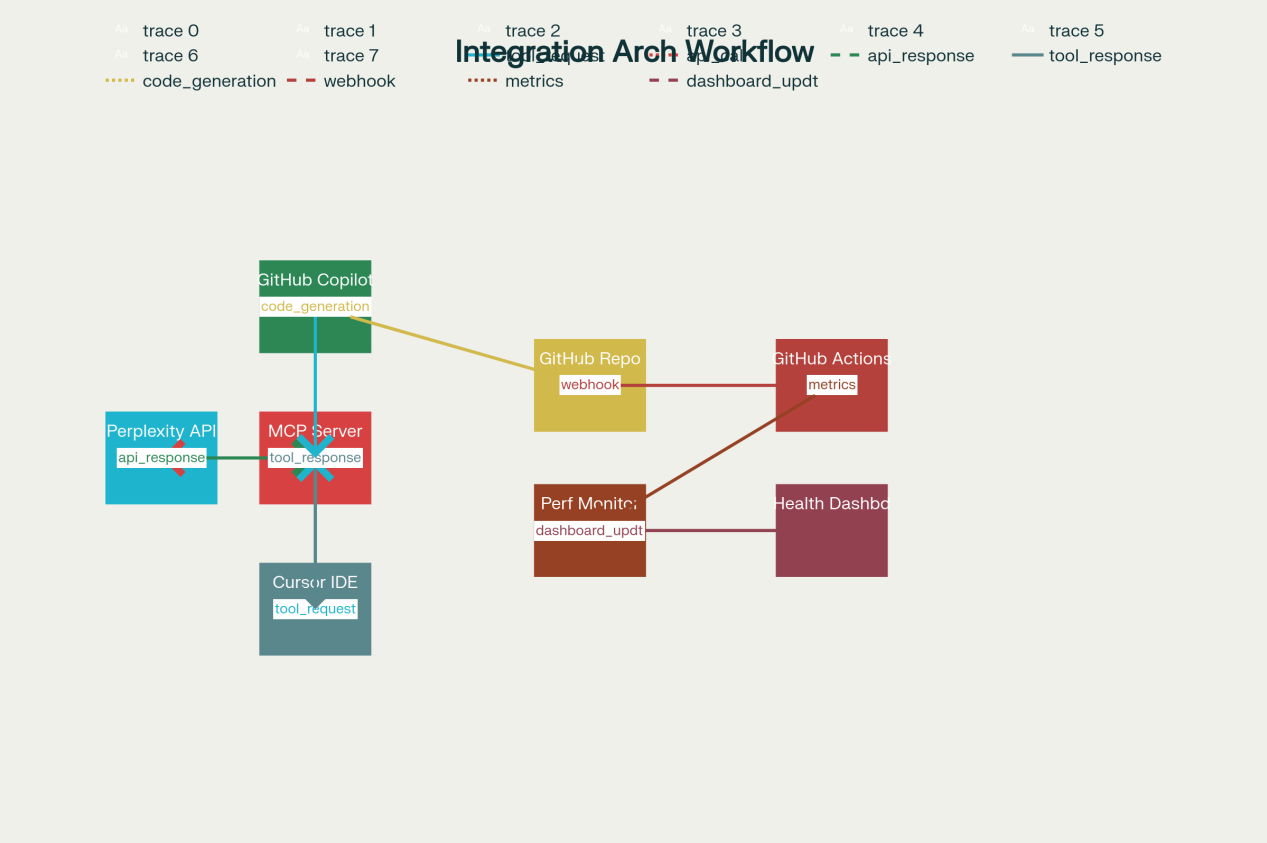
AI-Driven Automation Blueprint: Perplexity × MCP × GitHub Copilot × Cursor IDE

Main takeaway
Deploy a Perplexity-backed MCP server as the single research "brain," expose it to both GitHub Copilot Coding Agent and Cursor IDE, and wire the whole loop with GitHub Actions-based CI plus an observability stack. The result is a closed-loop, self-improving pipeline that researches, codes, tests, reviews, measures, and learns—continuously.

![Integration Architecture]



Comprehensive Integration Architecture for Perplexity API, GitHub Copilot, and Cursor IDE

1. Architecture Overview

Layer	Component	Role	Key References
Research	**Perplexity API (Sonar)**	128 k-context models for deep web search	[1] [2]

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Middleware	**Perplexity MCP Server** (`ask_perplexity`, `chat_perplexity`)	JSON-RPC 2 streamable server, OAuth 2.1 RS, 256 MB mem budget	[3] [4] [5] [6] [7]
Coding Agents	**GitHub Copilot Coding Agent**	Asynchronous PR-driven developer	[8] [9] [10] [11] [12] [13]
IDE	**Cursor IDE** (VS Code fork)	Context-aware local dev with `.cursor/mcp.json`, multi-level rules	[14] [15] [16] [17] [18] [19] [20]
CI / Ops	**GitHub Actions + Health Monitor**	Build, test, performance gates; REST `/health`, `/servers` endpoints	[21] [22] [23] [24] [25] [26]
Sec & Gov	OAuth RS/AS split, RFC 8707 resource indicators, RBAC, audit	[6] [27] [28] [29] [30] [31] [32] [33]	

2. Step-by-Step Implementation Guide

Phase 0 – Prerequisites

1. Obtain Perplexity API key (`PERPLEXITY_API_KEY`) and choose model (`sonar-deep-research` for high-latency research, `sonar-reasoning-pro` for interactive chats).[1] [2]
2. Provision GitHub Enterprise or Pro+ with Copilot Enterprise (includes coding agent preview).[11]
3. Install Cursor IDE ≥ v0.47 (June 2025) on all dev machines.[16] [19]

Phase 1 – Deploy the MCP Server

```
# Clone reference server
git clone https://github.com/ppl-ai/modelcontextprotocol.git
cd modelcontextprotocol/perplexity-ask
pnpm i   # or npm install
# Local test
PERPLEXITY_API_KEY=pplx-*** node dist/index.js --port 3333
```

Recommended production container:

```
FROM node:20-alpine
WORKDIR /srv
COPY . .
RUN npm ci --omit dev \
 && addgroup -S mcp && adduser -S mcp -G mcp
USER mcp
ENV PORT=3333 PERPLEXITY_API_KEY=__SECRET__
CMD ["node","dist/index.js"]
```

Security hardening

- Behind an OAuth 2.1 authorization server; the MCP server acts only as **resource server**.[6] [30]
- Enforce `resource` parameter (RFC 8707) to stop token mis-redemption.[6]
- Run non-root, read-only filesystem, seccomp profile, 256 MB mem/0.5 CPU limits.[9] [28]

Phase 2 – Wire into GitHub Copilot Coding Agent

1. Add self-hosted MCP in repo **Settings** → **Agents** → **Tools**.
2. Grant Copilot secret `PERPLEXITY_API_KEY` (Organization → Secrets → Copilot).
3. Create workflow `.github/workflows/copilot-agent.yml`:

```
name: Copilot Agent Bootstrap
on: workflow_call          # invoked by agent session
jobs:
  mcp:
    runs-on: ubuntu-latest
    steps:
      - name: Start Perplexity MCP
        uses: nick-invision/retry@v3
        with:
          command: docker run -d --network host \
                    -e PERPLEXITY_API_KEY=${{ secrets.PPLX_KEY }} \
                    mcp/perplexity-ask:latest
      - name: Await health
        run: curl --retry 15 --retry-connrefused http://localhost:3333/health
```

4. Delegate work:

```
@copilot Investigate flaky test in api/auth.spec.ts - gather last 7 days web results "jwt
```

Copilot will call `ask_perplexity`, generate a branch, push commits, open PR.

Phase 3 – Plug into Cursor IDE

1. Global server (~/.cursor/mcp.json):

```
{
  "servers": {
    "Perplexity": {
      "type": "stdio",
      "command": "docker",
      "args": ["run","--rm","-i","-e","PERPLEXITY_API_KEY","mcp/perplexity-ask"],
      "env": {
        "PERPLEXITY_API_KEY": "PROMPT:Perplexity API Key"
      }
    }
  }
}
```

2. Project rules: `.cursor/index.mdc` (Always):

```
# Architecture
* React + NestJS monorepo
* Use pnpm workspaces; strict ESLint / Prettier
# AI Conventions
* Prefer fp-ts over OOP
* Error handling with Zod + Result<E,A>
* Minimize changes (<20 LOC per iteration)
```

3. Dynamic rules in `.cursor/rules/*.mdc` for module-specific constraints (reduces token cost). [20]

Phase 4 – CI + Performance Guardrails

1. **Enhanced MCP validation** job:

```
- name: Run MCP perf tests
  run: |
    npx mcp-tester --server http://localhost:3333 \
                   --budget-p95 1500 --fail-under 90
```

2. Metrics export in GitHub Actions → Prometheus/OTel collector → Datadog/CICube dashboards. [21] [23] [24]
3. Health Monitor service on port 3010 surfaces `/servers` latency & failure window; alerts Slack if p95 > 1.5 s or 3 consecutive 5xx. [9]

3. Recommended Workflow Progression

Priority	Goal	Who/Where	Outputs
1	**Research-to-Code Loop**	Copilot Agent ⇄ MCP ⇄ Perplexity	PRs with cited sources
2	**Local Dev × Cursor**	Cursor IDE ⇄ MCP	Inline suggestions, chat
3	**Quality Gates**	GitHub Actions	Build + test, perf budgets
4	**Observability**	Health Monitor + Datadog	SLO dashboards, alerts
5	**Security Hardening**	OAuth RS/AS, RBAC, audit	Token scopes, logs
6	**Road-mapping & CI**	Continuous-Improvement retros, `.github/ISSUE_TEMPLATE`	Backlog tagged `research-needed` automatically triaged

4. Continuous Improvement & Road-mapping

1. Tag GitHub issues: `needs-research`, `performance-regression`, `tech-debt`.
2. Nightly Cron:

```
- name: Auto-triage research backlog
  if: github.event.schedule == '0 3 * * *'
  uses: actions/github-script@v7
  with:
    script: |
      // call ask_perplexity via MCP to fetch top links for each open 'needs-research' is
```

3. Weekly retro uses **Improvement Kata**; feed action items into `.github/ROADMAP.md` with priority labels.[34]

5. Security Checklist (MCP Servers)

Control	Implementation
Auth	OAuth 2.1 RS; no sessions[6] [32]
Scope minimization	One token = one server; use `resource` param
Input validation	Limit max tokens, sanitize markdown
Prompt-injection defense	Server strips system prompt overrides; log anomalies[27] [29]
Observability	OpenTelemetry traces; correlation-ID per request[28]
Least privilege runtime	Non-root, read-only FS, seccomp, 256 MB mem

6. Troubleshooting Playbook

Symptom	Likely Cause	Fix
502 from MCP	API quota exhausted	Rotate key, back-pressure requests
Copilot PR stalls	Agent workspace lacks MCP	Check bootstrap job logs
Cursor “tool not found”	Missing `.cursor/mcp.json` or server down	Restart local server; verify port
Latency > 1.5 s	Cold Docker pull or net lag	Pre-pull images; add CDN edge cache

Next-Step Enhancements

- Add **RAG** layer caching Perplexity responses in Postgres for deterministic CI.
- Introduce **policy-as-code** (OPA) to approve tool calls before execution.
- Roll out **OpenTelemetry GitHub Actions receiver** for full CI traces.[24]

Follow this blueprint to turn isolated AI helpers into a unified, self-optimizing development platform.

⁂

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