BEYOND THE BUZZWORD: A REACTIVE WEB APPLICATION IN PRACTICE

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JFOKUS 2016

AGENDA

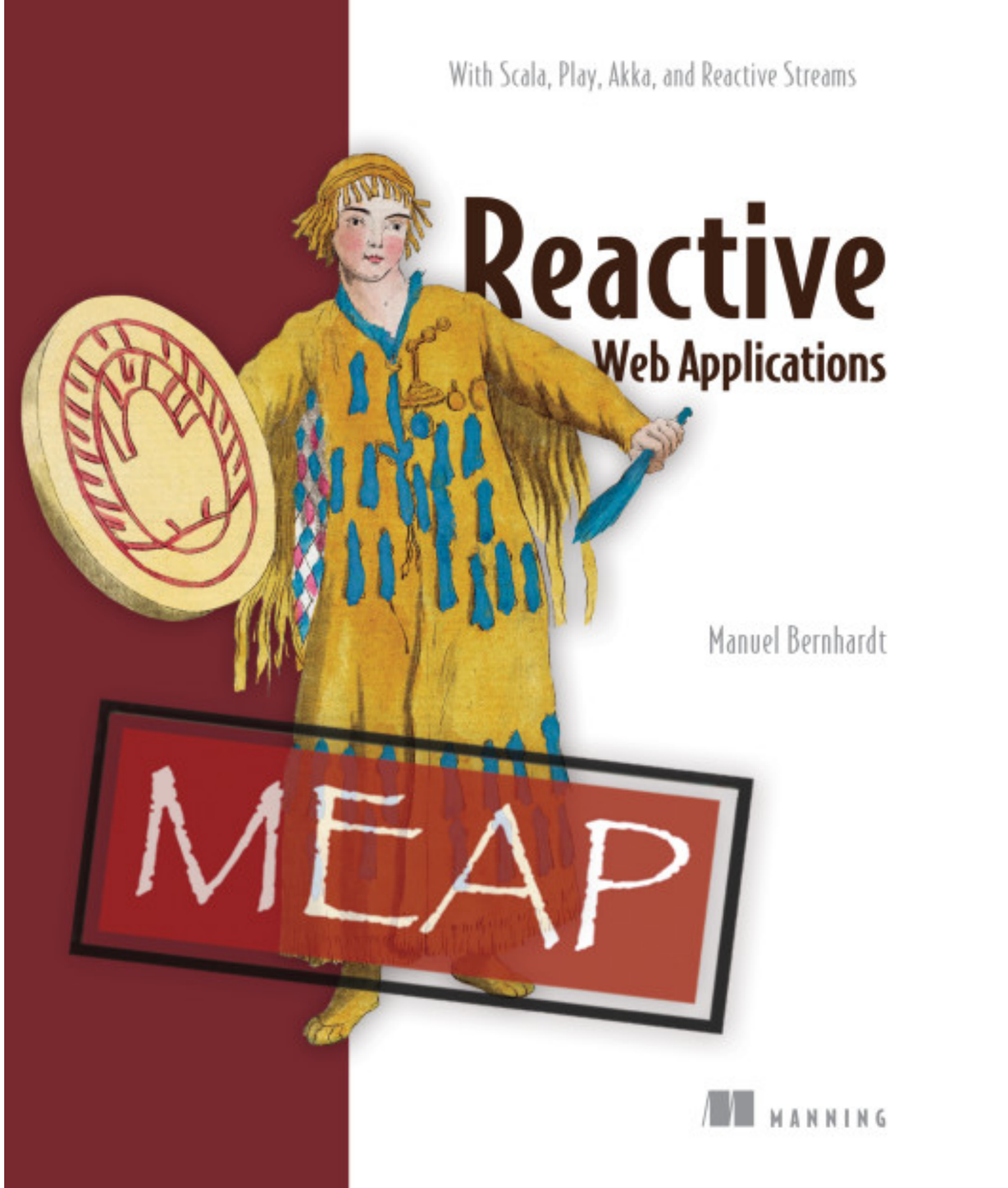
1. EVOLUTION OF WEB APPLICATION ARCHITECTURE
2. EVOLUTION OF HARDWARE
3. SMALL REACTIVE WEB APPLICATION
4. (DEPLOYMENT)

WHO IS SPEAKING

- WEB. WEB. WEB
- FREELANCE SOFTWARE CONSULTANT
- VIENNA SCALA USER GROUP
- ~~WRITING~~ WROTE A BOOK ON REACTIVE WEB-APPLICATIONS

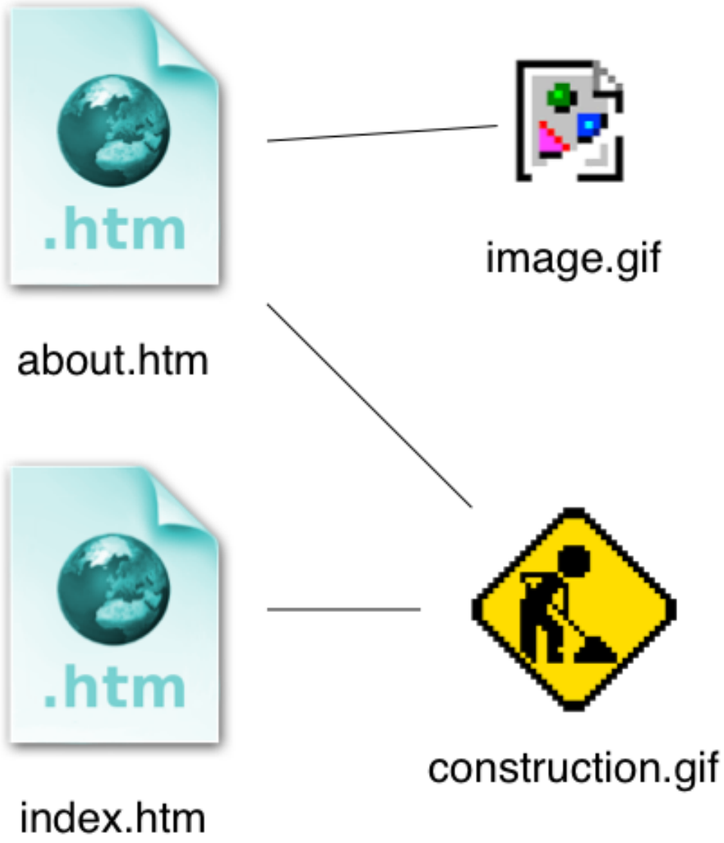
HTTP://WWW.MANNING.COM/BOOKS/REACTIVE-WEB-APPLICATIONS

39% OFF WITH CODE CTWJFOKUS16

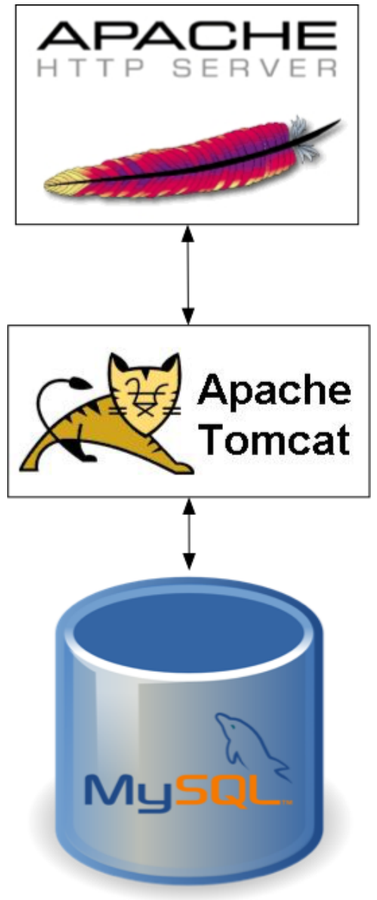


A SHORT (AND MOSTLY WRONG) HISTORY OF WEB APPLICATION ARCHITECTURE

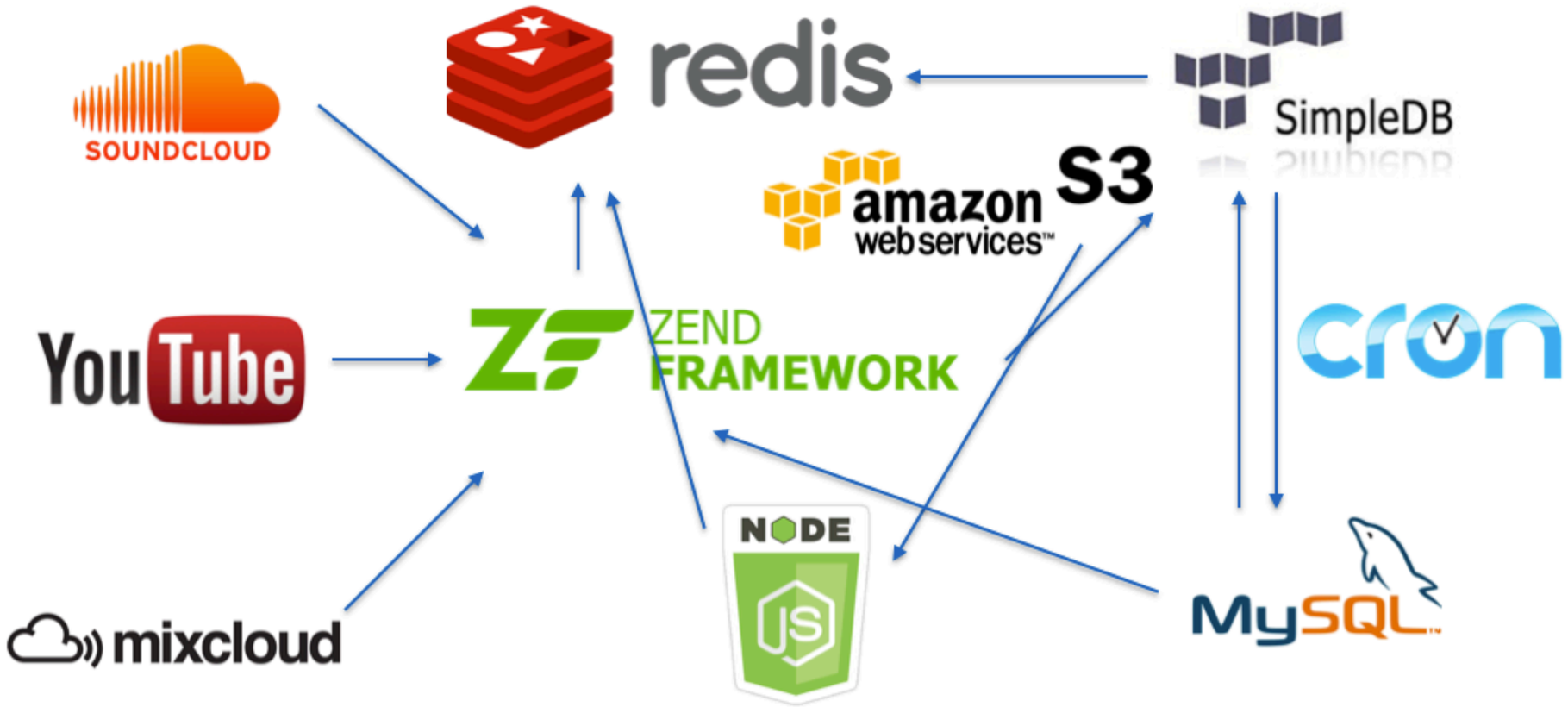
"GOOD OLD DAYS" ARCHITECTURE



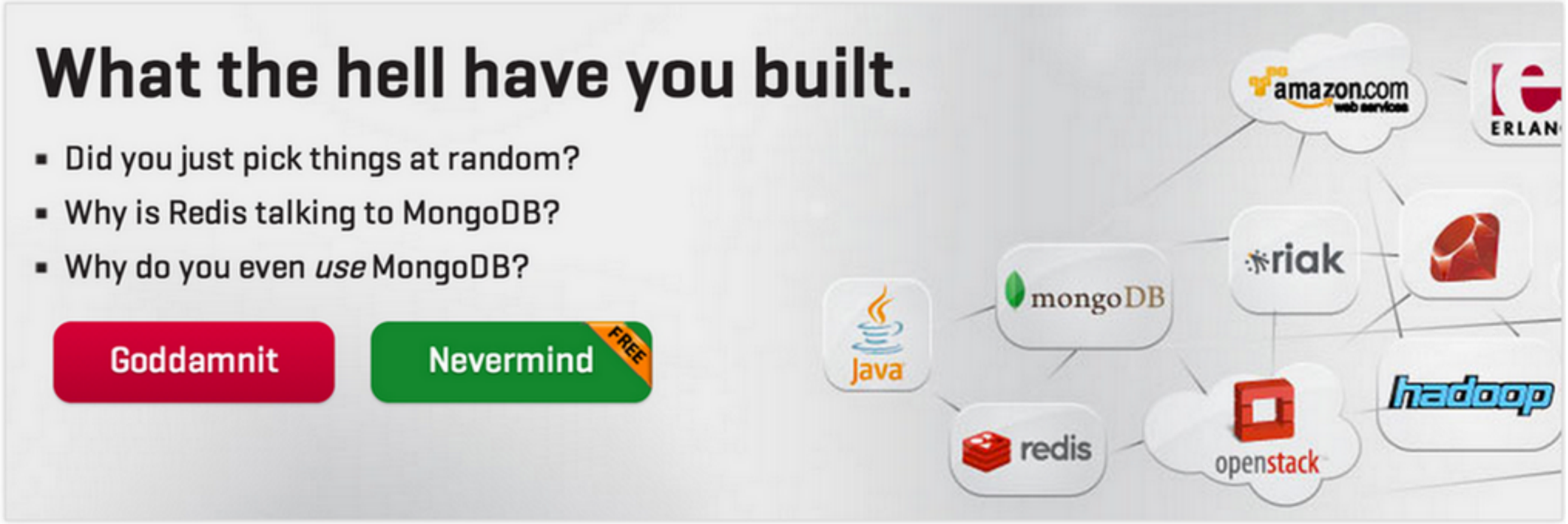
"3 TIER" ARCHITECTURE



"CLOUD" ARCHITECTURE

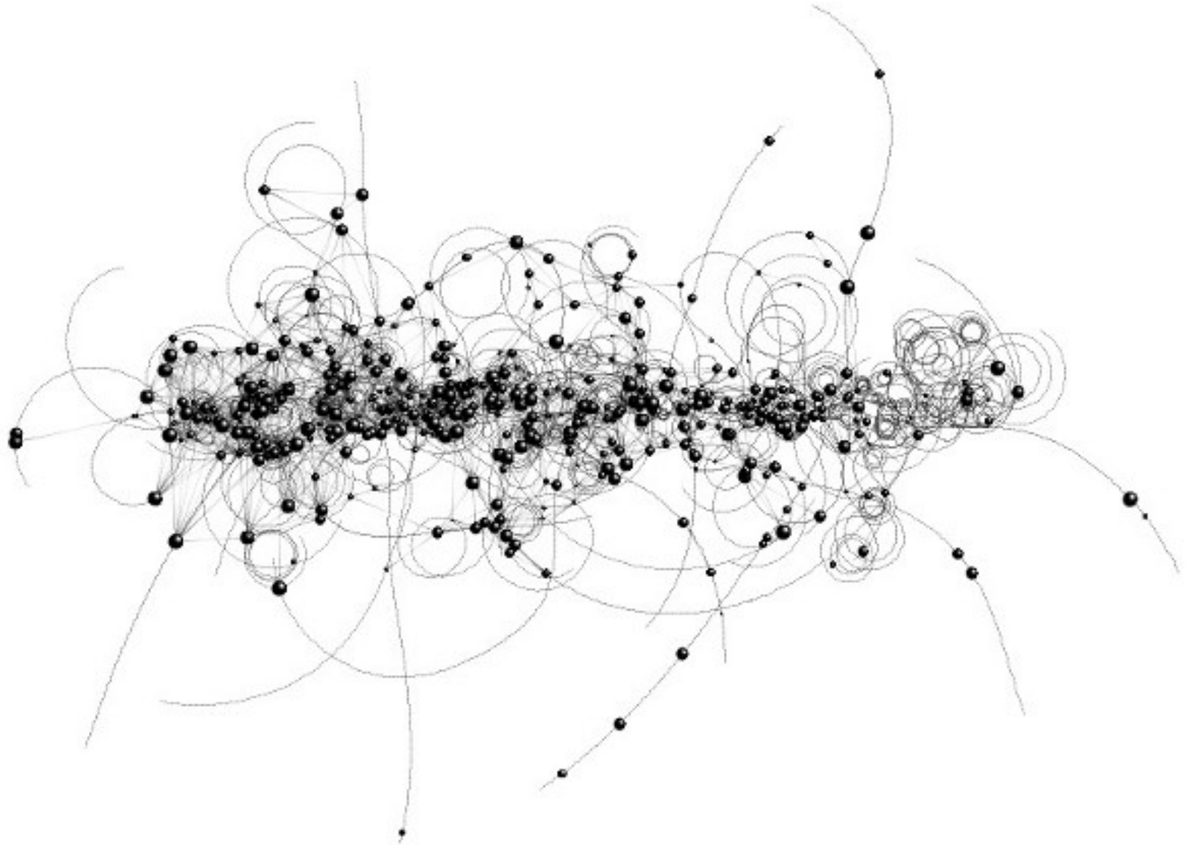


"CLOUD" ARCHITECTURE

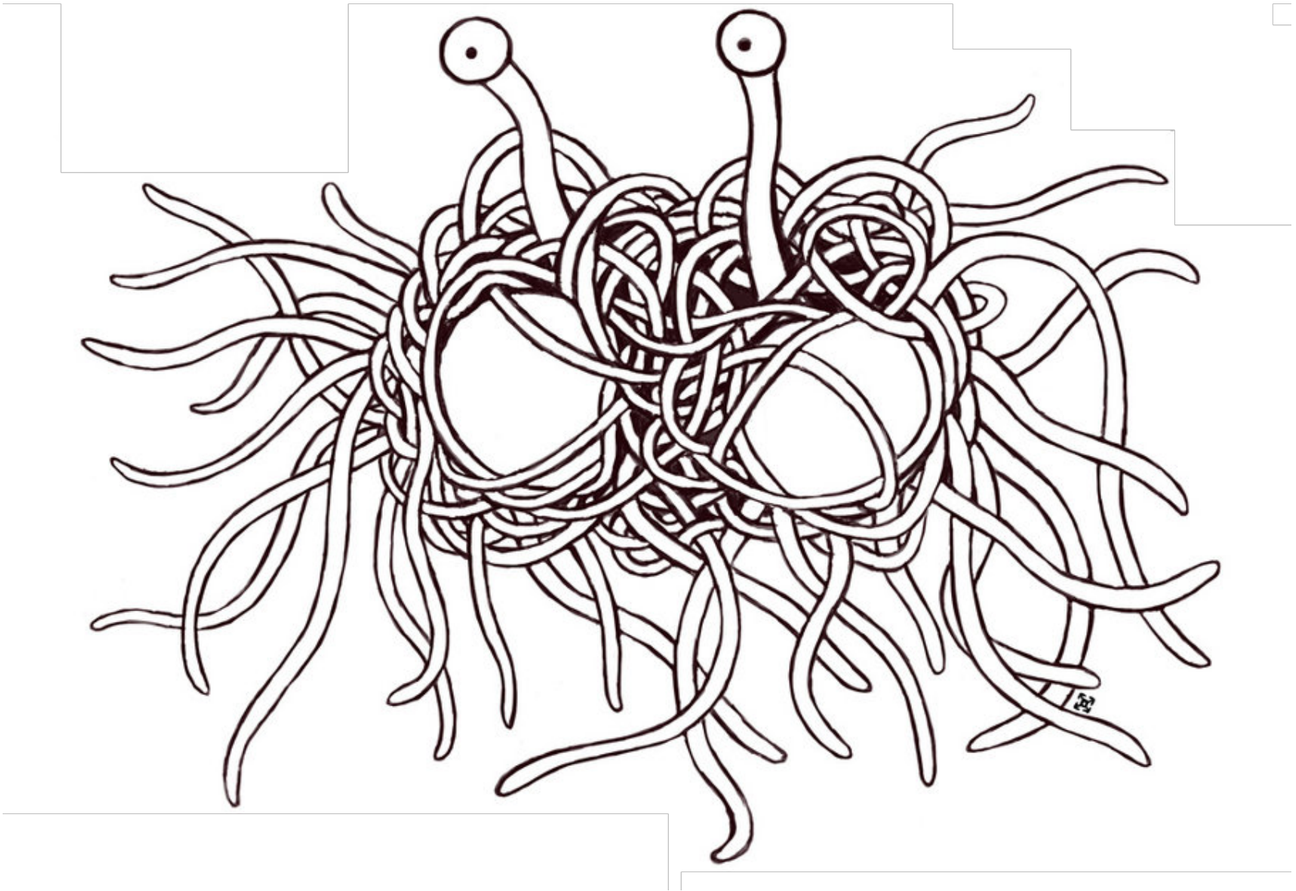


Jeff Atwood @codinghorror · Jun 18
What the hell have you built. pic.twitter.com/Tq7ktgDWzD

"MICROSERVICES" ARCHITECTURE



"MICROSERVICES" ARCHITECTURE



TREND: INCREASING AMOUNT OF NETWORK I/O

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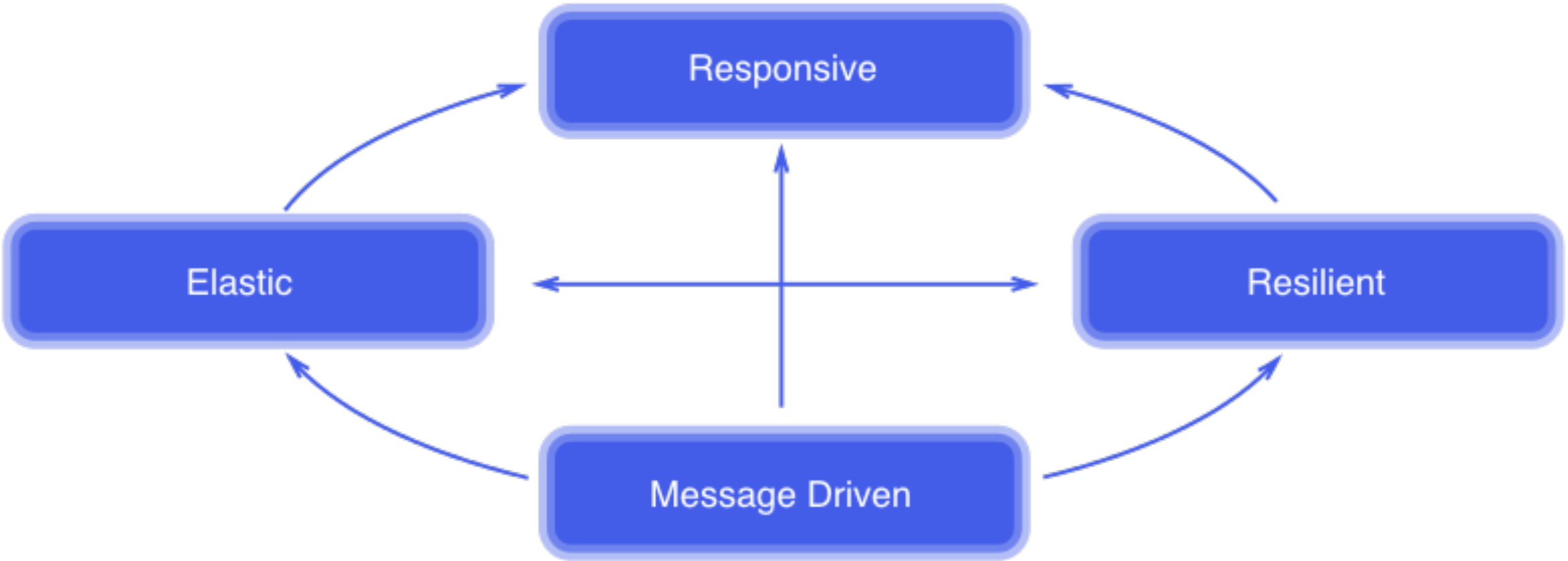
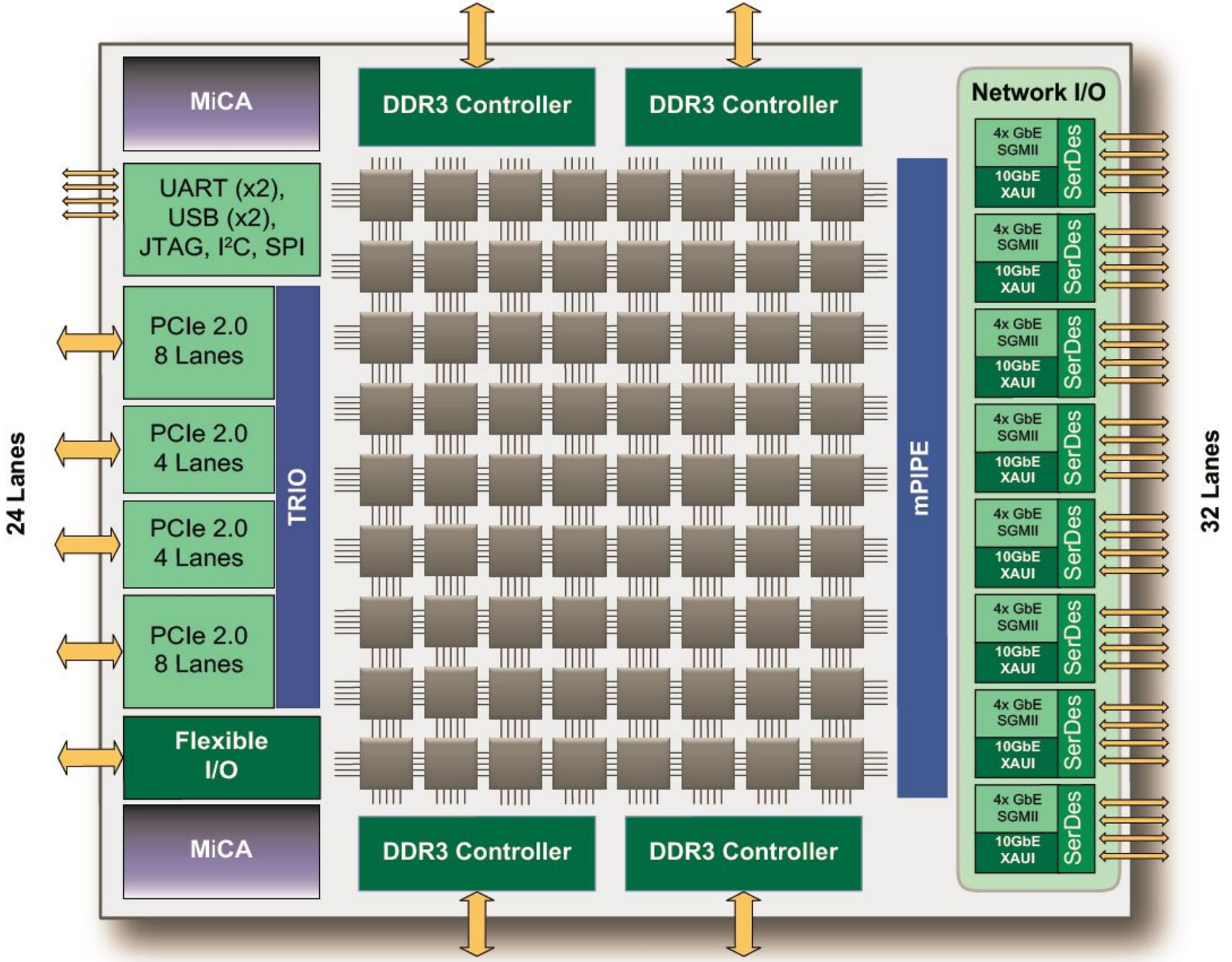
REACTIVE ARCHITECTURAL PATTERN



EVOLUTION OF HARDWARE


24X mx
CREATIVE
THIS COMPUTER IS NEVER OBSOLETE
emachines network
www.e-machines.net
unlimited Internet access for $19.95 per month*
WHEN YOU JOIN EMACHINES NETWORK
Fast, reliable Internet access powered by MCI/UUNET
The world's richest Internet content provided by Netscape
Surf! Email! Invest! Shop! Chat! Travel! and more
Plus, upgrade your PC to the fastest model on the market every 2 years for only $99!
AMERICA Online
VERSION 5.0 INCLUDED
SIGN ON TODAY!
intel inside
celeron
Designed for Microsoft Windows 98
Quantum
Quiet Drive Technology
etower 566i
566 MHz Intel® Celeron™ Processor
etower 566i
32 MB SyncDRAM 256MB Max.
128 KB L2 Cache 66MHz System Bus
7.5 GB Hard Drive Ultra DMA
40x CD-ROM 40x Max.
3D AGP Graphics Intel® Direct AGP
56K Fax Modem ITU K.56flex
USB and Game PORTS
emachines

EVOLUTION OF CPUS



TILE-Gx8072 Processor Block Diagram


iPad.

RESEARCH, TECHNOLOGY & ENGINEERING

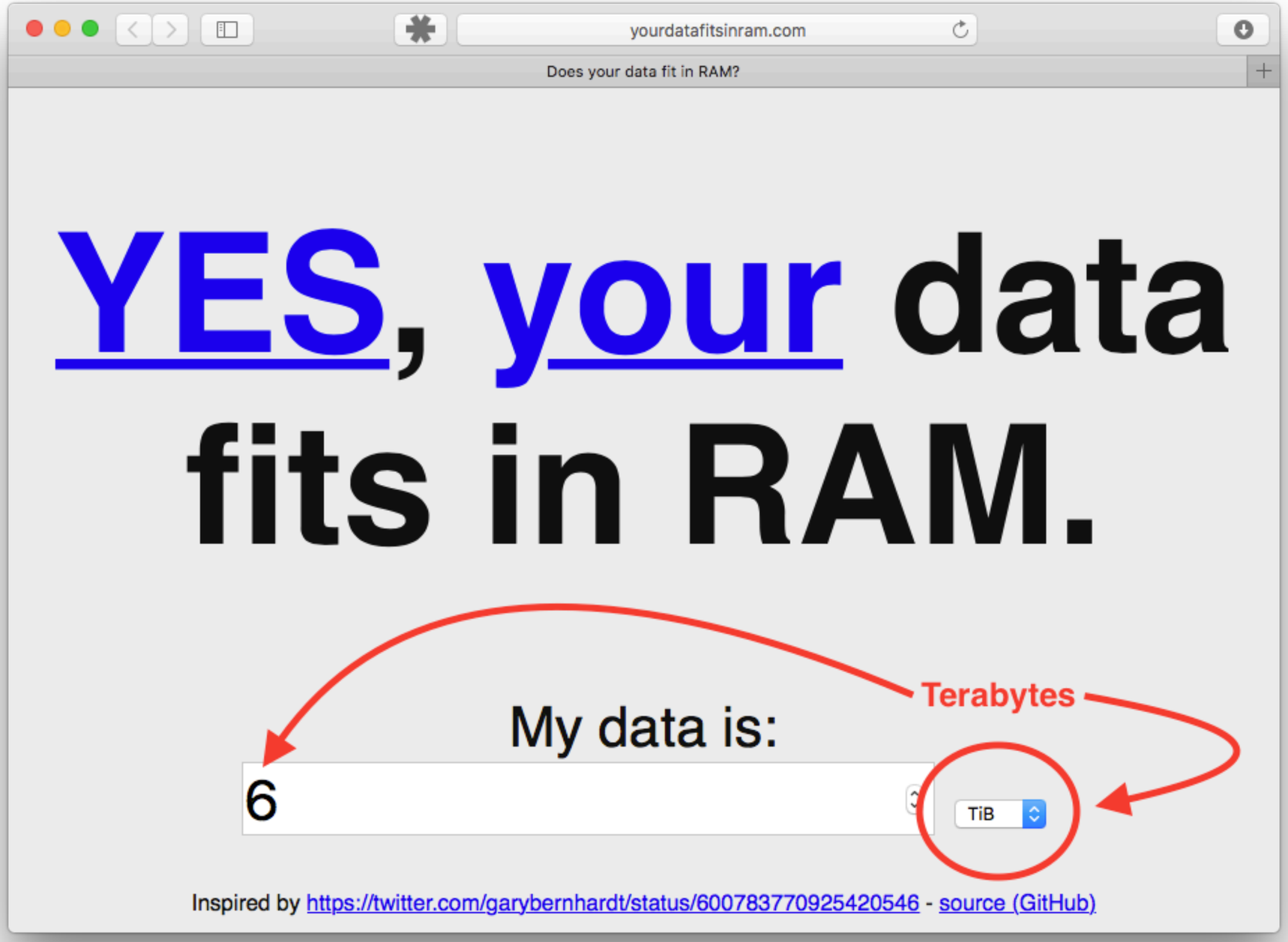
Engineers demo first processor that uses light for ultrafast communications

By Sarah Yang | DECEMBER 23, 2015

Engineers have successfully married electrons and photons within a single-chip microprocessor, a landmark development that opens the door to ultrafast, low-power data crunching.

The researchers packed two processor cores with more than 70 million transistors and 850 photonic components onto a 3-by-6-millimeter chip. They fabricated the microprocessor in a foundry that mass-produces high-performance computer chips, proving that their design can be easily and quickly scaled up for commercial production.

EVOLUTION OF MEMORY

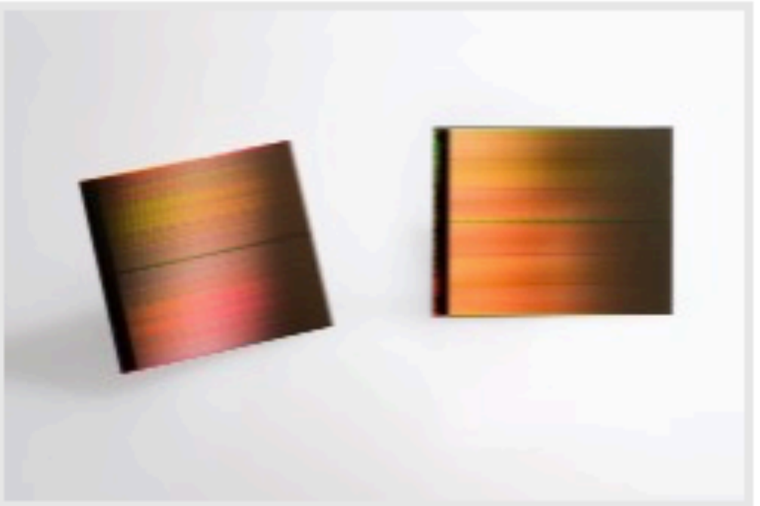

yourdatafitsinram.com
Does your data fit in RAM?
YES, your data fits in RAM.
Terabytes
My data is:
6
TiB
Inspired by https://twitter.com/garybernhardt/status/600783770925420546 - source (GitHub)

SANTA CLARA, Calif., and BOISE, Idaho, July 28, 2015 – Intel Corporation and Micron Technology, Inc. today unveiled 3D XPoint™ technology, a non-volatile memory that has the potential to revolutionize any device, application or service that benefits from fast access to large sets of data. Now in production, 3D XPoint technology is a major breakthrough in memory process technology and the first new memory category since the introduction of NAND flash in 1989.

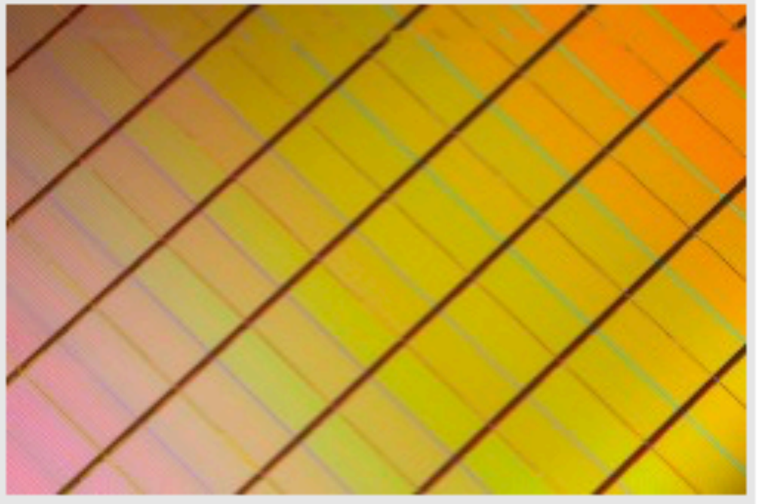
The explosion of connected devices and digital services is generating massive amounts of new data. To make this data useful, it must be stored and analyzed very quickly, creating challenges for service providers and system builders who must balance cost, power and performance trade-offs when they design memory and storage solutions. 3D XPoint technology combines the performance, density, power, non-volatility and cost advantages of all available memory technologies on the market today. The technology is up to 1,000 times faster and has up to 1,000 times greater endurance[3] than NAND, and is 10 times denser than conventional memory.

"For decades, the industry has searched for ways to reduce the lag time between the processor and data to allow much faster analysis," said Rob Crooke, senior vice president and general manager of Intel's Non-Volatile Memory Solutions Group. "This new class of non-volatile memory achieves this goal and brings game-changing performance to memory and storage solutions."

"One of the most significant hurdles in modern computing is the time it takes the processor to reach data on long-term storage," said Mark Adams, president of Micron. "This new class of non-volatile memory is a revolutionary technology that allows for quick access to enormous data sets and enables entirely new applications."



3D Xpoint™ technology is up to 1000x faster than NAND and an individual die can store 128Gb of data

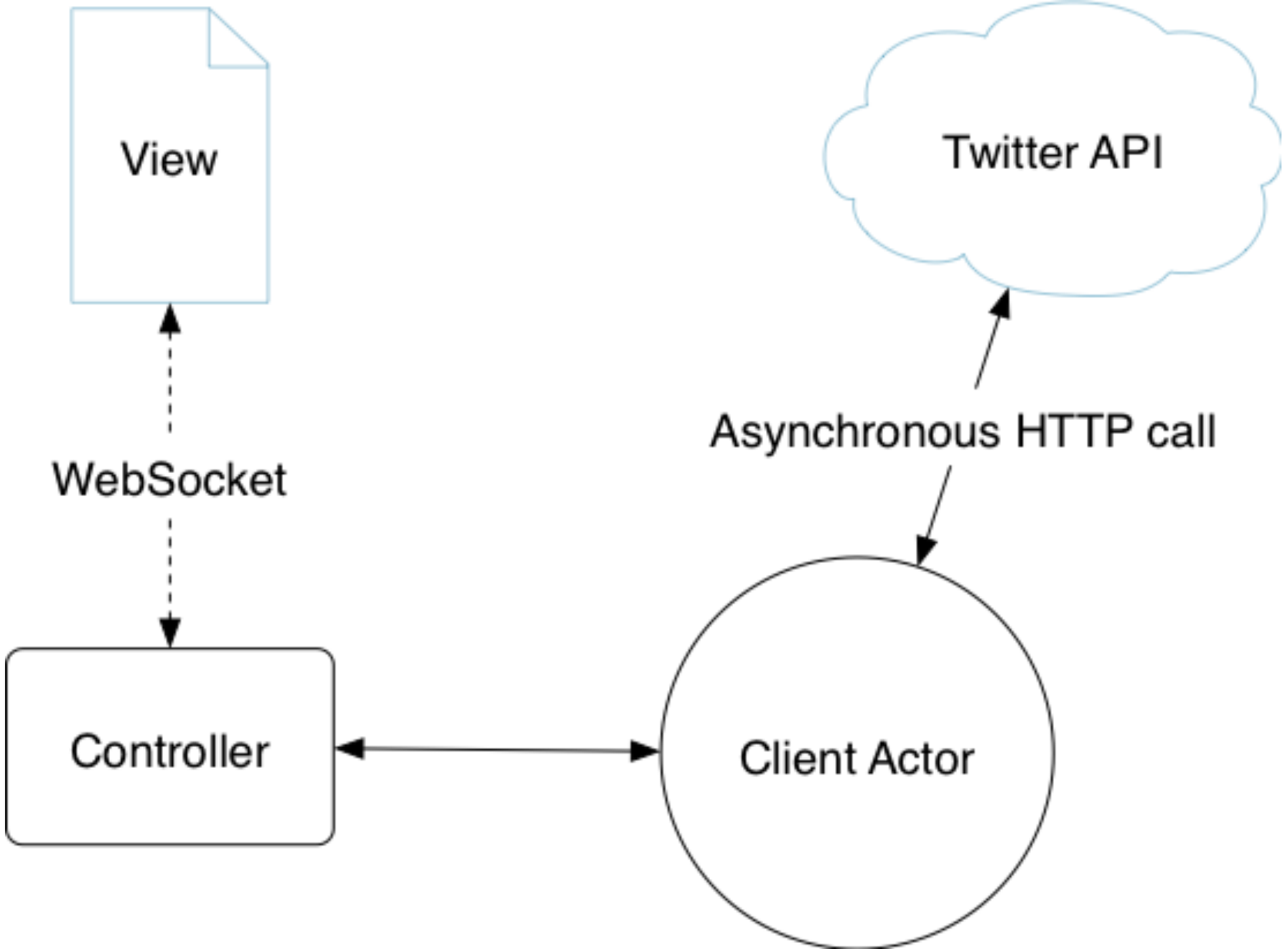


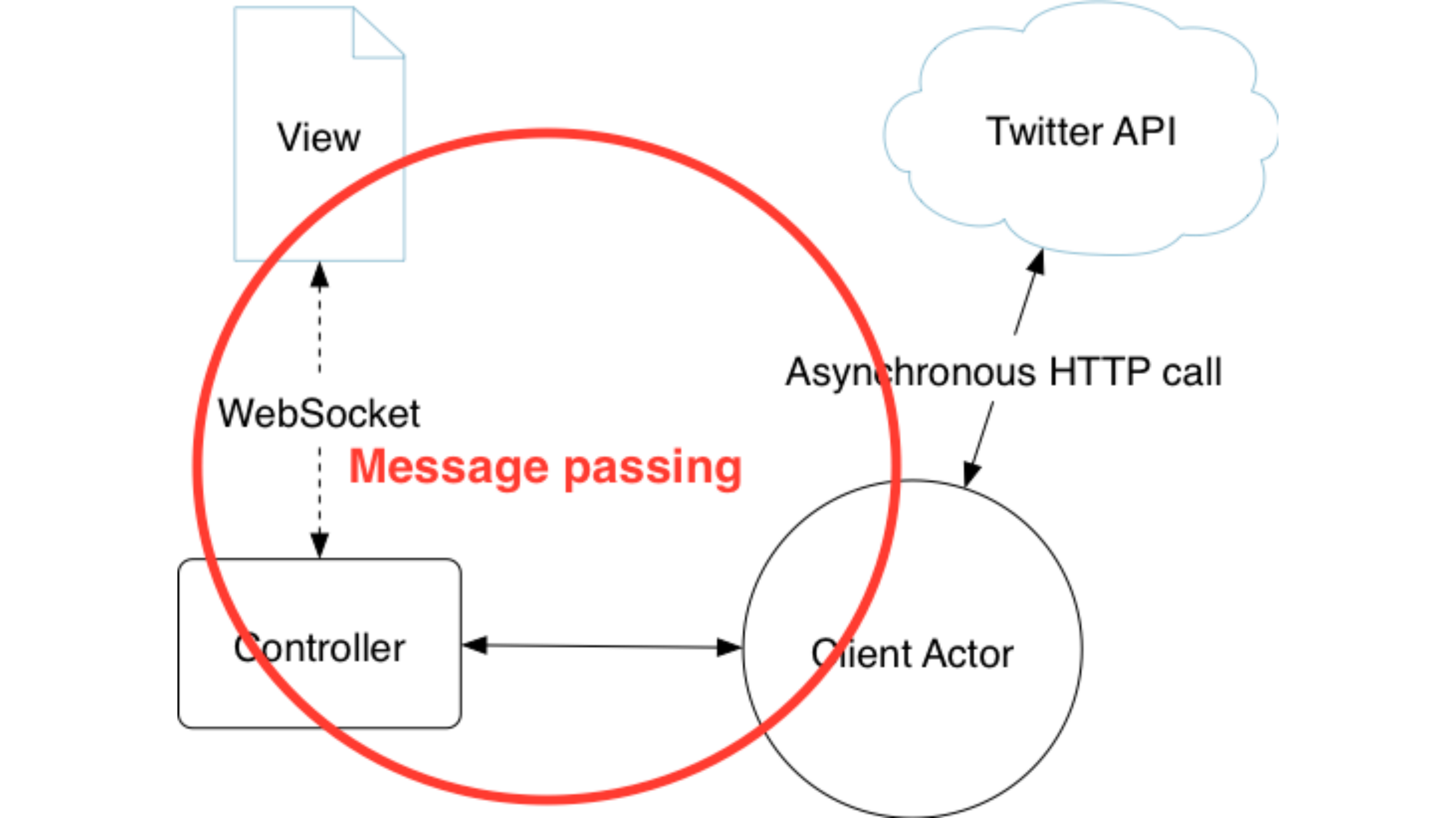
3D Xpoint™ technology wafers are currently running in production lines at Intel Micron Flash Technologies fab

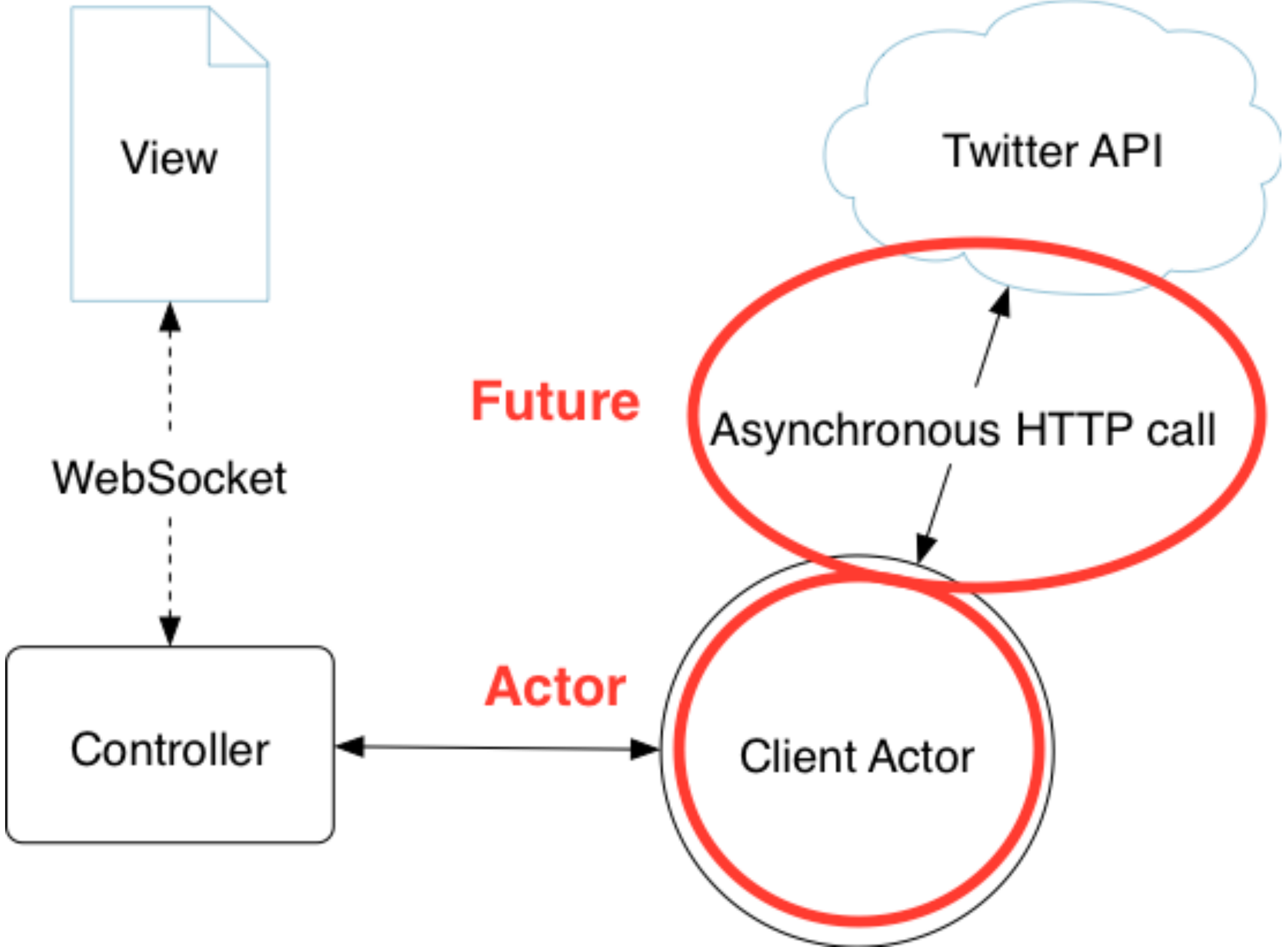
CONCLUSION

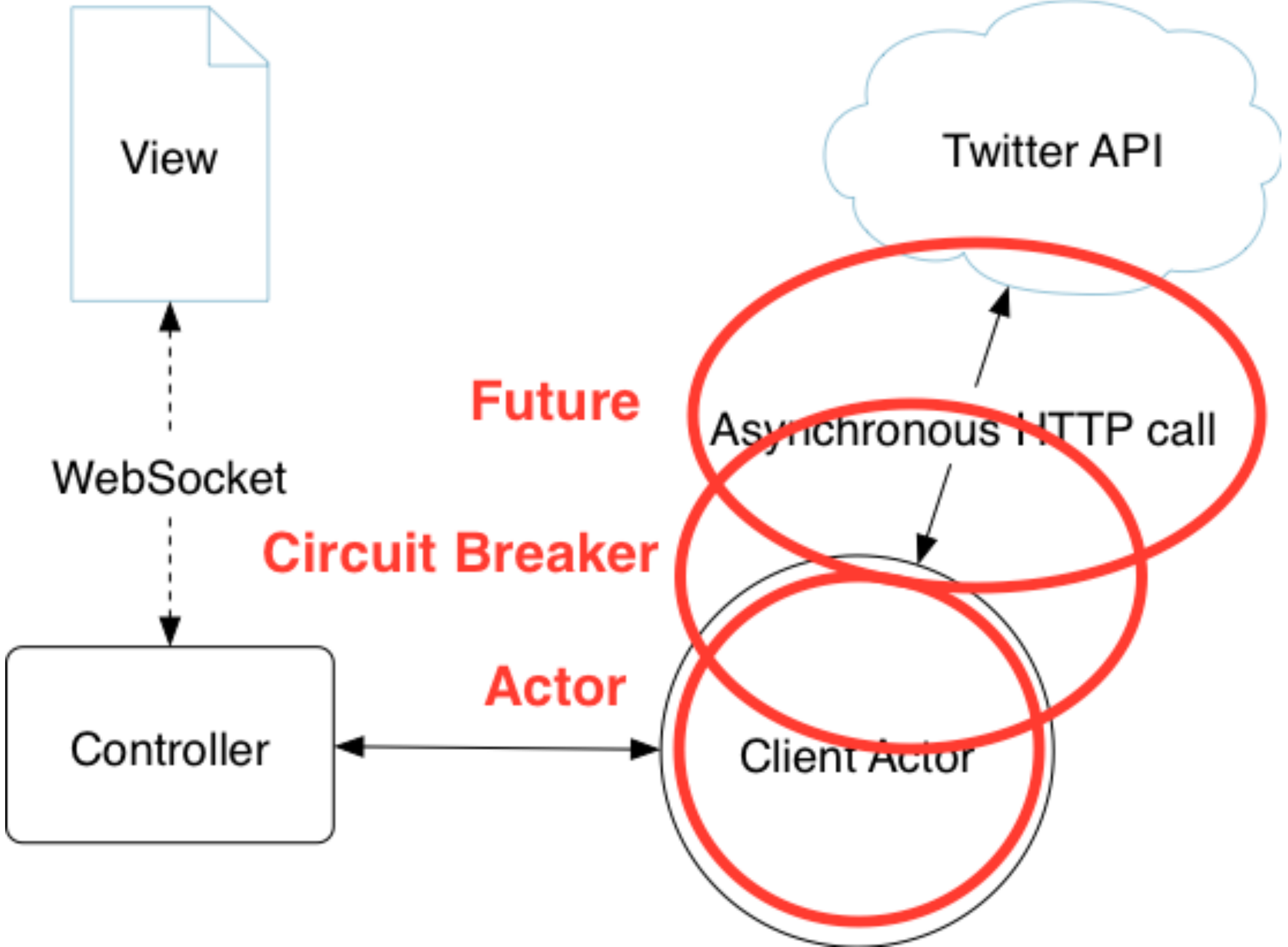
- MANY-CORE & DISTRIBUTED SYSTEMS
- EXPLICIT ASYNCHRONOUS PROGRAMMING IS GETTING IMPORTANT
- EXPLICIT FAILURE HANDLING IS GETTING IMPORTANT

LET'S BUILD A SMALL REACTIVE WEB APPLICATION

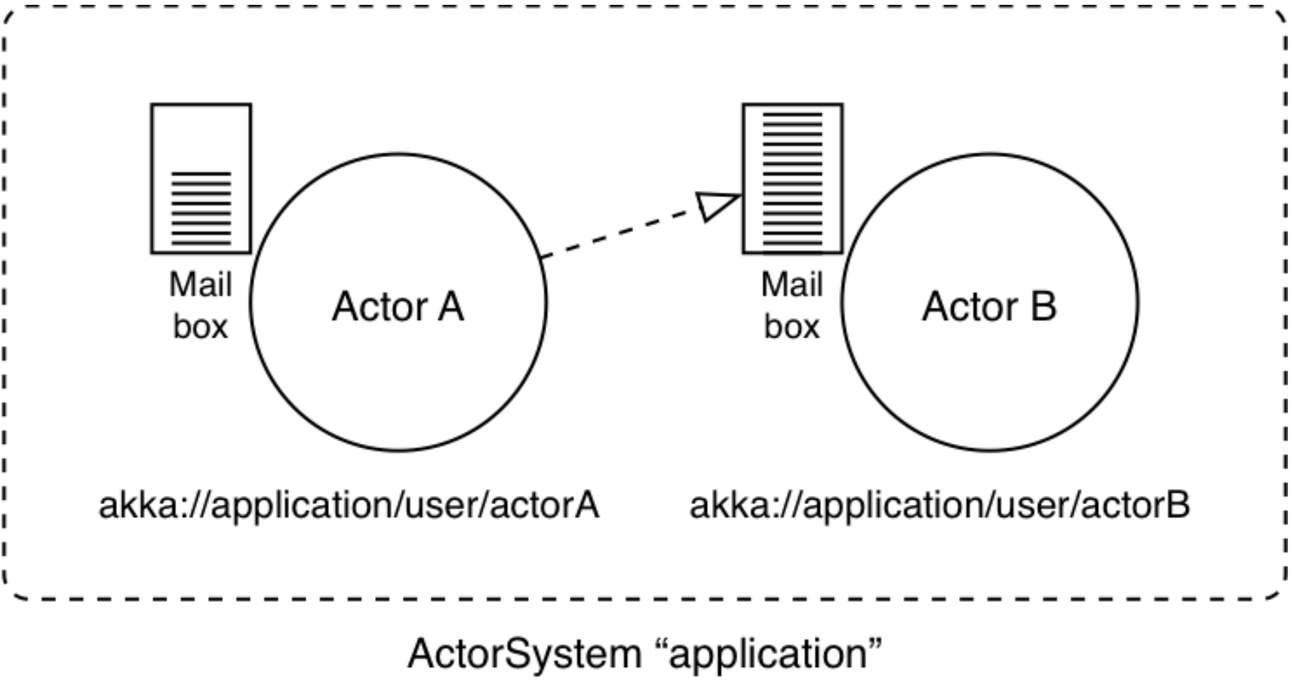

View
Twitter API
WebSocket
Asynchronous HTTP call
Controller
Client Actor


View
Twitter API
WebSocket
Message passing
Asynchronous HTTP call
Controller
Client Actor


View
Twitter API
Future
Asynchronous HTTP call
WebSocket
Actor
Controller
Client Actor


View
Twitter API
Future
Asynchronous HTTP call
WebSocket
Circuit Breaker
Actor
Controller
Client Actor

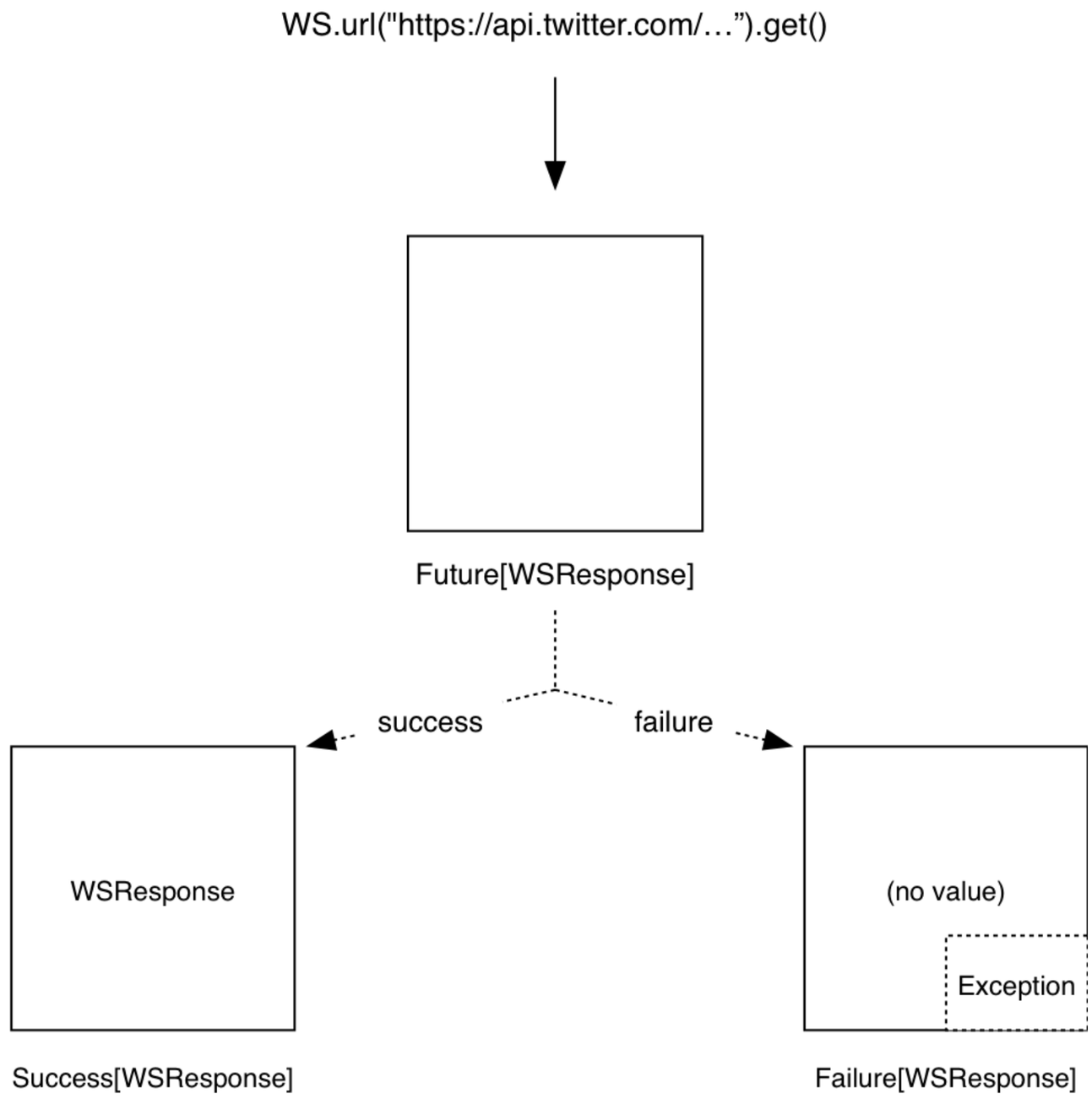
ACTORS



- LIGHTWEIGHT OBJECTS
- SEND AND RECEIVE MESSAGES (MAILBOX)
- CAN HAVE CHILDREN (SUPERVISION)

"LONG-LIVED" ASYNC COMPUTATION

CODING



FUTURES

`scala.concurrent.Future[T]`

- HOLDS A VALUE OF TYPE T
- CAN EITHER FAIL OR SUCCEED
- ASYNC CODE DOES NOT BLOCK A THREAD WHILE WAITING FOR COMPLETION

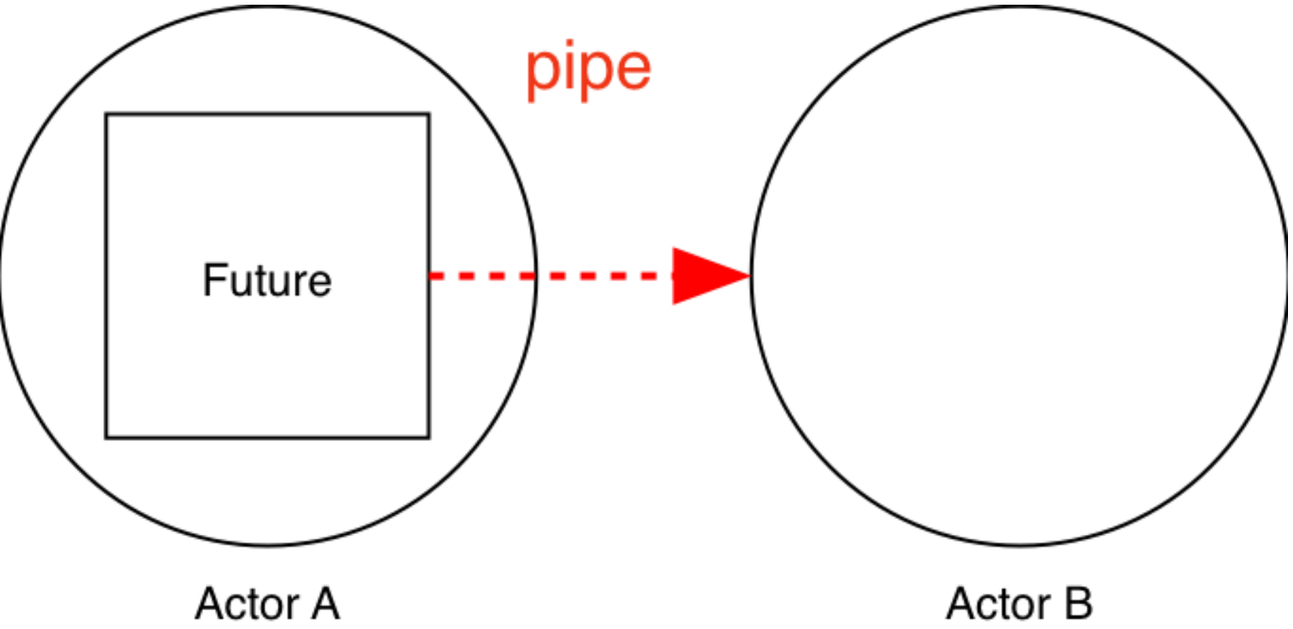
"SHORT-LIVED" ASYNC COMPUTATION

PIPE

`akka.pattern.pipe`

- BRIDGE BETWEEN FUTURES AND ACTORS
  - IMPLEMENTED AS ANONYMOUS ACTOR

PIPE



`akka.pattern.pipe`

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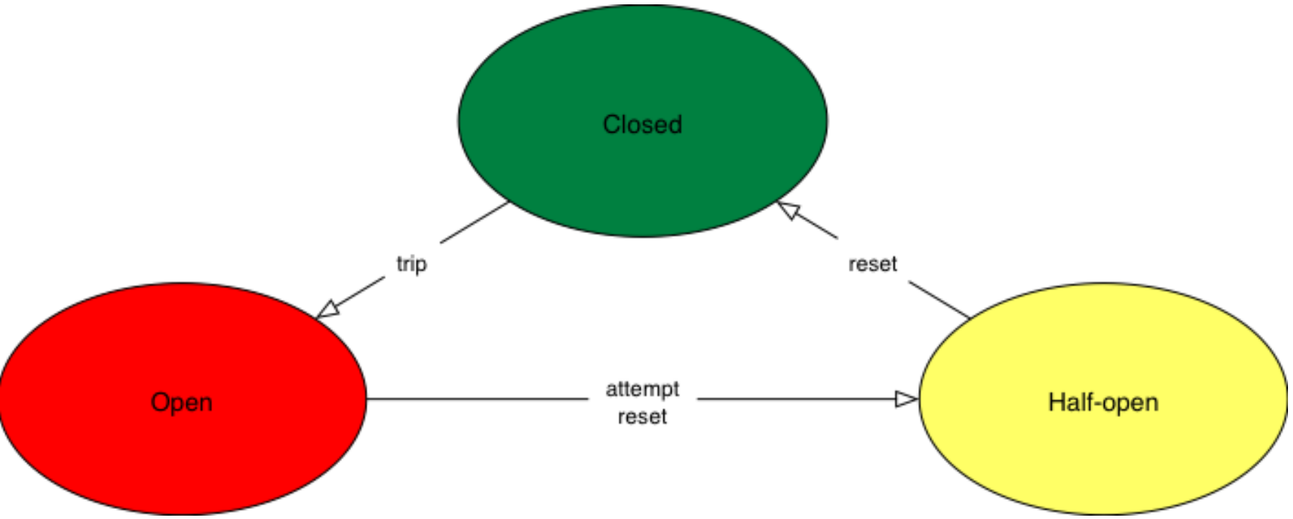
  - IMPLEMENTED AS ANONYMOUS ACTOR



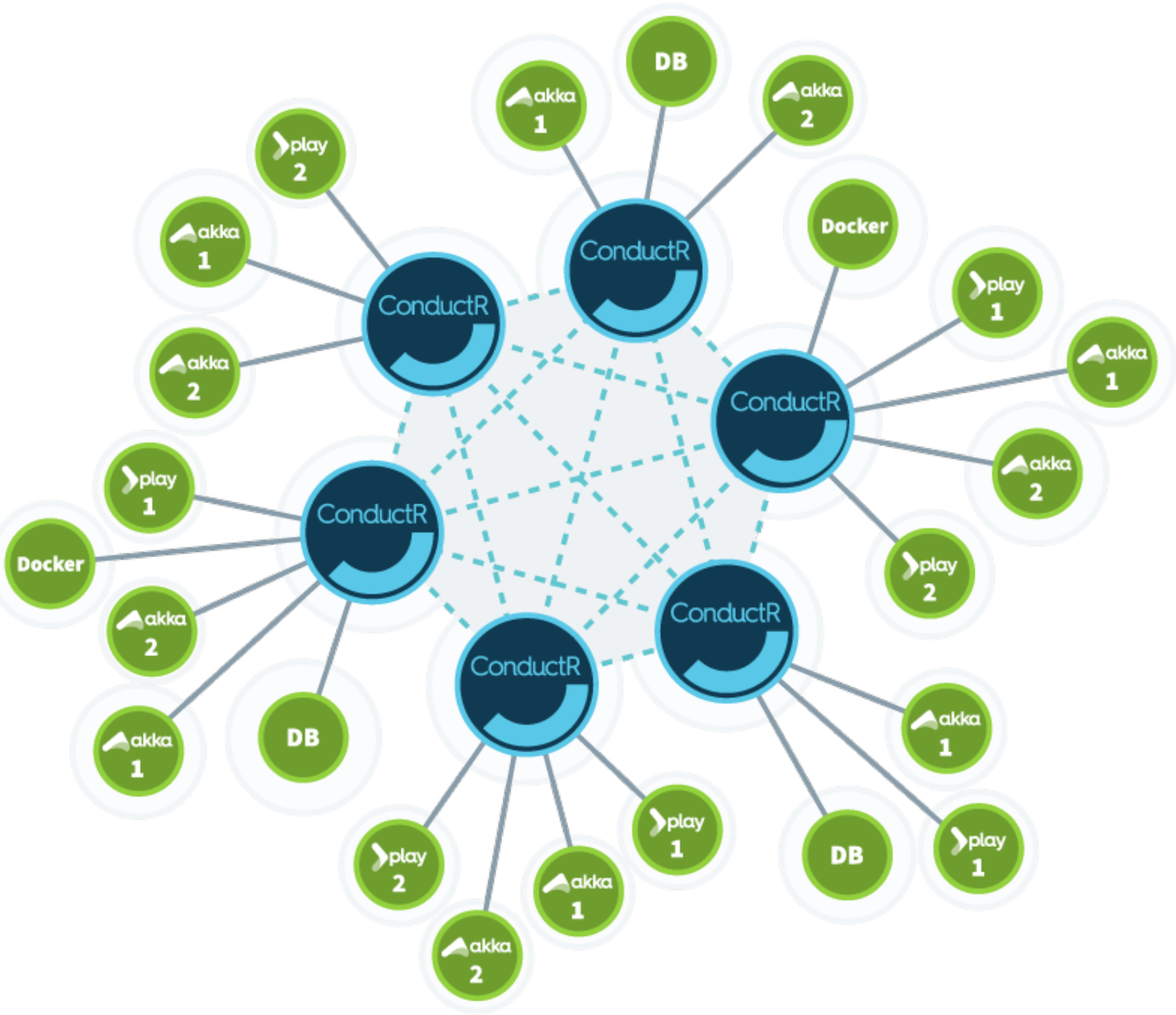
CIRCUIT BREAKER

`akka.pattern.CircuitBreaker`

- HELPFUL WHEN DEALING WITH LEGACY / SLOW SYSTEMS & PREVENTS CASCADING FAILURE
- LIKE AN ELECTRIC CIRCUIT BREAKER, TRIPS WHEN THERE'S A SURGE
- TRIPS AFTER A GIVEN NUMBER OF FAILURES, FOR A GIVEN TIMEOUT, THEN ATTEMPTS RESET

DEPLOYMENT

- STAND-ALONE VS. "ELASTIC DEPLOYMENT"
- ELASTIC, FAULT-TOLERANT IS NOT TRIVIAL
  - USE A MANAGED SERVICE / SOLUTION

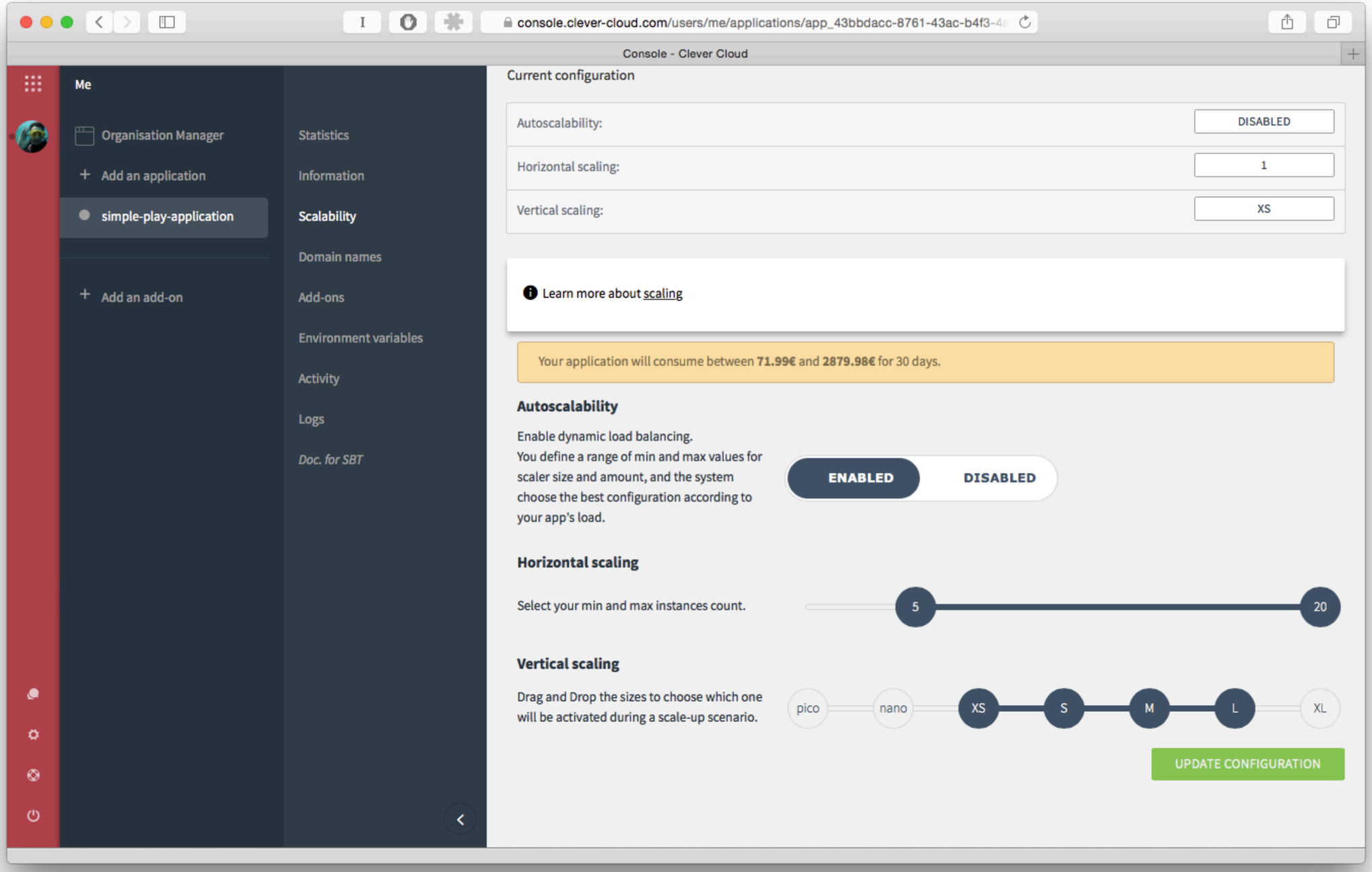


DEPLOYMENT

- TYPESAFE CONDUCTR
- AUTOMATED CLUSTER MANAGEMENT FOR PLAY / AKKA / ... APPLICATIONS
- AUTOMATED NODE FAILURE & NETWORK PARTITION RESOLUTION

DEPLOYMENT

- FULLY MANAGED OPERATIONS
- AUTO SCALABILITY FEATURE (HORIZONTAL & VERTICAL)
- ATTRACTIVE PRICING


console.clever-cloud.com/users/me/applications/app_43bbdacc-8761-43ac-b4f3-4
Console - Clever Cloud
Me
Organisation Manager
Add an application
simple-play-application
Add an add-on
Statistics
Information
Scalability
Domain names
Add-ons
Environment variables
Activity
Logs
Doc. for SBT
Current configuration
Autoscalability:
DISABLED
Horizontal scaling:
1
Vertical scaling:
XS
Learn more about scaling
Your application will consume between 71.99€ and 2879.98€ for 30 days.
Autoscalability
Enable dynamic load balancing.
You define a range of min and max values for scaler size and amount, and the system choose the best configuration according to your app's load.
ENABLED
DISABLED
Horizontal scaling
Select your min and max instances count.
5
20
Vertical scaling
Drag and Drop the sizes to choose which one will be activated during a scale-up scenario.
pico
nano
XS
S
M
L
XL
UPDATE CONFIGURATION

THANK YOU

@ELMANU

MANUEL@BERNHARDT.IO

QUESTIONS?

39% OFF WITH CODE
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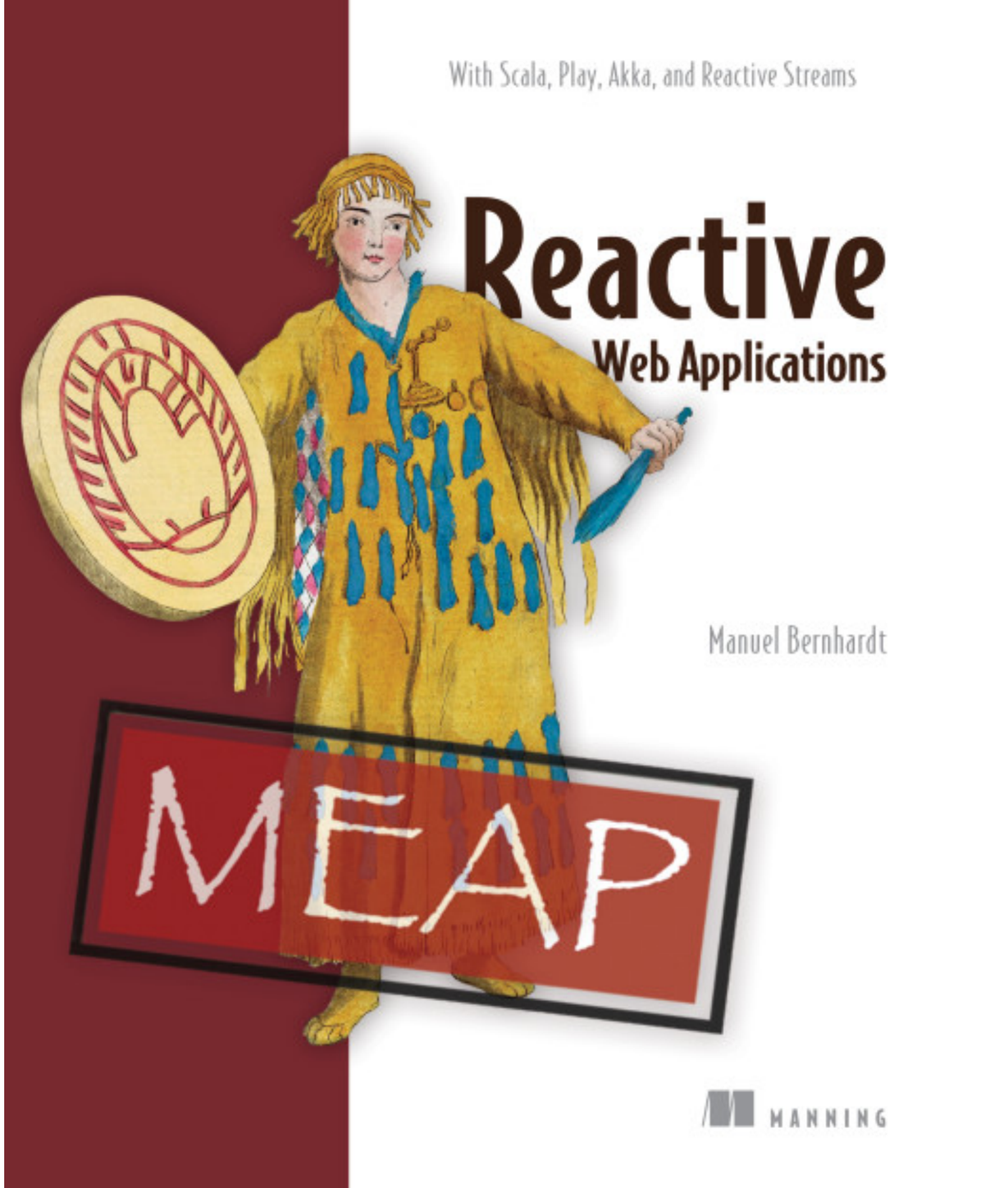
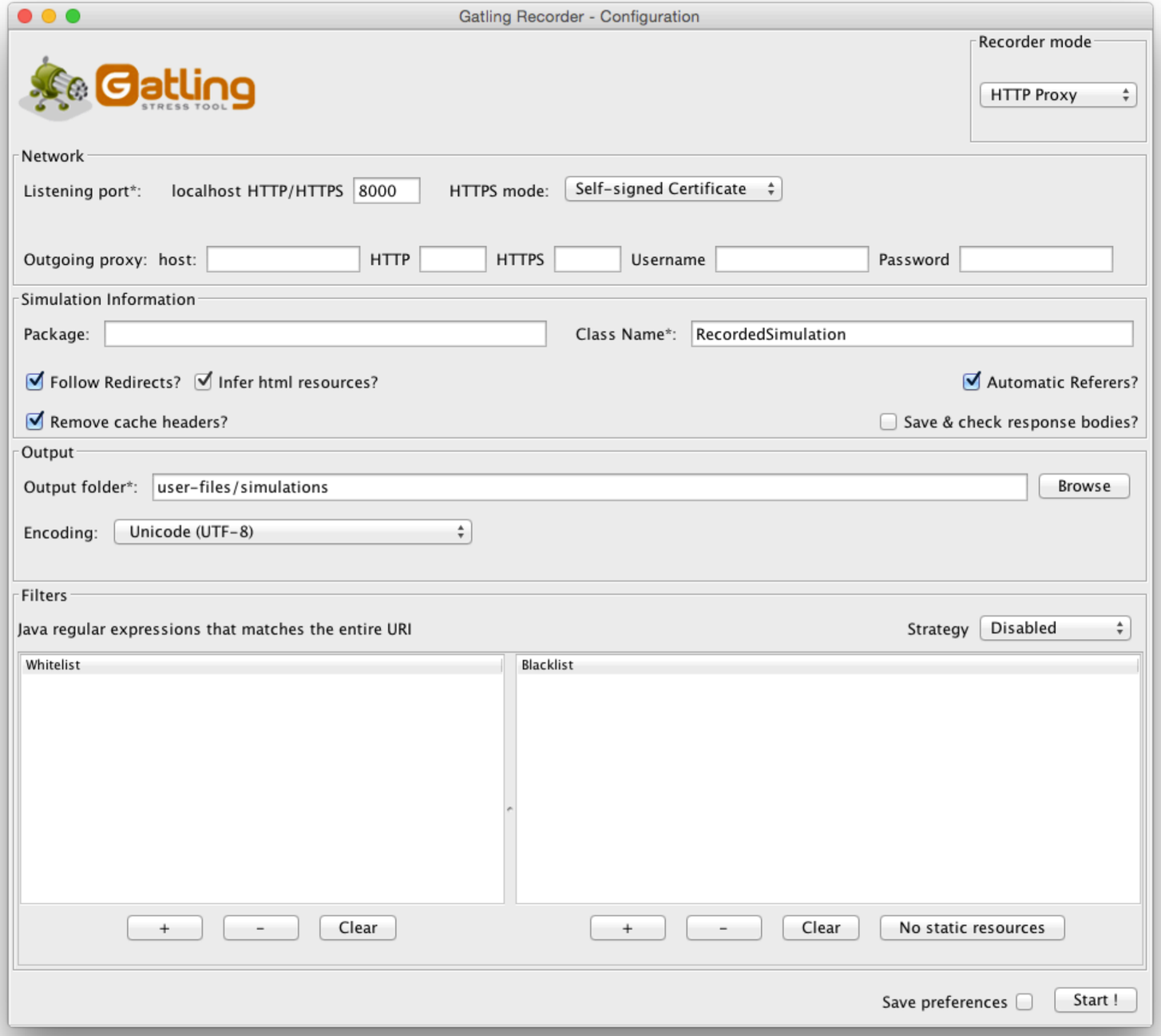


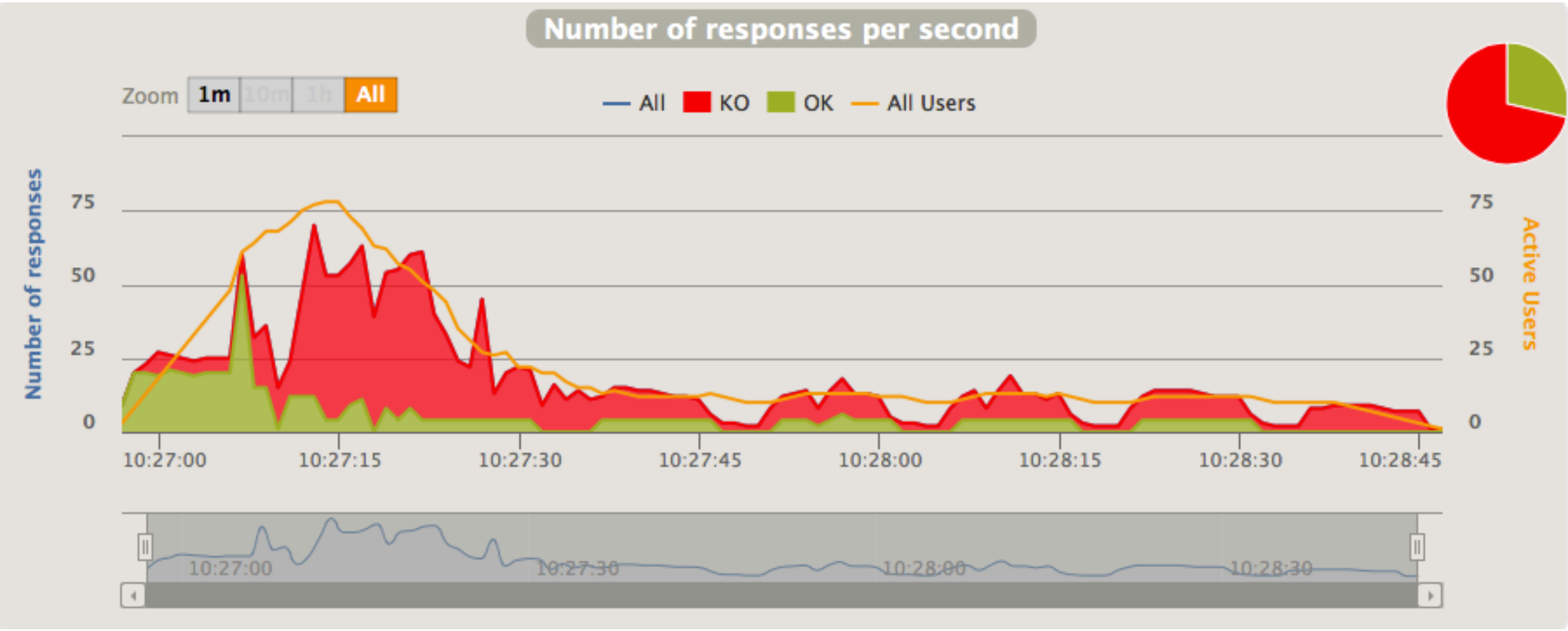
GATLING

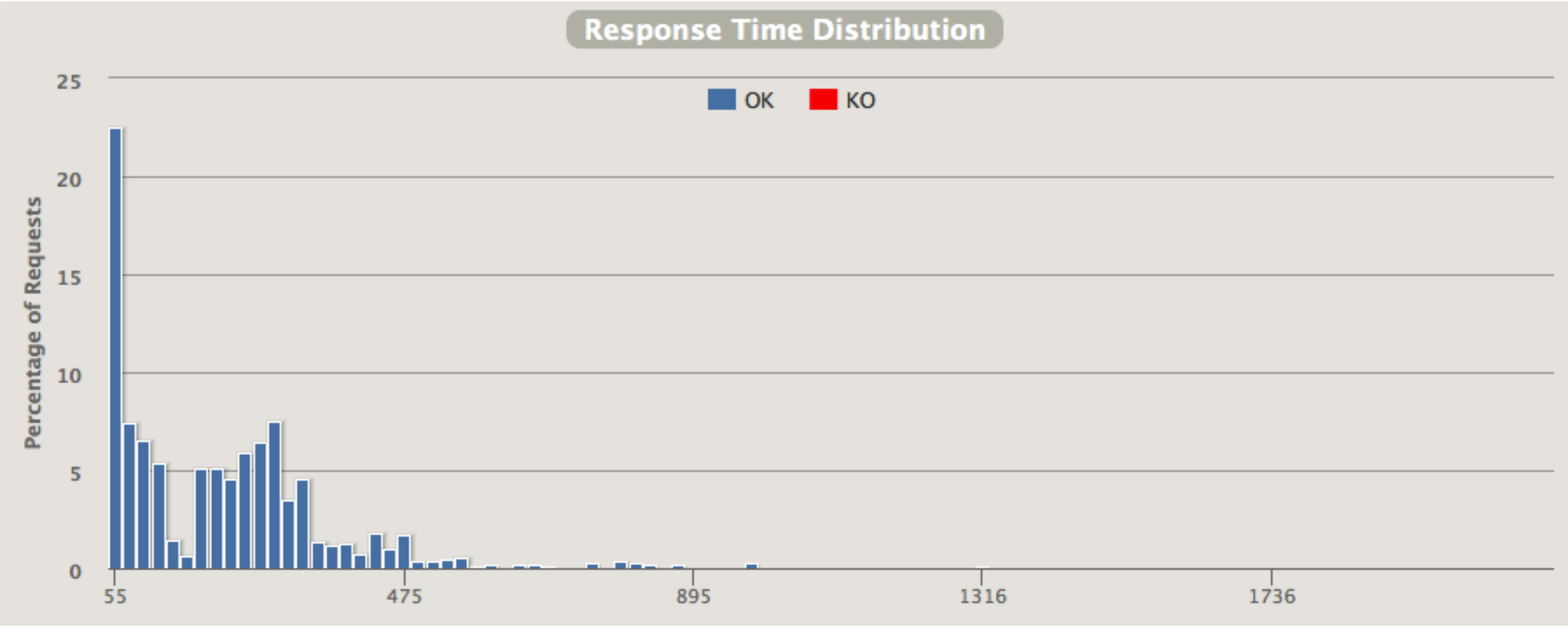
- OPEN-SOURCE LOAD TESTING FRAMEWORK
  - BUILT WITH SCALA, AKKA AND NETTY
    - TWO PHASES: RECORD AND RUN


Gatling Recorder - Configuration
Gatling
STRESS TOOL
Recorder mode
HTTP Proxy
Network
Listening port*:
localhost HTTP/HTTPS
8000
HTTPS mode:
Self-signed Certificate
Outgoing proxy:
host:
HTTP
HTTPS
Username
Password
Simulation Information
Package:
Class Name*:
RecordedSimulation
Follow Redirects?
Infer html resources?
Automatic Referers?
Remove cache headers?
Save & check response bodies?
Output
Output folder*:
user-files/simulations
Browse
Encoding:
Unicode (UTF-8)
Filters
Java regular expressions that matches the entire URI
Strategy
Disabled
Whitelist
Blacklist
+
-
Clear
+
-
Clear
No static resources
Save preferences
Start !

GATLING SIMULATION FILE

```
// ...
setUp(
  scn.inject(
    nothingFor(4 seconds),
    rampUsers(100) over(10 seconds),
    atOnceUsers(10),
    constantUsersPerSec(2) during(15 seconds) randomized,
    splitUsers(500) into (
      rampUsers(50) over(10 seconds)
    ) separatedBy(2 seconds)
  ).protocols(httpProtocol)
)
```


Number of responses per second
Zoom
1m
10m
1h
All
All
KO
OK
All Users
Number of responses
Active Users
75
50
25
0
10:27:00
10:27:15
10:27:30
10:27:45
10:28:00
10:28:15
10:28:30
10:28:45


Response Time Distribution
OK
KO
Percentage of Requests
25
20
15
10
5
0
55
475
895
1316
1736