

The state of Windows & Kubernetes

An honest tale of an attempt
to containerize an ERP app



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e·conomic in numbers

- 200 application servers
- 55+ mio requests / day
- 40.000 unique users / day
- Typical peak around 10.000 simultaneous users
- 18 TB of egress application traffic / month (excl. attachments)
- 2 TB SQL Server Database
- Approx 20 production deployments / month
- 79 microservices
- Auxiliary services; RabbitMQ, MongoDB, AWS S3, etc.
- 120.000+ danish companies as our customers

Background

First a little background on our public cloud journey

We started out by (attempting to) shard our database because it was “too big” to fit in the cloud.

We then tried to move to Azure.

Finally we moved everything to Google Cloud Platform.



Database Challenge

Before going further into Google Cloud, let's discuss the database



Database is “too big” to fit in the cloud

- 2 TB of data, some on 600K IOPS drives (NVMe)
- 32 cores per instance
- The essence is that we are unable to put enough DTUs in front of an Elastic Pool, so we need to shard it first.
 - Research done by a former colleague. We did not re-assert this but it fits with what we hear from Microsoft's own engineers.
- Sharding means heavy refactoring, because database access is all over the place.
- We have a lot of Classic ASP, and the sharding project is back-breaking work with little reward.

Hybrid Cloud “Shortcut”

Late 2017 we figured we could just migrate the application to the Cloud and keep the database in a “private cloud” connected on an Azure ExpressRoute, but it would have to be really close.

We were targeting Azure West-Europe and found a provider (Amsio) with 2ms latency to Azure West-EU



Let's move to the Cloud "Q1 2018"

An ambitious plan is set in motion, and we sign with the database provider (Amsio) early Q2 expecting to be able to migrate e-economic to a containerized workload in Azure fairly quickly based on proof of concept demos.

This does not go so well, more on that in a second. On top of this our CI pipeline required some major rework, which was a prerequisite for doing a proper CD pipeline.

The state of DevOps in e-economic was worse than anticipated, but a successful hiring spree starts turning this around.

New SQL Server Products

Azure launches a preview of SQL Managed Instances in the Summer 2018, which changes our situation, but we already signed a contract for our database provider, and Managed Instances are not great, more in a moment.

Google Cloud also has a SQL Server product (Spoiler; It's awesome)



CLOUDFLARE®

Having an intelligent CDN
gives us options

We brought on Cloudflare early

- We migrated our domains to Cloudflare early on, which took the initial blow of the migration as simply changing public IPs meant firewalls etc had to be changed
- Having Cloudflare done, means we can move traffic instantly
- We can split traffic between different cloud vendors, regions etc
- We even run code on the Cloudflare edge to perform routing logic for our new frontend distribution system
- Catches a lot of attacks on e-economic
- Unique Request ID through all layers (RAY-ID) with full logs (Enterprise)
- They have 155 anycast datacenters, incl. Copenhagen, so improved latency for danish users

Azure Caveats

A brief story on our experiences with Azure.

Your mileage may vary.

Opinions are my own and not the views of my employer.

Something is rotten in Azure

- Multiple fault domains failing simultaneously
- VM shortages (plural) in West-Europe
 - Forget about (auto) scaling up/down
 - There might not be VMs available the next day / on-peak period
- Whole region DNS outages
- Whole region network issues, both load-balancers and inter-VM connectivity
- Whole region storage issues



REDUNDANCY FAIL

*if you put your back-up in the same place as the original
you're inviting the same fate to befall both of them*

Personalized Health Dashboard

- What you see on <https://azure.microsoft.com/en-us/status/> is only a small part of the picture
- For a full view, you have to login and view the "[Personalized Health Dashboard](#)"
- Due to a Non Disclosure Agreement I can't share ours
- For those who know, if you looked at August and three months back, it was a thing of nightmares 
- I will instead share a few snippets from public websites and #sig-azure

Cooling Issues

- 11+ hour outage caused by warm weather in Ireland, apparently it doesn't always rain
- This outage was region wide
- ToR switches failed due increased humidity and took storage down with it
- Root cause; increase in outside air temperature

https://www.theregister.co.uk/2018/06/22/azure_north_europe_downdown_by_pleasant_weather/

Data Centre ▶ Cloud

Azure North Europe downed by the curse of the Irish – sunshine

Microsoft data center went sideways this week for hours with cooling issue

By Thomas Claburn in San Francisco 22 Jun 2018 at 23:57 24 □ SHARE ▾



Amid forecasts of heat and [fears of water shortage](#) in Ireland on Monday, Microsoft was about to confront a drought of a different kind: an Azure service outage.

The disruption, which lasted from 1744 UTC on Tuesday, June 19 to 0430 UTC on Wednesday, June 20, downed a slew of services, as we previously reported.

What was not disclosed at the time was the cause of the eleven-hour failure.

Cooling Issues

An issue in South Central US brings Azure Management Plane down globally & (limited) global storage issues.

Azure choose to let it go down, because regional failover would cause data loss.

<https://blogs.msdn.microsoft.com/vsservice/?p=17485>

https://www.datacenterdynamics.com/news/microsoft-azure-suffers-outage-after-cooling-issue/

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Microsoft Azure suffers outage after cooling issue

Even the status page is down

September 04, 2018 By: Sebastian Moss



Microsoft Azure is currently experiencing problems that have left users unable to access its cloud service.

The company claims that the outage only affects its South Central US region, but users are not so sure - and, to make matters worse, the Azure status page appears to be down, globally. **(Update:** Microsoft has published a [post-mortem](#). Read an [analysis here](#)). The status page is now available, intermittently). Further details available in the updates below.

Maybe host the status page elsewhere?

The status page is still accessible [via Google](#)

Cache. On it, Microsoft notes: "Starting at 09:29 UTC on 04 Sep 2018 a subset of customers in South Central US may experience difficulties connecting to resources hosted in this region. Engineers have isolated an issue with cooling in one part of the data center, which caused a



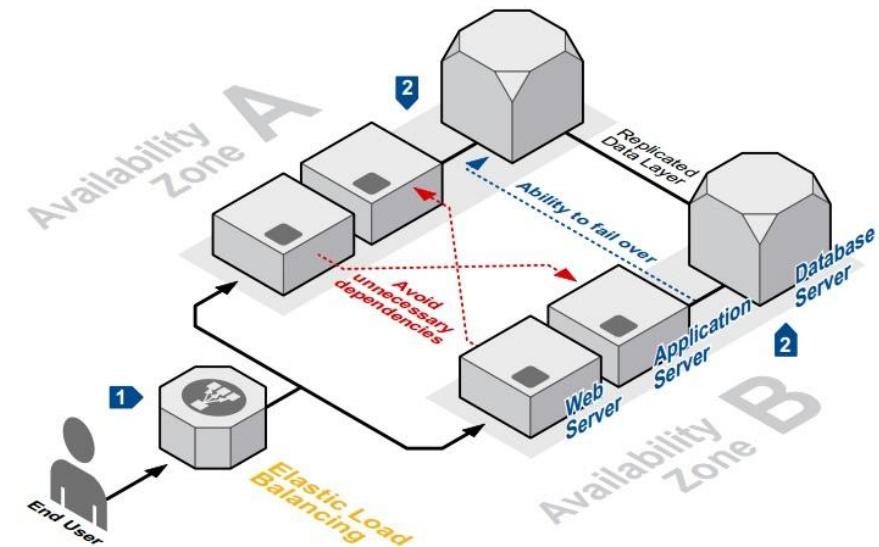
- DCD

US cooling issue brings down EU?

What you need to know about availability in Azure

(High) Availability?

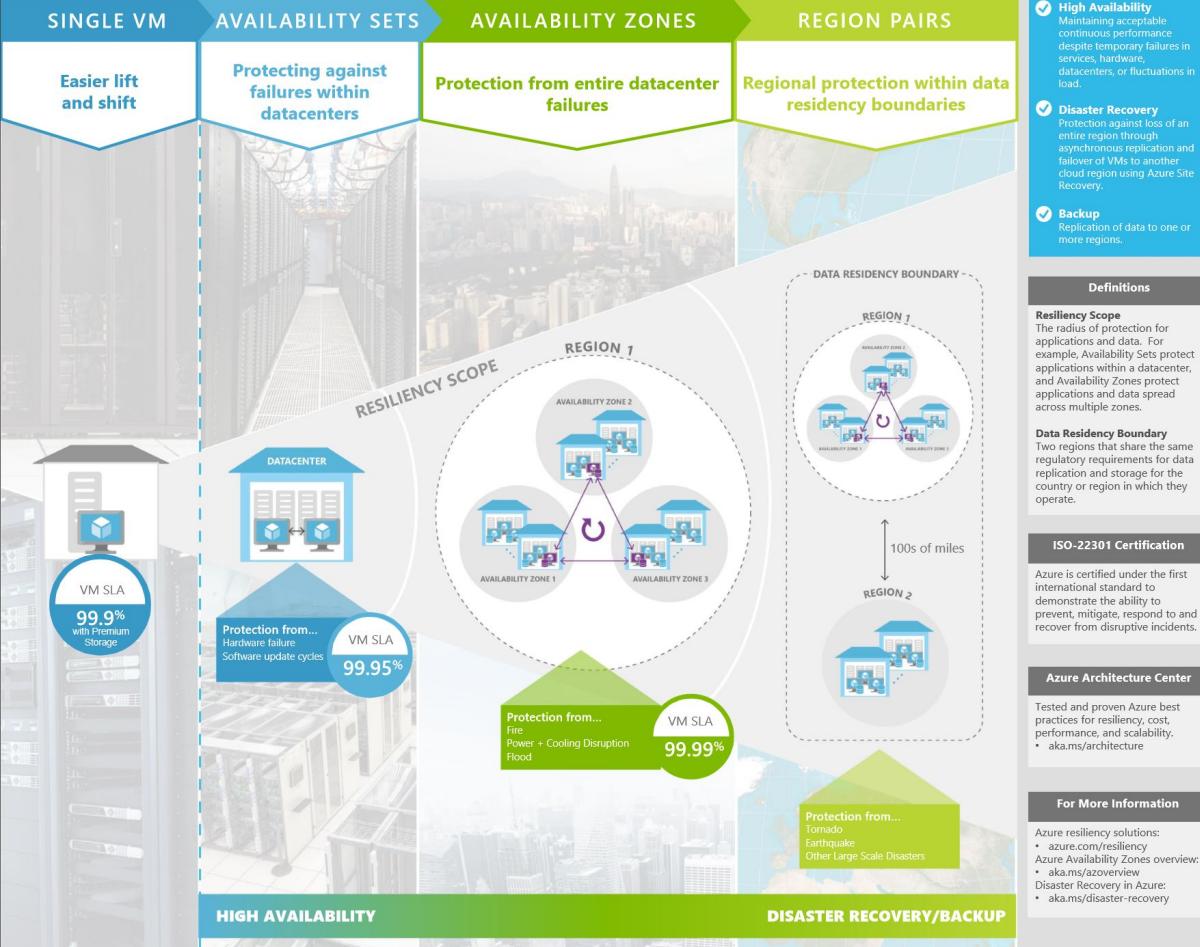
- Azure only recently (Mar 2018) started building Availability Zones
- AZs are being retro-fitted into Azure, and is not available for most regions and most services yet
- Azure is built on fault domains
- Fault Domains are just different racks, if there is an issue with datacenter networking / power / cooling, the whole region is offline
- You can't build an HA application in one Azure region like other clouds (yet)



How to design HA applications in the cloud

What is resiliency in Azure?

Comprehensive set of native business continuity solutions, providing high availability, disaster recovery, and backup to protect your mission critical applications and data.



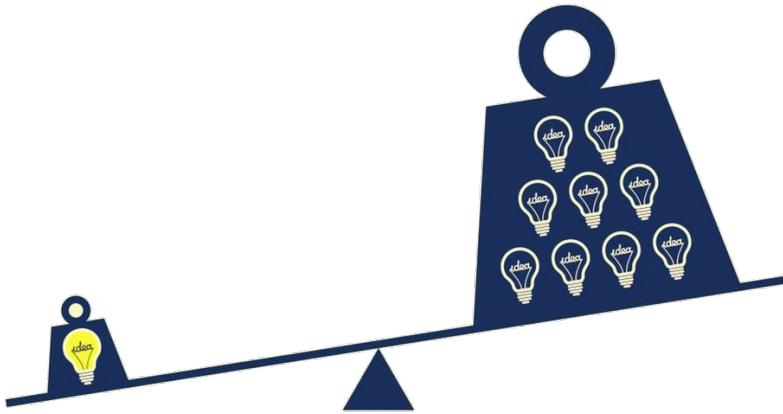
Microsoft has caught wind of this, so improvements are coming, but it's all still preview stage.

Only VMs and VMSS (scale sets) support Availability Zones, and you can't ensure the workloads are spread across zones

Azure has been preaching regional pairs as the solution

To scale or not to scale

How do you scale up if you can't spin up anything?



Azure is ~~very bad at capacity planning~~ a very popular cloud

- Azure runs out of a few common VM types in West Europe
 - Recommendation from Azure Support, choose a different VM type (SKU)
 - The result: Azure runs out of all types of VMs in all zones in West Europe
- Not only West Europe, this happens in US regions as well
- If you relied on (auto) scaling, you will suddenly one morning not be able to scale up to on-peak load
- Three known incidents of this in West Europe
 - Two region wide outages of all VMs, one in Nov 2017 and one in April 2018
 - Recently ran out of all High-CPU VMs in zones 2 & 3, took two weeks for it to return
 - Azure support simply closing and saying that you need to choose a different SKU and/or region

SKU Availability

- Lasted from 29th March to April 7th
- Affected failover regions too; North EU, France South + Central
- Availability may vary by zone too

The screenshot shows a GitHub issue page for a repository named 'Azure / AKS'. The title of the issue is 'VM SKU availability in West Europe #280'. The issue is marked as 'Closed' and was opened by 'slack' on 29 Mar. It has 47 comments. A comment from 'slack' on 29 Mar states: 'West Europe is under pressure for certain classes of VM SKUs. Expect limited availability for AKS clusters that are provisioned with Dv1, DSv1, Dv2 and DSv2 SKUs. AKS clusters created with Av1, Av2, H, GS or LS series should experience fewer provision errors.' This comment has 6 likes. Labels added by 'slack' include 'capacity' and 'known-issue'. The GitHub interface includes a navigation bar with 'Pull requests', 'Issues', 'Marketplace', and 'Explore' options.

Not only West Europe

- You can find multiple instances of this
- But not on the official status pages

reddit AZURE [kommentarer](#)

Dette er et arkiveret indlæg. Du kan ikke stemme eller kommentere.

Azure West Europe seems to be full. We opened multiple tickets and are waiting the second week now to have our vCPU limit increased. (self.AZURE)
tilføjet for 11 måneder siden* af Newkol

My company is starting multiple projects (new website, IoT, ...) in west europe and needs more resources right now.
I've opened multiple requests and tickets and Microsoft has not yet increased the limit.
Seems like the promised 'flexibility' is not a feature of Azure.
Do you have any tips for me? Should we use another region in the long run or am I just too impatient? I'm really tempted to try AWS to be honest since we are still in development.

12 kommentarer del gem skjul [giv guld](#) anmeld crosspost

alle 12 kommentarer
sorteret efter: [nye](#)

[+] [thesaintjim](#) 2 point for 11 måneder siden
North Central US is also full. I argued why won't they tell people this and they said because it is temporary. Told me to wait 5 weeks. What a joke

The Register®
Biting the hand that feeds IT

Data Centre ▶ Cloud

Want to provision a new VM on Azure? Get in line

UK West and South regions suffering from capacity issues

By Andrew Silver 9 Nov 2017 at 14:38

21 SHARE ▾



Multiple Microsoft customers have for the past nineteen hours been unable to provision new virtual machines in Azure's UK West and UK South regions.

Although there has been no formal notification on the Azure status page, *The Register* has seen a copy of a Microsoft issue summary report indicating issues since Wednesday morning.

Elasticity Issues

- Spinning up VMs can take anywhere between 5 to 45 minutes (no joke)
- Once spun up, you will need to wait an additional
 - 10 minutes in order to get an IP address for your VM
 - 10 minutes if you want a Storage Disk to go with that VM, if it's even successful, see previous list of issues
- Containers helps in this regard, because we can keep the VM (node) spun up and swap out containers on it

Generally Available

Azure Kubernetes is GA, but
Windows on Kubernetes is not?



“

The best Kubernetes experience in the cloud

Azure

”

Milestones

- ACS (RP v1); **Azure C**ontainer **S**ervice, launch preview June 2017
- **ACSEngine**; The building block of ACS & AKS, first release July 2017
- ACS RP v2; Launch in limited regions, August 2017
- Windows 17.09
 - Process isolation containers
 - No longer tied to Hyper-V
- AKS; **Azure K**ubernetes **S**ervice, launch October 2017
- Azure-CNI, GA December 2017
- Windows 18.03
 - Storage plugins
 - Multiple containers in same pod
- Windows 18.09 (when it launches)

Windows on Kubernetes on Azure

The screenshot shows a terminal window and a GitHub repository page side-by-side.

Terminal Session:

- Top panel: "Every 2.0s: kubectl get pods -o wide" command running.
- Bottom panel: Command "kubectl scale --replicas=6 deploy/win-webserver" executed.

GitHub Repository: Microsoft / iis-docker

- Branch: master
- Issues: 15
- Pull requests: 1
- Projects: 0
- Wiki
- Insights

Dockerfile Content:

```
FROM microsoft/windowsservercore:1709_KB4054517
RUN powershell -Command Add-WindowsFeature Web-Server
ADD ServiceMonitor.exe /ServiceMonitor.exe
EXPOSE 80
ENTRYPOINT ["C:\\ServiceMonitor.exe", "w3svc"]
```

(Generally) Available?

The screenshot shows a Microsoft Teams chat interface with several messages from different users:

- toby** 12:22 PM: anyone else experiencing networking issues in eastus on AKS? I've been having some issues since last night, restarting pods seemed to help. I'm thinking it may be the roll out of the streamwatcher fix. e.g. my ingress controller keep restarting because it can't connect to the API server
- omeric** 6:26 PM: Issue with west us? We got the same error: "AllocationFailed",\r\nnot have sufficient capaci
Read more about improving allocation guidance:
<http://aka.ms/allocation-guidance>
- Kevin Sullivan** 4:34 PM: I'm actually having TLS Handshake timeouts to my cluster in eastus2. Anyone else?
- mwiec**: pinging IP works, name does not
- neurot1cal** 4:37 PM: same thing for west europe
- neurot1cal** 4:37 PM: Man EU West seems to be a problem region ... looking over the last several months

A large callout box highlights the message from **omeric** and contains the text "Engine/AKS state".

Windows Containers

There has in the past been lot's of issues, some of what we experienced

- Clusters failed to provision if more than 4 nodes
- Unable to connect to any service from windows pods
- IP Addresses not cleaned up after pods, quickly leading to IP exhaustion if redeploying/scaling
- General network connectivity issues
- Scaling the cluster rendered the cluster unschedulable

Windows Containers

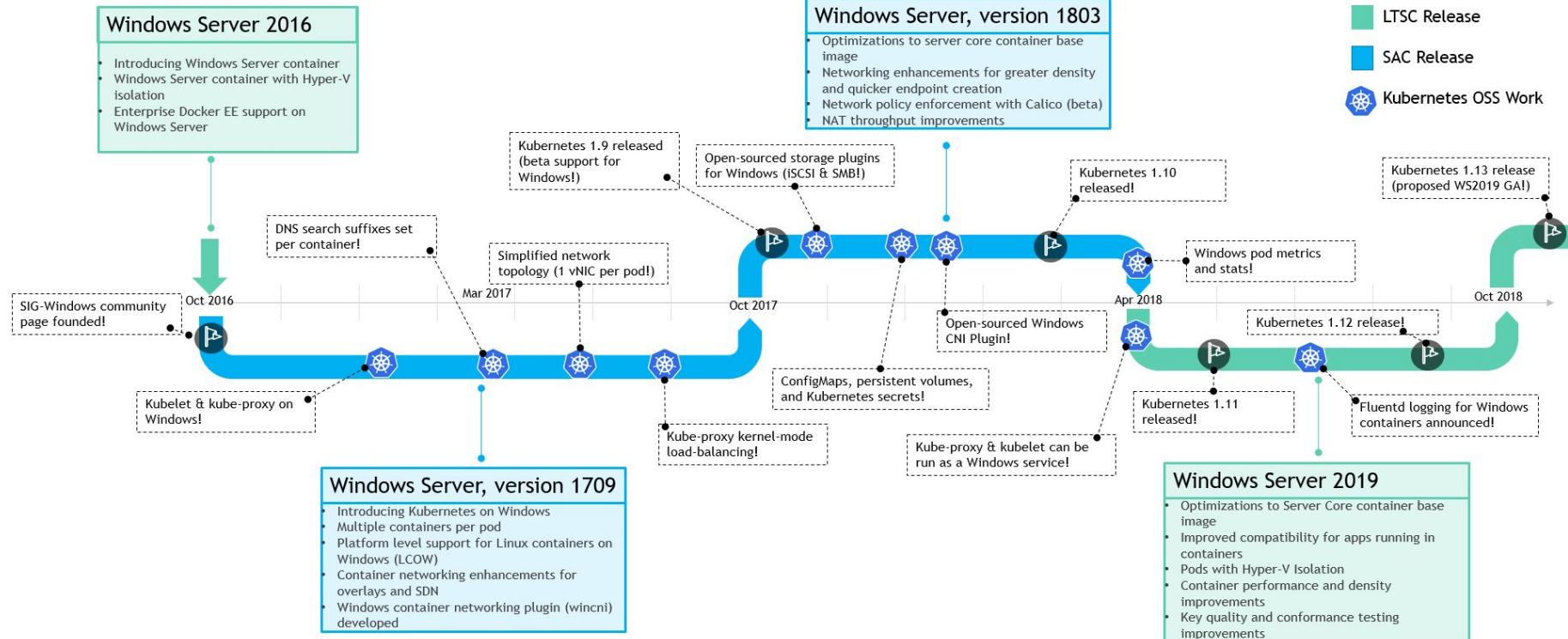
- Windows on Kubernetes is targeting GA for Kubernetes ~~1.12~~ 1.13
- However some issues are actually in the Windows kernel and not in K8S, so we need to wait for semi-annual windows releases
- Azure Engineers told us that with the Windows 18.03 semi annual release, Containers on Windows was ready for prime time
- Our testing shows otherwise, but only when we started running real workloads
- Windows 18.09 / 2019 was supposed to fix the issues, but the entire release was pulled due to data loss

Kubernetes 1.12 is a big thing

- Azure Availability Zone Support
 - Given the previous slides, you can understand why we think this is crucial
- Azure Virtual Machine Scale Sets – Stable & GA
 - Only VMSS support AZs so this goes towards the first item too
- Cluster-Autoscaler – Stable & GA
- Windows Fixes (the ones that isn't tied to the kernel)
- Virtual Machine Scale Sets (VMSS) are not ~~working~~ fully tested on windows yet
 - <https://github.com/Azure/acs-engine/issues/3833>
- Azure Availability Zones are alpha stage for 1.12, beta for 1.13
 - <https://github.com/kubernetes/enhancements/issues/586>

A lot has happened in two years

Kubernetes on Windows Server



Where to keep updated?

Everything is in the open!

SIG-Windows, GA Plan

<https://docs.google.com/document/d/1YkLZIYYLMQhxdl2esN5PuTkhQHhO0joNvnbHpW68yg8/edit>

Windows roadmap on Trello

<https://trello.com/b/rjTqrwjI/windows-k8s-roadmap>

<https://github.com/kubernetes/community/tree/master/sig-azure>

<https://github.com/kubernetes/community/tree/master/sig-windows>

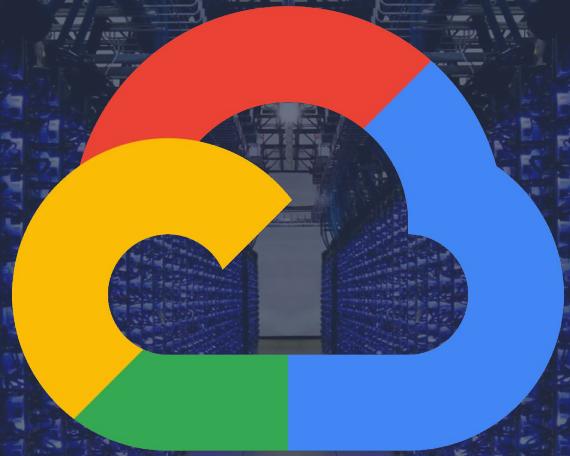


The turn of events

Azure is promising, but not there yet

Swapping out the entire Tech Stack

- We were running out of capacity on aging on-premise database hardware, and we had to move to the Cloud mid-October
- After concluding that Azure will not make it in time, and is way too risky, we decide mid August, just two months prior to migration date to switch Cloud Provider and tech stack
- Big Bang Migration
 - Database is lift-and-shift to new provider, with SQL 2014->2016, and Always-On
 - Application is moved to the cloud, on a new OS 2012->2016, deployed and managed by a brand new tooling.
 - All existing infrastructure automation is thrown out and replaced
 - We are moving all 120K customers & traffic at once



Google Cloud

Google Cloud

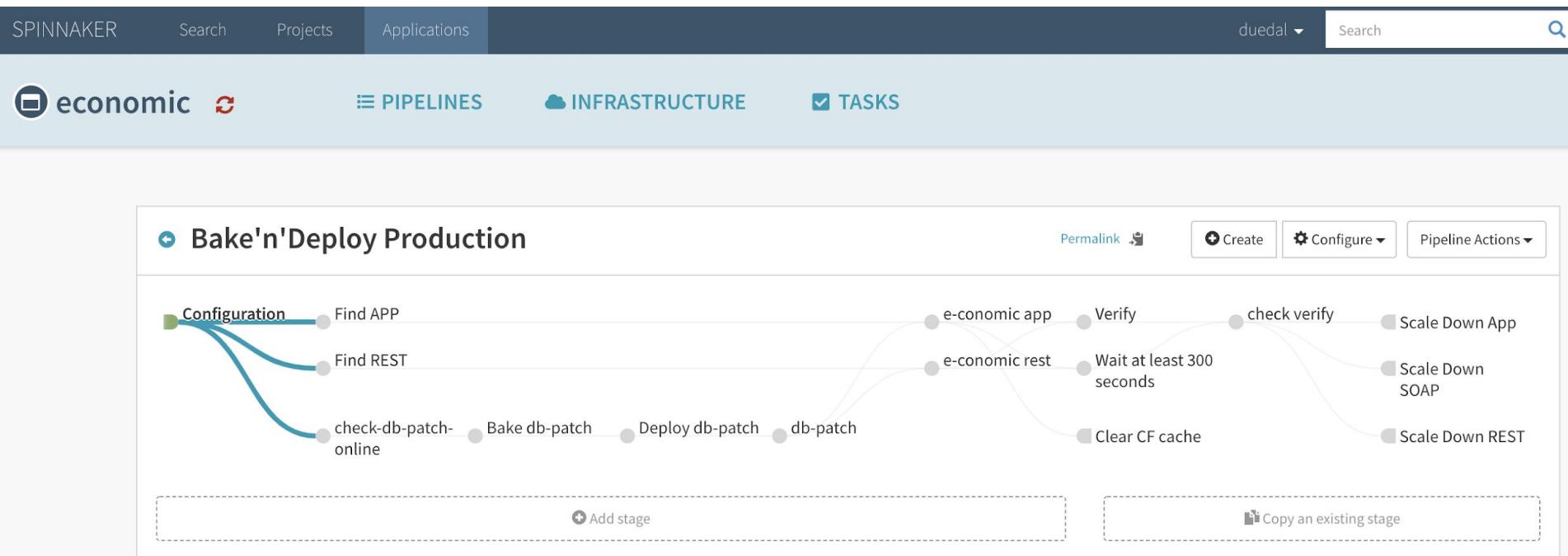
- Google Cloud have four regions in EU, including three availability zones in the Netherlands
- Better performance on primitives, ie. compute, storage, network etc.
- 30+% cheaper than Azure, even for windows workloads
- Spinning up takes minutes not hours
- Partner / CDN Interconnect for improved latency and cost
- Automatic Sustained Use Discounts

Spinnaker

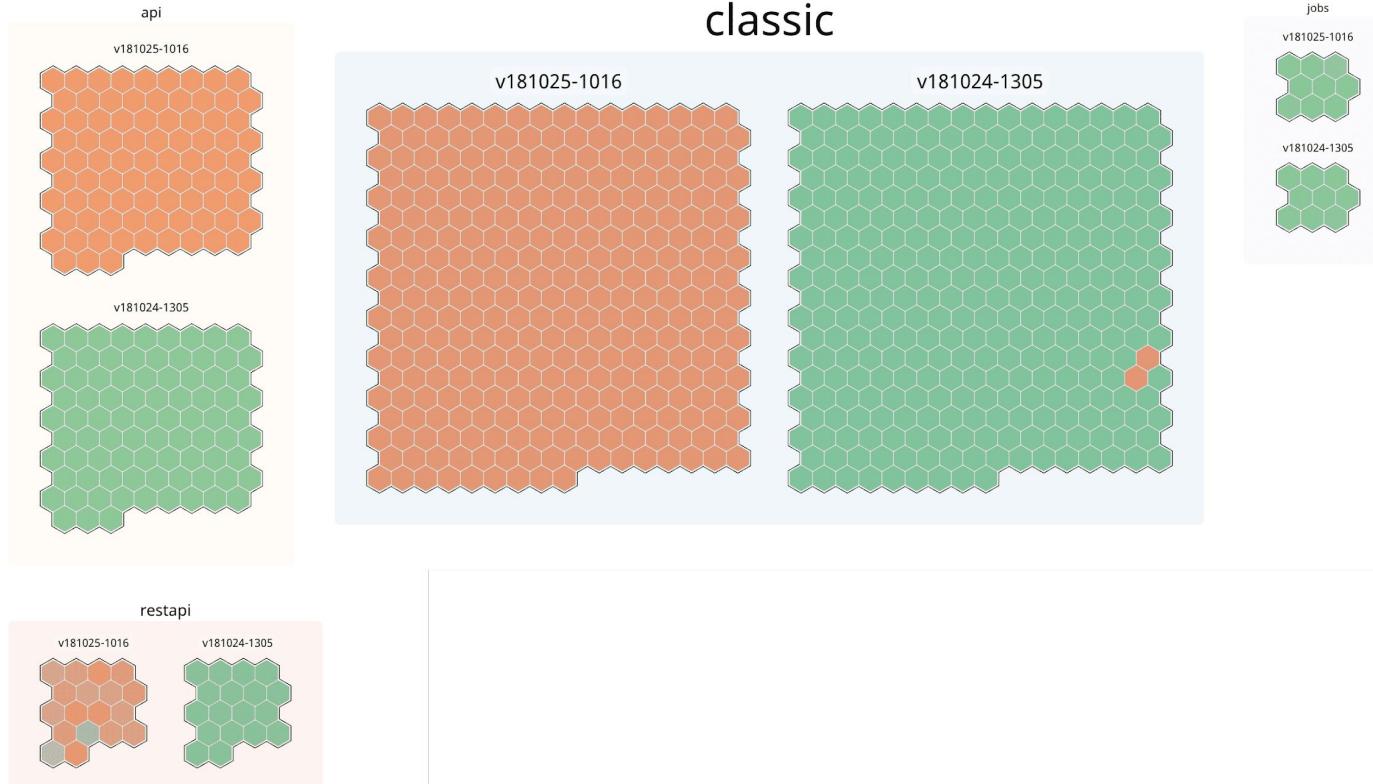


- We're taking a step back on the tech stack
- Instead of building a container, spinnaker will bake a VM
- We still get the following we need
 - Rolling (anytime) Deployments
 - Auto scaling
 - Self healing
 - Shipping a self-contained unit (but a VM image not container)
- We were going with the safest bet we could, since we needed to de-risk our cloud migration, as it was already risky enough.
- Spinnaker supports kubernetes too, so one tool to rule them all

Spinnaker is a game changer



Brand new VMs on every deploy



Migration Night

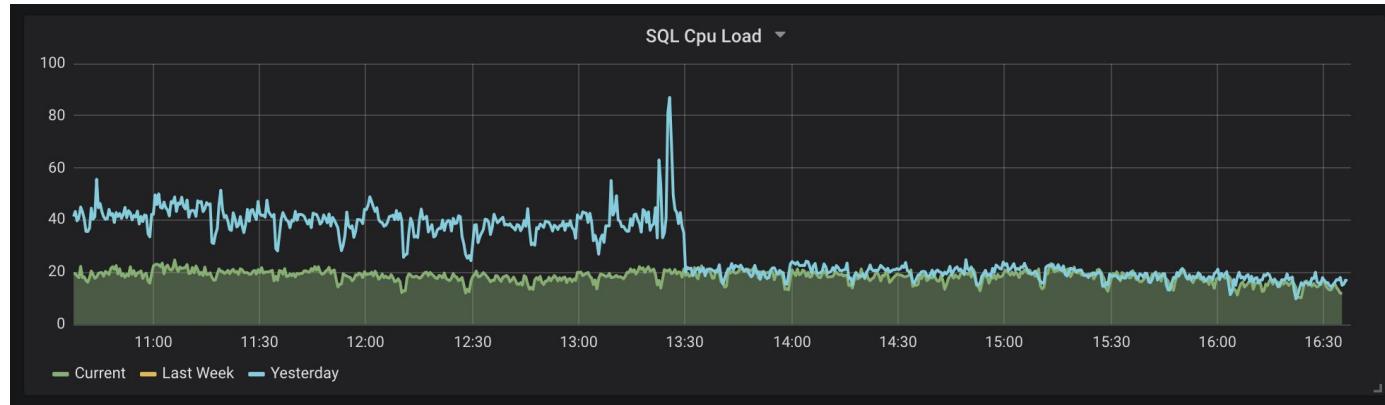
The actual migration goes extremely well, we had the entire application and database migrated in under an hour.

As with many things; preparation is key.

Post Migration Performance Issues

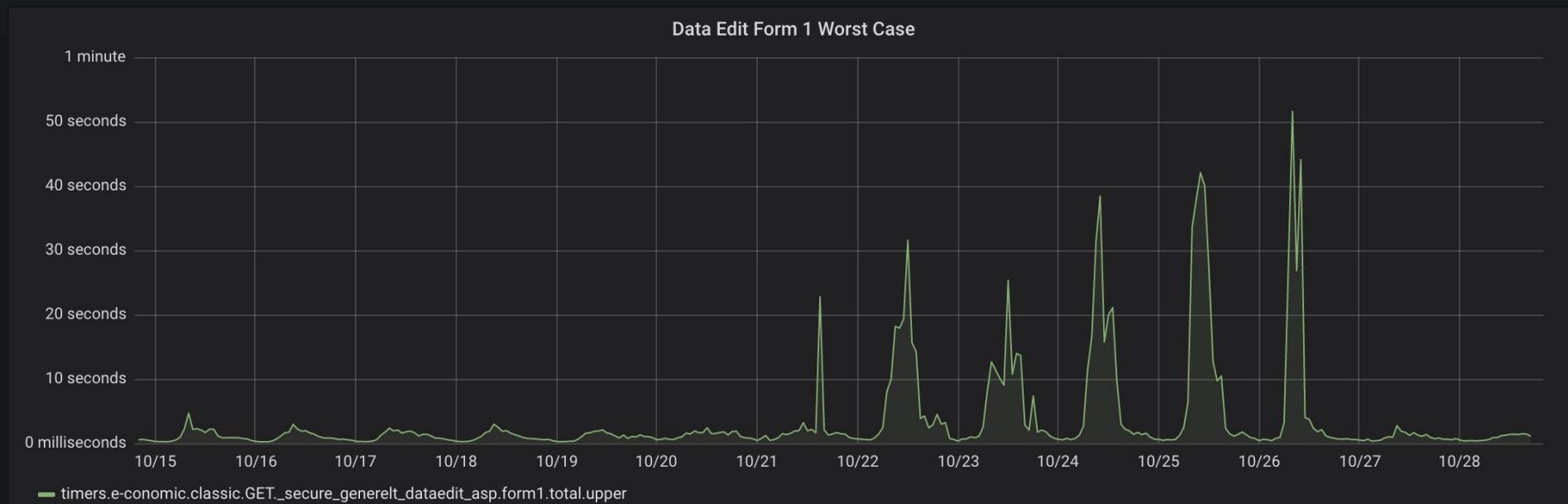
The weekend following the migration was quiet, but come Monday it was clear that something was wrong.

Turns out that some of the most used parts of the application was doing 160 SQL calls in series when it could do less than 20, because of an old regression.



Edge Cases

On less than 10% of requests, it suddenly takes up to 1 minute.



Wireshark APM™

http (tds.type==1 tds.type == 3) syslog						
No.	Time	Source	Destination	Protocol	Length	Info
5	0.017996000	172.20.0.21	172.21.64.7	HTTP	3309	GET /secure/generelt/dataedit.asp?form=1&ops=27475760&Kladdenr=8&fradato=22-10-2018&til
9	0.036304000	172.21.64.7	144.76.143.215	Syslog	110	ad645d50-6ab6-4595-9412-a9702bed75b4.e-economic.AspClient.InitApp:1 c
10	0.037605000	172.21.64.7	144.76.143.215	Syslog	125	ad645d50-6ab6-4595-9412-a9702bed75b4.e-economic.AspClient.GetSessionIdCookieName:1 c
11	0.038028000	172.21.64.7	144.76.143.215	Syslog	128	ad645d50-6ab6-4595-9412-a9702bed75b4.e-economic.AspClient.GetSessionStateCookieName:1 c
12	0.039184000	172.21.64.7	144.76.143.215	Syslog	128	ad645d50-6ab6-4595-9412-a9702bed75b4.e-economic.AspClient.GetSessionCacheCookieName:1 c
14	0.046885000	172.21.64.7	144.76.143.215	Syslog	124	ad645d50-6ab6-4595-9412-a9702bed75b4.e-economic.AspClient.InitWithCustomSession:1 c
16	0.050544000	172.21.64.7	144.76.143.215	Syslog	124	ad645d50-6ab6-4595-9412-a9702bed75b4.e-economic.AspClient.GetSessionStateObject:1 c
17	0.056029000	172.21.64.7	144.76.143.215	Syslog	124	ad645d50-6ab6-4595-9412-a9702bed75b4.e-economic.AspClient.GetSessionCacheObject:1 c
18	0.063035000	172.21.64.7	144.76.143.215	Syslog	111	ad645d50-6ab6-4595-9412-a9702bed75b4.e-economic.AspClient.LogBegin:1 c
32	0.090883000	172.21.64.7	10.30.15.41	TDS	184	SQL batch
34	0.101368000	172.21.64.7	144.76.143.215	Syslog	112	ad645d50-6ab6-4595-9412-a9702bed75b4.e-economic.AspClient.ExecuteRS:1 c
35	0.105919000	172.21.64.7	144.76.143.215	Syslog	115	ad645d50-6ab6-4595-9412-a9702bed75b4.e-economic.AspClient.GetIconClass:1 c
36	0.107387000	172.21.64.7	144.76.143.215	Syslog	124	ad645d50-6ab6-4595-9412-a9702bed75b4.e-economic.AspClient.GetIconClassTextAlign:1 c
37	0.108644000	172.21.64.7	144.76.143.215	Syslog	115	ad645d50-6ab6-4595-9412-a9702bed75b4.e-economic.AspClient.GetIconClass:1 c
38	0.110157000	172.21.64.7	10.30.15.41	TDS	302	SQL batch
43	0.116844000	172.21.64.7	144.76.143.215	Syslog	112	ad645d50-6ab6-4595-9412-a9702bed75b4.e-economic.AspClient.ExecuteRS:1 c
44	0.121167000	172.21.64.7	10.30.15.41	TDS	1771	Remote Procedure Call
48	0.127785000	172.21.64.7	144.76.143.215	Syslog	123	ad645d50-6ab6-4595-9412-a9702bed75b4.e-economic.AspClient.GetCurrentLanguageId:1 c
49	0.130215000	172.21.64.7	10.30.15.41	TDS	882	Remote Procedure Call
53	0.136837000	172.21.64.7	144.76.143.215	Syslog	132	ad645d50-6ab6-4595-9412-a9702bed75b4.e-economic.AspClient.HasAccessInternationalLedgers:
54	0.139454000	172.21.64.7	10.30.15.41	TDS	1068	Remote Procedure Call
56	0.153816000	172.21.64.7	144.76.143.215	Syslog	119	ad645d50-6ab6-4595-9412-a9702bed75b4.e-economic.AspClient.DoesDaybookExist:1 c
57	0.156138000	172.21.64.7	10.30.15.41	TDS	298	Remote Procedure Call
60	0.162581000	172.21.64.7	10.30.15.41	TDS	968	Remote Procedure Call
62	0.170472000	172.21.64.7	144.76.143.215	Syslog	122	ad645d50-6ab6-4595-9412-a9702bed75b4.e-economic.AspClient.GetKladde0psaetning:1 c
Procedure name length: 65535 Stored procedure ID: sp_executesql (10) ▶ Option flags: 0x002 ▶ Parameter Name length: 0 ▶ Status flags: 0x00 ▶ Type info (NVARCHARTYPE - NVarChar) ▶ Value (NVARCHARTYPE - NVarChar) Length: 1552 Data [truncated]: SELECT TOP (@0) T0.Aftalenr,T0.BrugerID,T0.Navn,T0.LastName,T0.Password,T0.Salt,T0.Rabat,T0.DatoOphoerRabat,T0.SuperBruger,T0.Tilmeldingsdato,T0.Frameld						
▶ Parameter						

Hybrid Cloud on GCP

- Google has a lot of options for Hybrid Cloud
- In general GCPs networking is vastly superior to other clouds
- Direct or Partner Interconnect (ExpressRoute) was not available at our location
- We ended with a simple Site-to-Site VPN setup with BGP Routing for redundancy, which can do more than 3 Gbit/s
- Nearest GCP region is 250 km from the database, so a round trip is around 5ms

Latency is a killer, even 5ms

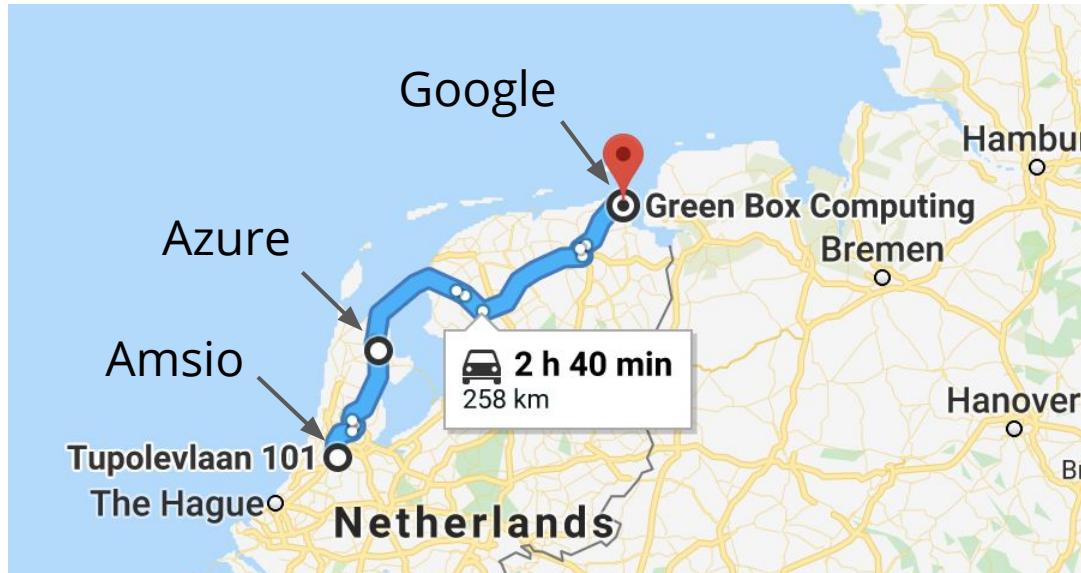
Turns out, that to book 60 entries in the journal/daybooks, our application made up to 2500+ calls to the database.

$2500 * 0.005\text{s} = 12.5 \text{ seconds}$. This used to take less than 1 second.

We can batch UPDATEs and DELETEs to cut this roughly in half, but we would still be dead on latency.

That 250 km of fiber optics is never going to fly, can we change the speed of light?

Datacenter Stalking



AWS Recently “doxxed”
<https://wikileaks.org/amazon-atlas/map/>

Database Challenge Revisited

If we can't make light go faster, than let's reduce the distance it needs to travel



Revisiting the database challenge

We already had a workshop with Microsoft on Azure SQL Managed Instances. Some things you need to know about them.

- They come in Gen 4 and Gen 5 types
- They come in General Purpose and Business Critical Tiers
- Depending on the combination, it has widely different performance
 - Even the maxed out version is slow! But it's really expensive, so that's good.
- Business Critical has Local SSD (ephemeral, so ☐)
- 4 TB max for Business Critical tier
- On Business Critical, IOPS are allocated proportionally to the number of cores. The per-core ratio may change before GA, but would be in low thousands of IOPS/core

For your reference

- Gen 4 CPUs are based on Intel E5-2673 v3 (Haswell) 2.4 GHz processors. In Gen 4, 1 vCore = 1 physical CPU
- Gen 4 has more memory per core than Gen5 (7 GB vs 5.5 GB)
- Gen 4 can scale up to 24 (physical) cores
- Gen 5 logical CPUs are based on Intel E5-2673 v4 (Broadwell) 2.3 GHz processors. In Gen 5, 1 vCore = 1 hyper thread
- Gen 5 can scale up to 80 (hyperthreaded) cores
- Gen 5 has NVMe SSD, Gen4 has slower SSD
- Gen 5 has up to 4 TB of local storage, Gen4 has up to 1 TB
- Gen 5 guarantees Accelerated Networking, Gen4 does not
- Gen 5 is likely to be around longer than Gen4

Google Cloud SQL Server

- Custom Machine Type; spec any way you like and scale up/down
- Current max; 96 Skylake Cores, 624 GB RAM
- Two Storage Options
- Persistent SSD
 - Up to 64 TB
 - 60,000 Read IOPS / 30,000 Write IOPS
 - Writes in parallel to 3 physical disks for redundancy
 - Throughput limit; Read 1200 MB/s, Write 400 MB/s
- Local SSD
 - 8 * 375 GB NVMe Storage = 3 TB max
 - 680,000 Read IOPS / 360,000 Write IOPS
 - \$33 / month / 375 GB
- 0.2ms intra-AZ, 0.4ms cross-AZ

Performance Comparison

We ran a few known heavy workloads on each DB, they were similarly spec'd for CPU & RAM. Sentia has IODrives, Amsio & Azure have NVMe SSDs but GCP is spec'd with much slower PD-SSD and still beats Azure.

If GCP was spec'd with local SSD it would be on par with Amsio.

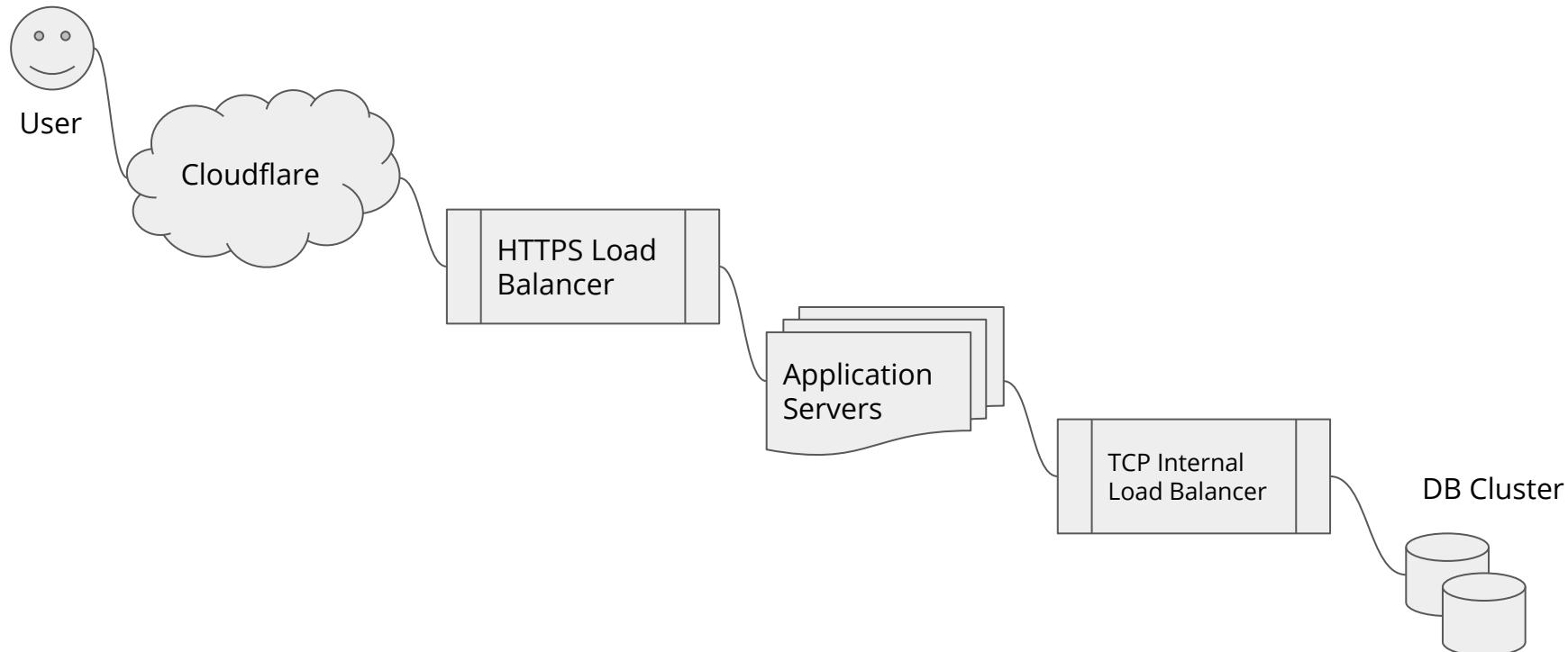
HammerDB would be better for objective benchmarks.

	Sentia	Amsio	Azure	GCP
EXEC EconFakGr_v3	90s-120s	55s	1m 33s	1m 13s
DBCC DBREINDEX('Postering','IX_Postering')	?	7m 6s	18m 6s	14m 57s

SQL Server Always-On

- When we moved to Amsio we migrated to a SQL Server Always-On cluster, and this aspect we wanted to keep for improved failover.
- Always-On is built on top of Windows Failover Clustering, which is not made for cloud environments as it uses gratuitous arp to implement a Floating IP.
- Gratuitous ARP, or ARP in general does not work in Cloud. Luckily Google has made a workaround.
- You make an internal load balancer, and set a special metadata option on the VMs, so Windows Failover Clustering Health is reflected to the Load Balancer, and the Load Balancer IP becomes the Floating IP.

Final Request Flow

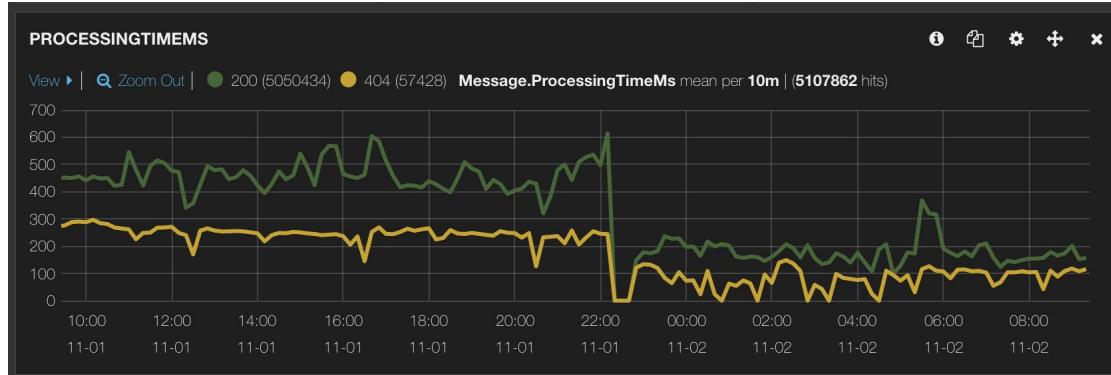


We migrated to Google Cloud last week!



Performance is already looking better

- Booking those 60 items in the journal now takes 800-900ms as opposed to 17 seconds
- REST API mean response time has gone from 500ms to 200ms
- Booking invoices has gone from 10s to 5s
- Lot's of future improvement by refactoring the application, this has really highlighted where we need to improve.



Benefits of e·conomic's cloud move

- Deploy anytime; No longer limited to 1-2 deployments per day
- Scale almost endlessly; VAT reporting busyness can be handled
- Every deployment is golden
 - When we deploy, a new “gold master image” is made, so we no longer need to do windows updates because every deployment comes fully updated.
 - No more running various automation scripts (ie. chef/puppet/ansible) during deployment which can be non-deterministic and error prone
- Increased performance; Newest Skylake CPU architecture
- Blue/Green Deployment Pattern, with Canary Deployments later
- Infrastructure Auto-Scaling & Auto-Healing

Next Steps

- Longer term we would like to move our application to windows containers on Kubernetes, which means Azure
 - Azure has the best Windows Container support
- If Latency permits we would prefer having a Dual Cloud approach, for extra redundancy
- Really long term .NET Core on Linux would be the way to go



Respect
Reliability
Innovation
Competence
Team spirit
HAVING FUN