



### **A Developer Portal for DevOps Environment**

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COOPERATION & MANAGEMENT (C&M, PROF. ABECK), INSTITUTE OF TELEMATICS, DEPARTMENT OF INFORMATICS

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#### About Me



- (1) Master's degree in computer science at the Karlsruhe Institute of Technology (KIT)
- (2) Doctoral student at KIT with the following research interests
  - (1) Systematic development of microservices-based applications
  - (2) API management
  - (3) DevOps and cloud technologies



#### **Motivation**

- (1) Microservice-based applications are composed of distributed microservices in a cluster
  - (1) Microservices are typically developed by multiple development teams
  - (2) APIs can act as a contract between microservices
- (2) Providing information about a microservice is crucial for the development
  - (1) Manual updating of documentation can lead to data inconsistencies
  - (2) Frequent changing developers and distributed teams can degrade the knowledge about microservices
- (3) Support of developers by providing a point of contact offering information about microservices
  - (1) Automated solution are used to provide source-of-truth

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### Goal of the MicroserviceDeveloperPortal (MDP)

Develop a microservice-based application (1)

(2)

- Following a systematic microservice engineering approach (1)
- Support developers by providing necessary information of deployed microservices Automated data collection (1) Repository (e.g., API, URL) using a built and CI/CD stage Meta deployed to monitors organized in Documentation Data Health monitoring (2) Monitorina (running) GitLab Microservices provides interacts with Specification Dependencies (re)uses requests Health Two capabilities (3) **Provision of CompileTimeData** Provision of RuntimeData requests Provision of RuntimeData (1) Developer Provision of CompileTimeData (2)



#### The MDP Dashboard



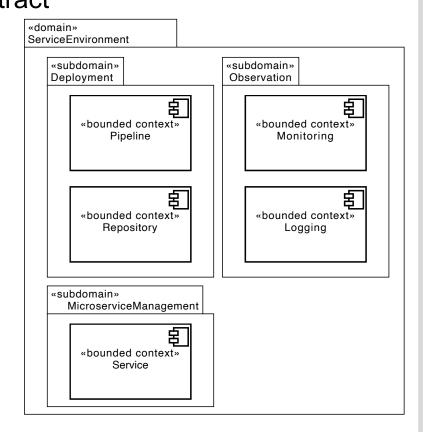
- (1) Dashboards provides a list of registered microservices
- (2) Selected service provides more detailed information and actions
  - (1) Hostname, health, version, address, code owner, Helm dependencies, links, and Kubernetes Pods

$\equiv$ MDP Dashboard				$\equiv$ MDP Dashboard					
List of Microservices			last refreshed: 15:39:14 GMT+0200 (CEST)	∠ Back cm-api-management ( <i>master</i> )					
Hostname	Health		Version Address	Actions:	Open Delete				
cm-api-management	UP	STABLE	master cm-api-management.cloud.iai.kit.edu	Health:		ABLE			
cm-medicaldevice	× DOWN		master cm-medicaldevice.cloud.iai.kit.edu	Code Owner:	@Vorname.Name @	Vorname2.Nar	me2		
cm-vehicle	UP	STABLE	master cm-vehicle.cloud.iai.kit.edu	Dependencies:					
				Dependencies.	template-chart: - ~1.0.0				
				Links:	REPOSITORY	PIPELINE	API	SWAGGER	
				Deployed Pods:	Name			ReplicaSet	Phase
					cm-api-management-56f45dcf65-hqhbj cm-api-management-56f45dcf65 Running				

### (1) New domain to place the MDP and extract application-agnostic logic

- (1) GitLab as bounded context Repository
- (2) GitLab CI/CD pipeline as bounded context Pipeline
- (2) Bounded contexts implemented as domain microservices
  - (1) Service stores microservice information (e.g., version)
  - (2) Monitoring stores health data (e.g., up, down)
- (3) Domain microservices provide Create, Read, Update, and Delete (CRUD) operations

### Domain ServiceEnvironment





#### **Application Sharing View**



- (1) Bounded contexts persist and share entities
  - (1) Repository
  - (2) Microservice
  - (3) Health

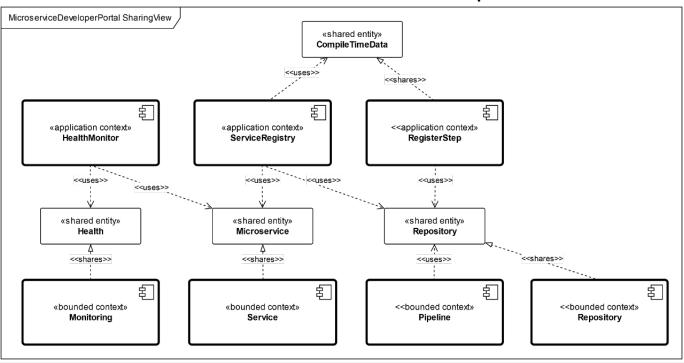
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(2) Application contexts create shared entities

CompileTimeData

- (1) Microservice
- (2) Health

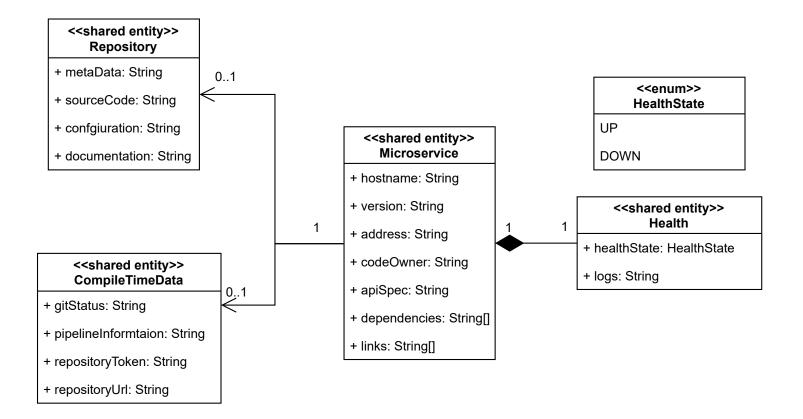
(3)



#### **Relation View**



(1) The relation view captures the entities shared by the bounded contexts and sets them into relation



#### Niklas Sänger et al.: A Developer Portal for DevOps Environment 9 17.09.21

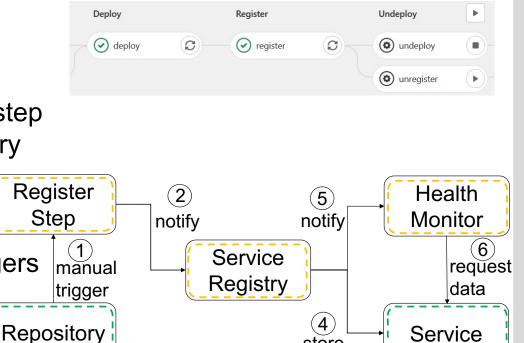
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Application Context Bounded Context

store

#### **Microservice Registration Process**

- Two stages added to a CI/CD (1) pipeline (i.e., register, unregister)
  - Docker image executing (1) Python scripts
- Registration of a microservice (2) triggered by a commit
  - Executed after the deploy step (1) notifying the ServiceRegistry
- The ServiceRegistry stores (3) a new entity in domain microservice Service and triggers HealthMonitor
- Unregistration in parallel to (4) undeploy stage





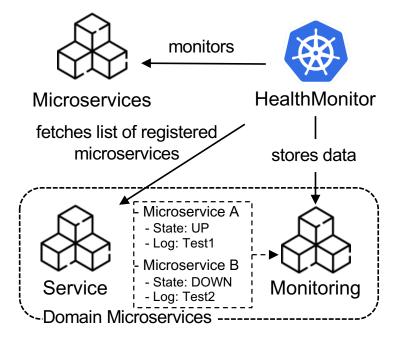
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## (1) Implemented as a Kubernetes

**Health Monitor** 

operator

- (1) Monitoring of Kubernetes Pod lifecycle (e.g., running, terminated)
- (2) Changes in pod lifecycle trigger an event
- (2) HealthMonitor fetches a list of registered microservices from the domain microservice Service
- (3) Health data is stored in the domain microservice Monitoring



#### **Results and Outlook**



- (1) A reusable microservice-based application called MicroserviceDeveloperPortal to support developers
  - (1) Providing CompileTimeData and RuntimeData to see the information about deployed microservice
  - (2) Utilizing a CI/CD pipeline to automate data collection
- (2) A domain ServiceEnvironment representing an environment in which microservices are developed and operated
- (3) Extend the MDP with a focus on the management of APIs
  - (1) Replace the HealthMonitoring mechanism
- (4) Remodeling of the RegisterStep to be part of the domain ServiceEnvironment



# Thank You for Your Attention