Developer Operations (devops)
Presentation Modul und Administrative Stuff

Who am I?

– **Prof. Dr.-Ing. Sebastian Graf**
Cloud Computing & agile Softwareoperations
Institute IMVS, FHNW Brugg/Windisch

– **CV**

- Dr.-Ing., University of Konstanz
- Sev. Startups as Software Engineer
- 8 years at SBB
  - Softwareengineer, -architect
  - Product Owner, Tools
  - Product Manager, Cloud and Tools

Who am I?

- **Prof. Dr.-Ing. Sebastian Graf**
  Cloud Computing & agile Softwareoperations
  Institute IMVS, FHNW Brugg/Windisch

- **E-Mail:** sebastian.graf@fhnw.ch
- **Mobile:** +41 56 202 80 83

Who am I?

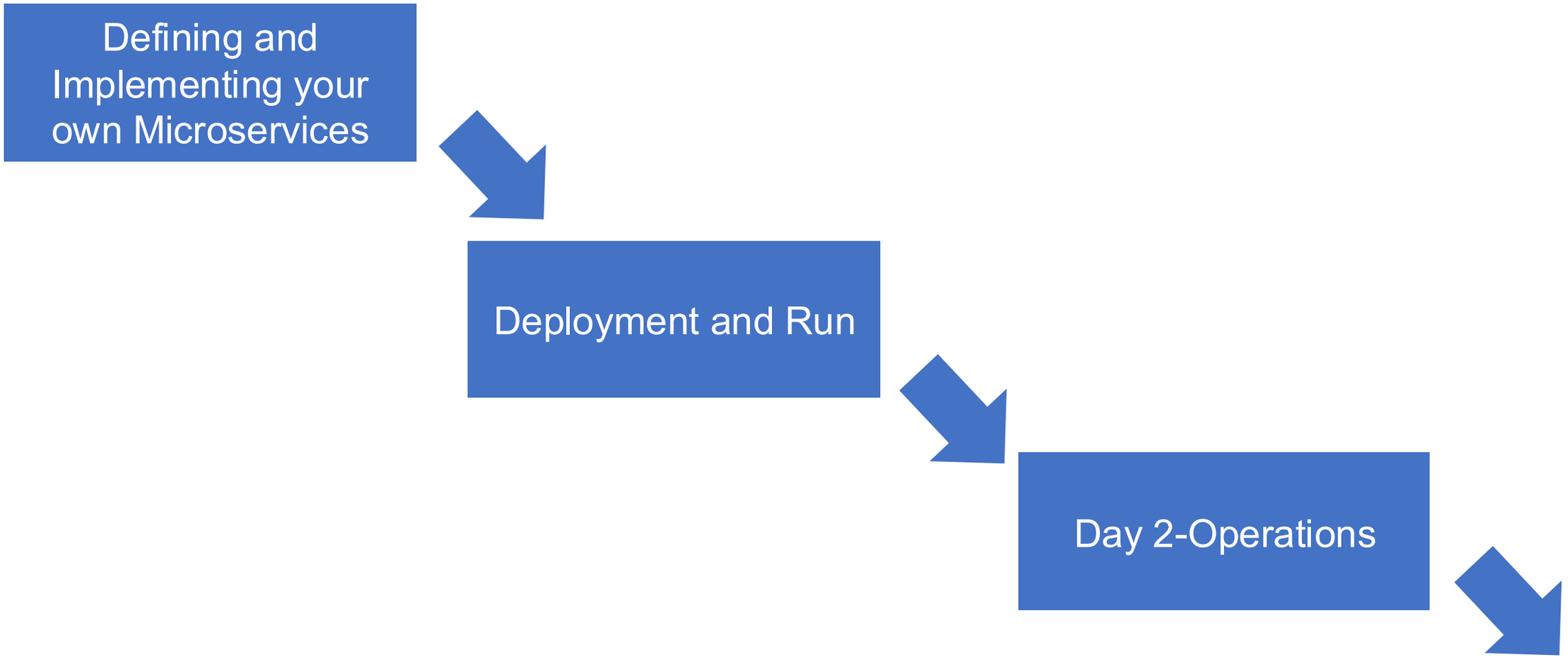
- **Prof. Daniel Hass**
  IT Platform Engineering
  Institute IMVS, FHNW Brugg/Windisch
- **CV**
  - M.Sc. ZHAW Zurich University of Applied Sciences
  - 10 years at Endress+Hauser
    - Systems Engineer (Databases + Business Applications)
    - Lead Architect Systems & Technology
      - Development-, Streaming- and Container Platform
- **E-Mail:** daniel.hass@fhnw.ch


WORKED FINE IN DEV
OPS PROBLEM NOW
memegenerator.net

Learning Target

- Awareness of Operating Challenges while developing applications
  - Architectural Considerations
  - Non-functional requirements
- Knowledge about bringing applications operational
  - Capacity Management
  - Building and Deployment
- Operating the application
  - Defining availability
  - Basic Logging / Monitoring

Setup of this course, Overview



Difference to last year

FS 2025

Grade:

Project based (100%)

- Individually
- Group-based
- 4 grades

Content, theoretical:

- Less topics, more in-depth

Content practical:

- Application will be self-defined
- re-use of application in upcoming modules of VT DevOps is possible (pcls / sysd / …)

HS 2025

Grade:

Project based (50%)

- Individually and Group-based
- 2 grades

Written Exam (50%)

- Individually via Campla / Moodle

Content, theoretical:

- Less topics, more in-depth

Content practical:

- Application will be self-defined
- re-use of application in upcoming modules of VT DevOps is possible (pcls / sysd / …)

Reusing your application

New study courses / content:
(Vertiefungsrichtung DevOps
/ Studienrichtung SPD)

Idea: not to stick to one module only but to reuse your own code:

- eat your own dogfood
- Learn that IT is nowadays product based and not project based

We plan that you can re-use the application in other modules (and extend them, etc.)

Setup of this course, Part 1

Software development/architecture in the DevOps-era

- ✓ Necessary MustHaves in Application-Architectures
  - ✓ Architectural considerations
  - ✓ Framework / Language Choices
- ✓ Continuous Integration
- ✓ Releasing
- ✓ Advanced Git-handling / Branching Strategies / Commits
- ✓ Containerization

Setup of this course, Part 1

Artifact to be delivered by you by the end of part 1

- ✓ Own implemented Microservices for given usecase (chatting LLMs)
  - ✓ Freedom of choice regarding language, framework with respect of given constraints
  - ✓ No boilerplate-solution available
  - ✓ I will act as coach and not as solution provider
- ✓ Build of the application
  - ✓ Commits and Releasing
  - ✓ Build / Pipeline Architecture
  - ✓ Lifecycle
- ✓ This part will be evaluated (mostly) on an individual base

Setup of this course, Part 2

Deploying and Rollout of Application

- ✓ Kubernetes Basics and Handling
- ✓ Continuous Deployment
- ✓ GitOps
- ✓ Deployment Pattern
- ✓ Lifecycle / Commits / Releasing

Setup of this course, Part 2

Artifact to be delivered by you by the end of part 2

- ✓ Deploying and Operating third-party software
  - ✓ Packaging, Handling
  - ✓ Lifecycle-Mgmt
- ✓ Own implemented Microservices deployed on Kubernetes
  - ✓ Deployment-Workflows
  - ✓ GitOps-Implementation

Homework

- Groups
  - Should consist of 2 person (at most 3: architecture will get more complex then). It is up to you to build a group
    - Size is fixed because of Kubernetes resources
  - Please insert your name into the File „admin/common.auto.tfvars“ in a group
    - Add new groups by yourself according to the existing schema: `^(hs25-group)\d{1,2}$`
    - Make sure the file stays valid (Line Breaks, Quotation Marks, etc.)
  - Each group gets
    - One GitLab group for their sourcecode (applications, registry and configurations)
    - One Kubernetes cluster on Azure AKS
- Weekly Assignments
  - …on a weekly base…
    - …is reflected at the beginning of each new slot
    - …within the reflection, we discuss aspects of possible solution and/or answer questions from you
    - … represent necessary parts of the grade

      (however it is up to you when you implement them as long as they are finished at their deadlines)
  - https://spd.pages.fhnw.ch/module/devops/templates/reports/devops-foundations/hs25/index.html

Project Grade

Project 25%	Project 25%	Exam 50%

Grading consists of two equal project parts (25% each) and one written exam (50%):

Common for project work: Git-Commits are monitored. If unbalanced histories occur, unbalanced grades will be given based in the individual effort that took place.

- Might be individually graded (where applicable)
- Sourcecode will be reviewed semi-automatically
- Platform will be reviewed semi-automatically
- Deadlines are written in the Drehbuch (always Sunday, 23:59h)
- Regular solving of homework distributes the load
  - The results of the weekly assignments are directly connected to the conclusion of each part
  - There will be time slots at the begin and at the end of each session, where you can bring in questions/problems
  - Problem solving is your job; supporting it is mine
- There will be a file for meta-information

Grading

Part 01:

- the quality of the sourcecode and the releasing
- security-checks of your own application
- containerization of the application with different dimensions
- the building and releasing of the applications
- architecture of the build pipeline
- handling and modularization of the build pipeline

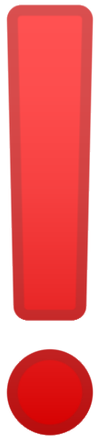
Part 02:

- the quality of the sourcecode and the releasing
- security-checks of your own application
- the deployment of third-party services
- the staging of the application
- the deployment of the application e.g. templating of common resources and deployment patterns

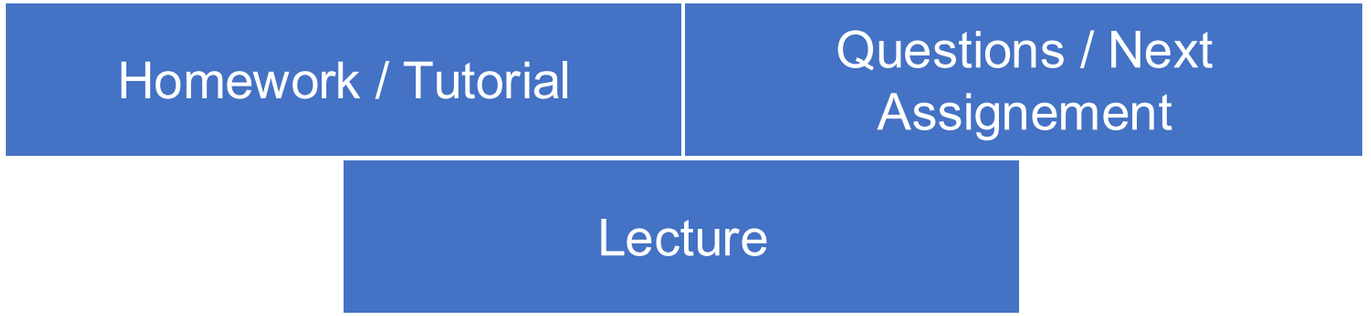
Written Exam

There will be a written exam in the last week:

- 60 min duration, **Montag, 15.12.2026, 18:15h**
  - **Please make sure to attend / check back in case of conflicts**
- Moodle with Campla
  - Test Exam one week before to check your setup
  - You are responsible to ensure you laptop will be able to work with Campla / Moodle
- Closed Book
  - Concepts
  - Multiple Choice
- Also notes from the lecture not directly mentioned on the slides might be part of the exam
  - This includes those parts of the tutorials not evaluated by the project grade
  - O'Reilly-List
- Drehbuch: https://sgi.pages.fhnw.ch/moduluebersicht/devops/drehbuch.html



Setup of one single schedule



- All session are planned to be held directly
  - No recording, no streaming planned

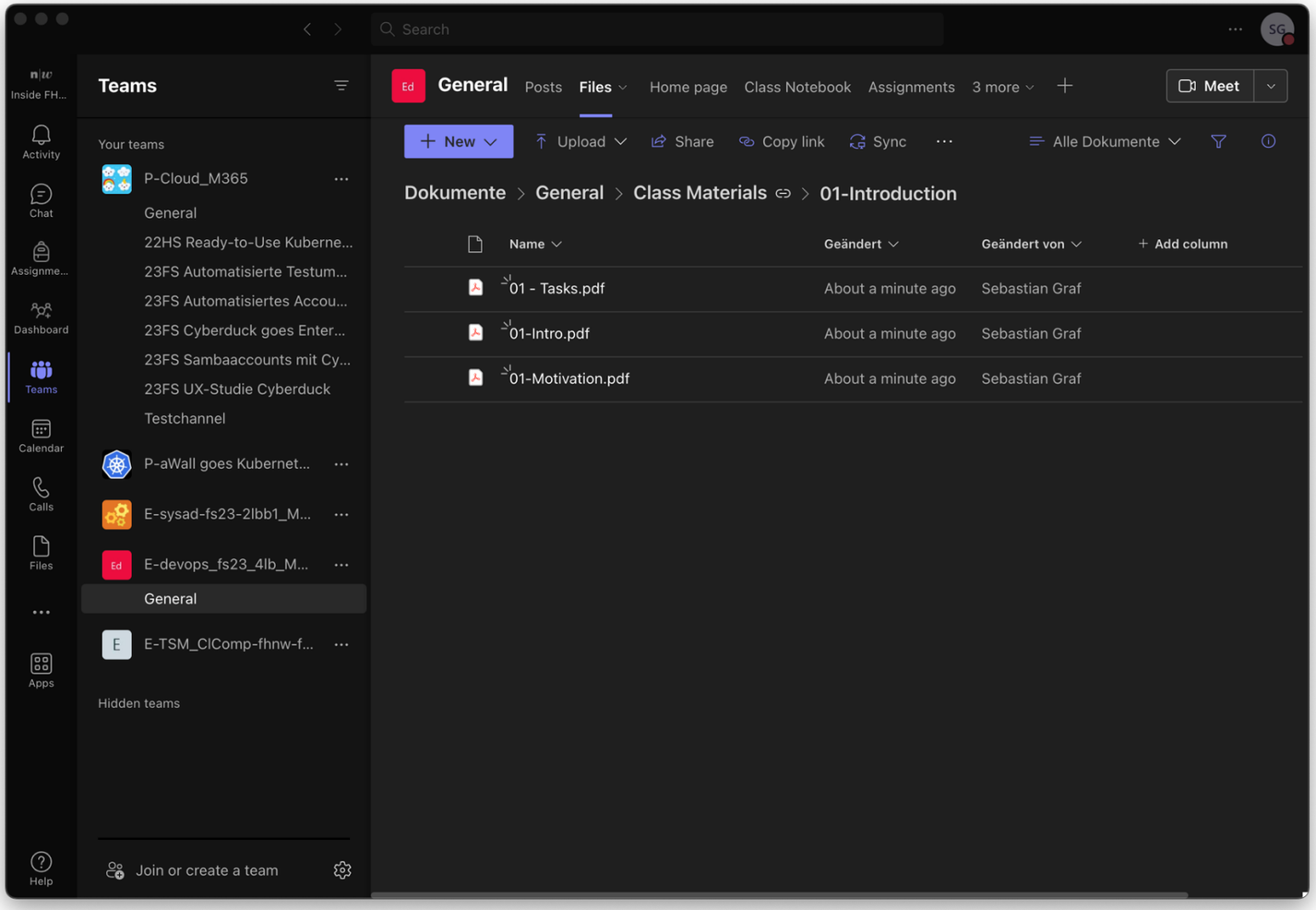
- Recap:
  - Homework in sourcecode
- Lecture:
  - Powerpoint / PDF
  - Literature
- Homework, Questions / Problems
  - Website
  - OneNote

Technical base

- Programming languages:
  - Java (GraalVM / Quarkus)
  - Python (Flask)
  - Go (Gin)
- Tools locally necessary:
  - Maven / Gradle
  - Java / GraalVM / Python 3.11 / virtualenv
  - Docker / Podman
  - Kubectl
  - Helm
  - git
- Server site platforms:
  - GitLab
  - AKS

I will present my toolsetup today at the end of the session for those interested

Communication



Anyone missing?

Gitlab

In “your“ projects:

Your applications:

- One application -> one repository
- Build is mandatory
- Container Registry will be used
- Releasing via Tagging

Your Deployment Configuration

- Building helper for linting

Your report-repository as fork from mine

Visibility is private for you and me

Templates and Solutions

Templates for optional forking in your projects

- Report-Repository
- Templates if necessary
- Visible

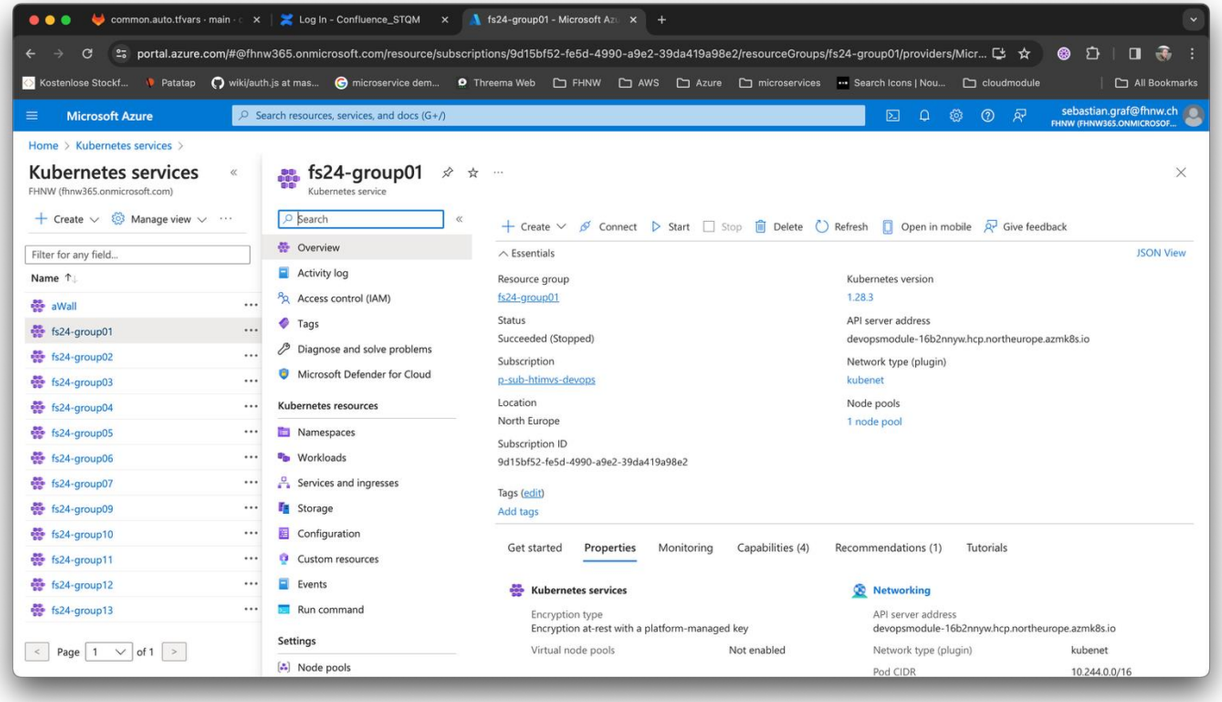
Solutions

- Discussed but not provided
- Not visible

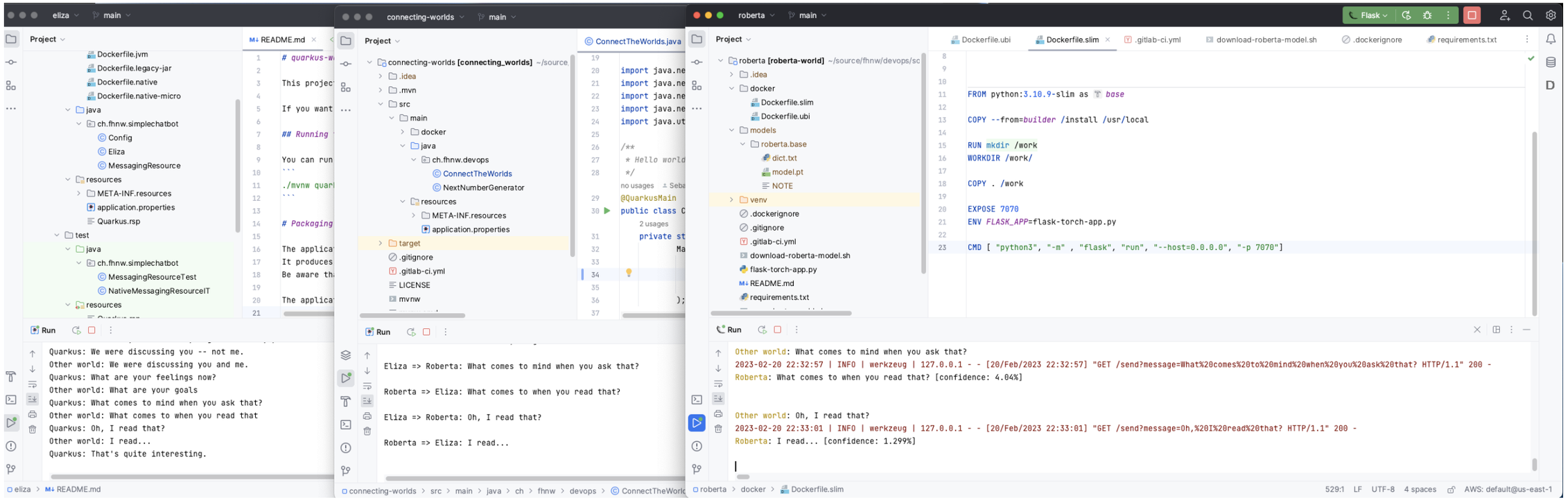
AKS

Your Cluster:

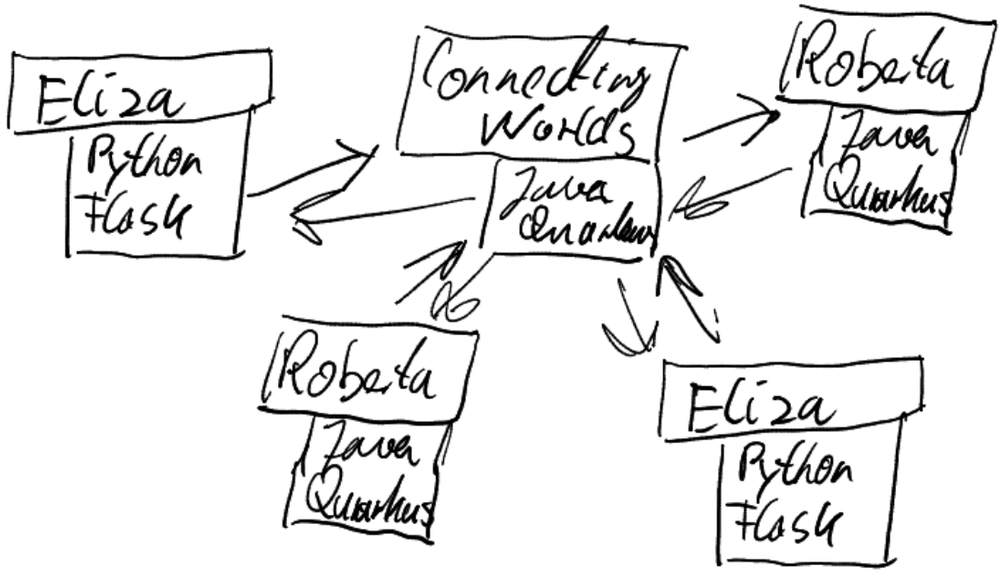
- Provided by Azure
- Control Plane provided by service
- Worker Nodes adjustable
  1-5 possible
- You are fully responsible for the “your“ cluster
  (no shared infrastructure)



Microservice Architecture



Microservice Architecture



Chatting LLMs:

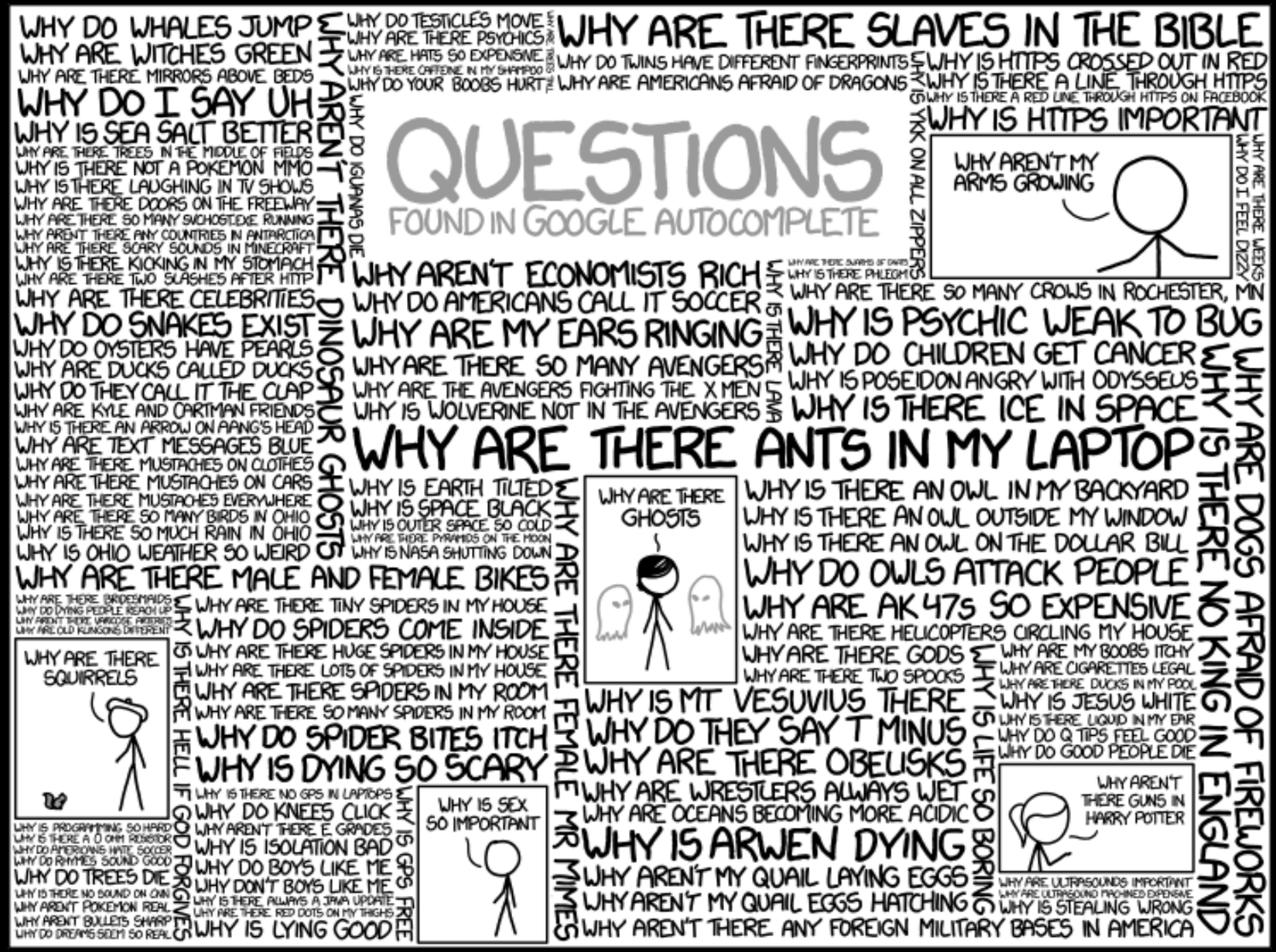
- Chatbots to be implemented by you
  - I can give some advices but it is up to you (individually) to implement one based on given constraints
  - Quality of LLM is not evaluated…
- “Connecting Worlds”
  - Message Broker
  - Provided by me, to be forked and adapted by you to connect your services

Knowledge Gaps

Different Profiles, different knowledge, different foundations…

- No fixed defined knowledge is needed
- ..however: you will have knowledge about
  - swc/stqm (building software with CI)
  - cloud/pcls (using cloud platforms)

  at the end the module
- …filling the gabs will be possible but it is up to you to do that
- Literature:
  https://learning.oreilly.com/playlists/ca1d7cff-d695-494c-b405-2347a602ae71


QUESTIONS
FOUND IN GOOGLE AUTOCOMPLETE
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 SYCHOSTICKS 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 REARM UP
WHY AREN'T THERE VARICOSE AIRBIKES
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 ARE THERE SLAVES IN THE BIBLE
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 IS YKK ON ALL ZIPPERS
WHY ARE THERE WEEKS
WHY DO I FEEL DIZZY
WHY DO IGUANAS DIE
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 ARE THERE SWARMS OF GNATS
WHY IS THERE PHLEGM
WHY ARE THERE SO MANY CROWS IN ROCHESTER, MN
WHY IS PSYCHIC WEAK TO BUG
WHY DO CHILDREN GET CANCER
WHY IS POSEIDON ANGRY WITH ODYSSEUS
WHY IS THERE ICE IN SPACE
WHY IS THERE LAVA
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 IS SEX SO IMPORTANT
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 ARE DOGS AFRAID OF FIREWORKS
WHY IS THERE NO KING IN ENGLAND
WHY IS LIFE SO BORING
WHY IS GPS FREE
WHY ARE THERE FEMALE MR MIMES
WHY IS THERE HELL IF GOD FORGIVES
WHY AREN'T THERE DINOSAUR GHOSTS