Modernizing CIME: Enhancing Efficiency and Flexibility in Earth System Modeling

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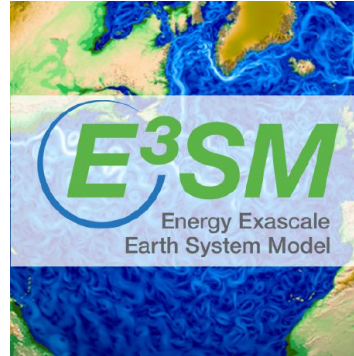06/11/2024

CIME

- Common Infrastructure for Modeling the Earth
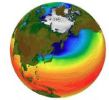 - Case Control System (CCS)
  - System Tests

Goals

- Improve user experience
- Modernize codebase
  - ~9 years old

ESCOMP/**CESM**

The Community Earth System Model

👥 14 Contributors   ⊙ 29 Issues   💬 2 Discussions   ⭐ 317 Stars   🍴 181 Forks
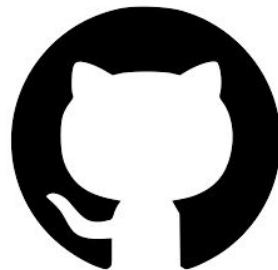
Improving user experience

- Documentation (Q4 24)
  - Organize
  - Update
  - FAQ
  - Examples
- Consistency in CLI arguments (Q4 24)
  - ~ 57 tools
  - Groupings
  - Clear descriptions
- Improve logging/error handling (Q4 24)
  - Very verbose logging (can be a lot of noise)
  - Filter
  - Ambiguous errors

Improving user experience

- Provide a public API (Q1 25)
  - Orchestrate/automate case creation, customization
  - Extend CIME e.g. tool to manage ensembles
- CLI tool (Proposed) (Q2 25)
  - cime create_newcase, cime build, cime submit
  - Remove CIME code/symlinks from case directories
  - Cases can be portable (exclude bld/run directories)
- Create pypi/conda packages (Q2 25)
  - Weekly release cycle

Modernize the codebase

- Refactor (Q4 24)
  - Cyclomatic complexity (via McCabe tool through Prospector)
    - 52 functions identified
    - 54% moderate risk, 44% high risk, 2% very high risk
  - Increase unit testing and improve code coverage
- Update (Q4 24)
  - Pylint 1848 messages
    - 68 unique
    - Some are trivial but many could improve code quality
  - pycodestyle (PEP8) 86 messages
  - Vulture 66 messages
    - 7 variables, 40 functions, 8 attributes

Modernize the codebase

- Removing model/driver specific code (Q4 24)
- Fix unittesting (Q4 24)
  - Not being parallelizable
- Reorganize modules (Q1 25)
  - Group by function
- Break out reusable code (Proposed) (Q2 25)
  - TestScheduler
  - check_input_data
- Provide ability for drop-in replacement of TestScheduler (Q3 25)

Questions

- GitHub
  - https://github.com/ESMCI/cime
- Docs
  - https://esmci.github.io/cime
- Issues
  - https://github.com/ESMCI/cime/issues/new