



CRaG Systems Modelling Training and Consultancy

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SysML for Systems Engineering Training Course - 4 Days

This SysML training course is aimed at systems engineers, system architects and developers who want to produce a detailed model of the structure and behaviour of real world systems sufficient to form the detailed specification, architecture and design of equipment for industrial, automotive, military and aerospace applications. The industry best practice model-based systems engineering (MBSE) techniques are based on the Systems Modelling Language SysML v1.4 and are taught within the context of systems engineering disciplines including specification, analysis, architecture, design, validation, verification and testing.

The models produced are sufficiently detailed to form the basis for the design of systems using a mixture of mechanical, hydraulic, electrical, electronic, firmware and software, real-time and embedded systems architectures. The advantages that using these techniques have for project estimation, requirements traceability, test development and project management is discussed. Each technique is taught to the level required for competence on a real project.

Understanding is tested with exercises based on a real-world project example either 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 and relationships
- How to model the detailed internal structure of blocks on internal block diagrams using parts, ports, connectors and flows
- 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

Suitable for:



Systems Engineers, Mechanical 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 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 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
<p>Introduction</p> <p>People - Course Structure - Modelling - Systems Engineering - System Modelling Language SysML</p> <p>Requirements Modelling</p> <p>Requirements Diagrams, Requirements and Hierarchy - Derived, Copy, Satisfy and Trace Dependencies - Test Cases - Problems, Rationale, Allocations and Callouts - Generating Documents - Managing Traceability - Repositories</p> <p>Requirements Modelling Workshop</p> <p>Specifying Functional Requirements with Use Cases</p> <p>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</p> <p>System Use Case Workshop</p>	<p>Block Definition Diagrams</p> <p>Blocks - Block Definition Diagrams - Namespace and Structure Compartments - Value Types, QuantityKind, Units - Enumerations - Stereotypes - Instance Specifications - Dependency - Reference Associations, Part and Shared Associations - Containment - Generalization</p> <p>Block Definition Diagrams Workshop</p> <p>Internal Block Diagrams</p> <p>Parts and Properties - Internal Block Diagrams - Connectors and Item Flows - Ports, Connectors and Item Flows - Blocks and Value Types to Specify Ports and Item Flows - Interface Blocks and Blocks as Function and Data Types - Proxy and Full Ports - Signals to Specify Events and Messages</p> <p>Internal Block Diagrams Workshop</p>

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, Call Behavior Action - 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 - Diagram Links - Synchronous and Asynchronous Messages - Selection and Iteration - Execution Specification - Creation and Destruction - Timing Constraints

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

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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