Publication date : 02/07/2024

# Course : Java, advanced programming

*Practical course - 5d - 35h00 - Ref. JAP*
*Price : 2610 € E.T.*

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The main objective is to present an overview of the main libraries for thread management, network communications, application administration and supervision. The course also presents the architectural principles underlying compositional application construction.

## Teaching objectives

**At the end of the training, the participant will be able to:**

- Implement thread-based concurrent programming
- Implement various communication techniques (Socket, RMI, JMS)
- Administer a Java application via JMX, monitor the JVM
- Implement reflexive and annotation-based programming

## Intended audience

Developers, engineers, project managers close to development.

## Prerequisites

Good knowledge of Java. Experience in Java programming required.

## Practical details

**Hands-on work**

This course illustrates the principles outlined above through the progressive construction of a Java application.

## Course schedule

**PARTICIPANTS**

Developers, engineers, project managers close to development.

**PREREQUISITES**

Good knowledge of Java. Experience in Java programming required.

**TRAINER QUALIFICATIONS**

The experts leading the training are specialists in the covered subjects. They have been approved by our instructional teams for both their professional knowledge and their teaching ability, for each course they teach. They have at least five to ten years of experience in their field and hold (or have held) decision-making positions in companies.

**ASSESSMENT TERMS**

The trainer evaluates each participant's academic progress throughout the training using multiple choice, scenarios, hands-on work and more.
Participants also complete a placement test before and after the course to measure the skills they've developed.

## 1 Concurrent programming

- Concepts of multithreaded programming: Java's activity model (Runnable and Thread).
- Thread creation/destruction. Thread scheduling.
- Thread synchronization. Method and instruction locking (synchronized). Monitors.
- Some multithreaded problems: interblocking (characterization, avoidance, prevention, detection), starvation.
- Model extensions introduced in Java.5 (Callable<T>, Future<T>, ExecutorService. New collections.
- Java 7's Fork/Join model. Java 8 extensions (CompletableFuture).
- Various competition management tools: shared/exclusive locks, semaphores, cyclic barriers.

### Hands-on work

Building a multithreaded application with concurrency constraints.

## 2 Socket communication

- Reminder of the main network concepts.
- Communication in connected mode.
- The client/server model. Sequential server versus concurrent server. Use of serialization.
- Programming in offline mode. The Peer to Peer model.

### Hands-on work

Programming the case study in client-server mode (sequential and concurrent).

## 3 Communication via remote method invocation : RMI

- General principles of ORBs (Object Request Brokers).
- The RMI model (concepts, interfaces, basic classes).
- The naming service.
- The client and server development process.
- Safety and class loading constraints.

### Hands-on work

Programming the case study using RMI.

## 4 Message-based communication: JMS

- General principles of message communication.
- The basic model (JMS concepts, interfaces and classes).
- The different forms of messages.
- Point-to-point communication.
- Publish/subscribe communication.

### Hands-on work

Programming the case study using JMS.

**TEACHING AIDS AND TECHNICAL RESOURCES**

• The main teaching aids and instructional methods used in the training are audiovisual aids, documentation and course material, hands-on application exercises and corrected exercises for practical training courses, case studies and coverage of real cases for training seminars.

• At the end of each course or seminar, ORSYS provides participants with a course evaluation questionnaire that is analysed by our instructional teams.

• A check-in sheet for each half-day of attendance is provided at the end of the training, along with a course completion certificate if the trainee attended the entire session.

**TERMS AND DEADLINES**

Registration must be completed 24 hours before the start of the training.

**ACCESSIBILITY FOR PEOPLE WITH DISABILITIES**

Do you need special accessibility accommodations? Contact Mrs. Fosse, Disability Manager, at psh-accueil@orsys.fr to review your request and its feasibility.

### 5 Application administration : JMX

- The JMX (Java Management eXtension) model: concepts, interfaces and corresponding classes.
- MBeans and MBeanServers.
- Setting up an administration layer.
- The administration console (JConsole).
- Communication using adapters and connectors.

**Hands-on work**
Setting up an administration-supervision layer for the case study.

### 6 Reflective programming

- Objectives and principles.
- Dynamic discovery of information about a class or object.
- Dynamic instantiation and invocation.
- Reflexivity and annotations in Java 5.

**Hands-on work**
Programming the case study in client-server mode (sequential and concurrent).

### 7 An overview of extensions from Java 5 to...

- Types: generics, enumerations, autoboxing/autounboxing, records.
- Lambda-expressions, functional interfaces.
- Java 8 streams.
- Java 9 modules.

## Dates and locations

**REMOTE CLASS**
2026 : 9 Mar., 13 Apr., 18 May, 7 Sep., 12 Oct., 2 Nov., 16 Nov.

**PARIS LA DÉFENSE**
2026 : 18 May, 12 Oct., 16 Nov.