Introduction to Kotlin

Feature comparison between J & K

@iChanSek

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SPAM !!!

About Me

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- meetup.com/BlrKotlin & blrkotlin.herokuapp.com

Kotlin - The selling point

Highlights of Kotlin

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- Statically typed language like Java

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- Billion Dollar mistake is no more as **Null** is in type system and treated specially

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- 100% interoperable with Java
- Believes in “Sharing is Caring” by supporting multi-platform

Highlights of Kotlin

- Statically typed language like Java
- Billion Dollar mistake is no more as **Null** is in type system and treated specially
- 100% interoperable with Java
- Believes in “Sharing is Caring” by supporting multi-platform
- Much more concise than Java

Why should you try Kotlin?

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Why should you try Kotlin?

- No need to refactor the whole project.
- Write Less - Maintain Less - Spend Less
- No NPE - Millions of Profit - More Team Budget *
- Lot of awesome features to write neat code.

Java vs Kotlin

final vs val

final vs val

```
class Test {
    private String tag = "Test";

    public void test() {
        Log.d(tag, "Testing...");
    }
}
```

final vs val

```java
class Test {
    private String tag = "Test";

    public void test() {
        Log.d(tag, "Testing...");
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```java
class Test {
    private var tag = "Test";

    fun test() {
        Log.d(tag, "Testing...");
    }
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- **final** is ignored in Java
- **var** is an evil keyword in Kotlin

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class Test {
    private var tag = "Test";

    fun test() {
        Log.d(tag, "Testing...");
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- **final** is ignored in Java
- **var** is an evil keyword in Kotlin
- Using **var** and not updating the value? You will be discouraged until you use **val**.

final vs val

```java
class Test {
    private String tag = "Test";

    public void test() {
        Log.d(tag, "Testing...");
    }
}
```

```kotlin
class Test {
    private val tag = "Test";

    fun test() {
        Log.d(tag, "Testing...");
    }
}
```

- **final** is ignored in Java
- **var** is an evil keyword in Kotlin
- Using **var** and not updating the value? You will be discouraged until you use **val**.

final vs open

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class Parent { }

class Child extends Parent { }
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- All classes are final by default.
- If you want to inherit, you have to plan and design the class accordingly.

final vs open

```
class Parent { }

class Child extends Parent { }
```

```
open class Parent

class Child extends Parent()
```

- All classes are final by default.
- If you want to inherit, you have to plan and design the class accordingly.
- **open** keyword does the thing for you.

private means private

private means private

```java
public class JavaEncapsulation {

    private class Animal { }

    private Animal animal;

    public Animal getAnimal() {
        return animal;
    }

    public void setAnima(Animal anima) {
        this.animal = anima;
    }
}
```

private means private

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```

```kotlin
class KtEncapsulation {

    private inner class Animal { }

    private var animal = Animal()

    fun getAnimal() = animal

    fun setAnimal(newAnimal: Animal) {
        animal = newAnimal
    }
}
```

private means private

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public class JavaEncapsulation {

    private class Animal { }

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        animal = newAnimal
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Animal type is private to this class

private means private

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public class JavaEncapsulation {

    private class Animal { }

    private Animal animal;

    public Animal getAnimal() {
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getAnimal() is public function

private means private

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Can not expose a private type Animal from public functions getAnimal() and setAnimal()

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Compiles fine as no violation of Encapsulation

concat vs template

concat vs template

```
public String toString() {
    return "User{" +
        "name='" + name + '\'' +
        ", email='" + email + '\'' +
        ", phone='" + phone + '\'' +
    '}';
}
```

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public String toString() {
    return "User{" +
        "name='" + name + '\'' +
        ", email='" + email + '\'' +
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    '}';
}
```

```fun
fun toString(): String {
    return "User(name='$name',
email='$email', phone='$phone')"
}
```

concat vs template

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public String toString() {
    return "User{" +
        "name='" + name + '\'' +
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- String Templating allows to write any expression within the String.

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- String Templating allows to write any expression within the String.
- A simple variable can be referred using **$** symbol as prefix.

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fun toString(): String {
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- String Templating allows to write any expression within the String.
- A simple variable can be referred using **$** symbol as prefix.
- A complex operation can also be done using **${operation}** syntax. For example - **${email.toUpperCase()}**

overloading vs default parameters

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```
int add(int a, int b) {
    return a + b;
}

int add(int a, int b, int c) {
    return a + b + c;
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public void testAdd() {
    add(10, 20);
    add(10, 20, 30);
}
```

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int add(int a, int b) {
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public void testAdd() {
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```

```fun
fun add(a: Int, b: Int, c: Int = 0) =
a + b + c

fun testAdd() {
    add(10, 20)
    add(10, 20, 30)
}
```

overloading vs default parameters

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- **a** and **b** are usual parameters.

overloading vs default parameters

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- **a** and **b** are usual parameters.
- **c** is having a default value as 0.
- When no value passed to **c**, 0 will be considered.

Type Cast vs Smart Cast

Type Cast vs Smart Cast

```java
public void print(Animal animal) {
    if (animal instanceof Dog) {
        Dog dog = (Dog) animal;
        S.out.println(dog.toDog());
    } else if (animal instanceof Cat) {
        Cat cat = (Cat) animal;
        S.out.println(cat.toCat());
    }
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```fun
fun print(animal: Animal) {
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- **is** more readable than **instanceof**

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- if - **animal** is already a **Dog**

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- if - **animal** is already a **Dog**
- else if - **animal** is already a **Cat**

POJO vs data class

POJO vs data class

```java
class User {
    private String name;
    private String email;
    private String phone;

    public String getName() { return name; }

    public void setName(String name) { this.name = name; }

    public String getEmail() { return email; }

    public void setEmail(String email) { this.email = email; }

    public String getPhone() { return phone; }

    public void setPhone(String phone) { this.phone = phone; }

    @Override
    public boolean equals(Object o) {
        if (this == o) return true;
        if (o == null || getClass() != o.getClass()) return false;
        User user = (User) o;
        return Objects.equals(name, user.name) &&
                Objects.equals(email, user.email) &&
                Objects.equals(phone, user.phone);
    }

    @Override
    public int hashCode() {
        return Objects.hash(name, email, phone);
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    @Override
    public String toString() {
        return "User{" +
```

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data class User(var name: String, var email: String, var phone: String)
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POJO vs data class

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- Just prefix with **data** keyword and your POJO is ready.

POJO vs data class

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- You get **getters**, **setters**, **equals()**, **hashCode()** and **toString()** for free.

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- A **copy()** also in addition to all.

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- **var** - both getters and setters

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    public void setName(String name) { this.name = name; }

    public String getEmail() { return email; }

    public void setEmail(String email) { this.email = email; }

    public String getPhone() { return phone; }

    public void setPhone(String phone) { this.phone = phone; }

    @Override
    public boolean equals(Object o) {
        if (this == o) return true;
        if (o == null || getClass() != o.getClass()) return false;
        User user = (User) o;
        return Objects.equals(name, user.name) &&
                Objects.equals(email, user.email) &&
                Objects.equals(phone, user.phone);
    }

    @Override
    public int hashCode() {
        return Objects.hash(name, email, phone);
    }

    @Override
    public String toString() {
        return "User{" +
```

```gradle
data class User(var name: String, val email: String, var phone: String)
```

- Just prefix with **data** keyword and your POJO is ready.
- You get **getters**, **setters**, **equals()**, **hashCode()** and **toString()** for free.
- A **copy()** also in addition to all.
- **var** - both getters and setters
- **val** - only getters

Features of Kotlin

Features that are not present in Java

Type System

Nullable Types

Nullable Types

- Kotlin’s solution to billion dollar mistake.

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  - non-nullable - Int, String, User
  - nullable - Int?, String?, User?

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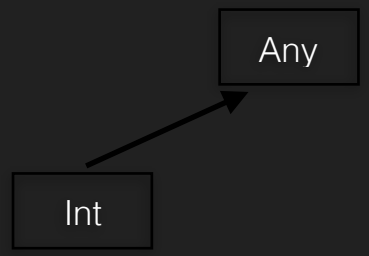
- Syntax:
  - non-nullable - Int, String, User
  - nullable - Int?, String?, User?
- **User?** is super class of **User** as it can hold null additionally.

Type Hierarchy

Type Hierarchy

Any

Type Hierarchy



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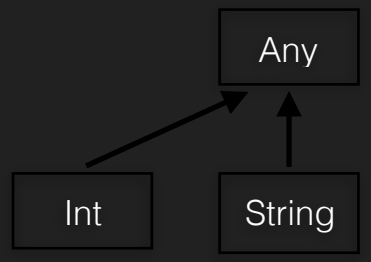

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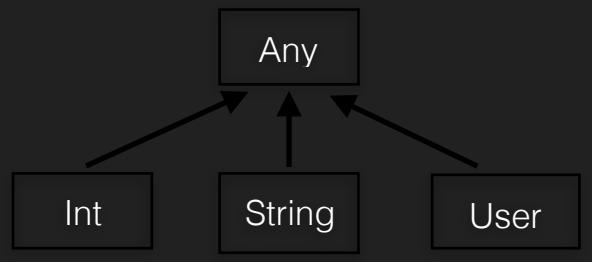

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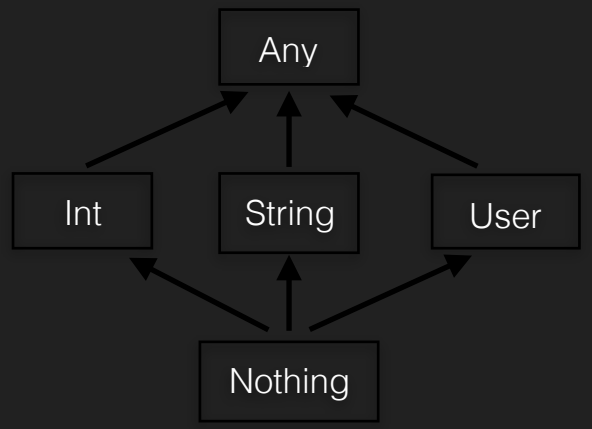
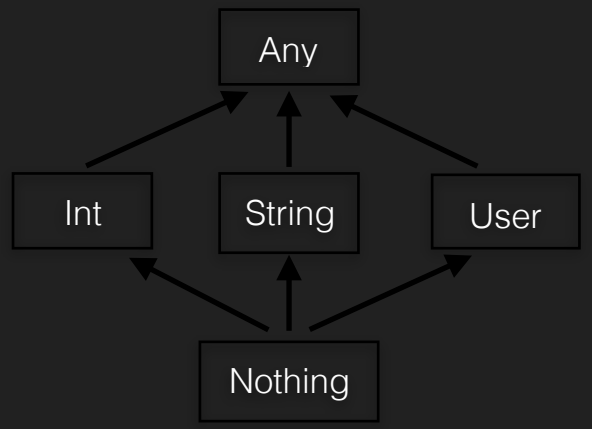
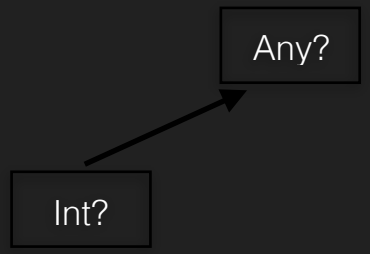


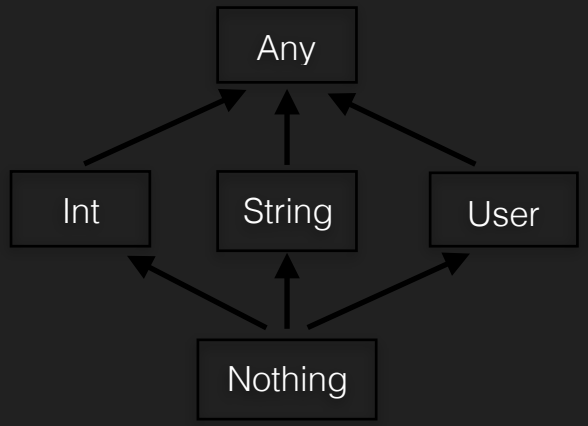
Type Hierarchy

Any?



Type Hierarchy





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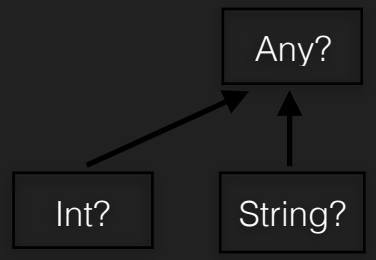

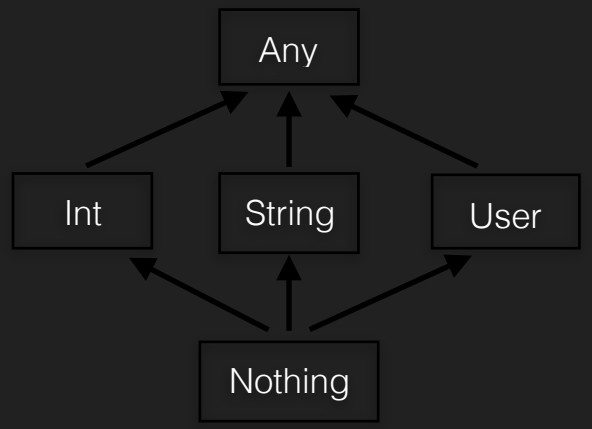

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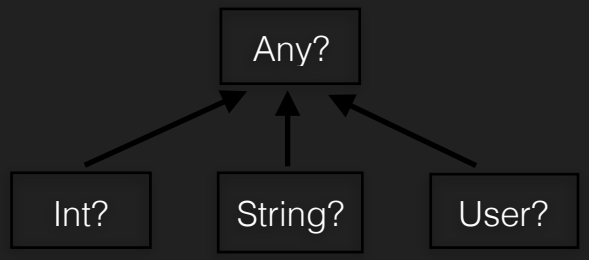

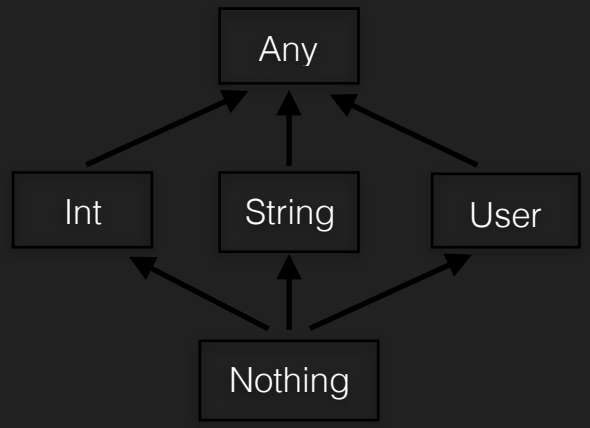

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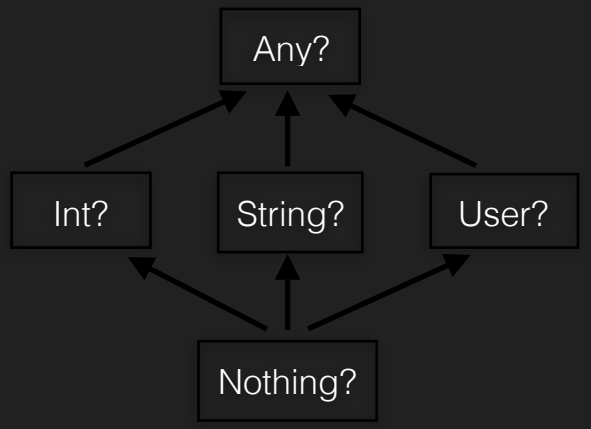

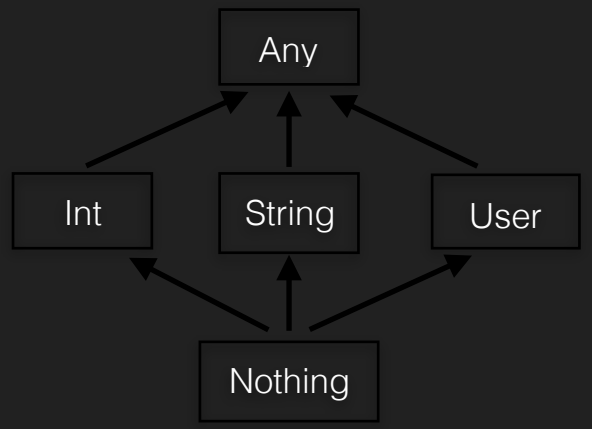

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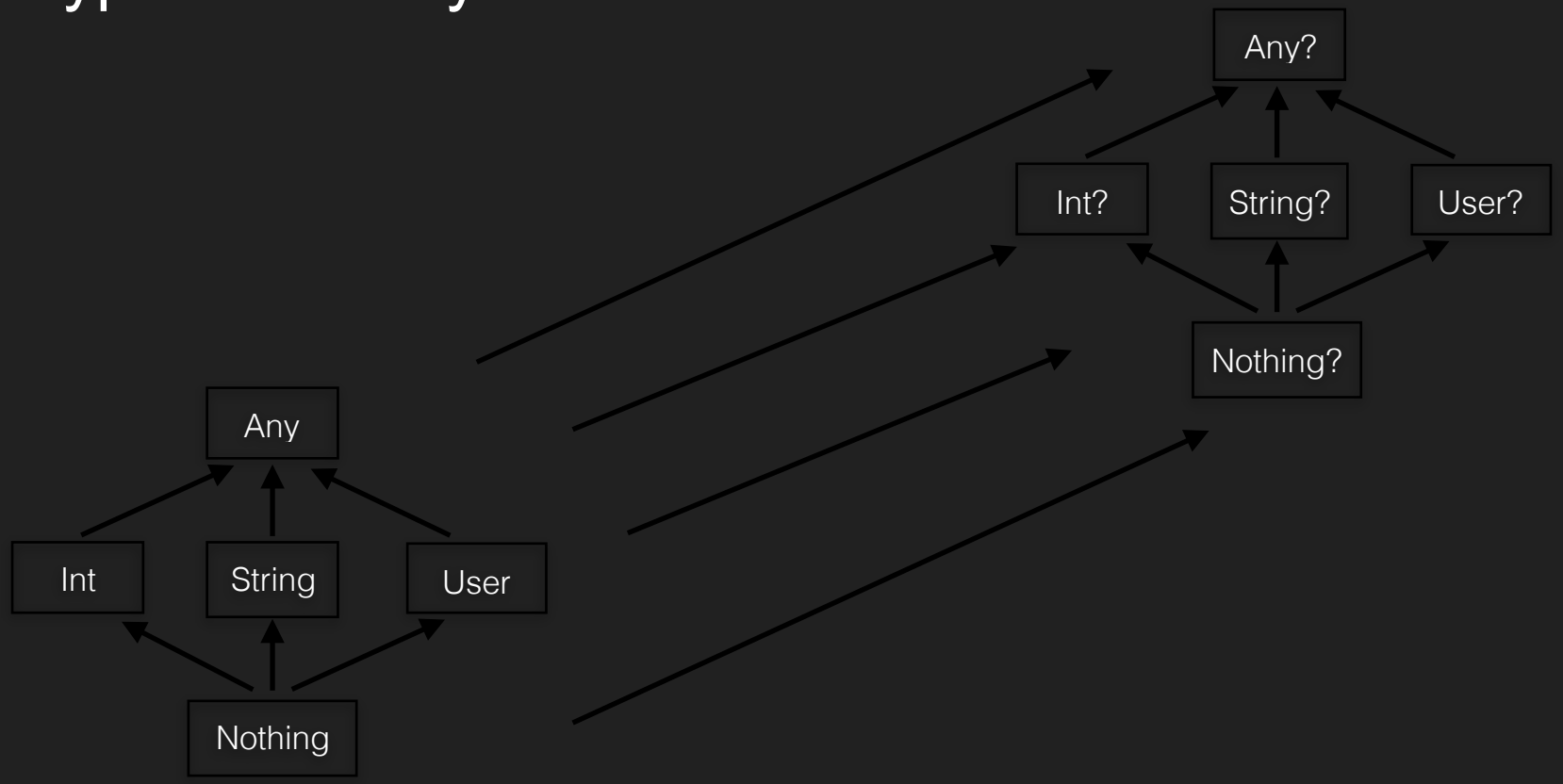

Examples - Nullable Types

Examples - Nullable Types

```
var nullableName: String = null
```

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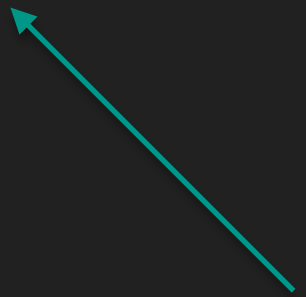

Compilation Error: Can't assign null to a nun-null String

Examples - Nullable Types

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var nullableName: String? = null
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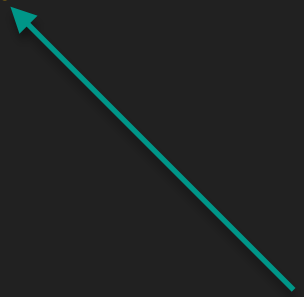

Compiles fine

Examples - Nullable Types

```
var nullableName: String = null

var nullableName: String? = null

var name: String = "BangaloreJUG"
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Type - Non Nullable

Examples - Nullable Types

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var nullableName: String = null

var nullableName: String? = null

var name: String = "BangaloreJUG"
```

Type - Non Nullable

Value should not be null

Examples - Nullable Types

```
var nullableName: String = null

var nullableName: String? = null

var name: String = "BangaloreJUG"

nullableName = name
```

Examples - Nullable Types

```
var nullableName: String = null

var nullableName: String? = null

var name: String = "BangaloreJUG"

nullableName = name
```

Compiles fine: String is sub-class of String?

Examples - Nullable Types

```
var nullableName: String = null

var nullableName: String? = null

var name: String = "BangaloreJUG"

nullableName = name

name = nullableName
```

Examples - Nullable Types

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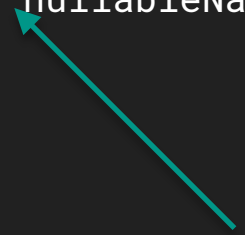

Compilation Error: You know why

Examples - Nullable Types

```
var nullableName: String = null

var nullableName: String? = null

var name: String = "BangaloreJUG"

nullableName = name

name = nullableName
```

Destructuring Declaration

Let’s return multiple values from a function

Let’s return multiple values from a function

```
data class User(var name: String,
                var email: String,
                var phone: String)
```

Let’s return multiple values from a function

```
data class User(var name: String,
                var email: String,
                var phone: String)



fun getUser() = User("BangaloreJUG",
            "bangalorejug@gmail.com",
            "0000000000")
```

Let’s return multiple values from a function

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data class User(var name: String,
                var email: String,
                var phone: String)
```

```
fun getUser() = User("BangaloreJUG",
            "bangalorejug@gmail.com",
            "0000000000")
```

```
val (name, email, phone) =
                User("Chandra Sekhar Nayak",
                        "chansek@live.com",
                        "8792629767")
println("Name is - $name")
println("Email is - $email")
println("Phone is - $phone")
```

Let’s return multiple values from a function

```
data class User(var name: String,
                var email: String,
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```
fun getUser() = User("BangaloreJUG",
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val (name, email, phone) =
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println("Name is - $name")
println("Email is - $email")
println("Phone is - $phone")
```

```
val (group, _, contact) = getUser()
println("Meetup Group name - $group")
println("Contact number - $contact")
```

Let’s return multiple values from a function

```
data class User(var name: String,
                var email: String,
                var phone: String)
```

```
fun getUser() = User("BangaloreJUG",
            "bangalorejug@gmail.com",
            "0000000000")
```

```
for ((key, value) in map) {
   // do something with key and value
}
```

```
val (name, email, phone) =
                User("Chandra Sekhar Nayak",
                        "chansek@live.com",
                        "8792629767")
println("Name is - $name")
println("Email is - $email")
println("Phone is - $phone")
```

```
val (group, _, contact) = getUser()
println("Meetup Group name - $group")
println("Contact number - $contact")
```

Ranges

The world of .. operator

The world of .. operator

```
if (i in 1..10) { // 1 <= i && i <= 10
    println(i)
}
```

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}
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```
for (i in 1..4) print(i) // "1234"
```

The world of .. operator

```
if (i in 1..10) { // 1 <= i && i <= 10
    println(i)
}
```

```
for (i in 1..4) print(i) // "1234"
```

```
for (i in 4..1) print(i) // No Output
for (i in 4 downTo 1)
    print(i)             // "4321"
```

The world of .. operator

```
if (i in 1..10) { // 1 <= i && i <= 10
    println(i)
}
```

```
for (i in 1..4 step 2) print(i) // "13"
```

```
for (i in 1..4) print(i) // "1234"
```

```
for (i in 4..1) print(i) // No Output
for (i in 4 downTo 1)
    print(i)             // "4321"
```

The world of .. operator

```
if (i in 1..10) { // 1 <= i && i <= 10
    println(i)
}
```

```
for (i in 1..4) print(i) // "1234"
```

```
for (i in 4..1) print(i) // No Output
for (i in 4 downTo 1)
    print(i)             // "4321"
```

```
for (i in 1..4 step 2) print(i) // "13"
```

```
for (i in 4 downTo 1 step 2)
    print(i)                    // "42"
```

The world of .. operator

```
if (i in 1..10) { // 1 <= i && i <= 10
    println(i)
}
```

```
for (i in 1..4) print(i) // "1234"
```

```
for (i in 4..1) print(i) // No Output
for (i in 4 downTo 1)
    print(i)             // "4321"
```

```
for (i in 1..4 step 2) print(i) // "13"
```

```
for (i in 4 downTo 1 step 2)
    print(i)                    // "42"
```

```
// i in [1, 10), 10 is excluded
for (i in 1 until 10) {
     println(i)
}
```

Operator Overloading

Unary Operations

Unary Operations

```
data class Point(val x: Int, val y: Int)
```

Unary Operations

```
data class Point(val x: Int, val y: Int)

operator fun Point.unaryMinus() = Point(-x, -y)
```

Unary Operations

```
data class Point(val x: Int, val y: Int)

operator fun Point.unaryMinus() = Point(-x, -y)

fun main(args: Array<String>) {
    val point = Point(10, 20)
    println(-point)  // prints "(-10, -20)"
}
```

Unary Operations

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data class Point(val x: Int, val y: Int)

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- 3 operators are supported.

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Unary Operations

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- 3 operators are supported.
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Unary Operations

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data class Point(val x: Int, val y: Int)

operator fun Point.unaryMinus() = Point(-x, -y)

fun main(args: Array<String>) {
    val point = Point(10, 20)
    println(-point)  // prints "(-10, -20)"
}
```

Expression	Function
+a	a.unaryPlus()
-a	a.unaryMinus()
!a	a.not()

- 3 operators are supported.
- Function names should not be changed.
- Like this there are some other functions for different operators.

Increment and Decrement Operations

Increment and Decrement Operations

Expression	Function
a++	a.inc()
a—	a.dec()

Increment and Decrement Operations

Expression	Function
a++	a.inc()
a—	a.dec()

Binary Operations

Expression	Function
a++	a.inc()
a—	a.dec()

Expression	Function
a + b	a.plus(b)
a - b	a.minus(b)
a * b	a.times(b)
a / b	a.div(b)
a % b	a.rem(b)
a..b	a.rangeTo(b)

Binary Operations

Expression	Function
a++	a.inc()
a—	a.dec()

Expression	Function
a + b	a.plus(b)
a - b	a.minus(b)
a * b	a.times(b)
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a..b	a.rangeTo(b)

‘in’ Operator

Expression	Function
a++	a.inc()
a—	a.dec()

Expression	Function
a + b	a.plus(b)
a - b	a.minus(b)
a * b	a.times(b)
a / b	a.div(b)
a % b	a.rem(b)
a..b	a.rangeTo(b)

Expression	Function
a in b	b.contains(a)
a !in b	!b.contains(a)

‘in’ Operator

Expression	Function
a++	a.inc()
a—	a.dec()

Expression	Function
a + b	a.plus(b)
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Expression	Function
a in b	b.contains(a)
a !in b	!b.contains(a)

Indexed Access Operator

Expression	Function
a++	a.inc()
a—	a.dec()

Expression	Function
a + b	a.plus(b)
a - b	a.minus(b)
a * b	a.times(b)
a / b	a.div(b)
a % b	a.rem(b)
a..b	a.rangeTo(b)

Expression	Function
a in b	b.contains(a)
a !in b	!b.contains(a)

Expression	Function
a[i]	a.get(i)
a[i, j]	a.get(i, j)
a[i1, i2, .., in]	a.get(i1, i2, .., in)
a[i] = b	a.set(i, b)
a[i, j] = b	a.set(i, j, b)
a[i1, i2, .., in] = b	a.set(i1, i2, .., in, b)

Indexed Access Operator

Expression	Function
a++	a.inc()
a—	a.dec()

Expression	Function
a + b	a.plus(b)
a - b	a.minus(b)
a * b	a.times(b)
a / b	a.div(b)
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a..b	a.rangeTo(b)

Expression	Function
a in b	b.contains(a)
a !in b	!b.contains(a)

Expression	Function
a[i]	a.get(i)
a[i, j]	a.get(i, j)
a[i1, i2, .., in]	a.get(i1, i2, .., in)
a[i] = b	a.set(i, b)
a[i, j] = b	a.set(i, j, b)
a[i1, i2, .., in] = b	a.set(i1, i2, .., in, b)

Invoke Operator

Expression	Function
a++	a.inc()
a—	a.dec()

Expression	Function
a + b	a.plus(b)
a - b	a.minus(b)
a * b	a.times(b)
a / b	a.div(b)
a % b	a.rem(b)
a..b	a.rangeTo(b)

Expression	Function
a in b	b.contains(a)
a !in b	!b.contains(a)

Expression	Function
a()	a.invoke()
a(i)	a.invoke(i)
a(i, j)	a.invoke(i, j)

Expression	Function
a[i]	a.get(i)
a[i, j]	a.get(i, j)
a[i1, i2, .., in]	a.get(i1, i2, .., in)
a[i] = b	a.set(i, b)
a[i, j] = b	a.set(i, j, b)
a[i1, i2, .., in] = b	a.set(i1, i2, .., in, b)

Invoke Operator

Expression	Function
a++	a.inc()
a—	a.dec()

Expression	Function
a + b	a.plus(b)
a - b	a.minus(b)
a * b	a.times(b)
a / b	a.div(b)
a % b	a.rem(b)
a..b	a.rangeTo(b)

Expression	Function
a in b	b.contains(a)
a !in b	!b.contains(a)

Expression	Function
a[i]	a.get(i)
a[i, j]	a.get(i, j)
a[i1, i2, .., in]	a.get(i1, i2, .., in)
a[i] = b	a.set(i, b)
a[i, j] = b	a.set(i, j, b)
a[i1, i2, .., in] = b	a.set(i1, i2, .., in, b)

Expression	Function
a()	a.invoke()
a(i)	a.invoke(i)
a(i, j)	a.invoke(i, j)

Extension Functions

Extending an existing class

Extending an existing class

- The most powerful feature of Kotlin

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- The most powerful feature of Kotlin
- No utility class is required

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- IDE can auto suggest

Extending an existing class

- The most powerful feature of Kotlin
- No utility class is required
- IDE can auto suggest
- Accidentally multiple utility function for same doesn’t get created

Let’s extend the functionality of a library class

Let’s extend the functionality of a library class

```
fun ArrayList<String>.swap(index1: Int, index2: Int) {
    val tmp = this[index1]
    this[index1] = this[index2]
    this[index2] = tmp
}
```

Let’s extend the functionality of a library class

```
fun ArrayList<String>.swap(index1: Int, index2: Int) {
    val tmp = this[index1]
    this[index1] = this[index2]
    this[index2] = tmp
}


fun main(args: Array<String>) {
    val list = arrayListOf("BangaloreJUG", "BlrKotlin", "BlrDroid")
    list.swap(0, 1)
    print(list)
}
```

Inline Functions

Inline Functions

```
var value = 0

fun operate(a: Int, func: () -> Unit) {
    value = a
    func()
}
```

Inline Functions

```
var value = 0

fun operate(a: Int, func: () -> Unit) {
    value = a
    func()
}
```

```
fun main(args: Array<String>) {
    assignAndOperate(2) {
        value *= 5
    }
    println(value)

    operate(2) {
        value *= 10
    }
    println(value)
}
```

Inline Functions

```
var value = 0

inline fun operate(a: Int, func: () -> Unit) {
    value = a
    func()
}
```

```
fun main(args: Array<String>) {
    assignAndOperate(2) {
        value *= 5
    }
    println(value)

    operate(2) {
        value *= 10
    }
    println(value)
}
```

Inline Functions

```
var value = 0

inline fun operate(a: Int, func: () -> Unit) {
    value = a
    func()
}
```

inline tells compiler to copy the function body to each calling place.

```
fun main(args: Array<String>) {
    assignAndOperate(2) {
        value *= 5
    }
    println(value)

    operate(2) {
        value *= 10
    }
    println(value)
}
```

Infix Functions

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```
class Couple(private val first: String, private val second: String)
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        "Rekha" loves "Amitabh"
)

val languages = mapOf(1 to "Java", 2 to "Kotlin", 3 to "Scala")
```

Java interoperability

Calling Java from Kotlin

Calling Java from Kotlin

```java
public class Student {
    private String name;
    private String rollNo;

    public String getName() { return name; }

    public void setName(String name) {
        this.name = name;
    }

    public String getRollNo() { return rollNo; }

    public void setRollNo(String rollNo) {
        this.rollNo = rollNo;
    }
}
```

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}
```

```kotlin
fun main(args: Array<String>) {
    val student = Student()
    student.name = "Rahim"
    student.rollNo = "R1"

    val name = student.name
    val rollNo = student.rollNo
}
```

Calling Java from Kotlin

```java
public class Student {
    private String name;
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    public String getName() { return name; }

    public void setName(String name) {
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}
```

```kotlin
fun main(args: Array<String>) {
    val student = Student()
    student.name = "Rahim"
    student.rollNo = "R1"

    val name = student.name
    val rollNo = student.rollNo
}
```

same as student.setName(“Rahim”)

Calling Java from Kotlin

```java
public class Student {
    private String name;
    private String rollNo;

    public String getName() { return name; }

    public void setName(String name) {
        this.name = name;
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    val name = student.name
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}
```

same as student.getRollNo()

Calling Kotlin from Java

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```kotlin
class Meetup {
    var name: String = ""
    var location: String = ""
}
```

Calling Kotlin from Java

```kotlin
class Meetup {
    var name: String = ""
    var location: String = ""
}
```

```java
public class Main {
    public static void main(String... args) {
        Meetup meetup = new Meetup();
        meetup.setName("BangaloreJUG");
        meetup.setLocation("Oracle");

        System.out.println(meetup.getName());
        System.out.println(meetup.getLocation());
    }
}
```

Calling Kotlin from Java

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}
```

same as meetup.name = “Rahim”

Calling Kotlin from Java

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        System.out.println(meetup.getLocation());
    }
}
```

same as meetup.location

Coroutines

A small example

A small example

```
fun main(args: Array<String>) {
    launch {
        delay(1000L)
        println("World!")
    }
    println("Hello,")
    Thread.sleep(2000L)
}
```

A small example

```
fun main(args: Array<String>) {
    launch {
        delay(1000L)
        println("World!")
    }
    println("Hello,")
    Thread.sleep(2000L)
}
```

launch new coroutine in background and continue

A small example

```
fun main(args: Array<String>) {
    launch {
        delay(1000L)
        println("World!")
    }
    println("Hello,")
    Thread.sleep(2000L)
}
```

non-blocking delay for 1 second (default time unit is ms)

A small example

```
fun main(args: Array<String>) {
    launch {
        delay(1000L)
        println("World!")
    }
    println("Hello,")
    Thread.sleep(2000L)
}
```

print after delay

A small example

```
fun main(args: Array<String>) {
    launch {
        delay(1000L)
        println("World!")
    }
    println("Hello,")
    Thread.sleep(2000L)
}
```

main thread continues while coroutine is delayed

Thank You

Join BlrKotlin for continuing your journey in Kotlin

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