

# Akka Persistence Typed

Renato Cavalcanti

Lightbend

@renatocaval

# History

- Started as an Akka Extension called Eventourced by Martin Krasser
- Brought into Akka as Akka Persistence in Akka 2.4.0
- Akka Persistence Query in Akka 2.5.0
- Akka Persistence Typed in Akka 2.6.0

Code examples  
based on Akka  
2.6.0. Yeah!!

# Akka Typed - protocol

When defining an Actor, we start by defining it's protocol

```
sealed trait Message  
final case class SayHello(name: String) extends Message  
final case class ChangeGreeting(greet: String) extends Message
```

# Akka Typed - behavior

In Akka Typed, an Actor is just a Behavior function

```
def behavior(greeting: String): Behavior[Message] =  
  Behaviors.receiveMessage {  
    case SayHello(name) =>  
      println(s"$greeting $name!")  
      Behaviors.same  
    case ChangeGreeting(greet) =>  
      behavior(greet)  
  }
```

# Akka Typed - ask pattern

There is no `sender()`. If you need to reply to an `ask`, your incoming message must have an `ActorRef[R]` that you can use to reply to.

```
final case class Hello(msg: String)
final case class SayHello(name: String, replyTo: ActorRef[Hello])

def behavior(greeting: String): Behavior[SayHello] =
  Behaviors.receiveMessage {
    case SayHello(name, replyTo) =>
      replyTo ! Hello(s"$greeting $name!")
      Behaviors.same
  }
```

# Akka Typed

```
final case class Hello(msg: String)
final case class SayHello(name: String, replyTo: ActorRef[Hello])

def behavior(greeting: String): Behavior[SayHello] =
  Behaviors.receiveMessage {
    case SayHello(name, replyTo) =>
      replyTo ! Hello(s"$greeting $name!")
      Behaviors.same
  }

val greeter: ActorSystem[SayHello] = ActorSystem(behavior("Hello"), "HelloAkka")
val res: Future[Hello] =
  greeter.ask(replyTo => SayHello("Akka Typed", replyTo))
```

# Akka Persistence Typed - Highlights

- Protocol is defined in terms of `Command`, `Event` and `State`
- `EventSourcedBehavior` instead of `Behavior`
- Tagging function
- Better controlled snapshotting (number of events and/or predicate)
- Enforced Replies
- Old plugins are still compatible
- Akka Persistence Query untouched, already typed and based on Akka Streams



# Commands, Events and State

```
sealed trait AccountCommand
final case class Deposit(amount: Double) extends AccountCommand
final case class Withdraw(amount: Double) extends AccountCommand
case class GetBalance(replyTo: ActorRef[Balance]) extends AccountCommand

sealed trait AccountEvent
final case class Deposited(amount: Double) extends AccountEvent
final case class Withdrawn(amount: Double) extends AccountEvent

case class Account(balance: Double)
```

# Command Handler

```
// (State, Command) ⇒ Effect
case class Account(balance: Double) {
  def applyCommand(cmd: AccountCommand): Effect[AccountEvent, Account] =
    cmd match {
      case Deposit(amount) ⇒
        Effect.persist(Deposited(amount))

      // other cases intentionally omitted
    }
}
```

# Event Handler

```
// (State, Event) ⇒ State
case class Account(balance: Double) {
  def applyEvent(evt: AccountEvent): Account = {
    evt match {
      case Deposited(amount) ⇒ copy(balance = balance + amount)
      case Withdrawn(amount) ⇒ copy(balance = balance - amount)
    }
  }
}
```

# EventSourcedBehavior

```
def behavior(id: String): EventSourcedBehavior[AccountCommand, AccountEvent, Account] = {  
  EventSourcedBehavior[AccountCommand, AccountEvent, Account](  
    persistenceId = PersistenceId("Account", id),  
    emptyState = Account(balance = 0),  
    // command handler: (State, Command) ⇒ Effect  
    commandHandler = (account, cmd) ⇒ account.applyCommand(cmd),  
    // event handler: (State, Event) ⇒ State  
    eventHandler = (account, evt) ⇒ account.applyEvent(evt)  
  )  
}
```

# Tagging

```
def behavior(id: String): EventSourcedBehavior[AccountCommand, AccountEvent, Account] = {  
  
  EventSourcedBehavior[AccountCommand, AccountEvent, Account](  
    persistenceId = PersistenceId("Account", id),  
    emptyState = Account(balance = 0),  
    commandHandler = (account, cmd) ⇒ account.applyCommand(cmd),  
    eventHandler = (account, evt) ⇒ account.applyEvent(evt)  
  )  
  .withTagger {  
    // tagging events are useful for querying by tag  
    case evt: Deposited ⇒ Set("account", "deposited")  
    case evt: Withdrawn ⇒ Set("account", "withdrawn")  
  }  
  
}
```

# Snapshots

```
def behavior(id: String): EventSourcedBehavior[AccountCommand, AccountEvent, Account] = {  
    EventSourcedBehavior[AccountCommand, AccountEvent, Account](  
        persistenceId = PersistenceId("Account", id),  
        emptyState = Account(balance = 0),  
        commandHandler = (account, cmd) ⇒ account.applyCommand(cmd),  
        eventHandler = (account, evt) ⇒ account.applyEvent(evt)  
    )  
    // save a snapshot on every 100 events and keep max 2  
    .withRetention(RetentionCriteria.snapshotEvery(numberOfEvents = 100, keepNSnapshots = 2))  
  
    // save a snapshot when a predicate holds  
    .snapshotWhen {  
        case (account, evt: Withdrawn, seqNr) ⇒ true  
        case _                               ⇒ false  
    }  
}
```

# Enforced Replies - live coding

# Cluster Sharding and Persistence

- Manage state over different JVMs
- Knows where is your instance
- Honours single writer principle for Persistence
- Entity Passivation
- Rolling updates without downtime
- Commands must be serializable



# Cluster Sharding - EntityContext

```
object Account {  
  
    val typeKey = EntityTypeKey[AccountCommand]("Account")  
  
    def behavior(entityContext: EntityContext[AccountCommand]):  
        EventSourcedBehavior[AccountCommand, AccountEvent, Account] = {  
  
        EventSourcedBehavior[AccountCommand, AccountEvent, Account](  
            persistenceId = PersistenceId(entityContext.entityTypeKey.name, entityContext.entityId),  
            emptyState = Account(balance = 0),  
            commandHandler = (account, cmd) ⇒ account.applyCommand(cmd),  
            eventHandler = (account, evt) ⇒ account.applyEvent(evt)  
        )  
    }  
}
```

# Cluster Sharding - Entity

```
clusterSharding.init(  
    Entity(Account.typeKey) { ctx ⇒ Account.behavior(ctx) }  
)
```

# Cluster Sharding - EntityRef

```
val account: EntityRef[AccountCommand] =  
  clusterSharding.entityRefFor(  
    typeKey = Account.typeKey,  
    entityId = "BE50 7314 3515 2919"  
  )
```

# Takeaways

- Declarative API
  - Developer can concentrate on modelling
  - Types everywhere
  - And functions
  - `Any`  $\Rightarrow$  `Unit` is part of the past
- 
- Event Sourcing opens the door for decoupling your services
  - High throughput with append only journals
  - Scalability with Cluster Sharding
  - Rolling updates when clustered
  - Distributed event consuming (included in Lagom, will be extracted)

# Thanks for listening

In GitHub:

[renatocaval/akka-persistence-typed-talk](https://github.com/renatocaval/akka-persistence-typed-talk)

Twitter: [@renatocaval](https://twitter.com/renatocaval)