



OpenVINO<sup>™</sup>  
DEVCON 中国  
系列工作坊 2023

# 高效开发 | GitHub Copilot 和 OpenVINO<sup>™</sup> 提升开发潜能

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# 初识 GitHub Copilot



# GitHub Copilot

Trained on billions of lines of code, GitHub Copilot turns natural language prompts into coding suggestions across dozens of languages.

[Explore docs >](#)

<https://github.com/features/copilot>

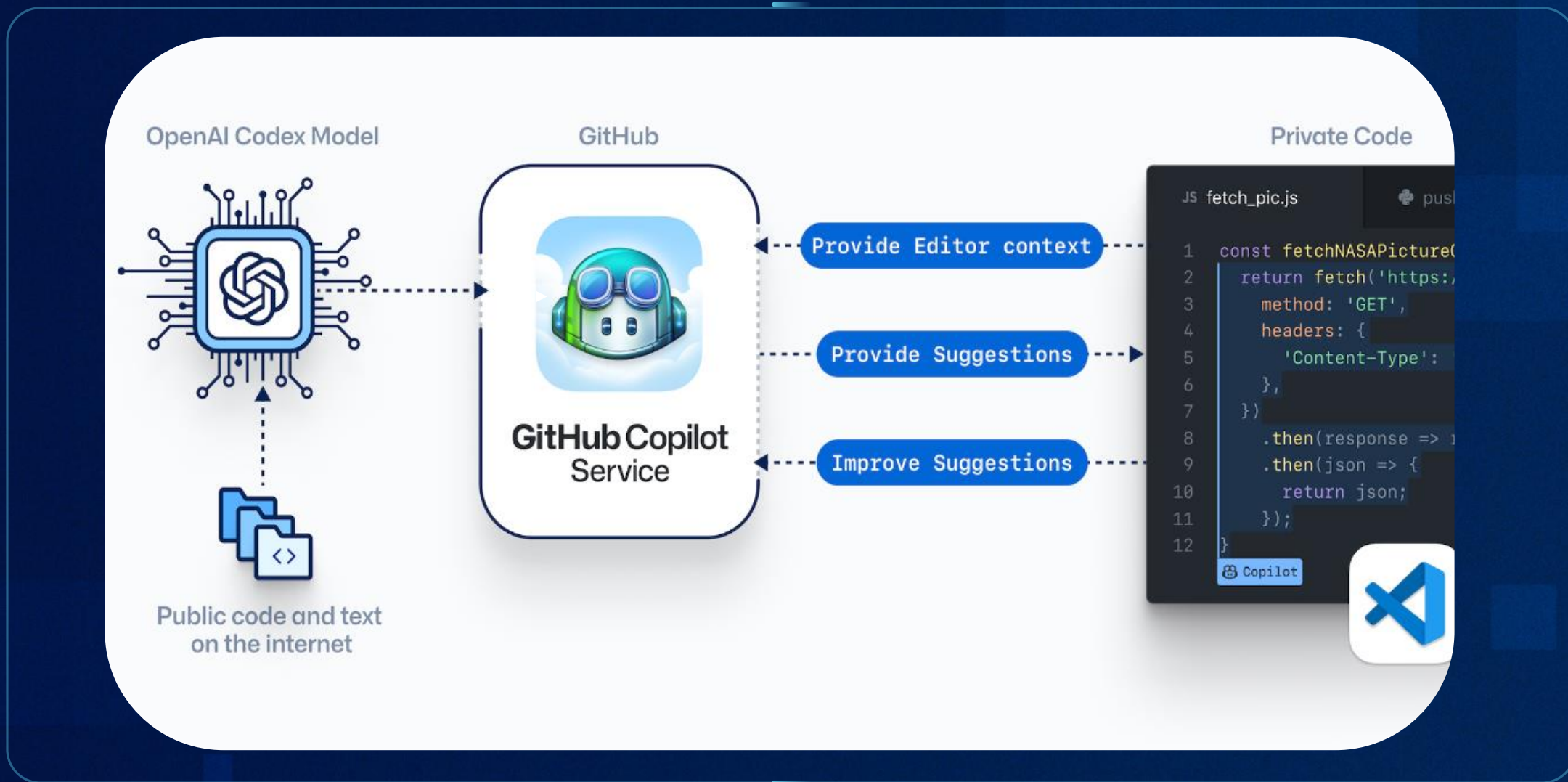


# GitHub Copilot Your AI pair programmer



```
19     ... screenshot = imageGrab.grab()
20     ... # Convert to text
21     ... text = image_to_string(screenshot)
22     ... # Parse text for email addresses
23     ... emails = re.findall(r'[\w\.-]+@[\w\.-]+', text)
24     ... return emails
25
26     def validate(addresses):
27         ...
28
```

# 人工智能打天下



# 工作方式

Editor

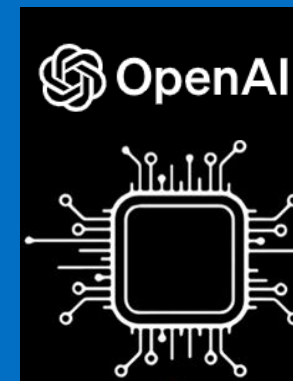
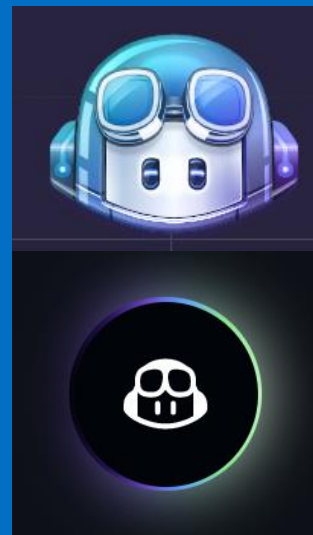
Proxy

Models

```
sentiments.ts write_sql.go parse_expenses.py addresses.rb
1 #!/usr/bin/env ts-node
2
3 import { fetch } from "fetch-h2";
4
5 // Determine whether the sentiment of text is positive
6 // Use a web service
7 async function isPositive(text: string): Promise<boolean> {
8   const response = await fetch(`http://text-processing.com/api/sentiment/`, {
9     method: "POST",
10    body: `text=${text}`,
11    headers: {
12      "Content-Type": "application/x-www-form-urlencoded",
13    },
14  });
15  const json = await response.json();
16  return json.label === "pos";
17 }
```

Copilot

Visual Studio Neovim VS Code JetBrains IDEs



# 开发人员眼中的 Copilot

## 将注释转换为代码

```
1 #!/usr/bin/env ts-node
2
3 import { fetch } from "fetch-h2";
4
5 // Determine whether the sentiment of text is positive.
6 // Use a web service.
7 async function isPositive(text: string): Promise<boolean> {
8   const response = await fetch("http://text-processing.com/api/sentiment/", {
9     method: "POST",
10    body: "text=${text}",
11    headers: {
12      "Content-Type": "application/x-www-form-urlencoded",
13    },
14  });
15  const json = await response.json();
16  return json.label === "pos";
17 }
```

Copilot

## 自动填充代码

```
1 const seconds = 3600
2 const minutes = seconds / 60
3 const hours = minutes / 60
4 const days = hours / 24
5 const weeks = days / 7
6 const months = days / 30
7 const years = months / 12
```

Copilot

## 显示备选方案

```
1 def max_sum_slice(xs):
2   max_ending = max_so_far = 0
3   begin = end = 0
4   for i, x in enumerate(xs):
5     if max_ending + x > 0:
6       max_ending += x
7     else:
8       max_ending = 0
9       begin = i
10    if max_ending > max_so_far:
11      max_so_far = max_ending
12    end = i
13  return begin, end, max_so_far
```

```
1 def max_sum_slice(xs):
2   if not xs:
3     return 0
4   max_ending = max_slice = 0
5   for x in xs:
6     max_ending = max(0, max_ending + x)
7     max_slice = max(max_slice, max_ending)
8   return max_slice
```

# GitHub Copilot

## 个人版

- 在编辑器中安装
- 可使用将自然语言生成代码
- 提供多行且复杂的功能 (function) 建议
- 加快生成测试
- 屏蔽与公开代码的直接匹配

## 企业版

包含个人版所有功能，以及：

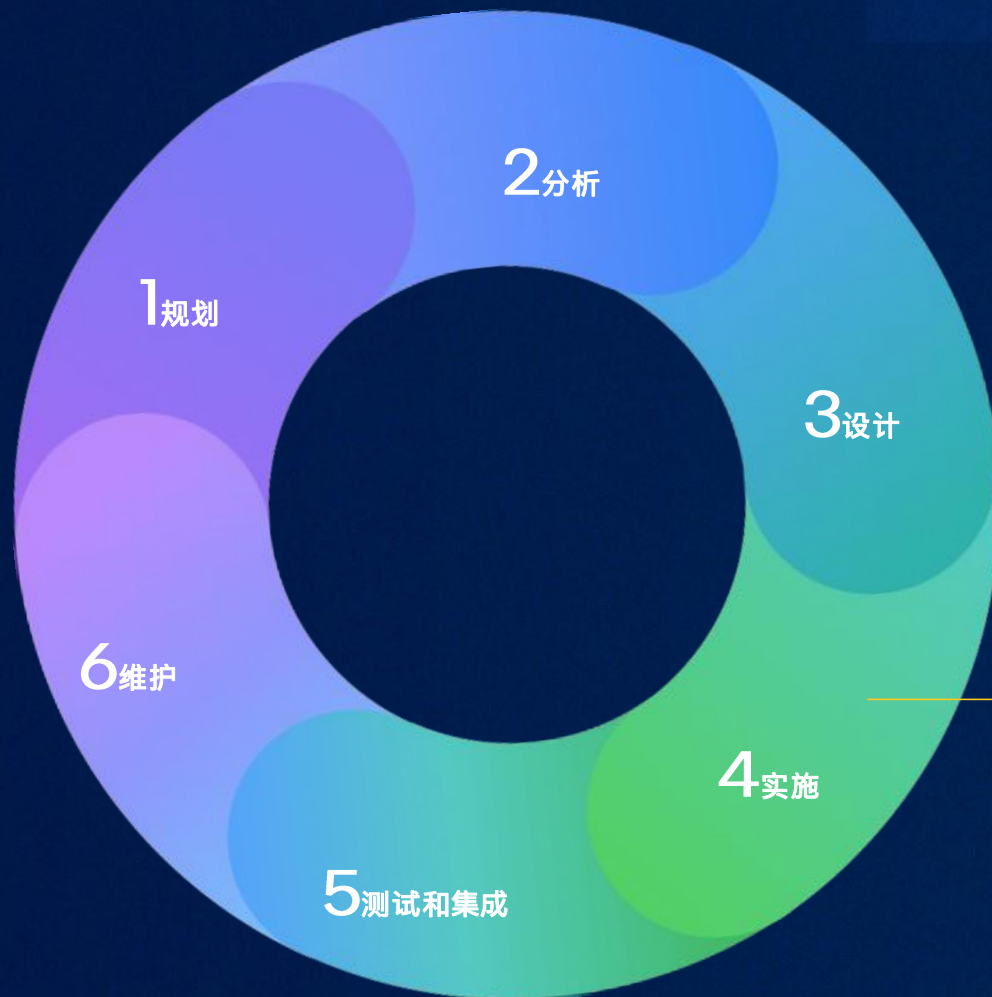
- 简单易用的许可证
- 管理组织级策略
- 制订管理行业领先的保密性



# 企业的 GitHub Copilot



# 企业要求的 Copilot 不只是简单的编码



## GitHub Copilot today

- Convert comments to code
- Autofill for repetitive code
- Show alternatives

GitHub Copilot 未来功能  
代码重构(代码翻译)  
代码审核(代码解释)  
撰写文档

GitHub Copilot 未来功能  
单元测试  
代码差错  
调试  
代码审核基于 AI 的 PR



# 通过 Copilot X 系列产品

<b>Copilot for Pull Requests</b> March 22, 2023 WAITLIST Pull requests are a central part of the GitHub user experience. Copilot for PRs brings the power of Copilot to the PR experience, to help you write better PR descriptions, and to help your team review and merge PRs faster.	<b>Copilot for CLI</b> March 22, 2023 USABLE PROTOTYPE Ever having trouble remembering that shell command or this obscure flag? Don't worry: we're building GitHub Copilot assistance right into your terminal.	<b>GitHub Copilot Radar</b> October 13, 2022 WIP GitHub Copilot Radar is a code navigation tool that shows developers the most relevant line to their position in the code. It's jump-to-definition on (neural) steroids.	<b>GitHub Copilot for 'Your' Codebase</b> October 13, 2022 WIP We want to let Copilot see the code in your entire repo to make suggestions even better.	<b>Visualizing a Codebase</b> August 4, 2021 USABLE PROTOTYPE How can we "fingerprint" a codebase to see its structure at a glance? Let's explore ways to automatically visualize a GitHub repo, and how that could be useful.	<b>GitHub Copilot</b> June 29, 2021 PRODUCT A new way to build software
<b>Copilot Voice</b> March 22, 2023 WAITLIST Write code without the keyboard. Difficulty typing? Use your voice to code without spelling things out by talking with GitHub Copilot.	<b>Code Brushes</b> January 11, 2023 USABLE PROTOTYPE Can editing code feel more tactile, like painting with Photoshop brushes? We added a toolbox of brushes to our Visual Studio Code extension that can modify your code.	<b>Incremental CodeQL</b> October 11, 2022 WIP Faster feedback about security vulnerabilities on your PRs.	<b>TestPilot</b> October 11, 2022 USABLE PROTOTYPE TestPilot helps you craft readable unit tests based on your code and documentation.	<b>Flat Data</b> May 18, 2021 PRODUCT Flat explores how to make it easy to work with data in git and GitHub, offering a simple pattern for bringing working datasets into your repositories and versioning them.	
<b>GitHub Blocks</b> November 8, 2022 WAITLIST Reimagine repositories with custom, interactive blocks. Build rich documentation, enhance your workflows, and bring your codebase to life.	<b>Collaborative Workspaces</b> October 14, 2022 NAPKIN SKETCH As we increasingly work together remotely, how might we unify our workflows to enable remote collaboration for developers? GitHub Next explores what "working together" means, beyond multiple cursors and a shared code editor.	<b>GitHub Copilot Labs</b> March 30, 2022 USABLE PROTOTYPE A VS Code extension for experimental applications of GitHub Copilot.	<b>React Webview UI Toolkit for VS Code</b> February 11, 2022 PRODUCT An ongoing collaboration with Microsoft to bring React to their library Webview UI Toolkit for Visual Studio Code		

<https://githubnext.com/#projects>

# Forever Waitlist 啦

```
import os
import json

import openai
from dotenv import load_dotenv
from langchain import LLMChain
from langchain.llms import AzureOpenAI
from langchain.embeddings import OpenAIEmbeddings
from langchain.text_splitter import RecursiveCharacterTextSplitter
from langchain.document_loaders import PyPDFLoader
from langchain.chains.summarize import load_summarize_chain
from langchain.prompts import PromptTemplate

loader = PyPDFLoader("./pdf/grade05.pdf")
pages = loader.load_and_split()

prompt_template = """
帮我从输入内容中提取该课本面向的年级、科目、和册数，请参考如下内容提取：

xxxxxxxxxx\n一年级 上册 语文\nxxxxxxxxx 提取后输出结果是一年级语文上册

内容如
{text}

该课本属于"""

prompt = PromptTemplate(template=prompt_template, input_variables=["text"])
```

## GitHub Copilot Labs

GitHub [github.com](https://github.com) | 554,071 | ★★★★★ (18)

Experimental features for GitHub Copilot

[Disable](#) [Uninstall](#)

This extension is enabled globally.

DETAILS | FEATURE CONTRIBUTIONS | RUNTIME STATUS

Copilot Labs is a place for GitHub to experiment with new ideas before we take them into production. These experiments may never become part of the official product, or may change significantly before they become part of the supported product. Because they are experimental, features may break, not work as expected, or otherwise fail to meet our quality standards for production-ready code. All Copilot Labs features are provided "as-is" with no guarantees of support.

Finally, Copilot Labs is governed by separate terms. GitHub may collect more/different telemetry in Copilot Labs because, again, the experiments are designed for learning and not production.

### GitHub Copilot Labs

GitHub Copilot Labs is a companion extension to [GitHub Copilot](#) that houses experimental and up-and-coming features in a sidebar.

To learn more about GitHub Copilot Labs, [read our post](#).

### Requirements

1. An active GitHub Copilot subscription. Visit the [Copilot Quickstart](#) to learn more.
2. You must have the main extension of [GitHub Copilot](#) installed alongside Labs.
3. You'll need to [sign up](#) and accept the [GitHub Next Pre-Release License Terms](#).

Categories: Other

Extension Resources: Marketplace, Repository, GitHub

More Info: Published 3/29/2022, 02:48:08, Last 5/12/2023, released 03:33:17, Last 5/12/2023, updated 08:00:15, Identifier github.copilot-labs

# 企业研发的 GitHub Copilot 转型





我们每个人都在  
使用 GitHub Copilot

## 企业反馈

企业代码风格

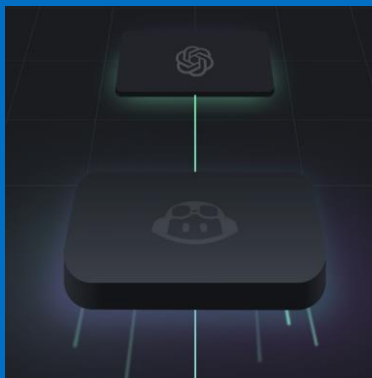
企业需求文档

企业知识库

企业测试用例

# CopilotXOps

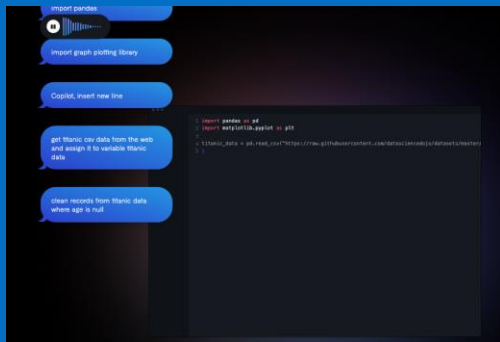
写



Copilot

<https://github.com/features/copilot/>

语音



Chat

<https://githubnext.com/projects/copilot-voice/>

研发

运维

## # Copilot for Docs

Whether you're learning a new library or API or you've been using it for years, it can feel like the documentation gets in your way more than it helps. Maybe the tutorials are too basic, or the reference manual is too sketchy, or the relevant information is split across multiple pages full of irrelevant details.

We're exploring a way to get you the information you need, faster. By surfacing the most relevant content for questions with tailored summaries that help connect the dots, Copilot for docs saves developers from scouring reams of documentation.

## GitHub Copilot Radar

GitHub Copilot Radar supports code navigation with a constantly updated view of other code locations most relevant to the one you're currently viewing or editing. As a jump-to-definition on steroids, it leverages both static analysis and GitHub Copilot's neural reasoning to make sure developers get the background they need about the code they touch.

WHAT'S IT FOR? Giving developers the context they need

STAGE: WIP

WHO MADE IT? Albert Ziegler, Amelia Wattenberger

SHARE: f t in

## GitHub Copilot for \*Your\* Codebase

When editing, GitHub Copilot only knows about the contents of your current file and possibly a few other open tabs, rendering it blind to important type definitions, patterns and greater connections in your codebase. We want to let GitHub Copilot see your entire repo when it comes up with its suggestions.

WHAT'S IT FOR? Getting better, more relevant Copilot suggestions

STAGE: WIP

WHO MADE IT? Eddie Aftandilian, Johan Rosenkilde, Amelia Wattenberger, Vincent Hellendoom

SHARE: f t in

## Copilot for Pull Requests

Pull requests are a central part of the GitHub user experience. Copilot for PRs brings the power of Copilot to the PR experience, to help you write better PR descriptions, and to help your team review and merge PRs faster.

WHAT'S IT FOR? Making pull requests magical.

STAGE: WAITLIST

WHO MADE IT? Andrew Rice, Devon Rifkin, Matt Rothenberg, Max Schaefer, Aqeel Siddiqui, Don Syme, Albert Ziegler

SHARE: f t in

## Copilot for CLI

Ever having trouble remembering shell commands and flags for this or that? Ever wish you could just say what you want the shell to do? Don't worry: we're building GitHub Copilot assistance right into your terminal.

WHAT'S IT FOR? Translating natural language to terminal commands

STAGE: USABLE PROTOTYPE

WHO MADE IT? Johan Rosenkilde, Matt Rothenberg

SHARE: f t in

## TestPilot

TestPilot takes the pain out of writing unit tests. It uses GitHub Copilot's AI technology to suggest tests based on your existing code and documentation. Unlike many other tools, TestPilot generates readable tests with meaningful assertions, and it can iteratively improve its suggestions based on your feedback.

WHAT'S IT FOR? Generate unit tests from code and documentation

STAGE: USABLE PROTOTYPE

WHO MADE IT? Max Schaefer, Sarah Nadi, Frank Tip

SHARE: f t in



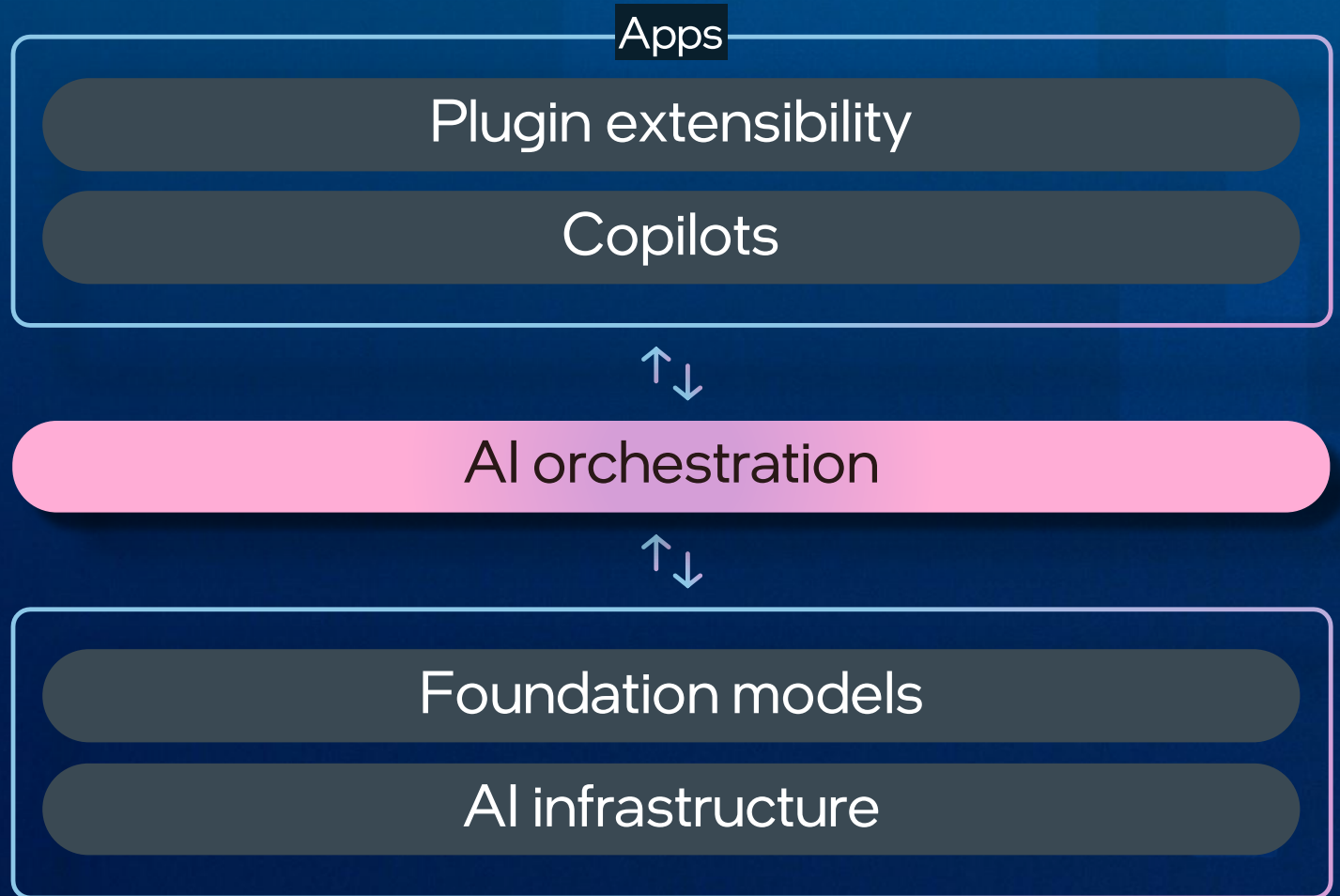
# Copilot X 没法等待

## 客户需要自己的魔法

# 构建自己的 GitHub Copilot



# Copilot stack



Semantic Kernel 是一款轻量级开源 AI 编排 SDK，可让您轻松地将 AI 提示与 C#，Java 和 Python 等传统编程语言混合搭配。

## Semantic Kernel

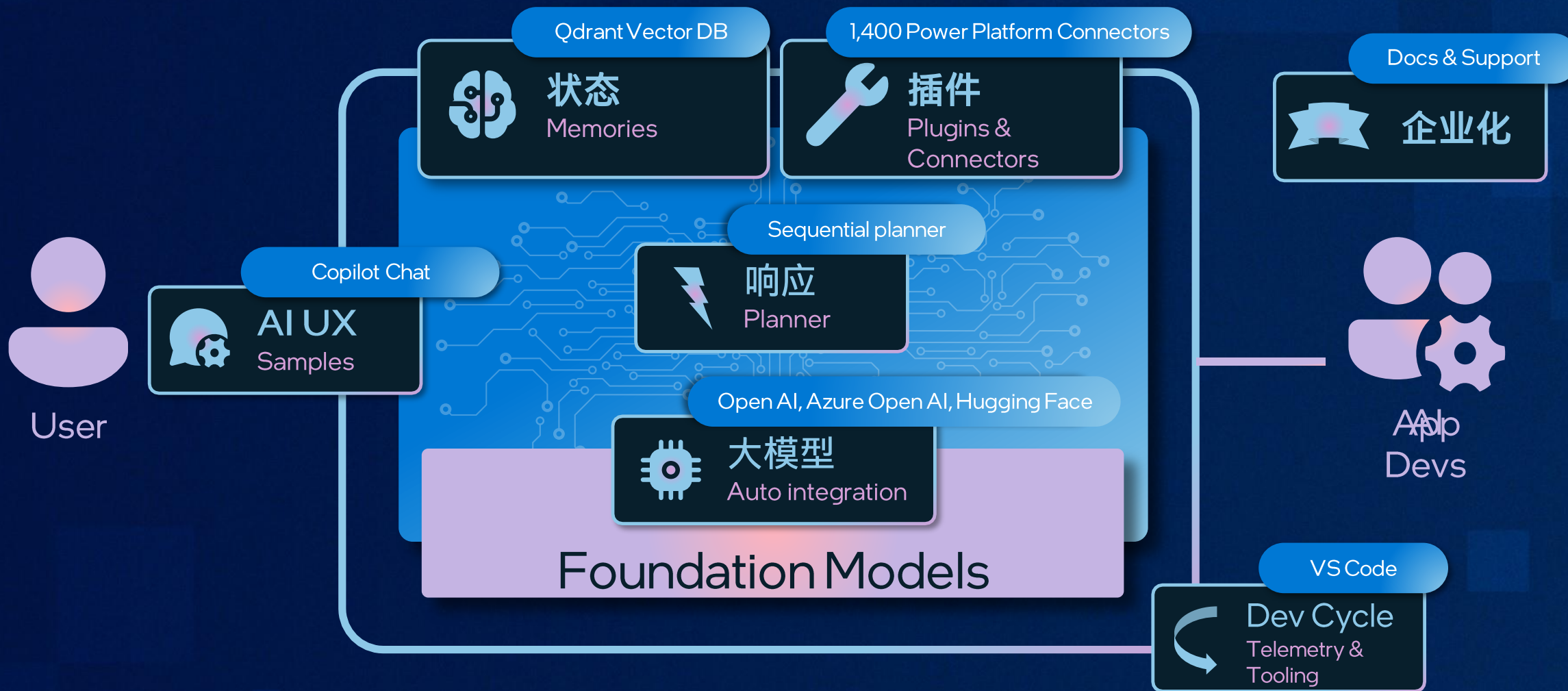
开源且值得信赖

可靠且高性能

为人工智能服务

MS 强大的企业数据和软件生态系统支持

# Semantic Kernel 使人工智能应用程序开发人员更容易上手



# Copilot application scenarios

GitHub Copilot



General Code Generation  
General Code Testing  
General Code Testing  
General Code Analyze

How to be Enterprise

Enterprise Copilot



<https://github.com/microsoft/node-api-dotnet>

Enterprise Code Analyze  
Enterprise Code Testing  
Enterprise Code Testing  
Enterprise Code Generation  
Enterprise Docs Generation  
Enterprise Arch Generation



Semantic Kernel



Azure OpenAI Service



Promptflow

# Enterprise Copilot

# Enterprise Copilot @Copilot Stack



VSCode Extensions

## Copilot frontend

Plugin extensibility

UX

Skills



- Enterprise Code Analyze
- Enterprise Code Testing
- Enterprise Code Testing
- Enterprise Code Generation
- Enterprise Docs Generation
- Enterprise Arch Generation



PromptFlow

## Orchestration

Prompt & response filtering

Metaprompt

Grounding

Plugin execution



Azure OpenAI Services



Code-Llama

## Foundation models

Hosted foundation models

Hosted fine-tuned foundation models

BYO models



Azure Machine Learning

AI infrastructure

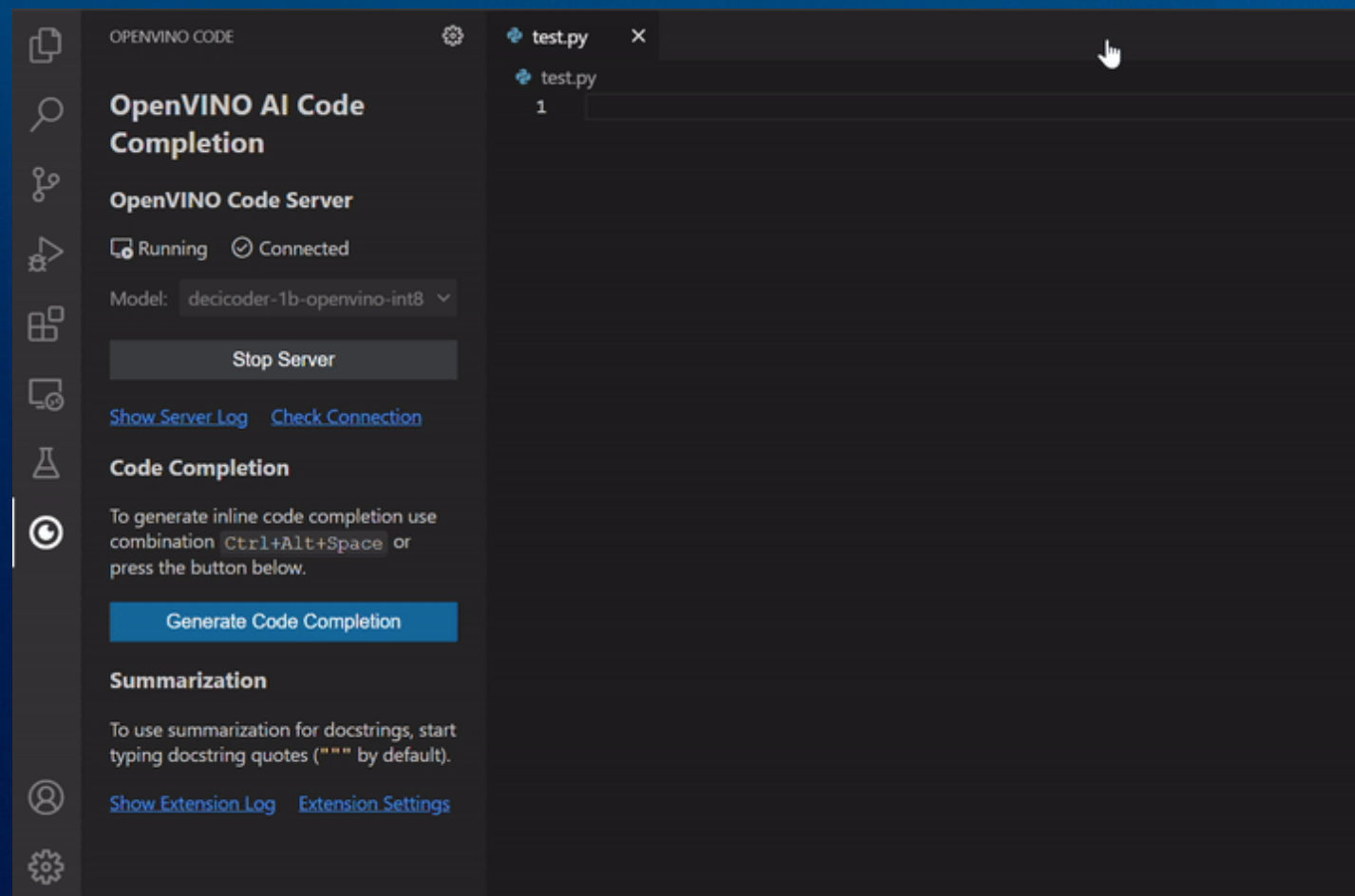
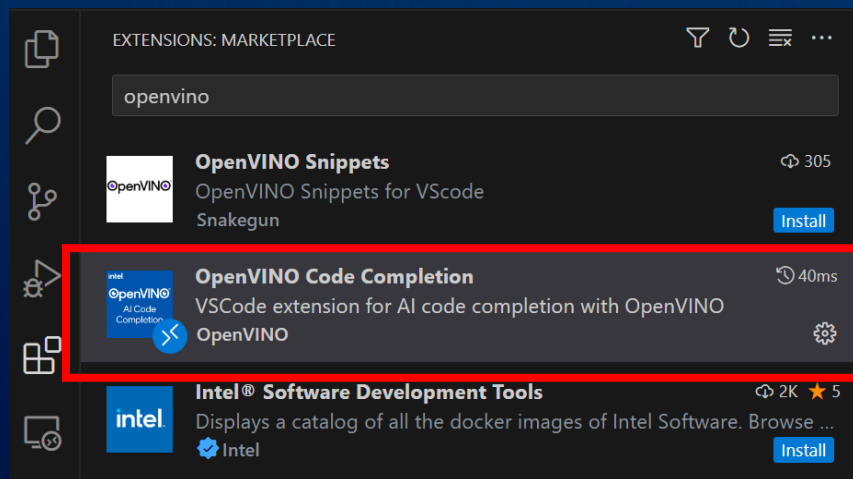
# Demo 1

<https://github.com/kinfey/VSCoDeEnterpriseCopilotWorkshop>



# OpenVINO™ Code Completion - VSCode extension

在本地运行 Code Generation 模型



# Demo 2

# Thank You

