

# Asynchronous programming with Kotlin coroutines



Konrad Kamiński  
[Allegro.pl](https://allegro.pl)

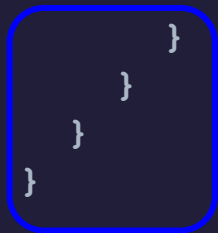


```
fun sendAuditMessage(userId: String) {  
    val accountId = getUserAccountId(userId)  
    val productCount = getProductCount(accountId)  
    sendMessage("User $userId has got $productCount products")  
}
```

```
fun getUserAccountId(userId: String): String  
fun getProductCount(accountId: String): Int  
fun sendMessage(message: String): Unit
```



```
fun sendAuditMessage(userId: String, callback: () -> Unit) {  
    getUserAccountId(userId) { accountId ->  
        getProductCount(accountId) { productCount ->  
            sendMessage("User $userId has got $productCount products") {  
                callback.invoke()  
            }  
        }  
    }  
}
```



← Callback hell

```
fun getUserAccountId(userId: String, callback: (String) -> Unit): Unit  
fun getProductCount(accountId: String, callback: (Int) -> Unit): Unit  
fun sendMessage(message: String, callback: () -> Unit): Unit
```



```
fun sendAuditMessage(userId: String) =  
    getUserAccountId(userId)  
        .thenCompose { accountId ->  
            getProductCount(accountId)  
        }  
        .thenAccept { productCount ->  
            sendMessage("User $userId has got $productCount products")  
        }
```

Combinators

```
fun getUserAccountId(userId: String): CompletableFuture<String>  
fun getProductCount(accountId: String): CompletableFuture<Int>  
fun sendMessage(message: String)
```



```
suspend fun sendAuditMessage(userId: String) {  
    val accountId = getUserAccountId(userId)  
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}
```

```
suspend fun getUserAccountId(userId: String): String  
suspend fun getProductCount(accountId: String): Int  
suspend fun sendMessage(message: String): Unit
```



```
suspend fun sendAuditMessage(userId: String): Unit

fun sendAuditMessage(userId: String, callback: Continuation<Unit>): Any?

interface Continuation<in T> {
    val context: CoroutineContext
    fun resumeWith(result: Result<T>)
}

val COROUTINE_SUSPENDED: Any = Any()
```



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1   val productCount = getProductCount(accountId)  
2   sendMessage("User $userId has got $productCount products")  
3}
```

```
class StateMachine(val userId: String,  
    val sendAuditMessageCallback: Continuation<Unit>): Continuation<Any?>{  
    var label: Int = 0  
    var accountId: String? = null  
    var productCount: Int? = null}
```

```
when (sm.label) {  
    0 -> { sm.label = 1; getUserAccountId(userId, sm) }  
    1 -> { sm.label = 2; sm.accountId = value as String;  
        getProductCount(sm.accountId!!, sm) }  
    2 -> { sm.label = 3; sm.productCount = value as Int;  
        sendMessage("User ${sm.userId} has got ...", sm) }  
    3 -> { sm.sendAuditMessageCallback.resumeWith(Result.success(Unit)) }
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    3 -> { sm.sendAuditMessageCallback.resumeWith(Result.success(Unit)) }
```



```
suspend fun myfun(param: Int): String =  
    suspendCoroutine { callback: Continuation<String> ->  
        // usually we'll invoke callback methods in a different thread  
        // if we want to return a value  
        callback.resumeWith(  
            Result.success("Result of myfun with $param"))  
  
        // if we want to throw an exception  
        callback.resumeWith(  
            Result.failure(Exception("Something went wrong")))  
    }  
  
suspend fun <T> suspendCoroutine(block: (Continuation<T>) -> Unit): T
```



```
launch {  
    //suspending functions can be invoked here  
}  
  
fun CoroutineScope.launch(block: suspend CoroutineScope.() -> Unit): Job  
  
interface Job {  
    fun cancel(cause: Throwable? = null): Boolean  
}  
  
interface CoroutineScope {  
    val isActive: Boolean  
    val coroutineContext: CoroutineContext  
}
```



```
runBlocking {  
    //suspending functions can be invoked here  
}
```

```
fun <T> runBlocking(block: suspend CoroutineScope.() -> T): T
```





```
val result = async {  
    //suspending functions can be invoked here  
}  
  
fun <T> CoroutineScope.async(block: suspend CoroutineScope.() -> T):  
    Deferred<T>  
  
interface Deferred<out T>: Job {  
    suspend fun await(): T  
}
```



```
val completableFuture: CompletableFuture<T> = future {  
    //suspending functions can be invoked here  
}
```

```
suspend fun <T> CompletionStage.await (): <T>
```

```
val single: Single<T> = rxSingle {  
    //suspending functions can be invoked here  
}
```

```
suspend fun <T> SingleSource.await (): <T>
```



# Things not covered

- `CoroutineContext`, `launch(UI) {...}`,
- `Mutex` (`lock/unlock`),
- `Channels/Actors` (`send/receive`),
- Interoperability with `Reactor`, `Guava`, ...
- and many more...



# Where to find more information

`github.com/Kotlin/kotlinx.coroutines`

`kotlinlang.org/docs/reference/coroutines.html`

Roman Elizarov talks



# Thank you



Konrad Kamiński  
[Allegro.pl](https://allegro.pl)

`github.com/konrad-kaminski/spring-kotlin-coroutine`

