



Deploying Multi-Agent Systems with Agent Developer Kit and Agent Engine

Course description

In this course, you will gain a comprehensive understanding of how to design, develop, and deploy robust multi-agent systems (MAS) using the Agent Developer Kit (ADK) and Agent Engine. You will learn the core concepts of agent-based architectures, master the ADK for creating intelligent agents with specific capabilities, and explore the Agent Engine for orchestrating, managing, and scaling these systems in production environments. Through practical insights and hands-on exercises, you will develop the skills to tackle complex problems requiring distributed intelligence, efficient communication, and dynamic collaboration among autonomous agents.

- Course level: Advanced
- Duration: 2 days

Activities

This course includes detailed presentations, extensive hands-on labs, live demonstrations, and collaborative group exercises to reinforce learning.

Course objectives

In this course, you will learn to:

- Summarize the fundamental concepts and benefits of multi-agent systems.
- Design intelligent agents using the Agent Developer Kit (ADK), defining their capabilities, memory, and communication protocols.
- Develop custom tools and integrations for ADK agents to interact with external systems.
- Understand the architecture and deployment models of the Agent Engine for MAS orchestration.
- Deploy, monitor, and manage multi-agent systems effectively using Agent Engine.
- Implement advanced strategies for agent coordination, scaling, and lifecycle management.
- Troubleshoot, optimize, and secure multi-agent system deployments.

Intended audience

This course is intended for professionals involved in designing, developing, and deploying intelligent systems:

- AI/ML Engineers and Developers
- Software Architects
- MLOps Engineers
- Data Scientists with a focus on AI solutions
- System Integrators
- Technical Leads overseeing AI projects

Prerequisites

We recommend that attendees of this course have:

- Strong proficiency in Python programming.
- Basic understanding of AI/ML concepts and software development principles.
- Familiarity with cloud computing environments (e.g., AWS, Azure, GCP) is beneficial but not strictly required.

Course outline

Module 1: Introduction to Multi-Agent Systems and the ADK/Agent Engine Ecosystem

- Multi-agent system fundamentals: definitions, characteristics, and advantages
- Challenges in building and deploying complex MAS
- Introducing the Agent Developer Kit (ADK): purpose, core components, and design philosophy
- Introducing the Agent Engine: role in orchestration, execution, and management of MAS
- Overview of the ADK and Agent Engine ecosystem and their interplay

Module 2: Agent Developer Kit (ADK) Fundamentals

- ADK architecture: agents, tasks, tools, and memories
- Defining agent capabilities and personas
- Implementing agent behaviors and action sequences
- Creating custom tools for external service integration
- Managing agent state and long-term memory
- Hands-on Lab: Building a Simple Conversational Agent with ADK

Module 3: Multi-Agent System Design with ADK

- Designing agent roles and defining system-level goals
- Agent communication protocols and patterns (e.g., message passing, shared memory)
- Strategies for agent coordination and collaboration
- Conflict resolution mechanisms in multi-agent environments
- Designing robust and fault-tolerant MAS architectures
- Hands-on Lab: Designing and Simulating a Collaborative Information Retrieval System

Module 4: Understanding Agent Engine (AE) for Deployment

- Agent Engine architecture: runtime environment, orchestrator, state store, and services
- Deployment models: local, hybrid, and cloud-native deployments
- Scaling multi-agent systems: horizontal vs. vertical scaling
- Performance considerations and optimization strategies within AE
- Security features and access control in Agent Engine
- Demo: Exploring the Agent Engine Management Console and its features

Module 5: Deploying Agents with Agent Engine

- Packaging ADK agents for Agent Engine deployment

- Configuring deployment manifests and environment variables
- Using Agent Engine SDKs and APIs for programmatic deployment
- Managing agent lifecycle: deployment, updates, and retirement
- Monitoring agent health, performance, and resource utilization
- Hands-on Lab: Deploying a Multi-Agent System to the Agent Engine Runtime

Module 6: Advanced Multi-Agent System Management

- Orchestration of complex, multi-stage agent workflows
- Dynamic agent spawning and termination based on demand
- Integrating MAS with external data sources and enterprise applications
- Version control and CI/CD pipelines for multi-agent systems
- High availability and disaster recovery strategies for AE deployments
- Demo: Implementing a CI/CD Pipeline for Agent Engine Deployments

Module 7: Troubleshooting and Optimization

- Common pitfalls in multi-agent system development and deployment
- Debugging multi-agent interactions across the system
- Advanced logging, tracing, and metrics for MAS monitoring
- Identifying and resolving performance bottlenecks in agents and the engine
- Best practices for building robust, observable, and maintainable MAS
- Hands-on Lab: Debugging and Optimizing a Failing Agent Interaction

Module 8: Real-World Use Cases and Future Trends

- Case studies of successful multi-agent system implementations in various industries
- Ethical considerations and responsible AI principles in MAS
- Future directions of the Agent Developer Kit and Agent Engine
- Overview of emerging trends in agentic AI and autonomous systems
- Course Wrap-up: Q&A, additional resources, and next steps for your MAS journey

Your course overview ends here.
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