52 System Design Interview Questions to Ask Applicants

Questions

1. How would you design a URL shortening service like bit.ly? Discuss the key components and databases you would use.

2. Can you explain how you would go about designing a messaging system that supports both real-time and delayed messaging?

3. What considerations would you take into account when designing a scalable e-commerce platform that handles high traffic during sales events?

4. How would you design a system for a ride-sharing application? What features would be essential?

5. Describe how you would ensure data consistency in a distributed database system. What strategies would you use?

6. If tasked with building a video streaming service, what architecture would you implement to handle millions of concurrent users?

7. How would you approach designing a search engine for a large dataset? What indexing strategies would you recommend?

8. What methods would you use to cache frequently accessed data in a web application? Explain your reasoning.

9. In designing a content management system, how would you structure the database to accommodate both content and user roles?

10. Can you describe a time when you had to make a trade-off between system performance and data integrity? What decision did you make?

11. How would you design a notification system for a social media platform?

12. What strategies would you employ to handle data migration in a large-scale system?

13. How would you approach designing a recommendation system for an online retail store?

14. How would you ensure the security of user data in a web application?

15. Explain how you would handle system failures in a distributed system.

16. What factors would you consider when designing a mobile application backend?

17. How would you design an analytics system to track user behavior on a website?

18. What considerations would you take into account when designing a multi-tenant SaaS application?

19. How would you design a distributed caching mechanism to improve data retrieval speeds?

20. What strategies would you use to partition a large database for scalability and performance?

21. Describe how you would design a fault-tolerant system to ensure continuous service availability.

22. How would you handle data synchronization across microservices in a distributed system?

23. What are your considerations when designing a logging and monitoring framework for a cloud-based application?

24. Can you explain how you would implement a rate-limiting mechanism to prevent abuse of an API?

25. How would you design a load balancing solution to distribute incoming traffic efficiently?

26. What approach would you take to design a highly available and scalable notification system?

27. How would you design a secure authentication and authorization system for a web application?

28. What factors would you consider when designing a data backup and recovery solution?

29. How would you approach designing an event-driven architecture for a real-time application?

30. Describe the steps you would take to optimize the performance of a database-heavy web application.

31. How would you design a microservices architecture to ensure loose coupling and high cohesion?

32. What are your considerations for designing a system that handles large-scale batch processing?

33. Explain how you would implement a versioning system for APIs to ensure backward compatibility.

34. How would you design a global content delivery network (CDN) to minimize latency for users worldwide?

35. Describe how you would design a system to process and analyze real-time data from millions of IoT devices.

36. How would you design a distributed task scheduling system for a large-scale microservices architecture?

37. Design a system for a global multiplayer game that can support millions of concurrent users with low latency.

38. How would you design a fraud detection system for a large e-commerce platform?

39. Design a system that can process and store petabytes of genomic data for quick retrieval and analysis.

40. How would you design a real-time bidding system for an advertising platform?

41. How would you design a system using the microservices architectural pattern? What are the benefits and challenges of this approach?

42. Can you explain the differences between monolithic and service-oriented architectures? In which scenarios would you choose one over the other?

43. Describe how you would implement an event-driven architecture in a system that requires real-time data processing.

44. How would you use the Model-View-Controller (MVC) pattern to design a web application? Explain how each component interacts.

45. What is the CAP theorem, and how does it affect the design of distributed systems?

46. Explain how the CQRS (Command Query Responsibility Segregation) pattern can be used to handle complex business logic. What are the trade-offs?

47. How would you design a system using the layered architecture pattern? What are the advantages and disadvantages of this approach?

48. Describe a scenario where you would use the microkernel architecture. How does it enhance system flexibility?

49. Can you explain how to implement the dependency injection pattern in a software system? What are its benefits?