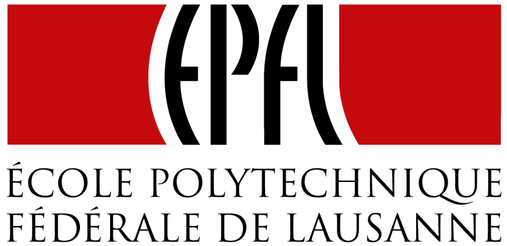


Promises, promises, promises

Principles of Reactive Programming

Erik Meijer

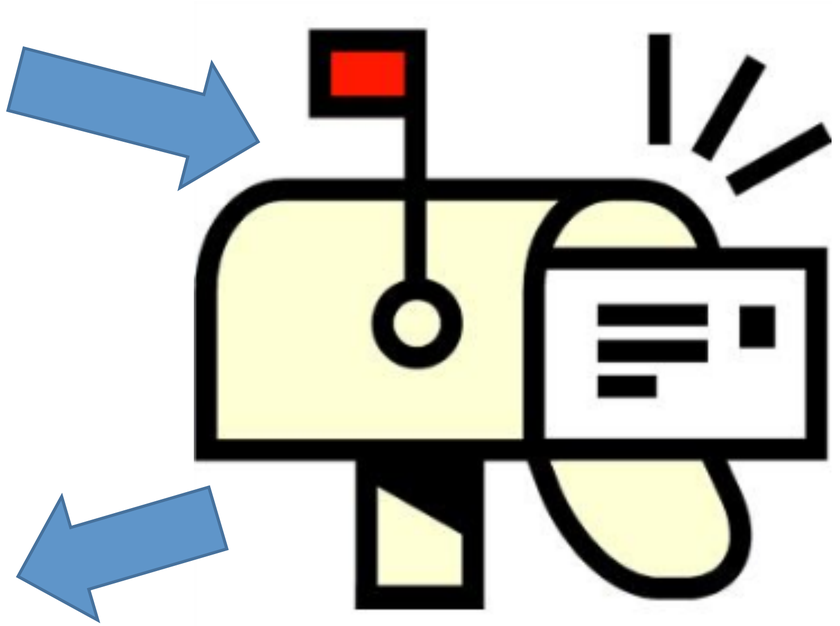
Reimplementing filter without await

```
def filter(pred: T ⇒ Boolean): Future[T] = {
  val p = Promise[T]()

  this onComplete {
    case Failure(e) ⇒
      p.failure(e)
    case Success(x) ⇒
      if (!pred(x)) p.failure(new NoSuchElementException)
      else p.success(x)
  }

  p.future
}
```

Promises

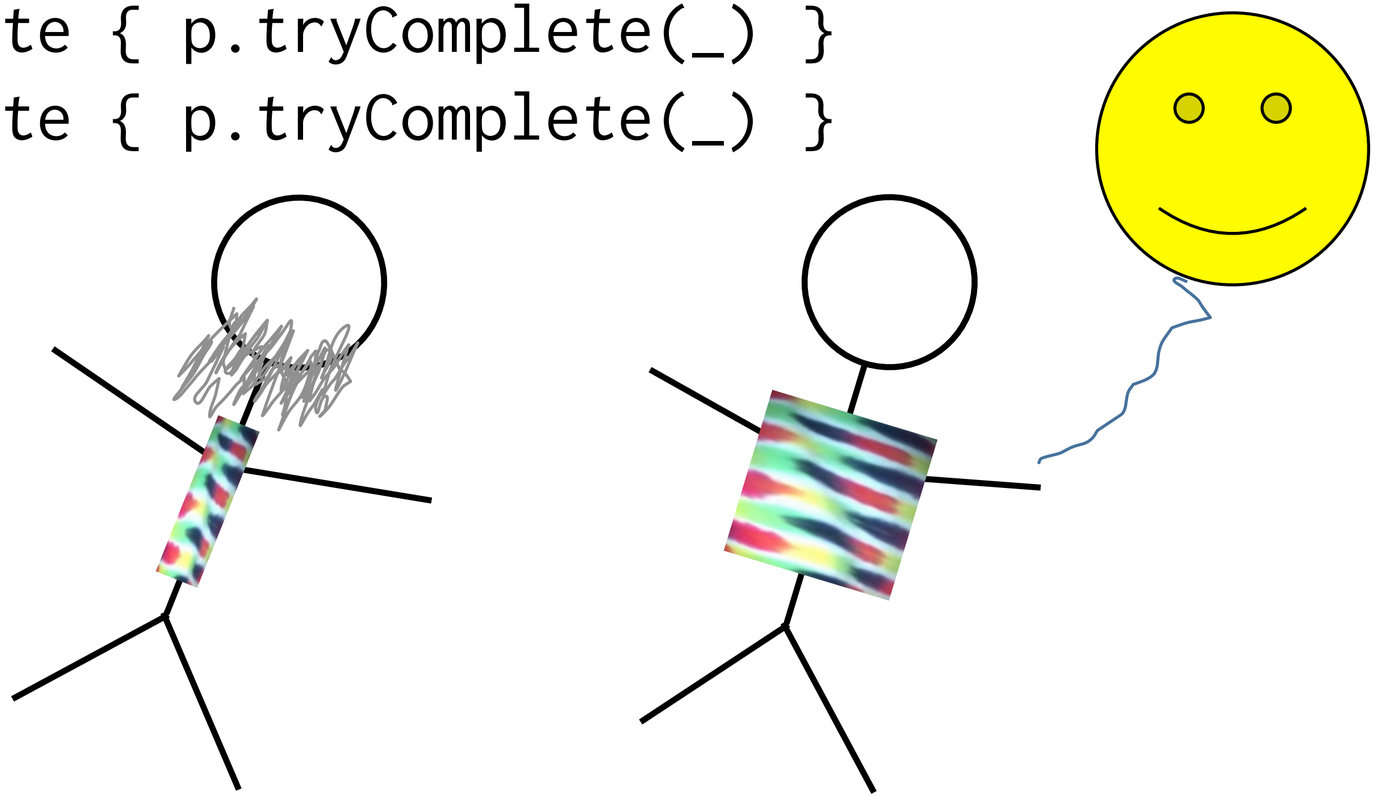
```
trait Promise[T] {
  def future: Future[T]
  def complete(result: Try[T]): Unit
  def tryComplete(result: Try[T]): Boolean
}
```

```
trait Future[T] {
  def onCompleted(f: Try[T] => Unit): Unit
}
```



Racing

```
import scala.concurrent.ExecutionContext.Implicits.global

def race[T](left: Future[T], right: Future[T]): Future[T] = {
  val p = Promise[T]()
  left  onComplete { p.tryComplete(_) }
  right onComplete { p.tryComplete(_) }
  p.future
}
```



Simple helper methods

```
def success(value: T): Unit = this.complete(Success(value))

def failure(t: Throwable): Unit = this.complete(Failure(t))
```

Reimplementing filter on Future[T]

```
def filter(pred: T ⇒ Boolean): Future[T] = {
  val p = Promise[T]()

  this onComplete {
    case Failure(e) ⇒
      p.failure(e)
    case Success(x) ⇒
      if (!pred(x)) p.failure(new NoSuchElementException())
      else p.success(x)
  }

  p.future
}
```

Reimplementing zip using Promises

```
def zip[S, R](that: Future[S], f: (T, S) => R): Future[R] = {
  val p = Promise[R]()

  this onComplete {
    case Failure(e) ⇒ p.failure(e)
    case Success(x) ⇒ that onComplete {
      case Failure(e) ⇒ p.failure(e)
      case Success(y) ⇒ p.success(f(x, y))
    }
  }

  p.future
}
```

Reimplementing zip with await

```
def zip[S, R](p: Future[S], f: (T, S) => R): Future[R] = async {
  f(await { this }, await { that })
}
```

Implementing sequence with await

```
def sequence[T](fs: List[Future[T]]): Future[List[T]] = async {
  var _fs = fs
  val r = ListBuffer[T]()
  while (_fs != Nil) {
    r += await { _fs.head }
    _fs = _fs.tail
  }
  f.result
}
```

Implement sequence with Promise

```
def sequence[T](fs: List[Future[T]]): Future[List[T]] = {
  val successful = Promise[List[T]]()
  successful.success(Nil)
  fs.foldRight(successful.future) {
    (f, acc) => for { x <- f; xs <- acc } yield x :: xs
  }
}
```

The Four Essential Effects In Programming

	One	Many
Synchronous	`T/Try[T]`	`Iterable[T]`
Asynchronous	`Future[T]`	`Observable[T]`