Android Development Tutorial (Basics)

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Agenda

- Compiled vs Interpreted Languages (20 Minutes)
- Communications between Activities (15 Minutes)
- Activity Interoperability (20 minutes)

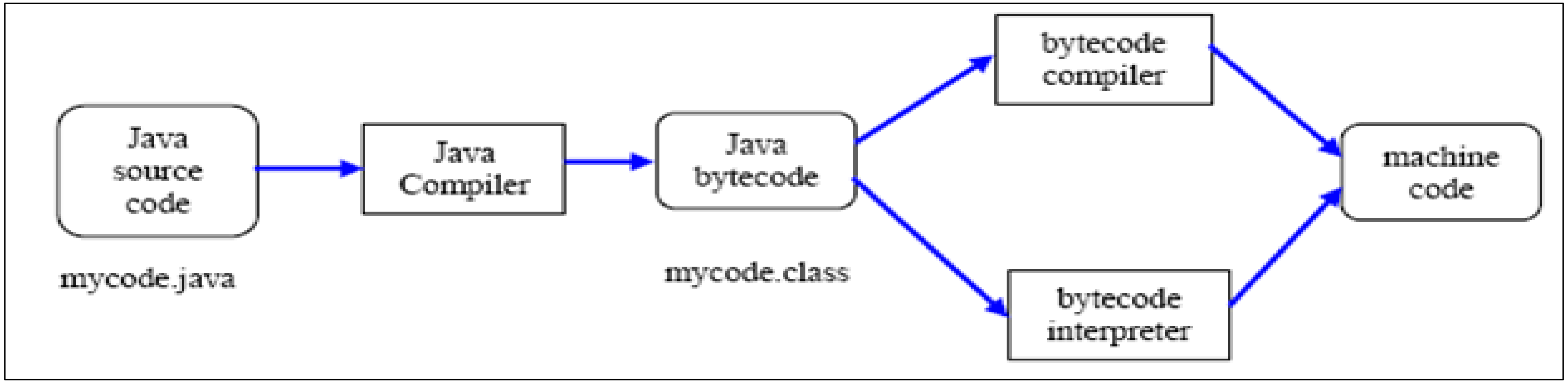
Disclaimer

I will be using Java and Python as the example since most of you are developing in Python.

However, in no way or manner am I indicating that either Python or Java is the superior language.

It all depends on needs and use case and what problems are you tackling.

Compiling Process



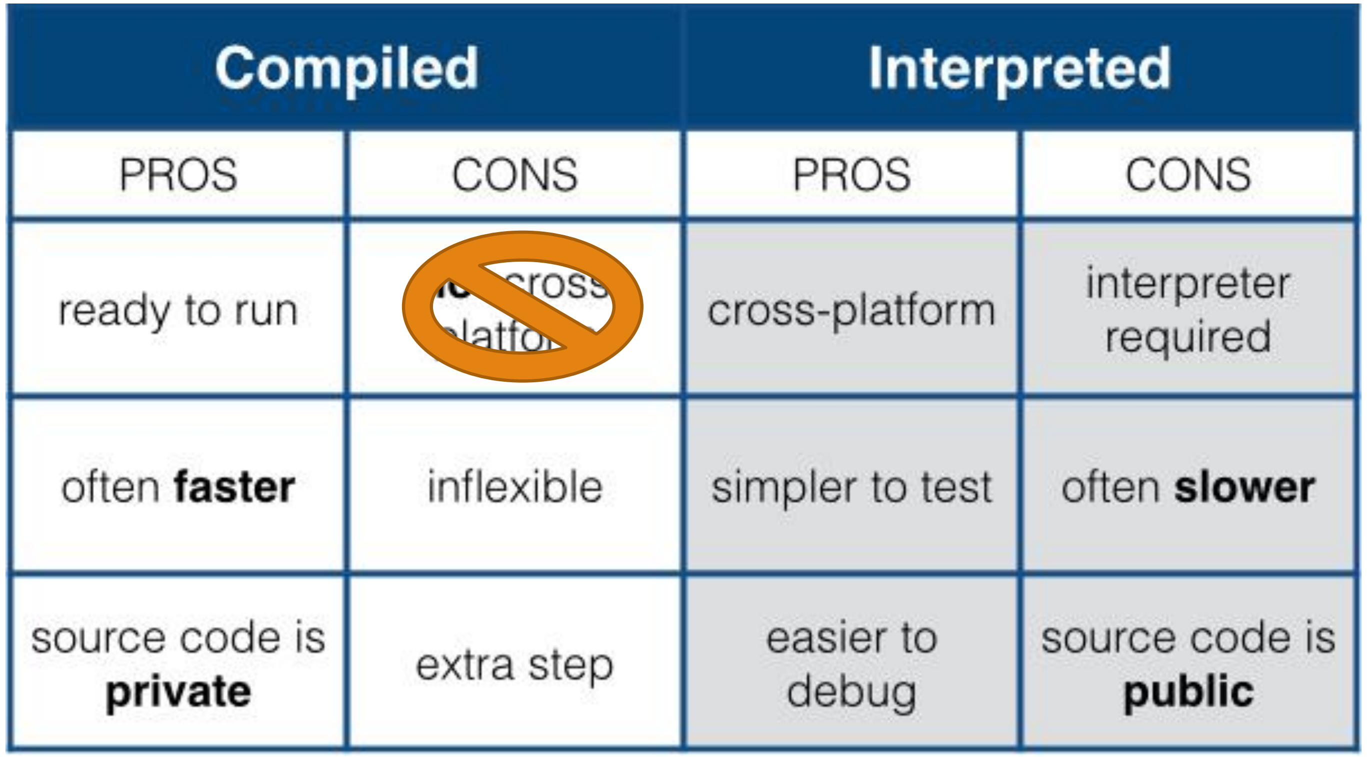
Compiled Languages : Source code (.java) to Byte code (.class) to Machine code

Interpreted Languages : Source code executed directly without compilation

Pros & Cons

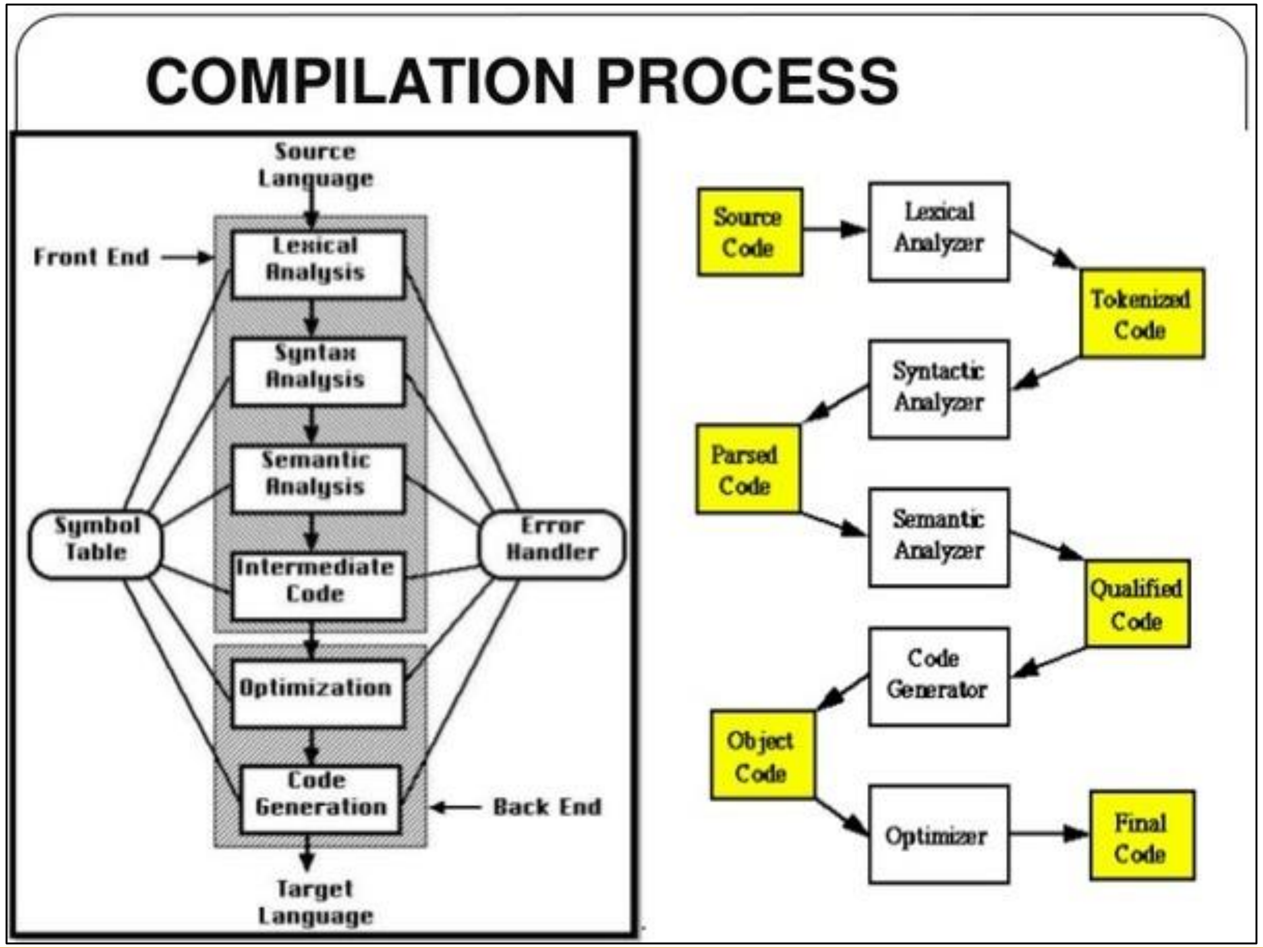
JVM (Java Virtual Machine)

Why Fast?

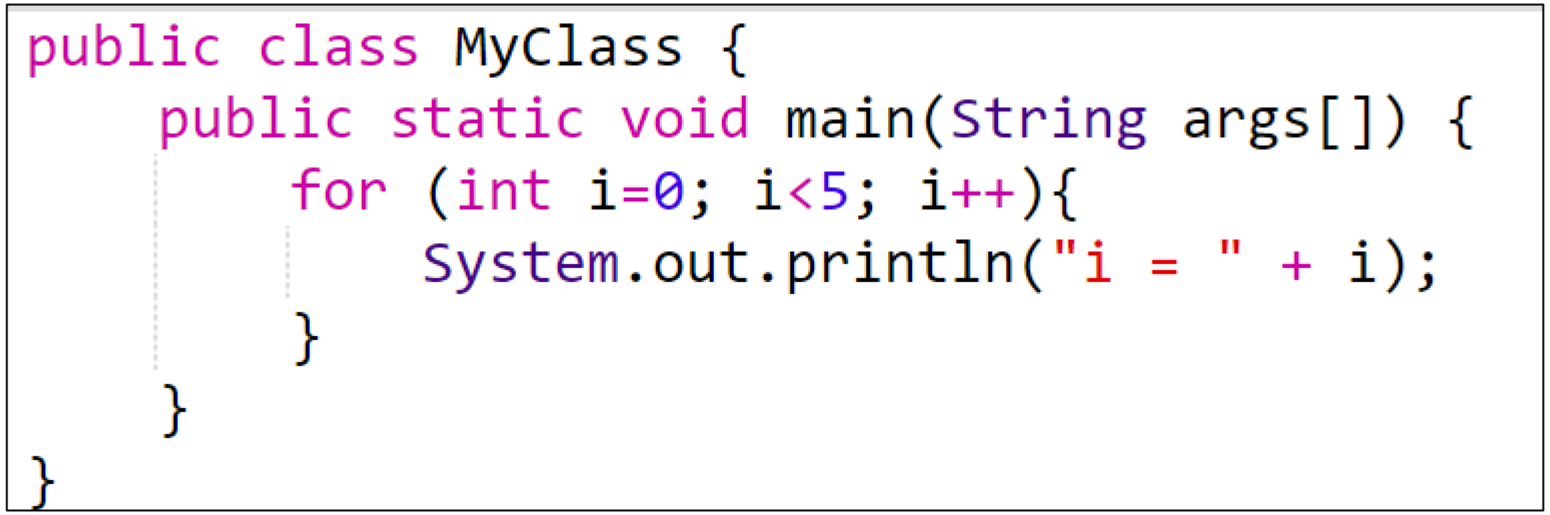


Compiled		Interpreted	
PROS	CONS	PROS	CONS
ready to run	~~not cross-platform~~	cross-platform	interpreter required
often **faster**	inflexible	simpler to test	often **slower**
source code is **private**	extra step	easier to debug	source code is **public**

Compilation Process



Compiler as Optimizer



```
public class MyClass {
    public static void main(String args[]) {
        for (int i=0; i<5; i++){
            System.out.println("i = " + i);
        }
    }
}
```

```
i = 0
i = 1
i = 2
i = 3
i = 4
```

Compiler as Optimizer

```
i = 0
Printing_Loop:
  condition = i >= 5
  if condition GOTO End
  sys.out "i = " + i
  i = i + 1
  GOTO Printing_Loop
End:
  return
```

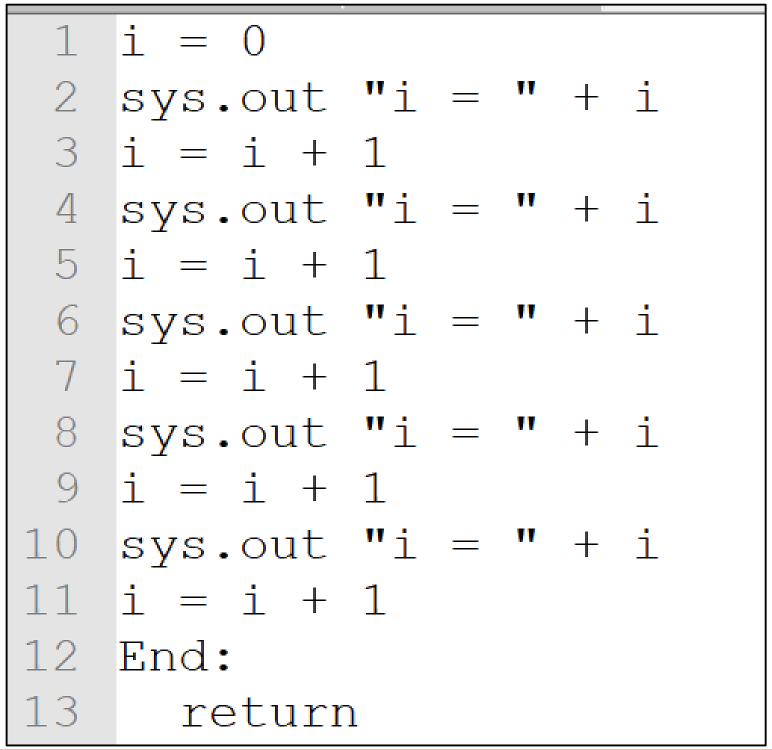
Some overheads:

- Same as recursion, jumping and goto will incur some overheads due to pointer arithmetic
- End of loop test after each iteration
- Reading Data from memory

Loop Unrolling (Basic Example)

Optimize a program's execution speed at the expense of its binary size (space-time tradeoff)

Programs actually spend a lot of time in loops



```
i = 0
sys.out "i = " + i
i = i + 1
sys.out "i = " + i
i = i + 1
sys.out "i = " + i
i = i + 1
sys.out "i = " + i
i = i + 1
sys.out "i = " + i
i = i + 1
End:
  return
```

```
i = 0
i = 1
i = 2
i = 3
i = 4
```

- Same output but visually more LOC
- No End of loop test after each iteration
- Imagine if i goes towards ("inf")!

More complicated optimizations

- Data-flow optimizations
  - Conduct data-flow analysis based on control edges in the control graph (graph theory)
- Constant folding and propagation
  - Replace constant “x = 3 + 8” with “x = 8” at compile time rather than doing the calculations in run-time
- Removal of recursion
  - Converting tail recurursion to iteration
- Many More different techniques :

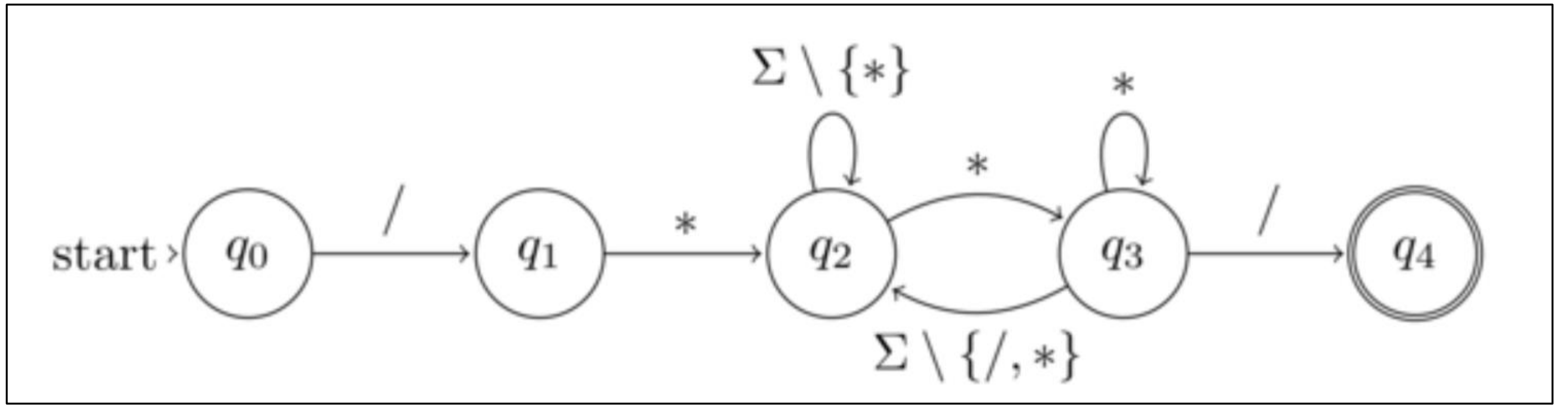
  https://en.wikipedia.org/wiki/Optimizing_compiler

Questions?

Question for you

Does using more comments leads to increase binary file size? **No**

DFA for comments in the scanning process



Continue to tokenize non-comment codes

Communications between Activities

- In this section, we will create a basic android application with 2 activities and learn how they can communicate using Intent

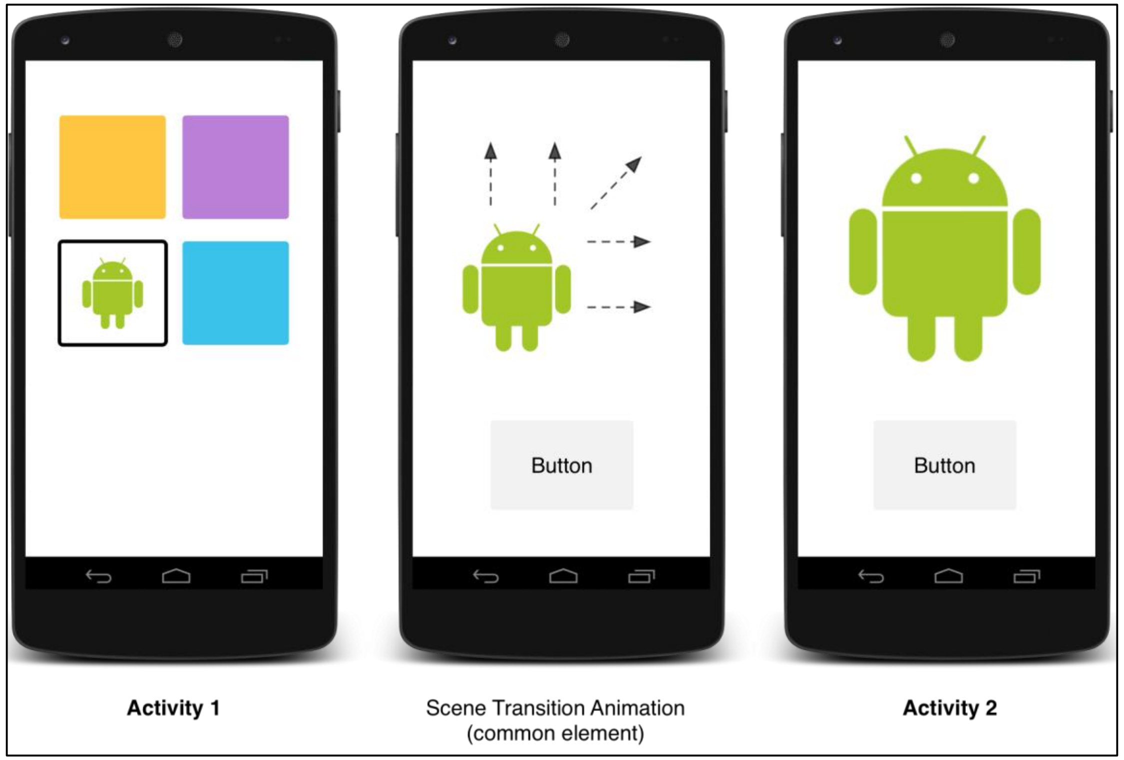
Communications between **Web Pages**

- Typically, data is not generated on your machine and most of the contents are generated by the back end server
- Communications between pages through params given in the URL or generated by server

http://127.0.0.1/?name=Jack

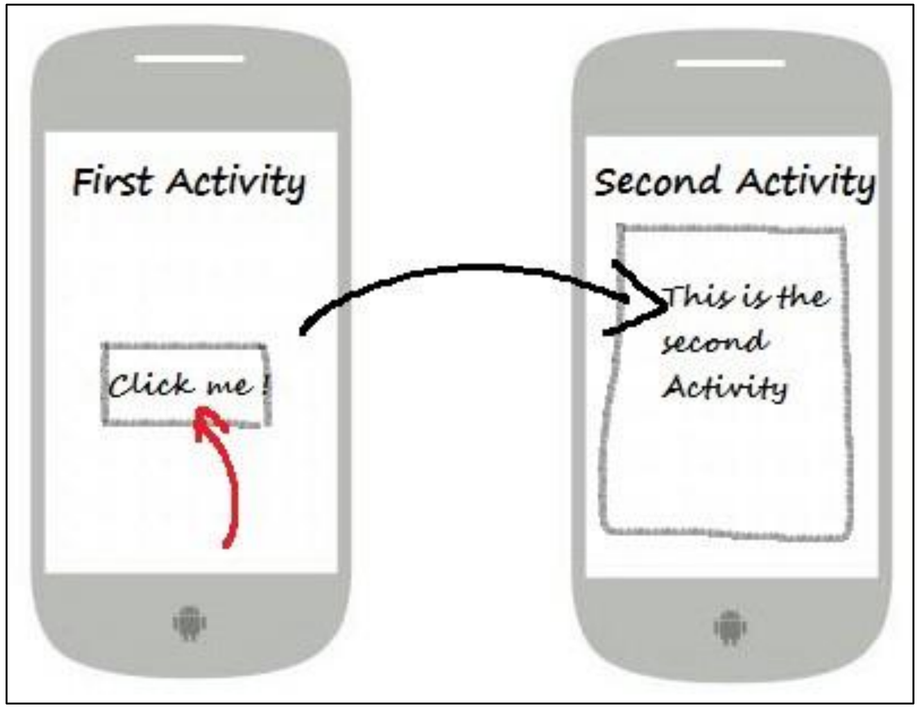
Activities

- Can see it as just a screen or User Interface.



Communications between Activities

- Achieved through Intents, a "data structure" that can be passed between activities or another application components



Communications between Activities

Live Coding – Simple communication between activities

- Create a simple GUI with a button and message box for user to type a message
- The message will be sent to the second activity(UI) to be displayed to the user

Activity Interoperability

- In this section, we will create a simple activity to perform simple interoperability actions such as pulling data from an API end point :

https://worldcup.sfg.io/teams/

Live Coding - Activity Interoperability

- We will first create a button to start the fetch from the end point
- Once the button is clicked, we will begin a async http get from the end point
  - Async calls should be used as networking calls should be on a separate thread from the UI thread to prevent the UI from freezing and app from crashing

References

- https://stackoverflow.com/questions/28209637/what-does-javac-exe-do-when-compile-a-java-file/28209778
- https://learntocodewith.me/programming/source-code/
- https://www.quora.com/What-is-role-of-compiler-during-execution-of-program
- https://cs.stackexchange.com/questions/396/a-dfa-for-recognizing-comments