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Title : Ant

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Agenda

- What's Ant, and why to use it
- Installing and executing Ant
- Ant terminology and concepts
- Core Ant tasks

What's ANT?

- Ant is a Java-based build tool with the full portability of pure Java code.
- According to Ant's original author, James Duncan Davidson. The name is an acronym for "Another Neat Tool".
- Ant is implemented in Java.
- Ant is Open Source, maintained by Apache.
- Ant is cross platform and portable.
- Ant is not a programming language

Ant is Operating System and Language Neutral

- Builds run on both Windows and UNIX/Linux systems
- Should run anywhere a Java VM runs
- Build targets can still do OS-specific tasks
- Works with anything that can be done from the command line
- Easy to extend (with Java)
- It is possible to extend with other languages as long as they have Java bindings but in practice, most people use Java to extend Ant

What can Ant do?

- Ant can get source code from version control
    - CVS, Subversion, Synergy, Perforce, ClearCase and many more
- Ant can compile source code
- Ant can run unit tests
    - JUnit3, JUnit4, TestNG, or any arbitrary test application
- Ant can package compiled code and resources
    - jars, wars, ears, tars, zips, whatever

Limitation of IDE

- IDE's are hard to automate
- IDE's are harder to setup
- IDE's are not ubiquitous
- Not everyone likes the same IDE
- All IDE's provide Ant integration, some even use Ant internally
- Ant is the least common denominator, it can be relied upon to work in all scenario

Build Automation

- Automated build procedures are a best practice
- Manual procedures are mistake prone
- Automated builds are self documenting
- Automated builds improve productivity
- Automated builds can be triggered by other tools

  Nightly builds using cron

  Continuous integration using CruiseControl

ANT software

- Apache Ant is a software tool for automating software build processes. It is similar to Make but is implemented using the Java language, requires the Java platform, and is best suited to building Java projects.

  -Wikipedia

- Website to Download Windows Ant

  http://code.google.com/p/winant/

- Download Apache Ant

  http://ant.apache.org/bindownload.cgi

Setup

- Download latest stable zip file

  from http://ant.apache.org/bindownload.cgi
- Unzip downloaded file into a directory
- Setup Environment Variables
- Define ANT_HOME to be the location where Ant was unzipped

Setup continued…

- Define JAVA_HOME to be the location where the JDK is installed
- Add %ANT_HOME%\bin to the PATH

- External tools can be integrated with Ant
- http://ant.apache.org/external.html

Structure of a typical build.xml file

```
<?xml version="1.0"?>
  <project name="MyFirstAntProject" default="MyTarget">
        <target name="init">
              <echo>Running target init</echo>
        </target>
        <target name="MyTarget" depends="init">
              <echo>Running target MyTarget</echo>
        </target>
  </project>
```

Best Practices

- The Begin and End tags for project (<project> and </project>) MUST start and end the file.
- The Begin <project> MUST have an attribute called default which is the name of one of the targets
- Each build file must have at least one target
- The Begin and End tags for <target> and </target> must also match EXACTLY.
- Each target MUST have a name
- Target depends are optional

Best Practices contd..

- Anything between <echo> and </echo> tags is outputted to the console if the surrounding target is called
- You can execute this from a DOS or UNIX command prompt by creating a file called build.xml and typing:
- -Ant
- Ant will search for the build file in the current directory and run the build.xml file:

Sample Output

```
Buildfile: C:\AntClass\Lab01\build.xml

    init:
         [echo] Running target init
    MyTarget:
         [echo] Running target MyTarget
    BUILD SUCCESSFUL
    Total time: 188 milliseconds
```

Ant Terminology

- **Ant Project** – a collection of named targets that can run in any order depending on the time stamps of the files in the file system. Each build file contains one project.
- **Ant Target** – a fixed series of ant tasks in a specified order that can depend on other named targets. Targets can depend only on other targets, not on projects or tasks. A target represents a particular item to be created, it can be a single item like a jar, or a group of items, like classes.
- **Ant Task** – something that ant can execute such as a compile, copy or replace. Most tasks have very convenient default values.

Ant Project

<project> is the top level element in an Ant script

<project> has three optional attributes:

→name:the name of the project

→default: the default target to use when no target is supplied

→basedir: the base directory from which all path calculations are don

Target

- Each project defines zero or more targets
- A target is a set of tasks you want to be executed
- When starting Ant, you can select which target(s) you want to have executed
- When no target is given, the project's default is used
- Targets can be conditionally executed (using if/unless)
- A target can depend on other targets
- Target dependencies are transitive

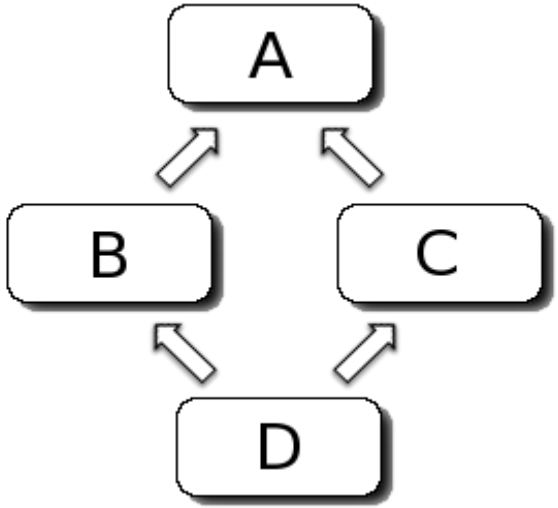
Target Example

<target name="A"/>

<target name="B" depends="A"/>

<target name="C" depends="A"/>

<target name="D" depends="B,C"/>



Suppose we want to execute target D, which depends upon B and C

- C depends on A
- B depends on A
- so first A is executed, then B, then C, and finally D

Tasks

File Tasks

<copy>, <concat>, <delete>, <filter>, <fixcrlf>, <get>

Compile Tasks

- <javac>

  Compiles the specified source file(s) within the running (Ant) VM, or in another VM if the fork attribute is specified.

- <apt>

  Runs the annotation processor tool (apt), and then optionally compiles the original code, and any generated source code.

- <rmic>

  Runs the rmic compiler

Archive Tasks

<zip>, <unzip>

Creates a zipfile.

<jar>, <unjar>

Jars a set of files.

<war>, <unwar>

An extension of the Jar task with special treatment web archive dirs.

<ear>

An extension of the Jar task with special treatment enterprise archive dirs.

Testing Tasks

- <junit>

  Runs tests from the JUnit testing framework.

  <junitreport>

  Merges the individual XML files generated by the Junit task and applies a stylesheet on the resulting merged document to provide a browsable report of the test cases results

Property Tasks

<dirname>

Sets a property to the value excluding the last path element.

<loadfile>

Loads a file into a property.

<propertyfile>

Creates or modifies property files.

<uptodate>

Sets a property if a given target file is newer than a set of source files.

MISCELLANEOUS TASKS

<echo> Echoes text to System.out or to a file.

<javadoc> Generates code documentation using the javadoc tool.

<sql> Executes a series of SQL statements via JDBC to a database. Statements can either be read in from a text file using the src attribute, or from between the enclosing SQL tags.

Optionally you can also pass ant the name of the target to run as a command line argument

- ant init

Ant does not have variables like in most standard programming languages. Ant has a structure called properties.

Ant Properties

- Ant properties are immutable meaning that once they are set they can not be changed within a build process!
- This may seem somewhat odd at first, but it is one of the core reasons that once targets are written they tend to run consistently without side effects. This is because targets only run if they have to and you can not predict the order a target will run
- Properties do not have to be used only inside a target. They can be set anywhere in a build file (or an external property file) and referenced anywhere in a build file after they are set.

Example: immutable

```
<project name="My Project" default="MyTarget">
  <target name="MyTarget">
  <property name="MyProperty" value="One"/> <!-- check to see
  that the property gets set --> <echo>MyProperty =
  ${MyProperty}</echo>
   <!-- now try to change it to a new value --> <property
  name="MyProperty" value="Two"/> <echo>MyProperty =
  ${MyProperty}</echo> </target>
  </project>
```

Apache Ant/Depends

The depends attribute can be included in the target tag to specify that this target requires another target to be executed prior to being executed itself. Multiple targets can be specified and separated with commas.

<target name="one" depends="two, three">

Here, target "one" will not be executed until the targets named "two" and "three" are, first.

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Example: Ant Depends

- <?xml version="1.0" encoding="UTF-8"?> <project default="three">
  <target name="one">
  <echo>Running One</echo>
  </target>
  <target name="two" depends="one"> <echo>Running Two</echo>
  </target>
  <target name="three" depends="two"> <echo>Running Three</echo>
  </target>
  </project>

Wildcards

Wildcards are used by ant to specify groups of files that have a pattern to their names.

- ? is used to match any character.
- * is used to match zero or more characters.
- ** is used to match zero or more directories.

Example :

```
<fileset dir="${server.src}" casesensitive="yes">          <include name="**/*.java"/>
        <exclude name="**/*Test*"/>
</fileset>
```

References

Links

→ant.apache.org

→http://www.exubero.com/ant/antintro-s5.html

→Wikipedia.org

→WikiBooks

Books

→Ant: The Definitive Guide, 2nd Edition by Holzner Steve (April 14, 2005)

→Pro Apache Ant by Matthew Moodie (Nov 16, 2005)

→Java Development with Ant by Erik Hatcher and Steve Loughran (Aug 2002)

→Ant Developer's Handbook by Allan Williamson, et al. (Nov 1, 2002)

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Thank You!