# Jmix Framework Training

Catalog

| Course item name | Duration, hours |
|---|---|
| *Introduction to Jmix[1]* | *2* |
| *Jmix security basics* | *1* |
| *Jmix applications deployment basics* | *1* |
| *Working with files in Jmix* | *1* |
| Data manipulation | 14 |
| Access control subsystem | 8 |
| Jmix applications deployment | 4 |
| Developing user interface for Jmix applications | 14 |
| Creating reports | 4 |
| Business Process Automation with Jmix BPM | 20 |
| Full-text search | 2 |
| Maps add-on | 4 |
| Charts add-on | 4 |
| Emailing functionality in Jmix | 2 |
| Multi-tenant applications | 1 |
| Testing Jmix applications | 2 |
| Jmix add-on creation | 1 |
| Using Jmix Studio efficiently | 2 |
| REST API add-on | 3 |

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[1] Topics in italics are free for self-study. The cost is indicated for training with a tutor.

# Introduction to Jmix

Duration: 2 hours

This course is designed to familiarize you with the Jmix framework, its main features, and the Jmix Studio development environment.

Course program:
- What is Jmix. The purpose and architecture of the framework
- Application data model. Creating a data model in Jmix Studio
- Database versioning. Database versioning scripts creation
- Administrative user interface. Generating screens for working with data
- Security basics. Jmix role types. User creation
- Working with data. Using DataManager
- Business logic creation. Using Business Logic in the administrative user interface
- FatJar. Application deployment

# Jmix security basics

Duration: 1 hour

This course is designed to study the main elements of the Jmix security subsystem, and the rules of building a role model providing access to the data and functionality.

Course program:
- Structure of the Jmix security subsystem
- The "User" entity. Purpose and usage
- Obtaining information about current user
- Resource roles. Defining resource roles in code, using in the application
- Row-level roles. Defining in code, using in the application
- Jmix built-in roles
- Roles combining. Roles structuring in the project

# Jmix Applications deployment basics

Duration: 1 hour

This course covers the basic ways to deploy Jmix applications.

Course program:
- Deployment format: WAR and JAR
- Creation of an executable file
- Execution profiles. Configuration options specific for a deployment environment
- Deployment format guidelines

# Working with files in Jmix

Duration: 1 hour

This course covers the API and ways to work with files in Jmix.

Course program:
- Storing files in the application - approaches and Jmix implementation
- The byte[] field in an entity
- The FileStorage service - architecture and usage
- Working with files in the administrative user interface. FileUploadField, FileStorageUploadField, and Image components

# Data manipulation

Duration: 14 hours

The course details the architecture and services of the Jmix data access layer.

Course program:
- Entity types in Jmix
- Jmix framework annotations for entities
- Data store. Supported databases
- Multiple data stores. Referencing entities from different data stores
- Traits: Versioned, Audit, HasUUID, SoftDelete
- Key-value entities
- Entity states
- Database versioning. Liquibase Tool
- Non-standard data types (JPA converters)
- Entity Manager service. Usage and transaction management
- Entity graph for data fetch
- DataManager and EntityManager services. Similarities and differences
- Data Security and DataManager
- Data and Query Cache. Cache customization
- JPA callbacks
- Entity lifecycle events
- Optimistic and pessimistic locks

Additional Topics:

- Data change audit
- Dynamic attributes

# Access control subsystem

Duration: 8 hours

This course examines in detail the architecture and functionality of the security and access control subsystem of the Jmix framework.

Course program:
- Roles - advanced topics
  - Scopes
  - Specific policies
- Data access restrictions
  - Application of restrictions
  - Overriding data access checks in business logic
- Anonymous access to the application UI
- Programmatic user management
  - Data model of users and roles
  - User creation
  - Role assignment
  - Implementing a scenario of user registration and activation
- Additional security features
  - System authentication
  - Authentication events
  - User substitution
- Accessing users in Jmix add-ons. UserDetails, UserRepository, UserManager
- External authentication services
  - Integration with LDAP and Active Directory
  - Integration with KeyCloak SSO
  - Login and registration via social networks (Google and GitHub)

# Jmix applications deployment

Duration: 4 hours

This course covers various ways to deploy Jmix applications.

Course program:
- Preparing the application for deployment
  - Deployment checklist
- Execution profiles
- Types of artifacts for deployment
  - Fat Jar
  - War
  - Docker image
- Application runtime overview
  - Dedicated server
  - Container
- Application deployment options
- Ensuring fault tolerance
  - Application clustering
  - Database replication
- Application monitoring and diagnostics tools

# Developing user interface for Jmix applications

Duration: 14 hours

This course focuses on developing an administrative user interface: from placing elements on views to creating custom visual components.

Course program:

- Views in Jmix
- Opening Views – ViewsNavigation and DialogWindows APIs
- Routing and Navigation
- Notifications and Dialogs
- Background tasks
- Facets – non-visual view components
- Views extensions and working with view template
- Event Bus – global events in Jmix
- Lazy loading in views
- Styling
- Layout rules
- Creating Custom Action class
- Creating UI components

Optional section:
- Creating views programmatically

# Creating reports

Duration: 4 hours

This course discusses the capabilities of the Jmix framework report generator.

Course program:
- Jmix report generator overview
  - YARG
  - Templates
  - Fetch data
- Report Wizard
- Creating a simple report
  - XLS format
  - DOC format
- Using Groovy to fetch data
- Displaying graphic files in a report
- Generating a Master-detail report
- Creating a matrix report
- APIs for working with reports
  - Standard Actions
  - Services

# Business Process Automation with Jmix BPM

Duration: 20 hours

This course covers the use of the Jmix BPM module to develop business process models in BPMN 2.0 notation, user interface, and business logic, including accessing the Jmix data model.

Course program:
- Overview of the BPM component of the Jmix framework
- BPMN Specification for developers
- Create and execute a simple business process
- Process Variables
- Assigning users to tasks
- User task management
- Accessing Jmix data from the process
- Decision-making using DMN notation
- Various types of service tasks
- Development of process forms
- Use of different types of subprocesses
- Transactions in BPMN and asynchronous tasks execution
- Loops in BPMN and working with collections (multi-instance activities)
- Using BPMN messages and signals in processes
- Inter-process collaboration
- Process administration capabilities
- Using Jmix software components as part of business processes
- Handling business process execution errors
- Execution listeners in Jmix
- APIs for working with business processes

# Full-text search

Duration: 2 hours

This course covers the Full-text search module: connecting, configuring, and using in Jmix applications.

Course program:
- Full-text search system architecture
  - Elastic search
  - The concept of a "document"
  - Indexes
- Integration with Jmix
  - Configuring an application
  - Starting indexing processes
  - Indexing data in a database
  - Indexing uploaded files
- Scaling the full-text search engine

# Maps add-on

Duration: 4 hours

This course covers the module for working with maps: programming interfaces, layers, and maps in the administrative user interface.

Course program:

- General information about add-on
- Component elements
- Raster layers and their sources
- Working with data
- Feature styling
- Cluster
- Heatmap
- Map interactivity
- Map projection
- Real-time data update

# Charts add-on

Duration: 4 hours

This course covers the module for displaying diagrams in the administrative user interface of Jmix applications.

Course program:
- Types of charts used in the module
- Data binding
  - Data containers
  - Programming interfaces
- Event Handling
- Incremental refresh for datasets

# Emailing functionality

Duration: 2 hours

This course covers the possibilities of working with email in Jmix applications.

Course program:
- Features of the module for sending emails
- Customization
- Creating messages
    - Creating simple messages
    - Using templates
    - Creating attachments
- Administrative interface
- Program interface of the module

# Multi-tenant applications

Duration: 1 hours

This course covers the possibilities of creating multi-tenant Jmix applications.

Course program:
- Definition of multitenancy. Approaches to building multitenant applications
- Implementation in Jmix
- Data model design features
  - Shared data
  - Client data
- Administration of multitenant applications
  - User creation
  - Local administration
  - Authorization from URL
- Multi-tenancy module API

# Testing Jmix applications

Duration: 2 hours

This course covers tools, libraries, and software components designed for testing Jmix applications, and their usage methodology.

Course program:
- Server-side testing
  - Rules for tests writing
  - JUnit
  - SpringBootTest
- Administrative interface testing
  - Selenide Library
- API testing
- BDD: using the Gauge Library

# Jmix add-on creation

Duration: 1 hour

This course covers Jmix add-on creation process.

Course program:
- Wizard add-on creation tool
- Created add-on base structure review
- Adding data model and views
- Add-on publishing and usage
- Security in add-ons

# Using Jmix Studio efficiently

Duration: 2 hours

This course covers the unique features of Jmix Studio, which allow you to speed up the development and reduce the number of errors in the code.

Course program:
- Code refactoring capabilities
- Code generation (Intentions)
- Inspections
- Jmix Studio configuration

# REST API add-on

Duration: 3 hours

The course discusses the possibilities of adding a REST API, installing it, configuring it, and using it.

Course program:
- Installing add-ons
- Configuring access to endpoints
- Embedded Endpoints - Overview and usage
- Business logic and proprietary REST controllers

# Content