

1. Introduction to Apache Airflow
 - Overview of workflow management systems
 - Introduction to Apache Airflow
 - Key features and benefits
 - Use cases
2. Installation and Setup
 - System requirements
 - Installation methods (pip, Docker, etc.)
 - Configuration options
 - Initializing Airflow database
 - Setting up Airflow web server and scheduler
3. Core Concepts
 - Directed Acyclic Graphs (DAGs)
 - Operators and Tasks
 - Sensors
 - Executors
 - Hooks and Connections
 - XComs
 - Variables

Hands-On Lab: Installation and Basic Setup

- Install Airflow
 - Configure Airflow
 - Initialize Airflow database
 - Start Airflow web server and scheduler
 - Create a simple DAG and run it
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4. Writing and Managing Workflows
 - Creating a DAG
 - Defining tasks with operators
 - Setting task dependencies
 - Templating with Jinja
 - Scheduling and triggering workflows
 5. Advanced Airflow Features
 - SubDAGs and TaskGroups
 - Branching and Conditional Logic
 - Trigger Rules
 - Managing Dependencies Dynamically

- Cross-DAG Dependencies

Hands-On Lab: Workflow Development

- Create complex DAGs with multiple tasks
- Implement branching and conditional logic
- Manage dynamic task dependencies
- Explore cross-DAG dependencies

6. Monitoring and Troubleshooting

- Logging and Alerts
- Monitoring DAG runs and task instances
- Retries and Failures
- Scaling Airflow for Production
- Performance optimization

7. Deployment and Integration

- High Availability and Fault Tolerance
- Security Best Practices
- Integration with External Systems (Databases, Cloud Services, etc.)
- Managing Airflow deployments in different environments

Hands-On Lab: Monitoring, Troubleshooting, and Deployment

- Configure logging and alerts
- Monitor DAG runs and task instances
- Handle retries and failures
- Deploy Airflow in a production-like environment
- Integrate Airflow with external systems

8. Airflow Ecosystem

- Introduction to Apache Airflow Providers
- Overview of Airflow-related tools and projects
- Comparison with other workflow orchestration tools