45426: Teste e Qualidade de Software

Code improvement through peer-reviews (in the CI pipeline)

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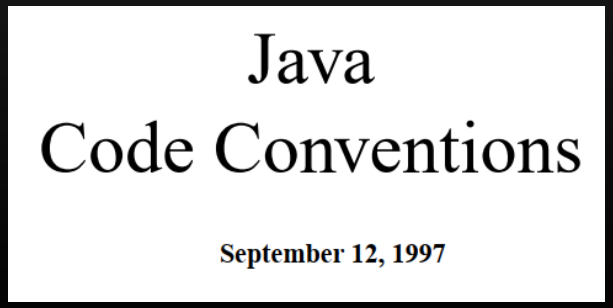
Learning objectives

- Describe the goals of formal and informal code reviews.
- Enumerate sample problems that can corrected in code reviews
- Identify best practices to conduct code reviews
- Explain the role of code Styles towards software maintenance

Motivation for a cleaner code

- 80% of the lifetime cost of a piece of software goes to maintenance.
- Hardly any software is maintained for its whole life by the original author.
- Code conventions improve the readability of the software, allowing engineers to understand new code more quickly and thoroughly.

http://www.oracle.com/technetwork/java/codeconventions-150003.pdf



You can make the code easier to maintain

Practices to find problems in the code

Static code analysis (inspectors)

Code reviews

...

Culture for clean/readable code

Developer/style guidelines

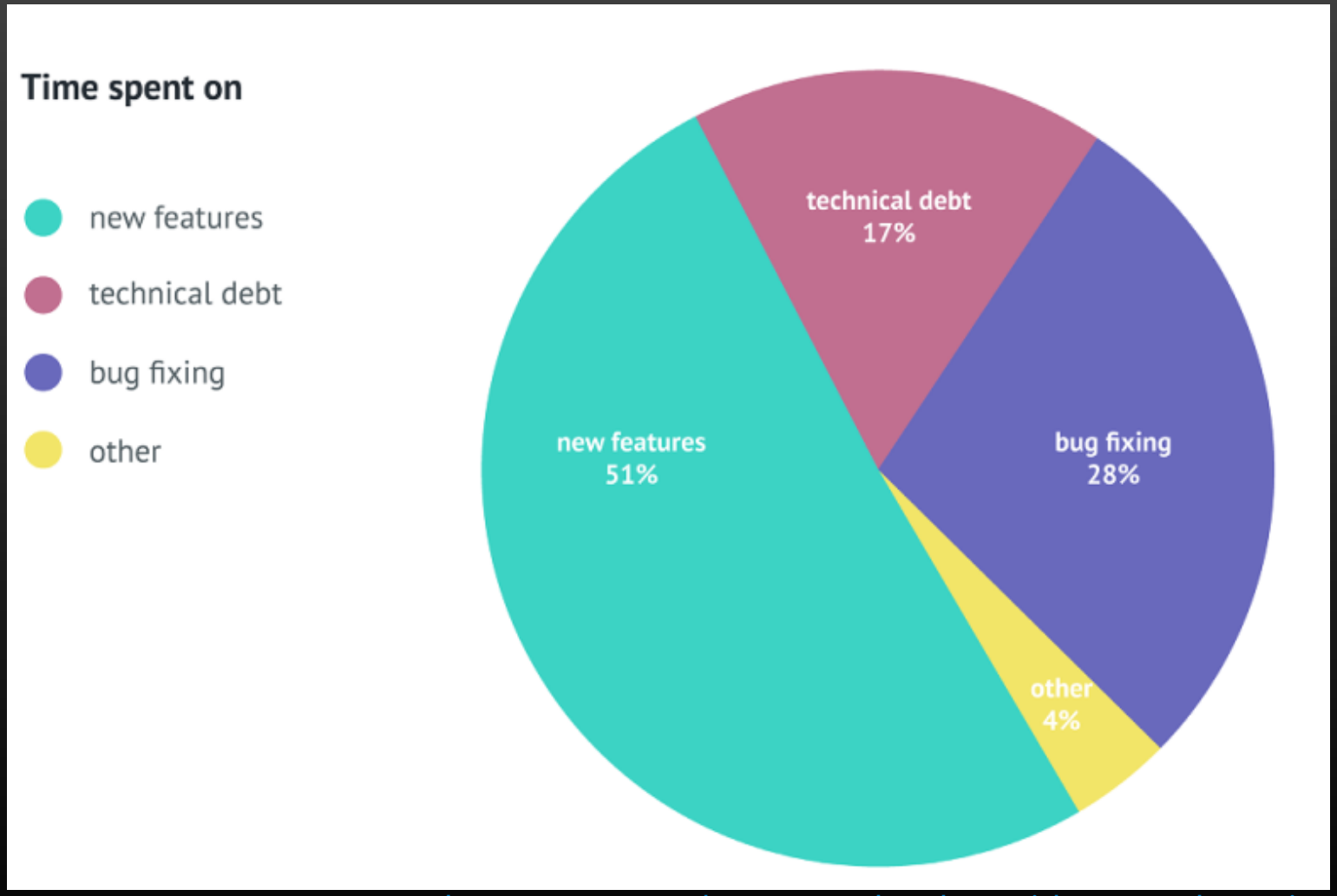
Definition of Done

Patterns (reuse)

...

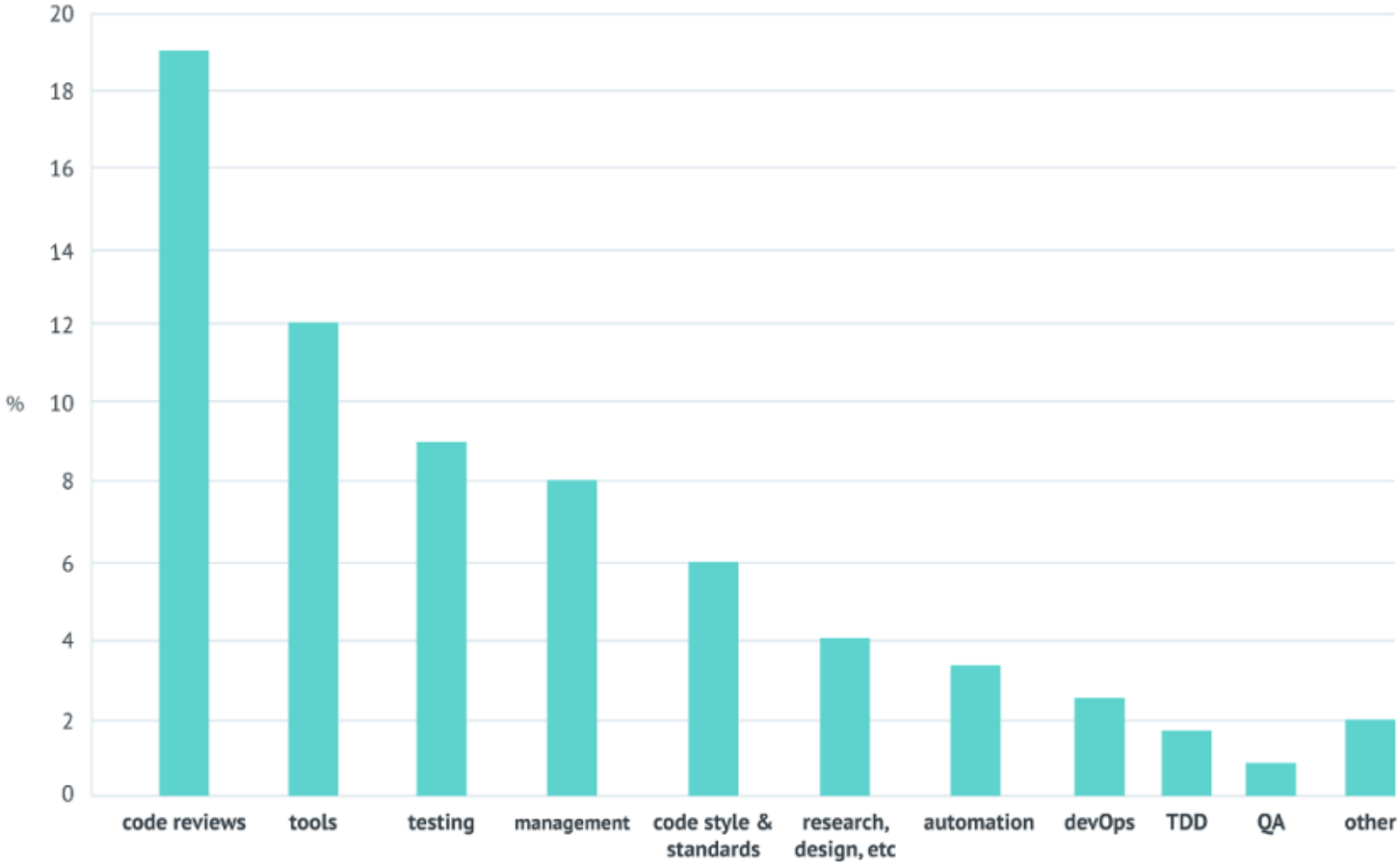
Oliveira (2018)

Survey among +600 developers



https://www.codacy.com/ebooks/guide-to-code-reviews

What change in your development process had the biggest impact to code quality?*



https://www.codacy.com/ebooks/guide-to-code-reviews

*The question was open-ended to avoid leading the respondents into specific answers.

Code review in the software development process

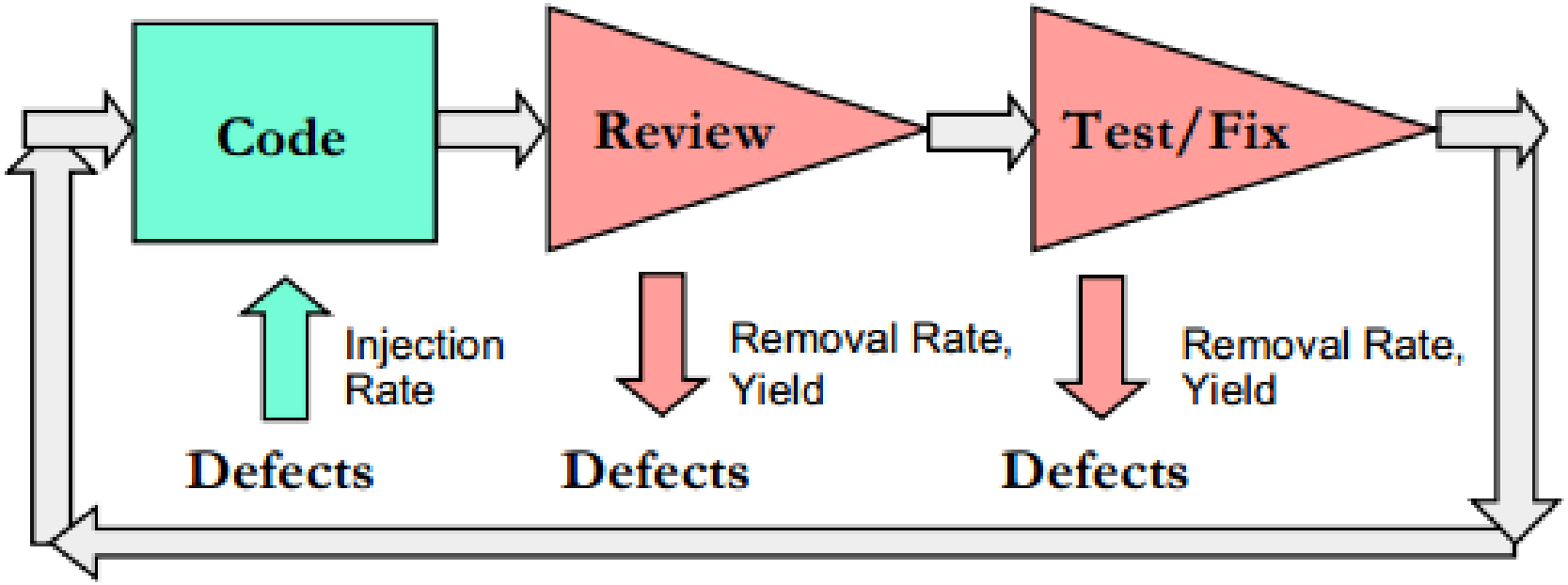
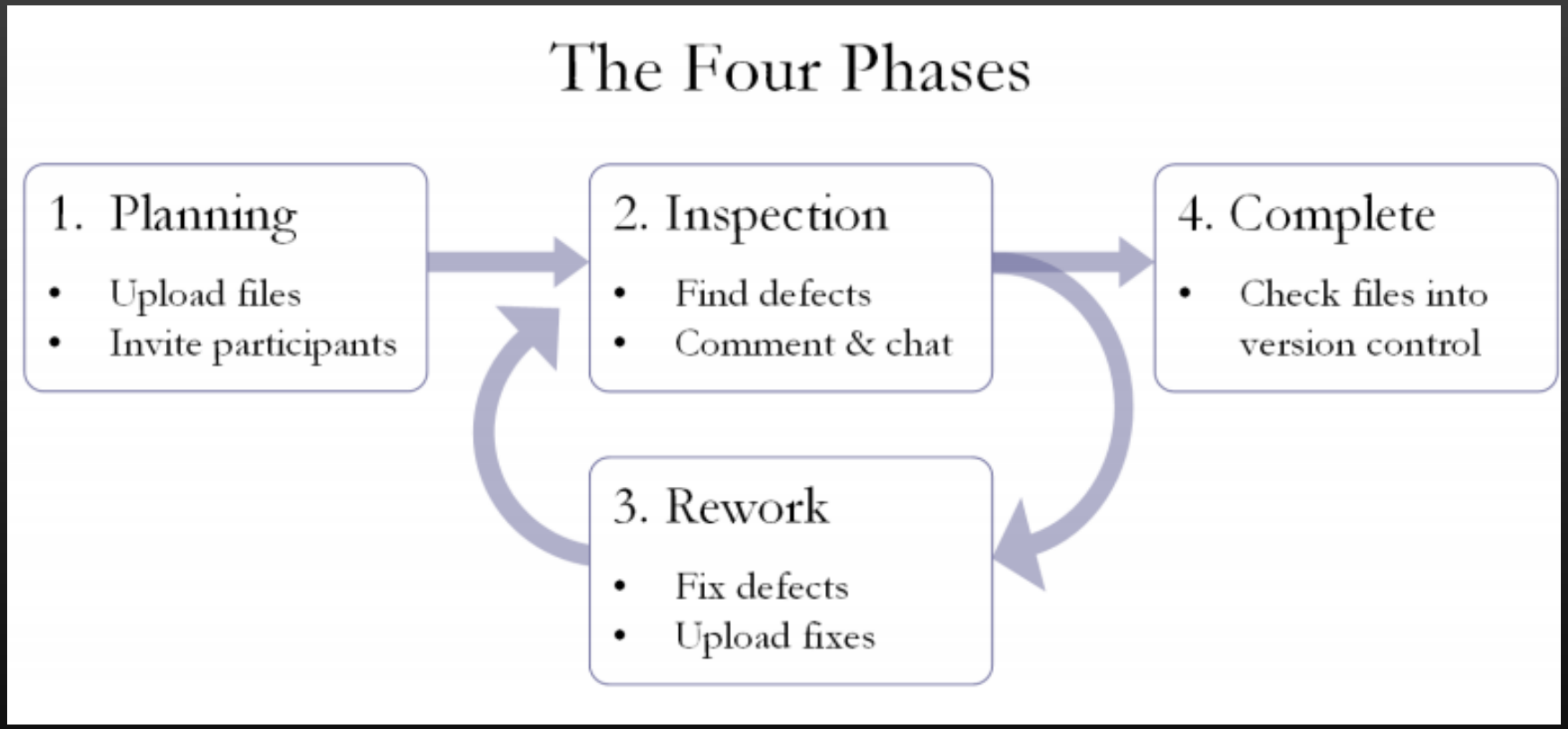


Figure 29: Software Process including a Code Review

The code review lifecycle has four main stages



See also: Cohen's book on code review

Oliveira (2018)

Defects most likely to find in a code review

Deviations from standards

either internally defined and managed or regulatory/legally defined

Requirements defects

e.g.: the requirements are ambiguous, or there are missing elements.

Design defects

e.g.: too much coupling; fail to use known patterns

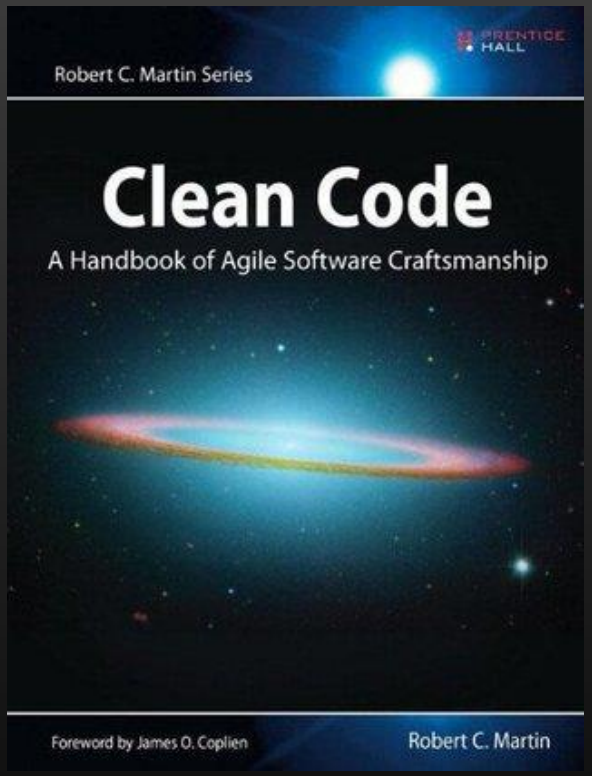
Insufficient maintainability

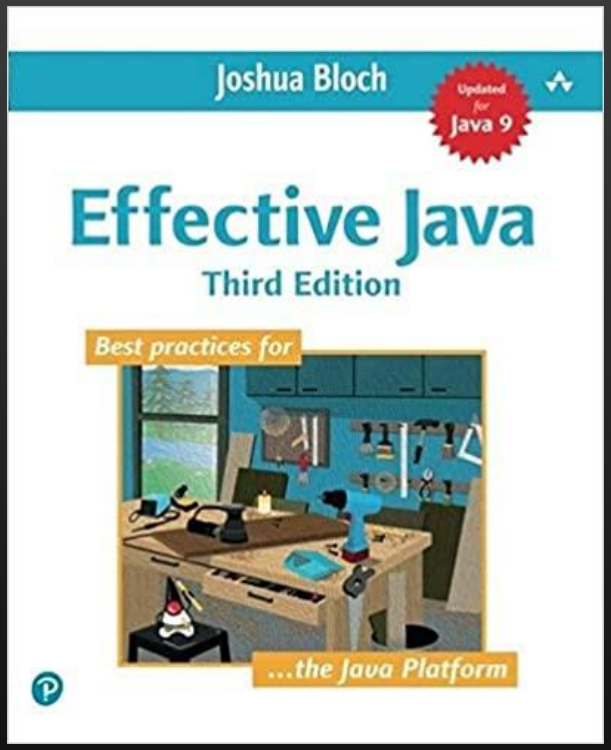
e.g.: the code is too complex to maintain

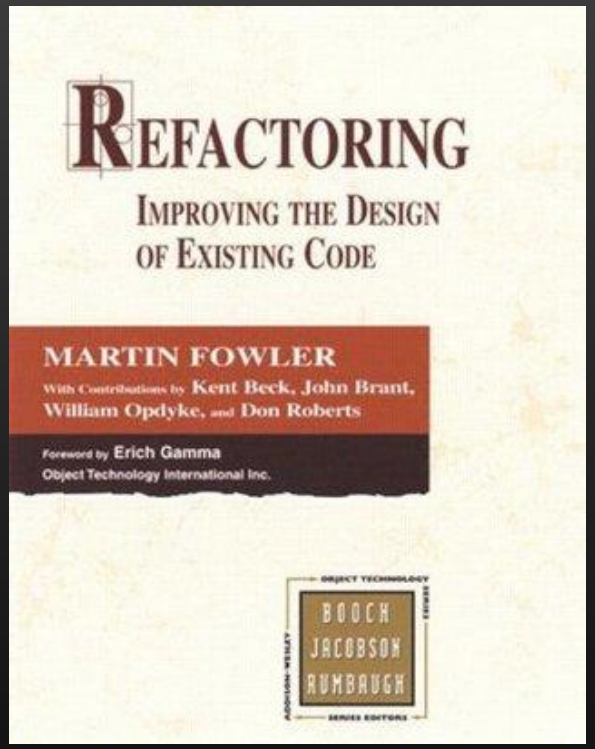
Incorrect interface specifications

Oliveira (2018)

What to look for in code reviews ?







The name of a variable, function, or class, should answer all the big questions. It should tell you why it exists, what it does, and how it is used. If a name requires a comment, then the name does not reveal its intent.

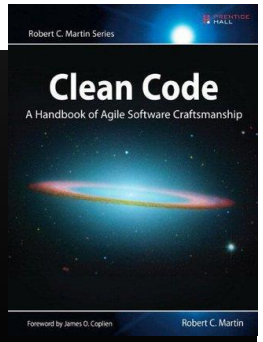
```
int d; // elapsed time in days
```

The name `d` reveals nothing. It does not evoke a sense of elapsed time, nor of days. We should choose a name that specifies what is being measured and the unit of that measurement:

```
int elapsedTimeInDays;
int daysSinceCreation;
int daysSinceModification;
int fileAgeInDays;
```

Choosing names that reveal intent can make it much easier to under code. What is the purpose of this code?

```
public List<int[]> getThem() {
  List<int[]> list1 = new ArrayList<int[]>();
  for (int[] x : theList)
    if (x[0] == 4)
      list1.add(x);
  return list1;
}
```



Explain Yourself in Code

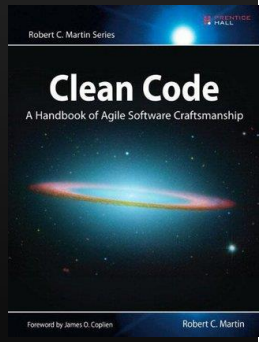
There are certainly times when code makes a poor vehicle for explanation. Unfortunately, many programmers have taken this to mean that code is seldom, if ever, a good means for explanation. This is patently false. Which would you rather see? This:

```
// Check to see if the employee is eligible for full benefits
if ((employee.flags & HOURLY_FLAG) &&
    (employee.age > 65))
```

Or this?

```
if (employee.isEligibleForFullBenefits())
```

It takes only a few seconds of thought to explain most of you
cases it's simply a matter of creating a function that says the san
you want to write.



Chapter 4: Comments

- Comments Do Not Make Up for Bad Code
- Explain Yourself in Code
- Good Comments
  - Legal Comments
  - Informative Comments
  - Explanation of Intent
  - Clarification
  - Warning of Consequences
  - TODO Comments
  - Amplification
  - Javadocs in Public APIs
- Bad Comments

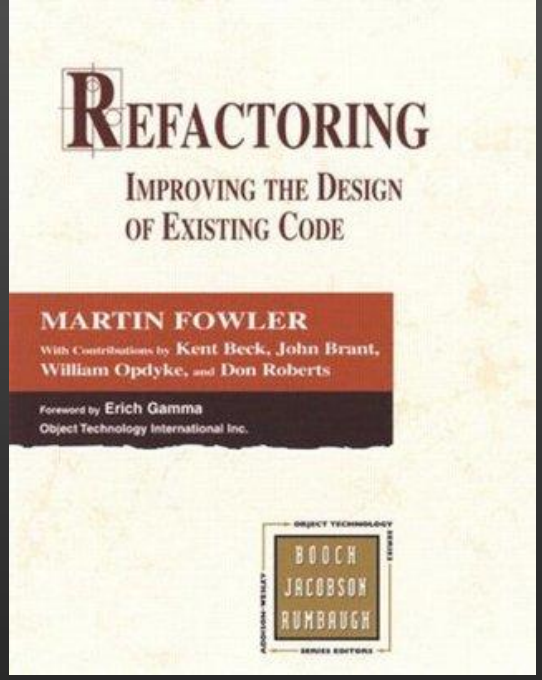
Effective Java

Item 1: Consider static factory methods instead of constructors

Item 58: Use checked exceptions for recoverable conditions and runtime exceptions for programming errors

"Bed smells" (M. Fowler)

Duplicate code
Very long methods
Large class
Long parameter list
Feature envy
Primitive obsession

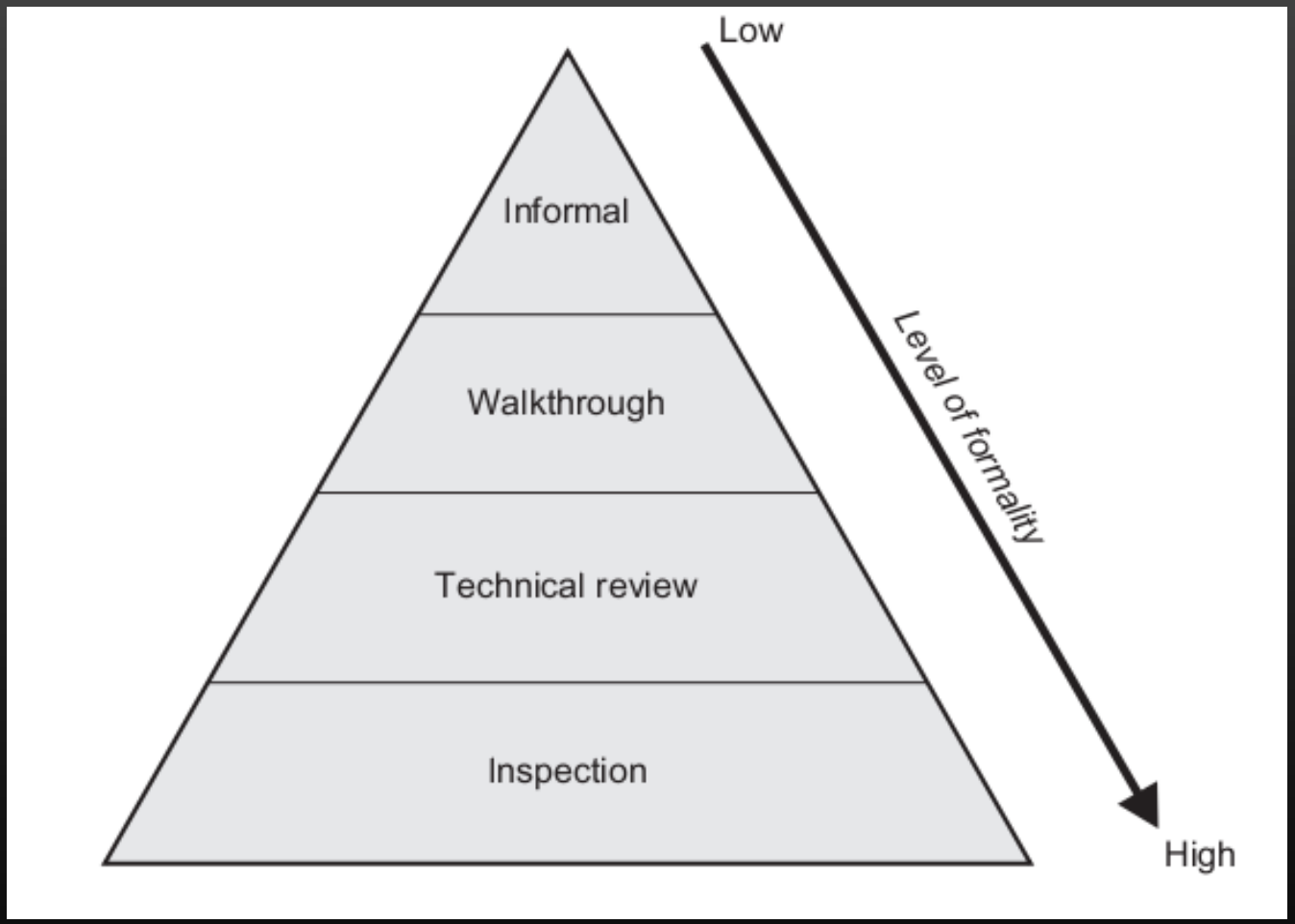


"When you feel the need to write a comment, first try to refactor the code so that any comment becomes superfluous."

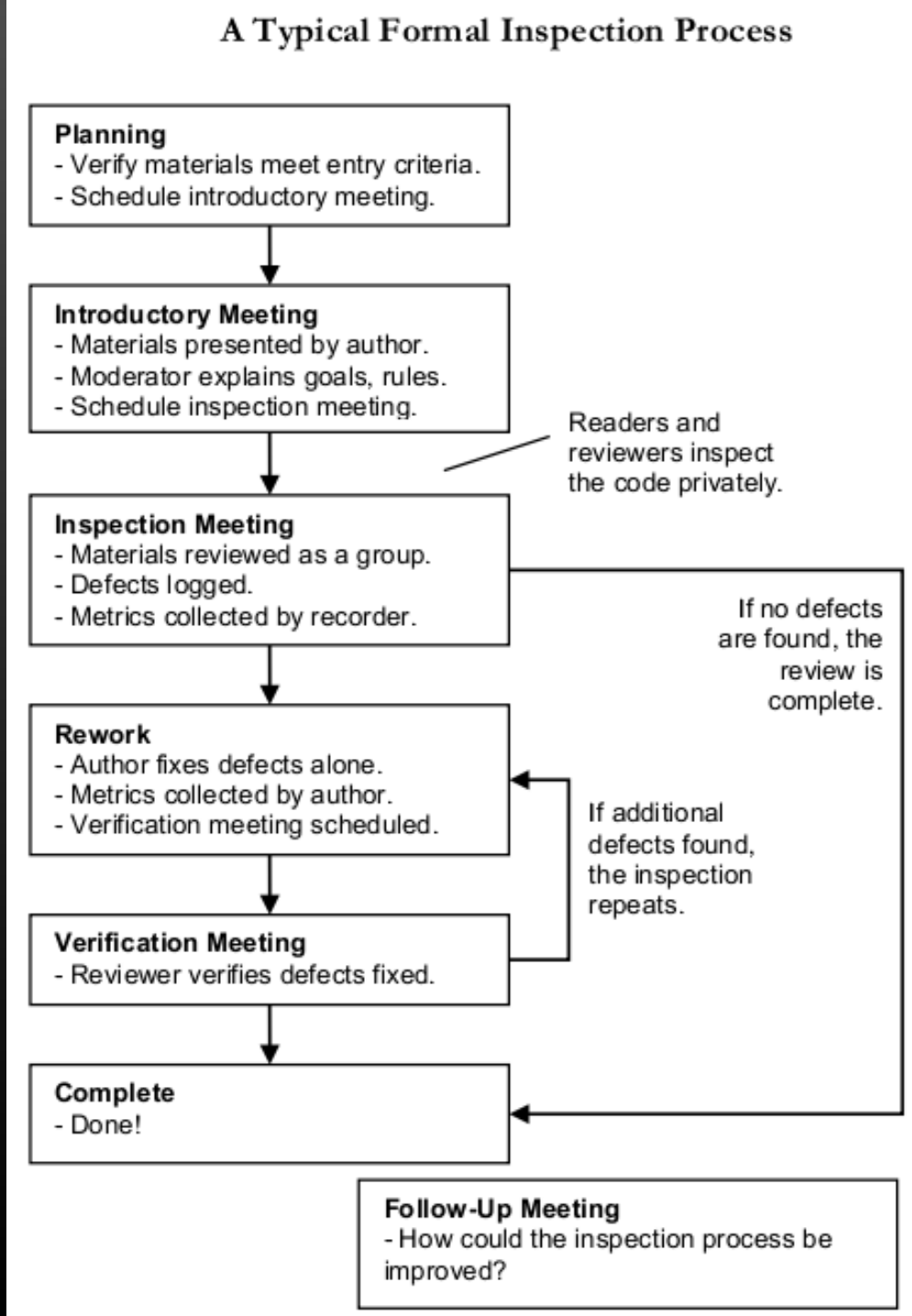
...

See also: http://sourcemaking.com/refactoring/bad-smells-in-code

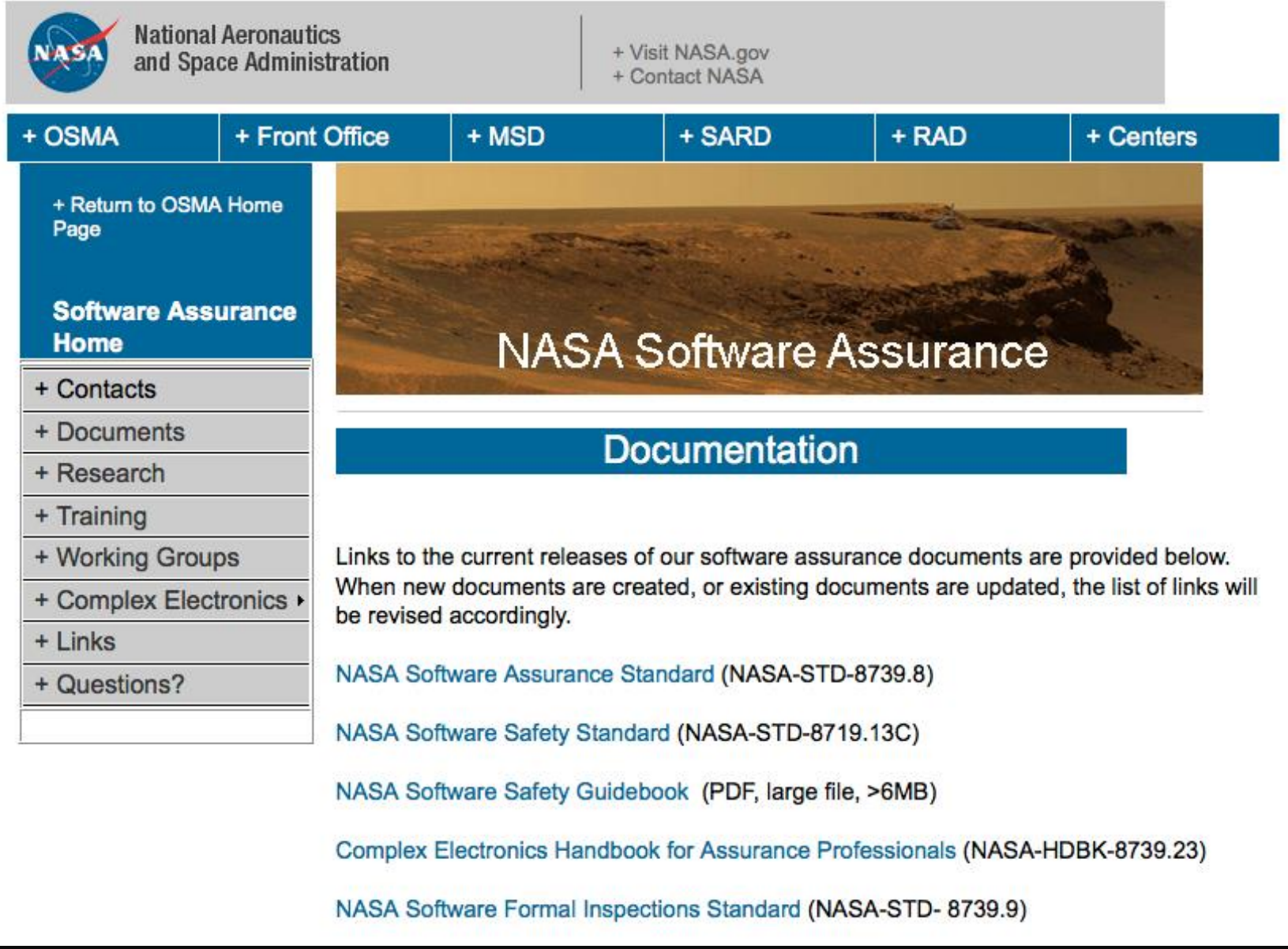
A review process can have very different levels of formality (Informal to Formal Tech Review)



More info:
Wiegers, K. E. (2002). Seven truths about peer reviews. Cutter IT Journal, 15(7), 31-37.



In: P. Farrell-Vinay, Manage Software Testing. Taylor & Francis, 2008.



https://standards.nasa.gov/standard/nasa/nasa-std-87399

Formal technical review [R. Pressman]

Objectives

to uncover errors in function, logic, or implementation for any representation of the software;

to verify that the software under review meets its requirements;

to ensure that the software has been represented according to predefined standards;

to achieve software that is developed in a uniform manner;

to make projects more manageable.

FTR serves as a training ground

junior engineers → observe different approaches to software analysis, design, and implementation.

Lightweight techniques for code review

Over-the-shoulder

a developer stands over the author's shoulder as the latter walks through the code changes.

Email pass-around

The author (or SCM system) emails code to reviewers

Pair Programming

Two authors develop code together at the same workstation.

Tool-assisted reviews

Authors and reviewers use specialized tools designed for peer code review.

Collect changes, support discussions, visualize diffs,...

E.g.: Collaborator , Guerrit, Upsource

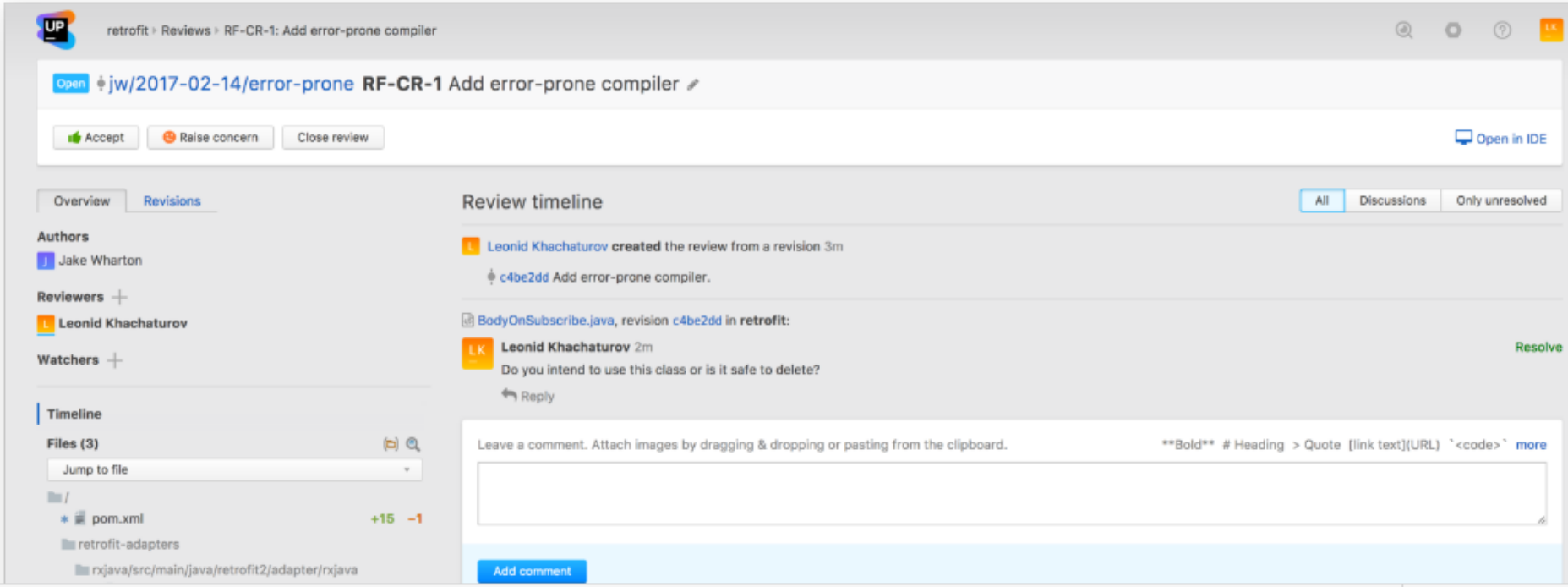
Upsource

What's New | Features | Docs & Demos | Buy & Renew | Download

Efficient Code Review

Performing ad-hoc code reviews provides an opportunity to improve code quality, enhance team collaboration, and learn from each other.

As Upsource does not impose any strict workflow, you can fit it into your preferred process: create a code review for a recent commit, for an entire branch, or review a GitHub pull request.

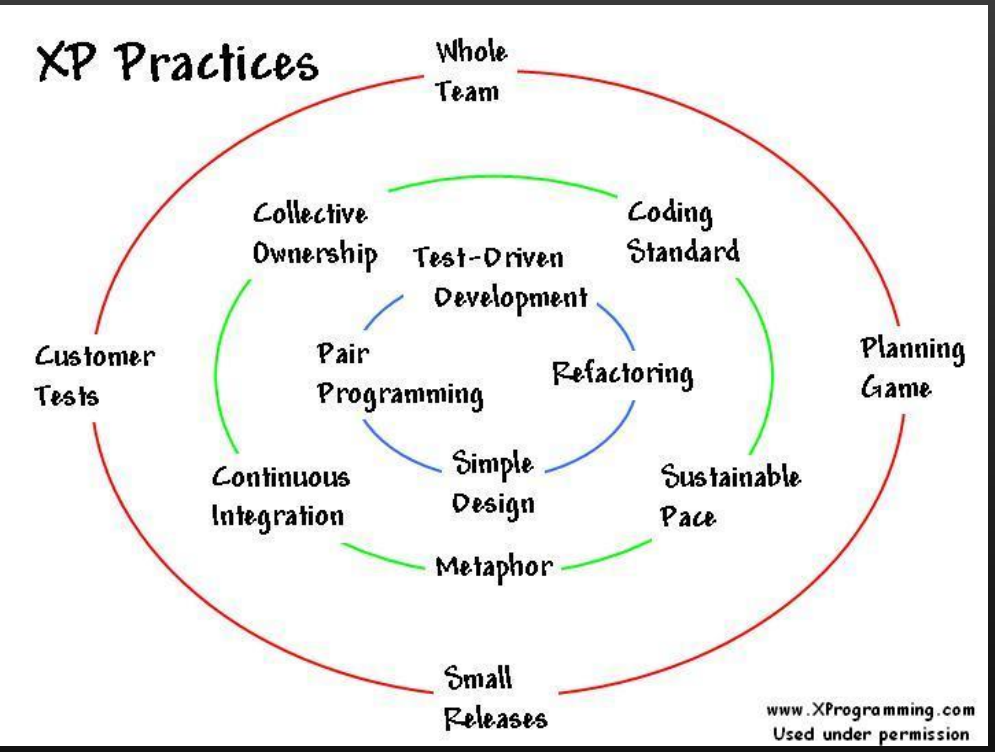


http://www.jetbrains.com/upsource/

https://www.atlassian.com/software/crucible

https://smartbear.com/product/collaborator/overview/

Pair programming does code review all the time



- all production code is written by pairs of programmers
- Each pair works together at a single workstation
- The code is the product of both brains, not just one (co-authors)
- A form of “continuous code review”

XP @Eclipse process framework

Pair programming must be done right to be effective and productive

Pairs are short-lived

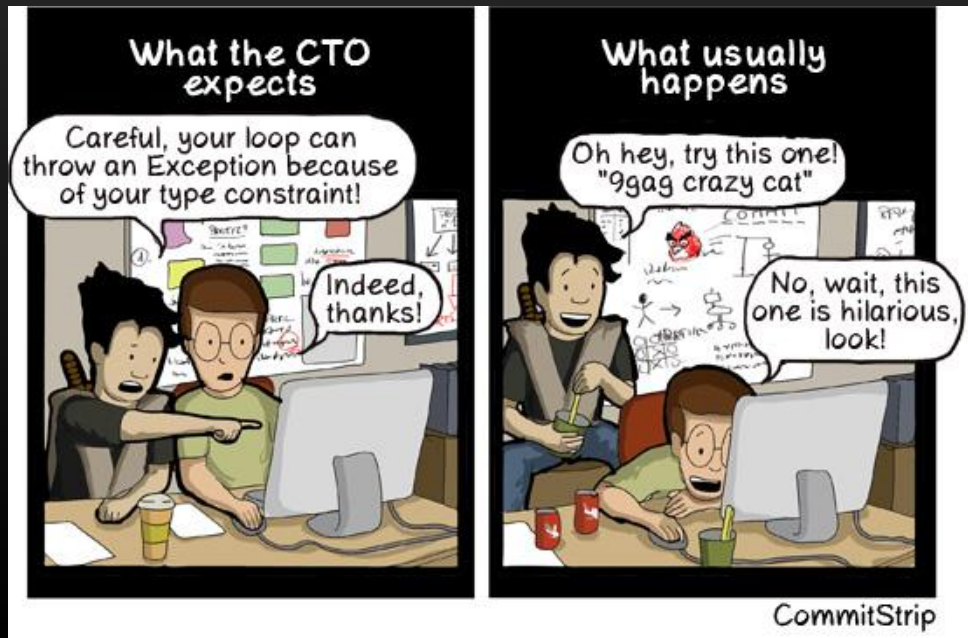
Half of the time, one is working on his own tasks (and then swap)

You can't check in production code that you have written on your own.

Excellent way to train a new team member in the existing code

Newbies should pair most often with team members with more seniority...

https://developer.atlassian.com/blog/2015/05/try-pair-programming/



Styles of code reviews

Pre-commit review

E.g.: discuss the changes with email, authorized maintainers will commit

Not integrated in the history; only one author for a feature/patch

Post-commit review

https://youtu.be/6qKpbWyb6tg?t=1036

Diffs (added and removed lines)

Review a single commit or a group of commits

Guerrit-style

https://www.gerritcodereview.com/

Specific workflow

Fetch, push to staging branch, vote (score)

Pull request (in Git)

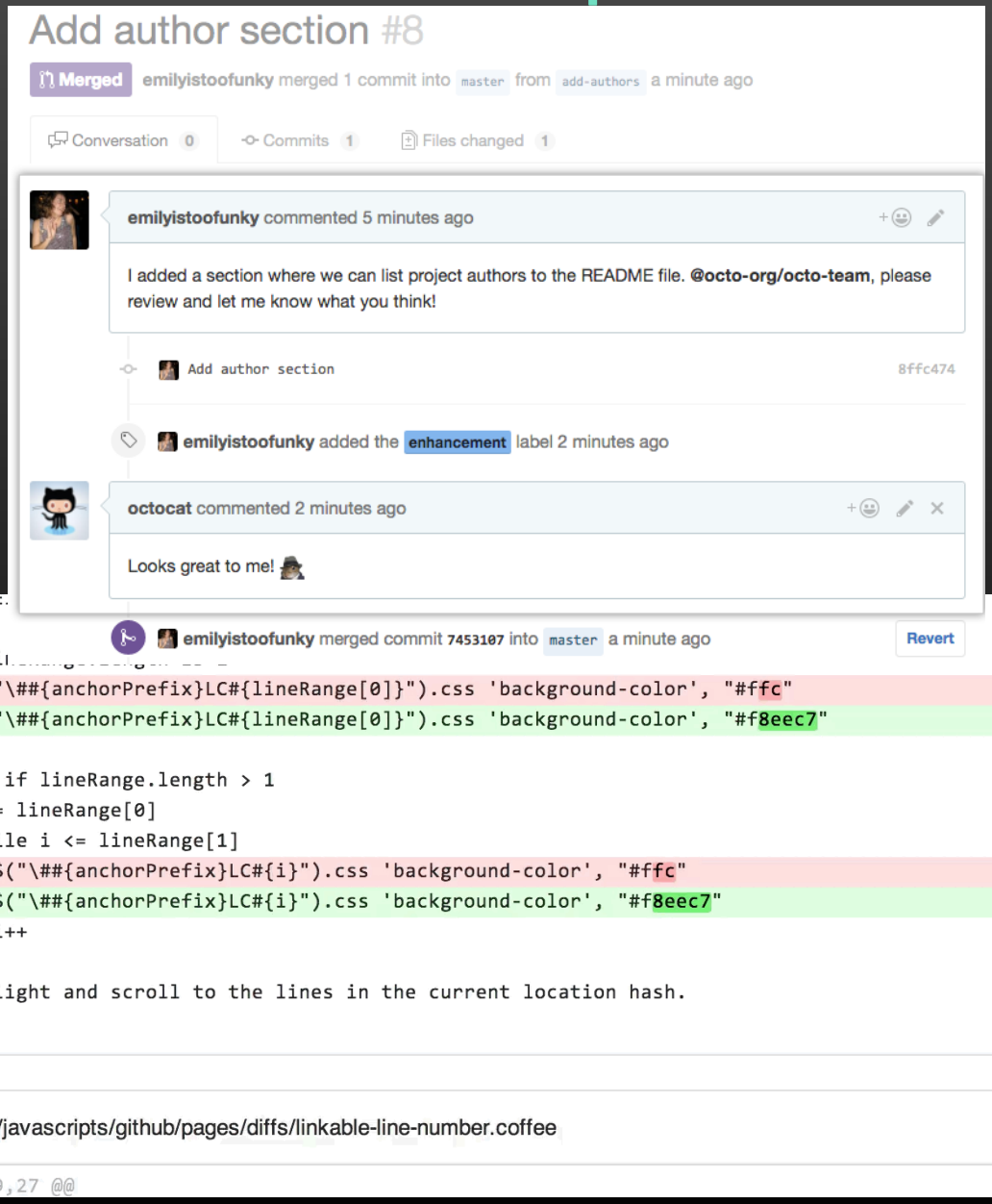
Review an unmerged branch before merge

Different merge strategies

Check whether build passes

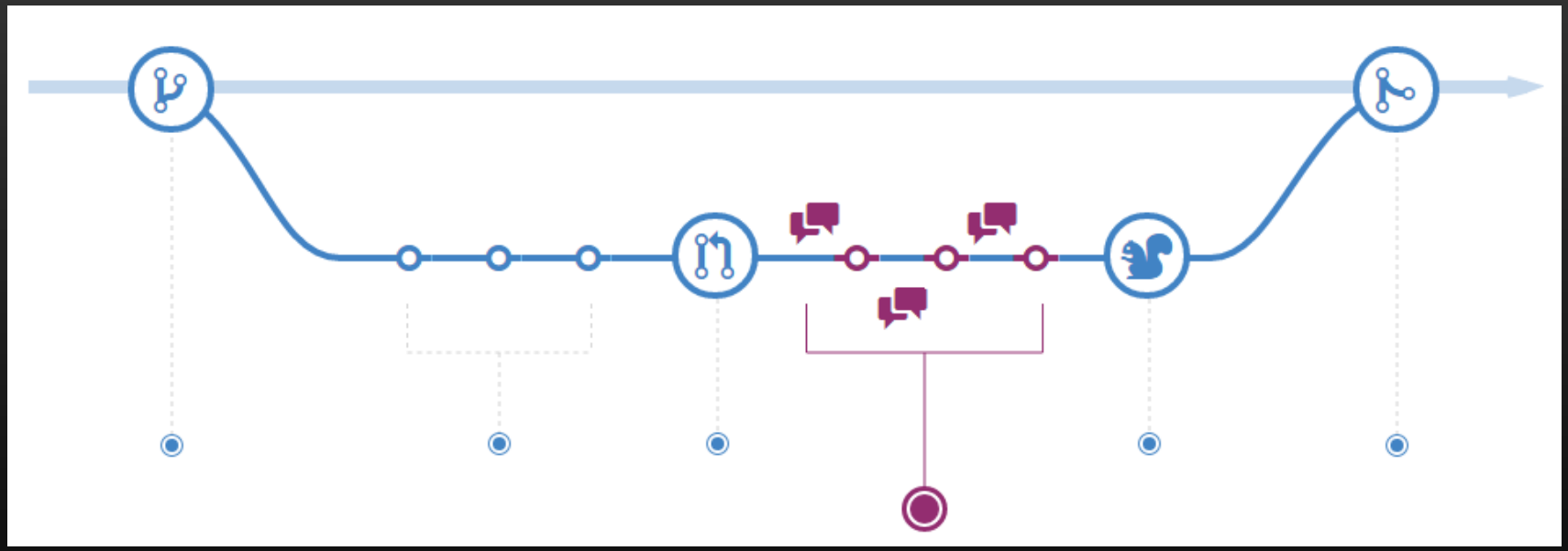
Integrate code review in the workflow with pull requests

All merge requests (ak.a. pull requests) […], whether written by a team member or a volunteer contributor, must go through a code review process to ensure the code is effective, understandable, and maintainable.



Understanding the GitHub Flow

5 minute read Download PDF version



https://guides.github.com/introduction/flow/index.html

In detail: http://scottchacon.com/2011/08/31/github-flow.html

Git-based workflows

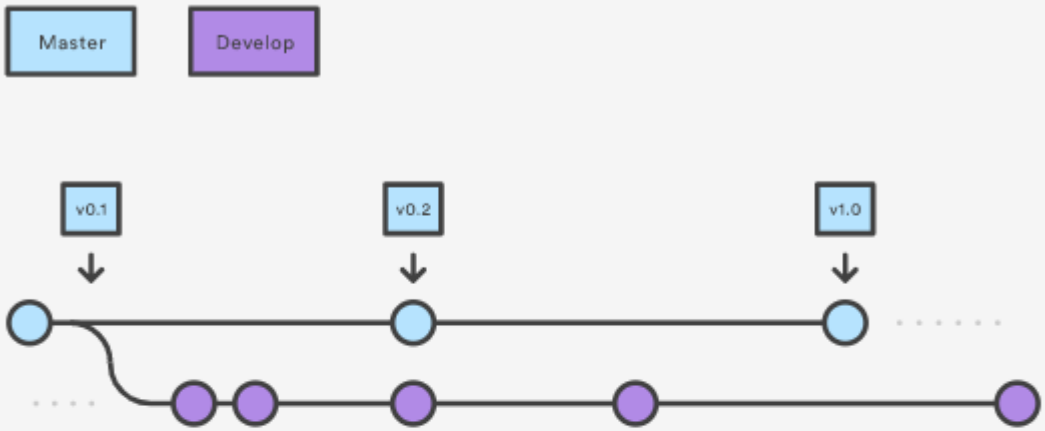
You use Git with a “protocol”

Feature branch

Git flow (releases and dev history)

...

https://www.atlassian.com/git/tutorials/comparing-workflows



Develop and Master Branches

Instead of a single `master` branch, this workflow uses two branches to record the history of the project. The `master` branch stores the official release history, and the `develop` branch serves as an integration branch for features. It's also convenient to tag all commits in the `master` branch with a version number.

Code review "etiquette" ("a set of rules about behaviour for people in a particular profession/social situations")

https://github.com/thoughtbot/guides/tree/master/code-review

Code Review

A guide for reviewing code and having your code reviewed. Watch a presentation that covers this material from Derek Prior at RailsConf 2015.

Everyone

- Accept that many programming decisions are opinions. Discuss tradeoffs, which you prefer, and reach a resolution quickly.
- Ask good questions; don't make demands. ("What do you think about naming this `:user_id`?")
- Good questions avoid judgment and avoid assumptions about the author's perspective.
- Ask for clarification. ("I didn't understand. Can you clarify?")
- Avoid selective ownership of code. ("mine", "not mine", "yours")
- Avoid using terms that could be seen as referring to personal traits. ("dumb", "stupid"). Assume everyone is intelligent and well-meaning.
- Be explicit. Remember people don't always understand your intentions online.
- Be humble. ("I'm not sure - let's look it up.")
- Don't use hyperbole. ("always", "never", "endlessly", "nothing")
- Don't use sarcasm.
- Keep it real. If emoji, animated gifs, or humor aren't you, don't force them. If they are, use them with aplomb.
- Talk synchronously (e.g. chat, screensharing, in person) if there are too many "I didn't understand" or "Alternative solution:" comments. Post a follow-up comment summarizing the discussion.

Having Your Code Reviewed

- Be grateful for the reviewer's suggestions. ("Good call. I'll make that change.")
- A common axiom is "Don't take it personally. The review is of the code, not you." We used to include this, but now prefer to

RULE 1

Do the code reviews before deployment. Your team will end up, on average, spending 7 percentage points% more of its time on building new features compared with those who do after, and 10 percentage points% more than those who don't do code reviews at all.

RULE 2

Make sure all your developers get to review code. This will improve the feeling of empowerment, facilitate knowledge transfer, and improve developer satisfaction and productivity.

RULE 3

The optimal amount of time to spend on code reviews is between 0.5 to 1 day per week per developer.

RULE 4

Make code reviews blocking, that is, don't deploy before they have been carried out.

RULE 5

Be strict and thorough when reviewing code. Your code quality and velocity will thank you.

Oliveira (2018)

https://www.codacy.com/ebooks/guide-to-code-reviews

11 Best Practices for Peer Code Review

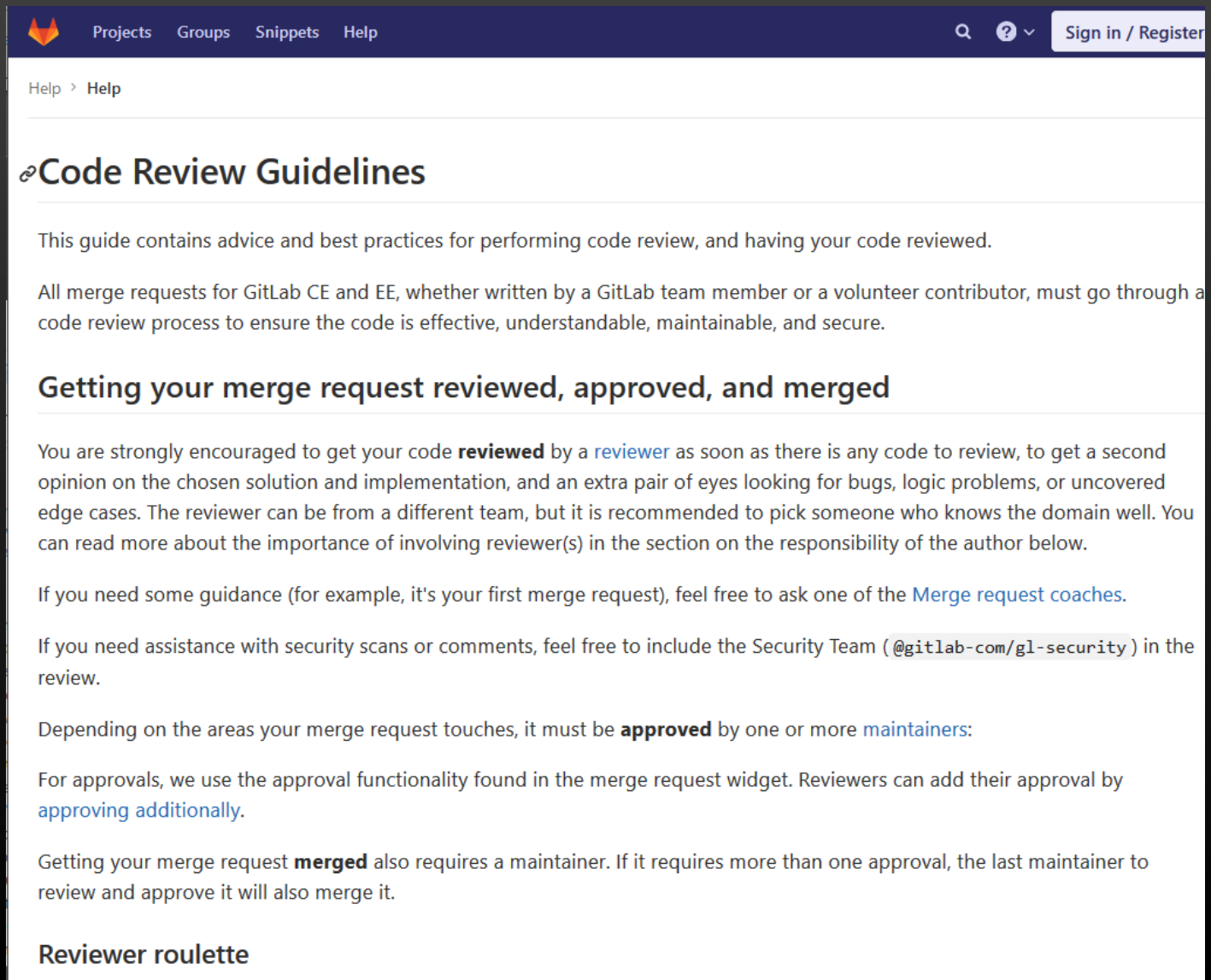
> Open

A SmartBear White Paper

1. Review fewer than 200-400 lines of code at a time.
2. Aim for your inspection rate of less than 300-500 LOC/hour.
3. Take enough time for a proper, slow review, but not more than 60-90 minutes.
4. Authors should annotate source code before the review begins.
5. Establish quantifiable goals for code review and capture metrics so you can improve your processes.
6. Checklists substantially improve results for both authors and reviewers.
7. Verify that defects are actually fixed!
8. Managers must foster a good code review culture in which finding defects is viewed positively.
9. Beware the "Big Brother" effect.
10. The Ego Effect: Do at least some code review, even if you don't have time to review it all.
11. Lightweight-style code reviews are efficient, practical, and effective at finding bugs.

Guidelines from specific tooling

https://gitlab.com/help/development/code_review.md



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Code Review Guidelines

This guide contains advice and best practices for performing code review, and having your code reviewed.

All merge requests for GitLab CE and EE, whether written by a GitLab team member or a volunteer contributor, must go through a code review process to ensure the code is effective, understandable, maintainable, and secure.

Getting your merge request reviewed, approved, and merged

You are strongly encouraged to get your code **reviewed** by a reviewer as soon as there is any code to review, to get a second opinion on the chosen solution and implementation, and an extra pair of eyes looking for bugs, logic problems, or uncovered edge cases. The reviewer can be from a different team, but it is recommended to pick someone who knows the domain well. You can read more about the importance of involving reviewer(s) in the section on the responsibility of the author below.

If you need some guidance (for example, it's your first merge request), feel free to ask one of the Merge request coaches.

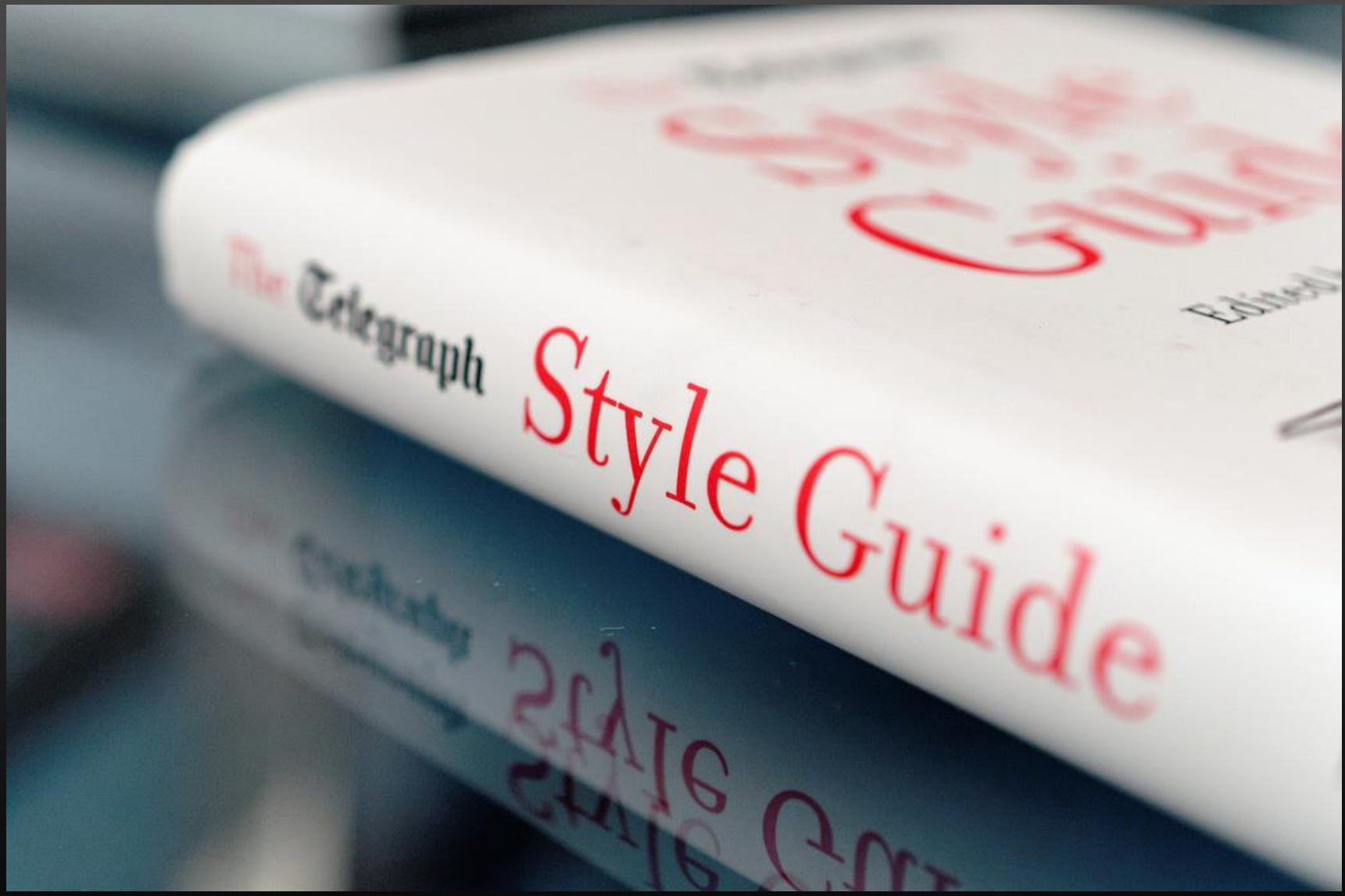
If you need assistance with security scans or comments, feel free to include the Security Team (`@gitlab-com/gl-security`) in the review.

Depending on the areas your merge request touches, it must be **approved** by one or more maintainers:

For approvals, we use the approval functionality found in the merge request widget. Reviewers can add their approval by approving additionally.

Getting your merge request **merged** also requires a maintainer. If it requires more than one approval, the last maintainer to review and approve it will also merge it.

Reviewer roulette


The Telegraph
Style Guide

Code style **improves readability**

Major references

Google coding styles

Mozilla Coding Style

Code style for projects:

Android open-source project (Good source for Java developers)

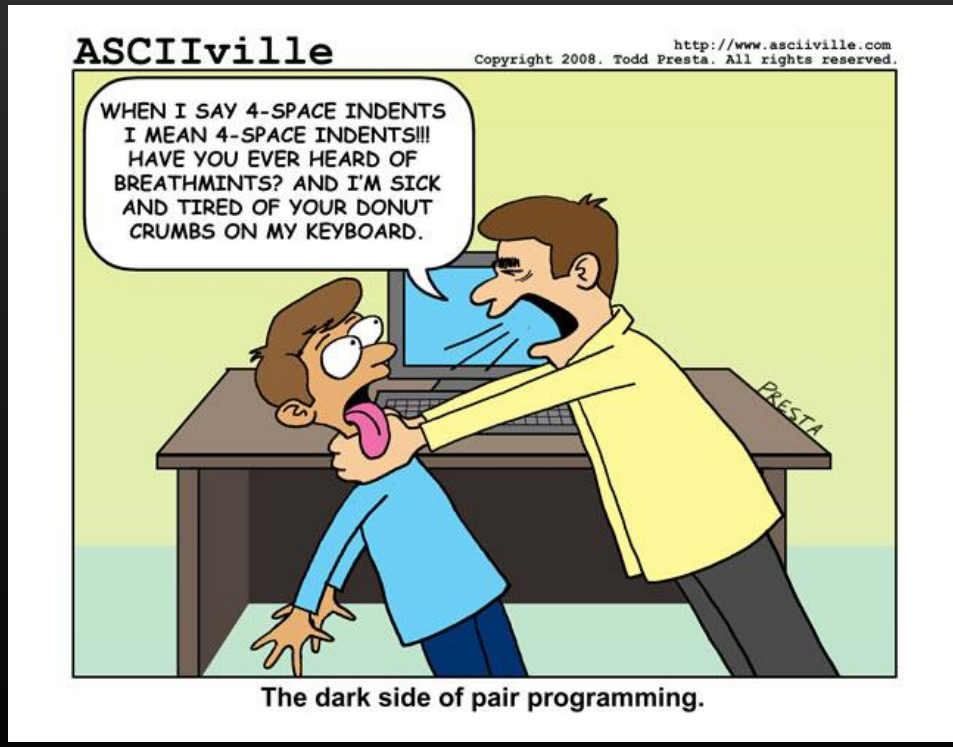
Code style for Chromium open source (after Google C++ style)

Java

Original conventions for Java

Linux

Kernel coding style



The dark side of pair programming.

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