

# Keycloak – Complete Notes (Installation, Run & Usage)

**Style:** JWT / OAuth jaise simple, handwritten-style notes


**Purpose:** Easy understanding + quick revision + interview ready

---

## What is Keycloak?

**Keycloak** ek **open-source Identity & Access Management (IAM) tool** hai.

Keycloak use hota hai: - **Authorization Server** banane ke liye - OAuth 2.0 & OpenID Connect implement karne ke liye - Login, Roles, Tokens manage karne ke liye

 Simple line:

**Keycloak = Ready-made Authorization + Authentication Server**

---

## Why Keycloak?

### Problems without Keycloak

- Login system khud banana padta hai
- Password security handle karni padti hai
- OAuth / OIDC complex hota hai

### Keycloak Solution

- Ready-made login pages
  - OAuth 2.0 + OpenID Connect support
  - Role-based access control
  - Token management
- 

## Keycloak Architecture (Basic)

- **User** → Actual user
  - **Client** → Your application (Spring Boot)
  - **Realm** → Isolated security domain
  - **Keycloak Server** → Authorization Server
-

## Keycloak Installation (Step-by-Step)

### Method 1: Using ZIP (Most Common)

 Download Keycloak from official site  Extract ZIP file  Go inside folder

Folder structure example:

```
keycloak-xx.x.x/  
├─ bin/  
├─ conf/  
└─ data/
```

---

## How to Run Keycloak (First Time)

### Step 1: Open Terminal / CMD

Go to Keycloak `bin` folder

```
cd keycloak/bin
```


### Step 2: Create Admin User

```
kc.bat bootstrap-admin
```

(Windows)

```
./kc.sh bootstrap-admin
```

(Linux / Mac)

 Username & Password set karo

---

### Step 3: Start Keycloak Server

```
kc.bat start-dev
```

(Windows)

```
./kc.sh start-dev
```

(Linux / Mac)

---

#### **Step 4: Access Admin Console**

Browser me open karo:

```
http://localhost:8080
```

Admin Console login karo

---

### **Important Keycloak Concepts**

#### **Realm**

- Security boundary
- Har project ka alag realm

Example:

```
my-realm
```

---

#### **Client**

- Application jo Keycloak use karti hai

Example: - Spring Boot app - React app

---

#### **User**

- End user
- Username, password, roles

---




## Roles

- Permissions define karte hain

Types: - Realm Roles - Client Roles





---

## Creating Realm (Basic Steps)

 Admin Console → Create Realm  Realm name set karo  Save





---

## Creating Client (Spring Boot App)

 Realm → Clients → Create  Client ID set karo  Client type: Public / Confidential  Save




---

## Creating User

 Realm → Users → Add User  Username set karo  Password set karo  Enable user

---

## Assigning Roles to User

 Users → Role Mappings  Select role  Assign

---







## Tokens in Keycloak

- **Access Token** → API access
- **ID Token** → User identity (OIDC)
- **Refresh Token** → New access token

All tokens are **JWT format**

---

## Keycloak + OAuth / OIDC Flow (Simple)

 User app open karta hai  App Keycloak login page par redirect karta hai  User login karta hai   
Keycloak token deta hai  App token use karta hai  API access milta hai

---

## Keycloak Ports & URLs

- Server URL: `http://localhost:8080`
- Admin Console: `/admin`
- Realm endpoint:

`/realms/{realm-name}`

---

## Common Problems & Solutions

### Server not starting

- Port 8080 free nahi

### Login page not loading

- Realm active nahi
- 

## Interview One-Liners

- Keycloak is an open-source IAM tool
  - Keycloak acts as Authorization Server
  - Supports OAuth 2.0 and OpenID Connect
  - Tokens issued by Keycloak are JWT
- 

## Quick Revision Summary

- Keycloak = Authorization Server
  - Ready-made OAuth + OIDC
  - Realm → Client → User → Role
  - Tokens = JWT
- 

👉 **These are SIMPLE, NOTEBOOK-READY Keycloak NOTES** Installation, run, and usage clearly covered