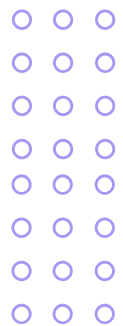


## Evaluating the Cost Dynamics of Serverless and Serverful Cloud Solutions: A Comparative Analysis

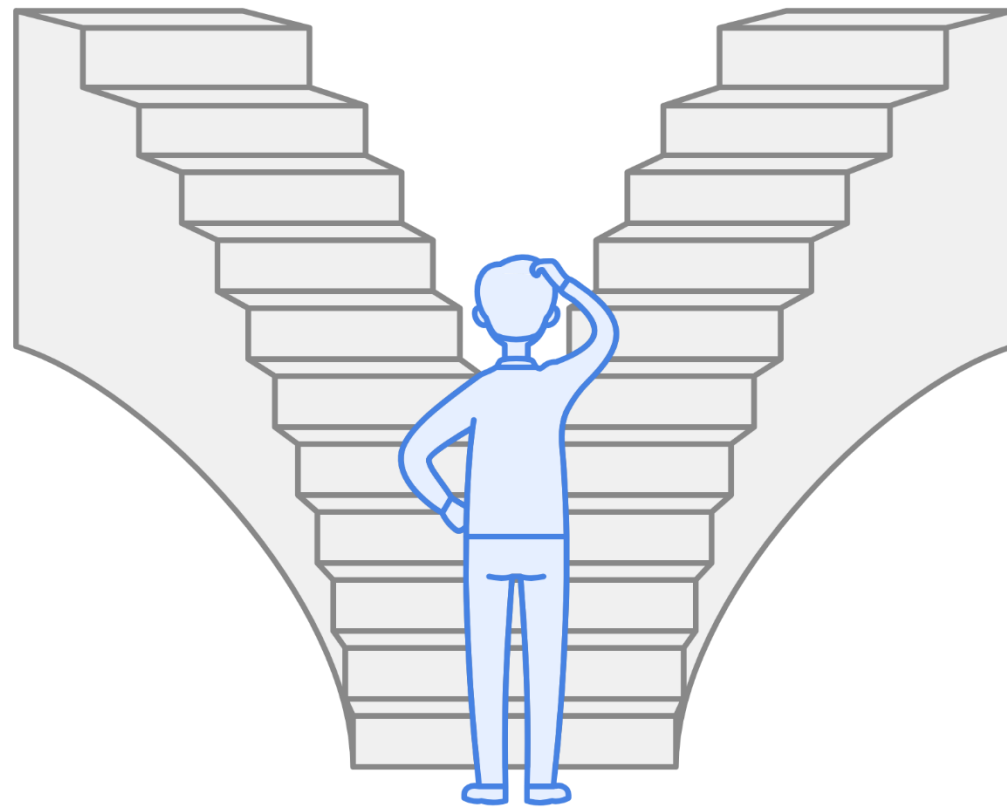


# Introduction

Which architecture model to choose for cloud-native apps?

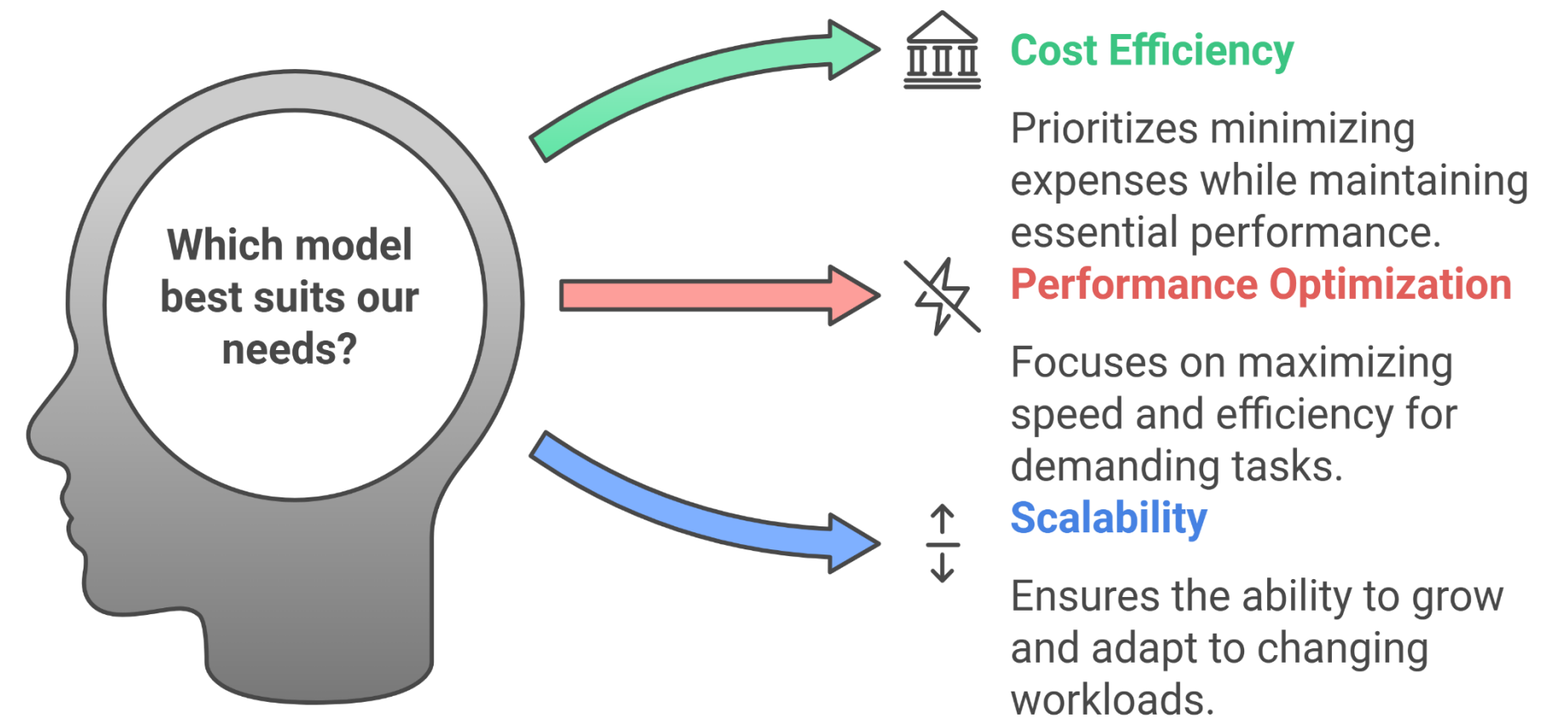
## Serverless Architecture

Offers auto-scaling and pay-per-use pricing, ideal for dynamic workloads.

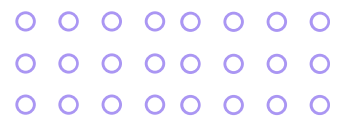
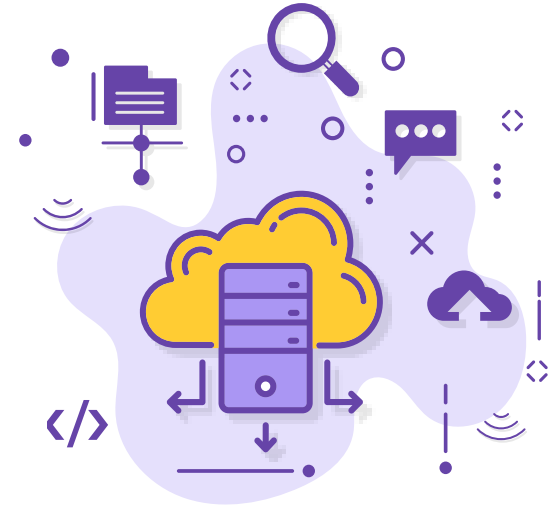
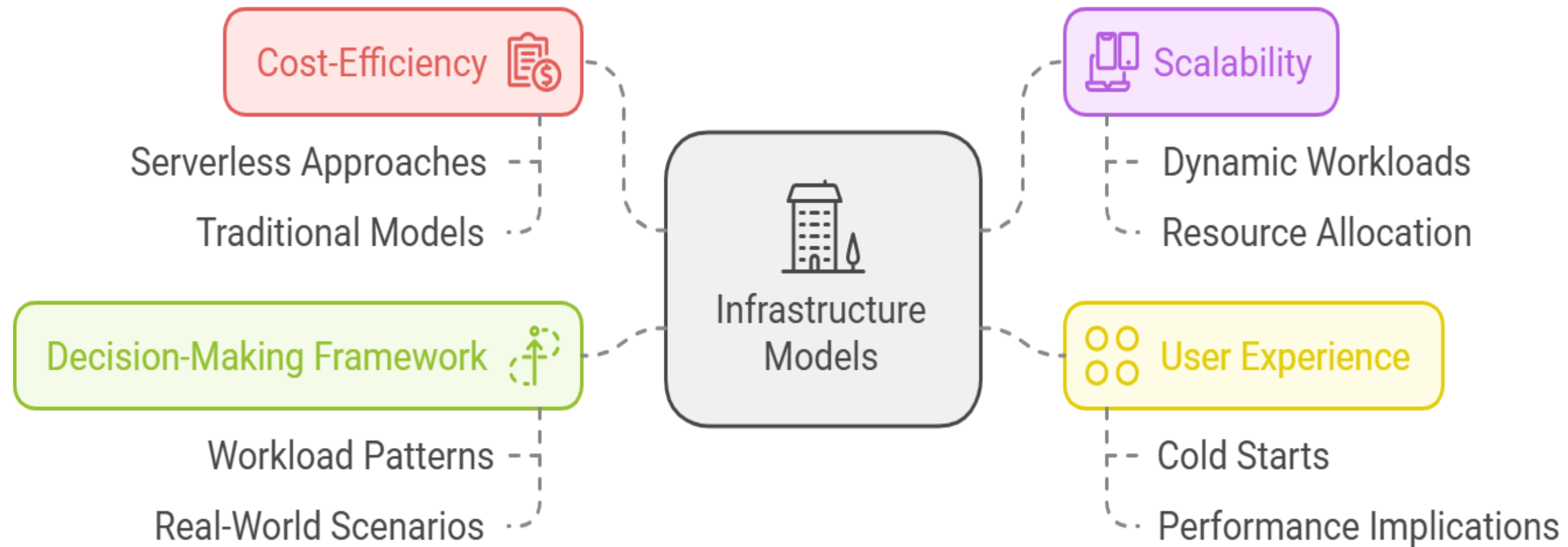


## Serverful Architecture

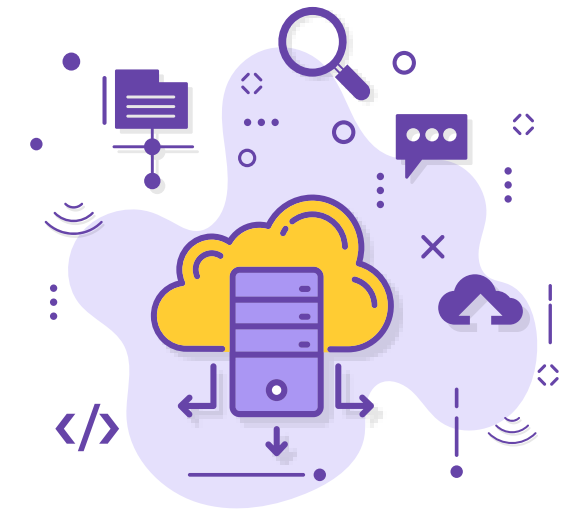
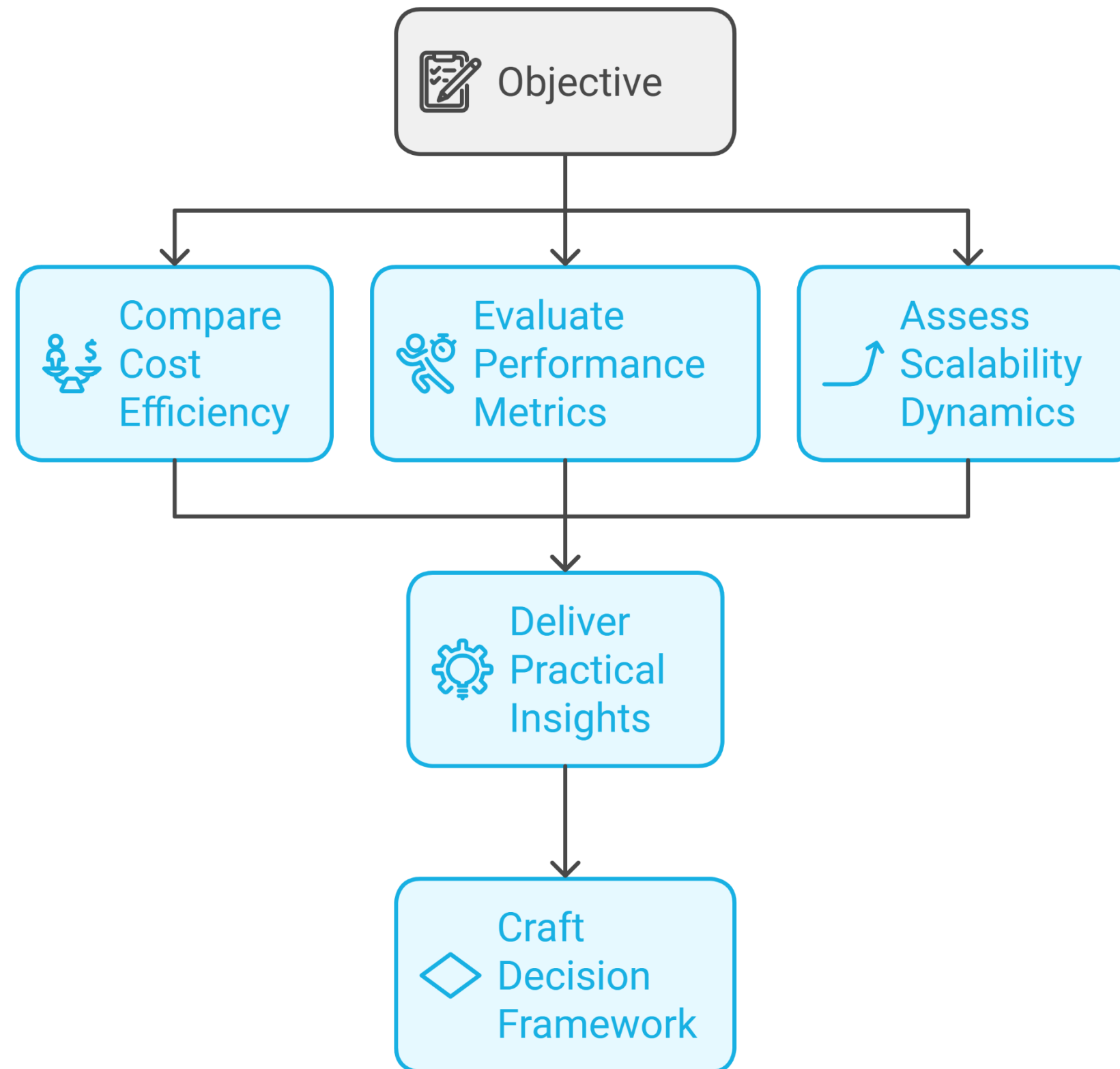
Provides control with fixed costs, suitable for stable, predictable workloads.



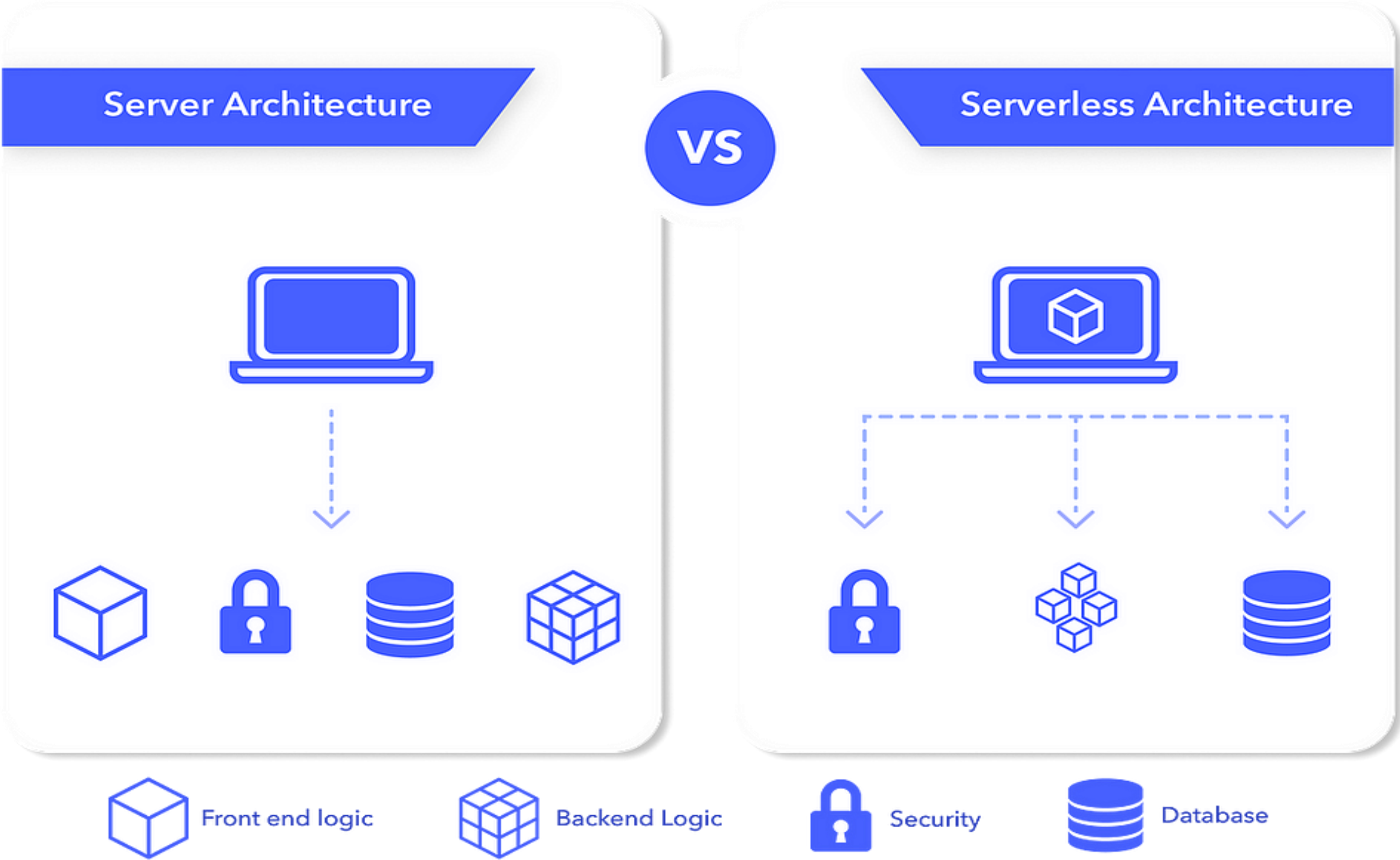
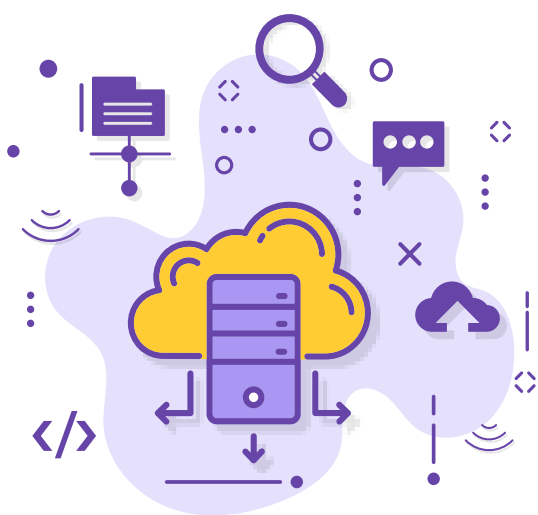
# Motivation



# Objectives



# System Architecture





# Road Map of our Research (Methodology)



## Analyze Data

Compare cost and performance in real-world scenarios

## Measure Necessary Metrics

Assess throughput, latency, response time etc.

## Record Data

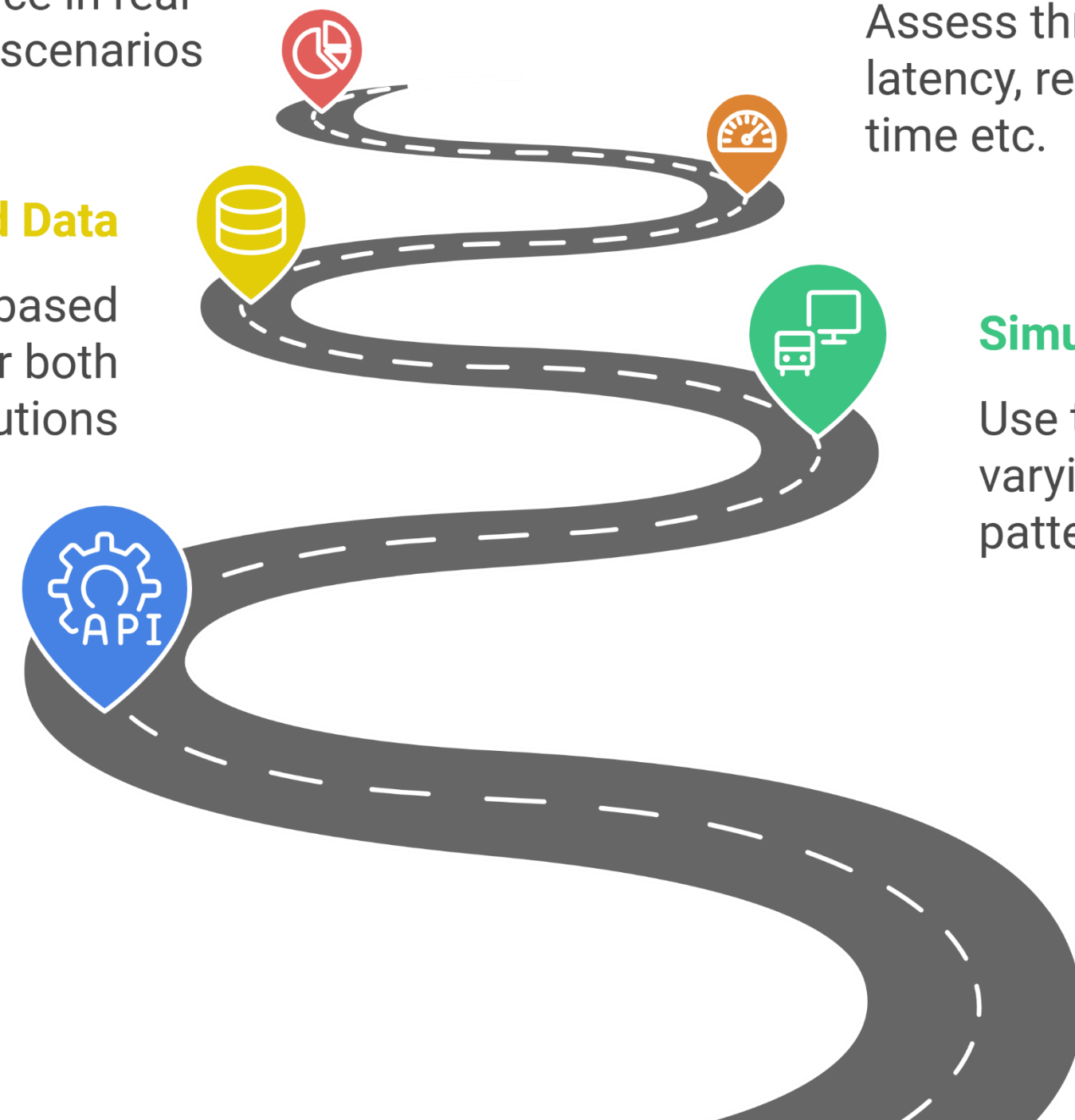
Collect data based on workload for both solutions

## Simulate Workloads

Use tools to create varying traffic patterns

## Deploy Web App

Set up dynamic web app using serverless and serverfull solutions





# Result Analysis

GET ProductAPI-SL

GET ProductAPI-SF

+

Select environment

GET

https://v

Send

Save

Parameters

Body

Headers

Authorization

Pre-request Script

Tests

Variables

Query Parameters

?

+

Key	Value	Description		
-----	-------	-------------	--	--

Status: 200 • OK Time: 777 ms Size: 630 B

JSON

Raw

Headers

Test Results

Response Body

1

[

2

{

3

"id": 1,

4

"title": "Mac Mini M4",

5

"image": "https://www.zdnet.com/a/img/2024/11/04/f0b91162-2d6b-4e4f-8c01-c28b0da9acb2/mac-mini-m4-pro-2.jpg",

6

"description": "The compact, do-it-all desktop now features the power of M4 and M4 Pro, and marks an important environmental milestone as the first carbon

7

neutral Mac.",

8

"category": "Electronics",

9

"price": 60000.0

10

},

11

{

12

"id": 2,

13

"title": "Macbook Pro M4 Pro",

14

"image": "https://www.zdnet.com/a/img/2024/11/04/f0b91162-2d6b-4e4f-8c01-c28b0da9acb2/mac-mini-m4-pro-2.jpg",

15

"description": "Macbook Pro M4 Pro - A new mackbook laptop from Apple",

16

"category": "Electronics",

17

"price": 180000.0

18

}

]

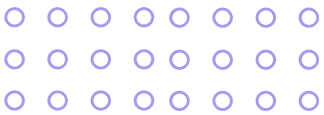
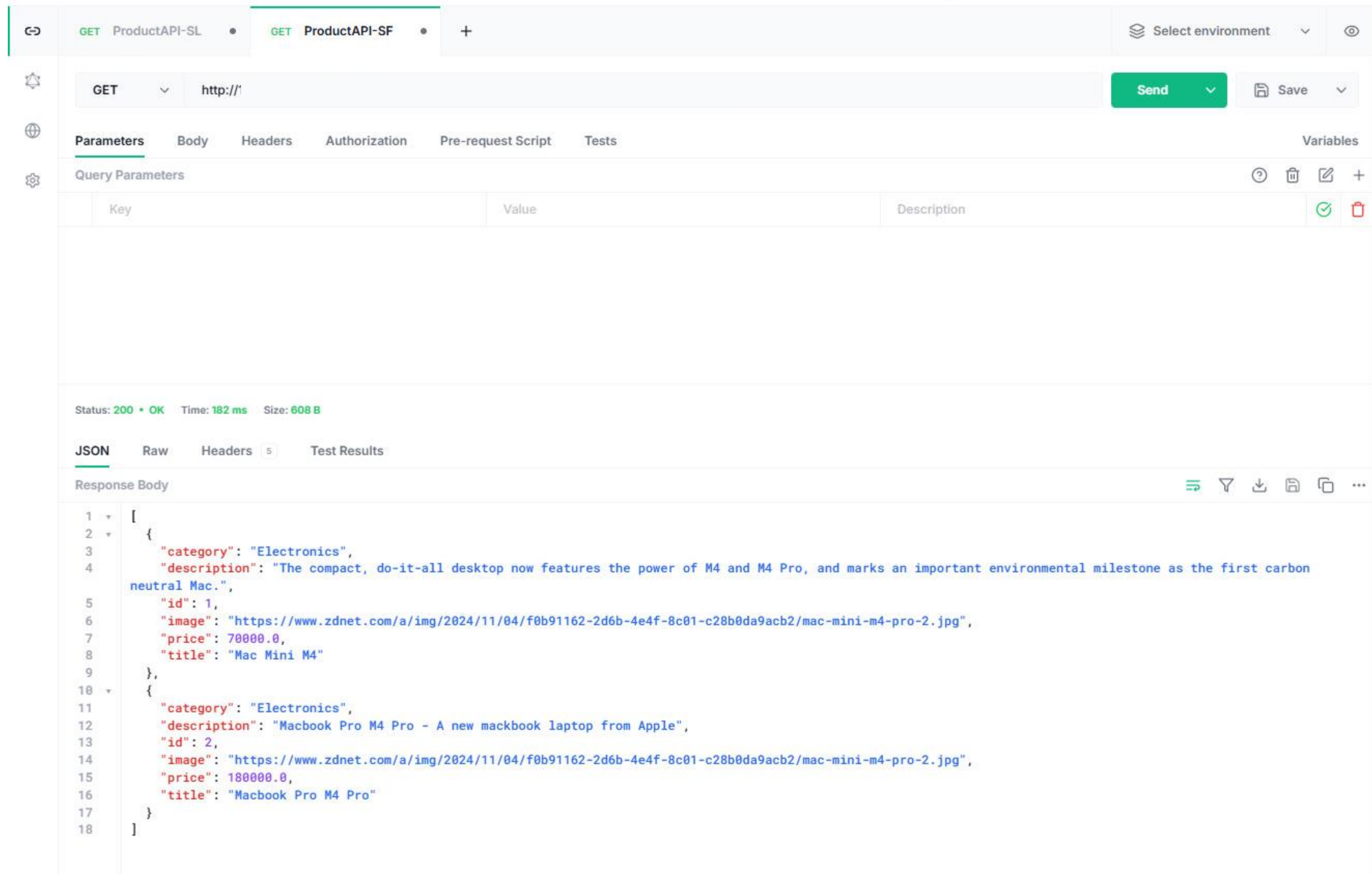


Fig: Initial Response of our API (Serverless)



# Result Analysis (cont.)



The image shows a Postman interface for a GET request to `ProductAPI-SF`. The request is successful with a status of 200 OK, a response time of 182 ms, and a size of 608 B. The response body is a JSON array containing two product objects.

**Request Details:**

- Method: GET
- URL: `http://`
- Environment: ProductAPI-SF

**Response Status:** 200 • OK, Time: 182 ms, Size: 608 B

**Response Body (JSON):**

```
[
  {
    "category": "Electronics",
    "description": "The compact, do-it-all desktop now features the power of M4 and M4 Pro, and marks an important environmental milestone as the first carbon neutral Mac.",
    "id": 1,
    "image": "https://www.zdnet.com/a/img/2024/11/04/f0b91162-2d6b-4e4f-8c01-c28b0da9acb2/mac-mini-m4-pro-2.jpg",
    "price": 70000.0,
    "title": "Mac Mini M4"
  },
  {
    "category": "Electronics",
    "description": "Macbook Pro M4 Pro - A new mackbook laptop from Apple",
    "id": 2,
    "image": "https://www.zdnet.com/a/img/2024/11/04/f0b91162-2d6b-4e4f-8c01-c28b0da9acb2/mac-mini-m4-pro-2.jpg",
    "price": 180000.0,
    "title": "Macbook Pro M4 Pro"
  }
]
```

Fig: Initial Response of our API (Serverful)



# Result Analysis

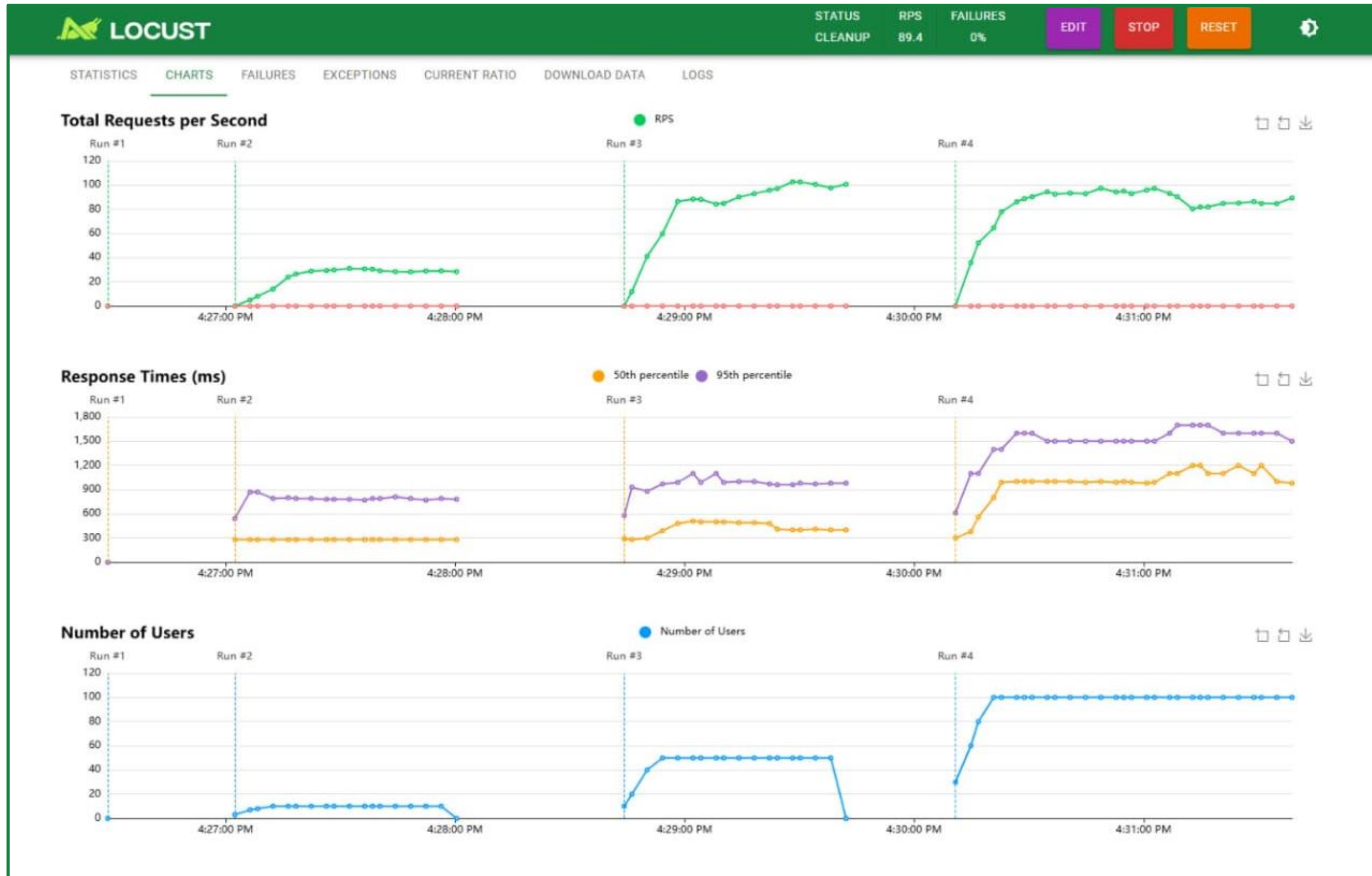


Fig: Visual Analysis 01 (Partial)

# Result Analysis (cont.)

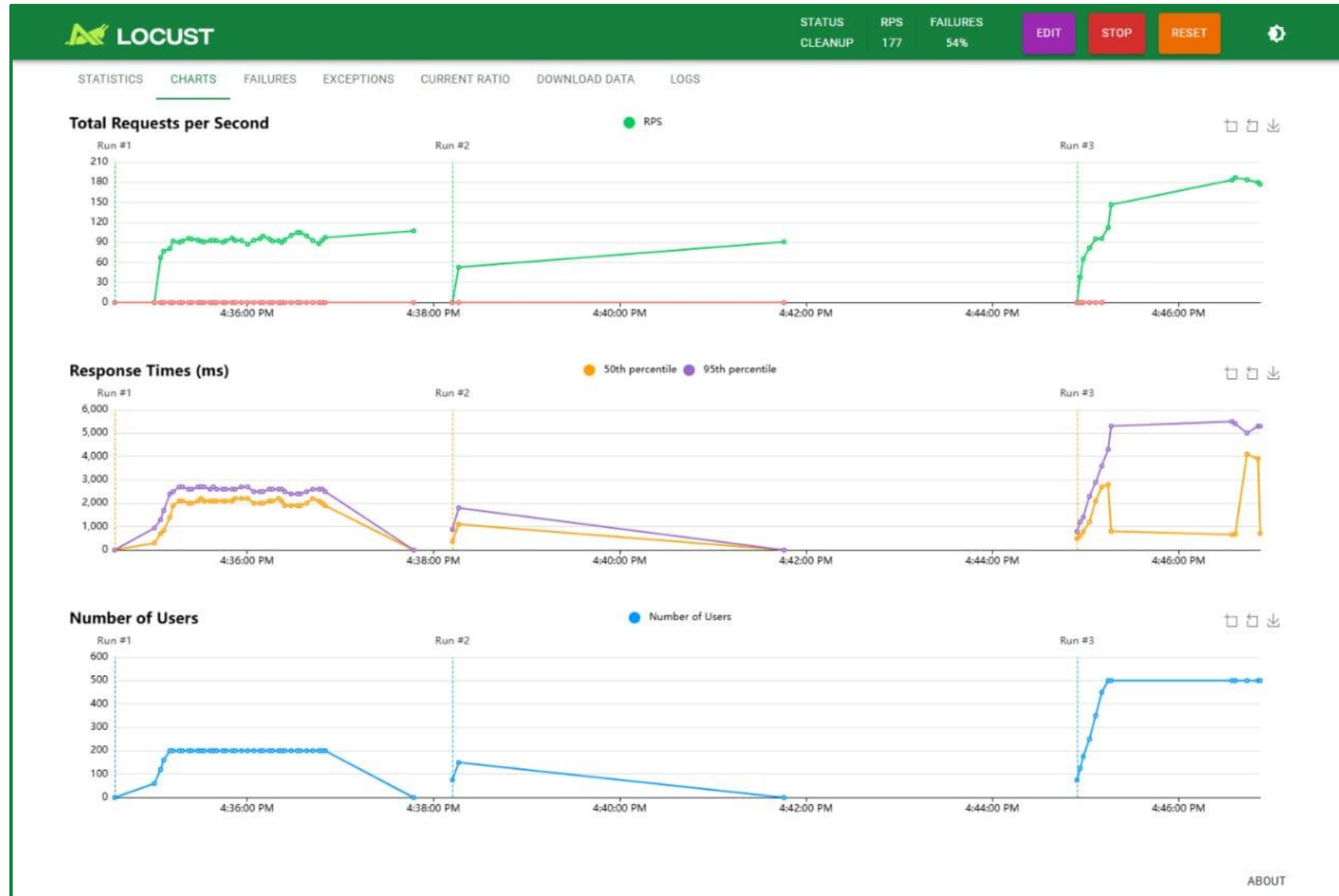


Fig: Visual Analysis 02 (Partial)



# Result Analysis (cont.)

Traffic Load	Metric	Serverless (AWS Lamda)	Serverful (Traditional VPS)
Low Traffic	10 Requests per Second	\$05.18/month	\$0.017 RPM (Tier A VPS)
	Idle Period: 60%	\$3.10/month	N/A (VM running constantly)
	Total Monthly Cost	> 5 USD	5~7 USD
Mid Traffic	200 Request per Second	\$103.60/month	\$0.011 RPM (Tier B VPS)
	Idle Period: 60%	\$41.47/month	N/A
	Total Monthly Cost	40~100 USD	12~15 USD
High Traffic	500 Request per Second	\$259.20/month	\$0.013 RPM (Tier C VPS)
	Idle Period: 40%	\$155.52/month	N/A
	Total Monthly Cost	\$250.00	20~30 USD

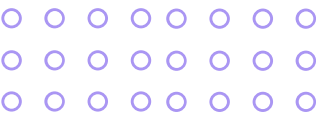


Fig: Cost Dynamics based on my testings





# Conclusion

Scenario	Recommended Architecture	Rationale
Low Traffic with Sporadic Use	Serverless (AWS Lambda)	Cost-effective for sporadic, low-traffic use cases due to its pay-per-use model.
Low Traffic with Consistent Use	Serverful (Traditional VPS)	Offers marginally lower costs with flat pricing and consistent resource availability.
Mid Traffic with Fluctuations	Serverful (Traditional VPS)	Substantially cheaper for sustained workloads with predictable traffic patterns.
High Traffic, Predictable Loads	Serverful (Traditional VPS)	Significantly lower costs for large-scale, predictable workloads with no elasticity required.
High Traffic with Spikes	Hybrid Solution	Combine serverful for steady traffic and serverless to absorb unpredictable traffic spikes.
Rapid Scaling or Dynamic Workloads	Serverless (AWS Lambda)	Ideal for applications with unpredictable or short-term spikes due to instant scaling benefits.

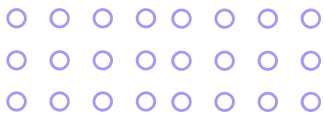


Fig: Decision table based on my findings so far







# Future Enhancements

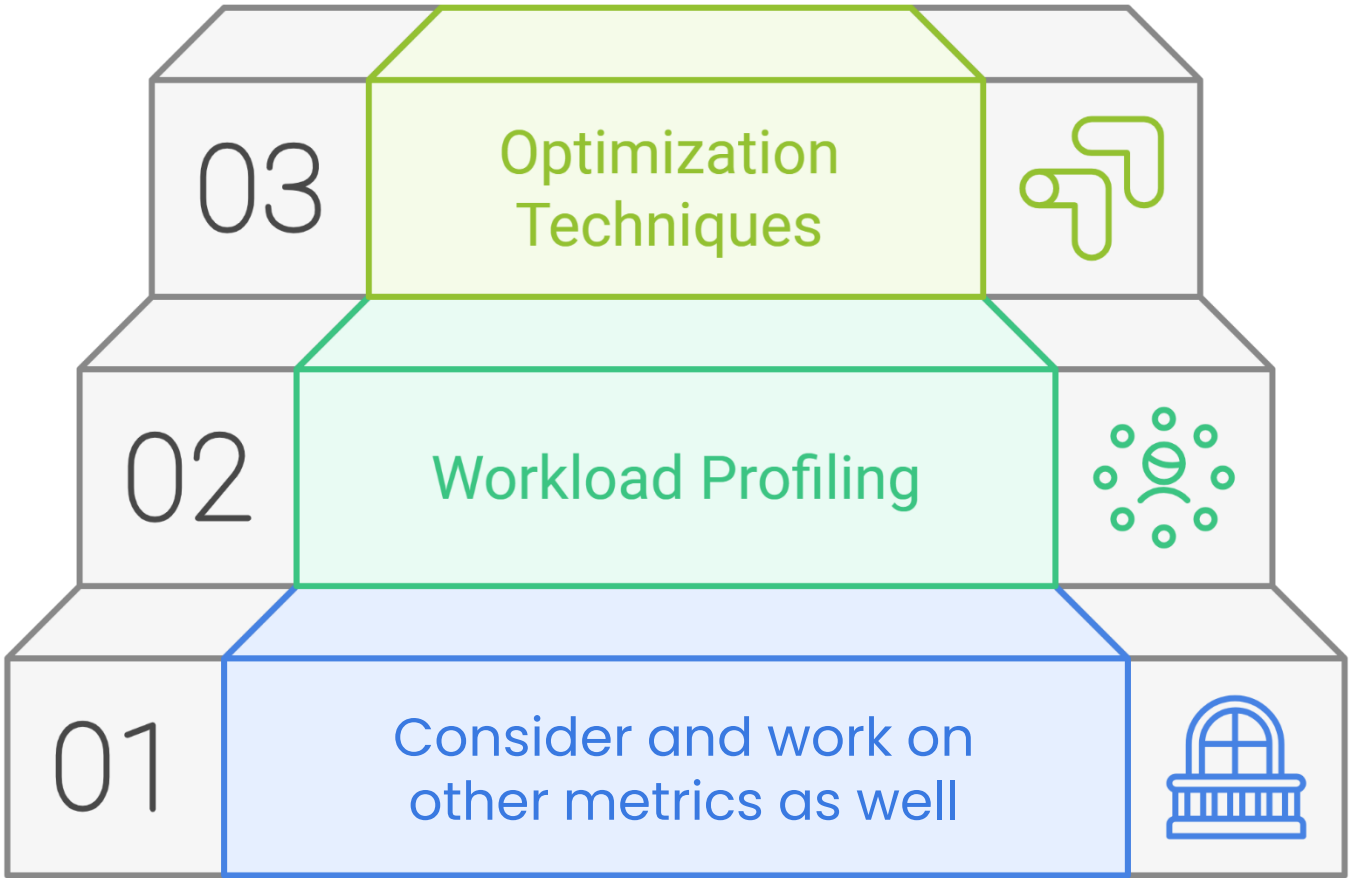
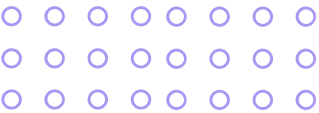


Fig: Probable Future Works



# Challenges

**Simulation Challenges**  
Difficulty in replicating real-world interactions



**High Costs**  
The financial burden of acquiring servers



**Time-Intensive Setup**  
The labor and time required for configuration

Fig: Limitations/Challenges





