Capacity, Architecture & Cost Estimation – Quiz App

Application Overview

This application is a quiz-based web platform designed for certification-style preparation. It serves curated question sets (~1000 questions) with associated static images (~2000–3000 images). Users receive questions in batches (5 at a time). Traffic is primarily read-heavy, with limited write operations (quiz submissions and score storage). The system prioritizes simplicity, portability, and vertical scalability over premature architectural complexity.

Stack Overview

```
- Angular Frontend (SPA)
- Node.js Backend (API)
- SQL (Postgres) OR MongoDB (primary datastore)
- Reverse Proxy (Caddy / Traefik / Nginx)
- Static curated images served locally
- Single Hetzner VPS node

Provisioning & Deployment:
- Ansible for OS provisioning, Docker installation, firewall, and deployment
- Docker Compose for service orchestration
```
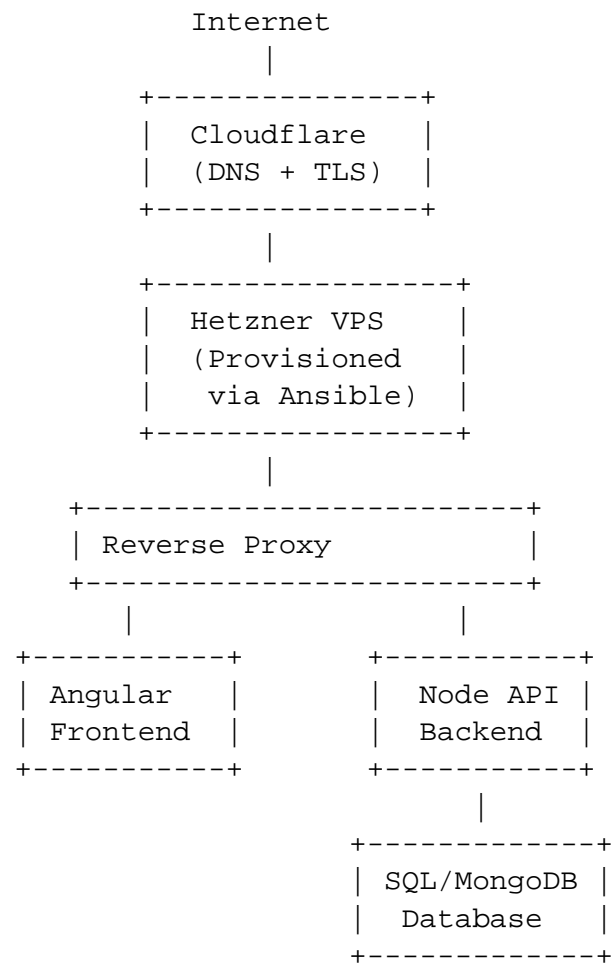
VPS Options & Pricing (Approximate Monthly)

Plan	vCPU	RAM	NVMe	Approx Price
CX22	2	4GB	40GB	€5
CX32	4	8GB	80GB	€9–12
CX42	8	16GB	160GB	€18–22

Architecture Overview — Single VPS Deployment

```
                Internet
                   |
         +---------------+
         | Cloudflare    |
         | (DNS + TLS)   |
         +---------------+
                 |
         +-----------------+
         |  Hetzner VPS    |
         |  (Provisioned   |
         |   via Ansible)  |
         +-----------------+
                 |
       +-------------------------+
       | Reverse Proxy           |
       +-------------------------+
            |               |
      +----------+    +-----------+
      | Angular  |    |  Node API |
      | Frontend |    |  Backend  |
      +----------+    +-----------+
                            |
                      +-------------+
                      | SQL/MongoDB |
                      |  Database   |
                      +-------------+
```

Vertical Scaling Strategy

```
Launch Strategy:
- First month: Start with CX32 or CX42 for traffic uncertainty.
- After stabilization: Downscale to CX22 if sustained load is low.

Vertical scaling process:
1. Stop VPS
2. Resize in Hetzner panel
3. Restart
4. Optional filesystem resize

Terraform can later be introduced for:
- VPS provisioning
- DNS management
- Firewall configuration
- Managed DB/CDN integration
```

Estimated Monthly Cost (Current State)

```
CX22 setup:
- VPS: €5
- Domain: €1-2
- Cloudflare (Free Tier): €0
Total: ~€6-7/month

CX32 setup:
- VPS: €9-12
- Domain: €1-2
Total: ~€10-14/month

CX42 setup:
- VPS: €18-22
- Domain: €1-2
Total: ~€19-24/month
```

Future Scaling Cost Reference

```
CDN Options (Later Stage):
- Cloudflare Free: €0
- Cloudflare Pro: ~€20/month
- Object Storage + CDN (Hetzner): ~€5-10/month

Managed Database Options:
- Managed Postgres (entry tier): €15-30/month
- Managed MongoDB (entry tier): €20-50/month

Load Balancer (Horizontal Scaling):
- Cloud LB: ~€5-15/month
```