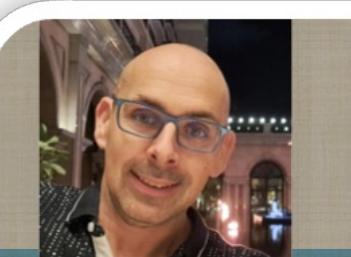




Navigating Cloud Sustainability

Insights and Strategies



Michiel Hamers

M C C²



Introduction – Michiel Hamers

- 46 years old
- Solution Lead & Microsoft Azure MVP
- Favourite Azure services: Function apps



soprasosteria

M C C²

Why?



Problem

Everyone is sleeping OK

Struggles across the board

- In a survey, 42% of CIOs and CTOs cited cloud waste as their top challenge. This waste often arises from overprovisioning and an inability to scale resources rapidly.
- About 7 out of 10 companies aren't sure where their cloud budget is being spent, showcasing a significant challenge in cost attribution and management.
- Forbes discusses cloud cost optimization as a pivotal part of cloud strategy, implying that managing cloud costs is a significant concern for organizations.



<https://www.cloudzero.com/blog/cloud-computing-statistics>

<https://www.forbes.com/sites/forbestechcouncil/2021/03/19/cloud-cost-optimization-a-pivotal-part-of-cloud-strategy/#>

55,7 miljard devices connected 2025

73,1 zetty
bytes (2022)

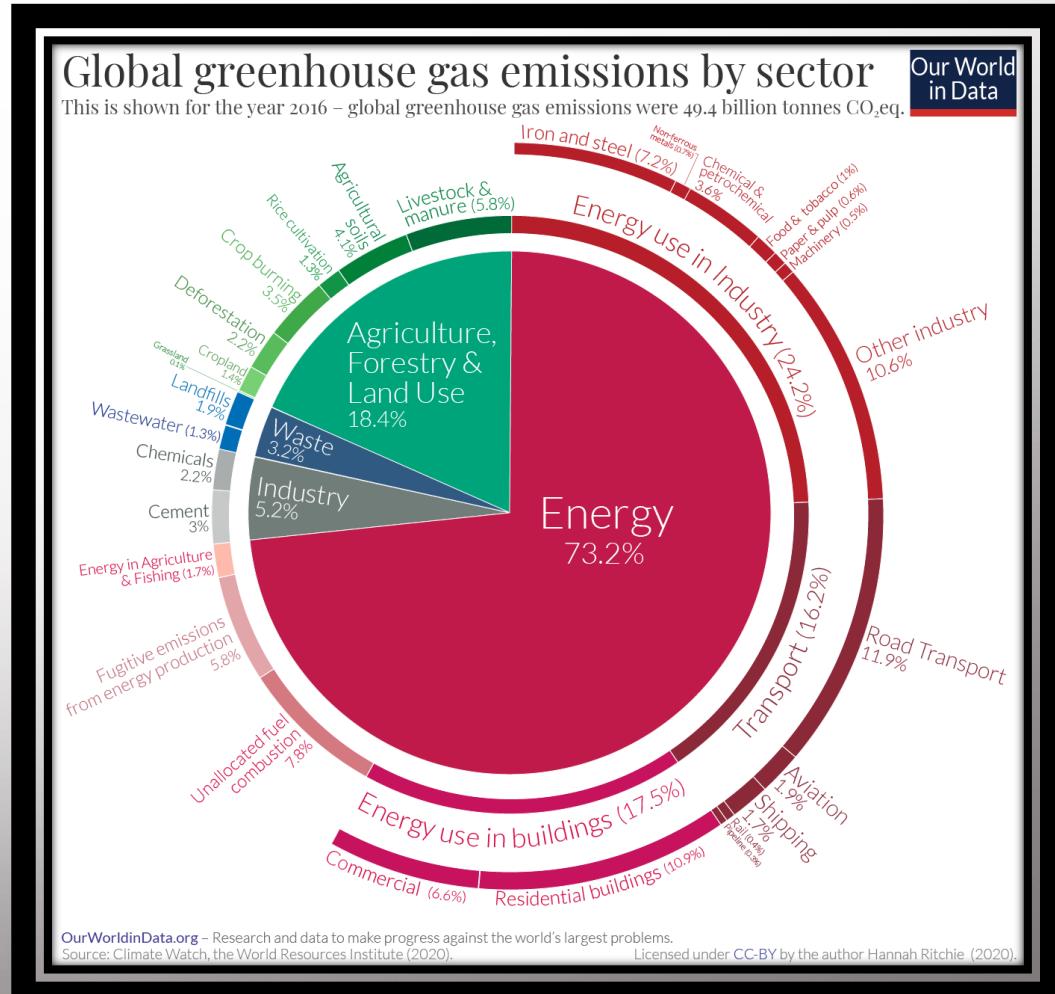
Data Industry
1% from TOTAL
World energy

4% of total CO₂
emissions van
data en ICT

55,6 miljoen
ton e-waste in
2019

Tech companies underreported CO₂ emmission

- Where do you report as IT?
 - Industry?
 - Retail?
 - Other?



First primary target: significant reduction CO₂ footprint

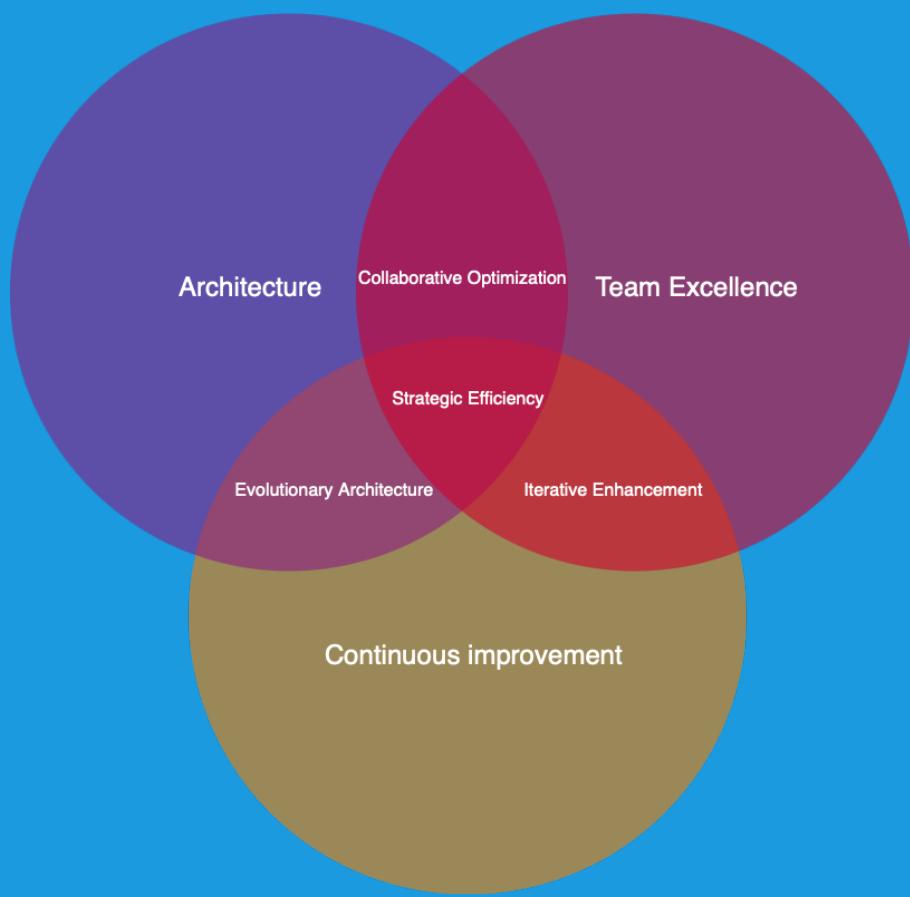
- Recycling
- Reduction energy consumption
- Sustainable design

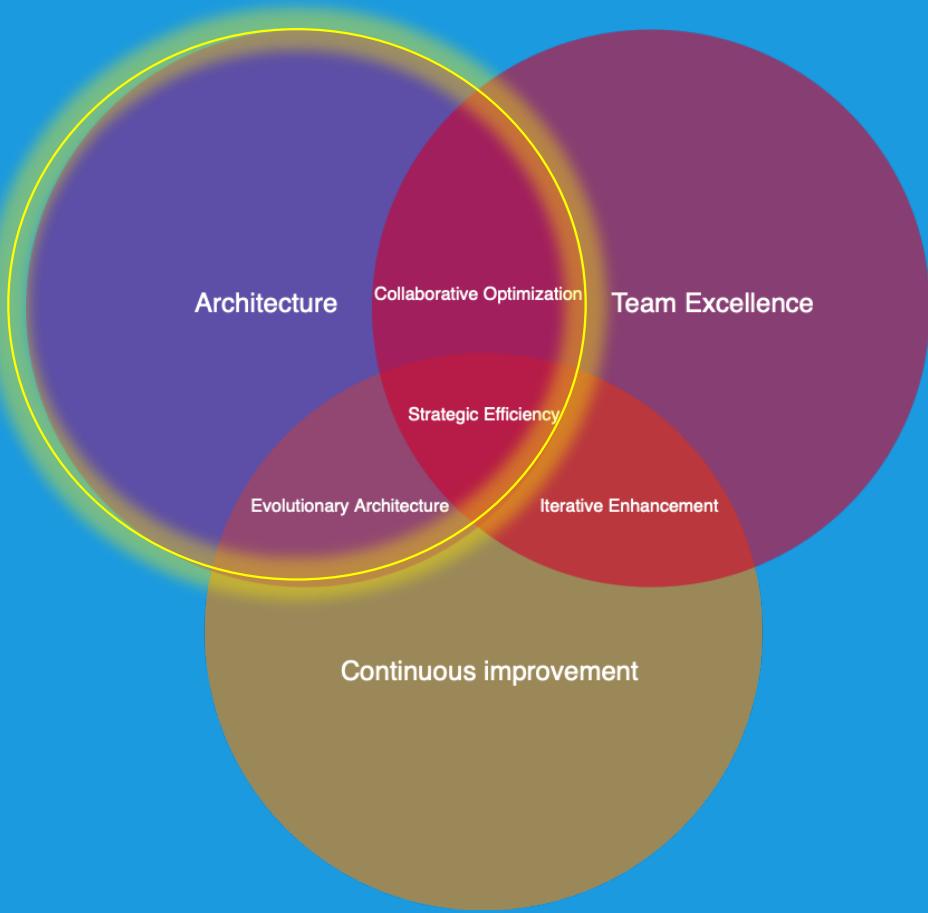
Sustainability is not only CO₂ ...

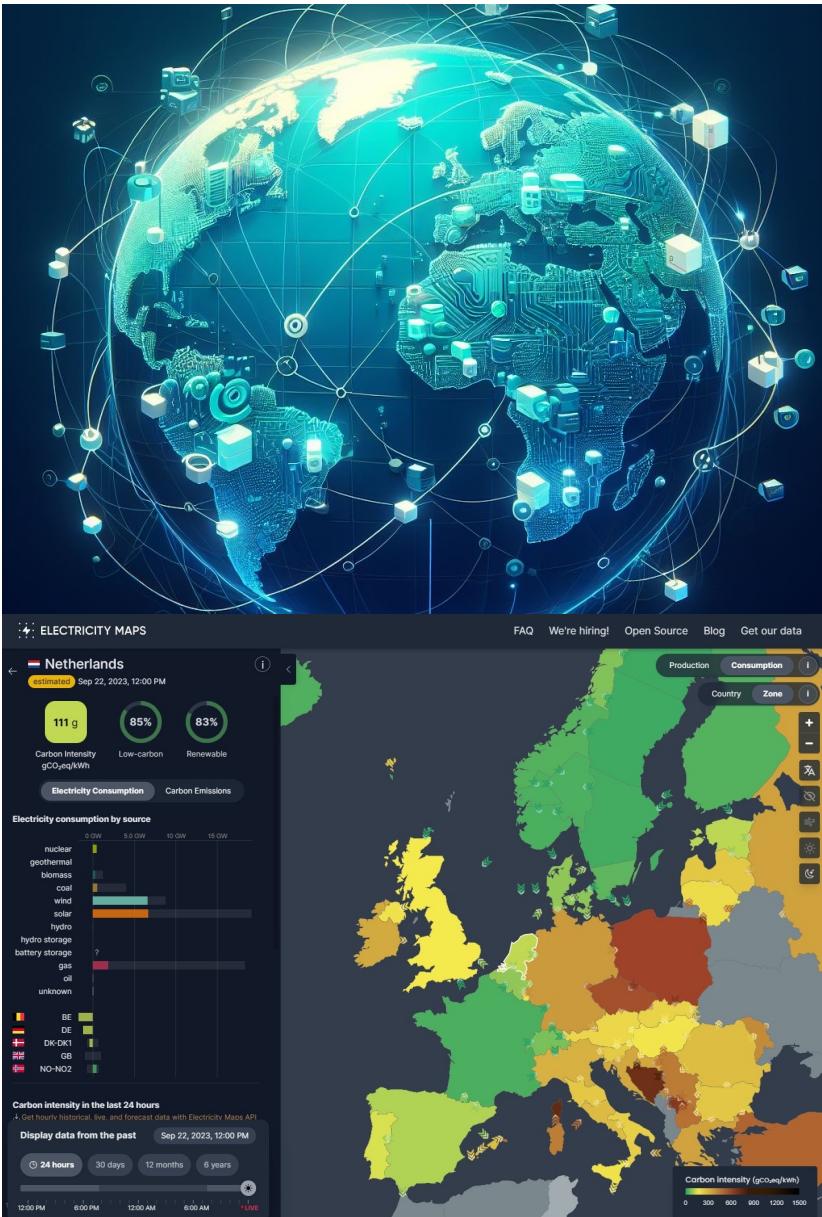
- Look at other targets and tasks within IT
- Promote sustainable projects and initiatives
- ^read that again and make a difference

What can you do?

- Recycle equipment
- Sustainable procurement
- Green IT infrastructure
- GREEN CODING
- Employee Awareness & Engagement







Geo Efficiency - Geo what ??

“Geo efficiency is the art of getting the same amount compute power at a different region for less impact on CO₂ and a lower price”

Geo Efficiency - It's all about the money

There is a big difference in Azure datacentres pricing between each region.

Let's select a VM : D16d v4 - 16 vCPU 64GB RAM OS:Ubuntu

West Europe: €750.77

North Europe: €695,57

Switzerland west: €1.073,73

Brazil SouthEast: €1.292,46

Poland Central: €830.98

South India: €879,12

Geo Efficiency - Picking an Azure region

Choose the right Azure region for you



Compliance and data residency

Get help choosing the right geography for your residency and compliance needs.

[Learn more about data residency](#)

[See compliance offerings](#)



Service availability

Ensure that the Azure services you need are available in the datacenter region that you're considering.

[Explore products by region](#)



Pricing

Factor cost into your decision-making process.

[Explore pricing](#)

Geo Efficiency-4 steps in region selection

Following Azure's guidelines deploying a new azure resources should follow these steps:

- 1.) Choose the region based on data residency/compliance
- 2.) Discover which region support your desired service
- 3.) Determine the network performance needs of your service
- 4.) Select the most economical/green region fitting your needs



Sizing - Generation switching

An offer you can't refuse.

VM Name	vCPUs	Memory (GiB)	Linux Price	Windows Price
Standard_D2	2	7	1,213.26	2,143.57
Standard_D2as_v5	2	8	n/a	1,561.91
Standard_D2d_v4	2	8	1,046.82	1,811.57
Standard_D2d_v5	2	8	1,046.82	n/a



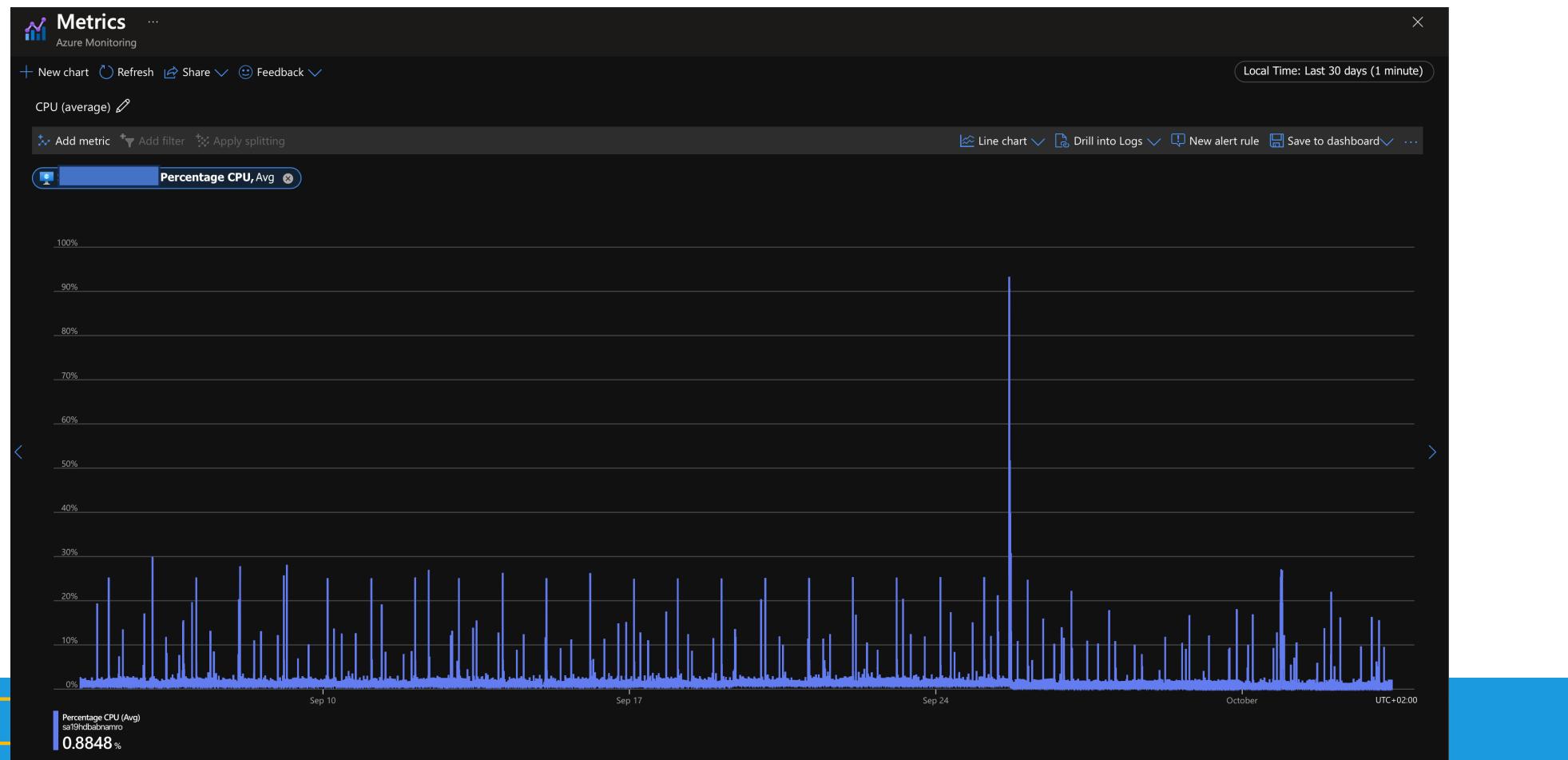
M C ²

Your cloud
contains waste

M C ²



What is waste



Waste

The screenshot shows the Mac OS X Disk Utility application window. The sidebar on the left lists "Internal" drives, with "Macintosh HD volumes" expanded, showing "Macintosh HD" and "Data". The main pane displays "Macintosh HD" as an "APFS Volume Group • APFS (Encrypted)" volume, mounted at "/". The volume is 994,66 GB in capacity, with 208,56 GB used, 6,09 GB other volumes, and 780,01 GB available. The status bar at the bottom indicates a snapshot name and UUID.

Disk Utility

Internal

Macintosh HD volumes

Macintosh HD

Data

Macintosh HD

APFS Volume Group • APFS (Encrypted)
macOS 13.5.2 (22G91)

994,66 GB
SHARED BY 5 VOLUMES

Used: 208,56 GB Other Volumes: 6,09 GB Free: 780,01 GB

Mount Point: /

Capacity: 994,66 GB

Available: 780,01 GB

Used: 208,56 GB

Snapshot Name: com.apple.os.update-A17B27811581529D33626973...

Type: APFS Volume Group

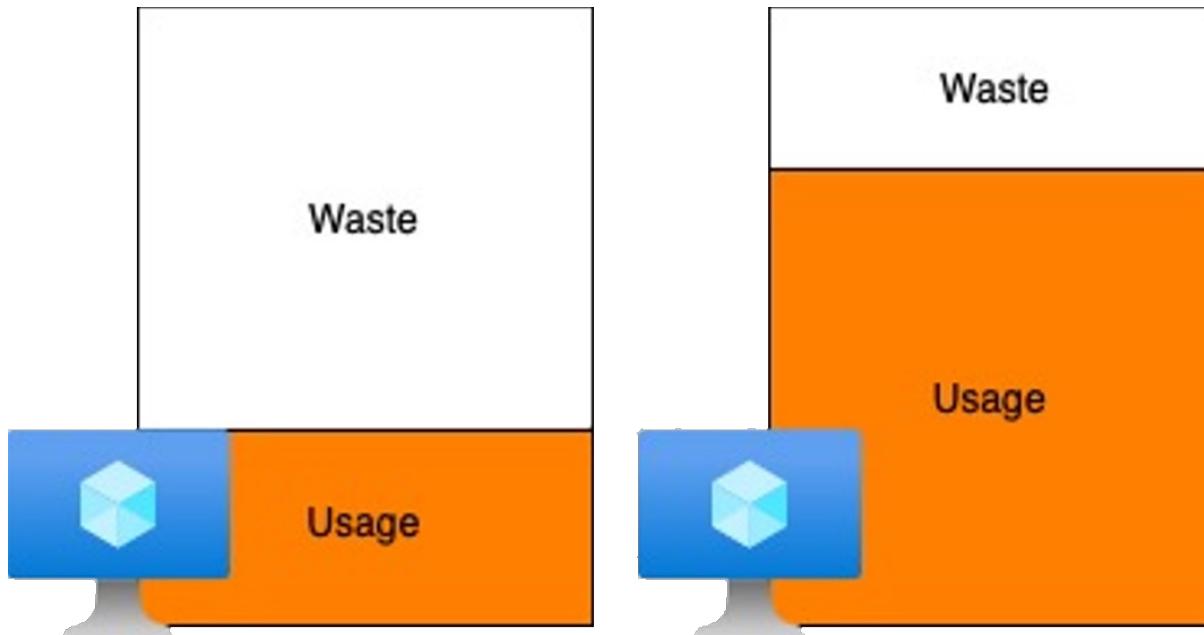
Owners: Enabled

Connection: Apple Fabric

Device: disk3s1s1

Snapshot UUID: A3179218-74AB-4119-A08F-8975AD54E3E4

Waste



How to calculate waste

$$Waste = 100 - \left(\frac{U}{M} \times 100 \right)$$

How to calculate waste

- U = Amount of users
- M = Maximum amount of users

$$Waste = 100 - \left(\frac{U}{M} \times 100 \right)$$

How to calculate waste

$$Waste = 100 - \left(\frac{100}{1000} X 100 \right)$$

90 % Waste

EXAMPLE

Waste

- Waste can be calculated with any possible timeframe
- For continuous load VM's are in some cases more cost efficient
- Dynamic load is most suited for App services or azure functions

How to reduce waste in the cloud



IMPROVE CODE
EFFICIENCY



PICK RIGHT SIZE
SKU



APPLY AUTO
SCALING



REDUCING ZERO
USER IMPACT



STACKING

Cost models*

CAPEX

OPEX

CAPEX – Datacenter

- Requiring huge upfront investments
- ROI is based on usages
- The more it's used the 'Greener' it is
- You and only you can use this asset



OPEX – Azure / Cloud

- Requiring no upfront investments
 - ROI is still based on usages
 - The less Azure you use, the greener you are
 - Shared by many companies



Just In time Cloud



Toyota's Lean DNA

In 1999, Spear and Bowen identified four rules which characterize the "Toyota DNA":

1. All work shall be highly specified as to content, sequence, timing, and outcome.
2. Every customer-supplier connection must be direct, and there must be an unambiguous yes or no way to send requests and receive responses.
3. The pathway for every product and service must be simple and direct.
4. Any improvement must be made in accordance with the scientific method, under the guidance of a teacher, at the lowest possible level in the organization.

Toyota's Cloud's Lean DNA

In 2023, Hamers and Koot identified four rules which characterize the "Cloud Lean DNA":

All infrastructure shall be highly specified as to content, sequence, timing, and outcome.

Every Requests-Response connection must be direct, and there must be an unambiguous yes or no way to send requests and receive responses.

The application for every product and service must be simple and direct.

Any improvement must be made in accordance with the scientific method, under the guidance of a Cloud architect, at the lowest possible level in the application.

How to improve? - LEAN

LEAN Manufacturing

- Defects
- Excess processing
- Overproduction
- Waiting
- Inventory
- Transportation
- Non-utilized Talent

LEAN Cloud

- Optimise quality
- Keep application simple
- Do you really need kube?
- Waiting
- Pick the right SKU's
- Reduce traffic size
- Non-utilized Talent

How to improve

Cloud automation



Cloud first



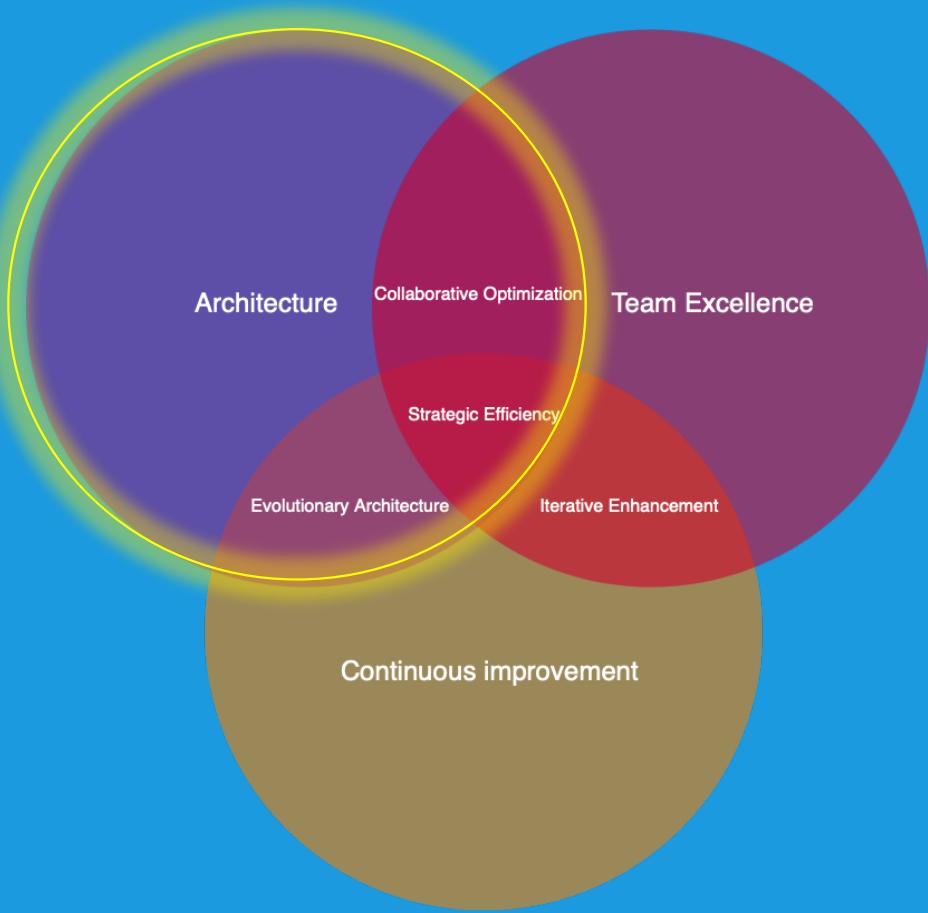
M C 2

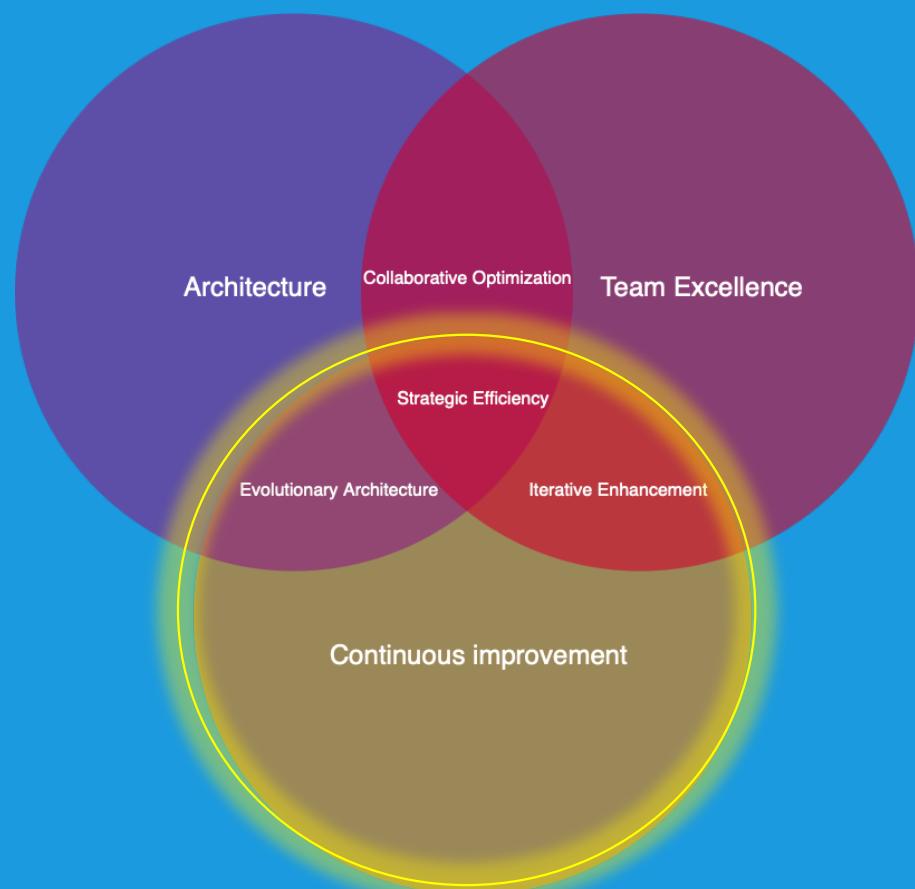
Cloud native
architecture



Monitoring







BUDGET



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Budget

An elastic cloud ...



...means an elastic budget

Budget – different types

Free for all



Fixed



Variable

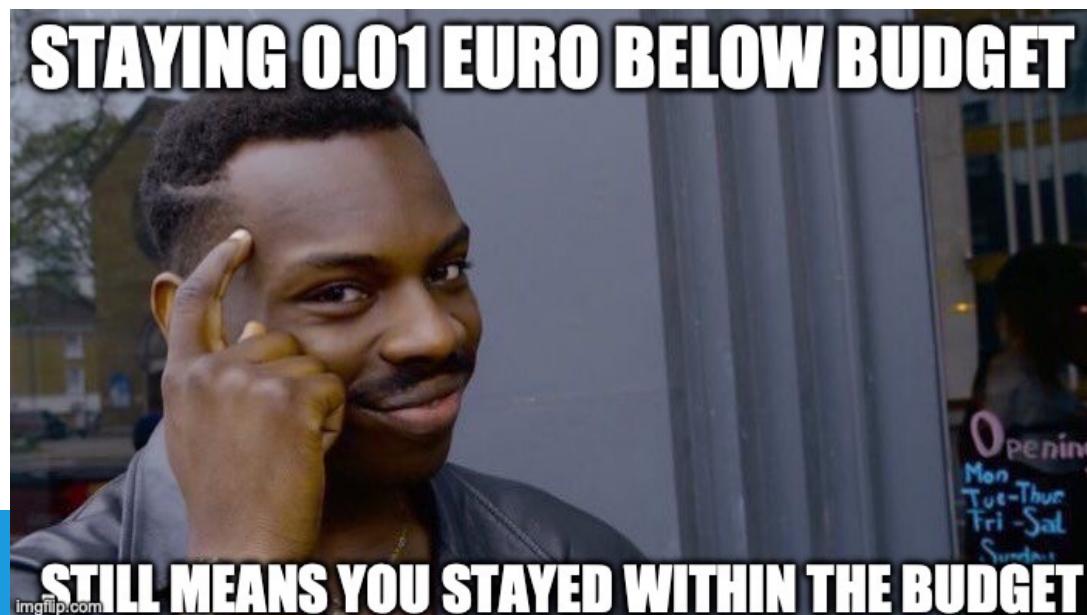


Metric based



Budget – A fixed Budget is an easy target

- Create an incentive to lower your costs
- Budget on metrics instead of fixed figures



Monitoring

Real-time Visibility

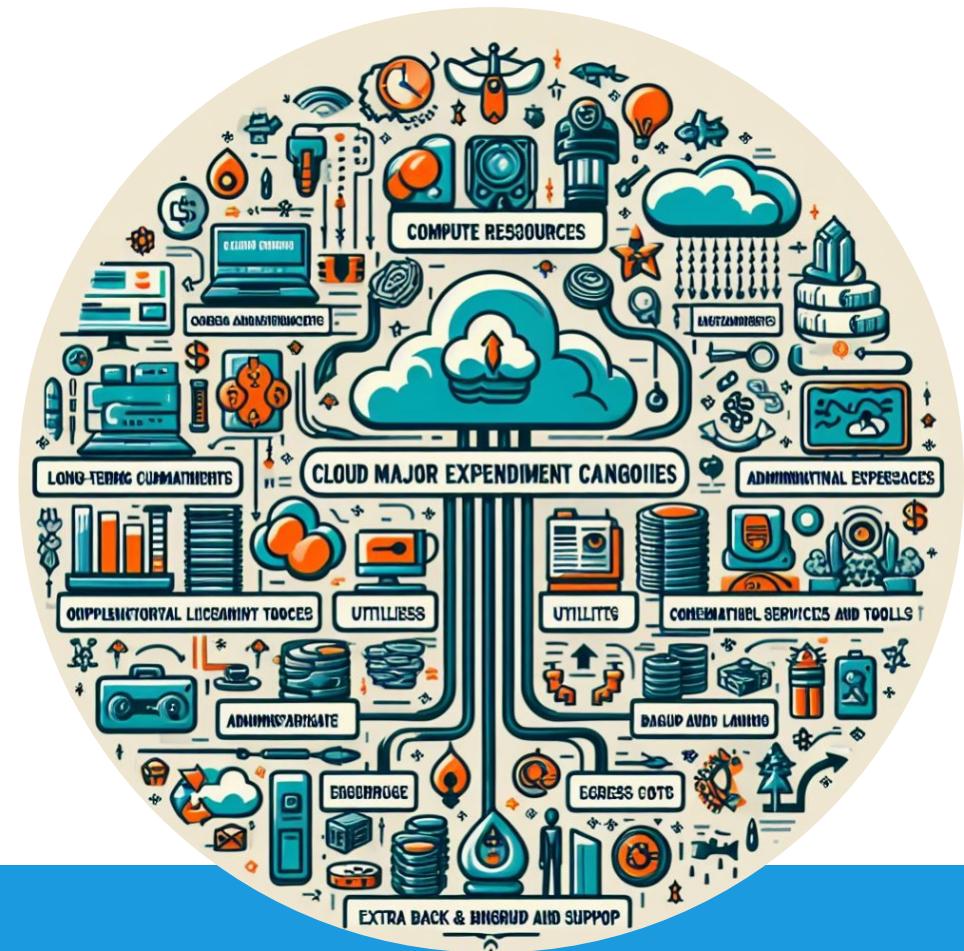
Granular Data

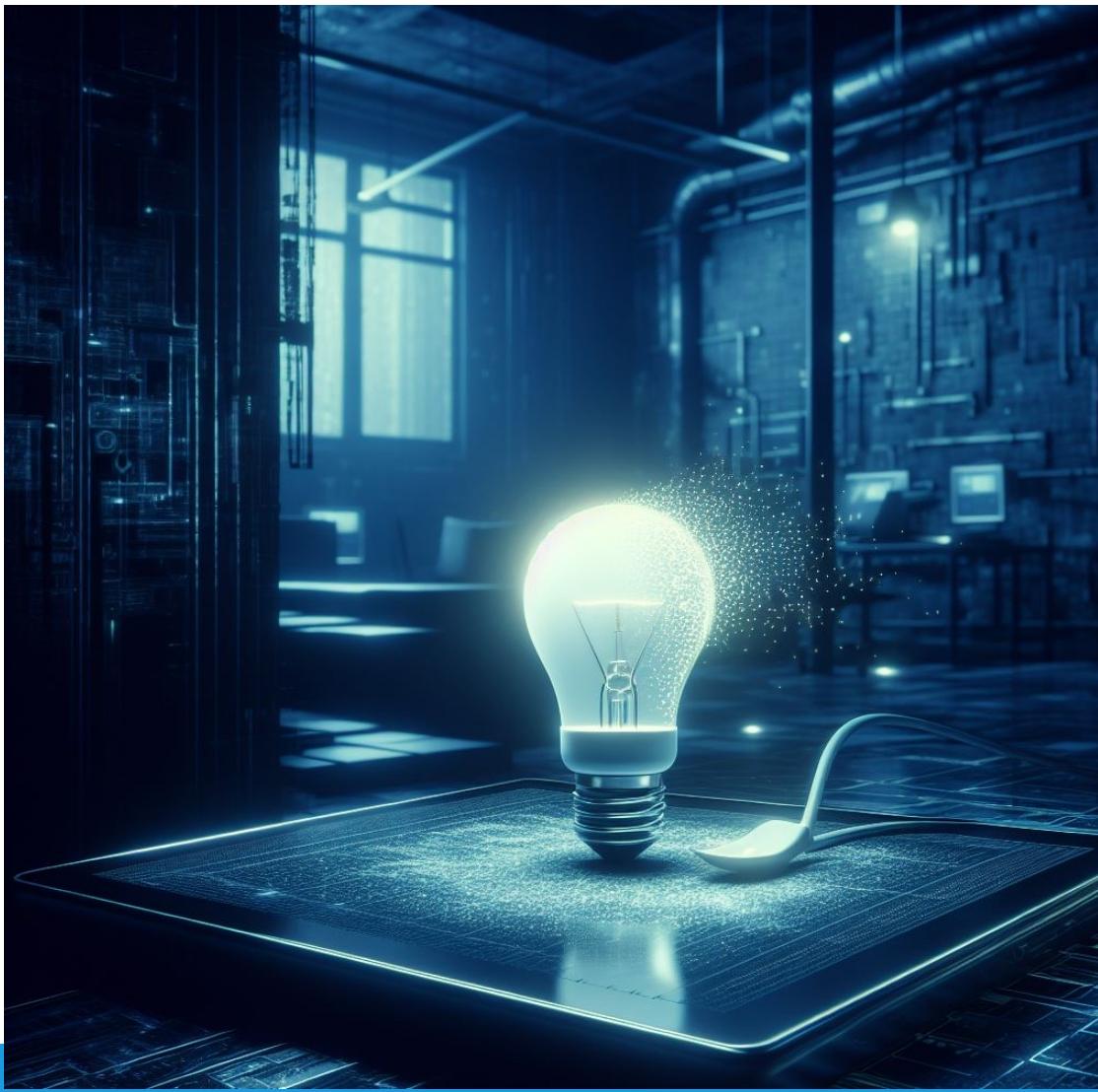
Cost Allocation



Cloud Major Expenditure Categories (CMEC)

- Compute Resources
 - Long-Term Commitments
 - Operational Expenses (Storage)
 - Utilities (Network and Bandwidth Costs)
 - Data Transfer and Migration
 - Complementary Services and Tools
 - Administrative Licensing and Support
 - Transaction Costs (Egress and Ingress)
 - Extra Backup and Archiving Costs
 - Software Licensing and Support





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Zero User impact

“the amount of impact associated with running your cloud environment without any user based activity”

Optimizations

- Multi-Tenancy:
Efficiently share resources to reduce costs.
- Resource Scaling:
Dynamically adjust resources based on usage.
- Transparency:
Provide cost & emission visibility to customers.
- Usage Analytics:
Monitor customer usage for optimization.
- Regular Cost Audits:
Identify cost savings opportunities.



Toolbox



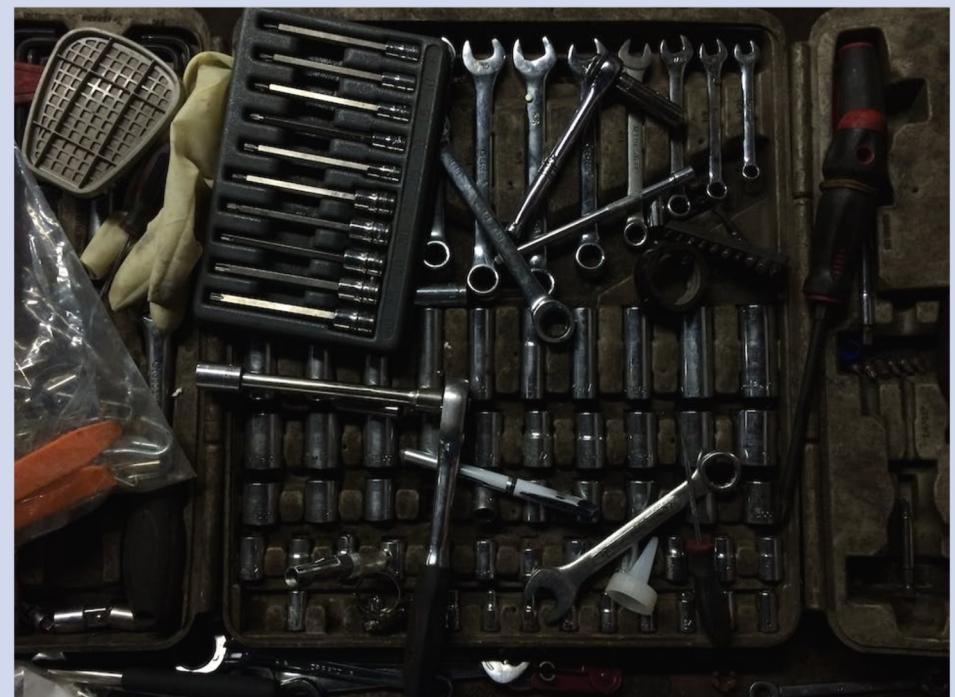
AWS Cost Explorer



Google Cloud's Cost Management Tools



Azure Cost Management



Toolbox



AWS Cost Explorer



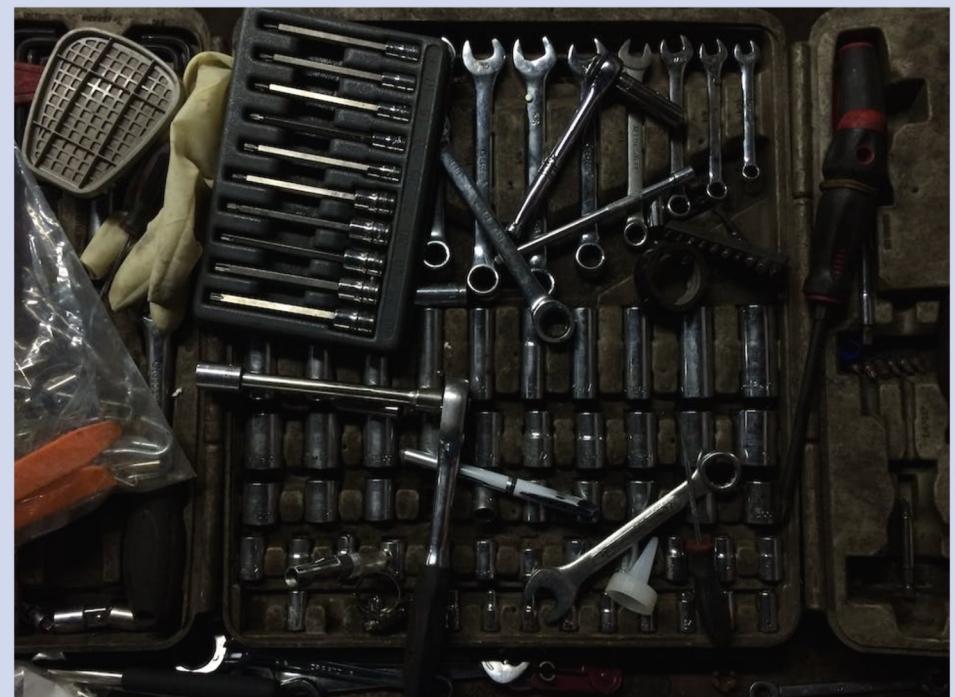
Google Cloud's Cost Management Tools

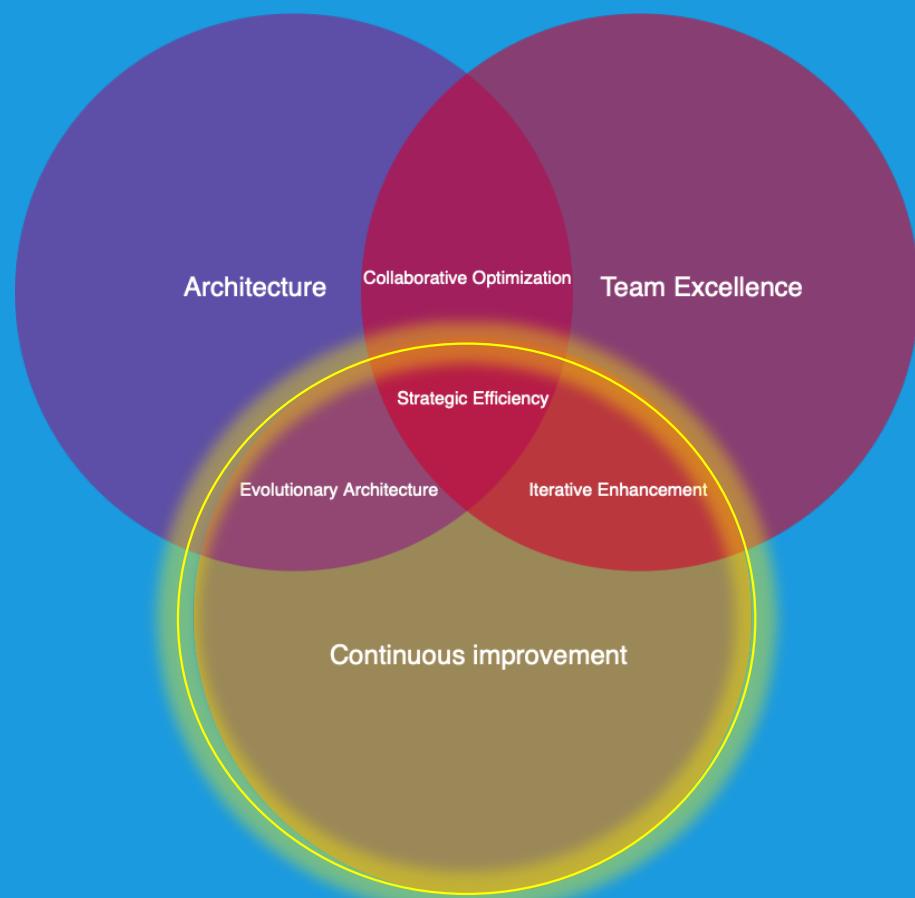


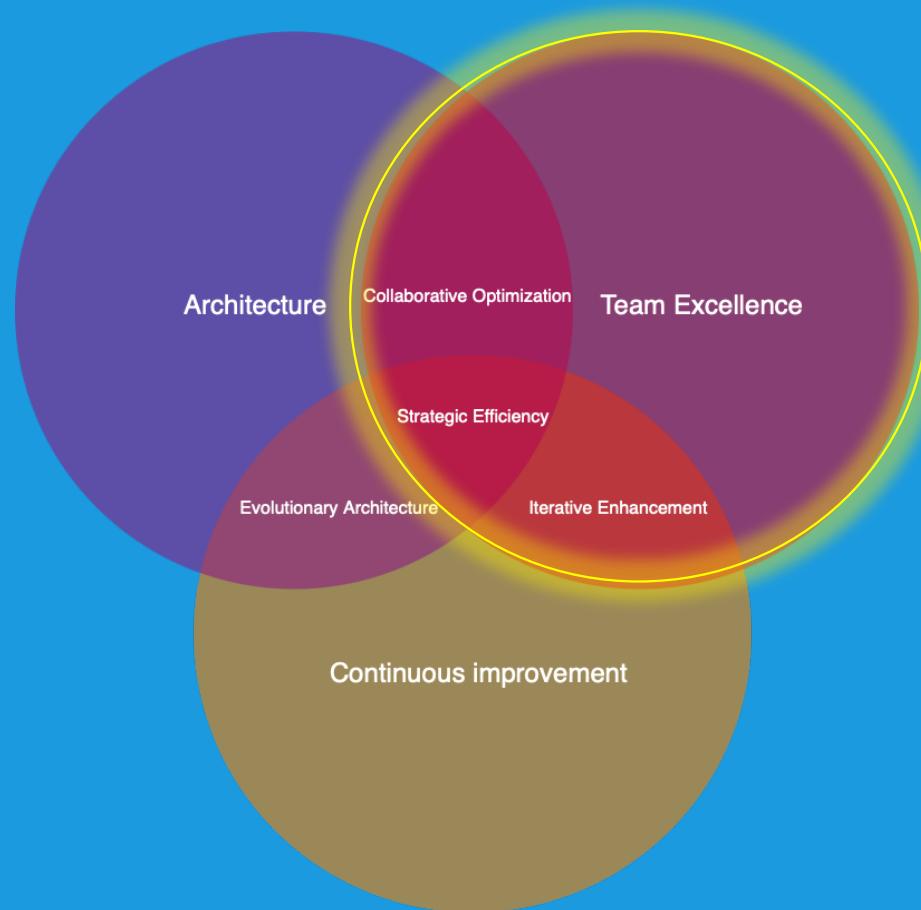
Azure Cost Management



Automation



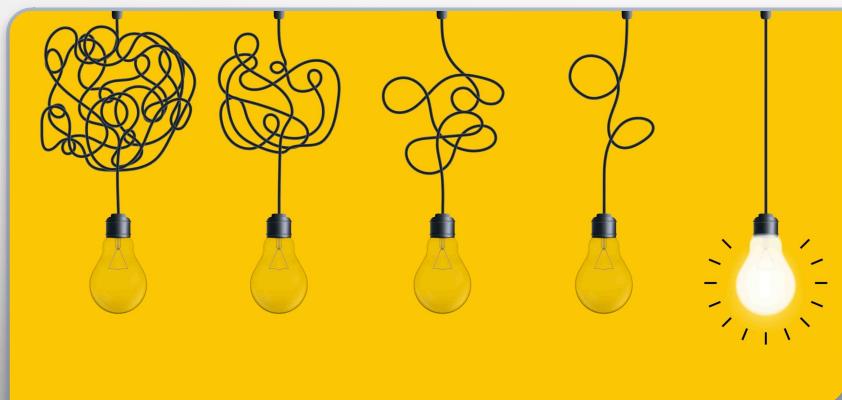




Green coding

- Code optimization
Resource optimization (CPU / Mem etc)
Energy-efficient design patterns Caching, lazy coding, async
- Sustainable development
Containerization, Serverless computing, Load balancing, deployment configuration
- Phasing out End-of-Life applications
Rapid phasing out of EoL, and making your applications or software)
- Testing Efficiency
Testing, usage profiling, and optimization tools)
- Reducing Software Bloat
Reducing complexity, removing unnecessary features, eliminating dependencies on libraries

Green coding



Code optimization

Sustainable development

Phasing out End-of-Life applications

Testing Efficiency

Reducing Software Bloat

The screenshot shows a Microsoft Learn module titled "The Principles of Sustainable Software Engineering". The module is categorized under "Training" and has a duration of 25 min. It is a "Module" consisting of 10 Units. A "Feedback" link is available. The module is tagged with various professional roles: Beginner, Developer, Administrator, Solution Architect, Student, DevOps Engineer, Data Scientist, Data Engineer, Database Administrator, AI Edge Engineer, AI Engineer, Technology Manager, Azure, .NET, and Microsoft Power Platform. A brief description states that Sustainable Software Engineering is an emerging discipline at the intersection of climate science, software, hardware, electricity markets, and data center design. The module aims to define, build, and run sustainable software applications. Learning objectives include identifying the six principles of Sustainable Software Engineering and understanding the two philosophies. A "Start" button and an "Add" button are at the bottom.

HTTPS://LEARN.MICROSOFT.COM

M C 2

Table 4. Normalized global results for Energy, Time, and Memory

Total			
	Energy	Time	Mb
(c) C	1.00	1.00	1.00
(c) Rust	1.03	1.04	1.05
(c) C++	1.34	1.56	1.17
(c) Ada	1.70	1.85	1.24
(v) Java	1.98	1.89	1.34
(c) Pascal	2.14	2.14	1.47
(c) Chapel	2.18	2.83	1.54
(v) Lisp	2.27	3.02	1.92
(c) Ocaml	2.40	3.09	2.45
(c) Fortran	2.52	3.14	2.57
(c) Swift	2.79	3.40	2.71
(c) Haskell	3.10	3.55	2.80
(v) C#	3.14	4.20	2.82
(c) Go	3.23	4.20	2.85
(i) Dart	3.83	6.30	3.34
(v) F#	4.13	6.52	3.52
(i) JavaScript	4.45	6.67	3.97
(v) Racket	7.91	11.27	4.00
(i) TypeScript	21.50	26.99	4.25
(i) Hack	24.02	27.64	4.59
(i) PHP	29.30	36.71	4.69
(v) Erlang	42.23	43.44	6.01
(i) Lua	45.98	46.20	6.62
(i) Jruby	46.54	59.34	6.72
(i) Ruby	69.91	65.79	7.20
(i) Python	75.88	71.90	8.64
(i) Perl	79.58	82.91	19.84



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Our Typical DevOps team



Building a Diverse and Collaborative Cloud Cost Team

- Diverse Expertise
- Cost Responsibility
- Collaboration
- Cost Visibility
- Emission Visibility
- Continuous Learning



Doorbelasting Azure omgevingen - januari 2024 - Inbox • michiel.hamers@ordina.nl

Delete Archive Move Flag Mark as Unread Sync ...

Doorbelasting Azure omgevingen - januari 2024

To: cms-finance <cms-finance@ordina.nl>
Cc: Morren, Wilco; Hamers, Michiel; Grootoorn, Maarten

Friday, 9 February 2024 at 15:3

Goedendag,

Hierbij ontvang je de specifiecatie betreffende de doorbelastingskosten van onderstaande Azure cloud omgeving(en) door de Ordina area Platform engineering & operations.

Je staat momenteel genoteerd als (gedelegeerd) contracteigenaar of aanspreekpunt voor het onderstaande overzicht.

Periode: januari 2024
Rijlabels: Azure Subscription-naam met resource-group-namen en/of reservationID
Kolomlabels: Ordina klant-contract-naam en kostenplaats.

Doorbelasting klant	Kolomlabels
Alliander	Alliander - Alliander XR HPT Azure Spatial Anchors
90392120	
Alliander XR HPT Azure Spatial Anchors	
azureapp-auto-alerts-972a0f-Michiel_Hamers_ordina_nl	€ 0
Ordina MTech	
	€ 7
azureapp-auto-alerts-44c91e-Twan_Koot_ordina_nl	€ 0
AzureArcTest	€ 0
cloud-shell-storage-westeurope	€ 1
defaultresourcegroup-weu	€ 0
oai-be-eastus	€ 0
RG_Afstudeerproject_Lucas_Spits_February_2023	€ 0
RG_ampersand	€ 23
rg_ampersand_aks	€ 155
rg_data_ai	€ 280
RG_MTechXR_data	€ 14
rg-advent-of-code	€ 0
rg-training-tests	€ 15
Stichting-NUTwente	€ 173
Ordina NL JTech - OpenSource	
	€ 48
cloud-shell-storage-westeurope	€ 1
internship-communication-platform	€ 69
mc_rg-aienhanceddevteams_ai_westeurope	€ 1
politie-voicid	€ 0
proxy	€ 13
rg-accelerator-aks	€ 0
rg-AIEnhancedDevTeams	€ 202
rg-AIEnhancedDevTeamsResource	€ 80
rg-appstarter-ontw	€ 0
Eindtotaal	€ 1.083

Met vriendelijke groet namens het CMS-Team,



Cost anomaly detected in the Ordina MTech subscription - Inbox • michiel.hamers@ordina.nl

Delete Archive Move Flag Mark as Unread Sync ...

Cost anomaly detected in the Ordina MTech subscription

Microsoft <microsoft-noreply@microsoft.com>

To: Hamers, Michiel

Tuesday,

Microsoft

Anomaly alert: An unusual cost decrease was detected

An unusual cost decrease was detected on September 10, 2023 for the Ordina MTech subscription. Cost Management detected a possible cost anomaly based on daily cost trends between July 13, 2023 and September 10, 2023. Please review changes to determine whether this was expected.

Message from the owner of this alert:

lets raars, ff MTech sub checken.

Subscription summary

Anomaly detected	Yes
Delta compared to expected range	-82.69 %

Resource group summary

- Cost changed 15.7% from 20 existing resource group(s).

Most significant changes in resource group(s) during this period

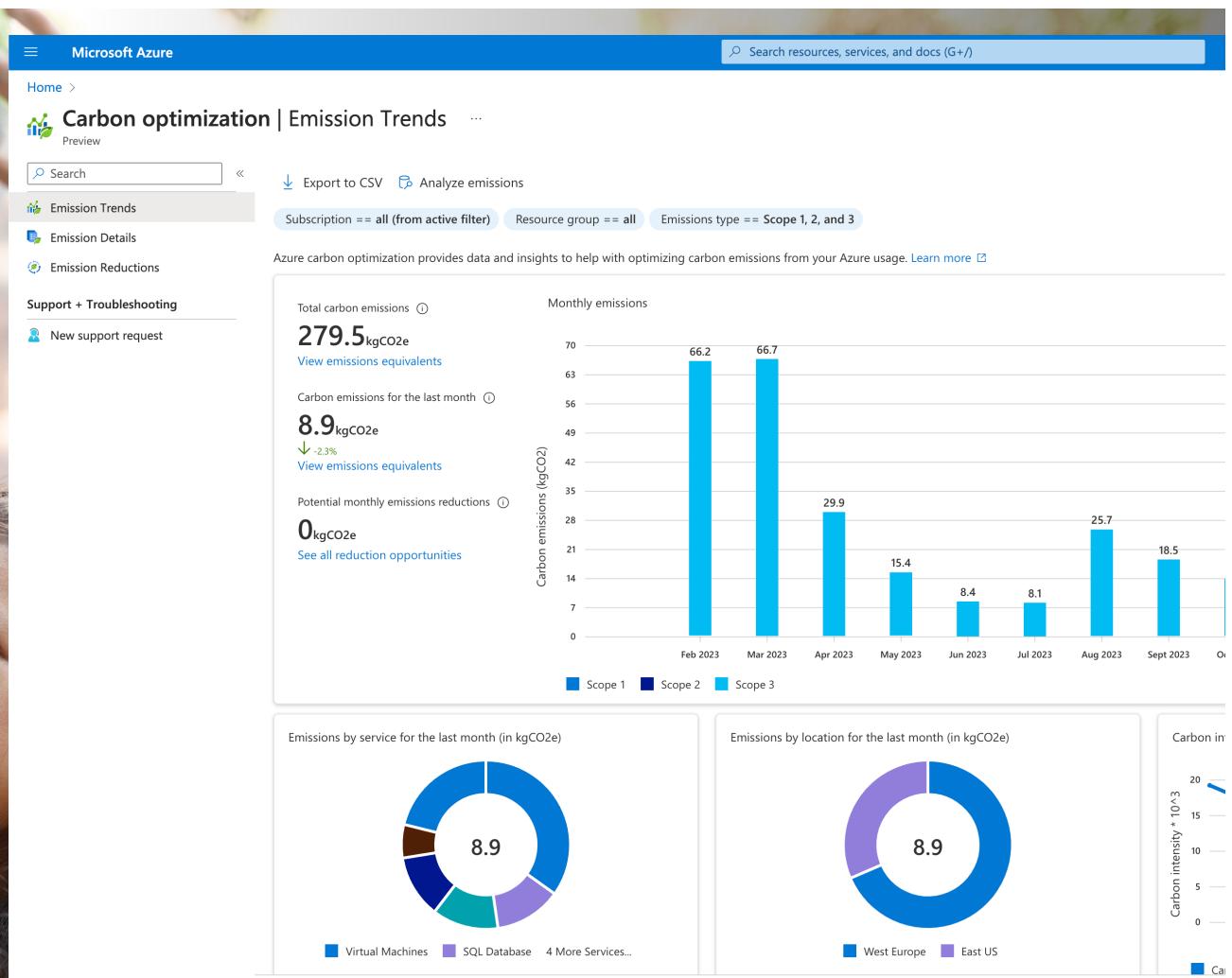
Name	Cost change %	Percent of total
twan-azureservice-stacking	20.66	22.65

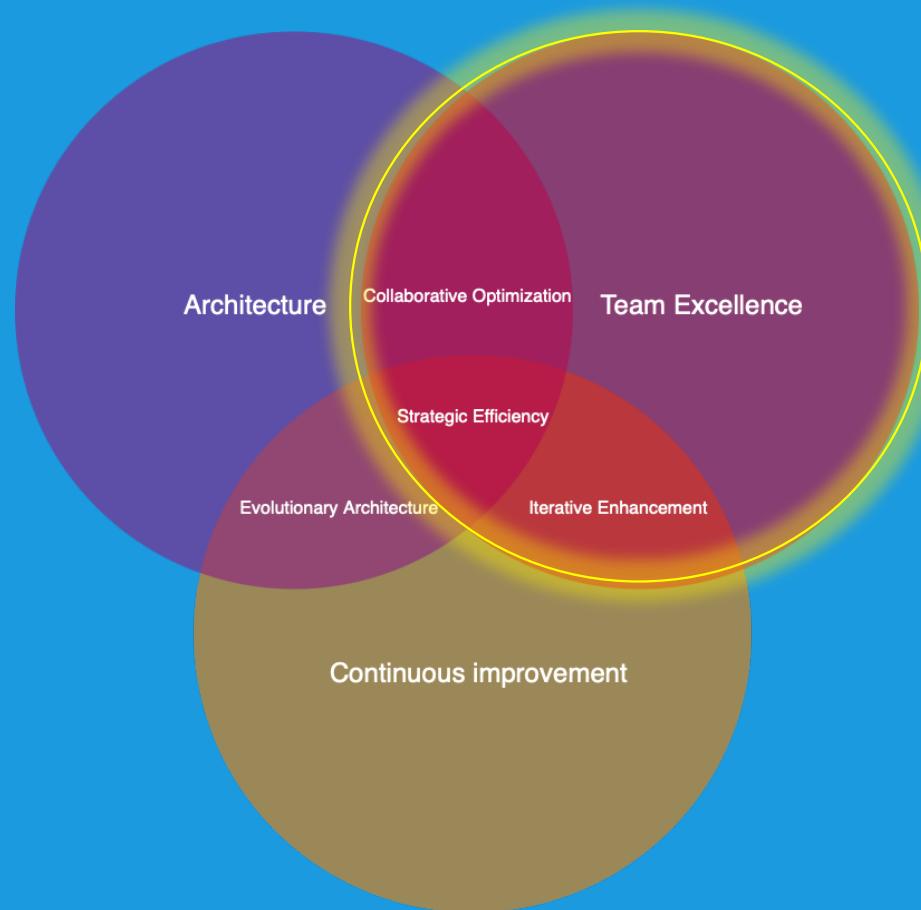
Insights example

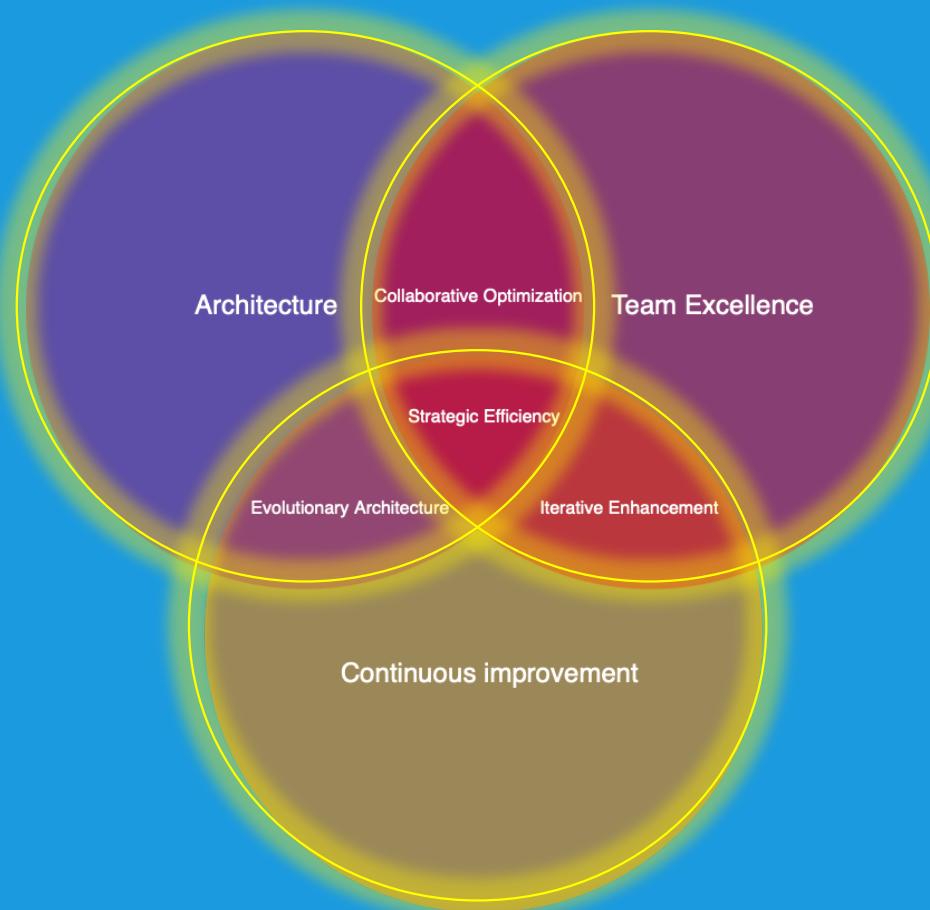


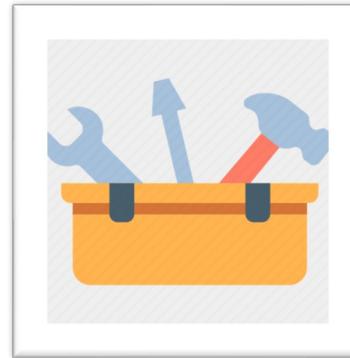
Reducing your CO₂ impact

Protecting our planet is evident to all of us. As global warming continues to rise, the need to reduce our impact on the Earth becomes crucial. Our solution not only focuses on cost reduction but also aims to reduce your CO₂ footprint in your cloud environment.









[Home](#) - [Newsroom](#) - [Press Releases](#) - [Press release](#)

**Sopra Steria commits itself to achieving
"net zero" emissions in 2028 and
accelerates its climate actions for a
sustainable digital transformation**

Paris, Sep 18, 2020 | 4 minute read





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Insights and Strategies

