Parallelization with Actors in C#

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Agenda

- Actors? What’s that?
- Cool stuff in Erlang
- Akka.NET
    - Basics
    - Parallelization
    - Remoting
    - Supervision

Actors? What’s that?

- Old idea (1973)
- Implemented as libraries and frameworks for very many programming languages
- Famously a feature of the Erlang language/environment
    - Erlang has been used by Facebook and WhatsApp as a platform for their chat services

Actors? What’s that?

- An actor can wait for incoming messages
- It can send messages to other actors
- It can create new actors to work under its supervision
- Idea: actors should work together like human team members. Well, actually they should work together much better than human team members :)

Demo

Actors in Erlang

Features of Actor systems

- Provide high level abstraction of services that can run in parallel or in distributed systems
- Build actor hierarchies where parents monitor children for failure
  - Actors can follow different strategies to deal with failure: restart child actors, stop them, escalate issues to their respective parents
  - Correctly implemented, this can provide “self-healing” systems

Akka.NET

- Open Source, ported from Akka for JVM
- Runs on .NET and Mono
    - I’ve had a bit of trouble with some features on Mono though
- Usable in any .NET language, special integration for F#
- Full actor system implementation, also has special types for finite state machines, actor state persistence and streaming
- Infrastructure for remoting and clustering

Demo

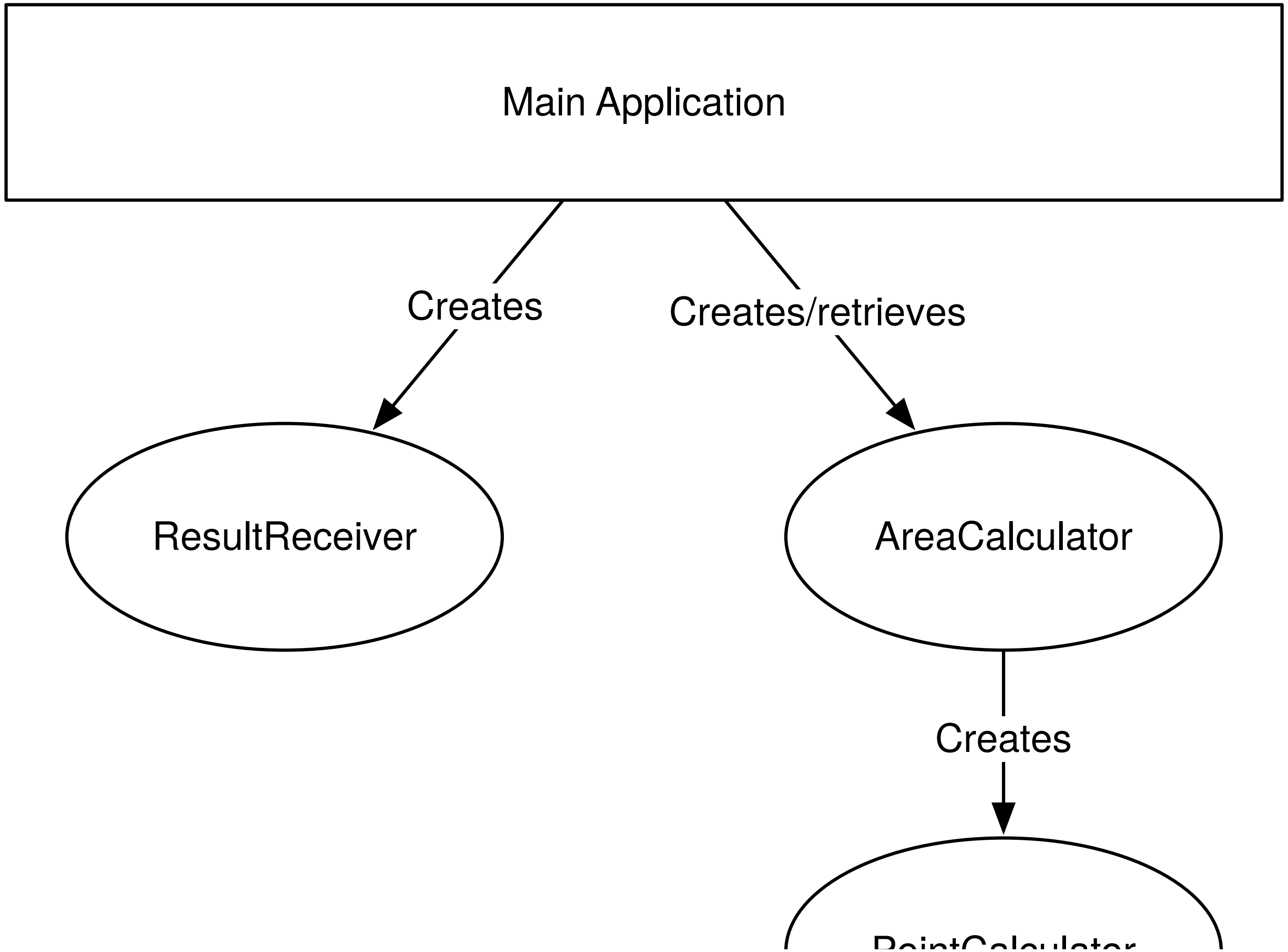
Akka.NET Hello World

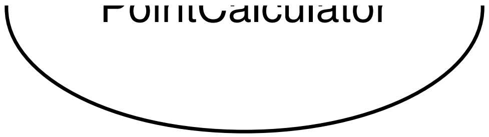
Demo

Akka.NET Mandelbrot

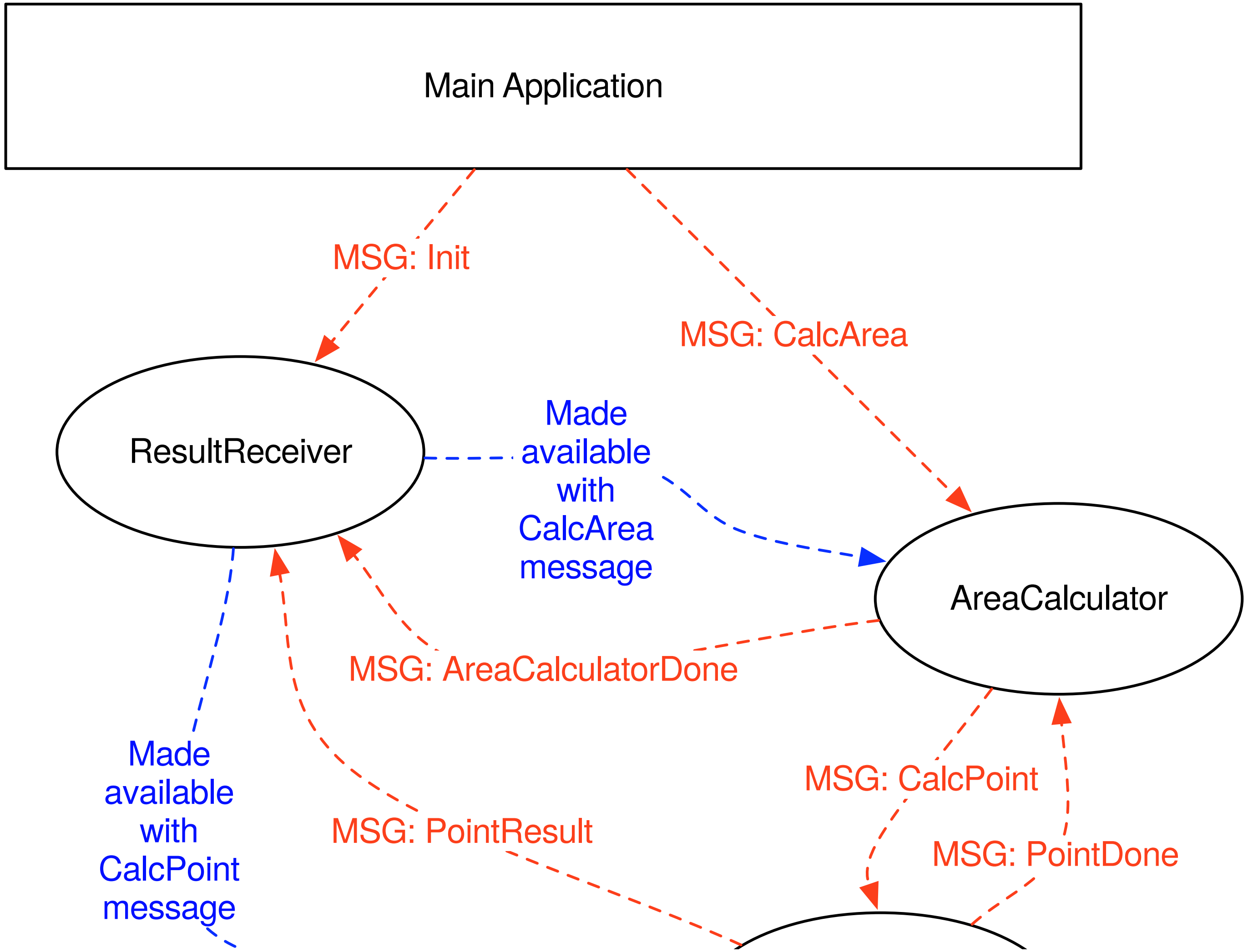
Transitioning to an actor system

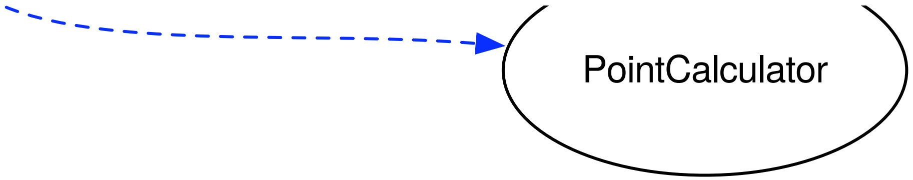
Actors in the system




PointCalculator

Interaction between actors




PointCalculator

Akka.NET Remoting

- Don’t confuse with .NET Remoting!
- Actors don’t have to run on the same system
- Peer-to-peer network of actors
- Transports etc configurable
- `ActorSelection` used to get hold of actors running elsewhere
- Actors can be “deployed” (remotely started) elsewhere
- Distributed systems can be configured externally!

Demo

Akka.NET Remoting

Supervision/Monitoring

- Parents control their children
- When children fail, parents decide on a strategy to handle the problem
- Any behavior applied to a failed child is transparent from the `IActorRef` perspective

Demo

Supervision/Monitoring

Sources

Demo source code: https://github.com/oliversturm/parallelization-with-actors-in-cs-demos

This presentation: https://oliversturm.github.io/parallelization-with-actors-in-cs-demos

- Deprettified content in pdf format: https://oliversturm.github.io/parallelization-with-actors-in-cs-demos/slidecontent.pdf

Thank You

Please feel free to contact me about the content anytime.

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