IBM IBM watsonx Orchestrate Hands-on Labs and Demos

IBM watsonx Orchestrate
Using Collaborator Agents to Implement a Healthcare
Insurance Provider AI Agent



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1 Introduction

1.1 IBM watsonx Orchestrate

IBM WatsonX Orchestrate (wxO) includes an Agent-Building capability.

Agents are autonomous entities that can perform tasks, make decisions, and interact with their environment. In IBM watsonx Orchestrate, agents are a key component of our agentic AI framework, enabling you to create complex, dynamic systems that can adapt and respond to changing conditions.

In this lab, you will use the IBM watsonx Orchestrate Agent Development Kit.

1.1.1 What is wxo ADK?

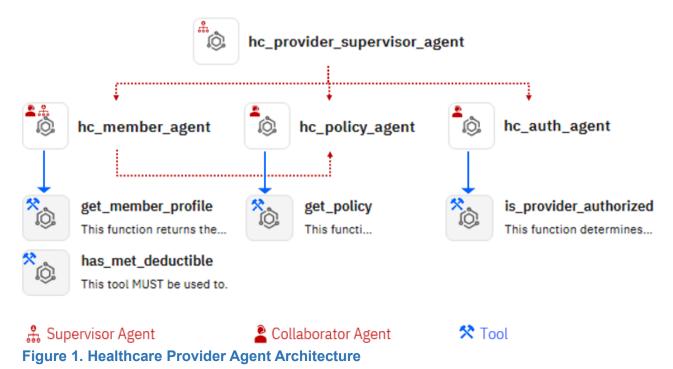
The **IBM** watsonx Orchestrate Agent Development Kit (ADK) is a set of tools designed to make it easy to build and deploy agents using <u>IBM watsonx Orchestrate</u>. It is packaged as a Python library and command-line tool that enables builders to configure agents running on the IBM WatsonX **Orchestrate** platform. The ADK also supports integrating agents and tools built on other frameworks.

1.2 Lab Scenario

1.2.1 Healthcare Provider

This lab shows how to set up and run a Healthcare Provider Al Agent for use by an insurance provider to answer provider questions about healthcare members

1.2.2 The Solution Architecture



1.2.3 Agents

HC_PROVIDER_SUPERVISOR_AGENT

This is a supervisor Agent that delegates to and supervises the work of three collaborator agents:

- HC MEMBER AGENT
- HC POLICY AGENT
- HC_AUTH_AGENT

All user interaction must go through the supervisor agent.

The agent includes a description of how to conduct a conversation with the user and what role each collaborator agent plays.

Here are excerpts from the agent description instructing the agent how to use the collaborator agents:

If you are asked about anything other than insurance questions, respond that you are not trained to answer those questions.

You must start every conversation by authorizing the provider user by using the hc_auth_agent collaborator.

Once authorization is complete, don't use the hc_auth_agent again. Any questions related to an individual member should go to the hc_member_agent collaborator.

This includes questions related to a member meeting their deductible, questions about member claims, and questions about personal information related to the member.

For questions about polices, deductibles, benefits, and coverage, use the hc_policy_agent collaborator.

If the user starts with a question instead of a greeting, answer the question.

HC_AUTH_AGENT

This agent uses a tool to collect the provider's information, authorizing the user (the provider) to use the agent.

Here are excerpts from the agent description instructing the agent when and how to collect the authorization information:

You are an Authorization Agent whose primary responsibility is to authorize providers. You should start every conversation by collecting the user's Provider ID and NPI number. Only collect these once per session. The Provider ID should be in the form of a single letter R followed by 8 numbers.

HC_MEMBER_AGENT

This agent uses a tool to collect and retrieve insurance member claims information.

Here are excerpts from the agent description instructing the agent to:

- Use the available tool to access and retrieve the member's information
- Use another tool to establish if a member has met their deductible
- Delegate all policy information required for the policy agent

You must always access the member's claims and profile data by using the get member profile tool.

The member's claims and other personal information will reside in the member profile in JSON format. Use the has_met_deductible tool to determine if a member has met their deductible.

To use this tool, you will need to get the amount paid towards the deductible from a member profile using the get_member_profile tool and the personal deductible from the healthcare policy agent.

When calling the get_member_porfile tool the Agent has the following information available when answering the user's questions or reasoning. Here is a sample JSON returned by the tool.

```
"member_id": "string",
"first_name": "string",
"last_name": "string",
"phone_number": "string",
'email": "string",
"address": {
 "street": "123 Elm St",
 "city": "Springfield",
 "state": "IL",
 "zip_code": 62701
"paid_toward_personal_deductible": 800,
'paid_toward_family_deductible": 1600,
"member_plan": "Gold PPO plan",
"claims_list": [
   "claim title": "Claim 1",
   "claim_number": 8452132299,
   "date_of_service": "2024-07-28",
   "status": "approved",
   "in_network": false,
   "provider": "Lexington Wellness Center",
   "claim description": "Postpartum follow-up visit."
```

HC_POLICY_AGENT

This agent answers questions about the Gold Preferred Provider Organization (PPO) insurance policy plan. The agent does not have any tools. All the PPO plan information is defined in the instructions section of the agent definition yaml file.

```
Your task is to answer user questions strictly based on the following policy details:
  - Deductible: $1,500 per person / $3,000 per family.
 - Covered Before Deductible: Preventive care, office visits, prescription drugs,
urgent care visits (subject to copayment), and eye exams/glasses for children.
 - Out-of-Pocket Limit: $7,800 per person / $15,600 per family.
  - Not Included in Out-of-Pocket Limit: Premiums, balance-billing charges, penalties
for lack of preauthorization, and non-covered services.
 - Primary Care Visits (In-Network): $30 copayment per visit; deductible does not
apply. Not covered out-of-network.
 - Specialist Visits (In-Network): $60 copayment per visit; deductible does not apply.
Not covered out-of-network.
  - Preventive Care (In-Network): No charge. Not covered out-of-network.
 - Diagnostic Tests (In-Network): 25% coinsurance. Not covered out-of-network.
 - Imaging (CT/PET/MRI) (In-Network): 25% coinsurance. Not covered out-of-network.
 - Generic Drugs (In-Network): $15 copayment (retail) / $45 (home delivery); deductible
does not apply. Not covered out-of-network.
  - Preferred Brand Drugs (In-Network): $30 copayment (retail) / $90 (home delivery);
deductible does not apply. Not covered out-of-network.
```

1.2.4 Tools

is_provider_authorized

A tool for validating the provider ID and NPI number of the provider

```
parameters:

npi_number (string)

provider_id (string)

results:

authorized (bool)

get_policy
```

A tool for returning policy details in JSON format.

```
parameters:

policy_name (string)

results:

object
```

The return object is defined as shown below.

```
"policy_name":"2025 Gold PPO insurance policy",
'personal_deductible":1500,
"family_deductible":3000
"covered_before_deductible_list":["Preventive care","office visits","prescr
"out_of_pocket_limit_personal":7800,
"out_of_pocket_limit_family":15600,
"not_covered_in_out_of_pocket_list":["Premiums","balance-billing charges",'
"in network coverage list":
      "service_name": "Primary Care Visits",
      "copay_amount":30,
      "coinsurance_percentage":0
      "service_name": "Specialist Visits",
      "copay_amount":60,
      "coinsurance_percentage":0
      "service_name": "Preventive Care",
      "copay_amount":0,
      "coinsurance_percentage":0
      "service_name":"Diagnostic Tests",
"copay_amount":0,
      "coinsurance_percentage":25
      "service_name":"Imaging (CT/PET/MRI)",
      "copay_amount":0,
      "coinsurance_percentage":25
out_of_network_coverage_list":[],
'in_network_drug_list":[
      "service_name":"Generic Drugs",
      "copay_amount":15,
      "coinsurance_percentage":25
      "service_name":"Preferred Brand (non-generic) Drugs",
      "copay_amount":30,
      "coinsurance_percentage":90
out_of_network_drug_list":[]
```

get_member_profile

A tool for returning claims associated with a member. Currently, two members are supported. One member ID is 12345678 (and any date of birth), the second set of claims will be returned for any member ID.

```
parameters:

member_id (string)

member_DOB (string)

results:

object
```

The return object is defined as shown below.

```
"member_id": "string",
"first_name": "string",
"last_name": "string",
"phone_number": "string",
"email": "string",
"address": {
 "street": "123 Elm St",
 "city": "Springfield",
 "state": "IL",
 "zip_code": 62701
"paid_toward_personal_deductible": 800,
'paid_toward_family_deductible": 1600,
'member_plan": "Gold PPO plan",
"claims_list": [
   "claim_title": "Claim 1",
   "claim_number": 8452132299,
   "date_of_service": "2024-07-28",
   "status": "approved",
   "in_network": false,
   "provider": "Lexington Wellness Center",
   "claim_description": "Postpartum follow-up visit."
```

has_met_deductible

A tool for checking if a deductible has been met.

```
parameters:
    paind_towards_deductible (float)
    member_personal_deductible (float)
results:
    authorized (bool)
```

1.3 Lab Overview

In this lab, you will deploy the Health Care Provider Agent solution and test it to understand which collaborator agents are summoned to answer a healthcare provider's questions.

2 Lab Setup Instructions

2.1 Lab Envrionmnet Setup

- _1. Download this document: https://ibm.ent.box.com/v/wxO-Agentic-SDK
- _2. Follow the step-by-step instructions in the above document to:
 - Reserve IBM watsonx Orchestrate ADK and DBA US East Only

Note: This environment includes Digital Business Automation VM, which provides the IBM Business Workflow runtime required for this lab.

- Open the wxo ADK VM in RDP running on your laptop
- In the VM, (if required) set up the Environment keys
- In the VM, start the wxo ADK server

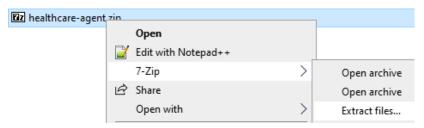
2.2 Download and Configure Project Files

2.2.1 Download and Create the Project Folders

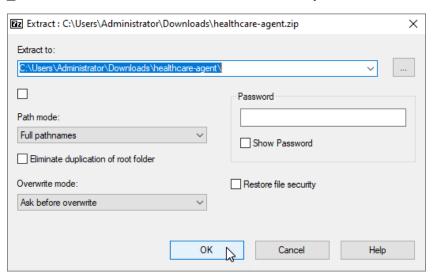
- _1. Inside the RDP session, open a Web Browser and paste this <u>link</u>
- 2. In the Web Browser, click the **Download** button.



- _3. Click the Download button to download the healthcare_agent.zip file to This PC > Downloads.
- _4. Use 7-zip to Extract files...



Select C:\wxolite-sdk\wxo-clients directory and click OK.



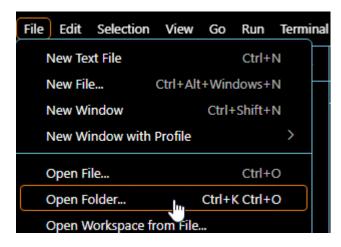
3 Lab Overview and Setup

3.1 Open the healthcare_agentProject Folder in VSCode

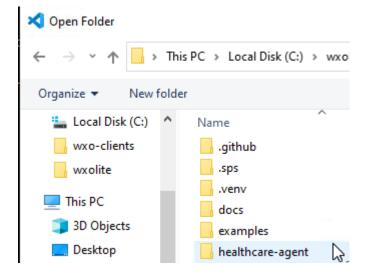
_1. Click the Visual Studio Code icon on your desktop to open VS Code.



_2. In VSCode, click File > Open Folder...

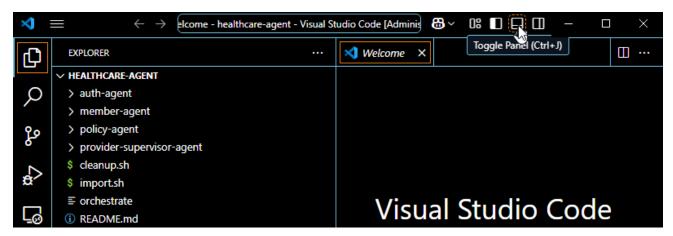


_3. Click the C:\wxolite-sdk\wxo-clients\healthcare_agentfolder to open it.



You should now see the Healthcare_agent folder open in VS Code. Before we start coding, you will learn bout the wxo ADK's programming model and familiarize yourself with the project files.

_4. If you do not see the Terminal panel, click the Toggle Panel as shown below.



3.2 Lab Overview

In this lab, you will not be required to do any coding. However, if you want to modify anything, you will need to become familiar with the programming model, development, and deployment.

3.2.1.1 What is wxO ADK?

The wxO ADK also provides a framework for developers to easily define new tools and agents programmatically. And then test them in the local development environment. Once ready, developers can deploy final solutions to external production tenants.

3.2.1.2 wxO ADK components

The ADK is built on top of the following components:

Component	Description	Key Features
Agent	An Al Agent uses tools and other Al Agents to plan and act, performing tasks while reflecting on the results and refining its output to align with its defined objectives.	 Can use other agents as collaborators to solve complex tasks Handles task decomposition and synthesis Uses tools autonomously to work on behalf of the user
Tool	A function that an Al Agent can invoke to perform specific actions or retrieve information	 Well-defined inputs and outputs Permission-based access control Support for two binding types: Python and OpenAPI. Schema validation Reusable across agents

The ADK has a Command-Line Interface (CLI). The CLI can streamline the process of building, testing, and deploying agents and tools. The CLI command name is 'orchestrate'. You can type 'orchestrate –help' in the Windows Command Window to learn more about its syntax.

In this lab, all the orchestrate commands are already created for you and packaged in two files:

- import.sh Deploys the Agent and its tools to the wxo ADK runtime and configures REST connections.
- cleanup.sh Undeploys your Agent.



3.2.1.3 Typical Development Steps

- 1) Tools are defined using one of the available binding types (Python, OpenAPI) and then imported into the Orchestrate platform using the Orchestrate CLI.
- 2) Agents are defined using the ADK and imported into the Orchestrate platform using the Orchestrate Command-Line Interface (CLI). Agents use the tools defined in step 1.
- 3) Once deployed, an agent can start conversations with users through the Orchestrate Agent Chat UI or the Orchestrate API.

3.2.2 What's in the Project?

The figure below illustrates the relationship between the project files and the Agentic Solution Architecture introduced in the Lab Scenario section.

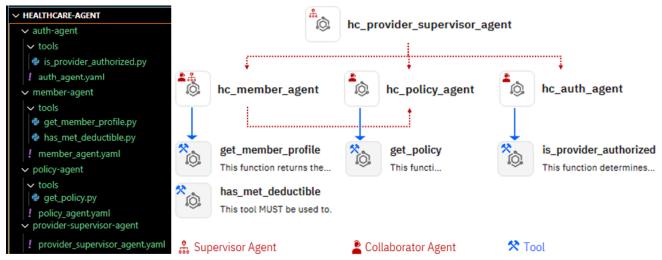
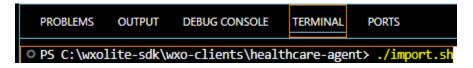


Figure 2. Project Files

4 Lab Instructions

4.1 Deploy the Agent

_1. In the Terminal pane, enter: ./import.sh and press Enter.



_2. Examine the log in the Bash Window and click Enter to close it.

```
/usr/bin/bash --login -i C:\wxolite-sdk\wxo-clients\healthcare-agent\import.sh

[INFO] - Tool 'get_member_profile' imported successfully

[INFO] - Tool 'has_met_deductible' imported successfully

[INFO] - Tool 'is_provider_authorized' imported successfully

[INFO] - Tool 'get_policy' imported successfully

[INFO] - Agent 'hc_policy_agent' imported successfully

[INFO] - Agent 'hc_member_agent' imported successfully

[INFO] - Agent 'hc_auth_agent' imported successfully

[INFO] - Agent 'hc_provider_supervisor_agent' imported successfully

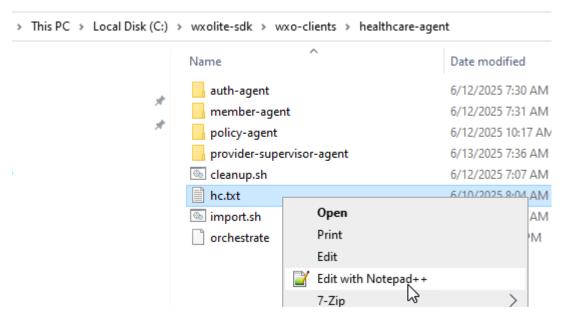
Press enter to continue
```

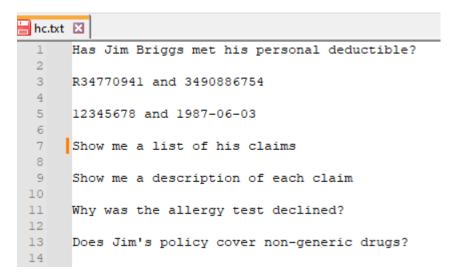
4.2 Demo the Healthcare Agent

The Healthcare Agent has the following features:

- Collects a Provider ID and NPI number to validate the provider.
- Collects the member ID and the date of birth for the member whose claims are being questioned.
- Returns the claims in a markdown table.
- Allows the user to ask open-ended questions about the claims.
- Makes sure all IDs are in the specified format.
- Avoids answering questions outside of claims.

When running the demo, open the **hc.txt** file in Notepad++ and copy the commands from this file to the Chat.



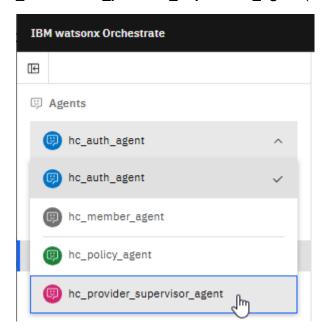


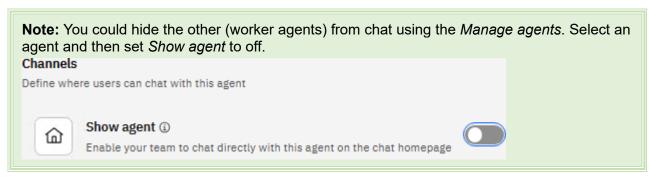
4.2.1 Start The Agent

_1. Open the **Chrome** Web browser from the Windows toolbar.



_2. Select hc_provider_supervisor_agnet (this is the Agent you just deployed).





4.2.2 React Agent's Variability

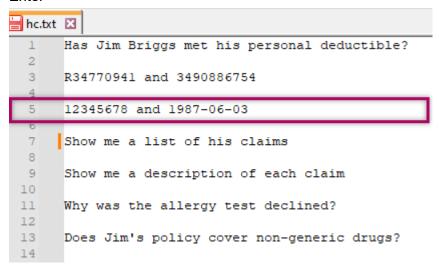
LLMs used in React Agents generate text and reason probabilistically. Without careful control (e.g., low temperature), they can output different chains of thoughts, actions, and even questions for the same input. This can make agents appear "random" or inconsistent.

Note that the ReAct agents in this lab will exhibit such variability in the way they ask questions and solve problems. This is expected. Consequently, the prompts, responses, and tool flow described in the lab steps below will vary.

For example in the lab sets, if the agent asks you about Jim's information



Enter



4.2.3 Find Member's Deductible Status

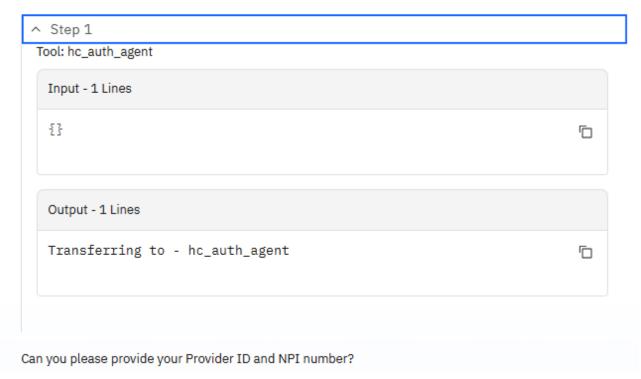
The provider will ask the Agent if a cusomer, Jim Briggs, has met his deductible.

1. In the prompt, enter **Has Jim Briggs met his deductible?** and press the **Enter** key.

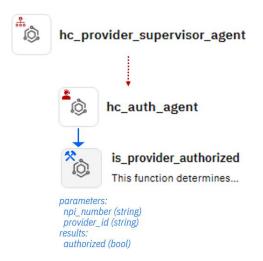
↑ Has Jim Briggs met his personal deductible?

2. Click Show Reasoning > Step 1





Note that the supervisor agent recognized that the provider must first be authorized. To this end, the supervisor is requesting that the authorization agent authorize the chat user. Since the authorization tool has two inputs, you will see this prompt.



_3. In the prompt, enter the provider authentication information **R34770941 and 3490886754** and press the **Enter** key.



_4. Click Show Reasoning > all steps



provider_supervisor_agent 08:35 AM | Show Reasoning



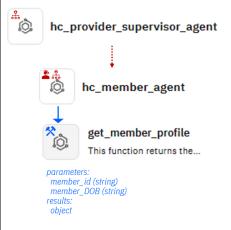
No, Jim Briggs has not met his deductible.

Reasoning: I used the hc_member_agent collaborator to retrieve information about Jim Briggs' claims and deductible status. The collaborator provided a list of claims, including their status, in-network status, provider, and claim description. I then used the hc_policy_agent collaborator to retrieve information about the policy, which included the deductible amount. Based on the information provided by the collaborators, I determined that Jim Briggs has not met his deductible.

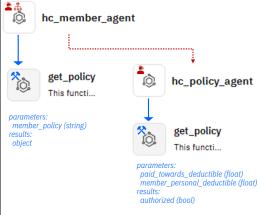
Let's examine the steps.



- 1. The supervisor agent transfers to the authorization agent.
- 2. The authorization agent authorizes the provider.
- The supervisor agent extracts the name of the member and transfers the query to the member agent
- 4. The member agent uses the get_member_profile tool is invoked with the authorization data for the member



5. The member agent uses the has_met_deductible tool to determine if member has met its deductible. Note that pains_towrds_decutibe came from the member profile. The member_personal_deductible came from the hc_policy agent (the trace does not show this currently)



4.2.4 Show Claims

The provider will ask the agents to show Jim's claims.

_1. In the prompt, enter **Show me a list of his claims** and press the **Enter** key.



_2. Note the list of claims displayed, then click Show Reasoning > all steps



Claim Number	Date of Service	Status	In- Network	Provider
3311	June 9th, 2024	Declined	No	Lexington Welness Clinic
1622	January 10, 2024	Approved	Yes	UK Imaging Center
4389	March 3, 2025	Declined	No	AllergyRx Clinic

The supervisor agent delegated the question to the member agent, which invoked the get_member_profile tool to get a list of Jim's claims.



_3. In the prompt, enter Show me a description of each claim and press the Enter key.



4. Note the list of claims displayed also includes the claim description.

Claim Title	Claim Number	Claim Description
Claim 1	3311	Office visit for discussion of general wellness and anti-aging strategies, including recommendations for nutritional supplements and stress management techniques, not related to the diagnosis or treatment of a specific medical condition.
Claim 2	1622	Office visit with a physician for evaluation and treatment, including examination via x-ray to assess and diagnose bone or joint condition.
Claim 3	4389	Allergy testing at an out-of-network provider.

4.2.5 Make Policy Inquiries

The provider will ask about the claim policies that apply to Jim.

1. In the prompt, enter **Why was the allergy test declined?** and press the **Enter** key.

↑ Why was the allergy test declined?

_2. Note the answer displayed, then click Show Reasoning > all steps



The allergy test was declined because it was performed at an out-of-network provider. The policy only covers services performed by in-network providers. Reasoning: I used the hc_policy_agent collaborator to retrieve information about the policy. The collaborator provided a list of covered services, including preventive care, office visits, prescription drugs, urgent care, and visits (subject to copayment). However, the policy does not cover services performed by out-of-network providers. Since the allergy test was performed at an out-of-network provider, it was declined.

The supervisor agent delegated the question to the policy agent, which invoked the get_policy tool to extract the policy referring to allergy tests. Note that the agent identified the claim number 4389 as the one related to the allergy test (the third row in the table shown as a result of the previous inquiry).



3. In the prompt, enter **Does Jim's policy cover non-generic drugs?** and press the **Enter** key.

不 Does Jim's policy cover non-generic drugs? ▷

_4. Note the answer displayed, then click Show Reasoning > all steps



hc_provider_supervisor_agent 10:03 AM | Show Reasoning



Yes, Jim's policy covers non-generic drugs. The policy covers 10% of the cost of non-generic drugs after the deductible is met, with a copay of \$30 per prescription. Reasoning: I used the hc_policy_agent collaborator to retrieve information about the policy. The collaborator provided a list of covered services, including prescription drugs. The policy covers 10% of the cost of non-generic drugs after the deductible is met, with a copay of \$30 per prescription.

The supervisor agent delegated the question to the policy agent, which invoked the get_policy tool to extract the policy about the non-generic drugs.

Note that the input to the get_policy tool (2025 Gold PPO inurance policy) was previously obtained when the agent retrieved Jim's policy details using the get_member_profile tool.



This marks the end of the lab.

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