TEST

Complete Documentation https://github.com/ghulammuzz/sre-F089348

SECTION 1

1. What does an SRE do and how is it different from a SysAdmin?

SRE (Site Reliability Engineer)

- Ensures systems are reliable, scalable, and efficient by applying software engineering principles to operations.

- Focuses on automation, observability, capacity planning, and incident response.

- Uses code & automation to manage systems.

- Works with SLOs, SLIs, and Error Budgets.

- Has a DevOps mindset, works closely with development teams.

SysAdmin (System Administrator)

- Focuses on day-to-day operations and manual system maintenance such as server configuration and patching.

- Manual configuration and setup.

- Mainly focuses on uptime.

- Often separated from development.

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2. Define SLA, SLO, SLI, Error Budget

- **SLA (Service Level Agreement)** → Contractual agreement with the customer about service performance (e.g., 99.9% uptime).

- **SLO (Service Level Objective)** → Internal performance target (e.g., 99.95% uptime).

- **SLI (Service Level Indicator)** → Metric that measures service performance (e.g., percentage of successful requests in 30 days).

- **Error Budget** → Maximum allowable downtime or errors before breaching the SLO.

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3. Uptime 99.9% per month

a. Allowed downtime calculation:
30 days = 30 × 24 × 60 = 43,200 minutes 0.1% of 43,200 = 43.2 minutes downtime allowed per month

b. Suggested monitoring & alerting:

- **Monitoring:** Prometheus/Grafana for metrics.
- **Alerting:** Alertmanager → send alerts to Slack/Email/PagerDuty when latency or error rate exceeds thresholds.
- **Synthetic checks:** Blackbox Exporter / UptimeRobot to verify availability from multiple locations.
- **Logging:** Loki / ELK Stack for root cause investigation.

SECTION 2

1. How a DNS lookup works for `https://flip.id`

1. Browser checks local DNS cache.
2. If not found, it queries a DNS resolver (ISP or public DNS like 8.8.8.8).
3. The resolver checks its own cache; if not found, queries the root DNS servers.
4. Root DNS servers return a referral to the `.id` TLD servers.
5. `.id` servers return the authoritative nameservers for `flip.id`.
6. The authoritative server returns the IP address to the resolver.
7. The resolver sends the IP back to the browser.
8. The browser initiates a TCP connection and performs a TLS handshake to the IP.

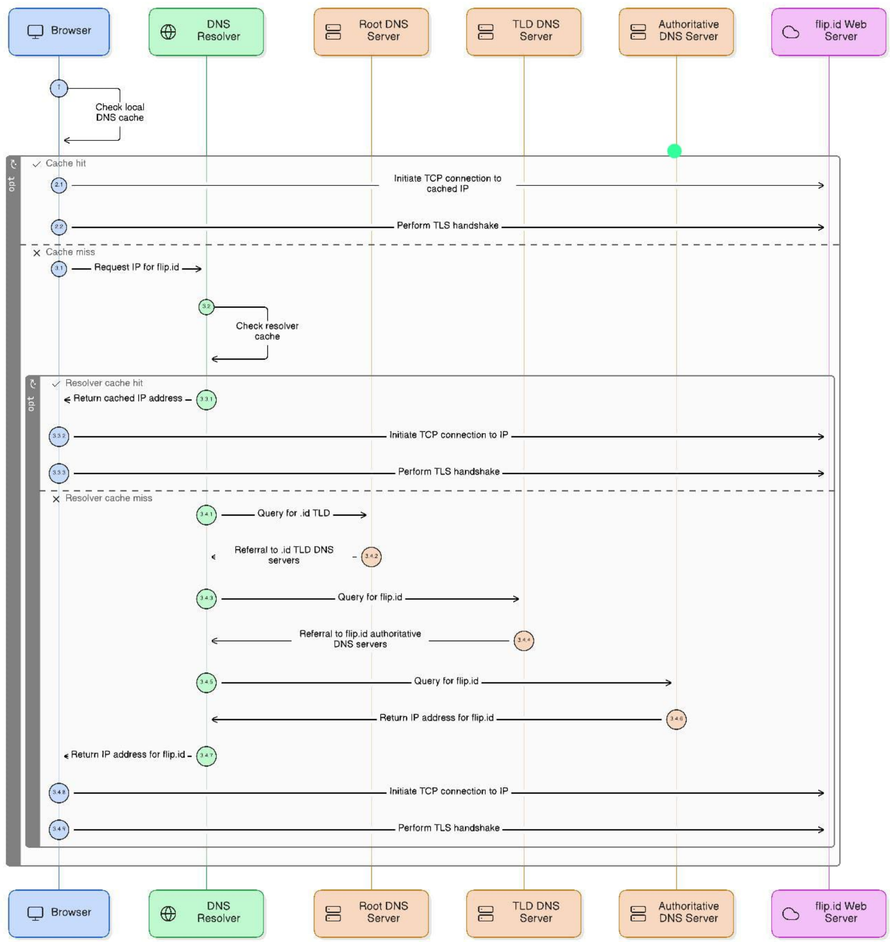

Figure 1: Diagram askdas

2. Host 192.168.1.2/29 pinging 192.168.1.50/24

- **a.** Ping will fail.

- **b. Reasoning:**
  - 192.168.1.2/29 → subnet range: `192.168.1.0 - 192.168.1.7`
  - 192.168.1.50/24 → subnet range: `192.168.1.0 - 192.168.1.255`

From the /29 host's perspective, 192.168.1.50 is outside its subnet and requires a gateway/router. If no gateway is configured, communication will fail.

SECTION 3

1. Troubleshooting with the OSI model

- **Layer 1 (Physical):** Check cables, power, network interface card.
- **Layer 2 (Data Link):** Check switch connection, VLAN settings.
- **Layer 3 (Network):** Verify IP, subnet, gateway, and ping tests.
- **Layer 4 (Transport):** Test connectivity using `telnet` or `netcat` to target port.
- **Layer 5 (Session):** Check for session timeouts or keepalive settings.
- **Layer 6 (Presentation):** Verify SSL/TLS certificates.
- **Layer 7 (Application):** Check application logs, configurations, and authentication.

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2. GCP choice for a simple web application

- **Answer: B. Cloud Run** → Ideal for running containerized apps without managing infrastructure, with automatic scaling -> simple.

- **When to choose differently:**
  - **GKE** → For complex, multi-service workloads.
  - **Compute Engine** → For full VM control.
  - **App Engine** → For a PaaS option with more opinionated runtime.

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3. High memory usage alert

- **Answer: B.** Check logs and metrics to determine if there's a memory leak or unusual load pattern.
- **Reasoning:** Increasing memory or restarting is only a temporary fix. Disabling alerts can hide real issues.
- **Verification:** Use tools like `top`, `htop`, `kubectl top pod`, and Prometheus metrics to identify the root cause.

SECTION 4

1. What is IaC and why is it important?

Infrastructure as Code (IaC) → Defining infrastructure in configuration files that can be executed automatically.

Importance:

- Consistent environments.
- Version-controlled infrastructure.
- Faster provisioning.
- Easier rollback and reproducibility.

Difference from manual provisioning: No manual clicks or step-by-step configuration; everything is automated and repeatable.

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2. Basic Terraform Config (EC2 provision with tagging for cost observ)

for here I use and utilize terragrunt as ec2 because the answer is the same as no. 4.4 and 4.3

```
2.4
  modules
    ec2_asg
      data.tf
      main.tf
      outputs.tf
      variables.tf
    vpc
      main.tf
```

```
        outputs.tf
        variables.tf
    output-public-ip.png
    terragrunt-insance-example.png
    terragrunt-vpc-example.png
```

e.g public_ip as a output

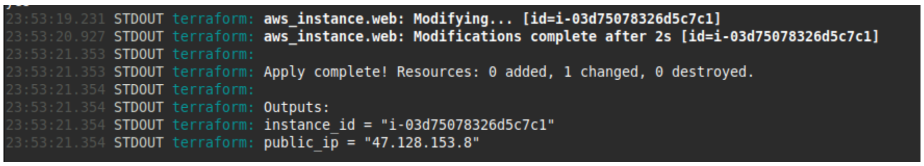

Figure 2: Diagram Arsitektur

3. Safely applying Terraform changes in collaboration

When working with multiple team members, it's important to ensure Terraform deployments are **safe**, **predictable**, and **free from state conflicts**. Here are the recommended practices:

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1. Use Remote State Storage

- Store the Terraform state file in a **remote backend** such as **Amazon S3**, **Google Cloud Storage (GCS)**, or **Terraform Cloud**.
- This ensures all team members work with the **same up-to-date state** instead of maintaining local copies.

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2. Enable State Locking

- Use a **locking mechanism** to prevent concurrent modifications:
  - **DynamoDB** (when using S3 backend)
  - **Terraform Cloud's built-in locking**
- This avoids **state corruption** caused by two people applying changes at the same time.

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3. Run `terraform plan` Before Applying

- Always run:

  ```
  terraform plan
  ```

- Review the plan to see what changes will be made.

- Share this plan for peer review before running:

  `terraform apply`

4. Consisten Provider and Module Versions

- lock provider using req_provider

```
terraform {
      required_providers {
            aws = {
                  source  = "hashicorp/aws"
                  version = "~> 5.0"
            }
      }
}
```

- lock module using versions in `source` ref

```
module "vpc" {
      source  = "git::https://github.com/example/vpc.git?ref=v1.2.0"
      }
```

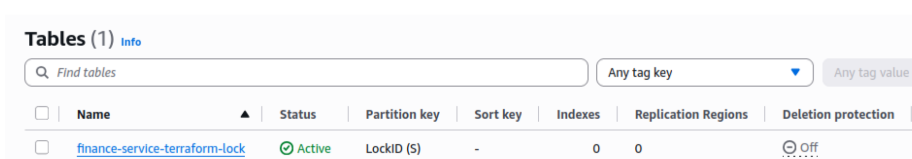
5. Automate with CI/CD Pipelines

- Implement automated workflows with GitHub Actions, GitLab CI, or similar.
- CI/CD pipeline should:
  - Run terraform fmt to format code
  - Run terraform validate to check syntax and provider configs
  - Generate a plan for review using -tfout to show in pr comment
  - Apply changes only in a controlled environment can via merge trigeer or via tools like `atlantis` to apply in comment review

```
prereq
    dynamodb-lock-tf.png
    main.tf
    terraform.tfstate
```

Directory

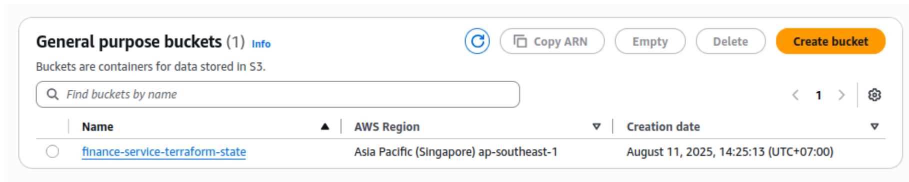
e.g table for lock

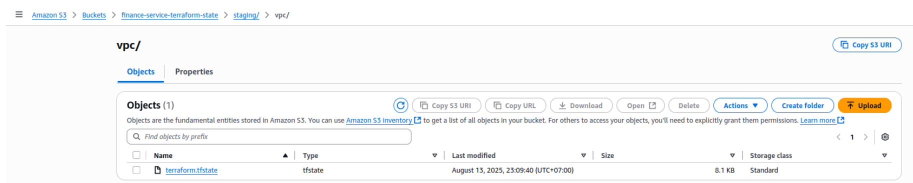


Tables (1) Info

Find tables | Any tag key | Any tag value

Name	Status	Partition key	Sort key	Indexes	Replication Regions	Deletion protection
finance-service-terraform-lock	Active	LockID (S)	-	0	0	Off

e.g s3 for save tfstate 

e.g s3 dir for tfstate 

4. Terraform structure for staging and production

To create identical infrastructure for staging and production with only minor differences (like instance type or number of replicas), I structure the codebase using Terragrunt and reusable Terraform modules. in this case im only changed to configure `instance_type`

```
2.4
  live
      production
          ec2_asg
              terragrunt.hcl
          vpc
              terragrunt.hcl
      root.hcl
      staging
          ec2_asg
              terragrunt.hcl
          vpc
              terragrunt.hcl
  modules
      ec2_asg
          data.tf
          main.tf
          outputs.tf
          variables.tf
      vpc
          main.tf
          outputs.tf
          variables.tf
  output-public-ip.png
  terragrunt-insance-example.png
  terragrunt-vpc-example.png
```

Environment-Specific Inputs Each environment passes its own variables to the same modules: Staging (live/staging/ec2_asg/terragrunt.hcl)

```
inputs = {
  aws_region    = "ap-southeast-1"
  instance_type = "t2.nano" <---
  subnet_id     = dependency.vpc.outputs.public_subnet_id
  env           = "staging"
  project       = "finance-service"
  cost_center   = "FIN001-FinancePlatform"
}
```

Production (live/production/ec2_asg/terragrunt.hcl)

```
inputs = {
  aws_region    = "ap-southeast-1"
  instance_type = "t2.micro" <----
  subnet_id     = dependency.vpc.outputs.public_subnet_id
  env           = "production"
  project       = "finance-service"
  cost_center   = "FIN001-FinancePlatform"
}
```

Only minor differences, like instance_type and env, are changed per environment. Everything else is reused from the same Terraform modules.