Building Agentic GraphQL APIs

With LLM Tool Use & Knowledge Graphs

William Lyon

Hypermode

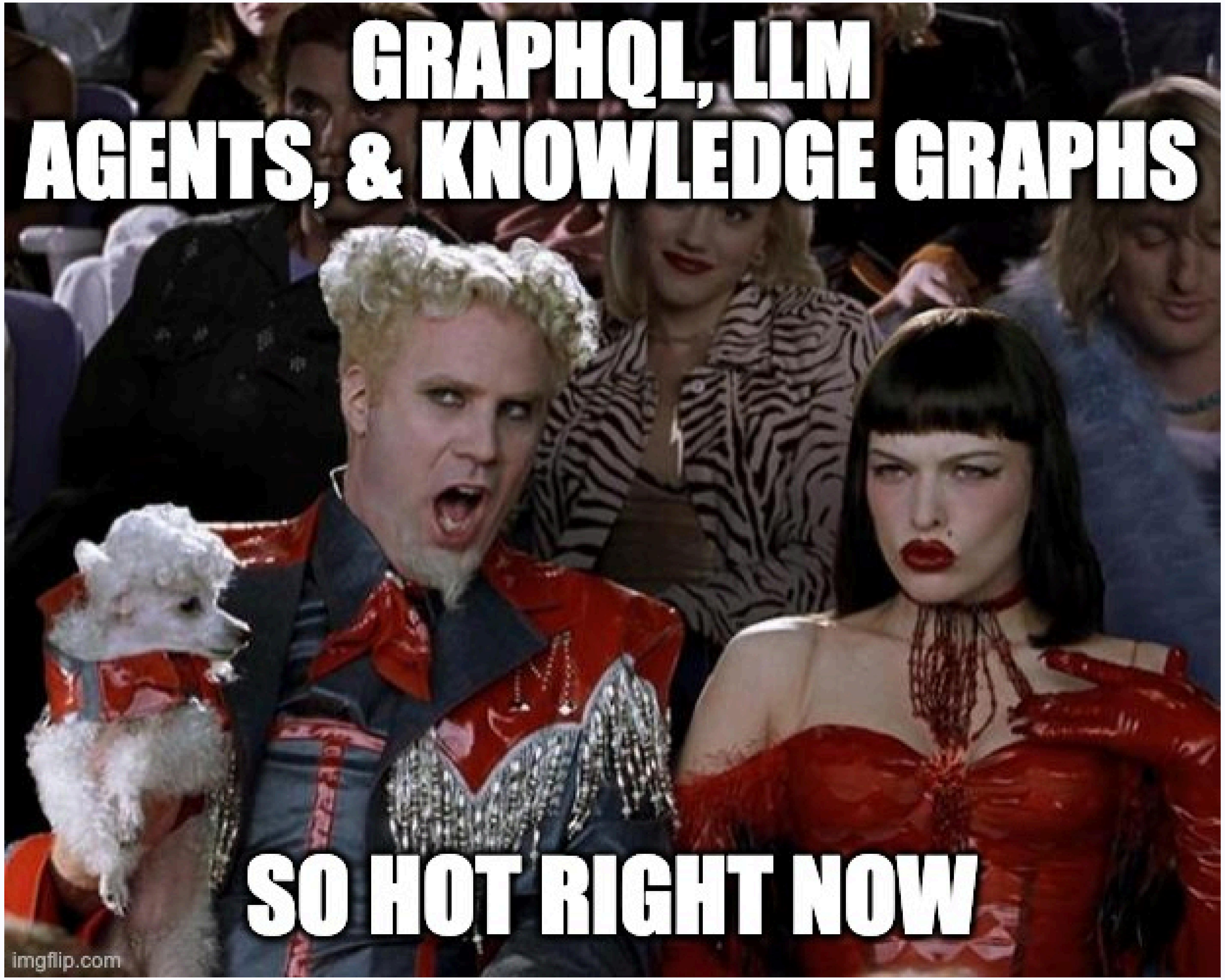
FOSDEM '25

Brussels

Feb 2025

hyp.foo/fosdem25

So many buzzwords!



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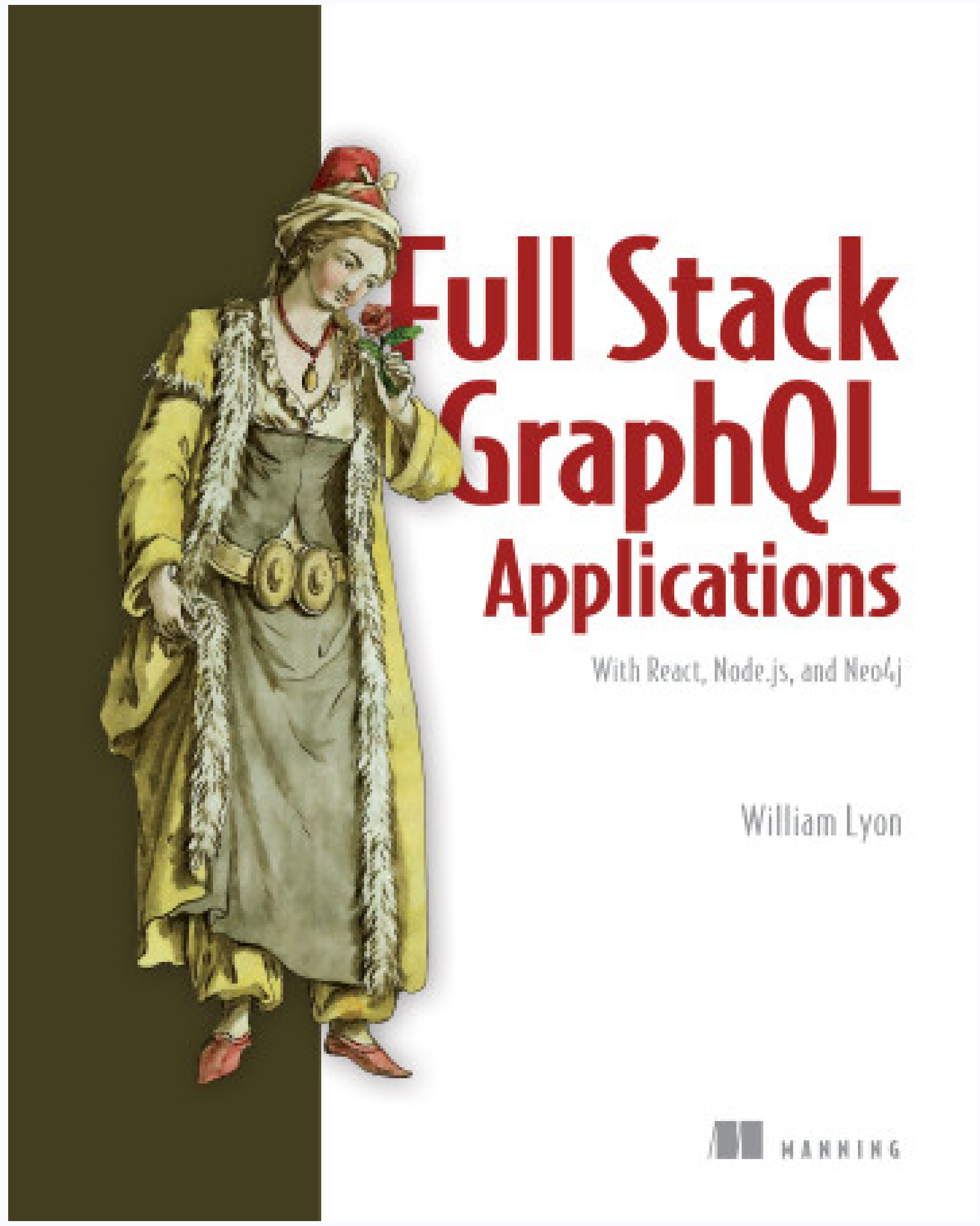
GraphQL

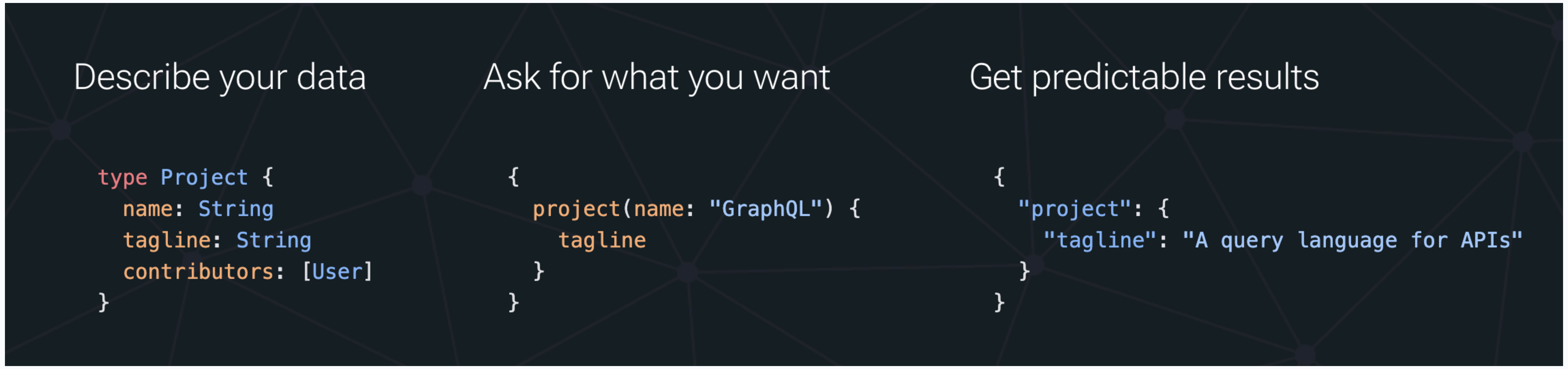


Full Stack GraphQL Applications

With React, Node.js, and Neo4j

William Lyon

MANNING



Describe your data

```
type Project {
  name: String
  tagline: String
  contributors: [User]
}
```

Ask for what you want

```
{
  project(name: "GraphQL") {
    tagline
  }
}
```

Get predictable results

```
{
  "project": {
    "tagline": "A query language for APIs"
  }
}
```

> “Your application data is a graph.”
> -- GraphQL

graphql.org

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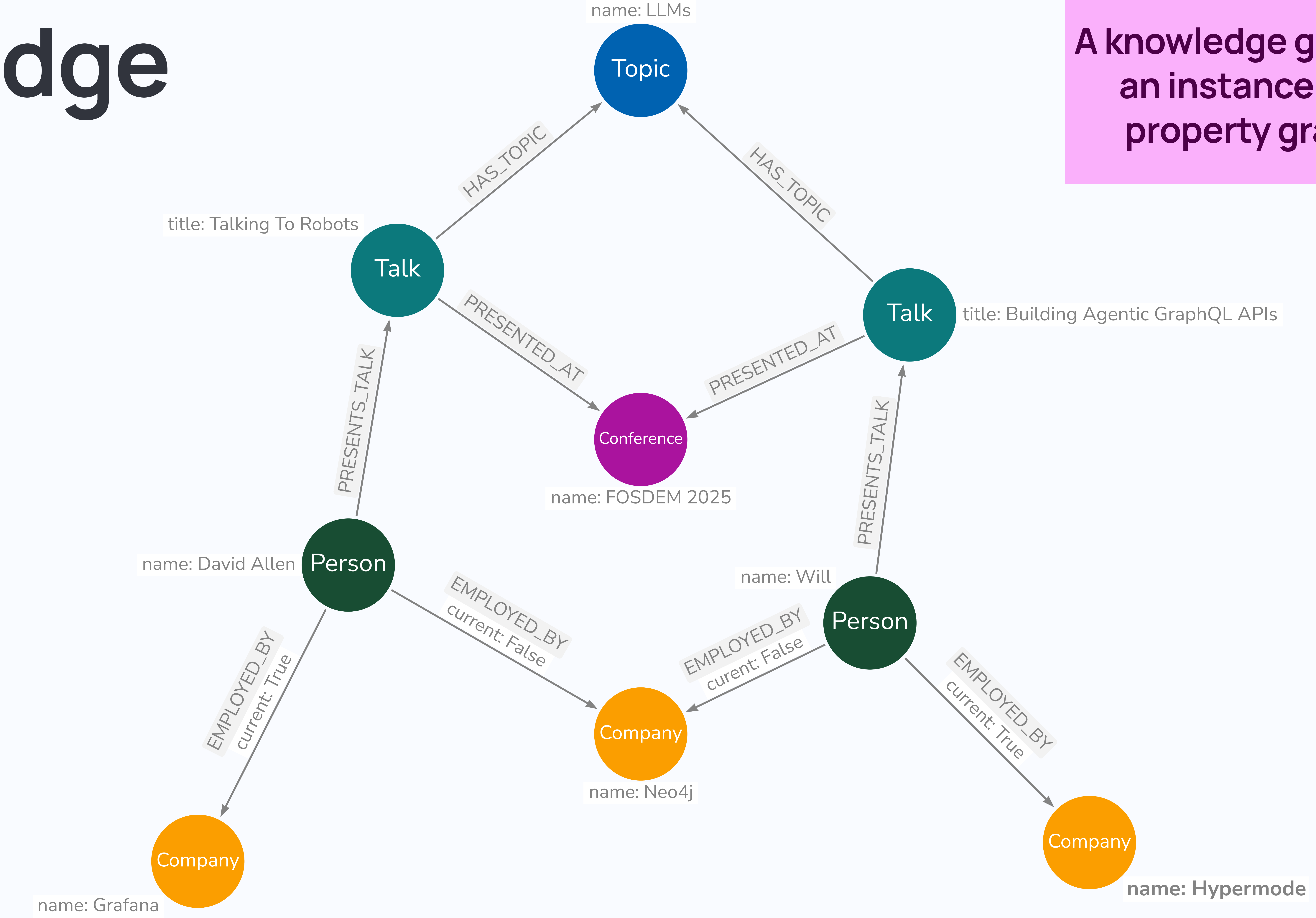
Knowledge Graphs

A knowledge graph is an instance of a property graph



Dgraph

neo4j

"Things, not strings."

Hypermode

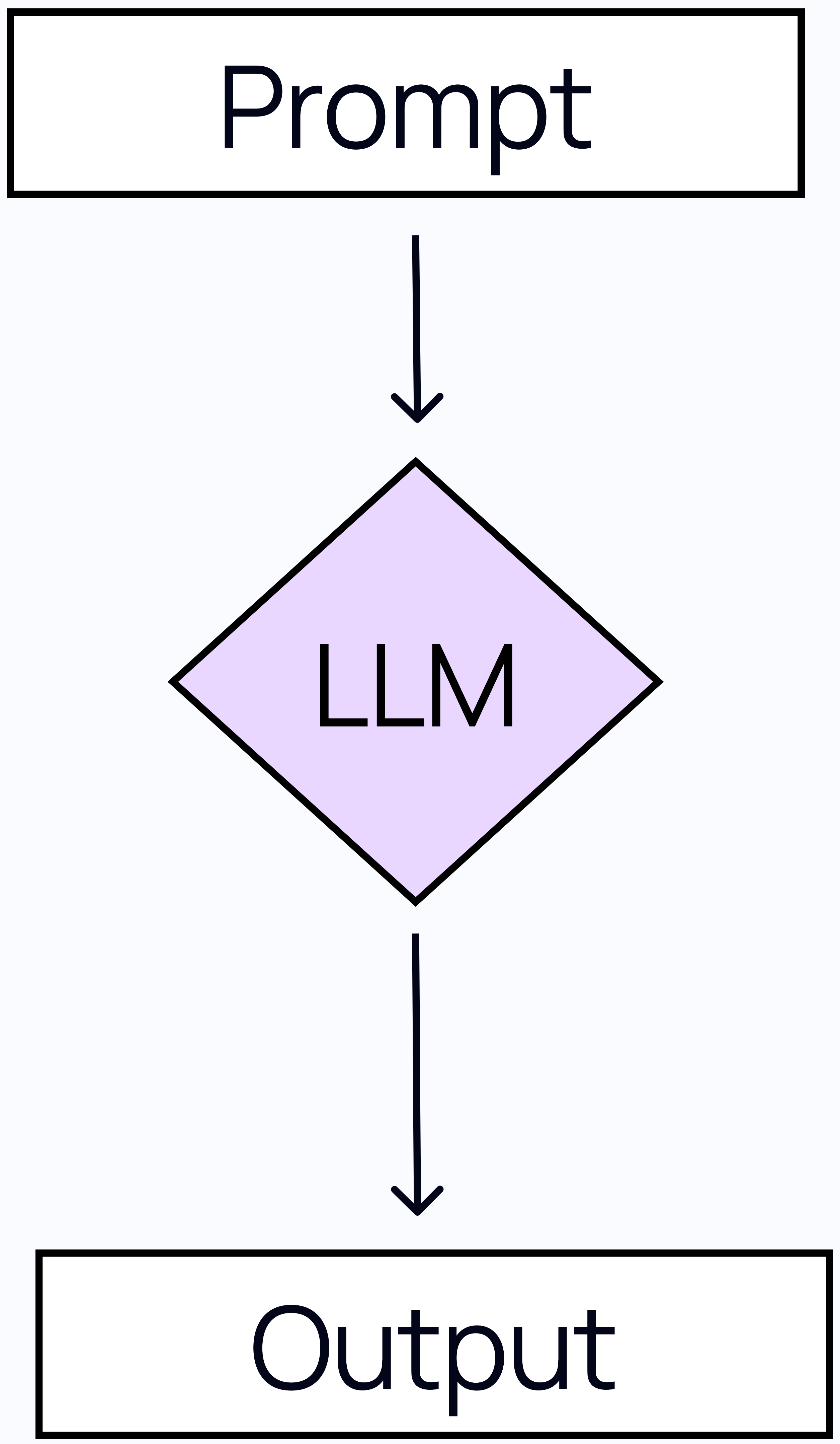
LLMs

Claude

OpenAI

deepseek

LLaMA
by Meta



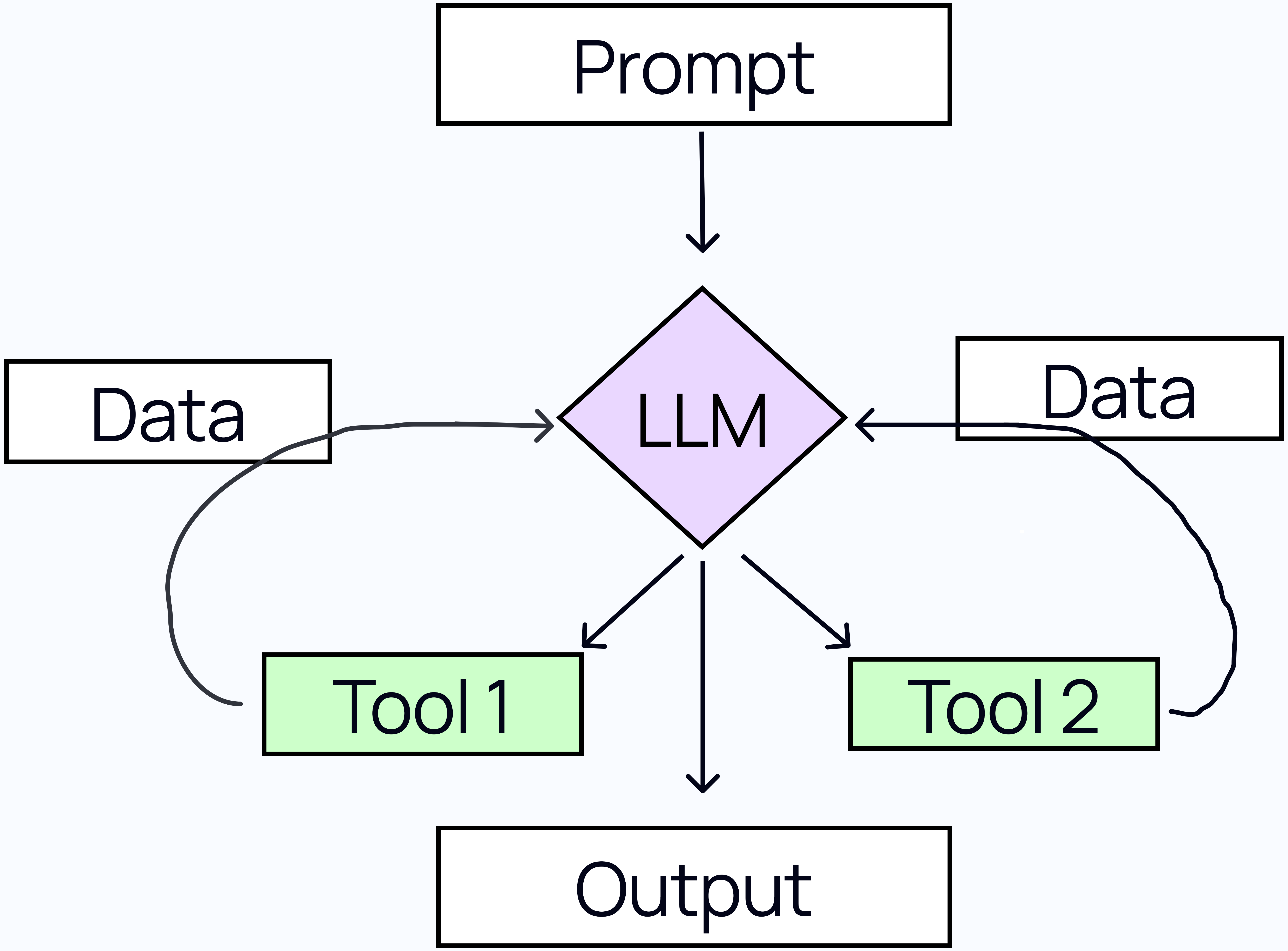
LLM Agents

Claude

OpenAI

deepseek

LLaMA by Meta



Open Source Tools To Build And Host Model-Native Apps

Hypermode

Cloud Platform
& Company

Serverless API Framework

Modus

Scalable real-time graph database

Dgraph

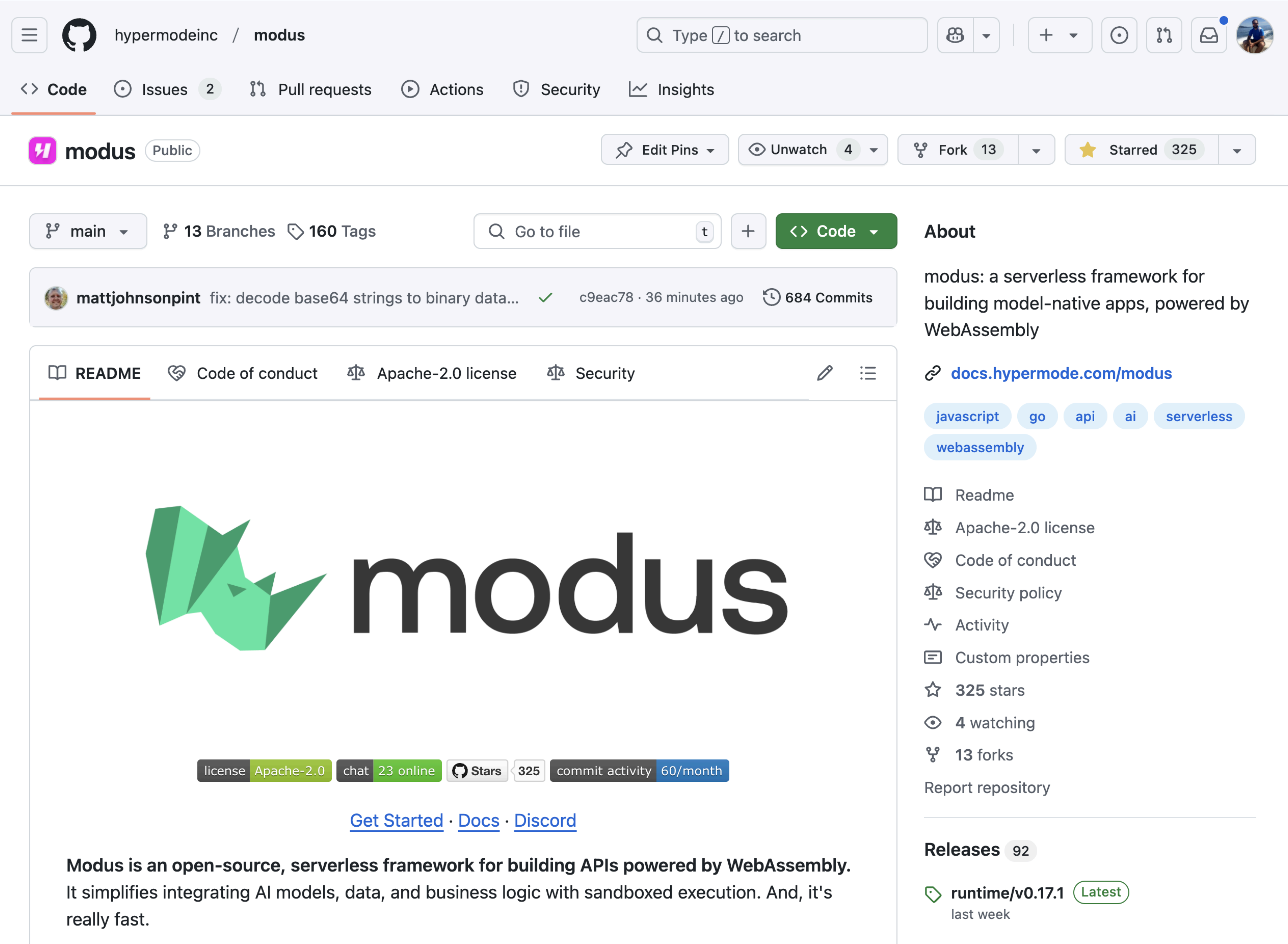
Embeddable fast key-value store

Badger

Fast cache library

Ristretto

Open Source
Developer
Infrastructure
& Tooling



mattjohnsonpint fix: decode base64 strings to binary data... ✓ c9eac78 · 36 minutes ago 684 Commits

Get Started · Docs · Discord

Modus is an open-source, serverless framework for building APIs powered by WebAssembly. It simplifies integrating AI models, data, and business logic with sandboxed execution. And, it's really fast.

About

modus: a serverless framework for building model-native apps, powered by WebAssembly

docs.hypermode.com/modus

javascript go api ai serverless webassembly

- Readme
- Apache-2.0 license
- Code of conduct
- Security policy
- Activity
- Custom properties
- 325 stars
- 4 watching
- 13 forks

Report repository

Releases 92

runtime/v0.17.1 Latest
last week

hyp.foo/modus

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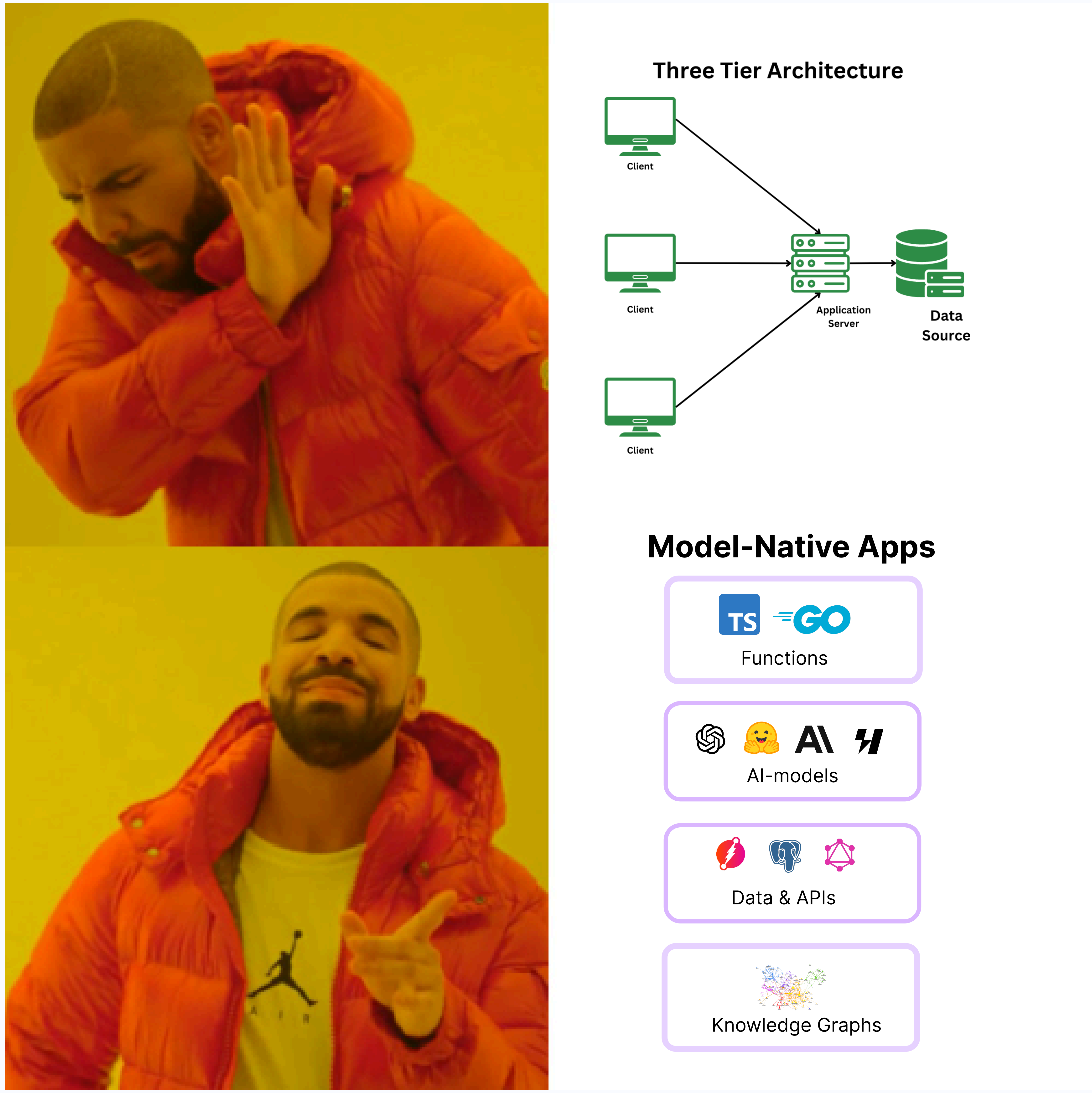
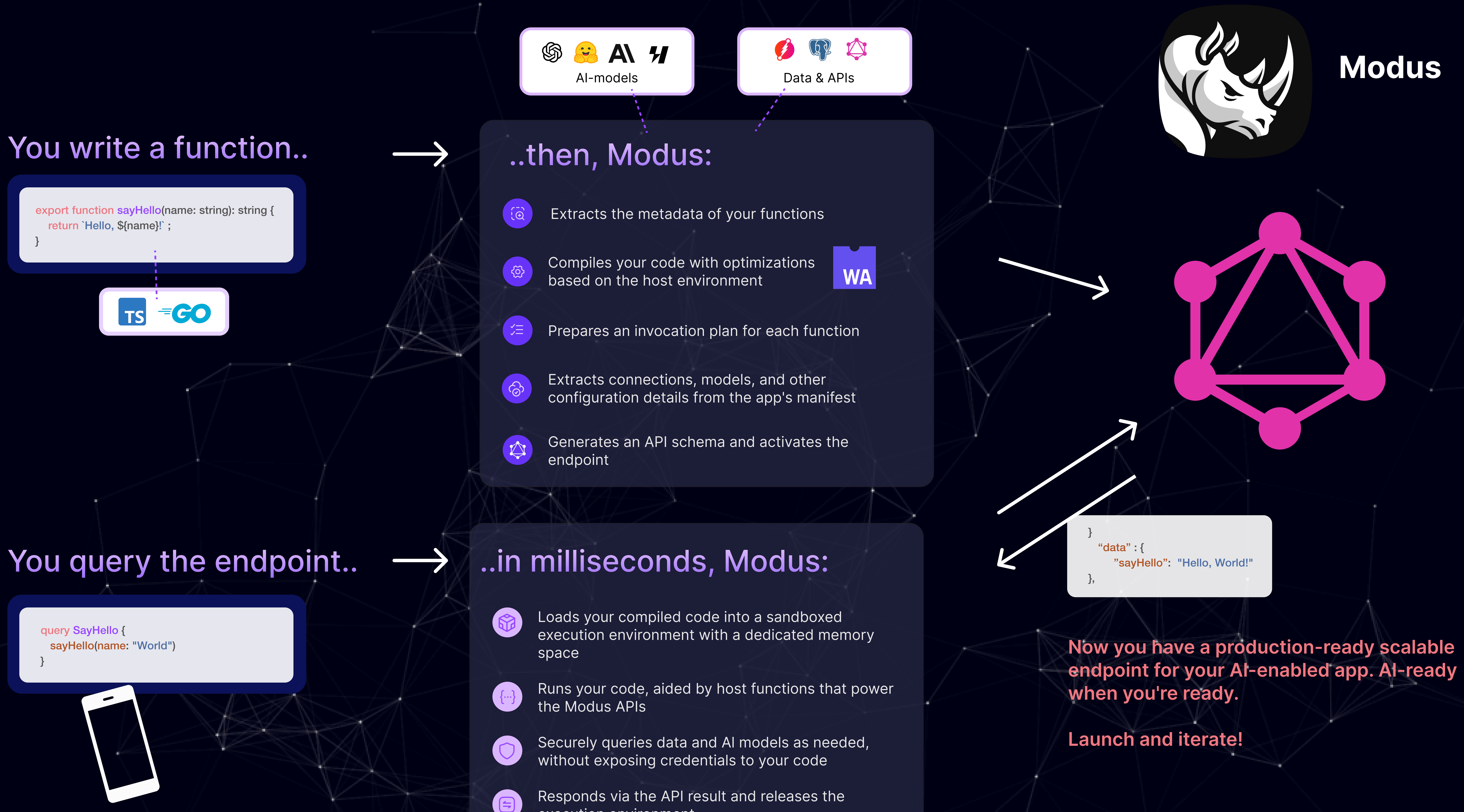


What is a model-native app? The abstractions developers work with have changed

Modus



You write a function..

```
export function sayHello(name: string): string {
   return `Hello, ${name}!` ;
}
```

..then, Modus:

- Extracts the metadata of your functions
- Compiles your code with optimizations based on the host environment
- Prepares an invocation plan for each function
- Extracts connections, models, and other configuration details from the app's manifest
- Generates an API schema and activates the endpoint

You query the endpoint..

```
query SayHello {
  sayHello(name: "World")
}
```

..in milliseconds, Modus:

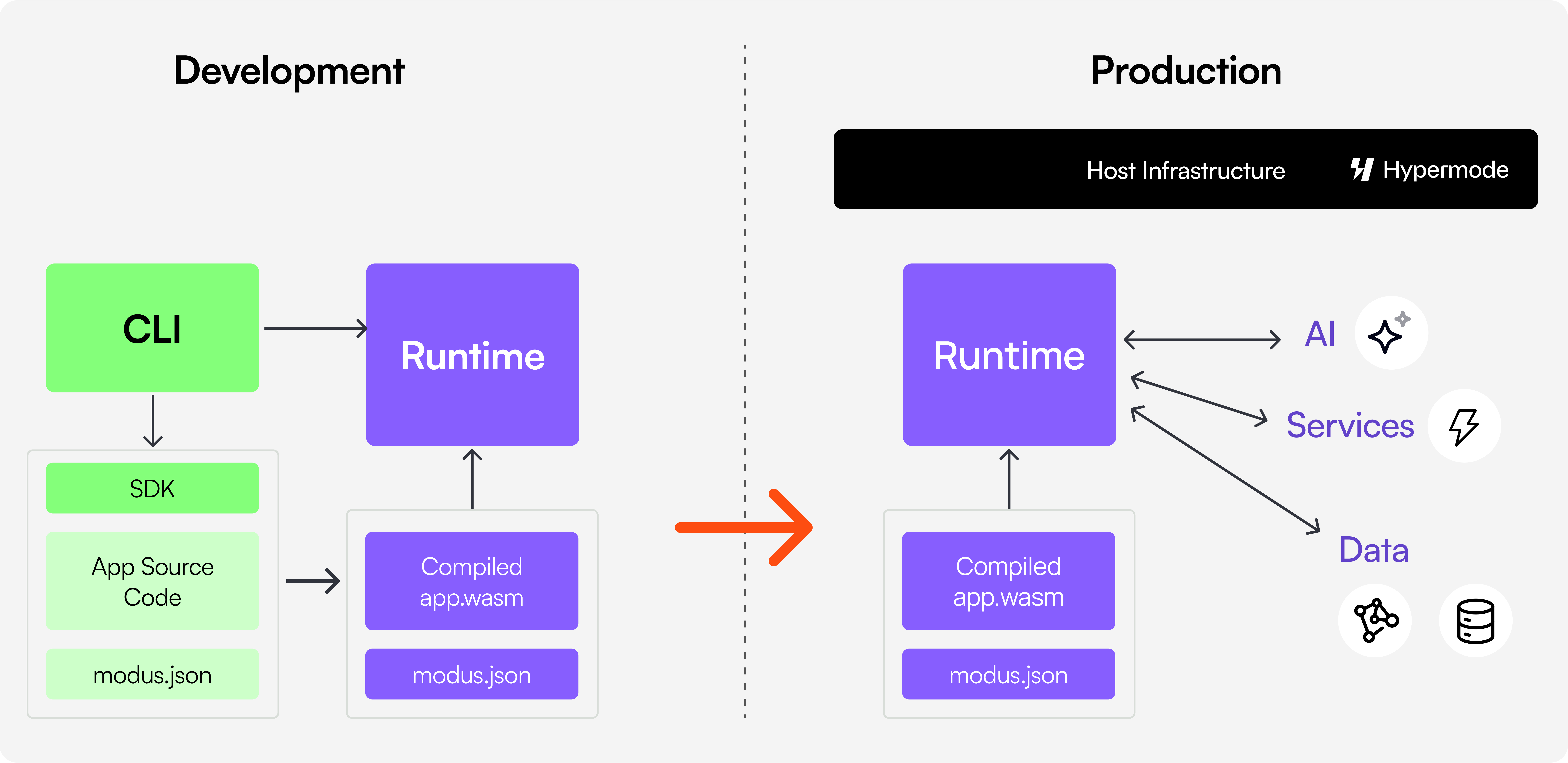
- Loads your compiled code into a sandboxed execution environment with a dedicated memory space
- Runs your code, aided by host functions that power the Modus APIs
- Securely queries data and AI models as needed, without exposing credentials to your code
- Responds via the API result and releases the execution environment

```
}
  “data” : {
    ”sayHello”:  "Hello, World!"
  },
```

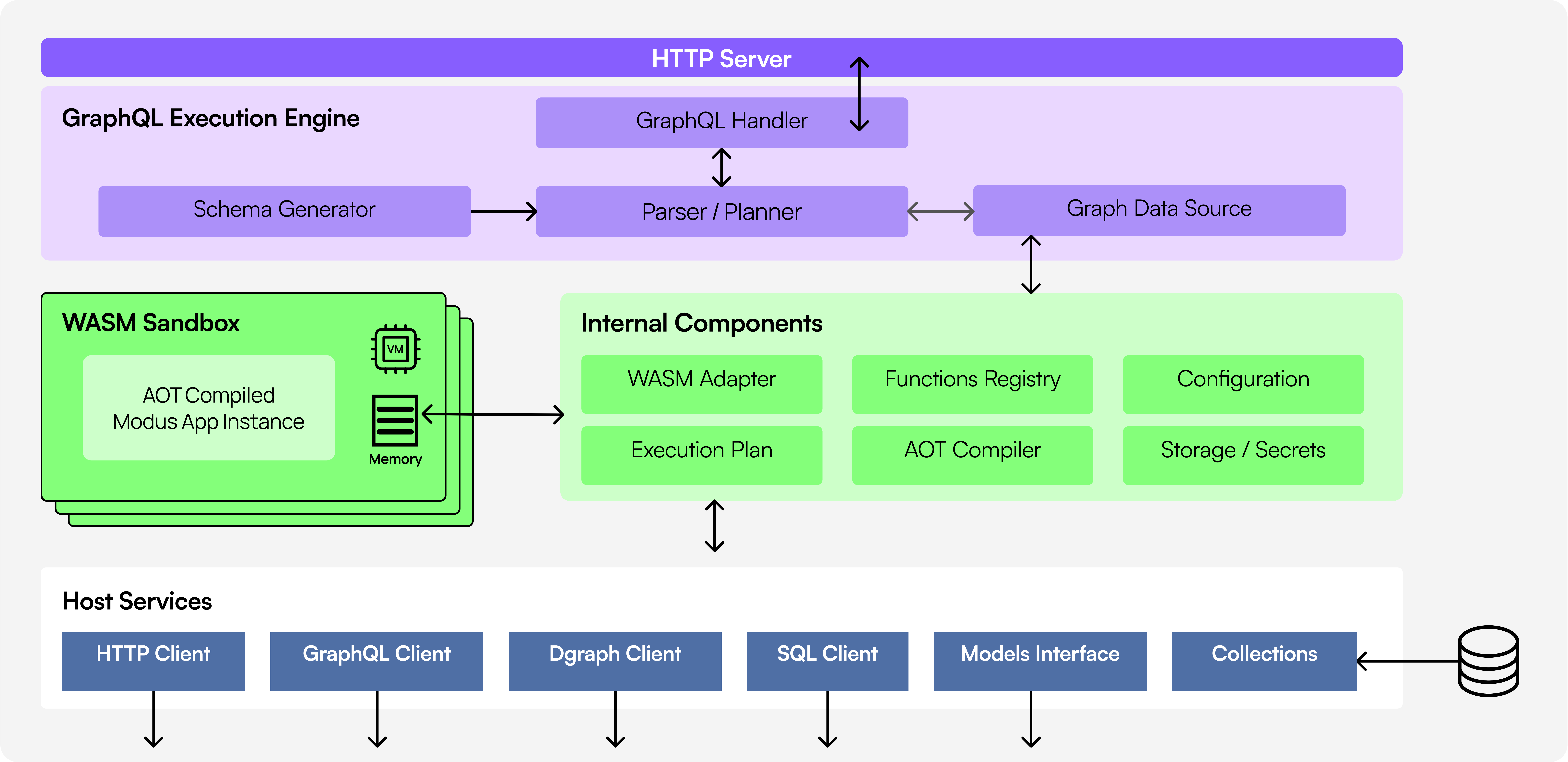
Now you have a production-ready scalable endpoint for your AI-enabled app. AI-ready when you're ready.

Launch and iterate!

Modus Components Overview



Modus Runtime Architecture



Get Started With The Modus CLI

```
npm i -g @hypermode/modus-cli
modus new
modus dev
```

hyp.foo/modus

Hypermode

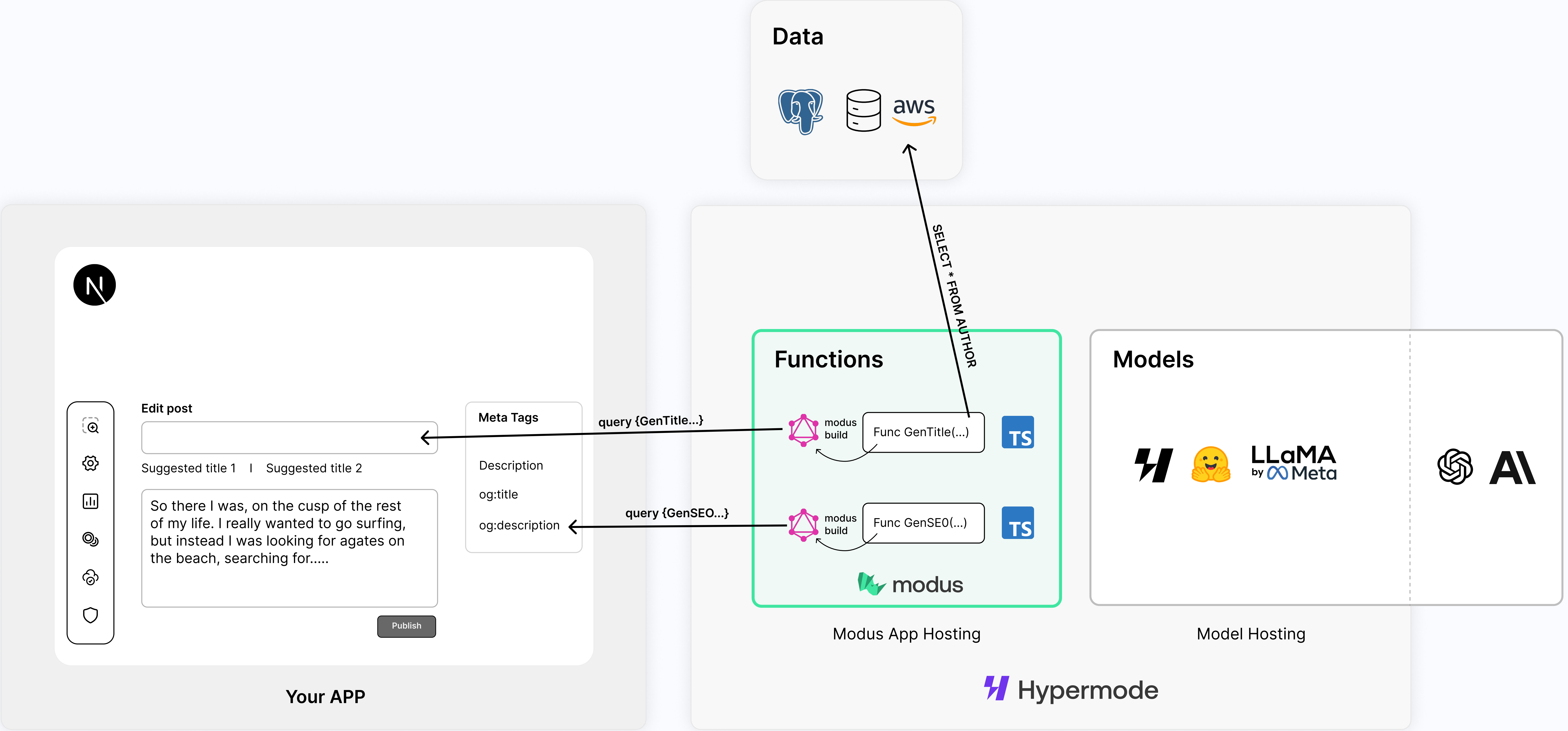
Building Blocks For
Model-Native Apps

Chaining Data & LLMs Together

Function Calling / Tool Use

Knowledge Graph RAG

Hypermode



So there I was, on the cusp of the rest of my life. I really wanted to go surfing, but instead I was looking for agates on the beach, searching for.....

Chaining Data & LLMs Together

Function Calling / Tool Use

Knowledge Graph RAG

Building Blocks For Model Native Apps

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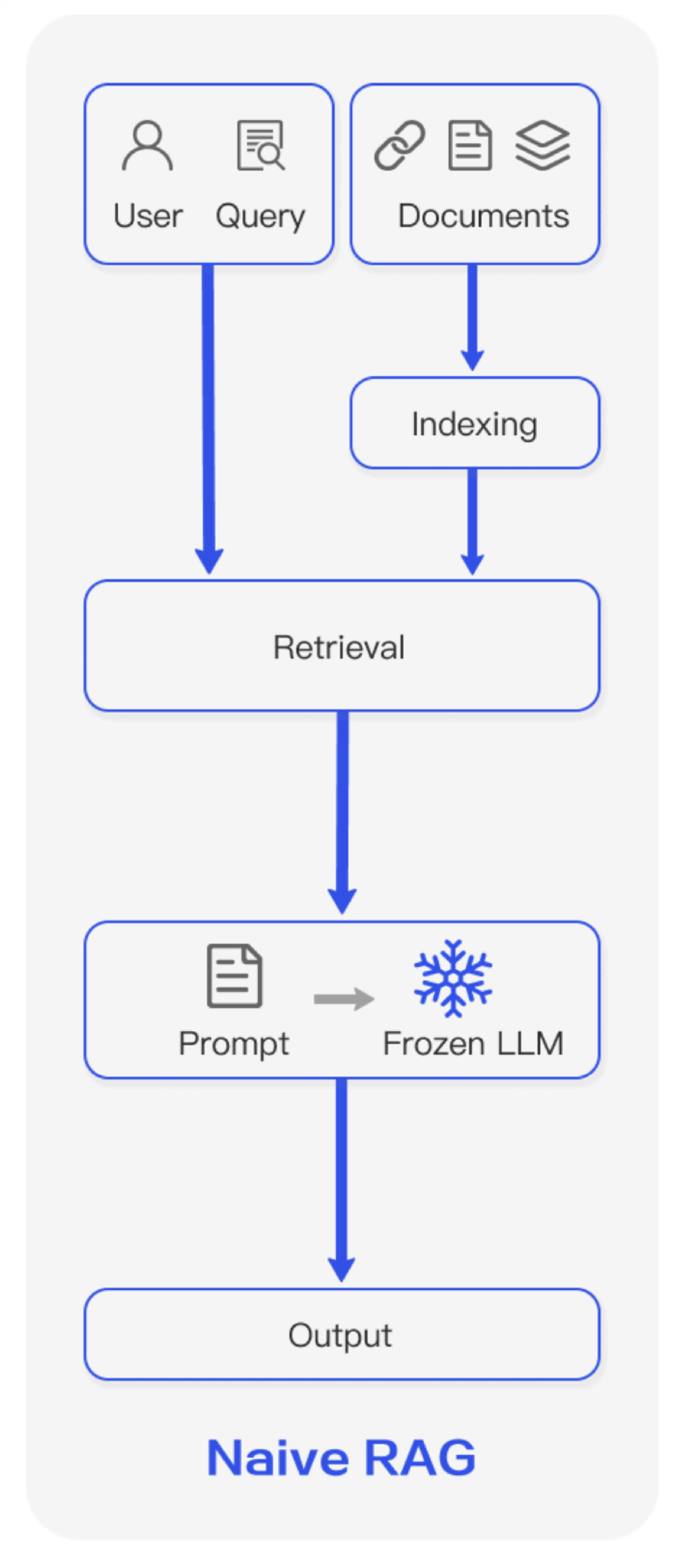
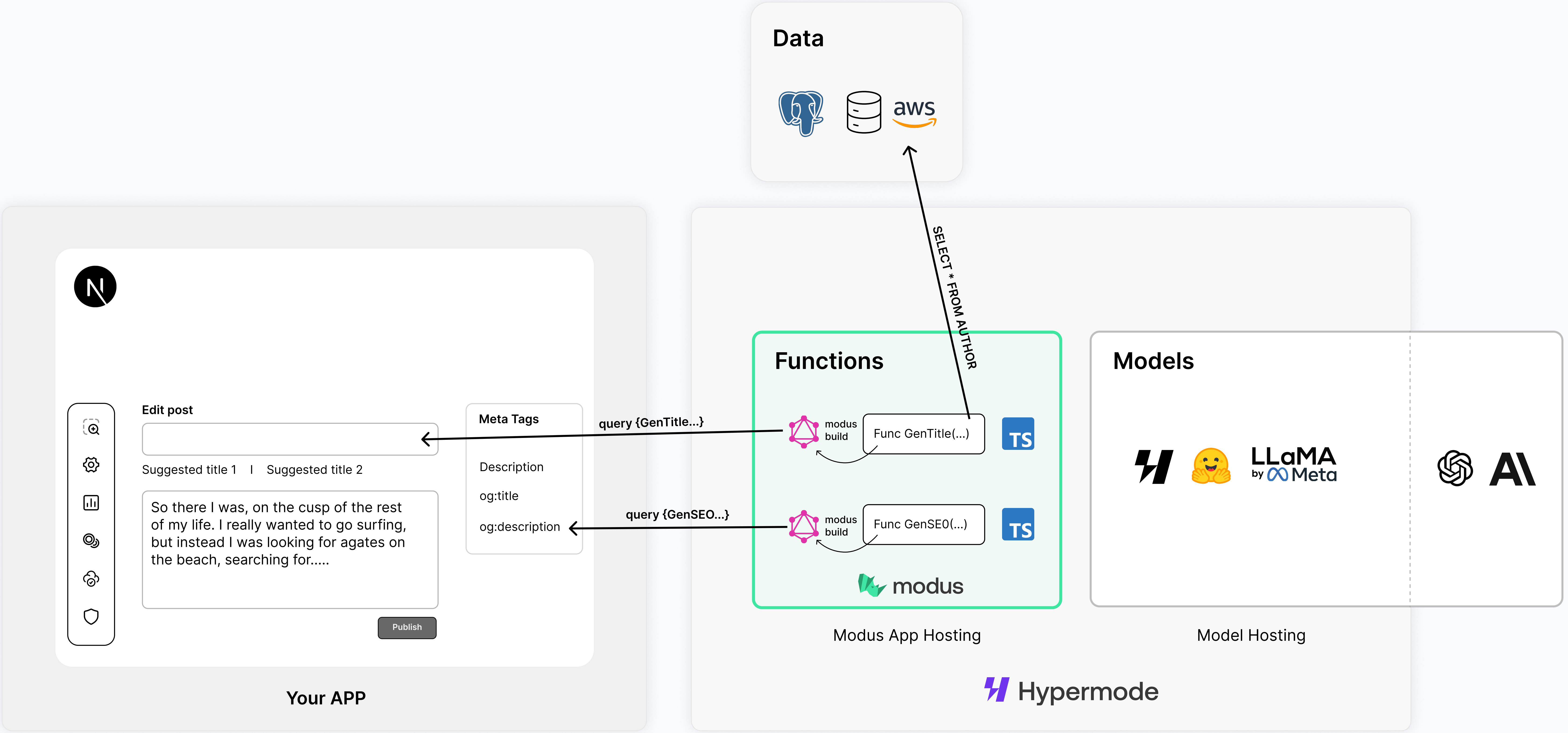
Hypermode





https://arxiv.org/abs/2312.10997v5

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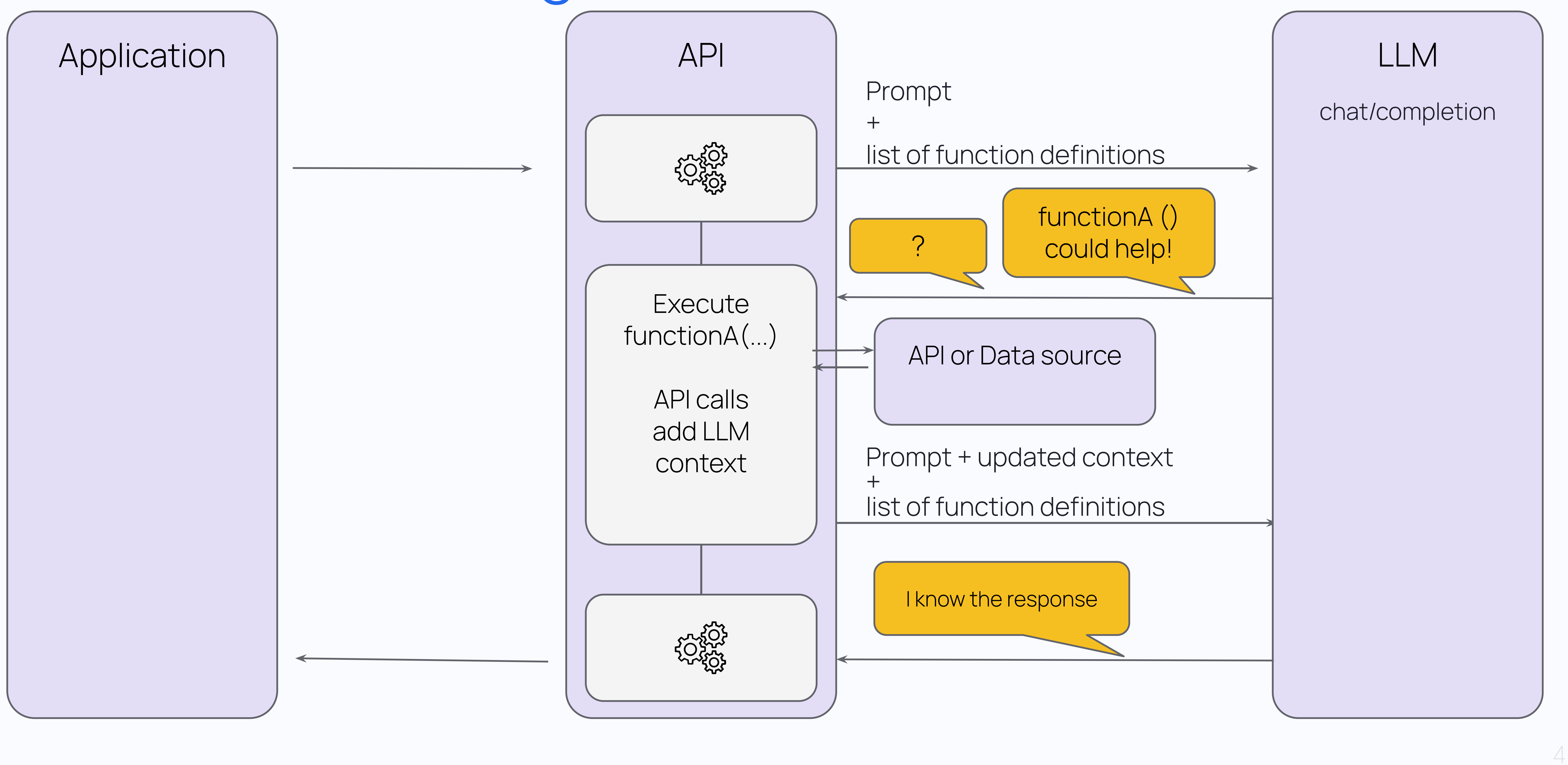
LLM Function Calling



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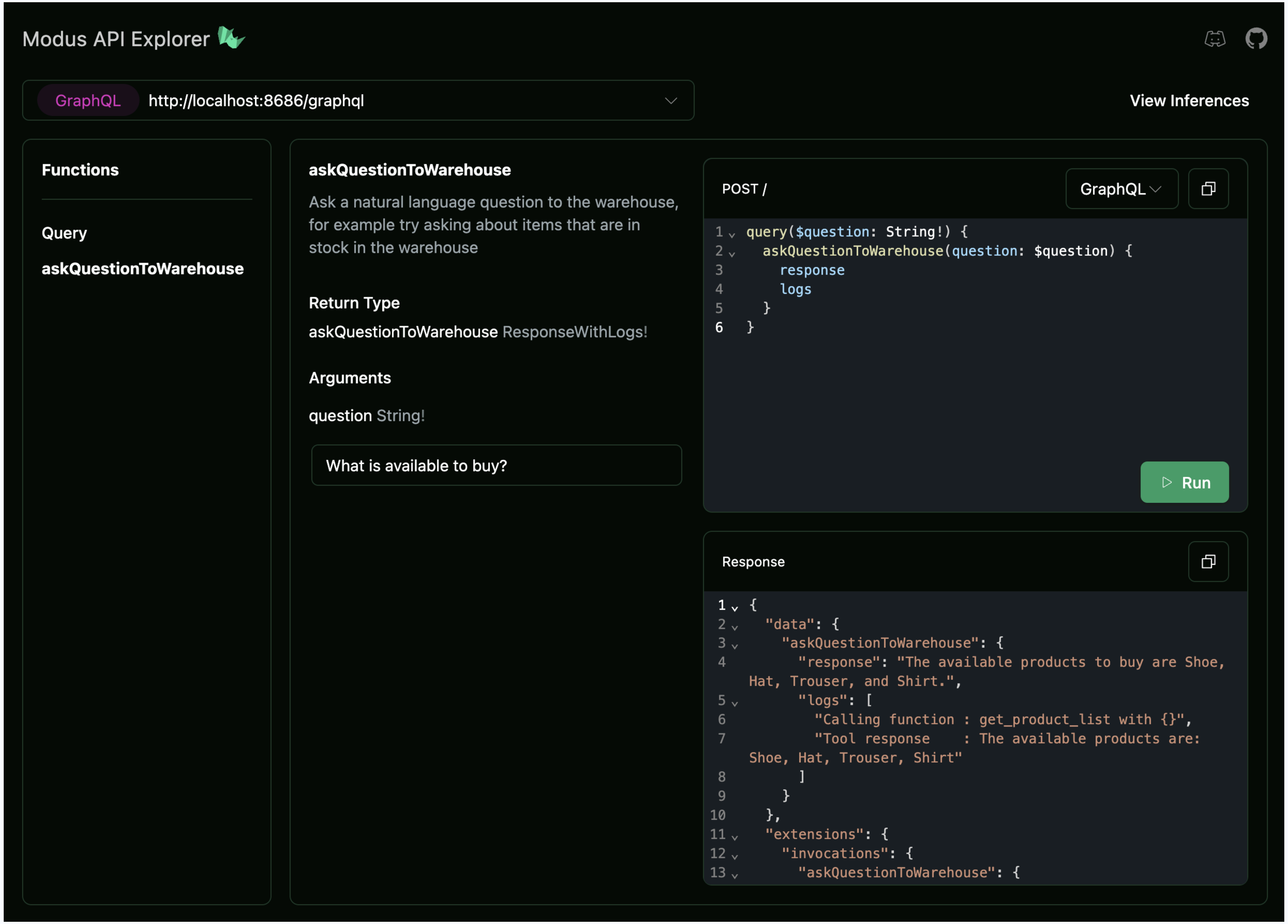


http://localhost:8686/graphql

Functions

Query

askQuestionToWarehouse

askQuestionToWarehouse

Ask a natural language question to the warehouse, for example try asking about items that are in stock in the warehouse

Return Type

askQuestionToWarehouse ResponseWithLogs!

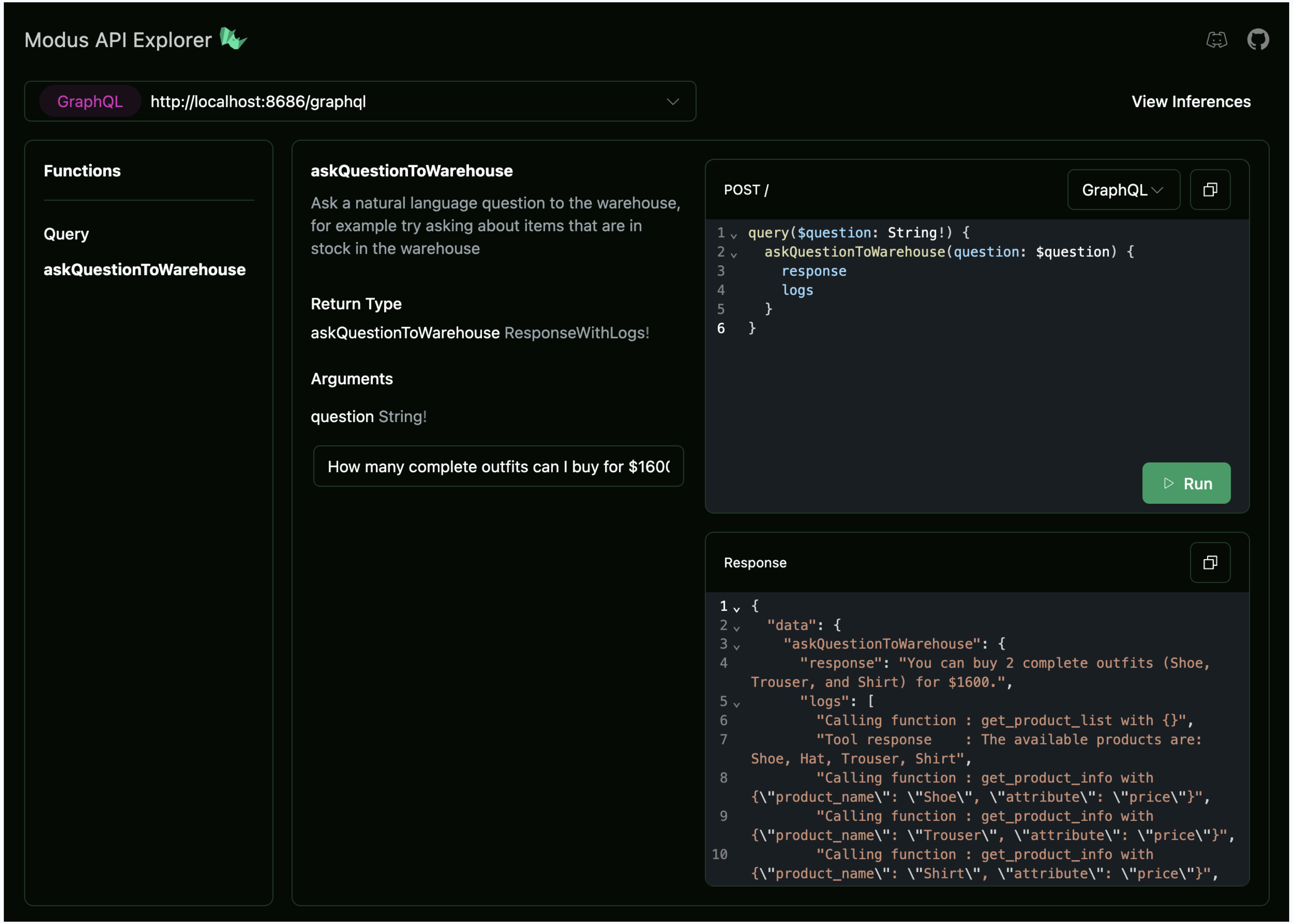
Arguments

question String!

What is available to buy?

```
query($question: String!) {
  askQuestionToWarehouse(question: $question) {
    response
    logs
  }
}
```

```
{
  "data": {
    "askQuestionToWarehouse": {
      "response": "The available products to buy are Shoe, Hat, Trouser, and Shirt.",
      "logs": [
        "Calling function : get_product_list with {}",
        "Tool response    : The available products are: Shoe, Hat, Trouser, Shirt"
      ]
    }
  },
  "extensions": {
    "invocations": {
      "askQuestionToWarehouse": {
```



askQuestionToWarehouse

Ask a natural language question to the warehouse, for example try asking about items that are in stock in the warehouse

Return Type

askQuestionToWarehouse ResponseWithLogs!

Arguments

question String!

How many complete outfits can I buy for $160(

```
query($question: String!) {
  askQuestionToWarehouse(question: $question) {
    response
    logs
  }
}
```

```
{
  "data": {
    "askQuestionToWarehouse": {
      "response": "You can buy 2 complete outfits (Shoe,
Trouser, and Shirt) for $1600.",
      "logs": [
        "Calling function : get_product_list with {}",
        "Tool response    : The available products are:
Shoe, Hat, Trouser, Shirt",
        "Calling function : get_product_info with
{\"product_name\": \"Shoe\", \"attribute\": \"price\"}",
        "Calling function : get_product_info with
{\"product_name\": \"Trouser\", \"attribute\": \"price\"}",
        "Calling function : get_product_info with
{\"product_name\": \"Shirt\", \"attribute\": \"price\"}",
```

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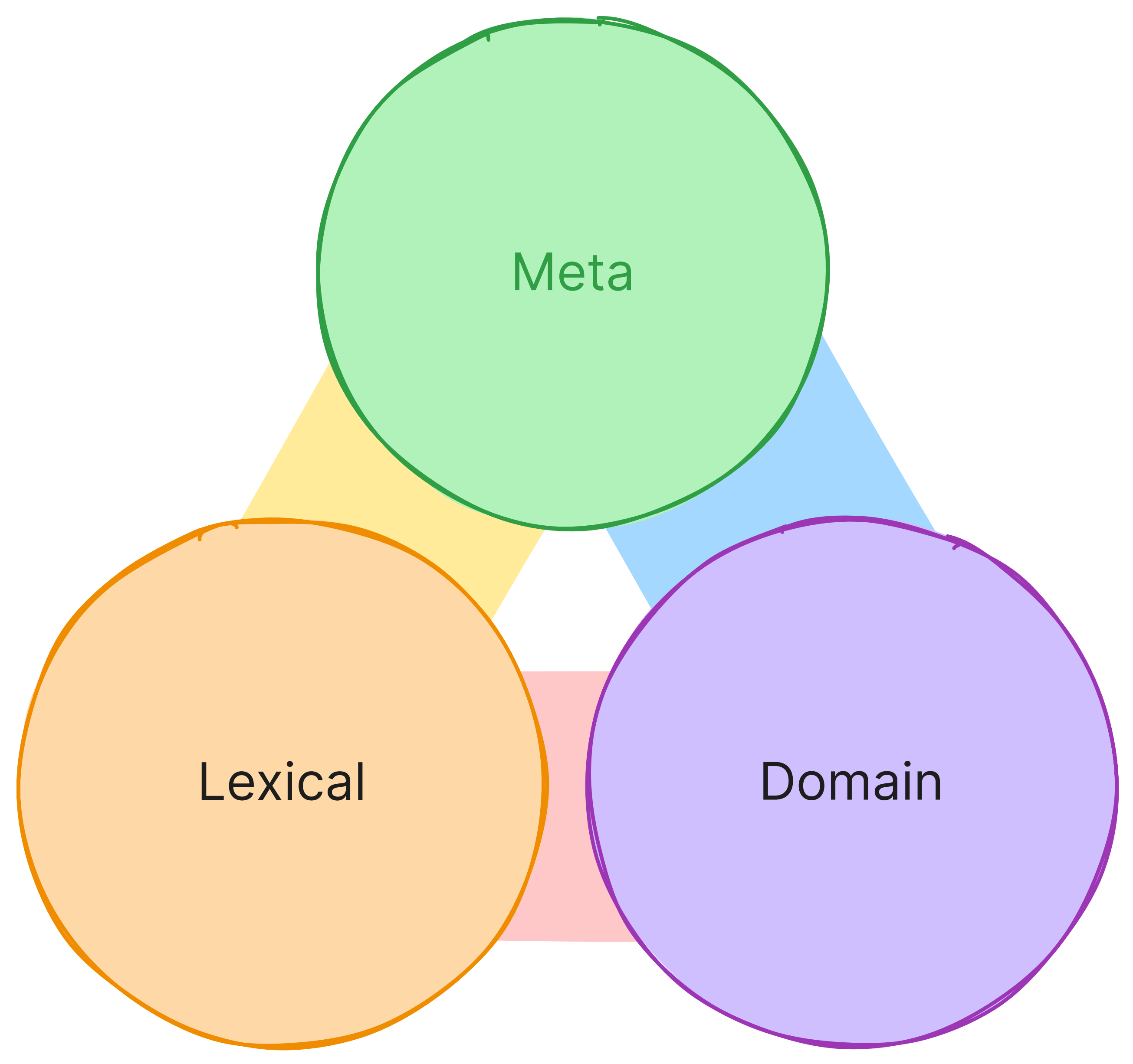
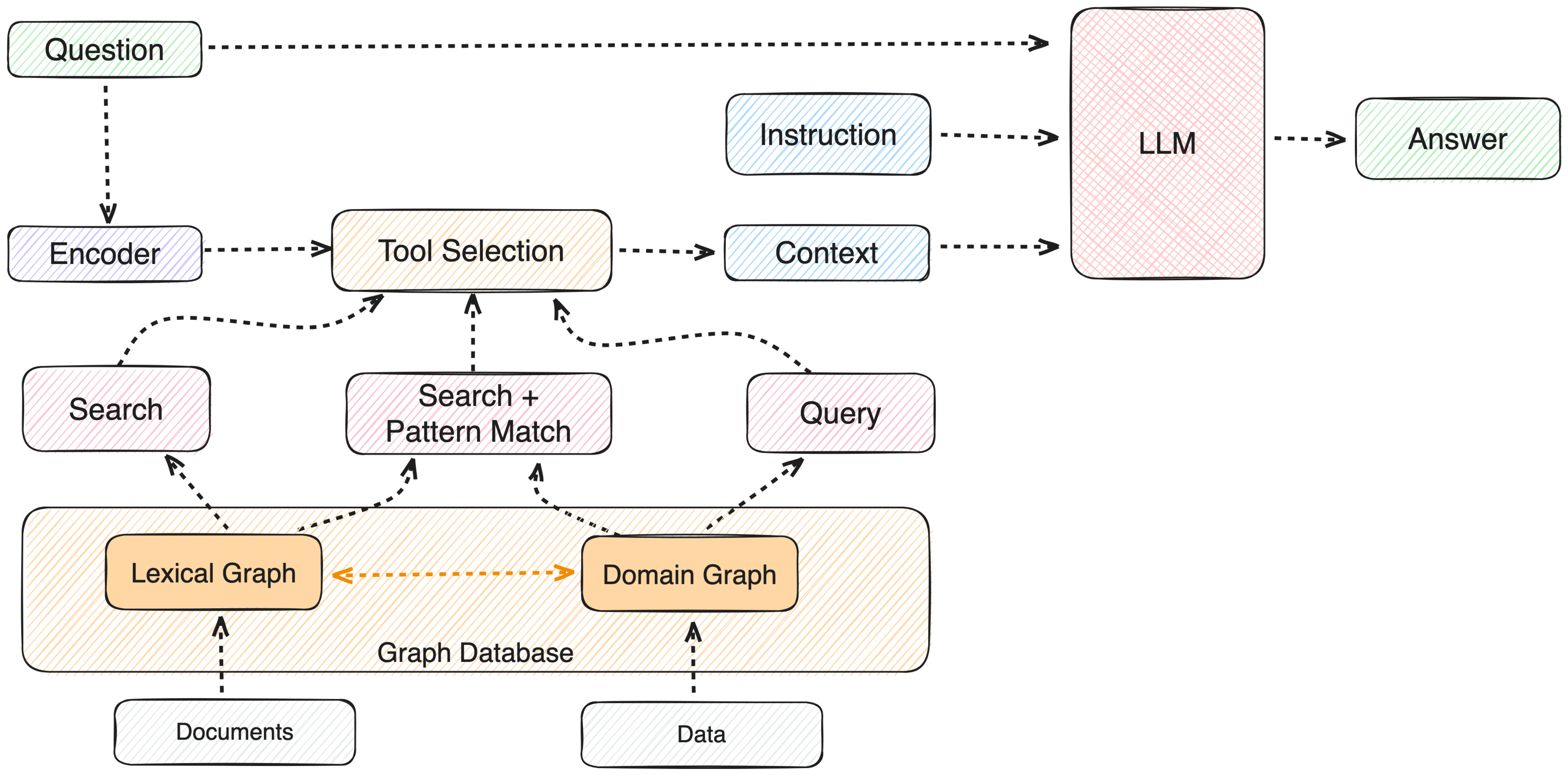




Chaining Data & LLMs Together

Function Calling / Tool Use

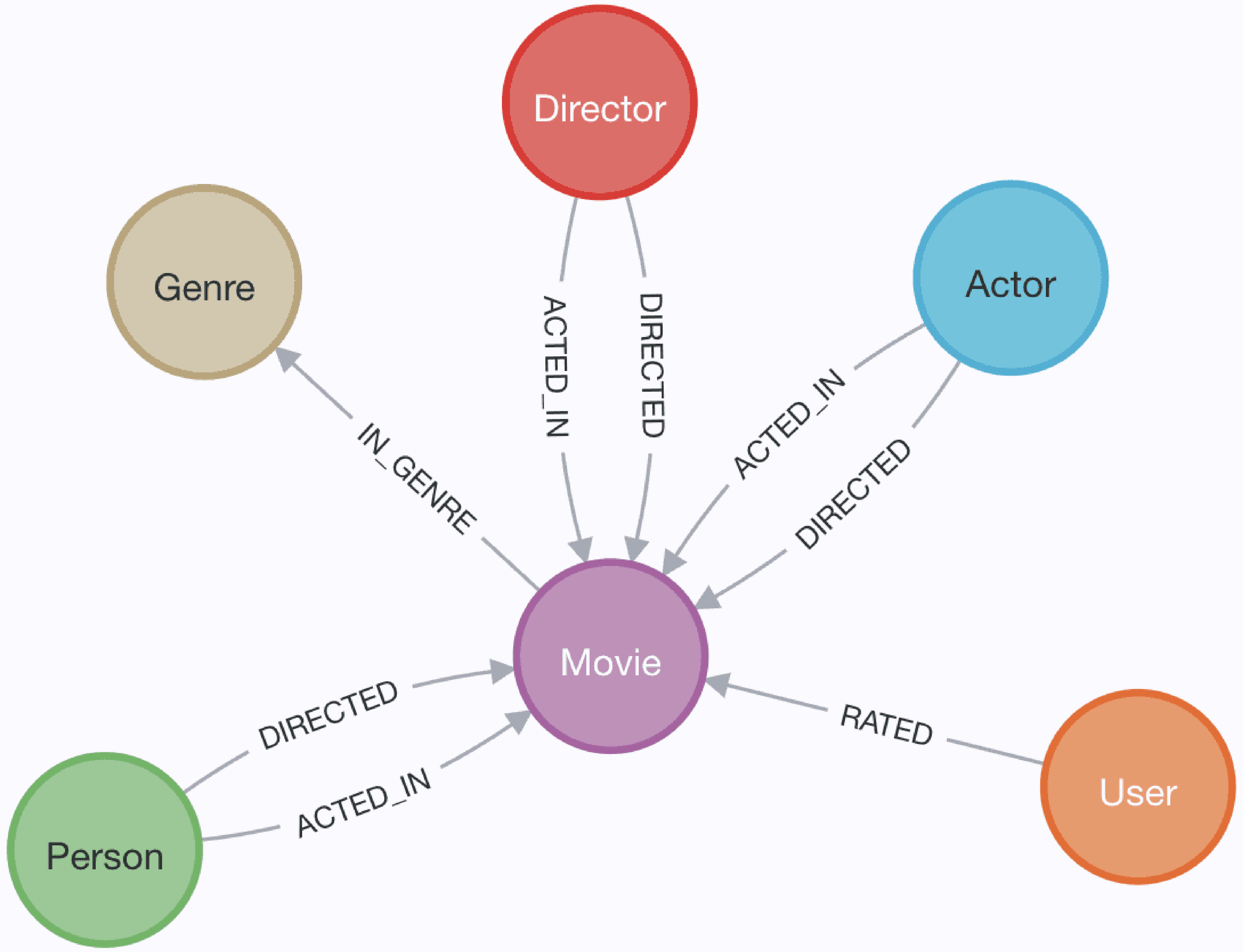
Knowledge Graph RAG

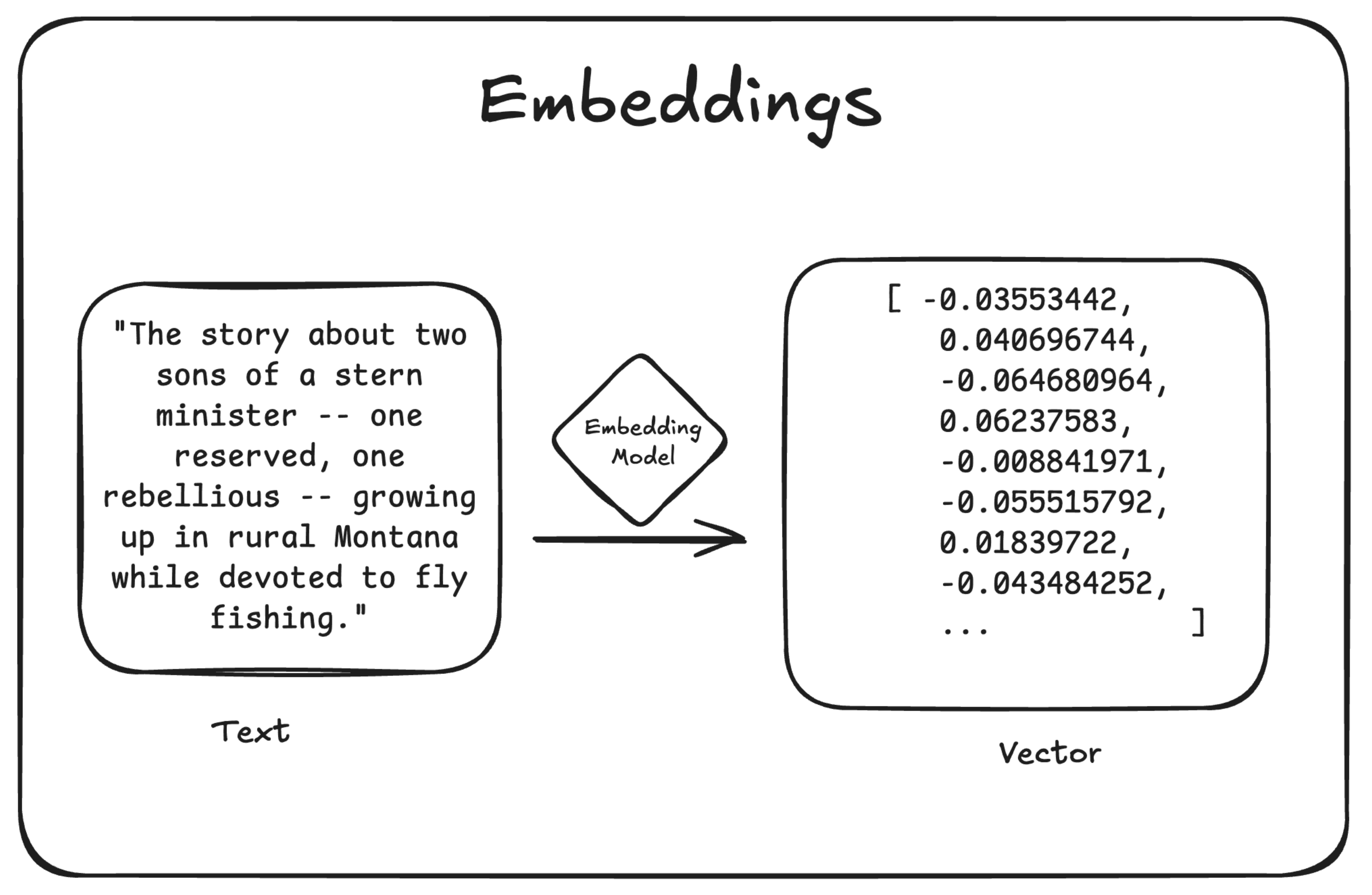
Building Blocks For Model Native Apps

graphrag.com

Hypermode

Movie Recommendation App





"The story about two sons of a stern minister -- one reserved, one rebellious -- growing up in rural Montana while devoted to fly fishing."

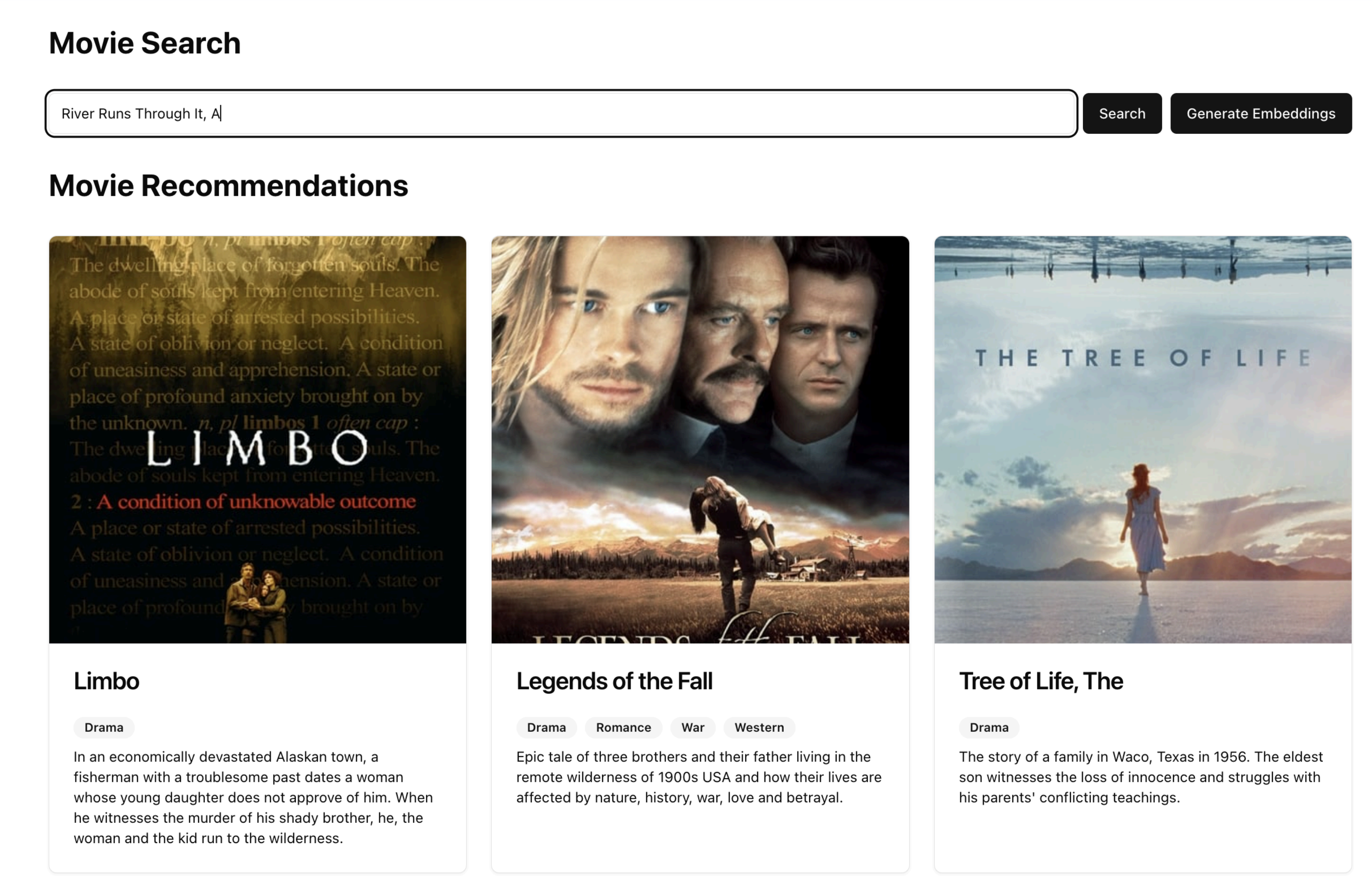
```
[ -0.03553442,
   0.040696744,
   -0.064680964,
   0.06237583,
   -0.008841971,
   -0.055515792,
   0.01839722,
   -0.043484252,
   ...              ]
```

Modus Recipes

Neo4j Modus Starter Kit

Modus

neo4j



Movie Search

River Runs Through It, A

Movie Recommendations

Limbo

Drama

In an economically devastated Alaskan town, a fisherman with a troublesome past dates a woman whose young daughter does not approve of him. When he witnesses the murder of his shady brother, he, the woman and the kid run to the wilderness.

Legends of the Fall

Drama · Romance · War · Western

Epic tale of three brothers and their father living in the remote wilderness of 1900s USA and how their lives are affected by nature, history, war, love and betrayal.

Tree of Life, The

Drama

The story of a family in Waco, Texas in 1956. The eldest son witnesses the loss of innocence and struggles with his parents' conflicting teachings.

https://github.com/hypermodeinc/modus-recipes/tree/main/neo4j/neo4j-modus-starter-kit

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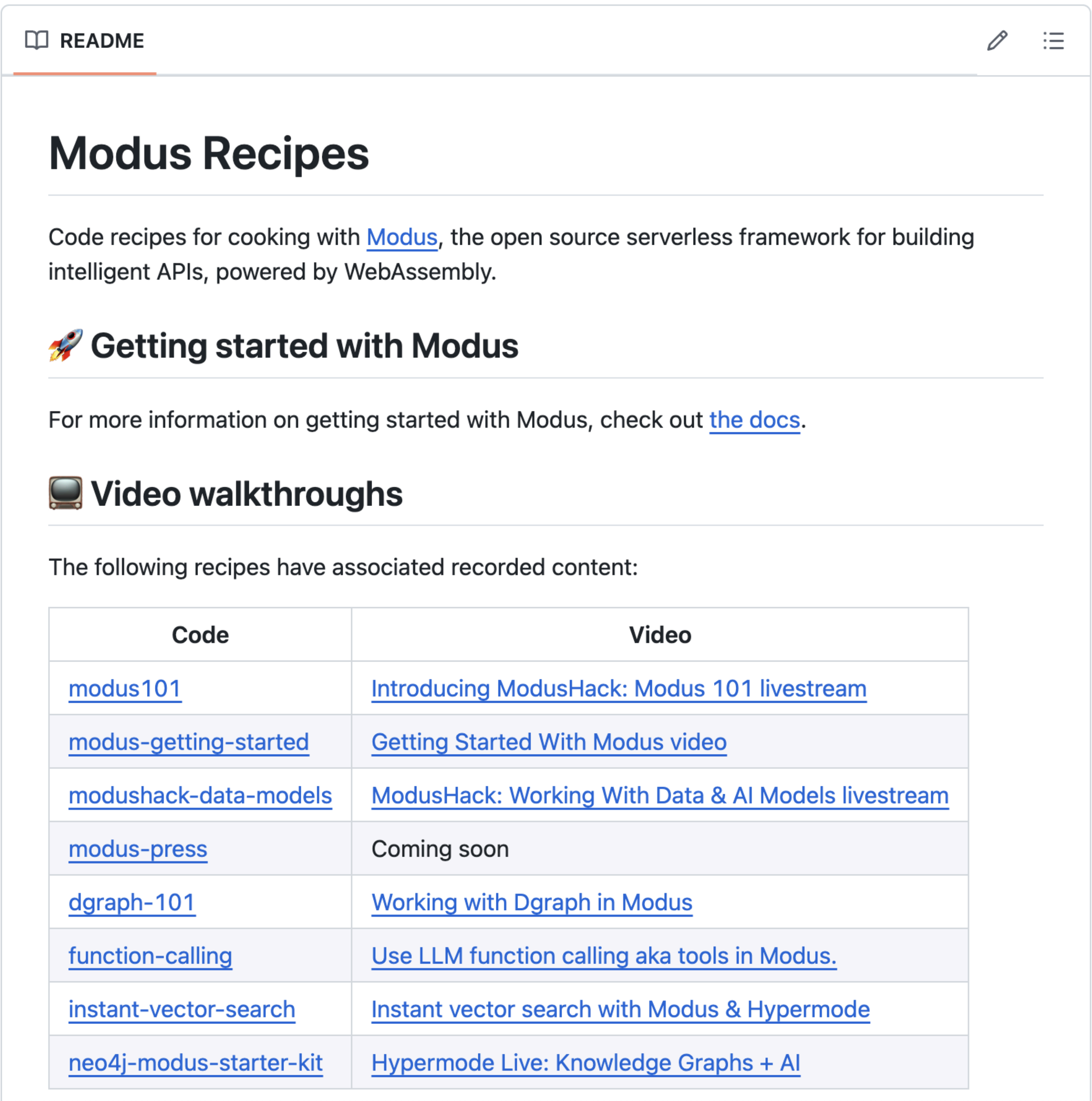
Modus Recipes

Starter Kits For Building Model Native Apps



Modus Recipes

Code recipes for cooking with Modus, the open source serverless framework for building intelligent APIs, powered by WebAssembly.

🚀 Getting started with Modus

For more information on getting started with Modus, check out the docs.

📺 Video walkthroughs

The following recipes have associated recorded content:

Code	Video
modus101	Introducing ModusHack: Modus 101 livestream
modus-getting-started	Getting Started With Modus video
modushack-data-models	ModusHack: Working With Data & AI Models livestream
modus-press	Coming soon
dgraph-101	Working with Dgraph in Modus
function-calling	Use LLM function calling aka tools in Modus.
instant-vector-search	Instant vector search with Modus & Hypermode
neo4j-modus-starter-kit	Hypermode Live: Knowledge Graphs + AI

https://github.com/hypermodeinc/modus-recipes/

hyp.foo/recipes

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Thank You!
Q&A?

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