

# Who didn't have problems installing ROOT: evolution of ROOT package management



Oksana Shadura, Brian Paul Bockelman, Vassil Vassilev

University of Nebraska–Lincoln, USA

oksana.shadura@cern.ch, bbockelm@cse.unl.edu, vvasilev@cern.ch

## ROOT CMake: motivation & current status

### Motivation

1. **Build component/package of ROOT on top of pre-configured/build ROOT**
2. Make a ROOT packaging more flexible and less monolithic
3. Develop ROOT-aware dependency manager

### Current status & troubles

Typical situation: **user wants to build ROOT foundation libraries and enable TMVA package** → **enabling TMVA option, user will install other extra *N* libraries.**

ROOT has around 110 CMake options, which are:

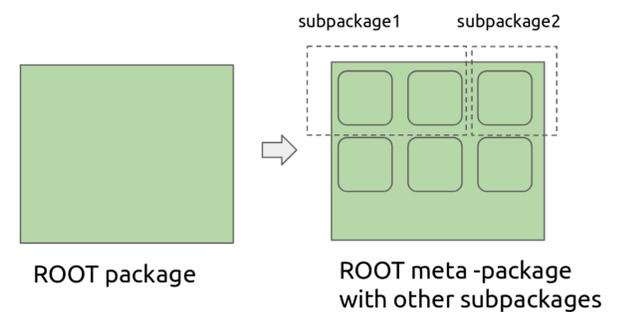
1. build features - 10 % [cxx11, cxx14, pch, cling.]
2. build options - 90 % [gsl\_shared, xml.]

CMake options can be unclear with no naming convention:

**do you know what will be enabled with xml option?**

As a solution, we propose to introduce the concept of a ROOT **subpackage**.

## ROOT CMake subpackages



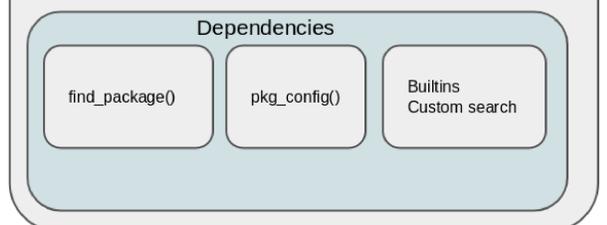
## Simplifying options

It will help to remove all *if()* – *endif()* cases and harmonize CMake code:

```
if(dcache)
  add_subdirectory(dcache)
endif()
⇒
add_subdirectory(dcache)
```

## Simplifying dependencies

### add\_root\_subdirectory(X)



## Layering ROOT: design goals

1. Arrange existing ROOT components into layers.  
For instance, core→mathcore→mathmore.
2. Allow each layer (subpackage) can be enabled/disabled.

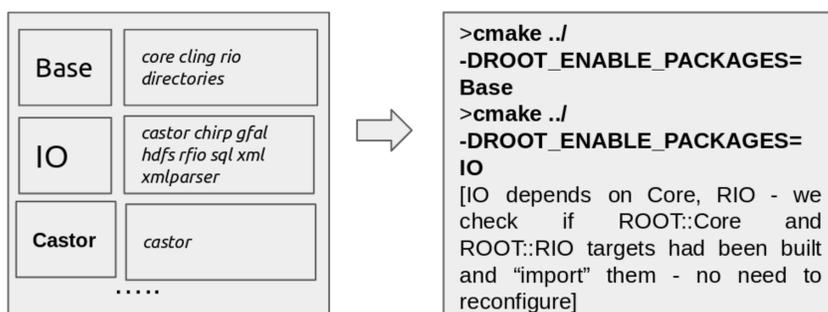
This is implemented as an overload of CMake `add_subdirectory` with iteration loop through `ROOTPackageMap.cmake` (similar to a package database).  
Similar implementation also exists in LLVM project:

- `add_llvm_subdirectory(x)`
- `add_clang_subdirectory(x)`
- `add_cling_subdirectory(x)`

## We propose a new way of organisation of ROOT build options

→ having a possibility to enable one ROOT library with its dependencies

Simplified example of package map, allowing to enable Base, IO, Castor subpackages:



## Use cases

- We have already built ROOT from sources, **we want to extend functionality of ROOT.**
- We touched one of ROOT component CMakeLists.txt and **we want to rebuild only this component, without reconfiguring all ROOT.**

### Interaction with PM

- **root-get:** it will enable the ROOT-aware package management with the root-get prototype.
- **Fedora:** it will be more easier to generate more granular ROOT packages.
- **Conda:** It will support a root-minimal package to further improve install times.

## Benefits for users

User can simply call:

```
>cmake ${ROOT_DIR} -DROOT_ENABLE_PACKAGES=Genvector
Enables only genvector and dependencies
>cmake ${ROOT_DIR} -DROOT_ENABLE_PACKAGES=RDataframe;RVec;VDT
Enables only rdataframe, rvec, vdt and dependencies and build on top of previous build
>cmake ${ROOT_DIR} -DROOT_ENABLE_PACKAGES=ALL
Enables all other packages and dependencies
```

This work was supported by the National Science Foundation under Grant ACI-1450323.