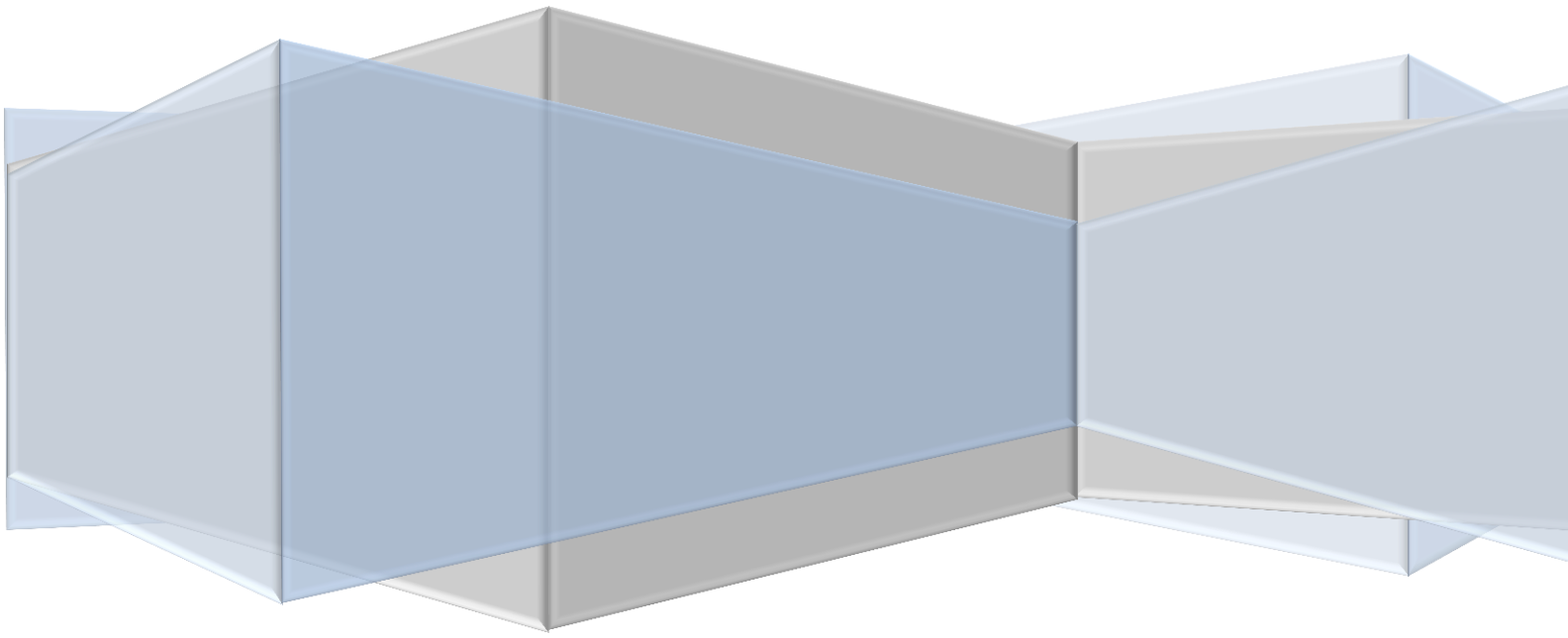


Maven as Project management and Build automation tool:

Using Maven, development team can automate the project's build infrastructure in almost no time as Maven uses a standard directory layout and a default build lifecycle.

In case of multiple development teams environment, Maven can set-up the way to work as per standards in a very short time. As most of the project setups are simple and reusable, Maven makes life of developer easy while creating reports, checks, build and testing automation setups.

Maven provides developers ways to manage following:

- Builds
- Documentation
- Reporting
- Dependencies
- SCMs
- Releases
- Distribution
- mailing list

Convention over Configuration

Maven uses *Convention* over *Configuration* which means developers are not required to create build process themselves.

Developers do not have to mention each and every configuration detail. Maven provides sensible default behavior for projects. When a Maven project is created, Maven creates default project structure. Developer is only required to place files accordingly and he/she need not to define any configuration in pom.xml.

As an example, following table shows the default values for project source code files, resource files and other configurations. Assuming, **${basedir}** denotes the project location:

Item	Default
source code	${basedir}/src/main/java
resources	${basedir}/src/main/resources
Tests	${basedir}/src/test
distributable JAR	${basedir}/target
Complied byte code	${basedir}/target/classes

In order to build the project, Maven provides developers options to mention life-cycle goals and project dependencies (that rely on Maven pluging capabilities and on its default conventions). Much of the project management and build related tasks are maintained by Maven plugins.

Developers can build any given Maven project without need to understand how the individual plugins work. Refer to Maven Plug-ins section for more detail.

Installing Apache Maven

The installation of Apache Maven is a simple process of extracting the archive and adding the bin folder with the mvn command to the PATH.

Detailed steps are:

Ensure JAVA_HOME environment variable is set and points to your JDK installation

Extract distribution archive in any directory

```
unzip apache-maven-3.3.9-bin.zip
```

or,

```
tar xzvf apache-maven-3.3.9-bin.tar.gz
```

Alternatively use your preferred archive extraction tool.

Add the bin directory of the created directory apache-maven-3.3.9 to the PATH environment variable

Confirm with mvn -v in a new shell. The result should look similar to

```
Apache Maven 3.3.9 (bb52d8502b132ec0a5a3f4c09453c07478323dc5;
2015-11-10T22:11:47+05:30)

Maven home: C:\apache-maven-3.3.9\bin\..

Java version: 1.8.0_112, vendor: Oracle Corporation

Java home: C:\Program Files\Java\jdk1.8.0_112\jre

Default locale: en_US, platform encoding: Cp1252

OS name: "windows 10", version: "10.0", arch: "amd64", family:
"dos"
```

Configure Maven on Windows

Check environment variable value e.g.

```
1. echo %JAVA_HOME%
2. C:\Program Files\Java\jdk1.7.0_51
```

Adding to PATH: Add the unpacked distribution's bin directory to your user PATH environment variable by opening up the system properties (WinKey + Pause), selecting the "Advanced" tab, and the "Environment Variables" button, then adding or selecting the PATH variable in the user variables with the value C:\Program Files\apache-maven-3.3.9\bin.

The same dialog can be used to set JAVA_HOME to the location of your JDK, e.g. C:\Program Files\Java\jdk1.7.0_51

Open a command window and run mvn –v to check if the Maven installation is successful.

Configure Maven on Linux systems

Check environment variable value

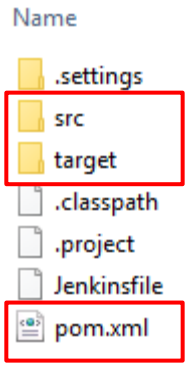
```
echo $JAVA_HOME
/Library/Java/JavaVirtualMachines/jdk1.8.0_45.jdk/Conte
  nts/Home
```

Adding to PATH

```
export PATH=/opt/apache-maven-3.3.9/bin:$PATH
```

Using Maven as a build tool:

Maven follows certain folder structure while running build. The build configuration is done using POM.xml file.



Using the POM.xml (project object model) file the developer / build masters perform the build action.

Maven follows the build life cycle which starts with validation → compile → test → package → integration test → verify → install → and Deploy.. Every Maven build follows this flow which sometimes can be time taking.

Maven Build lifecycle,

1. Validate
2. Compile
3. Test
4. Package
5. Integration-test
6. Verify
7. Install
8. Deploy

- **validate -** validate the project is correct and all necessary information is available
- **compile -** compile the source code of the project
- **test -** test the compiled source code using a suitable unit testing framework. These tests should not require the code be packaged or deployed
- **package -** take the compiled code and package it in its distributable format, such as a JAR.
- **verify -** run any checks on results of integration tests to ensure quality criteria are met
- **install** - install the package into the local repository, for use as a dependency in other projects locally
- **deploy** - done in the build environment, copies the final package to the remote repository for sharing with other developers and projects.

All dependencies in the software are resolved by Maven as mentioned in the POM.xml file.

```
<dependencies>
  <dependency>
    <groupId>junit</groupId>
    <artifactId>junit</artifactId>
    <version>3.8.1</version>
    <scope>test</scope>
  </dependency>

</dependencies>
```

Maven relies on the plug-ins to perform the build actions as mentioned in the Maven build lifecycle.

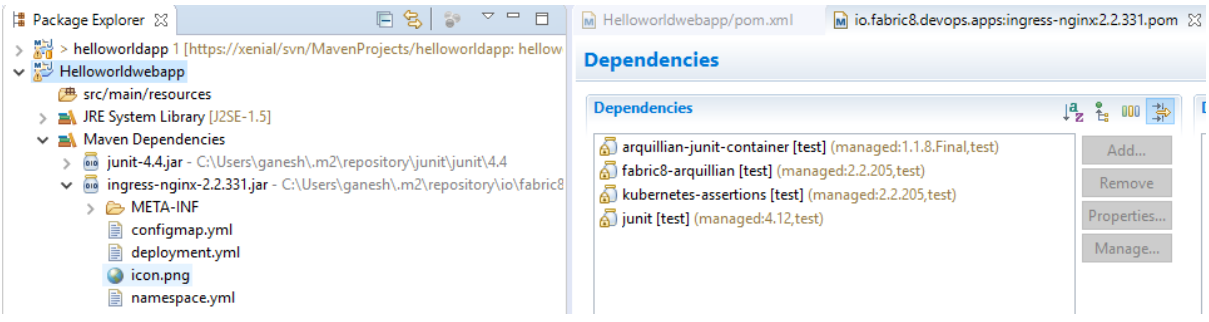
Maven connects to the http://maven.apache.org/ and downloads all plug-ins to carry the build actions, like compile, package, validate, etc.

Managing Maven Transitive Dependencies

If we add a dependency in the POM.xml file, Maven will go ahead download the dependency for us from the Maven Repository.

There can be some dependencies that the dependency itself needs to work satisfactorily. These are called as **transitive dependencies.**

Maven will identify such transitive dependencies and download the same for us as well.



Above image shows transitive dependencies for the ‘ingress-nginx .jar’. ‘nginx’ is added as a dependency in the project.