Airflow Executors
Past, Present and Future

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Let’s flow together
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Who Am I?

- Apache Airflow committer
- Sr. software engineer at Amazon
  - Amazon Managed Workflows for Apache Airflow (MWAA)
  - Founding member of the Amazon Apache Airflow Open Source Team
- Spent much of the last year working on Airflow executors
Past: What is an Executor?

- Executors facilitate the running of Airflow tasks (Task Instances)
- The Airflow scheduler decides *when* a task should run and the executor decides *how*.
- Examples: CeleryExecutor, KubernetesExecutor, LocalExecutor
- Runs within the Airflow scheduler process.
- Pluggable, kind of...
Past: What is an Executor?

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  - Local Executors: Airflow tasks are executed on the same host that the executor (i.e. scheduler) is running on. E.g.: LocalExecutor
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  - Remote Containerized Executors: Airflow tasks are executed ad hoc inside containers/pods. Each task is isolated in its own environment. E.g.: **KubernetesExecutor**
Past: What is an Executor?

- Airflow executors implement/inherit from the BaseExecutor class
  - This represents the public interface for executors
- It was always possible to write your own executor, however, there were some issues:
  - This interface was not strictly public in the past
  - Many executor features/use cases were baked into Airflow core code rather than the interface, we call this Executor Coupling
Past: Example of Executor Coupling

- This snippet is from the Airflow Backfill job.
- You can see the core Airflow code is hard coding executors, and must know their behaviour and implementation.
- How do we fix this?
Present: AIP-51 - Executor Decoupling

- **AIP-51** - Described the instances of Executor Coupling in the Airflow code base as well as proposals for how to fix them

- Community effort to implement the fixes for each source of coupling

- Many couplings were simple compatibility checks, but more interesting instances included Executors vending CLI commands as well as Airflow task logs
Present: Example Executor Coupling Fix

- Pickling support is now part of the public BaseExecutor interface
- Core code no longer coupled to specific executors and interacts with a known public API
Present: Executor Migration

- Now that the separation of Airflow executors from core Airflow is more distinct, some executors that used to live within Airflow can be moved to their own provider packages

- The CeleryExecutor and KubernetesExecutors:
  - These Executors were updated during the AIP-51 project to comply with the BaseExecutor interface
  - They have since been moved out of Airflow core to their own providers (thanks Jarek!)
Present: Writing Your Own Executor

- Now that implementing an Airflow executor is more supported than ever, it’s easy to write your own. So that’s what we did!

- Myself and some folks from the AWS OSS Airflow team, along with an initial contribution from Ahmed Elzeiny (aelzeiny/airflow-aws-executors) have been working on a new Airflow executor that leverages AWS technology

- https://github.com/apache/airflow/pull/34381
Present: ECS Executor

- Implemented in Amazon Provider Package, leveraging the public BaseExecutor interface
- Each task that Airflow schedules for execution is run within its own ECS container
Future: More Executors!

- We have more executors on the horizon built on AWS technology that many of you will be familiar with, including:
  - AWS Batch: Queued based executor with compute backed by ECS/EC2
  - Amazon EKS: Container based executor backed by Kubernetes/EKS
  - And more to come, stay tuned!
Future: Airflow Hybrid Execution

- Airflow Executors are easier to write, and more options are arriving now and in the future, wouldn’t it be nice to leverage more than one executor at once?

- Each executor has its own pros and cons and committing to just one restricts the capabilities of any one Airflow environment.

- Hardcoded hybrid executors exist (e.g. CeleryKubernetesExecutor), but are not ideal.

- Expect an AIP in the near future proposing full native support for multiple executors.
Questions?

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