

Installing CLHEP full version *(optional)*

- Create a directory for the installation procedure (ex.:clhep)

```
[geant4-tutorial] ~ >  
[geant4-tutorial] ~ >  
[geant4-tutorial] ~ >  
[geant4-tutorial] ~ >  
[geant4-tutorial] ~ > mkdir clhep  
[geant4-tutorial] ~ > cd clhep  
[geant4-tutorial] ~/clhep > █
```

- Move the downloaded tar-ball into this directory

```
[geant4-tutorial] ~/clhep >  
[geant4-tutorial] ~/clhep >  
[geant4-tutorial] ~/clhep >  
[geant4-tutorial] ~/clhep > mv ~/Desktop/clhep-2.0.3.2-src.tgz .  
[geant4-tutorial] ~/clhep > ls  
clhep-2.0.3.2-src.tgz  
[geant4-tutorial] ~/clhep > █
```

- Unzip the extract tar-ball into this directory

```
[geant4-tutorial] ~/clhep >  
[geant4-tutorial] ~/clhep >  
[geant4-tutorial] ~/clhep >  
[geant4-tutorial] ~/clhep > tar xzvf clhep-2.0.3.2-src.tgz  
2.0.3.2/  
2.0.3.2/CLHEP/  
2.0.3.2/CLHEP/CVS/  
2.0.3.2/CLHEP/CVS/Root  
2.0.3.2/CLHEP/CVS/Repository  
2.0.3.2/CLHEP/CVS/Entries  
2.0.3.2/CLHEP/CVS/Template  
2.0.3.2/CLHEP/CVS/Tag
```

- The extracted CLHEP package can be found in the subdirectory "2.0.3.2/CLHEP". Have a look at the content:

```
[geant4-tutorial] ~/clhep >
[geant4-tutorial] ~/clhep >
[geant4-tutorial] ~/clhep > ls
2.0.3.2 clhep-2.0.3.2-src.tgz
[geant4-tutorial] ~/clhep > ls 2.0.3.2/CLHEP
aclocal.m4      Evaluator      Matrix
autom4te.cache  Exceptions    missing
bootstrap      GenericFunctions Random
build-clheplib.in Geometry      RandomObjects
Cast           getObjectList.in README
ChangeLog      HepMC         ReadMe.cygwin-VC71
clhep-config.in HepPDT        RefCount
compilers.txt  INSTALL      setup.cygwin-VC71
config.guess   install-sh   StdHep
config.sub     makeBinaryTar.in Units
configure      Makefile.am  Utilities
configure.in   Makefile.in  Vector
CVS           makeSourceDist.in
```

Have a look in the "INSTALL" file: It contains more details on the installation procedure

- Create two directories (inside our "clhep" directory), which are used for building and installing the package:

```
[geant4-tutorial] ~/clhep >
[geant4-tutorial] ~/clhep > mkdir build
[geant4-tutorial] ~/clhep > mkdir install
[geant4-tutorial] ~/clhep > ls
2.0.3.2 build clhep-2.0.3.2-src.tgz install
[geant4-tutorial] ~/clhep > cd build
[geant4-tutorial] ~/clhep/build >
```

NOTE: The package will be finally installed in the directory "~/clhep/install"

- Inside the “build” directory, call the CLHEP configure script (which is contained in the “2.0.3.2/CLHEP” directory).

NOTE: As argument you need to specify the directory, where CLHEP should be installed. Thus the full command to be called is: `../2.0.3.2/CLHEP/configure --prefix=/home/geant4-tutorial/clhep/install`

```
[geant4-tutorial] ~/clhep/build >
[geant4-tutorial] ~/clhep/build > ../2.0.3.2/CLHEP/configure --prefix
x=/home/geant4-tutorial/clhep/install
checking build system type... i686-pc-linux-gnu
checking host system type... i686-pc-linux-gnu
checking target system type... i686-pc-linux-gnu
checking for a BSD-compatible install... /usr/bin/install
checking whether build environment is sane... yes
checking for gawk... gawk
checking whether make sets $(MAKE)... yes
checking for a BSD-compatible install... /usr/bin/install -c
checking whether ln -s works... yes
checking for ranlib... ranlib
```

Adapt prefix path according to your own installation directory!

- The `configure` script checks for required programs and libraries, and creates some files, e.g. makefiles, and directories:

```
[geant4-tutorial] ~/clhep/build >
[geant4-tutorial] ~/clhep/build >
[geant4-tutorial] ~/clhep/build >
[geant4-tutorial] ~/clhep/build > ls
build-clheplib  Evaluator          makeBinaryTar      RandomObjects
Cast           Exceptions         Makefile           RefCount
clhep-config   GenericFunctions  makeSourceDist     Units
config.log     Geometry          Matrix             Vector
config.status  getObjectList     Random
[geant4-tutorial] ~/clhep/build > █
```

- If no error occurred in the configure process, one can start to build the CLHEP package using the “make” command:

```
[geant4-tutorial] ~/clhep/build >
[geant4-tutorial] ~/clhep/build >
[geant4-tutorial] ~/clhep/build >
[geant4-tutorial] ~/clhep/build >
[geant4-tutorial] ~/clhep/build >
[geant4-tutorial] ~/clhep/build > make
Making all in Units
make[1]: Entering directory `/home/geant4-tutorial/clhep/build/Units'
Making all in Units
make[2]: Entering directory `/home/geant4-tutorial/clhep/build/Units/Units'
make all-am
make[3]: Entering directory `/home/geant4-tutorial/clhep/build/Units/Units'
make[3]: Für das Ziel »all-am« ist nichts zu tun.
make[3]: Leaving directory `/home/geant4-tutorial/clhep/build/Units/Units'
make[2]: Leaving directory `/home/geant4-tutorial/clhep/build/Units/Units'
Making all in .
make[2]: Entering directory `/home/geant4-tutorial/clhep/build/Units'
/home/geant4-tutorial/clhep/2.0.3.2/CLHEP/Units/autotools/install-sh -d /home/
geant4-tutorial/clhep/build/Units/CLHEP;
make[3]: Entering directory `/home/geant4-tutorial/clhep/build/Units/Units'
install headers in /home/geant4-tutorial/clhep/build/Units/CLHEP/Units
make[3]: Leaving directory `/home/geant4-tutorial/clhep/build/Units/Units'
make[2]: Leaving directory `/home/geant4-tutorial/clhep/build/Units'
```

This may take a while...

Only the initial and last output messages of the make command are shown

```
liblist=`./getObjectList -static Units Vector Evaluator GenericFunct
ions Geometry Random Matrix RandomObjects RefCount Cast Exceptions`;
\
ar cru libCLHEP-2.0.3.2.a $liblist; ranlib libCLHEP-2.0.3.2.a
rm -f libCLHEP-2.0.3.2.so
liblist=`./getObjectList -shared Units Vector Evaluator Ge
ions Geometry Random Matrix RandomObjects RefCount Cast Ex
\
g++ -O -ansi -pedantic -Wall -D_GNU_SOURCE -g -O2 -o lib
3.2.so -shared -Wl,-soname,libCLHEP-2.0.3.2.so $liblist -o libCLHEP-
2.0.3.2.so
make[1]: Leaving directory `/home/geant4-tutorial/clhep/build'
[geant4-tutorial] ~/clhep/build > █
```

*Compiling was successful if
“make” does not exit with error
messages...*

- Once the package was compiled successfully, CLHEP can be installed using the “**make install**” command:

```
[geant4-tutorial] ~/clhep/build >
[geant4-tutorial] ~/clhep/build > make install
Making install in Units
make[1]: Entering directory `/home/geant4-tutorial/clhep/build/Units'
Making install in Units
make[2]: Entering directory `/home/geant4-tutorial/clhep/build/Units/Units'
make[3]: Entering directory `/home/geant4-tutorial/clhep/build/Units/Units'
make[3]: Für das Ziel »install-exec-am« ist nichts zu tun.
test -z "/home/geant4-tutorial/clhep/install/include/CLHEP/Units" || mkdir -p -- "/home/geant4-tutorial/clhep/install/include/CLHEP/Units"
/usr/bin/install -c -m 644 '../2.0.3.2/CLHEP/Units/Units/GlobalPhysicalConstants.h' '/home/geant4-tutorial/clhep/install/include/CLHEP/Units/GlobalPhysicalConstants.h'
/usr/bin/install -c -m 644 '../2.0.3.2/CLHEP/Units/Units/GlobalSystemOfUnits.h' '/home/geant4-tutorial/clhep/install/include/CLHEP/Units/GlobalSystemOfUnits.h'
/usr/bin/install -c -m 644 '../2.0.3.2/CLHEP/Units/Units/PhysicalConstants.h' '/home/geant4-tutorial/clhep/install/include/CLHEP/Units/PhysicalConstants.h'
```

- The CLHEP libraries are now installed in the directory “**~/clhep/install**”
(NOTE: We specified the installation directory in the configure process; see the previous slides)

```
[geant4-tutorial] ~/clhep/install >
[geant4-tutorial] ~/clhep/install >
[geant4-tutorial] ~/clhep/install >
[geant4-tutorial] ~/clhep/install >
[geant4-tutorial] ~/clhep/install > ls
bin  include  lib
[geant4-tutorial] ~/clhep/install > █
```

Congratulations!

- What do the subdirectories in “~/clhep/install” contain?
 - **include**: Contains (in a defined directory tree structure) the C++ header files of CLHEP
 - **lib**: Contains the (static and shared) CLHEP libraries
 - **bin**: Contains configure scripts
- Finally, to save some disk space, you can remove the “build” directory, as well as the tar-ball and the source package

```
[geant4-tutorial] ~/clhep > du -sh *
27M      2.0.3.2
93M      build
4,9M     clhep-2.0.3.2-src.tgz
53M      install
[geant4-tutorial] ~/clhep > rm -r 2.0.3.2 build clhep-2.0.3.2-src.tgz
[geant4-tutorial] ~/clhep > █
```