Here’s a full guide from installing Python 3.9 to setting up and running Apache Airflow, including package installations and troubleshooting tips.

**Step 1: Install Python 3.9 on Ubuntu**

If Python 3.9 is not installed, you can install it by following these steps.

1. **Update Package List**:

bash

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sudo apt update

1. **Install Dependencies** (for building Python from source):

bash

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sudo apt install -y build-essential zlib1g-dev libncurses5-dev libgdbm-dev libnss3-dev libssl-dev \

libreadline-dev libffi-dev curl libsqlite3-dev wget

1. **Download Python 3.9**:

bash

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wget https://www.python.org/ftp/python/3.9.18/Python-3.9.18.tgz

1. **Extract the Downloaded File**:

bash

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tar -xf Python-3.9.18.tgz

1. **Navigate to the Extracted Directory**:

bash

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cd Python-3.9.18

1. **Configure and Install**:

bash

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./configure --enable-optimizations

make -j $(nproc)

sudo make altinstall

1. **Verify Python Installation**:

bash

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python3.9 --version

**Step 2: Set Up a Virtual Environment for Airflow**

1. **Install venv Package** (if not already installed):

bash

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sudo apt install -y python3.9-venv

1. **Create a Virtual Environment**:

bash

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python3.9 -m venv /mnt/e/airflow/airflow\_files\_main/airflow\_py39\_env

1. **Activate the Virtual Environment**:

bash

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source /mnt/e/airflow/airflow\_files\_main/airflow\_py39\_env/bin/activate

1. **Upgrade pip and setuptools**:

bash

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pip install --upgrade pip setuptools

**Step 3: Install System-Level Dependencies for Airflow**

Airflow may require certain system packages, especially on Ubuntu. Install these before installing Airflow.

bash

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sudo apt update

sudo apt install -y python3-dev libmysqlclient-dev libssl-dev libffi-dev libkrb5-dev

**Step 4: Install Apache Airflow**

Use Airflow’s constraints file to ensure package compatibility:

1. **Define Airflow Version and Constraints**:

bash

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export AIRFLOW\_VERSION=2.10.2

export PYTHON\_VERSION=3.9

export CONSTRAINT\_URL="https://raw.githubusercontent.com/apache/airflow/constraints-${AIRFLOW\_VERSION}/constraints-${PYTHON\_VERSION}.txt"

1. **Install Apache Airflow**:

bash

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pip install "apache-airflow==${AIRFLOW\_VERSION}" --constraint "${CONSTRAINT\_URL}"

**Step 5: Initialize Airflow Database**

1. **Set Up SQLite Database** for development and testing:

bash

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d /mnt/e/airflow/airflow\_files\_main

airflow db init

**Step 6: Create Airflow User (Optional for Web UI Access)**

1. **Create an Admin User**:
   * Use the following command to create an admin user for Airflow:

bash

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airflow users create \

--username admin \

--firstname VIJAY\

--lastname RODRIGUES\

--role Admin \

--email rodriguesvijay880@gmail.com

**Step 7: Start Airflow Services**

1. **Start the Airflow Web Server**:

bash

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airflow webserver --port 8080

1. **Start the Airflow Scheduler**:
   * In a new Command Prompt window (with the virtual environment activated):

bash

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airflow scheduler

**Step 8: Access Airflow**

* Open a browser and go to http://localhost:8080 to access the Airflow UI.