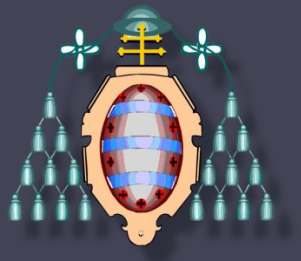
EN
English



Universidad of Oviedo

School of Computer Science

SOFTWARE ARCHITECTURE

Software architecture

Lab. 05

Building automation

Maven, Gradle, npm, grunt,...

Dependency management

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Software builders

- Tasks
  - Compilation
    - From source code to binary code
  - Packaging
    - Dependency management and integration
    - Also called linking
  - Test execution
  - Deployment
  - Documentation creation / *release notes*

Building automation

- Automatize building tasks
- Objectives:
  - Avoid errors (minimize "*bad buildings*")
  - Eliminate redundant and repetive tasks
  - Manage complexity
  - Improve the product quality
  - Store a building and release history
  - Continuous integration
  - Save time and money

Automation tools

- Makefile (C)
- Ant (Java)
- Maven (Java)
- Npm (Node.js)
- SBT (Scala, JVM languages)
- Gradle (Groovy, JVM languages)
- rake (Ruby)
- etc.

Maven

Building automation tool

- Describe how to build the software
- Describe software dependencies

Principle: Convention over configuration

- Maven provides a default behaviour for the project

Maven

Building phases:

`clean, compile, build, test, package, install, deploy`

Module identification

3 coordinates: Group, Artifact, Version

Dependencies between modules

Configuration: XML file (Project Object Model)

`pom.xml`

maven

Maven

- Artifacts storages
  - Store different types of artifact
    - JAR, EAR, WAR, ZIP files, plugins, etc.
  - All the interactions are done through the repository
    - Without relative paths
    - Share models between development teams

Maven

- POM file (pom.xml)
  - XML syntax
  - Describe a project
    - Name and version
    - Artifact type (jar, pom, …)
    - Source code localization
    - Dependencies
    - Plugins
    - Profiles
      - Alternative building configurations

Maven

- Project identification
  - GAV (Group, Artifact, Version)
    - Group: Group identifier
    - Artifact: Project name
    - Version: Format {Bigger}.{Smaller}.{Development}
      - "-SNAPSHOT“ can be added (during development)

```
<?xml version="1.0" encoding="UTF-8"?>
<project>
    <modelVersion>4.0.0</modelVersion>
    <groupId>es.uniovi.asw</groupId>
    <artifactId>Entrecine8</artifactId>
    <version>1.0</version>
</project>
```


Maven

Directory structure

- Maven uses a conventional structure
  - src/main
  - src/main/java
  - src/main/webapp
  - src/main/resources
  - src/test/
  - src/test/java
  - src/test/resources
  - . . .

Maven

Development cycle

- generate-sources/generate-resources
- compile
- test
- package
- integration-test
- install
- deploy
- clean

Invocation:

```
mvn clean
mvn compile
mvn clean compile
mvn compile install
...
```

Maven

Automatically managing of dependencies

- Identification through GAV
- Environment
  - compile
  - test
  - provided
- Type
  - jar, pom, war,...

```
<project>
    ...
    <dependencies>
        <dependency>
            <groupId>javax.servlet</groupId>
            <artifactId>servlet-api</artifactId>
            <version>2.5</version>
            <scope>provided</scope>
        </dependency>
        . . .
    </dependencies>
</project>
```

Maven

- Automatically managing of dependencies
  - Dependencies are downloaded
  - Stored in a local repository
  - Intermediate repositories can be created (proxies)
    - Example: common artifacts for a company
  - Transitivity
    - B depends of C
    - A depends of B -> C is also downloaded

maven

Maven

Multiple modules

Big projects can be divided

Each Project creates an artifact

- They have their own pom.xml file

The parent project groups all of them

```
<project>
    ...
    <packaging>pom</packaging>
    <modules>
        <module>extract</module>
        <module>game</module>
    </modules>
</project>
```


maven

Maven

Other phases and plugins

- `archetype:generate` – Generates the archetype of the project
- `eclipse:eclipse` – Generate eclipse project
- `site` – Generate website of the project
- site:run - Generate website and runs server
- javadoc:javadoc – Generate documentation
- cobertura:cobertura – Informs of the code coverage
- checkstyle:checkstyle – Check the codification style

Gradle

- Designed specifically for projects based on Java.
- Based on Groovy instead of XML
- To build multi-projects.

Gradle

- Two basic concepts
  - Project: Something that we build (for example jar files) or what we do (deploy our application)
  - Task: Atomic pieces of work during a build (for example compile our project or launch tests)

Gradle

- Tasks:
  - Scripts are saved in build.gradle.
  - Next example defines a task named “hello” that is used to print “ASW”

```
task hello {
        doLast{
                println ‘ASW’
                }
}
```

  - Execution:

```
C:\> gradle –q hello
```

Gradle

- Add dependencies to the tasks: A task can be only executed when the tasks that it depends on finish

```
task taskX << {
        println 'taskX' }
task taskY(dependsOn: 'taskX') << {
        println "taskY" }
```

```
task taskY << {
        println 'taskY' }
task taskX << {
        println 'taskX' }
taskY.dependsOn taskX
```

- Execution result:

```
taskX
taskY
```

Gradle

- dependencies: Similar to Maven the libraries are downloaded from a repository (it can even be a Maven repository)

```
apply plugin: 'java'
 repositories {
   mavenCentral()
}
 dependencies {
   compile group: 'org.hibernate', name: 'hibernate-core', version: '3.6.7.Final'
   testCompile group: 'junit', name: 'junit', version: '4.+'
}
```

Gradle

- Dependency configuration
  - Compile: The dependencies required to compile the source code of the project.
  - Runtime: Dependencies required by the producction classes during runtime.
  - Test Compile: Dependencies used to compile the test classes.
  - Test Runtime: Dependencies required to execute the tests.

Gradle

- External dependencies: Dependencies which some of their files are built outside the current build. They are stored in an external repository like Maven central:

```
dependencies {
   compile group: 'org.hibernate', name: 'hibernate-core', version: '3.6.7.Final'
}
```

Gradle

- Repositories: When external dependencies are added Gradle searches them in a repository

```
repositories {
   mavenCentral()
}
```

Gradle - plugins

- Plugin: Set of tasks
  - Extends the basic model of Gradle
  - Configs the Project
  - Applies specific configurations
- 2 types
  - Scripts: Can be applied locally or remotely

```
apply from: 'other.gradle'
```

  - Binaries: Identified by a plugin id

```
apply plugin: JavaPlugin
```

```
plugins {
   id 'java'
}
```

```
plugins {
   id "com.jfrog.bintray"
version "0.4.1"
}
```

npm

Node.js **P**ackage **M**anager

- Initially created by Isaac Schlueter
- Later became Npm inc.

3 things:

1. Website (https://www.npmjs.com/)
   - User and organization management
2. Software registry
   - Public/private packages
3. CLI application
   - Dependency and task management
   - Configuration file: package.json

npm configuration: package.json

- Configuration file: package.json
  - npm init creates a simple skeleton
- Fields:

```
{
 "name":                 "...mandatory...",
 "version":              "...mandatory...",
 "description":          "...optional...",
 "keywords":             "...",
 "repository":           {... },
 "author":               "...",
 "license":              "...",
 "bugs":                 {...},
 "homepage":             "http://. . .",
 "main":                 "index.js",
 "devDependencies":      { ... },
 "dependencies":         { ... }
 "scripts":              { "test": " ... " },
 "bin":                  {...},
}
```

Note: Yeoman provides fully featured scaffolding

npm packages

Registry: http://npmjs.org

Installing packages:

2 options:

Local

```
npm install <packageName> --save (--save-dev)
```

Downloads `<packageName>` contents to `node_modules` folder

Global

```
npm install -g <packageName>
```

Store the dependency in the `package.json`

Only for development

npm dependencies

- Dependency management
  - Local packages are cached at `node_modules` folder
  - Access to modules through: `require('...')`
- Global packages (installed with --global option)
- Scoped packages marked by @

npm commands and scripts

npm contains lots of commands

- `start` -> node server.js
- `test` -> node server.js
- `ls` lists installed packages
- ...

Custom scripts:

- `run <name>`

More complex tasks in NodeJs

- Gulp, Grunt

https://docs.npmjs.com/cli-documentation/

npm packages

- Dependencies: Stored in package.json
- Package: Identified by name and version
- Rule for names:
  - Less than or equal to 214 characters.
  - Can't start with a dot or an underscore.
  - New packages must not have uppercase letters in the name.
  - The name ends up being part of a URL, an argument on the command line, and a folder name. Therefore, the name can't contain any non-URL-safe characters.

npm semantic versioning

- Version of the package: Semantic versioning
  - Must be parseable by node-semver
- Ranges: Comparators which specify versions that satisfy the range
  - For example, the comparator >=1.2.7 would match the versions 1.2.7, 1.2.8, 2.5.3, and 1.3.9, but not the versions 1.2.6 or 1.1.0.
  - More at https://docs.npmjs.com/misc/semver

npm package.json fields

Reference: https://docs.npmjs.com/files/package.json

Fields:

- description
- keywords
- homepage: URL to Project homepage
- bugs: URL of project's issue tracker and/or the email address to which issues should be reported
- people fields: author, contributors.
  - The "author" is one person. "contributors" is an array of people. A "person" is an object with a "name" field and optionally "url" and "email"

npm package.json fields

- files: An array of file patterns that describes the entries to be included when your package is installed as a dependency
- file patterns follow a similar syntax to .gitignore, but reversed:
  - Including a file, directory, or glob pattern (*, **/*, and such) will make it so that file is included in the tarball when it's packed.
  - Omitting the field will make it default to ["*"], which means it will include all files.

npm files included

- Certain files are always included, regardless of settings:
  - package.json
  - README
  - CHANGES / CHANGELOG / HISTORY
  - LICENSE / LICENCE
  - NOTICE
  - The file in the “main” field

npm package.json fields

- main: module ID that is the primary entry point to your program
  - This should be a module ID relative to the root of your package folder.
  - For most modules, it makes the most sense to have a main script and often not much else.
- browser: If the module is meant to be used client-side the browser field should be used instead of the main field.
  - This is helpful to hint users that it might rely on primitives that aren't available in Node.js modules (eg a window).

npm package.json fields

- repository: the place where the code lives.

```
"repository": {
  "type" : "git",
  "url" : "https://github.com/npm/cli.git"
}

"repository": {
  "type" : "svn",
  "url" : "https://v8.googlecode.com/svn/trunk/"
}
```

npm package.json fields

- config: Used to set configuration parameters used in package scripts that persist across upgrades.

```
{
  "name" : "foo" ,
  "config" : { "port" : "8080" }
}
```

npm package.json fields

- dependencies: Dependencies are specified in a simple object that maps a package name to a version range.
  - The version range is a string which has one or more space-separated descriptors.
  - Version ranges based on semantic versioning:
    - See https://docs.npmjs.com/misc/semver

npm package.json fields

- devDependencies: Dependencies required to delevop the application such as unit tests.
- URL dependencies:
  - You may specify a tarball URL in place of a version range.
  - This tarball will be downloaded and installed locally to your package at install time.

```
<protocol>://[<user>[:<password>]@]<hostname>[:<port>][:][/]<path>[
#<commit-ish> | #semver:<semver>]
```

npm

- GIT URLs: Following form:

```
<protocol>://[<user>[:<password>]@]<hostname>[:<port>][:][/]<path>[#<commit-ish>|#semver:<semver>]
```

- Example

```
git+ssh://git@github.com:npm/cli.git#v1.0.27
git+ssh://git@github.com:npm/cli#semver:^5.0
git+https://isaacs@github.com/npm/cli.git
git://github.com/npm/cli.git#v1.0.27
```

Task Execution : Grup and Gulp

Execute JavaScript tasks:

- Compress images
- Package modules (webpack)
- Minimize js and css files
- Run tests
- Transcompile – babel.js

These tasks can be directly run with npm scripts or with Gulp and/or Grunt

Task Execution : Grup y Gulp

- Grup:
  - Module fs
  - Installation:

```
npm install -g grunt
npm install -g grunt-cli
```

  - package.json configuration

```
{  "name": “ASW",
   "version": "0.1.0",
   "devDependencies": {
      "grunt-contrib-jshint": "~0.10.0",
      "grunt-contrib-nodeunit": "~0.4.1",
      "grunt-contrib-uglify": "~0.5.0"
   }
}
```

- Gulp:
  - Module stream
  - Installation:

```
npm install --save-dev gulp
npm install -g gulp-cli
```

  - gulpfile.js configuration

```
function defaultTask(cb) {
 // tareas
 cb();
}
exports.default = defaultTask
```

Examples

Wrapper

```
module.exports  = function(grunt)  {
   // CONFIGURE  GRUNT
   grunt.initConfig({
(pkg.name)
      pkg:  grunt.file.readJSON('package.json'),
    });
   grunt.loadNpmTasks('grunt-contrib-uglify');
   grunt.registerTask('default',  ['uglify']);
};
```

Wrapper

```
gulp.task('jpgs',  function()
{ return gulp.src('src/images/*.jpg')
.pipe(imagemin({  progressive: true }))
.pipe(gulp.dest('optimized_images'));  });
```

End