Scaling Erlang Web Applications

100 to 100K users at one web server

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Inaka Labs

March 20, 2012

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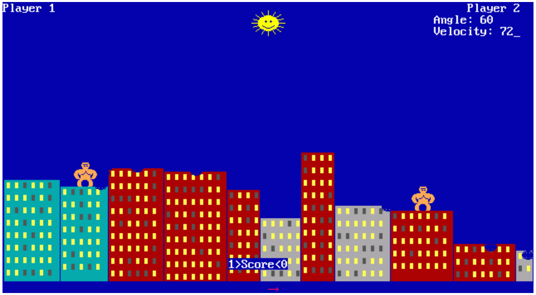
- I'm an Erlang developer since 2008
- I've worked in many dynamic web sites
- Most of them with high scale requirements
- I'll share my experience with you



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1. elbrujohalcon@Snow-Macky: ~/Projects/erlang/inaka/edis (gnumake)
elbrujohalcon@Sno... ⌘1
elbrujohalcon@Sno... ⌘2

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Introduction

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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We will try to improve the way we use

- OTP behaviours
- TCP and HTTP connections
- Underlaying system configurations

*We will **not** deal with*

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

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Match Stream

TODO: General system design graph

Requirements

This kind of system requires. . .

- Tons of users
- In two-hour-long bursts
- Real time updates

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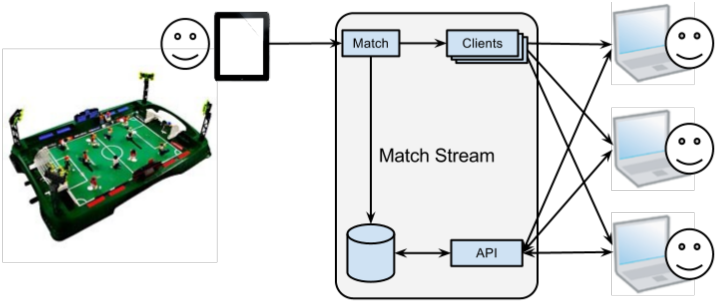
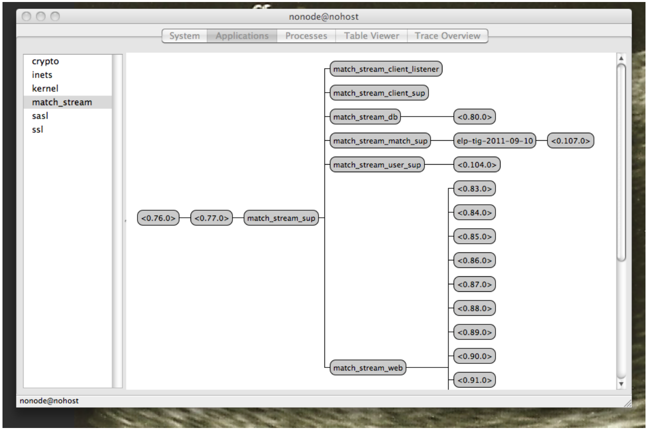
Match Stream
General Design



Match Stream
Architecture



For the Clients

CLIENT_LISTENER
: `gen_server`. Handles a listening TCP port to receive clients

CLIENT_SUP
: `supervisor`. Supervises client processes

USER_SUP
: `supervisor`. Supervises user processes

WEB
: `mochiweb`. Listener for HTTP API calls

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Lesson Learned

*Using Erlang to build your system is **not enough** to ensure **scalability***

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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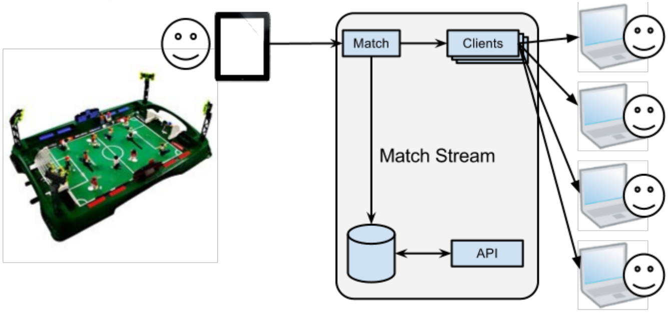

N = 1024 / C = 4

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

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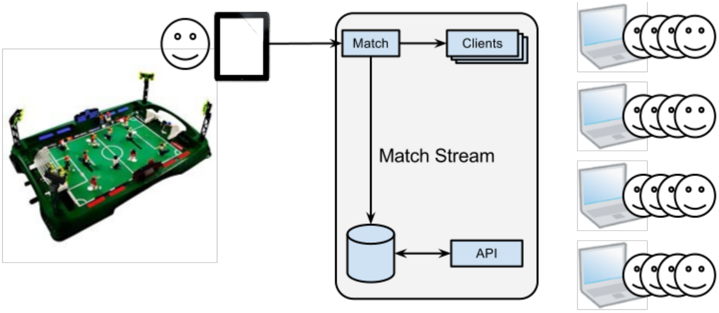

N = 4096 / C = 4

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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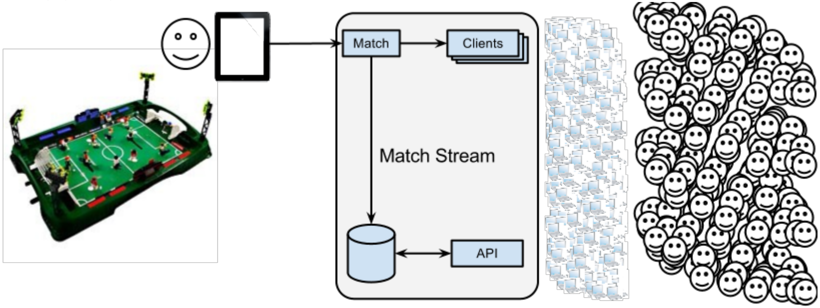

N = 65536 / C = 8192

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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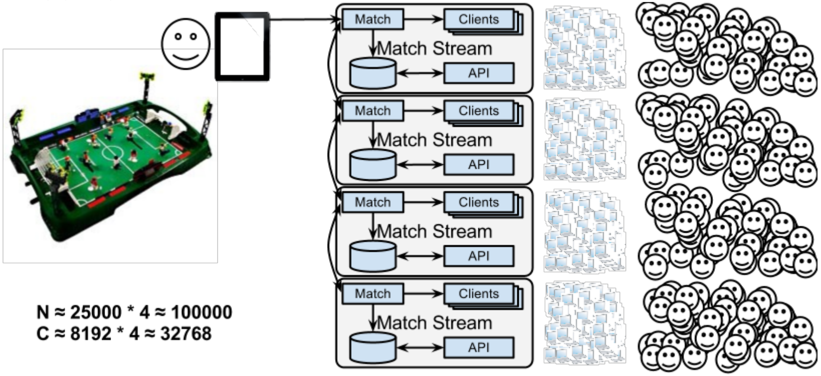
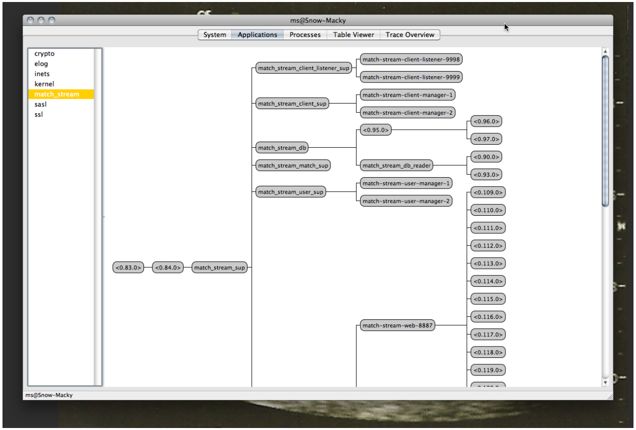


$N \approx 25000 * 4 \approx 100000$
$C \approx 8192 * 4 \approx 32768$

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
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Open Files Limit

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ulimit -n 999999
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Erlang VM tweaks

+P	Number of Processes
+K	Kernell Polling
-SMP	SMP Support

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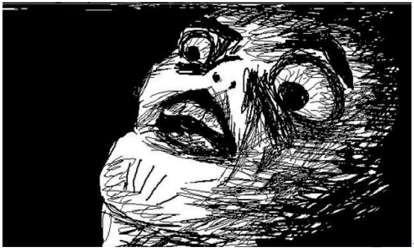

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Connection tweaks

Backlog

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

Connections

- Don't use just one of them
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- Don’t use it
- Monitor the processes instead

Long Delivery Queues

- Use *repeaters*

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Call Timeouts
Remember `gen_server:reply/2`

Memory Footprint
Remember `hibernate`

Long init/1
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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!