Cupertino: Offline Apple Documentation for AI Agents

TL;DR: I built an MCP server that gives Claude Desktop offline access to 22,000+ Apple documentation pages across 261 frameworks. No more hallucinated APIs.

The Problem

If you've used Claude or ChatGPT for Swift/iOS development, you've seen this:

> "Use the `NavigationView` with `.navigationBarTitle()` modifier..."

Except `NavigationView` is deprecated. It's `NavigationStack` now. And the modifier is `.navigationTitle()`.

AI models hallucinate APIs. They mix up iOS 14 patterns with iOS 17. They invent methods that don't exist. And when you're deep in a coding session, these small errors cost you hours.

The Solution: Cupertino

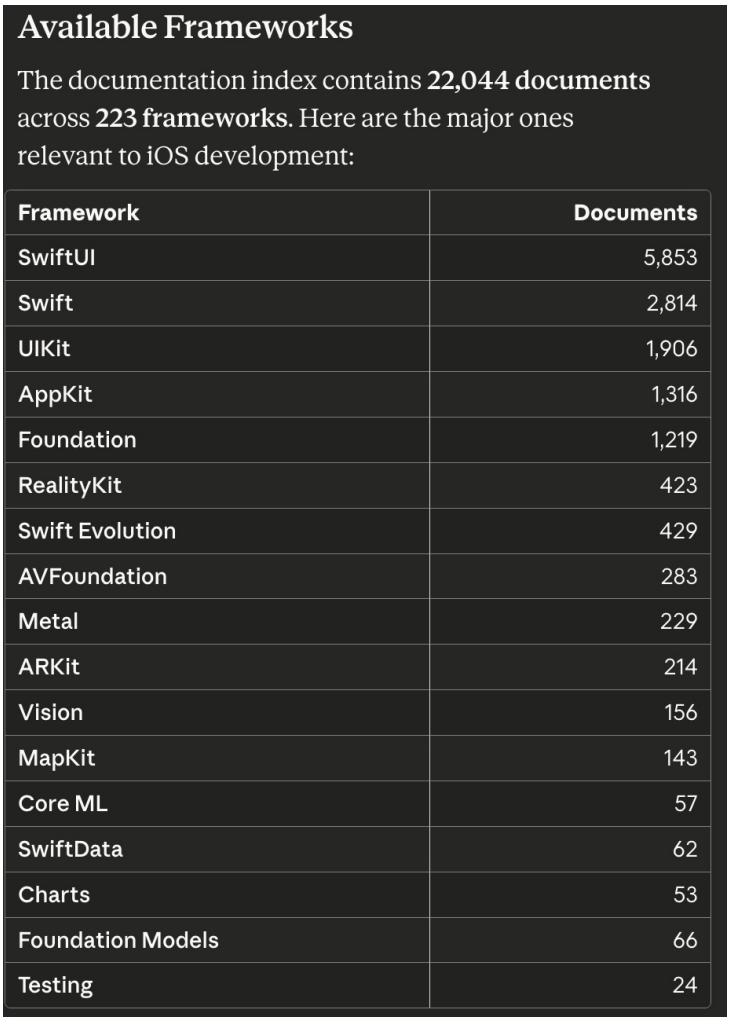
Cupertino is an MCP (Model Context Protocol) server that:

1. **Crawls** Apple Developer documentation, Swift Evolution proposals, and Swift.org
2. **Indexes** everything into a local SQLite FTS5 database with BM25 ranking
3. **Serves** documentation to Claude Desktop via MCP

When Claude needs to answer a SwiftUI question, it searches your local documentation instead of relying on training data.

What You Get

22,044 documents across 223 frameworks:



Available Frameworks

The documentation index contains **22,044 documents** across **223 frameworks**. Here are the major ones relevant to iOS development:

Framework	Documents
SwiftUI	5,853
Swift	2,814
UIKit	1,906
AppKit	1,316
Foundation	1,219
RealityKit	423
Swift Evolution	429
AVFoundation	283
Metal	229
ARKit	214
Vision	156
MapKit	143
Core ML	57
SwiftData	62
Charts	53
Foundation Models	66
Testing	24

The documentation index contains 22,044 documents across 223 frameworks, including all major Apple platforms.

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...	...

Two MCP tools:

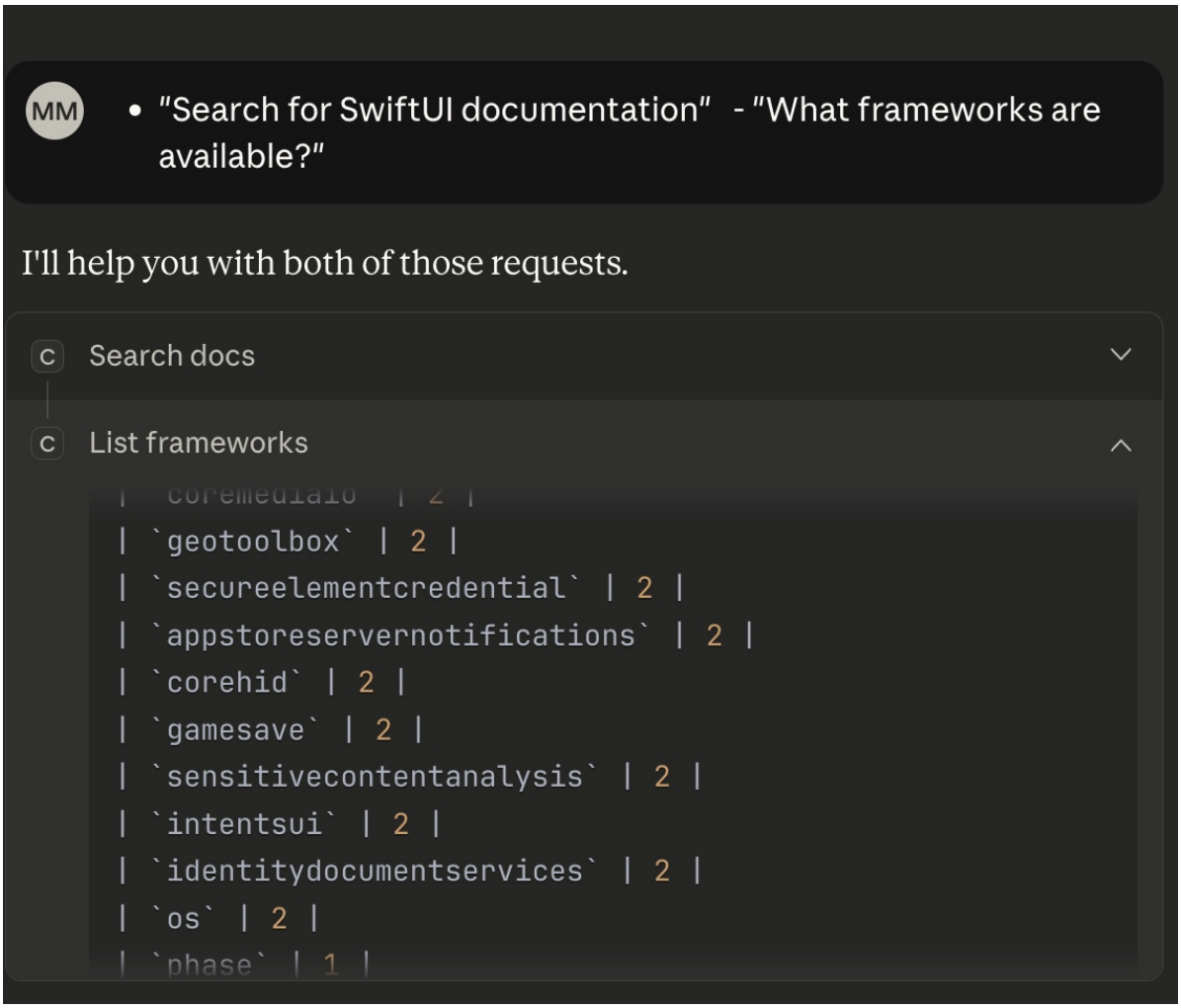
- `search_docs` - Full-text search with BM25 ranking
- `list_frameworks` - Discover available documentation

Example search result:

```
# Search Results for "SwiftUI View"

## 1. View | Apple Developer Documentation
- **Framework:** swiftui
- **URI:** apple-docs://swiftui/documentation_swiftui_view
- **Score:** 1.82
- **Words:** 2,682

Protocol# View
A type that represents part of your app's user interface...
```



Claude Desktop using Cupertino's MCP tools to search documentation and list available frameworks

Installation

1. Build from source

```
git clone https://github.com/mihaelamj/cupertino.git
cd cupertino
make build
sudo make install
```

2. Fetch documentation

```
# Quick start: Swift Evolution only (~5 minutes)
cupertino fetch --type evolution
cupertino save

# Full documentation (~20-24 hours, one-time)
cupertino fetch --type docs --max-pages 15000
```

```
cupertino fetch --type evolution
cupertino save
```

Expected output after indexing:

```
? Search index built successfully!
   Total documents: 22044
   Frameworks: 261
   Database: /Users/mm/.cupertino/search.db
   Size: 163.6 MB

? Tip: Start the MCP server with 'cupertino serve' to enable search
```

Why 20+ hours? The crawler respects Apple's servers with a 0.5s delay between requests. 21,000 pages × 0.5s = many hours. But it's a one-time operation.

3. Configure Claude Desktop

Edit `~/Library/Application Support/Claude/claude_desktop_config.json`:

```
{
  "mcpServers": {
    "cupertino": {
      "command": "/usr/local/bin/cupertino"
    }
  }
}
```

Restart Claude Desktop. Done.

4. Verify it works

```
cupertino doctor
```

```
? MCP Server
   ? Server can initialize
   ? Transport: stdio
   ? Protocol version: 2024-11-05

? Documentation Directories
   ? Apple docs: ~/.cupertino/docs (21,114 files)
   ? Swift Evolution: ~/.cupertino/swift-evolution (429 proposals)

? Search Index
   ? Database: ~/.cupertino/search.db
   ? Size: 156.0 MB
   ? Frameworks: 261

? All checks passed - MCP server ready
```

How It Works

```
1. Fetch:  cupertino fetch --type docs
   ? WKWebView renders JavaScript-heavy pages
   ? HTML converted to Markdown
   ? Saved to ~/.cupertino/docs/

2. Save:   cupertino save
   ? Markdown files indexed into SQLite FTS5
   ? BM25 ranking for relevance scoring
   ? ~160MB database for full index

3. Serve:  cupertino serve
   ? MCP server starts on stdio
   ? Claude Desktop connects via JSON-RPC
   ? Search queries hit local database
```

Architecture

Built with Swift 6.2 and strict concurrency:

```
Packages/
??? MCP/                # Model Context Protocol implementation
??? Search/             # SQLite FTS5 search engine
??? Core/               # Crawlers (WKWebView, GitHub API)
??? CLI/                # Command-line interface
??? Resources/          # Bundled catalogs (9,699 packages, 606 samples)
```

Key decisions:

- **Swift 6.2** with 100% strict concurrency checking
- **Actor isolation** for thread-safe state management
- **SQLite FTS5** with BM25 for fast, relevant search
- **WKWebView** to render Apple's JavaScript-heavy documentation

Room for Improvement

Honest feedback from testing: the search works, but it's not perfect.

Current limitation: BM25 treats all documents equally. A search for "SwiftUI" returns `mouseEntered(with:)` alongside `View` protocol because both contain "SwiftUI" with similar frequency.

Planned improvements:

1. **Boost by word count** - Comprehensive docs (2000+ words) rank higher than stub pages (61 words)
2. **Boost by path depth** - `/swiftui/view` ranks higher than `/swiftui/nshostingview/mouseentered`
3. **Document type weighting** - Overview pages rank higher than individual method docs
4. **Curated importance flags** - Mark foundational docs for priority ranking

The search is still useful for targeted queries like "SwiftUI NavigationStack" or "SE-0001". Broad queries need work.

Why I Built This

I was tired of:

- Claude inventing deprecated APIs
- Switching to Safari to verify every code suggestion
- Losing flow state to documentation lookups

Now Claude searches my local 160MB documentation database. Same query, same results, every time. Offline. Fast.

Links

GitHub: github.com/mihaelamj/cupertino
Requirements: macOS 15+, Swift 6.2+, Xcode 16+
License: MIT

Built with Swift, frustration, and too many hours debugging WKWebView concurrency issues.