Lecture #14

Asynchronous effects

What is a Pure Function???(Repetition of past material)

It is a function that meets the following set of criteria:

1. The function's output depends only on its input variables.

2. It doesn't mutate any hidden state

3. It doesn't have any "back doors": It doesn't read data from the outside world (including the console, web services, databases, files, etc.), or write data to the outside world.

Side Effect

We learned what a side effect is, but:

1. What do we do now?
2. How do we get rid of it?
3. Why is this happening to the best of us?

IO

A data type for encoding side effects as pure values, capable of expressing both synchronous and asynchronous computations.

IO can describe synchronous or asynchronous computations that:

1. on evaluation yield exactly one result
2. can end in either success or failure and in case of failure flatMap chains get short-circuited (IO implementing the algebra of MonadError)
3. can be canceled, but note this capability relies on the user to provide cancellation logic

IO effects

1. Pure Values — IO.pure & IO.unit

   You can lift pure values into IO, yielding IO values that are “already evaluated”

2. Synchronous Effects — IO.apply

   It’s probably the most used builder and the equivalent of Sync[IO].delay, describing IO operations that can be evaluated immediately, on the current thread and call-stack

3. Asynchronous Effects — IO.async & IO.cancelable

   IO can describe asynchronous processes via the IO.async and IO.cancelable builders.

ContextShift

ContextShift is the pure equivalent to:

- Scala’s ExecutionContext
- Java’s Executor
- JavaScript’s setTimeout(0) or setImmediate

Fiber

It represents the (pure) result of an Async data type (e.g. IO) being started concurrently and that can be either joined or canceled.

You can think of fibers as being lightweight threads, a fiber being a concurrency primitive for doing cooperative multi-tasking.

Additional resources

1. https://fp-tower.github.io/foundation/2-SideEffect.html#21
2. https://typelevel.org/cats-effect/datatypes/contextshift.html