Modern System Design and key characteristics

Unveiling the Secrets of Performance, Scalability, and Maintainability

Hina Arora
@hinaarora

Introduction

Hina Arora
@hinaarora

Definition of Modern System Design

Understanding the fundamentals of modern system design

Modern system design refers to the process of creating and implementing efficient, scalable, and maintainable systems that meet the complex demands of today's technology landscape.

Hina Arora
@hinaarora

Key Characteristics

Scalability

- **Vertical Scalability**

  Increase the resources (CPU, RAM) of a single machine to handle more load

- **Horizontal Scalability**

  Add more machines to the system to handle increasing load

- **Load Balancing**

  Distribute the incoming load across multiple machines to ensure optimal resource utilization

- **Database Sharding**

  Partition a large database into smaller, manageable shards to improve performance and scalability

- **Caching**

  Store frequently accessed data in a cache to reduce the load on the backend system

- **Asynchronous Processing**

  Handle long-running tasks asynchronously to free up resources and improve system responsiveness

Performance

- **Scalability**

  The ability of a system to handle growing amounts of work by adding resources or scaling horizontally.

- **Response Time**

  The time it takes for a system to respond to a request or perform a task.

- **Throughput**

  The number of tasks or requests a system can handle within a given time period.

- **Optimization**

  The process of improving performance by identifying and eliminating bottlenecks or inefficiencies in the system.

- **Caching**

  Storing frequently accessed data in a cache to reduce the need for expensive computations or database queries.

- **Load Balancing**

  Distributing incoming requests across multiple servers to prevent any single server from becoming overloaded.

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@hinaarora

Maintainability

Readable Code

Writing code that is easy to understand and follow

Modularity

Designing systems with components that can be easily updated or replaced

Documentation

Creating comprehensive documentation to aid in understanding and maintaining the system

Testing

Implementing automated testing to ensure system functionality and catch bugs early

Version Control

Using version control systems to track changes and manage codebase

Error Handling

Implementing robust error handling to handle unexpected scenarios

Refactoring

Regularly reviewing and improving code structure to enhance maintainability

Hina Arora
@hinaarora

Examples of Successful Modern System Designs

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@hinaarora

Example 1: Netflix

A modern system design revolutionizing entertainment

Netflix is a prime example of a successful modern system design that has revolutionized the entertainment industry with its cutting-edge technology and innovative approach, showcasing remarkable performance, scalability, and maintainability.

Hina Arora
@hinaarora

Example 2: Amazon Web Services

Amazon Web Services as a successful modern system design

Amazon Web Services (AWS) is a cloud computing platform that provides a variety of services and tools for building and managing modern system designs, offering high performance, scalability, and maintainability to businesses of all sizes.

Hina Arora
@hinaarora

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