SysML and UML for Real-Time Software Systems Development Training Course - 5 Days

This SysML/UML training course is aimed at real-time systems engineers, software architects and developers who want to use SysML to produce a detailed model of the context, requirements, structure and behaviour and UML for software architecture and design of real-time systems. Typically this will be for industrial, military and aerospace applications requiring the use of SysML for requirements and systems modelling, but where the software modelling is normally performed using UML. Industry best practice modelling techniques are based on the Systems Modelling Language SysML v1.4 and Unified Modelling Language UML v2.4.

The techniques are taught within the context of systems engineering disciplines including specification, analysis, architecture, design, validation and testing and are suitable for implementation as part of a model-driven software development process. Understanding is tested with exercises based on a real-world project example using Sparx Systems Enterprise Architect, another suitable SysML modelling tool or on paper. In order to make the exercises relevant to the project in question a customer domain specific model may be created instead of using a supplied case study.

Delegates will learn:

- The basics and the necessary detail of the Systems Modelling Language SysML
- How to create and maintain a diagram of hierarchical and interdependent written requirements
- How to create and maintain traceability between requirements and generate reports of requirements and models
- How to create an overview of the external functional requirements of a system with actors and use cases on a use case diagram
- How to write an effective use case description in a way that satisfies both non-technical and technical stakeholders
- How to model high-level system structure and decomposition using block definition diagrams, blocks, ports, interfaces and relationships
- How to model the detailed internal structure of blocks on internal block diagrams using parts, ports, connectors, flows and flow specifications
- How to define structural and functional parameters and constraints using constraint blocks, parametric diagrams and constraint properties
- How to model simple, hierarchical and concurrent behaviour using activities, actions, control and object flows on activity diagrams
- How to model timing, interaction and messaging between actors, blocks and parts using synchronous and asynchronous messages on sequence diagrams
- How to model state dependant behaviour using states, transitions, events and actions on state machine diagrams
- How to develop a flexible real-time system architecture from an analysis model
- How to develop component and deployment models for the system
- How to model the design of a component using sub-systems and interfaces
- How to integrate libraries and frameworks into the design of components
- How to generate frame code and keep the design and code models synchronised

Suitable for:

Systems Engineers, Requirements Gatherers, System Architects, Analysts and Developers with at least 2 years experience. This course is not suitable for those seeking certification as a step towards a qualification. See the Certification Policy for a detailed discussion.

Course Logistics:

Course attendance is normally limited to 12 students. Courses start at 9.30am on the first day, 9.00am on subsequent days and finish at 5.00pm each day. Students normally use a computer for the exercises, but these can be performed on paper if required. For a discussion on using a SysML/UML modelling tool please see Modelling Tool Use on Courses. Printed course manuals for each student with copies of all presentations, exercises and solutions are provided.

On-Site (In-House) Courses:

The client is expected to provide an appropriate venue, refreshments, XGA/WXGA projector and screen, whiteboard or flipchart and at least one computer per two students loaded with a suitable SysML/UML modelling tool, unless exercises are to be performed on paper. For a full discussion of on-site course issues please see On-Site Course Logistics.

Scheduled Public Courses:

CRaG Systems no longer provide scheduled public training. However, we continue to provide on-site (in-house) training for any number of students with special discounts for small classes. You will find our pricing competitive with most public courses for just 2 or 3 students. Please use the On-Site Course Pricing page to get a firm, downloadable quotation for on-site training.

Pricing:

On-site (in-house) course pricing is available from the On-Site Course Price Calculator page. For consultancy pricing please see the On-Site Consultancy Price Calculator.

Training Course Outline

Day 1	Day 2
Introduction	**Block Definition Diagrams**
People - Course Structure - Modelling - System Modelling Language SysML - UML for Software Architecture and Design	Blocks - Block Definition Diagrams - Value Types - QuantityKind - Unit - Enumerations - Stereotypes - Instance Specification - Namespace and Structure Compartments - Dependency - Reference, Part and Shared Associations - Containment - Generalization
Requirements Modelling	
Requirements Diagrams - Requirements - Hierarchic Requirements - Derived, Copy, Satisfy and Trace Dependencies - Test Cases - Callouts - Generating Documents - Managing Traceability - Repositories	*Block Definition Diagrams Workshop*
	Internal Block Diagrams
Requirements Modelling Workshop	Parts (Properties) - Internal Block Diagrams - Standard Ports and Connectors - Bi-Directional and Uni-Directional Connectors - Interfaces and Data Types - Binding Connectors - Flow Ports - Flows and Flow Specifications
Specifying Functional Requirements with Use Cases	
System Use Cases and Actors - Primitive Use Cases and the Basic Course - Writing Effective Use Case Descriptions - Writing Sub-flows and Alternate Flows - 'Include' and 'Extend' Relationships - Modelling Timing Constraints	*Internal Block Diagrams Workshop*
System Use Case Workshop	

Day 3

Parametric Modelling

Constraint Blocks - Parametric Diagrams - Constraint Properties

Parametric Modelling Workshop

Modelling Behaviour as Activity

Activity Diagrams - Activities, Activity Parameters, Parameter Sets - Actions, Action Pins, Control and Stream Pins - Objects - Control and Object Flows - Events, Signals and Interruptible Regions - Control Operator - Control Nodes: Initial, Final, Decision, Merge, Fork and Join - Partition and Allocation - Hierarchy with Structured Activities

Activity Modelling Workshop

Day 4

Modelling Interaction and Messaging

Interactions, Messages, Operations and Methods - Sequence Diagrams - Synchronous and Asynchronous Messages - Execution Specification - Selection and Iteration - Creation and Destruction - Timing Constraints - Diagram Links

Interaction Modelling Workshop

Modelling State Dependant Behaviour

The Meaning of the State Model - State Machine Diagrams - States and Transitions - Events and Conditions - Actions and Activities - Hierarchy and Concurrency - Actions on a State - Consistency with Other Diagrams - Direct Implementation

State Modelling Workshop

Day 5

Architecture, Components and Implementation Diagrams

Packages and Dependencies - Stereotypes - Control Objects - Layered Real-time Architectures - Interfaces, Subsystems and Components - Tasking - Component Diagrams - Deployment Diagrams

System Architecture Workshop

Detailed Design

Subsystem Design - Architectural Patterns - Linking to Libraries and Frameworks - Visibility and Other Properties - Completing the Model - Incremental Development - Traceability and Review

Detailed Design Workshop

Should the content of the available SysML courses not fit your exact requirements, then CRaG Systems can create a custom course for you. Please either email or call us to discuss your particular needs.

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