Langgraph: The Secret to Building Intelligent Agents

CISCO Live!

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CISCOU-3005

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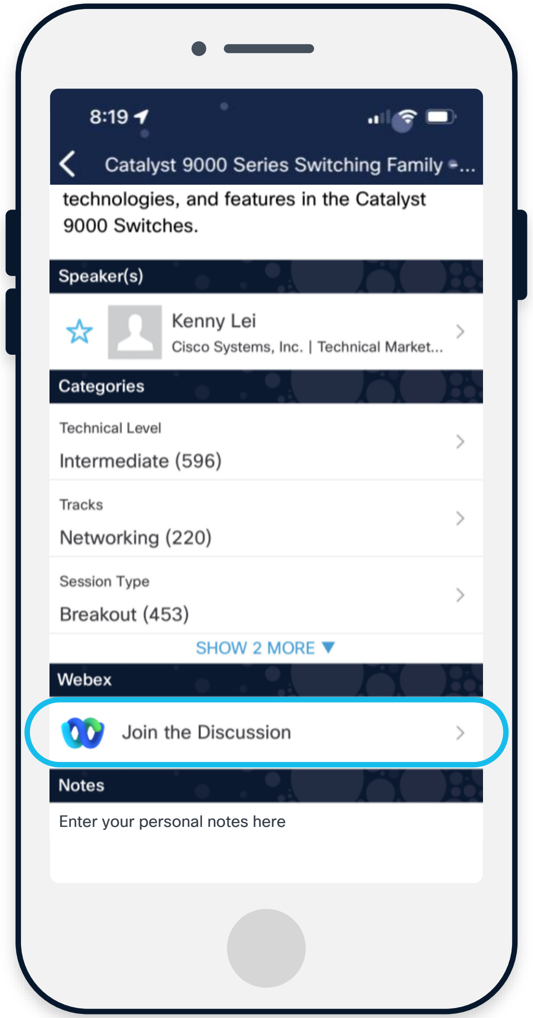

technologies, and features in the Catalyst 9000 Switches.

Speaker(s)

Kenny Lei
Cisco Systems, Inc. | Technical Market...

Categories

Technical Level
Intermediate (596)

Tracks
Networking (220)

Session Type
Breakout (453)

Webex

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Notes

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Agenda

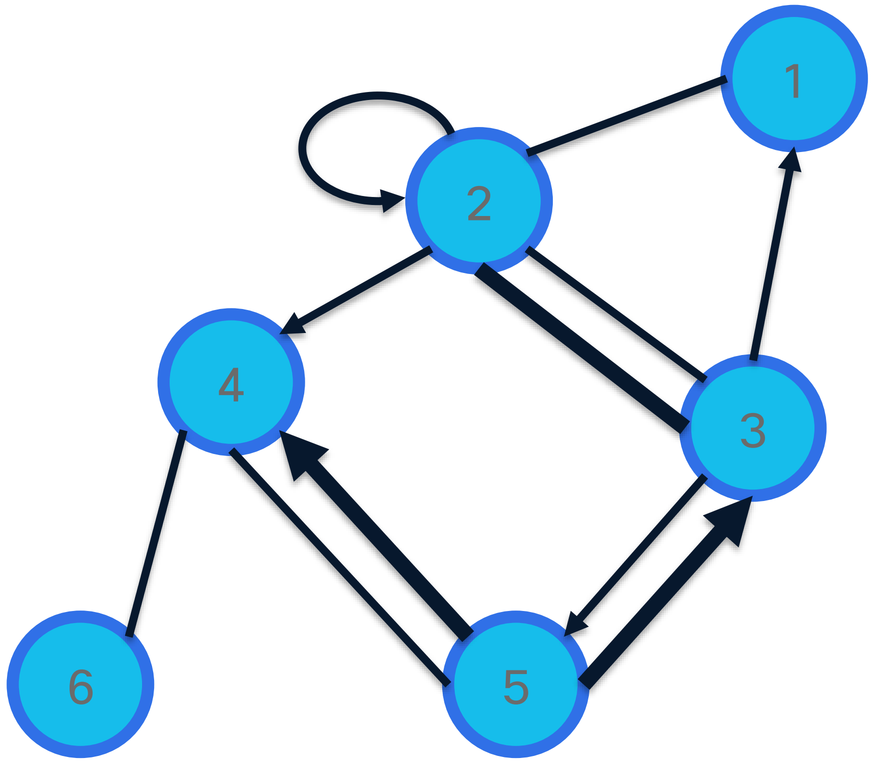
Intro

Why is a graph useful?

For Building!

- Algorithms.
- State machines.
- Workflows.

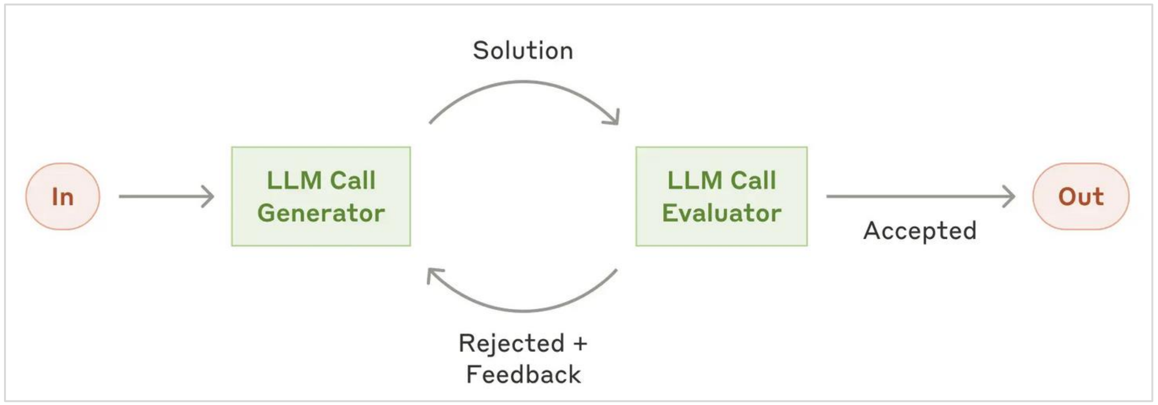
You can control the flow of the graph.

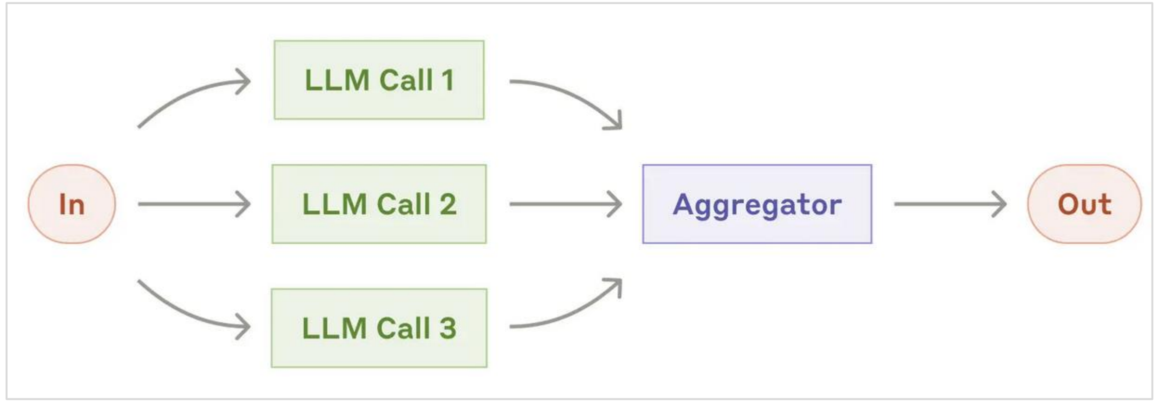


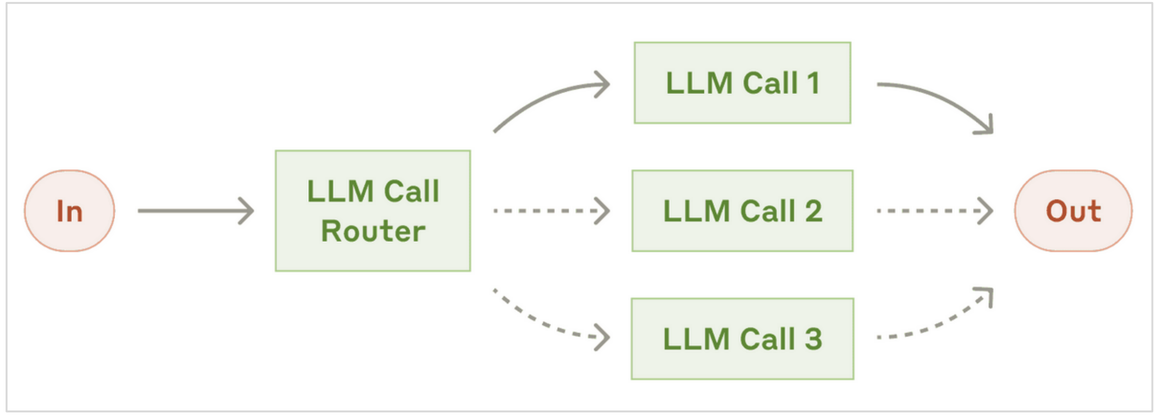
https://en.wikipedia.org/wiki/Graph_theory

Building like what?

Building Effective Agents







https://www.anthropic.com/engineering/building-effective-agents
https://langchain-ai.github.io/langgraph/tutorials/workflows/

What's out there

Code

LangGraph

https://www.langchain.com/langgraph

PydanticAI

https://ai.pydantic.dev/

crewai

https://www.crewai.com/

OpenAI Agents SDK

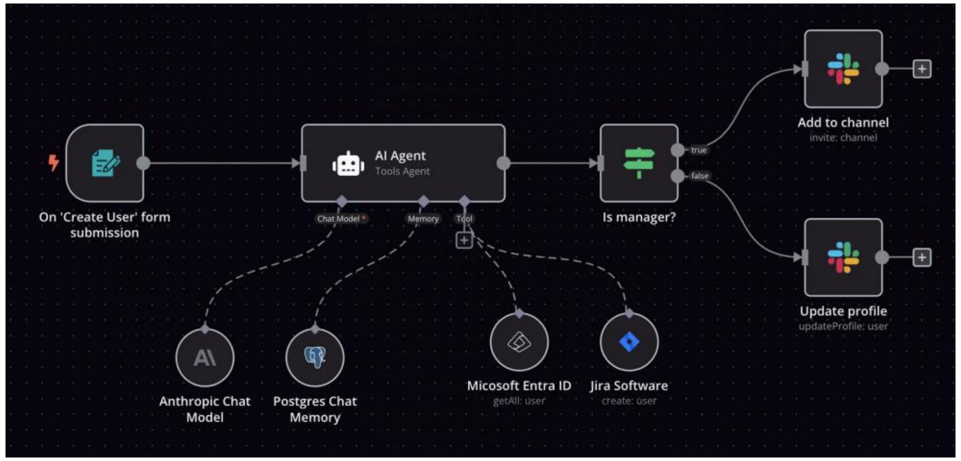
https://openai.github.io/openai-agents-python/

LlamaIndex

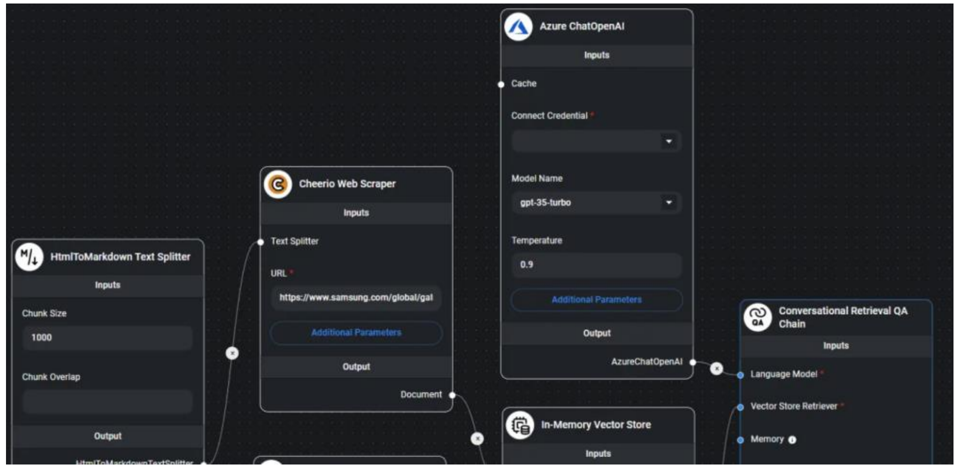
https://www.llamaindex.ai

Not a completed list…

No-Code / Low-Code



https://n8n.io/



https://flowiseai.com/

Multi-agent orchestration

Connect Agents from different frameworks

AGNTCY

https://agntcy.org/

https://github.com/google/A2A

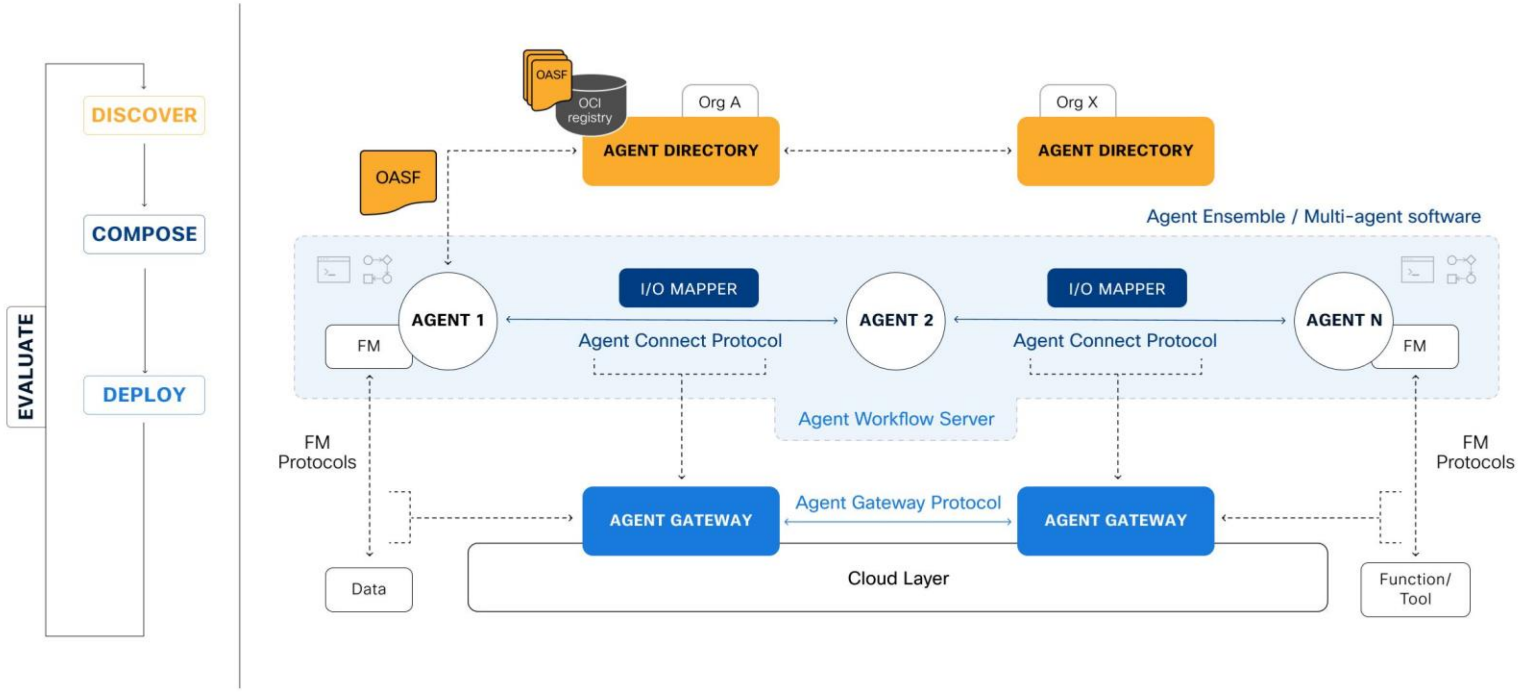
BeeAI Framework

https://i-am-bee.github.io/beeai-framework/

NVIDIA AgentIQ

https://github.com/NVIDIA/AgentIQ/

Still early environment...not a completed list

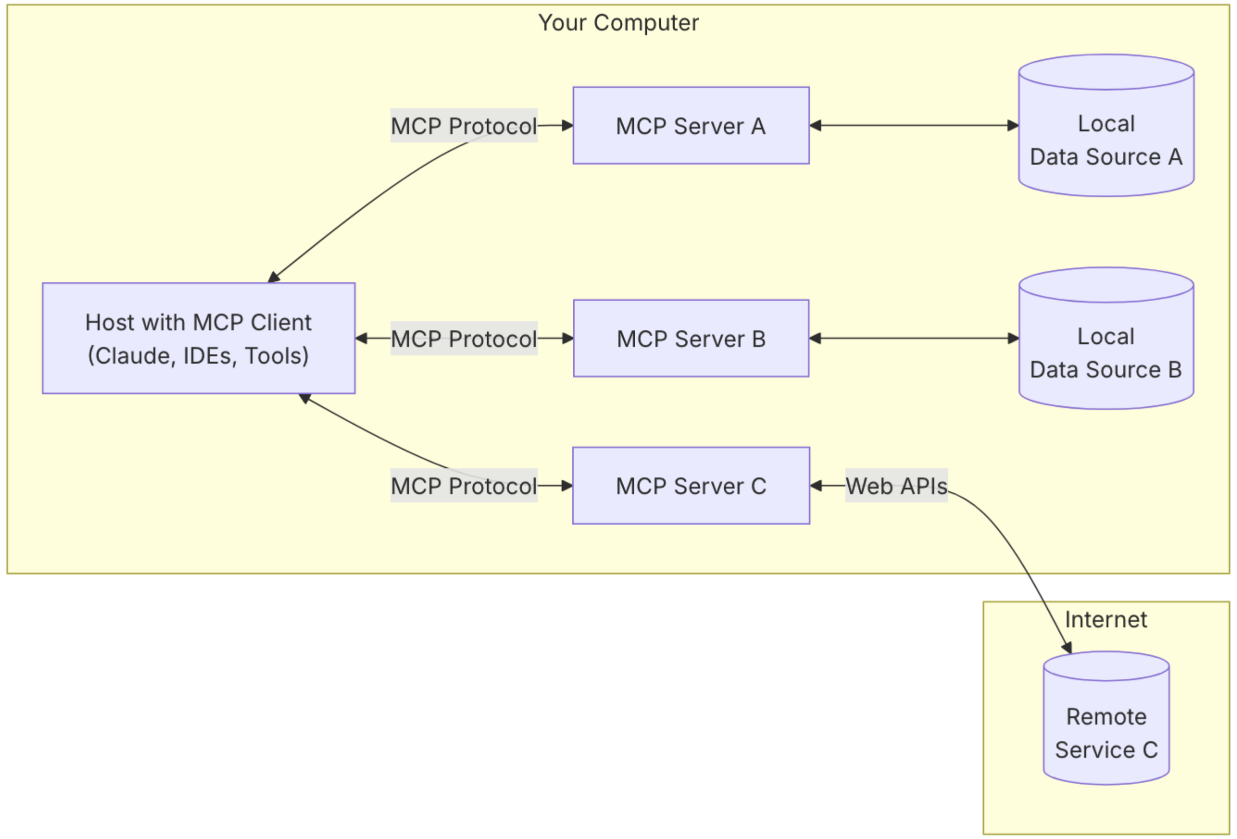


Model Context Protocol

Provide Context to your agent

- Tools.
- Resources.
- Prompts.

Tip, use official SDKs.



https://modelcontextprotocol.io/introduction

Core Concepts

Components

Nodes. Logic of your agents.

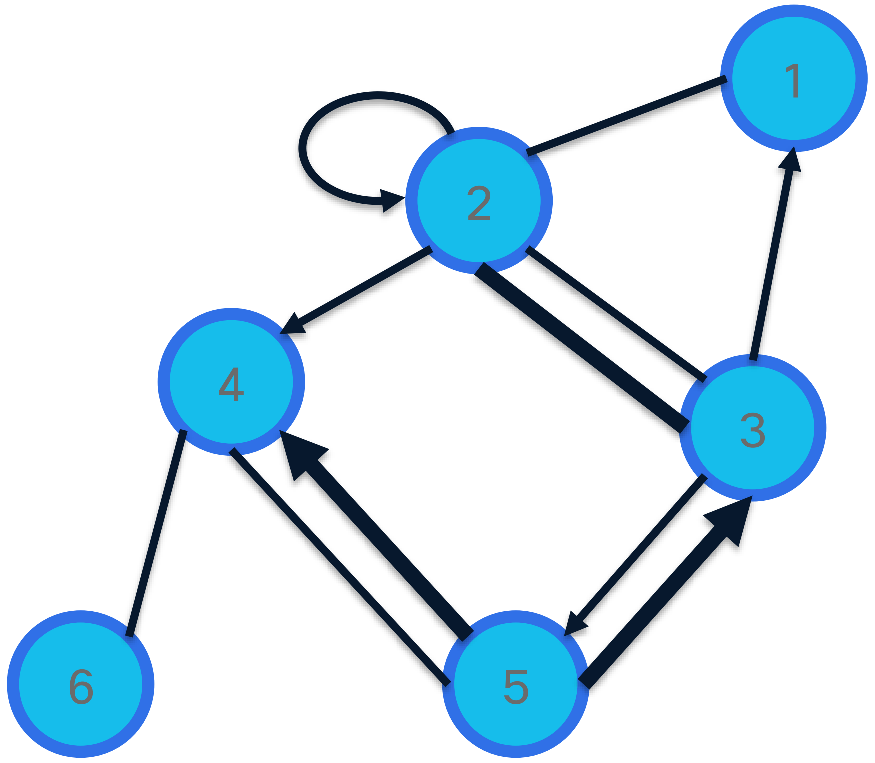
- This is where you call your agent(s).

Edges. Determines which Node to execute next.

- Control Flow.

State. Python object shared among nodes.

- This is Key!



https://langchain-ai.github.io/langgraph/concepts/low_level/

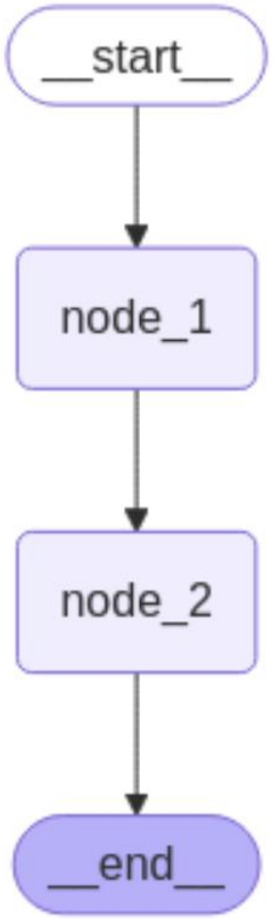
Nodes

```
from IPython.display import Image, display
from langgraph.graph import StateGraph
```

```
class State(TypedDict):
  graph_state: str
```

```
def node_1(state):
  print(f"-- Node 1 {state[‘graph_state’]} --")

def node_2(state):
  print(f"-- Node 2 {state[‘graph_state’]} --")
```

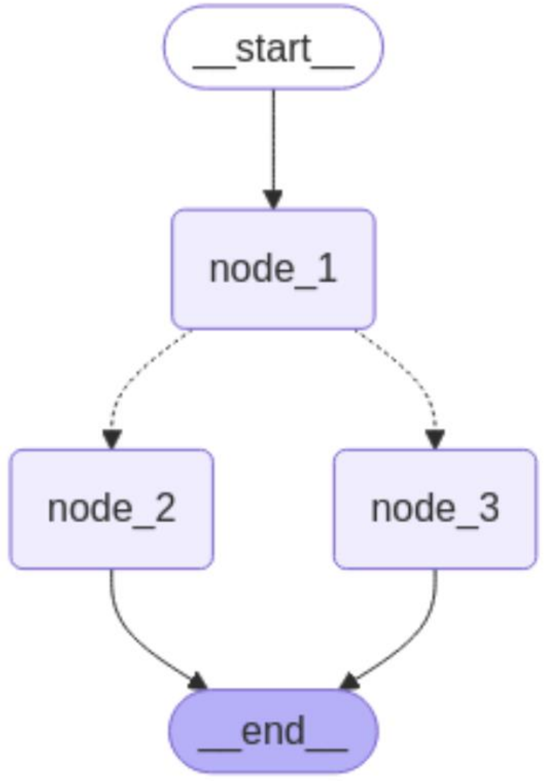
```
builder = StateGraph(State)
builder.add_node("node_1", node_1)
builder.add_node("node_2", node_2)

builder.set_entry_point("node_1")
builder.add_edge("node_1", "node_2")
builder.set_finish_point("node_2")
graph = builder.compile()
```



https://github.com/langchain-ai/langchain-academy/blob/main/module-1/simple-graph.ipynb

Control Flow

```
import random
from typing import Literal
from langgraph.graph import StateGraph, START, END

def decide_mood(state) -> Literal["node_2", "node_3"]:
  user_input = state['graph_state’]
  if random.random() < 0.5:
    return "node_2"
return "node_3"

builder = StateGraph(State)
builder.add_node("node_1", node_1)
builder.add_node("node_2", node_2)
builder.add_node("node_3", node_3)

builder.add_edge(START, "node_1")
builder.add_conditional_edges("node_1", decide_mood)
builder.add_edge("node_2", END)
builder.add_edge("node_3", END)

graph = builder.compile()
```



https://github.com/langchain-ai/langchain-academy/blob/main/module-1/simple-graph.ipynb

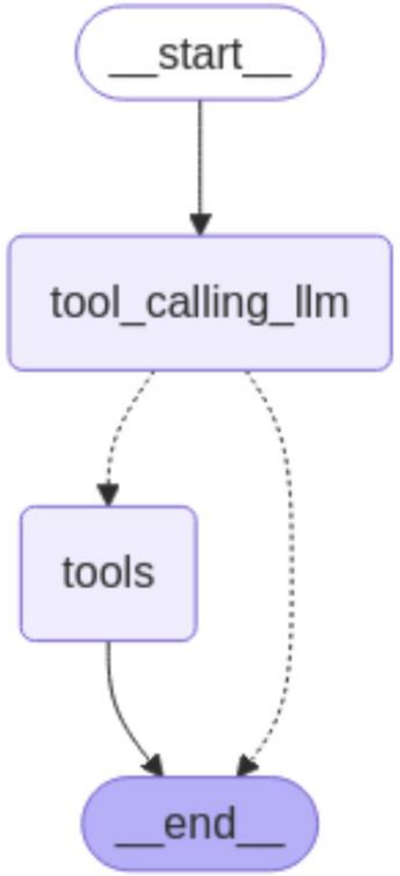
Tools

```
from langgraph.graph import StateGraph, START, END,
MessagesState
from langgraph.prebuilt import ToolNode,
tools_condition
from langchain_openai import ChatOpenAI
```

```
def multiply(a: int, b: int) -> int:
  """Multiply a and b.

     Args:
       a: first int
       b: second int
  """
return a * b
```

```
llm = ChatOpenAI(model="gpt-4o")
llm_with_tools = llm.bind_tools([multiply])
```

```
# Node
def tool_calling_llm(state: MessagesState):
  return {"messages":
     [llm_with_tools.invoke(state["messages"])]}
```



https://github.com/langchain-ai/langchain-academy/blob/main/module-1/router.ipynb

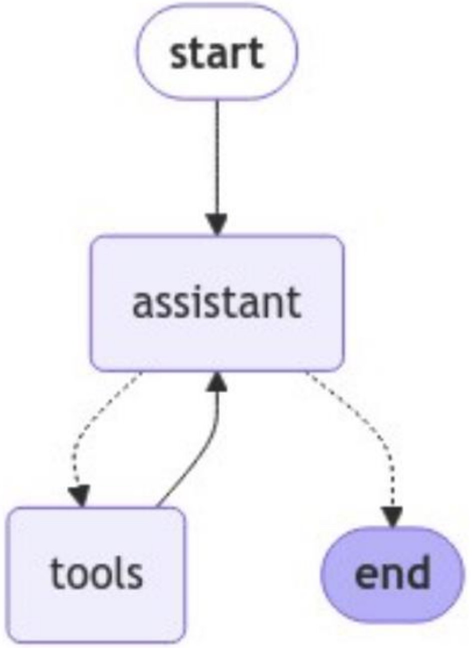
MCP Integration

```python
from langchain_mcp_adapters.client import MultiServerMCPClient
from langgraph.prebuilt import create_react_agent

async with MultiServerMCPClient(
    {
      "math": {
        "command": "python",
        "args": ["/path/to/math_server.py"],
        "transport": "stdio",
      },
    }
) as client:
    agent = create_react_agent(
      "anthropic:claude-3-7-sonnet-latest", client.get_tools()
    )
    math_response = await agent.ainvoke(
      {"messages": [{"role": "user", "content": "what's (3 + 5) x 12?"}]}
)
```

https://github.com/langchain-ai/langchain-mcp-adapters

Run the graph

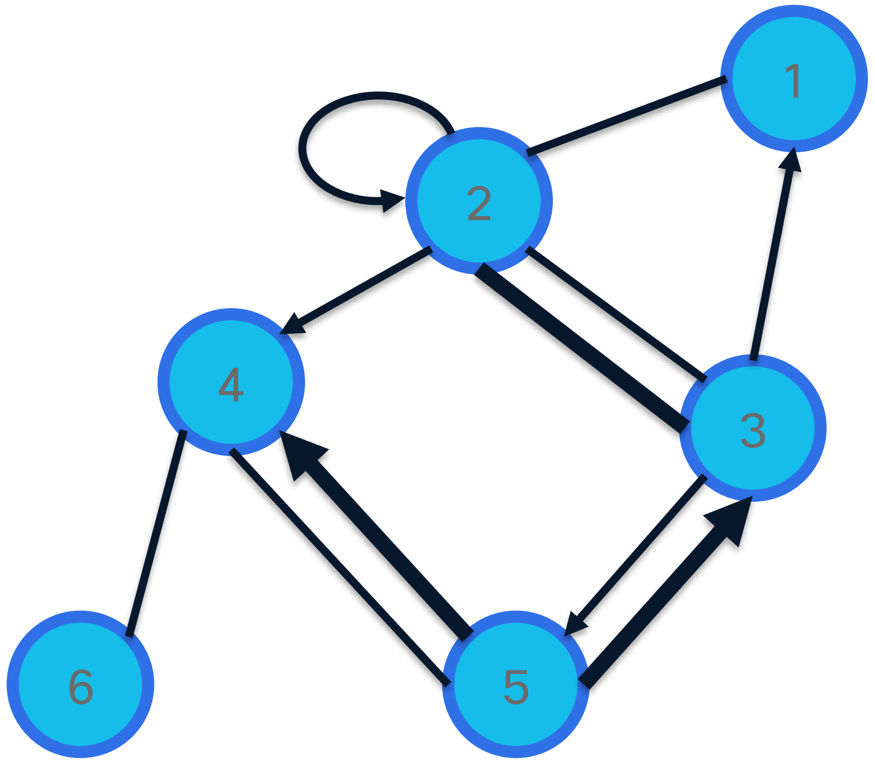
```
builder = StateGraph(MessagesState)

builder.add_node("assistant", assistant)
builder.add_node("tools", ToolNode(tools))

builder.add_edge(START, "assistant")
builder.add_conditional_edges("assistant",
                               tools_condition,
                               )
builder.add_edge("tools", "assistant")
graph = builder.compile()

messages = [HumanMessage(content="Add 3 and 4.
 Multiply the output by 2. Divide the output by 5")]

messages = graph.invoke({"messages": messages})

for m in messages['messages’]:
  m.pretty_print()
```



https://github.com/langchain-ai/langchain-academy/blob/main/module-1/agent.ipynb

Other Components

- Structure Output
- Memory
- Human in the loop
- Evals
- Subgraphs
- Multi-agent
- And many more..

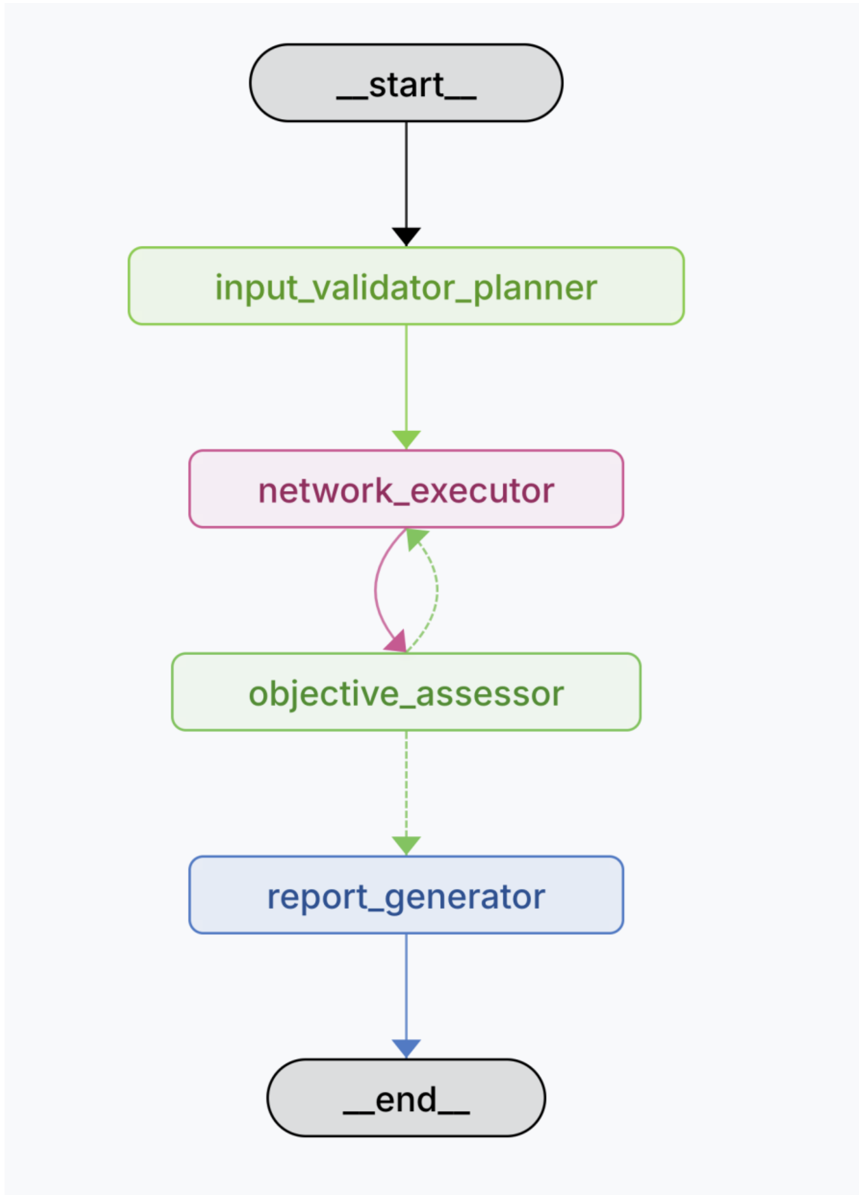


https://langchain-ai.github.io/langgraph/

Demo

Demo

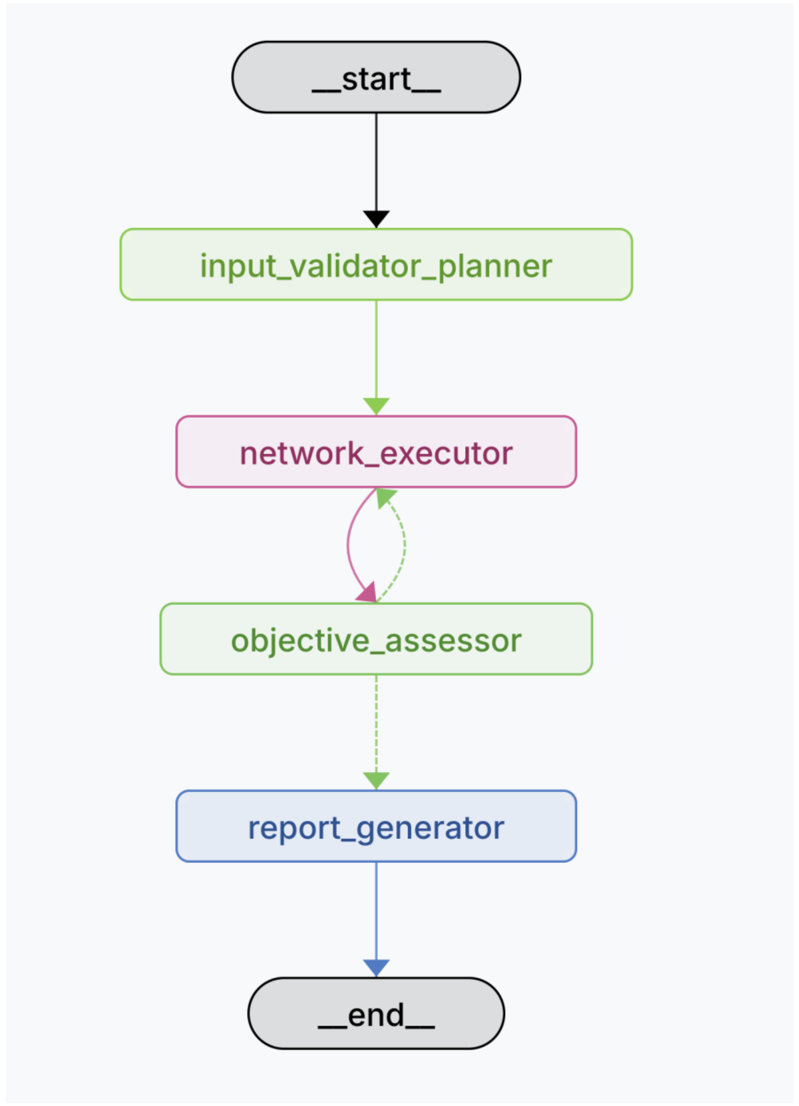
- Objective; extract state & configuration from the network.
- gGNMI tool connected via MCP.
- XRd topology.



Wrap up

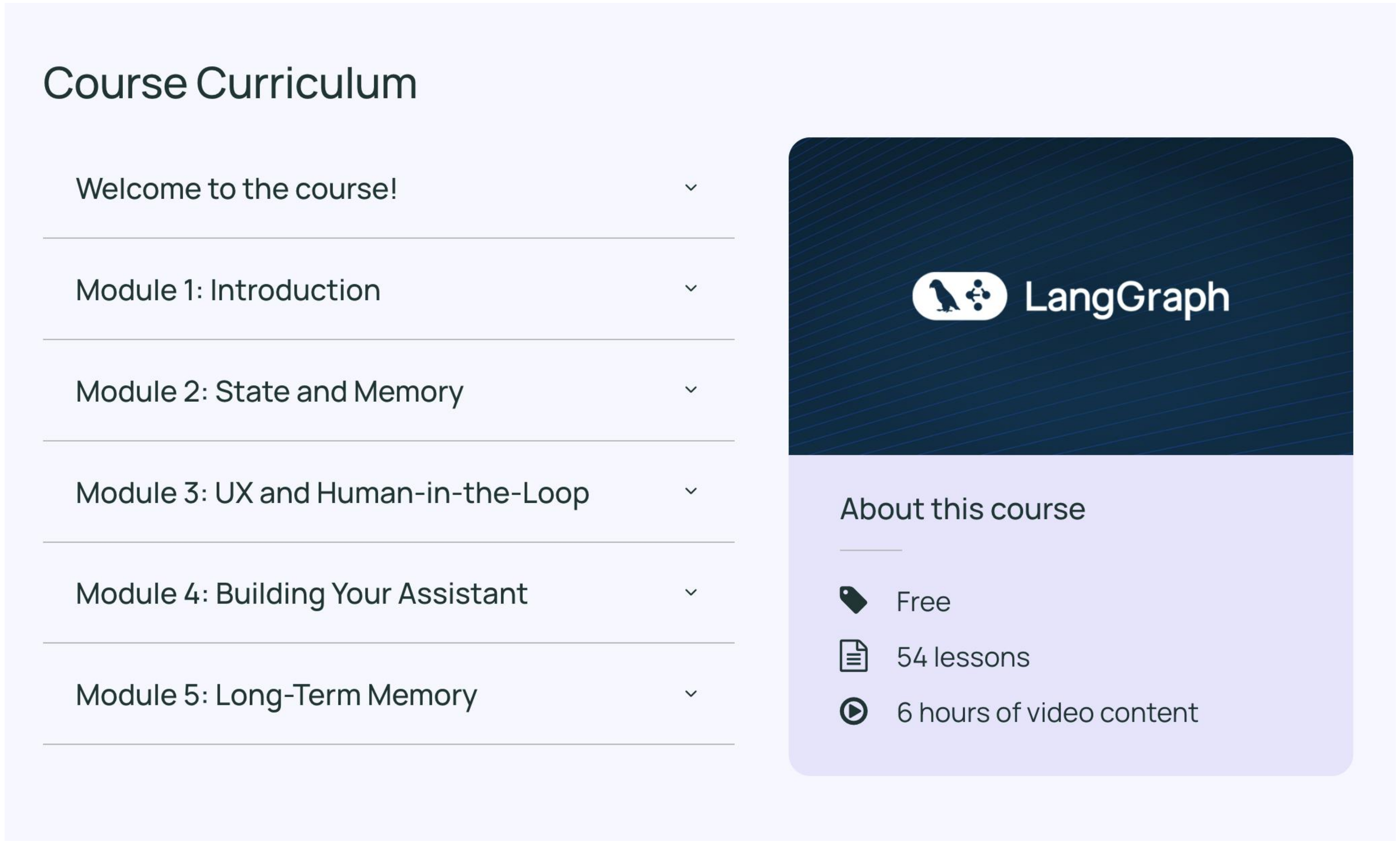
Leassons Learned

- Control the State and Flow with graphs.
- Agent workflow is easier with a Graph.
- An observability tool is crucial.
- The learning curve can be challenging.



Call to Action

- Check out the Langgraph course from Langgchain.
- Write your own graph!


Course Curriculum

Welcome to the course!

Module 1: Introduction

Module 2: State and Memory

Module 3: UX and Human-in-the-Loop

Module 4: Building Your Assistant

Module 5: Long-Term Memory

LangGraph

About this course

Free

54 lessons

6 hours of video content

https://academy.langchain.com/courses/intro-to-langgraph

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Thank you

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