



Google
Summer of Code



GSoC'24 Final Team Presentation

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16/10/2024



Goals of the project

- **Rework the cmake rules to incorporate efficiently ROOT via FetchContent**
 - **Completed:** PR #365 and #387
- **Replace invocations of genreflex in favor of rootcling**
 - **Completed:** PR #379 (not merged)
- **Enable C++ modules in rootcling**
 - **Completed:** PR #385. Not ready to merge (13/19 GHA passed)
 - All unit test passes!
- **Produce a comparison report**
 - **Completed:** This presentation and a pdf version in the final submission.

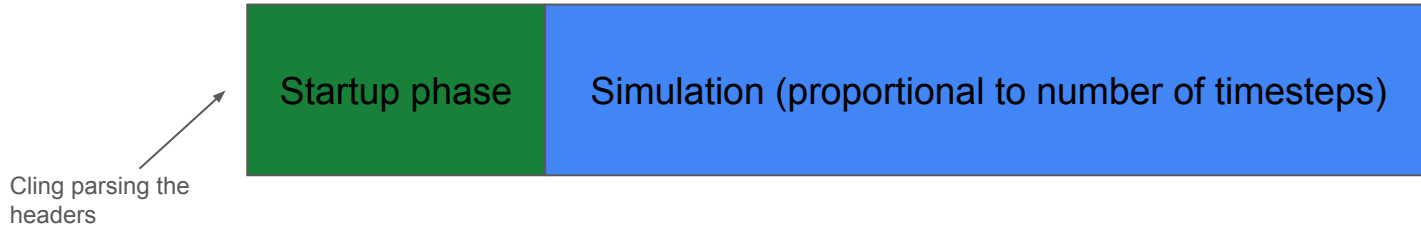


Overview of my work

- Changed genreflex invocations to rootcling.
- Imported and modified RootMacros.cmake from the ROOT repo.
- Added REFLEX argument in ROOT_GENERATE_DICTIONARY
- Used automatic generation for the module map with relative paths in the CMake system.
- Modified selection.xml to support the new dictionaries.
- Fixed headers with missing includes.
- Presented a poster at the Fourth MODE Workshop about this work.



How I measured the results?



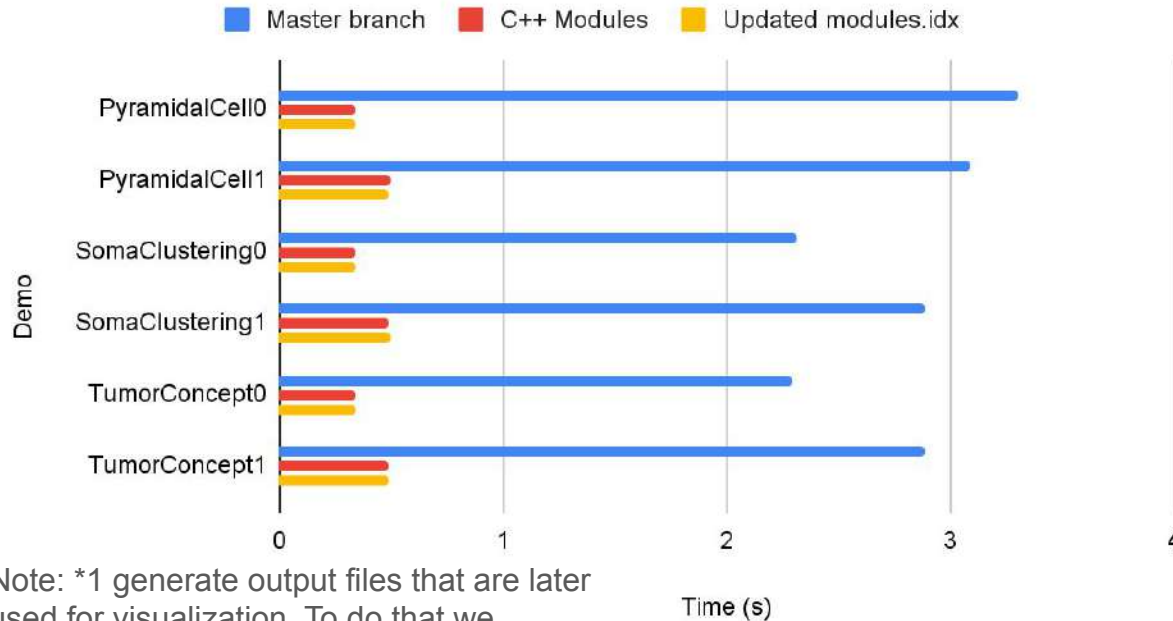
For Pyramidal Cell demo, it's 90% parsing and 10% runtime.

We can reduce the startup phase with C++ Modules!



The current state

Simulation startup time



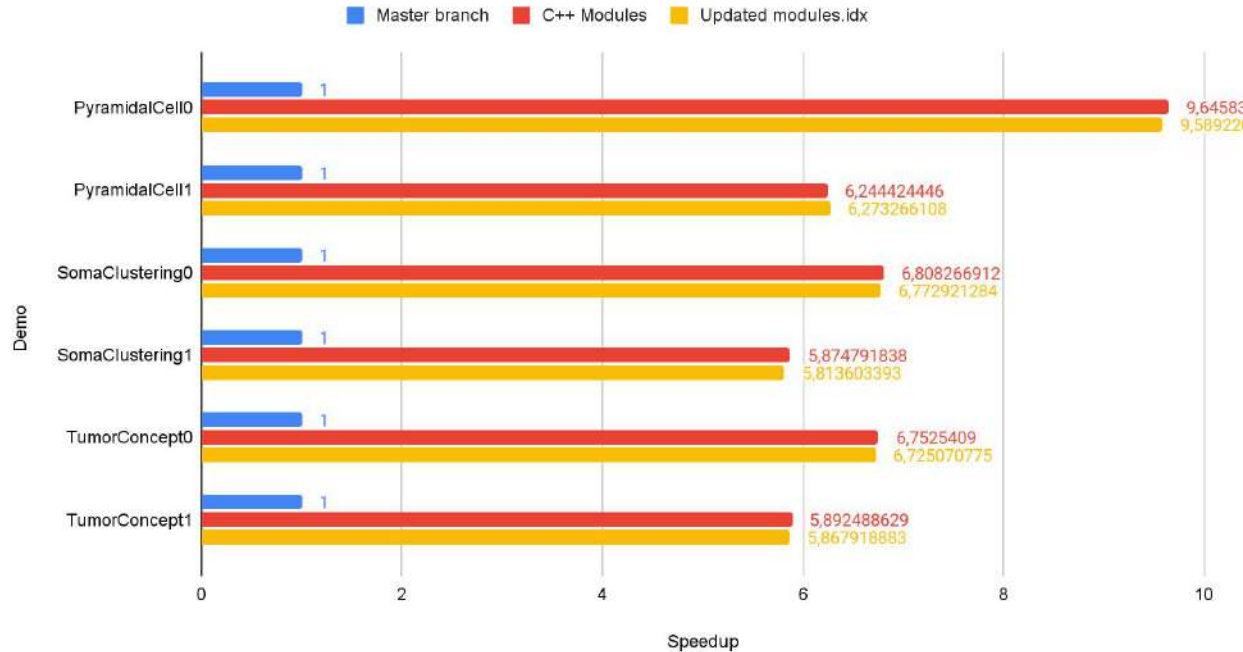
~ 80% less startup time!!!

Note: *1 generate output files that are later used for visualization. To do that we generate some code using cling. *0 doesn't

The current state



Simulation startup time

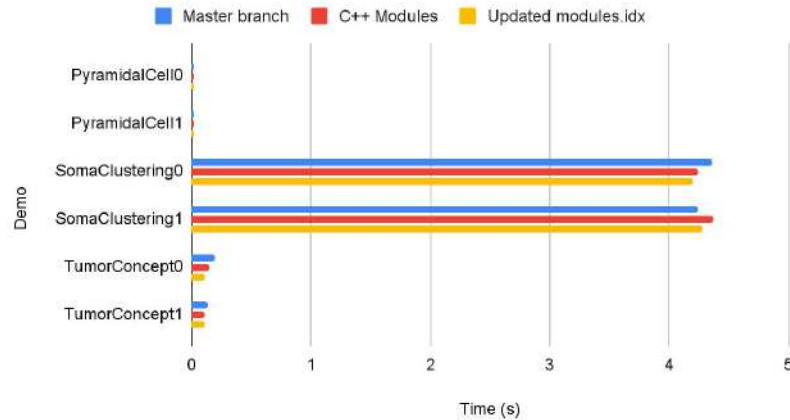


Between 6 and 9 times faster!!

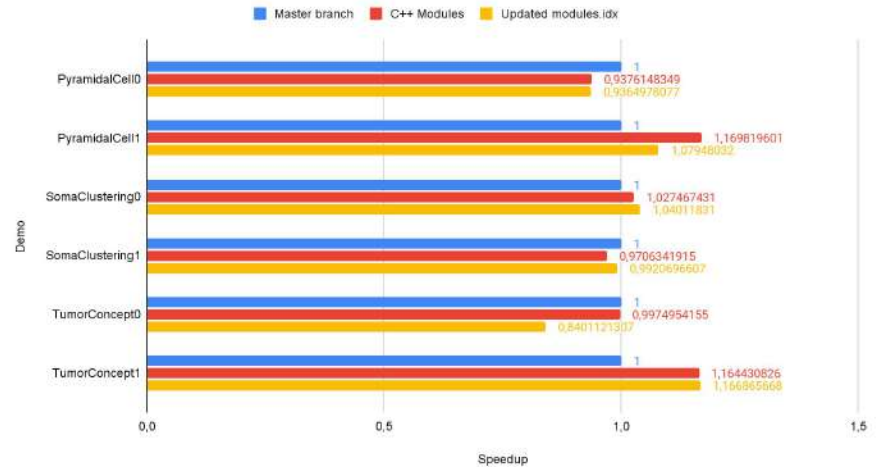
The current state



Simulation run time



Simulation run time

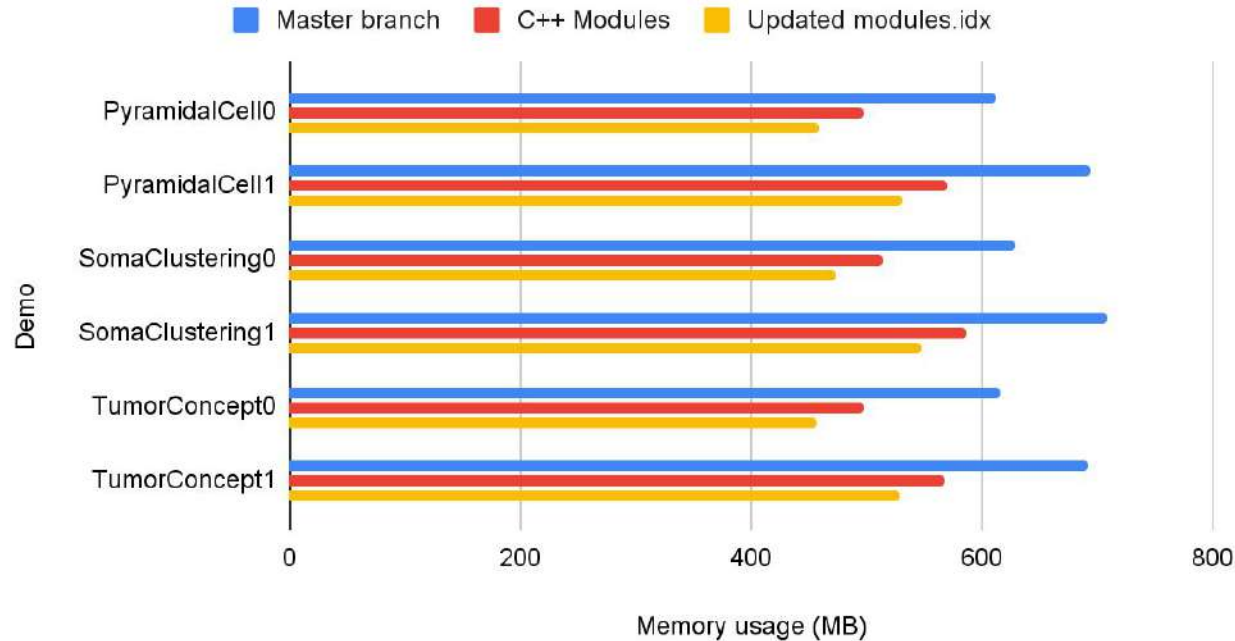


No conclusive results. As expected, the simulation run time remains almost the same.

The current state



Simulation peak memory usage

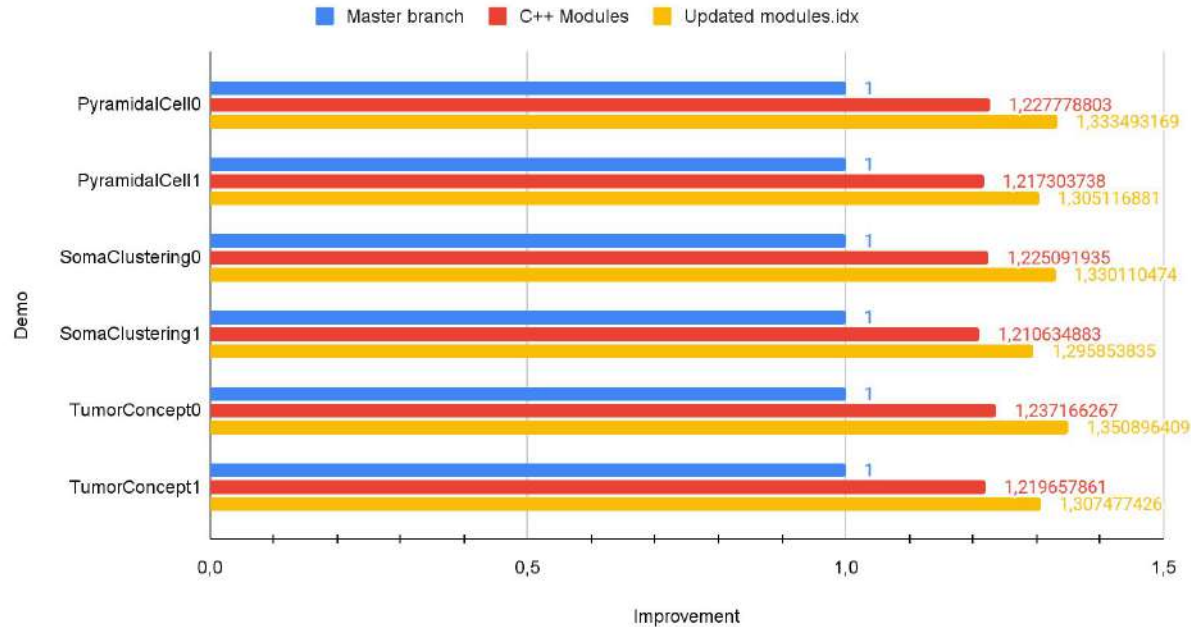


Around 18% less memory usage without updating modules.idx and around 25% after updating.

The current state



Simulation peak memory usage





What's left to do

- The demos generate dictionaries for themselves, which causes trouble with rootcling (modules not found)
 - Should we stop using dictionaries for the demos and only use them for the libraries?
- The new `ROOT_GENERATE_DICTIONARY` is causing memory leaks, according to Valgrind (both with and without modules).
- Fix notebooks error: `Kernel died while waiting for execute reply.`
- Meeting with the BDM team on October 23rd.
- Merging the code.



Thank you!