CERN openlab

Improvements on BioDynaMo build system

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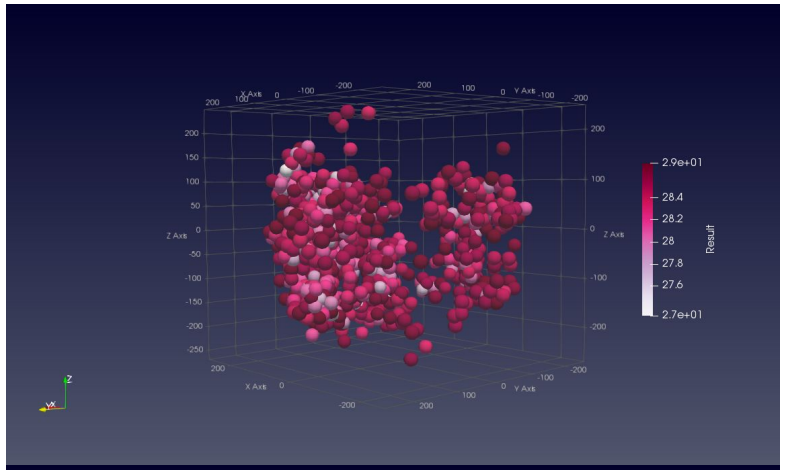
WHAT?

BioDynaMo
Biology Dynamics Modeller

Written in C++14
17000+ LoC (Lines of Code)
23+ External Dependencies
Available for 3 systems (MacOS, CentOS, Ubuntu)

a joint project between CERN and Newcastle University

WHAT?


2.9e+01
28.4
28.2
28
27.8
27.6
2.7e+01
Result
3.5e+01
34
32
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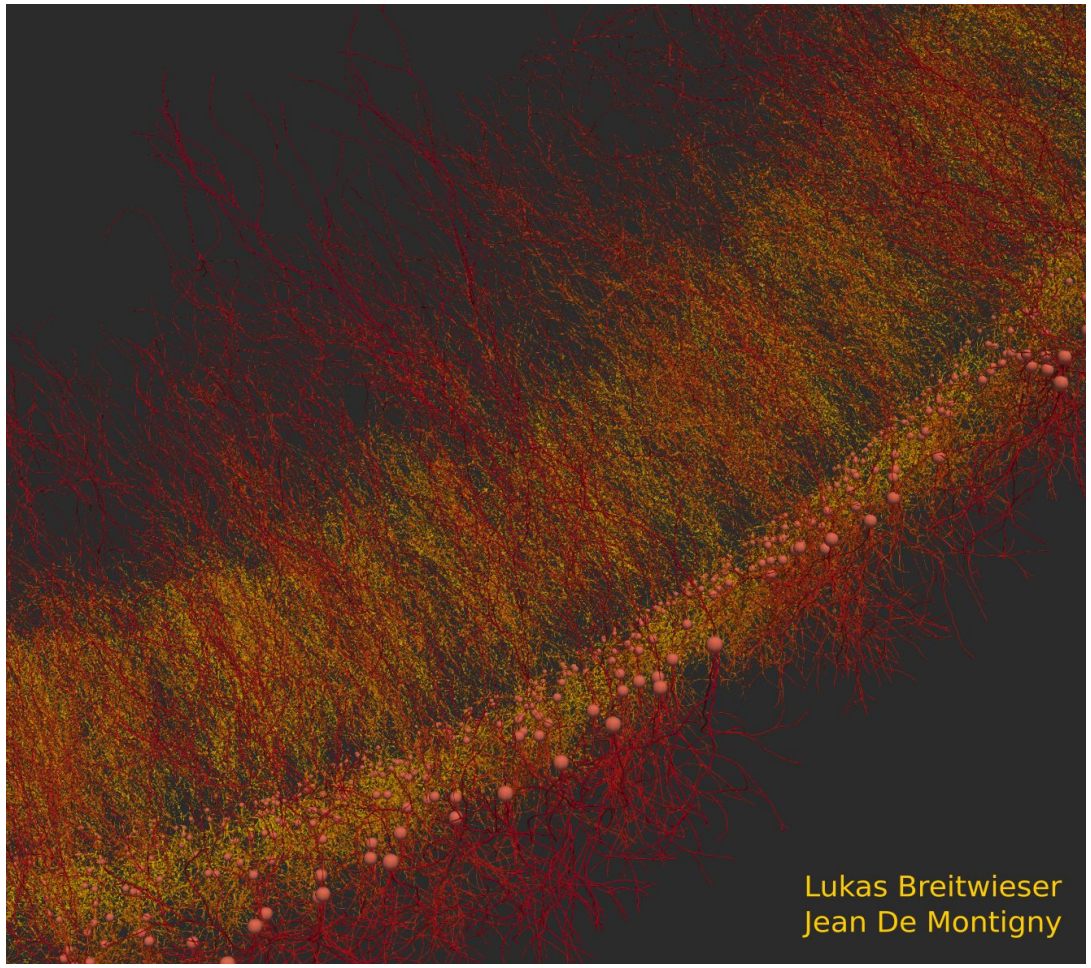
2.7e+01
Result


Lukas Breitwieser
Jean De Montigny

GOAL

Improve the CMake build system of BioDynaMo

(a.k.a how to compile/install/test the entire project)

WHY?

1) We wanted a more robust and flexible procedure

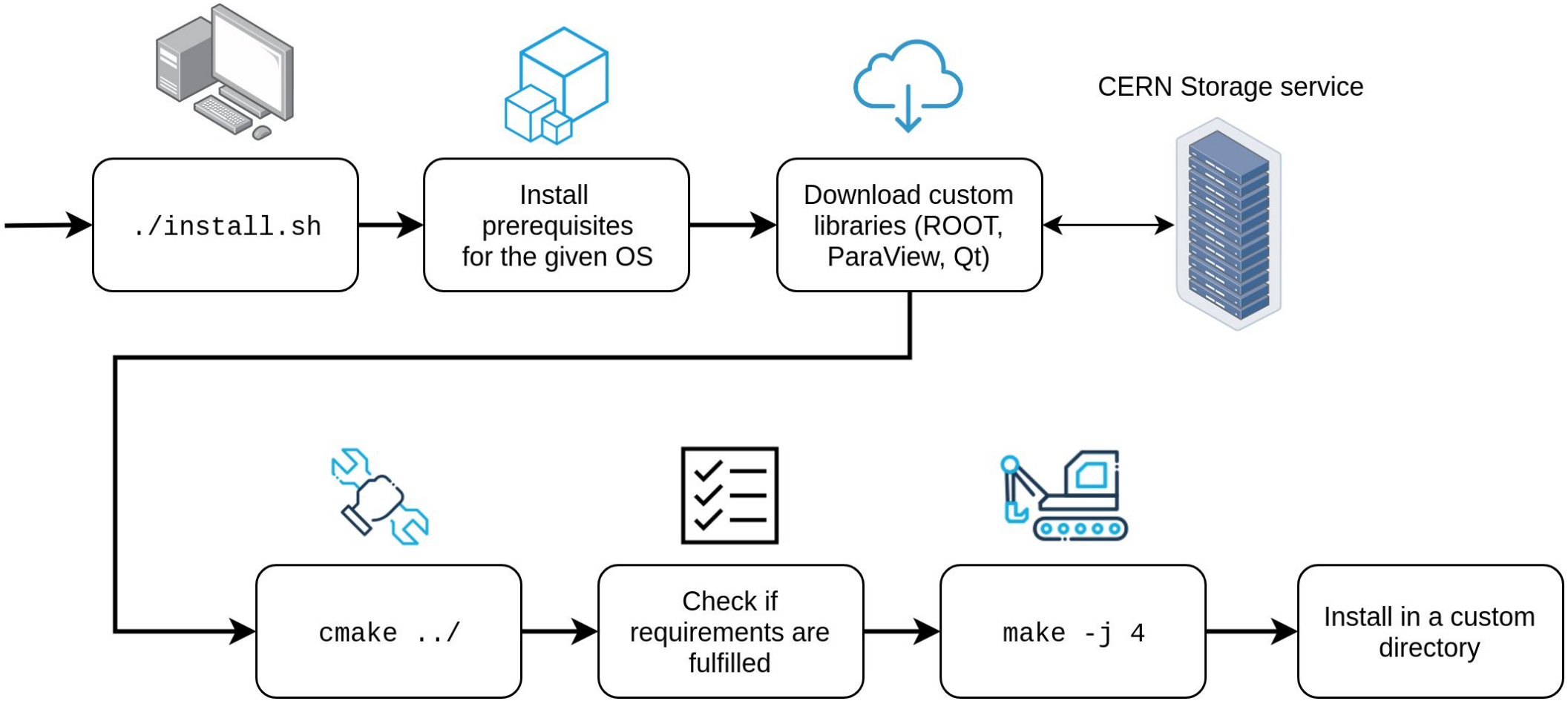
BioDynaMo was not built for just Computer Scientists!

2) We wanted a more maintainable codebase

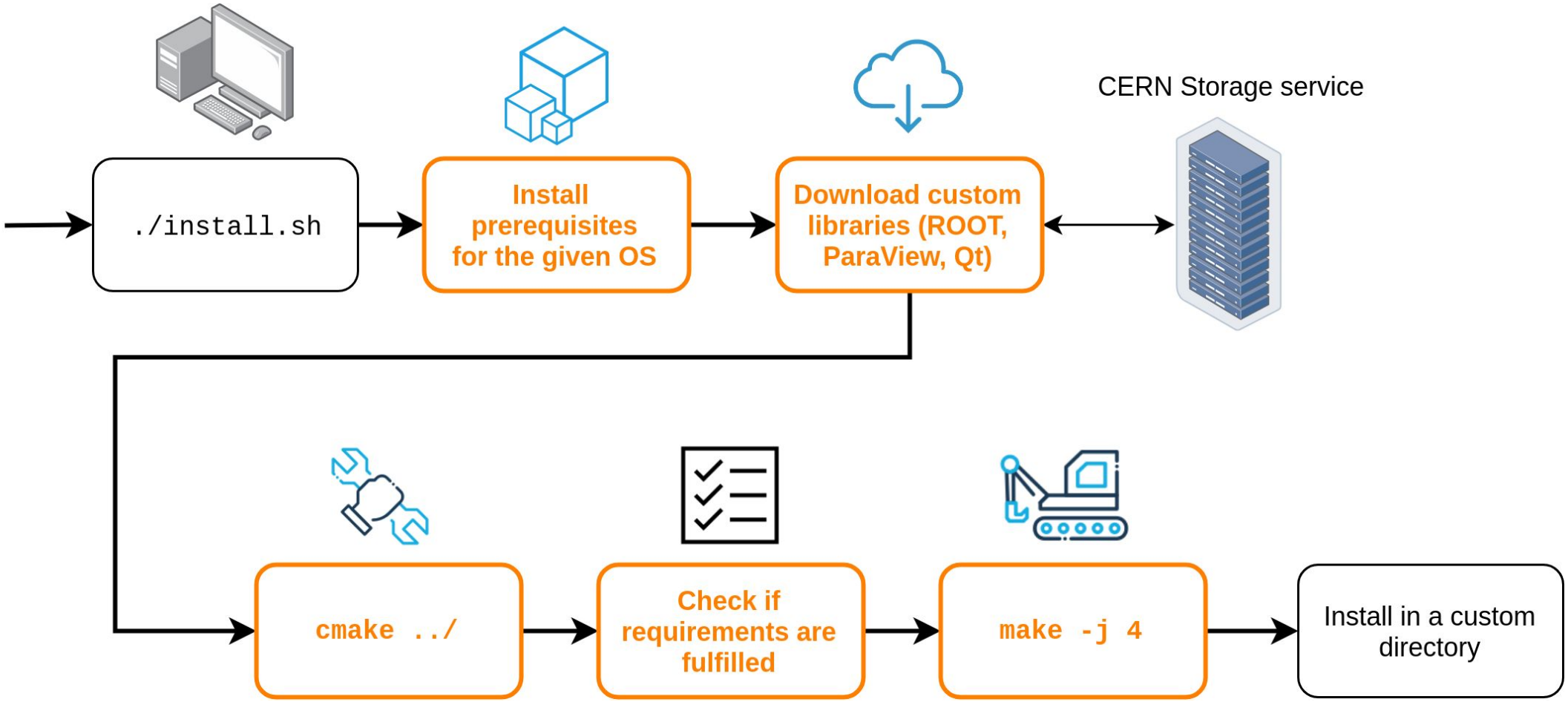
The original procedure was convoluted

WHERE DO I START?

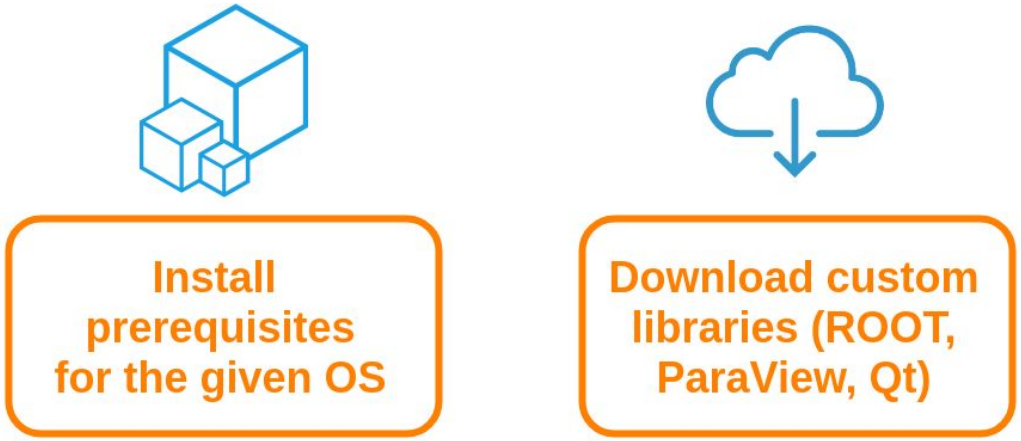
OLD BUILD SYSTEM



CRITICAL POINTS

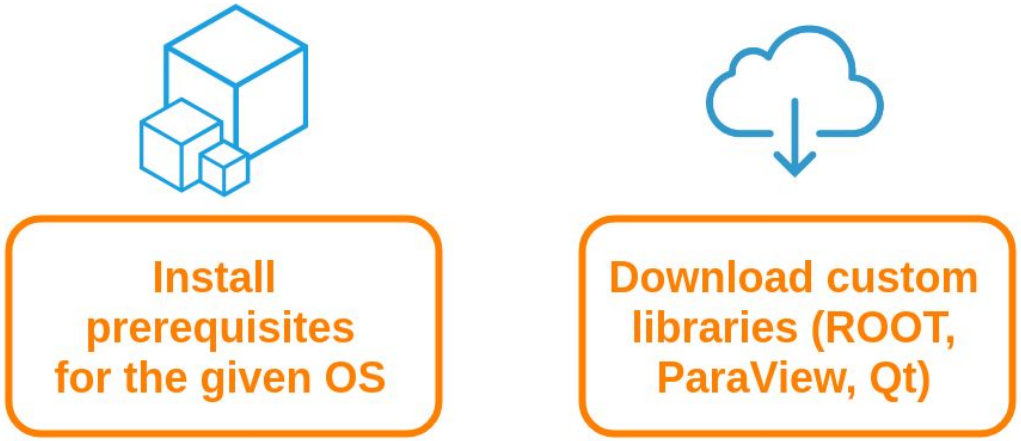


SHORTCOMINGS



Convoluted code and install logic.
The user could not choose which prerequisites to install.

SHORTCOMINGS



Convoluted code and install logic.
The user could not choose which prerequisites to install.

Improvements:
New user-friendly install procedure (`./prerequisites.sh all`).
Unified download procedure within CMake.

SHORTCOMINGS

Some requirements (packages versions, if installed, etc.) were not checked.
Hard-coded packages configurations (not portable).
This caused compilation errors.

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Improvements:
Better package detection process (CMake based).
Support for different compilers and libraries (gcc, cc, clang, etc.).
Automatic feature disabling mechanisms.

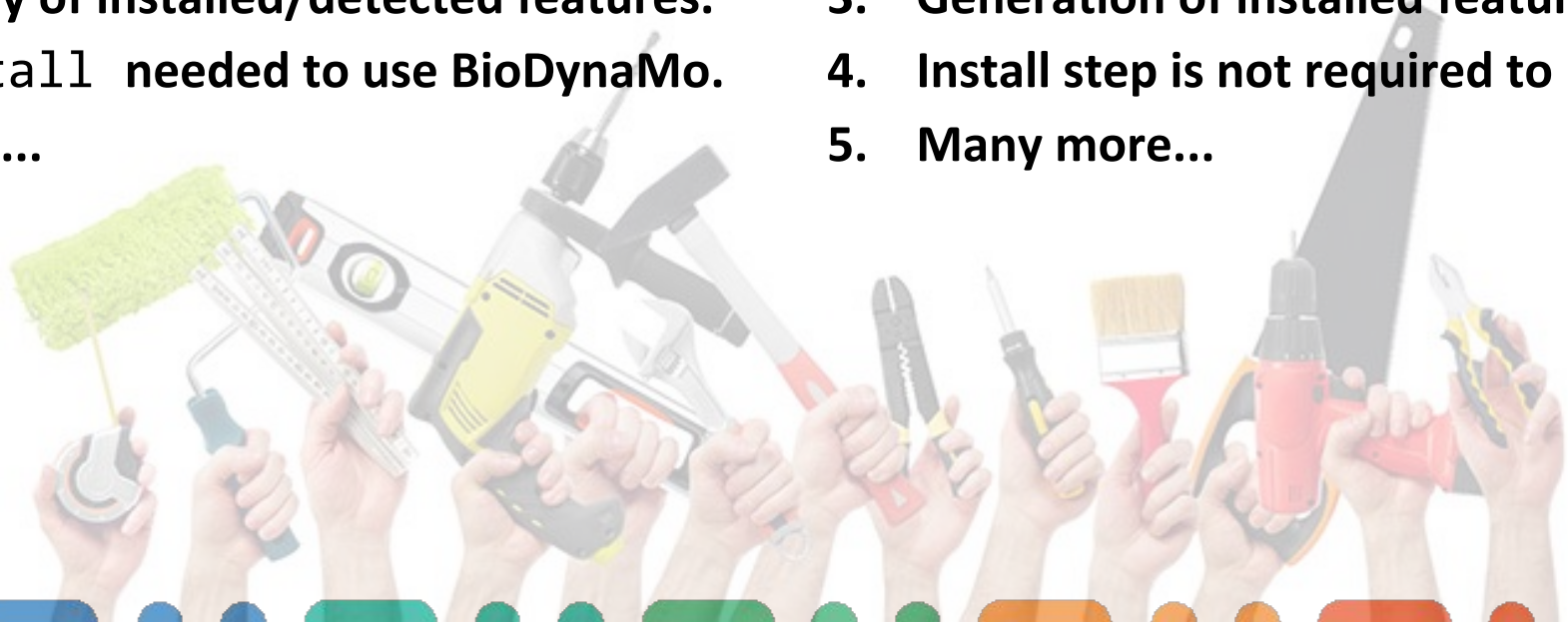
OTHER IMPROVEMENTS

Before

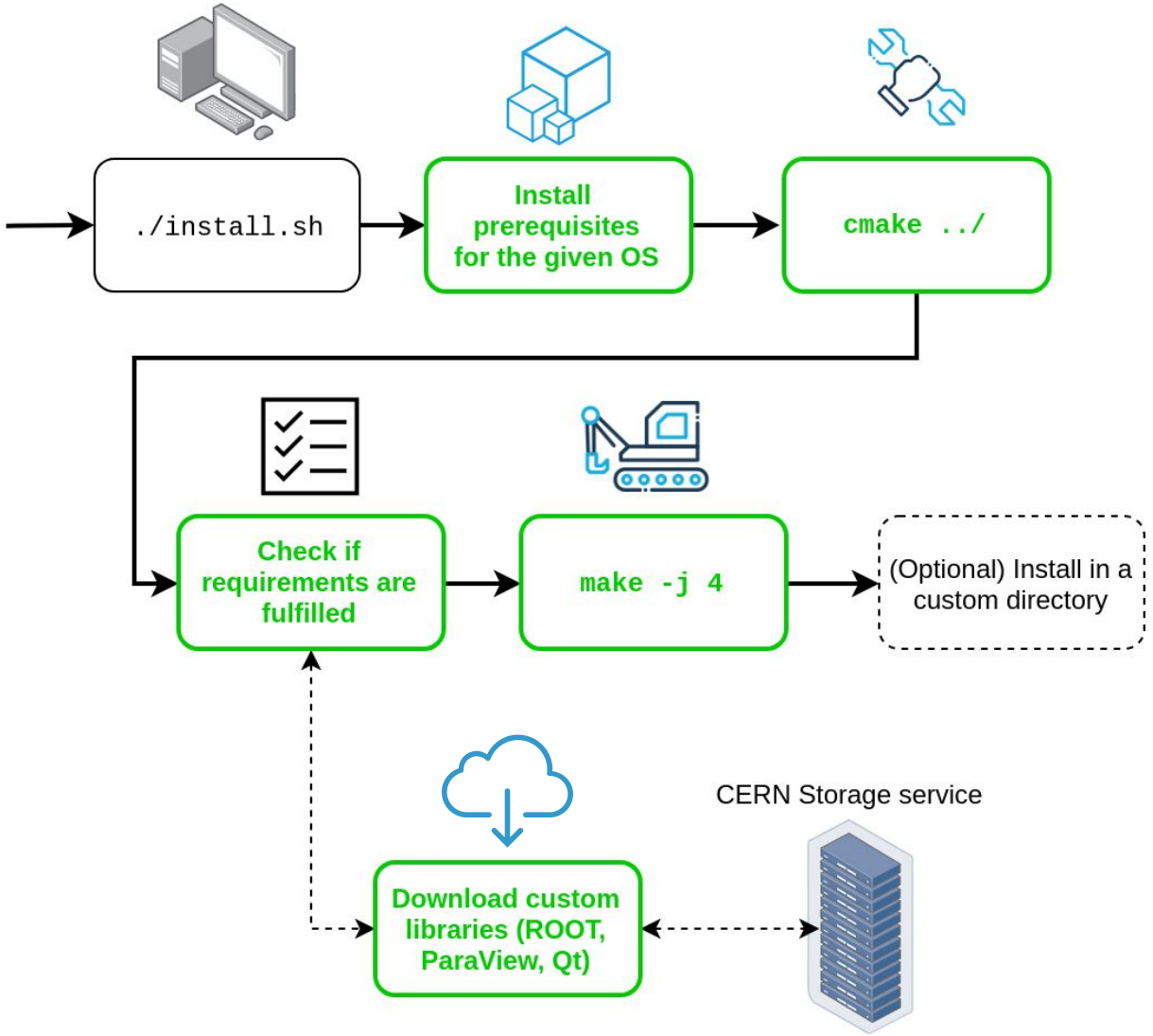
1. Convoluted procedure to add a new OS.
2. Few user diagnostic messages.
3. No summary of installed/detected features.
4. `make install` needed to use BioDynaMo.
5. Many more...

After

1. Easily extendable to support other OSes.
2. Improved user messages and warnings.
3. Generation of installed features summary.
4. Install step is not required to use the library.
5. Many more...



NEW BUILD SYSTEM



MY CONTRIBUTIONS

1) New flexible and robust automatic build procedure

Major codebase refactor.
Available on 4 major OS (MacOS, CentOS 7, Ubuntu 16.04/18.04).

2) Extensively tested and validated

The procedure was built with the user in mind.

3) Better documentation and user guides

Detailed instructions for all the supported OSes with code examples.

FUTURE WORK

1. Automate the build process even more!

Add BioDynaMo to package repositories (apt, yum, brew, etc.).

2. Extend support for other OSes

Add support for Windows, CentOS 6.5, etc.

THANK YOU!

QUESTIONS?

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RESOURCES

BioDynaMo Logo. Retrieved from https://biodynamo.web.cern.ch/sites/biodynamo.web.cern.ch/files/Logo_Full_Big.png

CERN Logo. Retrieved from https://design-guidelines.web.cern.ch/logo-0

Newcastle University Logo. Retrieved from https://logos-download.com/19585-newcastle-university-logo-download.html

Tumor Growth, Cells and Pyramidal cells simulations. Retrieved from https://biodynamo.web.cern.ch/. Courtesy of Lukas Breitwieser.

Cartoon buildings. Retrieved from https://tardis4g.uk/images/cb-buildings.png

Arrows pointing to a focal point. Retrieved from http://www.clker.com/cliparts/s/I/U/o/J/K/arrows-pointing-at-focal-point-hi.png

Man staring surprised. Retrieved from https://stanfordflipside.com/images/1424979273365.jpg

Hand checking bullet points. Retrieved from https://ak5.picdn.net/shutterstock/videos/9630245/thumb/8.jpg

Hands holding tools. Retrieved from https://greengroundswell.com/repairing-things-is-the-antidote-for-our-throwaway-society/2017/05/15/

Man looking at the future. Retrieved from https://wesleyancovenant.org/wp-content/uploads/2017/08/Future-of-OH.jpg

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