# Building Concurrent Systems with Akka.NET

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# About Me

Wirtley Consulting LLC

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Dayton .NET Developer Group

C#, WPF, MVC, Web API

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# Concurrency is hard,
# but increasingly relevant

# The Actor Model

- Actors
  - Send and receive messages
  - Create other actors
  - Decide what to do with the next message

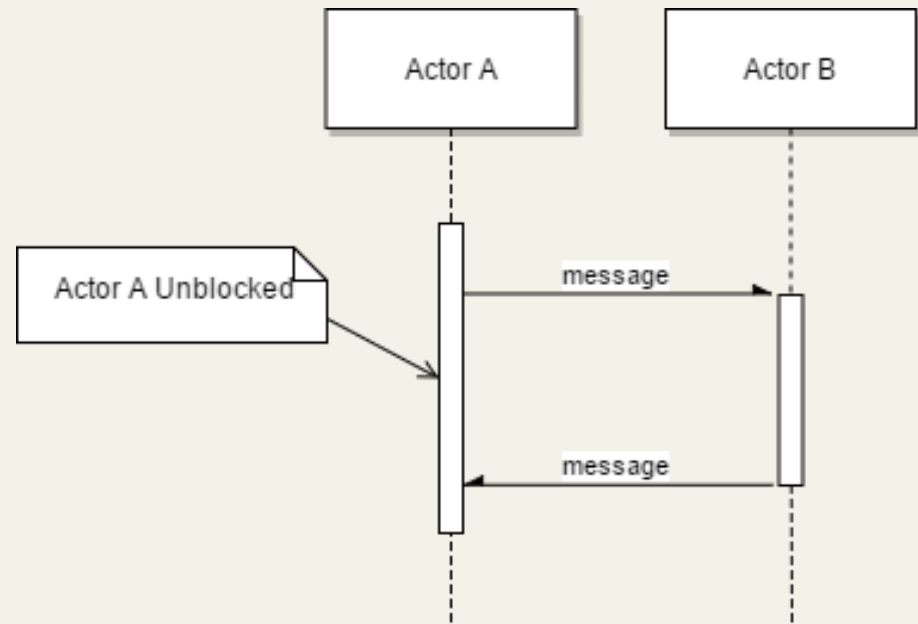Wirtley
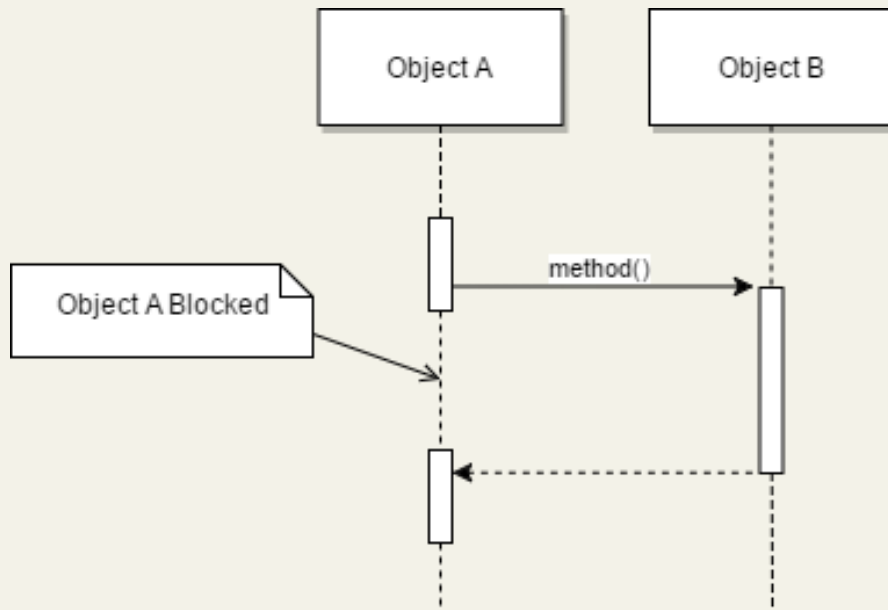Consulting LLC

# Context

- History

  - Conceptualized at Ericcson (1973)

  - Erlang (1986)

  - Akka on Scala/JVM (2009)

  - Akka.NET (2014)

- Use Cases

  - Concurrency, Parallelism

  - IoT

# Concurrency

Actor

Thread

# Demo

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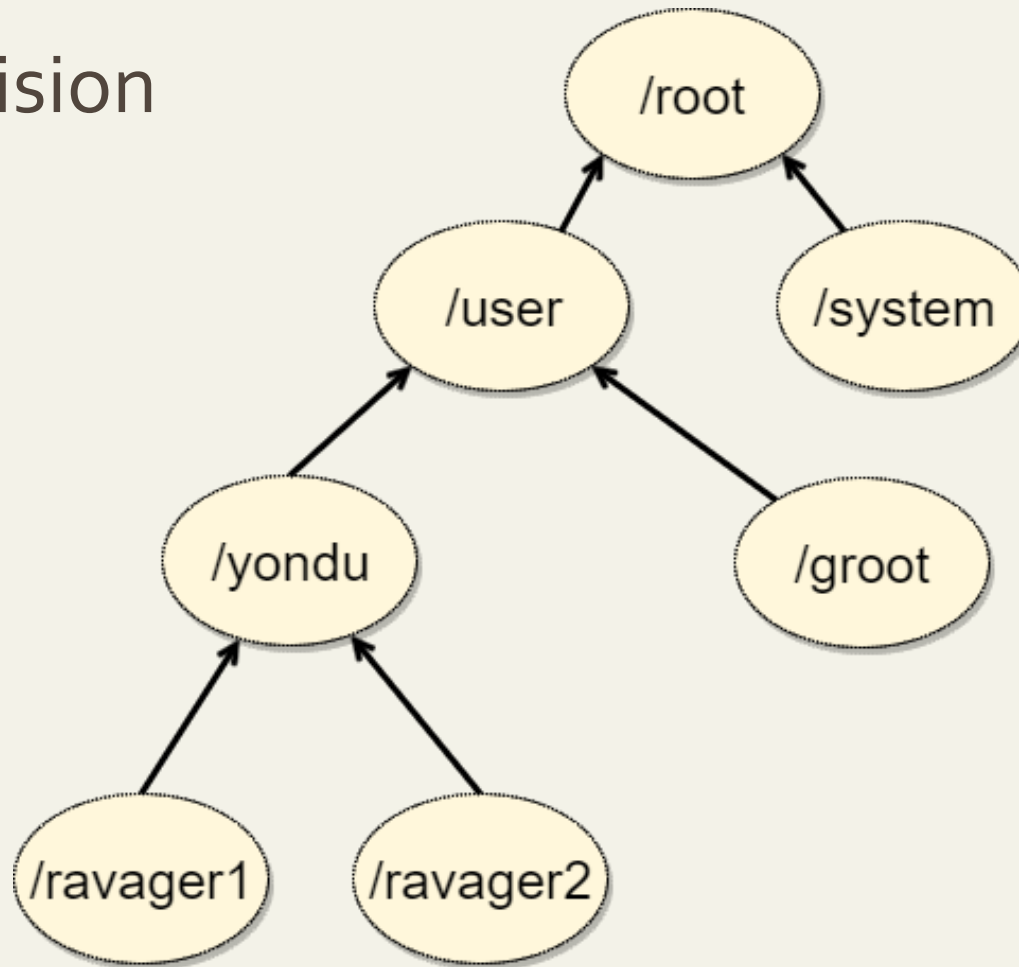# State Machines

- Become

- Stash

- FSM class

# Scalability

- Routers
  - Pools
  - Groups

- Strategies
  - RoundRobin
  - Broadcast
  - ConsistentHashing
  - TailChopping

- Dynamically Resizable Pools

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# Distribution

- Location transparency

- Addressing
    - Local
    akka://system/user/service-a/worker1

    - Remote
    akka.tcp://system@example.com:5678/user/service-b

# Fault Tolerance

Supervision

# Persistence

- Event Sourcing

- Snapshots

- Supports many stores
  - MS SQL, MySql, Redis, Cassandra , Mongo, CouchBase, PostgreSql, ServiceFabric

# Message Delivery

- Default delivery rules
  - At most once delivery
  - Message ordering guaranteed per sender-receiver

- Local delivery rules better
  - No message loss
  - Ordering mostly guaranteed

- At least once delivery part of persistence

# Clustering

- Peer-to-peer networks of Akka.NET applications

- Built on remoting to provide high availability, scalability, and fault tolerance

- Clustered routers

# Lessons Learned

- Looking at Akka is sometimes helpful
- Design thinking
  - Single Responsibility
  - State machines
  - Communicate with actors only via messages
- Problems occur at the boundary
- Ask is evil
- Extension methods
- Serializer

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# Other Topics

- Dependency Injection
  - Autofac, Castle Windsor, Ninject, SimpleInjector, StructureMap, Unity

- Logging support
  - Common Logging, Log4Net, NLog, Slf4net, Serilog

- Unit Testing
  - TestKit

- Scheduler

- Event Bus
  - Publish/Subscribe

- HOCON

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# Resources

- Akka.NET
  http://getakka.net/

- Bootcamp
  https://petabridge.com/bootcamp/

- GitHub
  https://github.com/akkadotnet/akka.net

# More Resources

- Pluralsight – Jason Roberts
    - Building Concurrent Applications with the Actor Model in Akka.NET
    - Improving Message Throughput in Akka.NET

- Reactive Applications with Akka.NET Anthony Brown, Manning

- Gitter
https://gitter.im/akkadotnet/akka.net

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# Alternatives

- Orleans (Microsoft)

- Service Fabric Reliable Actors (Microsoft)

- Proto.Actor

- Reactive Extensions (Rx)

# Contact Me

Presentation and source on GitHub:

http://bit.ly/AkkaNetPresentation

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http://WirtleyConsulting.com

O'Reilly Generics Screencast:
http://bit.ly/GenericsScreencast

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