Responsiveness

Principles of Reactive Programming

Roland Kuhn

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The goal of resilience is to be available.

Responsiveness implies resilience to overload scenarios.

Exploit Parallelism

Performing queries sequentially adds up latency:

```
class PostSummary(...) extends Actor {
  implicit val timeout = Timeout(500.millis)
  def receive = {
    case Get(postId, user, password) =>
      val response = for {
        status <- (publisher ? GetStatus(postId)).mapTo[PostStatus]
        text   <- (postStore ? Get(postId)).mapTo[Post]
        auth   <- (authService ? Login(user, password)).mapTo[AuthStatus]
      } yield if (auth.successful) Result(status, text)
              else Failure("not authorized")
      response pipeTo sender
  }
}
```

Exploit Parallelism

Performing queries in parallel reduces latency:

```
class PostSummary(...) extends Actor {
  implicit val timeout = Timeout(500.millis)
  def receive = {
    case Get(postId, user, password) =>
      val status = (publisher ? GetStatus(postId)).mapTo[PostStatus]
      val text = (postStore ? Get(postId)).mapTo[Post]
      val auth = (authService ? Login(user, password)).mapTo[AuthStatus]
      val response = for (s <- status; t <- text; a <- auth) yield {
          if (a.successful) Result(s, t) else Failure("not authorized")
        }
      response pipeTo sender
  }
}
```

Load vs. Responsiveness

When incoming request rate rises, latency typically rises.

- Avoid dependency of processing cost on load.
- Add parallelism elastically (resizing routers).

When the rate exceeds the system's capacity requests will pile up:

- Processing gets backlogged.
- Clients timeout, leading to unnecessary work being performed.

Circuit Breaker

```
class Retriever(userService: ActorRef) extends Actor {
  implicit val timeout = Timeout(2.seconds)
  val cb = CircuitBreaker(context.system.scheduler,
    maxFailures = 3,
    callTimeout = 1.second,
    resetTimeout = 30.seconds)

  def receive = {
    case Get(user) =>
      val result = cb.withCircuitBreaker(userService ? user).mapTo[String]
      ...
  }
}
```

Bulkheading (1)

Separate computing intensive parts from client-facing parts.

Actor isolation is not enough: execution mechanism is still shared.

Dedicate disjoint resources to different parts of the system.

```
Props[MyActor].withDispatcher("compute-jobs")
```

Bulkheading (2)

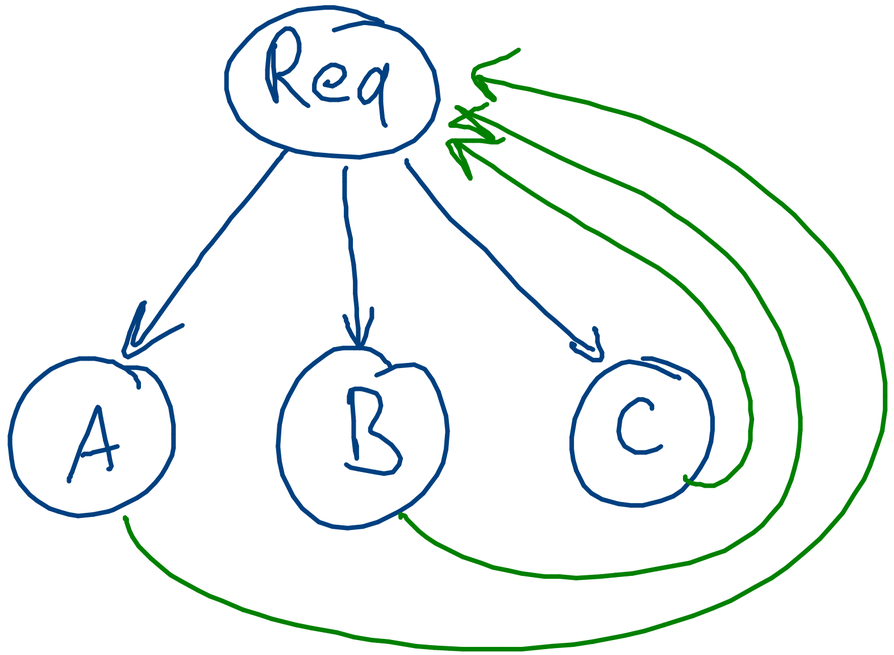
```
akka.actor.default-dispatcher {
  executor = ”fork-join-executor”
  fork-join-executor {
    parallelism-min = 8
    parallelism-max = 64
    parallelism-factor = 3.0
  }
}

compute-jobs.fork-join-executor {
  parallelism-min = 4
  parallelism-max = 4
}
```

Failures vs. Responsiveness

Detecting failure takes time, usually a timeout.

Immediate fail-over requires the backup to be readily available.

Instant fail-over is possible in active–active configurations.



Summary

- Event-driven systems can be scaled horizontally and vertically
- Responsiveness demands resilience and scalability