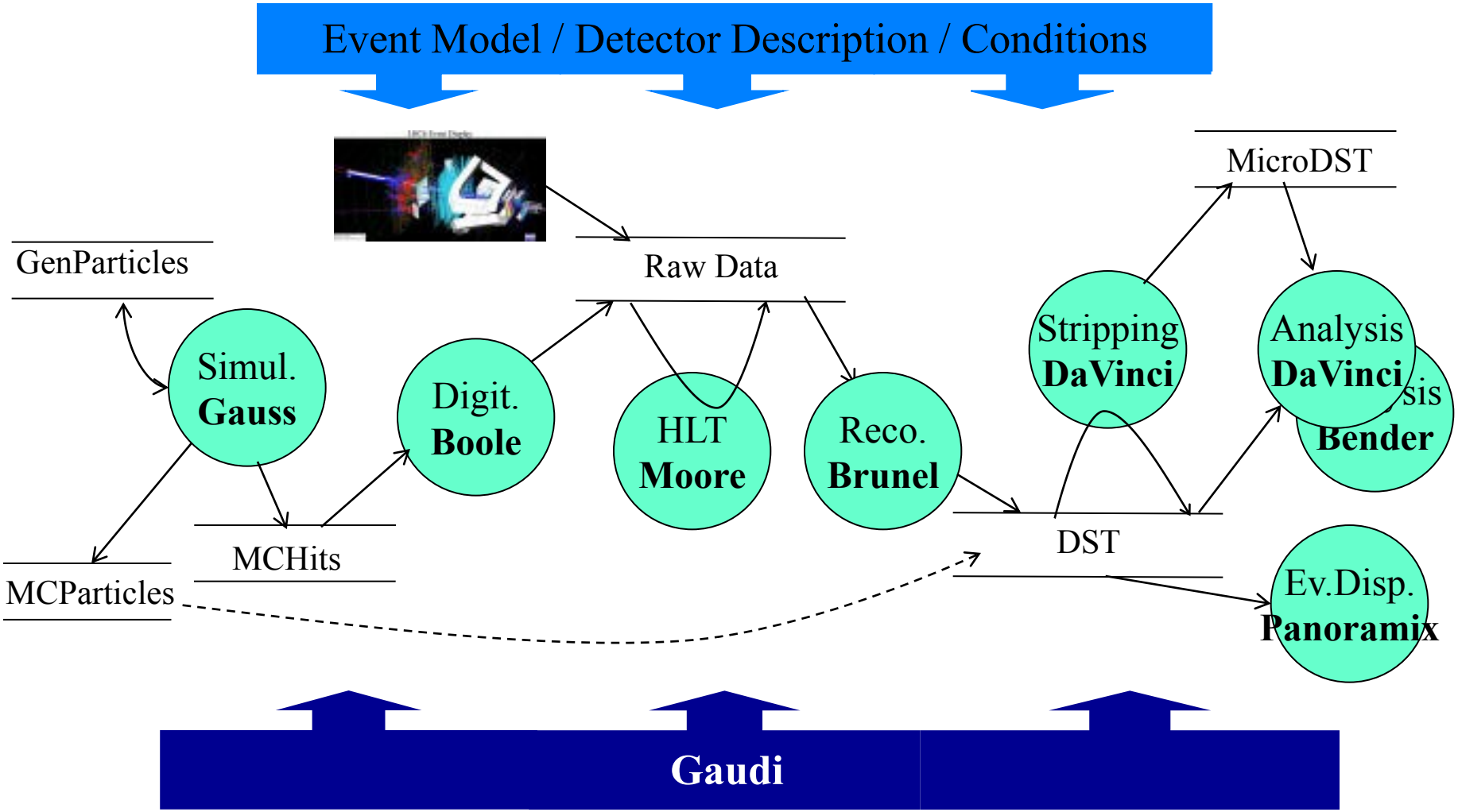
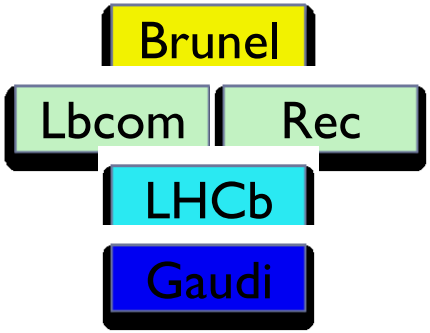
Overview of LHCb applications and software environment

LHCb applications



Software organisation

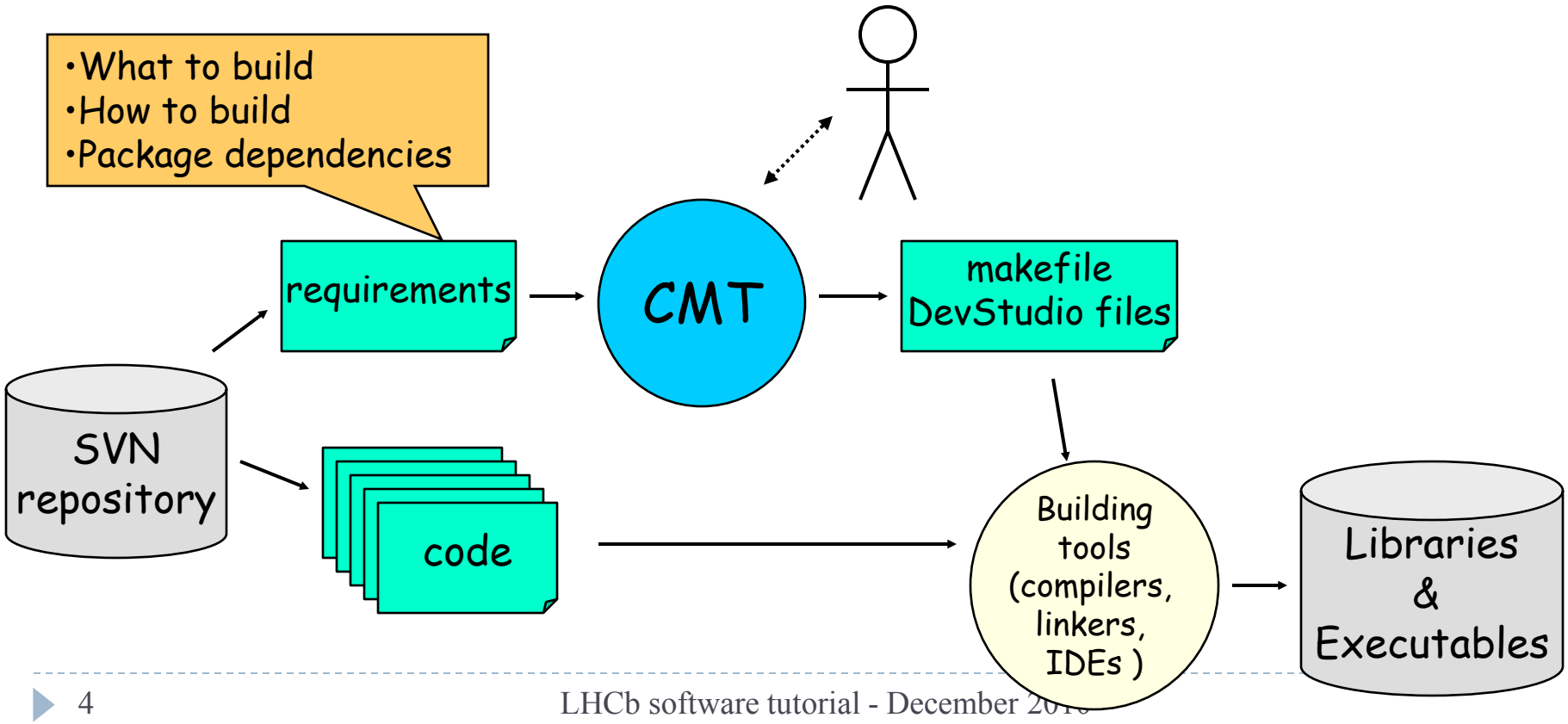
- Applications are released as a stack of *Projects*
  - One project per application
    - e.g. Brunel, DaVinci
  - Several independent projects for components
    - e.g. Lbcom, Rec, Hlt, Analysis, Stripping
  - Four projects for the framework
    - Gaudi, LHCb, Phys, Online



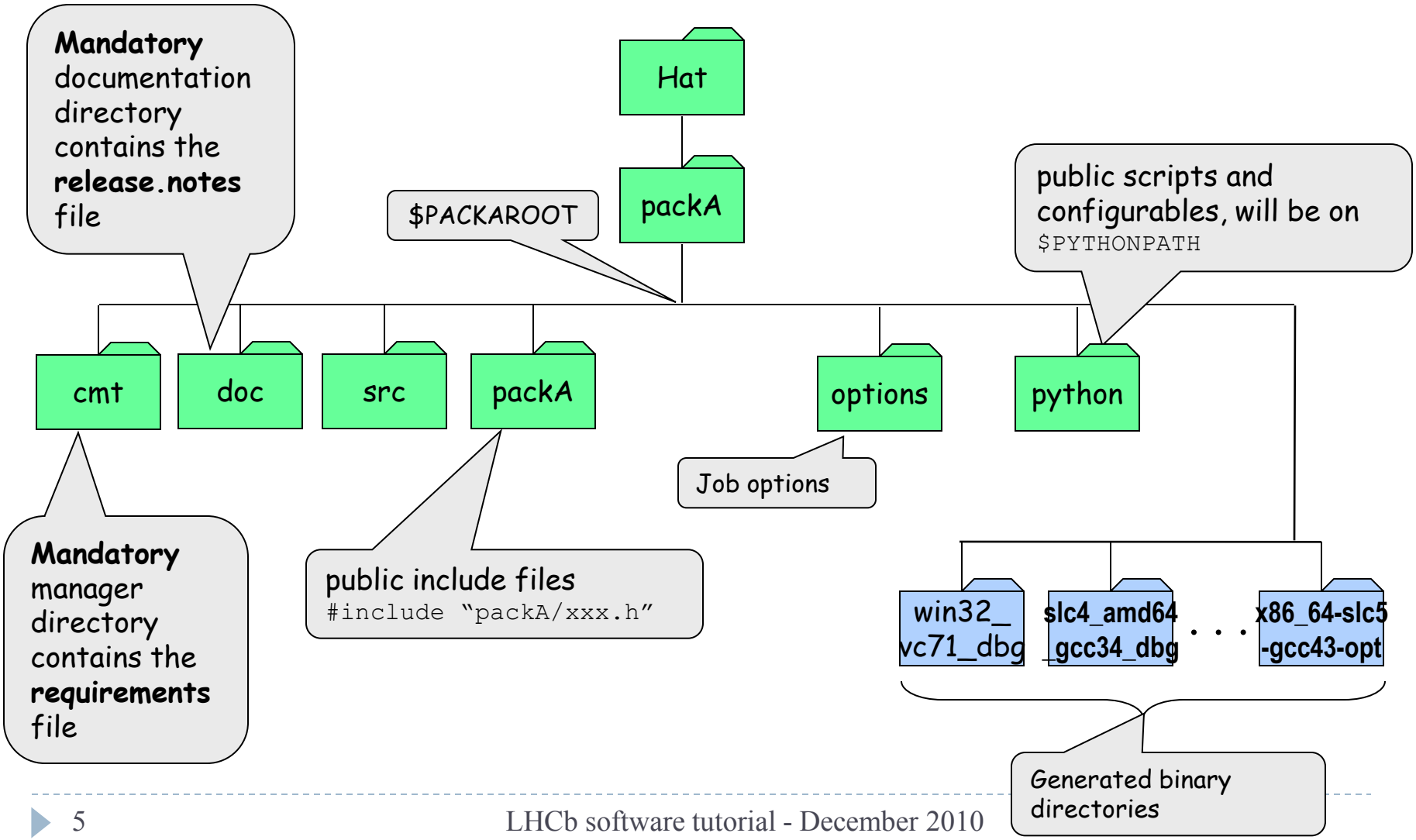
- Projects are collections of *Packages*
  - Group of classes in a logically cohesive physical unit.
    - Packaging structure reflects on:
      - Logical structure of the application
      - Organizational structure of the development team
  - Package is minimal entity that can be versioned
- A project version uniquely defines the versions of the packages it contains, and of the projects it depends on
  - Users work in the environment defined for a given version of the chosen project
    - e.g. SetupProject DaVinci v26r3p2

CMT (Configuration Management Tool)

- Based around the notion of package
- Provides a set of tools for automating the configuration and building of packages

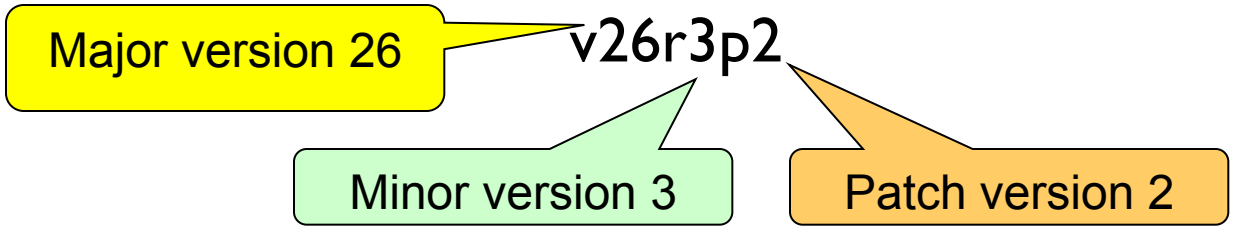


Package: Structure



Package versions

- Packages have several versions
  - Defined in cmt requirements file
  - Version number formatted according to convention:



- Major version
  - Indicates a change in the interface: all packages that use it may have to change
- Minor version
  - Indicates an internal only change
- Patch version
  - Not always present. A minor bug fix to an existing release

Package Categories

- Application: is a package that sets up the environment and contains the job options needed for configuring and running a program.
- Library: contains a list of classes and the list of dependent packages needed to compile it.
- Package group: contains a list of other packages with their version number (e.g. LHCbSys)
- Interface package: interfacing to packages not managed with CMT (e.g. Python, GSL, ROOT,…)

Link vs. Component Libraries

- Link libraries are linked to the program executable
  - (static or dynamic linking)
  - Base classes, event and geometry data classes
    - Loaded at program start
    - Must be found on LD_LIBRARY_PATH
- Component libraries are loaded on demand at run-time
  - Collection of components (Algorithms, Tools, Services, etc.)
    - "Plug-ins"
    - No need to recompile or re-link program if plug-in changes

CMT: requirements file

```
package           MyPackage
version           v1r0

# Structure, i.e. directories to process.
branches          cmt doc src

# Used packages.
use GaudiAlg      v*

# Component library building rule
library          MyPackage    ../src/*.cpp

# define component library link options
apply_pattern component_library library=MyPackage
```

CMT: Basic Commands

- cmt config
  - Configures the package (creates setup and make files)
  - Invoked automatically by getpack (see later slide)
- cmt show uses
  - Show dependencies and actual versions used
- cmt make
  - build the current package
- cmt broadcast <command>
  - Recursive CMT command in all used packages found in the current CMT project
  - e.g. cmt broadcast cmt make
- cmt run <command>
  - Executes <command> in current package environment

Setting the CMT environment

- Create a working directory for a given project

```
> setenv<Project> [<version>]
```

  - actually an alias for
    `SetupProject --build-env <Project> [<version>]`
  - creates working directory and `cd` to it:
    `~/cmtuser/<Project>_<version>`
- Packages are searched for in Projects that are on `CMTPROJECTPATH`
  - Default is `${User_release_area}:${LHCBPROJECTPATH}`
  - Add additional paths with `--nightly` and `--dev-dir` switches of `SetupProject`

Getting a package

- The "getpack" command
  - Script combining "svn checkout" + "cmt config"

```
> getpack [hat/]<package> [<version>] [head]
```

  - If no version given, it suggests the latest version of a package
    - N.B. Suggested version is not necessarily consistent with current environment; especially if you are not using the latest environment

Building a package

- Work in the /cmt directory
  - <hat>/<package>/cmt
- Set the CMT configuration ($CMTCONFIG)
  - Defines platform, compiler, directories where to find binaries
    - slc5 default: x86_64-slc5-gcc43-opt
    - LbLogin –c slc4_ia32_gcc34
    - setenv CMTCONFIG $CMTDEB
- Invoke the make command, via cmt

```
> cmt make [-j][target][clean][binclean]
```

  - Putting “cmt” in front of any command ensures that the command is executed in a shell that has defined all the environment described by the requirements file

Running the application

- Set the run time environment

```
> SetupProject <project> <version>
```

  - Takes into account value of CMTCONFIG
  - Needed once at beginning of session, then only if environment changes (new packages checked out, requirements file changed, CMTCONFIG changed, etc.)
- Execute the program

```
➢gaudirun.py job.py
```

- But see also **`cmt run`** command in hands on

SVN (Version Control System)

- Record the history of your source files
- Share your development with other people
  - Commit often
  - But only codes that compiles and builds
    - Tested by nightly builds
- LHCb and Gaudi Repositories reside on CERN-IT SVN server
  - Private repositories are also possible, but must be managed by yourself, see http://svn.web.cern.ch/svn/howto.php#creating-requesting

Accessing LHCb SVN server

- Web browsable
  - LHCb:
    - Trac: https://svnweb.cern.ch/trac/lhcb/browser
    - WebSVN: http://svnweb.cern.ch/world/wsvn/lhcb
  - Gaudi:
    - Trac: https://svnweb.cern.ch/trac/gaudi/browser
    - WebSVN: http://svnweb.cern.ch/world/wsvn/gaudi
- World readable if authenticated
  - SSH authentication
  - Automatic if authenticated in CERN AFS cell (lxplus)
- For write access
  - Register your account in the e-group lhcb-svn-writers
- Detailed instructions at https://twiki.cern.ch/twiki/bin/view/LHCb/SVNUsageGuidelines

Emacs customisation

- A customisation of emacs for LHCb:
  - Templates for creation of files
    - E.g. MyAlgorithm.h, MyAlgorithm.cpp, requirements, release.notes etc.
  - Various shortcuts for code insertions
  - Optionally, load an EDT keypad emulation
- Add following lines to ~/.emacs:
  - (load (expand-file-name "$EMACSDIR/edt"))
  - (load (expand-file-name "$EMACSDIR/lhcb"))
  - Or copy from $EMACSDIR/.emacs

Exercise

- Now read the web page attached to this lesson in the agenda and work through the exercises