Classic Solutions Architecture & Beanstalk

Section Introduction

- These solutions architectures are the best part of this course
- Let's understand how all the technologies we've seen work together
- This is a section you need to be 100% comfortable with

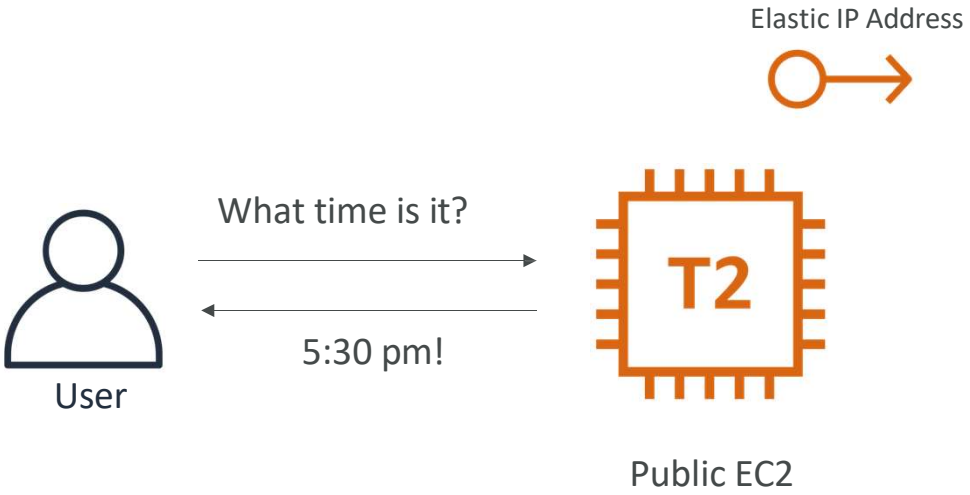
- We'll see the progression of a Solution's architect mindset through many sample case studies:
  - WhatIsTheTime.Com
  - MyClothes.Com
  - MyWordPress.Com
  - Instantiating applications quickly
  - Beanstalk

Stateless Web App: WhatIsTheTime.com

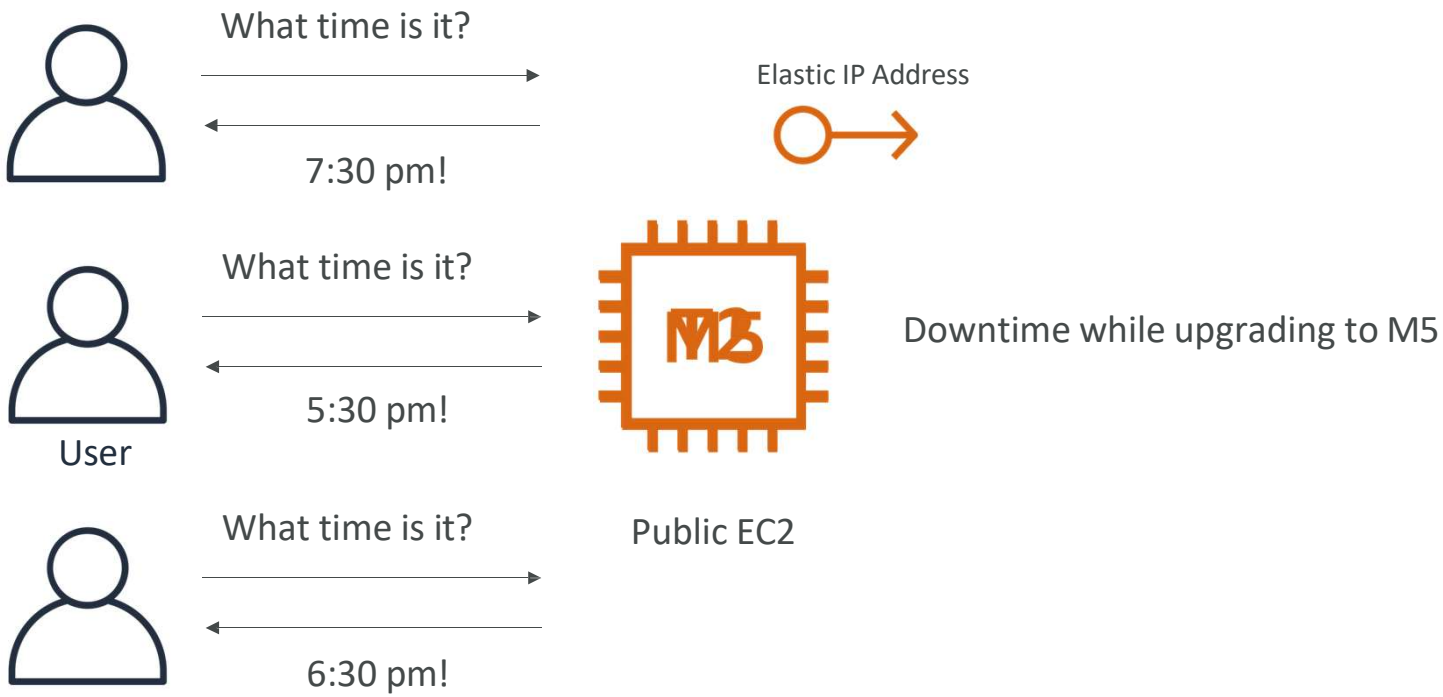
- WhatIsTheTime.com allows people to know what time it is
- We don't need a database
- We want to start small and can accept downtime
- We want to fully scale vertically and horizontally, no downtime
- Let's go through the Solutions Architect journey for this app

- Let's see how we can proceed!

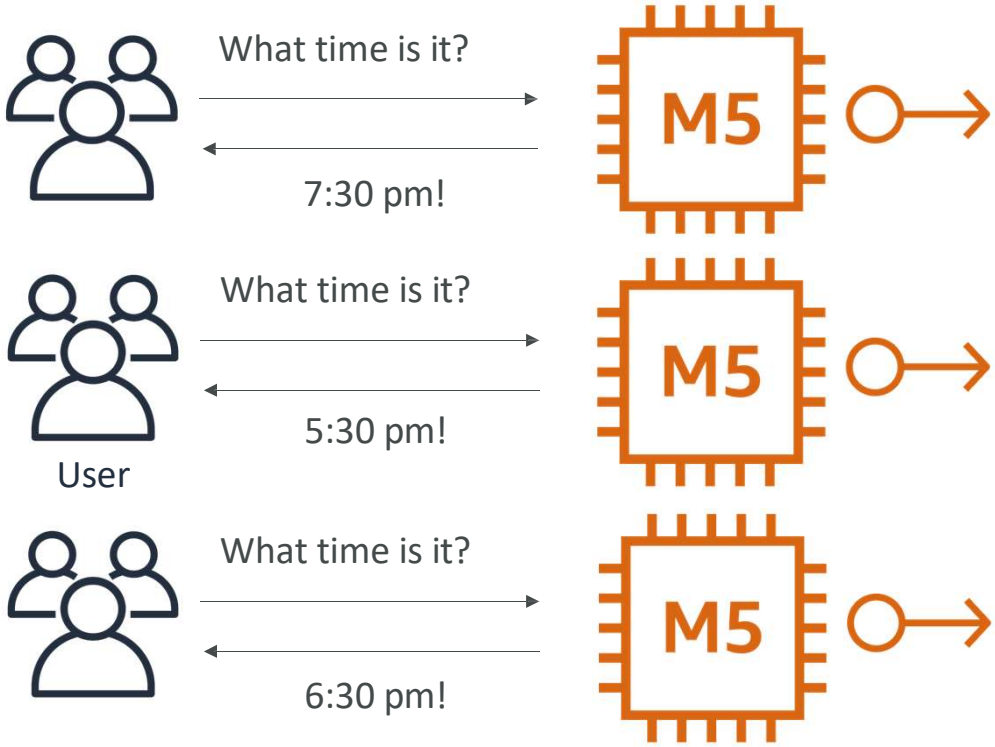
Stateless web app: What time is it? Starting simple



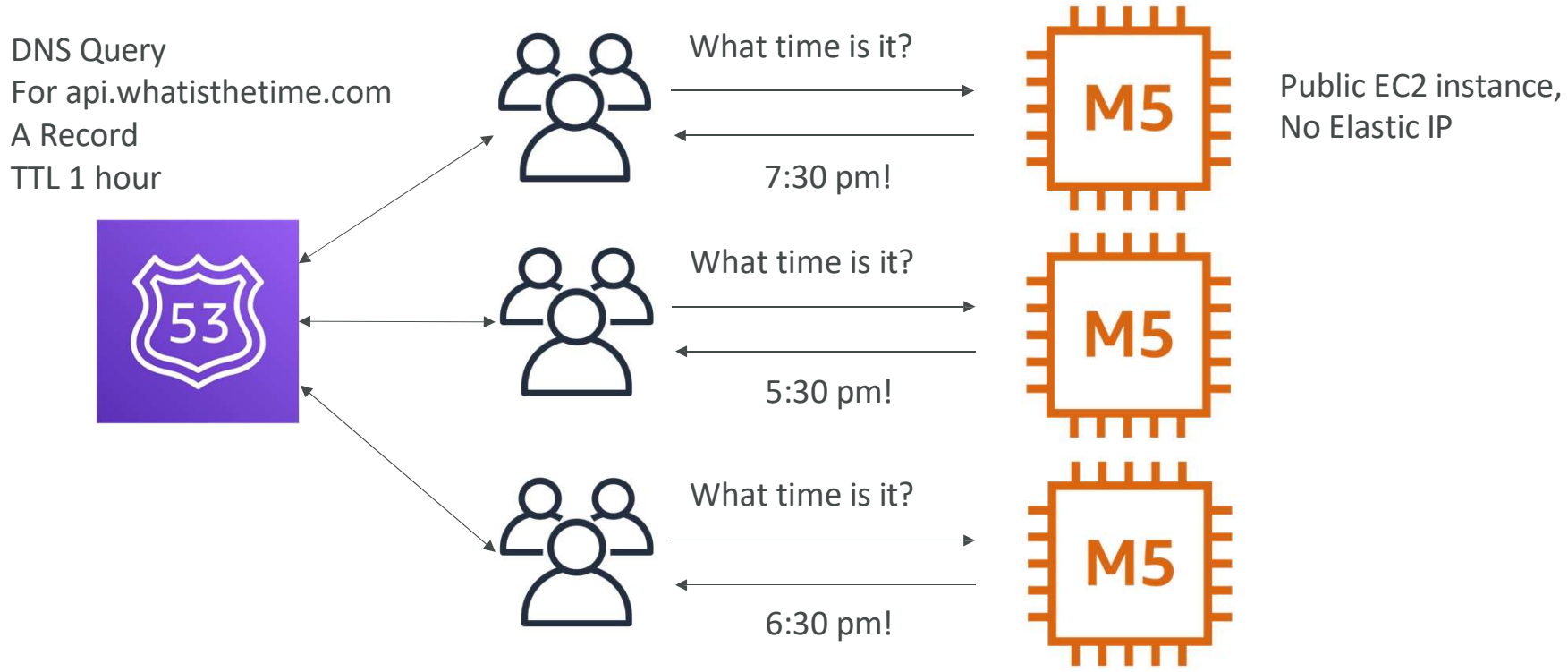
Stateless web app: What time is it? Scaling vertically



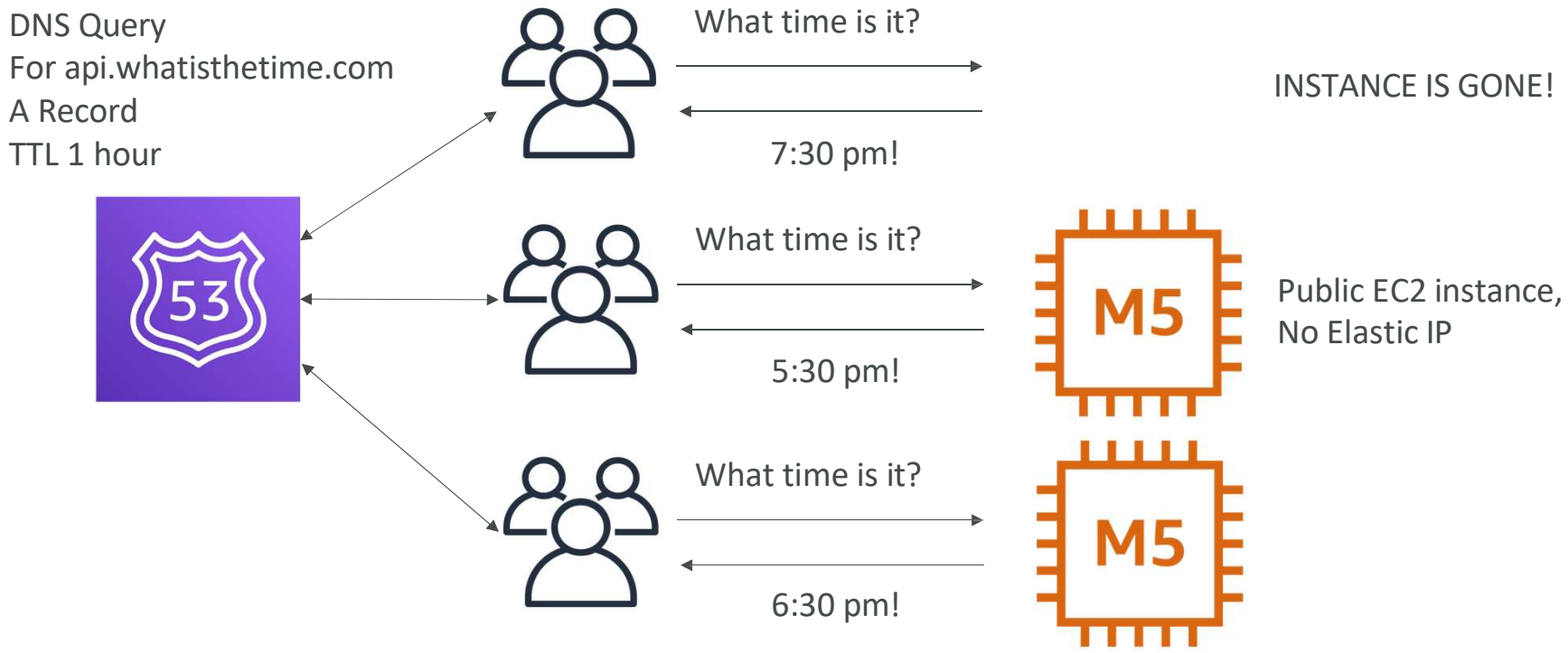
Stateless web app: What time is it? Scaling horizontally



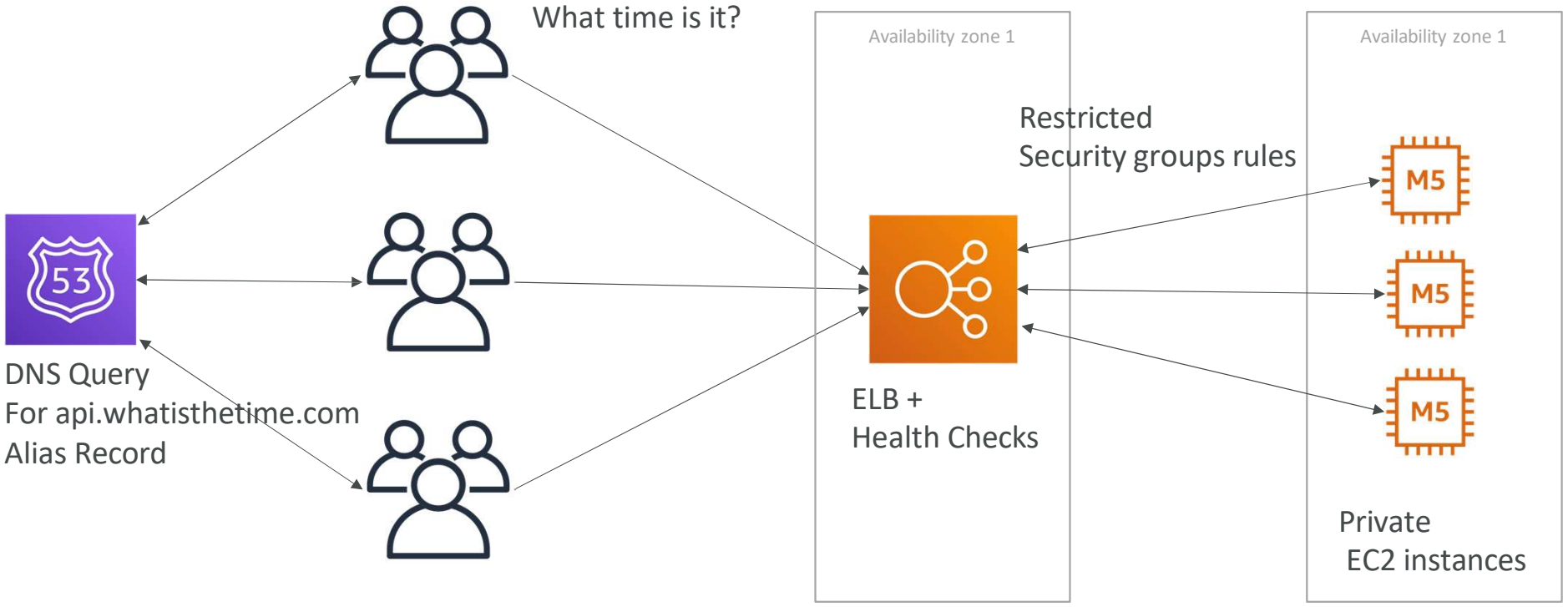
Stateless web app: What time is it? Scaling horizontally



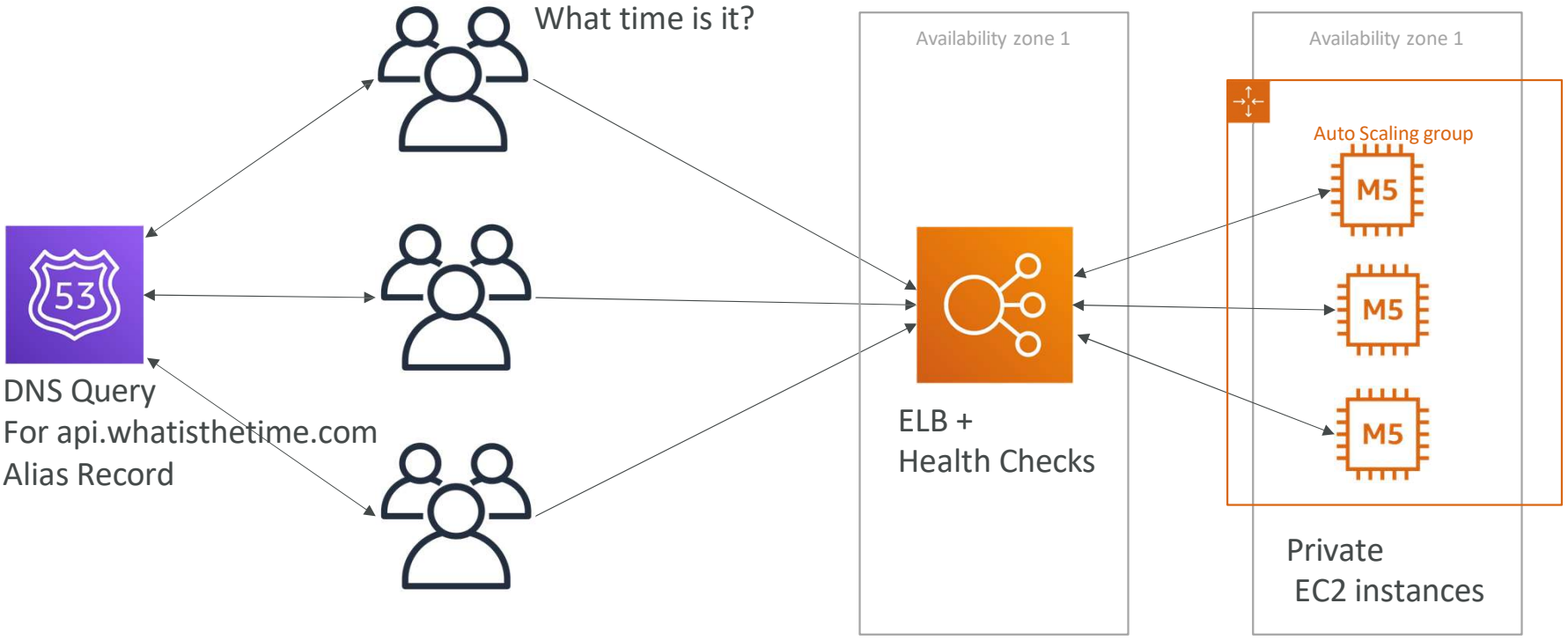
Stateless web app: What time is it?
Scaling horizontally, adding and removing instances



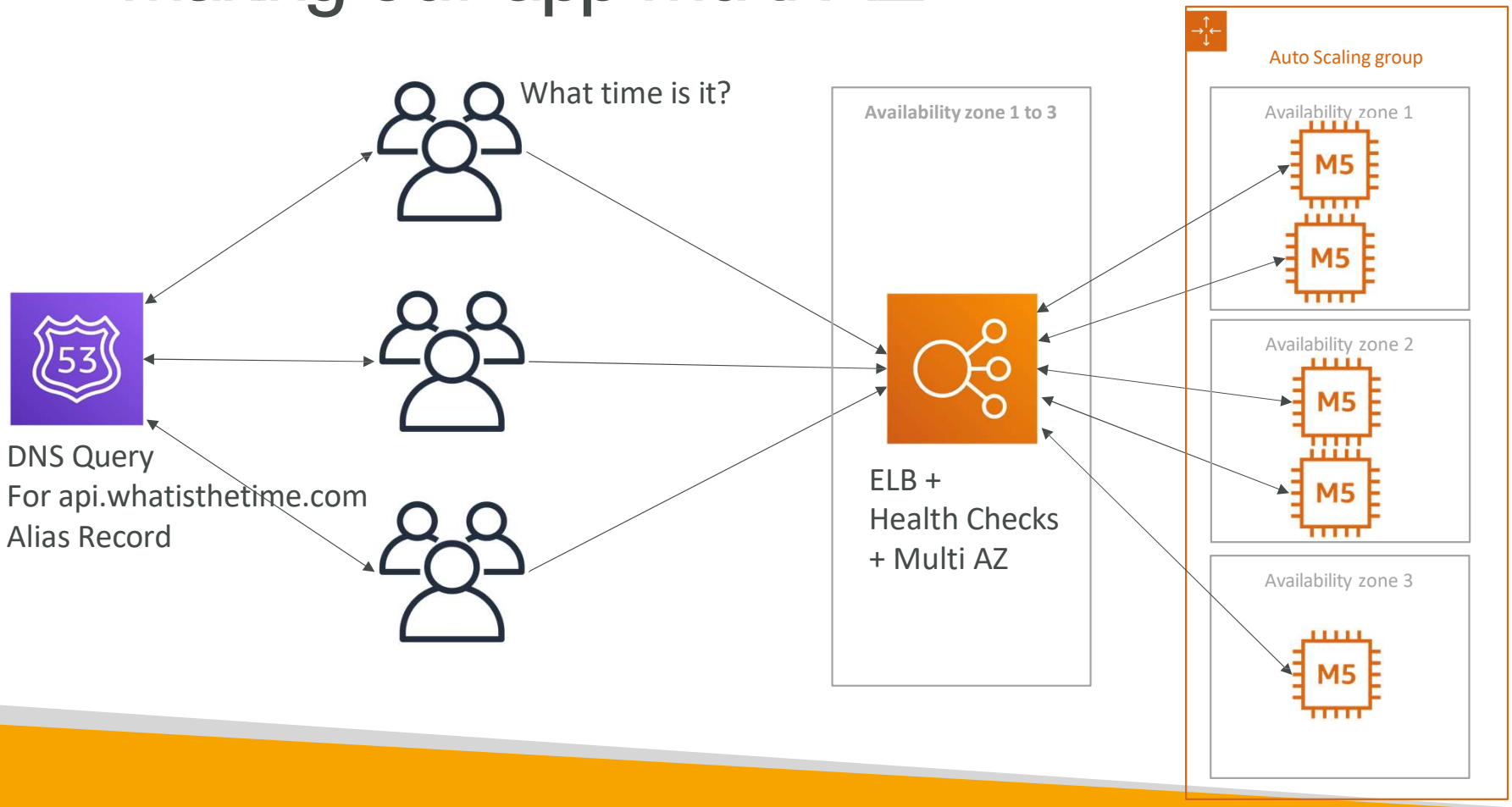
Stateless web app: What time is it?
Scaling horizontally, with a load balancer



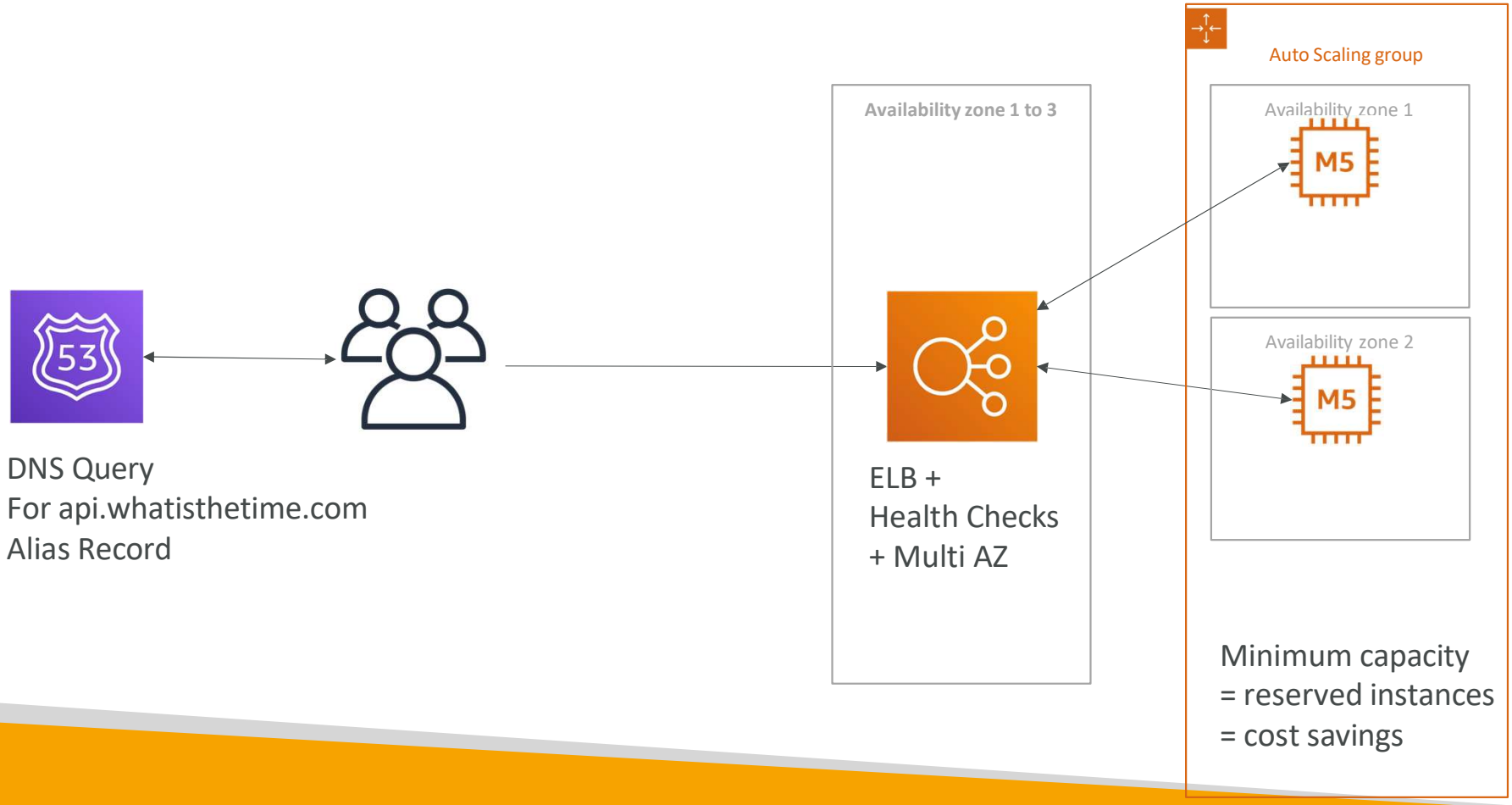
Stateless web app: What time is it?
Scaling horizontally, with an auto-scaling group



Stateless web app: What time is it? Making our app multi-AZ



Minimum 2 AZ => Let's reserve capacity



In this we've discussed...

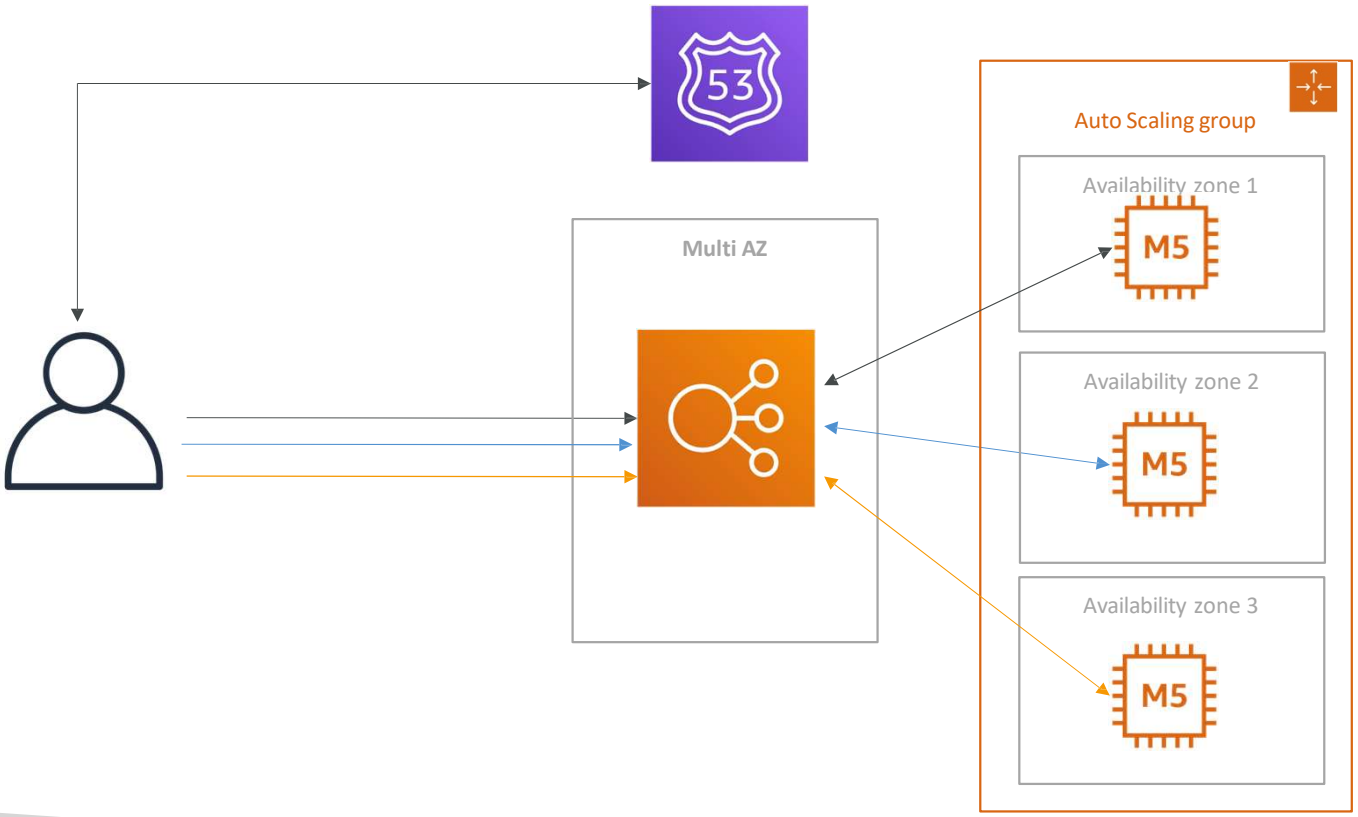
- Public vs Private IP and EC2 instances
- Elastic IP vs Route 53 vs Load Balancers
- Route 53 TTL, A records and Alias Records
- Maintaining EC2 instances manually vs Auto Scaling Groups
- Multi AZ to survive disasters
- ELB Health Checks
- Security Group Rules
- Reservation of capacity for costing savings when possible

Stateful Web App: MyClothes.com

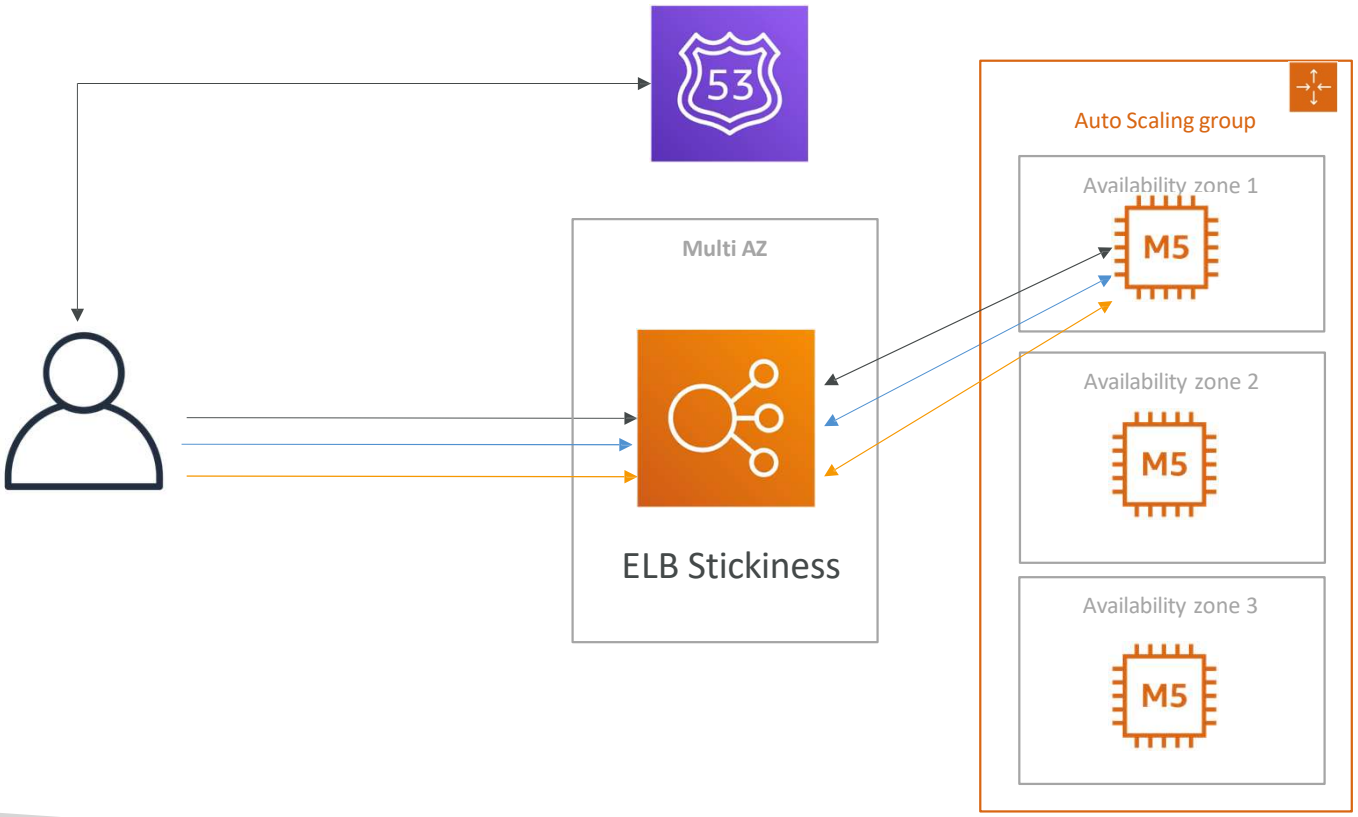
- MyClothes.com allows people to buy clothes online.
- There's a shopping cart
- Our website is having hundreds of users at the same time
- We need to scale, maintain horizontal scalability and keep our web application as stateless as possible
- Users should not lose their shopping cart
- Users should have their details (address, etc) in a database

- Let's see how we can proceed!

Stateful Web App: MyClothes.com



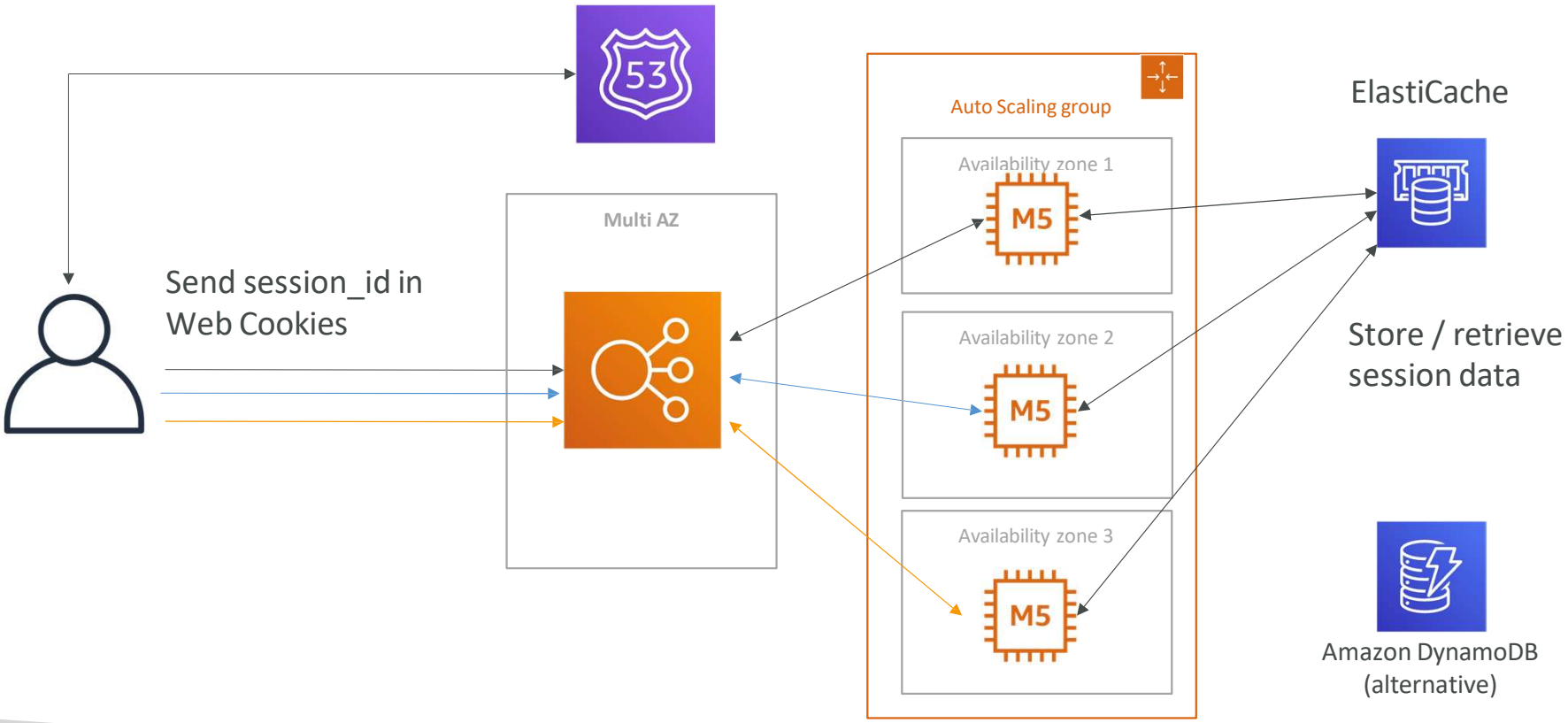
Stateful Web App: MyClothes.com Introduce Stickiness (Session Affinity)



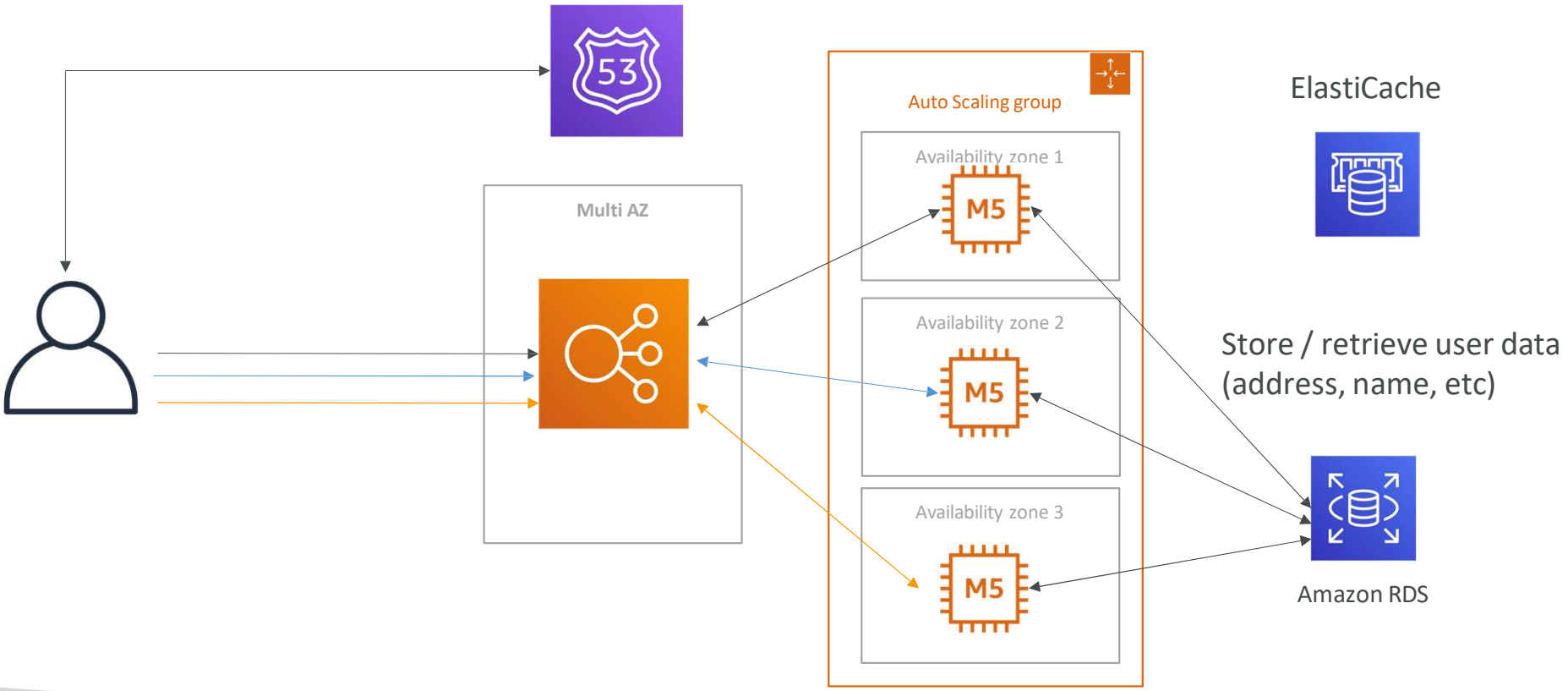
Stateful Web App: MyClothes.com Introduce User Cookies

Stateless
HTTP requests are heavier
Security risk
(cookies can be altered)
Cookies must be validated
Cookies must be less than 4KB

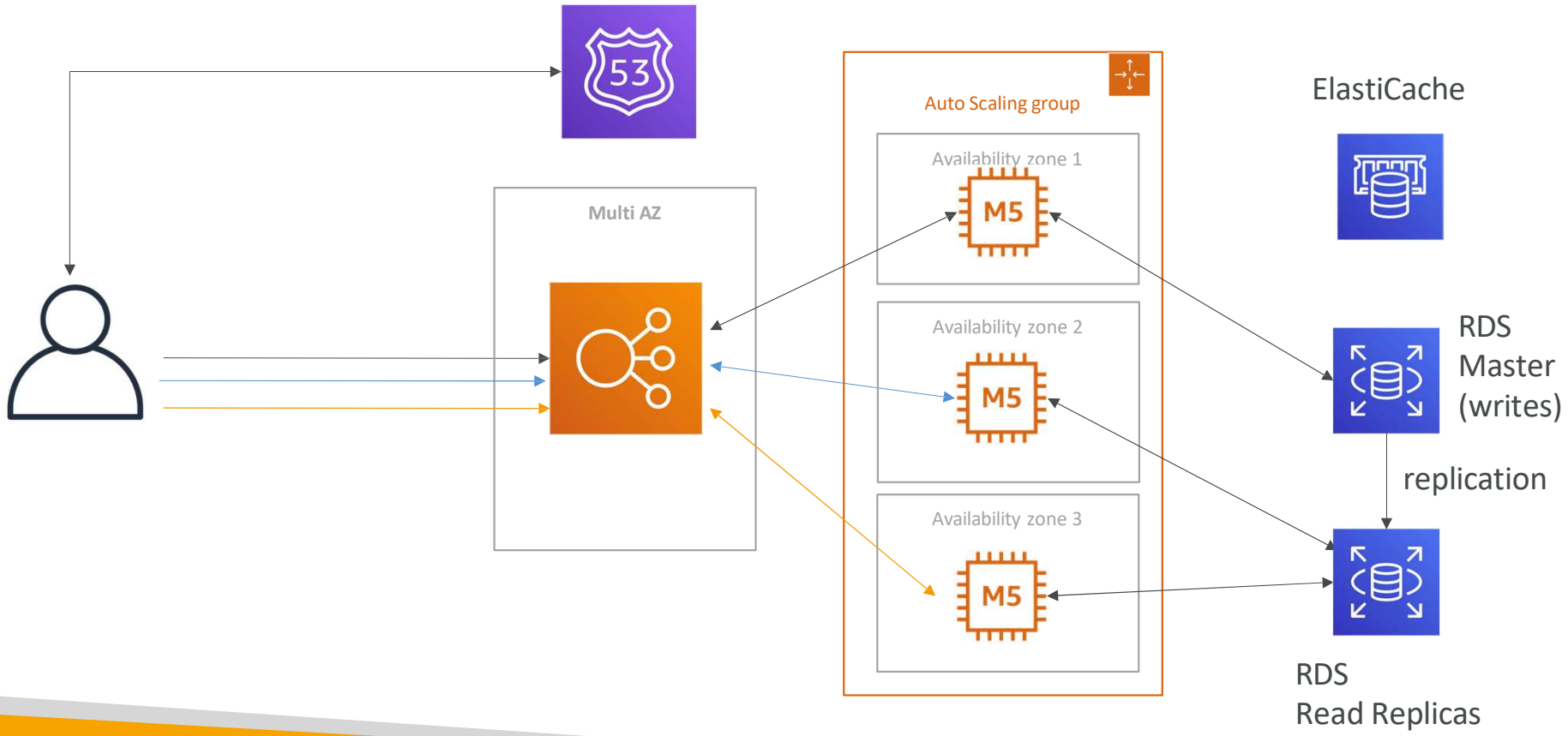
Stateful Web App: MyClothes.com
Introduce Server Session



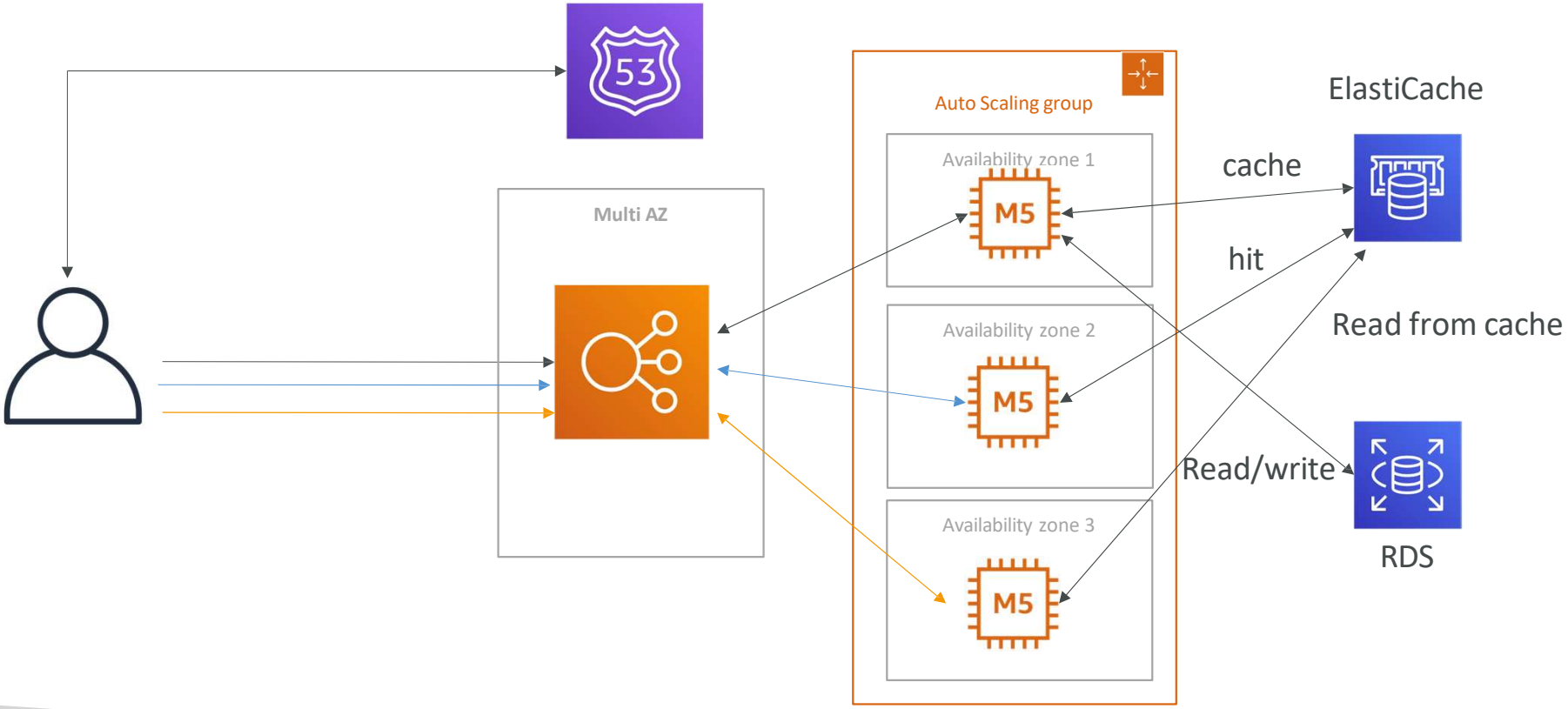
Stateful Web App: MyClothes.com
Storing User Data in a database



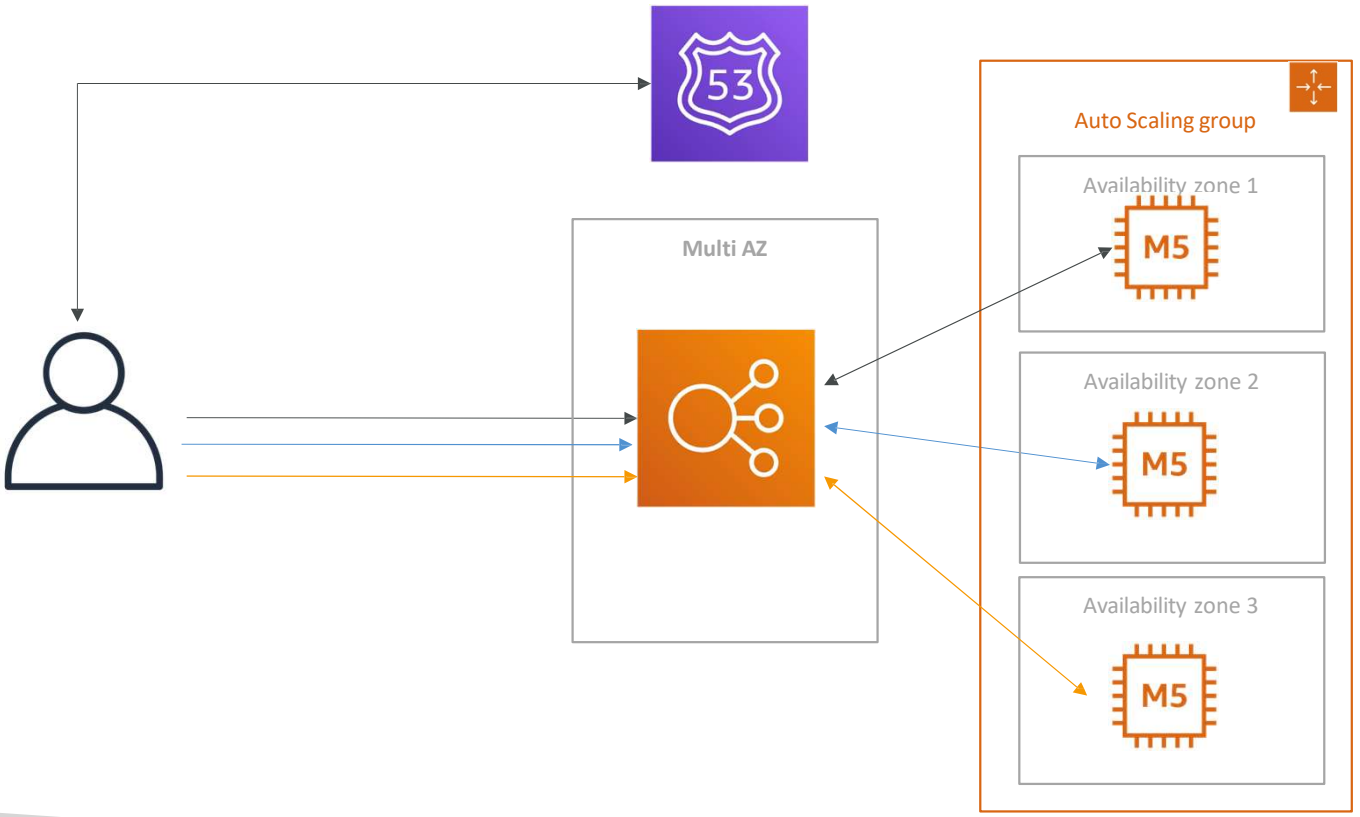
Stateful Web App: MyClothes.com
Scaling Reads



Stateful Web App: MyClothes.com
Scaling Reads (Alternative) - Lazy Loading



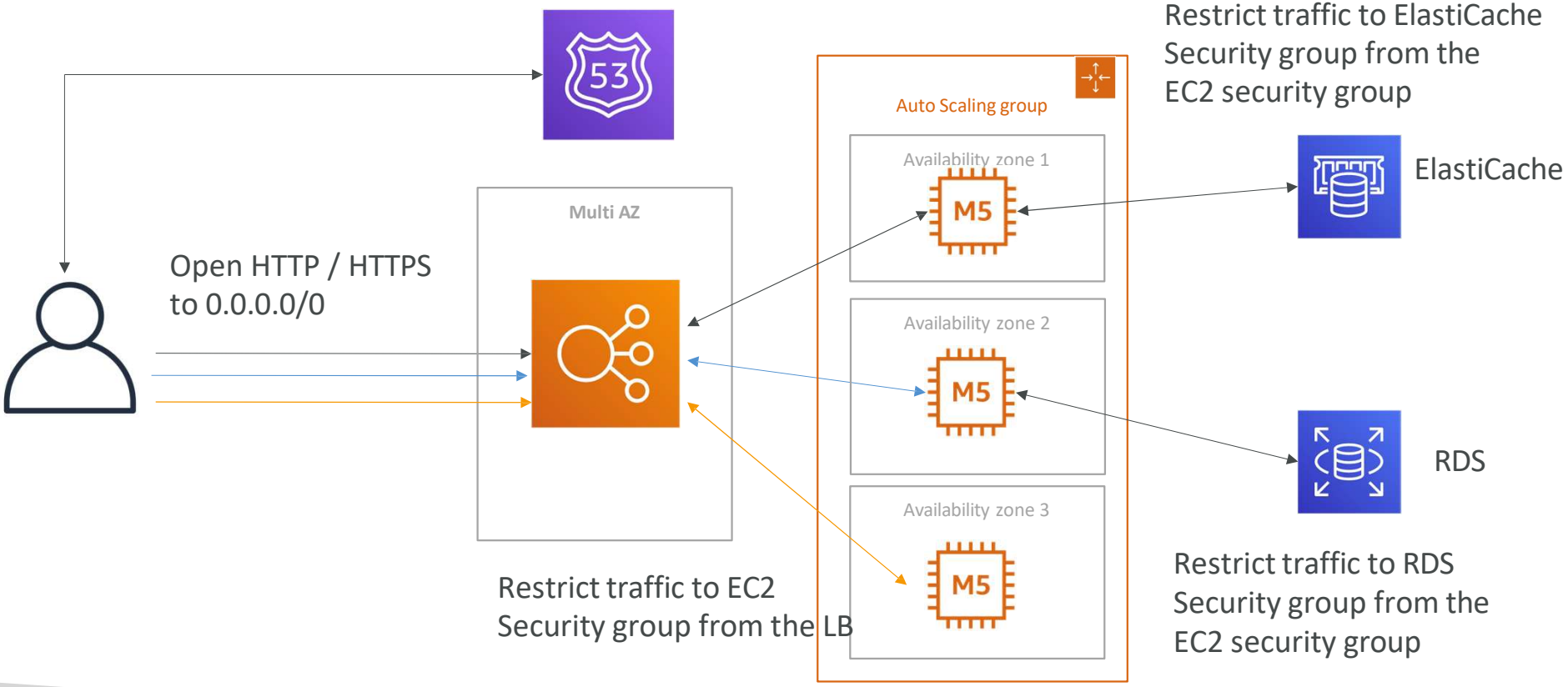
Stateful Web App: MyClothes.com
Multi AZ - Survive disasters



ElastiCache
Multi AZ

RDS
Multi AZ

Stateful Web App: MyClothes.com Security Groups



In this we've discussed...
3-tier architectures for web applications

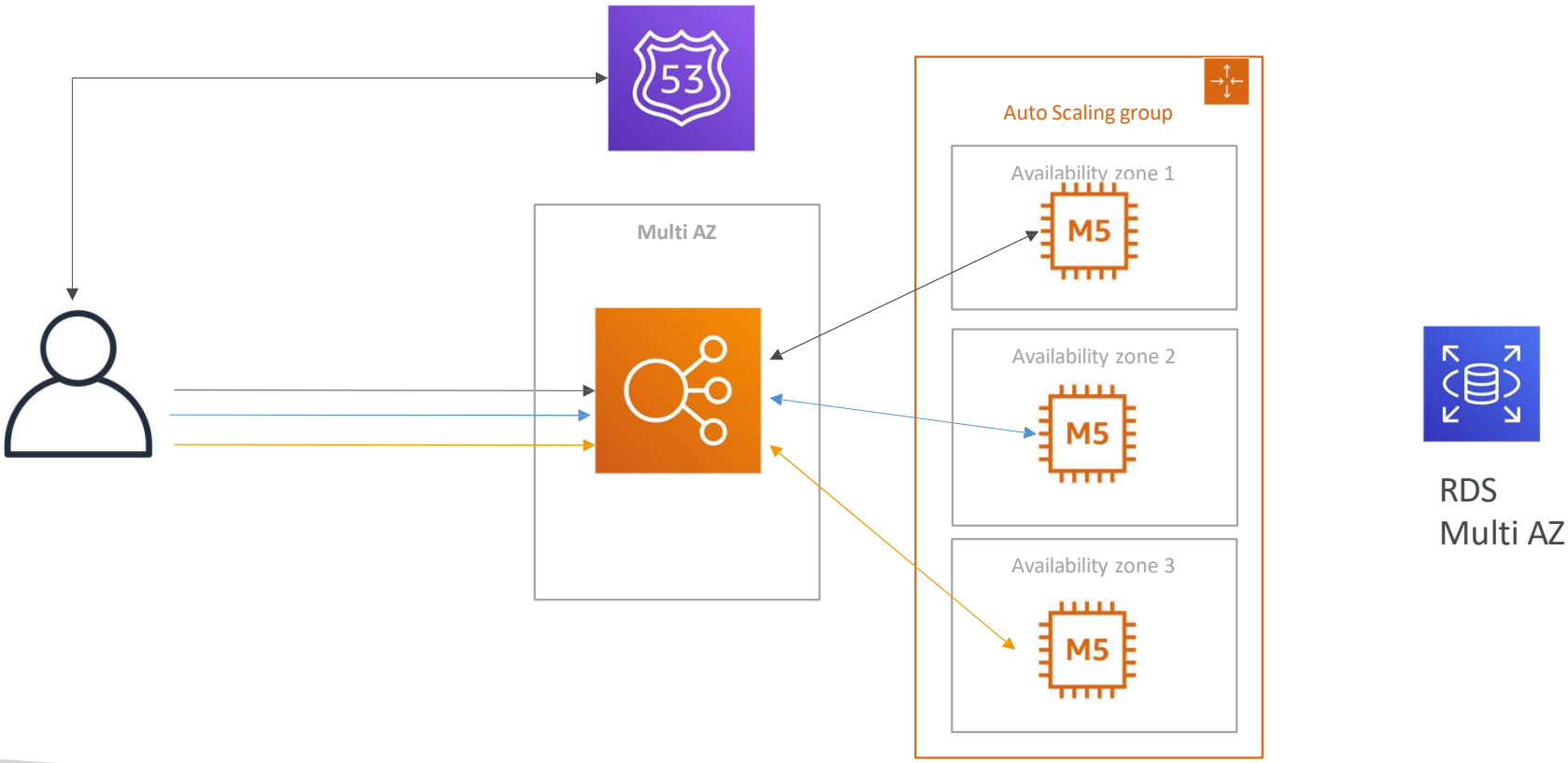
- ELB sticky sessions
- Web clients for storing cookies and making our web app stateless
- ElastiCache
  - For storing sessions (alternative: DynamoDB)
  - For caching data from RDS
  - Multi AZ
- RDS
  - For storing user data
  - Read replicas for scaling reads
  - Multi AZ for disaster recovery
- Tight Security with security groups referencing each other

Stateful Web App: MyWordPress.com

- We are trying to create a fully scalable WordPress website
- We want that website to access and correctly display picture uploads
- Our user data, and the blog content should be stored in a MySQL database.

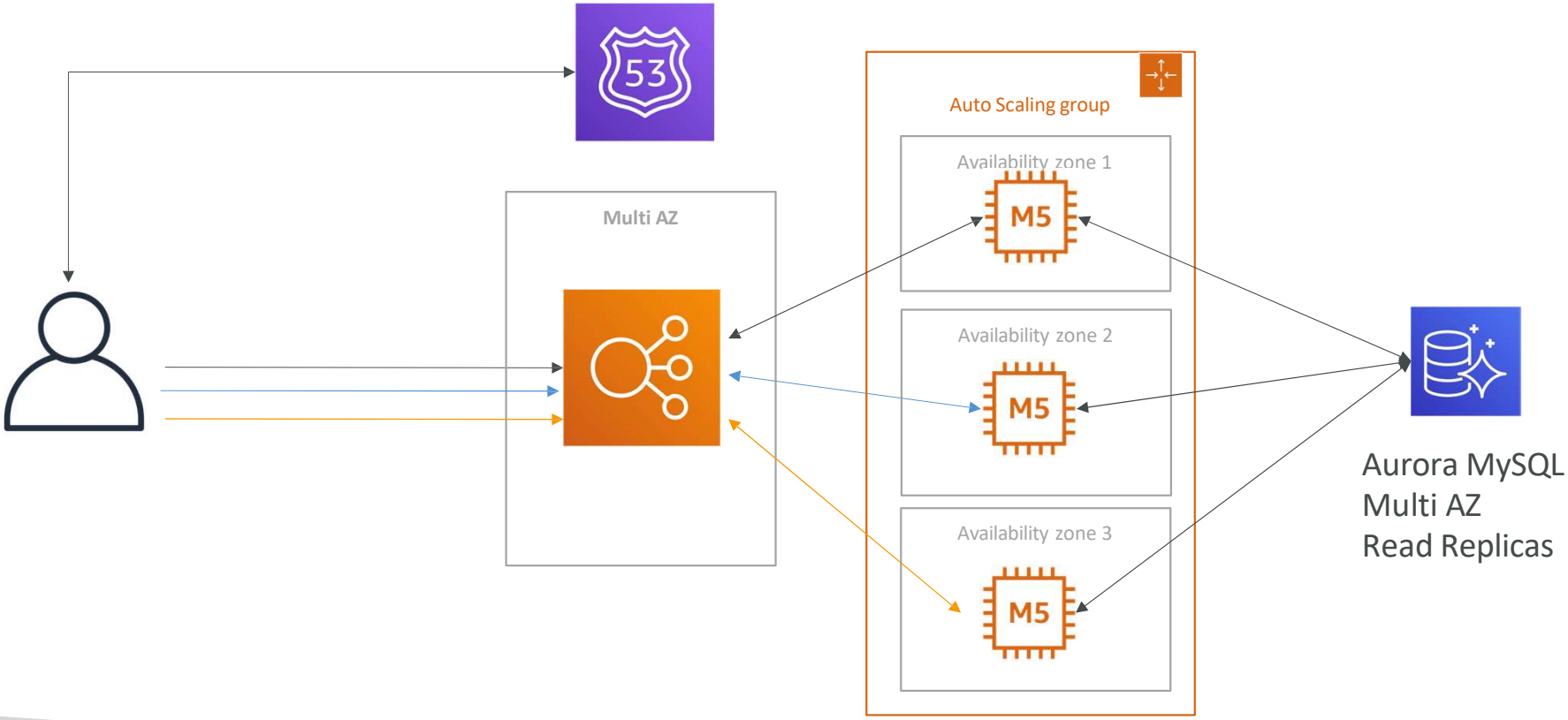
- Let's see how we can achieve this!

Stateful Web App: MyWordPress.com
RDS layer

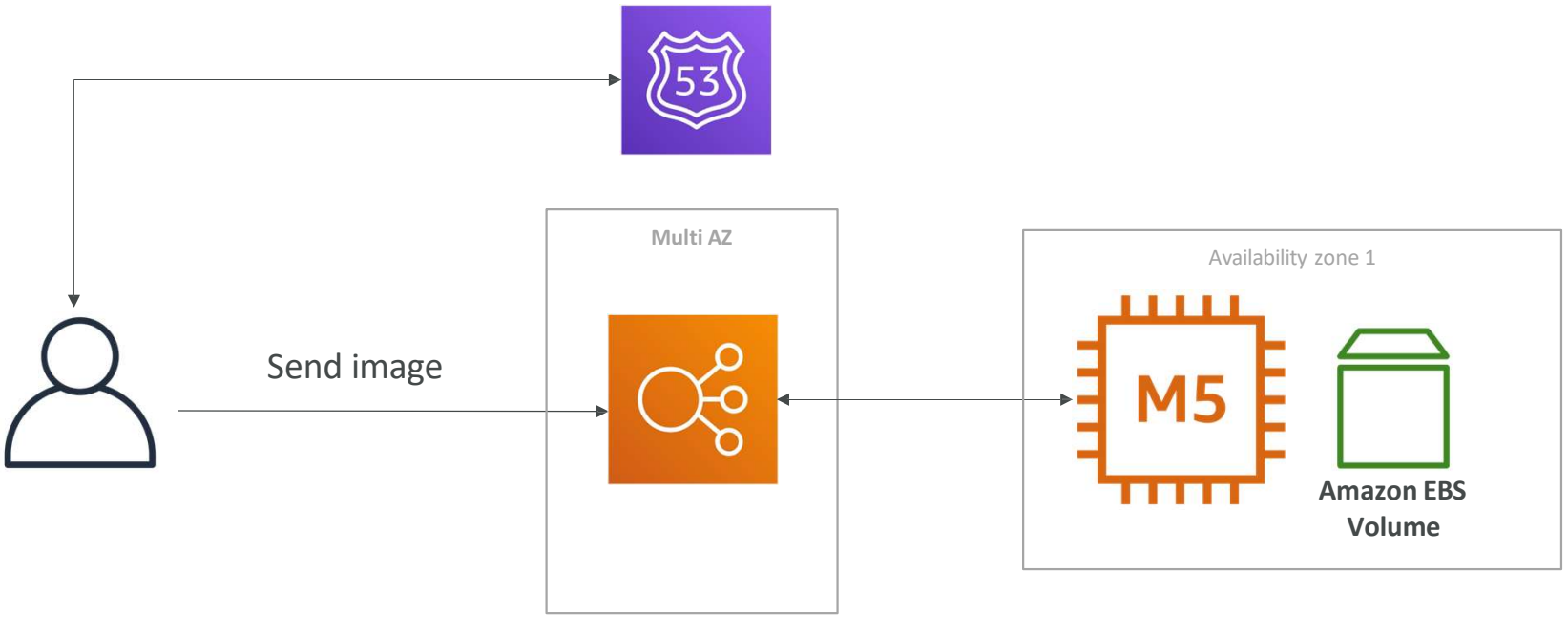


RDS
Multi AZ

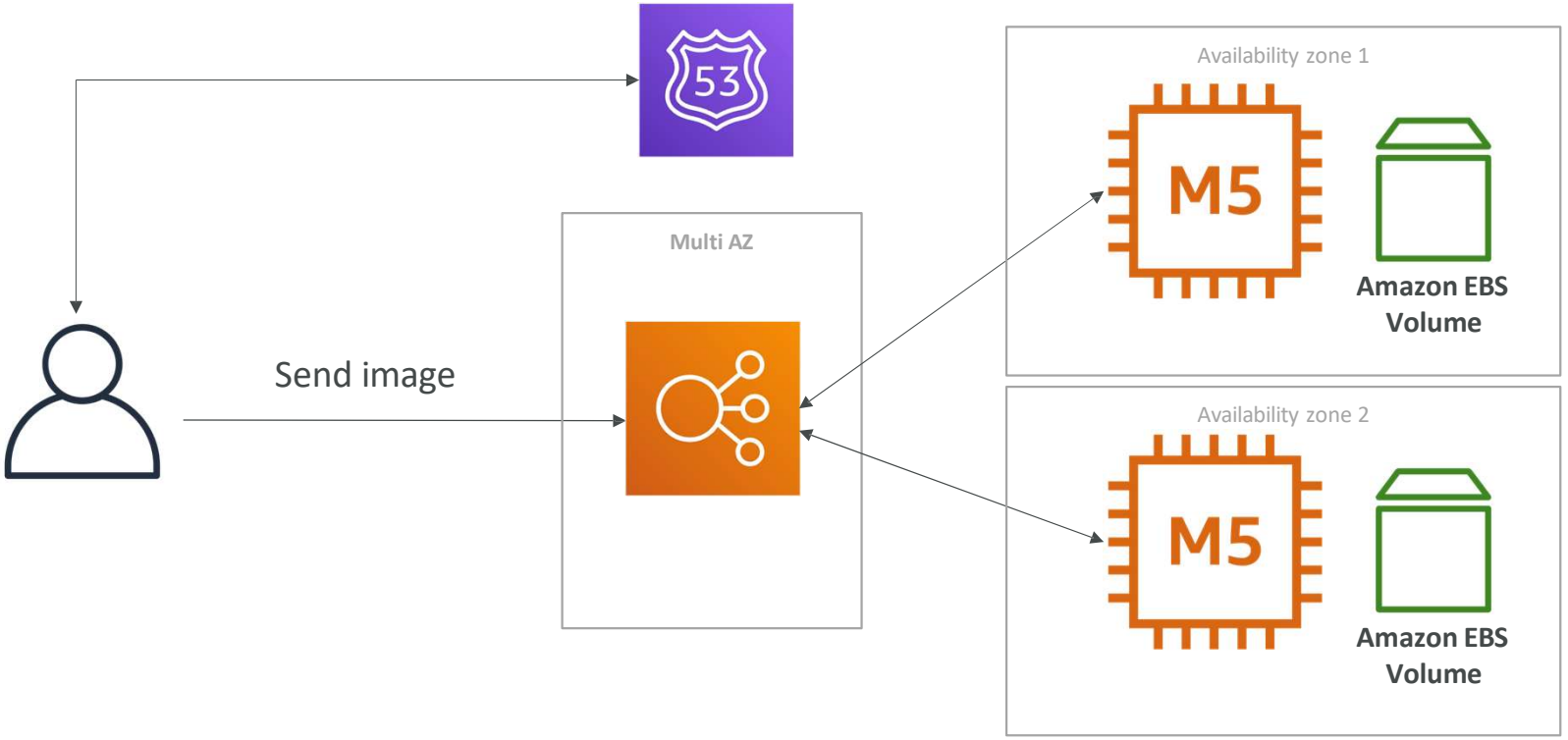
Stateful Web App: MyWordPress.com
Scaling with Aurora: Multi AZ & Read Replicas



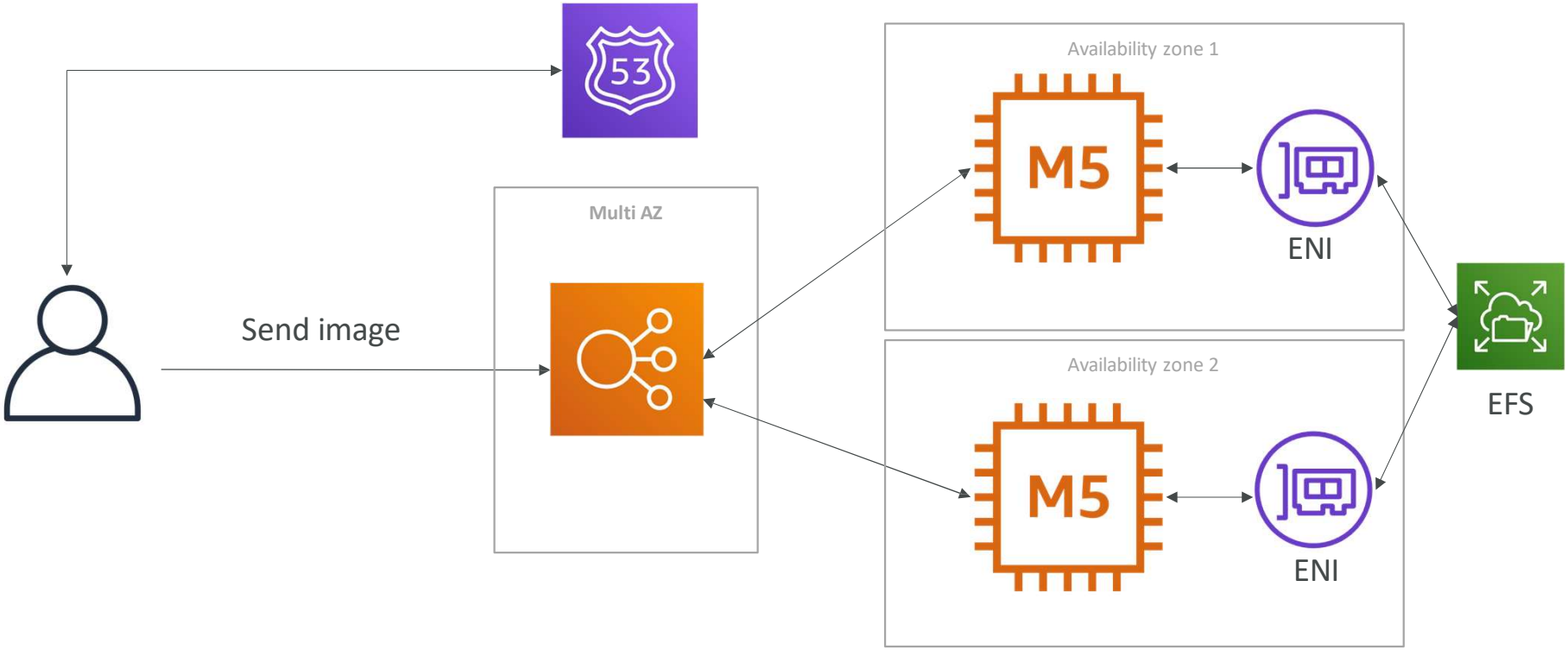
Stateful Web App: MyWordPress.com Storing images with EBS



Stateful Web App: MyWordPress.com Storing images with EBS



Stateful Web App: MyWordPress.com
Storing images with EFS



In this we've discussed...

- Aurora Database to have easy Multi-AZ and Read-Replicas
- Storing data in EBS (single instance application)
- Vs Storing data in EFS (distributed application)

Instantiating Applications quickly

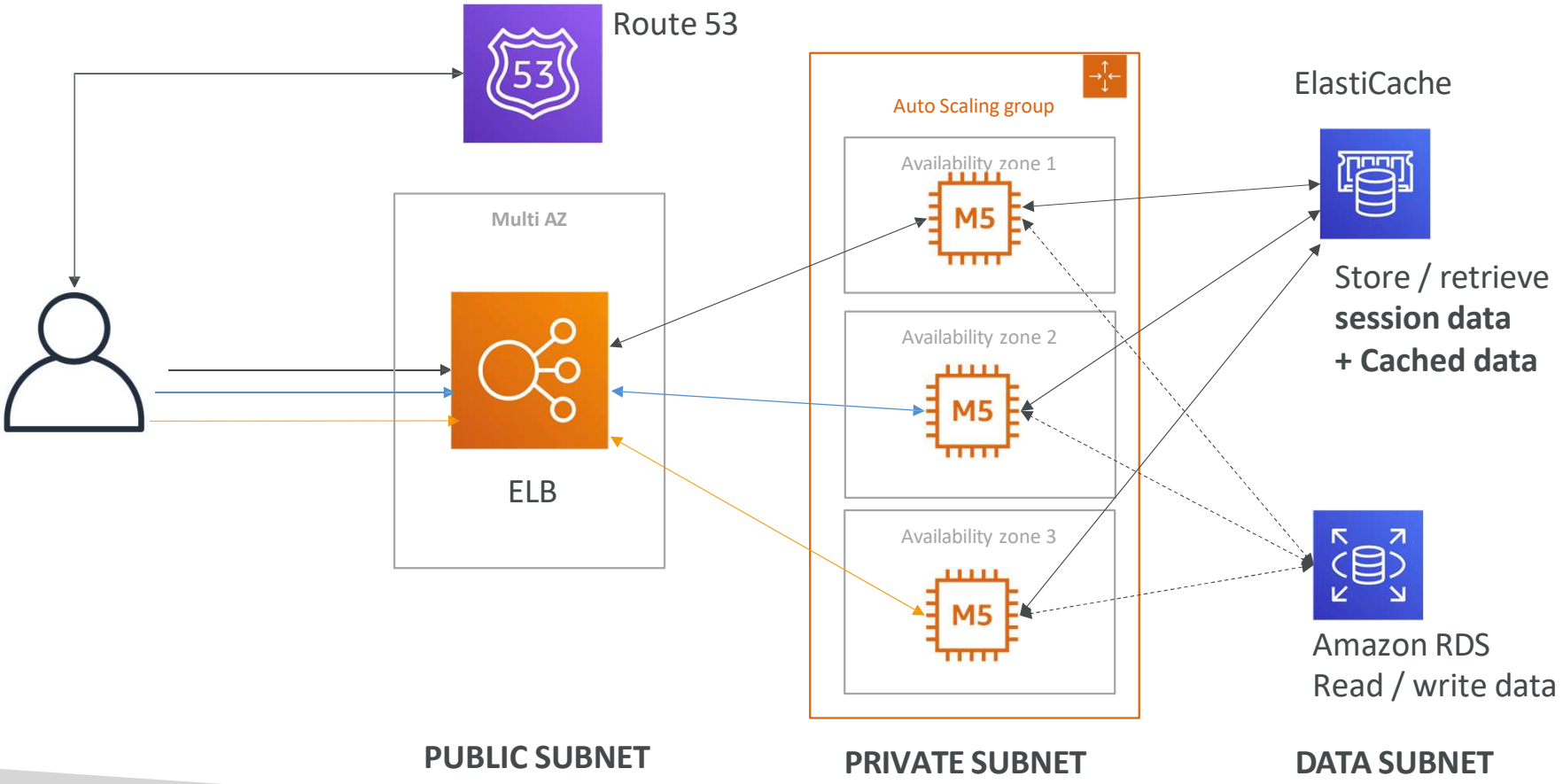
- When launching a full stack (EC2, EBS, RDS), it can take time to:
  - Install applications
  - Insert initial (or recovery) data
  - Configure everything
  - Launch the application

- We can take advantage of the cloud to speed that up!

Instantiating Applications quickly

- EC2 Instances:
  - Use a Golden AMI: Install your applications, OS dependencies etc.. beforehand and launch your EC2 instance from the Golden AMI
  - Bootstrap using User Data: For dynamic configuration, use User Data scripts
  - Hybrid: mix Golden AMI and User Data (Elastic Beanstalk)
- RDS Databases:
  - Restore from a snapshot: the database will have schemas and data ready!
- EBS Volumes:
  - Restore from a snapshot: the disk will already be formatted and have data!

Typical architecture: Web App 3-tier



Developer problems on AWS

- Managing infrastructure
- Deploying Code
- Configuring all the databases, load balancers, etc
- Scaling concerns

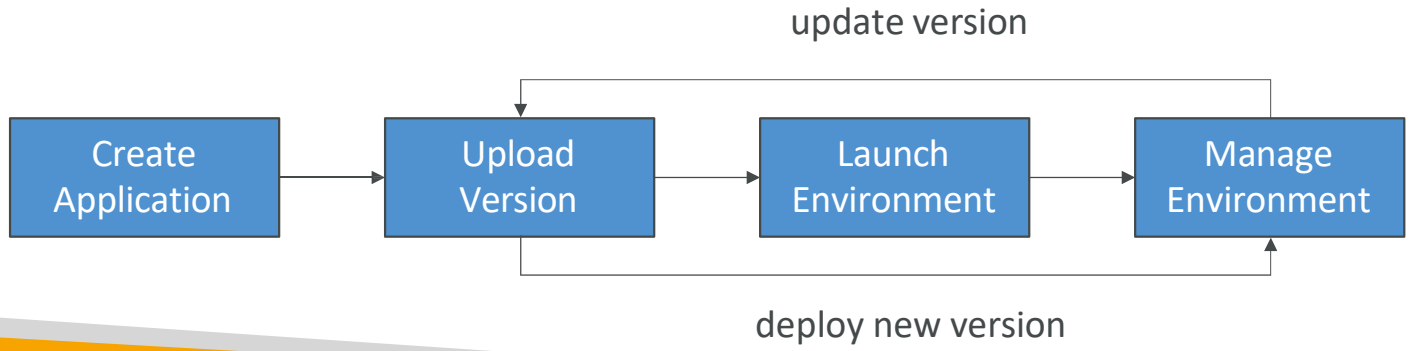
- Most web apps have the same architecture (ALB + ASG)
- All the developers want is for their code to run!
- Possibly, consistently across different applications and environments

Elastic Beanstalk - Overview

- Elastic Beanstalk is a developer centric view of deploying an application on AWS
- It uses all the component's we've seen before: EC2, ASG, ELB, RDS, ...
- Managed service
  - Automatically handles capacity provisioning, load balancing, scaling, application health monitoring, instance configuration, ...
  - Just the application code is the responsibility of the developer
- We still have full control over the configuration
- Beanstalk is free but you pay for the underlying instances

Elastic Beanstalk - Components

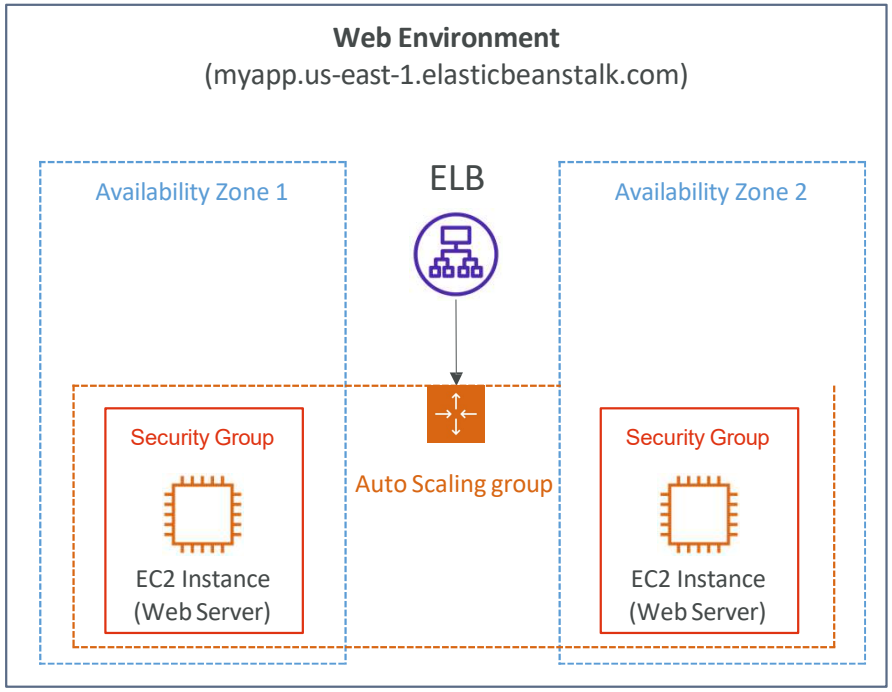
- Application: collection of Elastic Beanstalk components (environments, versions, configurations, ...)
- Application Version: an iteration of your application code
- Environment
  - Collection of AWS resources running an application version (only one application version at a time)
  - Tiers: Web Server Environment Tier & Worker Environment Tier
  - You can create multiple environments (dev, test, prod, ...)

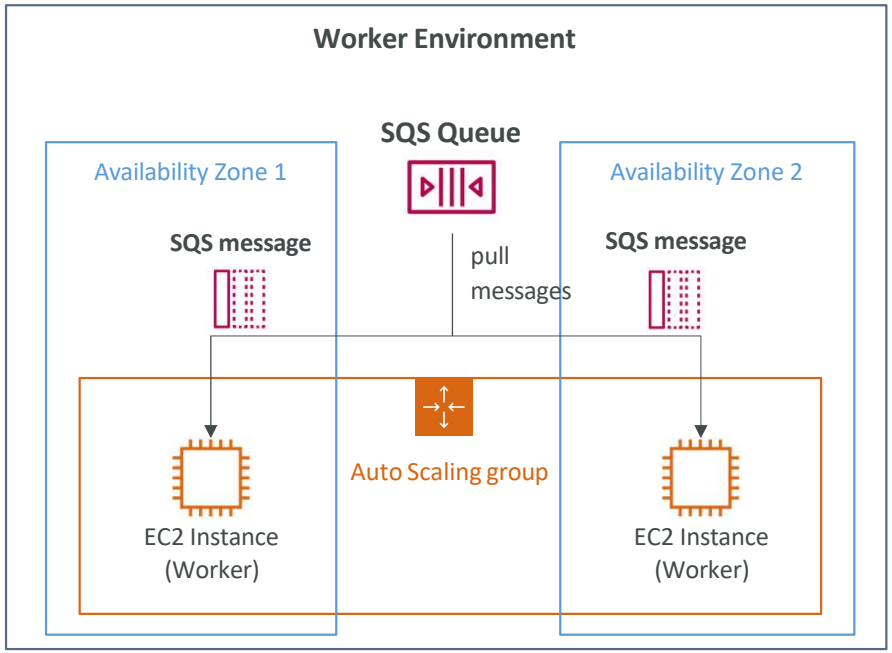


Elastic Beanstalk - Supported Platforms

- Go
- Java SE
- Java with Tomcat
- .NET Core on Linux
- .NET on Windows Server
- Node.js
- PHP
- Python
- Ruby
- Packer Builder
- Single Container Docker
- Multi-container Docker
- Preconfigured Docker

Web Server Tier vs. Worker Tier

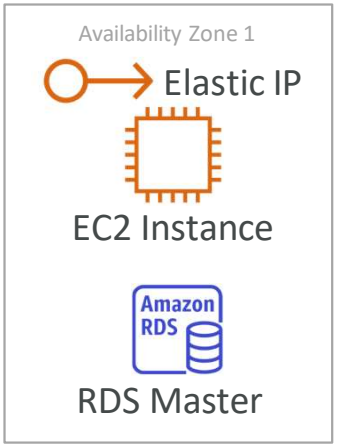




- Scale based on the number of SQS messages
- Can push messages to SQS queue from another Web Server Tier

Elastic Beanstalk Deployment Modes

Single Instance
Great for dev



High Availability with Load Balancer
Great for prod