Above the Clouds: Introducing Akka

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The problem

It is way too hard to build:

1. correct highly concurrent systems
2. truly scalable systems
3. fault-tolerant systems that self-heals

...using “state-of-the-art” tools

Introducing akka

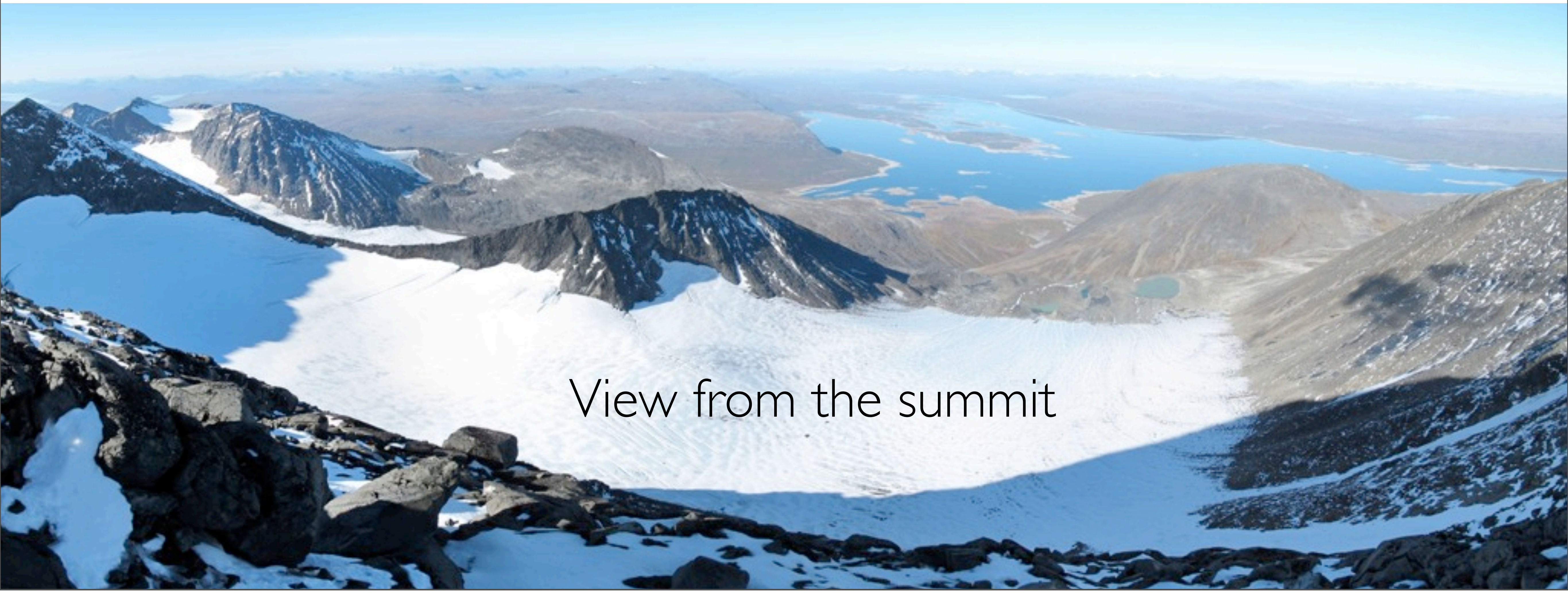
Introducing akka

Akka (Áhkká):

The name comes from the goddess in the Sami mythology that represented all the wisdom and beauty in the world.

It is also the name of a beautiful mountain in Laponia in the north part of Sweden

Introducing akka

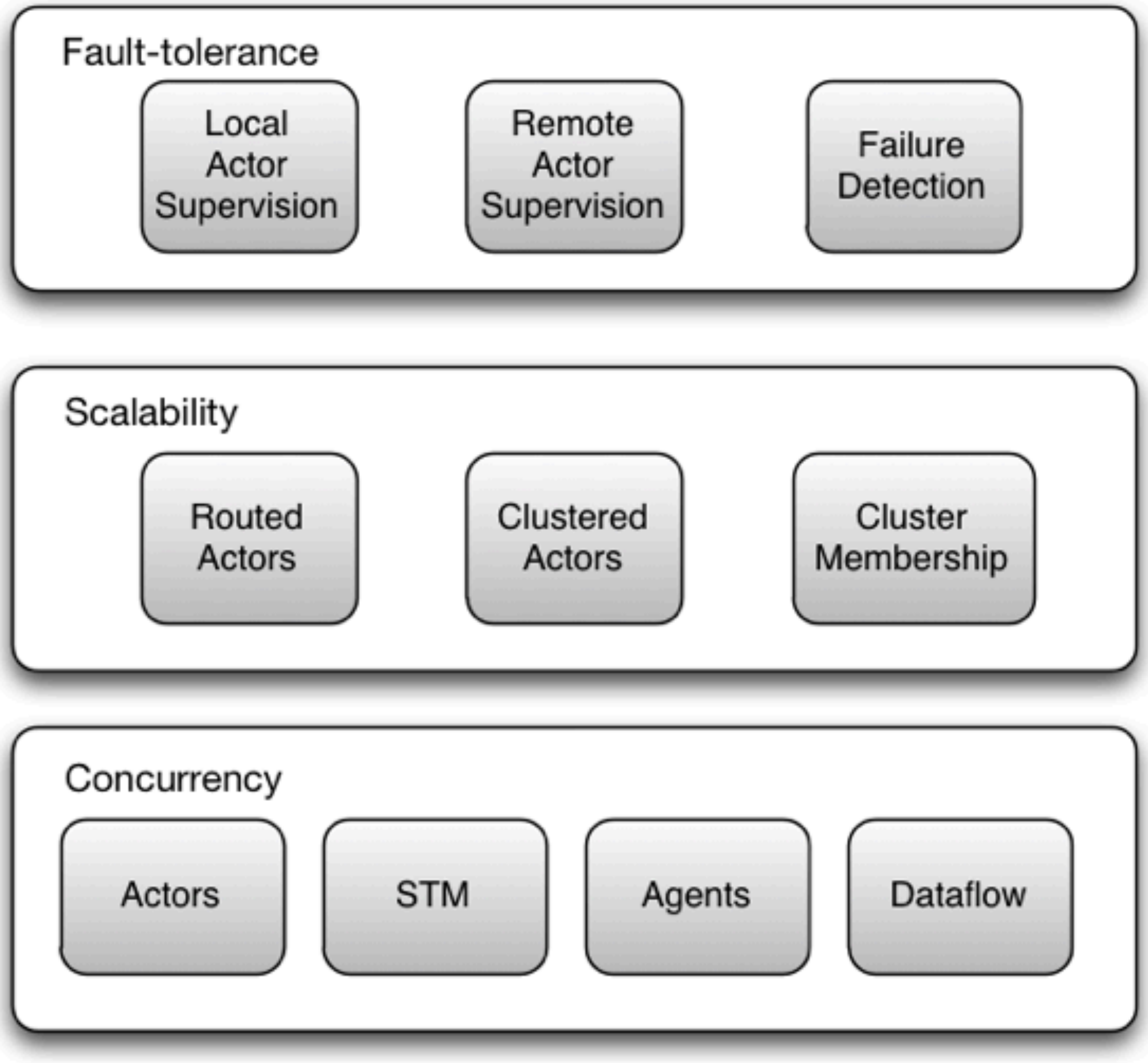


Vision

Simpler

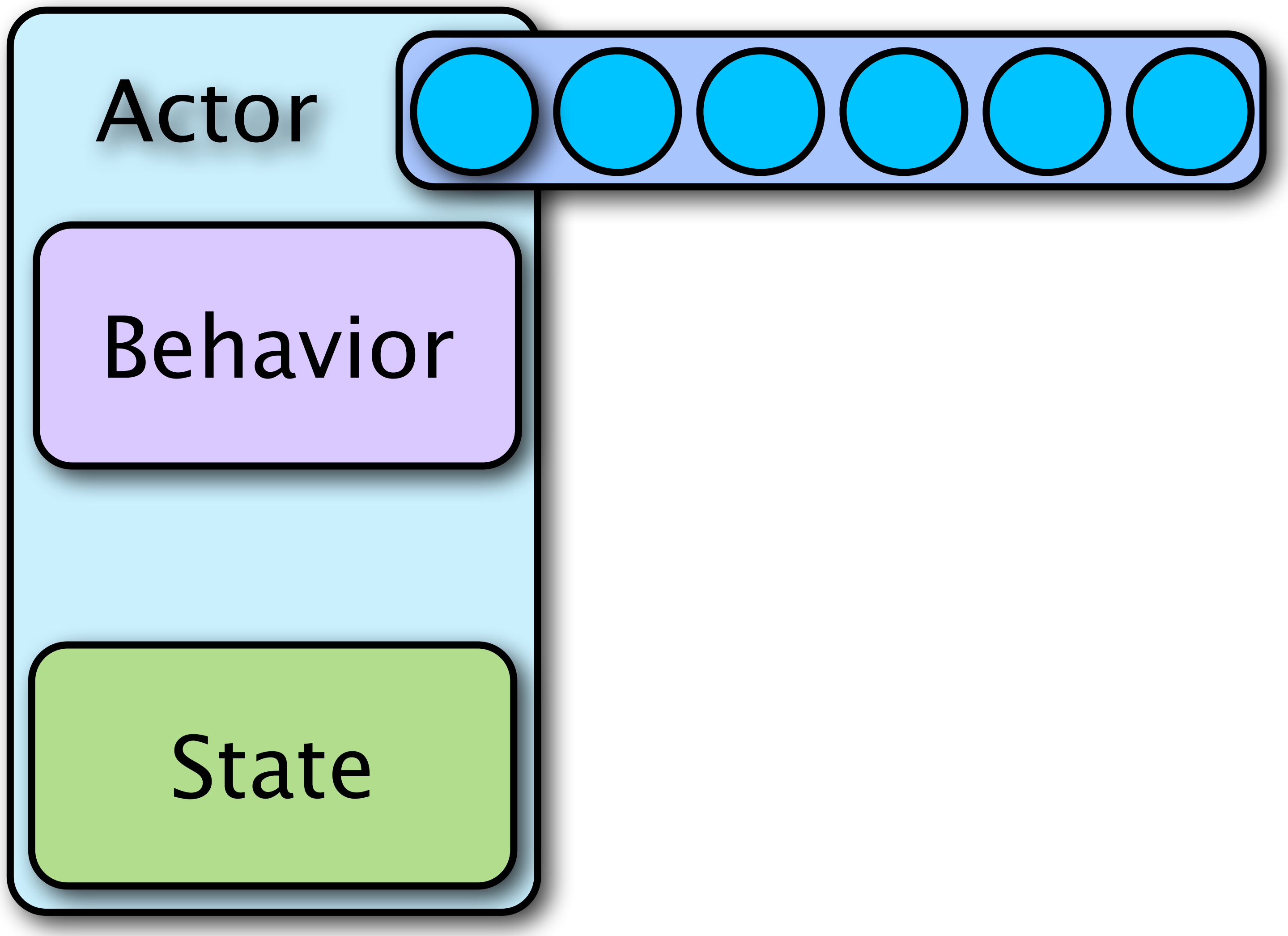
- Concurrency
- Scalability
- Fault-tolerance

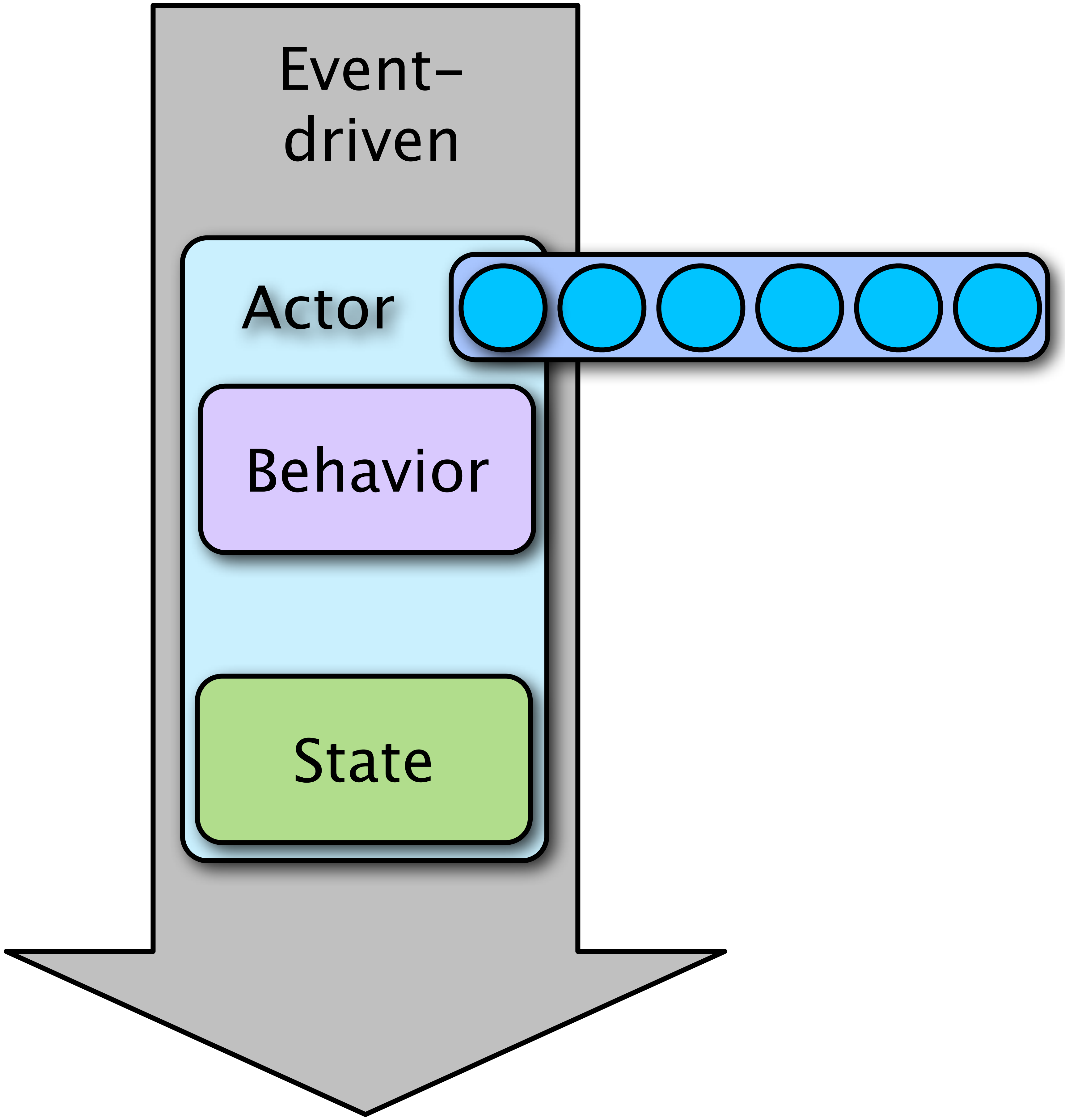
THE TOOLBOX...



CORE SERVICES

The Actor...


Actor
Behavior
State


Event-
driven
Actor
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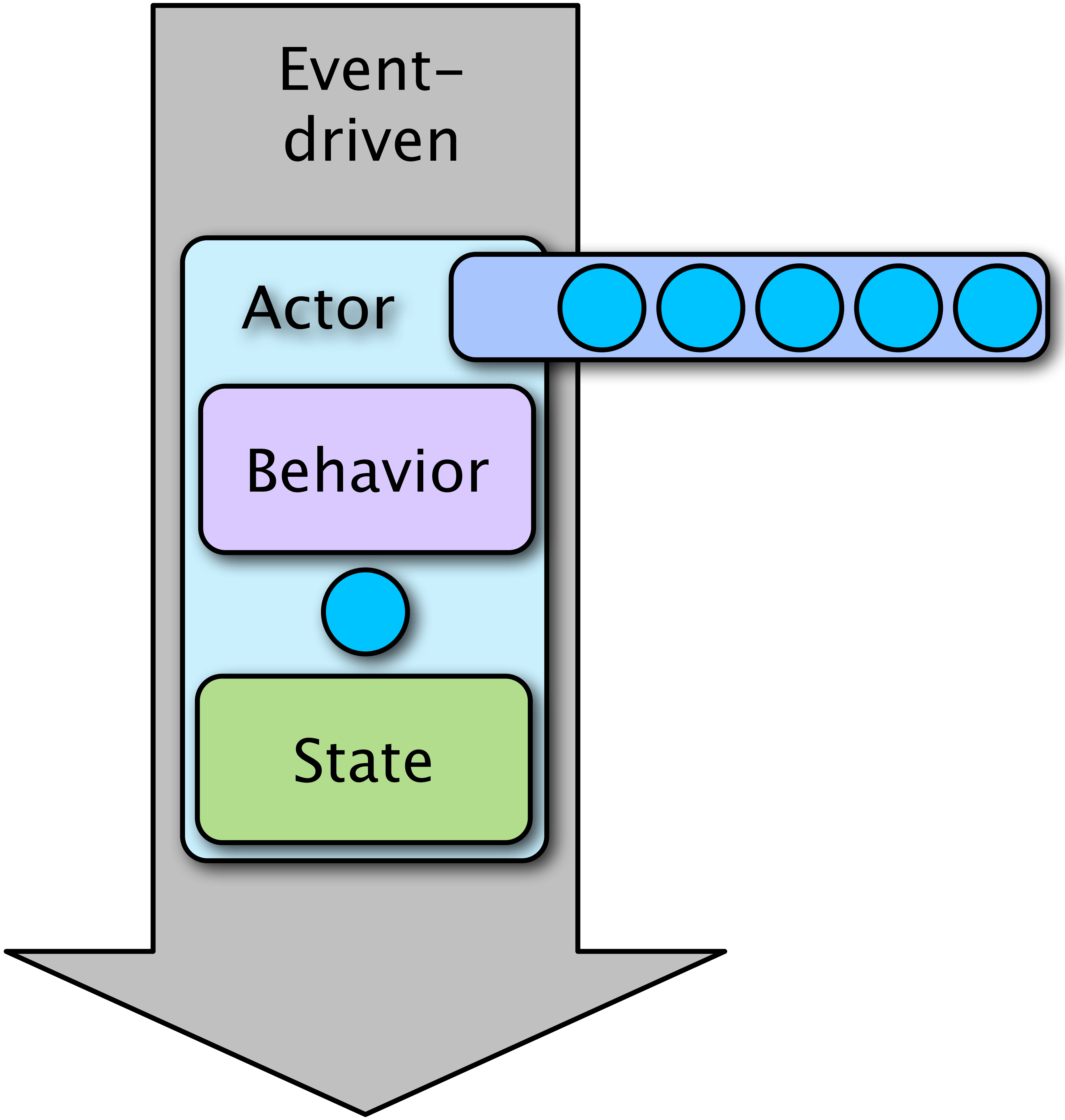
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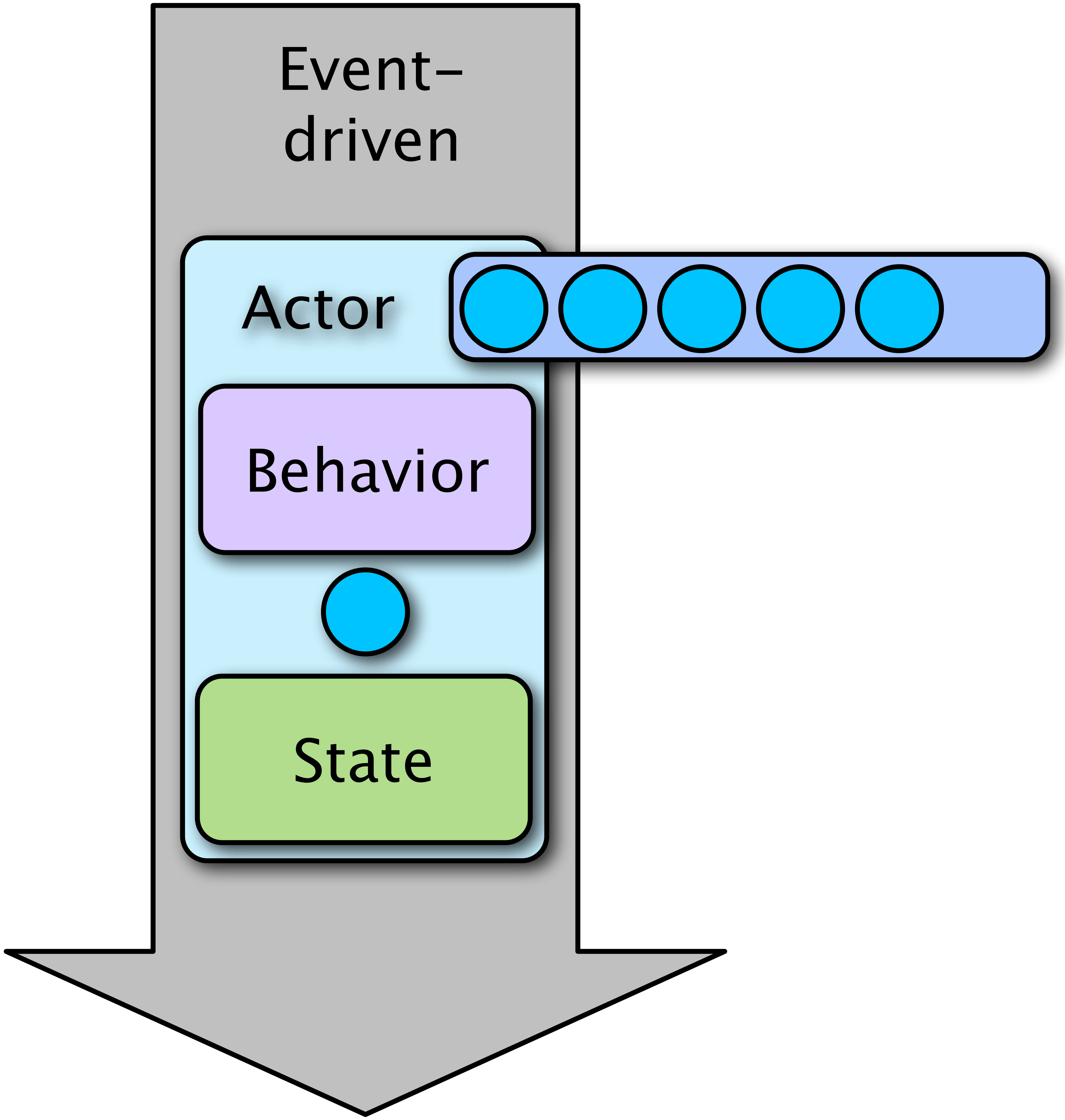
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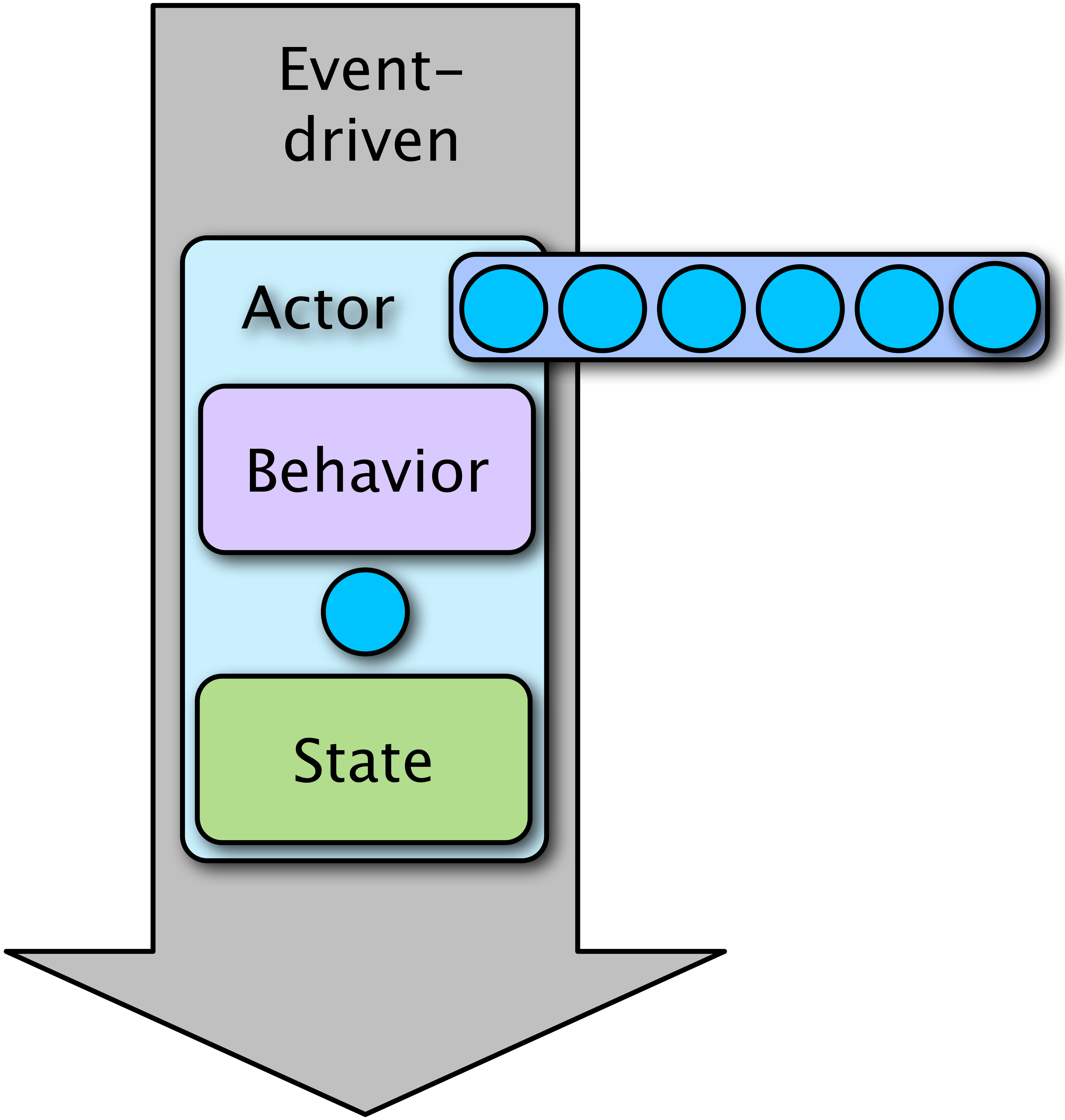
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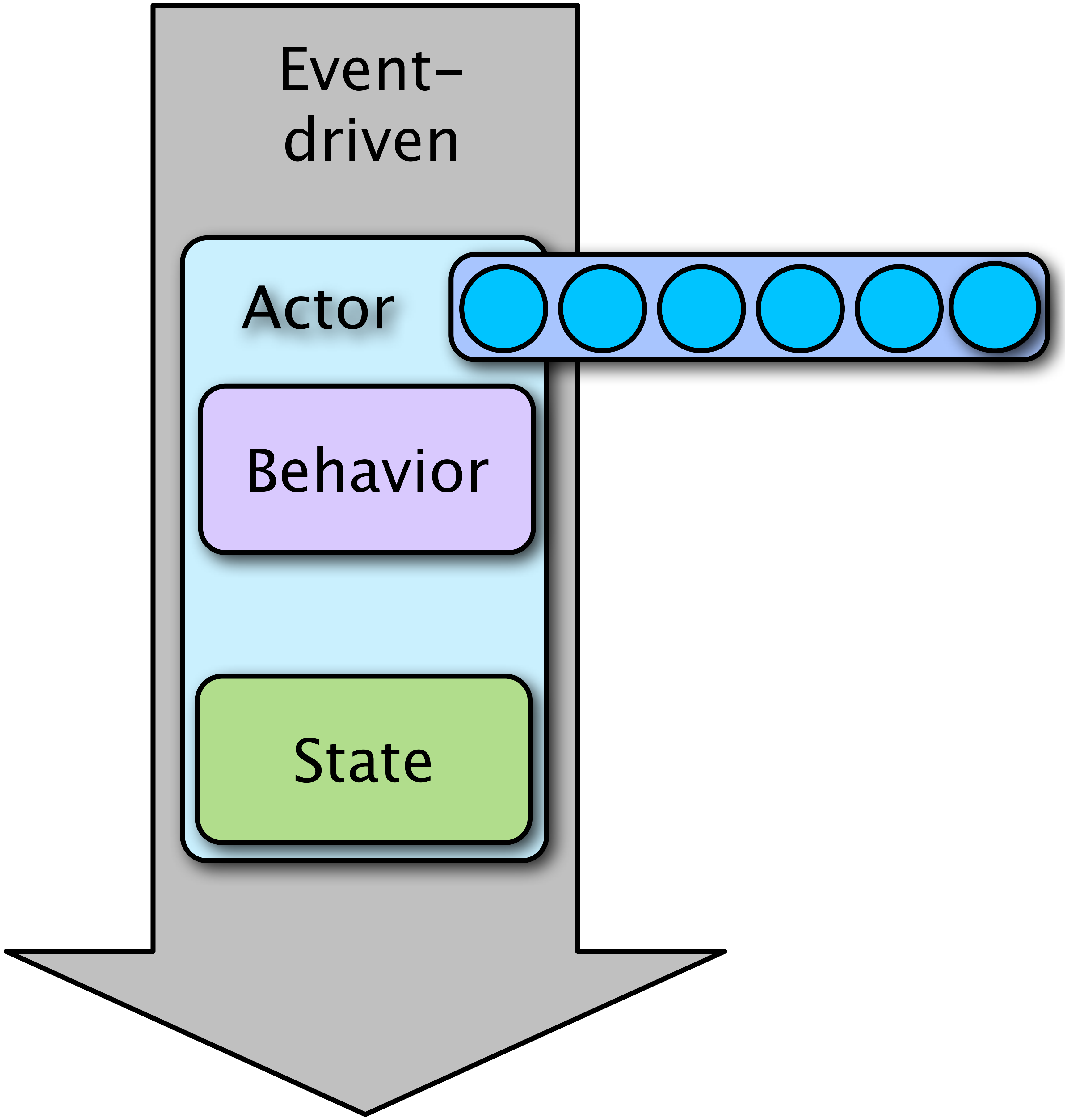
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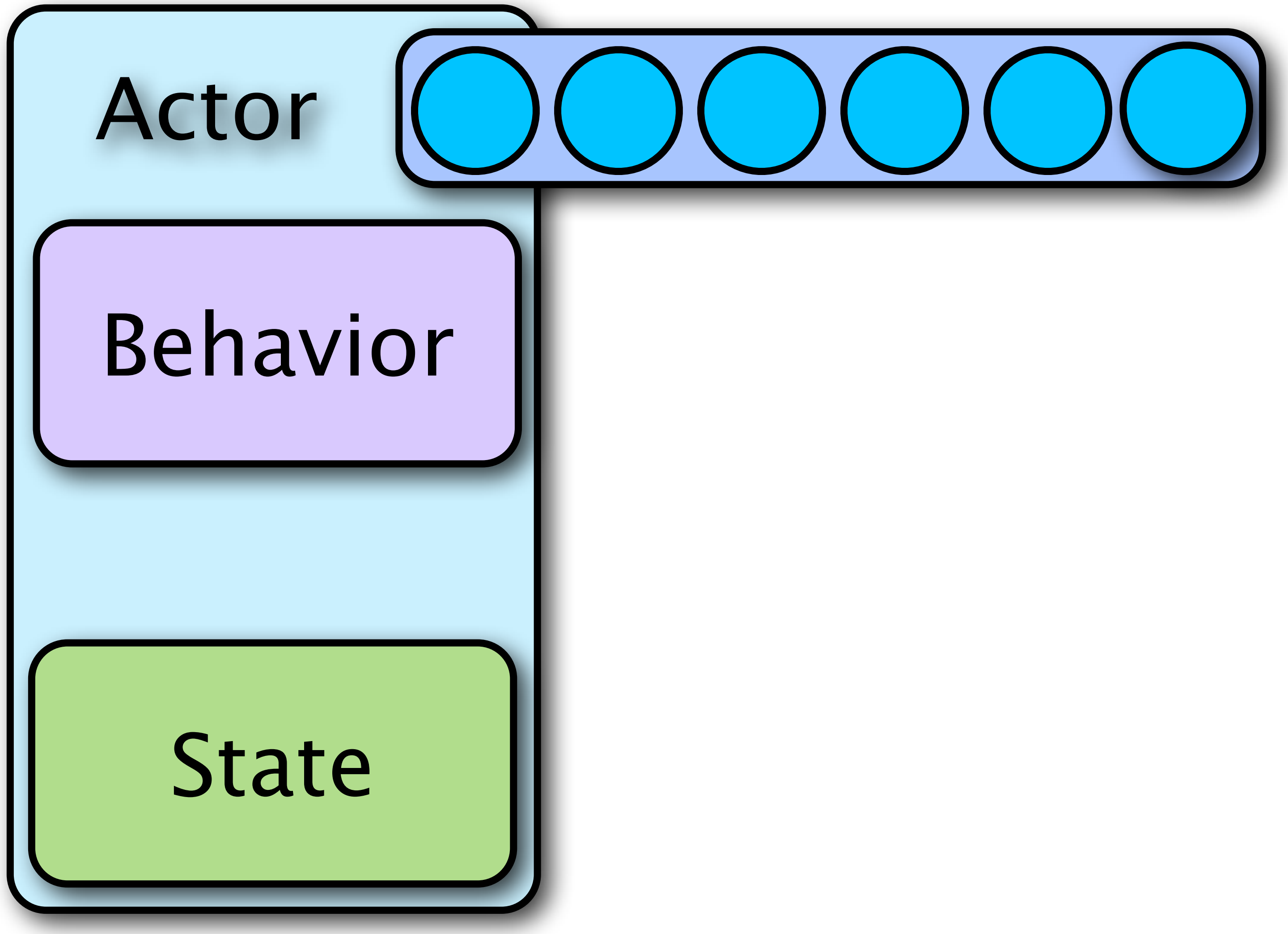
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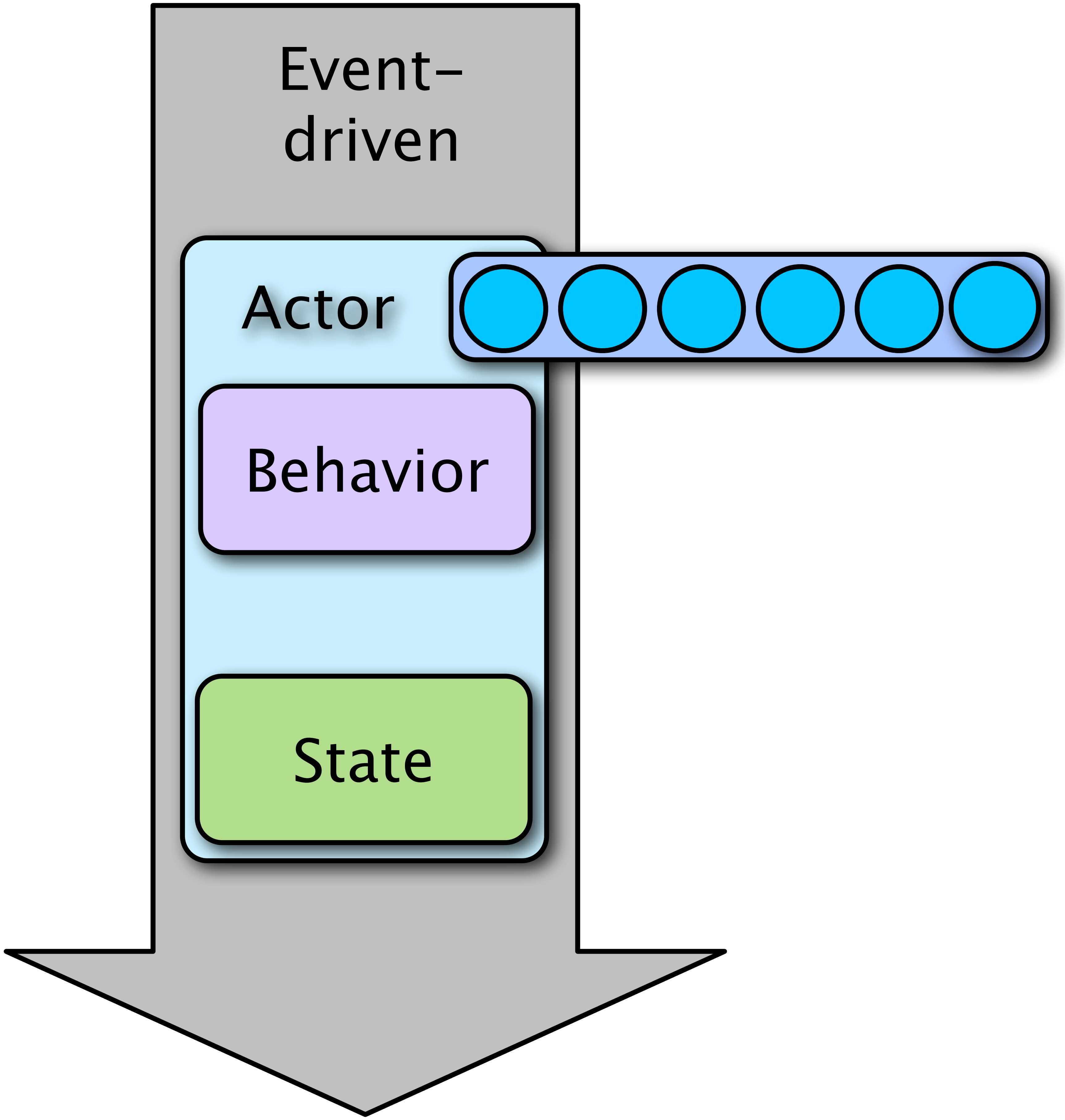

Event-
driven
Actor
Behavior
State

Akka Actors

Let the hakking begin!

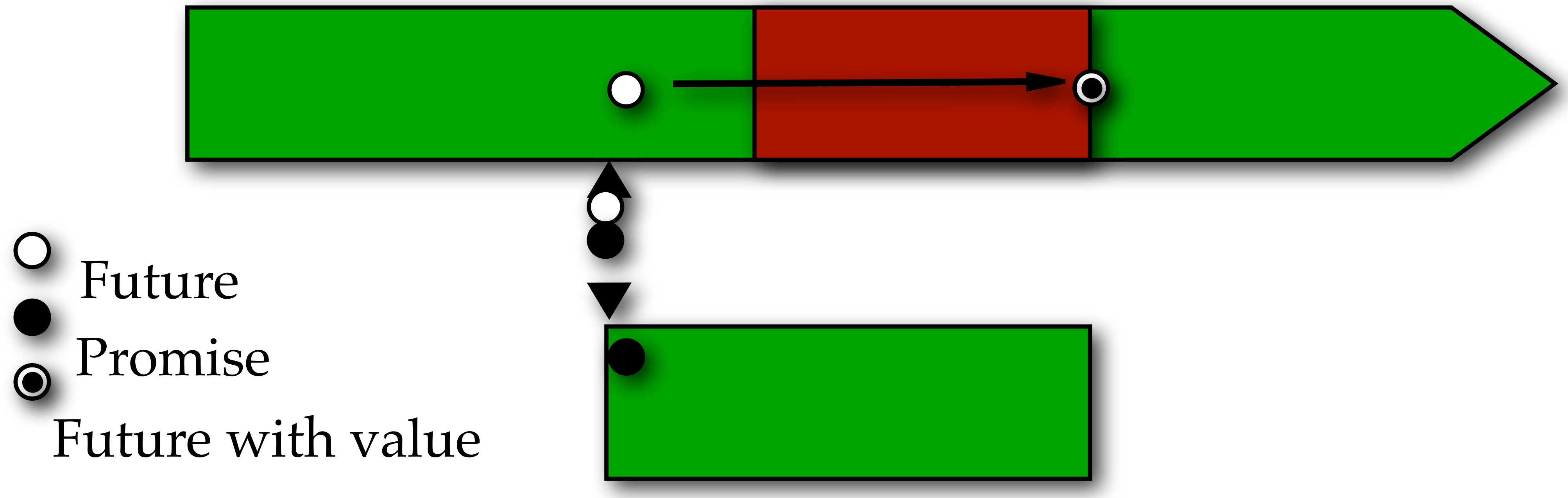
Take aways

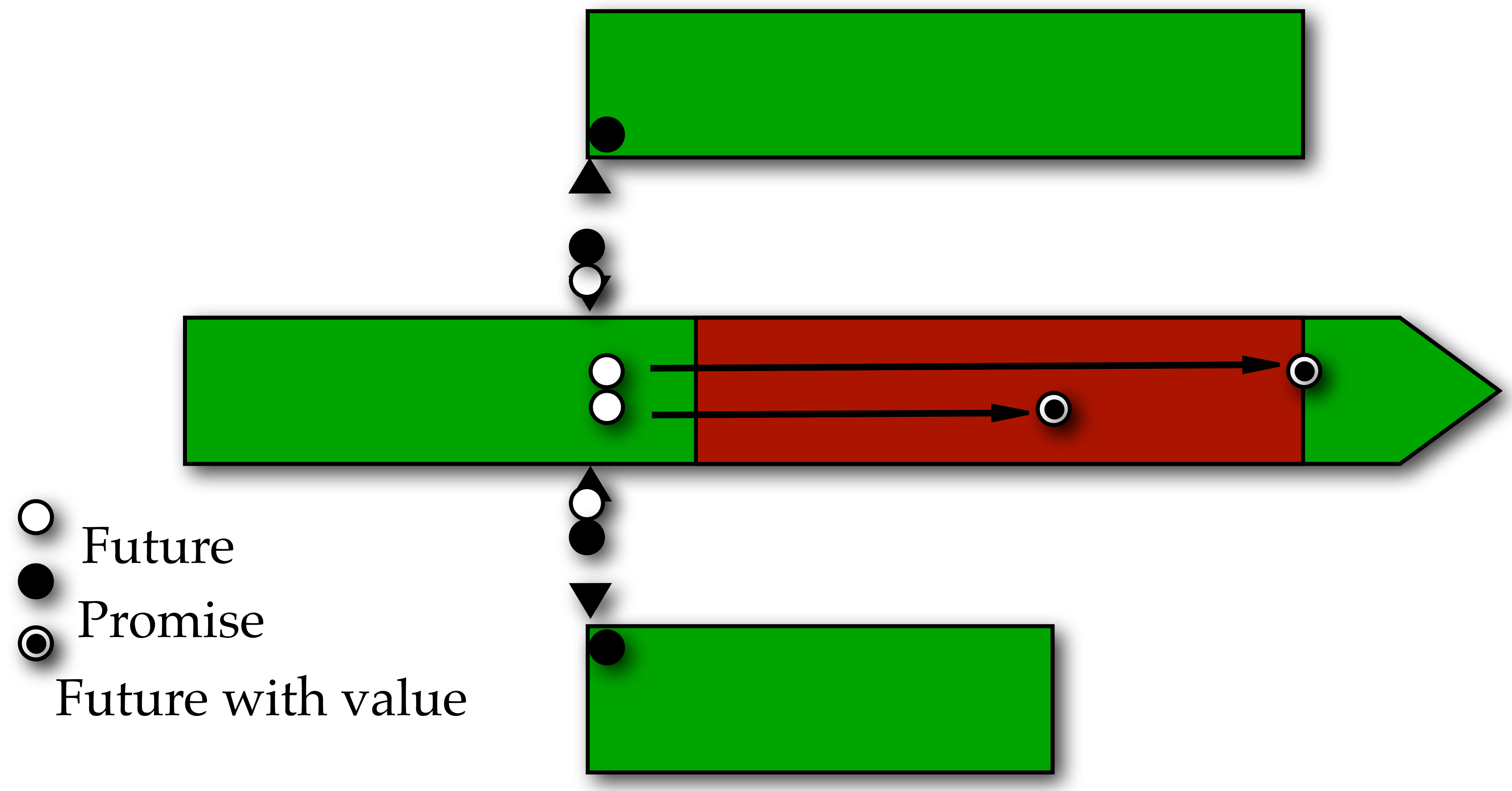
- Create an Actor: class AnActor extends Actor
- Start an Actor: actorOf[AnActor].start()
- Safe
  - Encapsulated state
  - One message at a time
- Asynchronous:
  - bang (!)
- Reply:
  - self.reply (m)
  - actor ? “message”

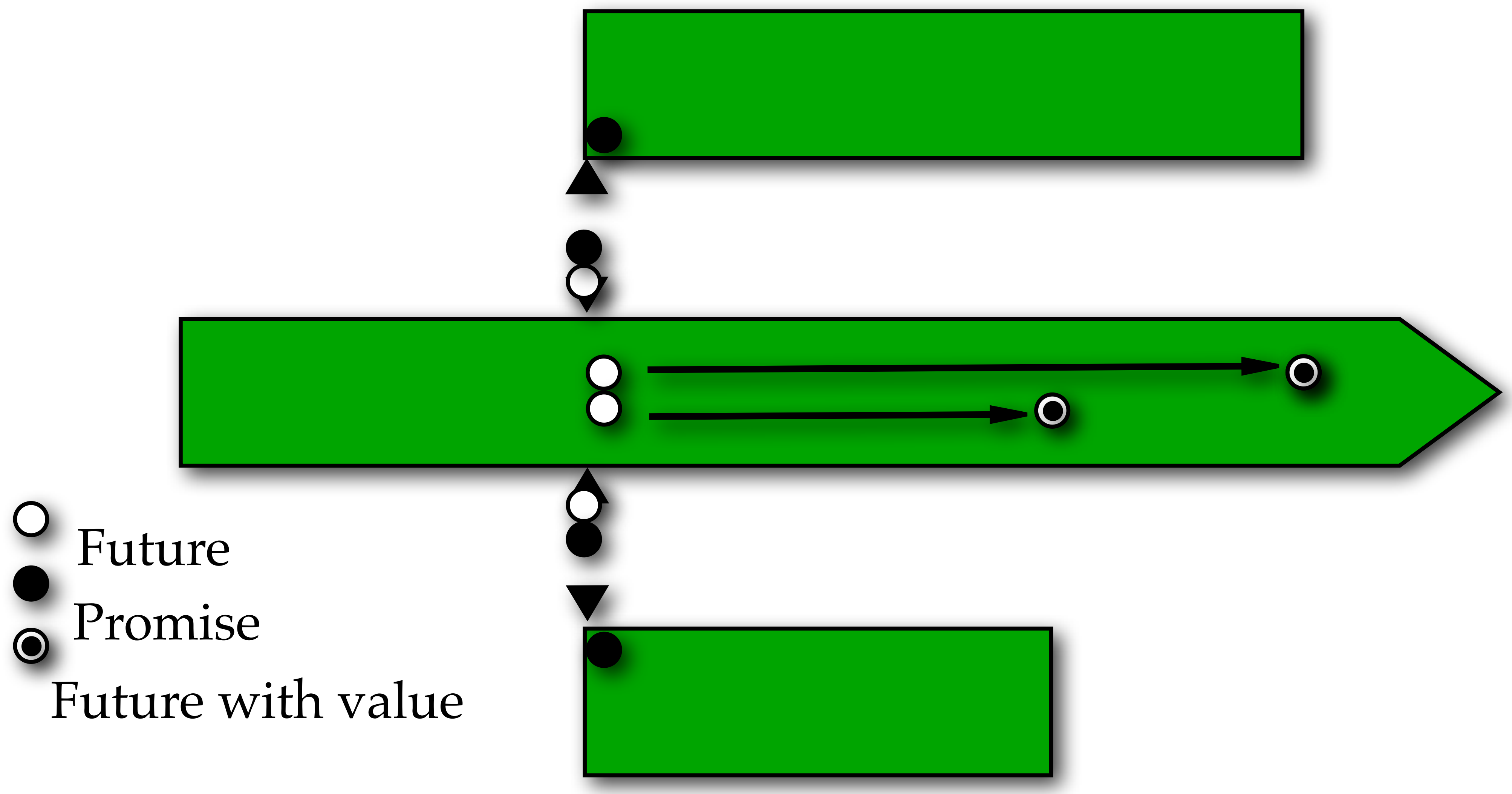
using

Akka Futures

without blocking


○ Future
● Promise
◉ Future with value


Future
Promise
Future with value


Future
Promise
Future with value

Take aways

- Use Futures when you need something in the Future without blocking
- Use onComplete
- Compose Futures
  - for - comprehensions
  - Check out the Futures utilities (firstCompletedOf and much, much more)

Remote Actors

Another snippet of code...

New Remote Actors

Name

```
appContext.actorOf[MyActor](“my-service”)
```

Bind the actor to a name

Deployment

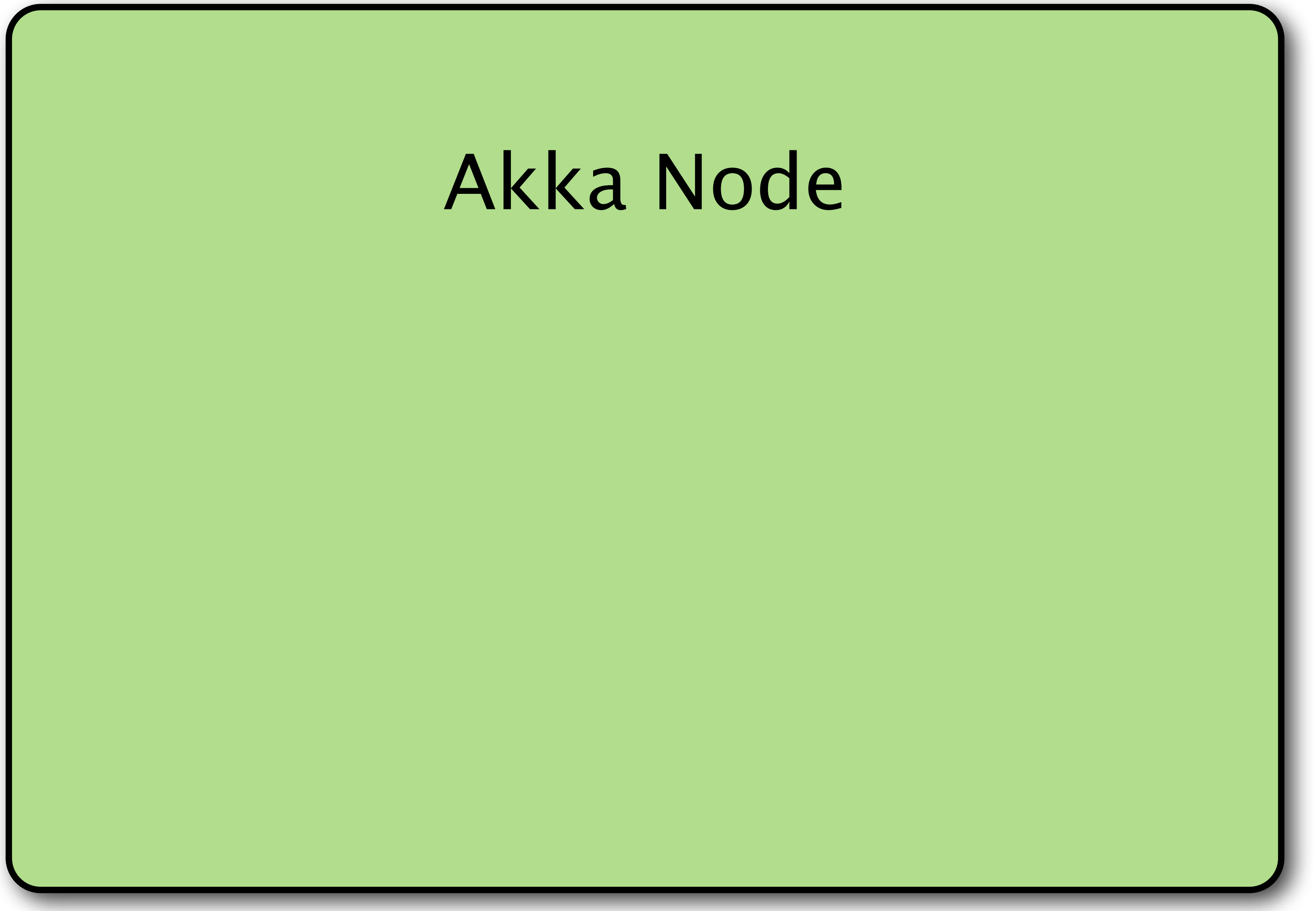
- Actor name is virtual and decoupled from how it is deployed
- If no deployment configuration exists then actor is deployed as local
- The same system can be configured as distributed without code change (even change at runtime)
- Write as local but deploy as distributed in the cloud without code change
- Allows runtime to dynamically and adaptively change topology

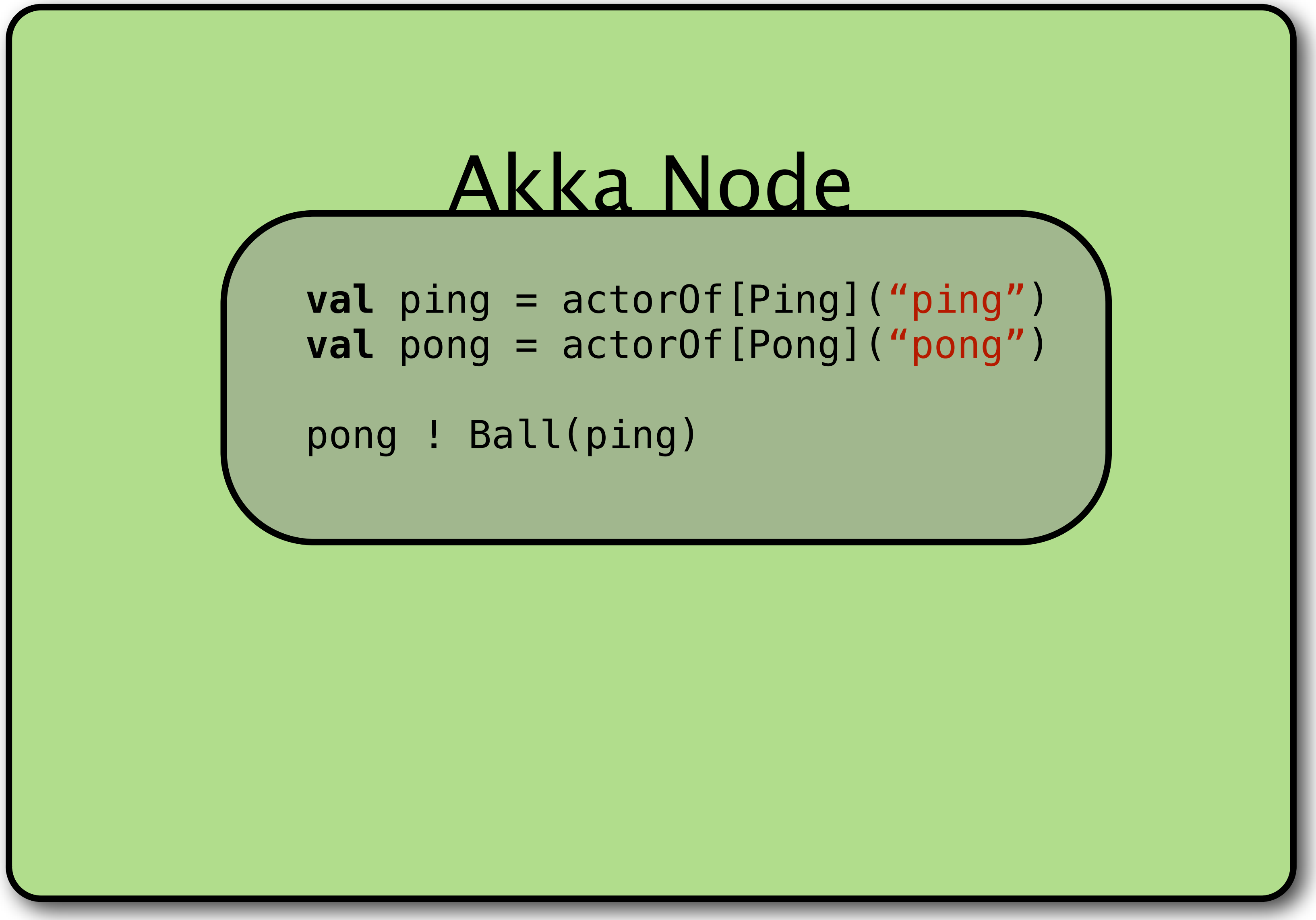
Deployment configuration

```
akka {
  actor {
    deployment {
      /path/to/my-service {
        router = "round-robin"
        nr-of-instances = 3
        remote {
          nodes = ["wallace:2552", "gromit:2552"]
        }
      }
    }
  }
}
```

The runtime provides

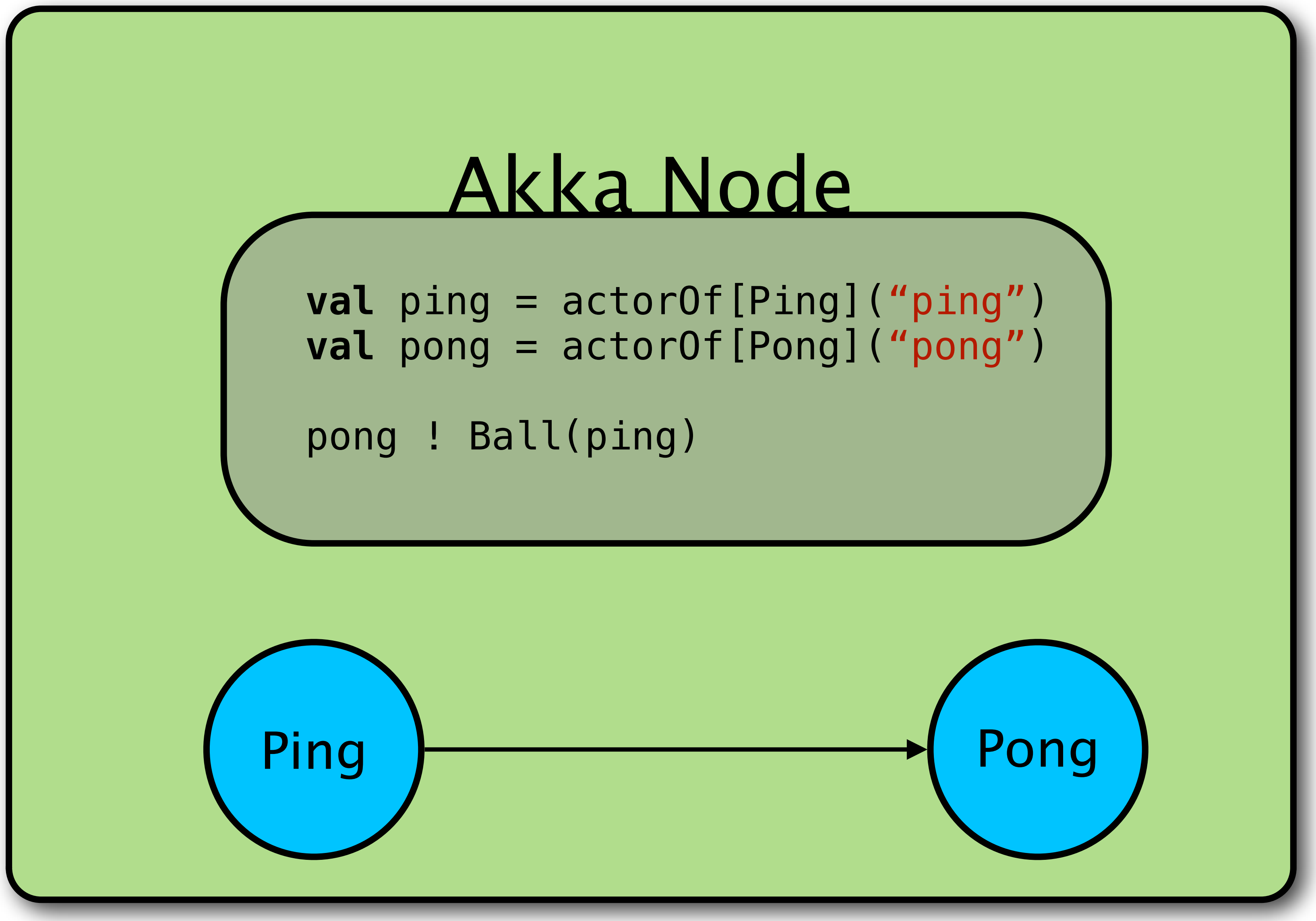
- Decentralized P2P gossip-based cluster membership (dynamo-style w/ vector clocks, hand-off on fail-over etc.)
- Automatic adaptive cluster rebalancing
- Automatic cluster-wide deployment
- Highly available configuration service
- Automatic replication with automatic fail-over upon node crash
- Transparent and user-configurable load-balancing
- ...and much more


Akka Node



```
val ping = actorOf[Ping](“ping”)
val pong = actorOf[Pong](“pong”)

pong ! Ball(ping)
```



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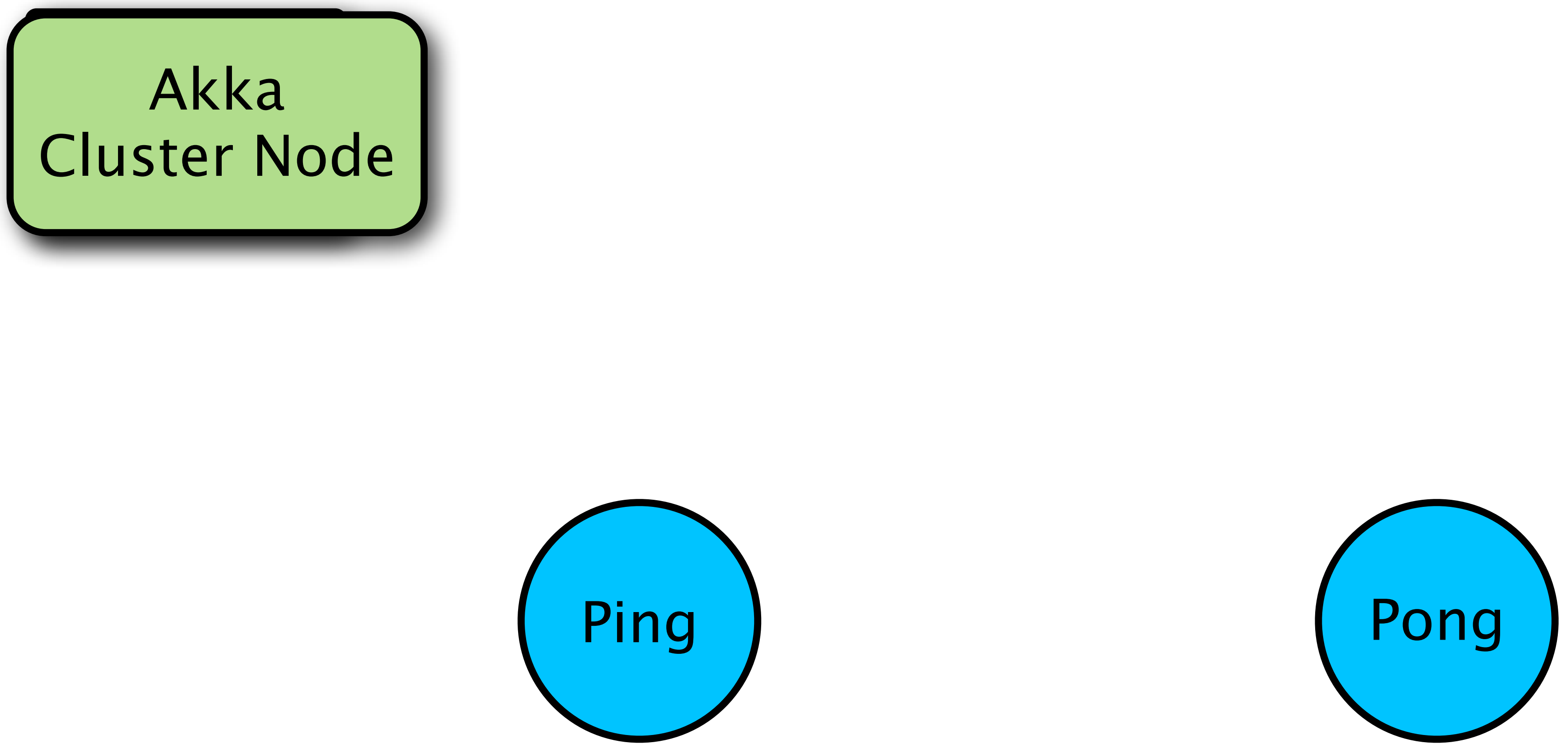
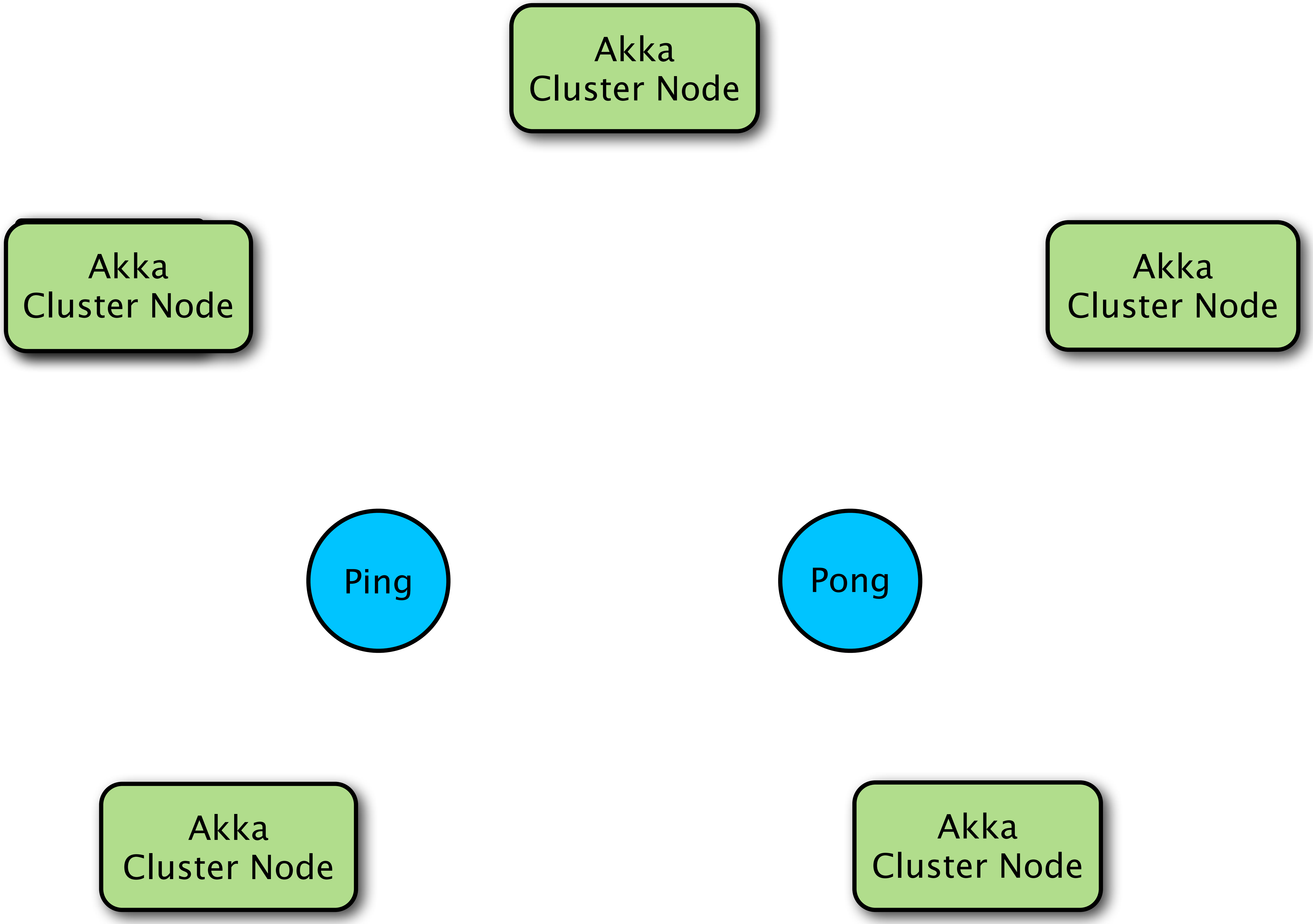

Akka
Cluster Node
Ping
Pong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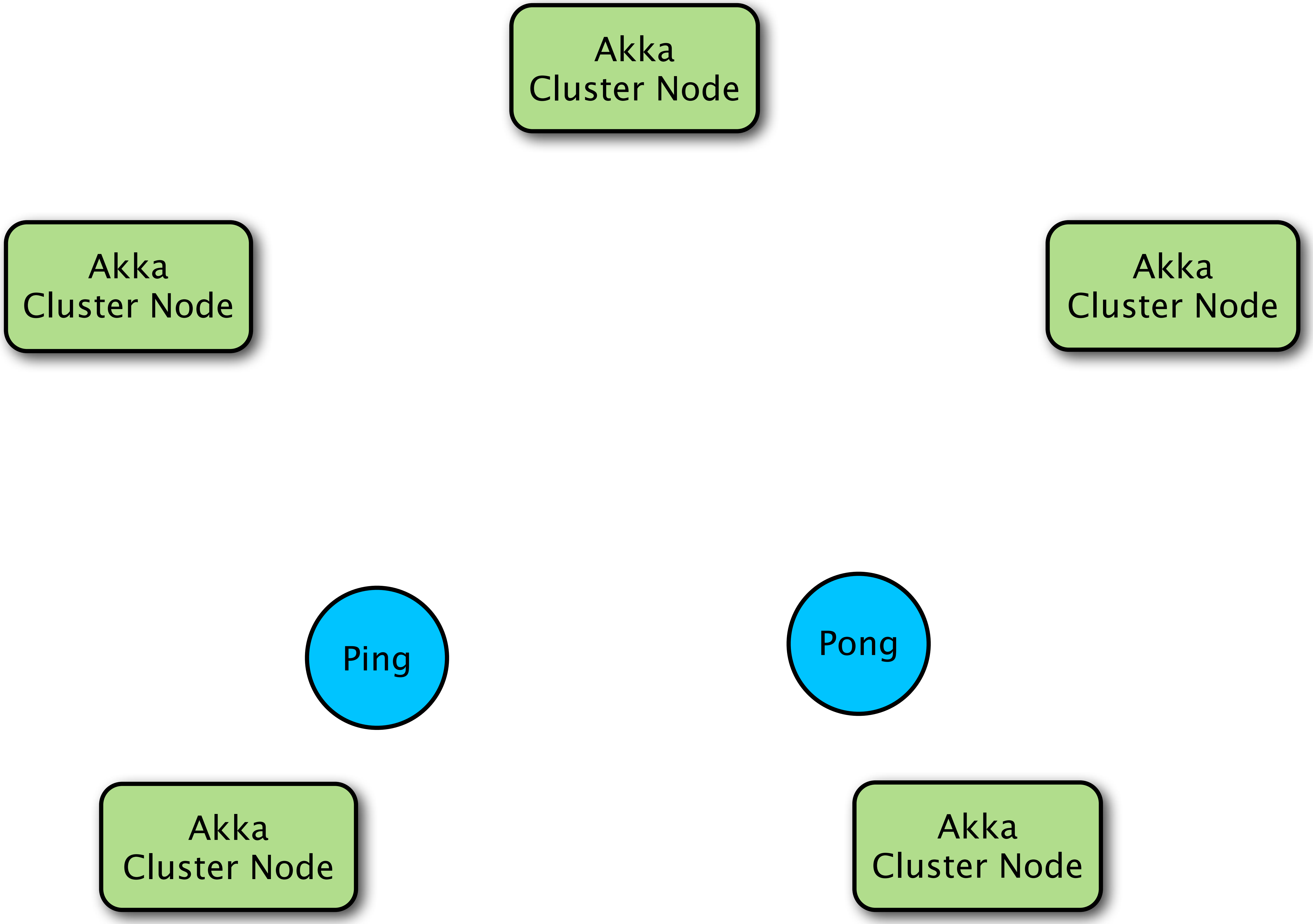
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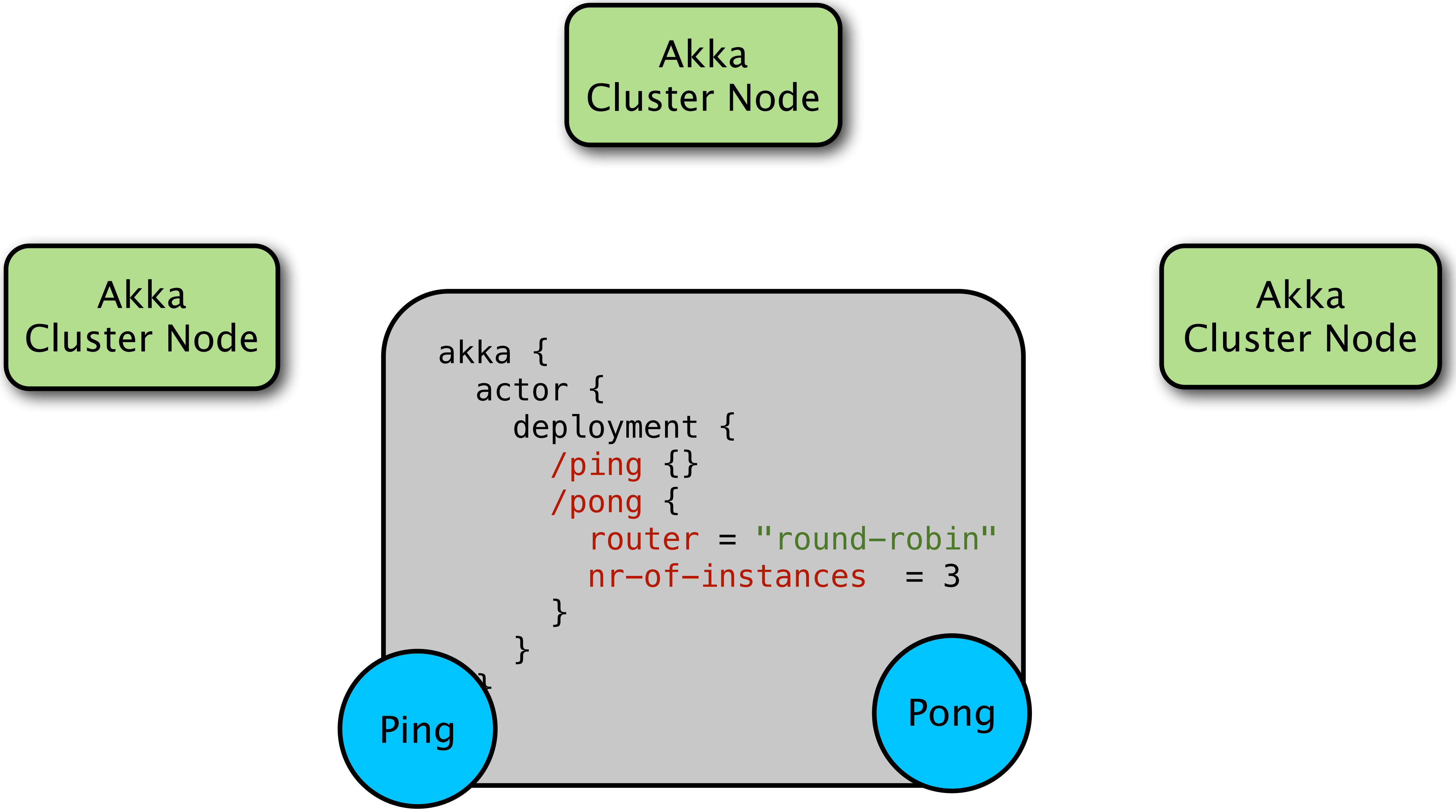

```
akka {
  actor {
    deployment {
      /ping {}
      /pong {
        router = "round-robin"
        nr-of-instances  = 3
      }
    }
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```

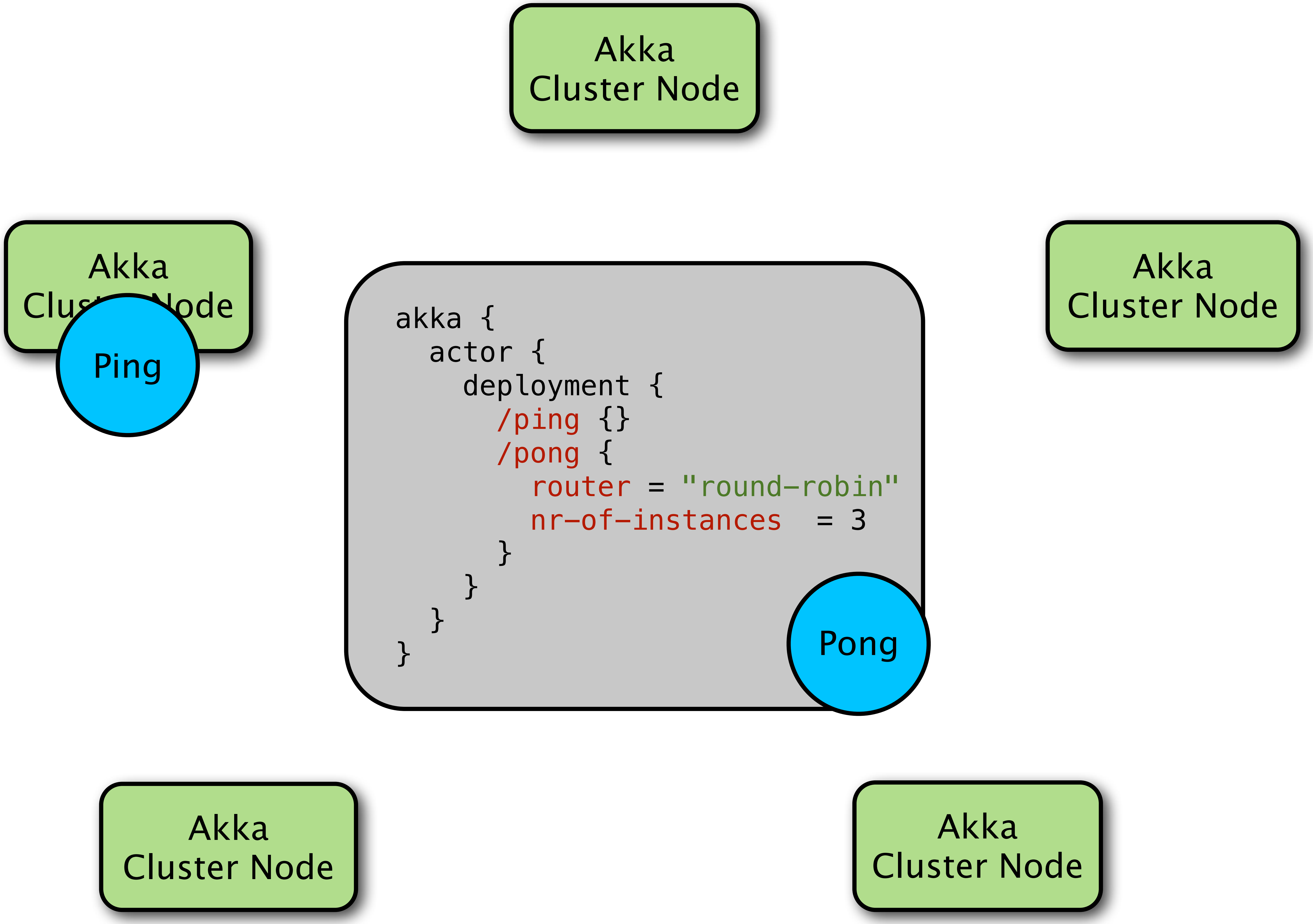

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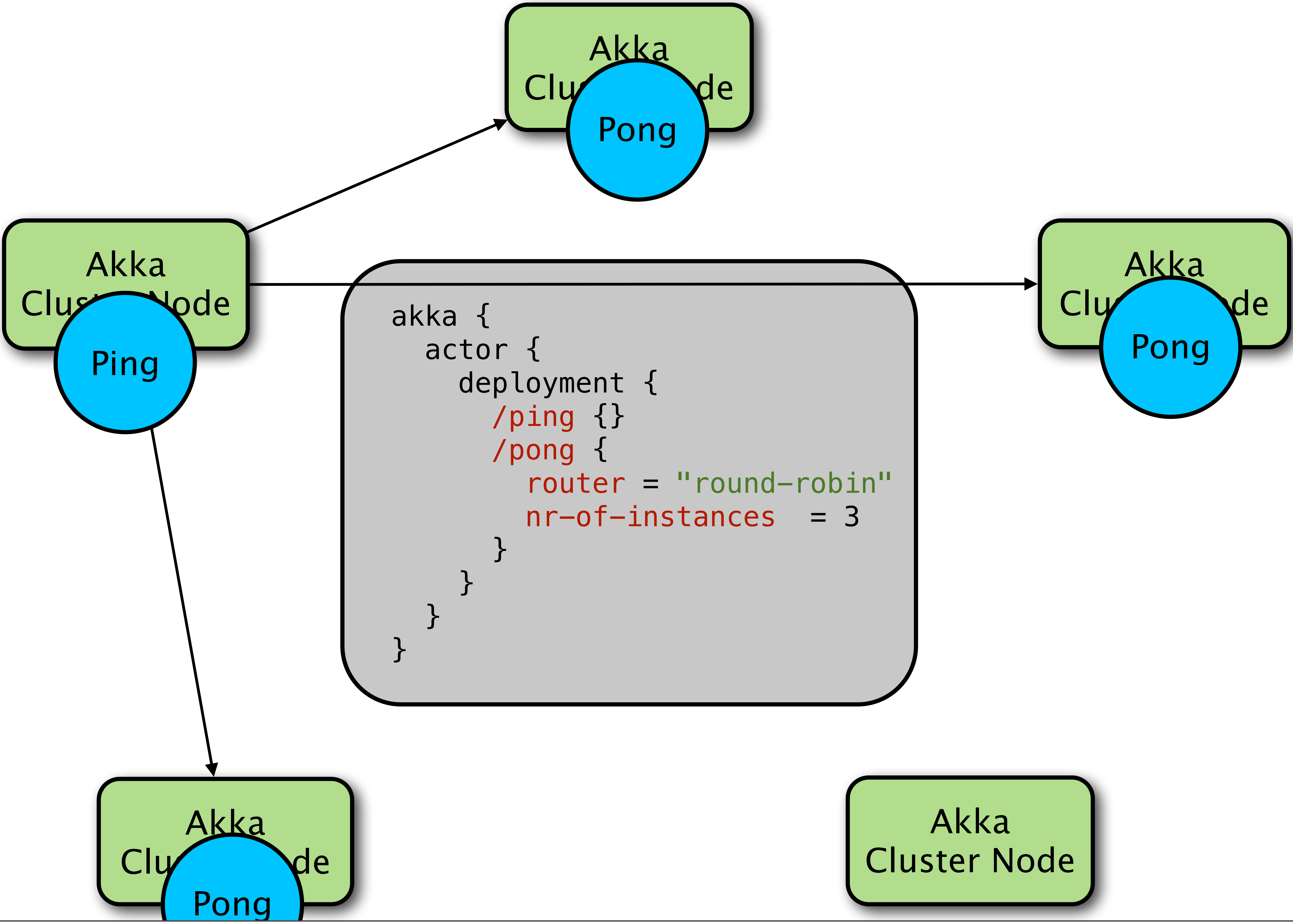

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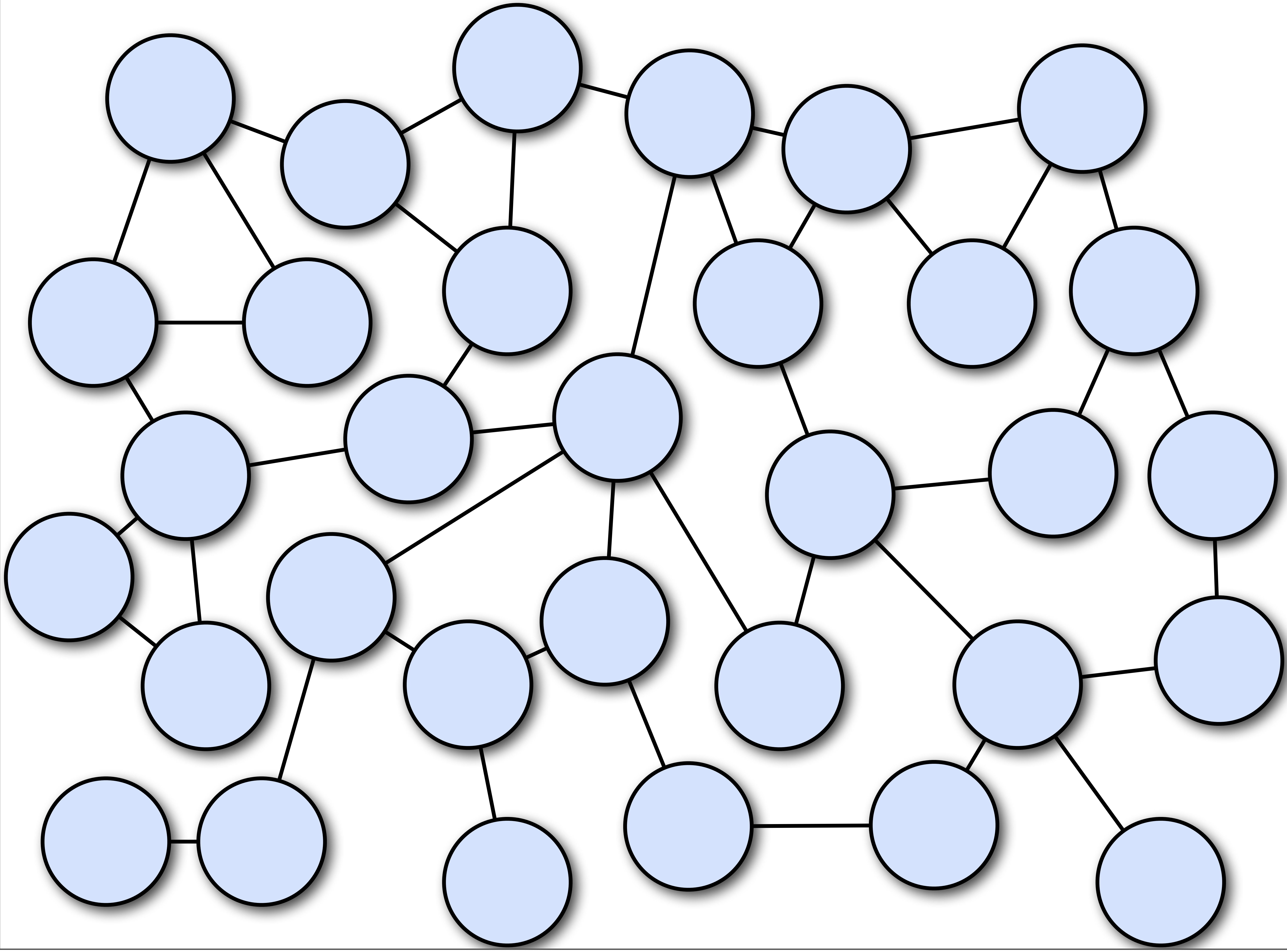
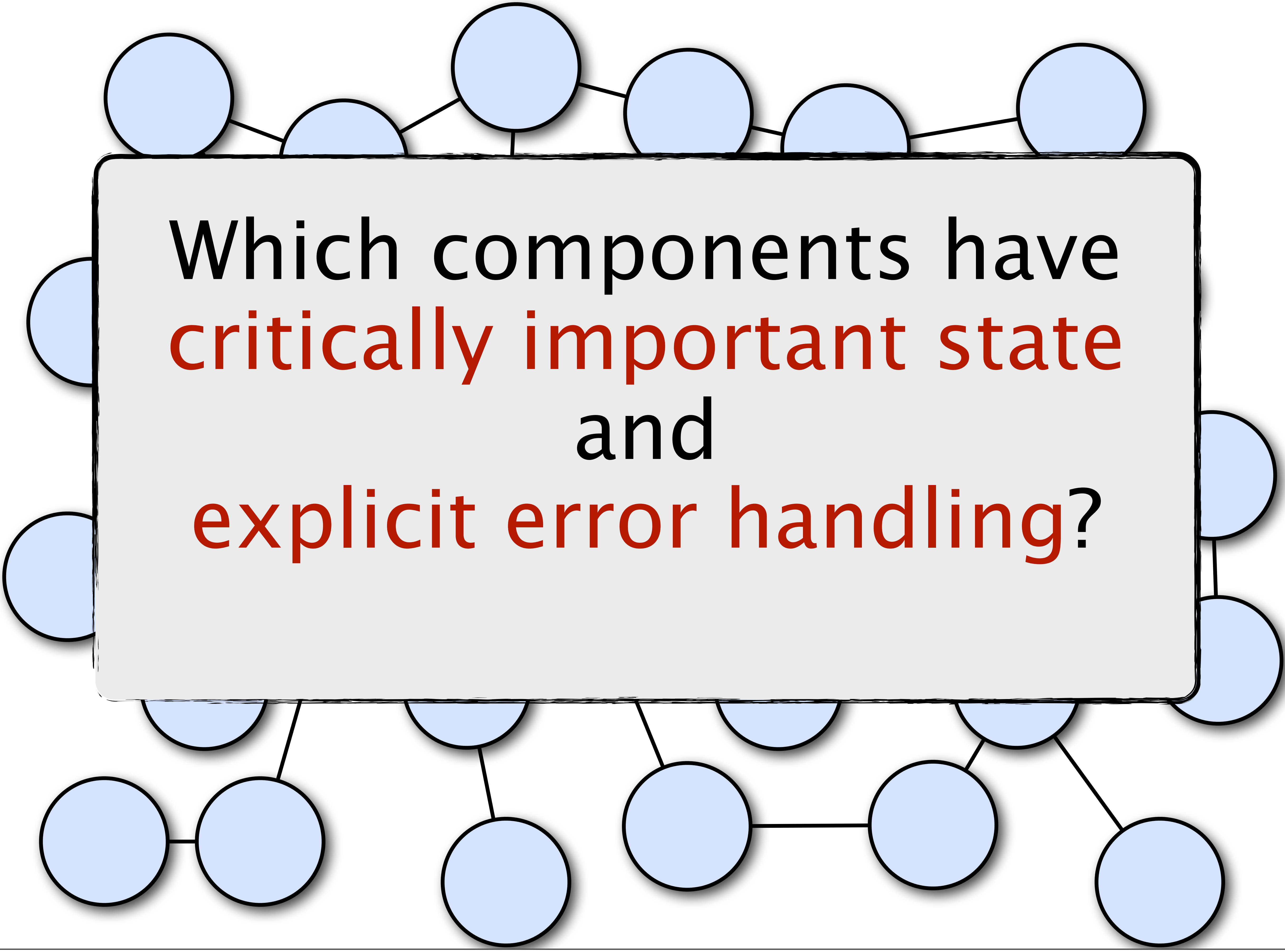
```

Summing up

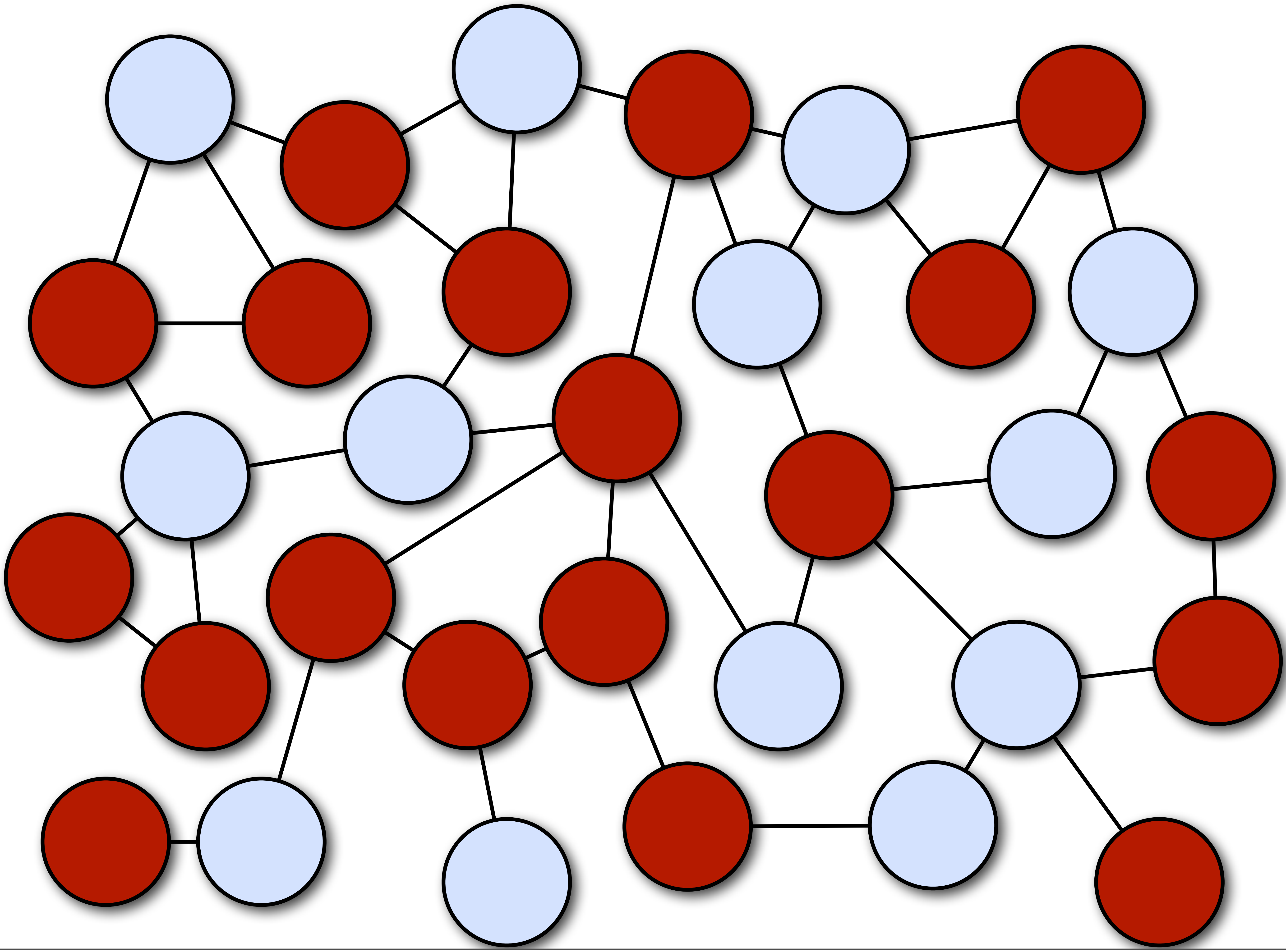
Let it crash
fault-tolerance

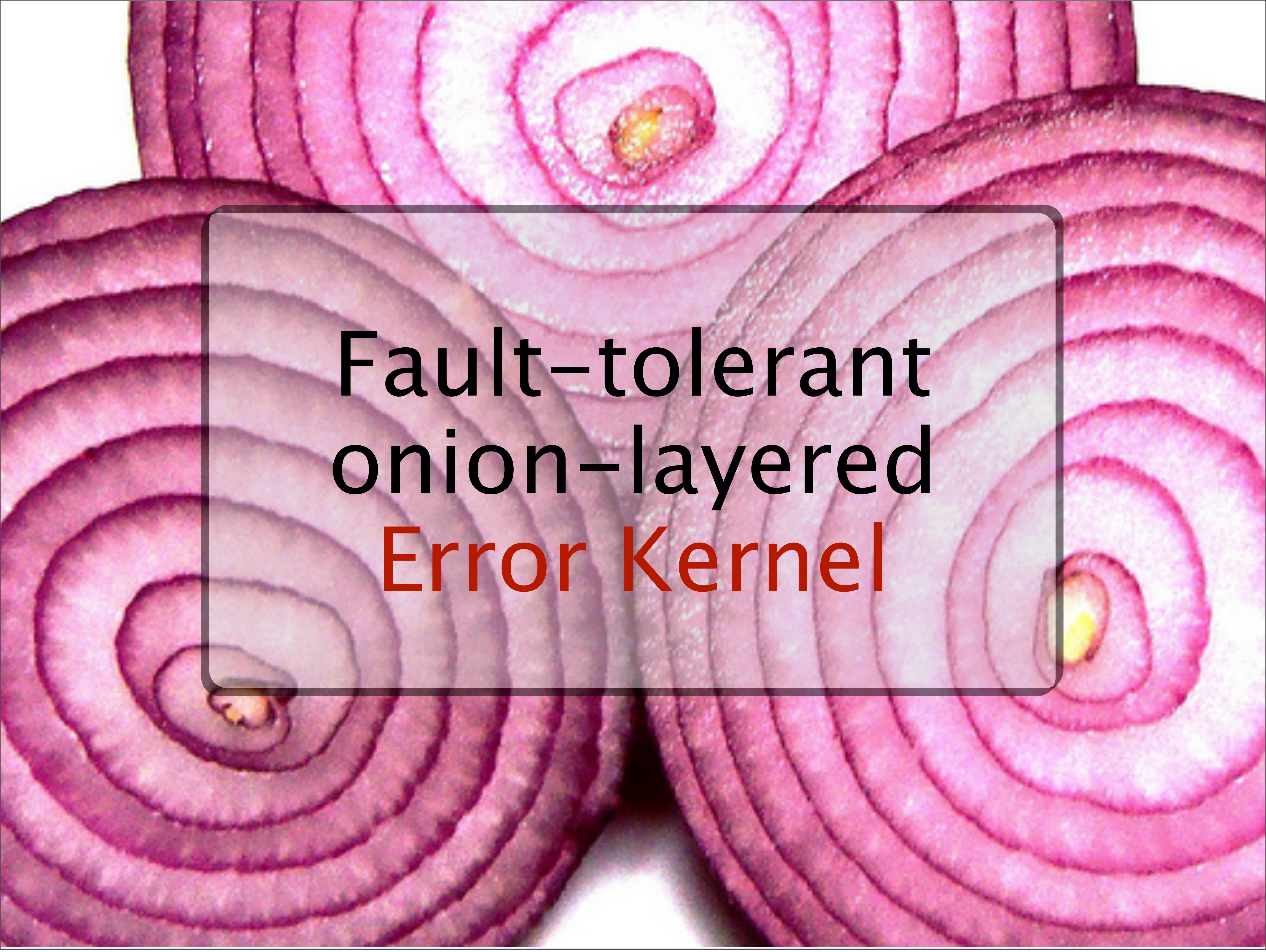
...let’s take a standard OO application



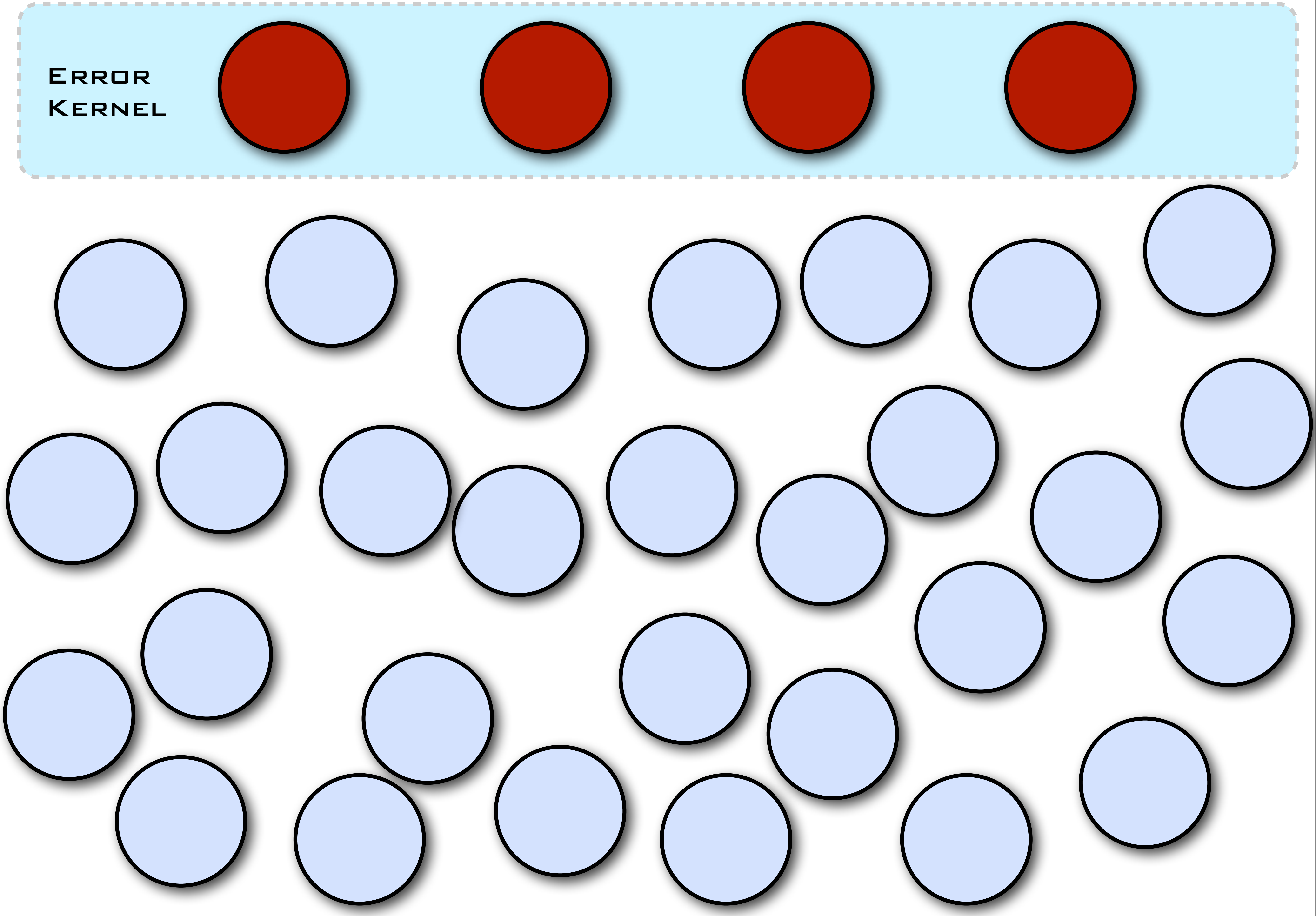


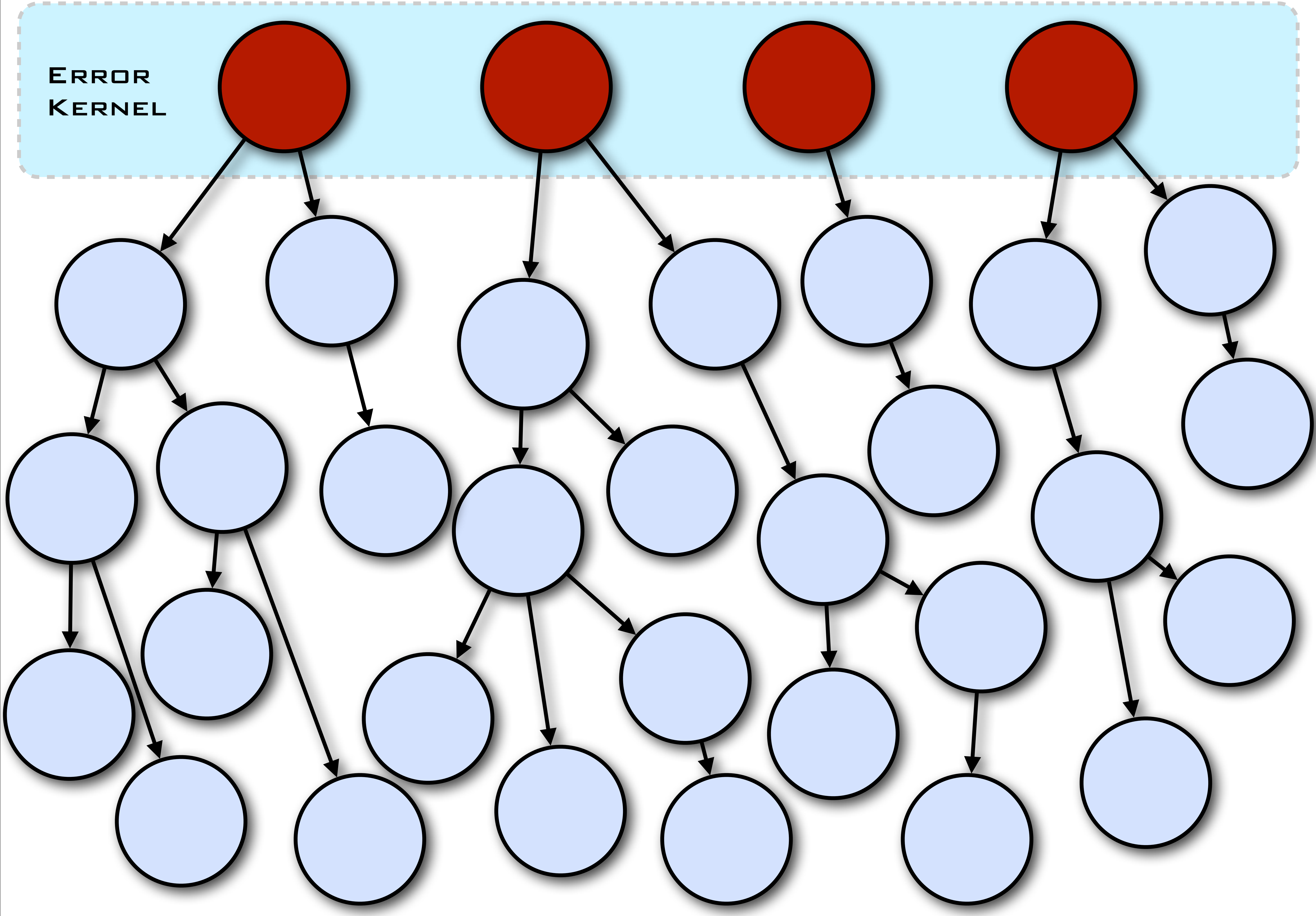
Which components have critically important state and explicit error handling?

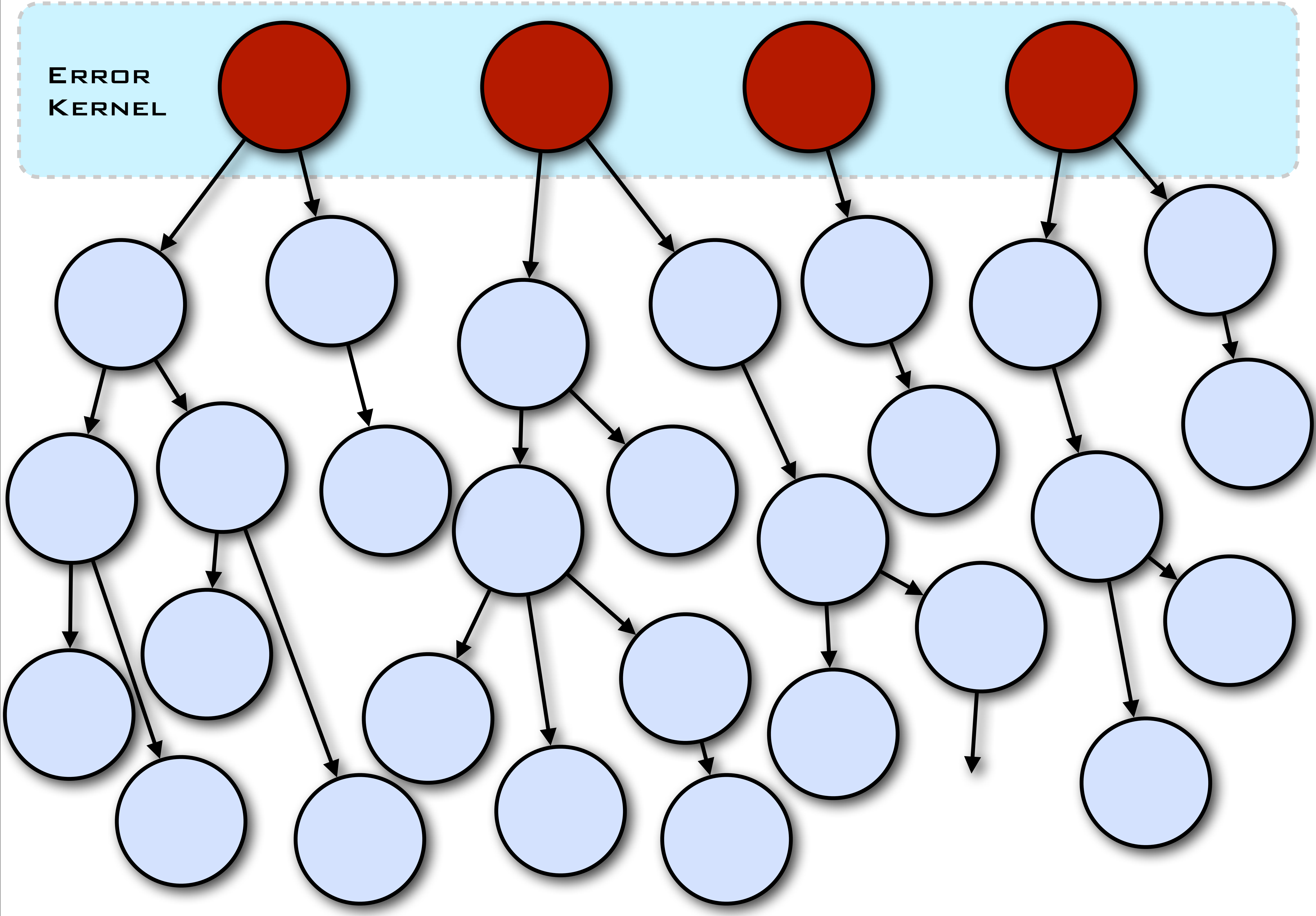




Fault-tolerant onion-layered Error Kernel


Error
Kernel


Error Kernel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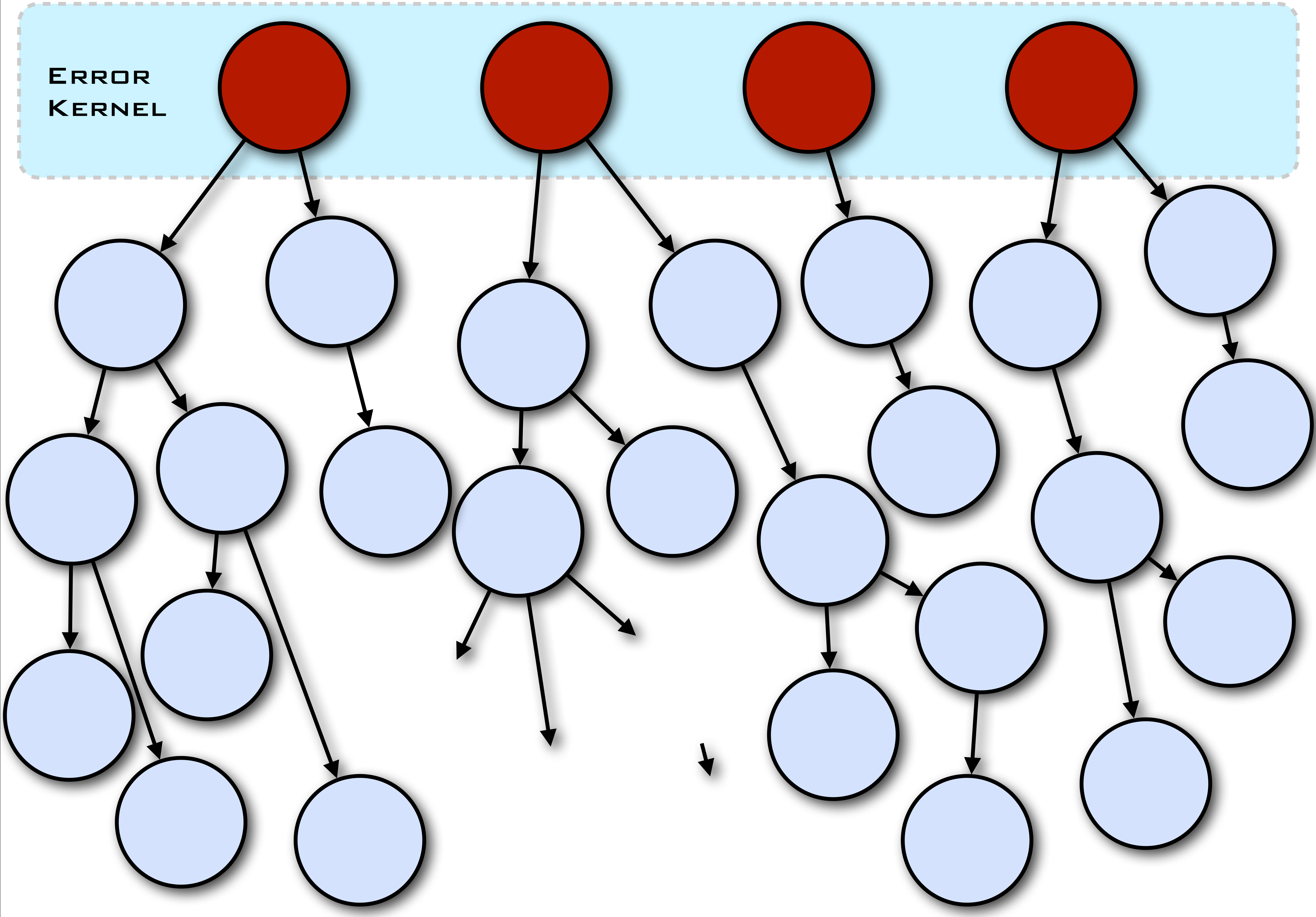
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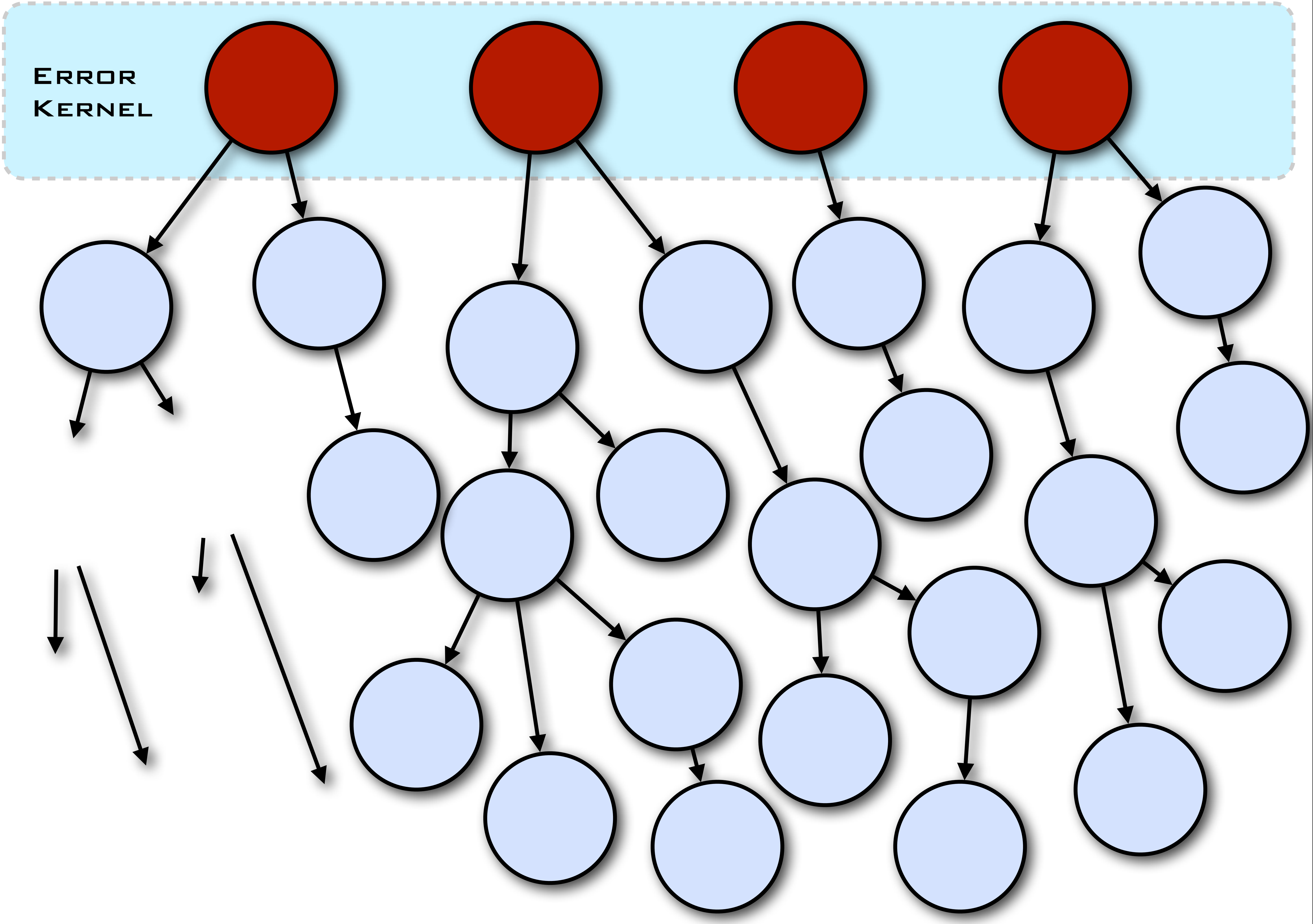
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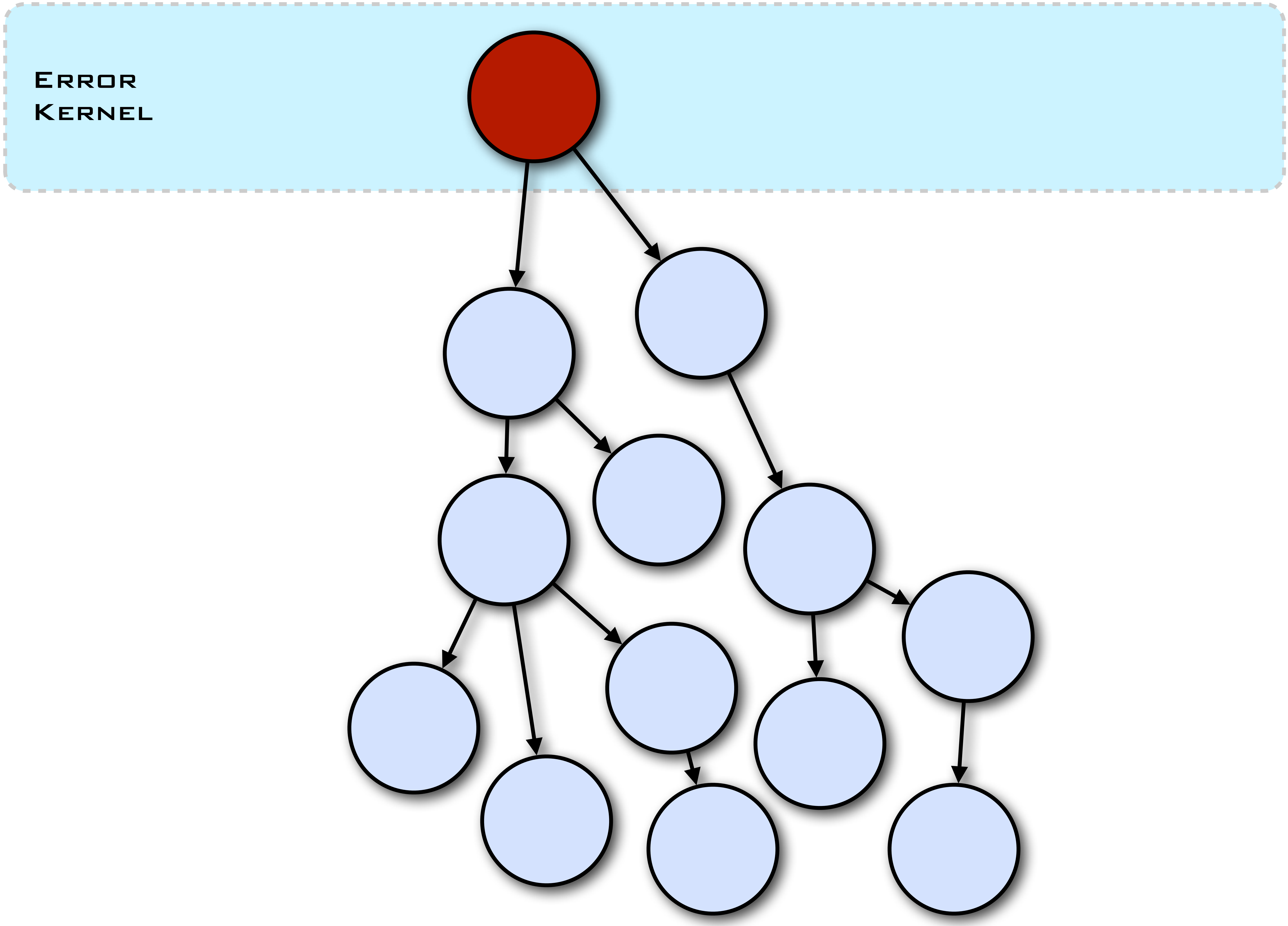
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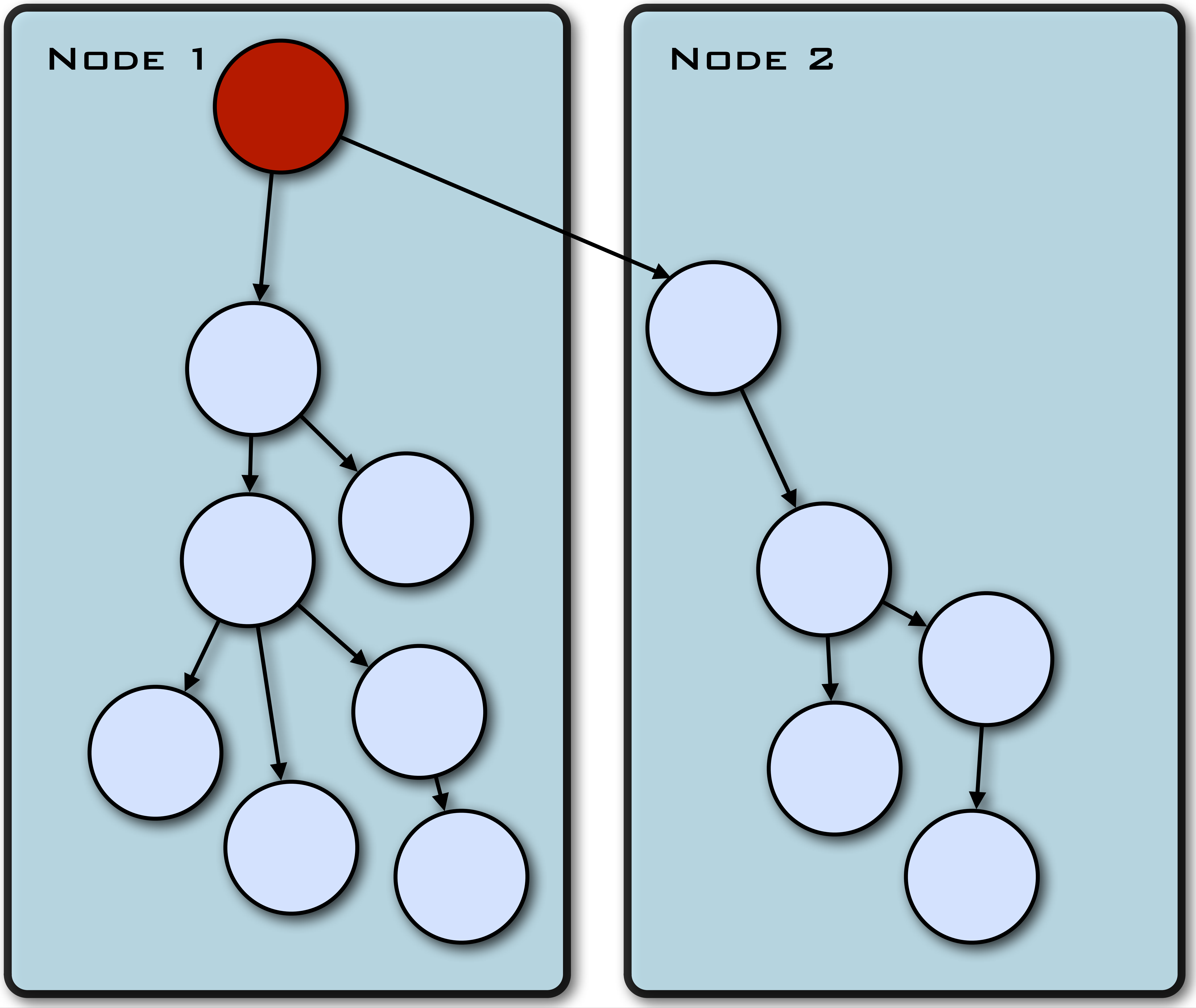
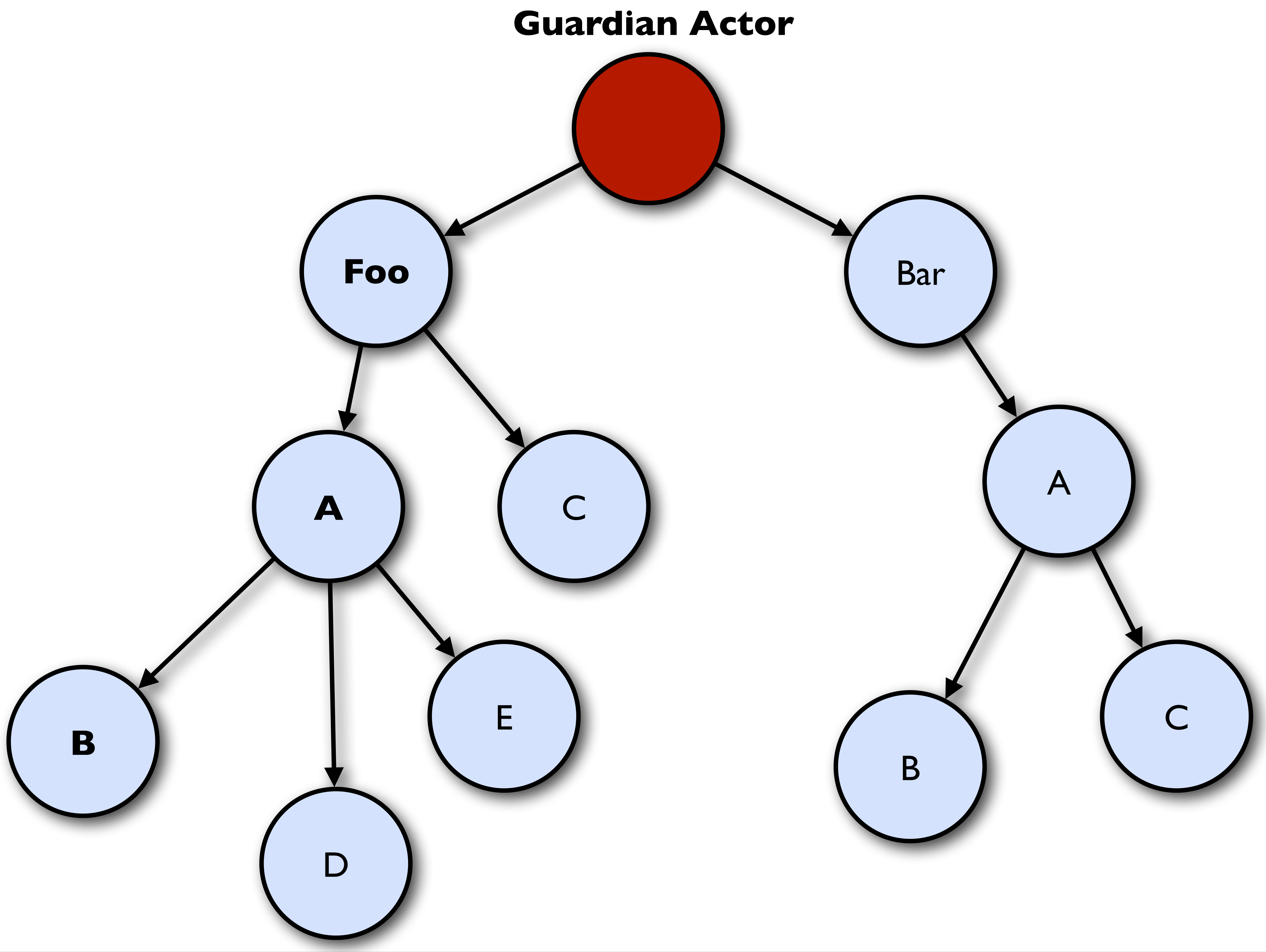

Node 1
Node 2

Parental automatic supervision

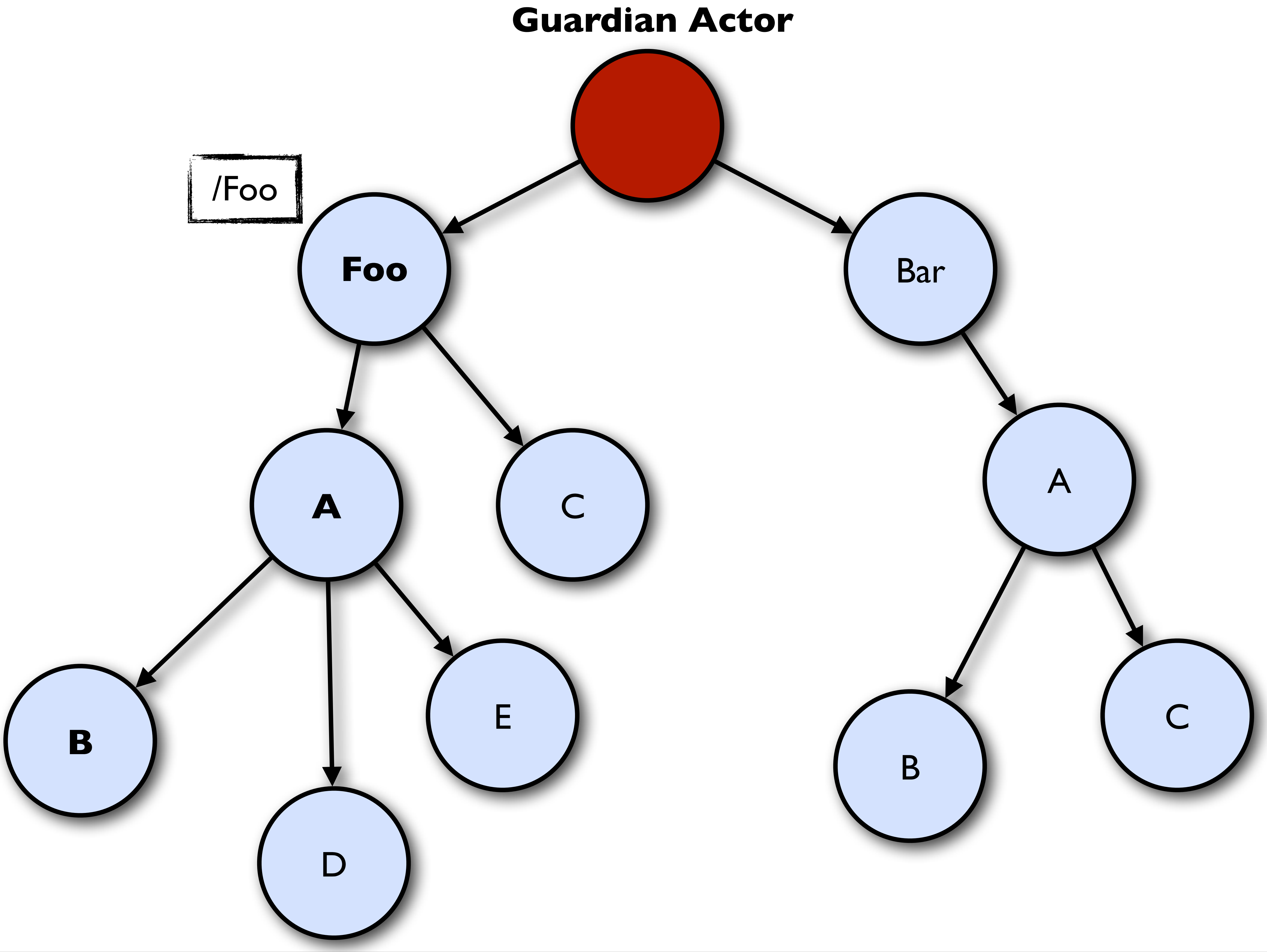
```
// from within an actor
context.actorOf[MyActor]
```

transparent and automatic fault handling by design

Parental automatic supervision



Parental automatic supervision



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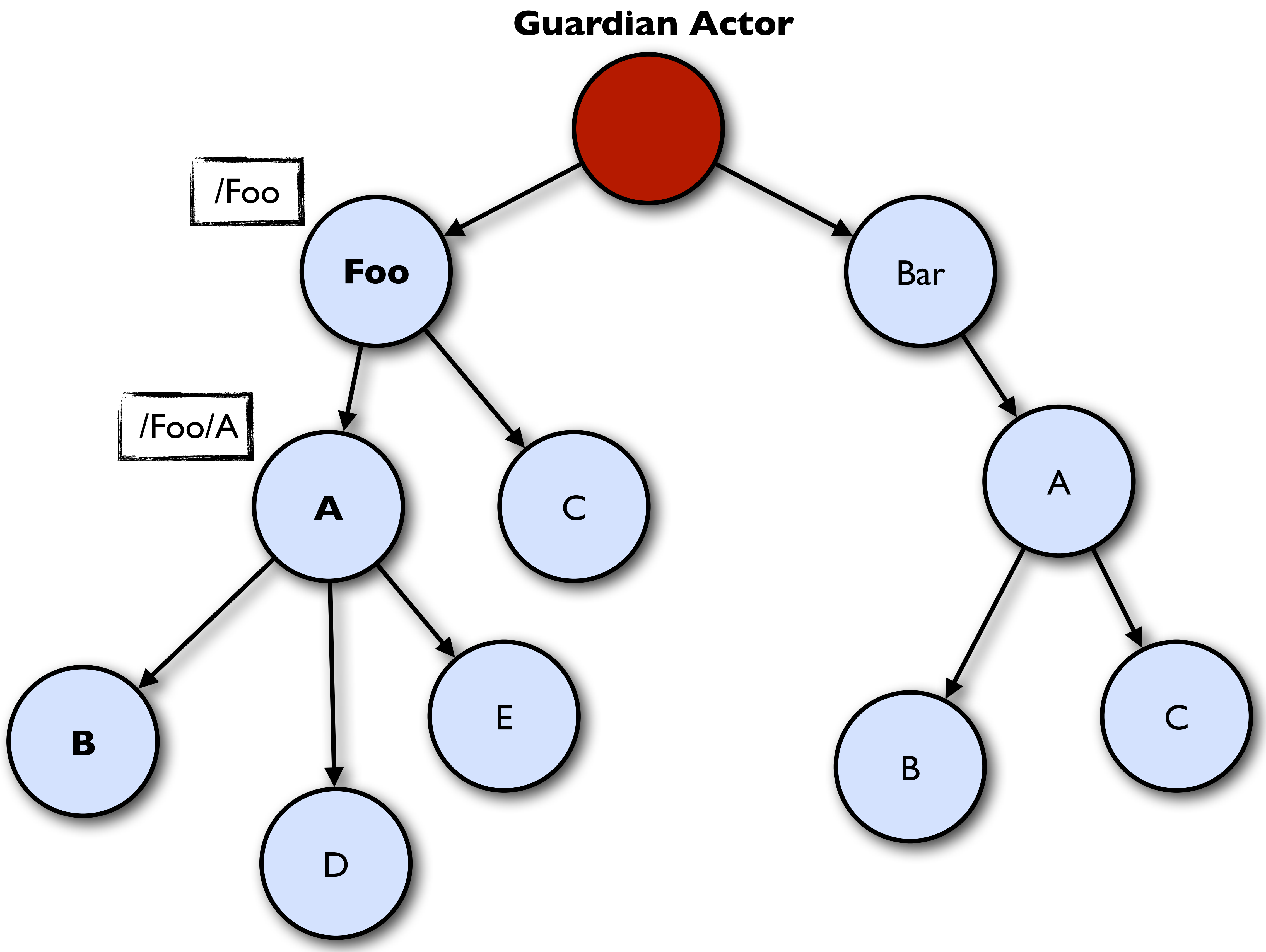

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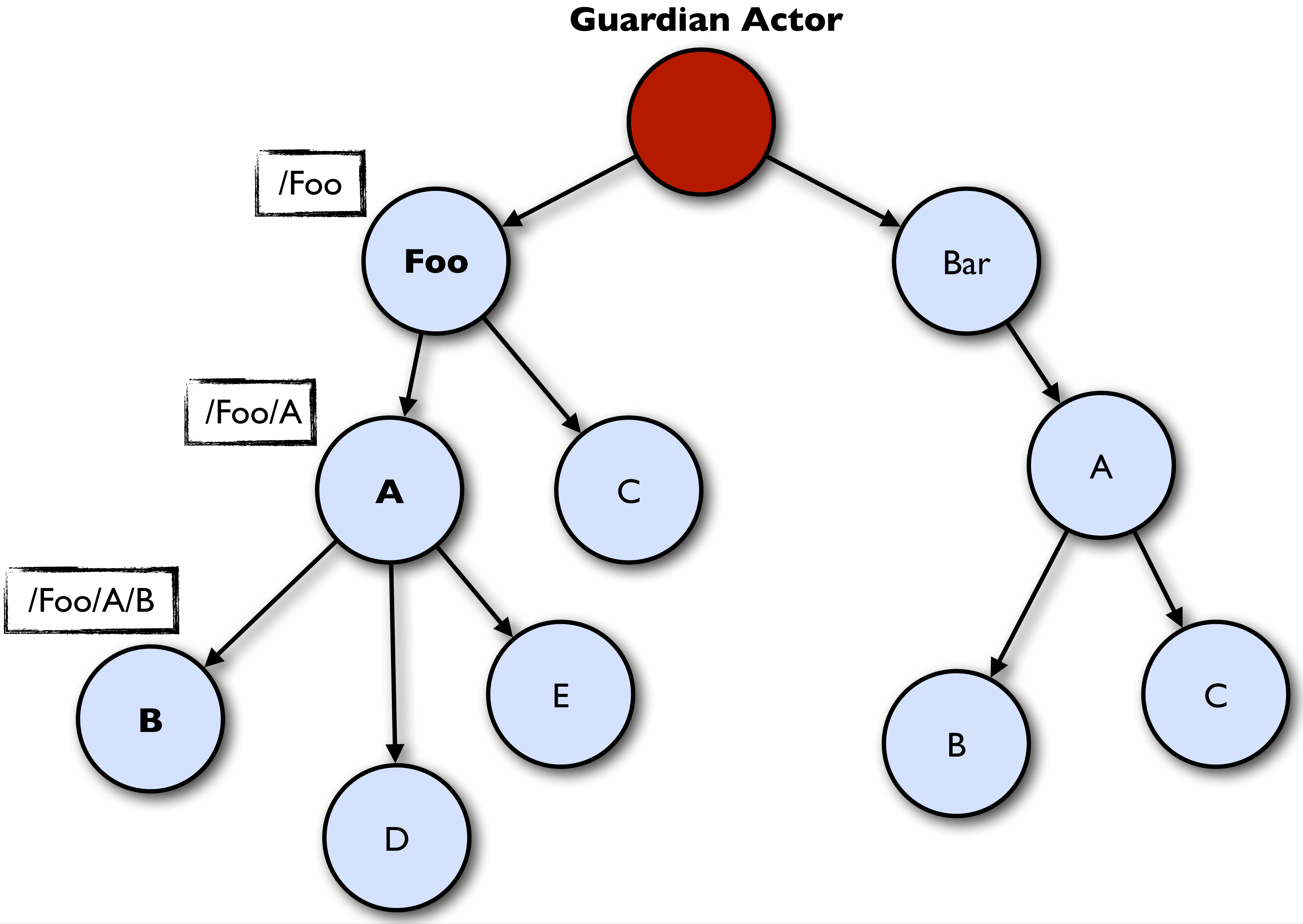

Supervision

```
class MySupervisor extends Actor {
  faultHandler = OneForOneStrategy({
   case _: ActorKilledException => Stop
   case _: ArithmeticException  => Resume
   case _: Exception            => Restart
   case _                       => Escalate
  },
  maxNrOfRetries  = None,
  withinTimeRange = None)

  def receive = {
    case NewUser(name) =>
      ... = context.actorOf[User](name)
  }
}
```

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    case NewUser(name) =>
      ... = context.actorOf[User](name)
  }
}
```
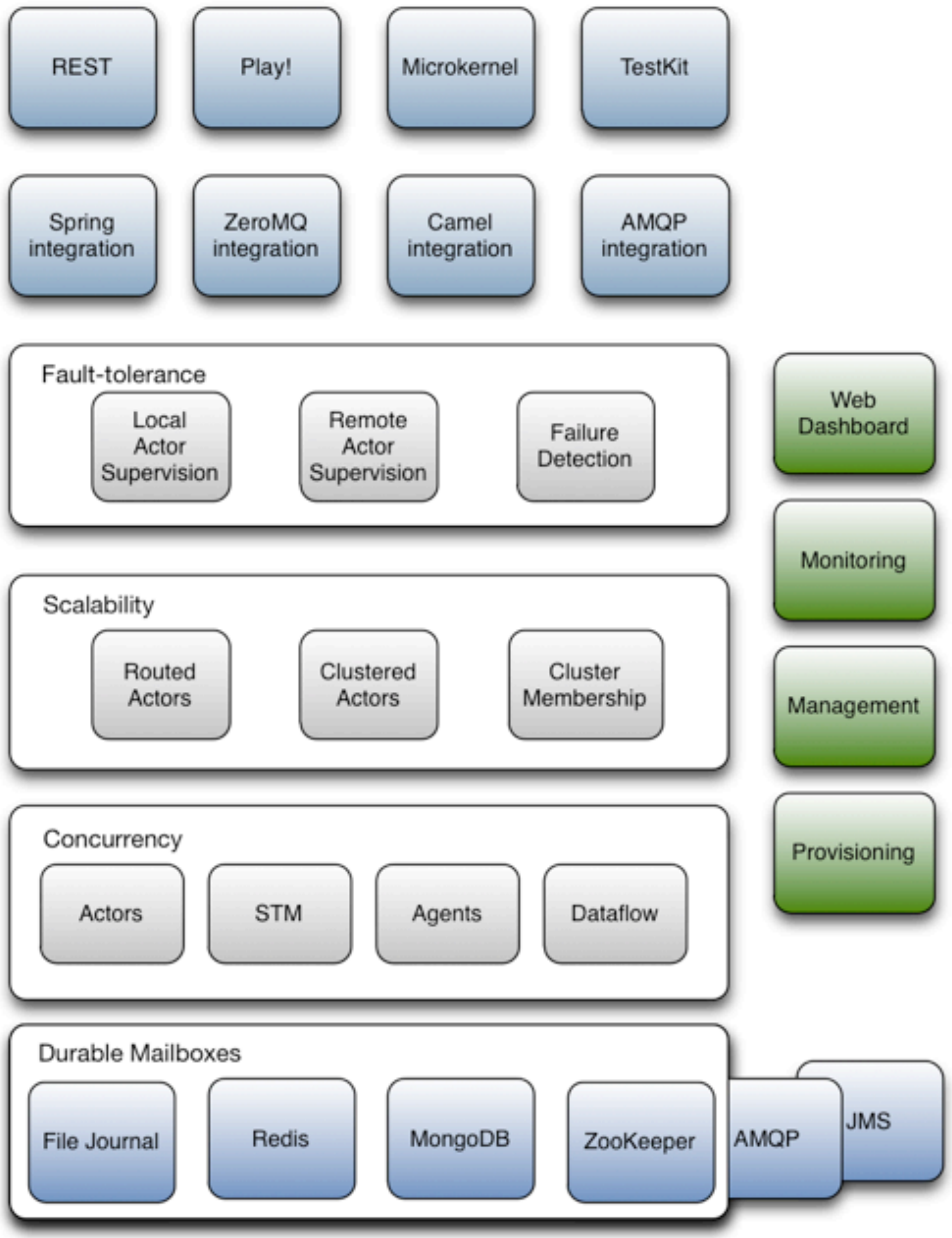

Manage failure

```scala
class FaultTolerantService extends Actor {
  ...
  override def preRestart(
    reason: Throwable, message: Option[Any]) = {
    ... // clean up before restart
  }
  override def postRestart(reason: Throwable) = {
    ... // init after restart
  }
}
```

ARCHITECTURE



TYPESAFE STACK ADD-ONS

Get it and learn more

http://akka.io

http://typesafe.com

https://gist.github.com/1388237

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