104 System Design interview questions to ask your applicants

Questions

1. Imagine you're building a simple photo-sharing app like Instagram. How would you let users upload pictures and then show those pictures to their friends?

2. Let's say you want to design a tiny search engine just for searching your favorite books. How would you store the book titles and quickly find the one you want?

3. If you were making a very basic online game where players can move around a map, how would you keep track of where everyone is at the same time?

4. Suppose you are building a service to shorten long website links, like bit.ly. How would you generate short, unique names for the links?

5. How would you design a system for a small library that lets people borrow and return books, keeping track of who has what?

6. If you were creating a simple chat application where people can send messages to each other, how would you make sure the messages get delivered even if someone is offline?

7. Let's design a system to recommend movies to users. If a user likes action movies, how can you make sure your system recommends similar movies?

8. Imagine you're designing a system to store user profiles (name, age, etc.). How would you efficiently search for all users who are in a specific age range?

9. If you were designing a system that sends out email notifications to users, how would you make sure that not everyone gets the email at the exact same moment?

10. How would you design a basic counter that keeps track of how many visitors come to a website each day?

11. You're building a system to store weather information for different cities. How would you let users quickly find the current temperature of any city?

12. If you wanted to build a music streaming service that allows users to create playlists, how would you store and manage those playlists efficiently?

13. Imagine you are building a system to manage student grades. How would you allow teachers to enter grades and students to view their own grades securely?

14. How would you go about designing a simple system to manage appointments for a doctor's office?

15. If you were designing a basic system to keep track of inventory for a small store, how would you handle adding new items and updating the quantity of existing items?

16. Let's say you're building a system to store comments on a blog post. How would you organize the comments so that they appear in the correct order?

17. Imagine you have to design the backend for a food delivery app, focusing on how restaurants manage their menu and update item availability. How would you approach this?

18. How would you design a very simple system to track tasks (like a to-do list) and their completion status?

19. If you were to design a system for a social media platform to display posts in a user's feed, how would you ensure the most relevant content shows up first?

20. Imagine you're building a system for a car rental company to manage vehicle availability. What are the key components of this system?

21. Design a system that manages user authentication for a simple website. How do you store and verify user credentials safely?

22. How can we design a system for a basic polling application, where users can vote on different options? How do we tally the votes accurately and display the results?

23. If you are designing a 'notes' application like Google Keep, how would you ensure all the notes are synced across devices for a user?

24. Design a system to provide customer support via live chat. How would you route conversations to available agents and manage multiple concurrent chats?

25. If you are building a social networking site, how do you design a system to track friend requests?

26. How do you design a system that stores the history of articles being updated on a website?

27. Design a system to recommend trending hashtags on a social media platform. How would you handle real-time updates and scalability?

28. How would you design a rate limiting system to protect an API from abuse? Consider different levels of granularity (user, IP address, etc.).

29. Design a system for managing and distributing software updates to a large fleet of devices. How would you ensure reliability and minimize downtime?

30. Design a system for processing and analyzing clickstream data from a website. How would you handle the high volume and velocity of data?

31. How would you design a system for managing user sessions in a distributed web application? Consider scalability, security, and fault tolerance.

32. Design a system to track the location of delivery vehicles in real-time. How would you handle GPS inaccuracies and network latency?

33. How would you design a system for A/B testing different versions of a website or application? Consider how to track and analyze results.

34. Design a system for backing up and restoring large databases. How would you ensure data consistency and minimize downtime?

35. How would you design a system for managing and scheduling background tasks in a distributed environment? Consider reliability and resource utilization.

36. Design a system for building and deploying machine learning models. How would you handle versioning, testing, and monitoring?

37. How would you design a system for caching frequently accessed data in a distributed environment? Consider different caching strategies and eviction policies.

38. Design a system for processing and analyzing logs from a distributed application. How would you handle the high volume and variety of logs?

39. How would you design a system for indexing and searching a large collection of documents? Consider different indexing techniques and query optimization strategies.

40. Design a system to send push notifications to mobile devices. How would you handle different platforms (iOS, Android) and ensure reliable delivery?

41. How would you design a system for storing and serving large media files (images, videos)? Consider different storage options and content delivery networks.

42. Design a system for managing user roles and permissions in a distributed application. How would you handle authentication and authorization?

43. How would you design a system for detecting and preventing fraudulent activity in an online transaction system? Consider different fraud detection techniques.

44. Design a system for real-time collaborative editing of documents. How would you handle concurrent edits and data consistency?

45. How would you design a system for monitoring the health and performance of a distributed application? Consider different metrics and alerting mechanisms.

46. Design a system for managing and scheduling social media posts across multiple platforms. How would you handle different API limitations and ensure timely delivery?

47. How would you design a payment processing system that handles transactions from various sources like credit cards and digital wallets?

48. Design a system for detecting fraudulent transactions in real-time. Consider different fraud patterns and scalability requirements.

49. How would you design a system for managing and deploying machine learning models at scale?

50. Let's design a distributed rate limiter that can handle millions of requests per second. Think about accuracy, fairness, and fault tolerance.

51. Design a system for A/B testing different versions of a website or application, handling metrics, user segmentation, and statistical significance.

52. How would you design a system to efficiently store and query time-series data from millions of IoT devices?

53. Design a recommendation system that can provide personalized recommendations to users based on their past behavior and preferences.

54. Let's design a system for distributed consensus, like Paxos or Raft, and how it can be applied to build a highly available database.

55. How would you design a system for analyzing social media trends and sentiment in real-time?

56. Design a system that can process and analyze large volumes of clickstream data to understand user behavior on a website.

57. Let's design a system for automatically scaling cloud resources based on real-time demand and performance metrics.

58. How would you design a system to efficiently back up and restore large databases with minimal downtime?

59. Design a system for managing and orchestrating microservices in a distributed environment.

60. Let's design a system that identifies and mitigates security vulnerabilities in a large-scale application.

61. How would you design a system for handling real-time bidding in an online advertising exchange?

62. Design a system for storing and querying graph data, such as social networks or knowledge graphs.

63. Let's design a system for managing and tracking inventory across multiple warehouses in a supply chain.

64. How would you design a system to ensure data consistency across multiple data centers in the event of a failure?

65. Design a system for processing and analyzing streaming data from multiple sources, such as sensors or financial markets.

66. Let's design a system for detecting and preventing denial-of-service (DoS) attacks on a website or application.

67. How would you design a system for managing and distributing software updates to a large fleet of devices?

68. How would you design a system to detect and prevent fraudulent transactions in real-time, considering various fraud patterns and evolving techniques?

69. Describe how you would design a global-scale, eventually consistent key-value store with minimal latency for reads and writes, handling network partitions and data consistency challenges.

70. Explain your approach to designing a system that can automatically scale resources based on real-time demand while optimizing for cost efficiency and minimizing latency.

71. How would you design a system for personalized recommendations that adapts to changing user behavior and provides relevant suggestions across different platforms?

72. Describe the design of a system for analyzing and visualizing large-scale social media data to identify trends, sentiment, and influential users in real time.

73. How would you design a system to efficiently process and store high-volume, high-velocity streaming data from IoT devices, ensuring data integrity and low latency for analytics?

74. Explain how you would design a system for real-time collaborative document editing with support for multiple users, conflict resolution, and version control.

75. How would you design a system to perform complex event processing (CEP) on streaming data to detect patterns and trigger actions based on predefined rules?

76. Describe the design of a system for building and deploying machine learning models at scale, including feature engineering, model training, and online prediction.

77. How would you design a system for secure and efficient storage and retrieval of sensitive data, ensuring compliance with privacy regulations and protecting against data breaches?

78. Explain how you would design a system for real-time monitoring and alerting of critical infrastructure components, such as servers, databases, and networks, with automated remediation capabilities.

79. How would you design a system for distributed consensus that can tolerate Byzantine faults and ensure data consistency in a decentralized environment?

80. Describe the design of a system for building and managing a large-scale microservices architecture, including service discovery, load balancing, and fault tolerance.

81. How would you design a system for efficient indexing and searching of unstructured data, such as text documents and images, with support for complex queries and relevance ranking?

82. Explain how you would design a system for real-time video processing and analysis, including object detection, tracking, and scene understanding, with low latency and high accuracy?

83. How would you design a system for automated code deployment and rollback, ensuring minimal downtime and seamless integration with continuous integration pipelines?

84. Describe the design of a system for managing and orchestrating containerized applications at scale, including resource allocation, scheduling, and monitoring.

85. How would you design a system for distributed tracing and debugging of complex microservices applications, enabling developers to identify performance bottlenecks and troubleshoot errors?

86. Explain how you would design a system for real-time anomaly detection in time-series data, identifying unusual patterns and triggering alerts based on statistical analysis?

87. How would you approach designing a system for A/B testing different versions of a website or application, collecting data on user behavior, and determining which version performs better?

88. Describe the design considerations for building a social network that supports billions of users, focusing on scalability, data consistency, and user experience.

89. How would you design a system for detecting and mitigating DDoS attacks on a large-scale web application, ensuring availability and performance under attack?

90. Explain the trade-offs and considerations when designing a system that requires both high availability and strong consistency, especially in a distributed environment.

91. How would you design a system to efficiently process and analyze genomic data for personalized medicine, considering the volume, variety, and velocity of the data?

92. Describe the challenges and solutions for building a system that can handle unpredictable spikes in traffic, such as during a major news event or product launch.

93. How would you design a system for managing and distributing software updates to a large fleet of devices, ensuring reliability and minimizing disruption to users?