# Lab 1: Apache Kafka Setup and Configuration for Windows

## Overview

This lab provides a complete setup guide for Apache Kafka on Windows systems. You’ll learn how to install, configure, and run Apache Kafka locally for development and learning purposes.

## Prerequisites

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

## Step 1: Install Java

### 1.1 Download Java JDK

1. Visit [Oracle JDK](https://www.oracle.com/java/technologies/downloads/) or [OpenJDK](https://adoptium.net/)
2. Download JDK 11 or higher for Windows x64
3. Run the installer and follow the installation wizard

### 1.2 Set JAVA\_HOME Environment Variable

1. **Right-click** on “This PC” or “My Computer”
2. Select **Properties**
3. Click **Advanced system settings**
4. Click **Environment Variables**
5. Under **System Variables**, click **New**
6. Set:
   * **Variable name:** JAVA\_HOME
   * **Variable value:** C:\Program Files\Java\jdk-11.0.x (adjust path to your installation)
7. Click **OK**

### 1.3 Add Java to PATH

1. In the same Environment Variables window
2. Under **System Variables**, find and select **Path**
3. Click **Edit**
4. Click **New**
5. Add: %JAVA\_HOME%\bin
6. Click **OK** on all dialogs

### 1.4 Verify Java Installation

Open Command Prompt and run:

java -version  
javac -version  
echo %JAVA\_HOME%

Expected output:

java version "11.0.x" 2023-xx-xx  
Java(TM) SE Runtime Environment 18.9 (build 11.0.x+xx-xx)  
Java HotSpot(TM) 64-Bit Server VM 18.9 (build 11.0.x+xx-xx, mixed mode)

## Step 2: Install Apache Kafka

### 2.1 Download Apache Kafka

1. Visit [Apache Kafka Downloads](https://kafka.apache.org/download)
2. Download the latest stable version (e.g., 3.5.1)
3. Choose the **Scala 2.13** version
4. Download the **tgz** file

### 2.2 Extract Kafka

1. **Right-click** the downloaded .tgz file
2. Select **Extract All** or use 7-Zip/WinRAR
3. Extract to a convenient location (e.g., C:\kafka)
4. Rename the extracted folder to kafka (remove version number)

### 2.3 Set KAFKA\_HOME Environment Variable

1. Open **Environment Variables** (same as Java setup)
2. Under **System Variables**, click **New**
3. Set:
   * **Variable name:** KAFKA\_HOME
   * **Variable value:** C:\kafka (adjust to your extraction path)
4. Click **OK**

### 2.4 Add Kafka to PATH

1. In **System Variables**, find and select **Path**
2. Click **Edit**
3. Click **New**
4. Add: %KAFKA\_HOME%\bin\windows
5. Click **OK** on all dialogs

### 2.5 Verify Kafka Installation

Open Command Prompt and run:

echo %KAFKA\_HOME%  
kafka-topics.bat --version

Expected output:

C:\kafka

## Step 3: Configure Kafka

### 3.1 Configure Zookeeper

1. Navigate to %KAFKA\_HOME%\config
2. Open zookeeper.properties in a text editor
3. Verify these settings:

# The directory where the snapshot is stored  
dataDir=C:/kafka/zookeeper-data  
  
# The port at which the clients will connect  
clientPort=2181  
  
# Disable the per-ip limit on the number of connections since this is a non-production config  
maxClientCnxns=0

### 3.2 Configure Kafka Server

1. In the same config folder, open server.properties
2. Verify these settings:

# The id of the broker. This must be set to a unique integer for each broker  
broker.id=0  
  
# The address the socket server listens on  
listeners=PLAINTEXT://localhost:9092  
  
# A comma separated list of directories under which to store log files  
log.dirs=C:/kafka/kafka-logs  
  
# The default number of log partitions per topic  
num.partitions=1  
  
# The replication factor for the offsets topic  
offsets.topic.replication.factor=1  
  
# The replication factor for the transaction topic  
transaction.state.log.replication.factor=1  
  
# The replication factor for the transaction topic  
transaction.state.log.min.isr=1  
  
# Delete topic enable  
delete.topic.enable=true

### 3.3 Create Data Directories

Open Command Prompt as Administrator and run:

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

## Step 4: Start Kafka Services

### 4.1 Start Zookeeper

1. Open a new Command Prompt
2. Navigate to Kafka directory:

cd %KAFKA\_HOME%

1. Start Zookeeper:

bin\windows\zookeeper-server-start.bat config\zookeeper.properties

Expected output:

[2023-xx-xx xx:xx:xx,xxx] INFO binding to port 0.0.0.0/0.0.0.0:2181 (org.apache.zookeeper.server.NIOServerCnxnFactory)

### 4.2 Start Kafka Server

1. Open another Command Prompt
2. Navigate to Kafka directory:

cd %KAFKA\_HOME%

1. Start Kafka:

bin\windows\kafka-server-start.bat config\server.properties

Expected output:

[2023-xx-xx xx:xx:xx,xxx] INFO [KafkaServer id=0] started (kafka.server.KafkaServer)

## Step 5: Test Kafka Installation

### 5.1 Create a Test Topic

Open a new Command Prompt and run:

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

Expected output:

Created topic test-topic.

### 5.2 List Topics

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

Expected output:

test-topic

### 5.3 Test Producer and Consumer

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

kafka-console-consumer.bat --topic test-topic --bootstrap-server localhost:9092 --from-beginning

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

kafka-console-producer.bat --topic test-topic --bootstrap-server localhost:9092

1. **Send Test Messages**:

> Hello Kafka!  
> This is a test message  
> Goodbye!

1. **Verify Messages** appear in the consumer window