Reading Code

Martin Kellogg

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Today’s agenda:

- Why does reading code matter?
- Strategies for reading code effectively
- Role of documentation
- Examples from Covey.Town

But first: reading quiz!

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A. Connect4
B. Tic-Tac-Toe
C. Snakes and Ladders
D. None of these

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- Code understanding is a **necessary precursor** for most other development activities:
  - debugging, testing, using an API, adding new features, etc.
- Most "code reading" is done **in service to some other goal**
  - i.e., a developer reads code because they want to add a new feature, fix a bug, etc.; not for its own sake

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My advice: Keep the goal in mind whenever you’re reading code. It’s easy to spend a long time looking at an irrelevant part of the system!

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Foreshadowing: the benefits of reading code are also one of the main advantages of "modern" code review, which we'll discuss later

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- To be productive in such a codebase, you need to be capable of making changes without having read all of the code
  - implication: you need strategies for figuring out which parts of the code are actually **important** to read for the task at hand!

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- Useful when you're unfamiliar with the code's application domain

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  - this technique requires you to have some idea of what you’re looking for, though

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    - trace the code backwards from there using a bottom-up strategy

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- However, documentation is limited: it is often **not up to date** vis-a-vis the code (usually because someone forget to update docs)
  - code is the source of truth about what the system actually does

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My advice: Trust documentation until you see evidence that it's wrong. But, always be willing to dive into the code if there is an inconsistency between docs and the behavior that you observe. Think critically!

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My advice: Following the best practices we talked about in the code-level design lecture gives most of the benefits of self-documenting code anyway. Use documentation to explain **rationale/why**, not what the code does (assume other devs know how to read code, too).

Example: how do tile maps work in covey.town?

- Suppose that for a course project, we’re interested in making some kind of modification to the “main map” of covey.town
    - this could be modifying the layout, adding a new area, etc.
- Let’s figure out how we would do something like this together!

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- Suppose that we want to modify how Town.ts (in the backend) adds a player to the town
  - it’s an “async” function
    - what does that mean?

async and promises

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- Promises interact mostly by passing values to one another
    - minimizes ***data races*** (a data race occurs when two instructions from different processes access the same memory location, and at least one of them is a write)

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- Utilize this "wasted" time by **doing something else**
    - e.g., processing data, communicating with remote hosts, timers that countdown while our app is running, waiting for users to provide input, etc., by **running a promise**

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- Whenever you do any kind of I/O (or other “slow” activity), you should use the promise system!

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Aside: a software engineer can be "blocked" if they're waiting for something from a coworker. This is a direct analogy to the I/O sense of "blocked" on this slide.

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```
async function makeRequest(requestNumber : number) {
  // some code (to be executed now)
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      await axios.get('https://rest-example.covey.town')
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- The http request is sent immediately.
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- The caller of `makeRequest` resumes immediately.

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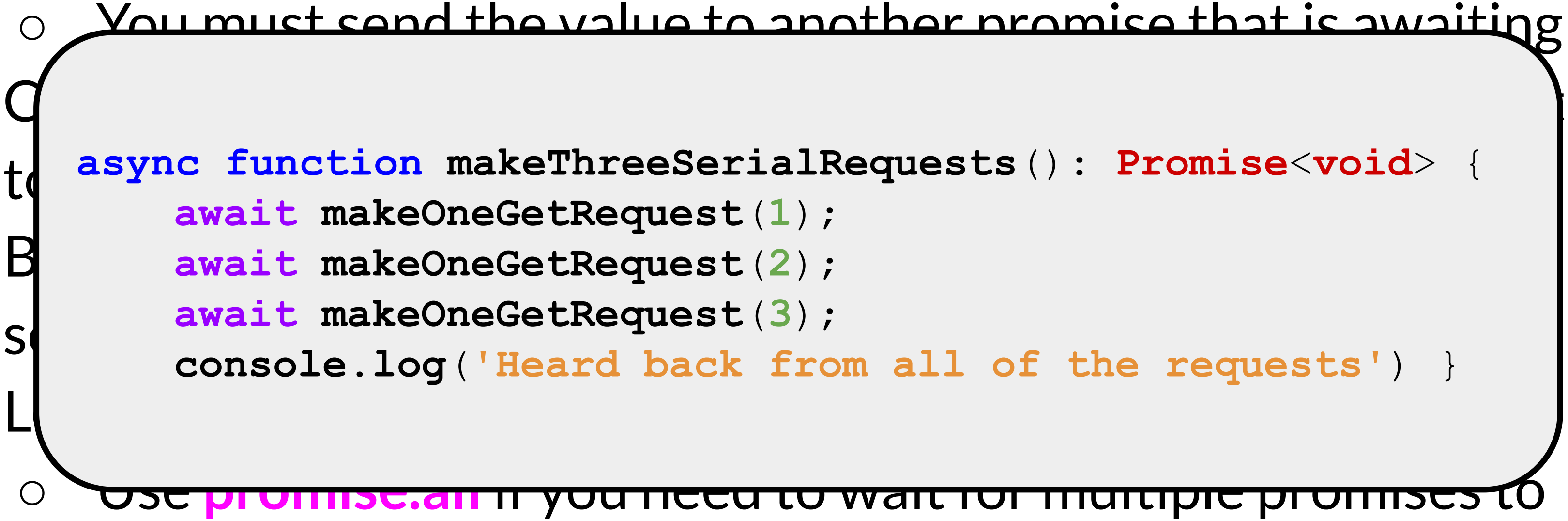

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async function makeThreeSerialRequests(): Promise<void> {
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"Make all of the requests now, then wait for all of the responses"

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- Leverage concurrency when possible
  - Use **promise.all** if you need to wait for multiple promises to return.
- Check for errors with **try**/**catch**

Takeaways

- Reading code is an important software engineering skill
  - like any skill, it requires **practice**!
- It’s usually infeasible to read all of the code, so you should focus on the parts that matter for whatever you’re trying to do
- Documentation is often useful, but also often wrong
  - important for context, but for details read the source code
- async/await are useful concurrency tools in TypeScript
  - you’ll need them for the course project

Advertising

- I’m coaching the ICPC team this year, and I’d love to have any/all of you participate
  - info session **TODAY** at 4pm, GITC 2121
  - ICPC is a team programming contest
    - excellent prep for LeetCode-style technical interviews!
  - we’ll run weekly practices until the real contest in November (?)
  - NJIT was most-improved team in our region last year
    - but we still finished 23rd(!), so plenty of room to improve
    - who doesn’t want to show up Rutgers/Columbia/NYU/etc?