A multi-faceted language for the Java platform

Apache Groovy is a powerful, **optionally typed** and **dynamic language**, with **static-typing** and **static compilation** capabilities, for the Java platform aimed at improving developer productivity thanks to a concise, **familiar and easy to learn syntax**. It integrates smoothly with any Java program, and immediately delivers to your application powerful features, including scripting capabilities, **Domain-Specific Language** authoring, runtime and compile-time **meta-programming** and **functional programming**.

Why Learn Groovy?

Groovy is an extension to Java

Write concise code

Automate recurring tasks

Who Is Using Groovy?

Netflix

LinkedIn

Walmart

IBM

Google

Oracle

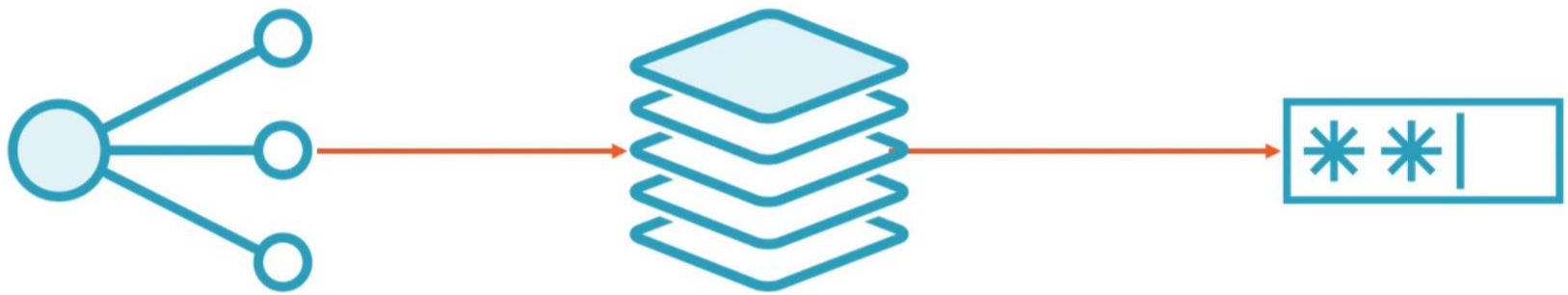
Java	Groovy
It is developed on JDK and is run on JVM	It is compiled to JVM Byte code and It is compatible with **Java** platform
It is used as programming and object oriented Language	It is used as both programming and scripting Language
In **Java** default access modifier **package**	In **Groovy** default access modifier **public**
In **Java**, you need to provide getters and setters method for fields, especially if you are following **Java** Beans naming convention	In **Groovy**, getters and setters are automatically generated for class members
In **Java** semicolons are compulsory	In **Groovy** semicolons are optional
In **Java** only **Java**.lang.* package is imported by default	In **Groovy** commonly used packages are imported by default
Java has primitive data types and wrapper classes to perform boxing and unboxing implicitly or explicitly	In **Groovy** everything is object and uses only object hence no concept of autoboxing or unboxing
Java has a requirement of the main method inside a class to run the program	**Groovy** does not require any main method or entry point of a method to run the class or any program

Understanding the Business Problem

Payment card industry (**PCI**) compliance is mandated by credit card companies to help ensure the security of credit card transactions in the payments industry

Companies need to mask the credit card numbers while displaying and mask in database logs

Understanding the Business Problem



AUDIT

Understanding the Business Problem

- **Scan the directory containing the log files**
- **Filter files with .log extension**
- **Scan for credit cards**
- **Mask card data except the last four digits**
- **Write the run time to a database**
- **Enhance the utility to process XML and JSON files**

Groovy Editors

SlickEdit

Textmate

IntelliJ

Vim

UltraEdit

IDE integration

Many IDEs and text editors support the Groovy programming language.

Editor	Syntax highlighting	Code completion	Refactoring
Groovy Eclipse Plugin	Yes	Yes	Yes
IntelliJ IDEA	Yes	Yes	Yes
Netbeans	Yes	Yes	Yes
Groovy Emacs Modes	Yes	No	No
TextMate	Yes	No	No
vim	Yes	No	No
UltraEdit	Yes	No	No
SlickEdit	Yes	No	No
EditRocket	Yes	No	No
VSCode	Yes	No	Yes

https://groovy-lang.org/ides.html

Environment Setup

Groovy 4 is compatible with any Java release Greater than version 8

JDK Download:

https://www.oracle.com/java/technologies/javase/jdk17-archive-downloads.html

Groovy Download:

https://groovy.apache.org/download.html

https://groovy.jfrog.io/ui/native/dist-release-local/groovy-zips/apache-groovy-sdk-4.0.1.zip

https://groovy.jfrog.io/ui/native/dist-release-local/groovy-zips/apache-groovy-sdk-4.0.6.zip

IntelliJ Download:

https://www.jetbrains.com/idea/download/#section=windows

Groovy is an optionally typed, dynamic language for the Java platform with features inspired by Python, Ruby, and Smalltalk, making them available to Java developers using a Java-like syntax.

Value Proposition of Groovy

- **Created as a companion to Java**
- **Increase the productivity of Java developers**
- **Feature-rich and Java-friendly compared to Scala, Kotlin, and Ceylon**
- **Can be called from a Java program**
- **Offers scripting capabilities**
- **A complete object-oriented language**
- **Ability to process XML, SQL, and JSON**
- **Dynamic programming**

Groovy Comments

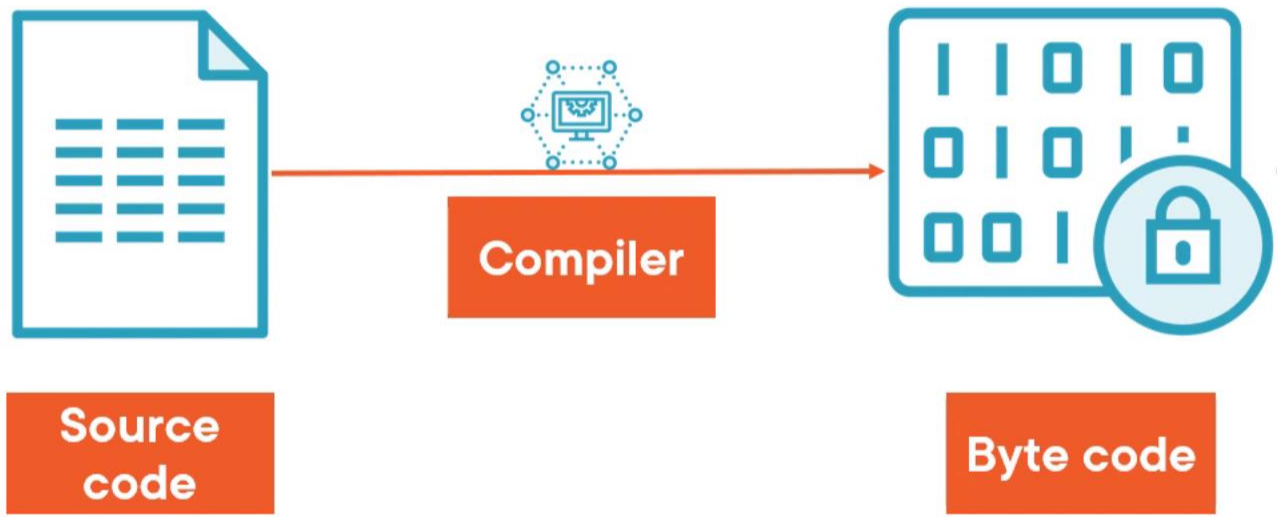
A single line comment starts with //

A multi-line comment starts with /* and ends with */

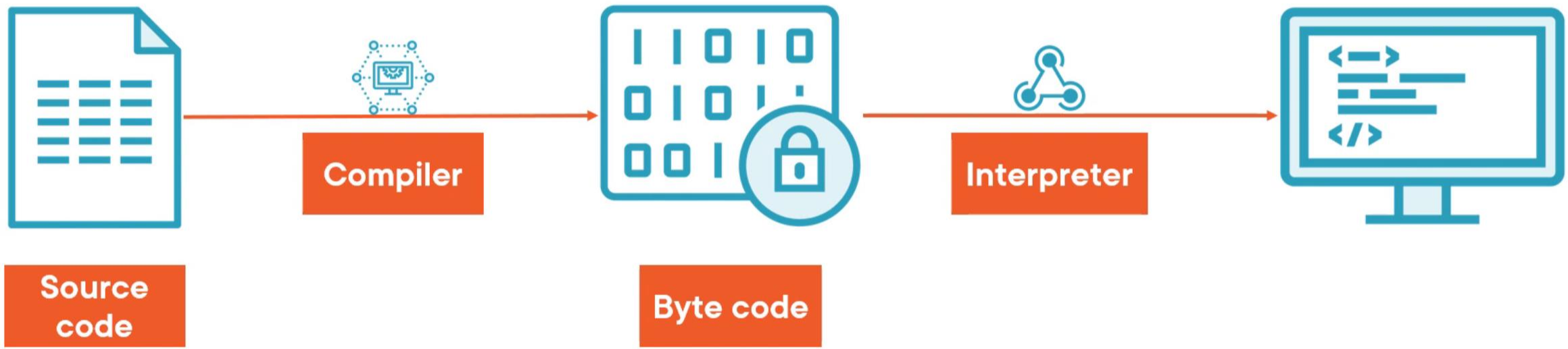
Compiled vs. Interpreted

Source code

Compiled vs. Interpreted



Compiled vs. Interpreted



Compiled vs. Interpreted

First groovy class & the compiler

File Name: Example.groovy

```
class Example {
   static void main(String[] args) {
      // Using a simple println statement to print output to the console
      println('Hello World')
   }
}
```

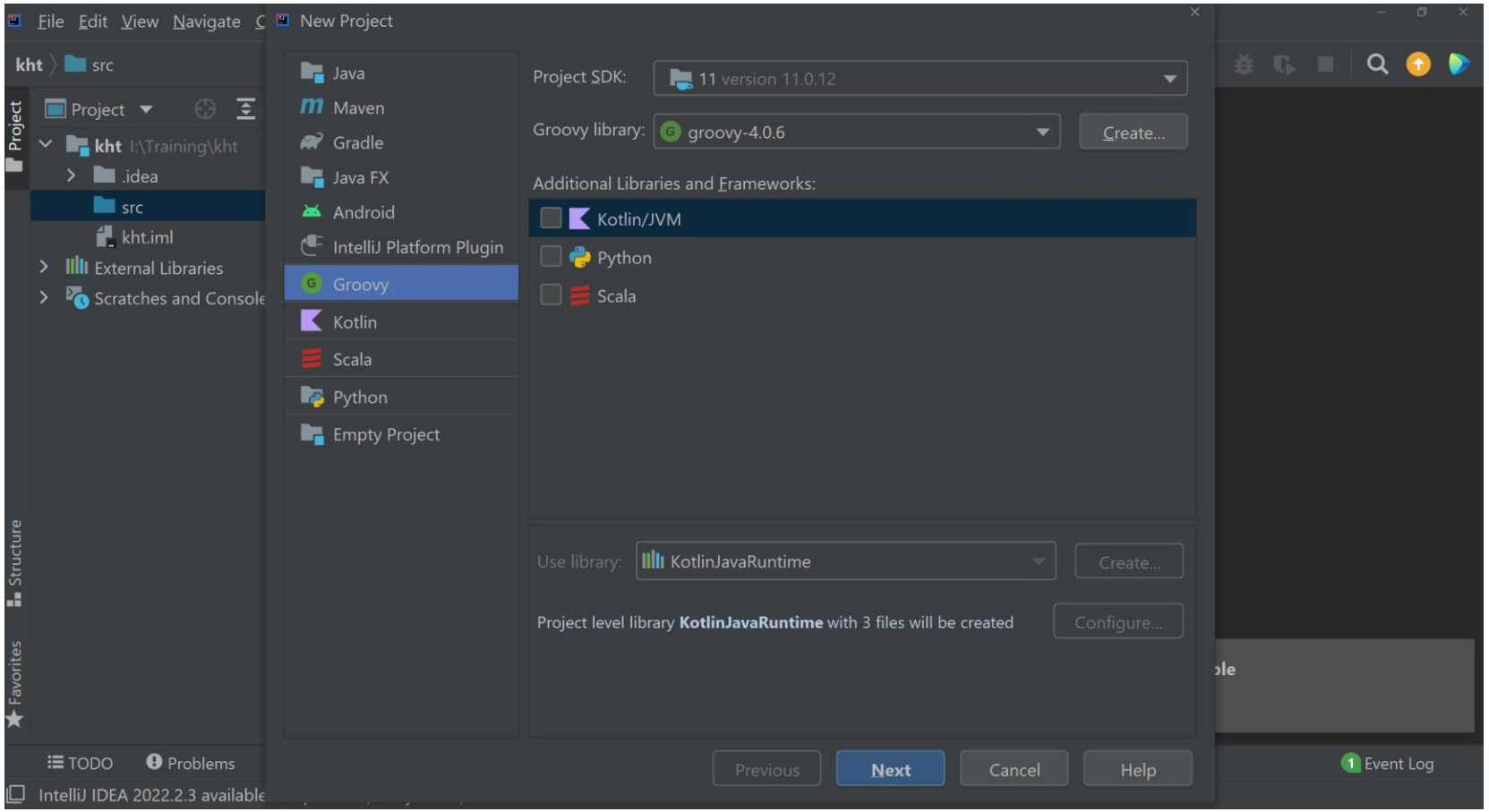
Groovyc compiler:

```
groovyc Example.groovy    ->    Example.class
```

Execute the class/groovy file:

```
groovy Example.groovy    /   groovy Example (with compiled file)
```

Create Groovy Project from IntelliJ



Groovy utilities

Step 1: Open Command Prompt

Step 2: execute **groovysh** utility in command prompt

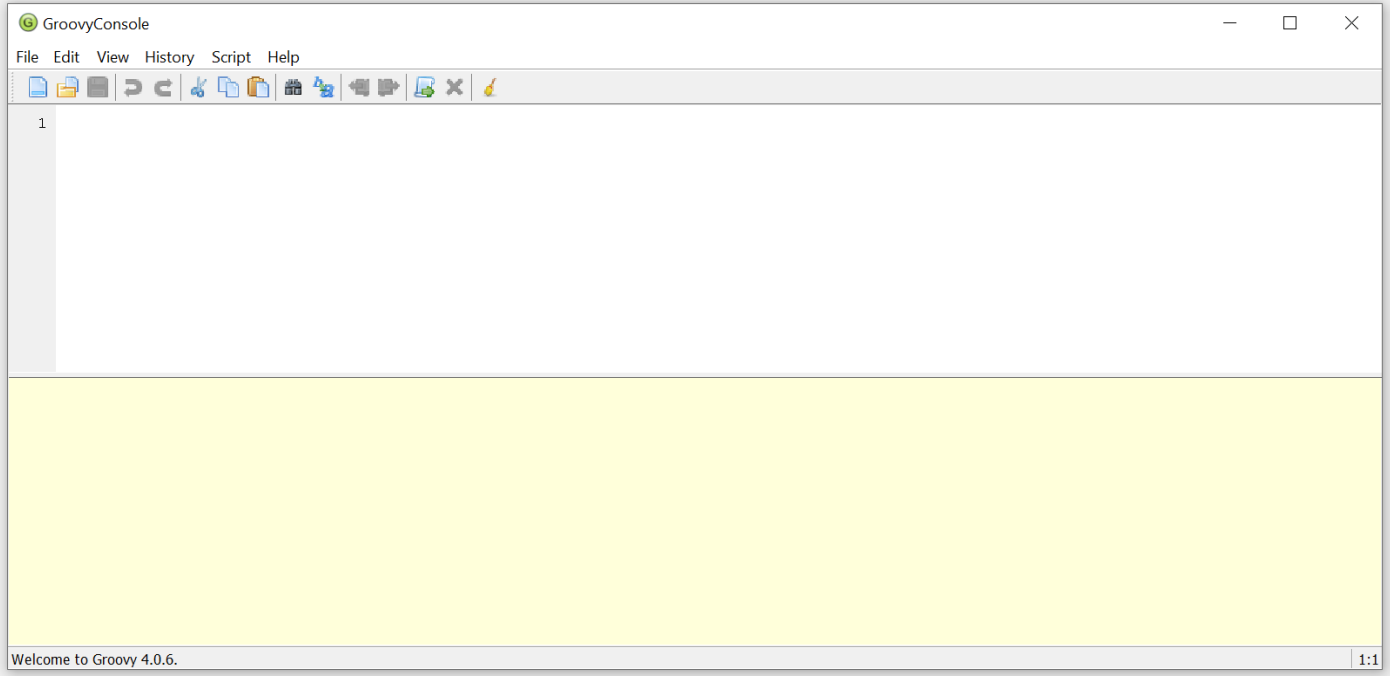
```
C:\Users\bvsra\OneDrive\Desktop\temp>groovysh
Groovy Shell (4.0.6, JVM: 11.0.12)
Type ':help' or ':h' for help.
------------------------------------------------------------
groovy:000> 1
===> 1
groovy:000> i = 10
===> 10
```

Groovy utilities

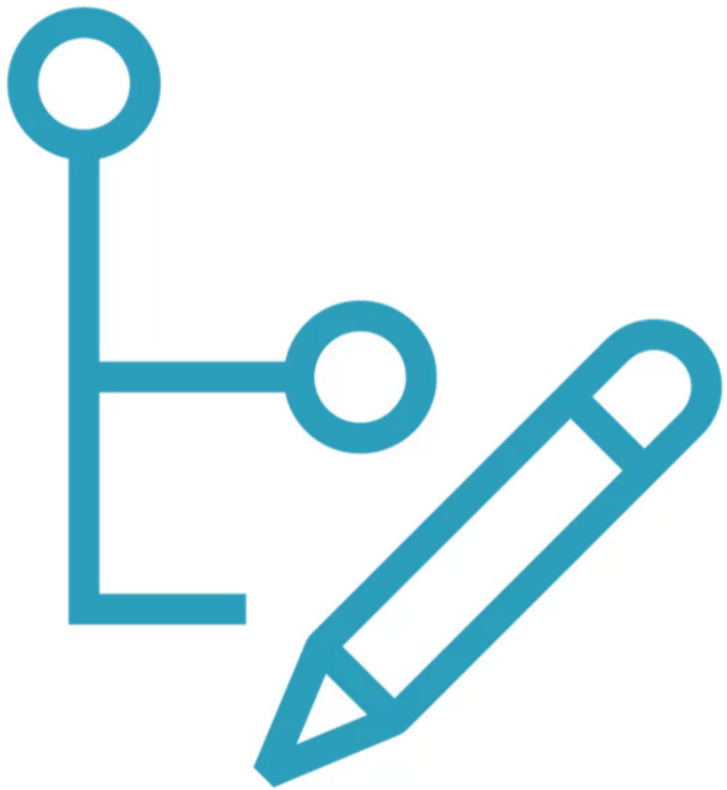
Step 1: Open Command Prompt

Step 2: execute **groovyconsole** utility in command prompt

```
C:\Users\bvsra\OneDrive\Desktop\temp>groovyconsole
```



Groovy Datatypes



byte, short, int, and long

- **Whole numbers**

float, double

- **Decimal point numbers**

char, string

- **Characters and string**

boolean

- **Logical values**

Groovy Datatypes Capacity

Datatype	Description	Capacity
byte	8-bit signed integer	-128 to +127
short	16-bit signed integer	-32768 to +32767
int	32-bit signed integer	-2^{31} to $2^{31}-1$
long	64-bit signed integer	-2^{63} to $2^{63}-1$
float	Single-precision 32-bit floating point	approximately ±3.40282347E+38F
double	Double-precision 64-bit floating point	approximately ±1.7976931348623157E+308
char	16-bit Unicode character	'\u0000' (or 0) to '\uffff' (or 65,535 inclusive)
boolean	Boolean value	true and false

Groovy Arithmetic Operations

Addition

Subtraction

Multiplication

Division

Modulus

Increment

Decrement

Operator Precedence

5 + 5 / 5 * 5

5 + 1 * 5

5 + 5

10

Operator Precedence

$$5 + 5 / (5 * 5)$$

Operator Precedence

5 + 5 / (5 * 5)

5 + 1 / 25

5 + 0.2

5.2

Boolean Values

A true value is represented by integer 1

A false value is represented by integer 0

Supports AND, OR, and NOT

Logical AND

Operand1	Operand2	Result
		
		
		
		

Logical OR

Operand1	Operand2	Result
		
		
		
		

Logical NOT

Operand	Result
	
	

Relational Operators

== -> object equality

!= -> object inequality

Java Strings

Single quoted string

Cannot interpolate variables

Double quoted string

Can interpolate variables

Dynamic Typing

Types are inferred based on context

Not strictly enforced during compile-time

Dynamic Typing Benefits

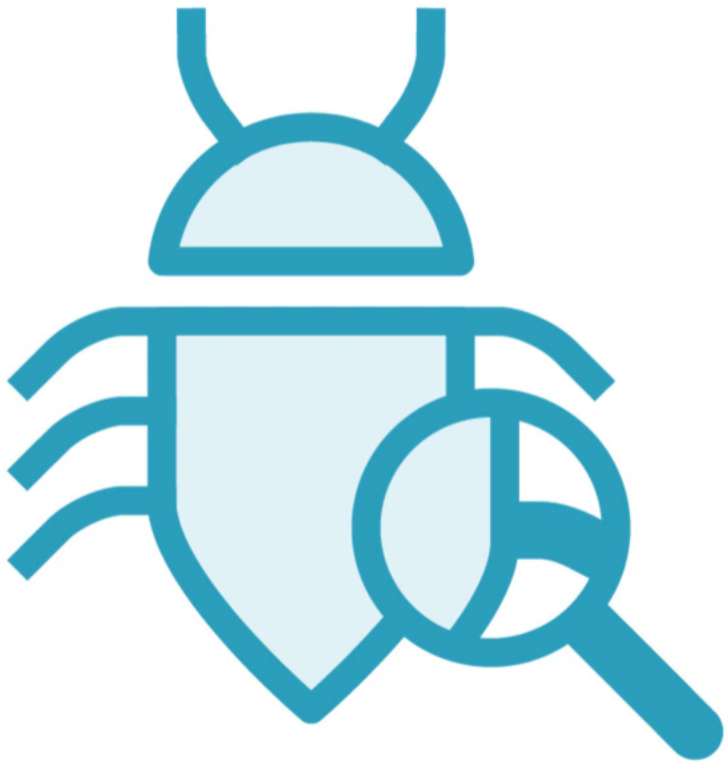
Less verbose code

Explicit type casting not required

Dynamic testing

Effective debugging

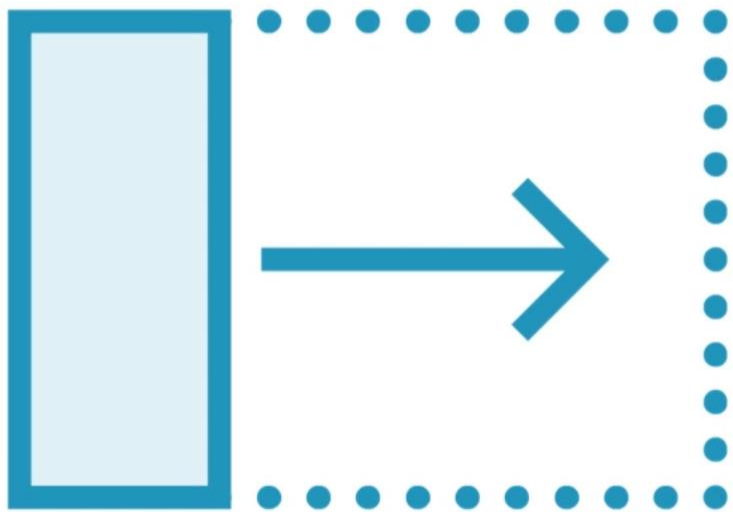
Unit Testing



Assertion helps validate an expression

Built-in feature in Groovy

Groovy Range



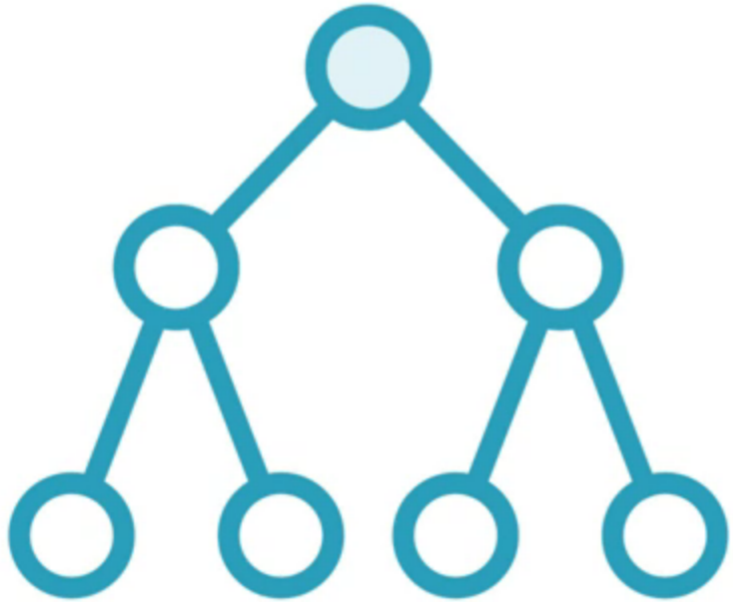
Not a good fit for storing random collections

Groovy Map

Stores elements as key-value pair

Branching Logic in Groovy

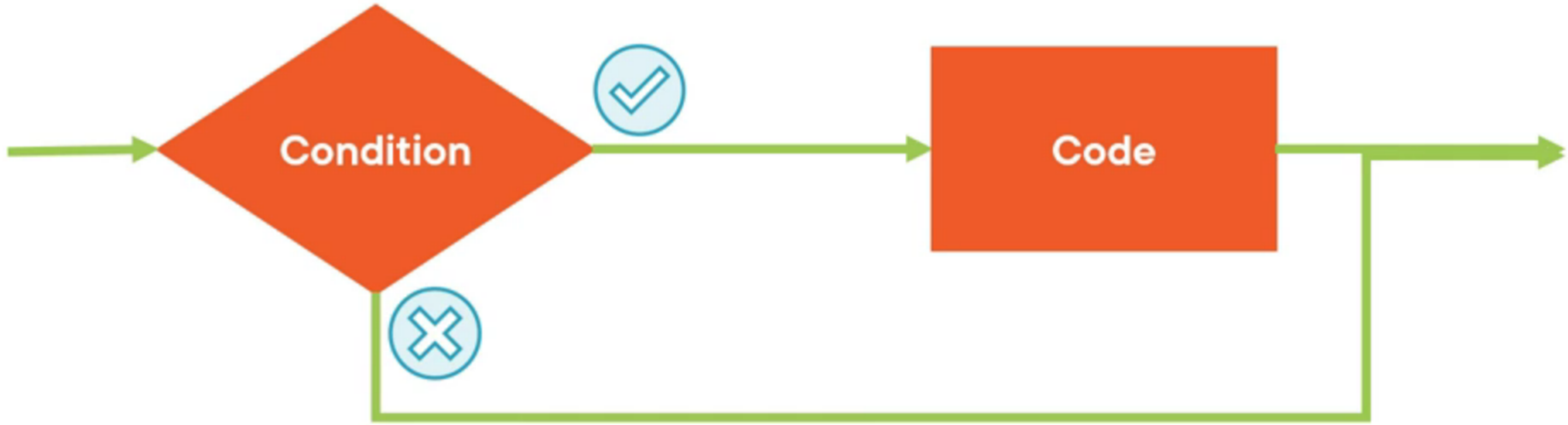
Branching Logic in Groovy



Executing code based on certain condition?

- **Use “if” statement**

Branching Logic in Groovy



Business Requirements

Execute a code block when the list has four elements

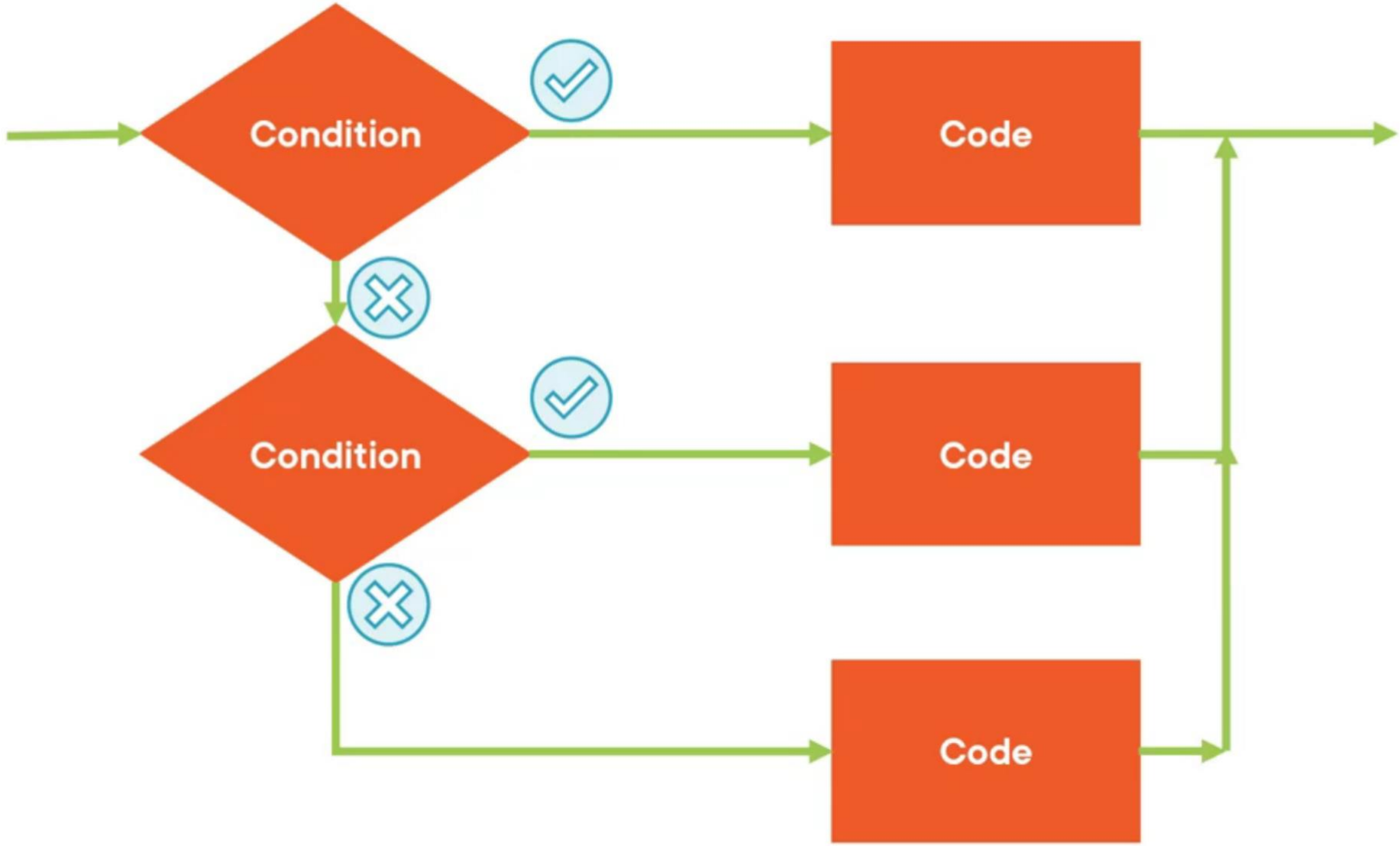
Business Requirements

Execute a code block when the list has four elements

Execute a different code block when the list has five elements

Print a default message for other scenarios

Branching Logic in Groovy

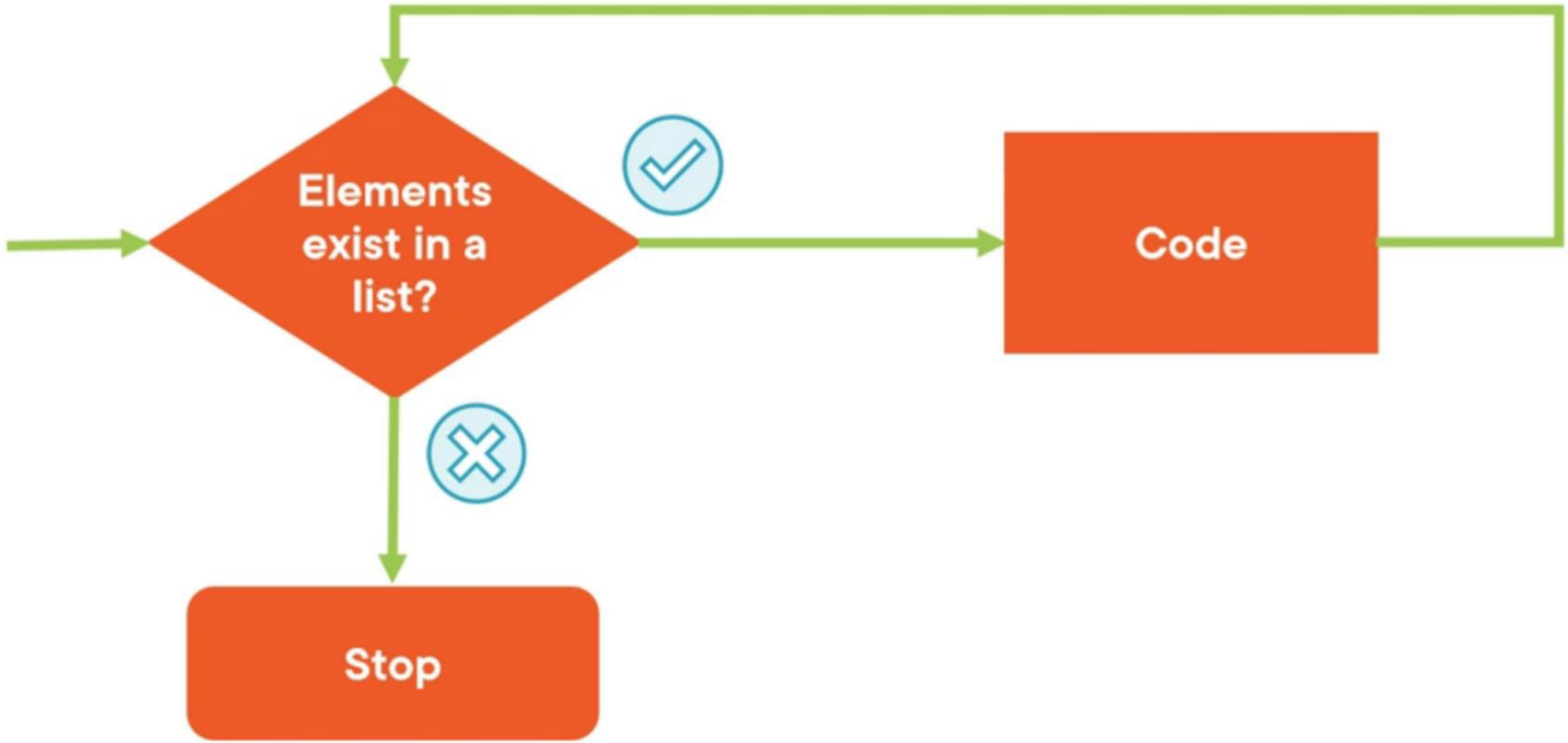


Looping Logic in Groovy

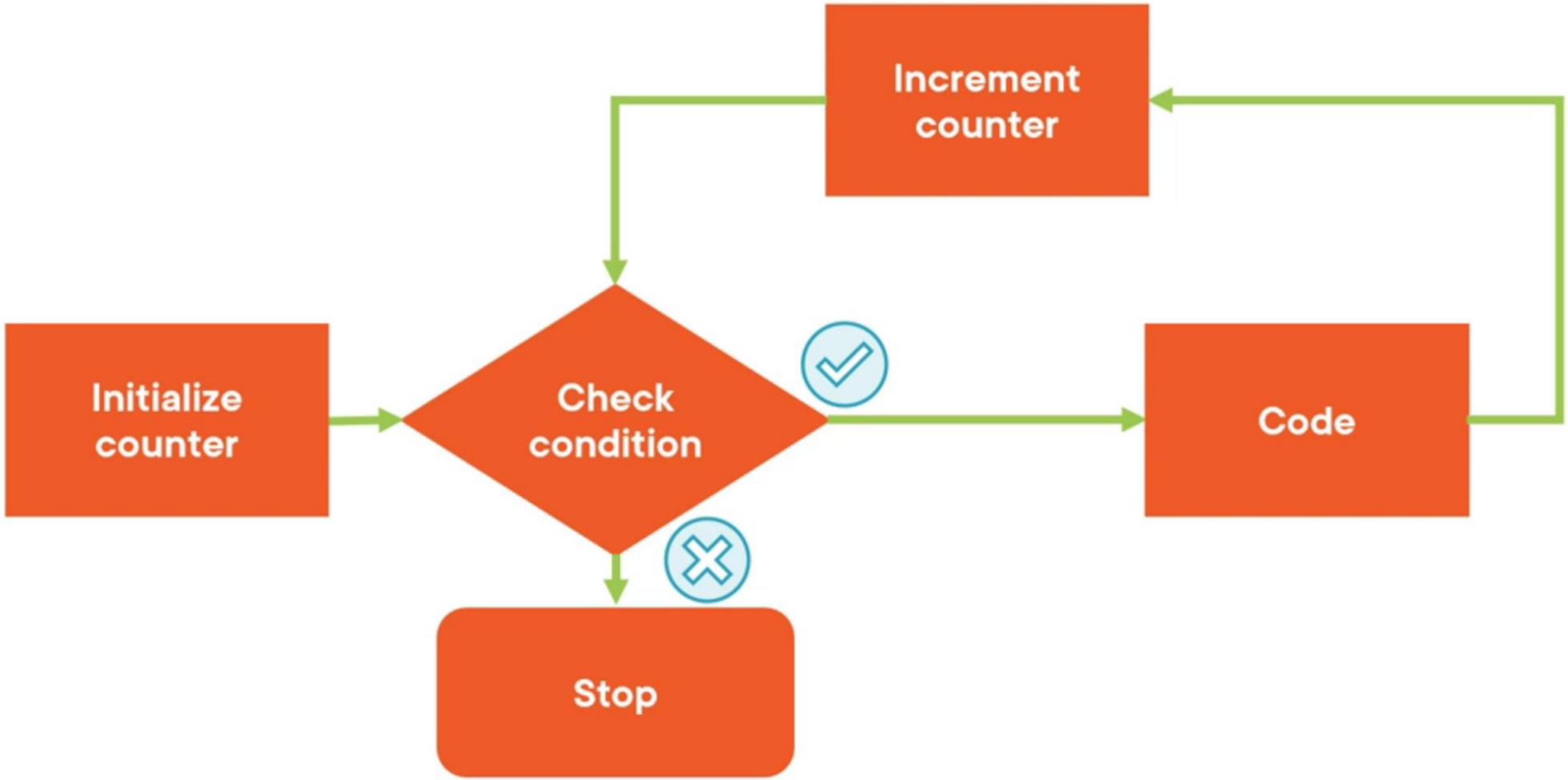
Need to iterate over all the elements in a collection?

- **Use “for” loop**

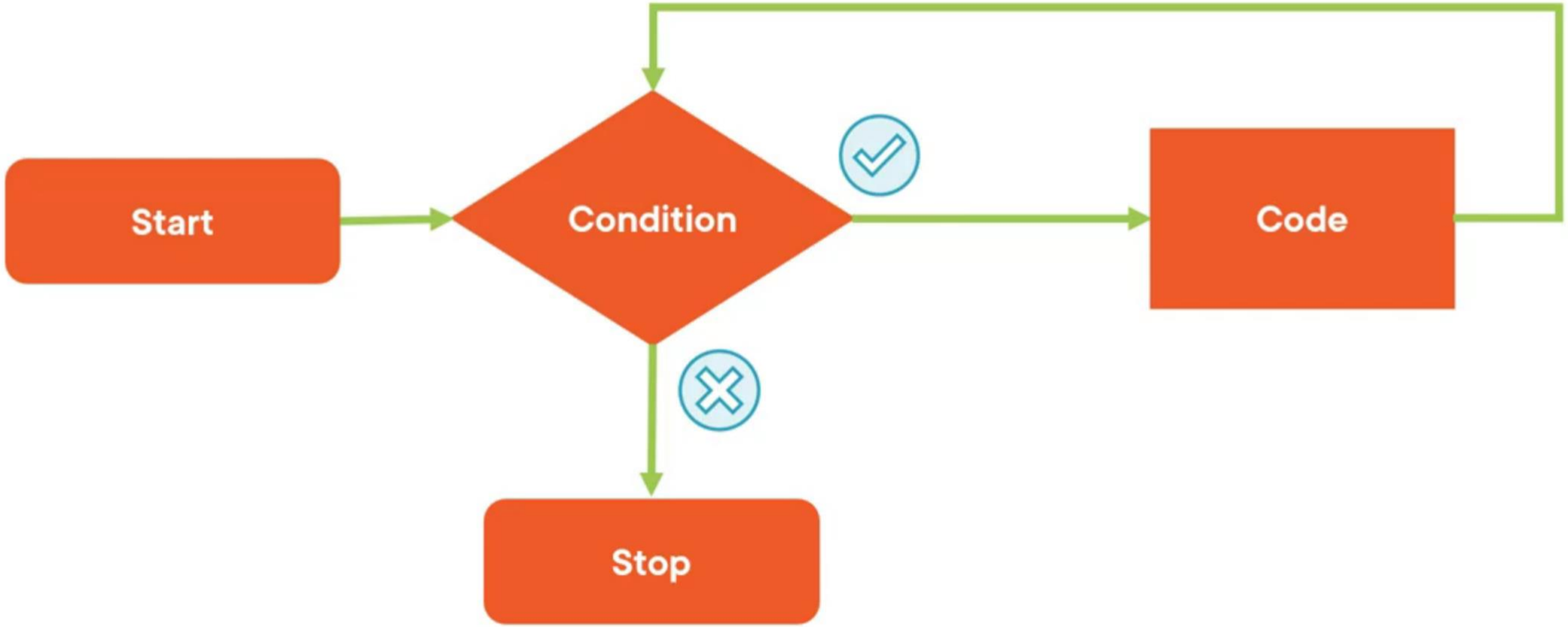
for Loop in Groovy



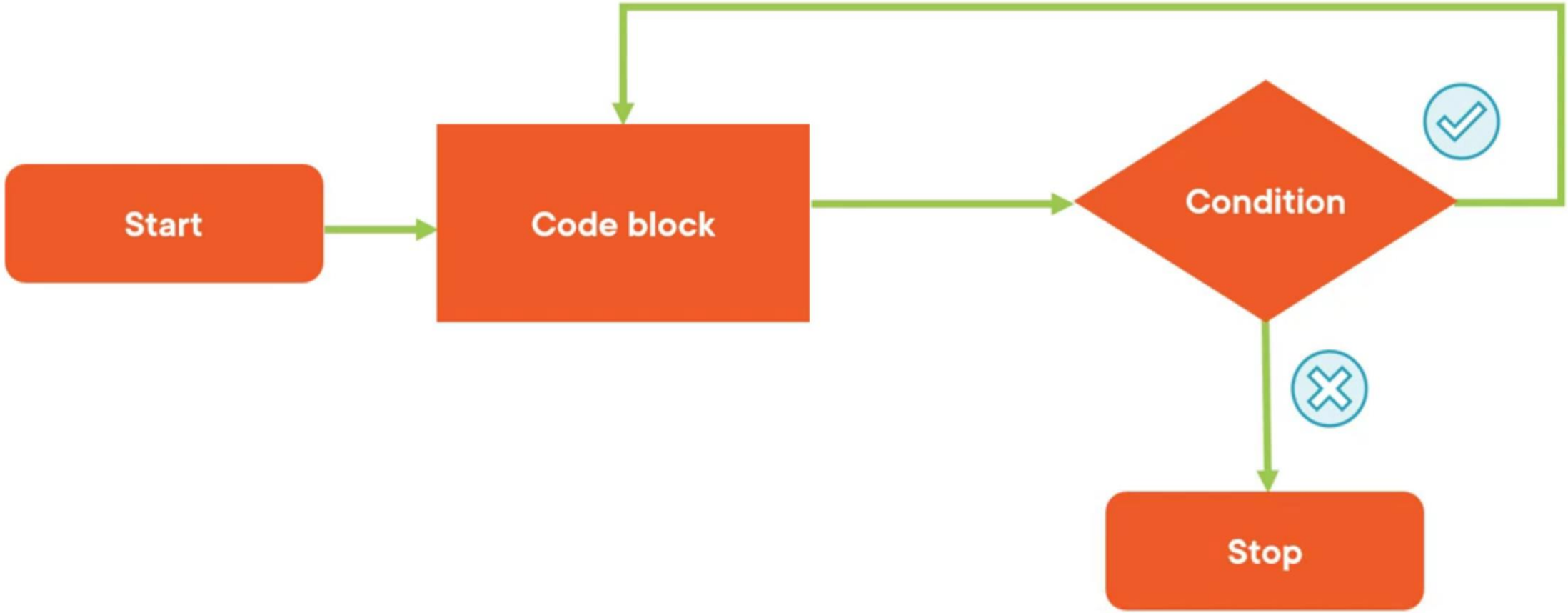
for Loop in Groovy



while Loop in Groovy



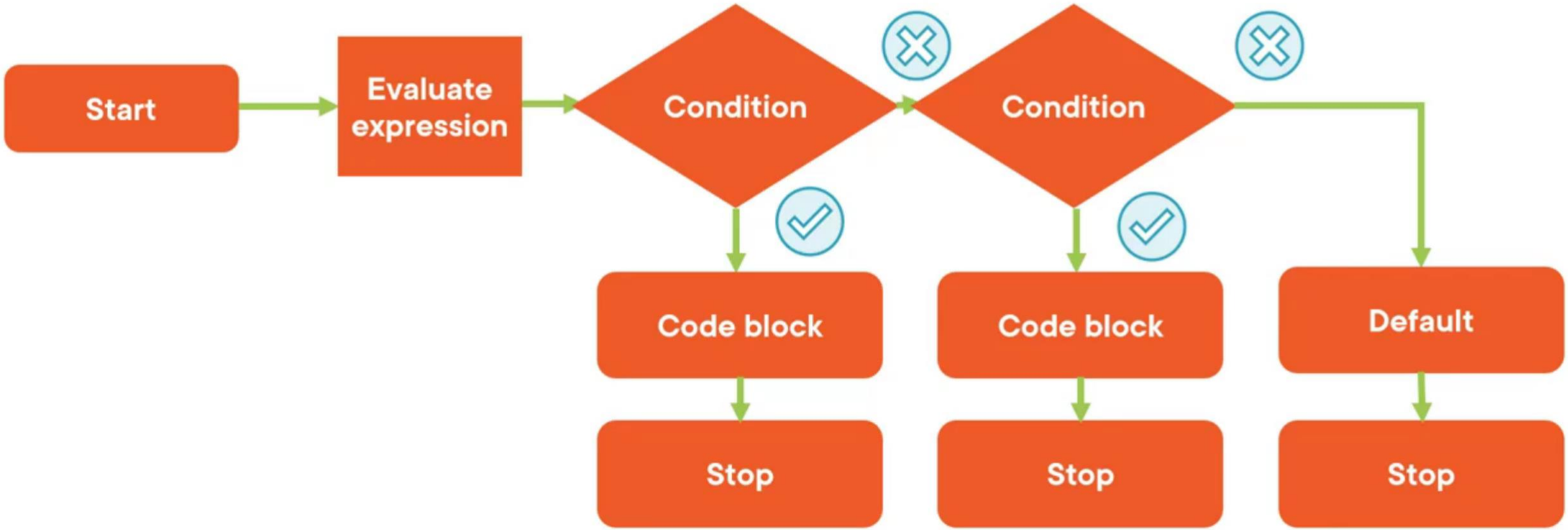
do/while Loop in Groovy



Switching Logic in Groovy

Reduce code clutter

Switch Statements in Groovy



Business Scenario

Prompt the user to enter a credit card type

Print a message for all valid card types

Print a warning message for any other string

Business Scenario

A new element has been added to the list

Skip the execution while processing this new element

Use Groovy “continue” statement

Business Scenario

A new element has been added to the list

Stop the execution while processing this new element

Use Groovy “break” statement

Iterating Using Groovy Built-in Methods

Exception Handling

Checked Exception

Groovy maintains a checklist of rules and validates against it during a program execution

A deviation from this rule is a checked exception

Checked at compile time

Runtime Exception

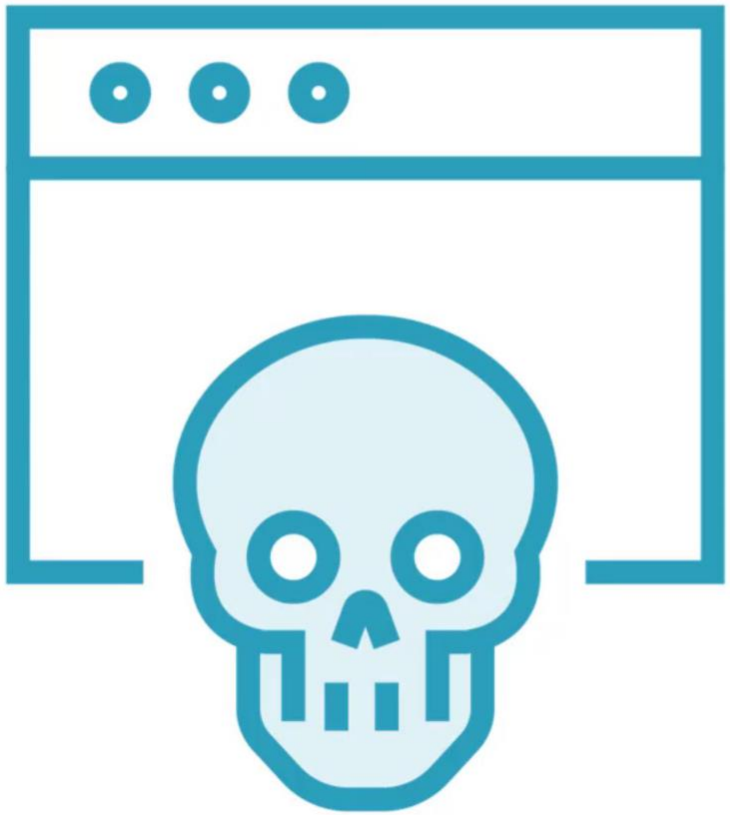
Not handled during compile time

- **NullpointerException**
- **ArrayIndexOutOfBoundsException**

Throwing an Exception

Program cautions against unforeseen circumstances

Error Handling

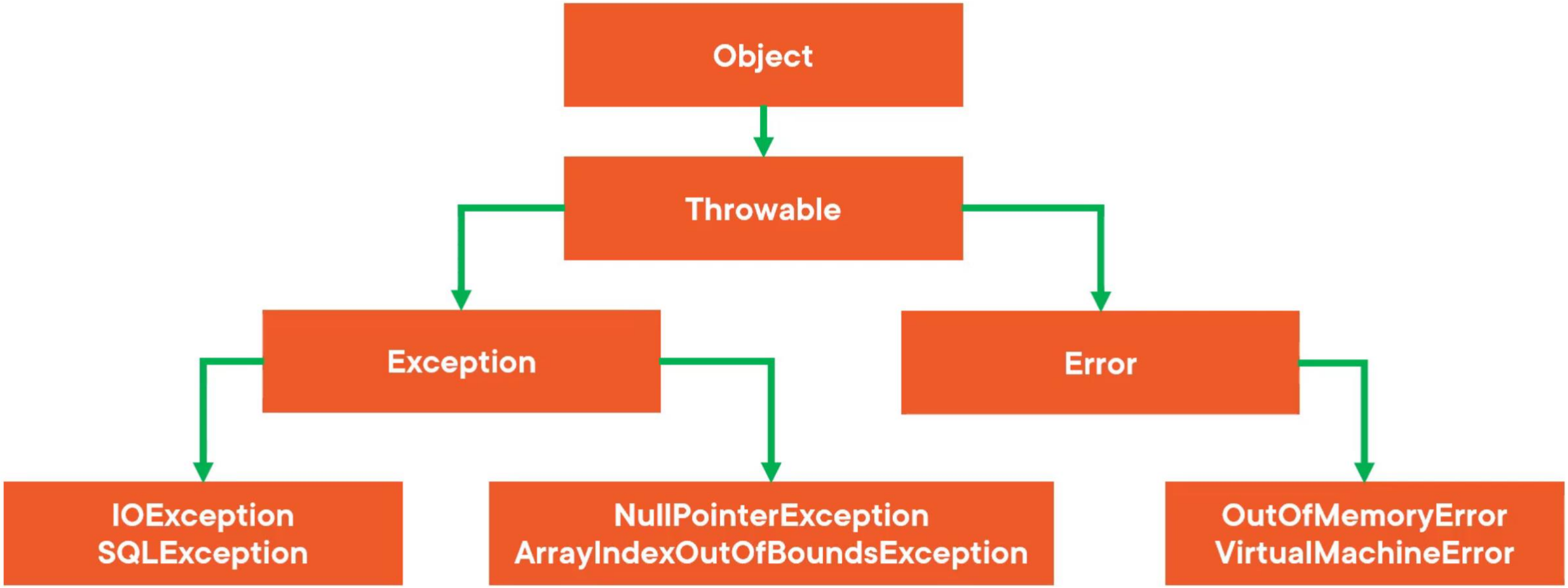


An exception is recoverable

An error is irrecoverable

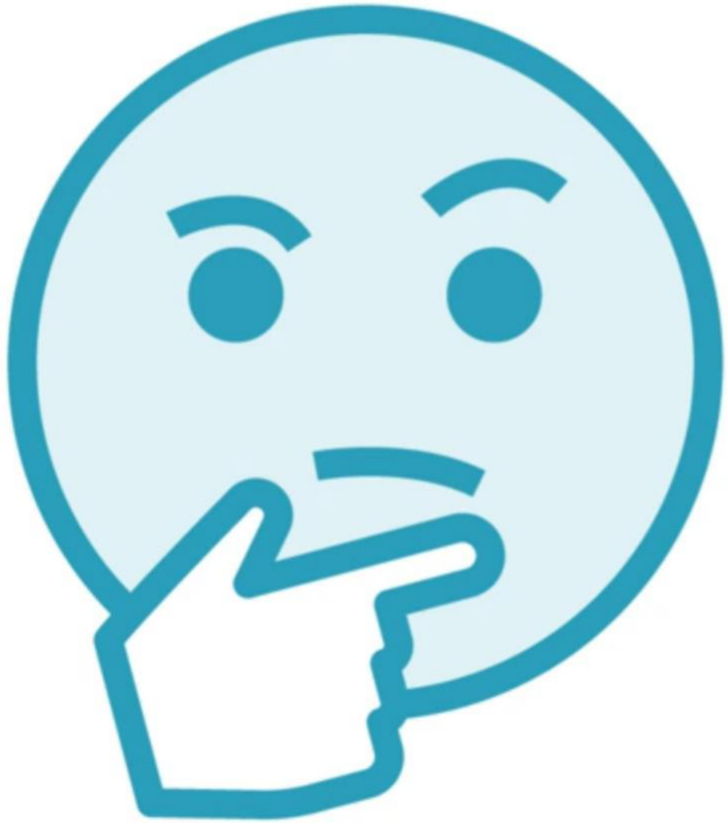
- **OutOfMemoryError**

Exception Hierarchy



Exception Handling Using try/catch Block

Exception Handling

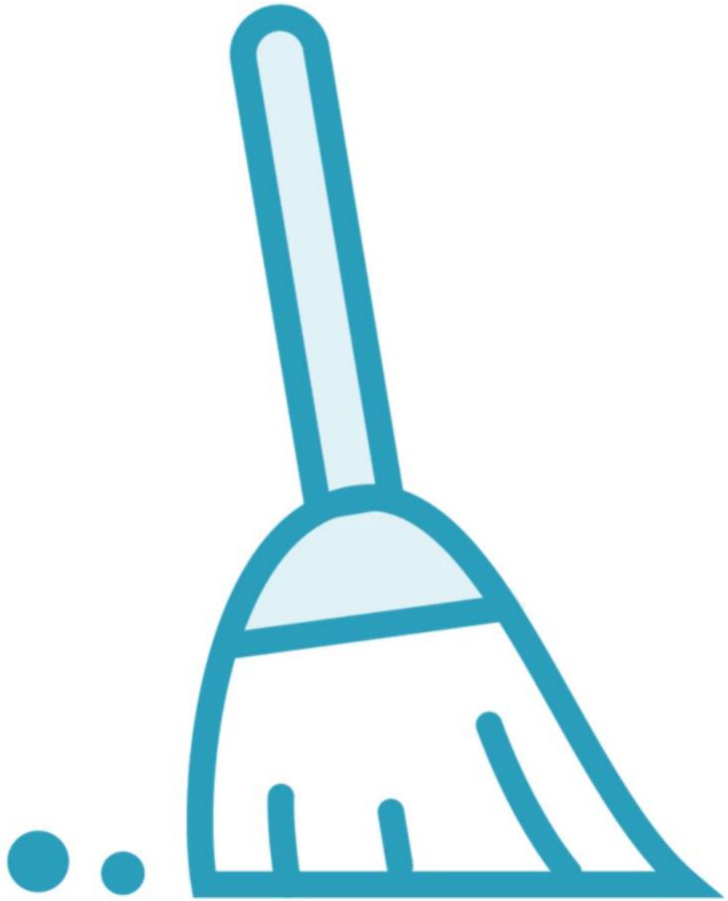


Impractical to add catch blocks for all potential exceptions

Use the parent Exception class in the catch block

Performing Cleanup after Execution

Code Cleanup



Closing file handles

Closing database connection

Unclosed resources adversely affect the performance

Throwing an Exception

Business Requirement

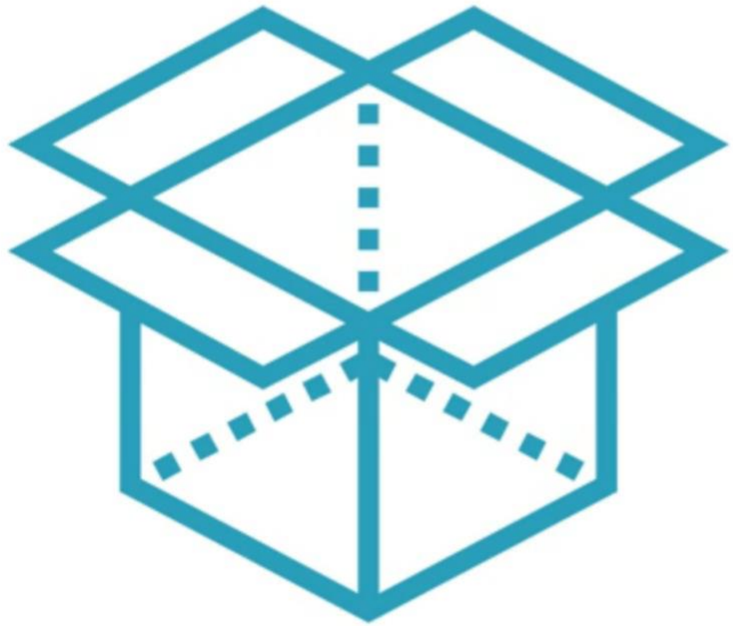
Process credit card containing 14 or more digits only

Throw an InvalidCardLengthException for cards containing fewer than 14 digits

Introducing Closures

A closure is an open, anonymous block of code that can take arguments, return a value, and be assigned to a variable. A closure may reference variables declared in its surrounding scope.

Closures



Can be treated as objects

Can be passed as method parameters

Helps write concise code

Used as an iterator, callbacks, higher-order functions, and builders

https://groovy-lang.org/closures.html

Passing Parameters and Returning Values in Closures

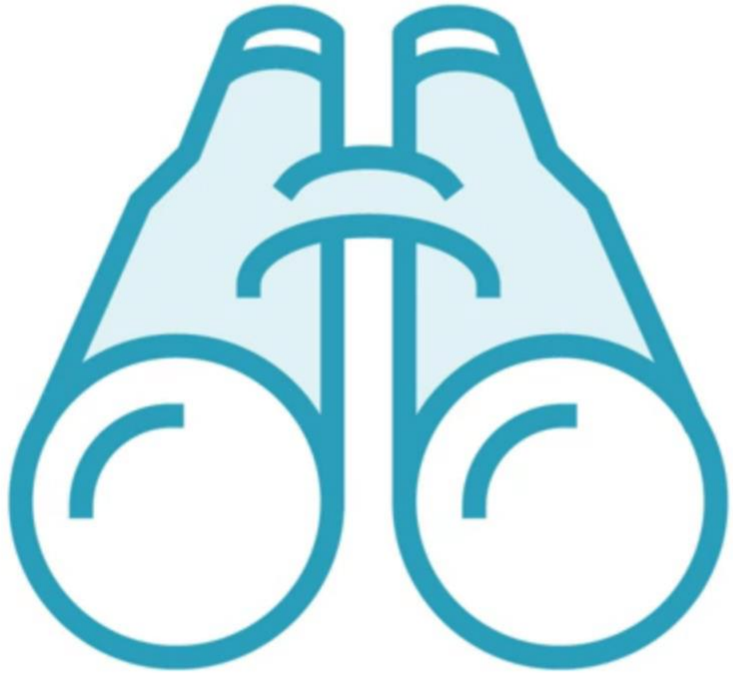
```
def sample_closure = { <params> -> <statements> }
```

Using Closures in Methods and Collections

A closure is an open, anonymous block of code that can take arguments, return a value, and be assigned to a variable. A closure may reference variables declared in its surrounding scope.

Using Closure Scope and Delegates

Closure Scope



Visibility of a closure

Three levels of scope

- **this**
  - **Corresponds to the enclosing class**
- **Owner**
  - **Corresponds to the enclosing object where it is defined**
- **Delegate**
  - **Corresponds to a third-party object where method calls are resolved**
  - **By default, the delegate is set to owner**

Summary

https://docs.groovy-lang.org/latest/html/documentation/core-syntax.html

Groovy datatypes

Groovy operators and operator precedence

Value proposition of dynamic typing and its implementation

Assertion

Differences between inclusive and exclusive Range

Differences between Groovy Array and List

Add, remove, and search elements in Groovy Map