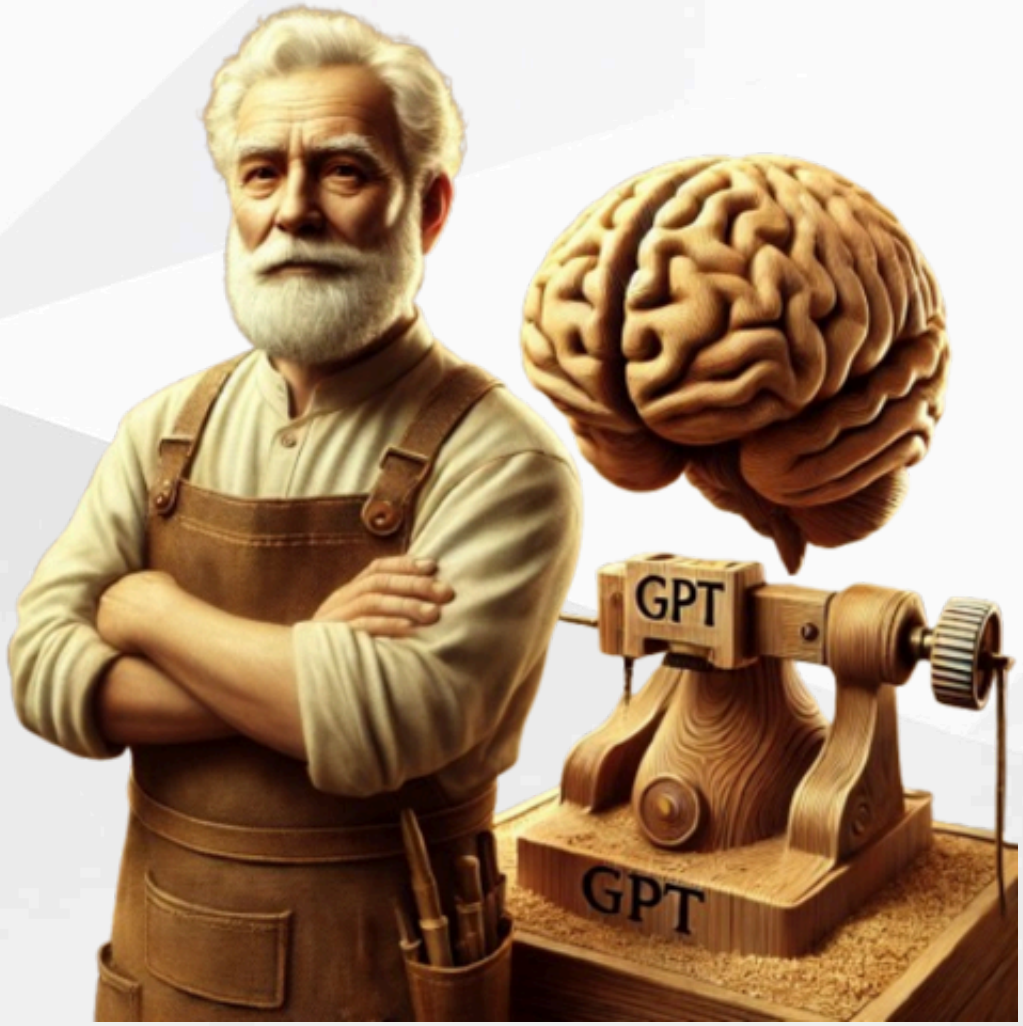
Developing Open LLM applications with

Apache OpenServerless

Lesson 1

First Steps



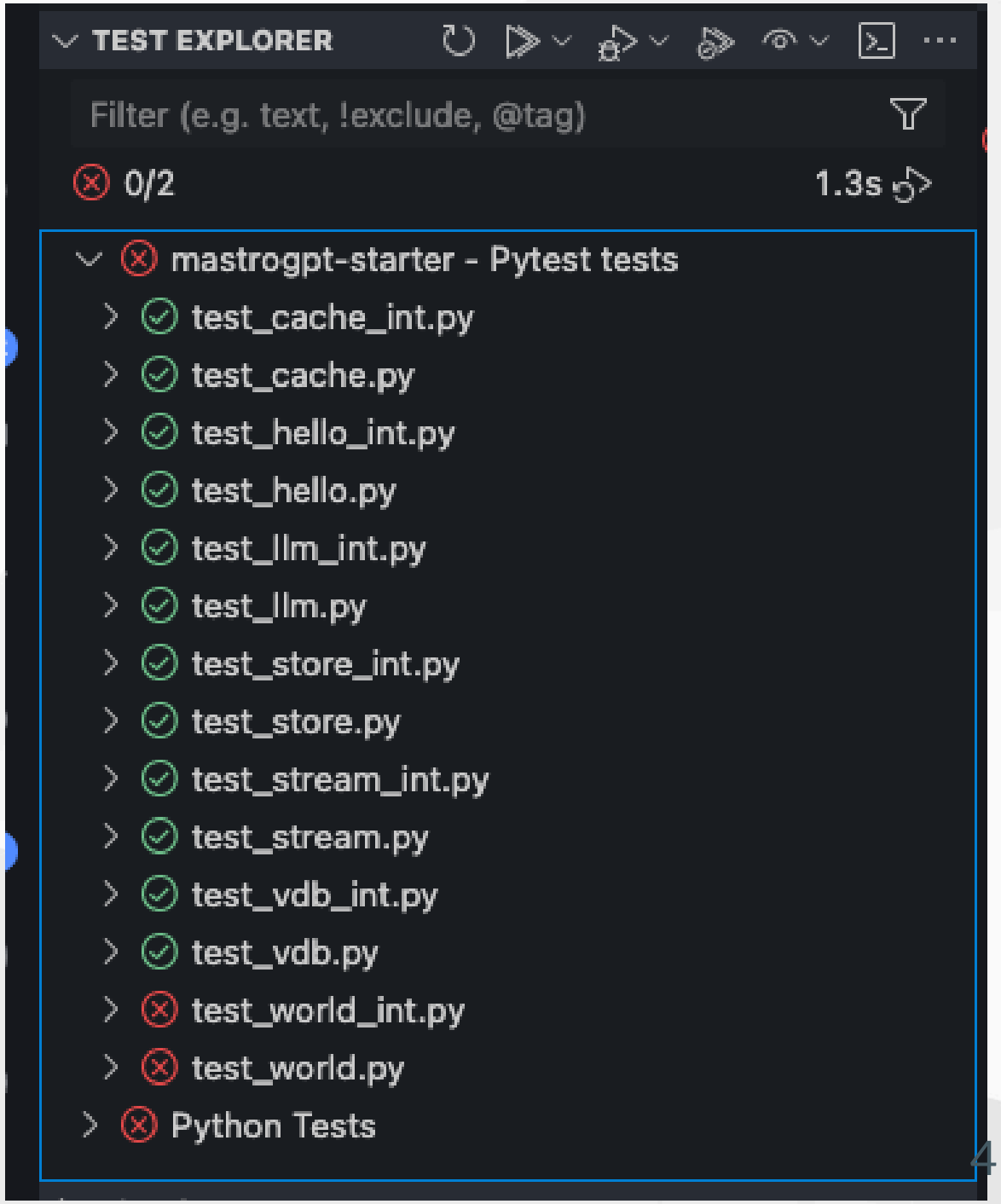
Agenda

- Integrated Services
- Examples: the `hello`s
- CLI tools
- Exercise: reverse
- About Nuvolaris
- What is next?

Integrated Services

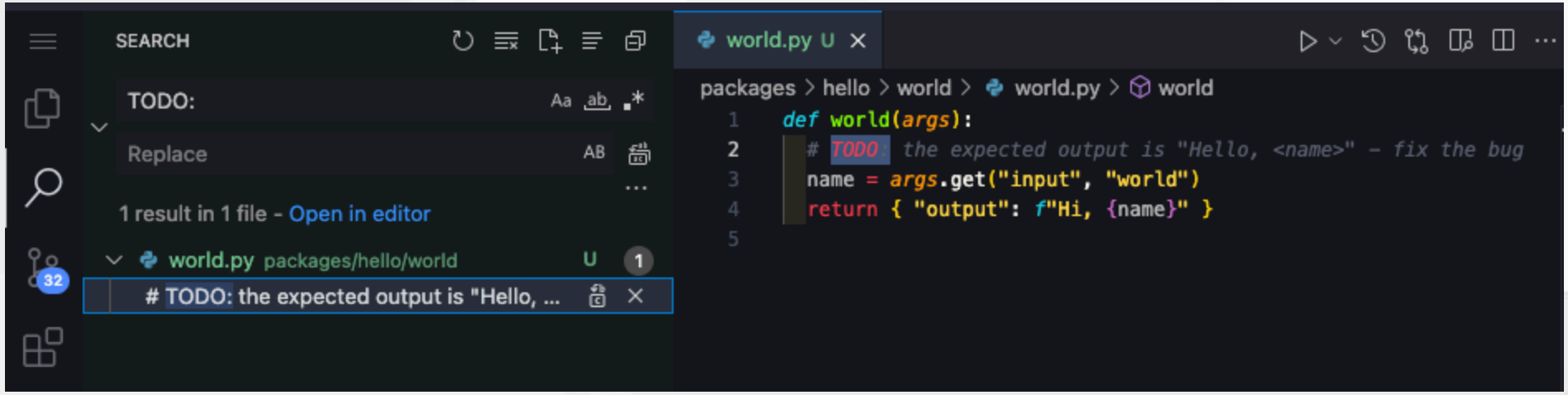
`hello` package

- Collection samples for all the services
- Launching the tests verifies all the services
- Also useful for interacting and debugging
- Servics are all both `local` and `remote`



Exercise: fixing a failing test (trivial bug)

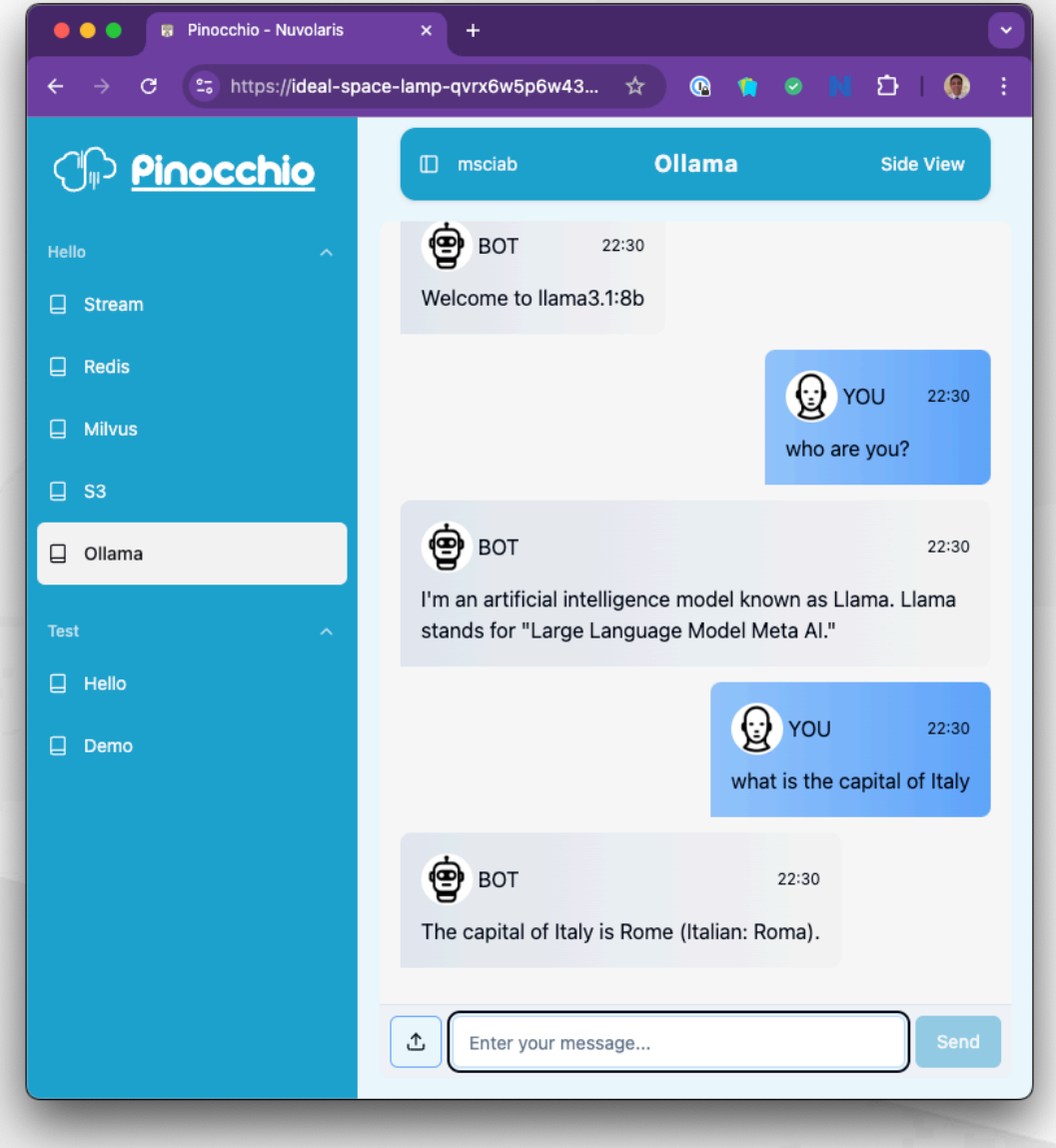
- Search for the `TODO:` string
- Investigate why a test is failing
- Fix it and run the unit test
- Deploy and run the integration test



Examples: the "hello"s

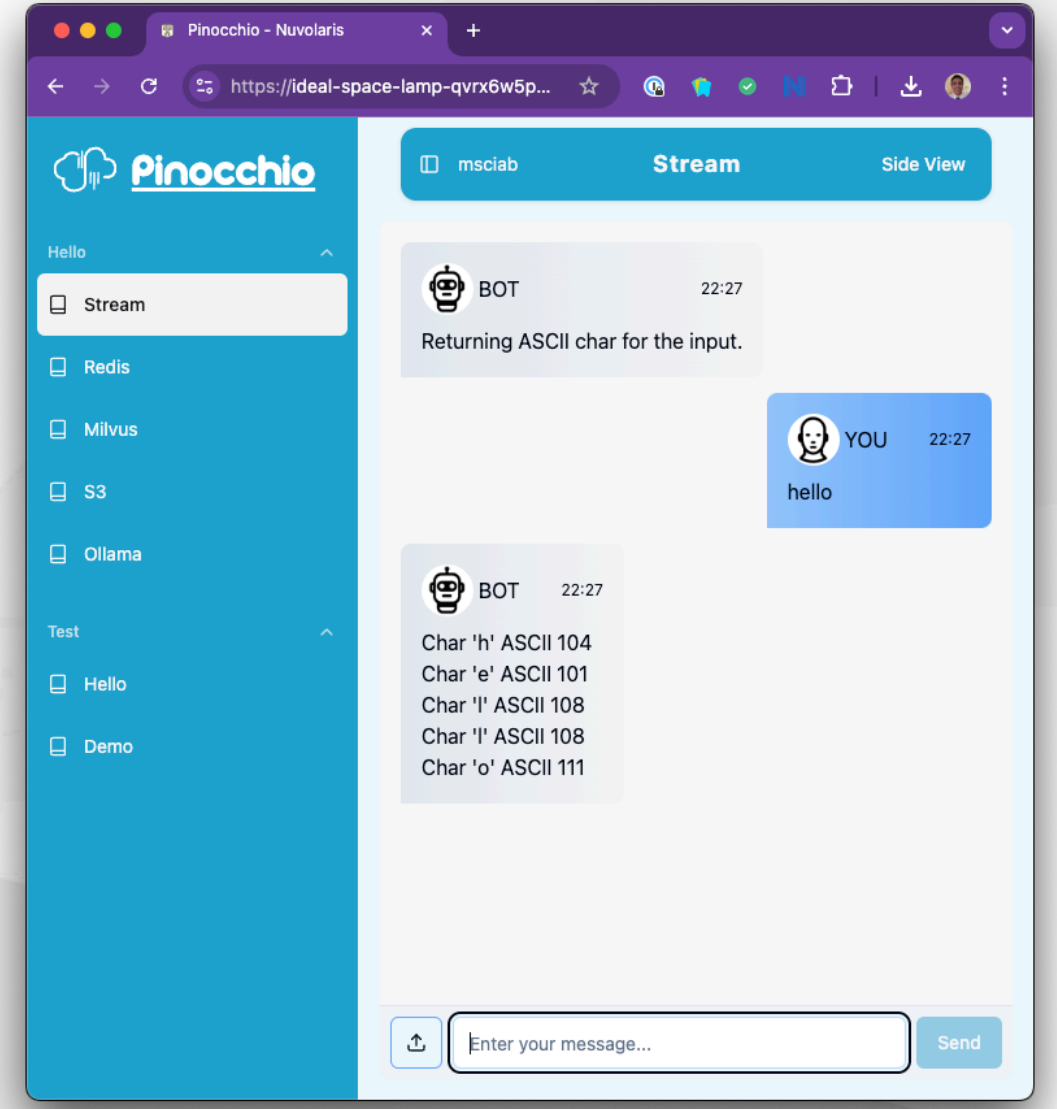
`hello/llm`

- Access to the LLM
- Ollama with
  - `llama3.1:8b`
    - powerful small model
  - `llama3.2-vision:11b`
    - with vision capabilities
  - `mxbai-embed-large:latest`
    - embedding model



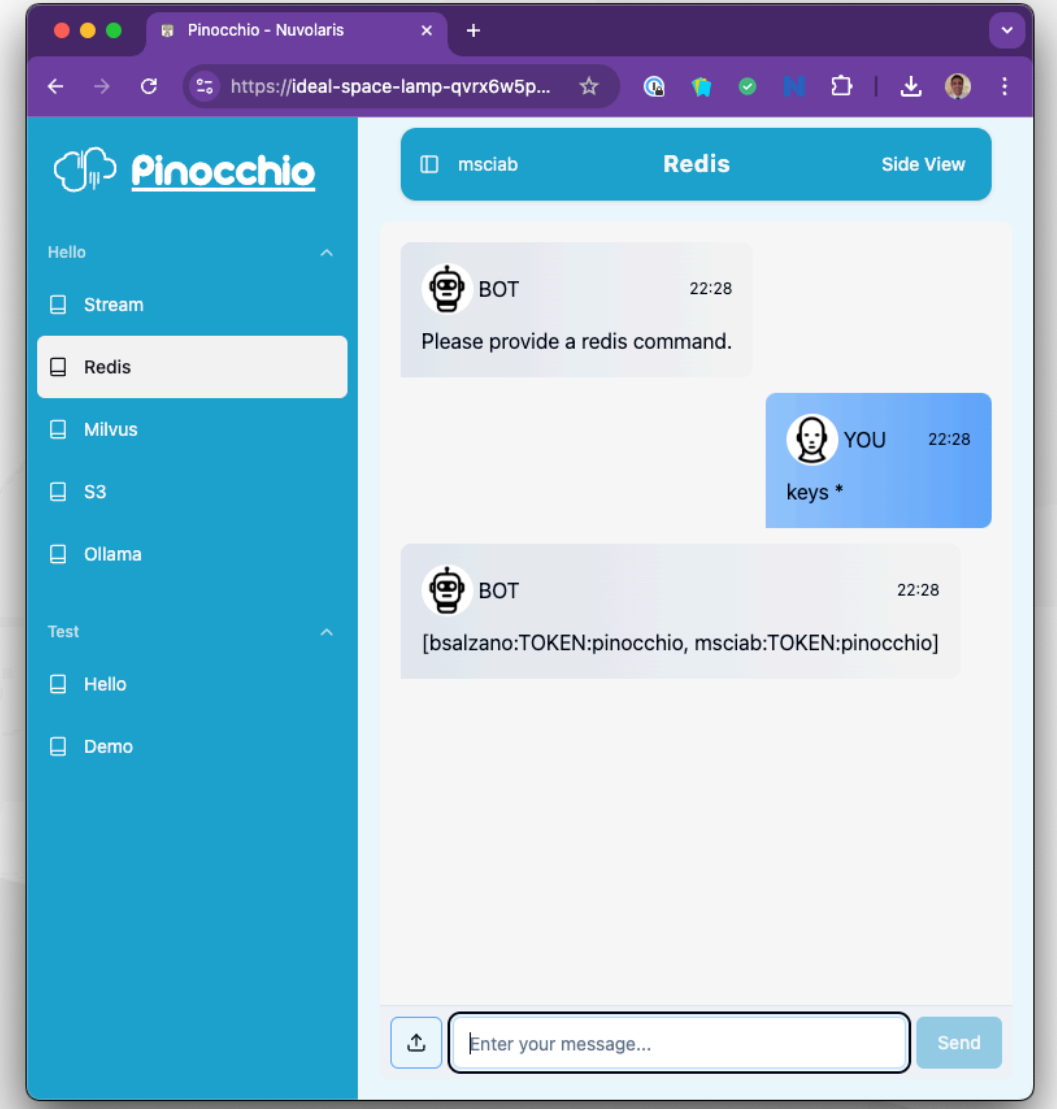
`hello/stream`

- An example of the streamer
- Return the ASCII of each caratecter
- Stream the input in 1 second interval



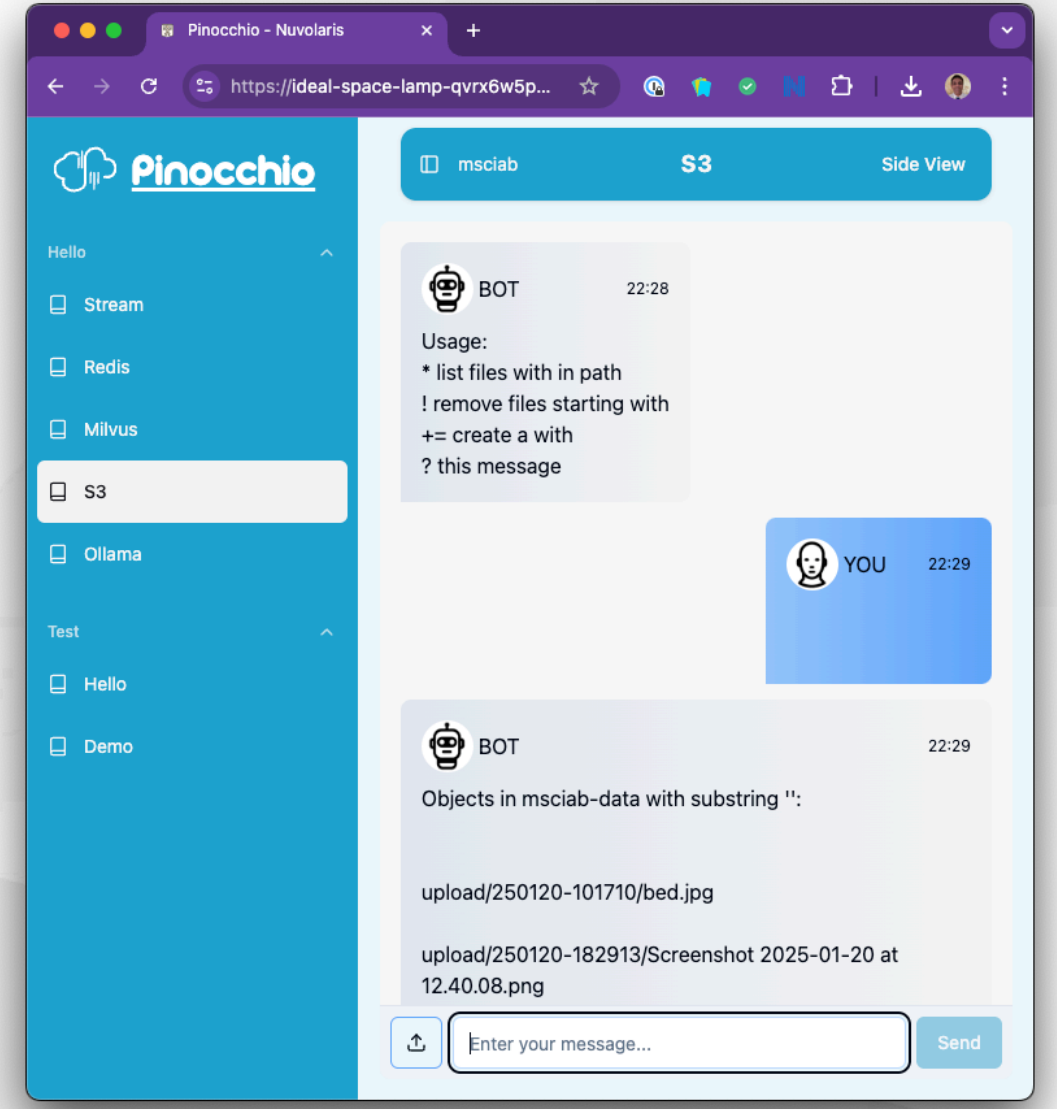
`hello/cache`

- Talk directly with REDIS
- Useful for debugging
- Remember there is a required `PREFIX` for the keys!
  - `<username>:`



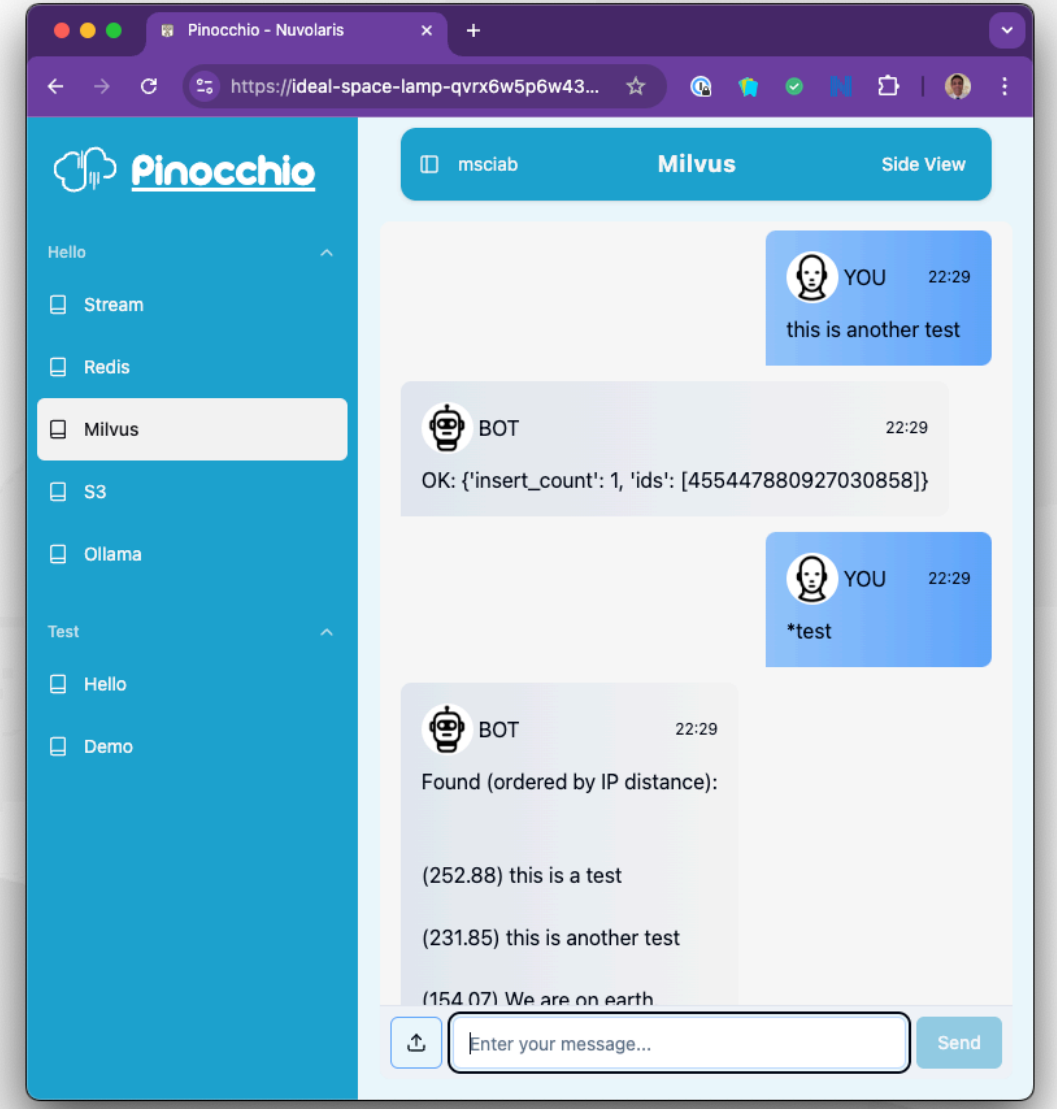
`hello/store`

- S3 Storage
- Files are uploaded here
- Simple commands:
  - `*<prefix>` list content by prefix
  - `!<prefix>` remove content by prefix
  - `+<file>=<content>` create a file on the fly



`hello/vdb`

- Milvus Vector Database
- Store what you type
- Simple commands:
  - `*<search>` vector search
  - `!<word>` remove entries containing a word



CLI Tools

`ops` docs on https://openserverless.apache.org

- It is also self-documenting:

```
ops                 # main help message
ops -h              # list embedded tools
ops -t              # list tasks
```

We will use mostly:

- `ops ide` support
- `ops ai` A.I. oriented plugin

ops essentials

- basics commands to manage actions

```
ops action list
ops action create reverse lessons/reverse.py
ops invoke reverse
ops invoke reverse input=hello
ops url reverse
curl https://openserverless.dev/api/v1/namespaces/msciab/actions/reverse
ops action update reverse lessons/reverse.py --web true
ops url reverse
curl https://openserverless.dev/api/v1/web/msciab/default/reverse
curl "https://openserverless.dev/api/v1/web/msciab/default/reverse?input=hello"
ops action delete reverse
ops action list
```

`ops ide` essentials

- manages packaging and hot-reload

```
ops ide                          # support tools main subcommand
ops ide login                    # login to one openserverless instance
ops ide deploy                   # package and deploy all the actions
ops ide deploy hello/llm         # package and deploy one action
ops ide devel                    # incremental development mode
ops ide clean                    # clean temporary files
```

`ops ai` essential

- our AI-oriented plugin

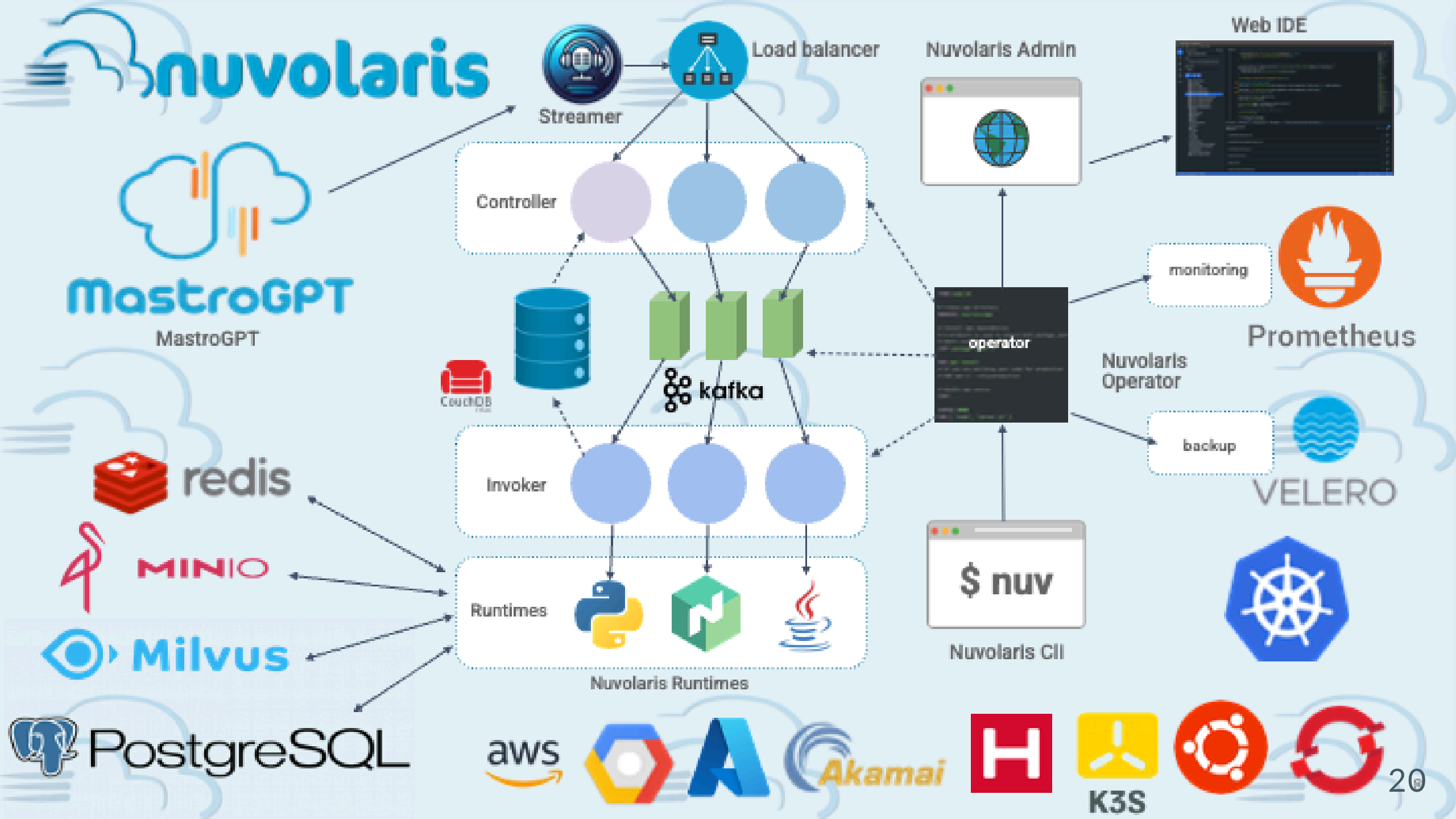
```
ops ai                  # help
ops ai lesson           # download lessons and solutions
ops ai user             # update users
ops ai chat             # command line chat
ops ai cli              # the Python REPL
ops ai new              # create a new service
```

Exercise: reverse

Exercise: implement a `reverse` chat

- `ops ai new reverse msciab`
- implement the code to a reverse functions
  - read input, return output
  - if empty input, return usage
- `ops ide deploy msciab/reverse`
- Add the service to `packages/mastrogpt/index/90-Tests.json`
- Use it in Pinocchio

About Nuvolaris


nuvolaris
Streamer
Load balancer
Nuvolaris Admin
Web IDE
MastroGPT
MastroGPT
Controller
monitoring
Prometheus
operator
Nuvolaris
Operator
CouchDB
kafka
backup
VELERO
redis
Invoker
MINIO
Milvus
Runtimes
$ nuv
Nuvolaris Cli
Nuvolaris Runtimes
PostgreSQL
aws
Akamai
K3S

nuvolaris Pricelist 2025

Purpose	Name	Requirements	Price/month	Price/year	Hosted	VCPU	HA	GPU
Development	Nuvolaris VM	1 VM 16GB 4VCPU	€100.00	€1,000.00	yes	shared	no	no
Development	Nuvolaris Dedicated Server	1 Server 64GB 12VCPU (3vm)	€200.00	€2,000.00	yes	dedicated	no	no
Development	Nuvolaris Dedicated GPU Server	1 Server 64GB 12VCPU 20GPU (3vm)	€500.00	€5,000.00	yes	dedicated	yes	yes
Production	Nuvolaris Cluster	3 VM 16GB 4VCPU +1 LB	€300.00	€3,000.00	yes	shared	yes	no
Production	Nuvolaris Cluster Pro	6 VM 16GB 4VCPU +1 LB	€600.00	€6,000.00	yes	shared	yes	no
Production	Nuvolaris Cluster Additional VM	1 VM 16GB 4VCPU	€100.00	€1,000.00	yes	shared	yes	no
Production	Nuvolaris Dedicated Cluster	3 Server 64GB 12VCPU (6vm) + 1LB	€1,000.00	€10,000.00	yes	dedicated	yes	no
Production	Nuvolaris Dedicated GPU Cluster	3 Server 64GB 12VCPU 20GPU (6vm) + 1LB	€2,000.00	€20,000.00	yes	dedicated	yes	yes
Production	Nuvolaris Cluster Additional Server	1 Server 64GB 12VCPU (2vm)	€200.00	€2,000.00	yes	dedicated	yes	no
Production	Nuvolaris Cluster Additional GPU Server	1 Server 64GB 12VCPU 20GPU (2vm)	€500.00	€5,000.00	yes	dedicated	yes	yes
Development	Nuvolaris Your VM	1 VM 16GB 4VCPU	€75.00	€750.00	no	yours	no	no
Development	Nuvolaris Your Dedicated Server	1 Server 64GB 12VCPU (3vm)	€150.00	€1,500.00	no	yours	no	no
Development	Nuvolaris Your Dedicated GPU Server	1 Server 64GB 12CPU 20GPU (6vm)	€300.00	€3,000.00	no	yours	yes	yes
Production	Nuvolaris Your Cluster	3 VM 16GB 4CPU + 1 LB	€200.00	€2,000.00	no	yours	yes	no
Production	Nuvolaris Your Cluster Pro	6 VM 16GB 4CPU +1 LB	€400.00	€4,000.00	no	yours	yes	no
Production	Nuvolaris Your Cluster Additional VM	1 VM 16GB 4VCPU	€75.00	€750.00	no	yours	yes	no
Production	Your Dedicated Cluster	3 Server 64GB 12VCPU (6vm) + 1LB	€900.00	€9,000.00	no	yours	yes	no
Production	Your Dedicated GPU Cluster	3 Server 64GB 12VCPU 20GPU (6vm) + 1LB	€1,200.00	€12,000.00	no	yours	yes	yes
Production	Nuvolaris Your Dedicated Additional Server	1 Server 64GB 12VCPU (3vm)	€150.00	€1,500.00	no	yours	yes	no
Production	Nuvolaris Your Dedicated Additional GPU Server	1 Server 64GB 12CPU 20GPU (6vm)	€300.00	€3,000.00	no	yours	yes	yes

What is Next?

Lesson 2 - Streaming Chat

Implementing an LLM chat with streaming support

More lessons

- Lesson 3: Form Support
- Lesson 4: Building an Assistant
- Lesson 5: Vision Support
- Lesson 6: VectorDB
- Lesson 7: Bulding a RAG