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Large Scale Software Development

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Pull Requests, Code Review, Continuous Integration and Branching Models

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Pull Requests

- Born in the context of open source software development.
- There's three sides to PRs:
  - the **documentation** of the changes.
  - the **asynchronous code review and discussion** of the changes.
  - the assumption of using **feature branches**.

Should Pull Requests be used?

It depends!

(Note: in any case, we will use them for our projects in DS)

Should Pull Requests be used for *documenting* changes?

Documenting changes is usually a good idea...

... even if we don’t necessarily need feature branches to do that.

Should Pull Requests be used for *asynchronous code reviews*?

- **Asynchronous code reviews** are often used by teams in low-trust environments (e.g., open source contributions).
- Co-located teams very often will benefit more from **synchronous code reviews**.
- What does a synchronous code review look like?
  - Pair Programming
  - Ensemble Programming

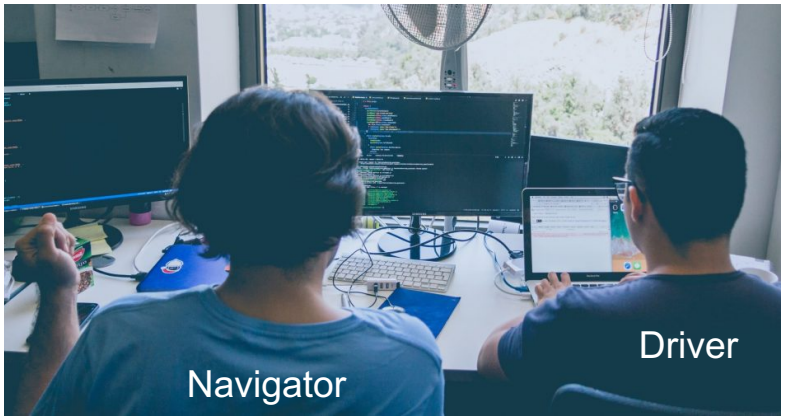
Recommended reading: A guide for reviewing code and having your code reviewed, by Thoughtbot
Reference: Expectations, outcomes, and challenges of modern code review, Alberto Bacchelli and Christian Bird

Pair Programming

- Two programmers work together at one machine.
- The *Driver* enters code and thinks tactically.
- The *Navigator* critiques the code and thinks strategically.
- Periodically switch roles and pairs.

Benefits:

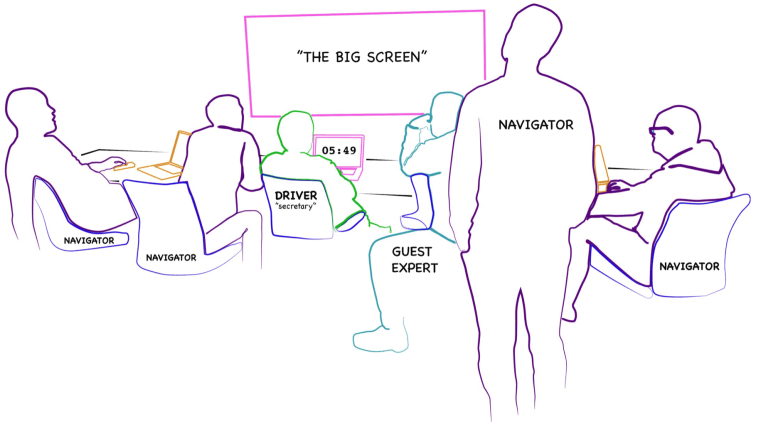
- Informal review process.
- Helps developing collective ownership and spread knowledge.
- Improves quality (less defects, better design) whilst maintaining (or improving) productivity.



Recommended reading: On Pair Programming, by Birgitta Böckeler.

Ensemble Programming
(aka Mob Programming)

- Basic rule: *"for an idea to go from your head into the computer it MUST go through someone else's hands."*
- The *Driver* sits at the keyboard and focuses on typing the code.
- The *Navigators* discuss the idea being coded and guide the Driver in creating the code.
- The *Driver* listens to and trusts the *Navigators*. The Navigators express their ideas to the Driver in a slow, metered approach.



- Each team member acts as the Driver for a short period of time (typically 10 to 15 minutes).
- To follow this approach we must become **good at communicating and discussing** each idea with another person before it can become part of the code base.

Recommended watching: Mob Programming and the Power of Flow, by Woody Zuill @ GOTO 2019

Continuous Integration

“What if engineers didn't hold on to modules for more than a moment? What if they made their (correct) change, and presto! everyone's computer instantly had that version of the module?

*You wouldn't ever have **integration hell**, because the system would always be integrated. You wouldn't need **code ownership**, because there wouldn't be any conflicts to worry about.*

[...] the fundamental assumption of CI is that there's only one interesting version, the current one”

Continuous Integration on the C2 wiki.

Should *feature branches* be used?

- They are useful to isolate and ensure stability of a shared code base.
- But **they work against continuous integration**! *Continuous Integration* (CI) implies integrating work at least daily, but probably multiple times per day.
- **Feature branches imply a cost** when the time comes to merge a set of changes. The longer-lived a branch is, the greater the cost might be!
- We can do ***trunk-based development*** by separating deployment from release. Some example techniques:
  - > Dark Launching
  - > Branch by Abstraction
  - > Feature flags

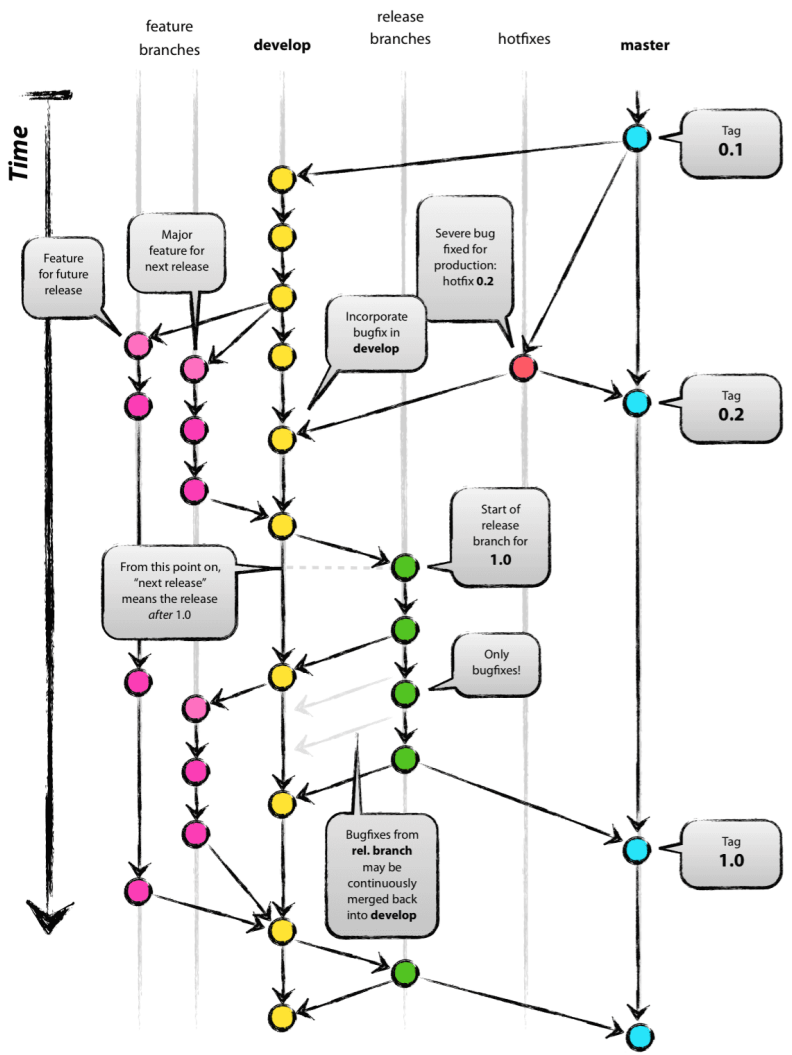
Recommended watching: *Continuous Integration vs Feature Branch Workflow*, by Dave Farley

Advice on Pull Requests

- Use small pull requests.
- Probably this means more than one pull request by backlog item.
- Each pull request should keep the source code stable.
- The code changes provided in the context of a pull request should be tested and documented within the same pull request.

What about GitFlow?

- It was never designed to be an all-or-nothing decision.
- You should pick the elements that make sense for your context.
- Some advice:
  - Avoid *develop* and *release* branches unless you really-really need them.
  - Have *feature* branches as short-lived as possible.



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