according to your Mac/PC (see next)
 - 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.
 - On **Windows**, you may uncompress your archive using the [7-Zip](#) application, freely available.
 - If asked, declare that the virtual machine **has been copied** (and not moved).
 - The total compressed file size is about 10 Go and reaches 20 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, you may switch from VM to macOS using **control AND 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 **Settings, Processors & Memory** 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, Processors & Memory.
- 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, do as follows:
 - Go to the Virtual Machine menu
 - Select **Sharing**
 - Select Add or + to chose a host path for a folder and give it a name, like « shared »
 - Make sure the « Active » option is selected (if available)
 - Click OK
- Under your Linux session, your **exchange directory** is located at `/mnt/hgfs/name_of_exchange_directory`
 - You can test : `ls /mnt/hgfs/name_of_exchange_directory`
- If this does not work, you may:
 - Deactivate and reactivate sharing in Virtual Machine menu / Sharing
 - Or 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.
- 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.
- 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).

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**: Visualization (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 AlmaLinux 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 .  
cd B3  
mkdir build  
cd build  
cmake ../B3a  
make  
./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](#)
- [Jupyter](#)
- [LibreOffice](#)
- [Python3](#) with [Jupyter](#) notebook, [Matplotlib](#), [NumPy](#), [SciPy](#) and [Sphinx](#)
- [Qt6](#)
- [ROOT](#) ★
- [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
- Tip: To copy / paste within the macOS VM
 - select your text with pad or mouse, then go to paste location, press '**command**' key, and click pad or mouse simultaneously



If you use the VM, please kindly cite

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

Thank you for your attention
Questions?