Tiny URL

Functional Requirements	Non Functional Requirements
Given a long url create a short url	Very low latency
Given a short url redirect to a long url	Very high availability

Tiny URL

API Design

REST API

1. POST: /create-url
    - Params: long-url
    - Status code: 201 Created
2. Get: /{short-url}
    - Status code: 301 Permanent Redirect

Tiny URL

API Design

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Schema

long-url	string
short-url	string
created-at	timestamp

Tiny URL

Key question: How long should the URL be?

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- Example: 1,000 URLs generated per second

1,000 * 60 * 60 * 24 * 365 = 31.5 billion urls created each year

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Alphanumeric:

• a - z	26
• A - Z	26
• 0 - 9	10
	62 characters

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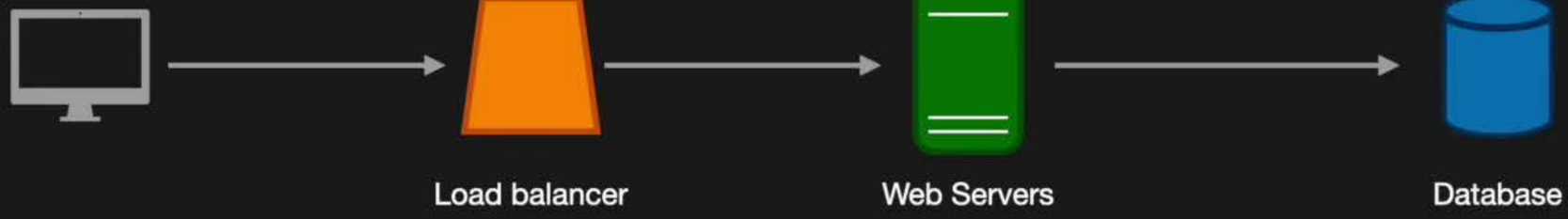
• 0 - 9	10
	62 characters

Unique short urls

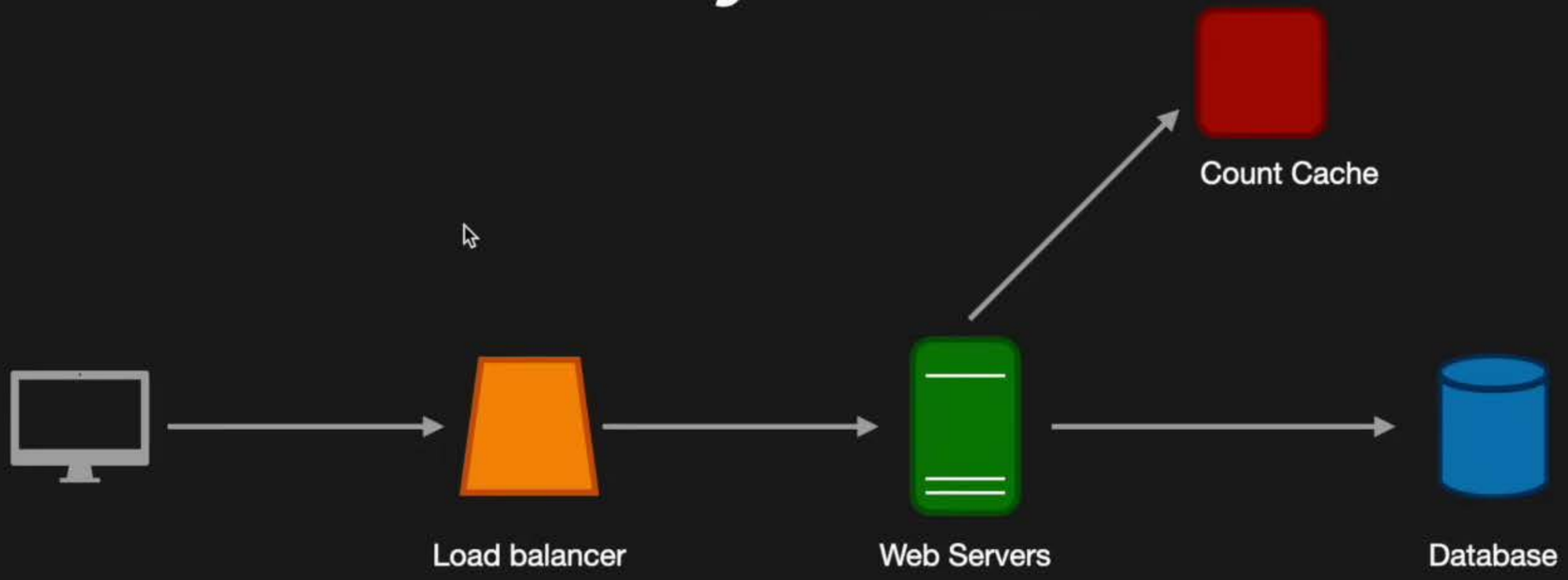
1^{62}	62
2^{62}	3,844
...	
6^{62}	56 billion
7^{62}	3.5 trillion

7 characters

Tiny URL



Tiny URL



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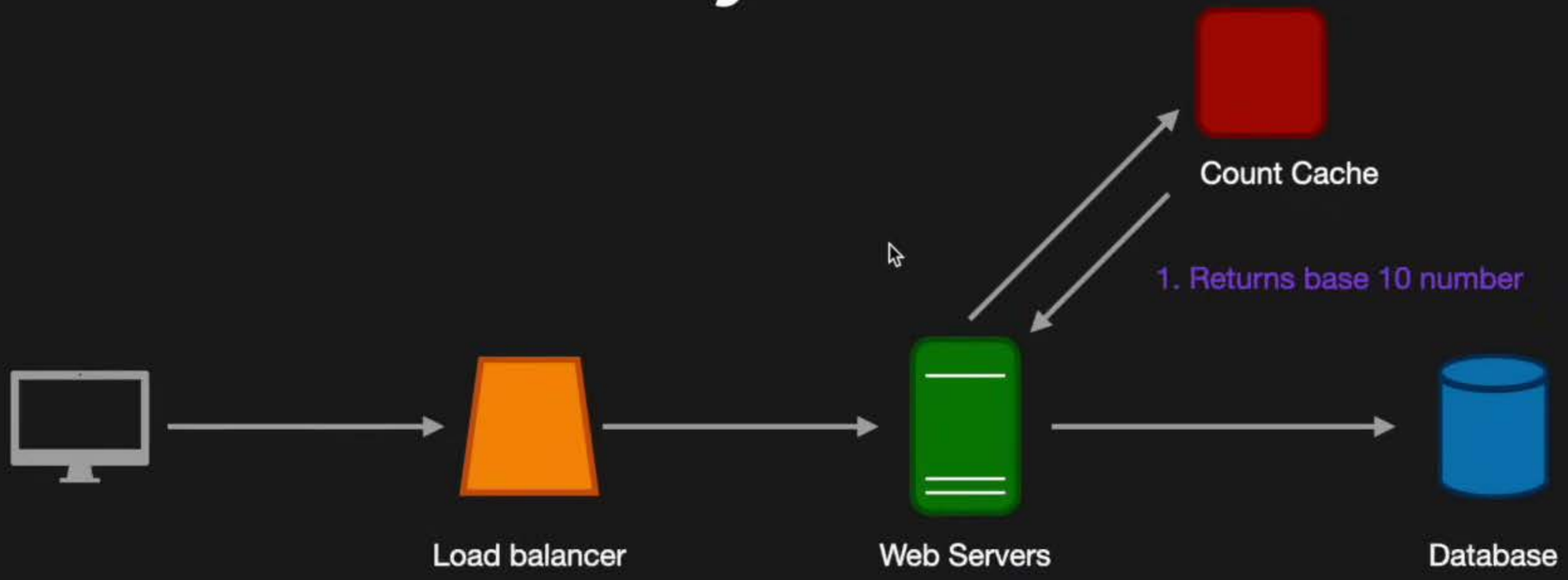
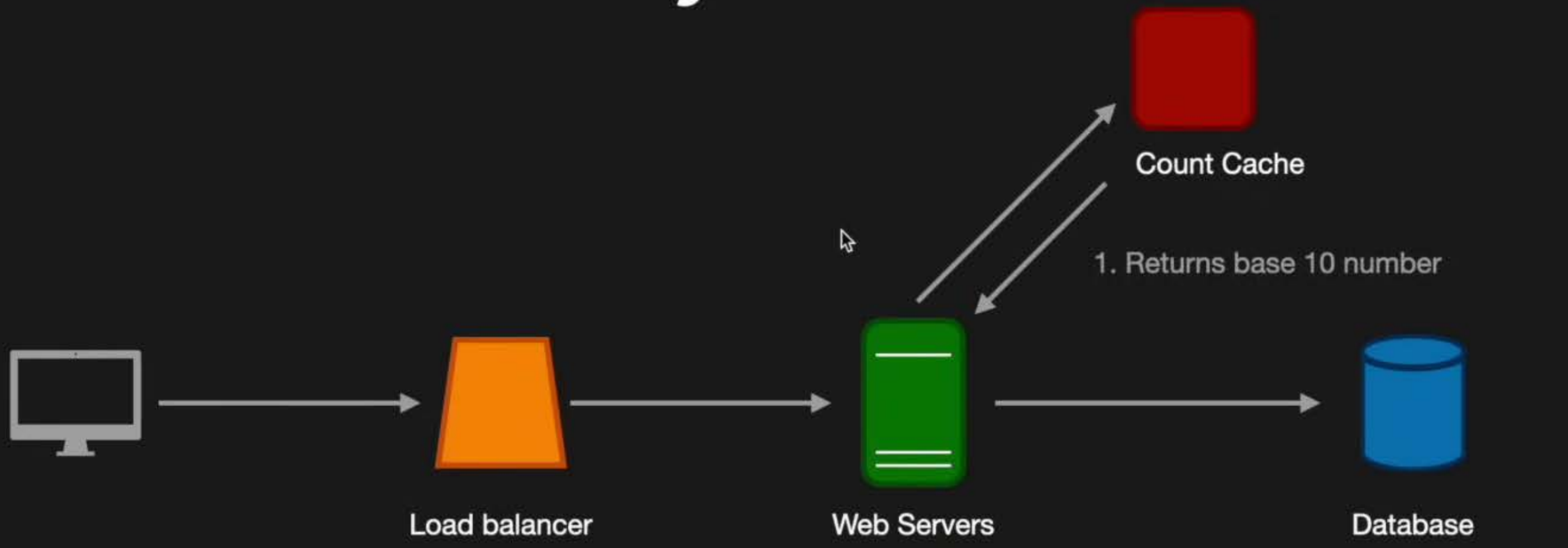
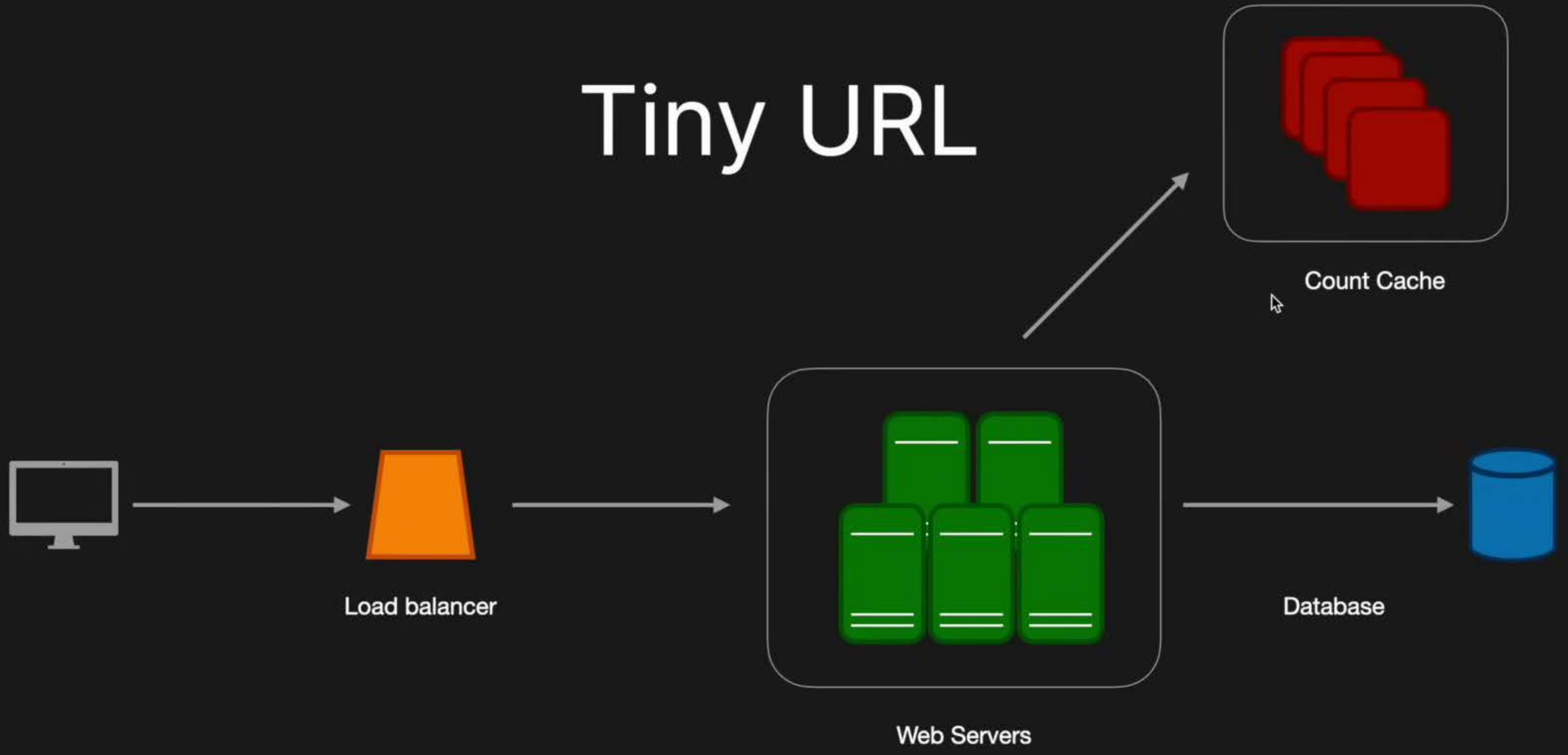

Count Cache
1. Returns base 10 number
Load balancer
Web Servers
Database

Tiny URL



2. Converts to base 62 which will be used as the short url

Tiny URL



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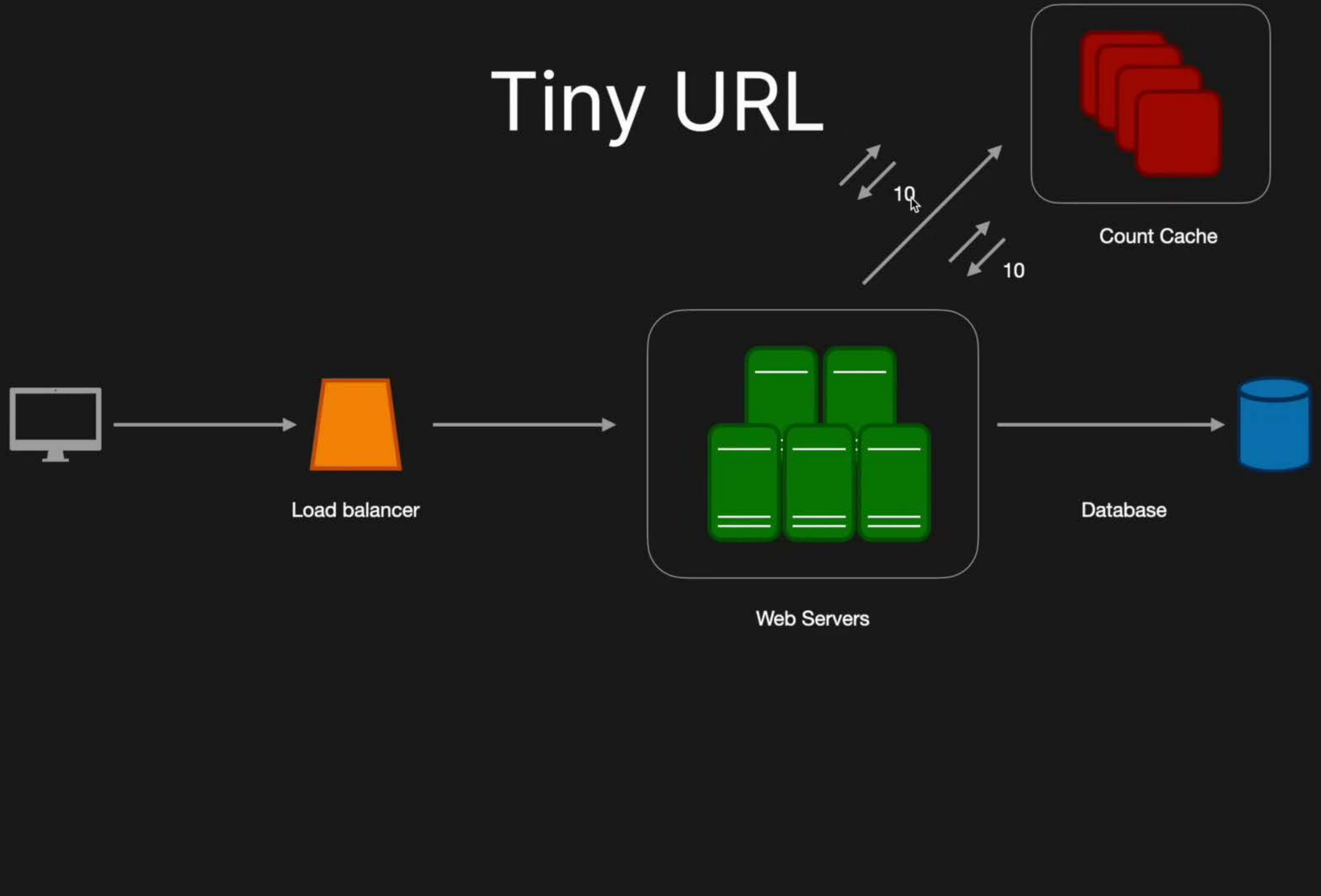

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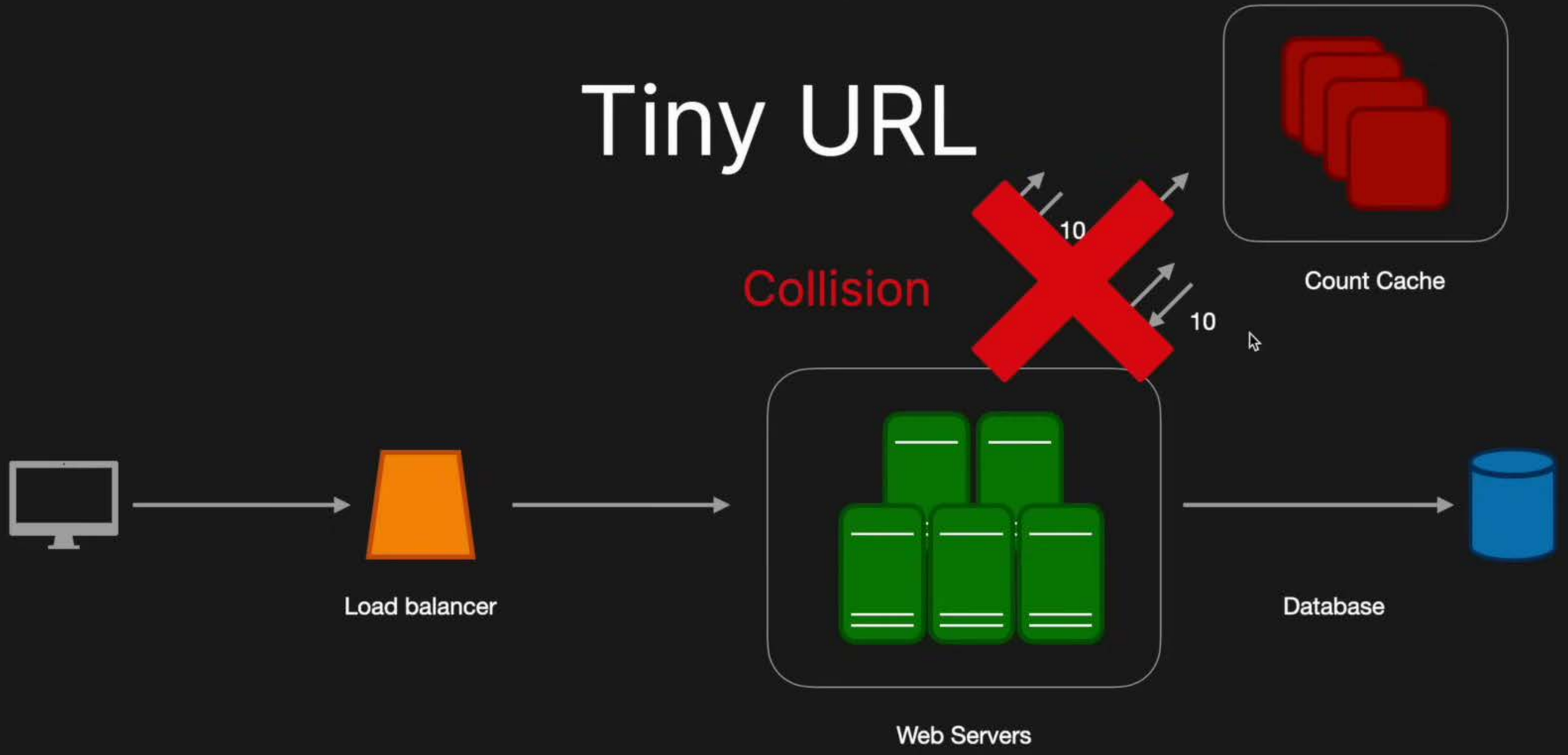
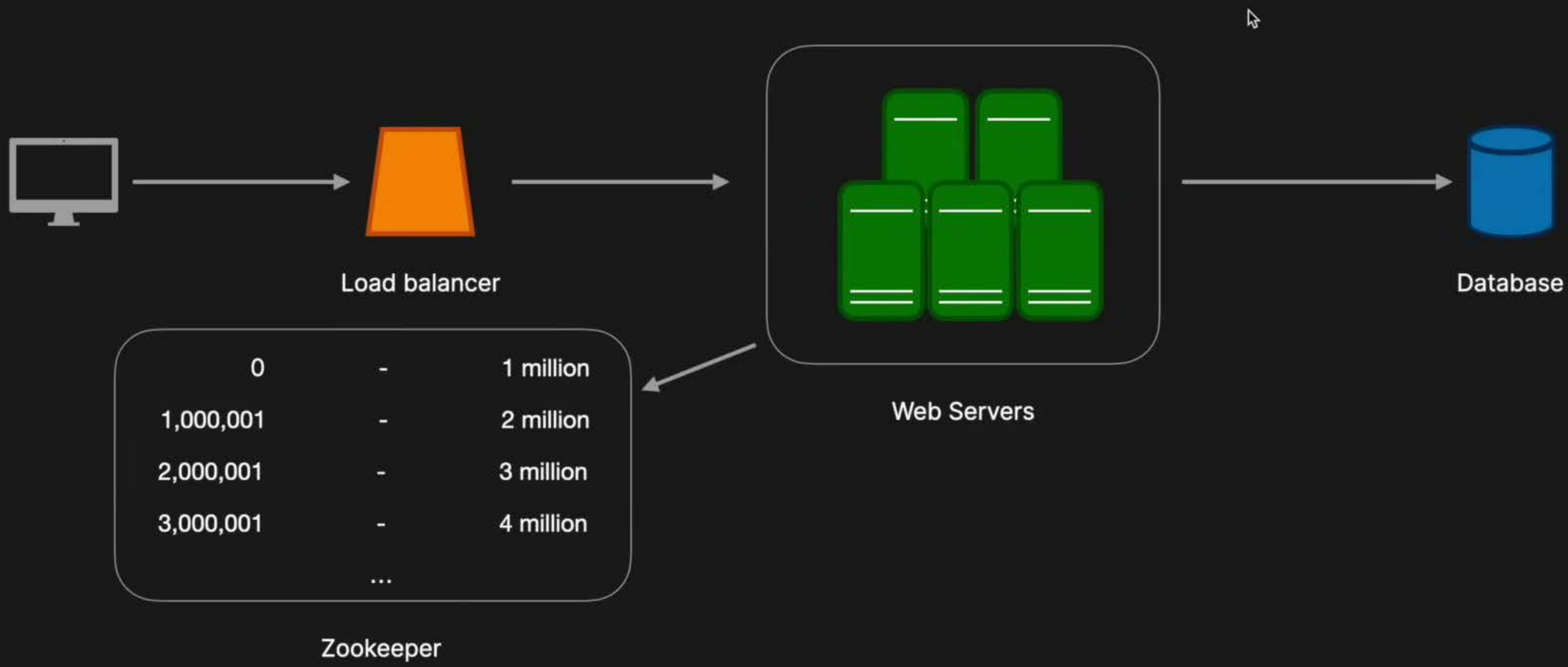
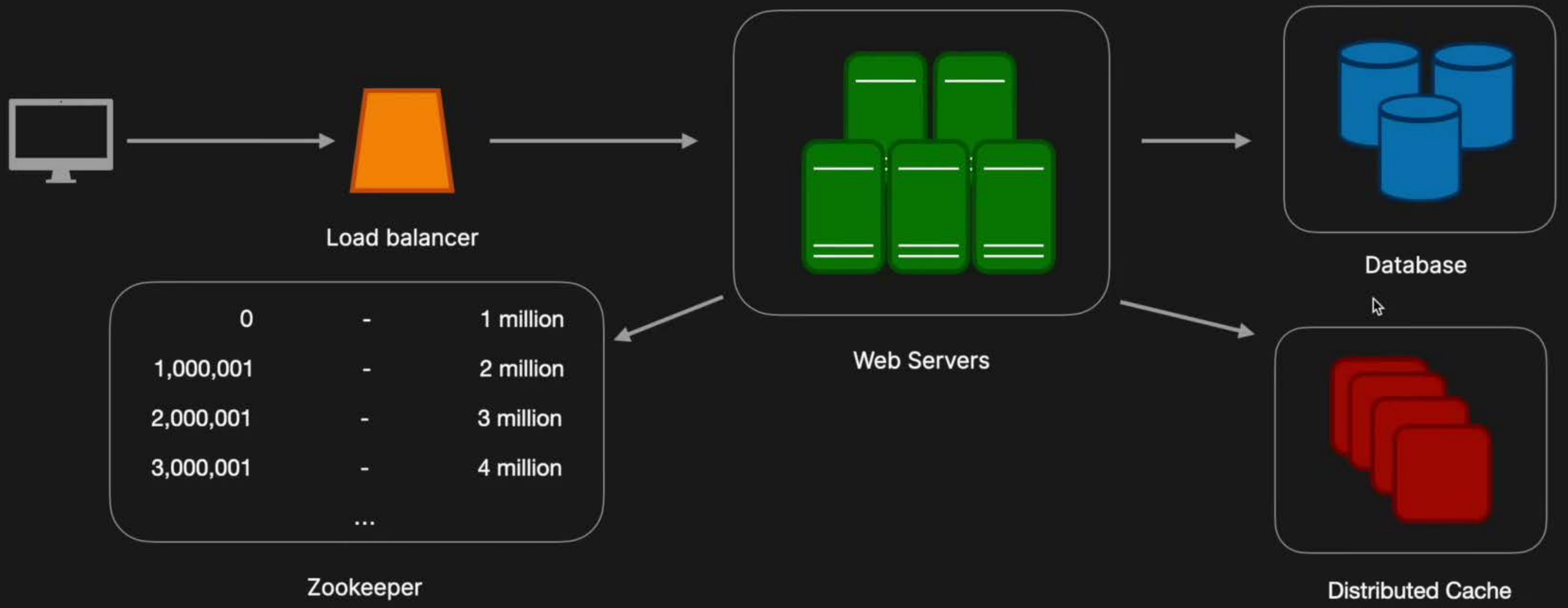

Collision
10
10
Count Cache
Load balancer
Web Servers
Database

Tiny URL


Load balancer
Web Servers
Database
0 - 1 million
1,000,001 - 2 million
2,000,001 - 3 million
3,000,001 - 4 million
...
Zookeeper

Tiny URL


Load balancer
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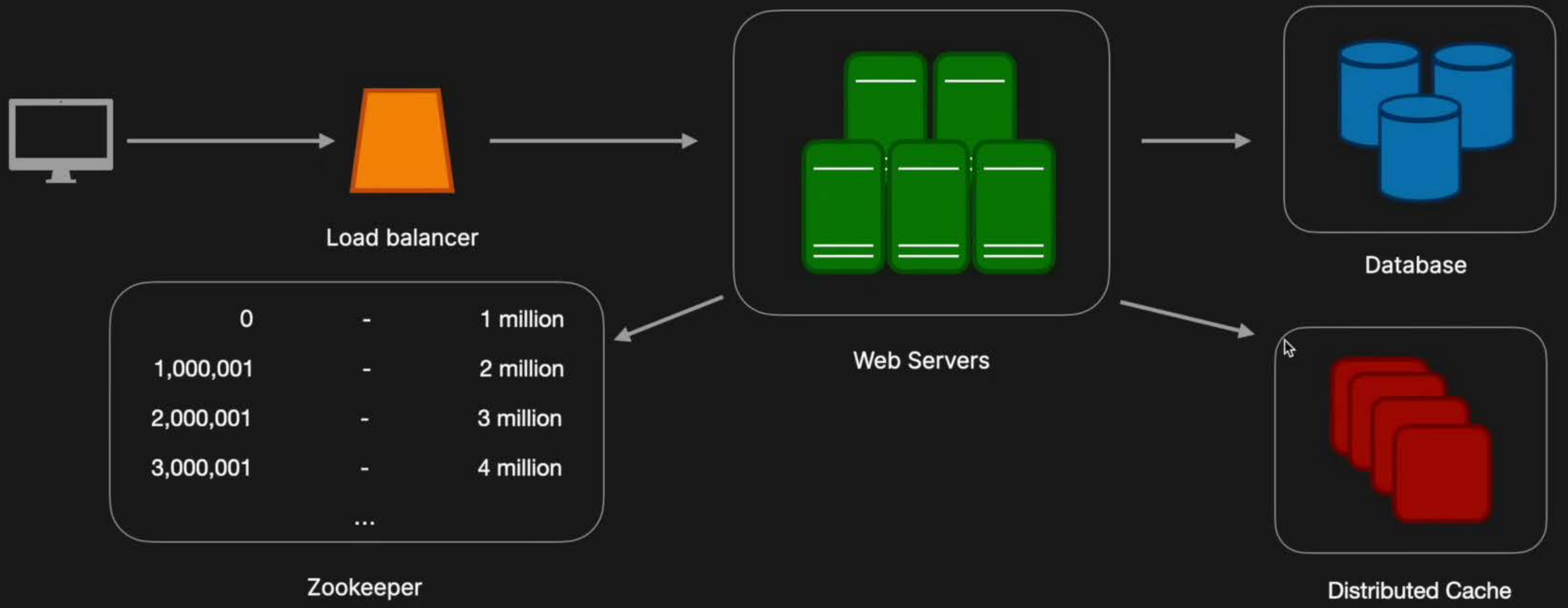
Zookeeper
Distributed Cache

Tiny URL

Post Request

1 Post request: /create-url



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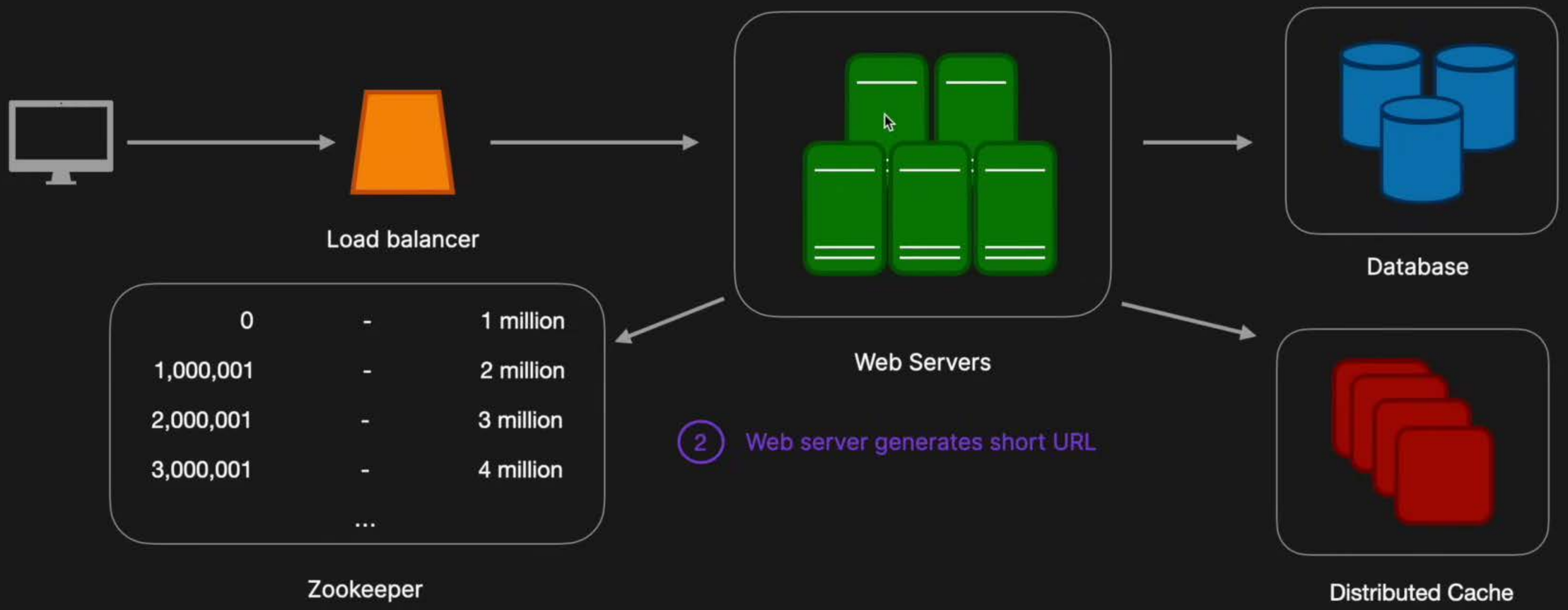
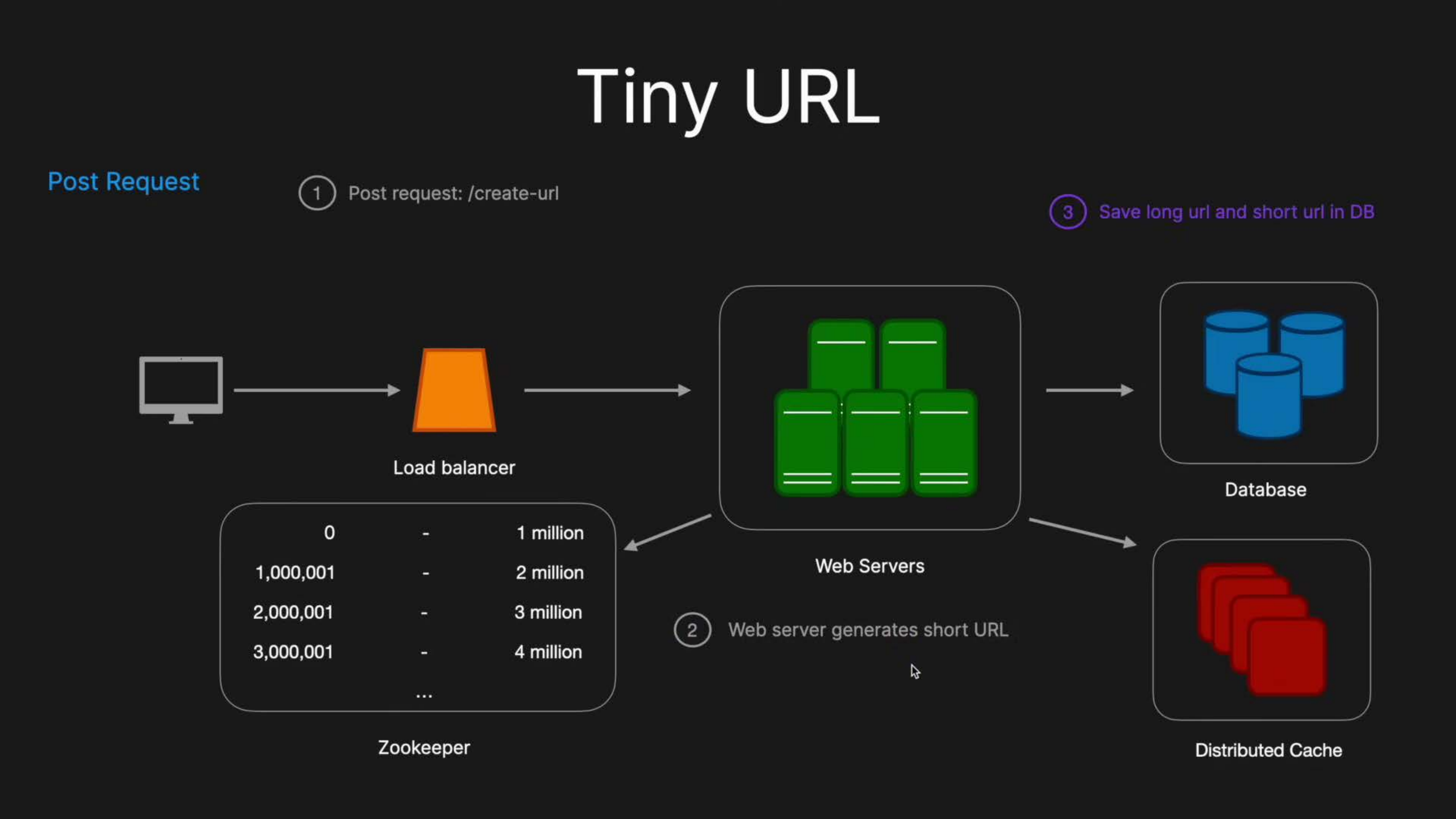


2 Web server generates short URL

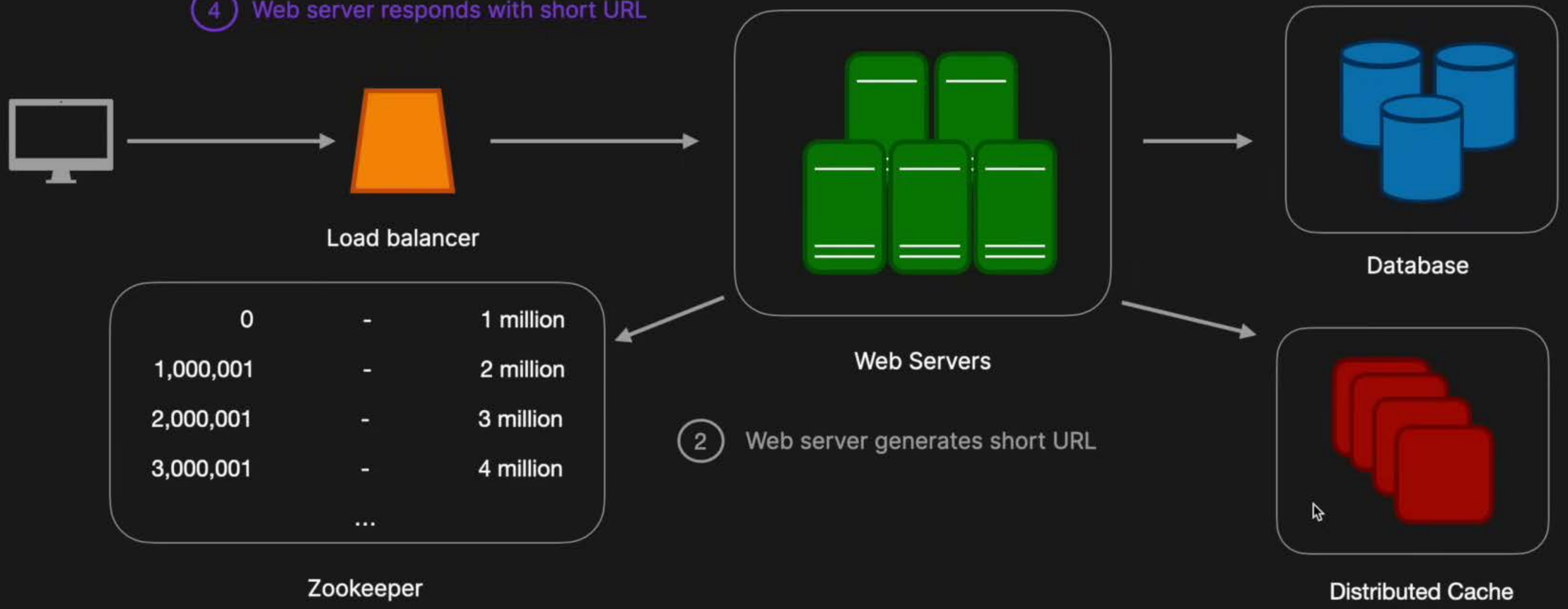
Tiny URL


Post Request
1
Post request: /create-url
3
Save long url and short url in DB
Load balancer
Web Servers
Database
0 - 1 million
1,000,001 - 2 million
2,000,001 - 3 million
3,000,001 - 4 million
...
2
Web server generates short URL
Zookeeper
Distributed Cache

Tiny URL

Post Request

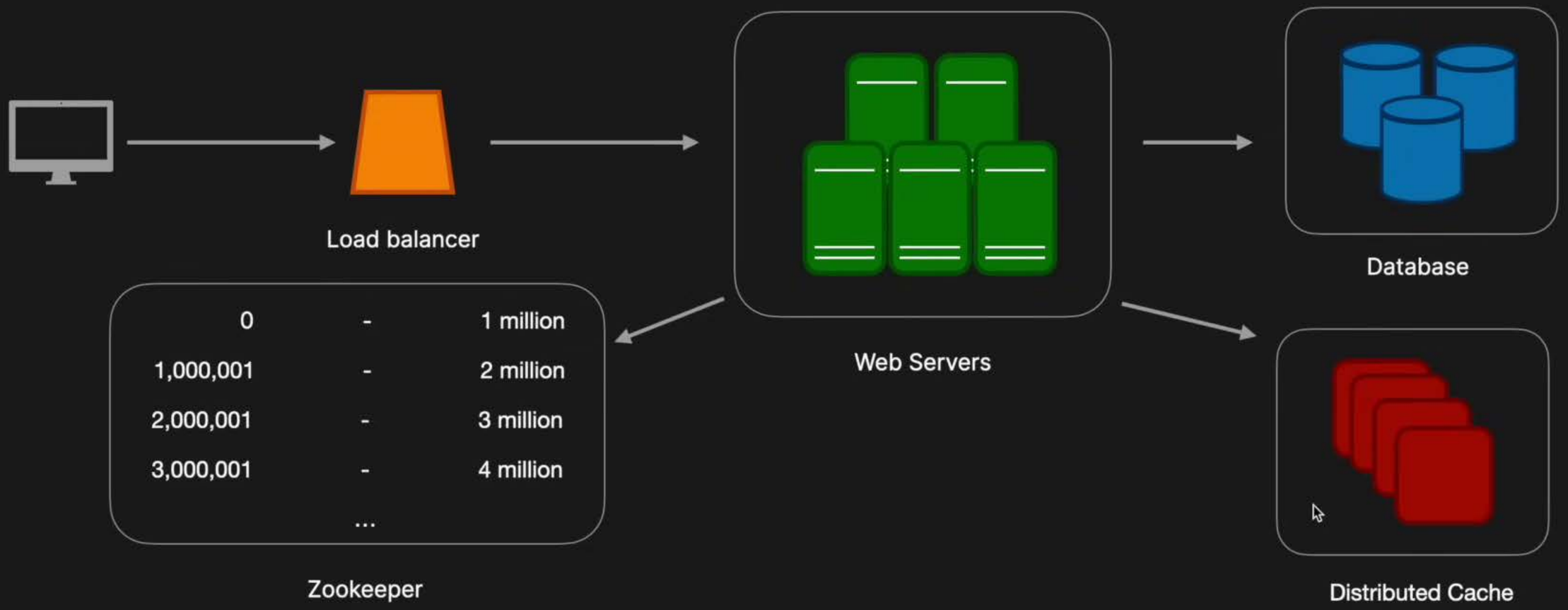
1. Post request: /create-url
2. Web server generates short URL
3. Save long url and short url in DB
4. Web server responds with short URL



Tiny URL

Get Request

1 Get request: /{short-url}



Tiny URL

Get Request

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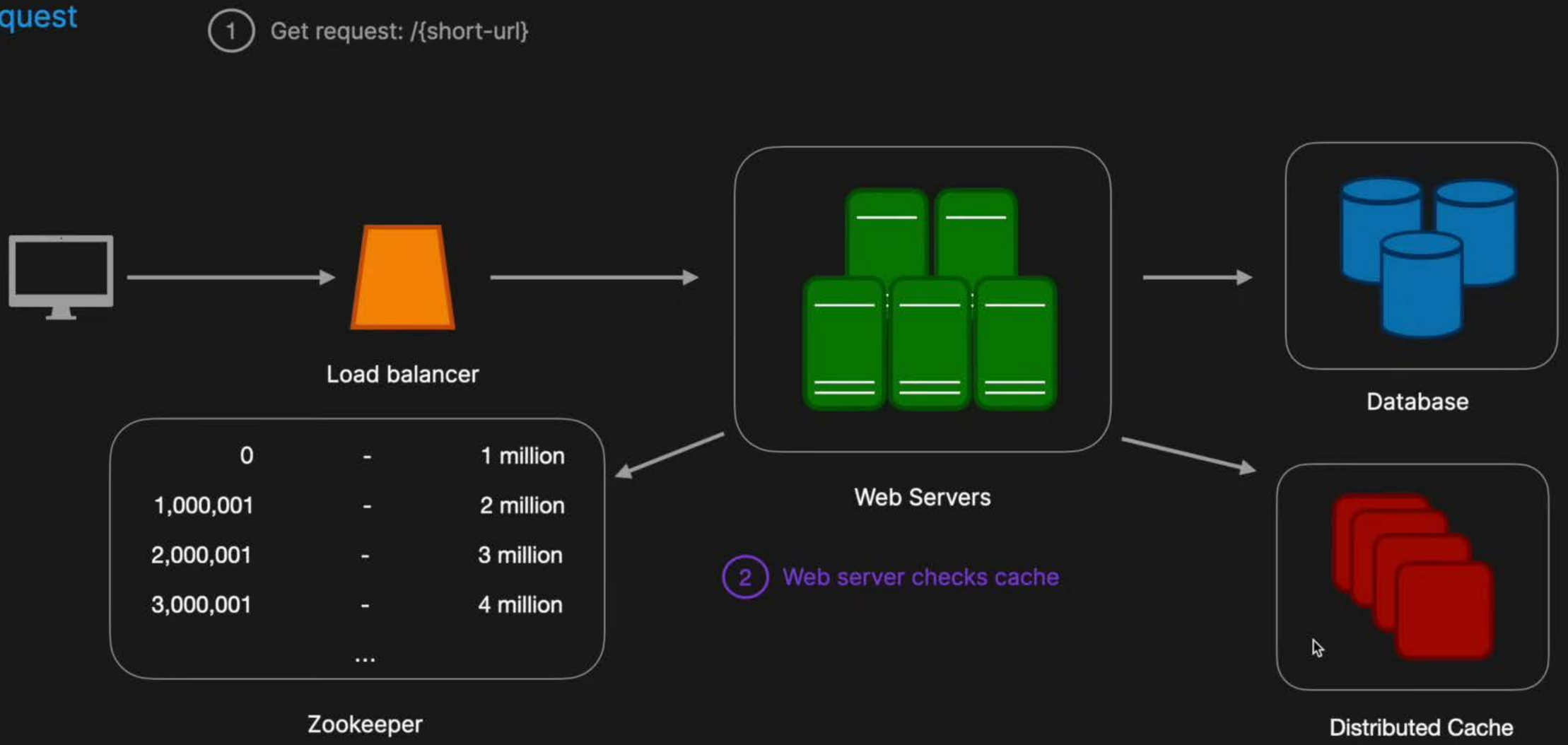

Tiny URL

Get Request

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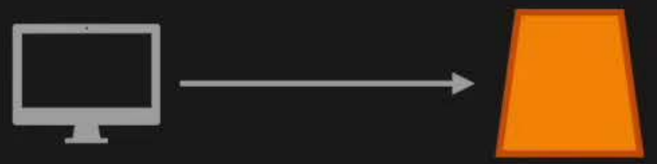
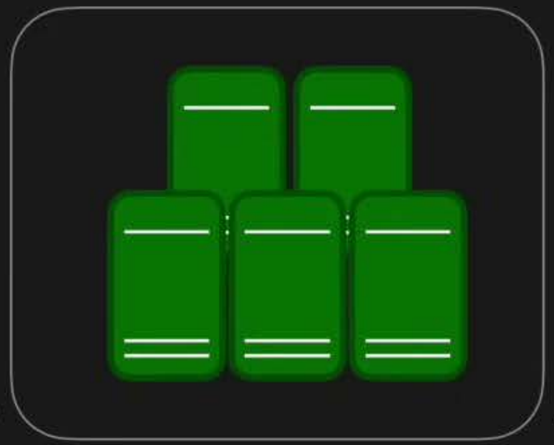


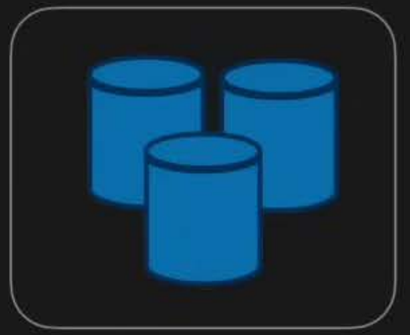
Load balancer



Web Servers

2. Web server checks cache

3. Web sever retrieves long url from DB



Database

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2,000,001	-	3 million
3,000,001	-	4 million
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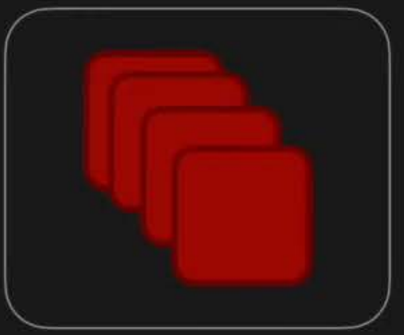
Zookeeper

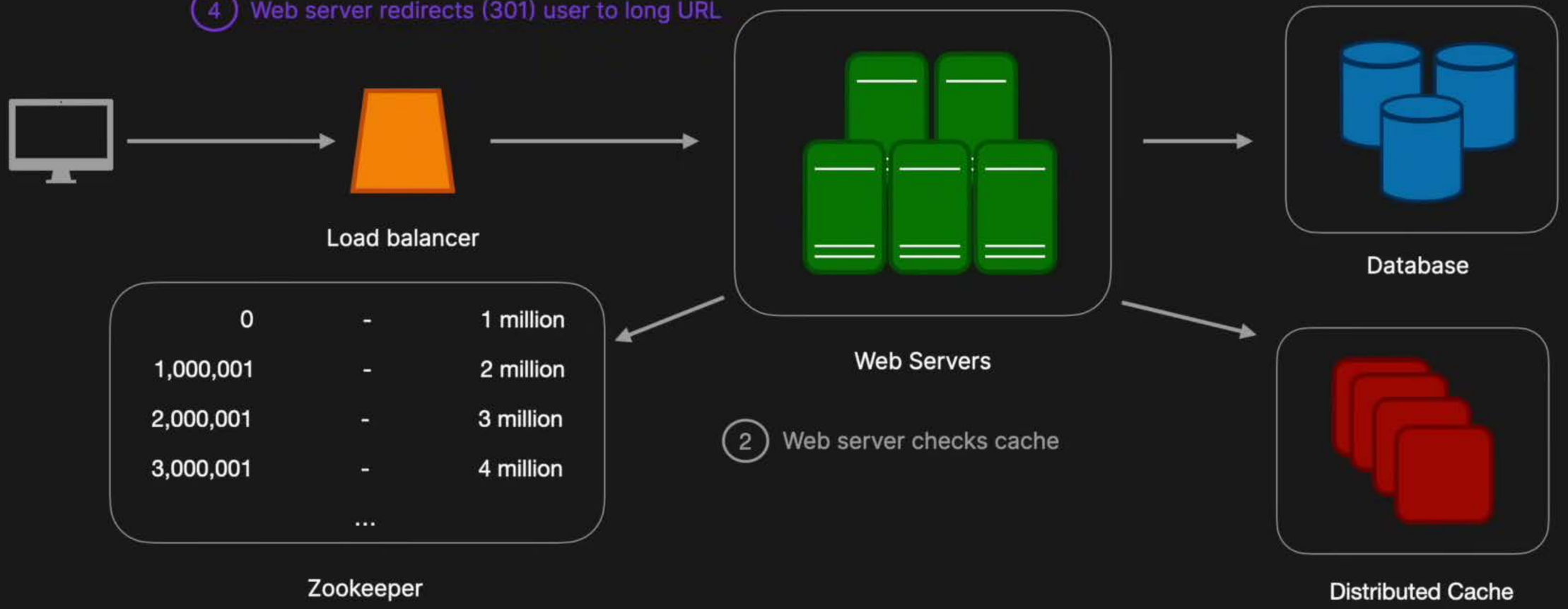


Distributed Cache

Tiny URL

Get Request

1. Get request: /{short-url}
2. Web server checks cache
3. Web sever retrieves long url from DB
4. Web server redirects (301) user to long URL



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Additional talking points

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1. Analytics

- Counts for each URL to determine which short URLS to cache
- IP address to store location information to determine where to locate caches etc.

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- Prevent DDoS attacks by malicious users

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- IP address to store location information to determine where to locate caches etc.

2. Rate limiting

- Prevent DDoS attacks by malicious users

3. Security considerations

- Add random suffix to the short url to prevent hackers predicting urls