

Training workshop:

C++ for Embedded Developers

Course Description:

This course introduces the C++ language for use on real-time and embedded applications. The first part of the course focuses on the language itself, highlighting areas of concern for real-time and embedded development. The latter part covers the application of C++ to real-time systems including interrupt handling and concurrency issues.

Participants perform hands-on embedded programming, on PC and ARM target board during course practical.

Overview:

This course covering C++ in core and use in non-desktop and real-time issues.

Course objectives:

- To provide an understanding of the essentials of the C++ programming language
- To give you practical experience of writing C++ for real-time and embedded systems
- To give you the confidence to apply these new concepts to your next real-time project

Participants will learn:

- The core C++ syntax and semantics
- How to access hardware in the language
- About memory and performance issues associated with C++

Course duration: 4 days

Pre-requisites:

A working knowledge of embedded C programming language

Who can benefit from this training:

The course is designed for real-time engineers who are embarking on a project using C++ for the first time. It is also target at developers currently reluctant to move to C++ from C as they believe it poses too great an overhead. This course will clearly demonstrate both the strengths and weaknesses of C++ versus C.

Covered topics:

1. Introduction to real-time systems

- What is a real-time and embedded computer system
- The need for a rigorous development procedure

2. From C to C++

- Non object-oriented C++ enhancements to basic C
- Conveniences of C++ over and above C

3. Introduction to Object Oriented (OO) Principles

- Key characteristics of OO development
- OO (object oriented) techniques and the real-time software development process

4. Introduction to Classes

- Classes & class instances
- Methods
- Constructors and destructors

5. More on Classes

- Inlining member functions
- Const member functions
- Static class members and functions
- Arrays of classes
- Implementing object relationships

6. Inheritance

- Building class hierarchies
- Dynamic binding for class methods, virtual functions
- Polymorphism

7. Multiple inheritance (MI)

- MI and interfaces

8. Functions and Operators

- Class defined conversions
- Overloading and function selection
- Friend functions
- Overloading operators
- Dynamic memory allocation revisited

9. Exception Handling

- What are exceptions?
- Throwing an exception
- The try block
- Catching an exception
- Rethrowing exceptions
- Catch all handlers
- Exception specifications

10. Templates

- Introduce parameterised types and functions
- Function templates
- Class templates

11. The Standard Library

- Introducing the Standard Template Library

12. Software Structuring

- Structuring large scale software systems
- Separate implementation from interface header files
- Dealing with name conflicts
- Linking with other languages

13. Embedded C++

- A Summary of Embedded C++
- Embedded C++ features

14. Real-Time Specifics

- Low level facilities of C++ including:
 - Accessing hardware
 - Manipulating information at the bit level
 - Synchronising I/O with CPU
 - Polling
 - Interrupts

15. Interrupt Programming

- Interrupt Service Routines in C++
- Functional approach
- Class approach

16. Target Specific Considerations:

- Data types
- Language features affecting portability
- Non-standard C++ language features
- Assembly language interfacing
- Designing ROMable objects

17. Concurrency

- Concurrency
- Scheduling strategies
- Sharing resources in multi-tasking systems
- Synchronizing tasks

Corporate Training - Registration Form

Organization			
Name of company		Contact Person :	
Address			
Tel		Fax :	Email :

Participant <i>(Please fill in BLOCK Letters)</i>			
Name		Designation :	
NRIC/Passport No.		H/P No:	Email :

(Please use page 2 for more than one nominee)

Course to Participate			
Course	Course Location	Dates of Training	Number of Nominees

Payment: An invoice will be issued for you to effect payment.

We confirm the above registration:

Name: _____ Signature: _____ Date: _____

Administration Details:

Registration is considered as confirmed upon full payment is made.

All cancellations must be made in writing. There will be no charge for cancellation received 15 or more working days before the start of the course. Cancellation received 7-14 working days before the start of the course is subject to a cancellation fee of 50% of the course fees. Cancellation received less than 7 working days before the start of the course is subject to a cancellation fee of 100% of the course fees. If the participant fails to attend the course, the full course fees are still payable. However, replacement can be accepted at no additional cost.

10% (or stated otherwise) group discount is applicable for registration of three (3) or more participants for the same course and of the same billing source.

We reserves the right to change the facilitator, venue, reschedule or cancel the course and all efforts will be taken to inform participants of the changes.

Upon submission of this form, our customer service will revert to you with necessary documents and updates to you or your representative!

Name of company		Contact Person :
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List of Participants *(Please fill in with BLOCK Letters)*

1. Name		Designation :
NRIC/Passport No.		H/P No: Email :

2. Name		Designation :
NRIC/Passport No.		H/P No: Email :

3. Name		Designation :
NRIC/Passport No.		H/P No: Email :

4. Name		Designation :
NRIC/Passport No.		H/P No: Email :

5. Name		Designation :
NRIC/Passport No.		H/P No: Email :

6. Name		Designation :
NRIC/Passport No.		H/P No: Email :

7. Name		Designation :
NRIC/Passport No.		H/P No: Email :

8. Name		Designation :
NRIC/Passport No.		H/P No: Email :