



DevOps School – Diploma

Rinat Sadykov (sark@bk.ru)

Variant 7

January 2022

# Task description

---

Variant 7

Task:

- Using API <https://www.metaweather.com/api/> get data about weather in Moscow for current month and store it into DB:
  - id
  - weather state name
  - wind direction compass
  - created
  - applicable date
  - min temp
  - max temp
  - the temp

Output the data by date (the date is set) in the form of a table and sort them by created in ascending order.

Application:

<http://dev-epm-diploma-v7.westeurope.cloudapp.azure.com/>

<http://prod-epm-diploma-v7.westeurope.cloudapp.azure.com/>

Grafana:

<http://grafana-epm-diploma-v7.westeurope.cloudapp.azure.com/>

GuthHb – application source code:

<https://github.com/rinxster/epam-diploma-v7>

GuthHb – Terraform IaC:

<https://github.com/rinxster/epam-diploma-v7-iaC>

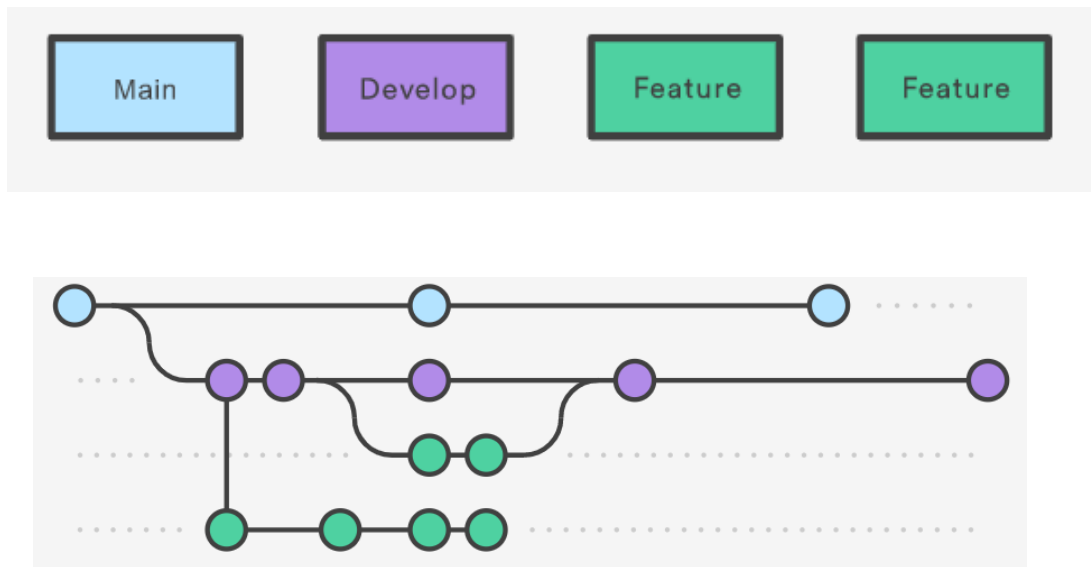
# Architecture Decisions

Domain	Related Course Module	Solution\tool used
SCM	Git	GitHub
Tests(optional)	CI/CD	N/A - Skipped as optional
Quality gate	CI/CD	SonarCloud + Azure Devops
IaC	Cloud, Terraform, Ansible	Terraform
Orchestration	Kubernetes	Azure Kubernetes Service (AKS)
Logging	Monitoring and Logging	Azure Monitor, LogAnalyticsWorkplace
Monitoring	Monitoring and Logging	Azure Monitor, Grafana
Runtime/Deployment	CI/CD	Azure Devops
Scalability/redundancy	Kubernetes	Azure Kubernetes Service (AKS)
Cloud and Cost efficiency**	Cloud	Azure costs management+Azure Budget

# SCM - GitHub



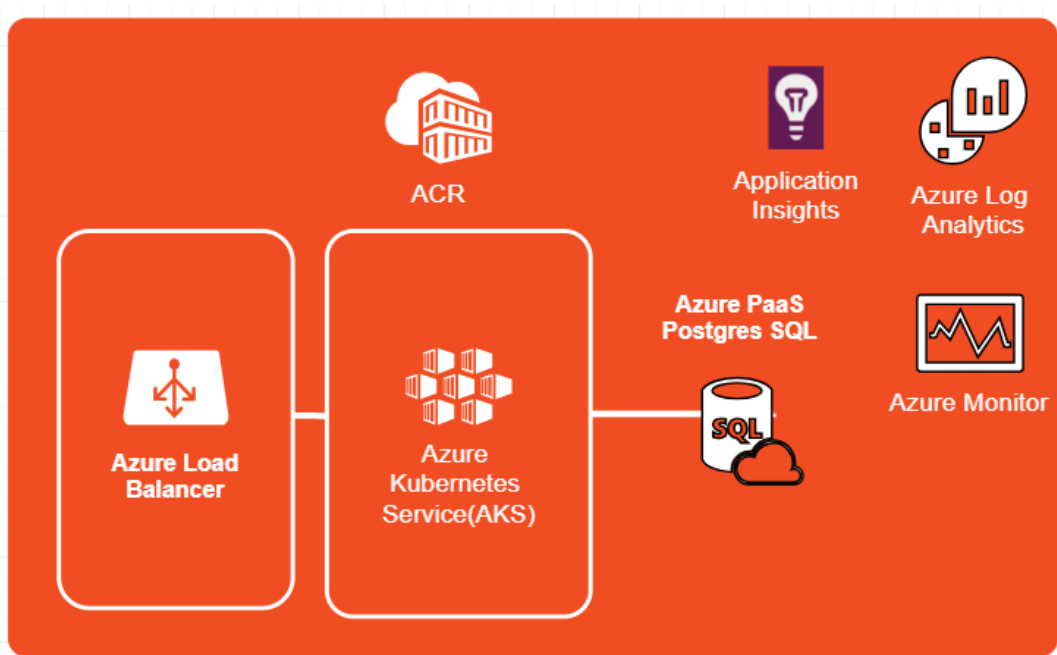
- GitFlow used as branching strategy
- Main and develop are permanent branches.
- Feature/fix branches are temporary and deleted after merge.



# IaC – Terraform



IaC design deployed using Terraform in Azure



GuthHb – Terraform IaC:

<https://github.com/rinxster/epam-diploma-v7-iaC>

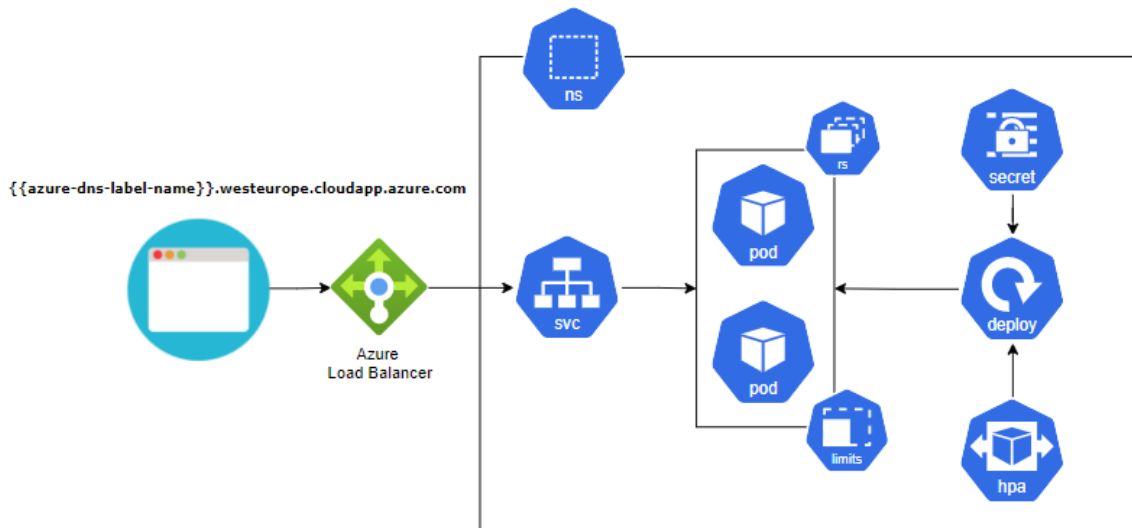
- NB: Following resources are pre-deployed in advance manually:
  - Storage Account(to store tfstate and run Azure Cloudshell)
  - Resource Group
  - Azure Key Vault(to prepare and store passwords for deployment)

# Orchestration - AKS



Azure Kubernetes Service (AKS)

Prod\Dev namespace overview



- 2 namespaces: Prod and Dev
- Secrets file generated with data from Azure KeyVault
- Horizontal pod autoscaler configured.
- 1 separate namespace for Grafana: "Monitoring"
- Grafana (deployed separately using helm chart).

# Runtime/Deployment - CI\CD



- Separate CI\CD pipelines for DEV and PROD.
- Dev\Prod CI triggered by commit in Dev\Main branches
- Dev\Prod CD triggered once appropriate Dev\Prod CI pipeline completed successfully.
- Azure KeyVault used to store passwords and keys securely for the files that are prepared and published during CI
- CD has Quality Gate enabled (SonarCloud)
- Annotations added to Grafana dashboard upon Prod\Dev CD completion.
- Telegram notifications sent upon CI\CD completion(whether failed or succeeded)

## CI Pipeline

Tasks Variables Triggers Options History Sa

**Pipeline**  
Build pipeline

Get sources  
rinxster/epam-diploma-v7 dev

SonarCloud Analysis  
Run on agent

Prepare analysis on SonarCloud  
Prepare Analysis Configuration

Run Code Analysis  
Run Code Analysis

Publish Quality Gate Result  
Publish Quality Gate Result

build Docker container  
Run on agent

buildAndPush  
Docker

upload artefacts  
Run on agent

Replace tokens in \*\*/\*.yaml  
Replace Tokens

Copy Files to: \$(Build.ArtifactStagingDirectory)  
Copy files

Publish Artifact: drop  
Publish build artifacts

Telegram Notification  
Run on agent

Send Telegram Notification  
Telegram Notification

## CD Pipeline

Agent job  
Run on agent

kubectl create namespace  
Kubectl

kubectl apply secret  
Kubectl

kubectl apply manifest  
Kubectl

Grafana Annotations  
Grafana Annotations

Send Telegram Notification  
Telegram Notification

## Telegram notifications example

epam\_diploma\_v7\_opschat  
2 members

epam-diploma-v7 17:29

Task Failed  
#Build-302  
Dev CI Completed  
Build queued by: Rinat S  
Project URL:  
epam-diploma-v7 17:38

Task Succeeded  
#Build-303  
Dev CI Completed  
Build queued by:  
Microsoft.VisualStudio.Ser  
vices.TFS  
Project URL:  
epam-diploma-v7 17:43

Task Succeeded  
#Release-53  
Dev CD Completed!  
Release queued by: Rinat  
S  
Project URL:  
epam-diploma-v7 17:43

# Quality Gate

## CI Pipeline

Results published

**sonarcloud** 

## CD Pipeline

sark0205 / epam-diploma-v7 / Pipelines

dev-epam-diploma-v7-CI

Tasks Variables Triggers Options History Save & queue

Get sources  
Run on agent

SonarCloud Analysis  
Run on agent

Prepare analysis on SonarCloud  
Prepare Analysis Configuration

Run Code Analysis  
Run Code Analysis

Publish Quality Gate Result  
Publish Quality Gate Result

build Docker container  
Run on agent

buildAndPush  
Docker

upload artefacts  
Run on agent

Replace tokens in \*\*/\*.yaml  
Replace Tokens

Copy Files to: \$(Build.ArtifactStagingDir...  
Copy Files

Publish Artifact: drop  
Publish build artifacts

311 Lines of Code Version 1.0 Last analysis 3 hours ago d8842955 1 warning

Quality Gate **Passed**

New Code Overall Code

Since 18 days ago

RELIABILITY	0 Bugs (0)	MAINTAINABILITY	0 Code Smells (0)
SECURITY	0 Vulnerabilities (0)	SECURITY REVIEW	0 Security Hotspots (0)
COVERAGE	0.0% Coverage (0) on 5 New Lines to cover	DUPLICATIONS	0.0% Duplications (0) on 45 New Lines

All pipelines > dev-CD

Pipeline Tasks Variables Retention Options History

+ Add

Stages | + Add

dev 1 job, 2 tasks

Triggers

Define the trigger that will start deployment to this stage

Pre-deployment approvals

Select the users who can approve or reject deployments to this stage

Gates

Define gates to evaluate before the deployment.

The delay before evaluation

5 Minutes

Deployment gates

Check SonarCloud Quality Gate status

Evaluation options

Deployment queue settings

dev-CD > Release-37 > dev Succeeded

Pipeline Tasks Variables Logs Tests Deploy Cancel Refresh Download all logs Edit

Deployment process

Succeeded

Pre-deployment gates

Succeeded

All gates succeeded at 1/8/2022, 11:20 PM

Deployment gates \samples

11:15 PM 11:20 PM

Check SonarCloud Quality Gate status



# Logging – Azure Monitor and Log Analytics Workplace



Azure Monitor



Log Analytics  
workspaces

[Home](#) > [Resource groups](#) > [epam-diploma-v7](#) > [rs-law01](#)

**rs-law01** | Logs ...  
Log Analytics workspace

Tags

Diagnose and solve problems

Settings

Locks

Agents management

Agents configuration

Custom logs

Computer Groups

Data Export

Linked storage accounts

Network isolation

General

Workspace summary

Workbooks

Logs

Solutions

Usage and estimated costs

Properties

Service Map

Workspace Data Sources

Virtual machines

New Query 1\*

rs-law01 Select scope

Tables Queries Functions ... <<

1 Filter Group by: Topic >

Collapse all

**Favorites**

You can add favorites by clicking on the ☆ icon

▶ Alerts

▶ Browsing data

▶ Performance

▶ Reports failures

Exceptions causing request failures

Failed operations

Failed requests – top 10

Failing dependencies

```
1 // Failed operations
2 // Calculate how many times operations failed, and how many users were impacted.
3 // To create an alert for this query, click '+ New alert rule'
4 AppRequests
5 where Success == false
6 summarize failedCount=sum(ItemCount), impactedUsers=count(UserId) by OperationName, _ResourceId
7 order by failedCount desc
```

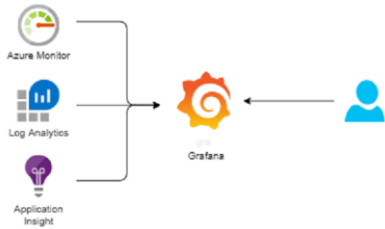
Results Chart Columns > Display time (UTC+03:00) > Group columns

Completed. Showing results from the last 24 hours.

00:00.7 155 records >

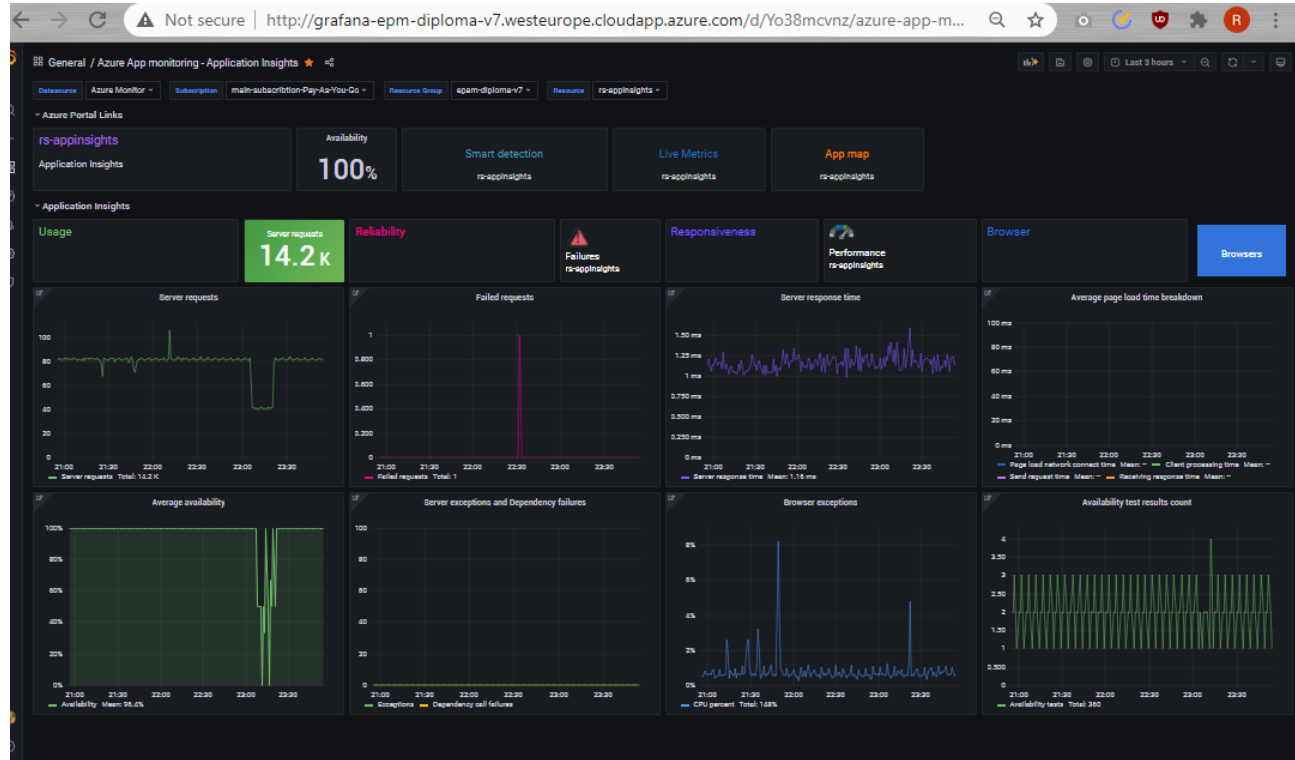
OperationName	_ResourceId	failedCount	impactedUsers
> GET /db/phpMyAdmin/index.php	/subscriptions/0255910c-f676-4e0d-912d-0c0abe4ba3e3/resou...	22	1
> GET /pma2015/index.php	/subscriptions/0255910c-f676-4e0d-912d-0c0abe4ba3e3/resou...	22	2
> GET /phpMyAdmin-3/index.php	/subscriptions/0255910c-f676-4e0d-912d-0c0abe4ba3e3/resou...	20	2
> GET /pma2011/index.php	/subscriptions/0255910c-f676-4e0d-912d-0c0abe4ba3e3/resou...	20	1
> GET /favicon.ico	/subscriptions/0255910c-f676-4e0d-912d-0c0abe4ba3e3/resou...	20	2
> GET /php-myadmin/index.php	/subscriptions/0255910c-f676-4e0d-912d-0c0abe4ba3e3/resou...	18	1
> GET /admin/phpMyAdmin/index.php	/subscriptions/0255910c-f676-4e0d-912d-0c0abe4ba3e3/resou...	18	2
> GET /db/phpmyadmin3/index.php	/subscriptions/0255910c-f676-4e0d-912d-0c0abe4ba3e3/resou...	18	2
> GET /phpppma/index.php	/subscriptions/0255910c-f676-4e0d-912d-0c0abe4ba3e3/resou...	18	2
> GET /phpMyAdmin-5.1.0/index.php	/subscriptions/0255910c-f676-4e0d-912d-0c0abe4ba3e3/resou...	18	2
> GET /phpmyadmin2021/index.php	/subscriptions/0255910c-f676-4e0d-912d-0c0abe4ba3e3/resou...	18	2

# Monitoring with Grafana and Azure Monitor



## Application Monitoring:

“appinsights” python module  
used to report data to Azure  
Application Insights(integrated  
into app.py and index.html  
template)



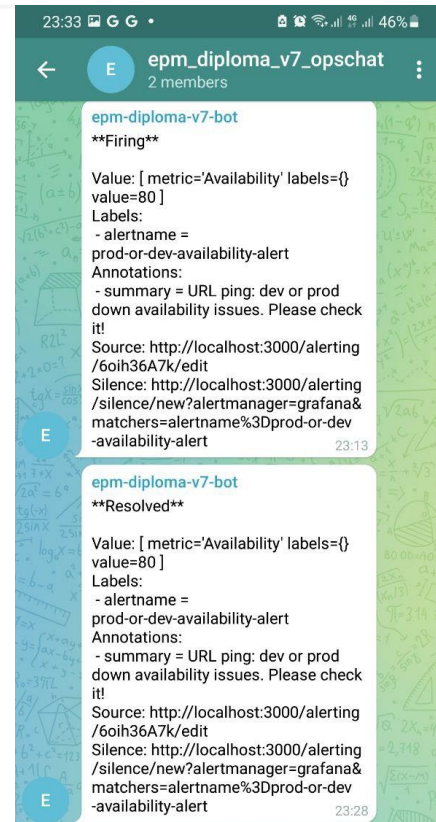
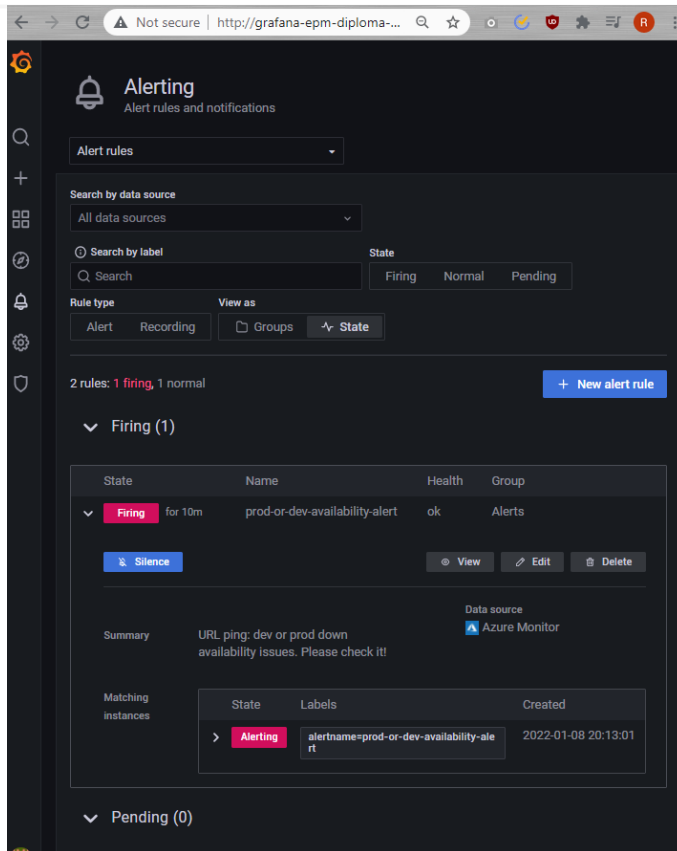
# Azure DevOps Webhooks and Grafana CD Release annotations



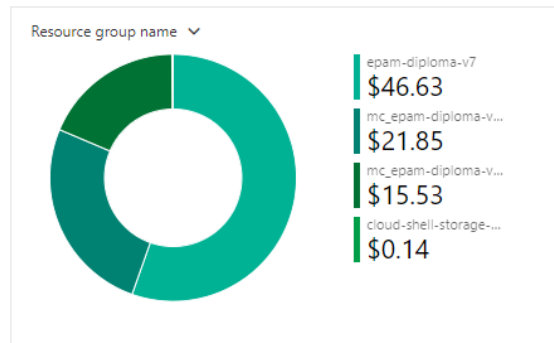
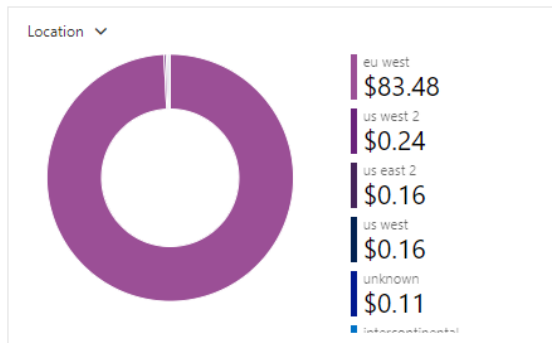
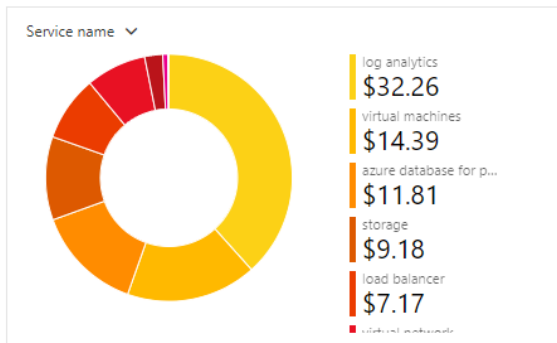
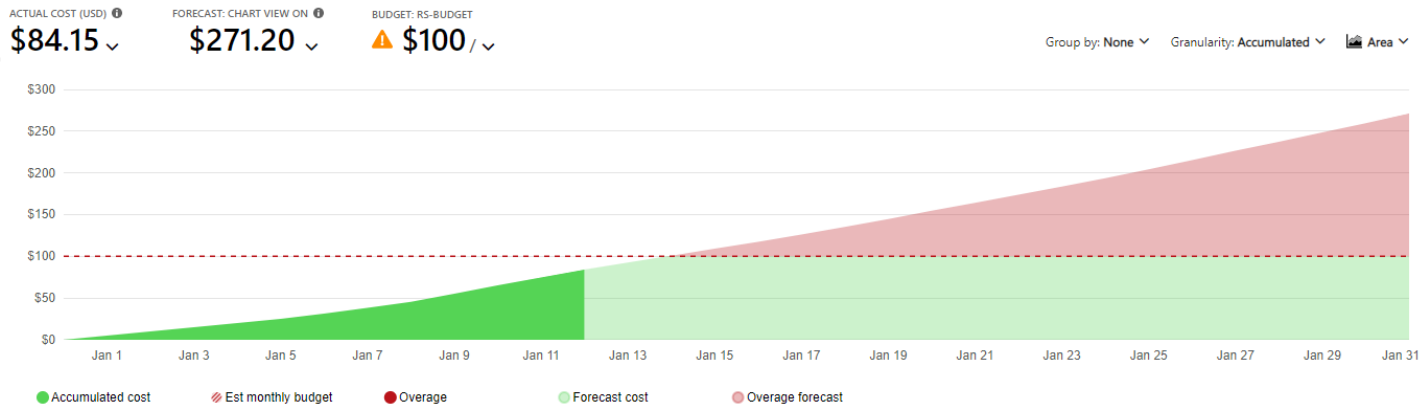
# Alerting with Grafana and Telegram

<http://dev-epm-diploma-v7.westeurope.cloudapp.azure.com/>

<http://prod-epm-diploma-v7.westeurope.cloudapp.azure.com/>



# Costs



NB: Application Monitoring: Personal (non Epam) Azure account and subscription used for this diploma to save time for resource limitations and access troubleshooting and fixing.

# Demo

---

- Application demo
- Terraform plan&apply
- K8s HPA Demo – cpu load and autoscaling
- Pipelines demo
- Telegram notifications/Grafana annotations

---

# Q&A