

Fitness Functions für Cloud-Architekturen

A person is shown rock climbing on a dark, craggy cliff face. The climber is in a dynamic pose, reaching up with one arm and foot. The background is a vibrant red sky with some dark clouds. The overall image has a high-contrast, energetic feel.

Alexander Kaserbacher | ak@embarc.de |  @alexksbr

Meetup Software-Architektur München
17. November 2022

embarc 
Software Consulting GmbH

Alexander Kaserbacher



ak@embarc.de



@alexksbr

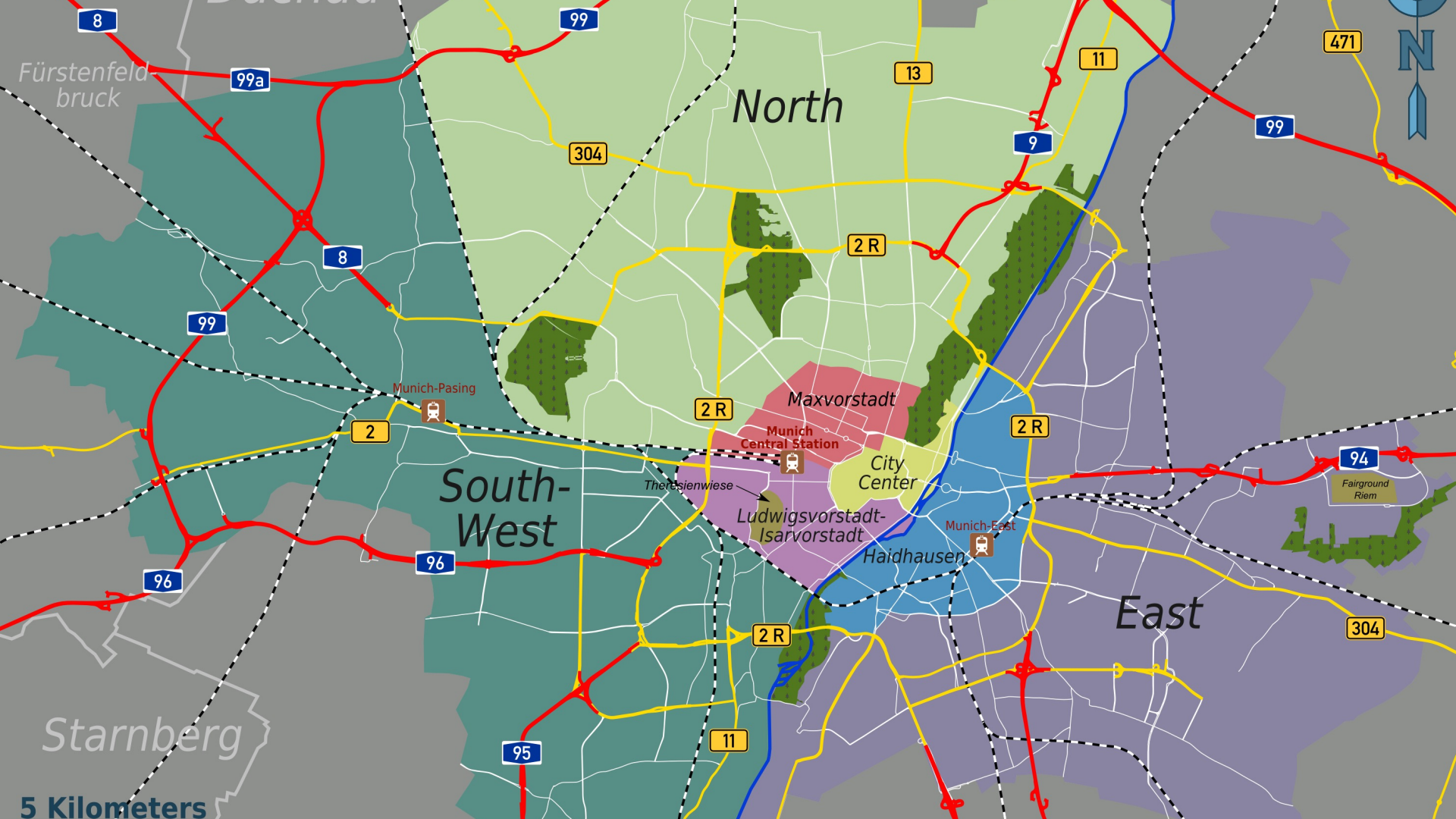


embarc.de



Fitness Functions





Qualitätsziele

Begriffe
nach
ISO 25010



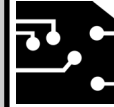
Funktionale Eignung
(Functional Suitability)

Sind die berechneten Ergebnisse
genau genug / exakt, ist die
Funktionalität angemessen? ...



Benutzbarkeit
(Usability)

Ist die Software intuitiv zu bedienen,
leicht zu erlernen, attraktiv?



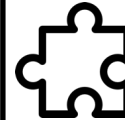
Portabilität
(Portability)

Ist die Software leicht auf andere
Zielumgebungen (z.B. anderes OS)
übertragbar?



Effizienz
(Performance)

Antwortet die Software schnell, hat
sie einen hohen Durchsatz, einen
geringen Ressourcenverbrauch? ...



Kompatibilität
(Compatibility)

Ist die Software konform zu
Standards, arbeitet sie gut mit
anderen zusammen?



Zuverlässigkeit
(Reliability)

Ist das System verfügbar, tolerant
gegenüber Fehlern, nach Abstürzen
schnell wieder hergestellt? ...



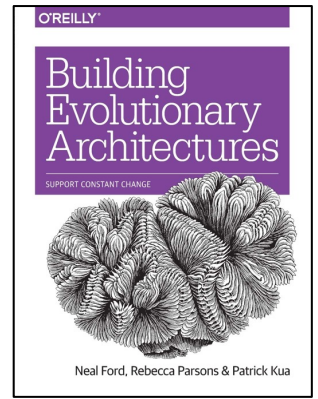
Sicherheit
(Security)

Ist das System sicher vor Angriffen? Sind
Daten und Funktion vor unberechtigtem
Zugriff geschützt? ...



Wartbarkeit
(Maintainability)

Ist die Software leicht zu ändern,
erweitern, testen, verstehen? Lassen
sich Teile wiederverwenden? ...



“An architectural fitness function provides an objective integrity assessment of some architectural characteristic(s).

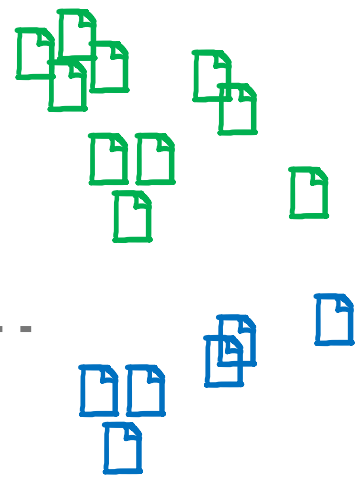
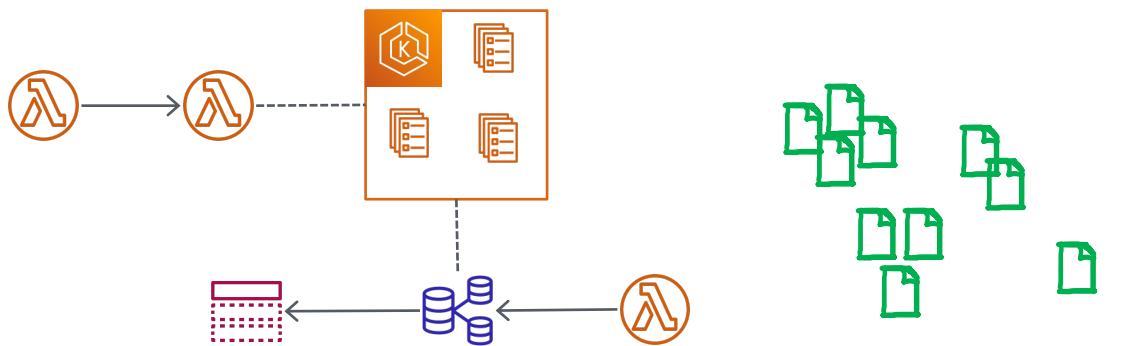
- Building Evolutionary Architectures – Ford, Parsons, Kua



Fitness Functions + Cloud

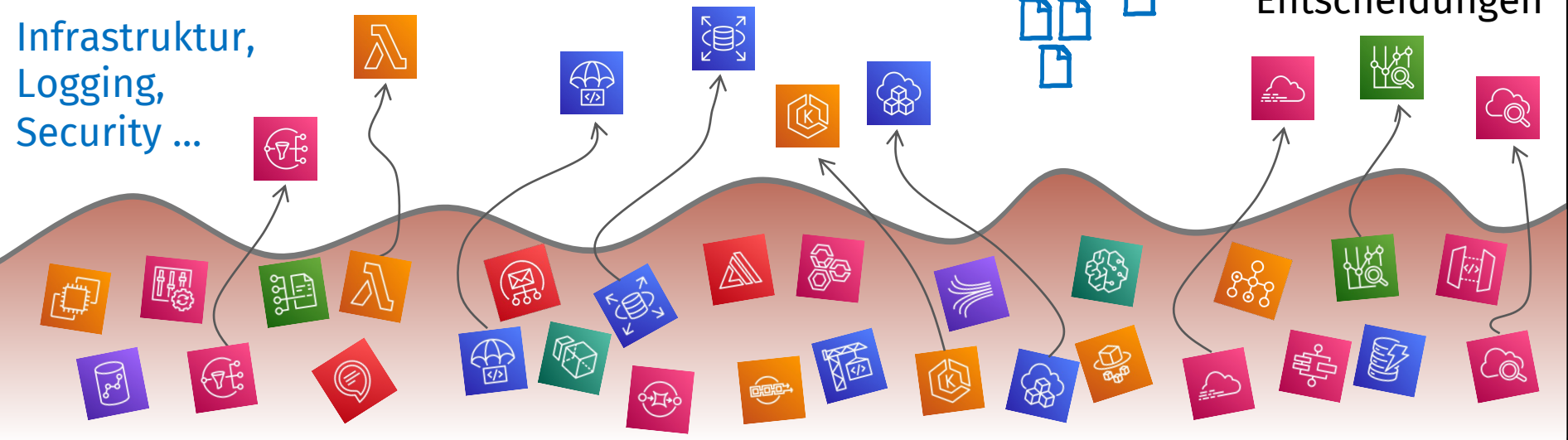


Applikation

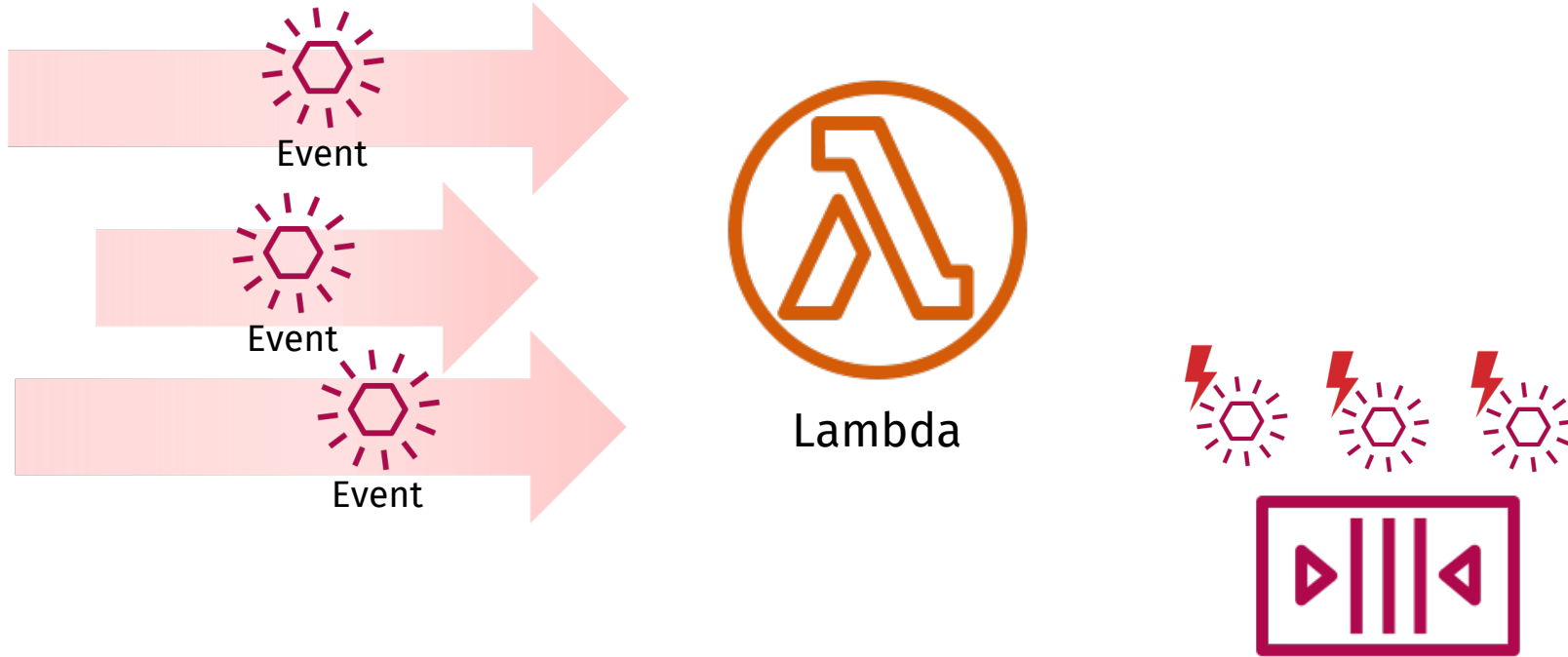


Entscheidungen

Infrastruktur,
Logging,
Security ...



Lambdas und Dead-Letter-Queues



Fitness Function mit AWS Config



- Zeichnet Änderungen an Ressourcen auf
- Gleicht Änderungen gegen definierte Regeln ab
- Generiert Reports und Metriken

AWS Config

Dashboard

Conformance packs

Rules

Resources

▼ Aggregators

Conformance packs

Rules

Resources

Authorizations

Advanced queries

Settings

What's new

Documentation

Partners

FAQs

Pricing

Share feedback

Parameters

Key	Type	Value	Description
dlqArns	String	-	Comma-separated list of Amazon SQS and Amazon SNS ARNs that must be configured as the Lambda function dead-letter queue target.

▼ Resources in scope

View details

Remediate



Noncompliant

< 1 >



Status	Annotation	Compliance
-	This AWS Lambda function is not configured with a dead-letter queue.	⚠ Noncompliant
-	This AWS Lambda function is not configured with a dead-letter queue.	⚠ Noncompliant
-	This AWS Lambda function is not configured with a dead-letter queue.	⚠ Noncompliant
-	This AWS Lambda function is not configured with a dead-letter queue.	⚠ Noncompliant
-	This AWS Lambda function is not configured with a dead-letter queue.	⚠ Noncompliant

AWS Config

✕

Dashboard

Conformance packs

Rules

Resources

▼ Aggregators

Conformance packs

Rules

Resources

Authorizations

Advanced queries

Settings

What's new

Documentation

Partners

FAQs

Pricing

Share feedback

AWS Config

>

Conformance packs

Conformance packs

A conformance pack is a collection of AWS Config rules and remediation actions that can be deployed and monitored as a single entity in your AWS account. [Learn more](#)

Conformance packs

🔄

Actions ▼

Conformance pack timeline

Deploy conformance pack

🔍 Search

< 1 > ⚙️

saa-conformance-pack

○

Deployment status

✔️ Completed

0%

Compliance score

View

Conformance packs

A conformance pack is a collection of AWS Config rules and remediation actions that can be deployed and monitored as a single entity in your AWS account. [Learn more](#)

Conformance packs

Actions ▼

Conformance pack timeline

Deploy conformance pack

< 1 >

saa-conformance-pack

Deployment status
 Completed

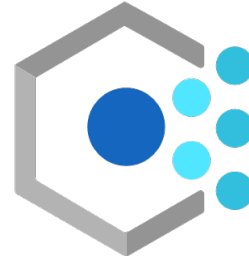
33%
Compliance score

View

AWS Config bei anderen Vendoren



Azure Monitor



Azure Policy



Asset Inventory



Probleme mit AWS Config als Fitness Function

- **Spätes Feedback, nicht in Deployment-Pipeline**
- **Verzögerung in Berechnung von Compliance Score in Conformance Packs**



Atomic vs. Holistic

Atomic



Holistic

- Fokus auf eine Dimension
- Fokus auf mehr als eine Dimension

Fitness Function mit AWS Config

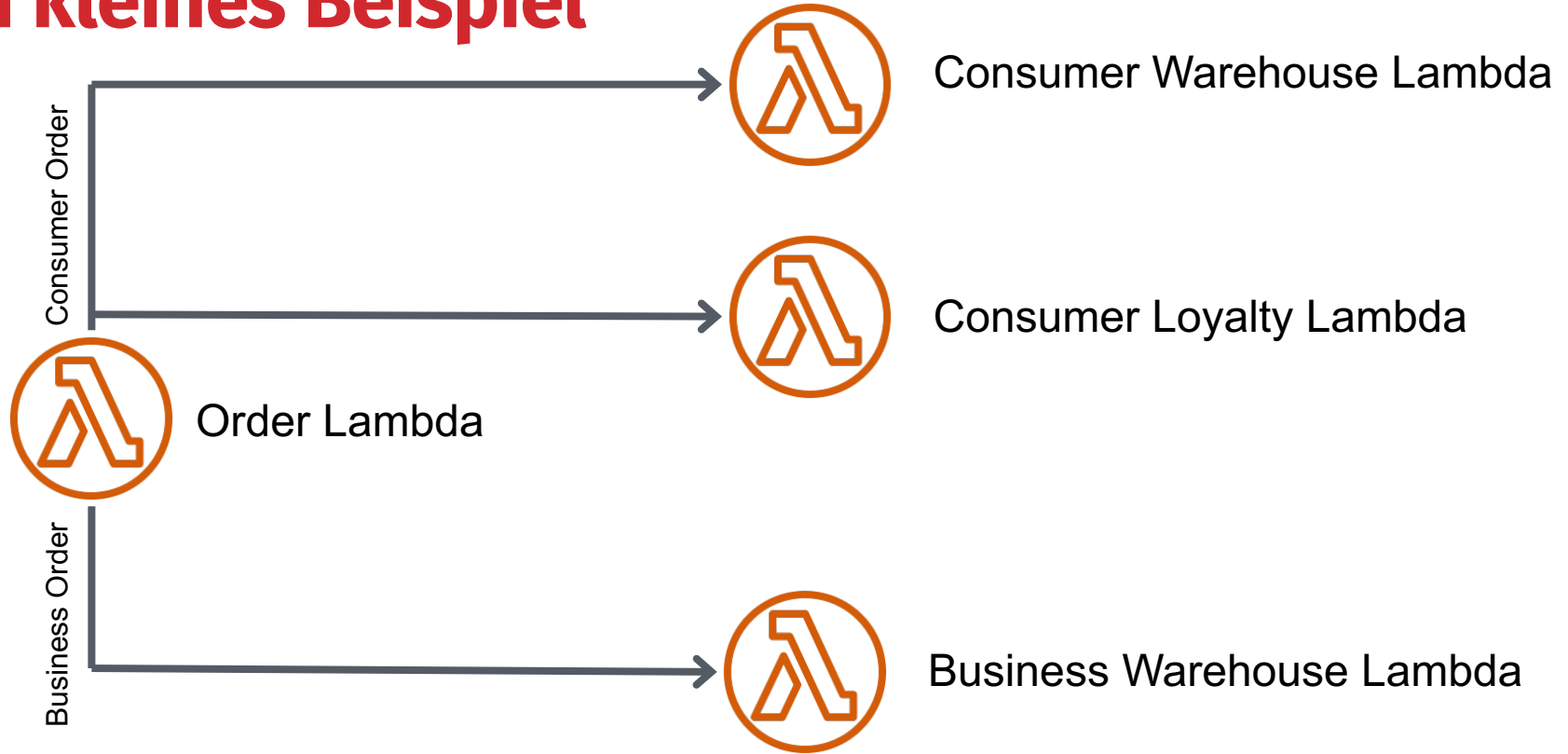
Atomic



Holistic



Ein kleines Beispiel



Fitness Function mit AWS Cloudtrail



- Zeichnet Events gegen Service APIs auf
- Stellt Daten als Monitoring-Service zur Verfügung
- Kann Daten von Nutzern und Services loggen

CloudWatch Management Console

eu-central-1.console.aws.amazon.com/cloudwatch/home?region=eu-central-1#home:

Services

Search for services, features, blogs, docs, and more

[Option+S]

Frankfurt

alexkaserbacher @ alexkaserbacher

CloudWatch

Switch to your original interface

Overview info

1h3h12h1d1wCustom

OverviewFilter by resource groupinfo

Actions

Get started with CloudWatch

You don't have any alarms, metrics or default dashboard. Once you set them up they will be displayed here. [View getting started page](#)



Set alarms on any of your metrics to receive notification when your metric crosses your specified threshold.

[Create alarms](#)



Create and name any CloudWatch dashboard **CloudWatch-Default** to display it here.

[Create a default dashboard](#)



Monitor using your existing system, application and custom log files.

[View logs](#)



Write rules to indicate which events are of interest to your application and what automated action to take.

[View events](#)

Get started with Application Insights info

Set up monitors and dashboards to detect issues and resolve problems with enterprise applications, databases, and workloads.

► How it works

Configure Application Insights

Feedback

Looking for language selection? Find it in the new [Unified Settings](#)

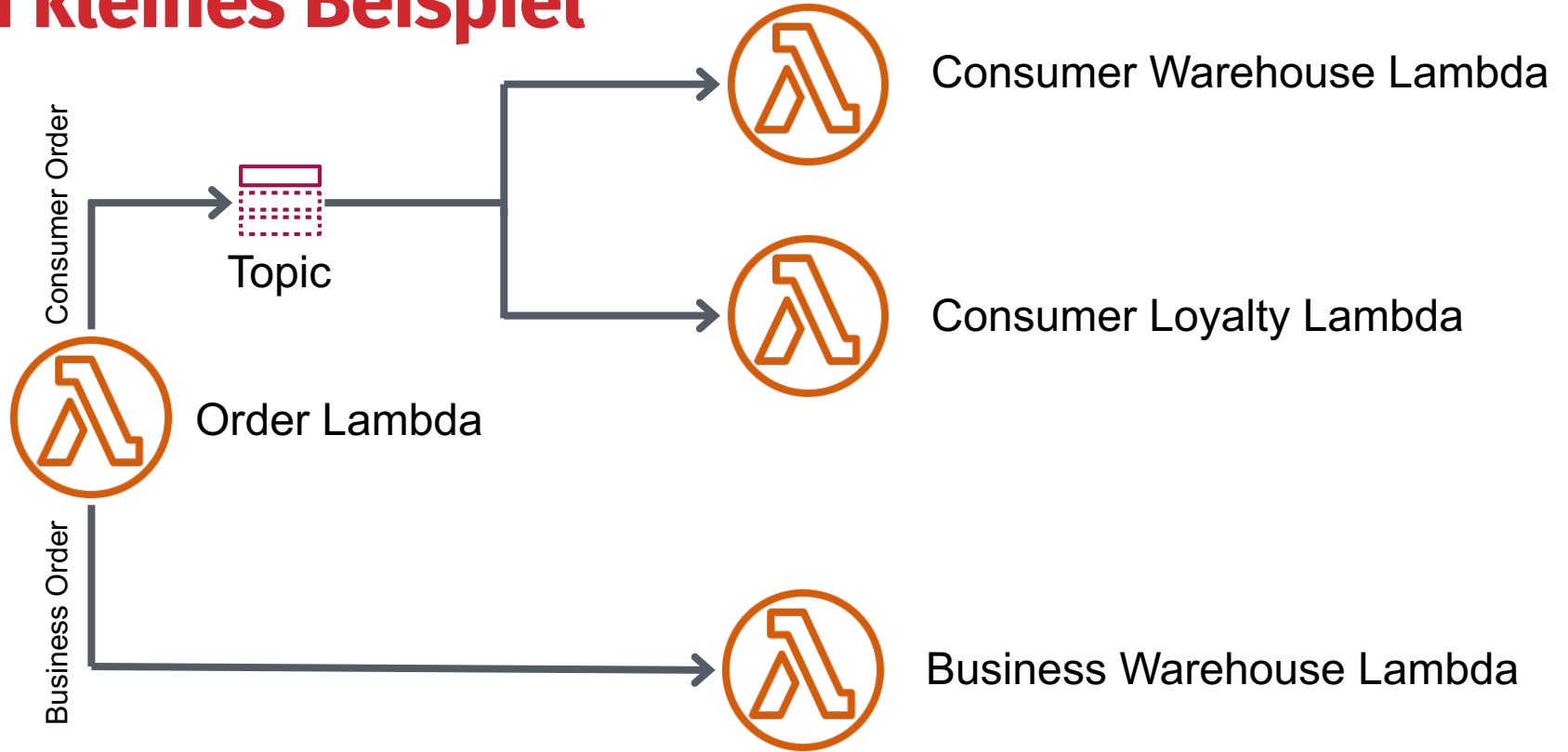
© 2022, Amazon Web Services, Inc. or its affiliates.

Privacy

Terms

Cookie preferences

Ein kleines Beispiel





CloudWatch > Dashboards > OrchestrationDashboard860A85B4-1a8qWJV1UyAX

OrchestrationDashboard860A85B4-1a8qWJV1UyAX

Search dashboards

1h

3h

12h

1d

3d

1w

Custom



Actions

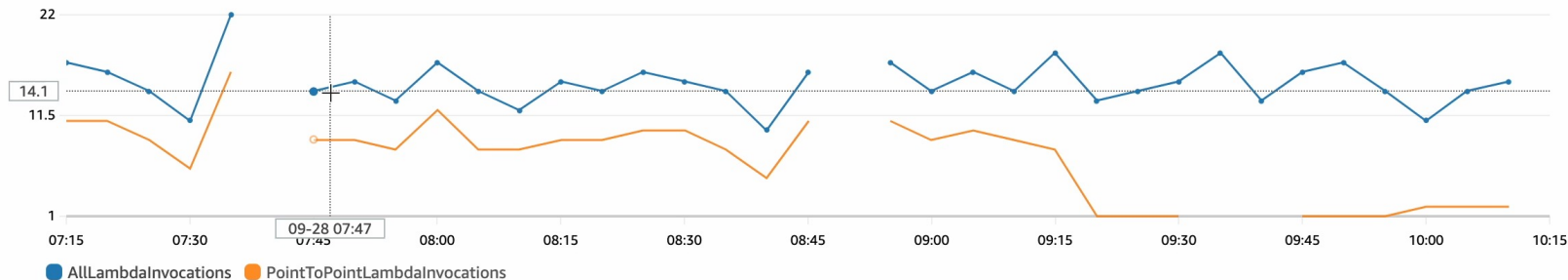
Save dashboard

Add widget

Lambda invocations

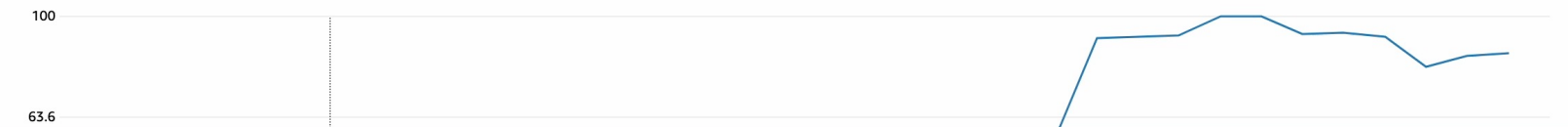


No unit



% of non-point-to-point Lambda invocations

No unit



Fitness Function mit AWS Cloudtrail

Atomic



Holistic



Triggered vs. Continuous

Triggered ←————→ Continuous

- Explizit ausgelöst
- z.B. in Deployment-Pipeline

- Läuft “im Hintergrund”
 - z.B. Monitoring



Fitness Function mit AWS Cloudtrail



AWS Cloudtrail bei anderen Vendoren



Azure Monitor Activity Log



Cloud Audit Logs

Chaos Engineering



Ein anderes kleines Beispiel



ContainerStack-ClusterEB0386A7-mEsgHOaDRqcw

Refresh Edit cluster Delete cluster

Cluster overview

ARN	Status	CloudWatch monitoring	Registered container instances
ContainerStack-ClusterEB0386A7-mEsgHOaDRqcw	Active	Default	2

Services

Draining	Active
-	2

Tasks

Pending	Running
-	2

Services Tasks Infrastructure Metrics Tags

Services (2)

Refresh Manage tags Edit Delete service Deploy

Filter services by value All launch types All service types < 1 > Settings

[Amazon Elastic Container Service](#) > [Clusters](#) > [ContainerStack-ClusterEB0386A7-mEsgHOaDRqcw](#) > [Services](#) > [ContainerStack-FinancialServiceEC569297-T1fKUbbOfmeX](#) > [Networking](#)

ContainerStack-FinancialServiceEC569297-T1fKUbbOfmeX

[Edit service](#) [Delete service](#)

Health and metrics

Logs

Configuration and tasks

Deployments and events

Networking

Tags

Network configuration

Network	Security groups	Service role	Load balancers
-	-	AWSServiceRoleForECS	Conta-Finan-RUPX6GPAXGXV
Subnets	Auto-assign public IP		DNS names
-	-		Conta-Finan-RUPX6GPAXGXV-1329473385.eu-central-1.elb.amazonaws.com open address
	Health check grace period		Target groups
	60		Conta-Finan-17AU4B5H7N8WU

CloudWatch Management Console

conta-finan-rupx6gpaxgv-132

eu-central-1.console.aws.amazon.com/cloudwatch/home?region=eu-central-1#synthetics:canary/list

aws

Services

Search for services, features, blogs, docs, and more

[Option+S]

Frankfurt

alexkaserbacher @ alexkaserbacher

CloudWatch

Favorites and recents

Dashboards

Alarms

0

0

0

Logs

Metrics

X-Ray traces

Events

Application monitoring

ServiceLens Map

Resource Health

Synthetics Canaries

Evidently

RUM

Insights

Settings

CloudWatch

Synthetics Canaries

Last updated: 1:47 PM. Auto-refreshes every 60 seconds.

Canaries

3 hours

Status

The status distribution of currently running canaries

Passed (1) Failed

Groups

By last run

Total

0

Failing

0

Alarming

0

Slowest performers

In last 3 hours

Slowest group

0.0ms

Slowest regions

1. Europe (Frankfurt)

Canaries (1)

Show groups

Actions

Create group

Create canary

Find resources

View all

All regions

< 1 >

	Name	Last run	Success %	Alarms	Region	Avg. duration	State
☐	financial-canary	Passed	100%	-	Europe (Frankfurt)	16.7s	Running

Feedback

Looking for language selection? Find it in the new Unified Settings

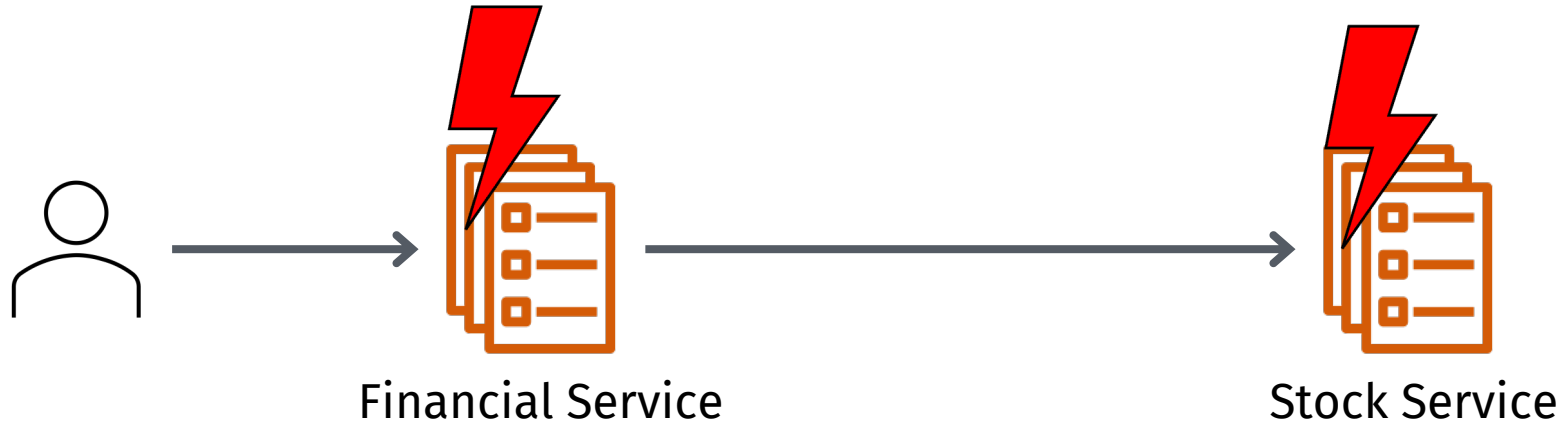
© 2022, Amazon Web Services, Inc. or its affiliates.

Privacy

Terms

Cookie preferences

Chaos?



AWS FIS

Experiment templates

Experiments

Share Feedback

AWS FIS > Experiment templates > EXT7ieao9BGaJnuQ4

EXT7ieao9BGaJnuQ4 / ECS experiment

Info

Actions

Start experiment

Details

Experiment template ID
EXT7ieao9BGaJnuQ4

Description
ECS experiment

IAM role
[AWSFISIAMRole-1664366995467](#)

Stop conditions
-

Creation time
September 28, 2022, 14:11:27
(UTC+02:00)

Last update time
September 28, 2022, 14:11:27
(UTC+02:00)

Actions

Targets

Export

Tags

Timeline

Actions (1)

View your experiment template actions, action duration, and action sequences.

► stop-all-tasks / aws:ecs:stop-task

Start: At beginning of experiment / Target: Tasks-Target-1

New ECS Experience

Tell us what you think

Amazon Elastic Container Service

Clusters

Task definitions

Account settings

Amazon ECR

Repositories

Documentation

Discover products

Subscriptions

Services

Draining

-

Active

2

Tasks

Pending

1

Running

1

Tasks (7)

Refresh

Stop

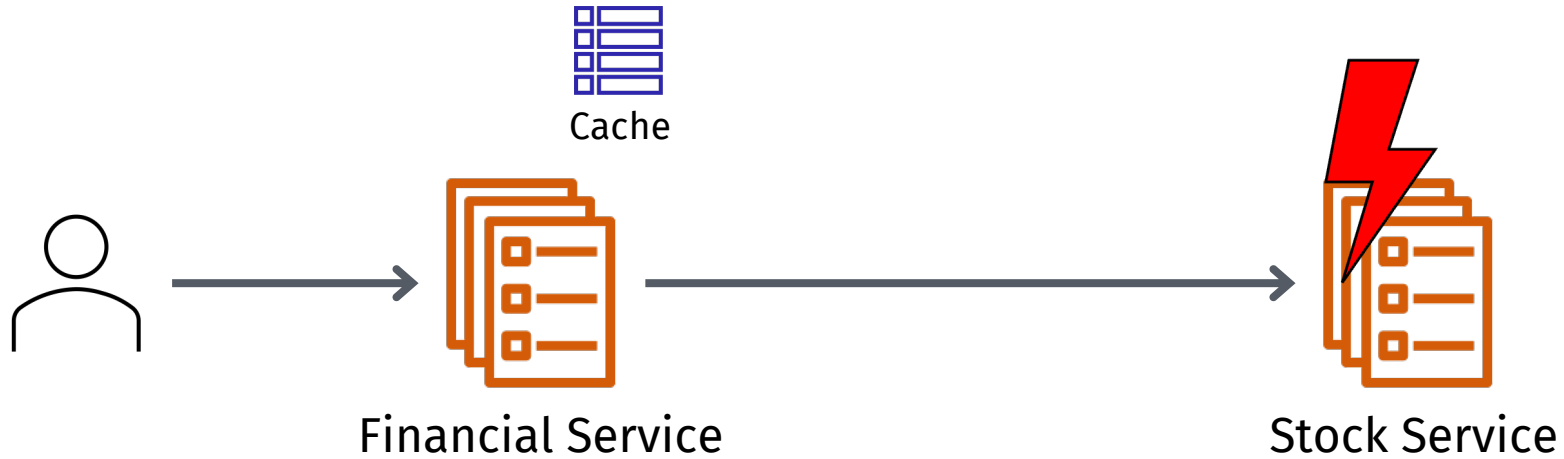
Run new task

Filter tasks by property or value

☐	Task	Last status	Desired st...	T...	Re...	Health sta...	Started...
☐	3c7cd8...	Running	Running	Container	13	Unknown	7 seconds ...
☐	d79a5...	Running	Running	Container	64	Unknown	3 seconds ...
☐	13fb64...	Stopped	Stopped	Container	13	Unknown	8 minutes...
☐	4672af...	Stopped	Stopped	Container	62	Unknown	2 hours ago
☐	6b62b...	Deprovisioning	Stopped	Container	64	Unknown	4 minutes...

```
[{"stockName": "XYZ INC", "stockValue": 121}]
```

Kein Chaos!



AWS FIS

Experiment templates
Experiments

Share Feedback

[AWS FIS](#) > [Experiment templates](#) > EXT7ieao9BGaJnuQ4

EXT7ieao9BGaJnuQ4 / ECS experiment

Info

Actions

Start experiment

Details

Experiment template ID EXT7ieao9BGaJnuQ4	Description ECS experiment	IAM role AWSFISIAMRole-1664366995467
Stop conditions -	Creation time September 28, 2022, 14:11:27 (UTC+02:00)	Last update time September 28, 2022, 14:11:27 (UTC+02:00)

Actions

Targets

Export

Tags

Timeline

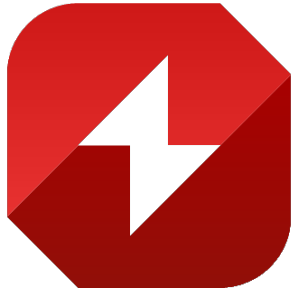
Actions (1)

View your experiment template actions, action duration, and action sequences.

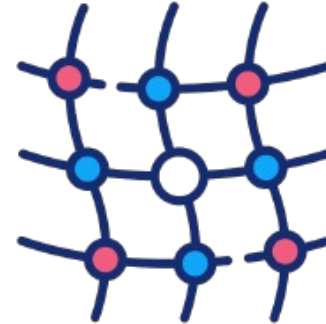
▶ stop-all-tasks / aws:ecs:stop-task

Start: At beginning of experiment / Target: Tasks-Target-1

Chaos Engineering bei anderen Vendors



Azure Chaos Studio



Chaos Mesh

Fitness Function mit Chaos Engineering

Atomic



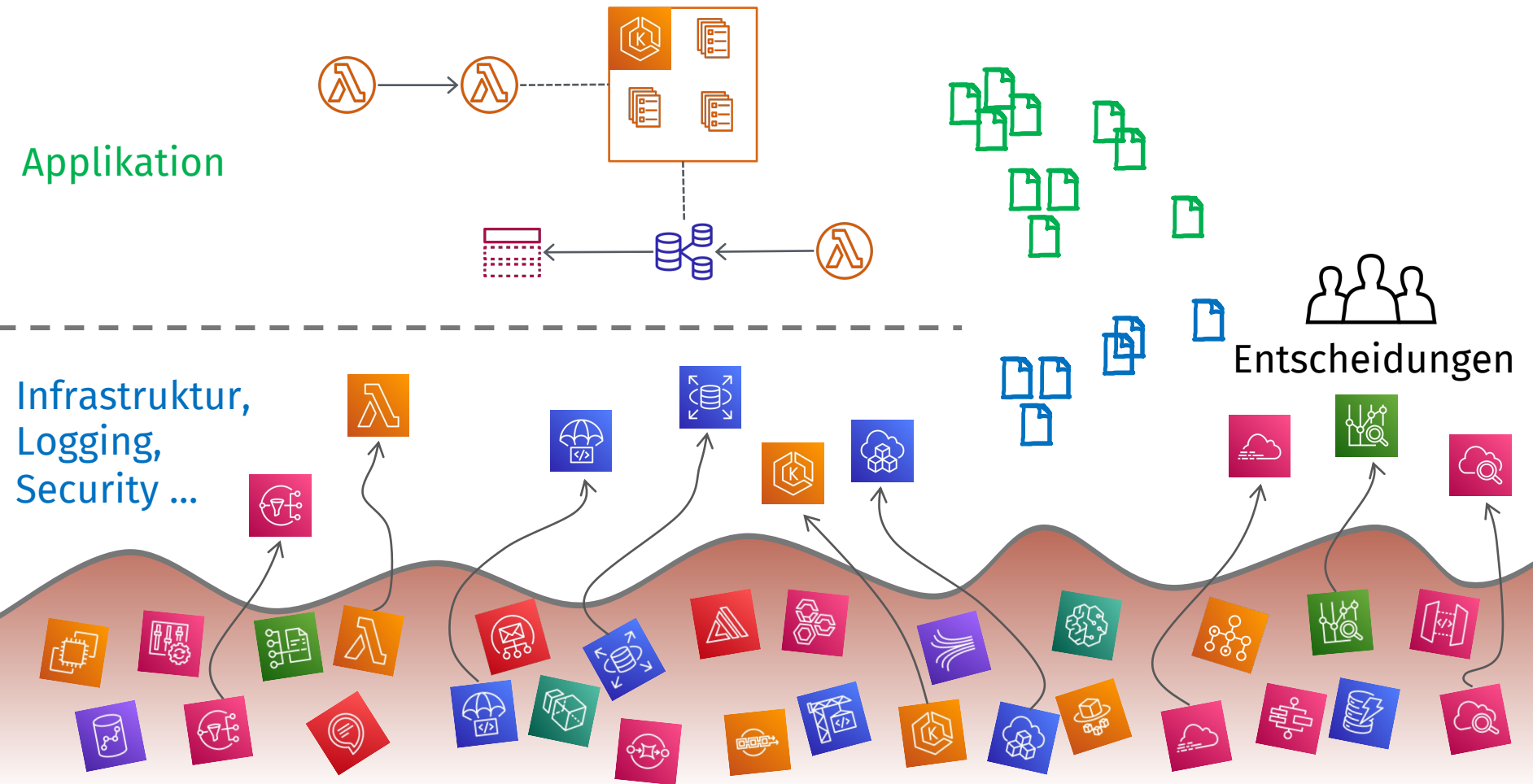
Holistic

Triggered



Continuous





Infrastruktur,
Logging,
Security ...

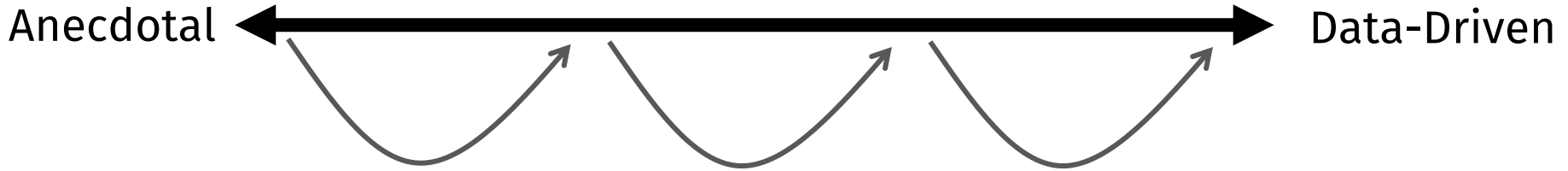
Anecdotal vs. Data-Driven

Anecdotal ←————→ Data-Driven

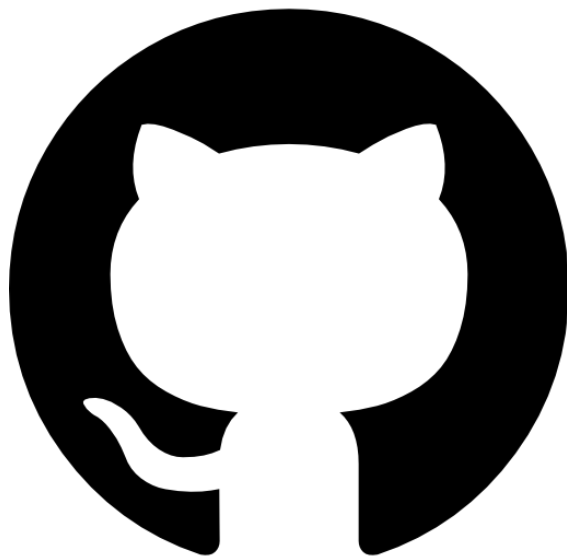
- Best Practices
- z.B. Findings von Tools und Checks
 - Aus Anwendungs- und Infrastruktur-Daten extrahiert
 - z.B. Metriken, Tracing



Shift Right



- Veränderung am System
- Neue Patterns erkennen
- Fitness Functions ersetzen und verbessern



<https://github.com/alexksbr/fitness-functions-cloud>



Danke.

Jegliche Fragen sind willkommen!



ak@embarc.de



@alexksbr



embarc.de



embarc 
Software Consulting GmbH

<https://www.embarc.de/fitnessfunctions-ak-swamuc-2022/>