ArchSummit

全球架构师峰会（深圳）2014

HIGHLY AVAILABLE ARCHITECTURES

WITH AMAZON WEB SERVICES

carlosco@amazon.lu
@caarlco

vimeo
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Log In
Explore
Help
Search
Your videos belong here.
First and Last Name
Email Address
Password
Join
I accept the Vimeo Terms of Service
Log in with Facebook
Watch the videos we love.
See more
Staff Picks »
vimeo
STAFF
PICK
Mostar
from DGA Productions
PLUS
LIKE
LATER
SHARE

Share Your Sounds

Capture a voice, moment or music in seconds or upload audio you've already created.

Everyone has sounds to share.
Now you can share yours.

Sign in with Facebook | Sign up

Take the tour or check our mobile apps

Create Original Sounds

Easily record and upload music and audio. See your sounds come to life in our unique waveform player.

Share With The World

Share your sounds to sites and social networks. Connect SoundCloud with hundreds of apps to share everywhere.

Connect With People

Find and follow friends to share sounds with each other. Add comments and likes to everyone's sounds too.

SmugMug

Give SmugMug Browse Photos Login Help Search

Your Photos Look Better Here.®

Billions of happy photos. Millions of passionate customers.

TRY US FREE!
NO CREDIT CARD REQUIRED

SKIP TRIAL
I'M ALREADY SOLD

Like 97,754 people like this. Be the first of your friends.

SHARE

- Publish to Facebook & Twitter
- Share photos via email
- Embed them on blogs, forums, & more

PROTECT

- Unlimited photo and video backups
- Advanced privacy options
- Watermarking for piracy prevention

$ BUY & SELL

- The best prints & gifts
- Your account pays for itself
- Promotions like coupons & packages

Beautiful

Safe

A Complete Solution

LET’S BUILD A WEBSITE

LET’S BUILD A HIGHLY AVAILABLE WEBSITE

LET’S BUILD A
HIGHLY AVAILABLE
AND DURABLE
WEBSITE

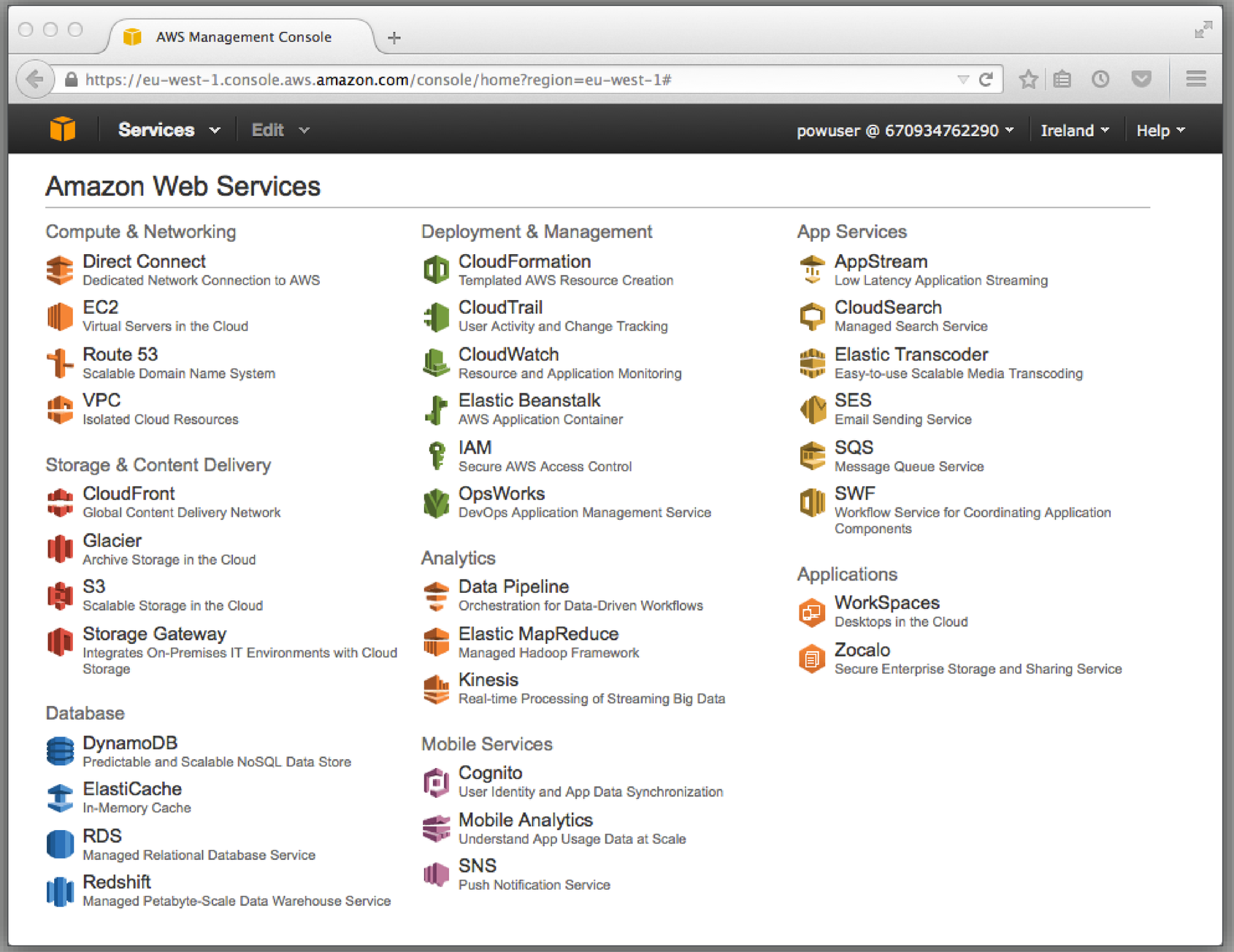
LET’S BUILD A
HIGHLY AVAILABLE,
SCALABLE
AND DURABLE
WEBSITE

LET’S BUILD A
HIGHLY AVAILABLE,
SCALABLE
AND DURABLE
WEBSITE
THAT REQUIRES LOW
MAINTENANCE

amazon
web services™

+32

SERVICES


AWS Management Console
https://eu-west-1.console.aws.amazon.com/console/home?region=eu-west-1#
Services
Edit
powuser @ 670934762290
Ireland
Help
Amazon Web Services
Compute & Networking
Direct Connect
Dedicated Network Connection to AWS
EC2
Virtual Servers in the Cloud
Route 53
Scalable Domain Name System
VPC
Isolated Cloud Resources
Storage & Content Delivery
CloudFront
Global Content Delivery Network
Glacier
Archive Storage in the Cloud
S3
Scalable Storage in the Cloud
Storage Gateway
Integrates On-Premises IT Environments with Cloud Storage
Database
DynamoDB
Predictable and Scalable NoSQL Data Store
ElastiCache
In-Memory Cache
RDS
Managed Relational Database Service
Redshift
Managed Petabyte-Scale Data Warehouse Service
Deployment & Management
CloudFormation
Templated AWS Resource Creation
CloudTrail
User Activity and Change Tracking
CloudWatch
Resource and Application Monitoring
Elastic Beanstalk
AWS Application Container
IAM
Secure AWS Access Control
OpsWorks
DevOps Application Management Service
Analytics
Data Pipeline
Orchestration for Data-Driven Workflows
Elastic MapReduce
Managed Hadoop Framework
Kinesis
Real-time Processing of Streaming Big Data
Mobile Services
Cognito
User Identity and App Data Synchronization
Mobile Analytics
Understand App Usage Data at Scale
SNS
Push Notification Service
App Services
AppStream
Low Latency Application Streaming
CloudSearch
Managed Search Service
Elastic Transcoder
Easy-to-use Scalable Media Transcoding
SES
Email Sending Service
SQS
Message Queue Service
SWF
Workflow Service for Coordinating Application Components
Applications
WorkSpaces
Desktops in the Cloud
Zocalo
Secure Enterprise Storage and Sharing Service

ON-DEMAND

ELASTIC

PAY AS YOU GO

AMAZON S3

SIMPLE STORAGE SERVICE

Dropbox

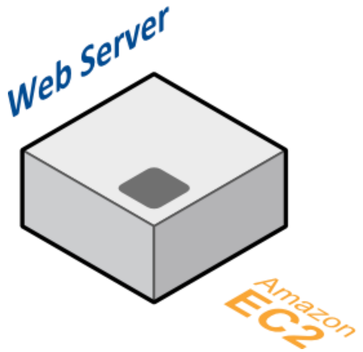
AWS BUILDING BLOCKS

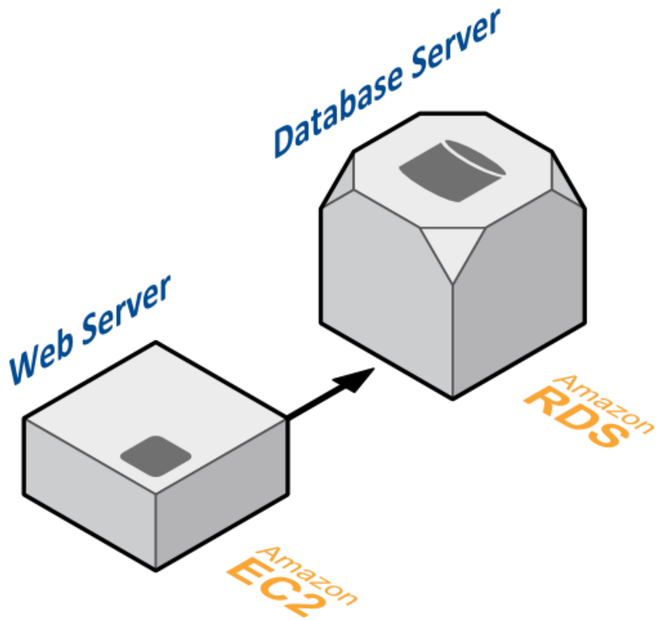
Inherently Fault-Tolerant Services

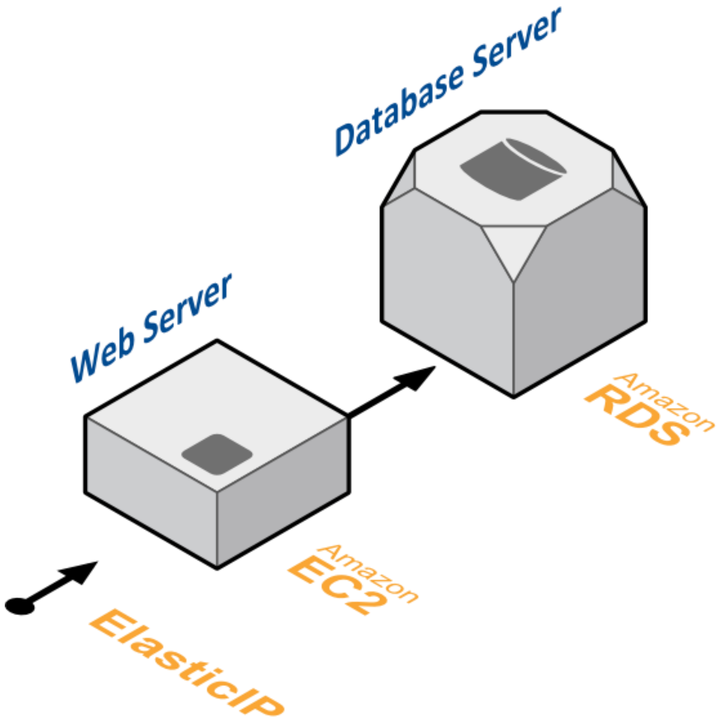
- Amazon S3
- Amazon SimpleDB
- Amazon DynamoDB
- Amazon CloudFront
- Amazon SWF
- Amazon SQS
- Amazon SNS
- Amazon SES
- Amazon Route53
- Elastic Load Balancing
- AWS IAM
- AWS Elastic Beanstalk
- Amazon ElastiCache
- Amazon EMR
- Amazon CloudSearch
- Amazon Redshift
- Amazon Kinesis
- Amazon Cognito
- Amazon AppStream
- Amazon CloudSearch

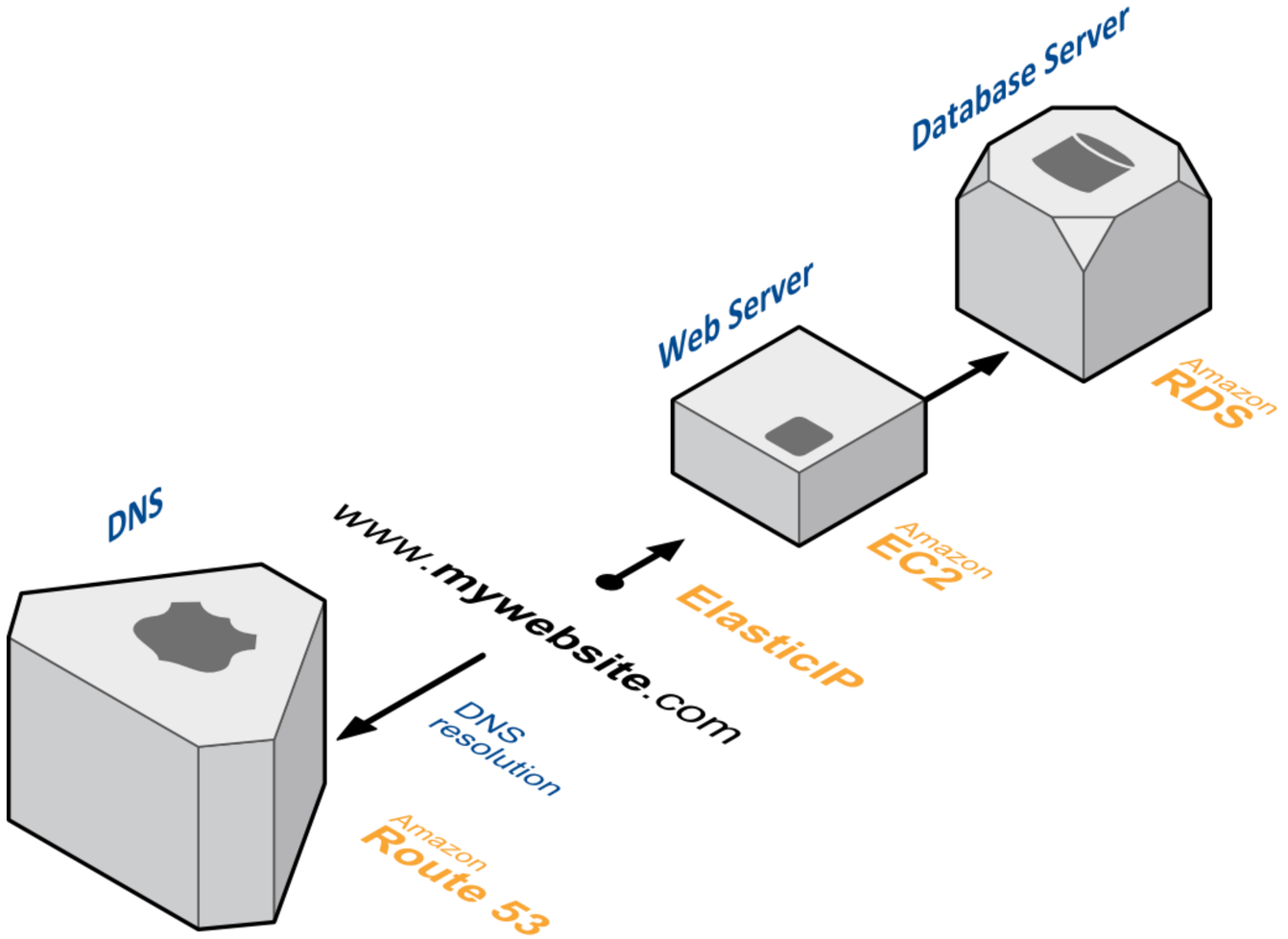
Fault-Tolerant with the right architecture

- Amazon EC2
- Amazon EBS
- Amazon RDS
- Amazon VPC


Web Server
Amazon
EC2


Database Server
Web Server
Amazon
RDS
Amazon
EC2


Database Server
Web Server
Amazon
RDS
Amazon
EC2
ElasticIP


Database Server
Web Server
Amazon
RDS
Amazon
EC2
ElasticIP
DNS
www.mywebsite.com
DNS
resolution
Amazon
Route 53

#1

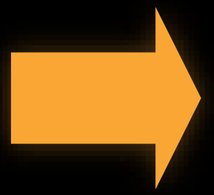
DESIGN FOR FAILURE

« Everything fails
all the time »

Werner Vogels
CTO of Amazon

YOUR GOAL:

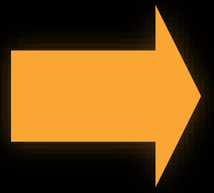
Applications should **continue to function** even if the underlying physical hardware **fails** or is **removed** or **replaced**



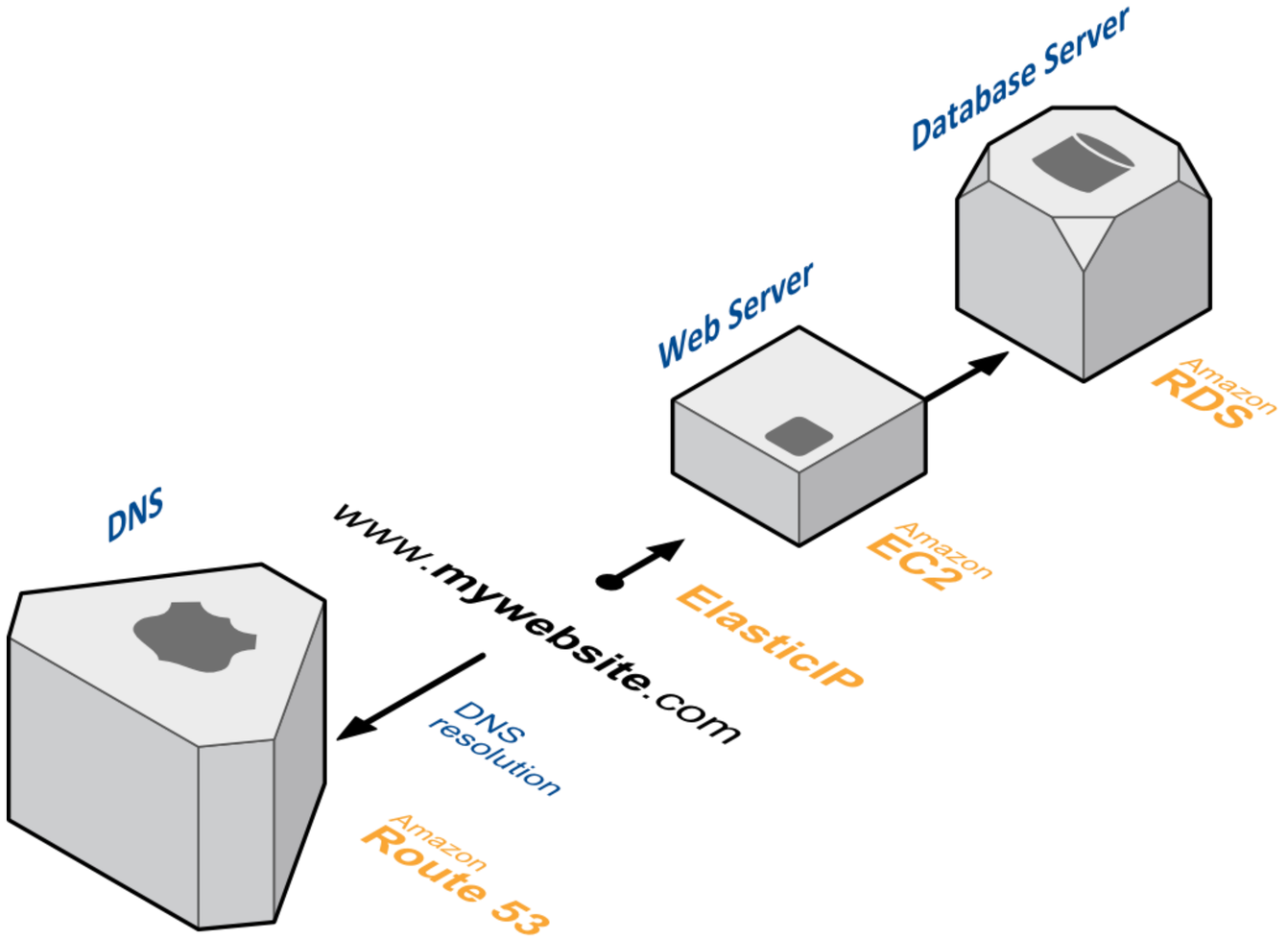
AVOID SINGLE POINTS OF FAILURE.

ASSUME EVERYTHING FAILS, AND DESIGN BACKWARDS.

AVOID SINGLE POINTS OF FAILURE.



ASSUME EVERYTHING FAILS, AND DESIGN BACKWARDS.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ElasticIP
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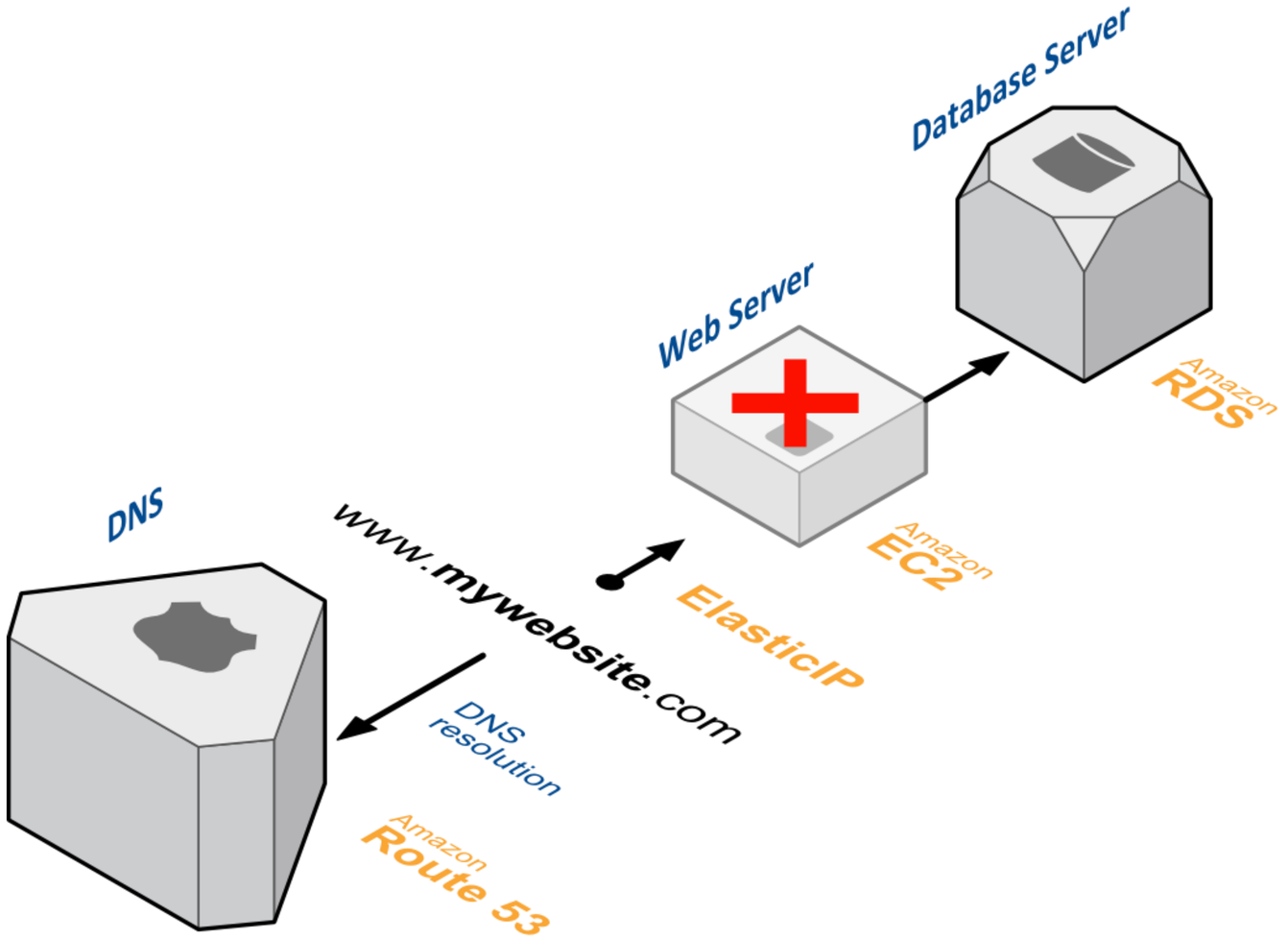
www.mywebsite.com
DNS
resolution
Amazon
Route 53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ElasticIP
DNS
www.mywebsite.com
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resolution
Amazon
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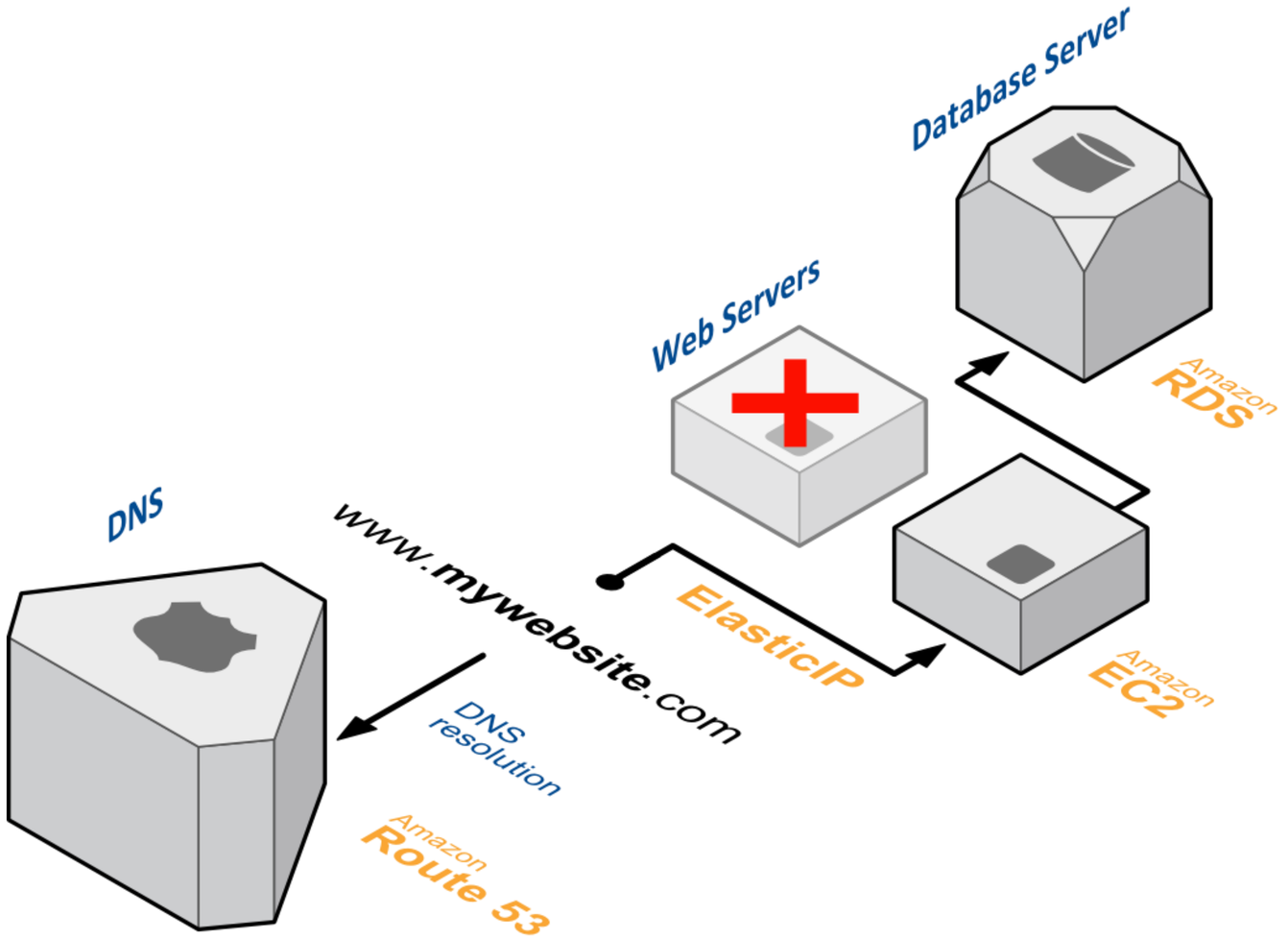
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DNS
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ElasticIP
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EC2
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resolution
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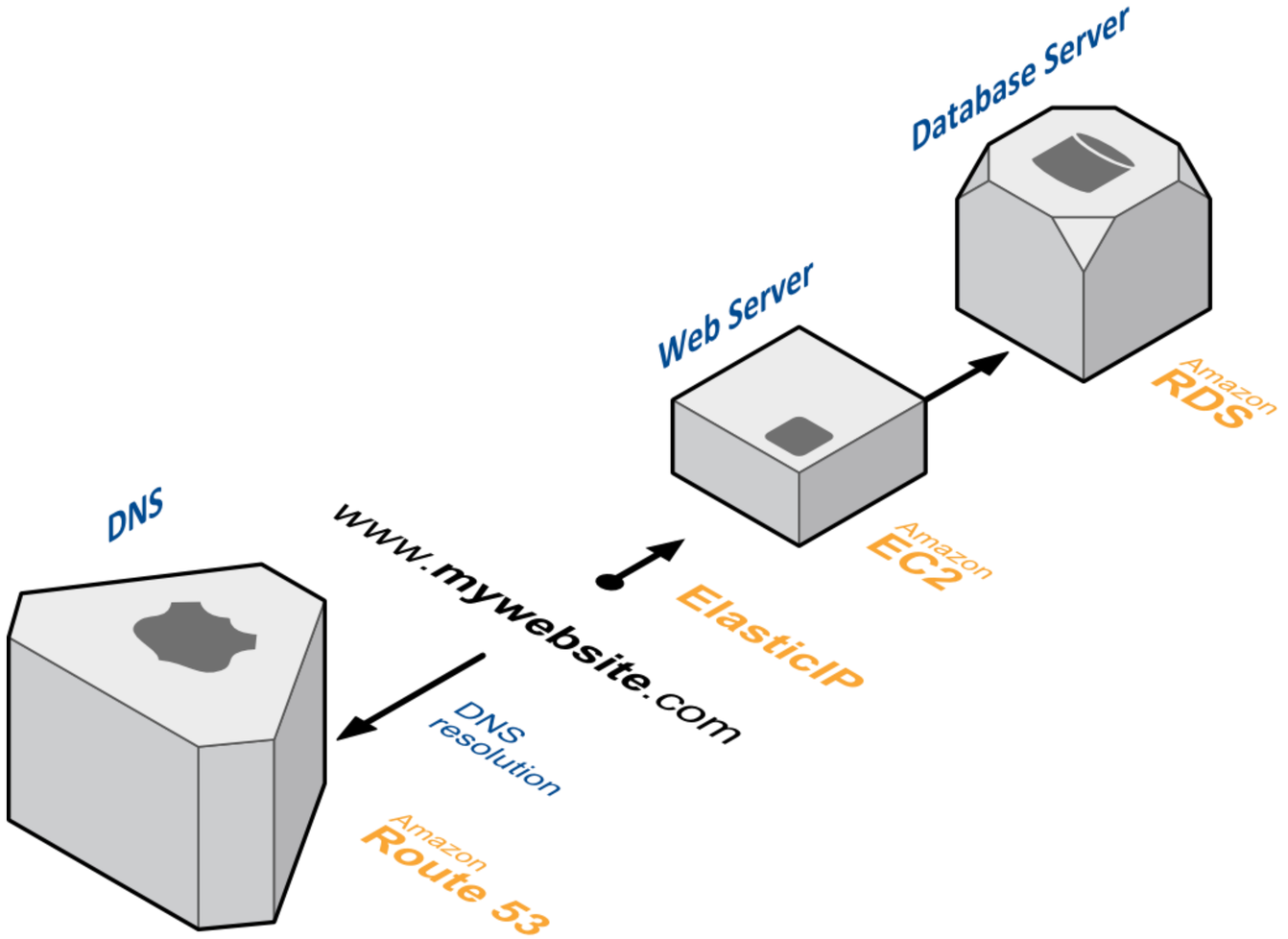
Route 53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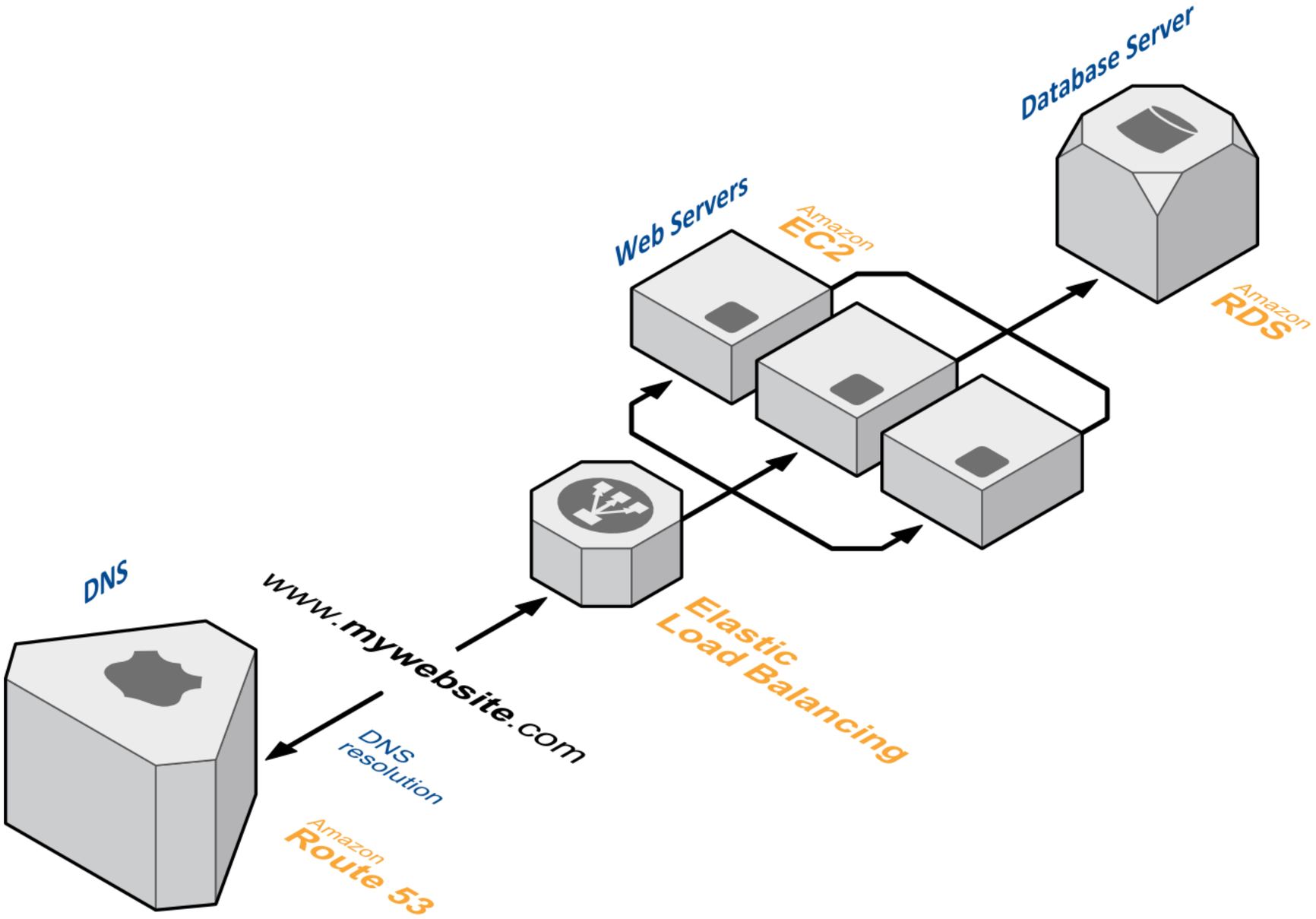
Route 53


Database Server
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RDS
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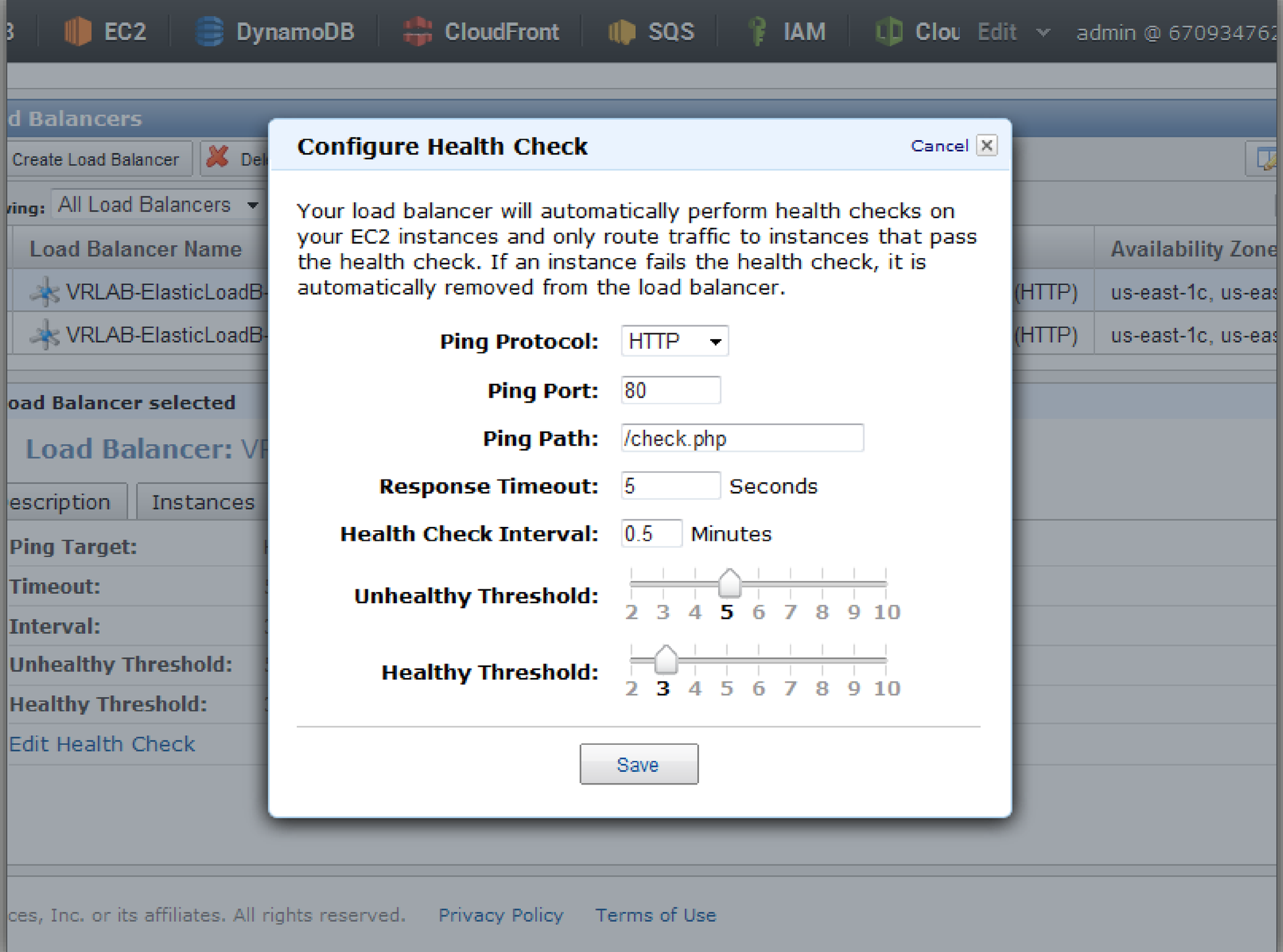
www.mywebsite.com
Elastic
Load Balancing
DNS
resolution
Amazon
Route 53

HEALTH CHECKS


EC2
DynamoDB
CloudFront
SQS
IAM
Edit
admin @ 670934762
d Balancers
Create Load Balancer
All Load Balancers
Load Balancer Name
Availability Zone
VRLAB-ElasticLoadB-
(HTTP)
us-east-1c, us-eas
oad Balancer selected
Load Balancer: VR
escription
Instances
Ping Target:
Timeout:
Interval:
Unhealthy Threshold:
Healthy Threshold:
Edit Health Check
Configure Health Check
Cancel
Your load balancer will automatically perform health checks on your EC2 instances and only route traffic to instances that pass the health check. If an instance fails the health check, it is automatically removed from the load balancer.
Ping Protocol:
HTTP
Ping Port:
80
Ping Path:
/check.php
Response Timeout:
5
Seconds
Health Check Interval:
0.5
Minutes
Unhealthy Threshold:
2 3 4 5 6 7 8 9 10
Healthy Threshold:
2 3 4 5 6 7 8 9 10
Save
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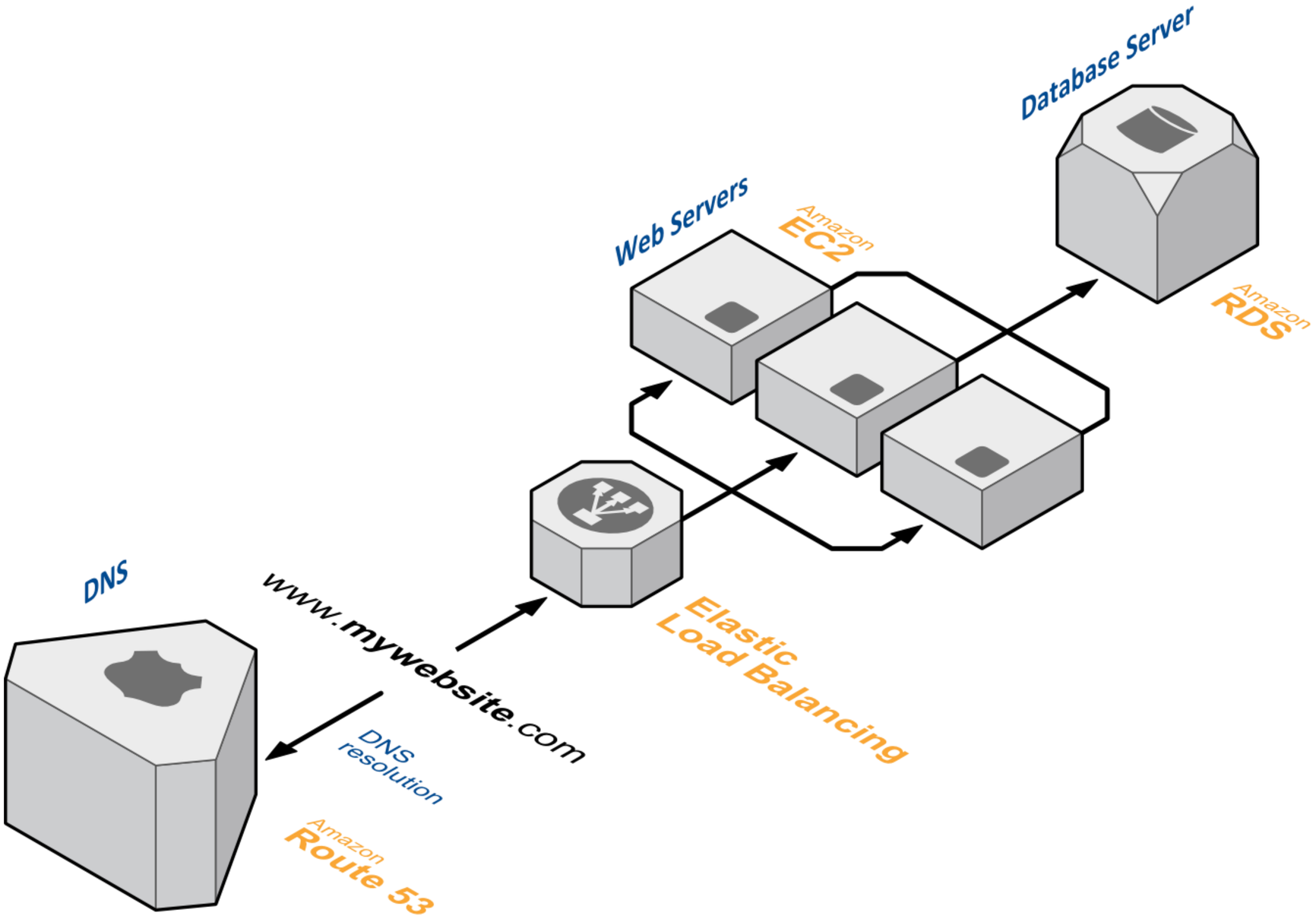
Privacy Policy
Terms of Use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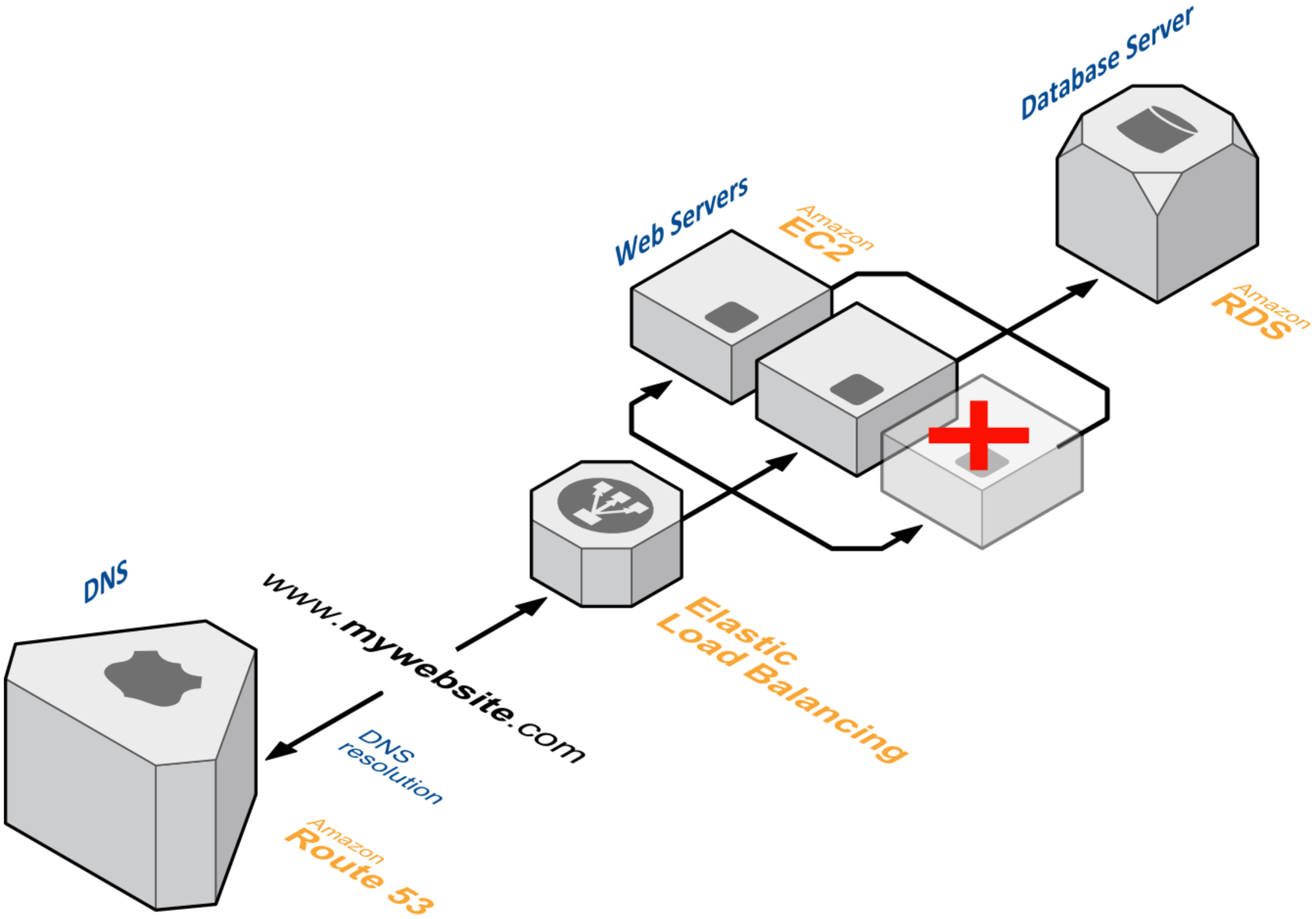
RDS
DNS
www.mywebsite.com
Elastic
Load Balancing
DNS
resolution
Amazon
Route 53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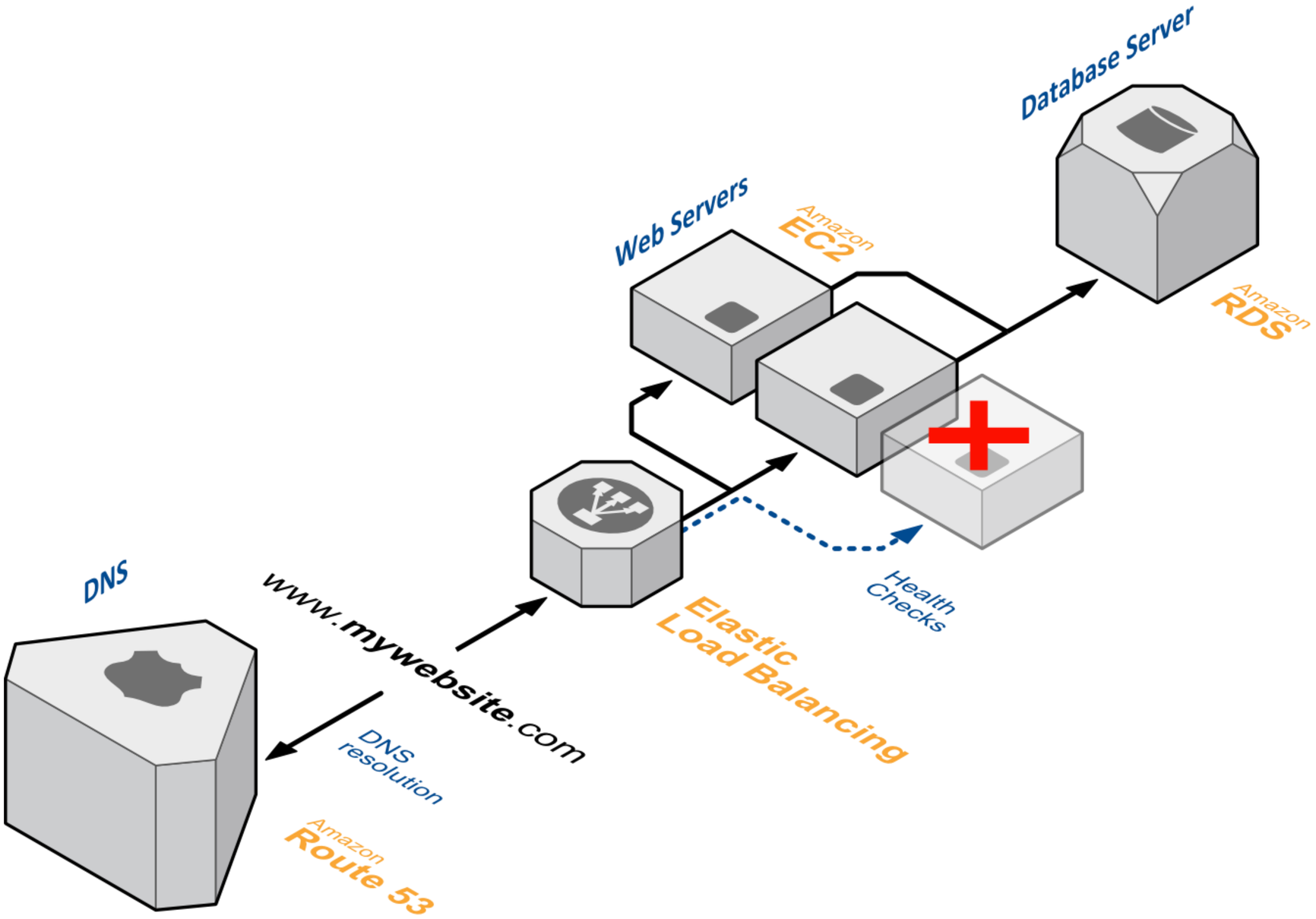
www.mywebsite.com
Elastic
Load Balancing
DNS
resolution
Amazon
Route 53


Database Server
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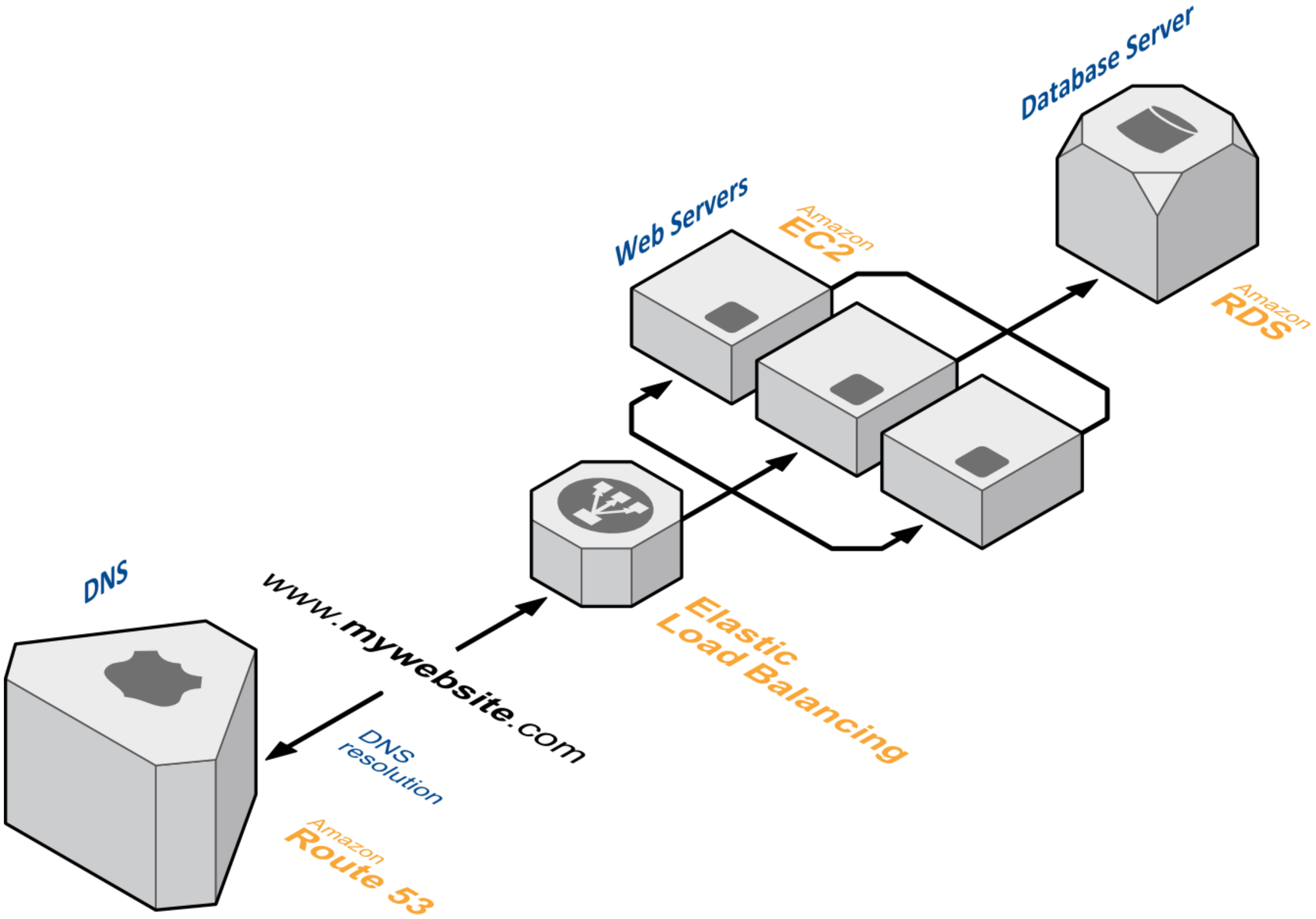
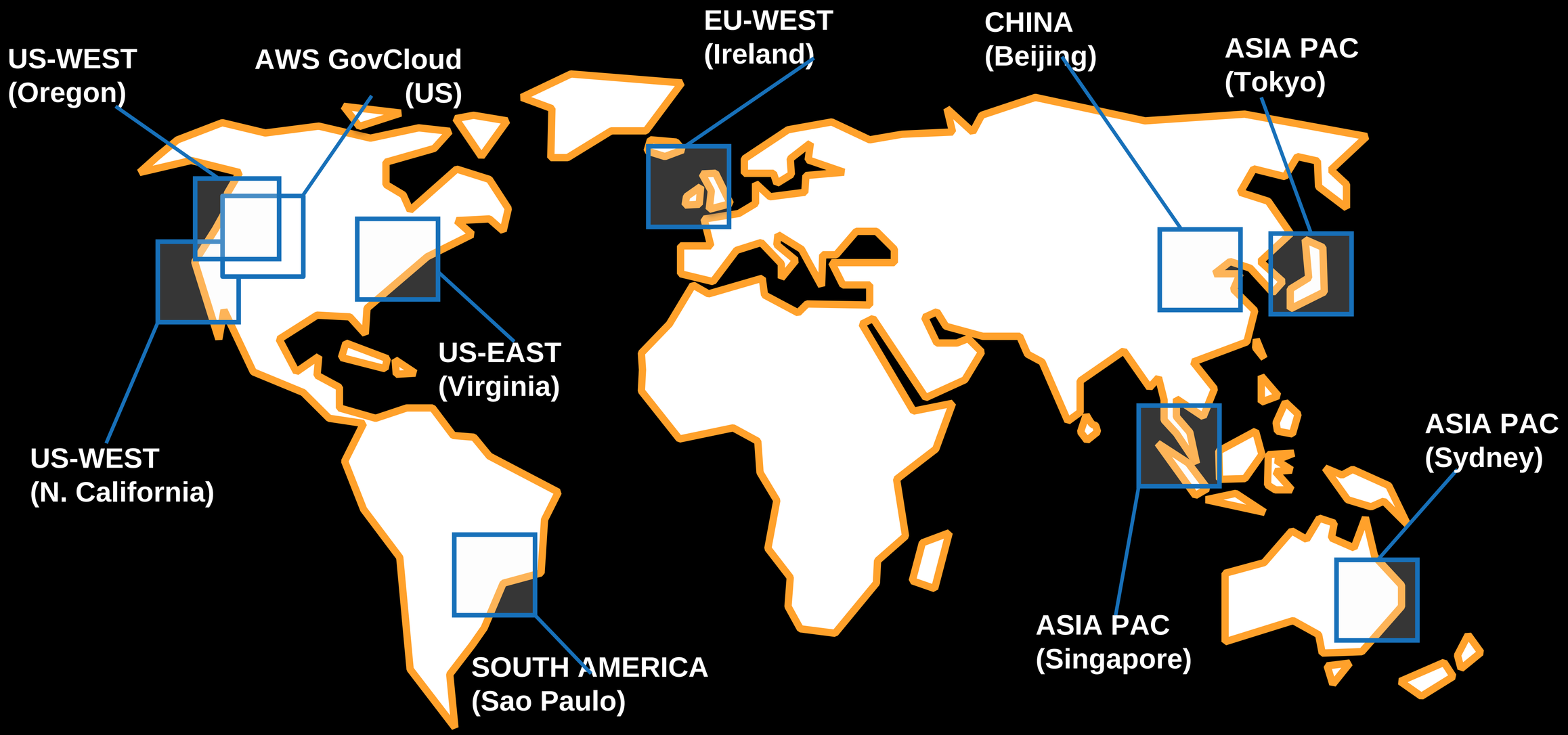
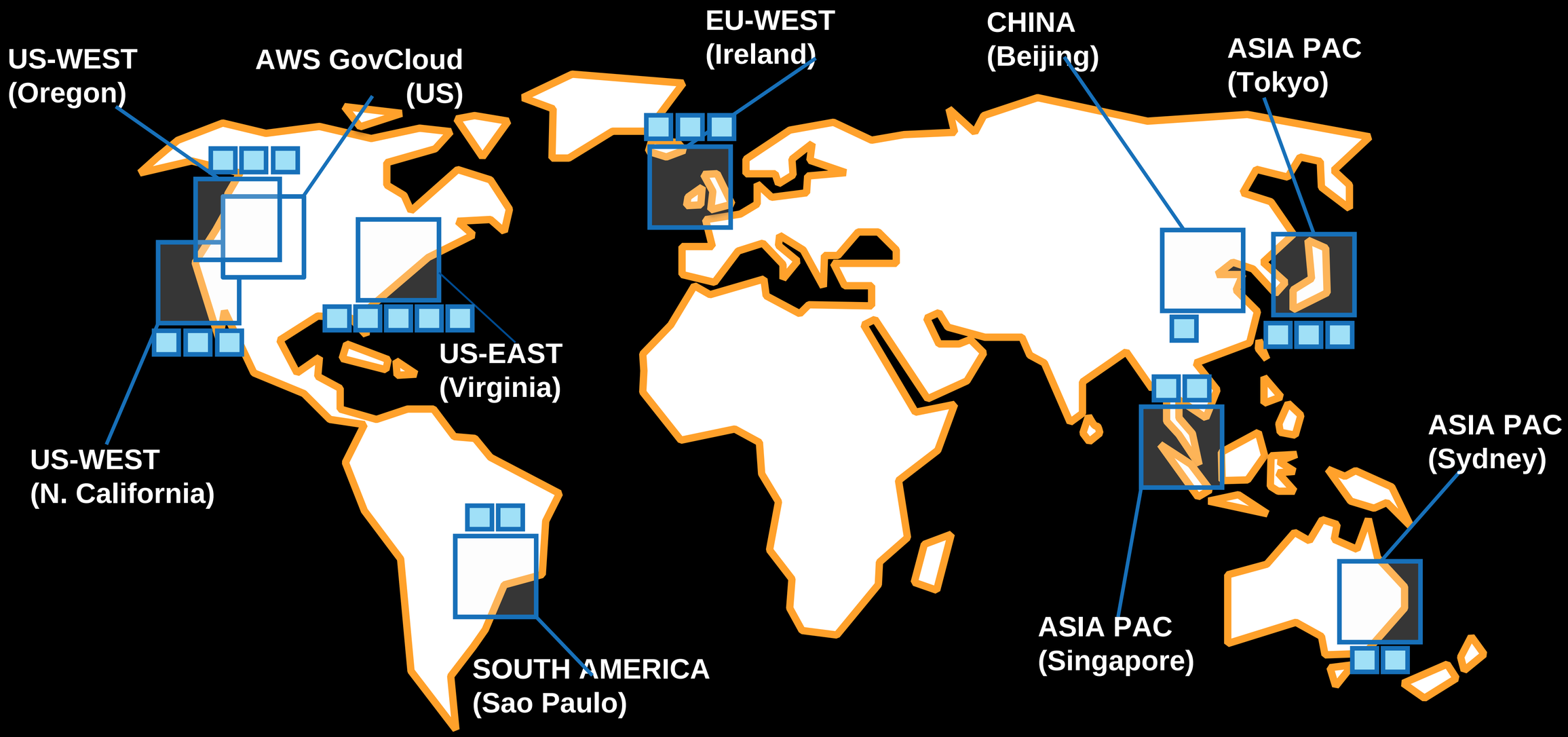
RDS
Web Servers
Amazon
EC2
Health
Checks
Elastic
Load Balancing
DNS
www.mywebsite.com
DNS
resolution
Amazon
Route 53


Database Server
Web Servers
Amazon
EC2
Amazon
RDS
DNS
www.mywebsite.com
Elastic
Load Balancing
DNS
resolution
Amazon
Route 53

#2

USE MULTIPLE AVAILABILITY ZONES


US-WEST
(Oregon)
AWS GovCloud
(US)
EU-WEST
(Ireland)
CHINA
(Beijing)
ASIA PAC
(Tokyo)
US-EAST
(Virginia)
US-WEST
(N. California)
ASIA PAC
(Sydney)
ASIA PAC
(Singapore)
SOUTH AMERICA
(Sao Paulo)


US-WEST
(Oregon)
AWS GovCloud
(US)
EU-WEST
(Ireland)
CHINA
(Beijing)
ASIA PAC
(Tokyo)
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US-WEST
(N. California)
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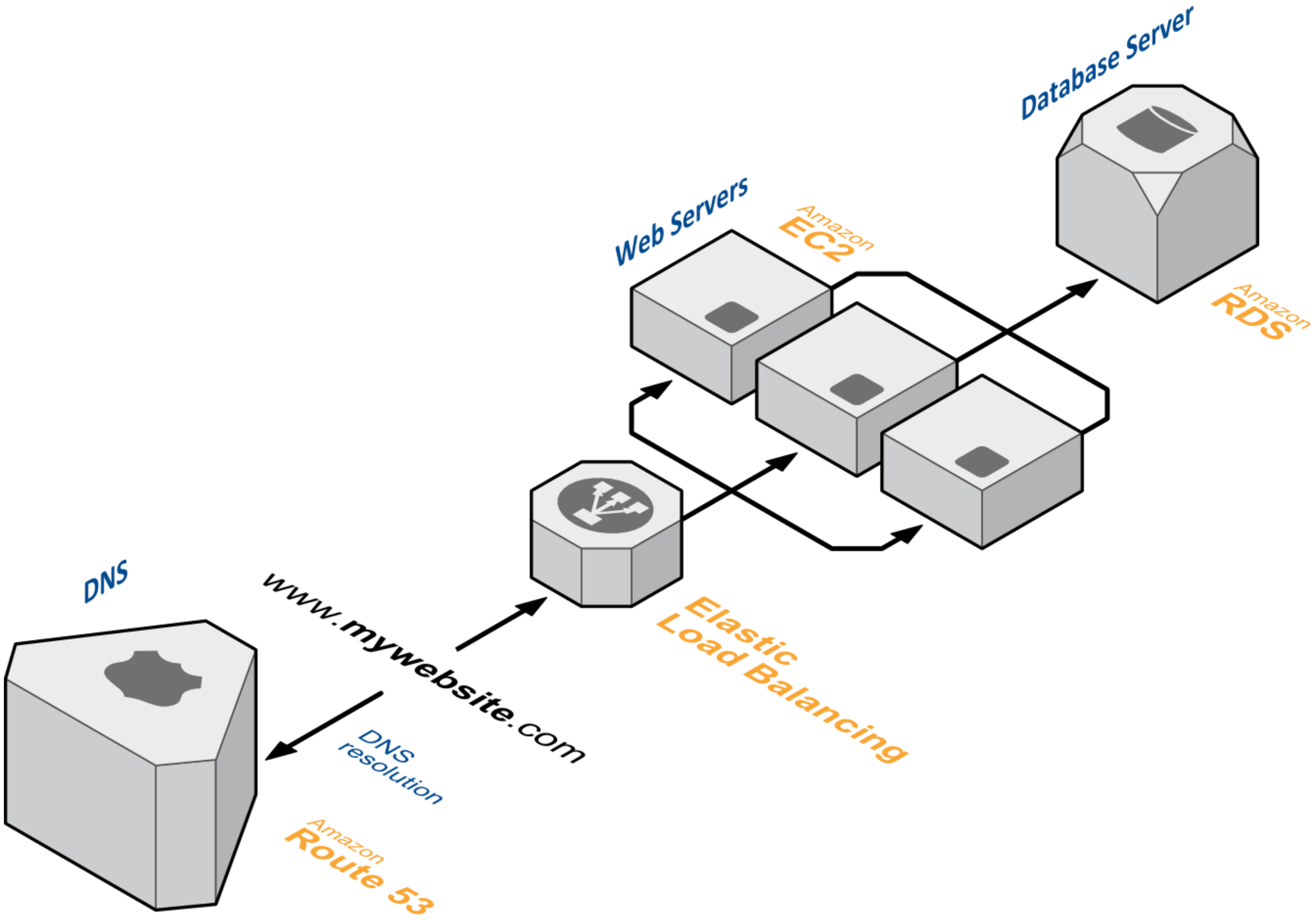
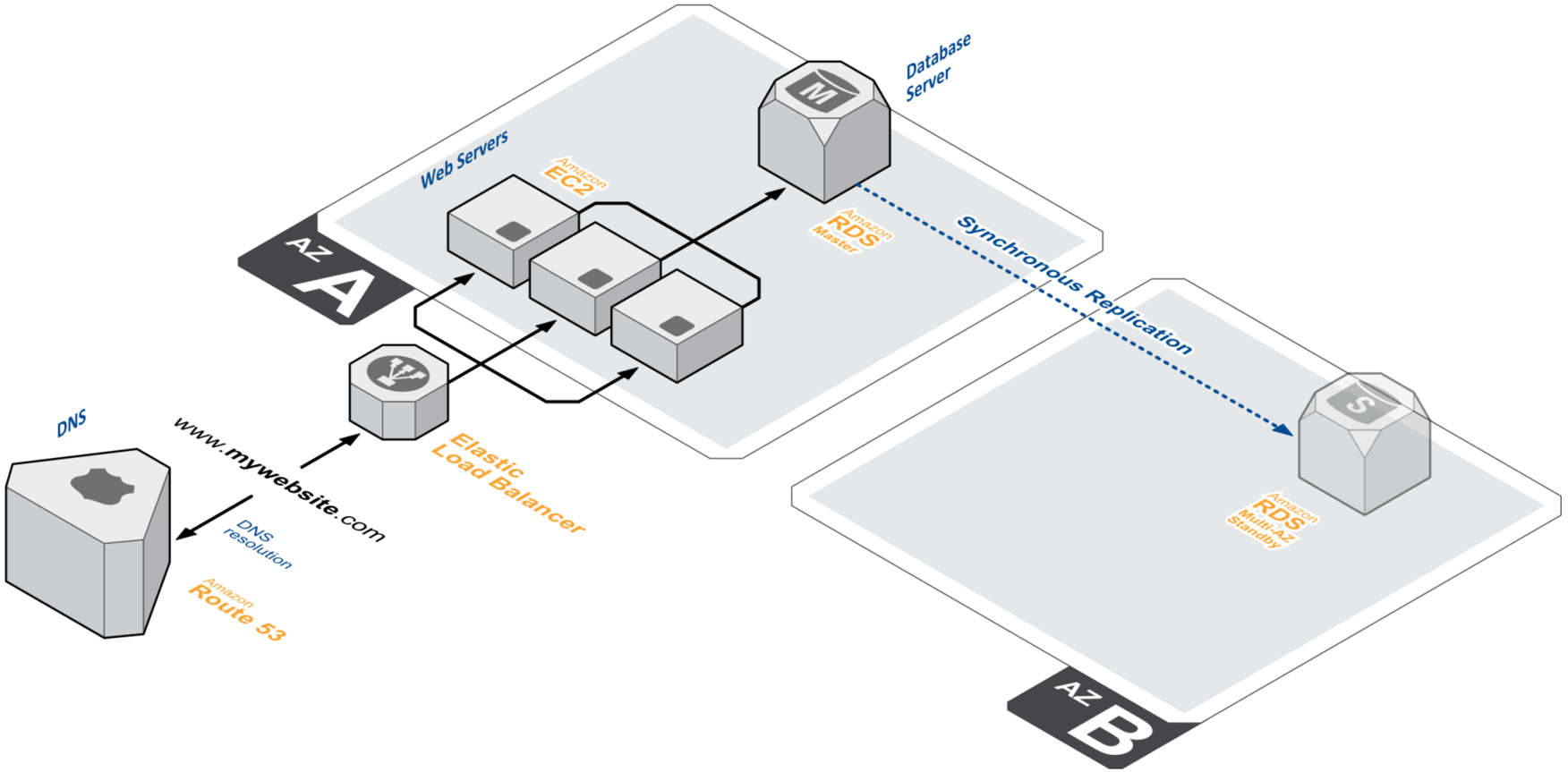
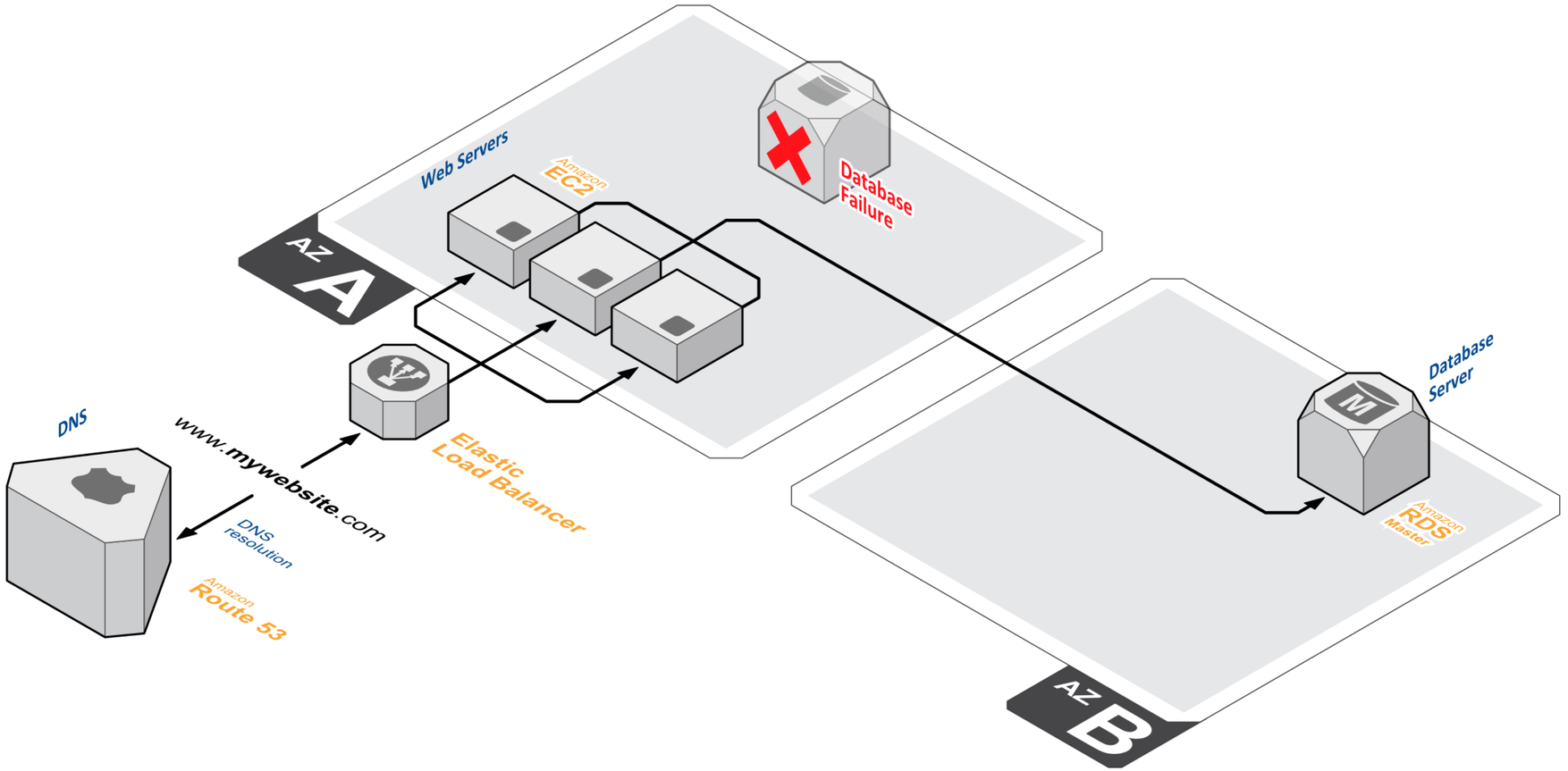
(Sydney)
ASIA PAC
(Singapore)
SOUTH AMERICA
(Sao Paulo)


Database Server
Web Servers
Amazon
EC2
Amazon
RDS
DNS
www.mywebsite.com
Elastic
Load Balancing
DNS
resolution
Amazon
Route 53

AMAZON RDS
MULTI-AZ


Database Server
Web Servers
Amazon EC2
Amazon RDS Master
Synchronous Replication
AZ A
AZ B
DNS
www.mywebsite.com
DNS resolution
Amazon Route 53
Elastic Load Balancer
Amazon RDS Multi-AZ Standby


Web Servers
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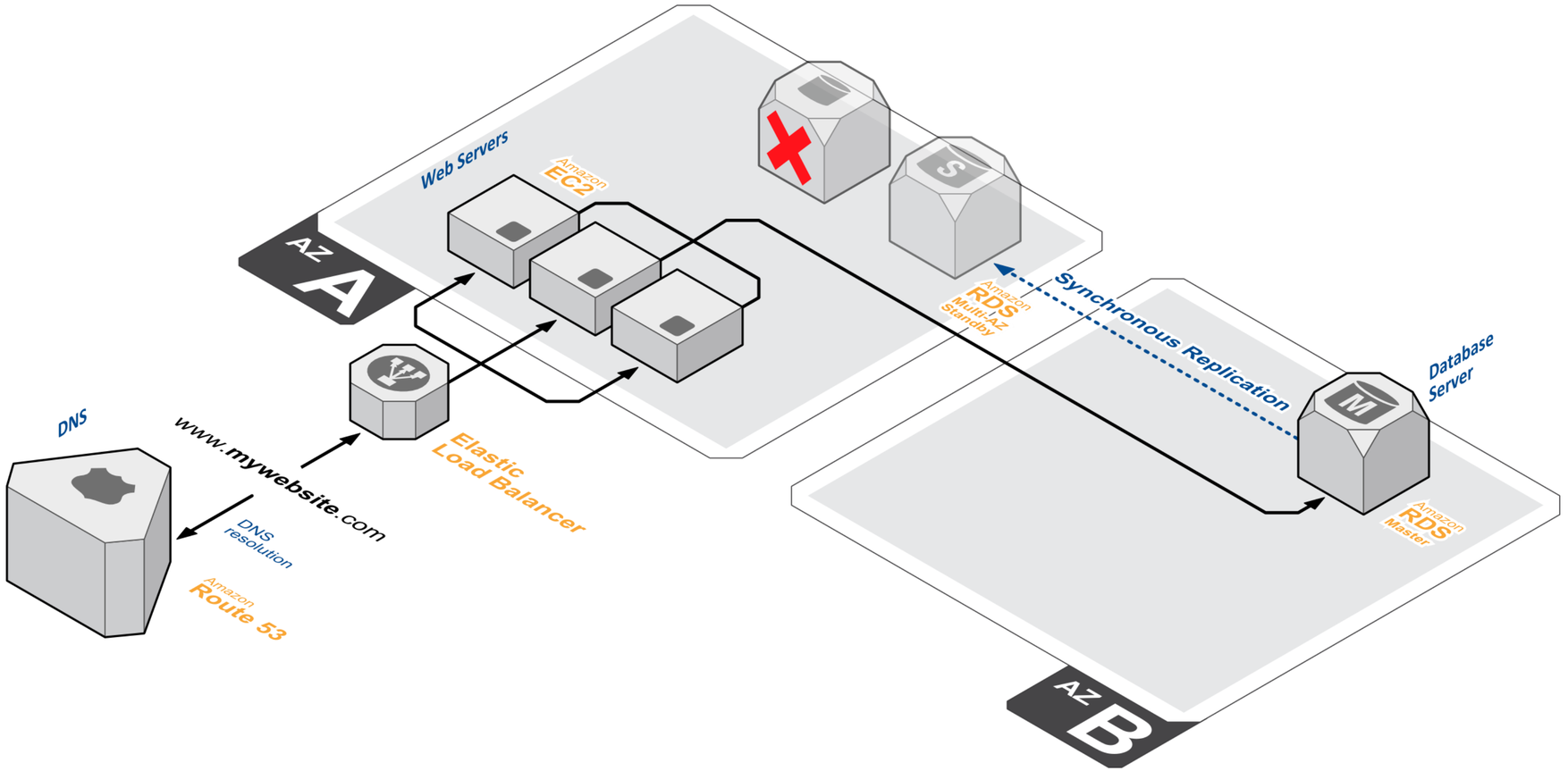
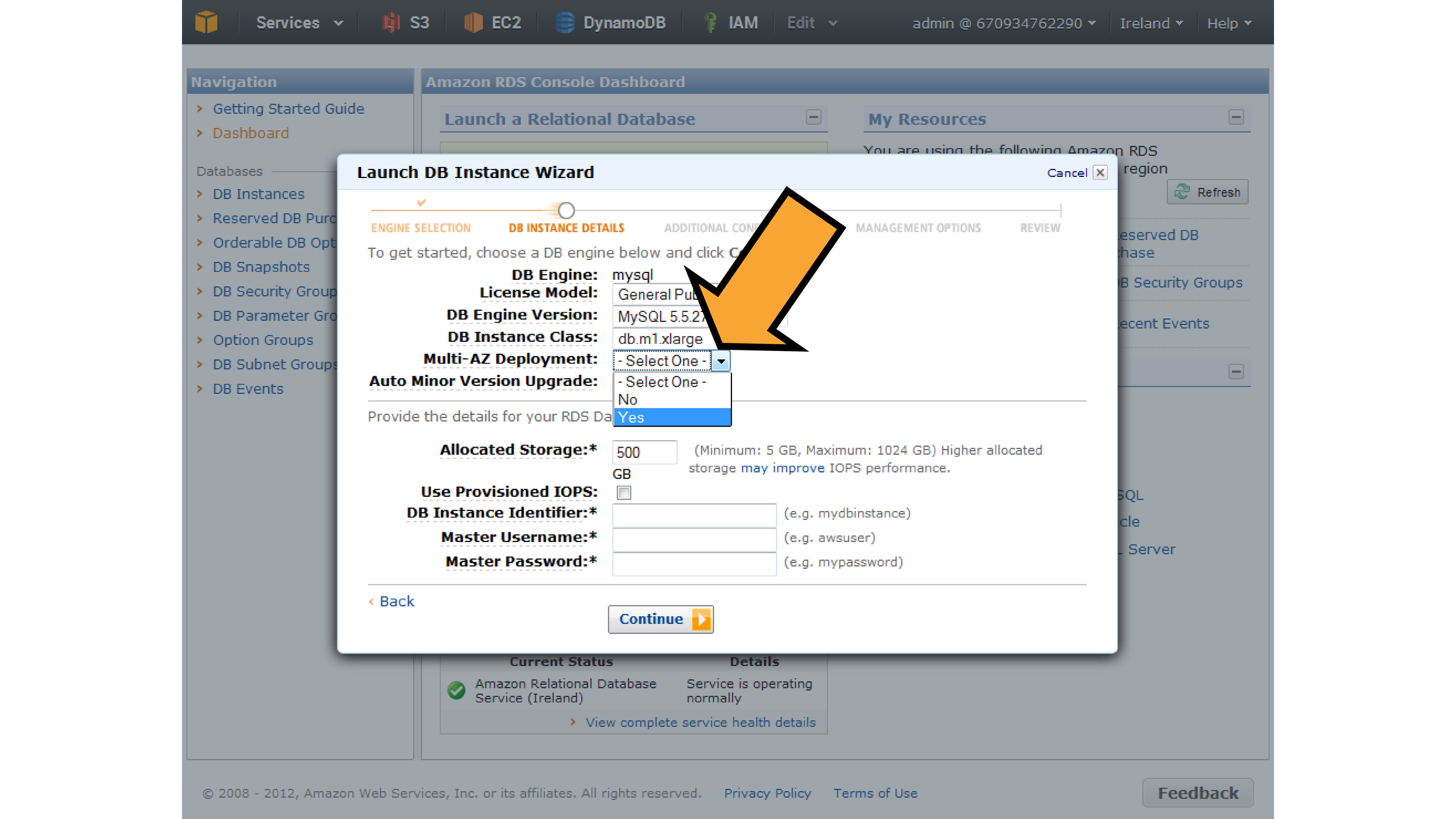
Database Failure
AZ A
Database Server
Amazon RDS Master
AZ B
DNS
www.mywebsite.com
DNS resolution
Amazon Route 53
Elastic Load Balancer


Web Servers
Amazon
EC2
AZ
A
S
Amazon
RDS
Multi-AZ
Standby
Synchronous Replication
Database
Server
M
Amazon
RDS
Master
AZ
B
DNS
www.mywebsite.com
DNS
resolution
Amazon
Route 53
Elastic
Load Balancer


Services
S3
EC2
DynamoDB
IAM
Edit
admin @ 670934762290
Ireland
Help
Navigation
Getting Started Guide
Dashboard
Databases
DB Instances
Reserved DB Purc
Orderable DB Opt
DB Snapshots
DB Security Group
DB Parameter Gro
Option Groups
DB Subnet Groups
DB Events
Amazon RDS Console Dashboard
Launch a Relational Database
My Resources
You are using the following Amazon RDS
region
Refresh
eserved DB
hase
B Security Groups
ecent Events
SQL
cle
Server
Launch DB Instance Wizard
Cancel
ENGINE SELECTION
DB INSTANCE DETAILS
ADDITIONAL CON
MANAGEMENT OPTIONS
REVIEW
To get started, choose a DB engine below and click C
DB Engine:
mysql
License Model:
General Pu
DB Engine Version:
MySQL 5.5.2
DB Instance Class:
db.m1.xlarge
Multi-AZ Deployment:
- Select One -
Auto Minor Version Upgrade:
- Select One -
No
Yes
Provide the details for your RDS Da
Allocated Storage:*
500
GB
(Minimum: 5 GB, Maximum: 1024 GB) Higher allocated storage may improve IOPS performance.
Use Provisioned IOPS:
DB Instance Identifier:*
(e.g. mydbinstance)
Master Username:*
(e.g. awsuser)
Master Password:*
(e.g. mypassword)
Back
Continue
Current Status
Details
Amazon Relational Database Service (Ireland)
Service is operating normally
View complete service health details
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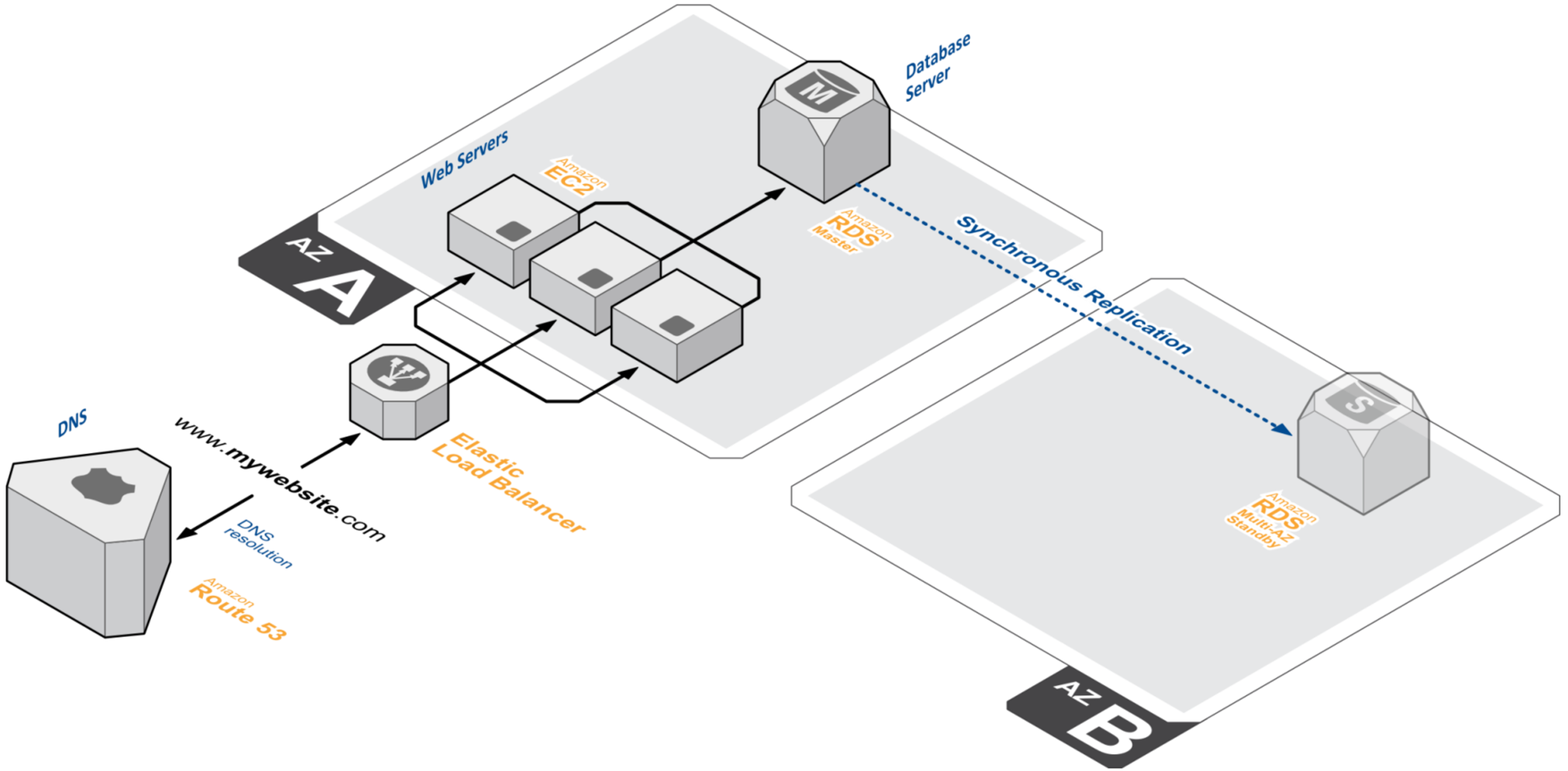
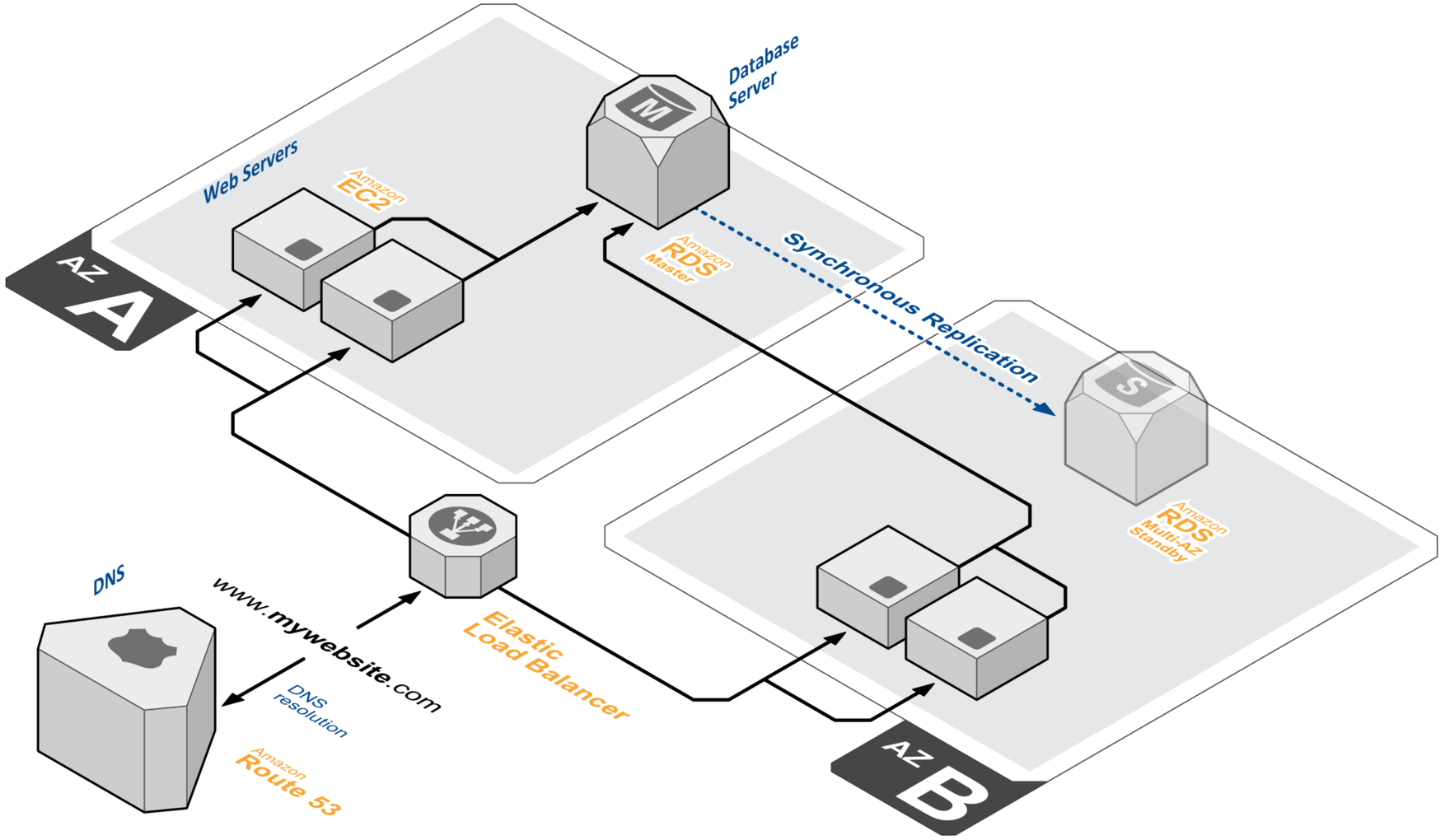
Privacy Policy
Terms of Use
Feedback


Database Server
Web Servers
Amazon EC2
Amazon RDS Master
Synchronous Replication
AZ A
AZ B
DNS
www.mywebsite.com
DNS resolution
Amazon Route 53
Elastic Load Balancer
Amazon RDS Multi-AZ Standby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www.mywebsite.com
DNS resolution
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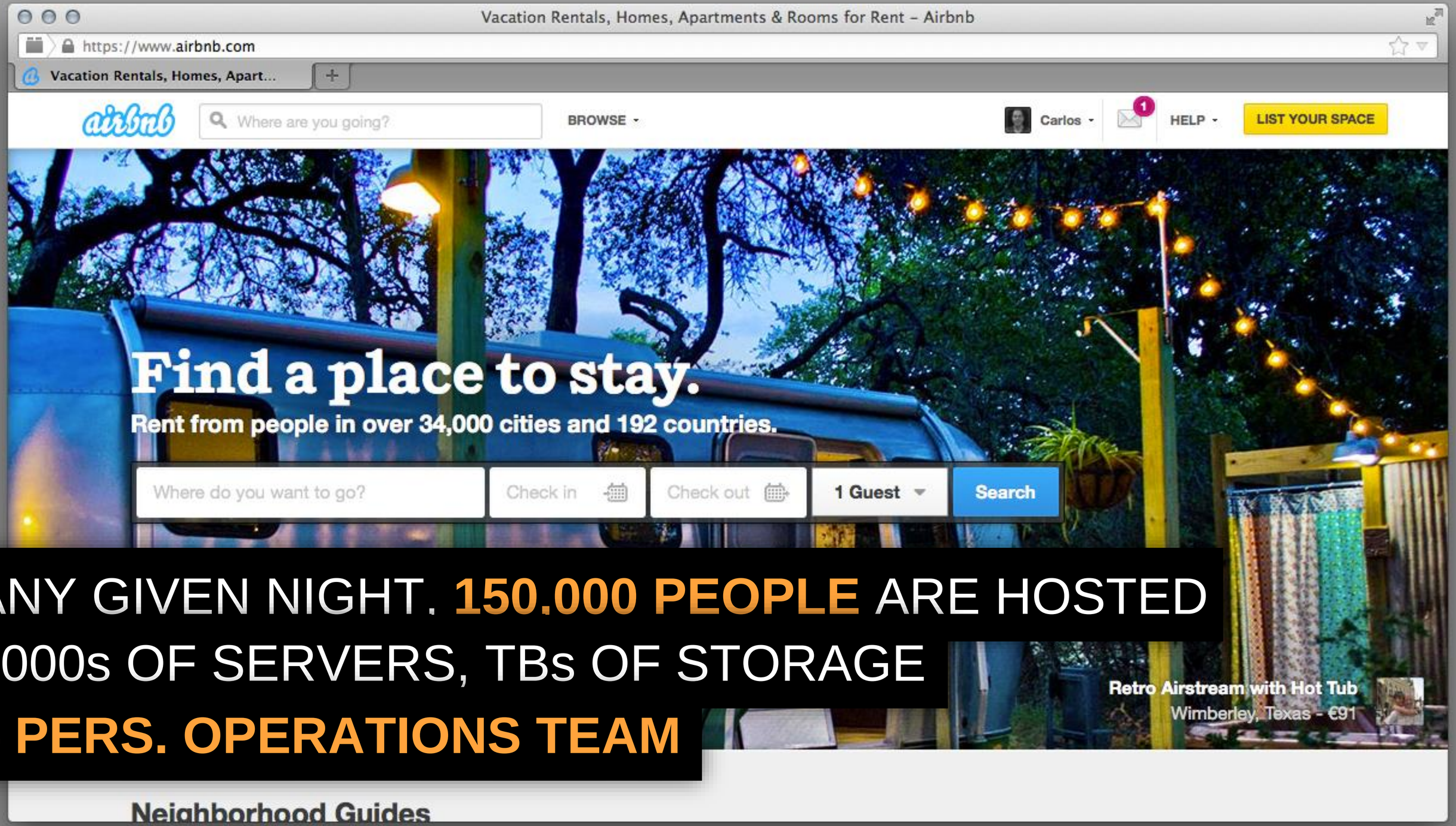


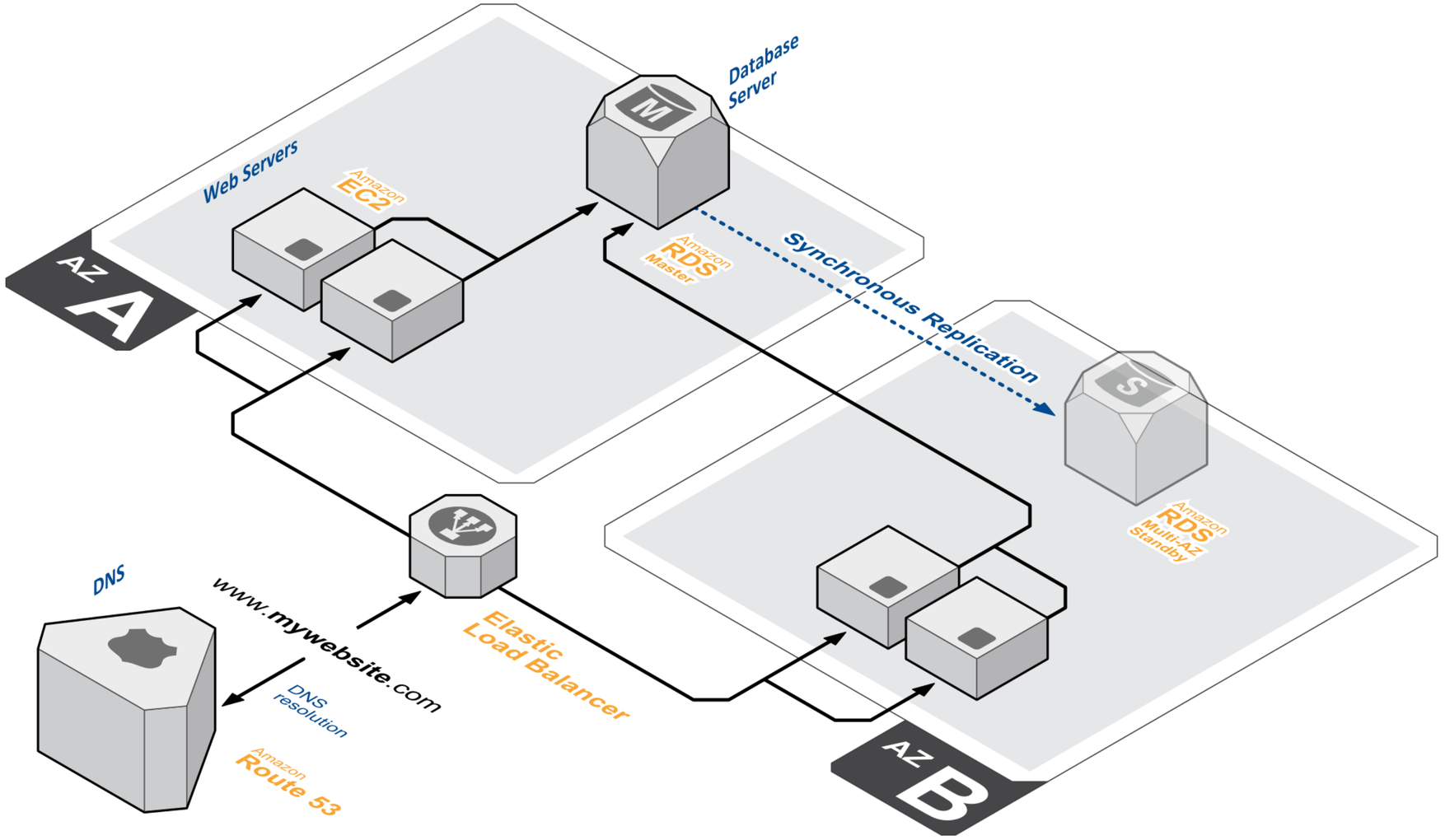
ANY GIVEN NIGHT. **150.000 PEOPLE** ARE HOSTED

1000s OF SERVERS, TBs OF STORAGE

5 PERS. OPERATIONS TEAM

#3

BUILD FOR SCALE


Database Server
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www.mywebsite.com
DNS resolution
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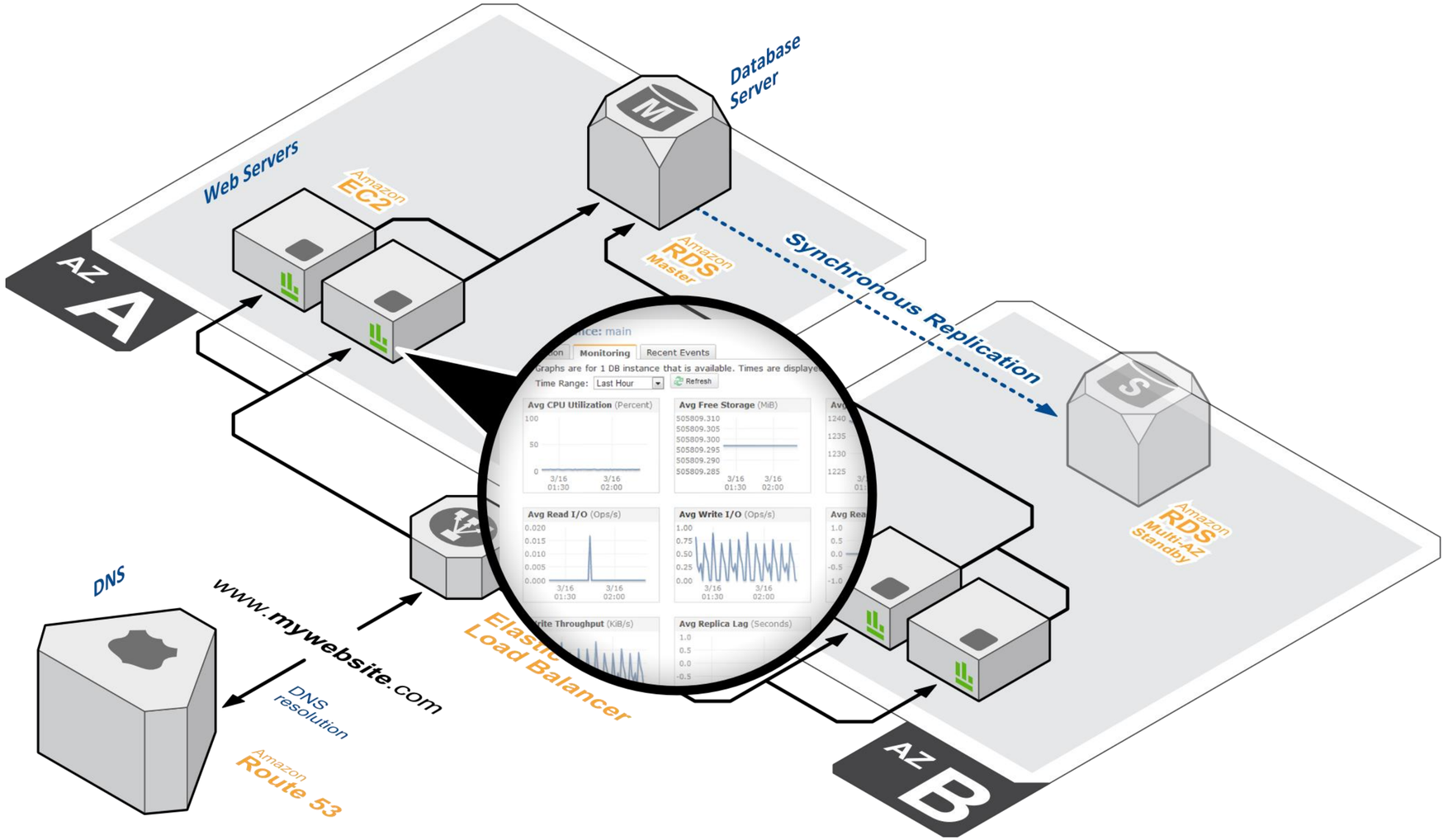
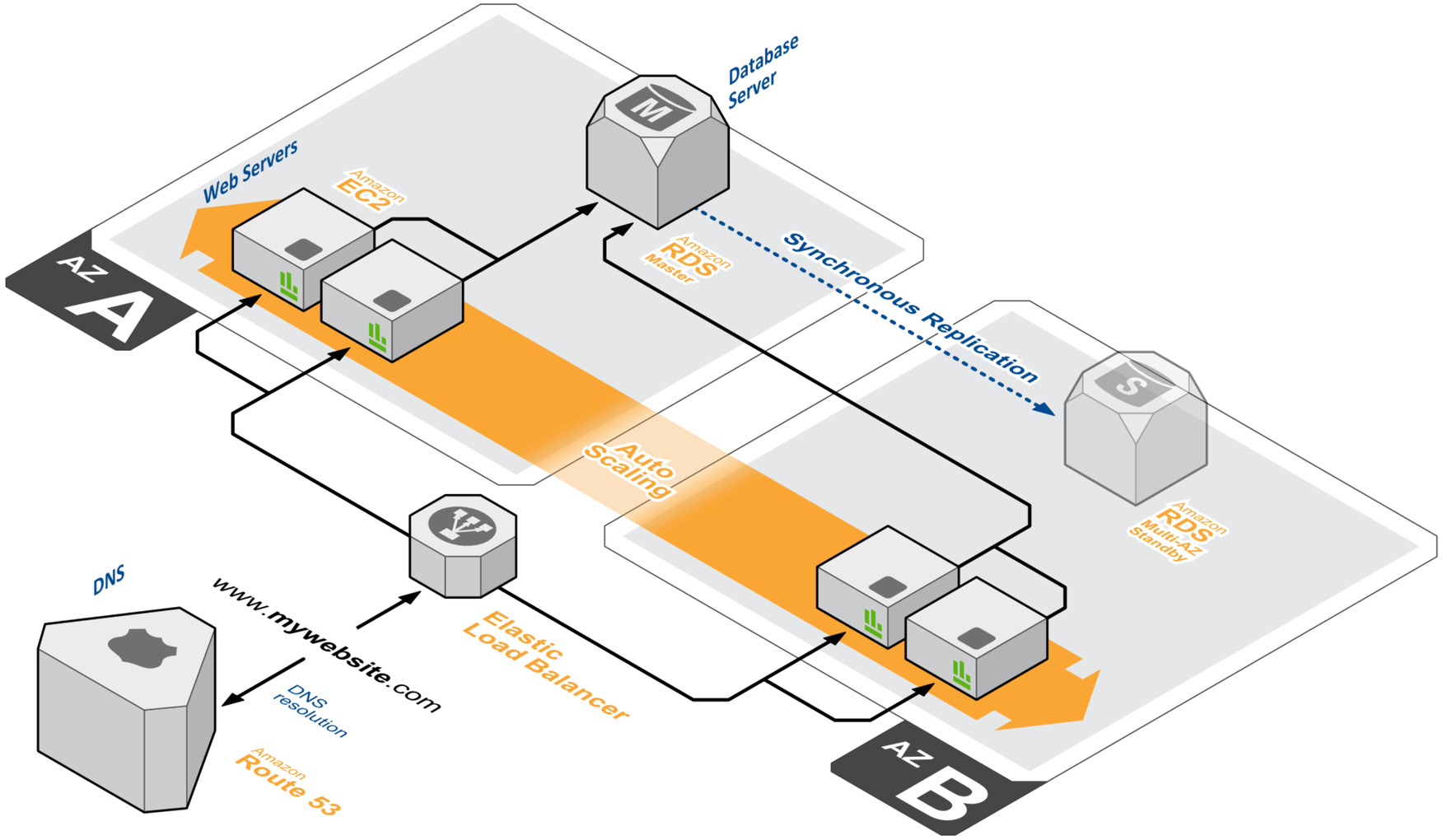
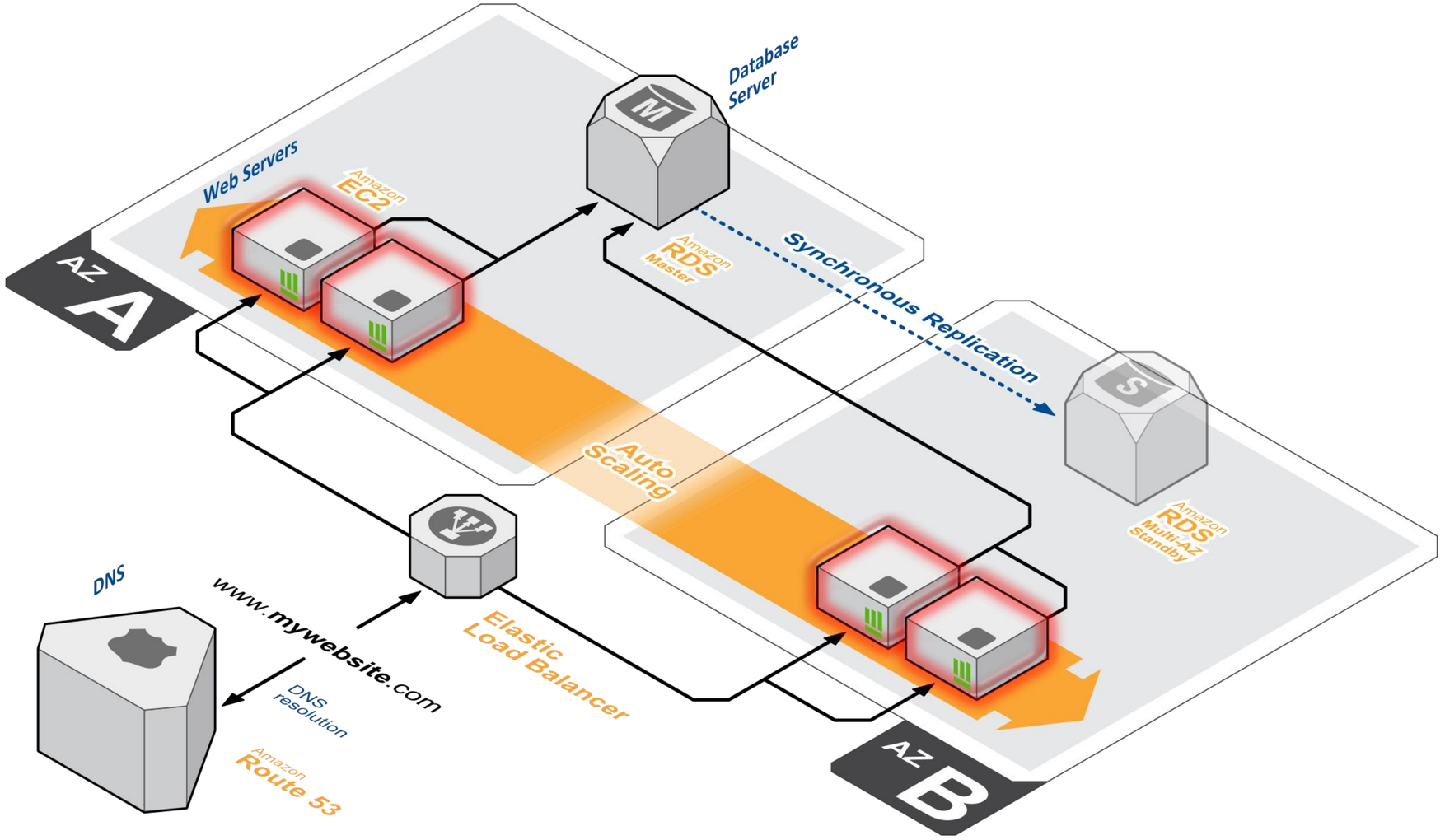

Database Server
Web Servers
Amazon EC2
AZ A
Amazon RDS Master
Synchronous Replication
Monitoring
Recent Events
Time Range: Last Hour
Refresh
Avg CPU Utilization (Percent)
Avg Free Storage (MiB)
Avg Read I/O (Ops/s)
Avg Write I/O (Ops/s)
Avg Replica Lag (Seconds)
Amazon RDS Multi-AZ Standby
DNS
www.mywebsite.com
DNS resolution
Amazon Route 53
Load Balancer
AZ B


Database Server
Web Servers
Amazon EC2
Amazon RDS Master
Synchronous Replication
Auto Scaling
Amazon RDS Multi-AZ Standby
AZ A
AZ B
DNS
www.mywebsite.com
DNS resolution
Amazon Route 53
Elastic Load Balancer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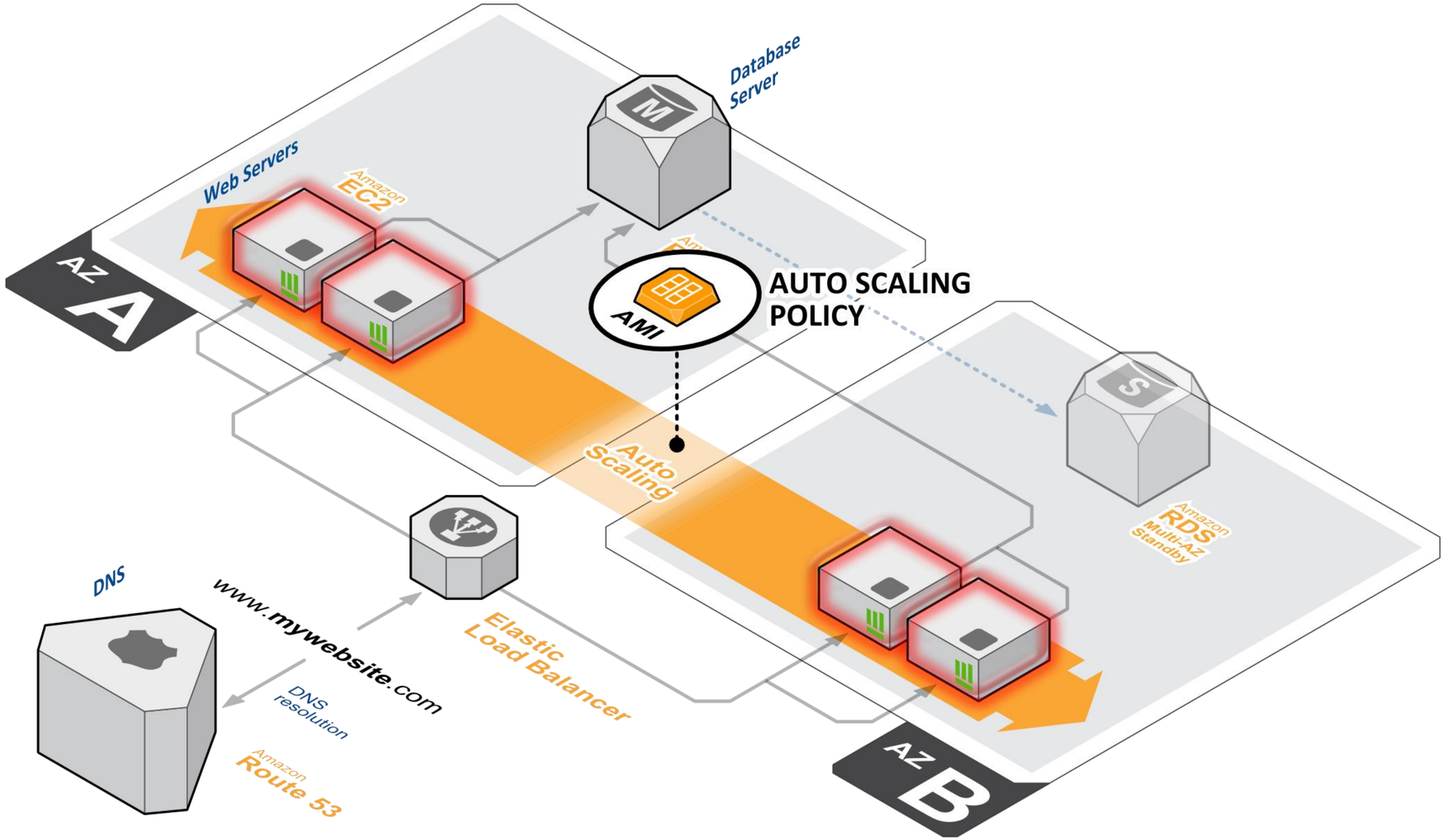
Database Server
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AMI
AUTO SCALING POLICY
Auto Scaling
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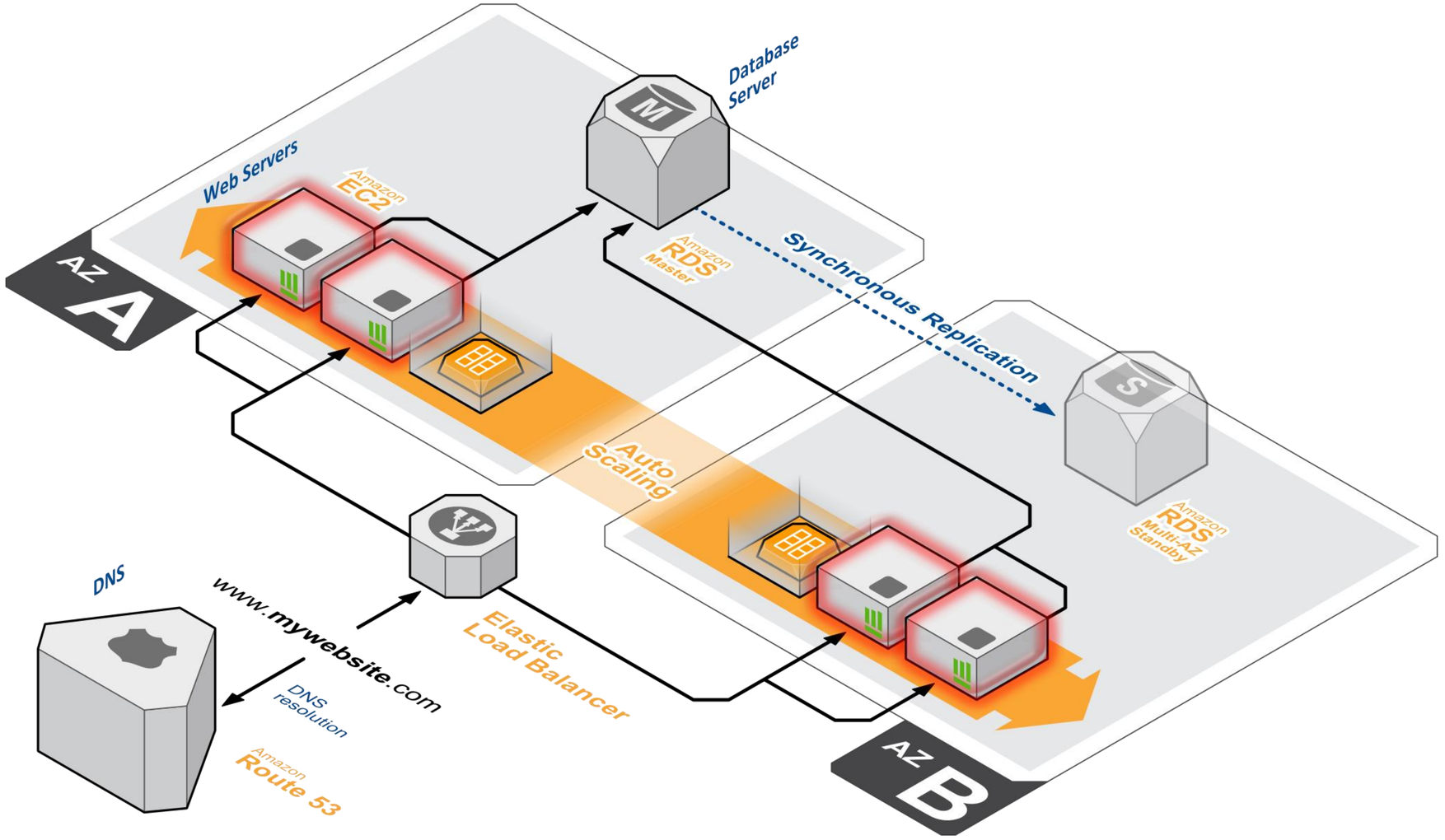
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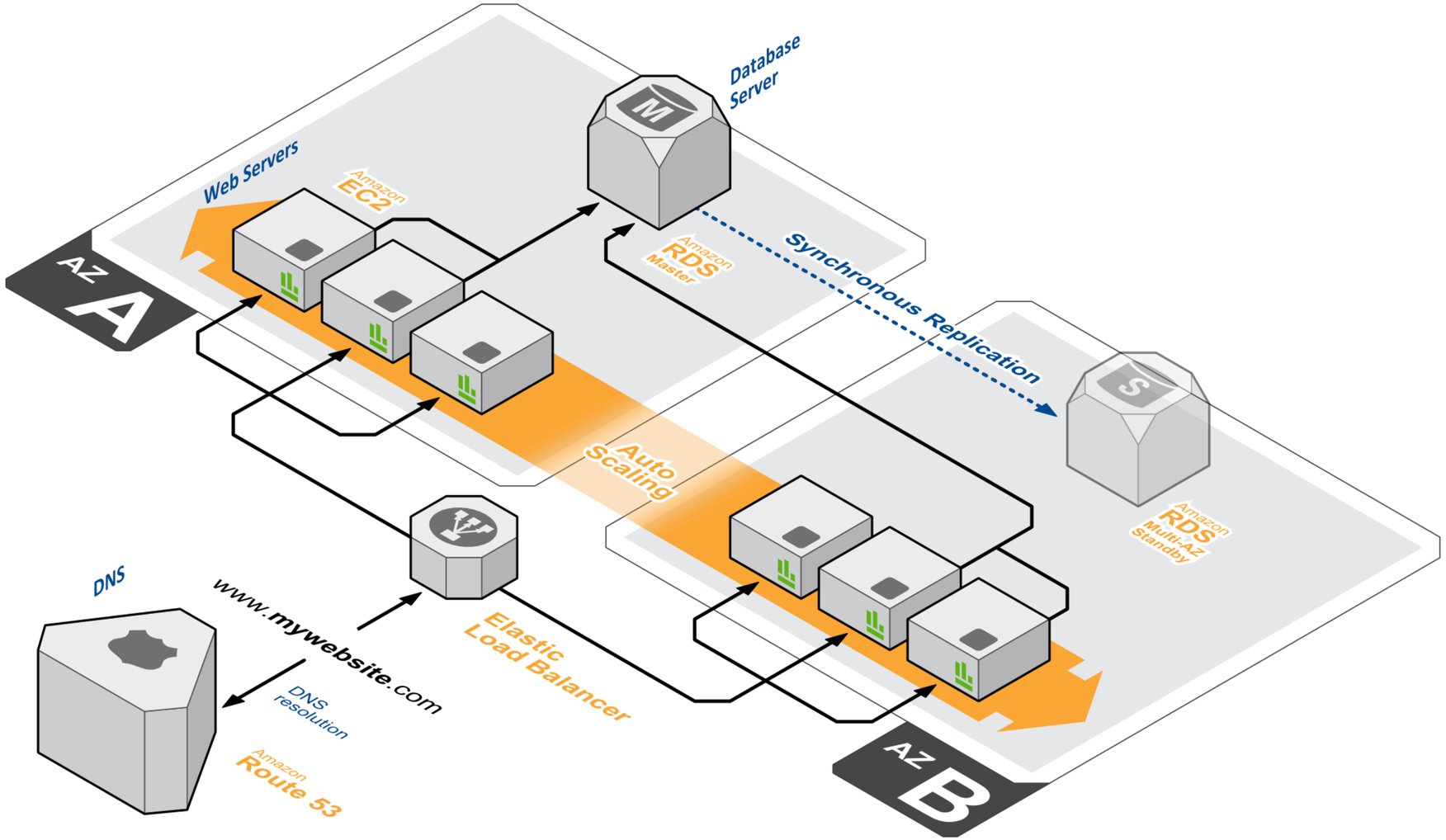
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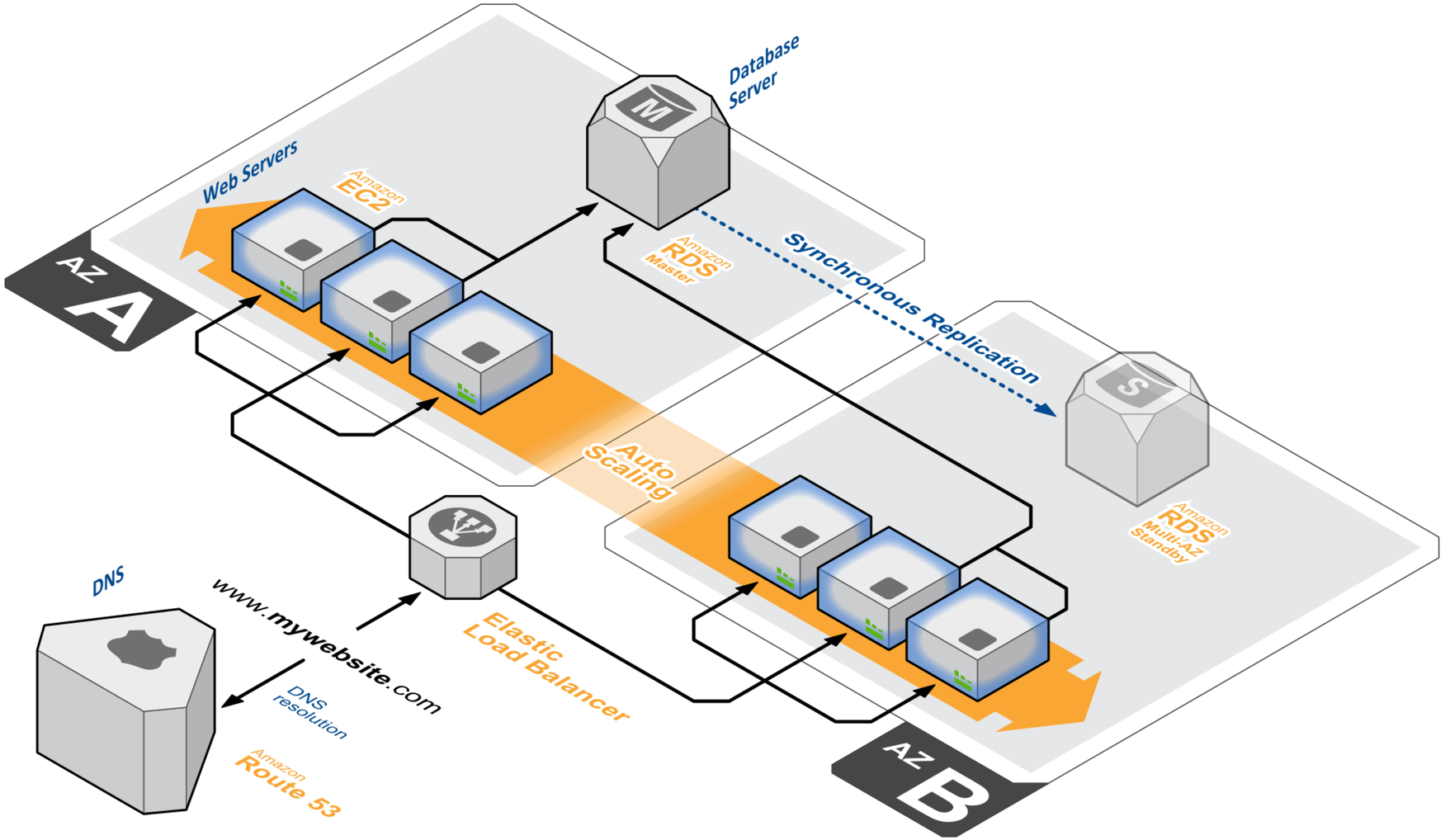
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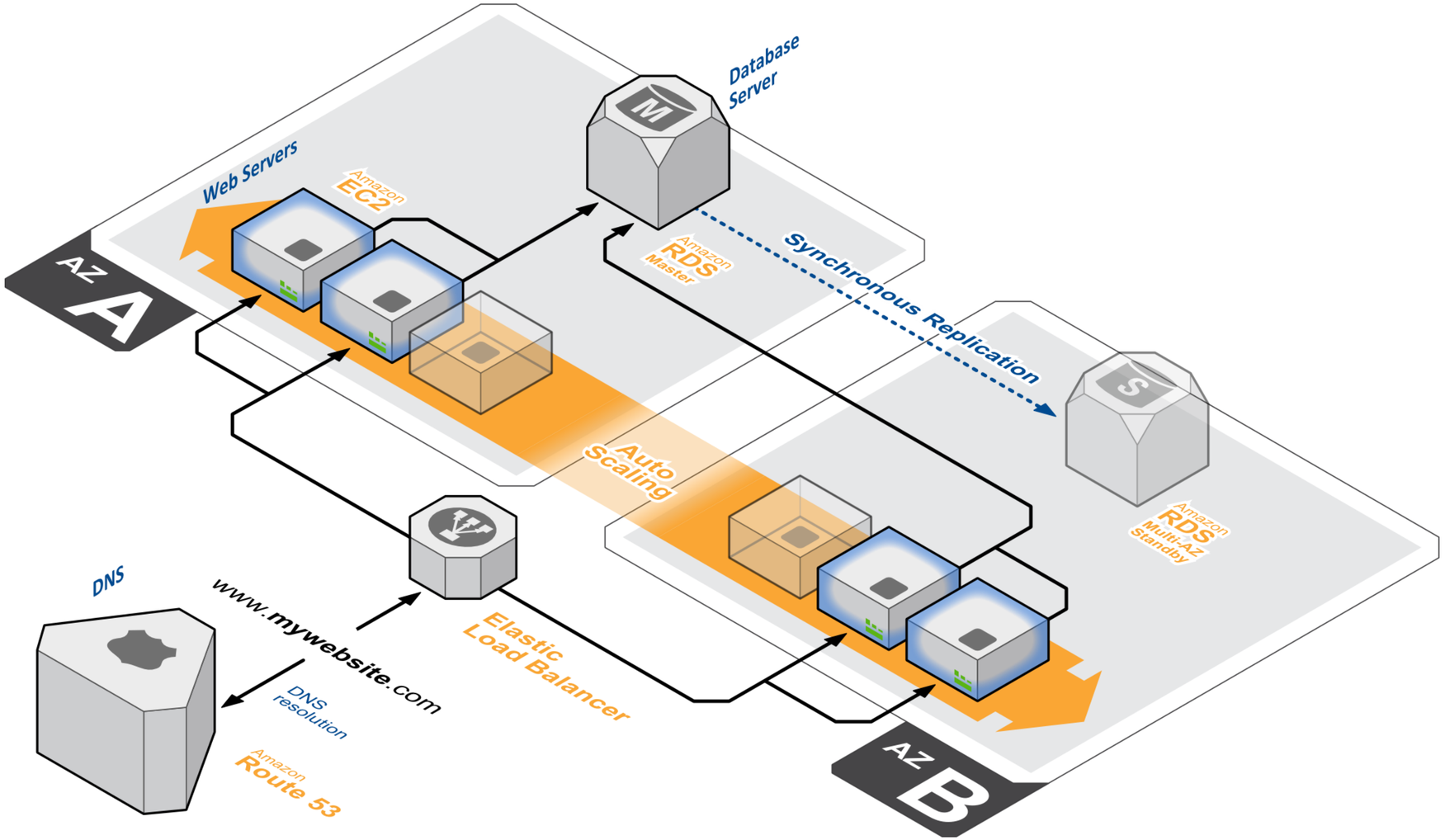
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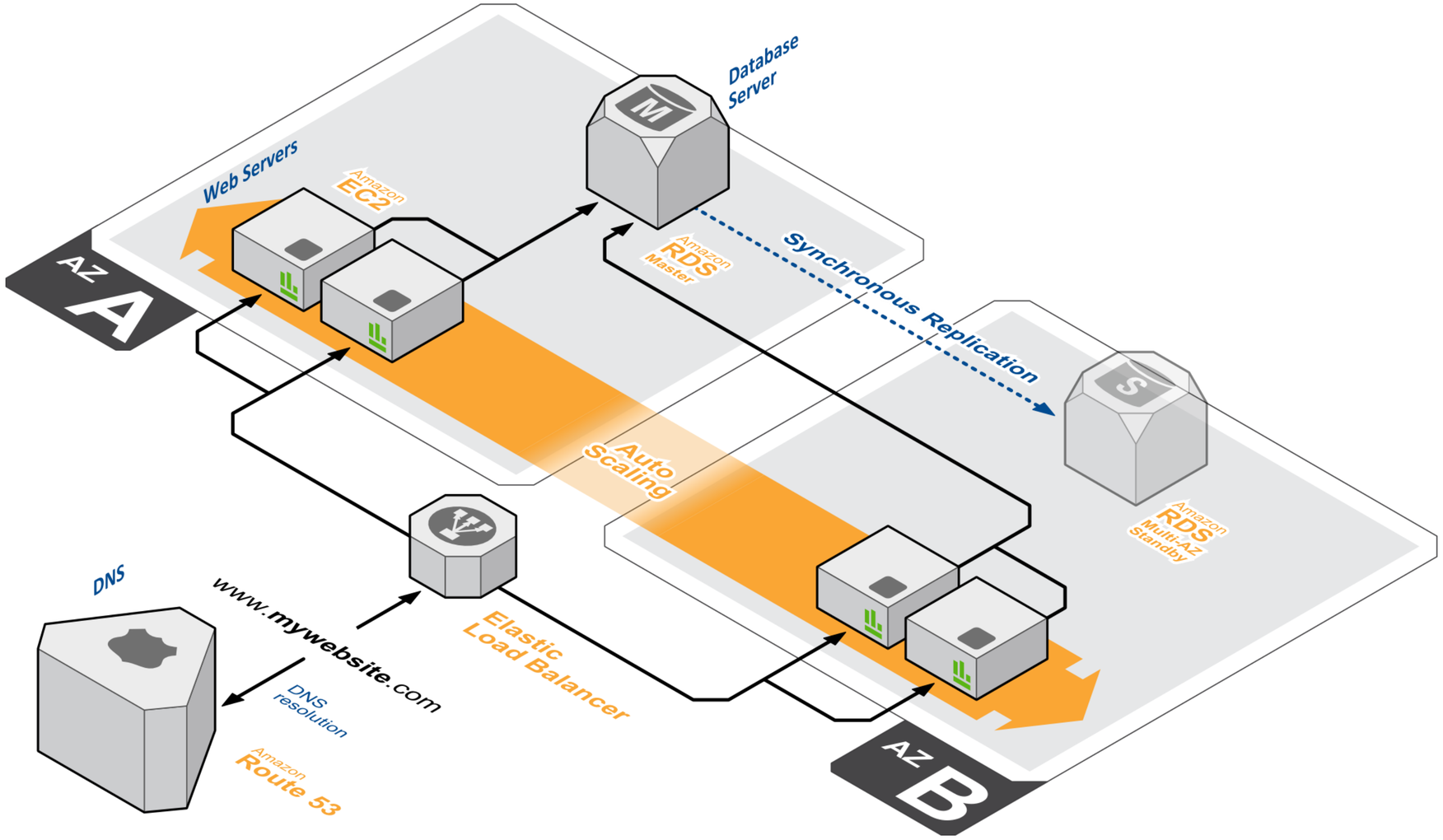
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HEALTH CHECKS

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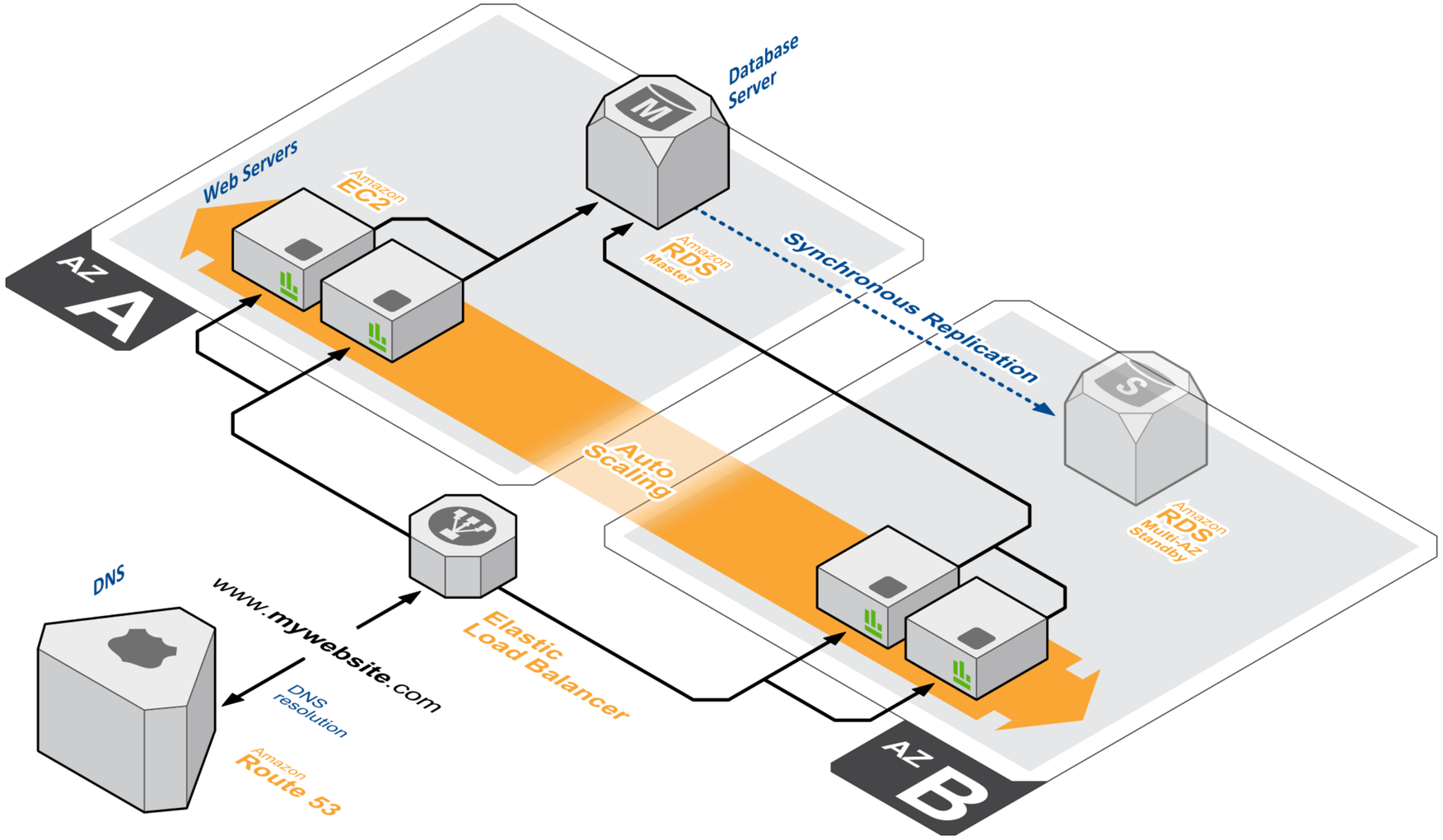
AUTO SCALING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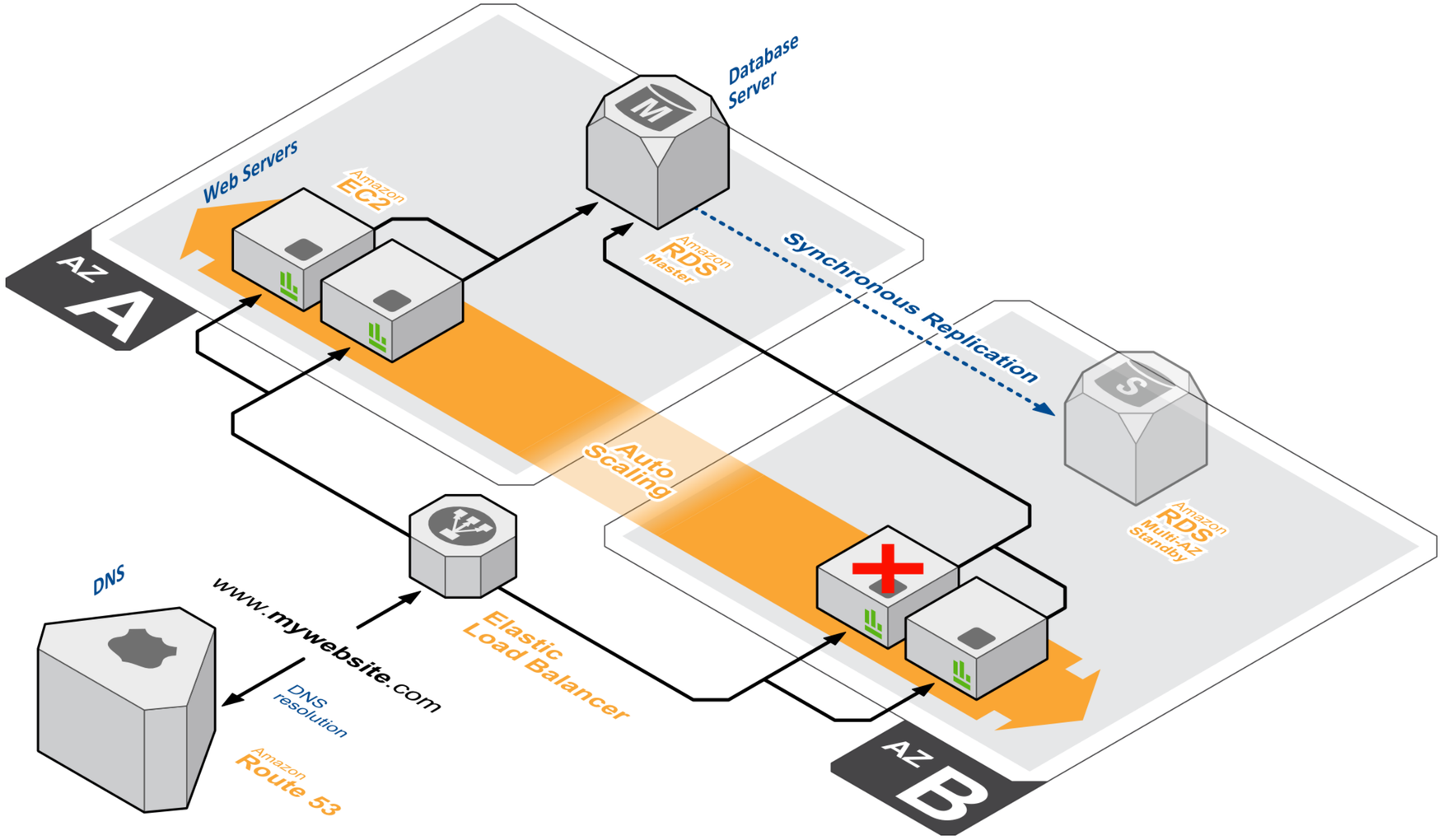
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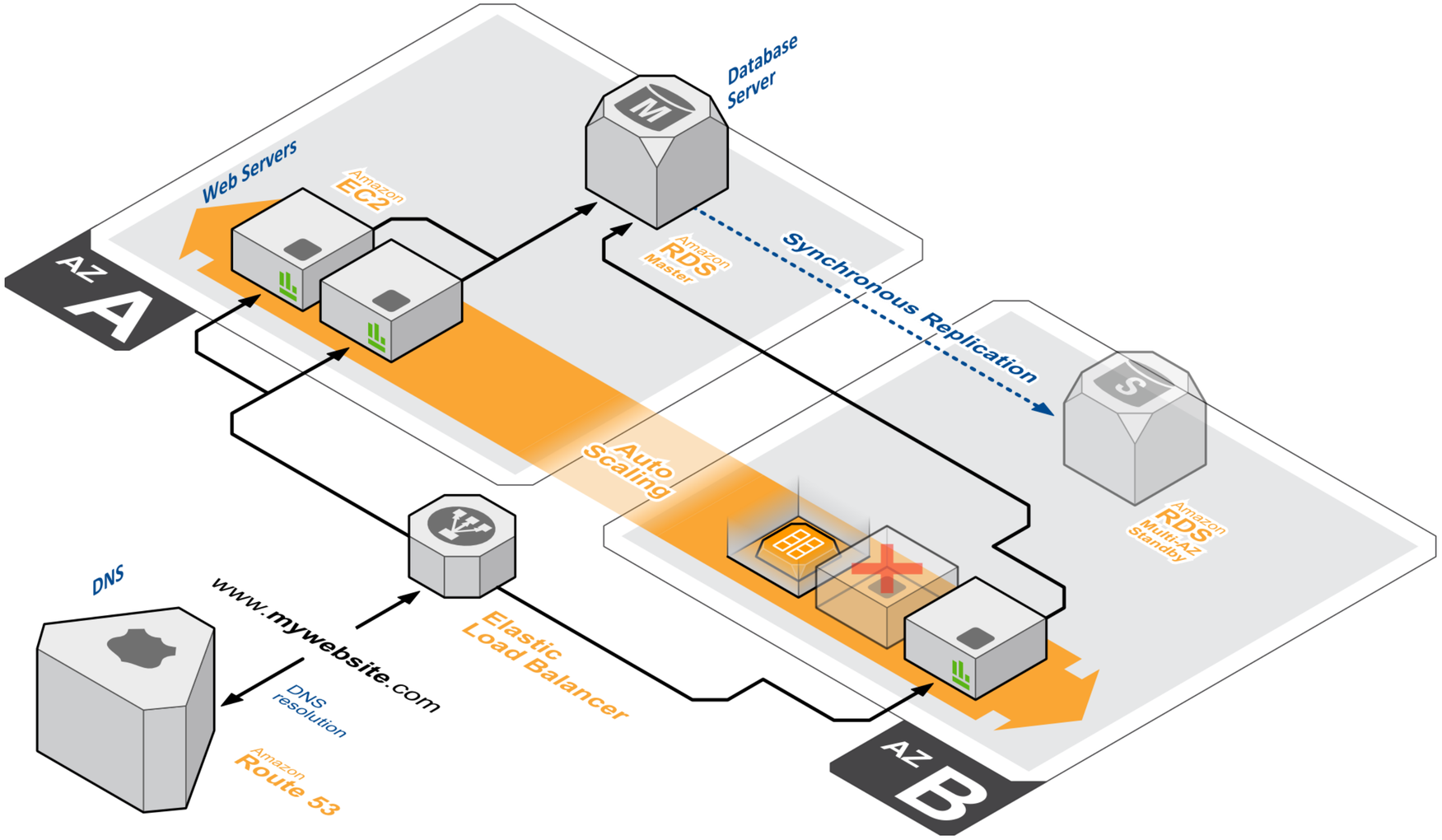
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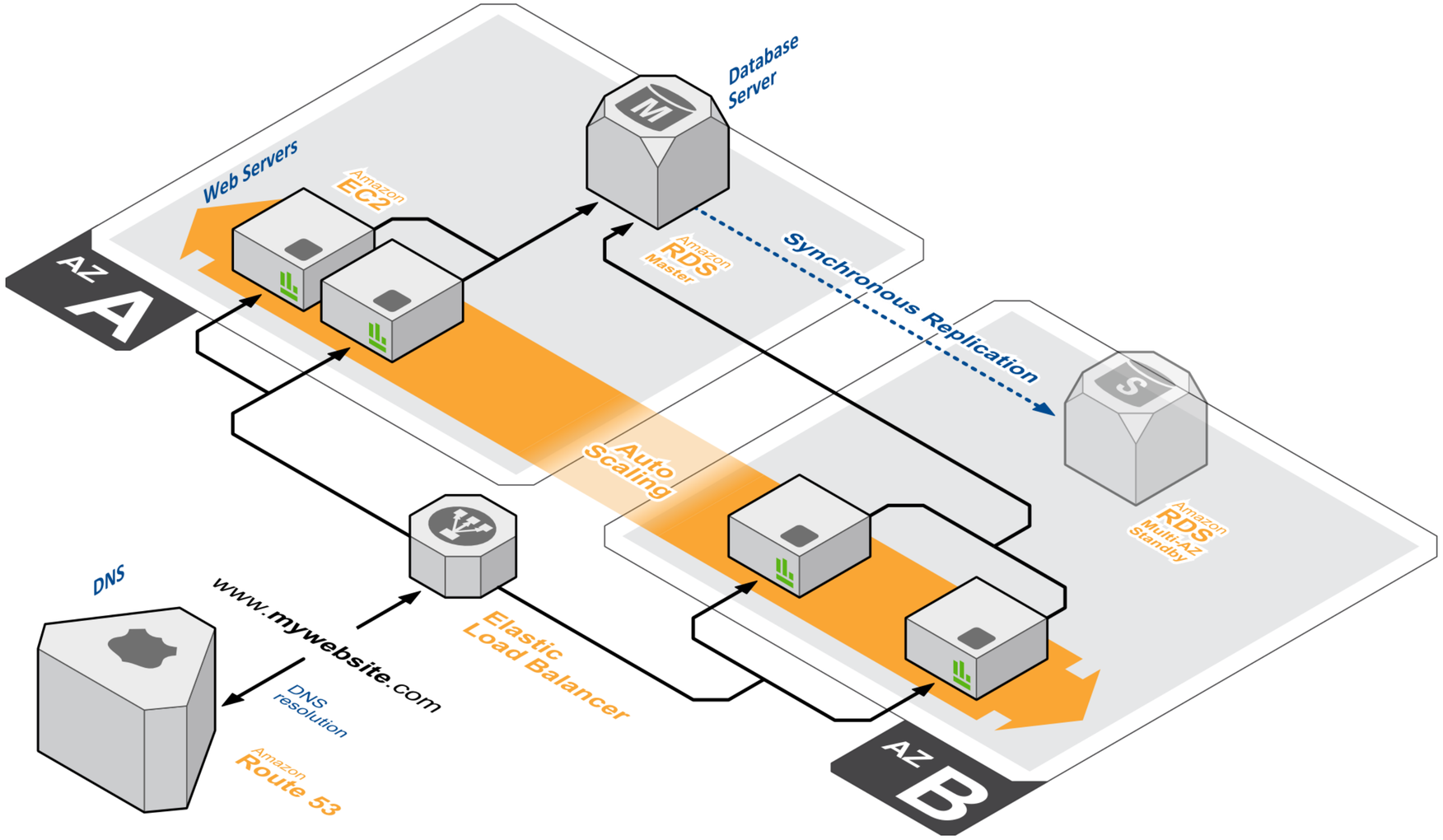
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HEALTH CHECKS

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AUTO SCALING

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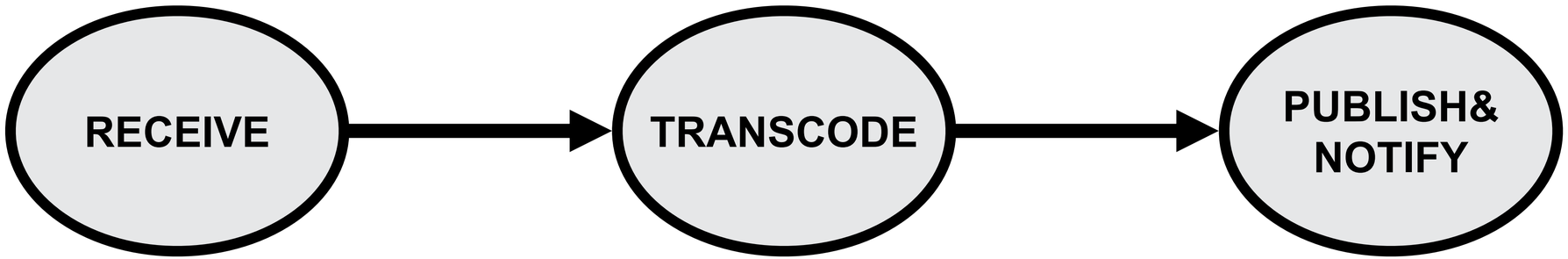
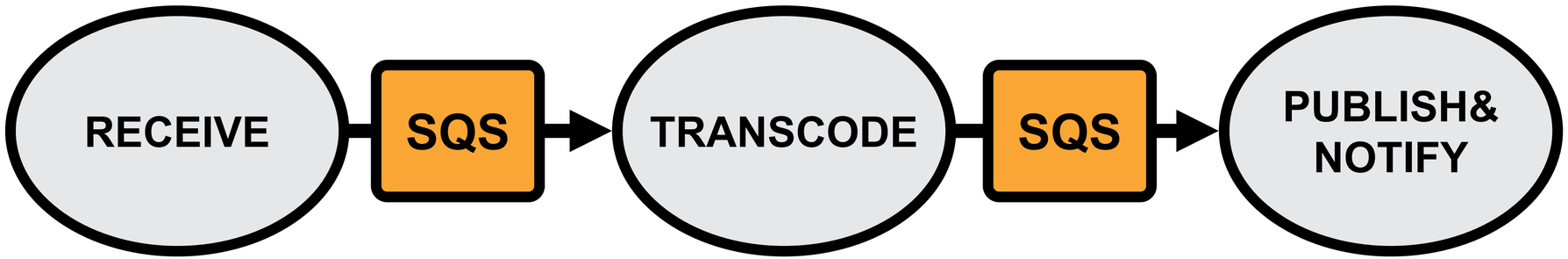
SELF-HEALING

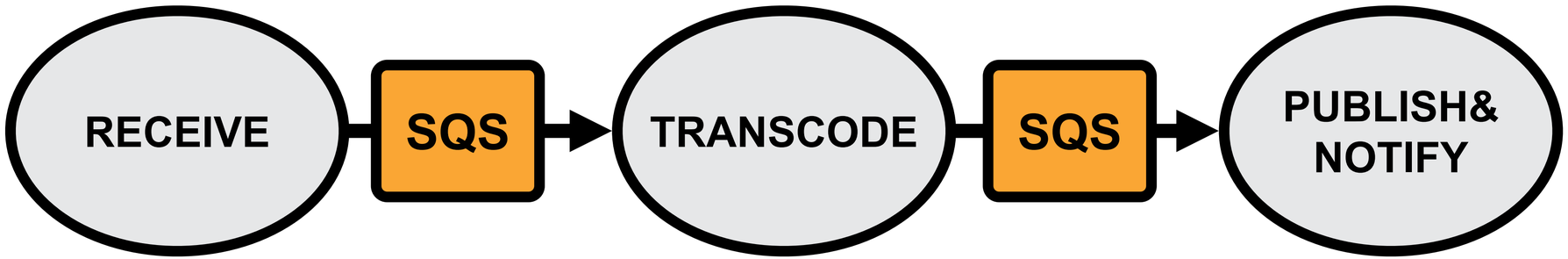
#4

LOOSE COUPLING


RECEIVE
TRANSCODE
PUBLISH&
NOTIFY


RECEIVE
SQS
TRANSCODE
SQS
PUBLISH&
NOTIFY

RECEIVE
SQS
SQS
PUBLISH&
NOTIFY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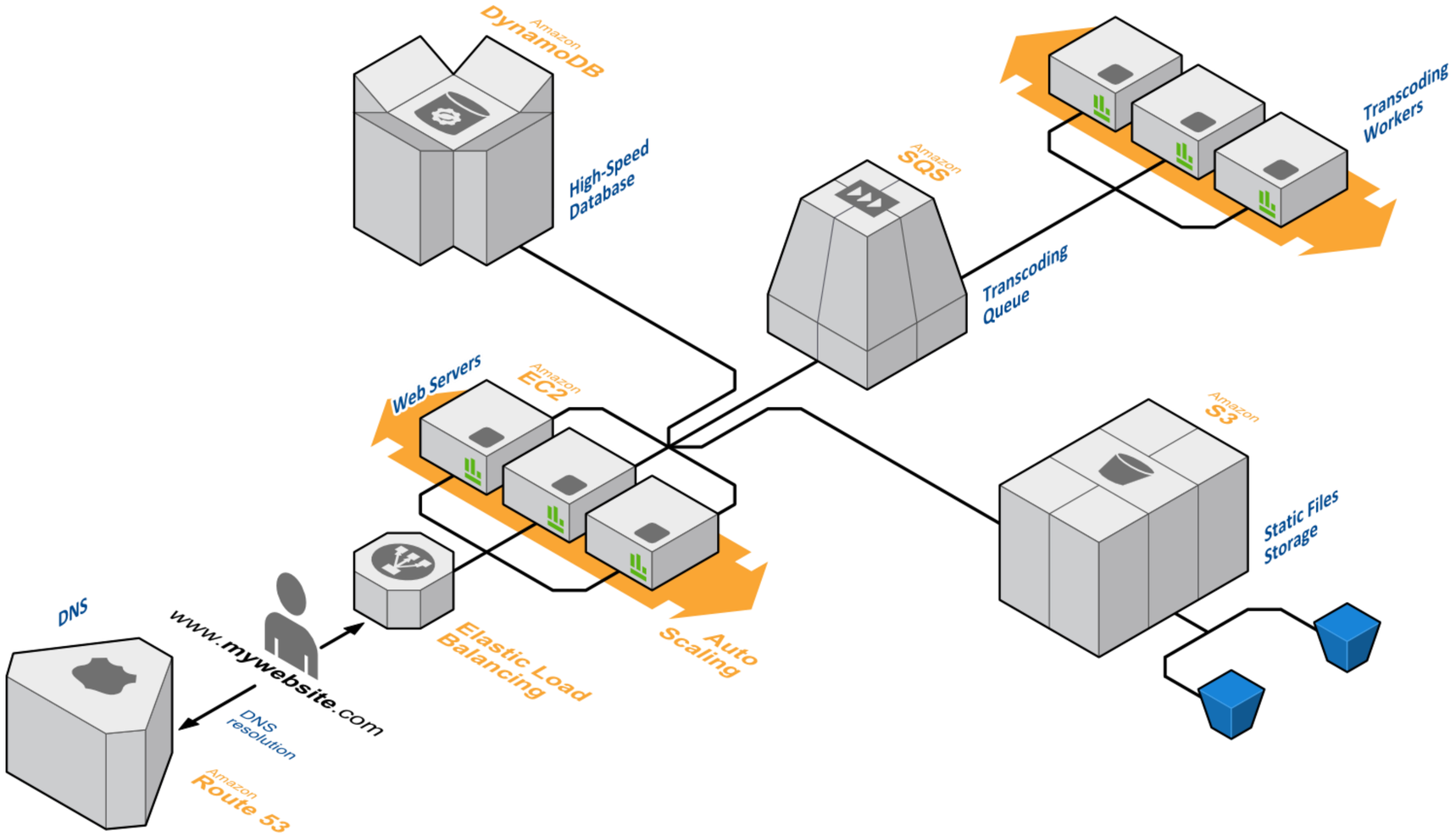
Amazon
DynamoDB
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Transcoding
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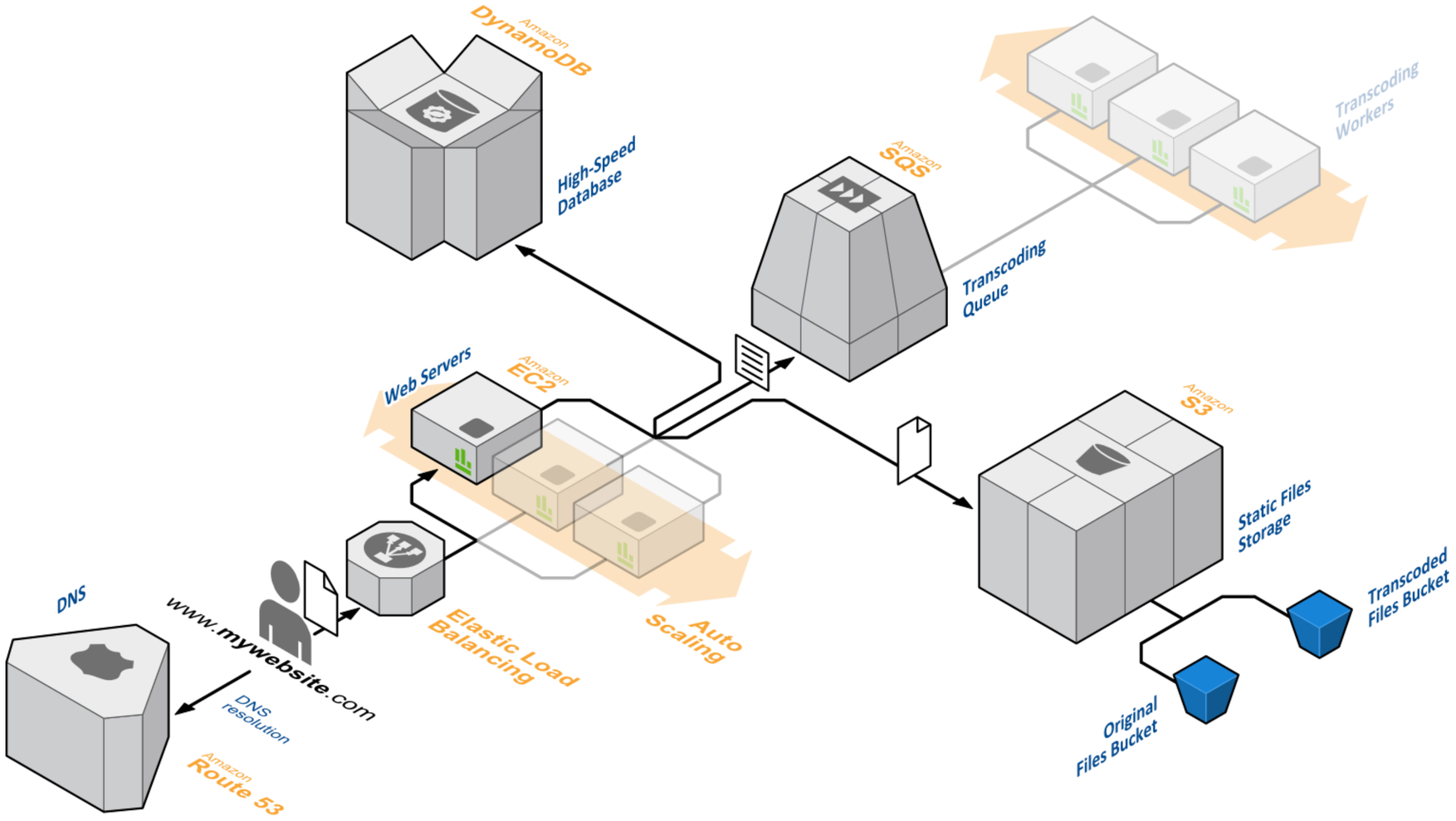
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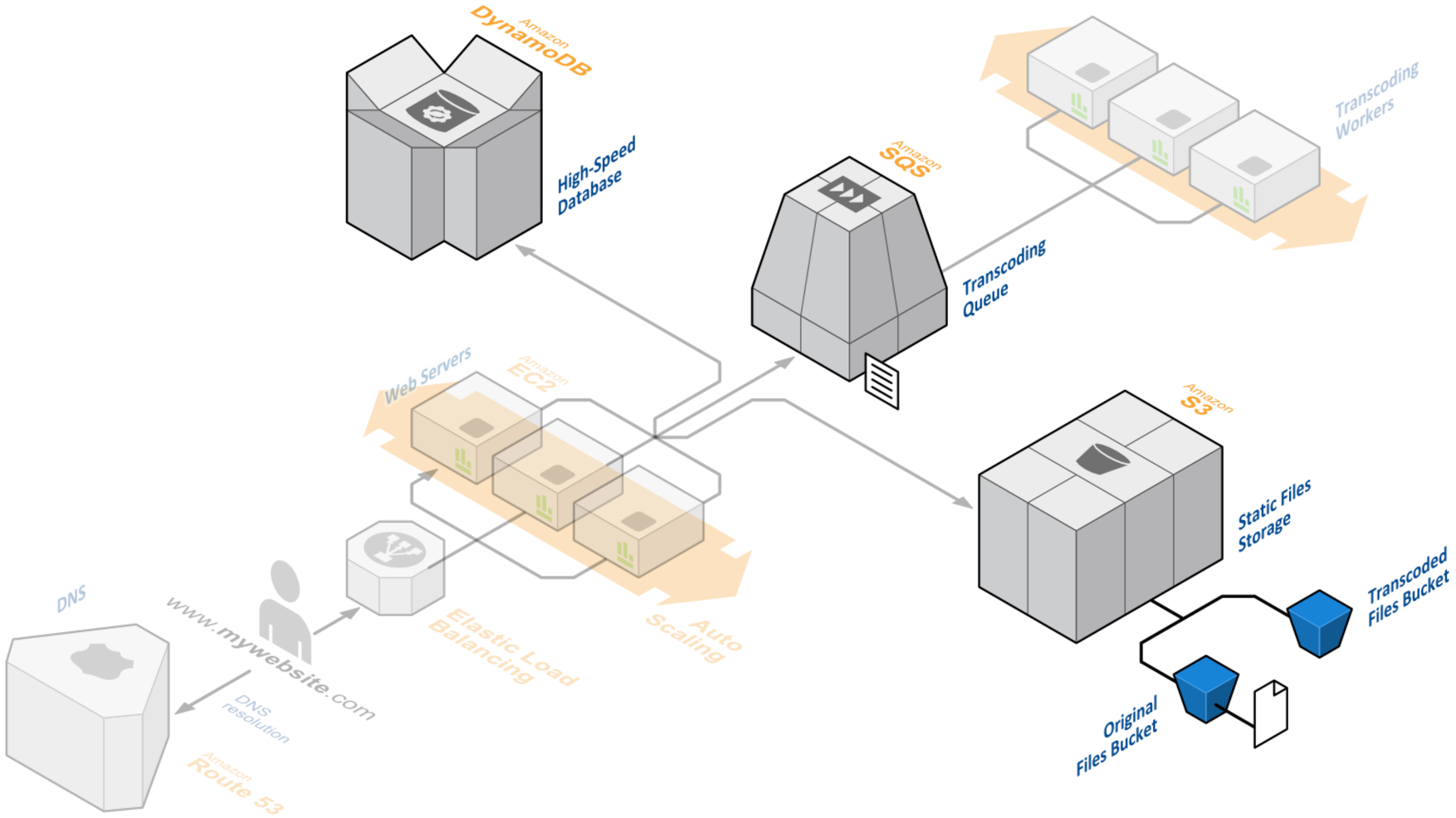
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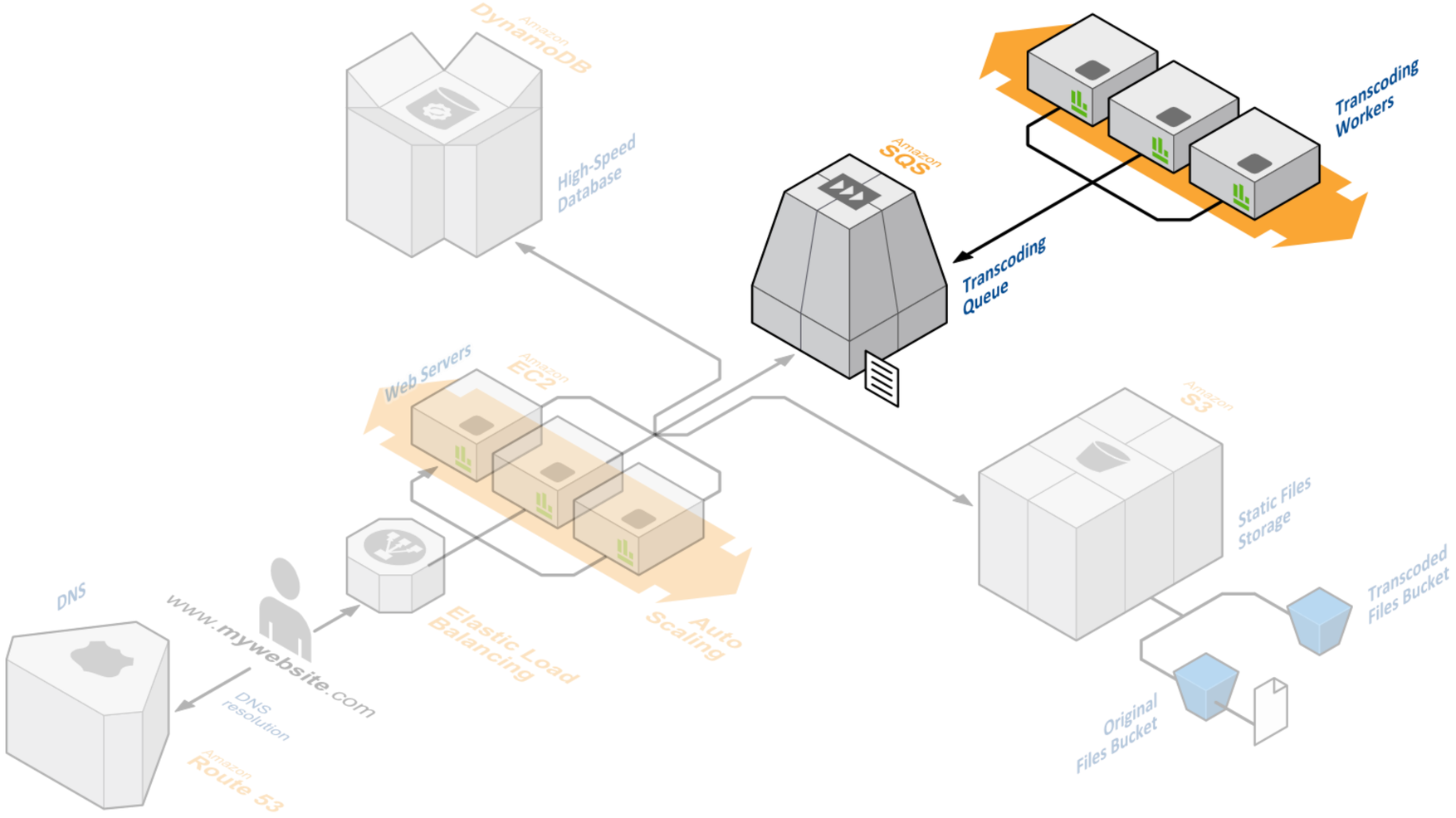
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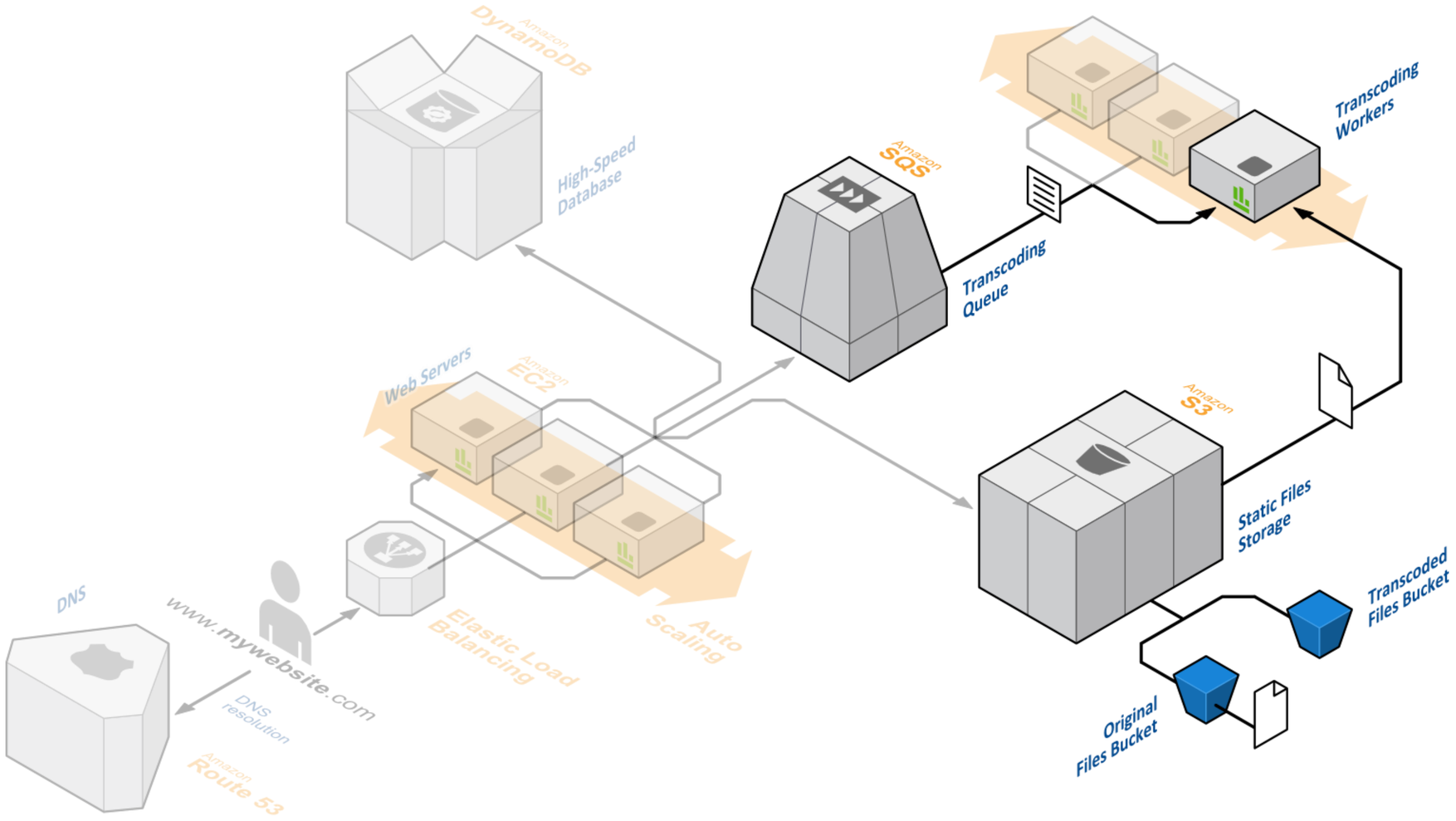
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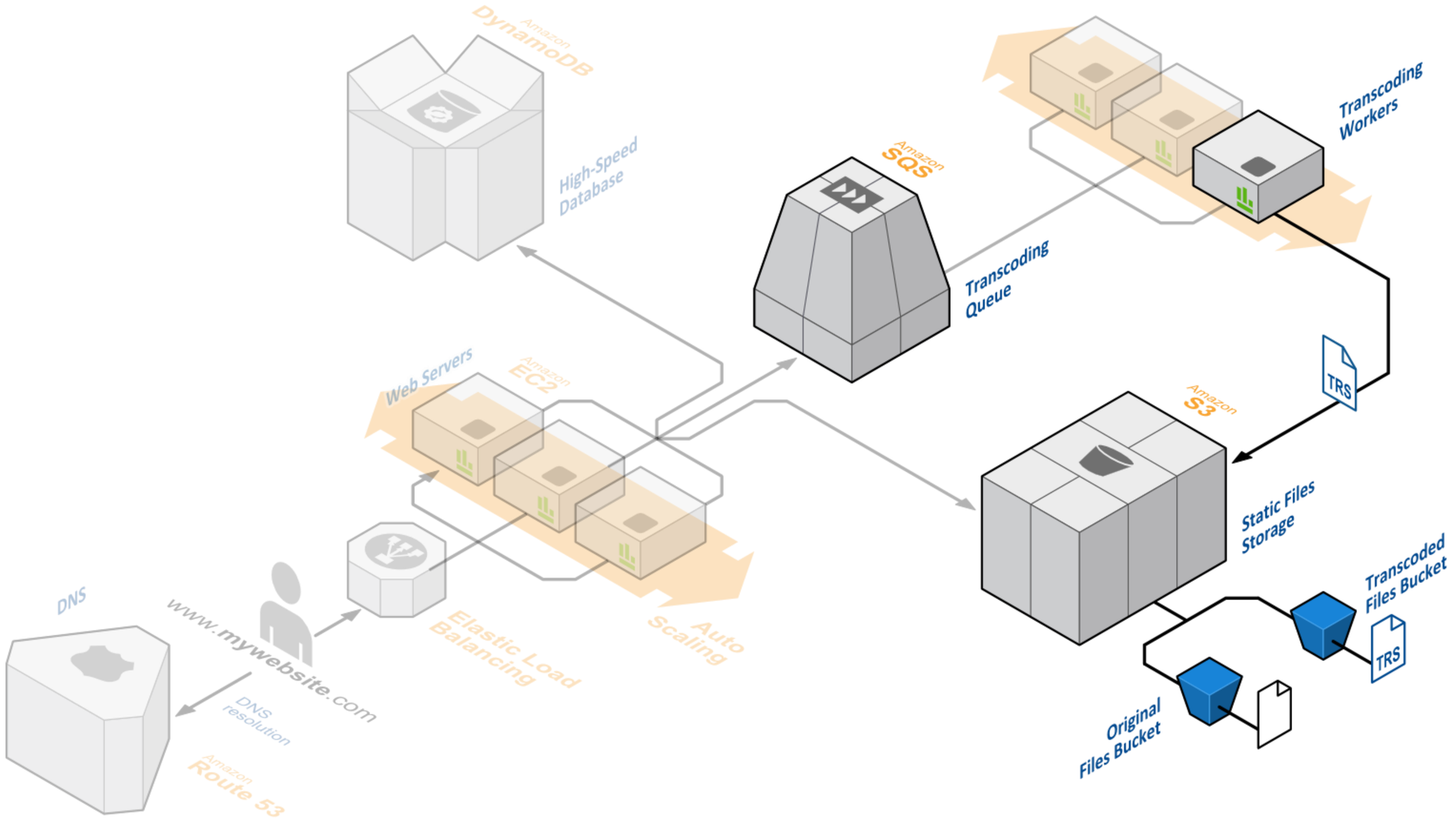
Amazon DynamoDB
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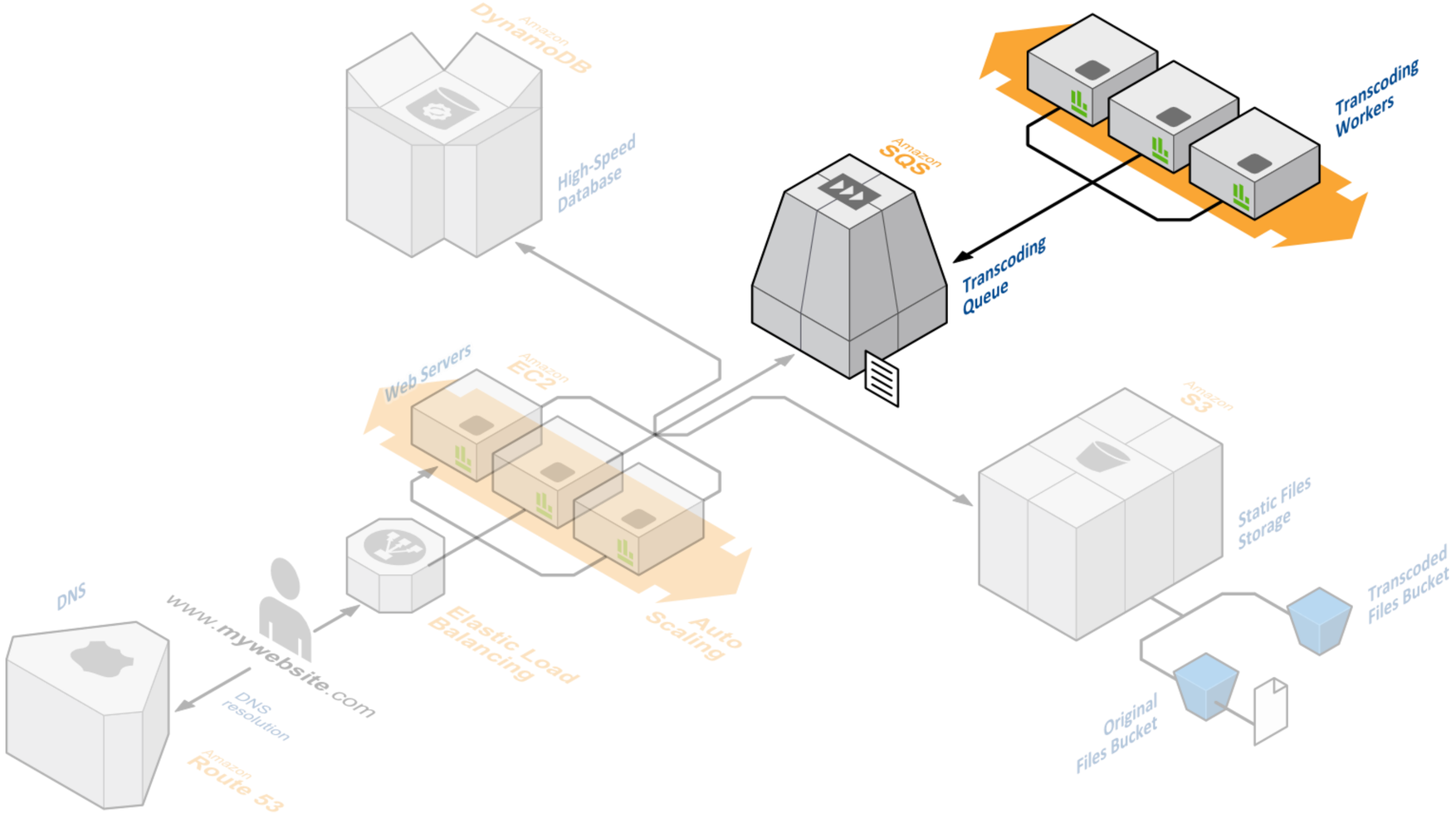
VISIBILITY TIMEOUT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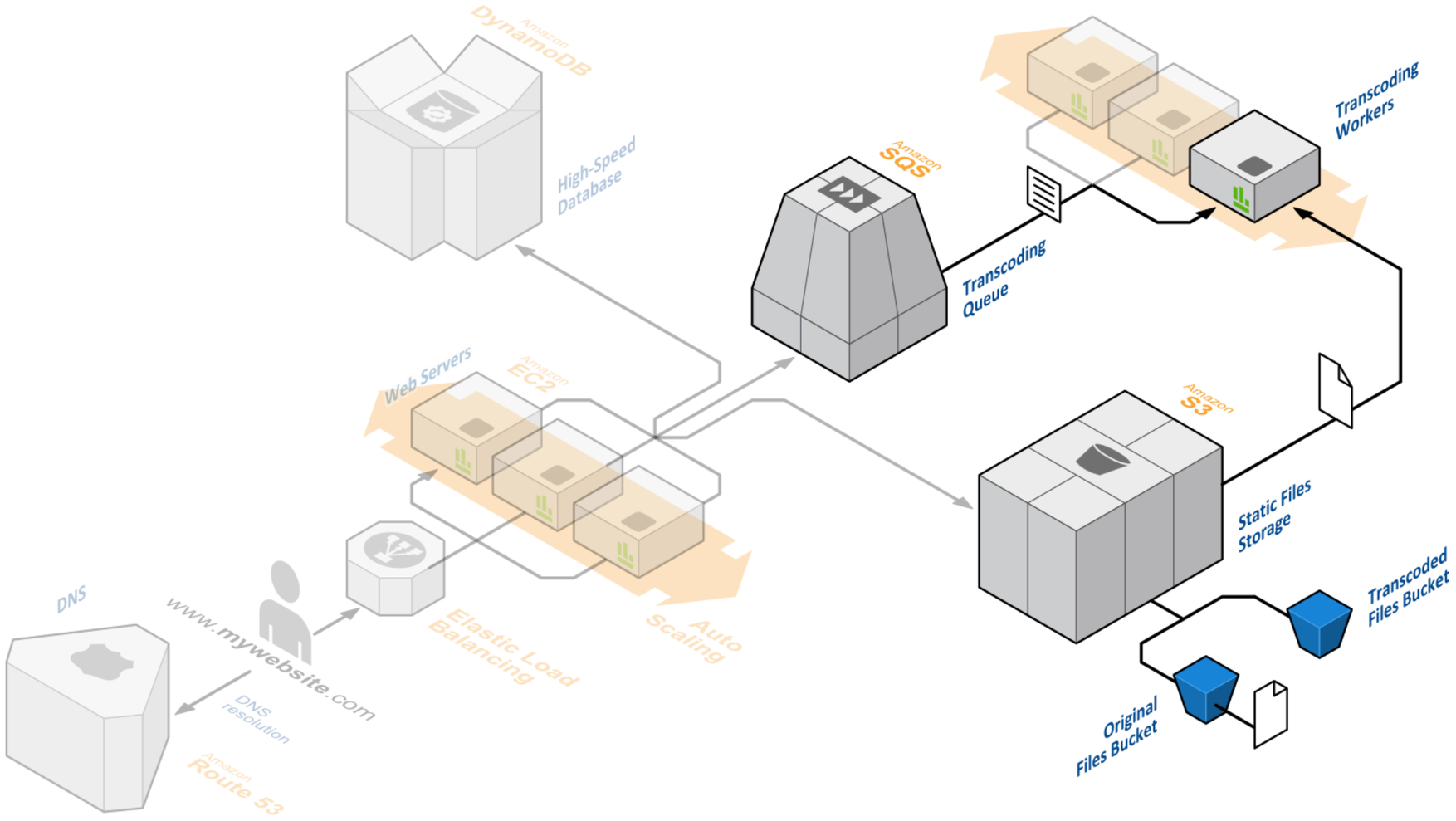
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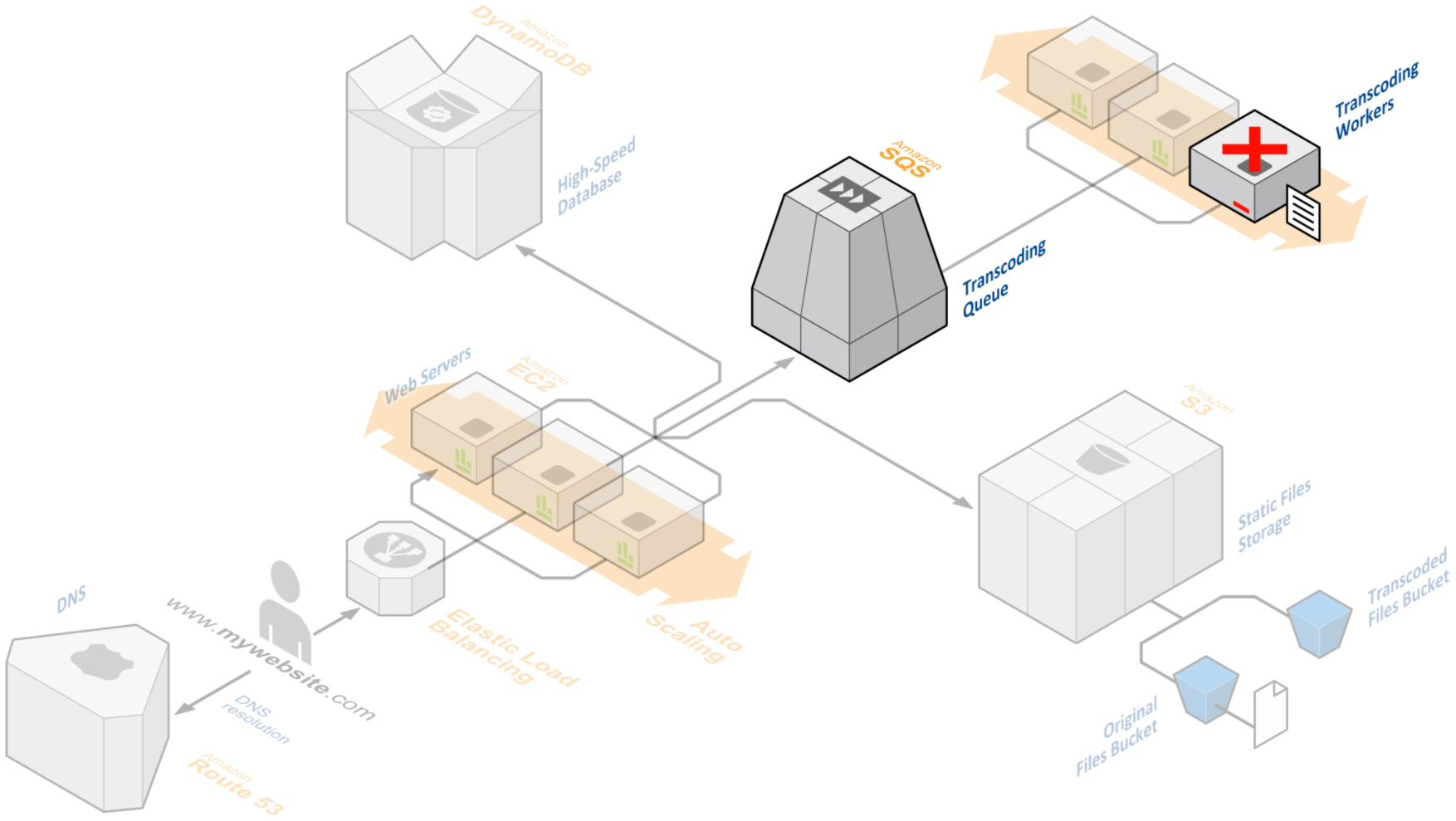
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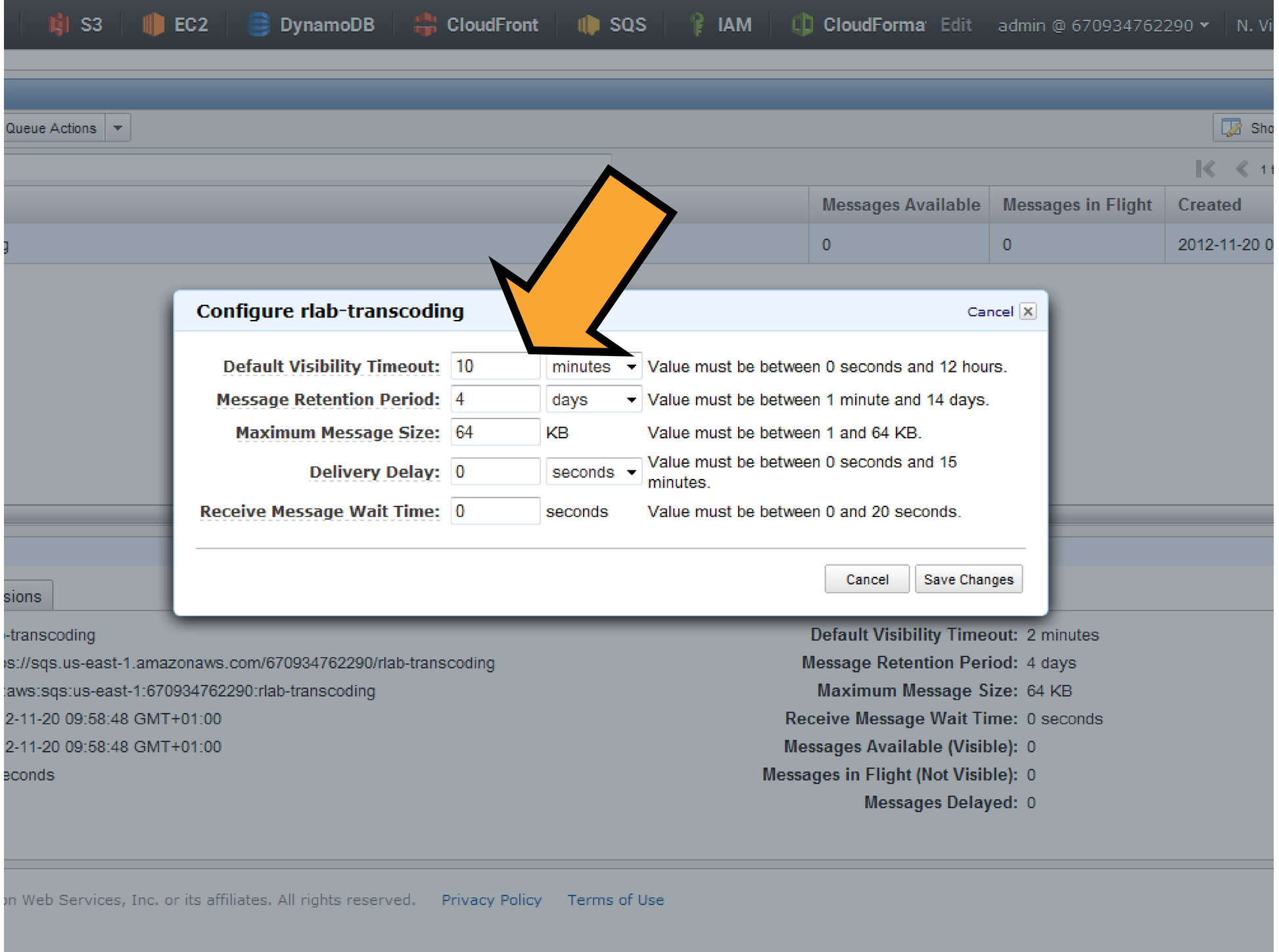
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EC2
DynamoDB
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SQS
IAM
CloudForma
Edit
admin @ 670934762290
Queue Actions
Messages Available
Messages in Flight
Created
0
0
2012-11-20 0
Configure rlab-transcoding
Cancel
Default Visibility Timeout:
10
minutes
Value must be between 0 seconds and 12 hours.
Message Retention Period:
4
days
Value must be between 1 minute and 14 days.
Maximum Message Size:
64
KB
Value must be between 1 and 64 KB.
Delivery Delay:
0
seconds
Value must be between 0 seconds and 15 minutes.
Receive Message Wait Time:
0
seconds
Value must be between 0 and 20 seconds.
Cancel
Save Changes
-transcoding
s://sqs.us-east-1.amazonaws.com/670934762290/rlab-transcoding
aws:sqs:us-east-1:670934762290:rlab-transcoding
2-11-20 09:58:48 GMT+01:00
2-11-20 09:58:48 GMT+01:00
econds
Default Visibility Timeout: 2 minutes
Message Retention Period: 4 days
Maximum Message Size: 64 KB
Receive Message Wait Time: 0 seconds
Messages Available (Visible): 0
Messages in Flight (Not Visible): 0
Messages Delayed: 0
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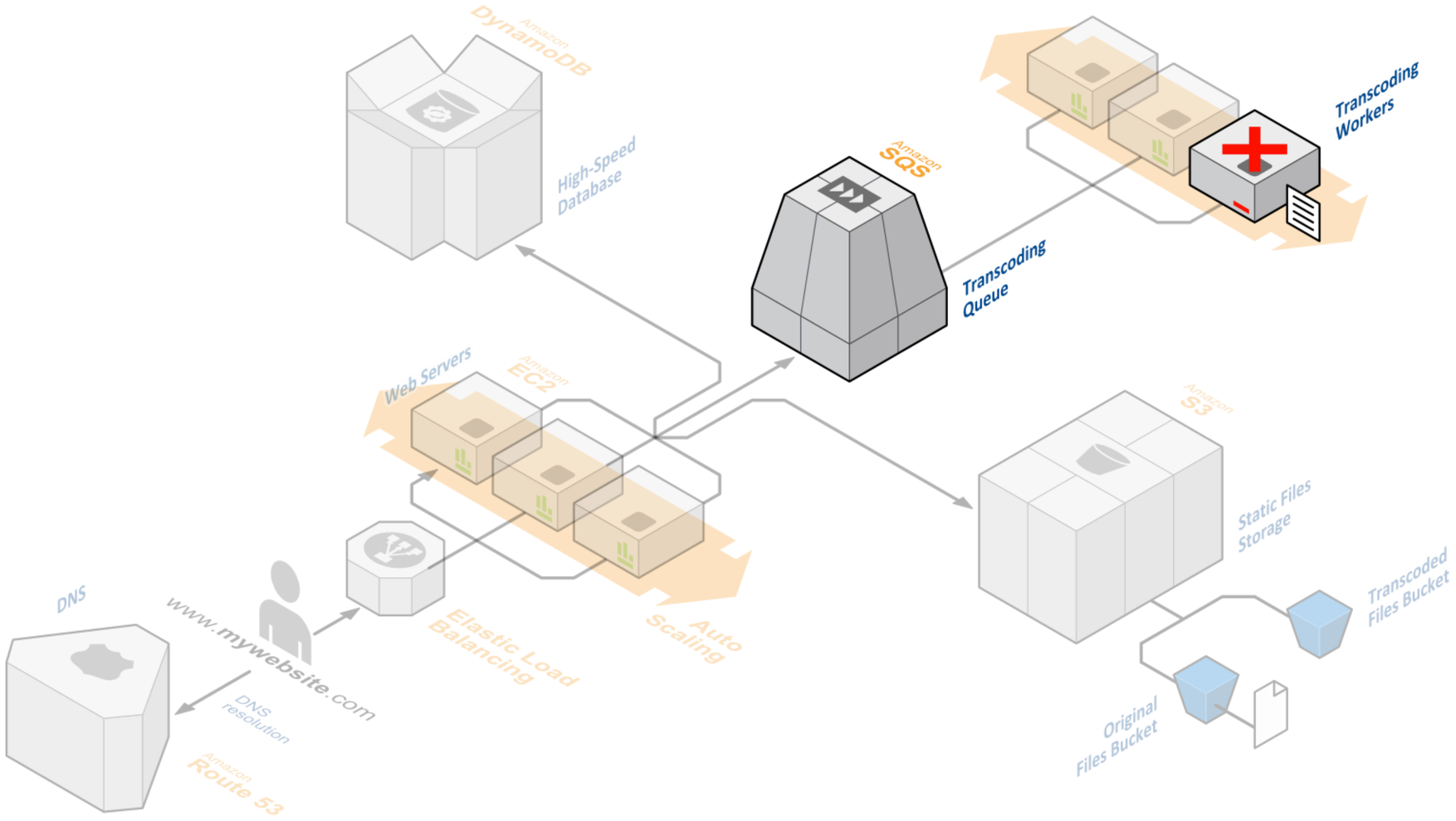
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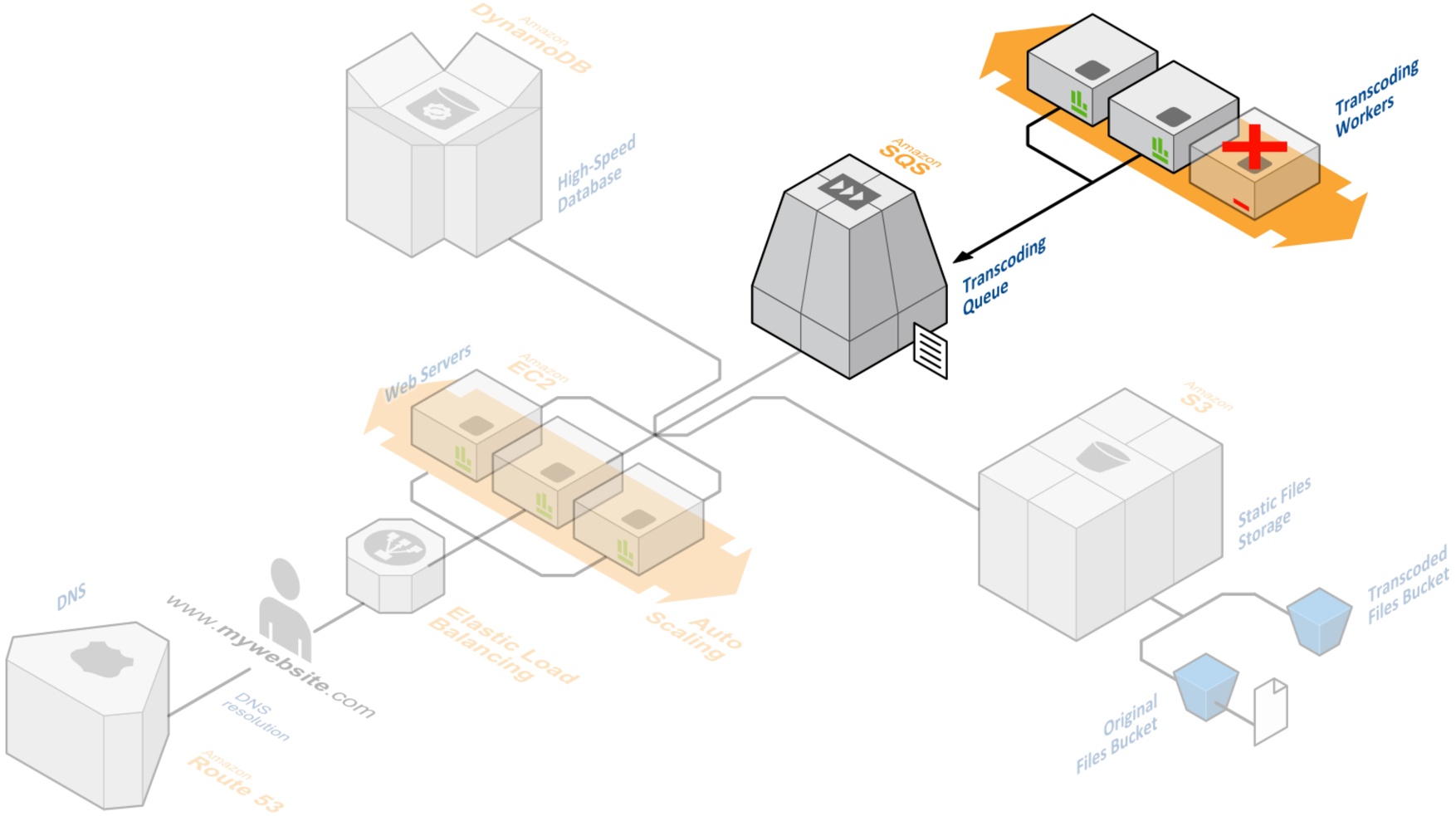
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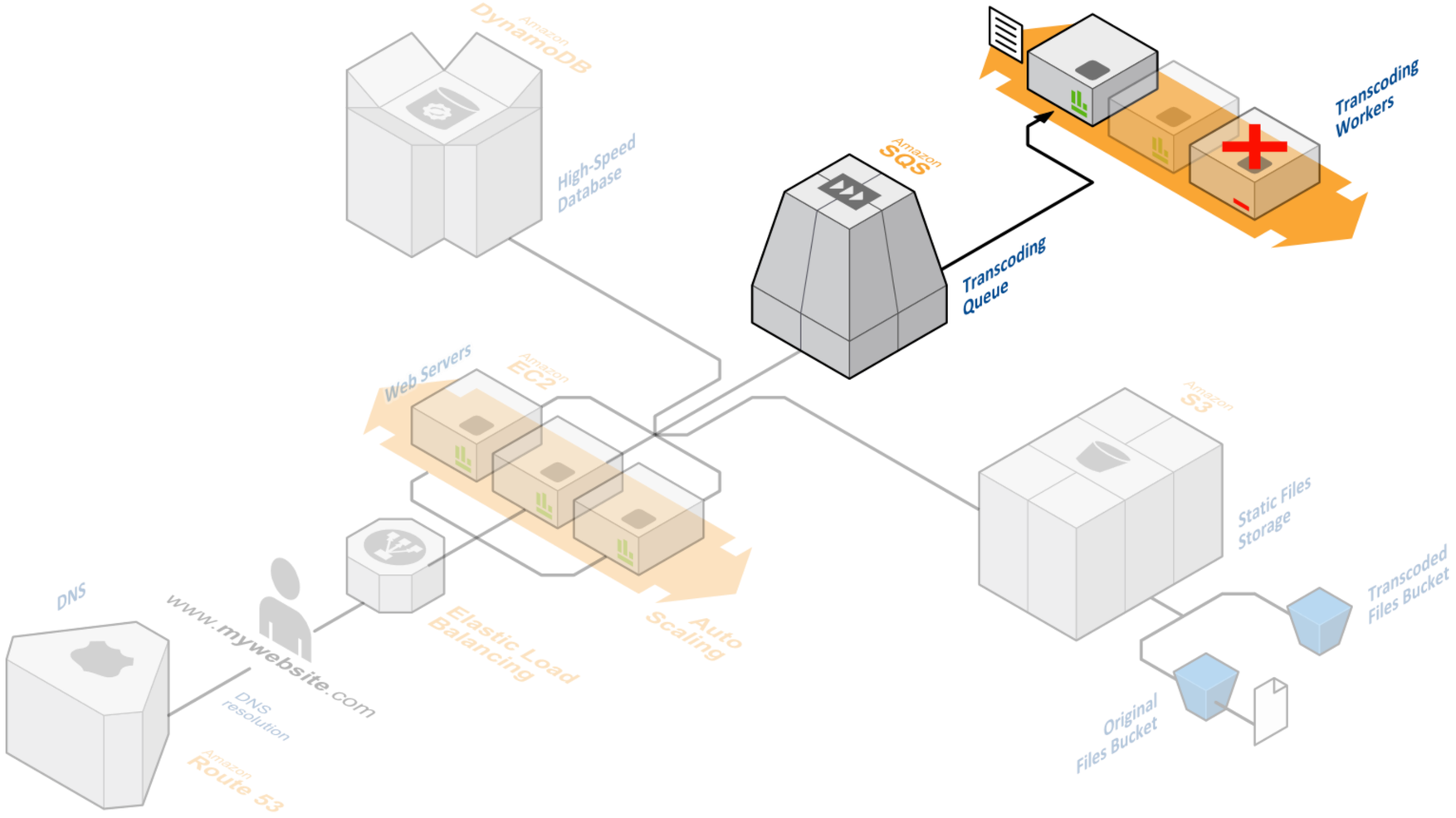
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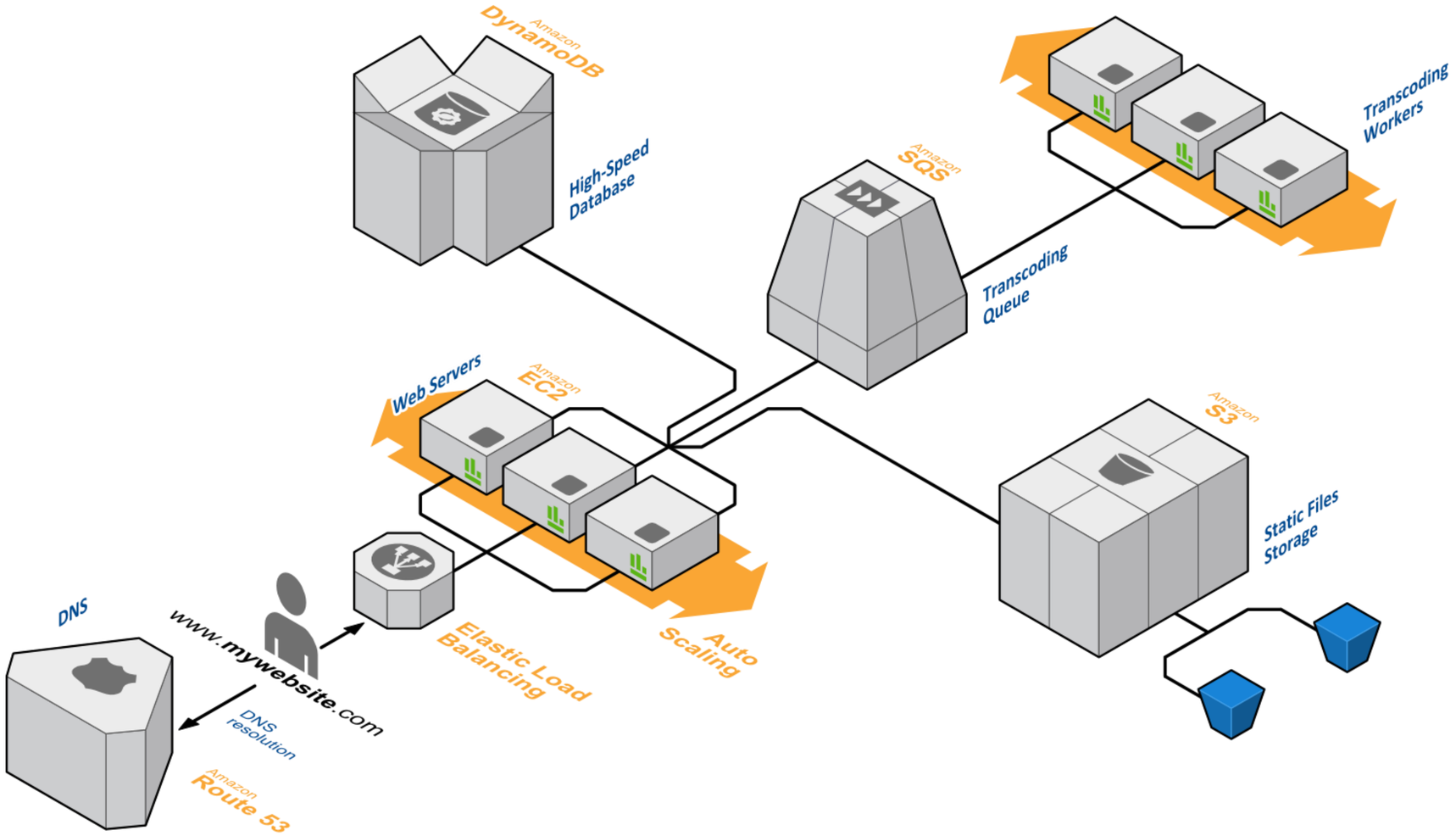
BUFFERING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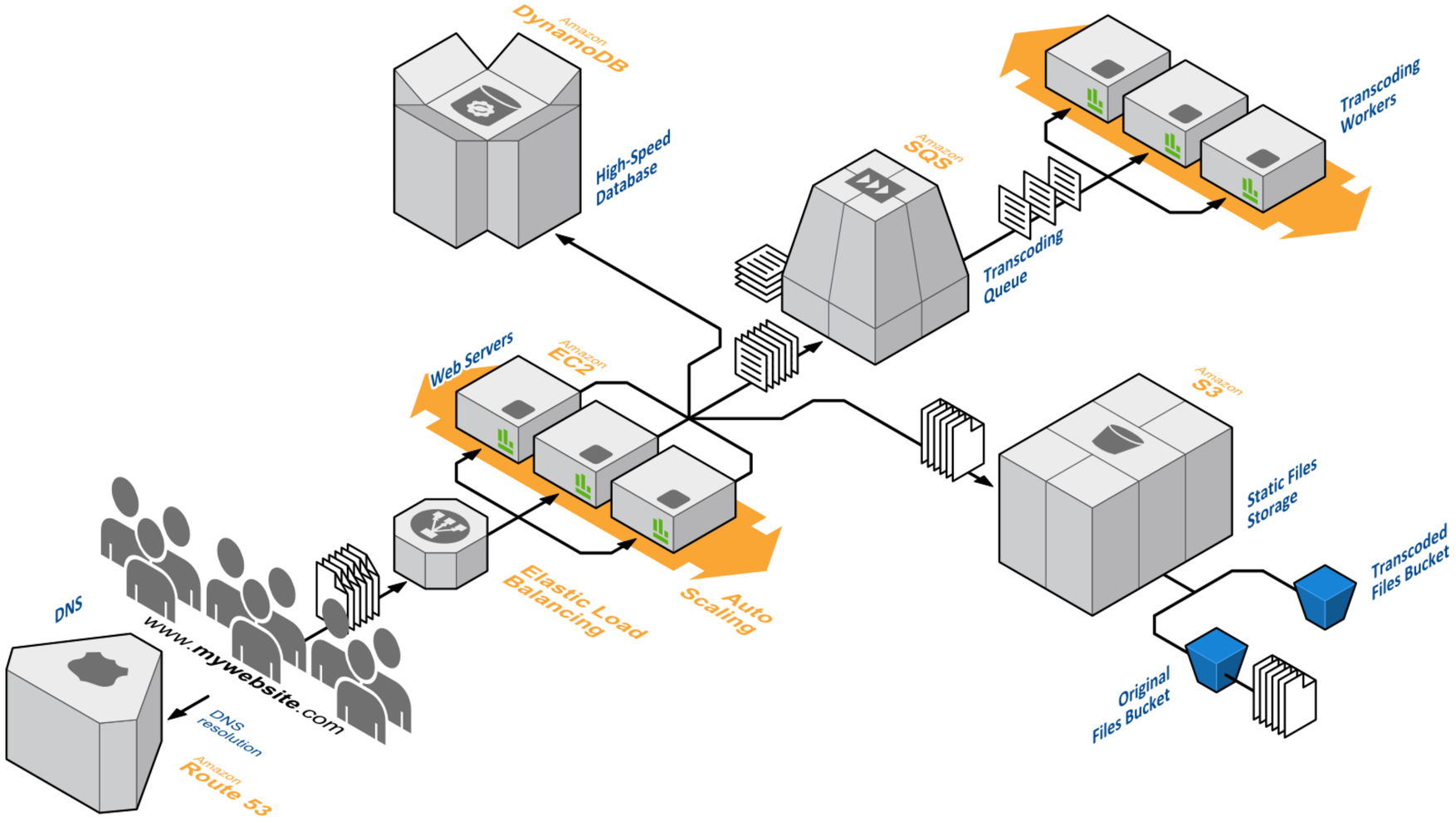
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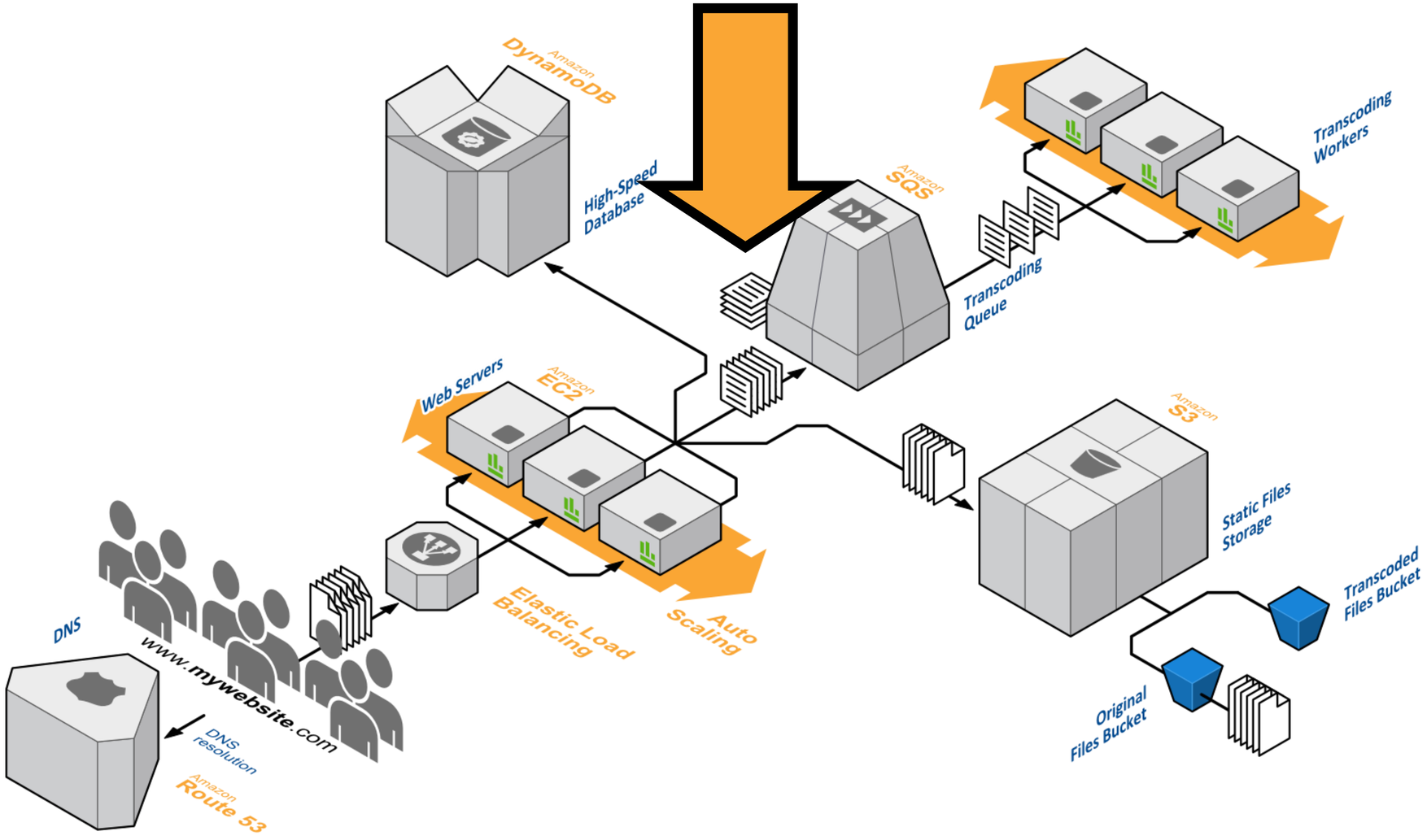
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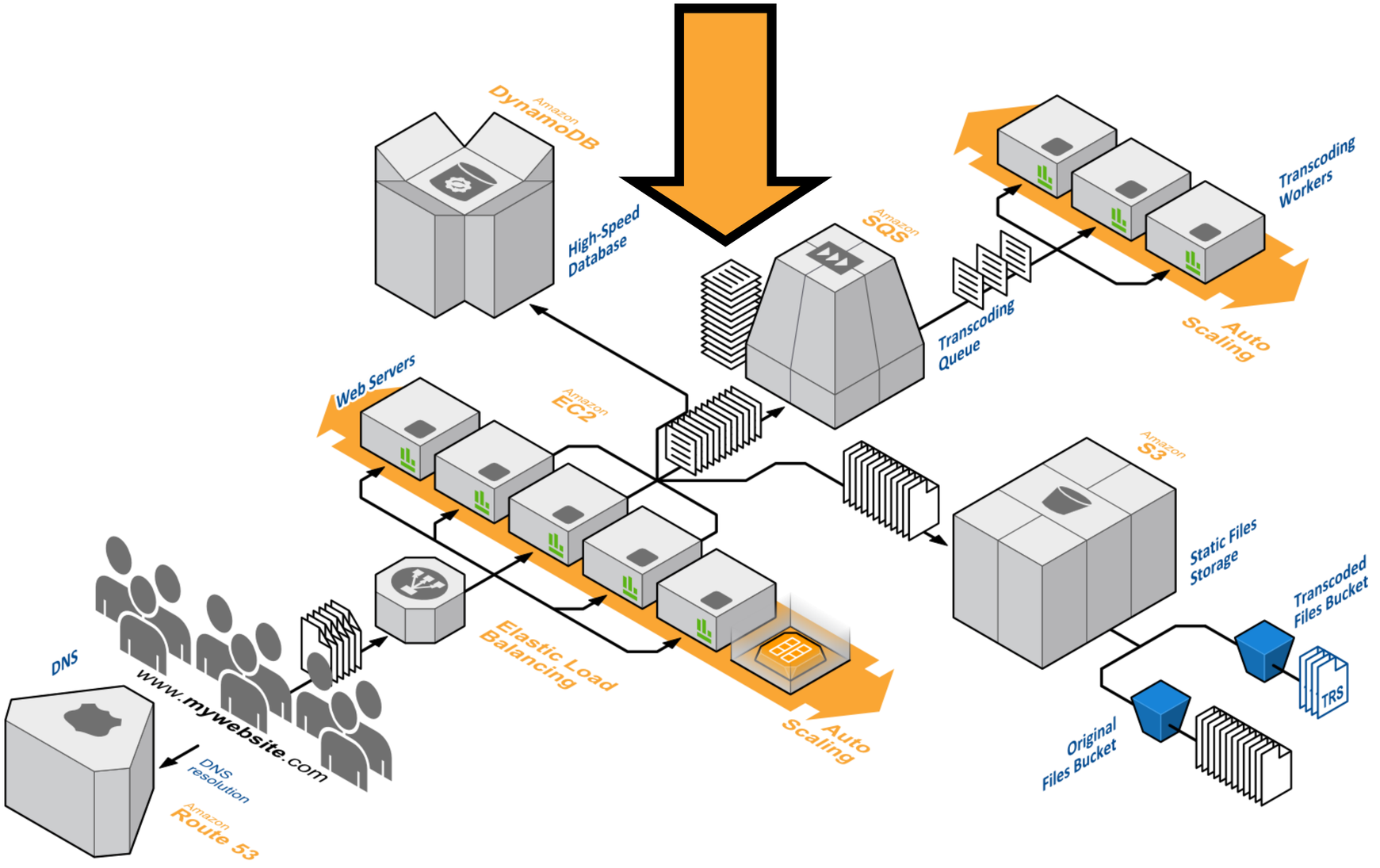
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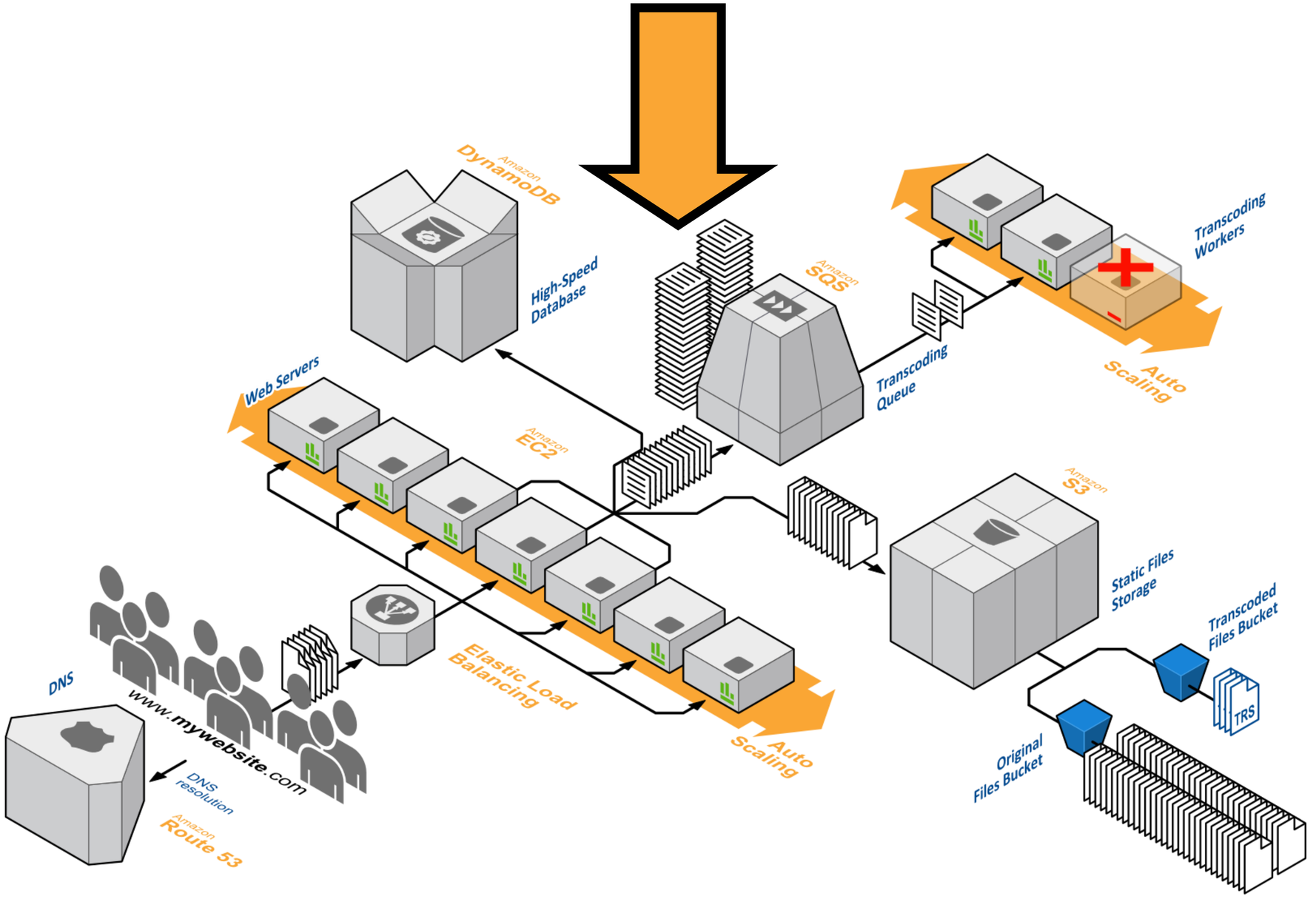
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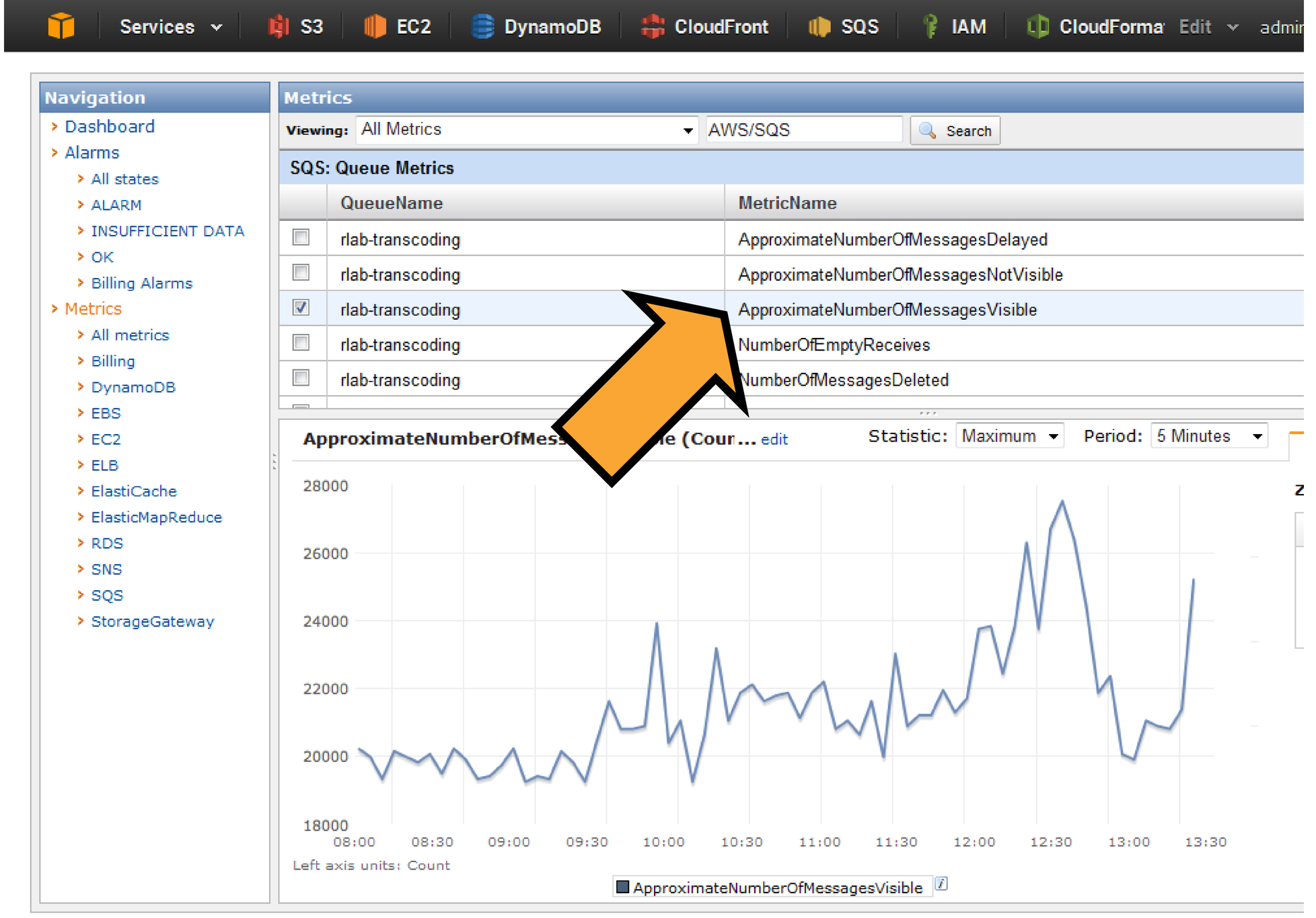
CLOUDWATCH METRICS FOR AMAZON SQS

+

AUTO SCALING



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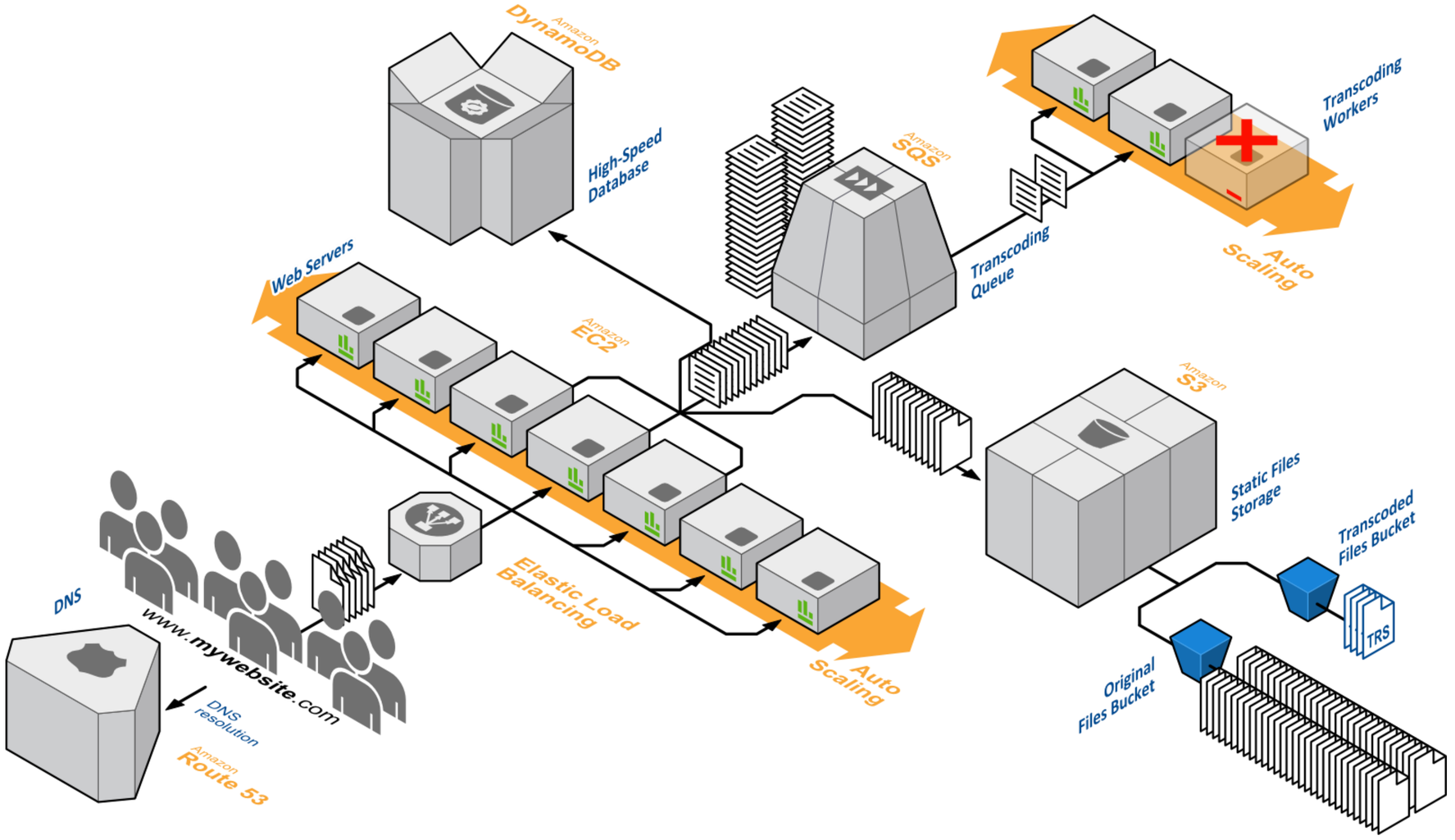
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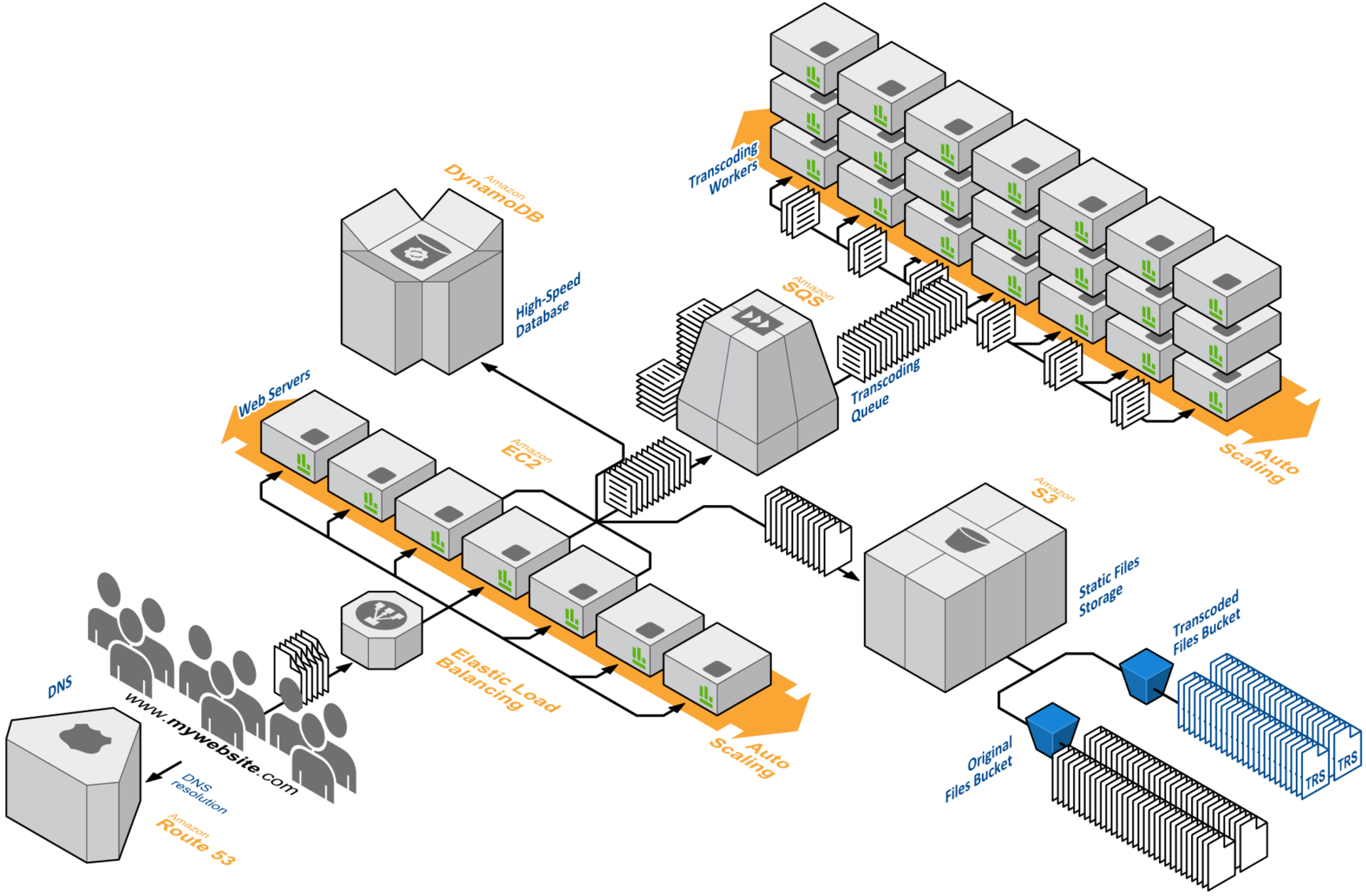
DynamoDB
High-Speed
Database
Amazon
SQS
Transcoding
Queue
Transcoding
Workers
Auto
Scaling
Web Servers
Amazon
EC2
Amazon
S3
Static Files
Storage
Transcoded
Files Bucket
TRS
Original
Files Bucket
Elastic Load
Balancing
Auto
Scaling
DNS
www.mywebsite.com
DNS
resolution
Amazon
Route 53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Transcoding Workers
Amazon SQS
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Web Servers
Amazon EC2
Amazon S3
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DNS resolution
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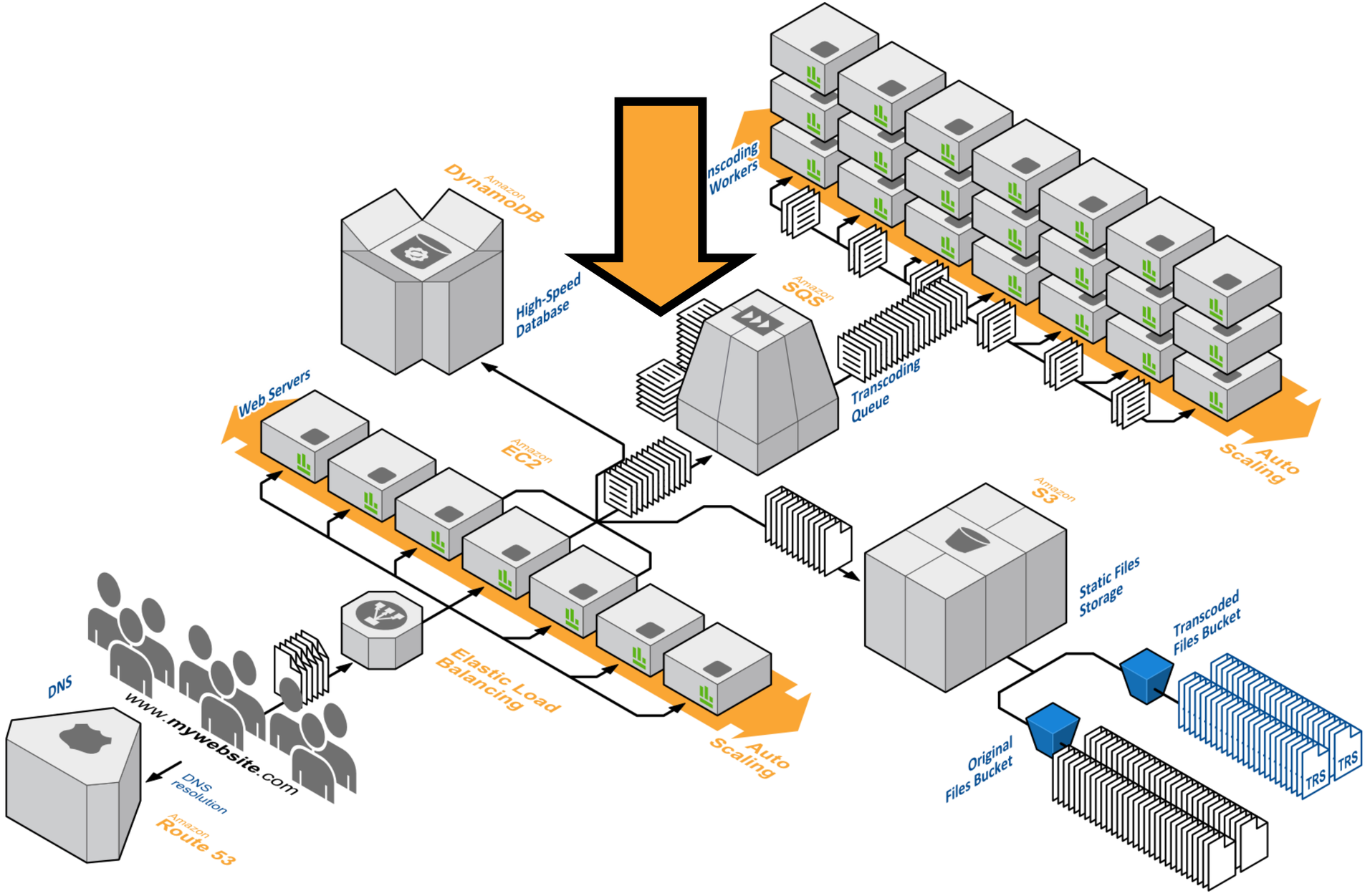
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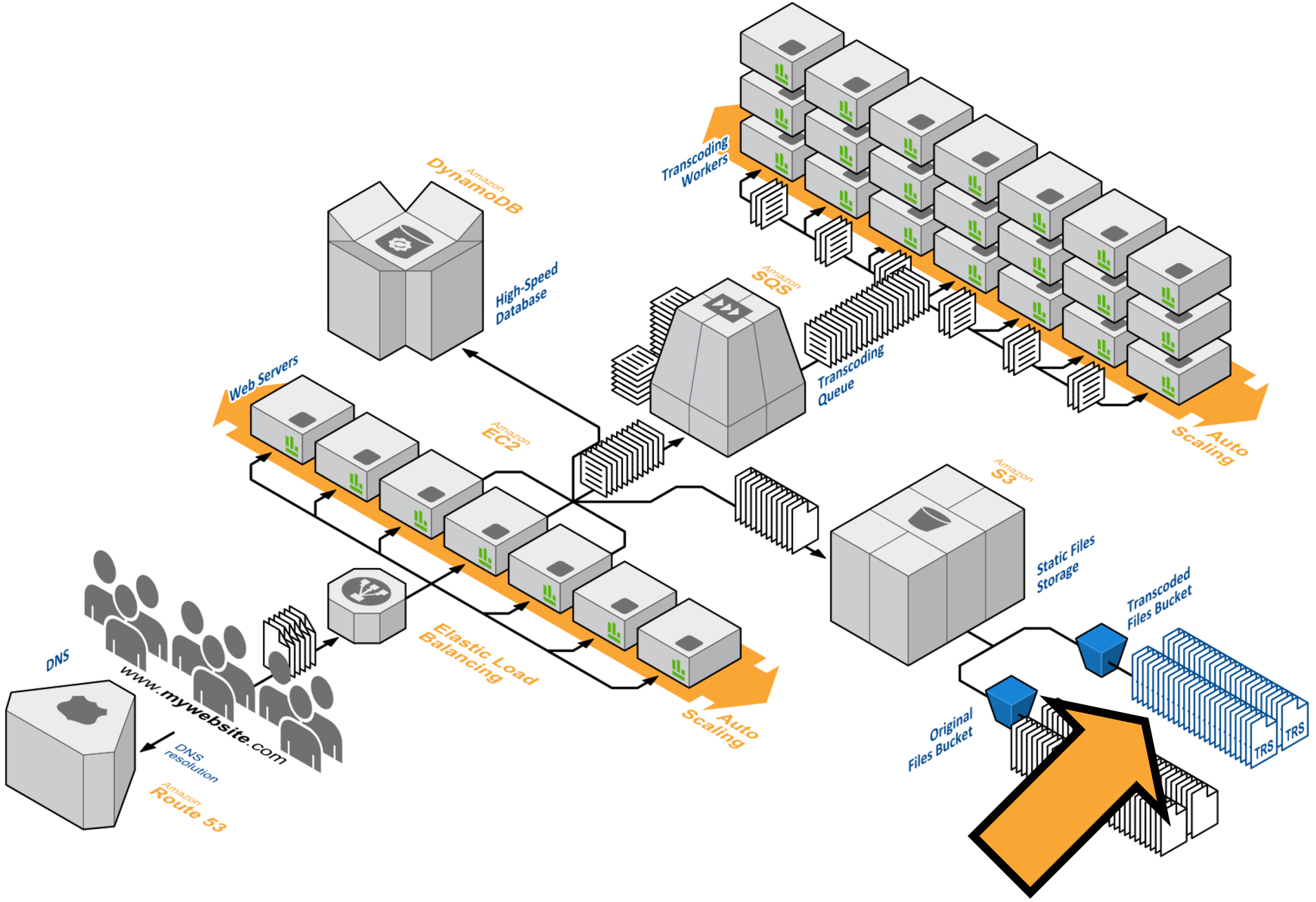
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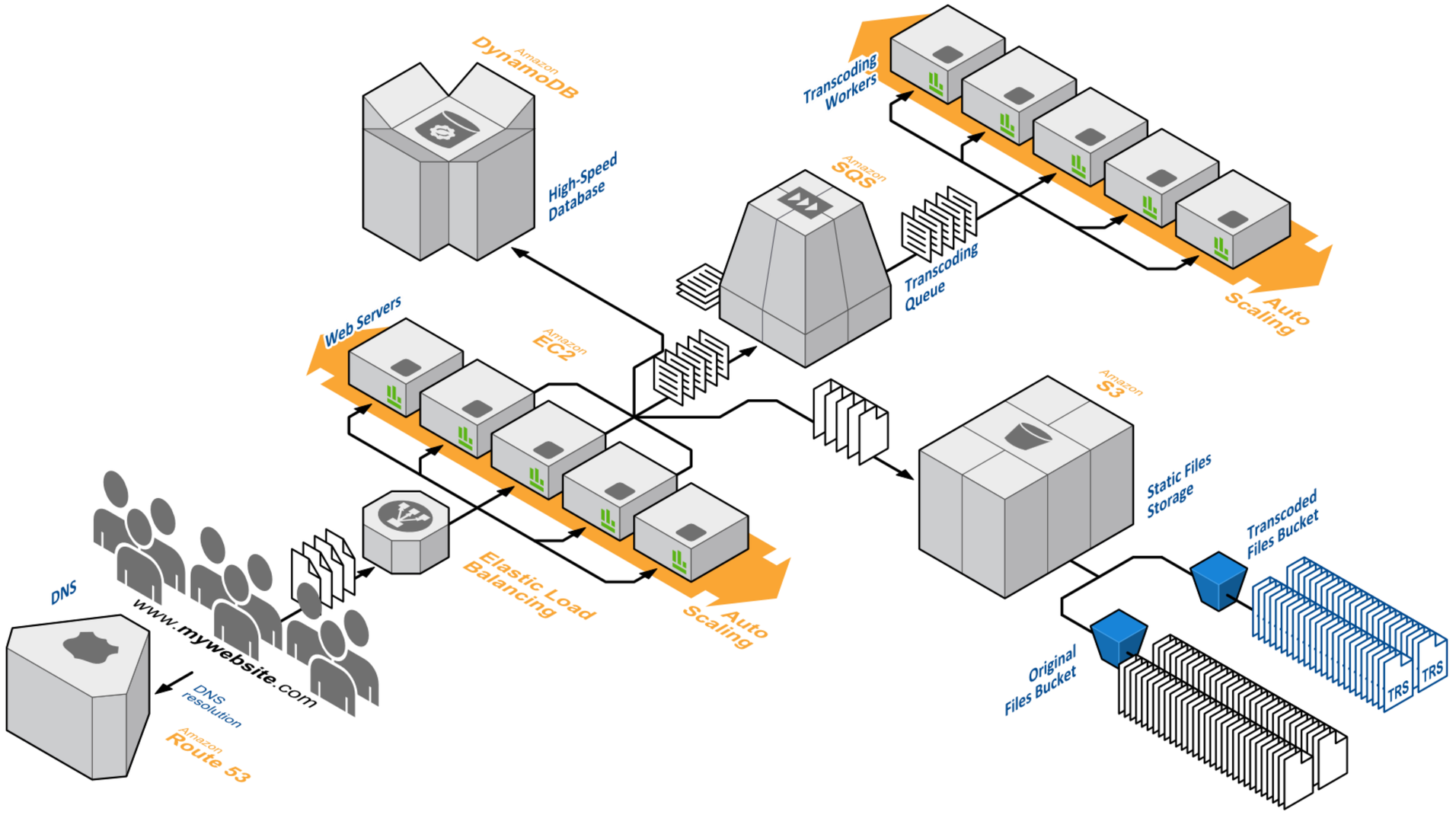
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TRS
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www.mywebsite.com
DNS
resolution
Amazon
Route 53
Elastic Load
Balancing
Auto
Scaling

BUILD LOOSELY COUPLED SYSTEMS

The **looser** they are coupled,
the **bigger** they scale,
the more **fault tolerant** they get…

#5

AUTOMATE & TEST

=

PROGRAMMABLE PLATFORM

Firefox

AWS SDKs & Tools

aws.amazon.com/tools/

SDKs

Simplify using AWS services in your applications with an API tailored to your programming language or platform.

Android

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IF YOU CAN PROGRAM IT
YOU CAN AUTOMATE IT

CASE STUDY

SmugMug

Give SmugMug Browse Photos Login Help Search

Your Photos Look Better Here.®

Billions of happy photos. Millions of passionate customers.

TRY US FREE!
NO CREDIT CARD REQUIRED

SKIP TRIAL
I'M ALREADY SOLD

Like 97,754 people like this. Be the first of your friends.

SHARE

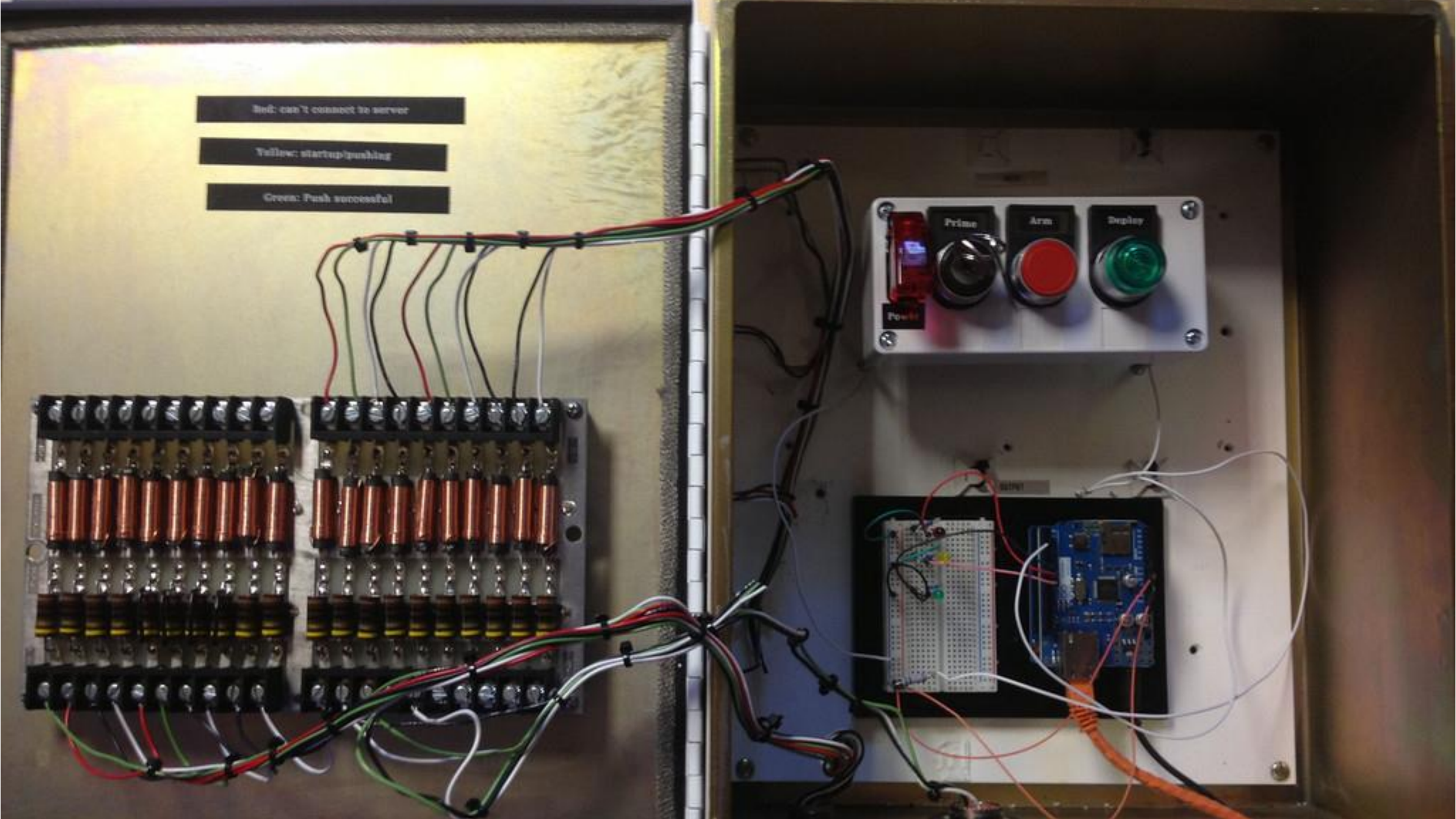
- Publish to Facebook & Twitter
- Share photos via email
- Embed them on blogs, forums, & more

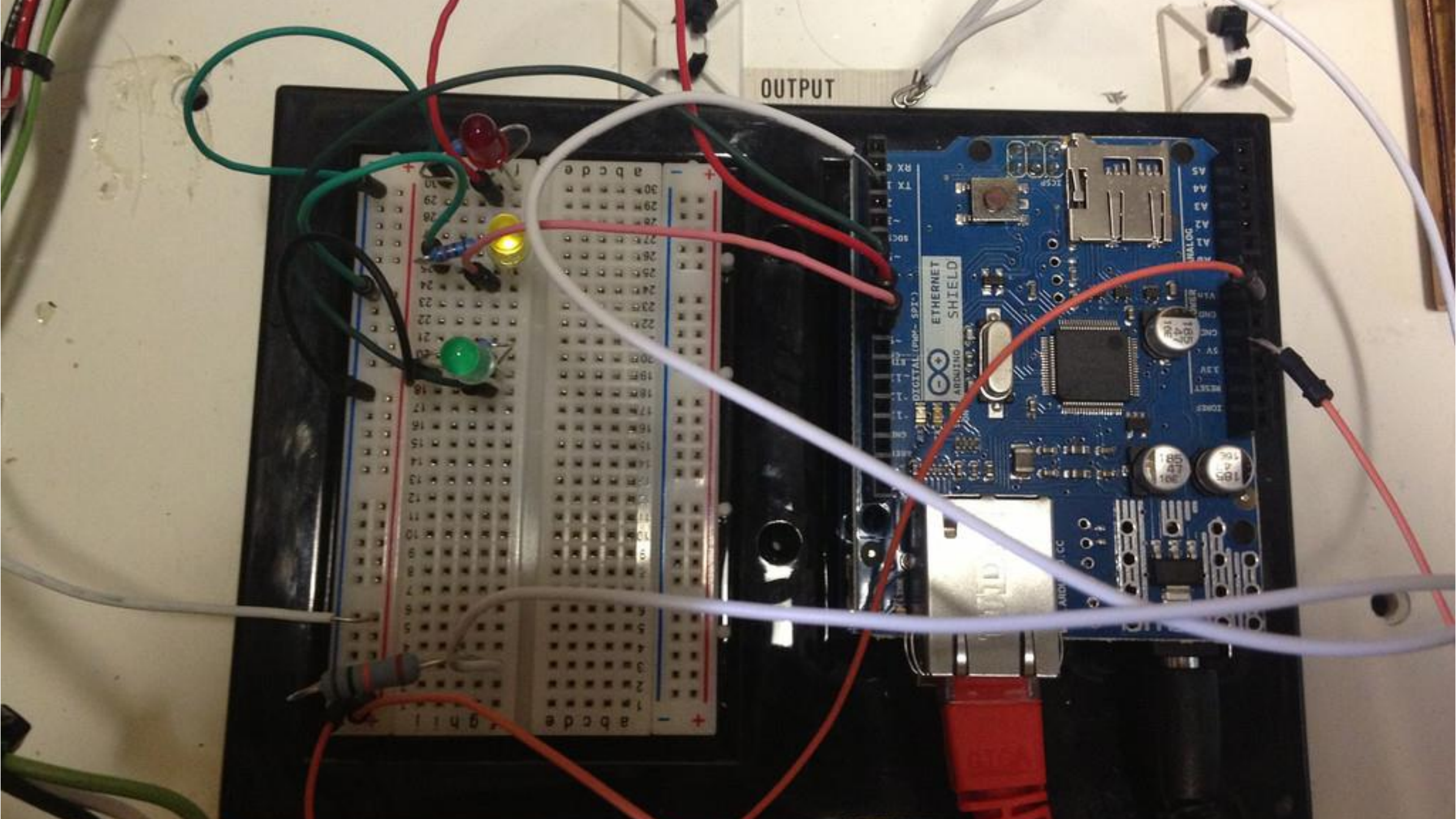
PROTECT

- Unlimited photo and video backups
- Advanced privacy options
- Watermarking for piracy prevention

$ BUY & SELL

- The best prints & gifts
- Your account pays for itself
- Promotions like coupons & packages


Red: can't connect to server
Yellow: startup/pushing
Green: Push successful
Prime
Arm
Deploy


OUTPUT
ETHERNET
SHIELD
ARDUINO

INPUT
Prime
Arm
Deploy

SmugMug Sorcery

Any sufficiently advanced technology is indistinguishable from magic. – Arthur C. Clarke

SmugMug

Type text to search here...

Home > DevOps > Push-button deployments with Arduino

Push-button deployments wit

January 30, 2013

TL;DR: Thanks to an Arduino, an Ardu
eBay, LEDs from Fry's, and SmugMug's deployment web app, we've created a push-button deployment process that looks like this:

HTTP://SORCERY.SMUGMUG.COM/

Search

- System Status
- Heroic Help
- Our StackExchange
- Digital Grin Photography Forum
- Our Wiki
- The SMUGs Blog
- Don MacAskill's blog (our CEO)

Recent Posts

- Push-button deployments with Arduino
- Scaling Puppet in EC2
- Speeding up SmugMug Search
- Using HTML5's Fullscreen API for Fun and Profit
- Deriving JSON types in Go

SmugMug on Twitter

- Smuggy at an RIT recruiting fair. Who

DEPLOYMENTS AT AMAZON.COM

11.6s

Mean time between deployments (weekday)

1,079

Max number of deployments in a single hour

10,000

Mean number of hosts simultaneously receiving a deployment

30,000

Max number of hosts simultaneously receiving a deployment

CASE STUDY

Firefox

Etsy - Il tuo spazio per comprare e vende...

www.etsy.com

Vendi Lista nozze Community Blogs Mobile Buoni regalo Aiuto

Etsy Registrati Accedi Ricerca per articolo o negozio Cerca Carrello

Naviga

- Arte
- Casa & Giardino
- Gioielli
- Alta gioielleria
- Donna
- Uomo
- Bambini
- Vintage
- Matrimoni
- Materiali per creare
- Articoli di tendenza
- Spring Celebrations
- Idee regalo
- Accessori per telefonini e

Oggetti Selezionati Mostra altro Scelti da Sharon

Vintage Concrete Bunny Gar...
msjeannieol... €27,86 EUR

Modern Spring Jewelry, Trian...
Caprichosa... €31,84 EUR

Clay hedgehogs woodland s...
WillowandQ... €9,55 EUR

oregano spice bottle. corked ...
vitrifiedstudio €23,88 EUR

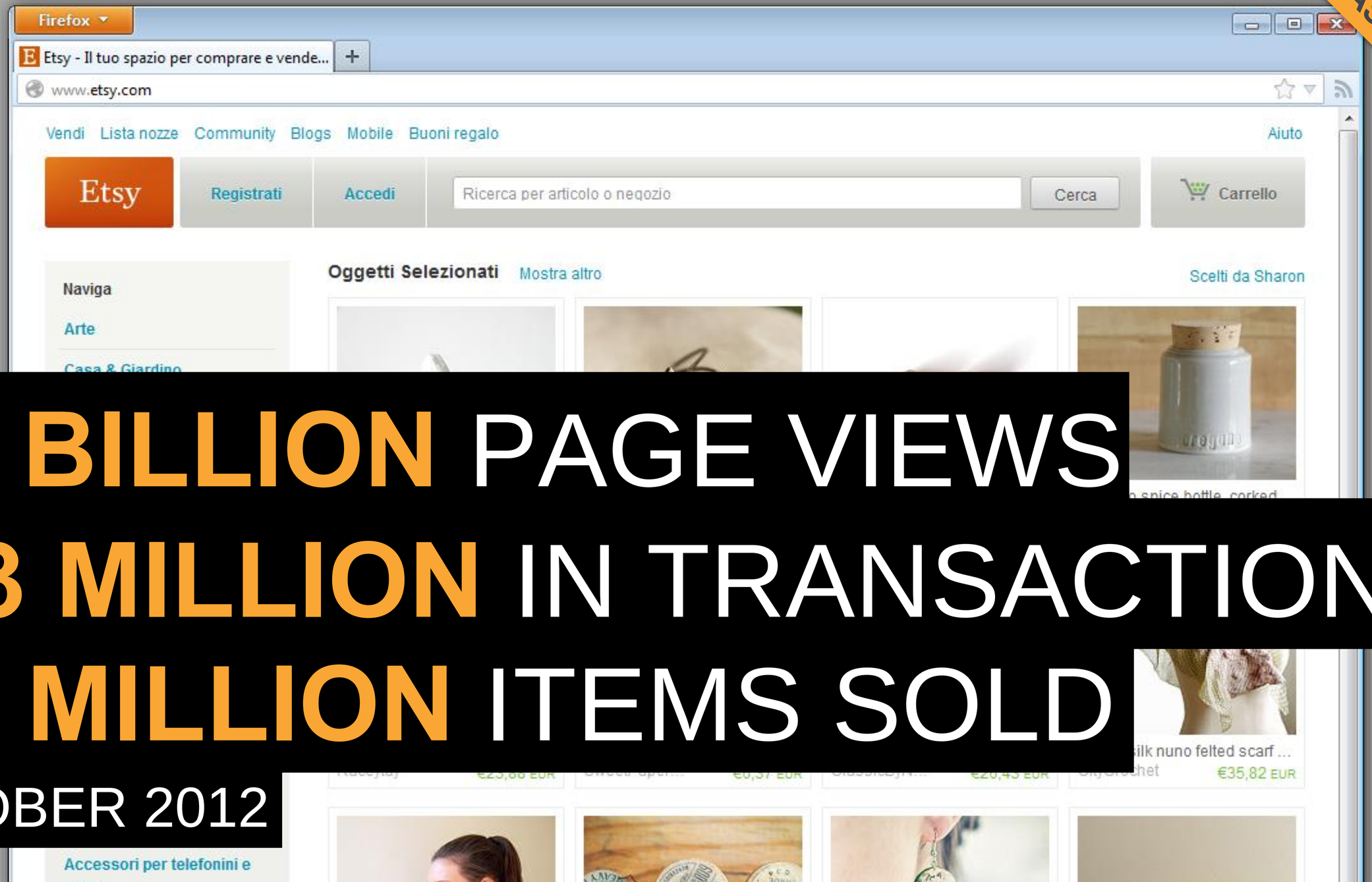
New York, Flatiron Building w...
Raceytay €23,88 EUR

Spring Bright Floral Paper B...
SweetPaper... €6,37 EUR

Bird pillow cover - Pillow cov...
ClassicByN... €26,43 EUR

Spring silk nuno felted scarf ...
CityCrochet €35,82 EUR

CASE STUDY



1.5 BILLION PAGE VIEWS
$83 MILLION IN TRANSACTIONS
4.2 MILLION ITEMS SOLD

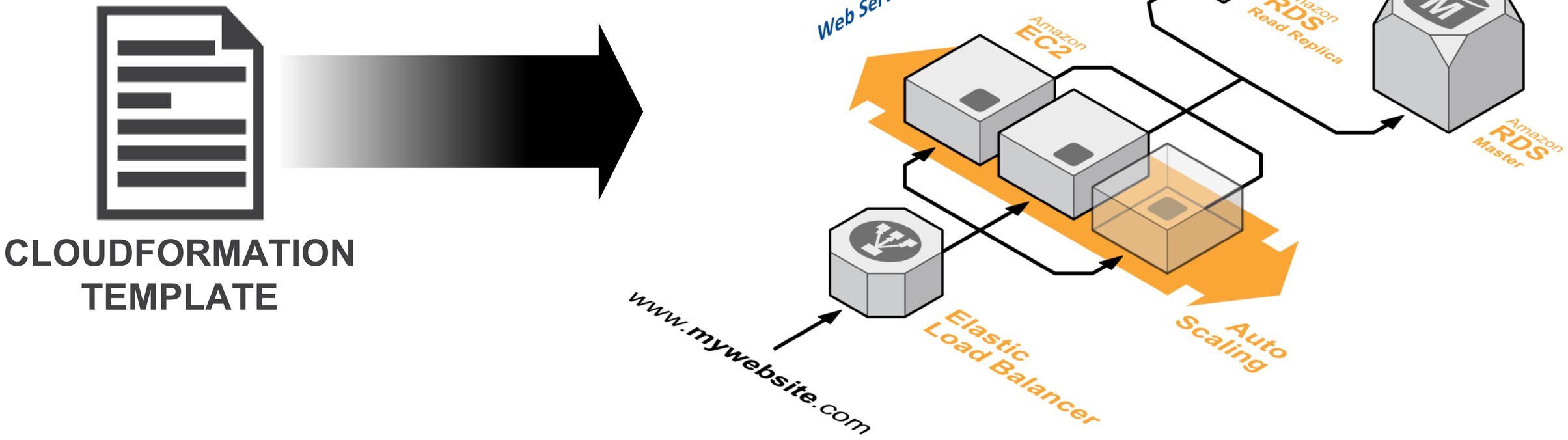
OCTOBER 2012

30 DEPLOYS PER DAY

1 DEPLOY EVERY 20 MINUTES

AWS CLOUDFORMATION

STACK-BASED DEPLOYMENT SERVICE


CLOUDFORMATION
TEMPLATE
Database Servers
Web Servers
Amazon
EC2
Amazon
RDS
Read Replica
Amazon
RDS
Master
www.mywebsite.com
Elastic
Load Balancer
Auto
Scaling

```
{
  "AWSTemplateFormatVersion" : "2010-09-09",

  "Description" : "Create an EC2 instances",

  "Parameters" : {
    "KeyName" : {
      "Description" : "Name of an existing EC2 KeyPair to enable SSH access to the instance",
      "Type" : "String"
    }
  },

  "Mappings" : {
    "RegionMap" : {
      "us-east-1" : {
          "AMI" : "ami-76f0061f"
      },
      "us-west-1" : {
          "AMI" : "ami-655a0a20"
      },
      "eu-west-1" : {
          "AMI" : "ami-7fd4e10b"
      },
      "ap-southeast-1" : {
          "AMI" : "ami-72621c20"
      },
      "ap-northeast-1" : {
          "AMI" : "ami-8e08a38f"
      }
    }
  },

  "Resources" : {
    "Ec2Instance" : {
      "Type" : "AWS::EC2::Instance",
      "Properties" : {
        "KeyName" : { "Ref" : "KeyName" },
        "ImageId" : { "Fn::FindInMap" : [ "RegionMap", { "Ref" : "AWS::Region" }, "AMI" ]},
        "UserData" : { "Fn::Base64" : "80" }
      }
    }
  },

  "Outputs" : {
    "InstanceId" : {
      "Description" : "InstanceId of the newly created EC2 instance",
      "Value" : { "Ref" : "Ec2Instance" }
    },
    "AZ" : {
      "Description" : "Availability Zone of the newly created EC2 instance",
      "Value" : { "Fn::GetAtt" : [ "Ec2Instance", "AvailabilityZone" ] }
    },
    "PublicIP" : {
      "Description" : "Public IP address of the newly created EC2 instance",
      "Value" : { "Fn::GetAtt" : [ "Ec2Instance", "PublicIp" ] }
    }
  }
}
```

Headers

Parameters

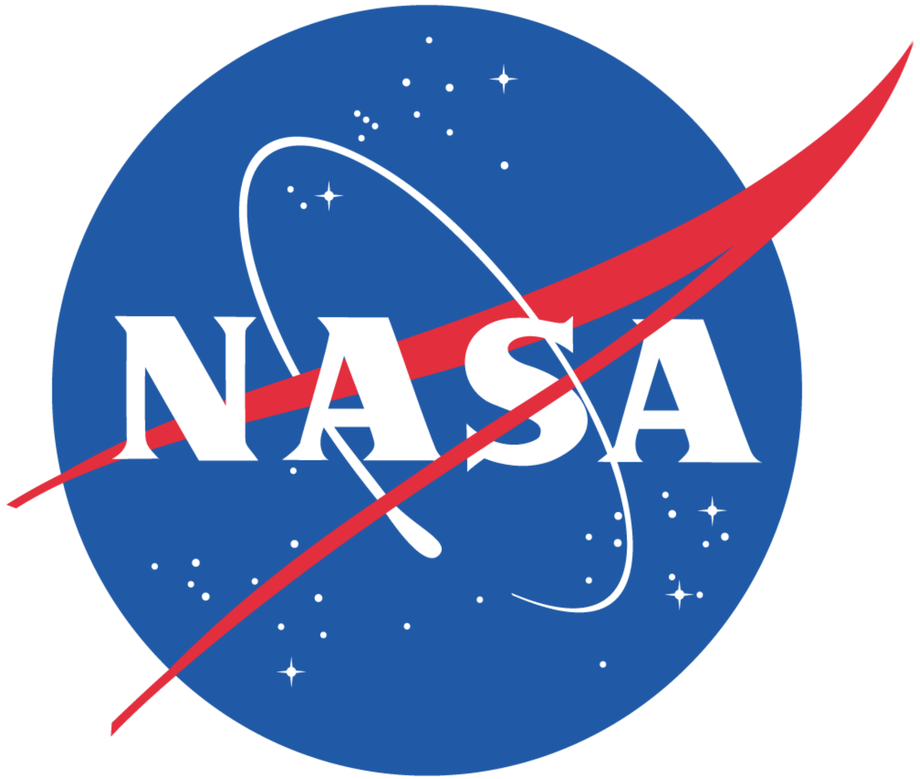
Mappings

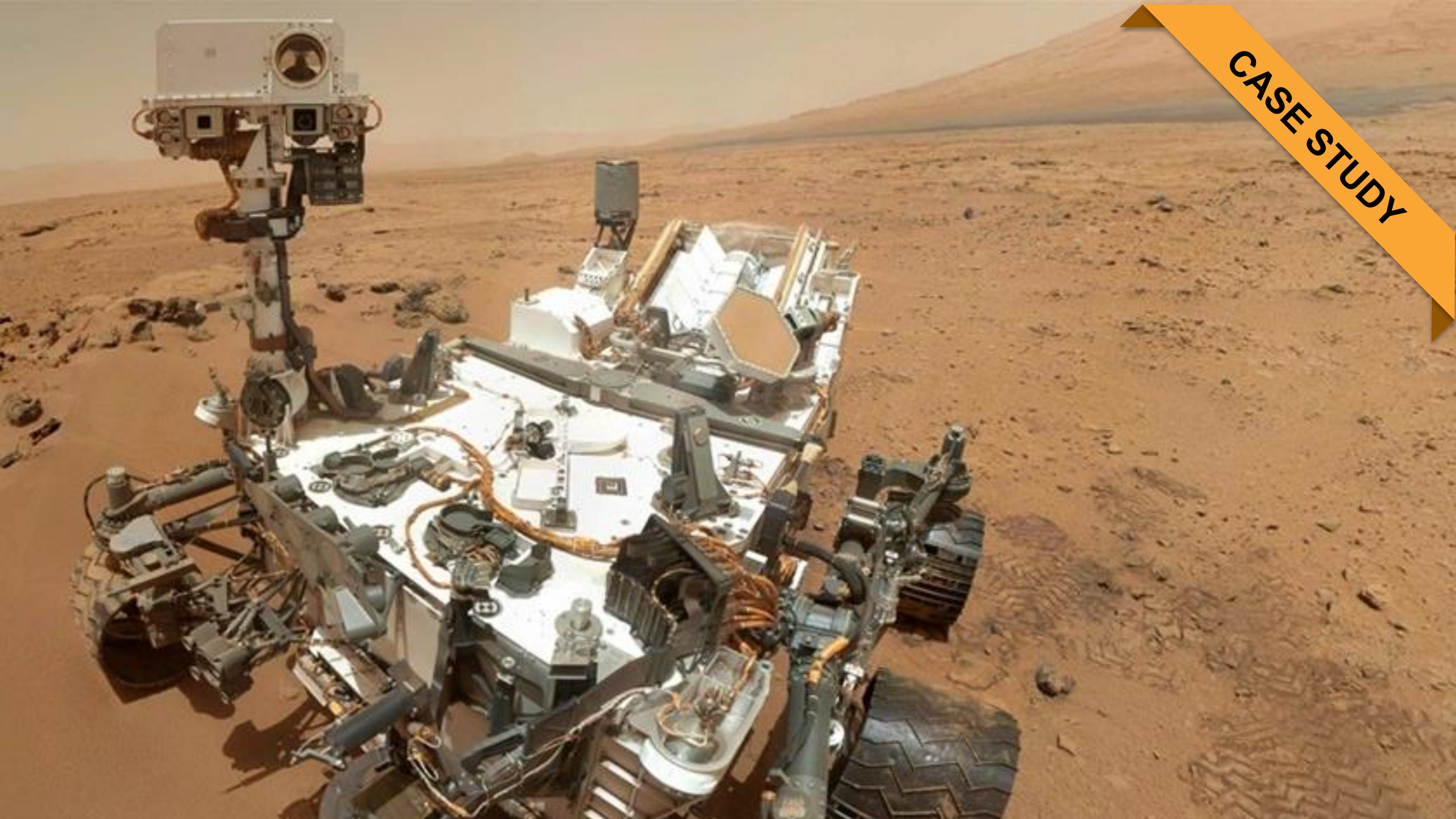
Resources

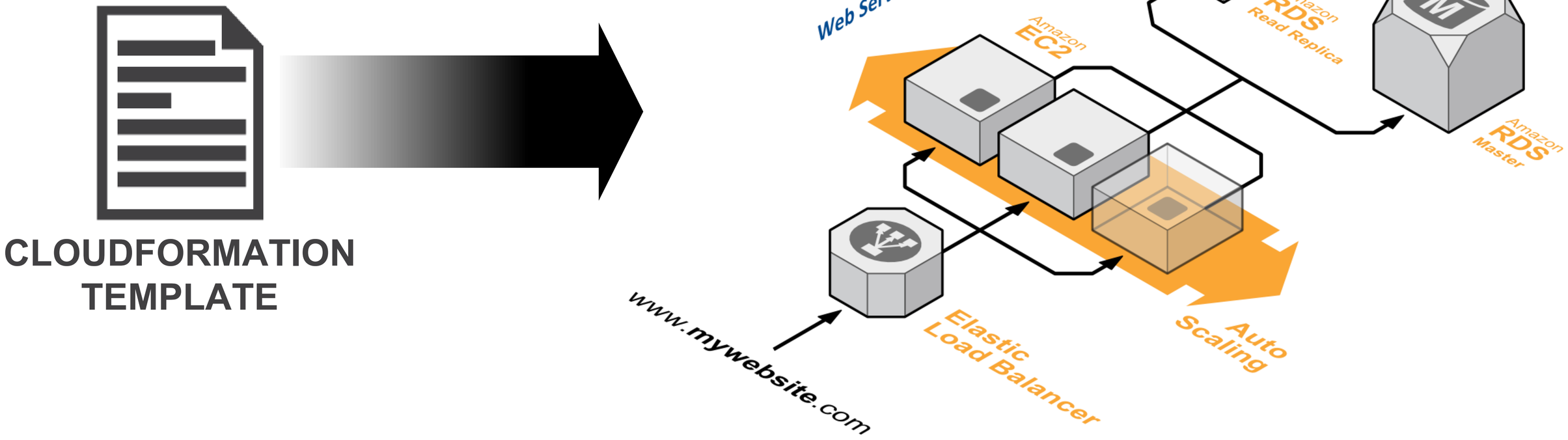
Outputs

```
{
  "Description" : "Create RDS with username and password",
  "Resources" : {

    "MyDB" : {
      "Type" : "AWS::RDS::DBInstance",
      "Properties" : {
        "AllocatedStorage" : "500",
        "DBInstanceClass" : "db.m1.small",
        "Engine" : "MySQL",
        "EngineVersion" : "5.5",
        "MasterUsername" : "MyName",
        "MasterUserPassword" : "MyPassword"
      }
    }
  }
}
```

```
"AWS::CloudFormation::Init" : {  "config" : {

    "packages" : {
      "yum" : {
        "mysql"         : [],
        "mysql-server" : [],
        "httpd"         : [],
        "php"           : [],
        "php-mysql"     : []
      }
    },
    "sources" : {
      "/var/www/html" :
         "https://s3.amazonaws.com/my-builds/build-v4.zip"
    }
  }
```


NASA


CASE STUDY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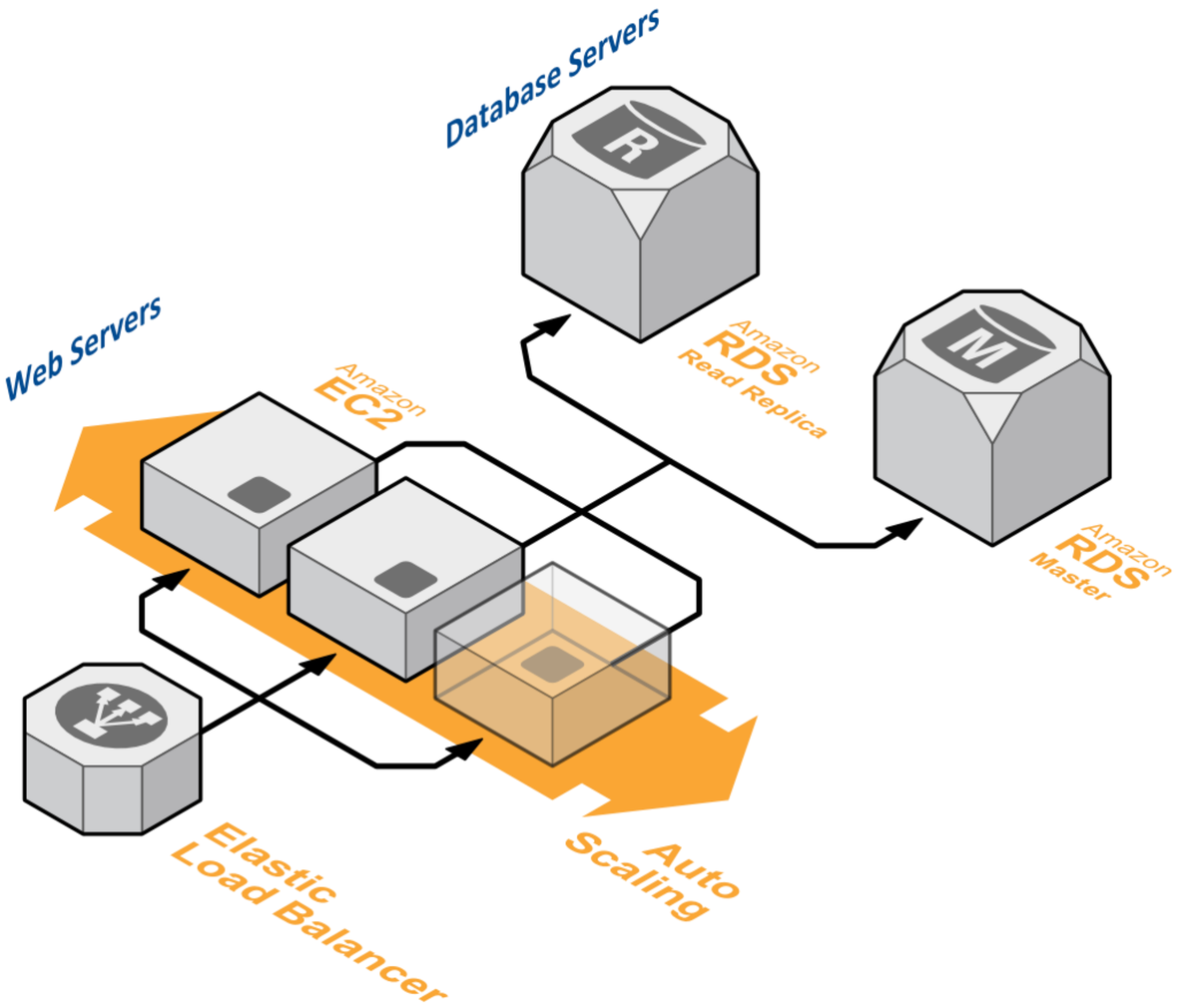
Scaling

ARCHITECTURE AS CODE

SOFTWARE
VERSIONS

ARCHITECTURE
VERSIONS

TEST ENVIRONMENTS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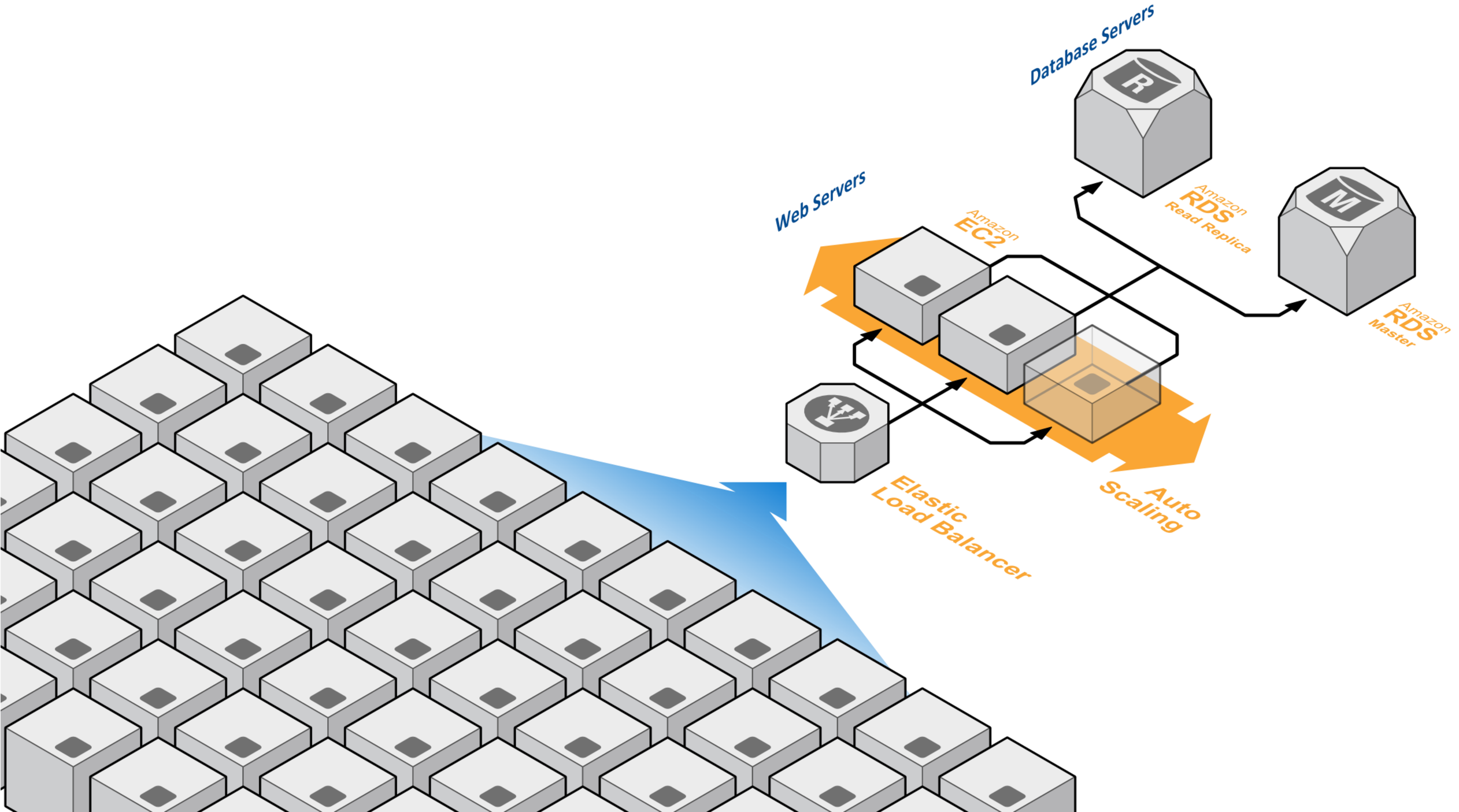
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Auto Scaling

CALL OF DUTY
MW3

USING AMAZON EC2 TO SIMULATE

2.4 MILLION PLAYERS

BEST PRACTICES

GAME DAYS

SIMULATE INCIDENTS IN A TEST ENVIRONMENT.
MEASURE SPEED OF DETECTION AND EXECUTION.

1. PUSH BUTTON TO OPEN DOOR
2. PULL RING OUT 6 FEET TO
JETTISON CANOPY
RESCUE
DANGER
EJECTION
SEAT
DANGER
DANGER

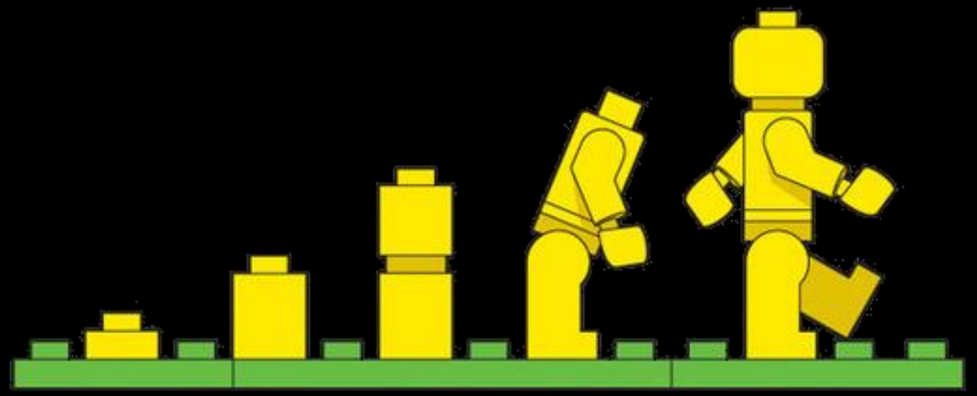
NETFLIX CHAOS MONKEY

RANDOMLY TERMINATE INSTANCES TO TEST FAULT-TOLERANCE

1. DESIGN FOR FAILURE
2. USE MULTI-AZs
3. BUILD FOR SCALE
4. DECOUPLE COMPONENTS
5. AUTOMATE & TEST

« Civilisation advances by extending the number of operations we can do without thinking about them. »

– Alfred North Whitehead



carlosco@amazon.lu @caarlco