Akka

Reactive Applications made easy

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TNG TECHNOLOGY CONSULTING

Akka

Akka mountain by Arvelius

What are reactive applications?

New requirements demand new technologies -
The Reactive Manifesto

interactive

scalable resilient

event-driven

What is Akka?

actor programming model
+ fault tolerance
+ location transparency

Actors

Creating an Actor is easy

```
class Adder extends UntypedActor {

    private int sum = 0;

    @Override
    public void onReceive(Object message) throws Exception {
        if (message instanceof Add) {
            sum += ((Add)message).value;
        } else if (message instanceof GetSum) {
            getSender().tell(new Sum(sum), getSelf());
        }
    }


}
```

Working with Actors

```
ActorSystem system = ActorSystem.create("AdderSystem");
ActorRef add = system.actorOf(Props.create(Adder.class));
add.tell(new Add(1), null);
```

Code

Props

```
Props props1 = Props.create(SimpleCalc.class);
Props props2 = Props.create(SimpleCalc.class, 5);
```

Props

Best practice:

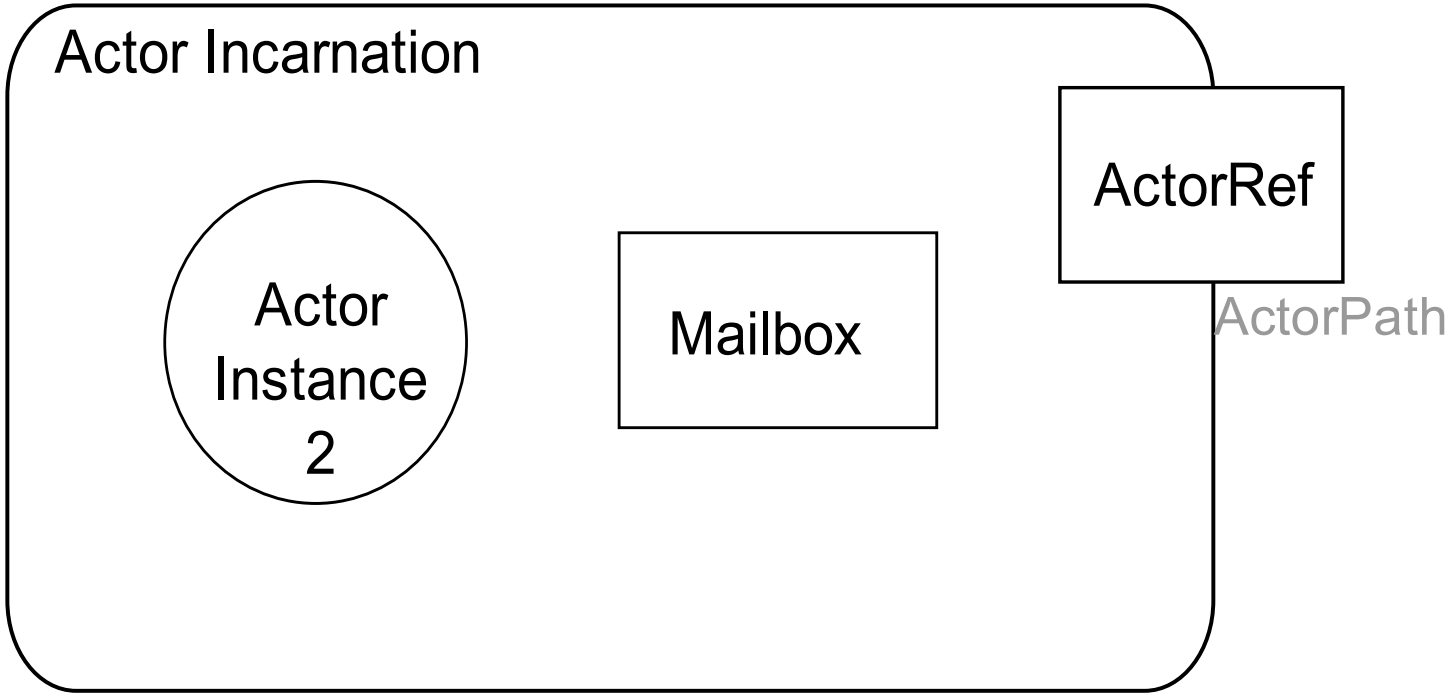
```
public static class Adder extends UntypedActor {

    public static Props props(int initialValue) {
        return Props.create(Adder.class, initialValue);
    }

    public Adder(int initialValue) {
        ...
    }

}
...
system.actorOf(Adder.props(42));
```

Inside an Actor



Resilience

Eltern haften für ihre Kinder by Katharina Hamacher

Creating a hierarchy is easy

```
// top-level actor
system.actorOf(Props.create(Adder.class));
// child actor
getContext().actorOf(Props.create(Adder.class));
```

The Akka Hierarchy

Supervision strategies

- One For One
- All For One

Supervision options

- Resume
- Restart
- Stop
- Escalate

Defining supervision is easy

```
private SupervisorStrategy strategy =
    new OneForOneStrategy(10, Duration.create(5, TimeUnit.SECONDS),
        new Function() {
            @Override
            public Directive apply(Throwable t) throws Exception {
                return SupervisorStrategy.resume();
            }
        });
@Override
public SupervisorStrategy supervisorStrategy() {
    return strategy;
}
```

Code

Remoting & Clustering

Server room by Torkild Retvedt

Configure the node first

```
akka {
    actor {
        provider = "akka.remote.RemoteActorRefProvider"
    }
    remote {
        enabled-transports = ["akka.remote.netty.tcp"]
        netty.tcp {
            hostname = "127.0.0.1"
            port = 2552
        }
    }
}
```

Remoting actors now is easy

```
akka {
    actor {
        deployment {
            /echoActor {
               remote = "akka.tcp://remoteSystem@127.0.0.1:2553"
            }
        }
    }
}
```

Code

Clustering

```
akka {
    actor {
        provider = "akka.cluster.ClusterActorRefProvider"
    }
    remote {
        ...
    }
    cluster {
        seed-nodes = [
            "akka.tcp://ClusterSystem@127.0.0.1:2551",
            "akka.tcp://ClusterSystem@127.0.0.1:2552"]

        auto-down-unreachable-after = 10s
    }
}
```

Code

Camel Integration

Greeting Web Service

```
public class GreetingService extends UntypedConsumerActor {

    @Override
    public void onReceive(Object message) throws Exception {
        if (message instanceof CamelMessage) {
            CamelMessage camelMsg = (CamelMessage) message;
            Map headers = camelMsg.getHeaders();
            getSender().tell("Hello " + headers.get("greetee"), getSelf()
        }
    }

    @Override
    public String getEndpointUri() {
        return "jetty:http://localhost:4242/greet";
    }
}
```

Example Code


easy
STAPLES

Testing

almeraeuroncap

Testing with scalatest

```
class AdderSpec extends TestKit with ImplicitSender with WordSpec ... {
    ...
      "An Adder actor" must {

        "return 3 as sum of 1 and 2" in {
          val greeter = system.actorOf(Props[Adder])
          greeter ! new Add(1)
          greeter ! new Add(2)
          greeter ! new GetSum()
          expectMsg(new Sum(3))
        }
      }
}
```

Testing with JUnit

```
@Test
public void add2to1() {
    ActorRef adder = system.actorOf(Props.create(Adder.class));
    JavaTestKit probe = new JavaTestKit(system);
    adder.tell(new Adder.Add(1), probe.getRef());
    adder.tell(new Adder.Add(2), probe.getRef());
    adder.tell(new Adder.GetSum(), probe.getRef());

    probe.expectMsgEquals(new Adder.Sum(3));
}
```

TestActorRef

```
"An Adder actor" must {
    "know the Answer to the Question of Life, the Universe, and Everything" i
      val greeter = TestActorRef[Adder]
      greeter.underlyingActor.sum = 42
      greeter ! new GetSum()
      expectMsg(new Sum(42))
    }
}
```

Code

Persistence

Fossil by Yaffa Phillips

Persisting state

```
public class PersistentAdder extends UntypedProcessor {
    private int sum = 0;

    @Override
    public void onReceive(Object message) throws Exception {
        if (message instanceof Persistent) {
            Object payload = ((Persistent) message).payload();
            if (payload instanceof Add) {
                sum += Integer.parseInt(((Add) payload).value);
            }
        }
    }
}
```

Code

Guaranteed delivery

```
public void onReceive(Object message){
    if (message instanceof ConfirmablePersistent) {
        ((ConfirmablePersistent) message).confirm();
        getSender().tell(((ConfirmablePersistent) message).payload(), get
    }
}
...
ActorRef channel = system.actorOf(Channel.props());
channel.tell(Deliver.create(
   Persistent.create("Hello Echo!"), echoActor.path()), inbox.getRef());
```

Code

Putting it together

Actors are your building blocks

- Keep actor logic short
- Do not block in actors
- Use meaningful names

Designing a system

- Actor systems are message-based
- Design patterns need to be message-based
- Enterprise Integration Patterns to the rescue:
  - Pipes and Filters
  - Scatter-Gather
  - Aggregator
  - ...

Akka und Java 8

Lambdafy your Actor

```
public class MyActor extends AbstractActor {

  @Override
  public PartialFunction receive() {
    return ReceiveBuilder.
      match(String.class, s -> {
        log.info("Received String message: {}", s);
      }).
      matchAny(o -> log.info("received unknown message")).
      build();
  }
}
```

Learning Akka

Typesafe Activator

- Great tool to learn about Akka
- Many templates exist, from Hello World to complex examples
- 81 templates are currently available, >30 for Akka

Link

Books

- Akka Concurrency, Derek Wyatt
- Akka in Action, Raymond Roestenburg

Thank you!

Questions?

Happy Hakking!

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