
# RUNTIME SYSTEM (Deep Dive)


presented by

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Firefly Logic




Twitter

#cpl13

#erlang

@bryan_hunter

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Booyah!
be
The Erlang Runtime System!
Good question, Bryan!


Why?

“Erlang is a programming language used to build

**massively scalable**

**soft real-time** systems

with requirements on **high availability**”

-from www.erlang.org

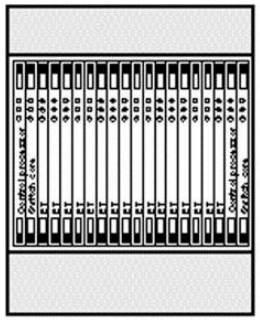


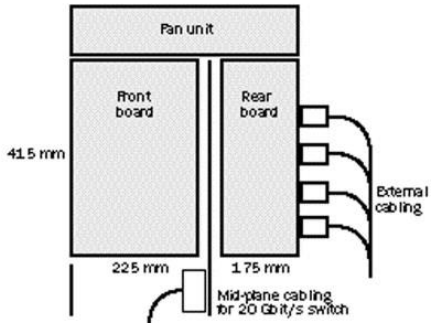
ERICSSON

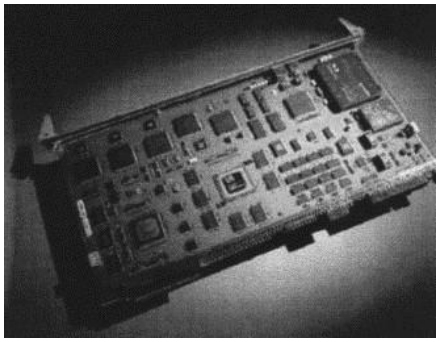
ERLANG

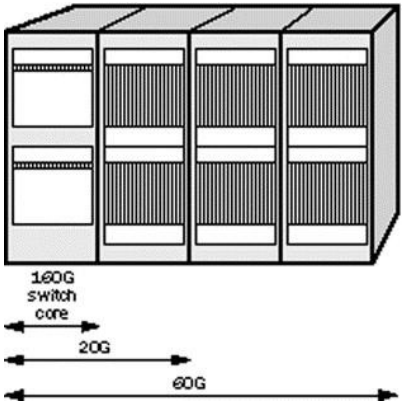

Erlang Runtime System

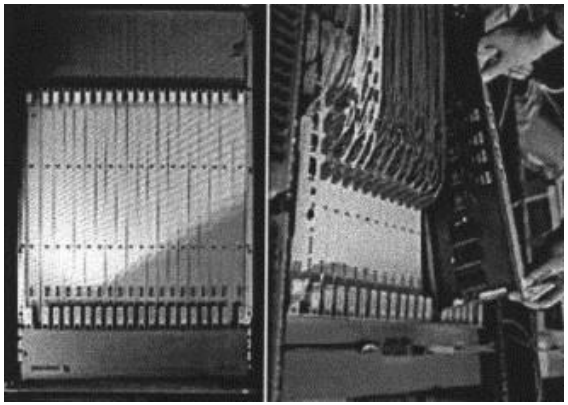
# ERICSSON




Fan unit
Front board
Rear board
41.5 mm
External cabling
225 mm
175 mm
Mid-plane cabling for 20 Gbit/s switch




160G switch core
20G
60G



















Erlang is proven

# The Erlang Runtime System

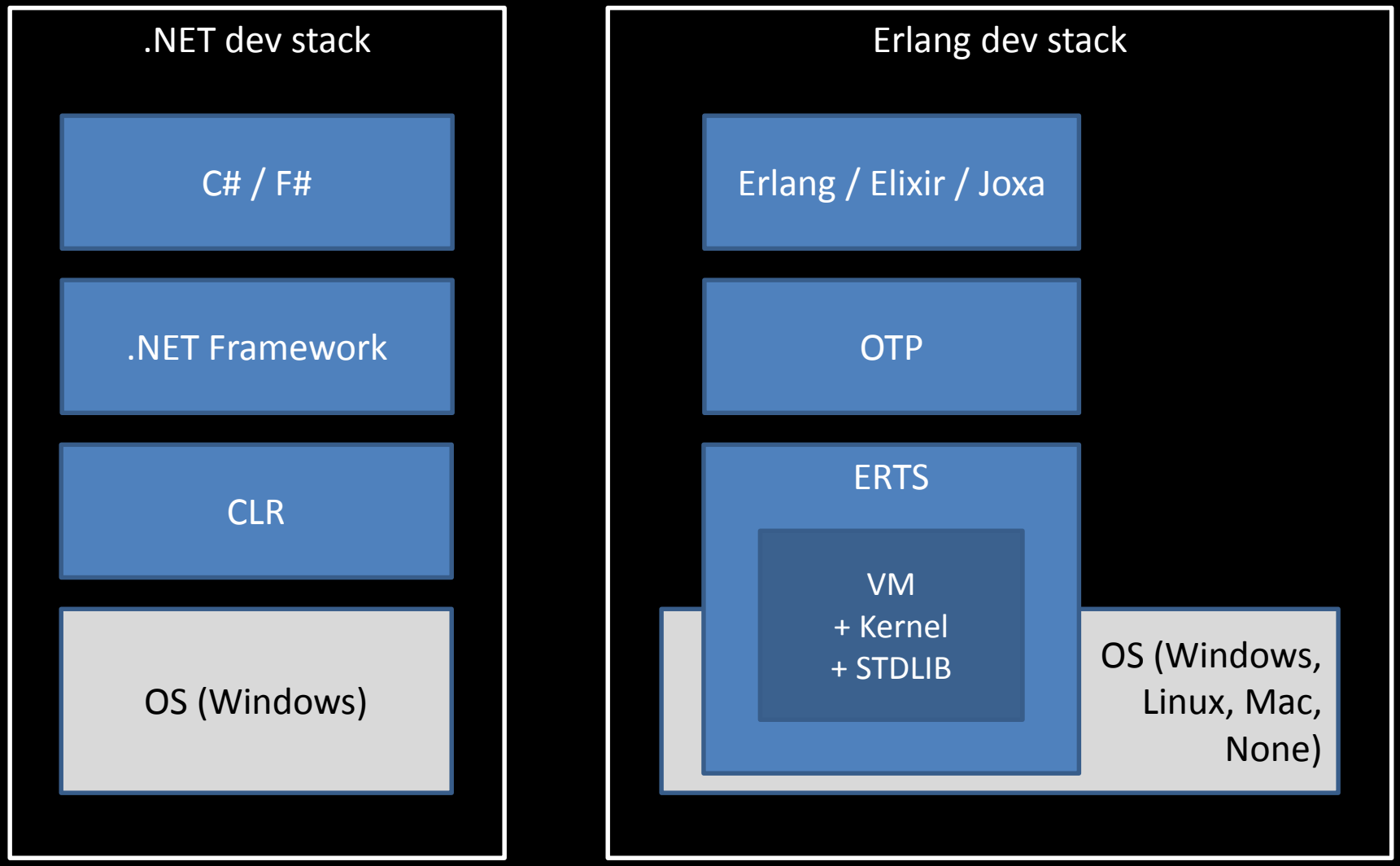
is a special-purpose

**operating system**

built for

**fault-tolerance,**
**concurrency,**
**and distribution**

# Erlang Runtime System *(in-context)*



# The ERTS

*(VM + Kernel + standard library)*

provides the following support…

“a consistent operating system interface on all platforms”

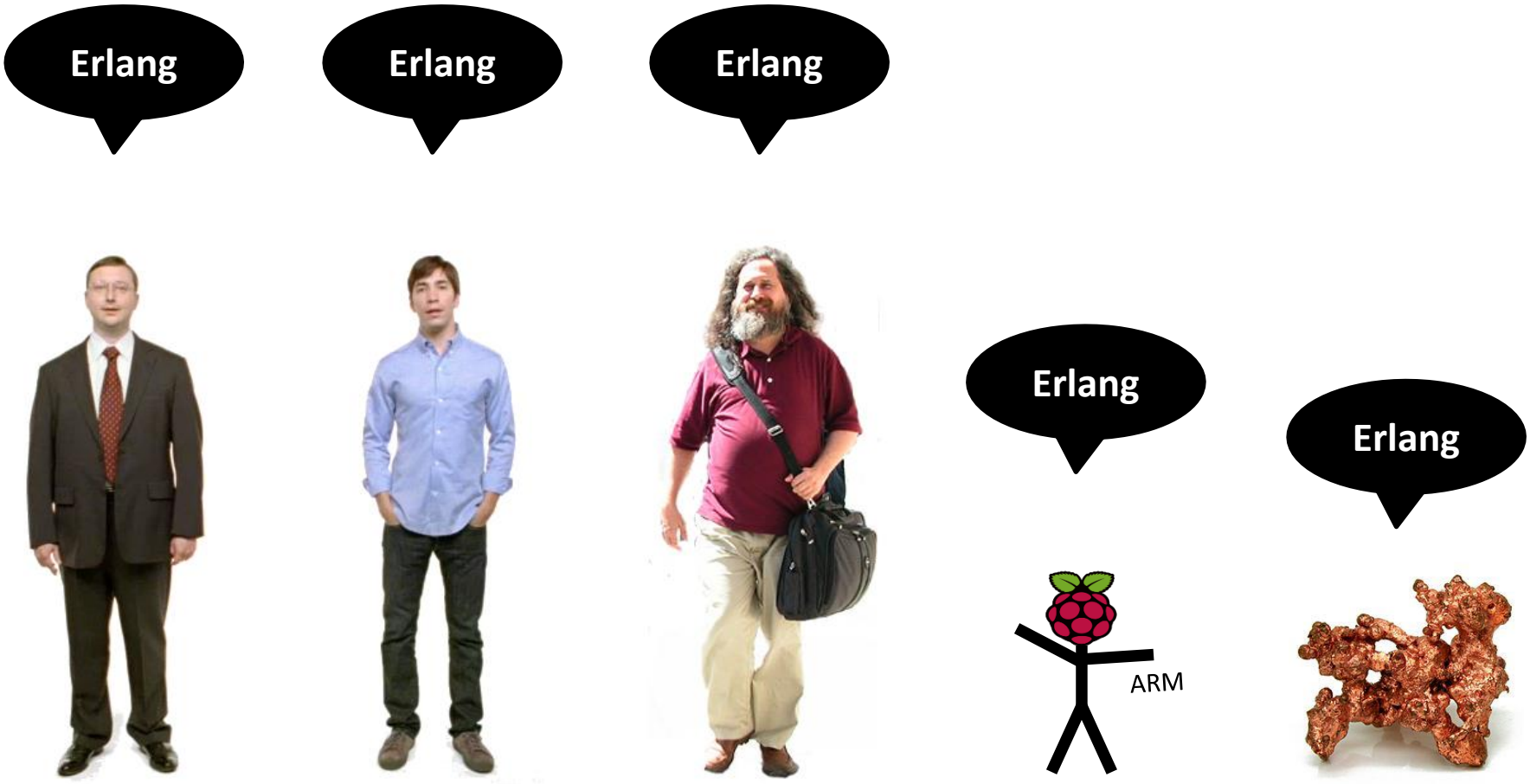
“light-weight concurrency and support for millions of simultaneous tasks”

“memory allocation and real-time garbage collection”

“transparent co-operation between all computers in the system”

“location and encapsulation of run-time errors”

“supervision of run-time code as it loads, when it is replaced, and while it is linked.”




> Consistent Operating System Interface on all Platforms

# The kernel

- The first application to be started.
- It provides low-level services needed
  - to start the ERTS,
  - to participate in a distributed system,
  - to handle errors,
  - and to perform IO operations.

Two thing to remember about

# Concurrency

1) Shared memory concurrency is hard

2) Message passing concurrency is easy

“The performance
of a concurrent language
is predicated by three things:
the **context switching time,**
The **message passing time**,
and the **time to create a process**.”

–Mike Williams

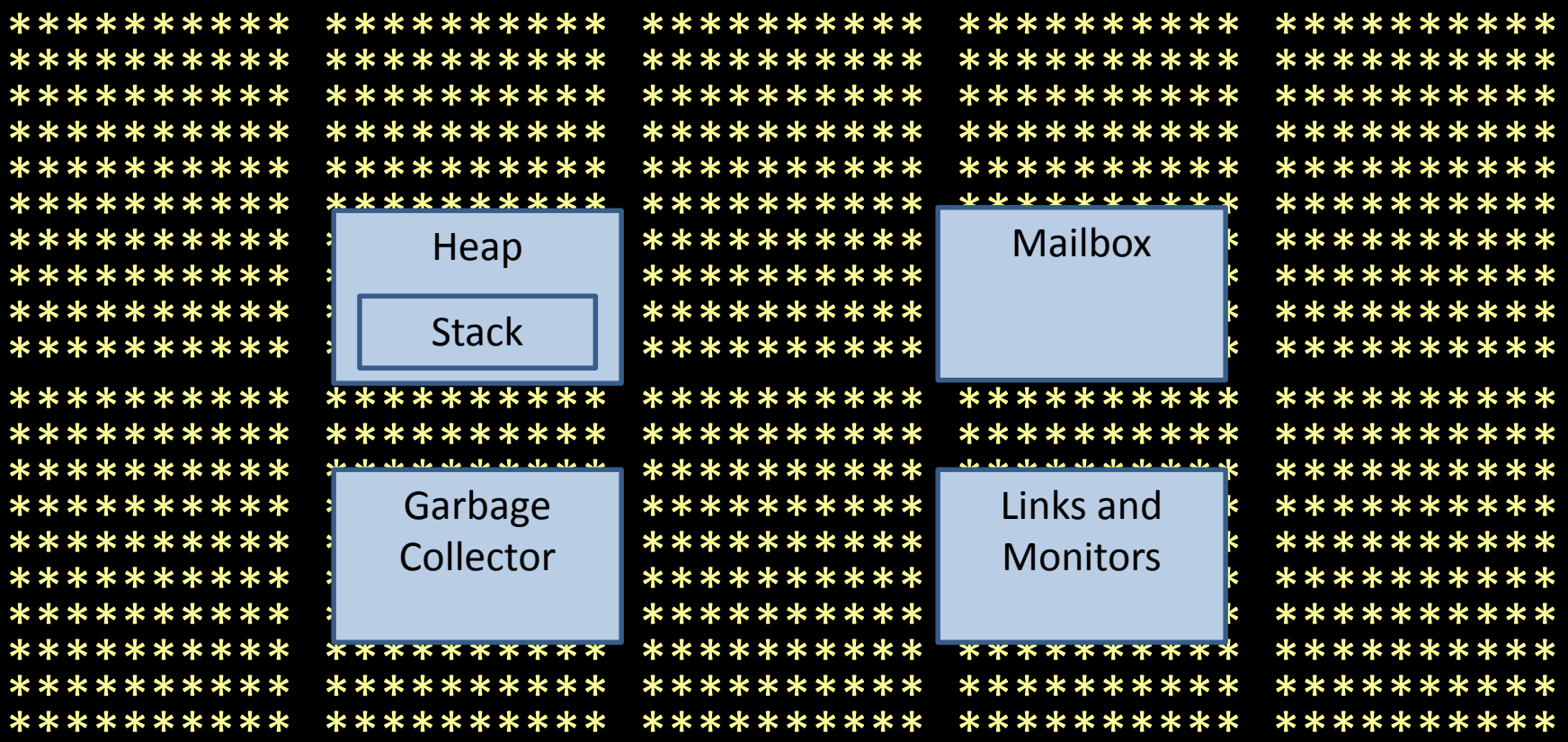
Erlang Processes

are *not* Winows/Linux processes

They are the unit of concurrency

You structure your programs
around these units of concurrency.

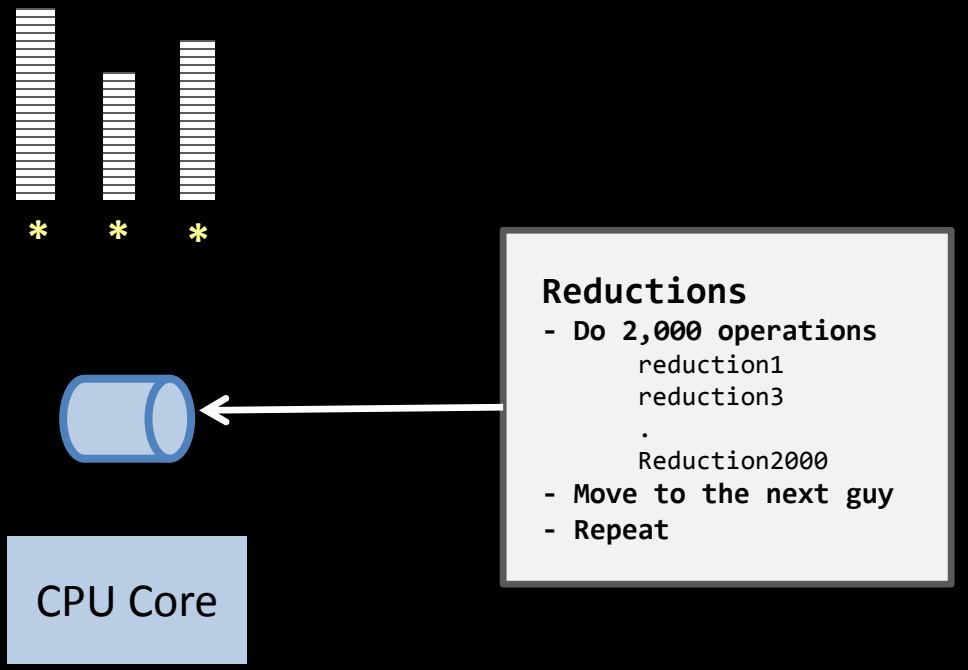
# One .NET 4.0 Thread
# (allocates one megabyte)



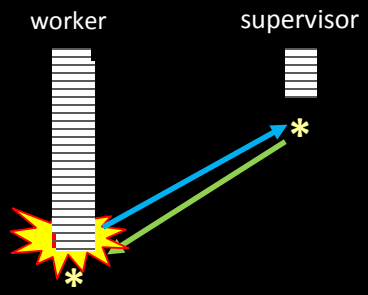

# One Erlang Process (allocates one kilobyte)

*

> light-weight concurrency

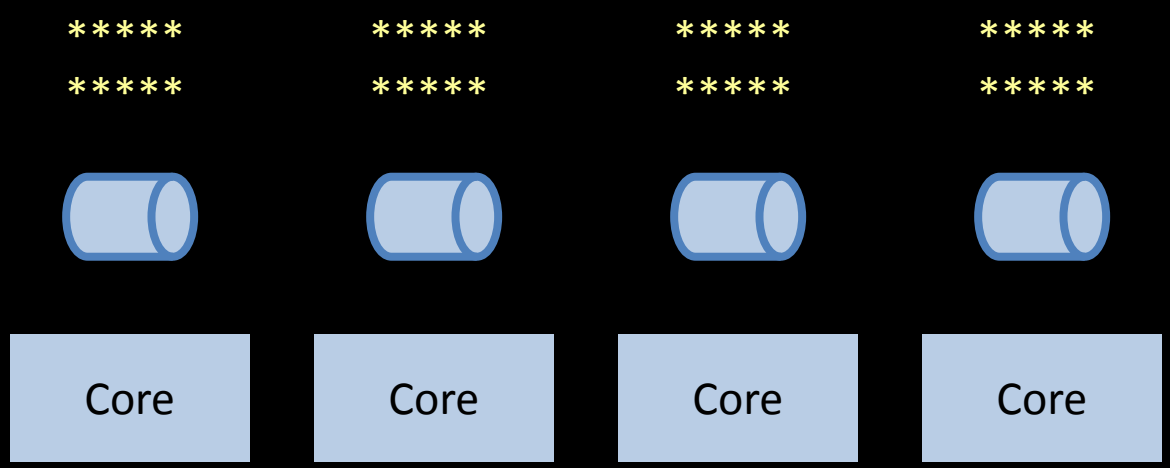



> Near-zero context switching cost. Non-blocking.



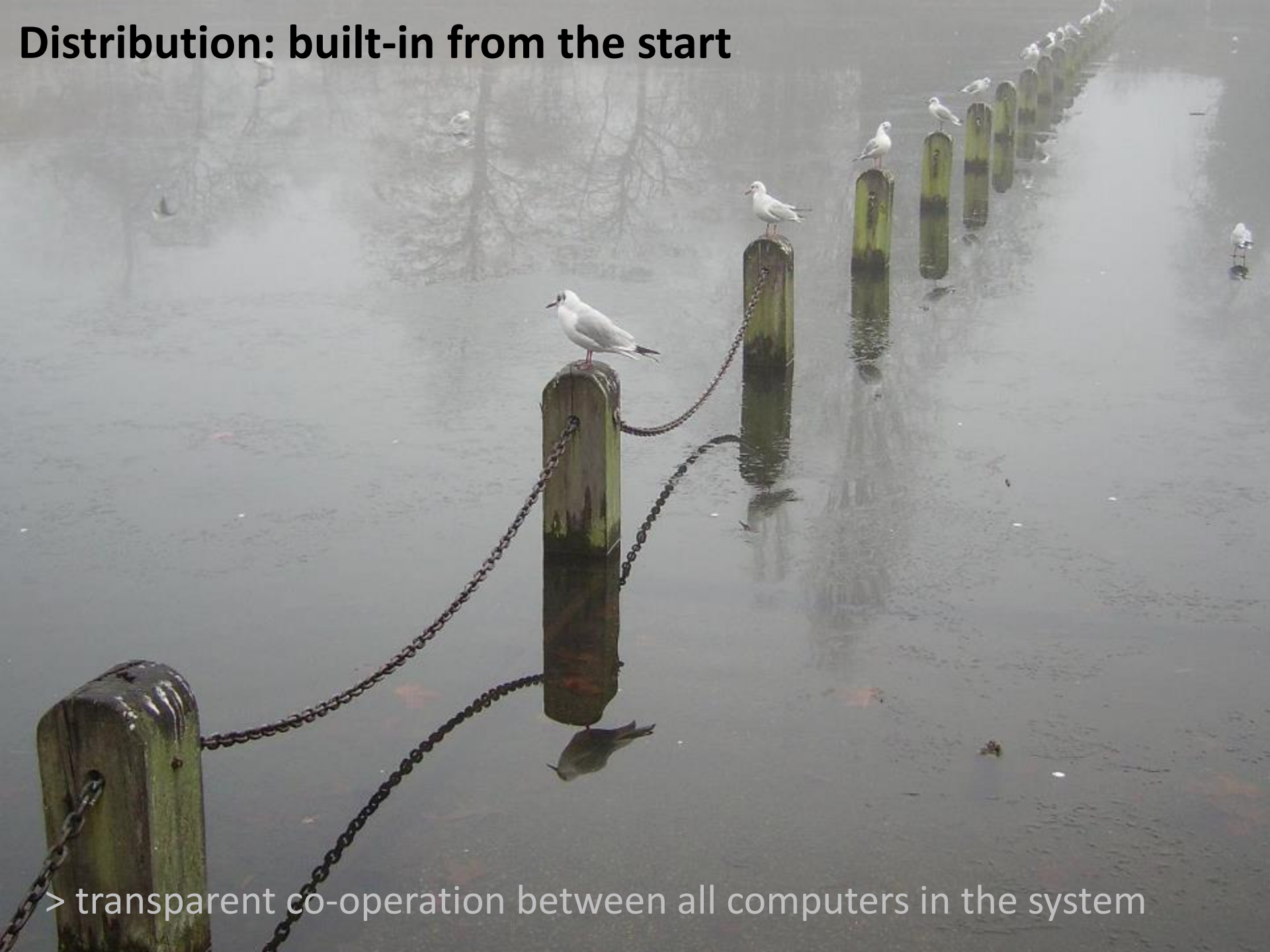

CPU Core

> Supervision




> load balancing, linear scaling, real-time GC, load “unbalancing”

# Distribution: built-in from the start



> transparent co-operation between all computers in the system

# Distribution and Nodes

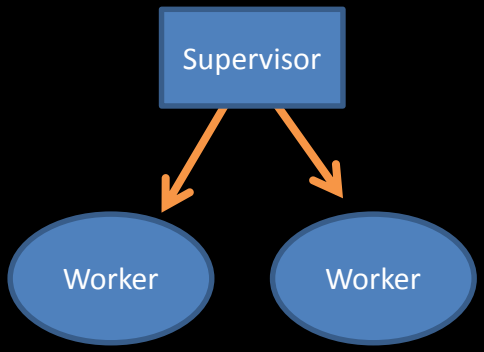
- A “node” is an instance of the ERTS
- `net_adm:ping` forms a cluster
- Connections are transitive (by default)

# Erlang Port Mapper Daemon

- Started at every host where an Erlang node is started.
- Responsible for mapping the symbolic node names to machine addresses.


*****
*****
Core

| Nines | Uptime | Annual Downtime |
|---|---|---|
| 9 | 99.9999999% | 30 milliseconds |
| 8 | 99.9999990% | 300 milliseconds |
| 7 | 99.9999900% | 3 seconds |
| 6 | 99.9999000% | 32 seconds |
| 5 | 99.9990000% | 5 minutes |
| 4 | 99.9900000% | 53 minutes |
| 3 | 99.9000000% | 8 hours, 46 minutes |
| 2 | 99.0000000% | 3 days, 15 hours, 36 minutes |

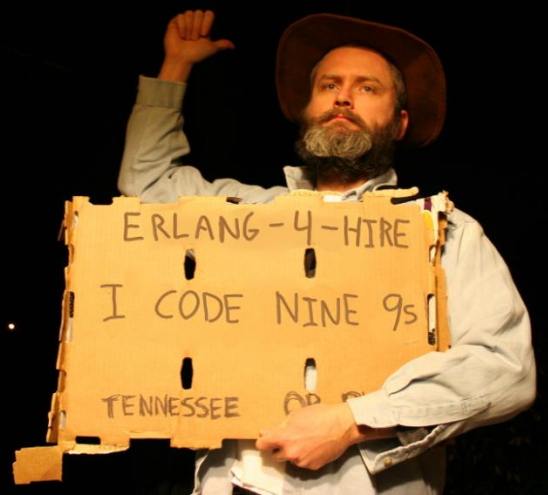



Links and monitors

No masters

Hot code loading

simple distribution, safe concurrency



[insert awe-inspiring demo here]

# What should Microsoft® be Researching?

*Psst…don't forget to show them my PDF*

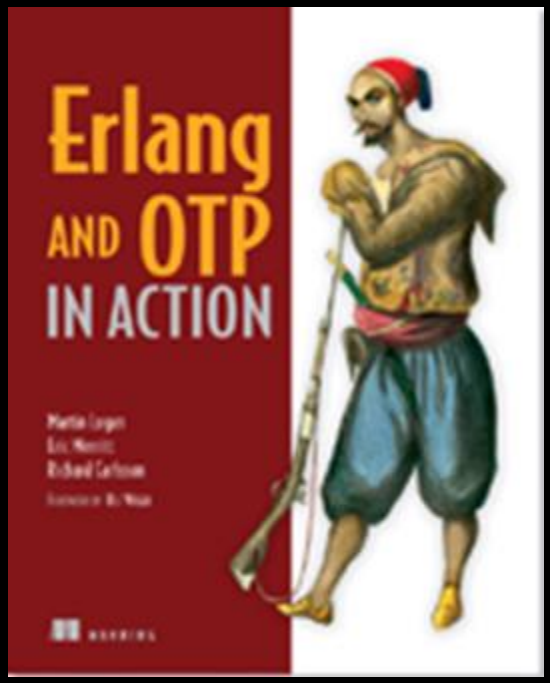
# “Learn You Some Erlang for Great Good!”

http://learnyousomeerlang.com/


How -> read this excellent and free online book

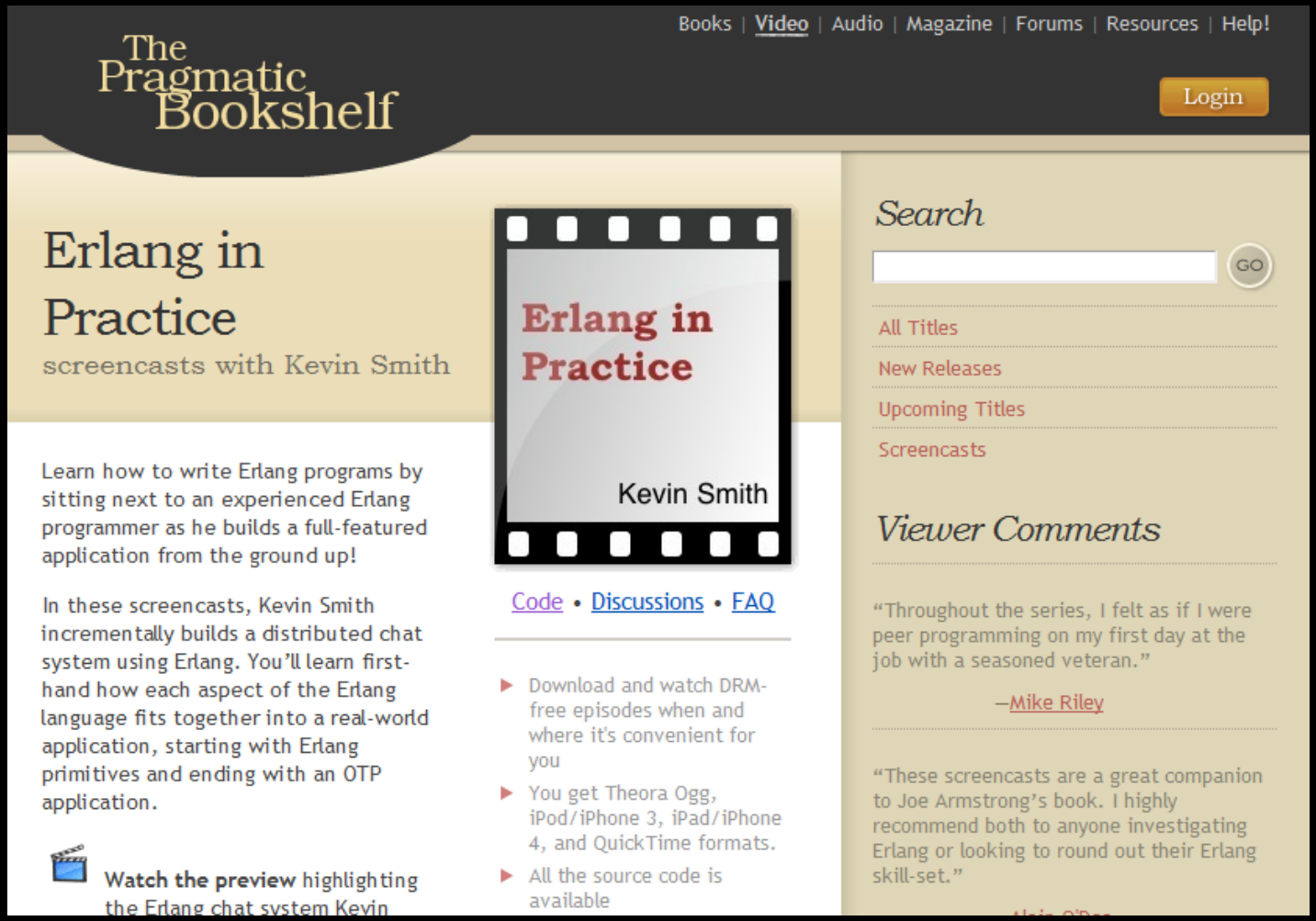
Start here






How -> read some books

# Search “pragmatic kevin smith”




How -> code alongside Kevin Smith for eight screencasts


My blog:

http://freshbrewedcode.com/bryanhunter/

How -> visit my blog


How -> **Nag Pluralsight**


LAMBDA JAM

A Conference for Functional Programmers

Chicago, July 8-10, 2013

# http://lambdajam.com

How -> buy your tickets now

ErlangCamp 2013

## Two Continents, Two ErlangCamps

We have had such great response from past ErlangCamps that this year we are putting on two. One will be in Europe and the other in the USA. We are happy to make access to great info on Erlang easier this year.

### Click For Amsterdam '13

Learn pro-strength Erlang in the Netherlands Aug 30-31, 2013


### Click For Nashville '13

Learn pro-strength Erlang in Music City, USA Oct 11-12, 2013

# http://erlangcamp.com

How -> Come to Nashville in October!


# http://nashfp.org

How -> Better yet; pack up and move to Nashville!

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How -> keep in touch