Software Engineering/Coupler Group

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ACME All-hands meeting
Establishing, maintaining, and improving the software engineering tools, processes and designs used in ACME.

- **Repository**
  - Tools: git, github
  - Processes and designs: code development workflow, code review

- **Testing**
  - Tools: Jenkins, test suites
  - Processes and designs: continuous integration testing, system and unit testing procedures

- **Productivity**
  - Tools: Confluence, JIRA
  - Processes and designs: bug tracking, build system, programming standards
SE/CPL Group role (2 of 2)

Develop and maintain inter-model infrastructure and top-level architecture of the ACME model.

• Coupler, main driver, other inter-model architecture
  – Modular interfaces and configurability of model
  – “shr” code
  – Model Coupling Toolkit

• I/O layers
  – Parallel I/O (PIO) sub-system
  – Component-level I/O systems
SE/CPL Group “Proposal Tasks” (lead)

- T7a  SE: Repository (Salinger)
- T7b  SE: Testing (Jacob)
- T7c  SE: Productivity (Salinger)
- C3   Parallel I/O (Krishna)
- C7   Configurability / Modularity (Jacob tmp)
- C9   Coupler (Jacob)
Work with science groups using “hub and spoke” model.

Spokes “improve SE consistency and accelerate adoption of new tools across science groups, as well as remove barriers that hinder sharing of technical advances across science model component groups.”
The ACME SE/CPL Group

Hub
- Jed Brown (ANL)
- Jim Foucar (SNL)
- Robert Jacob (ANL)
- Jeff Johnson (LBNL)
- Jayesh Krishna (ANL)
- Andy Salinger (SNL)
- Mark Taylor (SNL)

Spokes
- ATM: Balwinder Singh
- LND: Dali Wang
- OCN/ICE: Doug Jacobsen*
- COUPLED: TBD

* = honorary Hub member

Notable help from: Pat Worley, Gautum Bisht, Susannah Burrows, Renata McCoy
Integrators

• Move code from branches to master in our git repo
  – **Atmosphere**: Jin-Ho Yoon, Susannah Burrows, Mark Taylor, Balwinder Singh
  – **Land**: Dali Wang, Forrest Hoffman
  – **MPAS-O/LI/SI**: Doug Jacobsen
  – **drv/share/utils**: Rob Jacob, Jayesh Krishna, Jed Brown, Pat Worley
  – **Scripts**: Jim Foucar, Jeff Johnson
  – **Free agents**: Jim Foucar, Jed Brown
Progress: Productivity tools available

• Communication Tools, selection, training:
  – Confluence selected for wiki; huge success.
  – JIRA selected for task tracking
  – GoTo Meeting accounts for web conferencing
Progress: Repository live and active

- github:ACME-Climate/ACME
- ACME seen as single repository
  - most code in single *git* repo
- Defined code change workflow
  - Develop on a branch, issue a “Pull Request”.
  - 84 developers, 493 commits
- Selected Integrators to help bring changes to master
- Code reviews conducted on github
Progress: Tests are running

- Defined targeted and supported platforms/compilers for ACME
- Defined major testing categories:
  - Developers: run on any platform, < 1hr; (pre- pull request)
  - Integration: touches all targeted platforms; overnight; (pre-merge)
  - Master: catches if platforms change environments
- Continuous Integration (Jenkins): working on 5 platforms
Other Progress:

**Coupler**
- Made release candidate for MCT v2.9 and tested in ACME

**Parallel IO**
- Introduced new run-time configuration options in PIO.
- Optimized PIO settings for water cycle model on Titan and Mira platforms.
SE/CPL 12-month plan (excerpts)

• Expand test coverage platforms
  – “ACME-integration” must run overnight, via Jenkins, on a sufficiently wide number of machine-compiler combinations.
  – “ACME-developer” must run on all machines/compilers used for development. “By hand” and via Jenkins.

• Expand test coverage cases
  – Need more land model and atmosphere-model focused tests.

• Expand test types: unit tests
  – Framework to test individual subroutines for each component. Required for new subroutines or any subroutines modified for performance.
SE/CPL 12-month plan (excerpts)

• New/updated components available in repository
  – MPAS
  – MCT
  – PIO

• Adoption of CIME
  – New public version of model infrastructure (test system, build system, coupler, data models) with several needed features for testing.
  – No impact on science development.

• New coupler capabilities
  – Ocean – land-ice coupling (Jeremy Fyke)
  – Support for sub-grid orography (many people)
Communication with other groups

• In 12-month road-mapping meeting, no complaints about SE/CPL group performance so far.
  – New coupler capabilities will be a higher priority going forward.
  – Also had no complaints from external reviews.

• We are trying to communicate necessary code development deadlines and processes
  – Nov 1, 2015 “Feature freeze”: all code implementing v1 capabilities must have PR issued.
  – **Lots** of documentation on Confluence. Continuously improving.

• Need more attention from science groups on testing
  – All ACME-relevant cases/configurations should be covered.
SE/CPL group activities at All-hands

- This overview talk

- SE/CPL Plenary tutorial TODAY 1:45 – 2:15pm
  - Git and github. Exercises for you to do on your laptop!
  - Testing: how to run tests

- SE/CPL Group meeting: Wednesday 1:20 – 2:20pm

- SE/CPL Hands-On tutorial: Thursday 8:20 – 9:50am

- Looking forward to our speed dates: Thursday 10am-1:25pm