

# MCS-105 Microservices design & architecture

#### **Course Description:**

Microservices - also known as the microservice architecture - is an architectural style that structures an application as a collection of services that are:

- 1. Highly maintainable and testable
- 2. Loosely coupled
- 3. Independently deployable
- 4. Organized around business capabilities
- 5. Typically owned by a small team

The microservice architecture enables rapid, frequent and reliable delivery of large, complex applications. It also enables an organization to evolve its technology stack.

If you are having trouble building and scaling a product organized as a monolithic architecture, this will be a great opportunity to get your team familiarized with the microservices, related technologies and methodologies.

#### Structure: 70-80% theory, 20-30% practice

**Target audience:** Software/Solution Architects, Tech Leads, Solution Designers, Product Owners, Developers, Testers. Managers are also more than welcome, especially in the first day, to understand the topic from a business and management perspective.

#### Prerequisites: General IT and programming knowledge

Duration: 5 days, 7 hours/day. Structure per days:

- Day 1: enterprise architecture types, microservices architecture overview, services decomposition
- Day 2: the service-to-service communication patterns
- Day 3: the data writing and reading patterns
- Day 4: the microservices testing types, integrating security, a few infrastructure and resilience patterns
- Day 5: workshop day

As the microservices design and architecture domains require a lot of high and mid-level design and architectural discussions, the first day will be almost entirely theoretical. Starting from the second day, some sessions will be just theoretical and others will consist from a theoretical and a demonstration (trainer presented examples, discussions on them) part. The theoretical only sessions consist of a presentation and a discussion part. Therefore, depending on the topic, the ratio between the theoretical and the practical parts are varying from  $\sim 90/10\%$  to  $\sim 70/30\%$ .

### **Detailed Course Outline**

### DAY 1

- Training overview
- From monoliths to microservices
  - Enterprise architectures overview
  - Migrating to microservices

#### • Microservices patterns

- The microservices architecture high level overview, architectural patterns, environments
- Services decomposition
  - Decomposing an application into microservices, architectural styles
  - Defining an application's microservices architecture
  - $\bullet$  Designing APIs first  $\rightarrow$  defining and using a schema for the business domain model

### DAY 2

#### ○ Inter-process communication

- Overview of interprocess communication in a microservices architecture
- Communicating using the synchronous 'Remote Procedure Invocation' pattern
- Communicating using the 'Asynchronous messaging' pattern
- Creating an API specification for a messaging-based service API
- Choosing a messaging technology

## DAY 3

#### Application patterns

- Database architecture shared and individual
- Maintaining data consistency Sagas, consistency types (strong, eventual & causal)
- Data querying API Composition and CQRS
- Transactional messaging patterns
  - Transactional outbox
  - Transaction log tailing
  - Polling publisher

### DAY 4

- Testing
  - Testing overview, strategy, types of tests
  - Consumer driven contract testing
  - Unit and integration tests
  - Component tests

- End-to-end tests
- Load tests

#### • Application infrastructure patterns

- Overview security, services configurability and observability
- Securing a microservices architecture
- Externalized configuration using the Spring Cloud Config Server
- Cross cutting concerns logging, metrics, health-checks, distributed tracing
- Stability and reliability patterns
  - Retry, Rate limitting
  - Circuit breaking
  - Client-side load balancing
  - Bulkhead

#### • Deployment

- CI & CD flow overview
- Deployment patterns:
  - Single service per host
  - Multiple services per host

### DAY 5

- Microservices hands-on workshop
- Training wrap-up & retrospective