



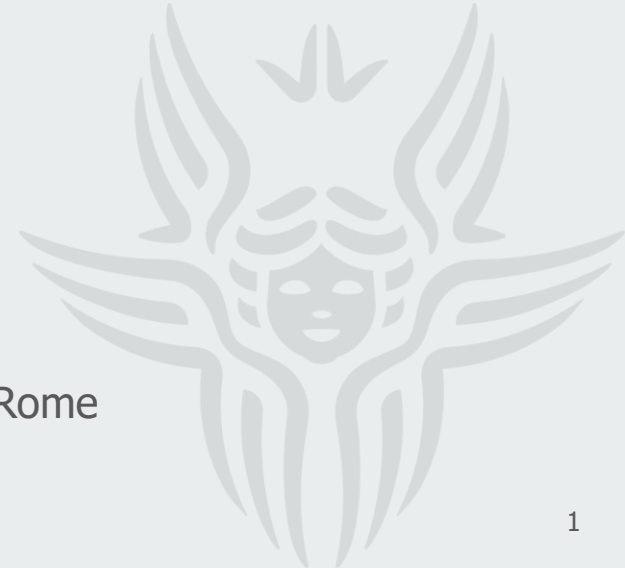
Cloud Computing Project

Barreca Federico – 1736423

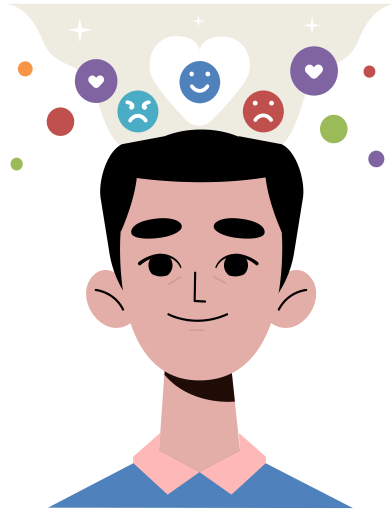
Bevilacqua Paolo Pio – 2002288

De Sio Ilaria – 2064970

Cloud Computing – A.Y. 2022-2023 Sapienza University of Rome



Description of the problem addressed



The user expresses emotions through a phrase.



It's a recommendation system designed to understand user's emotion and suggest Spotify songs.





Emotions - Songs

The connection between emotions and songs will be determined through the examination of these three fields:

Valence

Degree of similarity and positivity of a song

Energy

Perceptual measure of intensity and activity

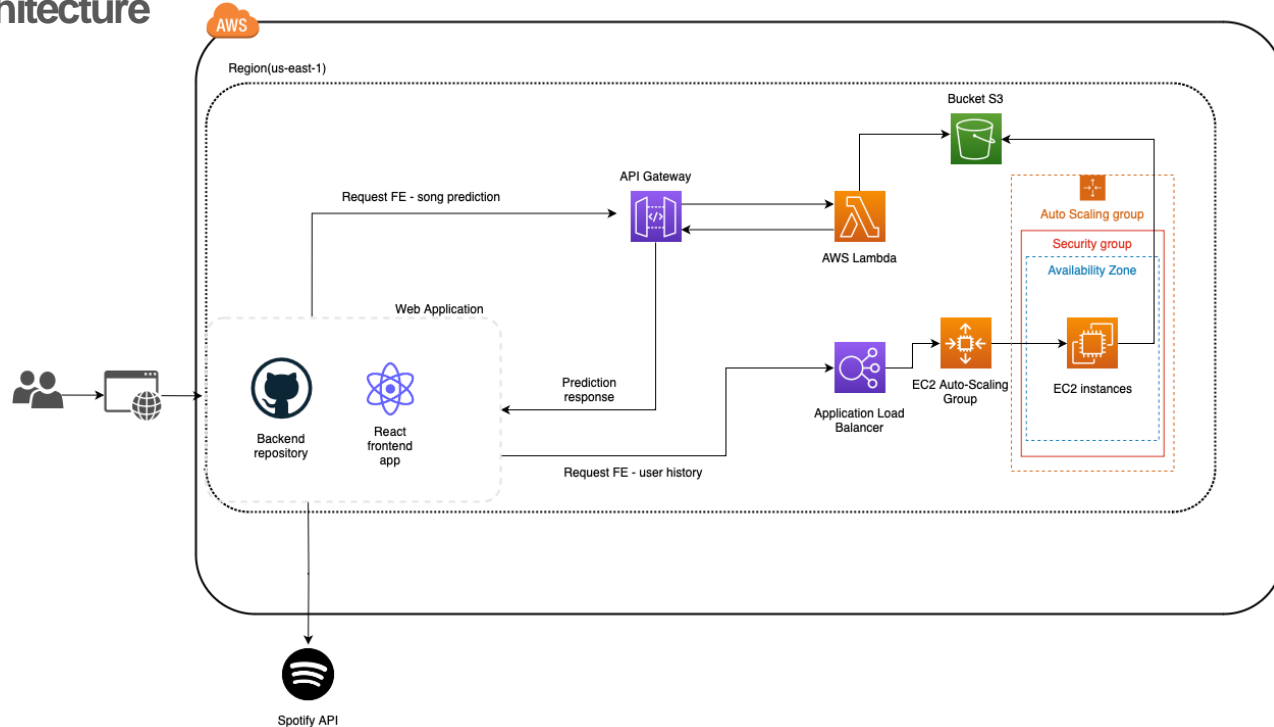
Tempo

Overall estimated tempo of a track in BPM



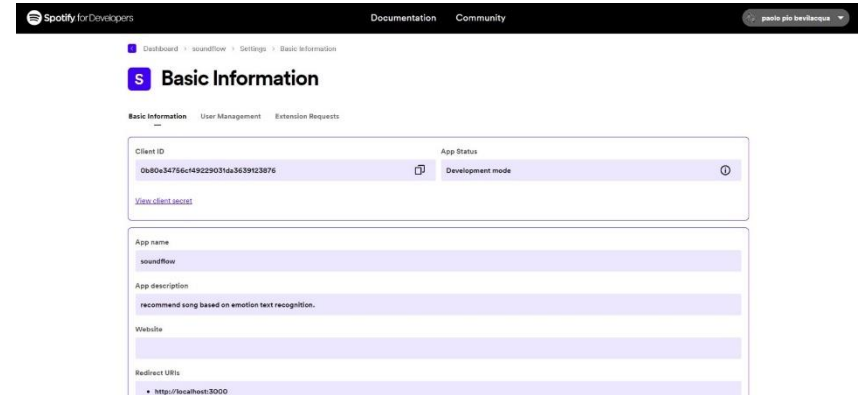
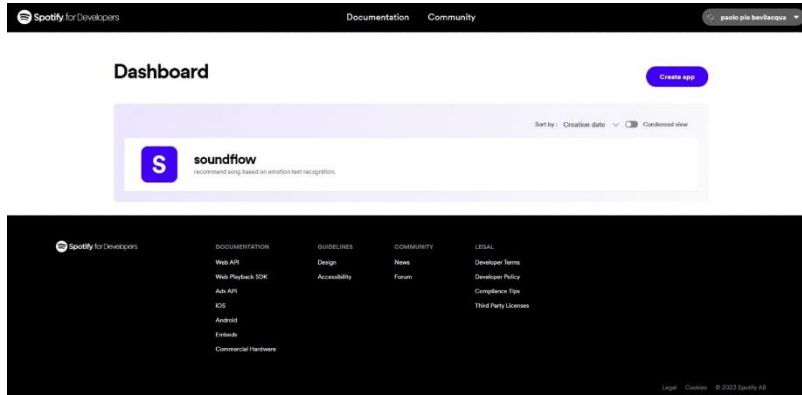
Design of the solution

Cloud Architecture



Description of the deployment of the solution

Step 1 – Integration with Spotify API



Description of the deployment of the solution

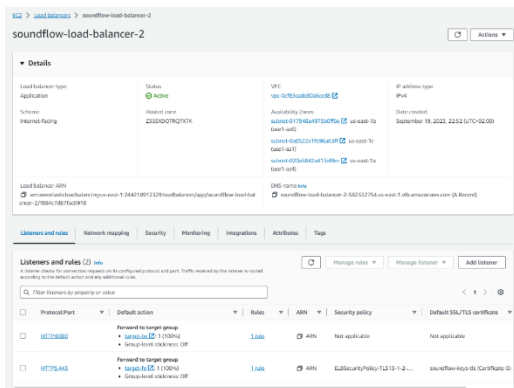
Step 2 – Lambda function

The screenshot displays the AWS Lambda console for the 'get_emotion_score' function. The top section, 'Panoramica della funzione', shows the function icon, a 'Layers' section with one layer, and an 'API Gateway' trigger. The right sidebar provides details: 'Descrizione' (empty), 'Ultima modifica' (4 ore fa), 'ARN della funzione' (arn:aws:lambda:us-east-1:244218912329:function:get_emotion_score), and 'URL della funzione' (https://2dvweyd67vtq2c4ryojfcvxsu0upku.lambda-url.us-east-1.on.aws/). The bottom section, 'Origine del codice', shows the code editor with the following Python code:

```
1 import json
2 import nltk
3 from nltk.sentiment import SentimentIntensityAnalyzer
4 import boto3
5 import pandas as pd
6
7 nltk.data.path.append("/opt/nltk_data")
8
```

Description of the deployment of the solution

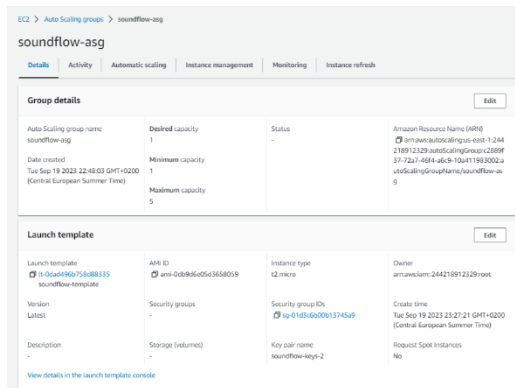
Step 3 – Setting EC2 service



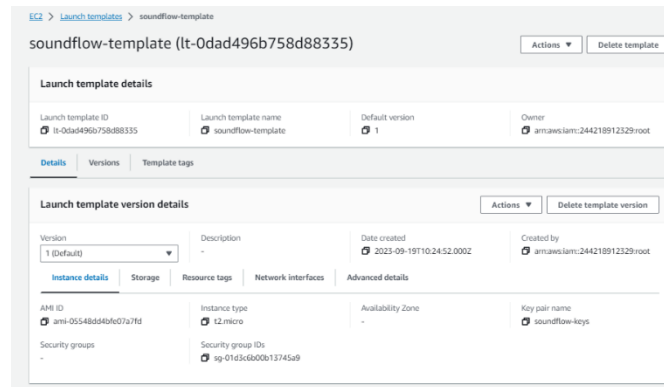
The screenshot displays the 'Details' tab for the 'soundflow-load-balancer-2' Load Balancer. It shows the application 'soundflow-load-balancer-2', the scheme 'Application', and the IP address type 'IPv4'. The 'Listeners and rules' section shows two listeners: 'HTTP:80' and 'HTTPS:443', both with a 'Default' action of 'Forward to target group'. The 'Rules' section shows a single rule for each listener, also with a 'Default' action of 'Forward to target group'.

Application Load Balancer

Auto-Scaling Group



The screenshot displays the 'Details' tab for the 'soundflow-asg' Auto Scaling Group. It shows the group name 'soundflow-asg', the desired capacity '1', and the status 'In Service'. The 'Launch template' section shows the launch template 'soundflow-template' with the AMI ID 'ami-0d4d496b758d88335', the instance type 't2.micro', and the security group 'sg-0145d600b13745a9'.



The screenshot displays the 'Launch template details' for the 'soundflow-template' Launch Template. It shows the launch template ID 'lt-0dad496b758d88335', the launch template name 'soundflow-template', the default version '1', and the owner 'arn:aws:iam::244218912329:root'. The 'Launch template version details' section shows the version '1 (Default)', the description '-', the date created '2023-09-19T10:24:52.000Z', and the created by 'arn:aws:iam::244218912329:root'.

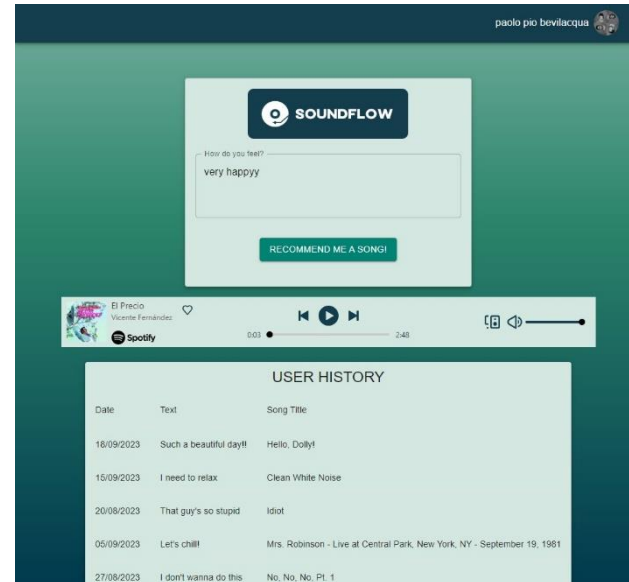
Launch template ASG

Interface of the application

Two main functionalities

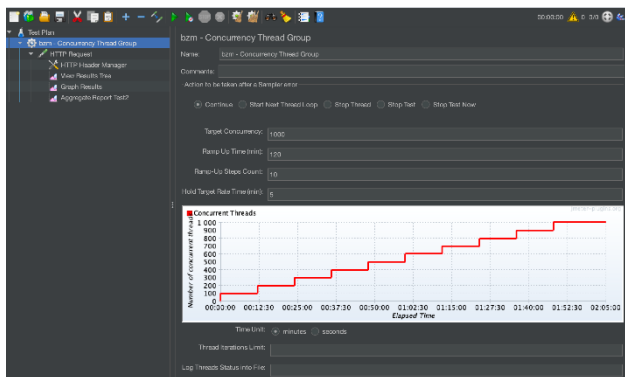
❑ Spotify Real-Time player

❑ User's history



Experimental Design

Configuration details of the tools for testing



❑ JMeter

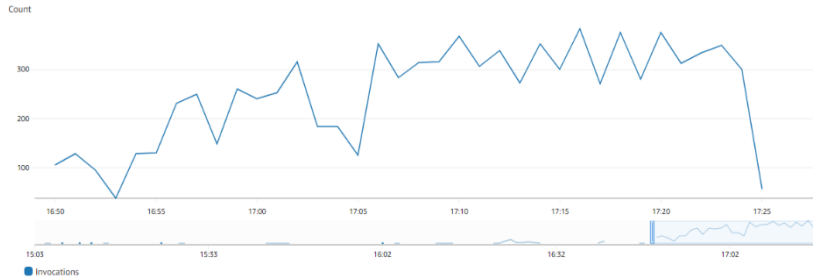
The screenshot shows the 'General Settings' and 'Scenarios' configuration for a test. The 'Name' is 'Load Balancing Test for SoundFlow'. The 'Test Type' is 'Single HTTP Request'. The 'HTTP Request' is configured with 'URL' 'http://10.10.10.10:8080/api/v1/health' and 'Type' 'GET'. The 'HTTP Headers (Editor)' is empty. The 'Scenarios' section shows a 'Single HTTP Request' scenario with a 'Test Type' of 'GET' and a 'URL' of 'http://10.10.10.10:8080/api/v1/health'.

❑ Distributed Load Testing

Experimental Results

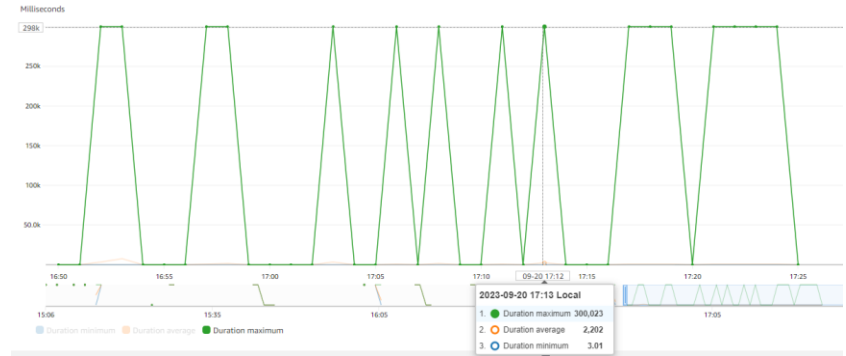
Chosen Metrics and graph results on AWS Lambda

Invocations



Indicates the number of times a Lambda function is activated or invoked in response to an event or request

Duration



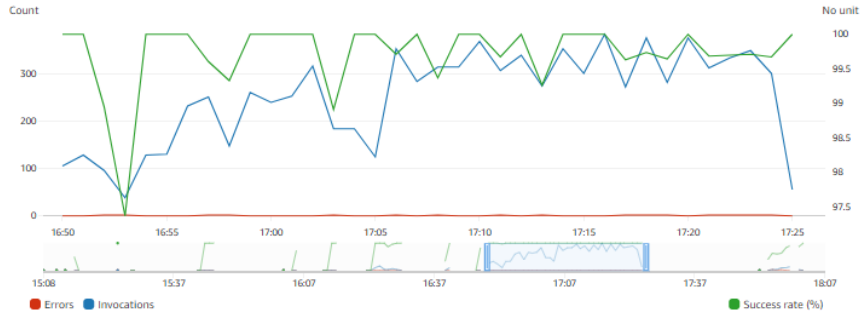
Determines the duration, measured in milliseconds, of a Lambda function's code execution in response to an invocation



Experimental Results

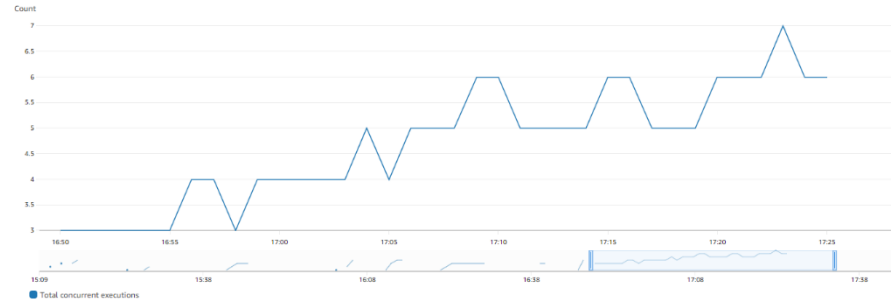
Chosen Metrics and graph results on AWS Lambda

Error count and success rate



These metrics provide an indicator of the stability and reliability of the function

Concurrent executions



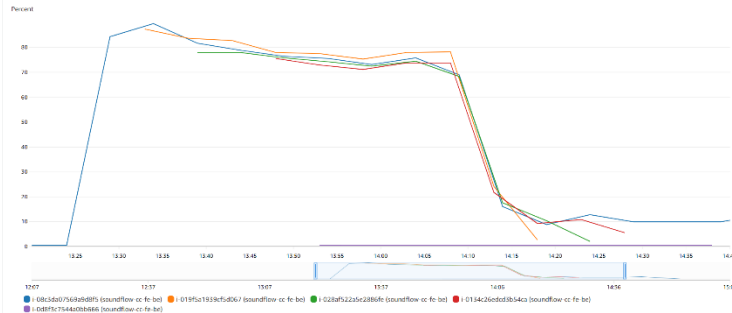
The maximum number of instances of a function that are active simultaneously at a given moment



Experimental Results

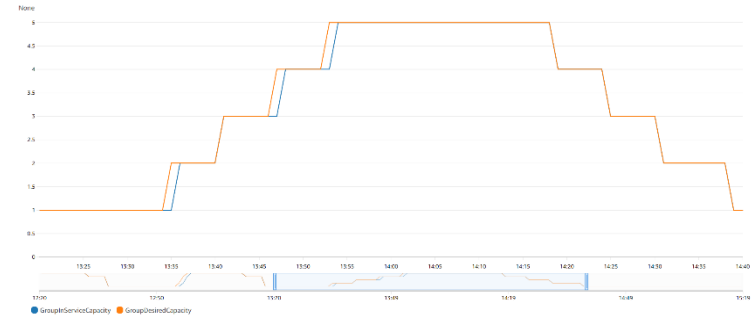
Chosen Metrics and graph results on AWS EC2

CPU Usage (per instance)



CPU usage for each instance
created in the test

Auto-Scaling Group



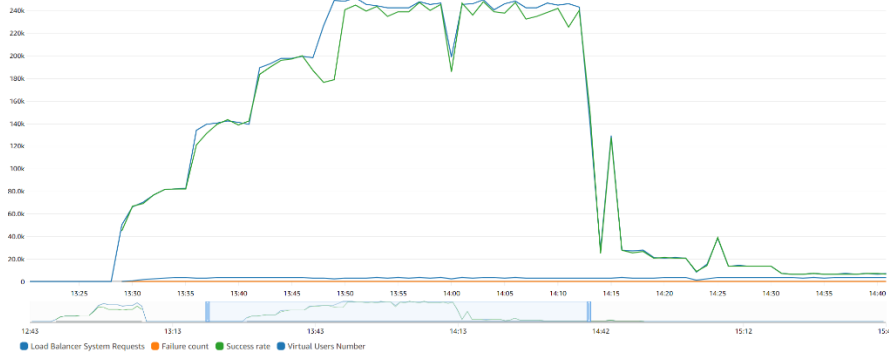
This graph compare Group Desired
capacity and Group in Service capacity



Experimental Results

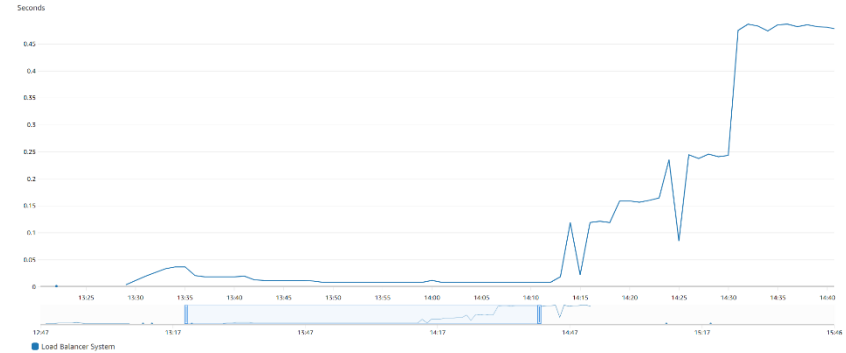
Chosen Metrics and graph results on AWS EC2

Distributed Load Testing



Number of the Request, Failure count, Success rate and Virtual Users number

Target Response Time



Response time of Load Balancer System



Cloud Cost Report

Estimated costs of SoundFlow

Riepilogo della stima

Costo anticipato	Costo mensile	Costo 12 months totale
0,00 USD	41.166,85 USD	494.002,20 USD
Include il costo anticipato		

- Expected Traffic : 5000 req/sec
- EC2 instance type : t2.micro
- Auto-Scaling group : capacity [1,5]

Riepilogo della stima

Costo anticipato	Costo mensile	Costo 12 months totale
0,00 USD	41.166,85 USD	494.002,20 USD
Include il costo anticipato		

Stima dettagliata

Nome	Gruppo	Regione	Costo anticipato	Costo mensile
Amazon EC2	Nessun gruppo applicato	US East (N. Virginia)	0,00 USD	42,34 USD
Stato: - Descrizione: Amazon EC2 Riepilogo configurazione: Tenancy (istanze condivise), Sistema operativo (Linux), Carico di lavoro (Consistent, Numero di istanze: 5), Istanza EC2 preventiva (t2.micro), Pricing strategy (On-Demand Utilization: 100 %Utilized/Month), Abilita monitoraggio (disabilitato), DT in entrata: Not selected (0 TB al mese), DT in uscita: Not selected (0 TB al mese), DT Intra-Region: (0 TB al mese)				
AWS Lambda	Nessun gruppo applicato	US East (N. Virginia)	0,00 USD	9.198,01 USD
Stato: - Descrizione: AWS Lambda Riepilogo configurazione: Architettura (x86), Quantità di archiviazione temporanea allocata (512 MB), Architettura (x86), Modalità di chiamata (Buffered), Numero di richieste (5000 al secondo)				
Amazon CloudWatch	Nessun gruppo applicato	US East (N. Virginia)	0,00 USD	0,20 USD
Stato: - Descrizione: Amazon CloudWatch Riepilogo configurazione: Numero di parametri (inclusi i parametri dettagliati e personalizzati) (1), Numero di dashboard (3), Numero di parametri di allarme di risoluzione standard (2)				
Amazon API Gateway	Nessun gruppo applicato	US East (N. Virginia)	0,00 USD	31.926,30 USD
Stato: - Descrizione: Amazon API Gateway Riepilogo configurazione: Unità di richiesta API REST (numero esatto), Dimensioni memoria cache (GB) (Nessuno), Unità di messaggio WebSocket (migliaia), Unità di richieste API HTTP (milioni), Dimensione media di ogni richiesta (30 Byte), Dimensione media del messaggio (32 KB), Richieste (al secondo), Richieste (5000 al secondo)				
Amazon Simple Storage Service (S3)	Nessun gruppo applicato	US East (N. Virginia)	0,00 USD	0,00 USD
Stato: - Descrizione: Amazon S3 (Simple Storage Service) Riepilogo configurazione: Storage S3 Standard (0.093 GB per mese), GET, SELECT e tutte le altre richieste da S3 Standard (5000), Dati restituiti da S3 Select (0.093 GB per mese)				
Amazon Virtual Private Cloud (VPC)	Nessun gruppo applicato	US East (N. Virginia)	0,00 USD	0,00 USD
Stato: - Descrizione: Amazon VPC (Virtual Private Cloud) Riepilogo configurazione: Giorni lavorativi al mese (22)				



Thank you for the attention!

