## Lab 1: Apache Kafka Setup and Configuration for Windows

### Scenario

You are starting your journey with Apache Kafka and need to set up a complete development environment on Windows. This lab will guide you through installing, configuring, and testing Apache Kafka locally.

### Software Required

* **Windows 10/11** operating system
* **Java 8 or higher** (JDK 11+ recommended)
* **Apache Kafka 3.0+** (latest stable version)
* **Administrator privileges** (for some installation steps)
* **Internet connection** (for downloading software)

### Instructions

#### Step 1: Install Java Development Kit (JDK)

1. Download JDK 11 or higher from [Oracle](https://www.oracle.com/java/technologies/downloads/) or [OpenJDK](https://adoptium.net/)
2. Install Java following the installation wizard
3. Set JAVA\_HOME environment variable to your Java installation path
4. Add %JAVA\_HOME%\bin to your system PATH
5. Verify installation by running java -version in Command Prompt

#### Step 2: Install Apache Kafka

1. Download Apache Kafka from [kafka.apache.org](https://kafka.apache.org/download)
2. Extract the downloaded file to C:\kafka
3. Set KAFKA\_HOME environment variable to C:\kafka
4. Add %KAFKA\_HOME%\bin\windows to your system PATH
5. Verify installation by running kafka-topics.bat --version

#### Step 3: Configure Kafka

1. Edit %KAFKA\_HOME%\config\zookeeper.properties:

* dataDir=C:/kafka/zookeeper-data  
  clientPort=2181  
  maxClientCnxns=0

1. Edit %KAFKA\_HOME%\config\server.properties:

* broker.id=0  
  listeners=PLAINTEXT://localhost:9092  
  log.dirs=C:/kafka/kafka-logs  
  num.partitions=1  
  offsets.topic.replication.factor=1  
  delete.topic.enable=true

1. Create data directories:

* mkdir C:\kafka\zookeeper-data  
  mkdir C:\kafka\kafka-logs

#### Step 4: Start Kafka Services

1. **Start Zookeeper** (in one Command Prompt):

* cd %KAFKA\_HOME%  
  bin\windows\zookeeper-server-start.bat config\zookeeper.properties

1. **Start Kafka** (in another Command Prompt):

* cd %KAFKA\_HOME%  
  bin\windows\kafka-server-start.bat config\server.properties

#### Step 5: Test Kafka Installation

1. **Create a test topic**:

* kafka-topics.bat --create --topic test-topic --bootstrap-server localhost:9092 --partitions 1 --replication-factor 1

1. **List topics**:

* kafka-topics.bat --list --bootstrap-server localhost:9092

1. **Test producer and consumer**:
   * Start consumer: kafka-console-consumer.bat --topic test-topic --bootstrap-server localhost:9092 --from-beginning
   * Start producer: kafka-console-producer.bat --topic test-topic --bootstrap-server localhost:9092
   * Send test messages and verify they appear in the consumer

### Expected Output

When running the test commands, you should see:

# Topic creation  
Created topic test-topic.  
  
# Topic listing  
test-topic  
  
# Consumer output  
Hello Kafka!  
This is a test message  
Goodbye!

## Complete Setup Guide

The complete setup guide with detailed instructions, troubleshooting, and convenience scripts is available in the Lab Code/Lab1/ folder:

### Project Structure

Lab1/  
├── README.md # Complete setup guide  
├── QUICK\_REFERENCE.md # Quick reference commands  
└── scripts/  
 ├── start-kafka.bat # Start Kafka services  
 ├── stop-kafka.bat # Stop Kafka services  
 ├── test-kafka.bat # Test installation  
 ├── check-environment.bat # Check environment setup  
 └── clean-kafka.bat # Clean Kafka data

### Quick Start Using Scripts

1. **Check Environment**:

* cd "Lab Code\Lab1\scripts"  
  check-environment.bat

1. **Start Kafka**:

* start-kafka.bat

1. **Test Installation**:

* test-kafka.bat

1. **Stop Kafka**:

* stop-kafka.bat

### Environment Variables Required

Set these environment variables in Windows:

# Java  
JAVA\_HOME=C:\Program Files\Java\jdk-11.0.x  
  
# Kafka  
KAFKA\_HOME=C:\kafka  
  
# Add to PATH  
%JAVA\_HOME%\bin  
%KAFKA\_HOME%\bin\windows

### Verification Checklist

* Java installed and java -version works
* JAVA\_HOME environment variable set
* Kafka downloaded and extracted to C:\kafka
* KAFKA\_HOME environment variable set
* Kafka commands available in PATH
* Data directories created (C:\kafka\zookeeper-data, C:\kafka\kafka-logs)
* Zookeeper starts successfully on port 2181
* Kafka starts successfully on port 9092
* Test topic created successfully
* Producer/Consumer test works

### Troubleshooting

#### Common Issues:

1. **“Command not found”**: Check PATH and environment variables
2. **“Port already in use”**: Kill existing processes or use different ports
3. **“Permission denied”**: Run Command Prompt as Administrator
4. **“Connection refused”**: Ensure Kafka services are running

#### Useful Commands:

# Check if services are running  
netstat -ano | findstr :2181  
netstat -ano | findstr :9092  
  
# Kill processes by port  
netstat -ano | findstr :9092  
taskkill /PID <PID> /F  
  
# View logs  
type %KAFKA\_HOME%\logs\server.log