University of Applied Sciences and Arts Northwestern Switzerland
School of Computer Science

Cloud Computing
(cloud)

Module Overview and Administration

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Who we are?

Reach out to us in the MS Teams Channel

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Who we are?

Prof. Sebastian Graf
Cloud Computing & Agile Software Operations
IMVS, FHNW Brugg/Windisch

CV in a nutshell

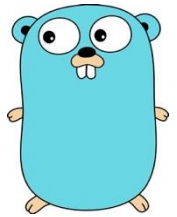
- Dr.-Ing. Universität Konstanz
- Sev. startups as Software Engineer
- 8 years at SBB
  - Softwareengineer, -architect
  - Product Owner, DevOps-Werkzeuge
  - Product Manager, Cloud and Tools
- Some Freelancing Jobs
- Part of several CAS / MSE

Who we are?

Norwin Schnyder
Senior Cloud Software Engineer
Airlock (Ergon Informatik)

CV in a nutshell

- MSc Information Technology, ETH Zurich
- MAS Management, Technology, and Economics, ETH Zurich
- 2019-2024: SIX Group
  - (Cloud) Software Engineer
  - Product Owner
  - Head Managed Container Platforms
- Since 2024: Airlock (Ergon Informatik)
  - Cloud Software Engineer
- Since 2025: Member of the kubernetes-sigs



gateway api

Experiences with Cloud Technologies?

...

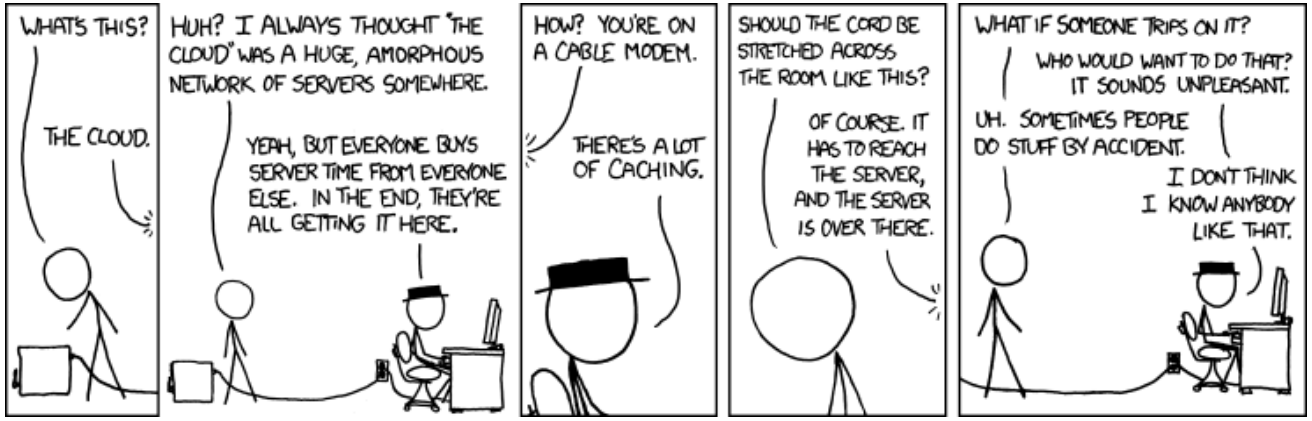
What do you expect?

...

Learning Target

- You have a **technical knowledge** about the different cloud services
- You have an understanding of the **concepts** of underlaying technology
- You are aware about the **technical challenges** cloud infrastructure have, regarding operating as well as using
- You know basically what it takes to **build** up a cloud.

How to get there…



Clouds are basically **platforms**…

so we learn concepts and build platforms

- IaaS:
  - Virtualization, Hypervisor, Virtual Machines, etc.
  - Lab: Proxmox
- PaaS:
  - Container, Paravirtualization, Scalability
  - Labs: Container, Docker Swarm, Kubernetes
- SaaS:
  - Storage
  - Lab: Ceph Storage

What we not cover...

- We will not use any public cloud services (neither will we take a deeper look into it)
  →refer to *Public Cloud Services (pcls)* instead
- We will not bridge between platform and application by deploying more than basic example applications into any cloud
  → refer to *Developer Operations (devops)* instead
- We will not cover Linux Basics / Network Basics / Operating System Basics. It is needed that students feel confident with the following technologies:
  - SSH
  - Linux / Debian
  - Git

  →refer to *sysad*, *bsys*, *dnet1*

You really have to know how to use Linux. If not, please let us know: We give you resources for filling your gaps

Lectures (on-site)

- **Normal Lecture**
  - No recording of the lecture itself
  - However: if there are single, temporary valid reasons, exception might be applied
    No guarantee about the quality will be given
  - If there are interactive sessions with sourcecode, I will share/record to give you the ability to recapitulate in «your speed» and that you might focus on the presentation itself

- **BSS: «Lab»-Sessions**
  - You will built cloud-platforms. In 4 sessions, there will be no active content but in the ability to work on the project while I am present (to answer questions, assist where necessary, etc.)
  - However, if no one will attend in these session, I will leave as well. You might find me in my office afterwards in case of later questions.

Assessment: Building Platforms

- There will be no weekly homework
  (If I find some suitable tutorials, I will refer you to them but up to now, I do not plan to do so)
- Instead, you will build 4 Cloud Platforms.
  The success/failure of building these platforms will generate the «Erfahrungsnote»
  - You will have at least 2 weeks time to build one platform.
  - For each platform, a short (individual) screencast needs to be recorded (see next slide for details)
  - Each platform count 25% towards the «Erfahrungsnote»
  - There will be a dedicated BSS/Lab-Slot instead of an active lecture where you ask me for support
  - Besides, you might me almost any time virtually
    (but expect partially longer latencies because of workload)

Assessment: Building Platforms

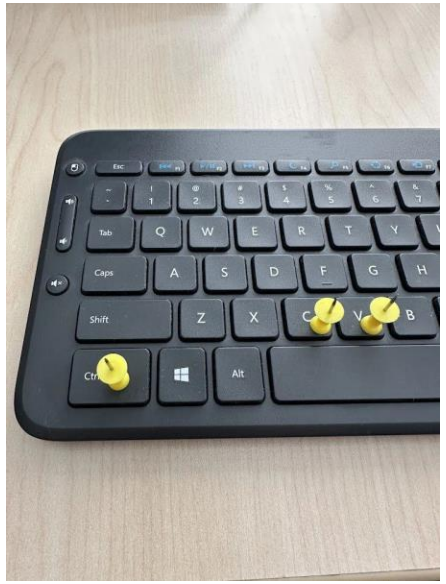
- It is expected that you build the platforms together with equal shares (no carrying please)
- Additionally to each platform, there will be the demand of an individual screencast (5min) related to the topic of the platform to ensure that every person has in-depth knowledge about the platform built

Which platforms to build?

- **Proxmox** (IaaS)
  Duration: 26.9. - 9.10.
  BSS: 3.10.
- **Container, Docker Swarm** (PaaS)
  Duration: 17.10. - 30.10.
  BSS: 24.10.
- **Container, Kubernetes** (PaaS)
  Duration: 7.11. – 20.11.
  BSS: 14.11.
- **Storage, Ceph** (SaaS)
  Duration: 28.11. – 11.12.
  BSS: 5.12.

How?

- Done by groups of 1-3 people (preferable 2)
- Implemented on SwitchEngines
  - Please fill you xls on teams if not done yet
  - Please use only the location defined (ZH/LS) (and do not use the other location)
- Evaluation is done via Ansible and SSH
  - Please add the pub-key to all of your machines with a user «eval» and root-access / sudo-rights: https://gitlab.fhnw.ch/spd/module/cloud/platforms_to_build/-/blob/main/access/id_ed25519.pub?ref_type=heads



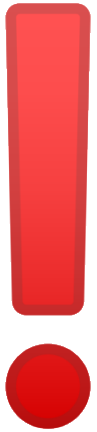
MSP

The following resources are relevant for the MSP:

- Presentations from the lectures (theory)
- Practical experience from the platforms
- Literature provided and directly linked in the lecture

MSP will be closed book and announced as soon as we got more information

Administative Guideline („**Drehbuch**“)



- Of course, a Link is on the share…
- …however refer to
  https://sgi.pages.fhnw.ch/moduluebersicht/cloud/drehbuch.html
  for updates relate to schedule, etc .
- Changes (especially to the schedule) might apply!

What we provide to you…

- https://sgi.pages.fhnw.ch/moduluebersicht/cloud/drehbuch.html : recent schedule
- Switch Engines
  - Projects should be large enough
  - Engines will shut down at night to reduce costs
- Support and indivdual help
  (Asking Google, ChatGPT, whatever first is highly appreciated…)
- Literature: https://learning.oreilly.com/playlists/43827098-7a87-435e-823e-736586b5694c

Software and Tools

What you need…

- SSH
- Web browser
- PDF Reader
- Any kind of IDE / Texteditor
- Internet Connection

Motivation

*"Cloud Services are one (if not **the**) main driver of the digitalization"*

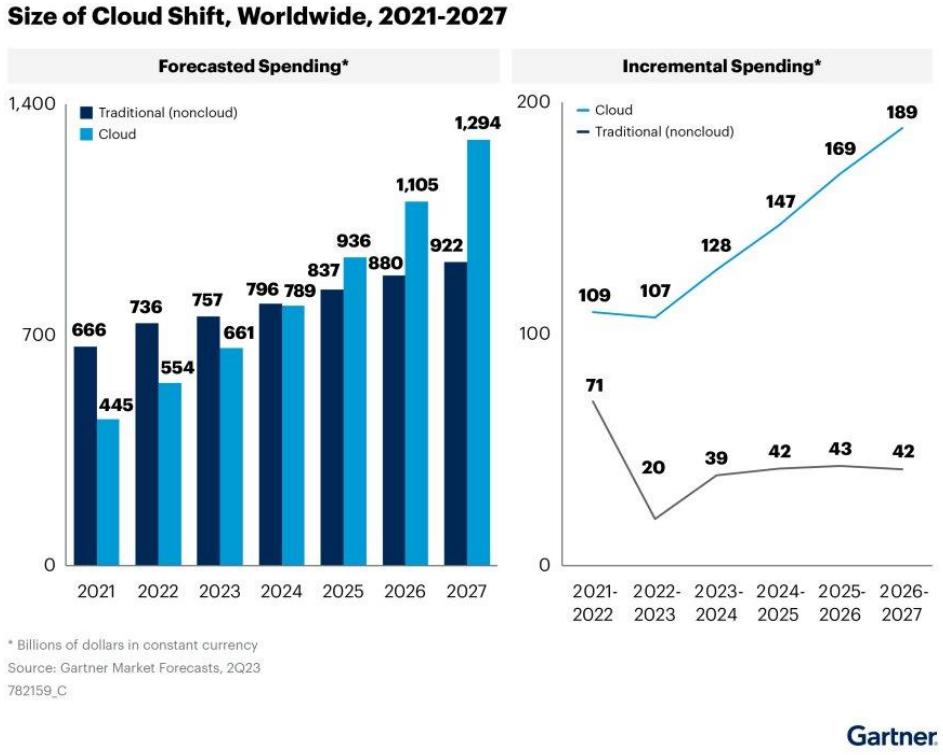
Impacts on IT Infrasturcture

- The Cloud Market grows linear
  (while the on prem-part remains constant)

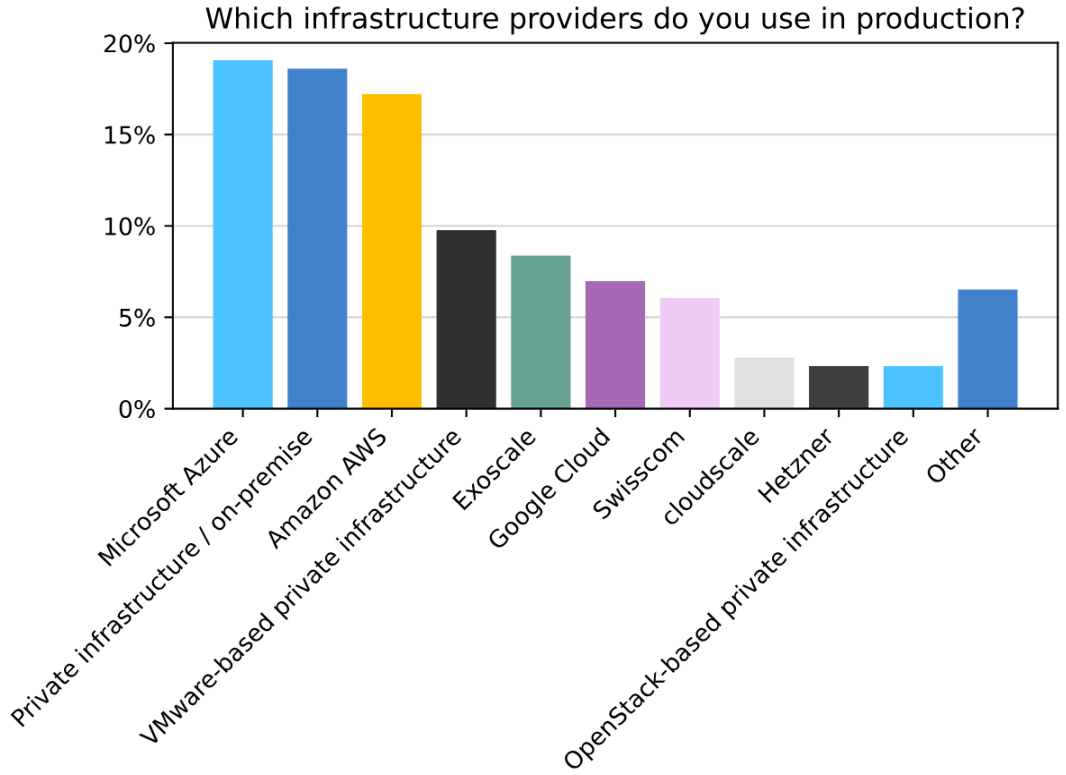
- **Software eats Infrastructure**
  More and more infrastructure will be virtualized

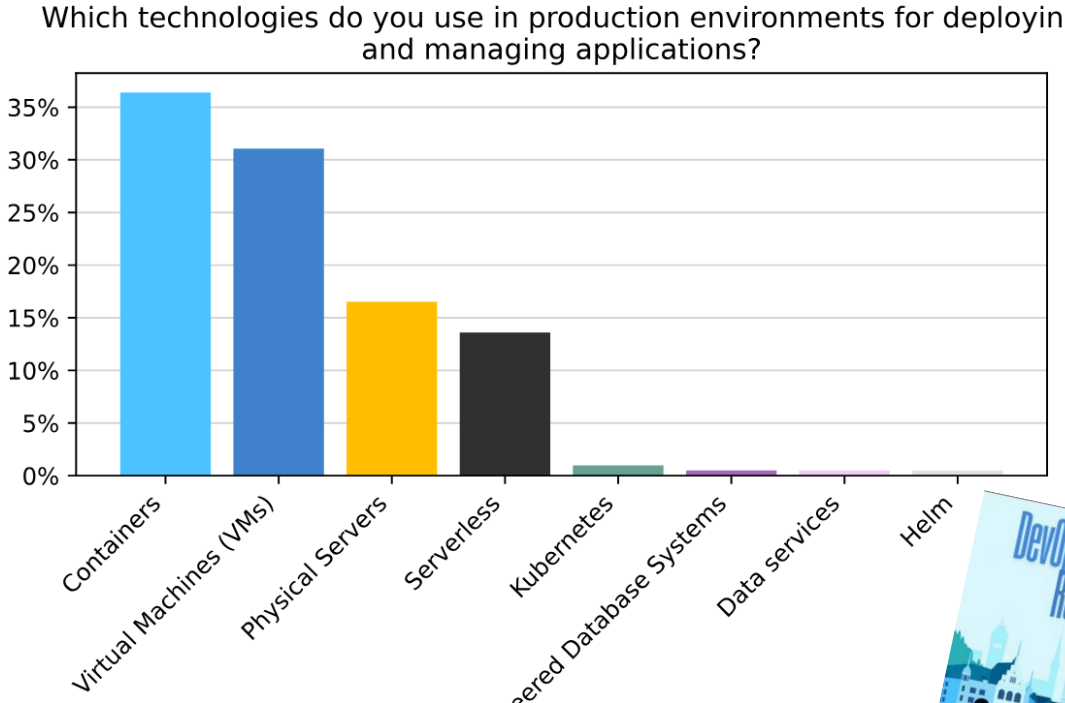
- **IaC** (*Infrastructure as Code*) Tools become usable

- **Shift left**
  Infrastructure becomes managable with the help of software development techniques, responsibilities shift left to product teams

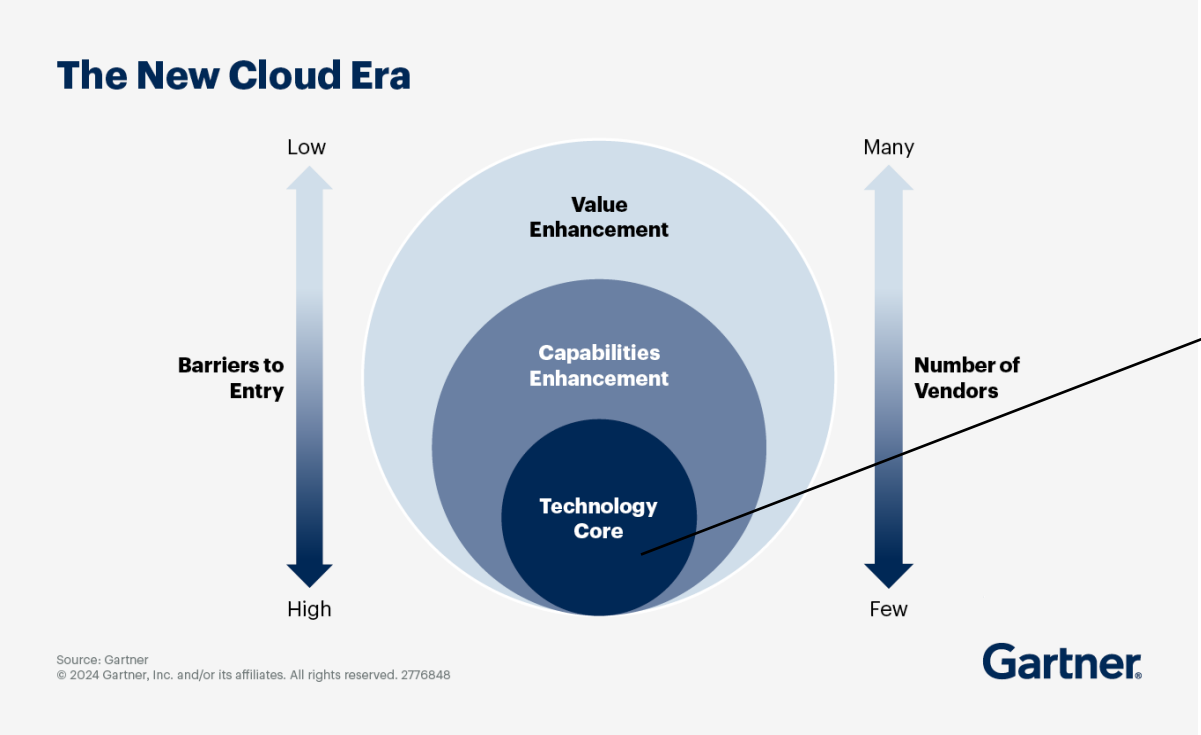


Cloud is Everywhere

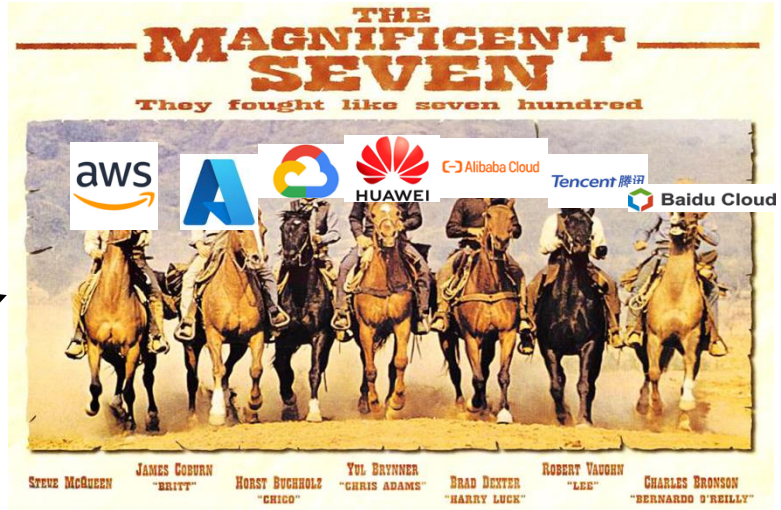




Impacts on the IT Hardware Industry



Hyperscalers



They are really big!

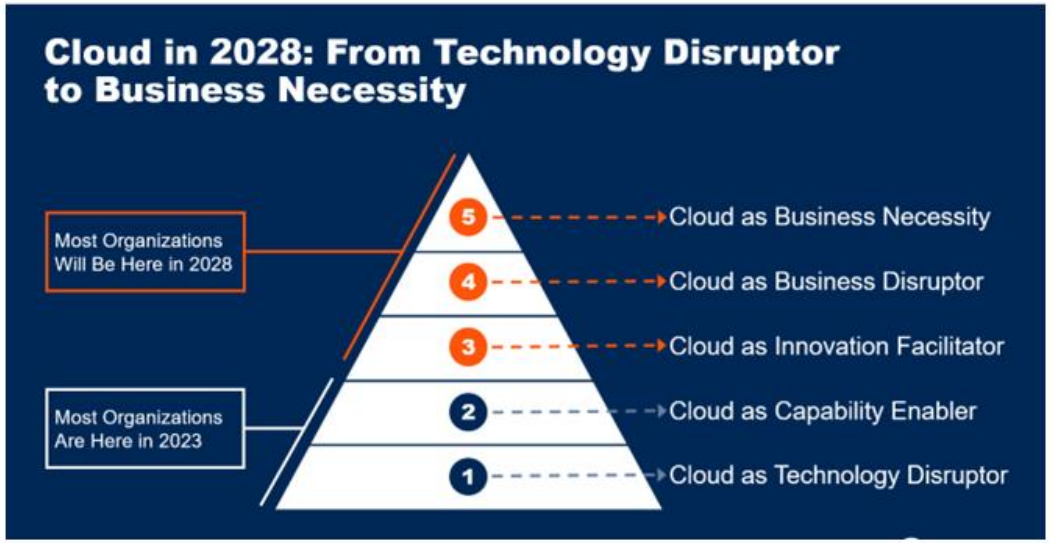
- Dominate the server market
- Build their own hardware

→ Less emphasis on standards and compatibility

Impacts on Organizations

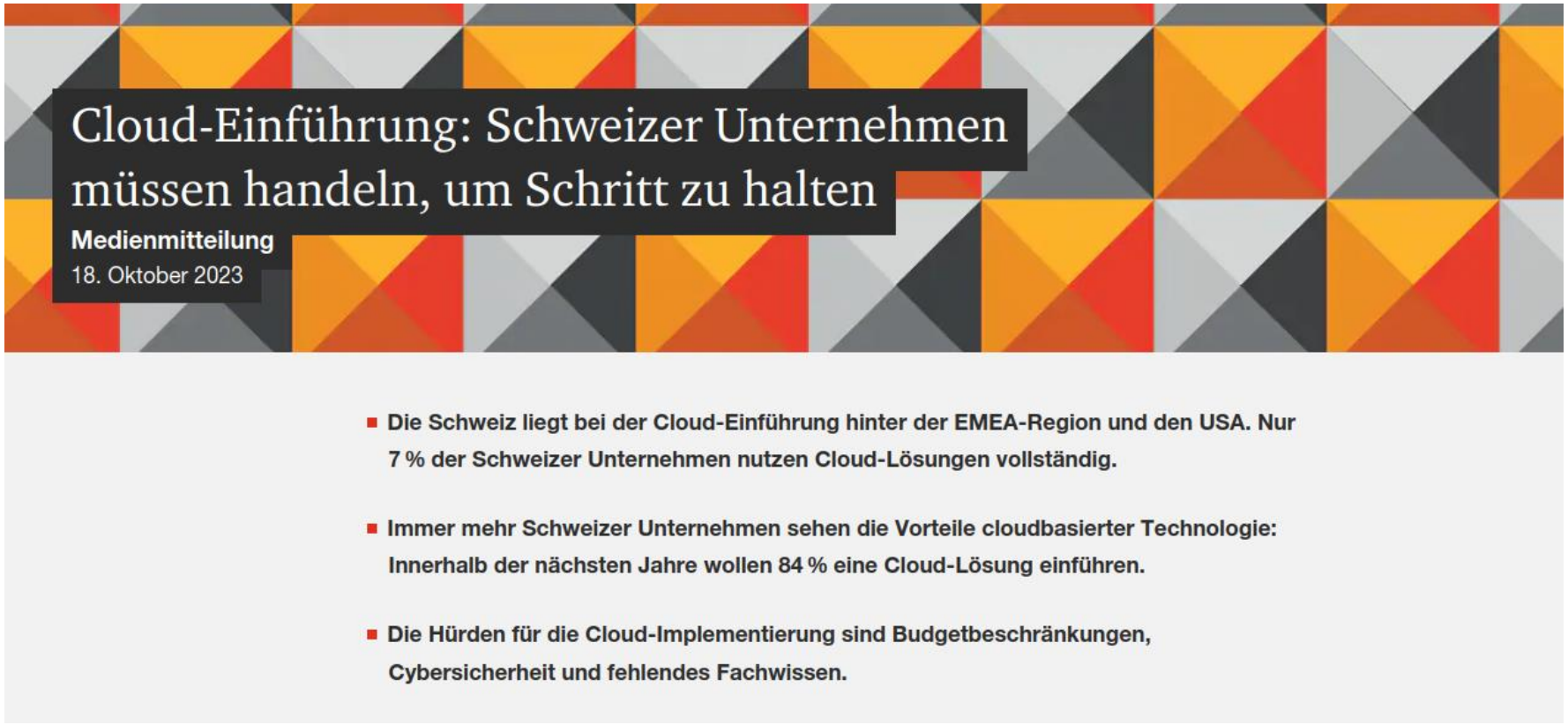
- Without Cloud, it is hard to automate.
- Without automation, it is hard to scale regarding operation
- Without scaling operations, it is impossible foster devops
- Without devops, agility is hampered

Figure 1. The Future of Cloud Computing Through 2028

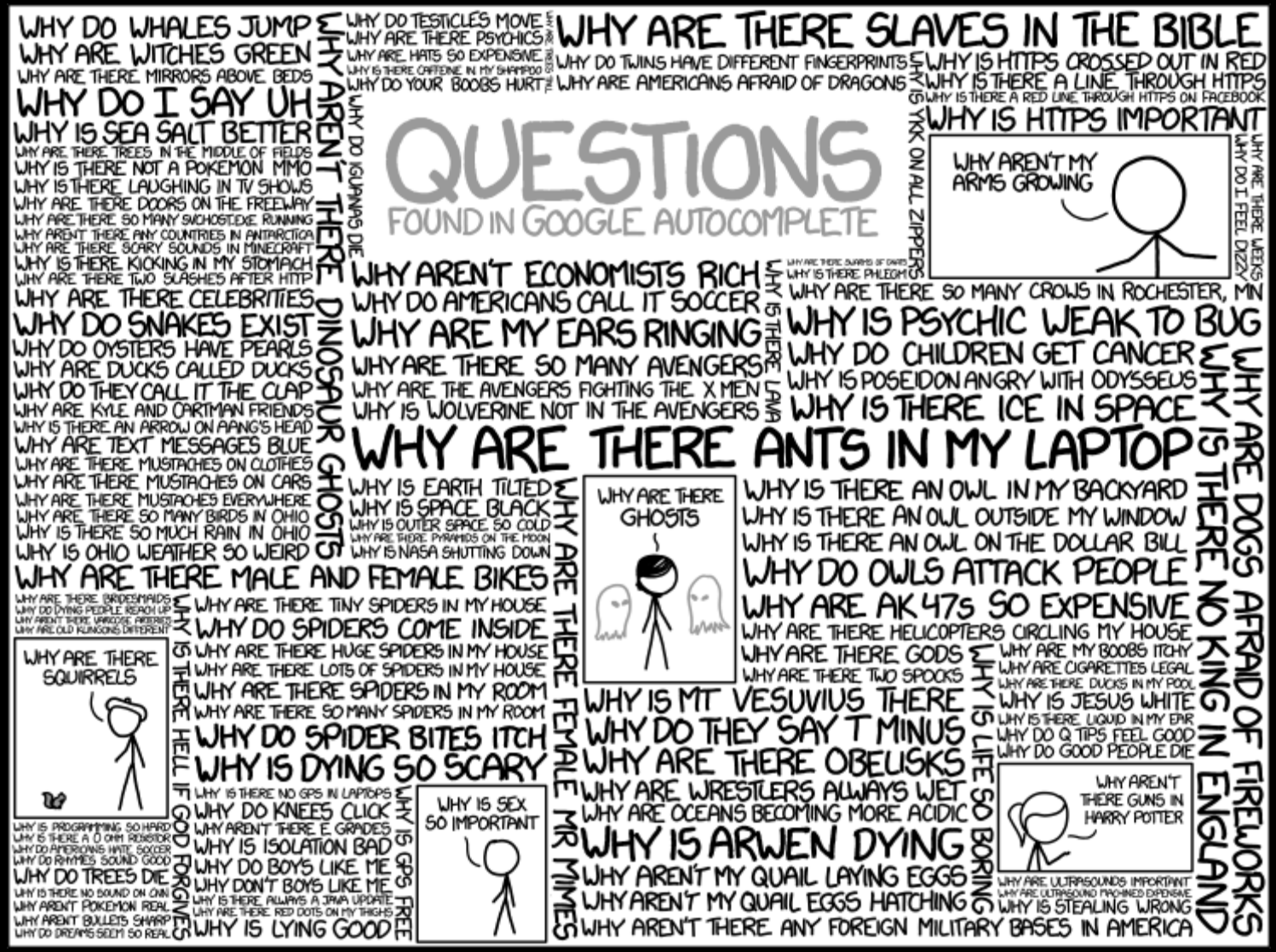


Source: Gartner (November 2023)

Swiss cloud gap



PwC, Cloud Business Survey - Behind the curve: An analysis of cloud technology adoption in Switzerland (2023)


QUESTIONS
FOUND IN GOOGLE AUTOCOMPLETE
WHY ARE THERE SLAVES IN THE BIBLE
WHY DO WHALES JUMP
WHY ARE WITCHES GREEN
WHY ARE THERE MIRRORS ABOVE BEDS
WHY DO I SAY UH
WHY IS SEA SALT BETTER
WHY ARE THERE TREES IN THE MIDDLE OF FIELDS
WHY IS THERE NOT A POKEMON MMO
WHY IS THERE LAUGHING IN TV SHOWS
WHY ARE THERE DOORS ON THE FREEWAY
WHY ARE THERE SO MANY SVCHOST.EXE RUNNING
WHY AREN'T THERE ANY COUNTRIES IN ANTARCTICA
WHY ARE THERE SCARY SOUNDS IN MINECRAFT
WHY IS THERE KICKING IN MY STOMACH
WHY ARE THERE TWO SLASHES AFTER HTTP
WHY ARE THERE CELEBRITIES
WHY DO SNAKES EXIST
WHY DO OYSTERS HAVE PEARLS
WHY ARE DUCKS CALLED DUCKS
WHY DO THEY CALL IT THE CLAP
WHY ARE KYLE AND CARTMAN FRIENDS
WHY IS THERE AN ARROW ON AANG'S HEAD
WHY ARE TEXT MESSAGES BLUE
WHY ARE THERE MUSTACHES ON CLOTHES
WHY ARE THERE MUSTACHES ON CARS
WHY ARE THERE MUSTACHES EVERYWHERE
WHY ARE THERE SO MANY BIRDS IN OHIO
WHY IS THERE SO MUCH RAIN IN OHIO
WHY IS OHIO WEATHER SO WEIRD
WHY ARE THERE MALE AND FEMALE BIKES
WHY ARE THERE BRIDESMAIDS
WHY DO DYING PEOPLE REACH UP
WHY AREN'T THERE VARICOSE ARTERIES
WHY ARE OLD KLINGONS DIFFERENT
WHY ARE THERE SQUIRRELS
WHY IS PROGRAMMING SO HARD
WHY IS THERE A 0 OHM RESISTOR
WHY DO AMERICANS HATE SOCCER
WHY DO RHYMES SOUND GOOD
WHY DO TREES DIE
WHY IS THERE NO SOUND ON CNN
WHY AREN'T POKEMON REAL
WHY AREN'T BULLETS SHARP
WHY DO DREAMS SEEM SO REAL
WHY ARE THERE TINY SPIDERS IN MY HOUSE
WHY DO SPIDERS COME INSIDE
WHY ARE THERE HUGE SPIDERS IN MY HOUSE
WHY ARE THERE LOTS OF SPIDERS IN MY HOUSE
WHY ARE THERE SPIDERS IN MY ROOM
WHY ARE THERE SO MANY SPIDERS IN MY ROOM
WHY DO SPIDER BITES ITCH
WHY IS DYING SO SCARY
WHY IS THERE NO GPS IN LAPTOPS
WHY DO KNEES CLICK
WHY AREN'T THERE E GRADES
WHY IS ISOLATION BAD
WHY DO BOYS LIKE ME
WHY DON'T BOYS LIKE ME
WHY IS THERE ALWAYS A JAVA UPDATE
WHY ARE THERE RED DOTS ON MY THIGHS
WHY IS LYING GOOD
WHY DO TESTICLES MOVE
WHY ARE THERE PSYCHICS
WHY ARE HATS SO EXPENSIVE
WHY IS THERE CAFFEINE IN MY SHAMPOO
WHY DO YOUR BOOBS HURT
WHY DO TWINS HAVE DIFFERENT FINGERPRINTS
WHY ARE AMERICANS AFRAID OF DRAGONS
WHY IS HTTPS CROSSED OUT IN RED
WHY IS THERE A LINE THROUGH HTTPS
WHY IS THERE A RED LINE THROUGH HTTPS ON FACEBOOK
WHY IS HTTPS IMPORTANT
WHY AREN'T MY ARMS GROWING
WHY ARE THERE SWARMS OF DAVES
WHY IS THERE PHLEGM
WHY ARE THERE SO MANY CROWS IN ROCHESTER, MN
WHY AREN'T ECONOMISTS RICH
WHY DO AMERICANS CALL IT SOCCER
WHY ARE MY EARS RINGING
WHY ARE THERE SO MANY AVENGERS
WHY ARE THE AVENGERS FIGHTING THE X MEN
WHY IS WOLVERINE NOT IN THE AVENGERS
WHY IS PSYCHIC WEAK TO BUG
WHY DO CHILDREN GET CANCER
WHY IS POSEIDON ANGRY WITH ODYSSEUS
WHY IS THERE ICE IN SPACE
WHY ARE THERE ANTS IN MY LAPTOP
WHY IS EARTH TILTED
WHY IS SPACE BLACK
WHY IS OUTER SPACE SO COLD
WHY ARE THERE PYRAMIDS ON THE MOON
WHY IS NASA SHUTTING DOWN
WHY ARE THERE GHOSTS
WHY IS THERE AN OWL IN MY BACKYARD
WHY IS THERE AN OWL OUTSIDE MY WINDOW
WHY IS THERE AN OWL ON THE DOLLAR BILL
WHY DO OWLS ATTACK PEOPLE
WHY ARE AK 47s SO EXPENSIVE
WHY ARE THERE HELICOPTERS CIRCLING MY HOUSE
WHY ARE THERE GODS
WHY ARE THERE TWO SPOOKS
WHY IS MT VESUVIUS THERE
WHY DO THEY SAY T MINUS
WHY ARE THERE OBELISKS
WHY ARE WRESTLERS ALWAYS WET
WHY ARE OCEANS BECOMING MORE ACIDIC
WHY IS ARWEN DYING
WHY AREN'T MY QUAIL LAYING EGGS
WHY AREN'T MY QUAIL EGGS HATCHING
WHY AREN'T THERE ANY FOREIGN MILITARY BASES IN AMERICA
WHY ARE MY BOOBS ITCHY
WHY ARE CIGARETTES LEGAL
WHY ARE THERE DUCKS IN MY POOL
WHY IS JESUS WHITE
WHY IS THERE LIQUID IN MY EAR
WHY DO Q TIPS FEEL GOOD
WHY DO GOOD PEOPLE DIE
WHY AREN'T THERE GUNS IN HARRY POTTER
WHY ARE ULTRASOUNDS IMPORTANT
WHY ARE ULTRASOUND MACHINES EXPENSIVE
WHY IS STEALING WRONG
WHY IS SEX SO IMPORTANT
WHY DO IGUANAS DIE
WHY AREN'T THERE DINOSAUR GHOSTS
WHY IS THERE LAVA
WHY ARE THERE FEMALE MR MIMES
WHY IS GPS FREE
WHY IS LIFE SO BORING
WHY IS THERE NO KING IN ENGLAND
WHY ARE DOGS AFRAID OF FIREWORKS
WHY DO I FEEL DIZZY
WHY ARE THERE WEEKS
WHY IS YYK ON ALL ZIPPERS
WHY DO FORGIVES