Build tools basics – Maven & Gradle. Git

Working with Git - repositories, commands, branches, pull requests, resolving conflicts

Course Schedule

- Block 1: 9:00 – 10:30
- Pause: 10:30 – 10:45
- Block 2: 10:45 – 12:15
- Lunch: 12:15 – 13:00
- Block 3: 13:00 – 14:30
- Pause: 14:30 – 14:45
- Block 4: 14:45 – 16:15

Where to Find The Code and Materials?

Java Academy projects and examples are available @GitHub:

https://github.com/iproduct/course-java-web-2021

Agenda for This Session

- Ant
- Maven
- Gradle
- Git - repositories, commands, branches, pull requests, resolving conflicts

Apache Ant

- Apache Ant is a software tool for automating software build processes, which originated from the Apache Tomcat project in early 2000.
- Replacement for the Make build tool of Unix, created due to a number of problems with Unix's make.
- Similar to Make but is implemented using the Java language, requires the Java platform, and is best suited to building Java projects.
- With Make, actions required to create a target are specified as shell commands which are specific to the platform on which runs.
- Ant solves this problem by providing a large amount of built-in functionality designed to behave similarly on all platforms.

Apache Ant - I

```
<?xml version="1.0"?>

<project name="Invoicing with Views" default="compile">

    <presetdef name="javac"><javac includeantruntime="false" /></presetdef>

    <property name="build.dir" location="${basedir}/bin"/>

    <target name="clean" description="remove intermediate files">

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

    <target name="clobber" depends="clean" description="remove all artifact files">

        <delete file="invoicing.jar"/>
    </target>

    <target name="compile" description="compile the Java source code to class files">

        <mkdir dir="${build.dir}"/>

        <javac srcdir="." destdir="${build.dir}"/>
    </target>
    ...
```

Apache Ant - II

```
...
    <target name="jar" depends="compile" description="create a Jar file for the app">
        <jar destfile="invoicing.jar">
            <fileset dir="${build.dir}" includes="**/*.class"/>
            <manifest>
                <attribute name="Main-Class" value="invoicing.view.MainMenu"/>
            </manifest>
        </jar>
    </target>
    <target name="run" depends="compile" description="run the application">
        <java classname="invoicing.view.MainMenu"
                classpath="${java.class.path};${build.dir}" dir="." fork="true" />
    </target>
    <target name="runJar" depends="jar" description="run the app from the jar file">
        <java jar="invoicing.jar" dir="." failonerror="true" fork="true" />
    </target>
</project>
```

Build Integration with Maven

What is Maven?

- What is Maven Apache Maven is a software project management and comprehension tool. Based on the concept of a **Project Object Model (POM)**, Maven can manage a project's build, reporting and documentation from a central piece of configuration – **pom.xml**
- Advantages over Ant:
  - Eliminate the hassle of maintaining complicated scripts
  - All the functionality required to build your project , i.e. , clean, compile, copy resources, install, deploy etc. is built right into the Maven
  - Cross Project Reuse – Ant has no convenient way to reuse target across projects, But Maven does provide this functionality

Maven Main Phases and Commands

Although hardly a comprehensive list, these are the most common default lifecycle phases excuted:

- **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.
- **integration-test**: process and deploy the package if necessary into an environment where integration tests can be run
- **verify**: run any checks to verify the package is valid and meets quality criteria
- **install**: install the package into the local repository, for use as a dependency in other projects locally
- **deploy**: done in an integration or release environment, copies the final package to the remote repository for sharing with other developers and projects.
- There are two other Maven lifecycles of note beyond the default list above. They are
- **clean**: cleans up artifacts created by prior builds
- **site**: generates site documentation for this project

Phase → Plugin:Goal

- *process-resources* -> resources:resources
- *compile* -> compiler:compile
- *process-test-resources* -> resources:testResources
- *test-compile* -> compiler:testCompile
- *test* -> surefire:test
- *package* -> ejb:ejb OR ejb3:ejb3 OR jar:jar OR par:par OR rar:rar OR war:war
- *install* -> install:install
- *deploy* -> deploy:deploy

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Maven Common Plugins

https://www.baeldung.com/core-maven-plugins

- Resources Plugin – copies resources
- Compiler Plugin - compile the source and test code
- Failsafe Plugin – run tests with cleanup
- Surefire Plugin – run tests
- Verifier Plugin – check invariants
- Install Plugin – install to local Maven repo
- Deploy Plugin – deploy to remote Maven repo
- Site Plugin – run Maven info site (site:site, site:run)
- Clean Plugin – cleans generated dirs (mvn clean)

Maven Dependency Management

- Apache Maven – https://spring.io/guides/gs/maven/
- Common arguments: **mvn compile, mvn package, mvn clean dependency:copy-dependencies package, mvn install, mvn clean deploy site-deploy,**
- **mvn -q compile exec:java -Dexec.mainClass= "simpledemo.AnnotationSpringDIDemo"**

```
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns="http://maven.apache.org/POM/4.0.0"
         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
         xsi:schemaLocation="http://maven.apache.org/POM/4.0.0
http://maven.apache.org/xsd/maven-4.0.0.xsd">
    <modelVersion>4.0.0</modelVersion>
    <groupId>org.iproduct.spring</groupId>
    <artifactId>01-introduction-maven</artifactId>
    <version>1.0-SNAPSHOT</version>
```


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Maven Configuration (continued)

```
<dependencies>
    <dependency>
        <groupId>org.springframework</groupId>
        <artifactId>spring-context</artifactId>
        <version>5.0.5.RELEASE</version>
    </dependency>
</dependencies>

<repositories>
    <repository>
        <id>io.spring.repo.maven.release</id>
        <url>http://repo.spring.io/release/</url>
        <snapshots>
            <enabled>false</enabled>
        </snapshots>
    </repository>
</repositories>
```


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Maven Configuration (continued)

```
    <build>
        <plugins>
            <plugin>
                <groupId>org.apache.maven.plugins</groupId>
                <artifactId>maven-compiler-plugin</artifactId>
                <configuration>
                    <source>9</source>
                    <target>9</target>
                </configuration>
            </plugin>
        </plugins>
    </build>

</project>
```


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Maven Configuration (enhanced)

```
<dependencyManagement>
    <dependencies>
        <dependency>
            <groupId>org.springframework</groupId>
            <artifactId>spring-framework-bom</artifactId>
            <version>5.0.5.RELEASE</version>
            <type>pom</type>
            <scope>import</scope>
        </dependency>
    </dependencies>
</dependencyManagement>

<dependencies>
    <dependency>
        <groupId>org.springframework</groupId>
        <artifactId>spring-context</artifactId>
    </dependency>
</dependencies>
```


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Gradle Dependency Management

- Gradle – https://spring.io/guides/gs/gradle/
- Init new project/ convert exisitng from Maven: **`gradle init`**
- Build project: **`gradle build`**
- Build project: **`gradle run`**
- Example configuration:

```
group 'org.iproduct.spring'
version '1.0-SNAPSHOT'
apply plugin: 'java'
apply plugin: 'application'
mainClassName = 'org.iproduct.spring.demo.xmlconfig.HelloWorldSpringDI'

sourceCompatibility = 1.8
```

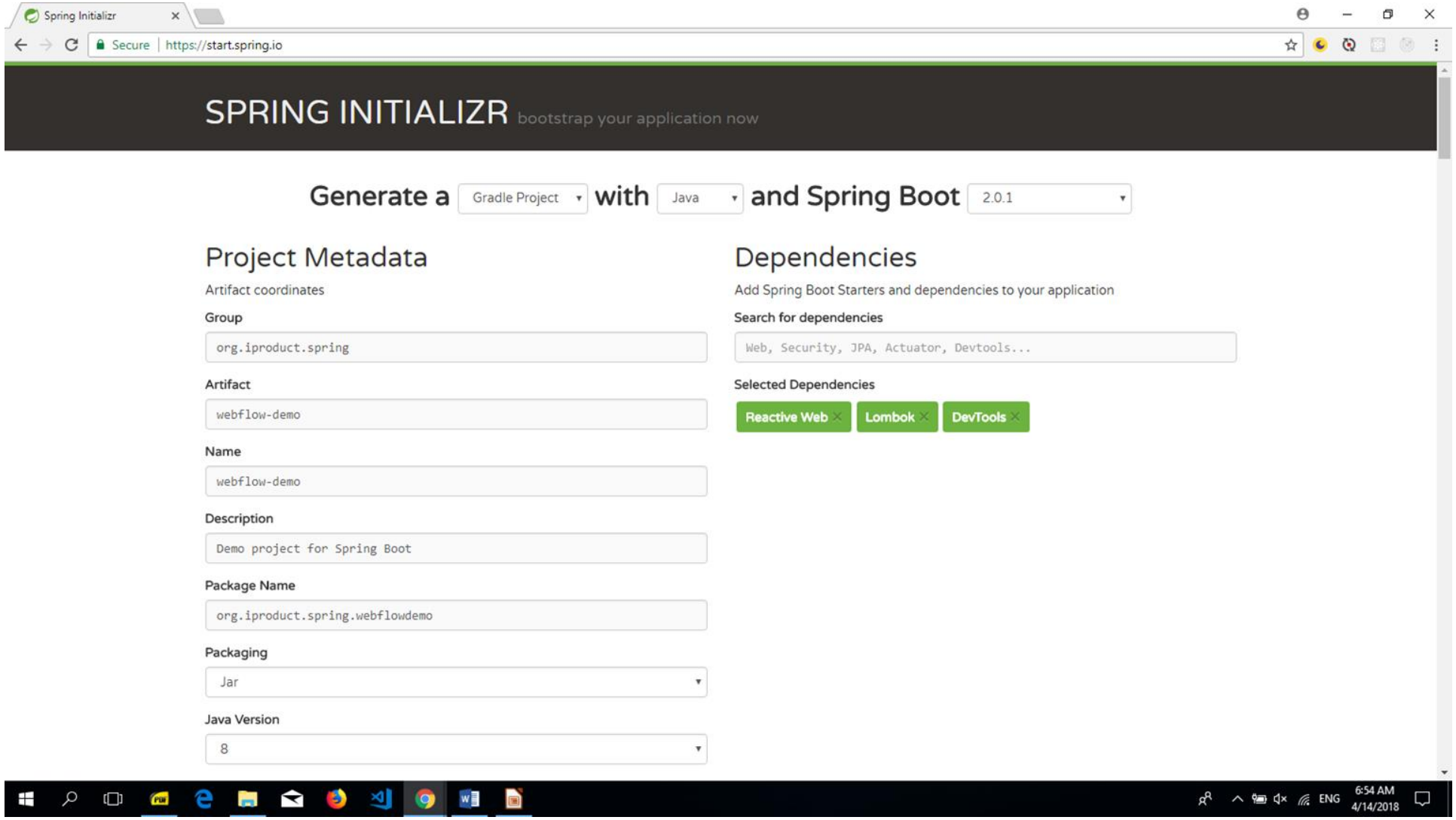
Gradle Configuration (continued)

```
task runApp(type: JavaExec) {
    classpath = sourceSets.main.runtimeClasspath
    main = 'org.iproduct.spring.demo.xmlconfig.HelloWorldSpringDI'
}

repositories {
    mavenLocal()
    mavenCentral()
    maven { url "https://repo.spring.io/snapshot" }
    maven { url "https://repo.spring.io/milestone" }
}

dependencies {
    implementation group: 'org.springframework',
            name: 'spring-context', version: '5.0.5.RELEASE'
    testImplementation group: 'junit', name: 'junit', version: '4.12'
}
```

Java Library plugin configurations for dependencies:

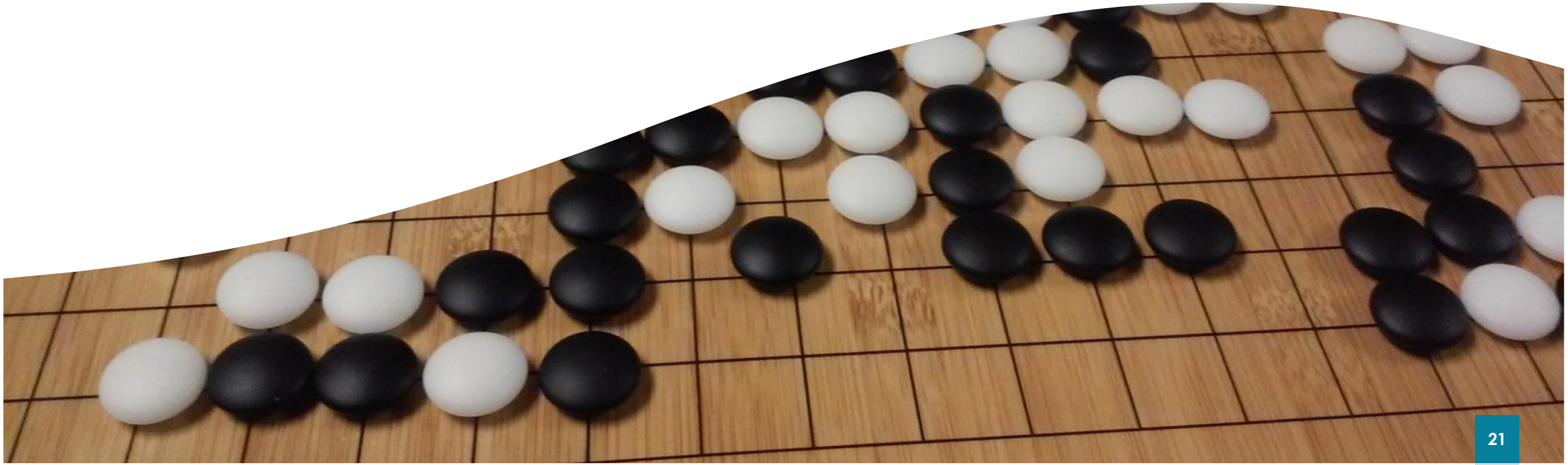
Configuration name	Role	Description
api	API dependencies	Dependencies which are transitively exported to consumers, for compile time and runtime.
implementation	implementation dependencies	Dependencies which are purely internal and not meant to be exposed to consumers (they are still exposed to consumers at runtime).
compileOnly	compile only dependencies	Dependencies which are required at compile time, but not at runtime. This typically includes dependencies which are shaded when found at runtime.
compileOnlyApi	compile only API dependencies	Dependencies which are required at compile time by your module and consumers, but not at runtime. This typically includes dependencies which are shaded when found at runtime.
runtimeOnly	runtime dependencies	Dependencies which are only required at runtime, not at compile time.
testImplementation	test dependencies	Dependencies used to compile tests.
testCompileOnly	test compile only dependencies	Dependencies which are only required at test compile time, but should not leak into the runtime. This typically includes dependencies which are shaded when found at runtime.
testRuntimeOnly	test runtime dependencies	Dependencies which are only required at test runtime, and not at test compile time.

Making Projects Easy: Spring Boot 2



Git

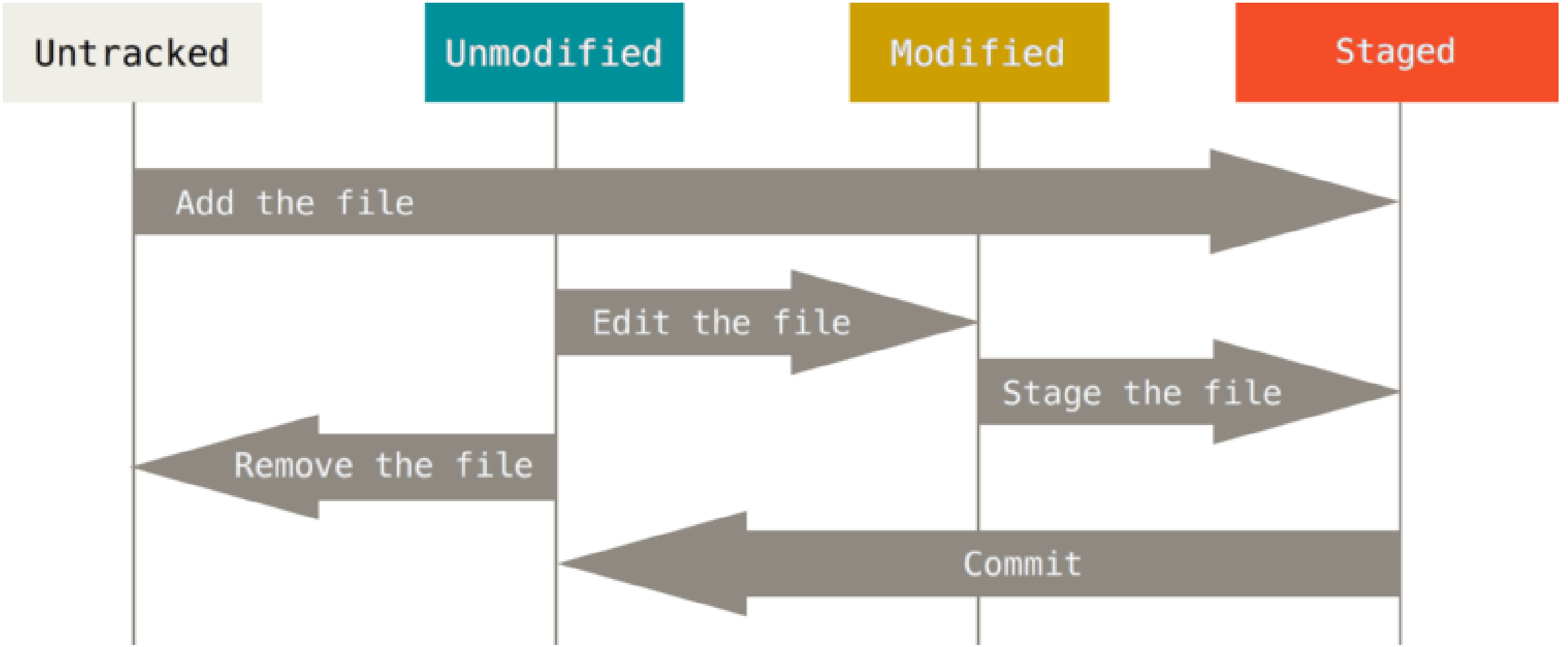
Materials from: https://git-scm.com/book/en/v2



Social Coding using Git

- Version control systems and collaborative coding: CVS, SVN, Git
- Version control system – allows saving the code changes in a structured and manageable way, with ability to recover previous code state (rollback), experiments (branches), and changes synchronization (merge)
- A distinctive feature of Git is that the changes are kept locally in a form of momentary pictures (snapshots), instead of saving the list of changes – allows fast operations.
- Three stages: **Modified** → **Staged** → **Committed**

Social Coding using Git



Main Git Commands (1)

- Configuring Git

```
$ git config --global user.name "John Smith"
$ git config --global user.email jsmith@company.com
```

- Help information for a command

```
$ git help <command_verb>
```

- Creating new repository in an existing directory

```
$ git init
```

- Local cloning of a git repository

```
$ git clone <repository_url> [<local_folder>]
```

Main Git Commands (2)

- Adding new files – Staging и Commit

```
$ git add *.java
$ git add README.txt
$ git commit -m ”initial commit of MyProject”
```

- Information about the status of the files in the project

```
$ git status
```

- Showing changes in the files

```
$ git diff
```

- Ignoring files – file **.gitignore**

```
$ cat .gitignore
```

Main Git Commands (3)

- Removing files

$ git rm README.txt

$ git commit -m ”removing README file from project”

- Renaming files

$ git mv README.txt README

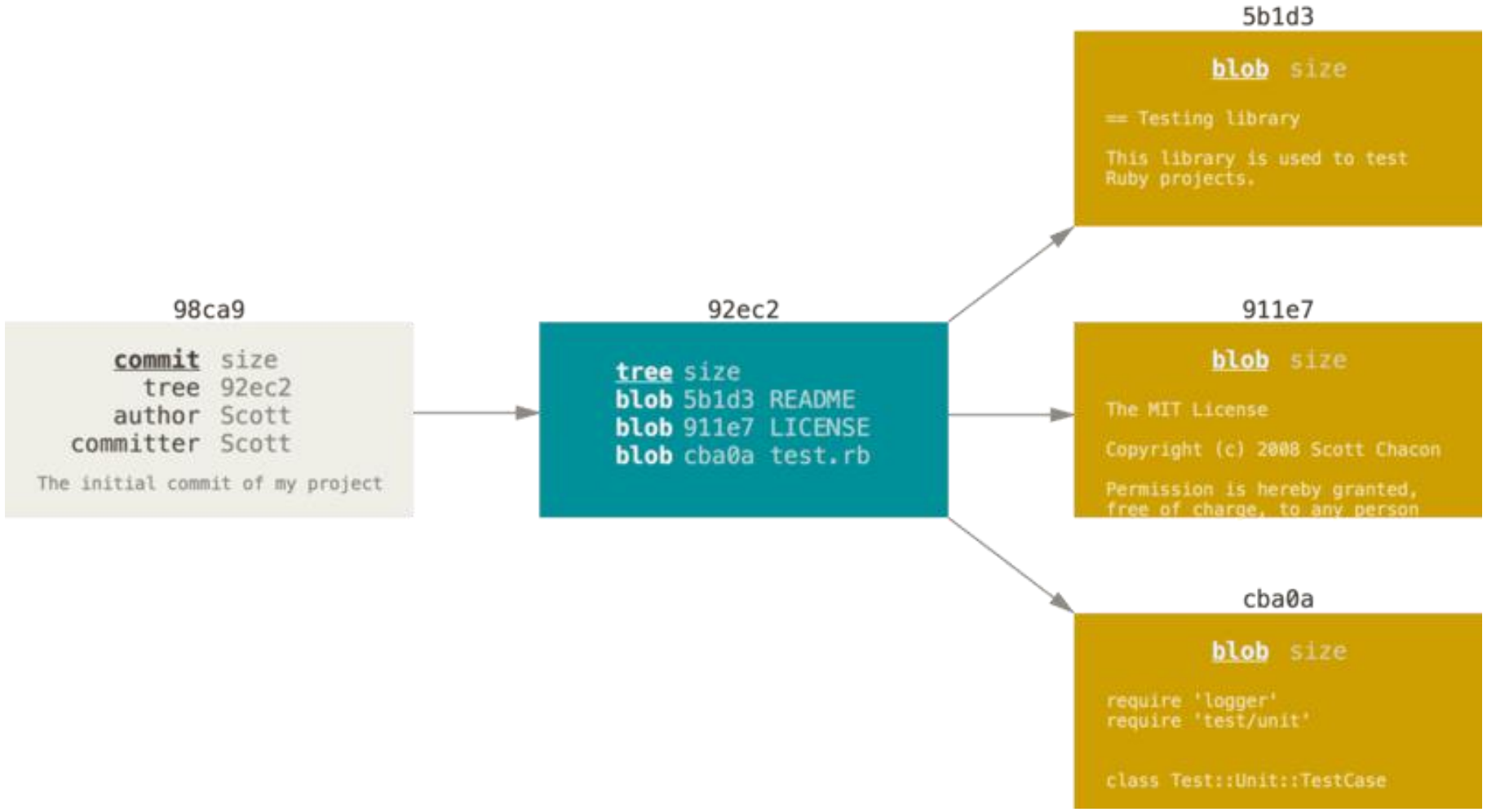
- For more information:

http://git-scm.com/book/en/Git-Basics-Recording-Changes-to-the-Repository

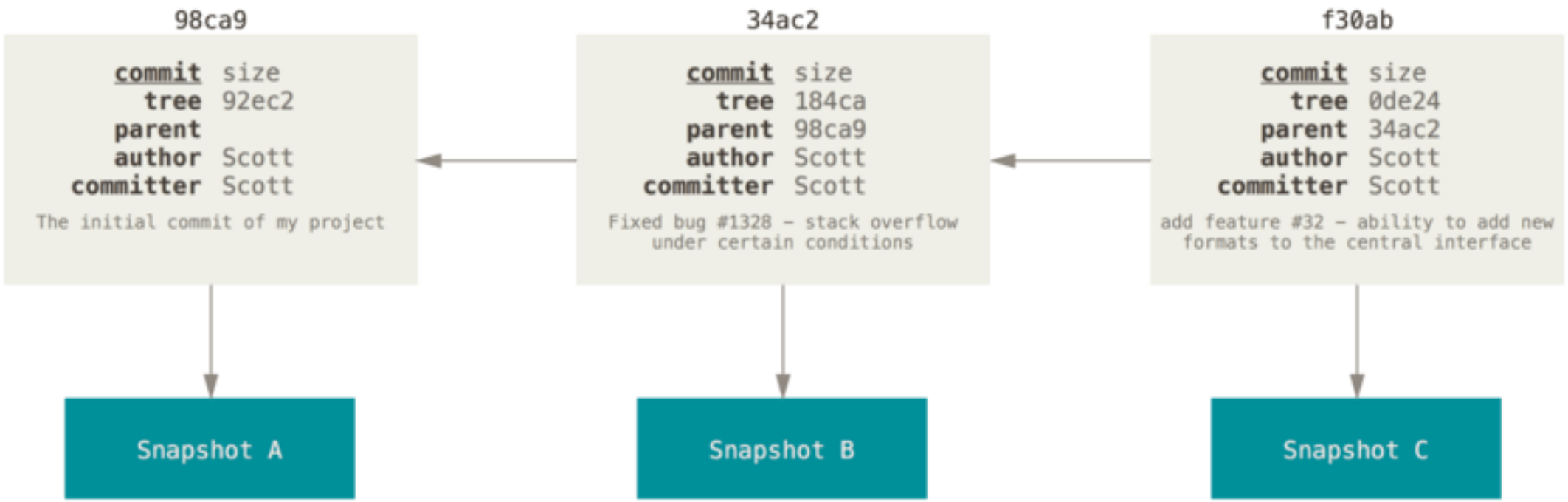
- Example Git project:

https://github.com/iproduct/course-java-web-2021

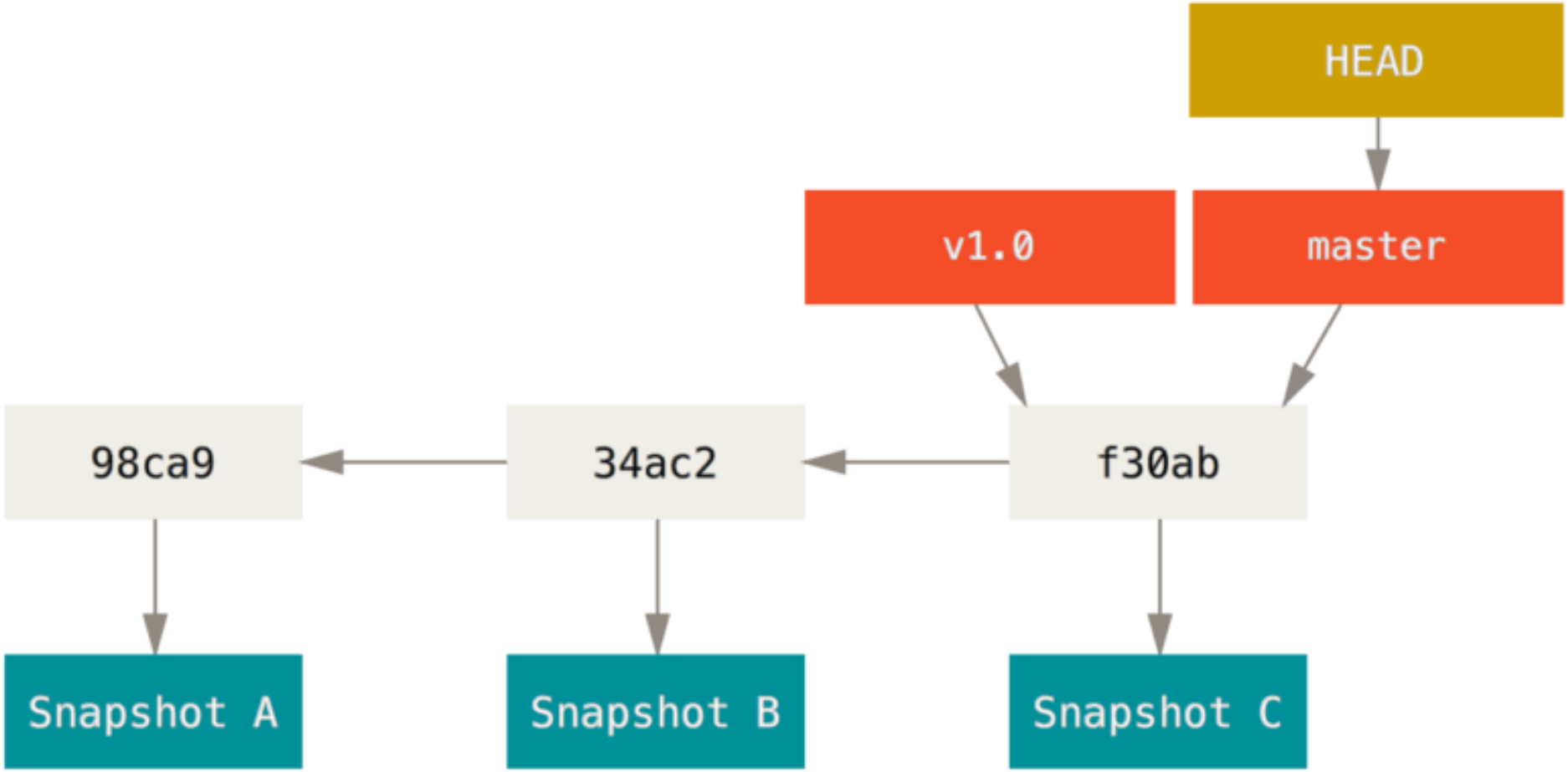
Git Blobs


98ca9
commit size
tree 92ec2
author Scott
committer Scott
The initial commit of my project
92ec2
tree size
blob 5b1d3 README
blob 911e7 LICENSE
blob cba0a test.rb
5b1d3
blob size
== Testing library
This library is used to test Ruby projects.
911e7
blob size
The MIT License
Copyright (c) 2008 Scott Chacon
Permission is hereby granted, free of charge, to any person
cba0a
blob size
require 'logger'
require 'test/unit'
class Test::Unit::TestCase

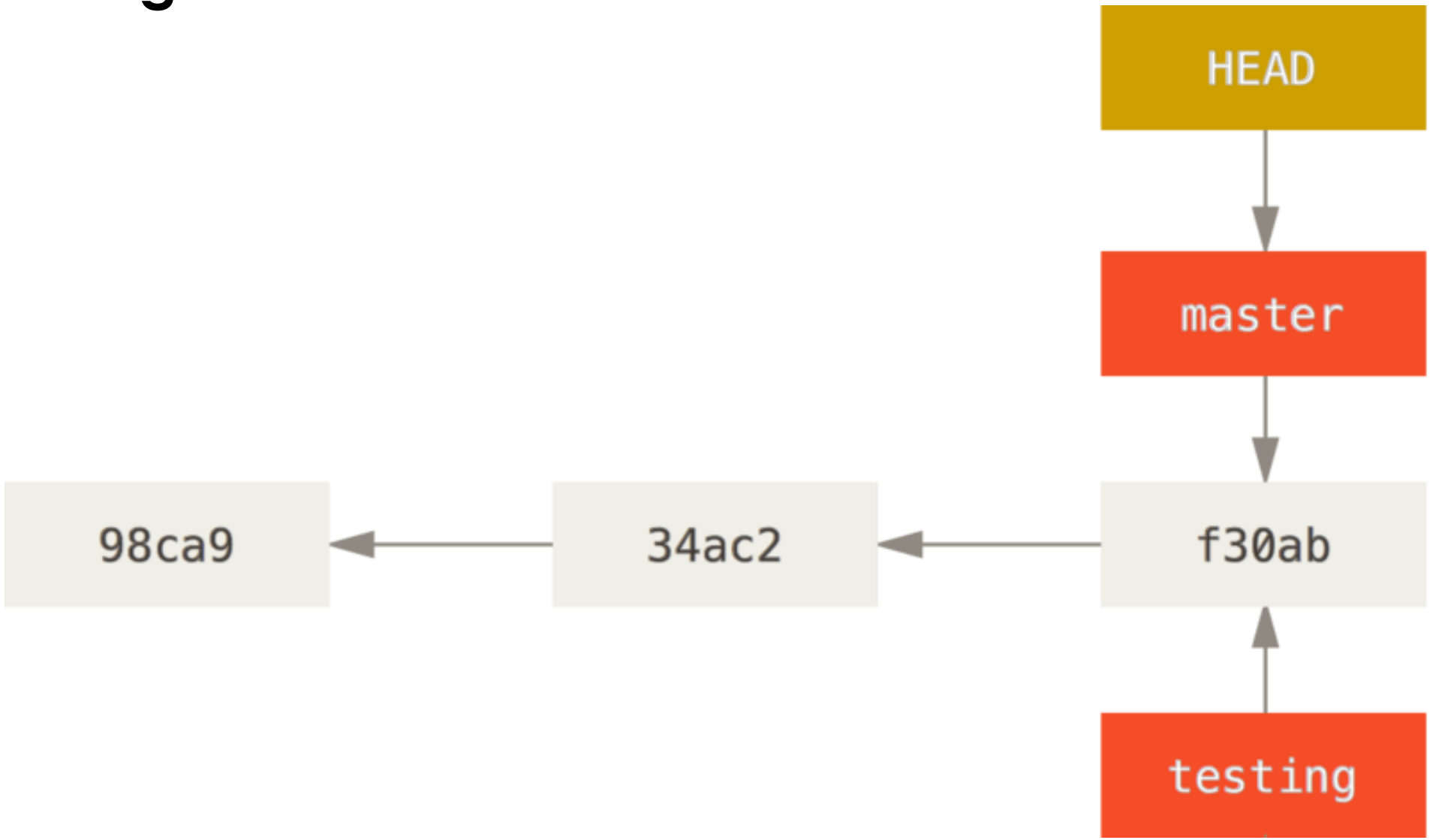
Git Commits


98ca9
commit size
tree 92ec2
parent
author Scott
committer Scott
The initial commit of my project
34ac2
commit size
tree 184ca
parent 98ca9
author Scott
committer Scott
Fixed bug #1328 - stack overflow under certain conditions
f30ab
commit size
tree 0de24
parent 34ac2
author Scott
committer Scott
add feature #32 - ability to add new formats to the central interface
Snapshot A
Snapshot B
Snapshot C

Head and Branches

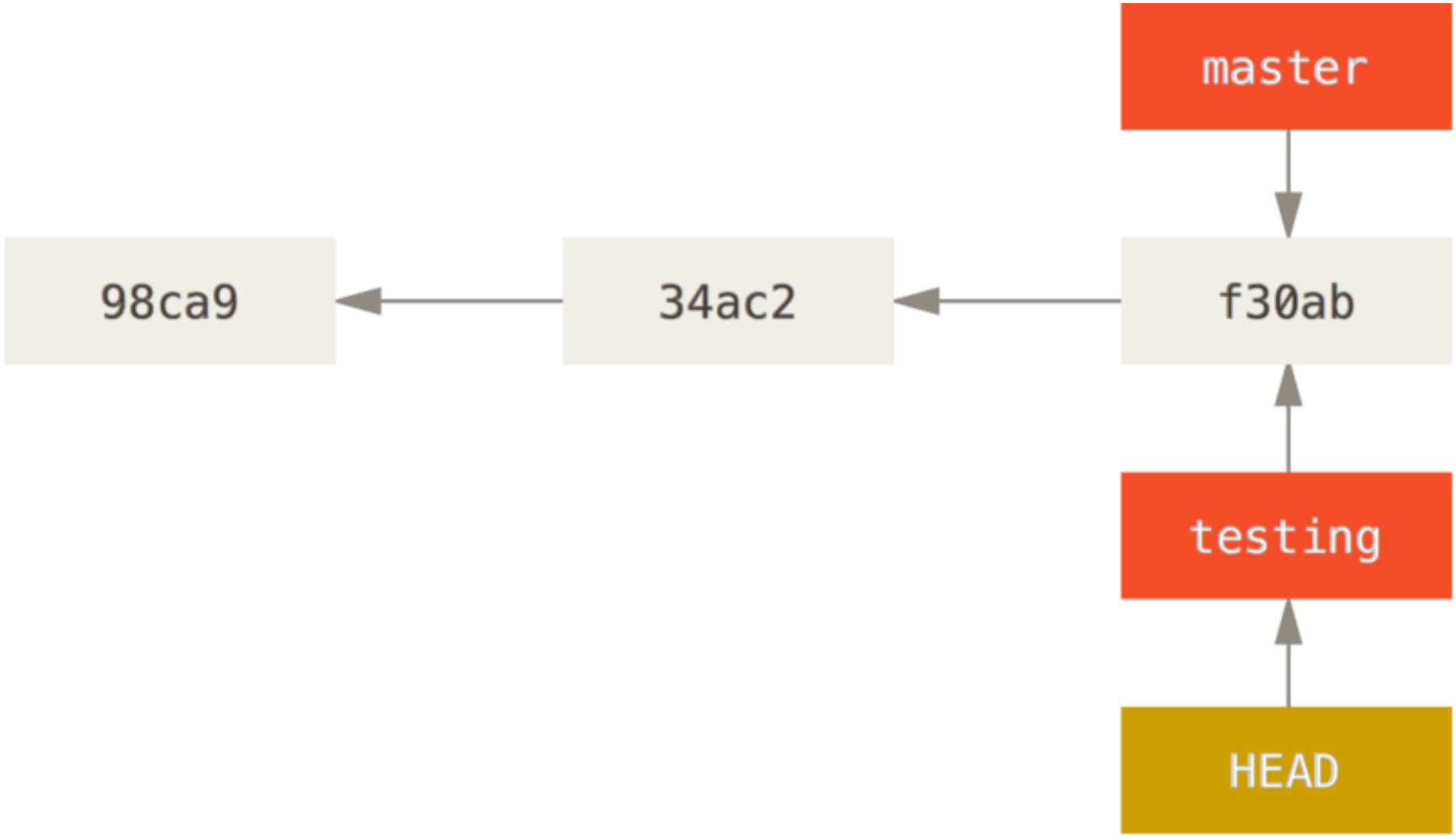


Branching



Switching Branches -

https://git-scm.com/book/en/v2/Git-Branching-Branches-in-a-Nutshell



C:\Windows\System32\cmd.exe

```
D:\Course_Java_Web_Development\git\course-git-lab>git reset --hard  e0ea918
HEAD is now at e0ea918 Merge branch 'test' into main

D:\Course_Java_Web_Development\git\course-git-lab>git log --oneline --decorate --graph --all
*   e0ea918 (HEAD, origin/main, main) Merge branch 'test' into main
|\
| * 74083d8 (origin/test, test) exit command added
* | 32f1102 PrintAllProductsCommand added
|/
*   0dca372 (tag: v1.4) conflict resolved - both products added
|\
| * b4692b6 (tag: v1.1) Update Main.java
* | aecdc9f product 1 changed
|/
*   a2295b4 Merge remote-tracking branch 'refs/remotes/origin/main' into main
|\
| * a0b619b Update README.md
* | 3f2f9ad book description changed, .idea forder ignored
|/
* 1cccd12 .gitignore ignores java unit tests
* e147ef0 .gitignore ignores java unit tests
* b116047 .gitignore ignores java unit tests
* d011b18 .gitignore ignores java unit tests
* 74607c8 .gitignore ignores java unit tests
* 7b3729c initial project commit

D:\Course_Java_Web_Development\git\course-git-lab>git checkout  0dca372 .

D:\Course_Java_Web_Development\git\course-git-lab>git checkout e0ea918 .

D:\Course_Java_Web_Development\git\course-git-lab>
```

Resources

- Guide to the Core Maven Plugins – https://www.baeldung.com/core-maven-plugins
- Guide to the Core Maven PluginsGradle User Manual – https://docs.gradle.org/current/userguide/userguide.html
- Pro Git book – https://git-scm.com/book/en/v2

Thank's for Your Attention!

Trayan Iliev

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