📌 **Project Title:**

Enable Cross-Region Backup Replication for EC2 using AWS Backup

---

1️⃣ Objective:

To automatically back up an EC2 instance in a **primary region (e.g., Mumbai/us-east-1)** and replicate the backup to a **secondary region (e.g., Singapore/us-west-2)** using AWS Backup with cross-region copy functionality.

2️⃣ Tools and Services Used:

Tool/Service	Purpose
Amazon EC2	Instance to backup
AWS Backup	To manage backup plans
IAM Role (default)	Allows AWS Backup access to EC2
Backup Vault	Storage for backups

3️⃣ Step-by-Step Implementation:

◆ Step 1: Launch EC2 Instance in Primary Region

1. Log in to **AWS Console**.
2. Choose **Region**: e.g., `us-east-1` or `ap-south-1`.
3. Go to **EC2 Dashboard → Launch Instance**.
4. Configure:
   - **Name**: `MyPrimaryEC2`
   - **AMI**: Amazon Linux 2 (Free tier)
   - **Type**: `t2.micro`
   - **Key Pair**: `ec2-key-prashant` (Create new if not available)
   - **Security Group**: Allow **SSH (22)** and **HTTP (80)**
5. Launch the instance.

✅ Connect to the instance:

```
ssh -i ec2-key-prashant.pem ec2-user@<Public-IP>
```

✅ Create a test file:

```
echo "<h1>Backup Test</h1>" > index.html
```

◆ Step 2: Create Backup Vaults

1. Go to **AWS Backup → Backup Vaults**.
2. Create:
    - `primary-vault` in `us-east-1`
    - `destination-vault` in `us-west-2` (or Singapore)

◆ Step 3: Create Backup Plan

1. Go to **AWS Backup → Backup plans → Create Plan**.
2. Choose: **Build a new plan**
3. Configuration:
    - **Plan Name**: `EC2CrossRegionPlan`
    - **Rule Name**: `DailyBackupRule`
    - **Frequency**: Daily
    - **Vault**: `primary-vault`
    - **Lifecycle**: Move to cold storage after 7 days (optional)

◆ Step 4: Assign EC2 to Backup Plan

1. In your **Backup Plan**, click **Assign resources**.
2. Fill:
    - **Resource assignment name**: `EC2Assignment`
    - **IAM Role**: `Default` (Backup_Default_Role)
    - **Resource Type**: EC2
    - **Select Instance**: `MyPrimaryEC2`
3. Click **Assign**

◆ Step 5: Enable Cross-Region Copy Rule

1. Open **EC2CrossRegionPlan → Edit Plan**.
2. Under `DailyBackupRule`, click ⋮ → **Edit**.
3. Scroll to **Copy to another region**:
    - ✅ **Enable copy to another region**
    - **Destination Region**: `us-west-2` (Oregon) or `ap-southeast-1` (Singapore)
    - **Destination Vault**: `destination-vault`
    - **Copy Frequency**: Same as source (Daily)
    - **Retention**: Match source
4. Click **Save Changes**

◆ Step 6: Trigger and Validate Backup

1. Go to **AWS Backup → Protected Resources**
2. Select EC2 → Actions → **Backup Now**
3. Confirm job starts.

🔎 Validation:

- Go to **Backup → Jobs**.
- Verify:
  - Source job = **Completed**
  - Copy job = **Completed**

🔎 Switch to **destination region** (us-west-2 or ap-southeast-1):

- Go to **Backup Vaults → destination-vault**
- ✅ Check if **Recovery Point** is available

🎯 Benefits:

- Ensures high data durability even if a region fails
- Automated Disaster Recovery (DR) readiness
- Simple, secure, and cost-effective
- No need for third-party backup tools

⚠️ Common Issues & Fixes:

Challenge	Solution
IAM Role Permission Error	Use `Backup_Default_Role`
Region Mismatch	Make sure source ≠ destination
EC2 Not Visible	Ensure EC2 is in same account and region

✅ Conclusion:

This project shows how to use **native AWS services** to back up EC2 instances and **replicate across regions**. It improves business continuity, data protection, and compliance with a **fully automated** and **cost-efficient** solution.
