In the beginning, there was Make as the only build tool available.
Later, it was improved with GNU Make.

JVM ecosystem is dominated with three build tools:

1. Ant with Ivy
2. Maven
3. Gradle

Ant
Ant was the first build tool released in 2000 and was easy to learn. Build scripts format was XML.

Drawback of ANT:

1. XML being hierarchical in nature, is not a good fit for procedural programming approach.

2. XML tends to *become unmanageably big* when used with all but very small projects

Maven
Maven was released in 2004. It has improved few of the problem of ANT.
Maven continues using XML as the format to write build script, however, structure is diametrically different.
The most important addition was the ability to download dependencies over the network(*later on adopted by **Ant through Ivy***)

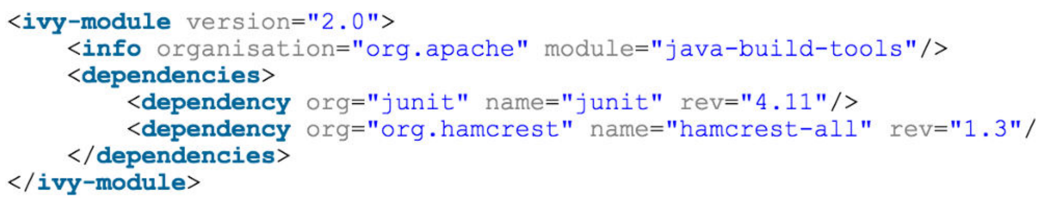
Drawback of Maven:

1. Dependencies management does not handle conflicts well between different versions of the same library.

2. Customization of targets (goals) is hard.

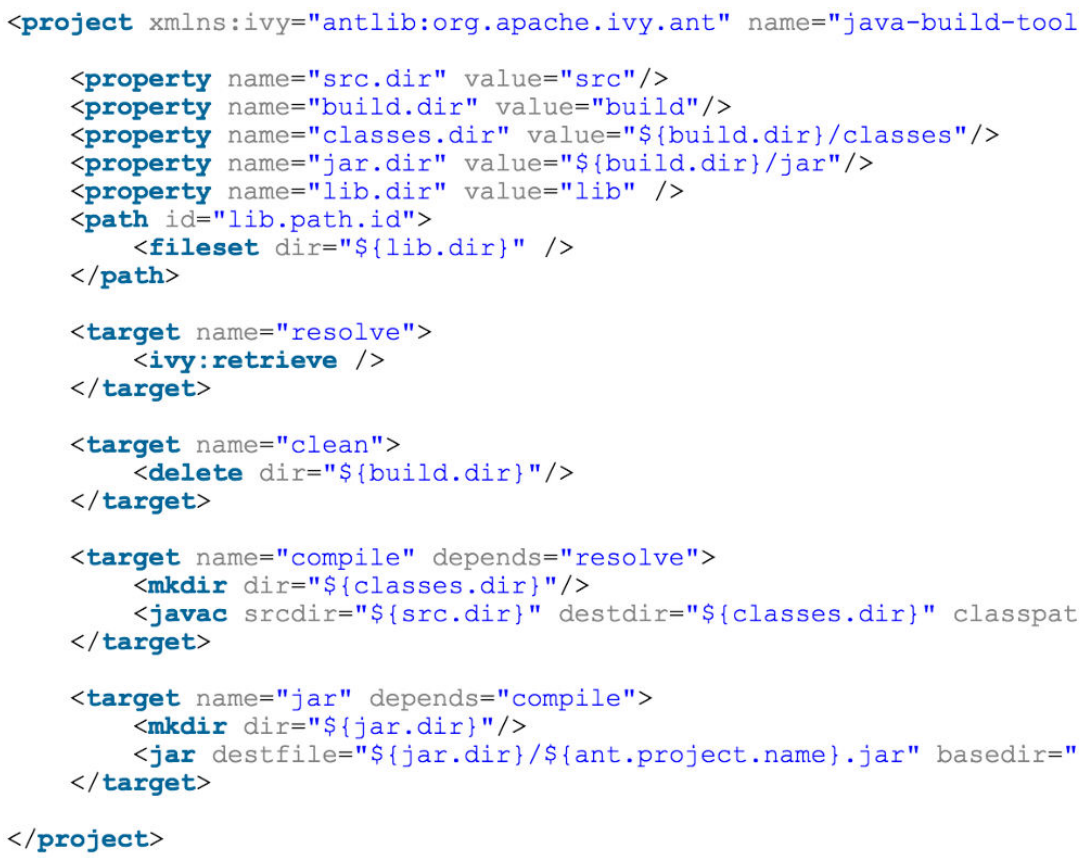
Gradle
Gradle was released in 2012. Google adopted Gradle as the default build tool for the Android OS. Gradle does not use XML. Instead, it had its own DSL based on Groovy (one of JVM languages).
As a result, Gradle build scripts tend to be much shorter and clearer than those written for Ant or Maven.
Initially, Gradle used Apache Ivy for its dependency management. Later, it moved to its own native dependency resolution engine.

Build script samples:



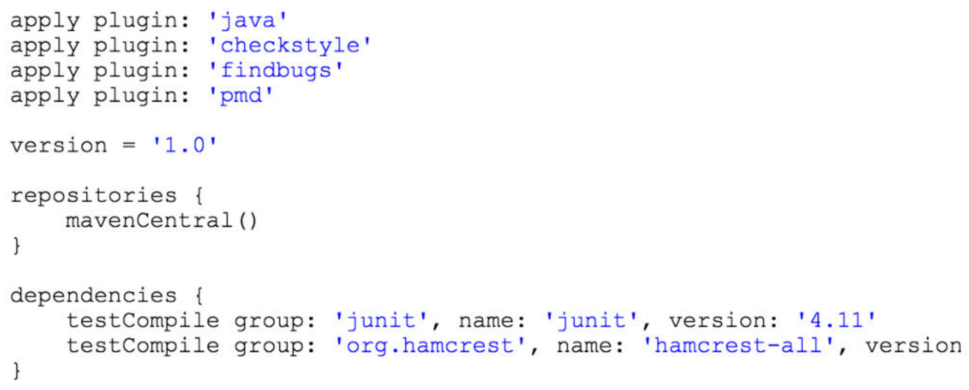
```
<ivy-module version="2.0">
    <info organisation="org.apache" module="java-build-tools"/>
    <dependencies>
        <dependency org="junit" name="junit" rev="4.11"/>
        <dependency org="org.hamcrest" name="hamcrest-all" rev="1.3"/
    </dependencies>
</ivy-module>
```

Ant Build Script Sample



```
<project xmlns:ivy="antlib:org.apache.ivy.ant" name="java-build-tool

    <property name="src.dir" value="src"/>
    <property name="build.dir" value="build"/>
    <property name="classes.dir" value="${build.dir}/classes"/>
    <property name="jar.dir" value="${build.dir}/jar"/>
    <property name="lib.dir" value="lib" />
    <path id="lib.path.id">
        <fileset dir="${lib.dir}" />
    </path>

    <target name="resolve">
        <ivy:retrieve />
    </target>

    <target name="clean">
        <delete dir="${build.dir}"/>
    </target>

    <target name="compile" depends="resolve">
        <mkdir dir="${classes.dir}"/>
        <javac srcdir="${src.dir}" destdir="${classes.dir}" classpat
    </target>

    <target name="jar" depends="compile">
        <mkdir dir="${jar.dir}"/>
        <jar destfile="${jar.dir}/${ant.project.name}.jar" basedir="
    </target>

</project>
```

Maven Build Script Sample



```
apply plugin: 'java'
apply plugin: 'checkstyle'
apply plugin: 'findbugs'
apply plugin: 'pmd'

version = '1.0'

repositories {
    mavenCentral()
}

dependencies {
    testCompile group: 'junit', name: 'junit', version: '4.11'
    testCompile group: 'org.hamcrest', name: 'hamcrest-all', version
}
```

Gradle Build Script

Maven,
is better for managing dependencies (but Ant is ok with them too, if you use **Ant**+**Ivy**) and build **artifacts**.
The main benefit from maven - its lifecycle.
You can just add specific actions on correct phase, which seems pretty logical:
- just launch your integration tests on integration-test phase for example. Also, there are many existing plugins, which can could almost everything.
  Maven **archetype** is powerful feature, which allows you to quickly create project.

Note, **What is a Maven artifact?**

In general software terms, an "artifact" is something produced by the software development process, whether it be software related documentation or an executable file.
In Maven terminology, the artifact is the resulting output of the maven build, generally a `jar` , `war` or other executable file.
Artifacts in maven are identified by a coordinate system of *groupId, artifactId*, and *version*. Maven uses the `groupId`, `artifactId`, and `version` to identify dependencies (usually other jar files) needed to build and run your code.

Note, **What is Archetype?**

In short, Archetype is a Maven project templating toolkit. An archetype is defined as *an original pattern or model from which all other things of the same kind are made*.

The name fits as we are trying to provide a system *that provides a consistent means of generating Maven projects.* Archetype will help authors create Maven project templates for users and provides users with the means to generate parameterized versions of those project templates.

Using archetypes provides a great way to enable developers quickly in a way consistent with best practices employed by your project or organization. Within the Maven project, we use archetypes to try and get our users up and running as quickly as possible by providing a sample project that demonstrates many of the features of Maven, while introducing new users to the best practices employed by Maven. In a matter of seconds, a new user can have a working Maven project to use as a jumping board for investigating more of the features in Maven. We have also tried to make the Archetype mechanism additive, and by that we mean allowing portions of a project to be captured in an archetype so that pieces or aspects of a project can be added to existing projects. A good example of this is the Maven site archetype. If, for example, you have used the quick start archetype to generate a working project, you can then quickly create a site for that project by using the site archetype within that existing project. You can do anything like this with archetypes.

You may want to standardize J2EE development within your organization, so you may want to provide archetypes for EJBs, or WARs, or for your web services. Once these archetypes are created and deployed in your organization's repository, they are available for use by all developers within your organization.

Ant,
is better for controlling of build process. Before your very first build you have to write you **build.xml**.
If your build process is very specific, you have to create complicated scripts.
For long-term projects support of ant-scripts could become really painful:
- Scripts become too complicated, people, who's written them, could leave project, etc.

Both of them use **xml**, which could become too big in big long-term projects.