Sandbox apps and workflow:// schema in Parsl: design, implementation and application lifecycle

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Introduction

- We extend workflow engine.
  - To support a new type of Sandbox App:
    - isolates each task in a scratch directory in a straightforward and transparent fashion.
    - using the workflow:// schema.
  - To address the following challenges:
    1. the definition of task dependencies.
    2. the execution of each task in an isolated sandbox.
    3. the data staging in the sandbox.

The workflow:// schema

The **workflow:// schema** uniquely identifies a task instance in the workflow

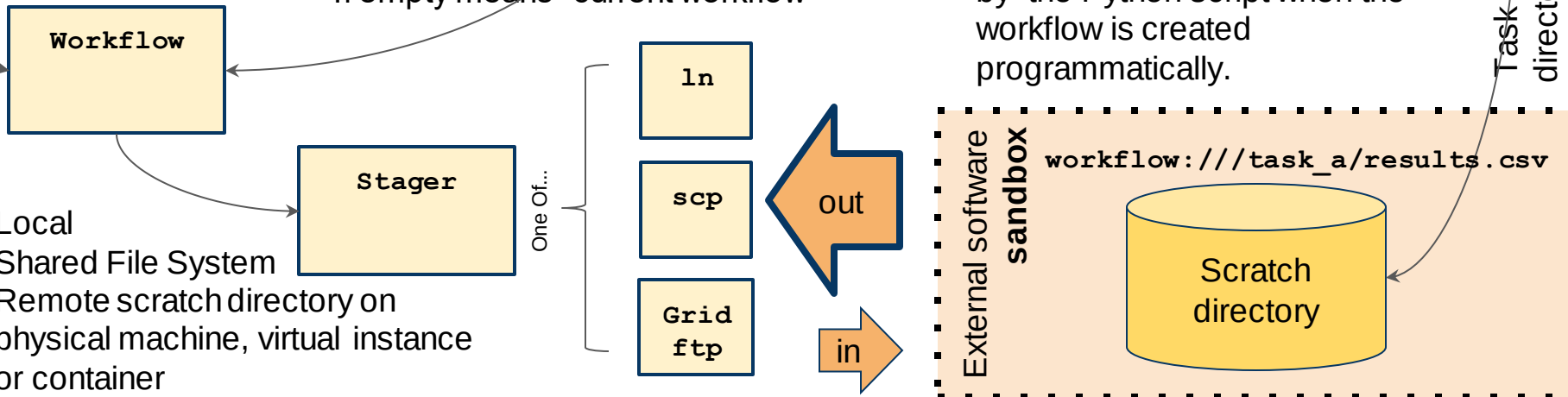
Designed for **Batch** tasks, is used for variables/files mapping for Native/Web/IoT.

The schema label

The workflow unique name
An UUID could be used
If empty means “current workflow”

The task unique name
Can be dynamically generated by the Python script when the workflow is created programmatically.

Task scratch directory root

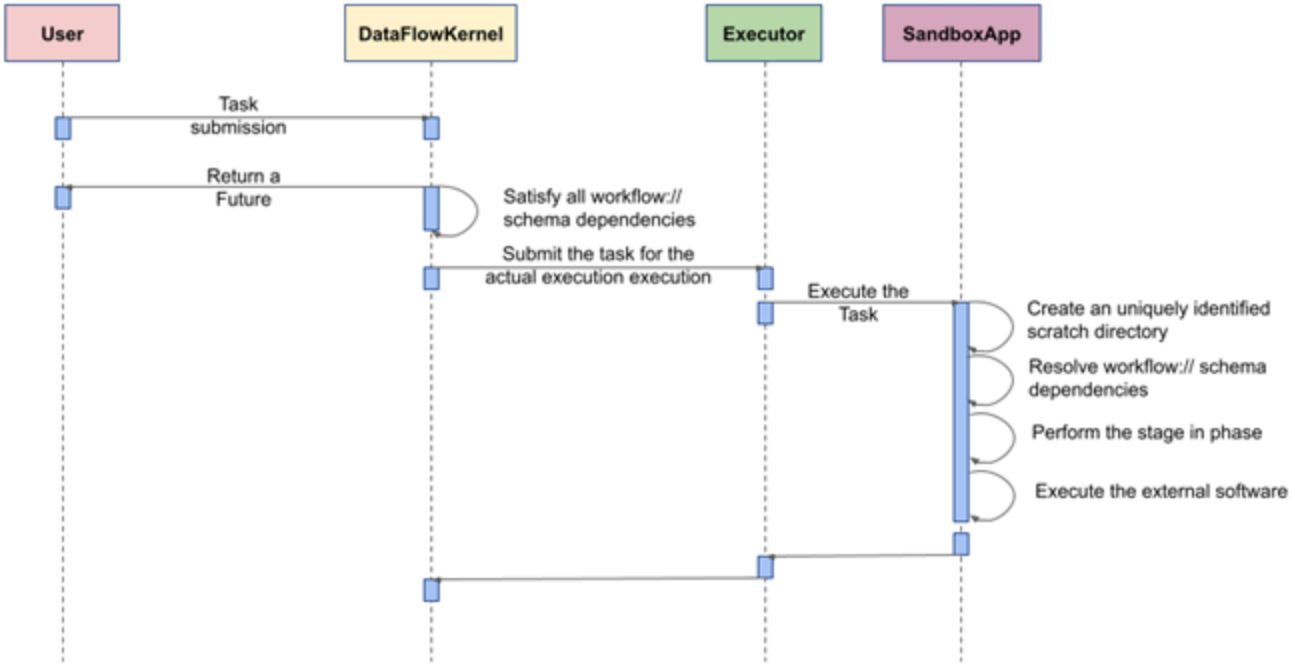


- Local
- Shared File System
- Remote scratch directory on physical machine, virtual instance or container

The Sandbox App in Parsl

The Sanbox App implements the following operations:

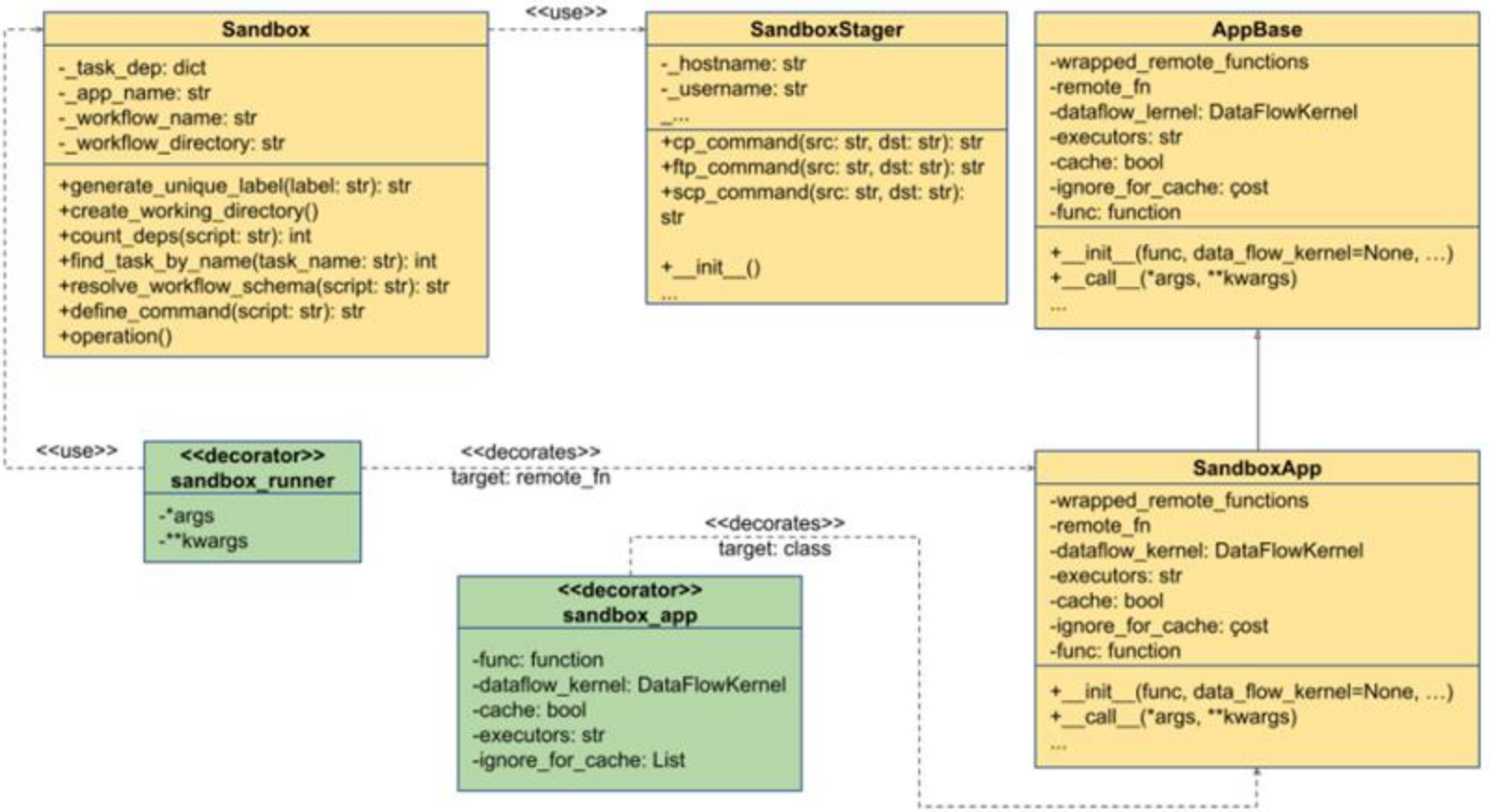
- Create a scratch directory.
- Resolve the workflow:// schema.
- Stage the input files.
- Execute the command in the scratch directory.

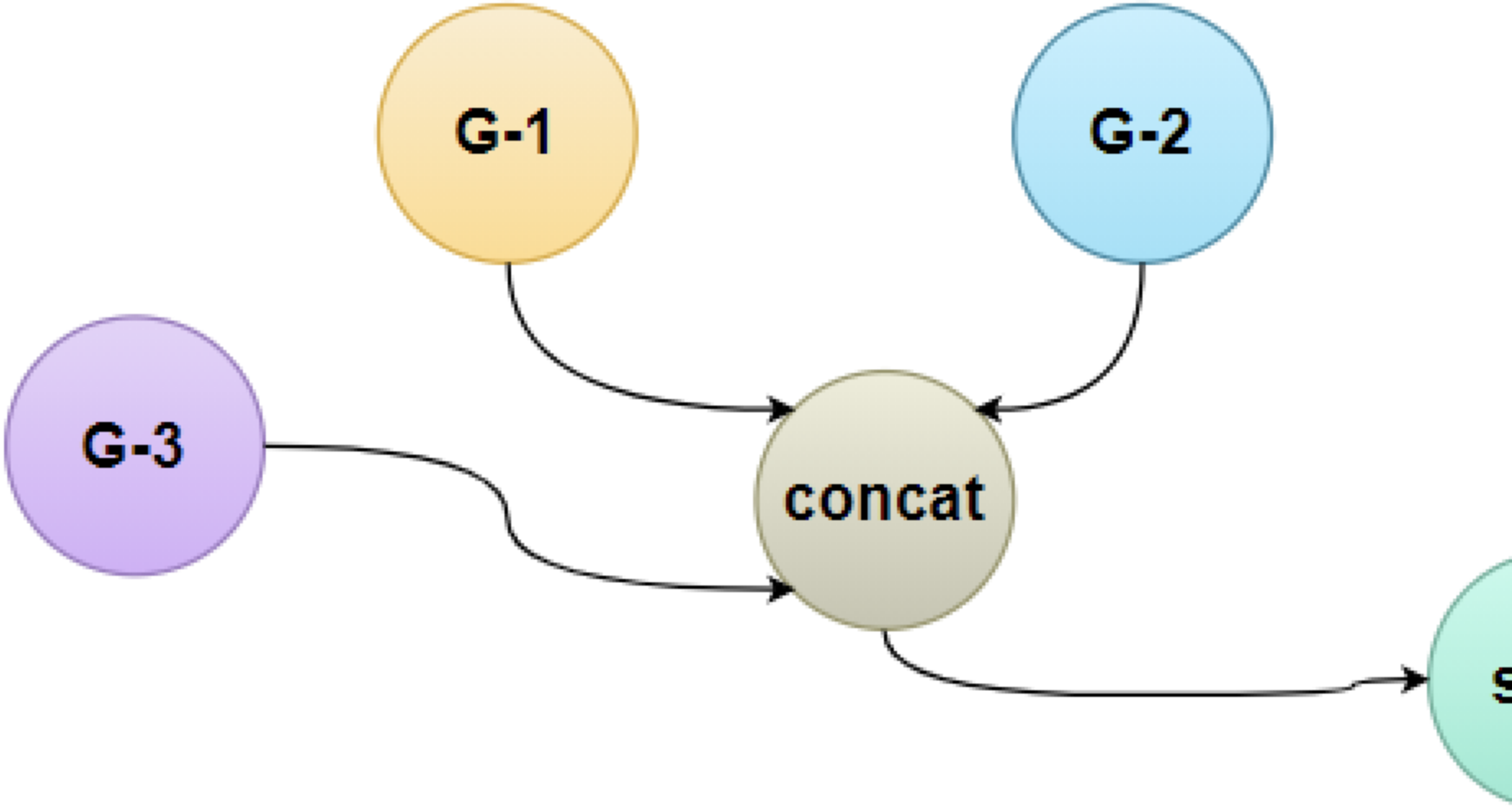



```
@sandbox_app
def hello(workflow_app_name="", project=""):
  return "'echo "hello world" > out.txt"
```

Listing 1: Definition of a Sandbox App

The Sandbox App in Parsl




G-1
G-2
G-3
concat

Conclusions

- We proposed an approach for integrating the workflow:// schema in Parsl.
- We designed and implemented a new type of Parsl App, called a Sandbox App.
- Using this approach, we automated the data staging phases of an external software task.
- We implemented these features and tested them using Parsl's LocalProvider.
- As a short-term future research plan, we will perform an extensive performance analysis.

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