

SCALING ERLANG WEB APPLICATIONS

100 TO 100K USERS AT ONE WEB SERVER

Fernando Benavides (*@elbrujothalcon*)

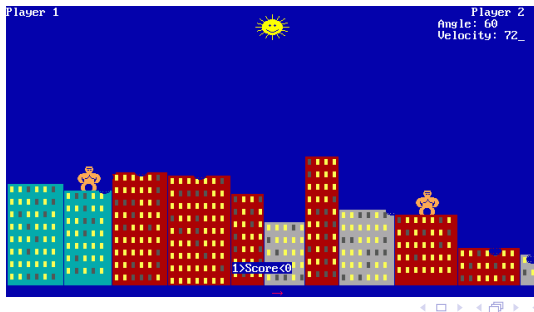
Inaka Labs

March 15, 2012



HELLO WORLD!

- I'm a developer since I was 10
- I'm an Erlang developer since 2008
- I've worked in many dynamic web sites
- Most of them with high scale requirements
- I'll share my experience with you



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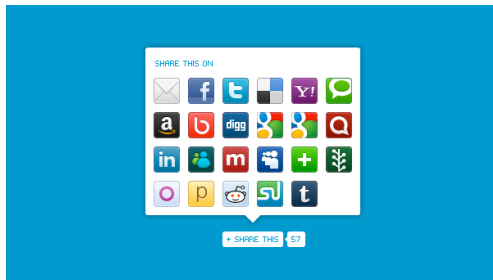
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OUTLINE

THE CHALLENGE

What do we have to deal with?

THE PLAN

How do we face it?

THE TIPS AND TRICKS

What have we learned from it?



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THE CHALLENGE

We will work on the scalability of a *web* project that has an *HTTP API* and a component that keeps clients *connected* to the server for *long periods* of time.

Examples:

- Social sites
- Chat sites
- Sports sites



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THE CHALLENGE

We will try to improve the way we use

- OTP behaviours
- TCP connections
- mochiweb
- Underlying system configurations

*We will **not** deal with*

- Multiple machines/nodes
- Database choices and/or implementations



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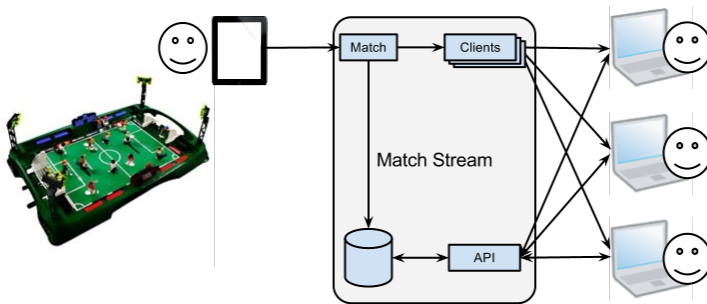
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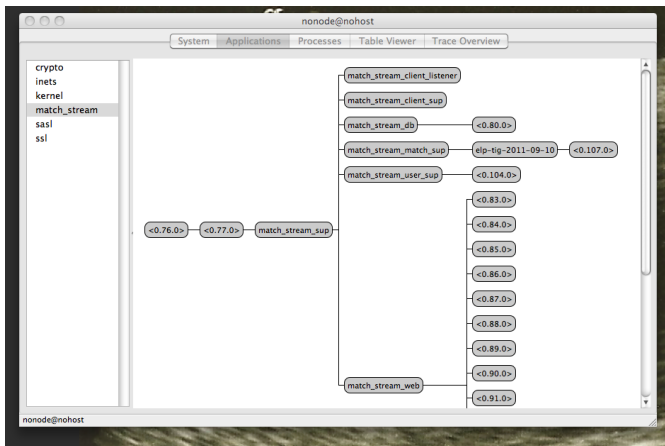
MATCH STREAM

THE SAMPLE PROJECT



MATCH STREAM

INITIAL ARCHITECTURE



THE PLAN



GENERAL RULES

THINGS YOU NEED TO KNOW WHEN SCALING YOUR SYSTEMS

- Start with a system that **works**
- Automate your clients
- Keep a human watching
- Be patient



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STAGE 1

FINDING THE INITIAL BOUNDARIES

GOALS

- Test the system as it is
- Find N and C

STEPS

- Create the automated testers
- Choose N and C
- Test the API and long-lived connections independently
- Test both together
- Repeat until you find the highest N and C



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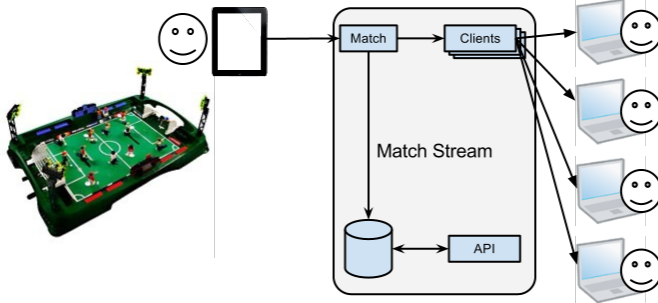
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STAGE 1

FINDING THE INITIAL BOUNDARIES

RESULTS



$N = 1024 / C = 4$



STAGE 2

BLACKBOX TESTS

GOALS

- Improve the system environment
- Find the highest N and C without altering the code

STEPS

- Check kernel variables
- Check system limits
- Check Erlang VM parameters
- Repeat from Stage 1



STAGE 2

BLACKBOX TESTS

GOALS

- Improve the system environment
- Find the highest N and C without altering the code

STEPS

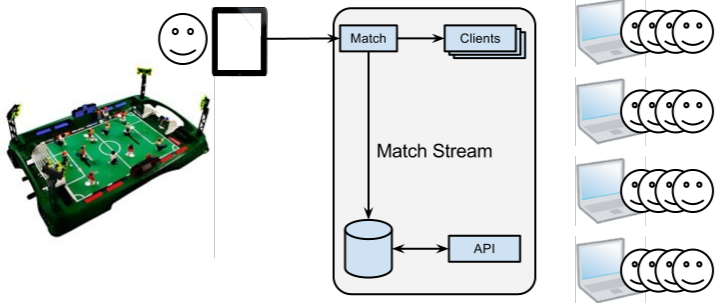
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- Check system limits
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STAGE 2

BLACKBOX TESTS

RESULTS



$N = 4096 / C = 4$



STAGE 3

ERLANG TUNING

GOALS

- Tune up **your** system
- Find the highest N and C for **one node**

STEPS

- Find a problem
- Fix it using the list of *Tips and Tricks*
- If not there, add it
- Repeat **from Stage 1**



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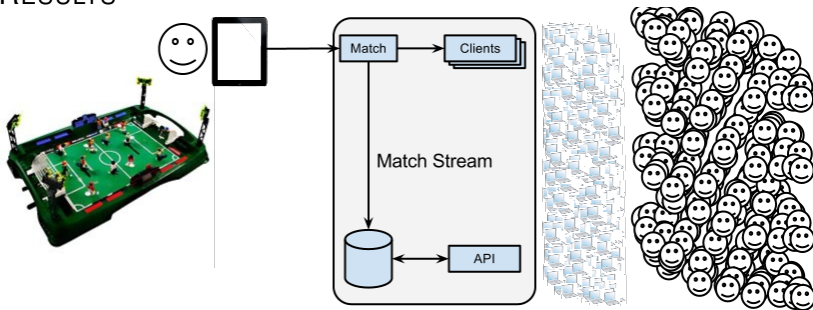
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STAGE 3

ERLANG TUNING

RESULTS



N = 65536 / C = 8192



STAGE 4

ADDING NODES

GOALS

- Find the best system topology
- Find N and C **per node**

STEPS

- Add a node
 - connected; or
 - independent
- Repeat **from Stage 1**



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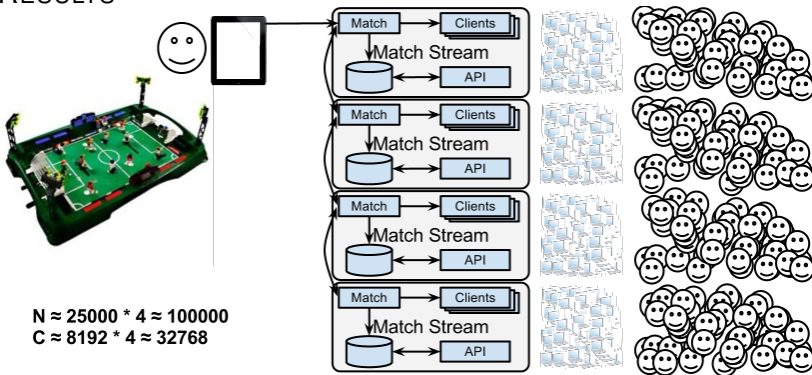
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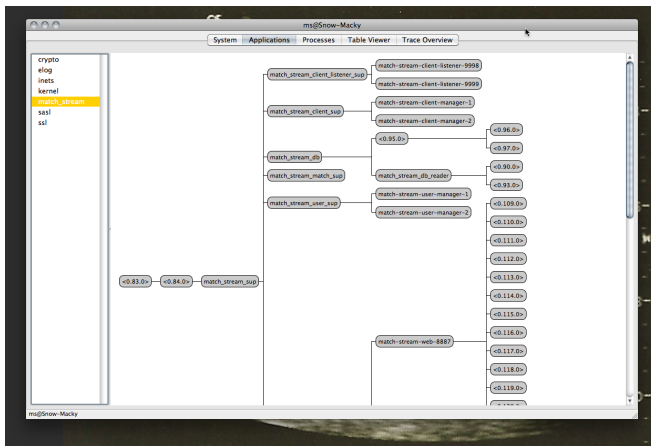
ADDING NODES

RESULTS



MATCH STREAM

FINAL ARCHITECTURE



TIPS AND TRICKS



OS TWEAKS

Kernel Variables

```
sysctl -w net.ipv4.ip_local_port_range="1024 65535"  
sysctl -w net.core.rmem_max=16777216  
sysctl -w net.core.wmem_max=16777216  
sysctl -w net.ipv4.tcp_rmem="4096 87380 16777216"  
sysctl -w net.ipv4.tcp_wmem="4096 65536 16777216"  
sysctl -w net.ipv4.tcp_syncookies=1  
sysctl -w net.ipv4.tcp_mem="50576 64768 98152"  
sysctl -w net.core.netdev_max_backlog=2500  
sysctl -w net.netfilter.nf_conntrack_max=1233000
```

Open Files Limit

```
ulimit -n 999999
```

Erlang VM tweaks

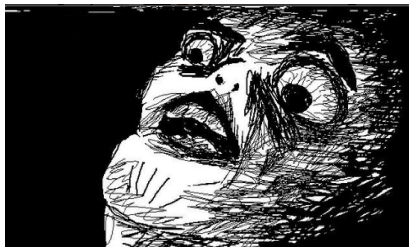
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+K Kernell Polling
-SMP SMP Support



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CONNECTION TWEAKS

BACKLOG

- Allow more concurrent connections
- Remember HTTP *runs on* TCP

CONNECTIONS

- Don't use just one of them
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SUP_HANDLER

- Don't use it
- Monitor the processes instead

LONG DELIVERY QUEUES

- Use *repeaters*



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GEN_SERVER

CALL TIMEOUTS

Remember `gen_server:reply/2`

MEMORY FOOTPRINT

Remember `hibernate`

LONG INIT/1

Use 0 timeout



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SUPERVISORS

- Sometimes `simple_one_for_one` supervisors get **overburdened** because they have too many children
- Try a supervisor hierarchy with several managers below the main supervisor
- Turn `supervisor:start_child/2` calls into something like

```
supervisor:start_child(  
  list_to_atom("module-name_" ++  
              integer_to_list(random:uniform(#ofSupervisors))).
```



OTHER PROCESSES

TIMERS

- Don't use the timer module
- Use `erlang:send_after`

LOGGING

- Don't log too much
- Use a good logging system

REGISTRATION

- Sometimes it's better to register processes instead of keeping track of their pids manually
- You can always register processes **both** locally and globally



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- It's no **silver bullet**
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SCALING TOPICS

THAT WEREN'T COVERED ON THIS PRESENTATION

- Adding nodes
- Choosing databases
- System specific improvements
- Measuring tools



QUESTIONS



Thanks!

