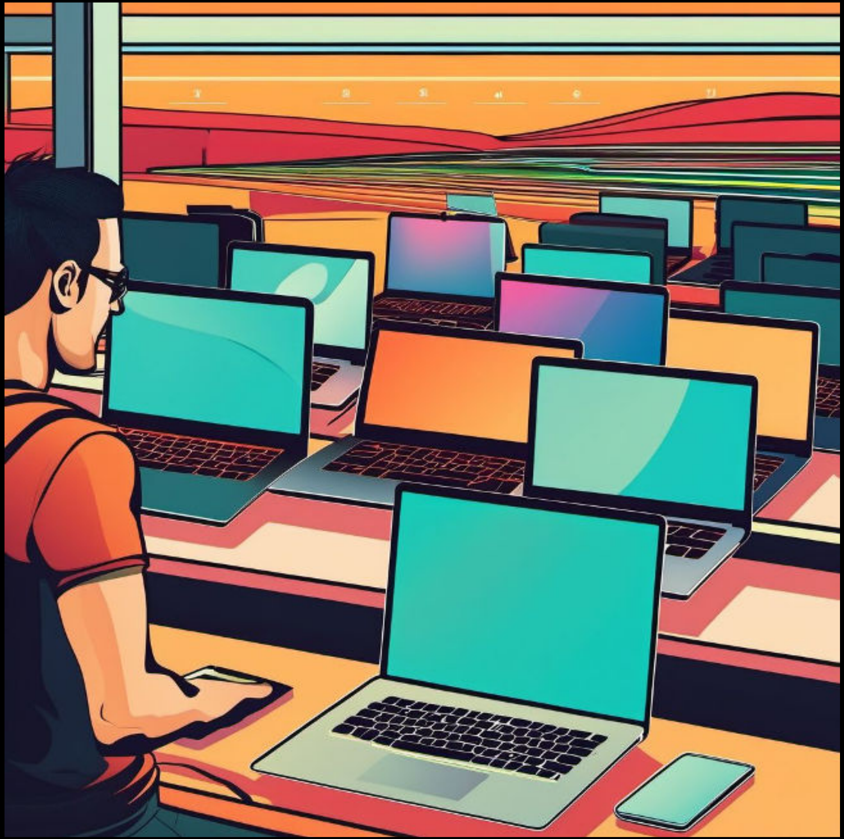
From Myth to Legend

How Generative AI can Supercharge Productivity to Create 10x Developers

Gautam Korlam
Principal Engineer

Serdar Badem
Lead Product Manager

Myth of the 10X developer



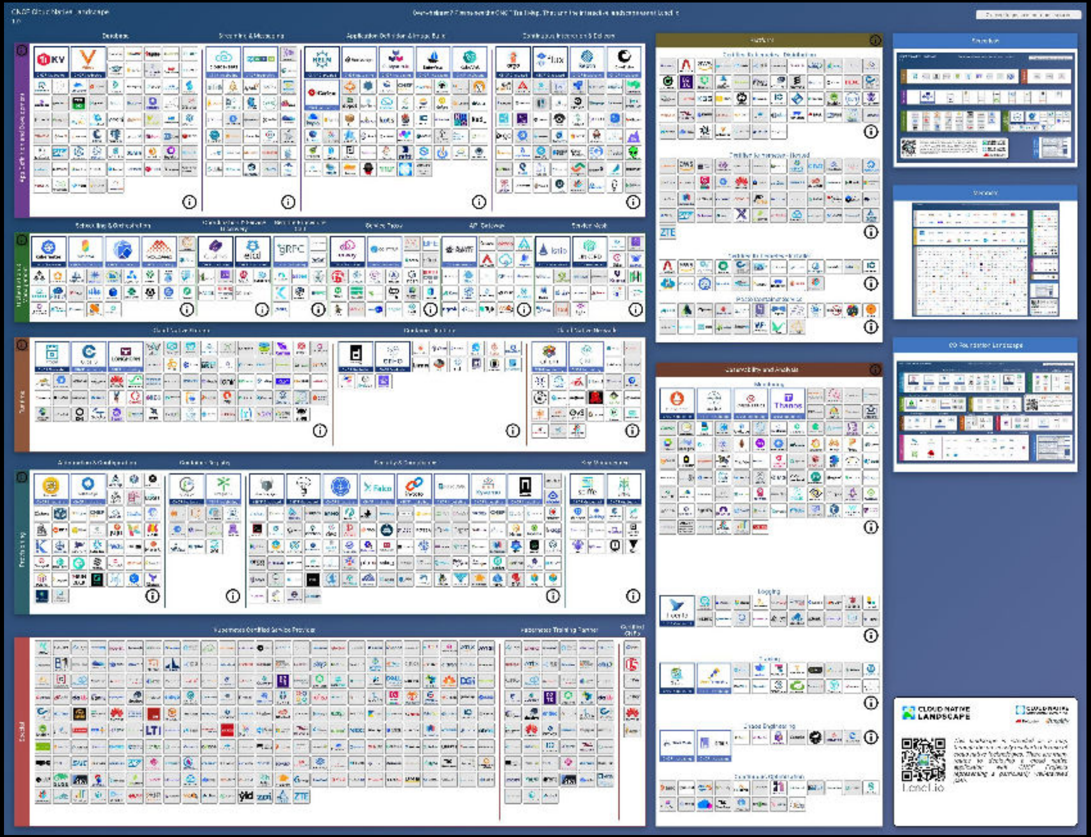
Knowledgeable

Productive

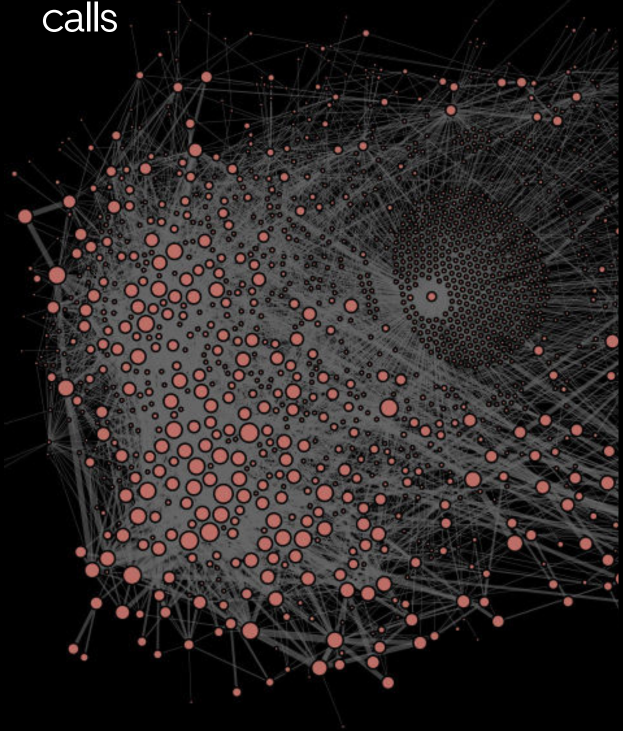
100%

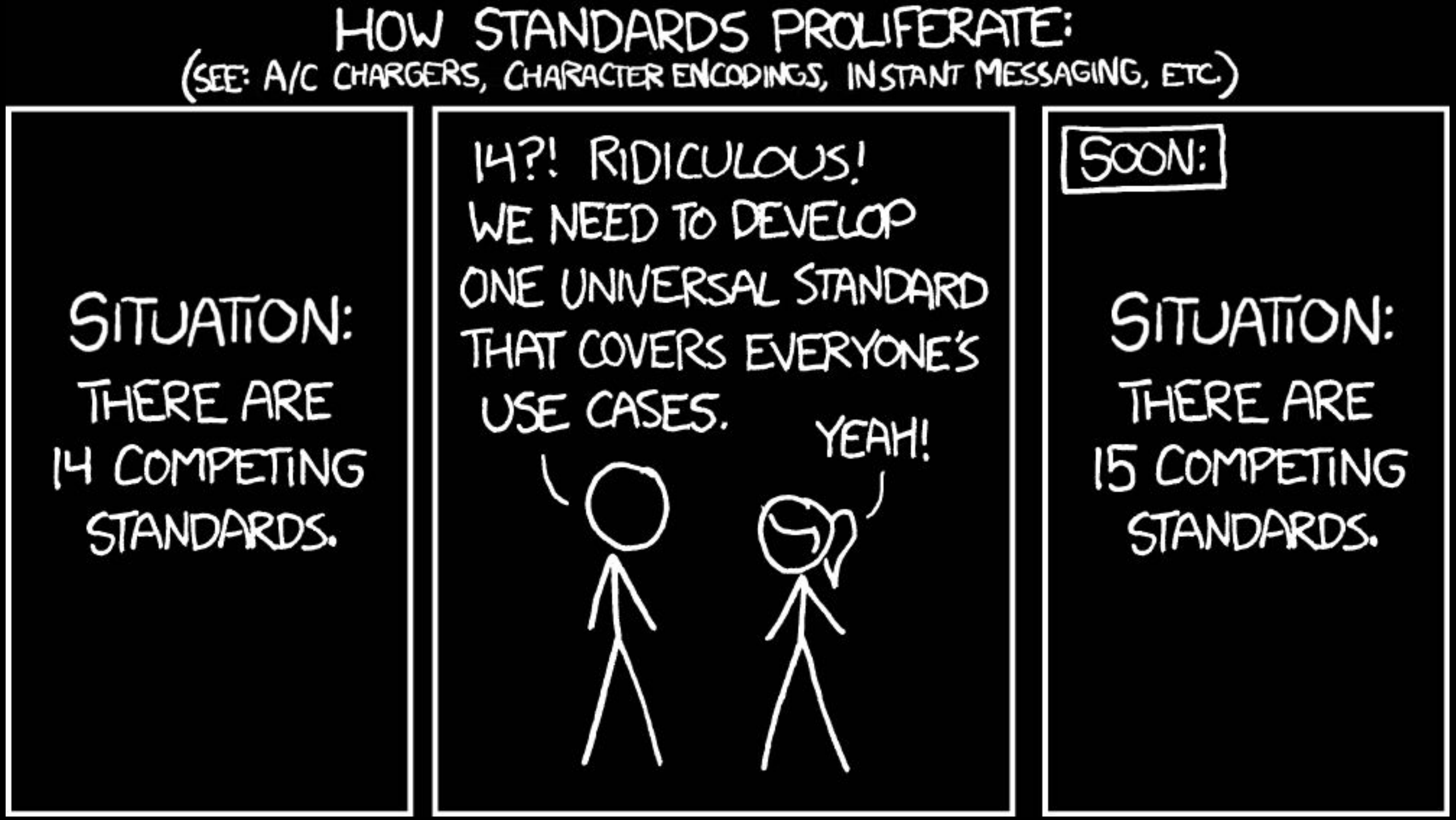
Perfectionist

Modern software complexity

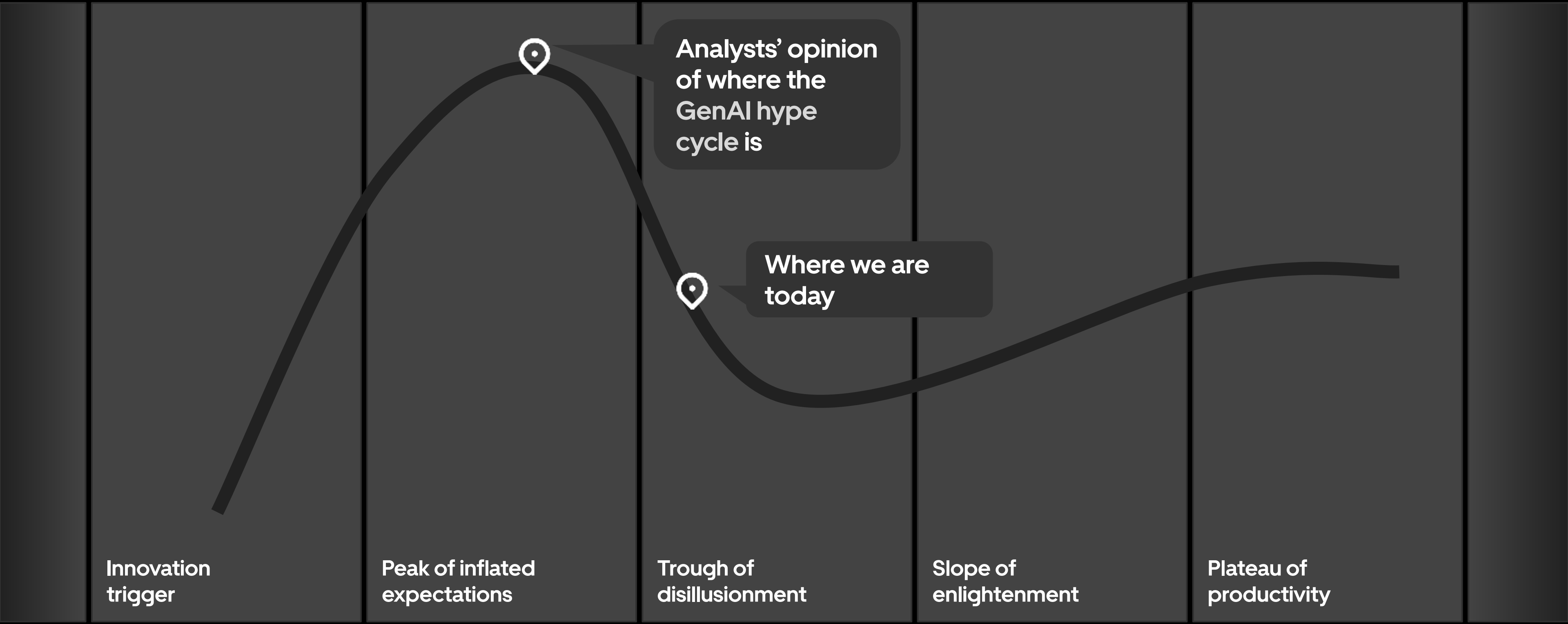


Thousands of services and hundreds of thousands of RPC calls




HOW STANDARDS PROLIFERATE:
(SEE: A/C CHARGERS, CHARACTER ENCODINGS, INSTANT MESSAGING, ETC.)
SITUATION:
THERE ARE 14 COMPETING STANDARDS.
14?! RIDICULOUS! WE NEED TO DEVELOP ONE UNIVERSAL STANDARD THAT COVERS EVERYONE'S USE CASES.
YEAH!
SOON:
SITUATION:
THERE ARE 15 COMPETING STANDARDS.

Enter Generative AI

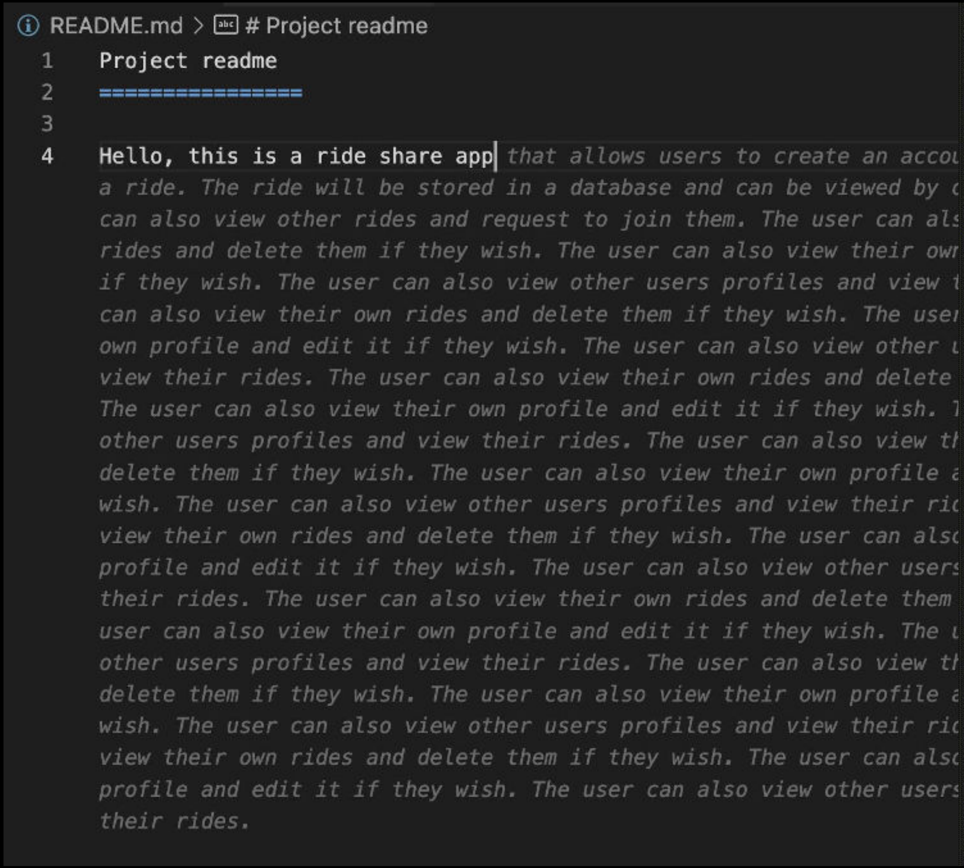


Analysts' opinion of where the GenAI hype cycle is

Where we are today

GenAI Hype Cycle

Expectations vs (alternate) reality



```
Project readme
================

Hello, this is a ride share app that allows users to create an accou
a ride. The ride will be stored in a database and can be viewed by c
can also view other rides and request to join them. The user can als
rides and delete them if they wish. The user can also view their owr
if they wish. The user can also view other users profiles and view t
can also view their own rides and delete them if they wish. The user
own profile and edit it if they wish. The user can also view other u
view their rides. The user can also view their own rides and delete
The user can also view their own profile and edit it if they wish. T
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delete them if they wish. The user can also view their own profile a
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view their own rides and delete them if they wish. The user can also
profile and edit it if they wish. The user can also view other users
their rides. The user can also view their own rides and delete them
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delete them if they wish. The user can also view their own profile a
wish. The user can also view other users profiles and view their ric
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profile and edit it if they wish. The user can also view other users
their rides.
```
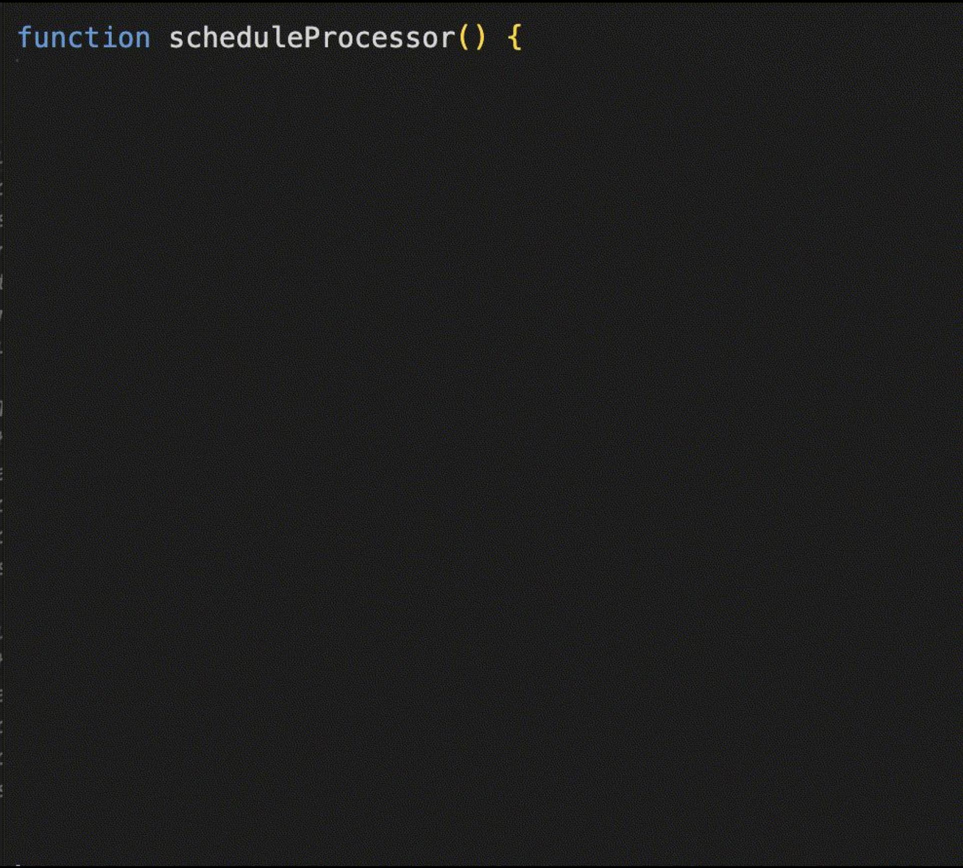
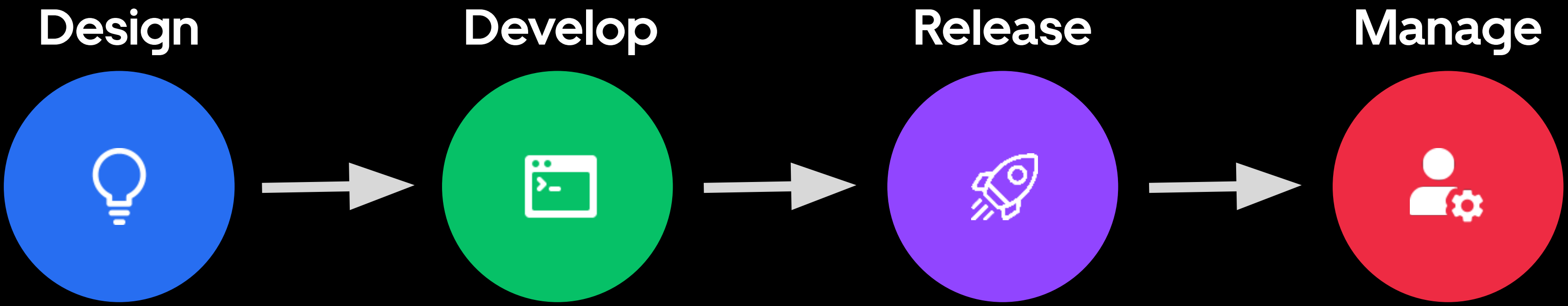



```
function scheduleProcessor() {
```

Gen AI opportunities in SDLC

AI opportunities in the developer workflow



Design

Develop

Release

Manage

Documentation

Design Review

UX Design

Code Generation

Code Quality

End to End Testing

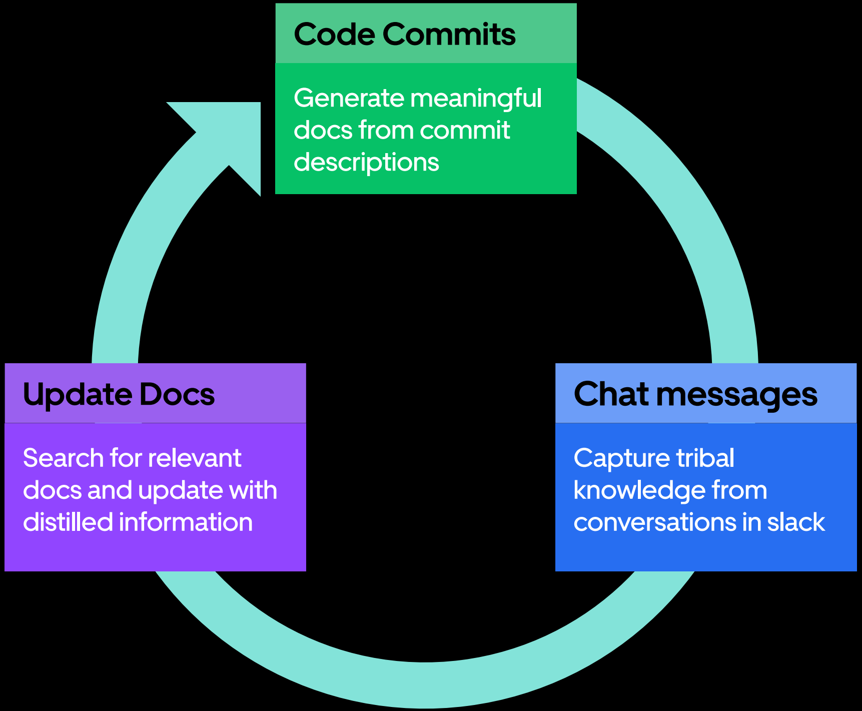
Incident Management

Automated Fixes

Knowledge Base, Support

Tailored to your enterprise

Automatic documentation freshness



Code Commits

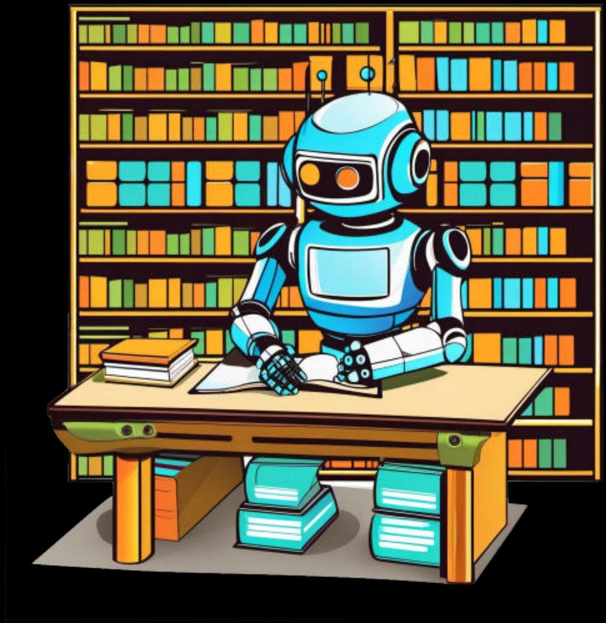
Generate meaningful docs from commit descriptions

Chat messages

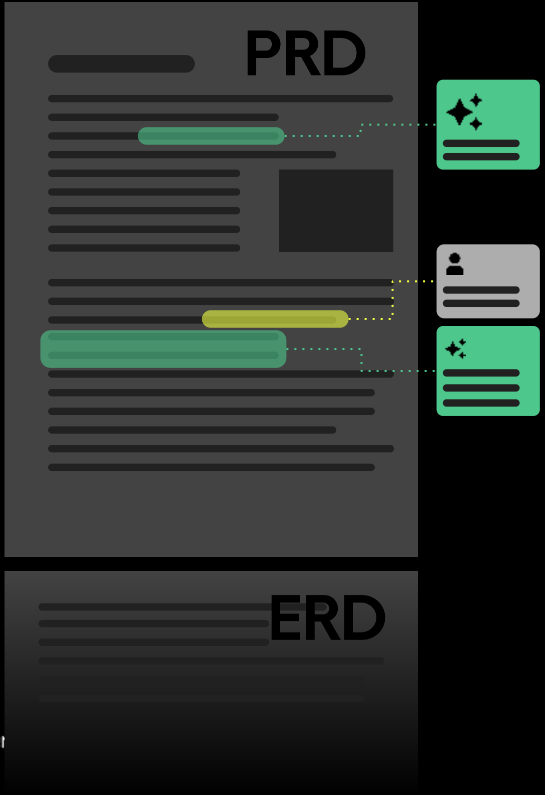
Capture tribal knowledge from conversations in slack

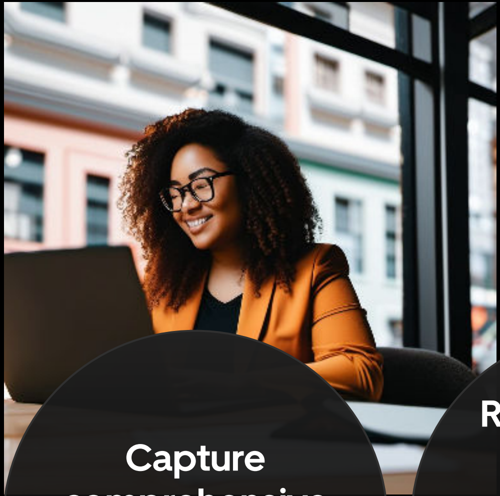
Update Docs

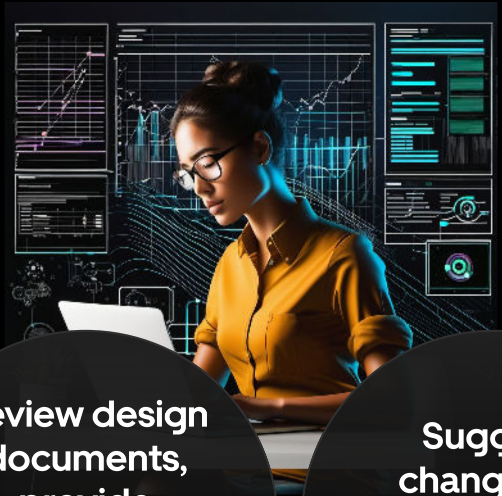
Search for relevant docs and update with distilled information



Automatic review of design requirements







Capture comprehensive requirements first time

PM, Product Ops, Sec, Privacy, Legal

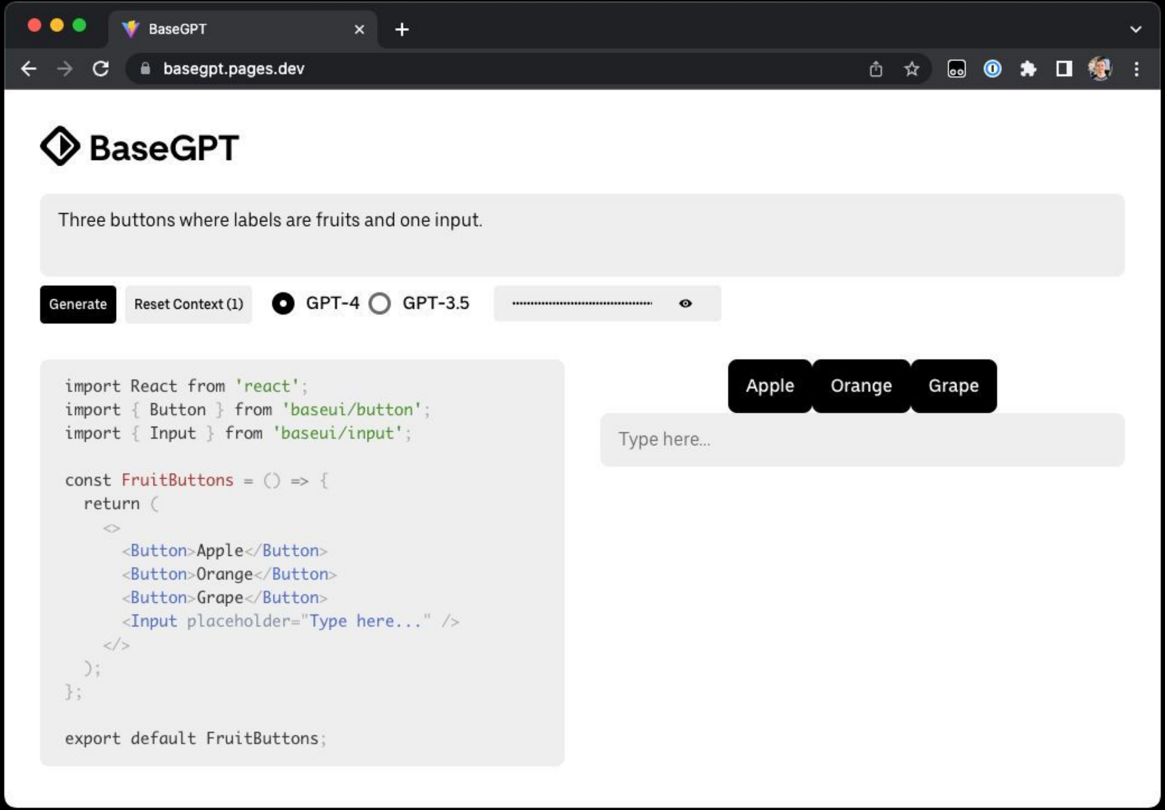
Review design documents, provide automatic suggestions for improvement

Developer, Eng team, Eng Sec, Privacy

Suggest changes to design based on existing user comments

Developer, Eng team

Faster UX design iteration



Three buttons where labels are fruits and one input.

● GPT-4 ○ GPT-3.5

```
import React from 'react';
import { Button } from 'baseui/button';
import { Input } from 'baseui/input';

const FruitButtons = () => {
  return (
    <>
      <Button>Apple</Button>
      <Button>Orange</Button>
      <Button>Grape</Button>
      <Input placeholder="Type here..." />
    </>
  );
};

export default FruitButtons;
```

Our experience using code assistants

29%
Acceptance rate

1.4
LOC per accepted code

75%
Feel more productive

6.0
NPS score for Copilot

Internal survey results

+ Effective for simple boilerplate code and tasks

> Copilot is really useful for writing 1-2 lines of straightforward / repetitive code

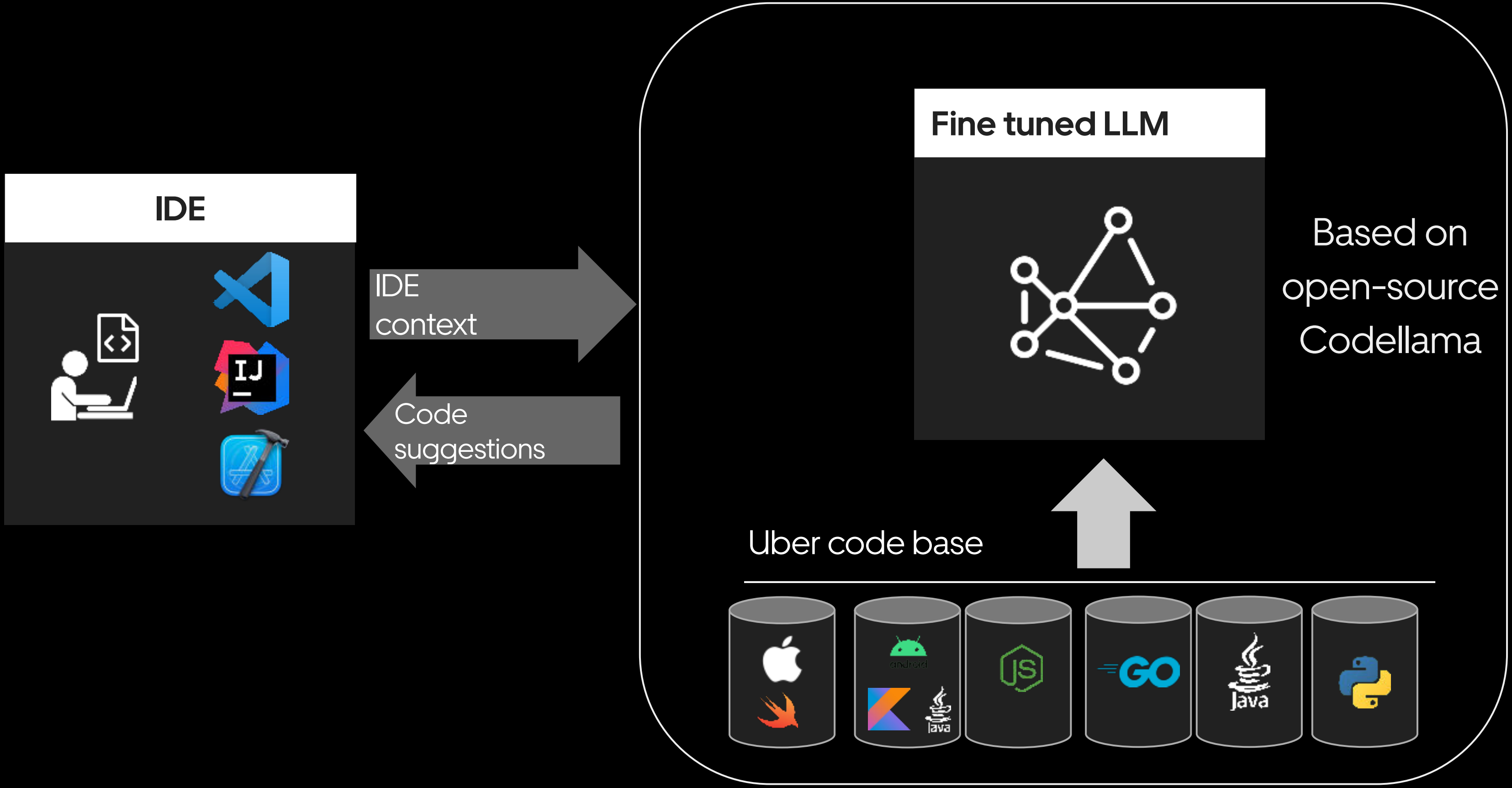
- Code suggestions frequently need further editing

> It frequently has small misses.
> I find myself usually double-checking Copilot's work for longer than it would have taken me to just write that work myself.

Code assistants are useful for simpler tasks

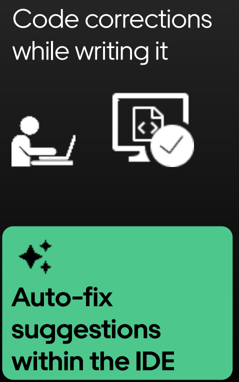
Gen AI beyond code completion

Uber code assistant



Automatically improve code quality

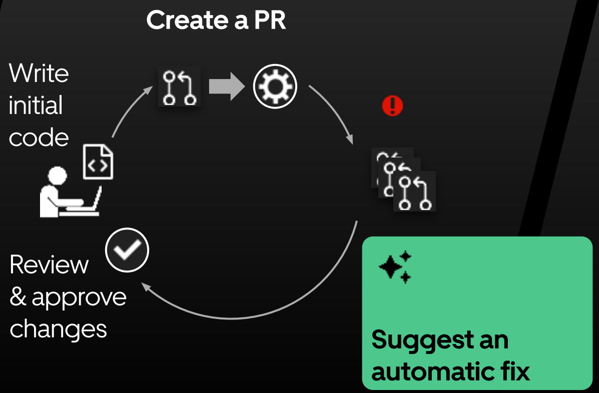
Suggest fixes in the IDE & local builds



Code corrections while writing it

Auto-fix suggestions within the IDE

Fix new errors in PRs



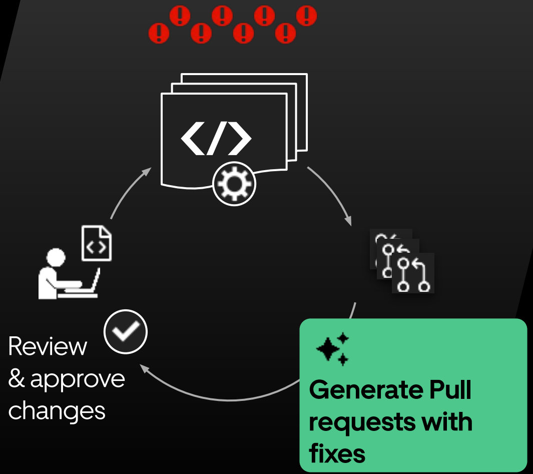
Create a PR

Write initial code

Review & approve changes

Suggest an automatic fix

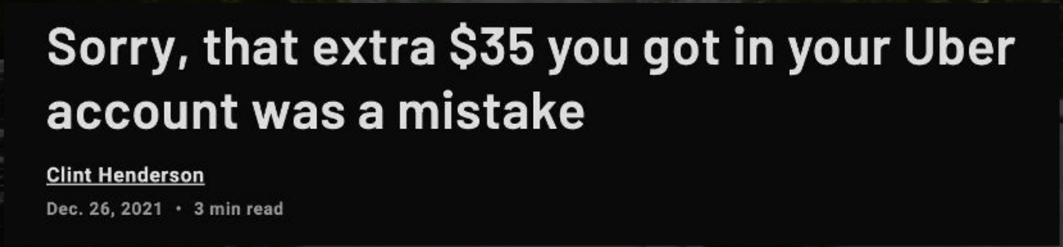
Continuously fix tech debt in the existing code base



Review & approve changes

Generate Pull requests with fixes

Impact of errors in code



Sorry, that extra $35 you got in your Uber account was a mistake

Clint Henderson

Dec. 26, 2021 • 3 min read

Incident in 2021 due to MisusedWeekYear

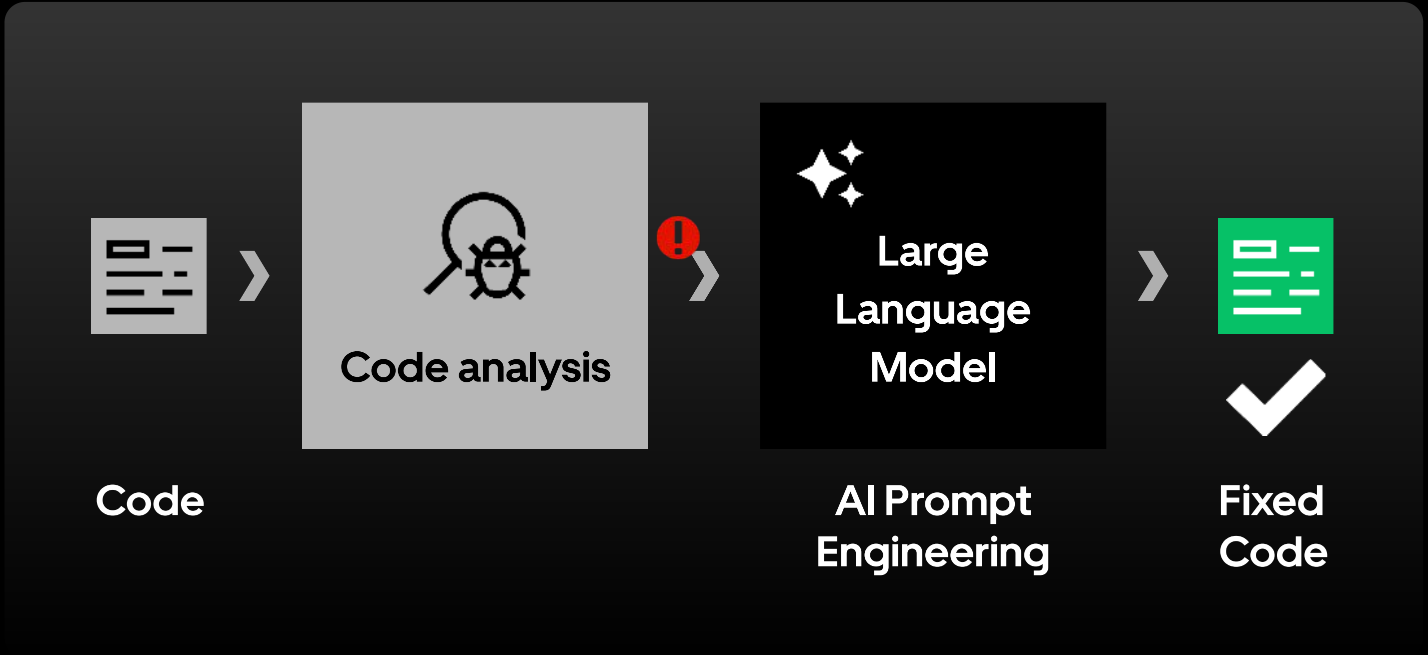
“Week year” is intended to be used for week dates,
e.g. “2015-W01-1”, but is often mistakenly used for calendar dates, e.g. 2014-12-29

```
@SuppressWarnings("MisusedWeekYear")
private static final DateTimeFormatter IDEMPOTENCY_DF=
DateTimeFormatter.ofPattern("MM_YYYY");
```

7K
Java errors / week

15min*
Dev time / error

Automatically fix errors in code



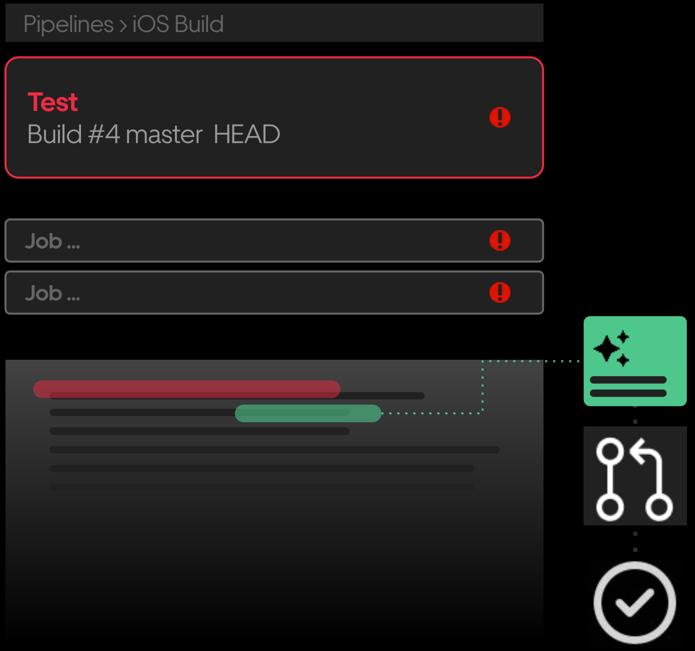
3.5K

Errors auto-fixed / week*

875

Dev hrs saved per week*

Automatically fix CI errors

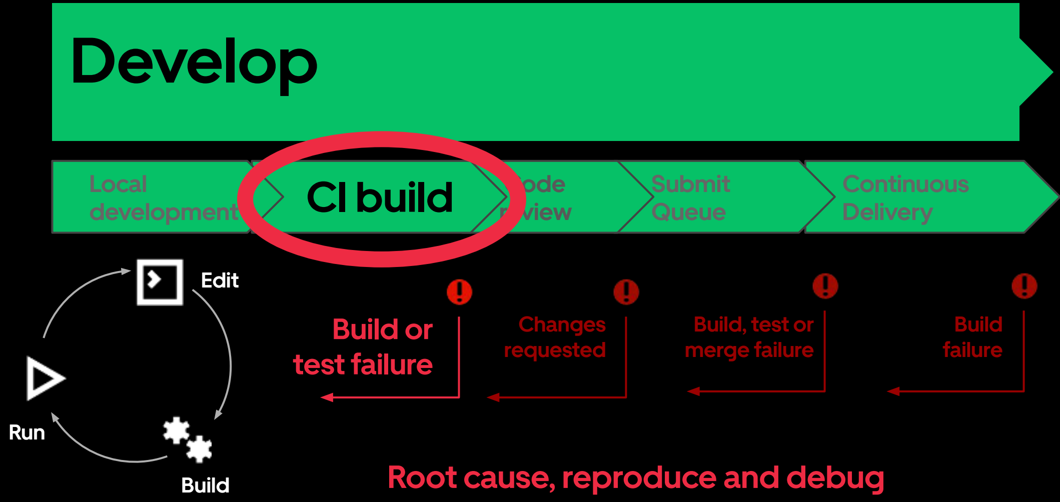


Pipelines > iOS Build

Test
Build #4 master HEAD

Job ...

Job ...



Develop

Local development

CI build

ode
review

Submit Queue

Continuous Delivery

Edit

Run

Build

Build or test failure

Changes requested

Build, test or merge failure

Build failure

Root cause, reproduce and debug

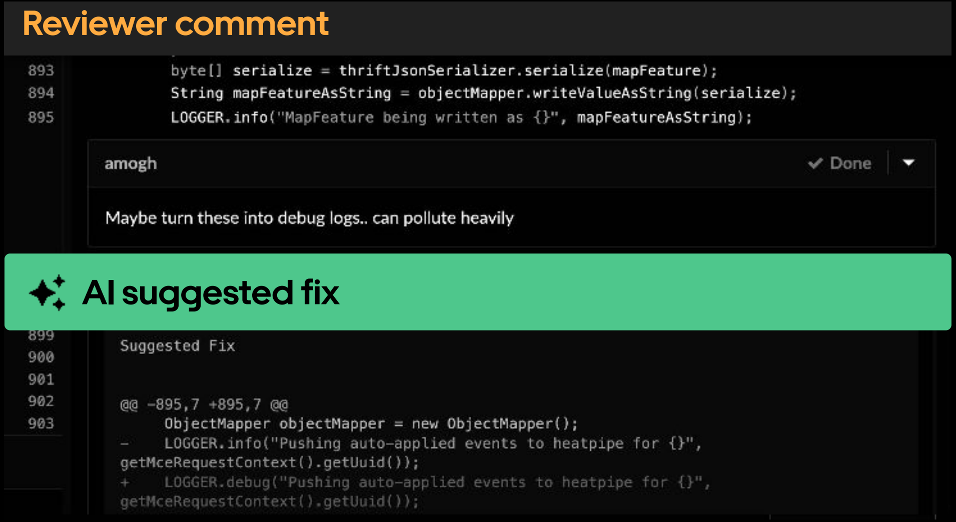
HIGH IMPACT WHEN

CI Failure Rate is **HIGH**

CI execution Time is **HIGH**

Automatically fix code review feedback

10K	1hr	~$1M	2K	2K	$10M
Diffs / week	Dev time/diff	Cost per week	Auto-fixes / week	Dev hrs saved per week	Savings per year



Reviewer comment

```
        byte[] serialize = thriftJsonSerializer.serialize(mapFeature);
        String mapFeatureAsString = objectMapper.writeValueAsString(serialize);
        LOGGER.info("MapFeature being written as {}", mapFeatureAsString);
```

amogh ✓ Done

Maybe turn these into debug logs.. can pollute heavily

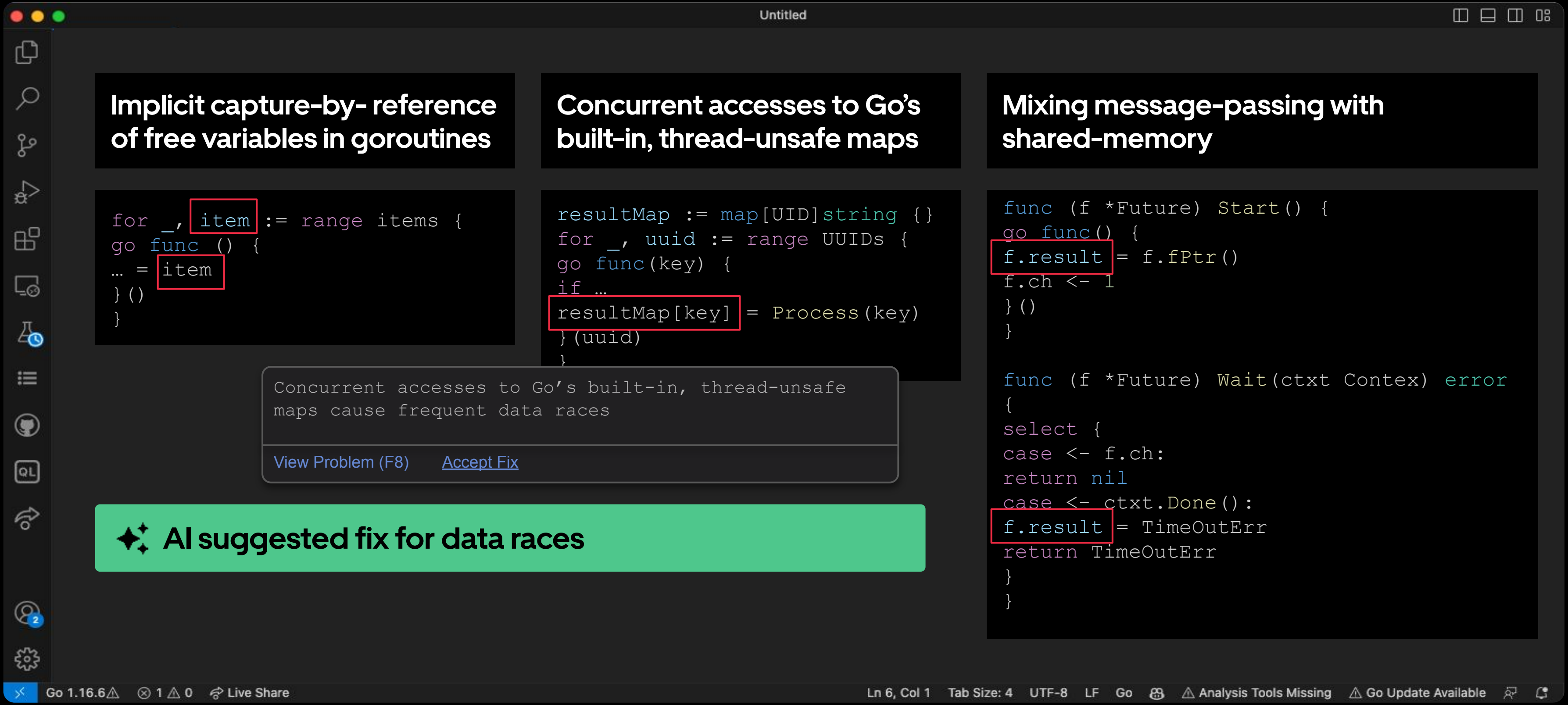
AI suggested fix

```
Suggested Fix


@@ -895,7 +895,7 @@
     ObjectMapper objectMapper = new ObjectMapper();
-    LOGGER.info("Pushing auto-applied events to heatpipe for {}",
getMceRequestContext().getUuid());
+    LOGGER.debug("Pushing auto-applied events to heatpipe for {}",
getMceRequestContext().getUuid());
```

Categories of review feedback fixed

- Rename, annotate or change type (11%)
- Nitpicks (3%)
- Other actionable feedback (6%)
  - Logging
  - Exception handling
  - Null checks
  - Collection & streams
  - Date & time APIs
  - Missing documentation

Automatically fix issues in the IDE



Implicit capture-by- reference of free variables in goroutines

```
for _, item := range items {
go func () {
… = item
}()
}
```

Concurrent accesses to Go’s built-in, thread-unsafe maps

```
resultMap := map[UID]string {}
for _, uuid := range UUIDs {
go func(key) {
if …
resultMap[key] = Process(key)
}(uuid)
}
```

Mixing message-passing with shared-memory

```
func (f *Future) Start() {
go func() {
f.result = f.fPtr()
f.ch <- 1
}()
}

func (f *Future) Wait(ctxt Contex) error
{
select {
case <- f.ch:
return nil
case <- ctxt.Done():
f.result = TimeOutErr
return TimeOutErr
}
}
```

```
Concurrent accesses to Go’s built-in, thread-unsafe
maps cause frequent data races
```

AI suggested fix for data races

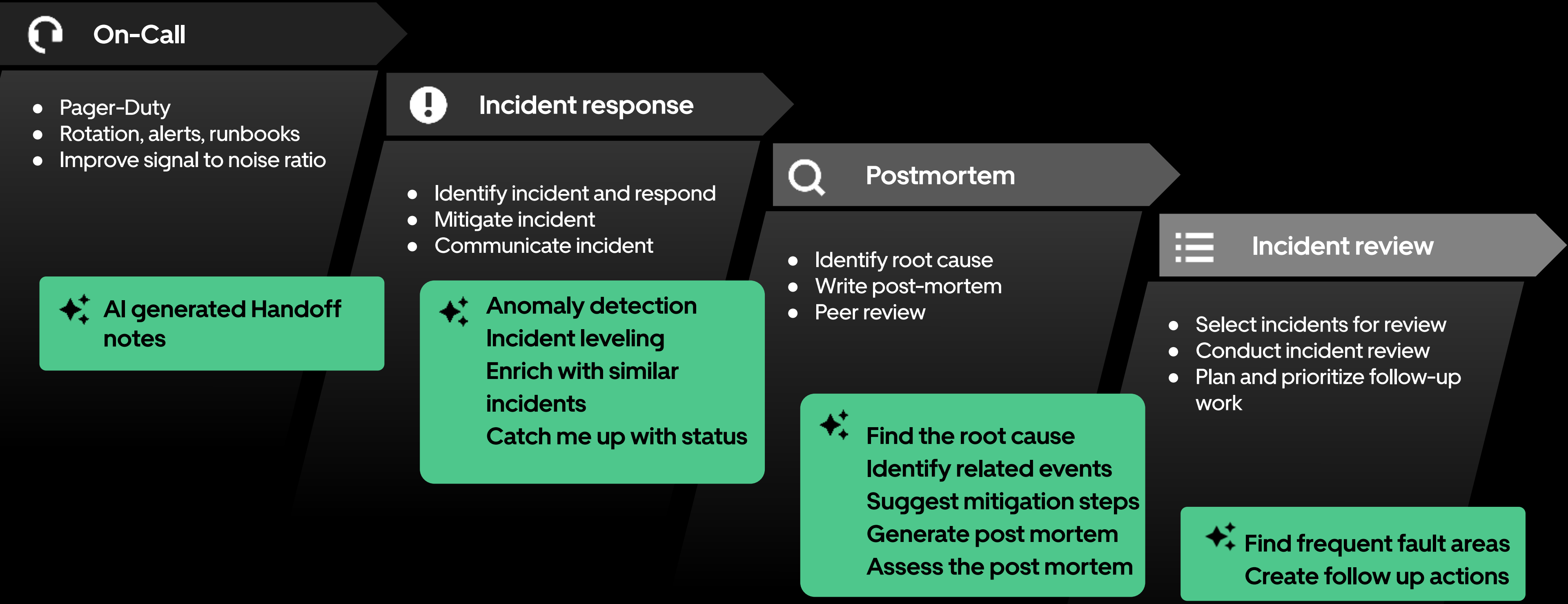
Automatic app testing

✦ **AI generated mobile test flow**

Eliminates costly test maintenance

Higher quality, less effort

Efficient incident management



On-Call

- Pager-Duty
- Rotation, alerts, runbooks
- Improve signal to noise ratio

AI generated Handoff notes

Incident response

- Identify incident and respond
- Mitigate incident
- Communicate incident

Anomaly detection
Incident leveling
Enrich with similar incidents
Catch me up with status

Postmortem

- Identify root cause
- Write post-mortem
- Peer review

Find the root cause
Identify related events
Suggest mitigation steps
Generate post mortem
Assess the post mortem

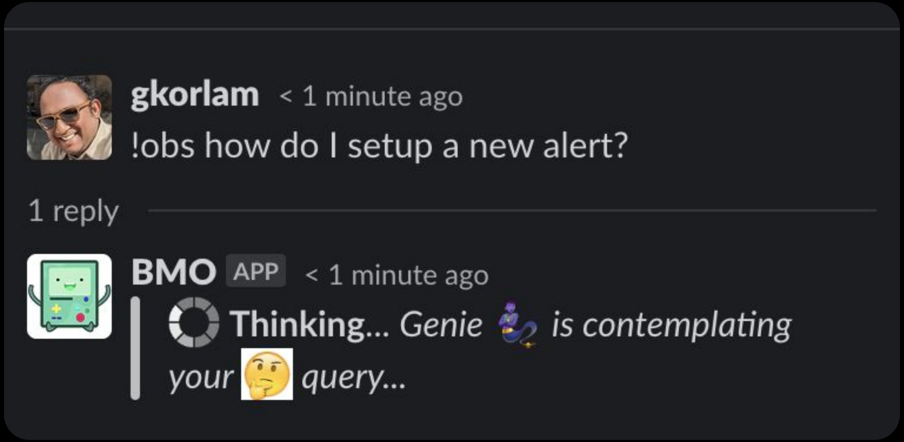
Incident review

- Select incidents for review
- Conduct incident review
- Plan and prioritize follow-up work

Find frequent fault areas
Create follow up actions

Automate developer support

✦ Slack bot to answer questions



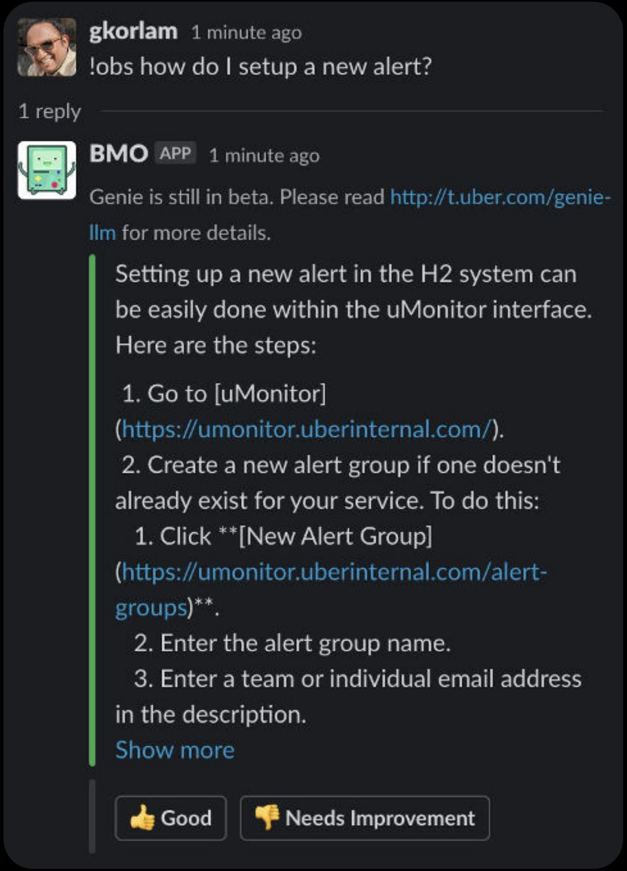
gkorlam < 1 minute ago

!obs how do I setup a new alert?

1 reply

BMO APP < 1 minute ago

Thinking... Genie is contemplating your 🤔 query...



gkorlam 1 minute ago

!obs how do I setup a new alert?

1 reply

BMO APP 1 minute ago

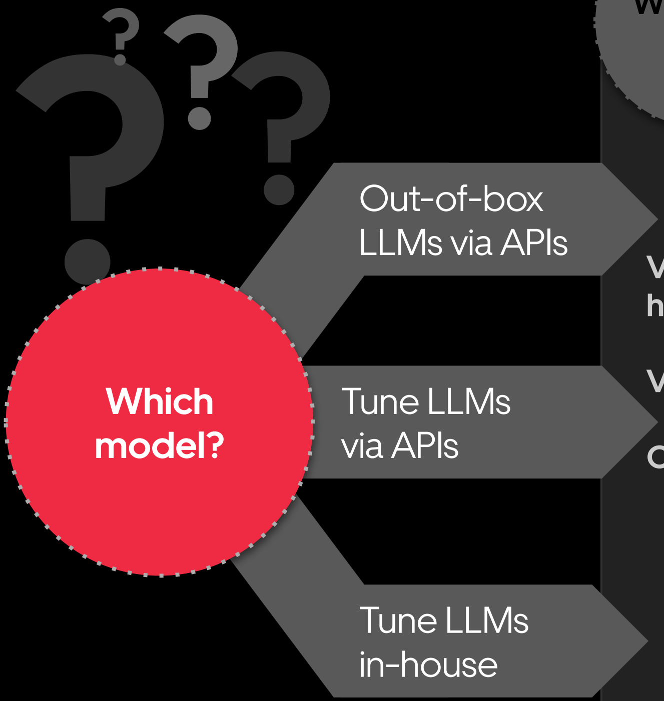
Genie is still in beta. Please read http://t.uber.com/genie-llm for more details.

> Setting up a new alert in the H2 system can be easily done within the uMonitor interface. Here are the steps:
>
> 1. Go to [uMonitor] (https://umonitor.uberinternal.com/).
> 2. Create a new alert group if one doesn't already exist for your service. To do this:
>   1. Click **[New Alert Group] (https://umonitor.uberinternal.com/alert-groups)**.
>   2. Enter the alert group name.
>   3. Enter a team or individual email address in the description.
>
> Show more

The Future

How to get started?

Considerations



Where to host

Vendor hosted

VPC

On-prem

Which LLM

OpenAI

Google Vertex

Antrophic

…

…

Knowledge context?

Generic knowledge

Company Limited

Company High context

Time to market

Critical

High

Medium

Low

Cost

$$$$

$$$

$$

$

Latency

Sensitive

High

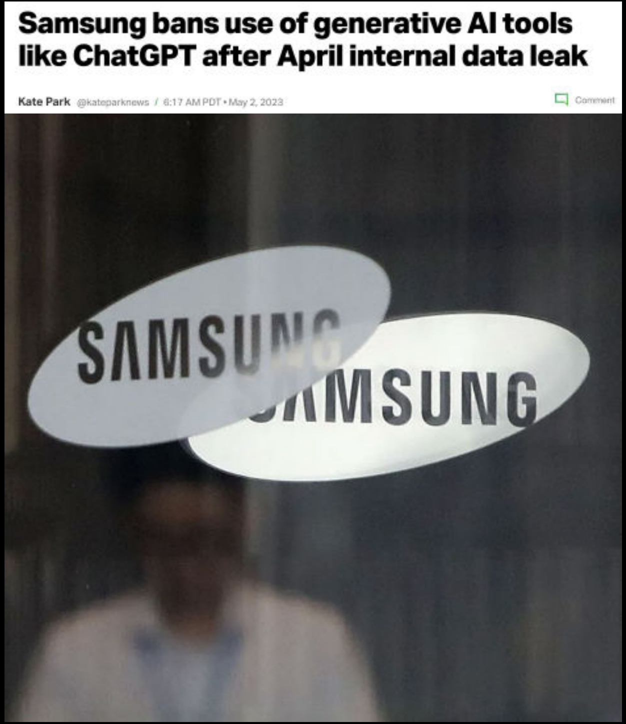
Medium

Low

Offline

Uber

Evaluate potential risks



Samsung bans use of generative AI tools like ChatGPT after April internal data leak

Kate Park @kateparknews / 6:17 AM PDT • May 2, 2023

RISKS

Data sent to LLMs

- **Data privacy** - Sharing private data with a 3rd party
- **IP** - Risk of exposing own IP into public domain

Data suggestions from LLM

- **IP** - Risk of getting back other’s copyrighted content
- **Quality** - Accuracy of the outputs
- **Explainability** - Not being able to trace back the output to its source

Get your team excited

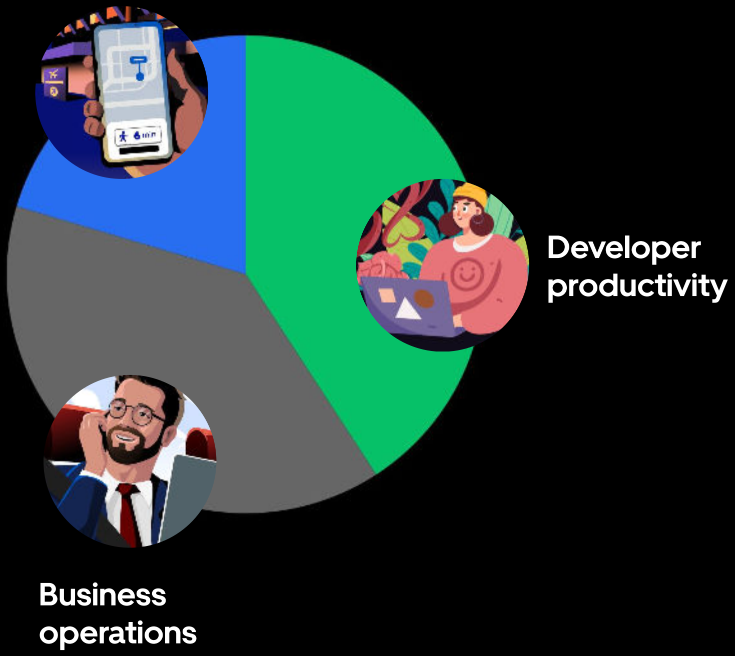
Internal Hackathon

700+
Participants

100
Projects demoed

6
Sites around the globe

3
Broad categories



Takeaways

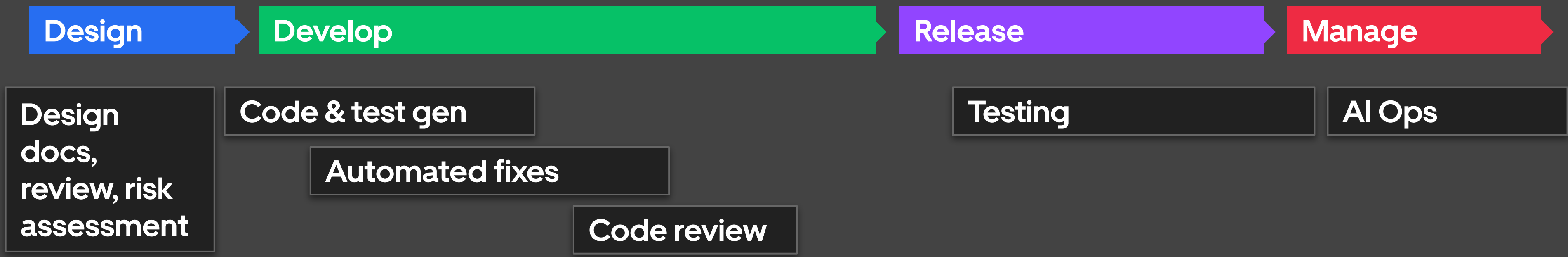
- Modern software development is complex
- Gen AI promises to tame this complexity
- Lots of opportunities in realizing these promises
- The entire Developer workflow needs to be rethought with AI
- Let's get started!

Thank you!

Questions ?

Backup

Developer workflow: AI opportunities



Design

Develop

Release

Manage

Design docs, review, risk assessment

Code & test gen

Automated fixes

Code review

Testing

AI Ops

Requirements
Write requirements
Review design docs
Risk assessment
UX design
UI/UX design

Code & test generation
Automated dependency upgrades,
Config generation,
Auto-refactor legacy code
Debugging: Debug helper,
Testing: Auto generate unit tests,
Automated fixes: Automated data race detection, code fixes
Code review: Automate code reviews, Auto fix based on review comments
CI debugging: CI failure classification

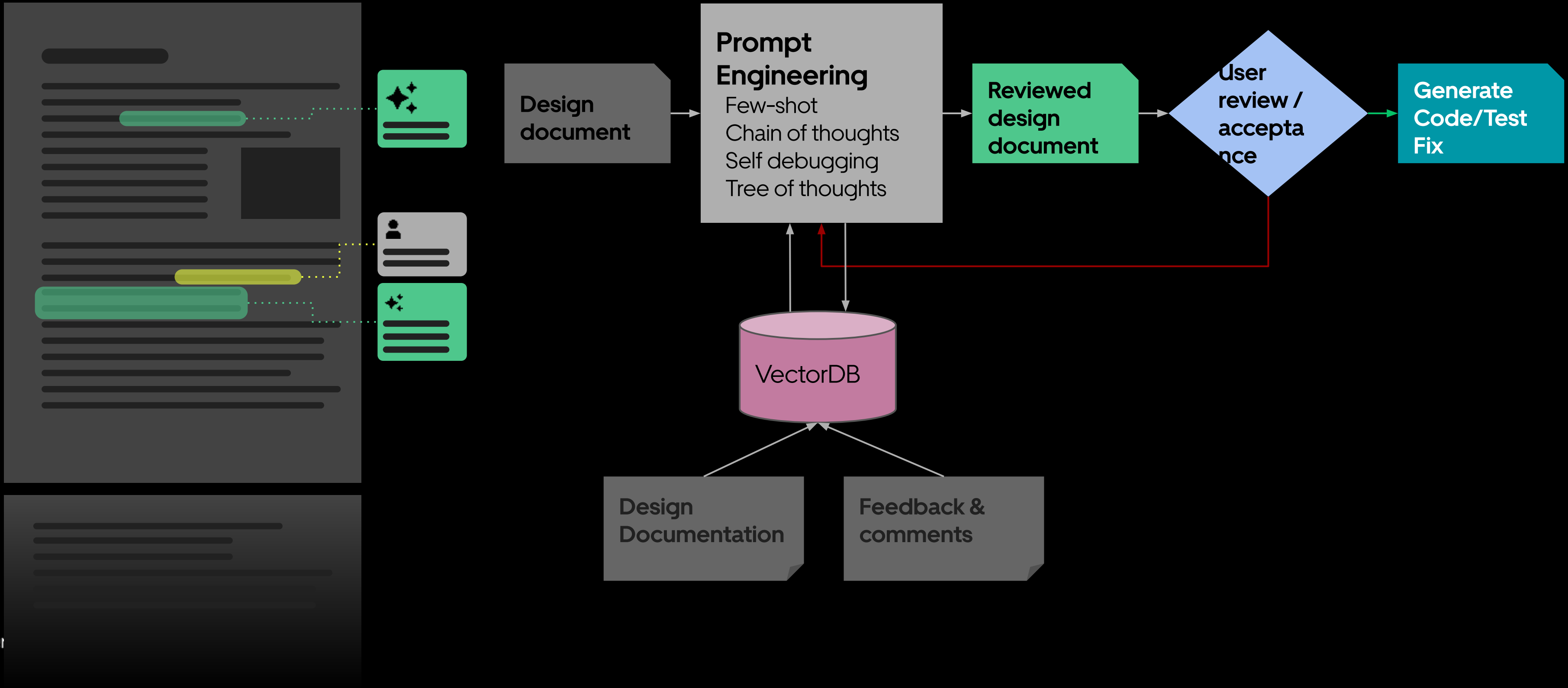
Automated E2E & mobile Testing:
Auto generate mobile, localization tests

Incident mitigation:
Troubleshoot analytics events,
Oncall assistant

Knowledge Base (Messaging, documentation, collaboration tools)

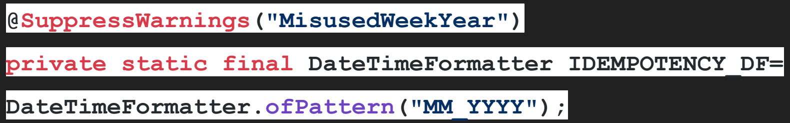
Documentation: Auto generate & update documentation,
Oncall experience: Chatbot for internal knowledge base

Design ERD automatic review



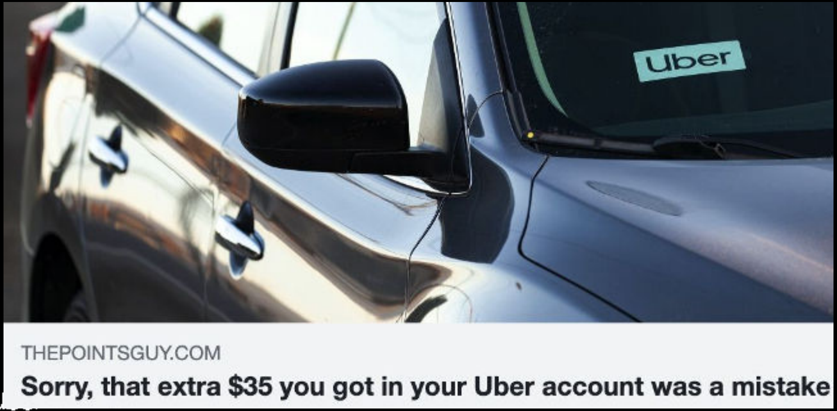
Automatically fixing static analysis errors

Incident in 2021 due to MisusedWeekYear



```
@SuppressWarnings("MisusedWeekYear")
private static final DateTimeFormatter IDEMPOTENCY_DF=
DateTimeFormatter.ofPattern("MM_YYYY");
```

“Week year” is intended to be used for week dates, e.g. “2015-W01-1”, but is often mistakenly used for calendar dates, e.g. 2014-12-29



THEPOINTSGUY.COM

Sorry, that extra $35 you got in your Uber account was a mistake

7K
Java errors / week

15min*
Dev time / Error

3.5K
Errors auto-fixed / week

875
Dev hrs saved per week

10K @SuppressWarnings in Java codebase

Other analyses in progress

- Go data races

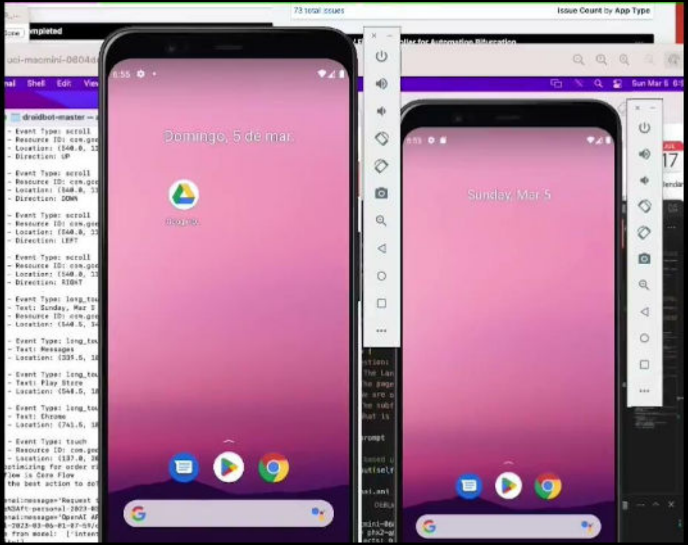
* Google study

AI-driven automated Mobile End-2-End Testing

E2E automation challenges

- Flakiness
- Maintenance
- Different languages
- Impossible to shift left

AI-based E2E testing



```
- Event Type: scroll
- Resource ID: com.goo
- Location: (540.0, 13
- Direction: UP

- Event Type: scroll
- Resource ID: com.goo
- Location: (540.0, 13
- Direction: DOWN

- Event Type: scroll
- Resource ID: com.goo
- Location: (540.0, 13
- Direction: LEFT

- Event Type: scroll
- Resource ID: com.goo
- Location: (540.0, 13
- Direction: RIGHT

- Event Type: long_tou
- Text: Sunday, Mar 5
- Resource ID: com.goo
- Location: (540.5, 34

- Event Type: long_tou
- Text: Messages
- Location: (339.5, 18

- Event Type: long_tou
- Text: Play Store
- Location: (540.5, 18

- Event Type: long_tou
- Text: Chrome
- Location: (741.5, 18

- Event Type: touch
- Resource ID: com.goo
- Location: (137.0, 36
ptimizing for order ri
Flow is Core Flow
 the best action to do
 
enai:message='Request t
eN3Aft-personal-2023-03
enai:message='OpenAI AP
-2023-03-06-01-07-59/
 from model:  ['intent
```

Uber Tech-wide HackDayz

713

Participants

6

Sites around the globe

98

Projects demoed

3

Broad categories

21

Finalists selected

6

Winners

Developer productivity

Code generation, Code reviews, Automated fixes, Testing & debugging, Knowledge base

Business operations

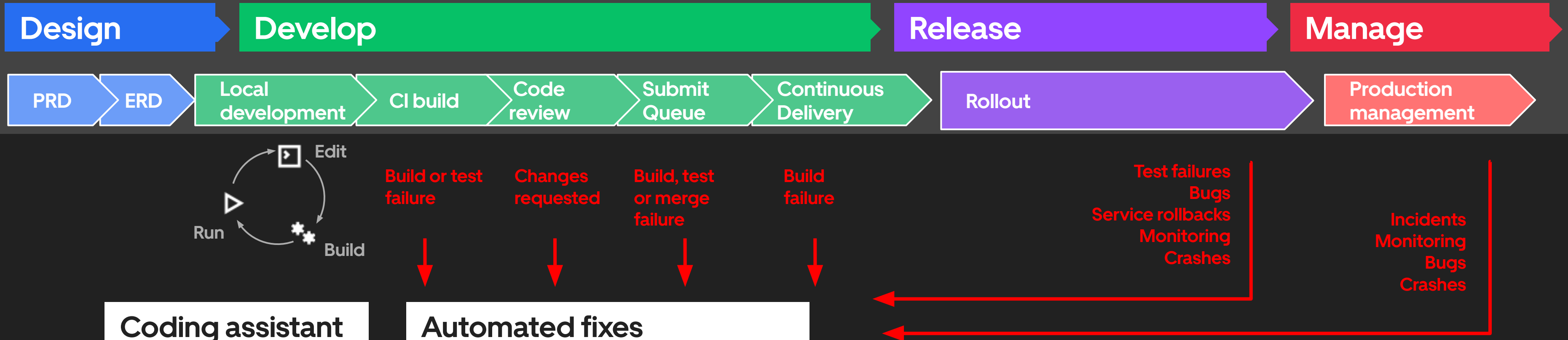
Operations improvements, Data & query optimization, Security, Privacy & safety risk, Employee experience

Product experience

Delivery experience, Rider experience, Earner experience

How to create internal LLM

What we have been able to get it to do



Design

- PRD
- ERD

Develop

- Local development
- CI build
- Code review
- Submit Queue
- Continuous Delivery

Release

- Rollout

Manage

- Production management

Build or test failure

Changes requested

Build, test or merge failure

Build failure

Test failures
Bugs
Service rollbacks
Monitoring
Crashes

Incidents
Monitoring
Bugs
Crashes

Coding assistant

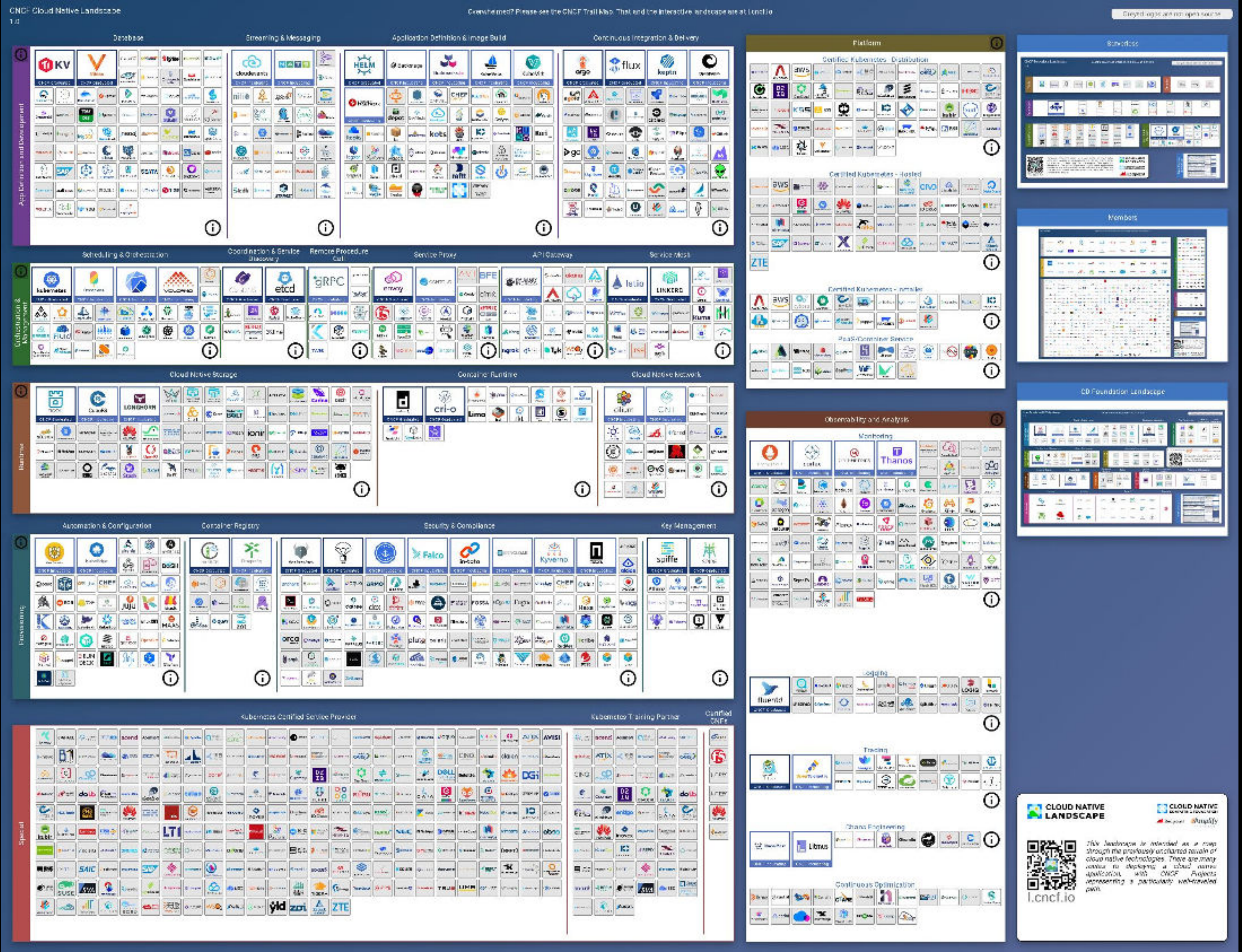
Copilot **Live**
Copilot X **Upcoming**

Automated fixes

Static / dynamic analysis
Review comments
Code migrations

Automated testing

Automated mobile E2E testing


CNCF Cloud Native Landscape
1.0
Overwhelmed? Please see the CNCF Trail Map. That and the interactive landscape are at l.cncf.io
Greyed logos are not open source
App Definition and Development
Database
Streaming & Messaging
Application Definition & Image Build
Continuous Integration & Delivery
Orchestration & Management
Scheduling & Orchestration
Coordination & Service Discovery
Remote Procedure Call
Service Proxy
API Gateway
Service Mesh
Runtime
Cloud Native Storage
Container Runtime
Cloud Native Network
Provisioning
Automation & Configuration
Container Registry
Security & Compliance
Key Management
Special
Kubernetes Certified Service Provider
Kubernetes Training Partner
Certified CNFs
Platform
Certified Kubernetes - Distribution
Certified Kubernetes - Hosted
Certified Kubernetes - Installer
PaaS/Container Service
Observability and Analysis
Monitoring
Logging
Tracing
Chaos Engineering
Continuous Optimization
Serverless
Members
CD Foundation Landscape
CLOUD NATIVE LANDSCAPE
This landscape is intended as a map through the previously uncharted terrain of cloud native technologies. There are many routes to deploying a cloud native application, with CNCF Projects representing a particularly well-traveled path.
l.cncf.io

Gen AI or Not?

👍 Great if your task is ...

- Related to natural language processing or image/video/audio creation
- Translation, summarization, sentiment analysis, extraction, search, similarity, retrieval
- Requires general knowledge and/or reasoning
- You have very little training data
  - i.e., zero / few shot learning

👎 Not so great if ...

- you already have an effective ML solution that's performing well
- (e.g., NLP classification)
- The cost of being inaccurate IS very high
- Explainability of a prediction IS very important
- Your use case is highly sensitive to latency

Color

brand palette

For more information and guidance on using brand colors, click here

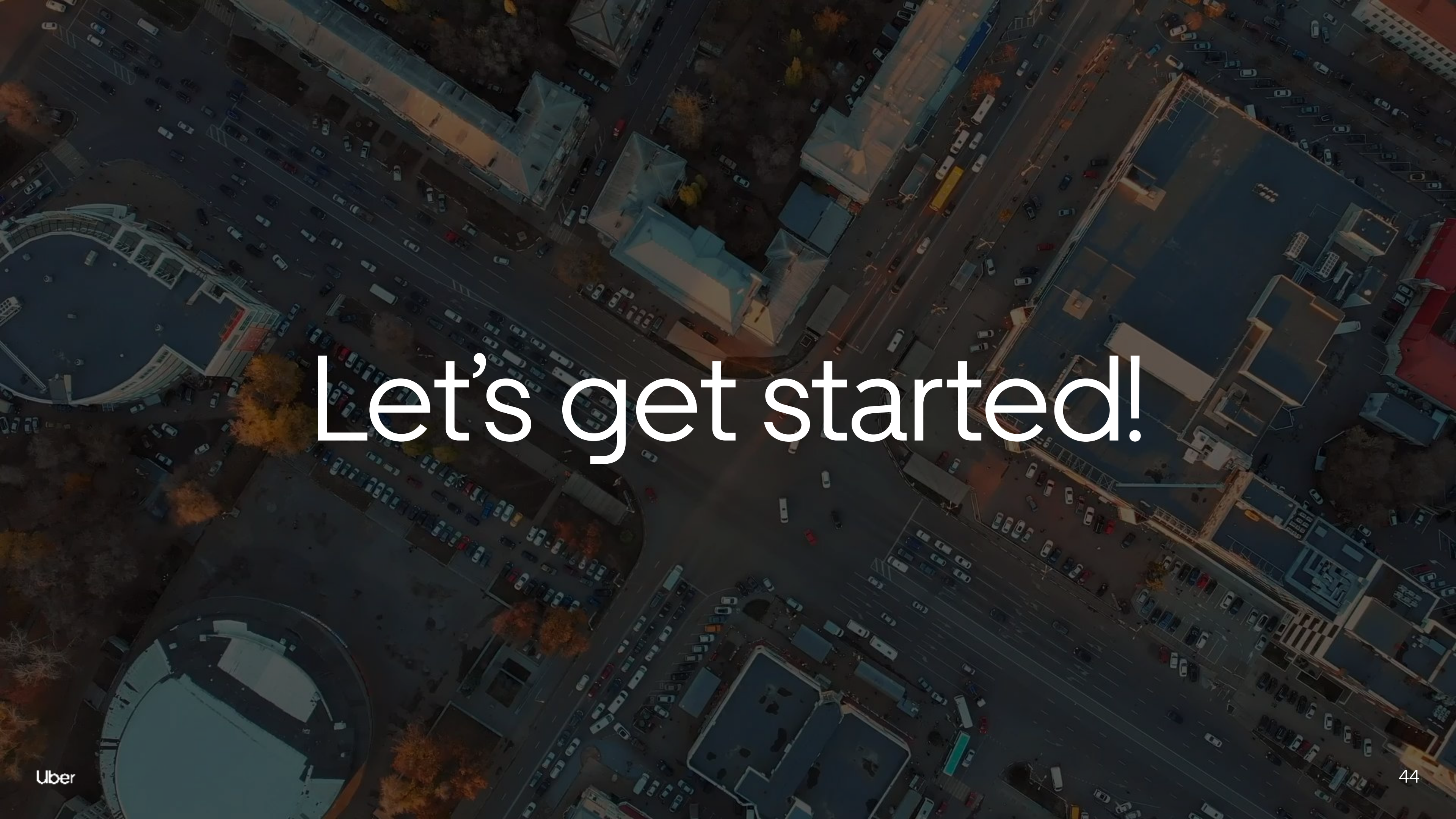
Our color palette embraces a full spectrum of color and has been brightened for its legibility and accessibility. All colors are ADA compliant when used as a background paired with black text or when used as colored typography paired with a black background.

For **Mobility**, be sure to use white or color headline text on a black background.
For **Delivery**, be sure to use black text over a color background.

#FFFFFF

#000000

#276EF1 (Safety Blue)	#6C9DF8	#B3CDFE	#FFA200	#FFC35B	#F4D790
#0694C1	#4AC8DB	#8ADFEC	#FF5F27	#FF8961	#FFB298
#06C167 (Eats Green)	#4EC78C	#8EE1A9	#EE2B43	#FF7373	#F1998E
#6ABB00	#A0CD64	#BBD896	#E84FB1	#FF7BB0	#FFA8CB
#FFD643	#FFE27C	#FFF1C1	#9145FF	#9A60EF	#B29DF4



Let’s get started!