

Pragmatic Evolution of Super 6 and Sky Bet for Resiliency

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Pragmatic and Achievable

- **Focus is on pragmatic, achievable improvements in availability**
- **Using common patterns**
- **Concrete examples that apply to many people in many companies**

A Brief History of Sky Betting & Gaming

- Acquired by Sky in 2000 as part of the Sports Internet Group & rebranded in 2002
- Soccer Saturday Super6 launched in 2008 -first in-house development
- SB&G sold to CVC in 2015



Starting out - Infrastructure & Ops Only

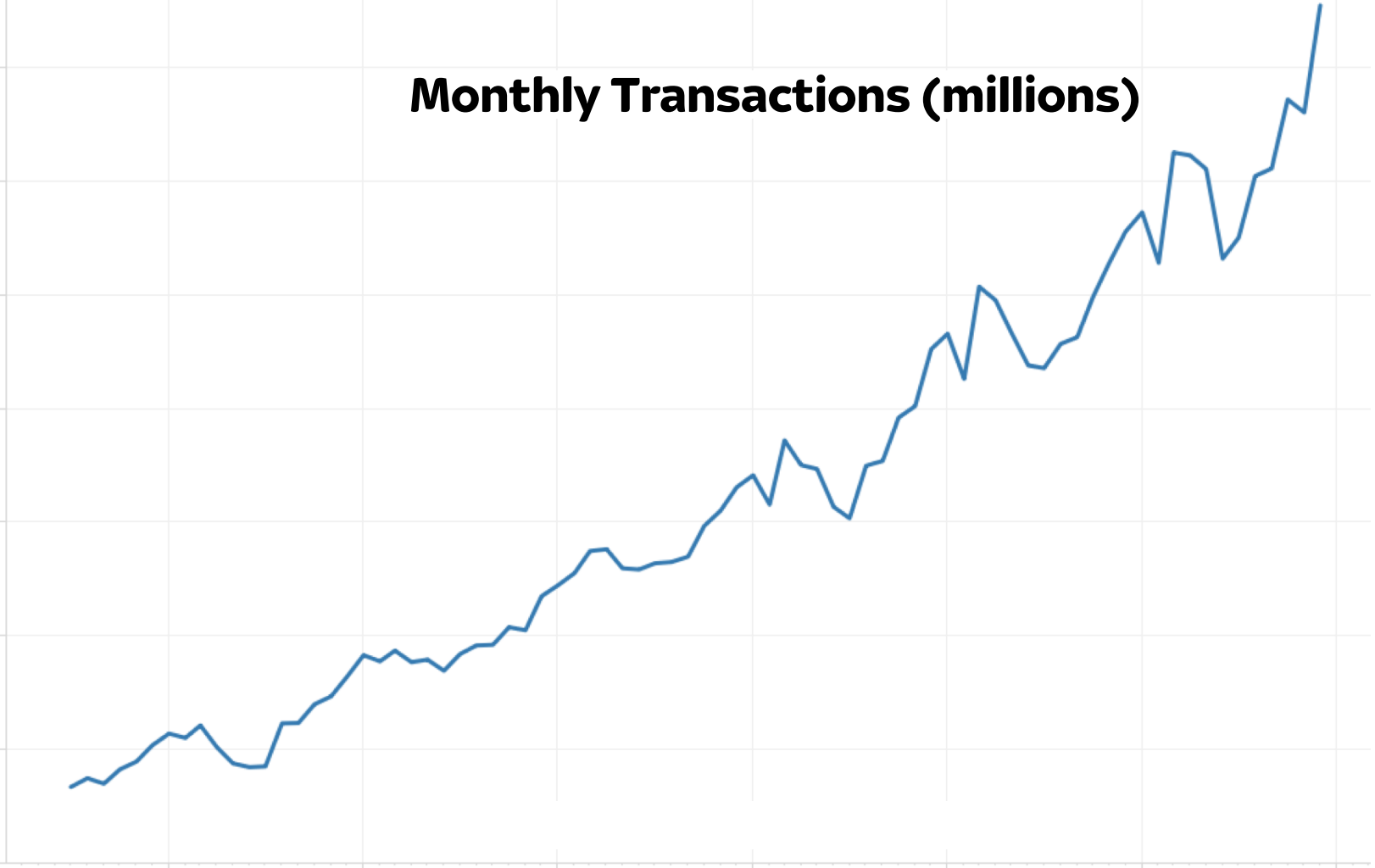
- **Tech Team**
 - **No in-house development**
 - **Hosting and operating third party vendors applications**
 - **Waterfall project management and delivery**

Transactions

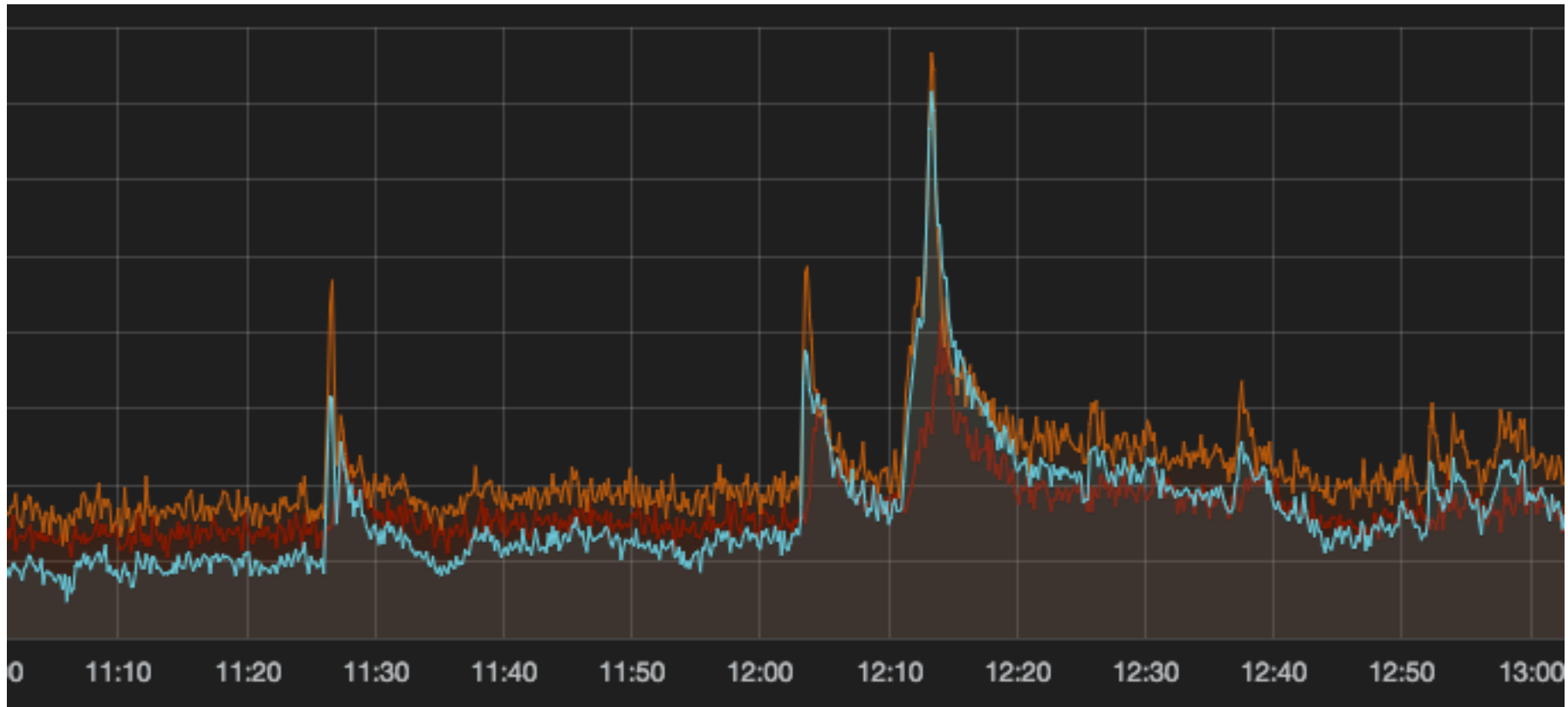
350M

Monthly Transactions (millions)

50M



One challenge to cope with is traffic that looks like this



WIN JEFF'S
£1MILLION

GUARANTEED £1M PRIZE UNTIL WON

Play For Free

Entries by 3:00pm, Saturday 10th February 2018.

How to Play

1

Login

You can use your existing Sky Bet or Fantasy Football login details.

2

Predict

The scores from the 6 matches in the current round.

Sit back as the goals go in, will you scoop the jackpot?

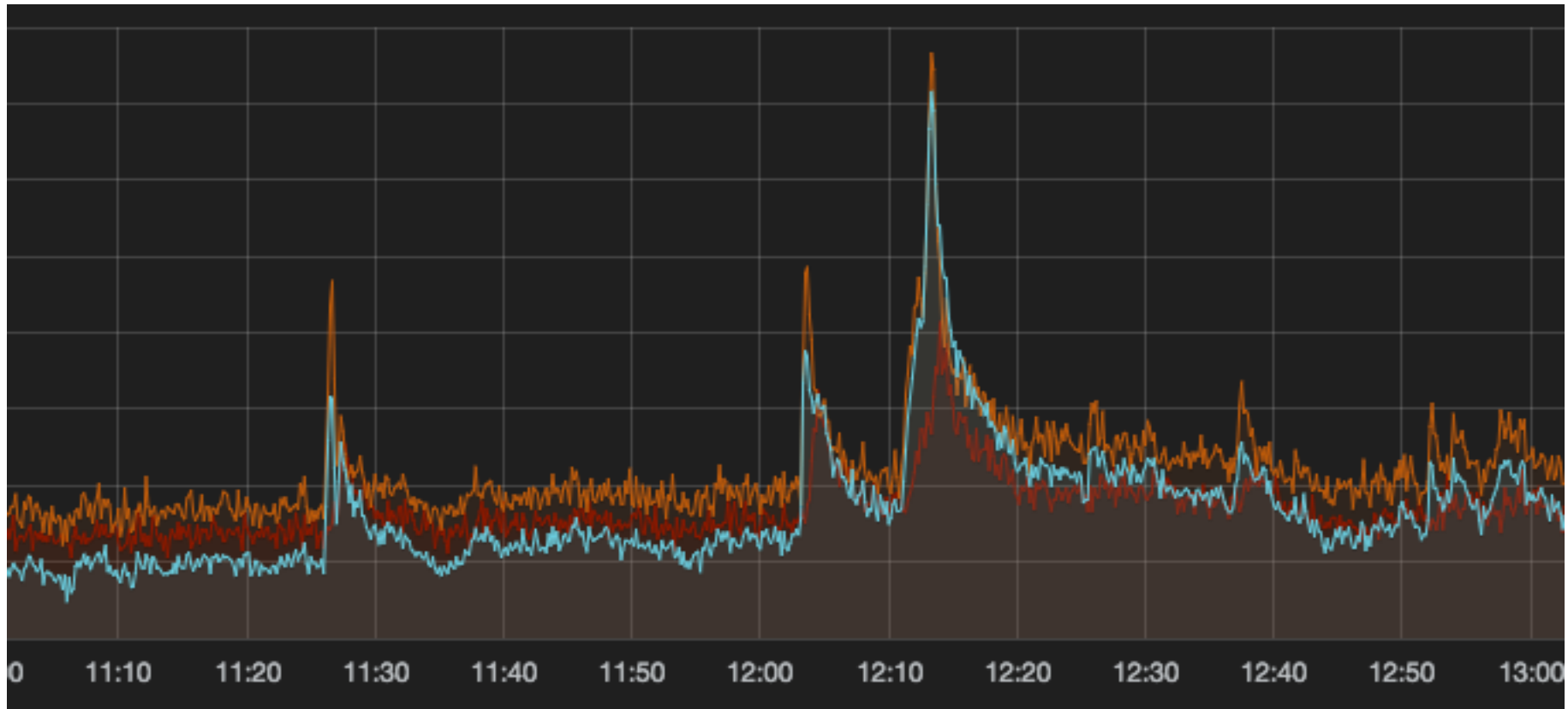
Latest Video

That Super 6 million is g...

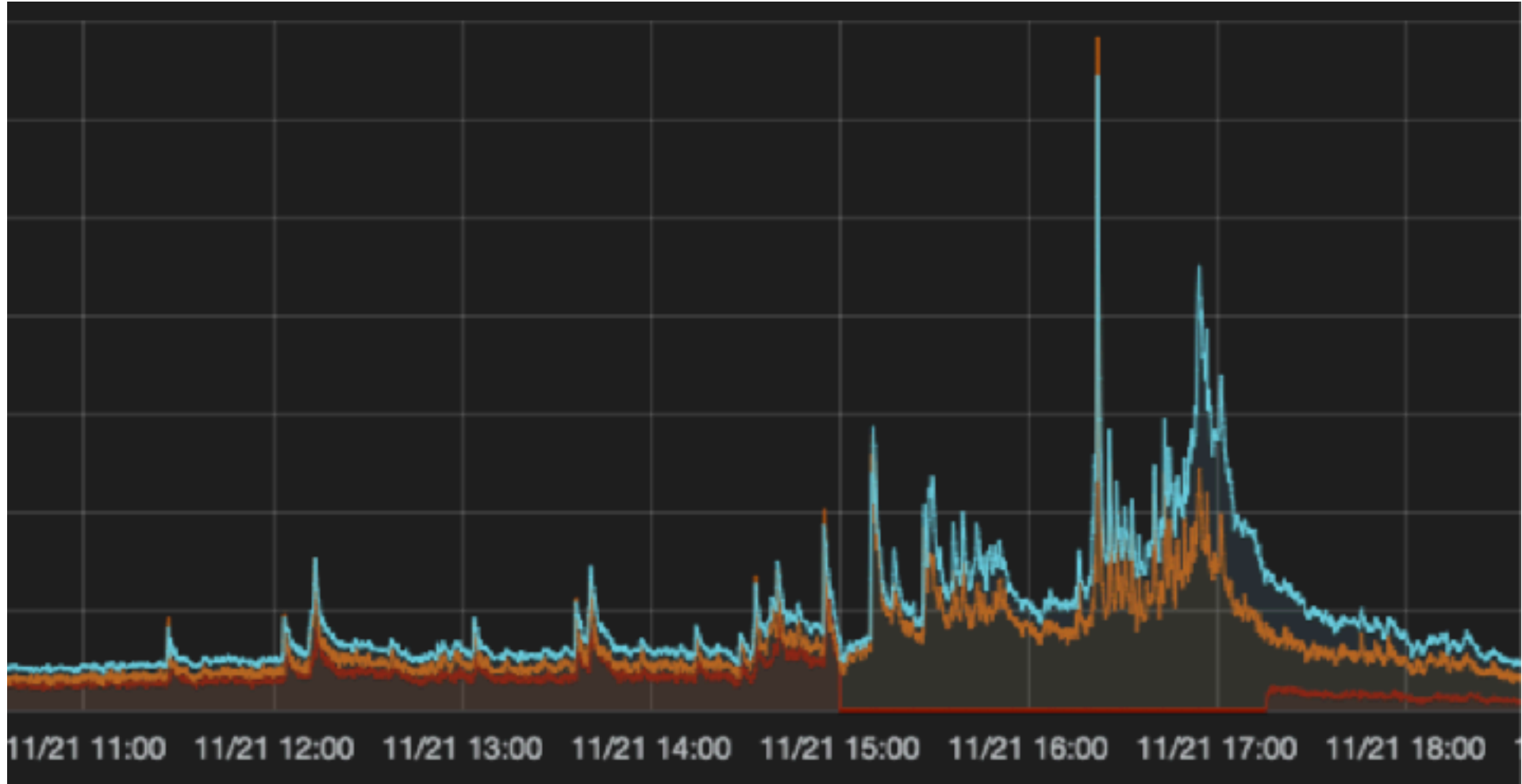


Great app and a free chance to win serious cash

What happens when Jeff says Super 6 on Sky Sports...



What happens when Jeff says Super 6 and something interesting happens in the football...



A Diverse Technology Stack



Overall Service Performance

- **Lots of definitions of 'reliability' or 'availability' or 'resilience'**
- **Today focus on reducing the impact of failure and maintaining overall service availability**
- **Percentage of time when no major product unavailable**
 - **14/15 - 97.9%**
 - **15/16 - 99.79%**
 - **16/17 - 99.9%**

Super 6 League Calculations



League Calculations

- **Customers predict scores**
 - **get points for correctly predicting the result and more points for the correct score**
- **Round, Month and Season leagues**

Pos	Player Name	Results	Scores	Points	
1564750	Michael Maibaum	13	4	46	View 

Share my Position



Global Top 15

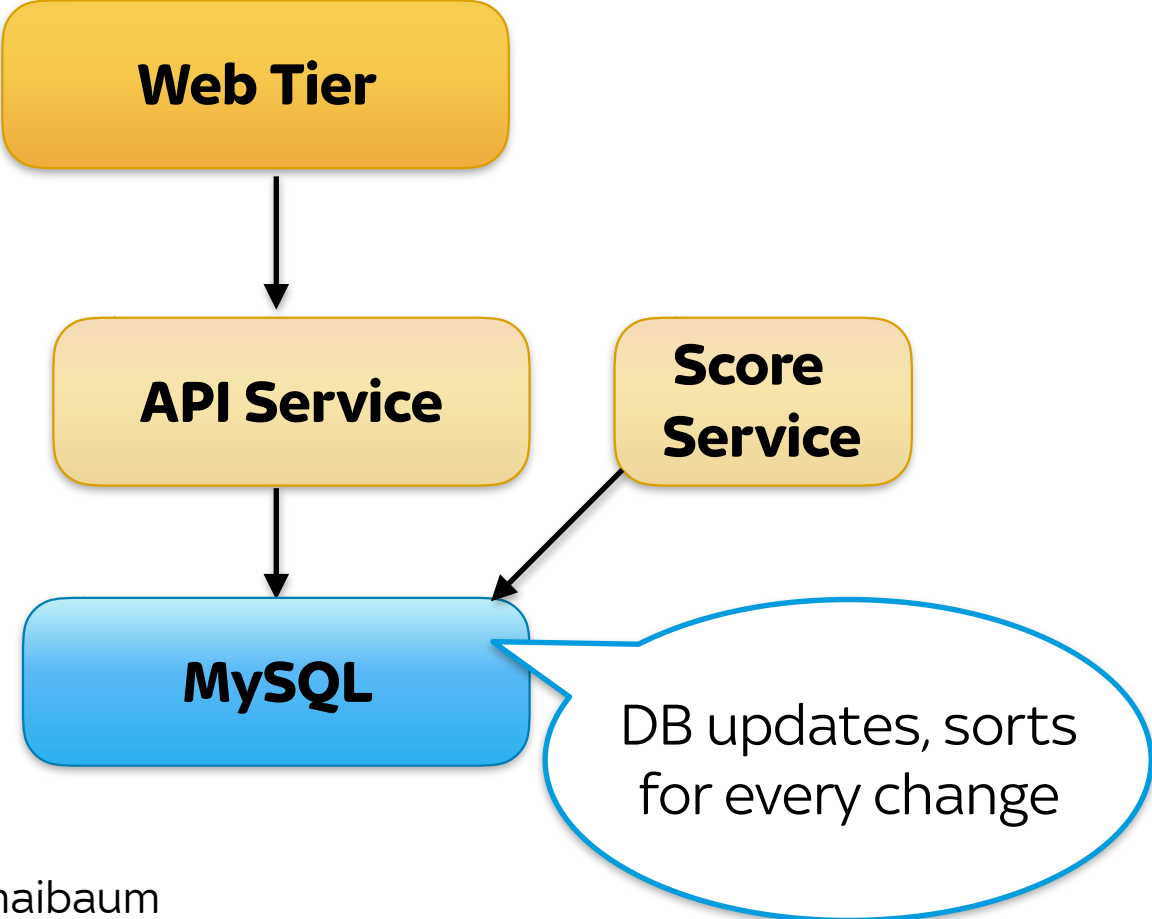
1	Jam	109	38	408	View 
2	Geo	93	44	406	View 
3	GAR	105	39	405	View 

League Calculations

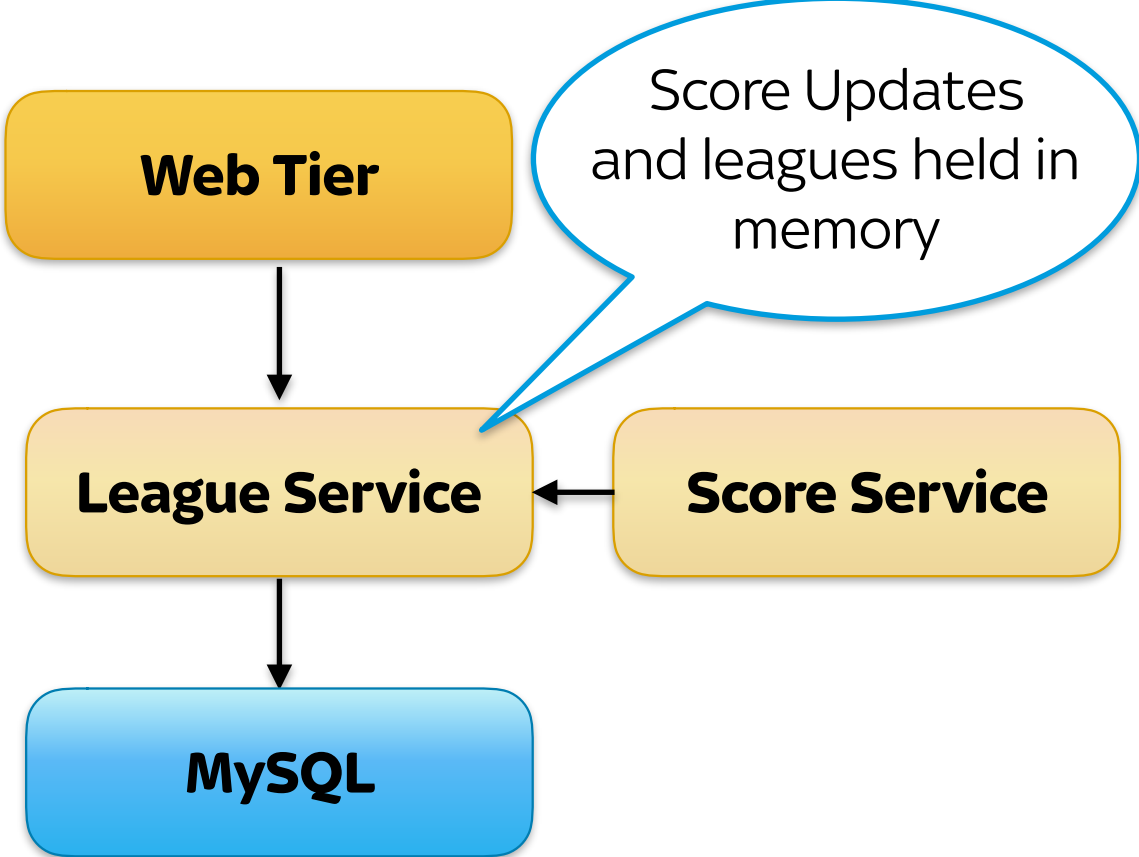
- **Update scores and leagues as goals go in**
- **Hit a scaling wall as product grew**
 - **Standard LAMP application architecture, League calculations falling behind**
 - **MySQL table, lots of updates to each entry, lots of sorting/reads during the updates**
- **Need to redesign and improve reliability**
 - **Lots of solutions proposed**
 - **Many complex, some fit to scale to 100s of millions**
 - **Quite a few included 'next gen' distributed computational or database services**

League Calculations

Original Approach

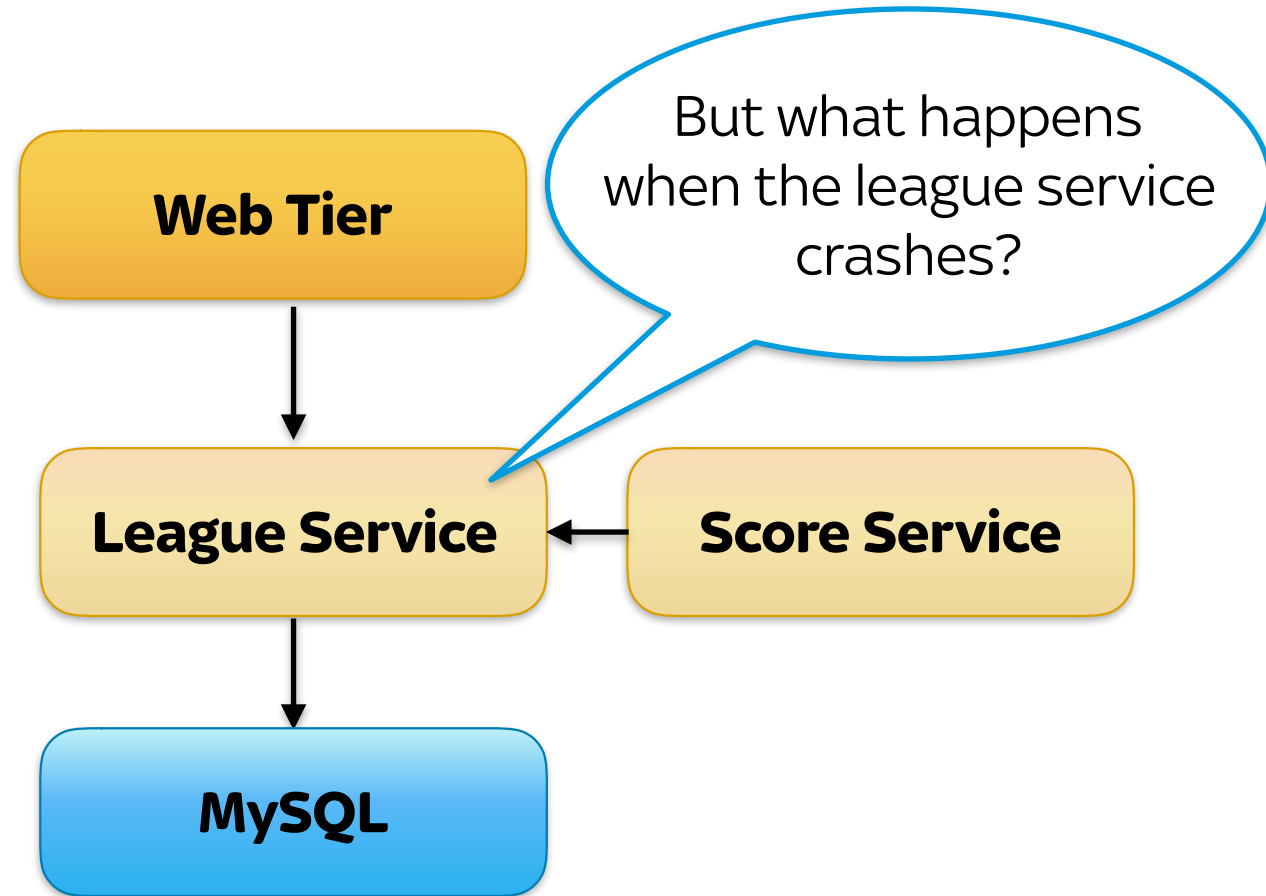


New Approach

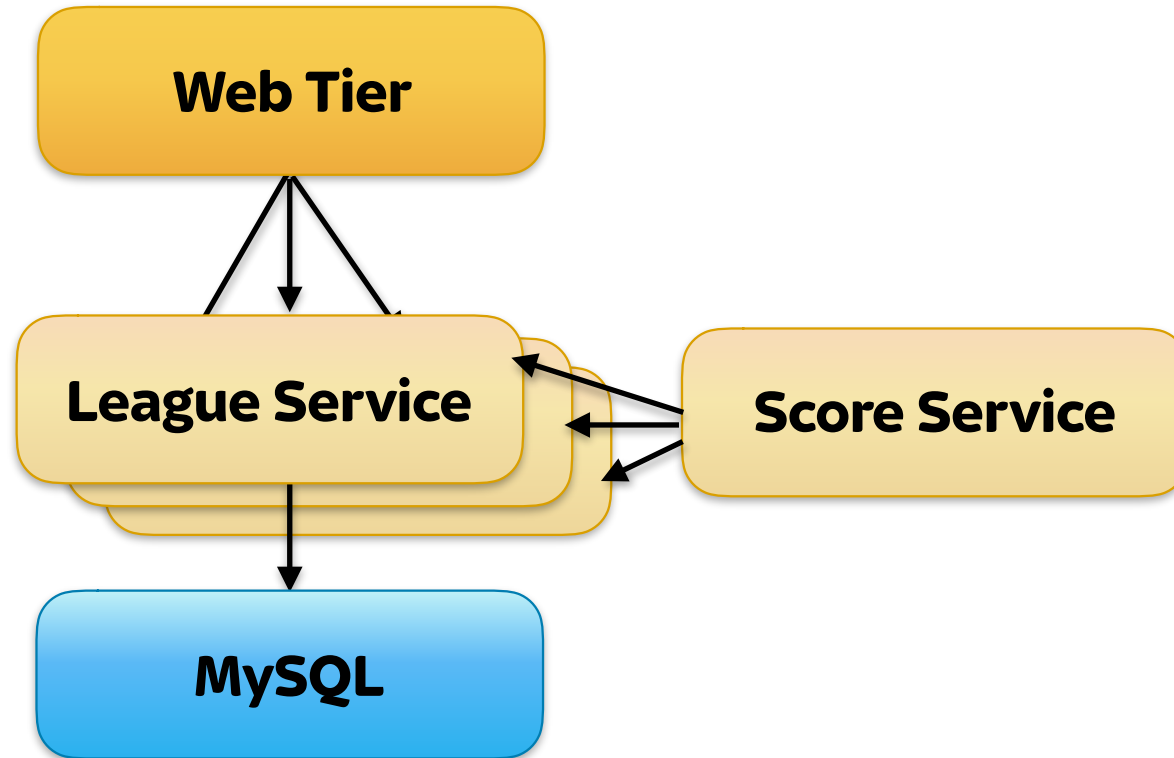


League Calculations

New Approach



Run more instances, do the work multiple times



Take Aways

- **Isolate the problem, you probably don't need to rewrite everything**
- **Don't overcomplicate things**
- **Take advantage of any reduction in accuracy requirements**
 - **Only the final result is truly crucial so any rare edge cases in synchronisation can be tolerated**

Decoupling Resources



Core Account Overview



oddschecker.com

sportinglife

sky BET

sky VEGAS sky CASINO

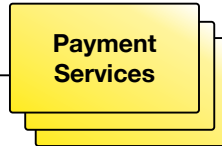
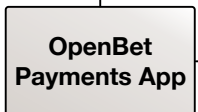
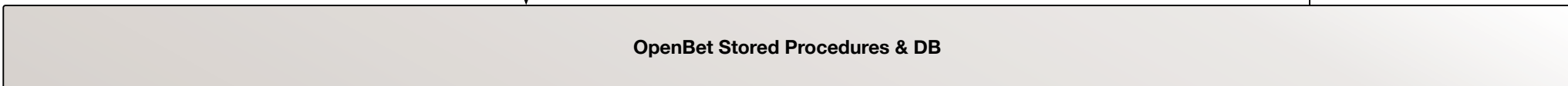
sky POKER sky BINGO



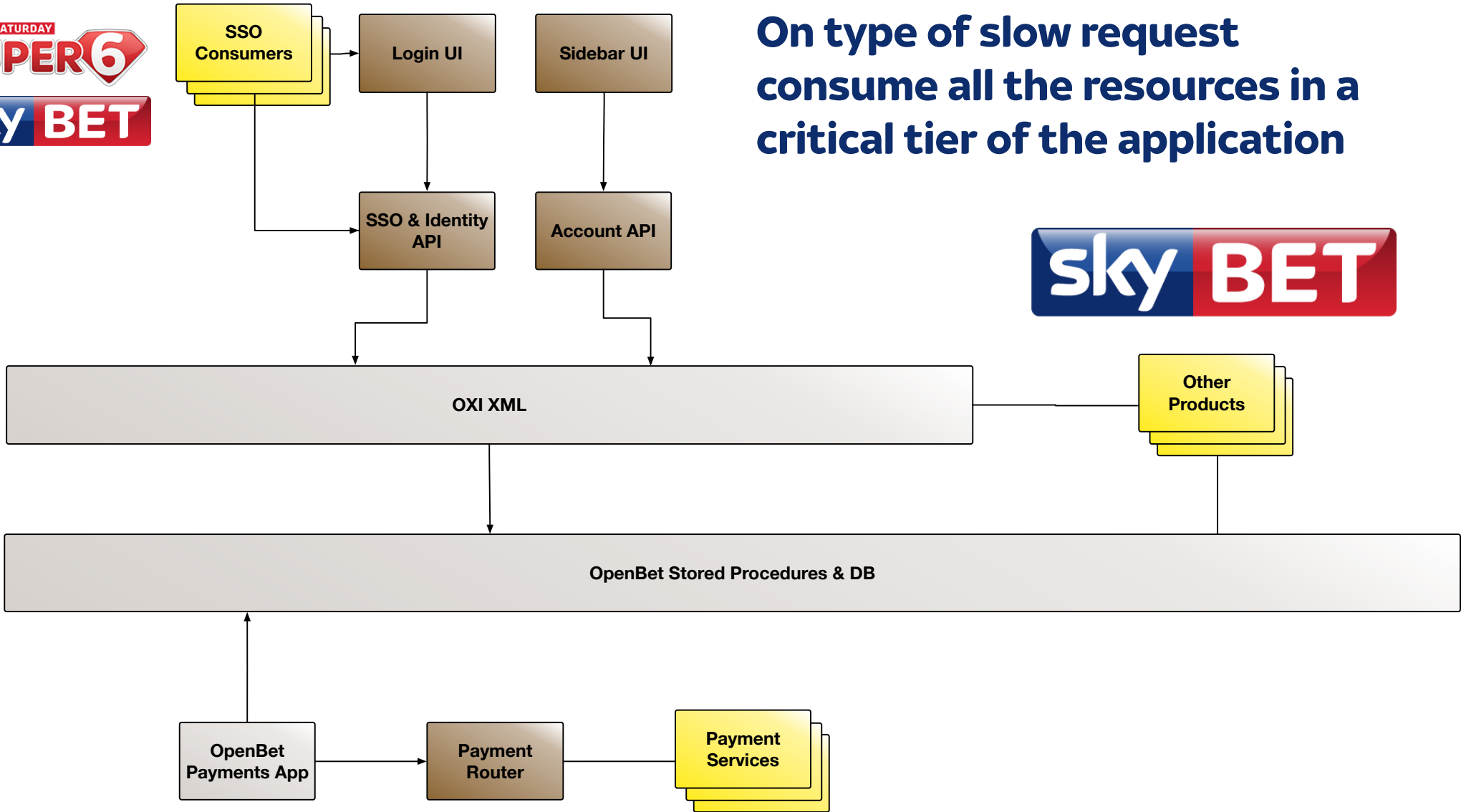
>4.5THz CPU

>3 TB RAM

>300 VMs



Core Account Overview

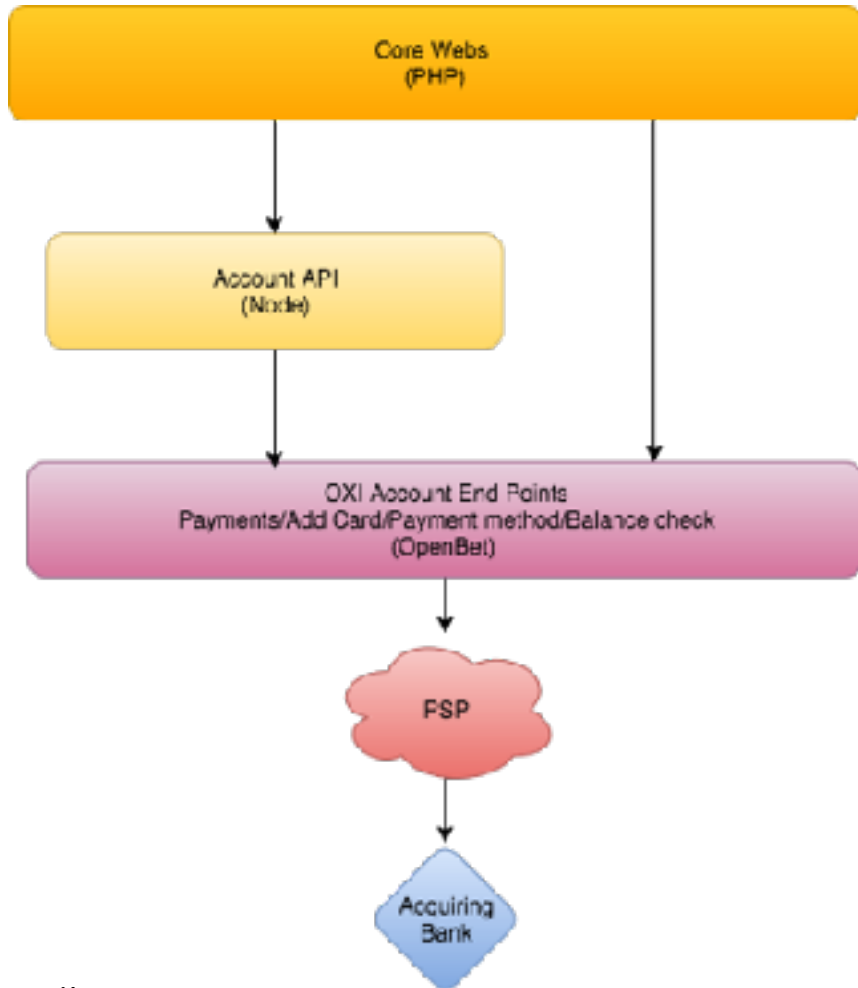


On type of slow request consume all the resources in a critical tier of the application



Reducing the Blast Radius

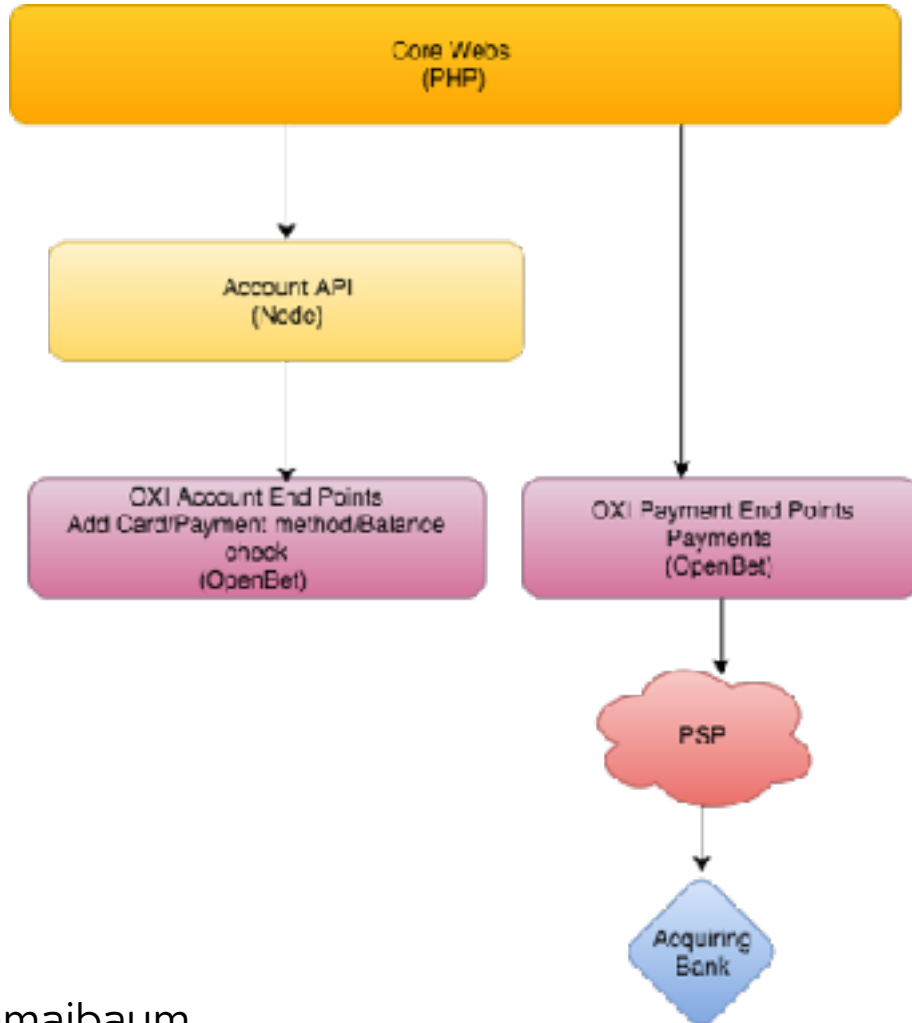
Can one kind of slow request consume all the resources in a critical tier of the application?



- We experienced problems with the PSP integration, causing OXi processes to stack up waiting for responses
- Eventually not enough OXi processes were available to service the non-payments workload



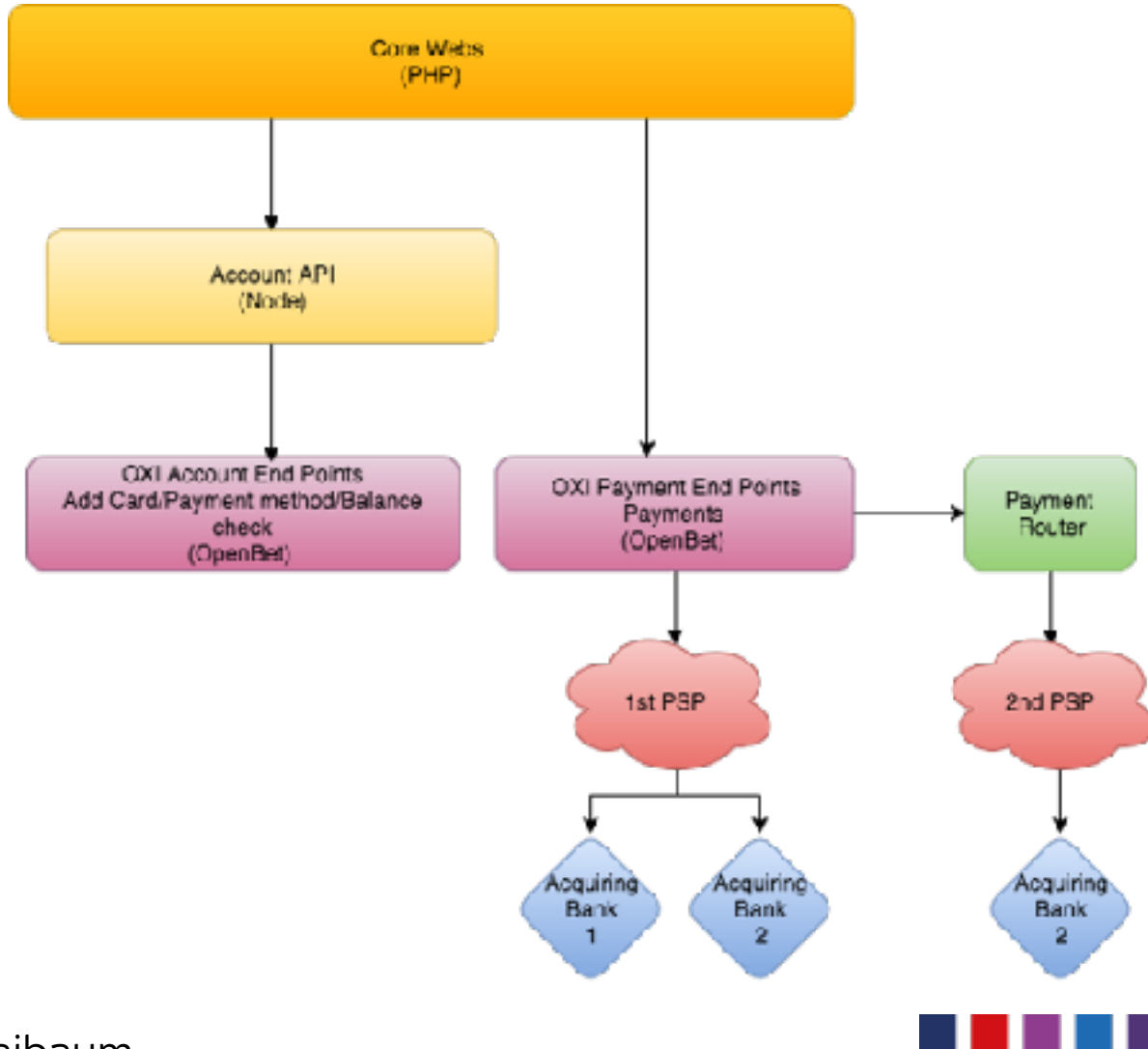
Separating Services and Limiting Resources



- We kept experiencing problems with the PSP
- By separating the OXi endpoints we could limit the impact on other services
- Limited number of payment 'procs' if they saturate, other requests fail quickly
- Generally better visibility of behaviour of the different requests once separated out. Easier to manage and scale



Reduce dependency on the third party



- Upper limit to reliability when you have one third party you rely on...
- So get more!

Take Aways

- **You might have a fairly monolithic service, or a single big DB but you can often still implement resource limits at some level of the application**
- **In many closely coupled systems limiting resources to particular use-case/journey is a key step in limiting the blast radius of a failure**
- **Your service can't be more reliable than an external third party service it relies on, consider using multiple suppliers - often commercially advantageous**

Proactive Bannerimg



After the Grand National

- **Grand National is a very busy day...**

17,000 bets / minute

93 payments / second

- **But taking the bets is the easier bit**

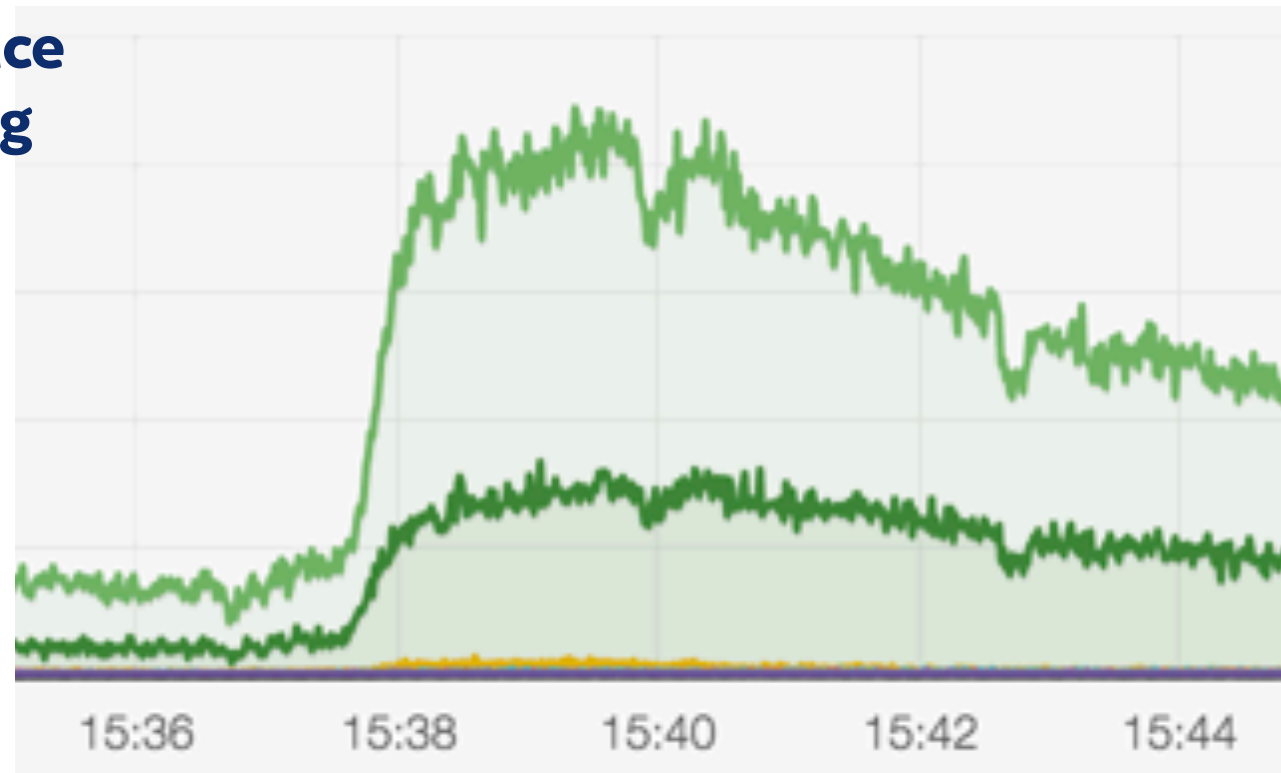


After the Grand National

- Everyone comes back after the race to find out if they've won anything

25,000 logins/minute

- Querying account history is relatively slow
- We probably haven't actually settled bets yet anyway...



**Example from a big race
(Cheltenham Gold Cup)**

After the Grand National

- We've crashed and burned under the load before
- DB maxes out, load balancers burning, web servers and redis session stores all under massive pressure



Banners

- **Banner deliberately**
- **Various banner types**
 - **Full banner for a minute or two for those not already on site**
 - **Account history banner until at least the most popular selections settled**
- **Gradually re-enable access**
 - **Ramp percentage of users**

Grand National Update

Unfortunately, Account History, My Bets and Cash Out are currently unavailable whilst we settle the Grand National. We're working hard to settle all bets by 7pm.

In the meantime, you can use the calculator below to see how much you might have won if your selections were winners.

[Refresh Page](#)

Position	Name	Price	Stake	E/W
1	Rule the World	33/1	£ <input type="text"/>	<input type="checkbox"/>
2	The Last Samurai	8/1	£ <input type="text"/>	<input type="checkbox"/>
3	Vics Canvas	100/1	£ <input type="text"/>	<input type="checkbox"/>
4	Gilgamboa	28/1	£ <input type="text"/>	<input type="checkbox"/>
5	Goonyella	12/1	£ <input type="text"/>	<input type="checkbox"/>

Returns: £ 0.00

How much could I win?

Simple Smart Banners

- **Implemented in Layer 7 Load Balancer rules**
- **Allow a configurable percentage of users in**
- **Once allowed in, allow users to continue using service until access code changed**

Pseudocode

```
threshold = 25
access_code = 'a3fd3d2df4'
banner_cookie = get_cookie('smart_banners')
if ( banner_cookie IS NULL ) {
    set_cookie( bucket = random_number(1,100) )
}
customer_bucket = cookie.get_value( 'bucket' )
customer_access_code =
cookie.get_value( 'access_code' )

if ( access_code == customer_access_code ) {
    route_request( 'service' )
}
else if ( customer_bucket <= threshold ) {
    set_cookie( 'access_code' = access_code )
    route_request( 'service' )
}
else {
    route_request( 'banner' )
}
```

Take Aways

- **Graceful Degradation less impactful than major failure and 'recovery' is quicker**
- **You can choose to invoke a degraded, less demanding operational mode**
- **We could make Account History work for post-GN load**
- **Just not important enough to invest in (yet)**

Circuit Breakers



My Bets

Open Bets Cash Out Bets Settled Bets

All Sports



 Single @ 11/4

£0.25

Potential returns: £0.94

Cash Out for £0.21



40'

Draw @ 11/4

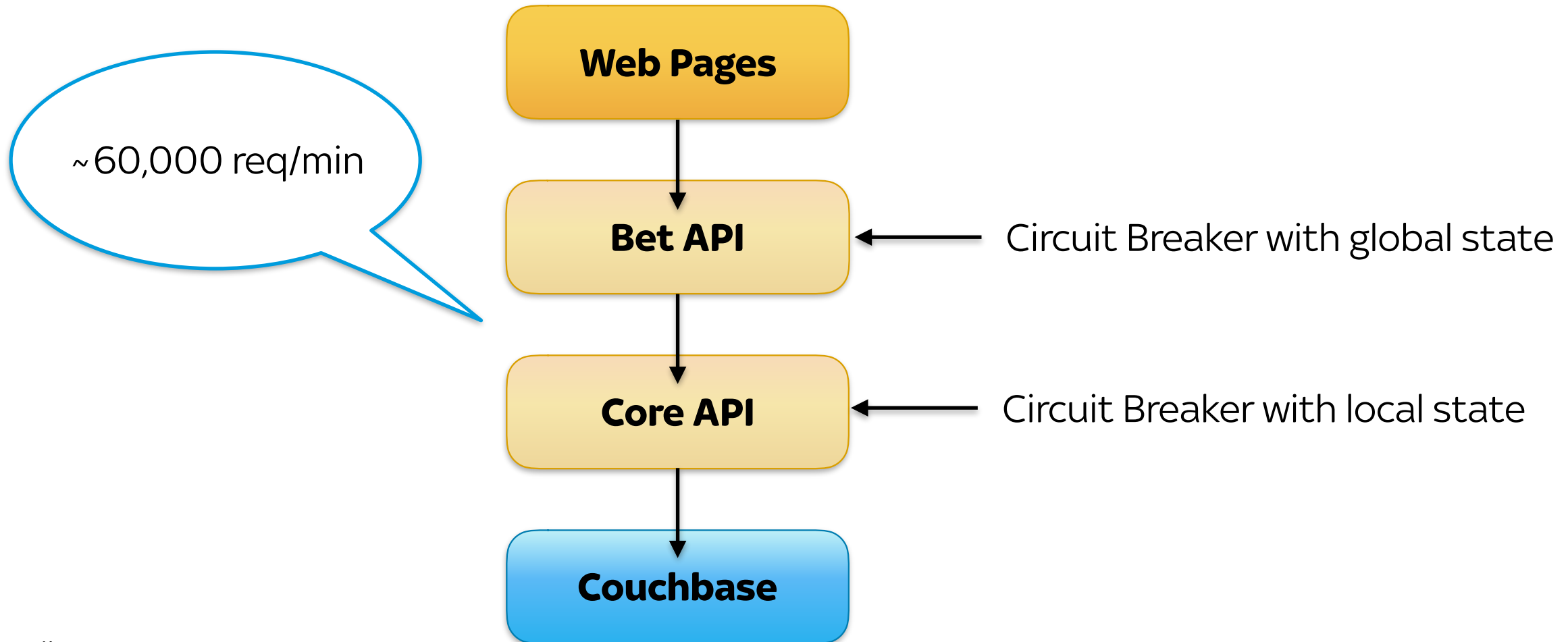
Malmö 1 v 2 FC Roskilde

Full Time Result



My Bets

Circuit breakers used to protect higher level services from underlying failures



Take Aways

- **Circuit breakers powerful pattern, crucial for maintaining customer experience**
- **Tuning sensitivity important, can amplify small failures into big ones**
- **Unless you need that twitchy, coordinated response, consider local circuit breaker state over global**

What about People?



Systems & Software Architecture isn't enough

- **Organisational Architecture & Culture are crucial**

Does the whole business care about failure?

Reactive vs proactive?

How do you persuade people care?

Do teams own and support their services?

Is technology seen as a 'contractor'?

How do we identify most pressing problems?

Reactive or Proactive?

- **Is the business reactive**
 - **You've had one big failure and then they care (briefly?)**
 - **or**
 - **Pro-active - they set targets and provide time and budget to achieve them?**
- **Perception of impact vs Actual impact**
- **We've been reactive at times**
 - **big failures leading to a massive focus on reliability**
 - **generally good performance leading to a lack of maintenance**
- **Too much of either isn't particularly healthy**

If you've got 100 things you could make better...

How do you prioritise?

- **Error budgets**
- **Classes of service**

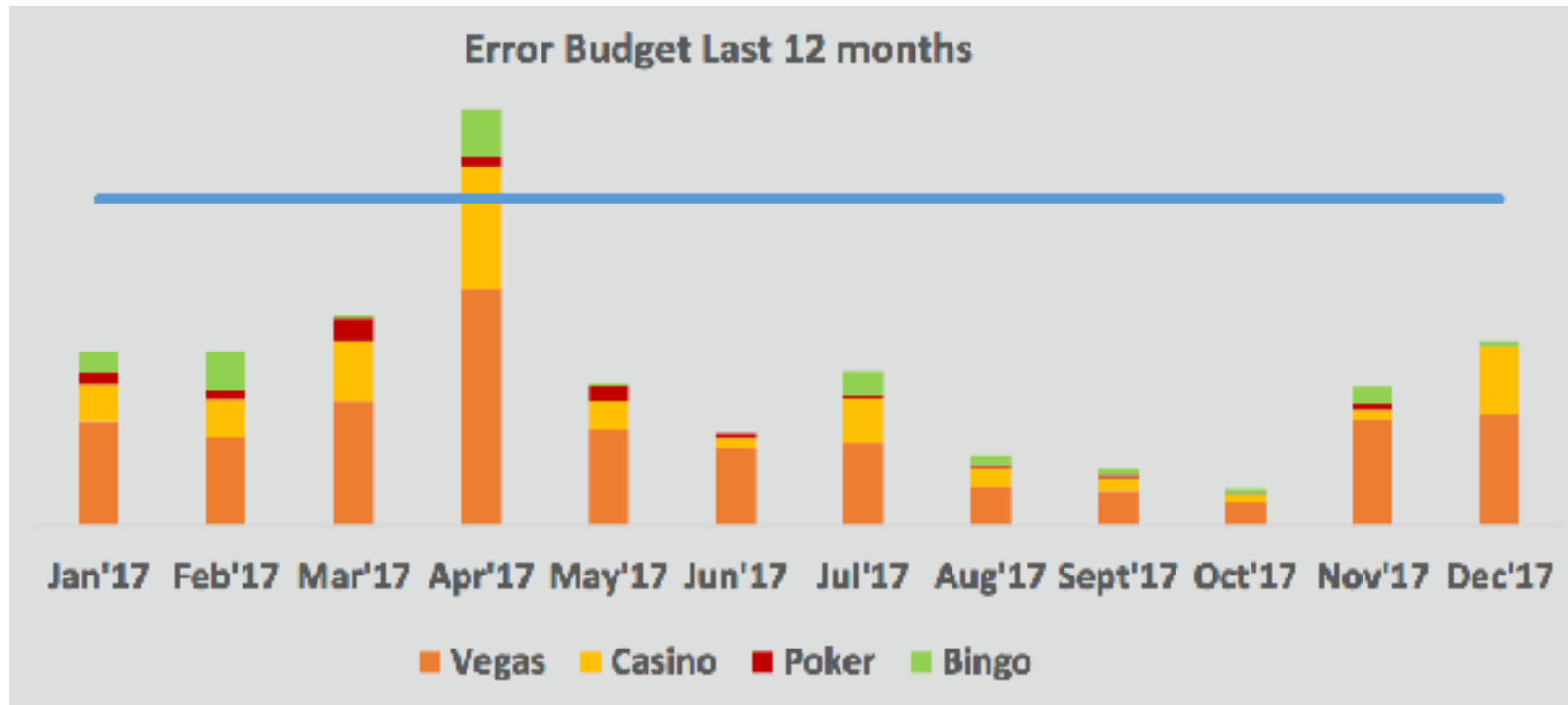
Error Budgets

- A way of setting a risk appetite
- Reduce pressure to react when you don't need to
- Help identify the components and problems that are causing the biggest impact

Products	Total Revenue Loss	Error Budget Used	Monthly Budget
sky VEGAS	£40k	75%	£50k
sky POKER	£500	5%	£10k
sky CASINO	£35k	87.5%	£40k
sky BINGO	£1.5k	5%	£30k

Error Budgets

- Trends
- Should you 'spend' your budget?



Classes of Service

- **Ensure ongoing capacity for different types of improvement**
- **50% strategic product improvements**
- **30% technical improvements and maintenance**
- **10% Product Small Improvements & Experiments**
- **10% unplanned work**



Measure. Make work visible.


Change the balance depending on the situation!

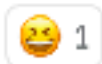
Technical Ownership



Pride
Knowledge
Feeling the Pain

Fire Drills

- **Small and large scenarios, Component failure and DR drills**
- **Things will always fail, even if your system is degrading gracefully it is still degraded**
- **As you grow the team, ways of managing incidents evolve, coordination becomes more important**
 - **Incident Command, Roles & Responsibilities**

 09:39
We have had a mass outbreak of Tribbles on Guernsey unfortunately they have now gained access to the Data Centre. Systems are overheating and we cant access the data halls as they are full of Tribbles. We expect to lose all systems in the data centre within the next 15 minutes. We are unsure how much longer we will be able to keep responding to this mailbox - we have lost access to our phone system.



 :39
 @mmaibz Hi, I've been called out for Infra , loss of GUEA systems

Take Aways

- **Common patterns, achievable in your team/architecture, can make a big difference through the accumulation of small improvements**
- **Culture and ways of working are more important than any technical magic wand, no matter how shiny**

H1 17/18 - 99.99%

