



Actor Composition

Principles of Functional Programming

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The Type of an Actor

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Superficially current Actor implementations are untyped:

- ▶ sending a message is `(Any => Unit)`
- ▶ behavior is `PartialFunction[Any, Unit]`

This limitation is not a fundamental.

Actor Composition

Actor Systems are composed like human organizations.

Actors are composed on a protocol level.

An Actor can

- ▶ translate and forward requests
- ▶ translate and forward replies
- ▶ split up requests and aggregate replies

The Customer Pattern

- ▶ fundamental request–reply pattern
- ▶ customer address included in the (original) request
- ▶ allows dynamic composition of actor systems

Interceptors

```
class AuditTrail(target: ActorRef) extends Actor with ActorLogging {  
  def receive = {  
    case msg =>  
      log.info("sent {} to {}", msg, target)  
      target forward msg  
  }  
}
```

A one-way proxy does not need to keep state.

The Ask Pattern

```
import akka.pattern.ask

class PostsByEmail(userService: ActorRef) extends Actor {
  implicit val timeout = Timeout(3.seconds)
  def receive = {
    case Get(email) =>
      (userService ? FindByEmail(email)).mapTo[UserInfo]
        .map(info => Result(info.posts.filter(_.email == email)))
        .recover { case ex => Failure(ex) }
        .pipeTo(sender())
  }
}
```

Result Aggregation

```
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()
  }
}
```

Risk Delegation

- ▶ create subordinate to perform dangerous task
- ▶ apply lifecycle monitoring
- ▶ report success/failure back to requestor
- ▶ ephemeral actor shuts down after each task

Example: File Writer

```
class FileWriter extends Actor {  
  var workerToCustomer = Map.empty[ActorRef, ActorRef]  
  override val supervisorStrategy = SupervisorStrategy.stoppingStrategy  
  def receive = {  
    case Write(contents, file) =>  
      val worker = context.actorOf(Props(new FileWorker(contents, file, self)))  
      context.watch(worker)  
      workerToCustomer += worker -> sender()  
    case Done                => workerToCustomer.get(sender()).foreach(_ ! Done)  
                                workerToCustomer -= sender()  
    case Terminated(worker) => workerToCustomer.get(worker).foreach(_ ! Failed)  
                                workerToCustomer -= worker  
  }  
}
```

Façade

- ▶ translation
- ▶ validation
- ▶ rate limitation
- ▶ access control