KEA

Full design

Product description

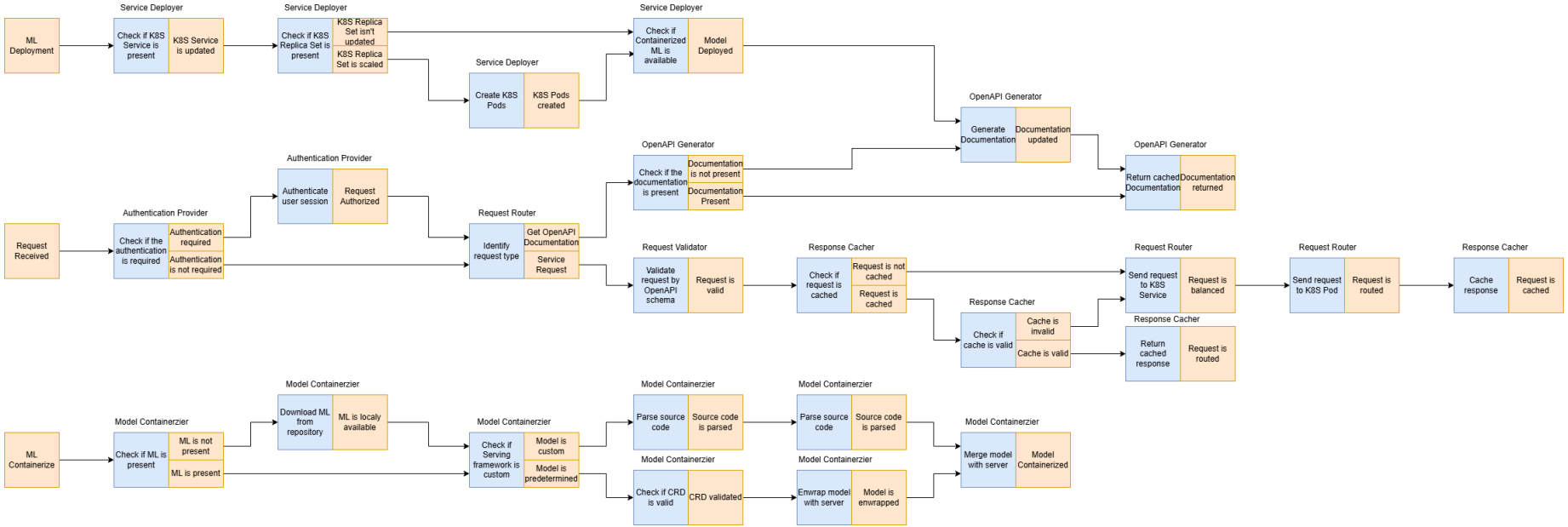
The product is a platform for deploying, managing, and scaling machine learning models in production. It offers a secure, flexible environment for automating ML tasks like model versioning, routing, and monitoring. With Kubernetes integration and containerization support, it's designed for developers, ML engineers, and enterprises needing scalable, reliable ML infrastructure.

Team K8C: Tsurkan Daniel; Dandamaev Gadji; Tsaturyan Konstantin; Smolkin Mikhail

Project repo: https://github.com/fanglores/Advanced-Software-Design

This report: https://github.com/fanglores/Advanced-Software-Design/blob/master/Practice%20Tasks/Module2/FinalTask_2/FinalTask_2.pdf

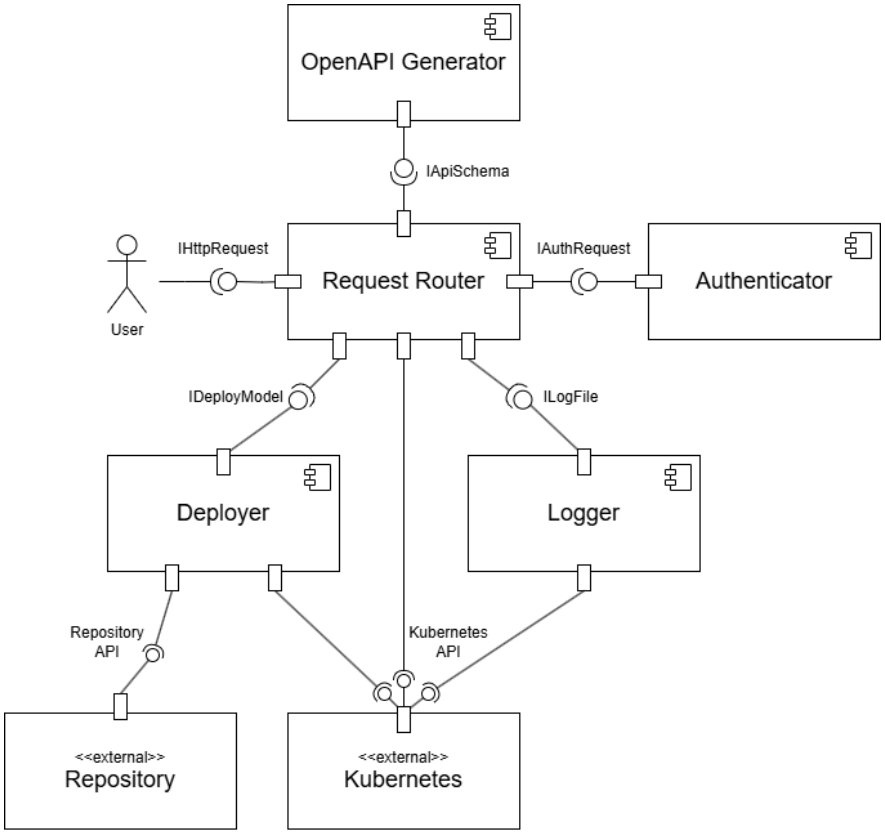
Event flow



https://github.com/fanglores/Advanced-Software-Design/tree/master/General/UseCases

System architecture

BASE
Microservices
RESTful API



Solution stack

Implementation

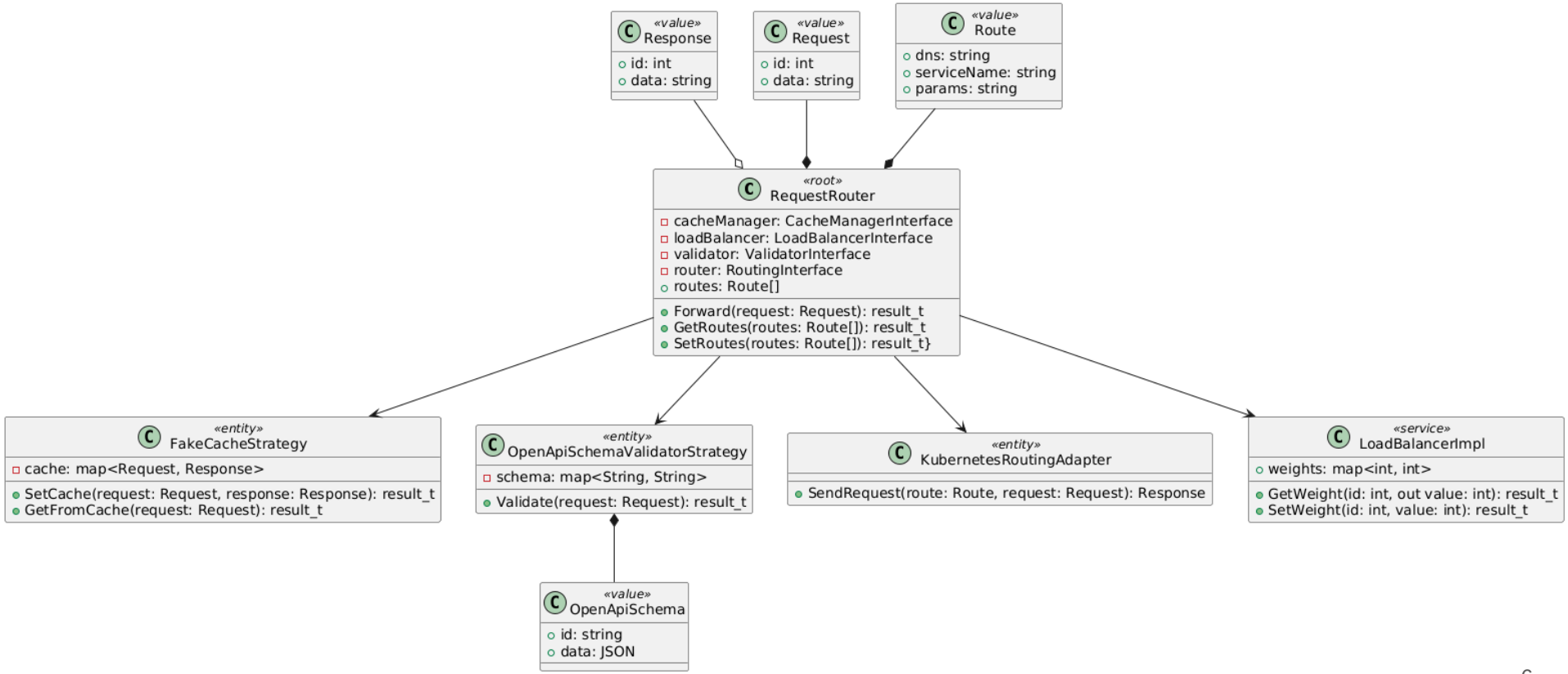
- API definition: OpenAPI
- Connection server for API: python gunicorn
- App framework: python FastAPI
- Serialization/state format: json

Testing tools pytest

Operations

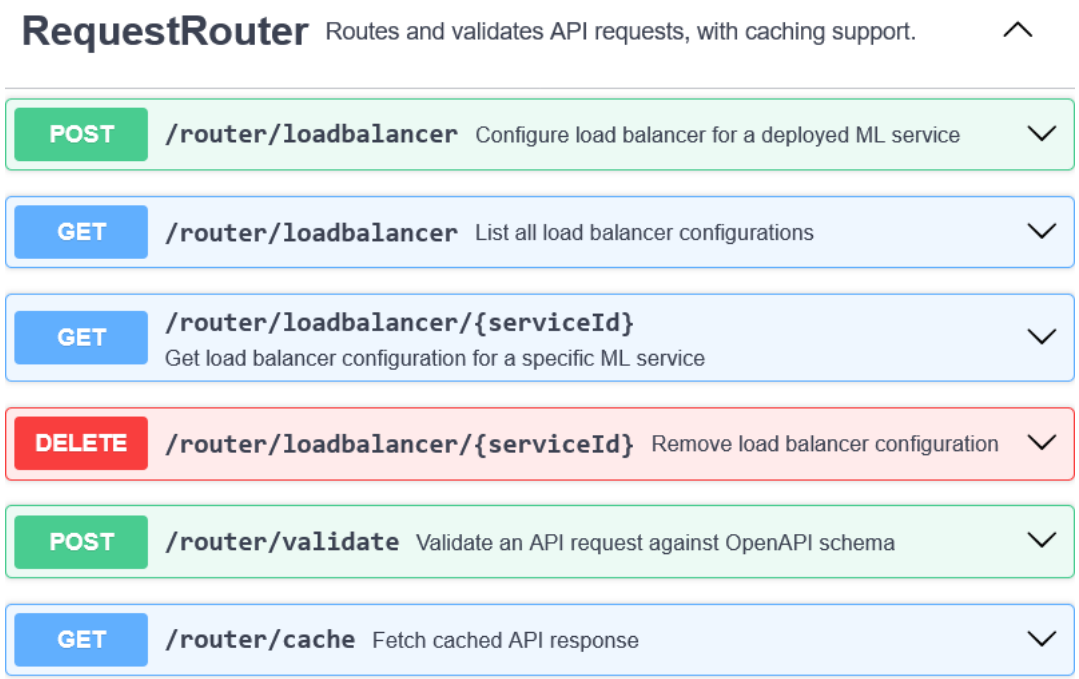
- App initializer: cookiecutter
- Code build: makefile
- CI/CD pipeline: github ci/cd
- Delivery method: docker
- Logging & monitoring: ELK

Logical data model **RequestRouter**

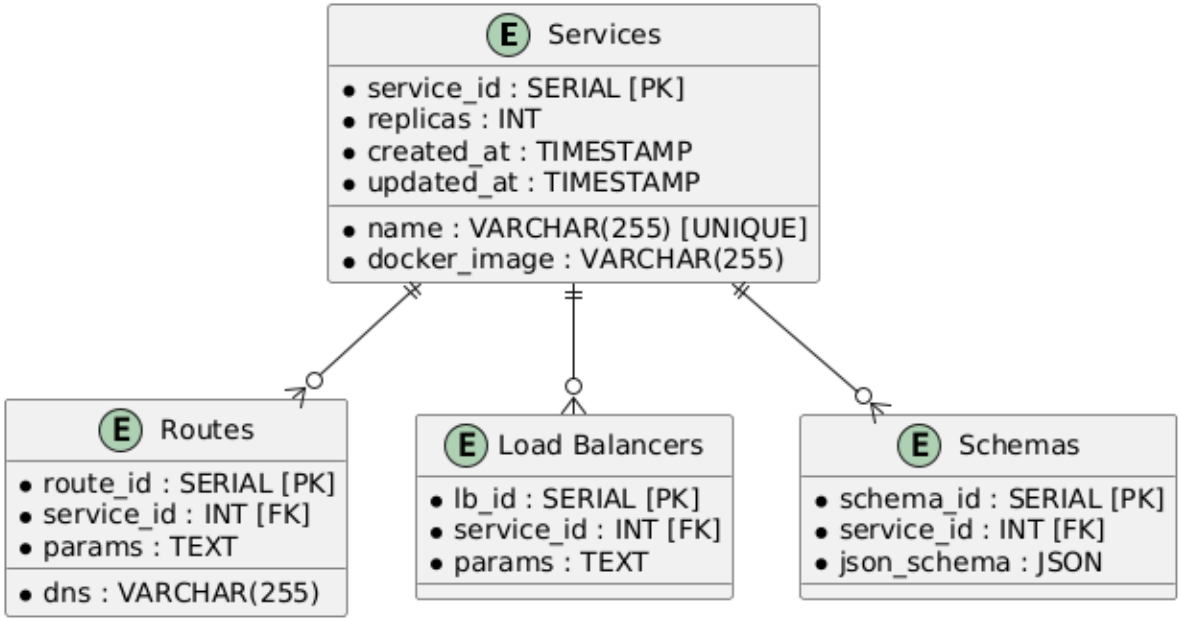


API usage **RequestRouter**

Use Case: Forward Request
Scenario:
User sends request to a service
Request is being validated by OpenAPI schema
Request is being forwarded to a specific K8s service



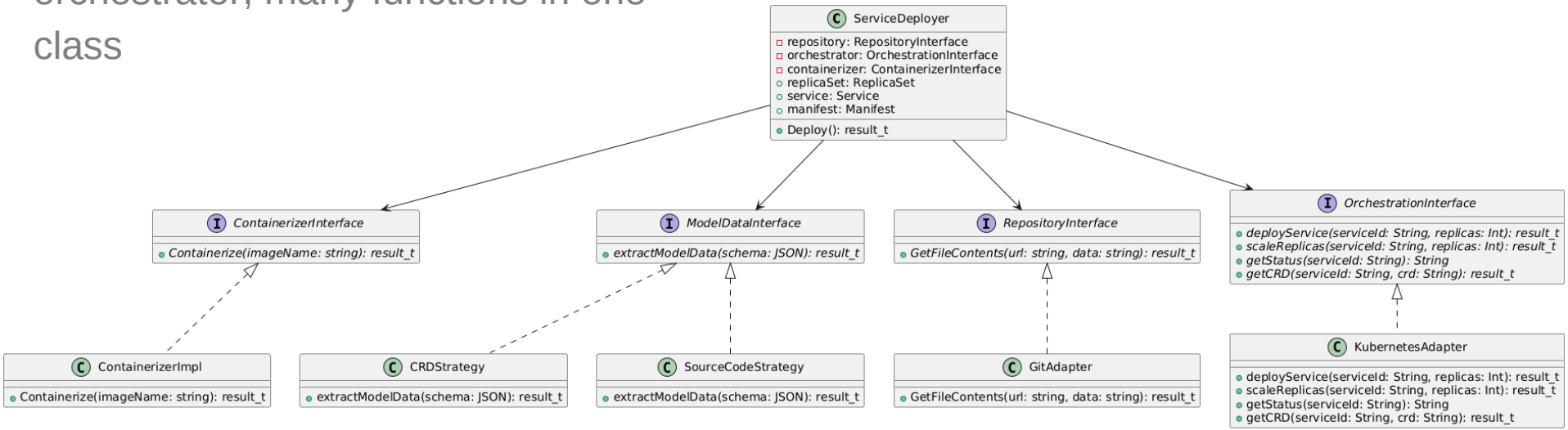
Physical schema **RequestRouter**



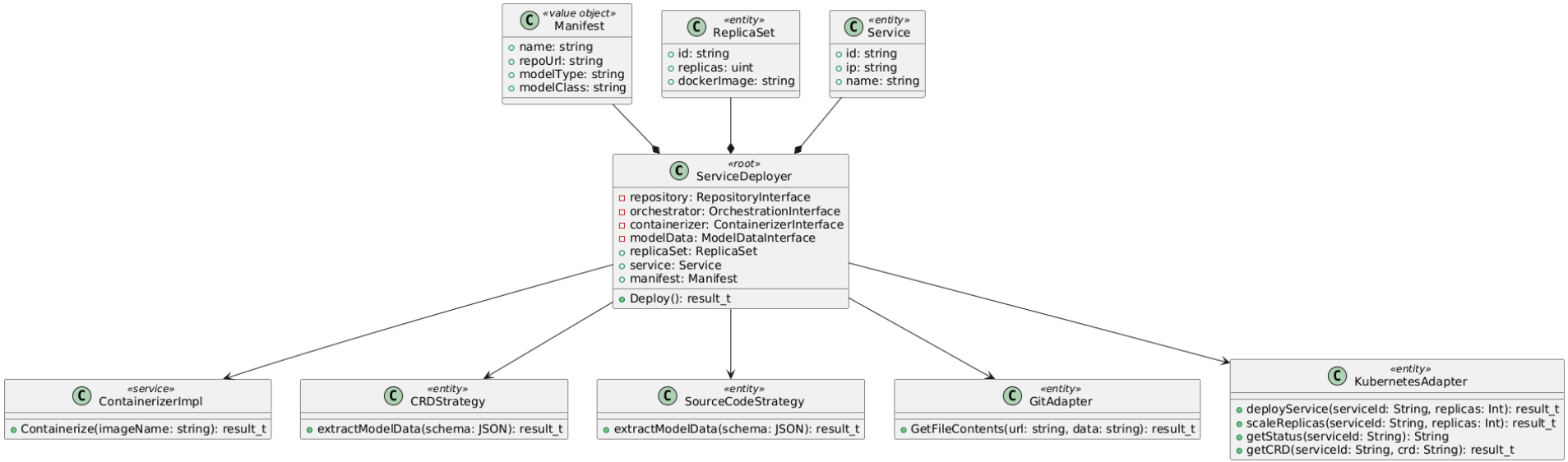
Design case of Service Deployer

Problems: new deploy strategies require changes in ServiceDeployer; ServiceDeployer can work with different data, repository or orchestrator, many functions in one class

Solutions: use SOLID principles, Adapter and Strategy patterns

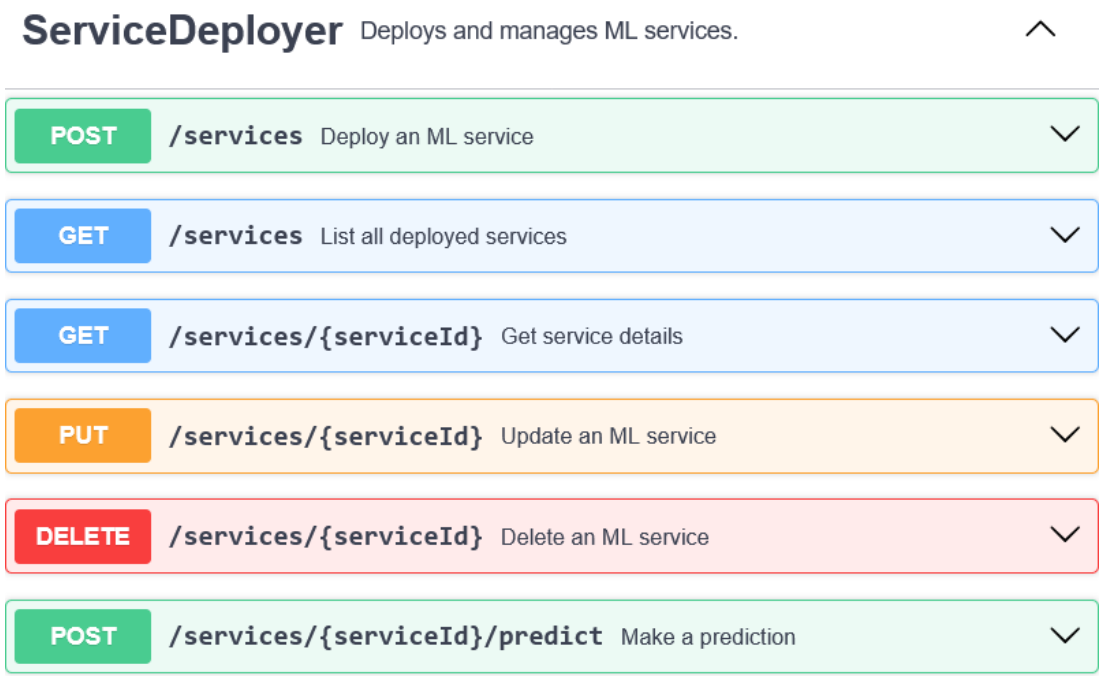


Logical data model **ServiceDeployer**

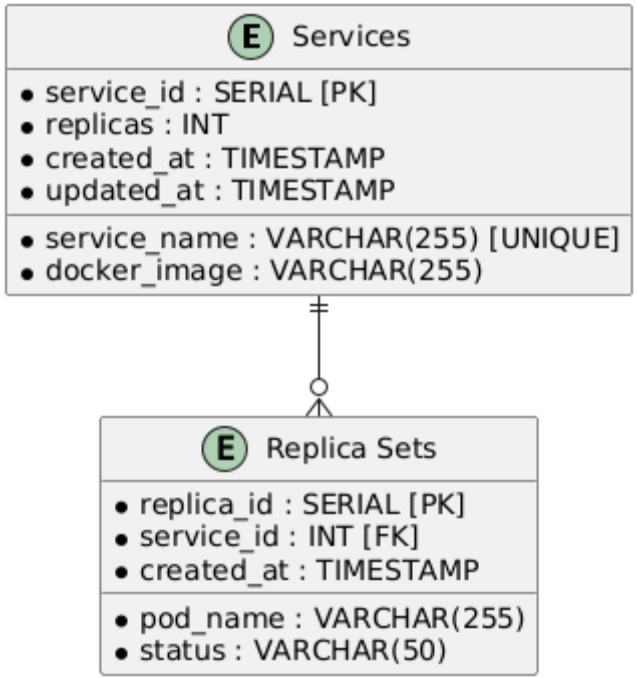


API usage **ServiceDeployer**

Use Case: Deploy Service
Scenario:
User sends request to deploy ML Model
ML Wrappers creates docker container
Docker container is deployed via service into K8s



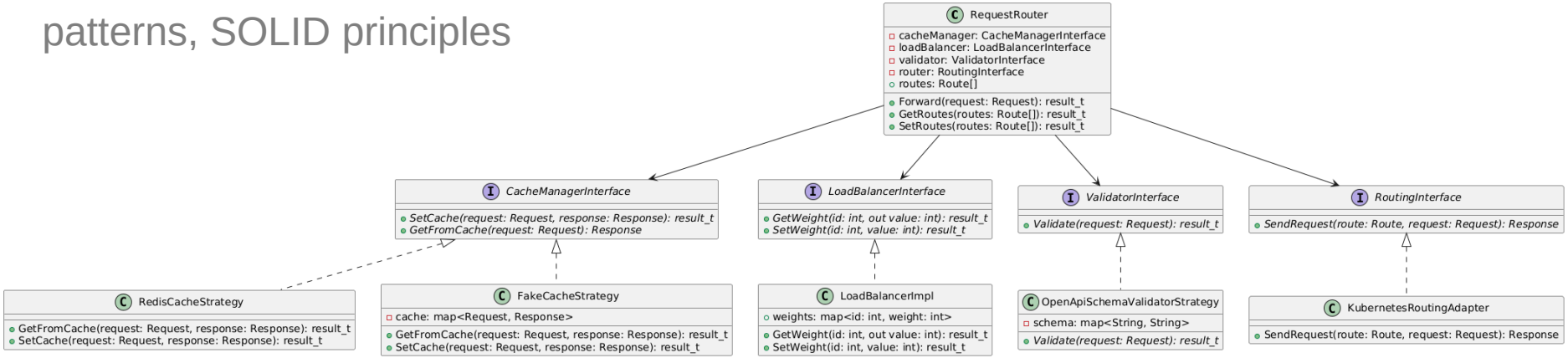
Physical schema **ServiceDeployer**



Design case for RequestRouter

Problems: strong dependency on Kubernetes, OpenAPI schemas, cache storage, many functions

Solutions: use Strategy and Adapter patterns, SOLID principles



Design complexity

Calculate metrics:

- All from Chidamber-Kemerer suite (except RFC, LCOM) for all classes in the largest microservice
- Service dependency metrics (SIY, AIS, ADS) for all microservices from this review:

  Bogner, J., Wagner, S., & Zimmermann, A. (2017, October). Automatically measuring the maintainability of service-and microservice-based systems: a literature review. In Proceedings of the 27th International Workshop on Software Measurement and 12th International Conference on Software Process and Product Measurement (pp. 107-115).

System demo

<Draw a diagram to present the structure of the system as deployed on k8s cluster. Choose appropriate notation>

<For each use case paste a link to a video with a demonstration how the product works at the k8s cluster. At least the main use case, recommended - one use case per team member>

Use case - <name of the UC/Story>
<url to video/screencast>

<Be prepared to repeat the demo at the exam>

Repository structure

Repository structure

```
.
├── product_img.jpg
├── README.md
├── General/
│   ├── Domain_description_en.md
│   ├── Task_description_en.md
│   ├── DFD0/
│   ├── StoryMap/
│   └── UseCases/
└── Practice Tasks/module2
    ├── FinalTask_2/
    ├── Task_8/
    ├── Task_9/
    ├── Task_9.1/
    ├── Task_10/
    ├── Task_11/
    └── Task_12/
```

Tools Used:

- Github
- Drawio
- Planttext
- Swagger

Team and roles

Class diagrams, design complexity	Use cases, design cases	Design cases/patterns, logical and physical schemas, components diagram	Event flow, API definition, K8s deployment, components diagram
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