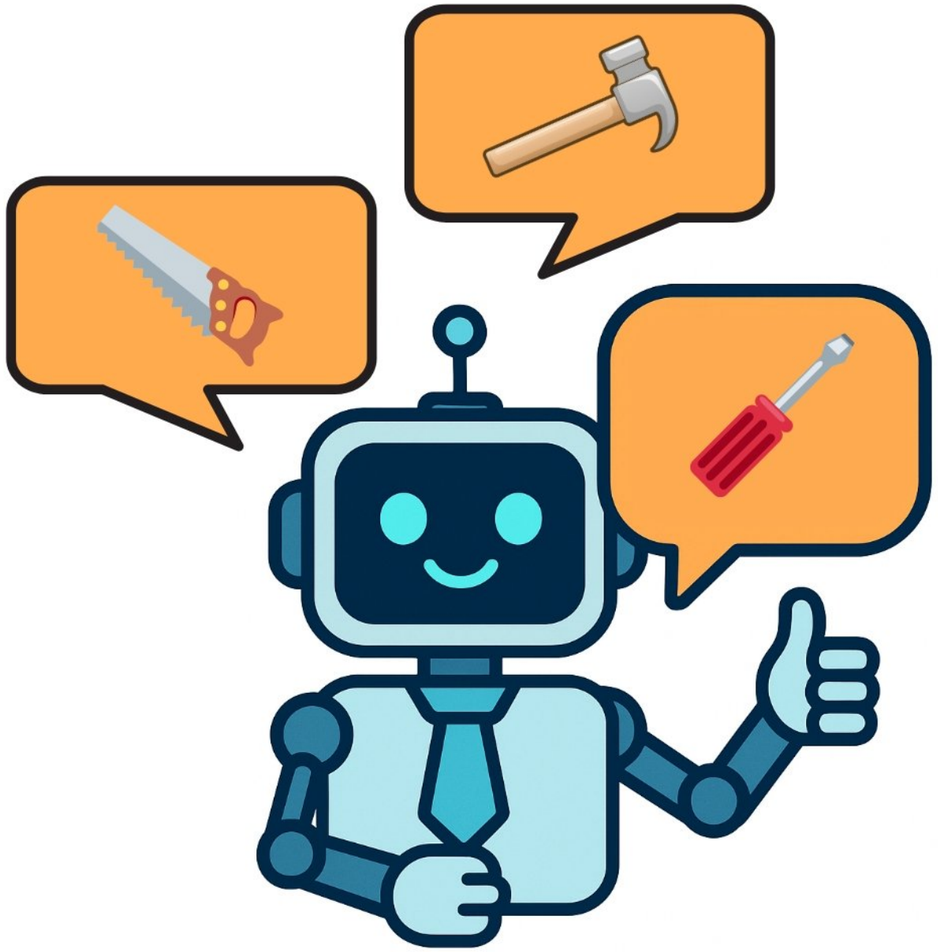
Multi-Agent Design Patterns

BUILDING SCALABLE AGENTIC SYSTEMS

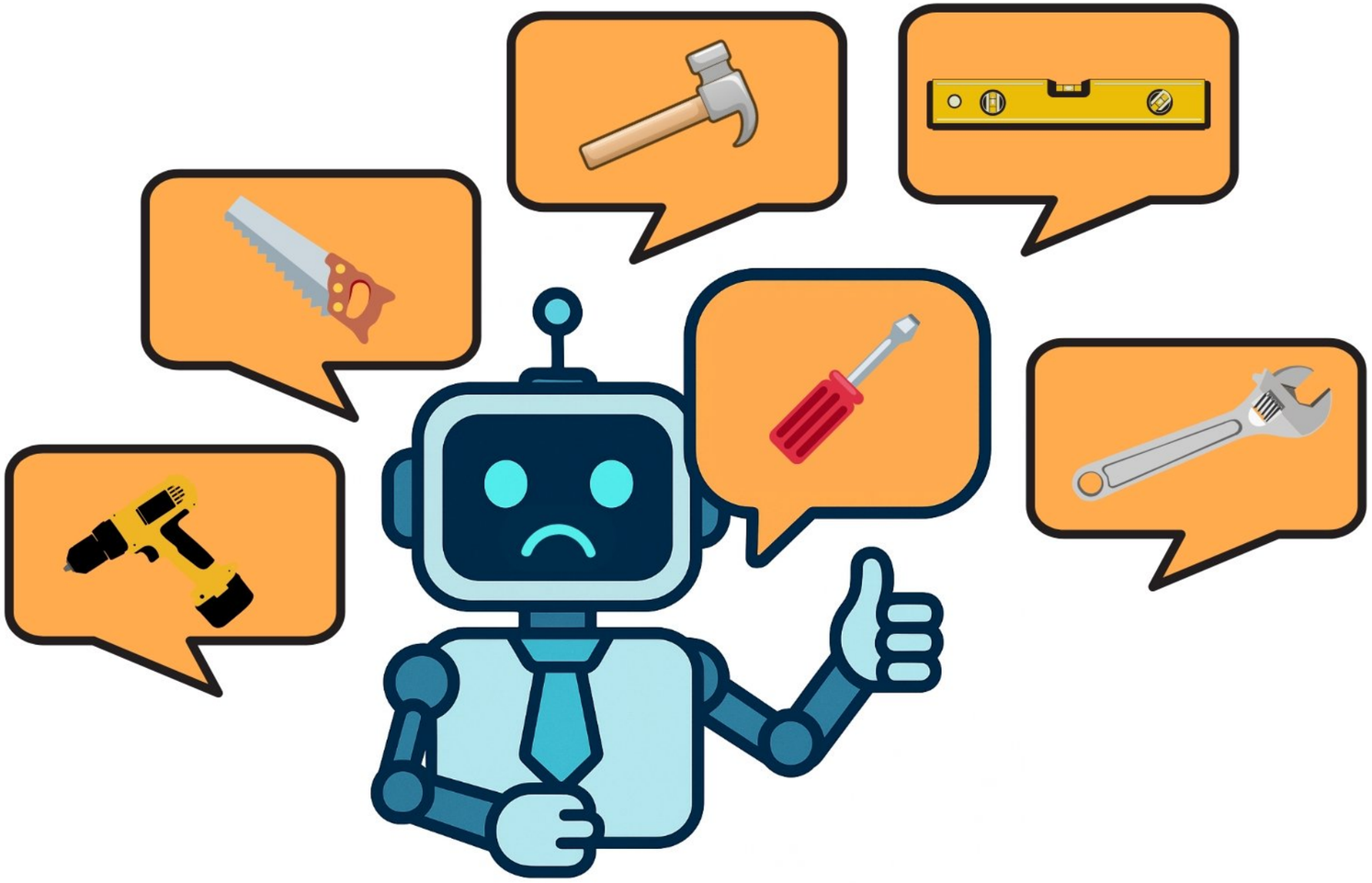
Korey Stegared-Pace
Senior AI Cloud Advocate, Microsoft

datacamp

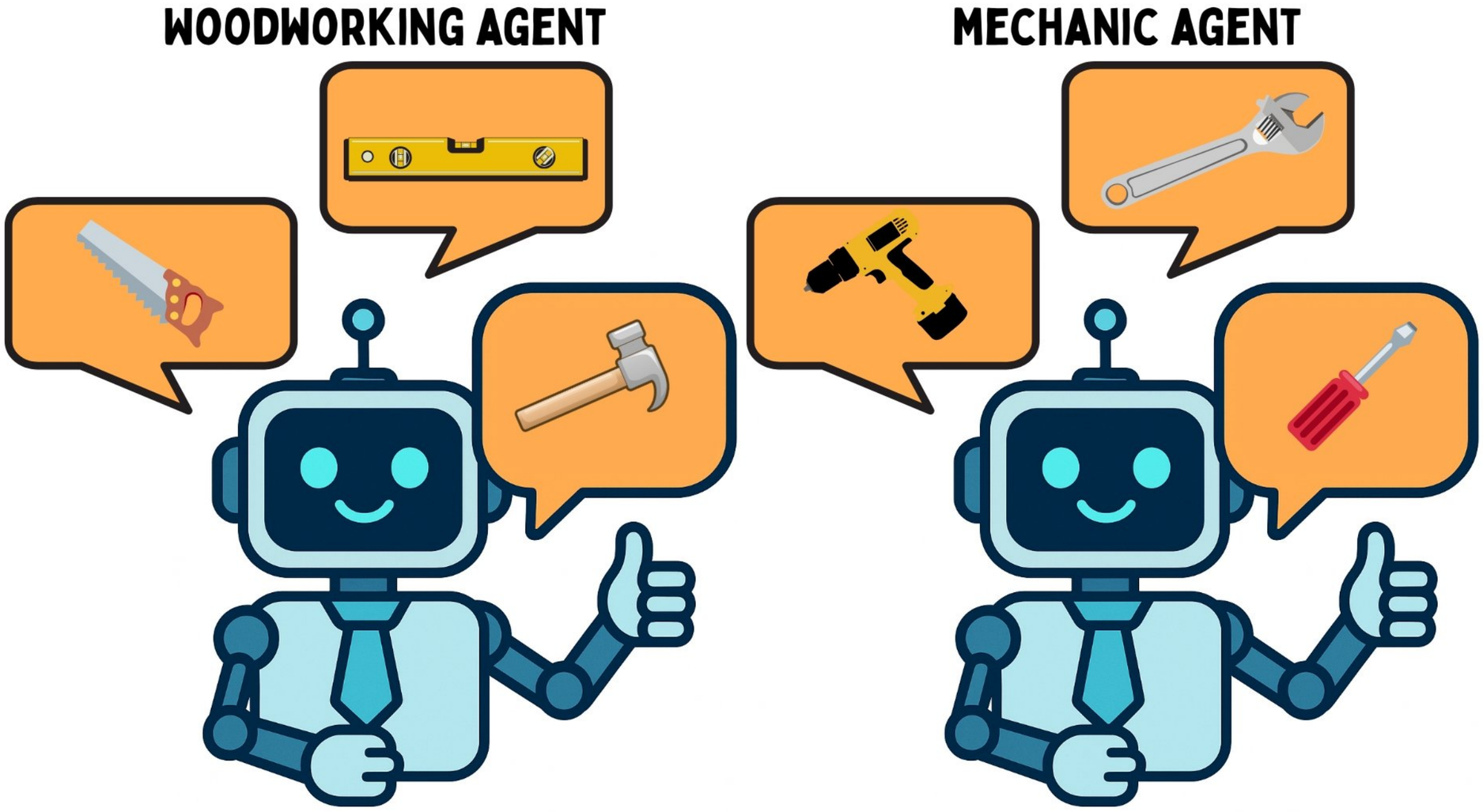
Single agents



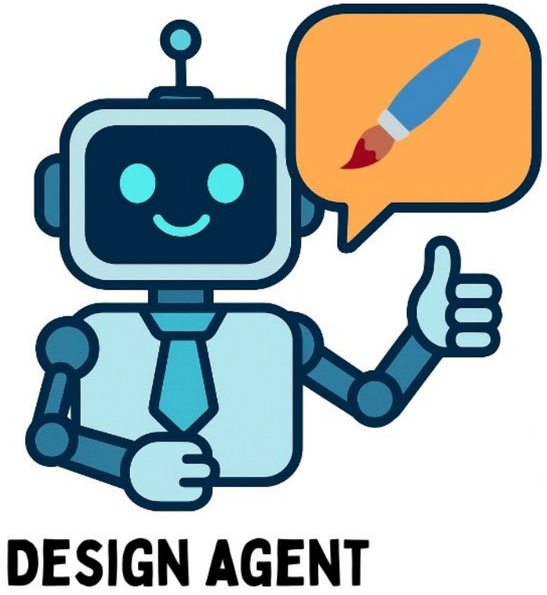
Single agents



Multi-agents



Example: A web app multi-agent



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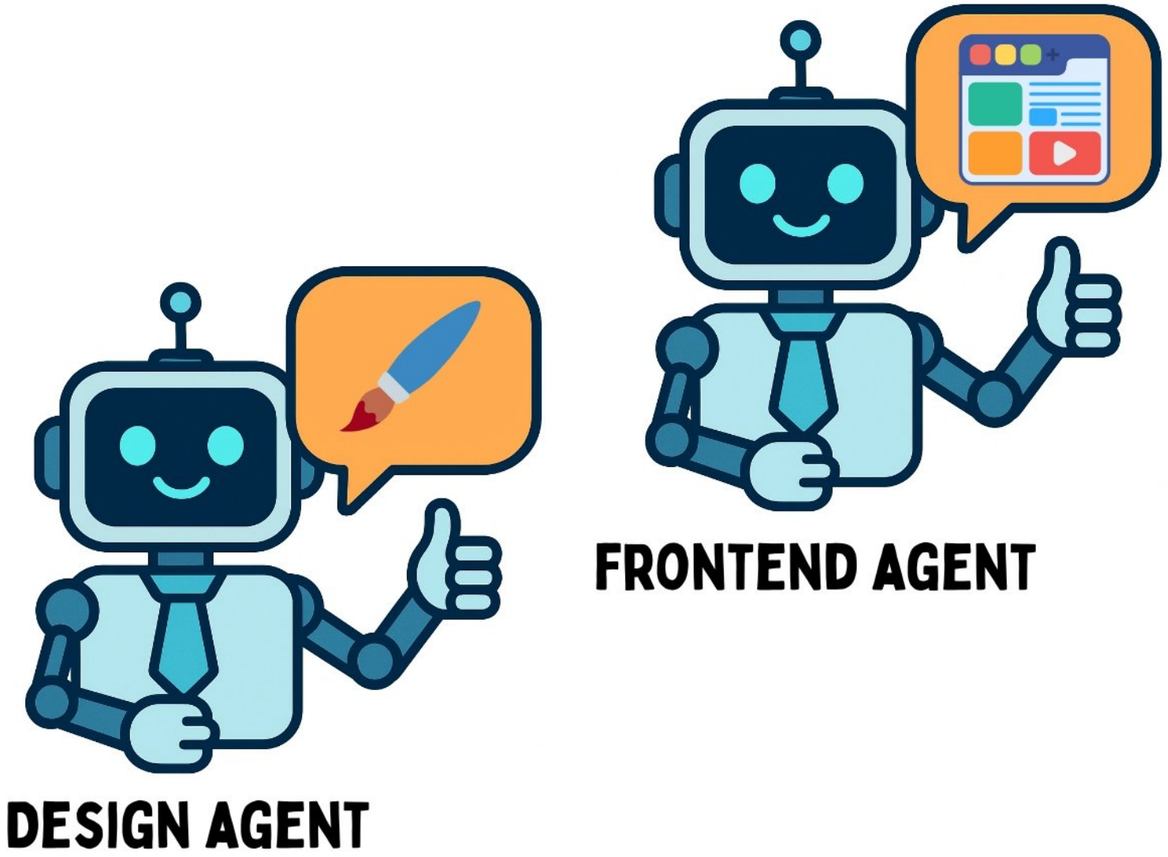

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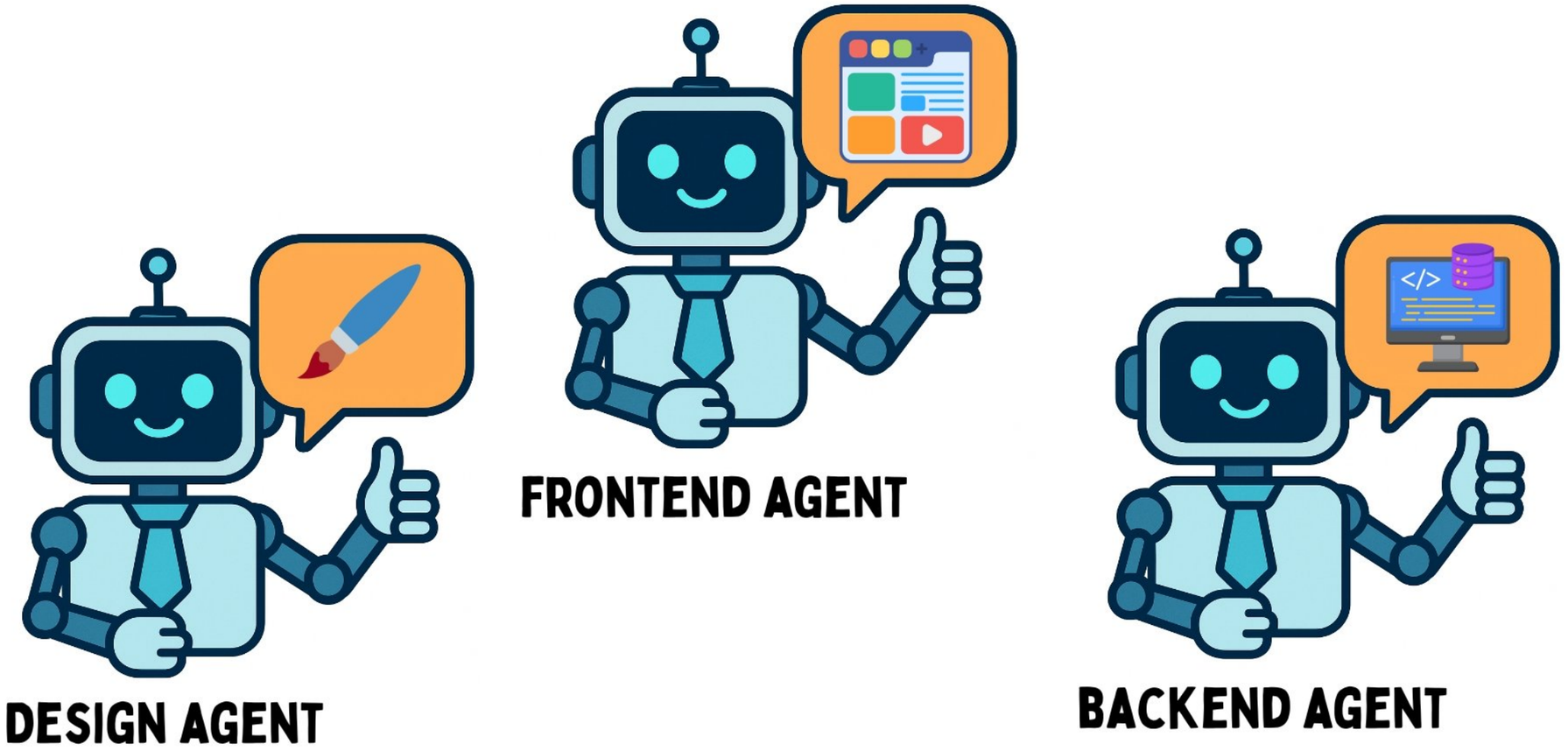

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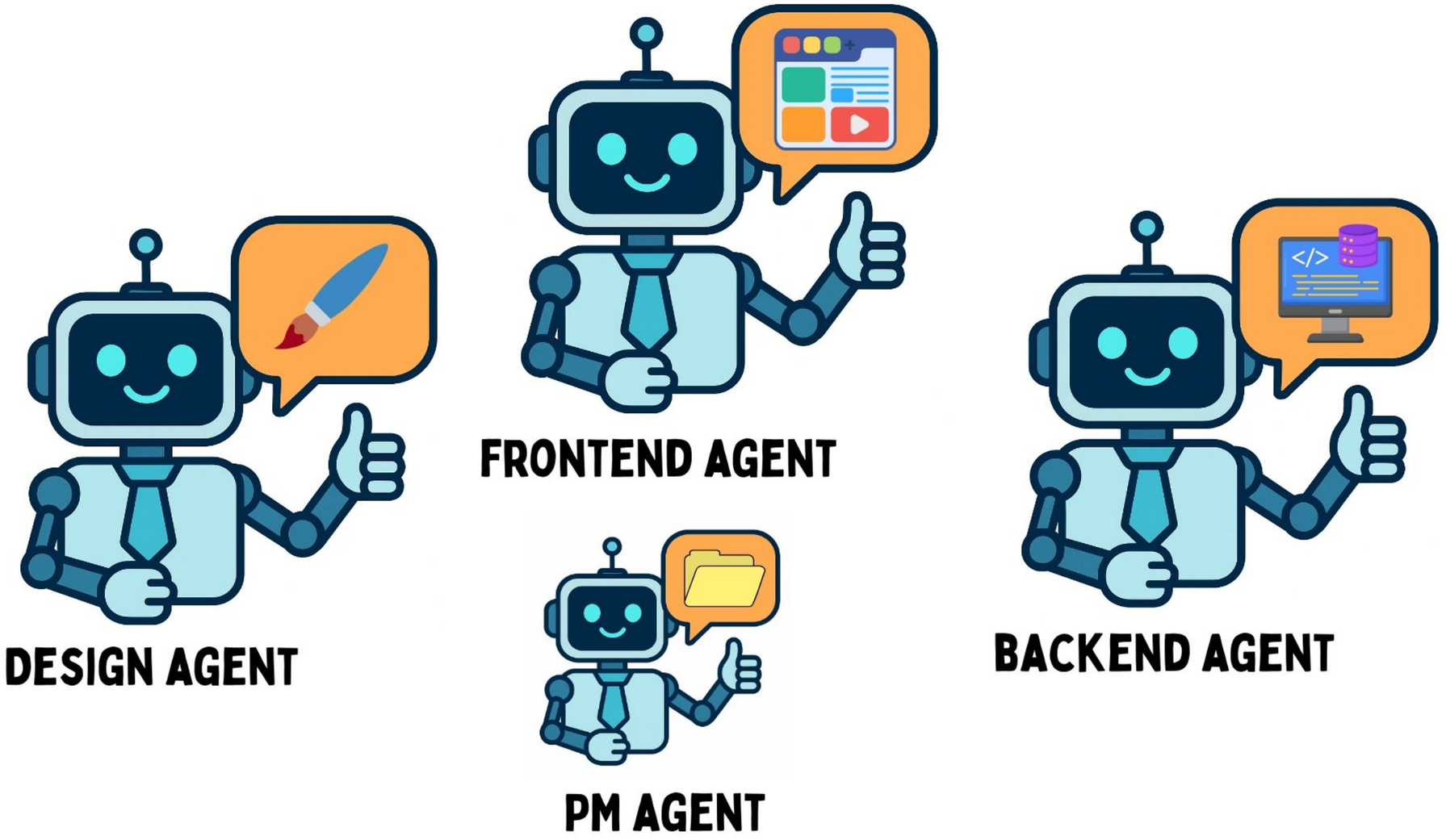
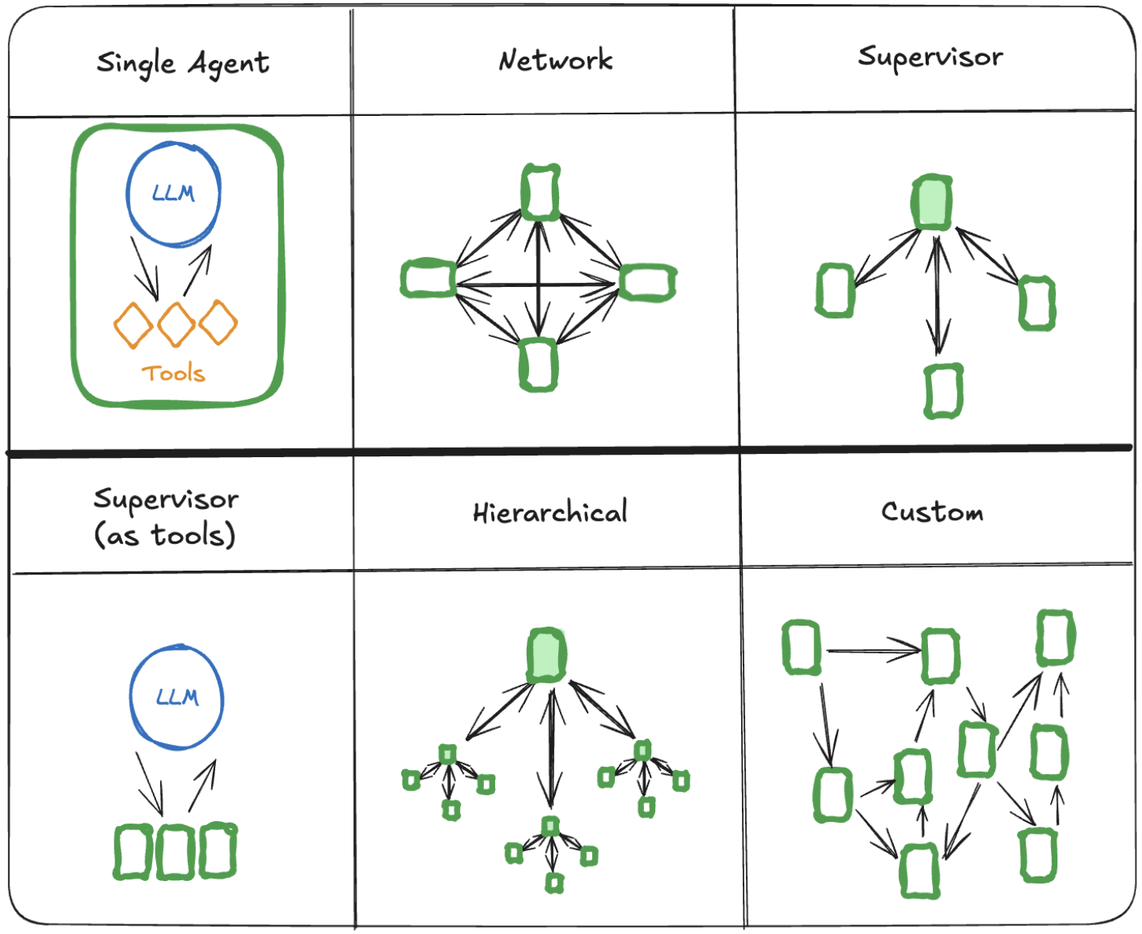


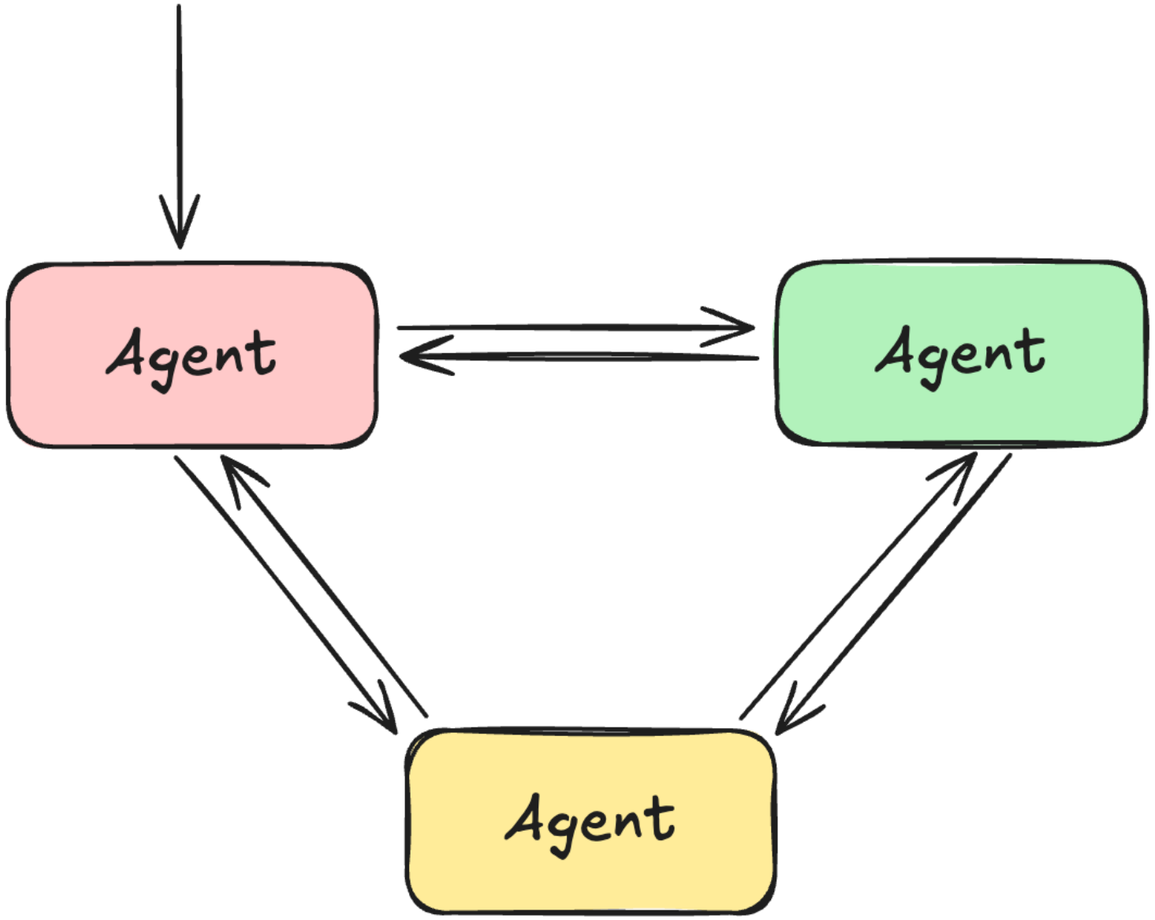
Multi-agent design patterns



[1] https://langchain-ai.github.io/langgraph/concepts/multi_agent/#multi-agent-architectures

Network multi-agents

- Also called *swarm* or *decentralized*



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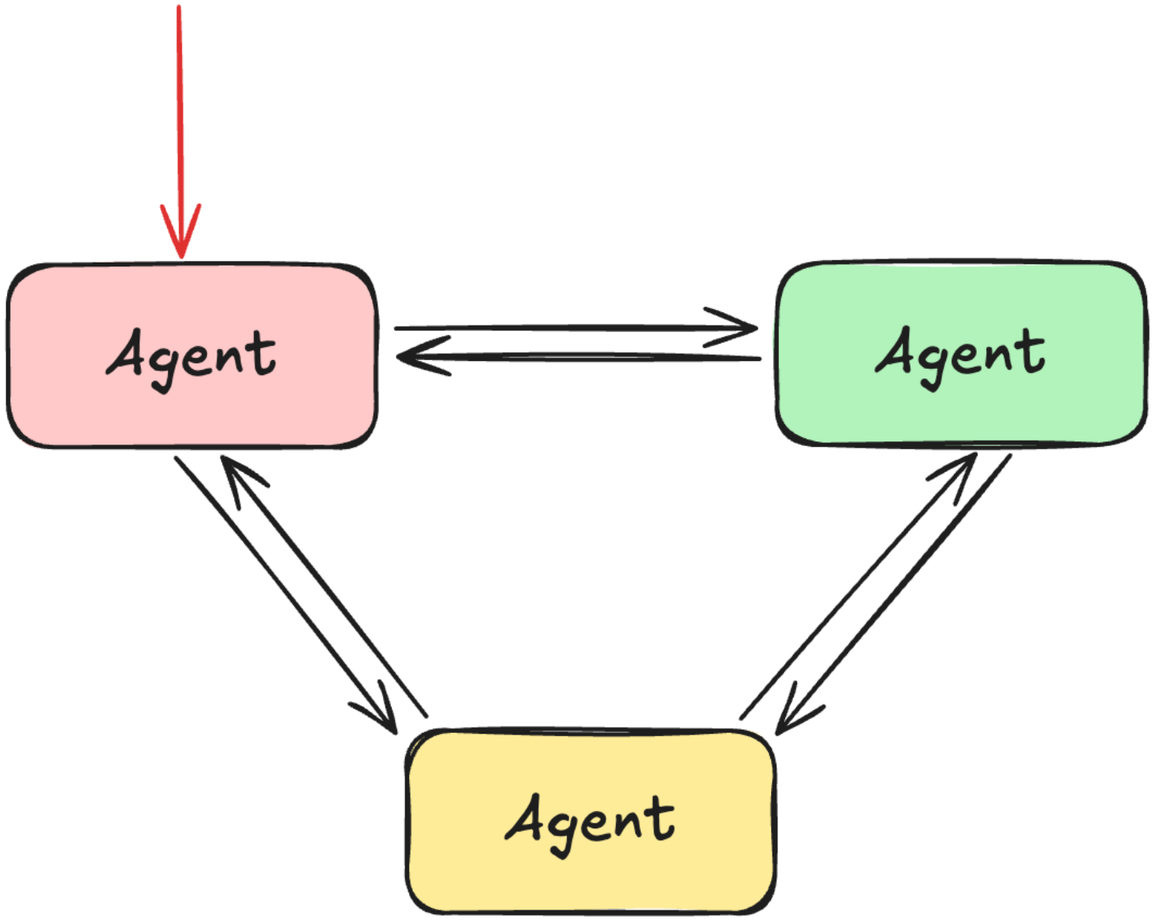

Network multi-agents

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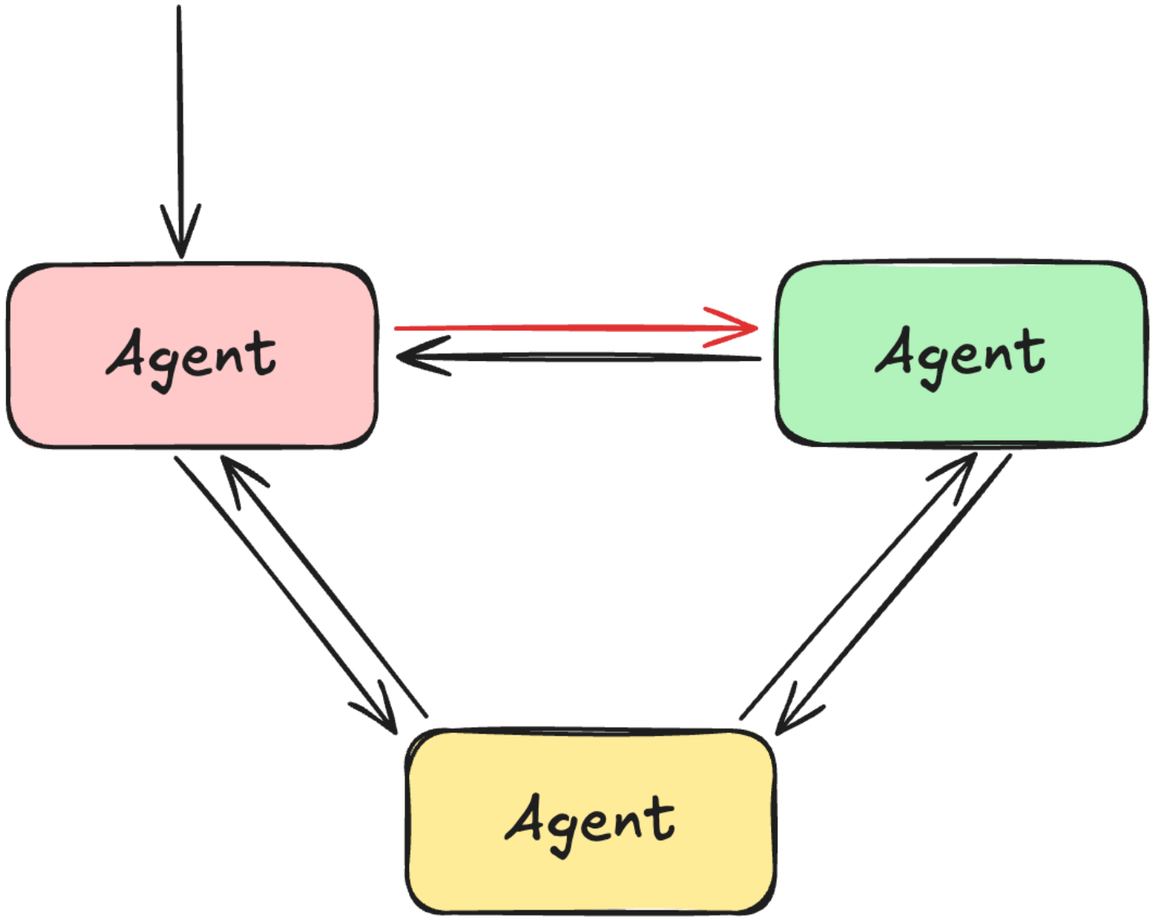
1. Input is sent to an initial agent
2. Agents *handoff* to one another to complete the task



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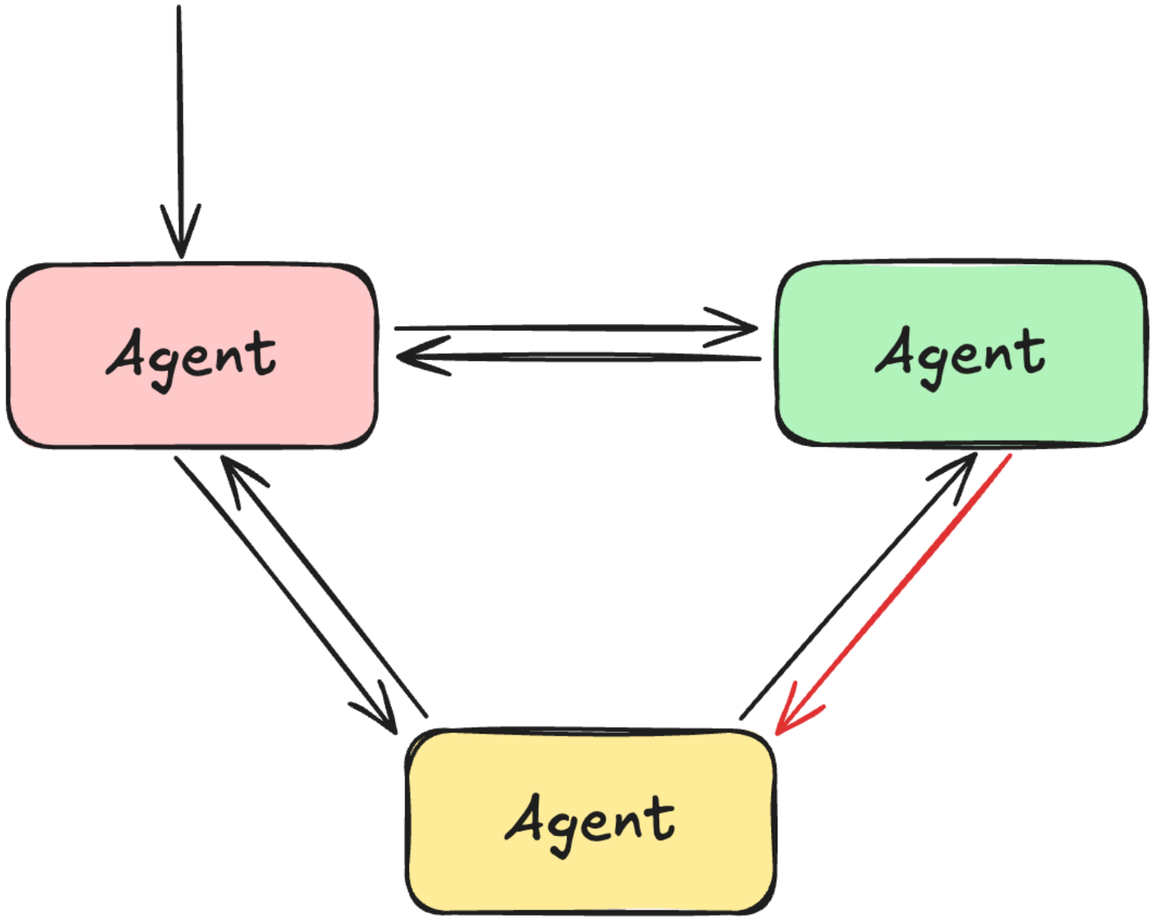

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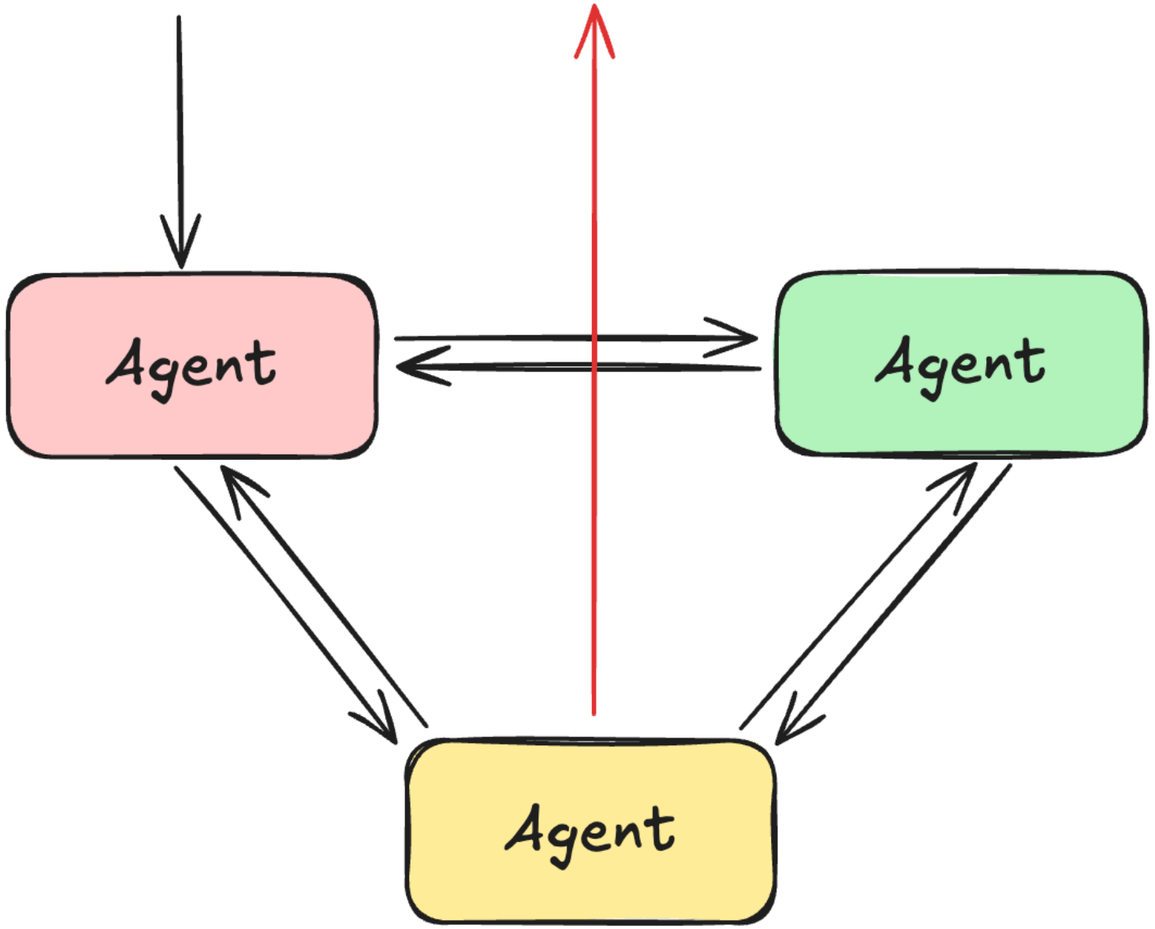

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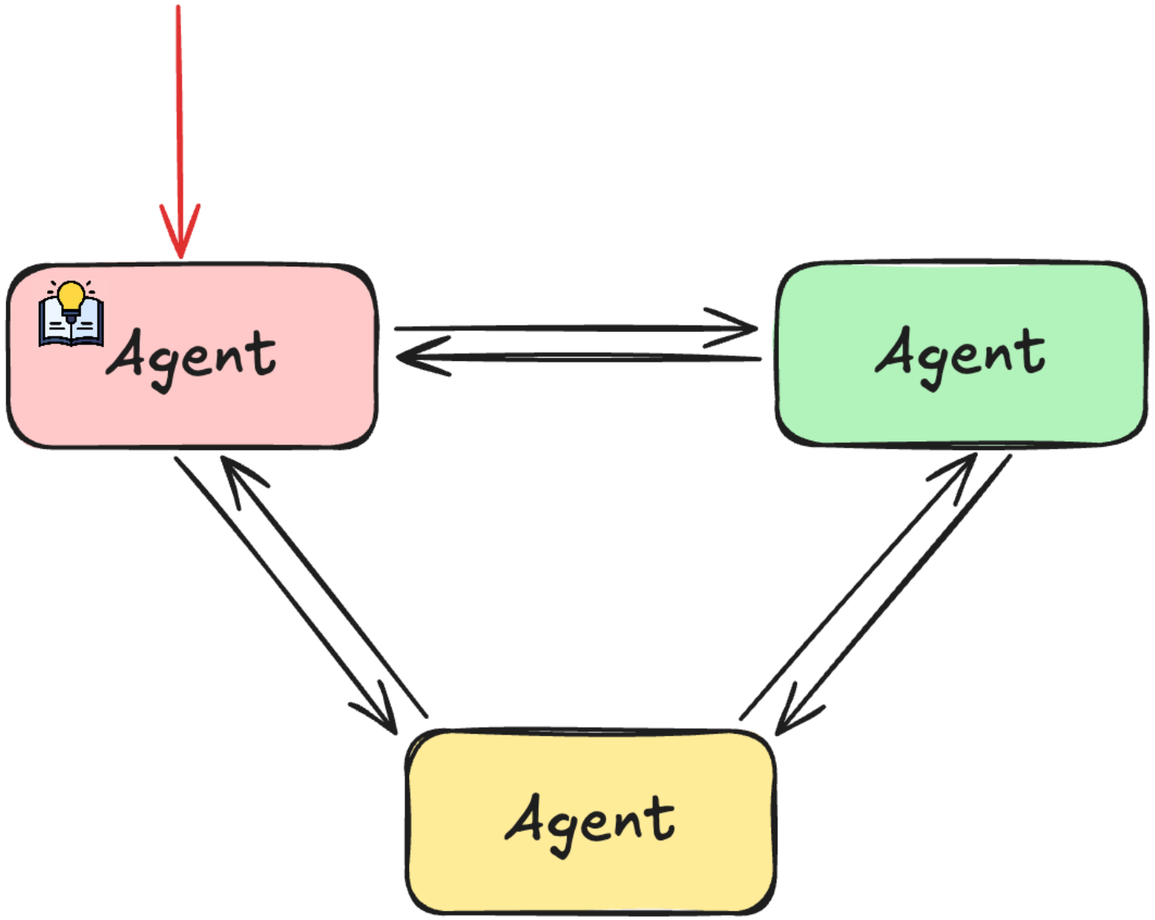

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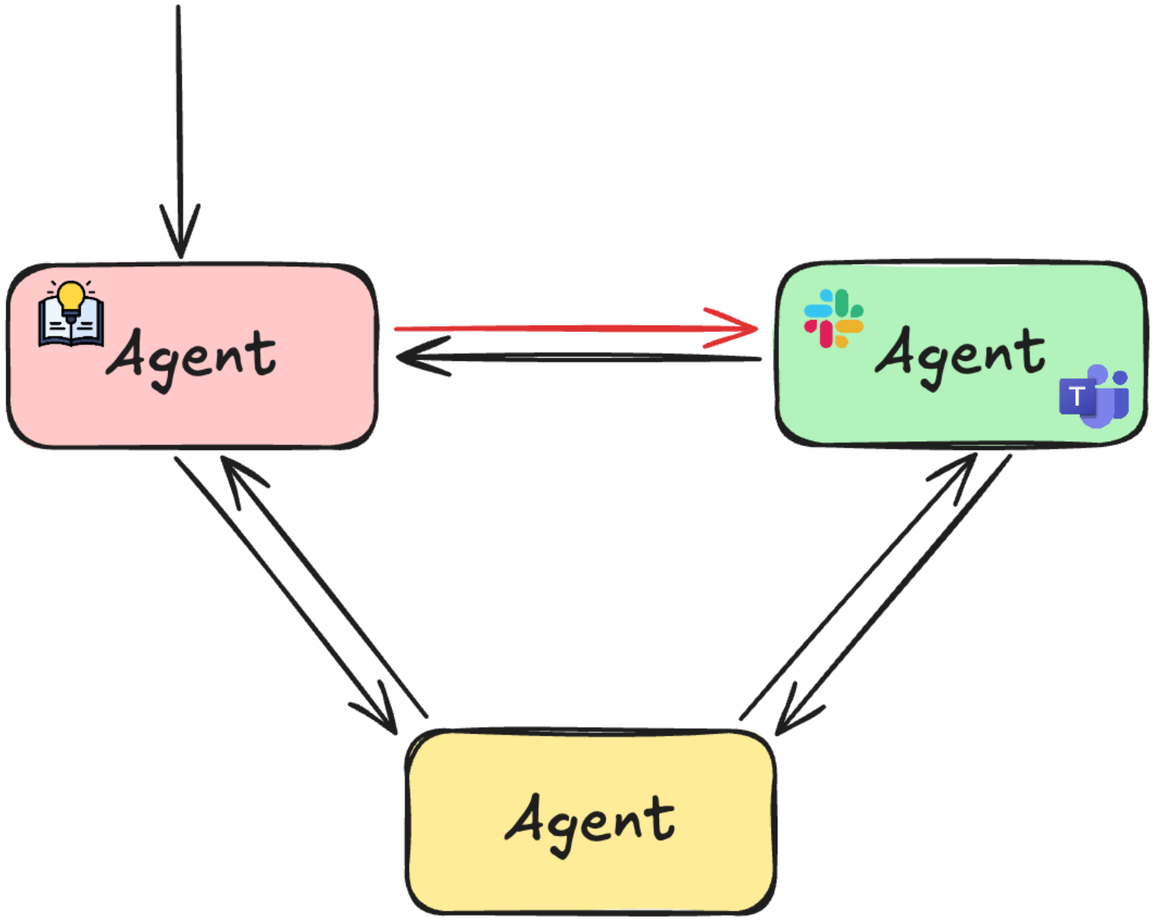

Network multi-agents

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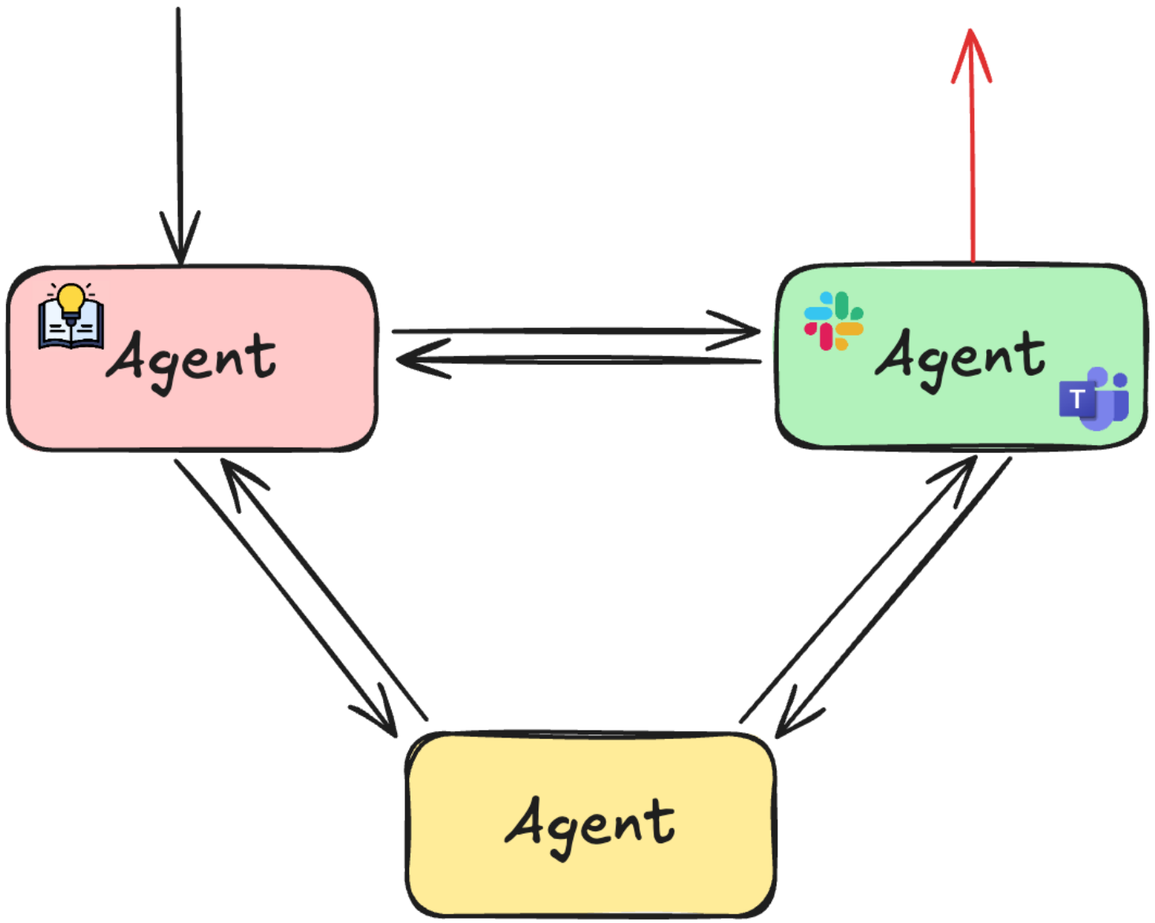
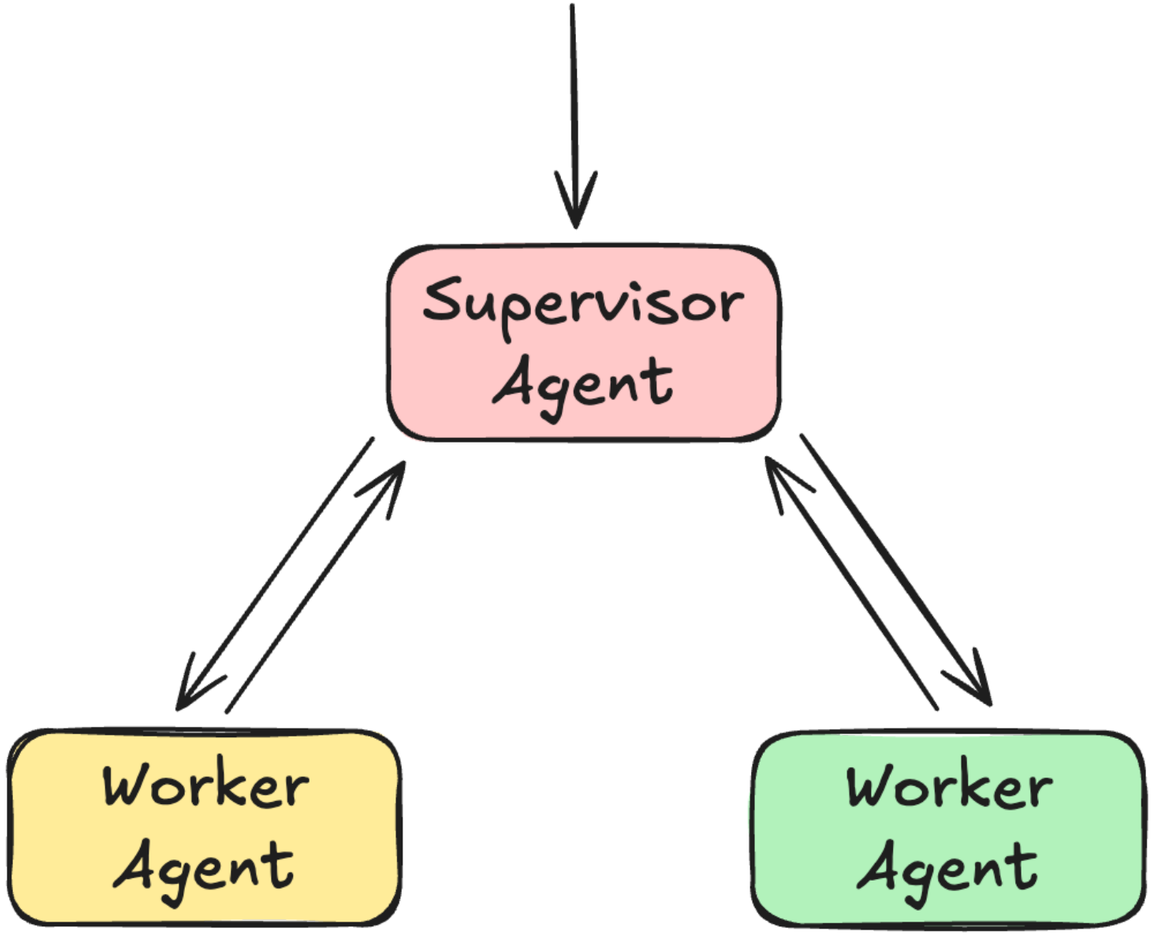
2. Agents *handoff* to one another to complete the task
3. Each agent can end the workflow and respond to the user

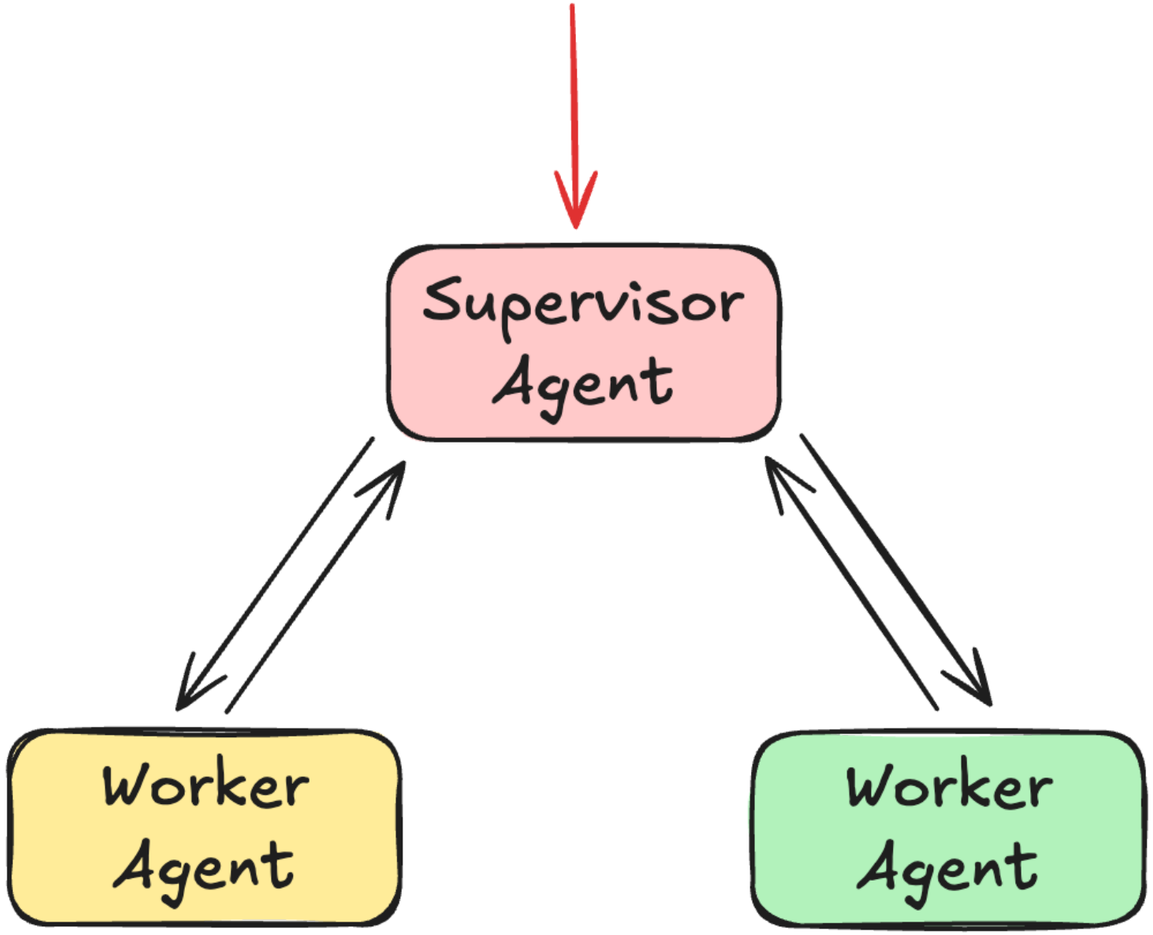


Supervisor multi-agents



1. Input sent to a *supervisor agent*
2. Supervisor hands tasks off to *worker agents*
3. Workers execute their tools and report back to the supervisor
4. Supervisor responds to the user

Supervisor multi-agents



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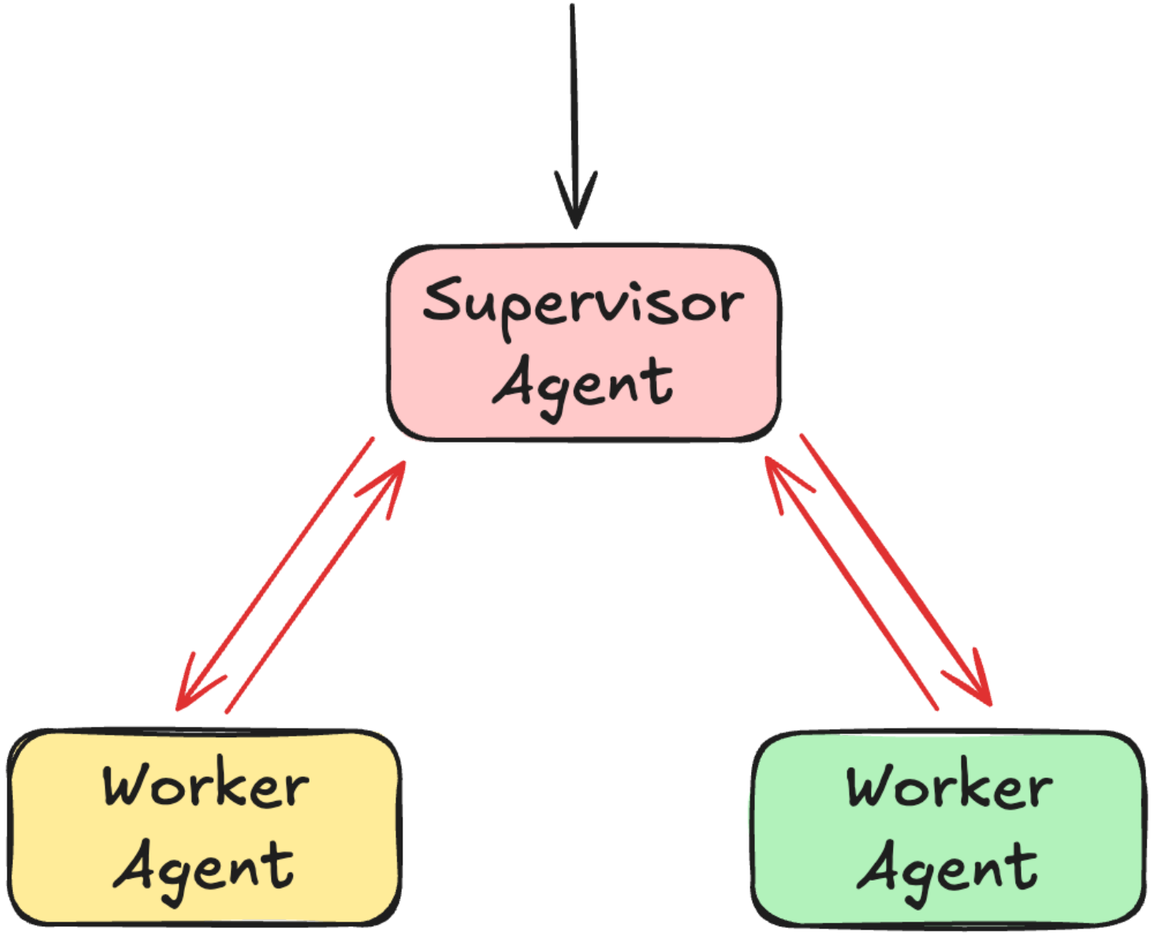

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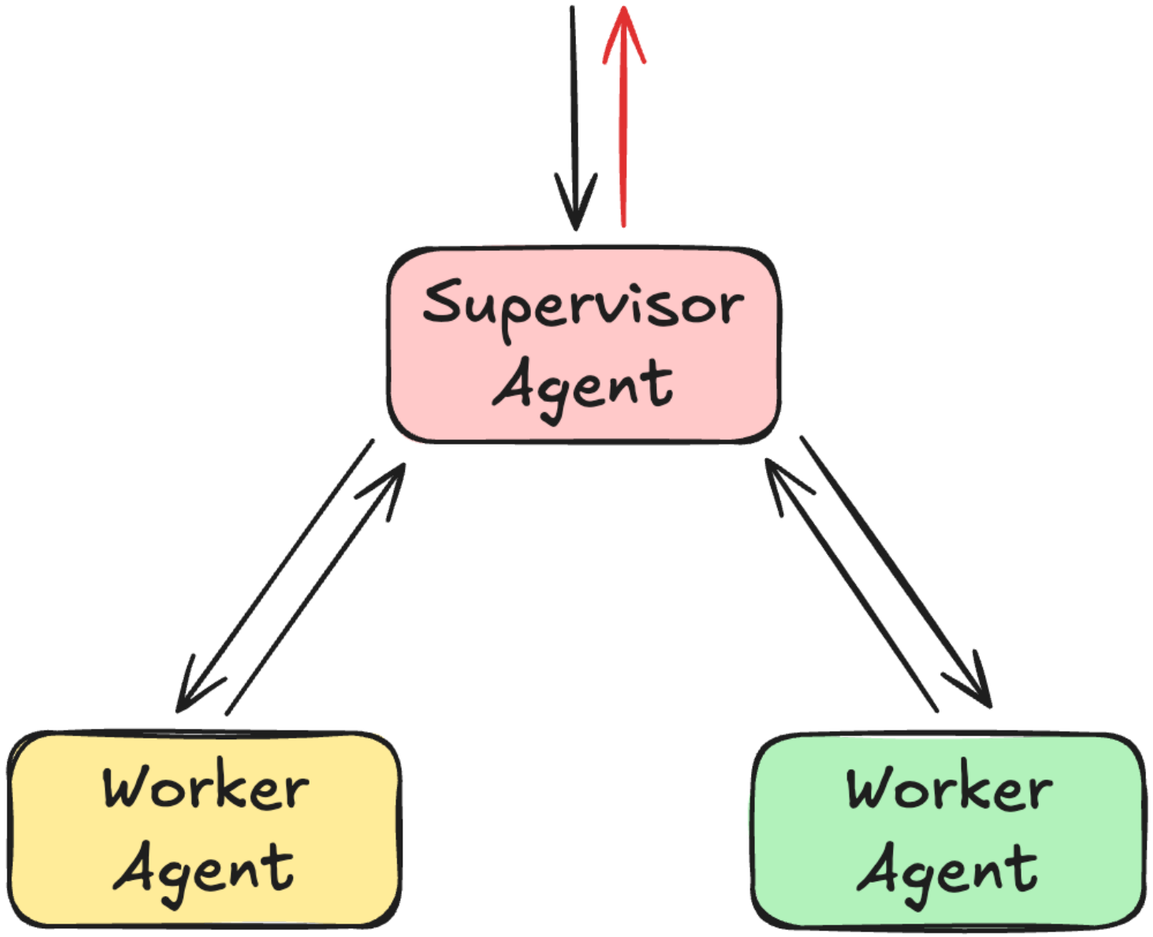

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Let's practice!

BUILDING SCALABLE AGENTIC SYSTEMS

The Model Context Protocol (MCP)

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Senior AI Cloud Advocate, Microsoft

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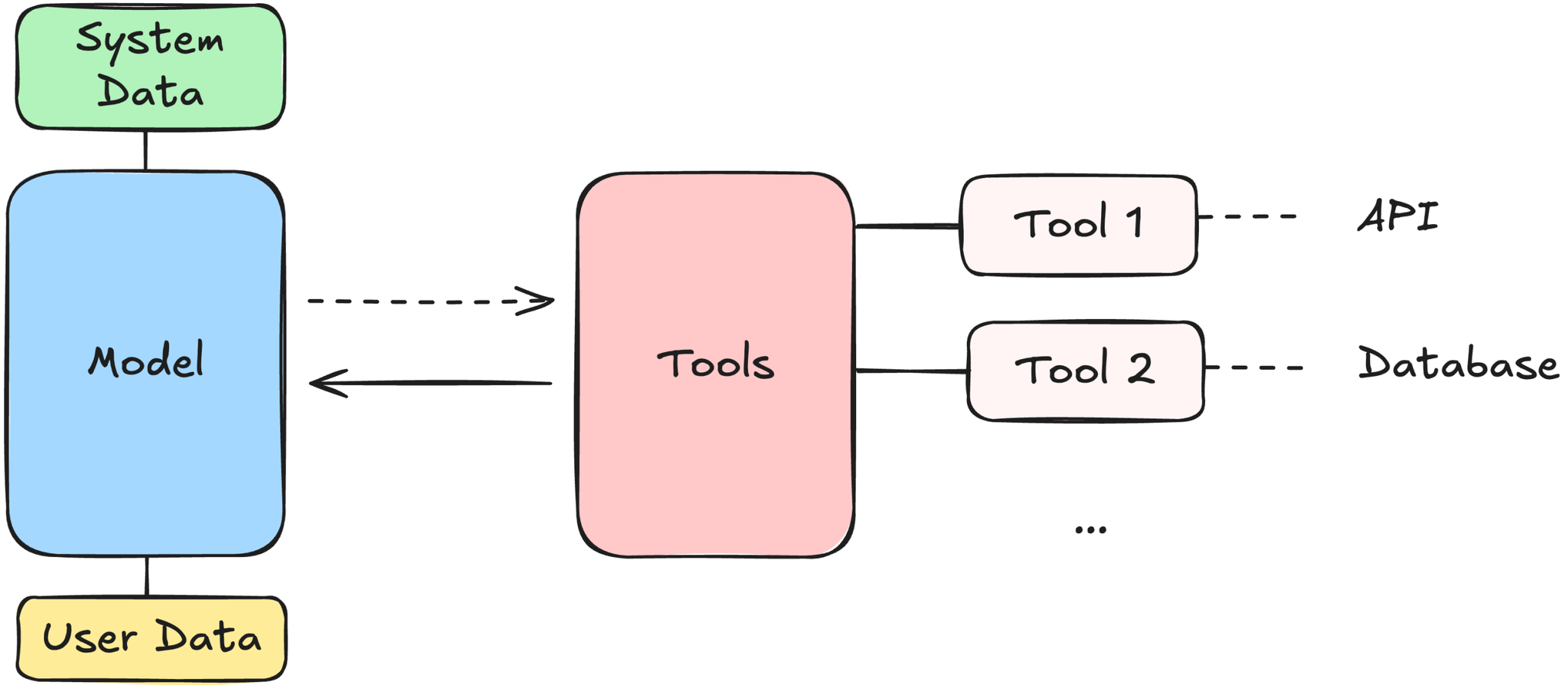
Agent interoperability: the state-of-play



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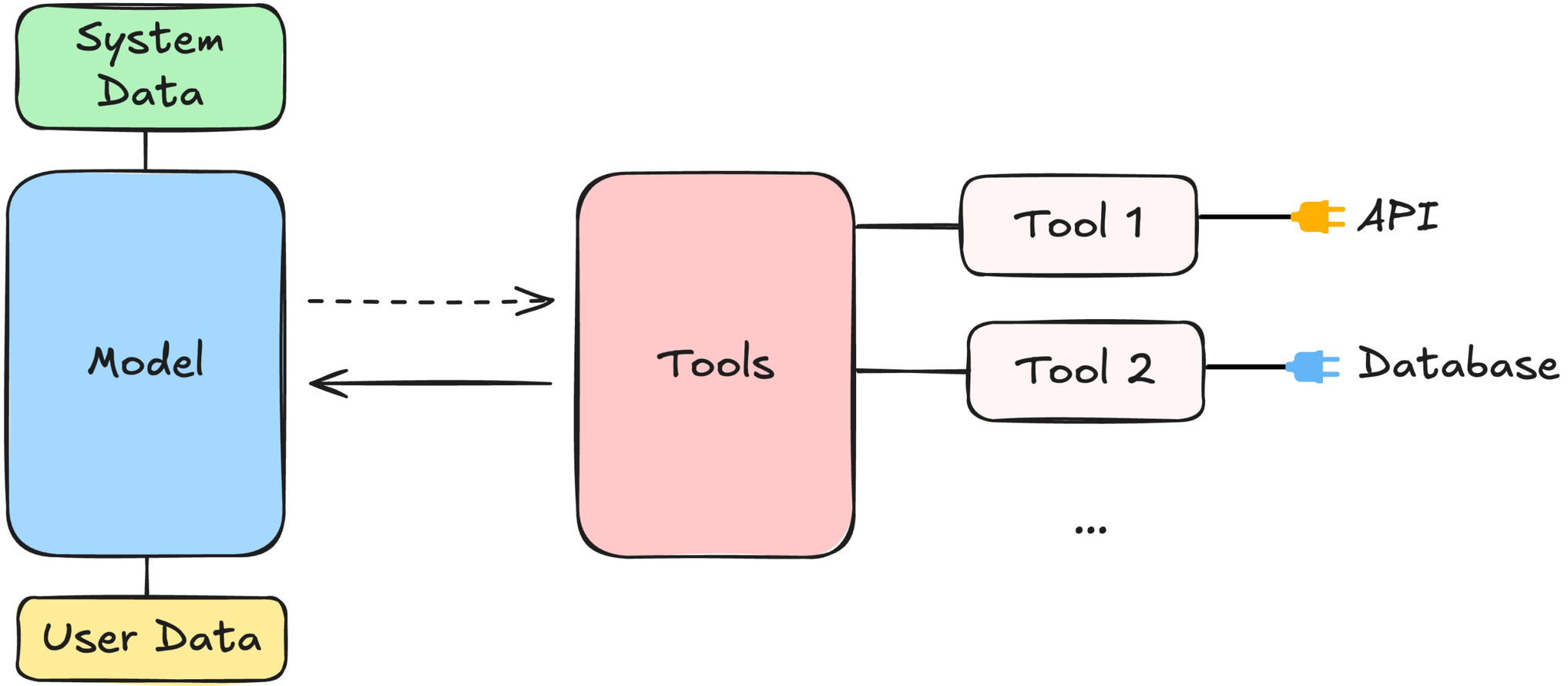
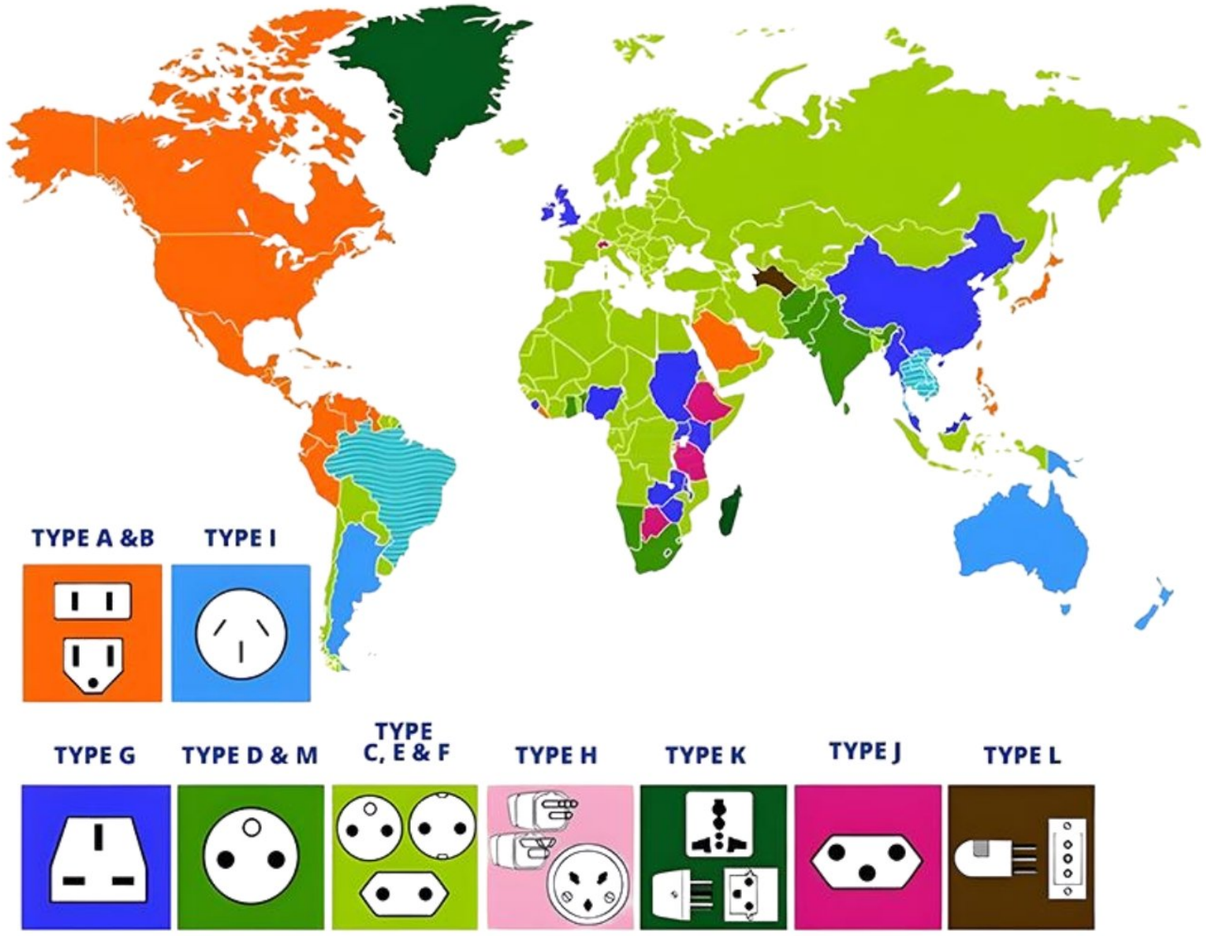


Sockets/power outlets from around the world



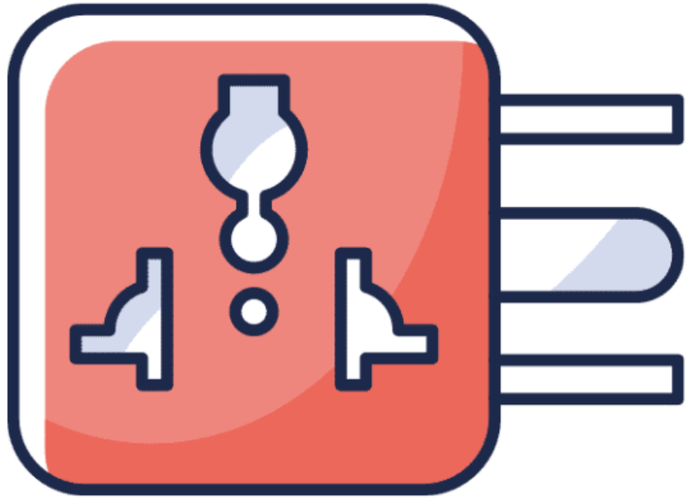
[1] Image Credit: Xstron

Model Context Protocol (MCP)

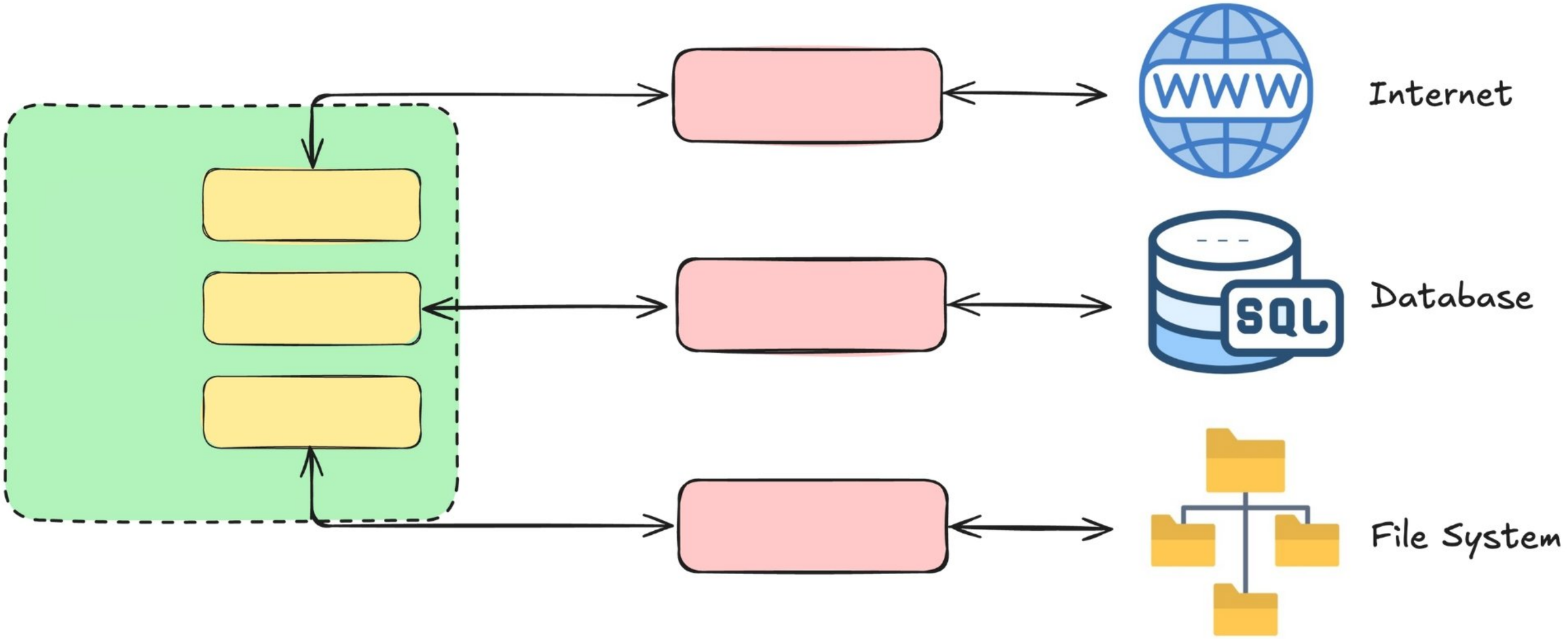
- Universal open standard for connecting AI with data!

Model Context Protocol

ANTHROP\C



The MCP architecture



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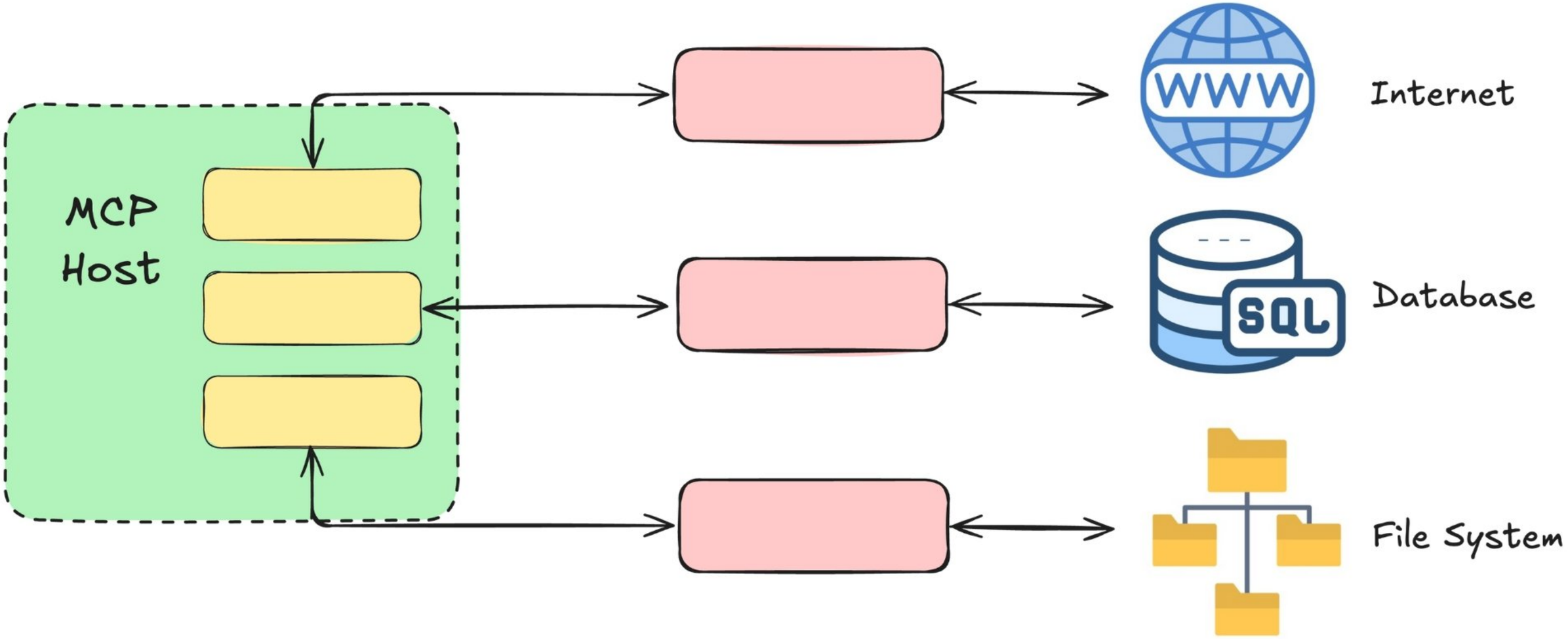

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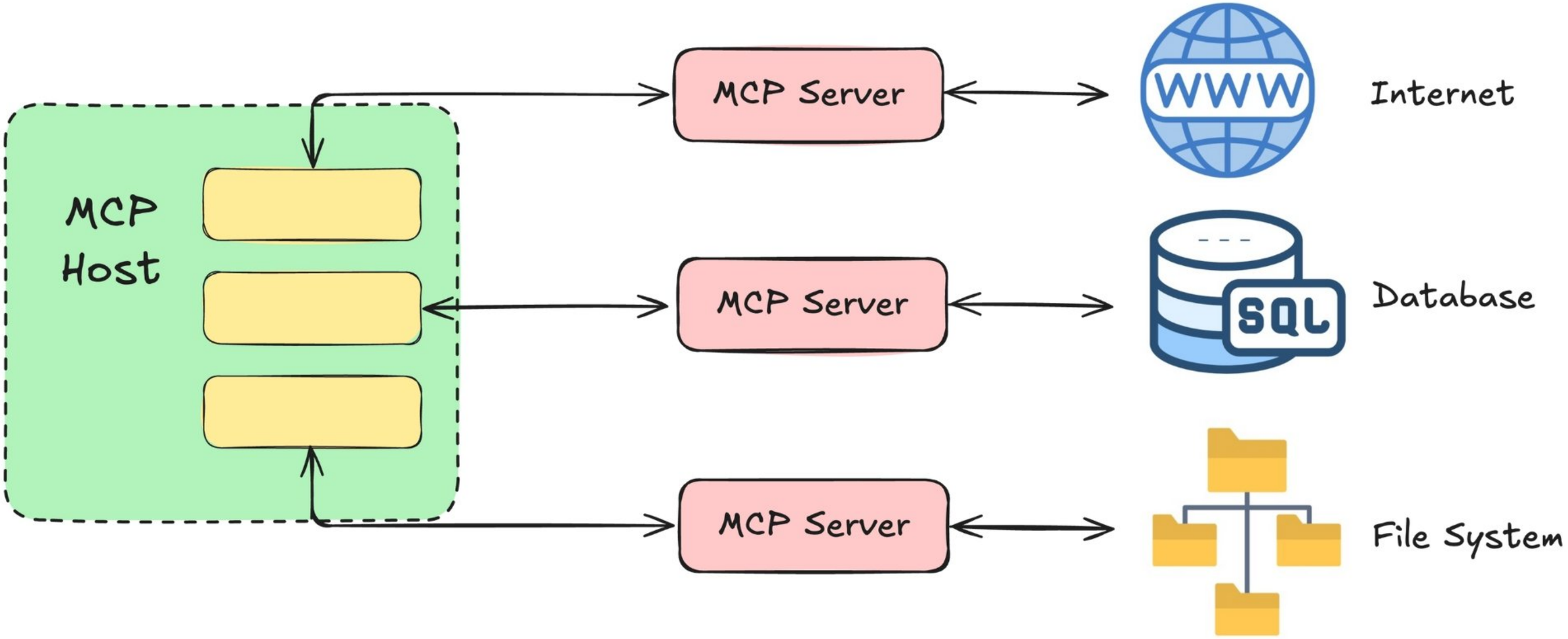

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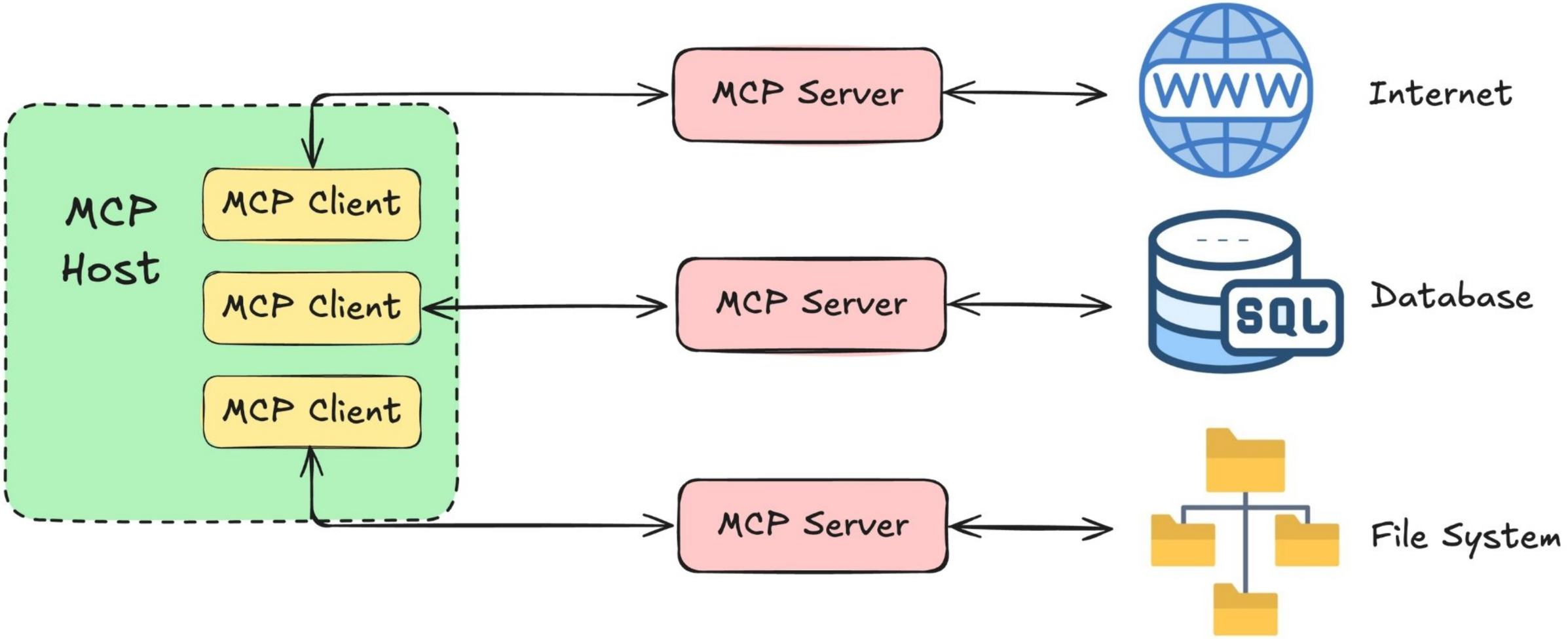

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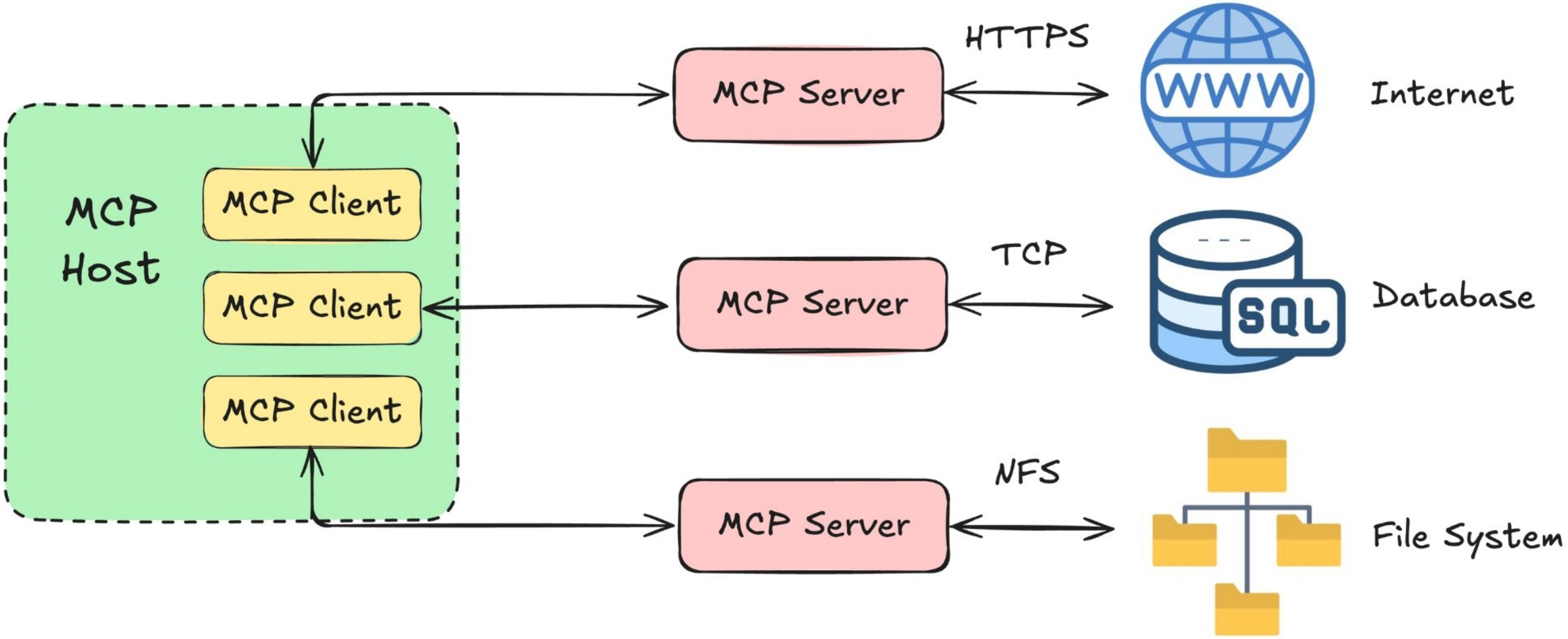
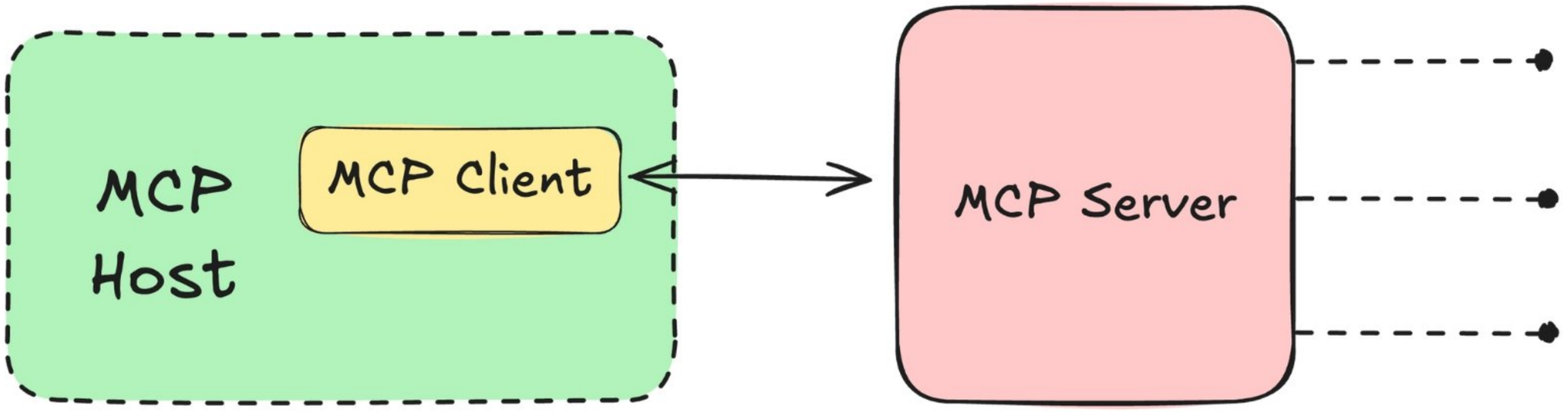


MCP servers



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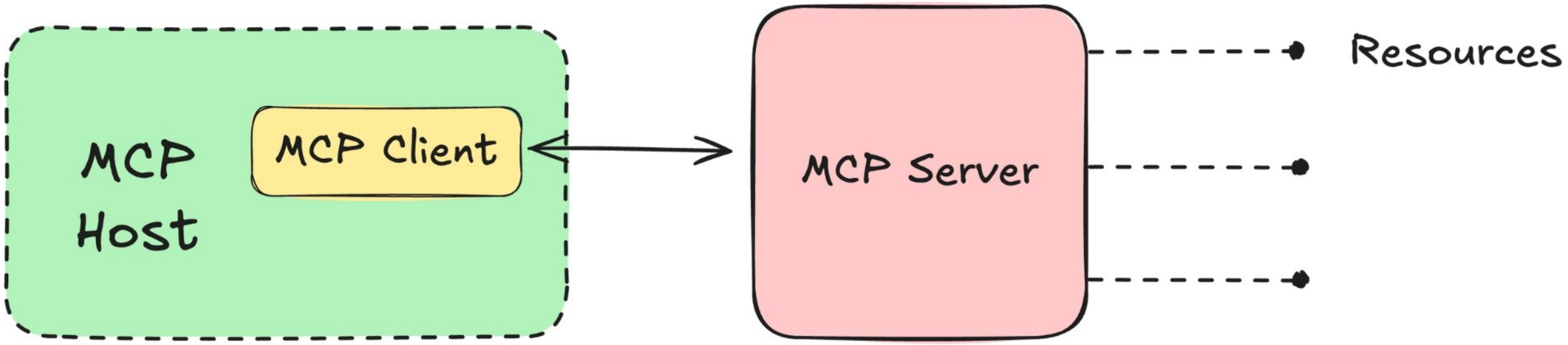

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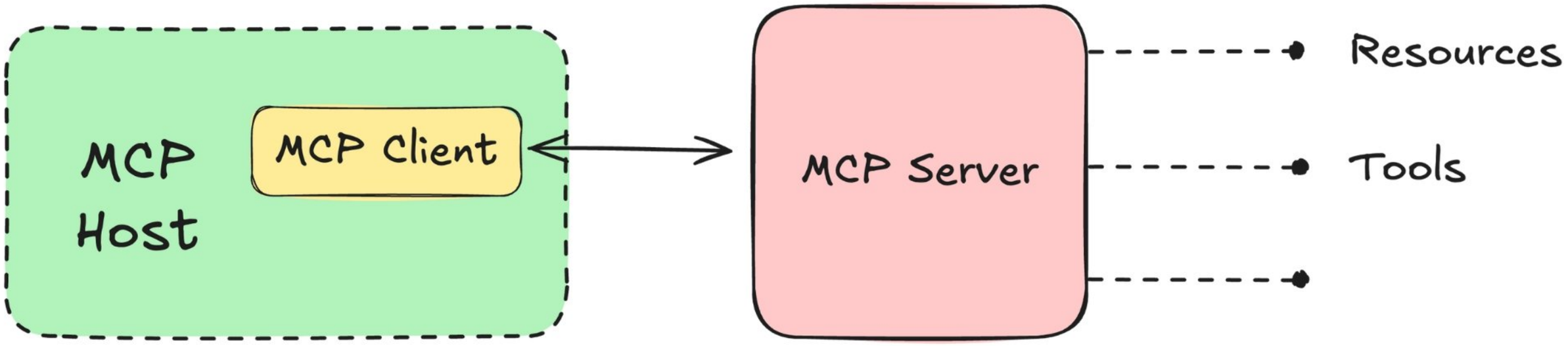

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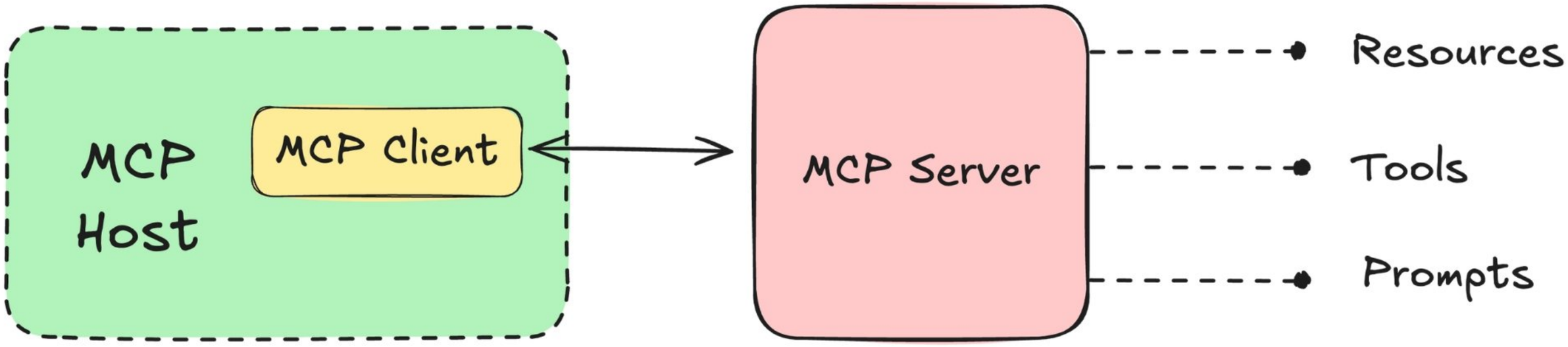
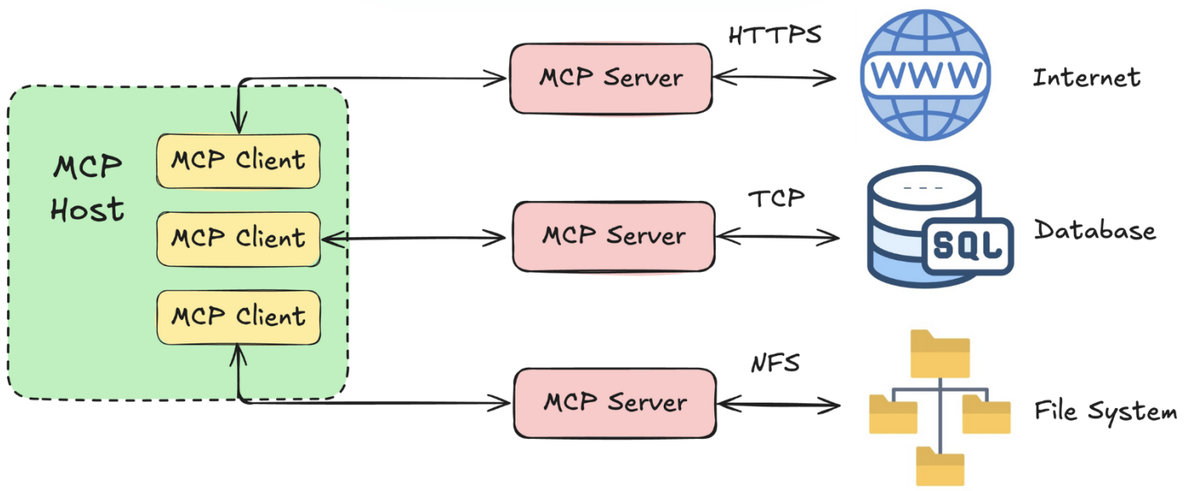


MCP

→ Standard for connecting AI and data

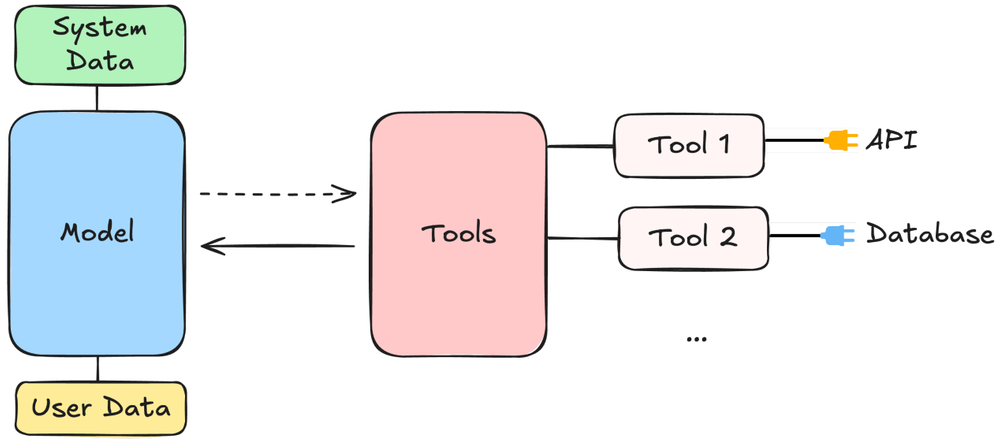
- Dynamic tool discovery ("integrate once")
- LLM-agnostic
- Standardized security



No framework

→ Custom integrations for each data source

- Tools need to be statically coded
- Often refactoring needed for different LLMs
- Tool-specific keys and authentication mode



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BUILDING SCALABLE AGENTIC SYSTEMS

The Agent-to-Agent (A2A) Protocol

BUILDING SCALABLE AGENTIC SYSTEMS

Korey Stegared-Pace
Senior AI Cloud Advocate, Microsoft

- Developed by **Google**
- Enable *multi-agent collaboration*
- Vendor- and tool stack-agnostic

Example: Corporate travel

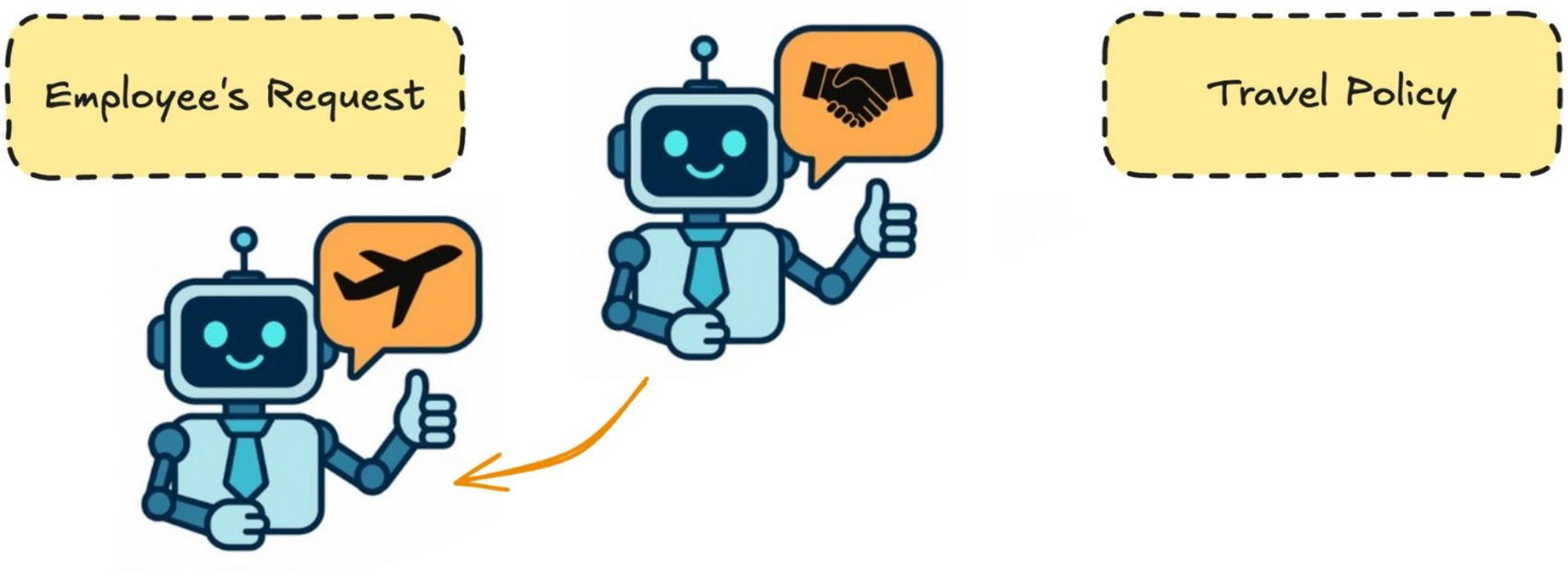
Employee's Request

Example: Corporate travel

Employee's Request

Travel Policy

Example: Corporate travel



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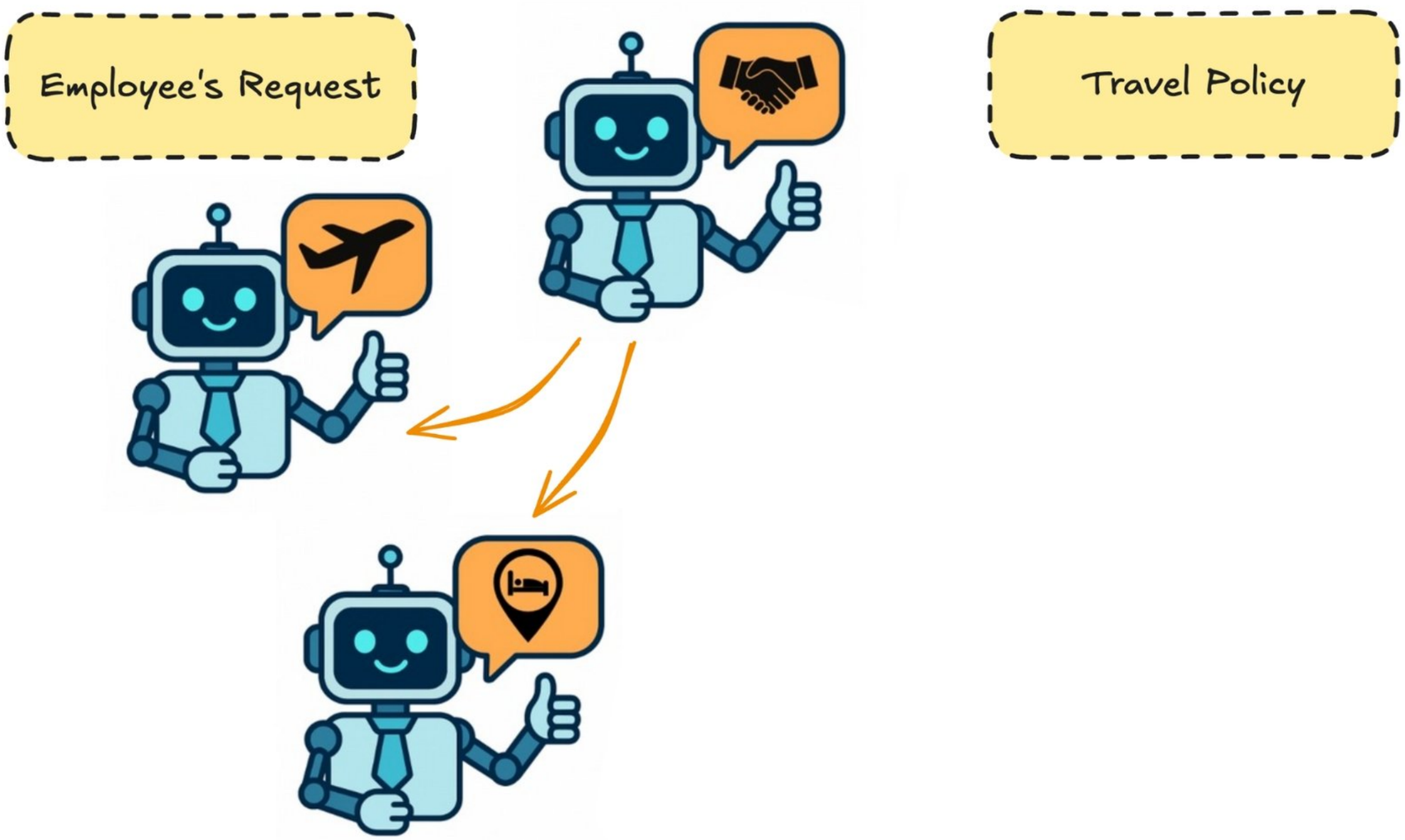

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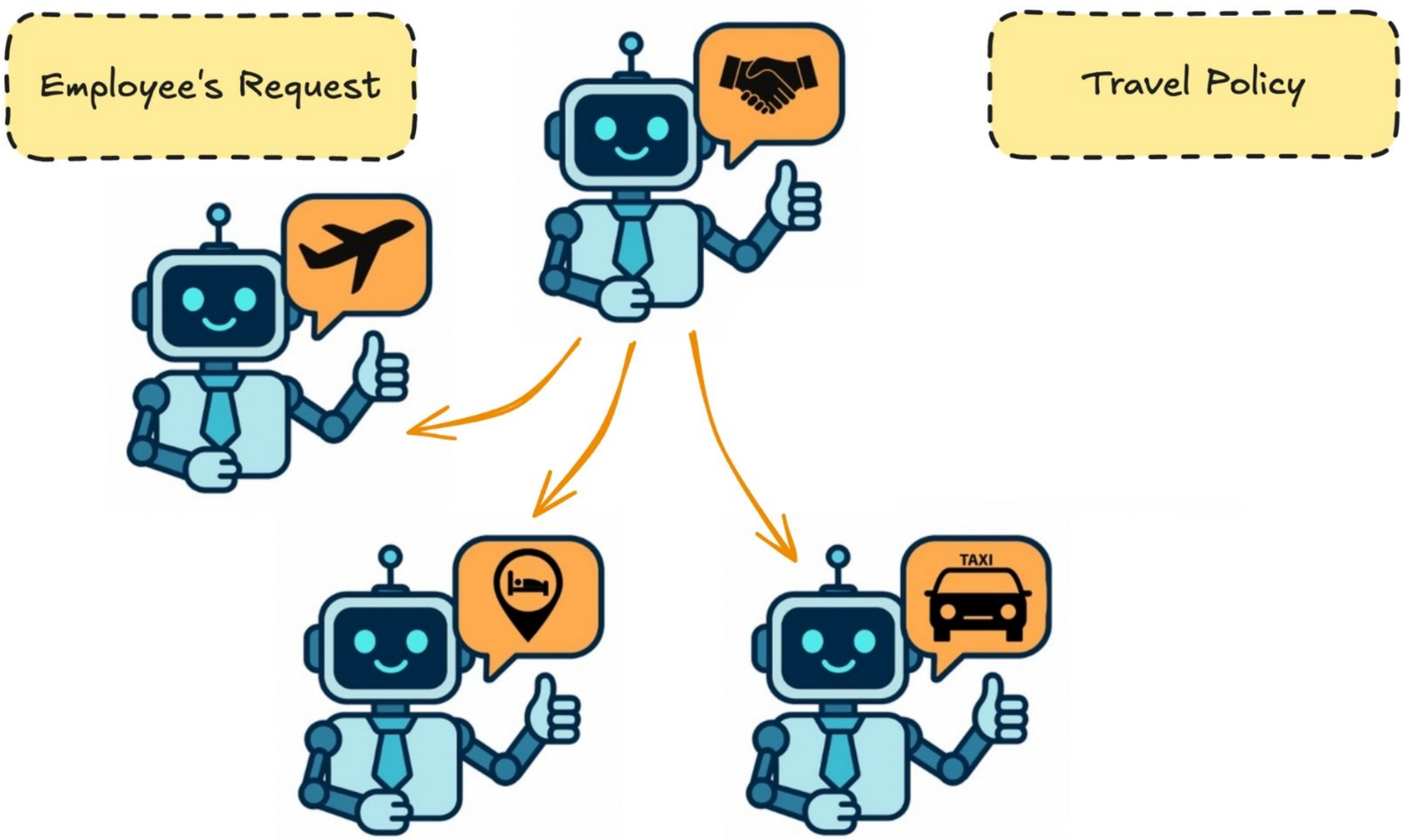

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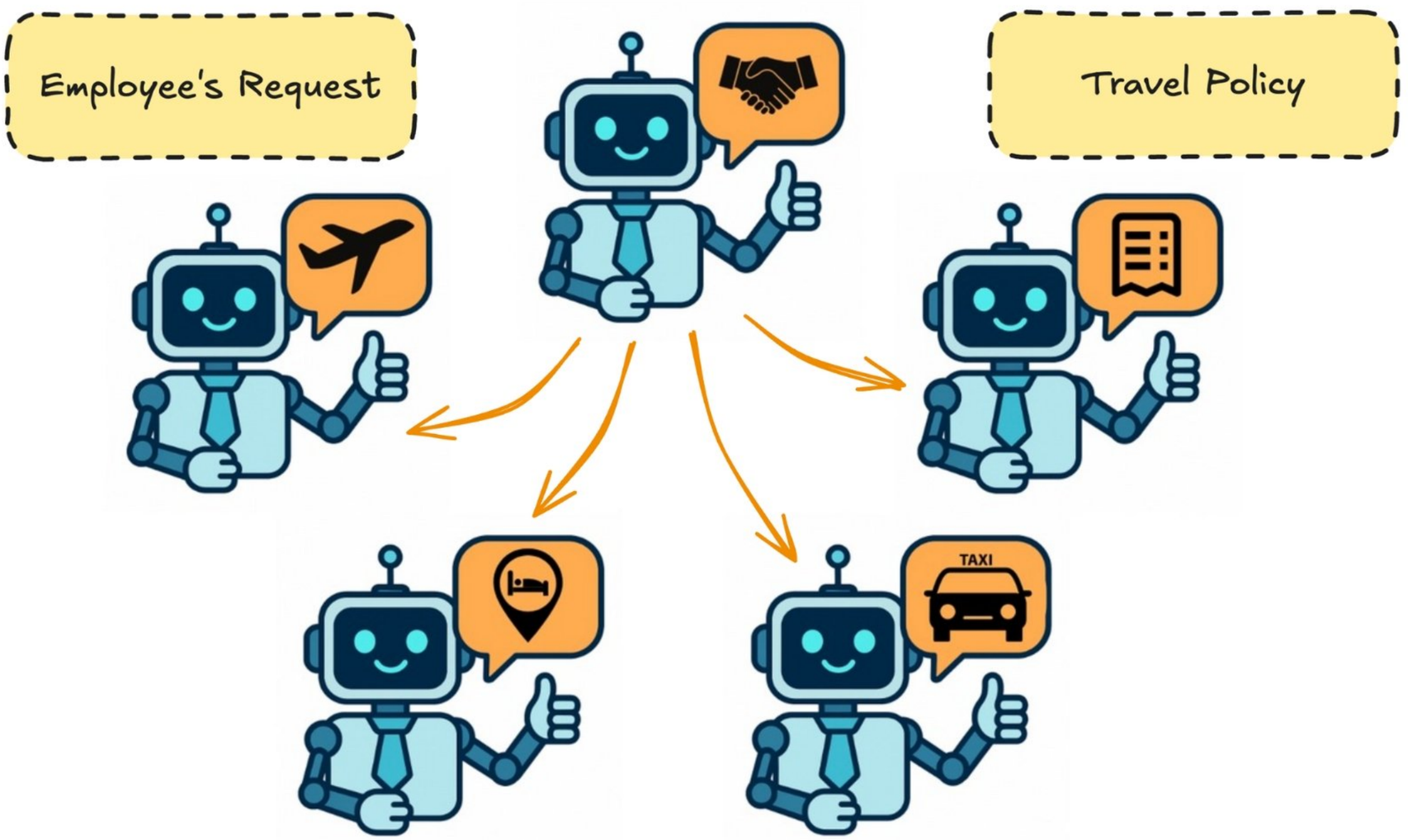
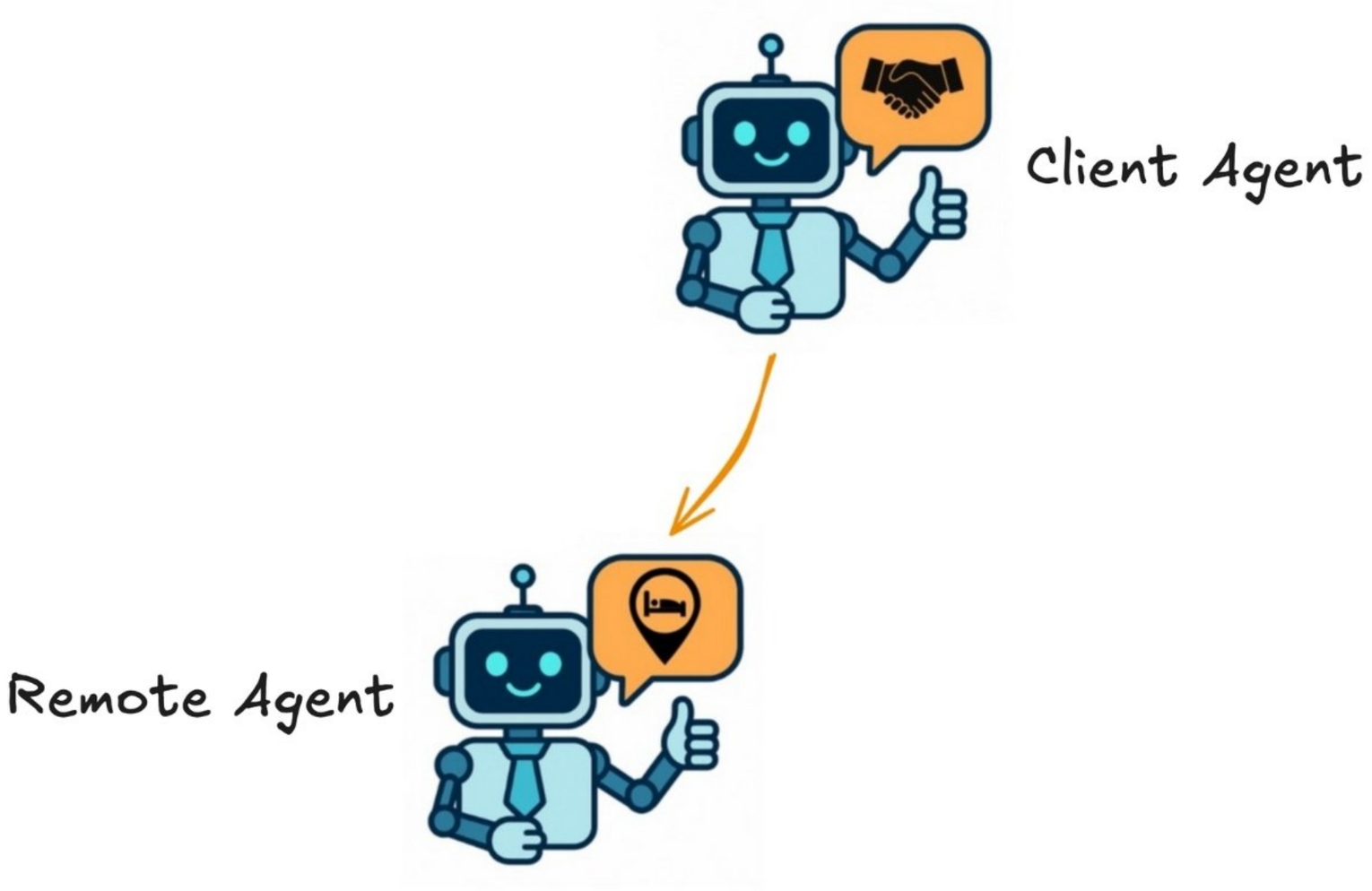


Agent-to-Agent (A2A)



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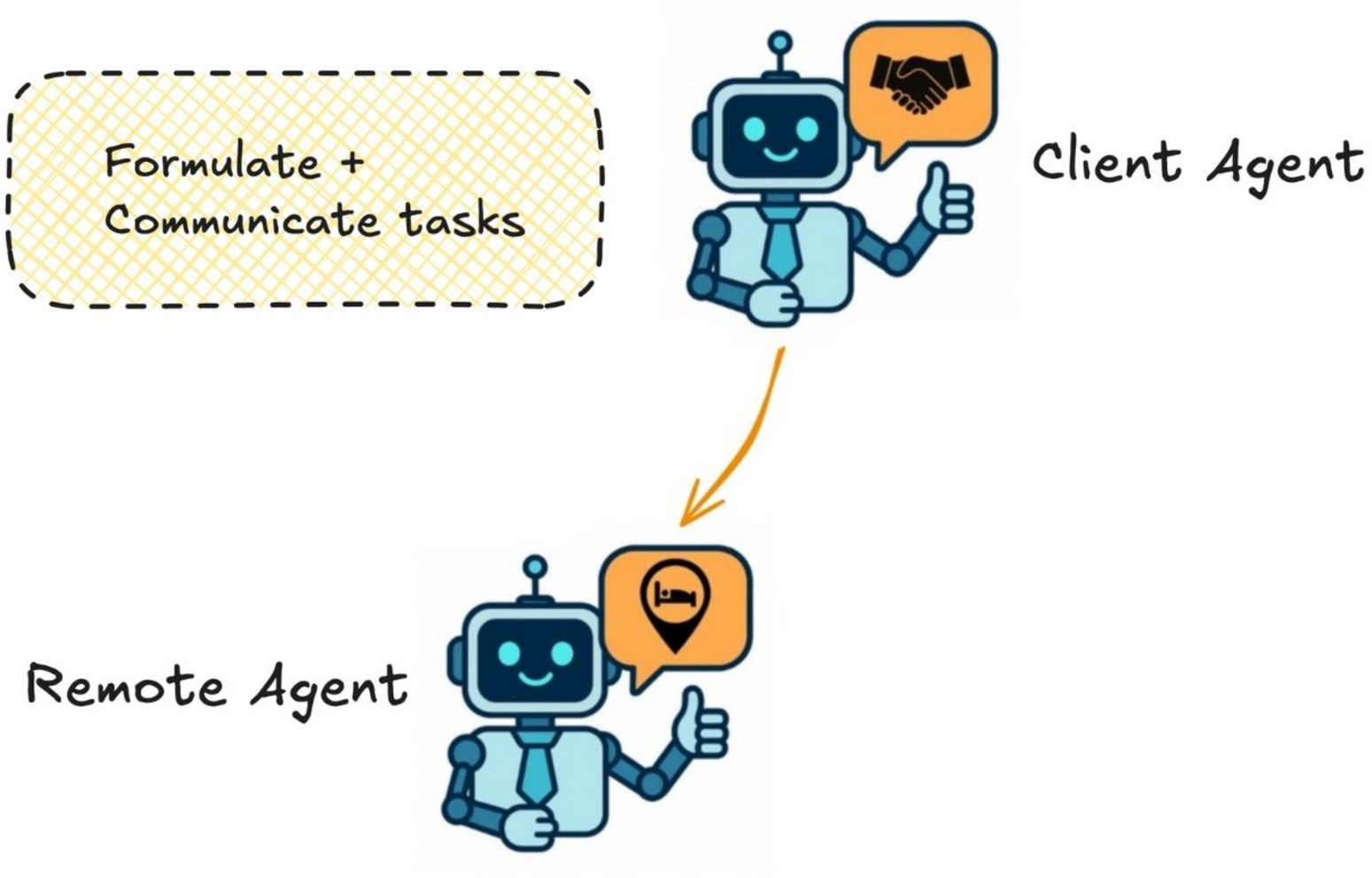

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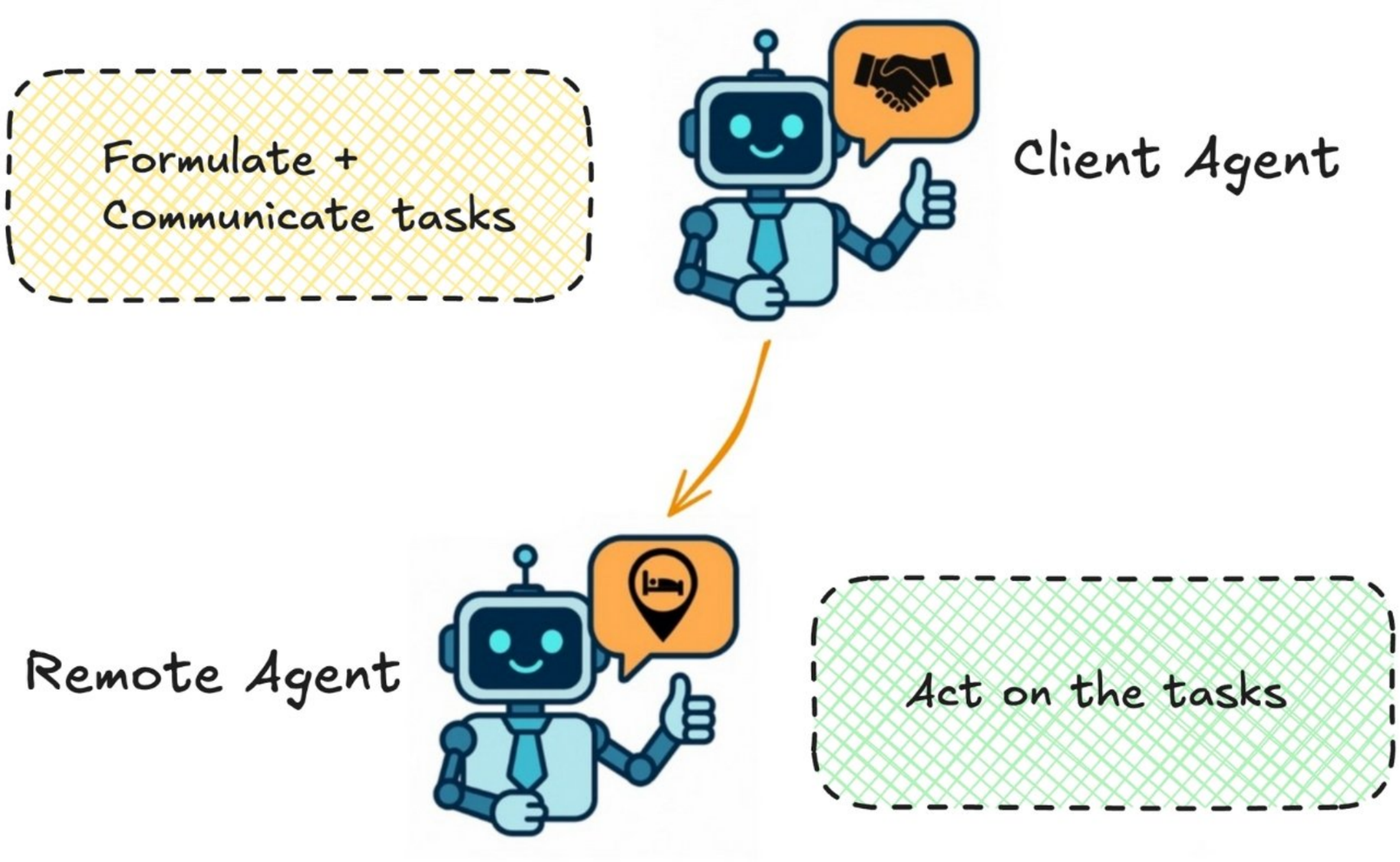
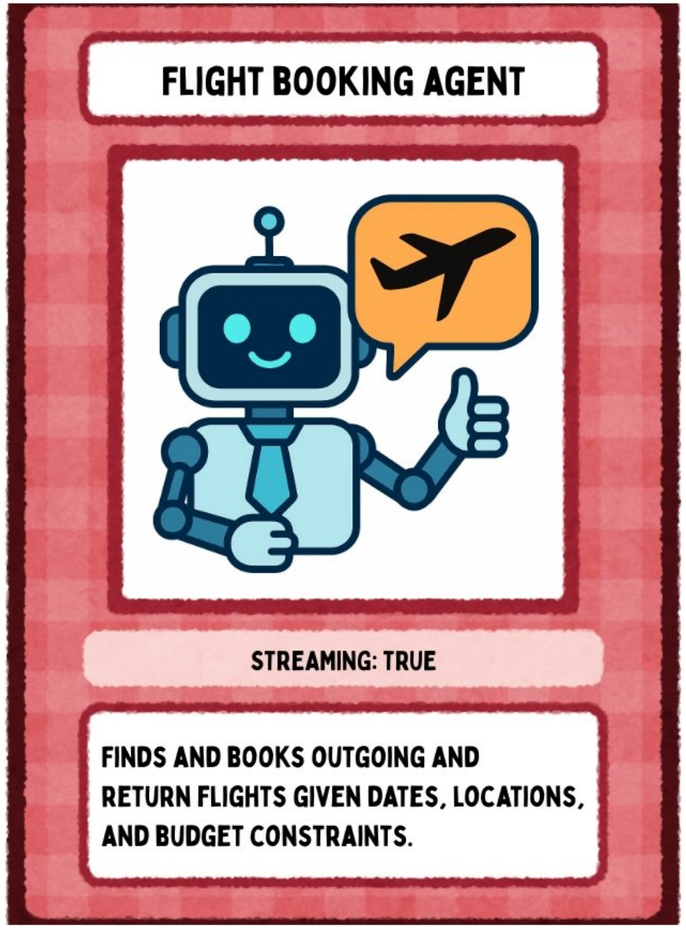
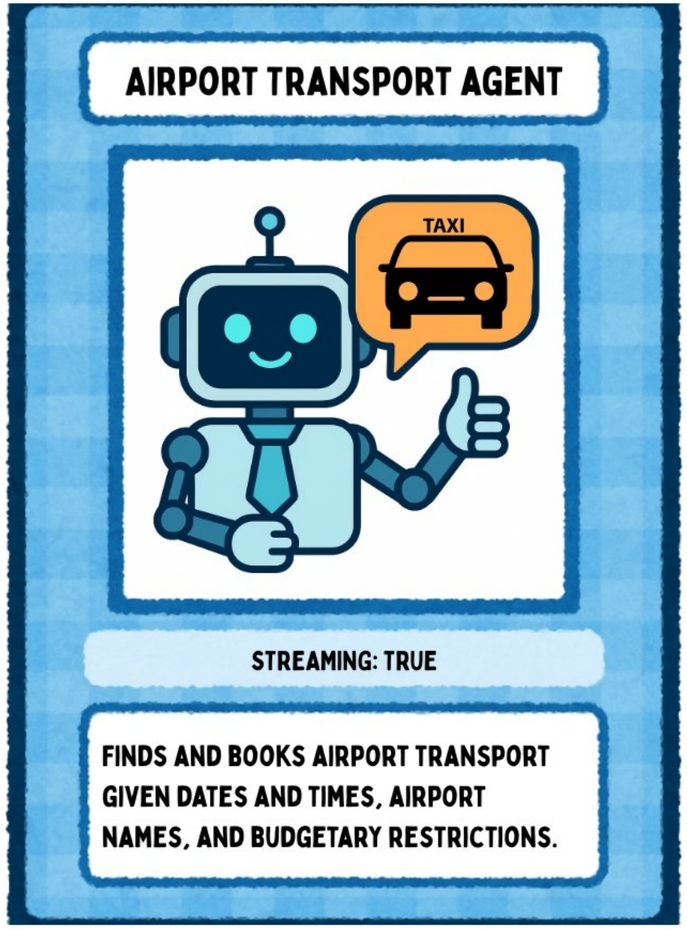
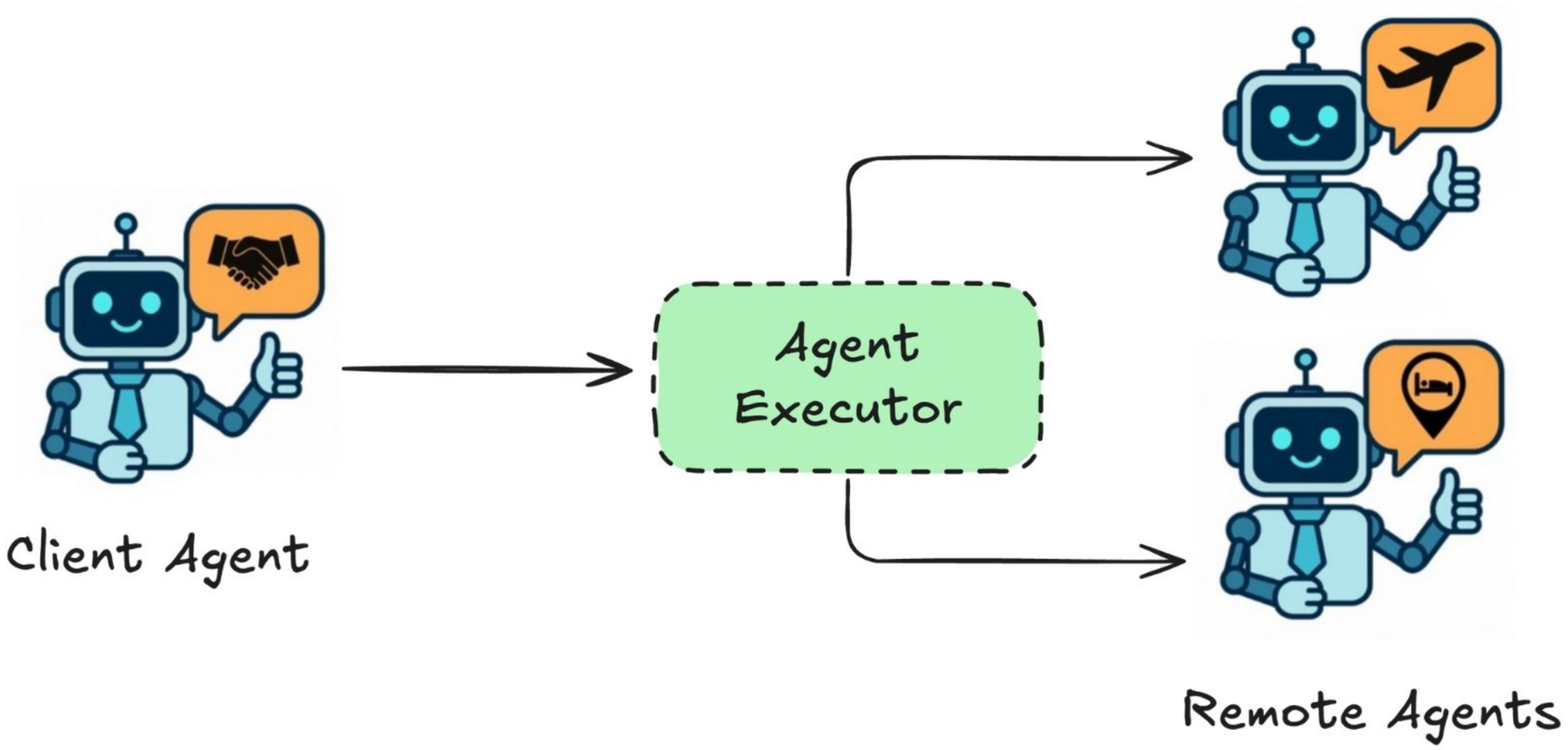
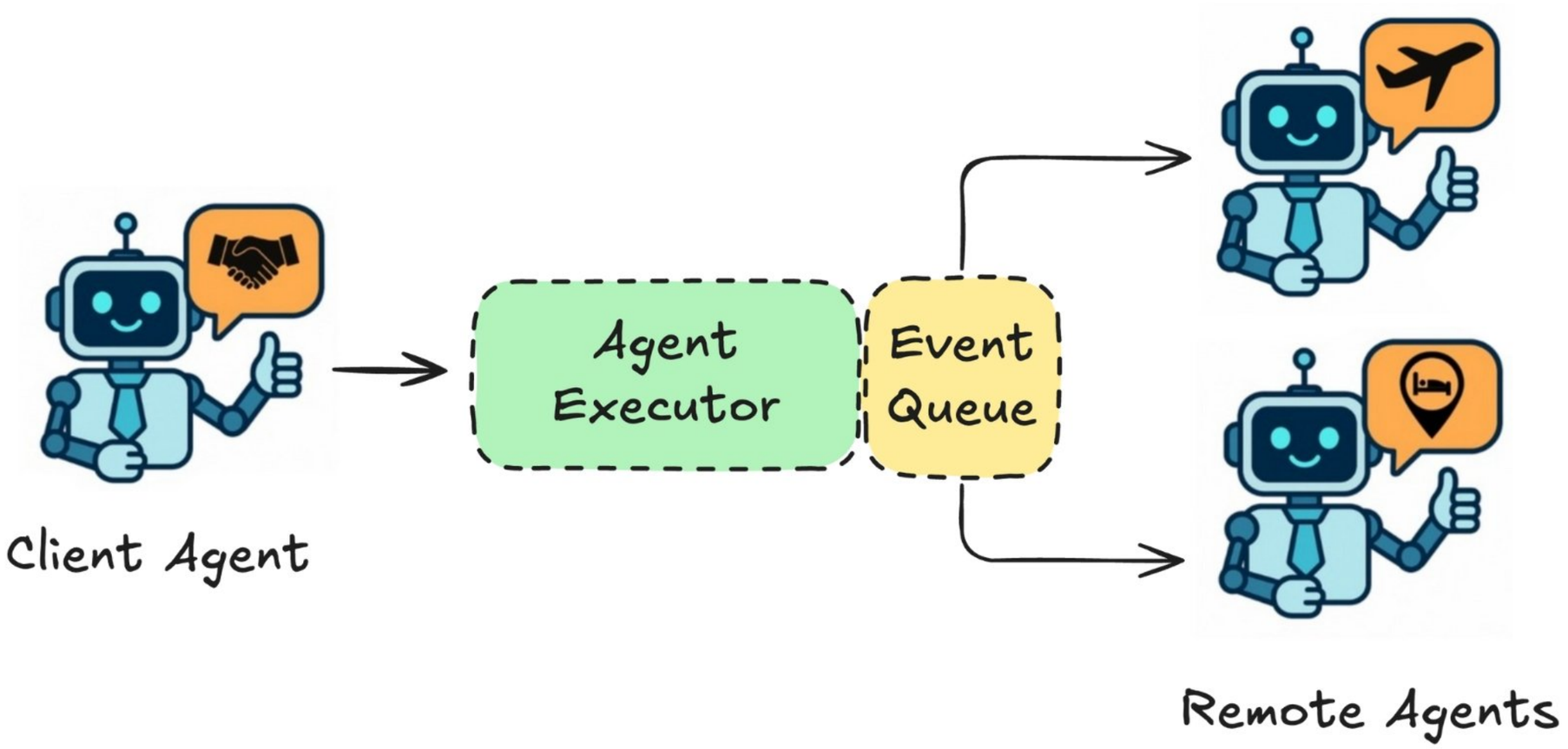


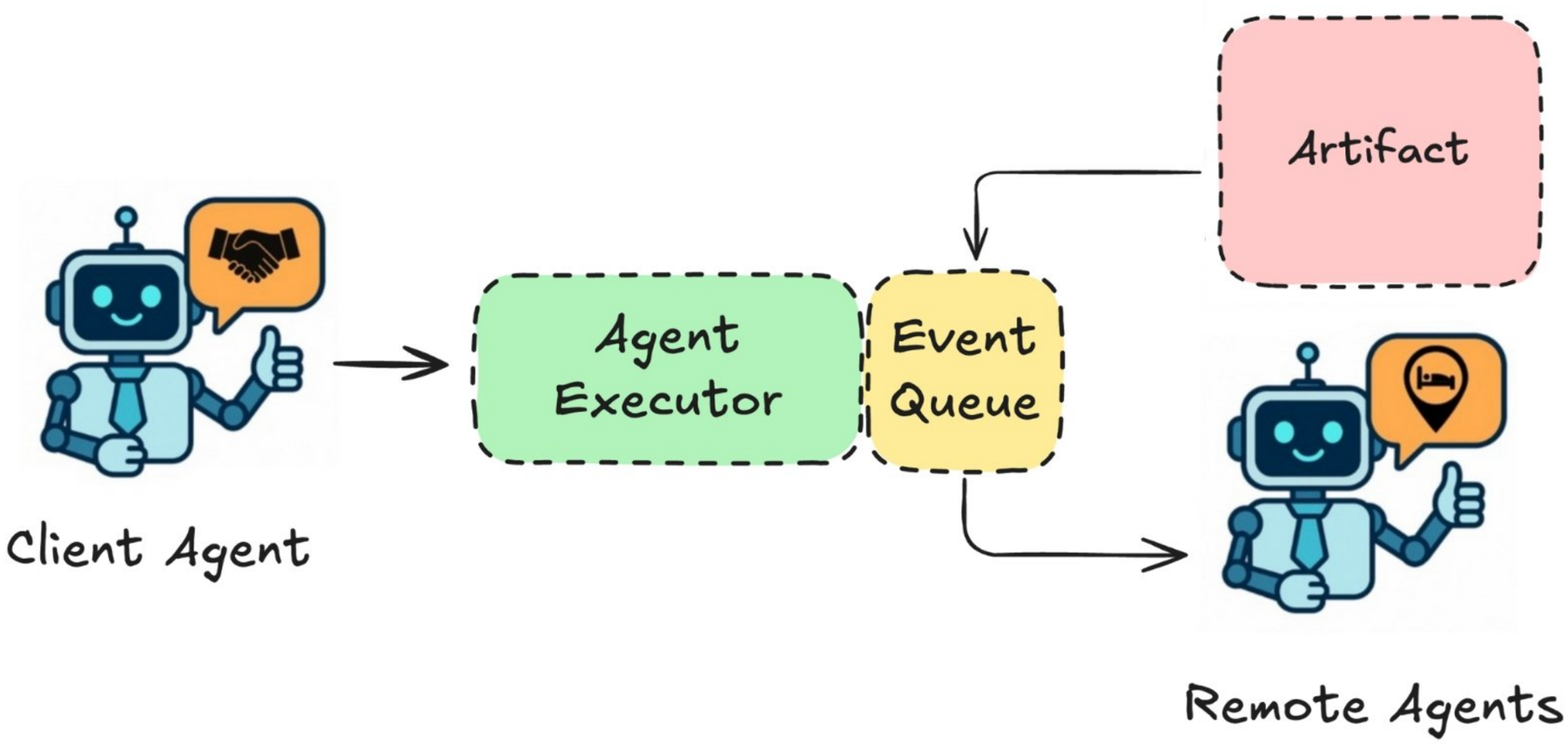
Agent cards


FLIGHT BOOKING AGENT
STREAMING: TRUE
FINDS AND BOOKS OUTGOING AND RETURN FLIGHTS GIVEN DATES, LOCATIONS, AND BUDGET CONSTRAINTS.

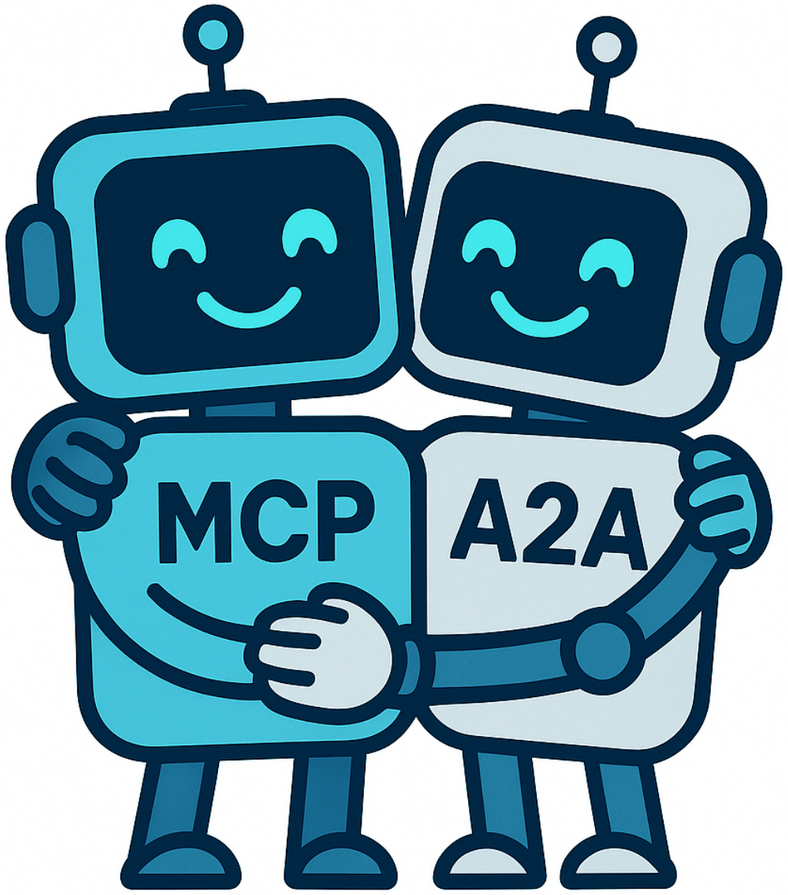

AIRPORT TRANSPORT AGENT
TAXI
STREAMING: TRUE
FINDS AND BOOKS AIRPORT TRANSPORT GIVEN DATES AND TIMES, AIRPORT NAMES, AND BUDGETARY RESTRICTIONS.


Agent
Executor
Client Agent
Remote Agents


Agent
Executor
Event
Queue
Client Agent
Remote Agents


Artifact
Agent Executor
Event Queue
Client Agent
Remote Agents

MCP and A2A



[1] Image generated with GPT-4o

Let's practice!

BUILDING SCALABLE AGENTIC SYSTEMS