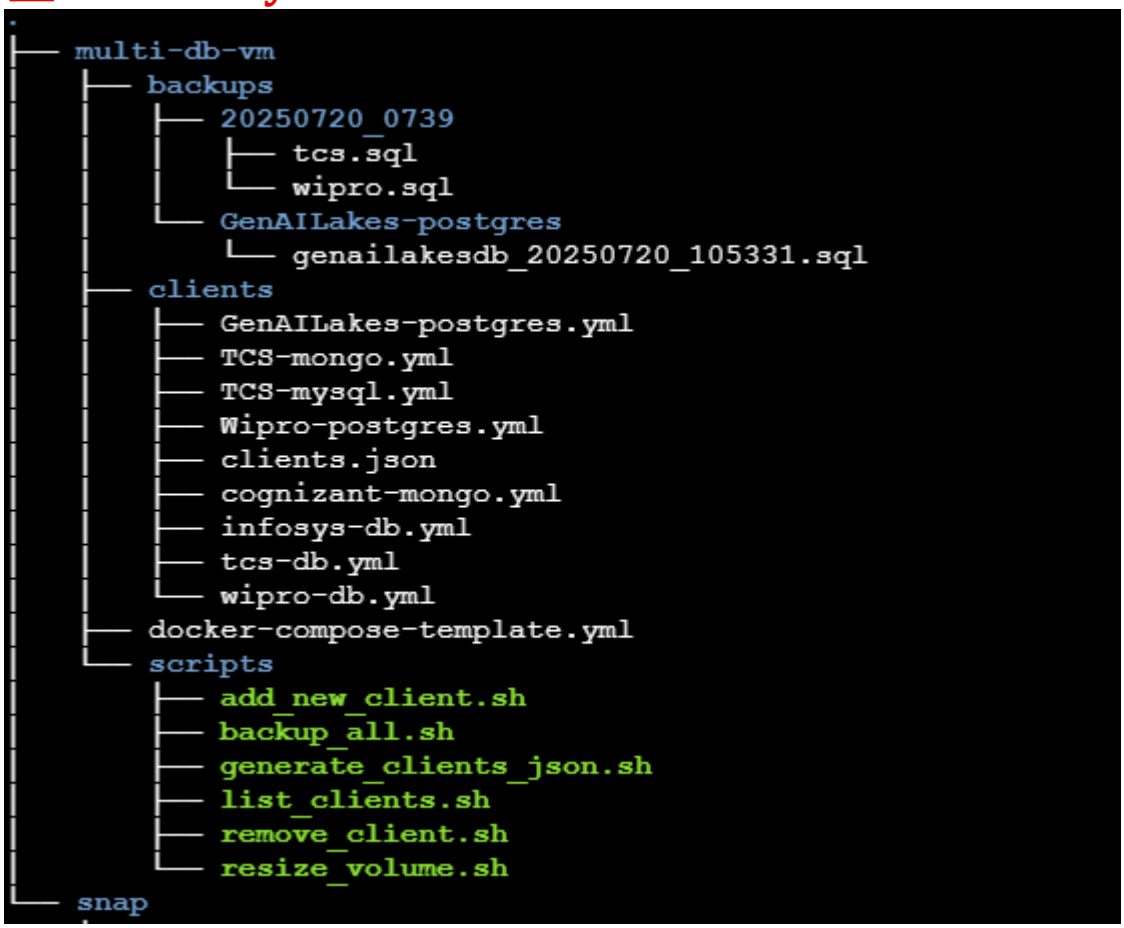
Multi-Database Hosting on a Single Virtual Machine:

🎯 **Objective: Build a secure, cost-effective, scalable system for hosting multiple client-specific databases (like PostgreSQL, MySQL, MongoDB etc.) using Docker on a single Ubuntu VM.**

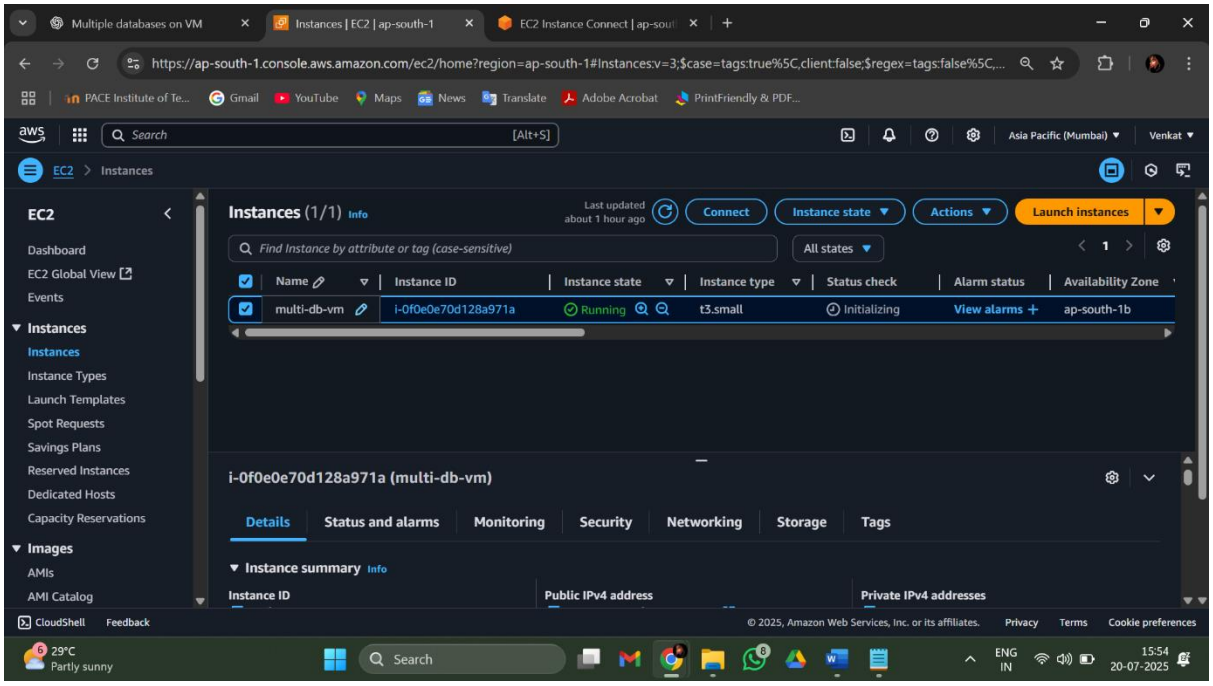
🗀 Directory Structure:



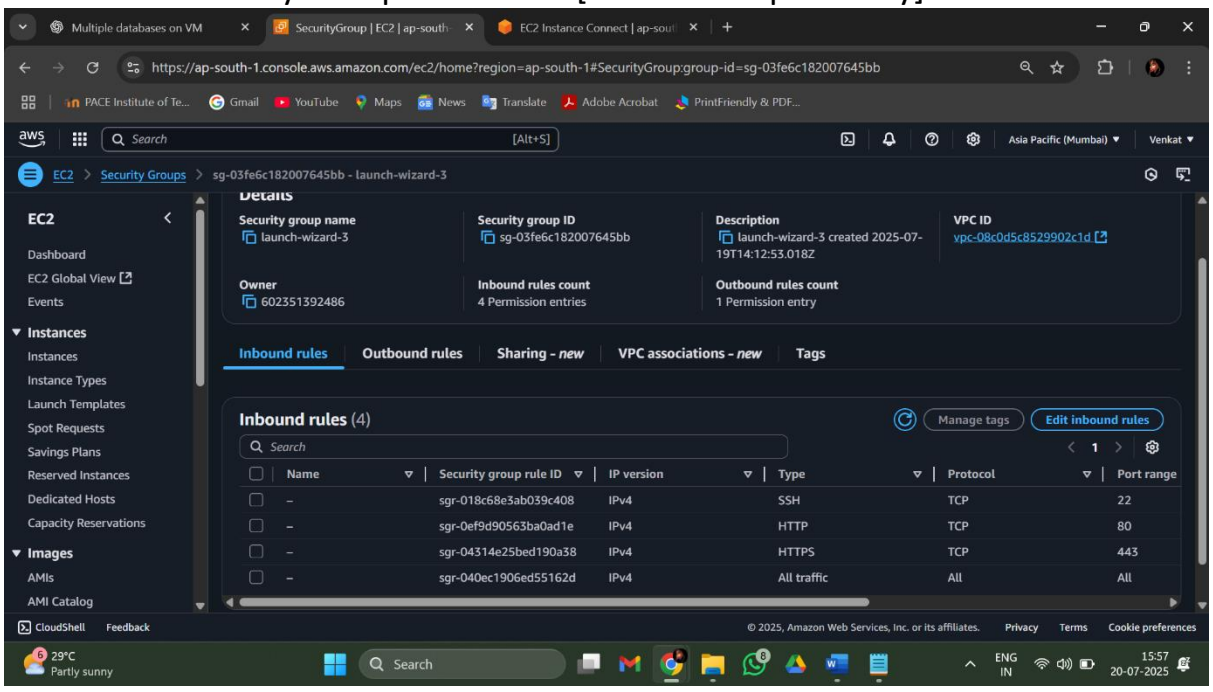
➔ Step-by-Step Build Process:

STEP 1: Install Prerequisites

- Ubuntu-based EC2 VM [Launched t3.small]
- Installed Docker and Docker Compose Packages.



➔Allowed Security Groups All Traffic [Practice Purpose only]:



➔# Install Docker

```
sudo apt update
sudo apt install -y docker.io docker-compose
sudo usermod -aG docker $USER
newgrp docker
```

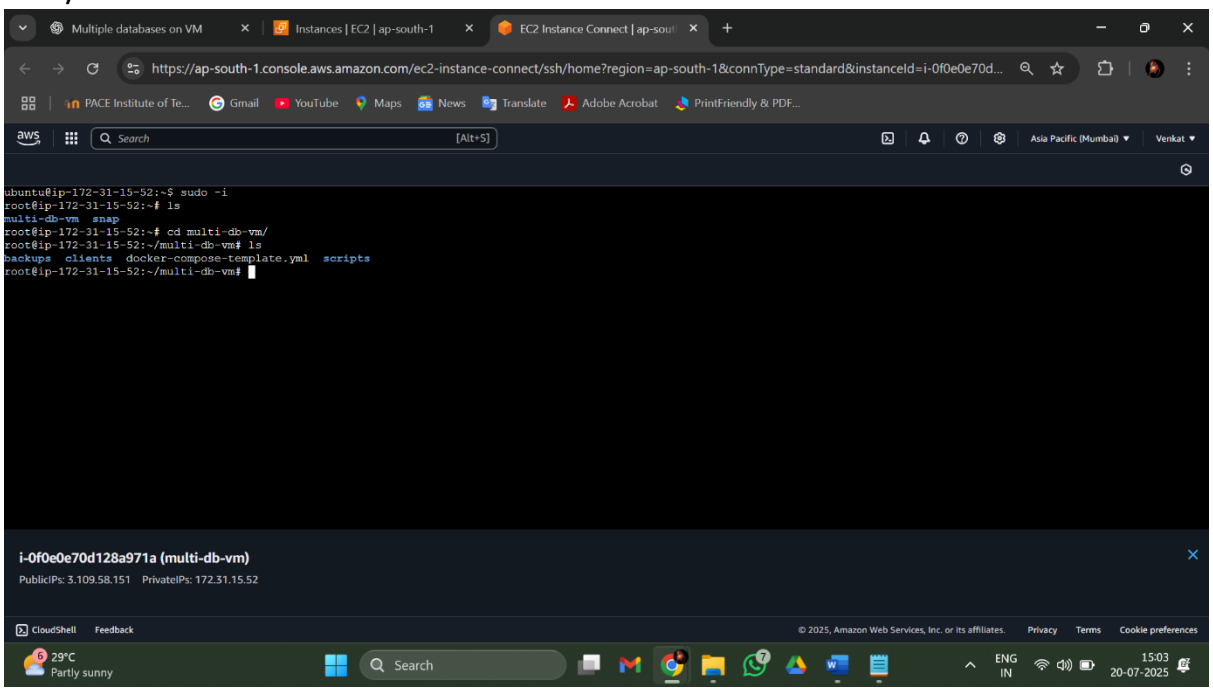
Enable Docker

⇨ sudo systemctl enable docker

➔docker-compose up -d

➔docker ps -a [It shows all the Containers Up & Excited]

➔mkdir -p ~/multi-db-vm/{scripts,clients,backups}
cd ~/multi-db-vm



➔cd multi-db-vm

⇨ Vi docker-compose-template.yml

```
---
version: '3.8'

services:
  ${CLIENT_NAME}-db:
    image: ${DB_IMAGE}
    container_name: ${CLIENT_NAME}-db
    restart: always
    environment:
      ${PASSWORD_ENV_VAR}: ${ROOT_PASSWORD}
    volumes:
      - ${CLIENT_NAME}_db_data:${VOLUME_PATH}
    ports:
```

```
    - "${PORT}:${DB_PORT}"
   networks:
    - db_net

volumes:
 ${CLIENT_NAME}_db_data:

networks:
 db_net:
  driver: bridge
```

STEP 2: vi add_new_client.sh

➔cd multi-db-vm/scripts/add_new_client.sh

```
#!/bin/bash

echo "🔗 Add New Client Database Setup"

# Prompt for client details
read -p "Enter client name: " client_name
read -p "Enter database type (postgres/mysql/mongo): " db_type

db_type=$(echo "$db_type" | tr '[:upper:]' '[:lower:]')

case "$db_type" in
 postgres)
  default_port=5432
  ;;
 mysql)
  default_port=3306
  ;;
 mongo)
  default_port=27017
  ;;
 *)
  echo "Unsupported database type: $db_type"
  exit 1
  ;;
esac
```

```
# Read user-defined DB config
read -p "Enter database name: " db_name
read -p "Enter database user: " db_user
read -s -p "Enter database password: " db_password
echo
read -p "Enter exposed port on host (default $default_port): " port
port=${port:-$default_port}

# Compose values
container_name="${client_name}-${db_type}"
volume_name="${client_name}-${db_type}-volume"
yml_path="../clients/${container_name}.yml"
network_name="clients_net"

# Create network if not exists
docker network inspect $network_name >/dev/null 2>&1 || docker network
create $network_name

# Create Docker Compose YAML
echo "Generating Compose file at: $yml_path"

cat > "$yml_path" <<EOF
version: '3.8'

services:
  ${container_name}:
    image: ${db_type}
    container_name: ${container_name}
    restart: unless-stopped
    environment:
EOF

# Set DB-specific environment
case "$db_type" in
  postgres)
    cat >> "$yml_path" <<EOF
      POSTGRES_DB: ${db_name}
      POSTGRES_USER: ${db_user}
      POSTGRES_PASSWORD: ${db_password}
```

```
    ports:
      - "${port}:5432"
EOF
    ;;
  mysql)
    cat >> "$yml_path" <<EOF
      MYSQL_DATABASE: ${db_name}
      MYSQL_USER: ${db_user}
      MYSQL_PASSWORD: ${db_password}
      MYSQL_ROOT_PASSWORD: ${db_password}
    ports:
      - "${port}:3306"
EOF
    ;;
  mongo)
    cat >> "$yml_path" <<EOF
      MONGO_INITDB_DATABASE: ${db_name}
      MONGO_INITDB_ROOT_USERNAME: ${db_user}
      MONGO_INITDB_ROOT_PASSWORD: ${db_password}
    ports:
      - "${port}:27017"
EOF
    ;;
esac

# Finish YAML
cat >> "$yml_path" <<EOF
    volumes:
      - ${volume_name}:/data/db
    networks:
      - ${network_name}

volumes:
  ${volume_name}:

networks:
  ${network_name}:
    external: true
EOF
```

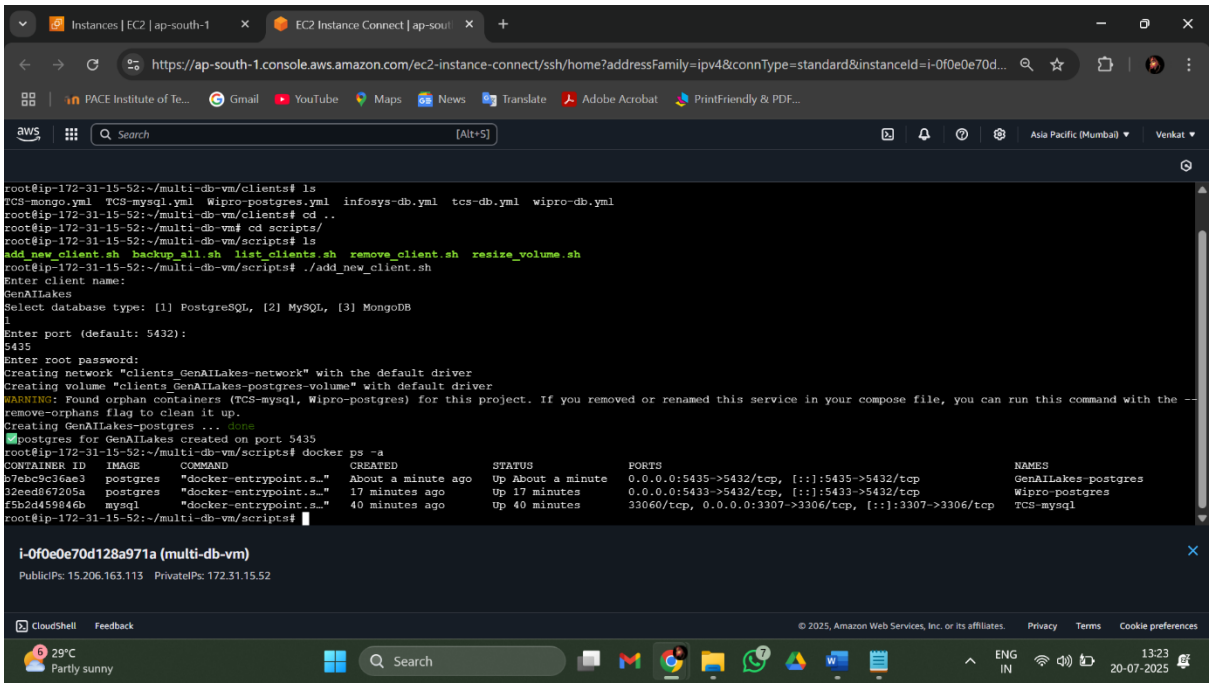
```
#  Launch the container
echo "Deploying $db_type container for $client_name..."
docker-compose -f "$yml_path" up -d

# Update clients.json
CLIENTS_JSON_PATH="../clients/clients.json"

# Create JSON file if it doesn't exist
if [ ! -f "$CLIENTS_JSON_PATH" ]; then
  echo "[]" > "$CLIENTS_JSON_PATH"
fi

# Remove existing entry for same client
TMP_JSON=$(mktemp)
jq "del(.[] | select(.name == \"$client_name\"))" "$CLIENTS_JSON_PATH" >
"$TMP_JSON" && mv "$TMP_JSON" "$CLIENTS_JSON_PATH"

# Append new client data
jq \
  --arg name "$client_name" \
  --arg type "$db_type" \
  --argjson port "$port" \
  --arg db_name "$db_name" \
  --arg db_user "$db_user" \
  --arg db_password "$db_password" \
  '. += [{name: $name, type: $type, port: $port, db_name: $db_name, db_user:
$db_user, db_password: $db_password}]' \
  "$CLIENTS_JSON_PATH" > "$TMP_JSON" && mv "$TMP_JSON"
"$CLIENTS_JSON_PATH"

echo "$client_name $db_type database added and running!"
echo "Tracked in: $CLIENTS_JSON_PATH"
```

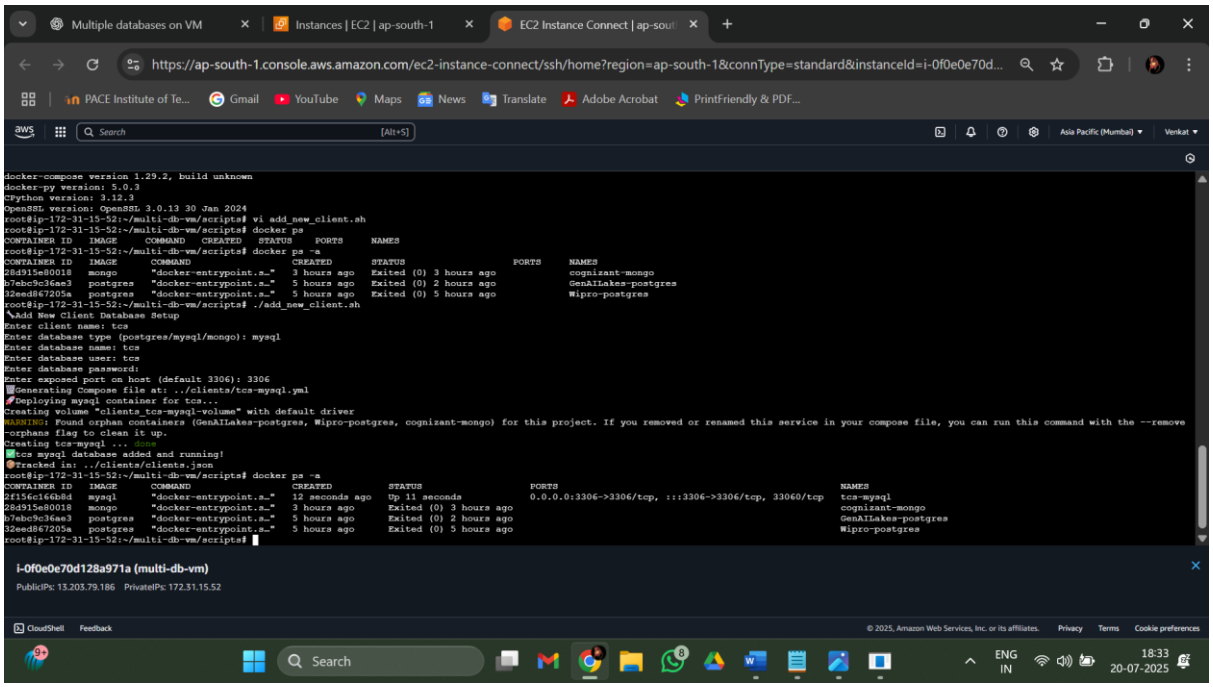
⇨ **chmod +x add_new_client.sh**
⇨ **./add_new_client.sh**

➔**add_new_client.sh it Support:**

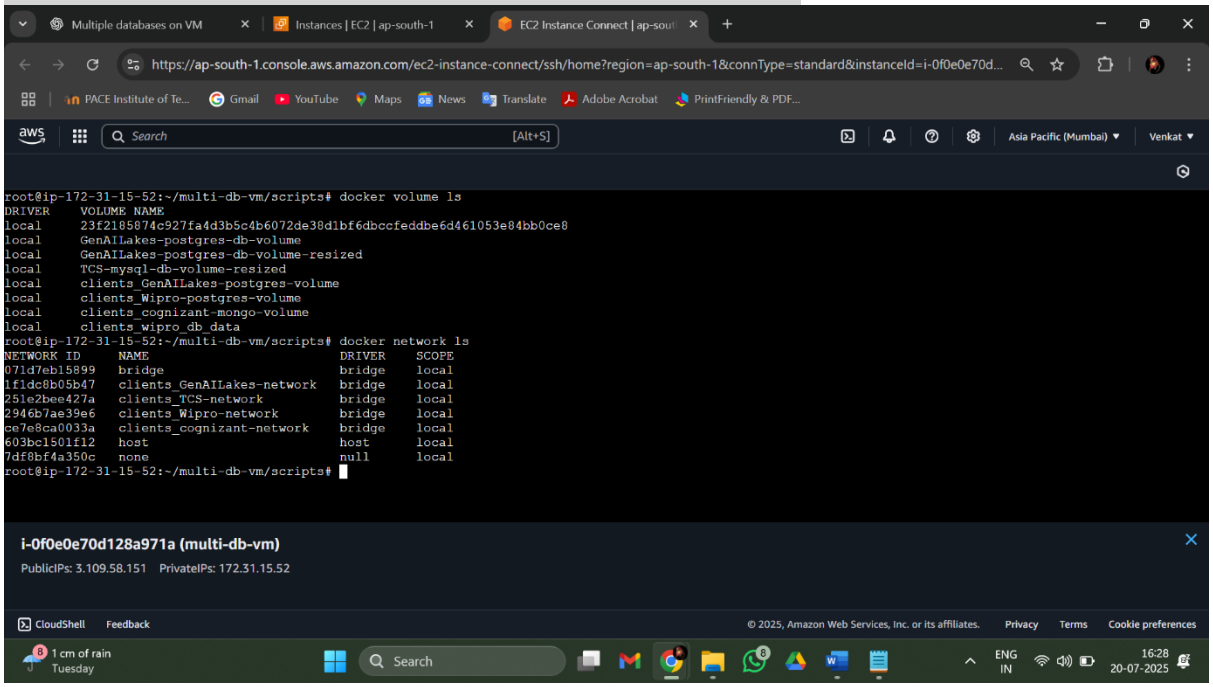
- **Client name**
- **Database type** (postgres, mysql, mongo)

- **Custom database name**, **username**, and **password**
- **Custom port**
- **Dynamically generates the correct Docker Compose file**
- **Tracks all clients in clients/clients.json**





Docker Volumes and Networks Created:



Database Access Example:

sudo apt install yamllint
yamllint ../clients/tcs-db.yml

apt update
apt install docker-compose-plugin

Test the Databases:

Example: TCS wants MySQL on port 3307
./add_new_client.sh tcs mysql 3307

Example: Wipro wants PostgreSQL on port 5433
./add_new_client.sh wipro postgres 5433

Access Example Table			
DB Type	Host	Port	Command Example
PostgreSQL	127.0.0.1	5433	`psql ...`
MySQL	127.0.0.1	3307	`mysql ...`
MongoDB	127.0.0.1	27018	`mongo ...`

➔docker ps -a

Connect to the database to test:

mysql -h 127.0.0.1 -P 3307 -u root -p
sudo apt install mysql-client -y

psql -h 127.0.0.1 -p 5433 -U postgres
sudo apt install postgresql-client -y

mongo -h 127.0.0.1 -p 27018 -u root -p
sudo apt install mongodb-client -y

➔Step 3: Resize a Volume:

Functionality:

- Creates a new volume
- Copies existing data
- Stops container
- Restarts container with new volume
- You can check in **df -h**

⇨ vi resize_volume.sh

```
#!/bin/bash

read -p "Enter client name: " CLIENT_NAME
read -p "Enter database type (postgres, mysql, mongo): " DB_TYPE

ORIGINAL_VOLUME="${CLIENT_NAME}-${DB_TYPE}-db-volume"
RESIZED_VOLUME="${CLIENT_NAME}-${DB_TYPE}-db-volume-resized"
CONTAINER_NAME="${CLIENT_NAME}-${DB_TYPE}"
COMPOSE_FILE="../clients/${CLIENT_NAME}-${DB_TYPE}.yml"
```

```
echo "📄 Original volume: $ORIGINAL_VOLUME"
echo "🆕 New volume: $RESIZED_VOLUME"
echo "⚙️ Container using volume: $CONTAINER_NAME"

read -p "Proceed with resizing volume for $CLIENT_NAME? (y/n): "
CONFIRM
if [ "$CONFIRM" != "y" ]; then
    echo "❌ Aborted."
    exit 1
fi

# Create new volume
docker volume create "$RESIZED_VOLUME"
echo "✅ New volume $RESIZED_VOLUME created."

# Find mount path from old volume
OLD_MOUNT=$(docker inspect --format '{{ range .Mounts }}{{ .Source }}{{
end }}' "$CONTAINER_NAME")

# Copy data
docker run --rm -v "$ORIGINAL_VOLUME":/from -v
"$RESIZED_VOLUME":/to alpine ash -c "cd /from && cp -av . /to"
echo "📂 Data copied from $ORIGINAL_VOLUME to $RESIZED_VOLUME."

# Stop and remove container
docker stop "$CONTAINER_NAME"
docker rm "$CONTAINER_NAME"
echo "🛑 Stopped and removed container $CONTAINER_NAME."

# Update compose file
if [ -f "$COMPOSE_FILE" ]; then
    sed -i "s/${ORIGINAL_VOLUME}/${RESIZED_VOLUME}/g"
"$COMPOSE_FILE"
    echo "✍️ Updated $COMPOSE_FILE to use resized volume."
else
    echo "⚠️ $COMPOSE_FILE not found. Skipping update."
fi

# Restart container
```

```
docker compose -f "$COMPOSE_FILE" up -d
echo "✅ Container $CONTAINER_NAME restarted with resized volume."
```

⇨ chmod +x resize_volume.sh
⇨ ./resize_volume.sh

➔Step 4: Take Database Backup:

Supports:

- pg_dump for PostgreSQL
- mysqldump for MySQL
- mongodump MongoDB

Saved to: logs/backups/<client>/<timestamp>.gz

⇨ vi backup_all.sh

```
#!/bin/bash

set -e
JSON_FILE="../clients/clients.json"

if [ ! -f "$JSON_FILE" ]; then
  echo "❌ clients.json not found. Please run add_new_client.sh first."
  exit 1
fi

echo "Enter client name to back up:"
read CLIENT_NAME

# Extract client data using jq
CLIENT_DATA=$(jq -r --arg name "$CLIENT_NAME" '.[] | select(.name ==
$name)' "$JSON_FILE")

if [ -z "$CLIENT_DATA" ]; then
  echo "❌ Client '$CLIENT_NAME' not found in clients.json."
  exit 1
fi

DB_TYPE=$(echo "$CLIENT_DATA" | jq -r '.type')
PORT=$(echo "$CLIENT_DATA" | jq -r '.port')
DB_NAME=$(echo "$CLIENT_DATA" | jq -r '.db_name')
```

```
DB_USER=$(echo "$CLIENT_DATA" | jq -r '.db_user')
DB_PASSWORD=$(echo "$CLIENT_DATA" | jq -r '.db_password')
TIMESTAMP=$(date +"%Y%m%d_%H%M%S")
BACKUP_DIR="../backups/${CLIENT_NAME}"
mkdir -p "$BACKUP_DIR"

echo "📦 Backing up $DB_TYPE database for $CLIENT_NAME..."

case "$DB_TYPE" in
  postgres)
    PGPASSWORD="$DB_PASSWORD" pg_dump -h 127.0.0.1 -p "$PORT" -U
"$DB_USER" "$DB_NAME" > "$BACKUP_DIR/${DB_NAME}_${TIMESTAMP}.sql"
    echo "✅ PostgreSQL backup saved to $BACKUP_DIR"
    ;;
  mysql)
    mysqldump -h 127.0.0.1 -P "$PORT" -u "$DB_USER" -p"$DB_PASSWORD"
"$DB_NAME" > "$BACKUP_DIR/${DB_NAME}_${TIMESTAMP}.sql"
    echo "✅ MySQL backup saved to $BACKUP_DIR"
    ;;
  mongodb)
    mongodump --host 127.0.0.1 --port "$PORT" --username "$DB_USER" --
password "$DB_PASSWORD" --db "$DB_NAME" --out
"$BACKUP_DIR/mongo_${TIMESTAMP}"
    echo "✅ MongoDB backup saved to $BACKUP_DIR"
    ;;
  *)
    echo "❌ Unsupported DB type: $DB_TYPE"
    exit 1
    ;;
Esac
```

⇨ chmod +x backup_all.sh
⇨ ./backup_all.sh

Backups will be organized like this:

```
multi-db-vm/
├── backups/
│   ├── TCS-mysql/
│   │   └── tcs_db_20250720_145511.sql
│   ├── Wipro-postgres/
│   │   └── wipro_db_20250720_145800.sql
│   └── Cognizant-mongo/
│       └── mongo_20250720_150012/
```

➔ STEP 5: Remove a Client

Actions:

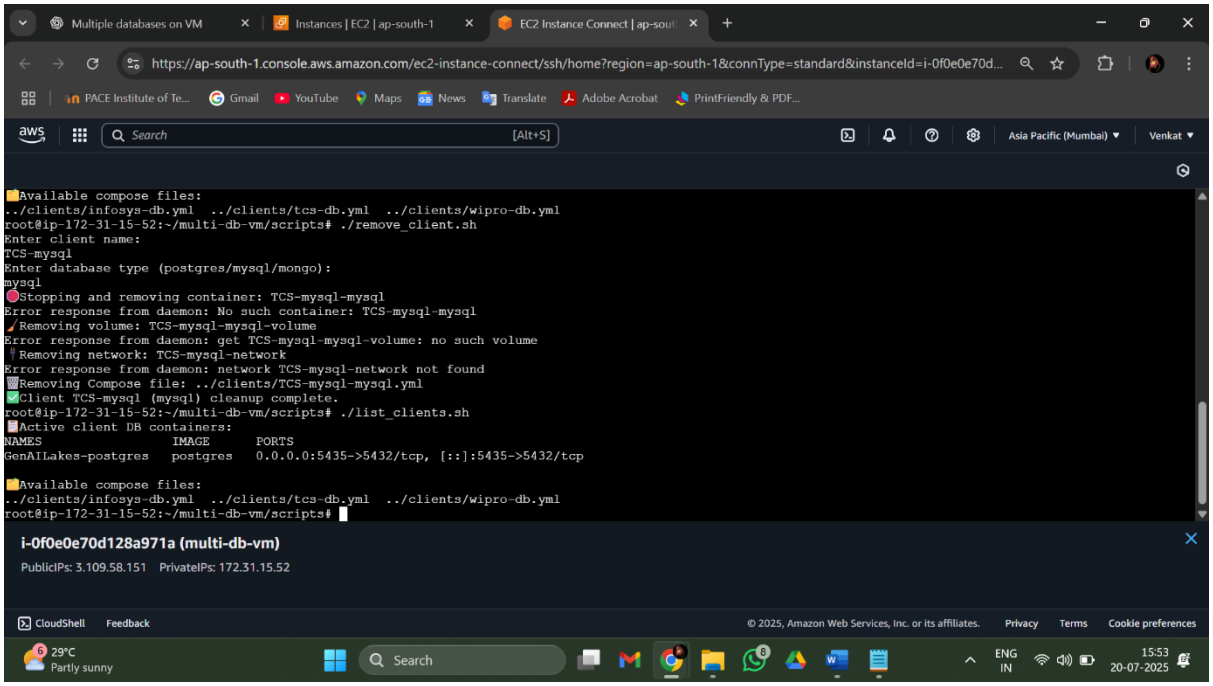
- Stops and removes container
- Deletes volume
- Deletes Compose file
- Removes network
- Updates clients.json

⇨ vi remove_client.sh

```
#!/bin/bash

echo "Enter client name:"
read CLIENT_NAME

echo "Enter database type (postgres/mysql/mongo):"
read DB_TYPE

COMPOSE_FILE="../clients/${CLIENT_NAME}-${DB_TYPE}.yml"
VOLUME_NAME="${CLIENT_NAME}-${DB_TYPE}-volume"
NETWORK_NAME="${CLIENT_NAME}-network"
CONTAINER_NAME="${CLIENT_NAME}-${DB_TYPE}"

echo "🛑 Stopping and removing container: $CONTAINER_NAME"
docker rm -f $CONTAINER_NAME
```

```
echo "🗑 Removing volume: $VOLUME_NAME"
docker volume rm $VOLUME_NAME

echo "🧹 Removing network: $NETWORK_NAME"
docker network rm $NETWORK_NAME

echo "🧾 Removing Compose file: $COMPOSE_FILE"
rm -f "$COMPOSE_FILE"

echo "✅ Client $CLIENT_NAME ($DB_TYPE) cleanup complete."
```

- **chmod +x remove_client.sh**
- **./remove_client.sh**



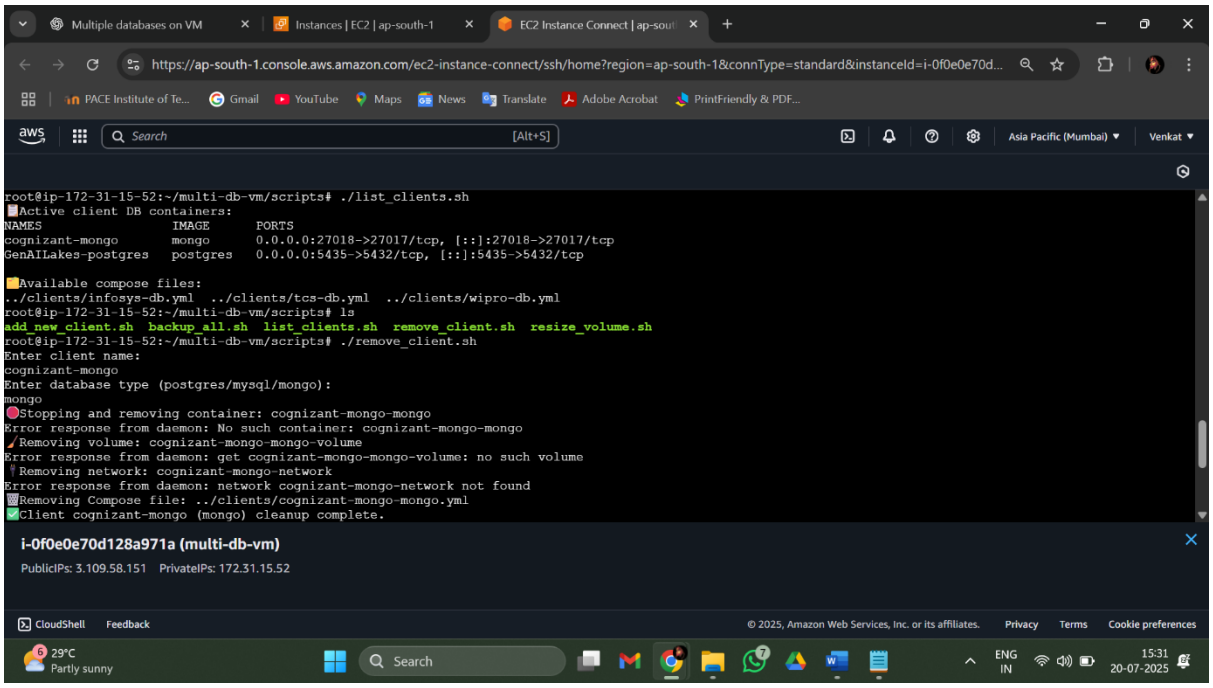
➔ STEP 6: Lists all the Clients:

⇨ vi list_clients.sh

```
#!/bin/bash

echo "📋 Active client DB containers:"
docker ps --format "table {{.Names}}\t{{.Image}}\t{{.Ports}}"

echo -e "\n🗂 Available compose files:"
```

ls ../clients/*-db.yml 2>/dev/null || echo "No client YAMLs found."

⇨ chmod +x list_clients.sh
⇨ ./list_clients.sh



➔ STEP 7: Generates Clients client.json file:

⇨ vi generate_clients_json.sh

```
#!/bin/bash

CLIENTS_DIR="../clients"
OUTPUT_FILE="$CLIENTS_DIR/clients.json"
CLIENT_ENTRIES=()

echo "🔄 Scanning $CLIENTS_DIR for *.yml files..."

for file in "$CLIENTS_DIR"/*.yml; do
  filename=$(basename "$file" .yml)
  name="$filename"

  # Auto-detect database type based on name
  if [[ "$name" == *"postgres"* ]]; then
```

```
    db_type="postgres"
    port_guess=5432
    user="postgres"
  elif [[ "$name" == *"mysql"* ]]; then
    db_type="mysql"
    port_guess=3306
    user="root"
  elif [[ "$name" == *"mongo"* ]]; then
    db_type="mongodb"
    port_guess=27017
    user="root"
  else
    echo "⚠ Could not determine DB type for $name, skipping..."
    continue
  fi

  # Generate a guessed port to avoid conflicts (5432 + random)
  port=$((port_guess + RANDOM % 100))

  # Strip known vendor name to use for DB name (just a guess)
  clean_name=$(echo "$name" | sed -E 's/[-_](postgres|mysql|mongo)//g' |
tr '[:upper:]' '[:lower:]')

  # Build JSON entry
  CLIENT_ENTRY=$(jq -n \
    --arg name "$name" \
    --arg type "$db_type" \
    --argjson port "$port" \
    --arg db_name "${clean_name}db" \
    --arg db_user "$user" \
    --arg db_password "changeme" \
    '{name: $name, type: $type, port: $port, db_name: $db_name, db_user:
$db_user, db_password: $db_password}'
  )

  CLIENT_ENTRIES+=("$CLIENT_ENTRY")
done

# Output to JSON array
jq -s '.' <<< "${CLIENT_ENTRIES[*]}" > "$OUTPUT_FILE"
```

echo "✅ Generated clients.json at $OUTPUT_FILE"

⇨ chmod +x generate_clients_json.sh

⇨ ./generate_clients_json.sh

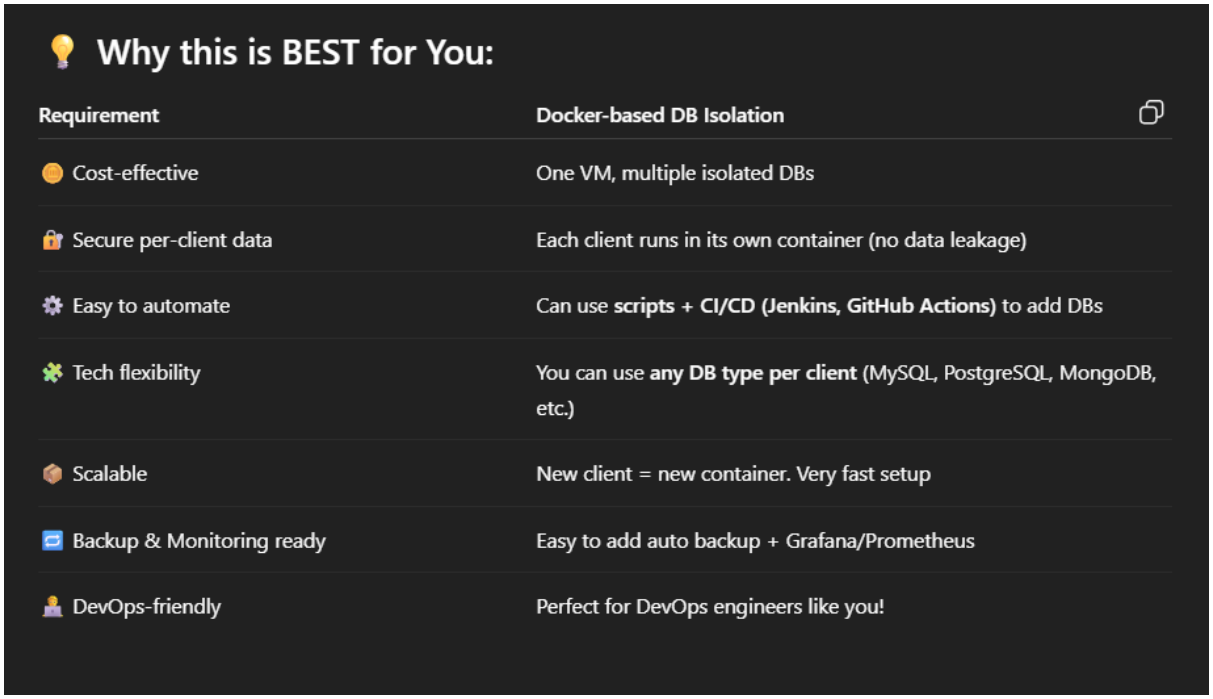
⇨ cat ../clients/clients.json | jq [You can View]

Features:

- ✅ Multiple Database support
- ✅ Isolated container per client
- ✅ Port/volume/network automation
- ✅ Dynamic database name, user, and password input
- ✅ Dynamic port assignment
- ✅ Safe volume resizing
- ✅ Backup per engine
- ✅ Client removal automation
- ✅ Docker logs
- ✅ Auto-update of clients.json for tracking
- ✅ Can scale to 30+ clients per VM (based on specs)

📊 Comparison Table

Approach	Security	Isolation	Cost	Management
Single DB Engine, Multiple DBs	Moderate	Shared process	Low	Easy
Dockerized DBs	High	Full container isolation	Low	Moderate
Multi-Tenant Schema	Depends on implementation	Shared schema	Very Low	Complex



💡 Why this is BEST for You:

Requirement	Docker-based DB Isolation
🟡 Cost-effective	One VM, multiple isolated DBs
🔐 Secure per-client data	Each client runs in its own container (no data leakage)
⚙️ Easy to automate	Can use **scripts + CI/CD (Jenkins, GitHub Actions)** to add DBs
🧩 Tech flexibility	You can use **any DB type per client** (MySQL, PostgreSQL, MongoDB, etc.)
📦 Scalable	New client = new container. Very fast setup
🔁 Backup & Monitoring ready	Easy to add auto backup + Grafana/Prometheus
👨‍💻 DevOps-friendly	Perfect for DevOps engineers like you!

Security Tips

- Use UFW to block unwanted ports
- Avoid hardcoded passwords
- Use encrypted volumes
- Limit Docker network scope per client

Ideal For:

- SaaS platforms
- Dev/test DB environments
- DB-as-a-Service (DBaaS)

✅ Suitable Use Cases

- 🔹 Startups & agencies hosting test/staging DBs for multiple clients.
- 🔹 Freelancers managing separate DBs for multiple projects.
- 🔹 Internal tools, POCs, small-scale multi-tenant applications.

❌ Not Suitable For

- ❌ Enterprises needing **high availability**, replication, and **auto-scaling**.
- ❌ Projects with **high compliance requirements** (like banking or healthcare).
- ❌ Apps needing **cloud-native DB features** (like AWS RDS snapshot, IAM auth, etc.)