



# MIGRATING AN INVOICING SYSTEM TO Elixir/ERLANG

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@Hiphoox

# HOW TO SURVIVE A REWRITE



WHERE?



CONTEXT



WHAT WE DID



THE FINISH

01

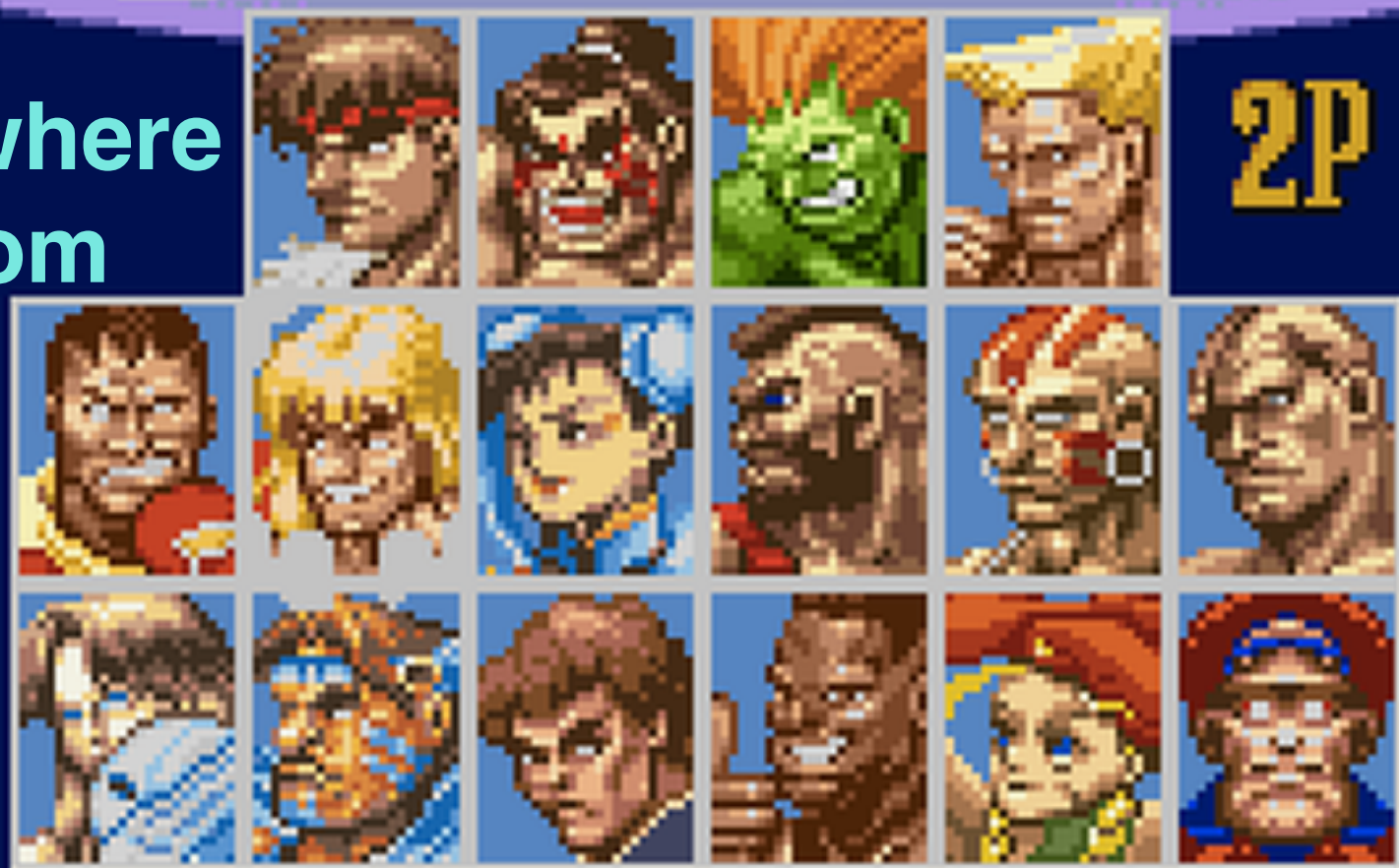
# WHERE?



# PLAYER SELECT



This is where  
I'm from



2P

*KEN*





# TACOGRAFÍA



Es tan amplio el mapa gastronómico del país que sólo los más exquisitos tacos han logrado trascender, al grado de ser considerados como típicos de una región o estado. Y aunque la lista puede llegar a ser infinita, aquí presentamos los tacos que representan con orgullo el sabor y la sazón de las distintas regiones del país.





© Lis Roldan









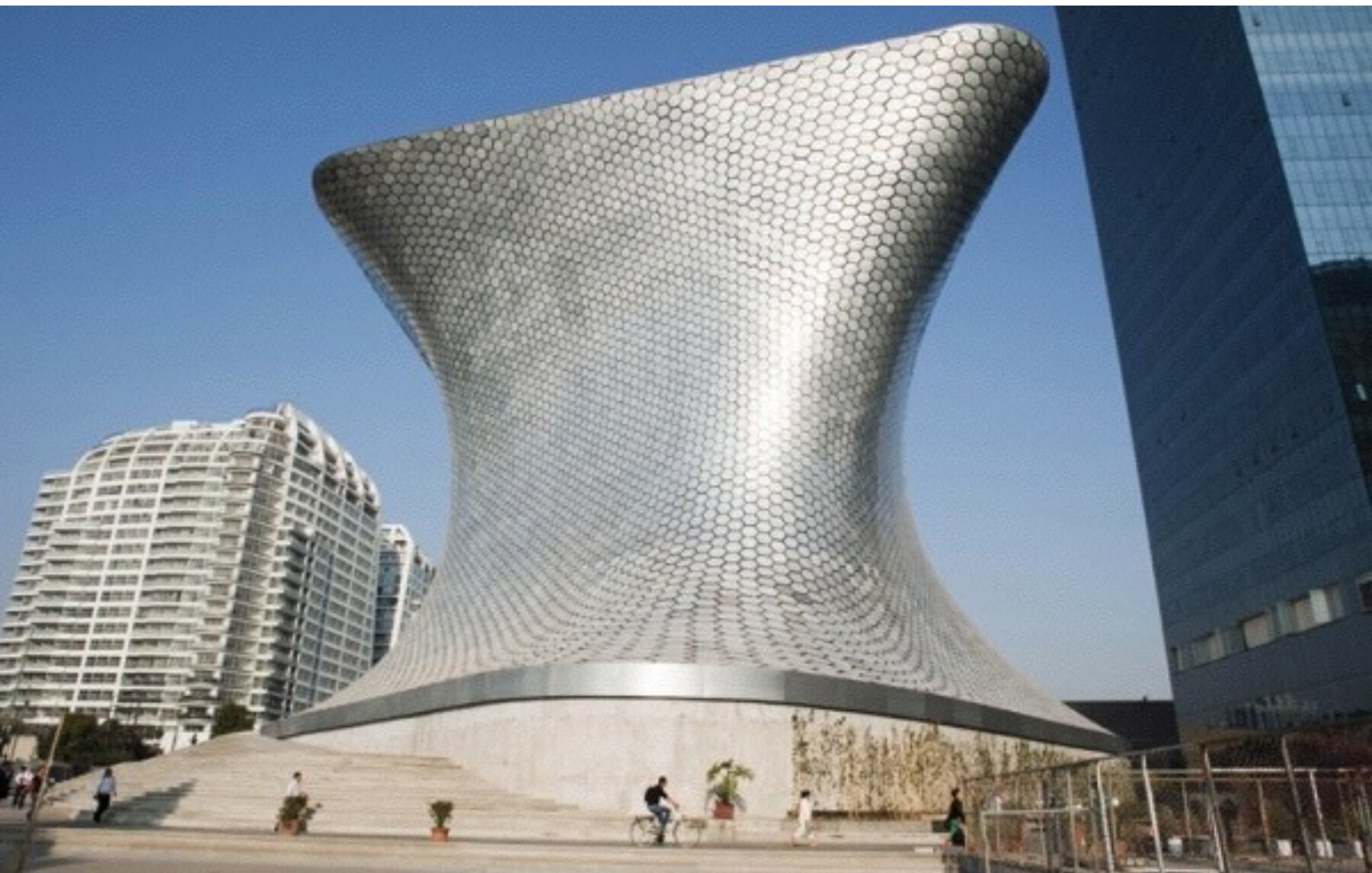














# Largest Elixir Meetups

## Largest Elixir Meetups

1

### Code Self Study

1,872 Members | [Berkeley, CA](#)



Organized by Josh



2

### Erlang & Elixir SF

1,366 Erlangutans | [San Francisco, CA](#)



Organized by Kyle Patterson



3

### Elixir Mexico City

919 Alquimista de Elixir | [México City, Mexico](#)



Organized by Norberto Ortigoza







[HOME](#) [CALL FOR TALKS](#) [VENUE](#) [SUBSCRIBE](#)

**JOIN US FOR THE SECOND EDITION OF THE ERLANG FACTORY LITE IN MÉXICO CITY!**

**MÉXICO CITY**  
**CONFERENCE: 29 OCTOBER**



**Last time we sold out in 3 weeks!**





**Everyone is invited!**

02

# CONTEXT





# Background

- **First** electronic invoices in 2005.
- **Electronic invoices** have been mandatory since 2014.
- **50 million** total tax payers in Mexico.
- **More electronic documents** in the next years: payroll documents, birth certificates, etc.



# Statistics

Transactions in 2015

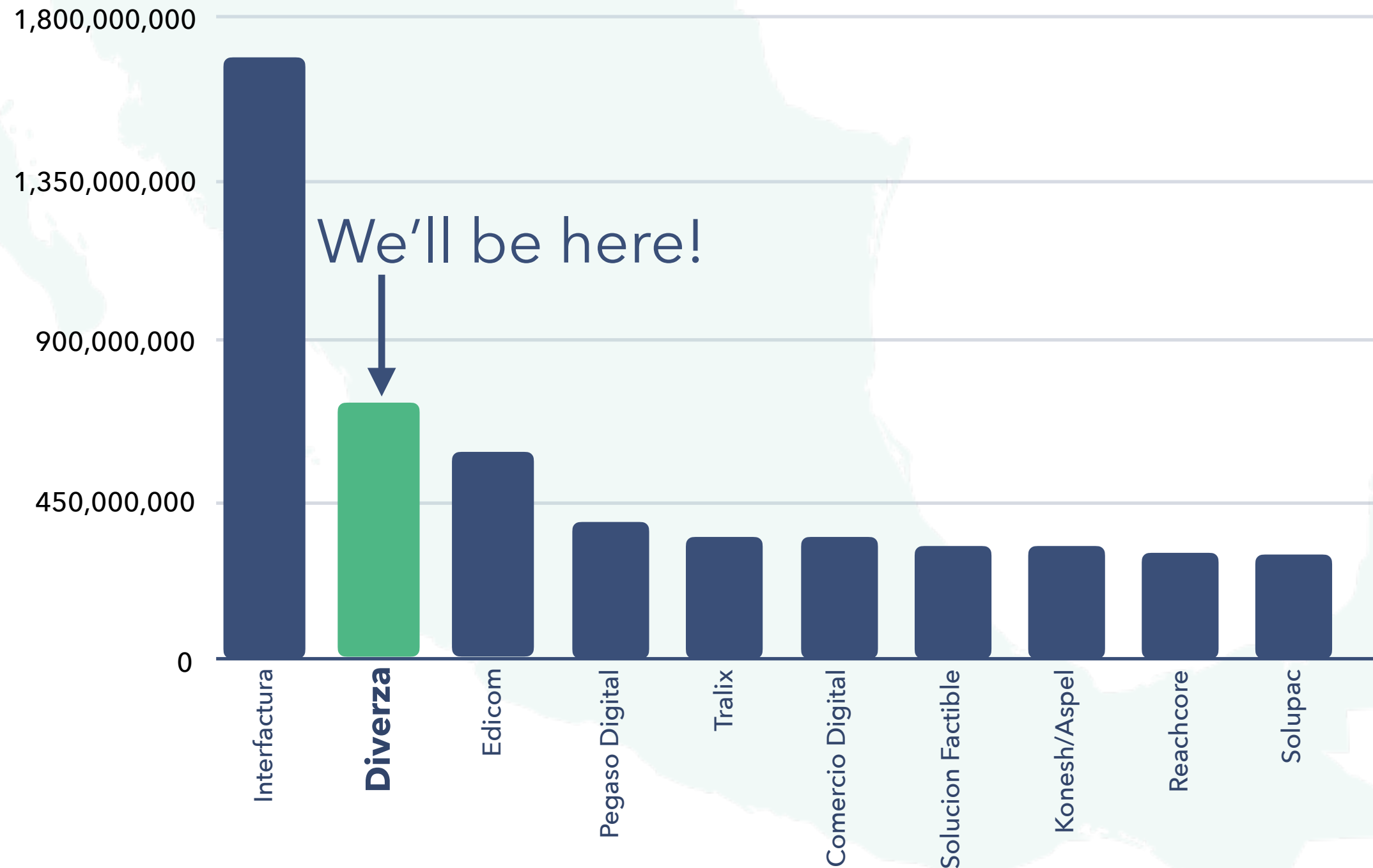
TOP 10 COMPANIES



# Statistics

Transactions in 2016

TOP 10 COMPANIES



# Statistics

- **700 millions transactions** by the end of 2016.
- Company has **341,000 users**.
- **44** transactions per second.

**That's it!?**  
**Really!?**



**SO...**

**IT WAS NOT  
ABOUT  
PERFORMANCE  
OR  
THROUGHPUT**

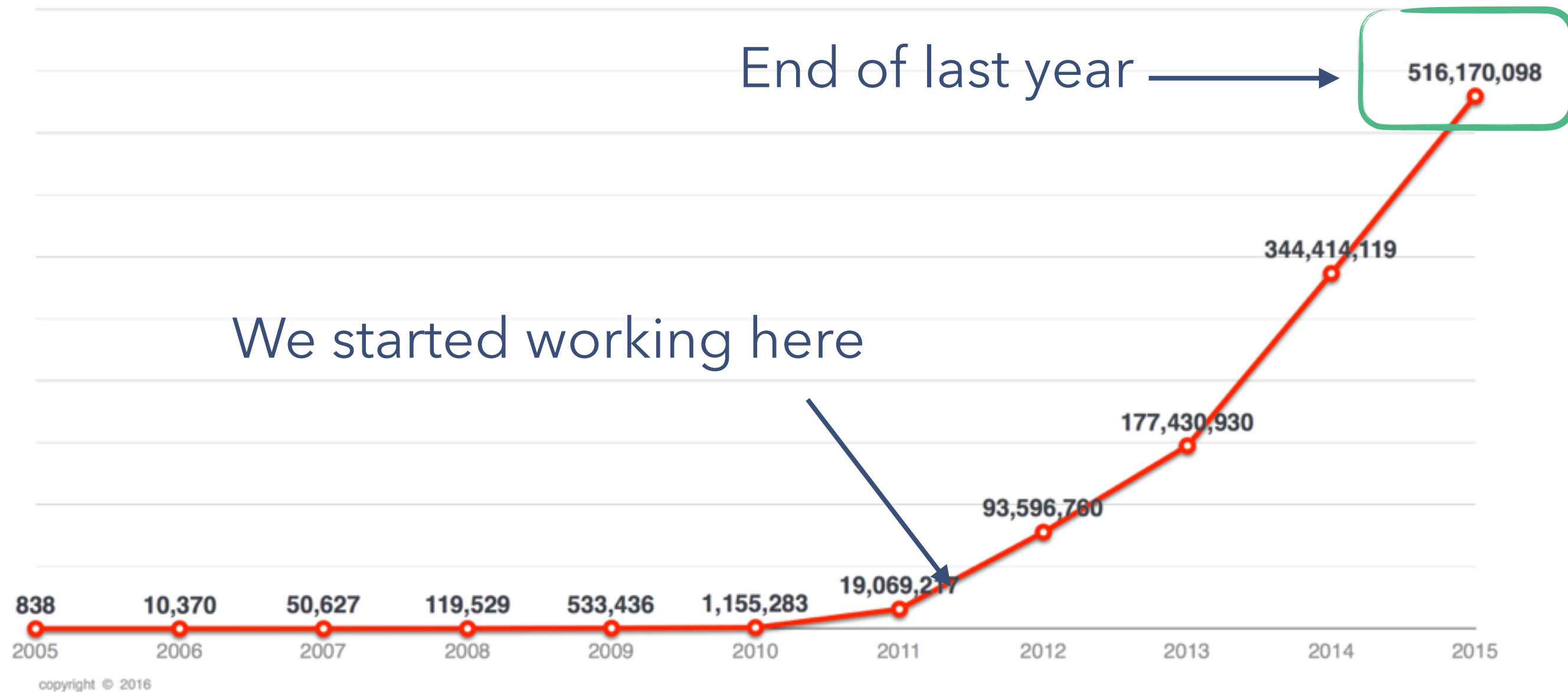


**IT WAS ABOUT  
AVAILABILITY  
AND COST  
REDUCTION**

# Requirements

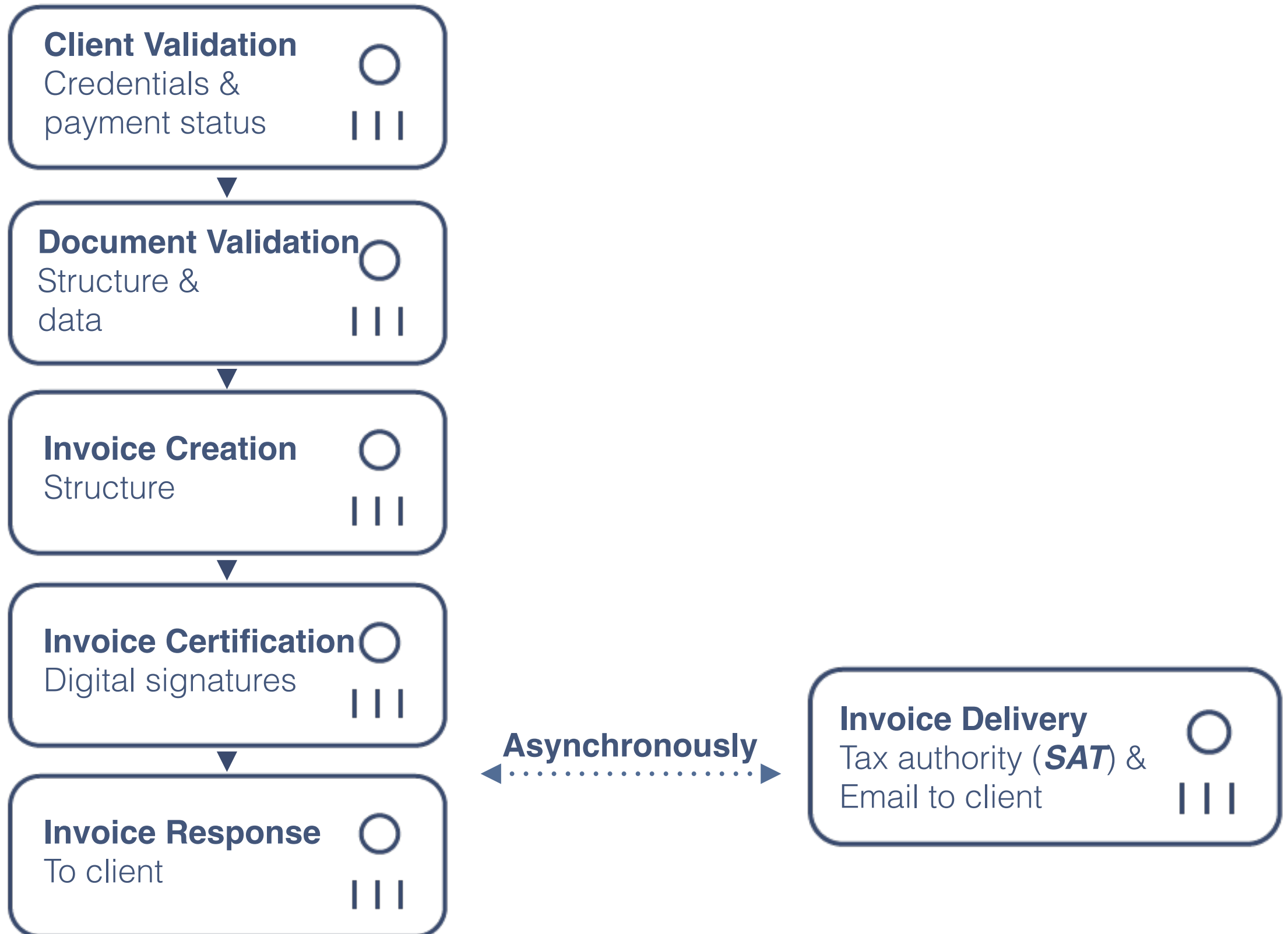
- Clients have **critical business processes** that depend on getting the invoices online.
- If not, they can **lose** money, clients or merchandise.
- Tax authority (**SAT**) has **heavy fines** if our clients or Diverza don't deliver invoices on time.
- System needs to be available **all the time**.
- We were **paying a lot of money** for infrastructure.

# Growth in the last years





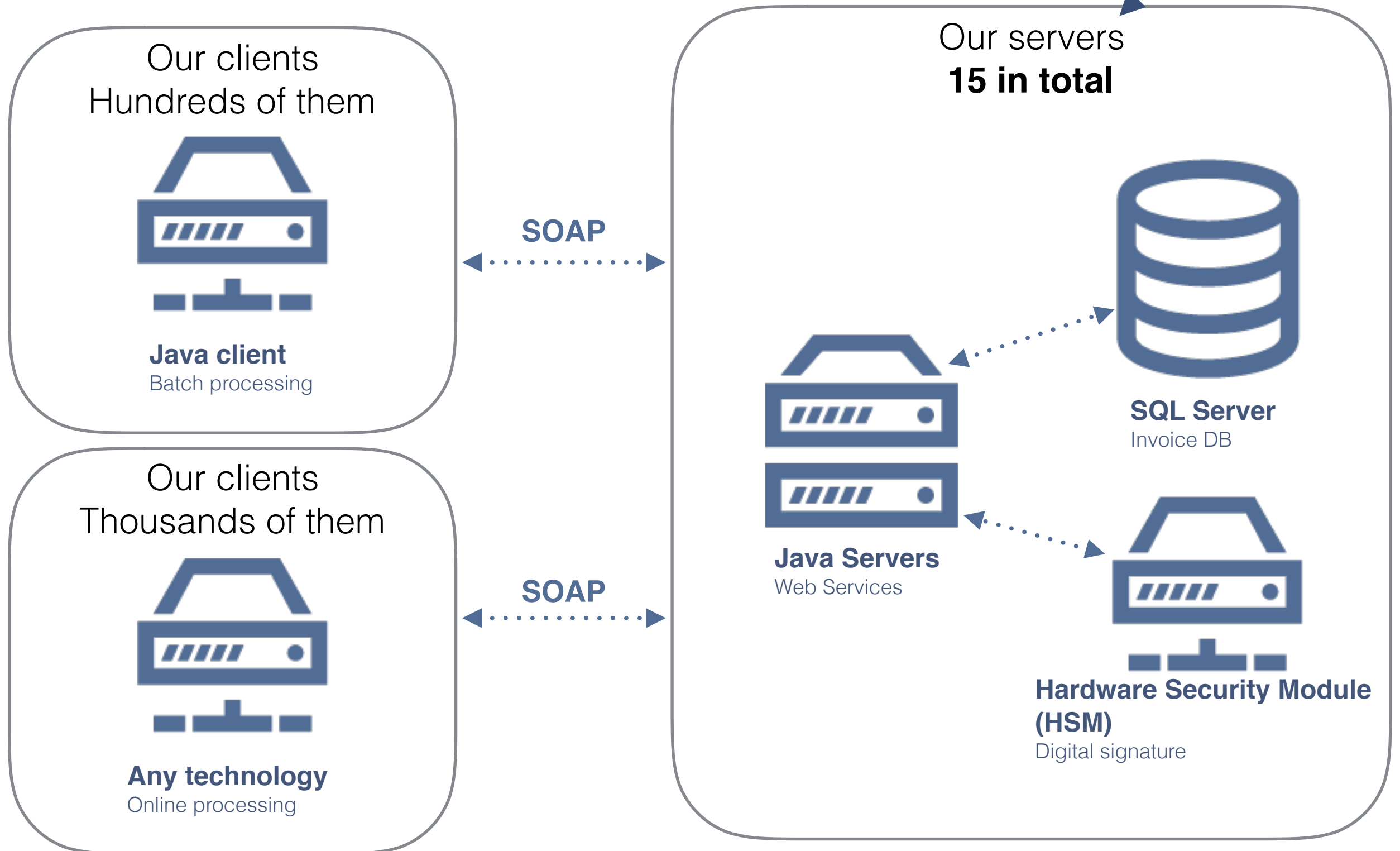
# Invoicing process



**ONCE UPON A TIME  
THERE WAS A SYSTEM...**

# Legacy System

Wow!



# Physical Servers

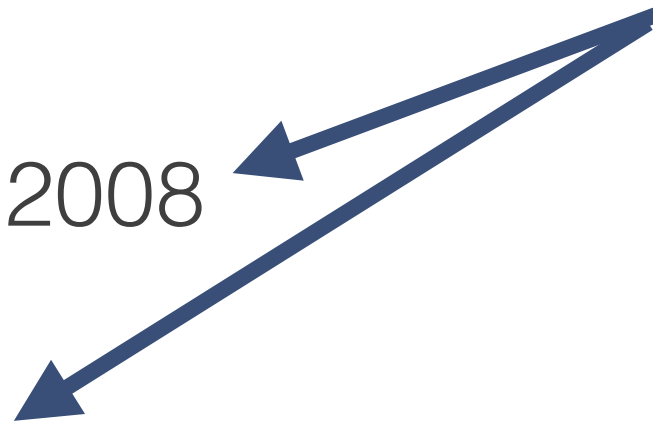
- 2 Type-1 Hypervisors
- Operating System: ESX
- Processor: Dual Processor, Octo Core Intel 2.70GHz.
- Memory: 128 GB (Std.)



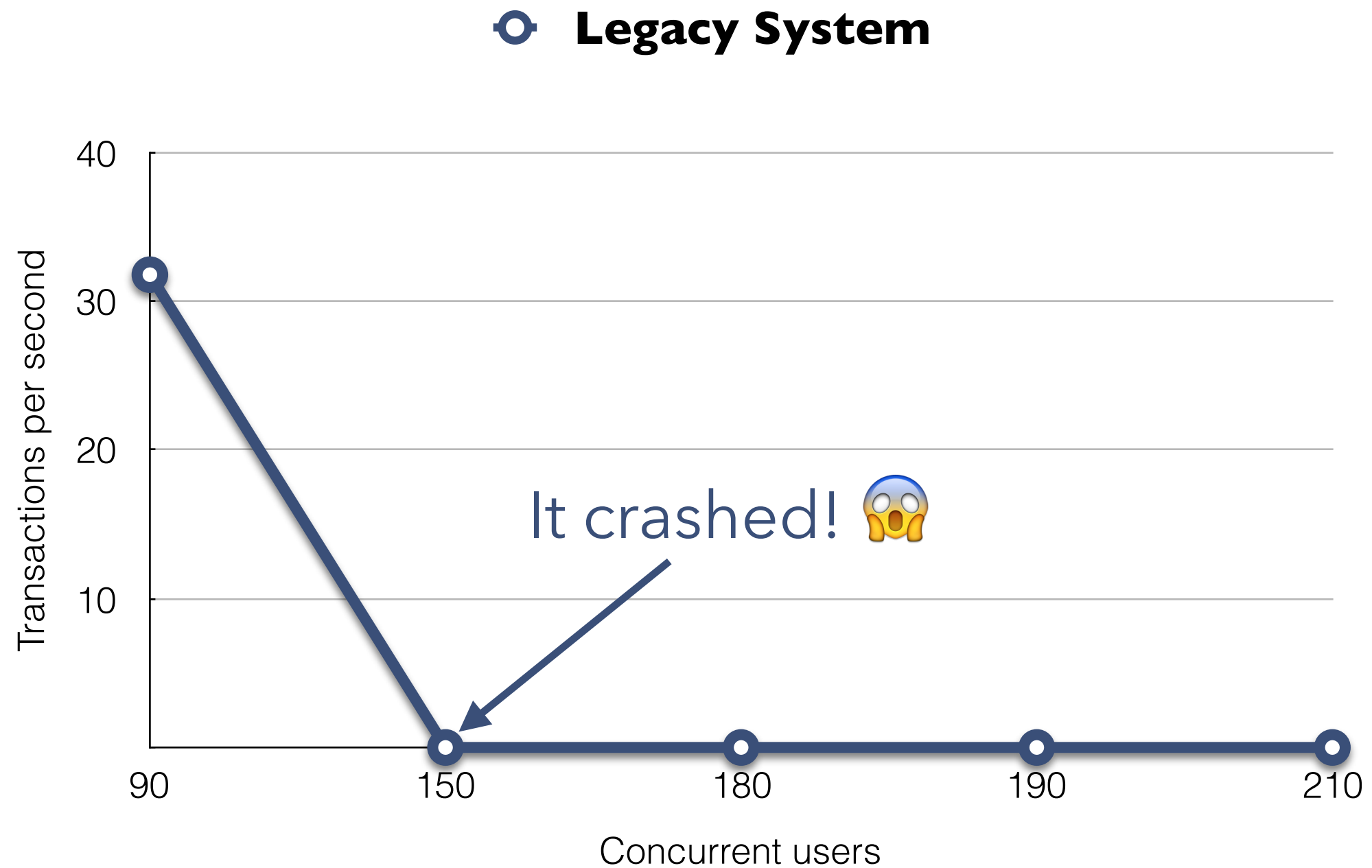
# Java Servers

- vCPUs: 4
- Memory: 18 - 24 GB
- Hard Drive: 50 GB
- OS: Windows Server 2008
- Web Server: Apache

**What!?**



# Concurrent Users



# Status

- Downtimes because of **memory leaks** and manual deployments.
- **Multiples copies** of the system in order to manage crashes and isolation.
- These copies **weren't synchronized**. Some were months apart.
- It consumes a **lot of resources**: servers, RAM, etc.



# Status

- Fixing **simple bugs takes too long** because of the dependencies in existing code.
- Adding **new features takes too long**, and costs too much (hard to avoid side effects and therefore we affected existing features).
- Testing **takes too long** (Manual).

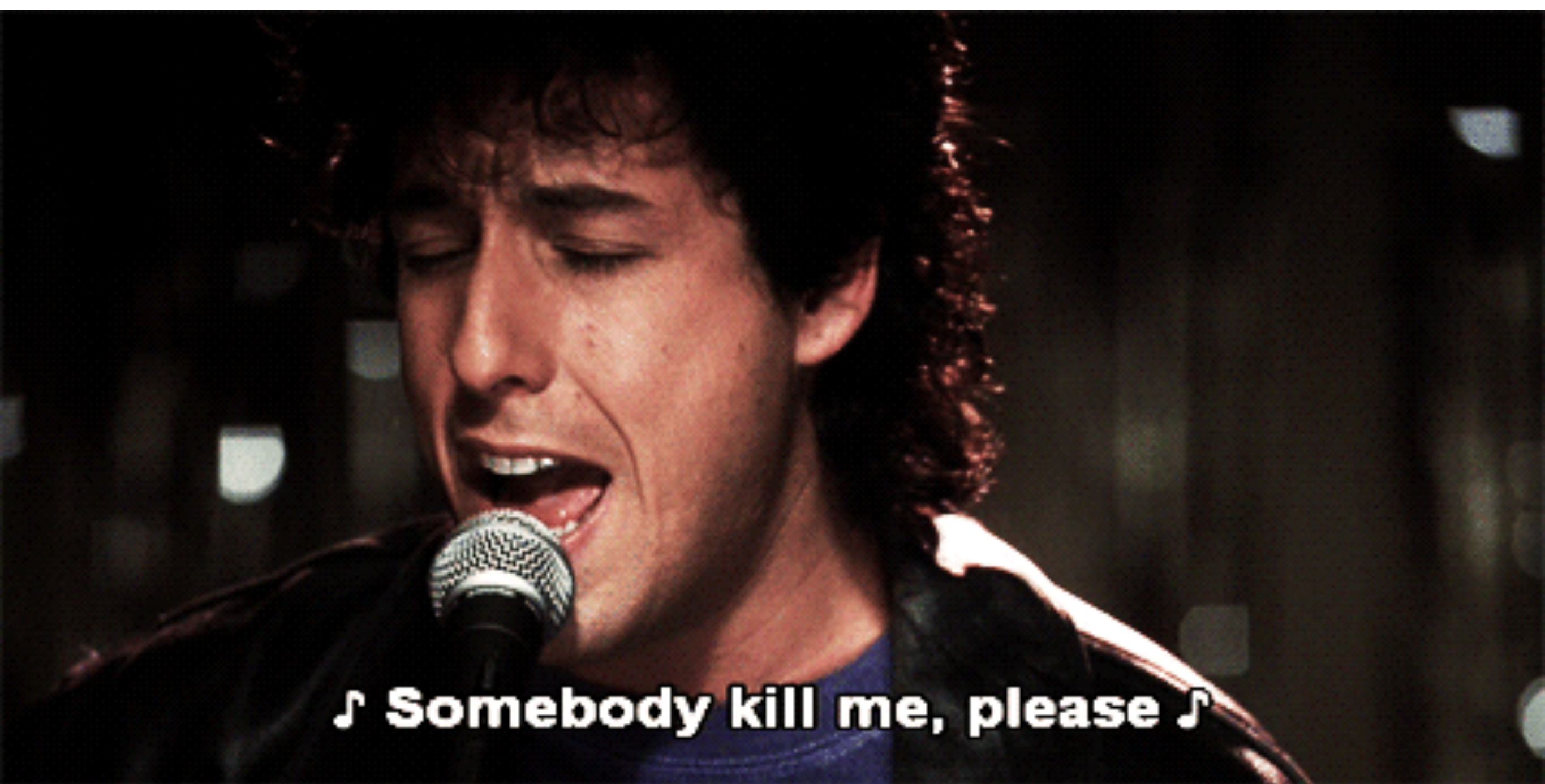


# Status

- General and client specific rules **mixed together**.
- We used a **very old** java library for PDF generation (FOP).
- Around **5,000 fop templates**, some of them very complex.
- **Outdated libraries**, couldn't replace them because of compatibility problems.

**WHAT WE WERE  
THINKING AT THAT  
MOMENT?**





♪ **Somebody kill me, please** ♪

I FOUND A FAMILY  
OF SQUIRRELS LIVING  
INSIDE OUR LEGACY  
SYSTEM.



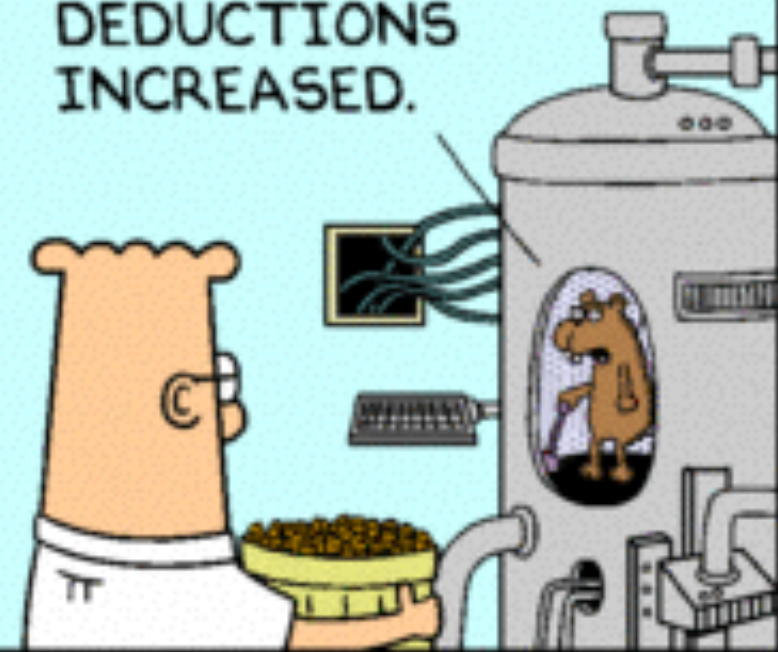
www.dilbert.com scottadams@aol.com

THEY CONTROL OUR  
PAYROLL DATABASE.  
THEY'RE MAKING  
DEMANDS.



12-19-06 ©2006 Scott Adams, Inc./Dist. by UFS, Inc.

LEAVE THE ACORNS AND  
NO ONE WILL GET THEIR  
DEDUCTIONS  
INCREASED.





03

# WHAT WE DID?



THE PROJECT I  
INHERITED HAS  
WEAK CODE. I NEED  
TO REWRITE IT  
FROM SCRATCH.



Dilbert.com DilbertCartoonist@gmail.com

WILL THERE EVER BE  
AN ENGINEER WHO SAYS,  
"THAT LAST GUY DID A  
GREAT JOB.  
LET'S KEEP  
ALL OF IT"?



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I'M HOPING THE  
IDIOT YOU HIRE  
TO REPLACE ME  
SAYS THAT.





**WAIT!**

“ They did ... the single worst strategic mistake that any software company can make:

**They decided to rewrite the code from scratch. ”**

– Joel on software





**Utz Westermann**

@UtzWestermann



**Follow**

@andrioid @BrandonLive the hydra effect in software development: when you replace a legacy system you have two legacy systems

RETWEET

**1**



4:26 PM - 19 Feb 2015

**DO WE REALLY  
NEED TO  
REWRITE  
EVERYTHING?**



# Strategy

Fix as much as possible the old system

Train the team in Erlang & Elixir

Replace the java client with a Go program

Start small projects in Erlang/Elixir

Start the big rewrite if still needed

Get fired for incompetence

**SOUNDS LIKE  
A GOOD PLAN!**



**LETS TRY IT!**

**HOW LONG  
CAN IT TAKE?**



**WHAT CAN GO  
WRONG?**

# Fixing the Old System

- We made changes to the Java System in order to support the new load.
- We updated most of the libraries, operating systems and applications servers.
- We rewrote small parts and replaced some modules.

# Fixing Old System

- Improved deployment system.
- Changed Data Center (Nightmare, **please don't do this**).
- Removed some copies of the system.
- Managed to support increased load from 2013 to 2015.



# Replacing the Client with Go

- It eliminates dependencies. Doesn't need a runtime preinstalled.
- It supports multiple platforms.
- It has good support for concurrency.
- It is very fast!

**This one doesn't need high availability**

**It's ok for Go** 😊

# Training the Team

- We created a 2 days Elixir/Erlang/Phoenix course.
- We gave the course for free for 1 and a half years and received feedback.
- More than 100 people trained in total.
- Now we have a 7 days course! 😊
- We created the Mexico City Elixir group.

# Small Projects in Elixir

- We created a proxy using Dynamo just before Valim announced that it was deprecated 😬
- Some time later we replaced that proxy with Phoenix. 😊
- Hardware Secure Module (HSM) emulator.
- A lot of Proofs of Concept (POCs).



# The Big Rewrite

- We had luck! New version of the Invoice standard came out.
- We still had problems with costs and slow development cycle.
- A team of 5 people was created.
  - 2 people doing elixir development.
  - 1 person doing deployment.
  - 2 people doing test design and test automation.

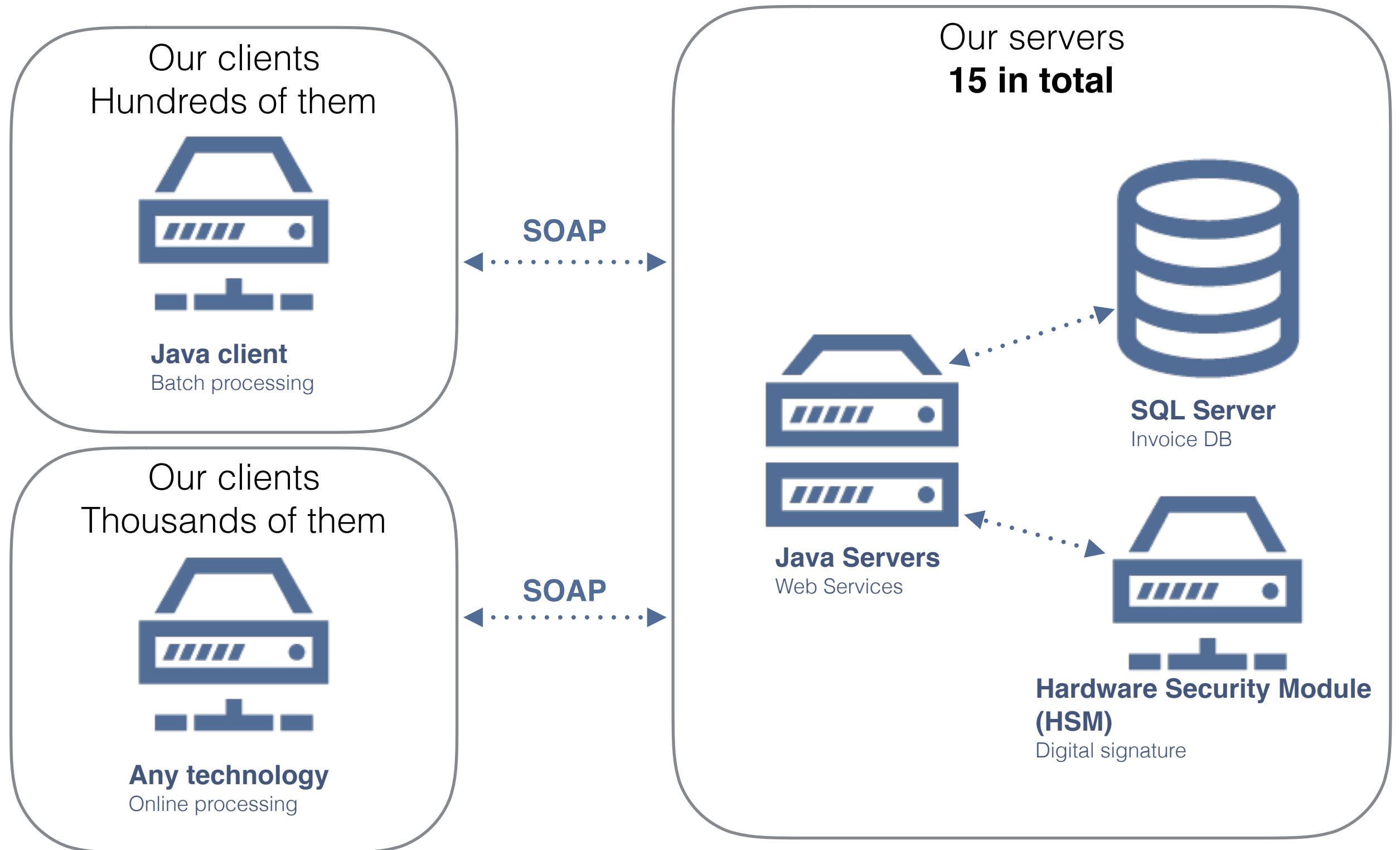
# The Big Rewrite

- We wrote a first version in 6 months (part-time). Just one Phoenix App.
- We rewrote the system one time (to use OTP Applications) in 3 months.
- We restructured it one time (to use Umbrella projects and isolate Phoenix). 1 week.

**Happy for Chris' keynote!**

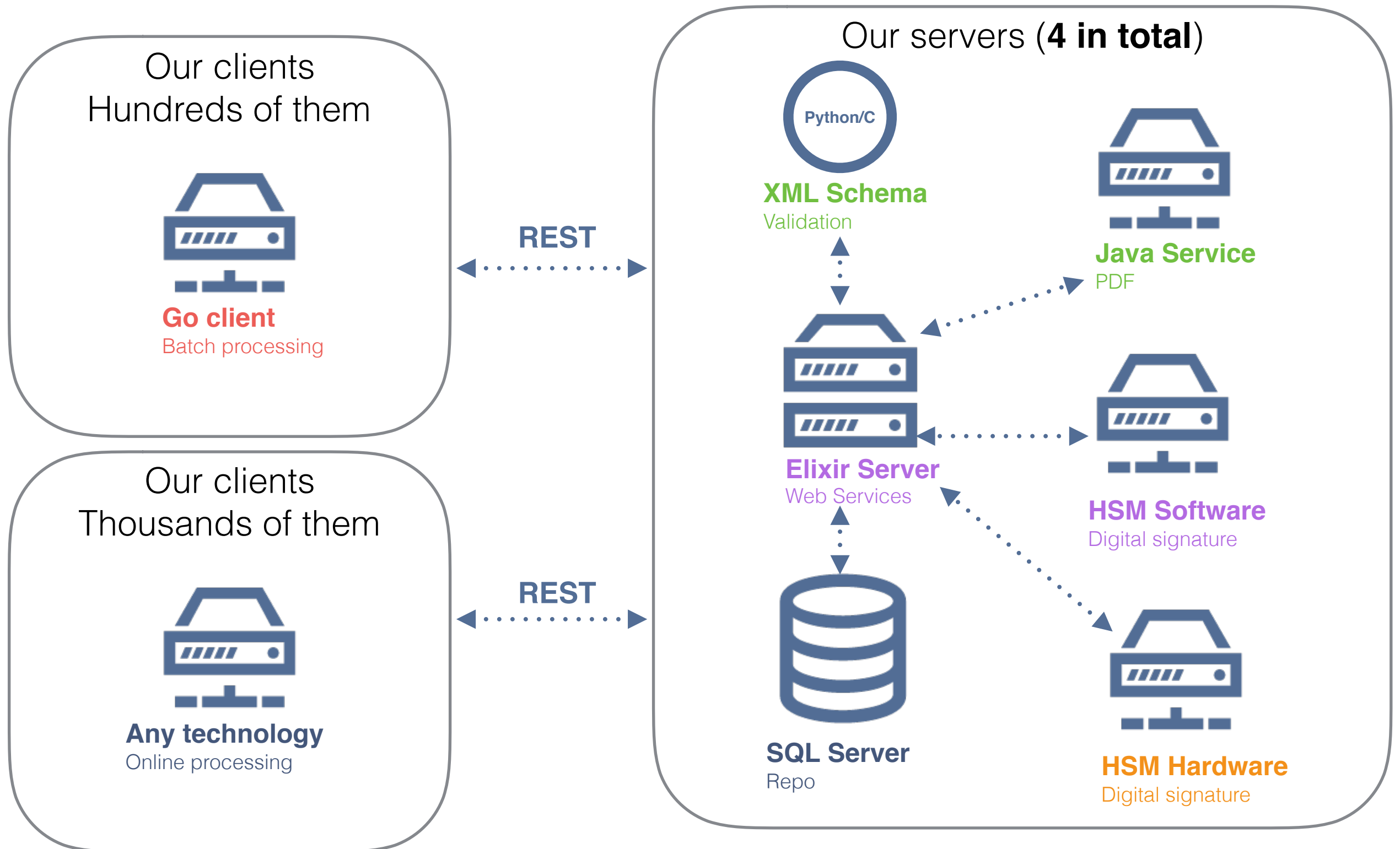


# Previous System



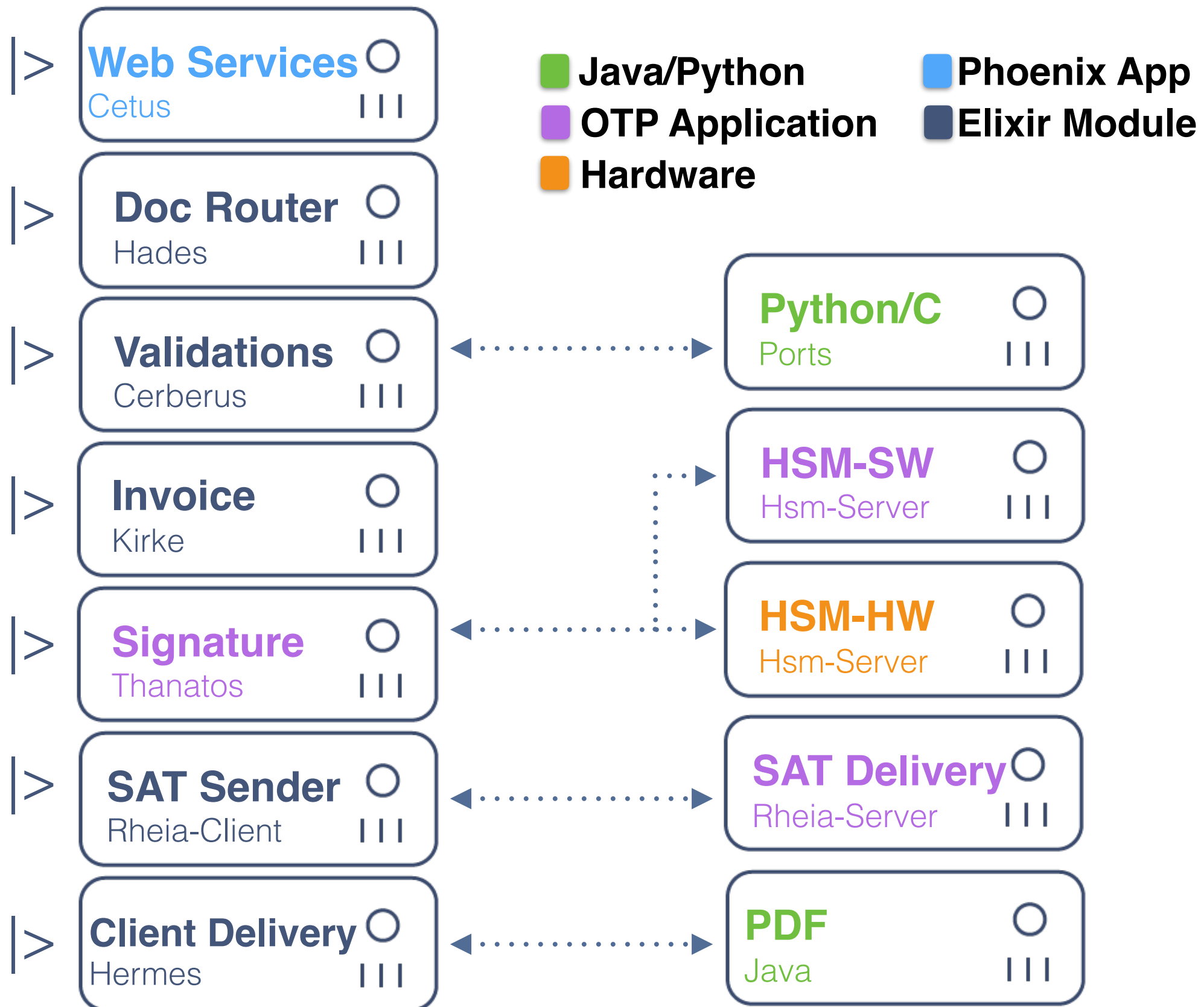


# The Big Rewrite



# Elixir System

## Request

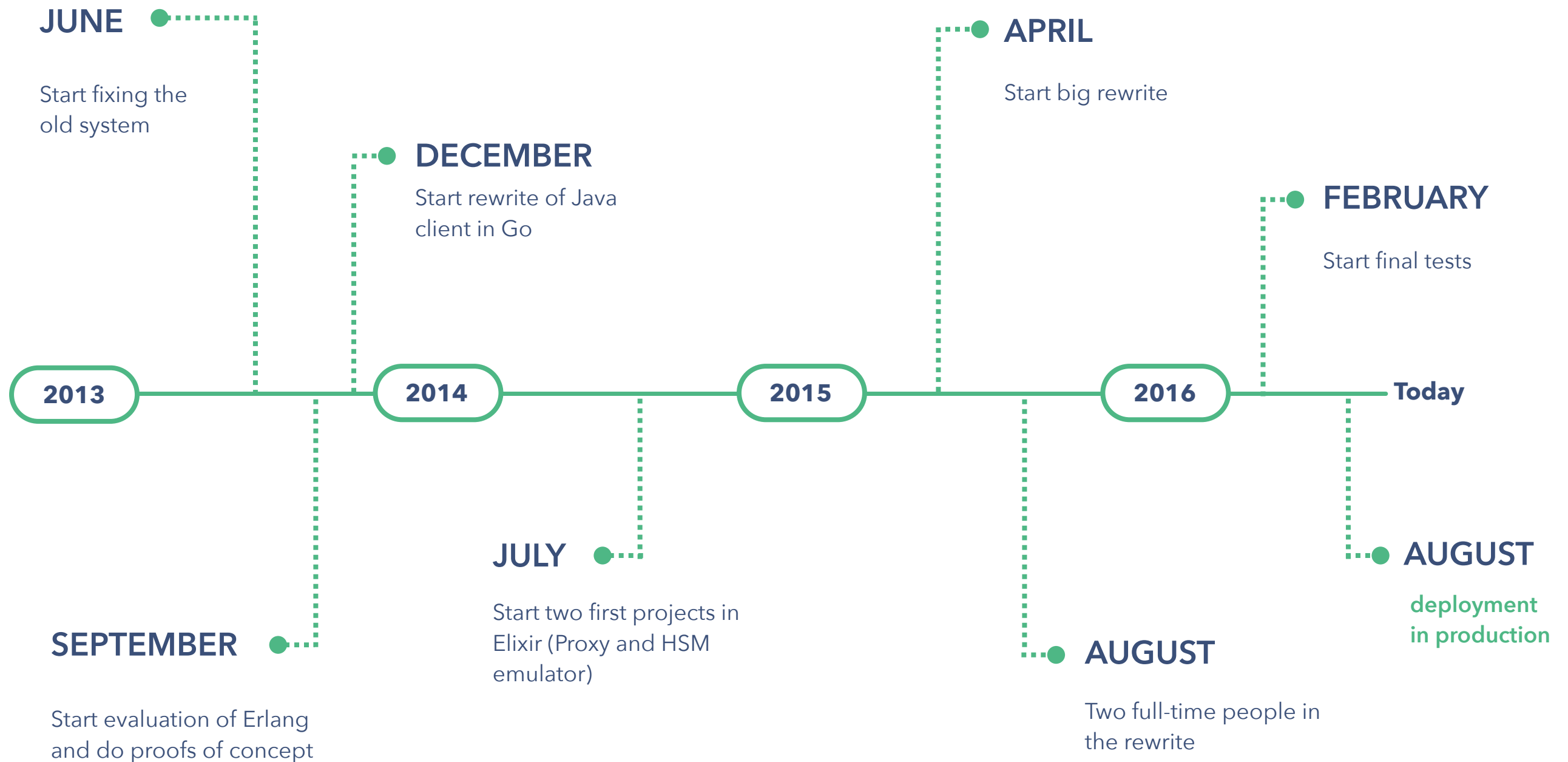


# Elixir Servers

- vCPUs: 2
- Memory: 8 GB
- Hard Drive: 50 GB
- OS: Red Hat Enterprise Linux 6 (64 bit)



# FINAL TIMELINE



**It just took 3 years!**

04

# THE FINISH



# New System

- PDF Generation uses Java, but no longer uses Application Servers.
- XML Schema validation uses a Python library and Erlang Ports.
- Best performance and latency.
- PostgreSQL for development and SQLServer in production.



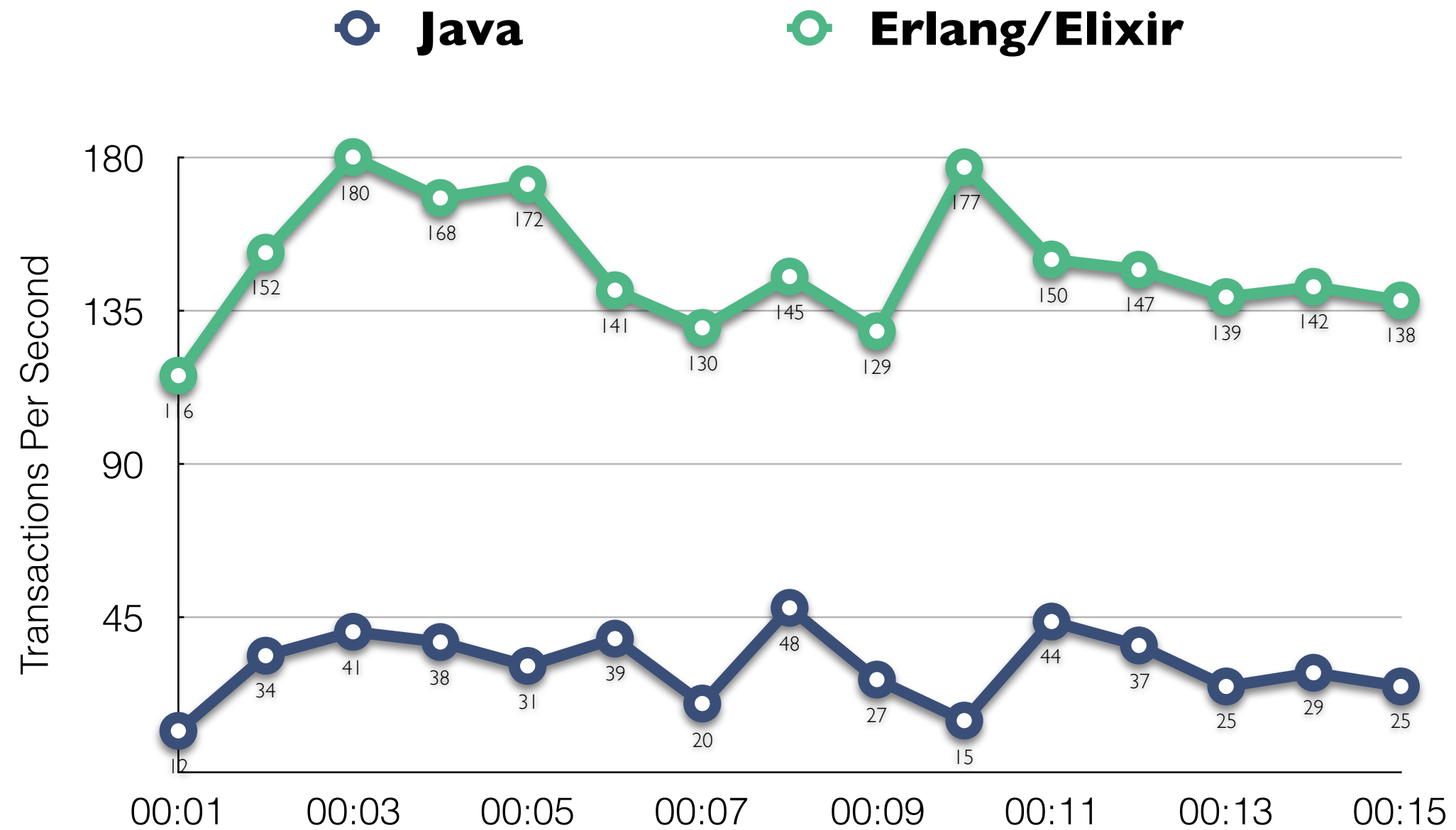
# New System

- Deployment using Ansible and Erlang releases (exrm).
- Test suit with 990 tests, takes 5 minutes to run.
- You can develop and test everything without any external dependency.
- We also have a Single Sign-On service in Erlang.

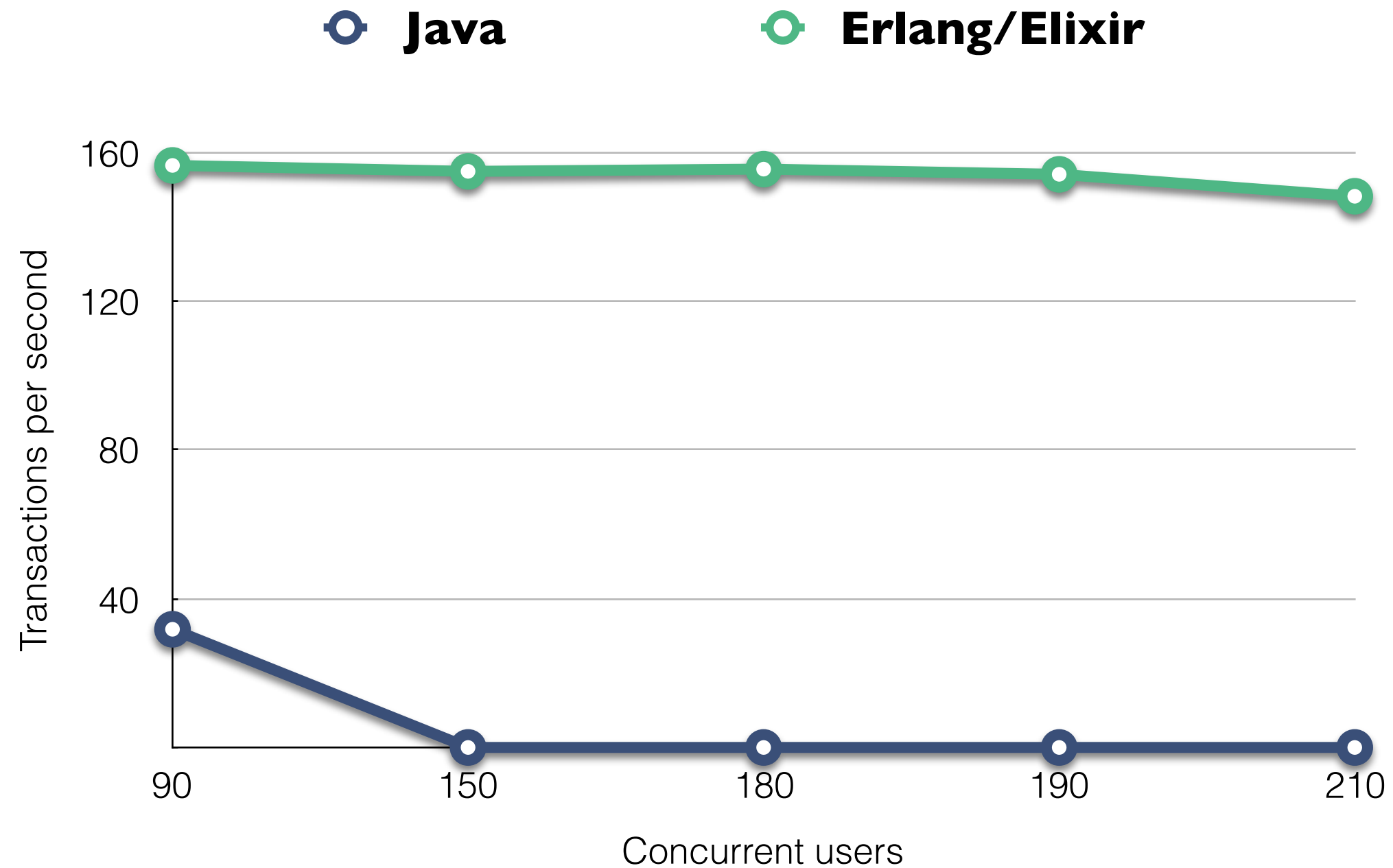
# New System

- Flexibility to add new requirements very quickly.
- No memory leaks.
- Centralized error management.
- 35 KLOCs in Elixir vs 500 KLOCs in Java.

# Max transactions/sec

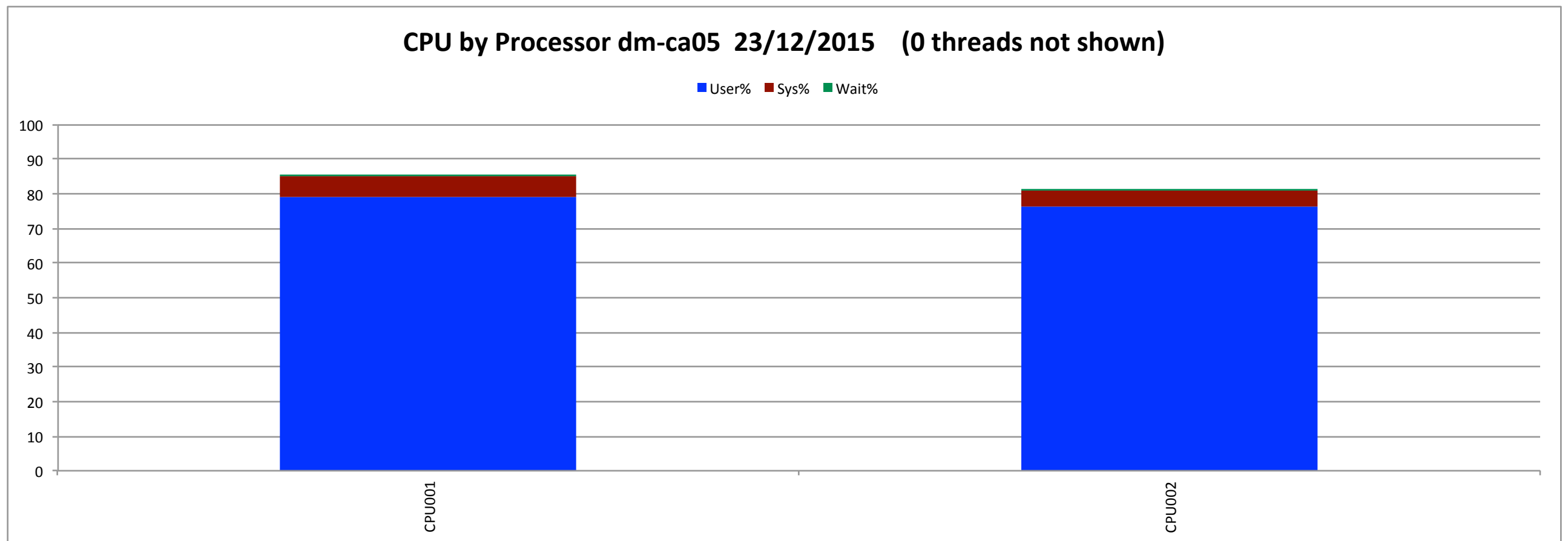


# Concurrent users



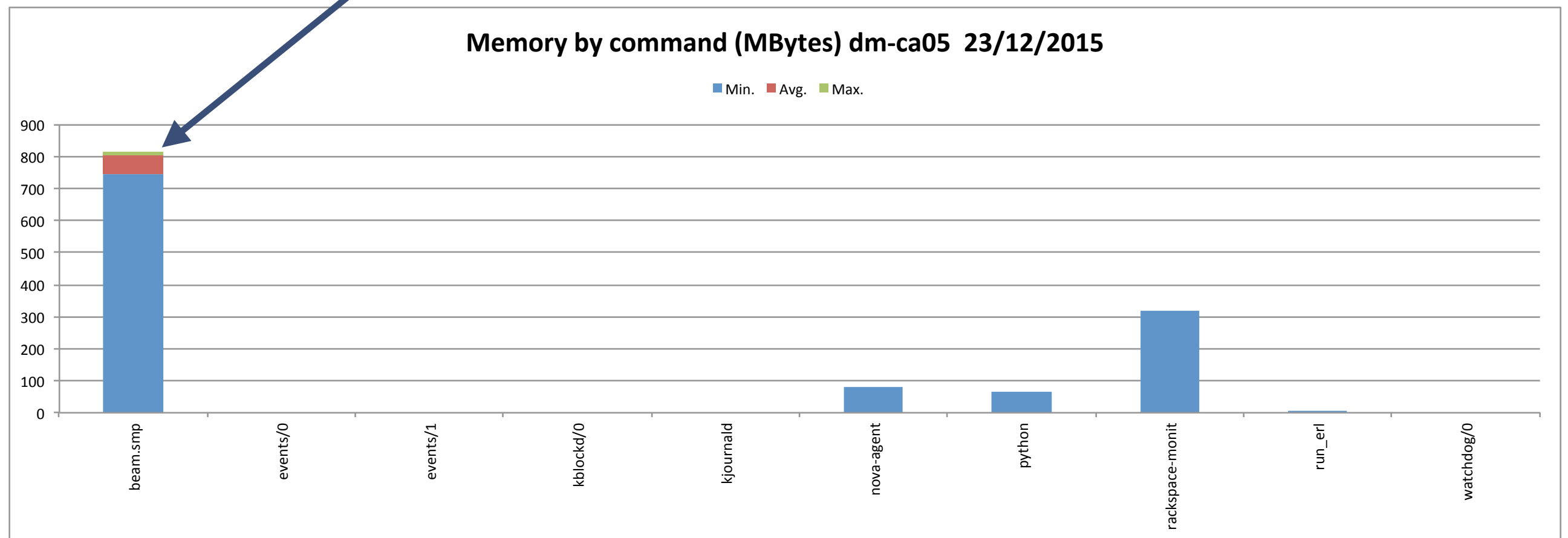


# Performance - CPU



# Performance - Memory

< 1 GB! 🤯



# Final Words

- It can take a **long time**. Be prepared for that.
- You will need **support** from the CEO.
- If you don't have time it will cost **more money**.
- You need to have a **training path** for your team.

# Final Words

- Team **really loves Erlang & Elixir**. People get motivated.
- Be patient, sometimes you need to **wait for the right time**. Be ready for that moment.
- You are going to **support the old system** for a long period of time.
- Erlang is awesome for **binary protocols**.



# Final Words

- You **don't need** to trash everything from the old system. Be open to reuse legacy code.
- Sometimes you **can't trash** everything from the old system. That's fine.
- Erlang is good to **orchestrate** other systems.

# Final Words

- From one monolithic project to going crazy with different repos to finally use **umbrella projects**.
- Don't be afraid of **changing direction** and make **big changes**.
- 4 months to have someone to understand and use OTP.

**THANKS  
AND...**





# SEE YOU IN MEXICO!



Norberto  
@Hiphoox

