



An Embedded Technology  
Services Organization  
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An Embedded Technology  
Awareness & Training Group  
from eACT Technologies  
[www.eact-tech.com](http://www.eact-tech.com)

## UML for Embedded Systems using C/C++

( Programs are conducted at a suitable Venue with Local IT Training Institutes @ SE Asia )

### Course Description:

The Unified Modeling Language (UML) is a design notation. To develop software using UML you must cleave to a process which describes how to use these notation. This course describes a process for designing UML oriented systems using UML 2.X as the notation.

This course uses comprehensive and complete examples and also identifies the areas where UML 2.X improves on design, but also still identifies its weaknesses. The course is backed up by a comprehensive CASE study demonstrating how to apply UML 2.x to practical systems.

### Course Objectives:

- To show how to develop Application software in a rigorous and systematic manner using UML 2.x modeling techniques.
- To enable attendees to develop their own practical design skills.
- To show its capabilities for designing

### Delegates will learn:

- How to develop practical designs for embedded systems using UML 2.x modeling techniques.
- How to apply these ideas in the framework of an integrated, traceable and consistent software design process.

### Pre-requisites:

- Knowledge of the basics of OO design principles and methods.
- Some understanding of technical software development methods and some knowledge of a high-level programming language.

### Who Should Attend:

- Ideal for engineers who have attended vendor tool training but now need to learn practical application of UML
- Designers looking to improve the way they apply UML
- Designers new to the area of real-time software design.
- Developers with notational UML knowledge who are embarking on projects using UML-based techniques for the first time.

**Duration:** Four days.

### Course Materials:

- Trainee handbook
- All worked examples and solutions

### Course Workshop:

Approximately 50% of the course involves practical application of the techniques. Delegates work in small groups dealing with problems based on real scenario systems.

### Other Workshops related:

- \* Embedded C
- \* Embedded C++
- \* Real-time Programming for Embedded Systems
- \* OOAD analysis and design using UML
- \* UML fundamentals
- \* Rhapsody Tool Workshop
- \* Embedded Linux and Device Drivers

\* Outline is subject to change during or before the program

### UML FUNDAMENTALS

What is UML?  
UML 2 Diagrams  
Use Case Diagram, Sequence Diagram, Class Diagram, Object Diagram, Structure Diagram, State Machine Diagram, Activity Diagram, Package Diagram, Communication Diagram, Component Diagram, Deployment Diagram, Timing Diagram, Interaction Overview Diagram

### How Does UML Apply to Real-Time?

How Do We Describe Structure Using UML?

#### What is an Object?

Object Identity, Views, Interface, Attributes, Operations, Classes  
UML Class, UML Object  
Multiplicity

### Object Discovery Strategies

Identify the Nouns  
Services to be Performed  
Physical Devices, Key Concepts  
Transactions  
Persistent Information  
Control Elements

### How Do We Describe Behavior?

Why Use State Machines?  
State Machines Are Executable  
States/Transitions/Actions  
Basic State Machine Syntax  
Types of Events, Time Event  
Handling Transitions  
Reaction in State  
Transitions: Guards  
Actions  
States  
State Machine Syntax — AND States  
AND-State Communication  
State Machine Syntax — Connectors  
Timeouts Revisited  
Inherited State Behavior

### How Do We Model Communication Using UML?

Object Collaboration  
Messages  
Relationships  
Associations, Multiplicity / Navigation, Aggregation, Composition, Structured Class Example, Template / Generic Classes, Dependencies, Generalization,

### Interfaces and Ports

Interfaces : Why do we need them?  
Interfaces  
Ball & Socket Notation  
Ports

### How Can We Model the Following in UML?

Improved Design with UML 1  
UML 2 Ports  
Things to Remember About Ports  
Ports Can Have Multiplicity

### Using UML with C

Before We Start  
Creating a Project  
The Browser  
Drawing a Class  
Remove from View/Delete from Model

### Basic Example: Hello World

The Test Component  
Initial Instance

### Settings

Renaming our OMD  
Generating Code  
Hello World  
The Generated Files  
Editing the Code  
The Generated Code

### Profiles

CProfile  
Using the Profile  
Cash Register  
Referenced Profile  
Project Description

### More Examples: Count Down

Case Study: Dishwasher  
Extended Exercises

### Using UML with C++

Capturing Requirements  
Gateway  
Word Requirement Document  
Gateway Configuration  
Showing Word Requirements in Gateway  
Word Coverage Analysis  
Adding Requirements to Rhapsody

### Requirements in Rhapsody

AnalysisPkg  
Principal Uses  
Actors  
Configure the Products  
Secondary Use Cases  
The Browser  
Manage Special Offers  
Navigation  
Following the Hyperlinks  
Use Case Driven Approach  
Getting along with UML and further references



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