

@WILLHITBET: Love Failure & Embrace The Fall Out



William **HILL**

THE HOME OF BETTING

In numbers

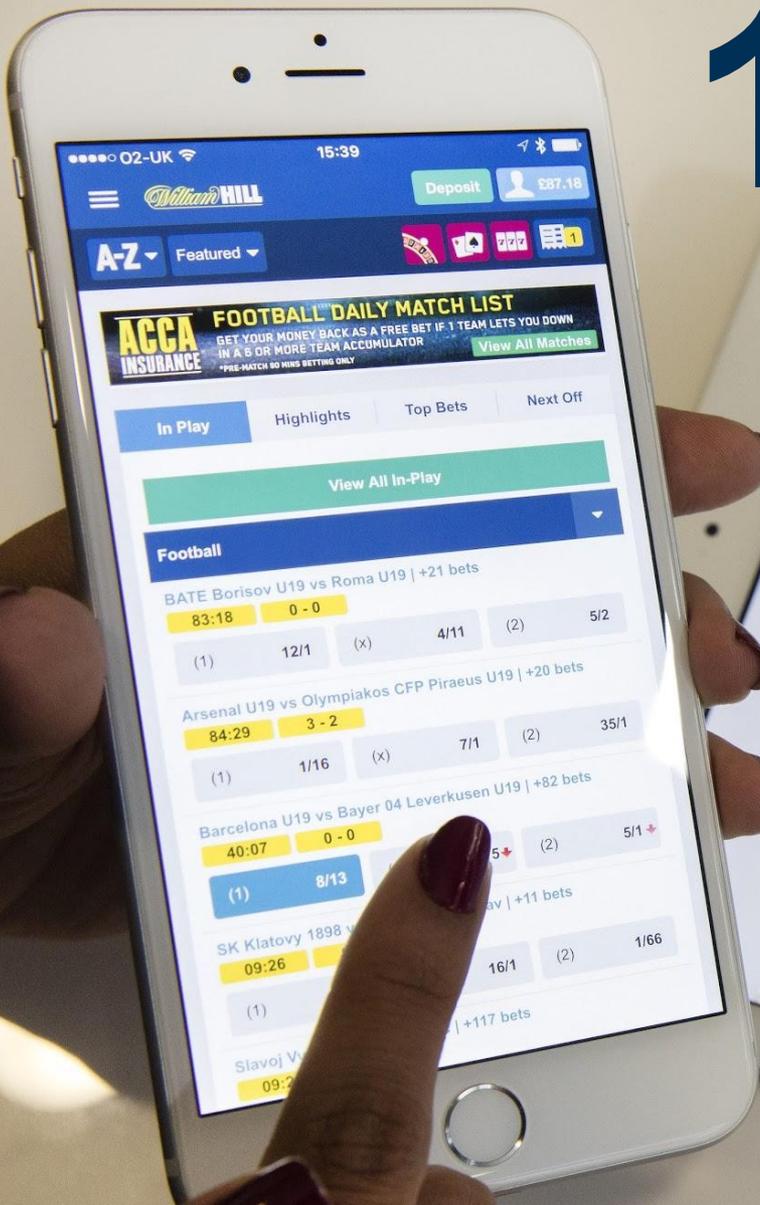


450

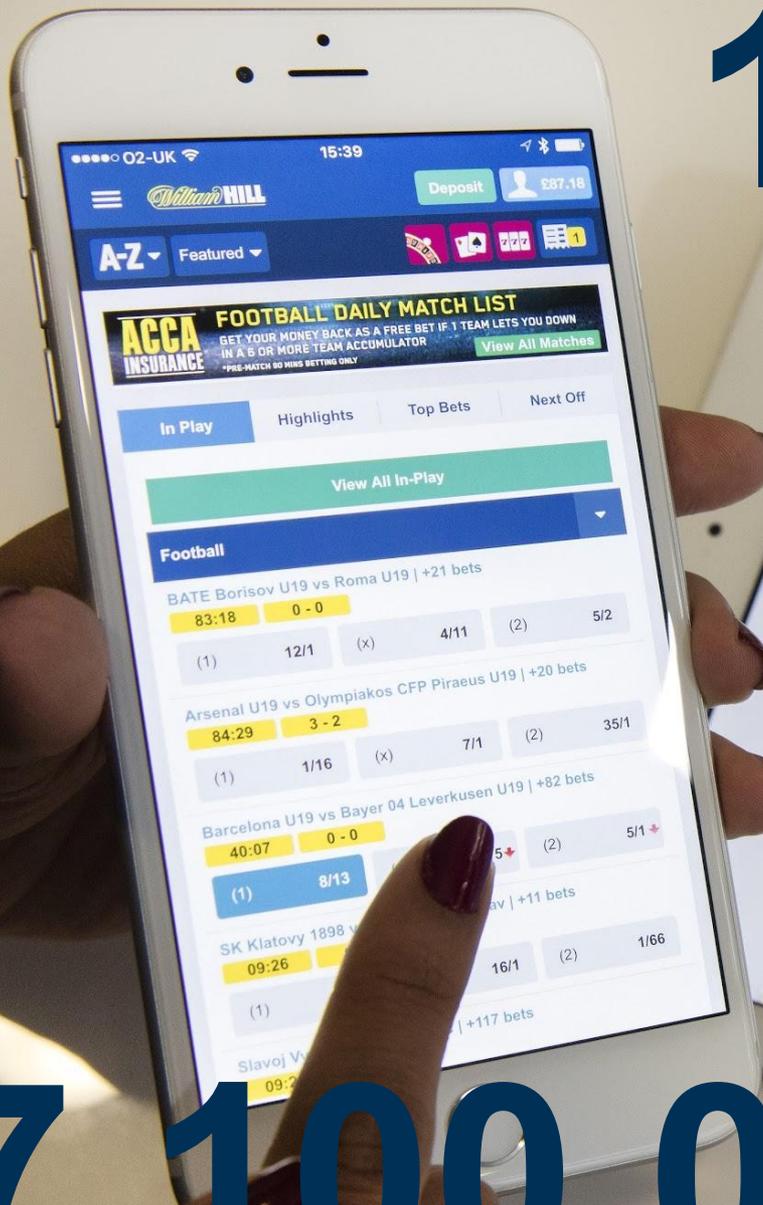


3,000,000,000

1,500,000



1,500,000



7,100,000

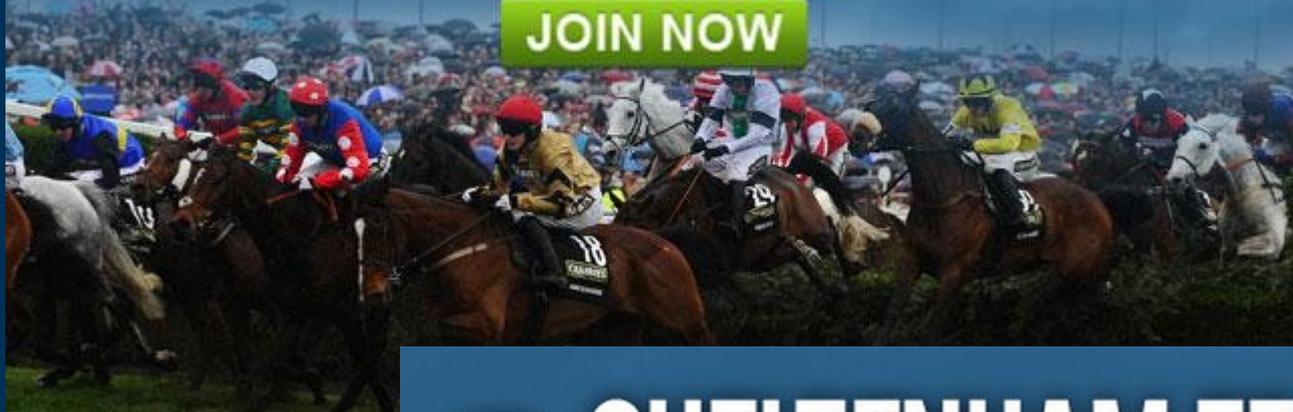
The Sporting Calendar


GRAND NATIONAL

CRABBIE'S GRAND NATIONAL

11 APRIL 2015

JOIN NOW



CHELTENHAM FESTIVAL



JOIN NOW





william hill



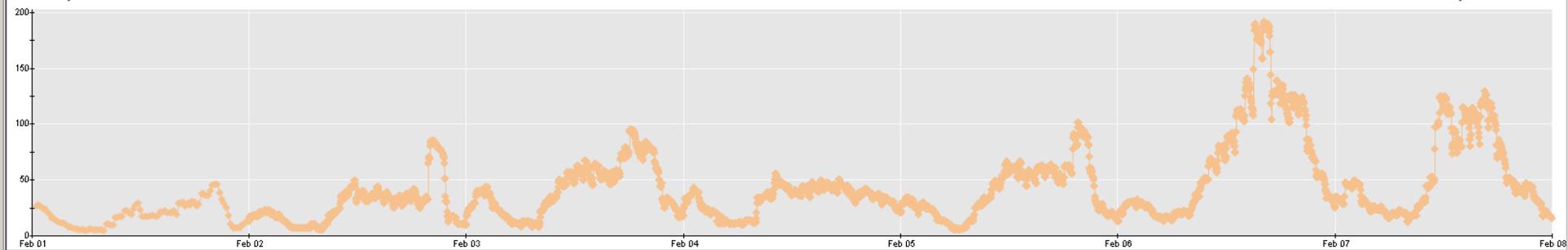
Total Number Of Events (IA HTTP Stats in *SuperDomain*)



Configuration

01 February 2016 00:00:42 GMT

07 February 2016 23:59:57 GMT



*SuperDomain*lgibux913|The Normans|URLs|Http Stats|IA|InRunning.Total Number Of Events|8734 Data Points

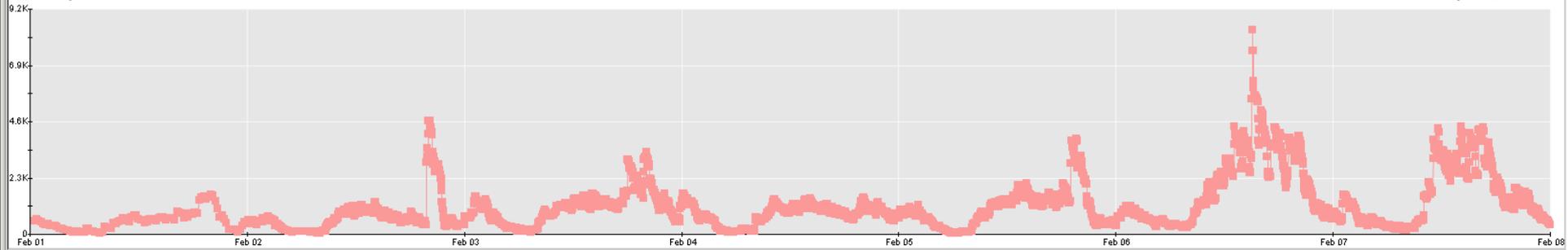
Total Number Of Markets (IA HTTP Stats in *SuperDomain*)



Configuration

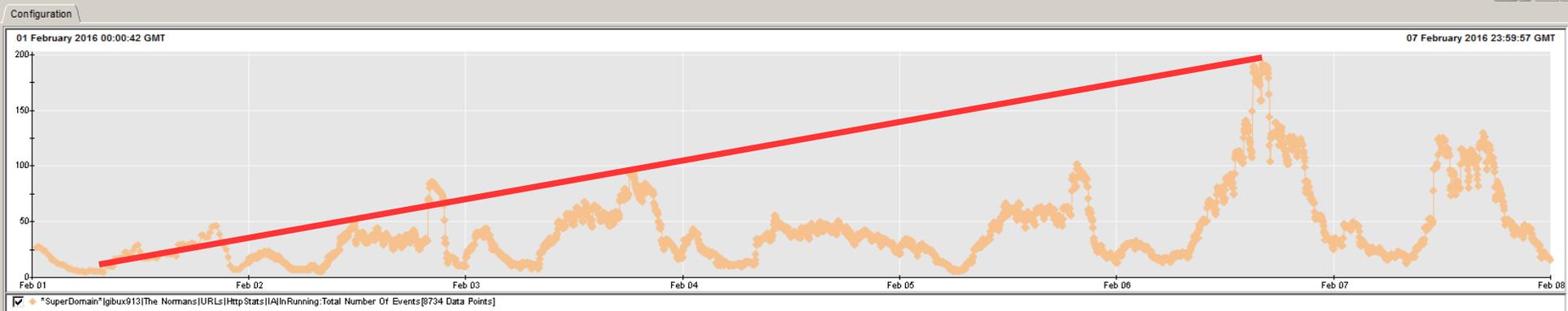
01 February 2016 00:00:42 GMT

07 February 2016 23:59:57 GMT



*SuperDomain*lgibux913|The Normans|URLs|Http Stats|IA|InRunning.Total Number Of Markets|8734 Data Points

Total Number Of Events (IA HTTP Stats in *SuperDomain*)



Total Number Of Markets (IA HTTP Stats in *SuperDomain*)



CHELTENHAM FESTIVAL 2015

MONEY BACK AS A FREE BET

IF YOUR WIN OR E/W BET DOESN'T COME IN
SUPREME NOVICES*, 1:30PM 10TH MARCH

AVAILABLE TO ALL CUSTOMERS — UP TO £25 FREE BET

JOIN US

* Wagering and Terms Apply

10TH MAR 2015

SUPREME NOVICES HURDLE

AMINABAD	50/1
LASER HAWK	66/1
BENTELIMAR	25/1
SILVER CONCORDE	25/1
DABADIYAN	40/1
ALVISIO VILLE	16/1
ALL HELL LET LOOSE	50/1
BLACK HERCULES	25/1

1 SIGN UP
REGISTER & USE
PROMO CODE: C30

2 BET
PLACE A £10 SPORTS BET

3 ENJOY
WE WILL CREDIT YOUR ACCOUNT
WITH 3 X £10 FREE BETS



Stuff breaks

A problem has been detected and windows has been shut down to prevent damage to your computer.

The problem seems to be caused by the following file: SPCMDCON.SYS

PAGE_FAULT_IN_NONPAGED_AREA

If this is the first time you've seen this stop error screen, restart your computer. If this screen appears again, follow these steps:

Check to make sure any new hardware or software is properly installed. If this is a new installation, ask your hardware or software manufacturer for any windows updates you might need.

If problems continue, disable or remove any newly installed hardware or software. Disable BIOS memory options such as caching or shadowing. If you need to use Safe Mode to remove or disable components, restart your computer, press F8 to select Advanced Startup Options, and then select Safe Mode.

Technical information:

*** STOP: 0x00000050 (0xFD3094C2,0x00000001,0xFBFE7617,0x00000000)

*** SPCMDCON.SYS - Address FBFE7617 base at FBFE5000, Datestamp 3d6dd67c

You need to restart your computer. Hold down the Power button for several seconds or press the Restart button.

Veillez redémarrer votre ordinateur. Maintenez la touche de démarrage enfoncée pendant plusieurs secondes ou bien appuyez sur le bouton de réinitialisation.

Sie müssen Ihren Computer neu starten. Halten Sie dazu die Einschalttaste einige Sekunden gedrückt oder drücken Sie die Neustart-Taste.

コンピュータを再起動する必要があります。パワーボタンを数秒間押し続けるか、リセットボタンを押してください。



Call Trace:

[<c041b7f2>] iounmap+0x9e/0xc8
[<c053480d>] agp_generic_free_gatt_table+0x2e/0x9e
[<c0533991>] agp_add_bridge+0x1a8/0x26f
[<c05439eb>] __driver_attach+0x0/0x6b
[<c04e6bf4>] pci_device_probe+0x36/0x57
[<c0543945>] driver_probe_device+0x42/0x8b
[<c0543a2f>] __driver_attach+0x44/0x6b
[<c054344a>] bus_for_each_dev+0x37/0x59
[<c05438af>] driver_attach+0x11/0x13
[<c05439eb>] __driver_attach+0x0/0x6b
[<c0543152>] bus_add_driver+0x64/0xfd
[<c04e6d22>] __pci_register_driver+0x47/0x63
[<c040044d>] init+0x17d/0x2f7
[<c0403dee>] ret_from_fork+0x6/0x1c
[<c04002d0>] init+0x0/0x2f7
[<c04002d0>] init+0x0/0x2f7
[<c0404c3b>] kernel_thread_helper+0x7/0x10

=====
Code: 78 29 8b 44 24 04 29 d0 8b 54 24 10 c1 f8 05 c1 e0 0c 09 f8 89 02 8b 43 0c
85 c0 75 08 0f 0b 9c 00 77 c8 61 c0 48 89 43 0c eb 08 <0f> 0b 9f 00 77 c8 61 c0
8b 03 f6 c4 04 0f 85 a5 00 00 00 a1 0c

EIP: [<c041bd49>] change_page_attr+0x19a/0x275 SS:ESP 0068:c14f7ec0

<0>Kernel panic - not syncing: Fatal exception

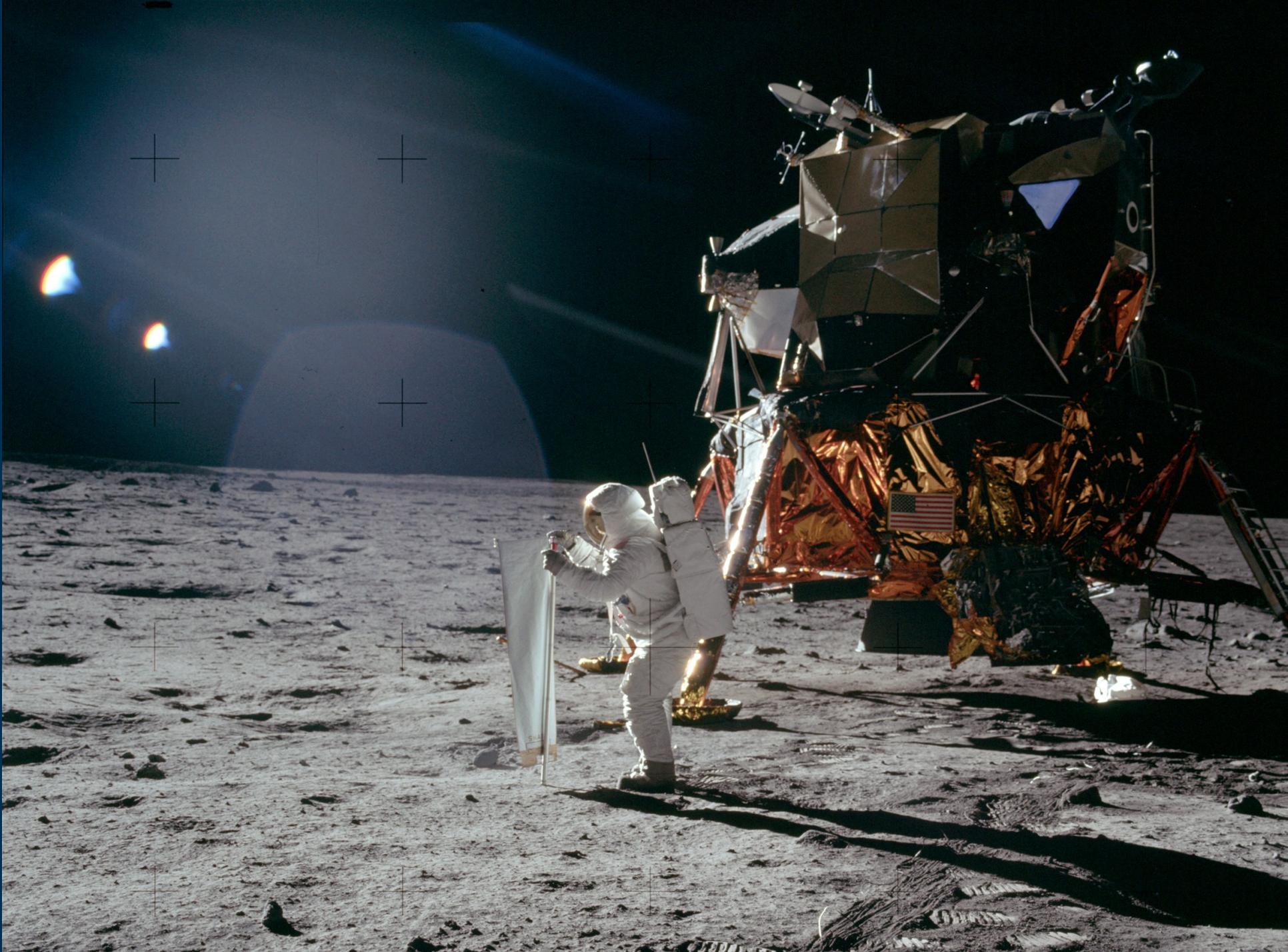
-

Gibraltar fire leads to blackout and halts online betting

Power station blaze interrupts Gibtelecom services, bringing down worldwide betting services



Smoke billows behind residential buildings following an explosion at Gibraltar's power plant Photo: AFP/Getty Images



**Why does system failure
matter?**



**‘william hill is not working. I
can't see any scores, no
cash out and I can not place
a bet’**



Disclaimer



Here's a Standard Authority !

NO 4-FOX'S ATHLETIC LIBRARY.

THE OFFICIAL
BOOK OF RULES

FOR ALL
SPORTS



keep learning





If it's not broken, try harder

GOOD THINGS COME
TO THOSE WHO
COMPOST

shells... peelings... teabags... vegetable scraps... paper...

**Development treated as
production**

DISRUPT OUR INDUSTRY FROM THE INSIDE OUT...

*William***HILL**

2018

amazon

2007: UPROOTS RETAIL, BOOK DISTRIBUTION & PUBLISHING (\$142BN)



2007: TRANSFORMS MOBILE INDUSTRY (\$686BN)

NETFLIX

2007: DESTROYS 'POSTAL' RENTALS (\$19BN)



2001: REIMAGINES MUSIC DISTRIBUTION & CONSUMPTION

Google

1998: TRANSFORMS ADVERTISING (NOW \$350BN)

 **Netscape**

1994: REVOLUTIONIZES COMMERCE

WHERE DID THEY COME FROM?

SQUARE (FINANCE) - \$6BN

AIRBNB (HOSPITALITY) \$10BN

UBER (TRANSPORT) \$40BN

Our 'anti-pattern'



Some months later



Some years later



**Do you have a time
machine?**



The problem is..



Pattern tends to repeat..











And the alternative?









CAT

966G

0240022

**What are we trying to
achieve?**



**'william hill is not working. I
can't see any scores, no
cash out and I can not place
a bet'**



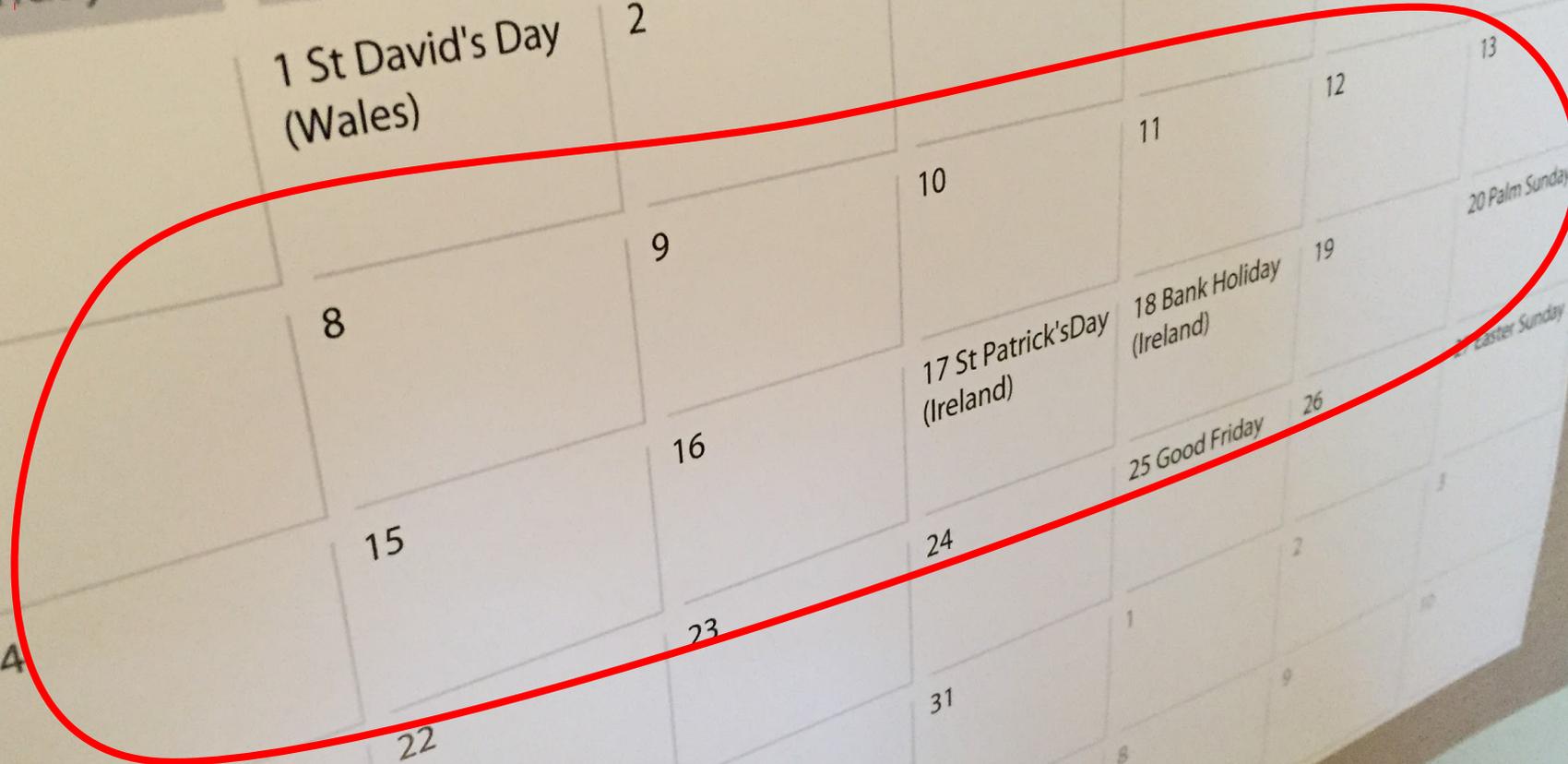
**'william hill, I can not cash
out'**



Design and approach

MARCH 2016

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
29	1 St David's Day (Wales)	2	3	4	5	6 Mother's Day
7	8	9	10	11	12	13
14	15	16	17 St Patrick's Day (Ireland)	18 Bank Holiday (Ireland)	19	20 Palm Sunday
21	22	23	24	25 Good Friday	26	27 Easter Sunday
28 Easter Monday	29	30	31	1	2	3
		6	7	8	9	10



```
[gstevenson@wh5003077 ~] $ ls -l /usr/sbin/mkfs.*
-rwxr-xr-x. 1 root root 296456 Nov 18 17:25 /usr/sbin/mkfs.btrfs
-rwxr-xr-x. 1 root root  36472 Nov 18 11:29 /usr/sbin/mkfs.cramfs
-rwxr-xr-x. 5 root root 111472 Jun 17  2015 /usr/sbin/mkfs.ext2
-rwxr-xr-x. 5 root root 111472 Jun 17  2015 /usr/sbin/mkfs.ext3
-rwxr-xr-x. 5 root root 111472 Jun 17  2015 /usr/sbin/mkfs.ext4
-rwxr-xr-x. 5 root root 111472 Jun 17  2015 /usr/sbin/mkfs.ext4dev
-rwxr-xr-x. 1 root root  28640 Sep 18 17:25 /usr/sbin/mkfs.fat
-rwxr-xr-x. 1 root root  28944 Jun 17  2015 /usr/sbin/mkfs.hfsplus
-rwxr-xr-x. 1 root root  78720 Nov 18 11:29 /usr/sbin/mkfs.minix
lrwxrwxrwx. 1 root root    8 Sep 18 17:25 /usr/sbin/mkfs.msdos -> mkfs.fat
lrwxrwxrwx. 1 root root   16 Jun 18  2015 /usr/sbin/mkfs.ntfs -> /usr/sbin/mkntfs
lrwxrwxrwx. 1 root root    8 Sep 18 17:25 /usr/sbin/mkfs.vfat -> mkfs.fat
-rwxr-xr-x. 1 root root 363000 Jul 30  2015 /usr/sbin/mkfs.xfs
```





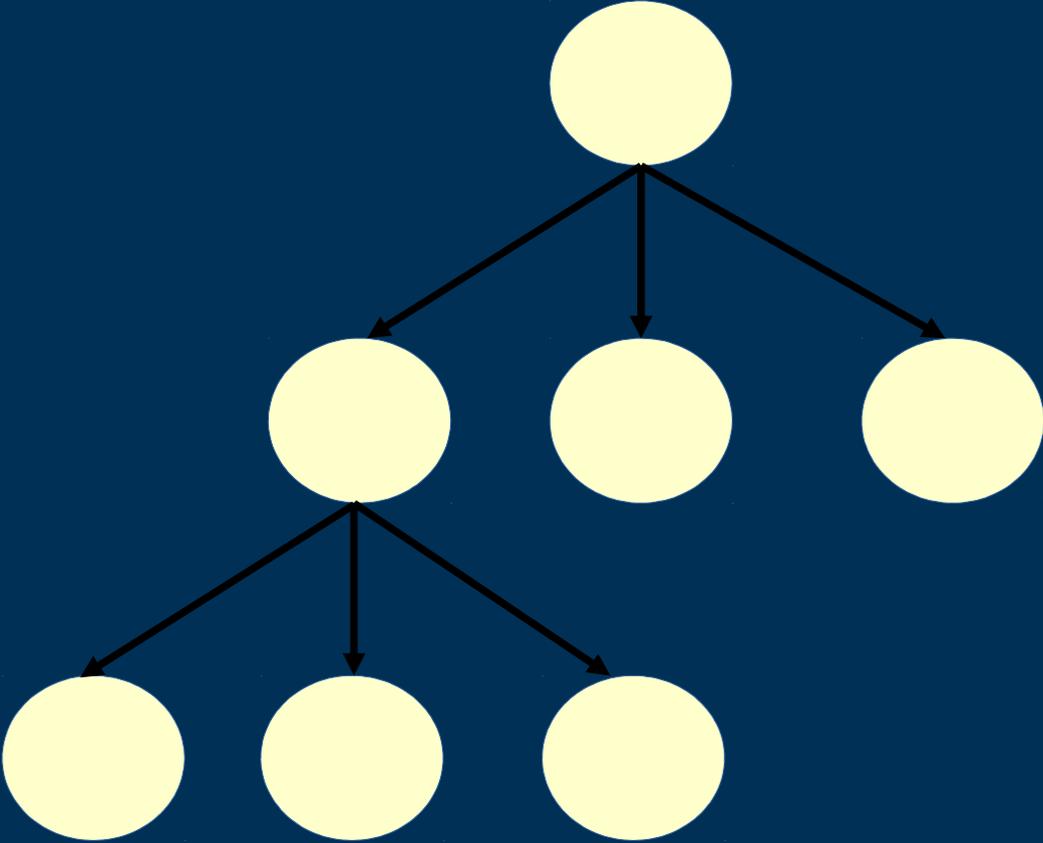


Epoch:

Sports Betting Engine

[gstevenson@wh5003077 ~] \$ █







GO



<http://golang.org>

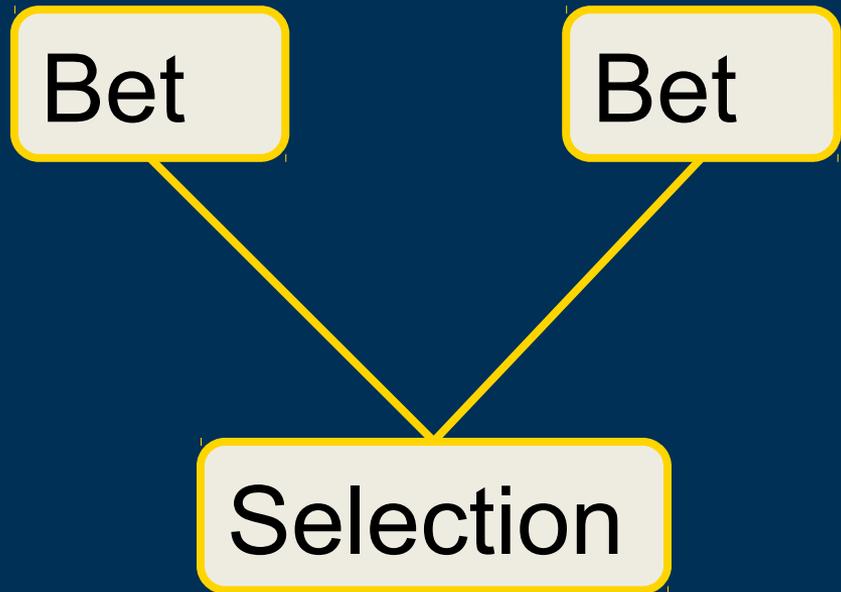


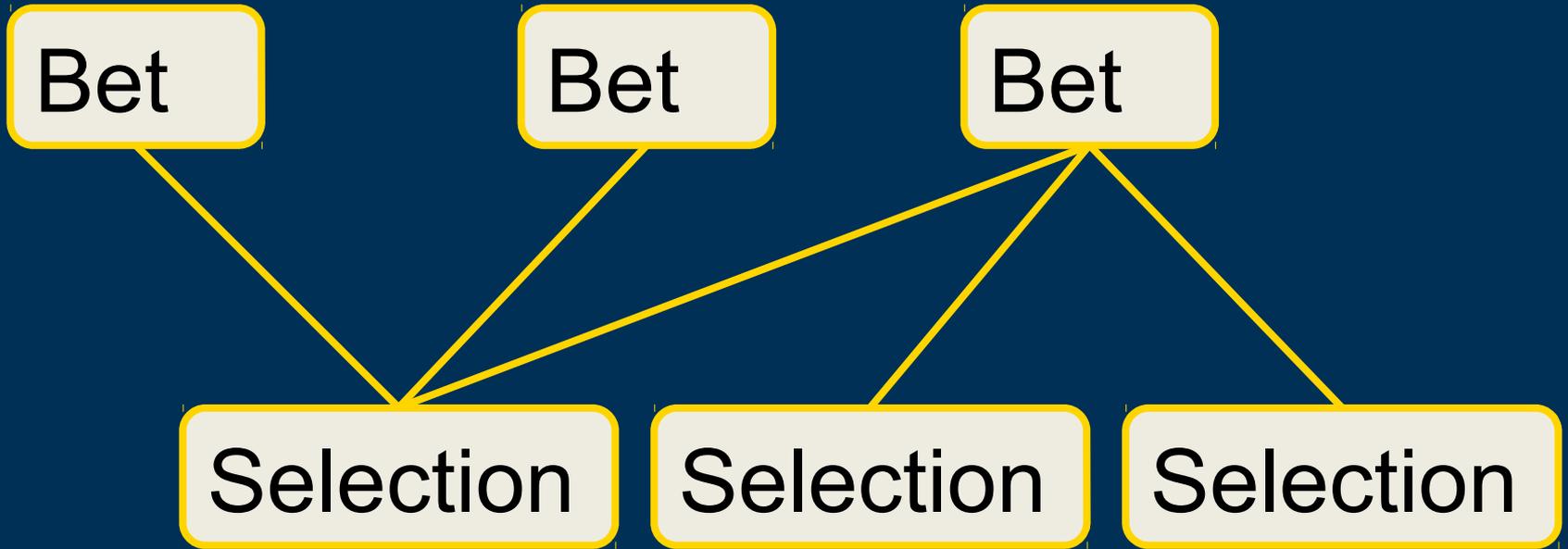
https://en.wikipedia.org/wiki/Actor_model

The 1 and 0's

Bet

Selection







DO NOT REMOVE THIS LABEL
OR THE DRIVE WILL BE VOID
OF WARRANTY

DO NOT COVER ANY DRIVE HOLES

WARRANTY
VOID
IF REMOVED

63

62

SEC 146 HCH9
K182G0446C
ELITE7875C

Testing?

File Edit View Search Terminal Help

ctor":1.0,"type":{"accumulator":9})

id: 616389317

event: /bets/valuated

```
data: {"cash_in_valuation":2.38,"channel":"online","customer_id":4322298,"id":1428469873,"leg_type":"win","price":"undefined","selections":[{"current_price":3.25,"epoch":{"place_price":-1,"price":-1,"status":-1},"event_id":8966624,"id":1127016156,"market_id":343178472,"place_price":1.0,"status":"open","struck_price":3.25}],"current_price":1.91,"epoch":{"place_price":-1,"price":-1,"status":-1},"event_id":8966603,"id":1127015888,"market_id":343178451,"place_price":1.0,"status":"open","struck_price":1.91},"slip_id":1428469873,"stake":2.5,"stake_factor":1.0,"type":"double"}
```

id: 616389445

event: /bets/valuated

```
data: {"cash_in_valuation":0.25,"channel":"online","customer_id":13194627,"id":1428469874,"leg_type":"win","price":"undefined","selections":[{"current_price":3.25,"epoch":{"place_price":-1,"price":-1,"status":-1},"event_id":8966624,"id":1127016156,"market_id":343178472,"place_price":1.0,"status":"open","struck_price":3.25}],"current_price":3.75,"epoch":{"place_price":-1,"price":-1,"status":-1},"event_id":8966194,"id":1126789853,"market_id":343101726,"place_price":1.0,"status":"open","struck_price":3.75}],"current_price":1.67,"epoch":{"place_price":-1,"price":-1,"status":-1},"event_id":8966626,"id":1127016174,"market_id":343178474,"place_price":1.0,"status":"open","struck_price":1.67}],"current_price":3.25,"epoch":{"place_price":-1,"price":-1,"status":-1},"event_id":8966193,"id":1126789838,"market_id":343101725,"place_price":1.0,"status":"open","struck_price":3.25},"slip_id":1428469874,"stake":0.26,"stake_factor":1.0,"type":{"accumulator":4}}
```

id: 616389509

event: /bets/valuated

```
data: {"cash_in_valuation":5.23,"channel":"online","customer_id":12173469,"id":1428469875,"leg_type":"win","price":"undefined","selections":[{"current_price":4.2,"epoch":{"place_price":-1,"price":-1,"status":-1},"event_id":8930198,"id":1126848423,"market_id":343122933,"place_price":1.0,"status":"open","struck_price":4.2}],"current_price":3.5,"epoch":{"place_price":-1,"price":-1,"status":-1},"event_id":8930847,"id":1125240138,"market_id":342618829,"place_price":1.0,"status":"open","struck_price":3.5},"slip_id":1428469875,"stake":5.5,"stake_factor":2.0,"type":"double"}
```

id: 616389573

event: /bets/valuated

```
data: {"cash_in_valuation":1.9,"channel":"online","customer_id":13116019,"id":1428469876,"leg_type":"win","price":"undefined","selections":[{"current_price":1.25,"epoch":{"place_price":-1,"price":-1,"status":-1},"event_id":8930198,"id":1126848424,"market_id":343122933,"place_price":1.0,"status":"open","struck_price":1.25}],"slip_id":1428469876,"stake":2.0,"stake_factor":1.0,"type":"single"}
```

id: 616389629

event: /bets/valuated

```
data: {"cash_in_valuation":0.66,"channel":"online","customer_id":1478389,"id":1428469879,"leg_type":"each_way","price":"undefined","selections":[{"current_price":0.5,"epoch":{"place_price":-1,"price":-1,"status":-1},"event_id":8907793,"id":1127467116,"market_id":343326175,"place_price":1.0,"status":"open","struck_price":0.5}],"slip_id":1428469879,"stake":0.7,"stake_factor":1.0,"type":"single"}
```

id: 616389957

event: /bets/valuated

```
data: {"cash_in_valuation":17.13,"channel":"online","customer_id":2791146,"id":1428469882,"leg_type":"win","price":"undefined","selections":[{"current_price":2.0,"epoch":{"place_price":-1,"price":-1,"status":-1},"event_id":8921961,"id":1117415957,"market_id":340167866,"place_price":1.0,"status":"open","struck_price":2.0}],"current_price":1.2,"epoch":{"place_price":-1,"price":-1,"status":-1},"event_id":8931323,"id":1119552357,"market_id":340841462,"place_price":1.0,"status":"open","struck_price":1.2}],"current_price":2.0,"epoch":{"place_price":-1,"price":-1,"status":-1},"event_id":8931324,"id":1119552849,"market_id":340842225,"place_price":1.0,"status":"open","struck_price":2.0},"slip_id":1428469882,"stake":18.03,"stake_factor":1.0,"type":"treble"}
```

id: 616390021

event: /bets/valuated

```
data: {"cash_in_valuation":2.38,"channel":"online","customer_id":15108046,"id":1428469883,"leg_type":"win","price":"undefined","selections":[{"current_price":4.0,"epoch":{"place_price":-1,"price":-1,"status":-1},"event_id":8931112,"id":1119338601,"market_id":340778150,"place_price":1.0,"status":"open","struck_price":4.0}],"current_price":2.0,"epoch":{"place_price":-1,"price":-1,"status":-1},"event_id":8921961,"id":1117415957,"market_id":340167866,"place_price":1.0,"status":"open","struck_price":2.0}],"current_price":2.45,"epoch":{"place_price":-1,"price":-1,"status":-1},"event_id":8931178,"id":1119440684,"market_id":340806946,"place_price":1.0,"status":"open","struck_price":2.45}],"current_price":1.14,"epoch":{"place_price":-1,"price":-1,"status":-1},"event_id":8930858,"id":1119310816,"market_id":340771599,"place_price":1.0,"status":"open","struck_price":1.14}],"current_price":1.2,"epoch":{"place_price":-1,"price":-1,"status":-1},"event_id":8931320,"id":1119557381,"market_id":340844739,"place_price":1.0,"status":"open","struck_price":1.2}],"current_price":1.33,"epoch":{"place_price":-1,"price":-1,"status":-1},"event_id":8930824,"id":1119320635,"market_id":340772886,"place_price":1.0,"status":"open","struck_price":1.33}],"slip_id":1428469883,"stake":2.5,"stake_factor":1.0,"type":{"accumulator":6}}
```


Iteration 1

(two weeks)



Server Sent Event Streams

```
curl http://server/chat
```

```
id: 918273
```

```
event: /message/from/bob
```

```
data: {"message", "Not telling you"}
```

```
curl http://server/chat?from=918273
```

```
id: 918273
```

```
event: /message/from/fred
```

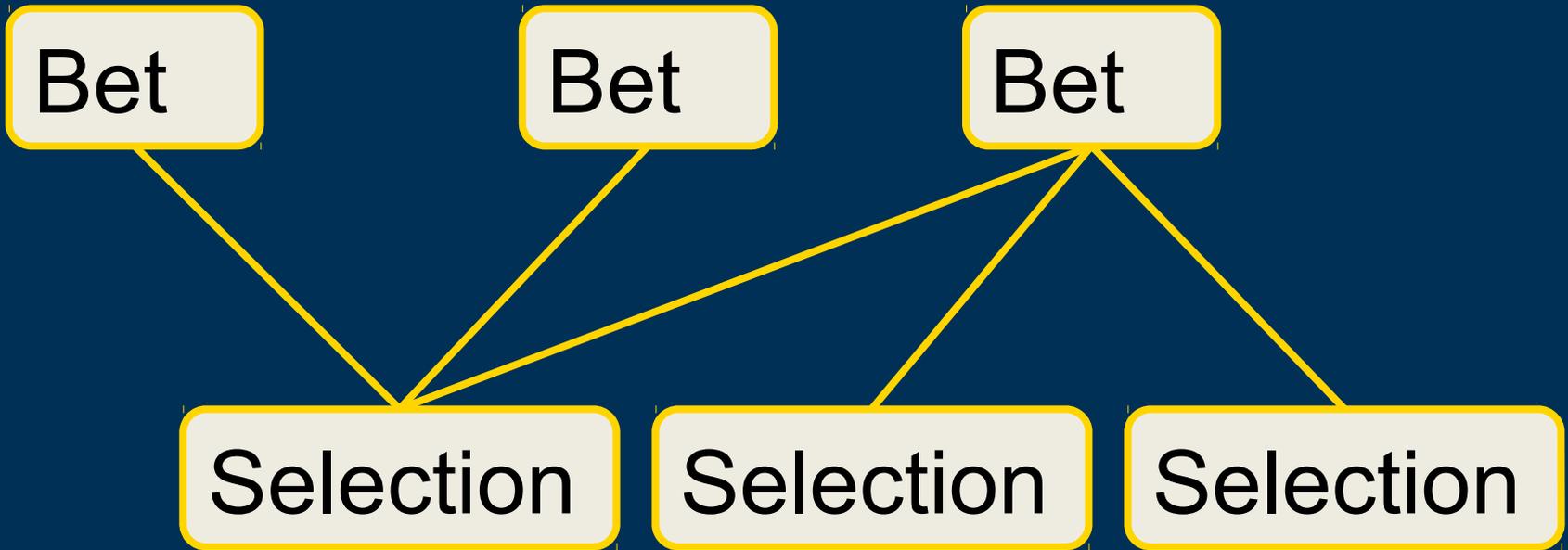
```
data: {"message", "Anybody know where  
the bananas are hidden?"}
```

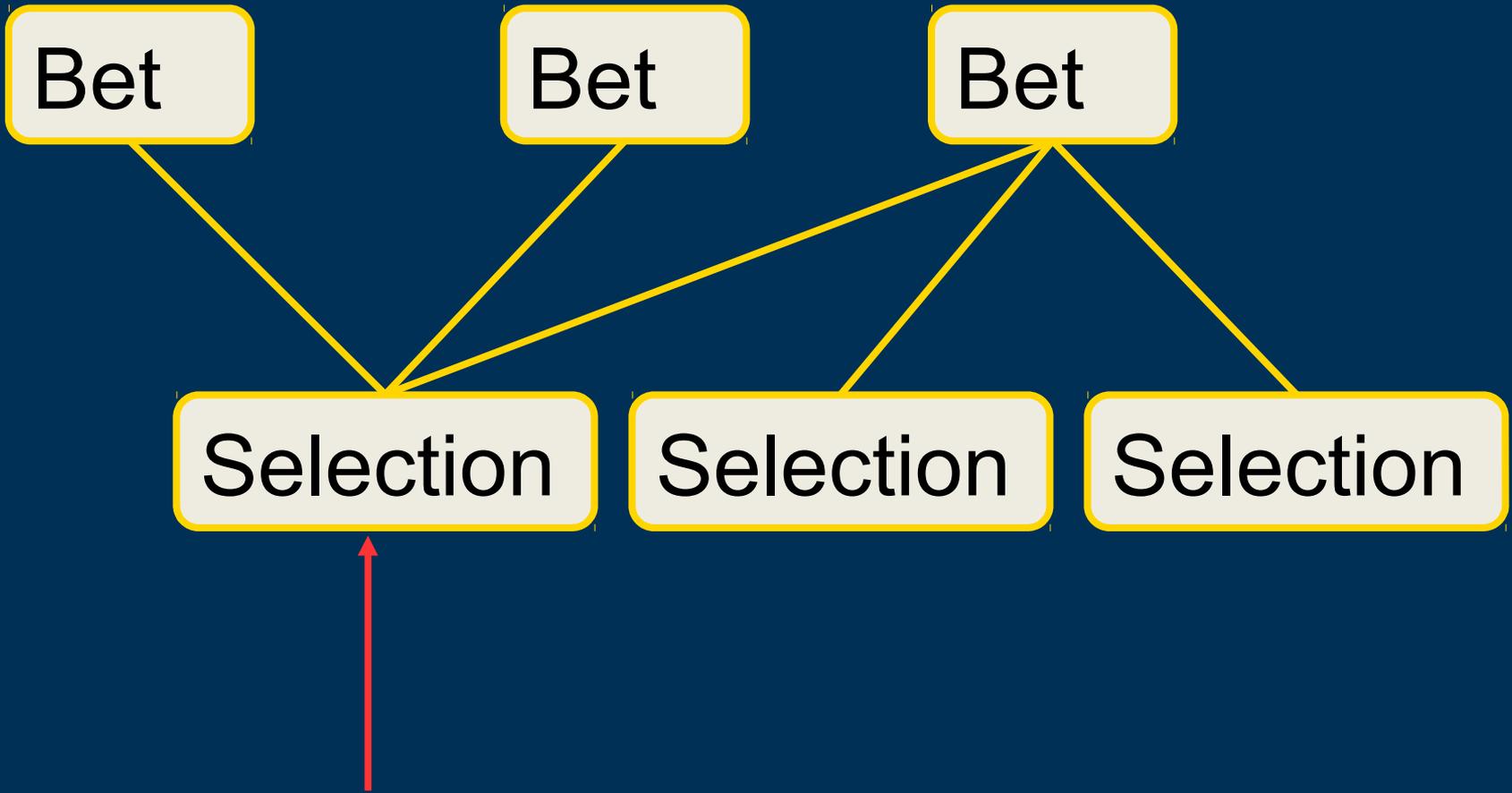
```
id: 918274
```

```
event: /message/from/bob
```

```
data: {"message", "Not telling you"}
```







It works

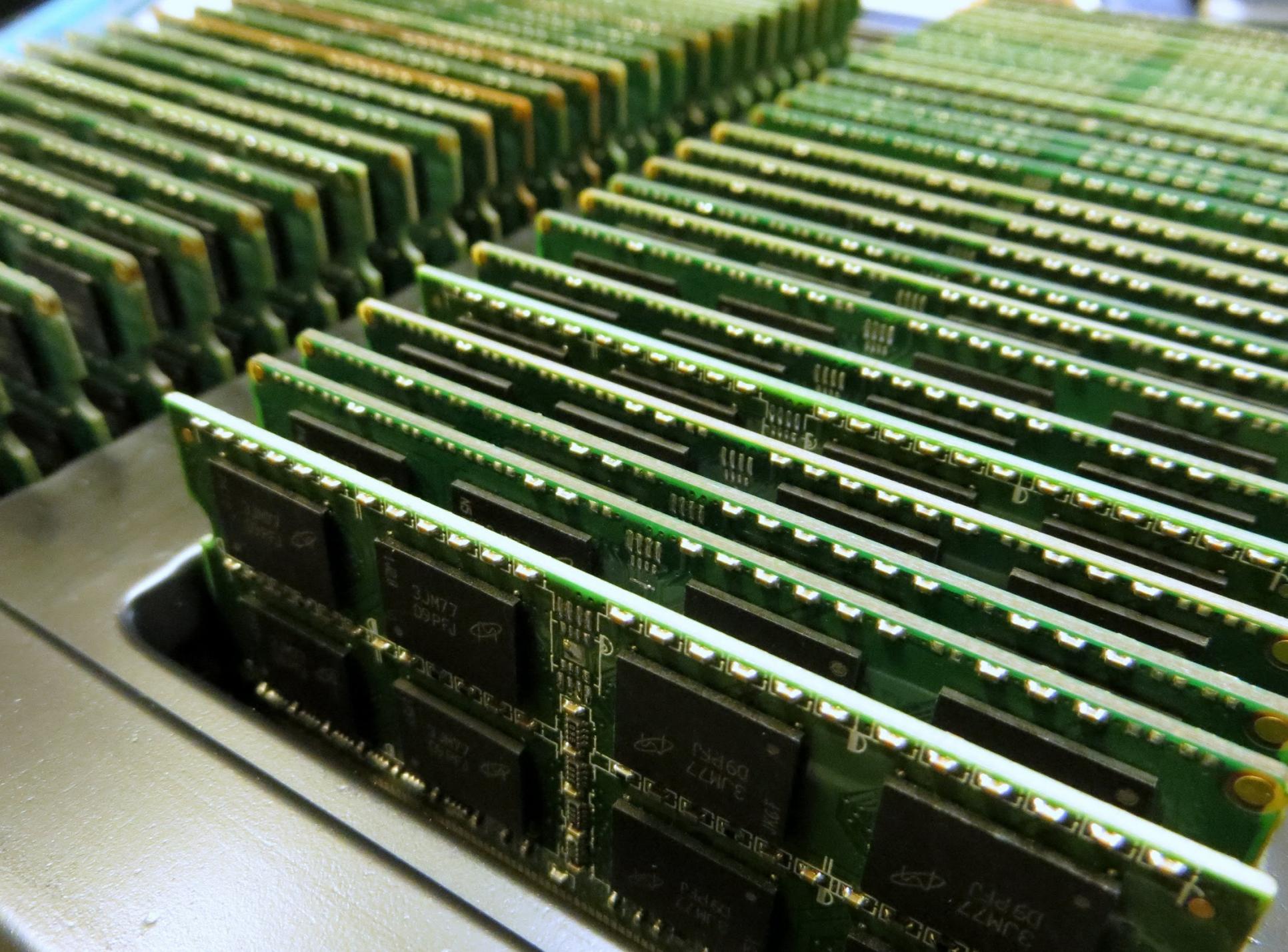




If it's not broken, try harder

It failed





gstevenson@wh5003077:~

gstevenson@wh5003077:~\$

```
1  [||||] 3.3% 5  [|||||] 11.2%
2  [|||||] 7.9% 6  [||] 2.6%
3  [||||||] 9.9% 7  [||] 2.0%
4  [|||||||] 13.2% 8  [|||||||] 16.6%
Mem [|||||||||||||||||] 3.46G/31.3G Tasks: 146, 452 thr; 3 running
Swp [  ] 0K/7.81G Load average: 0.04 0.21 0.24
Uptime: 02:26:11
```

gstevenson@wh5003077:~\$

```
[gstevenson@wh5003077 ~]$ s erl +P 7000000
Erlang/OTP 18 [erts-7.2.1] [source] [64-bit] [smp:8:8] [async-threads:10] [hipe] [kernel-poll:false]
```

```
Eshell V7.2.1 (abort with ^G)
```

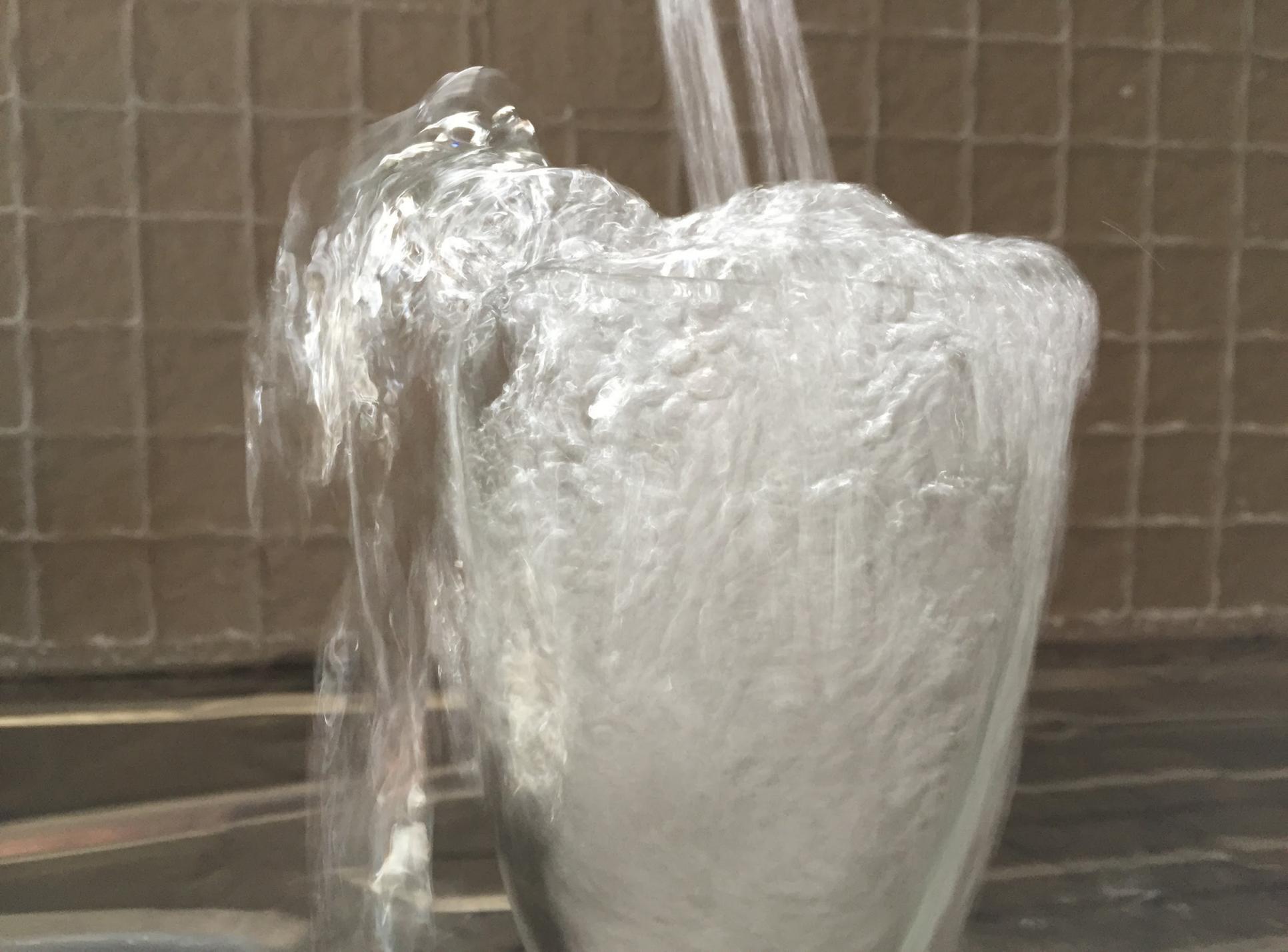
```
1> F = fun() -> receive _ -> ok end end.
```

```
#Fun<erl eval.20.54118792>
```

```
2> length(erlang:processes()).
```

```
25
```

```
3> [ spawn(F) || _ <- lists:seq(0,6000000)].
```



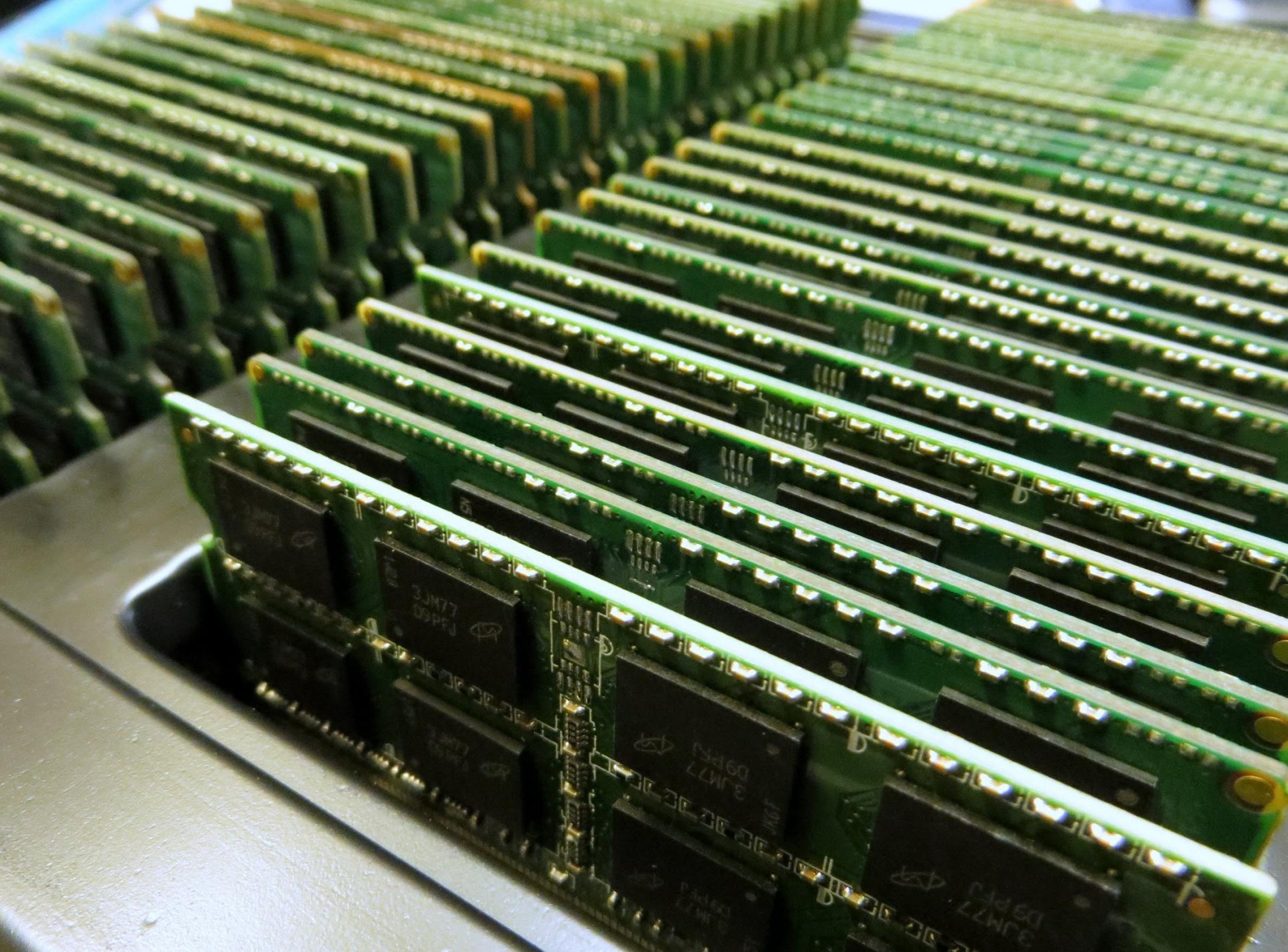


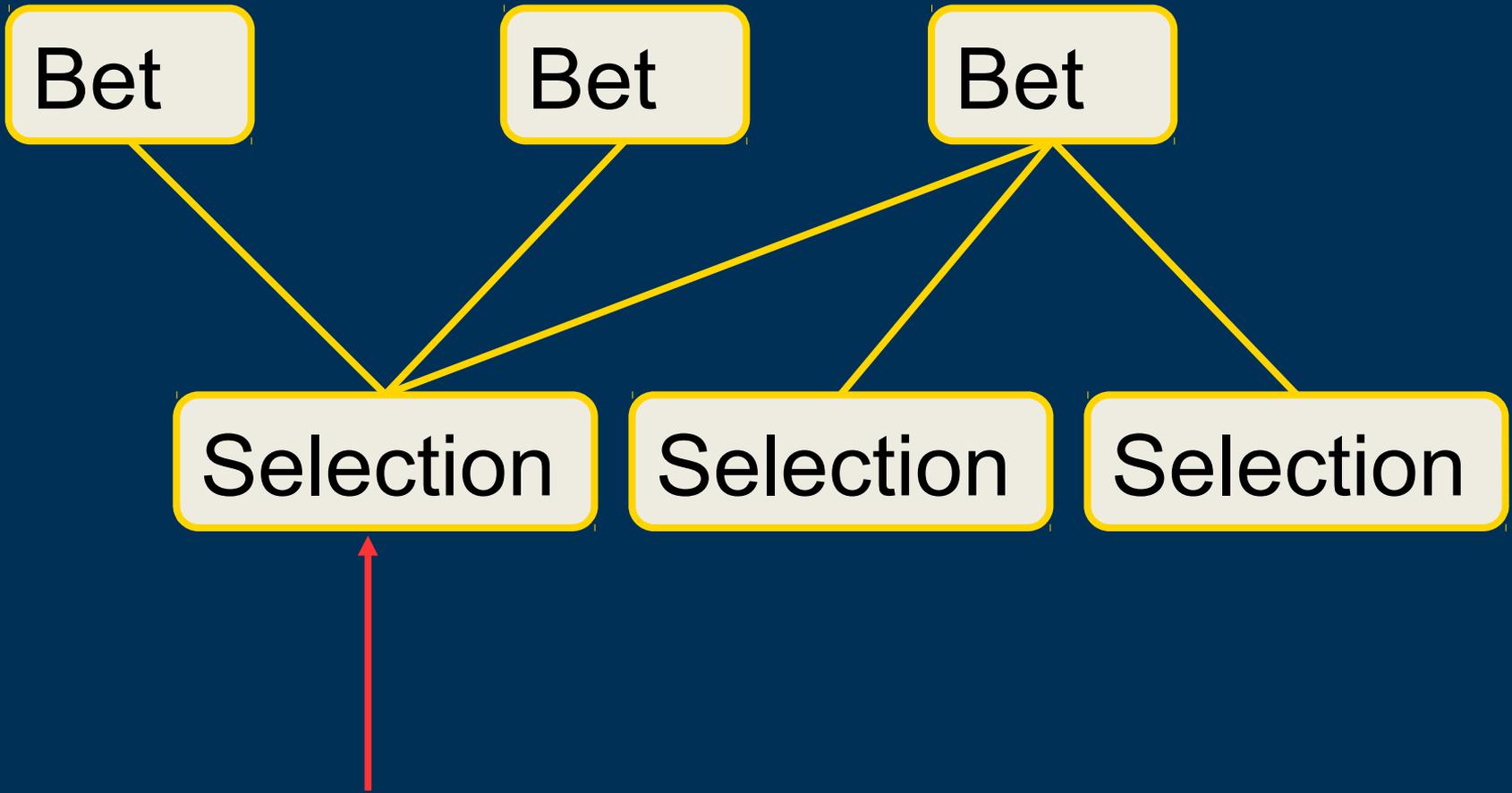
Iteration 3
(from scratch,
two weeks)











Iteration 5
(from scratch,
two weeks)

Bets and Selections Stored in ETS



English Football Association
CHALLENGE CUP
FOOTBALL ASSOCIATION
ESTABLISHED 1863

WILLIAMS HILL

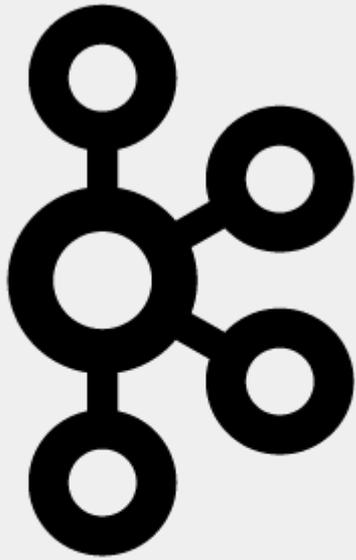
62

SEC 146 HCH9
K182G0446C
ELITE7875C



If it's not broken, try harder





kafka

 **Scala**

KENWOOD STEREO CASSETTE DECK KX-550HX



TAPE COUNTER
5 7 5
RESET

OPERATING IND.
PLAY REC

AUTO TAPE SEL.
NORM CrO₂ METAL

DPSS
DIRECT PROGRAM SEARCH SYSTEM

TIMER
REC OFF PLAY

DOLBY NR
B OFF C

◀ ▶ ▶▶

■

REC /
ARM PAUSE

||
PAUSE

BIAS ADJ.



HX PRO

COMPUTER CONTROL SYSTEM

DOLBY B-C NR HX PRO

Bets SSE

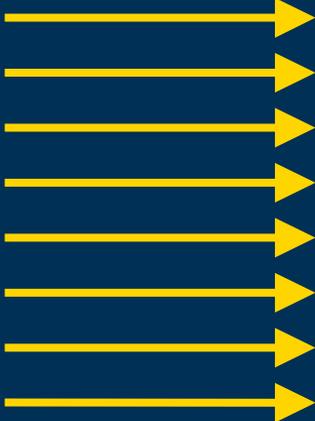
Results SSE

**Betting
Engine**

Settlement SSE



Bets Topic

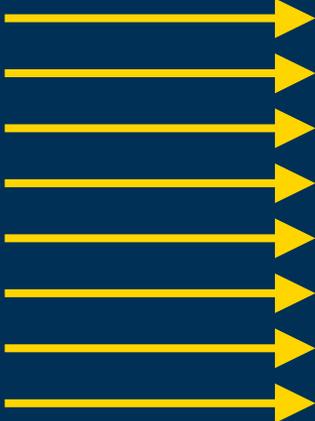


**Betting
Engine**

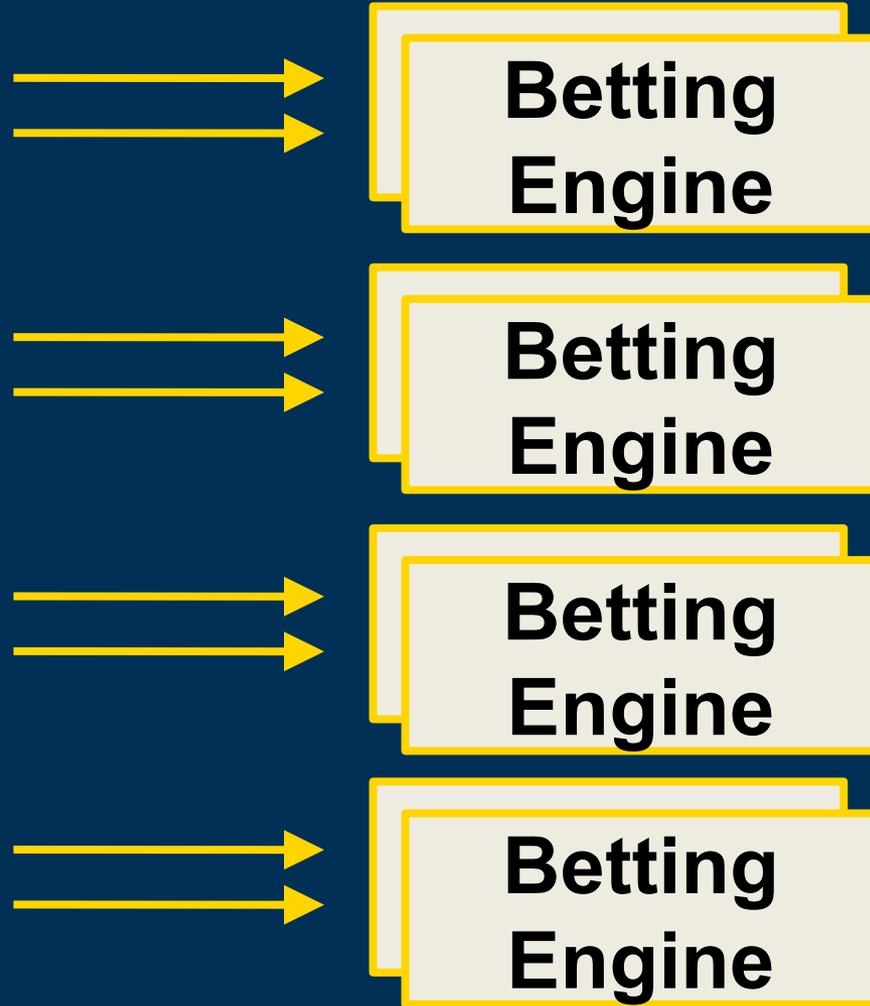
Settlement SSE



Selections Topic



Bets Topic





Platform == Supervision





Current plan



GitLab

/ gitlab_runners ▾ · Builds

🔍 Search

Build #623 for commit **cd87bdcd** from develop

✔ erlang_18_2_1_build ✔ erlang_18_0_build ✔ erlang_18_0_lcmt_build ✔ erlang_18_1_build ✔ erlang_18_1_lcmt_build ✔ erlang_17_5_build

✔ push_build_on_erlang ✔ docker_base_build ✔ erlang_base_build ✔ polymer ✘ java_8_build **Build #623** · ⚠ This build was retried.

✔ passed 59 seconds

2 months ago

```
gitlab-ci-multi-runner 1.0.0-beta.5.gf1300da (f1300da)
Using Docker executor with image docker.rand.dev.williamhill.plc:5000/gitlabci_runner/docker_basic:latest ...
Pulling docker image gitlab/gitlab-runner:build ...
Pulling docker image docker.rand.dev.williamhill.plc:5000/gitlabci_runner/docker_basic:latest ...

Running on runner-d7cf894b-project-2-concurrent-0 via 489384b75cef...
Fetching changes...
HEAD is now at bfa936d Added Erlanf 18.2.1
From https://git.rand.dev.williamhill.plc/gstevenson/gitlab_runners
   bfa936d..cd87bdc  develop    -> origin/develop
Checking out cd87bdcd as develop...
Previous HEAD position was bfa936d... Added Erlanf 18.2.1
HEAD is now at cd87bdc... Fixed docker tag for 18.2.1

$ docker build --pull=true --no-cache=true --force-rm=true -t docker.rand.dev.williamhill.plc:5000/gitlabci_runner/docker_basic:1
atest docker_basic
Sending build context to Docker daemon 6.144 kB
Sending build context to Docker daemon
Step 1 : FROM docker-registry.prod.williamhill.plc/library/rhel7:7.1
Trying to pull repository docker-registry.prod.williamhill.plc/library/rhel7 ... 219febbe72c9: Pulling image (7.1) from docker-re
gistry.prod.williamhill.plc/library/rhel7
219febbe72c9: Pulling image (7.1) from docker-registry.prod.williamhill.plc/library/rhel7, endpoint: https://docker-registry.pro
```

Build #623

Retry Erase

Duration: 59 seconds

Created: 2 months ago

Finished: 2 months ago

Runner: #1

Commit cd87bdcd

Branch: develop

Author: Gavin Stevenson

Message: Fixed docker tag for 18.2.1

```
[gstevenson@wh5003077 llb] $ cat .gitlab-ci.yml
```

```
types:
```

```
  - build
```

```
build:
```

```
  type: build
```

```
  tags:
```

```
    - POLYMER
```

```
  script:
```

```
    - sh build-info.sh
```

```
    - npm install
```

```
    - bower --allow-root install
```

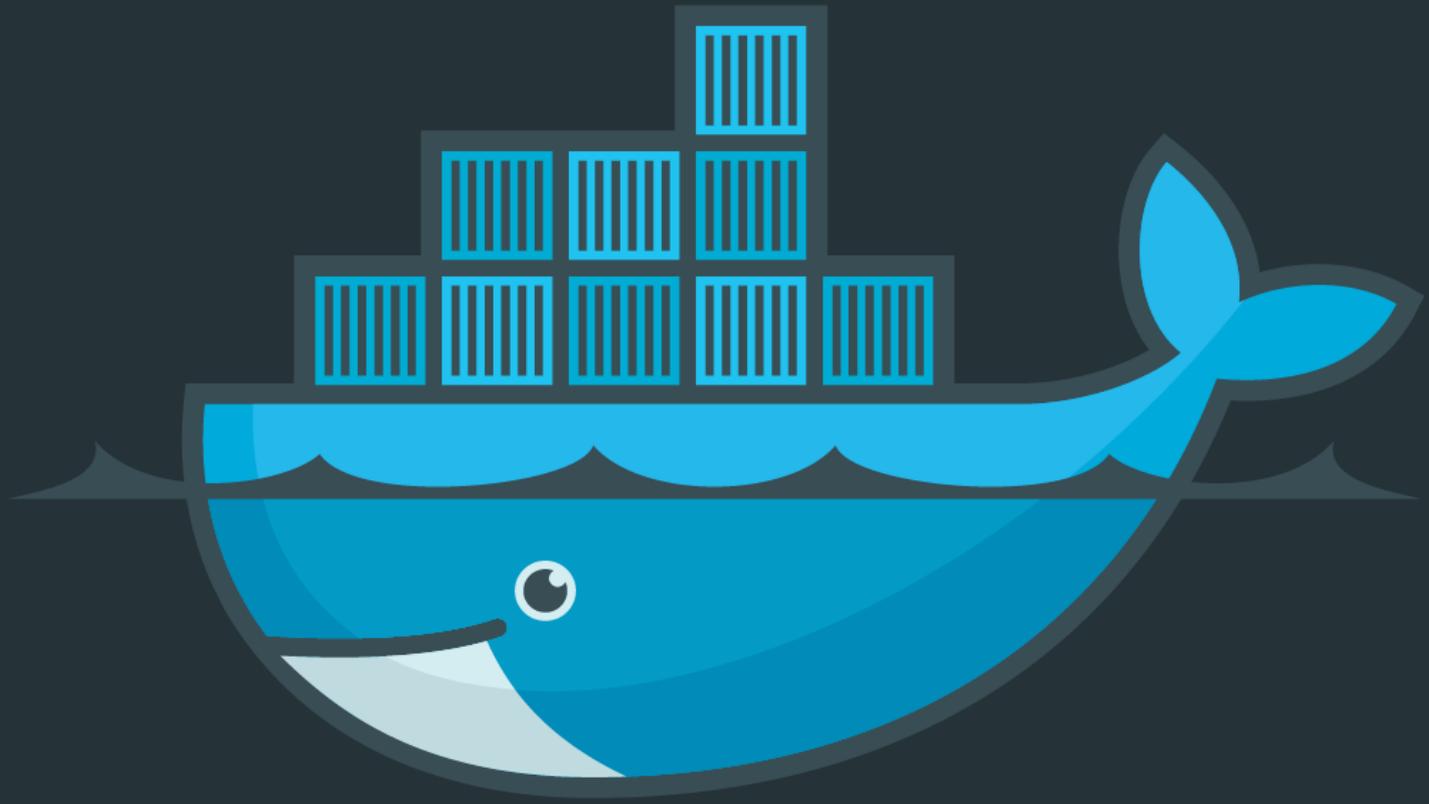
```
    - gulp
```

```
    - docker build --pull=true --no-cache=true --tag docker/gstevenson/1
```

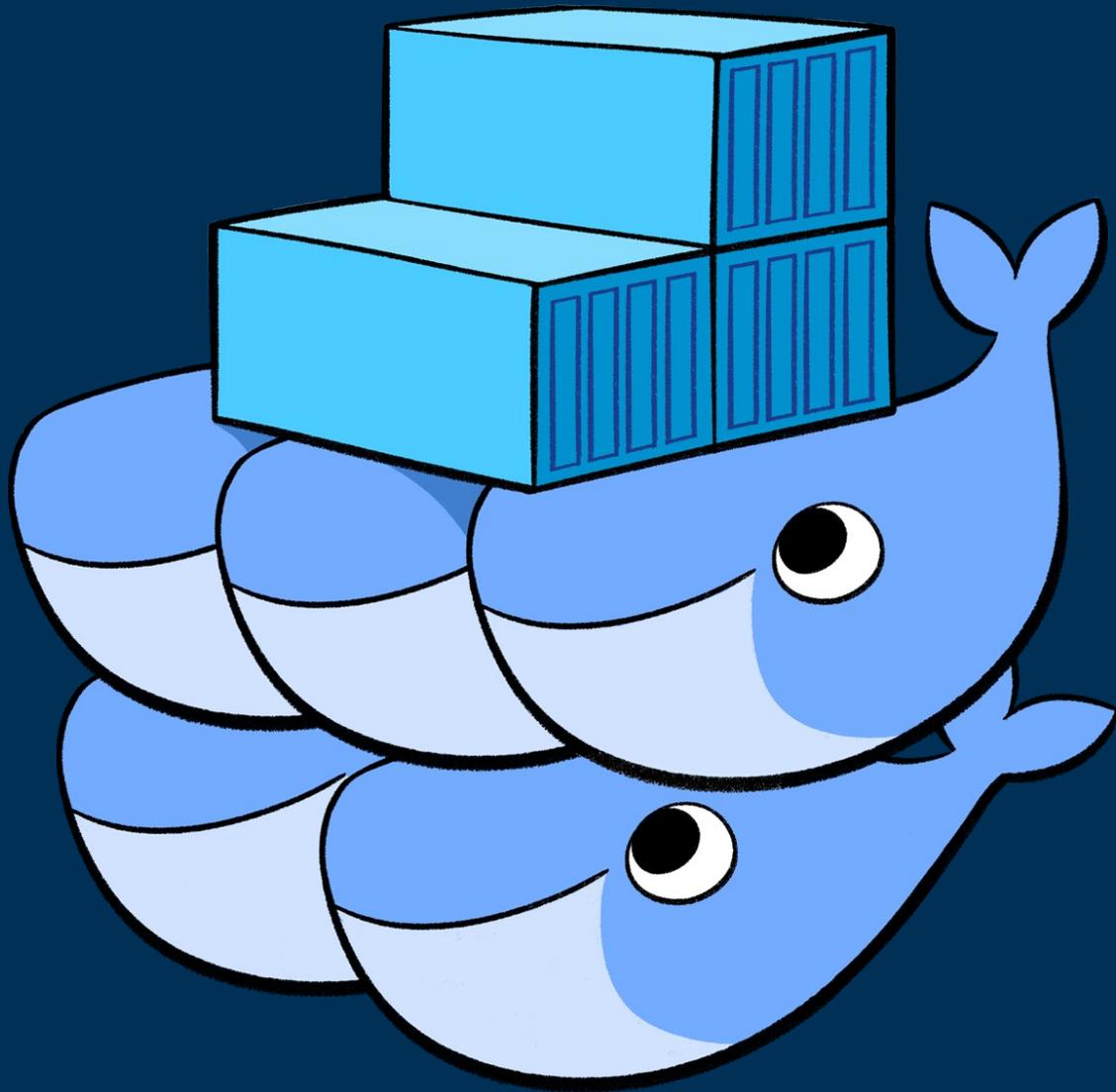
```
lb:latest .
```

```
    - docker push docker/gstevenson/llb:latest
```

```
[gstevenson@wh5003077 llb] $ █
```



docker



Discovery and load balancing in the Swarm

**NO
STOPPING**



**A Reactive Micro Service
based architecture right?**





**Which language is right for
our enterprise?**

**Erlang, Scala, Java, Ruby,
Python, Go, c#, vb.net, c, c+
+, assembly, JavaScript....**

**I think that is the wrong
question**

We're hiring

DEVOPS

SOFTWARE

ENGINEERS

CLOUD QUALITY

CYBER SECURITY

EXPERIENCED IN: CSS, JAVASCRIPT, OBJECTIVEC, SWIFT, ANDROID, JAVA, FUNCTIONAL PROGRAMMING, SCALA, KAFKA, NOSQL, CASSANDRA, NODE.JS, ANGULAR, REACT, LINUX, DOCKER, MESOS, VMWARE, PUPPET, SPLUNK.