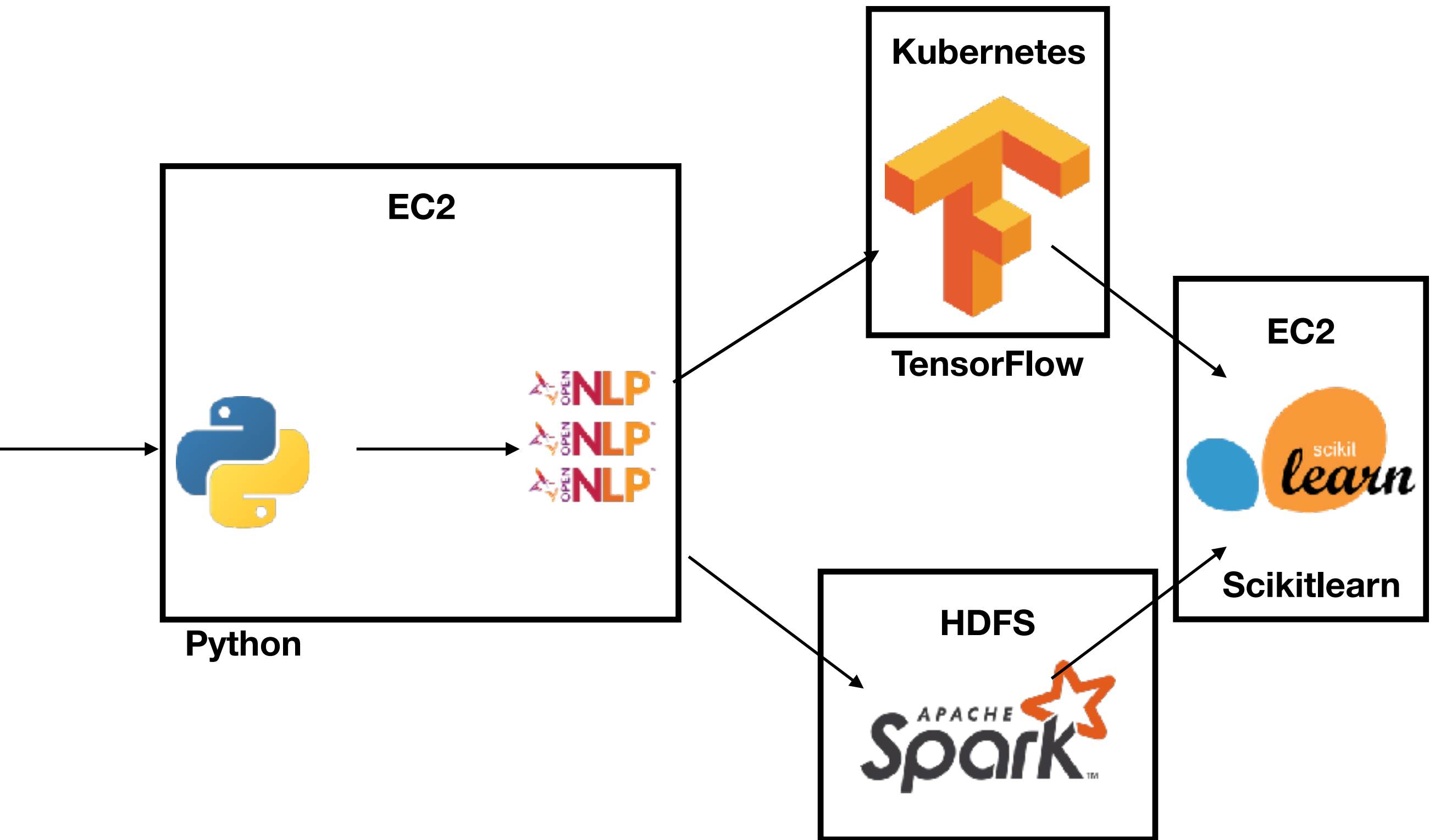


Airflow + Kubernetes

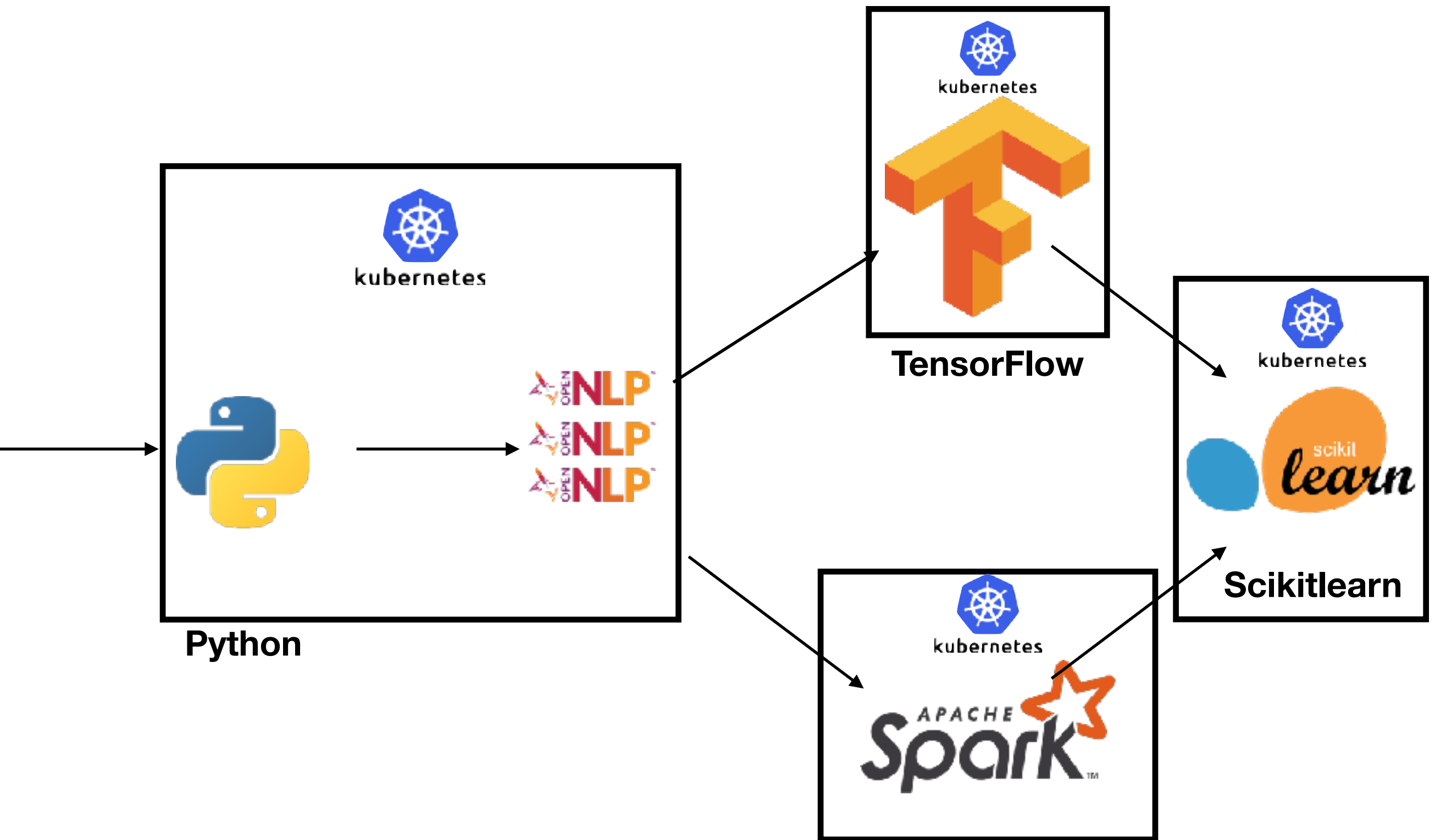
Airflow @ Bloomberg

- Data Science Platform
- Flexibility/language + framework heterogeneity
- Ease of Use (Data scientists don't need to know internals)

Data Science Platform



Data Science Platform



System Overview

- Launching Jobs
- Monitoring Jobs
- Error Handling

Launching Jobs

- Kubernetes Operator
- Kubernetes Executor

Kubernetes Operator

- Allow users to generatively build out a pod and deploy it at run-time
- Uses the Kubernetes python client
- Adds new level of dependency flexibility to custom operators

Dependency Management

SciKitOperator



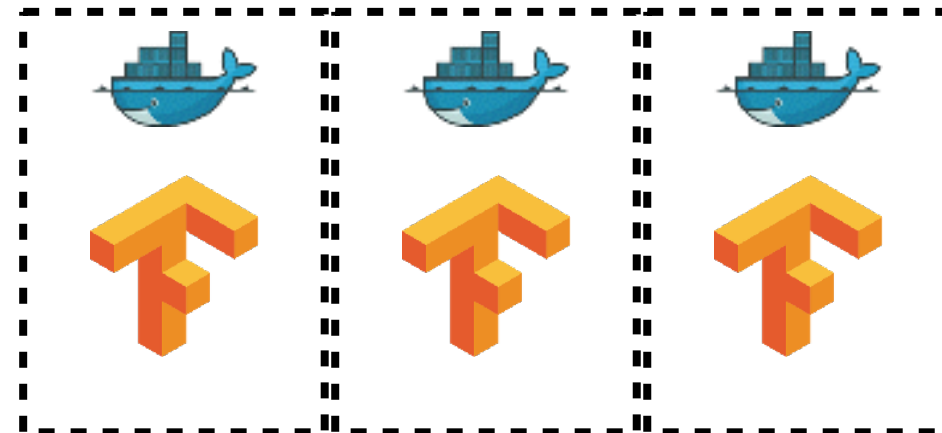
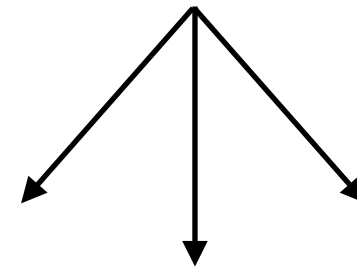
PodOperator



TensorFlowOperator



PodOperator



Helm

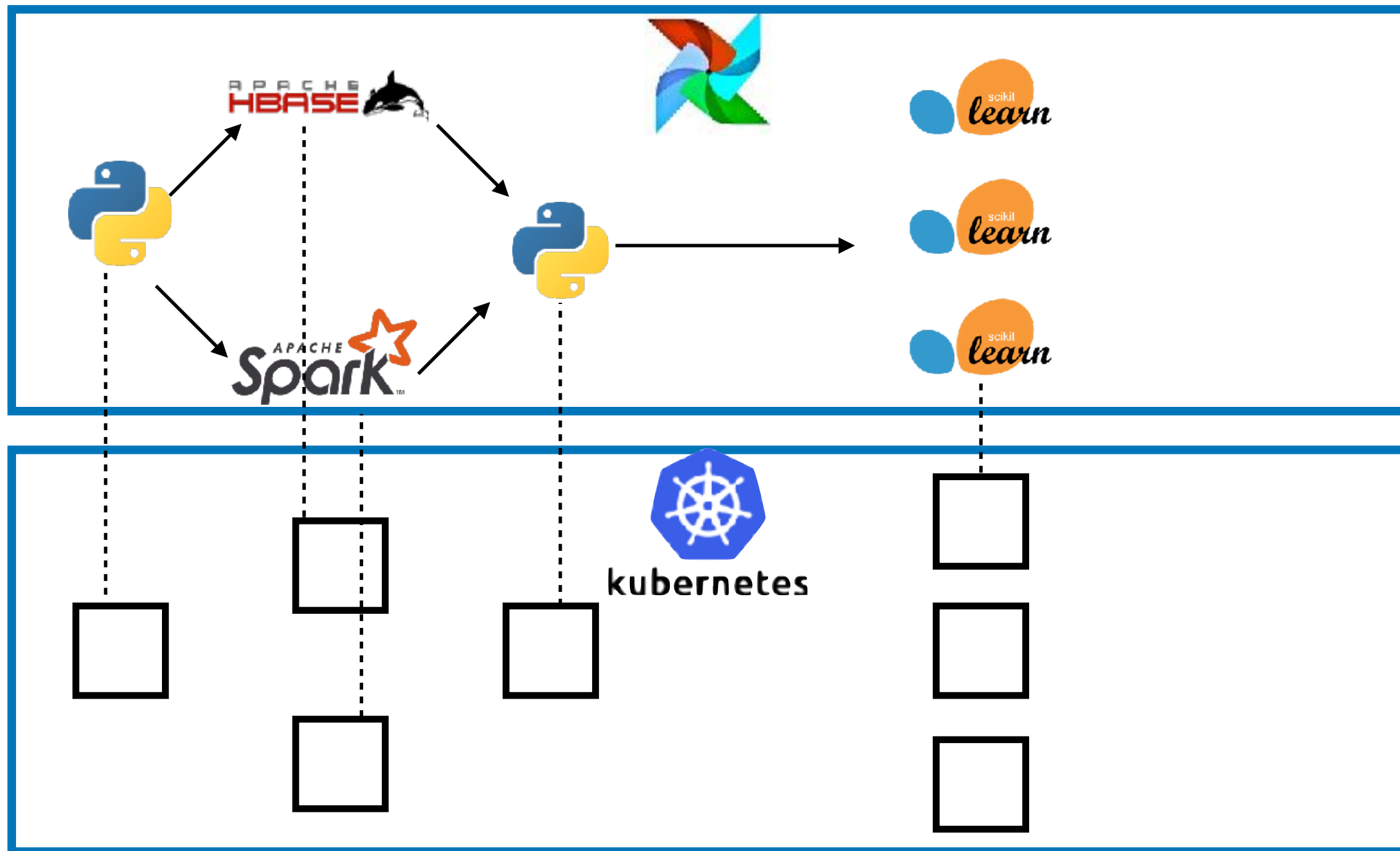


- “Homebrew for kubernetes”
- pre-configure clusters and allow modifications
- e.g. Tensorflow cluster, scikit cluster, etc

Kubernetes Executor

- Every task created by an operator will launch a new pod that will run the single task before dying
- Upside: increased scalability, less reliance on workers being HA, better resource management
- Downside: Each worker will have start-up time. (Though that is dependent on size of DAGs/storage method)

Kubernetes Executor



Kubernetes Executor

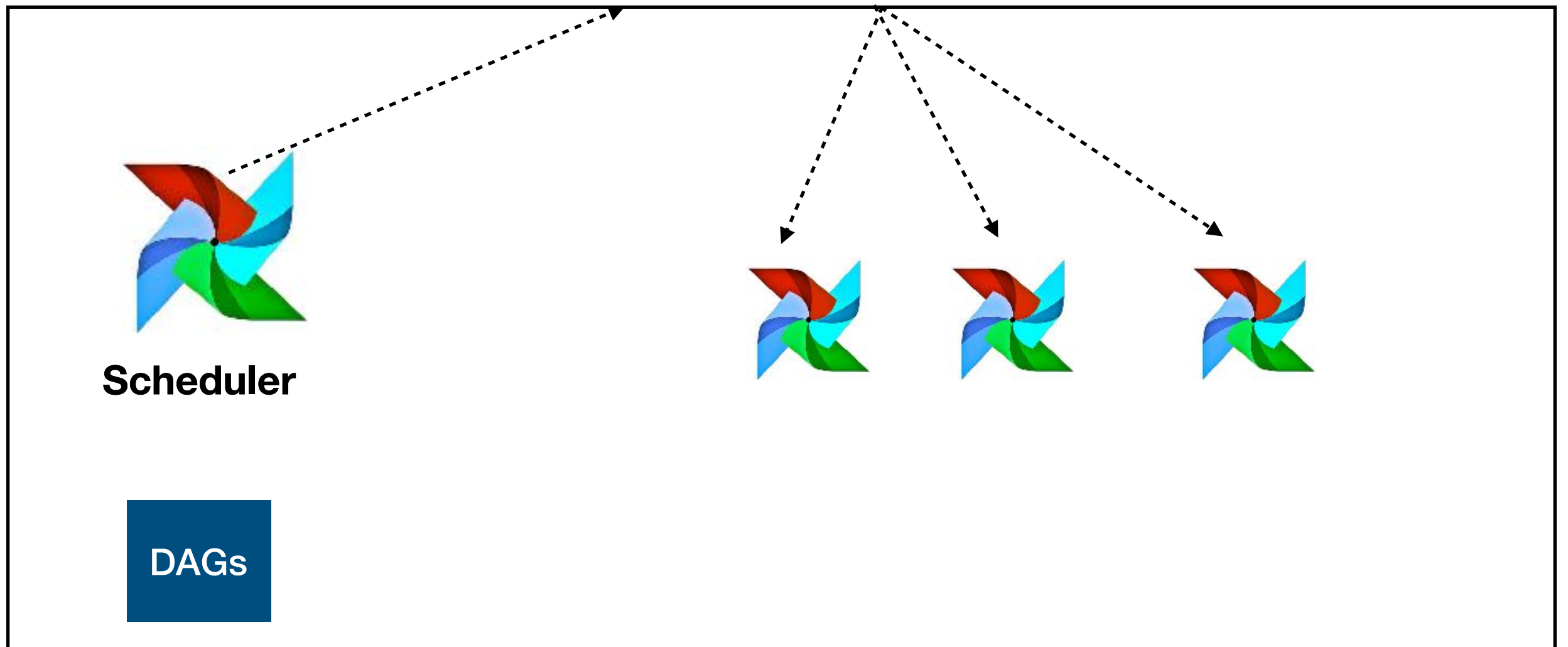


kubernetes

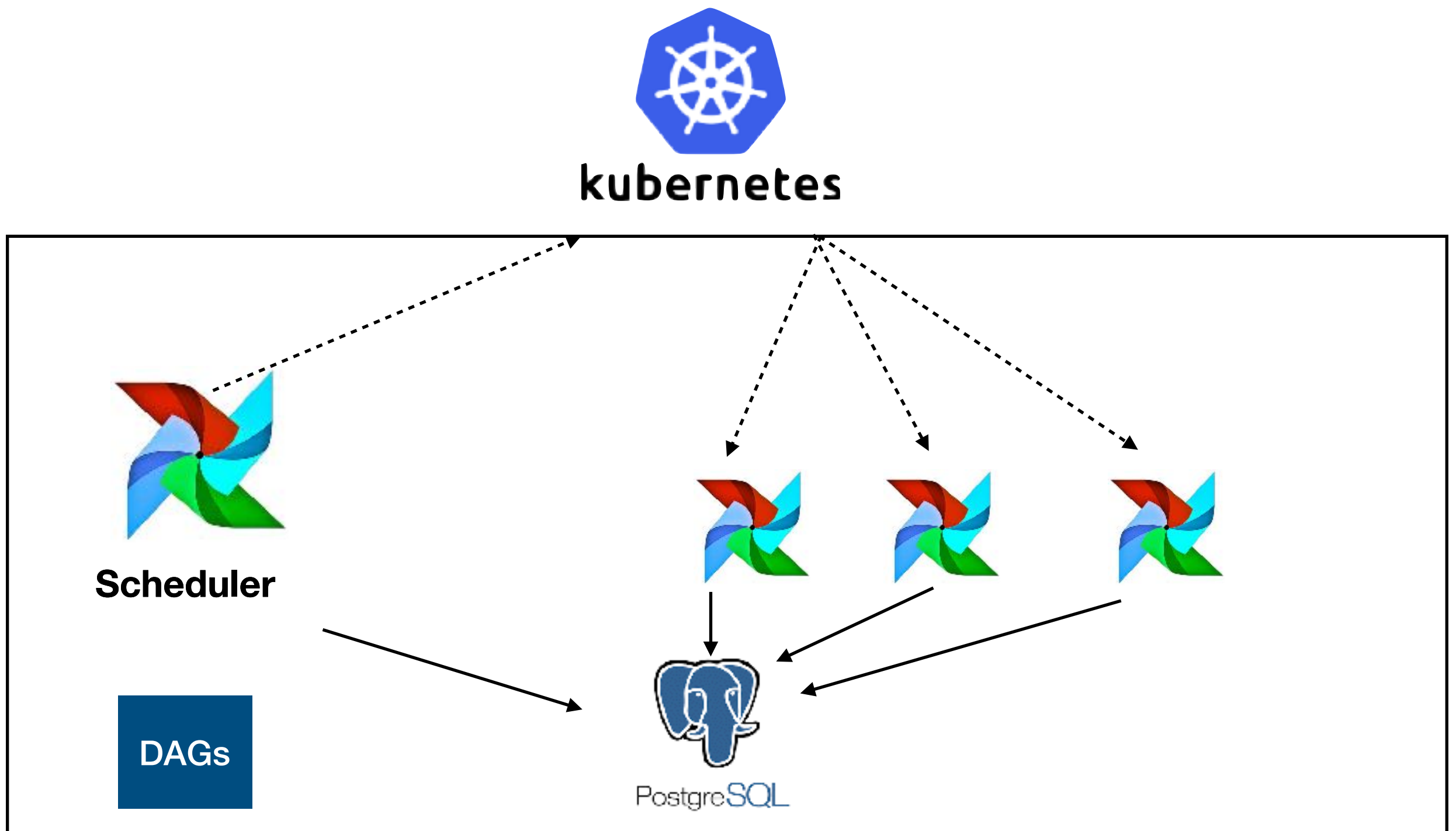


Scheduler

DAGs



Kubernetes Executor



Kubernetes Executor

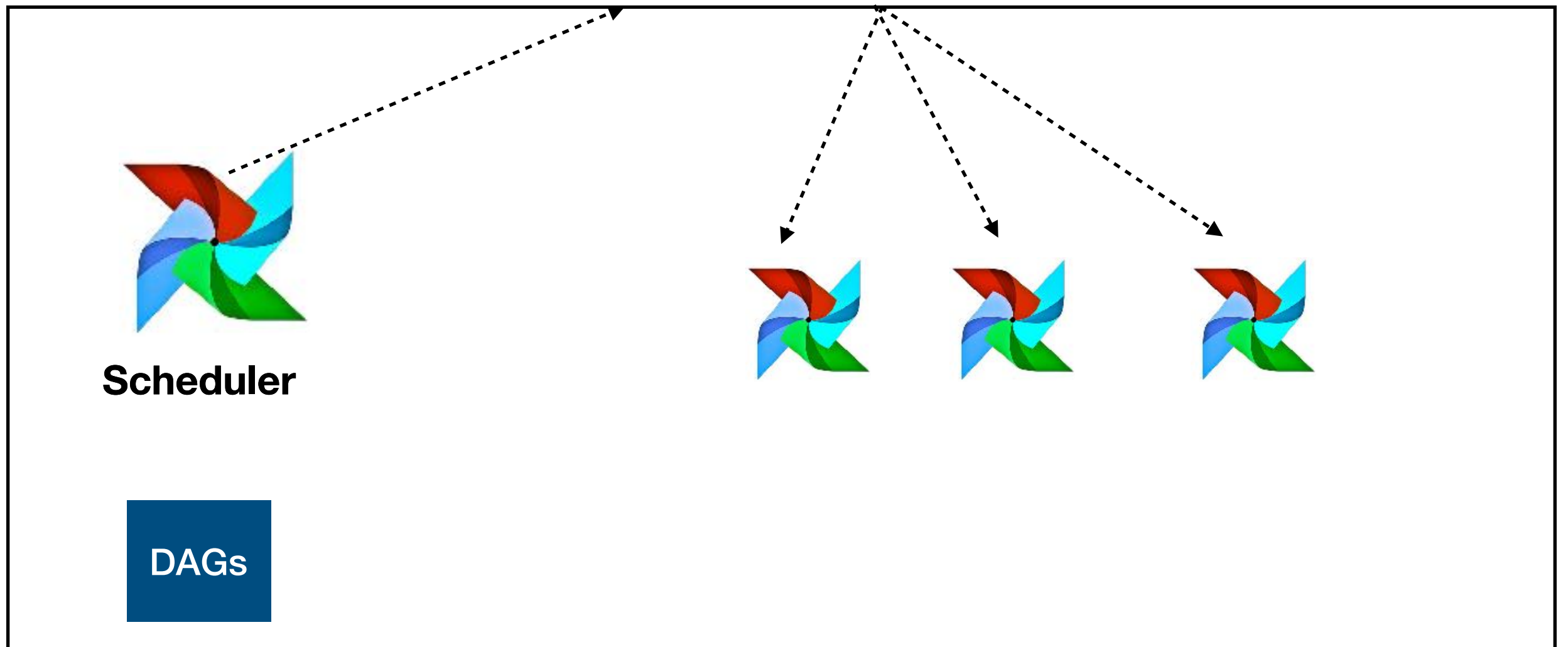


kubernetes



Scheduler

DAGs



Kubernetes Executor



kubernetes



Scheduler

DAGs



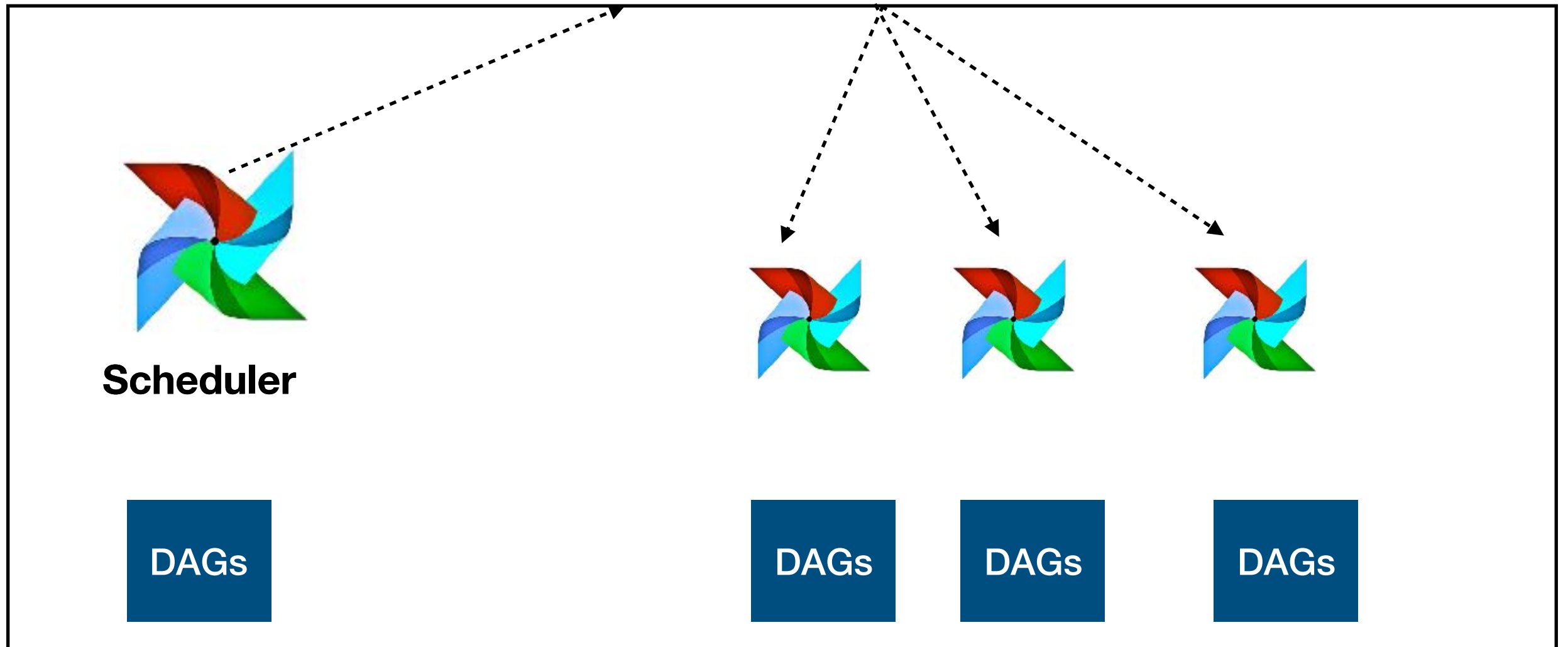
DAGs



DAGs



DAGs



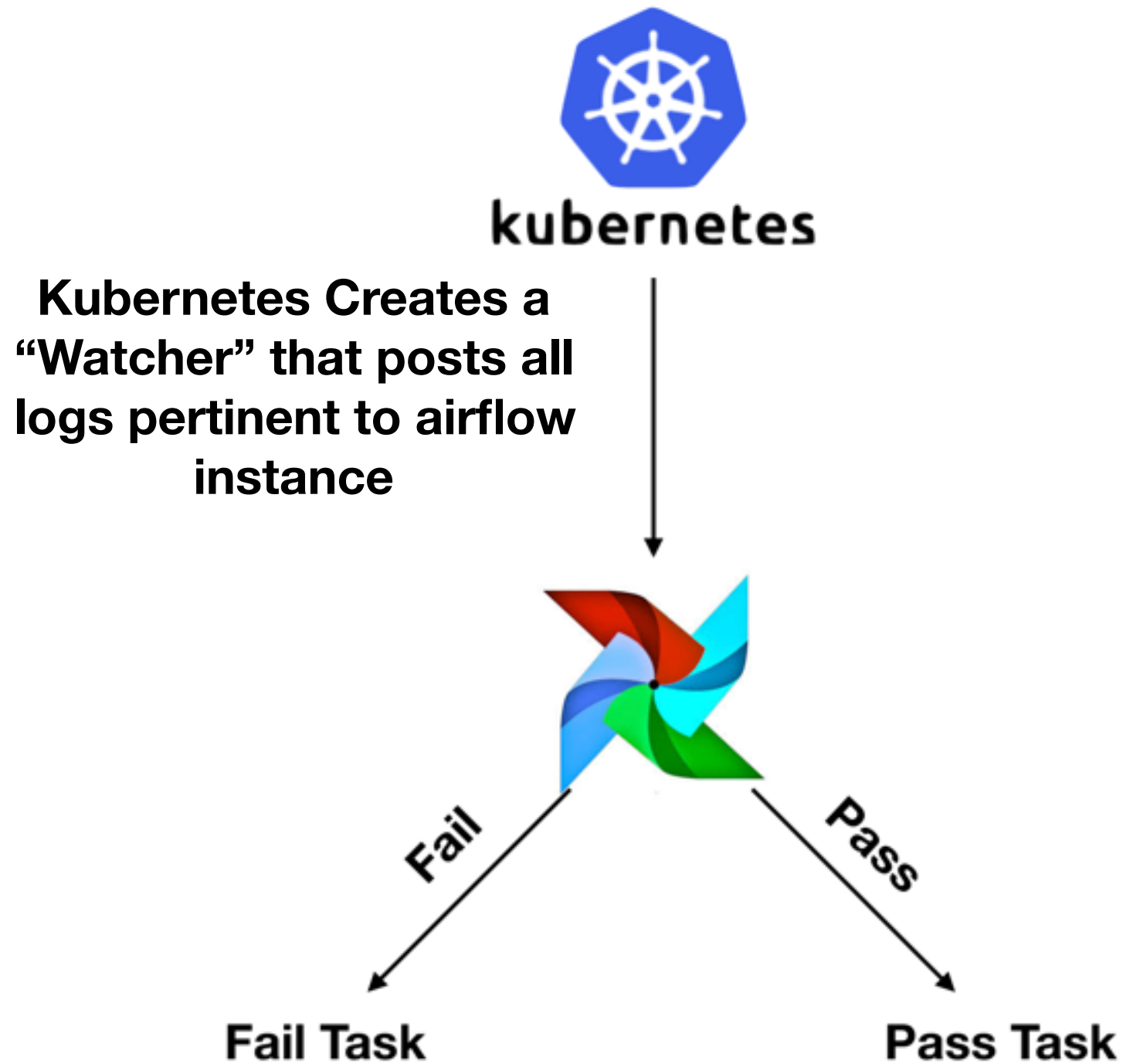
Volume Mounting

- Airflow DAGs can become very expensive to transport. One team can have thousands of DAGs with MB per dag
- Solution: Utilize kubernetes volumes
- Can use GitHub, NFS, EFS, Cinder, etc...
- Allow users to define volume hooks for those we choose not to create

Monitoring

- Using Kubernetes Watch API
- Passively retrieving events vs. polling for each task
- Can run on separate thread

Monitoring



Error Handling

- Kubernetes keeps logs of all actions taken by a pod (Airflow team currently working on logging)
- Any failure of the k8s pod will lead to the scheduler failing the task
- Upon completion of the task, pod will send results to SQL instance

Future work

- Helm Integration for cluster management
- ETCD for XCOM

Thank You

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Questions?