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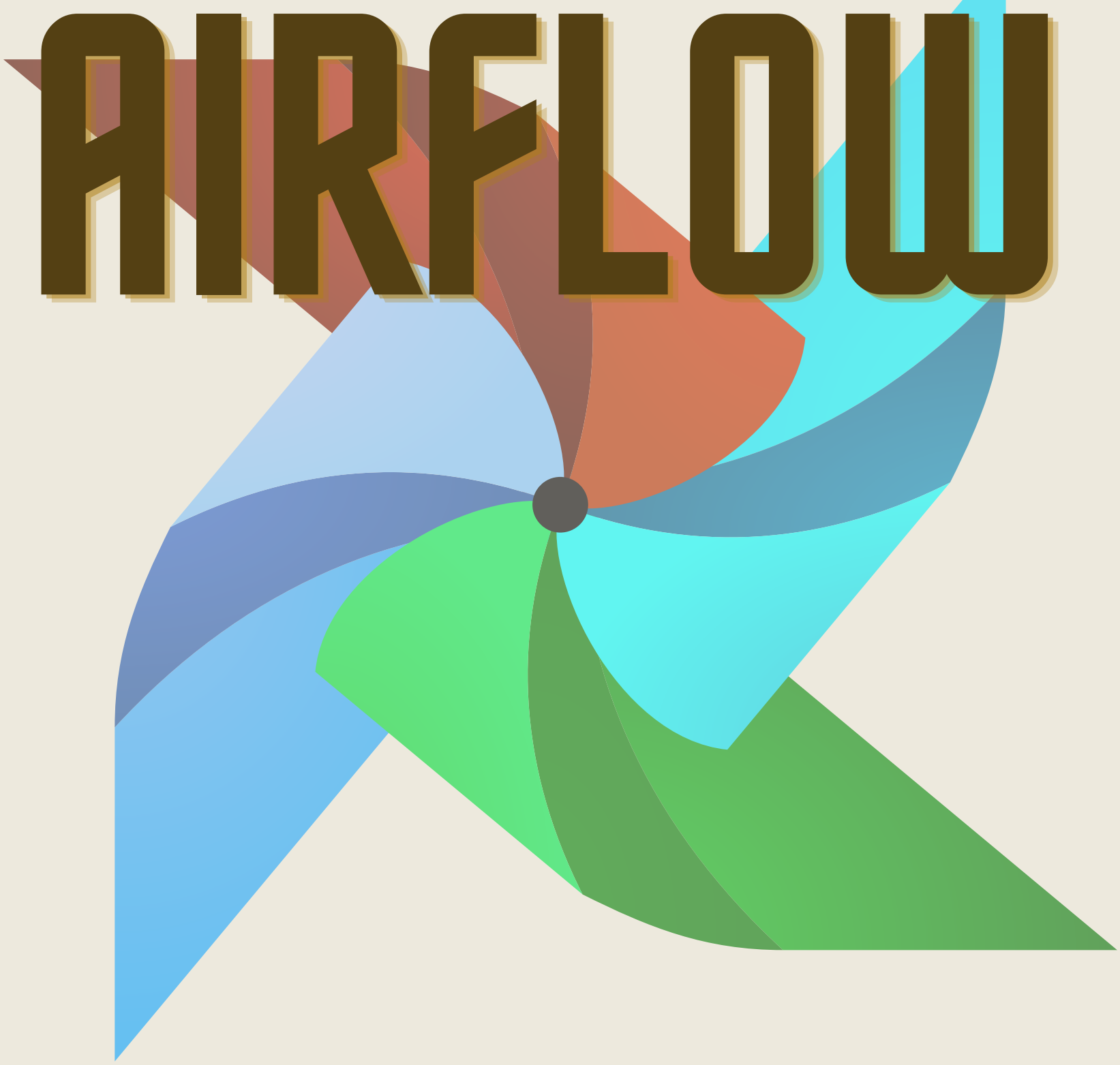

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WHAT IS APACHE AIRFLOW?

Apache Airflow is an open-source platform to programmatically author, schedule, and monitor workflows.

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WHAT IS A DAG IN AIRFLOW?

A Directed Acyclic Graph (DAG) is a collection of all the tasks you want to run, organized in a way that reflects their relationships and dependencies.

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HOW DO YOU DEFINE A TASK IN AIRFLOW?

Tasks are defined using operators. An operator defines a single task in a workflow.

```
python from airflow.operators.bash
import BashOperator
task =
BashOperator(task_id='bash_example',
bash_command='echo "Hello World"',
dag=dag)
```

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DATA ENGINEERING 101 - AIRFLOW

WHAT ARE THE DIFFERENT TYPES OF OPERATORS IN AIRFLOW?

Common types include BashOperator, PythonOperator, EmailOperator, and DummyOperator.

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DATA ENGINEERING 101 - AIRFLOW

WHAT IS A SENSOR IN AIRFLOW?

A sensor is a special kind of operator that will wait for a certain condition to be met before it proceeds.

```
python from airflow.sensors.filesystem
import FileSensor
file_sensor_task =
FileSensor(task_id='wait_for_file',
filepath='/path/to/file', dag=dag)
```

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DATA ENGINEERING 101 - AIRFLOW

HOW DO YOU SET DEPENDENCIES BETWEEN TASKS IN A DAG?

Dependencies are set using bitshift operators (>>, <<) or the set_upstream and set_downstream methods.

```
python start >> task_1  task_1 >> end
or
task_1.set_upstream(start)
task_1.set_downstream(end)
```

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DATA ENGINEERING 101 - AIRFLOW

HOW DO YOU HANDLE RETRIES FOR A TASK IN AIRFLOW?

You can configure the retries and retry_delay parameters in the task definition.

```
python task =
BashOperator(task_id='bash_example',
bash_command='exit 1',
retries=3,
retry_delay=timedelta(minutes=5),
dag=dag)
```

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DATA ENGINEERING 101 - AIRFLOW

WHAT IS THE PURPOSE OF THE AIRFLOW WEBSERVER?

The Airflow Webserver provides a user interface to monitor and manage DAGs and tasks.

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DATA ENGINEERING 101 - AIRFLOW

HOW CAN YOU TRIGGER A DAG MANUALLY IN AIRFLOW?

You can trigger a DAG manually using the Airflow UI or the CLI command airflow dags trigger.

bash airflow dags trigger example_dag

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DATA ENGINEERING 101 - AIRFLOW

WHAT IS THE ROLE OF THE AIRFLOW SCHEDULER?

The scheduler is responsible for scheduling jobs, monitoring DAGs, and triggering tasks.

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DATA ENGINEERING 101 - AIRFLOW

HOW DO YOU BACKFILL A DAG IN AIRFLOW?

Backfilling is done by running a DAG for historical dates. This can be triggered via the CLI or UI.

```
bash airflow dags backfill -s 2021-01-01 -e 2021-01-07 example_dag
```

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WHAT ARE AIRFLOW HOOKS?

Hooks are interfaces to external systems, allowing tasks to interact with databases, cloud services, etc.

```
python from airflow.hooks.base_hook
import BaseHook
class MyCustomHook(BaseHook):
def get_conn(self):  pass
```

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WHAT IS A CUSTOM OPERATOR IN AIRFLOW?

A custom operator is an extension of Airflow's base operators to include custom logic.

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WHAT ARE POOLS IN AIRFLOW?

Pools are used to limit the execution parallelism on resources like database connections.

bash airflow pools set my_pool 5 "Description of the pool"

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WHAT IS SLA (SERVICE LEVEL AGREEMENT) IN AIRFLOW?

SLAs are used to set time limits for tasks, with alerts triggered if the time is exceeded.

```
python task =
BashOperator(task_id='bash_example',
bash_command='echo "Hello World"',
dag=dag, sla=timedelta(minutes=30))
```

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DATA ENGINEERING 101 - AIRFLOW

HOW DO YOU SECURE AN AIRFLOW INSTANCE?

Security in Airflow can be managed through RBAC (Role-Based Access Control) and SSL encryption.

```
bash airflow users create
--role Admin
--username admin
--email admin@example.com
--firstname admin
--lastname user
--password admin
```

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DATA ENGINEERING 101 - AIRFLOW

WHAT IS THE DIFFERENCE BETWEEN SEQUENTIALEXECUTOR AND LOCALEXECUTOR?

SequentialExecutor runs tasks sequentially, one at a time, while LocalExecutor can run parallel tasks.

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WHAT ARE TASK INSTANCES IN AIRFLOW?

Task instances represent a specific run of a task within a DAG.

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HOW DO YOU PASS PARAMETERS TO A TASK IN AIRFLOW?

Parameters can be passed using the op_args and op_kwargs arguments in the task definition.

```
python python_task =
PythonOperator(task_id='python_example',
python_callable=my_function,
op_args=['arg1'], dag=dag)
```

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DATA ENGINEERING 101 - AIRFLOW

WHAT IS THE AIRFLOW REST API?

The Airflow REST API allows interaction with the Airflow instance programmatically.

```
bash curl -X GET
"http://localhost:8080/api/v1/dags" -H
"accept: application/json"
```

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HOW DO YOU USE THE AIRFLOW CLI?

The Airflow CLI is used to manage DAGs, tasks, and the Airflow environment from the command line.

bash airflow dags list

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HOW DO YOU CREATE A CONNECTION IN AIRFLOW?

Connections can be created using the Airflow UI, CLI, or by defining them in airflow.cfg.

```
bash airflow connections
add my_conn --conn-type mysql
--conn-host localhost
--conn-login root
--conn-password root
```

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WHAT IS A DAG RUN IN AIRFLOW?

A DAG Run is an instance of a DAG, representing a specific execution of the DAG.

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HOW DO YOU PAUSE AND UNPAUSE A DAG IN AIRFLOW?

DAGs can be paused and unpaused using the Airflow UI or CLI.

```
bash airflow dags pause example_dag
airflow dags unpause example_dag
```

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WHAT IS THE PURPOSE OF AIRFLOW.CFG FILE?

The airflow.cfg file is used to configure the Airflow environment, including database connections and executor settings.

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DATA ENGINEERING 101 - AIRFLOW

HOW DO YOU HANDLE TASK DEPENDENCIES DYNAMICALLY?

Task dependencies can be set dynamically within a DAG definition based on runtime conditions.

python if condition: task_1 >> task_2
else: task_1 >> task_3

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WHAT IS THE ROLE OF THE AIRFLOW METADATA DATABASE?

The metadata database stores information about DAGs, task instances, variables, connections, and more

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HOW DO YOU MANAGE VARIABLES IN AIRFLOW?

Variables can be managed through the Airflow UI, CLI, or API. They are key-value pairs used to store configuration or runtime parameters.

bash airflow variables set key value python my_var = Variable.get("my_variable")

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WHAT IS A SUBDAGOPERATOR?

The SubDagOperator is used to define a sub-DAG within a DAG. It is useful for organizing and reusing parts of workflows.

```
python from airflow.operators.subdag
import SubDagOperator
subdag_task =
SubDagOperator(task_id='subdag',
subdag=subdag, dag=dag)
```

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HOW DO YOU HANDLE TASK TIMEOUTS IN AIRFLOW?

Timeouts can be handled by setting the execution_timeout parameter in the task definition.

```
python task =
BashOperator(task_id='bash_example',
bash_command='sleep 300',
execution_timeout=timedelta(minutes=
5), dag=dag)
```

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WHAT IS A TRIGGERDAGRUNOPERATOR?

The TriggerDagRunOperator triggers another DAG from within a DAG.

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HOW DO YOU TEST AN AIRFLOW DAG?

DAGs can be tested using the airflow test command or by running them in the Airflow UI in a safe environment.

bash airflow dags test example_dag 2021-01-01

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DATA ENGINEERING 101 - AIRFLOW

WHAT IS THE PURPOSE OF PROVIDE_CONTEXT IN PYTHONOPERATOR?

provide_context passes context variables to the task's callable function, allowing access to metadata and other information.

```
python def my_function(**kwargs):
execution_date = kwargs['execution_date']
python_task =
PythonOperator(task_id='python_example',
python_callable=my_function,
provide_context=True, dag=dag)
```

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WHAT ARE THE DIFFERENT TYPES OF EXECUTORS IN AIRFLOW?

Common executors include SequentialExecutor, LocalExecutor, CeleryExecutor, and KubernetesExecutor.

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DATA ENGINEERING 101 - AIRFLOW

HOW DO YOU SCHEDULE A DAG TO RUN AT A SPECIFIC INTERVAL?

The schedule interval can be set using a cron expression or predefined interval strings like '@daily', '@hourly'.

```
python dag = DAG('example_dag',
schedule_interval='@daily',
start_date=days_ago(1))
```

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DATA ENGINEERING 101 - AIRFLOW

HOW DO YOU SET UP AIRFLOW LOGGING?

Airflow logs can be configured in the airflow.cfg file, specifying the logging level and log location.

```ini
[logging]
base_log_folder = /path/to/logs
remote_logging = True
remote_log_conn_id = my_s3_conn
```

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WHAT IS AIRFLOW'S DEFAULT DATABASE?

Airflow uses SQLite as the default database, but it can be configured to use MySQL or PostgreSQL for production.

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DATA ENGINEERING 101 - AIRFLOW

HOW DO YOU SET TASK PRIORITIES IN AIRFLOW?

Task priorities can be set using the priority_weight parameter in the task definition.

```
python task =
BashOperator(task_id='bash_example',
bash_command='echo "Hello World"',
priority_weight=10, dag=dag)
```

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WHAT IS A DAGBAG IN AIRFLOW?

DagBag is a collection of DAGs, typically from a directory on the file system. It parses and loads DAGs for the scheduler to manage.

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HOW DO YOU USE THE BRANCHPYTHONOPERATOR?

The BranchPythonOperator allows branching based on the result of a Python function.

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HOW DO YOU DEFINE GLOBAL VARIABLES IN AIRFLOW?

Global variables can be defined in the airflow.cfg file or managed through the Airflow UI.

ini [variables] key = value

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DATA ENGINEERING 101 - AIRFLOW

HOW DO YOU DEFINE THE START_DATE FOR A DAG?

The start_date parameter is used to define the date and time when the DAG should start running.

```
python dag = DAG('example_dag',
start_date=datetime(2021, 1, 1))
```

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WHAT ARE SLA MISSES IN AIRFLOW?

SLA Misses occur when a task exceeds its defined SLA time. They can be monitored and alerted on.

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WHAT IS THE FUNCTION OF THE EXECUTION_DATE IN AIRFLOW?

execution_date represents the logical date and time for which the DAG Run is scheduled, used in templating and execution.

```
python task =
BashOperator(task_id='bash_example',
bash_command='echo {{ ds }}',
dag=dag)
```

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HOW DO YOU SKIP TASKS IN AIRFLOW?

Tasks can be skipped using the SkipMixin class or by setting conditions within a task.

```
python from airflow.models import SkipMixin
class MyTask(SkipMixin, BaseOperator):
def execute(self, context):
if condition:  self.skip(context['dag_run'], context['ti'].task_id, context['execution_date'])
```

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DATA ENGINEERING 101 - AIRFLOW

HOW DO YOU HANDLE TASK DEPENDENCIES DYNAMICALLY?

Task dependencies can be set dynamically within a DAG definition based on runtime conditions.

```
python if condition:   task_1 >> task_2
else:   task_1 >> task_3
```

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DATA ENGINEERING 101 - AIRFLOW

WHAT IS THE DIFFERENCE BETWEEN THE START_DATE AND END_DATE IN AIRFLOW?

start_date defines when a DAG should start running, while end_date defines when it should stop running.

```
python dag = DAG('example_dag',
start_date=datetime(2021, 1, 1),
end_date=datetime(2021, 12, 31))
```

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DATA ENGINEERING 101 - AIRFLOW

HOW DO YOU TRIGGER A DAG FROM ANOTHER DAG?

The TriggerDagRunOperator is used to trigger another DAG from within a DAG.

```
python from
airflow.operators.dagrun_operator
import TriggerDagRunOperator
trigger_task =
TriggerDagRunOperator(task_id='trigger
_dag', trigger_dag_id='example_dag',
dag=dag)
```

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WHAT IS THE USE OF AIRFLOW'S TASKFLOW API?

The Taskflow API simplifies the creation and management of task dependencies and data passing between tasks.

```
python from airflow.decorators import dag, task @dag(schedule_interval='@daily', start_date=days_ago(2)) def example_dag():  @task  def extract():  return 'data'  @task  def process(data):  return f'processed {data}'  data = extract()  process(data)
```

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WHAT IS THE ROLE OF THE AIRFLOW SCHEDULER?

The scheduler is responsible for scheduling jobs, monitoring DAGs, and triggering tasks.

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DATA ENGINEERING 101 - AIRFLOW

HOW DO YOU CONFIGURE RETRIES FOR A TASK IN AIRFLOW?

Retries can be configured using the retries and retry_delay parameters in the task definition.

```
python task =
BashOperator(task_id='bash_example',
bash_command='exit 1', retries=3,
retry_delay=timedelta(minutes=5),
dag=dag)
```

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WHAT ARE TASK INSTANCES IN AIRFLOW?

Task instances represent a specific run of a task within a DAG.

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HOW DO YOU HANDLE TASK FAILURES IN AIRFLOW?

Task failures can be handled by setting up retries, using the on_failure_callback, or configuring alerts.

```
python def failure_callback(context):
print("Task failed")
task =
BashOperator(task_id='bash_example',
bash_command='exit 1',
on_failure_callback=failure_callback,
dag=dag)
```

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DATA ENGINEERING 101 - AIRFLOW

WHAT IS THE USE OF EXECUTION_DATE IN AIRFLOW?

execution_date represents the logical date and time for which the DAG Run is scheduled, used in templating and execution.

```
python task =
BashOperator(task_id='bash_example',
bash_command='echo {{ ds }}',
dag=dag)
```

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DATA ENGINEERING 101 - AIRFLOW

WHAT IS A SENSOR IN AIRFLOW?

A sensor is a special kind of operator that will wait for a certain condition to be met before it proceeds.

```
python from airflow.sensors.filesystem
import FileSensor

file_sensor_task =
FileSensor(task_id='wait_for_file',
filepath='/path/to/file', dag=dag)
```

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DATA ENGINEERING 101 - AIRFLOW

HOW DO YOU USE TEMPLATES IN AIRFLOW?

Templates in Airflow are used to dynamically generate task parameters using Jinja templating.

```
python from datetime import datetime
task =
BashOperator(task_id='templated_task',
bash_command='echo {{ ds }}',
dag=dag)
```

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WHAT ARE THE DIFFERENT TYPES OF EXECUTORS IN AIRFLOW?

Common executors include SequentialExecutor, LocalExecutor, CeleryExecutor, and KubernetesExecutor.

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DATA ENGINEERING 101 - AIRFLOW

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```
python task =
BashOperator(task_id='bash_example',
bash_command='echo {{ ds }}',
dag=dag)
```

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DATA ENGINEERING 101 - AIRFLOW

HOW DO YOU SECURE AN AIRFLOW INSTANCE?

Security in Airflow can be managed through RBAC (Role-Based Access Control) and SSL encryption.

```
bash airflow users create
--role Admin
--username admin
--email admin@example.com
--firstname admin
--lastname user
--password admin
```

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DATA ENGINEERING 101 - AIRFLOW

HOW DO YOU SCHEDULE A DAG TO RUN AT A SPECIFIC INTERVAL?

The schedule interval can be set using a cron expression or predefined interval strings like '@daily', '@hourly'.

```
python dag =
DAG('example_dag',
schedule_interval='@daily',
start_date=days_ago(1))
```

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THANK YOU