

multi_agent_prebuilt

September 5, 2025

1 Multi-Agent System with LangGraph

This notebook provides a detailed walkthrough of the `multi_agent_prebuilt.py` script. We will explore how to build multi-agent systems using LangGraph, specifically focusing on Supervisor and Swarm patterns, as well as custom handoffs between agents.

Overview of the `multi_agent_prebuilt.py` script:

The script demonstrates three different approaches to building multi-agent systems:

1. **Supervisor Pattern:** A central supervisor agent delegates tasks to specialized agents.
2. **Swarm Pattern:** Agents can hand off tasks to each other directly.
3. **Custom Handoffs:** A more granular implementation of agent-to-agent task handoffs.

1.1 Section 1: Setup and Imports

This section handles the initial setup, including loading environment variables for API keys and importing necessary libraries. The `dotenv` library is used to load the `OPENAI_API_KEY` from a `.env` file. `rich` is used for pretty-printing outputs.

```
[25]: import os
      from dotenv import load_dotenv
      from rich import print
      from langchain_openai import ChatOpenAI
      from langgraph.prebuilt import create_react_agent
      from langgraph_supervisor import create_supervisor
      load_dotenv()
      # Make sure to set your OPENAI_API_KEY in a .env file or as an environment
      ↪variable
```

[25]: True

1.2 Section 2: Supervisor Multi-Agent System

This example demonstrates a supervisor-worker architecture. A `supervisor` agent receives a user request and routes it to the appropriate specialized agent (`flight_assistant` or `hotel_assistant`).

Code Logic:

1. **Tool Definition:** Simple functions `book_hotel` and `book_flight` are defined as tools for the agents.
2. **Agent Creation:** Two `create_react_agent` instances are created. Each agent is specialized for a single task (booking flights or hotels) and is given access to the relevant

tool. 3. **Supervisor Creation:** `create_supervisor` is used to create a managing agent that orchestrates the two specialized agents. 4. **Execution:** The system is run by streaming a user request through the compiled supervisor graph.

```
[26]: def book_hotel(hotel_name: str):
        """Book a hotel"""
        return f'Successfully booked a stay at {hotel_name}.'

def book_flight(from_airport: str, to_airport: str):
        """Book a flight"""
        return f'Successfully booked a flight from {from_airport} to {to_airport}.'

[27]: # Create specialized agents
flight_assistant = create_react_agent(
    model=ChatOpenAI(model='gpt-4o-mini'),
    tools=[book_flight],
    prompt='You are a flight booking assistant. Help users book flights.',
    name='flight_assistant',
)

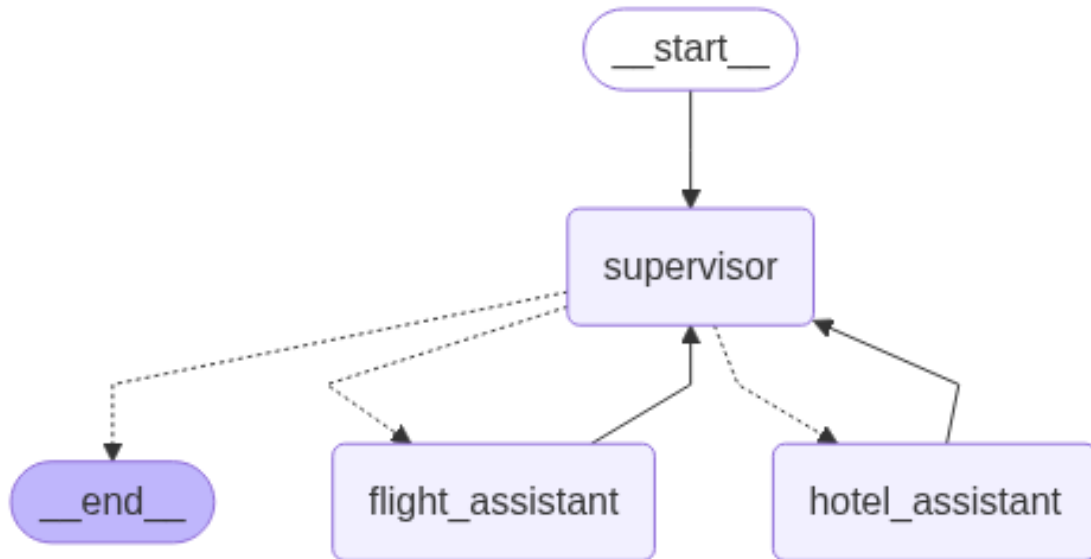
hotel_assistant = create_react_agent(
    model=ChatOpenAI(model='gpt-4o-mini'),
    tools=[book_hotel],
    prompt='You are a hotel booking assistant. Help users book hotels.',
    name='hotel_assistant',
)

# Create supervisor
supervisor = create_supervisor(
    agents=[flight_assistant, hotel_assistant],
    model=ChatOpenAI(model='gpt-4o-mini'),
    prompt='You manage hotel and flight booking assistants. Assign work to them.
↪',
).compile()

[28]: print('Subgraph structure:')
# Optional: Display a visualization of the graph's structure.
try:
    from IPython.display import Image, display

    display(Image(supervisor.get_graph().draw_mermaid_png()))
except Exception:
    pass
```

Subgraph structure:



```
[29]: print('=== SUPERVISOR EXAMPLE ===')
for chunk in supervisor.stream({'messages': [{'role': 'user', 'content': 'Book_
    ↳ a flight from LAX to NYC'}]}], debug=True):
    if chunk:
        print('-'*60)
        print(f'Chunk: {chunk}')
        # print(chunk)
```

=== SUPERVISOR EXAMPLE ===

```
[values] {'messages': [HumanMessage(content='Book a flight from LAX to
NYC', additional_kwargs={}, response_metadata={},
id='4ca25026-fbf9-4f2a-b300-8e21701a428f')]}
[updates] {'supervisor': {'messages': [HumanMessage(content='Book a
flight from LAX to NYC', additional_kwargs={}, response_metadata={},
id='4ca25026-fbf9-4f2a-b300-8e21701a428f'), AIMessage(content='',
additional_kwargs={'tool_calls': [{'id': 'call_zuuNYDhCObdvREfLWLZONee1',
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6ce4fc22-23cb-455c-8a49-4787caf3762d-0', tool_calls=[{'name':
```

```

'transfer_to_flight_assistant', 'args': {}, 'id':
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usage_metadata={'input_tokens': 88, 'output_tokens': 14, 'total_tokens': 102,
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{'audio': 0, 'reasoning': 0}}, ToolMessage(content='Successfully transferred to
flight_assistant', name='transfer_to_flight_assistant',
id='a80b641f-6147-4260-a1e8-ebc0dd7a127f',
tool_call_id='call_zuuNYDhC0bdvrEfLWLZONee1'))]]}

```

```

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Chunk: {'supervisor': {'messages': [HumanMessage(content='Book a flight from LAX
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[updates] {'flight_assistant': {'messages': [AIMessage(content='Your
flight from LAX to NYC has been successfully booked! If you need any further
assistance, feel free to ask.', additional_kwargs={'refusal': None},
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id='55b97dc0-4306-46c3-ac78-40d9a12ad65a', tool_calls=[{'name':
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'f0d05ade-4f7f-479b-939c-a50ce013b751', 'type': 'tool_call'}]),
ToolMessage(content='Successfully transferred back to supervisor',
name='transfer_back_to_supervisor', id='6cf4ce09-723f-4f86-9bc1-0e5681a7a2c2',
tool_call_id='f0d05ade-4f7f-479b-939c-a50ce013b751'))]]}

```

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```

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booked your flight from LAX to NYC. If you have any more requests or need
assistance with anything else, just let me know!", additional_kwargs={'refusal':
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```

```

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tool_call_id='f0d05ade-4f7f-479b-939c-a50ce013b751'), AIMessage(content="I've
    ↳booked your flight from LAX to NYC.
If you have any more requests or need assistance with anything else, just let me
    ↳know!",
additional_kwargs={'refusal': None}, response_metadata={'token_usage':
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```

```

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```

```

[values] {'messages': [HumanMessage(content='Book a flight from LAX to
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additional_kwargs={'tool_calls': [{'id': 'call_zuuNYDhCObdvrEfLWLZONee1',
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usage_metadata={'input_tokens': 88, 'output_tokens': 14, 'total_tokens': 102,
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tool_call_id='call_zuuNYDhCObdvrEfLWLZONee1'), AIMessage(content='Your flight
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```

```

AIMessage(content='Transferring back to supervisor', additional_kwargs={},
response_metadata={'__is_handoff_back': True}, name='flight_assistant',
id='55b97dc0-4306-46c3-ac78-40d9a12ad65a', tool_calls=[{'name':
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'f0d05ade-4f7f-479b-939c-a50ce013b751', 'type': 'tool_call'}]),
ToolMessage(content='Successfully transferred back to supervisor',
name='transfer_back_to_supervisor', id='6cf4ce09-723f-4f86-9bc1-0e5681a7a2c2',
tool_call_id='f0d05ade-4f7f-479b-939c-a50ce013b751'), AIMessage(content="I've
booked your flight from LAX to NYC. If you have any more requests or need
assistance with anything else, just let me know!", additional_kwargs={'refusal':
None}, response_metadata={'token_usage': {'completion_tokens': 29,
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'stop', 'logprobs': None}, name='supervisor', id='run--
7ae78393-16c9-447d-ae0-d39fb08eac66-0', usage_metadata={'input_tokens': 202,
'output_tokens': 29, 'total_tokens': 231, 'input_token_details': {'audio': 0,
'cache_read': 0}, 'output_token_details': {'audio': 0, 'reasoning': 0}})])

```

1.3 Section 3: Swarm Multi-Agent System

This example showcases a swarm architecture where agents can directly hand off tasks to one another. This is useful for more collaborative workflows.

Code Logic: 1. **Tool Definition:** Similar to the supervisor example, `book_hotel_swarm` and `book_flight_swarm` are defined. 2. **Handoff Tool Creation:** `create_handoff_tool` is used to create special tools that allow one agent to transfer control to another. 3. **Agent Creation:** Agents are created with both their primary tool and the handoff tools. 4. **Swarm Creation:** `create_swarm` assembles the agents into a collaborative system. A `default_active_agent` is specified to handle the initial user request. 5. **Execution:** The user request is streamed through the swarm.

```

[30]: from langchain_openai import ChatOpenAI
from langgraph.prebuilt import create_react_agent
from langgraph_swarm import create_swarm, create_handoff_tool

# Define booking tools
def book_hotel_swarm(hotel_name: str):
    """Book a hotel"""
    return f'Hotel booked: {hotel_name}'

def book_flight_swarm(from_airport: str, to_airport: str):
    """Book a flight"""
    return f'Flight booked: {from_airport} to {to_airport}'

```

```
[31]: # Create handoff tools
transfer_to_hotel = create_handoff_tool(
    agent_name='hotel_assistant',
    description='Transfer to hotel booking assistant.',
)

transfer_to_flight = create_handoff_tool(
    agent_name='flight_assistant',
    description='Transfer to flight booking assistant.',
)

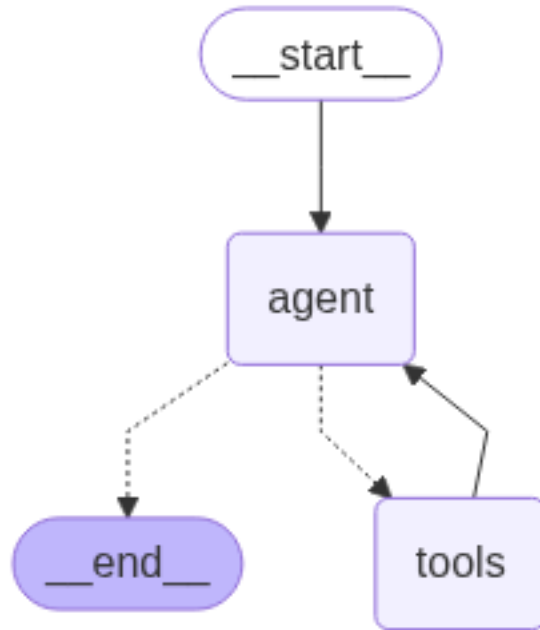
# Create agents
flight_assistant_swarm = create_react_agent(
    model=ChatOpenAI(model='gpt-4o-mini'),
    tools=[book_flight_swarm, transfer_to_hotel],
    prompt='You are a flight booking assistant.',
    name='flight_assistant',
)

hotel_assistant_swarm = create_react_agent(
    model=ChatOpenAI(model='gpt-4o-mini'),
    tools=[book_hotel_swarm, transfer_to_flight],
    prompt='You are a hotel booking assistant.',
    name='hotel_assistant',
)
```

```
[32]: print('Subgraph structure:')
# Optional: Display a visualization of the graph's structure.
try:
    from IPython.display import Image, display

    display(Image(hotel_assistant_swarm.get_graph().draw_mermaid_png()))
except Exception:
    pass
```

Subgraph structure:



```
[33]: # Create swarm
swarm = create_swarm(agents=[flight_assistant_swarm, hotel_assistant_swarm],
    ↪ default_active_agent='flight_assistant').compile()

print('\n=== SWARM EXAMPLE ===')
for chunk in swarm.stream({'messages': [{'role': 'user', 'content': 'Book a
    ↪ hotel at Marriott'}]}], debug=True):
    if chunk:
        print('-'*60)
        print(f'Chunk: {chunk}')
        # print(chunk)
```

=== SWARM EXAMPLE ===

```
[values] {'messages': [HumanMessage(content='Book a hotel at Marriott',
additional_kwargs={}, response_metadata={},
id='2dc38b55-a439-4fe5-888b-843184996a92')]}
[updates] {'flight_assistant': {'messages': [HumanMessage(content='Book
a hotel at Marriott', additional_kwargs={}, response_metadata={},
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additional_kwargs={'tool_calls': [{'id': 'call_MnvTBzovKXQWPviSEoAxOPEI',
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```

```

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'hotel_assistant'}}

```

```

-----

Chunk: {'flight_assistant': {'messages': [HumanMessage(content='Book a hotel at
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↳'hotel_assistant'}}

```

```
[values] {'messages': [HumanMessage(content='Book a hotel at Marriott',
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'hotel_assistant'}

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```

```

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```

```

Chunk: {'hotel_assistant': {'messages': [HumanMessage(content='Book a hotel at
↳Marriott', additional_kwargs={}),
response_metadata={}, id='2dc38b55-a439-4fe5-888b-843184996a92'),
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additional_kwargs={'tool_calls': [{'id': 'call_MnvTBzovKXQWPviSEoAxOPEI',
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```



```

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  ↳'output_token_details': {'audio': 0,
'reasoning': 0}}), ToolMessage(content='Successfully transferred to␣
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AIMessage(content='Your hotel at Marriott has been successfully booked! If you␣
  ↳need anything else, just let me
know.', additional_kwargs={'refusal': None}, response_metadata={'token_usage':␣
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```

```
{'audio_tokens': 0, 'cached_tokens': 0}}, 'model_name':
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  ↳ 'default', 'finish_reason':
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  ↳ id='run--dd6d8c79-9a42-42e2-9bf5-cfb81f79a537-0',
usage_metadata={'input_tokens': 149, 'output_tokens': 21, 'total_tokens': 170,
  ↳ input_token_details': {'audio': 0,
'cache_read': 0}, 'output_token_details': {'audio': 0, 'reasoning': 0}}]}}
```

```
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additional_kwargs={}, response_metadata={},
id='2dc38b55-a439-4fe5-888b-843184996a92'), AIMessage(content='',
additional_kwargs={'tool_calls': [{'id': 'call_MnvTBzovKXQWPviSEoAxOPEI',
'function': {'arguments': '{}', 'name': 'transfer_to_hotel_assistant'}, 'type':
'function'}], 'refusal': None}, response_metadata={'token_usage':
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0, 'reasoning_tokens': 0, 'rejected_prediction_tokens': 0},
'prompt_tokens_details': {'audio_tokens': 0, 'cached_tokens': 0}}, 'model_name':
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'finish_reason': 'tool_calls', 'logprobs': None}, name='flight_assistant',
id='run--dc3f416d-30e3-4d94-b0fa-79d82ecd57c3-0', tool_calls=[{'name':
'transfer_to_hotel_assistant', 'args': {}, 'id':
'call_MnvTBzovKXQWPviSEoAxOPEI', 'type': 'tool_call'}],
usage_metadata={'input_tokens': 82, 'output_tokens': 14, 'total_tokens': 96,
'input_token_details': {'audio': 0, 'cache_read': 0}, 'output_token_details':
{'audio': 0, 'reasoning': 0}}), ToolMessage(content='Successfully transferred to
hotel_assistant', name='transfer_to_hotel_assistant',
id='aa2fec9d-427f-4e8d-adf9-29ed48bb9434',
tool_call_id='call_MnvTBzovKXQWPviSEoAxOPEI'), AIMessage(content='',
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'function': {'arguments': '{"hotel_name": "Marriott"}', 'name':
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response_metadata={'token_usage': {'completion_tokens': 19, 'prompt_tokens':
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'cached_tokens': 0}}, 'model_name': 'gpt-4o-mini-2024-07-18',
'system_fingerprint': 'fp_e665f7564b', 'id': 'chatcmpl-
CCbQ0J7wP0iymr1vvr220eDC1R9K', 'service_tier': 'default', 'finish_reason':
'tool_calls', 'logprobs': None}, name='hotel_assistant', id='run--
ad0bae1e-7d2b-47c5-a462-43b940475b8b-0', tool_calls=[{'name':
'book_hotel_swarm', 'args': {'hotel_name': 'Marriott'}, 'id':
'call_yBrstTjoQC1wAlIVggSvOXg3', 'type': 'tool_call'}],
usage_metadata={'input_tokens': 111, 'output_tokens': 19, 'total_tokens': 130,
```

```
'input_token_details': {'audio': 0, 'cache_read': 0}, 'output_token_details':
{'audio': 0, 'reasoning': 0})), ToolMessage(content='Hotel booked: Marriott',
name='book_hotel_swarm', id='daleb735-9a21-4c70-95bc-e2416c0fb596',
tool_call_id='call_yBrstTjoQC1wAlIVggSv0Xg3'), AIMessage(content='Your hotel at
Marriott has been successfully booked! If you need anything else, just let me
know.', additional_kwargs={'refusal': None}, response_metadata={'token_usage':
{'completion_tokens': 21, 'prompt_tokens': 149, 'total_tokens': 170,
'completion_tokens_details': {'accepted_prediction_tokens': 0, 'audio_tokens':
0, 'reasoning_tokens': 0, 'rejected_prediction_tokens': 0},
'prompt_tokens_details': {'audio_tokens': 0, 'cached_tokens': 0}}, 'model_name':
'gpt-4o-mini-2024-07-18', 'system_fingerprint': 'fp_e665f7564b', 'id':
'chatcmpl-CCbQPR8UtkoKF0JfatTNKseYRm0qU', 'service_tier': 'default',
'finish_reason': 'stop', 'logprobs': None}, name='hotel_assistant', id='run--
dd6d8c79-9a42-42e2-9bf5-cfb81f79a537-0', usage_metadata={'input_tokens': 149,
'output_tokens': 21, 'total_tokens': 170, 'input_token_details': {'audio': 0,
'cache_read': 0}, 'output_token_details': {'audio': 0, 'reasoning': 0}})],
'active_agent': 'hotel_assistant'}
```

1.4 Section 4: Custom Handoffs Implementation

This section provides a from-scratch implementation of handoffs, giving you more control over the agent interaction logic. It uses a `StateGraph` to define the workflow explicitly.

Code Logic:

- Tool Definition:** `book_hotel_custom` and `book_flight_custom` are defined.
- Custom Handoff Tool Factory:** A function `create_handoff_tool` is created. This factory generates a tool that, when called, returns a `Command` object. This `Command` instructs the graph to transition to a different agent node.
- Agent Definition:** Agents are created with their respective tools, including the custom handoff tools.
- Graph Building:** A `StateGraph` is constructed. The agents are added as nodes, and an entry point (`START`) is defined, directing initial requests to the `flight_assistant`.

```
[34]: from typing import Annotated
from langchain_core.tools import tool, InjectedToolCallId
from langchain_openai import ChatOpenAI
from langgraph.prebuilt import create_react_agent, InjectedState
from langgraph.graph import StateGraph, START, MessagesState
from langgraph.types import Command

# Define booking tools
def book_hotel_custom(hotel_name: str):
    """Book a hotel"""
    return f'Custom hotel booking: {hotel_name}'

def book_flight_custom(from_airport: str, to_airport: str):
    """Book a flight"""
    return f'Custom flight booking: {from_airport} to {to_airport}'
```

```
[35]: # Custom handoff tool factory
def create_handoff_tool_custom(*, agent_name: str, description: str):
    name = f'transfer_to_{agent_name}'

    @tool(name, description=description)
    def handoff_tool(
        state: Annotated[MessagesState, InjectedState],
        tool_call_id: Annotated[str, InjectedToolCallId],
    ) -> Command:
        tool_message = {
            'role': 'tool',
            'content': f'Transferred to {agent_name}',
            'name': name,
            'tool_call_id': tool_call_id,
        }
        return Command(
            goto=agent_name,
            update={'messages': state['messages'] + [tool_message]},
            graph=Command.PARENT,
        )

    return handoff_tool
```

```
[36]: # Create handoff tools
transfer_to_hotel_custom = create_handoff_tool_custom(
    agent_name='hotel_assistant',
    description='Transfer to hotel assistant.',
)

transfer_to_flight_custom = create_handoff_tool_custom(
    agent_name='flight_assistant',
    description='Transfer to flight assistant.',
)

# Define agents
flight_assistant_custom = create_react_agent(
    model=ChatOpenAI(model='gpt-4o-mini'),
    tools=[book_flight_custom, transfer_to_hotel_custom],
    prompt='You are a flight booking assistant.',
    name='flight_assistant',
)

hotel_assistant_custom = create_react_agent(
    model=ChatOpenAI(model='gpt-4o-mini'),
    tools=[book_hotel_custom, transfer_to_flight_custom],
    prompt='You are a hotel booking assistant.',
    name='hotel_assistant',
)
```

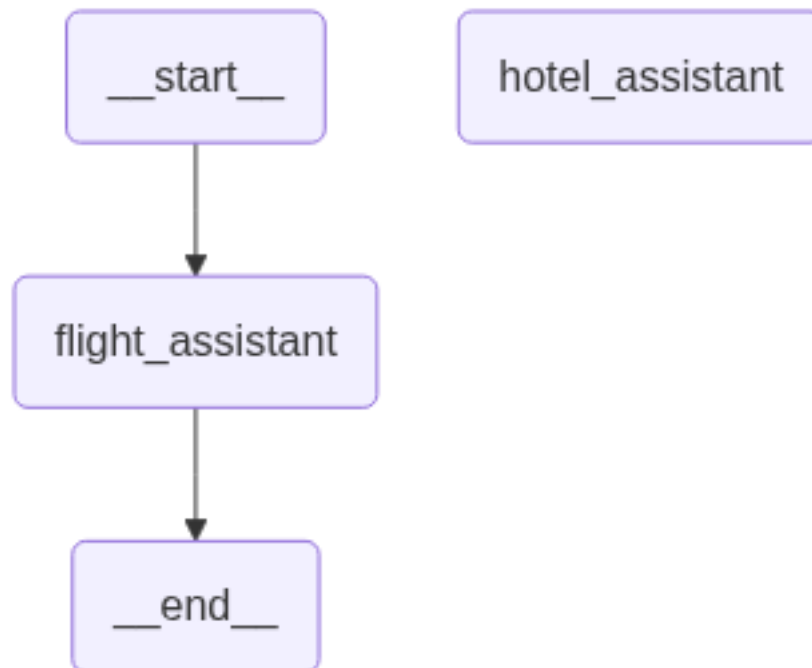
```
)

# Build graph
multi_agent_graph = (
    StateGraph(MessagesState)
    .add_node('flight_assistant', flight_assistant_custom)
    .add_node('hotel_assistant', hotel_assistant_custom)
    .add_edge(START, 'flight_assistant')
    .compile()
)
```

```
[37]: print('Subgraph structure:')
# Optional: Display a visualization of the graph's structure.
try:
    from IPython.display import Image, display

    display(Image(multi_agent_graph.get_graph().draw_mermaid_png()))
except Exception:
    pass
```

Subgraph structure:



```
[38]: from regex import P

print('\n=== CUSTOM HANDOFFS EXAMPLE ===')
for chunk in multi_agent_graph.stream({'messages': [{'role': 'user', 'content': 'Book a flight from SFO to LAX'}]}, debug=True):
    if chunk:
        print('-'*60)
        print(f'Chunk: {chunk}')
        # print(chunk)
```

=== CUSTOM HANDOFFS EXAMPLE ===

```
[values] {'messages': [HumanMessage(content='Book a flight from SFO to LAX', additional_kwargs={}, response_metadata={}, id='186cce3e-417a-48b8-a34d-946e1440b370')]}
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```

```
'chatcmpl-CCbQRWxHAgmMvDMaiugaCirpfNN3y', 'service_tier': 'default',
'finish_reason': 'stop', 'logprobs': None}, name='flight_assistant', id='run--
8b125750-36b5-4370-867b-39fdc34a4a9c-0', usage_metadata={'input_tokens': 133,
'output_tokens': 46, 'total_tokens': 179, 'input_token_details': {'audio': 0,
'cache_read': 0}, 'output_token_details': {'audio': 0, 'reasoning': 0}})]}}
```

```
-----

Chunk: {'flight_assistant': {'messages': [HumanMessage(content='Book a flight
↳from SFO to LAX',
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↳'cached_tokens': 0}}, 'model_name':
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'service_tier': 'default', 'finish_reason': 'tool_calls', 'logprobs': None},
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id='run--a4d60074-46be-402b-a2d3-b0550906ceb7-0', tool_calls=[{'name':
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{'from_airport': 'SFO', 'to_airport': 'LAX'}, 'id':
↳'call_sTdaAZ9PdyFcg8h5aFLkoiR1', 'type': 'tool_call'}],
usage_metadata={'input_tokens': 84, 'output_tokens': 26, 'total_tokens': 110,
↳'input_token_details': {'audio': 0,
'cache_read': 0}, 'output_token_details': {'audio': 0, 'reasoning': 0}}),
↳ToolMessage(content='Custom flight
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↳id='a01d5778-28ec-4402-85e7-c596155bdbe2',
tool_call_id='call_sTdaAZ9PdyFcg8h5aFLkoiR1'), AIMessage(content='Your flight
↳from San Francisco International
Airport (SFO) to Los Angeles International Airport (LAX) has been successfully
↳booked. If you need any further
assistance, such as hotel transfers or additional bookings, feel free to ask!',
↳additional_kwargs={'refusal':
None}, response_metadata={'token_usage': {'completion_tokens': 46,
↳'prompt_tokens': 133, 'total_tokens': 179,
'completion_tokens_details': {'accepted_prediction_tokens': 0, 'audio_tokens':
↳0, 'reasoning_tokens': 0,
```



```

'rejected_prediction_tokens': 0}, 'prompt_tokens_details': {'audio_tokens': 0,
↳ 'cached_tokens': 0}}, 'model_name':
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↳ 'chatcmpl-CCbQRWxHAgmMvDMaiugaCirpfNN3y',
'service_tier': 'default', 'finish_reason': 'stop', 'logprobs': None},
↳ name='flight_assistant',
id='run--8b125750-36b5-4370-867b-39fdc34a4a9c-0', usage_metadata={'input_tokens':
↳ 133, 'output_tokens': 46,
'total_tokens': 179, 'input_token_details': {'audio': 0, 'cache_read': 0},
↳ 'output_token_details': {'audio': 0,
'reasoning': 0}}]}}}

```

```

[values] {'messages': [HumanMessage(content='Book a flight from SFO to
LAX', additional_kwargs={}, response_metadata={},
id='186cce3e-417a-48b8-a34d-946e1440b370'), AIMessage(content='',
additional_kwargs={'tool_calls': [{'id': 'call_sTdaAZ9PdyFcg8h5aFLkoiR1',
'function': {'arguments': '{"from_airport": "SFO", "to_airport": "LAX"}', 'name':
'book_flight_custom'}, 'type': 'function'}], 'refusal': None},
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'finish_reason': 'tool_calls', 'logprobs': None}, name='flight_assistant',
id='run--a4d60074-46be-402b-a2d3-b0550906ceb7-0', tool_calls=[{'name':
'book_flight_custom', 'args': {'from_airport': 'SFO', 'to_airport': 'LAX'},
'id': 'call_sTdaAZ9PdyFcg8h5aFLkoiR1', 'type': 'tool_call'}],
usage_metadata={'input_tokens': 84, 'output_tokens': 26, 'total_tokens': 110,
'input_token_details': {'audio': 0, 'cache_read': 0}, 'output_token_details':
{'audio': 0, 'reasoning': 0}}), ToolMessage(content='Custom flight booking: SFO
to LAX', name='book_flight_custom', id='a01d5778-28ec-4402-85e7-c596155bdbe2',
tool_call_id='call_sTdaAZ9PdyFcg8h5aFLkoiR1'), AIMessage(content='Your flight
from San Francisco International Airport (SFO) to Los Angeles International
Airport (LAX) has been successfully booked. If you need any further assistance,
such as hotel transfers or additional bookings, feel free to ask!',
additional_kwargs={'refusal': None}, response_metadata={'token_usage':
{'completion_tokens': 46, 'prompt_tokens': 133, 'total_tokens': 179,
'completion_tokens_details': {'accepted_prediction_tokens': 0, 'audio_tokens':
0, 'reasoning_tokens': 0, 'rejected_prediction_tokens': 0},
'prompt_tokens_details': {'audio_tokens': 0, 'cached_tokens': 0}}, 'model_name':
'gpt-4o-mini-2024-07-18', 'system_fingerprint': 'fp_8bda4d3a2c', 'id':
'chatcmpl-CCbQRWxHAgmMvDMaiugaCirpfNN3y', 'service_tier': 'default',
'finish_reason': 'stop', 'logprobs': None}, name='flight_assistant', id='run--
8b125750-36b5-4370-867b-39fdc34a4a9c-0', usage_metadata={'input_tokens': 133,
'output_tokens': 46, 'total_tokens': 179, 'input_token_details': {'audio': 0,
'cache_read': 0}, 'output_token_details': {'audio': 0, 'reasoning': 0}})]}]

```


1.5 Section 5: Conclusion

This notebook has demonstrated three powerful patterns for building multi-agent systems with LangGraph:

- **Supervisor:** Ideal for hierarchical task delegation where a manager oversees workers.
- **Swarm:** Suitable for collaborative environments where agents can pass tasks amongst themselves.
- **Custom Handoffs:** Offers the most flexibility for designing complex, bespoke agent interactions.

Potential Extensions:

- **Error Handling:** Implement more robust error handling within each agent.
- **Dynamic Routing:** Add more complex conditional logic for routing tasks.
- **State Management:** Enhance the state to carry more context between agent interactions.