

Deep Dive into Solution Architecture and System Design

FA-0485 · 1 day

Software Development · DevOps, Cloud & Infrastructure · Cybersecurity · Data & Analytics

Introduction

Duration: 1 day

As businesses increasingly rely on complex software systems to drive innovation and deliver value, the role of a Solution Architect or System Designer has become more critical than ever. At the heart of this role lies the ability to design systems that are not only robust and scalable but also future-proofed against evolving business and technological demands.

This advanced 1-day course is designed for seasoned professionals who want to deepen their expertise in solution architecture and system design. Unlike introductory courses, this program dives into the intricacies of architecture patterns, explores complex trade-offs, and provides actionable frameworks for designing mission-critical systems. Taught by an industry veteran with over 30 years of experience, the course emphasizes real-world challenges, focusing on solving today's pressing design problems with cutting-edge solutions.

Learning outcomes

By the end of this course, participants will be able to:

- Architect complex systems for large-scale, distributed environments.
- Navigate advanced trade-offs between performance, availability, consistency, and cost.
- Apply advanced architecture patterns such as event sourcing, data sharding, and polyglot persistence.
- Design for reliability, disaster recovery, and global-scale system requirements.

- Integrate security and compliance into the system design lifecycle.
 - Evaluate and select tools, technologies, and cloud-native solutions for enterprise systems.
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Prerequisites

- At least 3 years of experience in software development, architecture, or system design.
 - A solid understanding of distributed systems and networking principles.
 - Familiarity with database systems (both relational and NoSQL).
 - Experience working with cloud platforms (e.g., AWS, Azure, GCP) is highly recommended.
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Training outline

1. 1. Advanced Fundamentals of Solution Architecture

- Revisiting core architecture principles: performance, scalability, availability, and cost-efficiency.
- Beyond basics: understanding latency, throughput, and system behavior at scale.
- Evolving the role of the architect in DevOps and Agile environments.

2. 2. Advanced Design Methodologies

- Leveraging Domain-Driven Design (DDD) for large-scale systems.
- Breaking down complex requirements into bounded contexts.
- Strategic patterns: Anti-Corruption Layer, Shared Kernel, and Context Mapping.

3. 3. Scalability and Performance Optimization

- Vertical scaling vs. horizontal scaling: strategies and trade-offs.
- Advanced caching strategies (e.g., distributed caching, write-behind, and cache partitioning).

Database scaling:

- Data sharding and partitioning techniques.
- Replication strategies for consistency and fault tolerance.
- Using content delivery networks (CDNs) for global performance improvement.

4. 4. Architecture Patterns for Large-Scale Systems

Deep dive into advanced patterns:

- Event sourcing and Command Query Responsibility Segregation (CQRS).
- Saga patterns for distributed transactions.
- Circuit breaker and retry patterns for fault-tolerant systems.
- Designing event-driven and reactive architectures for real-time systems.
- Hybrid architectures: integrating legacy monoliths with microservices.

5. 5. Designing for Reliability and Fault Tolerance

- Achieving high availability: redundancy, failover, and load balancing.
- Building disaster recovery strategies with Recovery Point Objective (RPO) and Recovery Time Objective (RTO).
- Handling system failures gracefully: chaos engineering principles and practices.

6. 6. Cloud-Native Architectures and Design Tools

Advanced use of cloud-native services (AWS, Azure, GCP):

- Auto-scaling, serverless computing, and managed databases.
- Designing for multi-region deployments and global systems.
- Container orchestration with Kubernetes: advanced concepts like Helm, operators, and service meshes.
- Infrastructure as Code (IaC): Terraform and CloudFormation for automated deployments.

7. 7. Security and Compliance in System Design

- Threat modeling for secure architecture.
- Designing secure APIs and ensuring data privacy.
- Handling sensitive data with encryption and tokenization.
- Architecting systems for regulatory compliance (e.g., GDPR, HIPAA).

8. 8. Evaluating and Balancing Trade-Offs

- Deep dive into the CAP theorem: navigating consistency, availability, and partition tolerance.
- Cost vs. performance: how to make informed decisions without over-engineering.
- Long-term maintenance vs. short-term delivery: choosing the right architecture approach for the business.

This intensive course will challenge your understanding of system design, pushing you to think critically about architectural decisions and trade-offs. With an emphasis on industry standards and real-world applicability, this program ensures participants are well-prepared to tackle the most demanding challenges

in modern software architecture.

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