# GRADLE

**[https://gradle.org/]**

Gradle is an open-source build automation tool that is widely used for building, testing, and deploying software projects. It is designed to be flexible, highly customizable, and efficient. Gradle builds upon the concepts of Apache Ant and Apache Maven but introduces a more expressive and concise syntax using the Groovy programming language.

Gradle has strong support for Java, Groovy, and Kotlin, it can be extended and customized to build projects in various languages like C++, Android, Python, JavaScript, Scala, Go.etc..

**SAMPLE BUILD.GRADLE FILE LOOKS LIKE (JAVA APPLICATION)**

**plugins {**

id 'java'

id 'war'

**}**

**java {**

sourceCompatibility = JavaVersion.VERSION\_11

targetCompatibility = JavaVersion.VERSION\_11

**}**

**repositories {**

jcenter()

**}**

**dependencies {**

// Servlet API

providedCompile 'javax.servlet:javax.servlet-api:4.0.1'

// JSP API

providedCompile 'javax.servlet.jsp:javax.servlet.jsp-api:2.3.3'

providedCompile 'javax.servlet.jsp.jstl:javax.servlet.jsp.jstl-api:1.2.1'

// JSP implementation (Tomcat)

providedCompile 'org.apache.tomcat.embed:tomcat-embed-jasper:9.0.50'

**}**

**war {**

archiveFileName = 'gradle-web-app.war'

**}**

**Gradle Repository:**

Gradle supports multiple types of repositories for resolving dependencies and accessing external artifacts. Here are the different types of repositories that Gradle supports:

1. Maven Central: Gradle can easily resolve dependencies from the Maven Central Repository, which is a widely used repository for hosting open-source Java libraries.
2. JCenter: JCenter is another popular repository for hosting Java libraries. Gradle has built-in support for resolving dependencies from JCenter.
3. Ivy repositories: Gradle supports Ivy repositories, which are like Maven repositories but follow a different dependency resolution format. You can configure Gradle to resolve dependencies from Ivy repositories if needed.
4. Local repositories: Gradle can use local directories as repositories. You can specify a local directory path in your build script or Gradle settings to resolve dependencies from a specific location on your machine.

Other types of repositories: Gradle can also work with various other repository types, including Artifactory, Nexus, Bintray, and more.

**GRADLE TERMINOLOGY AND THEIR EXPLANATIONS:**

1. Project: In Gradle, a project represents the overall software project being built.
2. Build Script: The build script is a Groovy or Kotlin script that defines how the project is built. It contains the configurations, tasks, and dependencies necessary for building and packaging the project. The build script is typically named **build.gradle** and is located in the project's root directory.
3. Task: A task represents a specific unit of work to be executed during the build process. It can perform actions such as compiling code, running tests, packaging artifacts, or deploying the application.
4. Dependency: A dependency represents a software component or library that is required by the project. Dependencies can be external libraries, frameworks, or other projects within the same build.
5. Configuration: A configuration defines the settings and dependencies for a particular aspect of the project, such as the compile classpath, runtime classpath, or test classpath. Configurations determine what dependencies are included in each classpath and how they are resolved.
6. Plugin: A plugin is a reusable piece of functionality that extends Gradle's capabilities. Plugins can define tasks, configurations, conventions, and other build-related features. Gradle provides a rich ecosystem of plugins for various purposes, including **Java, Android, web development, and more.**
7. Repository: A repository is a location where Gradle looks for dependencies and other artifacts required by the project. Repositories can be local directories, remote servers, or online repositories like **Maven Central or JCenter**. Gradle resolves dependencies by fetching them from the specified repositories.
8. Gradle Wrapper: The Gradle Wrapper is a small script and a couple of configuration files that allow the project to be built with a specific version of Gradle. It ensures that everyone working on the project uses the same version of Gradle, eliminating the need for users to install Gradle separately.

**PROJECT-2 (GRADLE + WEB APP + TOMCAT)**

List of steps involved in deploying a Gradle Web application on Tomcat server.

|  |  |
| --- | --- |
| **Description** | **Command** |
| Install updates to linux instance | sudo yum update -y |
| Install openjdk-11 | sudo yum install java-11-openjdk -y |
| Check the java version | java -version |
| Install wget utility | sudo yum install git wget tree nano -y |
| Verify the git version | git --version |
| Download the latest version of Gradle [https://gradle.org/releases/] | sudo wget https://services.gradle.org/distributions/gradle-8.1-bin.zip -P /tmp |
| Extract the Gradle tar file to ‘/opt’ | sudo unzip /tmp/gradle-8.1-bin.zip -d /opt/ |
| Rename the extracted directory to ‘gradle’ in ‘/opt’ directory | sudo mv /opt/gradle-8.1/ /opt/gradle |
| Add the environment variables with correct value of GRADLE\_HOME in ‘/etc/profile.d/gradle.sh’ file | sudo nano /etc/profile.d/gradle.sh  export GRADLE\_HOME=/opt/gradle  export PATH=$PATH:$GRADLE\_HOME/bin |
| Change the permissions of ‘gradle.sh’ file to executable | sudo chmod +x /etc/profile.d/gradle.sh |
| Run the ‘gradle.sh’ file with source | source /etc/profile.d/gradle.sh |
| Now, Gradle is available, and we can verify Gradle version. | gradle -v |
| Proceeding to download Apache-tomcat latest version and saving it to ‘/tmp’ directory | sudo wget https://dlcdn.apache.org/tomcat/tomcat-9/v9.0.75/bin/apache-tomcat-9.0.75.tar.gz -P /tmp |
| Extracting the contents of the tarball to ‘/opt’ directory | sudo tar xvzf /tmp/apache-tomcat-9.0.75.tar.gz -C /opt |
| Rename the extracted directory in ‘/opt’ to ‘tomcat’ | sudo mv /opt/apache-tomcat-9.0.75 /opt/tomcat |
| If we are running other application with port 8080 in the same instance we can consider to change the port for tomcat application by editing the ‘server.xml’ file | sudo nano /opt/tomcat/conf/server.xml  # update port number to 8081 , ctrl+O and ctrl+X |
| Create user and group ‘tomcat’ | sudo useradd tomcat |
| Change ownership of ‘/opt/tomcat’ directory to ‘tomcat’ user and group | sudo chown -R tomcat:tomcat /opt/tomcat |
| Make the binary files of tomcat as executable | sudo sh -c 'chmod +x /opt/tomcat/bin/\*.sh' |
| Verify the JAVA\_HOME environment variable to be added to ‘tomcat.service’ file | readlink -f $(which java)  # copy /usr/lib/jvm/java-11-openjdk-11.0.18.0.10-1.el7\_9.x86\_64 |
| Add the following text to ‘tomcat.service’ file with proper JAVA\_HOME variable  (Using this script, We are creating a service file for starting and stopping the tomcat service without entering the lengthy commands every time) | sudo nano /etc/systemd/system/tomcat.service  [Unit]  Description=Apache Tomcat Web Application Container  After=network.target  [Service]  Type=oneshot  RemainAfterExit=yes  User=tomcat  Group=tomcat  Environment="JAVA\_HOME=/usr/lib/jvm/java-11-amazon-corretto.x86\_64/"  Environment="JAVA\_OPTS=-Djava.security.egd=file:///dev/urandom -Djava.awt.headless=true"  Environment= "CATALINA\_BASE=/opt/tomcat"  Environment= "CATALINA\_HOME=/opt/tomcat"  Environment= "CATALINA\_PID=/opt/tomcat/temp/tomcat.pid"  Environment="CATALINA\_OPTS=-Xms512M -Xmx1024M -server -XX:+UseParallelGC"  ExecStart=/opt/tomcat/bin/startup.sh  ExecStop=/opt/tomcat/bin/shutdown.sh  [Install]  WantedBy=multi-user.target |
| Reload the system daemon  (The command sudo systemctl daemon-reload tells the Linux system manager (systemd) to reload its configuration files and unit files (which define services), so changes you made to service definitions will take effect without restarting your computer or stopping services. Use this command after you add or modify service files, so systemd knows about your updates.) | sudo systemctl daemon-reload |
| Enable tomcat service to run at startup.  (This command is used to enable the tomcat server. In tomcat disabled mode, when we restart the system the tomcat will not start and run automatically. For tomcat to run automatically when the system is restarted, we need to enable the tomcat service.) | sudo systemctl enable tomcat |
| Start the tomcat service | sudo systemctl start tomcat |
| Install firewalld if not already installed | sudo yum install firewalld -y |
| Enable firewalld to run at startup (good practice) | sudo systemctl enable firewalld |
| Start firewalld service | sudo systemctl start firewalld |
| Add an exception to port 8081 which is presently being used by tomcat application in this project | sudo firewall-cmd --zone=public --permanent --add-port=8081/tcp |
| Reload the firewall to apply the exception to port 8081 | sudo firewall-cmd --reload |
| Edit the tomcat-users.xml file to add new roles ‘admin-gui’ and ‘manager-gui’ and user credentials for both the roles | sudo nano /opt/tomcat/conf/tomcat-users.xml  Add the following roles in the file:  <role rolename="admin-gui"/>  <role rolename="manager-gui"/>  <user username="admin" password="admin" roles="admin-gui,manager-gui"/> |
| Add your system IP into the allow rules for Manager and Host-manager pages of tomcat application | sudo nano /opt/tomcat/webapps/manager/META-INF/context.xml  Add your system IP to the allow list (|.\*) |
| sudo nano /opt/tomcat/webapps/host-manager/META-INF/context.xml  Add your system IP to the allow list (|.\*) |
| Restart tomcat service to apply the updated changes | sudo systemctl restart tomcat |
| Clone the application code from github repository | git clone https://github.com/javabyraghu/gradle-web-app.git |
| Switch into the application directory | cd gradle-web-app |
| Build the package using Gradle | gradle build |
| Verify if the ‘.war’ file is created in ‘./libs’ sub-directory of the application directory | ls -l app/build/libs/ |
| Copy the ‘.war’ file to ‘/opt/tomcat/webapps’ directory | sudo cp ./app/build/libs/gradle-web-app.war /opt/tomcat/webapps/ |
| Now the application can be accessed by the user at the specified URL | Enter URL like:  http://<ifconfig>:8081/gradle-web-app |

**Spring boot GRADLE FILE (build.gradle) generated from: start.spring.io**

plugins {

id 'java'

id 'org.springframework.boot' version '3.0.6'

id 'io.spring.dependency-management' version '1.1.0'

}

group = 'com.raghu'

version = '0.0.1-SNAPSHOT'

sourceCompatibility = '17'

configurations {

compileOnly {

extendsFrom annotationProcessor

}

}

repositories {

mavenCentral()

}

dependencies {

implementation 'org.springframework.boot:spring-boot-starter-web'

compileOnly 'org.projectlombok:lombok'

runtimeOnly 'com.h2database:h2'

annotationProcessor 'org.projectlombok:lombok'

testImplementation 'org.springframework.boot:spring-boot-starter-test'

}

tasks.named('test') {

useJUnitPlatform()

}