Stateful Architectures in Akka

Nick Isaacs
@jorge_distress
Sr. VP Fungineering @
VictorOps

What Is This Talk?

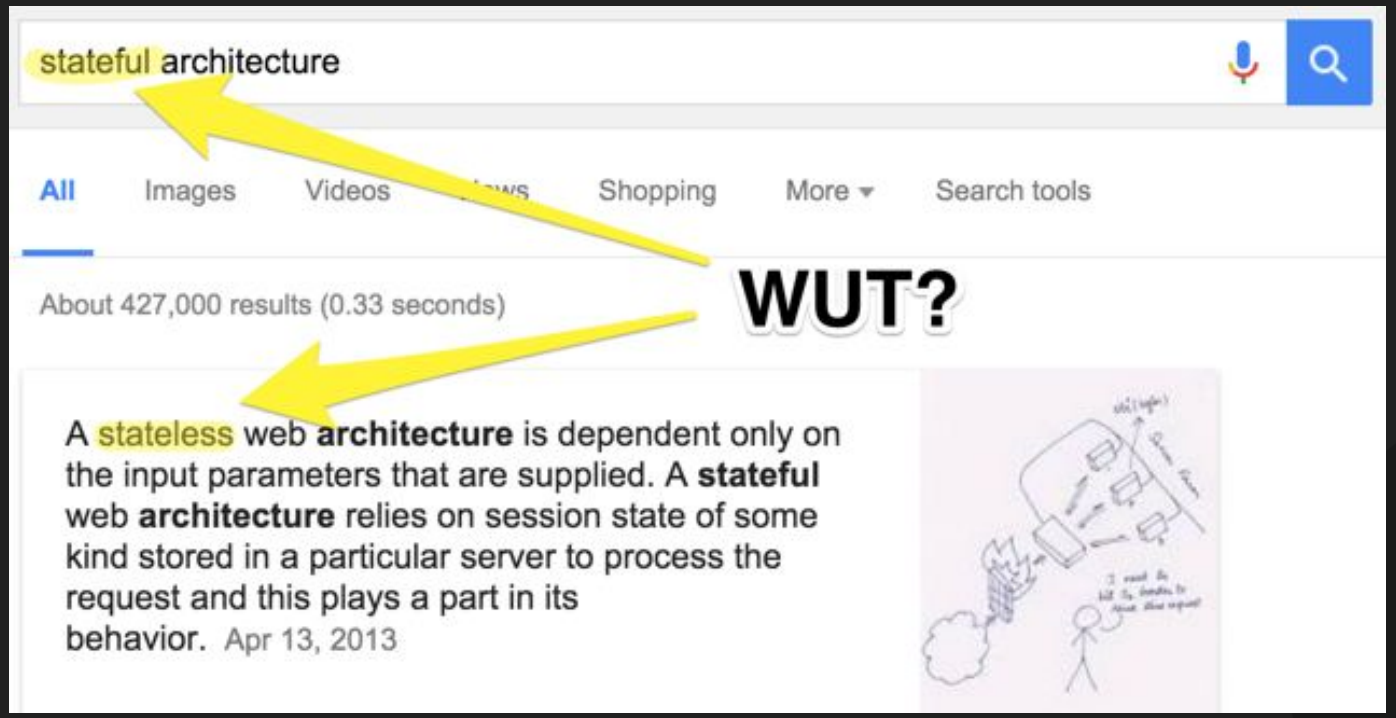
- Anecdotal
- Informational
- A work in progress
- First steps

Why


Computers
VictorOps
Users

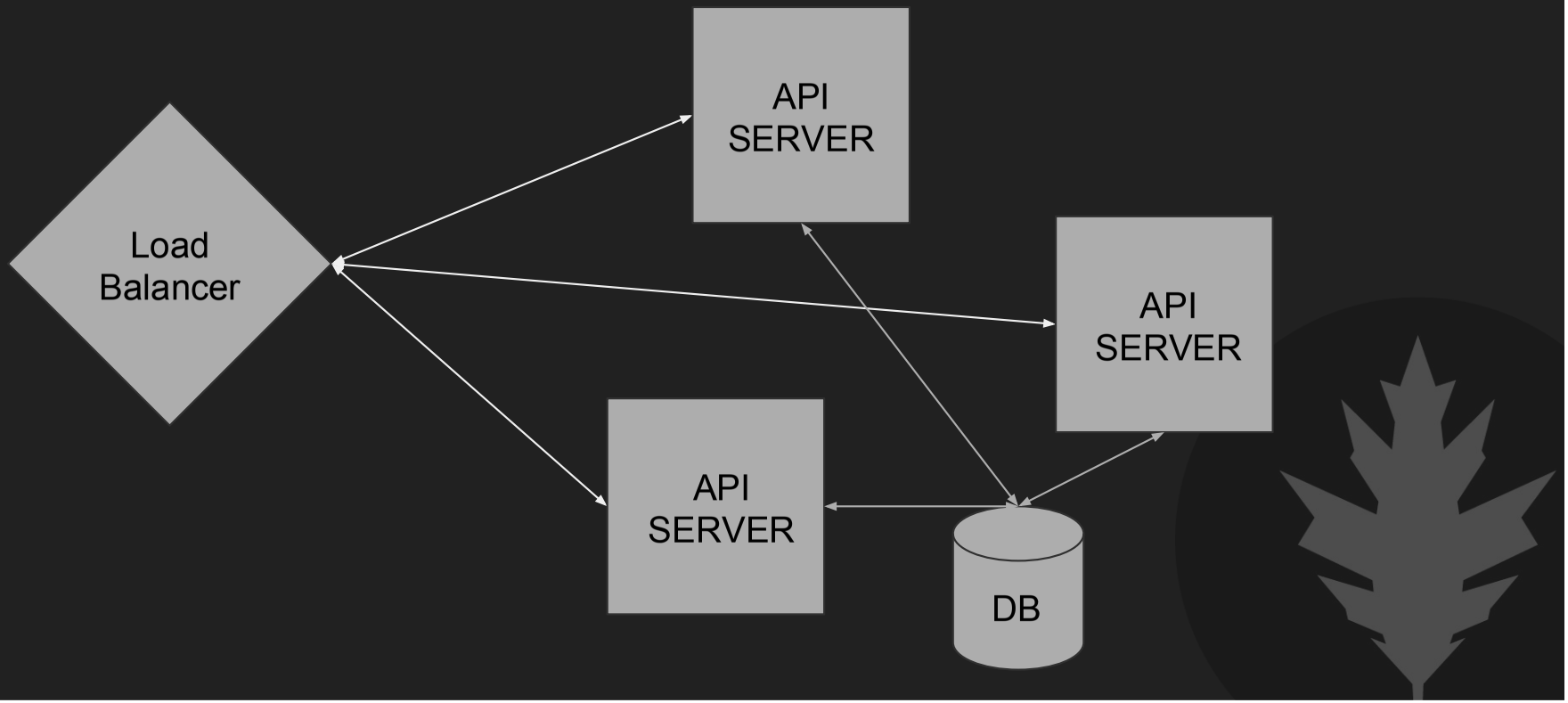
Stateful Architecture

Stateful what?



Stateless Architectures

A typical load balanced API server cluster



Stateless Request Flow

1. Hit load balancer
2. Hit API box
3. Lookup state from persistence layer
4. ???
5. Respond
6. Profit

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Stateful Request Flow

1. Hit load balancer
2. Hit API box
3. ~~Lookup state from persistence layer~~
4. ???
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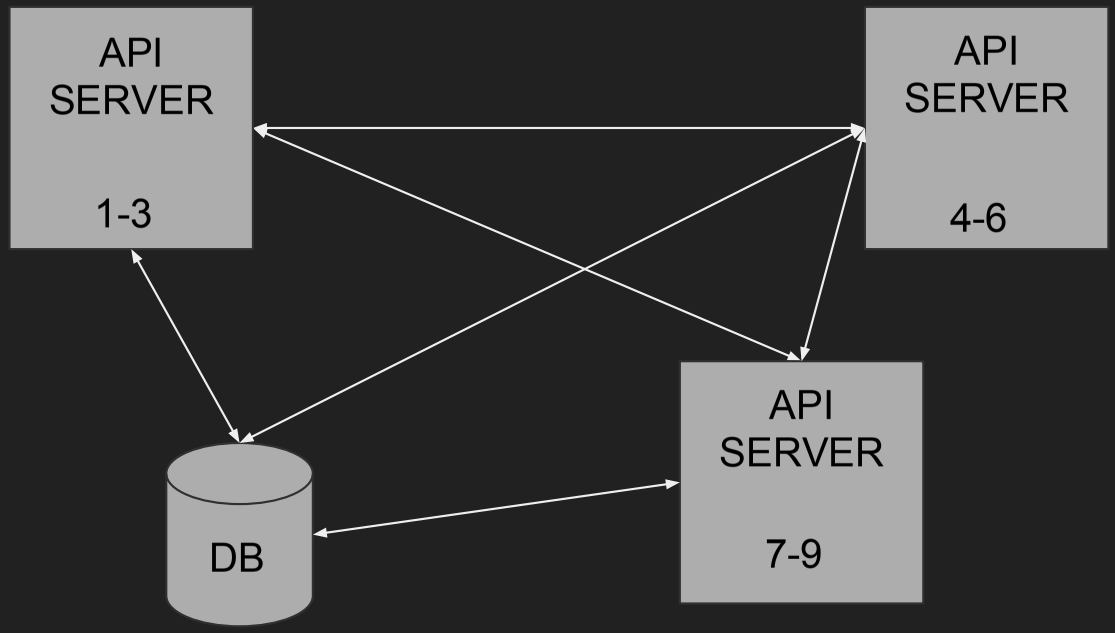
Strategies

- Ephemeral applications (avoid state)
- Caching
- Sharding

Stateful Architecture

A stateful API cluster. Each node has a subset of the application domain.



Sharding Applications

- Keeping data/logic in a known place
- Membership
- Consistent hashing
- Routing
- Coordination

What is Akka?

- Actor implementation on the JVM
- Actors send and receive messages
- Actors can “become” a new state between messages
- Actors are “islands of state”
- You cannot directly access an Actor’s state
- Many great intro talks/posts available

Akka to the Rescue

- Fantastic abstraction of state
- Persistent actors
- Rich message delivery semantics
- Simple message passing across the network
- Failure is a first class citizen

A Little Example

- TemperatureActor
- All of the state is managed in memory
- Fault tolerant, replayable log of our current state

https://github.com/nicky-isaacs/SCALE-14x-demo

1. Actor comes to life, time to read back the state

```
override def receiveRecover: Receive = {
    case SnapshotOffer(_, TempuratureSnapshot(t)) =>
        this.currentTempurature = Some(t)

    case cmd :TempuratureCmd =>
        updateState(cmd)
}
```

2. Actor is recovered, time to work

```
override def receiveCommand: Receive = {
    case GetTempurautre =>
        this.currentTempurautre match {
            case Some(t) =>
                sender() ! t

            case _ =>
                sender ! AkkaFalilure(new TempuratureException("No tempurature to get"))
        }

    case cmd: TempuratureCmd =>
        persist(cmd){ persistedCmd =>
            if (shouldSnapshot()) {
                this.currentTempurature foreach { t =>
                    snapshotAndSweep(TempuratureSnapshot(t))
                }
            }

            updateState(persistedCmd) match {
                case Success(_) =>
                    sender() ! AkkaSuccess(())

                case Failure(err) =>
                    sender() ! AkkaFailure(err)
            }
        }
}
```

Finite State Machine (thanks Akka)

- Recovering
  - No messages from the outside world
  - Reading snapshots and journaled messages
  - Getting back to last known state

- Receiving
  - Ready to respond to the world
  - State changes go to disk asynchronously
  - writes are all in memory, performance++

How We Cluster Today

- Stateful sharding of applications
- Zookeeper based membership
- Consistently hashed by organization
- Single leader

Where We Could Go

- Leaderless clusters
- Gossip membership protocol
- Replication of work as cluster scales

Extra Credit

- Uber Ringpop
  - “application-layer sharding for Node.js applications”
- Akka Clustering
- Dynamo paper

“I regret nothing. The end.”

- Ron Swanson