I have seen the top of Akka Mountain, and it is good!

In One Sentence....

“To help you understand Actors, Supervision, Futures, Routers in both Scala and Java”

A note about my presentation style

- Trying to achieve the right mix of demonstration and slides.
- Code for this presentation is available on GitHub: `git@github.com:dhinojosa/akka-study.git`
- Goal is to provide you with code that you can use and reference with a presentation to back it.

About Akka

- Set of libraries used to create concurrent, fault-tolerant and scalable applications.
- It contains many API packages:
  - Actors, Logging, Futures, STM, Dispatchers, ...
- We are going to only focus on some of the core items.
- Managing processes in the same VM or in a Remote VM.

Game changer?

- Imagine life asynchronously
- Actors manage their own
- Web sites are faster because they delegated tasks
- What if you need something persisted later, don't necessarily need it right now?
- What if emails can be sent later on?

Actors

- Based on the Actor Model from Erlang.
- Encapsulate State and Behavior
- Concurrent processors that exchange messages.
- Each message is immutable (cannot be changed, this is required!)
- Each message should not be a closure
- Breath of fresh air if you have suffered concurrency

Actors (The basics)

- Create a message
- Send a message to an actor
- Each message has to be immutable
- Each message should not be a closure.

What does immutable look like? (Java)

```
public class Person {
    private String firstName;
    private String lastName;

    public Person(String firstName, String lastName) {
        this.firstName = firstName;
        this.lastName = lastName;
    }

    public String getFirstName() {
        return firstName;
    }

    public String getLastName() {
        return lastName;
    }

    @Override
    public boolean equals(Object o) {...}

    @Override
    public int hashCode() {...}
}
```

What does immutable look like? (Scala)

```
case class Person(val firstName:String, val lastName:String)
```

What does closure look like? (Java)

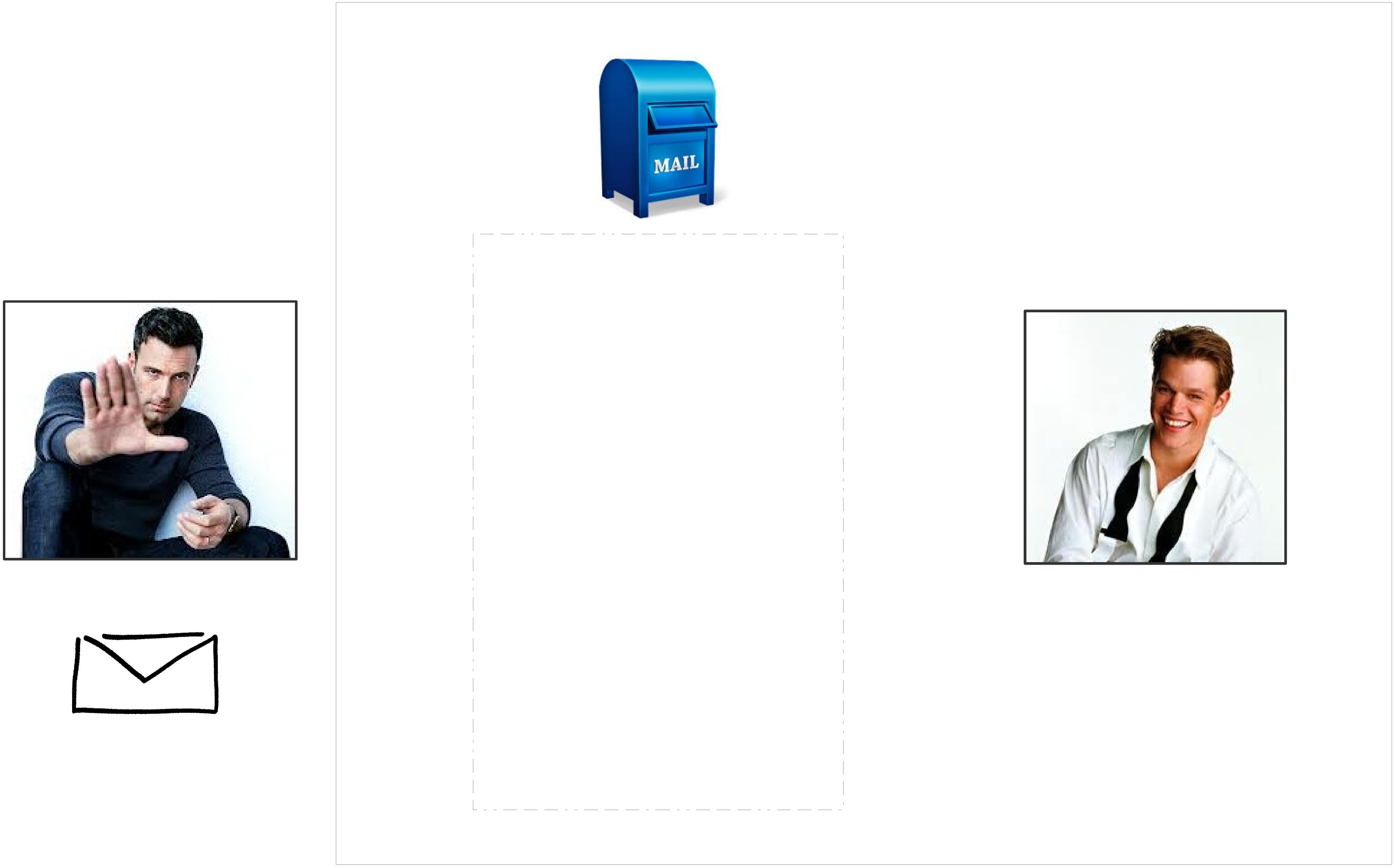
```
@see Java 8
```

What does closure look like? (Scala)

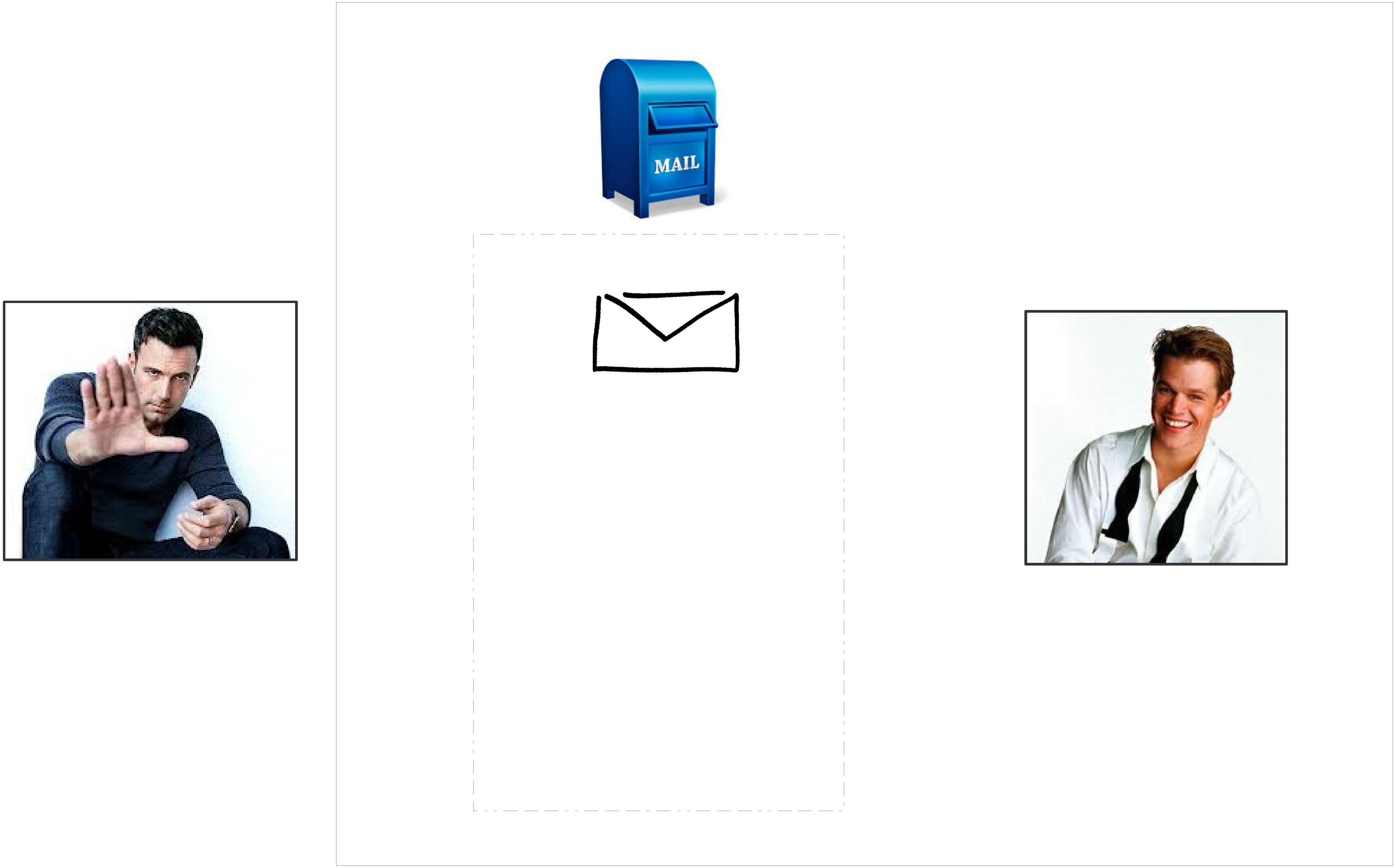
```
var x = 3

val y = {x:Int => x + 4}

def foo(w: Int => Int) = w(5)

foo(y) //9
```

Inside the Actor's Studio

Actor Visual



Actor Visual



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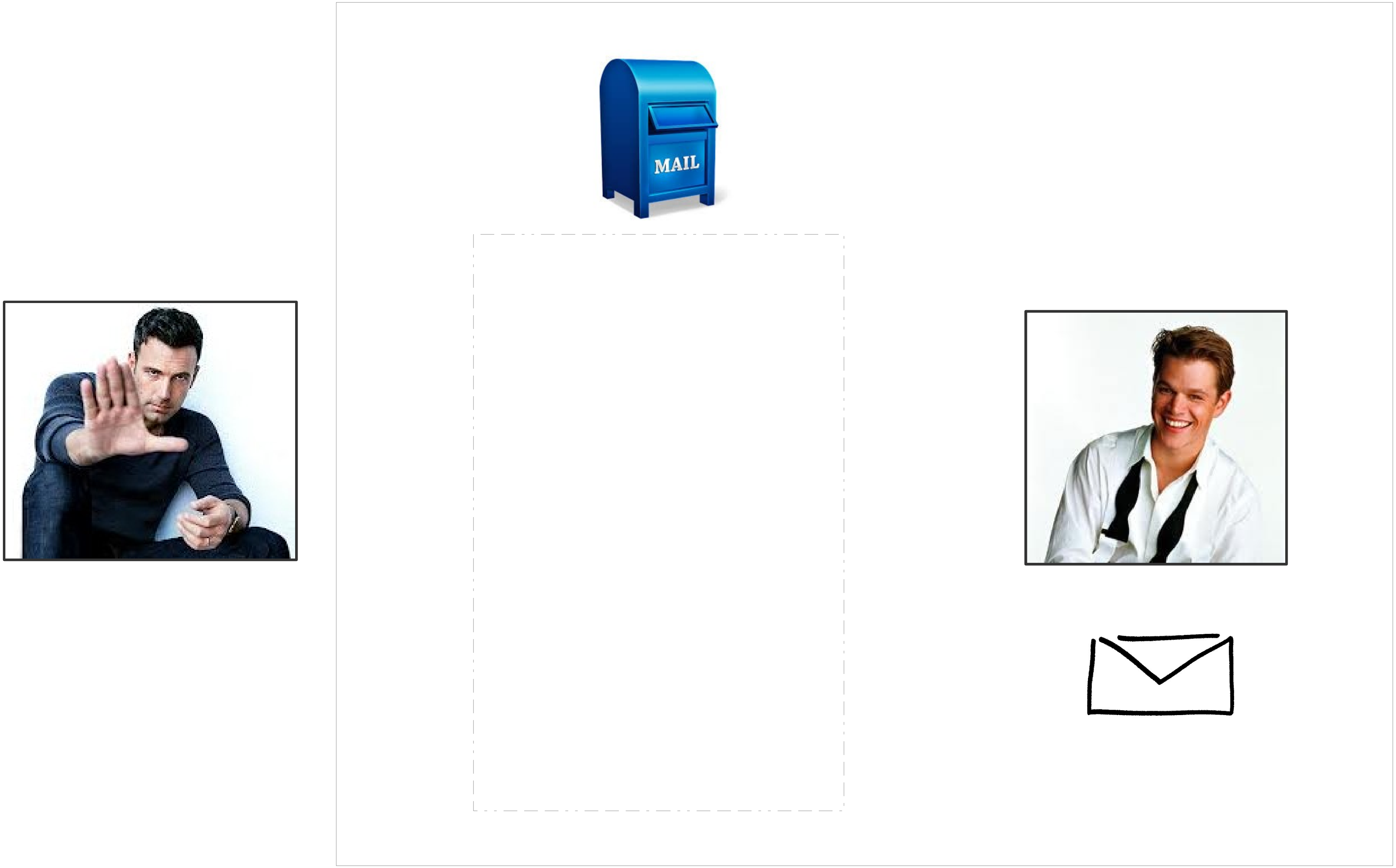

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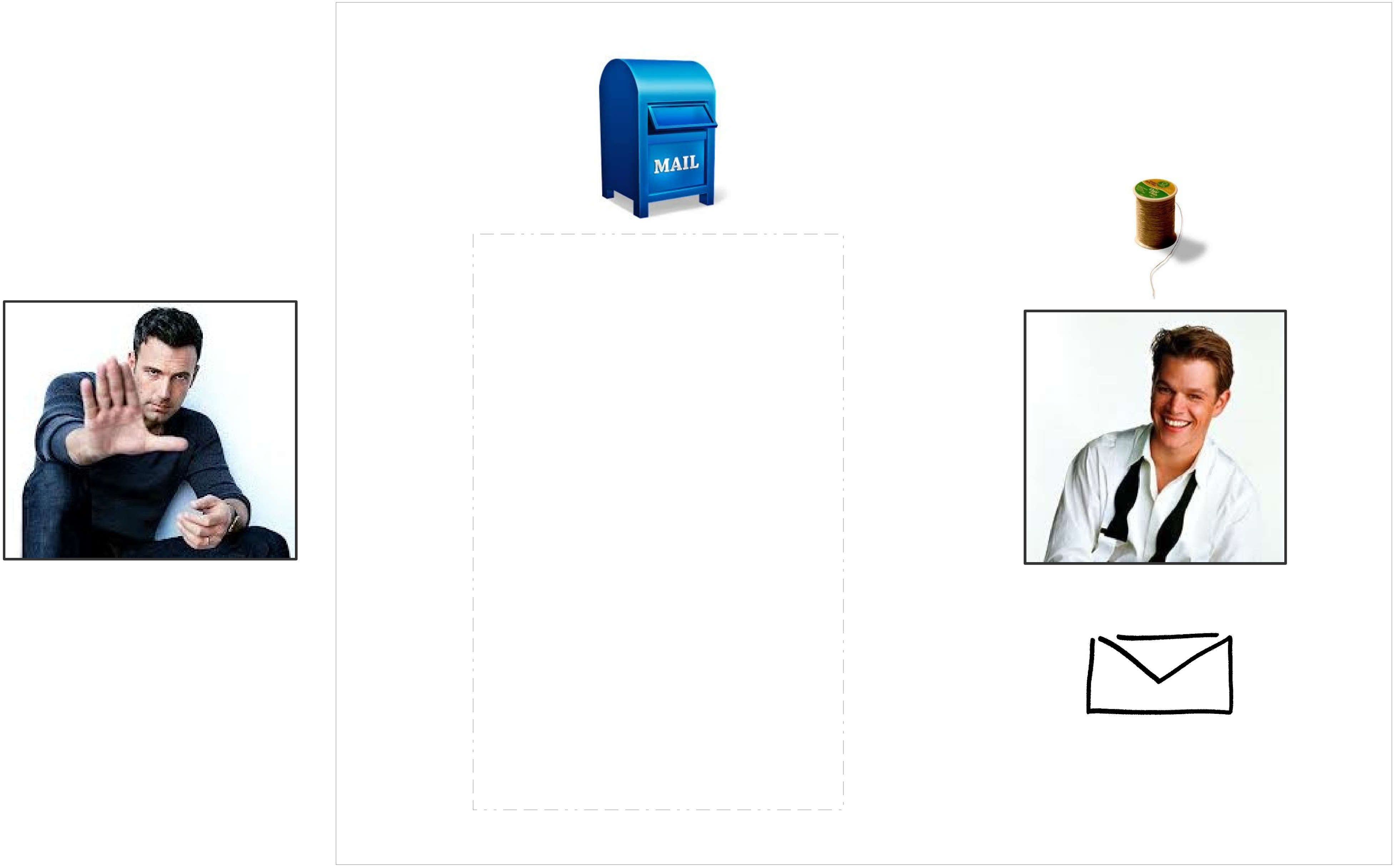
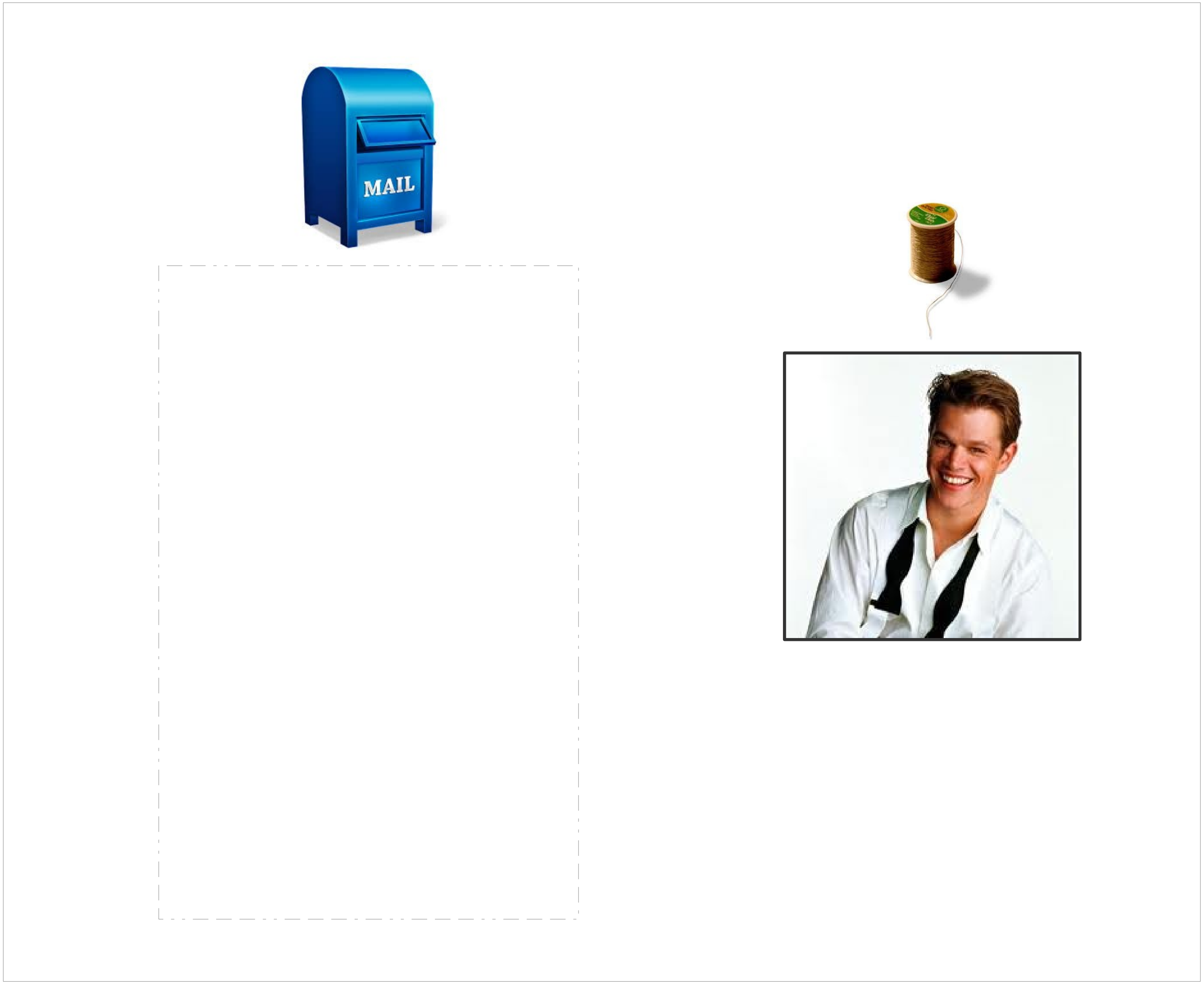
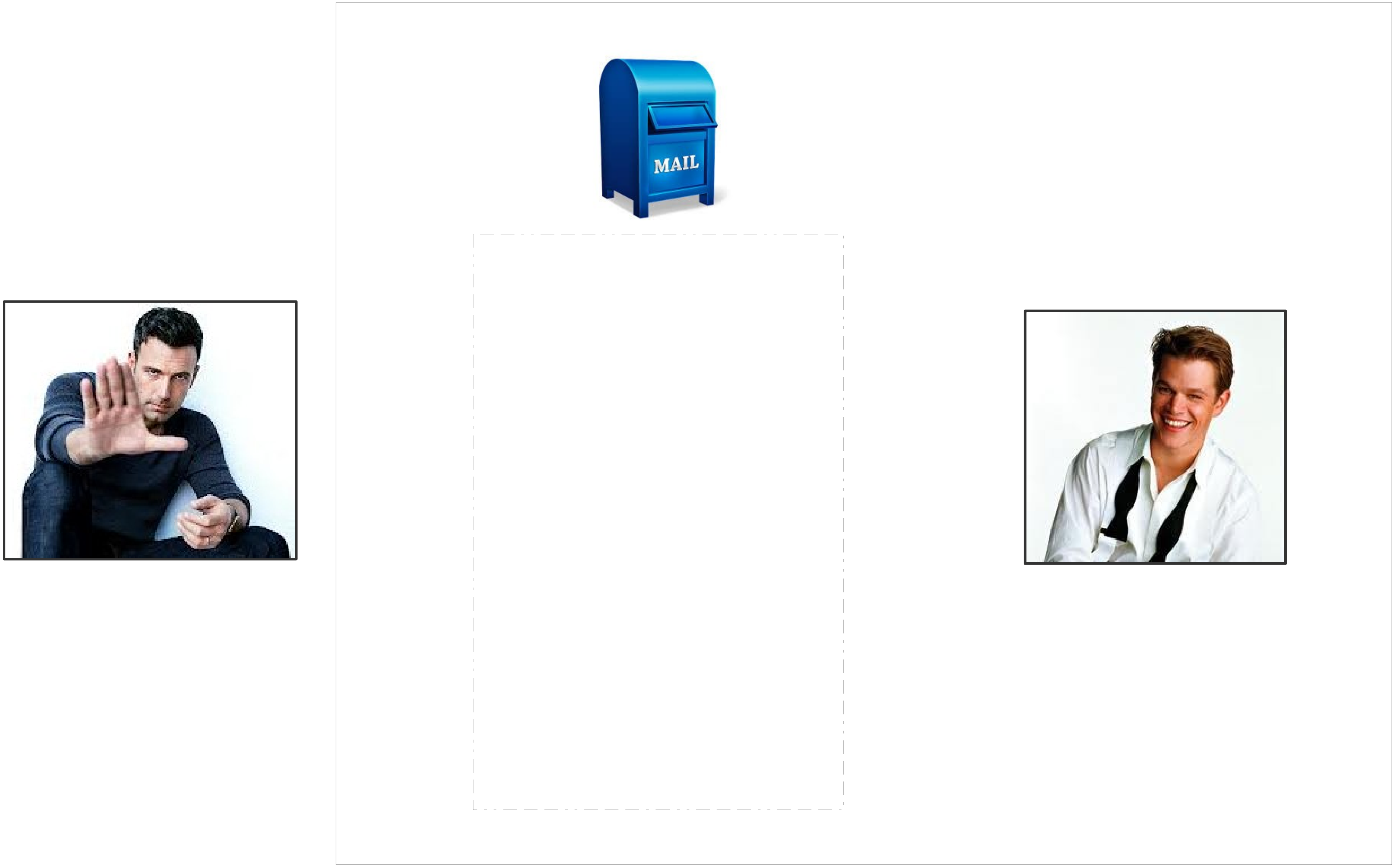


Actor Visual

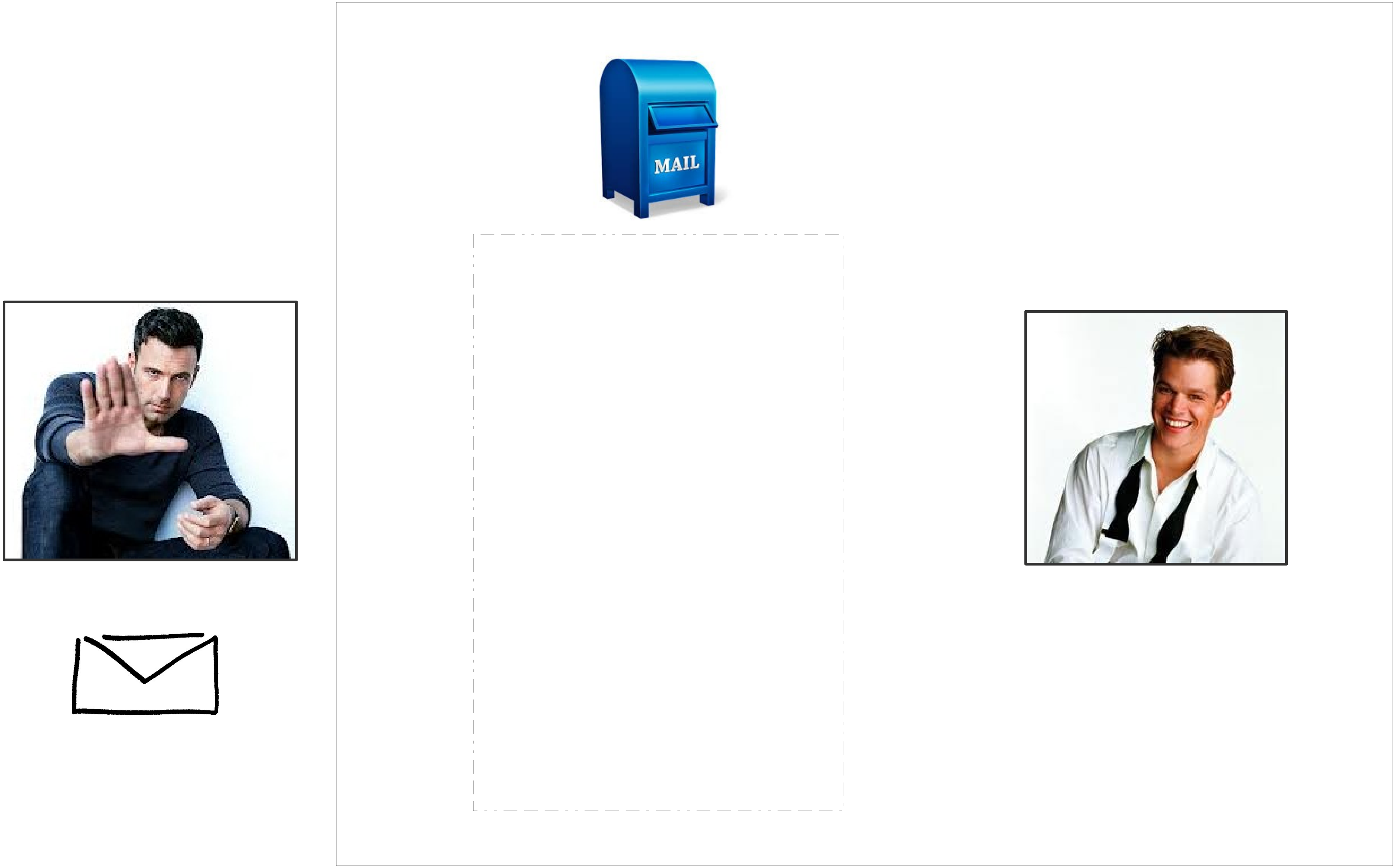


Actor Visual

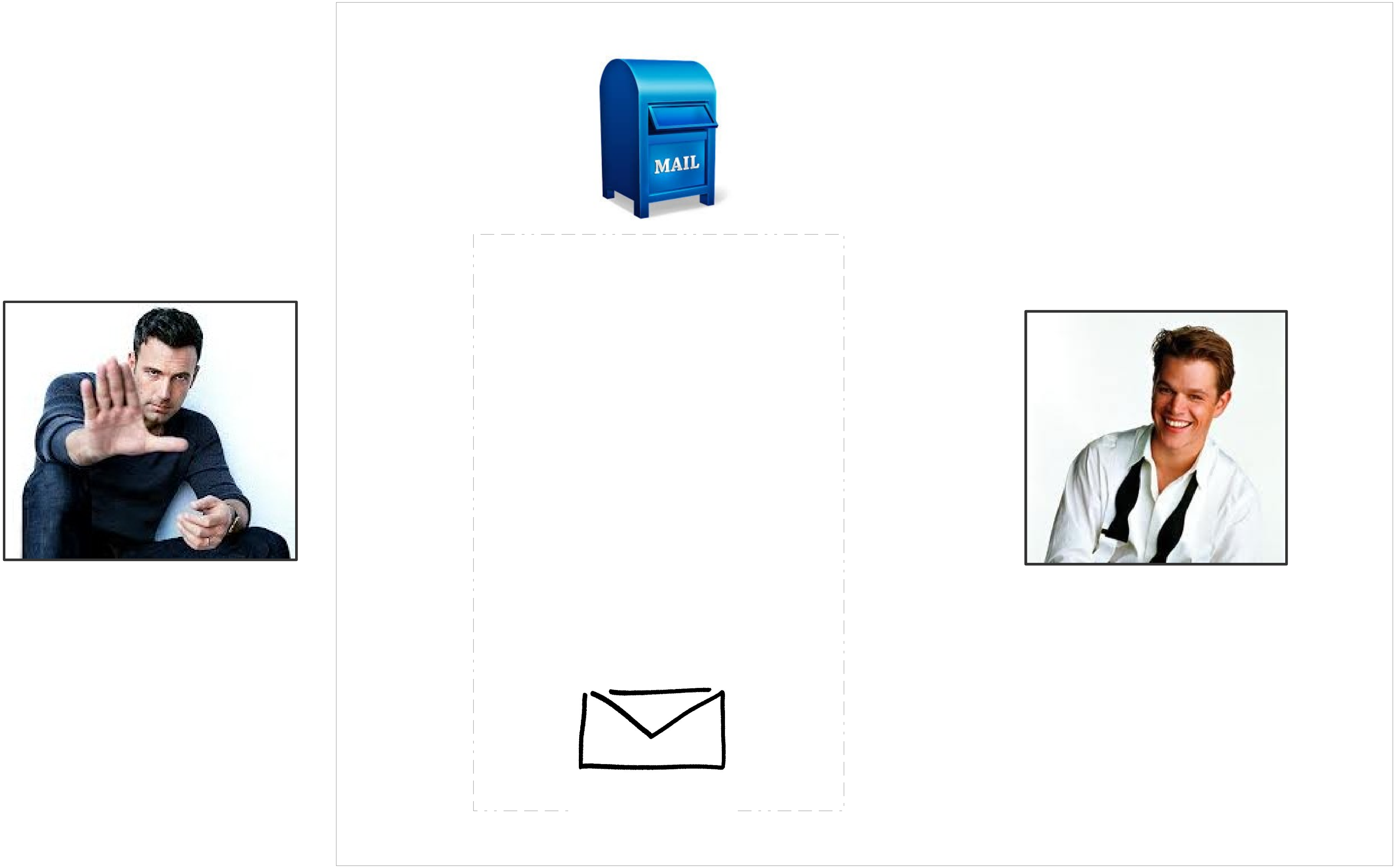


Inside the Actor's Studio Again

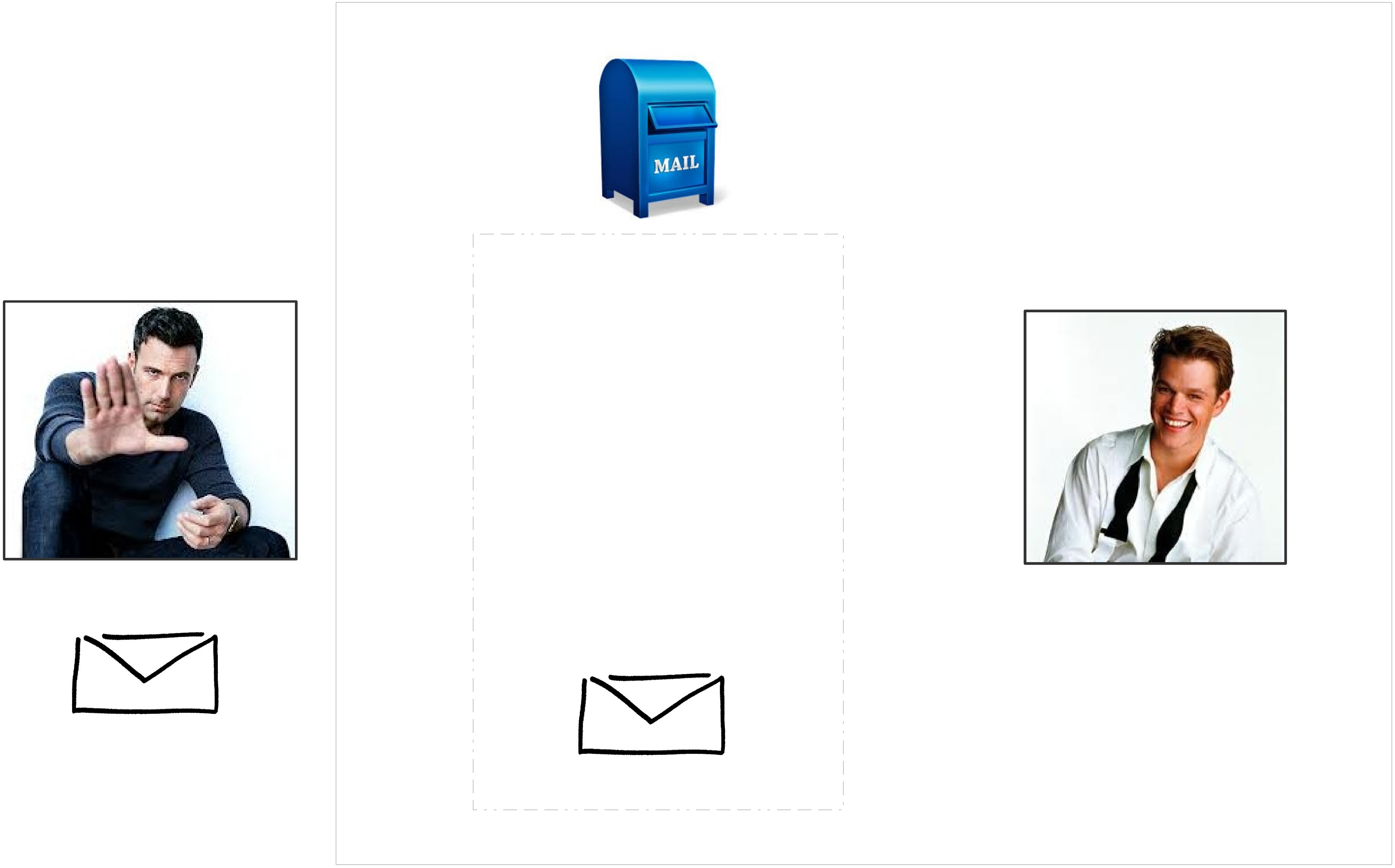
Actor Visual



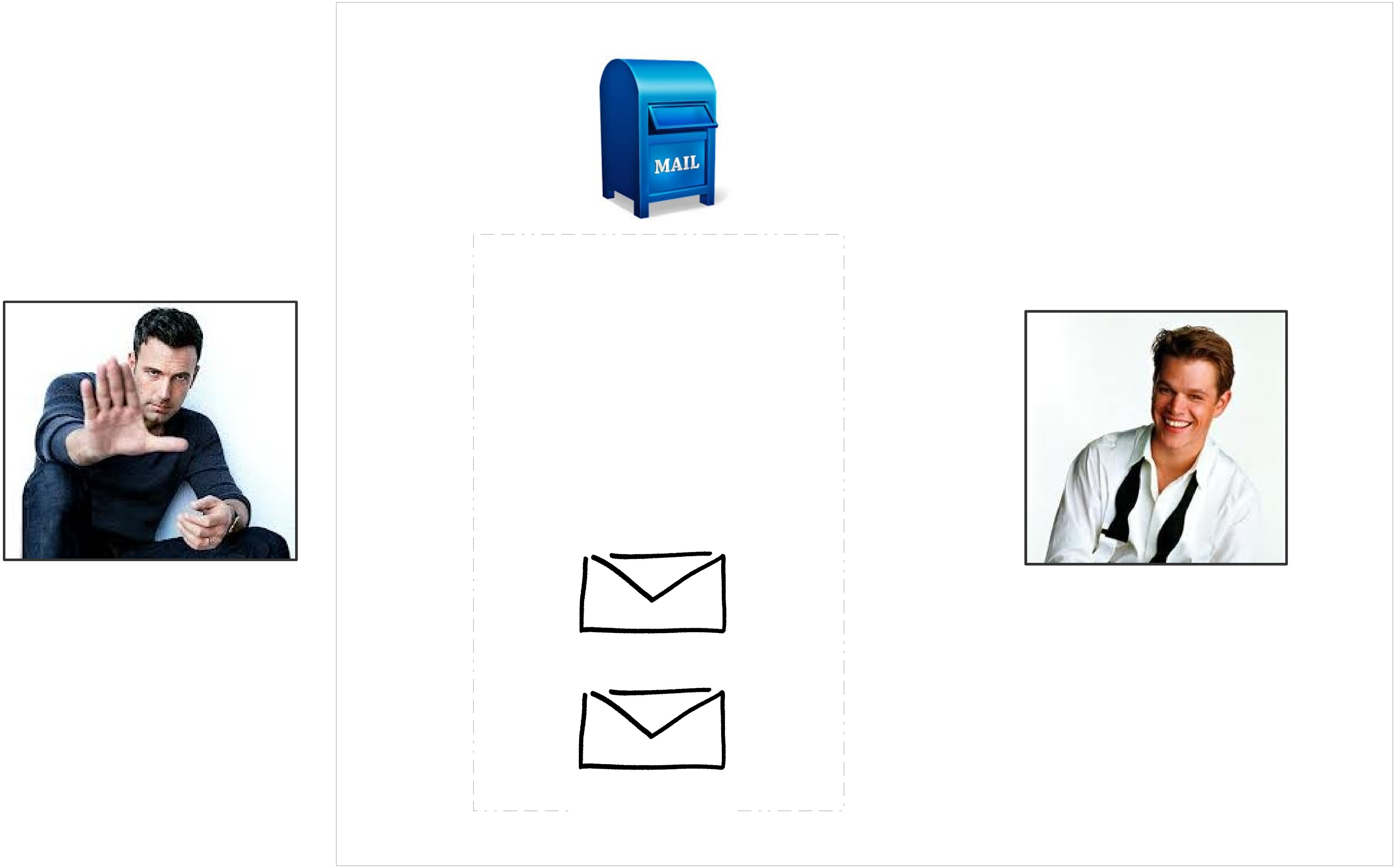
Actor Visual



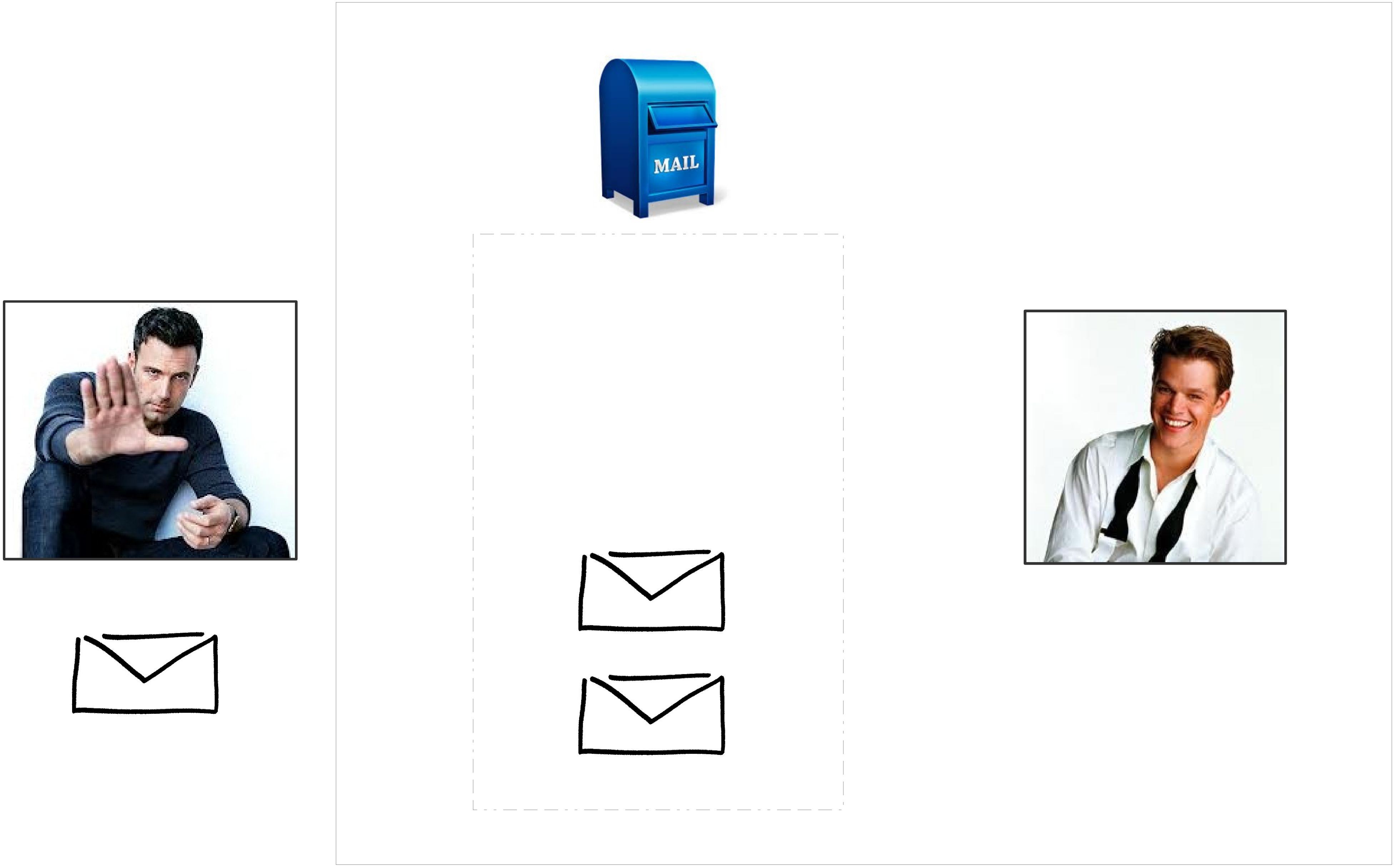
Actor Visual



Actor Visual



Actor Visual



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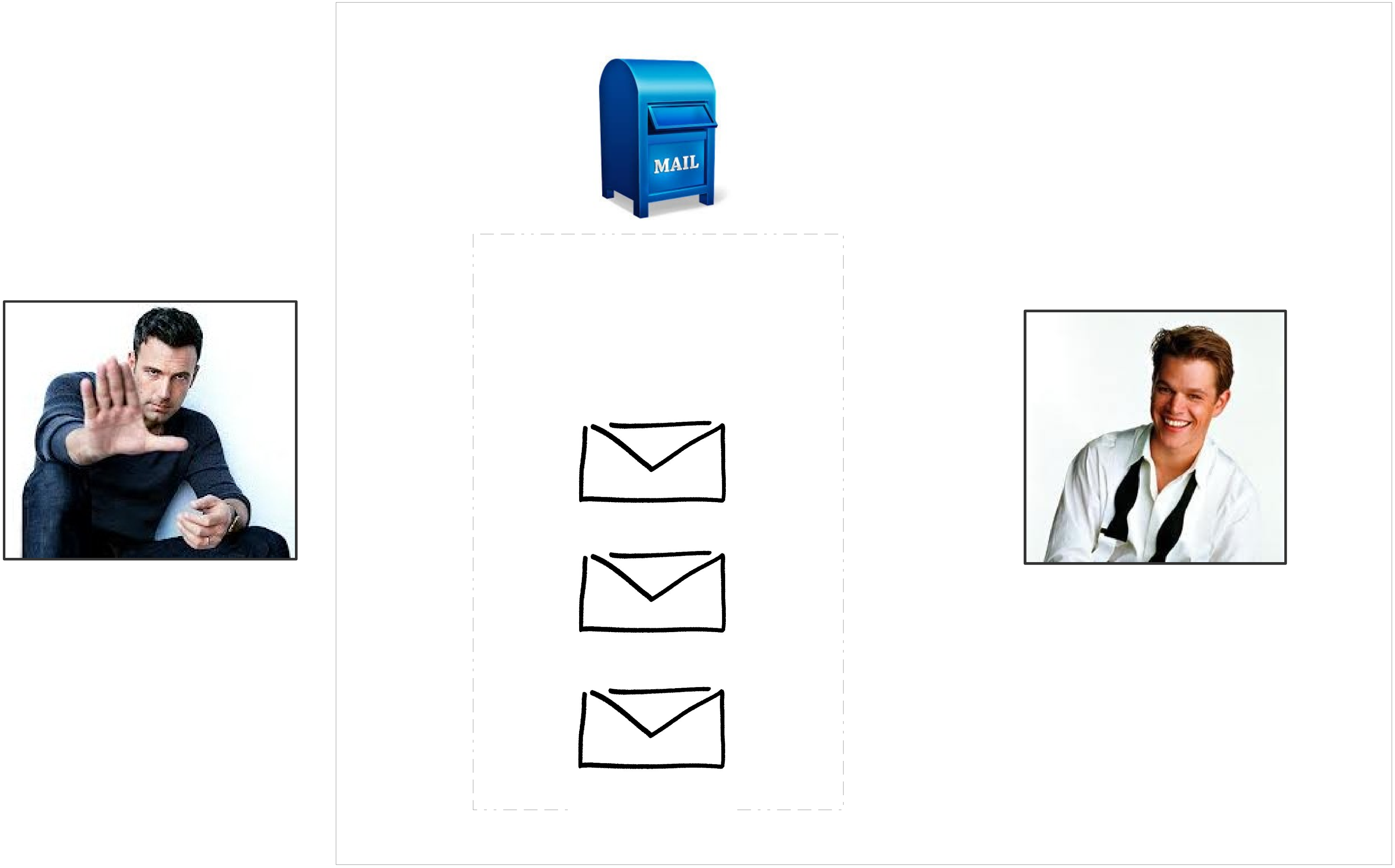
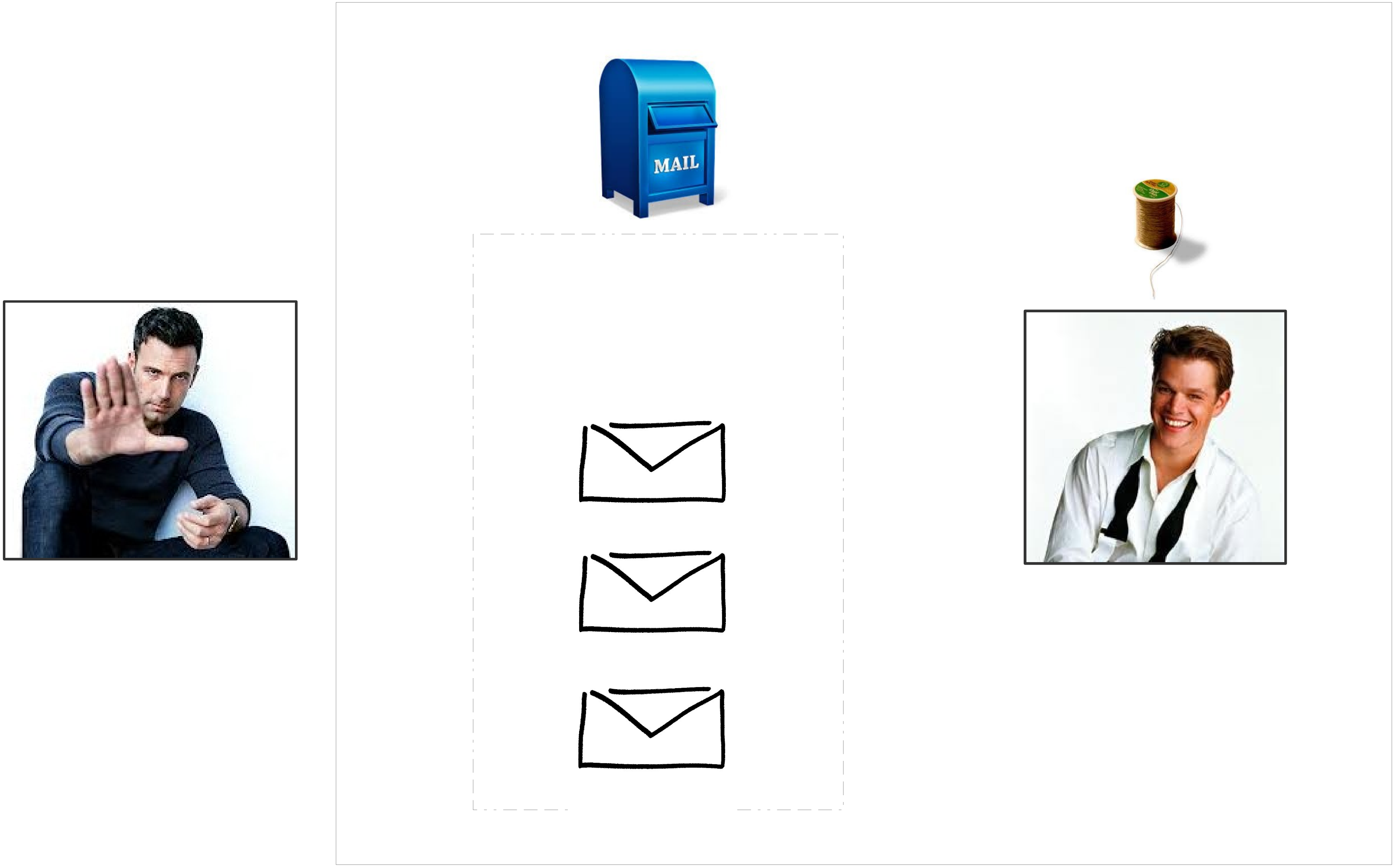


Actor Visual



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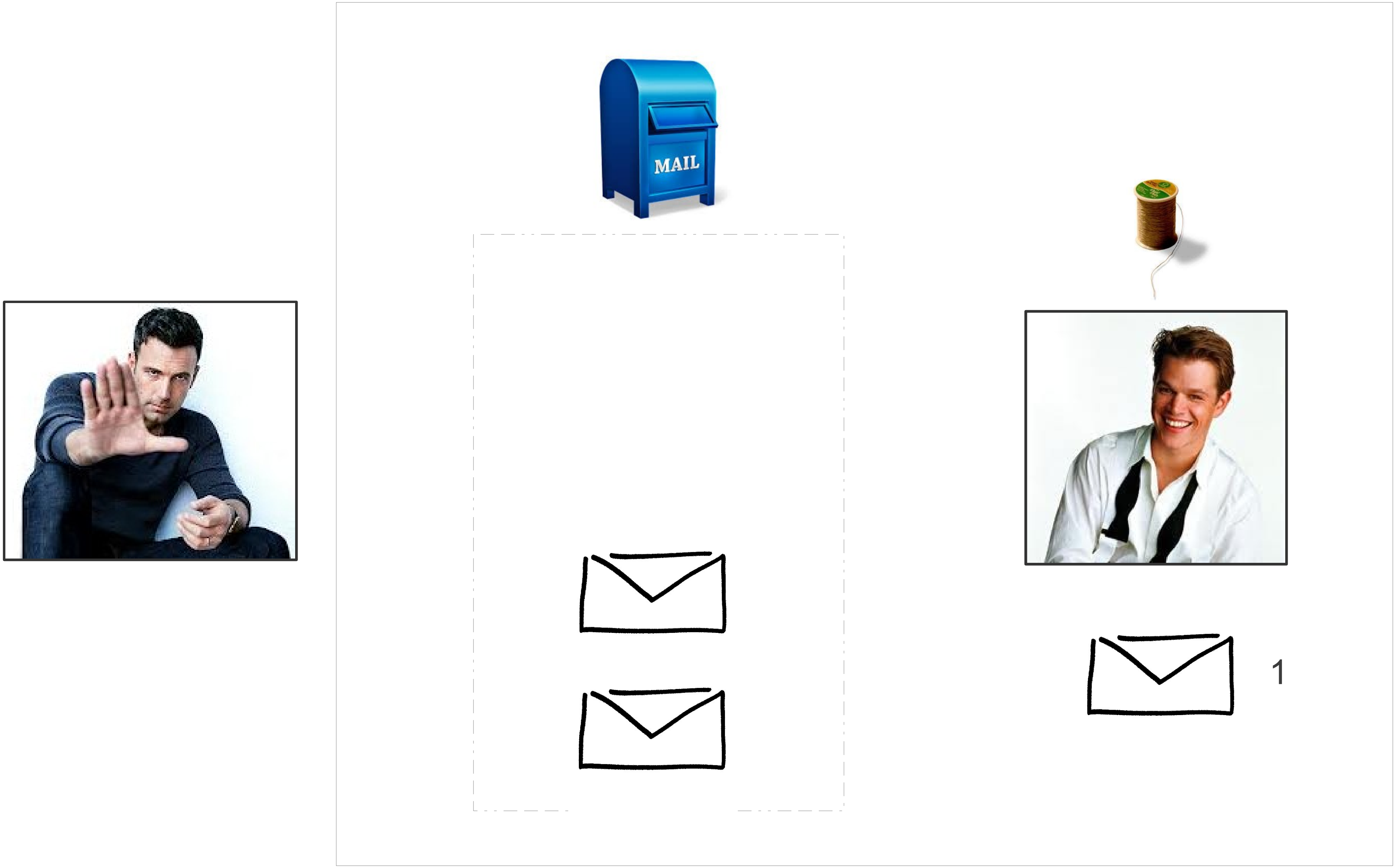

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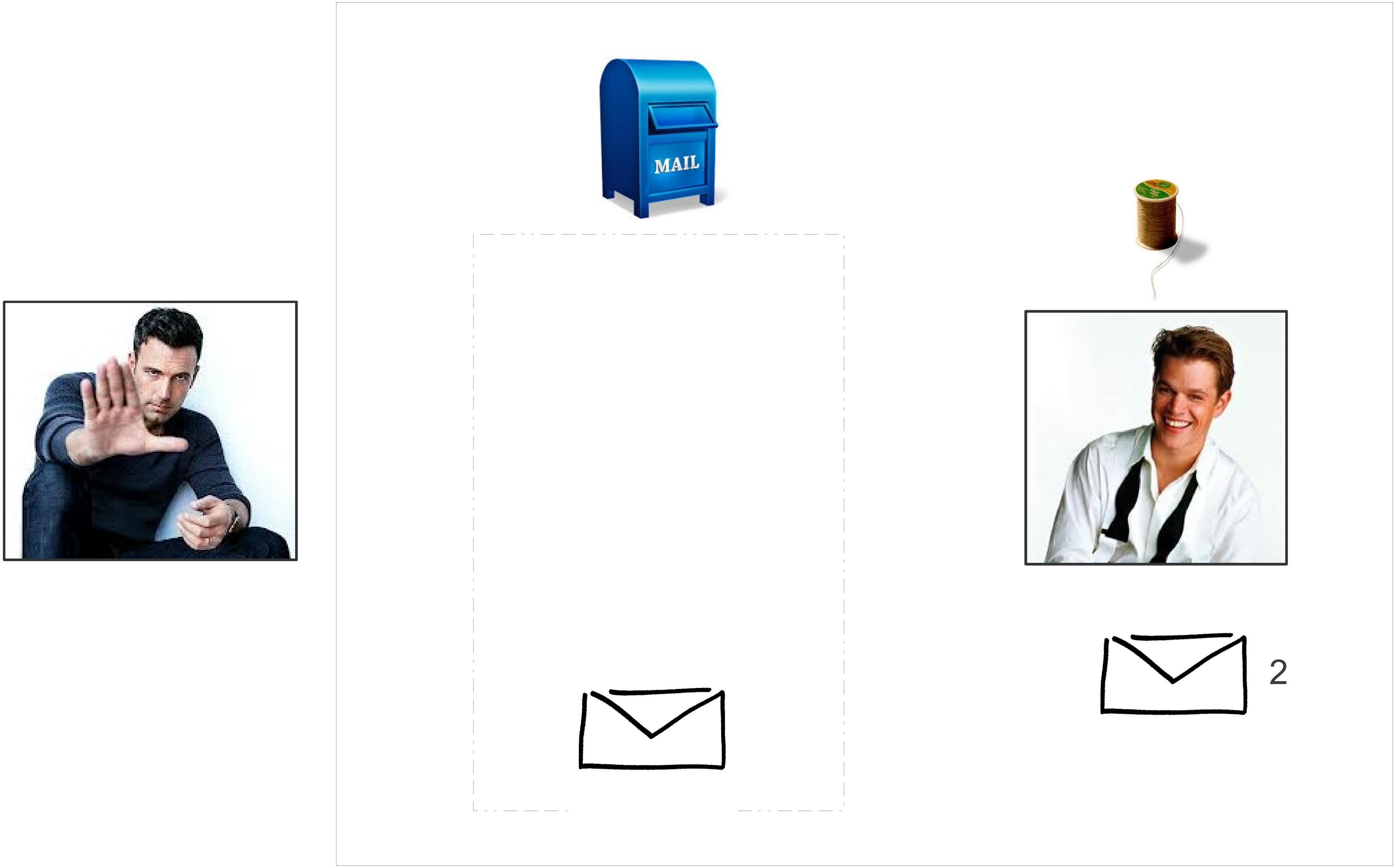
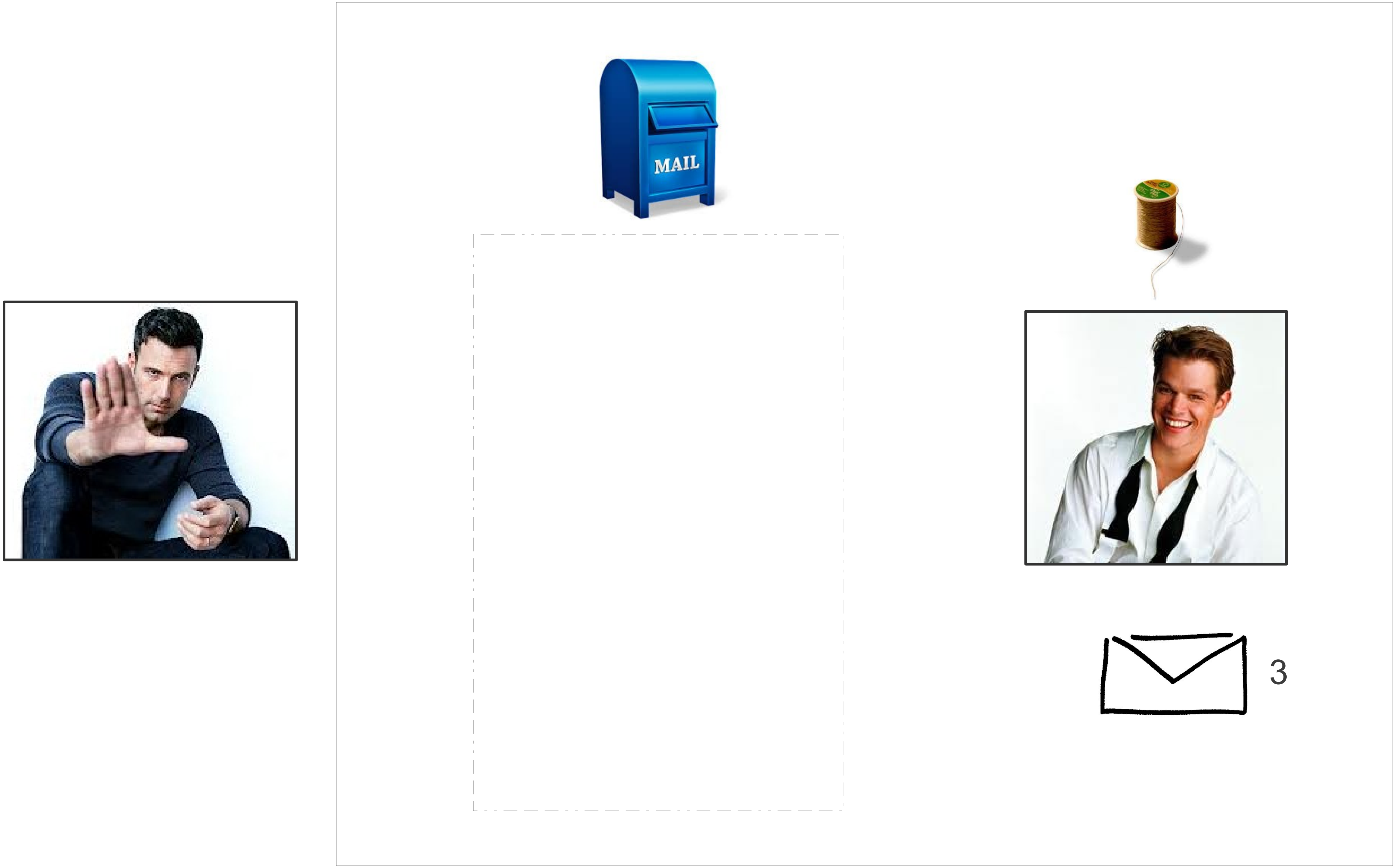
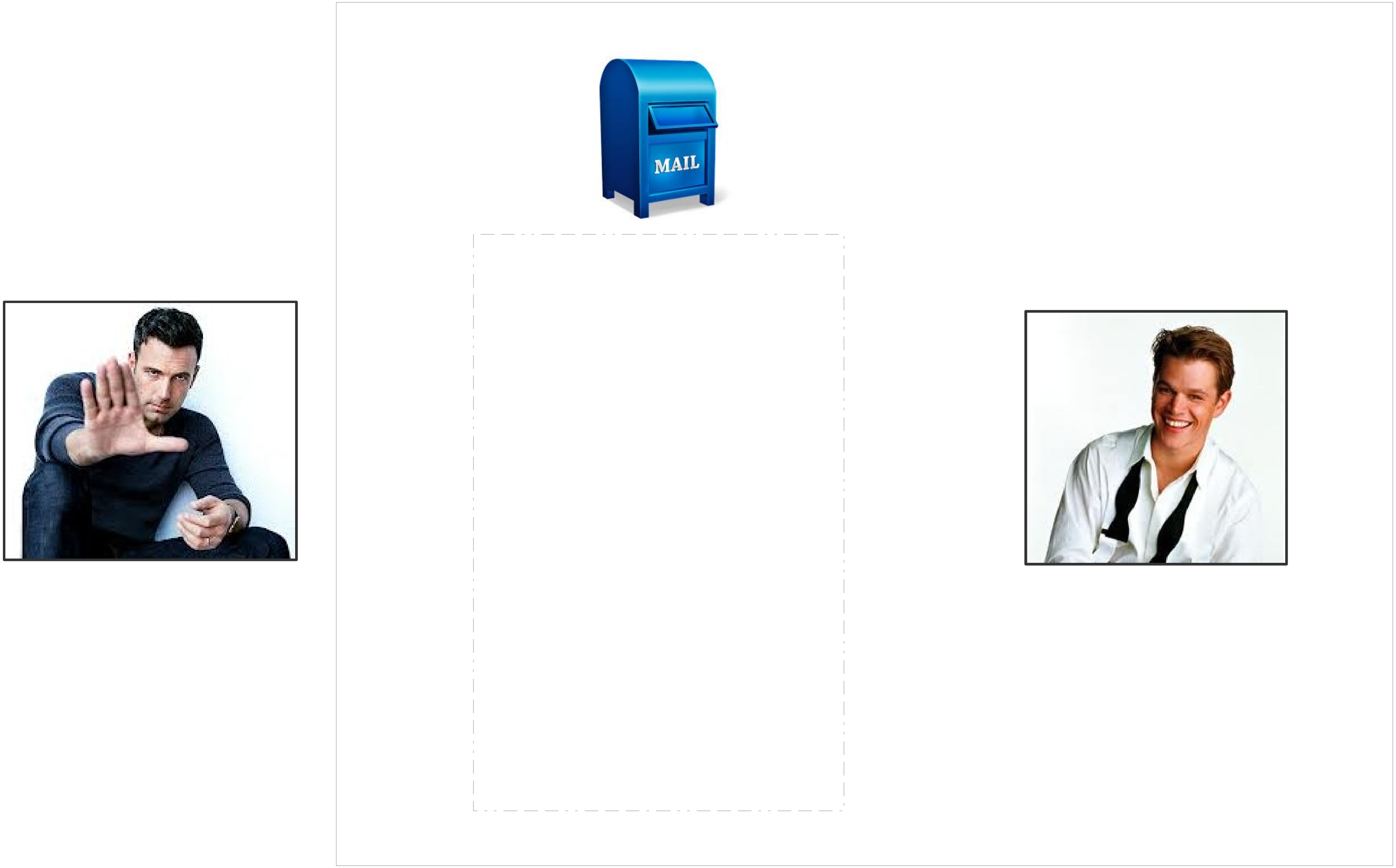


Actor Visual



Actor Visual



Location Transparency

- Actors can be local and remote
- Vertical and Horizontal Growth
- Horizontal Growth driven by remoting systems
- Vertical Growth driven by routers
- All configuration based

Parralelism vs. Concurrency

- Parallelism: A condition that arises when at least two threads are executing simultaneously.
- Concurrency: A condition that exists when at least two threads are making progress. A more generalized form of parallelism that can include time-slicing as a form of virtual parallelism.
- Akka does whatever you tell it to do.

Untyped Actor in Java

```java
public class SimpleActorJava extends UntypedActor {
    LoggingAdapter log = Logging.getLogger
                         (getContext().system(), this);

    public void onReceive(Object message) {
        if (message instanceof String)
            log.info(
                "Received String message in SimpleActorJava {}",
                 message);
        else
            unhandled(message);
    }
}
```

Actor in Scala

```
class SimpleActorScala extends Actor {
   val log = Logging(context.system, this)

   def receive = {
     case "test" ⇒ log.info
                   ("received message test
                     in Simple Actor Scala")
     case _ ⇒ log.info("received unknown message
                        test in Simple Actor Scala")
   }
 }
```

Actor System

- Houses Untyped and Typed Actors
- Tasks are split up and delegated until they become small enough to be handled in one piece.
- The root of all Actors.

Actor System in Java

```
ActorSystem system = ActorSystem.create("MySystem");
```

Actor System in Scala

```
val system = ActorSystem("MySystem")
```

actorOf()

- Creates an actor onto a system
- Creates an actor with a name
- You will receive an `ActorRef` in return
- Using the `ActorRef` a message can be sent to the Actor that the `ActorRef` represents

actorOf() in Scala

```
val system = ActorSystem("MySystem")
val myActor = system.actorOf(Props[SimpleActorScala], name =
                             "simpleActorJava")
```

actorOf() in Java

```
ActorSystem system = ActorSystem.create("MySystem");
ActorRef myActor = system.actorOf(new Props(SimpleActorJava.class),
"simpleActorJava");
```

Sending a message in Scala

```
val system = ActorSystem("MySystem")
val myActor = system.actorOf(Props[SimpleActorScala], name =
                             "simpleActorJava")
myActor ! "Simple Test"
myActor ! "test"
```

Sending a message in Java

```
ActorSystem system = ActorSystem.create("MySystem");
ActorRef myActor = system.actorOf(new
                     Props(SimpleActorJava.class),
                           "simpleActorJava");
myActor.tell("Bueno!"); //Depracated. But works.
```

Demo of Running an Actor

Mad Props

- Specifies the creation of Actors

Mad Props in Java

```
ActorRef myActor = system.actorOf(new
                     Props(SimpleActorJava.class),
                           "simpleActorJava");


ActorRef myActor = system.actorOf(new
                     Props(
    new UntypedActorFactory() {
        public UntypedActor create() {
          return new SimpleActorJava();
    }}), "simpleActorJava");
```

Mad Props in Java

```
Props basic = new Props();

Props withActors = basic.withCreator(
      new UntypedActorFactory() {
          public UntypedActor create() {
             return new MyUntypedActor();
      }
});
```

Mad Props in Scala

```
val props1 = Props.empty
val props2 = Props[SimpleActorScala]
val props3 = Props(new SimpleActorScala)
val props4 = Props(
  creator = { () ⇒ new SimpleActorScala})
val props5 = props1.withCreator(new MyActor)
```

Actor Refs

- A subtype of `ActorRef`
- Intent is to send messages to `Actor` that it represents, proxy.
- `self()` refers to it's own referenc
- Each actor has reference to the `sender()` that sent the message.
- Any reference can be sent to another actor so that actor can send messages to it.

Various Other Types Of References

- Pure Local Actor References
- Local Actor References
- Local Actor References with Routing
- Remote Actor References
- Promise Actor References
- Dead Letter Actor References
- Cluster Actor References

Paths

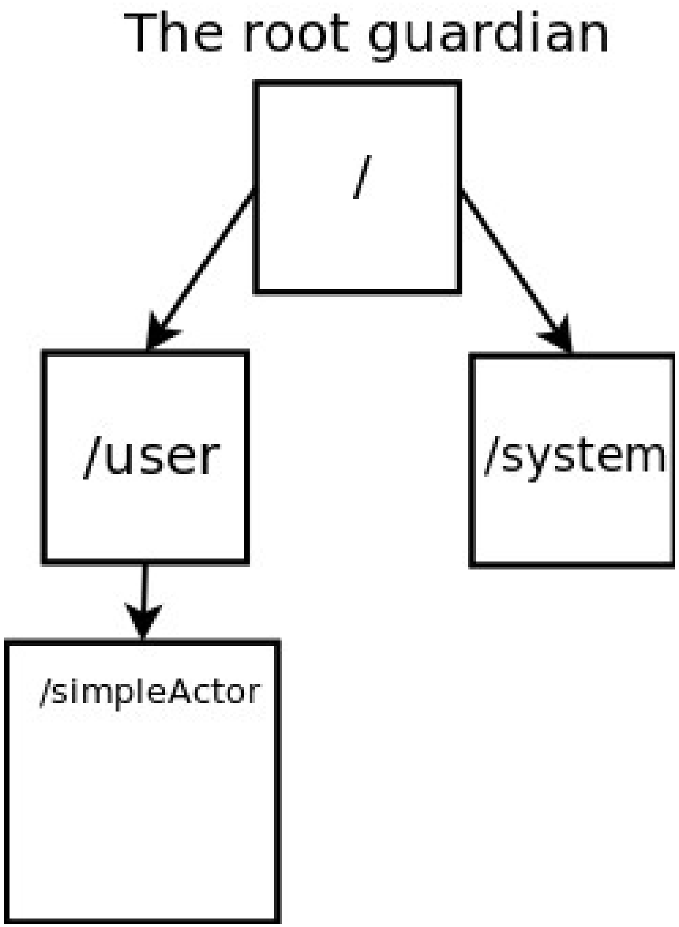
- Can be local or remote
- Can be absolute or relative

```
"akka://my-sys/user/service-a/worker1" // purely local

"akka://my-sys@host.example.com:5678/user/service-b" // local or remote

"cluster://my-cluster/service-c" // clustered (Future Extension)
```

Anatomy of the Actor System



Logical/Physical Paths

- A logical path is seen as if one element is a without recognized if one actor is remote
- A physical path is the direct path to the server and the direct location.

actorFor()

- Actor references can be looked up using `ActorSystem.actorFor` method.
- `ActorSystem.actorFor` can return a local or a remote reference.
- Reference can be used as long as the actor is alive.
- Only ever looks up an existing actor, i.e. does not create one.
- For Local Actor References
  - The actor must exist
  - If not, you will receive an `EmptyLocalActorRef`
- For Remote Actor References
  - A search by path on the remote system will occur.

actorFor()

```
val system = ActorSystem("MySystem")

system.actorOf(Props[SimpleActorScala],
name = "simpleActorJava")

val myActor =
system.actorFor("akka://MySystem/user/simp
leActorJava")

myActor ! "Simple Test"
```

Typed Actor

- POJO and Actor Hybrids
- Consists of Two Parts, a public interface, and an implementation
- Cannot use `become`/`unbecome` to the type.
- Proxied
- Use Sparingly

Typed Actor in Java

```
public class Person { private String firstName; private String
lastName; //bunch of junk}


public interface RegistrationActor {
    public void registerPerson(Person person);

    public int getCount();
}
```

Typed Actor in Java

```
public class RegistrationActorImpl
      implements RegistrationActor, TypedActor.PreStart {

      private List<Person> people;

      @Override
      public void preStart() {
          this.people = new ArrayList<>();
      }

      @Override
      public void registerPerson(Person person) {
          this.people.add(person);
      }

      @Override
      public int getCount() {
          return people.size();
      }
  }
```

Running the Typed Actor in Java

```
ActorSystem system = ActorSystem.create("MySystem");
RegistrationActor registrationActor =
      TypedActor.get(system).typedActorOf(
            new
      TypedProps<RegistrationActorImpl>(RegistrationActor.class,
RegistrationActorImpl.class),"registrationActor");
      registrationActor.registerPerson(new Person("Abraham",
"Lincoln"));
```

Typed Actor in Scala

```
case class Person(firstName: String, lastName: String)

trait RegistrationActor {
  def registerPerson(person: Person)

  def getCount: Int
}

class RegistrationActorImpl extends RegistrationActor {
  var list = List[Person]()

  def registerPerson(person: Person) {
    list = list :+ person
  }

  def getCount: Int = list.size
}
```

Running the Typed Actor in Scala

```
val system = ActorSystem("MySystem")
val registrationActor =
TypedActor(system).typedActorOf(TypedProps[RegistrationActorImpl
], name = "registrationActor")
registrationActor.registerPerson(Person("Cesar", "Chavez"))
```

Demo of Typed Actors!

self() , sender(), context

Dead Letters Mailbox

- `/dev/null` for Akka!
- Where bad letters go to die.
- If a message cannot be delivered due to non existing actor, actor death, or other reasons, the message will be placed in the dead letters mailbox.
- To retrieve all dead letters pluck it from the event stream

EventStream

- Pub/Sub Stream of Events
- Both System and User Generated
- Subscribers are `ActorRefs`
- Channels are Classes and Events
- `EventStreams` employ SubchannelClassification (you will receive message of that type or subtype)
- The event stream is the main event bus of each actor system

Demo: What is going into the Dead Letters?

Futures and Promises

- Data structure used to retrieve the result of some concurrent operation.
- It can be retrieved “synchronously” (blocked) or “asynchronously” (unblocked)
- Futures need something called an `ExecutionContext` in scope in order to work

Futures by themselves, blocking

```
implicit val executionContext =
ExecutionContext.fromExecutorService(Executors.newFixedThreadPool(1
2))

val future = Future {
   "Hello" + " " + "World"
}

implicit val timeout = Timeout(5 seconds)

println("Step 1")
val result = Await.result(future, timeout.duration) //blocking
println("Step 2: " + result)
```

Futures by themselves, nonblocking

```
implicit val executionContext =
ExecutionContext.fromExecutorService(Executors.newFixedThreadPool(1
2))

val future = Future {
  "Hello" + " " + "World"
}

future foreach (x => println("****" + x)) //asynchonous
println("running1")
println("running2")
println("running3")
```

Demo: Futures & Asking in Scala

Configuration

HOCON ANGRY!

HOCON

"Human-Optimized Config Object Notation"

HOCON

```
db.default.driver=org.h2.Driver
db.default.url="jdbc:h2:mem:play"
db.default.user=sa
db.default.password=""
```

HOCON

```
db {
  default.driver=org.h2.Driver
  default.url="jdbc:h2:mem:play"
  default.user=sa
  default.password=""
}
```

HOCON

```
db {
  default{
    driver=org.h2.Driver
    url="jdbc:h2:mem:play"
    user=sa
    password=""
  }
}
```

application.conf

- Contains settings.
- Based on HOCON
- Can be set up in parts

Demo: Remote Actors

Demo: Routers

Demo: Becoming & Unbecoming

Thank You!