# Intro to OTP

urigorelik

# OTP is…

> *The OTP framework is a set of modules and standards [...] designed to help you build applications with the languages' built-in facilities: links, monitors, servers, timeouts, trapping exits, etc. [...] by grouping these essential practices into a set of libraries that have been carefully engineered and battle-hardened over years.*
>
> *Every Erlang [and Elixir] programmer should use them.*

http://learnyousomeerlang.com/what-is-otp

# OTP is?

1. Parallelism
2. Concurrency
3. Erlang/Elixir
4. OTP

# Parallelism

*Simultaneous execution of multiple things (possible related, not not always) - doing a lot of things - execution - Rob Pike*

- CPU cores
- [OS] Processes
- Threads
- Why?

# Processes

- fork
- Memory

# Threads

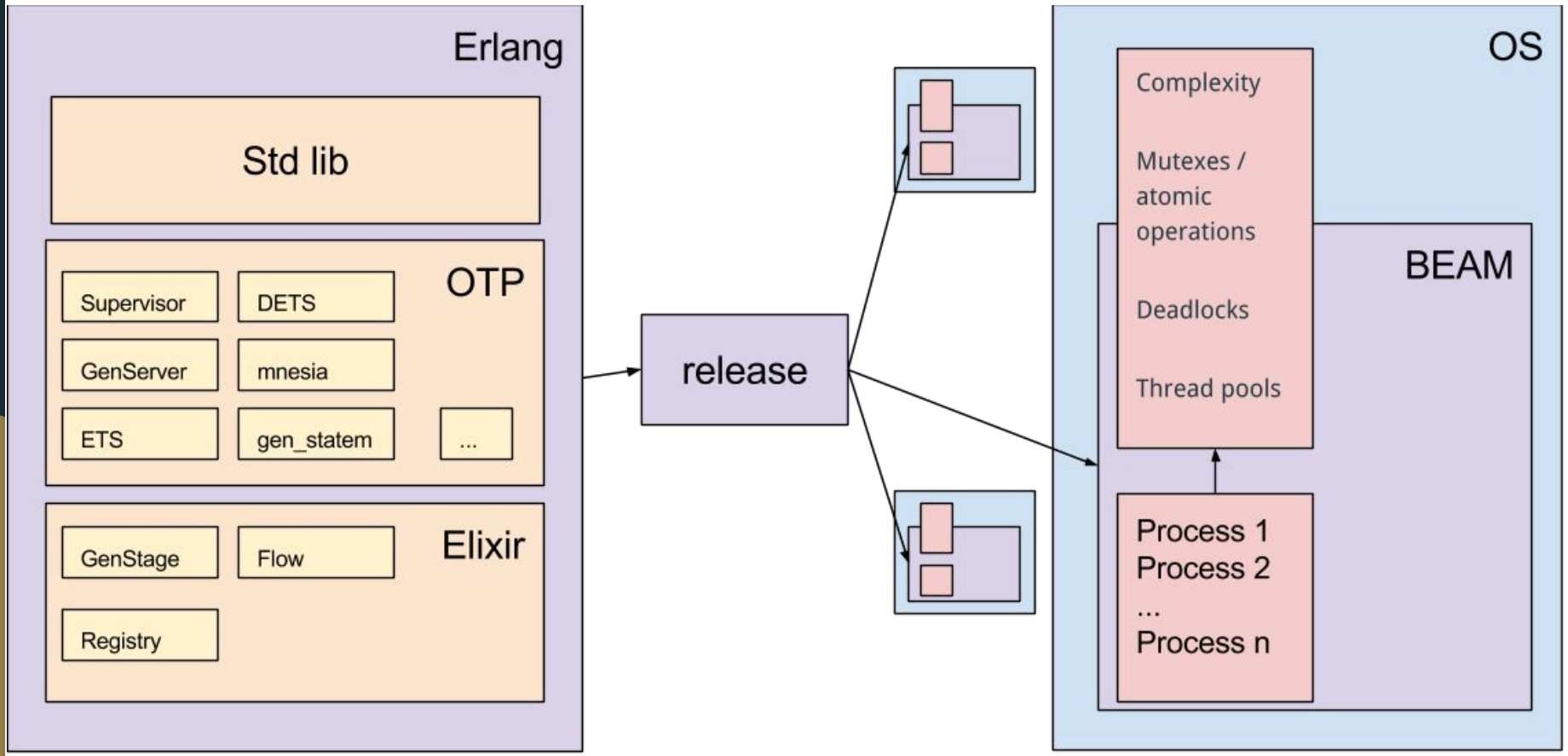
- Low memory footprint
- Complexity (too many)
- Mutexes / atomic operations
- Deadlocks
- Thread pools
- GIL (for some languages)

# Concurrency

- Design / structure
- Division of work into logical segments
- Parallel?
- Concurrent before threaded
- Erlang c. 2007

# Erlang / Elixir

- Functional
- Immutable
- Actor pattern


Erlang
Std lib
OTP
Supervisor
DETS
GenServer
mnesia
ETS
gen_statem
...
Elixir
GenStage
Flow
Registry
release
OS
Complexity
Mutexes / atomic operations
Deadlocks
Thread pools
BEAM
Process 1
Process 2
...
Process n

# OTP in the wild

- DemonWare**: Call of Duty Modern Warfare**, **Call of Duty Black Ops**, Diablo III, many more
  - *Goodness what would have happened if we hadn't switched to Erlang* - Malcolm Dowse
- RabbitMQ, CouchDB, tsung
- WhatsApp
- Discord (Elixir)

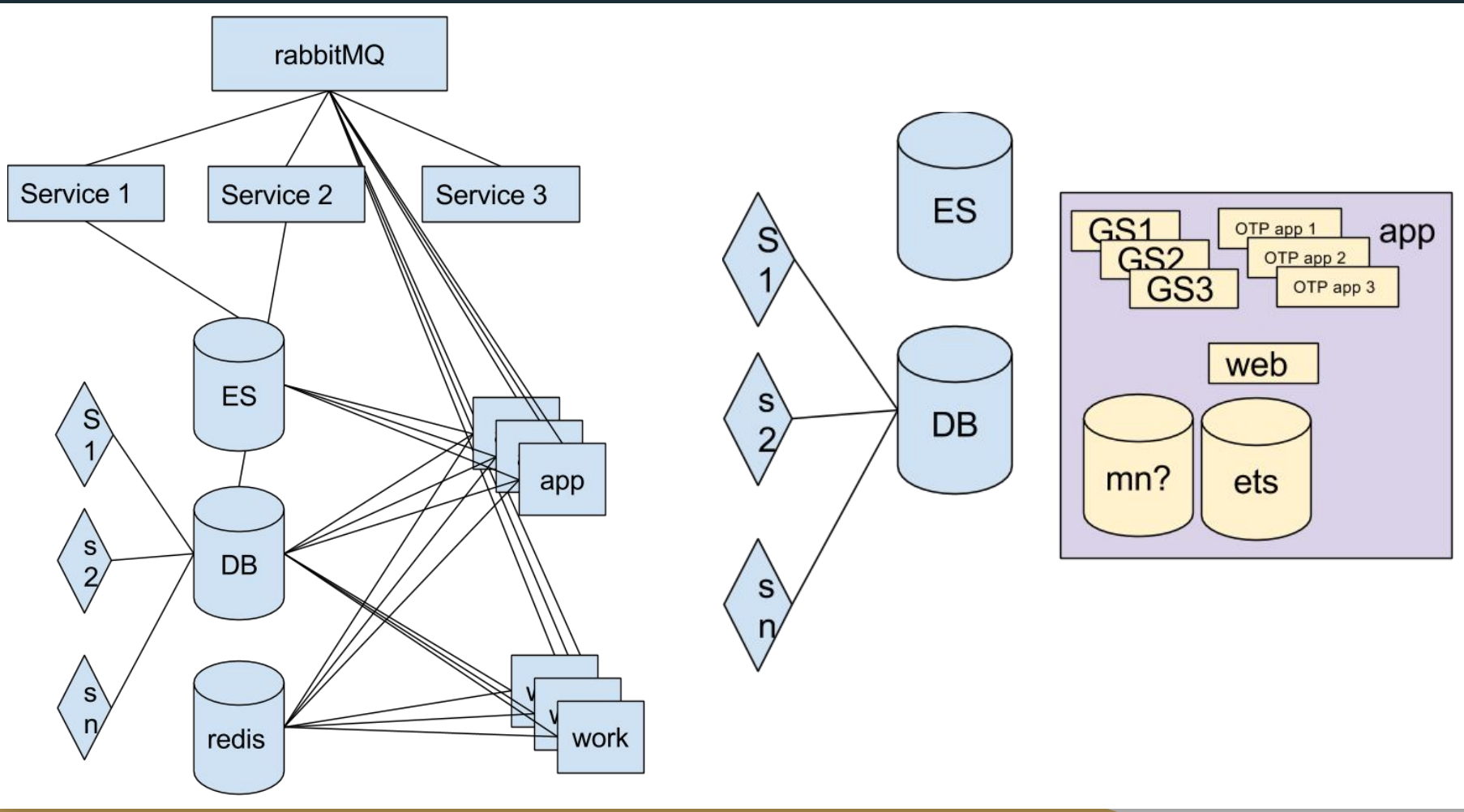
# Scaling Phoenix

http://phoenixframework.org/blog/the-road-to-2-million-websocket-connections

https://www.youtube.com/watch?v=N4Duii6Yog0&feature=youtu.be

8k -> 330k -> 450k -> 1.3M -> 2M

> *Final results from Phoenix channel benchmarks* ***4core/15gb box @ 450k clients****! on* ***40core/128gb box 2 million*** *clients, limited by* ***ulimit***
>
> -- Chris McCord


rabbitMQ
Service 1
Service 2
Service 3
ES
S
1
s
2
s
n
DB
redis
app
work
ES
S
1
s
2
s
n
DB
app
GS1
GS2
GS3
OTP app 1
OTP app 2
OTP app 3
web
mn?
ets

# OTP Behaviours

- Supervisors
- GenServer
- GenStage
- GenFSM -> gen_statem, plain_fsm

# Supervisors

- Monitor other processes
- Restart on failure
  - Network
  - Unexpected value
  - Missing node
  - Unhandled exception
- Ensure reliability
- Assume processes will fail

# GenServer

- Generic server
- Stores state
- Asynchronous calls
- Synchronous calls

# GenStage

# ETS

Erlang term storage

In memory key-value store (rel: redis)

DETS: disk key-value store

http://minhajuddin.com/2017/10/04/ets-versus-redis-benchmarks-for-a-simple-key-value-store/

# mnesia

Distributed database

Not a drop in replacement for relational db.

Richer API over ETS

# Bonuses

- Flow
- Hot code swapping

# Where to go from here

Rob Pike concurrency vs Parallelism

Elixir Official Documentation / Elixir School

Programming Elixir by Dave Thomas