Highly Available, Fault Tolerant, Containerized Application

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Introduction

Couchbase - Cross Data Center Replication, Scaling, Sharding & Fault tolerance

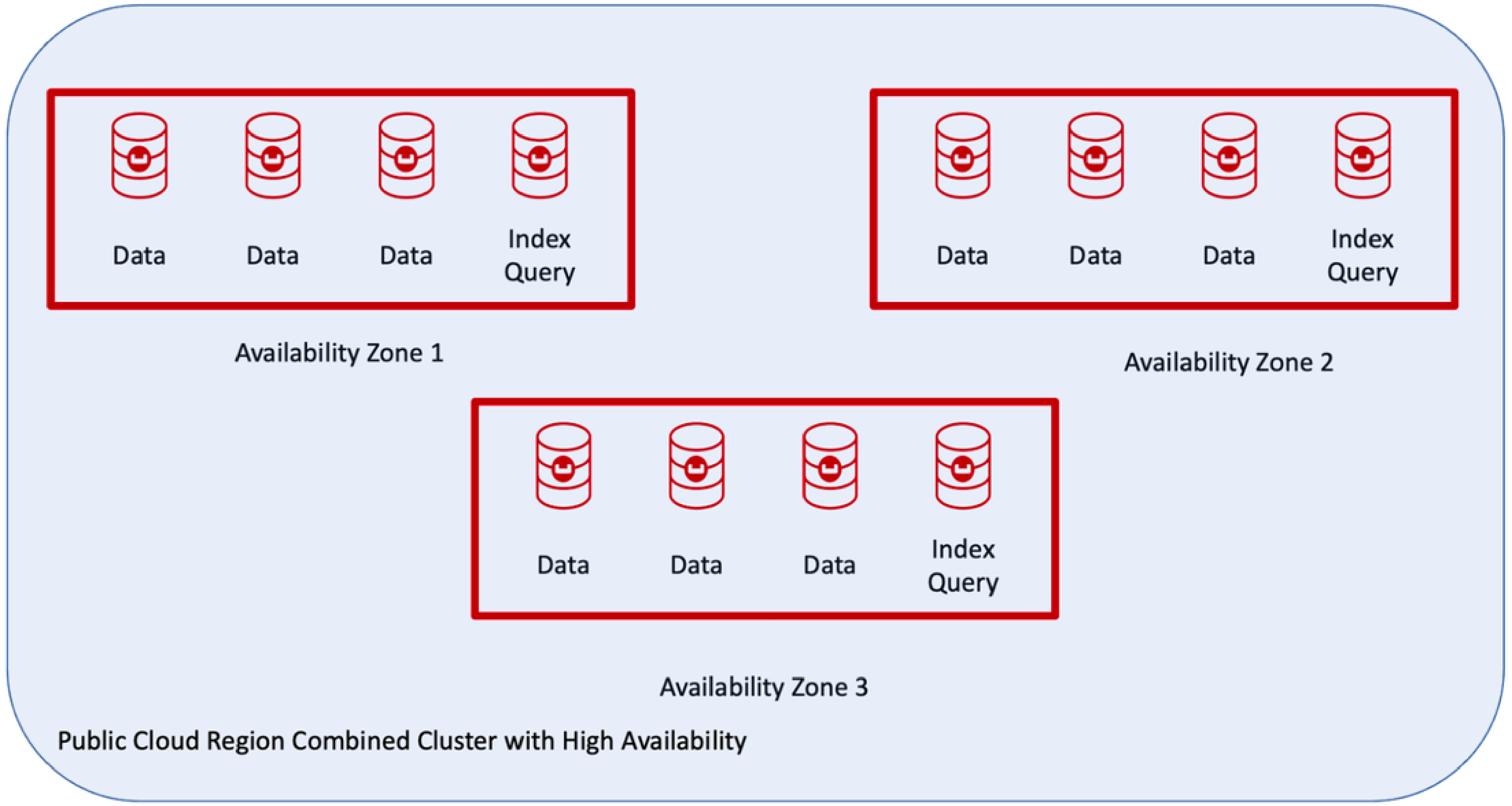
Containerization - Docker

AWS - ECS, ELB

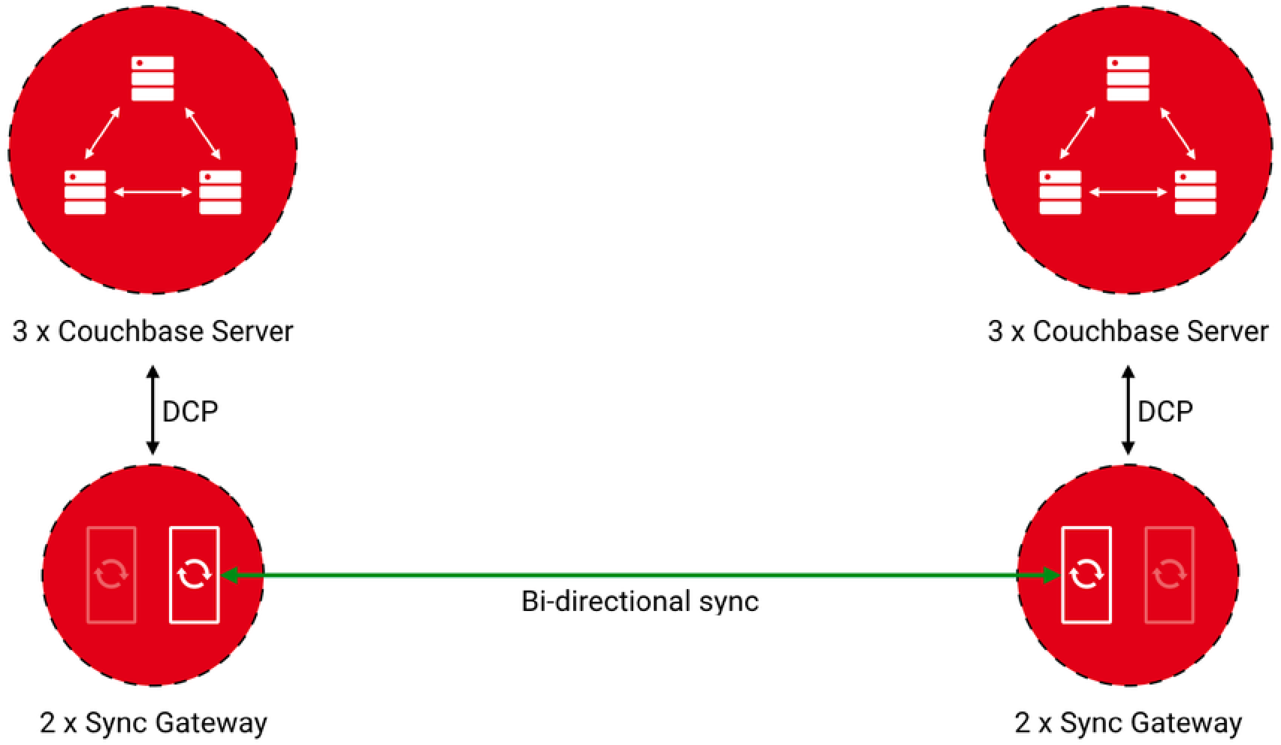
System Architecture

Let's breakdown the features of our project

High Availability & Disaster Recovery

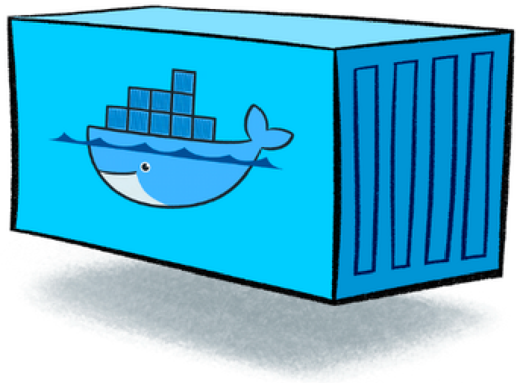


Replication

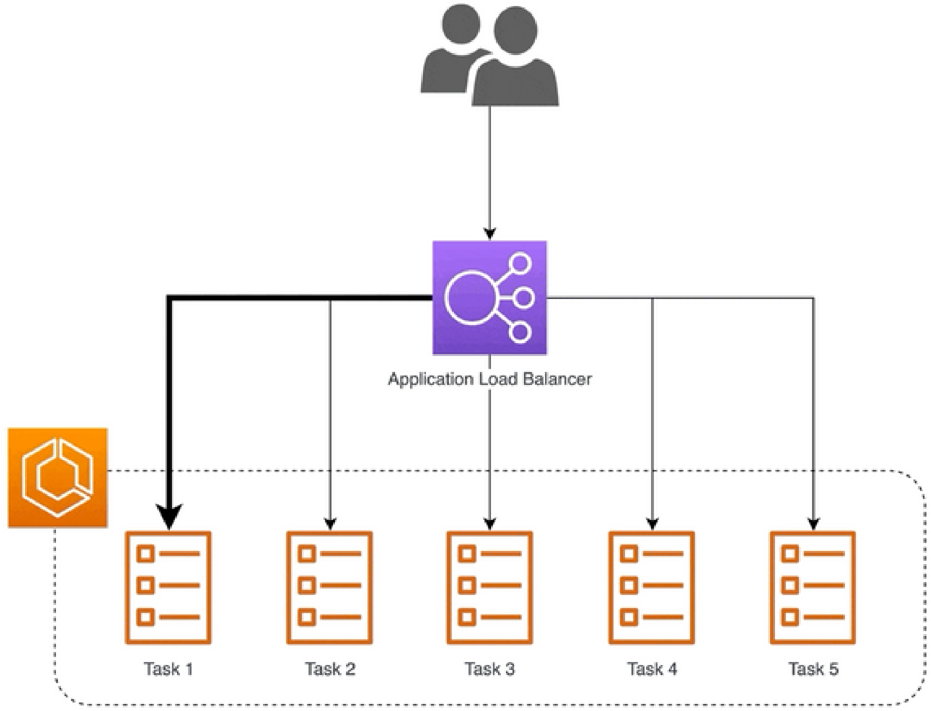


Let's breakdown the features of our project

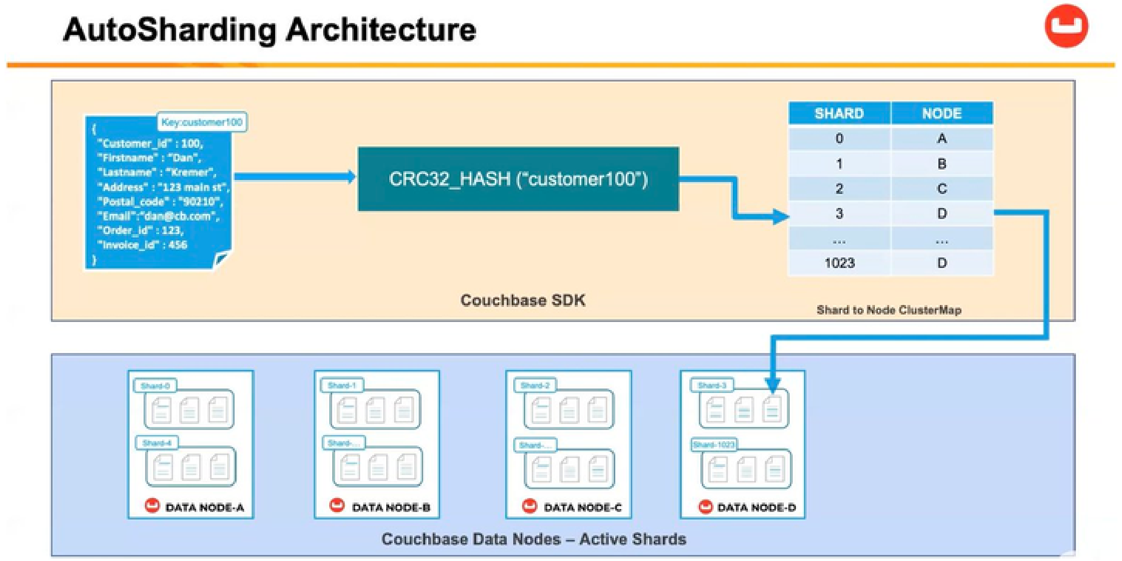
Containerization



Load Balancing



Sharding



AutoSharding Architecture

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"Firstname" : "Dan",
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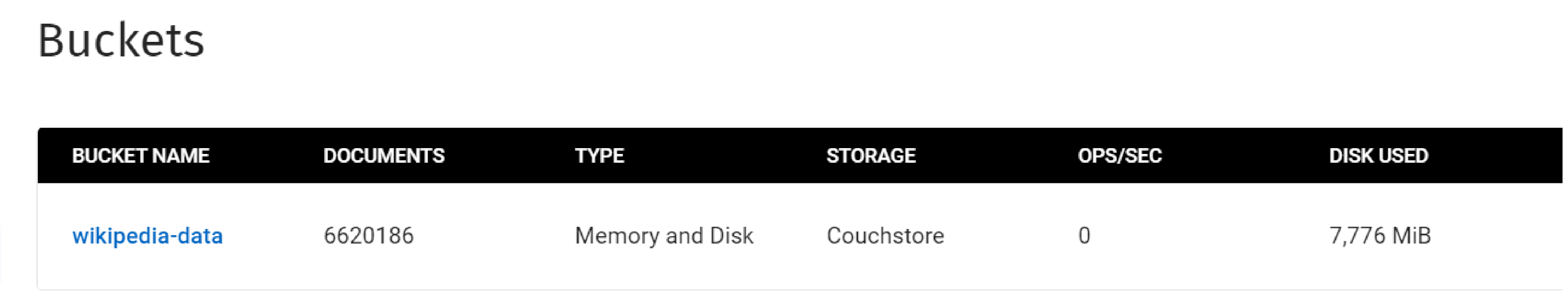
"Address" : "123 main st",
"Postal_code" : "90210",
"Email":"dan@cb.com",
"Order_id" : 123,
"Invoice_id" : 456
}
```

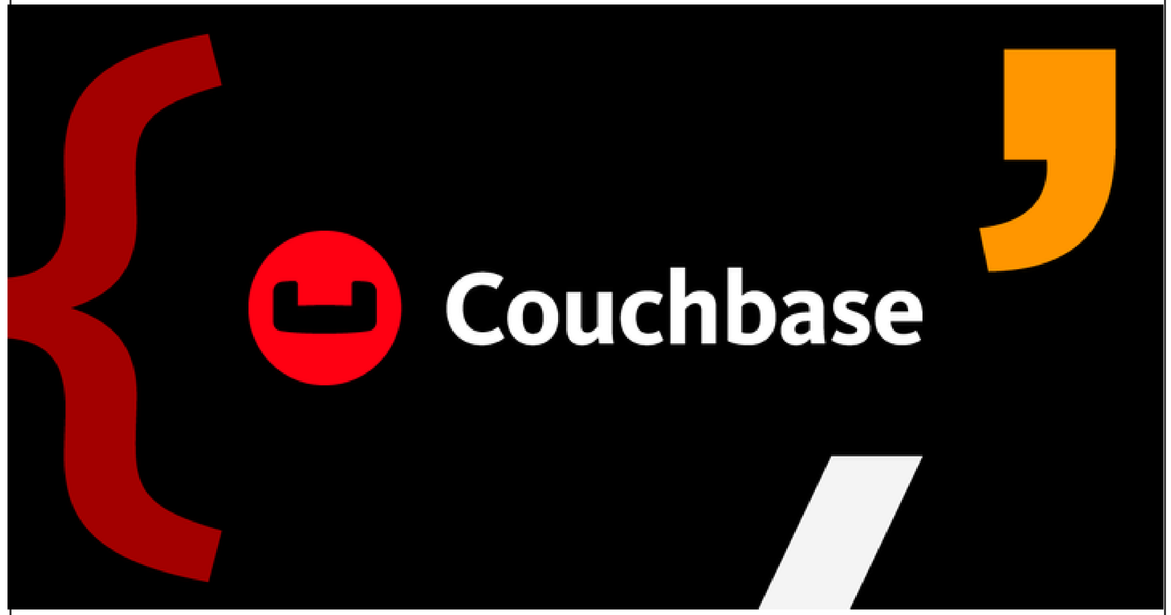
SHARD	NODE
0	A
1	B
2	C
3	D
...	...
1023	D

Shard to Node ClusterMap



Buckets

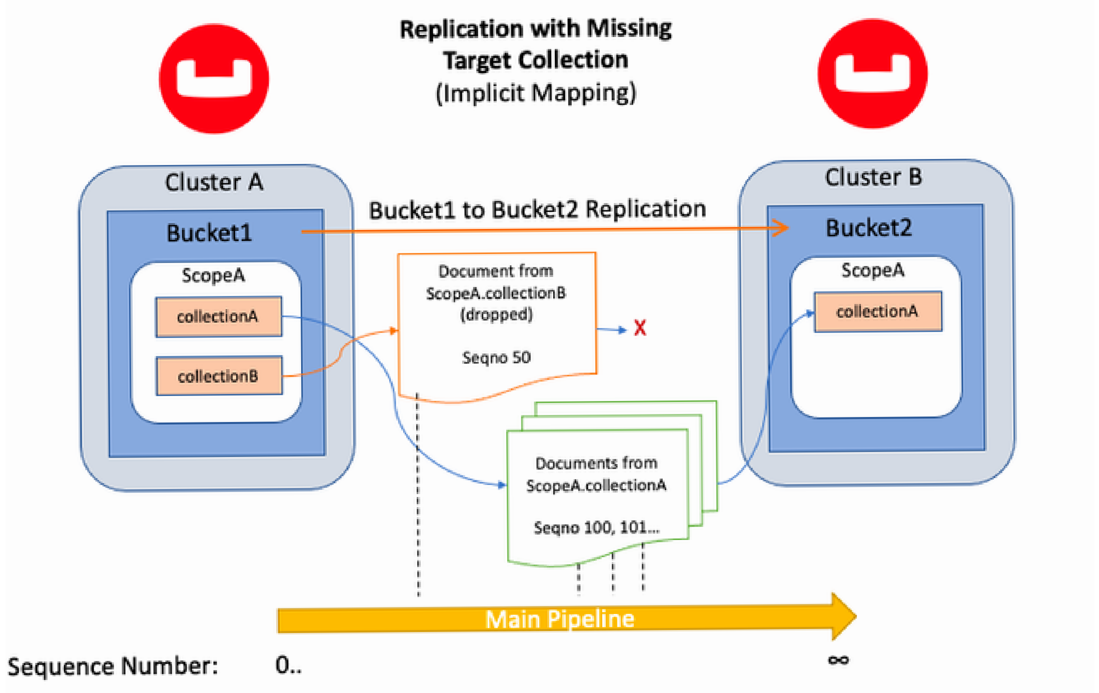
BUCKET NAME	DOCUMENTS	TYPE	STORAGE	OPS/SEC	DISK USED
wikipedia-data	6620186	Memory and Disk	Couchstore	0	7,776 MiB



Couchbase

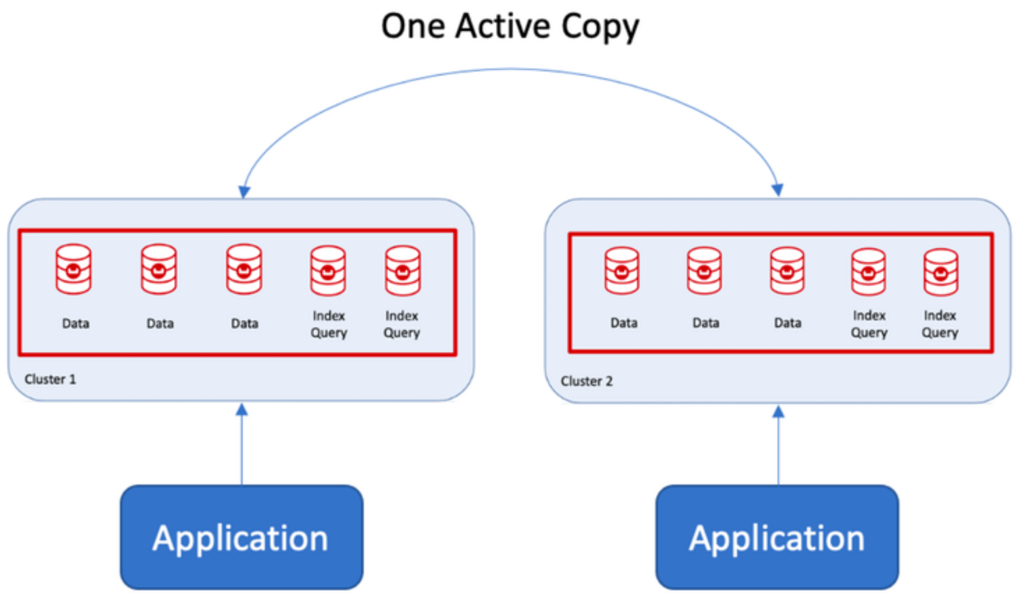
- Distributed NoSQL database designed for high performance, scalability, and flexibility in modern applications
- Built on a shared-nothing architecture, it distributes and replicates data seamlessly across multiple nodes, ensuring replication, fault tolerance, and high availability.

Couchbase - Replication


Replication with Missing Target Collection (Implicit Mapping)
Cluster A
Bucket1
ScopeA
collectionA
collectionB
Bucket1 to Bucket2 Replication
Document from ScopeA.collectionB (dropped)
Seqno 50
X
Cluster B
Bucket2
ScopeA
collectionA
Documents from ScopeA.collectionA
Seqno 100, 101...
Main Pipeline
Sequence Number:
0..
∞

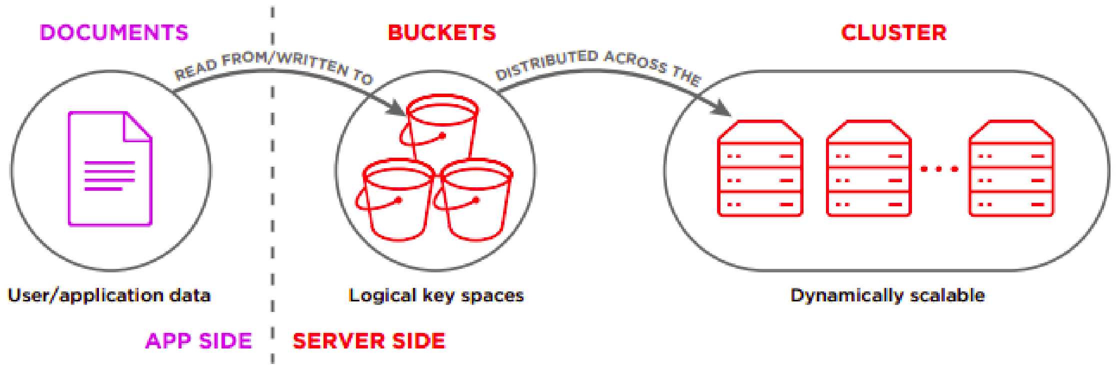
- Cross Data Center Replication (XDCR) facilitates synchronization of data across multiple geographically distributed data centers
- Supports active-active deployments, allowing global applications to read and write to any data center

Couchbase - Failover



- Swiftly responds to node failures through automated mechanisms
- Failed node's data and workload seamlessly shift to healthy nodes in the cluster

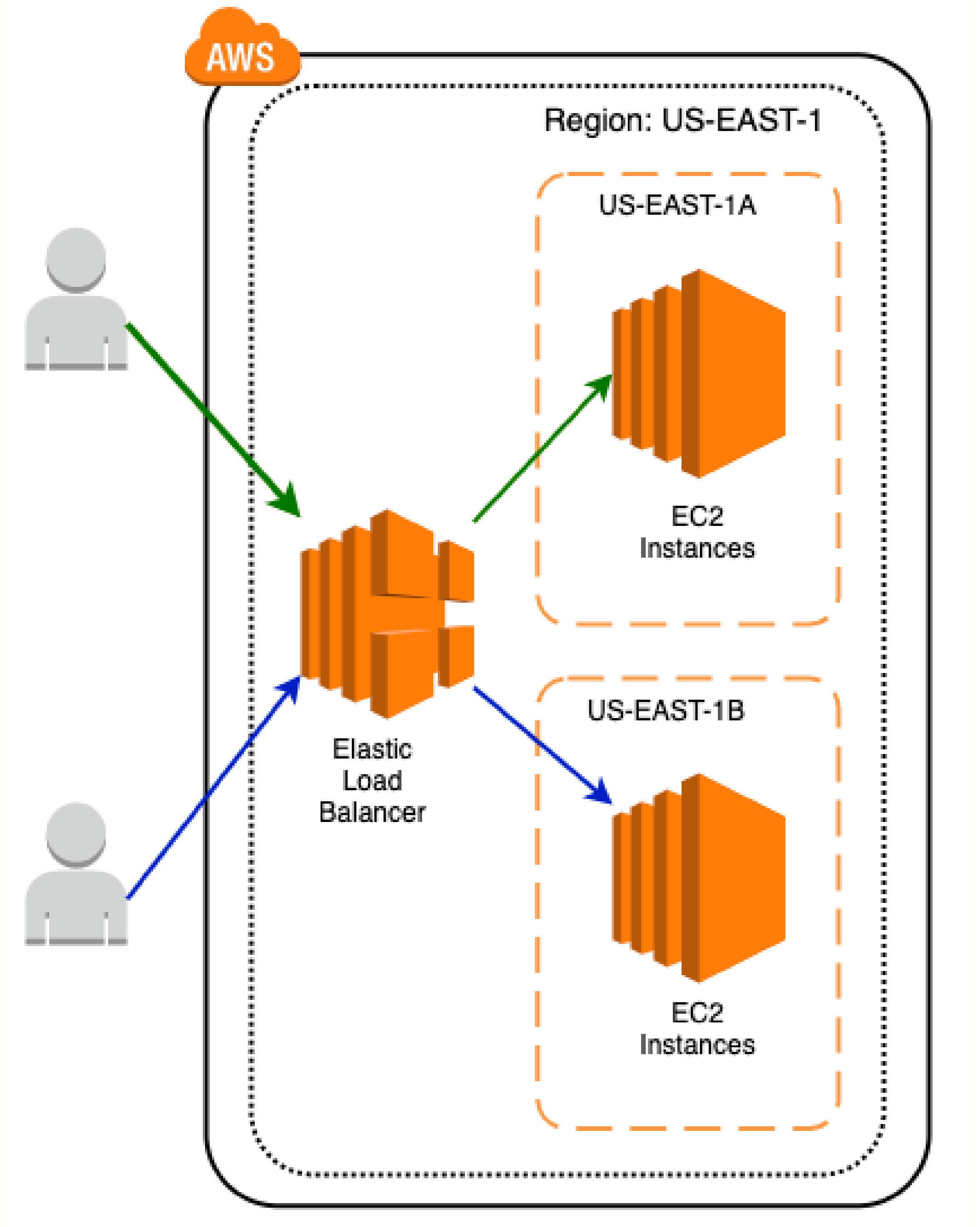
Couchbase - Sharding



- Employs data sharding to distribute and scale data horizontally across multiple nodes
- Improves performance by allowing parallel processing of data across distributed nodes

Docker - Containerization

- Allows applications to be packaged along with their dependencies into lightweight, portable containers
- Uses container images to package applications and dependencies, ensuring consistency across different environments



AWS - Elastic Load Balancing (ELB)

- Managed load-balancing solution provided by AWS
- Automatically distributes incoming application traffic across multiple AWS EC2 instances
- Enhances system performance by preventing individual servers from becoming overwhelmed, ensuring optimal resource utilization, and minimizing response times

Other Technologies used in the project

NodeJS

Javasrcipt runtime popularly used for making server-side applications

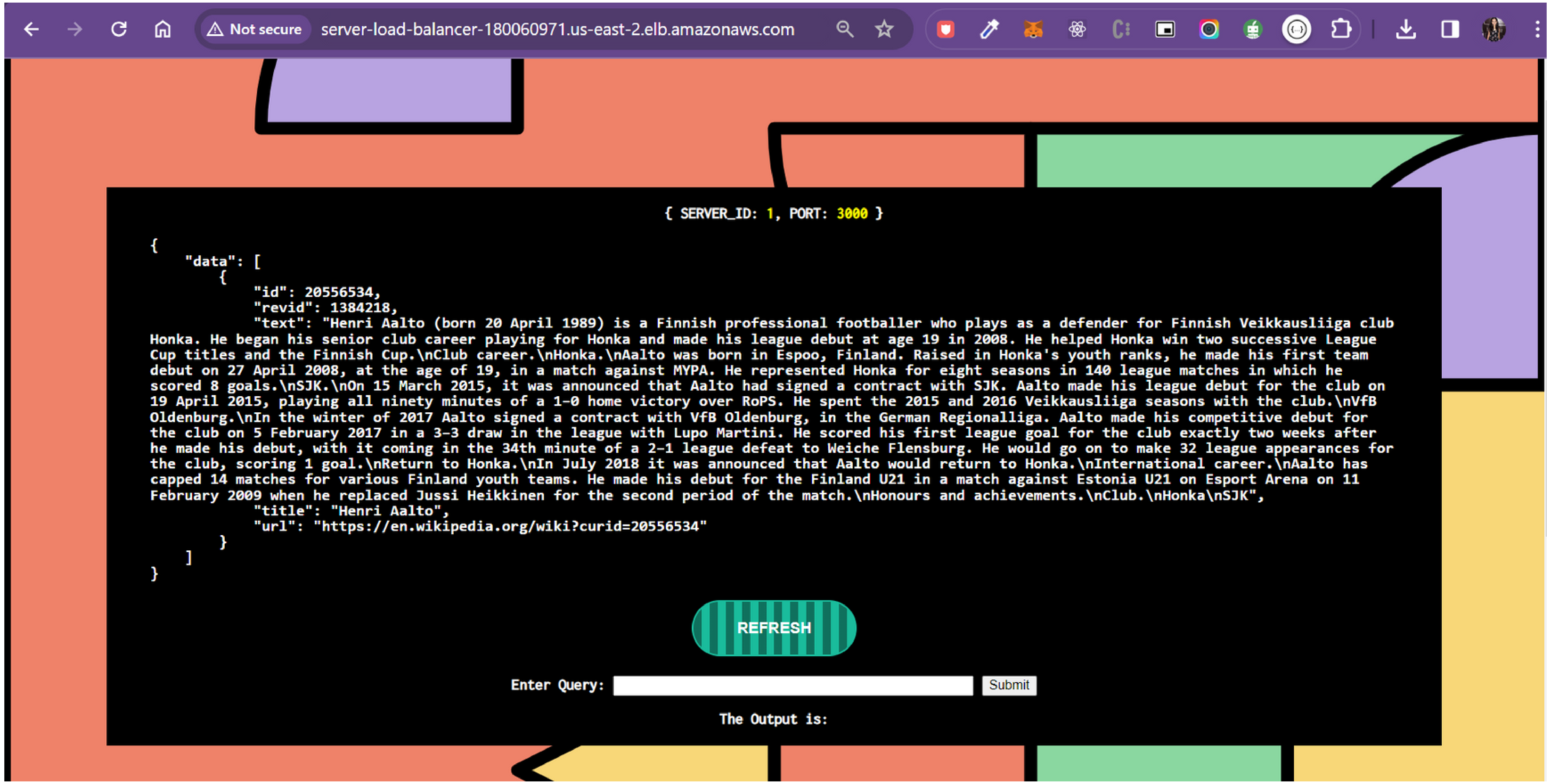
Other Technologies used in the project

NGINX

Fast and free open-source load balancing solftware capable of doubling as a reverse-proxy

What did we make?

A small app leveraging these distributed system design tools & features



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Honka. He began his senior club career playing for Honka and made his league debut at age 19 in 2008. He helped Honka win two successive League
Cup titles and the Finnish Cup.\nClub career.\nHonka.\nAalto was born in Espoo, Finland. Raised in Honka's youth ranks, he made his first team
debut on 27 April 2008, at the age of 19, in a match against MYPA. He represented Honka for eight seasons in 140 league matches in which he
scored 8 goals.\nSJK.\nOn 15 March 2015, it was announced that Aalto had signed a contract with SJK. Aalto made his league debut for the club on
19 April 2015, playing all ninety minutes of a 1-0 home victory over RoPS. He spent the 2015 and 2016 Veikkausliiga seasons with the club.\nVfB
Oldenburg.\nIn the winter of 2017 Aalto signed a contract with VfB Oldenburg, in the German Regionalliga. Aalto made his competitive debut for
the club on 5 February 2017 in a 3-3 draw in the league with Lupo Martini. He scored his first league goal for the club exactly two weeks after
he made his debut, with it coming in the 34th minute of a 2-1 league defeat to Weiche Flensburg. He would go on to make 32 league appearances for
the club, scoring 1 goal.\nReturn to Honka.\nIn July 2018 it was announced that Aalto would return to Honka.\nInternational career.\nAalto has
capped 14 matches for various Finland youth teams. He made his debut for the Finland U21 in a match against Estonia U21 on Esport Arena on 11
February 2009 when he replaced Jussi Heikkinen for the second period of the match.\nHonours and achievements.\nClub.\nHonka\nSJK",
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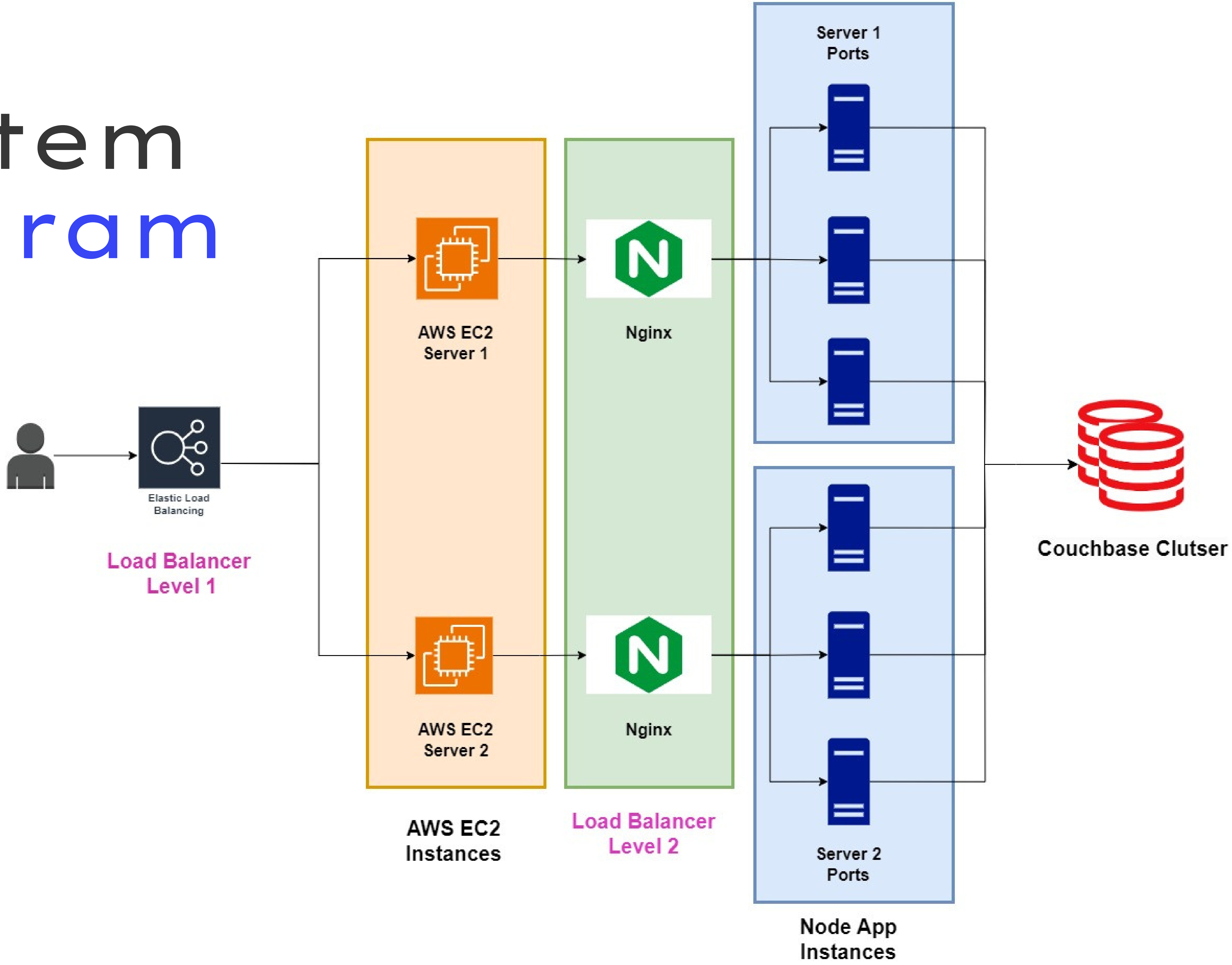
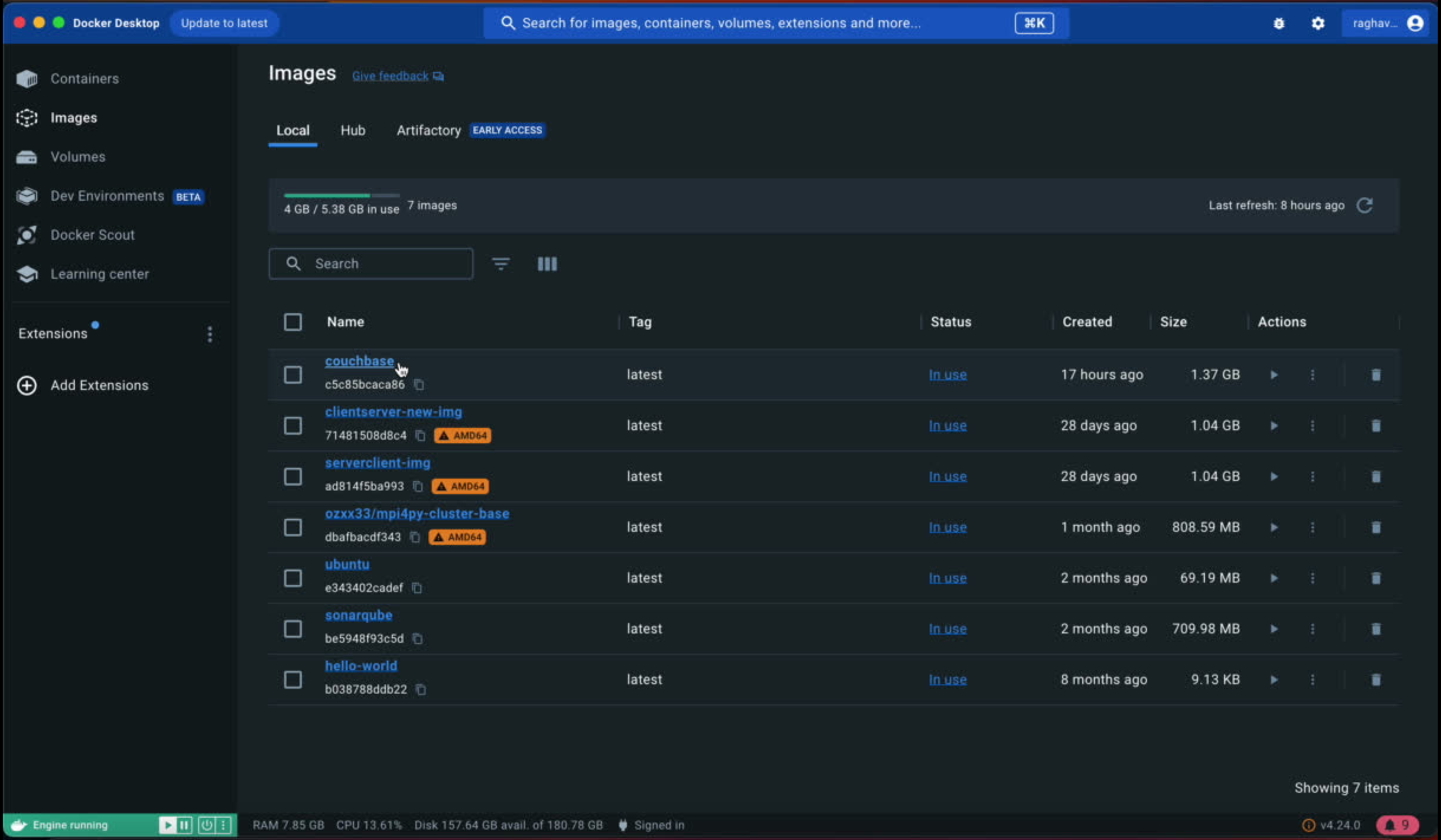
Enter Query:

The Output is:

System Diagram



Let’s head to the demo!



Images

4 GB / 5.38 GB in use 7 images

Last refresh: 8 hours ago

□	Name	Tag	Status	Created	Size	Actions
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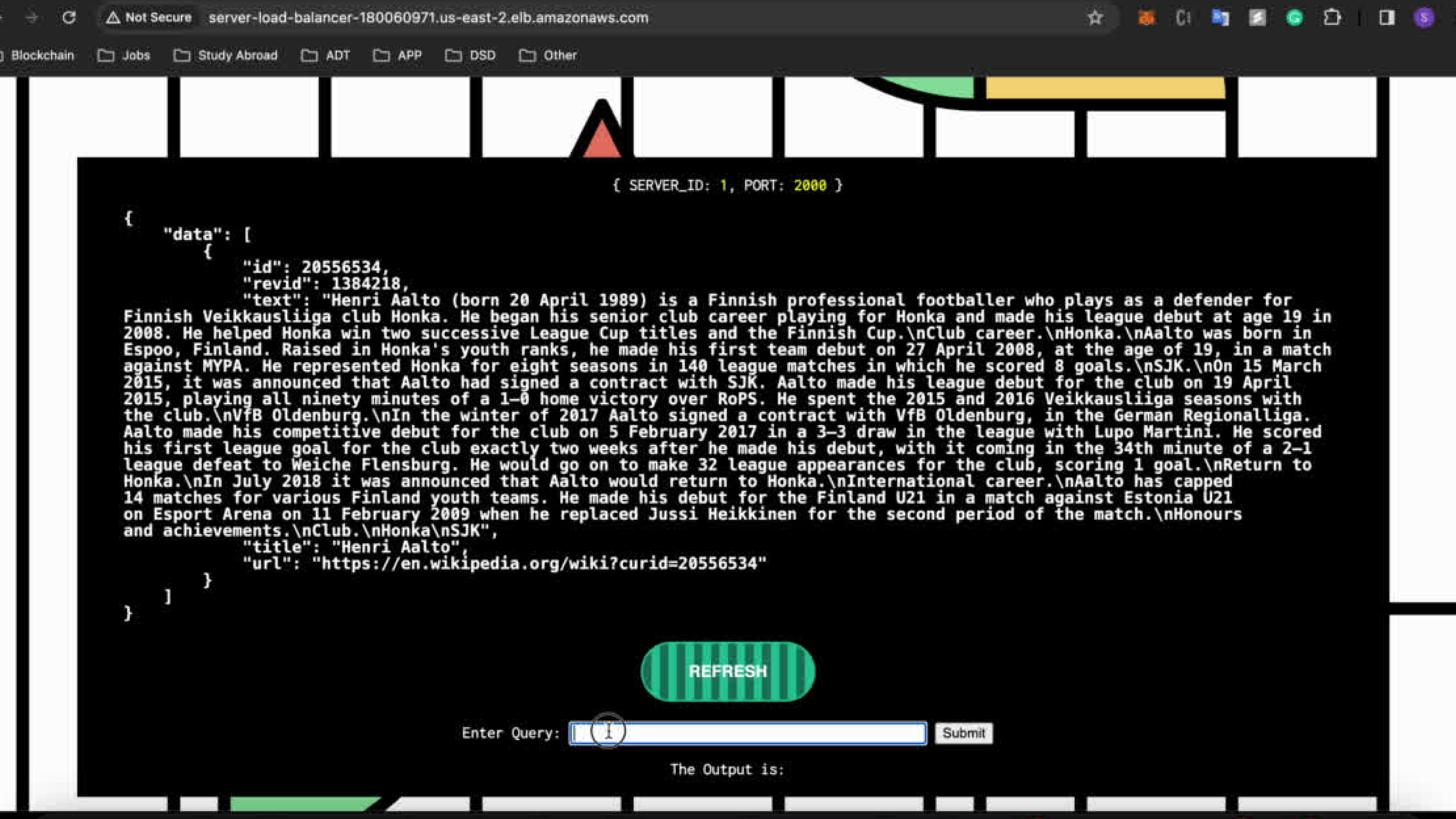
□	clientserver-new-img 71481508d8c4 AMD64	latest	In use	28 days ago	1.04 GB	
□	serverclient-img ad814f5ba993 AMD64	latest	In use	28 days ago	1.04 GB	
□	ozxx33/mpi4py-cluster-base dbafbacdf343 AMD64	latest	In use	1 month ago	808.59 MB	
□	ubuntu e343402cadef	latest	In use	2 months ago	69.19 MB	
□	sonarqube be5948f93c5d	latest	In use	2 months ago	709.98 MB	
□	hello-world b038788ddb22	latest	In use	8 months ago	9.13 KB	

Showing 7 items

RAM 7.85 GB CPU 13.61% Disk 157.64 GB avail. of 180.78 GB Signed in

v4.24.0 9



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}
```

Thank you!