Copilot Workspace: From Concept to Preview

Don Syme and the whole Copilot Workspace team
GitHub Next

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Investigating the future of software development

The Situation

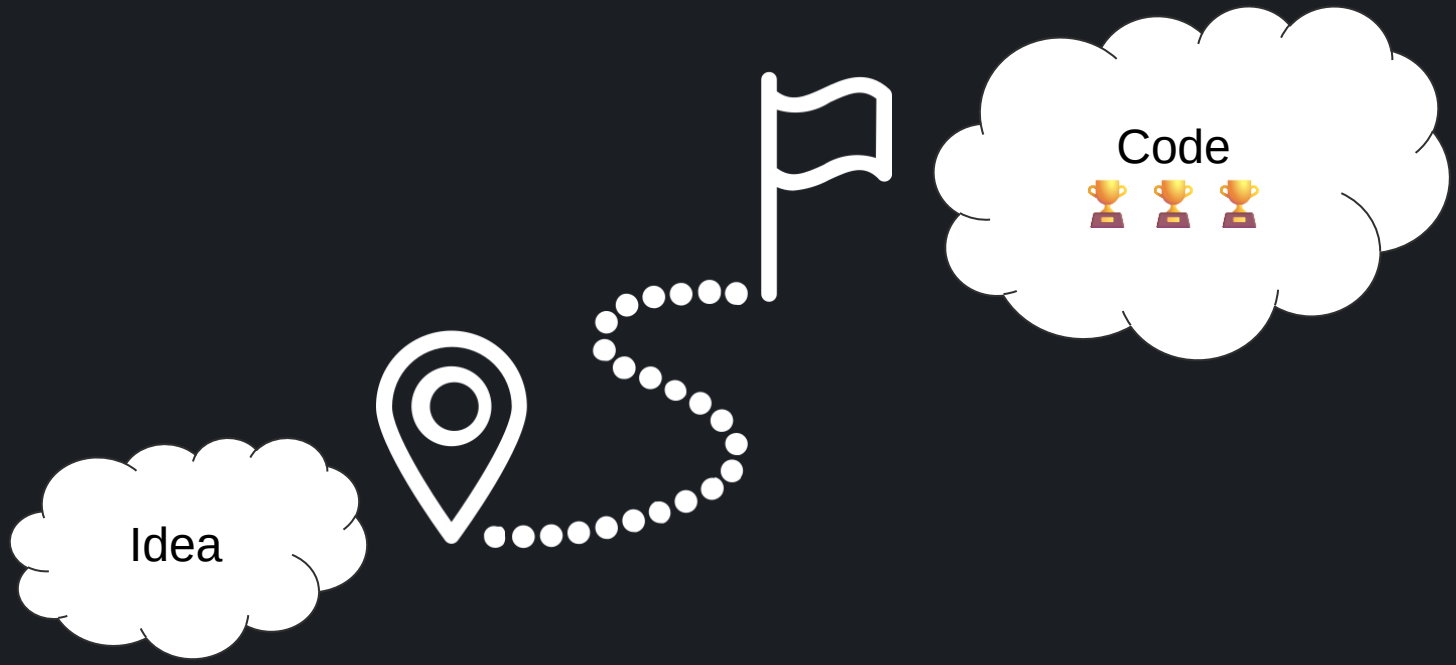
Software activity begins with words and intent

Before a code change, before a pull request, there are words - a discussion, a bug report, a feature request, an engineering task, a meeting, a design document, an idea.

A Journey, Together

https://www.flaticon.com/free-icons/

A Journey, Together



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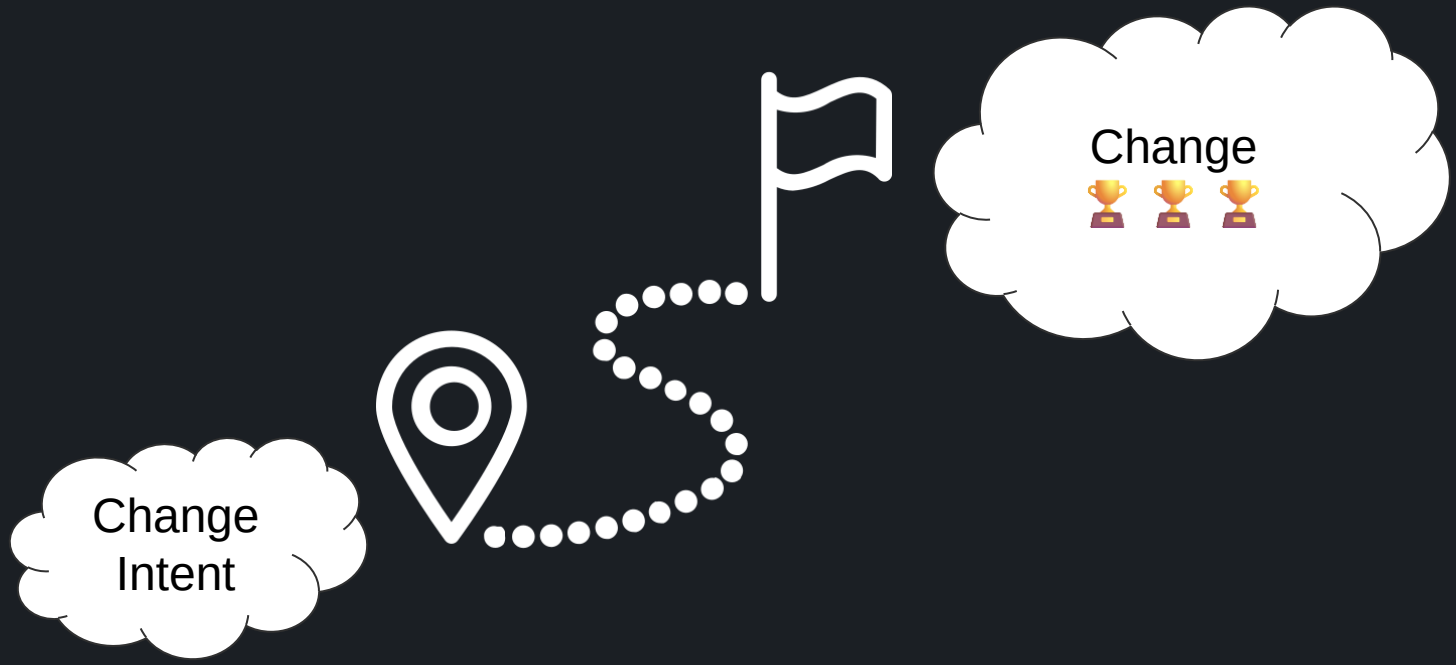

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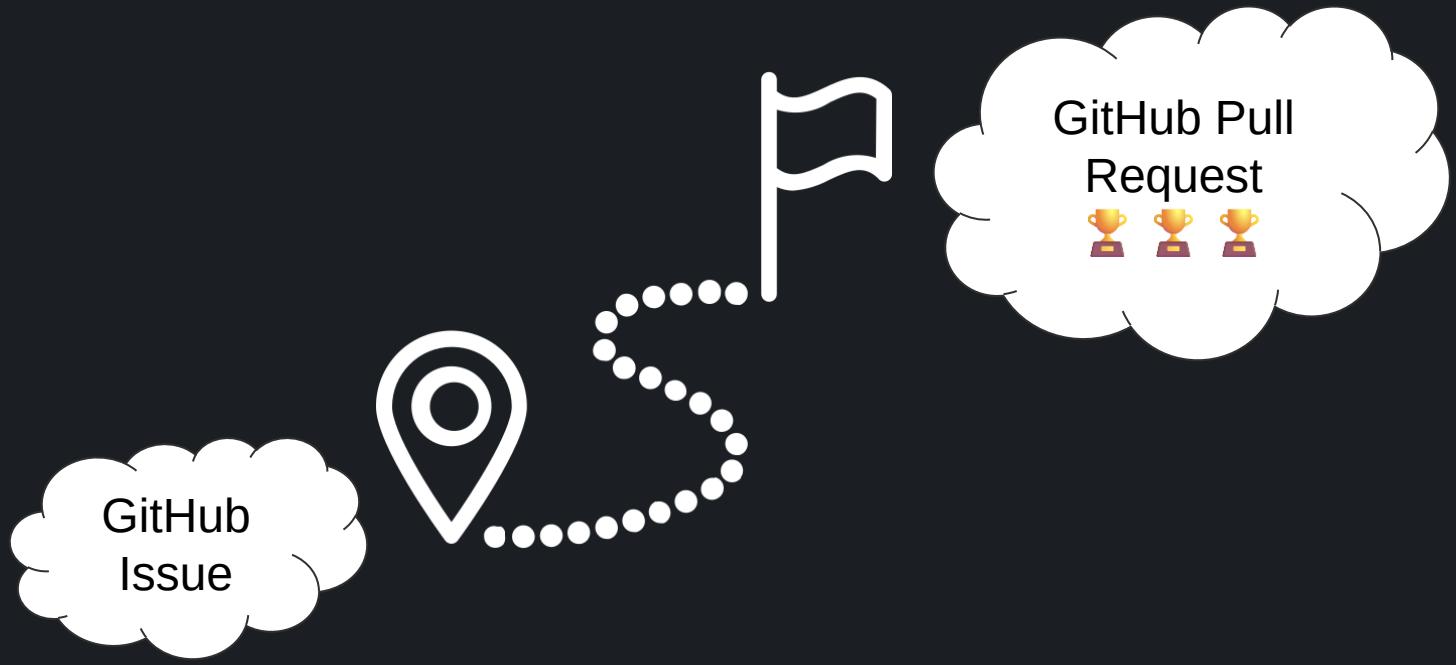

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A Journey, Together

The original GitHub Copilot completes code in your editor

- You are already located at a pinpoint of change
- You accept/reject small bits
- You move your cursor around
- You have to type quite a lot
- Copilot sort of infers what you are trying to do

This is magical: a finely honed surgical assistant

A Journey, Together

Changing perspective

Pinpoint Surgery → Whole Operation

Single Point of Change → Whole Repository

Implicit Task →
Explicit Task

A Journey, Together

“Add a refresh button to the main page”

“Create end-to-end tests using Playwright”

“Set up continuous integration using GitHub Actions”

“Set up production resources in Azure using Terraform”

“Read this coverage report and add more unit tests to this repository”

The Need

Contextual. Aware of the context — repository, issue, pull request

Assistive. Navigate unfamiliar tasks, augmenting your development skills

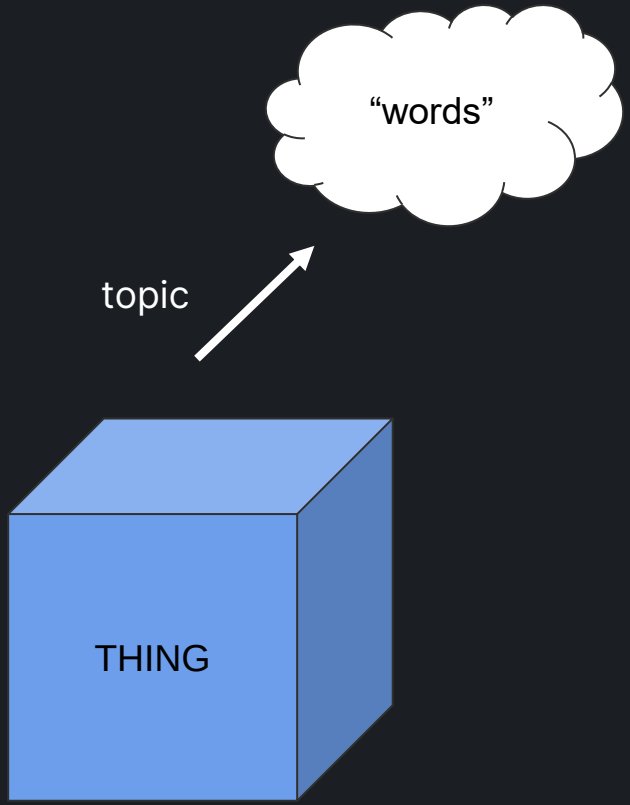
Pervasive. Ready and waiting for you, wherever software change begins, on every issue in every repository

Iterative. Empowers you to check, review, refine AI-generated outputs - you are in control

Collaborative. You share sessions with your team, publish links to your sessions.

Configurable. Integrate into workflows, e.g. via deep links

The Original Concept



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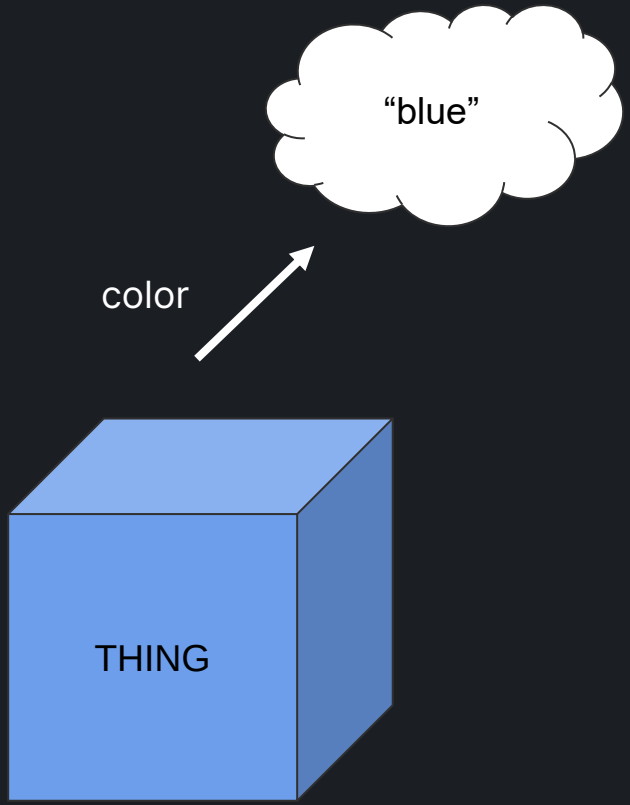

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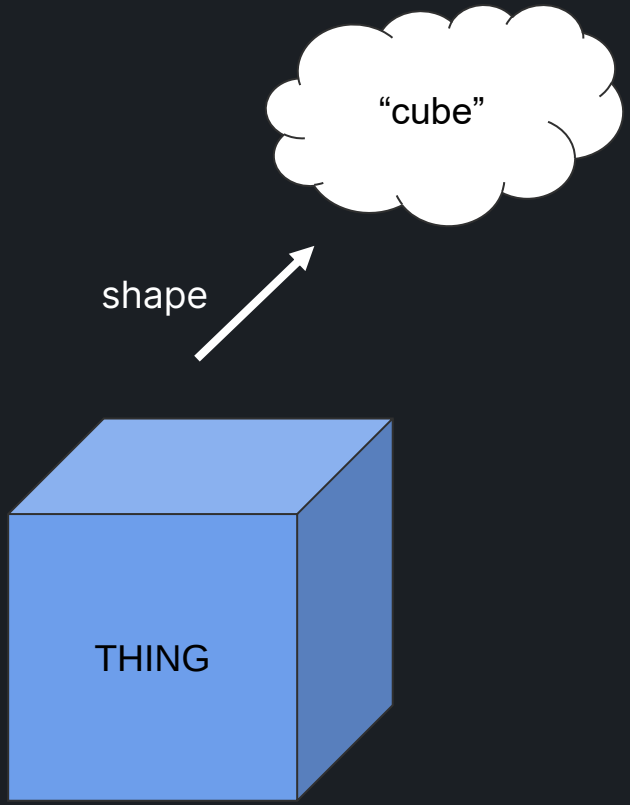

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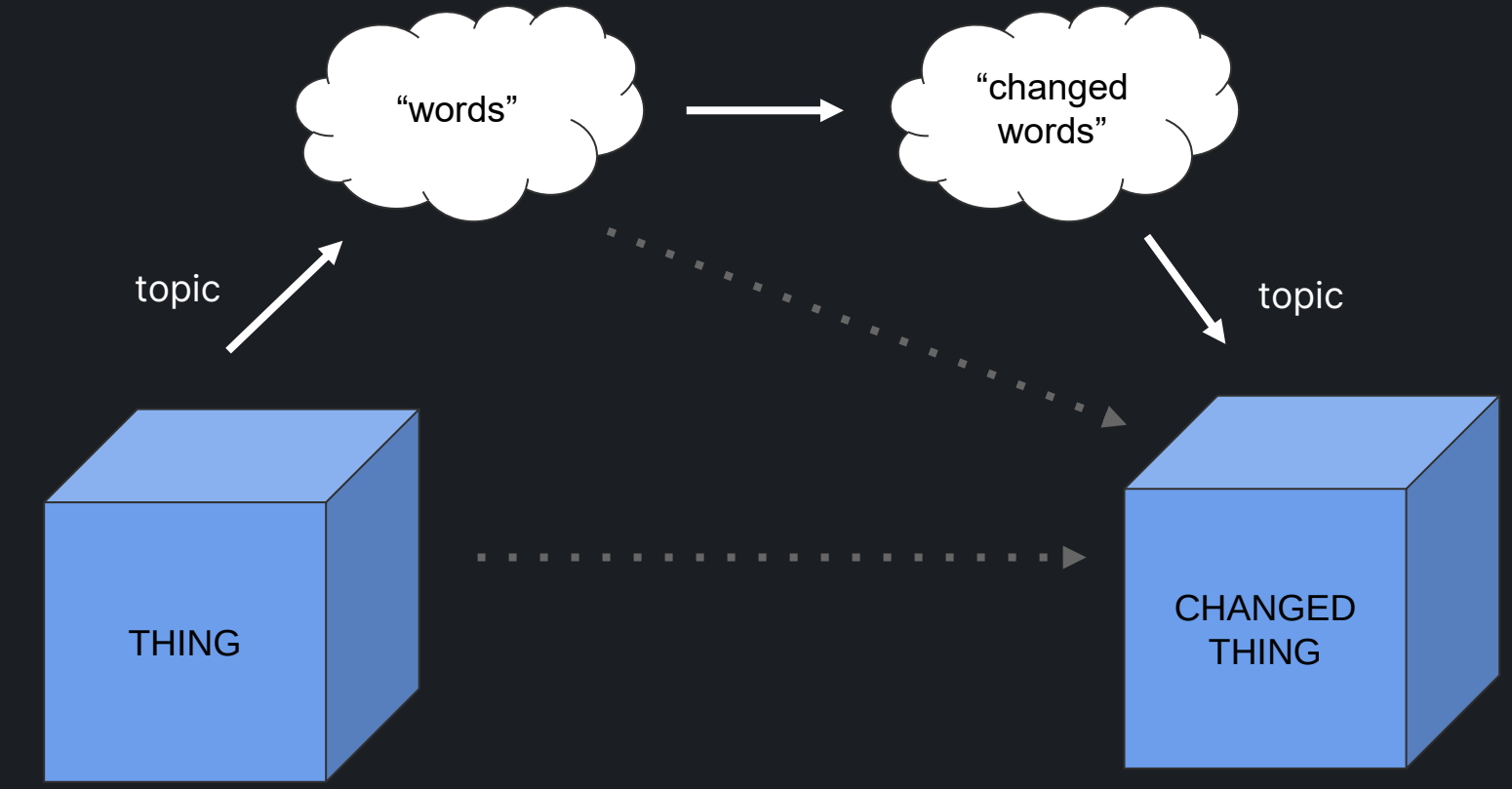

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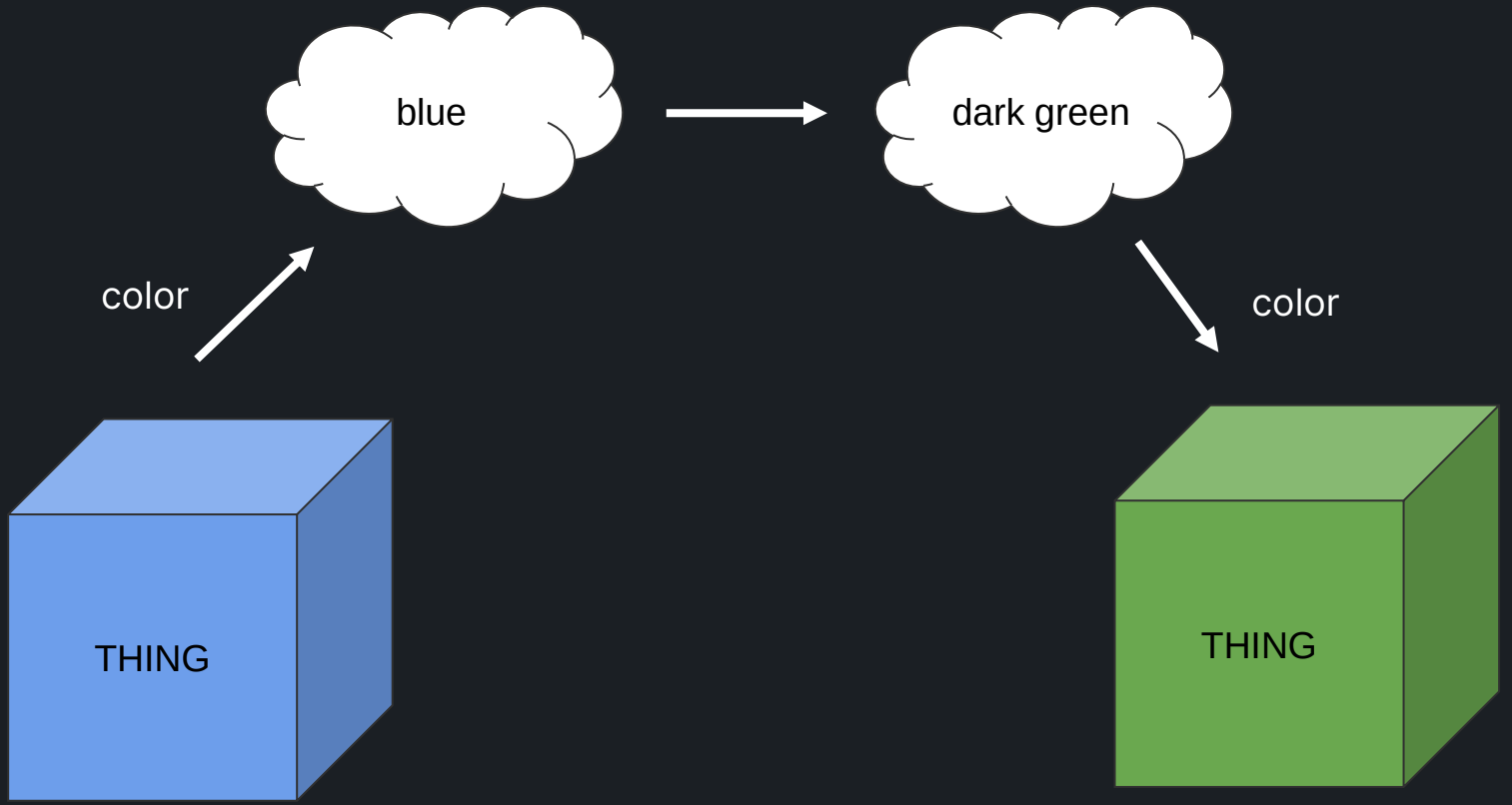

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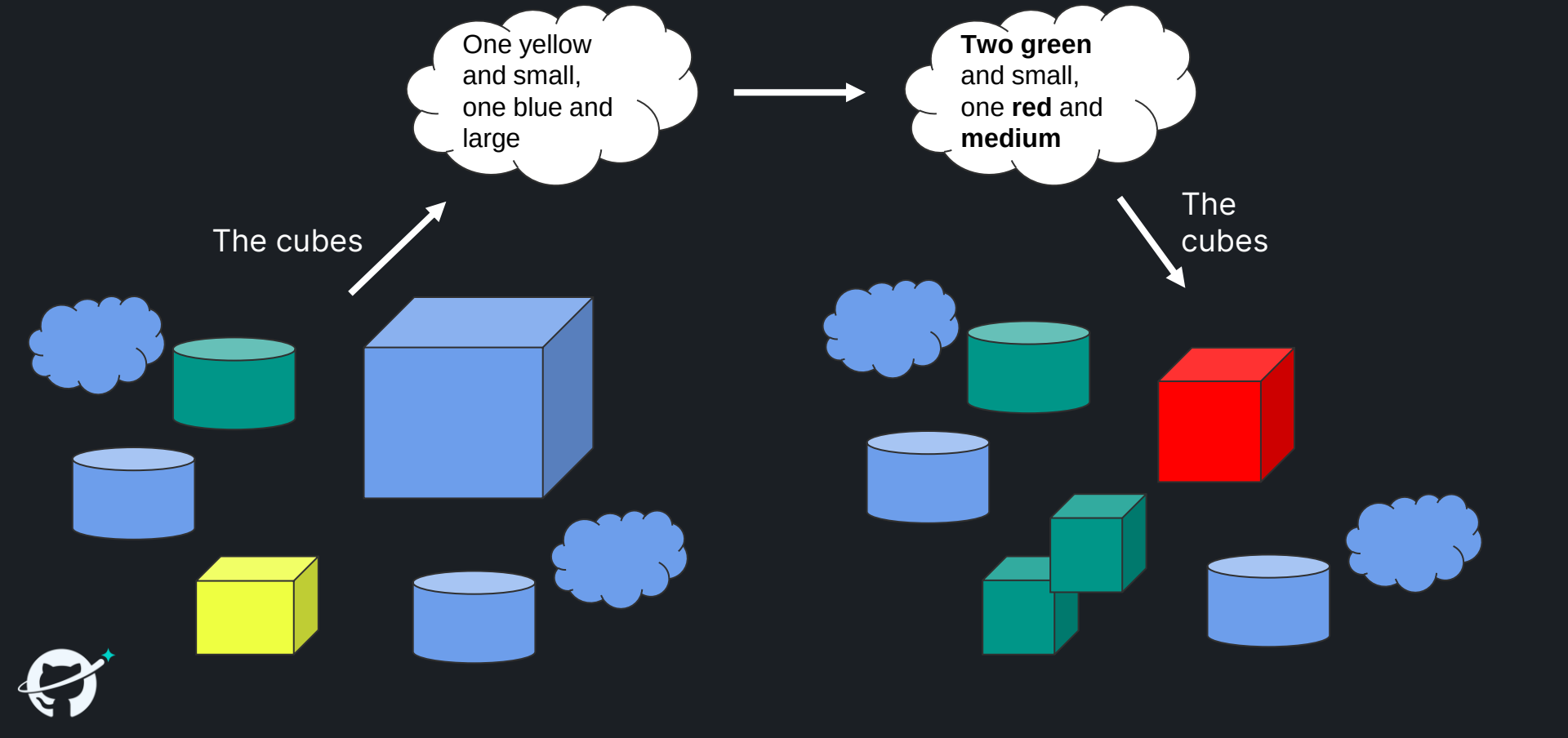

Principles

- Change is described in **natural language**
- Specifications are **ephemeral**
- There are **many possible specifications**, one for each task/topic
- Embrace the **fluidity** and **power** of **words**
- The model both **hides** and **fills in** the details

Demo

From Agents to Co-agents

AI tooling is an endless sequence of divergence and re-convergence between the human and the AI. This is the "**Co**" in "**Co**pilot".

An AI **agent** is usually conceptualised as autonomous.We must discard this thinking, and instead embrace a variation of the concept suited for integration into **Co**pilot: **co-agents**.

A **co-**agent is a controllable, guidable, cooperative unfolding of the reasoning and decision points of an agent.

If an autonomous agent has progress A → B → C, the co-agent is one that can

- propose step A to the human - or multiple possibilities A1, A2 etc.
- receive confirmation of A **and/or adjustment to take step A'**
- etc..

From Agents to Co-agents

- Co-agents don’t offer more in a step than a human can digest
- Each significant offering from a co-agent is editable
- Those edits apply to all downstream offerings
- Co-agents attempt to maintain the integrity of their offerings under change to inputs

Techniques and challenges

- Extracting and authoring change intent
- Iterative lowering of change intent
- Partial repository selection
- Partial repository rewriting

Techniques and challenges

- Extracting and authoring change intent
  - Start with GitHub issues or ephemeral tasks
  - User and AI in co-operation, iteratively
- Iterative lowering of change intent
- Partial repository selection
- Partial repository rewriting

Techniques and challenges

- Extracting initial change intent
- Iterative lowering of change intent
  - Change Intent → Plan → Changes
  - Iteration and clarification
  - User and AI in co-operation
- Partial repository selection
- Partial repository rewriting

Techniques and challenges

- Extracting initial change intent
- Iterative lowering of change intent
- Partial repository selection
  - Crucial for almost every AI feature
  - Based on topic, plan etc
  - Use combination of search, LLM
  - Scales to truly massive repositories
- Partial repository rewriting

Techniques and challenges

- Extracting initial change intent
- Iterative lowering of change intent
- Partial repository selection
- Partial repository rewriting
  - The key performance bottleneck
  - Very challenging to scale
  - Plan files, rewrite some of them
  - Iteration currently at file granularity

The Future of Programming?

- Software is **created** using words
- Software is **changed** using words
- **Code** is still the permanent notation of record

The programming language used is still critical (like the format used for an image or document is critical)

Give it a go!

- Sign up to the preview!
  send us your github handle, we'll get you added
- githubnext.com/projects/copilot-workspace/

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githubnext.com

Key Challenges

- Getting Closer to the Dev Loop
  - **Web delivery** for generality and simplicity
  - Eventually **IDE delivery** to get closer to the dev loop
  - **Issue-first** workflows
  - Utilise **codespaces** as a general runtime for dev/test loop