Agile Methodologies

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- **The requested citation the overall tutorial is: David E. Bernholdt, Anshu Dubey, Rinku K. Gupta, and David M. Rogers, Software Productivity and Sustainability track, in Argonne Training Program on Extreme-Scale Computing (ATPESC), online, 2021. DOI: 10.6084/m9.figshare.15130590**
- Individual modules may be cited as *Speaker, Module Title*, in Better Scientific Software tutorial…

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Outline

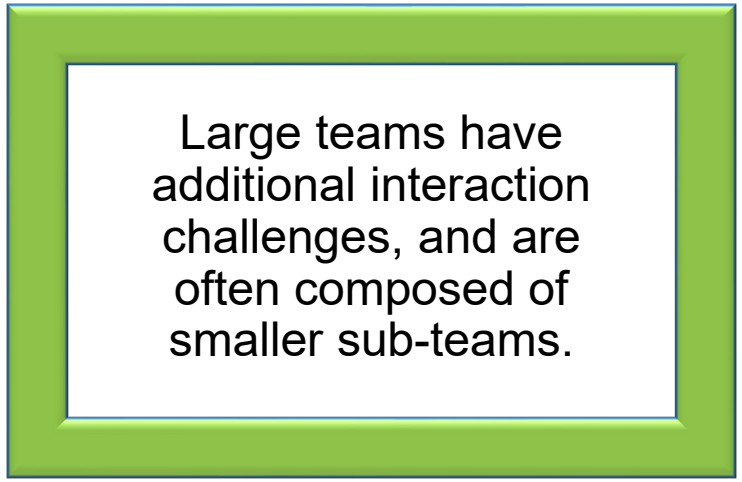
- Small Team Models, Challenges
- Agile workflow management for small teams.
  - Intro to terminology and approaches
  - Overview of Kanban
  - Building on Kanban
  - Free tools: Trello, GitHub

Small Teams

Ideas for managing transitions and steady work.

Small team interaction model

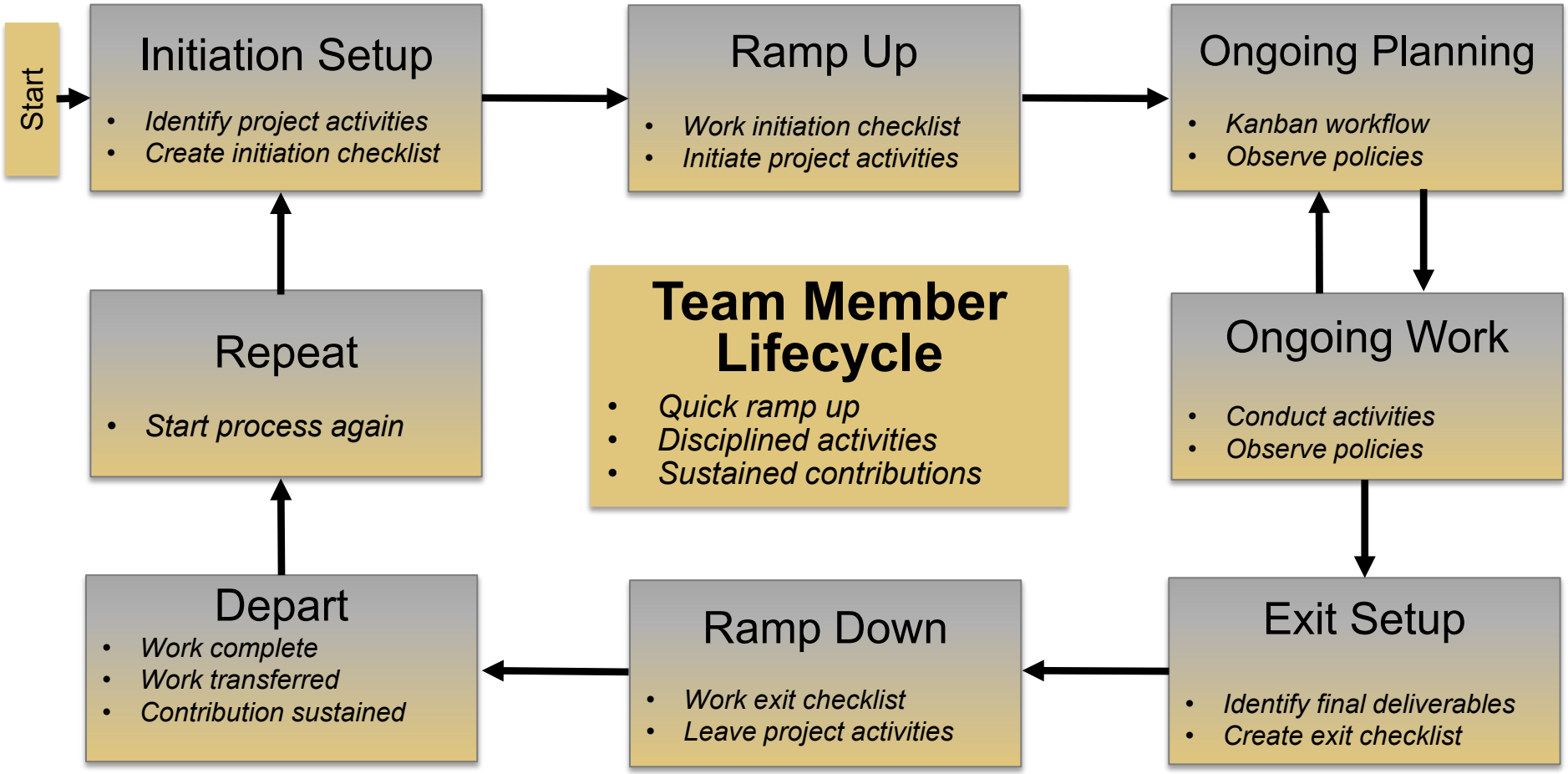
- Team composition:
  - Senior staff, faculty:
    - Stable presence, in charge of science questions, experiments.
    - Know the conceptual models well.
    - Spend less time writing code, fuzzy on details.
  - Junior staff, students:
    - Transient, dual focus (science results, next position).
    - Staged experience: New, experienced, departing.
    - Learning conceptual models.
    - Write most code, know details.



Small team challenges

- Heavy processes are often neither necessary nor appropriate
  - Adopt only those processes that add value
- Ramping up new junior members:
  - Background.
  - Conceptual models.
  - Software practices, processes, tools.
- Preparing for departure of experienced juniors.
  - Doing today those things needed for retaining work value.
  - Managing dual focus.

Research Team Member Lifecycle



Checklists & Policies

Team Member Phase		
New Team Member	Steady Contributor	Departing Member
Checklist	Policies	Checklist

- New, departing team member checklists:
  - Example: Trilinos New Developer Checklist.
  - Simple – prevents omissions
  - https://github.com/trilinos/Trilinos/wiki/New-Trilinos-Developers
- Steady state: Policy-driven.
  - Example: xSDK Community policies.
  - https://xsdk.info/policies/

New developer checklist snippet

_x_ Verify familiarity with and configure git. Each machine requires base configuration:
https://github.com/trilinos/Trilinos/wiki/VC-%7C-Initial-Git-Setup
Introductory material available at:
https://github.com/trilinos/Trilinos/wiki/Tools--%7C-Git
Date completed:

_x_ Learn about the Trilinos develop / master branch workflow:
https://github.com/trilinos/Trilinos/wiki/VC-(VERSION-CONTROL)
https://github.com/trilinos/Trilinos/wiki/VC-%7C-'develop'-'master'-workflow
Date completed:

_x_ Become familiar with the Trilinos Policies page and review relevant policies:
https://github.com/trilinos/Trilinos/wiki/POLICIES
Date completed:

_x_ Complete a GitHub pull request with a mentor:
+ Fork Trilinos and issue a pull request from a branch on your fork.
+ Remember that all pushes to the Trilinos repository and modifications to Trilinos webpages are world-wide releases of information, so institution-specific copyright, review, approval and other appropriate policies must be followed.
+ Make any necessary changes to GitHub Issues (also after the next day's test harness results, if appropriate).
Date completed:

Agile Methodologies

Why Agile?

- Fits the research experience better than heavier-weight approaches
  - Aligns more naturally with how scientific progress is made
- Well-suited for scientific software efforts (when tailored correctly)
  - Works well for small teams
  - Provides meaningful, beneficial structure that promotes
    - Productivity
    - Productization
    - Sustainability
    - Flexibility in requirements
    - Communication

What is Agile?

- Agile is not a software development lifecycle model
- I've seen Agile informally defined as
  - I don't write documentation
  - I don't do formal requirements, design, or really test…
  - Agile is not an excuse to do sloppy work
- Some people consider agile to be synonymous with Scrum
  - From Atlassian: Scrum is a framework that helps teams work together
  - Scrum is Agile, Agile is not (only) Scrum
  - A square is a rectangle, not all rectangles are squares
  - Agile is not Kanban either

What is Agile?

http://agilemanifesto.org/

Principles behind the Agile Manifesto

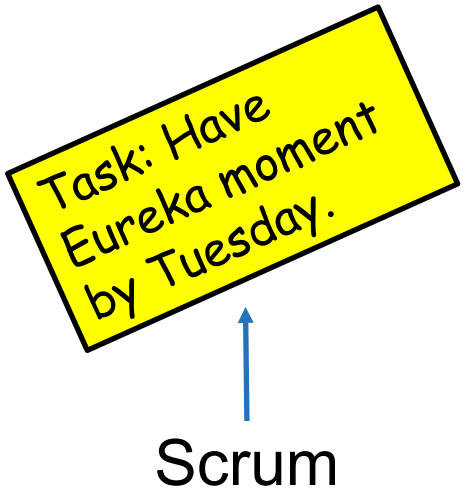
- Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
- Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
- Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
- Business people and developers must work together daily throughout the project.
- Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.
- The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.

Principles behind the Agile Manifesto

- Working software is the primary measure of progress.
- Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
- Continuous attention to technical excellence and good design enhances agility.
- Simplicity--the art of maximizing the amount of work not done- is essential.
- The best architectures, requirements, and designs emerge from self-organizing teams.
- At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

Getting Started with Agile

- Agile principles are not hard and fast rules
- Try adopting a few Agile practices
  - Following a rigid, ill-fit framework usually leads to failure



- Kanban is a good starting framework
  - Follow basic principles, add practices when advantageous
  - Better than removing elements from Scrum

Basic Kanban

Backlog	Ready	In Progress	Done
• Any task idea • Trim occasionally • Source for other columns	• Task + description of how to do it. • Could be pulled when slot opens. • Typically comes from backlog.	• Task you are working on *right now.* • **The only Kanban rule: Can have only so many "In Progress" tasks.** • Limit is based on experience, calibration. • **Key: Work is *pulled*. You are in charge!**	• Completed tasks. • Record of your life activities. • Rate of completion is your "velocity".

Notes:

- Ready column is not strictly required, sometimes called "Selected for development".
- Other common column: In Review
- Can be creative with columns:
  - Waiting on Advisor Confirmation.
  - Blocked

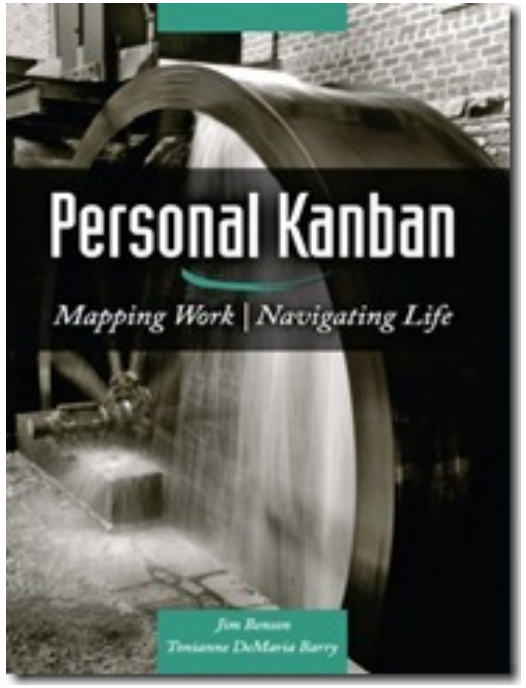
Kanban principles

- Limit number of “In Progress” tasks
  - Must be tuned by each team
  - Common convention: 2n-1 tasks where n = # team members
- Productivity improvement:
  - Optimize “flexibility vs swap overhead” balance. No overcommitting.
  - Productivity weakness exposed as bottleneck. Team must identify and fix the bottleneck.
  - Effective in R&D setting. Avoids a deadline-based approach. Deadlines are dealt with in a different way.
- Provides a board for viewing and managing issues

Personal Kanban

- Personal Kanban: Kanban applied to one person.
  - Apply Kanban principles to your life.
  - Fully adaptable.

- Personal Kanban: Commercial book/website.
  - Useful, but not necessary.



http://www.personalkanban.com

https://bssw.io/items/using-personal-kanban-for-productivity

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Kanban tools

- Wall, whiteboard, blackboard: Basic approach.
- Software, cloud-based:
  - Trello, JIRA, GitHub Issues & Project Board.
  - Many more.
- I use Trello (browser, Android, iPhone, iPad).
  - Can add, view, update, anytime, anywhere.
  - Different boards for different contexts
    - Effective when people are split on multiple projects

Big question: How many tasks?

- No single answer. Choose something and adjust from there.
- Personal Kanban approach: Start with 2 or 3.
- Use a freeway traffic analogy:
  - Does traffic flow best when fully packed? No.
  - Same thing with your effectiveness.
- Spend time consulting board regularly.
  - Brings focus.
  - Enables reflection, retrospection.
  - Use slack time effectively.
  - When you get out of the habit, start up again.
  - Steers towards previously started tasks

Importance of “In Progress” concept for you

- Junior community members:
  - Less control over tasks.
  - Given by supervisor.
- In Progress column: Protects you.
  - If asked to take on another task, respond:
    - Is this important enough to
      - back-burner a, b, and c?
      - become less efficient?
    - Sometimes it is.

Building on Kanban

- Focus: Solve issues!
  - (not add process)
- 15 minute stand-ups
  - Maybe not daily
- Planning meetings
- Retrospectives
- Scrum Master
- Product Owner
- **Epic, story, task**
- Definition of Done

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Building on Kanban

- Epic, Story, Task
  - Formal or informal
  - Start with high-level requirements
  - Break down and refine when and as needed
    - Close to when the work will be done
    - Only for work that will take place
    - Can be valuable for estimating
    - There is no “correct” level of granularity
  - Epics are very high level objectives
  - Stories should represent an increment of value to the customer
    - ”Done” criteria – understandable to user
  - Tasks are the steps necessary to complete a story
    - May not individually provide value to the customer

Building on Kanban

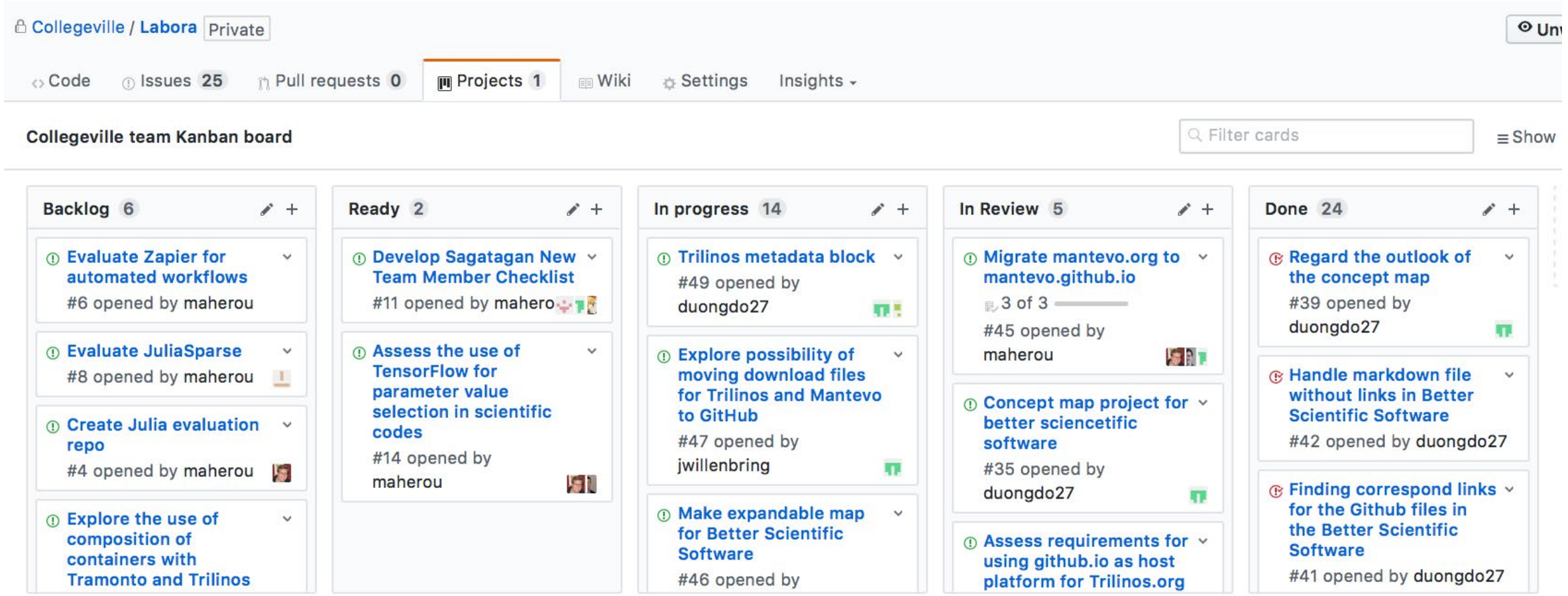
- User stories (optional)
  - Form: As a <stakeholder>, I want <describe what is needed> so that <why do you want this?>
  - Can be useful to improve communication and requirements elicitation
- In heat example:
  - User stories collected
    - As a developer, I want to modularize the heat equation utilities so that I can more easily make use of the utilities for other projects.
    - As a developer, I want to be able to use multiple integration functions easily so that I can utilize the function best suited for the problem I am solving.

Building on Kanban

- Epic (derived from user stories): Refactor code for enhanced modularity
  - Description: The heat equation code needs refactoring to improve modularity. Specifically, there are utilities that could be generalized and used with for other applications. Also, the integration function is currently hard-coded. In the future, we want to use alternative integration functions, so we should generalize the interface for this function.
    - Story 1: Separate out utilities
    - Story 2: Separate out integration function

- This idea needs to be socialized with stakeholders
- No staffing/funding currently available

Samples from Collegeville Org: Kanban Board



Kanban in GitHub

- GitHub supports basic Agile development workflows
  - Filing issues
    - @mention
  - Kanban board
  - Projects
- GitHub lacks more advanced features
  - Dependencies between issues
    - You can reference one issue in another
  - Advanced notification schemes
  - Custom fields
    - You can create custom labels

Building on Kanban

- A-Team Tools: A collection of resources for understanding and applying lightweight agile practices to your scientific SW project
  - Especially useful for
    - Small teams
    - Teams of teams
    - Teams that frequently have members come and go
  - https://betterscientificsoftware.github.io/A-Team-Tools/

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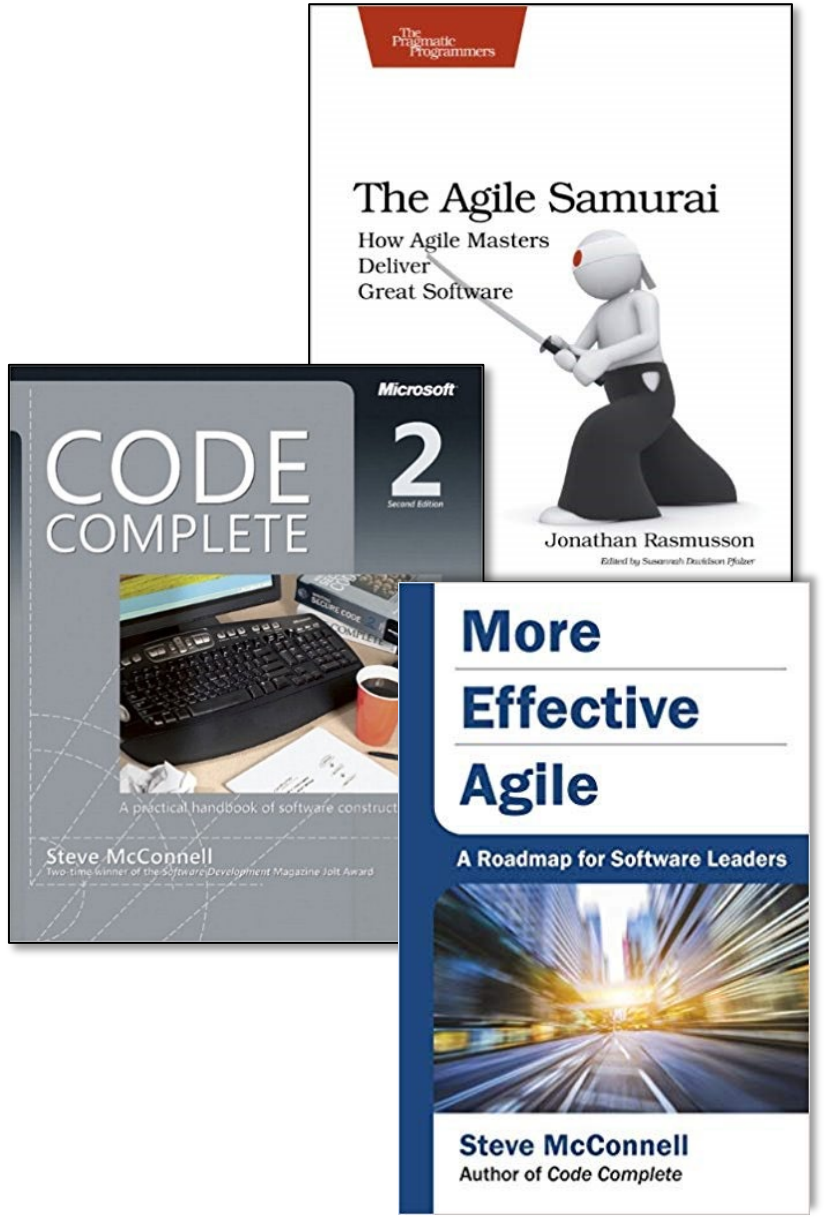
Other Resources

- **The Agile Samurai: How Agile Masters Deliver Great Software (Pragmatic Programmers),** Jonathan Rasmusson.
  - http://a.co/eUGIe95
  - Excellent, readable book on Agile methodologies.
  - *Also available on Audible.*
- **Code Complete: A Practical Handbook of Software Construction,** Steve McConnell.
  - http://a.co/eEgWvKj
  - Great text on software.
  - *Construx website has large collection of content.*
- **More Effective Agile: A Roadmap for Software Leaders,** Steve McConnell.
  - http://a.co/22EPvt6
  - New: A realistic view of Agile effectiveness with great advice for project leaders.



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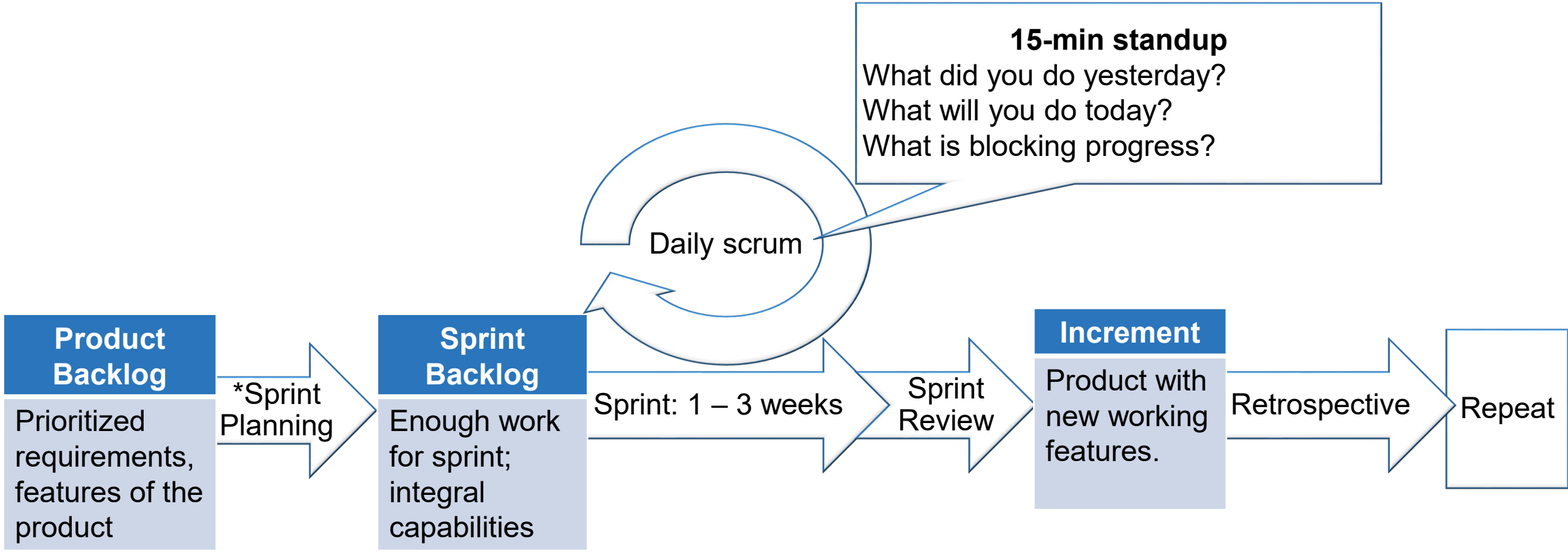
A Bit about Scrum: Roles

Scrum team

Product Owner	Scrum Master	Development Team
• Interface between development team and stakeholders. • Responsible for defining and managing work backlog. • Needs good domain knowledge. • Needs adequate time to do job well.	• Leads and coaches development team. • Assures scrum processes followed. • Needs good Scrum knowledge and discipline. • Can be a developer if sufficient time.	• Cross-functional group of 3 – 9 that develops product. • Completes all work necessary to be done-done. • Collectively need design, development, testing, documentation skills. • Works in collaboration with product owner, scrum master.

A Bit about Scrum: Process



* Sprint planning happens during previous sprint

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