3 Degrees of Agentic Freedom

powered by AG2 and Waldiez

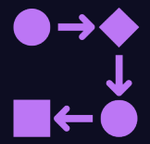
3 Degrees of Agentic Freedom

Agentic freedom refers to the varying levels of autonomy and flexibility granted to agents within an AI system. Understanding these degrees helps in designing workflows that balance control with adaptability. The three primary degrees are:

1. **Communication Pipelines:**
   - Focuses on how agents interact and exchange information.
   - Ranges from fixed sequences to dynamic, self-organizing communication structures.

2. **Tool Utilization:**
   - Pertains to the tools and resources agents employ to accomplish tasks.
   - Spans from using predefined tools to autonomously creating and implementing new.

3. **Agent Configuration:**
   - Relates to the setup and customization of agent roles and behaviors.
   - Varies from user-defined to automatic, system-generated agent assemblies.

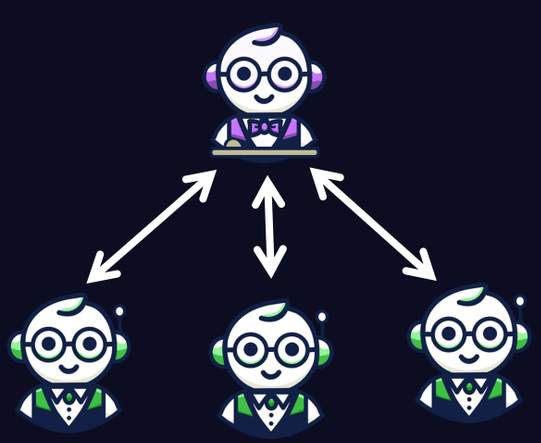


Degree 1: Communication Pipelines

Fixed Pipeline (Freedom Level 0)

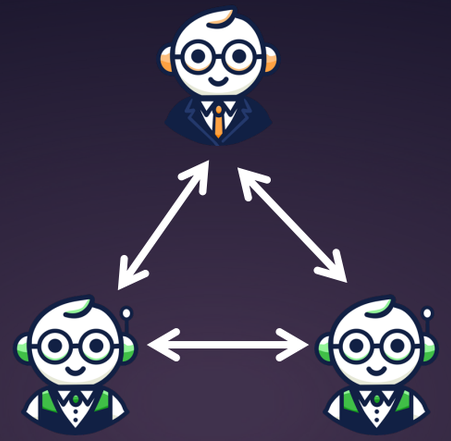
A rigid, predefined sequence where agents communicate in a set order without deviation predetermined by the designer (human).

These types of pipelines include sequential, hierarchical or joint communication patterns between the agents (and a human proxy).



Hierarchical

Sequential

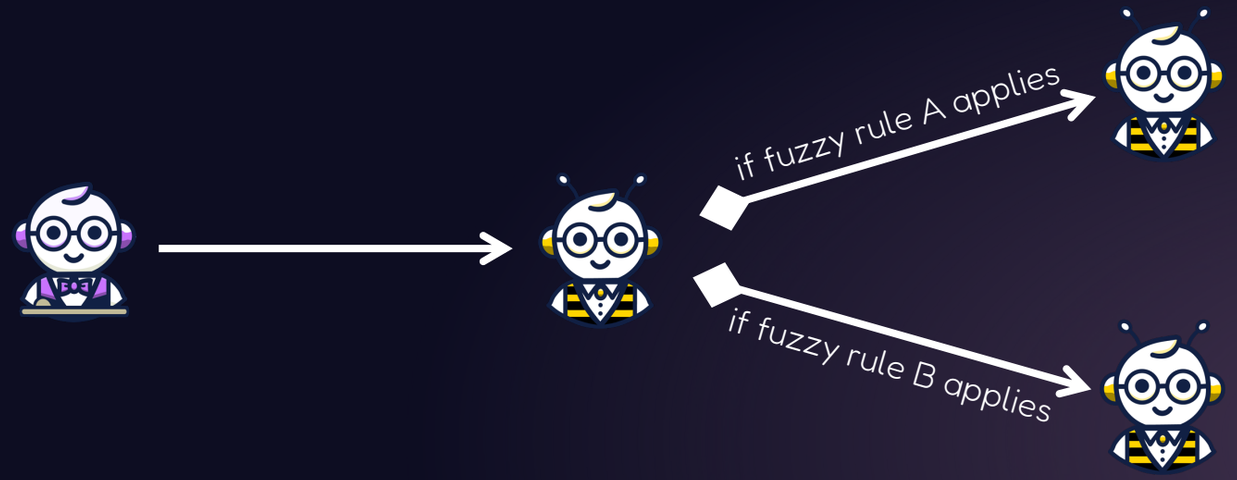


Joint

Fuzzy Pipeline (Freedom Level 1)

Agents have the flexibility to delegate tasks among themselves based on capabilities, allowing dynamic handoffs relying on **fuzzy** rules (not deterministic).

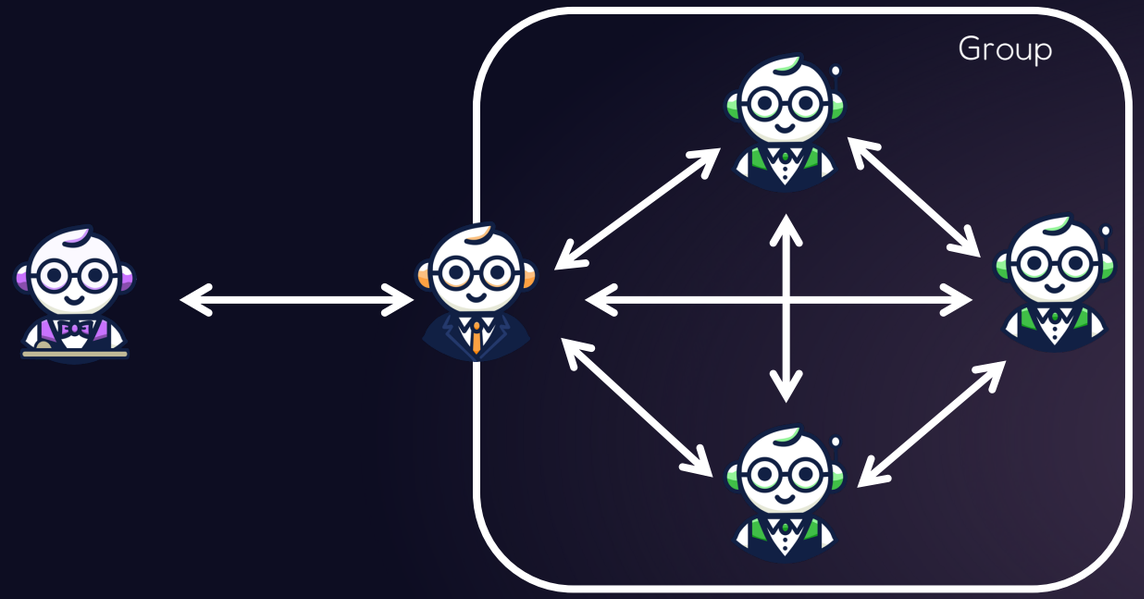
These types of pipelines include mostly swarm communication patterns between the agents (and a human proxy) and/or conversable agents capable of handling fuzzy handoffs.



Self-organizing Pipeline (Freedom Level 2)

A collaborative environment where agents interact freely, with the AI system autonomously selecting the next speaker based on context.

These types of pipelines include mostly group chat communication pattern with speaker selection methods assigned to the group manager.

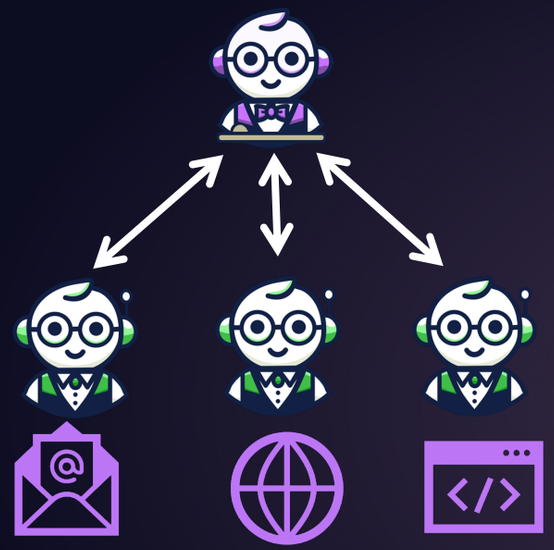


Degree 2: Tool Utilization

Assigned tools (Freedom Level 0)

Agents operate using a fixed set of tools assigned to them without modification capabilities.

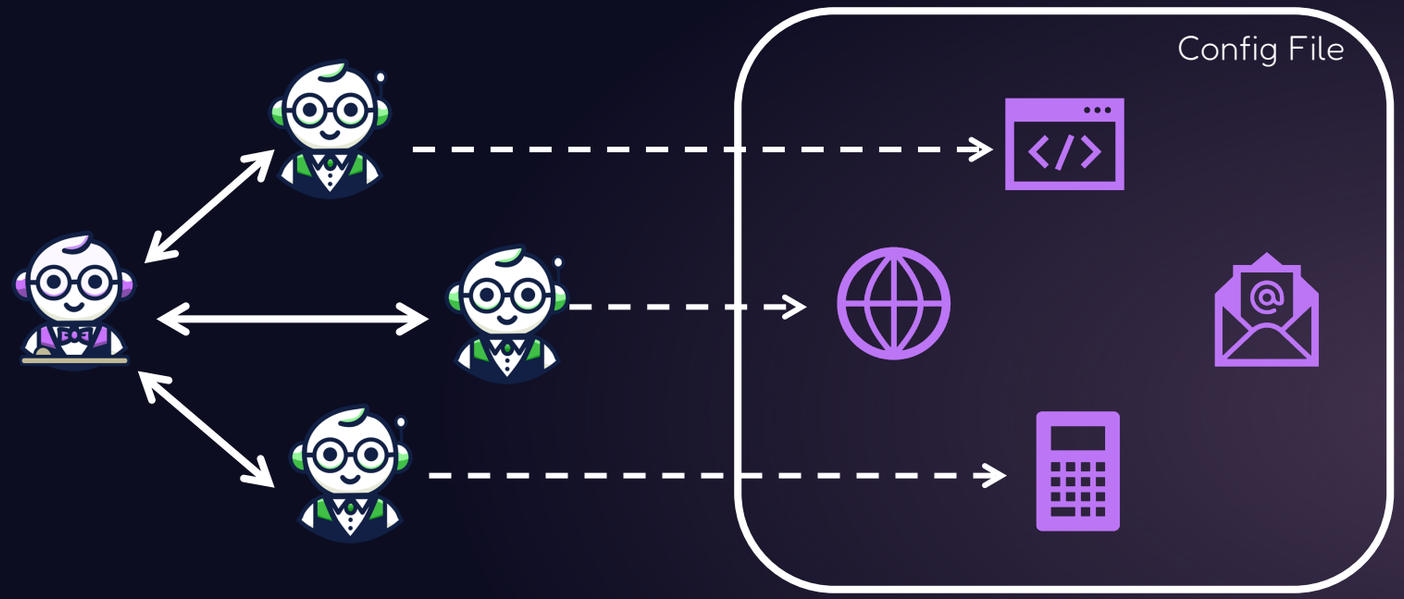
These types of tools are python-based and are assigned to each one of the agents. Using the tools agents may do task like API (e.g., send emails, web search, etc) or custom function calling exploiting code execution capabilities.



Specified tools (Freedom Level 1)

Agents can select from a set of tools specified in a configuration file, allowing some customization.

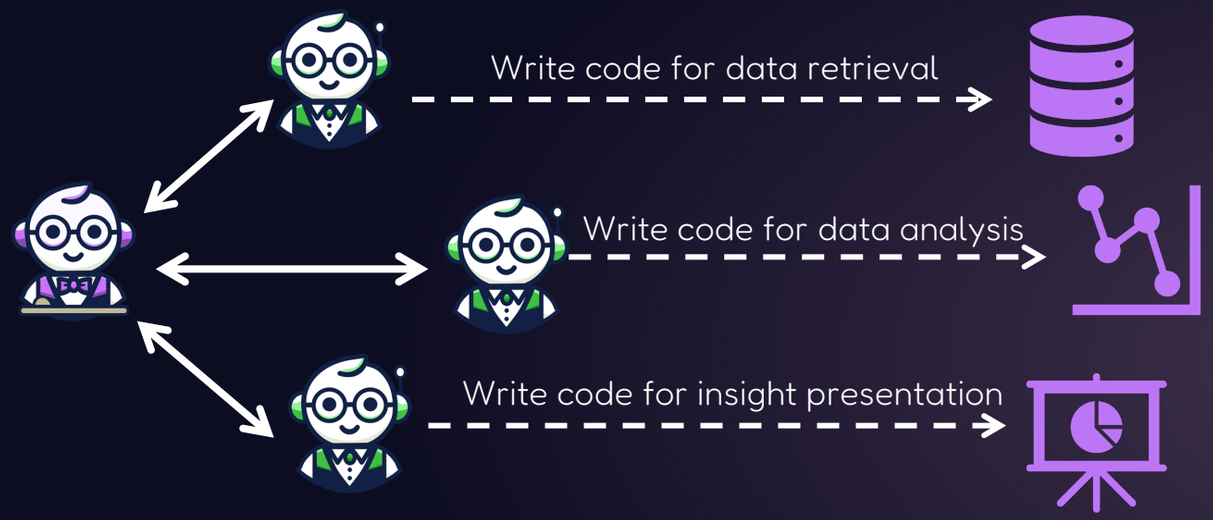
These types of tools are usually JSON-defined and can be dynamically assigned to each one of the agents, leaving more agentic freedom to the system.



Dynamically created tools (Freedom Level 2)

Agents have the autonomy to create and implement new tools through code as needed.

These types of tools are dynamically defined by the agents usually python, leaving more flexibility to the system to address the user's objective.

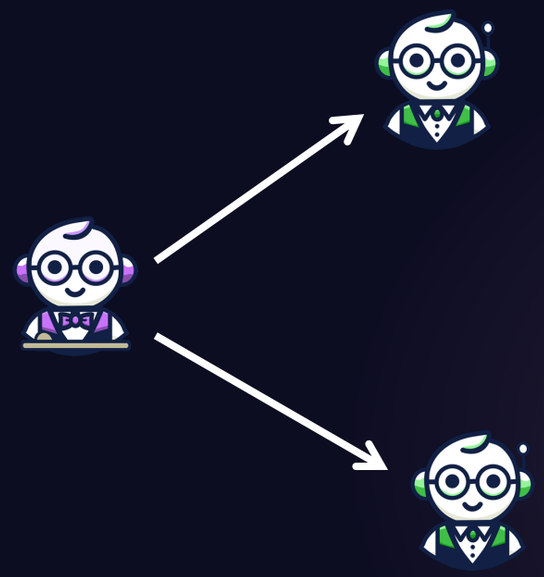


Degree 3: Agent Configuration

User-Defined Agents (Freedom Level 0)

All agents are manually configured by the user with specific roles and parameters.

These types of agents and their behaviors change only manually (human intervention).



Name: Data Scientist

Behavior: You are data scientist agent with advanced data analysis capabilities

Model: Claude

Name: Product Manager

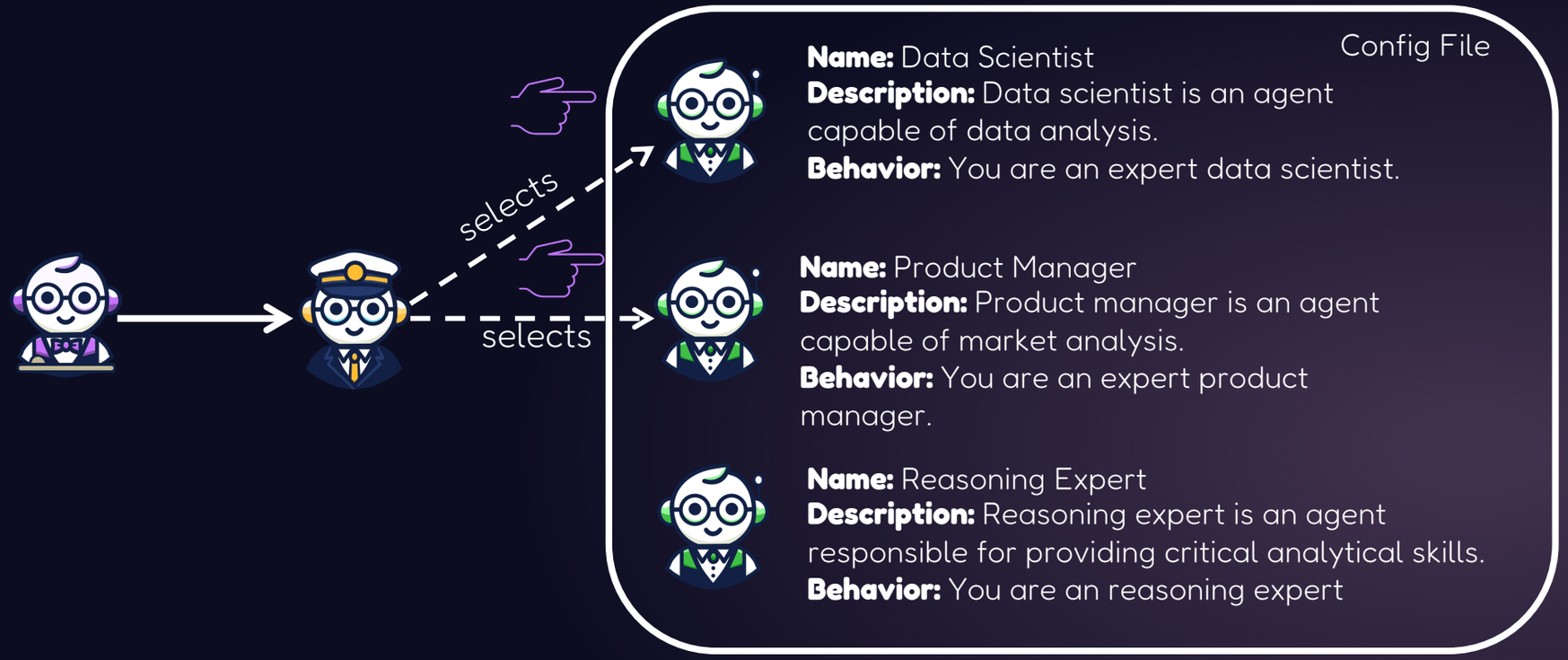
Behavior: You are product manager agent capable of applying market research

Model: GPT

Defined pool of agents (Freedom Level 1)

All agents are defined in a configuration file having specific names, roles and descriptions.

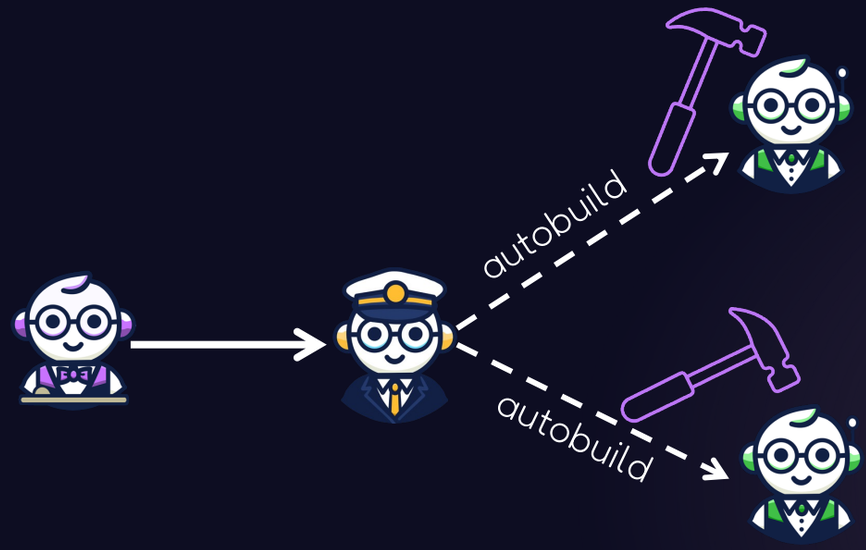
The captain agent selects to instantiate the most suitable ones given a specific (human) task based on their descriptions.



Autobuilt agents (Freedom Level 2)

All agents are automatically generated by other agents having autobuild capabilities (i.e., captain agent).

These agents inherit their behaviors automatically (no human intervention).



Name: Data Scientist
Description: Data scientist is an agent capable of data analysis.
Behavior: You are an expert data scientist.

Name: Product Manager
Description: Product manager is an agent capable of market analysis.
Behavior: You are an expert product manager.

Use Cases

Sequential customer onboarding chat

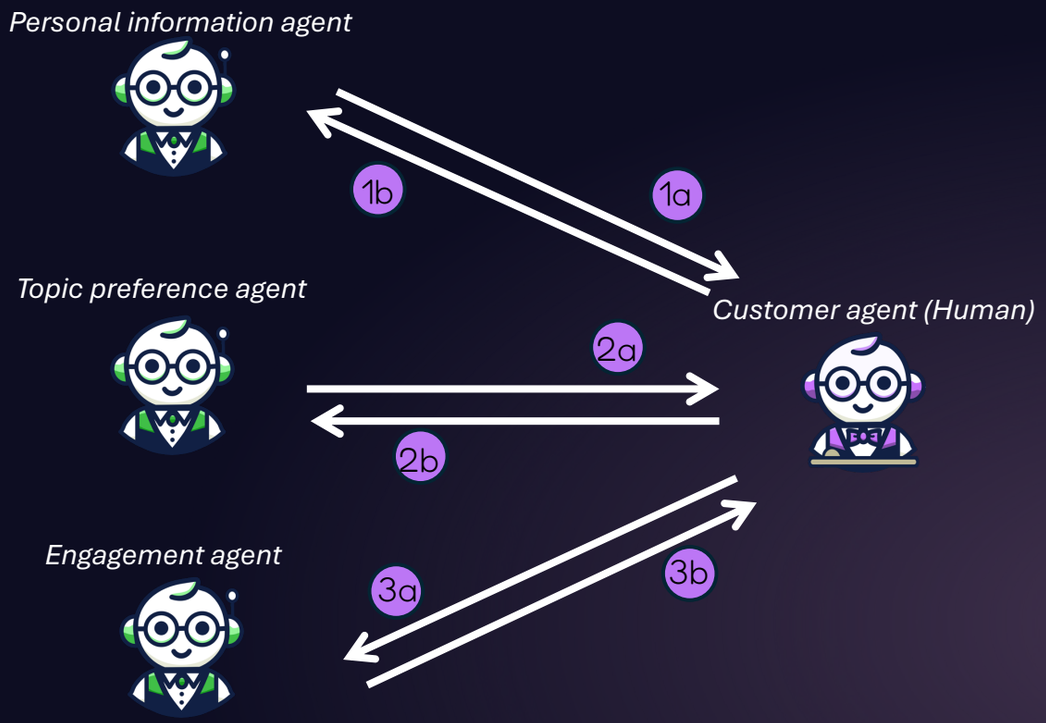
Communication Freedom Level: **0** | Tool Utilization Freedom Level: **N/A** | Agent Configuration Freedom Level: **0**

1a. Personal information assistant asks user for name and location

1b. User provides personal information to assistant

2a. Topic preference assistant asks user for preferences

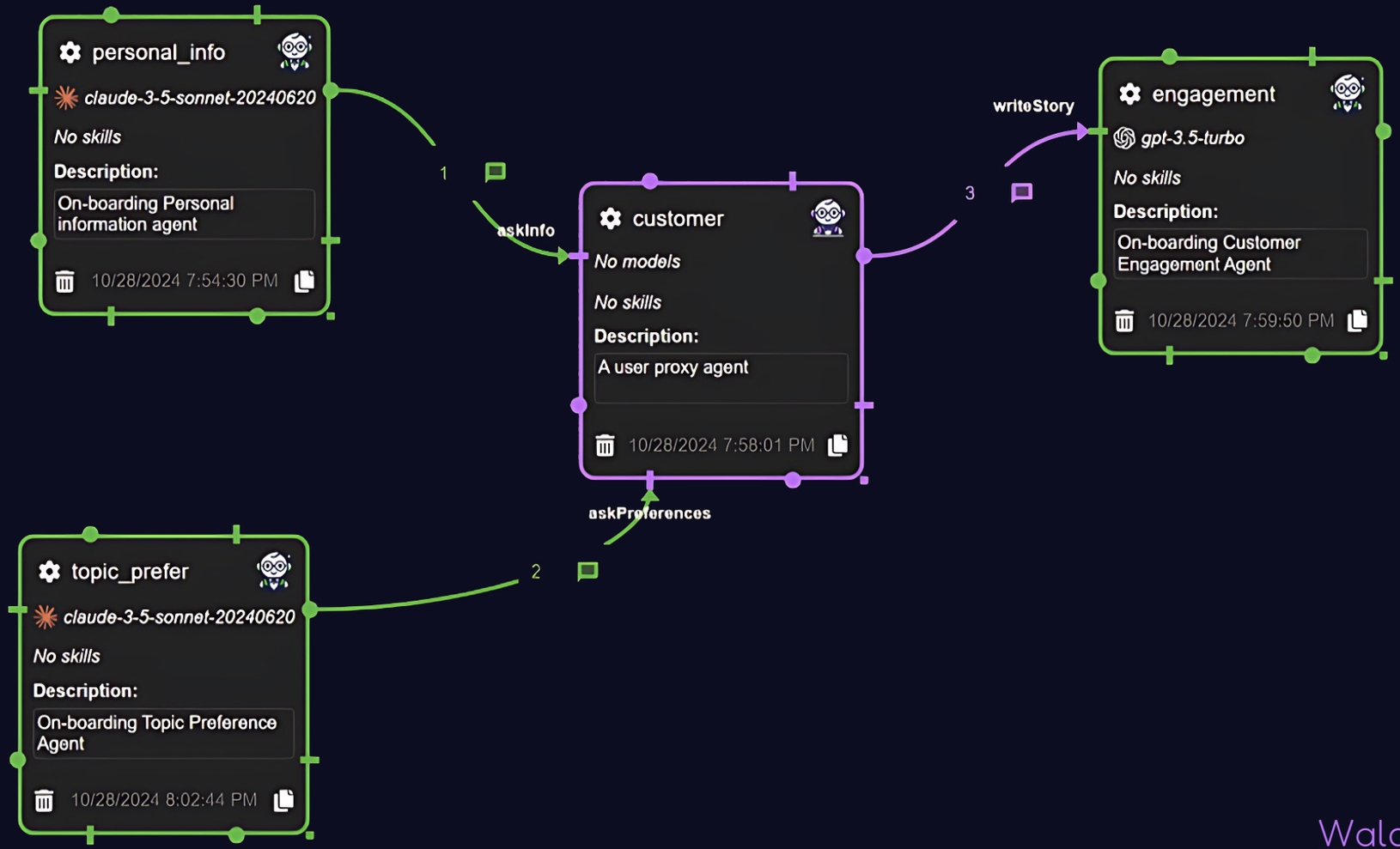
2b. User provides topic of preference to assistant



3a. User forwards collected context by personal information and topic preference assistant to engagement agent

3b. Engagement agent writes a short story or joke based on the user's info and preferences.

Sequential customer onboarding chat on **Waldiez**



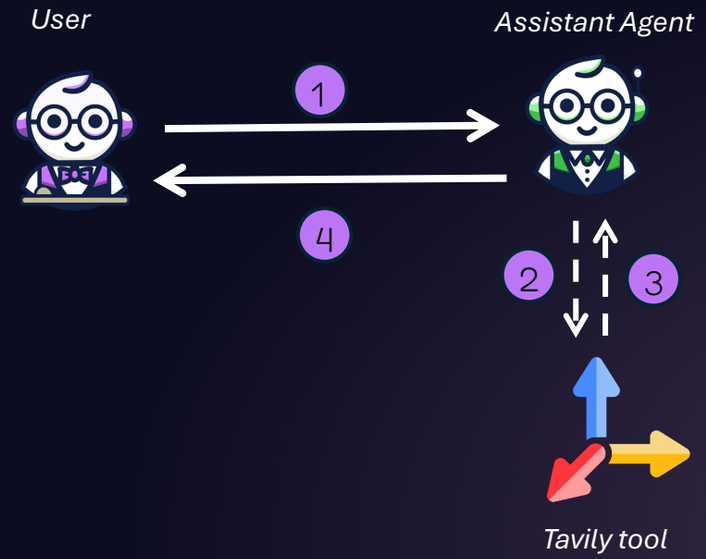
Waldiez example

Web search workflow

Communication Freedom Level: **0** | Tool Utilization Freedom Level: **0** | Agent Configuration Freedom Level: **0**

1. User (human) asks info about latest NBA standings.

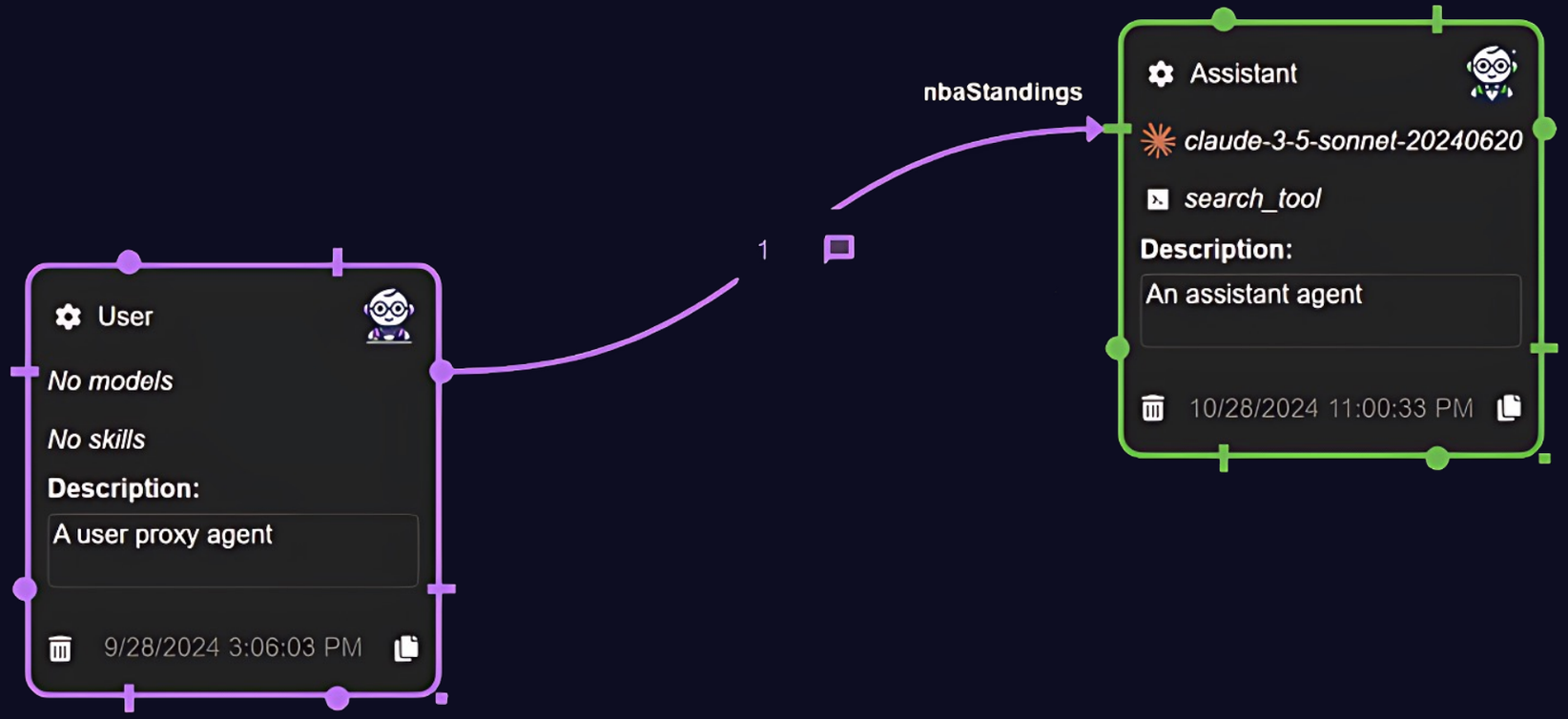
2. Assistant agent uses Tavily tool to answer the query.



3. Tavily API retrieves corresponding info.

4. Assistant agent curates info and sends them to user.

Web search workflow on **Waldiez**



Waldiez example

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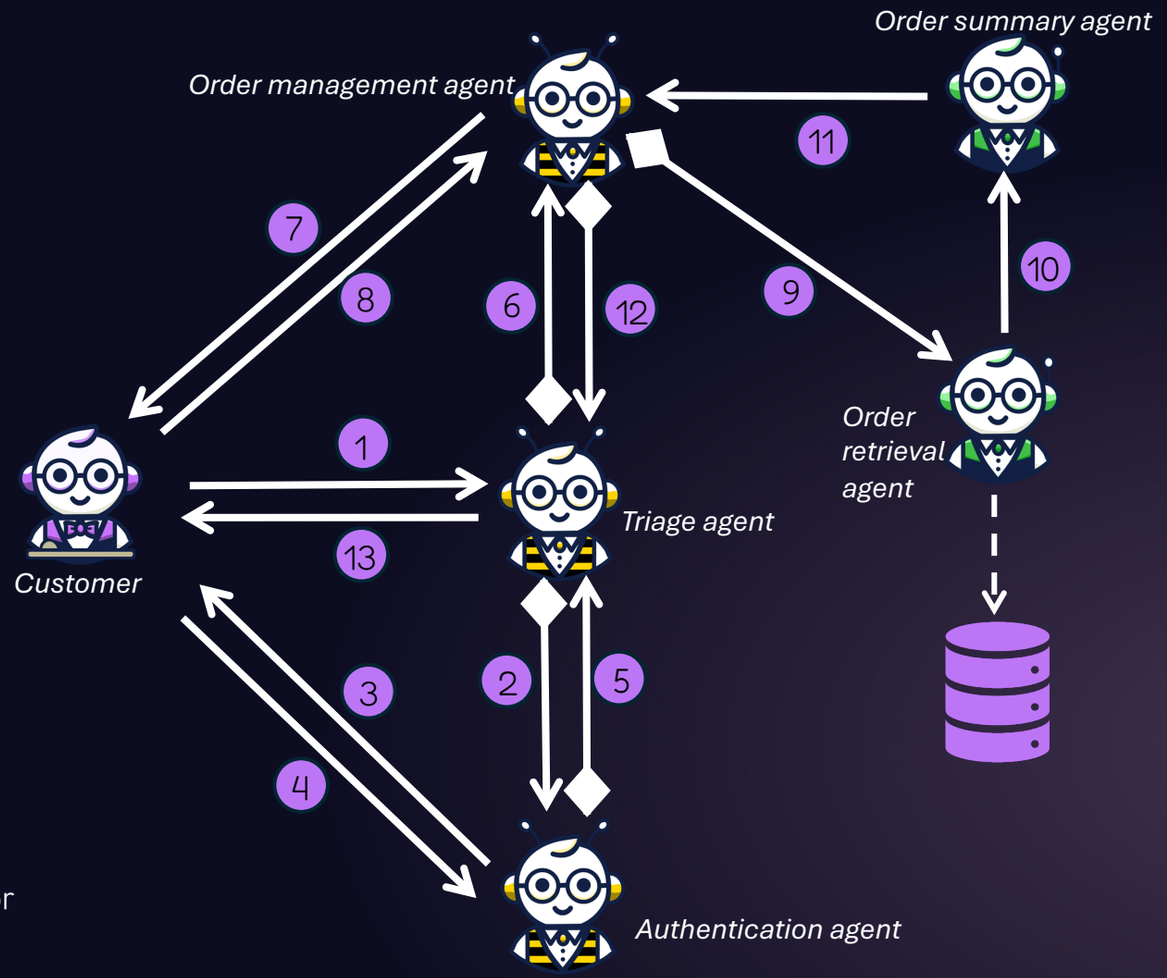
Order enquiry workflow

Communication Freedom Level: **1** | Tool Utilization Freedom Level: **0** | Agent Configuration Freedom Level: **0**



1. Customer (human) asks info about its product.

2. Triage agent check if (s)he is logged in. If not asks authentication agent to ask him/her.

3. Authentication agent asks for username.

4. User provides username.

5. If username exists authentication agent informs the triage agent.

6. Triage agent checks if the user has specified order number. If not passes the floor to order management agent.

7. Order management agent asks user to specify the order number.

8. User provides order number.

9. If order number exists agent asks order retrieval agent to retrieve order status.

10. Status is passed to the order summary agent to provide more human readable text.

11. Order status is sent to the order management agent.

12. Order status is sent to the triage agent, if no more enquiries.

13 Order status is sent to the customer (human).

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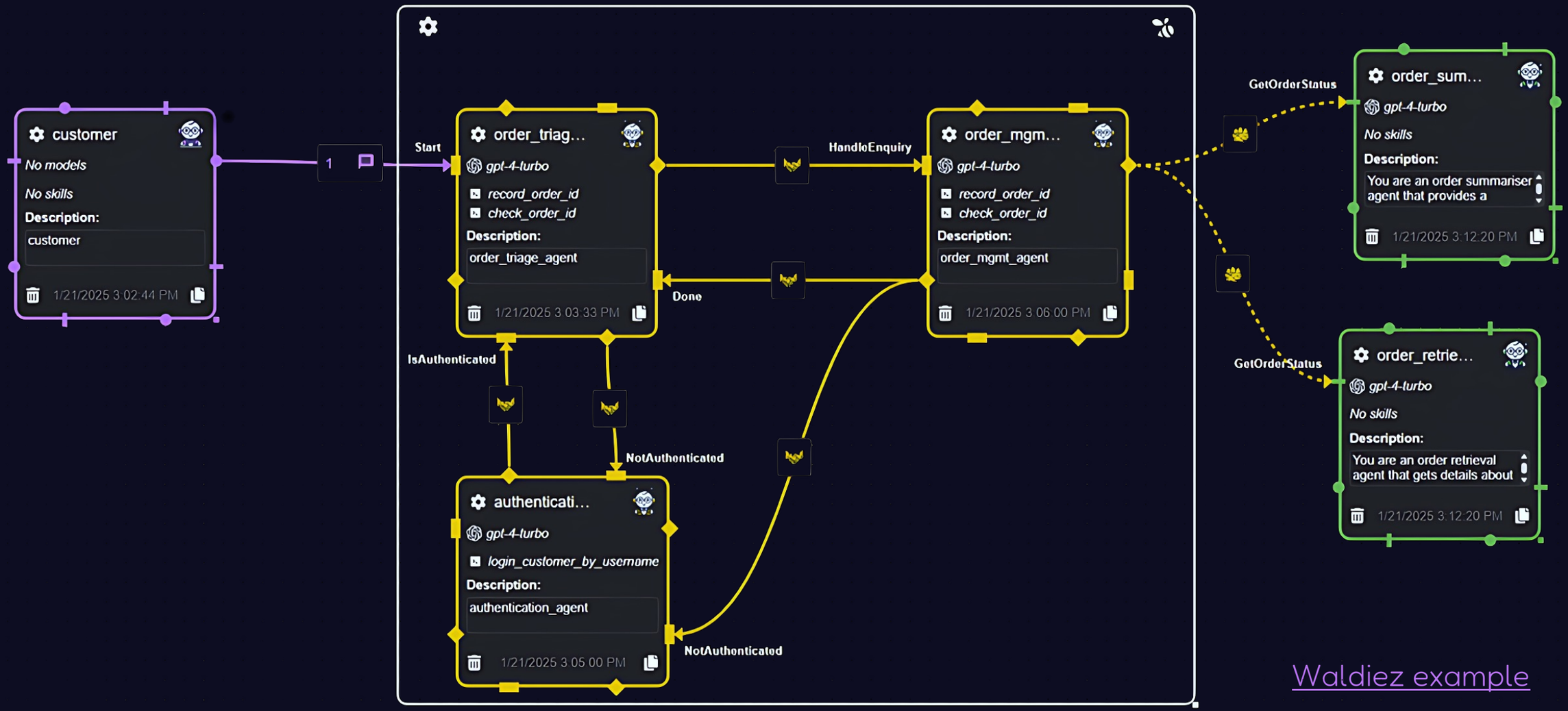
Order enquiry workflow on Waldiez



Waldiez example

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NVIDIA stock price analysis workflow

Communication Freedom Level: **2** | Tool Utilization Freedom Level: **2** | Agent Configuration Freedom Level: **0**

1. Admin (human) asks for a blog on NVIDIA stock for the last month.

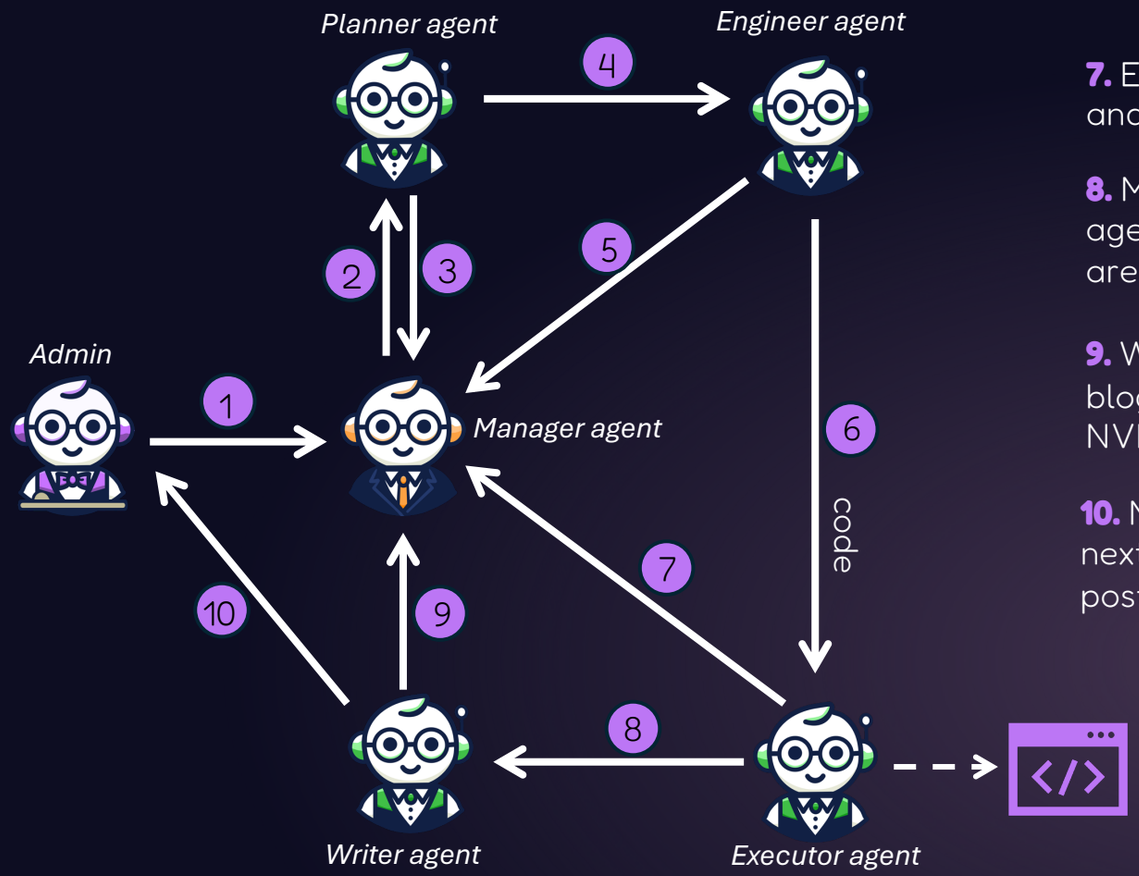
2. Manager agent delegates task to planner.

3. Planner provides plan.

4. Manager selects engineer as next agent and planner message is forwarded to it.

5. Engineer provides python code to retrieve data.

6. Manager selects executor and engineer's message is forwarded to it.



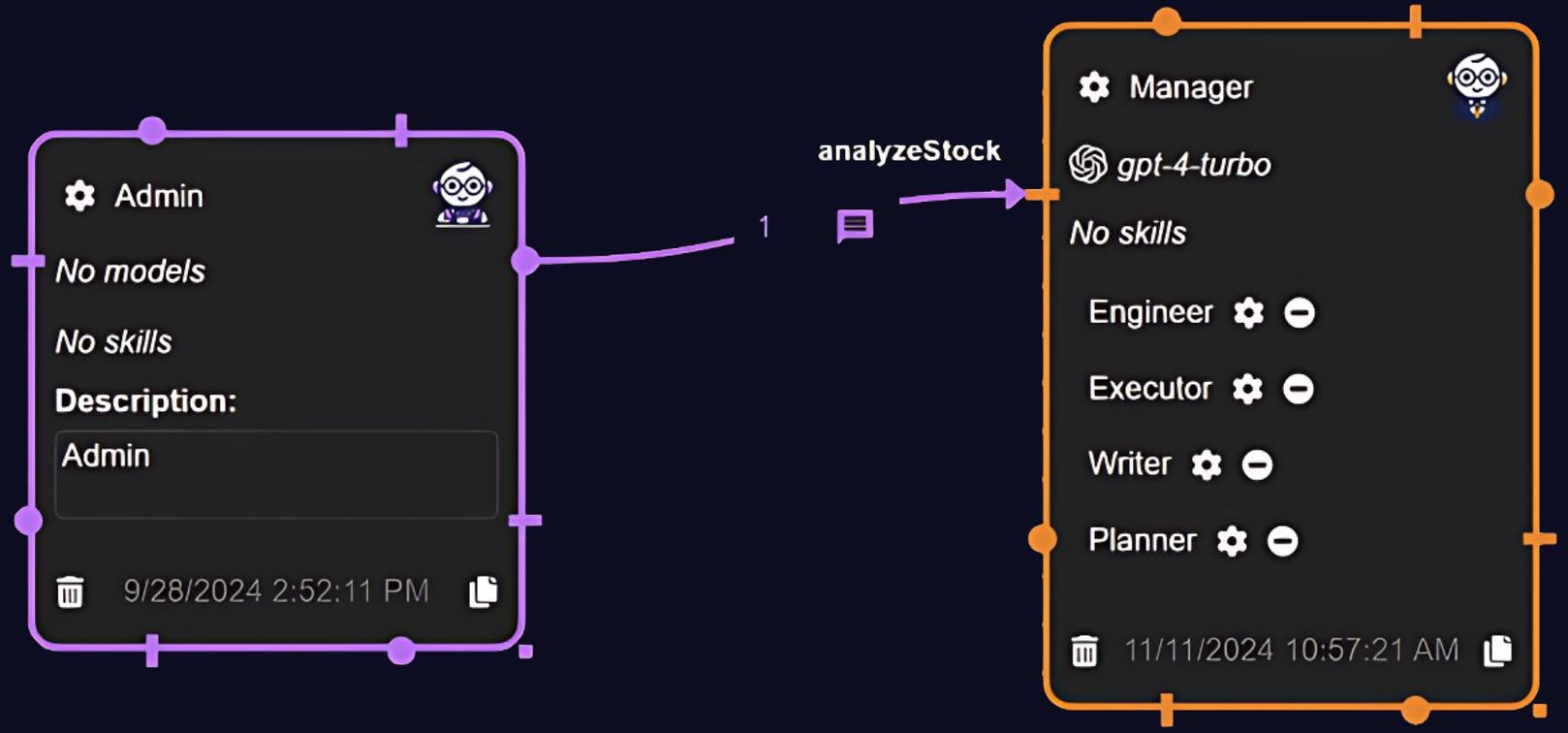
7. Executor runs the code and retrieves data.

8. Manager selects writer agent and retrieved data are forwarded to it.

9. Writer agent provides a blog post based on the NVIDIA stock price.

10. Manager selects admin as next in line and written blog post is forwarded to him/her.

NVIDIA stock price analysis workflow on **Waldiez**



Waldiez example

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YouTube video transcript analysis

Communication Freedom Level: **2** | Tool Utilization Freedom Level: **1** | Agent Configuration Freedom Level: **1**

1. Users asks for info on what a character says on a youtube video

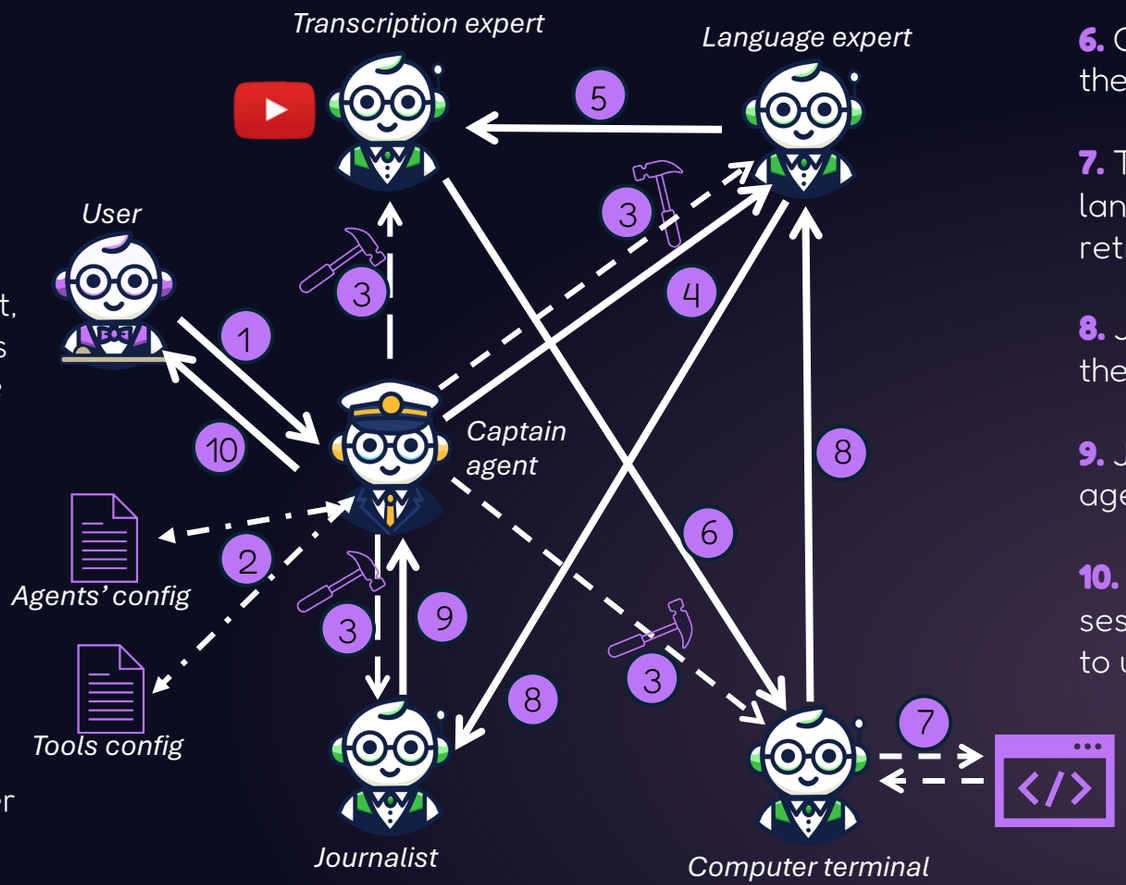
2. Captain agent checks an agents' config file and a tools config file.

3. It builds a a) transcription expert, b) language expert, and c) journalist, d) computer terminal agent. Assigns the youtube transcription tool to the transcription agent

4. Captain agent delegates task to language expert.

5. Language expert ask transcript agent for the transcript.

6. Transcript expert uses youtube transcription tool and asks computer terminal agent to execute.



6. Computer terminal runs the code and retrieves info.

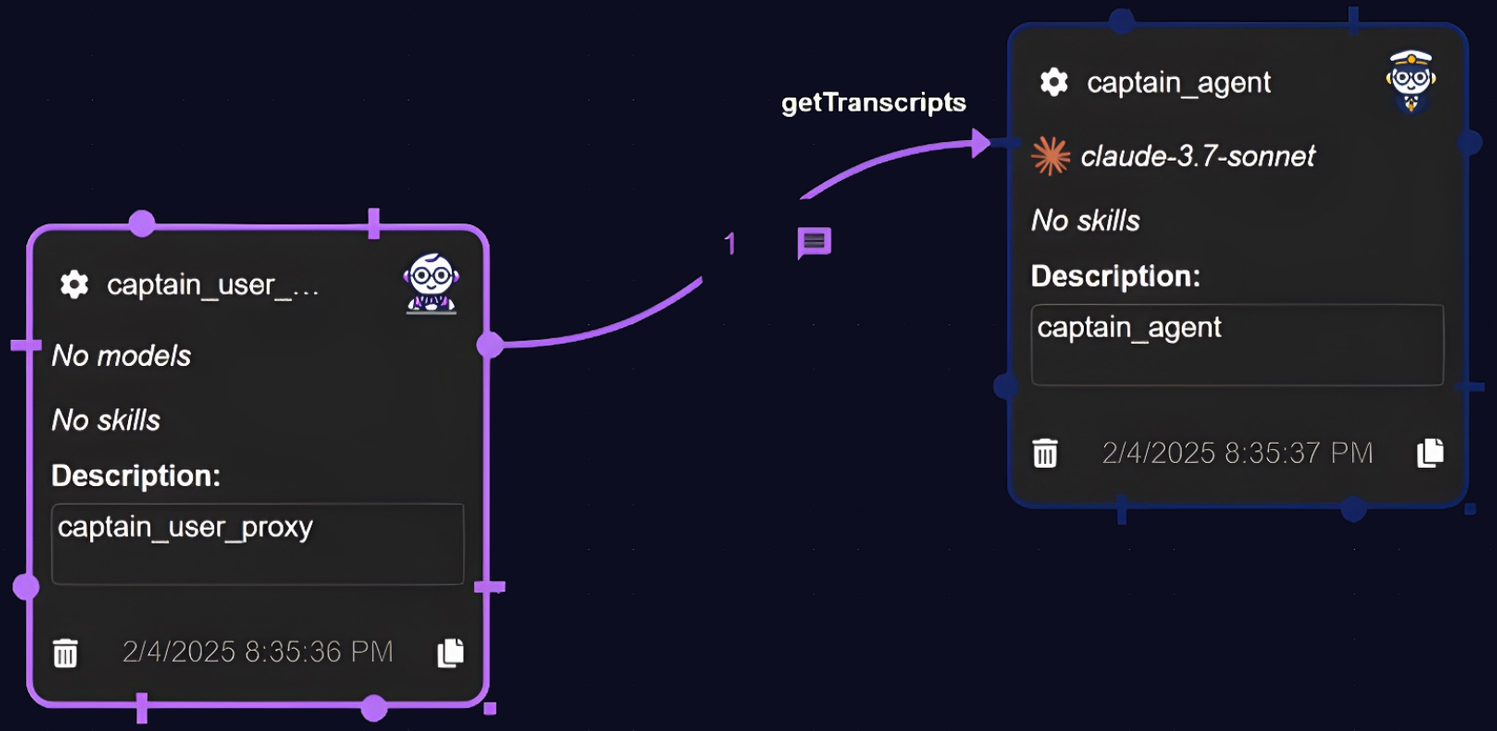
7. Transcripts are sent to language expert that retrieves the answer.

8. Journalist verifies that's the answer.

9. Journalist asks captain agent to terminate session.

10. Captain closes the session and returns answer to user.

YouTube video transcript analysis on **Waldiez**



Agents' config

Tools config

Waldiez example

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Analysis of LLM-based Arxiv Paper

Communication Freedom Level: **2** | Tool Utilization Freedom Level: **2** | Agent Configuration Freedom Level: **2**

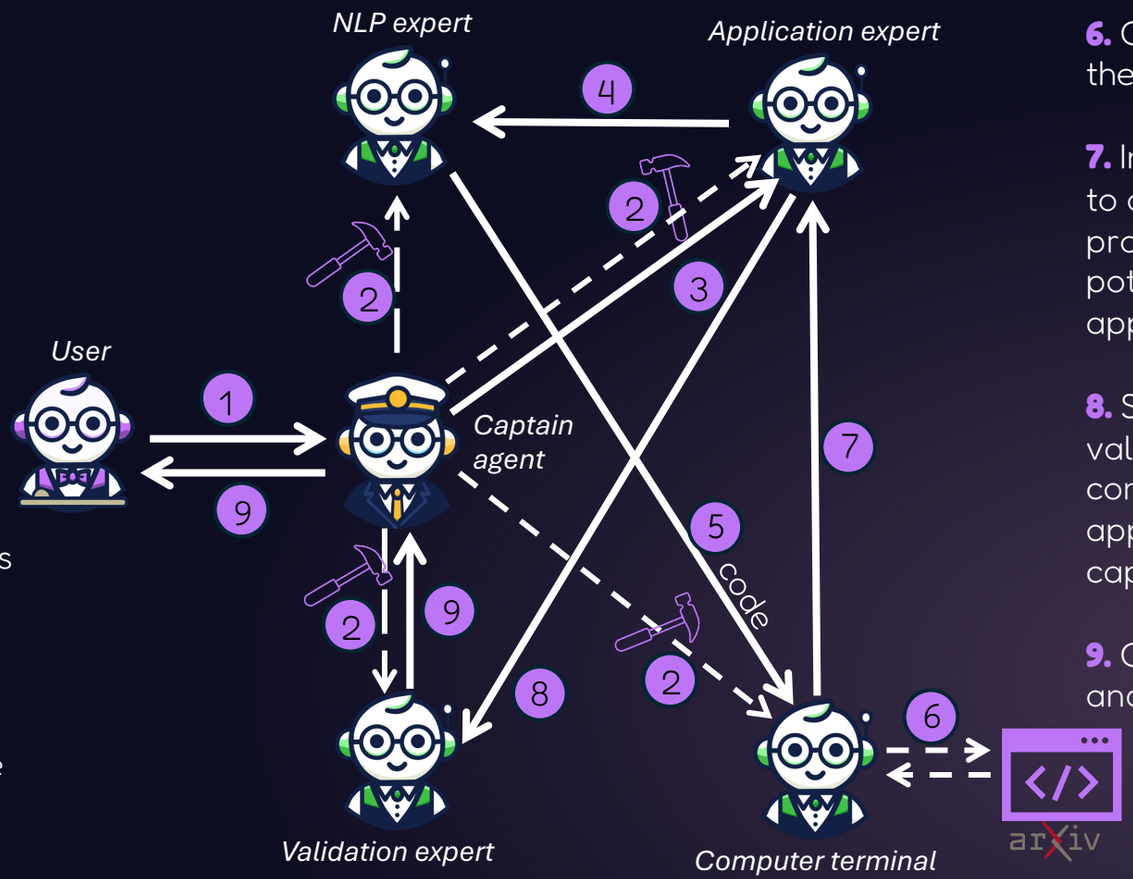
1. Users asks for a recent paper about LLMs on arxiv and its potential applications in SW.

2. Captain agent builds a) NLP expert, b) application expert, and c) validation expert, d) computer terminal agent.

3. Captain agent delegates task to application expert.

4. Application expert breaks down task objectives and passes them to NLP expert.

5. NLP expert writes code to retrieve recent paper about the application of LLMs. Sends code to computer terminal agent.



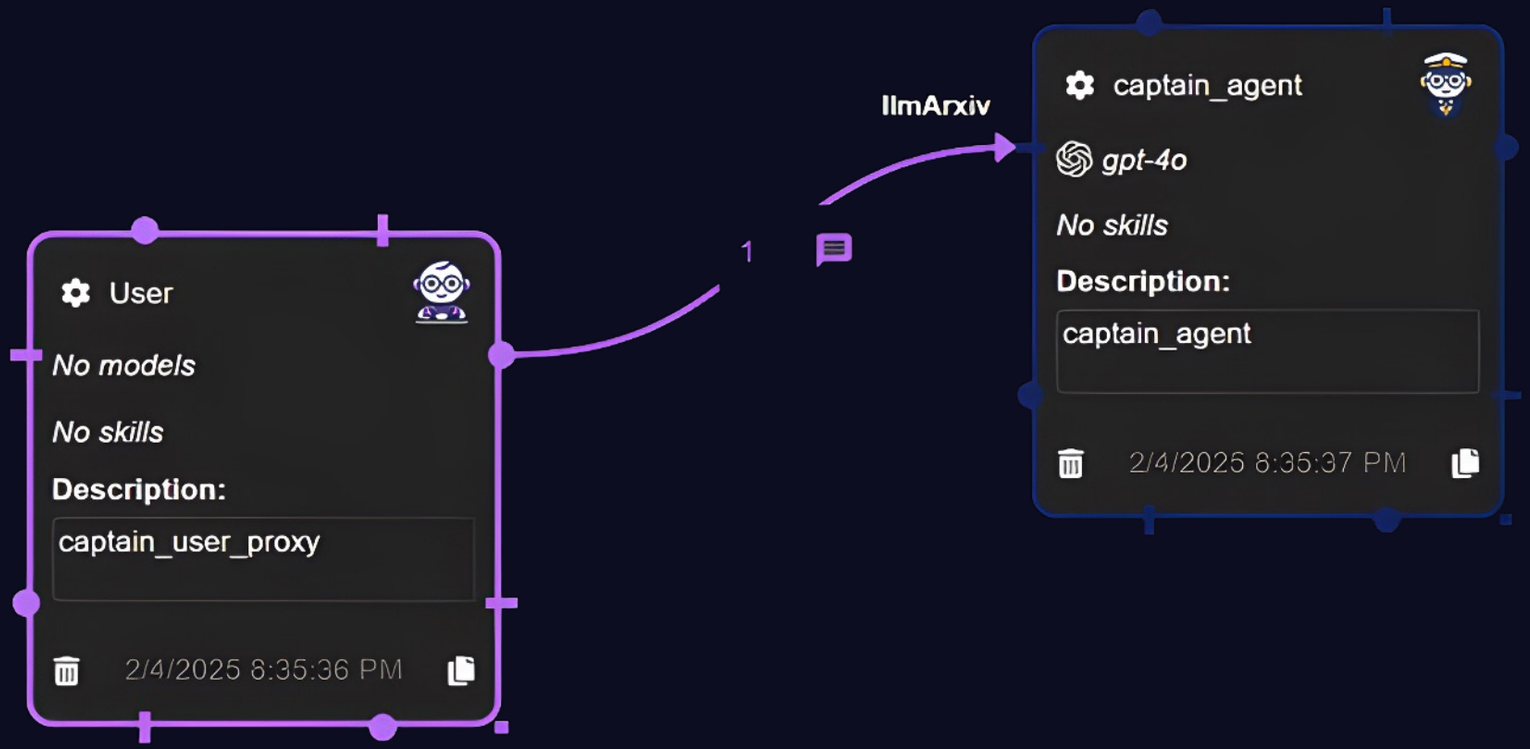
6. Computer terminal runs the code and retrieves info.

7. Info of the paper are sent to application expert providing a summary of the potential LLM-based applications.

8. Summary is sent to validation expert that confirms that the proposed apps are valid and ask captain to close the session.

9. Captain closes the session and returns answer to user.

Analysis of LLM-based Arxiv Paper on **Waldiez**



Waldiez example

Choosing Between Agentic Freedom and Deterministic Workflows

Task Complexity and Variability

Agentic Freedom:

- ✓ Ideal for tasks requiring adaptability to dynamic conditions or ambiguous inputs. Suited for scenarios where predefined rules are insufficient.
- ✓ Examples: creative problem-solving, strategic planning, and tasks involving human-like judgment.

Deterministic Workflows:

- ✓ Best for repetitive, well-defined tasks with clear procedures. Applicable when outcomes must be consistent and predictable.
- ✓ Examples: data entry, transaction processing, and compliance checks.

LLM Capabilities

LLMs are powering agentic AI, they are the brain of an AI agent, so consider the following:

High-Powered LLMs:

- ✓ Capable of handling complex, nuanced tasks with a higher degree of autonomy. Enable the effective implementation of agentic workflows by understanding context and generating appropriate responses.

Less Powerful LLMs:

- ✓ More suitable for deterministic workflows where tasks are straightforward and require minimal interpretation. May struggle with tasks requiring deep contextual understanding or creative problem-solving.

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