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From Architect Interview Questions: Design National University 🎓

Recently, I tackled a thought architect interview question:

"Design a system for the National University of City X to expand its operations globally and provide both internal and external students access to Computer Science courses. The platform should deliver high-quality educational materials (videos, articles, books) and automate grading for student-submitted solutions, all while being cost-efficient and scalable."

This was no small task—it required thinking critically about scalability, automation, and user experience while staying mindful of costs. Here's how I approached it:

Breaking Down the Problem:

1️⃣ Global Scale: The platform must support thousands (if not millions) of users accessing content and submitting solutions simultaneously.

2️⃣ Automated Grading: The grading system needs to evaluate solutions quickly and handle spikes in workload during deadlines or exams.

3️⃣ Content Delivery: Videos, articles, and books must be delivered seamlessly to students worldwide.

4️⃣ Cost Efficiency: The design must ensure efficient resource usage without compromising performance.

Solution Overview:

Frontend Services:

- A User Web App for internal and online students to access courses, submit assignments, and receive feedback.

- Authentication to secure access and manage user identities.

- A WAF Shield to protect against cyber threats.

- API Gateway/Proxy:

Acts as the central router, connecting frontend requests to the appropriate backend services.

Internal Services:

- Automated Grading System: Dynamically scales horizontally based on submission queue length. For

instance, during peak times, additional grading workers spin up to handle the load.

- Payment Services for enrollment.

- Notification Services for real-time updates.

- Analytics and Reporting to monitor user performance and engagement.

- Data Management:

SQL databases for structured data like user profiles, grades, and payments.

NoSQL databases for unstructured data, such as submitted assignments and media content.

- Static File Storage for educational materials.

- Content Delivery Network (CDN):

Ensures fast and reliable delivery of videos, articles, and books across the globe.

Core Features: 💡

The grading system scales horizontally, adapting to queue length to handle bursts of submissions
efficiently.

The use of CDN minimizes latency for users accessing content from different parts of the world.

The design ensures a cost-effective and reliable platform with modular, easily scalable components.

Bellow implementation diagram.

#SystemDesign #ArchitectureInterview #Scalability #EdTech #Automation

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