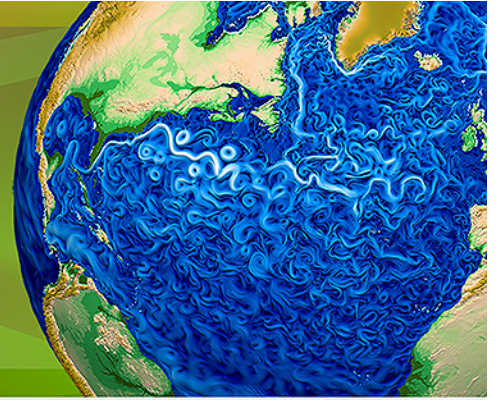




Accelerated Climate Modeling
for Energy

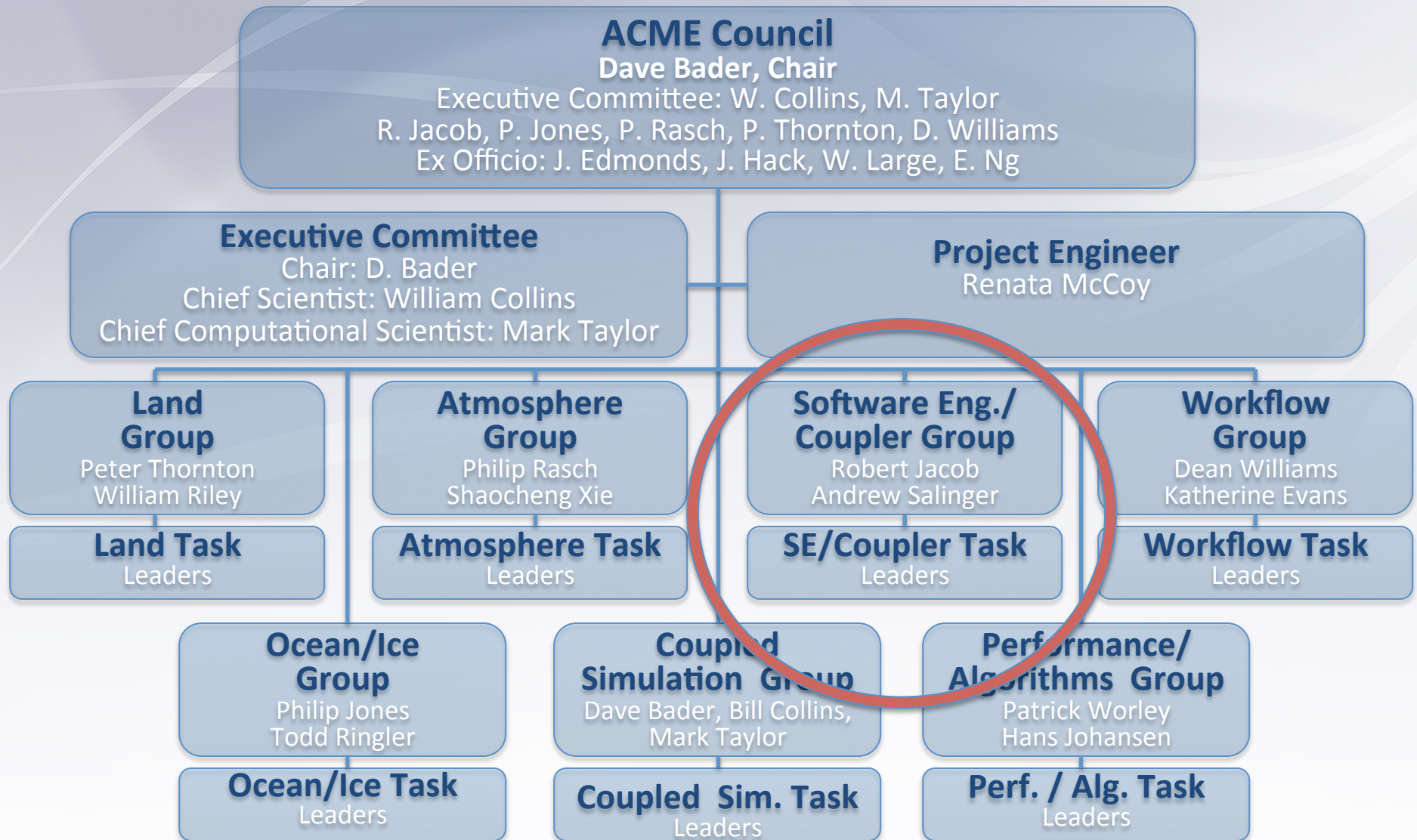


Software Engineering/Coupler Group

Robert Jacob
Andy Salinger

May 5, 2015
ACME All-hands meeting

ACME organization



SE/CPL Group role (1 of 2)

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.

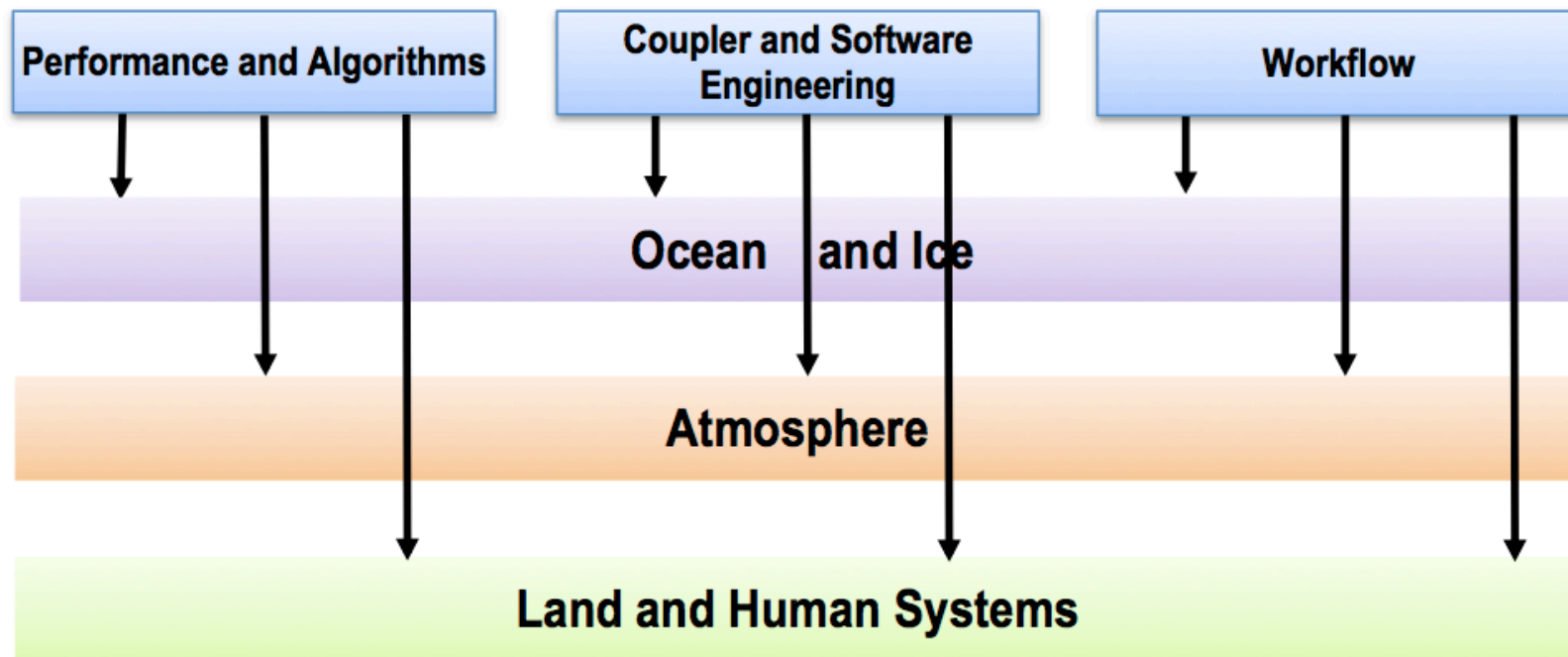


Figure 7.6-2: Computational Science is organized as hubs (the blue boxes) with spokes extending to the three Science areas to enable and facilitate communication and integration.

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

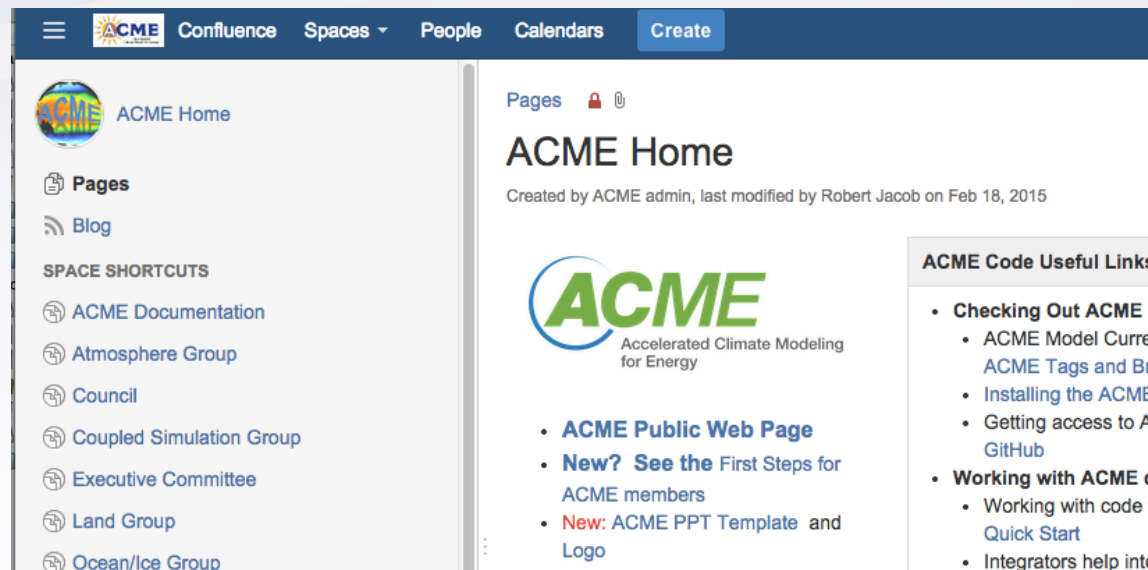
Integrators

- 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

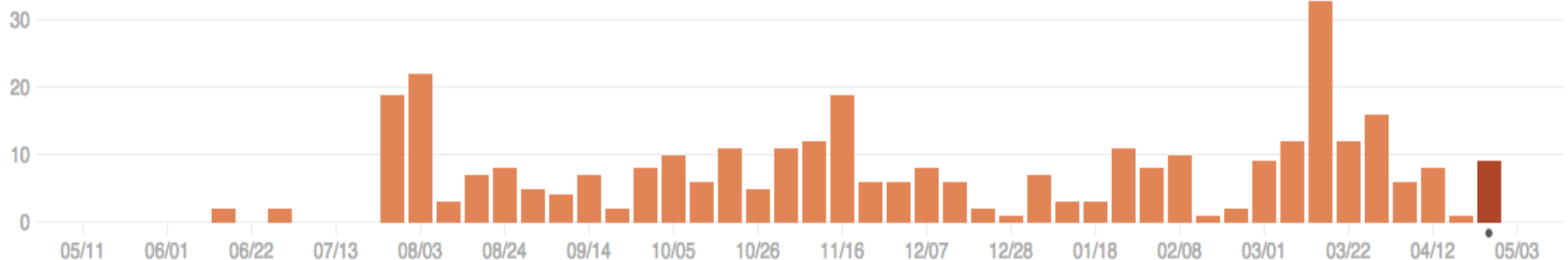
- Communication Tools, selection, training:
 - Confluence selected for wiki; huge success.
 - JIRA selected for task tracking
 - GoTo Meeting accounts for web conferencing



The screenshot shows the ACME Confluence home page. The top navigation bar includes the ACME logo, 'Confluence', 'Spaces', 'People', 'Calendars', and a 'Create' button. The main content area features the ACME Home page title, a creation date of Feb 18, 2015, and the ACME logo with the tagline 'Accelerated Climate Modeling for Energy'. A sidebar on the left lists 'SPACE SHORTCUTS' such as 'ACME Documentation', 'Atmosphere Group', 'Council', 'Coupled Simulation Group', 'Executive Committee', 'Land Group', and 'Ocean/Ice Group'. A right sidebar titled 'ACME Code Useful Links' contains a list of links including 'Checking Out ACME M...', 'ACME Model Current...', 'ACME Tags and Bra...', 'Installing the ACME M...', 'Getting access to AC...', 'GitHub', 'Working with ACME de...', 'Working with code wi...', 'Quick Start', and 'Integrators help integ...'.

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

Nightly

| Site | Build Name | Update | Configure | | Build | | Test | | | Build Time |
|-----------|---|--------|-----------|------|-------|------|---------|------|---------------------------------|--------------------------|
| | | Files | Error | Warn | Error | Warn | Not Run | Fail | Pass | |
| melvin |  acme_developer_master_gnu | | | | | | 0 | 0 | 15 | Apr 30, 2015 - 22:38 EDT |
| melvin |  acme_developer_next_gnu | | | | | | 0 | 0 | 15 | May 01, 2015 - 05:05 EDT |
| skybridge |  acme_integration_next_intel | | | | | | 0 | 0 | 31 ⁺¹ _{,-1} | May 01, 2015 - 18:02 EDT |

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/CPI 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