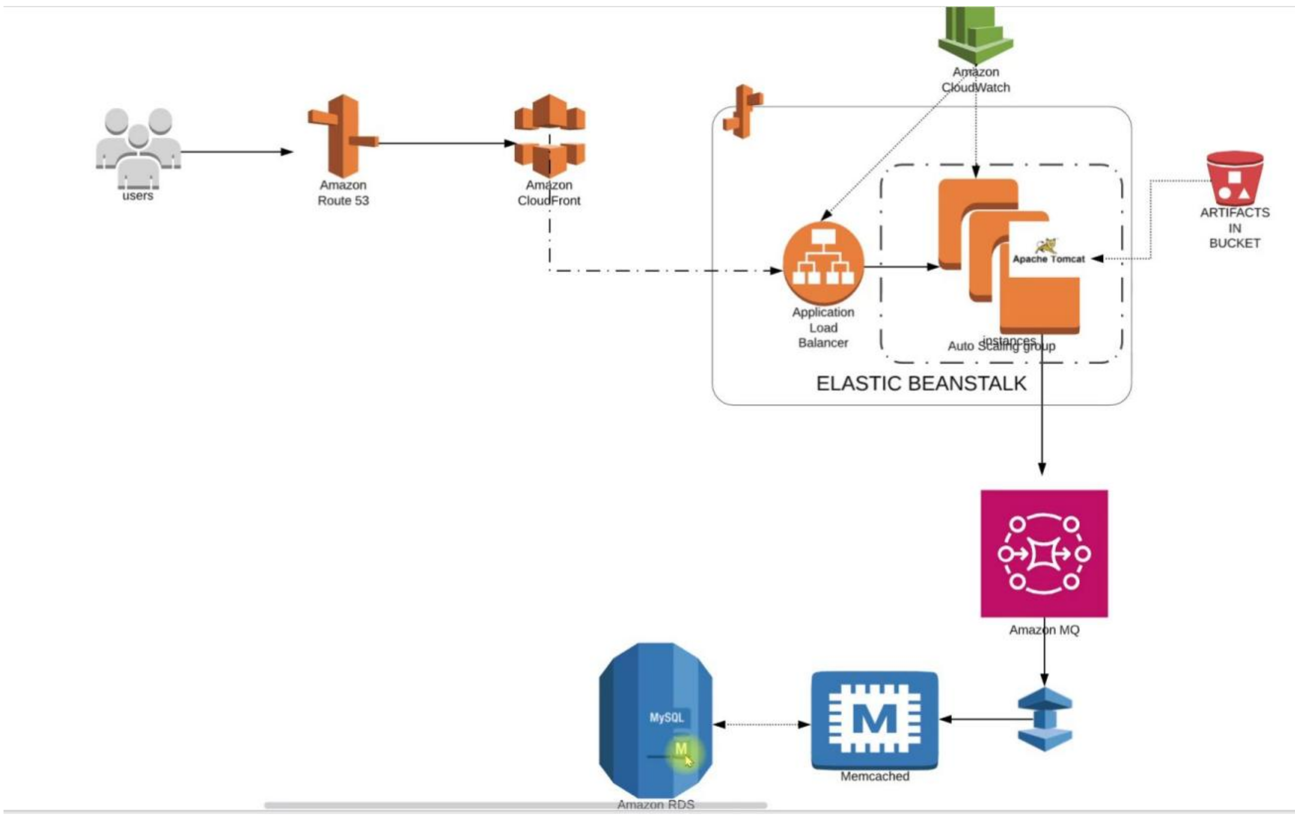
- Different types of **SERVICES**:
  - IaaS (Infrastructure as a Service):
    - It provides raw computing resources i.e. servers, networking, storage -- on demand.
    - You manages: OS, runtime, data, applications
    - Provider manages: Physical servers, virtualization, networking, storage
    - Examples:
      - AWS EC2
      - GCE (Google Compute Engine)
      - Azure Virtual Machines
    - Devops usecase:
      - Provisioning servers quickly for deployments, running custom environments, hosting databases, setting up CI/CD agents.
  - PaaS (Platform as a Service):
    - It provides a ready-to-use platform for building, testing, and deploying applications. You don't worry about OS or infrastructure — only your code and configurations.
    - You manage: Applications & data.
    - Provider manages: OS, middleware, runtime, scaling, infrastructure..
    - Examples:
      - AWS Elastic Beanstalk
      - Google App Engine
      - Heroku
      - Azure App Service
    - Devops usecase:
      - Deploying apps quickly without managing servers — great for microservices, CI/CD pipelines, and rapid testing.
  - SaaS (Software as a Service):
    - It provides fully functional end-user applications over the internet. No setup, no server — just use the software.
    - You manage: Nothing (just use the app).
    - Provider manages: Everything (infrastructure, platform, software, updates).
    - Examples:
      - Gmail
      - Google Docs

        - Slack
        - Jira
        - Dropbox
    - Devops usecase:
        - Using SaaS tools for collaboration, project management, monitoring (e.g., Datadog), or CI/CD (e.g., GitHub Actions).
  - Analogy:
    - IaaS → Renting an empty apartment (you bring furniture, design, etc.).
    - PaaS → Renting a fully furnished apartment (you just bring your stuff and live).
    - SaaS → Booking a hotel room (everything is ready; you just check in and use).

- Services that are gonna used:
  - Beanstalk
    - It'll manage the EC2 instances.
    - It has load balancer and auto scaling as well.
  - S3/EFS
    - Storage
  - RDS Instances
    - Databases
  - Elastic cache
    - In place of Memcached
  - Active MQ
    - In place of Rabbit MQ
  - Route 53
    - For DNS
  - Cloudfront
    - For CDN
      - A CDN is a network of servers located in different regions that cache and deliver website content (images, CSS, JS, videos, HTML) to users from the server closest to them.
      - Example: If your site is hosted in the US, a user in India will get data from a nearby CDN server in India, not directly from the US — making it load much faster.



➢

➢ Quick Overview:

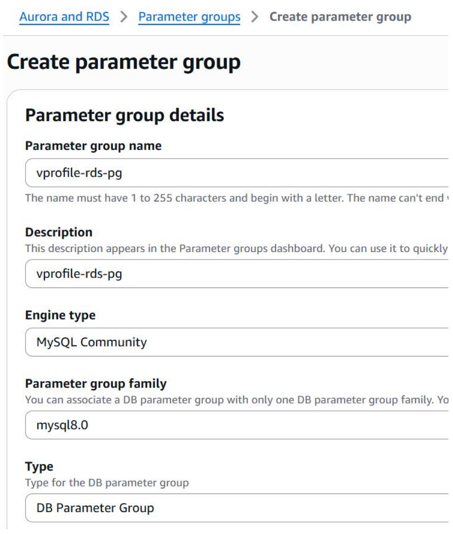
- Here user will access out URL which will be resolved to an end-point in **Route 53** (before it was happening inside **GoDaddy**).
  - That end-point will be of **Amazon CloudFront (CDN)** which will cache so many things to serve the Global audience.
- **Elastic Beanstalk:**
  - After cloud-front, it'll fo to **Application Load Balancer** (which is a part of **Elastic Beanstalk**).
  - After that it'll go to the **EC2** instances (which is part of **Auto Scaling Group**).
  - Means Entire frontend will be managed by Beanstalk.
- For backend;
  - **Amazon MQ** instead of **RabbitMQ**
  - **Elastic Cache** instead of **Memcache**
  - **RDS** instead of **database running on EC2** instances.

➢ Requirements:

- Keypair:
  - For beanstalk instance login
- Security Groups:
  - 1. Elastic cache

        - 2. RDS
        - 3. Active MQ
    - Create :
        - RDS
        - Amazon Elastic Cache
        - Amazon Active MQ
    - Create Elastic Beanstalk Environment
    - Update SG of backend to allow traffic from Bean SG
- Flow of Execution:
    - Launch EC-2 instance for DB initializing
    - Login to the instance and initialize RDS DB
    - Change health-check on beanstalk to /login
    - Add 443 HTTPS listener to ELB
    - Build artifact with backend information
    - Deploy artifact to Beanstalk
    - Create CDN with SSL certificate
    - Update entry in GoDaddy DNS zones

PROCESS OF CONFIGURING THE SERVERS AND APPS

- Created security group:
  - **vprofile-backend-sg**:
    - **All traffic** from it self for the communication between backend servers.
- Inside **RDS**:
  - Create one parameter group:
    - 

      Aurora and RDS > Parameter groups > Create parameter group

      Create parameter group

      Parameter group details

      Parameter group name: vprofile-rds-pg

      The name must have 1 to 255 characters and begin with a letter. The name can't end

      Description: This description appears in the Parameter groups dashboard. You can use it to quickly

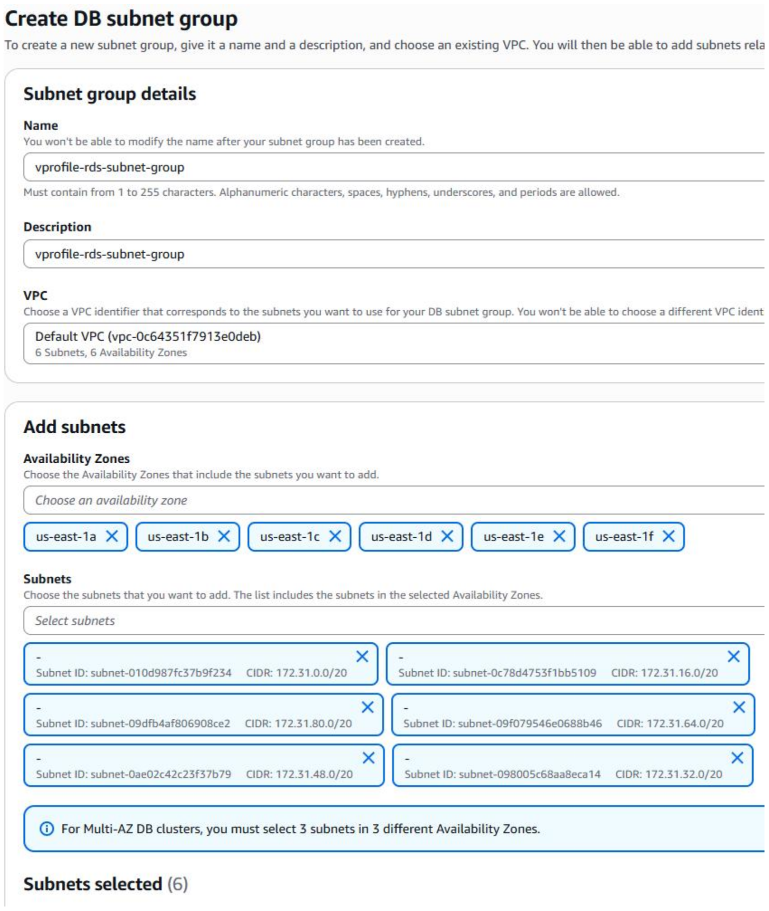
      vprofile-rds-pg

      Engine type: MySQL Community

      Parameter group family: You can associate a DB parameter group with only one DB parameter group family. Yo

      mysql8.0

      Type: Type for the DB parameter group

      DB Parameter Group
    - Create subnet group:
      - 

        Create DB subnet group

        To create a new subnet group, give it a name and a description, and choose an existing VPC. You will then be able to add subnets rela

        Subnet group details

        Name: You won't be able to modify the name after your subnet group has been created.

        vprofile-rds-subnet-group

        Must contain from 1 to 255 characters. Alphanumeric characters, spaces, hyphens, underscores, and periods are allowed.

        Description: vprofile-rds-subnet-group

        VPC: Choose a VPC identifier that corresponds to the subnets you want to use for your DB subnet group. You won't be able to choose a different VPC ident

        Default VPC (vpc-0c64351f7913e0deb)
        6 Subnets, 6 Availability Zones

        Add subnets

        Availability Zones: Choose the Availability Zones that include the subnets you want to add.

        Choose an availability zone

        us-east-1a, us-east-1b, us-east-1c, us-east-1d, us-east-1e, us-east-1f

        Subnets: Choose the subnets that you want to add. The list includes the subnets in the selected Availability Zones.

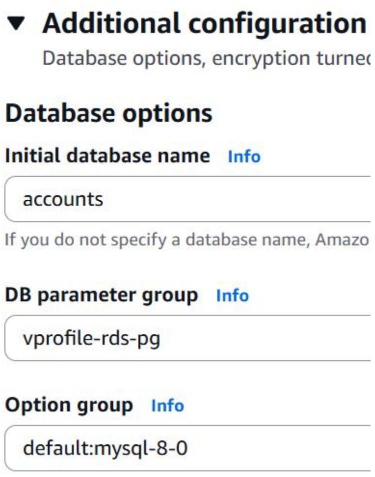
        Select subnets

Subnet ID: subnet-010d987fc37b9f234 CIDR: 172.31.0.0/20	Subnet ID: subnet-0c78d4753f1bb5109 CIDR: 172.31.16.0/20
Subnet ID: subnet-09dfb4af806908ce2 CIDR: 172.31.80.0/20	Subnet ID: subnet-09f079546e0688b46 CIDR: 172.31.64.0/20
Subnet ID: subnet-0ae02c42c23f37b79 CIDR: 172.31.48.0/20	Subnet ID: subnet-098005c68aa8eca14 CIDR: 172.31.32.0/20

        For Multi-AZ DB clusters, you must select 3 subnets in 3 different Availability Zones.

        Subnets selected (6)

- Now create **database:**
  - Standard create
  - MySQL (engiene type)
  - Give one **DB instance identifier**
  - Under **connectivity** section,
    - select your created **subnet group**.
    - Additional details: database port as **3306**



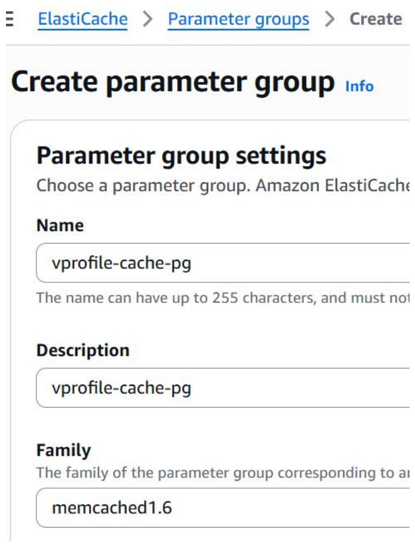
▼ Additional configuration
Database options, encryption turnec

Database options
Initial database name Info
accounts
If you do not specify a database name, Amazo

DB parameter group Info
vprofile-rds-pg

Option group Info
default:mysql-8-0

- Create **Elastic Cache:**
  - Create **Parameter Group**



ElastiCache > Parameter groups > Create

Create parameter group Info

Parameter group settings
Choose a parameter group. Amazon ElastiCache

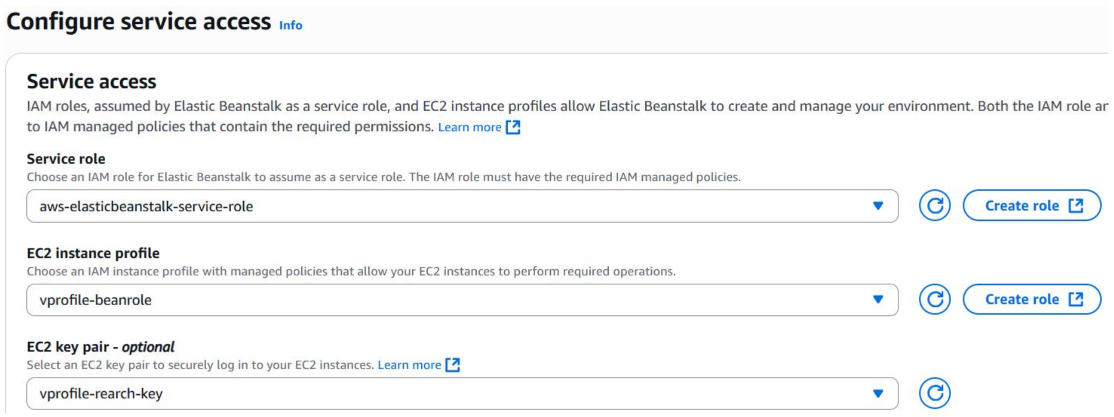
Name
vprofile-cache-pg
The name can have up to 255 characters, and must not

Description
vprofile-cache-pg

Family
The family of the parameter group corresponding to ai
memcached1.6

    - So many options are there inside the family like Redis, Memcache, Valkey
  - Create **Subnet Group**
  - Create **Cache** (select **Memcache**)
    - Give the correct port that is mentioned inside the *application.properties* file.
    - Choose **backend-sg** as the security group.

- Create **Amazon MQ**:
  - Engiene type: RabbitMQ
  - Give one username and password.
  - Private access
  - Choose your security group
- Launch one EC-2 instance (ubuntu) (temporarily only):
  - We'll use this to setup database inside RDS.
  - Install mysql-client, git.
  - Copy the DNS of RDS and execute the command:
    - **mysql -h <DNS> -u <username> -p**
      - Then enter password
    - Example:
      - **mysql -h vprofile-rds.c8v0iamky18r.us-east-1.rds.amazonaws.com -u admin -p**
  - I clone the git repo to get the db_backup file and update the RDS database.
  - **mysql -h** *<DNS>* **-u** *<username>* **-p***<password; no space between -p and password>* **accounts < src/main/resources/db_backup.sql** (it is the db_backup path in my case)
  - Now DB initialization was successful. You can delete the instance now.
- Create one IAM role for beanstalk application:
  - Service: EC2
  - Policies:
    - AdministratorAccess-AWSElasticBeanstalk
    - AWSElasticBeanstalkCustomPlatformforEC2Role
    - AWSElasticBeanstalkRoleSNS
    - AWSElasticBeanstalkWebTier
- Now, **BEANSTALK**:
  - Environment: Web server environment
  - Platform: tomcat; branch: tomcat 10
  - Presets: custom configuration



Configure service access Info

Service access

IAM roles, assumed by Elastic Beanstalk as a service role, and EC2 instance profiles allow Elastic Beanstalk to create and manage your environment. Both the IAM role ar to IAM managed policies that contain the required permissions. Learn more

Service role

Choose an IAM role for Elastic Beanstalk to assume as a service role. The IAM role must have the required IAM managed policies.

aws-elasticbeanstalk-service-role

EC2 instance profile

Choose an IAM instance profile with managed policies that allow your EC2 instances to perform required operations.

vprofile-beanrole

EC2 key pair - *optional*

Select an EC2 key pair to securely log in to your EC2 instances. Learn more

vprofile-rearch-key

- If you don't see that ***aws-elasticbeanstalk-service-role*** then just create one clicking the link (**create role**) at the right.
- All the options will be auto selected. Just click next, next and create.

- Under **Instance Setting**, *enable* public ip address. And select all the subnets under **instance subnets**.
- Keep the **database** option as **disabled** only. Because we have our own RDS.
- Select **GP3** as the **root volume**.
- Don't select any security group. Leave it blank so that beanstalk will create one by itself. Later we can edit the roles.
- Under capacity section, use **Load Balanced** as environment type.
- Tomcat runs on port 8080; but in beanstalk it runs on port 80.
- Enable stickiness in the Processes section.
- Rolling updates and deployments: Deployment policies (need to explore it separately)
  - In my case, I chose **rolling** with batch size of **50%** (for percentage you need to select that radio button for percentage)

- Now open the backend-sg and add the instance security group (created by beanstalk) in its inbound rule for **All Traffic**.
- Copy dns of RDS, AmazonMQ, Elastic cache (along with that port, username and password as well if applicable)
  - Then update the application.properties file according to that.
  - Like in place of *db01*, write the *dns of RDS* i.e. *xyz.com*, and update username and password as well.
- After updating the application.properties, execute the command **mvn install** and then the artifact will be generated (***.war*** file inside the folder *target*).
- Now just upload the **.war** file in the beanstalk application.

- You can see:
  - Initially both the instance will be healthy (inside target group)
  - Then as soon as the deployment happens, one will become unhealthy.
  - When the deployment completes, the instance will become healthy.
- Edit **Instance traffic and scaling** section inside **configuration** and add one listener for **HTTPS** traffic (port 443).

- VPC:
  - Virtual Private Cloud: a logically isolated network inside AWS where you can launch resources like EC2, RDS, Load Balancers, etc.
  - One VPC spans across an entire region.
  - By default, one subnet is there for each AZs inside the region.
- RDS:
  - It is a managed service - not just an instance.
  - Under the hood, AWS does run EC2 instance to host your database.
  - But those instances are hidden from you. You can't ssh to that.
  - Instead AWS gives you service interface (RDS console, API, CLI etc)
    - Launch databases.
    - Configure settings (via parameter groups, option groups).
    - Scale up/down.
    - Enable Multi-AZ.
    - Manage backups, snapshots, failovers.
  - RDS is *"**not** just an EC2 running a DB,"* but: *"A managed database platform, where AWS controls the underlying infra (EC2, storage, networking, OS, patching), and you only control the database engine and how your app connects to it."*
  - Simply,
    - Creating EC2 instance, installing the database things and running it: **IAAS (Infrastructure as a Service)**
    - Using RDS: **PAAS (Platform as a Service)**
- RDS objects:
  - DB Parameter Group:
    - Acts like a configuration file of RDS.
    - Examples of parameters:
      - max_connections (limit of DB connections)
      - innodb_buffer_pool_size
      - log_min_duration_statement
    - Default parameter group is applied automatically.
    - You can create one custom parameter group and apply them to DB instances for file-tuning.
  - DB Subnet Group:
    - Inside which subnet of your VPC (either default or custom), your DB instance will be placed in.