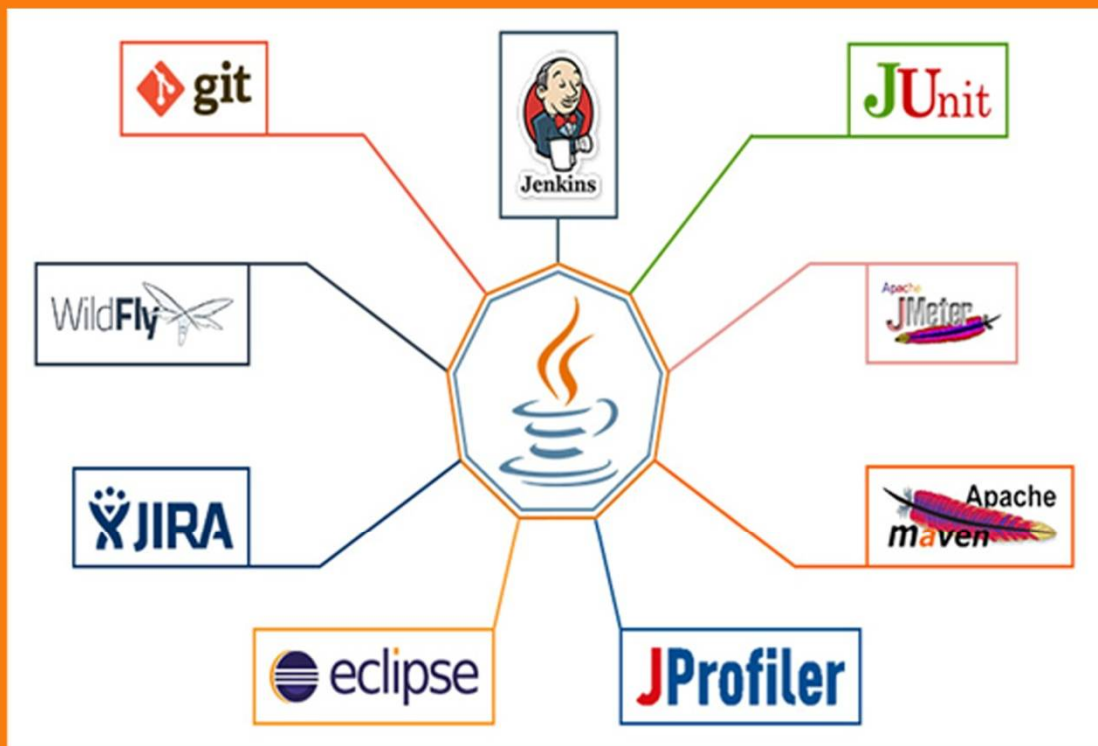


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An Introduction to Ant

## Index

- Installing Ant
- Ant Setup
- Project Organization
- Anatomy of a Build File
- Projects
- Build File
- Properties
- Build File with Properties
- Targets
- Build File with Targets
- Tasks
- Initialization Target & Tasks
- Compilation Target & Tasks
- Javadoc Target & Tasks
- Cleanup Target & Tasks
- Completed Build File (1 of 2)
- Completed Build File (2 of 2)
- Running Ant – Command Line
- Running Ant – Eclipse
- 

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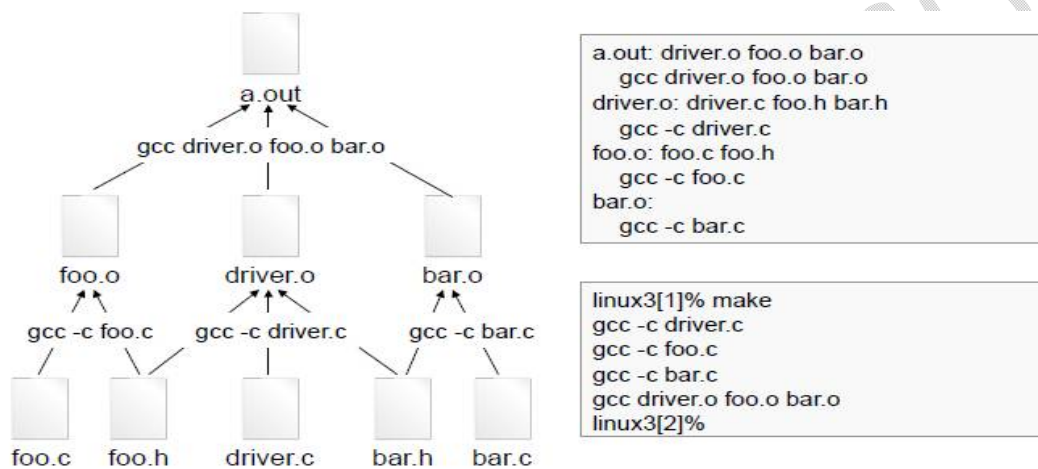
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## What is Ant?

- Ant is a Java based tool for automating the build process
- Similar to make but implemented using Java
  - Platform independent commands (works on Windows, Mac & Unix)
- XML based format
- Avoids the dreaded tab issue in make files
- Easily extendable using Java classes
- Ant is an open source (free) Apache project

## Automating the Build (C & make)

- The goal is to automate the build process



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### Installing Ant

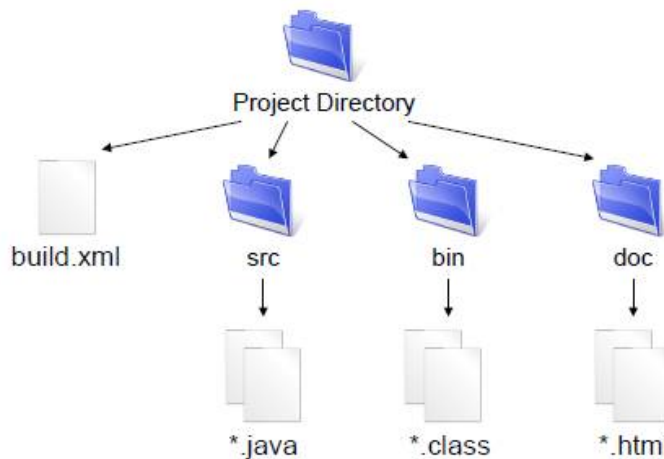
- Ant can be downloaded from...– <http://ant.apache.org/>
- Ant comes bundled as a zip file or a tarball
- Simply unwrap the file to some directory where you want to store the executables
  - I typically unwrap the zip file into C:\ProgramFiles, and rename to C:\Program Files\ant\
  - This directory is known as ANT\_HOME

### Ant Setup

- Set the ANT\_HOME environment variable to where you installed Ant
- Add the ANT\_HOME/bin directory to your path
- Set the JAVA\_HOME environment variable to the location where you installed Java
- Setting environment variables
  - Windows: right click My Computer □ Properties □ Advanced □ Environment Variables
  - UNIX: shell specific settings

### Project Organization

- The following example assumes that your workspace will be organized like so...



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### Anatomy of a Build File

- Ant's build files are written in XML
  - Convention is to call file build.xml
- Each build file contains
  - A project
  - At least 1 target
- Targets are composed of some number of tasks
- Build files may also contain properties
  - Like macros in a make file
- Comments are within `<!-- -->` blocks

### Projects

- The **project tag** is used to define the project you wish to work with
- Projects tags typically contain 3 attributes
  - name – a logical name for the project
  - default – the default target to execute
  - basedir – the base directory for which all operations are done relative to
- Additionally, a description for the project can be specified from within the project tag

### Build File

```
<project name="Sample Project" default="compile" basedir=".">
<description>
A sample build file for this project
</description>
</project>
```

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## Properties

- Build files may contain constants (known as properties) to assign a value to a variable which can then be used throughout the project
  - Makes maintaining large build files more manageable
- Projects can have a set of properties
- **Property tags** consist of a name/value pair
  - Analogous to macros from make

## Build File with Properties

```
<project name="Sample Project" default="compile" basedir=".">
<description>
A sample build file for this project
</description>
<!-- global properties for this build file -->
<property name="source.dir" location="src"/>
<property name="build.dir" location="bin"/>
<property name="doc.dir" location="doc"/>
</project>
```

## Targets

- The **target tag** has the following required attribute
  - name – the logical name for a target
- Targets may also have optional attributes such as
  - depends – a list of other target names for which this task is dependant upon, the specified task(s) get executed first
  - description – a description of what a target does
- Like make files, targets in Ant can depend on some number of other targets
  - For example, we might have a target to create a jarfile, which first depends upon another target to compile the code
- A build file may additionally specify a default target

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### Build File with Targets

```
<project name="Sample Project" default="compile" basedir=".">
...
<!-- set up some directories used by this project -->
<target name="init" description="setup project directories">
</target>
<!-- Compile the java code in srcdir into build dir -->
<target name="compile" depends="init" description="compile java sources">
</target>
<!-- Generate javadocs for current project into docs dir -->
<target name="doc" depends="init" description="generate documentation">
</target>
<!-- Delete the build & doc directories and Emacs backup (*~) files -->
<target name="clean" description="tidy up the workspace">
</target>
</project>
```

### Tasks

- A task represents an action that needs execution
- Tasks have a variable number of attributes which are task dependant
- There are a number of build-in tasks, most of which are things which you would typically do as part of a build process
  - Create a directory
  - Compile java source code
  - Run the javadoc tool over some files
  - Create a jar file from a set of files
  - Remove files/directories
  - And many, many others...
- For a full list see: <http://ant.apache.org/manual/coretasklist.html>

### Initialization Target & Tasks

- Our initialization target creates the build and documentation directories
  - The **mkdir** task creates a directory

```
<project name="Sample Project" default="compile" basedir=".">
...
<!-- set up some directories used by this project -->
<target name="init" description="setup project directories">
  <mkdir dir="${build.dir}"/>
  <mkdir dir="${doc.dir}"/>
</target>
...
</project>
```



### Compilation Target & Tasks

- Our compilation target will compile all javafiles in the source directory
  - The `javac` task compiles sources into classes
  - Note the dependence on the init task

```
<project name="Sample Project" default="compile" basedir=".">
...
<!-- Compile the java code in ${src.dir} into ${build.dir} -->
<target name="compile" depends="init" description="compile java sources">
<javacsredirect="`${source.dir}`" destdir="`${build.dir}`"/>
</target>
...
</project>
```

### Javadoc Target & Tasks

- Our documentation target will create the HTML documentation
  - The `javadoc` task generates HTML documentation for all sources

```
<project name="Sample Project" default="compile" basedir=".">
...
<!-- Generate javadocs for current project into ${doc.dir} -->
<target name="doc" depends="init" description="generate documentation">
<javadocsourcpath="`${source.dir}`" destdir="`${doc.dir}`"/>
</target>
...
</project>
```



## Cleanup Target & Tasks

- We can also use ant to tidy up our workspace
  - The **delete task** removes files/directories from the file system

```
<project name="Sample Project" default="compile" basedir=".">
...
<!-- Delete the build & doc directories and Emacs backup (*~) files -->
<target name="clean" description="tidy up the workspace">
<delete dir="${build.dir}"/>
<delete dir="${doc.dir}"/>
<delete>
<fileset defaultexcludes="no" dir="${source.dir}" includes="**/*~"/>
</delete>
</target>
...
</project>
```

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## Completed Build File (1 of 2)

```
<project name="Sample Project" default="compile" basedir=".">
<description>
A sample build file for this project
</description>
<!-- global properties for this build file -->
<property name="source.dir" location="src"/>
<property name="build.dir" location="bin"/>
<property name="doc.dir" location="doc"/>
<!-- set up some directories used by this project -->
<target name="init" description="setup project directories">
<mkdir dir="${build.dir}"/>
<mkdir dir="${doc.dir}"/>
</target>
<!-- Compile the java code in ${src.dir} into ${build.dir} -->
```

```
<target name="compile" depends="init" description="compile java sources">
<javacsrcdir="${source.dir}" destdir="${build.dir}"/>
</target>
```

### Completed Build File (2 of 2)

```
<!-- Generate javadocs for current project into ${doc.dir} -->
<target name="doc" depends="init" description="generate documentation">
<javadocsrcepath="${source.dir}" destdir="${doc.dir}"/>
</target>
<!-- Delete the build & doc directories and Emacs backup (*~) files -->
<target name="clean" description="tidy up the workspace">
<delete dir="${build.dir}"/>
<delete dir="${doc.dir}"/>
<delete>
<filesetdefaultexcludes="no" dir="${source.dir}" includes="**/*~"/>
</delete>
</target>
</project>
```

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### Running Ant – Command Line

- Simply cd into the directory with the build.xml file and type ant to run the project default target
- Or, type ant followed by the name of a target

```

C:\WINDOWS\system32\cmd.exe

C:\Documents and Settings\Dan\workspace\hello-world>ant
Buildfile: build.xml

init:
  [mkdir] Created dir: C:\Documents and Settings\Dan\workspace\hello-world\bin
  [mkdir] Created dir: C:\Documents and Settings\Dan\workspace\hello-world\doc

compile:
  [javac] Compiling 1 source file to C:\Documents and Settings\Dan\workspace\h
ello-world\bin

BUILD SUCCESSFUL
Total time: 1 second
C:\Documents and Settings\Dan\workspace\hello-world>

```

### Running Ant – Eclipse

- Eclipse comes with out of thebox support for Ant
  - No need to separatelydownload and configure Ant
- Eclipse provides an Ant view
  - Window ☐ Show View ☐ Ant
- Simply drag and drop a buildfile into the Ant view, then double click the target to run

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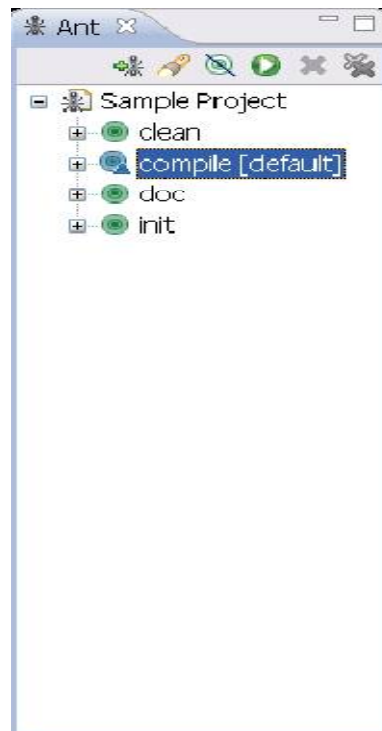
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