Frameworks Java

Prof. Dr. Edson A. Oliveira Junior
edson@din.uem.br
www.din.uem.br/~edson

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Agenda

- Ferramentas e Tecnologias Java
- Listagem de Frameworks Java
- Spring MVC

Motivação para Adoção de Ferramentas e Tecnologias Java

Prof. Dr. Edson A. Oliveira Junior
edson@din.uem.br
www.din.uem.br/~edson

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Survey sobre Ferramentas e Tecnologias Java

- 2040 respostas – Mar a Abr de 2016
- Survey por RebelLabs – Simon Maple
- Disponível em https://zeroturnaround.com/rebellabs/reports
- Vamos aos dados...

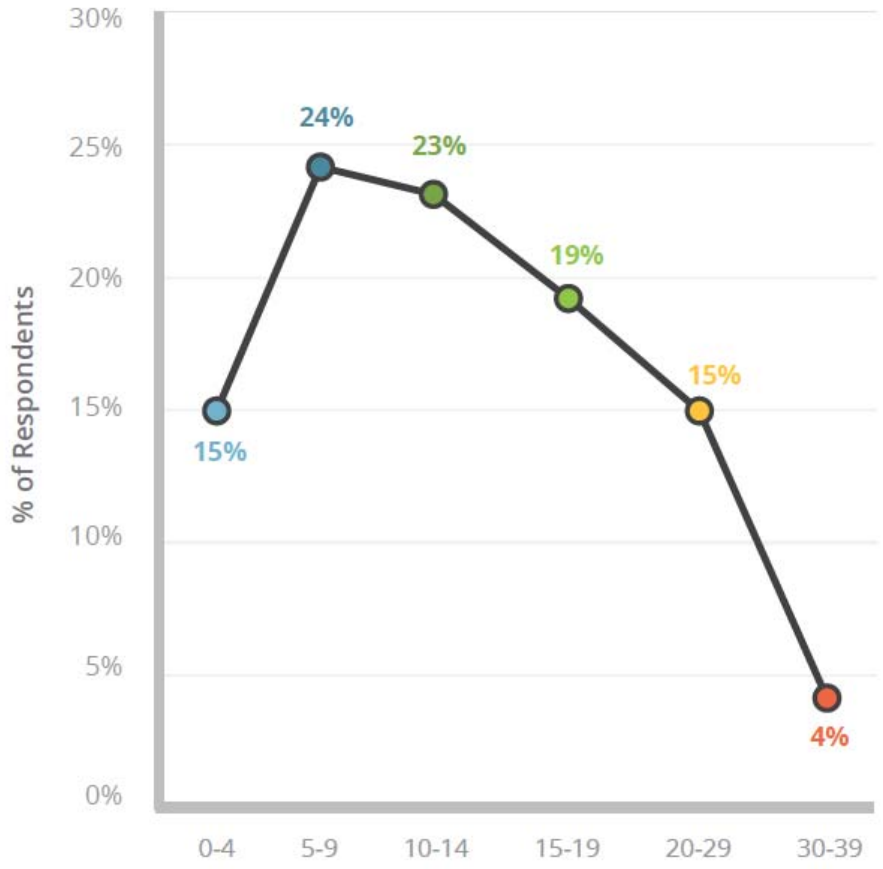
Survey sobre Ferramentas e Tecnologias Java

Survey sobre Ferramentas e Tecnologias Java

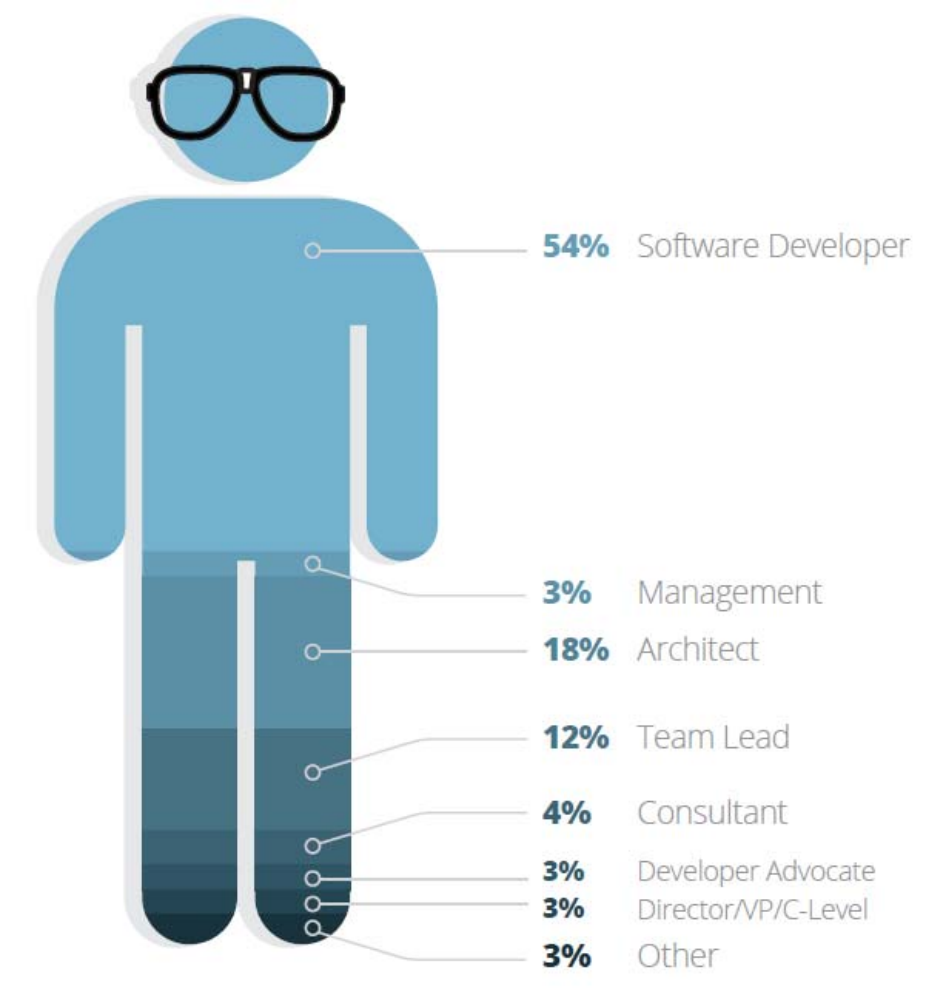
How many years of experience do you have in software engineering?

This was a question we've not asked in past surveys. This year, we wanted to understand more about the type of person who responds to the survey as well as their technology preferences. We actually had a pretty good spread of results as you can see from *Figure 1.1*. Around half of the respondents exist in the 5-15 years of experience bracket. The overall median is 10 years of experience and the average is 12.2 years.

Figure 1.1 Years of experience in software engineering



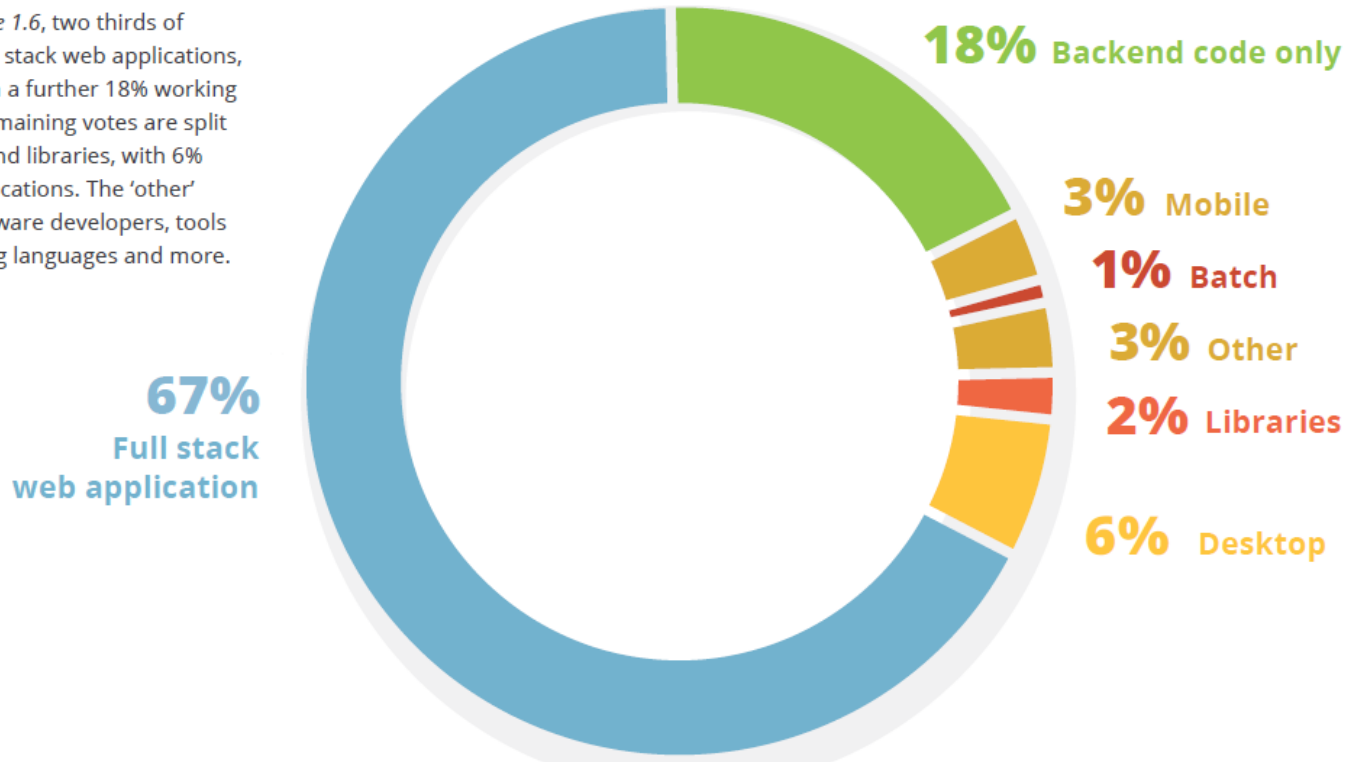
Survey sobre Ferramentas e Tecnologias Java



Survey sobre Ferramentas e Tecnologias Java

Which type of application describes the main project you work on?

We're always keen to get a breakdown of the applications that our respondents work with. As we can see from *Figure 1.6*, two thirds of respondents work on full stack web applications, as you might expect, with a further 18% working on backend code. The remaining votes are split between batch, mobile and libraries, with 6% working on desktop applications. The 'other' option contained middleware developers, tools developers, programming languages and more.

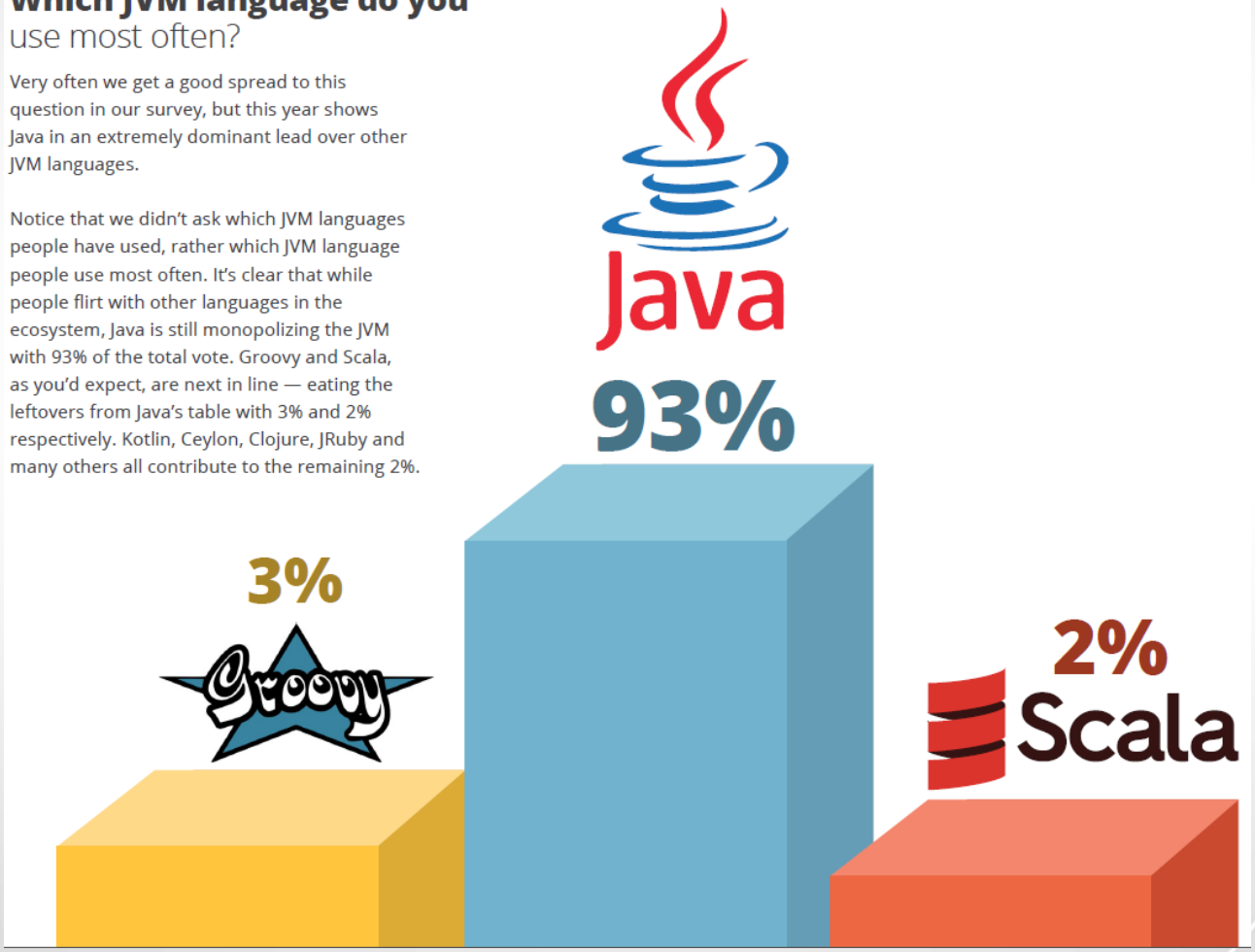


Survey sobre Ferramentas e Tecnologias Java

Which JVM language do you use most often?

Very often we get a good spread to this question in our survey, but this year shows Java in an extremely dominant lead over other JVM languages.

Notice that we didn't ask which JVM languages people have used, rather which JVM language people use most often. It's clear that while people flirt with other languages in the ecosystem, Java is still monopolizing the JVM with 93% of the total vote. Groovy and Scala, as you'd expect, are next in line — eating the leftovers from Java's table with 3% and 2% respectively. Kotlin, Ceylon, Clojure, JRuby and many others all contribute to the remaining 2%.



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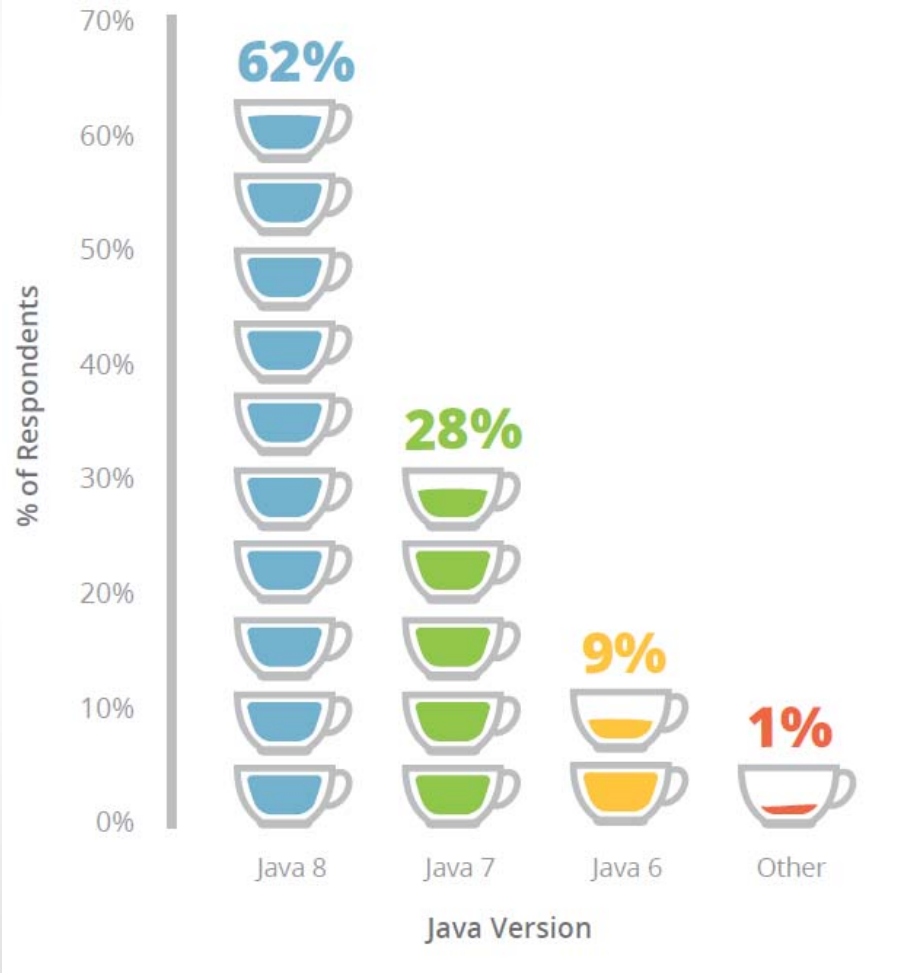

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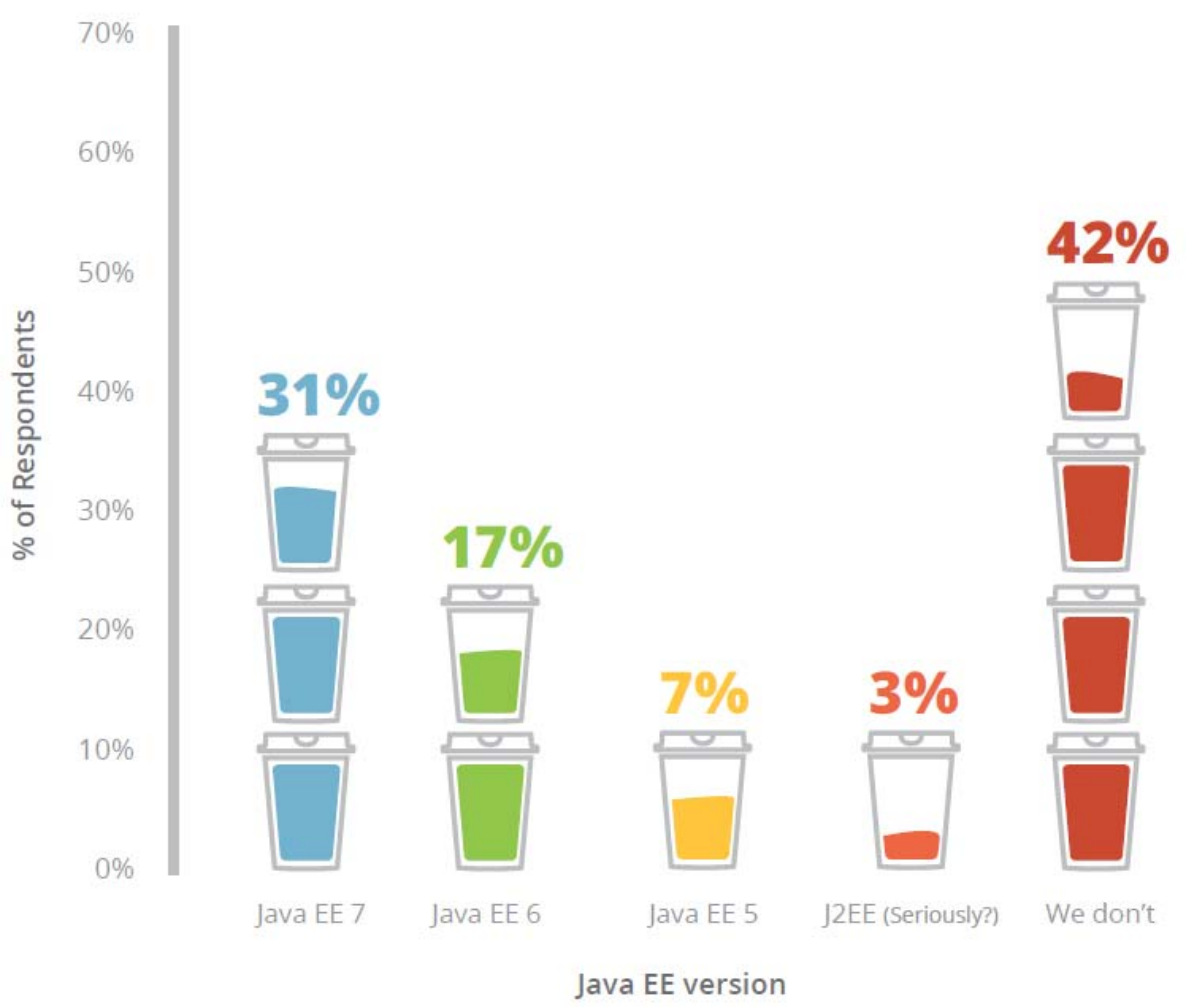

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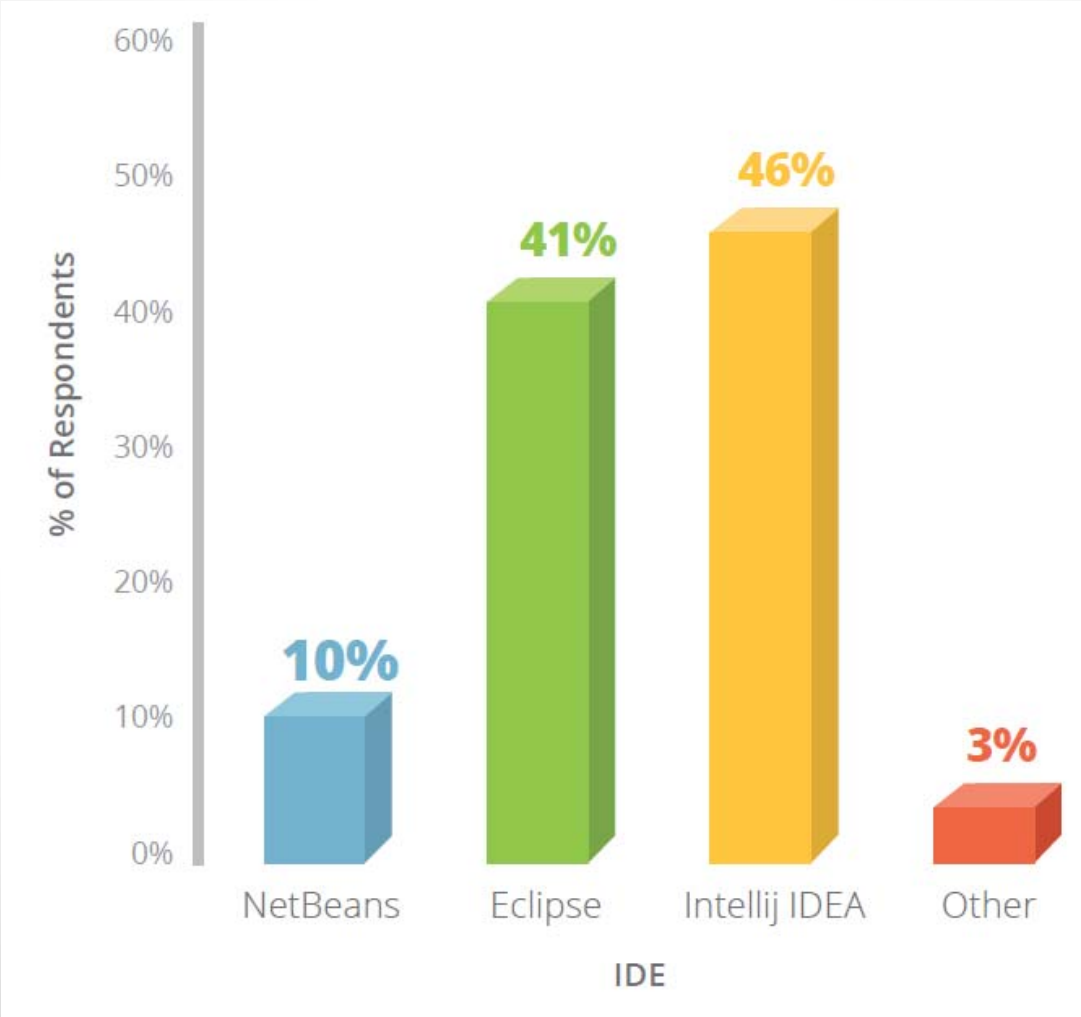

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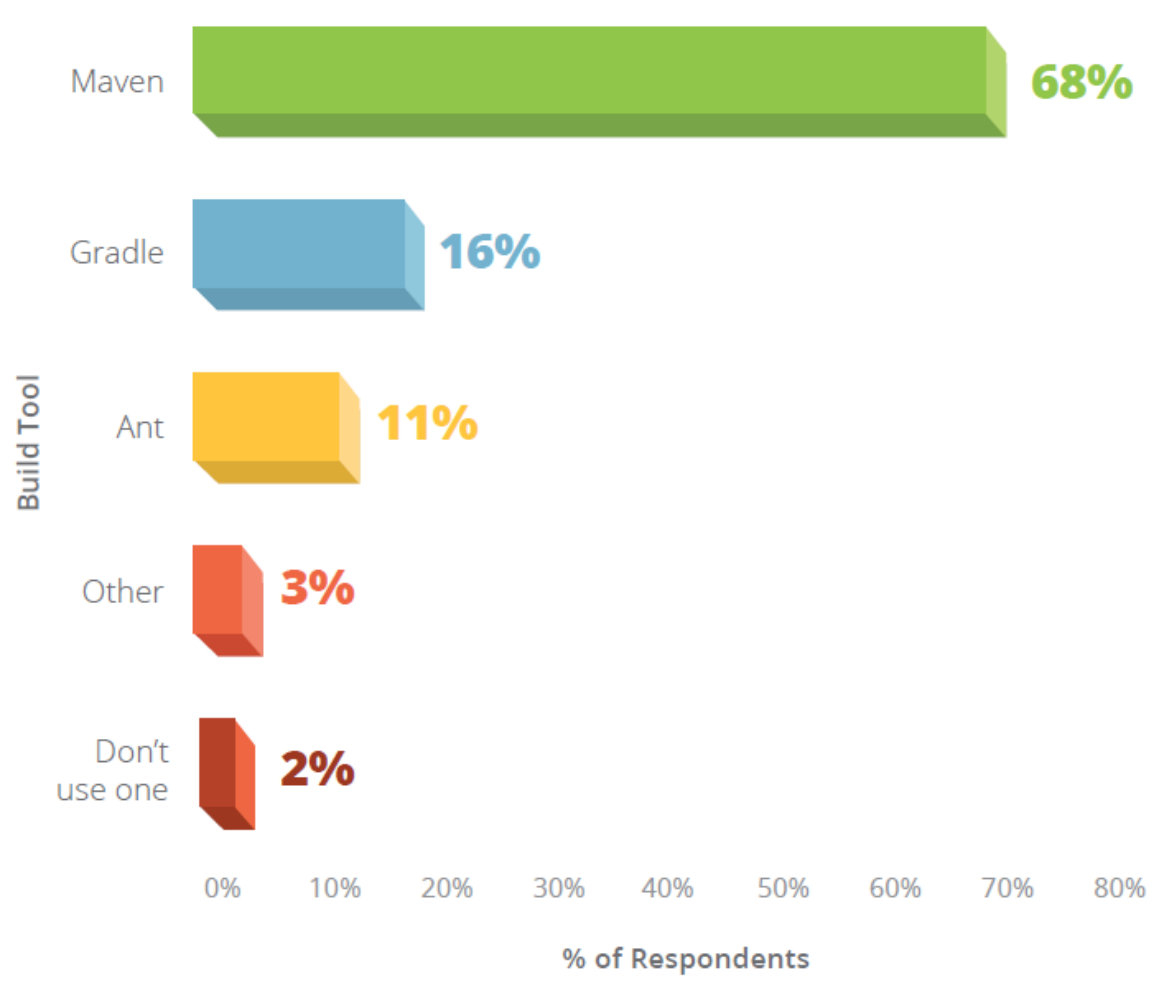

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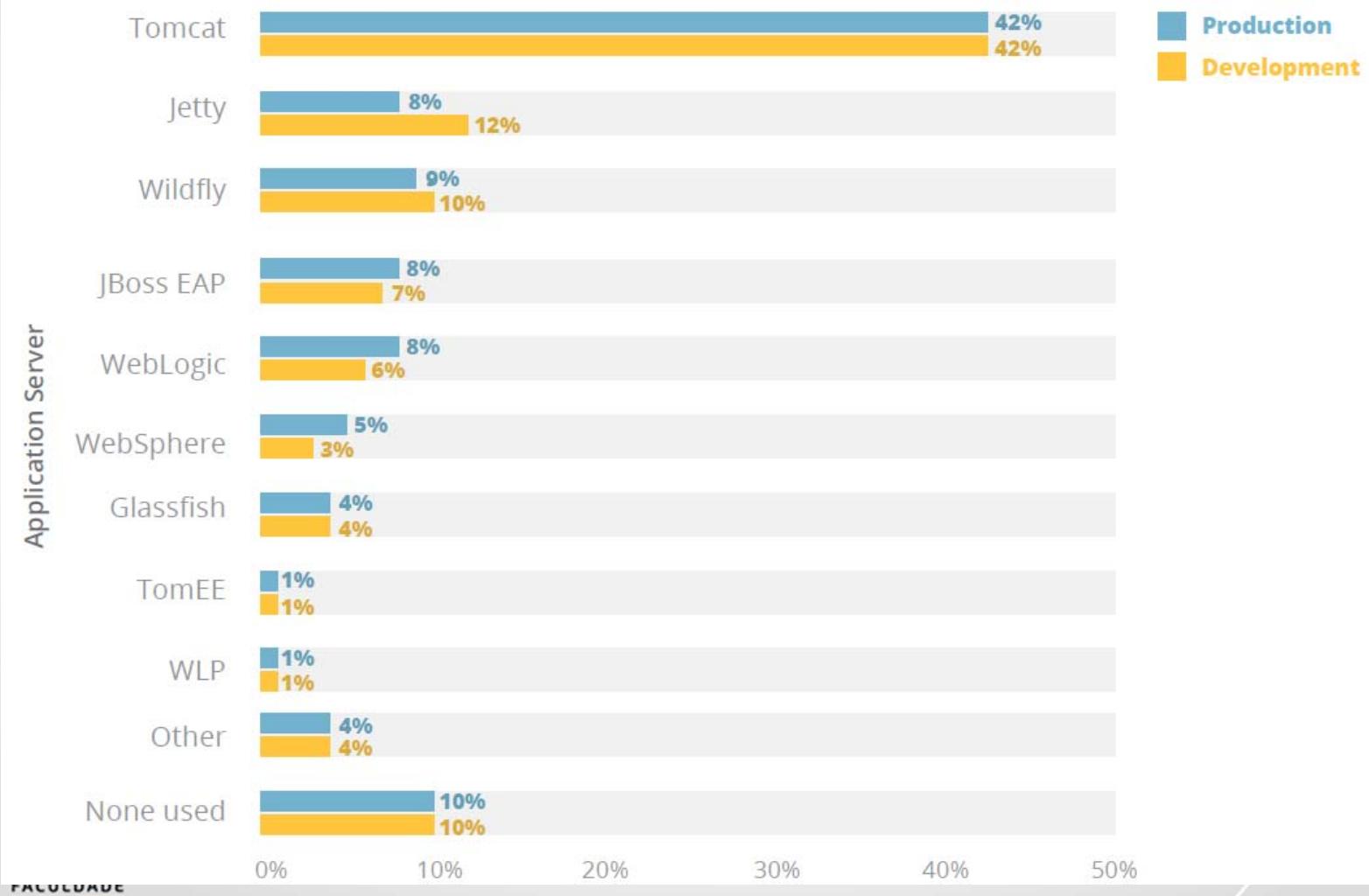

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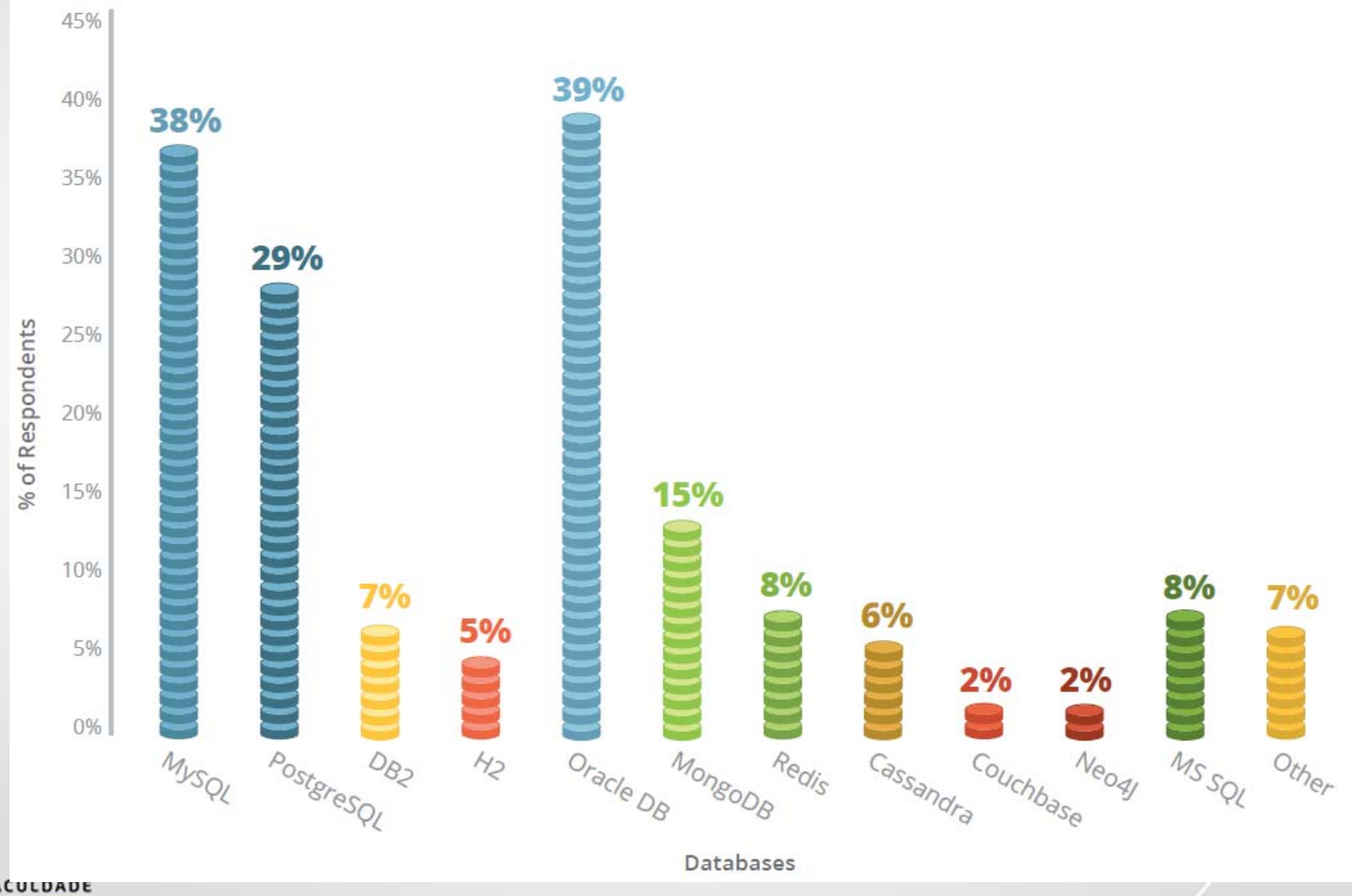

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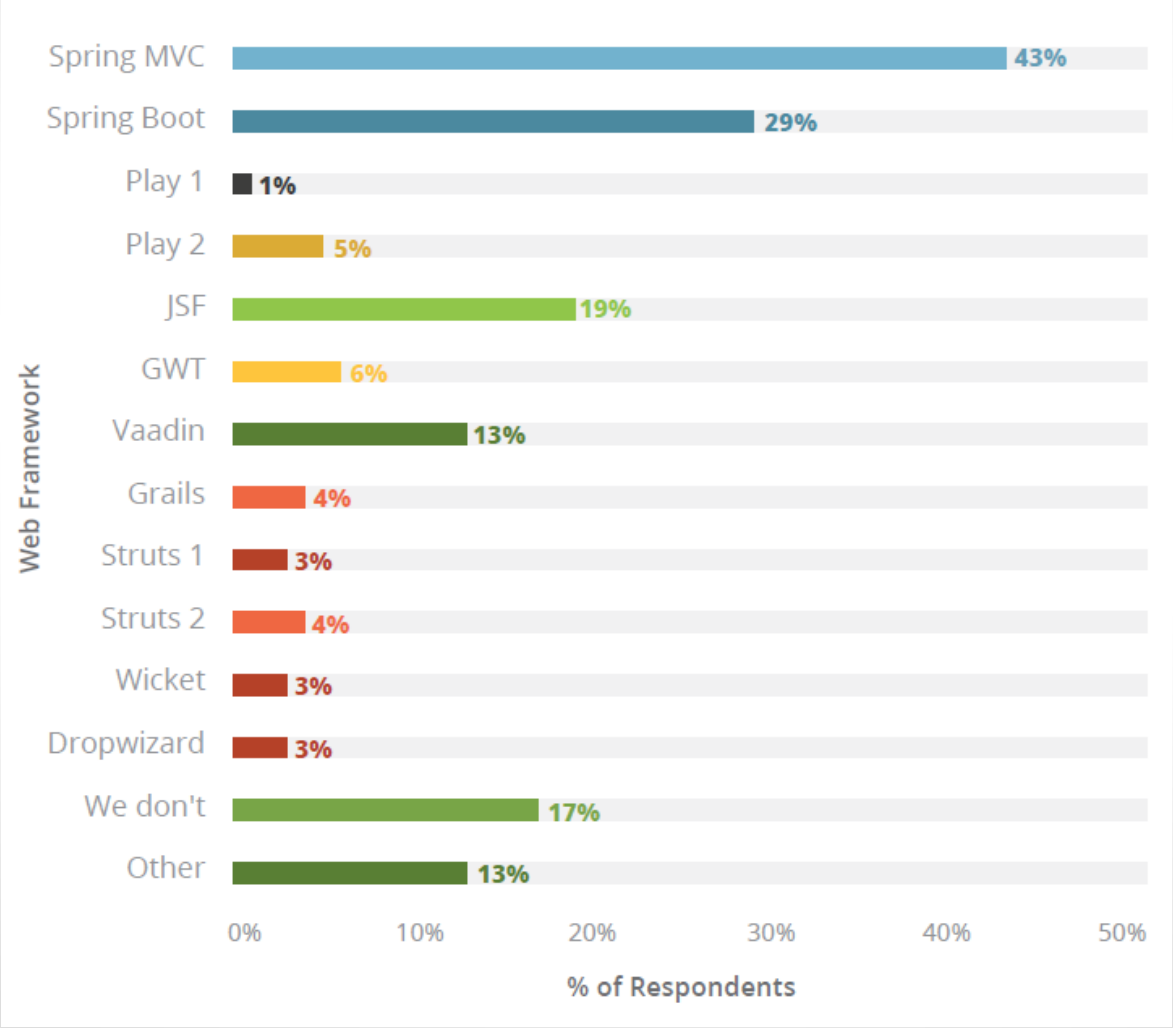
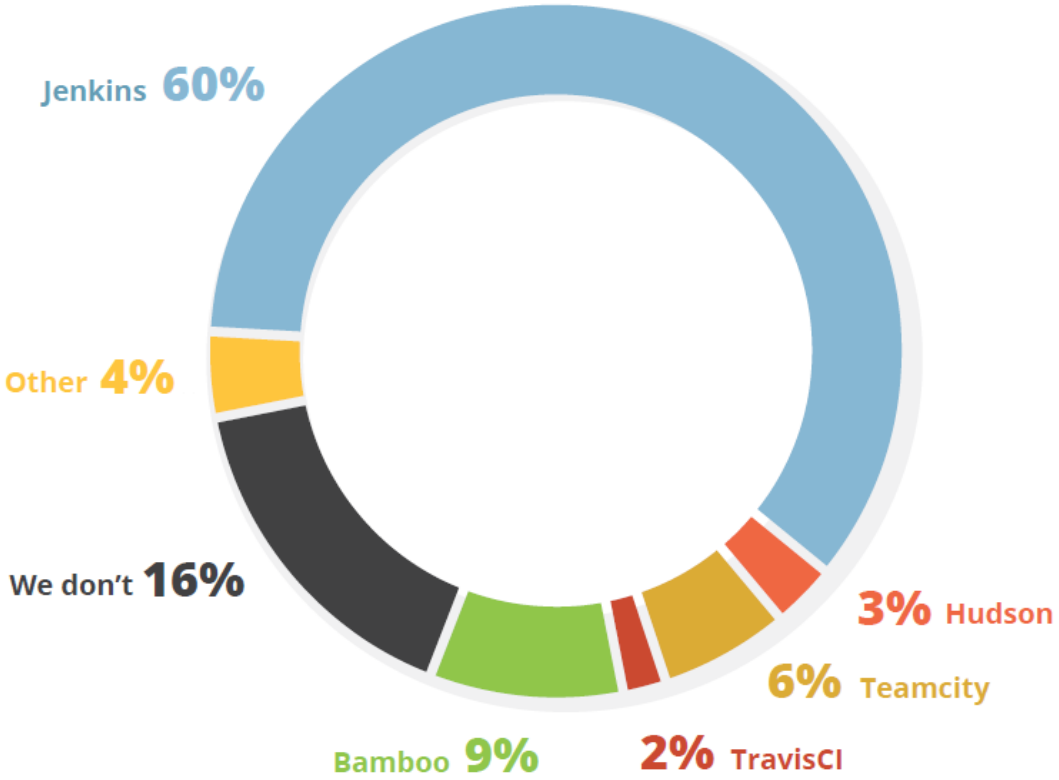


Survey sobre Ferramentas e Tecnologias Java

Which Continuous Integration Server do you use?

As one might expect from a survey that asks which CI servers people use, Jenkins is the runaway winner. The 10-year-old CI server is used by almost two in every three (60%) respondents. The biggest competition by votes is ironically the "We don't do CI" category, which makes Jenkins' dominance even more impressive. Bamboo is the next most popular CI server with 9% of the votes, with TeamCity, Hudson and Travis CI taking up the rest of the share. In the 'other' category, Circle CI is certainly a server worth mentioning that had a good portion of the remaining votes.

Before we go, we should mention Hudson, the CI server from which Jenkins was forked back in 2011, with overwhelming support from the community. Note that Hudson was transferred from Oracle to the Eclipse foundation in 2012. Since Jenkins owns the market in the CI space and with 20 (twenty) times the number of users (using our sample data) compared to Hudson, it's a mystery why Hudson is still being developed or supported today. The game has long been won by Jenkins and perhaps it's time to unplug Hudson altogether.



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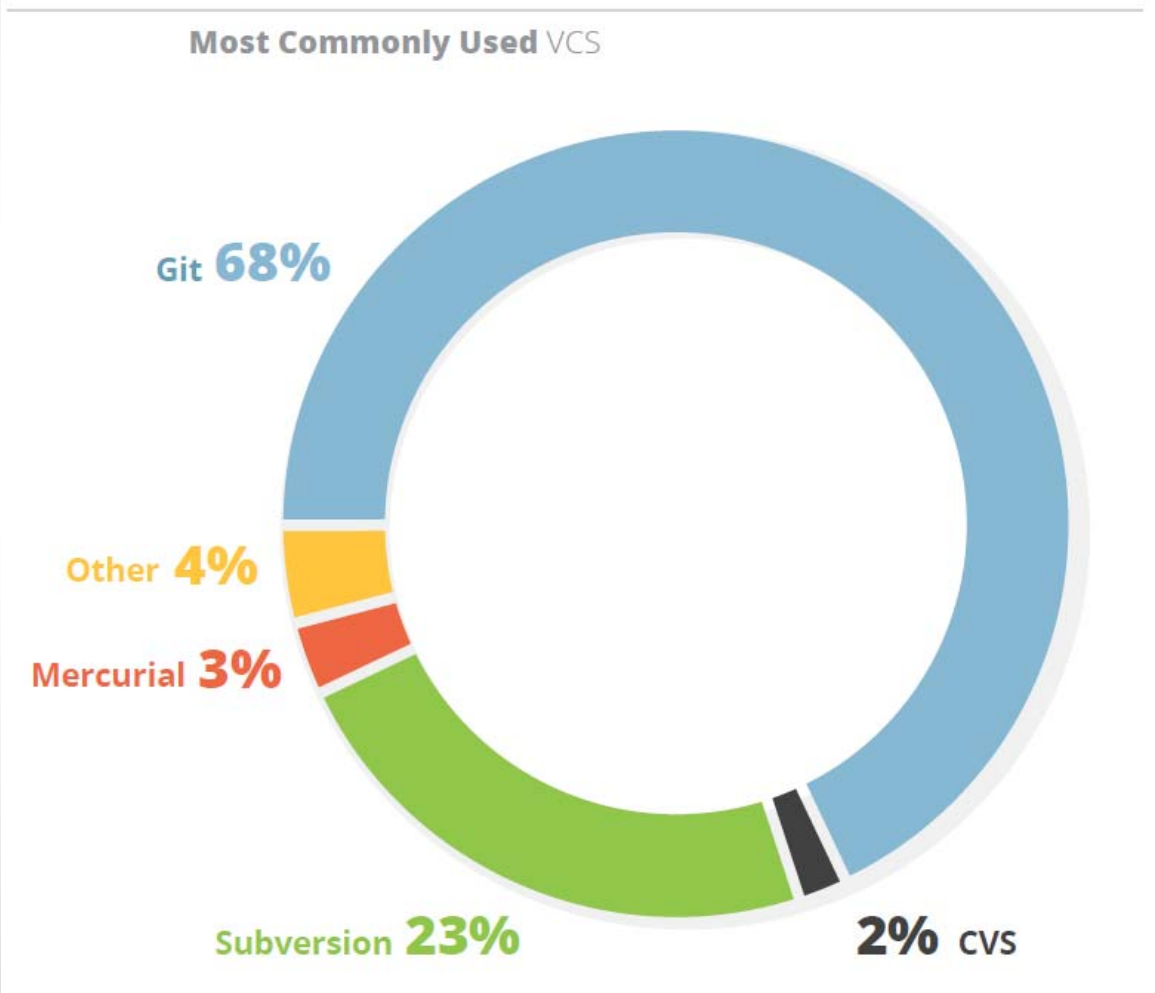

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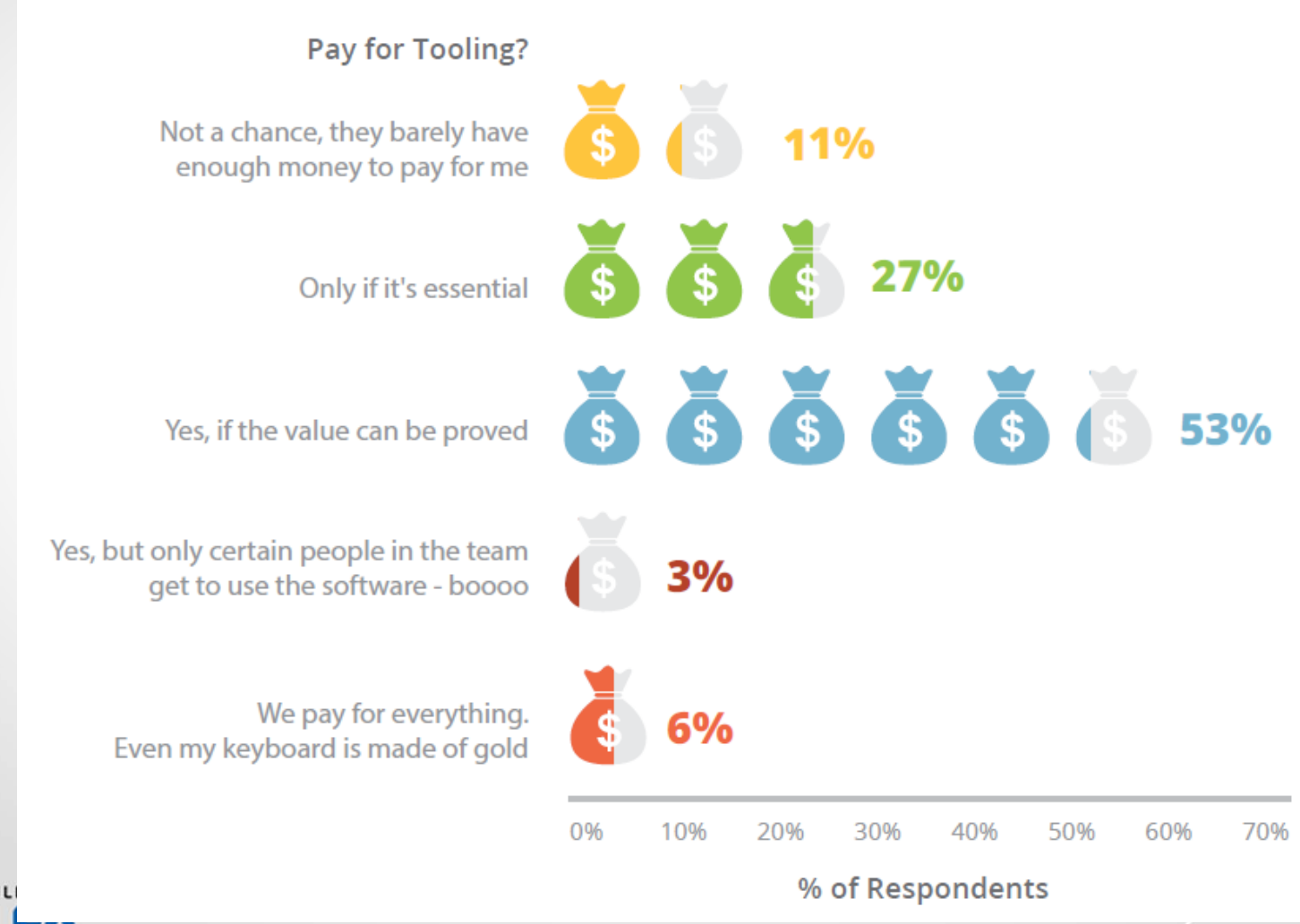

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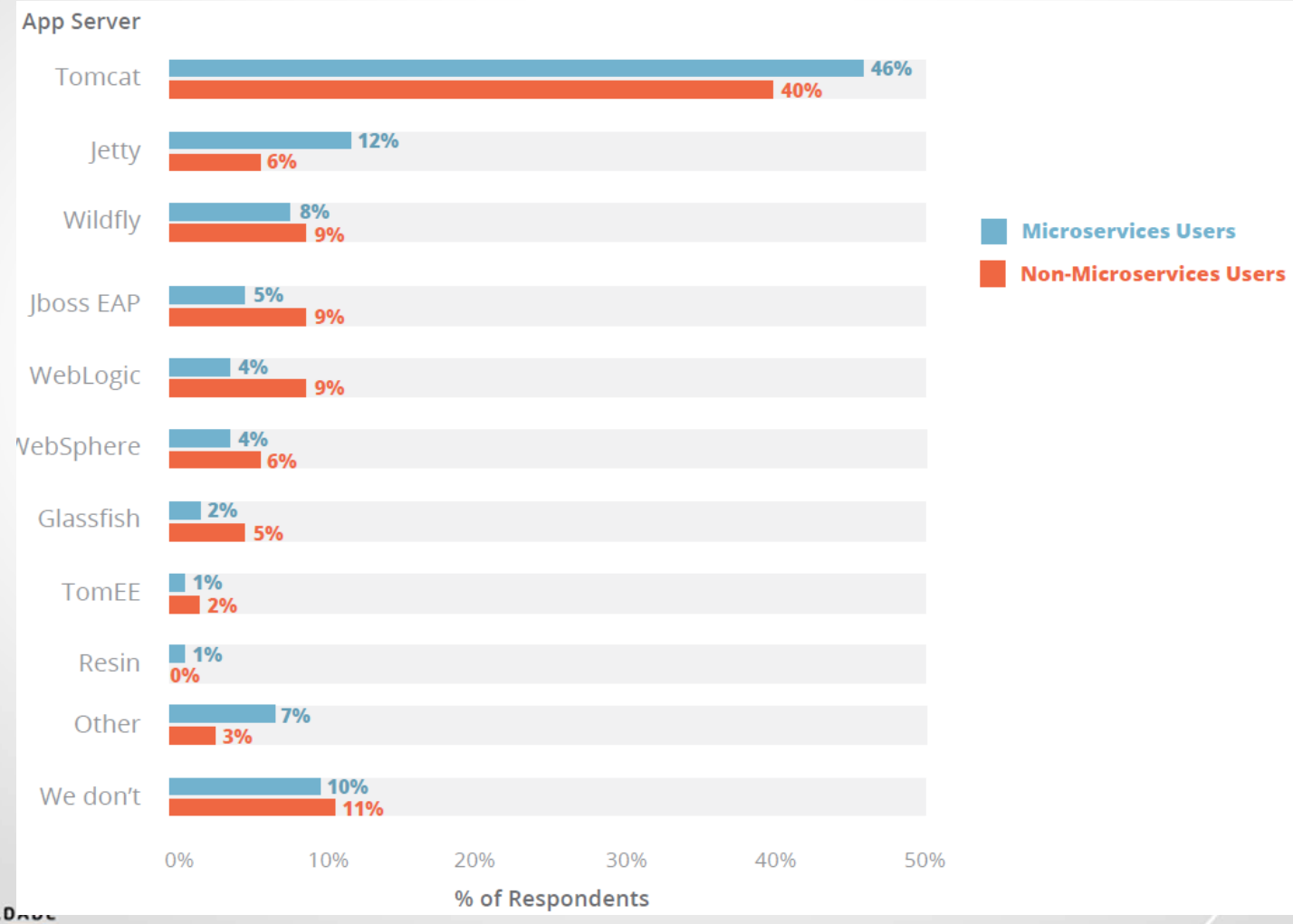

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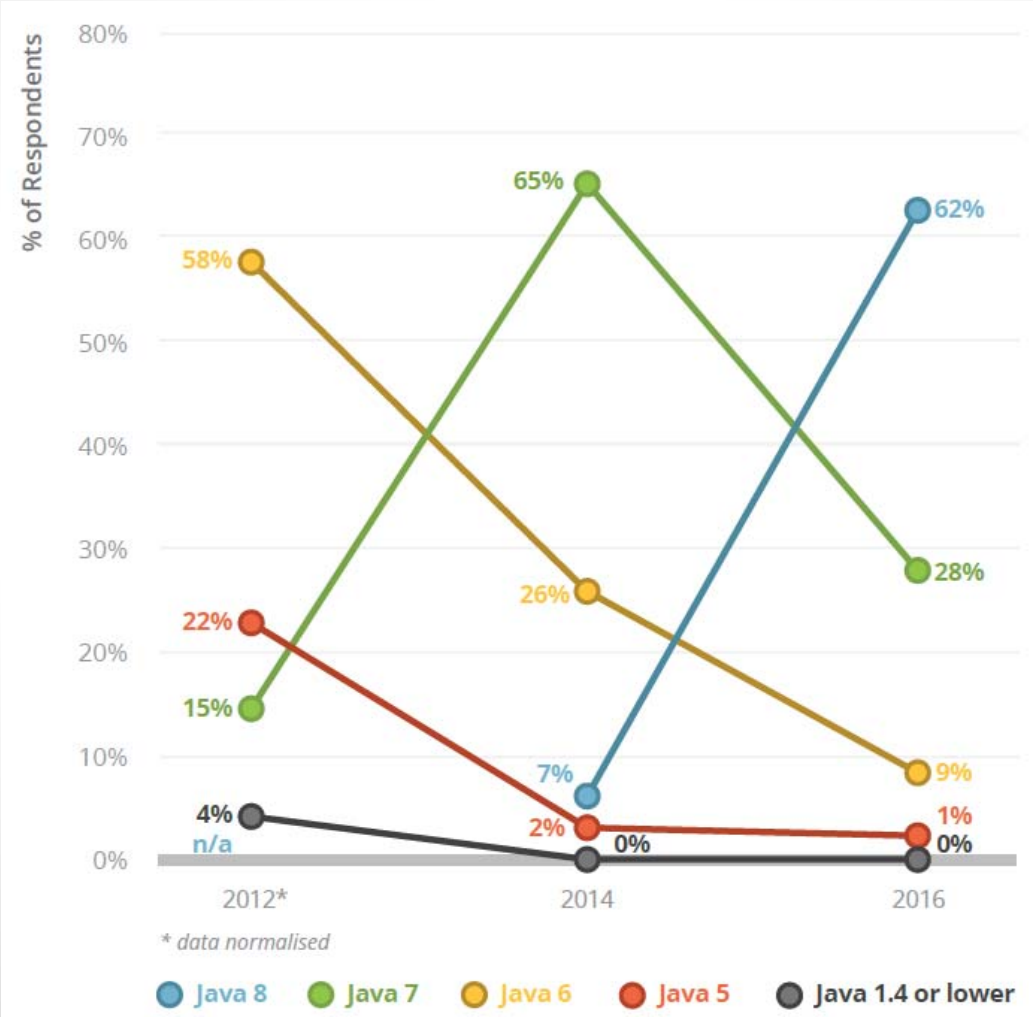

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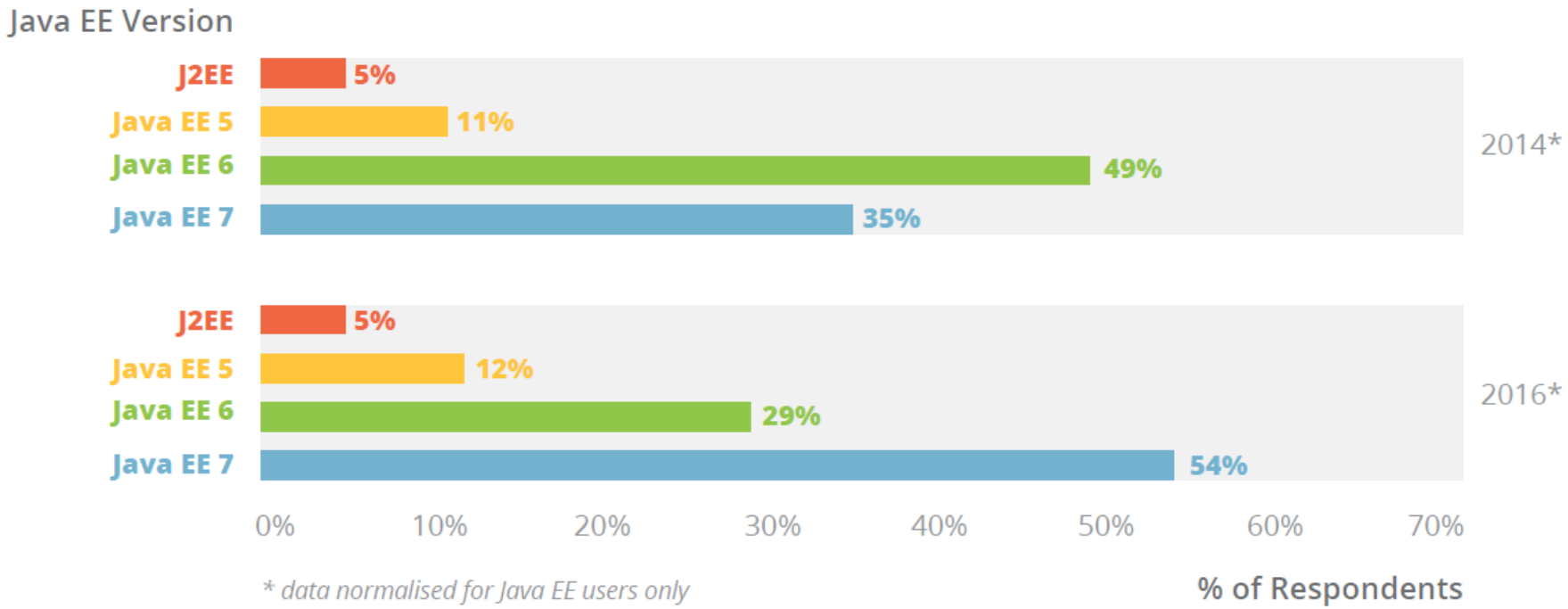

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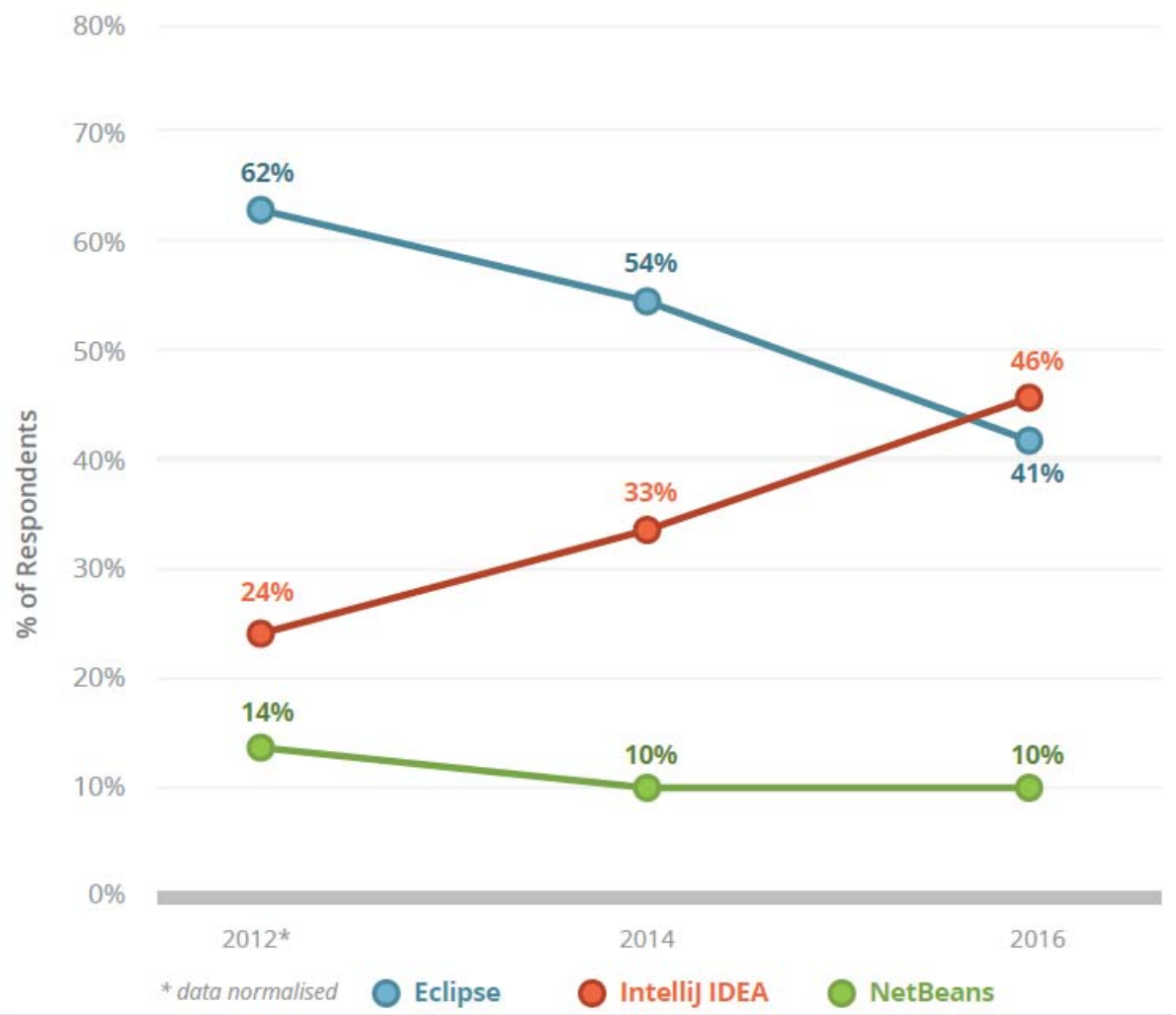

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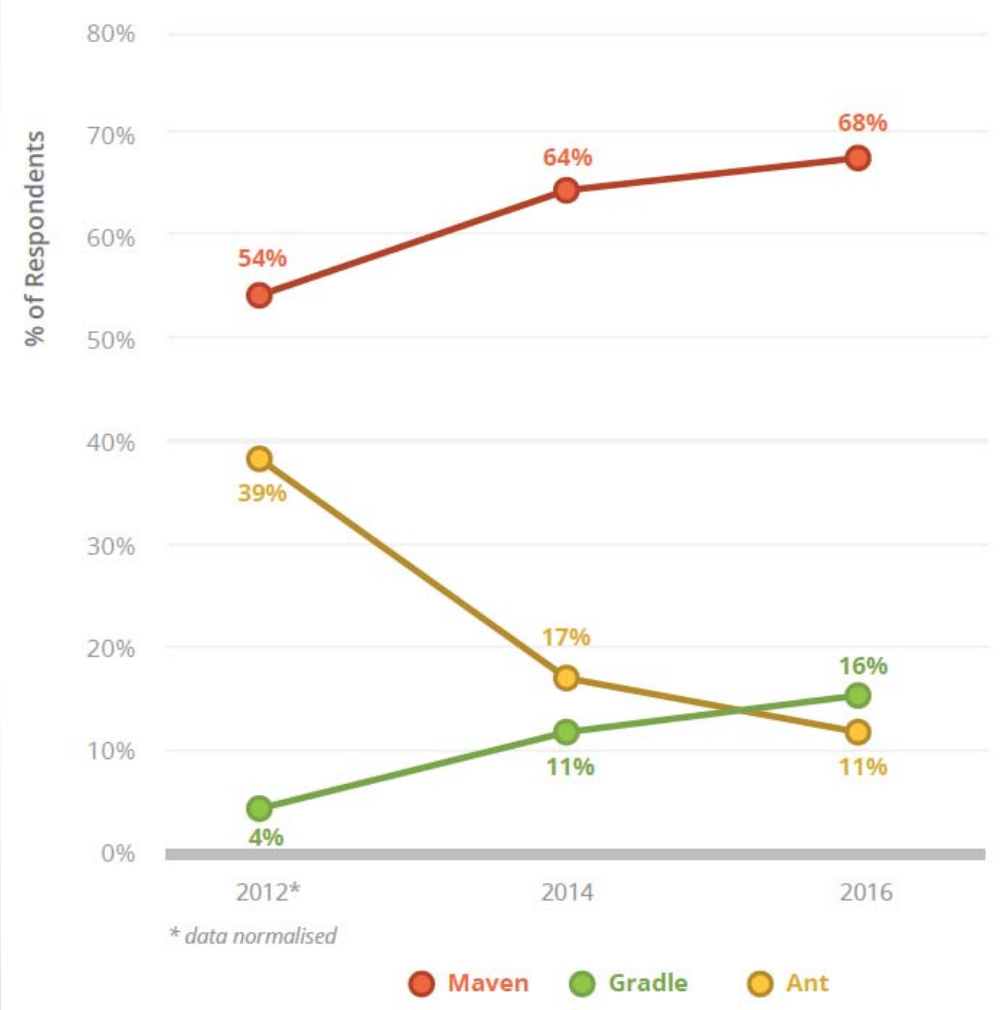

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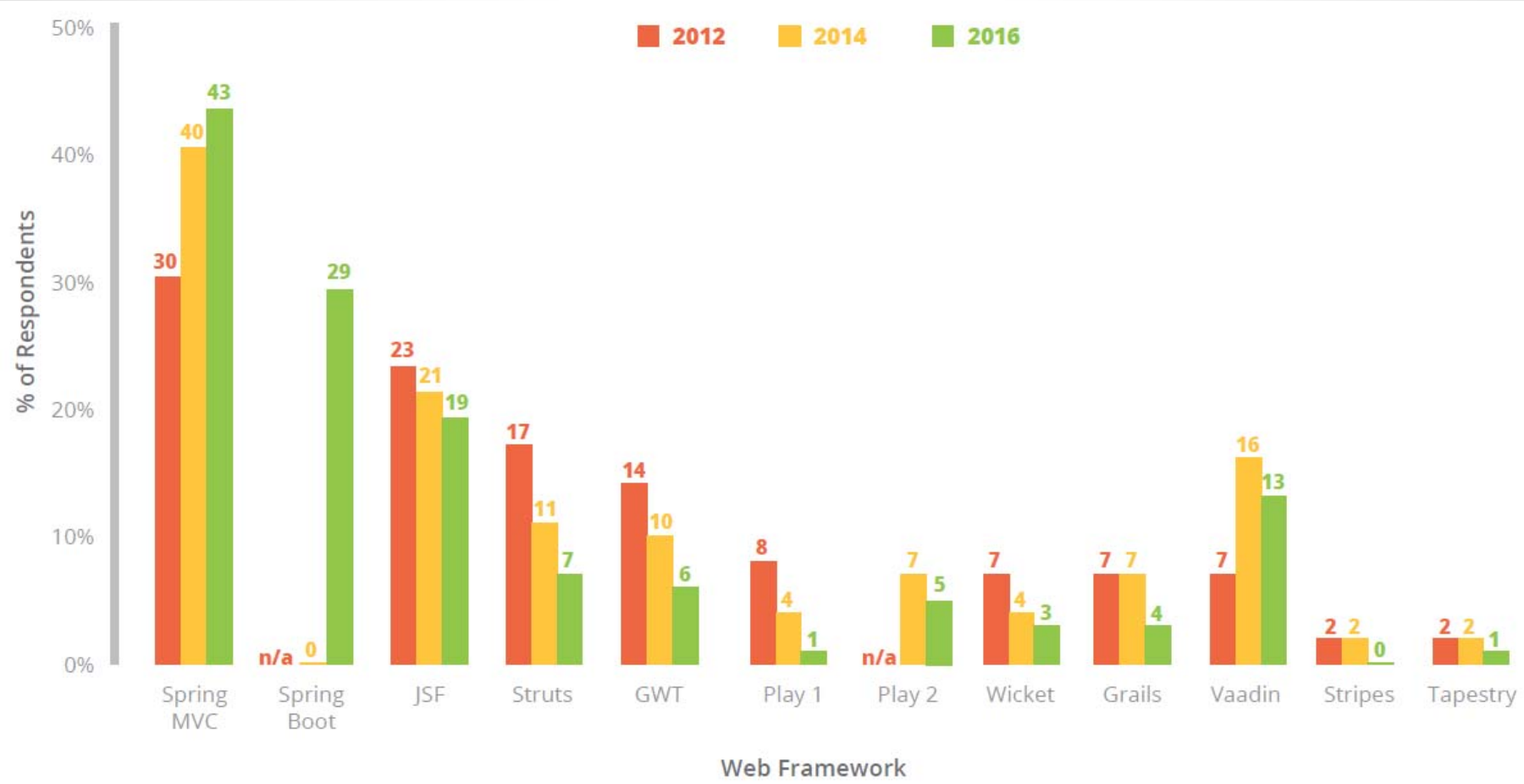

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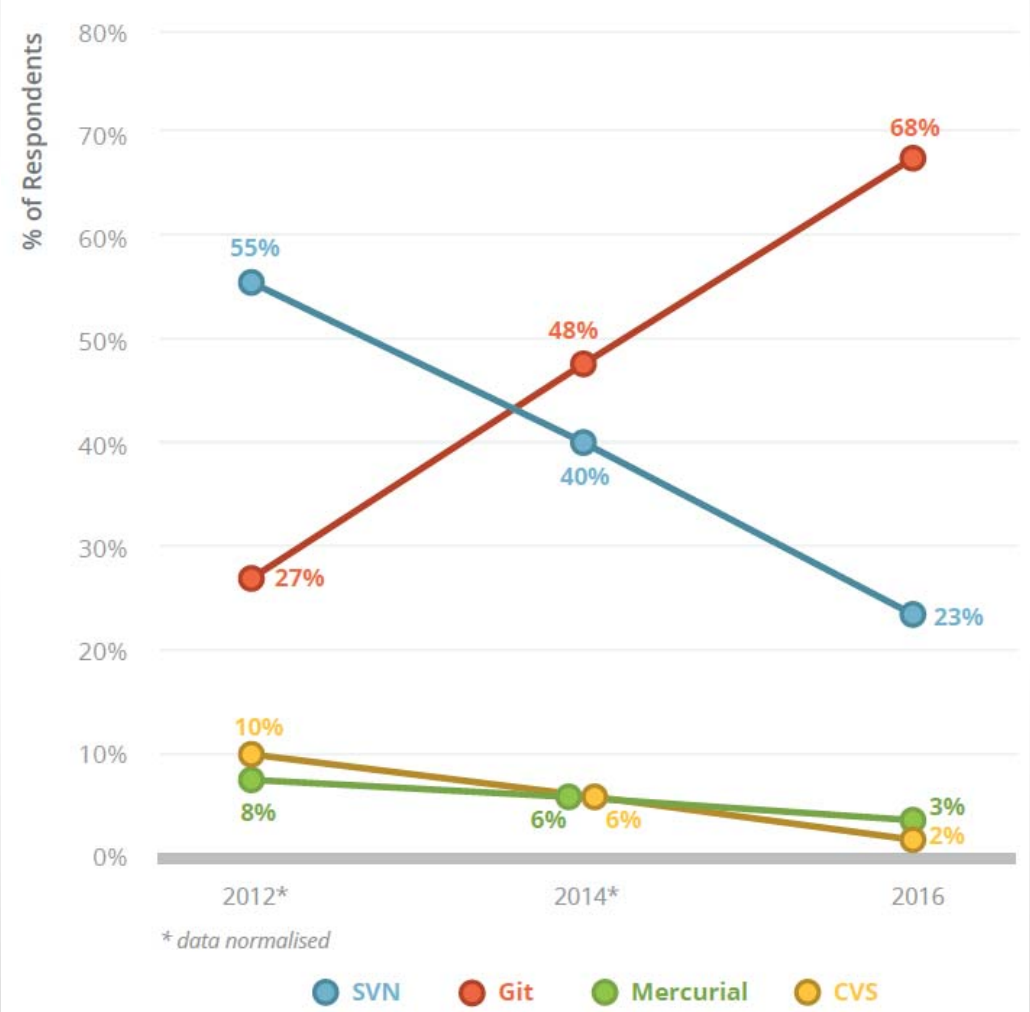

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Cheat Sheet – JVM Options

Standard Options

$ java
List all standard options.

-Dblog=RebelLabs
Sets a 'blog' system property to 'RebelLabs'. Retrieve/set it during runtime like this:

```
System.getProperty("blog");
//RebelLabs
```

```
System.setProperty("blog", "RL");
```

-javaagent:/path/to/agent.jar
Loads the java agent in agent.jar.

-agentpath:pathname
Loads the native agent library specified by the absolute path name.

-verbose:[class/gc/jni]
Displays information about each loaded class/gc event/JNI activity.

Non-Standard Options

$ java -X
List all non-standard options.

-Xint
Runs the application in interpreted-only mode.

-Xbootclasspath:path
Path and archive list of boot class files.

-Xloggc:filename
Log verbose GC events to filename.

-Xms1g
Set the initial size (in bytes) of the heap.

-Xmx8g
Specifies the max size (in bytes) of the heap.

-Xnoclassgc
Disables class garbage collection.

-Xprof
Profiles the running program.

Advanced Options

BEHAVIOR

-XX:+UseConcMarkSweepGC
Enables CMS garbage collection.

-XX:+UseParallelGC
Enables parallel garbage collection.

-XX:+UseSerialGC
Enables serial garbage collection.

-XX:hashCode=n
Modifies the results of Object.hashCode.

-XX:+FlightRecorder (requires **-XX:+UnlockCommercialFeatures)**
Enables the use of the Java Flight Recorder.

DEBUGGING

-XX:ErrorFile=file.log
Save the error data to file.log.

-XX:+HeapDumpOnOutOfMemory
Enables heap dump when **OutOfMemoryError** is thrown.

-XX:+PrintGC
Enables printing messages during garbage collection.

-XX:+TraceClassLoading
Enables Trace loading of classes.

-XX:+PrintClassHistogram
Enables printing of a class instance histogram after a **Control+C** event (**SIGTERM**).

PERFORMANCE

-XX:MaxPermSize=512k (Java 7 or earlier)
Sets the max perm space size (in bytes).

-XX:ThreadStackSize=256k
Sets Thread Stack Size (in bytes).

-XX:+UseStringCache
Enables caching of commonly allocated strings.

-XX:G1HeapRegionSize=4m
Sets the sub-division size of G1 heap (in bytes).

-XX:MaxGCPauseMillis=n
Sets a target for the maximum GC pause time.

-XX:MaxNewSize=256m
Max size of new generation (in bytes).

XX:+AggressiveOpts
Enables the use of aggressive performance optimization features.

-XX:OnError="<cmd args>"
Run user-defined commands on fatal error.

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Cheat Sheet – Git

Create a Repository

From scratch -- Create a new local repository
`$ git init [project name]`

Download from an existing repository
`$ git clone my_url`

Observe your Repository

List new or modified files not yet committed
`$ git status`

Show the changes to files not yet staged
`$ git diff`

Show the changes to staged files
`$ git diff --cached`

Show all staged and unstaged file changes
`$ git diff HEAD`

Show the changes between two commit ids
`$ git diff commit1 commit2`

List the change dates and authors for a file
`$ git blame [file]`

Show the file changes for a commit id and/or file
`$ git show [commit]:[file]`

Show full change history
`$ git log`

Show change history for file/directory including diffs
`$ git log -p [file/directory]`

Working with Branches

List all local branches
`$ git branch`

List all branches, local and remote
`$ git branch -av`

Switch to a branch, my_branch, and update working directory
`$ git checkout my_branch`

Create a new branch called new_branch
`$ git branch new_branch`

Delete the branch called my_branch
`$ git branch -d my_branch`

Merge branch_a into branch_b
`$ git checkout branch_b`
`$ git merge branch_a`

Tag the current commit
`$ git tag my_tag`

Make a change

Stages the file, ready for commit
`$ git add [file]`

Stage all changed files, ready for commit
`$ git add .`

Commit all staged files to versioned history
`$ git commit -m "commit message"`

Commit all your tracked files to versioned history
`$git commit -am "commit message"`

Unstages file, keeping the file changes
`$ git reset [file]`

Revert everything to the last commit
`$ git reset --hard`

Synchronize

Get the latest changes from origin (no merge)
`$ git fetch`

Fetch the latest changes from origin and merge
`$ git pull`

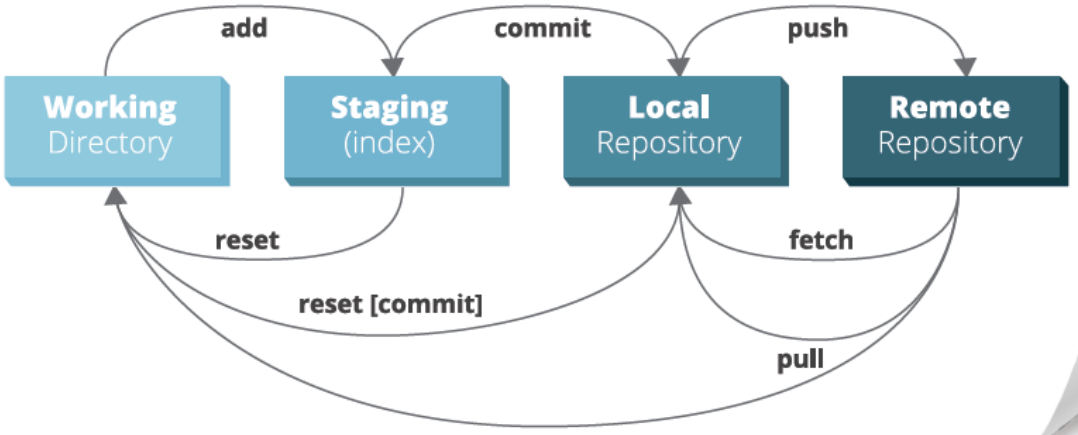
Fetch the latest changes from origin and rebase
`$ git pull --rebase`

Push local changes to the origin
`$ git push`

Finally!

When in doubt, use git help
`$ git command --help`

Or visit https://training.github.com/ for official GitHub training.



Cheat Sheet – Java Collections

Notable Java collections libraries

Fastutil

http://fastutil.di.unimi.it/

Fast & compact type-specific collections for Java

Great default choice for collections of primitive types, like int or long. Also handles big collections with more than 2^{31} elements well.

Guava

https://github.com/google/guava

Google Core Libraries for Java 6+

Perhaps the default collection library for Java projects. Contains a magnitude of convenient methods for creating collection, like fluent builders, as well as advanced collection types.

Eclipse Collections

https://www.eclipse.org/collections/

Features you want with the collections you need

Previously known as gs-collections, this library includes almost any collection you might need: primitive type collections, multimaps, bidirectional maps and so on.

JCTools

https://github.com/JCTools/JCTools

Java Concurrency Tools for the JVM.

If you work on high throughput concurrent applications and need a way to increase your performance, check out JCTools.

What can your collection do for you?

Collection class	Thread-safe alternative	Your data				Operations on your collections						
						Order of iteration			Performant 'contains' check	Random access		
		Individual elements	Key-value pairs	Duplicate element support	Primitive support	FIFO	Sorted	LIFO		By key	By value	By index
HashMap	ConcurrentHashMap	✗	✓	✗	✗	✗	✗	✗	✓	✓	✗	✗
HashBiMap (Guava)	Maps.synchronizedBiMap (new HashBiMap())	✗	✓	✗	✗	✗	✗	✗	✓	✓	✓	✗
ArrayListMultimap (Guava)	Maps.synchronizedMultiMap (new ArrayListMultimap())	✗	✓	✓	✗	✗	✗	✗	✓	✓	✗	✗
LinkedHashMap	Collections.synchronizedMap (new LinkedHashMap())	✗	✓	✗	✗	✓	✗	✗	✓	✓	✗	✗
TreeMap	ConcurrentSkipListMap	✗	✓	✗	✗	✗	✓	✗	✓*	✓*	✗	✗
Int2IntMap (Fastutil)		✗	✓	✗	✓	✗	✗	✗	✓	✓	✗	✓
ArrayList	CopyOnWriteArrayList	✓	✗	✓	✗	✓	✗	✓	✗	✗	✗	✓
HashSet	Collections.newSetFromMap (new ConcurrentHashMap<>())	✓	✗	✗	✗	✗	✗	✗	✓	✗	✓	✗
IntArrayList (Fastutil)		✓	✗	✓	✓	✓	✗	✓	✗	✗	✗	✓
PriorityQueue	PriorityBlockingQueue	✓	✗	✓	✗	✗	✓**	✗	✗	✗	✗	✗
ArrayDeque	ArrayBlockingQueue	✓	✗	✓	✗	✓**	✗	✓**	✗	✗	✗	✗

** O(log(n)) complexity, while all others are O(1) - constant time*

*** when using Queue interface methods: offer() / poll()*

How fast are your collections?

Collection class	Random access by index / key	Search / Contains	Insert
ArrayList	O(1)	O(n)	O(n)
HashSet	O(1)	O(1)	O(1)
HashMap	O(1)	O(1)	O(1)
TreeMap	O(log(n))	O(log(n))	O(log(n))

Remember, not all operations are equally fast. Here's a reminder of how to treat the Big-O complexity notation:

O(1) - constant time, really fast, doesn't depend on the size of your collection

O(log(n)) - pretty fast, your collection size has to be extreme to notice a performance impact

O(n) - linear to your collection size: the larger your collection is, the slower your operations will be

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Cheat Sheet – Java Generics

Basics

Generics don't exist at runtime!

```
class Pair<T1, T2> { /* ... */ }
```

-- the type parameter section, in angle brackets, specifies type variables.

Type parameters are substituted when objects are instantiated.

```
Pair<String, Long> p1 = new
  Pair<String, Long> ("RL", 43L);
```

Avoid verbosity with the diamond operator:

```
Pair<String, Long> p1 =
  new Pair<>("RL", 43L);
```

Wildcards

`Collection<Object>` - heterogenous, any object goes in.
`Collection<?>` - homogenous collection of arbitrary type.

Avoid using wildcards in return types!

Intersection types

```
<T extends Object &
  Comparable<? super T>> T
max(Collection<? extends T> coll)
```

The return type here is ***Object***!

Compiler generates the bytecode for the most general method only.

Producer Extends Consumer Super (PECS)

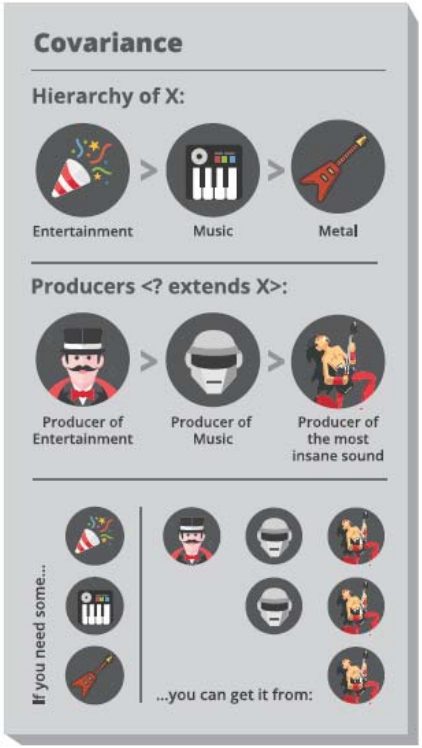
```
Collections.copy(List<? super T> dest, List<? extends T> src)
```

src -- contains elements of type T or its subtypes.

dest -- accepts elements, so defined to use T or its supertypes.

*Consumers are **contravariant** (use super).*

*Producers are **covariant** (use extends).*



Method Overloading

```
String f(Object s) {
  return "object";
}
String f(String s) {
  return "string";
}
<T> String generic(T t) {
  return f(t);
}
```

If called **generic("string")** returns "object".

Recursive generics

Recursive generics add constraints to your type variables. This helps the compiler to better understand your types and API.

```
interface Cloneable<T extends
Cloneable<T>> {
  T clone();
}
```

Now `cloneable.clone().clone()` will compile.

Covariance

`List<Number> ≯ ArrayList<Integer>`

Collections are not covariant!

Cheat Sheet – Java 8 Best Practices

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Default methods

Evolve interfaces & create traits

```
//Default methods in interfaces
@FunctionalInterface
interface Utilities {
  default Consumer<Runnable> m() {
    return (r) -> r.run();
  }
  // default methods, still functional
  Object function(Object o);
}
class A implements Utilities { // implement
  public Object function(Object o) {
    return new Object();
  }
  {
    // call a default method
    Consumer<Runnable> n = new A().m();
  }
}
```

Lambdas

Syntax:
(parameters) -> expression
(parameters) -> { statements; }

```
// takes a Long, returns a String
Function<Long, String> f = (l) -> l.toString();
// takes nothing gives you Threads
Supplier<Thread> s = Thread::currentThread;
// takes a string as the parameter
Consumer<String> c = System.out::println;

// use them with streams
new ArrayList<String>().stream().
// peek: debug streams without changes
peek(e -> System.out.println(e)).
// map: convert every element into something
map(e -> e.hashCode()).
// filter: pass some elements through
filter (hc -> (hc % 2) == 0).
// collect all values from the stream
collect(Collectors.toCollection(TreeSet::new))
```

java.util. Optional

A container for possible null values

```
// Create an optional
Optional<String> optional =
Optional.ofNullable(a);
// process the optional
optional.map(s -> "RebelLabs:" + s);
// map a function that returns Optional
optional.flatMap(s -> Optional.ofNullable(s));

// run if the value is there
optional.ifPresent(System.out::println);
// get the value or throw an exception
optional.get();

// return the value or the given value
optional.orElse("Hello world!");
// return empty Optional if not satisfied
optional.filter(s -> s.startsWith("RebelLabs"));
```

Rules of Thumb

Traits: 1 default method per interface
Don't enhance functional interfaces
Only conservative implementations

Expressions over statements
Refactor to use method references
Chain lambdas rather than growing them

Fields - use plain objects
Method parameters, use plain objects
Return values - use Optional
Use *orElse()* instead of *get()*

Cheat Sheet – Java 8 Streams

Definitions

- ☑ A stream **is** a pipeline of functions that can be evaluated.
- ☑ Streams **can** transform data.
- ☒ A stream **is not** a data structure.
- ☒ Streams **cannot** mutate data.

Intermediate operations

- Always return streams.
- Lazily executed.

Common examples include:

Function	Preserves count	Preserves type	Preserves order
map	✓	✗	✓
filter	✗	✓	✓
distinct	✗	✓	✓
sorted	✓	✓	✗
peek	✓	✓	✓

Stream examples

Get the unique surnames in uppercase of the first 15 book authors that are 50 years old or over.

```
library.stream()
    .map(book -> book.getAuthor())
    .filter(author -> author.getAge() >= 50)
    .distinct()
    .limit(15)
    .map(Author::getSurname)
    .map(String::toUpperCase)
    .collect(toList());
```

Compute the sum of ages of all female authors younger than 25.

```
library.stream()
    .map(Book::getAuthor)
    .filter(a -> a.getGender() == Gender.FEMALE)
    .map(Author::getAge)
    .filter(age -> age < 25)
    .reduce(0, Integer::sum):
```

Terminal operations

- Return concrete types or produce a side effect.
- Eagerly executed.

Common examples include:

Function	Output	When to use
reduce	concrete type	to cumulate elements
collect	list, map or set	to group elements
forEach	side effect	to perform a side effect on elements

Parallel streams

Parallel streams use the common ForkJoinPool for threading.

```
library.parallelStream()...
```

or intermediate operation:

```
IntStream.range(1, 10).parallel()...
```

Useful operations

Grouping:

```
library.stream().collect(
    groupingBy(Book::getGenre));
```

Stream ranges:

```
IntStream.range(0, 20)...
```

Infinite streams:

```
IntStream.iterate(0, e -> e + 1)...
```

Max/Min:

```
IntStream.range(1, 10).max();
```

FlatMap:

```
twitterList.stream()
    .map(member -> member.getFollowers())
    .flatMap(followers -> followers.stream())
    .collect(toList());
```

Pitfalls

- ☒ Don't update shared mutable variables i.e.

```
List<Book> myList =
new ArrayList<>();
library.stream().forEach
(e -> myList.add(e));
```

- ☒ Avoid blocking operations when using parallel streams.

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Cheat Sheet – Java 8 Spring

Spring Boot and Web annotations

Use annotations to configure your web application.

T **@SpringBootApplication** - uses @Configuration, @EnableAutoConfiguration and @ComponentScan.

T **@EnableAutoConfiguration** - make Spring guess the configuration based on the classpath.

T **@Controller** - marks the class as web controller, capable of handling the requests. T **@RestController** - a convenience annotation of a @Controller and @ResponseBody.

M T **@ResponseBody** - makes Spring bind method's return value to the web response body.

M **@RequestMapping** - specify on the method in the controller, to map a HTTP request to the URL to this method.

P **@RequestParam** - bind HTTP parameters into method arguments.

P **@PathVariable** - binds placeholder from the URI to the method parameter.

Spring Cloud annotations

Make you application work well in the cloud.

T **@EnableConfigServer** - turns your application into a server other apps can get their configuration from.

Use `spring.application.cloud.config.uri` in the client @SpringBootApplication to point to the config server.

T **@EnableEurekaServer** - makes your app an Eureka discovery service, other apps can locate services through it.

T **@EnableDiscoveryClient** - makes your app register in the service discovery server and discover other services through it.

T **@EnableCircuitBreaker** - configures Hystrix circuit breaker protocols.

M **@HystrixCommand(fallbackMethod = "fallbackMethodName")** - marks methods to fall back to another method if they cannot succeed normally.

Spring Framework annotations

Spring uses dependency injection to configure and bind your application together.

T **@ComponentScan** - make Spring scan the package for the @Configuration classes.

T **@Configuration** - mark a class as a source of bean definitions.

M **@Bean** - indicates that a method produces a bean to be managed by the Spring container.

T **@Component** - turns the class into a Spring bean at the auto-scan time. T **@Service** - specialization of the @Component, has no encapsulated state.

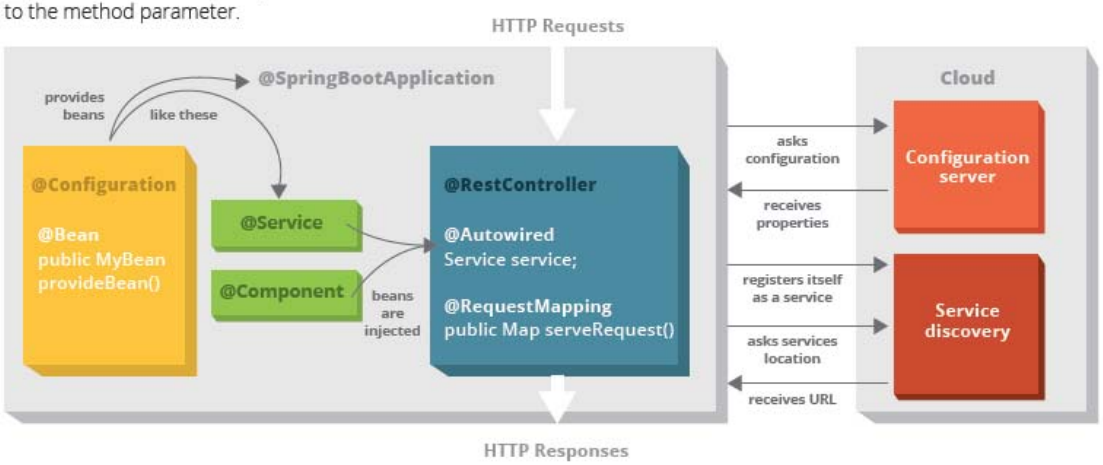
C F M **@Autowired** - Spring's dependency injection wires an appropriate bean into the marked class member.

T M **@Lazy** - makes @Bean or @Component be initialized on demand rather than eagerly.

C F M **@Qualifier** - filters what beans should be used to @Autowire a field or parameter.

C F M **@Value** - indicates a default value expression for the field or parameter, typically something like `"#{systemProperties.myProp}"`

C F M **@Required** - fail the configuration, if the dependency cannot be injected.



Legend

T - class
F - field annotation
C - constructor annotation
M - method
P - parameter

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ALFA

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Cheat Sheet – JUnit

Assertions and assumptions

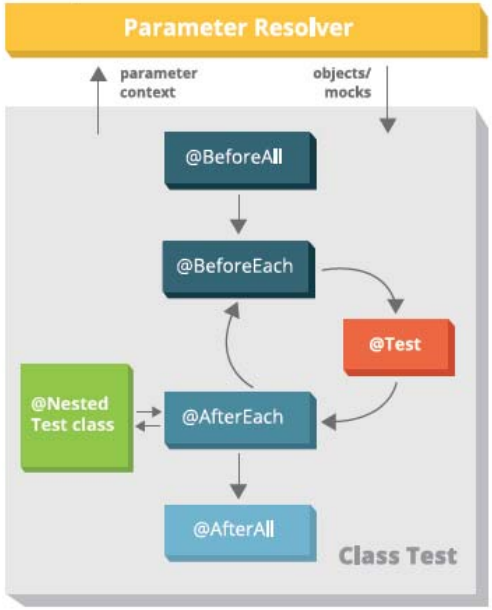
Use assertions to verify the behavior under test:

```
Assertions.assertEquals(Object expected,
Object actual, Supplier<String> message)

// Group assertions are run all together and
reported together.
Assertions.assertAll("heading",
  () -> assertTrue(true),
  () -> assertEquals("expected",
              objectUnderTest.getSomething());

// To check for an exception:
expectThrows(NullPointerException.class,
  () -> { ((Object) null).getClass();});
```

Lifecycle of standard tests



Parameter resolution

ParameterResolver - extension interface to provide parameters

```
public class MyInfoResolver implements ParameterResolver {
  public Object resolve(ParameterContext paramCtx,
                        ExtensionContext extCtx) {
    return new MyInfo();
  }
}
```

Extend your tests with your parameter resolver.

```
@ExtendWith(MyInfoResolver.class)
class MyInfoTest { … }
```

Useful code snippets

```
@TestFactory
Stream<DynamicTest> dynamicTests(MyContext ctx) {
// Generates tests for every line in the file
 return Files.lines(ctx.testDataFilePath).map(l ->
dynamicTest("Test:" + l, () -> assertTrue(runTest(l)));
}

@ExtendWith({ MockitoExtension.class,
DataParameterProvider.class })
class Tests {
  ArrayList<String> list;

  @BeforeEach
  void init() { /* init code */ }

  @Test
  @DisplayName("Add elements to ArrayList")
  void addAllToEmpty(Data dep) {
    list.addAll(dep.getAll());
    assertAll("sizes",
      () -> assertEqual(dep.size(), list.size(),
              () -> "Unexpected size:" + instance),
      () -> assertEqual(dep.getFirst(), list.get(0),
              () -> "Wrong first element" + instance));
  }
}
```

Useful annotations

@Test - marks a test method
@TestFactory - method to create test cases at Runtime
@DisplayName - make reports readable with proper test names
@BeforeAll/@BeforeEach - lifecycle methods executed prior testing
@AfterAll/AfterEach - lifecycle methods for cleanup
@Tag - declare tags to separate tests into suites
@Disabled - make JUnit skip this test.

Use **@Nested** on an inner class to control the order of tests.

Use **@ExtendWith()** to enhance the execution: provide mock parameter resolvers and specify conditional execution.

Use the lifecycle and **@Test** annotations on the default methods in interfaces to define contracts:

```
@Test
interface HashCodeContract<T> {
  <T> getValue();
  <T> getAnotherValue();
  @Test
  void hashCodeConsistent() {
    assertEquals(getValue().hashCode(),
                 getAnotherValue().hashCode(),
                 "Hashes differ");
}
```

"Never trust a test you haven't seen fail."

— Colin Vipurs

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Cheat Sheet – SQL

Basic Queries

```
-- filter your columns
   SELECT col1, col2, col3, ... FROM table1
-- filter the rows
   WHERE col4 = 1 AND col5 = 2
-- aggregate the data
   GROUP by ...
-- limit aggregated data
   HAVING count(*) > 1
-- order of the results
   ORDER BY col2
```

Useful keywords for **SELECTS**:

DISTINCT - return unique results
BETWEEN a **AND** b - limit the range, the values can be numbers, text, or dates
LIKE - pattern search within the column text
IN (a, b, c) - check if the value is contained among given.

Data Modification

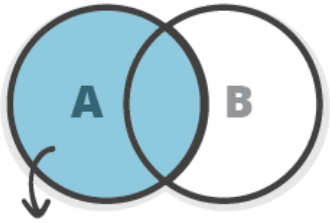
```
-- update specific data with the WHERE clause
   UPDATE table1 SET col1 = 1 WHERE col2 = 2
-- insert values manually
   INSERT INTO table1 (ID, FIRST_NAME, LAST_NAME)
      VALUES (1, 'Rebel', 'Labs');
-- or by using the results of a query
   INSERT INTO table1 (ID, FIRST_NAME, LAST_NAME)
      SELECT id, last_name, first_name FROM table2
```

Views

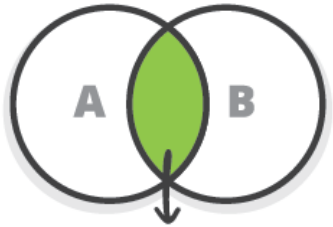
A **VIEW** is a virtual table, which is a result of a query.
They can be used to create virtual tables of complex queries.

```
CREATE VIEW view1 AS
SELECT col1, col2
FROM table1
WHERE ...
```

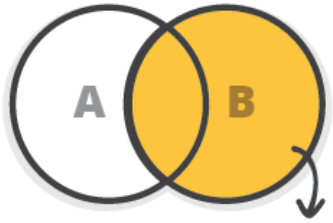
The Joy of JOINs



LEFT OUTER JOIN - all rows from table A, even if they do not exist in table B



INNER JOIN - fetch the results that exist in both tables



RIGHT OUTER JOIN - all rows from table B, even if they do not exist in table A

Updates on JOINed Queries

You can use **JOIN**s in your **UPDATE**s

```
UPDATE t1 SET a = 1
FROM table1 t1 JOIN table2 t2 ON t1.id = t2.t1_id
WHERE t1.col1 = 0 AND t2.col2 IS NULL;
```

NB! Use database specific syntax, it might be faster!

Semi JOINs

You can use subqueries instead of **JOIN**s:

```
SELECT col1, col2 FROM table1 WHERE id IN
   (SELECT t1_id FROM table2 WHERE date >
      CURRENT_TIMESTAMP)
```

Indexes

If you query by a column, index it!

```
CREATE INDEX index1 ON table1 (col1)
```

Don't forget:

Avoid overlapping indexes
Avoid indexing on too many columns
Indexes can speed up **DELETE** and **UPDATE** operations

Useful Utility Functions

```
-- convert strings to dates:
   TO_DATE (Oracle, PostgreSQL), STR_TO_DATE (MySQL)
-- return the first non-NULL argument:
   COALESCE (col1, col2, "default value")
-- return current time:
   CURRENT_TIMESTAMP
-- compute set operations on two result sets
   SELECT col1, col2 FROM table1
   UNION / EXCEPT / INTERSECT
   SELECT col3, col4 FROM table2;
```

Union - returns data from both queries
Except - rows from the first query that are not present in the second query
Intersect - rows that are returned from both queries

Reporting

Use aggregation functions

COUNT - return the number of rows
SUM - cumulate the values
AVG - return the average for the group
MIN / MAX - smallest / largest value

Frameworks Java

Prof. Dr. Edson A. Oliveira Junior
edson@din.uem.br
www.din.uem.br/~edson

FACULDADE ALFA

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Lista de Frameworks Java - iMasters

- https://imasters.com.br/linguagens/java/listagem-de-frameworks-java

Introdução ao

Spring MVC

Prof. Dr. Edson A. Oliveira Junior
edson@din.uem.br
www.din.uem.br/~edson

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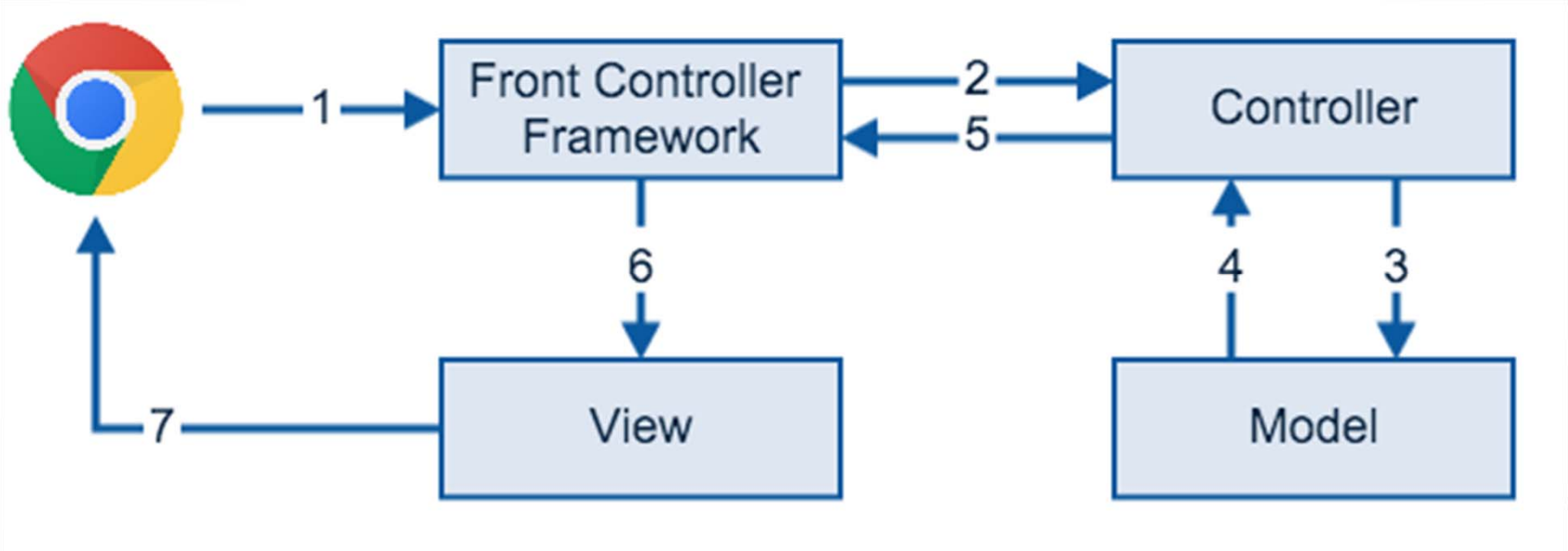
Spring MVC

- O que é o Spring MVC?
  - Framework de apoio ao desenvolvimento de aplicações Web em Java
  - Implementação do MVC do Spring Framework
- Principais funcionalidades implementadas:
  - atende requisições HTTP;
  - delega responsabilidades de processamento de dados a outros componentes;
  - prepara resposta ao cliente.

Spring MVC

- Fluxo de controle em Spring MVC



Spring MVC

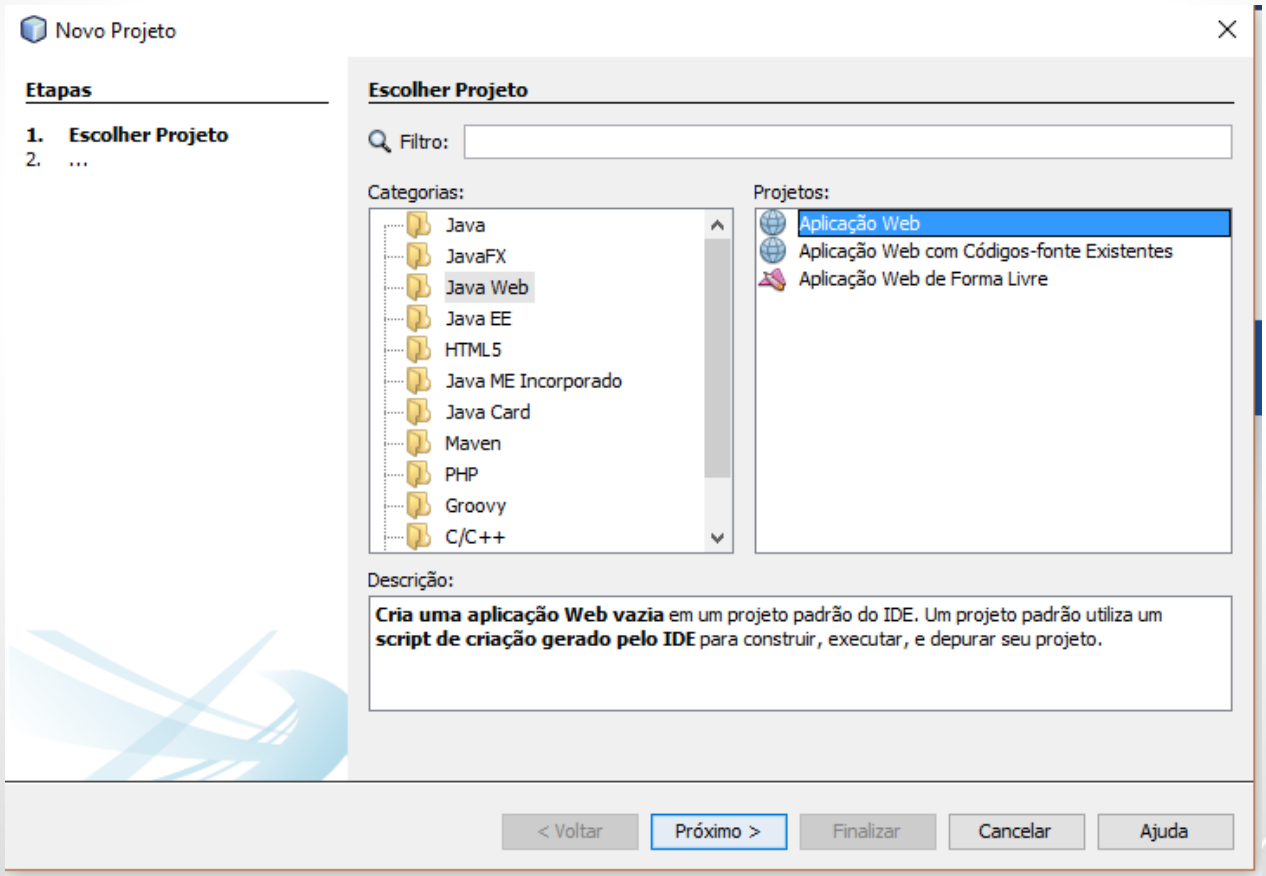
- Fluxo de controle em Spring MVC:
  1. **Browser** envia requisição HTTP ao servidor com a aplicação Spring MVC;
  2. O **Front Controller** identifica a classe Controller responsável para tratar a requisição;
  3. O **Controller** envia os dados ao Model para execução de operações;
  4. O **Model** devolve o resultado das operações ao Controller;
  5. O **Controller** retorna ao Front Controller o nome da View para exibir os resultados;
  6. O **Front Controller** busca a View que processa os dados, gerando um HTML; e
  7. A **View** retorna o HTML ao browser.

Spring MVC - Criando uma Aplicação

- Há 2 maneiras de fazer:
  - Criando uma aplicação Web comum simples;
  - Usando o Spring Boot
- Nesta aula vamos seguir a primeira opção por termos pouco tempo disponível. Porém, o mais recomendado é seguir a segunda opção!

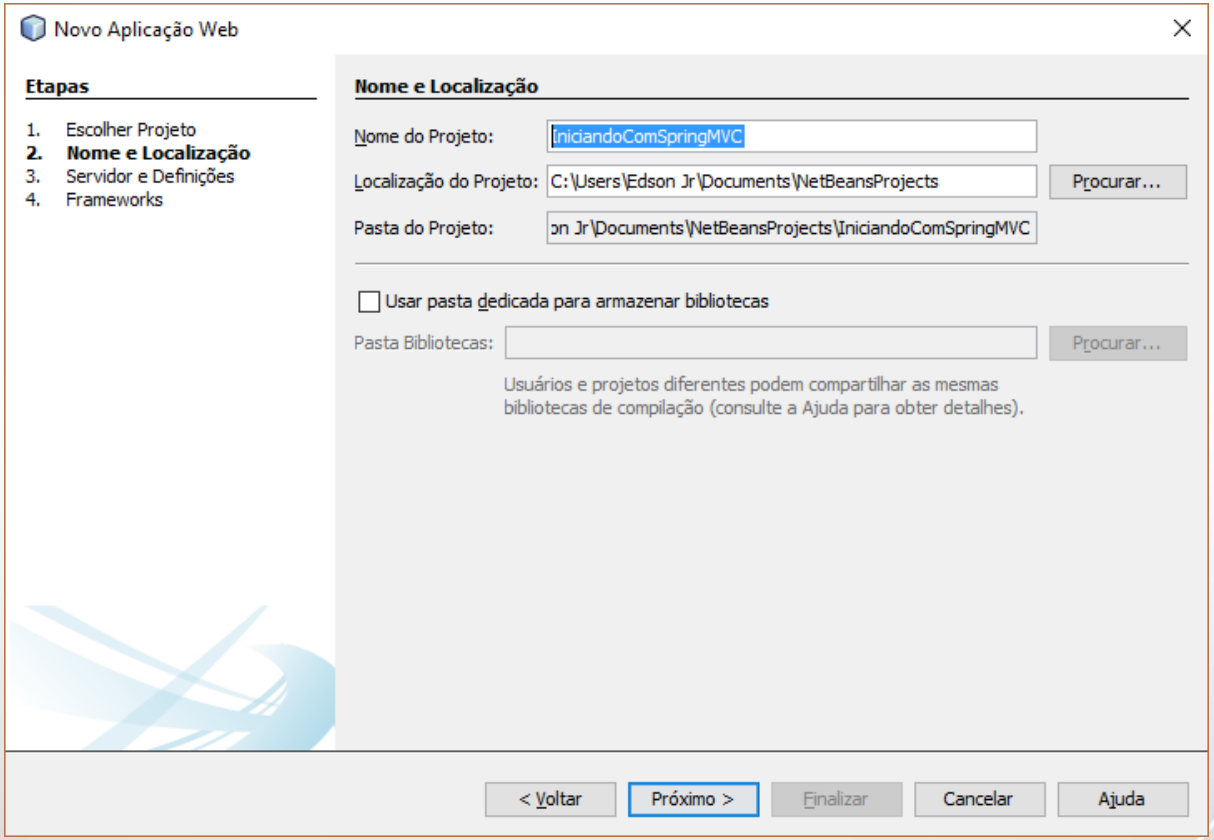
Configurando um Projeto no Netbeans

- Vá em: Arquivo/Novo Projeto
- Em Categorias escolha: Java Web
- Em Projetos escolha: Aplicação Web
- Clique em Próximo



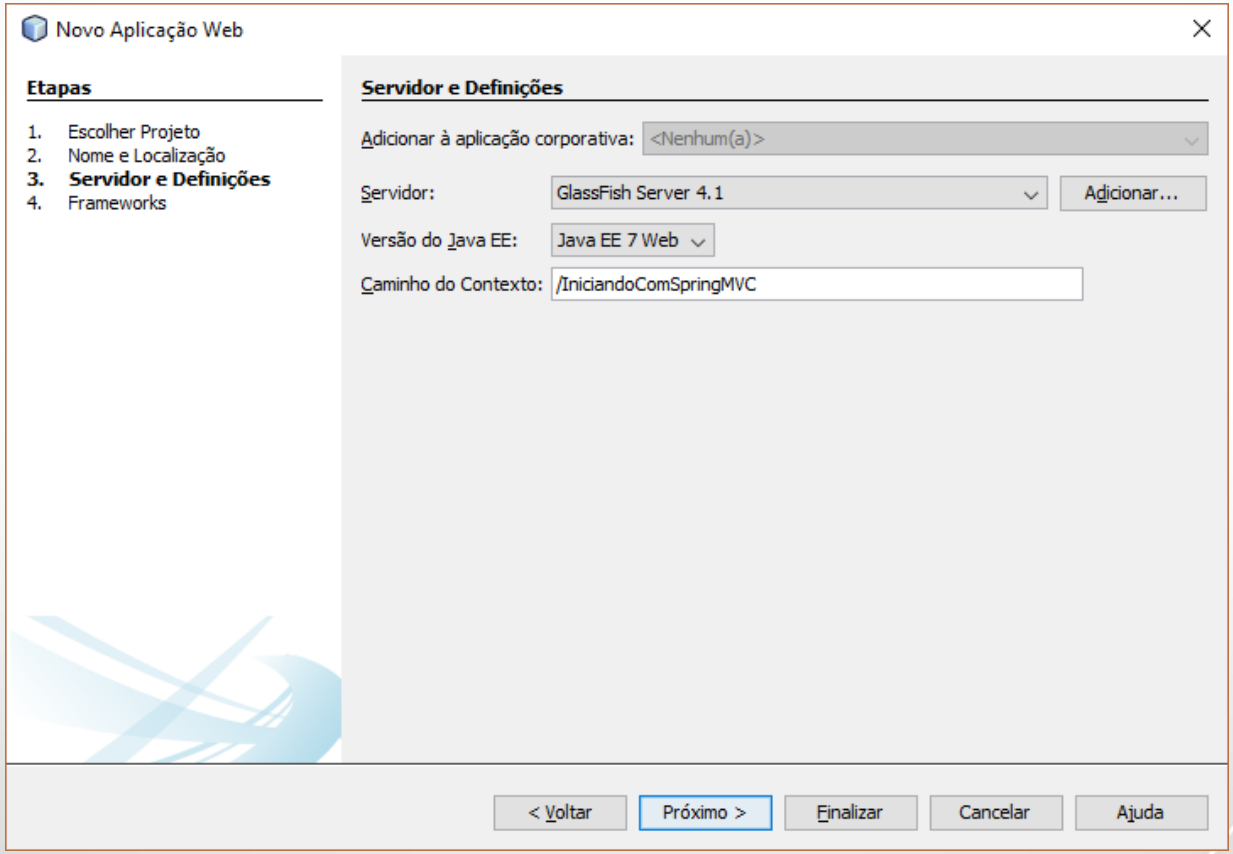
Configurando um Projeto no Netbeans

- Dê um nome ao seu projeto em Nome do Projeto → IniciandoComSpringMVC
- Clique em Próximo



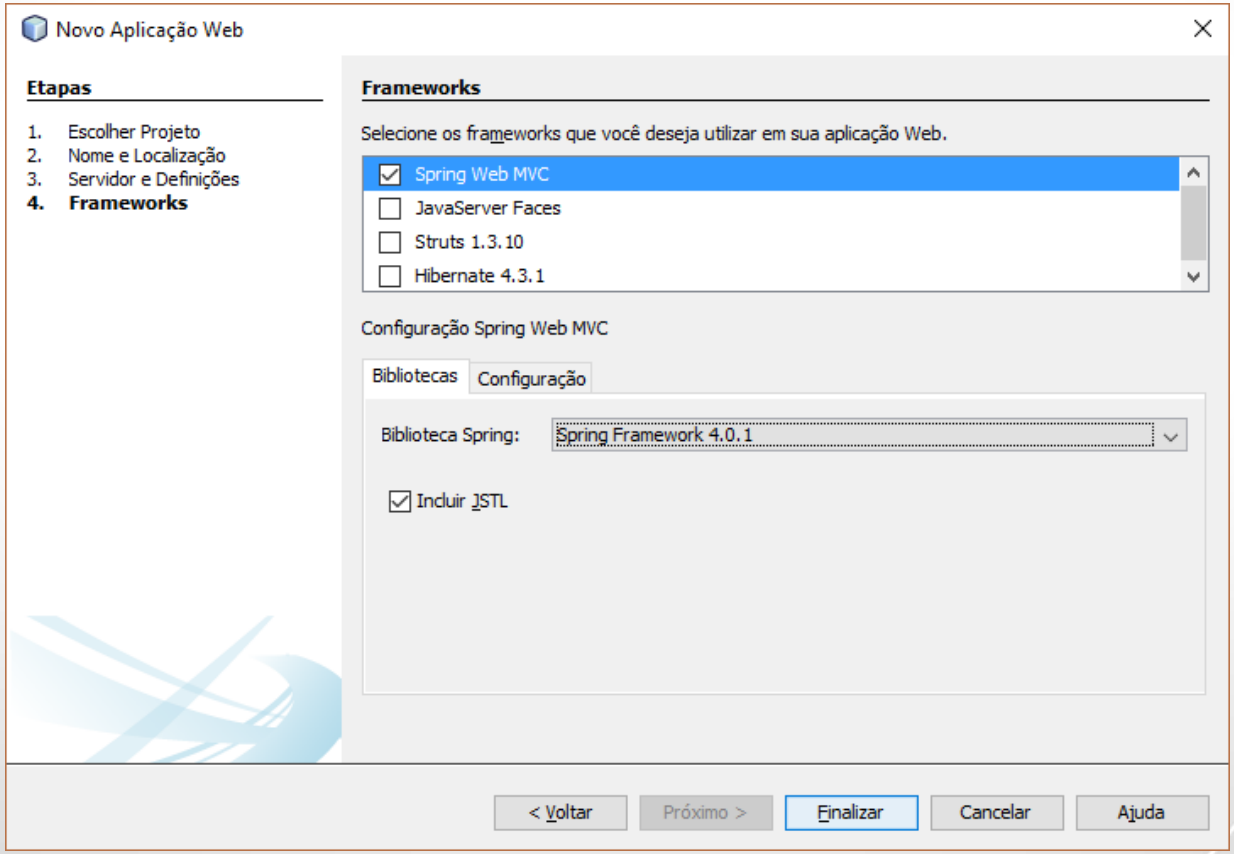
Configurando um Projeto no Netbeans

- Escolha o Servidor de sua preferência: GlassFish ou Tomcat
- Escolha a versão do Java EE
- De um nome ao contexto (root) da aplicação → /IniciandoComSpringMVC
- Clique em Próximo



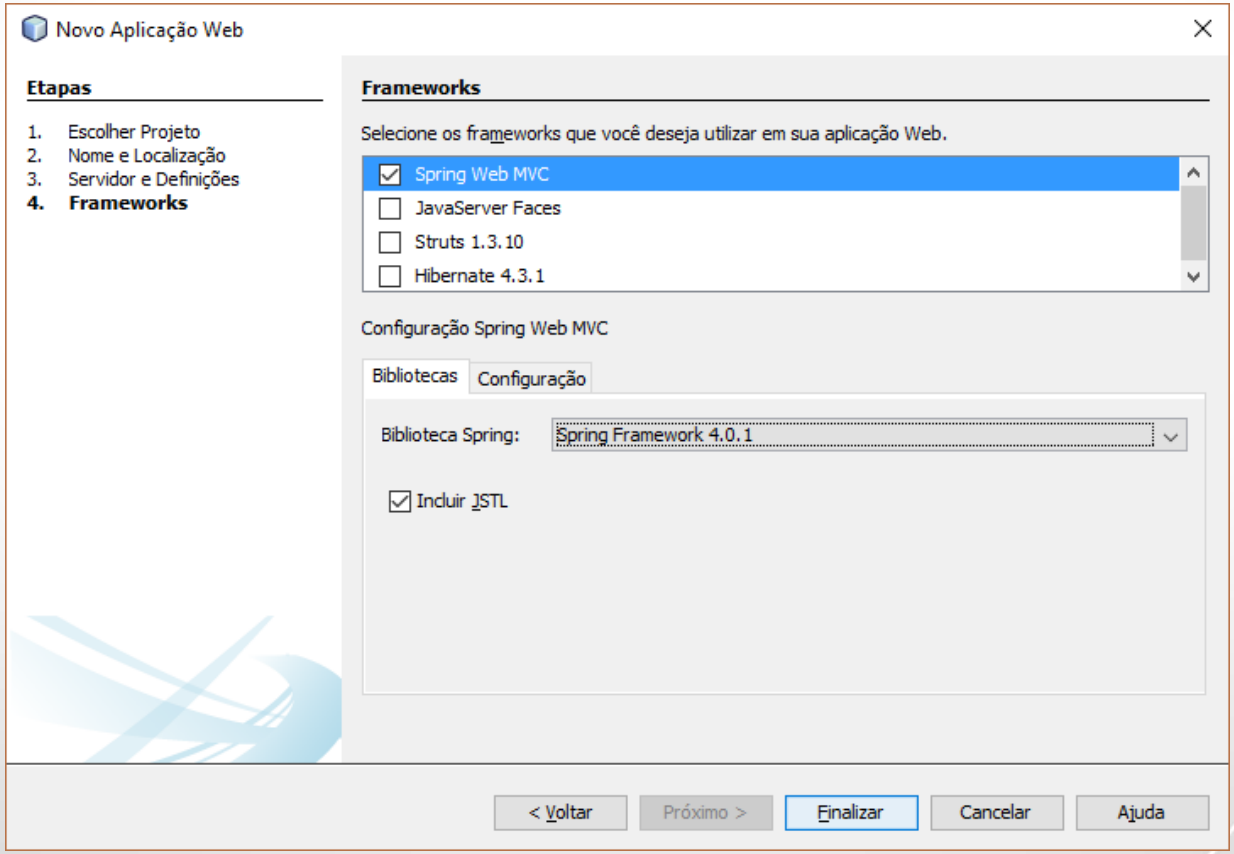
Configurando um Projeto no Netbeans

- Escolha o(s) Framework(s) que você precisa de suporte → Spring Web MVC
- Em Bibliotecas Spring escolha a versão desejada
- Marque Incluir JSTL



Configurando um Projeto no Netbeans

- Na aba Configuração, mude o Mapeamento de emissores para "/"
- Clique em Finalizar



Configurando um Projeto no Netbeans

- Veja a estrutura gerada pelo NB

NetBeans IDE 8.0.2

Arquivo Editar Exibir Navegar Código-Fonte Refatorar Executar Depurar Perfil Equipe Ferramentas Janela Ajuda

Projetos | Arquivos | Serviços

- IniciandoComSpringMVC
  - Páginas Web
    - WEB-INF
      - jsp
        - index.jsp
      - applicationContext.xml
      - dispatcher-servlet.xml
      - web.xml
    - redirect.jsp
  - Pacotes de Códigos-fonte
    - <pacote default>
  - Bibliotecas
    - Spring Framework 4.0.1 - org-apache-commons-logging.jar
    - Spring Framework 4.0.1 - cglib-2.2.jar
    - Spring Framework 4.0.1 - spring-aop-4.0.1.RELEASE.jar
    - Spring Framework 4.0.1 - spring-aspects-4.0.1.RELEASE.jar
    - Spring Framework 4.0.1 - spring-beans-4.0.1.RELEASE.jar
    - Spring Framework 4.0.1 - spring-build-src-4.0.1.RELEASE.jar
    - Spring Framework 4.0.1 - spring-context-4.0.1.RELEASE.jar
    - Spring Framework 4.0.1 - spring-context-support-4.0.1.RELEASE
    - Spring Framework 4.0.1 - spring-core-4.0.1.RELEASE.jar
    - Spring Framework 4.0.1 - spring-expression-4.0.1.RELEASE.jar
    - Spring Framework 4.0.1 - spring-framework-bom-4.0.1.RELEASE.
    - Spring Framework 4.0.1 - spring-instrument-4.0.1.RELEASE.jar
    - Spring Framework 4.0.1 - spring-instrument-tomcat-4.0.1.RELEAS
    - Spring Framework 4.0.1 - spring-jdbc-4.0.1.RELEASE.jar
    - Spring Framework 4.0.1 - spring-jms-4.0.1.RELEASE.jar
    - Spring Framework 4.0.1 - spring-messaging-4.0.1.RELEASE.jar
    - Spring Framework 4.0.1 - spring-orm-4.0.1.RELEASE.jar
    - Spring Framework 4.0.1 - spring-oxm-4.0.1.RELEASE.jar
    - Spring Framework 4.0.1 - spring-test-4.0.1.RELEASE.jar
    - Spring Framework 4.0.1 - spring-tx-4.0.1.RELEASE.jar
    - Spring Framework 4.0.1 - spring-web-4.0.1.RELEASE.jar
    - Spring Framework 4.0.1 - spring-webmvc-4.0.1.RELEASE.jar
    - Spring Framework 4.0.1 - spring-webmvc-portlet-4.0.1.RELEASE.
    - Spring Framework 4.0.1 - spring-websocket-4.0.1.RELEASE.jar
    - JSTL 1.2.2 - jstl-impl.jar
    - JSTL 1.2.2 - jstl-api.jar
    - JDK 1.8 (Default)
    - GlassFish Server 4.1
  - Arquivos de Configuração
    - MANIFEST.MF
    - web-fragment.xml
    - web.xml

applicationContext.xml - Navegador

- version='1.0' encoding='UTF-8'

Filtros:

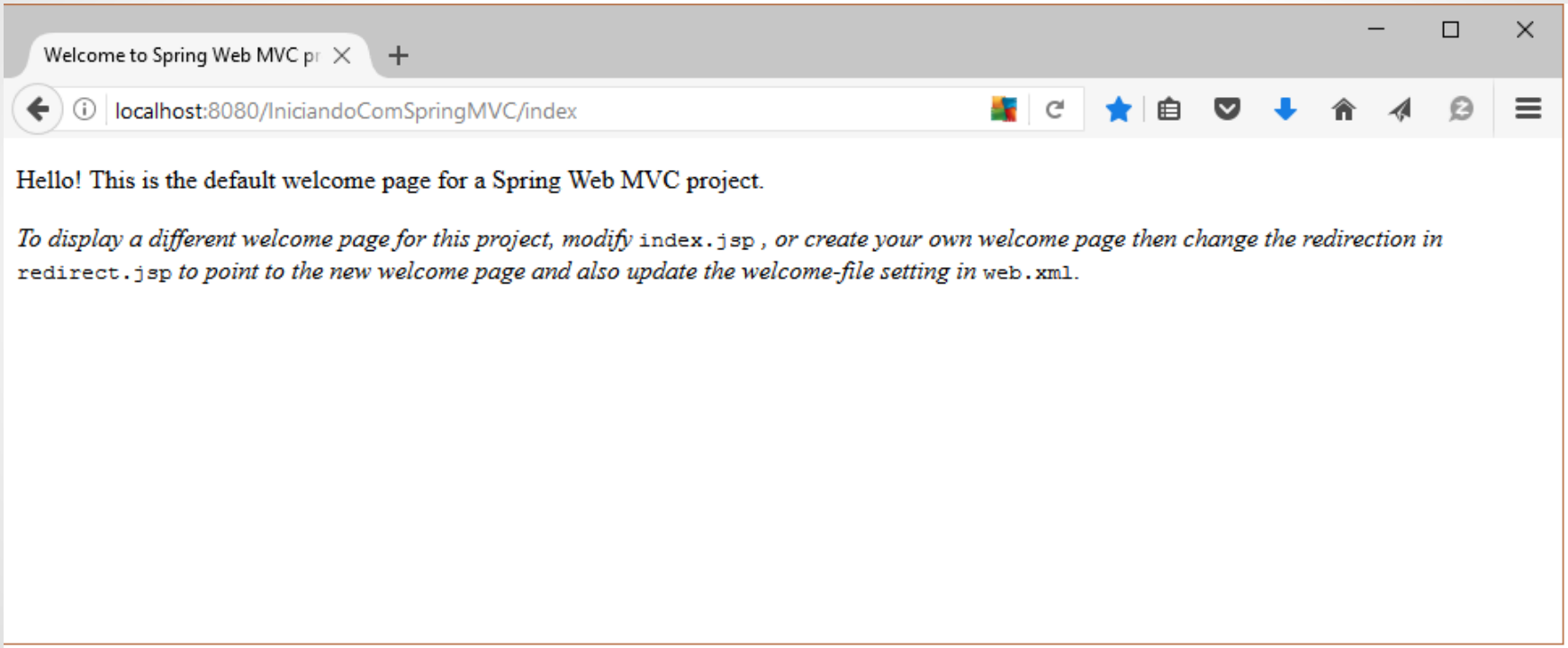
redirect.jsp | index.jsp | dispatcher-servlet.xml | applicationContext.xml

Código-Fonte | Histórico

```
1  <?xml version='1.0' encoding='UTF-8' ?>
2  <!-- was: <?xml version="1.0" encoding="UTF-8"?> -->
3  <beans xmlns="http://www.springframework.org/schema/beans"
4         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
5         xmlns:p="http://www.springframework.org/schema/p"
6         xmlns:aop="http://www.springframework.org/schema/aop"
7         xmlns:tx="http://www.springframework.org/schema/tx"
8         xsi:schemaLocation="http://www.springframework.org/schema/beans http://www.springframework.org/schema/beans/spring-beans-4.0.xsd
9         http://www.springframework.org/schema/aop http://www.springframework.org/schema/aop/spring-aop-4.0.xsd
10        http://www.springframework.org/schema/tx http://www.springframework.org/schema/tx/spring-tx-4.0.xsd">
11
12     <!--bean id="propertyConfigurer"
13          class="org.springframework.beans.factory.config.PropertyPlaceholderConfigurer"
14          p:location="/WEB-INF/jdbc.properties" />
15
16 <bean id="dataSource"
17     class="org.springframework.jdbc.datasource.DriverManagerDataSource"
18     p:driverClassName="${jdbc.driverClassName}"
19     p:url="${jdbc.url}"
20     p:username="${jdbc.username}"
21     p:password="${jdbc.password}" /-->
22
23     <!-- ADD PERSISTENCE SUPPORT HERE (jpa, hibernate, etc) -->
24
25 </beans>
26
```

Configurando um Projeto no Netbeans

- Executando....



Configurando um Projeto no Netbeans

- Removendo o código gerado que é desnecessário por enquanto..

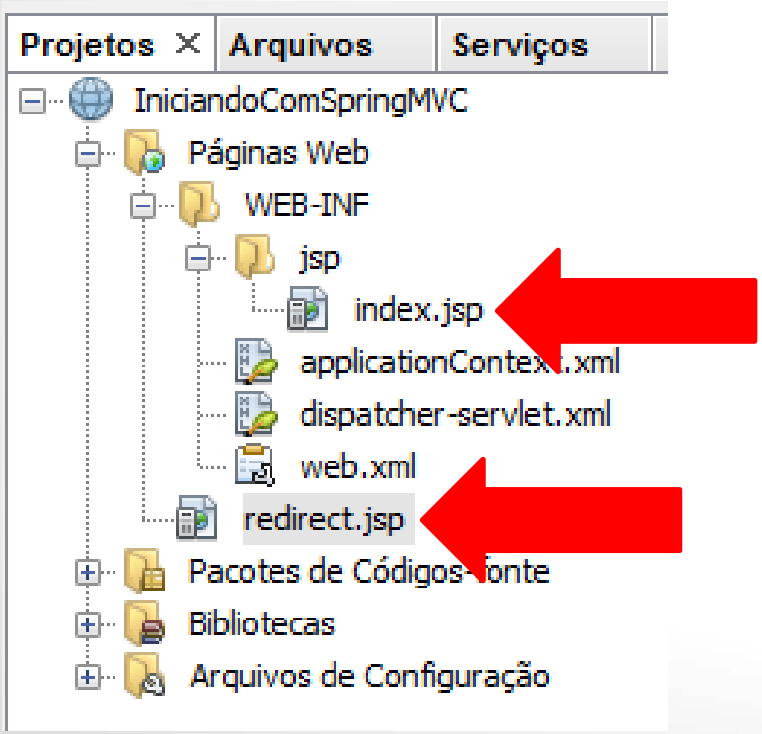
Página Inicial | redirect.jsp | index.jsp | dispatcher-servlet.xml | applicationContext.xml | web.xml

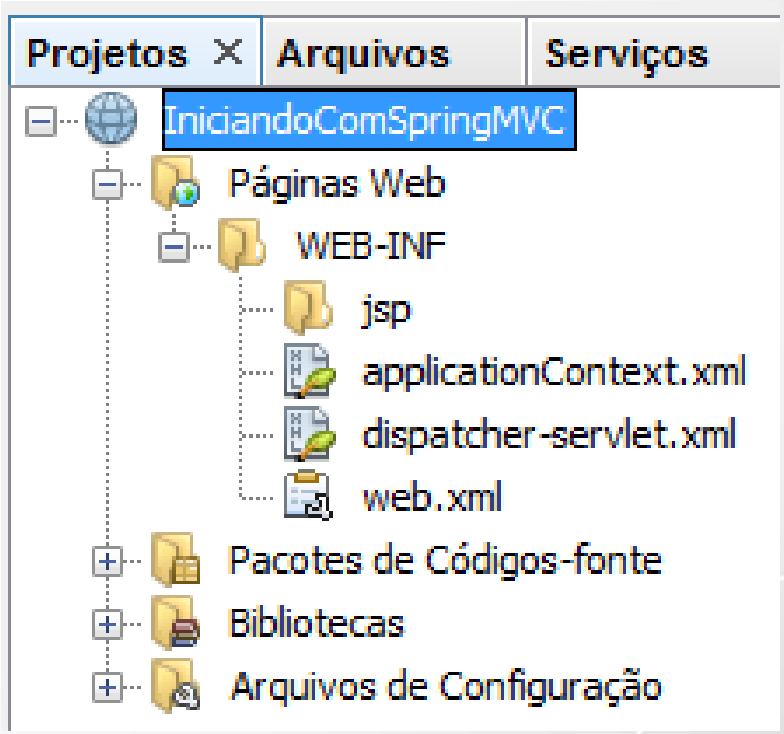
Código-Fonte | Histórico

```
1  <?xml version='1.0' encoding='UTF-8' ?>
2  <!-- was: <?xml version="1.0" encoding="UTF-8"?> -->
3  <beans xmlns="http://www.springframework.org/schema/beans"
4         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
5         xmlns:p="http://www.springframework.org/schema/p"
6         xmlns:aop="http://www.springframework.org/schema/aop"
7         xmlns:tx="http://www.springframework.org/schema/tx"
8         xsi:schemaLocation="http://www.springframework.org/schema/beans http://www.springframework.org/schema/beans/spring-beans-4.0.xsd
9         http://www.springframework.org/schema/aop http://www.springframework.org/schema/aop/spring-aop-4.0.xsd
10        http://www.springframework.org/schema/tx http://www.springframework.org/schema/tx/spring-tx-4.0.xsd">
11
12     <bean class="org.springframework.web.servlet.mvc.support.ControllerClassNameHandlerMapping"/>
13
14     <!--
15     Most controllers will [illegible]lerClassNameHandlerM[illegible]t
16     for the index contro[illegible]terizat[illegible] must
17     define an explicit mapping[illegible]
18     -->
19     <bean id="urlMapping" class="[illegible]dler.SimpleUrlHandlerMapping">
20         <property name="map[illegible]
21             <props>
22                 <prop key=[illegible]controller</prop>
23             </props>
24         </property>
25     </bean>
26
27     <bean id="viewResolver"
28           class="org.springframework.web.servlet.view.InternalResourceViewResolver"
29           p:prefix="/WEB-INF/jsp/"
30           p:suffix=".jsp" />
31
32     <!--
33     The index controller.
34     -->
35     <bean name="indexController"
36           class="org.sprin[illegible]oller"
37           p:viewName="inde[illegible]
38
39 </beans>
40
```

Configurando um Projeto no Netbeans

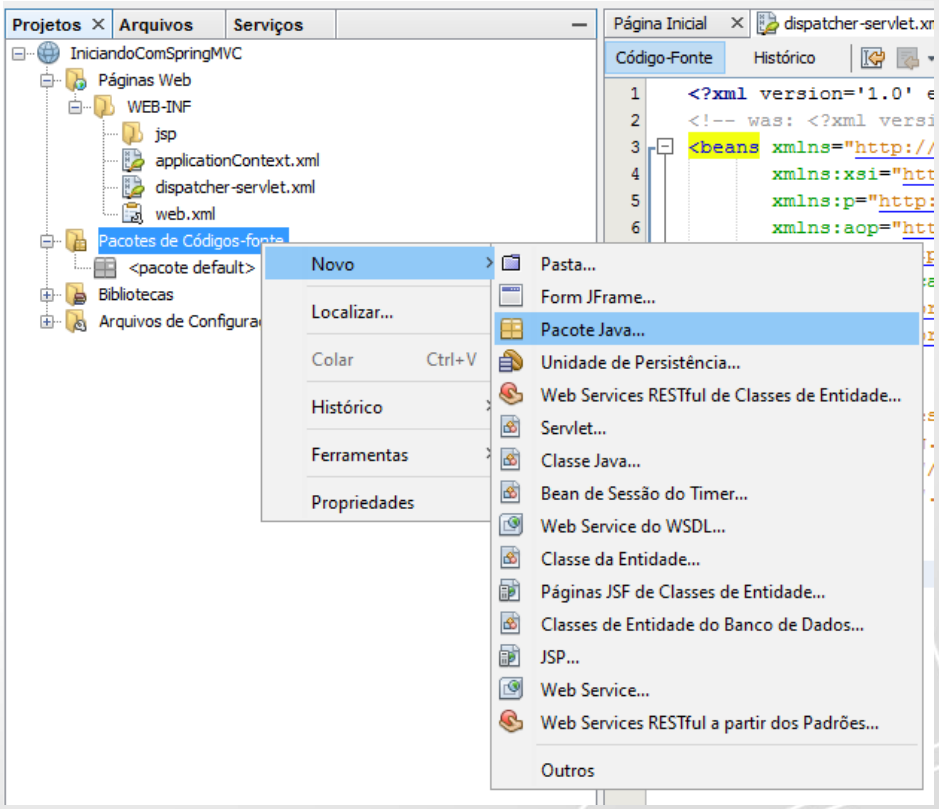
- Apagar o redirect.jsp e o index.jsp para podermos criar o nosso próprio Controller!!! Vamos trabalhar com URL Mapping somente!!!





Criando um Controller

- Todo Controller é uma classe, logo devemos criar tal classe em Pacotes de Códigos-fonte, certo?
- Vá em Pacotes de Códigos-fonte e clique com o botão direito
- Escolha a opção Novo/Pacote Java
- Dê um nome ao pacote:
  - br.uem.din.grsse.springmvc.controller



Criando um Controller

- Para a criação dos controllers usaremos Java Annotations
- Para isso, inclua o seguinte código no arquivo dispatcher-servlet.xml
  - <mvc:annotation-driven />
  - <context:component-scan base-package="br.uem.din.grsse.springmvc" />
- Em seguida, inclua as seguintes linhas na tag beans
  - xmlns:mvc="http://www.springframework.org/schema/mvc"
  - xmlns:context="http://www.springframework.org/schema/context"
  - Inclua as linhas abaixo na propriedade xsi:schemaLocation:
    - http://www.springframework.org/schema/mvc http://www.springframework.org/schema/mvc/spring-mvc-4.0.xsd
    - http://www.springframework.org/schema/context http://www.springframework.org/schema/context/spring-context-4.0.xsd

Criando um Controller

Código-Fonte Histórico

```xml
<?xml version='1.0' encoding='UTF-8' ?>
<!-- was: <?xml version="1.0" encoding="UTF-8"?> -->
<beans xmlns="http://www.springframework.org/schema/beans"
       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
       xmlns:p="http://www.springframework.org/schema/p"
       xmlns:aop="http://www.springframework.org/schema/aop"
       xmlns:tx="http://www.springframework.org/schema/tx"
       xmlns:mvc="http://www.springframework.org/schema/mvc"
       xmlns:context="http://www.springframework.org/schema/context"
       xsi:schemaLocation="http://www.springframework.org/schema/beans http://www.springframework.org/schema/beans/spring-beans-4.0.xsd
       http://www.springframework.org/schema/aop http://www.springframework.org/schema/aop/spring-aop-4.0.xsd
       http://www.springframework.org/schema/tx http://www.springframework.org/schema/tx/spring-tx-4.0.xsd
       http://www.springframework.org/schema/mvc http://www.springframework.org/schema/mvc/spring-mvc-4.0.xsd
       http://www.springframework.org/schema/context http://www.springframework.org/schema/context/spring-context-4.0.xsd">


    <mvc:annotation-driven />
    <context:component-scan base-package="br.uem.din.grsse.springmvc" />

    <bean id="viewResolver"
          class="org.springframework.web.servlet.view.InternalResourceViewResolver"
          p:prefix="/WEB-INF/jsp/"
          p:suffix=".jsp" />


</beans>
```

Criando um Controller

- Para criar a classe controller clique com o botão direito no pacote criado e escolha a opção Novo/Classe Java
- Dê um nome para a classe → MeuController
- Anote a classe da seguinte forma:
  - Antes da assinatura da classe inclua
    - @Controller
- Crie o método a seguir:
  - public String index() { return “index”;}
  - Anote-o com @RequestMapping("/inicio")

- Veja no próximo slide!!

Criando um Controller

Código-Fonte Histórico

```java
1   package br.uem.din.grsse.springmvc.controller;
2
3   import org.springframework.stereotype.Controller;
4   import org.springframework.web.bind.annotation.RequestMapping;
5
6   /**
7    *
8    * @author Edson OliveiraJr <edson@din.uem.br> - www.din.uem.br/~edson
9    */
10
11  @Controller
12  public class MeuController {
13
14      @RequestMapping("/inicio")
15      public String index() {
16          return "index";
17      }
18
19  }
```

Criando o index.jsp

- Na pasta jsp crie um arquivo do tipo JSP
- Clique com o botão direito na pasta jsp e escolha a opção Novo/JSP...
- Dê o nome de index
- Obs.: o nome do arquivo tem que ser exatamente o mesmo retorno do método criado na classe controller MeuController: ”index”
- Execute o projeto...
- Acesse: http://localhost:8080/IniciandoComSpringMVC/inicio

Adicionando um formulário de cadastro

- Em index.jsp adicione:
  - Clique aqui para cadastrar!!

- Crie uma nova pasta em ”jsp” chamada:
  - “pessoas”
  - Nesta pasta crie um jsp chamado cadastroPessoas.jsp
  - O conteúdo deste arquivo está disponível em:
    - www.din.uem.br/~edson/cadastroPessoas.jsp

Adicionando um formulário de cadastro

- Em MeuController inclua o seguinte método:

  public String cadastro() { return "pessoas/cadastroPessoa"; }

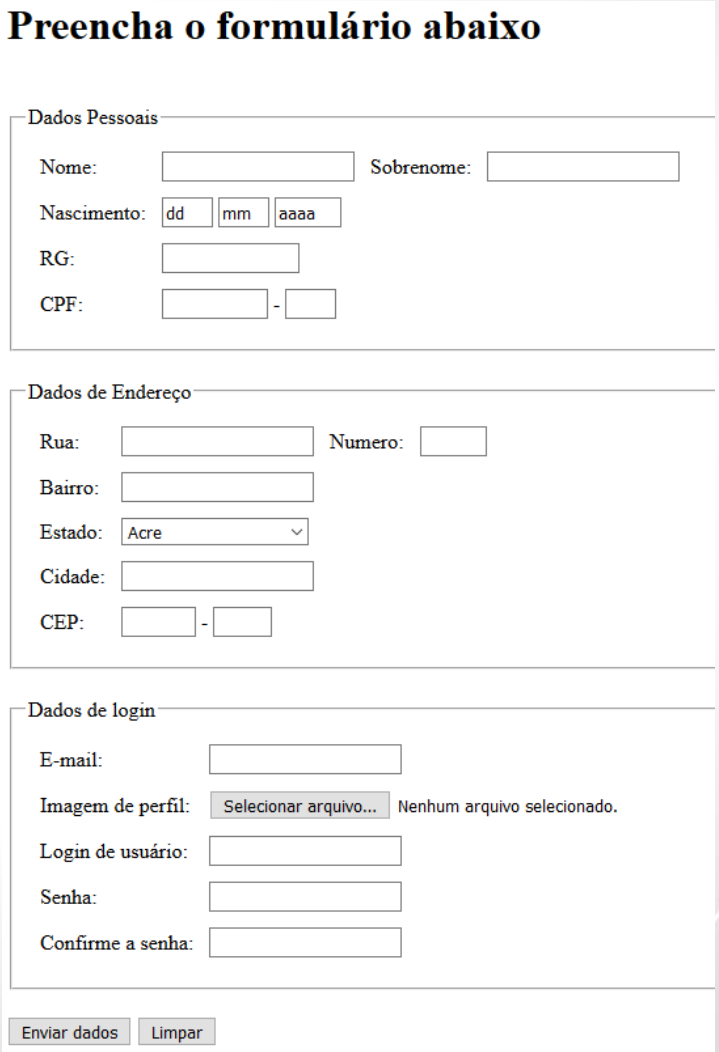
- Anote o método criado com: RequestMapping("/cadastrarAlguem")

Código-Fonte | Histórico

```
1  package br.uem.din.grsse.springmvc.controller;
2
3  import org.springframework.stereotype.Controller;
4  import org.springframework.web.bind.annotation.RequestMapping;
5
6  /**
7   *
8   * @author Edson OliveiraJr <edson@din.uem.br> - www.din.uem.br/~edson
9   */
10
11 @Controller
12 public class MeuController {
13
14     @RequestMapping("/inicio")
15     public String index() {
16         return "index";
17     }
18
19     @RequestMapping("/cadastrarAlguem")
20     public String cadastro() {
21         return "pessoas/cadastroPessoa";
22     }
23
24 }
```

Adicionando um formulário de cadastro

- Execute o projeto
- Acesse:
  - http://localhost:8080/IniciandoComSpringMVC/cadastrarAlguem

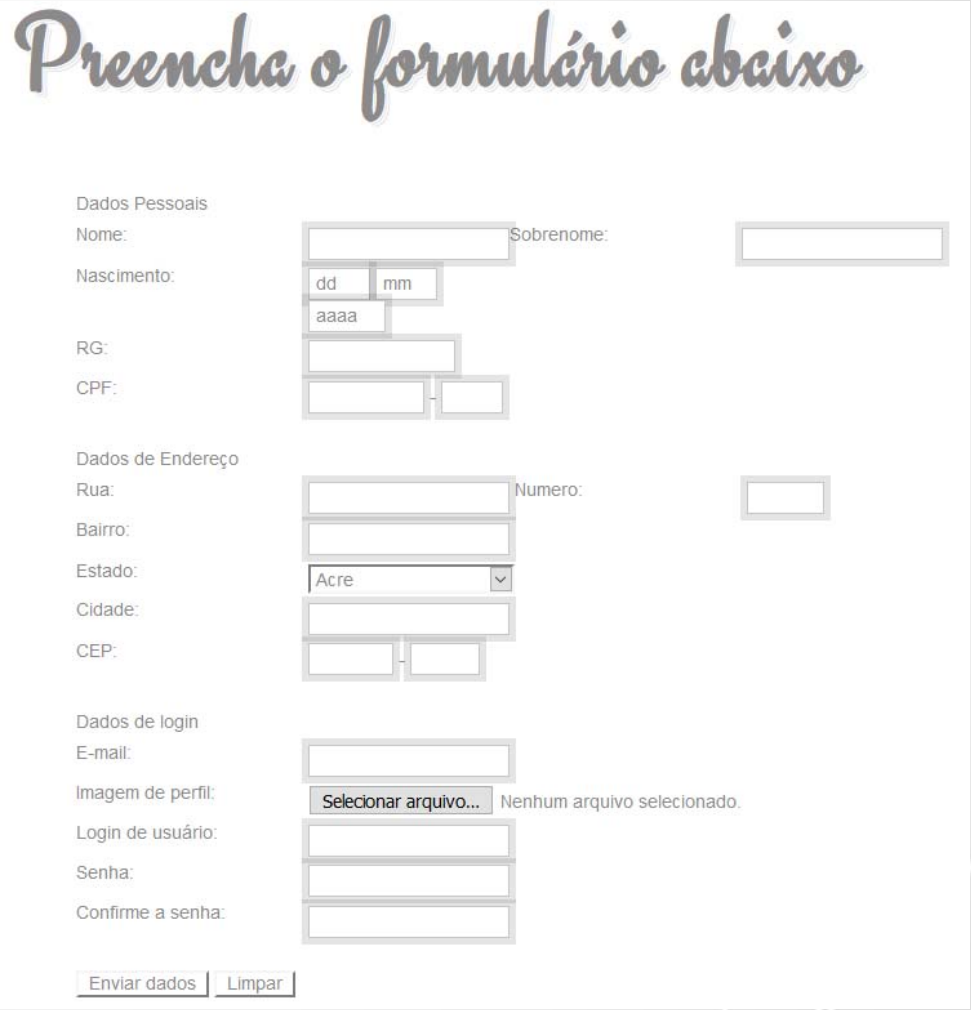


Adicionando CSS

- Em Páginas Web crie a pasta: resources/css
- Copie um arquivo CSS qualquer para a pasta css
- Inclua a seguinte tag em dispatcher-servlet.xml
  - <mvc:resources mapping="/resources/**" location="/resources/" />
- Em cadastroPessoa.jsp incluir:
  - <%@taglib prefix="c" uri="http://java.sun.com/jsp/jstl/core" %>
  - <link href="<c:url value="resources/css/style.css" />" rel="stylesheet" type="text/css" />
- Aplique o CSS ao cadastroPessoa.jsp

Adicionando CSS

- Execute o projeto
- Acesse: http://localhost:8080/IniciandoComSpringMVC/cadastrarAlguem



Tarefa

- Continue trabalhando no projeto IniciandoComSpringMVC
- Crie uma aplicação que permita o cadastro de:
  - Contas bancárias (poupança ou conta corrente);
  - Vincule pelo menos uma conta a cada pessoa;
  - Forneça o relatório em tela das contas vinculadas a uma determinada pessoa;
  - Imprima em tela o extrato completo de uma conta com base no mês atual ou no mês escolhido pelo usuário;
  - Permita o saque e o depósito em qualquer conta.

Tarefa

- Instruções:
  - Toda a persistência deverá ser feita em memória primária usando Java Collections;
  - Utilize os recursos front-end que achar necessário na sua aplicação. Ex.: JavaScript para validação, CSS para formatação, etc;
  - Cada grupo em trio;
  - Terminar em sala de aula ou trazer pronto para a próxima aula.
- Obs.: este projeto será usado na próxima aula!