Academy: Empowering Scientific Workflows with Federated Agents

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globus labs

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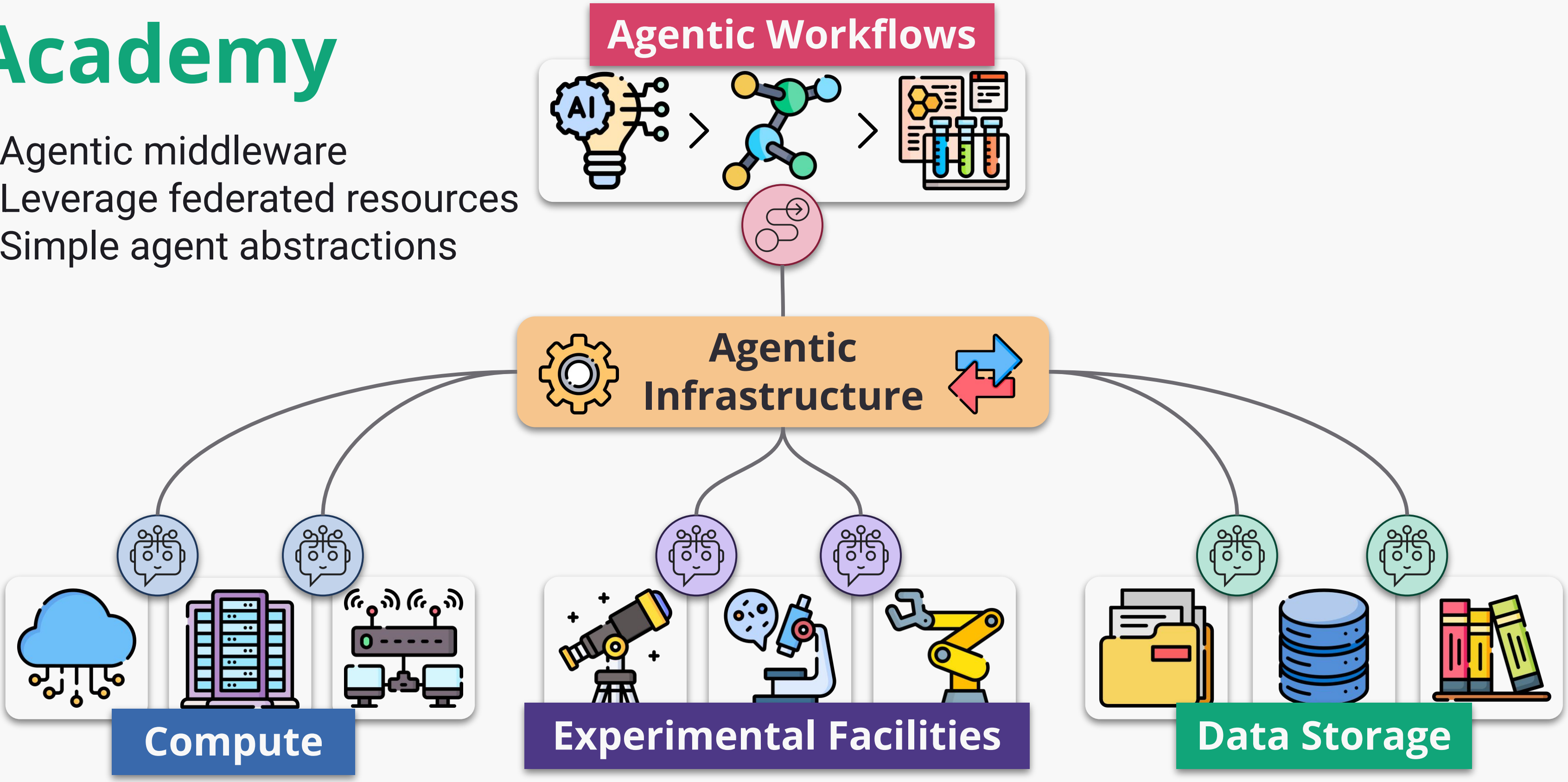
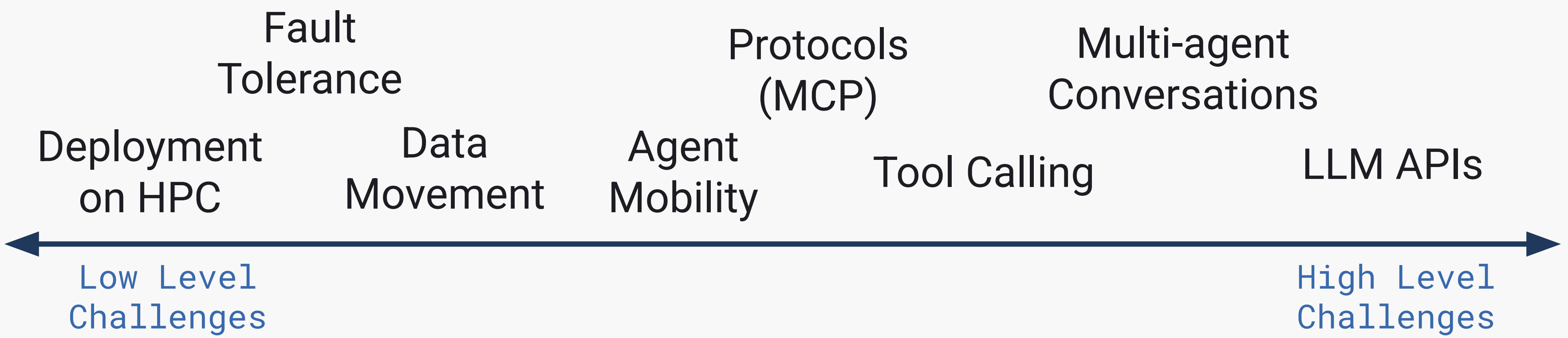
- Agentic middleware
- Leverage federated resources
- Simple agent abstractions



Agentic Middleware: Scope & Challenges



Academy → **Cool Science?** ← **LangChain, AutoGen, Pydantic AI, etc.**

Agentic Middleware: Using Research Infrastructure

Centralized

- Agents co-located (workstation, cloud)
- Research infrastructure available via APIs (REST, SDKs, …)
- Use infrastructure via tool calling

++ Rapidly growing library ecosystem
-- Limited APIs for infrastructure

LangChain, AutoGen, Pydantic AI, etc.

Decentralized

- Agents distributed across infrastructure
- Agents interact asynchronously
- Use infrastructure directly (actuate a robot, submit job, …)

++ Data locality, perf., loose coupling
-- Deployment complexity

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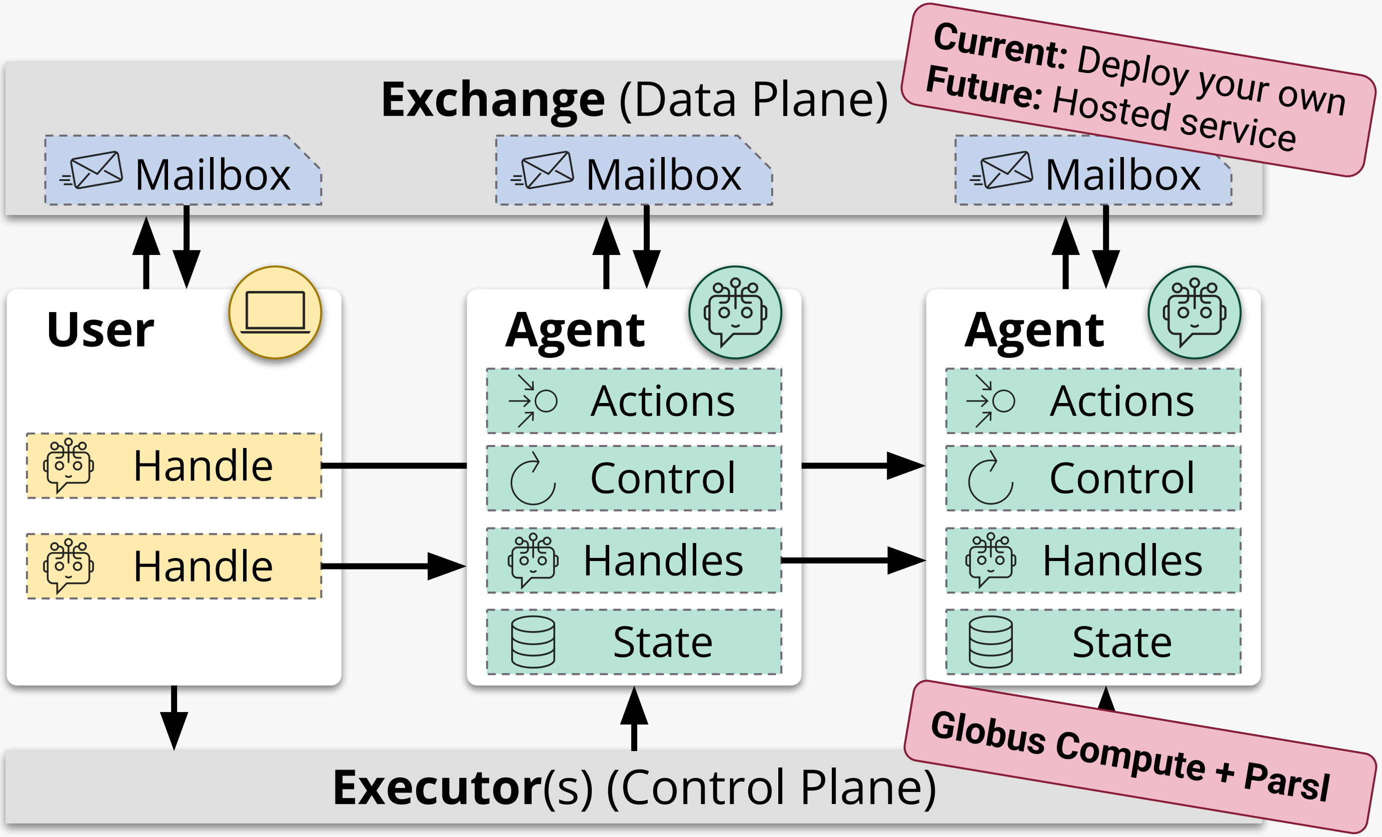
Design

Focus 3: Coordinate async agent messaging

Focus 1: Program diverse agents and interactions

Focus 2: Deploy agents on federated resources


Exchange (Data Plane)
Current: Deploy your own
Future: Hosted service
Mailbox
Mailbox
Mailbox
User
Handle
Handle
Agent
Actions
Control
Handles
State
Agent
Actions
Control
Handles
State
Globus Compute + Parsl
Executor(s) (Control Plane)

https://academy.proxystore.dev/latest/concepts/

Agents defined by a class

Clients & other agents can request actions

Instance of an agent is state

Control loops for autonomous behavior

```python
import asyncio
from academy.agent import Agent, action, loop

class Example(Agent):
    def __init__(self) -> None:
        self.count = 0  # State stored as attributes

    @action
    async def square(self, value: float) -> float:
        return value**2

    @loop
    async def count(self, shutdown: asyncio.Event) -> None:
        while not shutdown.is_set():
            self.count += 1
            await asyncio.sleep(1)
```

https://academy.proxystore.dev/latest/get-started/

Single interface for managing your agents

Launch agent and get handle

Interact with agents via handles

```python
from academy.exchange.redis import RedisExchangeFactory
from academy.manager import Manager
from globus_compute_sdk import GlobusComputeExecutor

gce = GlobusComputeExecutor('<UUID>')

async with await Manager.from_exchange_factory(
    factory=RedisExchangeFactory('localhost', 6379),
    executor=gce,
) as manager:
    handle = await manager.launch(Example)

    result = await handle.square(2)
    assert result == 4

    await handle.shutdown()  # Or via the manager
    await manager.shutdown(handle, blocking=True)
```

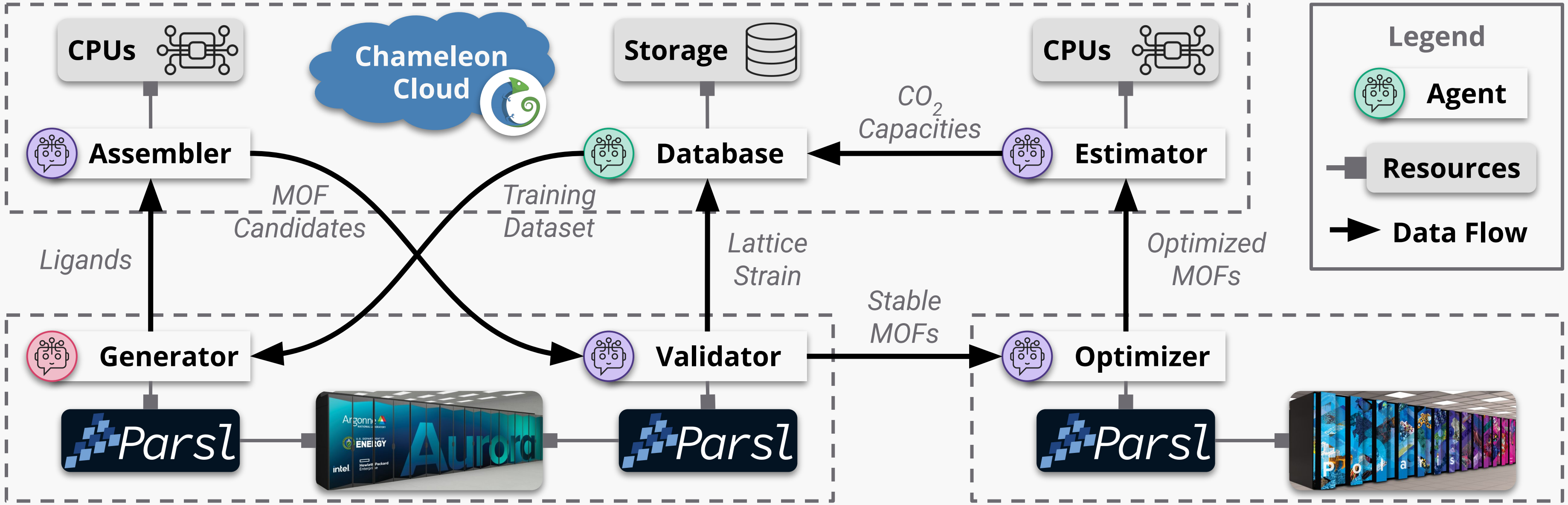
Launch agents via Globus Compute

Pass handles to other agents

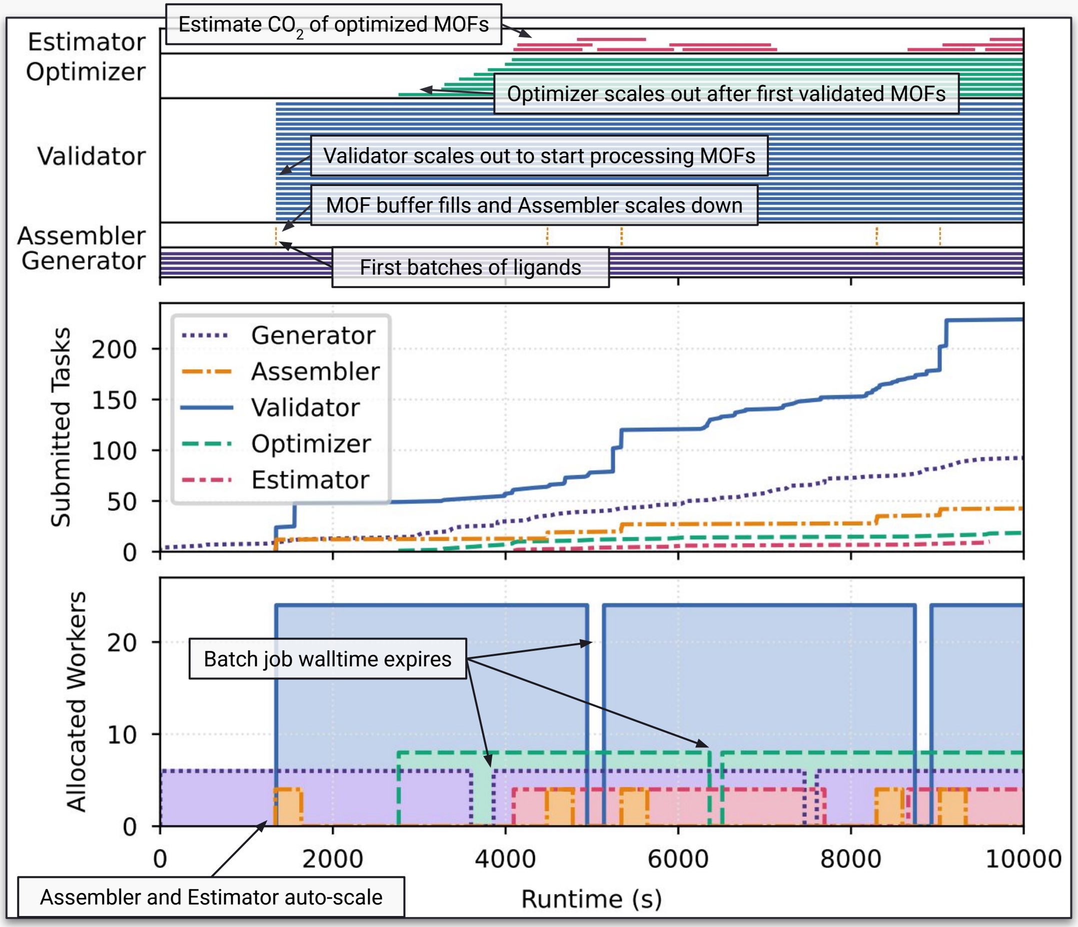
https://academy.proxystore.dev/latest/get-started/

Application

MOF Discovery through Autonomous Agents



Agents executed remotely via Globus Compute



Agentic Workflow Trace

Why is this agentic model better?

- ➔ **Placement:** Move agents to resources
- ➔ **Separation of concerns:** Resource acquisition and scaling based on local workload
- ➔ **Loose coupling:** Swap agents or integrate new agents (e.g., SDL)
- ➔ **Shared agents:** Multiple workflows can share agents (microservice-like)

Academy

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Learn more/stay up to date:

- arxiv.org/abs/2505.05428
- github.com/proxystore/academy
- academy.proxystore.dev

SC25 St. Louis, MO | hpc ignites.

Attend our tutorial!
Sunday 8:30am-12pm

⭐ Academy on GitHub!