



Google  
Summer of Code



# GSoC'24 Final Team Presentation

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# Goals of the project

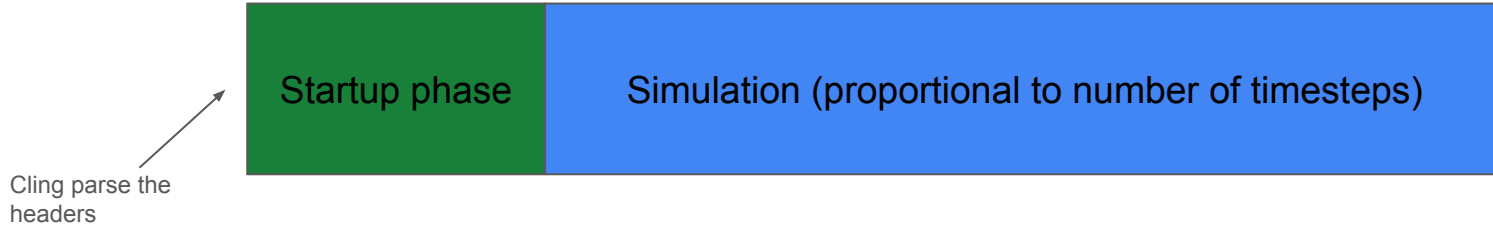
- **Rework the cmake rules to incorporate efficiently ROOT via FetchContent**
  - **Completed:** PR #365 and #387
- **Replace invocations of genreflex in favor of rootcling**
  - **Completed:** PR #379 (not merged)
- **Enable C++ modules in rootcling**
  - **Completed:** PR #385. Not ready to merge (13/19 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 support 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 that didn't use the correct includes.
- Presented a poster at the Fourth MODE Workshop about this work.

# How I measured the results?



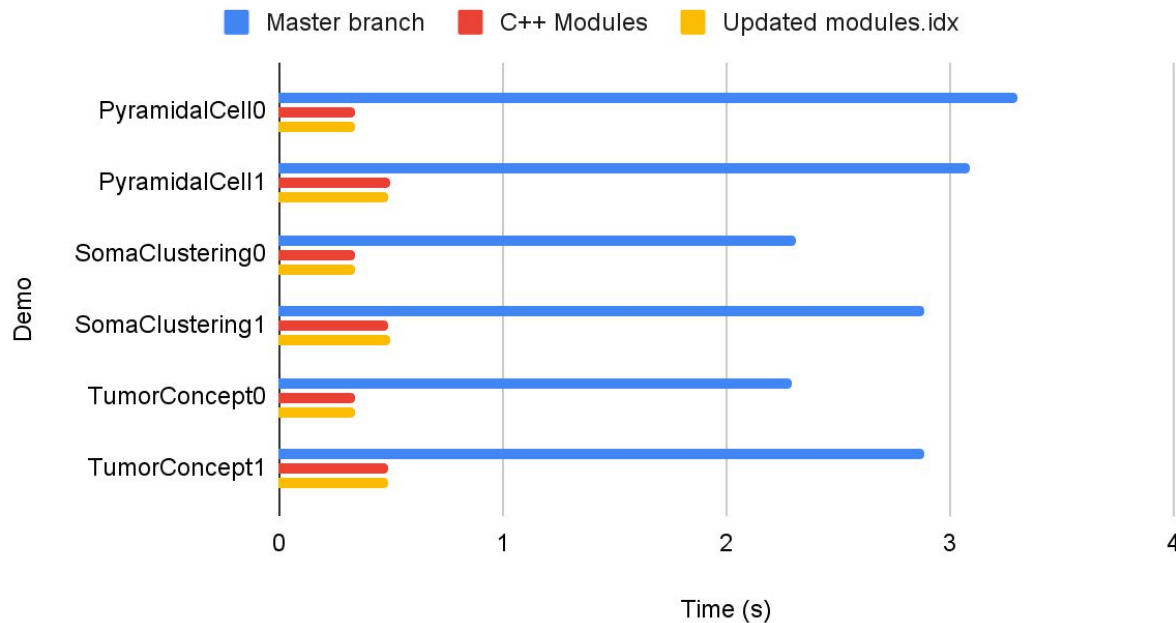
For Pyramidal Cell demo, it's 90% parsing and 10% runtime.

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

# The current state



## Simulation startup time

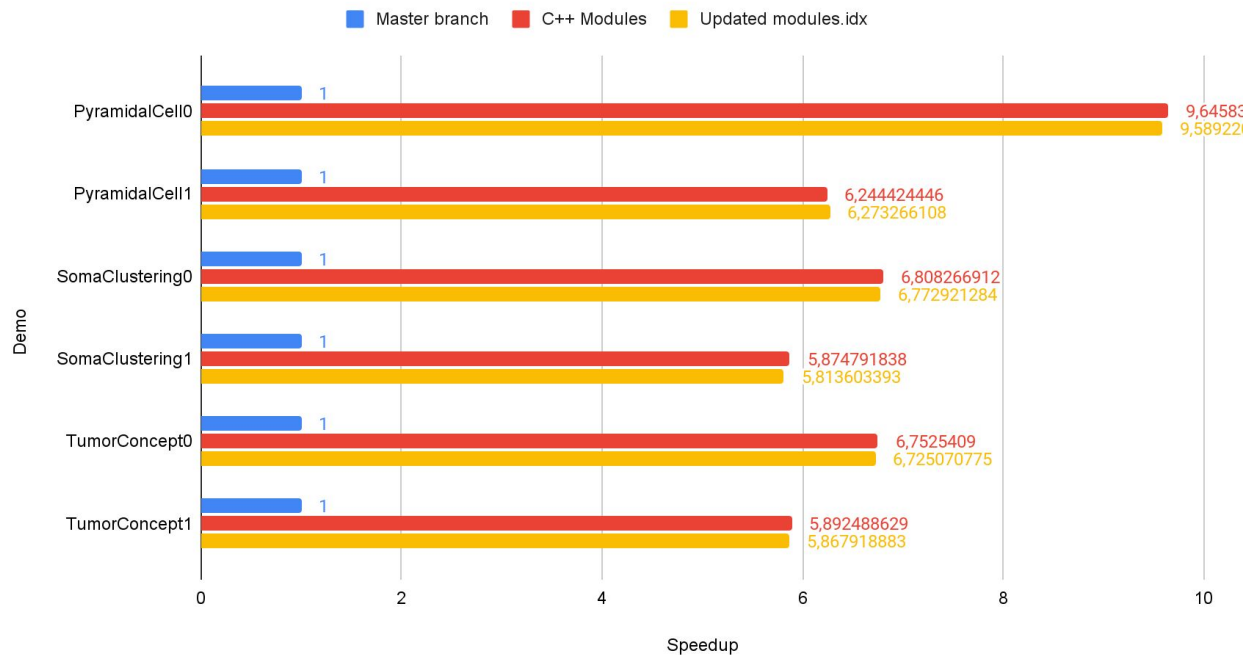


~ 80% less startup time!!!

# The current state



## Simulation startup time

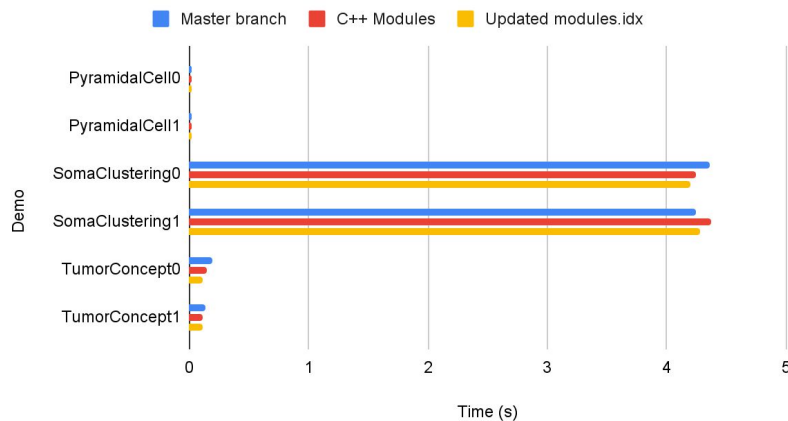


Between 6 and 9 times faster!!

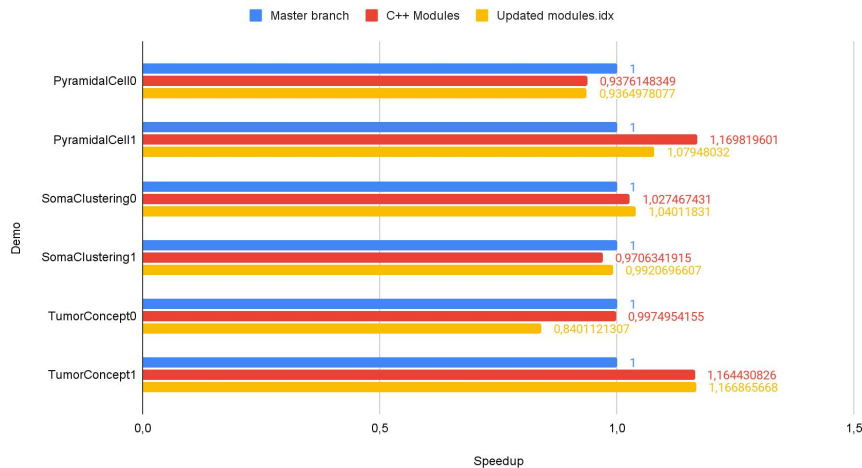
# The current state



Simulation run time



Simulation run time

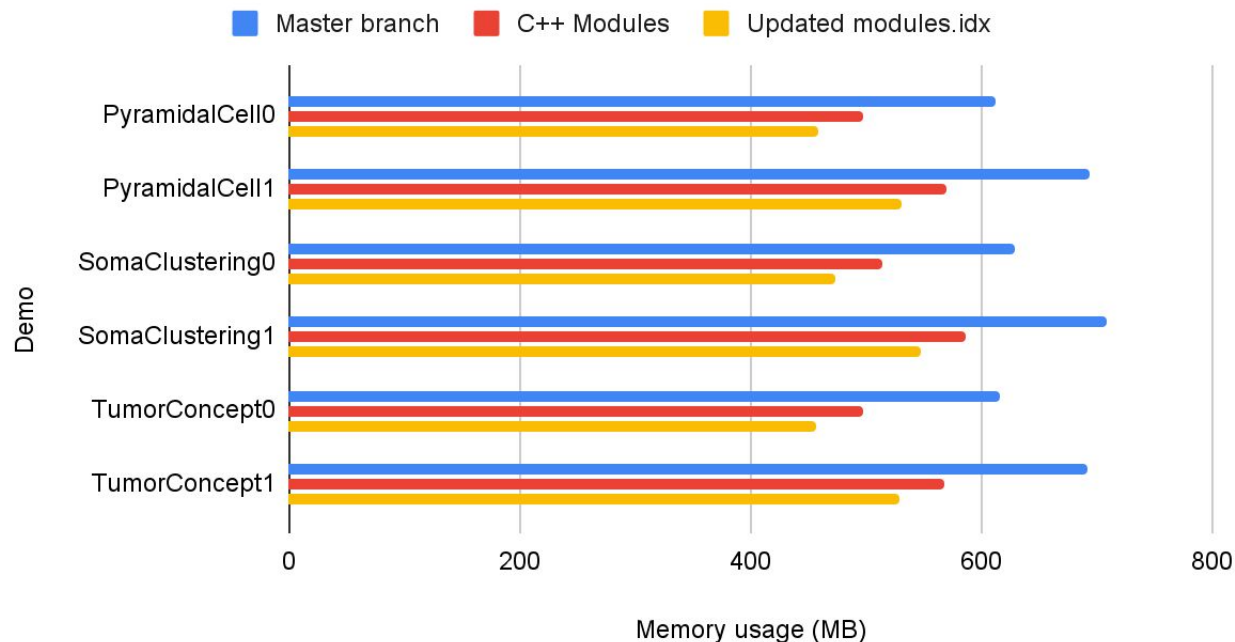


No conclusive results. As expected, the simulation run time remains almost the same.

# The current state



## Simulation peak memory usage



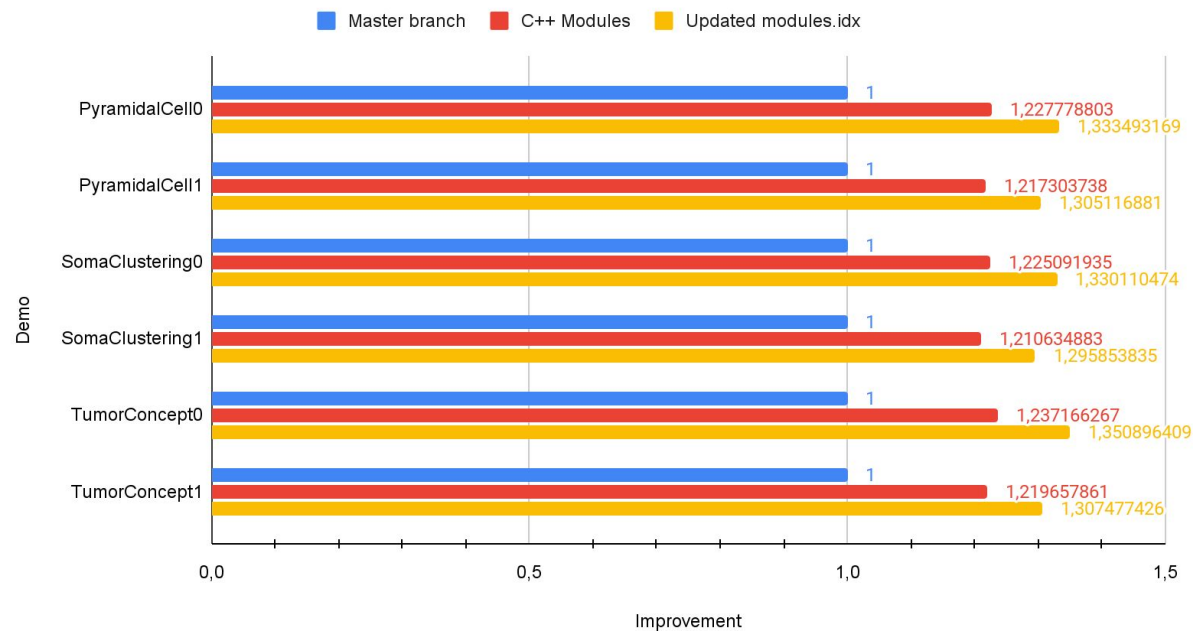
Around 18% less memory usage without updating modules.idx and around 25% after updating.



# 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!**