APPLICATION COMMON OPERATING ENVIRONMENT (APPCOE) USER MANUAL

Release 1.8.1

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Chapter 1.About this Guide

This chapter contains the following topics:

Objectives

This manual describes about AppCOE IDE and offers information on porting your application to different toolsets and platforms, and information on how to use our functionality and learn our user interface (UI). AppCOE provides a multiple OS interface host environment with provisions to generate optimized code for a wide variety of target OS platforms.

Topics in this manual also apply to the other MapuSoft's interfaces supported by OS Changer which allows you to re-use a wide variety of legacy code such as VxWorks, pSOS, Nucleus PLUS, POSIX/LINUX, Windows, uITRON, ThreadX.

Audience

This manual is designed for anyone who wants to port applications to different operating systems, create projects, and run applications. This manual is intended for the following audiences:

- Customers with technical knowledge and experience with the Embedded Systems
- Application developers who want to migrate their application to different RTOSs
- Managers who want to minimize the cost and leverage on their existing code

How to Use This Manual

This manual and the other MapuSoft Technologies manuals explain how to port and migrate applications to different operating systems.

The organization of this document is as described below:

Using these documents, you can

- Develop & Port legacy applications.
- Generate code optimization & target code generation.
- Generate Full Library Package OS Abstractor/OS Changer Packages
- Enable Application profiling and platform profiling
- Convert Ada 83/95 applications to C/C++

Document Conventions

Table 1_1 defines the notice icons used in this manual.

Table 1_1: Notice Icons

Icon	Meaning	Description
☐	Informational note	Indicates important features or icons.
⚠	Caution	Indicates a situation that might result in loss of data or software damage.

Table 1_2defines the Text and Syntax conventions used in this manual.

Table 1_2: Text and Syntax Conventions

Convention	Description
Courier New	Identifies Program listings and Program examples.
Italic text like this	Introduces important new terms. • Identifies book names • Identifies Internet draft titles.
COURIER NEW,ALL CAPS	Identifies File names.
Courier New, Bold	Identifies Interactive Command lines

MapuSoft Technologies and Related Documentation

Reference manuals can be provided under NDA. Click http://mapusoft.com/contact/to request for a reference manual. The document description table lists MapuSoft Technologies manuals.

Table 1_3: Document Description Table

User Guides	Description
System Configuration Guide	Provides detailed description on the system configuration to work with MapuSoft products. This guide: • Describes the system requirements and configurations to get started with MapuSoft Technologies products
AppCOE Quick Start Guide	Provides detailed description on how to become familiar with AppCOE product and use it with ease. This guide: • Explains how to quickly set-up AppCOE on Windows/Linux Host and run the demos that came along AppCOE
OS Abstractor Interface Reference Manual	Provides detailed description of how to use OS Abstraction. This guide: • Explains how to develop code independent of the underlying OS • Explains how to make your software easily support multiple OS platforms
VxWorks Interface Reference Manual	Provides detailed description of how to get started with VxWorks interface support that MapuSoft provides. This guide: • Explains how to use VxWorks interface, port applications
POSIX Interface Reference manual	Provides detailed description of how to get started with POSIX interface support that MapuSoft provides. This guide: • Explains how to use POSIX interface, port applications
pSOS Interface Reference Manual	Provides detailed description of how to get started with pSOS interface support that MapuSoft provides. This guide: • Explains how to use pSOS interface, port applications
pSOS Classic Interface Reference Manual	Provides detailed description of how to get started with pSOS Classic interface support that MapuSoft provides. This guide • Explains how to use pSOS Classic interface, port applications
Nucleus Interface Reference Manual	Provides detailed description of how to get started with Nucleus interface support that MapuSoft provides. This guide: • Explains how to use Nucleus interface, port applications
Micro-ITRON Interface Reference Manual	Provides detailed description of how to get started with uITRON interface support that MapuSoft provides. This guide: • Explains how to use uITRON interface, port applications

User Guides	**Description**
ThreadX Interface Reference Manual	Provides detailed description of how to get started with ThreadX interface support that MapuSoft provides. This guide: Explains how to use ThreadX interface, port applications
µC/OS Interference Reference Manual	Provides detailed description of how to get started with µC/OS interface support that MapuSoft provides. This guide: • Explains how to use µC/OS interface, port applications
FreeRTOS Interference Reference Manual	Provides detailed description of how to get started with FreeRTOS interface support that MapuSoft provides. This guide: • Explains how to use FreeRTOS interface, port applications
Windows Interface Reference Manual	Provides detailed description of how to get started with Windows interface support that MapuSoft provides. This guide: • Explains how to use Windows interface, port applications
RTLinux Interface Reference Manual	Provides detailed description of how to get started with RTLinux interface support that MapuSoft provides. This guide: • Explains how to use RTLinux interface, port applications
VRTX Interface Reference Manual	Provides detailed description of how to get started with VRTX interface support that MapuSoft provides. This guide: • Explains how to use VRTX interface, port applications
QNX Interface Reference Manual	Provides detailed description of how to get started with QNX interface support that MapuSoft provides. This guide: • Explains how to use QNX interface, port applications
Release Notes	Provides the updated release information about MapuSoft Technologies new products and features for the latest release. This document: • Gives detailed information of the new products • Gives detailed information of the new features added into this release and their limitations, if required

Requesting Support

Technical support is available through the MapuSoft Technologies Support Centre. If you are a customer with an active MapuSoft support contract, or covered under warranty, and need post sales technical support, you can access our tools and resources online or open a conversation/ticket at http://www.mapusoft.com/support

Anyone can initially contact sales/admin/tech via the above mechanism, however tech support is offered to only registered users or evaluation customers.

Registering a New Account

If you are a customer with valid tech support contract or a trial user, please request an account be created by providing your email address, company address, telephone number etc by contacting sales@mapusoft.com. You will be provided via account name (your email) and also password to sign-in

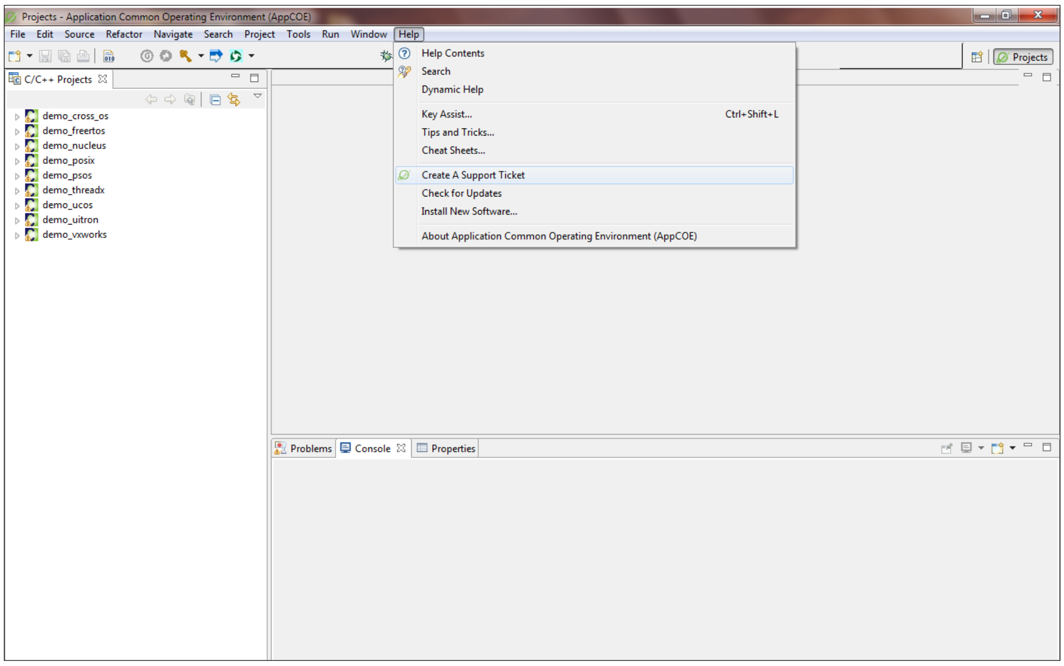
Submitting a Ticket

1. To submit a ticket, simple sign-in into your account **http://www.mapusoft.com/support**and open a conversation.

2. To submit a ticket from within AppCOE IDE

From AppCOE main menu, Select Help > Create a Support Ticket as shown in below Figure

Figure 1_1: Create a Support Ticket from AppCOE



To submit a ticket, simple sign-in into your account **http://www.mapusoft.com/support**and open a conversation.

MapuSoft Support personnel will get back to you within 48 hours with a valid response.

Live Support

Chat: MapuSoft Technologies also provides technical support through Live Chat from www.mapusoft.com website. If Chat is offline, please leave a detailed message including your email address, telephone number and company name so that MapuSoft personnel's can quickly respond to either responding to your chat by calling you on the number that you have provided

Telephone: You can also reach us at our toll free number: **1-877-627-8763** and press the tech support option to contact MapuSoft tech support team for any urgent assistance.

Documentation Feedback

We greatly appreciate your feedback. Simple sign-in or just start a conversation and let us know via:http://www.mapusoft.com/support/

Chapter 2.Introduction to AppCOE

This chapter contains the following topics:

About AppCOE

AppCOE is an Eclipse based IDE. AppCOE integrates software interoperability & reuse tools like OS Changer and OS Abstractor with Eclipse's CDT to offer an IDE for developing and porting embedded applications on many host/target platforms.

With AppCOE you can perform the following actions:

- Creation of C and C++ AppCOE projects
- Porting of legacy applications
- Host development with simulation for many OS applications
- Converting Ada source code to C/C++ code
- Platform and Application profiling
- Automatic configuration of any OS Changer and OS Abstractor APIs needed by the application
- Custom configuration of OS& OS Abstractor resources needed by the application
- Custom configuration of OS Abstractor for single or multi-application development (Process Feature support)
- Optimized source code generation
- Full Source Library Package generation

Contact MapuSoft to receive the components needed for using AppCOE. The steps for using AppCOE are comprehensively described in the following pages.

Installing AppCOE

You can download an evaluation copy from our website or install AppCOE via the evaluation CD given by MapuSoft Technologies.

To install AppCOE:

1. Click on the **exe or tar** file from CD/download and run it. A welcome html page will be auto run
2. Select**Host**

   ForWindows Host,

   1. For Ada-C/C++ Changer™Product, download **appcoe_x32.exe or appcoe_x64.exe**into the local drive
   2. For OS Changer® Porting Kit, Cross-OS Development Platform™, Cross-OS Hypervisor™, Linux OK™, OS Simulator™, App/Platform Profiler™, OS Version UpKit™products, download either **appcoe_x32.exe or appcoe_x64.exe**depending on the host machine CPU architecture
   3. Installer will ask for a directory to install AppCOE release. Browse to the directory or provide a directory name when prompted
   4. Once AppCOE is installed, reboot the system. AppCOE will not run properly without re-boot
   5. Now, Run the **AppCOE.exe** in AppCOE <installdir> or launch the AppCOE application from the windows shortcut in desktop

   For Linux Host,

   1. For Ada-C/C++ Changer™Product, download app-coe-linux_x32.tar.gz into the local drive
   2. For OS Changer® Porting Kit, Cross-OS Development Platform™, Cross-OS Hypervisor™, Linux OK™, OS Simulator™, App/Platform Profiler™, OS Version UpKit™products, download either **app-coe-linux_x32.tar.gz or app-coe-linux_x64.tar.gz**depending on the host machine CPU architecture
   3. Extract the tar file **app-coe-linux_x32.tar.gz or app-coe-linux_x64.tar.gz**. You will get **install.sh**&**app-coe-linux.bin**
   4. Run the install.sh program, it will check for dependency needed for installing AppCOE, Install the missing dependencies and try running this script again, If no dependencies is found, AppCOE installer will start
   5. Installer will ask for a directory to install AppCOE release, Browse to the directory <installdir> or provide a directory name when prompted (ensure that the logged-in user has full read/write/execute privileges to in this install directory)
   6. After AppCOE gets installed, **install.sh** will check for AppCOE dependencies. Install the missing dependencies if any
   7. Then run **app-coe-linux.bin** to launch theAppCOE installer.
   8. Repeat steps 2-4 as in the Linux host

NOTE:

For Windows Host:

By default, it is c:\MapuSoft\AppCOE.

For Linux Host:

By default path is /usr/local/AppCOE

Do not provide special characters to the <installdir> as you will get java run-time errors.AppCOE may have problems with paths containing spaces, and if not, usually other programs used with AppCOE will experience problems with such paths.

Uninstalling AppCOE

To uninstall AppCOE:

1. Browse to the installed AppCOE directory and start the **Uninstall** application.
2. For Windows only,you can also uninstall AppCOE by selecting **Control Panel> Add/Remove Programs.** Select AppCOE and click **Remove**.
3. There is a possibility of user generated/modified files to be left on your **AppCOE** installation directory. If not necessary, delete the files manually to remove the files.

Supported Host Platforms

AppCOE supports the following host platforms:

- Windows XP/7 /8
- Linux

Supported Development APIs:

- Cross-OS: OS Abstractor* Interface

  **supports Windows 2000, Windows XP®, Windows CE, Windows Vista, Android, Linux, MQX®, NetBSD, Nucleus PLUS®, QNX, Solaris, ThreadX®, uCOS, micro-ITRON, VxWorks®, ecos , T-Kernel® , LynxOS® , LynxOS , QNX ,UCOS® target operating systems.*

- Cross-OS: OS Abstractor POSIX/LINUX Interface
- Cross-OS: OS Abstractor UITRON Interface
- OS Changer: Nucleus Interface
- OS Changer: pSOS Interface (1.5 Revision& 2.x Revision)
- OS Changer: ThreadX Interface
- OS Changer: VxWorks Interface
- OS Changer: Windows Interface
- OS Changer: µC/OS Interface
- OS Changer: FreeRTOS Interface

For a list of AppCOE supported target operating systems, click here: www.mapusoft.com/

Getting a License for AppCOE

AppCOE is licensed by the following host and target licenses. A 30-day advanced evaluation license is available for the host licenses. Click www.mapusoft.com/downloads/ to request an evaluation license.

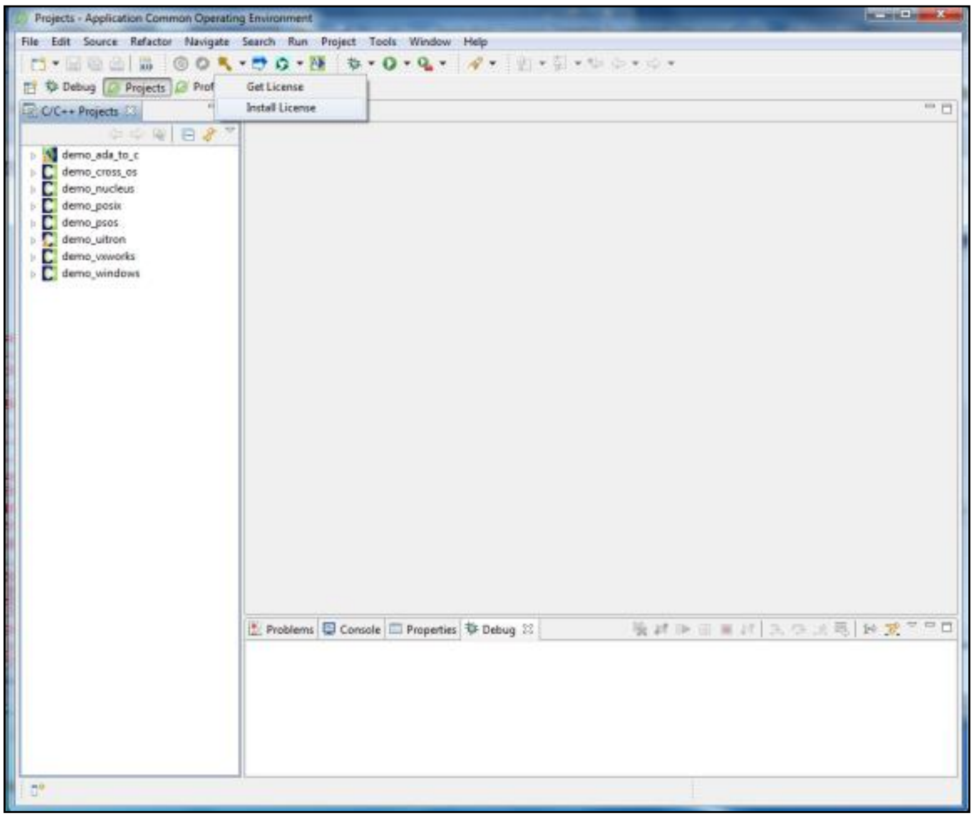
Installing License for AppCOE

MapuSoft provides a license key to the customers. Once the customers provide the Mac Address of their system, MapuSoft Technologies provides a License key for that particular system. This establishes security for the license.

To install the license:

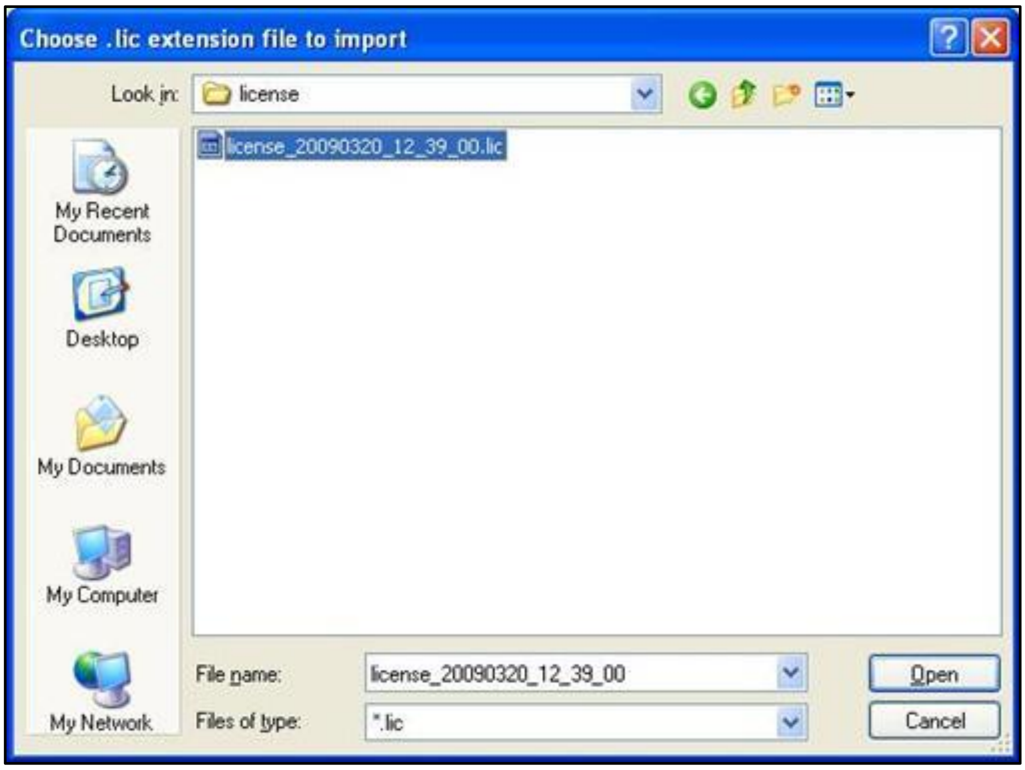
1. Save the license file given to you by MapuSoft.
2. On AppCOE main menu, click the down arrow next to **Key** button and select **Install License** as shown inFigure 2_1.

Figure 2_1: Importing License



3. Browse to the location of the saved license file,click **Open** as shown in Figure 2_2. The license key is installed and now you can work on AppCOE.

Figure 2_2: Selecting the Saved License File



Updating APPCOE

Getting Updates for AppCOE

NOTE: This feature requires AppCOE Host License. Clickhttp://www.mapusoft.com/contact/ to send a request to receive licenses and documentation.

You can get latest AppCOE updates from http://www.mapusoft.com using the following two options:

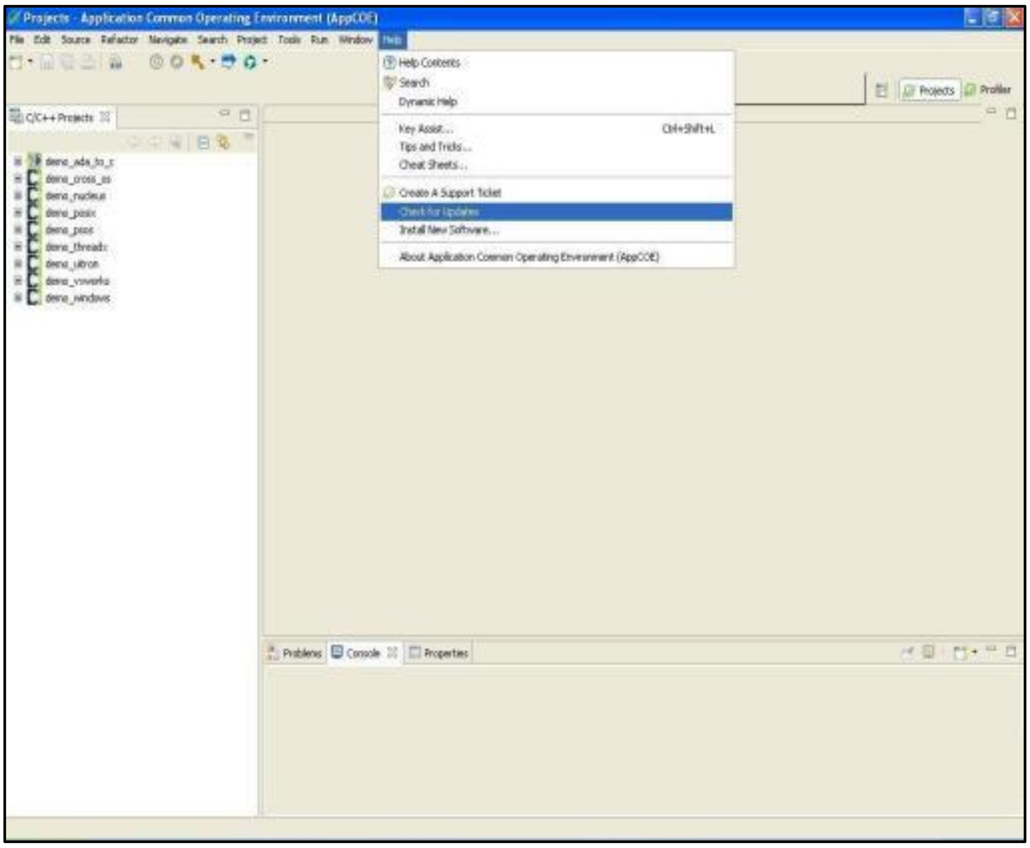
- Remote Update: By using Remote Update Site, the system will automatically contact http://www.mapusoft.com/ website and search for the latest updates. You need internet connectivity for this to work
- Local Update: By using Local Update Site, you can do AppCOE updates without connecting to the Internet. For this to work, you need to get the updated files from http://www.mapusoft.com/ by e-mail or CD

Updating Software Using Remote Update Site

To update software using Remote update site:

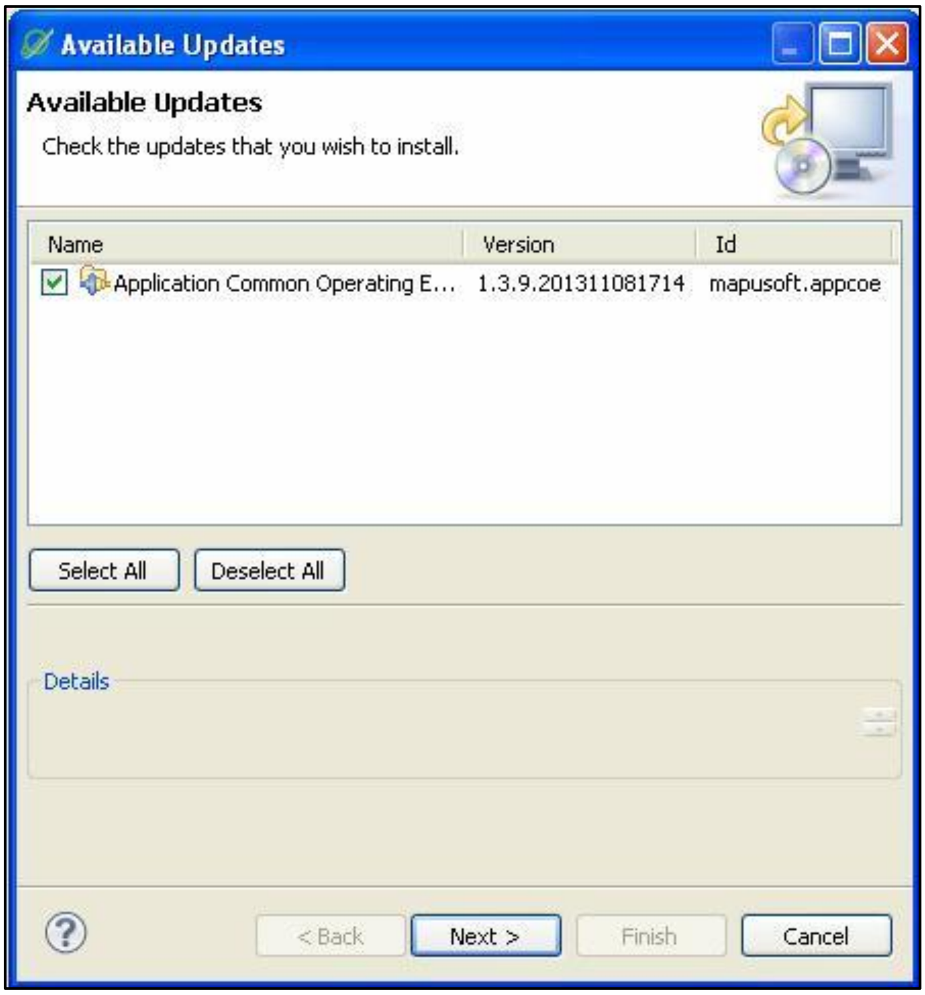
1. From AppCOE main menu, select **Help >Check for Updates** as shown inFigure 2_3.

Figure 2_3: Software Updates Using Remote Site



2. Check the Available Updates that you wish to install as shown in Figure2_4.

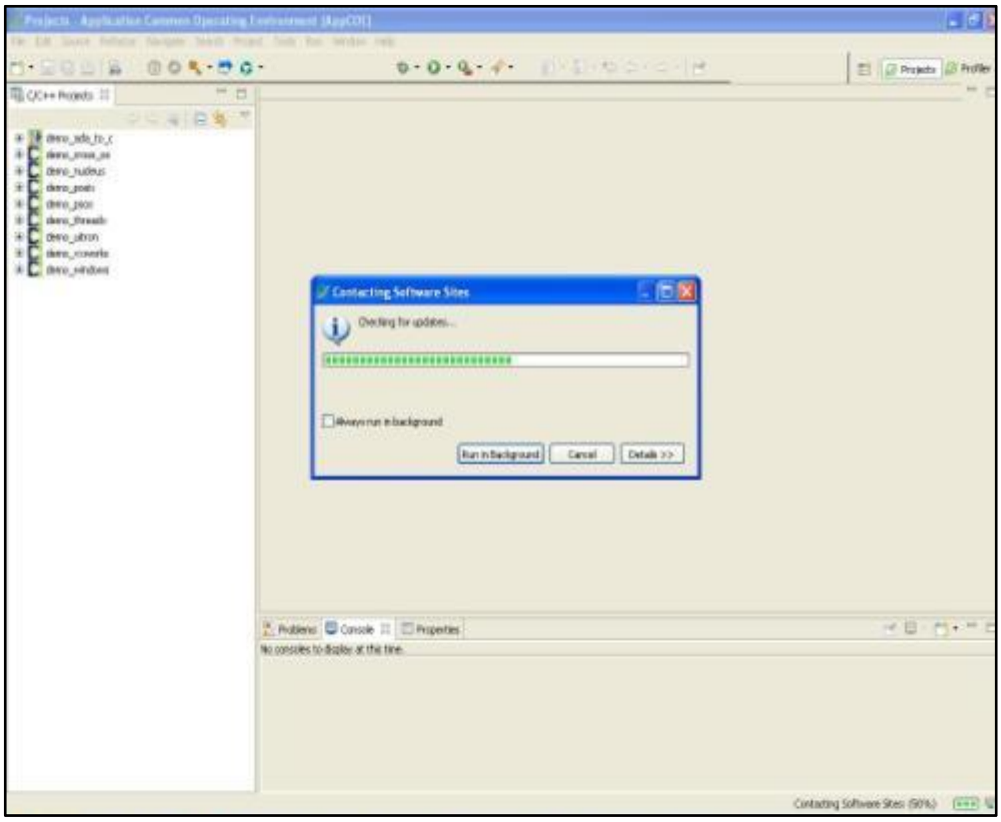
Figure2_4: Check the Available Updates



Name	Version	Id
✓ Application Common Operating E...	1.3.9.201311081714	mapusoft.appcoe

3. Contacting Software Sites for Updates as shown in Figure 2_5.

Figure 2_5: Contacting Software Sites for Updates



Checking for updates...

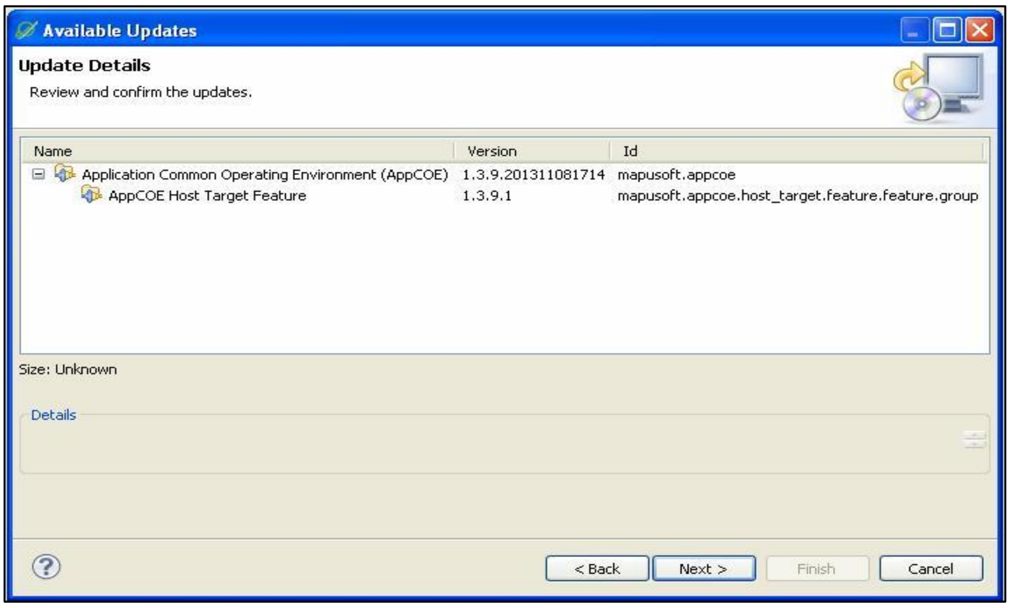
Always run in background

No consoles to display at this time.

Contacting Software Sites (50%)

4. On Available Updates Search Results window, select the features under the **AppCOE Update Site** tree parent and click **Next** as shown in Figure 2_6.

Figure 2_6: Review and Confirm the Updates



Update Details

Review and confirm the updates.

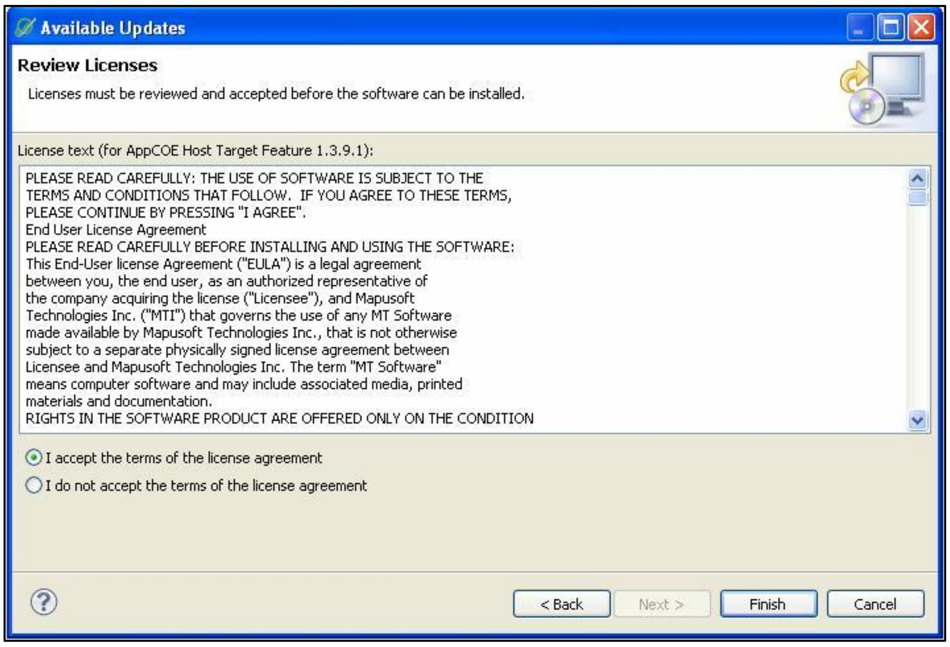
Name	Version	Id
Application Common Operating Environment (AppCOE)	1.3.9.201311081714	mapusoft.appcoe
AppCOE Host Target Feature	1.3.9.1	mapusoft.appcoe.host_target.feature.feature.group

Size: Unknown

Details

5. On Review License window, select the radio button next to **I accept the terms in the license agreements** and click **Finish** as shown inFigure 2_7.

Figure 2_7: Remote Update Host Target Feature License



Licenses must be reviewed and accepted before the software can be installed.

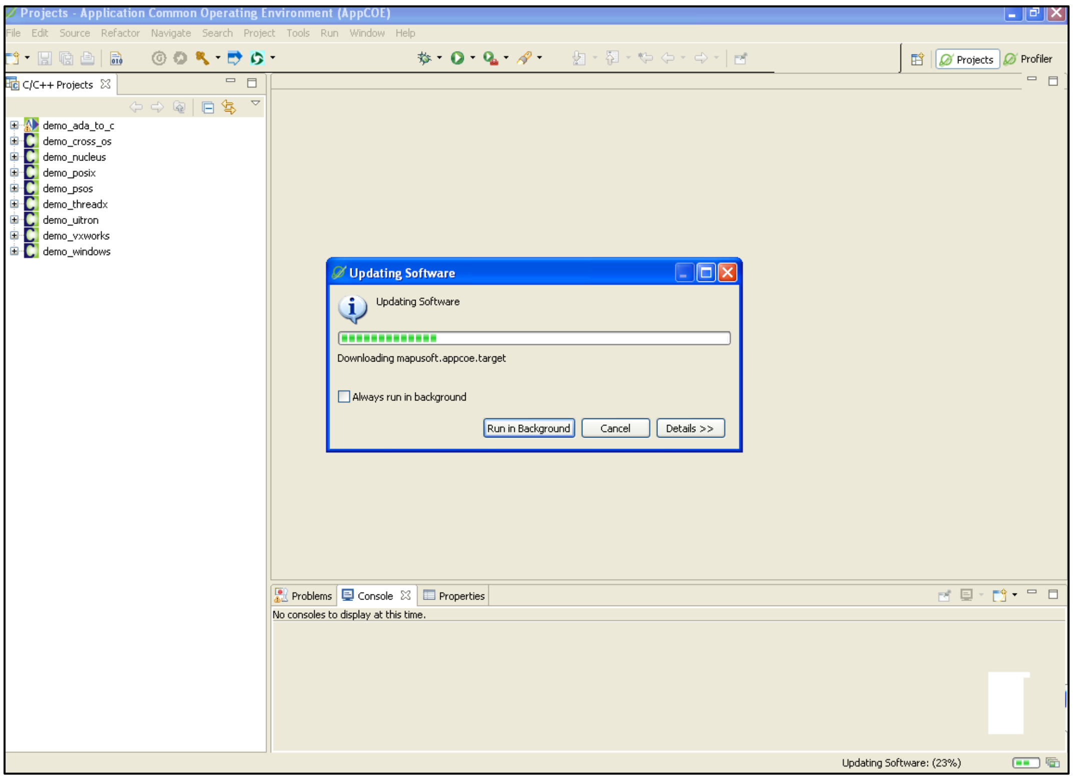
License text (for AppCOE Host Target Feature 1.3.9.1):

PLEASE READ CAREFULLY: THE USE OF SOFTWARE IS SUBJECT TO THE TERMS AND CONDITIONS THAT FOLLOW. IF YOU AGREE TO THESE TERMS, PLEASE CONTINUE BY PRESSING "I AGREE".
End User License Agreement
PLEASE READ CAREFULLY BEFORE INSTALLING AND USING THE SOFTWARE:
This End-User license Agreement ("EULA") is a legal agreement between you, the end user, as an authorized representative of the company acquiring the license ("Licensee"), and Mapusoft Technologies Inc. ("MTI") that governs the use of any MT Software made available by Mapusoft Technologies Inc., that is not otherwise subject to a separate physically signed license agreement between Licensee and Mapusoft Technologies Inc. The term "MT Software" means computer software and may include associated media, printed materials and documentation.
RIGHTS IN THE SOFTWARE PRODUCT ARE OFFERED ONLY ON THE CONDITION

[✓ I accept the terms of the license agreement]
I do not accept the terms of the license agreement

6. During the Updating Software Window, you can view the new plug-ins being downloaded as shown in Figure 2_8.

Figure 2_8: Remote Updates Download


Updating Software

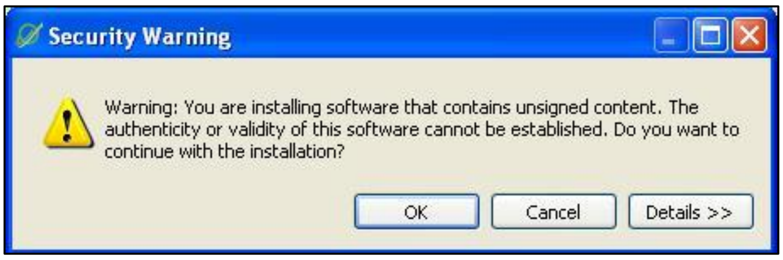
Updating Software

Downloading mapusoft.appcoe.target

Always run in background

7. Security Warning in between the Installation as shown inFigure 2_9.

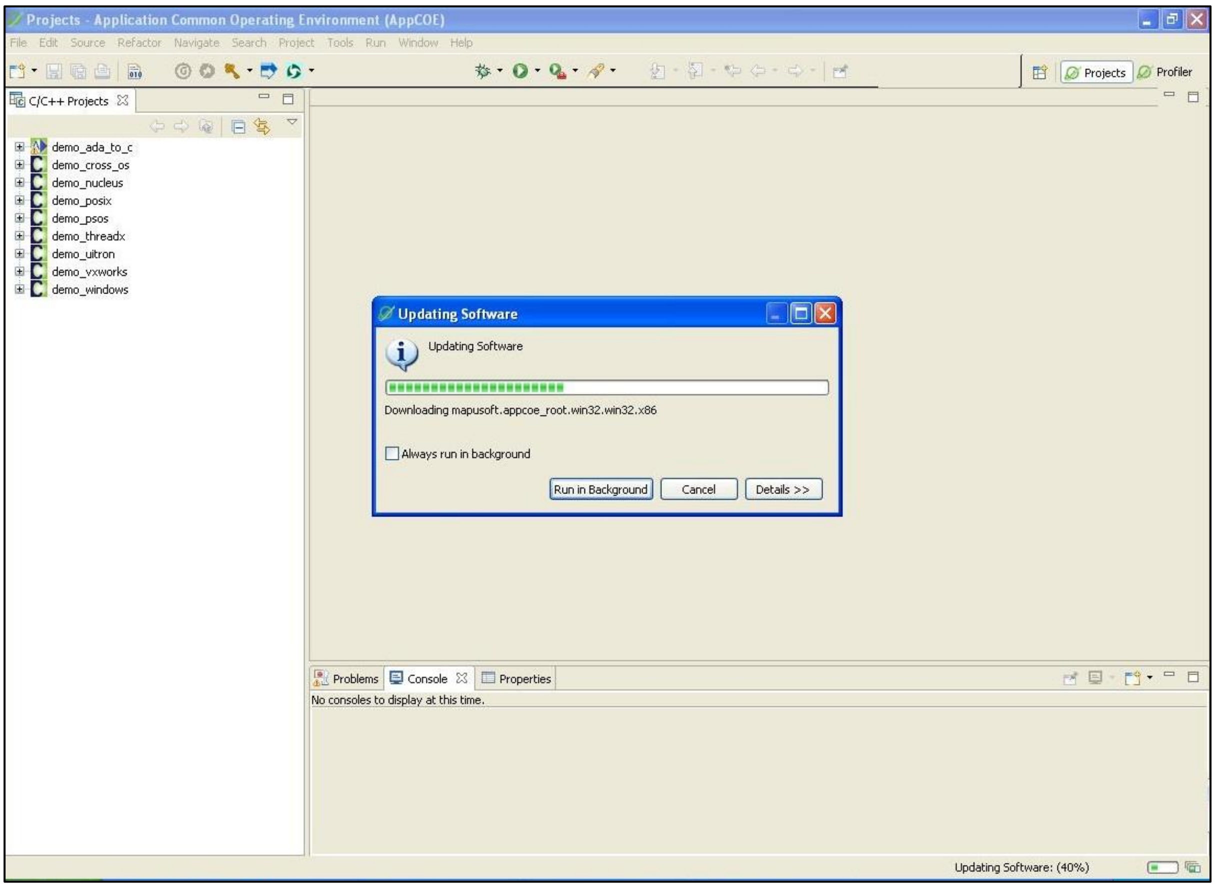
Figure 2_9: Security Warning


Security Warning

Warning: You are installing software that contains unsigned content. The authenticity or validity of this software cannot be established. Do you want to continue with the installation?

8. After press ok,Installation Continue as shown in
9. Figure 2_10.

Figure 2_10: Updating Software



Updating Software

Updating Software

Downloading mapusoft.appcoe_root.win32.win32.x86

☐ Always run in background

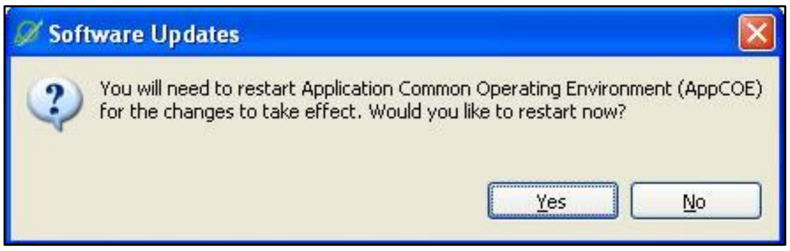
No consoles to display at this time.

Updating Software: (40%)

Once all the features and plug-ins have been downloaded successfully and their files installed into the product on the local computer, a new configuration that incorporates these features & plug-ins will be formulated. Click **yes** when asked to exit and restart the Workbench for the changes to take effect as shown in

Figure 2_11. You have now successfully installed new feature updates to your AppCOE using the Remote Update Site.

Figure 2_11: Restart AppCOE

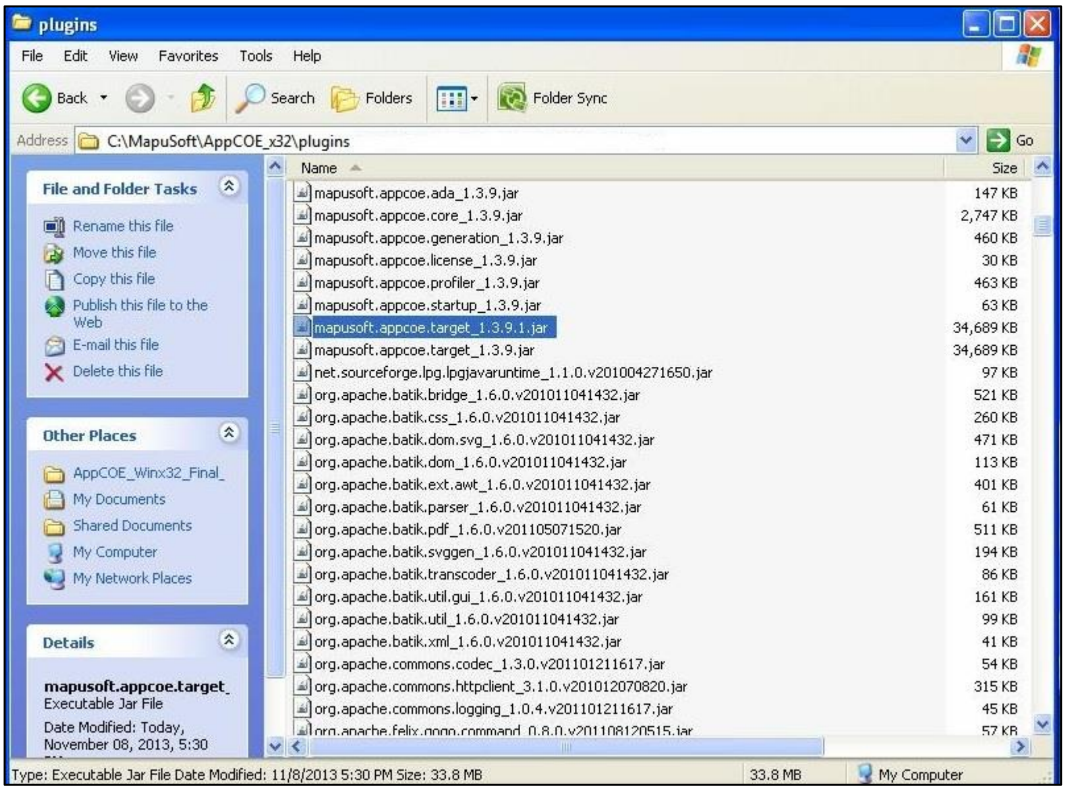


Software Updates

You will need to restart Application Common Operating Environment (AppCOE) for the changes to take effect. Would you like to restart now?

10. Check the new features installed correctly from the **AppCOE installed directory > plugins** as shown in Figure 2_12.

Figure 2_12: Confirmation of new features installed



plugins

Address C:\MapuSoft\AppCOE_x32\plugins

Name	Size
mapusoft.appcoe.ada_1.3.9.jar	147 KB
mapusoft.appcoe.core_1.3.9.jar	2,747 KB
mapusoft.appcoe.generation_1.3.9.jar	460 KB
mapusoft.appcoe.license_1.3.9.jar	30 KB
mapusoft.appcoe.profiler_1.3.9.jar	463 KB
mapusoft.appcoe.startup_1.3.9.jar	63 KB
mapusoft.appcoe.target_1.3.9.1.jar	34,689 KB
mapusoft.appcoe.target_1.3.9.jar	34,689 KB
net.sourceforge.lpg.lpgjavaruntime_1.1.0.v201004271650.jar	97 KB
org.apache.batik.bridge_1.6.0.v201011041432.jar	521 KB
org.apache.batik.css_1.6.0.v201011041432.jar	260 KB
org.apache.batik.dom.svg_1.6.0.v201011041432.jar	471 KB
org.apache.batik.dom_1.6.0.v201011041432.jar	113 KB
org.apache.batik.ext.awt_1.6.0.v201011041432.jar	401 KB
org.apache.batik.parser_1.6.0.v201011041432.jar	61 KB
org.apache.batik.pdf_1.6.0.v201105071520.jar	511 KB
org.apache.batik.svggen_1.6.0.v201011041432.jar	194 KB
org.apache.batik.transcoder_1.6.0.v201011041432.jar	86 KB
org.apache.batik.util.gui_1.6.0.v201011041432.jar	161 KB
org.apache.batik.util_1.6.0.v201011041432.jar	99 KB
org.apache.batik.xml_1.6.0.v201011041432.jar	41 KB
org.apache.commons.codec_1.3.0.v201101211617.jar	54 KB
org.apache.commons.httpclient_3.1.0.v201012070820.jar	315 KB
org.apache.commons.logging_1.0.4.v201101211617.jar	45 KB
org.apache.felix.gogo.command_0.8.0.v201108120515.jar	57 KB

Details

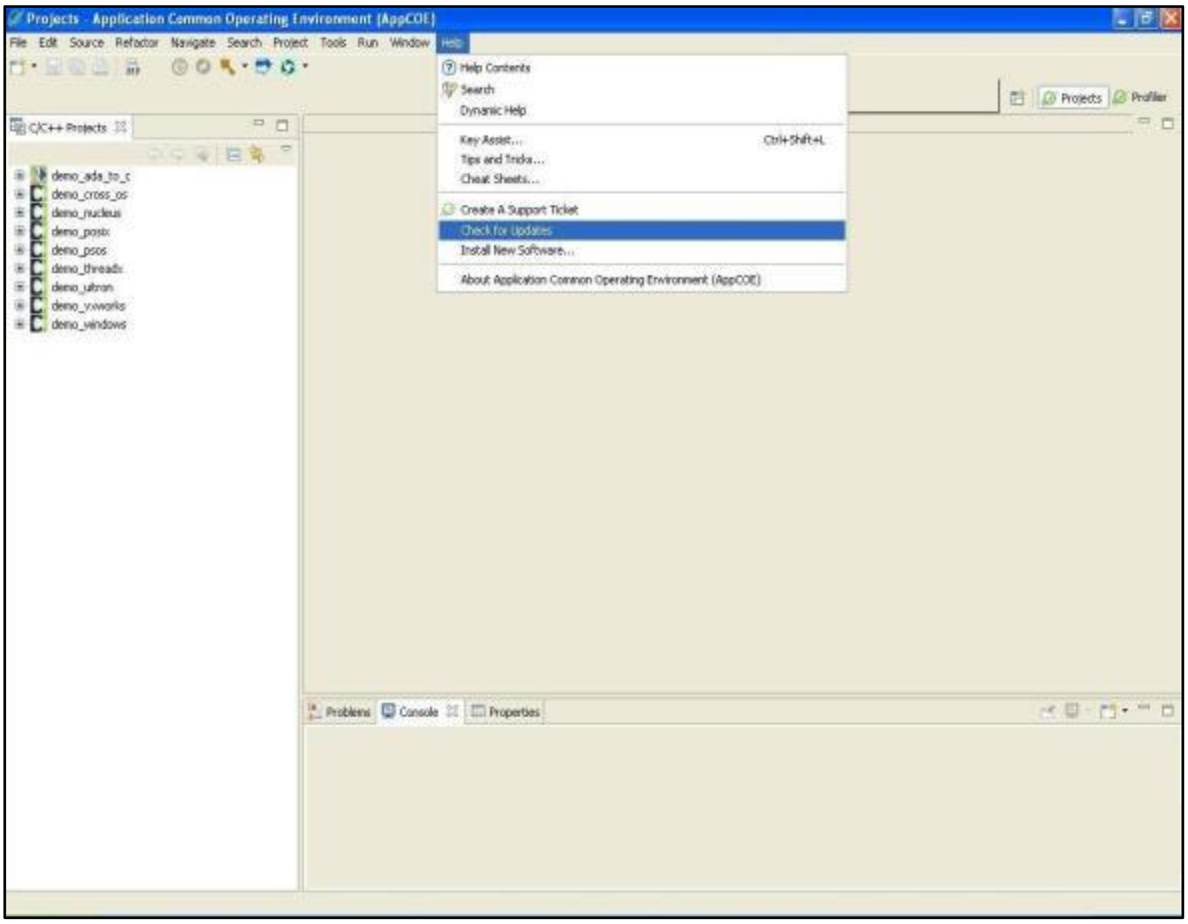
mapusoft.appcoe.target_
Executable Jar File
Date Modified: Today, November 08, 2013, 5:30

Type: Executable Jar File Date Modified: 11/8/2013 5:30 PM Size: 33.8 MB 33.8 MB My Computer

Updating Software Using Local Update Site

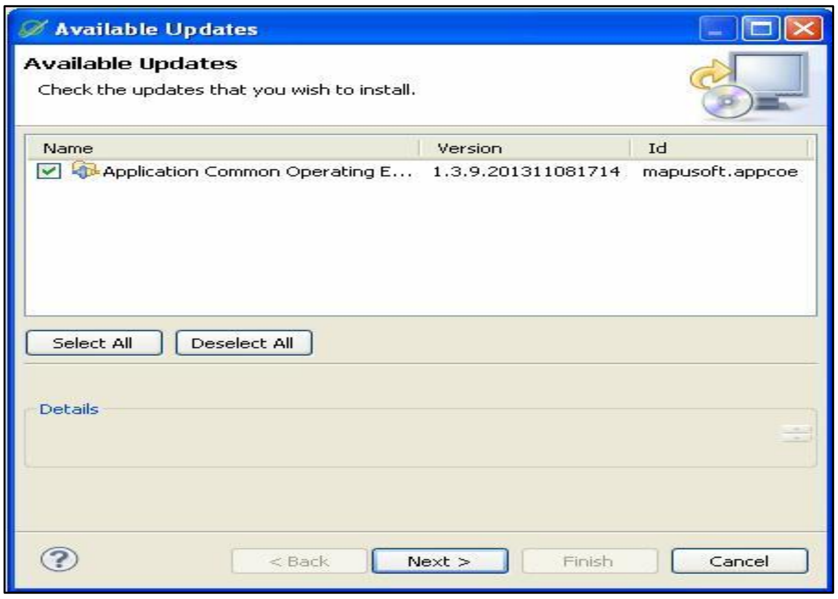
1. From AppCOE main window, select **Help >Check for Updates** as shown in Figure 2_13.

   Figure 2_13: Software Updates Using Local Site



2. Check the **Available Updateswindows** that you wish to install and click **Next** as shown in Figure 2_1.

Figure 2_14: AppCOE Software Updates

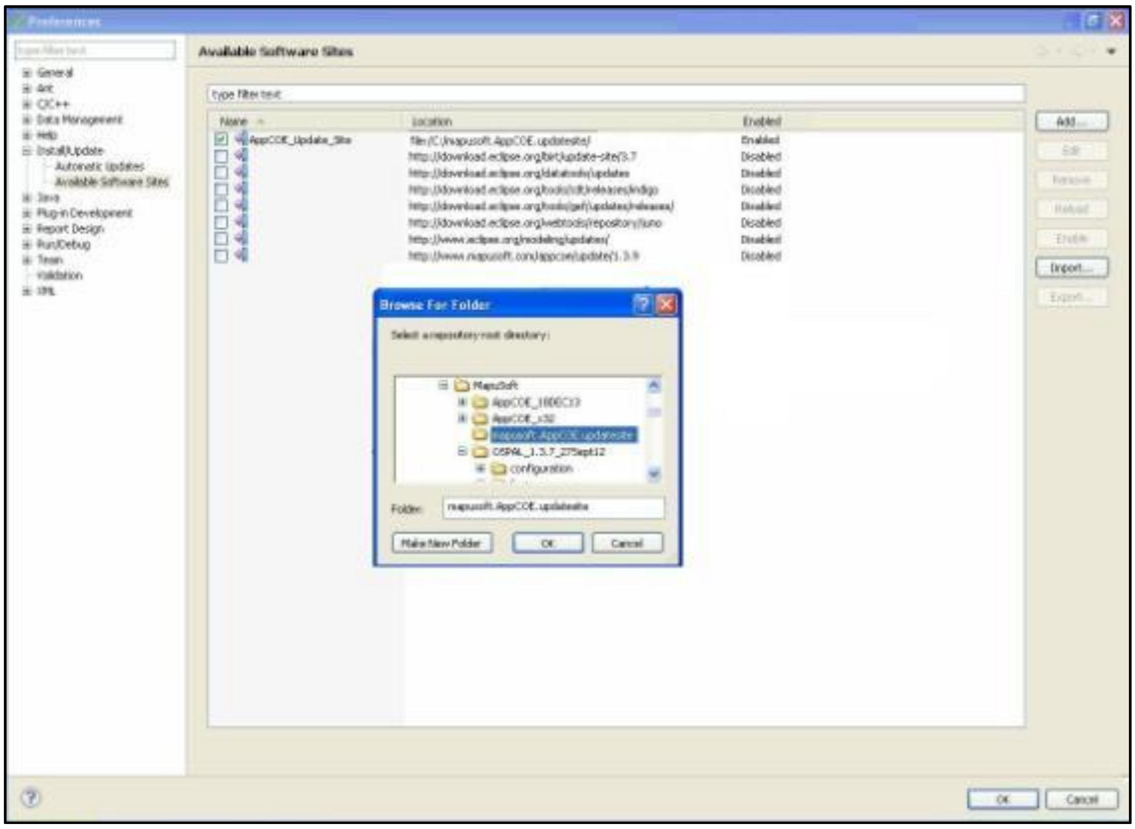


Name	Version	Id
✓ Application Common Operating E...	1.3.9.201311081714	mapusoft.appcoe

On Updates sites to visit window, select **Add** and browse for the folder provided by MapuSoft, named as **mapusoft.AppCOE.updatesite** and click **OK** as shown in Figure 2_15.

NOTE: If the system does not allow you to give the same site name, select the previous *updatesite* folder from the list and click **Remove**. Or, you can also save the Updatesite folder in any other location on your local disk.

Figure 2_15: Installing Updates by Using Local Update Site



Available Software Sites

Name	Location	Enabled
☑ AppCOE_Update_Site	file:/C:/mapusoft.AppCOE.updatesite/	Enabled
☐	http://download.eclipse.org/birt/update-site/3.7	Disabled
☐	http://download.eclipse.org/datatools/updates	Disabled
☐	http://download.eclipse.org/tools/cdt/releases/indigo	Disabled
☐	http://download.eclipse.org/tools/gef/updates/releases/	Disabled
☐	http://download.eclipse.org/webtools/repository/juno	Disabled
☐	http://www.eclipse.org/modeling/updates/	Disabled
☐	http://www.mapusoft.com/appcoe/update/1.3.9	Disabled

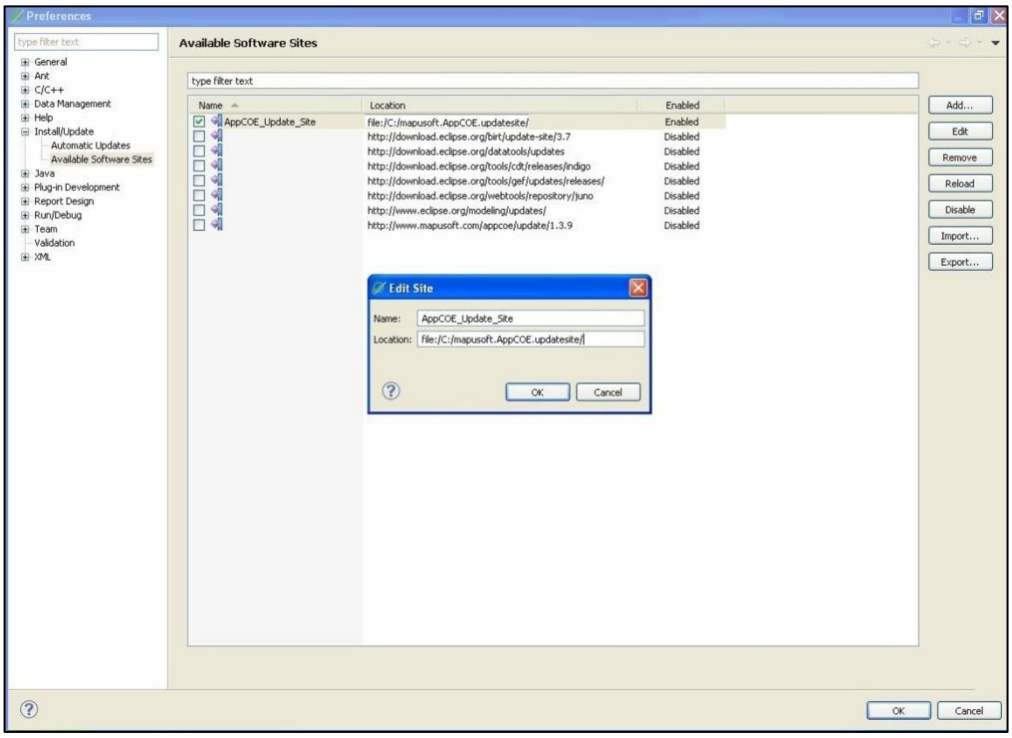
Browse For Folder

Select a repository root directory:

Folder: mapusoft.AppCOE.updatesite

3. On Edit Local Site pop up window, next to **Name** text box, provide a different name and click **OK**. The name can be any name that is not already present on the list as shown inFigure 2_16.and click **OK.**

Figure 2_16: Available Software Sites



Available Software Sites

Name	Location	Enabled
☑ AppCOE_Update_Site	file:/C:/mapusoft.AppCOE.updatesite/	Enabled
☐	http://download.eclipse.org/birt/update-site/3.7	Disabled
☐	http://download.eclipse.org/datatools/updates	Disabled
☐	http://download.eclipse.org/tools/cdt/releases/indigo	Disabled
☐	http://download.eclipse.org/tools/gef/updates/releases/	Disabled
☐	http://download.eclipse.org/webtools/repository/juno	Disabled
☐	http://www.eclipse.org/modeling/updates/	Disabled
☐	http://www.mapusoft.com/appcoe/update/1.3.9	Disabled

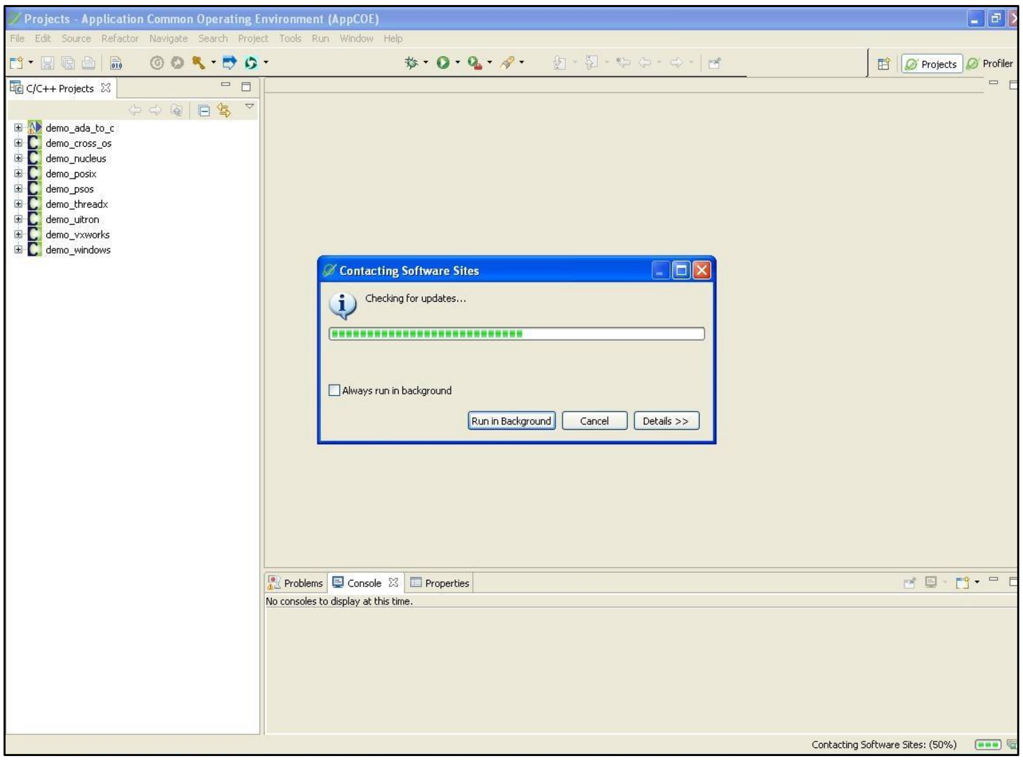
Edit Site

Name: AppCOE_Update_Site

Location: file:/C:/mapusoft.AppCOE.updatesite/

4. Contacting Software Sites for Updates as shown inFigure 2_17.

Figure 2_17: Contacting Software Sites for Updates



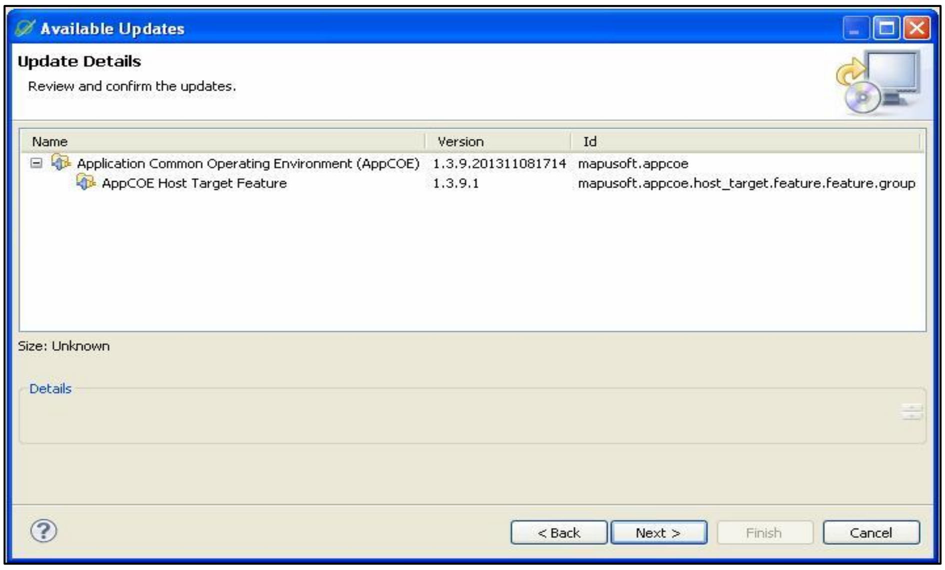
Checking for updates...

No consoles to display at this time.

Contacting Software Sites: (50%)

5. On Available Updates Window, select the features under the **AppCOE Update Site**tree parent and click **Next** as shown in Figure 2_18.

Figure 2_18: Review and confirm the Updates

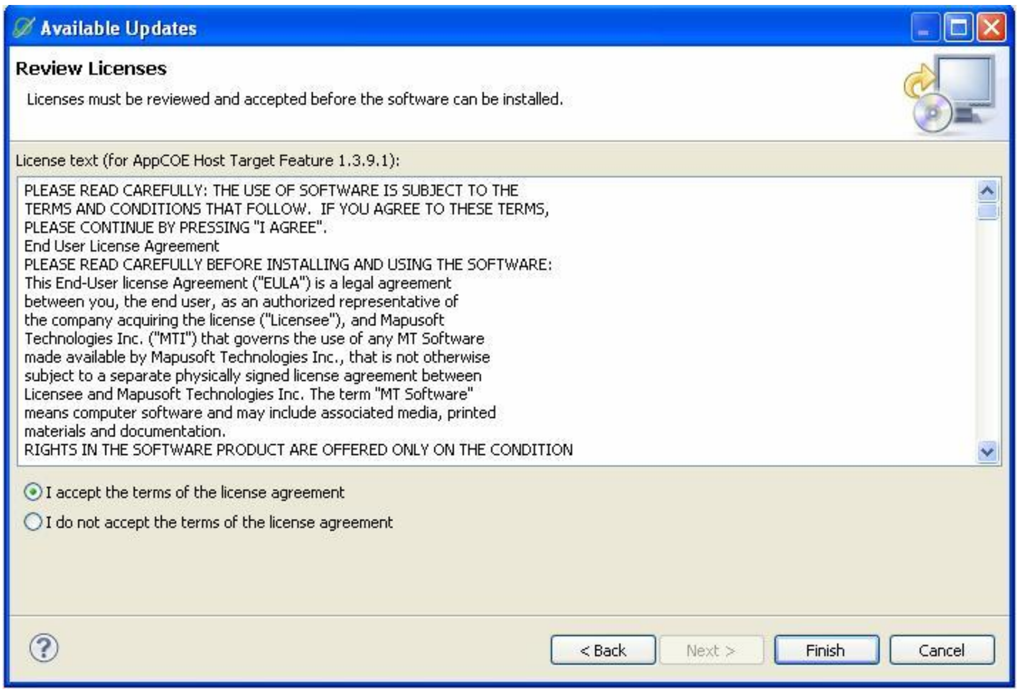


Name	Version	Id
Application Common Operating Environment (AppCOE)	1.3.9.201311081714	mapusoft.appcoe
AppCOE Host Target Feature	1.3.9.1	mapusoft.appcoe.host_target.feature.feature.group

Size: Unknown

6. On Available Updates window, select the radio button next to **I accept the terms in the license agreements** and click **Finish** as shown in Figure 2_19.

Figure 2_19: Remote Update Host Target Feature License


Available Updates
Review Licenses
Licenses must be reviewed and accepted before the software can be installed.

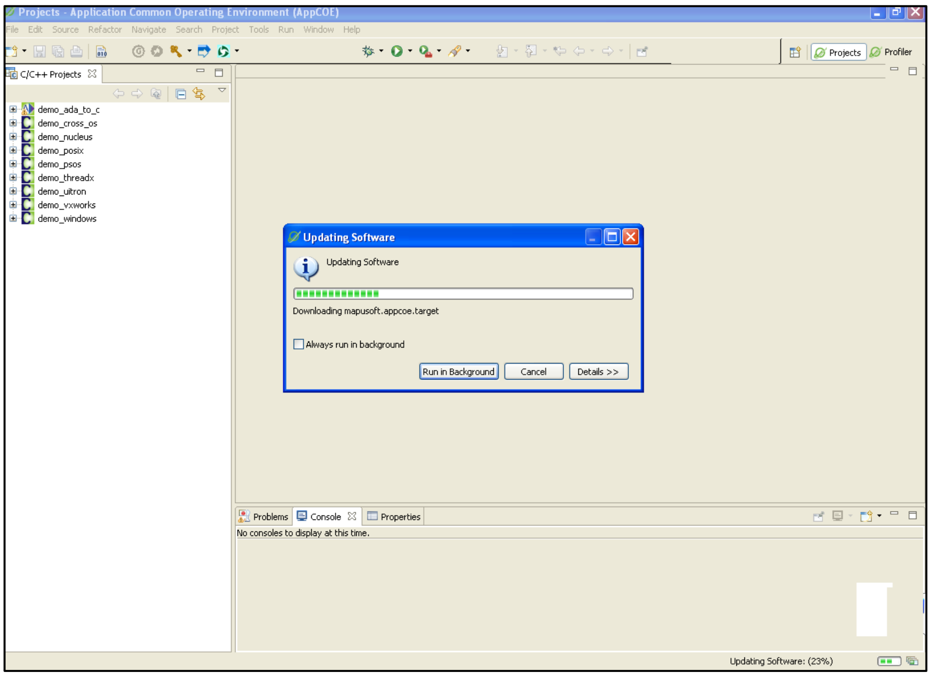
License text (for AppCOE Host Target Feature 1.3.9.1):

PLEASE READ CAREFULLY: THE USE OF SOFTWARE IS SUBJECT TO THE
TERMS AND CONDITIONS THAT FOLLOW. IF YOU AGREE TO THESE TERMS,
PLEASE CONTINUE BY PRESSING "I AGREE".
End User License Agreement
PLEASE READ CAREFULLY BEFORE INSTALLING AND USING THE SOFTWARE:
This End-User license Agreement ("EULA") is a legal agreement
between you, the end user, as an authorized representative of
the company acquiring the license ("Licensee"), and Mapusoft
Technologies Inc. ("MTI") that governs the use of any MT Software
made available by Mapusoft Technologies Inc., that is not otherwise
subject to a separate physically signed license agreement between
Licensee and Mapusoft Technologies Inc. The term "MT Software"
means computer software and may include associated media, printed
materials and documentation.
RIGHTS IN THE SOFTWARE PRODUCT ARE OFFERED ONLY ON THE CONDITION

[✓ I accept the terms of the license agreement]
I do not accept the terms of the license agreement

7. During the Updating Software Window, you can view the new plug-ins being downloaded as shown in Figure 2_20.

Figure 2_20: Remote Updates Download


Updating Software

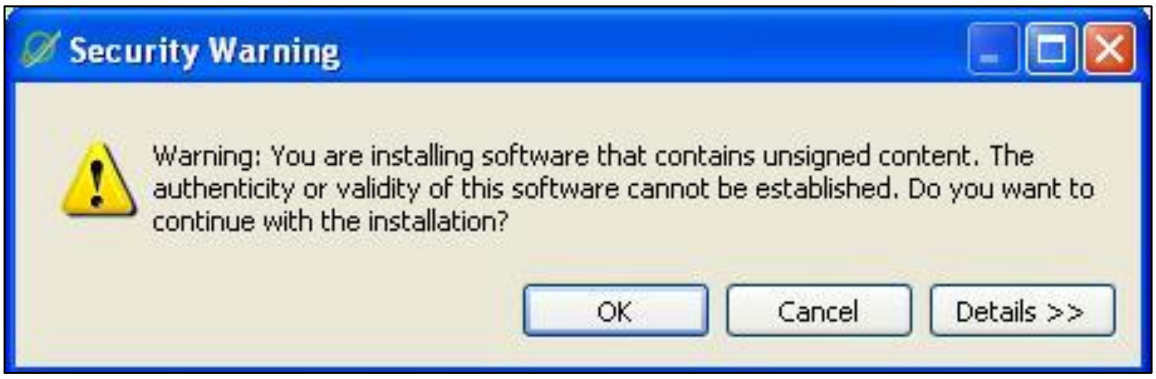
Downloading mapusoft.appcoe.target

No consoles to display at this time.

Updating Software: (23%)

8. Security Warning in between the Installation as shown in Figure 2_21.

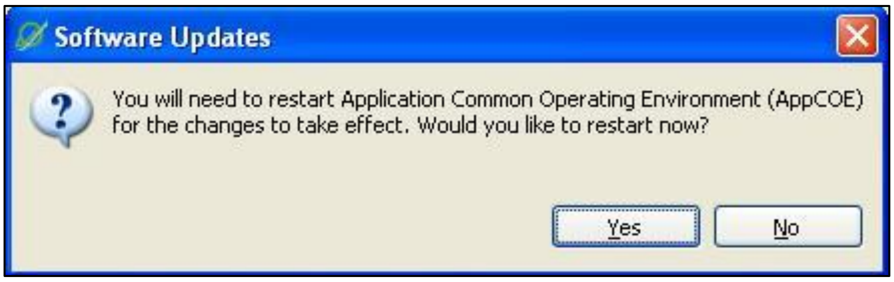
Figure 2_21: Security Warning


Warning: You are installing software that contains unsigned content. The authenticity or validity of this software cannot be established. Do you want to continue with the installation?

9. Once all the features and plug-ins have been downloaded successfully and their files installed into the product on the local computer, a new configuration that incorporates these features and plug-ins will be formulated. Click **Yes** when asked to exit and restart the Workbench for the changes to take effect as shown inFigure 2_22.

10. You have now successfully installed new feature updates to your AppCOE using the Remote Update Site.

Figure 2_22: Restart AppCOE

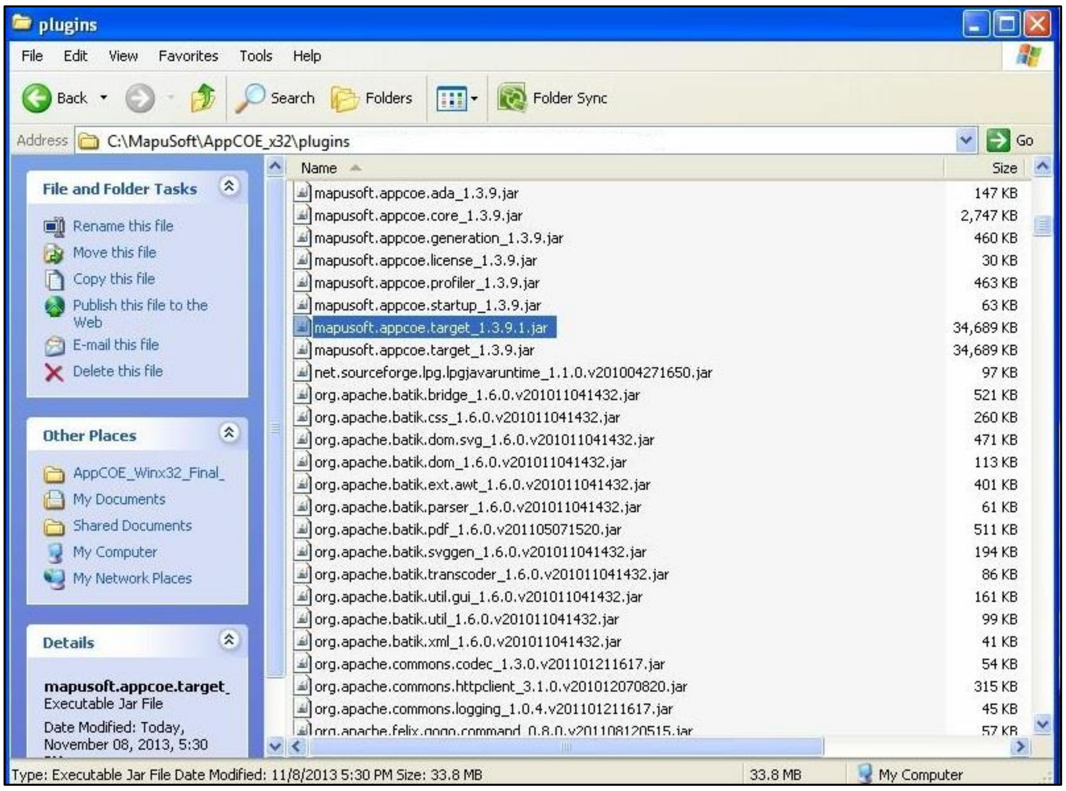


Software Updates

You will need to restart Application Common Operating Environment (AppCOE) for the changes to take effect. Would you like to restart now?

11. Check the new features installed correctly from the **AppCOE installed directory >plugins** as shown Figure 2_23.

Figure 2_23: Confirmation of new features installed



Address C:\MapuSoft\AppCOE_x32\plugins

Name	Size
mapusoft.appcoe.ada_1.3.9.jar	147 KB
mapusoft.appcoe.core_1.3.9.jar	2,747 KB
mapusoft.appcoe.generation_1.3.9.jar	460 KB
mapusoft.appcoe.license_1.3.9.jar	30 KB
mapusoft.appcoe.profiler_1.3.9.jar	463 KB
mapusoft.appcoe.startup_1.3.9.jar	63 KB
mapusoft.appcoe.target_1.3.9.1.jar	34,689 KB
mapusoft.appcoe.target_1.3.9.jar	34,689 KB
net.sourceforge.lpg.lpgjavaruntime_1.1.0.v201004271650.jar	97 KB
org.apache.batik.bridge_1.6.0.v201011041432.jar	521 KB
org.apache.batik.css_1.6.0.v201011041432.jar	260 KB
org.apache.batik.dom.svg_1.6.0.v201011041432.jar	471 KB
org.apache.batik.dom_1.6.0.v201011041432.jar	113 KB
org.apache.batik.ext.awt_1.6.0.v201011041432.jar	401 KB
org.apache.batik.parser_1.6.0.v201011041432.jar	61 KB
org.apache.batik.pdf_1.6.0.v201105071520.jar	511 KB
org.apache.batik.svggen_1.6.0.v201011041432.jar	194 KB
org.apache.batik.transcoder_1.6.0.v201011041432.jar	86 KB
org.apache.batik.util.gui_1.6.0.v201011041432.jar	161 KB
org.apache.batik.util_1.6.0.v201011041432.jar	99 KB
org.apache.batik.xml_1.6.0.v201011041432.jar	41 KB
org.apache.commons.codec_1.3.0.v201101211617.jar	54 KB
org.apache.commons.httpclient_3.1.0.v201012070820.jar	315 KB
org.apache.commons.logging_1.0.4.v201101211617.jar	45 KB
org.apache.felix.gogo.command_0.8.0.v201108120515.jar	57 KB

mapusoft.appcoe.target_
Executable Jar File
Date Modified: Today, November 08, 2013, 5:30

Type: Executable Jar File Date Modified: 11/8/2013 5:30 PM Size: 33.8 MB 33.8 MB My Computer

Chapter 3.AppCOE Components

This chapter introduces all the AppCOE components. They are as follows:

Introduction to AppCOE Components

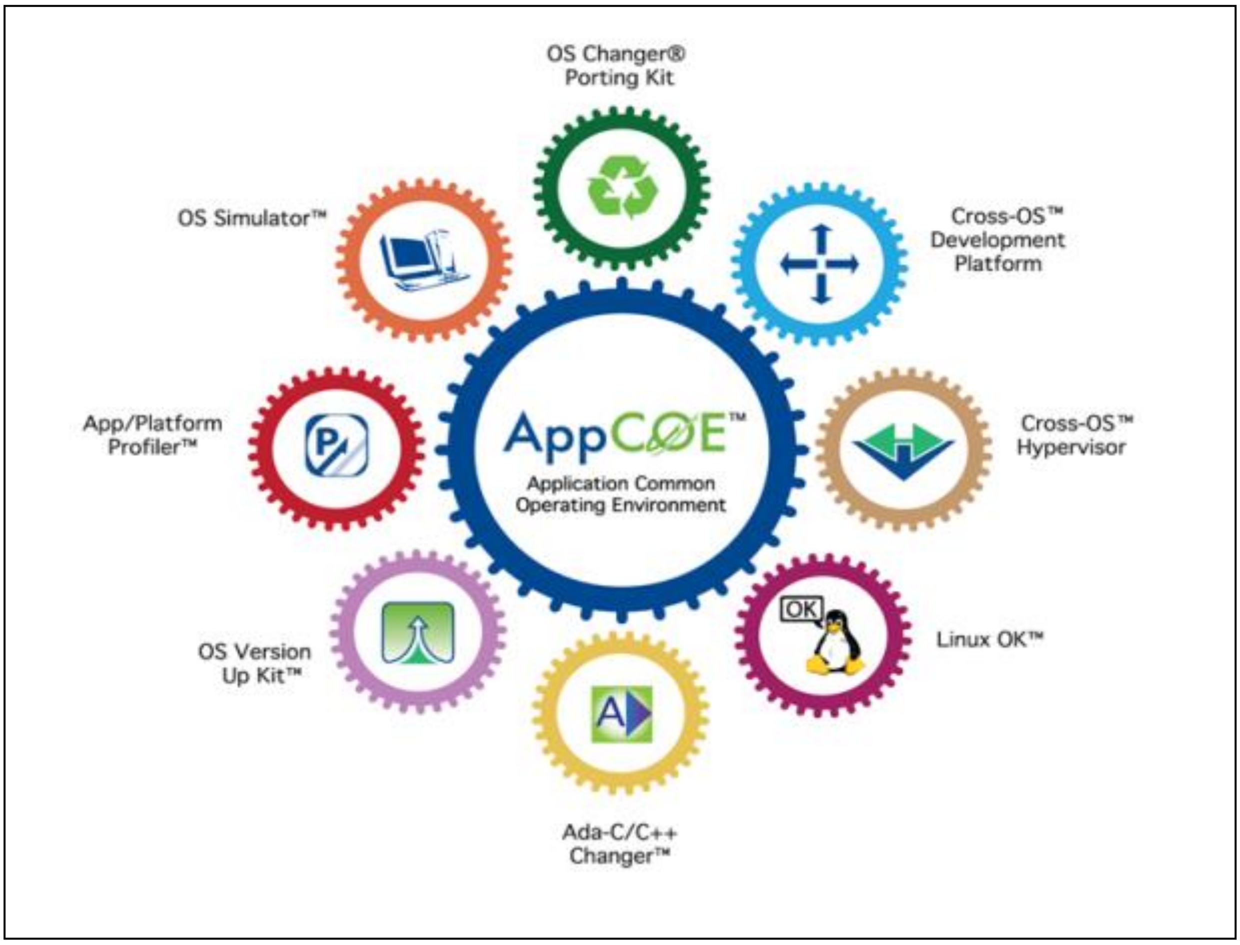
With Application Common Operating Environment (AppCOE) you can easily port, abstract and optimize your code on a host machine and run the application on different target platforms. AppCOE leverages the existing OS Changer and OS Abstractor technologies while adding advanced code optimization capacities on multiple OS environments. AppCOE provides users an easy-to-use graphical user interface that is integrated with the Eclipse® based CDT environment.

AppCOE uses OS Abstractor and OS Changer technology to produce Cross-OS development platform for manytargets.AppCOE target features include:

- Porting of legacy applications to your new chosen OS (OS Changer Porting Kit)
- Development of embedded applications on Host environment (OS Simulator)
- Convert Ada source code to C/C++ code (Ada-C/C++ Changer)
- Application profiling and platform profiling for your APIs (App/Platform Profiler)
- Generate API Profiling timing report and Profiling Timing comparison report (App/Platform Profiler)
- Cross-OS Development Platform Features that includes:
    - Automatic configuration of any OS Changer and OS Abstractor APIs needed by the application
    - Custom configuration of OS & OS Abstractor resources needed by the application
    - Custom configuration of OS Abstractor for single or multi-application development (Process Feature support)
    - Full Source Library Package generation
    - Generation of project files for your IDE
    - Generated target code is optimized to contain only the APIs used by the application
    - Allows for further optimization by in-lining user selected API's
    - Enables to convert Ada source code into C/C++ code
- Target selection and configuration tabs to optimize the target code specific for your application
    - Target OS selection
    - Profiler configuration
    - Task configuration including a task pooling feature
    - Process configuration including a process feature
    - Memory configuration
    - Resource configuration
    - Debug configuration
    - Output configuration including the ability to output to a console or serial port
    - ANSI Mapping configuration
    - Device I/O configuration

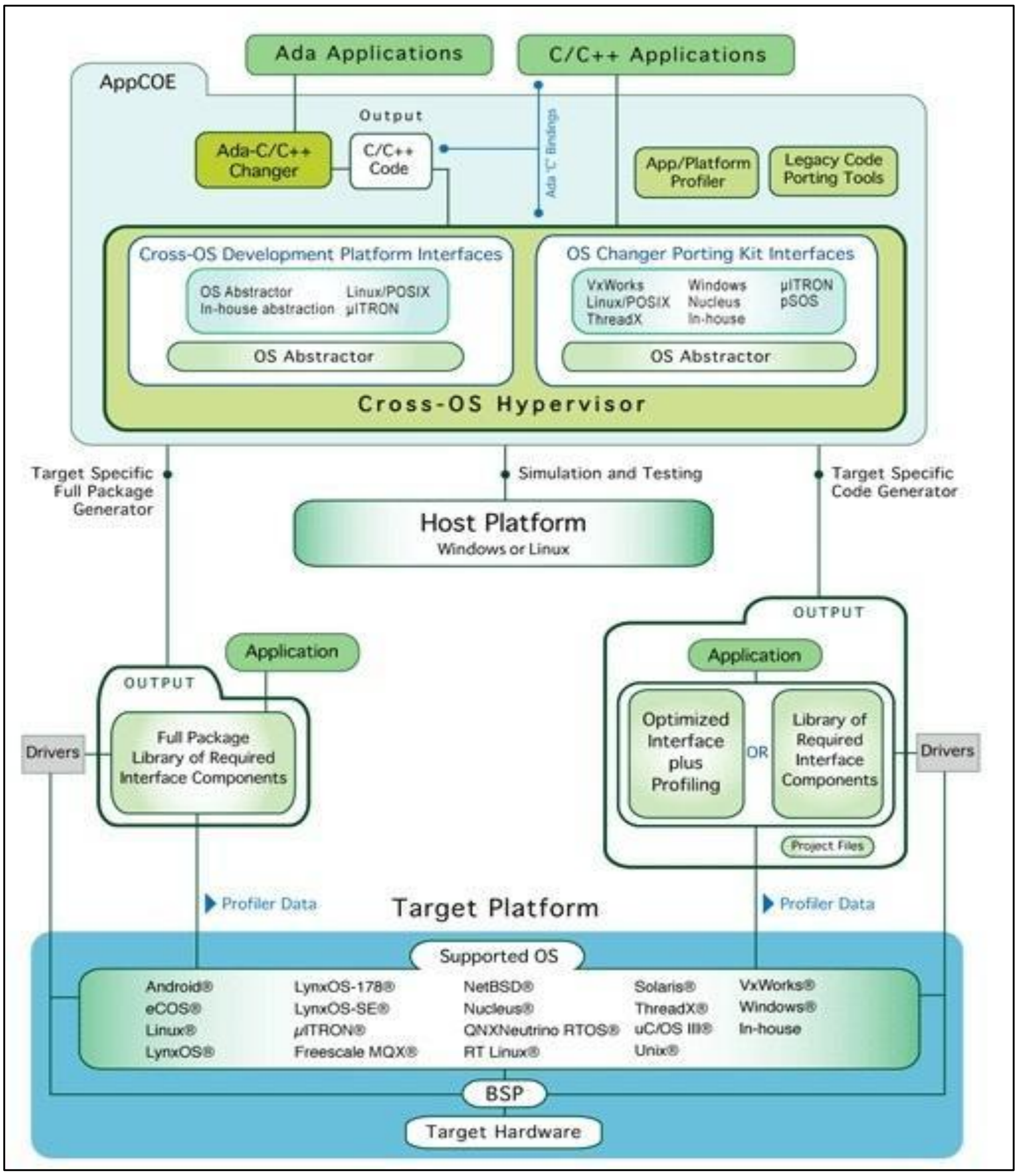
MapuSoft provides an illustration to describe all the components of AppCOE. AppCOE leverages the existing OS Changer and OS Abstractor technologies while adding advanced code optimization capacities on multiple OS environments. They are all interlinked and work closely as shown inFigure 3_1.

Figure 3_1: AppCOE Components



AppCOE Architecture

Figure 3_2: AppCOE Architecture



OS Simulator

AppCOE simulates various OS interfaces such as VxWorks, pSOS, POSIX/LINUX, Windows, ThreadX and Nucleus on host development environments so users can develop embedded code with preferred OS APIs and without the target hardware. AppCOE's state-of-the-art Eclipse based IDE offers seamless integration into existing development flows.

With Application Common Operating Environment (AppCOE) you can easily port, abstract and optimize your code on a host machine and run the application on different target platforms. AppCOE leverages the existing OS Changer and OS Abstractor technologies while adding advanced code optimization capacities on multiple OS environments. AppCOE provides users an easy-to-use graphical user interface that is integrated with the Eclipse® based CDT environment. Target operating systems supported can be found here: http://mapusoft.com/products.

This chapter includes the following topics:

- List of Available OS Simulators
- Host Development Environment
- Creating an AppCOE C/C++ Project
- C Project Template Files
- HOST Defines
- Adding Source Code Files to AppCOE C/C++ Project
- Building Binary Files for a Project
- Executing Binary Files
- Debugging the Demos Supplied by MapuSoft
- Debugging Using External Console/Terminal
- Inserting Application Code to Run only on Host Environment
- Inserting Application Code to Run only on Specific Target OS Environment
- Updating Project Settings

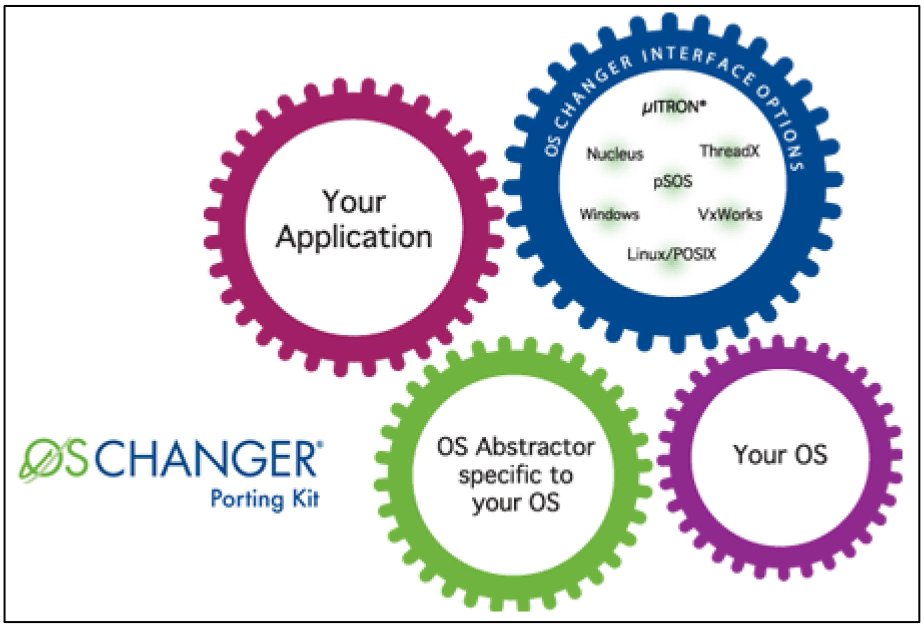
For more information on the host development refer to OS Simulator.

OS Changer Porting kit

The OS Changer family of products is COTS porting tools that give users the freedom to change operating systems while reusing their existing embedded code and knowledge base to protect their software investment and avoid costly porting issues. OS Changer also allows developers to write code using a familiar application programming interface (API) and run the application on a wide variety of supported target OS platforms. Solutions are available for porting from VxWorks, pSOS, Windows and Nucleus to many different real time (RTOS) and non-real time operating systems. Target operating systems supported can be found here: http://mapusoft.com/products/.

OS Changer is designed for use as a C library. Services used inside your application software are extracted from the OS Abstractor libraries and are combined with the other application objects to produce the complete image. OS Changer is graphically represented in the follow as shown in Figure 3_3.

Figure 3_3: OS Changer Porting kit



For more information on the host development refer to OS Changer.

Cross-OS development Platform

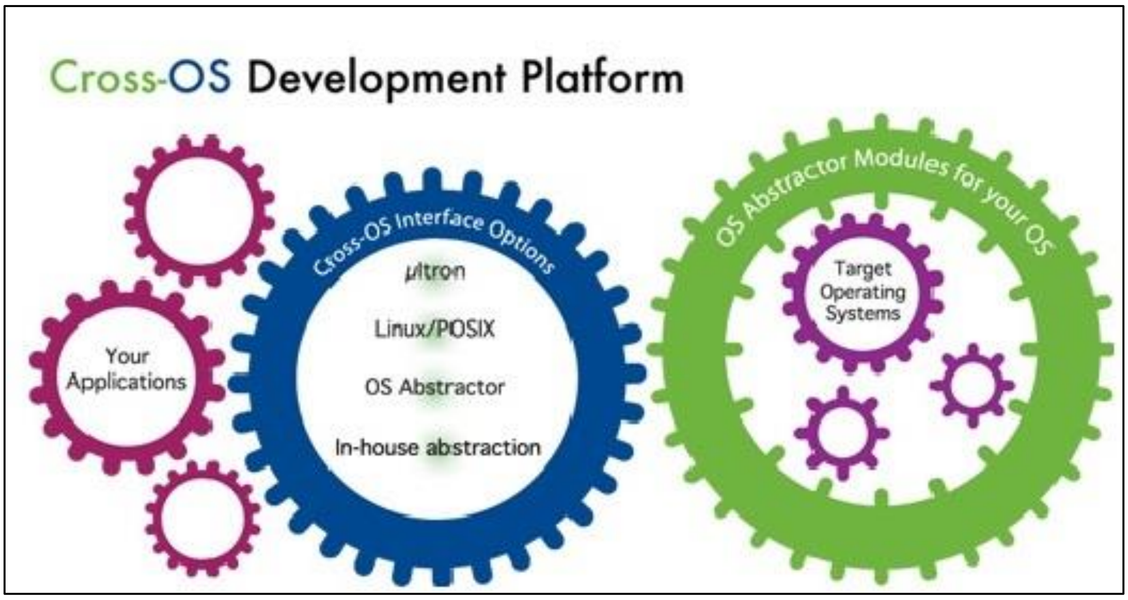
Developing a solid software architecture that can run on multiple operating systems requires considerable planning, development and testing as well as upfront costs associated with the purchase of various OS and tools to validate your software. MapuSoft's OS Abstractor is an effective and economical software abstraction alternative for your embedded programming. By using OS Abstractor, your embedded application can run on many real time (RTOS) and non-real time operating systems to negate any porting issues in the future when your platform changes. Target operating systems supported can be found here: http://mapusoft.com/products.

OS Abstractor interface provides you a robust and standard OS interface architecture for flexible application development and portability while eliminating the risks associated with selecting an OS and dependency on a single vendor. OS Abstractor makes your application adapt to multiple operating system platforms with a standard OS interface, thereby reducing cost associated with code maintenance and learning multiple operating systems.

OS Abstractor is designed for use as a fully scalable C library. Services used inside your application software are extracted from the OS Abstractor libraries and are combined with the other application objects to produce the complete image. This image may be downloaded to the target platform or placed in ROM on the target platform. Application developers need to specify the OS for the application and also include the required OS Abstractor libraries while building the application. Application developers can also select the individual OS Abstractor components that are needed and exclude the ones that are not required.

OS Abstractor is graphically represented in the follow as shown in Figure 3_4 .

Figure 3_4: Cross-OS development Platform



For more information on the host development refer toCross-OS development Platform.

Full Library Package Generator

With Application Common Operating Environment (AppCOE) you can easily generate a source code package to create libraries and develop application using your own IDE.

You can manually scale andconfigurethe product by modifying the user configuration file.

AppCOE provides users an easy-to-use graphical user interface that is integrated with the Eclipse® based CDT environment. Target operating systems supported can be found here: http://mapusoft.com/products/.

Full Source Library Package Generator chapter includes the following topics:

- Generating Full Library Packages
- How to Use Libraries with Your Application

For more information on full source library package generator, refer to Full Library Package Generator.

Optimized Target Code Generator

With Application Common Operating Environment (AppCOE) you can easily port, abstract and optimize your code on a host machine and run the application on different target platforms. AppCOE leverages the existing OS Changer and OS Abstractor technologies while adding advanced code optimization capacities on multiple OS environments. AppCOE provides users an easy-to-use graphical user interface that is integrated with the Eclipse® based CDT environment. Target operating systems supported can be found here: http://mapusoft.com/products/.

AppCOE reads application source code to determine the services used by your application and produces OS specific interface code optimized for your specific application and for each target OS platform. AppCOE gives you the ability to support multiple OS. It is also easily expandable to generate code for your proprietary OS.

Optimized Target Code Generator chapter includes the following topics:

- Generating Target Code
- Generating Project Files for your Target
- Running AppCOE Generated Code on your Target

For more information on optimized target source code generator, refer to Optimized Target Code Generator.

Ada-C/C++ Changer

MapuSoft Technologies now offers the Ada-C/C++ Changer tools that convertsAda to C &give developers the ability to automatically convert legacy software written in Ada to the C programming language. This automatic code conversion process eliminates the need for a costly and tedious code re-write to provide developers extensive cost and time savings. Ada tool gives users peace of mind by providing an error free tool that prevents mistakes made in the error prone task of a manual rewrite. Ada tool supports converting Ada 83 and Ada 95 source code and generates ANSI C output as well as certain C++ features while preserving the Ada code's comments, files structures and variable names to ease ongoing code maintenance.

For more information on using Ada-C/C++ Changer.

App/Platform Profiler

AppCOE enables you to view API performance data

- The App/Platform Profiler feature enables API data collection
- Collected data provides feedback concerning the utilization of MapuSoft's APIs in the project
- Reports allow for performance impact analysis by detailing API execution time
- Offers area, bar, line, pie and scatter charts for data analysis
- Generate API timing report and Timing comparison report
- Platform API Profiling–System specific API profiling
- Application Profiling–User specific API profiling

Platforms Supported for App/Platform Profiler

- VxWorks 6x® and VxWorks 5x®
- Linux 2.4® and Linux 2.6®
- LynxOS® and LynxOS-SE®
- Solaris
- Unix®
- Windows CE®
- Windows XP, Window 7 & Windows 8 ®
- QNX®

For more information on Profiling, refer to App/Platform Profiler.

Chapter 4.Using OS Simulator

This chapter contains the following topics:

List of Available OS Simulators

The following is the list of available OS Simulators:

- VxWorks
- pSOS
- Nucleus
- POSIX/LINUX/Linux
- uITRON
- Windows
- ThreadX
- µC/OS
- FreeRTOS

Host Development Environment

Host development needs a proper environment to run and build embedded programs. To develop an environment, you need the following GNU tools:

- Eclipse IDE
- MinGW
- GNU Compiler
- PAL Debugger

Eclipse

An IDE is a powerful set of tools in the Application Common Operating Environment (AppCOE) development suite. The IDE is based on the Eclipse Platform developed by Eclipse.org, an open consortium of tools vendors.

The IDE incorporates into the Eclipse framework several AppCOE -specific plugins designed for building projects for target systems running on HOST. The tools suite provides a single, consistent, integrated environment; regardless of the host platform you are using Windows or Linux. Plugins from most vendors should work within the Eclipse framework in the same way.

NOTE: For more information on Eclipse and working on Eclipse framework, refer to http://www.eclipse.org/documentation/.

MinGW

MinGW, a contraction of "Minimalist GNU for Windows", is a port of the GNU Compiler Collection (GCC), and GNU Binutils, for use in the development of native Microsoft Windows applications. Offered in easily installed binary package format, for native deployment on MS-Windows, or user-built from source, for cross-hosted use on UNIX or GNU/Linux, the suite exploits Microsoft's standard system DLLs to provide the C-Runtime and Windows API. It is augmented by additional function libraries for improved ISO C-99 compatibility, and further, by community supported add-on tools and libraries, many pre-built, many more in the form of "mingw PORTs", to be built by the end user.

MinGW provides a complete Open-Source programming tool set which is suitable for the development of native MS-Windows applications, and which do not depend on any 3rd-party C-Runtime DLLs.

GNU Compiler

The GNU Compiler Collection includes front ends for C, C++, Java as well as libraries for these languages (such as libstdc++, libgcj).

AppCOE Supplied GDB

A debugger is a computer program that is used to test and debug other programs (the "target" program). The code to be examined might alternatively be running on an instruction set simulator (ISS), a technique that allows great power in its ability to halt when specific conditions are encountered but which will typically be somewhat slower than executing the code directly on the appropriate processor. Some debuggers offer two modes of operation - full or partial simulation to limit this impact.
Typically, debuggers also offer more sophisticated functions such as running a program step by step (single-stepping or program animation), stopping (breaking) (pausing the program to examine the current state) at some event or specified instruction by means of a breakpoint, and tracking the values of some variables. Some debuggers have the ability to modify the state of the program while it is running, rather than merely to observe it. It may also be possible to continue execution at a different location in the program.
The GNU Debugger, usually called just GDB and named gdb as an executable file, is the standard debugger for the GNU software system. It is a portable debugger that runs on many Unix-like systems and works for many programming languages.
While working on AppCOE, you must use MapuSoft's GNU Debugger, called as "AppCOE Supplied GDB".

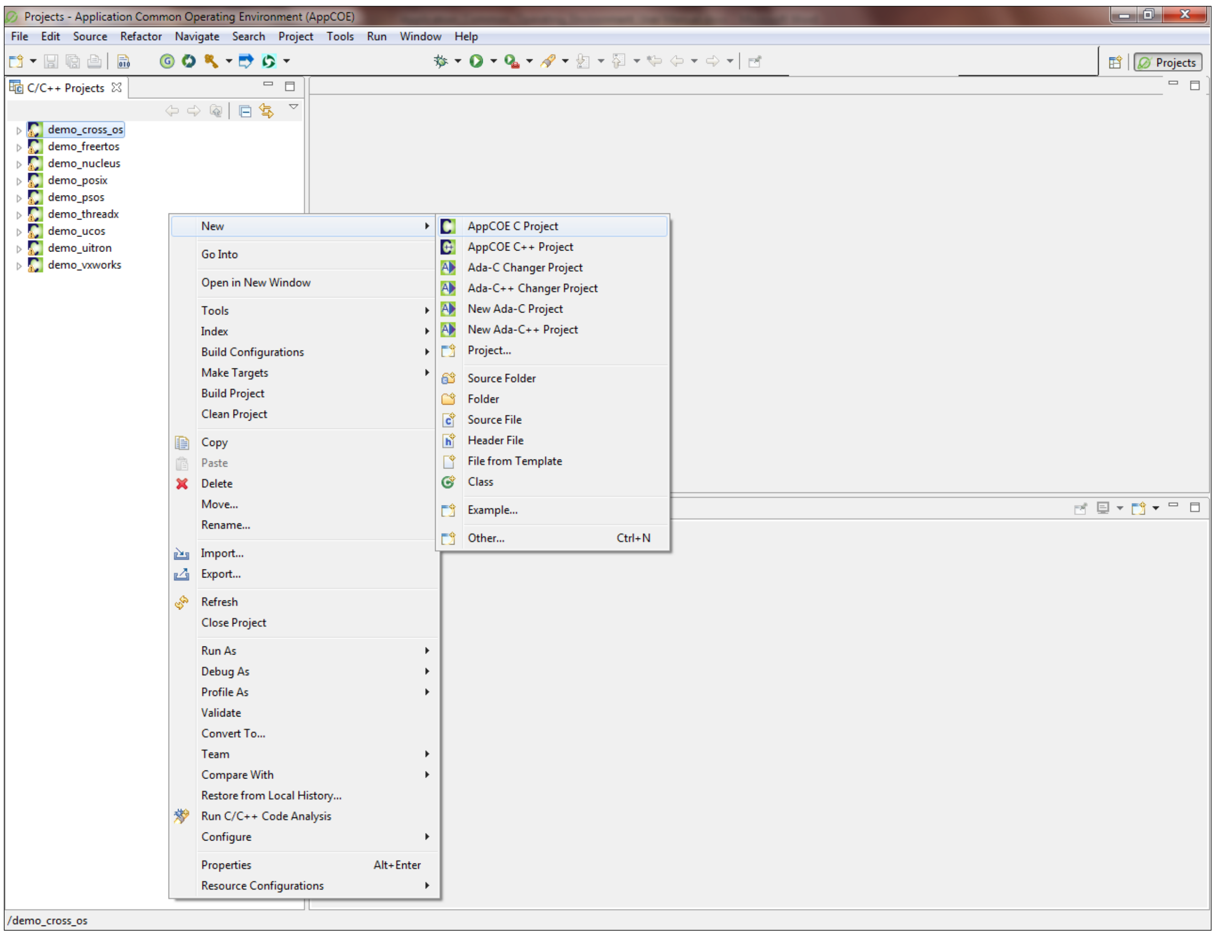
Creating an AppCOE C/C++ Project

NOTE: This feature requires a license. Click http://mapusoft.com/downloads/AppCOE-evaluation/ to request an evaluation license.

To create an AppCOE C/C++ project:

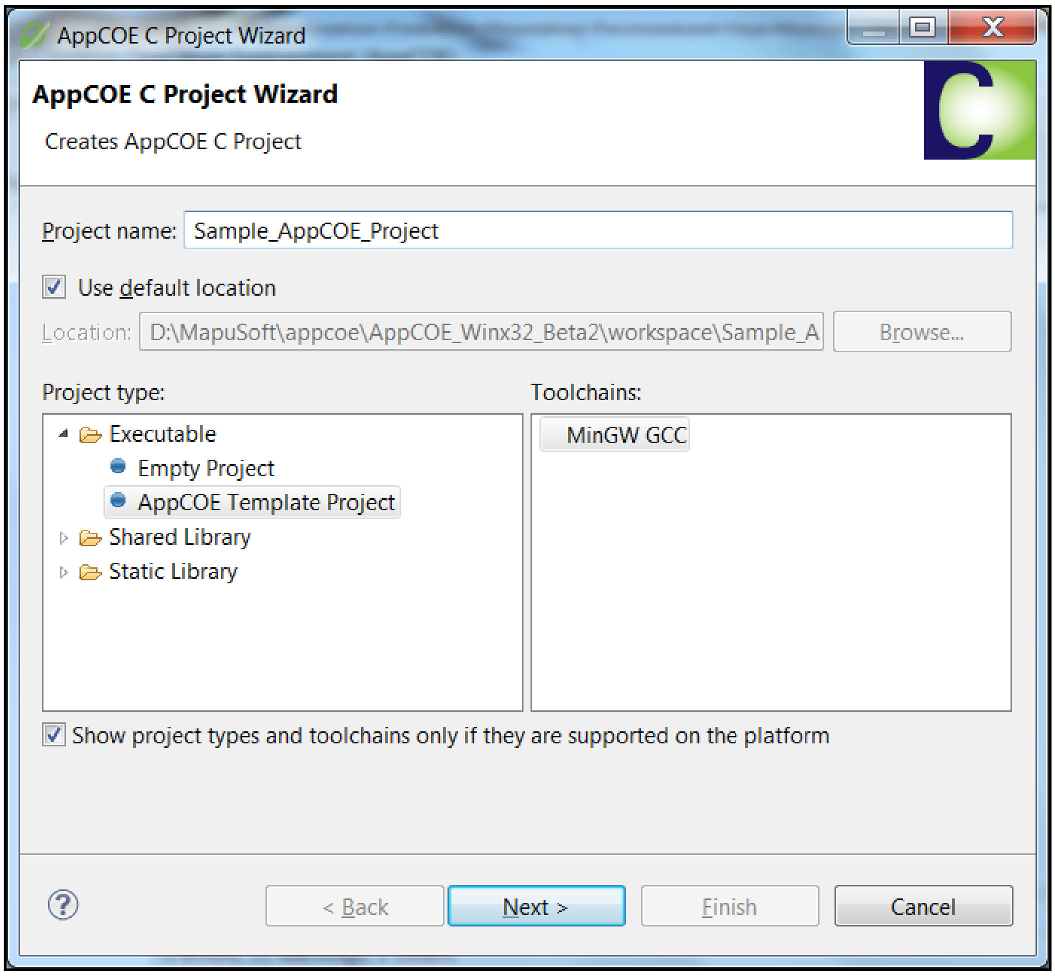
1. From AppCOE main window, select any project under**C/C++ Projects** tab on the left pane.
2. Select **New >AppCOE C/C++ Project** as shown in Figure 4_1.

Figure 4_1: Creating an AppCOE C Project



3. On AppCOE C/C++ Project Wizard window, type a project name and give a location next to **Project Name** text box.
4. Under Project Types, expand the **Executable** menu. Select **AppCOE Template Project** and click **Next** as shown inFigure 4_2.

Figure 4_2: AppCOE C Project Wizard Window


AppCOE C Project Wizard

AppCOE C Project Wizard

Creates AppCOE C Project

Project name: Sample_AppCOE_Project

☑ Use default location

Location: D:\MapuSoft\appcoe\AppCOE_Winx32_Beta2\workspace\Sample_A

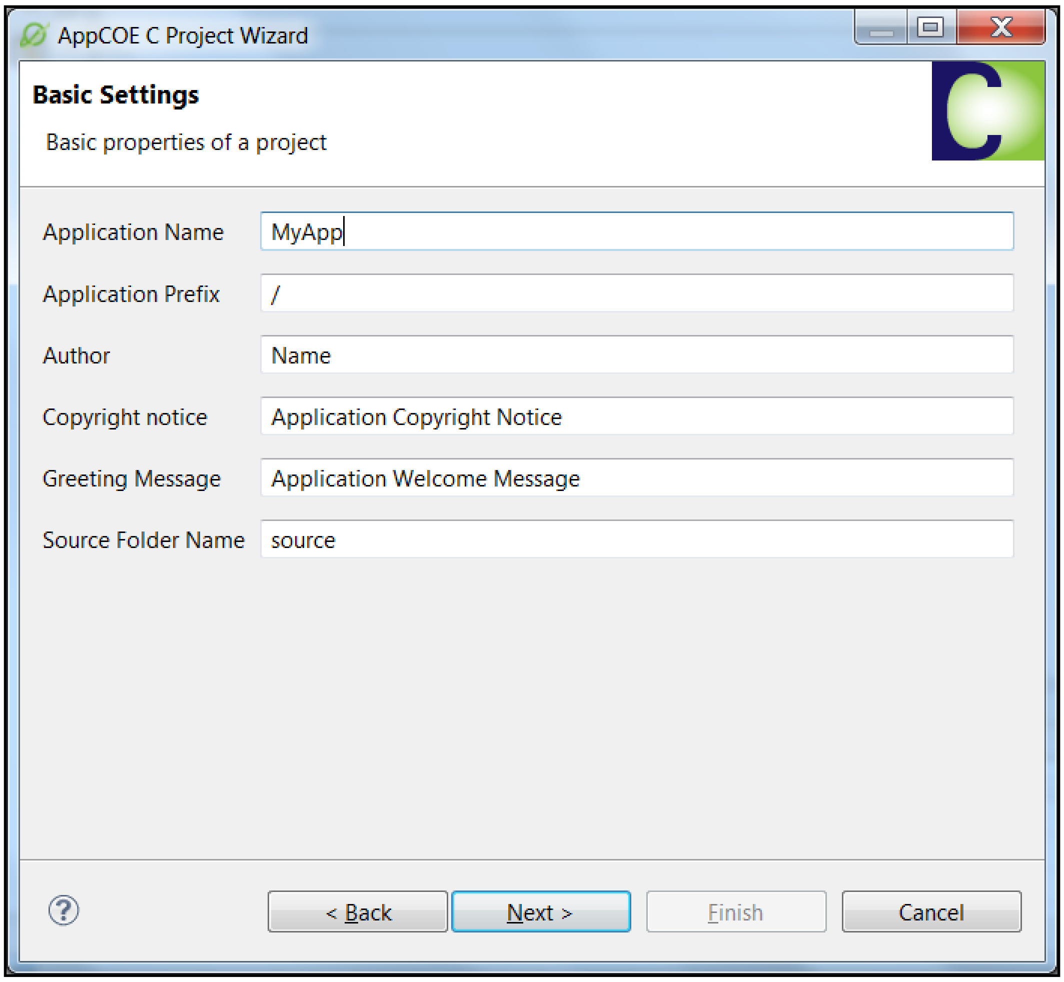
Project type:
- Executable
  - Empty Project
  - AppCOE Template Project
- Shared Library
- Static Library

Toolchains: MinGW GCC

☑ Show project types and toolchains only if they are supported on the platform

5. On Basic Settings window, define the basic properties of your project and click **Next** as shown inFigure 4_3.

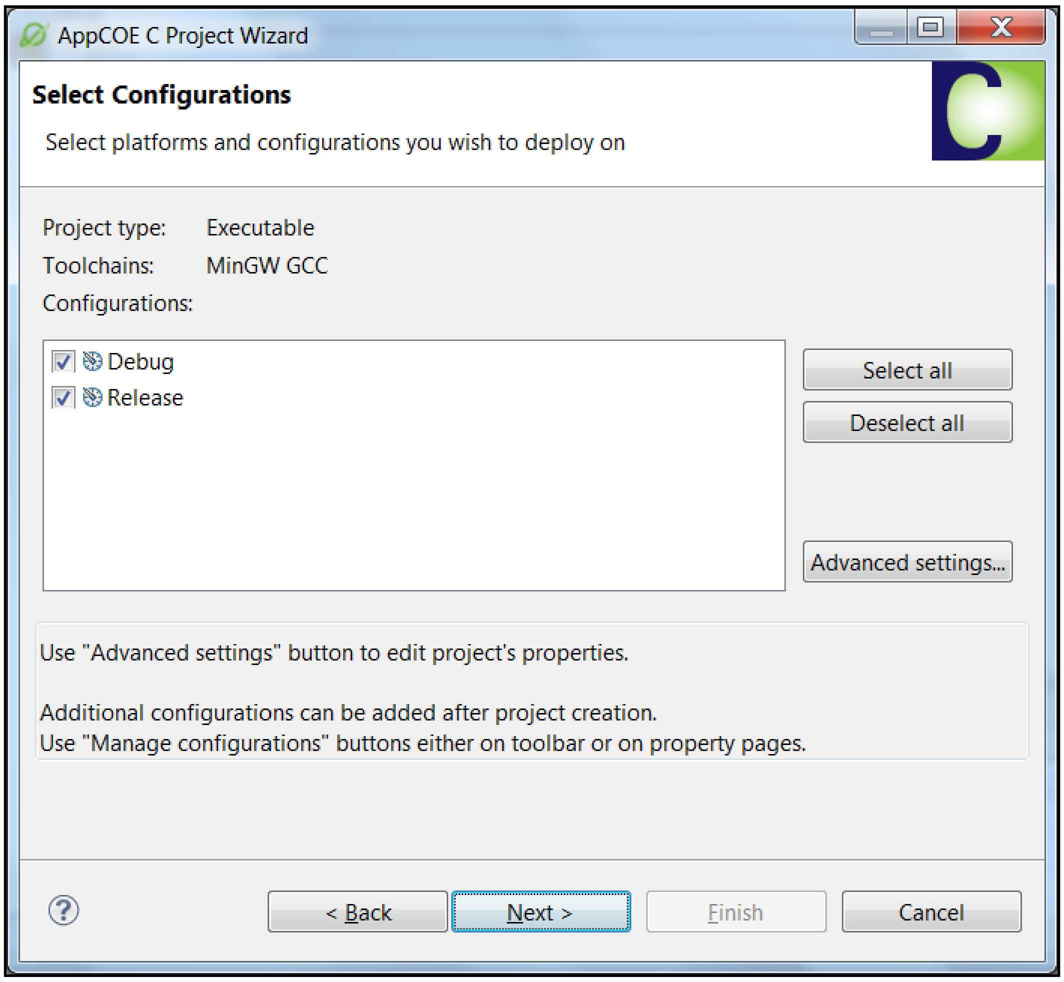
Figure 4_3: Basic Settings Window



Application Name	MyApp
Application Prefix	/
Author	Name
Copyright notice	Application Copyright Notice
Greeting Message	Application Welcome Message
Source Folder Name	source

6. On Select Configurations window, select the platforms and configurations for deployment and click **Next** as shown in Figure 4_4.

Figure 4_4: Configurations Window



AppCOE C Project Wizard

Select Configurations

Select platforms and configurations you wish to deploy on

Project type: Executable
Toolchains: MinGW GCC
Configurations:

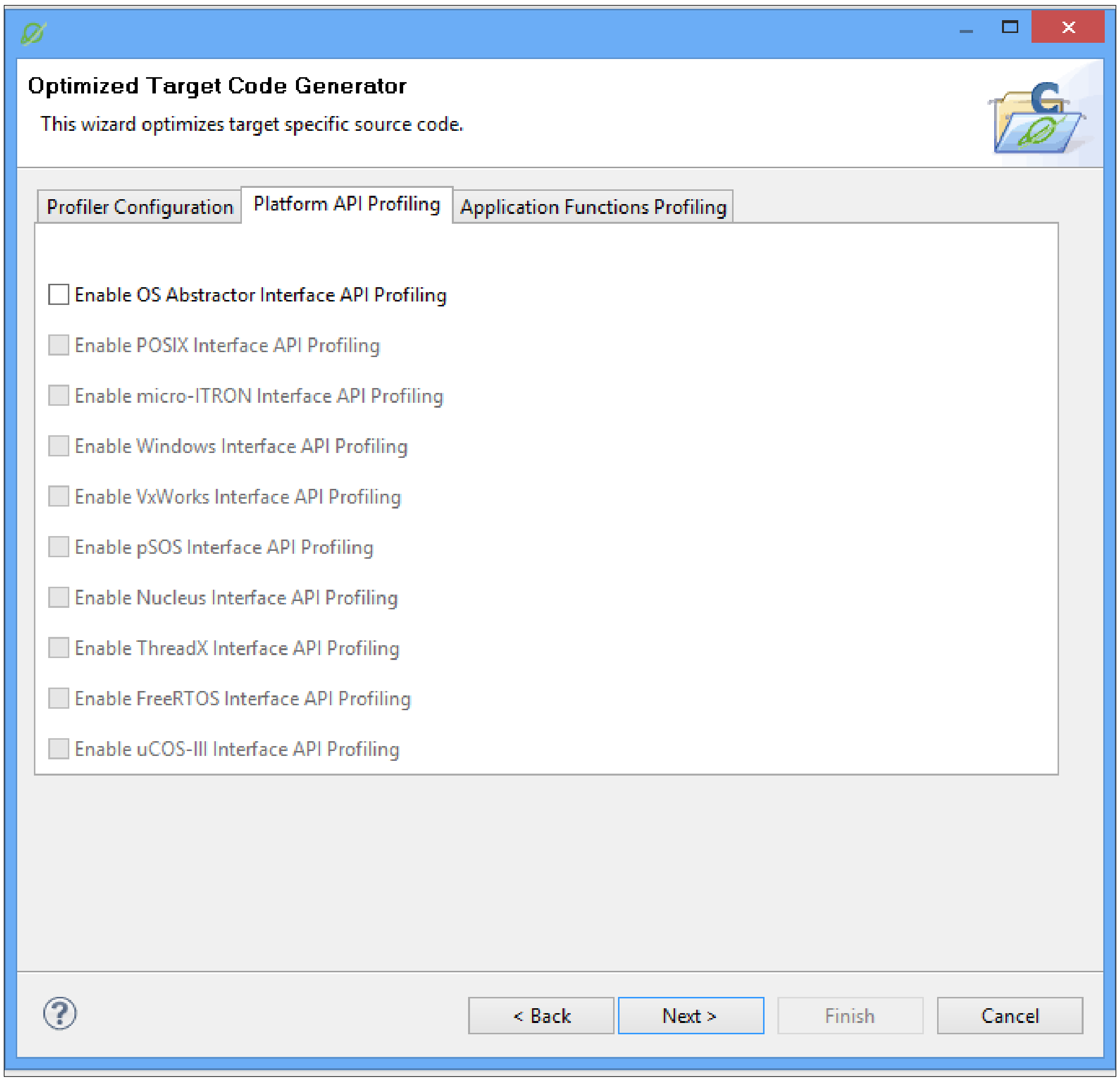
- [✓] Debug
- [✓] Release

Use "Advanced settings" button to edit project's properties.

Additional configurations can be added after project creation.
Use "Manage configurations" buttons either on toolbar or on property pages.

7. On Select APIs Interface window, select the required AppCOE development APIs and click **Finish** as shown inFigure 4_5.

Figure 4_5: Select APIs Window



Optimized Target Code Generator

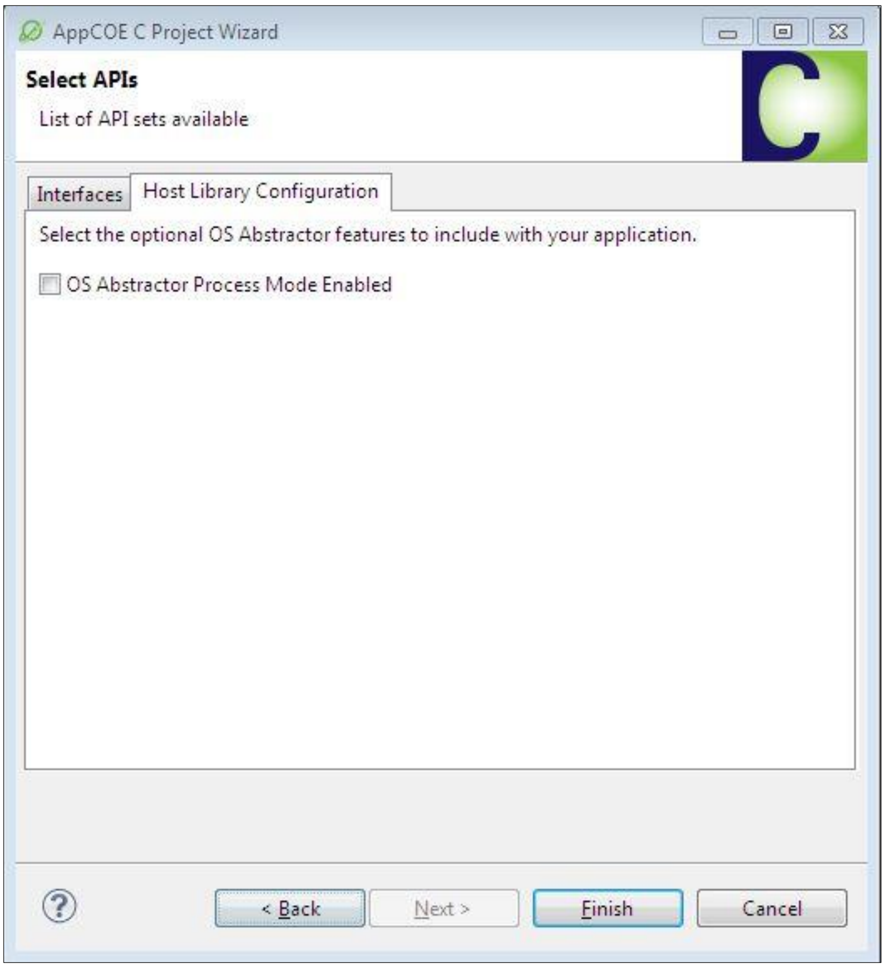
This wizard optimizes target specific source code.

Profiler Configuration | Platform API Profiling | Application Functions Profiling

- [ ] Enable OS Abstractor Interface API Profiling
- [ ] Enable POSIX Interface API Profiling
- [ ] Enable micro-ITRON Interface API Profiling
- [ ] Enable Windows Interface API Profiling
- [ ] Enable VxWorks Interface API Profiling
- [ ] Enable pSOS Interface API Profiling
- [ ] Enable Nucleus Interface API Profiling
- [ ] Enable ThreadX Interface API Profiling
- [ ] Enable FreeRTOS Interface API Profiling
- [ ] Enable uCOS-III Interface API Profiling

8. On Select Host Library Configuration window, select **OS Abstractor Process Mode** if the created application runs in multiple processas shown in Figure 4_6.

Figure 4_6: Select Host Library Configuration Window

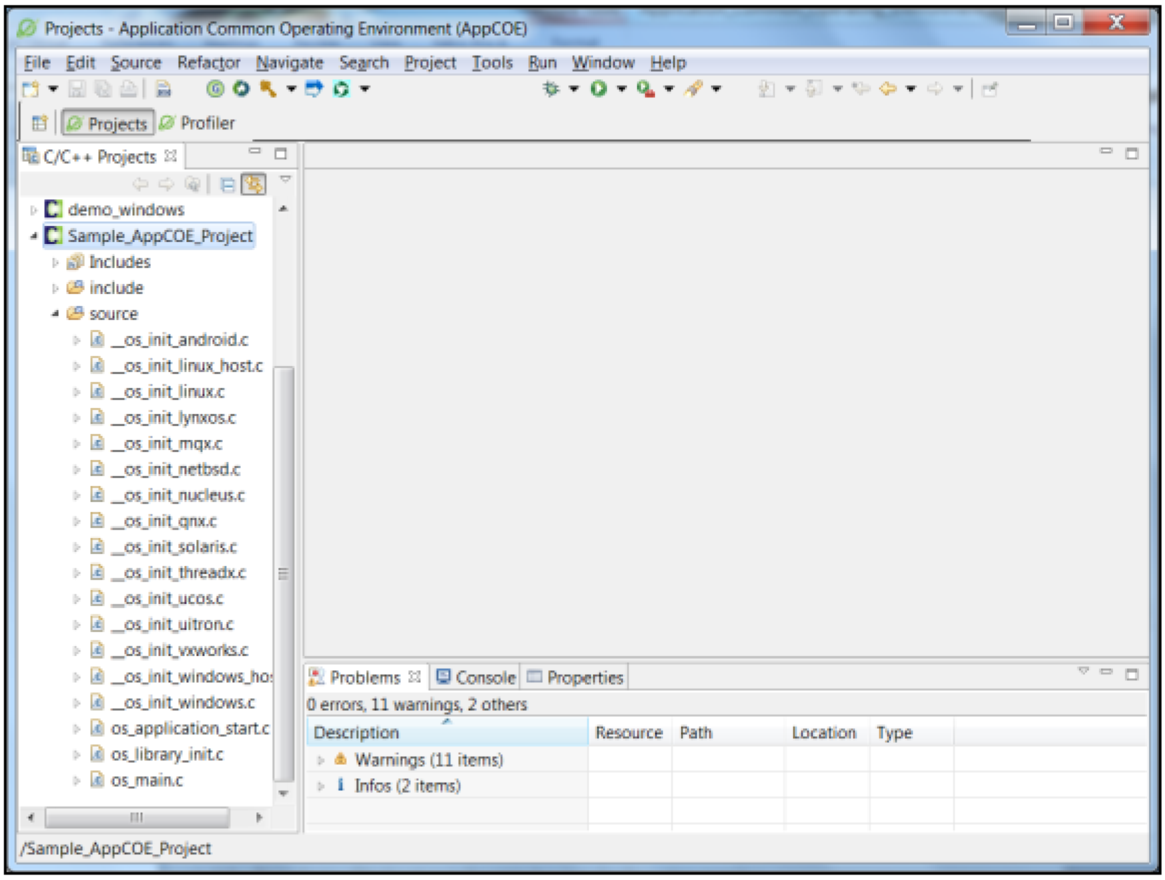


Select the optional OS Abstractor features to include with your application.

☐ OS Abstractor Process Mode Enabled

You can see the output as shown inFigure 4_7.

Figure 4_7: Creating AppCOE C/C++ Project Output



Projects - Application Common Operating Environment (AppCOE)

File Edit Source Refactor Navigate Search Project Tools Run Window Help

Projects Profiler

C/C++ Projects

- demo_windows
- Sample_AppCOE_Project
  - Includes
  - include
  - source
    - _os_init_android.c
    - _os_init_linux_host.c
    - _os_init_linux.c
    - _os_init_lynxos.c
    - _os_init_mqx.c
    - _os_init_netbsd.c
    - _os_init_nucleus.c
    - _os_init_qnx.c
    - _os_init_solaris.c
    - _os_init_threadx.c
    - _os_init_ucos.c
    - _os_init_uitron.c
    - _os_init_vxworks.c
    - _os_init_windows_hos
    - _os_init_windows.c
    - os_application_start.c
    - os_library_init.c
    - os_main.c

Problems Console Properties

0 errors, 11 warnings, 2 others

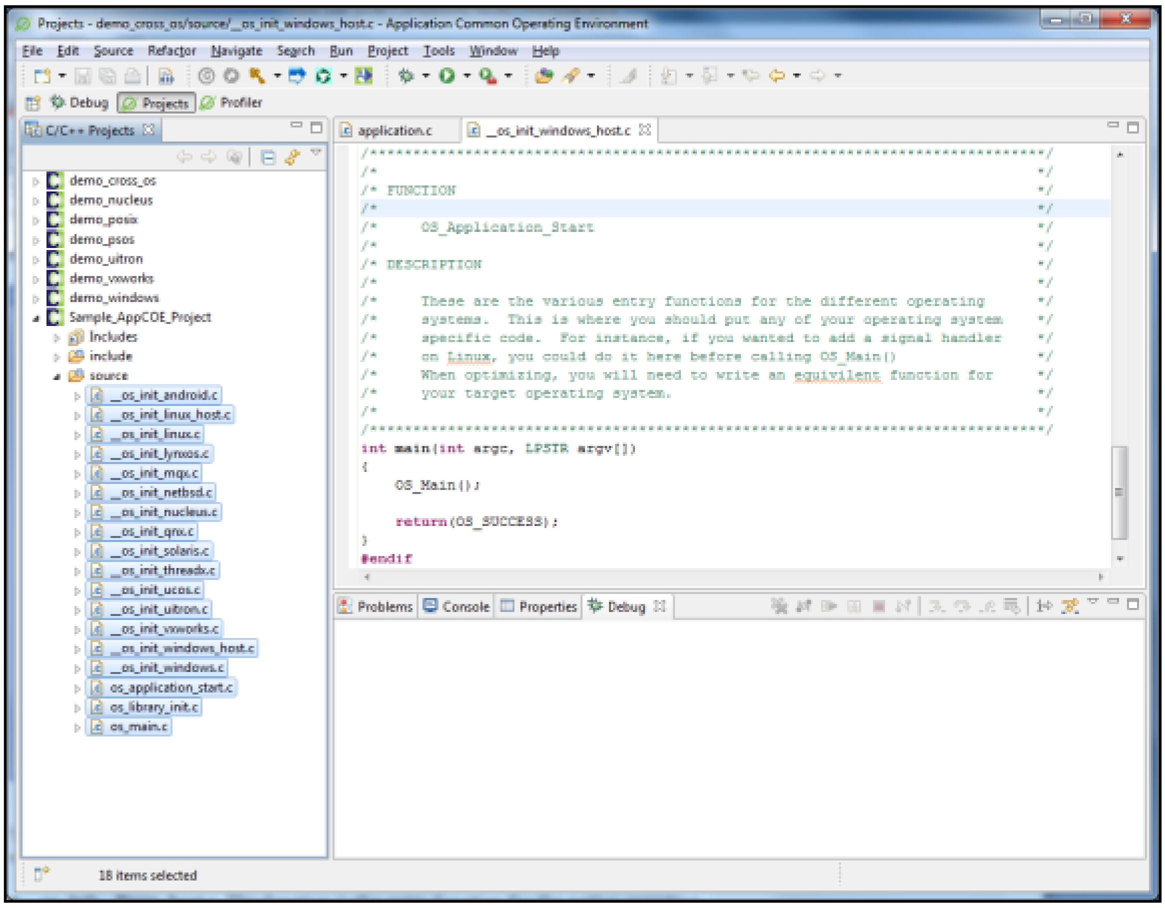
Description	Resource	Path	Location	Type
Warnings (11 items)				
Infos (2 items)				

/Sample_AppCOE_Project

AppCOE C/C++ Project Template Files

To view the AppCOE C/C++ project template files, expand the project folder you have just created by clicking on the +sign beside the Project name as shown inFigure 4_8.

Figure 4_8: AppCOE C/C++ Project Template Files



```
/*****************************************************************************/
/*                                                                           */
/* FUNCTION                                                                  */
/*                                                                           */
/*     OS_Application_Start                                                  */
/*                                                                           */
/* DESCRIPTION                                                               */
/*                                                                           */
/*     These are the various entry functions for the different operating    */
/*     systems.  This is where you should put any of your operating system  */
/*     specific code.  For instance, if you wanted to add a signal handler  */
/*     on Linux, you could do it here before calling OS_Main()              */
/*     When optimizing, you will need to write an equivilent function for   */
/*     your target operating system.                                        */
/*                                                                           */
/*****************************************************************************/
int main(int argc, LPSTR argv[])
{
    OS_Main();

    return(OS_SUCCESS);
}
#endif
```

You can view the following template files for your project on the left pane of the window:

- **__os_init__linux_host.c**–This function is the entry function for the native operating system. This is where you should put any of your operating system specific code. For instance, if you want to add a signal handler on Linux host, you could do it here before calling OS_Main().
- **__os_init_linux.c–**This function is the entry function for the native operating system. This is where you should put any of your operating system specific code. For instance, if you want to add a signal handler on Linux, you could do it here before calling OS_Main().
- **__os_init_lynxos.c–** This function is the entry function for the native operating system. This is where you should put any of your operating system specific code. For instance, if you want to add a signal handler on LynxOS, you could do it here before calling OS_Main().
- **__os_init_mqx.c–**This function is the entry function for the native operating system. This is where you should put any of your operating system specific code. For instance, if you wanted to add a signal handler on MQX, you could do it here before calling OS_Main().
- **__os_init_nucleus.c–** This function is the entry function for the native operating system. This is where you should put any of your operating system specific code. For instance, if you wanted to add a signal handler on Nucleus, you could do it here before calling OS_Main().

- **__os_init_qnx.c–** This function is the entry function for the native operating system. This is where you should put any of your operating system specific code. For instance, if you wanted to add a signal handler on QNX, you could do it here before calling OS_Main().
- **__os_init_solaris.c–** This function is the entry function for the native operating system. This is where you should put any of your operating system specific code. For instance, if you want to add a signal handler on Solaris, you could do it here before calling OS_Main().
- **__os_init_threadx.c–** This function is the entry function for the native operating system. This is where you should put any of your operating system specific code. For instance, if you want to add a signal handler on ThreadX, you could do it here before calling OS_Main ().
- **__os_init_uitron.c–** This function is the entry function for the native operating system. This is where you should put any of your operating system specific code. For instance, if you want to add a signal handler on micro-ITRON, you could do it here before calling OS_Main ().
- **__os_init_vxworks.c–** This function is the entry function for the native operating system. This is where you should put any of your operating system specific code. For instance, if you want to add a signal handler on VxWorks, you could do it here before calling OS_Main ().
- **__os_init_windows_host.c–**These functions are the various entry functions for the different operating systems. This is where you should put any of your operating system specific code. For instance, if you want to add a signal handler on Windows host, you could do it here before calling OS_Main ().When optimizing, you will need to write an equivalent function for your target operating system.
- **__os_init_windows.c–** These functions are the various entry functions for the different operating systems. This is where you should put any of your operating system specific code. For instance, if you want to add a signal handler on Windows, you could do it here before calling OS_Main(). When optimizing, you will need to write an equivalent function for your target operating system**.**
- **__os_init_android.c–**This function is the entry function for the native operating system. This is where you should put any of your operating system specific code. For instance, if you want to add a signal handler on android, you could do it here before calling OS_Main ().
- **__os_init_ucos.c–**This function is the entry function for the native operating system. This is where you should put any of your operating system specific code. For instance, if you want to add a signal handler on uCOS, you could do it here before calling OS_Main().
- **__os_init_netbsd.c–**This function is the entry function for the native operating system. This is where you should put any of your operating system specific code. For instance, if you want to add a signal handler on NetBSD, you could do it here before calling OS_Main ().
- **os_application_start.c–** This function is the first OS agnostic function and should be the start point for the application development**.**
- **os_library_init.c–** This function initializes the required Interface products and creates the entry threads for each product.
- **os_main.c–** This function initializes the OS Abstractor Interface layer and calls OS_Application_Wait_For_End which will suspend until OS_Application_Free or OS_Delete_Process is called. It also spawns the first OS Independents thread which is the true entry point for OS Abstractor Interface.

The application code starts in the os_library_init.c file, the user defined entry function and name of the application for OS Abstractor Interface can be specified in:

```
#define OS_ABSTRACTOR_BASE_ENTRY_FUNCTION
#define OS_APPLICATION_START_TASK_NAME
```

For VxWorksInterface, the user defined entry function and stack size can be specified in:

```
#define VXWORKS_ENTRY_FUNCTION
#define VXWORKS_ENTRY_FUNCTION_STACK_SIZE
```

Similarly, this is how it works for all the remaining changers/abstractors.

You can insert code that is only included when they use AppCOE host in the following way:

- For windows host you can insert code in __os_init_windows_host.c (inside main function before calling `OS_MAIN`), that is only included in AppCOE windows host.
- For Linux host, you can insert code in __os_init_linux_host.c (inside main function before calling `OS_MAIN`), that is only included in AppCOE Linux host.

You can insert code that is specific to a target OS (inside main function before calling `OS_MAIN`) in the following way:

- For LynxOS target, insert in __os_init_lynxos.c
- For mqx target, insert in __os_init_mqx.c
- For Linux target, insert in __os_init_linux.c
- For Nucleus target, insert in __os_init_nucleus.c
- For QNX target, insert in __os_init_qnx.c
- For Solaris target, insert in __os_init_solaris.c
- For Threadx target, insert in __os_init_threadx.c
- For uITRON target, insert in __os_init_uitron.c
- For VxWorks target, insert in __os_init_vxworks.c
- For Android target, insert in __os_init_android.c
- For uCOS target, insert in __os_init_ucos.c
- For NetBSD target, insert in __os_init_netbsd.c
- For FreeRTOS target, insert in _os_init_freertos.c

Host System Configuration

The below defines are the system settings used by the OS_Application_Init() function. Use these to modify the settings when running on the host. A value of -1 for any of these will use the default values located in cross_os_usr.h. When you optimize for the target side code, the wizard will create a custom cross_os_usr.h using the settings you specify at that time so these defines will no longer be necessary.

```
#define HOST_DEBUG_INFO                    -1
#define HOST_TASK_POOL_TIMESLICE           -1
#define HOST_TASK_POOL_TIMEOUT             -1
#define HOST_ROOT_PROCESS_PREEMPT          -1
#define HOST_ROOT_PROCESS_PRIORITY         -1
#define HOST_ROOT_PROCESS_STACK_SIZE       -1
#define HOST_ROOT_PROCESS_HEAP_SIZE        -1
#define HOST_ROOT_PROCESS_AFFINITY  -1
#define HOST_DEFAULT_TIMESLICE             -1
#define HOST_MAX_TASKS                     -1
#define HOST_MAX_TIMERS                    -1
#define HOST_MAX_MUTEXES                   -1
#define HOST_MAX_PIPES                     -1
#define HOST_MAX_PROCESSES                 -1
#define HOST_MAX_QUEUES                    -1
#define HOST_MAX_PARTITION_MEM_POOLS       -1
#define HOST_MAX_DYNAMIC_MEM_POOLS         -1
#define HOST_MAX_EVENT_GROUPS              -1
#define HOST_MAX_SEMAPHORES                -1
#define HOST_USER_SHARED_REGION1_SIZE      -1
```

OS_HOST: This flag is used only in AppCOE environment. It is not used in the target environment.

Host mode defines can be modified in os_main.c file. For example, modify maximum tasks under host environment in HOST_MAX_TASKS.

NOTE: You can manually change the values in the Optimized Target Code GeneratorWizard. Refer to Generating Optimized Target Code chapter in the manual.

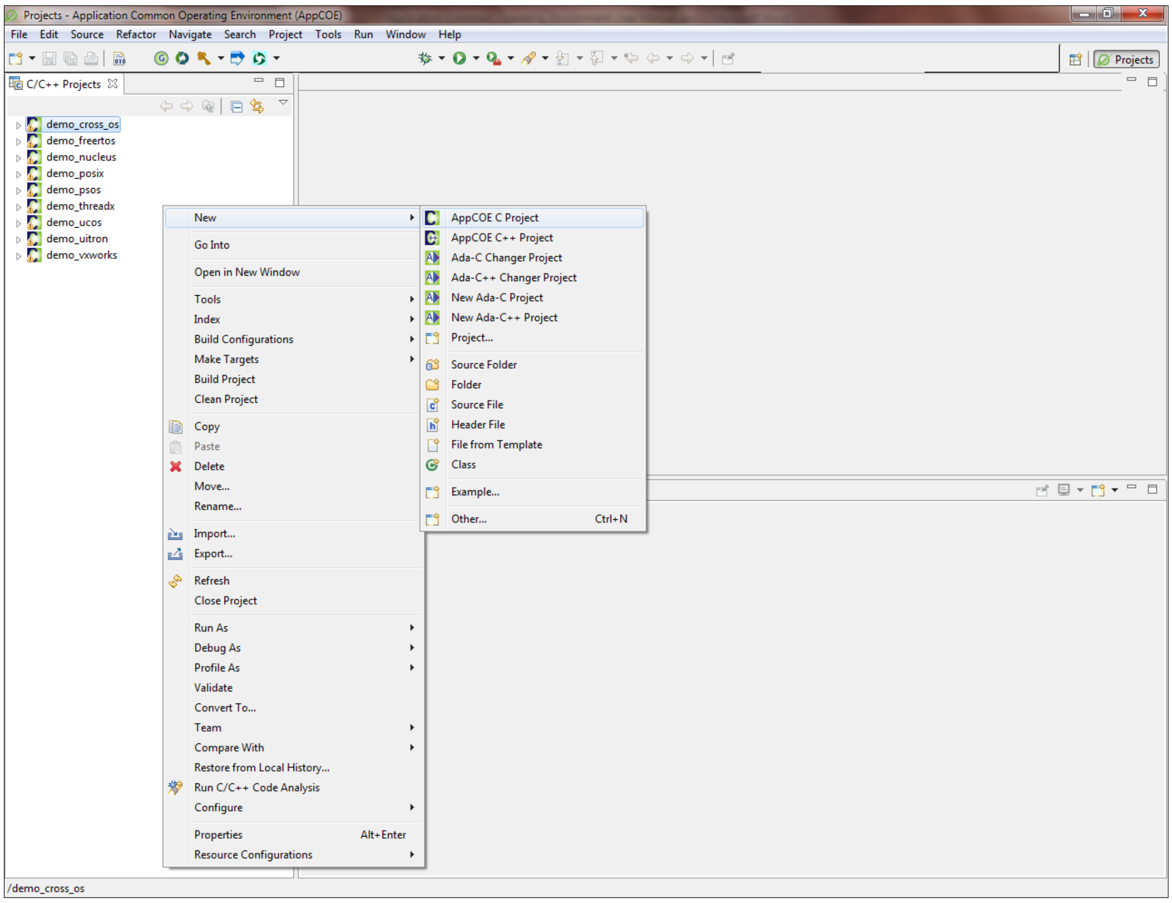
Creating AppCOE C/C++ Project with Multiple Interfaces

NOTE: This feature requires a license. Click http://mapusoft.com/downloads/AppCOE-evaluation/ to request an evaluation license.

To create AppCOE C/C++ project with multiple interfaces:

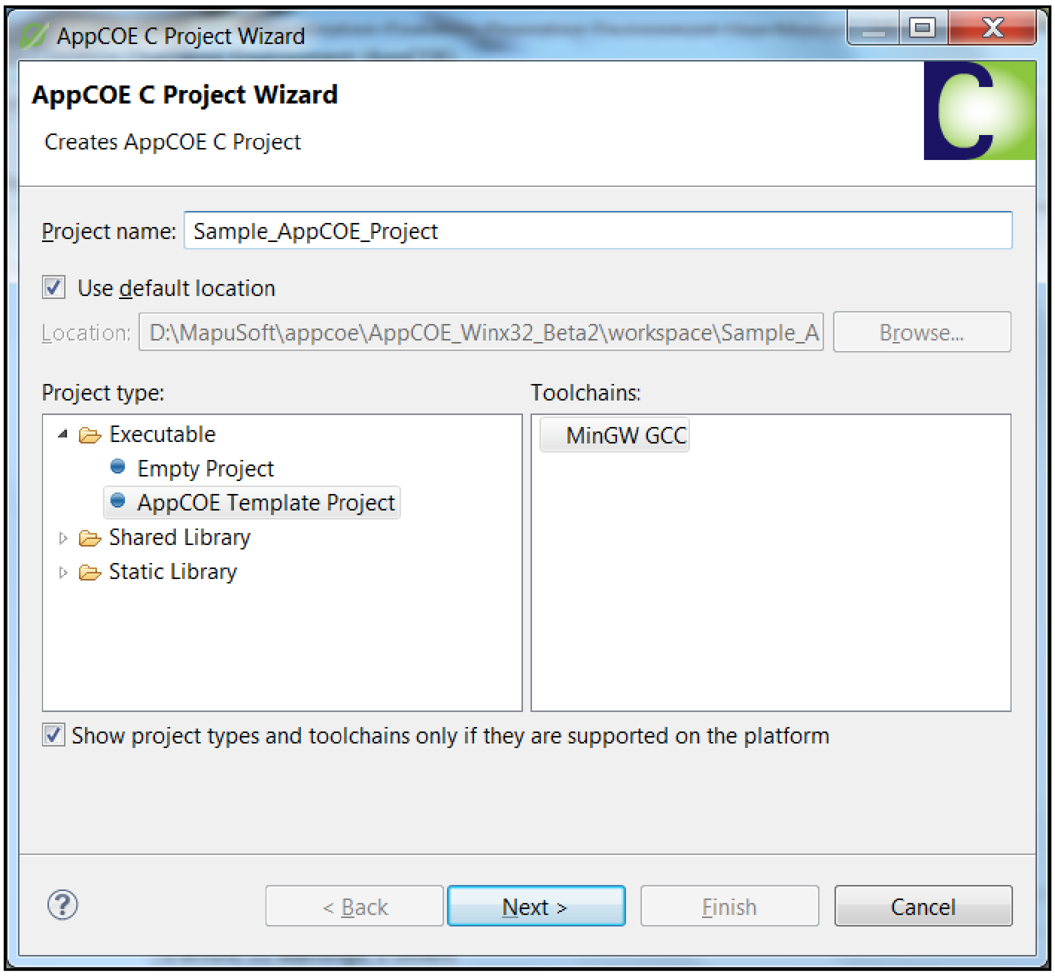
1. From AppCOE main window, select any project under**C/C++ Projects** tab on the left pane.
2. Select **New >AppCOE C/C++ Project** as shown inFigure 4_9.

Figure 4_9: Creating a Project with Multiple Interfaces



3. On AppCOE C Project Wizard window, type a project name and give a location next to **Project Name** text box.
4. Under Project Types, expand the **Executable** menu. Select **AppCOE Template Project** and click **Next** as shown inFigure 4_10.

Figure 4_10: AppCOE CProject Wizard Window



AppCOE C Project Wizard

AppCOE C Project Wizard

Creates AppCOE C Project

Project name: Sample_AppCOE_Project

☑ Use default location

Location: D:\MapuSoft\appcoe\AppCOE_Winx32_Beta2\workspace\Sample_A

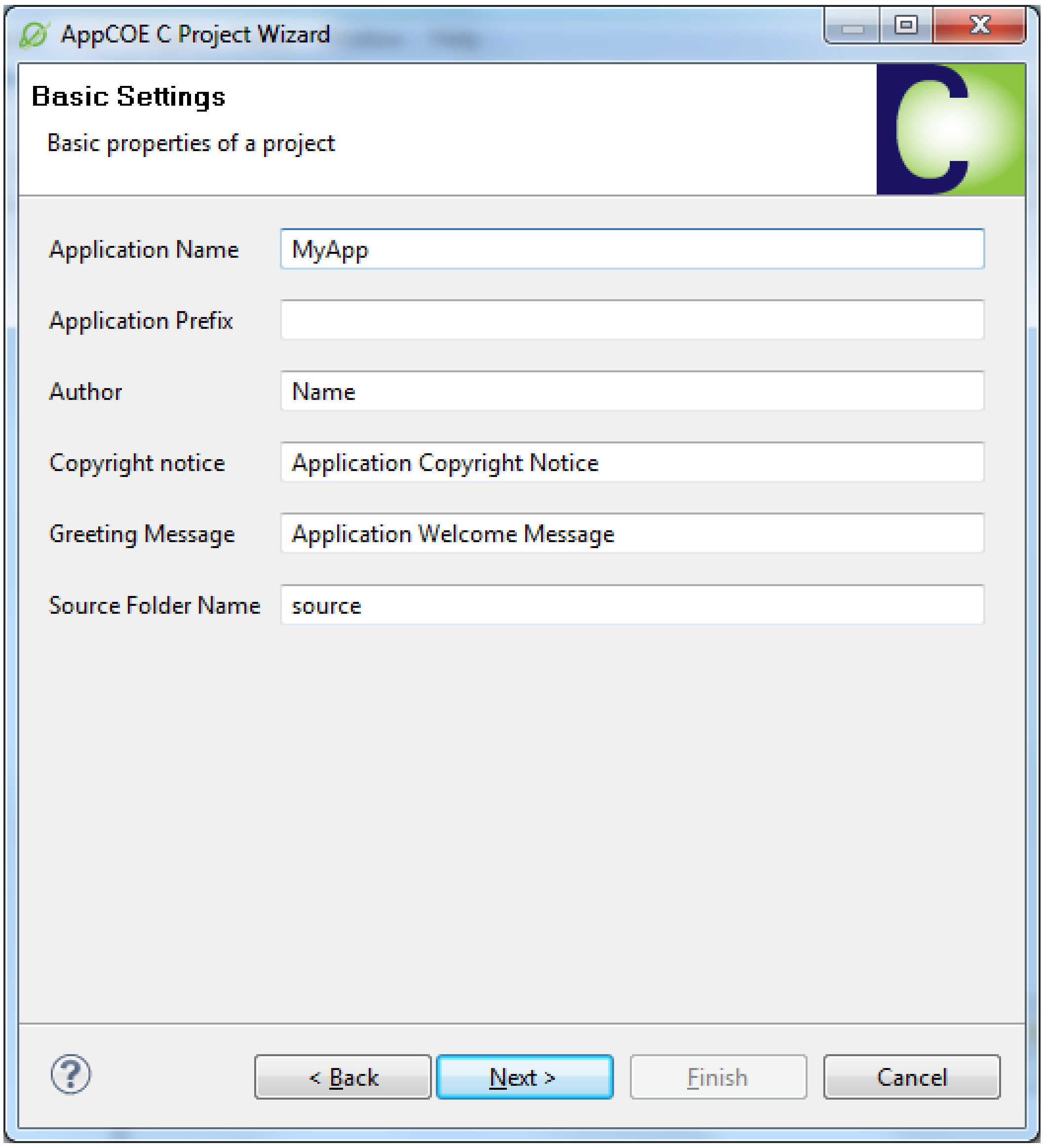
Project type:
- Executable
  - Empty Project
  - AppCOE Template Project
- Shared Library
- Static Library

Toolchains: MinGW GCC

☑ Show project types and toolchains only if they are supported on the platform

5. On Basic Settings window, define the basic properties of your project and click **Next** as shown in Figure 4_11.

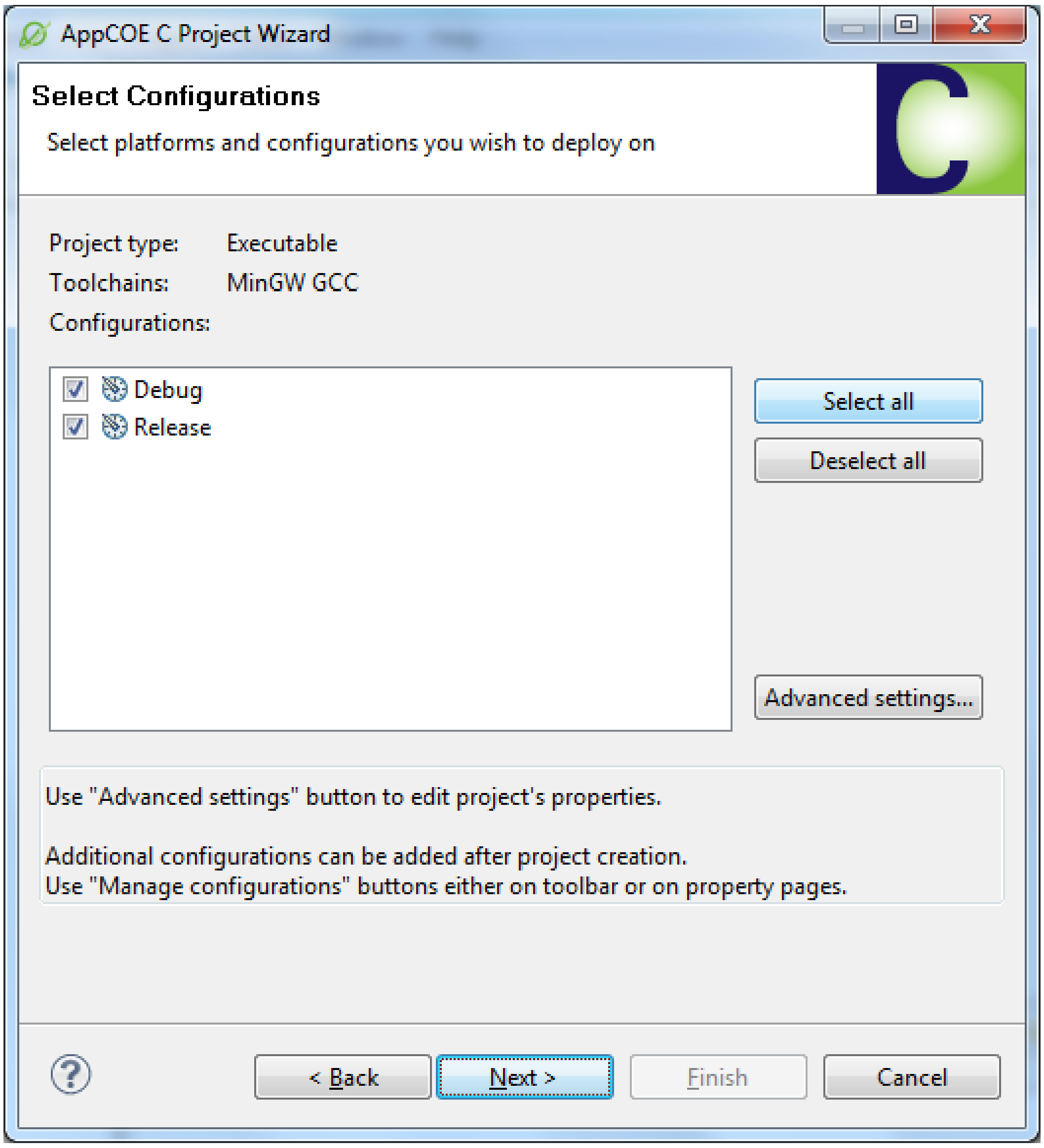
Figure 4_11: Basic Settings Window



Application Name	MyApp
Application Prefix	
Author	Name
Copyright notice	Application Copyright Notice
Greeting Message	Application Welcome Message
Source Folder Name	source

6. On Select Configurations window, select the platforms and configurations for deployment and click **Next** as shown inFigure 4_12.

Figure 4_12: Configurations Window



AppCOE C Project Wizard

Select Configurations

Select platforms and configurations you wish to deploy on

Project type: Executable

Toolchains: MinGW GCC

Configurations:

☑ Debug

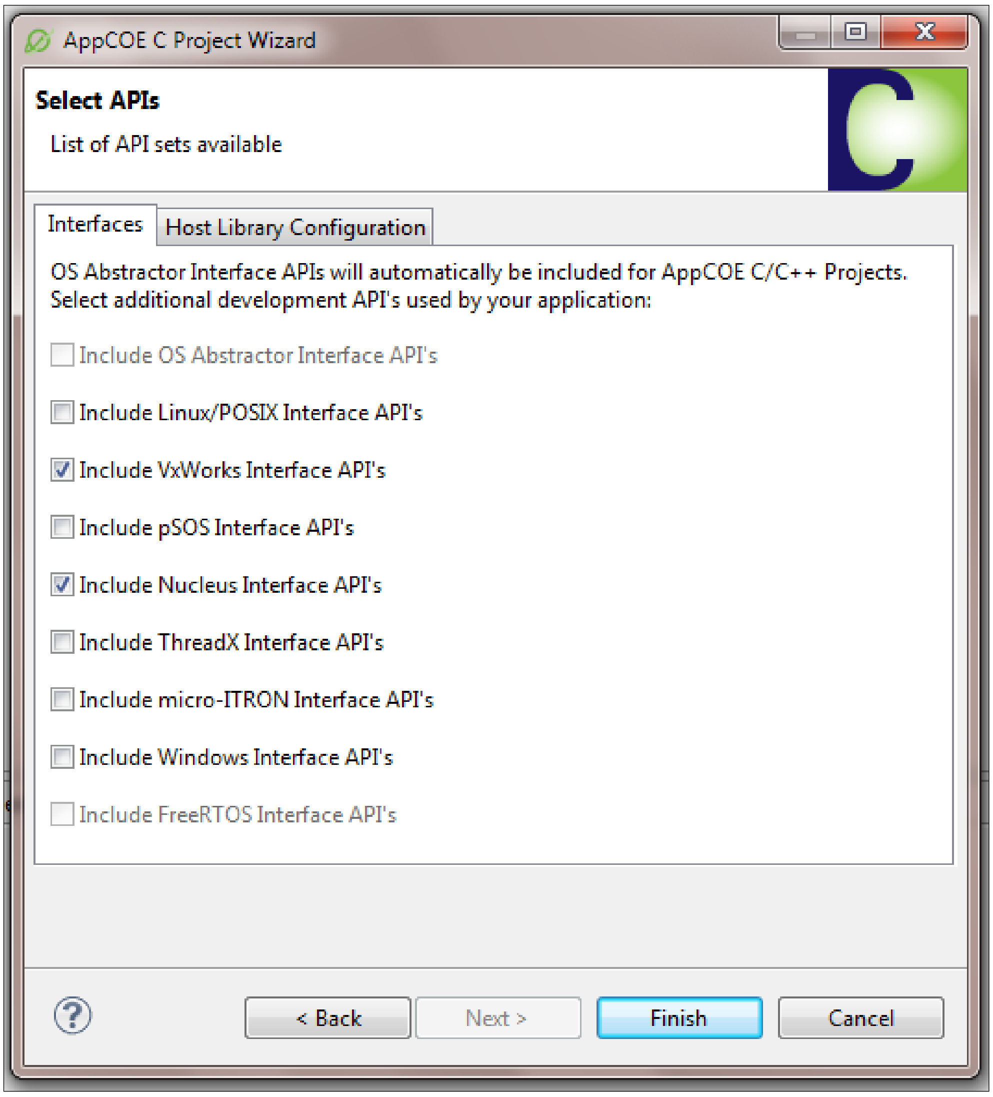
☑ Release

Use "Advanced settings" button to edit project's properties.

Additional configurations can be added after project creation.
Use "Manage configurations" buttons either on toolbar or on property pages.

7. On Select APIs window, select the required check box. In this example, we have shown **Nucleus and VxWorks Interfaces API's**, selected. Click**Finish**as shown in Figure 4_13.

Figure 4_13: Select APIs Window.



AppCOE C Project Wizard

Select APIs

List of API sets available

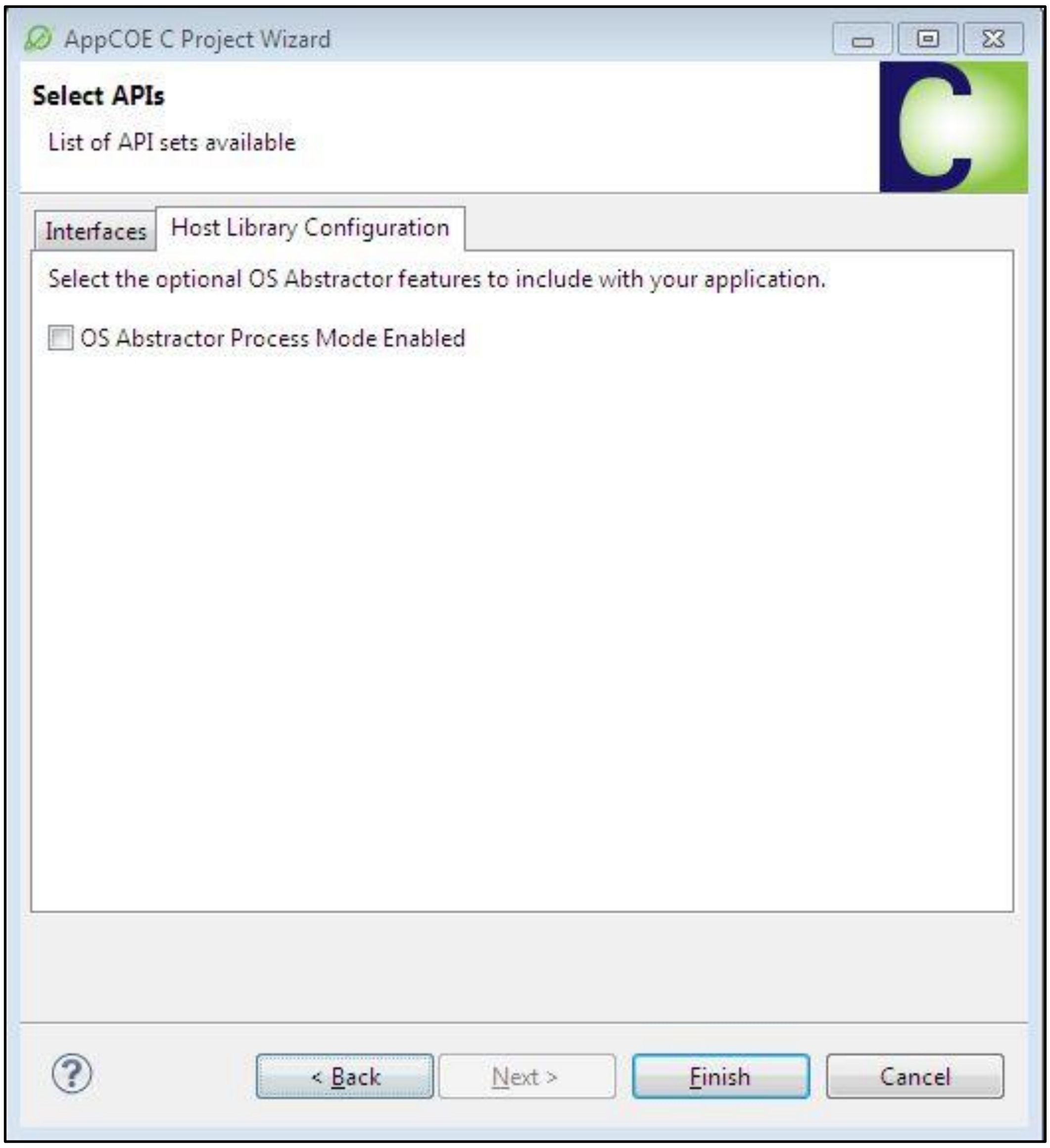
Interfaces | Host Library Configuration

OS Abstractor Interface APIs will automatically be included for AppCOE C/C++ Projects.
Select additional development API's used by your application:

- [ ] Include OS Abstractor Interface API's
- [ ] Include Linux/POSIX Interface API's
- [x] Include VxWorks Interface API's
- [ ] Include pSOS Interface API's
- [x] Include Nucleus Interface API's
- [ ] Include ThreadX Interface API's
- [ ] Include micro-ITRON Interface API's
- [ ] Include Windows Interface API's
- [ ] Include FreeRTOS Interface API's

8. On Select Host Library Configuration window, if you checked **OS Abstractor Process ModeEnabled**option, application runs in multiple Processes otherwiseapplication runs in Single Process as shown inFigure 4_14.

Figure 4_14: Select Host Library Configuration

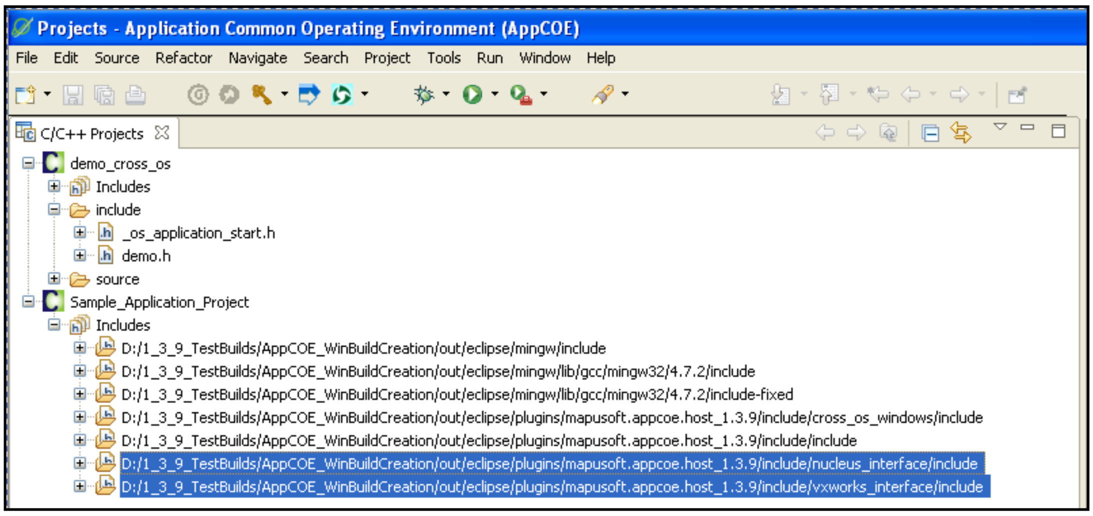


Select the optional OS Abstractor features to include with your application.

☐ OS Abstractor Process Mode Enabled

You cansee the output as shown inFigure 4_15.

Figure 4_15: A Project with multiple Interfaces Output


Projects - Application Common Operating Environment (AppCOE)
File Edit Source Refactor Navigate Search Project Tools Run Window Help
C/C++ Projects

```
demo_cross_os
    Includes
    include
        _os_application_start.h
        demo.h
    source
Sample_Application_Project
    Includes
        D:/1_3_9_TestBuilds/AppCOE_WinBuildCreation/out/eclipse/mingw/include
        D:/1_3_9_TestBuilds/AppCOE_WinBuildCreation/out/eclipse/mingw/lib/gcc/mingw32/4.7.2/include
        D:/1_3_9_TestBuilds/AppCOE_WinBuildCreation/out/eclipse/mingw/lib/gcc/mingw32/4.7.2/include-fixed
        D:/1_3_9_TestBuilds/AppCOE_WinBuildCreation/out/eclipse/plugins/mapusoft.appcoe.host_1.3.9/include/cross_os_windows/include
        D:/1_3_9_TestBuilds/AppCOE_WinBuildCreation/out/eclipse/plugins/mapusoft.appcoe.host_1.3.9/include/include
        D:/1_3_9_TestBuilds/AppCOE_WinBuildCreation/out/eclipse/plugins/mapusoft.appcoe.host_1.3.9/include/nucleus_interface/include
        D:/1_3_9_TestBuilds/AppCOE_WinBuildCreation/out/eclipse/plugins/mapusoft.appcoe.host_1.3.9/include/vxworks_interface/include
```

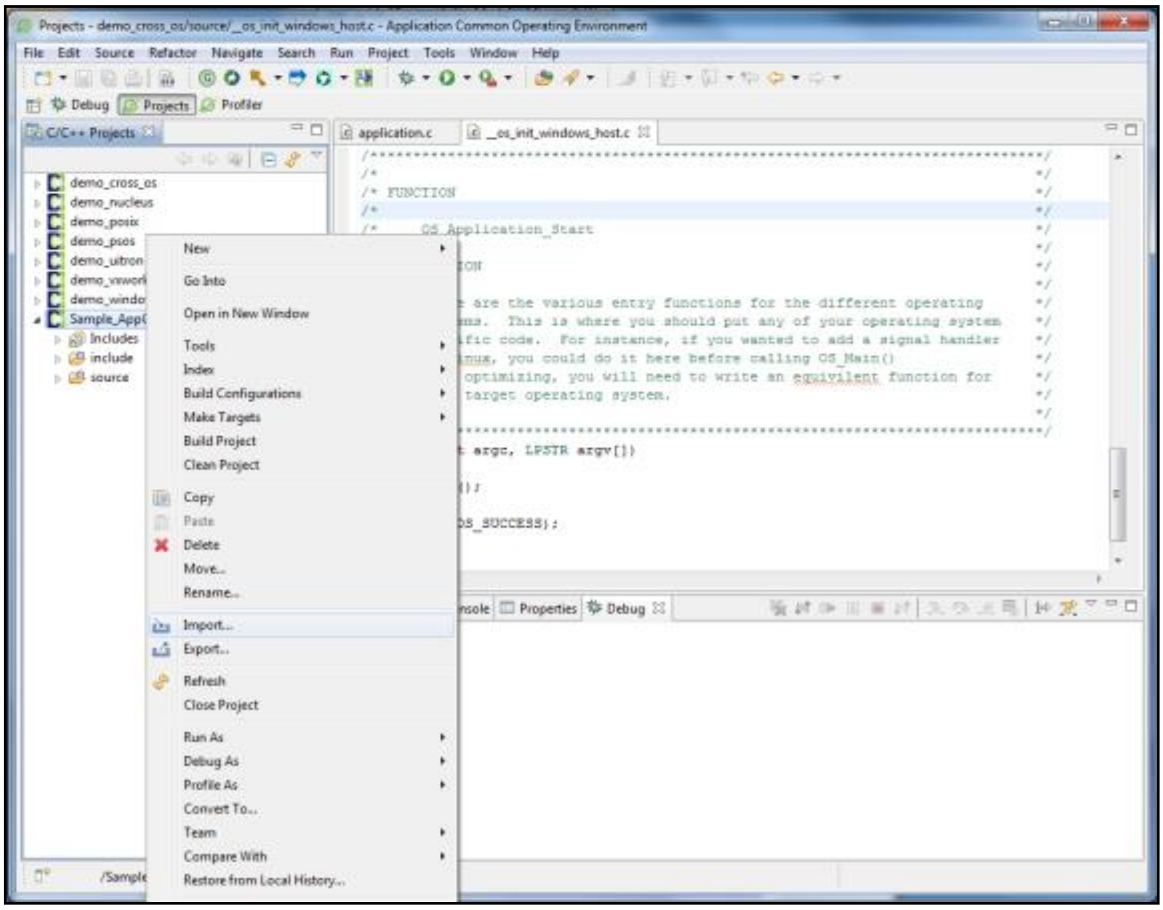
Adding Source Code Files to AppCOE C/C++Project

NOTE: This feature requires a license. Click http://mapusoft.com/downloads/AppCOE-evaluation/to request an evaluation license.

To add source code files:

1. Select a project under C/C++ Projects pane.
2. Right click on it and select **Import** as shown inFigure 4_16.

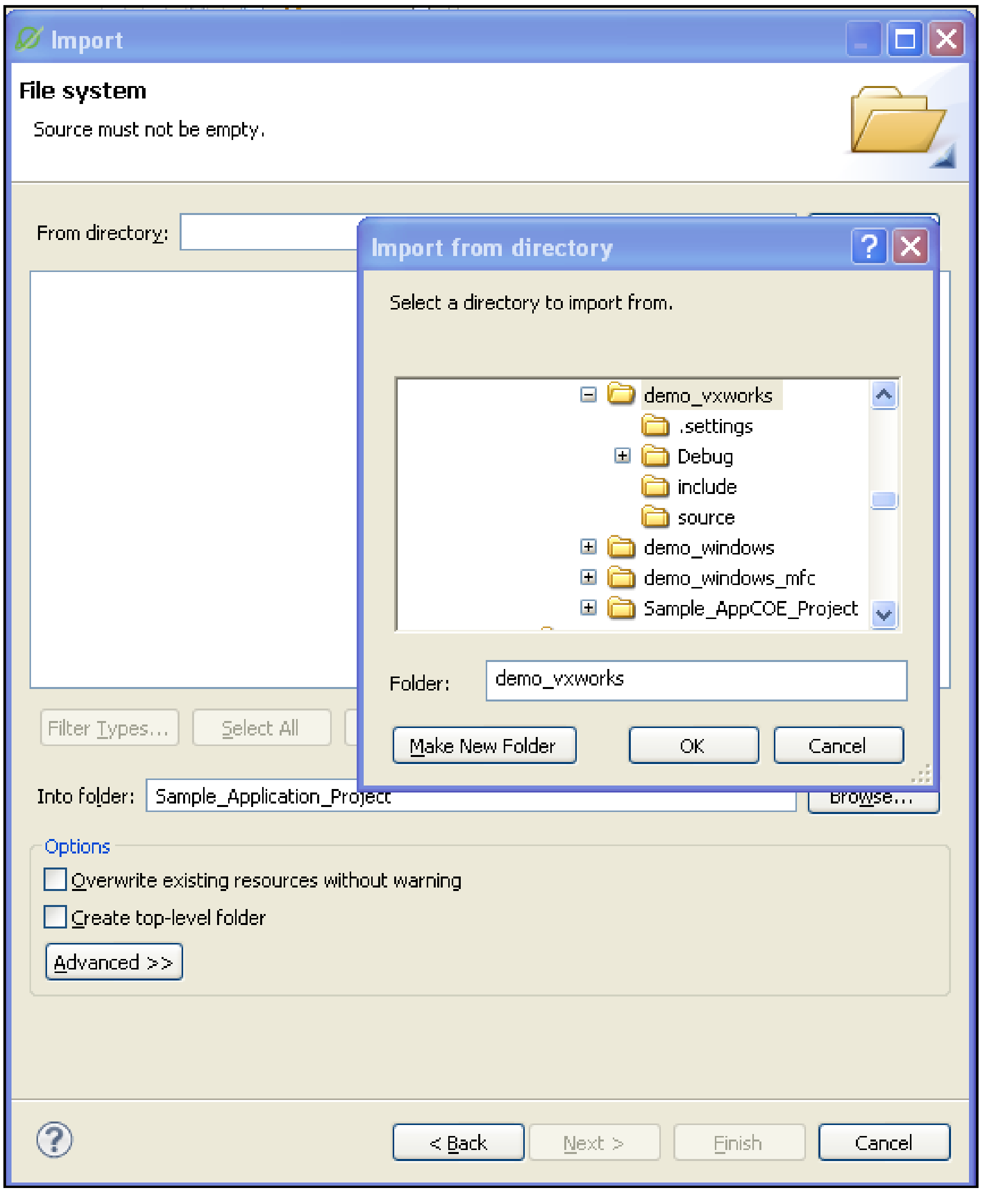
Figure 4_16: Adding Source Code Files



```
/****************************************************************************/
/*                                                                          */
/* FUNCTION                                                                 */
/*                                                                          */
/*      OS_Application_Start                                                */
                                                                          */
 ION                                                                      */
                                                                          */
 e are the various entry functions for the different operating            */
 ems.  This is where you should put any of your operating system          */
 ific code.  For instance, if you wanted to add a signal handler          */
 inux, you could do it here before calling OS_Main()                      */
  optimizing, you will need to write an equivilent function for           */
  target operating system.                                                */
                                                                          */
****************************************************************************/
t argc, LPSTR argv[])

();

OS_SUCCESS);
```

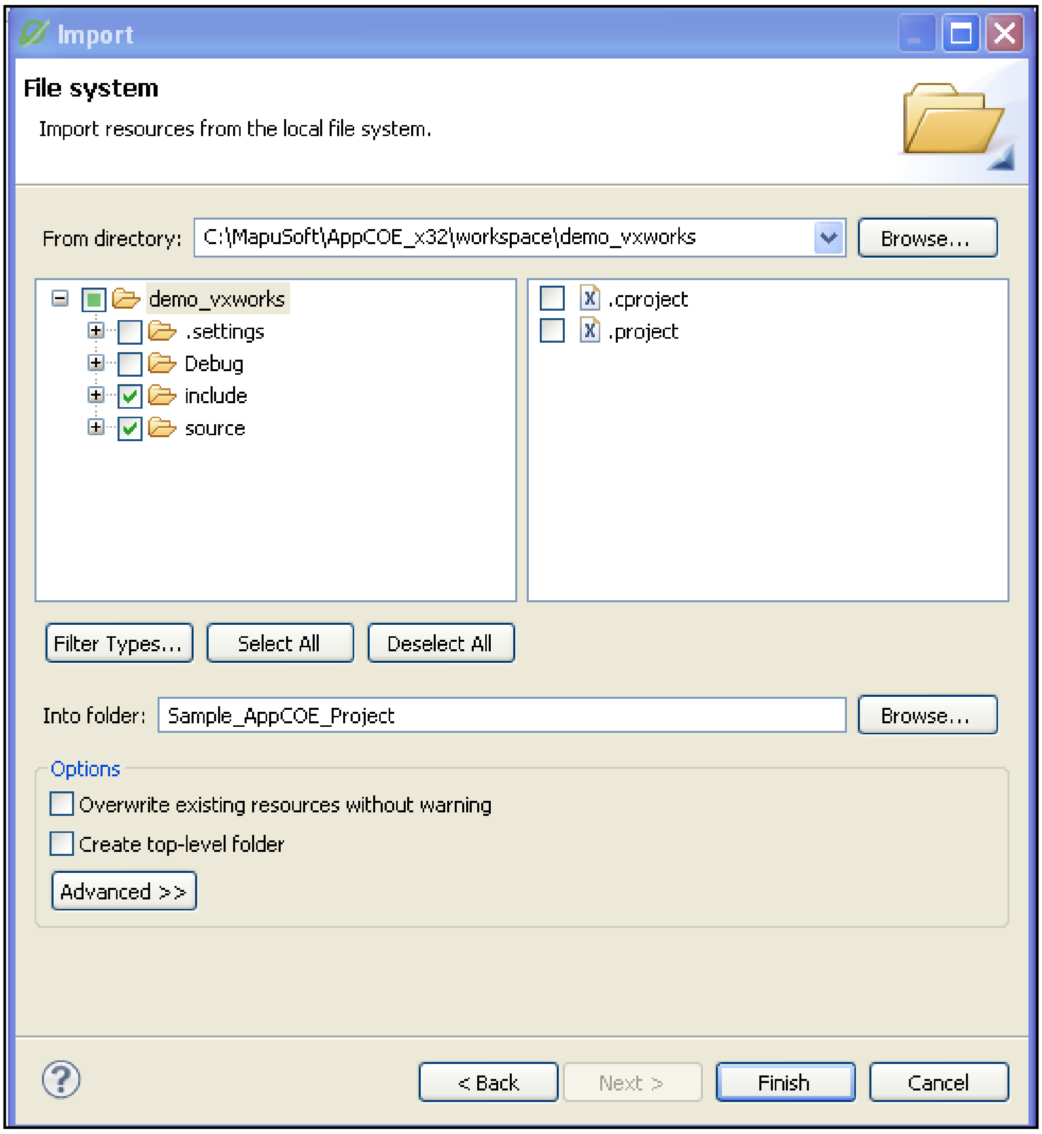
3. Select your import source from General > File System and thenclick **Next**
4. Select the directory on your local file system which contains the source code files and click **OK** as shown inFigure 4_17.

Figure 4_17: Importing Source Code Files from Directory



5. Select the check boxes corresponding to the source code files you want to import and click **Finish** as shown inFigure 4_18

Figure 4_18: Selecting Source Code Files for Importing


Import

File system

Import resources from the local file system.

From directory: C:\MapuSoft\AppCOE_x32\workspace\demo_vxworks

- [■] demo_vxworks
  - [ ] .settings
  - [ ] Debug
  - [✓] include
  - [✓] source

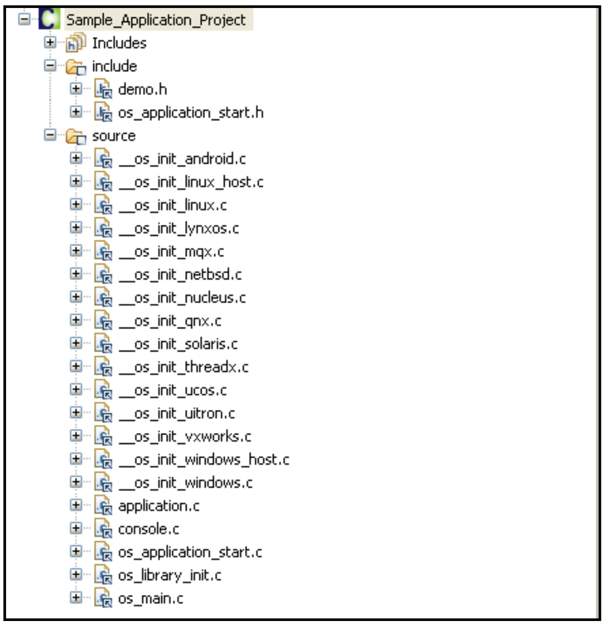
- [ ] .cproject
- [ ] .project

Into folder: Sample_AppCOE_Project

Options
- [ ] Overwrite existing resources without warning
- [ ] Create top-level folder

6. You can view the source code files added to your AppCOE C/C++ project as shown inFigure 4_19.

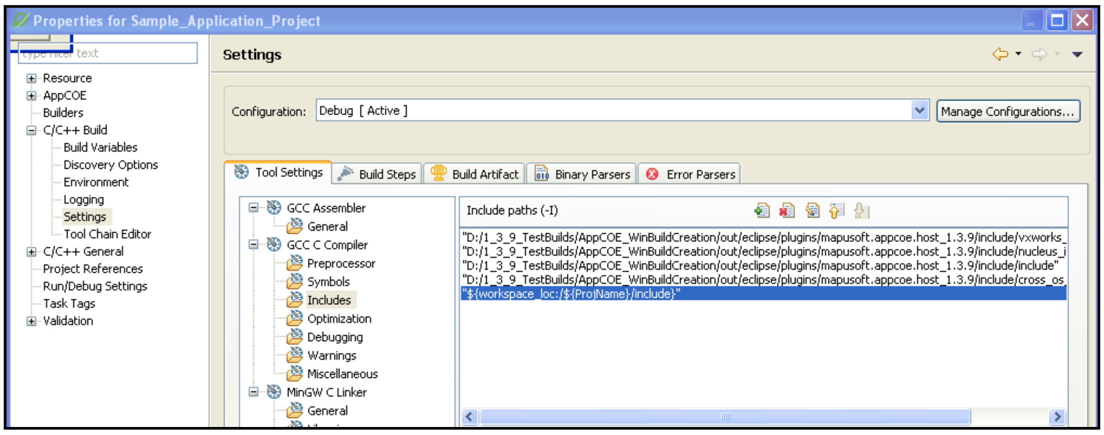
Figure 4_19: Importing Source Code Files Output



```
Sample_Application_Project
  Includes
  include
    demo.h
    os_application_start.h
  source
    __os_init_android.c
    __os_init_linux_host.c
    __os_init_linux.c
    __os_init_lynxos.c
    __os_init_mqx.c
    __os_init_netbsd.c
    __os_init_nucleus.c
    __os_init_qnx.c
    __os_init_solaris.c
    __os_init_threadx.c
    __os_init_ucos.c
    __os_init_uitron.c
    __os_init_vxworks.c
    __os_init_windows_host.c
    __os_init_windows.c
    application.c
    console.c
    os_application_start.c
    os_library_init.c
    os_main.c
```

7. Add the project include path by right click your created application project then Go to Properties,expand the C/C++ Build > select **Settings**and then add Include path: “**${workspace_loc:/${ProjName}/include}**”as shown in Figure 4_20

Figure 4_20: Add Project Include path



Properties for Sample_Application_Project

Settings

Configuration: Debug [Active]

Include paths (-I)

```
"D:/1_3_9_TestBuilds/AppCOE_WinBuildCreation/out/eclipse/plugins/mapusoft.appcoe.host_1.3.9/include/vxworks_
"D:/1_3_9_TestBuilds/AppCOE_WinBuildCreation/out/eclipse/plugins/mapusoft.appcoe.host_1.3.9/include/nucleus_i
"D:/1_3_9_TestBuilds/AppCOE_WinBuildCreation/out/eclipse/plugins/mapusoft.appcoe.host_1.3.9/include/include"
"D:/1_3_9_TestBuilds/AppCOE_WinBuildCreation/out/eclipse/plugins/mapusoft.appcoe.host_1.3.9/include/cross_os_
"${workspace_loc:/${ProjName}/include}"
```

Building Your Project

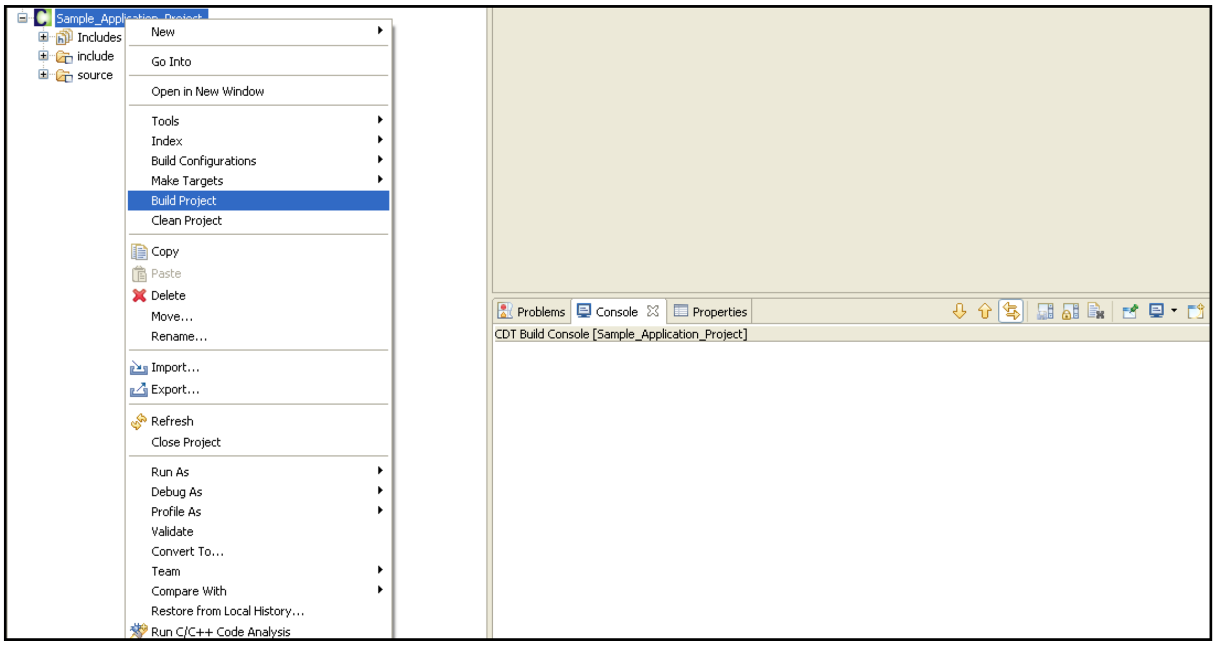
NOTE: This feature requires a license. Click http://mapusoft.com/downloads/AppCOE-evaluation/ to request an evaluation license.

Creating an AppCOE C/C++ Project.

Adding Source Code Files to AppCOE C/C++Project

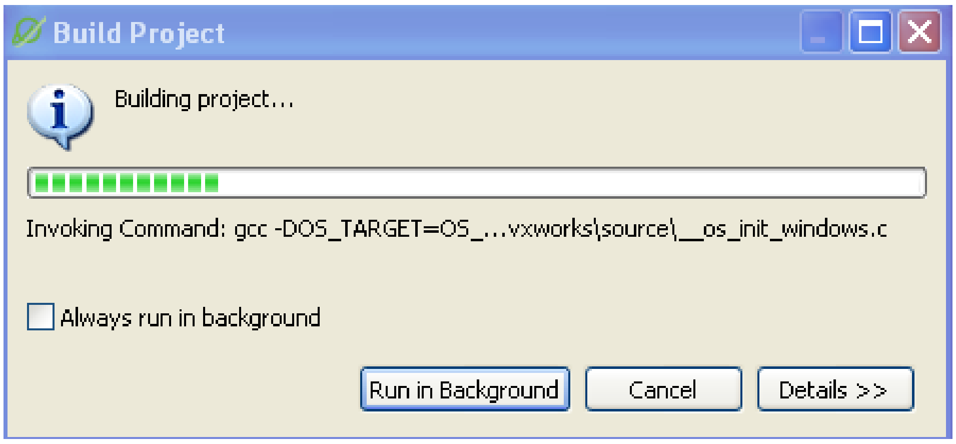
1. Select a project under C/C++ Projects pane, right click and select **Build Project** as shown inFigure 4_21

Figure 4_21: Building Your Project



2. Building process as shown in Figure 4_22

Figure 4_22: Building Process



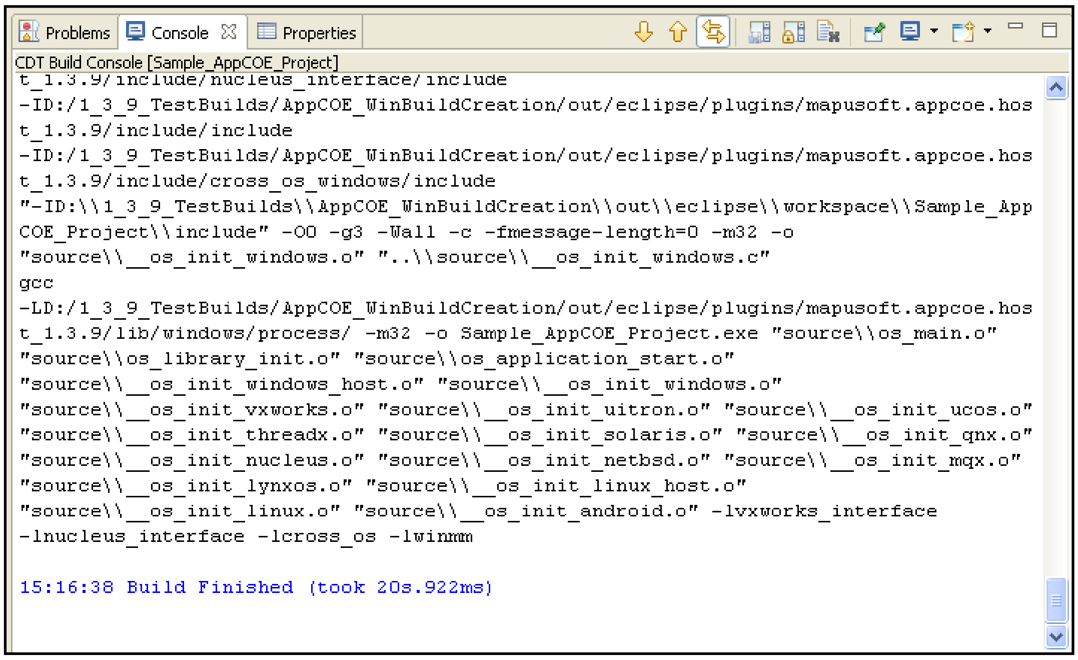
Building project...

Invoking Command: gcc -DOS_TARGET=OS_...vxworks\source\__os_init_windows.c

☐ Always run in background

3. You can view how the binary files are built inFigure 4_23.

Figure 4_23: Output for Building Binary Files for a Project



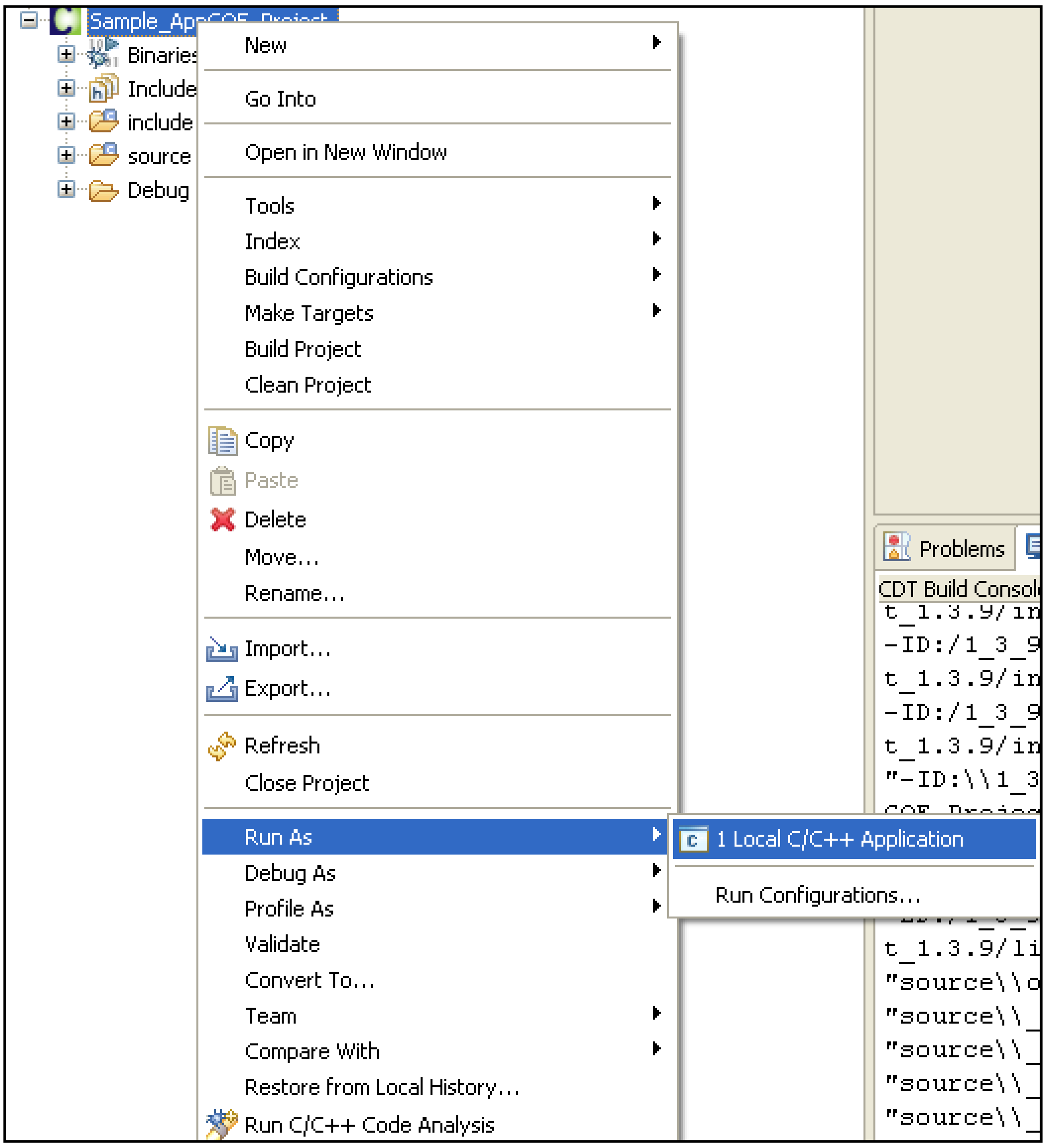
```
CDT Build Console [Sample_AppCOE_Project]
t_1.3.9/include/nucleus_interface/include
-ID:/1_3_9_TestBuilds/AppCOE_WinBuildCreation/out/eclipse/plugins/mapusoft.appcoe.hos
t_1.3.9/include/include
-ID:/1_3_9_TestBuilds/AppCOE_WinBuildCreation/out/eclipse/plugins/mapusoft.appcoe.hos
t_1.3.9/include/cross_os_windows/include
"-ID:\\1_3_9_TestBuilds\\AppCOE_WinBuildCreation\\out\\eclipse\\workspace\\Sample_App
COE_Project\\include" -O0 -g3 -Wall -c -fmessage-length=0 -m32 -o
"source\\__os_init_windows.o" "..\\source\\__os_init_windows.c"
gcc
-LD:/1_3_9_TestBuilds/AppCOE_WinBuildCreation/out/eclipse/plugins/mapusoft.appcoe.hos
t_1.3.9/lib/windows/process/ -m32 -o Sample_AppCOE_Project.exe "source\\os_main.o"
"source\\os_library_init.o" "source\\os_application_start.o"
"source\\__os_init_windows_host.o" "source\\__os_init_windows.o"
"source\\__os_init_vxworks.o" "source\\__os_init_uitron.o" "source\\__os_init_ucos.o"
"source\\__os_init_threadx.o" "source\\__os_init_solaris.o" "source\\__os_init_qnx.o"
"source\\__os_init_nucleus.o" "source\\__os_init_netbsd.o" "source\\__os_init_mqx.o"
"source\\__os_init_lynxos.o" "source\\__os_init_linux_host.o"
"source\\__os_init_linux.o" "source\\__os_init_android.o" -lvxworks_interface
-lnucleus_interface -lcross_os -lwinmm

15:16:38 Build Finished (took 20s.922ms)
```

Executing Binary Files

To execute the binary in Windows host:

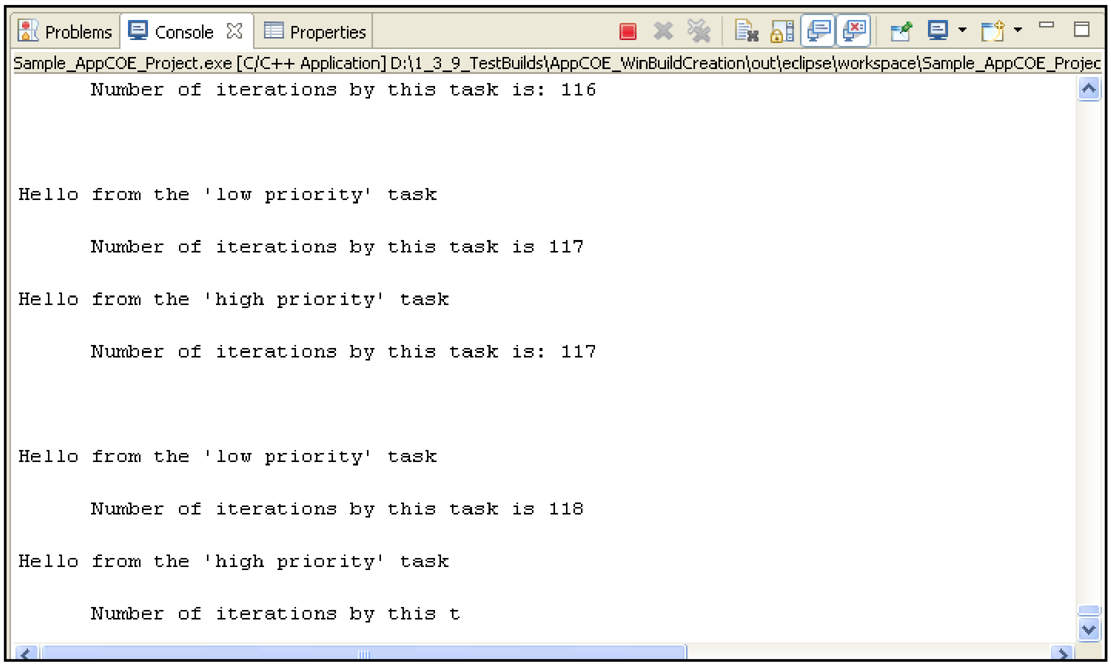
1. Select Project that you have created.
2. Select Created Application Project, right click and select **Run As>Local C/C++ Application** as shown inFigure 4_24.

Figure 4_24: Executing the Binary File



3. Getting the Run Time output into Console View as shown inFigure 4_25.

Figure 4_25: Binary Output



Sample_AppCOE_Project.exe [C/C++ Application] D:\1_3_9_TestBuilds\AppCOE_WinBuildCreation\out\eclipse\workspace\Sample_AppCOE_Projec

```
      Number of iterations by this task is: 116



Hello from the 'low priority' task

      Number of iterations by this task is 117

Hello from the 'high priority' task

      Number of iterations by this task is: 117



Hello from the 'low priority' task

      Number of iterations by this task is 118

Hello from the 'high priority' task

      Number of iterations by this t
```

Caution:

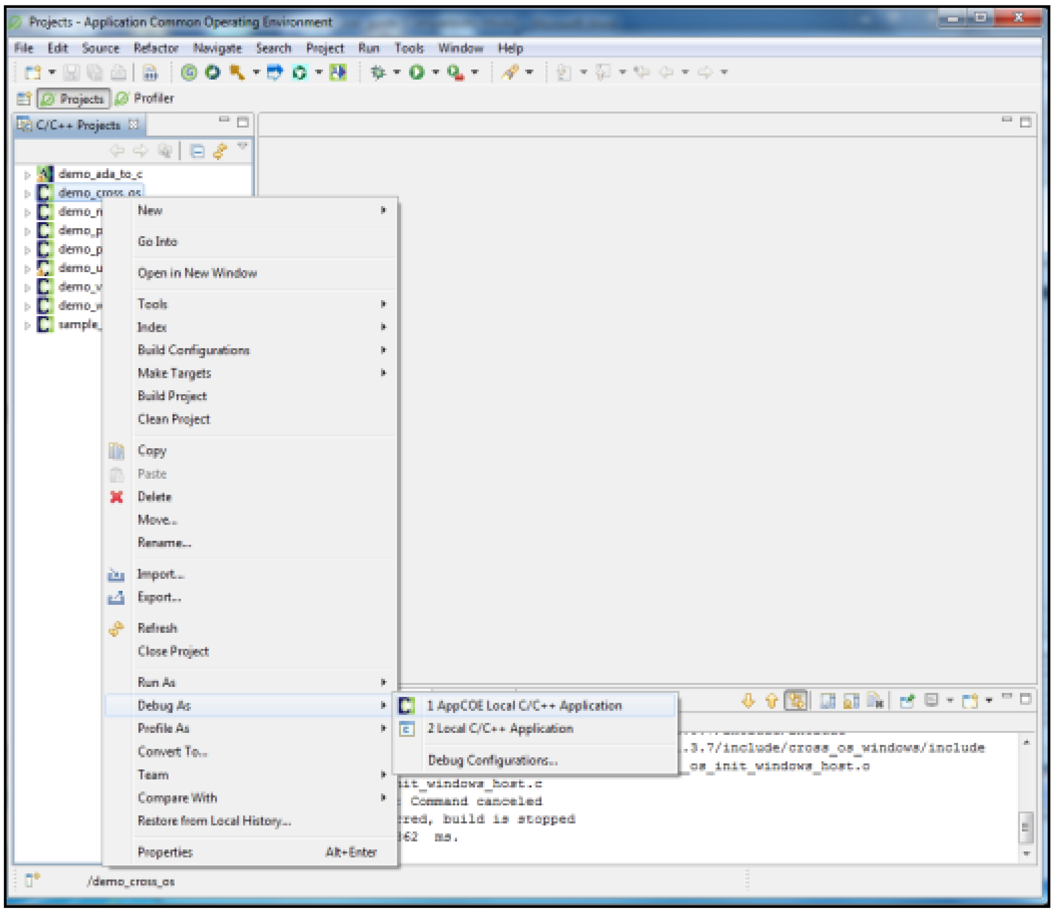
If you try torebuild the createdApplication project whileexecutable of same Application project running in background under windows operating system, you will face permission denied Error that means you are not correctly terminated your previous executable file. Before clean& rebuild you any application in AppCOE, you make sure thatyour application is terminating correctly.

Debugging the Demos Supplied by MapuSoft

Example: Debugging the demo_cross_os application

1. From AppCOE main window, select demo_cross_os project.
2. Right click on the project and select **Debug as >AppCOELocalC\C ++ Application** or click on debugging icon as highlighted inFigure 4_26.

Figure 4_26: Debugging the Demo Application



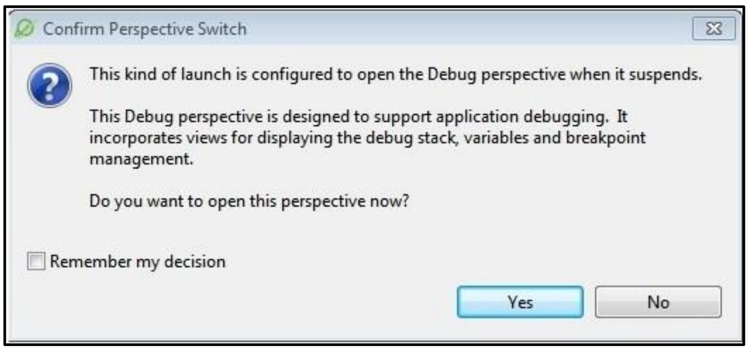
```
.3.7/include/cross_os_windows/include
 os_init_windows_host.o
it_windows_host.c
 Command canceled
red, build is stopped
62  ms.
```

NOTE: If the user uses the Debug dialog to create a new configuration then they need to select **AppCOE Local C/C++ Application** before creating. The other option is to not use the debug dialog, but instead select “AppCOE Local C/C++ Application" from the Debug asmenu. This method will create the correct configuration automatically.

3. After selected the **AppCOE Local Application** for debugging, Confirm Perspective Switch window is to confirm the Debug Perspective support for debugging the application and it is displayed as shown inFigure 4_27, at a same time, windows command prompt is displayed as shown inFigure 4_28.

   Note: if the user used to open the Debug Perspective for debugging the application by click **Yes** button, then debugging progress is started as shown in Figure 4_29

Figure 4_27: Confirm Perspective Switch window

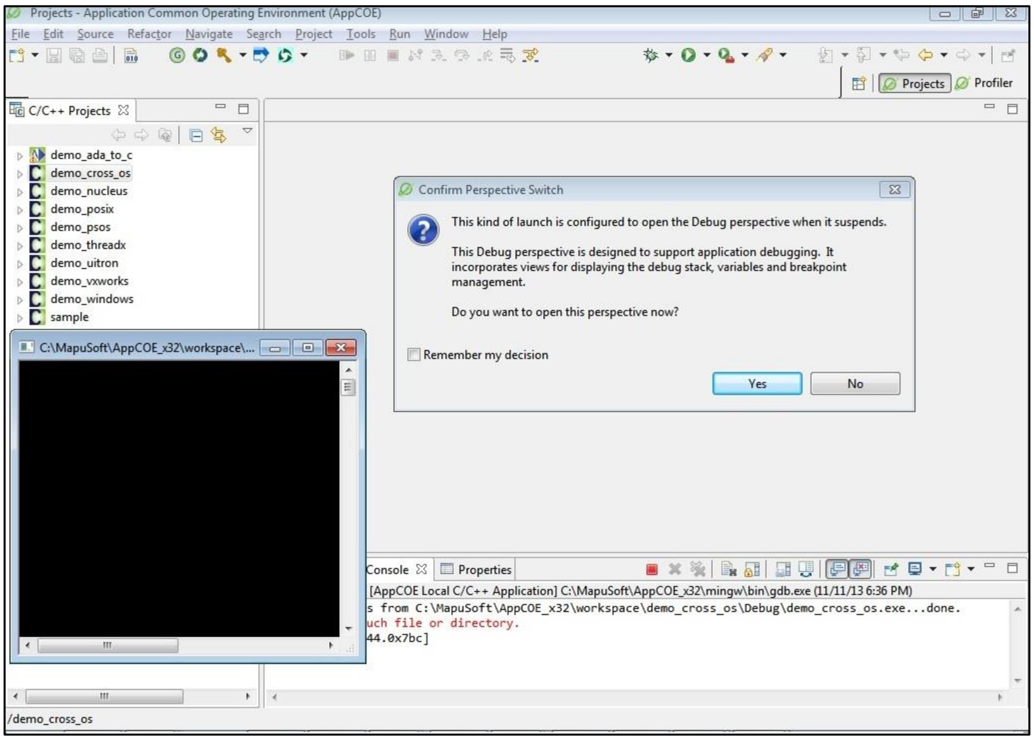


This kind of launch is configured to open the Debug perspective when it suspends.

This Debug perspective is designed to support application debugging. It incorporates views for displaying the debug stack, variables and breakpoint management.

Do you want to open this perspective now?

Figure 4_28: Confirm Perspective Switch window& Windows Command Prompt opened



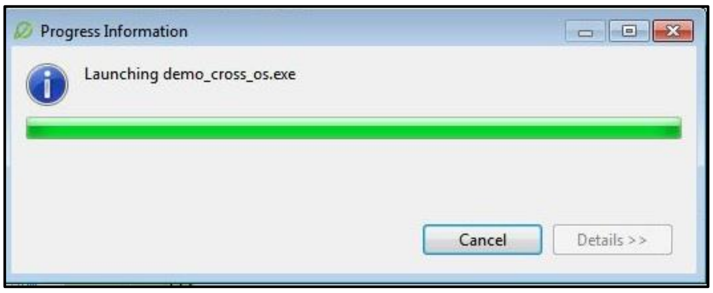
This kind of launch is configured to open the Debug perspective when it suspends.

This Debug perspective is designed to support application debugging. It incorporates views for displaying the debug stack, variables and breakpoint management.

Do you want to open this perspective now?

```
[AppCOE Local C/C++ Application] C:\MapuSoft\AppCOE_x32\mingw\bin\gdb.exe (11/11/13 6:36 PM)
s from C:\MapuSoft\AppCOE_x32\workspace\demo_cross_os\Debug\demo_cross_os.exe...done.
uch file or directory.
44.0x7bc]
```

Figure 4_29: Debugging Progress Information

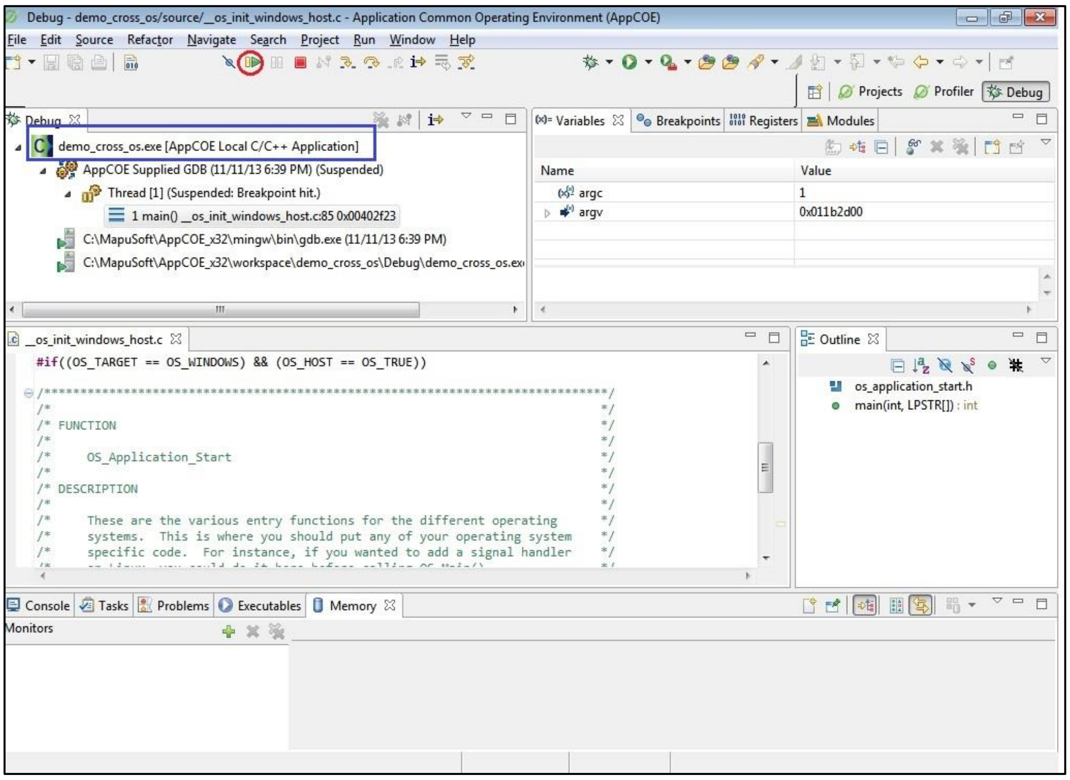


Launching demo_cross_os.exe

.

4. Debugging stops at the main function. Click **Resume** icon (highlightedin red circle) to resume the debugging process as shown inFigure 4_30.

Figure 4_30: Resume Debugging process


Debug - demo_cross_os/source/__os_init_windows_host.c - Application Common Operating Environment (AppCOE)
File Edit Source Refactor Navigate Search Project Run Window Help
Projects
Profiler
Debug
Variables
Breakpoints
Registers
Modules
Outline
Console
Tasks
Problems
Executables
Memory
Monitors

```
demo_cross_os.exe [AppCOE Local C/C++ Application]
  AppCOE Supplied GDB (11/11/13 6:39 PM) (Suspended)
    Thread [1] (Suspended: Breakpoint hit.)
      1 main() __os_init_windows_host.c:85 0x00402f23
  C:\MapuSoft\AppCOE_x32\mingw\bin\gdb.exe (11/11/13 6:39 PM)
  C:\MapuSoft\AppCOE_x32\workspace\demo_cross_os\Debug\demo_cross_os.exe
```

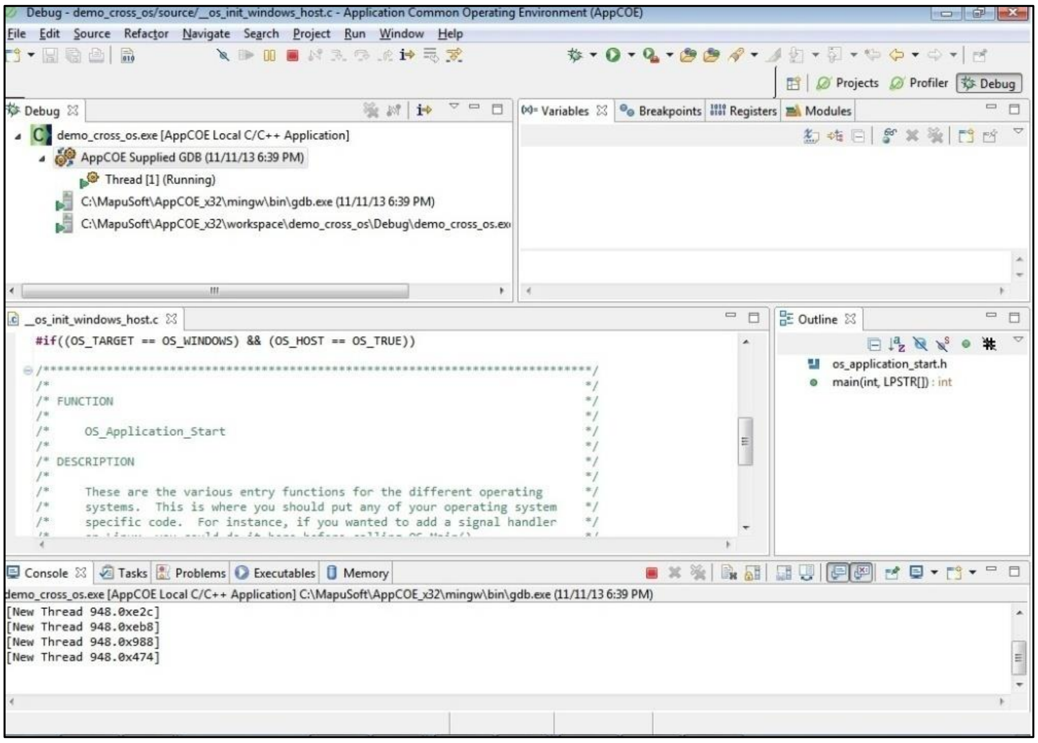
Name	Value
argc	1
argv	0x011b2d00

```
#if((OS_TARGET == OS_WINDOWS) && (OS_HOST == OS_TRUE))

/*****************************************************************************/
/*                                                                           */
/* FUNCTION                                                                  */
/*                                                                           */
/*     OS_Application_Start                                                  */
/*                                                                           */
/* DESCRIPTION                                                               */
/*                                                                           */
/*     These are the various entry functions for the different operating     */
/*     systems.  This is where you should put any of your operating system   */
/*     specific code.  For instance, if you wanted to add a signal handler   */
```

```
os_application_start.h
main(int, LPSTR[]) : int
```

5. The debugging resumes as shown inFigure 4_31.

Figure 4_31: Debug Demo Application Perspective


Debug - demo_cross_os/source/__os_init_windows_host.c - Application Common Operating Environment (AppCOE)
File Edit Source Refactor Navigate Search Project Run Window Help
Projects
Profiler
Debug
Variables
Breakpoints
Registers
Modules
Outline
Console
Tasks
Problems
Executables
Memory

```
demo_cross_os.exe [AppCOE Local C/C++ Application]
  AppCOE Supplied GDB (11/11/13 6:39 PM)
    Thread [1] (Running)
  C:\MapuSoft\AppCOE_x32\mingw\bin\gdb.exe (11/11/13 6:39 PM)
  C:\MapuSoft\AppCOE_x32\workspace\demo_cross_os\Debug\demo_cross_os.exe
```

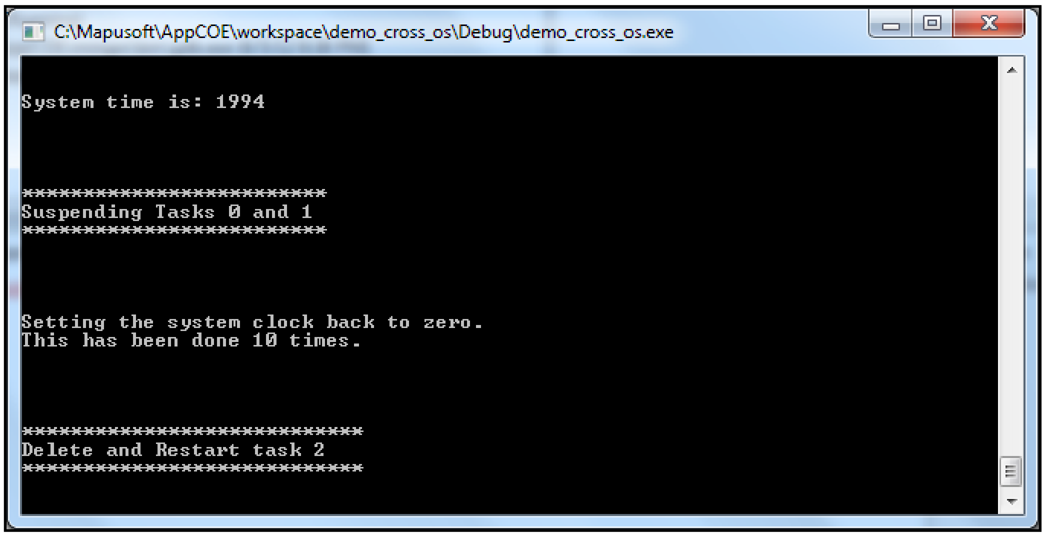
```
#if((OS_TARGET == OS_WINDOWS) && (OS_HOST == OS_TRUE))

/*****************************************************************************/
/*                                                                           */
/* FUNCTION                                                                  */
/*                                                                           */
/*     OS_Application_Start                                                  */
/*                                                                           */
/* DESCRIPTION                                                               */
/*                                                                           */
/*     These are the various entry functions for the different operating     */
/*     systems.  This is where you should put any of your operating system   */
/*     specific code.  For instance, if you wanted to add a signal handler   */
```

```
os_application_start.h
main(int, LPSTR[]) : int
```

```
demo_cross_os.exe [AppCOE Local C/C++ Application] C:\MapuSoft\AppCOE_x32\mingw\bin\gdb.exe (11/11/13 6:39 PM)
[New Thread 948.0xe2c]
[New Thread 948.0xeb8]
[New Thread 948.0x988]
[New Thread 948.0x474]
```

You can see the debugging on the console as shown inFigure 4_32.

Figure 4_32: Debug Demo Application Output



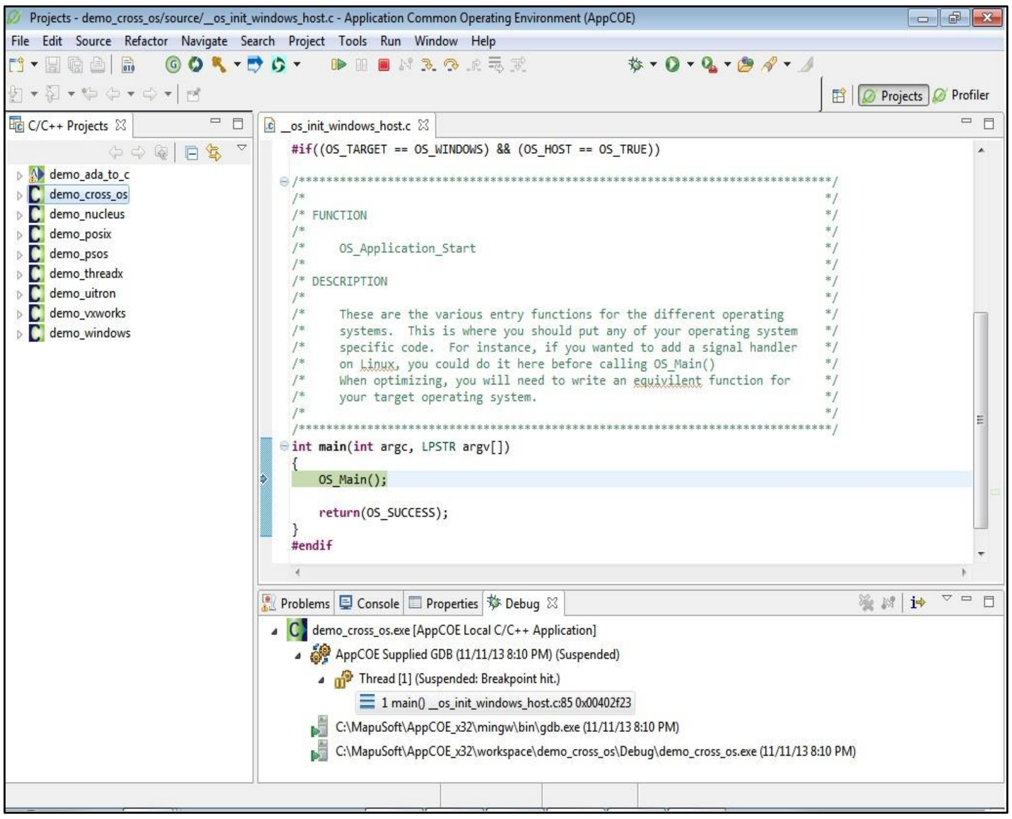
C:\Mapusoft\AppCOE\workspace\demo_cross_os\Debug\demo_cross_os.exe

```
System time is: 1994



**************************
Suspending Tasks 0 and 1
**************************




Setting the system clock back to zero.
This has been done 10 times.




*****************************
Delete and Restart task 2
*****************************
```

Note: If the user not use the Debug Perspective by click **No** button from Debug Perspective windows as shown inFigure 4_27. Debugging the Demo application from AppCOE only as shown in the Figure 4_33 andFigure 4_34

Note: Best ways is user should use the Debug Perspective for debugging the demo application, because its only helps to views for displaying the debug stack, variables, breakpoint management.

Figure 4_33: Debug Demo ApplicationUsing AppCOE

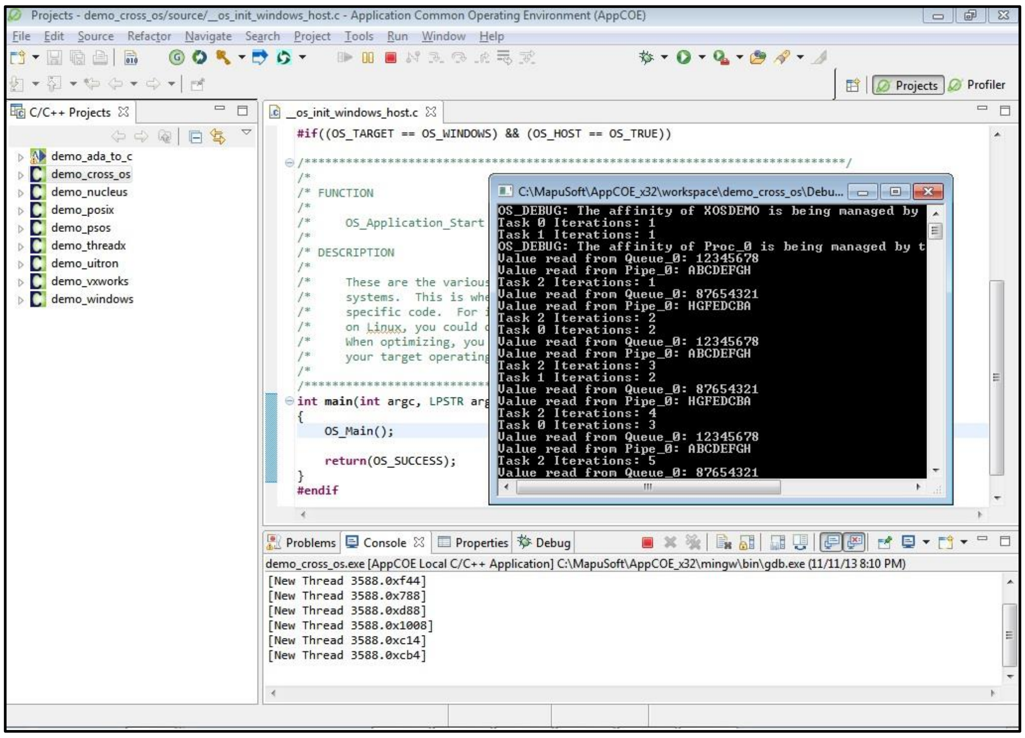


Projects - demo_cross_os/source/__os_init_windows_host.c - Application Common Operating Environment (AppCOE)

```
#if((OS_TARGET == OS_WINDOWS) && (OS_HOST == OS_TRUE))

/****************************************************************************/
/*                                                                          */
/* FUNCTION                                                                 */
/*                                                                          */
/*      OS_Application_Start                                                */
/*                                                                          */
/* DESCRIPTION                                                              */
/*                                                                          */
/*      These are the various entry functions for the different operating   */
/*      systems.  This is where you should put any of your operating system */
/*      specific code.  For instance, if you wanted to add a signal handler */
/*      on Linux, you could do it here before calling OS_Main()             */
/*      When optimizing, you will need to write an equivilent function for  */
/*      your target operating system.                                       */
/*                                                                          */
/****************************************************************************/
int main(int argc, LPSTR argv[])
{
    OS_Main();

    return(OS_SUCCESS);
}
#endif
```

```
demo_cross_os.exe [AppCOE Local C/C++ Application]
    AppCOE Supplied GDB (11/11/13 8:10 PM) (Suspended)
        Thread [1] (Suspended: Breakpoint hit.)
            1 main() __os_init_windows_host.c:85 0x00402f23
    C:\MapuSoft\AppCOE_x32\mingw\bin\gdb.exe (11/11/13 8:10 PM)
    C:\MapuSoft\AppCOE_x32\workspace\demo_cross_os\Debug\demo_cross_os.exe (11/11/13 8:10 PM)
```

Figure 4_34: Resume Debugging process



Projects - demo_cross_os/source/__os_init_windows_host.c - Application Common Operating Environment (AppCOE)

C:\MapuSoft\AppCOE_x32\workspace\demo_cross_os\Debu...

```
OS_DEBUG: The affinity of XOSDEMO is being managed by
Task 0 Iterations: 1
Task 1 Iterations: 1
OS_DEBUG: The affinity of Proc_0 is being managed by t
Value read from Queue_0: 12345678
Value read from Pipe_0: ABCDEFGH
Task 2 Iterations: 1
Value read from Queue_0: 87654321
Value read from Pipe_0: HGFEDCBA
Task 2 Iterations: 2
Task 0 Iterations: 2
Value read from Queue_0: 12345678
Value read from Pipe_0: ABCDEFGH
Task 2 Iterations: 3
Task 1 Iterations: 2
Value read from Queue_0: 87654321
Value read from Pipe_0: HGFEDCBA
Task 2 Iterations: 4
Task 0 Iterations: 3
Value read from Queue_0: 12345678
Value read from Pipe_0: ABCDEFGH
Task 2 Iterations: 5
Value read from Queue_0: 87654321
```

demo_cross_os.exe [AppCOE Local C/C++ Application] C:\MapuSoft\AppCOE_x32\mingw\bin\gdb.exe (11/11/13 8:10 PM)

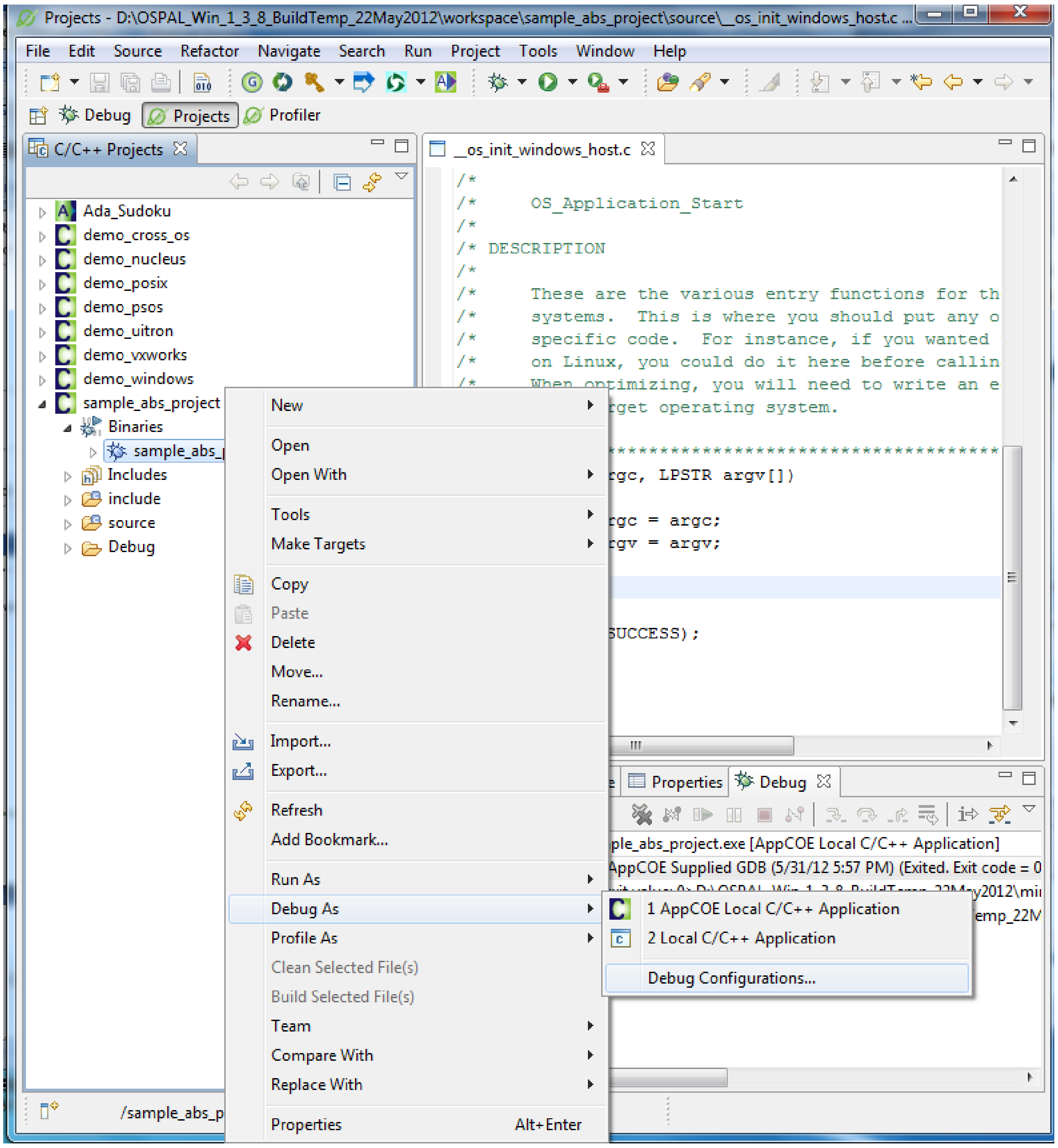
```
[New Thread 3588.0xf44]
[New Thread 3588.0x788]
[New Thread 3588.0xd88]
[New Thread 3588.0x1008]
[New Thread 3588.0xc14]
[New Thread 3588.0xcb4]
```

Debugging Using External Console/Terminal

Debugging can be done using an external console or terminal in the following way:

1. From AppCOE main window, select the demo_cross_os project.
2. Right click on the project and select **Debug as > Debug Configuration** as shown inFigure 4_35.

Figure 4_35: Open Debug Dialog



```
/*
/*     OS_Application_Start
/*
/* DESCRIPTION
/*
/*     These are the various entry functions for th
/*     systems.  This is where you should put any o
/*     specific code.  For instance, if you wanted
/*     on Linux, you could do it here before callin
/*     When optimizing, you will need to write an e
                    rget operating system.

                    ************************************
                    rgc, LPSTR argv[])

                    rgc = argc;
                    rgv = argv;

                    SUCCESS);
```

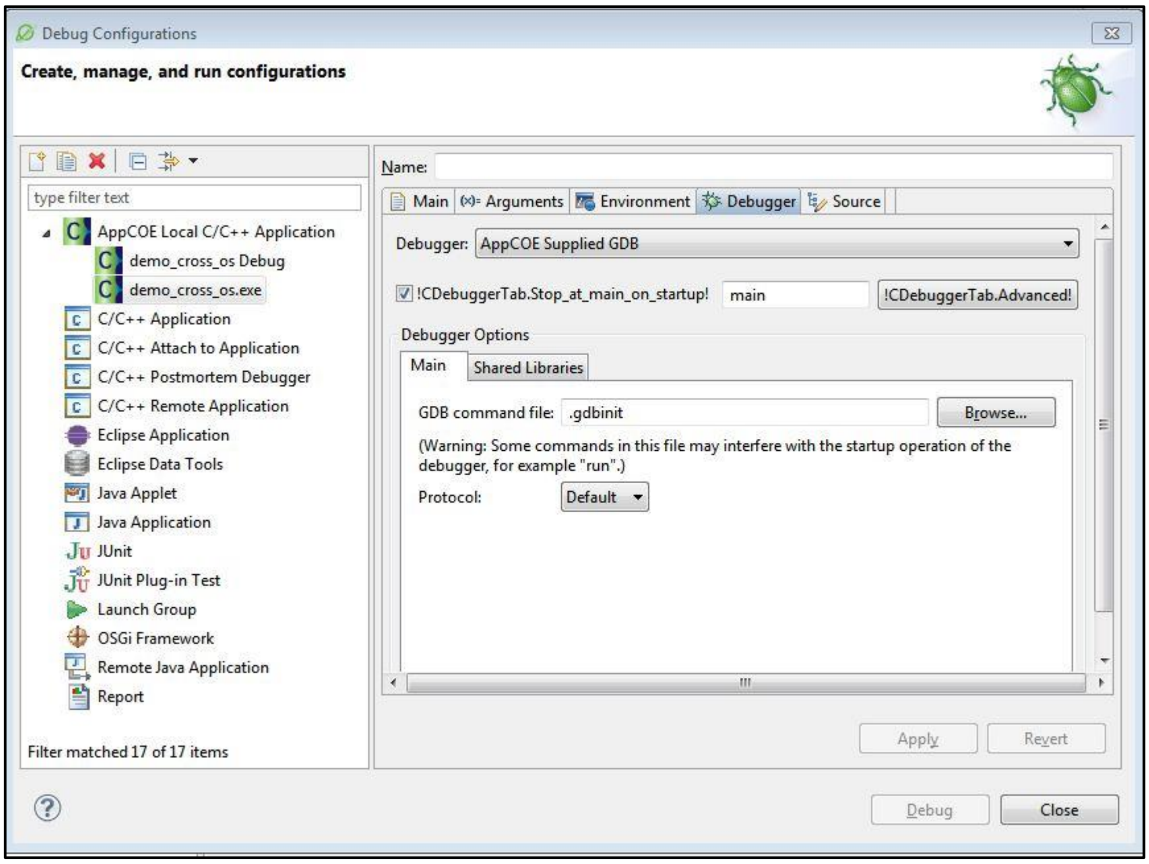
```
ple_abs_project.exe [AppCOE Local C/C++ Application]
AppCOE Supplied GDB (5/31/12 5:57 PM) (Exited. Exit code = 0
```

3. On Debug Configuration window, you can set your options for debugging as shown in Figure 4_36,

   NOTE: You must use MapuSoft Supplied GDB to execute debugging.

   NOTE: AppCOE does not support Cygwin tools and its use is not recommended.

Figure 4_36: Debug Configuration Window



Debugger: AppCOE Supplied GDB

[✓] !CDebuggerTab.Stop_at_main_on_startup! main !CDebuggerTab.Advanced!

Debugger Options

Main | Shared Libraries

GDB command file: .gdbinit Browse...

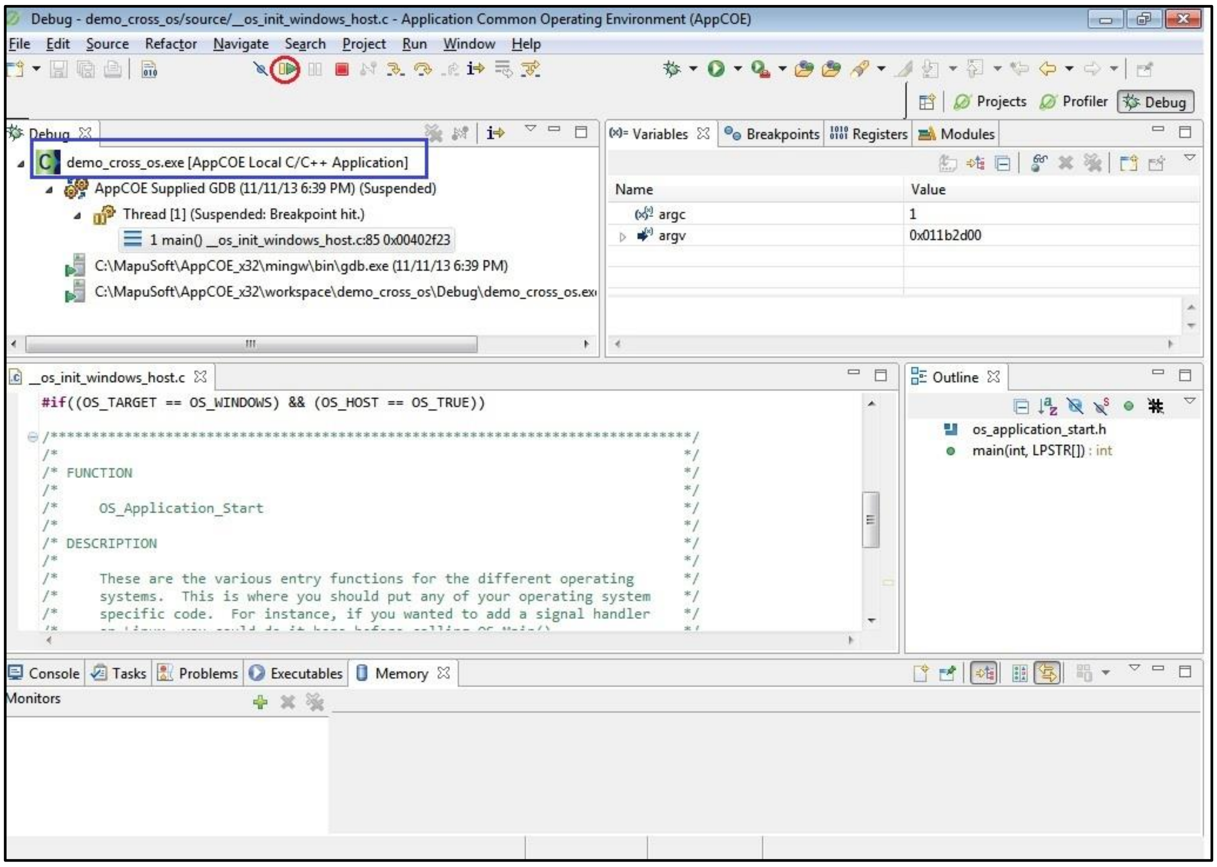
(Warning: Some commands in this file may interfere with the startup operation of the debugger, for example "run".)

Protocol: Default

4. You can change any of the options here and click **Apply.**

5. Click **Debug** to execute debugging using the external console or Terminal**.** You can view the debugging process in your console as shown inFigure 4_37.

Figure 4_37: Debugging Output Using External Console/Terminal



Debug - demo_cross_os/source/__os_init_windows_host.c - Application Common Operating Environment (AppCOE)

```
demo_cross_os.exe [AppCOE Local C/C++ Application]
  AppCOE Supplied GDB (11/11/13 6:39 PM) (Suspended)
    Thread [1] (Suspended: Breakpoint hit.)
      1 main() __os_init_windows_host.c:85 0x00402f23
  C:\MapuSoft\AppCOE_x32\mingw\bin\gdb.exe (11/11/13 6:39 PM)
  C:\MapuSoft\AppCOE_x32\workspace\demo_cross_os\Debug\demo_cross_os.ex
```

Name	Value
argc	1
argv	0x011b2d00

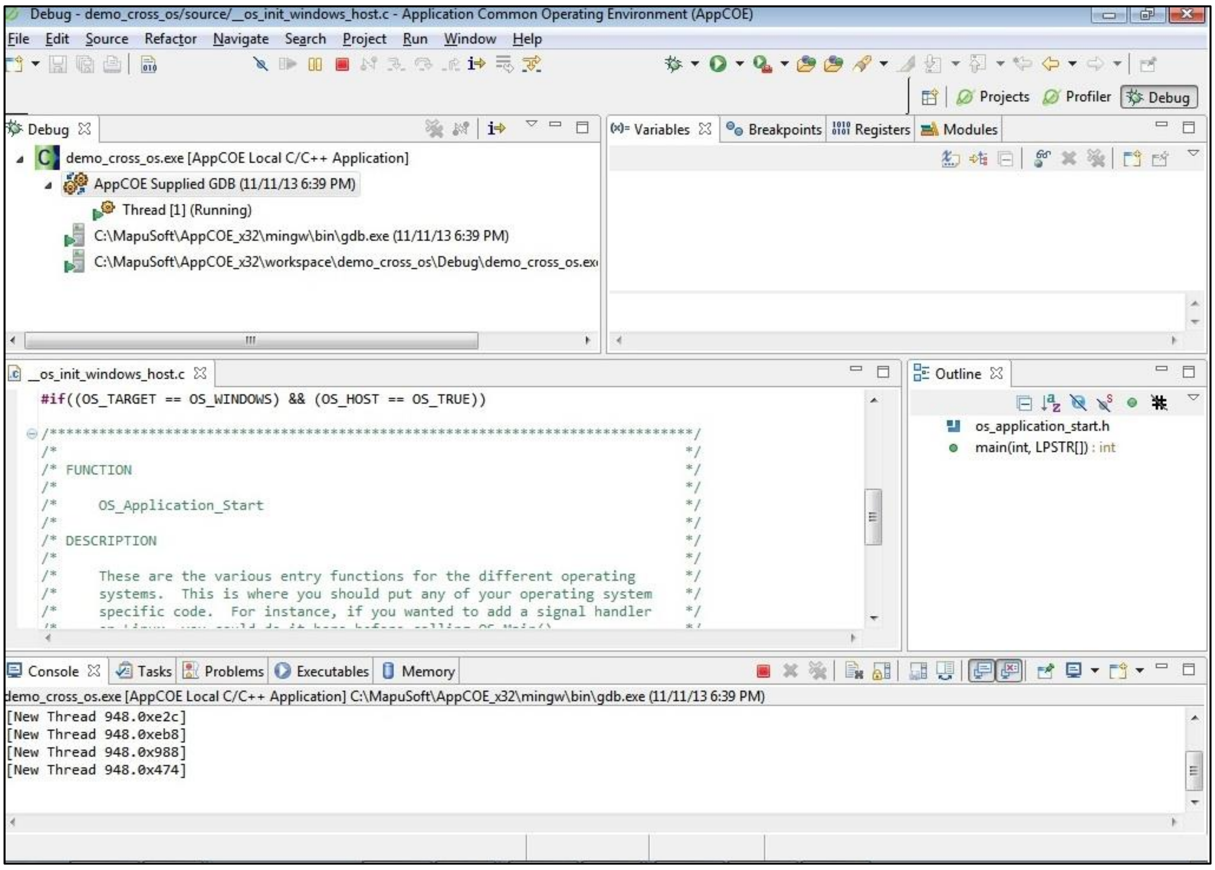
__os_init_windows_host.c

```
#if((OS_TARGET == OS_WINDOWS) && (OS_HOST == OS_TRUE))

/*******************************************************************************/
/*                                                                             */
/* FUNCTION                                                                    */
/*                                                                             */
/*     OS_Application_Start                                                    */
/*                                                                             */
/* DESCRIPTION                                                                 */
/*                                                                             */
/*     These are the various entry functions for the different operating      */
/*     systems.  This is where you should put any of your operating system    */
/*     specific code.  For instance, if you wanted to add a signal handler    */
```

```
os_application_start.h
main(int, LPSTR[]) : int
```

6. To resume debugging, click the resume icon on the debugging window as shown in Figure 4_38.

Figure 4_38: Resume Debugging Using External Console/Terminal


Debug - demo_cross_os/source/_os_init_windows_host.c - Application Common Operating Environment (AppCOE)
File Edit Source Refactor Navigate Search Project Run Window Help
Projects Profiler Debug
Debug
Variables Breakpoints Registers Modules
_os_init_windows_host.c
Outline
os_application_start.h
main(int, LPSTR[]) : int
Console Tasks Problems Executables Memory

demo_cross_os.exe [AppCOE Local C/C++ Application]
AppCOE Supplied GDB (11/11/13 6:39 PM)
Thread [1] (Running)
C:\MapuSoft\AppCOE_x32\mingw\bin\gdb.exe (11/11/13 6:39 PM)
C:\MapuSoft\AppCOE_x32\workspace\demo_cross_os\Debug\demo_cross_os.ex

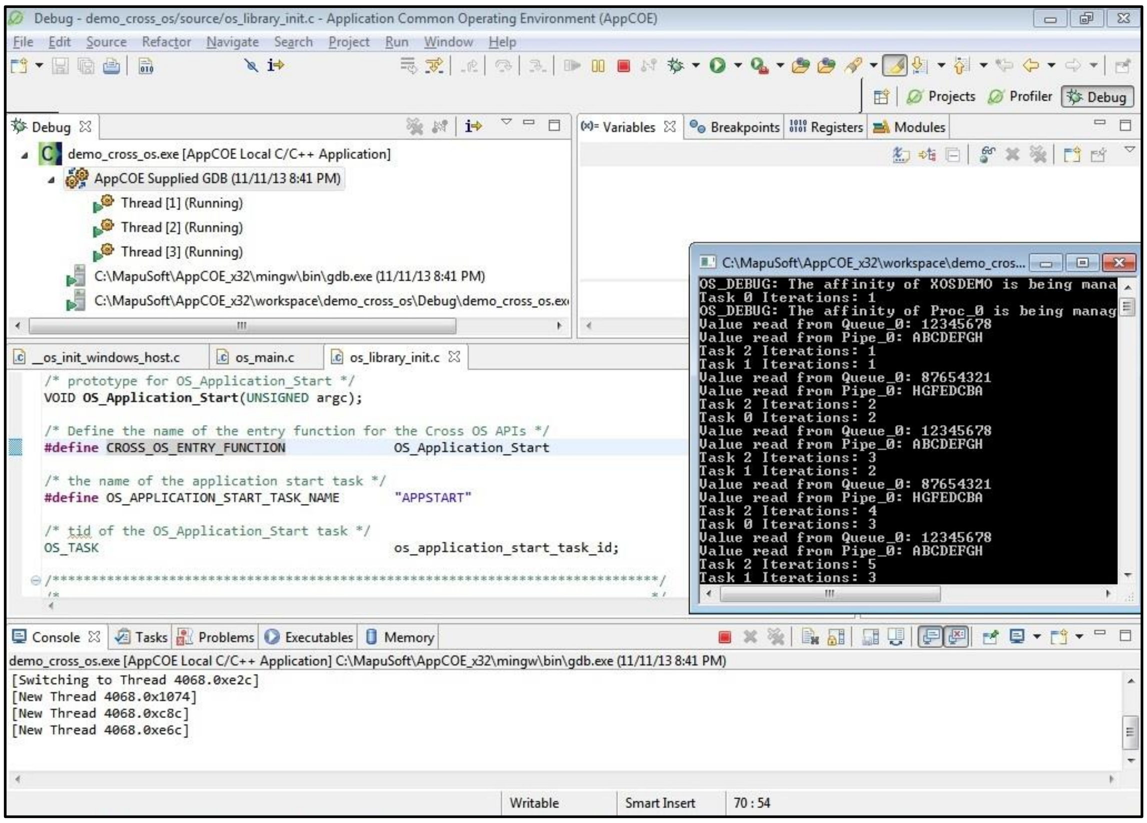
```
#if((OS_TARGET == OS_WINDOWS) && (OS_HOST == OS_TRUE))

/*******************************************************************************/
/*                                                                             */
/* FUNCTION                                                                    */
/*                                                                             */
/*     OS_Application_Start                                                    */
/*                                                                             */
/* DESCRIPTION                                                                 */
/*                                                                             */
/*     These are the various entry functions for the different operating       */
/*     systems.  This is where you should put any of your operating system     */
/*     specific code.  For instance, if you wanted to add a signal handler     */
```

demo_cross_os.exe [AppCOE Local C/C++ Application] C:\MapuSoft\AppCOE_x32\mingw\bin\gdb.exe (11/11/13 6:39 PM)

```
[New Thread 948.0xe2c]
[New Thread 948.0xeb8]
[New Thread 948.0x988]
[New Thread 948.0x474]
```

7. You have now successfully finished debugging by using external console or terminal as shown inFigure 4_39.

Figure 4_39: Debugging in Progress


Debug - demo_cross_os/source/os_library_init.c - Application Common Operating Environment (AppCOE)
File Edit Source Refactor Navigate Search Project Run Window Help
Projects Profiler Debug
Debug
Variables Breakpoints Registers Modules
_os_init_windows_host.c os_main.c os_library_init.c
Console Tasks Problems Executables Memory
Writable Smart Insert 70 : 54

```
demo_cross_os.exe [AppCOE Local C/C++ Application]
    AppCOE Supplied GDB (11/11/13 8:41 PM)
        Thread [1] (Running)
        Thread [2] (Running)
        Thread [3] (Running)
    C:\MapuSoft\AppCOE_x32\mingw\bin\gdb.exe (11/11/13 8:41 PM)
    C:\MapuSoft\AppCOE_x32\workspace\demo_cross_os\Debug\demo_cross_os.ex
```

```
/* prototype for OS_Application_Start */
VOID OS_Application_Start(UNSIGNED argc);

/* Define the name of the entry function for the Cross OS APIs */
#define CROSS_OS_ENTRY_FUNCTION                 OS_Application_Start

/* the name of the application start task */
#define OS_APPLICATION_START_TASK_NAME          "APPSTART"

/* tid of the OS_Application_Start task */
OS_TASK                                         os_application_start_task_id;

/*****************************************************************************/
/*                                                                          */
```

```
C:\MapuSoft\AppCOE_x32\workspace\demo_cros...
OS_DEBUG: The affinity of XOSDEMO is being mana
Task 0 Iterations: 1
OS_DEBUG: The affinity of Proc_0 is being manag
Value read from Queue_0: 12345678
Value read from Pipe_0: ABCDEFGH
Task 2 Iterations: 1
Task 1 Iterations: 1
Value read from Queue_0: 87654321
Value read from Pipe_0: HGFEDCBA
Task 2 Iterations: 2
Task 0 Iterations: 2
Value read from Queue_0: 12345678
Value read from Pipe_0: ABCDEFGH
Task 2 Iterations: 3
Task 1 Iterations: 2
Value read from Queue_0: 87654321
Value read from Pipe_0: HGFEDCBA
Task 2 Iterations: 4
Task 0 Iterations: 3
Value read from Queue_0: 12345678
Value read from Pipe_0: ABCDEFGH
Task 2 Iterations: 5
Task 1 Iterations: 3
```

```
demo_cross_os.exe [AppCOE Local C/C++ Application] C:\MapuSoft\AppCOE_x32\mingw\bin\gdb.exe (11/11/13 8:41 PM)
[Switching to Thread 4068.0xe2c]
[New Thread 4068.0x1074]
[New Thread 4068.0xc8c]
[New Thread 4068.0xe6c]
```

Inserting Application Code to Run only on Host Environment

The below defines are the system settings used by the OS_Application_Init() function. Use these to modify the settings when running on the host. A value of -1 for any of these will use the default values located in cross_os_usr.h.

When you optimize for the target side code, the wizard will create a custom cross_os_usr.h using the settings you specify at that time so these defines will no longer be necessary.

You can add some application code or debug statements like printf, assert, which is mostly used in host environment only. This line of code will be ignored by the compiler in target environment.

OS HOST Selection

The flag has to be false for Full Source Library Package generation.

Table4_1: OS HOST Selection

Flag and Purpose	Available Options
OS_HOST To select the host operating system	This flag is set as OS_TRUE by default in AppCOE environment.

Target 64 bit CPU Selection

Based on the OS you want the application to be built, set the following pre-processor definition in your project setting or make files:

Table 4_2: Target 64-bit CPU Selection

Flag and Purpose	Available Options
OS_CPU_64BIT To select the target CPU type.	The value of OS_CPU_64BIT can be any ONE of the following: • OS_TRUE – Target CPU is 64 bit type CPU • OS_FALSE – Target CPU is 32 bit type CPU **NOTE**: In New C projects creation, the flag OS_CPU_64BIT will be set to OS_FALSE by default and user needs to make this true if they run on a 64-bit OS.

Updating Project Settings

AppCOE provides exclusive way to update the Projects Settings by just a click of a button. This is very useful in any one of the following cases:

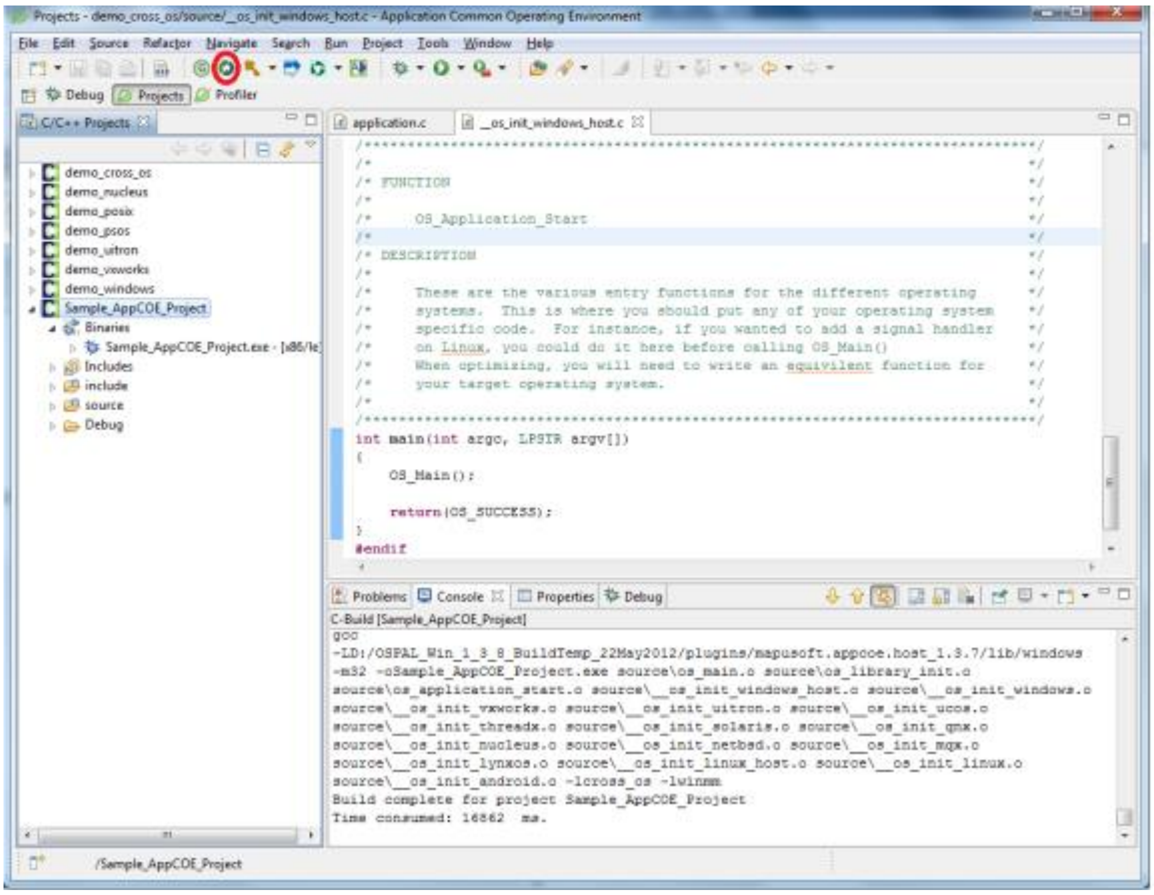
1. If the user has moved his workspace to a different location
2. If the project requires new tool-chain that is installed recently

The **Update** button performs an auto update on all the projects updates which include files, new directory structures, libraries, and tool-chains to the Project Settings.

To update project settings:

1. From AppCOE main menu select **Tools** > **Update Settings** or click AppCOE C/C++Project Settings button on AppCOE main menu or, as shown inFigure 4_40.

Figure 4_40: Updating Project Settings

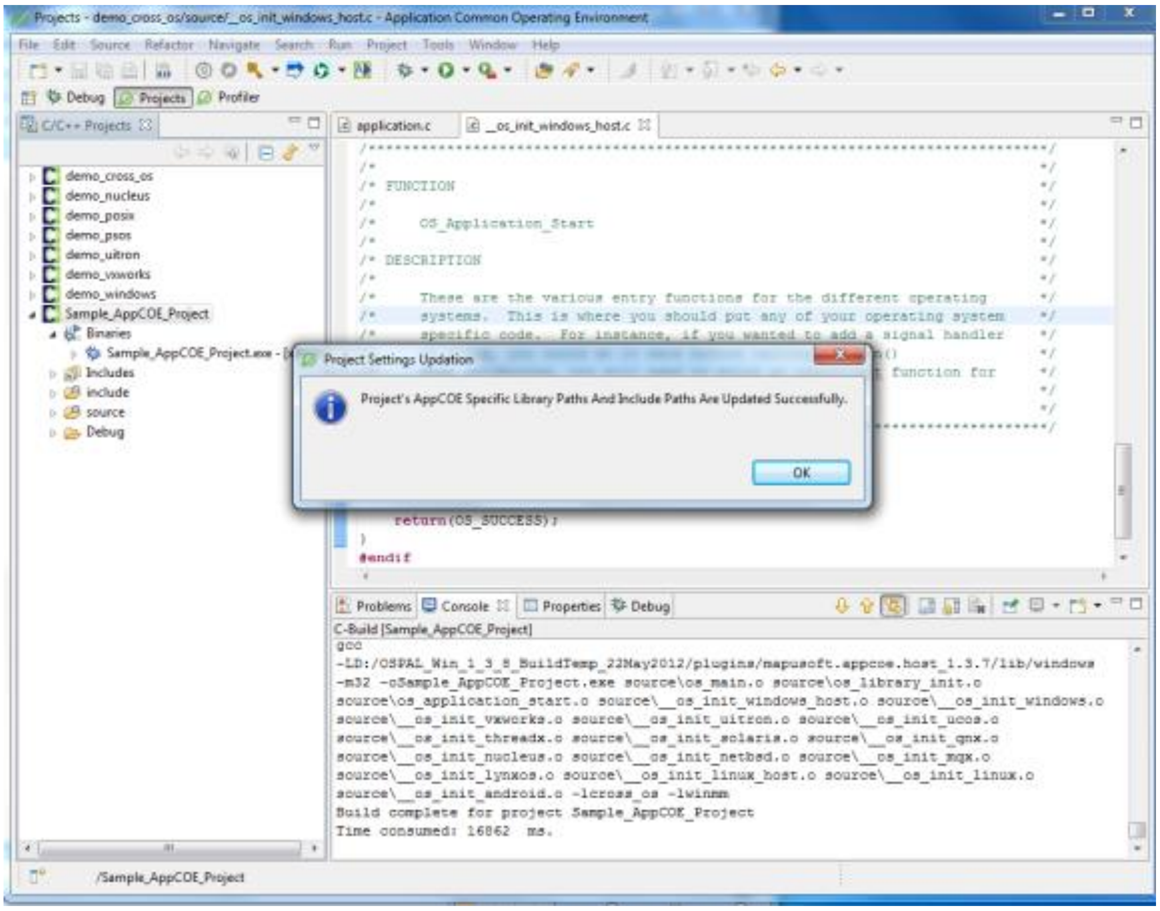

Projects - demo_cross_os/source/__os_init_windows_host.c - Application Common Operating Environment
File Edit Source Refactor Navigate Search Run Project Tools Window Help
Debug Projects Profiler
C/C++ Projects
demo_cross_os
demo_nucleus
demo_posix
demo_psos
demo_uitron
demo_vxworks
demo_windows
Sample_AppCOE_Project
Binaries
Sample_AppCOE_Project.exe - [x86/le]
Includes
include
source
Debug
application.c
__os_init_windows_host.c
Problems Console Properties Debug
C-Build [Sample_AppCOE_Project]
/Sample_AppCOE_Project

```
/****************************************************************************/
/*                                                                          */
/* FUNCTION                                                                 */
/*                                                                          */
/*     OS_Application_Start                                                 */
/*                                                                          */
/* DESCRIPTION                                                              */
/*                                                                          */
/*     These are the various entry functions for the different operating    */
/*     systems.  This is where you should put any of your operating system  */
/*     specific code.  For instance, if you wanted to add a signal handler  */
/*     on Linux, you could do it here before calling OS_Main()              */
/*     When optimizing, you will need to write an equivilent function for   */
/*     your target operating system.                                        */
/*                                                                          */
/****************************************************************************/
int main(int argc, LPSTR argv[])
{
    OS_Main();

    return(OS_SUCCESS);
}
#endif
```

```
gcc
-LD:/OSPAL_Win_1_3_8_BuildTemp_22May2012/plugins/mapusoft.appcoe.host_1.3.7/lib/windows
-m32 -oSample_AppCOE_Project.exe source\os_main.o source\os_library_init.o
source\os_application_start.o source\__os_init_windows_host.o source\__os_init_windows.o
source\__os_init_vxworks.o source\__os_init_uitron.o source\__os_init_ucos.o
source\__os_init_threadx.o source\__os_init_solaris.o source\__os_init_qnx.o
source\__os_init_nucleus.o source\__os_init_netbsd.o source\__os_init_mqx.o
source\__os_init_lynxos.o source\__os_init_linux_host.o source\__os_init_linux.o
source\__os_init_android.o -lcross_os -lwinmm
Build complete for project Sample_AppCOE_Project
Time consumed: 16862  ms.
```

2. AppCOE does an auto search for the project updates and updates the settings as shown in the Project Settings Updating window inFigure 4_41

Figure 4_41: AppCOE C/C++ Project Updates



Project Settings Updation

Project's AppCOE Specific Library Paths And Include Paths Are Updated Successfully.

```
/*****************************************************************************/
/*                                                                           */
/* FUNCTION                                                                  */
/*                                                                           */
/*     OS_Application_Start                                                  */
/*                                                                           */
/* DESCRIPTION                                                               */
/*                                                                           */
/*     These are the various entry functions for the different operating     */
/*     systems.  This is where you should put any of your operating system   */
/*     specific code.  For instance, if you wanted to add a signal handler   */
```

```
    return(OS_SUCCESS);
}
#endif
```

C-Build [Sample_AppCOE_Project]

```
gcc
-LD:/OSPAL_Win_1_3_8_BuildTemp_22May2012/plugins/mapusoft.appcoe.host_1.3.7/lib/windows
-m32 -oSample_AppCOE_Project.exe source\os_main.o source\os_library_init.o
source\os_application_start.o source\__os_init_windows_host.o source\__os_init_windows.o
source\__os_init_vxworks.o source\__os_init_uitron.o source\__os_init_ucos.o
source\__os_init_threadx.o source\__os_init_solaris.o source\__os_init_qnx.o
source\__os_init_nucleus.o source\__os_init_netbsd.o source\__os_init_mqx.o
source\__os_init_lynxos.o source\__os_init_linux_host.o source\__os_init_linux.o
source\__os_init_android.o -lcross_os -lwinmm
Build complete for project Sample_AppCOE_Project
Time consumed: 16862  ms.
```

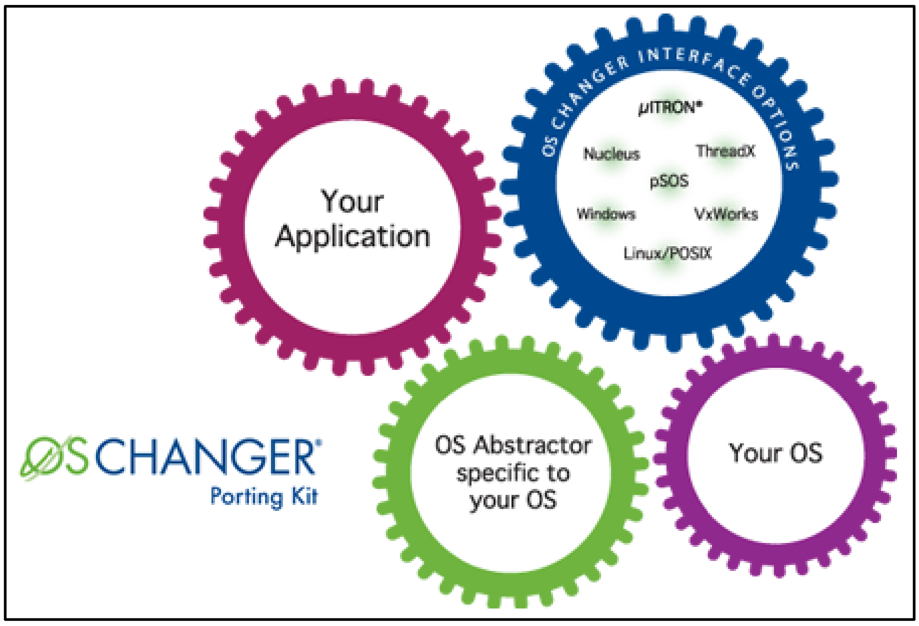
Chapter 5. Using OS Changer Porting Kit

This chapter contains the following topics:

About OS Changer

OS Changer allows you to reuse the code on any new OS without having to rewrite or port your code. This saves time and money by reducing the porting effort.
OS Changer provides extensive support to various common proprietary libraries widely used by the application developers. Further, developers can use the native TARGET OS interface as well. This works toward getting the migration effort faster and much easier.

Figure 5_1: About OS Changer



OS Changer is designed for use as a C library. Services used inside your application software are extracted from the OS Changer and TARGET OS libraries, and, are then combined with the other application objects to produce the complete image.

OS Changer is optimized to take full advantage of the underlying TARGET RTOS features. It is built to be totally independent of the target hardware and all the development tools (like compilers and debuggers).

Please note that there may be some minor implementation differences in some of the OS Changer APIs when compared to the native API's. This may be as a result of any missing features within the underlying RTOS that OS Changer provides migration to.

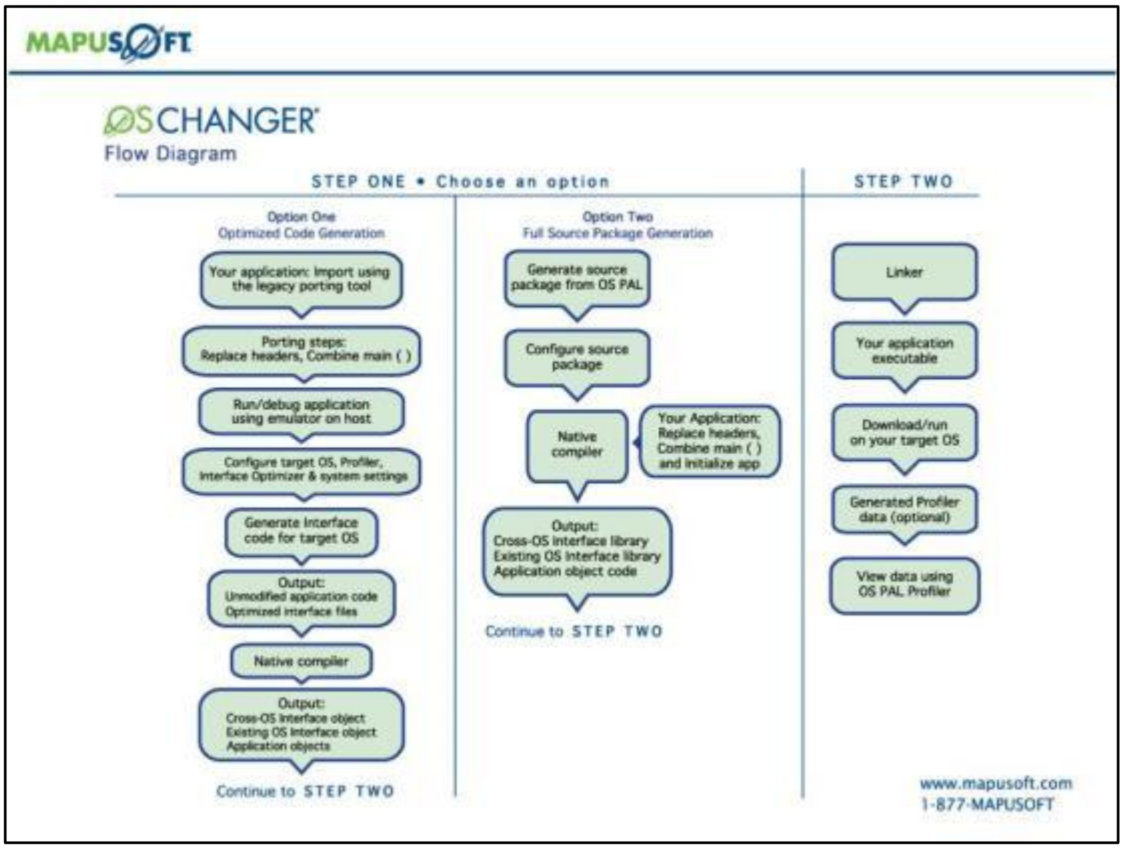

OS CHANGER
Flow Diagram
STEP ONE • Choose an option
STEP TWO
Option One
Optimized Code Generation
Your application: Import using the legacy porting tool
Porting steps: Replace headers, Combine main ( )
Run/debug application using emulator on host
Configure target OS, Profiler, Interface Optimizer & system settings
Generate Interface code for target OS
Output: Unmodified application code Optimized interface files
Native compiler
Output: Cross-OS Interface object Existing OS Interface object Application objects
Continue to STEP TWO
Option Two
Full Source Package Generation
Generate source package from OS PAL
Configure source package
Native compiler
Your Application: Replace headers, Combine main ( ) and initialize app
Output: Cross-OS Interface library Existing OS Interface library Application object code
Continue to STEP TWO
Linker
Your application executable
Download/run on your target OS
Generated Profiler data (optional)
View data using OS PAL Profiler
www.mapusoft.com
1-877-MAPUSOFT

Figure 5_2: OS Changer Flow Diagram

Your legacy application can be re-usable and also portable by the support provided by the OS Changer library and the OS Abstractor library. Applications can directly use the native target OS API, however doing so will not make your code portable across operating systems. We recommend that you use the optimized abstraction APIs for the features and support that are not provided by the OS Changer compatibility library.

NOTE: For more information on configuration and target OS specific information, see OS Abstractor Interface Reference Manual.

Interfaces Available for OS Changer

The following are the interfaces available for OS Changer:

- VxWorks
- Nucleus
- pSOS
- micro-ITRON
- POSIX/LINUX
- Windows
- ThreadX
- µC/OS
- FreeRTOS
- VRTX
- QNX
- RTLinux

Using OS Changer

OS Changer is designed for use as a C library. Services used inside your application software are extracted from the OS Changer and TARGET OS libraries, and, are then combined with the other application objects to produce the complete image. This image can be loaded to the target system or placed in ROM on the target system.

The steps for using OS Changer are described in the following generic form:

- Remove the TARGET RTOS header file defines from all the TARGET RTOS source files.
- Remove definitions and references to all the TARGET RTOS configuration data structures in your application.
- Include the TARGET RTOS_interface.h (For example, nucleus_interface.h in case of OS Changer Nucleus Interface) and os_target.h in the source files.
- Modify the OS Changer init code (see sample provided) and the TARGET RTOS root task of your application appropriately. (For example, Application_Initialize)
- Compile and link your application using appropriate development tools. Resolve all compiler and linker errors.
- Port the underlying low-level drivers to Target OS.
- Load the complete application image to the target system and run the application.
- Review the processor and development system documentation for additional information, including specific details on how to use the compiler, assembler, and linker.

Error Handling

Applications receive a run-time error via the OS_Fatal_Error () function on some occasions. This happens due to:

- Unsupported API function call, or
- Unsupported parameter value or flag option in a API call, or
- Error occurred on the target OS for which there are no matching error codes in OS Abstractor Interface.

OS Changer calls OS_Fatal_Error and passes along an error code and error string. The OS_Fatal_Error handling function is fully customizable to the application needs. At the moment it prints the error message if the OS_DEBUG_INFO conditional compile option is set, then OS_Fatal_Error does not return. For more details on error handling and definition of this function, refer to the OS Abstractor Interface Reference Guide. The non-zero value in the error code corresponds to the underlying RTOS API error. Refer to the target OS documentation for a better description of the errors. Error Handling section lists the errors and the reasons for the occurrence.

Porting VxWorks Applications

Porting applications into the AppCOE host environment can be done in three different ways:

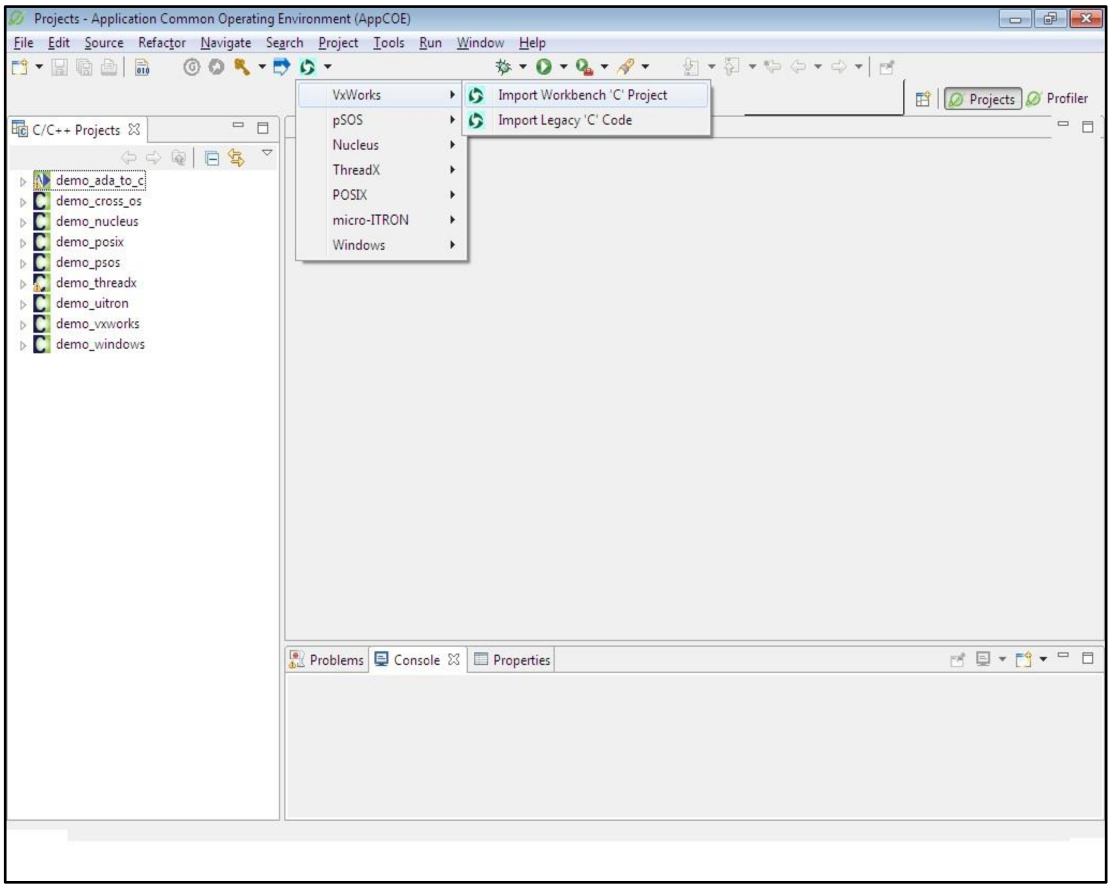
1. Porting a WindRiver Workbench project
2. Porting a Legacy application
3. Manual porting using AppCOE

Method 1– Porting a WindRiver Workbench 'C' Project

NOTE: This feature requires a license. Click http://mapusoft.com/downloads/AppCOE-evaluation/ to request an evaluation license.

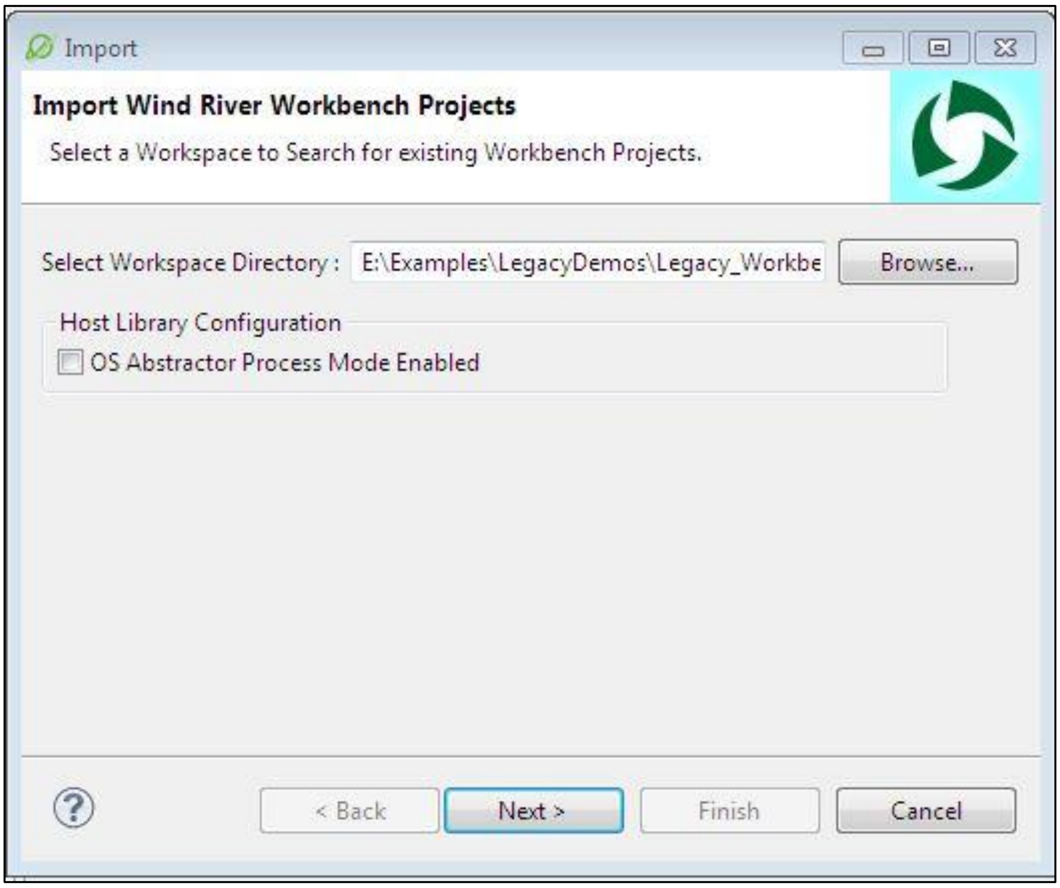
1. From AppCOE main window, select any project under**C/C++ Projects** tab on the left pane.
2. Select **Tools > Porting >VxWorks> Import Workbench 'C' Project** as shown in Figure 5_3. You can also click on the Porting icon from the task bar.

Figure 5_3: Importing a VxWorks Workbench 'C' Project in AppCOE



3. On AppCOE Import window, select a workspace directory to search for existing workbench projects by clicking on **Browse** button next to **the** text box, and click **Next** as shown inFigure 5_4.
4. On Select Host Library Configuration window, select **OS Abstractor Process Mode** if the imported application runs in multiple process
5. In Import Wind River Workbench Projects window, the projects list is displayed in a checkbox Tree. Application projects and Library projects are separated into respective categories.
6. Select or deselect any one or all of the projects by selecting the check box next to the project name and click **Finish** to import the project as shown inFigure 5_4.

Figure 5_4: AppCOE Import Window



Import Wind River Workbench Projects

Select a Workspace to Search for existing Workbench Projects.

Select Workspace Directory : E:\Examples\LegacyDemos\Legacy_Workbe

Browse...

Host Library Configuration

☐ OS Abstractor Process Mode Enabled

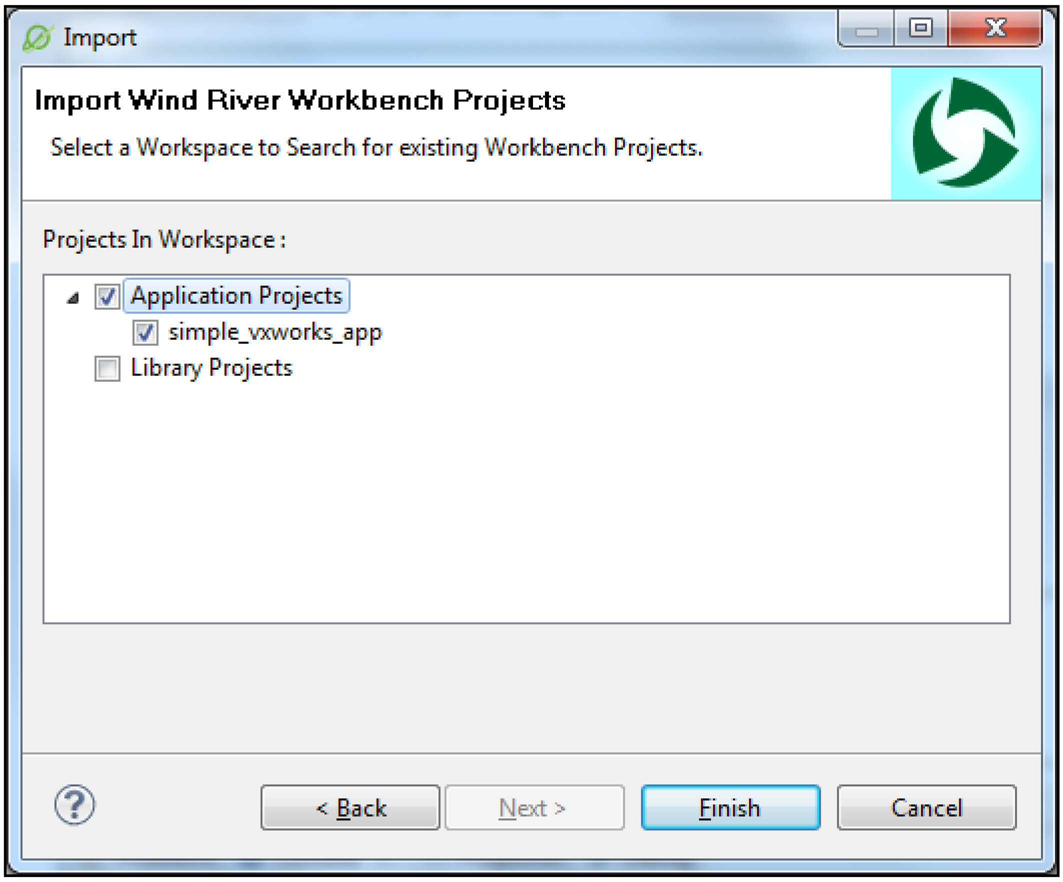
The following are the project types:

- **Application Projects** - Provides an executable application. This project type folder contains three templates. The makefile for the Executable project type is automatically created by the CDT.
- **Library Projects**- An executable module that is compiled and linked separately. When you create a project that uses a shared library (libxx.so), you define your shared library's project as a Project Reference for your application. The makefile for this project type is automatically created by the CDT.

  NOTE: Select the check box next to your required library or application project to be imported.

7. If you select Application project, and click **Finish,** you get Application Start up Files windowas shown inFigure 5_5.

Figure 5_5: Application Startup Files Window


Import

Import Wind River Workbench Projects

Select a Workspace to Search for existing Workbench Projects.

Projects In Workspace :

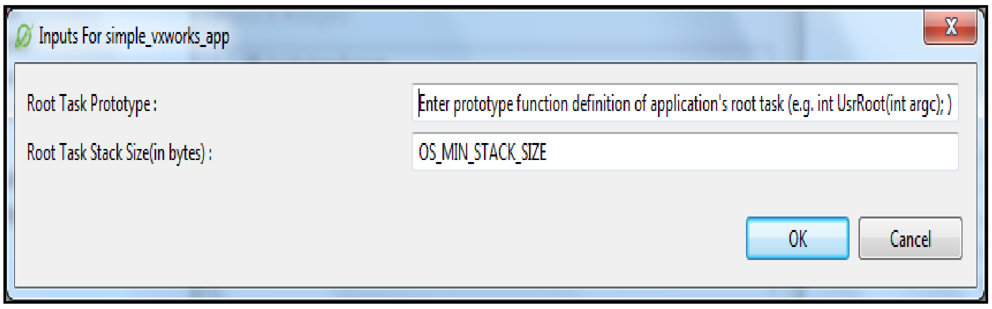
- [✓] Application Projects
  - [✓] simple_vxworks_app
- [ ] Library Projects

8. If you are importing a kernel application, click **Yes** to automatically create start up files to connect the imported application to the OS platform.

   NOTE: If you are porting a library project, click **No** to continue with the porting.

9. If you select any application type project, provide the inputs for the project andclick **OK** as shown in Figure 5_6. If you do not want to provide the inputs, you can just click **Cancel**.

Figure 5_6: Provide Inputs for Projects Window



Inputs For simple_vxworks_app

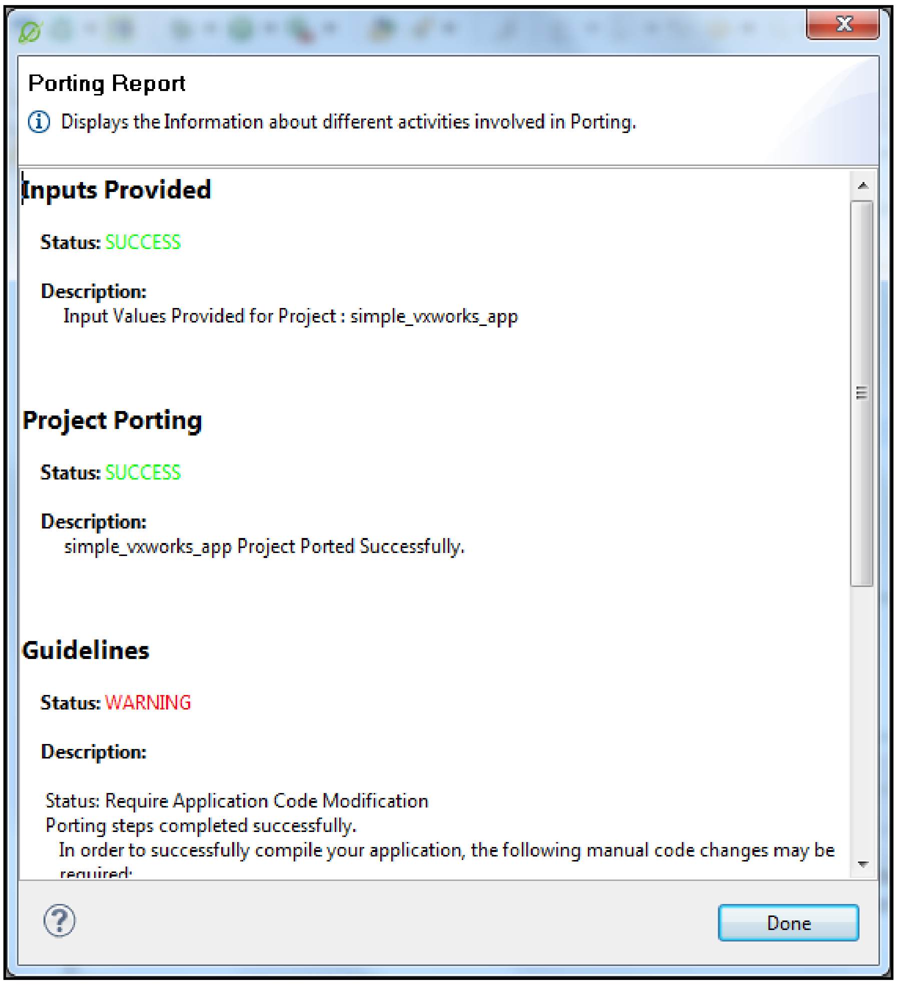
Root Task Prototype: Enter prototype function definition of application's root task (e.g. int UsrRoot(int argc);)

Root Task Stack Size(in bytes): OS_MIN_STACK_SIZE

NOTE: If you select an application project and if it contains any referenced projects not selected by you, then a Confirmation dialogue box is displayed on your screen to ask if you want to port the project. If you want to port, click **OK**. You can see the porting processing results as shown in Figure 5_6 .

After the porting is successfully done, the porting report page is displayed as shown inFigure 5_7, Click **Done** to complete the process.

Figure 5_7: Porting Reports Page



Porting Report

Displays the Information about different activities involved in Porting.

Inputs Provided

Status: SUCCESS

Description:
Input Values Provided for Project : simple_vxworks_app

Project Porting

Status: SUCCESS

Description:
simple_vxworks_app Project Ported Successfully.

Guidelines

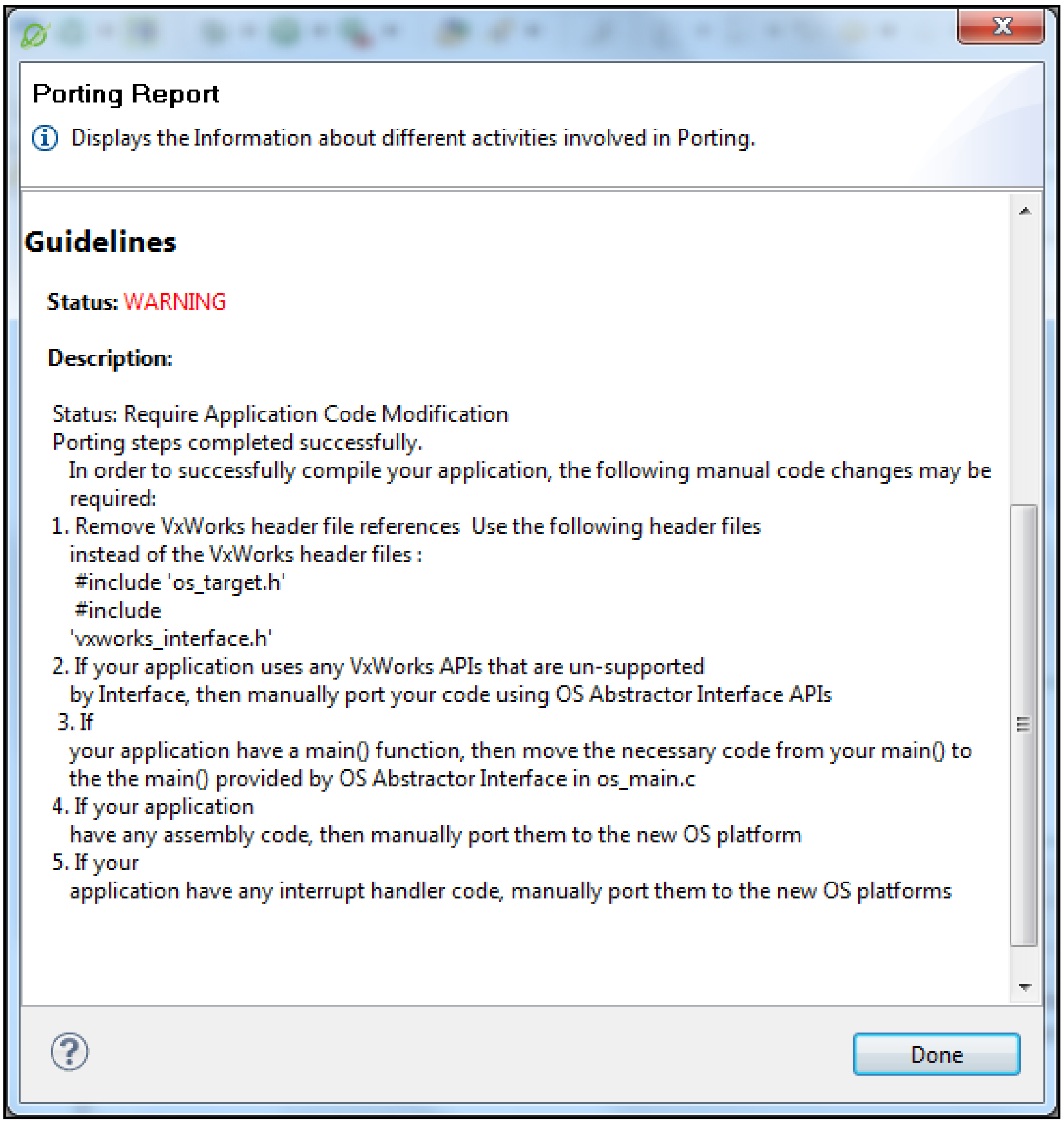
Status: WARNING

Description:

Status: Require Application Code Modification
Porting steps completed successfully.
In order to successfully compile your application, the following manual code changes may be

10. In order to successfully compile your application, follow the guidelines highlightedas shown inFigure 5_8.

Figure 5_8: Porting Reports Page Guidelines



Porting Report

Displays the Information about different activities involved in Porting.

Guidelines

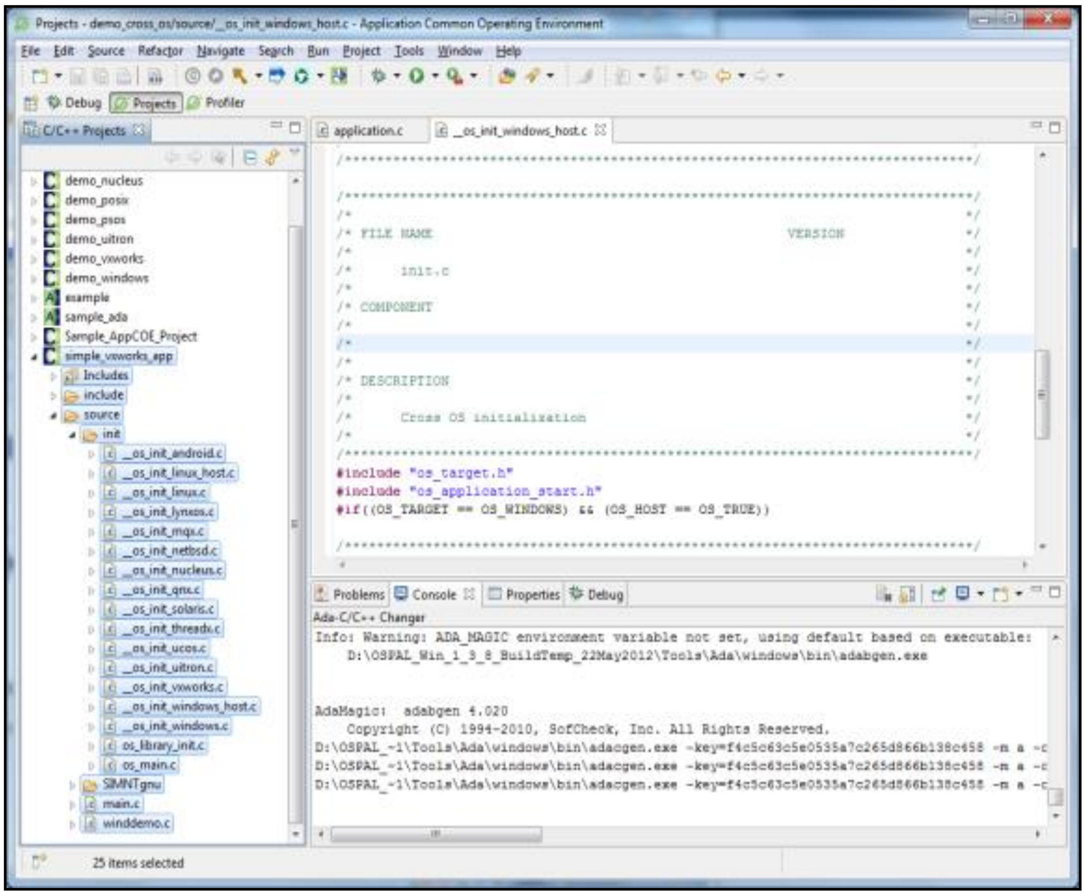
Status: WARNING

Description:

Status: Require Application Code Modification
Porting steps completed successfully.
In order to successfully compile your application, the following manual code changes may be required:
1. Remove VxWorks header file references Use the following header files
instead of the VxWorks header files :
#include 'os_target.h'
#include
'vxworks_interface.h'
2. If your application uses any VxWorks APIs that are un-supported
by Interface, then manually port your code using OS Abstractor Interface APIs
3. If
your application have a main() function, then move the necessary code from your main() to the the main() provided by OS Abstractor Interface in os_main.c
4. If your application
have any assembly code, then manually port them to the new OS platform
5. If your
application have any interrupt handler code, manually port them to the new OS platforms

11. In AppCOE C/C++ projects perspective, the ported projects are displayed as shown in Figure 5_9.

Figure 5_9: Project Perspective of the Ported Projects



```
/*************************************************************************/

/*************************************************************************/
/*                                                                       */
/* FILE NAME                                          VERSION            */
/*                                                                       */
/*      init.c                                                           */
/*                                                                       */
/* COMPONENT                                                             */
/*                                                                       */
/*                                                                       */
/*                                                                       */
/* DESCRIPTION                                                           */
/*                                                                       */
/*      Cross OS initialization                                          */
/*                                                                       */
/*************************************************************************/
#include "os_target.h"
#include "os_application_start.h"
#if((OS_TARGET == OS_WINDOWS) && (OS_HOST == OS_TRUE))

/*************************************************************************/
```

```
Info: Warning: ADA_MAGIC environment variable not set, using default based on executable:
    D:\OSPAL_Win_1_3_8_BuildTemp_22May2012\Tools\Ada\windows\bin\adabgen.exe


AdaMagic:  adabgen 4.020
    Copyright (C) 1994-2010, SofCheck, Inc. All Rights Reserved.
D:\OSPAL_~1\Tools\Ada\windows\bin\adacgen.exe -key=f4c5c63c5e0535a7c265d866b138c458 -m a -c
D:\OSPAL_~1\Tools\Ada\windows\bin\adacgen.exe -key=f4c5c63c5e0535a7c265d866b138c458 -m a -c
D:\OSPAL_~1\Tools\Ada\windows\bin\adacgen.exe -key=f4c5c63c5e0535a7c265d866b138c458 -m a -c
```

You have successfully imported your VxWorks application to AppCOE.

To know more about the project template files, go to AppCOE C/C++Project Template Files.

Method 2–Porting VxWorks Legacy ‘C’ Code

This section explains Porting VxWorks Legacy Applications using AppCOE Porting Plug-in. A sample porting of VxWorks Legacy application using AppCOE is described with an example here.

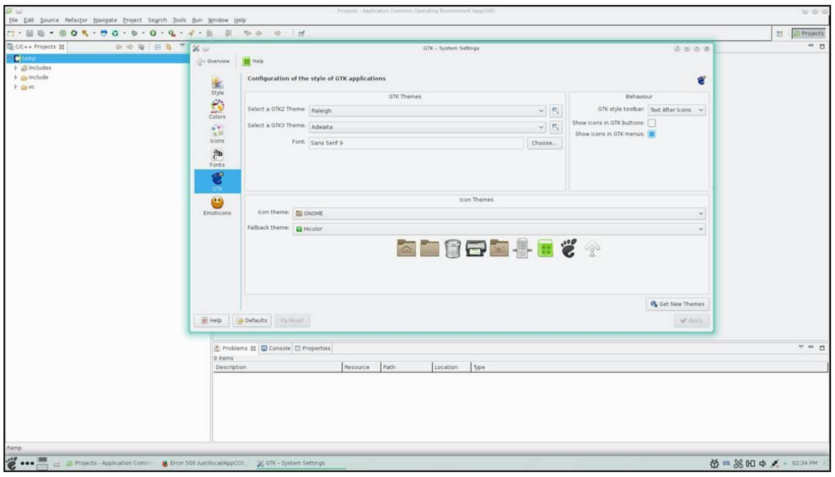
NOTE:

1. This feature requires a license. Click **http://mapusoft.com/downloads/AppCOE-evaluation/** to request an evaluation license.

2. On OpenSuse 13.2, change the GTK2 Theme setting from "oxygen-gtk" to a different theme:

    - Click on the OpenSuse launcher icon and select "Configure Desktop".
    - On the dialog that appears, click on the "Application Appearance" icon.
    - Under both the Style and GTK sections, change any currently applied GTK, GTK2, or GTK3 settings such that any "Oxygen" related settings are change to a different setting. For example, select the "GTK" icon and then on that view, for "Select a GTK2 Theme:” choose a different item, such as "Raleigh".
    - Click "Apply" to save changes.

Changing the theme settings on OpenSUSE 13.2


Projects - Application Common Operating Environment (AppCOE)
File Edit Source Refactor Navigate Project Search Tools Run Window Help
GTK - System Settings
Overview
Help
Style
Colors
Icons
Fonts
GTK
Emoticons
Get New Themes
Help
Defaults
Reset
Apply
Problems
Console
Properties

Configuration of the style of GTK applications

GTK Themes

Select a GTK2 Theme: Raleigh

Select a GTK3 Theme: Adwaita

Font: Sans Serif 9 Choose...

Behaviour

GTK style toolbar: Text After Icons

Show icons in GTK buttons: ☐

Show icons in GTK menus: ☑

Icon Themes

Icon theme: GNOME

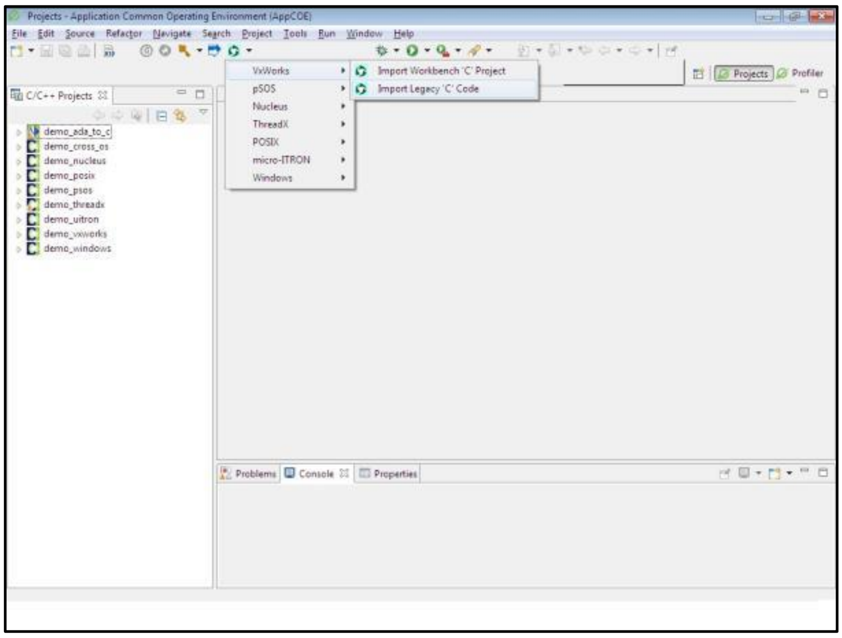
Fallback theme: Hicolor

0 items

Description	Resource	Path	Location	Type

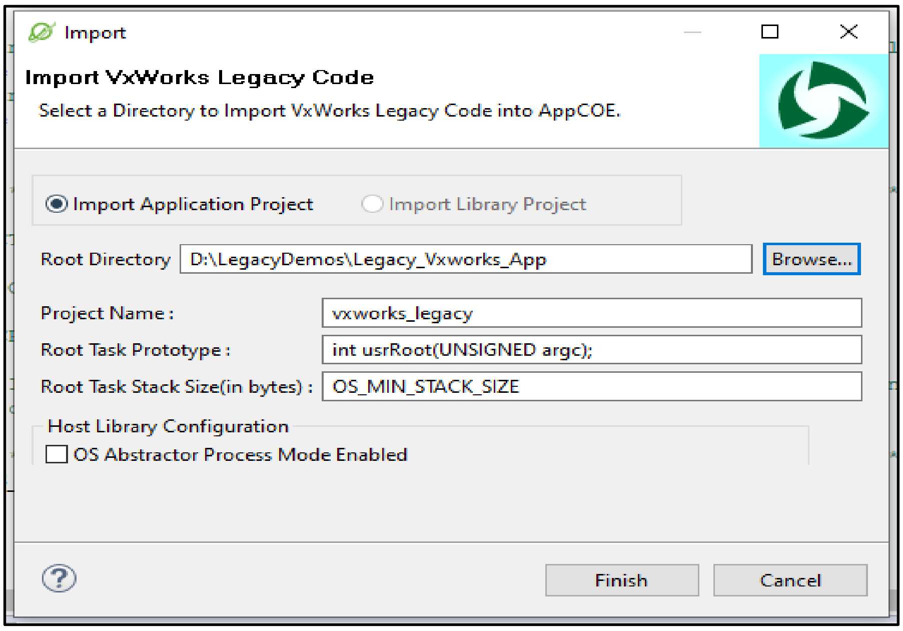
Select **Tools> Porting >VxWorks> Import Legacy ‘C’ Code** as shown inFigure 5_10. You can also click on the Porting icon from the task bar.

Figure 5_10: Porting VxWorks Legacy ‘C’ Code in AppCOE



1. On AppCOE Import Window select the Import Application Project/Library Project radio button with reference to your project. Here we are considering importing an application project for example purpose.
2. Select the root directory from where you want to import the legacy code by clicking on **Browse** button next to **the** text box, and click **Next** as shown inFigure 5_11.
3. On Select Host Library Configuration window, select **OS Abstractor Process Mode** if the imported application runs in multiple processes.

Figure 5_11: Import VxWorks Legacy Code Window


Import

Import VxWorks Legacy Code

Select a Directory to Import VxWorks Legacy Code into AppCOE.

[✓ Import Application Project] Import Library Project

Root Directory: D:\LegacyDemos\Legacy_Vxworks_App

Project Name : vxworks_legacy

Root Task Prototype : int usrRoot(UNSIGNED argc);

Root Task Stack Size(in bytes) : OS_MIN_STACK_SIZE

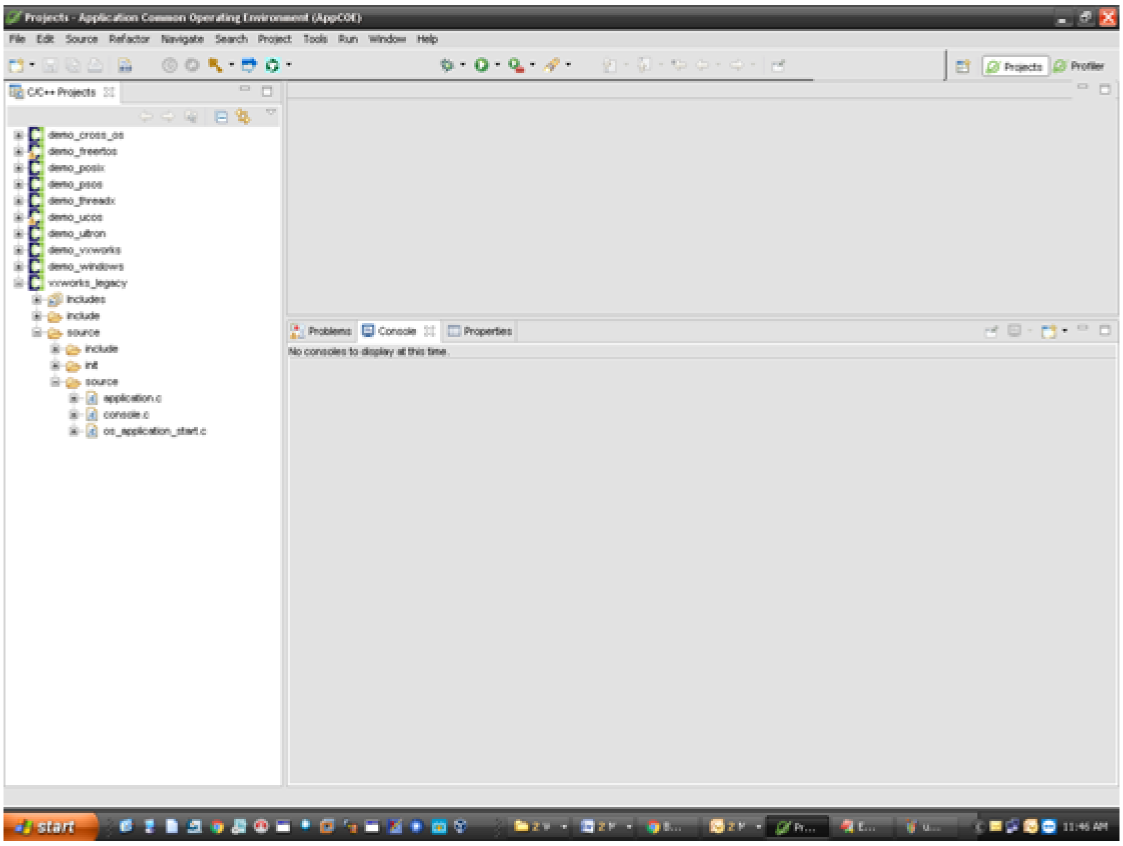
Host Library Configuration

☐ OS Abstractor Process Mode Enabled

4. Enter the project name for which you want to import the legacy code in the **Project Name** text box.
5. Enter the root task prototype as **int usrRoot(UNSIGNED argc)**;, next to **Root Task Prototype** text box.

6. Enter the root task stack size, next to the **Root Task Stack Size** text box. The value should be in bytes.**Note:** By Default, Root Task Stack Size should be OS_MIN_STACK_SIZE, even though if you changed.
7. Click **Finish** to complete the importing of legacy code into AppCOE.
8. You have successfully imported the legacy vxWorks code and a project with your given project name is created in the current workspace as shown in Figure 5_12.

Figure 5_12: ImportedvxWorks Legacy Code output



No consoles to display at this time.

Method 3– Manually Porting Legacy Applications using Import Feature

Step 1: In your source code, remove references to the original OS include files and use os_target.h and the header files of your ported legacy API instead.

1. Remove the original OS specific initialization code and use OS_Application_Init function call instead (refer to the OS Abstractor Interface Reference Manual).
2. Create an AppCOE C/C++ project for your legacy application and select the legacy API that your application will need (E.g.: to port VxWorks application, you need to check the “Include OS Changer VxWorks Interface API’s”).
3. If your application uses any APIs that are not supported under AppCOE, re-write the code using OS Abstractor Interface APIs.
4. Import your legacy application into the new project.
5. Compile and link your application and resolve all compiler and linker errors.
6. Run or debug your application under AppCOE host in an x86 environment. You should rewrite/replace any hardware specific code in your application for this step.

Step 2: Moving from AppCOE Host to target using AppCOE Optimized Target Code Generator:

1) Generate the code for your target OS using the AppCOE Optimized Target Code Generator.
2) Using cross-compiler compile, link, and download the AppCOE generated code to your target.
3) Port low level drivers and hardware interrupt code as required (refer to OSAbstractor Interface I/O and device driver APIs sections in the OS Abstractor Reference Manual).
4) Resolve any run time errors.

Porting POSIX/LINUX Legacy 'C' Code

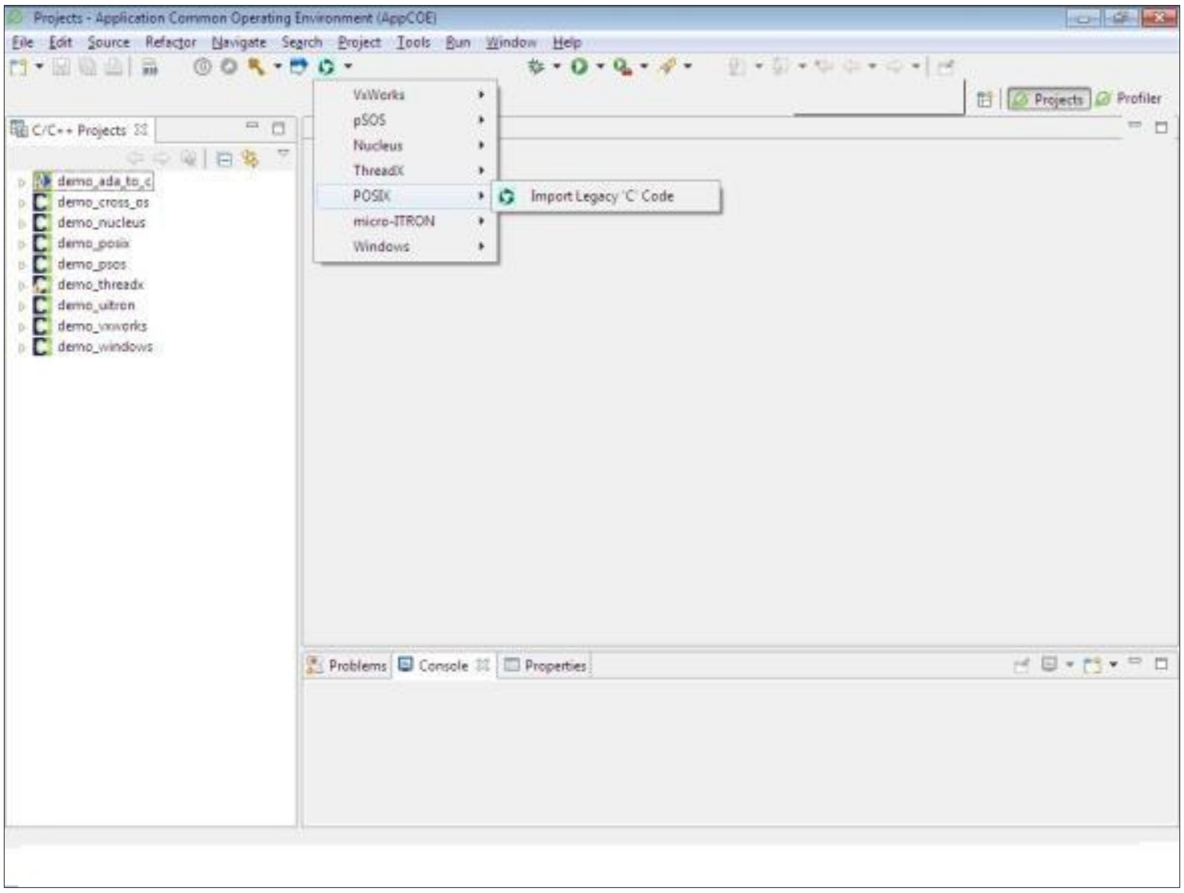
This section explains Porting POSIX/LINUX Legacy Applications using AppCOE Porting Plugin. A sample porting of POSIX/LINUX Legacy applications using AppCOE is described with an example here.

NOTE: This feature requires a license. Click http://mapusoft.com/downloads/AppCOE-evaluation/ to request an evaluation license.

To port a sample POSIX/LINUX legacy application:

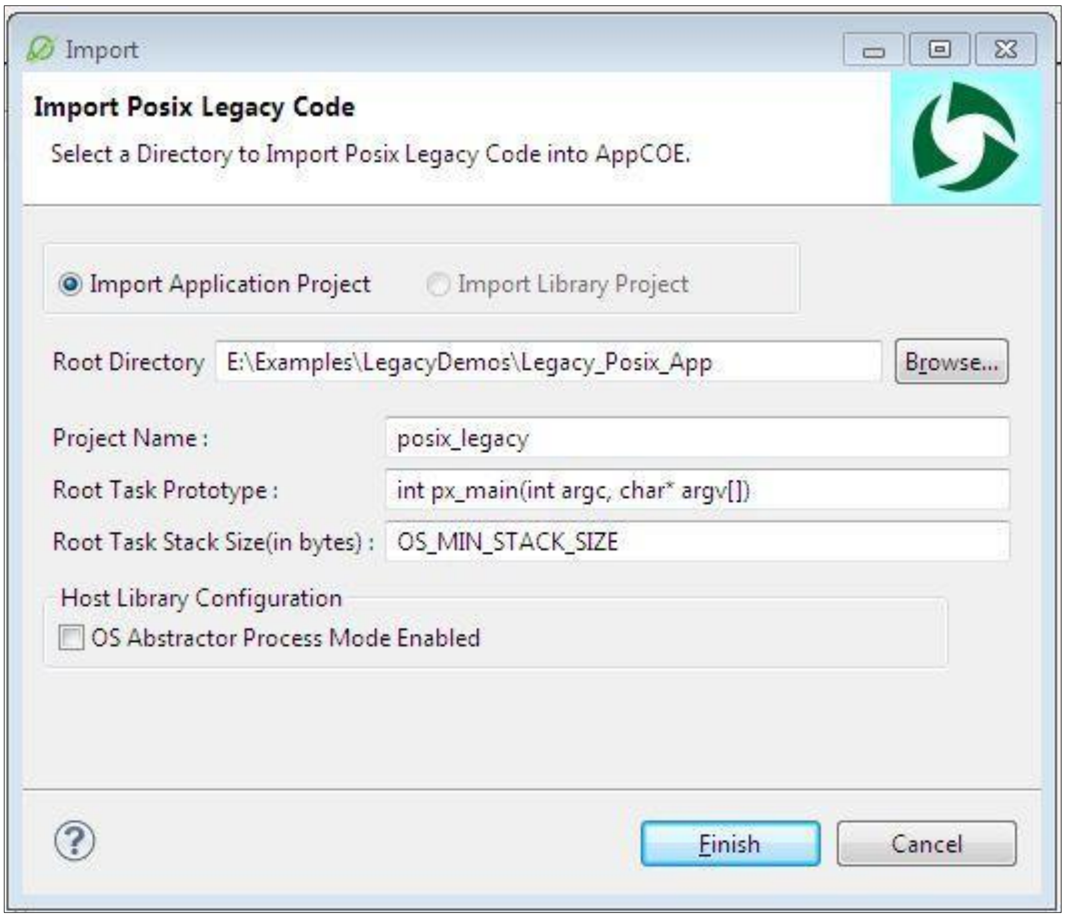
1. Select **Tools> Porting >POSIX/LINUX> Import Legacy 'C' Code** as shown inFigure 5_13. You can also click on the Porting icon from the task bar.

Figure 5_13: Porting POSIX/LINUX Legacy 'C' Code in AppCOE



3. On AppCOE Import Window select the Import Application Project/Library Project radio button with reference to your project. Here we are considering importing a application project for example purpose.
4. Select the root directory from where you want to import the legacy code by clicking on **Browse** button next to the text box, and click **Next** as shown inFigure 5_13.

Figure 5_13: Import POSIX/LINUX Legacy Code Window


Import

Import Posix Legacy Code

Select a Directory to Import Posix Legacy Code into AppCOE.

(●) Import Application Project ( ) Import Library Project

Root Directory E:\Examples\LegacyDemos\Legacy_Posix_App

Project Name : posix_legacy

Root Task Prototype : int px_main(int argc, char* argv[])

Root Task Stack Size(in bytes) : OS_MIN_STACK_SIZE

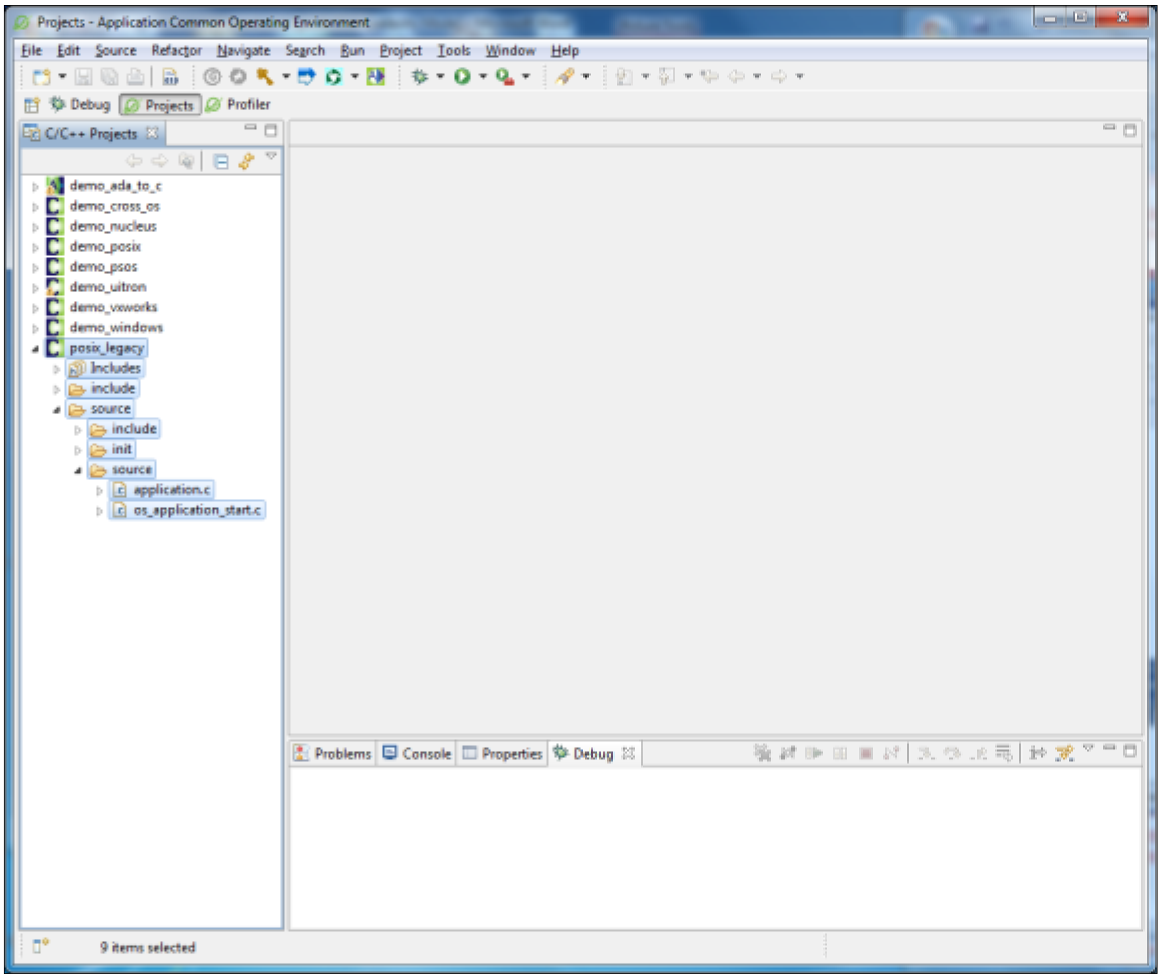
Host Library Configuration

[ ] OS Abstractor Process Mode Enabled

5. Enter the project name for which you want to import the legacy code in the **Project Name** text box.
6. Enter the root task prototype as**int px_main(int argc, char* argv[])**, next to **Root Task Prototype** text box.
7. Enter the root task stack size, next to the **Root Task Stack Size** text box. The value should be in bytes.

8. Click **Finish** to complete the importing of legacy code into AppCOE. You can see POSIX/LINUX legacy code you have imported as shown in Figure 5_14.

Figure 5_14 : Importing POSIX/LINUX Legacy Code Output

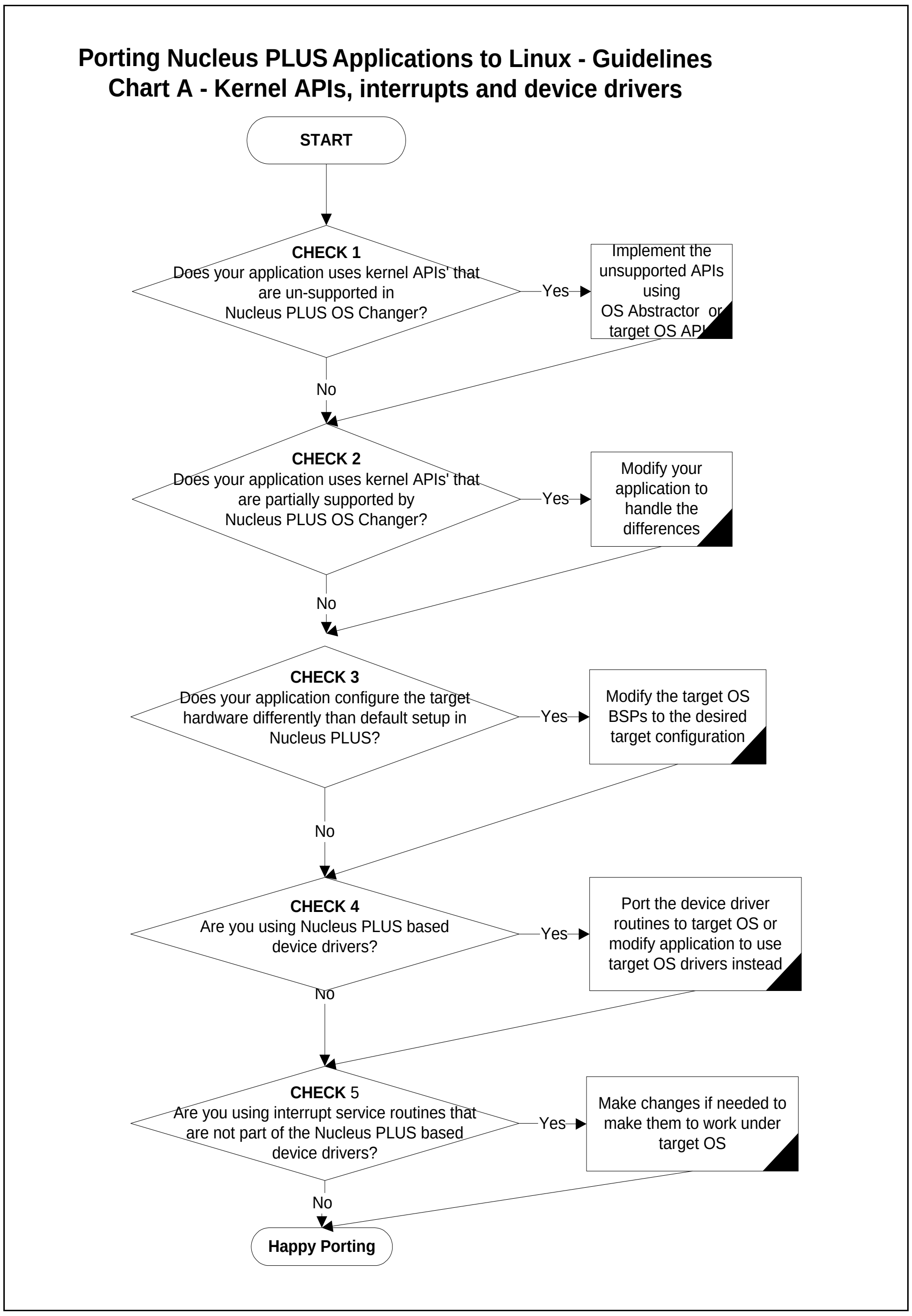


You have successfully imported the POSIX/LINUX legacy C code and a project with your given project name is created in the current workspace.

Porting Applications from Nucleus PLUS Legacy Code to Target OS

In most applications, using Nucleus OS Changer is straightforward. The effort required in porting is mostly at the underlying driver layer. Since we do not have specific information about your application, it will be hard to tell how much work is required. However, we want you to be fully aware of the surrounding issues upfront so that necessary steps could be taken for a successful and timely porting. This section provides porting guidelines in a flow chart format. This covers issues relating with Nucleus OS Changer, device drivers, interrupt service routines, etc. It is possible that we have not addressed all your application specific issues in the flow chart, so for further information, contact MapuSoft Technologies.

Figure 5_15: Porting Nucleus PLUS Applications



Porting Nucleus PLUS Applications to Linux - Guidelines
Chart A - Kernel APIs, interrupts and device drivers
START
CHECK 1
Does your application uses kernel APIs' that are un-supported in Nucleus PLUS OS Changer?
Yes
Implement the unsupported APIs using OS Abstractor or target OS API
No
CHECK 2
Does your application uses kernel APIs' that are partially supported by Nucleus PLUS OS Changer?
Yes
Modify your application to handle the differences
No
CHECK 3
Does your application configure the target hardware differently than default setup in Nucleus PLUS?
Yes
Modify the target OS BSPs to the desired target configuration
No
CHECK 4
Are you using Nucleus PLUS based device drivers?
Yes
Port the device driver routines to target OS or modify application to use target OS drivers instead
No
CHECK 5
Are you using interrupt service routines that are not part of the Nucleus PLUS based device drivers?
Yes
Make changes if needed to make them to work under target OS
No
Happy Porting

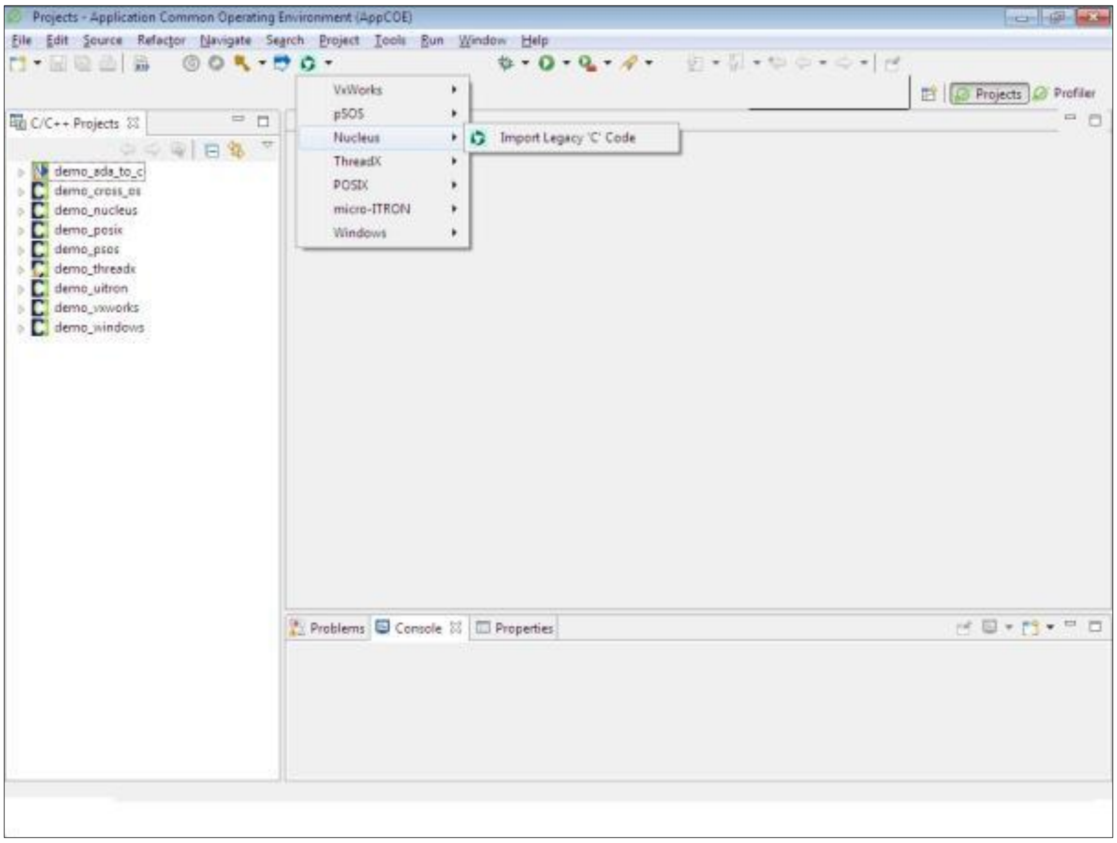
Porting Nucleus Legacy ‘C’ Code

This section explains Porting Nucleus Legacy Applications using AppCOE Porting Plugin. A sample porting of Nucleus Legacy application using AppCOE is described with an example here.

NOTE: This feature requires a license. Click http://mapusoft.com/downloads/AppCOE-evaluation/to request an evaluation license.

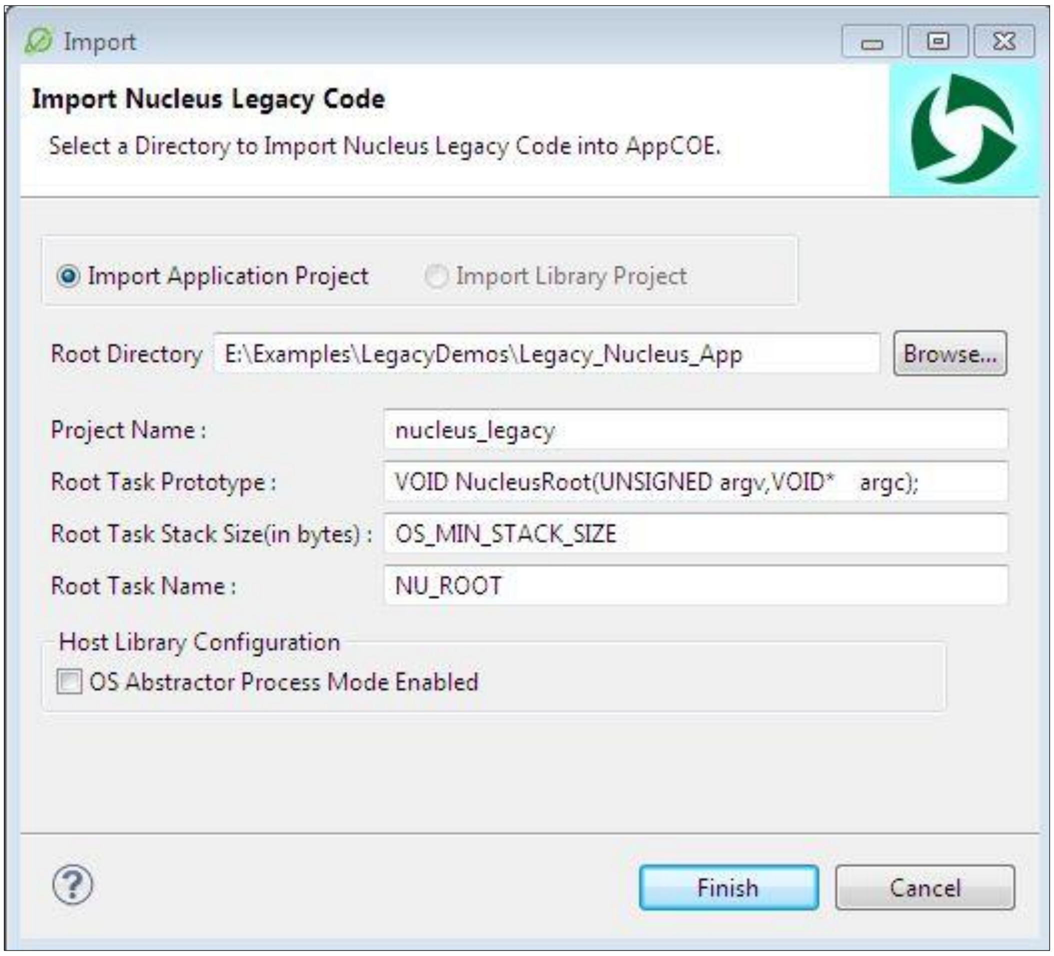
1. Select **Tools> Porting > Nucleus > Import Legacy ‘C’ Code** as shown inFigure 5_16. You can also click on the Porting icon from the task bar.

Figure 5_16: Importing Nucleus Legacy ‘C’ Code in AppCOE



2. On AppCOE Import Window select the Import Application Project/Library Project radio button with reference to your project. Here we are considering importing an application project for example purpose.
3. Select the root directory from where you want to import the legacy code by clicking on Browse button next to the text box, and click Next as shown in Figure 5_17.
4. **On Select Host Librar**y Configuration window, select **OS Abstractor Process Mode** if the imported application runs in multiple process

Figure 5_17: Import Nucleus Legacy Code Window


Import
Import Nucleus Legacy Code
Select a Directory to Import Nucleus Legacy Code into AppCOE.
Browse...
Host Library Configuration
Finish
Cancel

(● Import Application Project) ○ Import Library Project

Root Directory: E:\Examples\LegacyDemos\Legacy_Nucleus_App

Project Name : nucleus_legacy

Root Task Prototype : VOID NucleusRoot(UNSIGNED argv,VOID* argc);

Root Task Stack Size(in bytes) : OS_MIN_STACK_SIZE

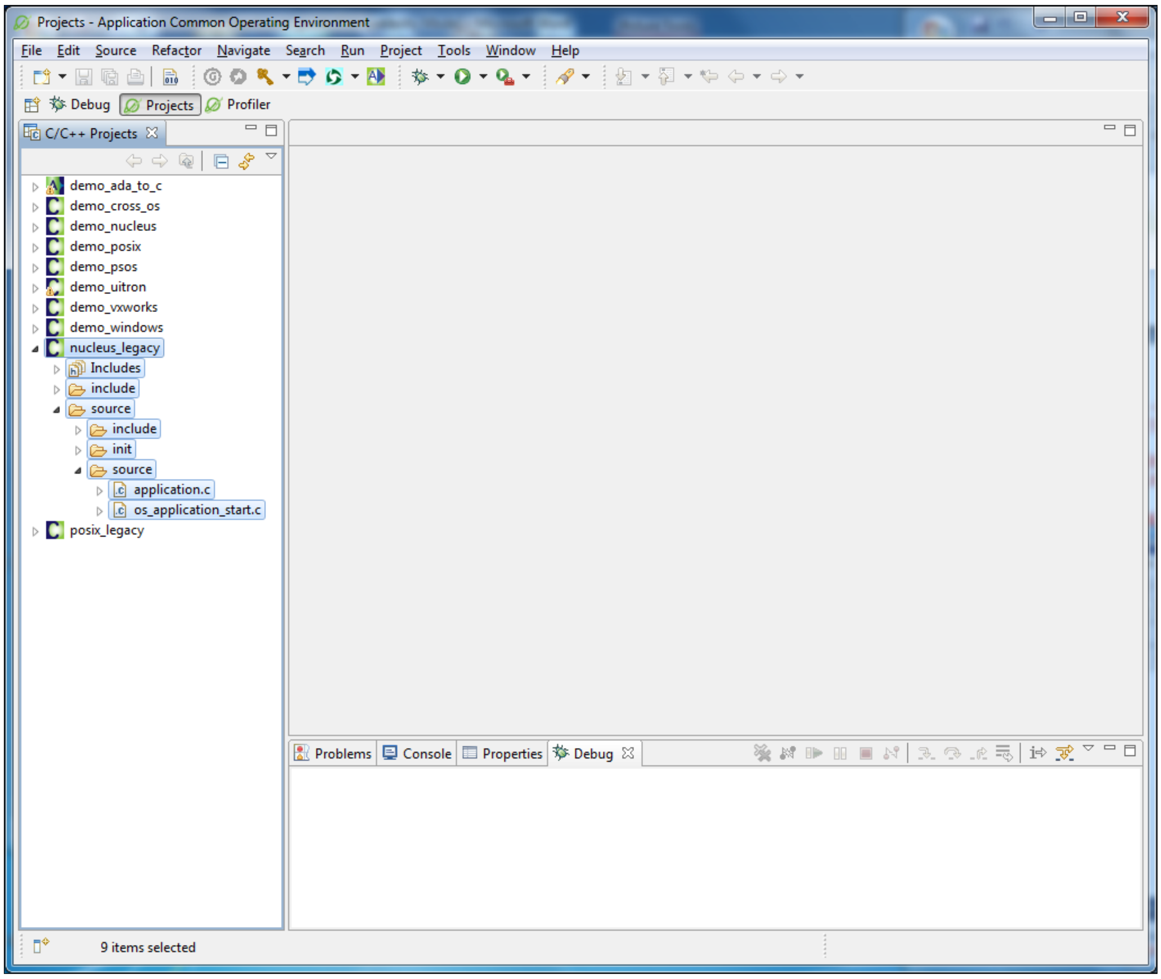
Root Task Name : NU_ROOT

☐ OS Abstractor Process Mode Enabled

5. Enter the project name for which you want to import the legacy code in the **Project Name** text box.
6. Enter the root task prototype as**VOID NucleusRoot(UNSIGNEDargv,VOID* argc);**, next to **Root Task Prototype** text box.
7. Enter the root task stack size, next to the **Root Task Stack Size** text box. The value should be in bytes.
8. Enter the root task name, next to **Root Task Name**text box.

9. Click **Finish** to complete the importing of legacy code into AppCOE. You can see the output as shown inFigure 5_18.

Figure 5_18: Importing Nucleus Code Output



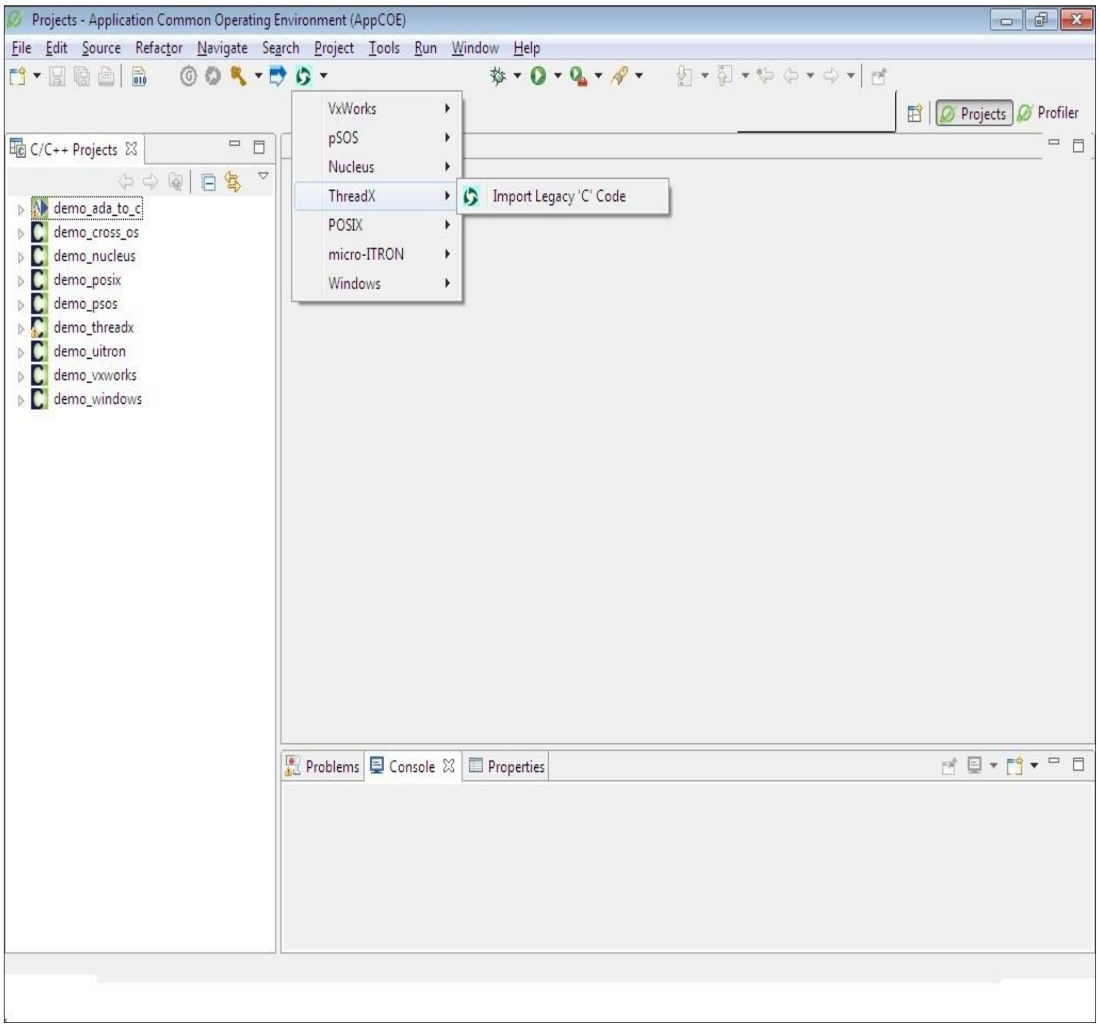
10. You have successfully imported Nucleus legacy C code and a project with yourgiven project name is created in the current workspace.

Porting Threadx Legacy ‘C’ Code
This section explains Porting Threadx Legacy Applications using AppCOE Porting Plugin. A sample porting of Threadx Legacy application using AppCOE is described with an example here.

NOTE: This feature requires a license. Click http://mapusoft.com/downloads/AppCOE-evaluation/ to request an evaluation license.

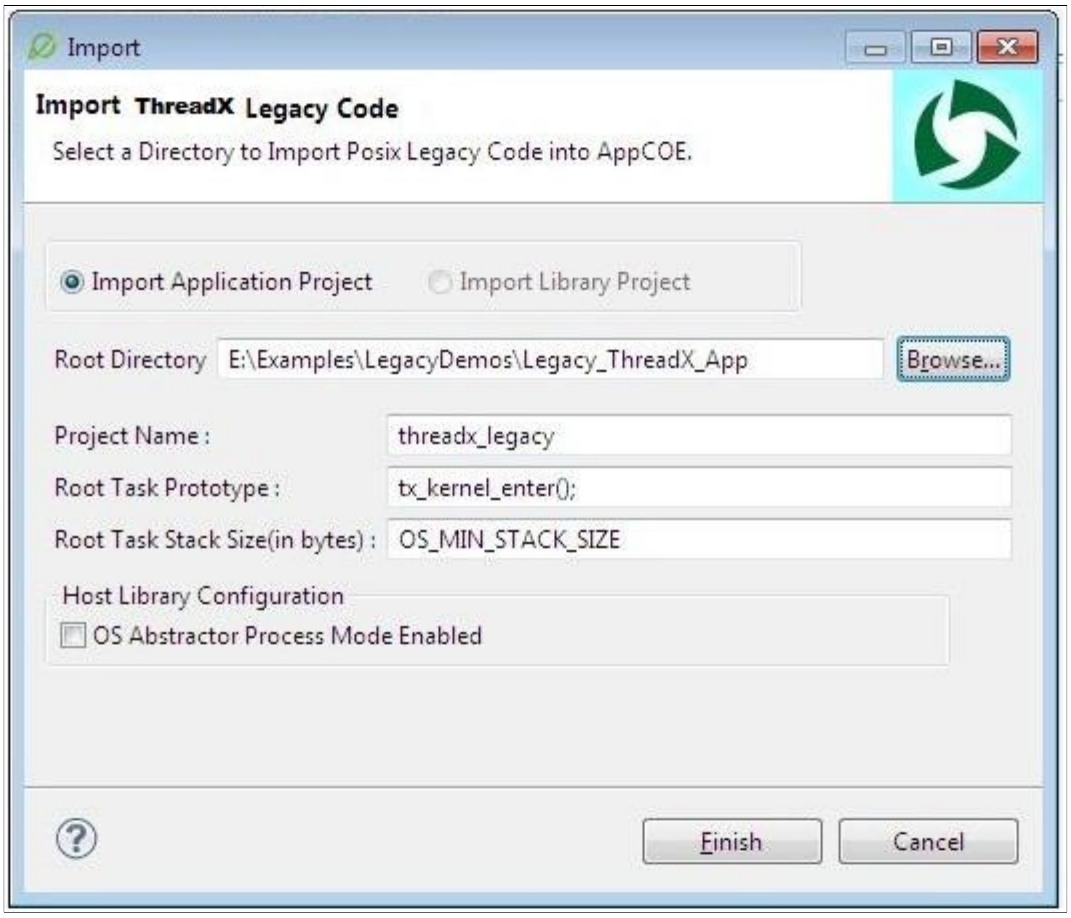
1. Select **Tools> Porting > ThreadX> Import Legacy ‘C’ Code** as shown inFigure 5_19. You can also click on the Porting icon from the task bar.

Figure 5_19: Importing ThreadX Legacy ‘C’ Code in AppCOE



2. On AppCOE Import Window select the Import Application Project/Library Project radio button with reference to your project. Here we are considering importing a application project for example purpose.
3. Select the root directory from where you want to import the legacy code by clicking on **Browse** button next to **the** text box, and click **Next** as shown inFigure 5_20.
4. On Select Host Library Configuration window, select **OS Abstractor Process Mode** if the imported application runs in multiple process

Figure 5_20: Import Threadx Legacy Code Window


Import

Import ThreadX Legacy Code

Select a Directory to Import Posix Legacy Code into AppCOE.

[✓ Import Application Project] Import Library Project

Root Directory: E:\Examples\LegacyDemos\Legacy_ThreadX_App

Project Name : threadx_legacy

Root Task Prototype : tx_kernel_enter();

Root Task Stack Size(in bytes) : OS_MIN_STACK_SIZE

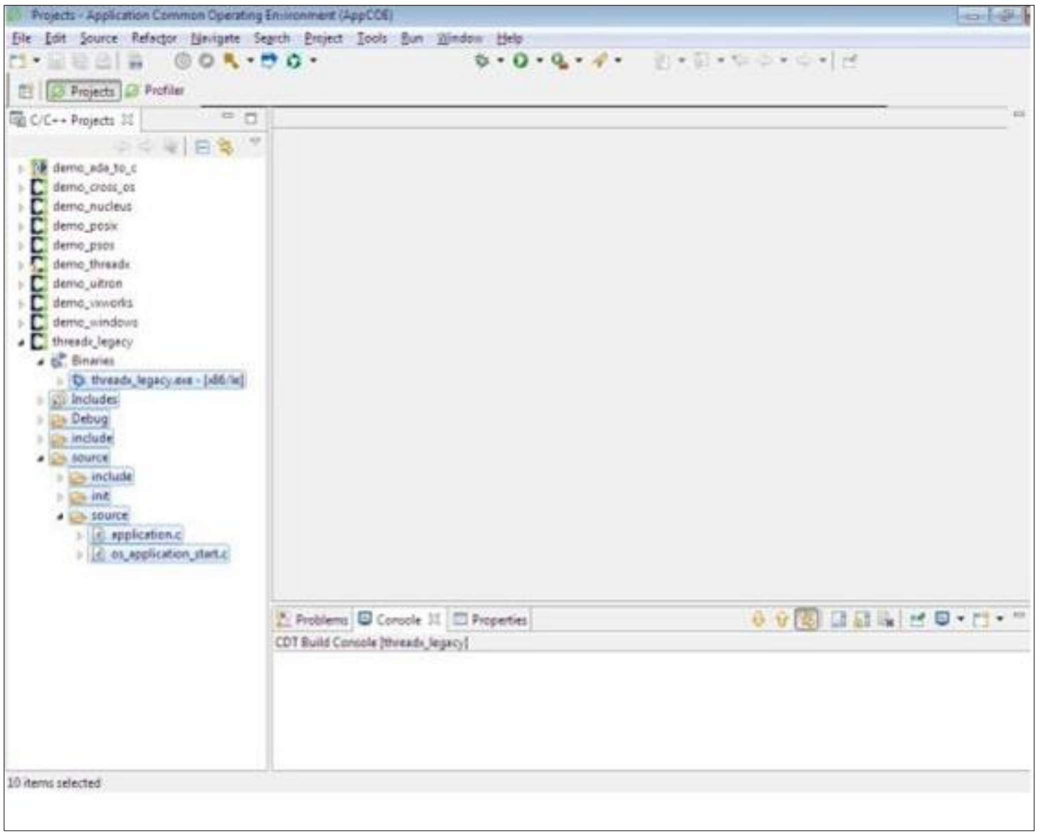
Host Library Configuration

☐ OS Abstractor Process Mode Enabled

5. Enter the project name for which you want to import the legacy code in the **Project Name** text box.
6. Enter the root task as a **tx_kernel_enter();** prototype, next to **Root Task Prototype** text box.
7. Enter the root task stack size, next to the **Root Task Stack Size** text box. The value should be in bytes.
8. Enter the root task name, next to **Root Task Name**text box.

9. Click **Finish** to complete the importing of legacy code into AppCOE. You can see the output as shown in Figure 5_21.

Figure 5_21: Importing Threadx Code Output



10. You have successfully imported ThreadX legacy C code and a project with your given project name is created in the current workspace.

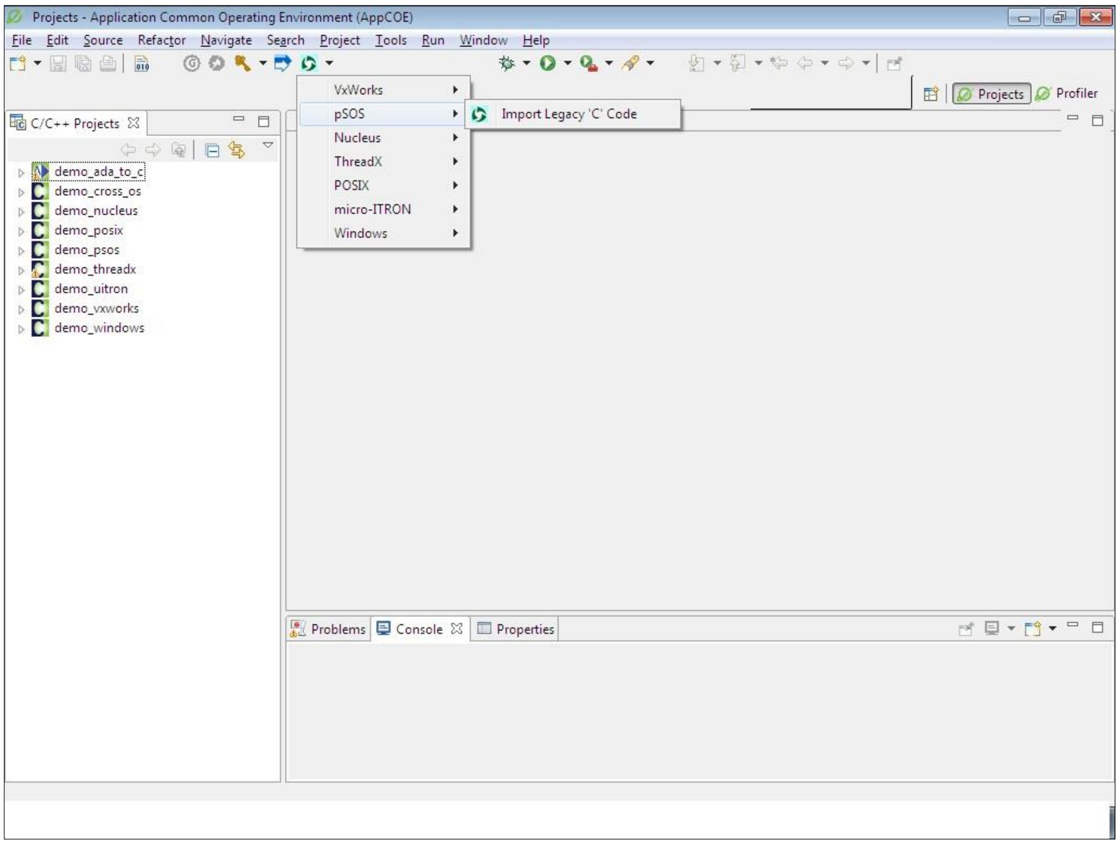
Porting pSOS Legacy 'C' Code

This section describes the sample porting of pSOS Legacy Applications using AppCOE Porting Plug-in. A description for porting pSOS Legacy applications using AppCOE is described with an example here.

NOTE: This feature requires a license. Click http://mapusoft.com/downloads/AppCOE-evaluation/ to request an evaluation license.

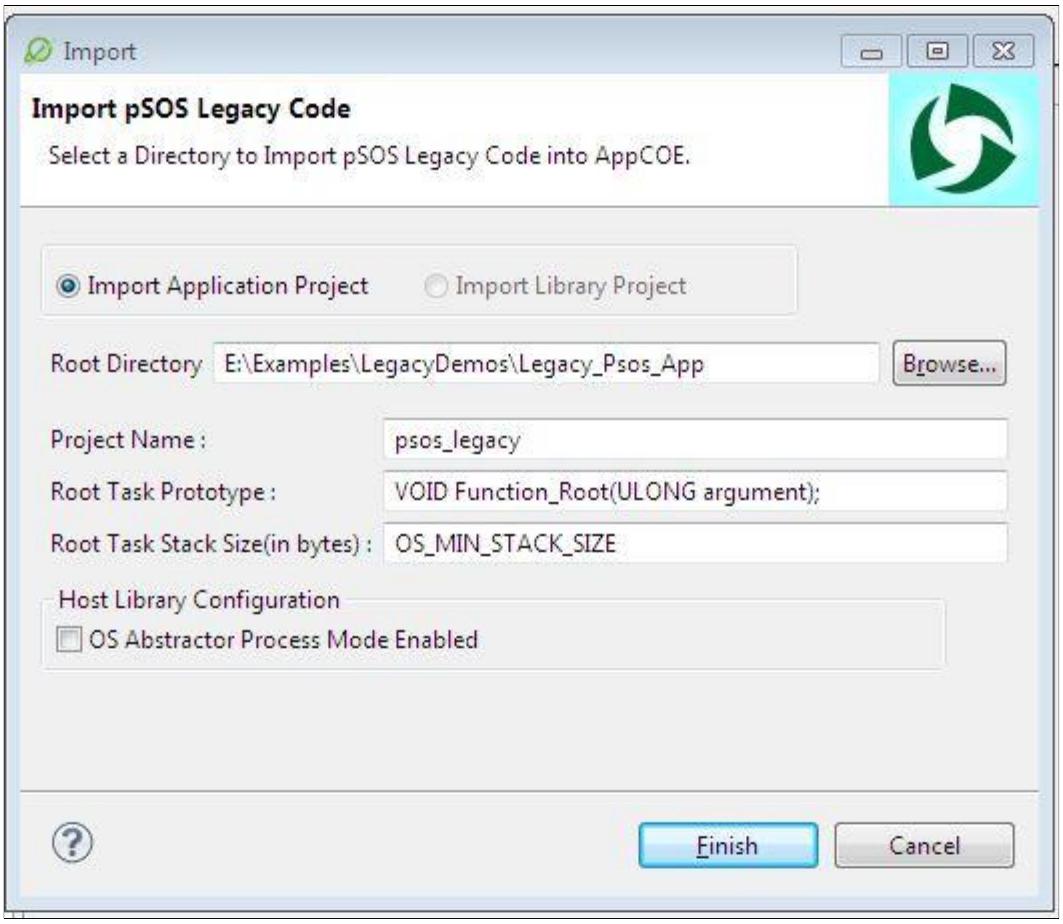
1. Select **Tools> Porting >pSOS> Import Legacy 'C' Code** as shown inFigure 5_22, you can also click on the Porting icon from the task bar.

Figure 5_22: Importing pSOS Legacy 'C' Code in AppCOE



3. On AppCOE Import Window select the Import Application Project/Library Project radio button with reference to your project. Here we are considering importing a application project for example purpose.
4. Select the root directory from where you want to import the legacy code by clicking on **Browse** button next to **the** text box, and click **Next**as shown Figure 5_23.
5. On Select Host Library Configuration window, select **OS Abstractor Process Mode** if the imported application runs in multiple process

Figure 5_23: Import pSOS Legacy Code Window



Import pSOS Legacy Code

Select a Directory to Import pSOS Legacy Code into AppCOE.

[✓ Import Application Project] Import Library Project

Root Directory E:\Examples\LegacyDemos\Legacy_Psos_App

Project Name : psos_legacy

Root Task Prototype : VOID Function_Root(ULONG argument);

Root Task Stack Size(in bytes) : OS_MIN_STACK_SIZE

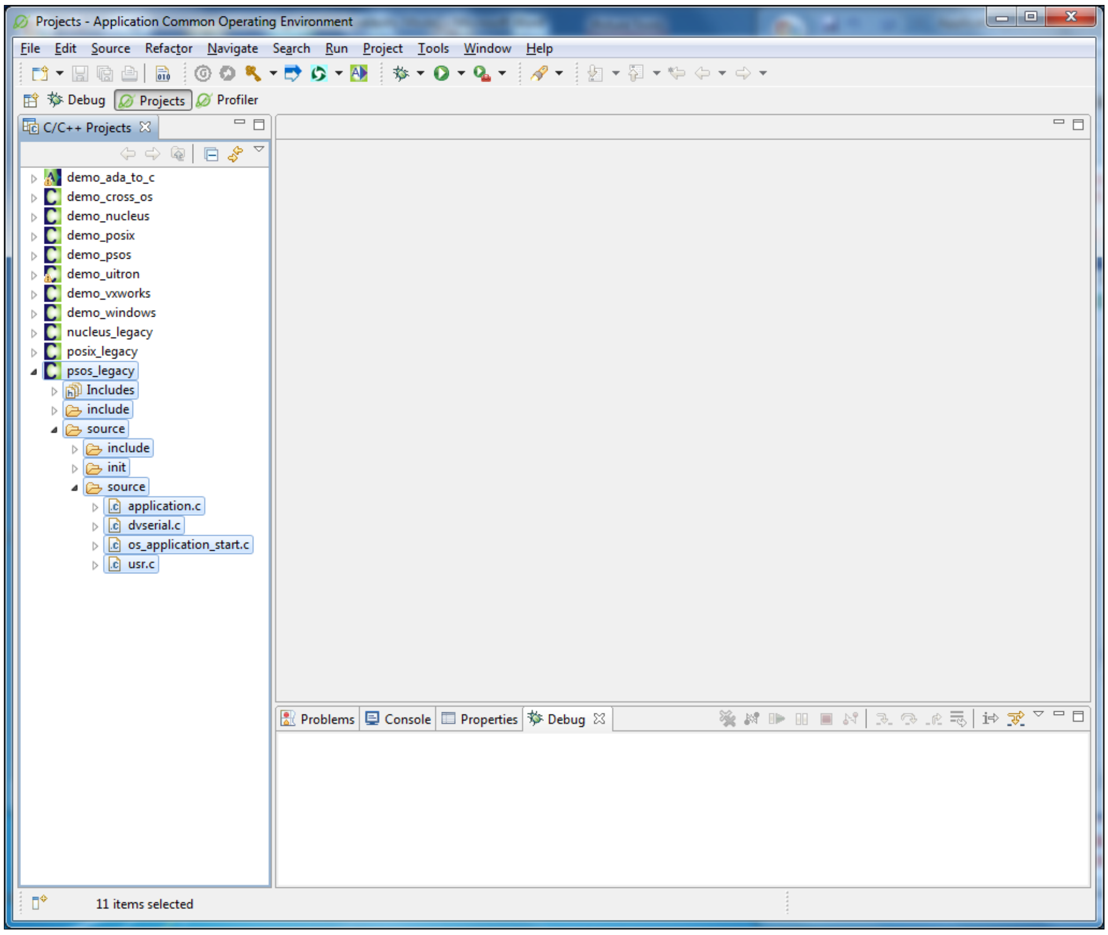
Host Library Configuration

☐ OS Abstractor Process Mode Enabled

6. Enter the project name for which you want to import the legacy code in the **Project Name** text box as shown in the Figure .
7. Enter the root task prototype as `VOID Function_Root(ULONG argument);`, next to **Root Task Prototype** text box as shown in the Figure 5_24.
8. Enter the root task stack size, next to the **Root Task Stack Size** text box as shown in Figure 5_24.. The value should be in bytes.

9. Click **Finish** to complete the importing of legacy code into AppCOE. You can see POSIX/LINUX legacy code you have imported as shown in Figure 5_24 .

Figure 5_24: Importing pSOS Legacy Code Output



10. You have successfully imported pSOS legacy C code and a project with your given project name is created in the current workspace.

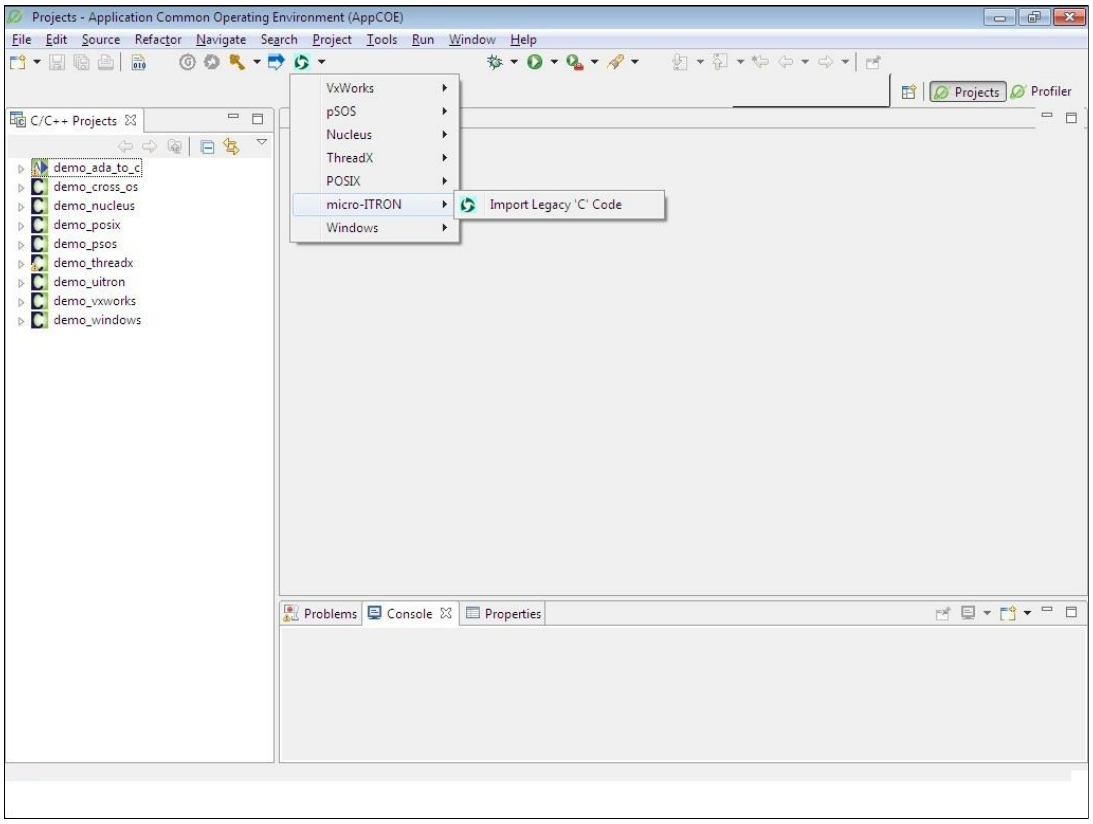
Porting micro-ITRON Legacy 'C' Code

This section explains porting of micro-ITRON Legacy Applications using AppCOE Porting Plugin. A sample porting of micro-ITRON Legacy applications using AppCOE is described with an example here.

NOTE: This feature requires a license. Click http://mapusoft.com/downloads/AppCOE-evaluation/ to request an evaluation license.

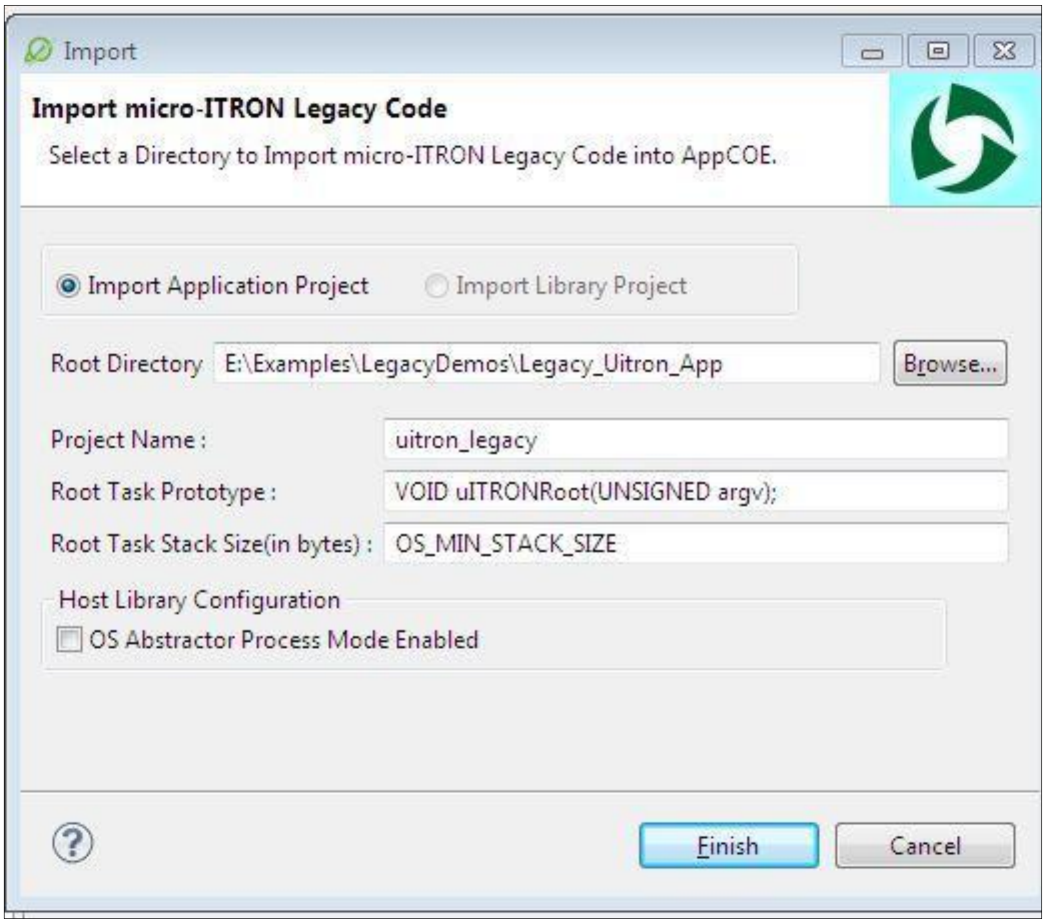
1. Select Tools> **Porting >micro-ITRON> Import Legacy 'C' Code** as shown inFigure 5_25. You can also click on the Porting icon from the task bar.

Figure 5_25: Importing micro-ITRON Legacy 'C' Code in AppCOE



3. On AppCOE Import Window select the Import Application Project/Library Project radio button with reference to your project. Here we are considering importing a application project for example purpose.
4. Select the root directory from where you want to import the legacy code by clicking on **Browse** button next to **the** text box, and click **Next** as shown in Figure 5_26.
5. On Select Host Library Configuration window, select**OS Abstractor Process Mode** if the imported application runs in multiple process

Figure 5_26: Import micro-ITRON Legacy Code Window



Import

Import micro-ITRON Legacy Code

Select a Directory to Import micro-ITRON Legacy Code into AppCOE.

(● Import Application Project) (○ Import Library Project)

Root Directory: E:\Examples\LegacyDemos\Legacy_Uitron_App

Project Name: uitron_legacy

Root Task Prototype: VOID uITRONRoot(UNSIGNED argv);

Root Task Stack Size(in bytes): OS_MIN_STACK_SIZE

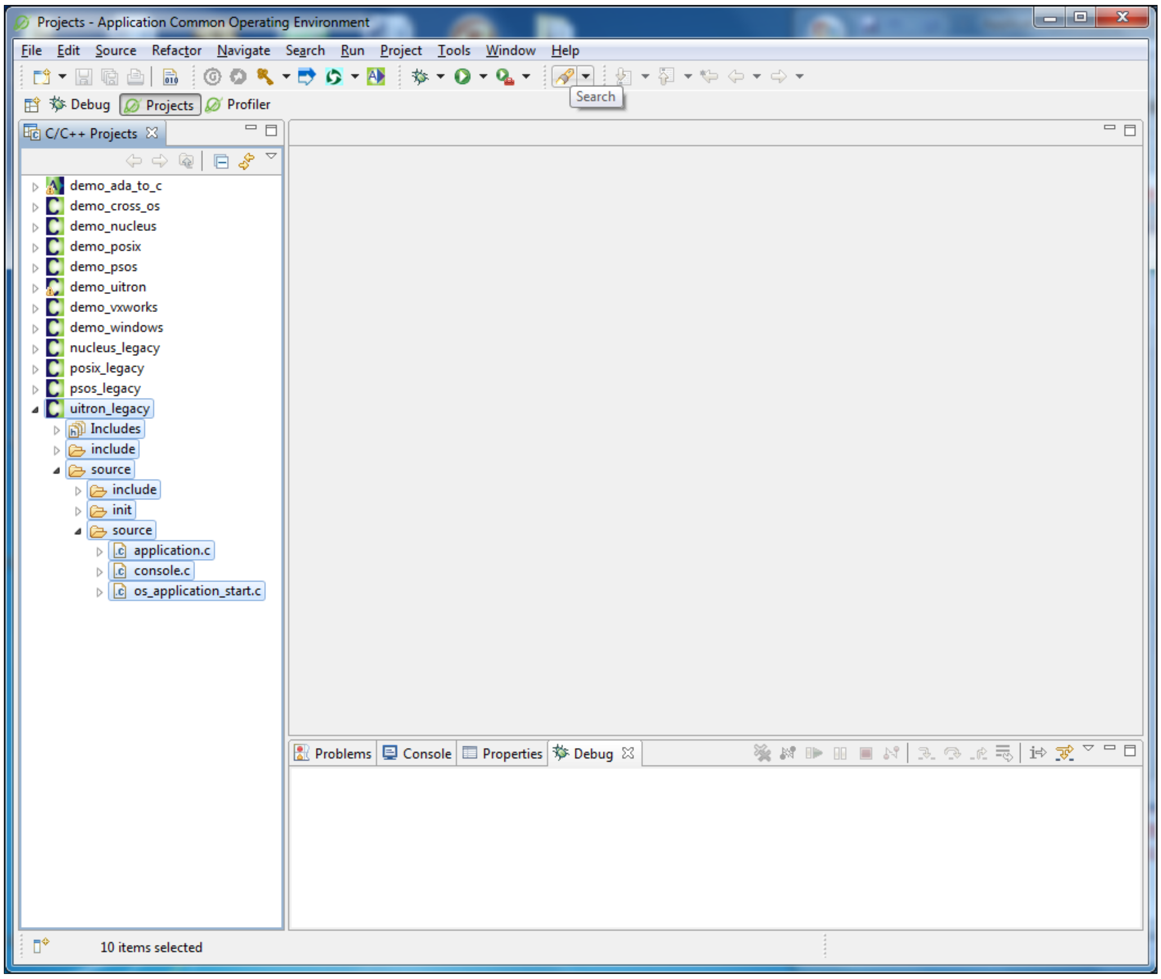
Host Library Configuration

☐ OS Abstractor Process Mode Enabled

6. Enter the project name for which you want to import the legacy code in the **Project Name** text box.
7. Enter the root task prototype as a `VOID uITRONRoot(UNSIGNED argv);`, next to **Root Task Prototype** text box as shown in Figure 5_27.
8. Enter the root task stack size, next to the **Root Task Stack Size** text box as shown. The value should be in bytes.

9. Click **Finish** to complete the importing of legacy code into AppCOE . You can see micro-ITRON legacy code you have imported as shown in Figure 5_27.

Figure 5_27: Importing micro-ITRON Legacy Code Output



10. You have successfully imported micro-ITRON legacy C code and a project with your given project name is created in the current workspace.

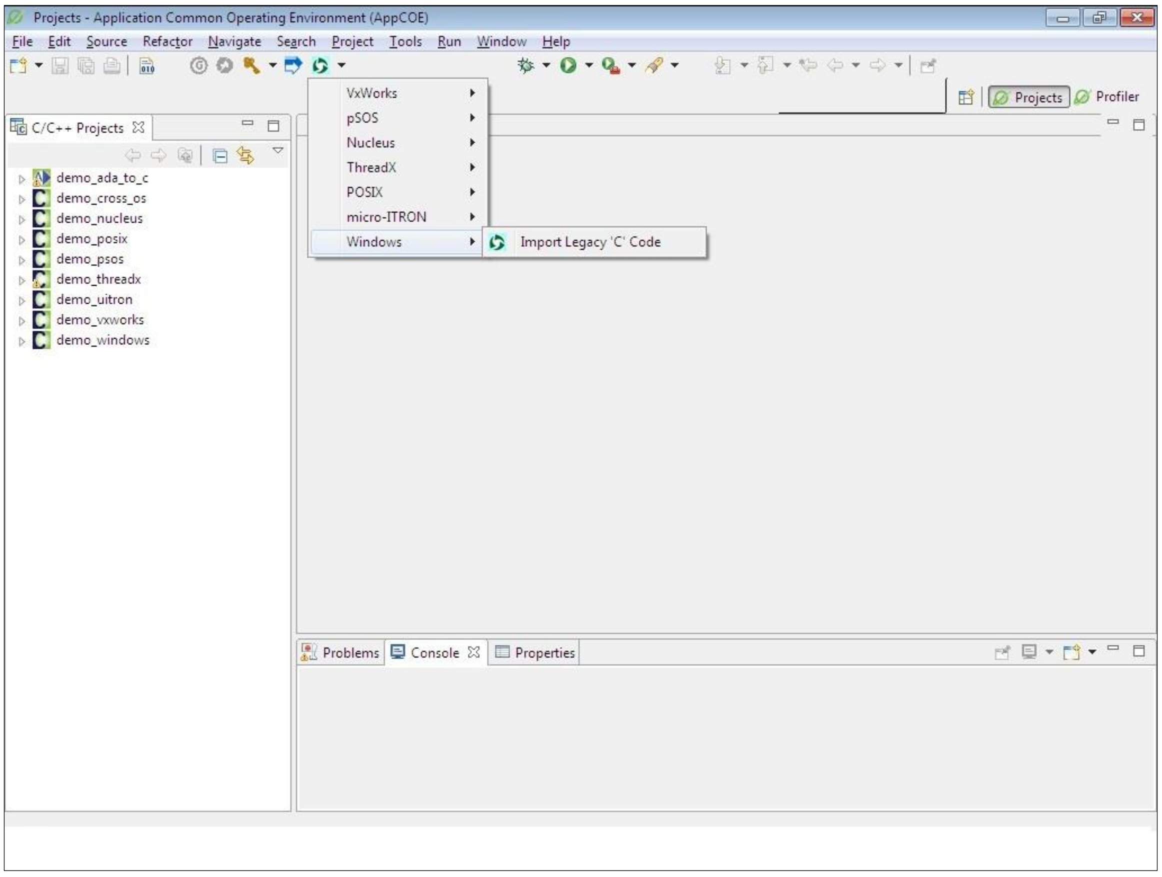
Porting Windows Legacy 'C' Code

This section explains porting of Windows Legacy Applications using AppCOE Porting Plug-in. A sample porting of Windows Legacy applications using AppCOE is described with an example here.

NOTE: This feature requires a license. Click http://mapusoft.com/downloads/AppCOE-evaluation/ to request an evaluation license.

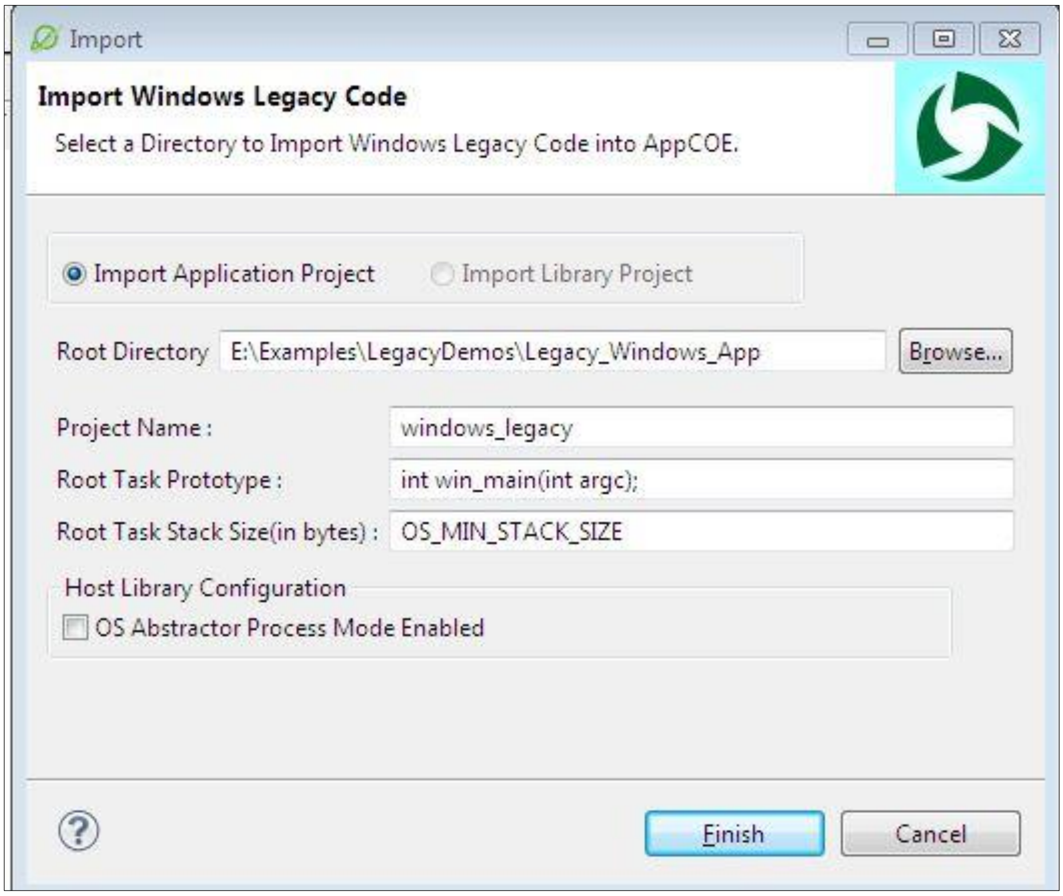
1. Select **Tools> Porting >Windows> Import Legacy 'C' Code** as shown inFigure 5_28. You can also click on the Porting icon from the task bar.

Figure 5_28: Importing Windows Legacy 'C' Code in AppCOE



3. On AppCOE Import Window select the Import Application Project/Library Project radio button with reference to your project. Here we are considering importing a application project for example purpose.
4. Select the root directory from where you want to import the legacy code by clicking on **Browse** button next to **the** text box, and click **Next** as shown inFigure 5_29.
5. On Select Host Library Configuration window, select **OS Abstractor Process Mode** if the imported application runs in multiple process

Figure 5_29: Import Windows Legacy Code



Import

Import Windows Legacy Code

Select a Directory to Import Windows Legacy Code into AppCOE.

[● Import Application Project] ○ Import Library Project

Root Directory: E:\Examples\LegacyDemos\Legacy_Windows_App

Project Name : windows_legacy

Root Task Prototype : int win_main(int argc);

Root Task Stack Size(in bytes) : OS_MIN_STACK_SIZE

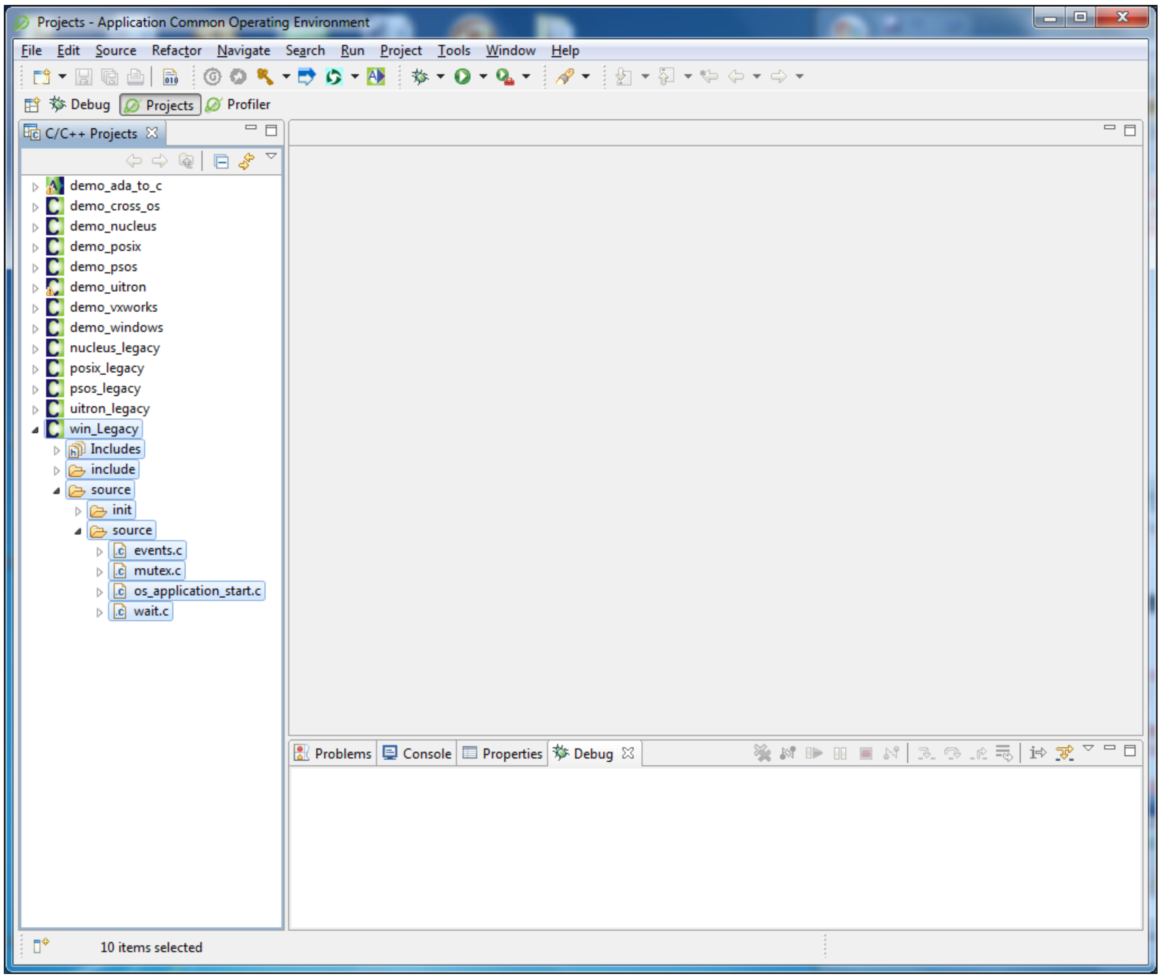
Host Library Configuration

☐ OS Abstractor Process Mode Enabled

6. Enter the project name for which you want to import the legacy code in the **Project Name** text box as shown in the Figure 5_29.
7. Enter the root task prototype like `int win_main(intargc);` next to **Root Task Prototype** text box as shown in the Figure 5_29.
8. Enter the root task stack size, next to the **Root Task Stack Size** text box as shown in the Figure 5_29. The value should be in bytes.

9. Click **Finish** to complete the importing of legacy code into AppCOE. You can see Windows legacy C code you have imported as shown in Figure 5_30.

Figure 5_30: Importing Windows Legacy Code Output



You have successfully imported Windows legacy code and a project with your given project name is created in the current workspace.

Note: Legacywindows is supported only when process mode is true, so the user might always check out the OS Abstractor Process Mode Enabled.

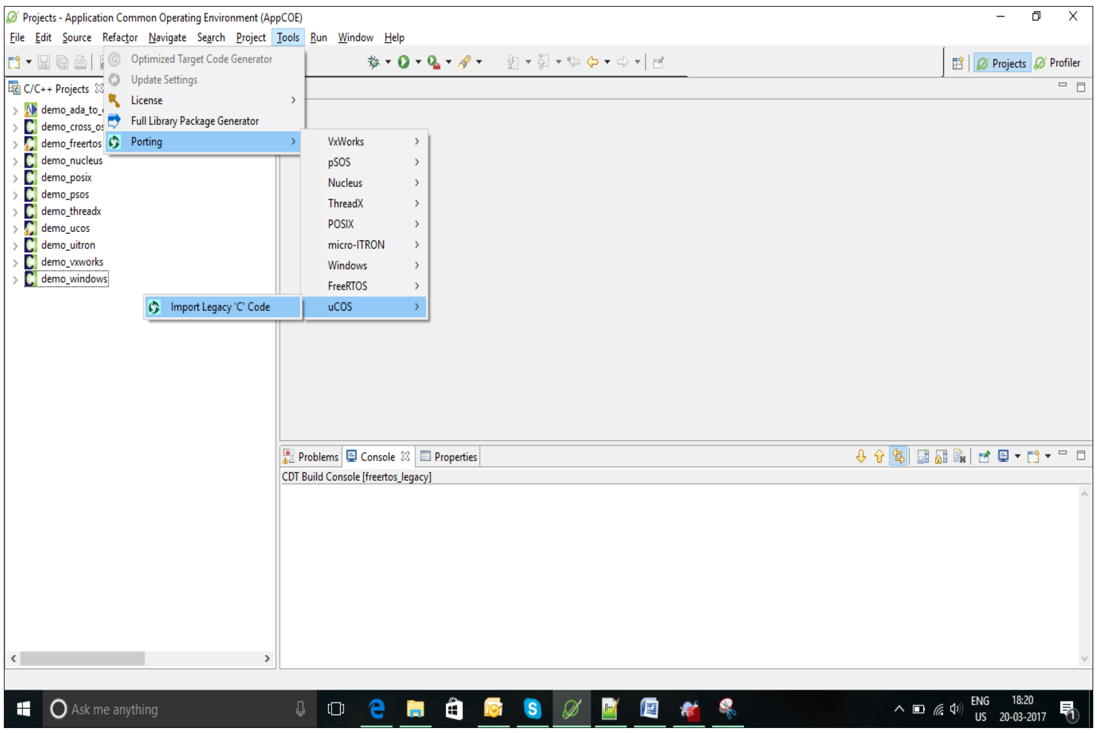
Porting µC/OS Legacy 'C' Code

This section explains porting of µC/OS Legacy Applications using AppCOE Porting Plugin. A sample porting of µC/OS Legacy applications using AppCOE is described with an example here.

NOTE: This feature requires a license. Click http://mapusoft.com/downloads/AppCOE-evaluation/ to request an evaluation license.

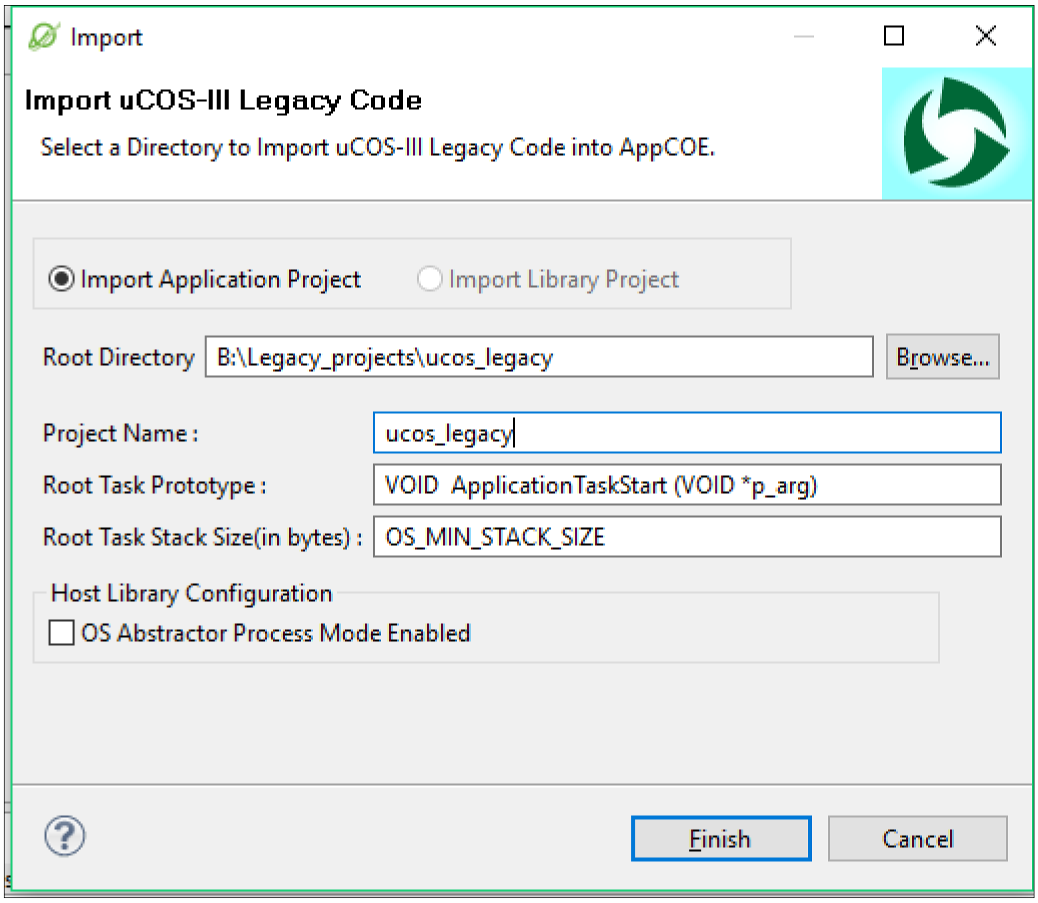
1. Select Tools> **Porting >µC/OS> Import Legacy 'C' Code** as shown inFigure 5_31. You can also click on the Porting icon from the task bar.

Figure 5_31: Importing µC/OSLegacy 'C' Code in AppCOE



3. On AppCOE Import Window select the Import Application Project/Library Project radio button with reference to your project. Here we are considering importing a application project for example purpose.
4. Select the root directory from where you want to import the legacy code by clicking on **Browse** button next to **the** text box, and click **Next** as shown in Figure 5_32.
5. On Select Host Library Configuration window, select**OS Abstractor Process Mode** if the imported application runs in multiple process

Figure 5_32: Import µC/OS Legacy Code Window



Import

Import uCOS-III Legacy Code

Select a Directory to Import uCOS-III Legacy Code into AppCOE.

[● Import Application Project] ○ Import Library Project

Root Directory: B:\Legacy_projects\ucos_legacy

Project Name : ucos_legacy

Root Task Prototype : VOID ApplicationTaskStart (VOID *p_arg)

Root Task Stack Size(in bytes) : OS_MIN_STACK_SIZE

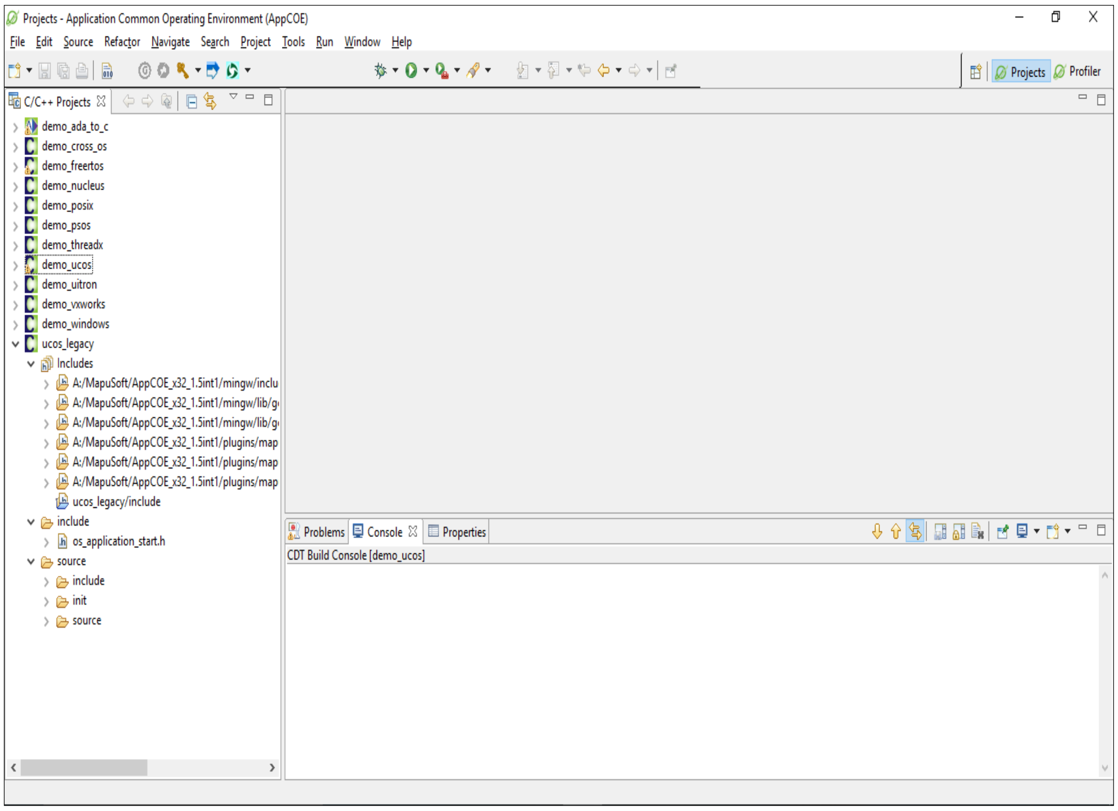
Host Library Configuration

☐ OS Abstractor Process Mode Enabled

6. Enter the project name for which you want to import the legacy code in the **Project Name** text box.
7. Enter the root task prototype as **VOID ApplicationTaskStart(VOID *p_arg);**, next to **Root Task Prototype** text box as shown in Figure 5_32.
8. Enter the root task stack size, next to the **Root Task Stack Size** text box as shown. The value should be in bytes.

9. Click **Finish** to complete the importing of legacy code into AppCOE . You can see µC/OS legacy code you have imported as shown in Figure 5_33.

Figure 5_33: Importing µC/OS Legacy Code Output


Projects - Application Common Operating Environment (AppCOE)
File Edit Source Refactor Navigate Search Project Tools Run Window Help
Projects Profiler
C/C++ Projects
demo_ada_to_c
demo_cross_os
demo_freertos
demo_nucleus
demo_posix
demo_psos
demo_threadx
demo_ucos
demo_uitron
demo_vxworks
demo_windows
ucos_legacy
Includes
A:/MapuSoft/AppCOE_x32_1.5int1/mingw/inclu
A:/MapuSoft/AppCOE_x32_1.5int1/mingw/lib/g
A:/MapuSoft/AppCOE_x32_1.5int1/mingw/lib/g
A:/MapuSoft/AppCOE_x32_1.5int1/plugins/map
A:/MapuSoft/AppCOE_x32_1.5int1/plugins/map
A:/MapuSoft/AppCOE_x32_1.5int1/plugins/map
ucos_legacy/include
include
os_application_start.h
source
include
init
source
Problems Console Properties
CDT Build Console [demo_ucos]

10. You have successfully imported µC/OS legacy C code and a project with your given project name is created in the current workspace.

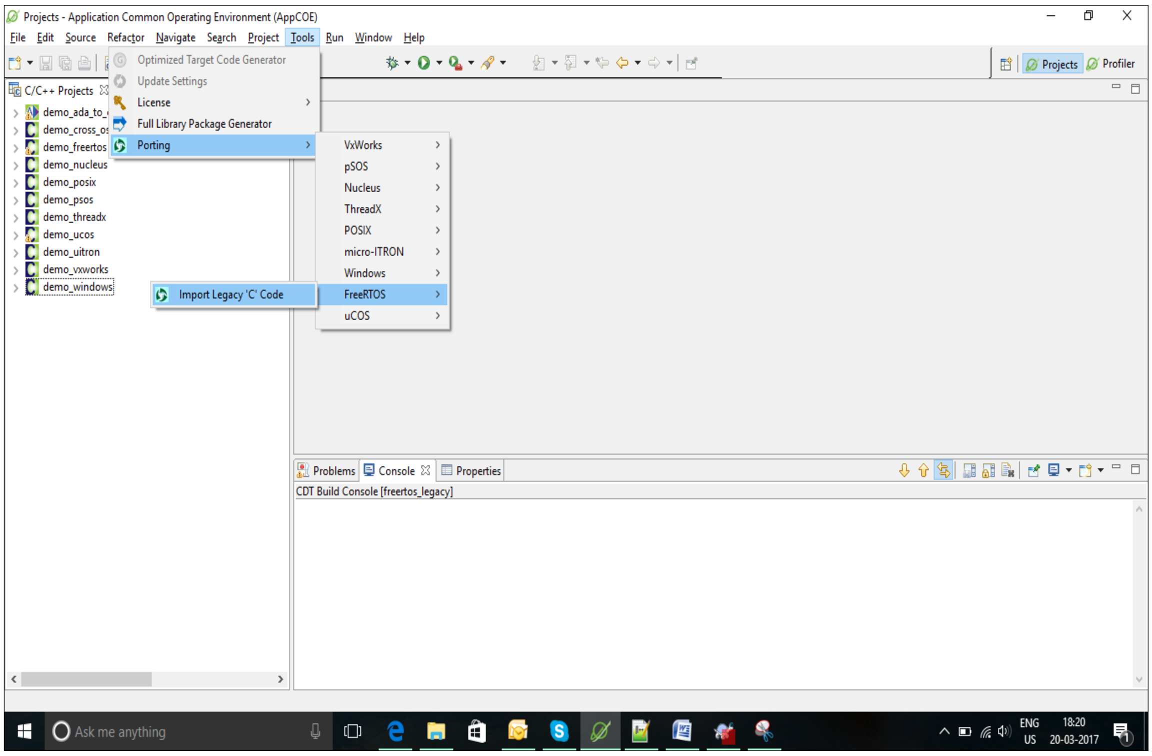
Porting FreeRTOSLegacy 'C' Code

This section explains porting of FreeRTOSLegacy Applications using AppCOE Porting Plugin. A sample porting of FreeRTOS Legacy applications using AppCOE is described with an example here.

NOTE: This feature requires a license. Click http://mapusoft.com/downloads/AppCOE-evaluation/ to request an evaluation license.

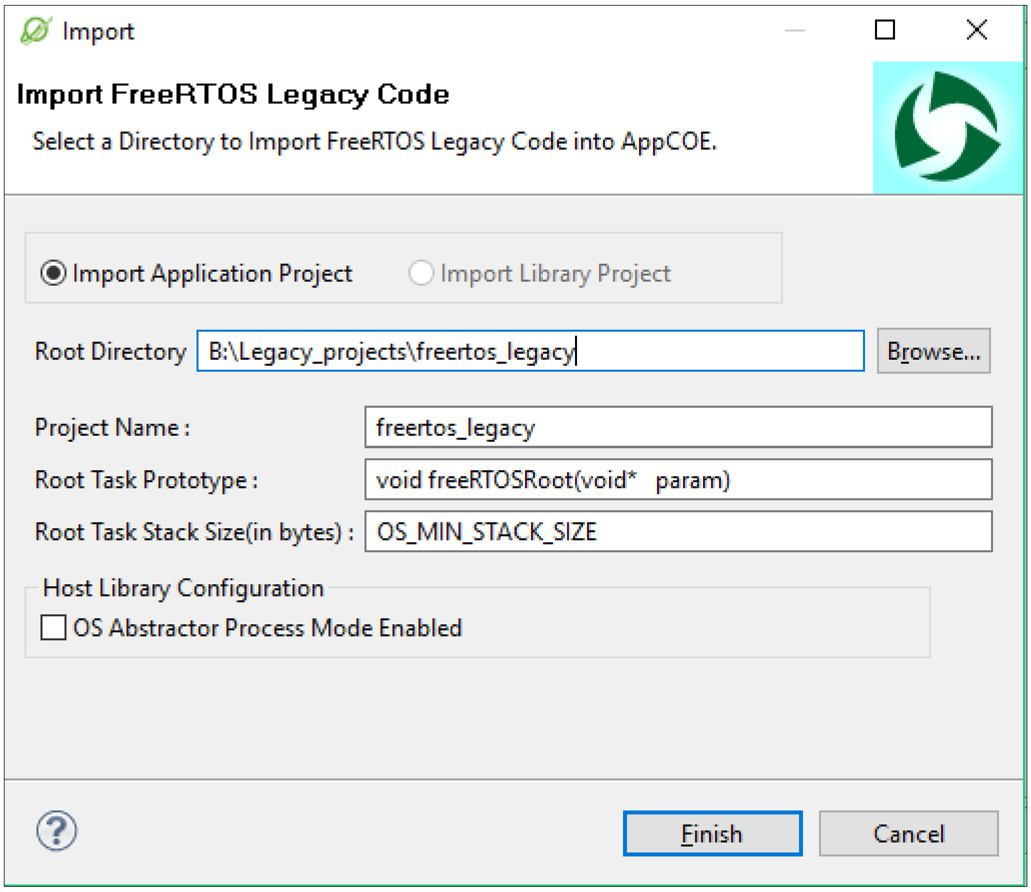
1. Select Tools> **Porting >FreeRTOS> Import Legacy 'C' Code** as shown inFigure 5_34. You can also click on the Porting icon from the task bar.

Figure 5_34: Importing FreeRTOSLegacy 'C' Code in AppCOE



3. On AppCOE Import Window select the Import Application Project/Library Project radio button with reference to your project. Here we are considering importing a application project for example purpose.
4. Select the root directory from where you want to import the legacy code by clicking on **Browse** button next to **the** text box, and click **Next** as shown in Figure 5_35.
5. On Select Host Library Configuration window, select **OS Abstractor Process Mode** if the imported application runs in multiple process

Figure 5_35: Import FreeRTOSLegacy Code Window


Import

Import FreeRTOS Legacy Code

Select a Directory to Import FreeRTOS Legacy Code into AppCOE.

(● Import Application Project) ○ Import Library Project

Root Directory: B:\Legacy_projects\freertos_legacy

Project Name : freertos_legacy

Root Task Prototype : void freeRTOSRoot(void*   param)

Root Task Stack Size(in bytes) : OS_MIN_STACK_SIZE

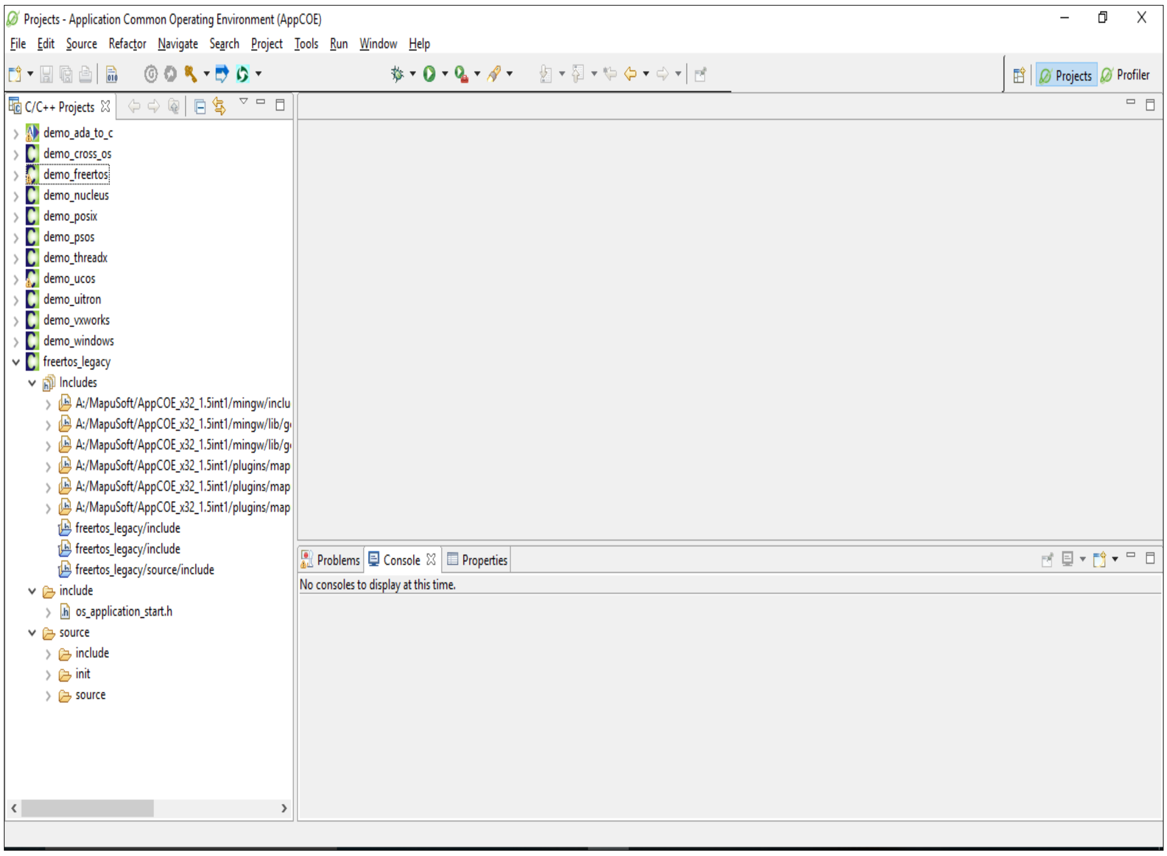
Host Library Configuration

☐ OS Abstractor Process Mode Enabled

6. Enter the project name for which you want to import the legacy code in the **Project Name** text box.
7. Enter the root task prototype as **void freeRTOSRoot(void*   param);**, next to **Root Task Prototype** text box as shown inFigure 5_35.
8. Enter the root task stack size, next to the **Root Task Stack Size** text box as shown. The value should be in bytes.

9. Click **Finish** to complete the importing of legacy code into AppCOE . You can see FreeRTOSlegacy code you have imported as shown in Figure 5_36.

Figure 5_36: Importing FreeRTOS Legacy Code Output


Projects - Application Common Operating Environment (AppCOE)
File Edit Source Refactor Navigate Search Project Tools Run Window Help
Projects
Profiler
C/C++ Projects
demo_ada_to_c
demo_cross_os
demo_freertos
demo_nucleus
demo_posix
demo_psos
demo_threadx
demo_ucos
demo_uitron
demo_vxworks
demo_windows
freertos_legacy
Includes
A:/MapuSoft/AppCOE_x32_1.5int1/mingw/inclu
A:/MapuSoft/AppCOE_x32_1.5int1/mingw/lib/g
A:/MapuSoft/AppCOE_x32_1.5int1/mingw/lib/g
A:/MapuSoft/AppCOE_x32_1.5int1/plugins/map
A:/MapuSoft/AppCOE_x32_1.5int1/plugins/map
A:/MapuSoft/AppCOE_x32_1.5int1/plugins/map
freertos_legacy/include
freertos_legacy/include
freertos_legacy/source/include
include
os_application_start.h
source
include
init
source
Problems
Console
Properties
No consoles to display at this time.

10. You have successfully imported FreeRTOS legacy C code and a project with your given project name is created in the current workspace.

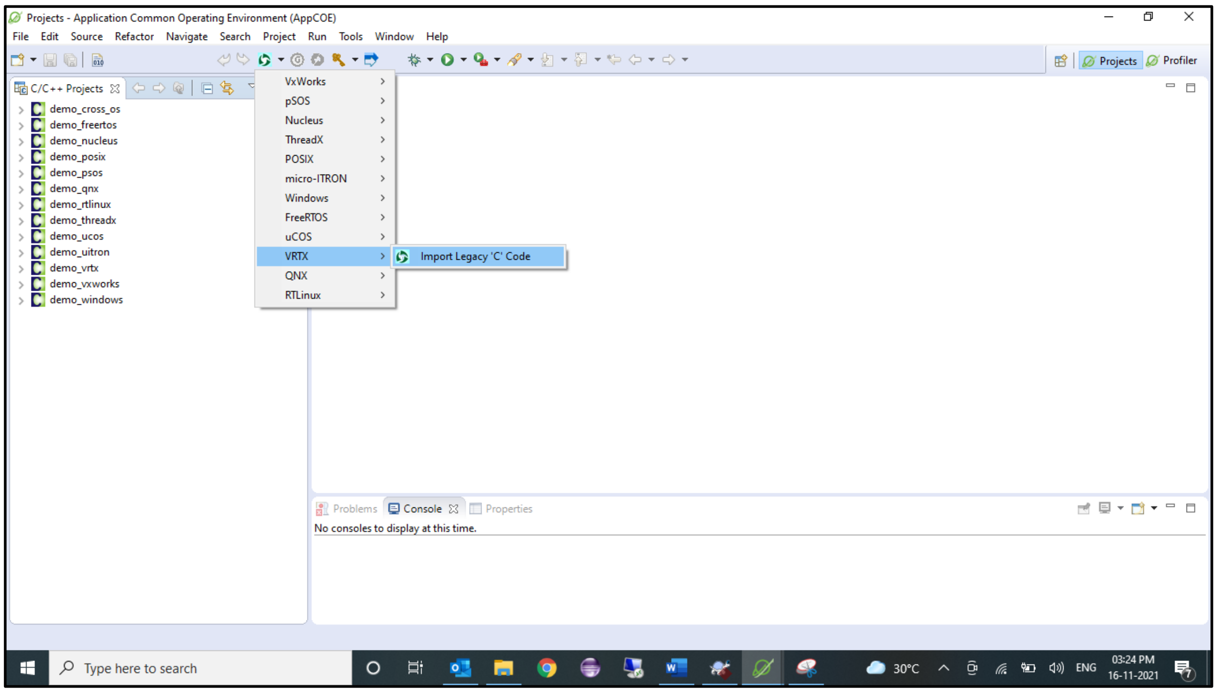
Porting VRTXLegacy ‘C’ Code

This section explains porting of VRTX Legacy Applications using AppCOE Porting Plugin. A sample porting of VRTX Legacy applications using AppCOE is described with an example here.

NOTE: This feature requires a license. Click http://mapusoft.com/downloads/AppCOE-evaluation/ to request an evaluation license.

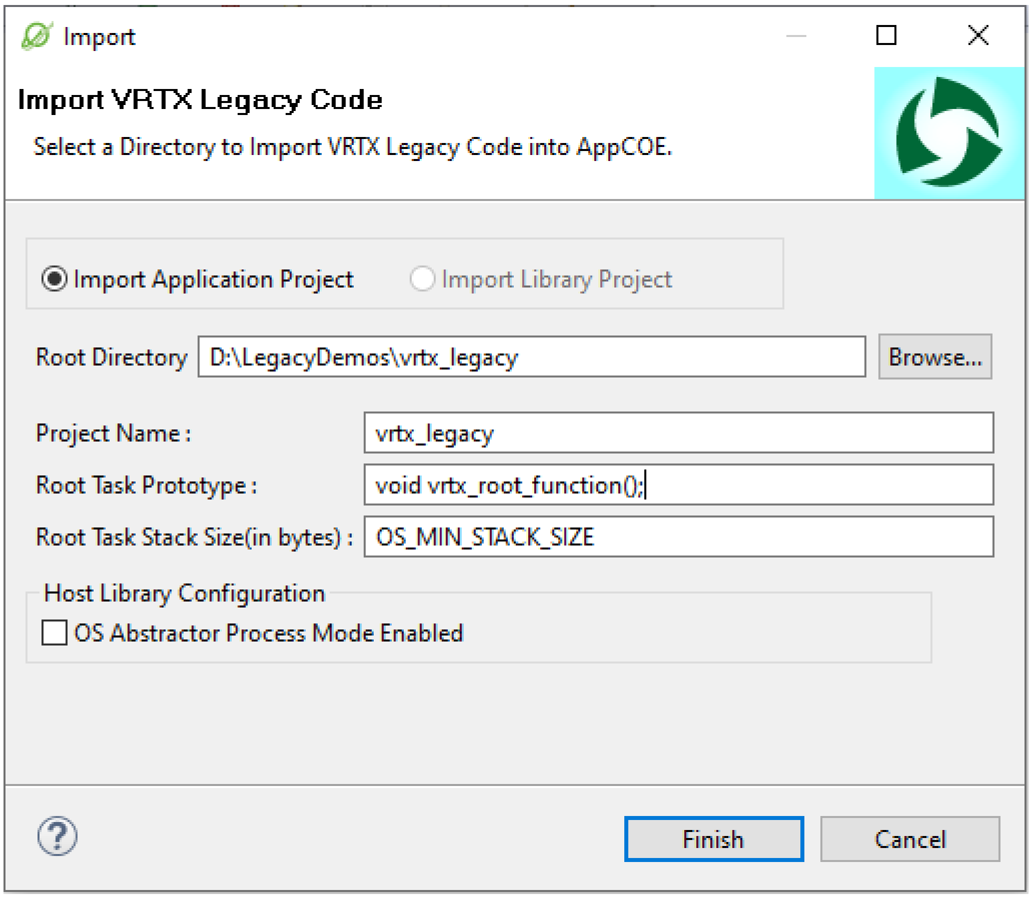
1. Select Tools> **Porting >VRTX> Import Legacy ‘C’ Code** as shown inFigure 5_37. You can also click on the Porting icon from the task bar.

Figure 5_37: Importing VRTX Legacy ‘C’ Code in AppCOE



2. On AppCOE Import Window select the Import Application Project/Library Project radio button with reference to your project. Here we are considering importing a application project for example purpose.
3. Select the root directory from where you want to import the legacy code by clicking on **Browse** button next to **the** text box, and click **Next** as shown in Figure 5_38.
4. On Select Host Library Configuration window, select **OS Abstractor Process Mode** if the imported application runs in multiple process

Figure 5_38: Import VRTX Legacy Code Window


Import

Import VRTX Legacy Code

Select a Directory to Import VRTX Legacy Code into AppCOE.

[✓ Import Application Project] Import Library Project

Root Directory: D:\LegacyDemos\vrtx_legacy

Project Name : vrtx_legacy

Root Task Prototype : void vrtx_root_function();

Root Task Stack Size(in bytes) : OS_MIN_STACK_SIZE

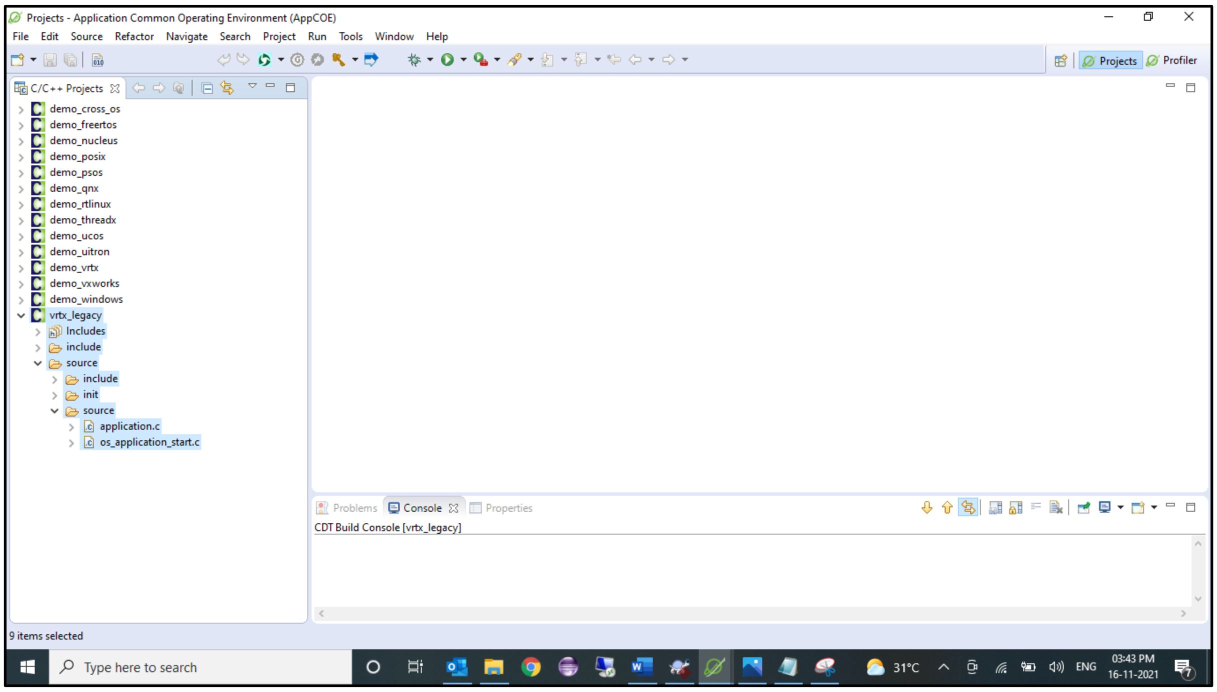
Host Library Configuration

☐ OS Abstractor Process Mode Enabled

5. Enter the project name for which you want to import the legacy code in the **Project Name** text box.
6. Enter the root task prototype as **void vrtx_root_function();**,next to **Root Task Prototype** text box as shown in Figure 5_38.
7. Enter the root task stack size, next to the **Root Task Stack Size** text box as shown. The value should be in bytes.

8. Click **Finish** to complete the importing of legacy code into AppCOE. You can see VRTXlegacy code you have imported as shown in Figure 5_39.

Figure 5_39: Importing VRTX Legacy Code Output



9. You have successfully imported VRTX legacy C code and a project with your given project name is created in the current workspace.

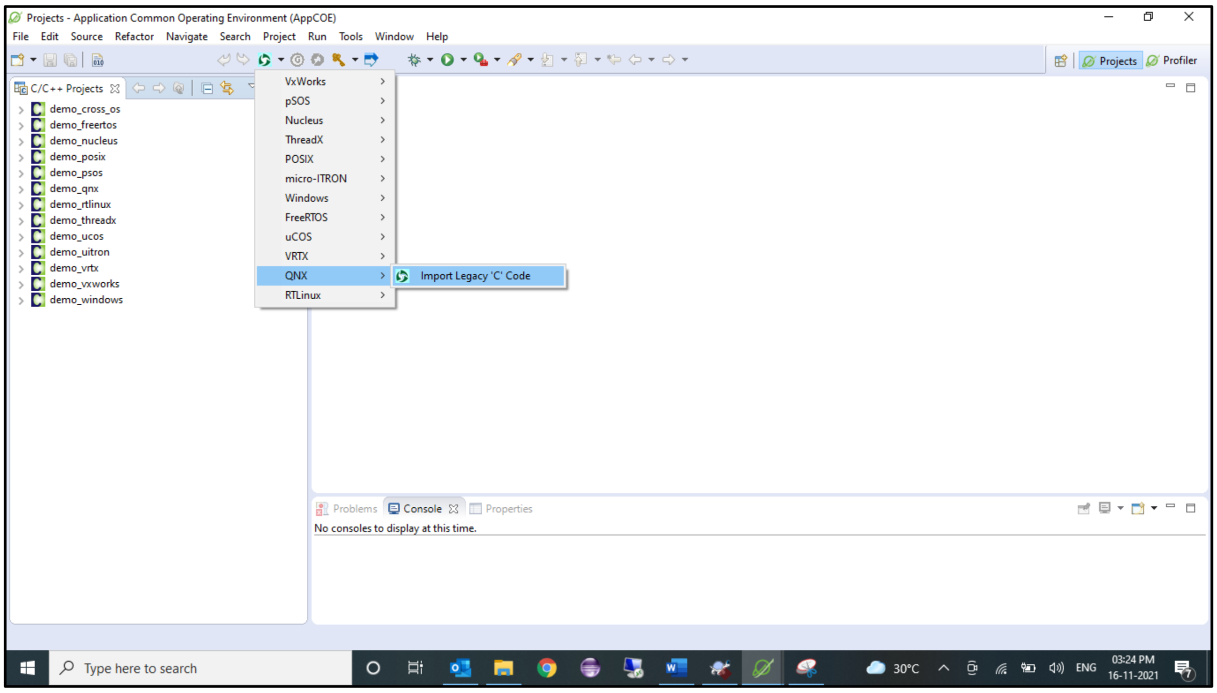
Porting QNXLegacy 'C' Code

This section explains porting of QNX Legacy Applications using AppCOE Porting Plugin. A sample porting of QNX Legacy applications using AppCOE is described with an example here.

NOTE: This feature requires a license. Click http://mapusoft.com/downloads/AppCOE-evaluation/ to request an evaluation license.

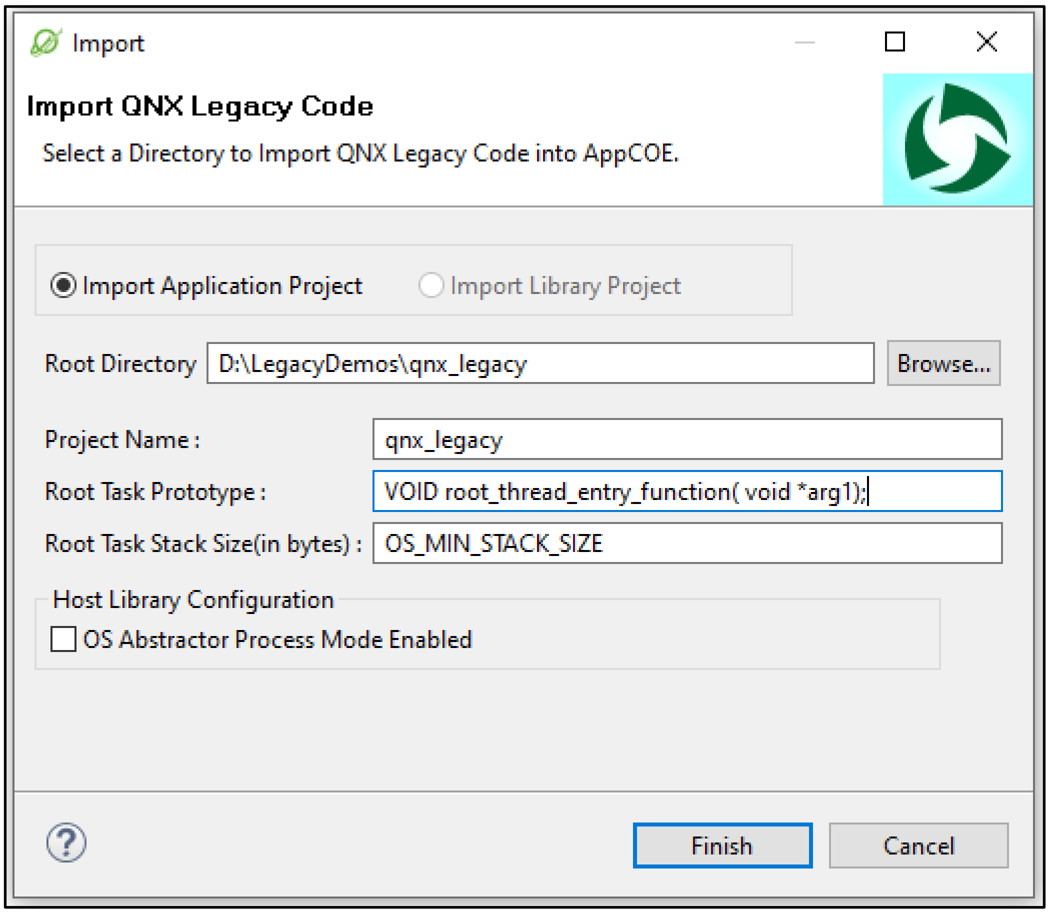
1. Select Tools> **Porting >QNX> Import Legacy 'C' Code** as shown inFigure 5_40. You can also click on the Porting icon from the task bar.

Figure 5_40: Importing QNX Legacy 'C' Code in AppCOE



2. On AppCOE Import Window select the Import Application Project/Library Project radio button with reference to your project. Here we are considering importing a application project for example purpose.
3. Select the root directory from where you want to import the legacy code by clicking on **Browse** button next to **the** text box, and click **Next** as shown in Figure 5_41.
4. On Select Host Library Configuration window, select **OS Abstractor Process Mode** if the imported application runs in multiple process

Figure 5_41: Import QNXLegacy Code Window



Import

Import QNX Legacy Code

Select a Directory to Import QNX Legacy Code into AppCOE.

(● Import Application Project) ○ Import Library Project

Root Directory: D:\LegacyDemos\qnx_legacy

Project Name : qnx_legacy

Root Task Prototype : VOID root_thread_entry_function(void *arg1);

Root Task Stack Size(in bytes) : OS_MIN_STACK_SIZE

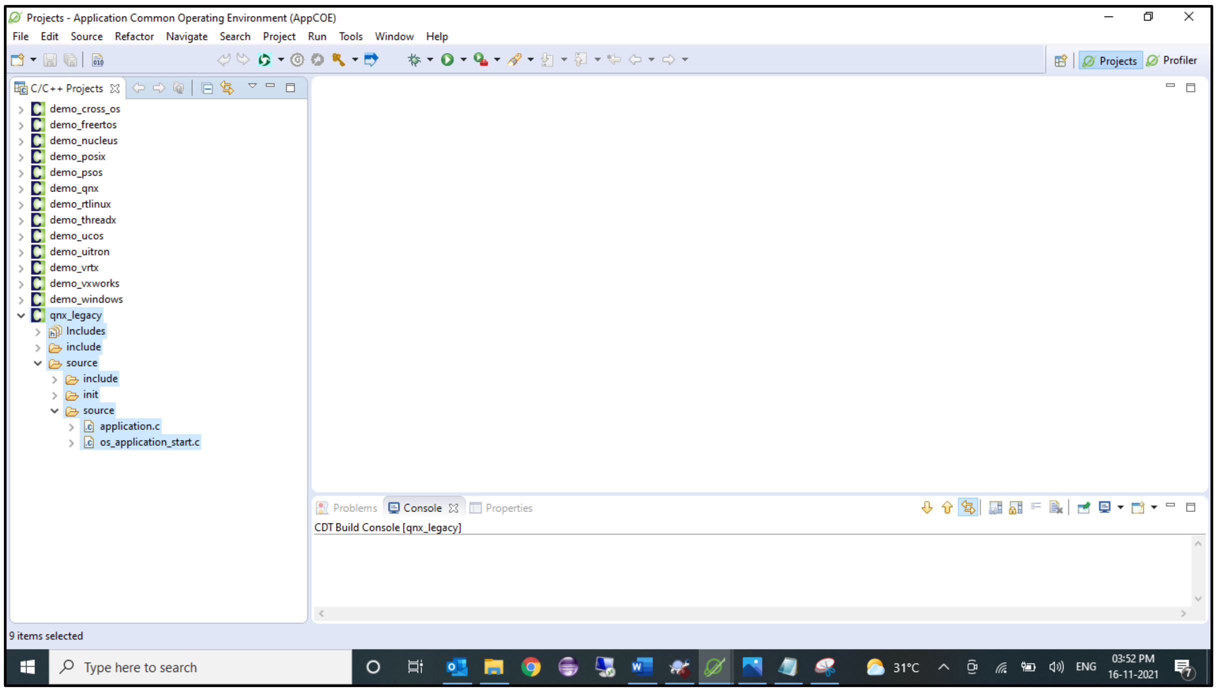
Host Library Configuration

☐ OS Abstractor Process Mode Enabled

5. Enter the project name for which you want to import the legacy code in the **Project Name** text box.
6. Enter the root task prototype as **VOID root_thread_entry_function(void *arg1);**,next to **Root Task Prototype** text box as shown in Figure 5_41.
7. Enter the root task stack size, next to the **Root Task Stack Size** text box as shown. The value should be in bytes.

8. Click **Finish** to complete the importing of legacy code into AppCOE. You can see QNXlegacy code you have imported as shown in Figure 5_42.

Figure 5_42: Importing QNX Legacy Code Output



9. You have successfully imported QNX legacy C code and a project with your given project name is created in the current workspace.

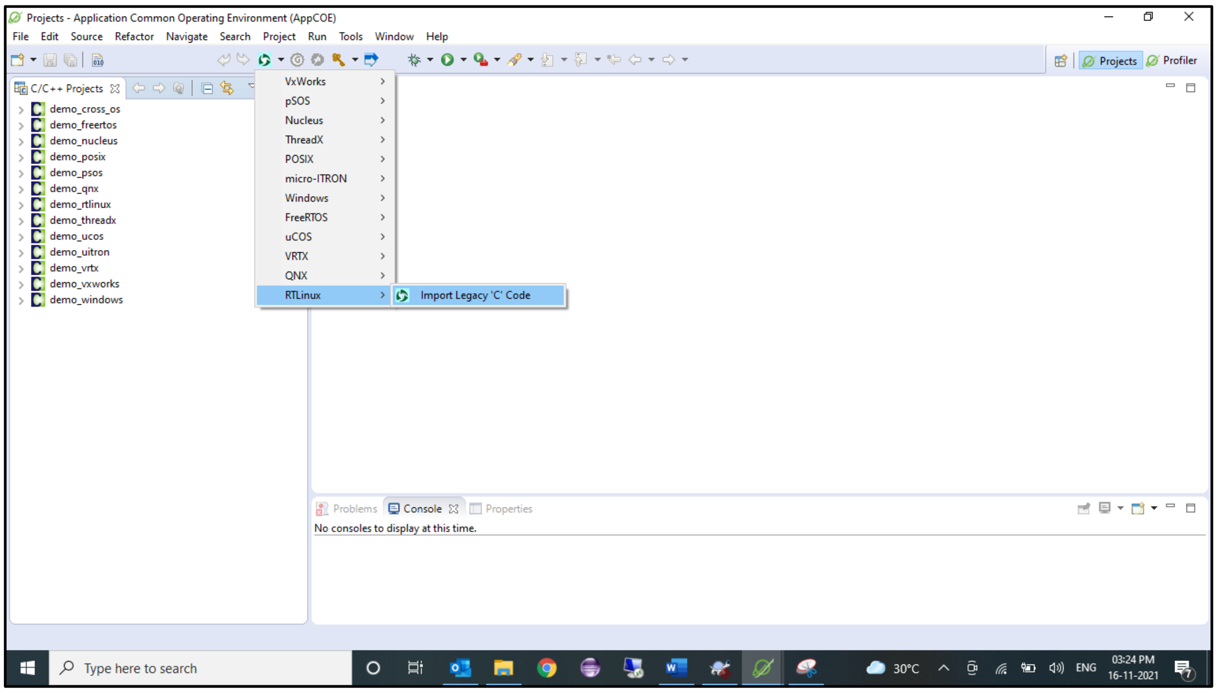
Porting RTLINUXLegacy 'C' Code

This section explains porting of RTLINUX Legacy Applications using AppCOE Porting Plugin. A sample porting of RTLINUX Legacy applications using AppCOE is described with an example here.

NOTE: This feature requires a license. Click http://mapusoft.com/downloads/AppCOE-evaluation/ to request an evaluation license.

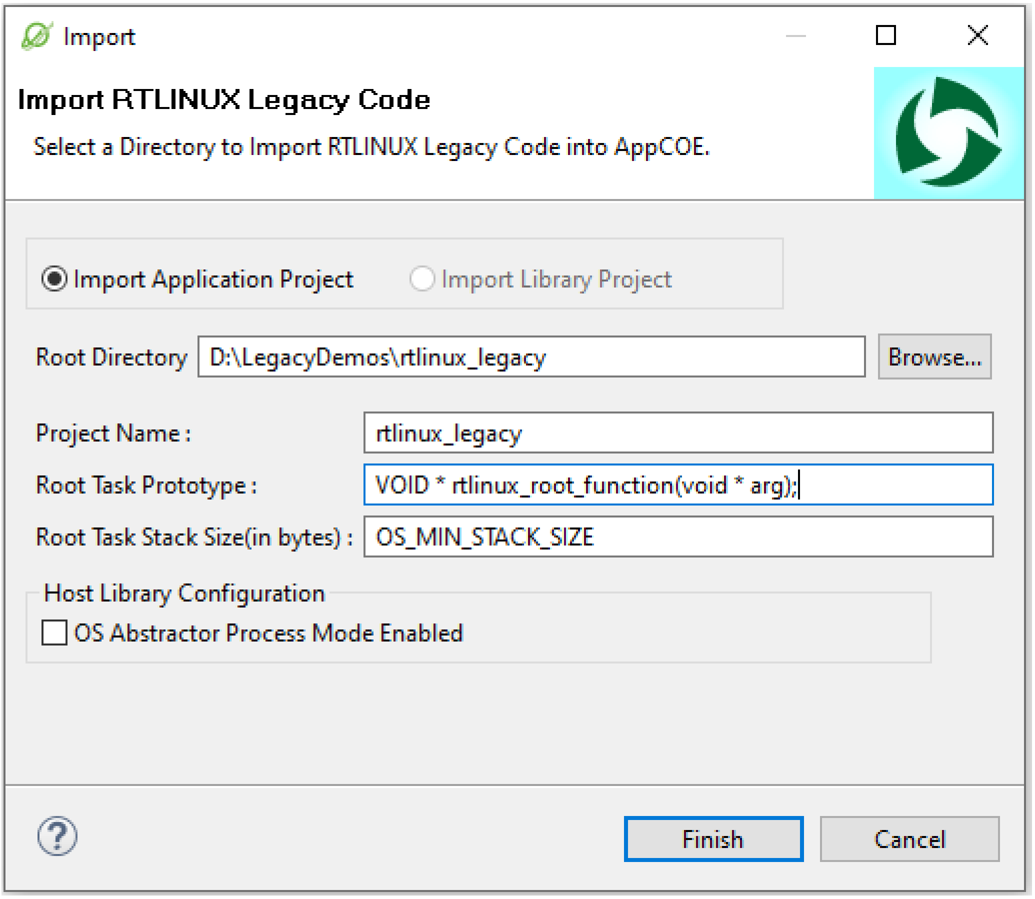
1. Select Tools> **Porting >RTLINUX> Import Legacy 'C' Code** as shown inFigure 5_43. You can also click on the Porting icon from the task bar.

Figure 5_43: Importing RTLINUX Legacy 'C' Code in AppCOE



2. On AppCOE Import Window select the Import Application Project/Library Project radio button with reference to your project. Here we are considering importing a application project for example purpose.
3. Select the root directory from where you want to import the legacy code by clicking on **Browse** button next to **the** text box, and click **Next** as shown in Figure 5_44.
4. On Select Host Library Configuration window, select **OS Abstractor Process Mode** if the imported application runs in multiple process

Figure 5_44: Import RTLINUX Legacy Code Window


Import

Import RTLINUX Legacy Code

Select a Directory to Import RTLINUX Legacy Code into AppCOE.

(●) Import Application Project ( ) Import Library Project

Root Directory: D:\LegacyDemos\rtlinux_legacy

Project Name : rtlinux_legacy

Root Task Prototype : VOID * rtlinux_root_function(void * arg);

Root Task Stack Size(in bytes) : OS_MIN_STACK_SIZE

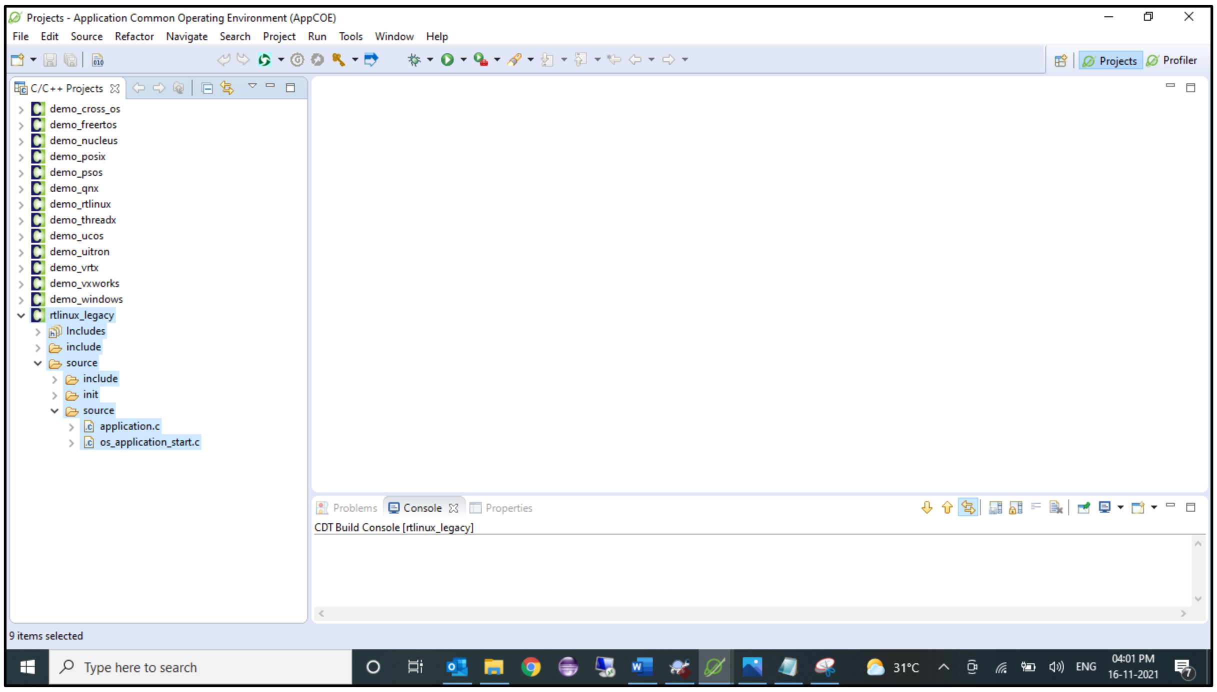
Host Library Configuration

☐ OS Abstractor Process Mode Enabled

5. Enter the project name for which you want to import the legacy code in the **Project Name** text box.
6. Enter the root task prototype as **VOID * rtlinux_root_function(void * arg);**,next to **Root Task Prototype** text box as shown in Figure 5_44.
7. Enter the root task stack size, next to the **Root Task Stack Size** text box as shown. The value should be in bytes.

8. Click **Finish** to complete the importing of legacy code into AppCOE. You can see RTLINUXlegacy code you have imported as shown in Figure 5_45.

Figure 5_45: Importing RTLINUX Legacy Code Output



9. You have successfully imported RTLINUX legacy C code and a project with your given project name is created in the current workspace.

Building OS Abstractor Interface Library

Before using OS Abstractor Interface, make sure the OS and tools are configured correctly for your target. To ensure this, compile, link and execute a native sample demo application that is provided by the OS vendor on your target. Refer to the OS vendor provided documentation on how to compile, link, download, and debug the demo applications for your specific target and toolset. After this step, you are ready to use the OS Abstractor Interface library to develop your applications.

Building OS Abstractor Interface Demo Application

The demo application is located at the \mapusoft\demo_cross_os directory location. From this location, you will find the make files or project files at the appropriate specific/<OS>/<tool>/<target> directory. For instance, if you need the demo application to be built for Windows OS using visual studio 12 tools and for x86 target, then the make file location will be at specific\windows\x86\vsnet2012 directory.

OS Changer VxWorks Interface

The OS Changer Nucleus Interface library contains the following modules

Table 5_1: VxWorks Interface Header File

Module	Description
`vxworks_interface.h`	This header file is required in all of the VxWorks source modules. This header file provides the translation layer between the VxWorks defines, APIs and parameters to OS Abstraction

The OS Changer VxWorks Interface OS Changer OS Changer VxWorks Interface demo contains the following modules:

Table 5_2: VxWorks Interface Demo Application File

Module	Description
`demo.c`	Contains a sample demo application

Building OS Changer VxWorks Interface

Before building the VxWorks Interface library and/or application, ensure that the flag INCLUDE_OS_VxWorks is set to OS_TRUE in the cross_os_usr.h configuration file.

Building OS Changer VxWorks Interface Library

The VxWorksInterface library is located at \mapusoft\ vxworks_interface directory. From this location, you will find the make files or project files at the appropriate specific/<OS>/<tool>/<target> directory. For instance, if you need the demo application to be built for VxWorks OS using Eclipse tools and for x86 targets, then the make file location will be at specific\vxworks\<OS>\x86\eclipse directory.

Building OS Changer VxWorks Interface Demo Application

The demo application is located at the \mapusoft\ demo_vxworks directory location. From this location, you will find the make files or project files at the appropriate specific/<OS>/<tools>/<target> directory. For instance, if you need the demo application to be built for VxWorks OS using Eclipse tools and for x86 targets, then the make file location will be at specific\vxworks_interface\<OS>\x86\eclipse directory.

OS Changer POSIX/LINUX Interface

The OS Changer POSIX/LINUX Interface library contains the following modules:

Table 5_3: Posix Interface Header File

Module	Description
posix_interface.h	This header file is required in all of the POSIX/LINUX source modules. This header file provides the translation layer between the POSIX/LINUX defines, APIs and parameters to OS Abstraction

The POSIX/LINUX Interface demo contains the following modules:

Table 5_4: POSIX/LINUX Interface Demo Application File

Module	Description
demo.c	Contains a sample demo application

Building OS Changer POSIX/LINUXInterface

Before building the POSIX/LINUX Interface library and/or application, ensure that the flags INCLUDE_OS_POSIX is set to OS_TRUE in the cross_os_usr.h configuration file.

Building OS Changer POSIX/LINUX Interface Library

The OS Changer POSIX/LINUX Interface library is located at \mapusoft\posix_interface directory. From this location, you will find the make files or project files at the appropriate specific/<OS>/<tool>/<target> directory. For instance, if you need the demo application to be built for POSIX/LINUX OS using Eclipse tools and for x86 targets, then the make file location will be at specific\posix\<OS>\x86\elipse directory.

BuildingOS ChangerPOSIX/LINUX Interface Demo Application

The demo application is located at the \mapusoft\demo_posix directory location. From this location, you will find the make files or project files at the appropriate specific/<OS>/<tools>/<target> directory. For instance, if you need the demo application to be built for POSIX/LINUX OS using Eclipse tools and for x86 target, then the make file location will be at specific\posix\<OS>\x86\eclipse directory. We need to have the OS Abstractor Interface Library. It has to be included in all the Interface demos.

After every demo application, include/link in the POSIX/LINUX Interface library.

OS Changer Nucleus Interface

The OS Changer Nucleus Interface library contains the following modules:

Table 5_5: Nucleus Interface Header File

Module	Description
nucleus_interface.h	This header file is required in all of the Nucleus PLUS source modules. This header file provides the translation layer between the Nucleus PLUS defines, APIs and parameters to OS Abstraction

The OS Changer Nucleus Interface demo contains the following modules:

Table 5_6: Nucleus Interface Demo Application File

Module	Description
demo.c	Contains a sample demo application

Building OS Changer Nucleus Interface

Before building the OS Changer Nucleus Interface library and/or application, ensure that the flag INCLUDE_OS_Nucleus is set to OS_TRUE in the cross_os_usr.h configuration file.

Building OS Changer Nucleus Interface Library

The Nucleus Interface library is located at \mapusoft\nucleus_interface directory. From this location, you will find the make files or project files at the appropriate specific/<OS>/<tool>/<target> directory. For instance, if you need the demo application to be built for Nucleus OS using Eclipse tools and for x86 targets, then the make file location will be at specific\nucleus\<OS>\x86\eclipse directory.

Building OS Changer Nucleus Interface Demo Application

The demo application is located at the \mapusoft\ demo_nucleus directory location. From this location, you will find the make files or project files at the appropriate specific/<OS>/<tools>/<target> directory. For instance, if you need the demo application to be built for Nucleus OS using Eclipse tools and for x86 targets, then the make file location will be at specific\nucleus\<OS>\x86\eclipse directory.

OS Changer ThreadX Interface

The OS Changer ThreadX Interface library contains the following modules:

Table 5_7: ThreadX Interface Header File

Module	Description
threadx_interface.h	This header file is required in all of the ThreadX source modules. This header file provides the translation layer between the ThreadX defines, APIs and parameters to OS Abstraction

The OS Changer ThreadX Interface demo contains the following modules:

Table 5_8: Nucleus Interface Demo Application File

Module	Description
demo.c	Contains a sample demo application

Building OS Changer ThreadX Interface

Before building the OS Changer ThreadX Interface library and/or application, ensure that the flag INCLUDE_OS_ThreadX is set to OS_TRUE in the cross_os_usr.h configuration file.

Building OS Changer ThreadX Interface Library

The ThreadX Interface library is located at \mapusoft\ThreadX_interface directory. From this location, you will find the make files or project files at the appropriate specific/<OS>/<tool>/<target> directory. For instance, if you need the demo application to be built for ThreadX OS using Eclipse tools and for x86 target, then the make file location will be at specific\ThreadX\<OS>\x86\eclipse directory.

Building OS Changer ThreadX Interface Demo Application

The demo application is located at the \mapusoft\ demo_ThreadX directory location. From this location, you will find the make files or project files at the appropriate specific/<OS>/<tools>/<target> directory. For instance, if you need the demo application to be built for ThreadX OS using Eclipse tools and for x86 target, then the make file location will be at specific\ThreadX\<OS>\x86\eclipse directory.

OS Changer pSOS Interface

The pSOS Interface library contains the following modules:

Table 5_9: pSOS Interface Header File

Module	Description
`psos_interface.h`	This header file is required in all of the pSOS source modules. This header file provides the translation layer between the pSOS defines, APIs and parameters to OS Abstraction

The pSOS Interface demo contains the following modules:

Table 5_10: pSOS Interface Demo Application File

Module	Description
`demo.c`	Contains a sample demo application

Building OS Changer pSOS Interface

Before building the pSOS Interface library and/or application, ensure that the flag INCLUDE_OS_pSOS is set to OS_TRUE in the cross_os_usr.h configuration file.

Building OS Changer pSOS Interface Library

The pSOS Interface library is located at \mapusoft\ psos_interface directory. From this location, you will find the make files or project files at the appropriate specific/<OS>/<tool>/<target> directory. For instance, if you need the demo application to be built for pSOS OS using Eclipse tools and for x86 target, then the make file location will be at specific\psos_interface/<OS>\x86\eclipse directory.

Building OS Changer pSOS Interface Demo Application

The demo application is located at the \mapusoft\ demo_pSOS directory location. From this location, you will find the make files or project files at the appropriate specific/<OS>/<tools>/<target> directory. For instance, if you need the demo application to be built for pSOS OS using eclipse tools and for x86 target, then the make file location will be at specific\psos\<OS>\x86\eclipse directory.

OS Changer micro-ITRON Interface

The OS Changer micro-ITRON Interface library contains the following modules:

Table 5_11: OS Changer micro-ITRON Interface Header File

Module	Description
`uitron_interface.h`	This header file is required in all of the uITRON source modules. This header file provides the translation layer between the uITRON defines, APIs and parameters to OS Abstraction

The OS Changer micro-ITRON Interface demo contains the following modules:

Table 5_12: OS Changer micro-ITRON Interface Demo Application File

Module	Description
`demo.c`	Contains a sample demo application

Building OS Changer micro-ITRON Interface

Before building the OS Abstractor micro-ITRON Interface library and/or application, ensure that the flag INCLUDE_OS_UITRON is set to OS_TRUE in the cross_os_usr.h configuration file.

Building OS Changer micro-ITRON Interface Library

The OS Abstractor micro-ITRON Interface library is located at \mapusoft\uitron_interface directory. From this location, you will find the make files or project files at the appropriate specific/<OS>/<tool>/<target> directory. For instance, if you need the demo application to be built for uITRON OS using Eclipse tools and for x86 target, then the make file location will be at specific\uitron\<OS>\x86\eclipse directory.

Building OS Changer micro-ITRON Interface Demo Application

The demo application is located at the \mapusoft\demo_uitron directory location. From this location, you will find the make files or project files at the appropriate specific/<OS>/<tools>/<target> directory. For instance, if you need the demo application to be built for micro-ITRON OS using Eclipse tools and for x86 targets, then the make file location will be at specific\uitron\<OS>\x86\eclipse directory.

OS Changer µC/OS Interface

The µC/OS Interface library contains the following modules:

Table 5_13: OS Changer µC/OSInterface Header File

Module	Description
`ucos_interface.h`	This header file is required in all of the uCOS source modules. This header file provides the translation layer between the uCOS defines, APIs and parameters to OS Abstraction

The µC/OS Interface demo contains the following modules:

Table 5_14: µC/OS Interface Demo Application File

Module	Description
`demo.c`	Contains a sample demo application

Building OS Changer µC/OS Interface

Before building the OS Abstractor µC/OS Interface library and/or application, ensure that the flag INCLUDE_OS_UCOS is set to OS_TRUE in the cross_os_usr.h configuration file.

Building OS Changer µC/OS Interface Library

The OS Abstractor µC/OS Interface library is located at \mapusoft\ucos_interface directory. From this location, you will find the make files or project files at the appropriate specific/<OS>/<tool>/<target> directory. For instance, if you need the demo application to be built for µC/OS using Eclipse tools and for x86 target, then the make file location will be at specific\ucos\<OS>\x86\eclipse directory.

Building OS Changer µC/OS Interface Demo Application

The demo application is located at the \mapusoft\demo_ucos directory location. From this location, you will find the make files or project files at the appropriate specific/<OS>/<tools>/<target> directory. For instance, if you need the demo application to be built for µC/OS using Eclipse tools and for x86 targets, then the make file location will be at specific\ucos\<OS>\x86\eclipse directory.

OS Changer FreeRTOS Interface

The FreeRTOS Interface library contains the following modules:

Table 5_15: OS Changer FreeRTOSInterface Header File

Module	Description
`freertos_interface.h`	This header file is required in all of the freertos source modules. This header file provides the translation layer between the freertos defines, APIs and parameters to OS Abstraction

The freertos Interface demo contains the following modules:

Table 5_16: FreeRTOSInterface Demo Application File

Module	Description
`demo.c`	Contains a sample demo application

Building OS Changer FreeRTOS Interface

Before building the OS Abstractor freertos Interface library and/or application, ensure that the flag INCLUDE_OS_FREERTOS is set to OS_TRUE in the cross_os_usr.h configuration file.

Building OS Changer FreeRTOS Interface Library

The OS Abstractor freertos Interface library is located at \mapusoft\freertos_interface directory. From this location, you will find the make files or project files at the appropriate specific/<OS>/<tool>/<target> directory. For instance, if you need the demo application to be built for freertos using Eclipse tools and for x86 target, then the make file location will be at specific\freertos\<OS>\x86\eclipse directory.

Building OS Changer FreeRTOS Interface Demo Application

The demo application is located at the \mapusoft\demo_freertos directory location. From this location, you will find the make files or project files at the appropriate specific/<OS>/<tools>/<target> directory. For instance, if you need the demo application to be built for freertos using Eclipse tools and for x86 targets, then the make file location will be at specific\freertos\<OS>\x86\eclipse directory.

OS Changer RTLinux Interface

The RTLinux Interface library contains the following modules:

Table 5_17: OS Changer RTLinuxInterface Header File

Module	Description
`rtlinux_interface.h`	This header file is required in all of the rtlinux source modules. This header file provides the translation layer between the rtlinux defines, APIs and parameters to OS Abstraction

The rtlinux Interface demo contains the following modules:

Table 5_18: RTLinux Interface Demo Application File

Module	Description
`demo.c`	Contains a sample demo application

Building OS Changer RTLinux Interface

Before building the OS Abstractor rtlinux Interface library and/or application, ensure that the flag INCLUDE_OS_RTLINUX is set to OS_TRUE in the cross_os_usr.h configuration file.

Building OS Changer RTLinux Interface Library

The OS Abstractor rtlinux Interface library is located at \mapusoft\rtlinux_interface directory. From this location, you will find the make files or project files at the appropriate specific/<OS>/<tool>/<target> directory. For instance, if you need the demo application to be built for rtlinux using Eclipse tools and for x86 target, then the make file location will be at specific\rtlinux\<OS>\x86\eclipse directory.

Building OS Changer RTLinux Interface Demo Application

The demo application is located at the \mapusoft\demo_rtlinux directory location. From this location, you will find the make files or project files at the appropriate specific/<OS>/<tools>/<target> directory. For instance, if you need the demo application to be built for rtlinux using Eclipse tools and for x86 targets, then the make file location will be at specific\rtlinux\<OS>\x86\eclipse directory.

OS Changer Windows Interface

The OS Changer Windows Interface library contains the following modules:

Table 5_19: OS Changer Windows Interface Header File

Module	Description
`windows_interface.h`	This header file is required in all of the Windows source modules. This header file provides the translation layer between the Windows defines, APIs and parameters to OS Abstraction

The Windows Interface demo contains the following modules:

Table 5_20: Windows Interface Demo Application File

Module	Description
`demo.c`	Contains a sample demo application

Building OS Changer Windows Interface

Before building the WINDOWS Interface library and/or application, ensure that the flags INCLUDE_OS_WINDOWS and INCLUDE_OS_PROCESS are set to OS_TRUE in the cross_os_usr.h configuration file.

Building OS Changer Windows Interface Library

The WINDOWS Interface library is located at \mapusoft\windows_interface directory. From this location, you will find the make files or project files at the appropriate specific/<OS>/<tool>/<target> directory. For instance, if you need the demo application to be built for WINDOWS OS using Eclipse tools and for x86 target, then the make file location will be at specific\windows\<OS>\x86\eclipse directory.

Building OS Changer Windows Interface Demo Application

The demo application is located at the \mapusoft\demo_windows directory location. From this location, you will find the make files or project files at the appropriate specific/<OS>/<tools>/<target> directory. For instance, if you need the demo application to be built for Windows OS using Eclipse tools and for x86 target, then the make file location will be at specific\windows\<OS>\x86\eclipse directory. We need to have the OS Abstractor Interface Library. It has to be included in all the Interface demos.

Building Application with Multiple Interface Components

MapuSoft provides a feature to build application with multiple interfaces. For example; you can build an application with both Nucleus and VxWorks interfaces.

Building Application with Multiple Interfaces

Before building the multiple Interface library and/or application, ensure that the corresponding flags are set to OS_TRUE in the cross_os_usr.h configuration file.

For instance; If you want to build an application with both Nucleus and VxWorks interfaces, set `INCLUDE_OS_NUCLEUS and INCLUDE_OS_VXWORKS`asOS_TRUE.

Developing Applications with Multiple Interfaces

The steps for developing applications on host targets are described as follows:

1. Include os_target.h in all your application source files.
2. Set the appropriate compiler switches within the project build files to indicate the target OS and other target configurations.
3. Initialize the OS Abstractor library by calling OS_Application_Init() function. If you are also using POSIX/LINUX Interface, then also use OS_Posix_Init() function call to initialize the POSIX/LINUX component as well. For instance, to develop an application with both Nucleus and VxWorks application development, go to os_library_init.c and give your appropriate entry function in NUCLEUS_ENTRY_FUNCTION. Define the name of the Nucleus entry task. The default entry task is NU_ROOT. Give your appropriate entry function in VXWORKS_ENTRY_FUNCTION. You also have to give the appropriate stack size for your entry function in VXWORKS_ENTRY_FUNCTION_STACK_SIZE. The default stack size given by MapuSoft is OS_MIN_STACK_SIZE. In the main thread, call OS_Application_Wait_For_End() function to suspend the main thread and wait for application re-start or termination requests.
4. Compile and link your application using development tools provided by Mapusoft.
5. Download the complete application image to the target system and let it run.

Refer to the sample demo applications provided with OS Abstractor as a reference point to start your application. Please review the target processor and development tools documentation for additional information, including specific details on how to use the compiler, assembler, and linker.

Chapter 6: Using Cross-OS Development platform

Cross-OS Development Platform provides you a robust and industry standard OS interface architecture for flexible application development while allowing the user to protect the software from being locked to one OS. Cross-OS Development Platform makes your application adapt to multiple operating system, reduces cost associated with code maintenance, need for learning multiple operating systems and eliminates the risk associated with the OS selection process.

This chapter contains the following topics:

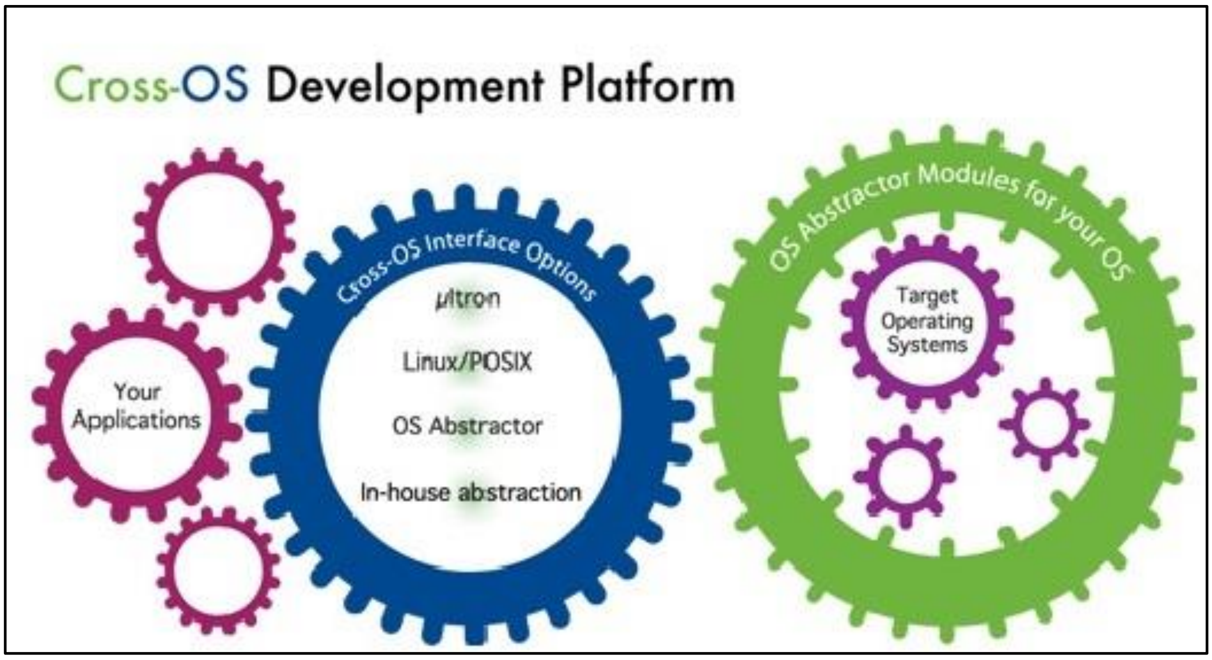
About Cross-OS Development Platform

There are three interfaces in the OS Abstractor Interface options providing the ability to develop & use portable application.

1. **OS Abstractor** development interfaces from Mapusoft – OS Abstractor Target Specific Module (specific to each target OS) provides the connection to your target operating system(s).
2. **Linux/POSIX Interface**– Providing the POSIX/LINUX re-host capability
3. **micro-ITRON Interface**. – Provides ITRON re-host capability

Developers also have the ability to choose multiple Interfaces for use within the sameapplication and existing applications can connect to the appropriate Interface for re-hosting on a different OS.

Figure 6_1: Cross-OS Development Platform



About OS Abstractor

OS Abstractor is designed for use as a C library. Services used inside your application software are extracted from the OS Abstractor libraries and are then combined with the other application objects to produce the complete image. This image may be downloaded to the target system or placed in ROM on the target system. OS Abstractor will also function under various host environments.

Developing a solid software architecture that can run on multiple operating systems requires considerable planning, development and testing as well as upfront costs associated with the purchase of various OS and tools to validate your software. MapuSoft's OS Abstractor is an effective and economical software abstraction alternative for your embedded programming. By using OS Abstractor, your embedded application can run on many real time (RTOS) and non-real time operating systems to negate any porting issues in the future when your platform changes.

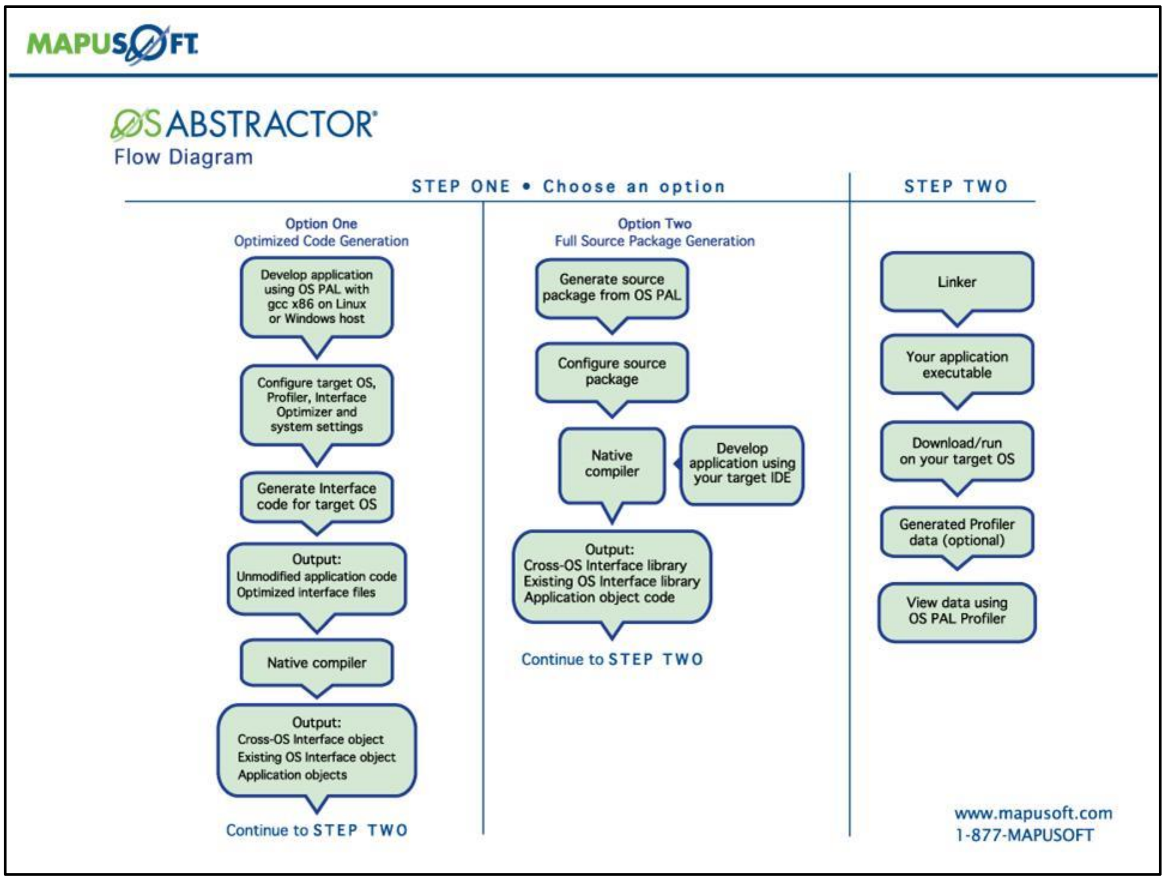

MAPUSOFT
OS ABSTRACTOR
Flow Diagram
STEP ONE • Choose an option
STEP TWO
Option One
Optimized Code Generation
Develop application using OS PAL with gcc x86 on Linux or Windows host
Configure target OS, Profiler, Interface Optimizer and system settings
Generate Interface code for target OS
Output: Unmodified application code Optimized interface files
Native compiler
Output: Cross-OS Interface object Existing OS Interface object Application objects
Continue to STEP TWO
Option Two
Full Source Package Generation
Generate source package from OS PAL
Configure source package
Native compiler
Develop application using your target IDE
Output: Cross-OS Interface library Existing OS Interface library Application object code
Continue to STEP TWO
Linker
Your application executable
Download/run on your target OS
Generated Profiler data (optional)
View data using OS PAL Profiler
www.mapusoft.com
1-877-MAPUSOFT

Figure 6_2: OS Abstractor Flow Diagram

Interfaces Available for OS Abstractor

The following are the OS Abstractor products:

- POSIX/LINUX
- micro-ITRON
- VxWorks
- pSOS
- Nucleus
- Windows

- ThreadX
- μC/OS
- FreeRTOS
- VRTX
- QNX
- RTLinux

Application developers need to specify the target operating system that the application and the libraries are to be built for inside the project build scripts. Application developers can also customize OS Abstractor to include only the components that are needed and exclude the ones that are not required for their application.

If the Application also uses Interface products, additional configuration may be necessary. Please refer to the individual Interface documents.

Developing OS Abstractor or Cross-OS Application

The steps for using OS Abstractor are described in the following generic form:

1. Include `os_target.h` in all your application source files.
2. Set the appropriate compiler switches within the project build files to indicate the target OS and other target configurations.
3. Configure the pre-processor defines found in the `cross_os_usr.h` header file under each target OS folder to applications requirements.
4. Initialize the OS Abstractor library by calling `OS_Application_Init()` function. If you are also using POSIX/LINUX Interface, then also use `OS_Posix_Init()` function call to initialize the POSIX/LINUX component as well. If you use OS Changer(s), you may need to call other appropriate initialization functions as well. After initialization, create your initial application resources and start the application's first task. After this and within the main thread, call `OS_Application_Wait_For_End()` function to suspend the main thread and wait for application re-start or termination requests.
5. Compile and link your application using appropriate development tools.
6. Download the complete application image to the target system and let it run.

NOTE: Make sure to disable User Account Control (UAC) in order to have administration permission in Windows Vista and Windows7.

Turning Off UAC

In order to run our products successfully, users need to turn off the User Access Control (UAC).

To turn off UAC:

- On **Windows Vista**:
  1. Go to **Start> Control Panel > Security Center > Other Security Settings.**
  2. Turn off **User Access Control**.
- On **Windows 7/8**:
  1. Go to **Start>Control Panel\User Accounts and Family Safety\User Accounts.**
  2. Set the notification to **Never Notify**.

Refer to the sample demo applications provided with OS Abstractor as a reference point to start your application. Please review the target processor and appropriate development tools documentation for additional information, including specific details on how to use the compiler, assembler, and linker.

Full Library Package Generator

MapuSoft enables you to generate a full library code package to create libraries and develop applications using your own IDE. You can manually scale and configurethe product by modifying the user configuration file.

Note: Before you begin, refer to MapuSoft System Configuration Guide.

This section contains the following topics

Generating Full Library Packages
Generating Binary Packages

Generating Full Library Packages

NOTE: This feature requires a Library Package generation license. Click http://mapusoft.com/contact/ to send a request to receive licenses and documentation.

AppCOE can also create full library packages to complete the porting and development outside of AppCOE with your own tools and environment.

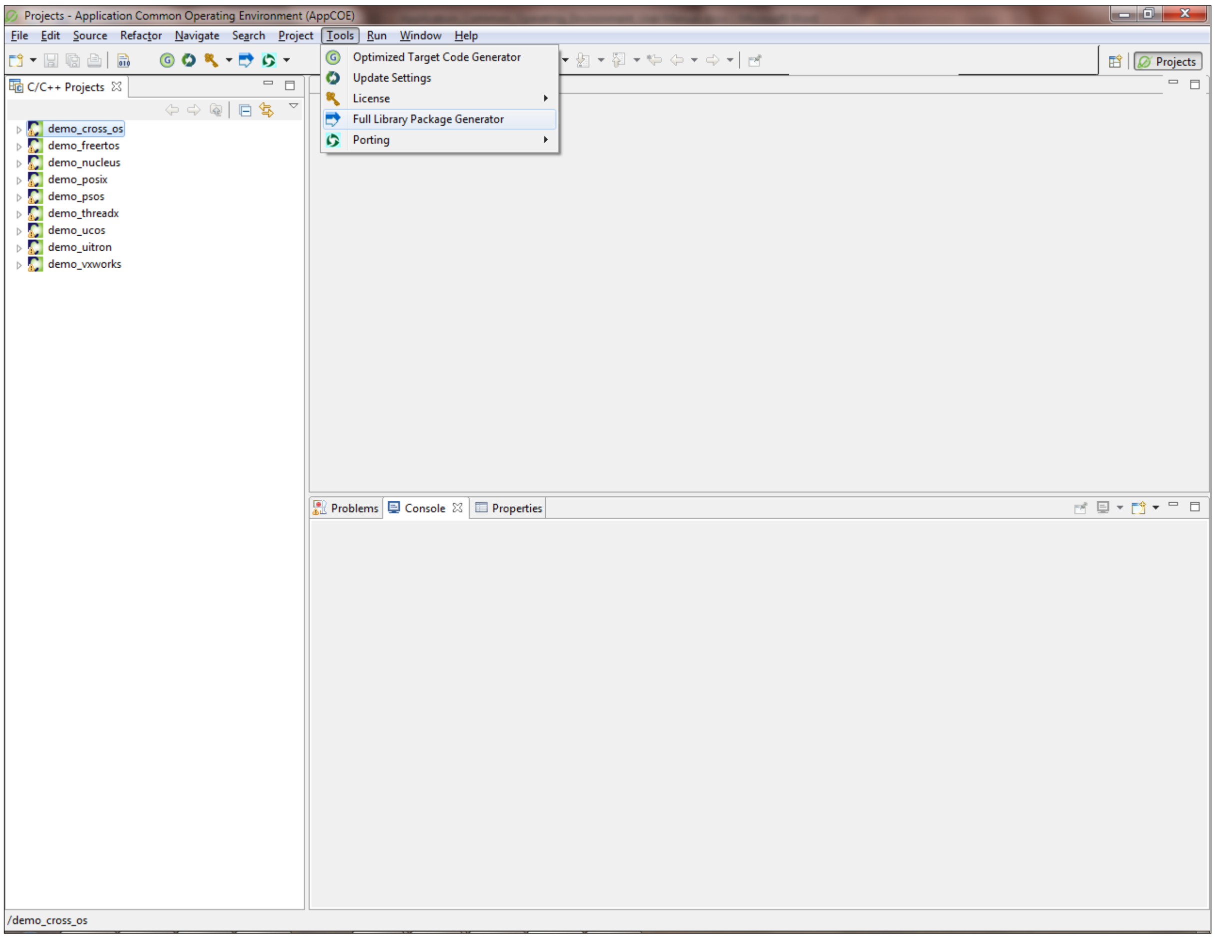
NOTE: To generate full library package on Windows Interface, ensure that the flag INCLUDE_OS_PROCESSis set to OS_TRUE in the `cross_os_usr.h` configuration file.

To generate full source library package, follow the steps:

To generate full library package:

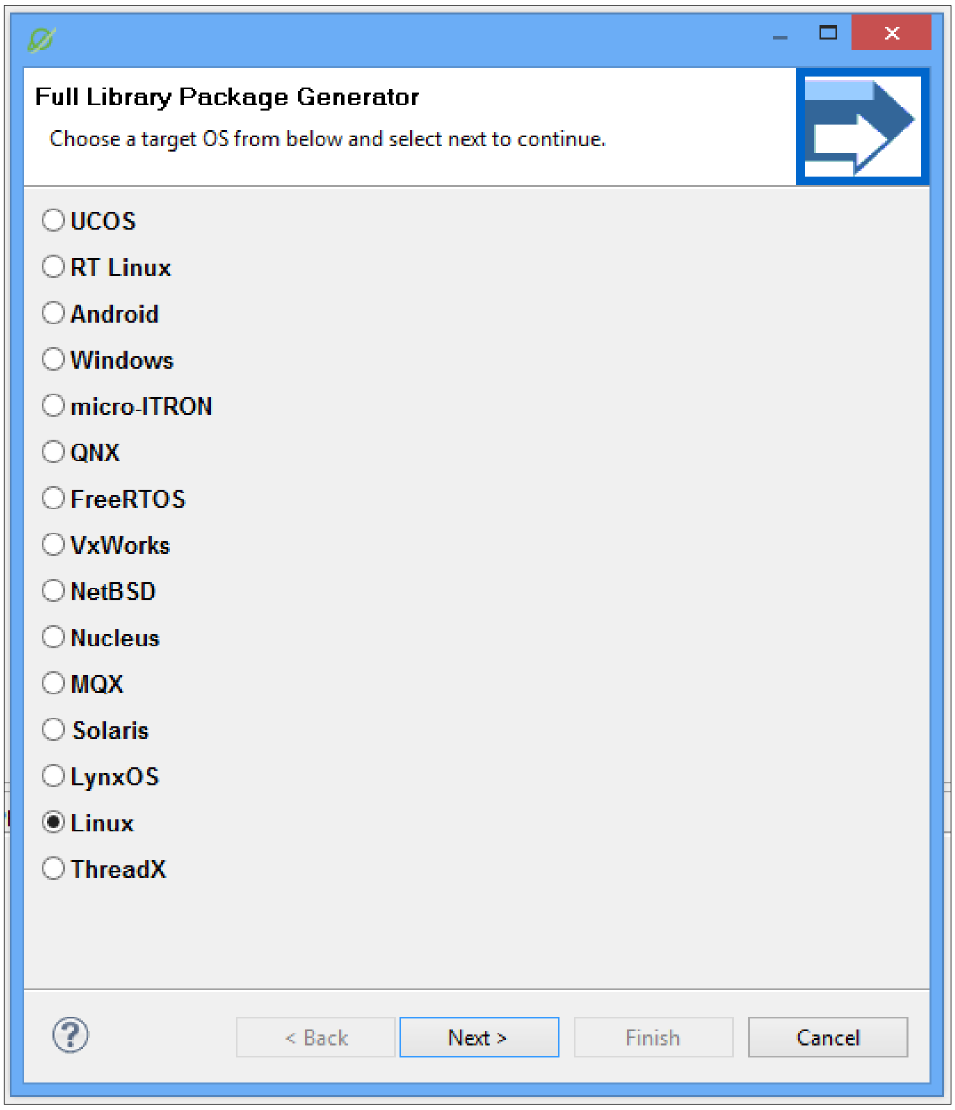
- From AppCOE main menu, click **Full Library Package Generator** button on the tool bar as highlighted inFigure 6_3Or select **Tools > Full Library Package Generator.**

Figure 6_3: Generating Library Package


Projects - Application Common Operating Environment (AppCOE)
File Edit Source Refactor Navigate Search Project Tools Run Window Help
Optimized Target Code Generator
Update Settings
License
Full Library Package Generator
Porting
C/C++ Projects
demo_cross_os
demo_freertos
demo_nucleus
demo_posix
demo_psos
demo_threadx
demo_ucos
demo_uitron
demo_vxworks
Projects
Problems
Console
Properties
/demo_cross_os

- On Full Library Package Generator window, select the required Target OS from the list and click Nextas shown in Figure 6_4.

Figure 6_4: Select Target OS



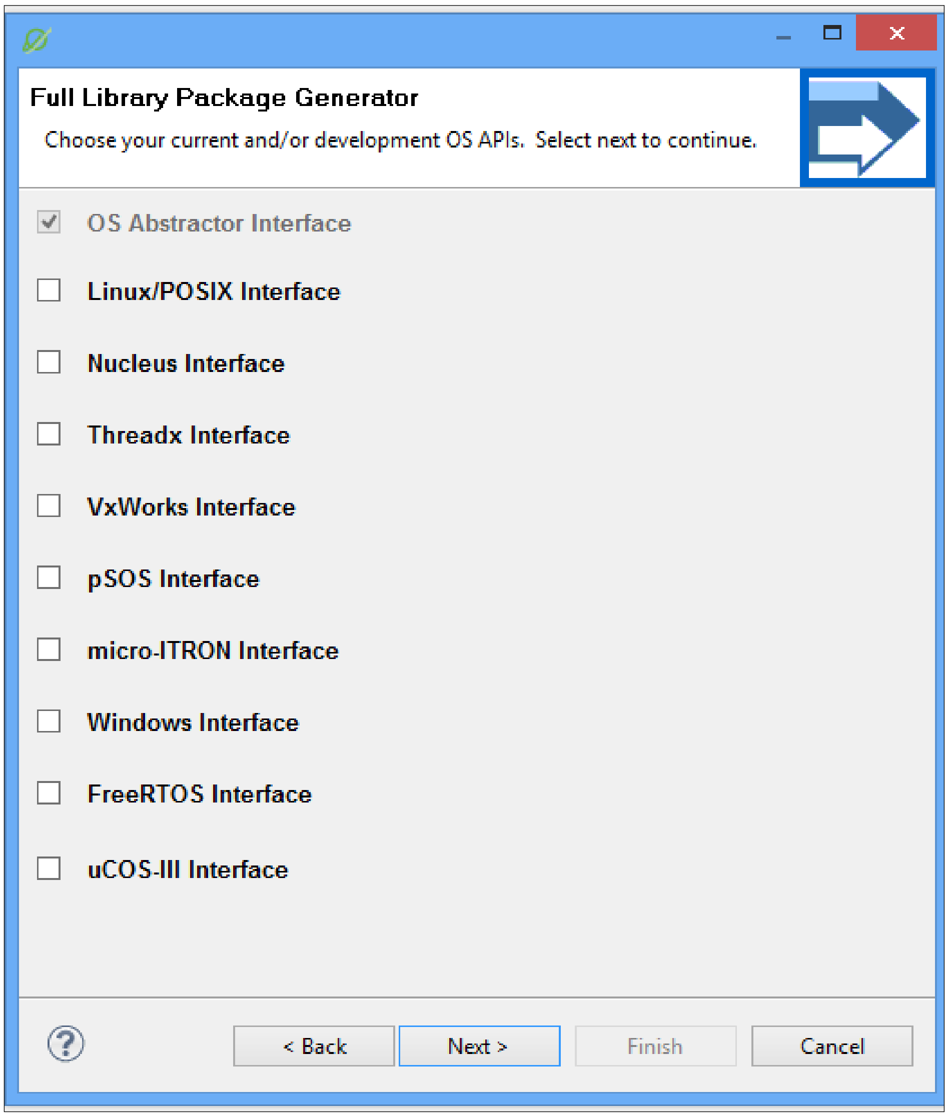
Full Library Package Generator

Choose a target OS from below and select next to continue.

- ( ) UCOS
- ( ) RT Linux
- ( ) Android
- ( ) Windows
- ( ) micro-ITRON
- ( ) QNX
- ( ) FreeRTOS
- ( ) VxWorks
- ( ) NetBSD
- ( ) Nucleus
- ( ) MQX
- ( ) Solaris
- ( ) LynxOS
- (●) Linux
- ( ) ThreadX

- Select the development OS APIs needed to generate full library package and click Nextas shown inFigure 6_5.

Figure 6_5: Select OS Changer or OS Abstractor Products



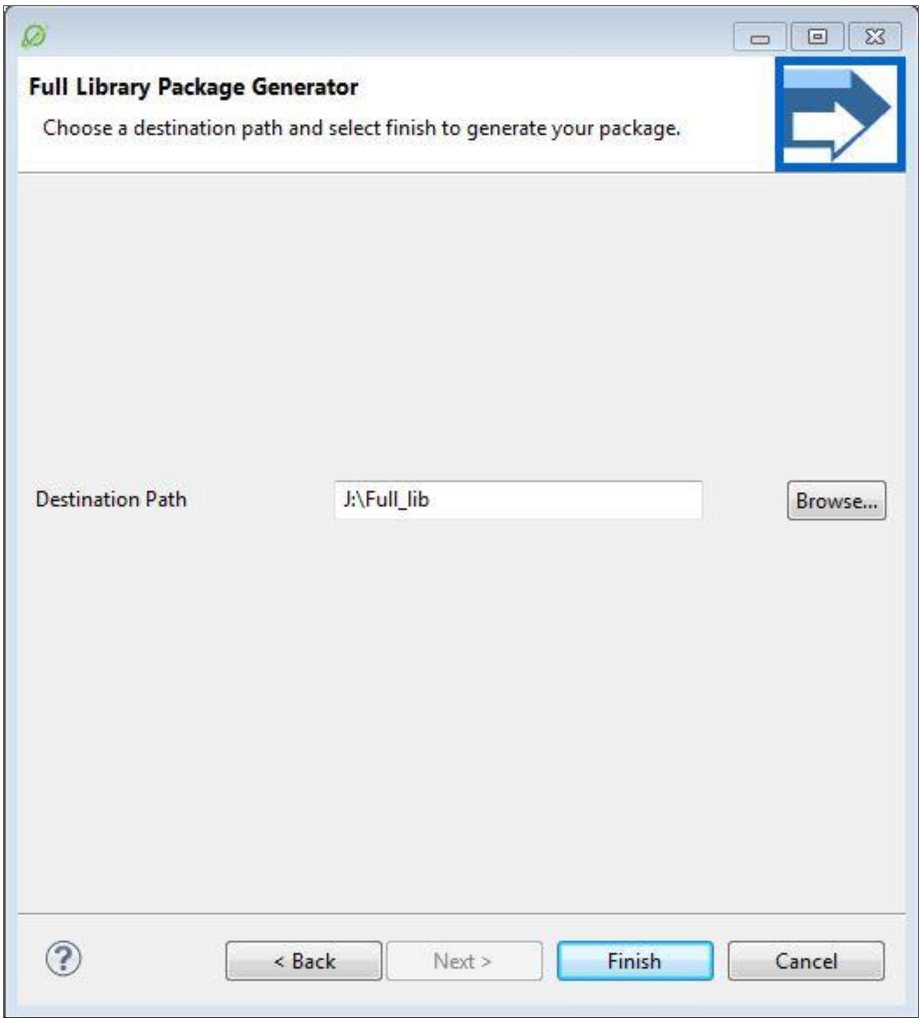
Full Library Package Generator

Choose your current and/or development OS APIs. Select next to continue.

- [✓] OS Abstractor Interface
- [ ] Linux/POSIX Interface
- [ ] Nucleus Interface
- [ ] Threadx Interface
- [ ] VxWorks Interface
- [ ] pSOS Interface
- [ ] micro-ITRON Interface
- [ ] Windows Interface
- [ ] FreeRTOS Interface
- [ ] uCOS-III Interface

- Select the destination path to save the generated package and click **Finish** as shown in Figure 6_6.

Figure 6_6: Select Destination Path



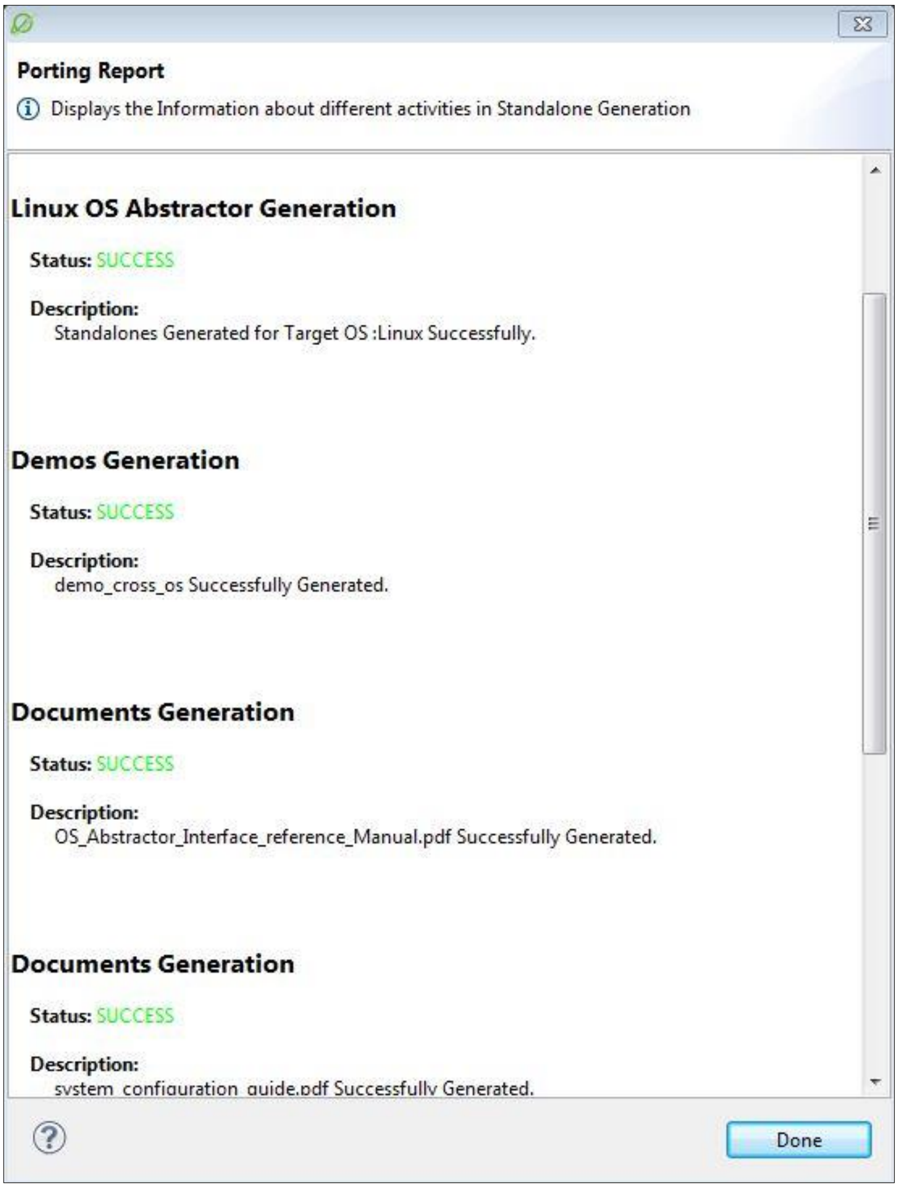
Full Library Package Generator

Choose a destination path and select finish to generate your package.

Destination Path: J:\Full_lib

- The successful library package generation is shown inFigure 6_7 .

Figure 6_7: Full Library Package Generation Verification Report



Porting Report

Displays the Information about different activities in Standalone Generation

Linux OS Abstractor Generation

Status: SUCCESS

Description:
Standalones Generated for Target OS :Linux Successfully.

Demos Generation

Status: SUCCESS

Description:
demo_cross_os Successfully Generated.

Documents Generation

Status: SUCCESS

Description:
OS_Abstractor_Interface_reference_Manual.pdf Successfully Generated.

Documents Generation

Status: SUCCESS

Description:
system_configuration_guide.pdf Successfully Generated.

Note: Incase of linux 64 bit machines the user might be required to change the path of the library from usr/lib to usr/lib64 for smooth execution of the projects. Otherwise the following compilation error might be faced,

```
/usr/bin/ld: skipping incompatible /usr/lib/libpthread.so when searching
for -lpthread
/usr/bin/ld: skipping incompatible /usr/lib/librt.so when searching for -
lrt
/usr/bin/ld: skipping incompatible /usr/lib/libc.so when searching for –lc
```

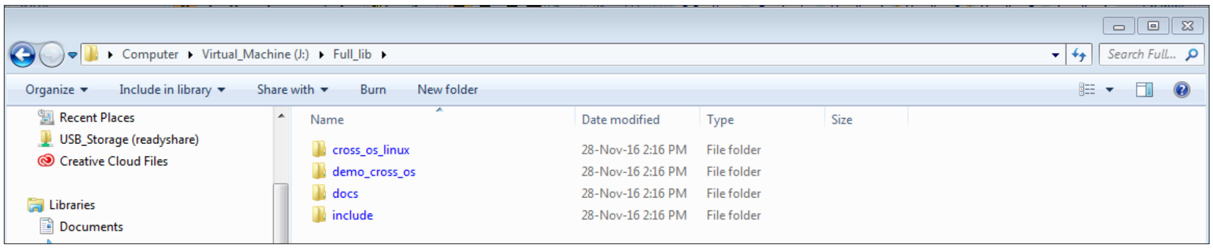
Show the Full Library Package Created by AppCOE

The full library package includes libraries with full source code to manually link into the applications. Once the application is recompiled with MapuSoft's products it will run on the new OS.

To view the generated full library package:

a) Open the folder created by AppCOE.
b) Click on the folder to view the files included in the package as shown inFigure 6_8, which include:
    - A sample application
    - Libraries containing the MapuSoft products needed to run their application on the new OS

Figure 6_8: Full Library Package Generation Folder



Name	Date modified	Type	Size
cross_os_linux	28-Nov-16 2:16 PM	File folder	
demo_cross_os	28-Nov-16 2:16 PM	File folder	
docs	28-Nov-16 2:16 PM	File folder	
include	28-Nov-16 2:16 PM	File folder	

3. Make sure if your application is built for 32bit architecture, OS_CPU_64BIT is set as OS_FALSE as a command line option.

Note: Incase of linux 64 bit machines the user might be required to change the path of the library from usr/lib to usr/lib64 for smooth execution of the projects. Otherwise the following compilation error might be faced,

```
/usr/bin/ld: skipping incompatible /usr/lib/libpthread.so when
searching for -lpthread
/usr/bin/ld: skipping incompatible /usr/lib/librt.so when searching
for -lrt
/usr/bin/ld: skipping incompatible /usr/lib/libc.so when searching
for -lc
```

Steps to compile the extracted source code using Makefile project

If your target is of linux based operating systems, Makefile can also be used in compilation. Copy the extracted source code to the linux machine and follow the below steps.

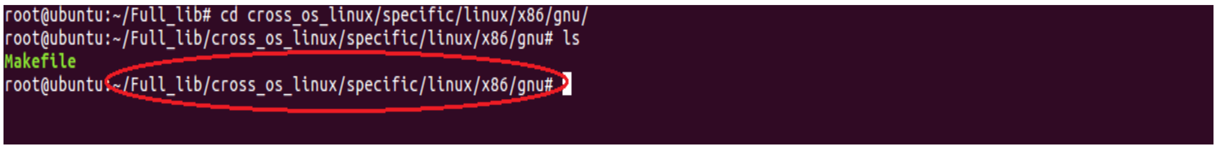
Makefile command line options

Table 6_1: User specific command line options of make file

Command line options	Descrption
`ROOT_DIR=<path>`	Sets the user selected path as the root directory
`LIB_OUT_DIR=<path>`	Sets the user selected path as the directory holding the library extension file(eg:libcross_os.a)
`make all`	Compiles the extracted source code
`make clean`	Cleans/Removes the built libraries completely
`make ARCH=32`	Compiles the 32 bit os_abstractor application in a X86_64 bit machine

- From the extracted directory, Makefile is navigated. It will be found in /../../cross_os_linux/specific/linux/x86/gnu/

Figure 6_9: Navigating the extracted folder

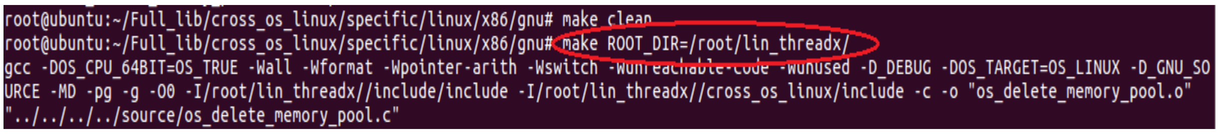


```
root@ubuntu:~/Full_lib# cd cross_os_linux/specific/linux/x86/gnu/
root@ubuntu:~/Full_lib/cross_os_linux/specific/linux/x86/gnu# ls
Makefile
root@ubuntu:~/Full_lib/cross_os_linux/specific/linux/x86/gnu#
```

- In order to set a different root directory of your make file, the following command is used.

```
make ROOT_DIR=<path>
```

Figure 6_10: Setting the user selected root directory



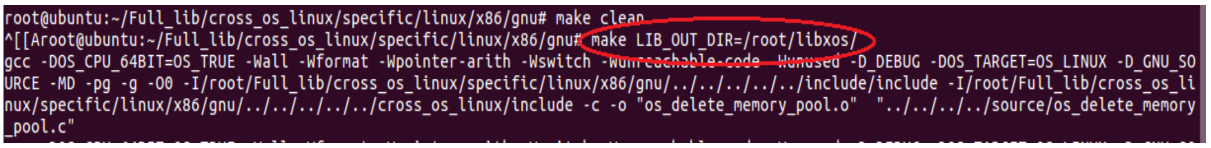
```
root@ubuntu:~/Full_lib/cross_os_linux/specific/linux/x86/gnu# make clean
root@ubuntu:~/Full_lib/cross_os_linux/specific/linux/x86/gnu# make ROOT_DIR=/root/lin_threadx/
gcc -DOS_CPU_64BIT=OS_TRUE -Wall -Wformat -Wpointer-arith -Wswitch -Wunreachable-code -Wunused -D_DEBUG -DOS_TARGET=OS_LINUX -D_GNU_SO
URCE -MD -pg -g -O0 -I/root/lin_threadx//include/include -I/root/lin_threadx//cross_os_linux/include -c -o "os_delete_memory_pool.o"
"../../../../source/os_delete_memory_pool.c"
```

- In default the library extension file(eg: libcross_os.a)can be found in the <extracted source code directory>/lib/... The user can also select their own target directory using the command line option

`make LIB_OUT_DIR=/…(path)`

For eg: `make LIB_OUT_DIR=/root/target/`

Figure 6_11: User selected library directory



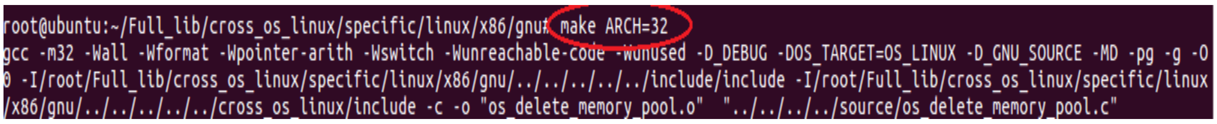
```
root@ubuntu:~/Full_lib/cross_os_linux/specific/linux/x86/gnu# make clean
^[[Aroot@ubuntu:~/Full_lib/cross_os_linux/specific/linux/x86/gnu# make LIB_OUT_DIR=/root/libxos/
gcc -DOS_CPU_64BIT=OS_TRUE -Wall -Wformat -Wpointer-arith -Wswitch -Wunreachable-code -Wunused -D_DEBUG -DOS_TARGET=OS_LINUX -D_GNU_SO
URCE -MD -pg -g -O0 -I/root/Full_lib/cross_os_linux/specific/linux/x86/gnu/../../../../../include/include -I/root/Full_lib/cross_os_li
nux/specific/linux/x86/gnu/../../../../../cross_os_linux/include -c -o "os_delete_memory_pool.o"  "../../../../source/os_delete_memory
_pool.c"
```

- If you have a X86_64 bit machine and you are in need of compiling a 32 bit os_abstractor application, then the following command is used.

  `make ARCH=32`

  The flag **–m32**could be found in the compilation window in this case.

Figure 6_12: Compiling a 32 bit application in X86_64 machine

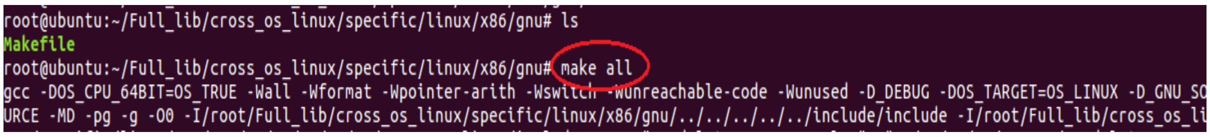


```
root@ubuntu:~/Full_lib/cross_os_linux/specific/linux/x86/gnu# make ARCH=32
gcc -m32 -Wall -Wformat -Wpointer-arith -Wswitch -Wunreachable-code -Wunused -D_DEBUG -DOS_TARGET=OS_LINUX -D_GNU_SOURCE -MD -pg -g -O
0 -I/root/Full_lib/cross_os_linux/specific/linux/x86/gnu/../../../../../include/include -I/root/Full_lib/cross_os_linux/specific/linux
/x86/gnu/../../../../../cross_os_linux/include -c -o "os_delete_memory_pool.o"  "../../../../source/os_delete_memory_pool.c"
```

(**Note**: In default Makefile will have `ARCH=64`)

- In order to compile the extracted os_abstractor source code, the command **`make all`**is given in the terminal.

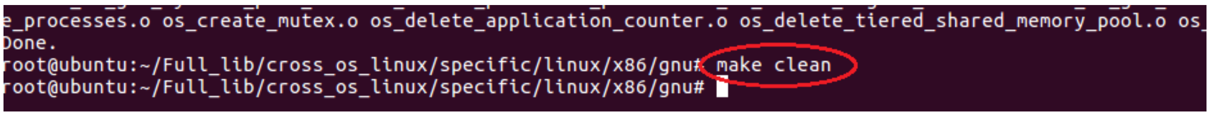
Figure 6_13: Compiling the extracted source code



```
root@ubuntu:~/Full_lib/cross_os_linux/specific/linux/x86/gnu# ls
Makefile
root@ubuntu:~/Full_lib/cross_os_linux/specific/linux/x86/gnu# make all
gcc -DOS_CPU_64BIT=OS_TRUE -Wall -Wformat -Wpointer-arith -Wswitch -Wunreachable-code -Wunused -D_DEBUG -DOS_TARGET=OS_LINUX -D_GNU_SO
URCE -MD -pg -g -O0 -I/root/Full_lib/cross_os_linux/specific/linux/x86/gnu/../../../../../include/include -I/root/Full_lib/cross_os_li
```

- If you have made changes in your source after giving **`make all`** command, you can either give **`make/make all`** command to update your libraries with changed code or you can clean/remove all your libraries using the command **`make clean`** and then it can be compiled again from the first using the command **`make all`**.

Figure 6_14: Cleaning the libraries



```
e_processes.o os_create_mutex.o os_delete_application_counter.o os_delete_tiered_shared_memory_pool.o os_
Done.
root@ubuntu:~/Full_lib/cross_os_linux/specific/linux/x86/gnu# make clean
root@ubuntu:~/Full_lib/cross_os_linux/specific/linux/x86/gnu# 
```

Steps to cross-compile the source code using Makefile for target hardware.

If you need to cross-compile for target hardware Makefile can also be used in cross-compilation using make command along with arguments. Copy the extracted source code to the existing host machine and follow the below steps.

Makefile command line options for target hardware

Table 6_2: User specific command line options of make file for target hardware.

Command line options	Description
`ROOT_DIR=<path>`	Sets the user selected path as the root directory
`LIB_OUT_DIR=<path>`	Sets the user selected path as the directory holding the library extension file(eg:libcross_os.a)
`make all`	Compiles the extracted source code
`make clean`	Cleans/Removes the built libraries completely
`make ARCH=32`	Compiles the 32 bit os_abstractor application in a X86_64 bit machine
`CROSS=<cross compiler tool prefix>`	Specifies the cross compiler executable prefix.
`TOOL_DIR=<installation location of cross compiler tool>`	Sets the path of the cross compiler package installed on your Linux host machine.

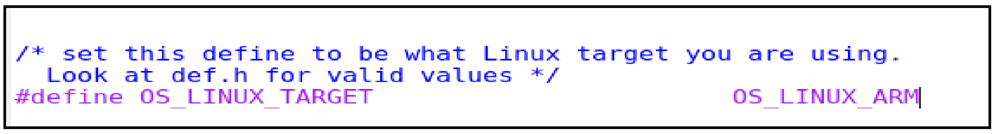
- Make change in cross_os_usr.h for the target you need to compile. Default will be OS_LINUX_X86.

  ```
  #define OS_LINUX_TARGET                         OS_LINUX_X86
  ```

  You can change to OS_LINUX_ARM, OS_LINUX_ARM_RASPBERRY_PI and OS_LINUX_OTHERS as defined in cross_os_def.h.

  For example : Target is ARM

Figure 6_15: Editing the cross_os_usr.h file.



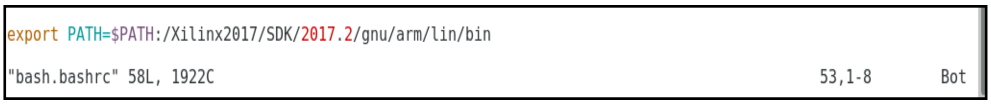
```
/* set this define to be what Linux target you are using.
  Look at def.h for valid values */
#define OS_LINUX_TARGET                     OS_LINUX_ARM
```

- Configure the cross-compiler on your host machine after successful installation of the cross -compiler.

  For example: Configuring the arm-xilinx-linux-gnueabi- on Debian 9 host machine.

  Xilinx_SDK_2017.2_0616_1_Lin64.bin package installed on your Linux host machine. Edit the bash.bashrc using vi editor or using other utility application as export PATH=<Xilinx SDK_location>/SDK/2017.2/gnu/arm/lin/bin

Figure 6_16: Configuring the cross-compiler path in.bashrc file.



```
export PATH=$PATH:/Xilinx2017/SDK/2017.2/gnu/arm/lin/bin
"bash.bashrc" 58L, 1922C                                   53,1-8        Bot
```

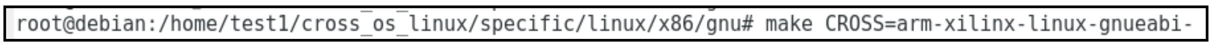
- Build your cross_os and other interfaces source code packages using the make command passing the argument as name of the cross-compiler. The command stated as follows:

  ```
  make CROSS=<cross compiler tool prefix>
  ```

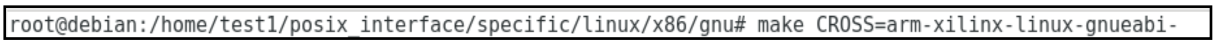
  For example : After configuring the arm-xilinx-linux-gnueabi-, make command to build cross_os and interfaces as :

  ```
  make CROSS=arm-xilinx-linux-gnueabi-
  ```

Figure 6_17: Cross-compiling the cross os and interfaces using cross-compiler



```
root@debian:/home/test1/cross_os_linux/specific/linux/x86/gnu# make CROSS=arm-xilinx-linux-gnueabi-
```



```
root@debian:/home/test1/posix_interface/specific/linux/x86/gnu# make CROSS=arm-xilinx-linux-gnueabi-
```

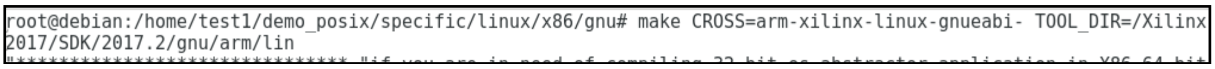
- Then build your application using the make command passing the argument as name of the cross-compiler and the path of the binary of the cross-compiler package installed in your linux . The command stated as follows:

  ```
  make CROSS=<cross compiler tool prefix> TOOL_DIR=<binary path of the
  cross compiler tool>
  ```

  For example: make command to build the canned demo application.

  ```
  make CROSS = arm-xilinx-linux-gnueabi-
  TOOL_DIR=/Xilinx2017/SDK/2017.2/gnu/lin
  ```

  Figure 6_18: Cross-compiling the demo/other applications using cross-compiler.



```
root@debian:/home/test1/demo_posix/specific/linux/x86/gnu# make CROSS=arm-xilinx-linux-gnueabi- TOOL_DIR=/Xilinx
2017/SDK/2017.2/gnu/arm/lin
```

- The executable of application can run on target hardware.

Generating Binary Packages

NOTE: If you want to build a library as a Shared Library, use the makefile named makefile_s under cross_os_xxxx/specific/x86/gnu/makefile.

Optimized Target Code Generator

AppCOE's Optimized Target Code Generator generates porting and OS Abstractor Interface source code optimized for your application. This allows you to create project files. This also includes the system settings you chose in the GUI-based Wizard.

Note: Before you begin, refer to MapuSoft System Configuration Guide.

This section contains the following topics:

Generating Optimized Target Code

This section describes how to generate optimized target code using AppCOE. Most of the configurations described below can also be changed at run time using the OS_Application_Init function.

NOTE 1: This feature requires a target license. Click http://mapusoft.com/contact/ to send a request to receive licenses and documentation.

NOTE 2: For all Optimized Target Code Generation the preprocessor OS_HOST flag is set to OS_FALSE. If the user intends to do the host development on the optimized target code, they need to change this preprocessor flag to OS_TRUE manually.

NOTE 3: On Linux target, PC hangs while running demo_uitron from terminal if you terminate the execution by `Ctrl+C`. Make sure that #define OS_BUILD_FOR_SMP is set to False when compiling for non SMP processors.

NOTE 4: If you select a library project, which either has, a C/C++ generic library project or AppCOE library project, Target Code Generator icon is disabled.

NOTE 5: API optimization is not supported for AppCOE libraries linked with application project during target code generation.

NOTE 6: The Eclipse Indexer may report errors after successfully building an application. These errors are related to missing symbols and are due to the fact that the indexer is not detecting the changes in the source files which are generated., and select Index > Rebuild from the context menu.

To resolve the errors:

1. Right-click the Project, then Select **Project > Properties > C/C++ General > Indexer**.
2. Click **Enable Project Specific Settings** check box, and click **Enable Indexer** check box.
3. Click Apply and OK.

Optimized Target Code Generation for Ada Projects

AppCOE allows Optimized Target Code Generation for Ada-C/C++ Changer Projects, when the projects are created with OS Abstractor Integration.

NOTE 1: The project file generated to QNX Momentics 4.x IDE using optimized target does not enable the build variant, so you need to manually enable the build variant after importing in the QNX IDE.

To enable the Build Variant:

- Select the project and go to **Project Properties->C/C++ General->QNX C/C++Project.**
- Select **Build variant** tab.
- To enable the build variant, select the **X86** check box.

NOTE 2: Check if the Indexer is enabled**.** Generating Optimized Target Code will not work if Indexer is OFF.

NOTE 3: For all Optimized Target Code Generation the preprocessor OS_HOST flag is set to OS_FALSE. If the user intends to do the host development on the optimized target code, they need to change this preprocessor flag to OS_TRUE manually.

NOTE 4: The QNX Momentics IDE has an issue where relative path names are not updated unless there is a modification to the project settings. This will cause the initial build of the Full Source version of OS Abstractor to fail since the project files were created in a different location than where they were installed.

To force Momentics to update these paths:

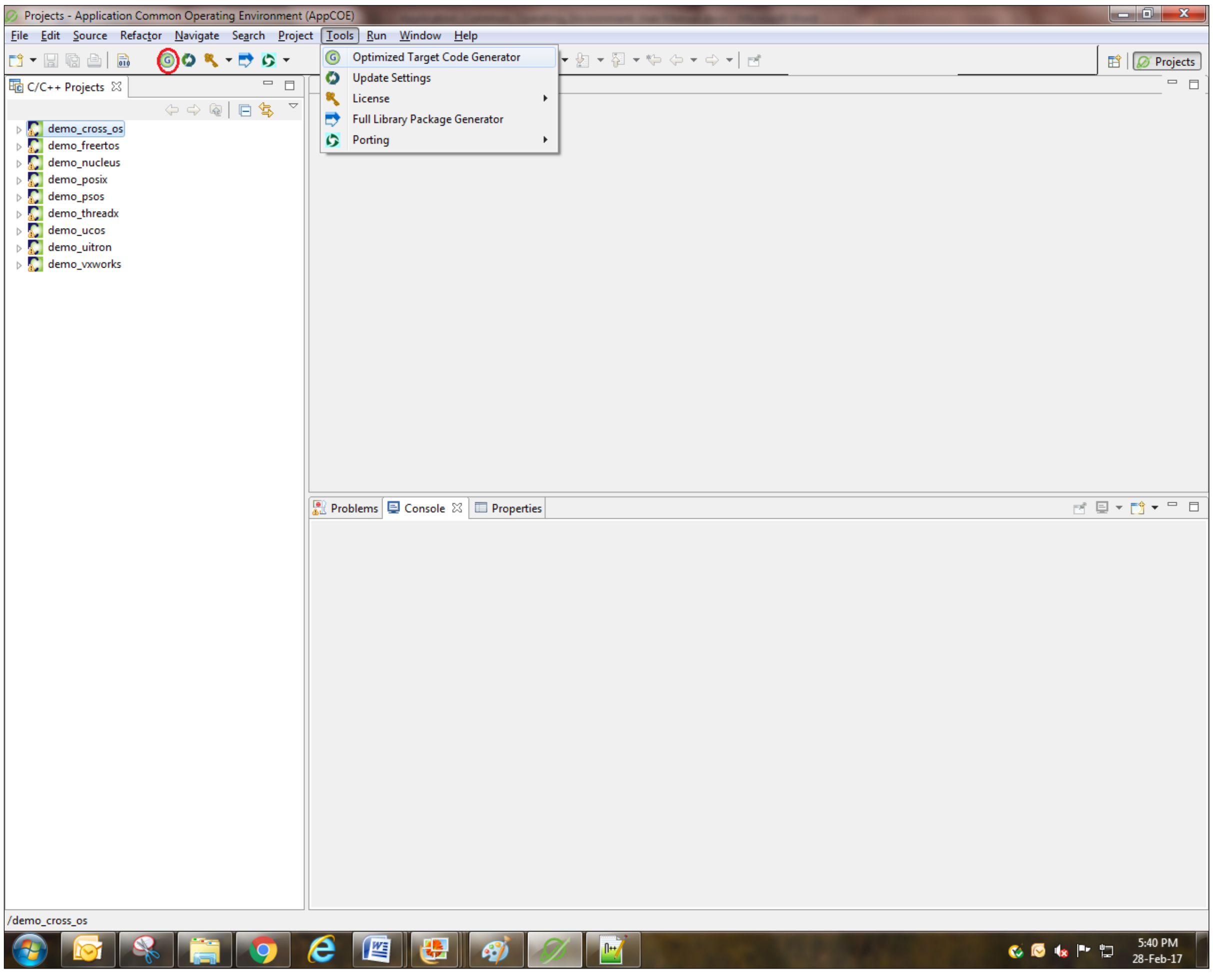
- Right-click on the project and select **Properties** from the context menu. Then click **Apply** and close the properties window.

NOTE 5: To generate optimized target code on Windows Interface, ensure that the flag INCLUDE_OS_PROCESS is set to OS_TRUE in the cross_os_usr.h configuration file.

To generate Optimized Target Code:

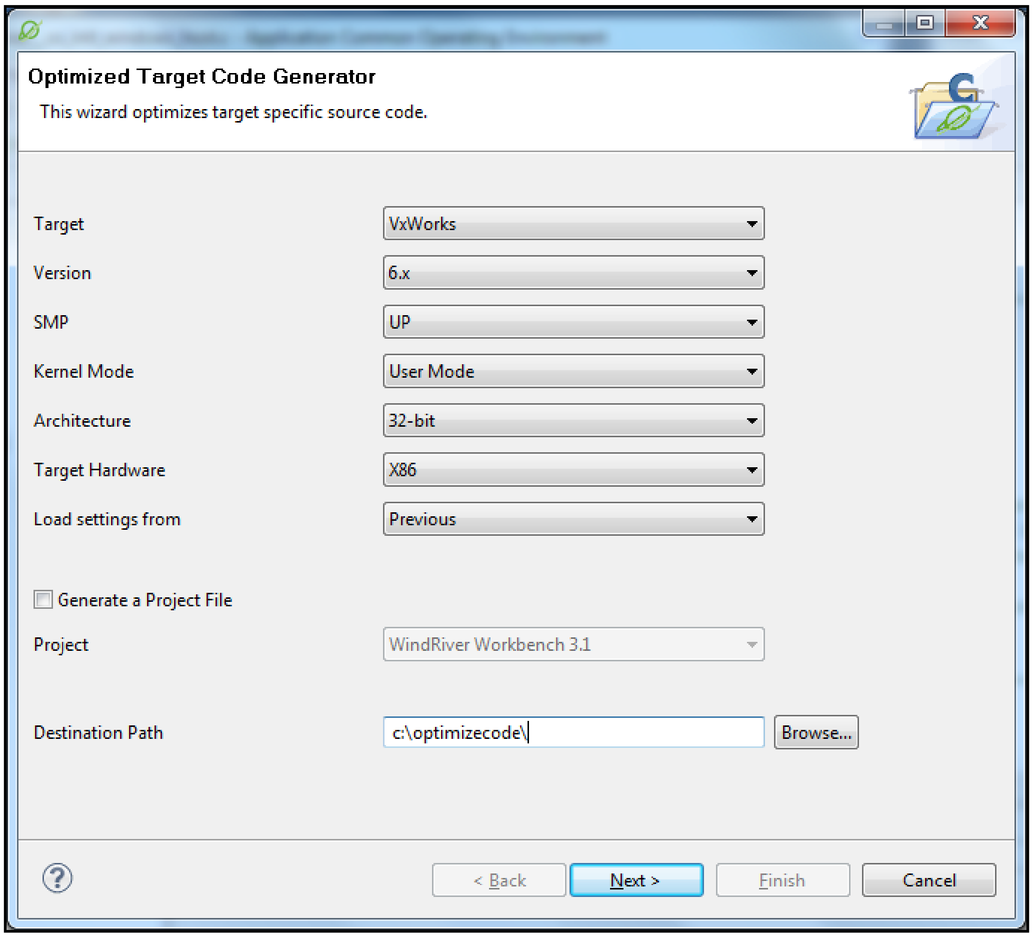
1. From AppCOE C/C++ projects, select a project.
2. From AppCOE main menu, click **Tools >Optimize Target Code Generator** or click the Optimized Target Code Generator button on the AppCOE Toolbar as shown inFigure 6_19.

Figure 6_19:AppCOE Target Code Generator



3. From AppCOE Optimized Target Code Generator window, select your target platform specifications from the drop down list. VxWorks operating system is selected as an example as shown in6_20.

Figure 6_20: Selected VxWorks Target in this Example



Optimized Target Code Generator

This wizard optimizes target specific source code.

Target	VxWorks
Version	6.x
SMP	UP
Kernel Mode	User Mode
Architecture	32-bit
Target Hardware	X86
Load settings from	Previous

☐ Generate a Project File

Project	WindRiver Workbench 3.1
Destination Path	c:\optimizecode\

The field descriptions on AppCOE Optimized Target Code Generator window are as follows:

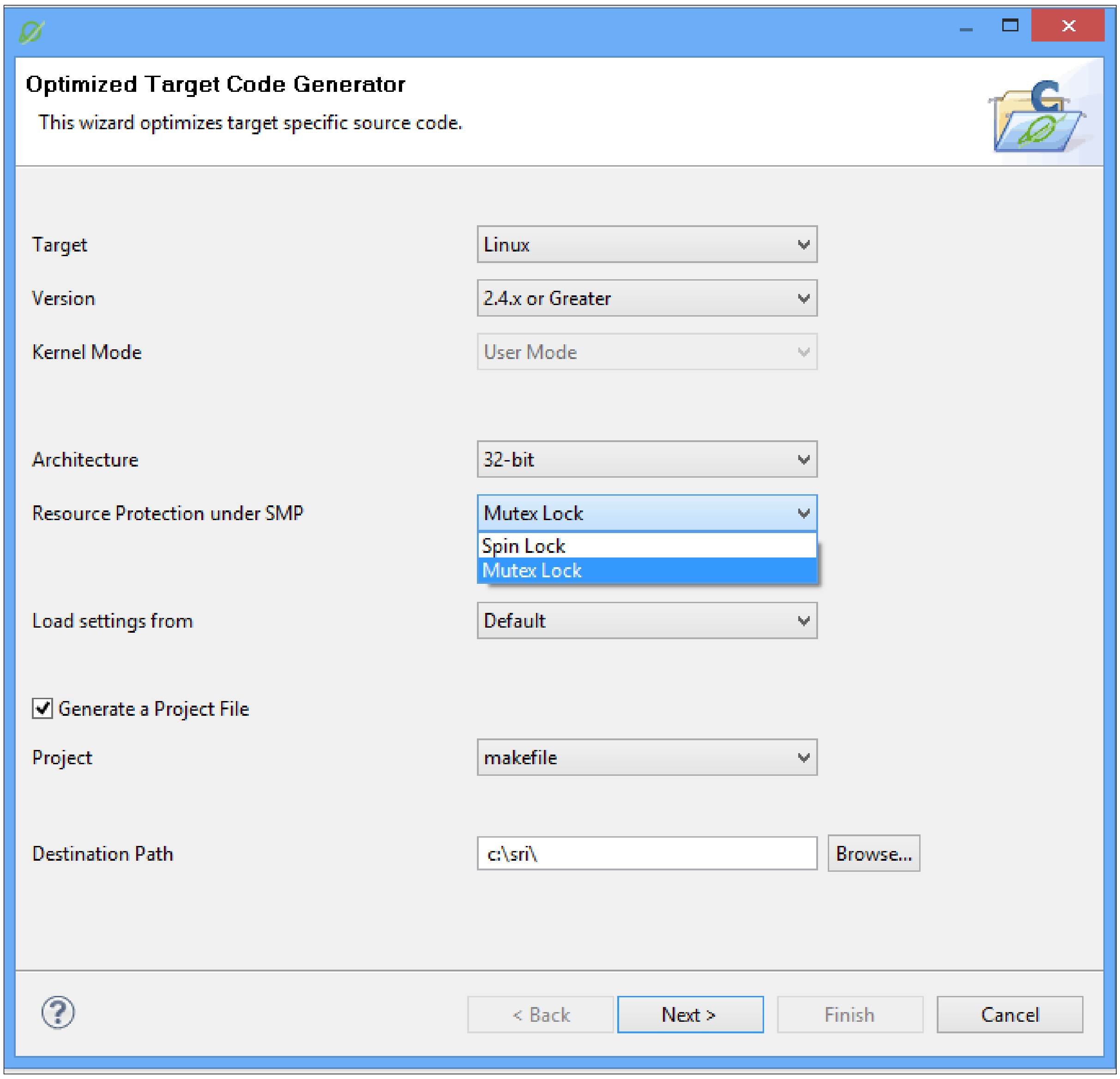
Table 6_3: Field descriptions on AppCOE Optimized Target Code Generator

Field	**Description**	**Your Action**
Target	Specifies the target OS name.	Enter the target OS name in the text box.
Version	Based on the Target OS name you selected, this specifies, the available version names listed in the Version drop down list.	Select the appropriate target version.
SMP	This specifies the Symmetric Multi processor.	Select this if your target supports SMP or UP.
Kernel Mode	If applicable to the Target OS name and version, this specifies the following modes: • User mode • Kernel mode	Select the Target kernel mode by selecting it from the drop down list.
Architecture	This specifies the architecture of the Target OS. The options are: • 32-bit • 64-bit	Select the architecture you need.
Target Hardware	Specifies the type of target hardware used to complete code optimization. **Note**: You can select the target hardware only when you select VxWorks as your target OS.	Select the type of target hardware used. The options are: PPC,PPC_604,X86,ARM,M68K,MCORE,MIPS,SH,SIMLINUX,SIMNT,SIMSOLARIS,SPARC
Load Settings	This specifies the following two options to load settings from: • **Previous**: If you select Previous, then initial values for this wizard are loaded from previously saved settings and populated. • **Default:** If you select Default, then the values from default settings are populated.	Select the option to load settings from by selecting from the drop down list.
Generate a Project File	Specifies if you want to generate a project file.	Select the check box next to Generate project file.
Project	Specifies the different target project types that you can generate for this project. The generated project files are directly imported into the specified IDE (Eclipse/Visual Studio), and this project becomes a project of that IDE.	Select the project from the drop down list.
Destination Path	Specifies the path to place the generated optimized target code.	Click **Browse** and select the folder to place the generated code.

4. From AppCOE Optimized Target Code Generator window, when you select your target platform as Linux/RT Linux Resource Protection Under SMP selection is provided as shown in Figure 6_17.

Resource Protection Under SMP has option of either **Spin Lock** or **Mutex Lock** . Spin lock is useful if protection is required for a short time. Spin Lock wastes CPU if protection required is for longer periods. If you have two or more cores and when you see serious performance issues then it is recommended to use Mutex Lock. When you enable Mutex Lock as shown inFigure 6_21,this willset **OS_PROTECTION_USE_MUTEX_LOCK** flag to **OS_TRUE** in **cross_os_usr.h** file. The following**Figure 6.17** will show the Spin Lock or Mutex Lock in selection.

Figure 6_21: Resource Protection under SMP selection in Linux/RT Linux



Optimized Target Code Generator

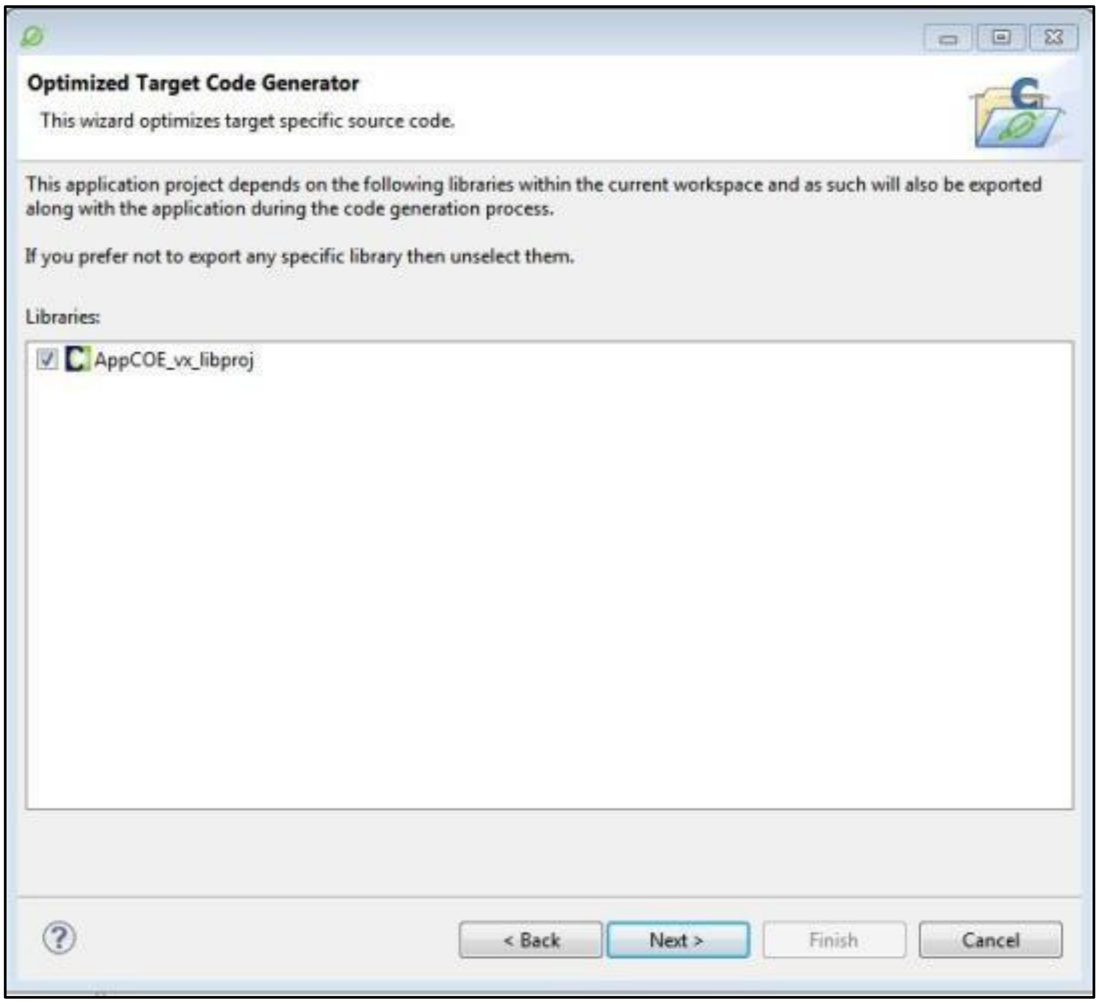
This wizard optimizes target specific source code.

Target	Linux
Version	2.4.x or Greater
Kernel Mode	User Mode
Architecture	32-bit
Resource Protection under SMP	Mutex Lock
Load settings from	Default
☑ Generate a Project File	
Project	makefile
Destination Path	c:\sri\

If you select an application project, AppCOE checks if the application project has any linked-in libraries and queries the workspace for any matching library projects. If AppCOE finds any libraries, then it will install the available libraries on the page as shown in 6_22.

All the libraries are selected by default, and you can select or deselect any/all libraries to export library sources along with the application during code generation process. Select the libraries and click **Next**.

Figure 6_22: Select the linked-in Libraries



Optimized Target Code Generator

This wizard optimizes target specific source code.

This application project depends on the following libraries within the current workspace and as such will also be exported along with the application during the code generation process.

If you prefer not to export any specific library then unselect them.

Libraries:

☑ AppCOE_vx_libproj

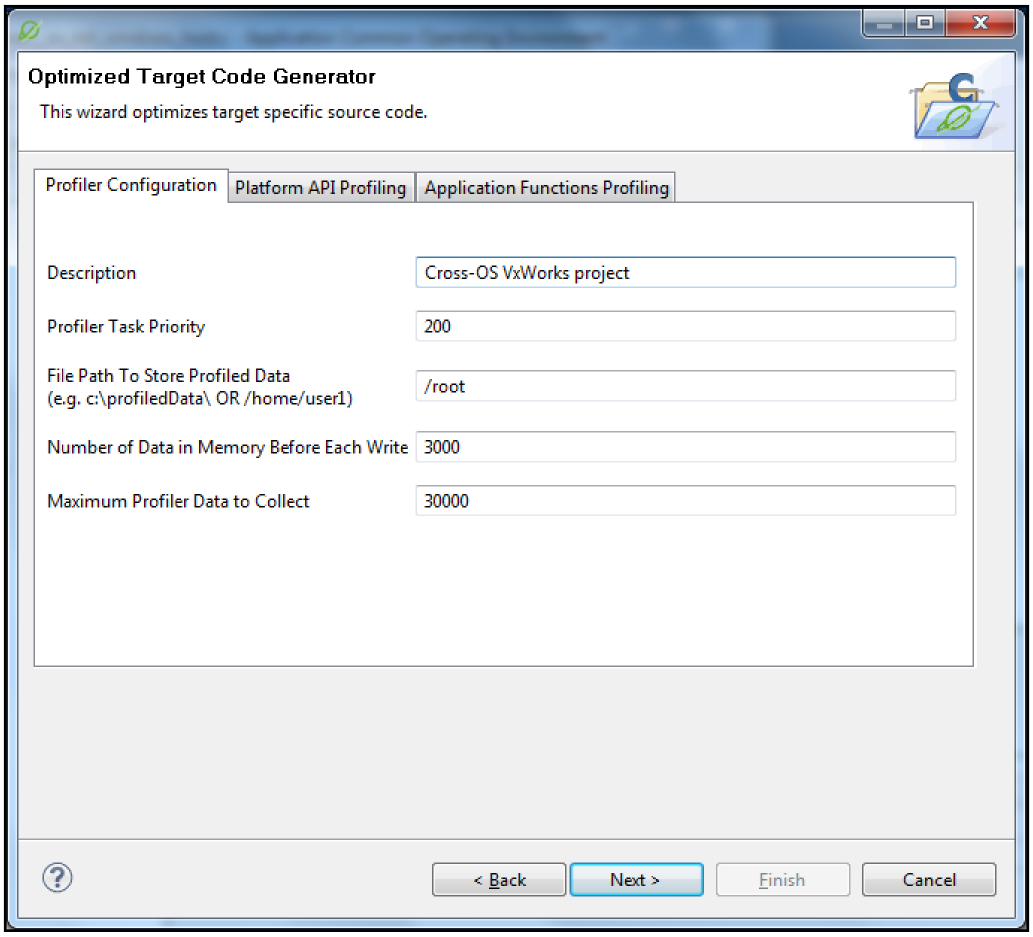
NOTE: When you export AppCOE libraries, it will skip API Optimization.

Target Code Generator will contain the following folders/files:

- Application project sources and project/make files.
- OS Abstractor Interfaces (the ones that are included in the project)
- Library sources without project files.

5. On **Profiler Configuration** tab, define your profiler data specifications as shown in Figure 6_2323.

Figure 6_23: Profiler Configuration


Optimized Target Code Generator
This wizard optimizes target specific source code.
Profiler Configuration
Platform API Profiling
Application Functions Profiling
< Back
Next >
Finish
Cancel

Description	Cross-OS VxWorks project
Profiler Task Priority	200
File Path To Store Profiled Data (e.g. c:\profiledData\ OR /home/user1)	/root
Number of Data in Memory Before Each Write	3000
Maximum Profiler Data to Collect	30000

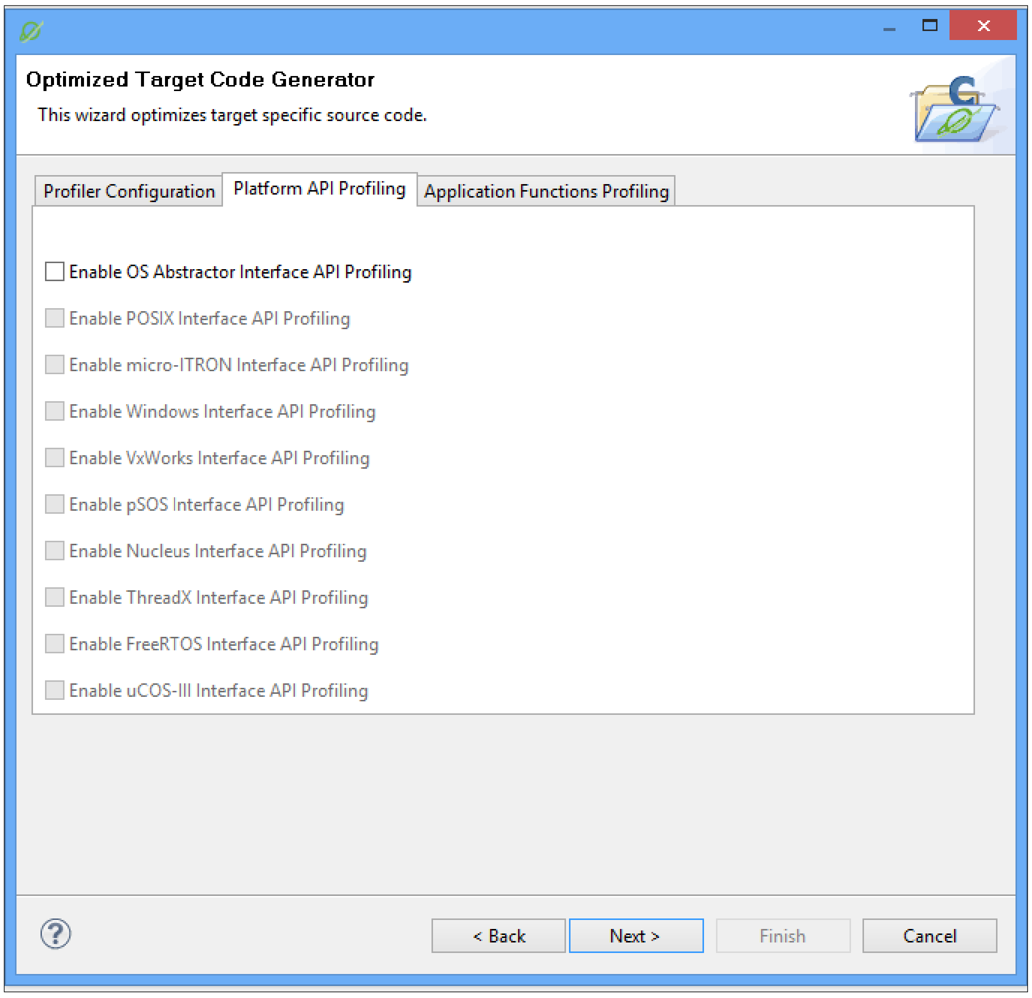
The field descriptions on Profiler Configuration tab are as follows:

Table 6_4: Field descriptions on Profiler Configuration tab

Field	**Description**	**Your Action**
Description	Specifies the description for the OS Abstractor Interface project.	Type description for the OS Abstractor Interface project.
Profiler Task Priority	Specifies the priority level of the profiler thread.	Enter a priority level for the profiler thread. The value can be between 0 through 225. The default value is set to 200.
File Path to Store Profiled Data	Specifies the directory location where the profiler file will be created.	Enter a data file path. The default location set is */root* on Unix based machines and *c/* on MS Windows machine.
Number of Data in Memory Before Each Write	Specifies the depth of the profiler queue.	Enter the number of data in memory before each write. The default value is set to 3000.
Maximum Profiler Data to Collect	Specifies the maximum records collected in the XML file.	Enter the number of profiler messages. The default value is set to 30000.

6. On **Platform API Profiling** tab, select the check box to enable your appropriate Interface API Profiling as shown inFigure 6_24.

Figure 6_24: Platform API Profiling



Optimized Target Code Generator

This wizard optimizes target specific source code.

- [ ] Enable OS Abstractor Interface API Profiling
- [ ] Enable POSIX Interface API Profiling
- [ ] Enable micro-ITRON Interface API Profiling
- [ ] Enable Windows Interface API Profiling
- [ ] Enable VxWorks Interface API Profiling
- [ ] Enable pSOS Interface API Profiling
- [ ] Enable Nucleus Interface API Profiling
- [ ] Enable ThreadX Interface API Profiling
- [ ] Enable FreeRTOS Interface API Profiling
- [ ] Enable uCOS-III Interface API Profiling

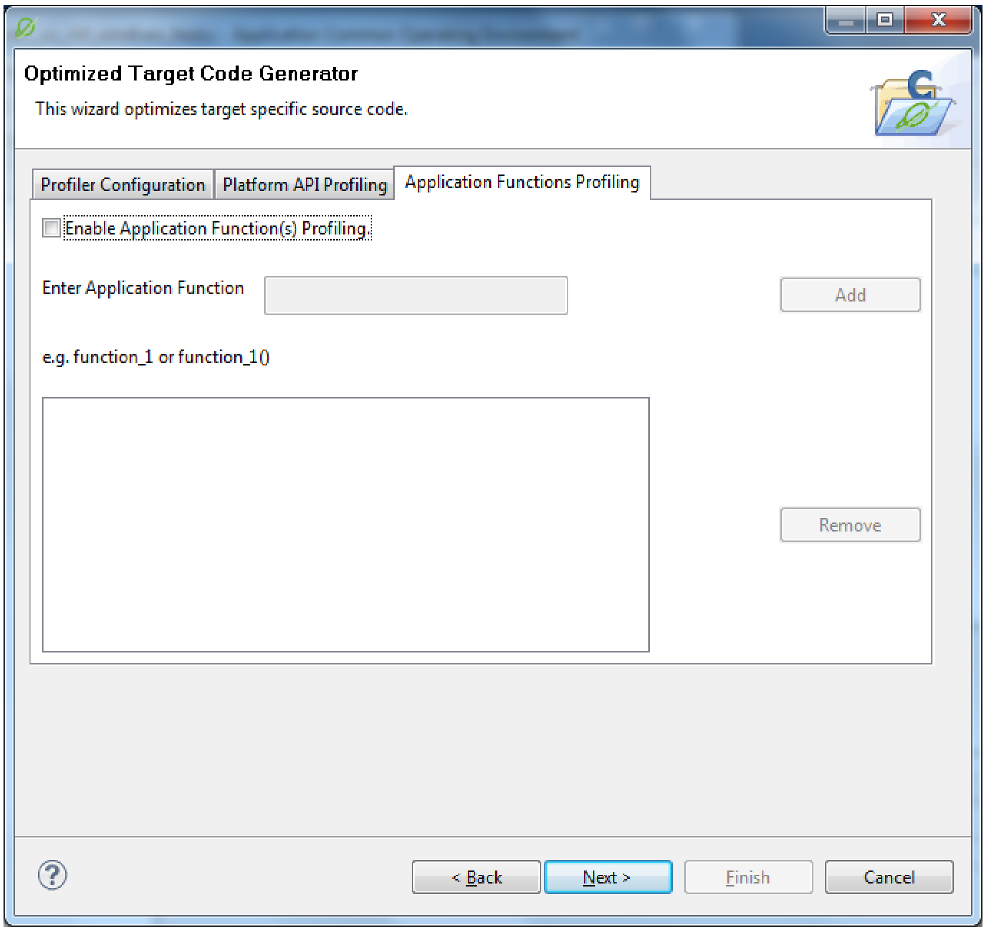
The field descriptions on Platform API Profiling tab are as follows:

Table 6_5: Field descriptions on Platform API Profiling tab

Field	Description	Your Action
Enable OS Abstractor Interface API Profiling	Specifies if the OS Abstractor Interface API Profiling feature is enabled or disabled.	Select the check box to enable platform profiling. Platform Profiling means OS Abstractor Interface APIs profiling. **NOTE**: By default, OS Abstractor Interface API profiling is enabled for all projects.
Enable POSIX/LINUX Interface API Profiling	Specifies if OS Abstractor POSIX/LINUX Interface API Profiling feature is enabled for your project.	Select the check box, if you need profiling for your POSIX/LINUX APIs.
Enable micro-ITRON Interface API Profiling	Specifies if OS Abstractor micro-ITRON Interface API Profiling feature is enabled for your project.	Select the check box, if you need profiling for your micro-ITRON APIs.
Enable Windows Interface API Profiling	Specifies if OS Changer Windows Interface API Profiling feature is enabled for your project.	Select the check box, if you need profiling for your Windows APIs.
Enable VxWorks Interface API Profiling	Specifies if VxWorks Interface API Profiling feature is enabled for your project.	Select the check box, if you need profiling for your VxWorks Interface APIs.
Enable pSOS Interface API Profiling	Specifies if OS Changer pSOS Interface API Profiling feature is enabled for your project.	Select the check box, if you need profiling for your pSOS Interface APIs.
Enable Nucleus Interface API Profiling	Specifies if OS Changer Nucleus Interface API Profiling feature is enabled for your project.	Select the check box, if you need profiling for your OS Changer Nucleus Interface APIs.
Enable µC/OS Interface API Profiling	Specifies if OS Changer µC/OS Interface API Profiling feature is enabled for your project.	Select the check box, if you need profiling for your OS Changer µC/OS Interface APIs.
Enable FreeRTOS Interface API Profiling	Specifies if OS Changer FreeRTOS Interface API Profiling feature is enabled for your project.	Select the check box, if you need profiling for your OS Changer FreeRTOS Interface APIs.

7. On **Application Functions Profiling** tab, you can also perform profiling for your specific APIs as shown in Figure 6_25.

Figure 6_25: Application Function Profiling



Optimized Target Code Generator

This wizard optimizes target specific source code.

☐ Enable Application Function(s) Profiling.

Enter Application Function

e.g. function_1 or function_1()

The field descriptions on Application Functions Profiling tab are as follows:

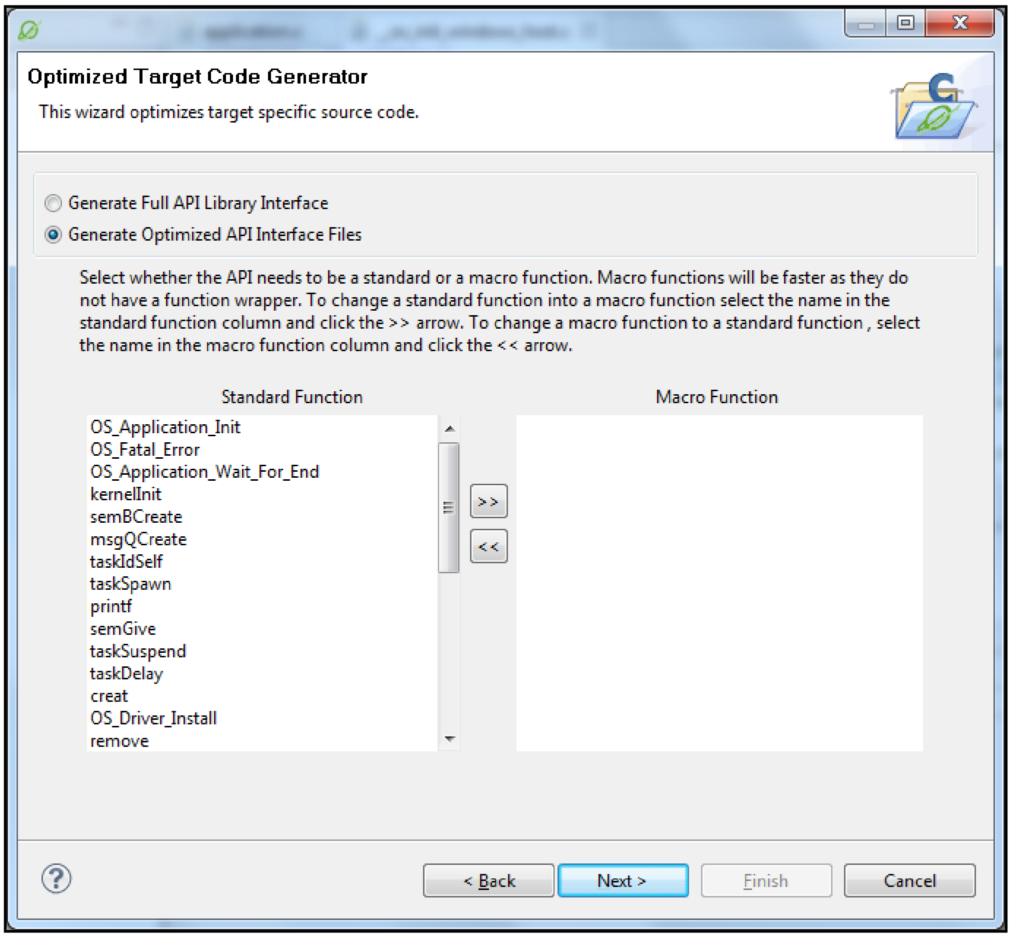
Table 6_6: Field descriptions on Application Functions Profiling tab

Field	**Description**	**Your Action**
Enable Application Functions Profiling	Specifies if the Application Functions Profiling feature is enabled or disabled.	Select the check box to enable Application Functions profiling. This profiling is used for User APIs profiling.
Enter Application Function	Specifies the name of the Application Function for profiling.	Enter the name of the application function. **NOTE**: This field is case sensitive.
Add	Specifies if you want to add any application functions.	To add any application function, enter the name in the text box, and click **Add.**
Remove	Specifies if you want to remove any application functions from the list.	To remove any application function from the list, select the name of the application function in the text box, and click **Remove.**

8. Add your APIs by typing in the name of the API next to **Enter Application Function** text box and click **Add and click Next**.

9. On **API Optimization** tab, you can select either to generate Full API Library Interface or Optimized API interface. In API Optimization, you can select the API's which needs to be a standard function or a macro function and move the selected API using the double arrow button as shown in Figure 6_26. Macro functions will execute faster but will increase the memory footprint of the application and click **Next**.

Figure 6_26: API Optimization


Optimized Target Code Generator

This wizard optimizes target specific source code.

Generate Full API Library Interface [✓ Generate Optimized API Interface Files]

Select whether the API needs to be a standard or a macro function. Macro functions will be faster as they do not have a function wrapper. To change a standard function into a macro function select the name in the standard function column and click the >> arrow. To change a macro function to a standard function , select the name in the macro function column and click the << arrow.

Standard Function	Macro Function
OS_Application_Init	
OS_Fatal_Error	
OS_Application_Wait_For_End	
kernelInit	
semBCreate	
msgQCreate	
taskIdSelf	
taskSpawn	
printf	
semGive	
taskSuspend	
taskDelay	
creat	
OS_Driver_Install	
remove	

Need for Code Optimization: Macro function is used to eliminate the time overhead when a function is called. It is typically used for functions that execute frequently. It also has a space benefit for very small functions, and is an enabling transformation for other optimizations.

Without macro functions, however, the compiler decides which functions to inline. The programmer has little or no control over which functions are macro functions and which are not. Giving this degree of control to the programmer allows her/him to use application-specific knowledge in choosing which functions to macro.

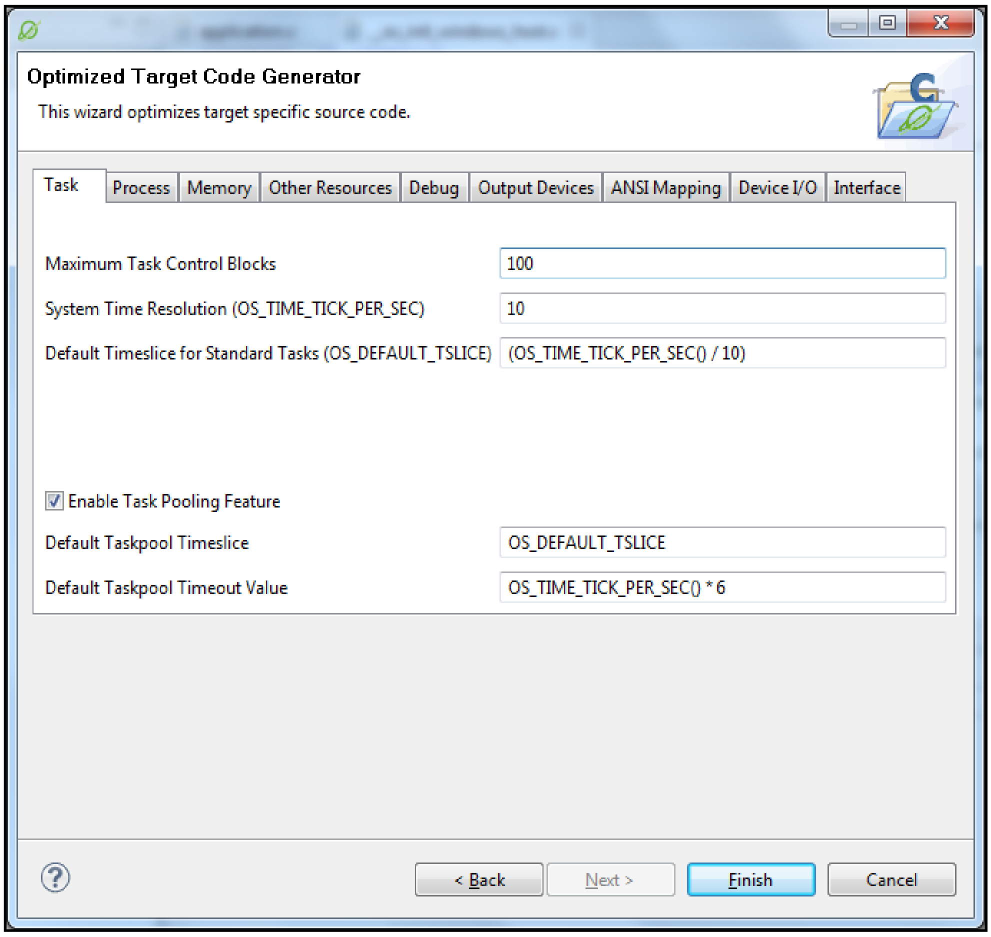
The field descriptions on API Optimization tab are as follows:

Table 6_7: Field descriptions on API Optimization tab

Field	Description	Your Action
Generate Full API Library Interface	Specifies if you want to generate full API library package. **Note:** You can do this if you have a valid license for standalone generation.	Select the radio button to generate full library package. **Note:** If you select this option, the rest of the fields on this window are disabled.
Generate Optimized API Interface Files	Specifies if you want to generate optimized API interface files. **Note:** If the application includes AppCOE based application libraries, generating optimized API interface option is disabled.	Select the radio button to generate optimized API interface files. **Note:** By default this option is enabled.
Standard Function	Specifies if the APIs used in your application are standard functions.	Select the functions used in this application as standard functions for the target OS project. You can select multiple function names at once to place them in the other list. You can select all function names in a list using the select All (Ctrl+A) action also.
Macro Function	Specifies that a compiler inserts the complete body of the function in every place in the code where that function is used. It is used to eliminate the time overhead when a function is called and execute it frequently.	To select a standard function into a macro function, select the API and click the right arrow. To select a macro function into a standard function, select the API under macro function, and click the left arrow. **Note:** You can use optimization for this. If a function is being called repeatedly, they can improve the performance by making this a macro function.

10. On **Task** configuration tab, configure the options to your specifications as shown in Figure 6_27. Applications can create OS Abstractor Interface tasks during initialization and will be able to re-use the task envelope repeatedly by selecting the check box next to **Enable Task Pooling Feature**.

Figure 6_27: Task Tab



Optimized Target Code Generator

This wizard optimizes target specific source code.

Maximum Task Control Blocks	100
System Time Resolution (OS_TIME_TICK_PER_SEC)	10
Default Timeslice for Standard Tasks (OS_DEFAULT_TSLICE)	(OS_TIME_TICK_PER_SEC() / 10)

[✓] Enable Task Pooling Feature

Default Taskpool Timeslice	OS_DEFAULT_TSLICE
Default Taskpool Timeout Value	OS_TIME_TICK_PER_SEC() * 6

NOTE: In the current release, Task Pooling feature is not supported in ThreadX and Nucleus targets.

The field descriptions on Task tab are as follows:

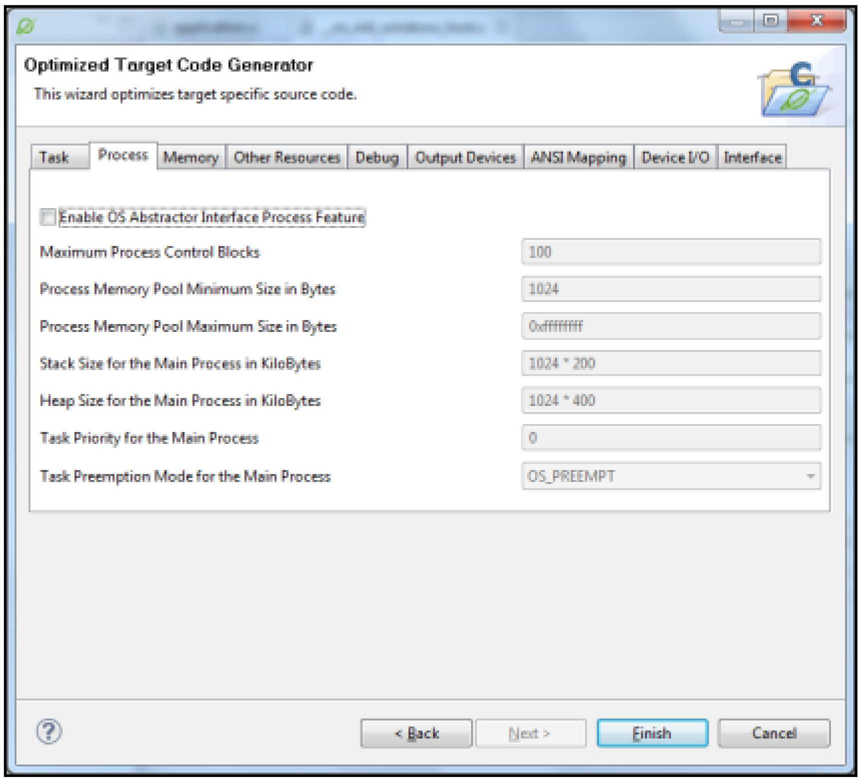
Table 6_8:Field descriptions on Task tab

Field	Description	Your Action
Maximum Task Control Blocks	Specifies the total number of tasks required by the application.	Enter a value. **NOTE:** The default value is 100. One control block will be used by the OS_Application_Init function when the INCLUDE_OS_PROCESS option is true.
System Time Resolution (OS_TIME_TICK_PER_SEC)	Specifies the system clock ticks (not hardware clock tick). For example, when you call OS_Task_Sleep(5), you are suspending task for a period (5* OS_TIME_RESOLUTION).	Enter a value. **NOTE:** The default value is 10000 micro second (= 10milli sec). This value is derived from the target OS. If you cannot derive the value, refer to the target OS reference manual and set the correct per clock tick value. **NOTE:** Since the system clock tick resolution may vary across different OS under different target, it is recommended that the application use the macro OS_TIME_TICK_PER_SEC to derive the timing requirement instead of using the raw system tick value in order to keep the application portable across multiple OS.
Default Time slice for Standard Tasks (OS_DEFAULT_TSLICE)	Specifies the default time slice scheduling window width among the same priority pre-emptiable threads when they are all in ready state.	Enter a default time slice for standard tasks. **NOTE**: The default value is 10 ms. If system tick is 10ms, then the threads will be scheduled round-robin at the rate of every 100ms. **NOTE**: On Linux operating system, the time slice cannot be modified per thread. OS Abstractor Interface ignores this setting and only uses the system default time slice configured for the Linux kernel.
Enable Task Pooling Feature	Specifies if the Task pooling feature is enabled for this application. Task pooling feature enhances the performances and reliability of application. If you enable the task pooling feature, applications can create OS Abstractor Interface tasks	To enable task pooling feature, select the check box.

Field	Description	Your Action
	during initialization and be able to re-use the task envelope repeatedly. To configure task-pooling, set the following pre-processor flag as follows: INCLUDE_OS_TASK_POOLING.	
Default Task pool Time slice	Specifies the default Task pool Time slice.	Enter the default Task pool Time slice. **NOTE**: The default value is OS_DEFAULT_TSLICE.
Default Task pool Timeout Value	Specifies the default Task pool timeout value.	Enter the default Task pool timeout value. **NOTE**: The default value is OS_TIME_TICK_PER_SEC() * 6.

11. On **Process** configuration tab, configure the options to your specifications as shown inFigure 6_28. Select the check box next to **Enable OS Abstractor Interface Process Feature** to allocate the memory from a shared memory region to allow applications to communicate across multiple processes. By disabling this option, the memory will be allocated from the individual application/process specific pool, which is created during the OS_Application_Init function call.

Figure 6_28: Process Tab



☐ Enable OS Abstractor Interface Process Feature	
Maximum Process Control Blocks	100
Process Memory Pool Minimum Size in Bytes	1024
Process Memory Pool Maximum Size in Bytes	0xffffffff
Stack Size for the Main Process in KiloBytes	1024 * 200
Heap Size for the Main Process in KiloBytes	1024 * 400
Task Priority for the Main Process	0
Task Preemption Mode for the Main Process	OS_PREEMPT

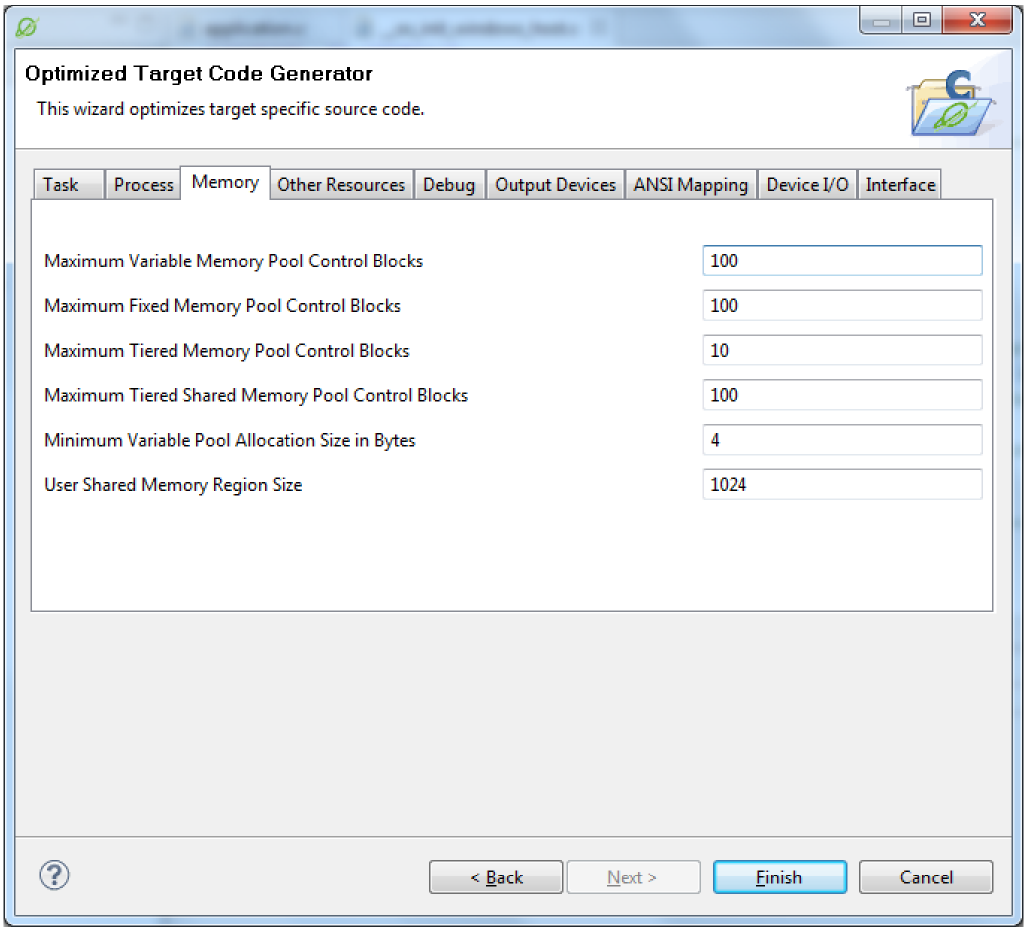
The field descriptions on Process tab are as follows:

Table 6_9: Field descriptions on Process tab

Field	Description	Your Action
Enable OS Abstractor Interface Process Feature	Specifies if the OS Abstractor Interface process feature is enabled or disabled.	Select the check box to enable this feature.
Maximum Process Control Blocks	Specifies the total number of processes required by the application	Enter the maximum number of process control blocks for the application. **NOTE**: Default value is 100.
Process Memory Pool Minimum Size in Bytes	Specifies the minimum size of the process memory pool in Bytes.	Enter the minimum size of the process memory pool. **NOTE**: Default value is 1024 Bytes.
Process Memory Pool Maximum Size in Bytes	Specifies the maximum size of the process memory pool in Bytes.	Enter the maximum size of the process memory pool. **NOTE**: Default value is 0xffffffff Bytes.
Stack Size for the Main Process in kilobytes	Specifies the stack size for the main process in Kilobytes.	Enter the stack size for the main process. **NOTE**: Default value is 1024 * 200 Kilobytes.
Heap Size for the Main Process in kilobytes	Specifies the heap size for the main process in Kilobytes.	Enter the heap size for the main process. **NOTE**: Default value is 1024 * 400 Kilobytes.
Task priority for the Main Process	Specifies the task priority for the main process.	Enter the task priority for the mail process. **NOTE**: Default value is 0.
Task Preemption Mode for the Main Process	Specifies the preemption status of this task.	Enter the task preemption status of the task. **NOTE**: The valid parameters are: ▪ OS_PREEMPT – Task can be pre-empted by the system. ▪ OS_NO_PREEMPT – Task cannot be pre-empted.

12. On **Memory** configuration tab, configurethe options to your specifications as shown in Figure 6_29.

Figure 6_29: Memory Tab



Maximum Variable Memory Pool Control Blocks	100
Maximum Fixed Memory Pool Control Blocks	100
Maximum Tiered Memory Pool Control Blocks	10
Maximum Tiered Shared Memory Pool Control Blocks	100
Minimum Variable Pool Allocation Size in Bytes	4
User Shared Memory Region Size	1024

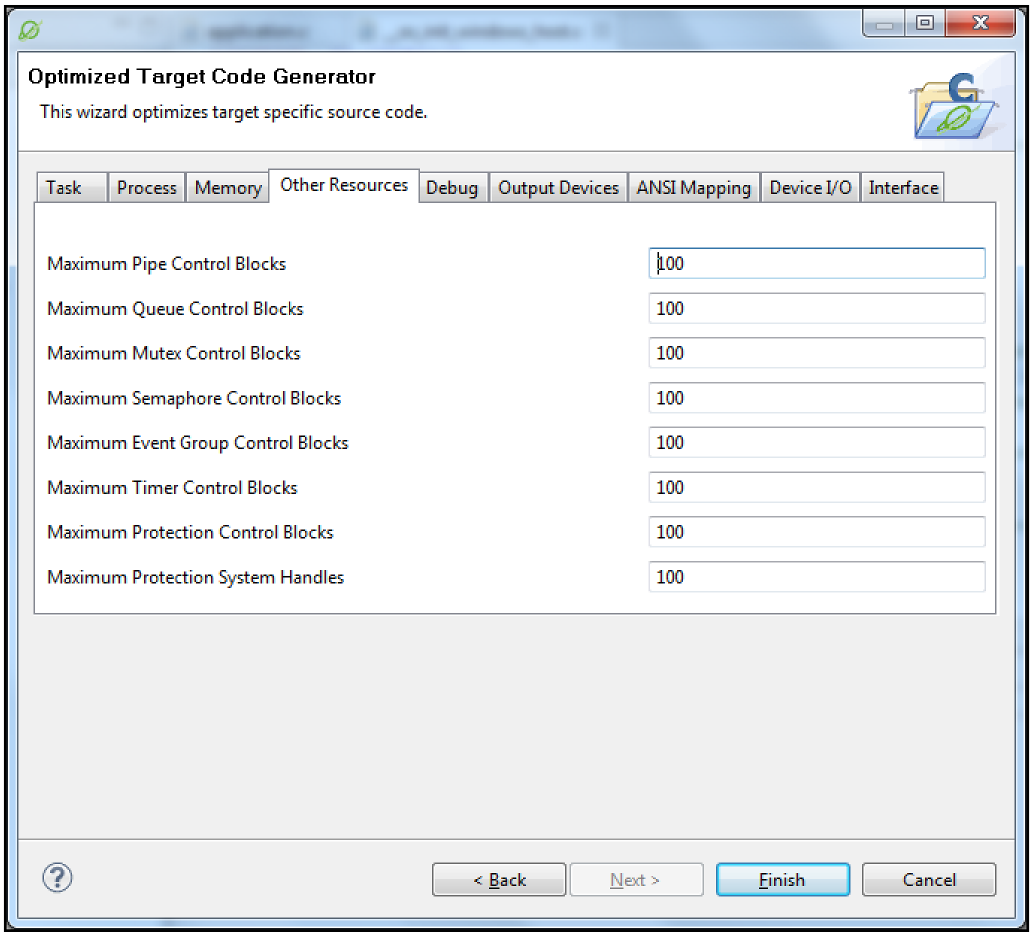
The field descriptions on Memory tab are as follows:

Table 6_10: Field descriptions on Memory tab

Field	Description	Your Action
Maximum Variable Memory Pool Control Blocks	Specifies the total number of dynamic variable memory pools required by the application.	Enter the maximum number of dynamic variable pools. **NOTE**: Default value is 100.
Maximum Fixed Memory Pool Control Blocks	Specifies the total number of partitioned (fixed-size) memory pools required by the application.	Enter the maximum number of partitioned memory pools. **NOTE**: Default value is 100.
Minimum Variable Pool Allocation Size in Bytes	Specifies the minimum memory allocated by *the malloc()* and/or OS_Allocate_Memory() calls. **NOTE**: Increasing this value further reduces memory fragmentation at the cost of more wasted memory.	Enter the minimum memory allocated. **NOTE**: Default value is 4. Increasing this value further reduces memory fragmentation at the cost of more wasted memory.
User Shared Memory Region Size	Specifies the application defined shared memory region usable across all OS Abstractor Interface processes/applications.	Enter the user shared memory region size. **NOTE**: Default value is 1024 Bytes.
Maximum Tiered Memory Pool Control Blocks	Specifies the total number of Tiered Memory Pools required by the application.	Enter the maximum number of Tiered Memory variable pools. **NOTE**: Default value is 100.
Maximum Tiered Shared Memory Pool Control Blocks	Specifies the total number of Tiered Shared Memory Pools required by the application.	Enter the maximum number of Tiered Shared Memory variable pools. **NOTE**: Default value is 100.

13. On **Other Resources** configuration tab, configure the options to your specifications as shown in Figure 6_30.

Figure 6_30: Other Resources Tab



Optimized Target Code Generator

This wizard optimizes target specific source code.

Maximum Pipe Control Blocks	100
Maximum Queue Control Blocks	100
Maximum Mutex Control Blocks	100
Maximum Semaphore Control Blocks	100
Maximum Event Group Control Blocks	100
Maximum Timer Control Blocks	100
Maximum Protection Control Blocks	100
Maximum Protection System Handles	100

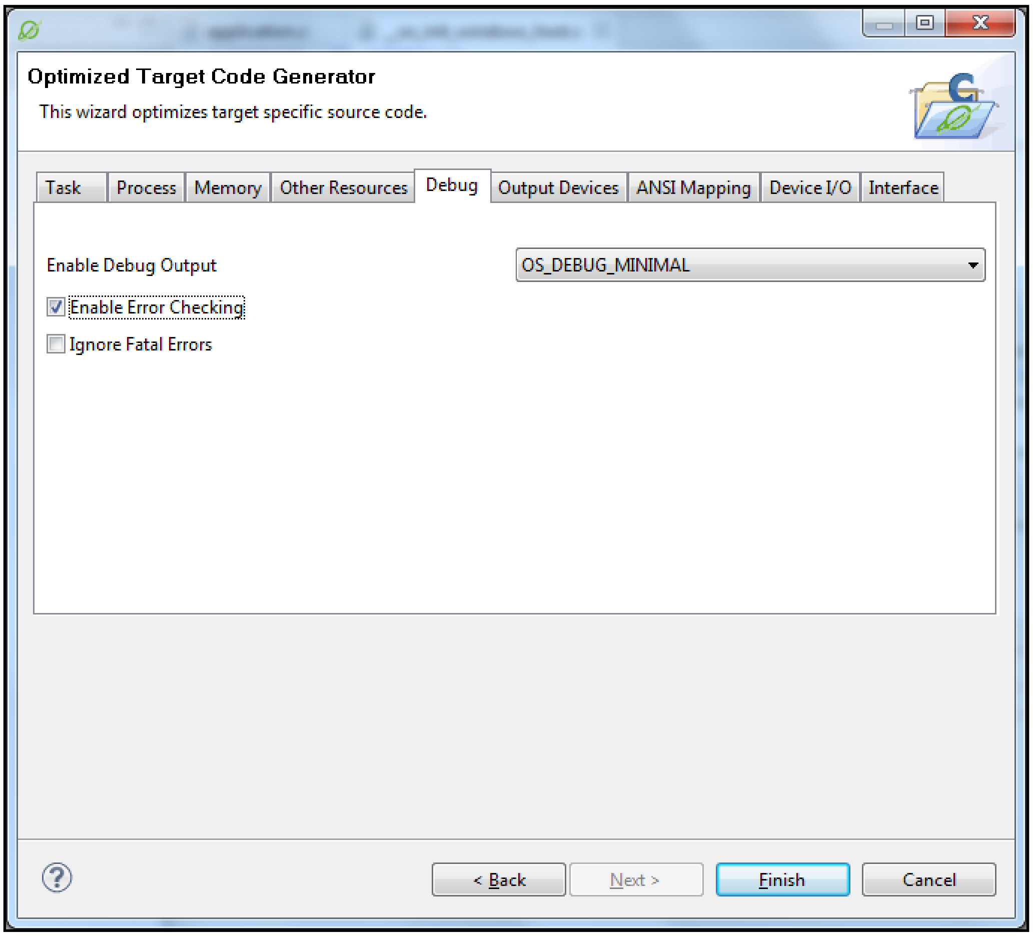
The field descriptions on Other Resources tab are as follows:

Table 6_11: Field descriptions on Other Resources tab

Field	Description	Your Action
Maximum Pipe Control Blocks	Specifies the total number of pipes for message passing required by the application.	Enter the maximum number of pipe control blocks. **NOTE**: Default value is 100.
Maximum Queue Control Blocks	Specifies the total number of queues for message passing required by the application.	Enter the maximum number of queue control blocks. **NOTE**: Default value is 100.
Maximum Mutex Control Blocks	Specifies the total number of mutex semaphores required by the application.	Enter the maximum number of mutex control blocks. **NOTE**: Default value is 100.
Maximum Semaphore Control Blocks	Specifies the total number of regular (binary/count) semaphores required by the application.	Enter the maximum number of semaphore control blocks. **NOTE**: Default value is 100.
Maximum Event Group Control Blocks	Specifies the total number of event groups required by the application	Enter the maximum number of event group control blocks. **NOTE**: Default value is 100.
Maximum Timer Control Blocks	Specifies the total number of application timers required by the application	Enter the maximum number of timer control blocks. **NOTE**: Default value is 100.
Maximum Protection Control Blocks	Specifies the total number of Protection Control blocks required by the application	Enter the maximum number of Protection control blocks. Note: Default value is 100.
Maximum Protection System Handles	Specifies the total number of System handles required by the application	Enter the maximum number of System Handles. Note: Default value is 100.

14. On **Debug** tab, configure the options to your specifications as shown in Figure 6_31. The application will be checked for API usage errors by selecting the check box next to **Enable Error Checking**. Disabling error checking will increase the application performance and reduce your code size.

Figure 6_31: Debug Tab



Optimized Target Code Generator

This wizard optimizes target specific source code.

Enable Debug Output: OS_DEBUG_MINIMAL

[✓] Enable Error Checking

[ ] Ignore Fatal Errors

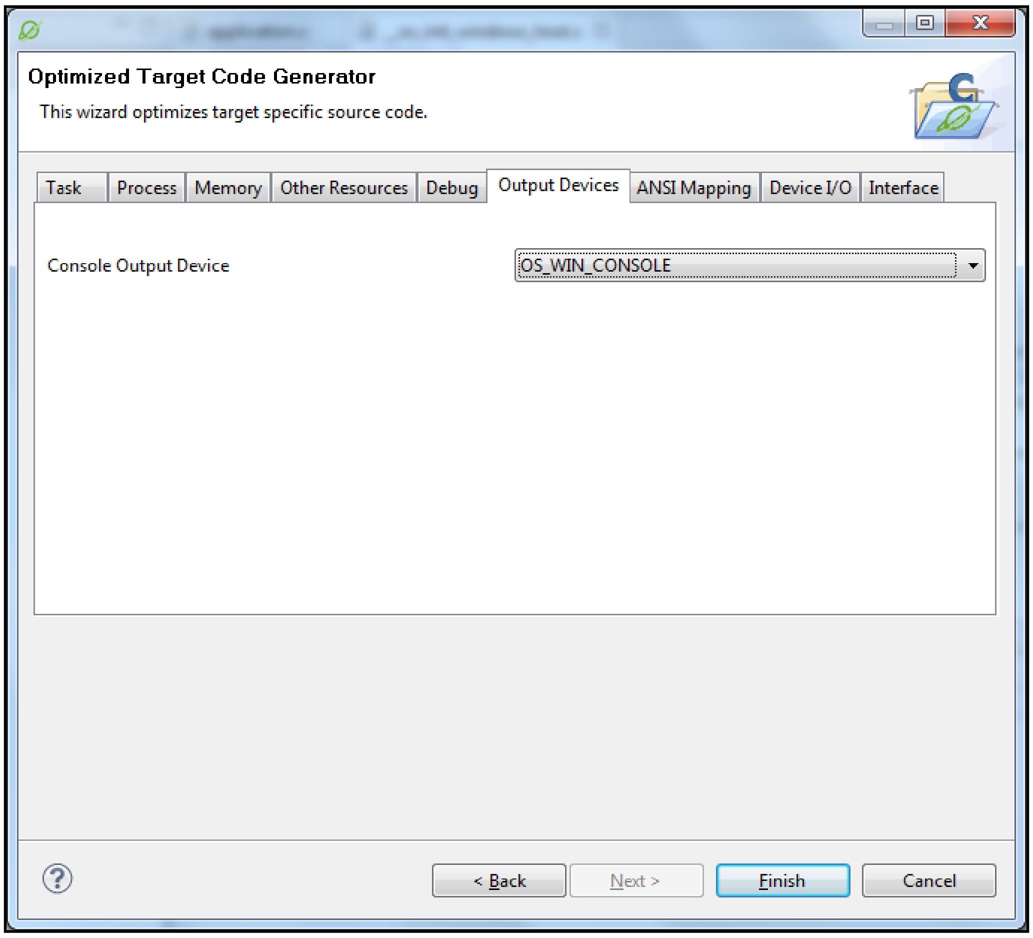
The field descriptions on Debug tab are as follows:

Table 6_12: Field descriptions on Debug tab

Field	**Description**	**Your Action**
Enable Debug Output	Specifies if you want to enable the debug output.	Select the debug output from the dropdown menu: ▪ OS_DEBUG_VERBOSE – print debug info, fatal and compliance errors ▪ OS_DEBUG_MINIMUM – print minimum amount of debug info OS_DEBUG_VERBOSE **Note**: The default value is OS_DEBUG_VERBOSE
Enable Error Checking	Specifies if you want to enable the error checking.	To enable error checking, select the check box. Use this option to increase performance and reduce code size. **Note**: By default this feature is enabled.
Ignore Fatal Errors	Specifies if you want to enable the feature to ignore fatal errors.	To enable the feature to ignore fatal errors, select the check box. **Note**: By default this feature is disabled.

15. On **Output Devices** configuration tab, select your output device from the drop drown list as shown in 6_32.

Figure 6_32: Output Devices Tab


Optimized Target Code Generator

This wizard optimizes target specific source code.

Console Output Device: OS_WIN_CONSOLE

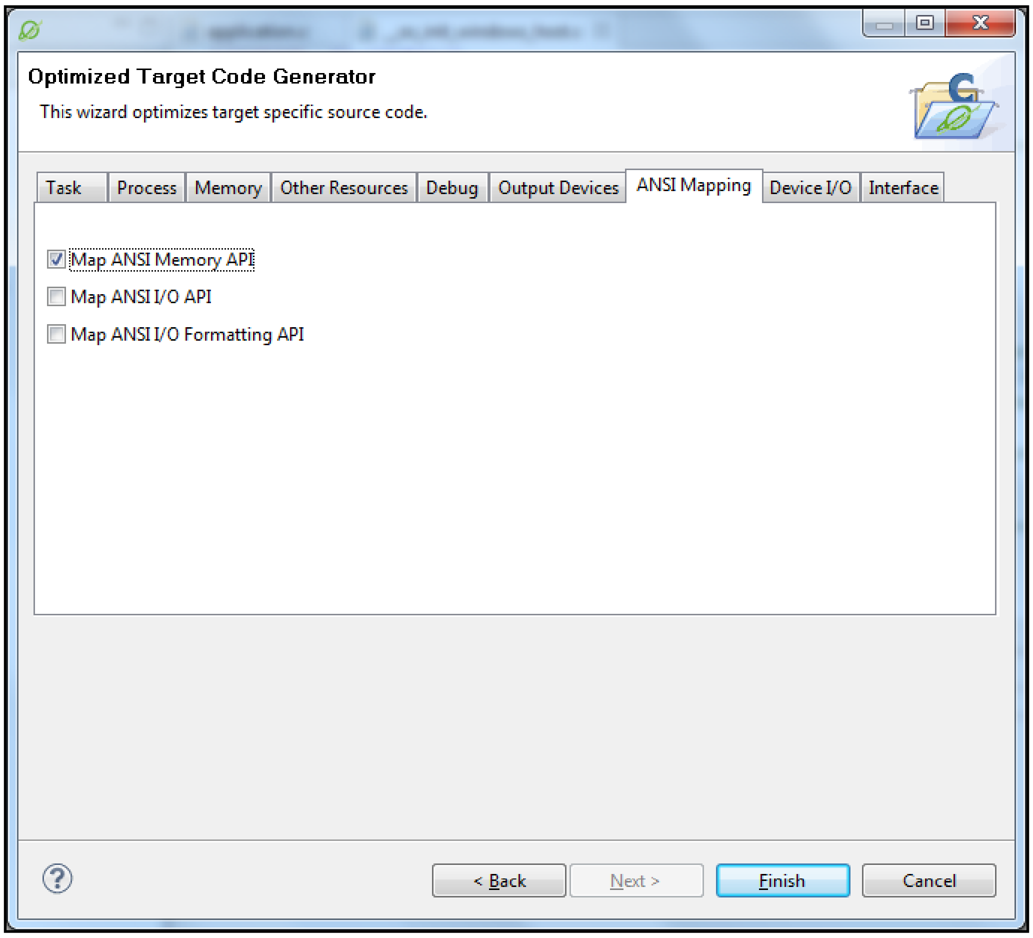
The field descriptions on Output Devices tab are as follows: .

Table 6_13: Field descriptions on Output Devices tab

Field	Description	Your Action
Console Output Device	Specifies the console output device for the application.	Select the output device from the dropdown menu: ▪ OS_WIN_CONSOLE – print to console ▪ OS_SERIAL_PORT – print to serial **NOTE**: The default value is OS_WIN_CONSOLE User can print to other devices by modifying the appropriate functions within *usr.h* and use OS Abstractor Interface's format I/O calls.

16. On **ANSI Mapping** configuration tab, as shown in 6_33. Make surethe ANSI mapping is unchecked, because we no longersupport thisin1.8 AppCOE.

Figure 6_33: ANSI Mapping Tab



Optimized Target Code Generator

This wizard optimizes target specific source code.

- [✓] Map ANSI Memory API
- [ ] Map ANSI I/O API
- [ ] Map ANSI I/O Formatting API

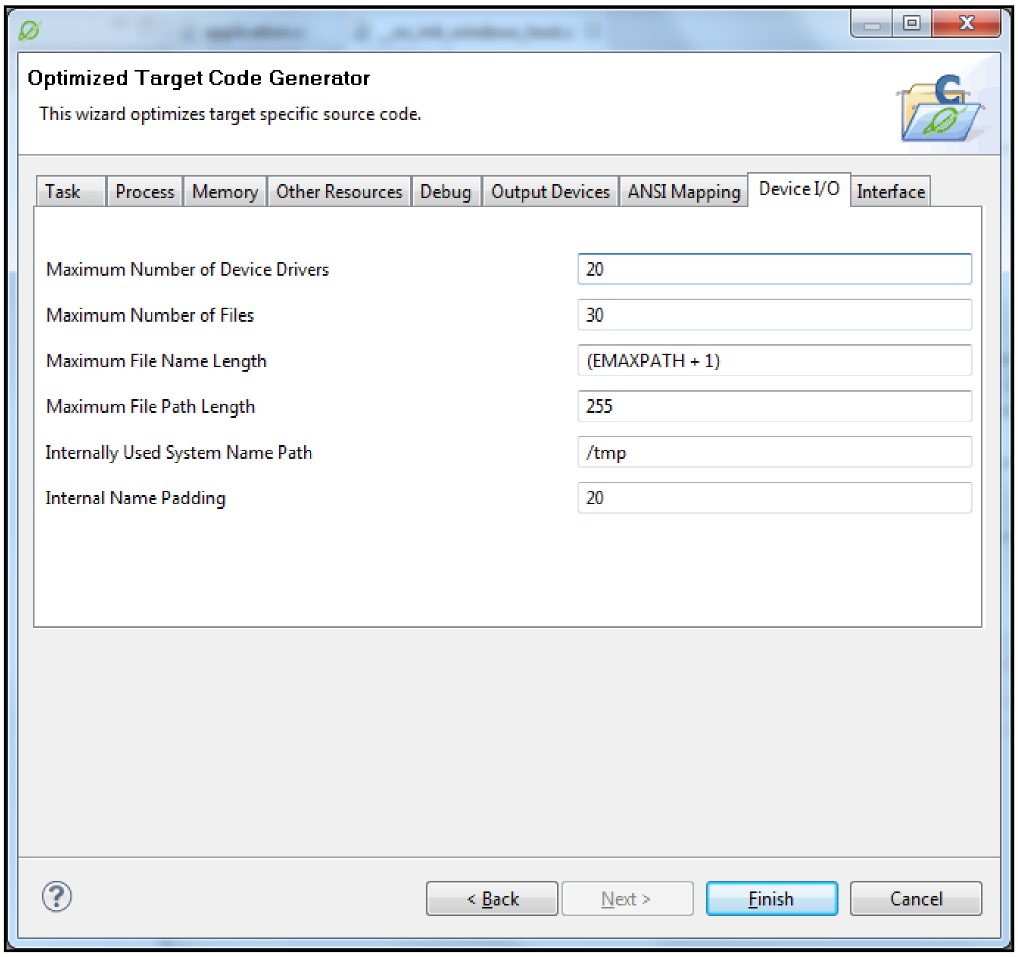
The field descriptions on ANSI Mapping tab are as follows:

Table 6_14: Field descriptions on ANSI Mapping tab

Field	**Description**	**Your Action**
Map ANSI Memory API	Specifies you want to map ANSI malloc() and free() to OS Abstractor Interface equivalent functions.	To map ANSI to OS Abstractor Interface equivalent functions, select the check box. By default this feature is disabled. **Note**: We no longer support this feature in 1.8 AppCOE
Map ANSI I/O API	Specifies if you want to map ANSI device I/O functions like open(), close(), read(), write, ioctl(), etc. to OS Abstractor Interface equivalent functions.	To map ANSI I/O functions to OS Abstractor Interface equivalent functions, select the check box. By default this feature is disabled. **Note**: We no longer support this feature in 1.8 AppCOE
MAP ANSI I/O Formatting API	Specifies if you want to map ANSI printf() and sprintf() to OS Abstractor Interface equivalent functions.	To map ANSI I/O formatting functions to OS Abstractor Interface equivalent functions, select the check box. By default this feature is disabled. **Note**: We no longer support this feature in 1.8 AppCOE

17. On **Device I/O** configuration tab, configure the options to your specifications as shown in Figure 6_34.

Figure 6_34: Device Input or Output Tab



Maximum Number of Device Drivers	20
Maximum Number of Files	30
Maximum File Name Length	(EMAXPATH + 1)
Maximum File Path Length	255
Internally Used System Name Path	/tmp
Internal Name Padding	20

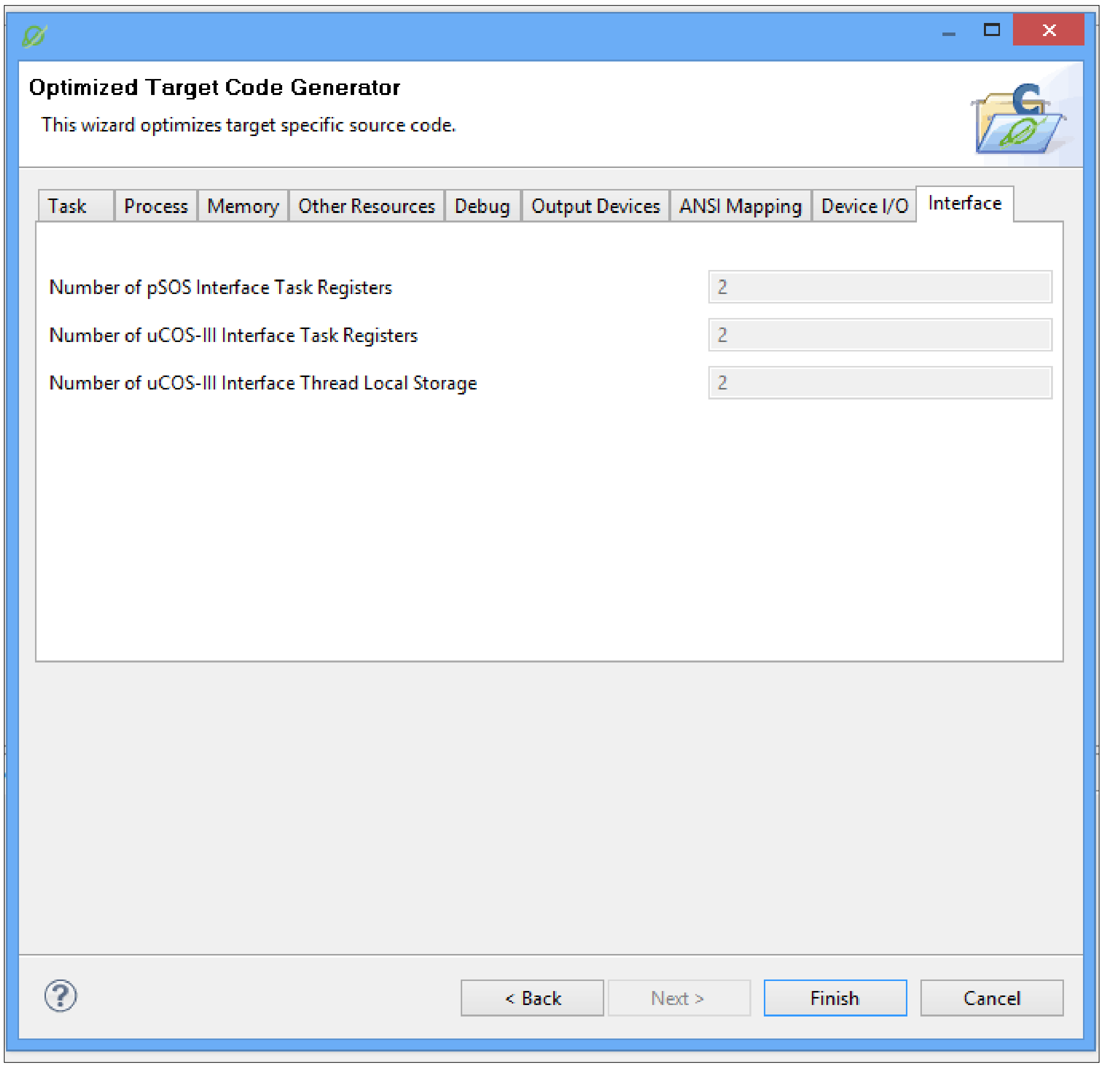
The field descriptions on Device I/O tab are as follows:

Table 6_15: Field descriptions on Device I/O tab

Field	Description	Your Action
Maximum Number of Device Drivers	Specifies the maximum number of drivers allowed in the OS Abstractor Interface driver table structure. **Note**: This excludes the native drivers the system, since they do not use the OS Abstractor Interface driver table structure.	Enter the maximum number of device drivers. **Note**: Default value is 20.
Maximum Number of Files	Specifies the maximum number of files that can be opened simultaneously using the OS Abstractor Interface file control block structure. **Note**: One control block is used when the OS Abstractor Interface driver is opened. These settings do not impact the OS setting for max number of files.	Enter the maximum number of files that can be opened simultaneously. **Note**: Default value is 30.
Maximum File Name Length	Specifies the maximum length of the file name.	Enter the maximum number of files that can be opened simultaneously. **Note**: Default value is Maximum File Path Length +1.
Maximum File Path Length	Specifies the maximum length of the directory path name including the file name for OS Abstractor Interface use excluding the null char termination.	Enter the maximum length of the file path. **Note**: Default value is 255. This setting does not impact the OS setting for the max path/file name.
Internally Used System Name Path	Specifies the temporary directory of the file path.	Enter the temporary directory of the file path. **Note**: Default value is /tmp.
Internal Name Padding	Specifies the padding for the internal name.	Enter the padding for the internal name. **Note**: Default value is 20.

18. If your project uses pSOSInterface or µC/OS Interface, in **Interface** configuration tab, assign the number of unsigned arrays used to store the task's data as shown in Figure 6_35.The number of Thread Local Storage in µC/OS can also be defined here.

Figure 6_35: Interface Tab



Optimized Target Code Generator

This wizard optimizes target specific source code.

Number of pSOS Interface Task Registers	2
Number of uCOS-III Interface Task Registers	2
Number of uCOS-III Interface Thread Local Storage	2

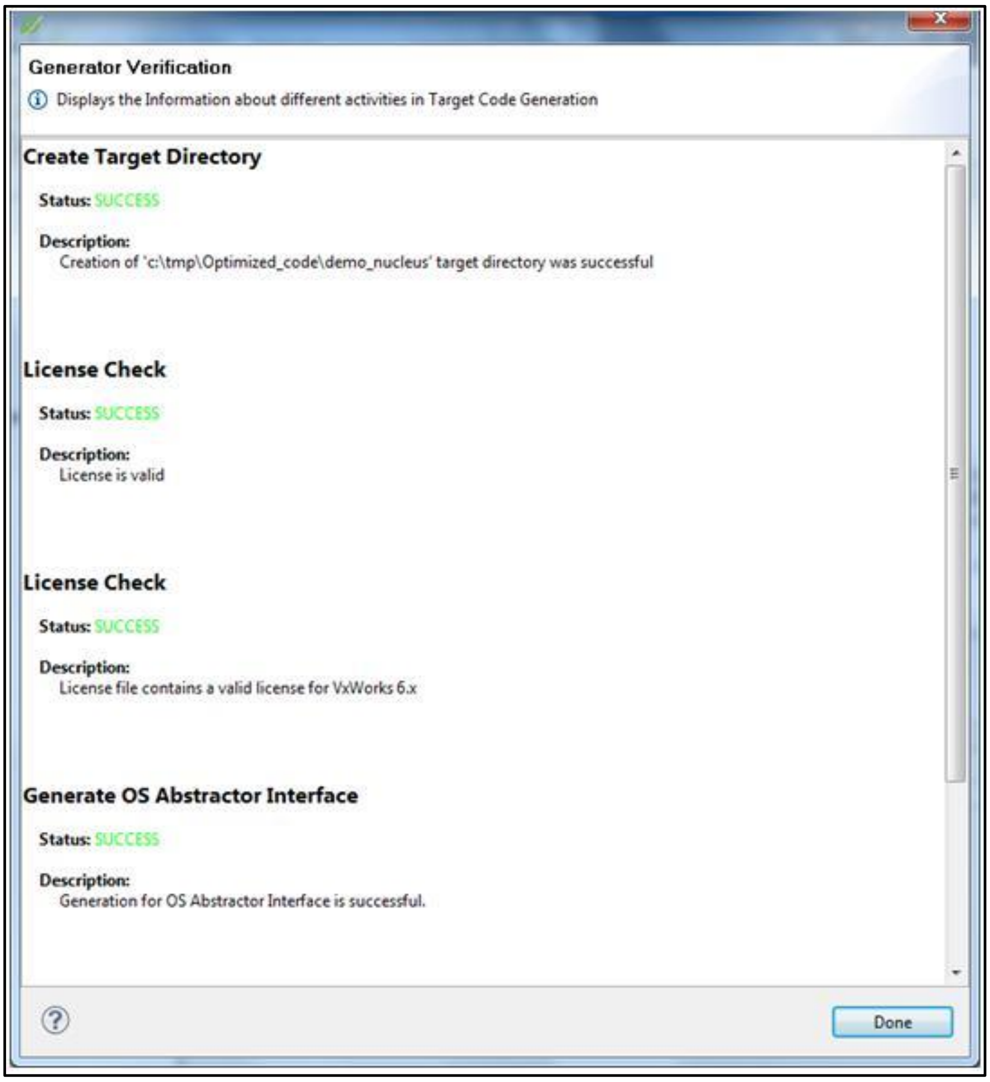
The field descriptions on Interface tab are as follows:

Table 6_16: Field descriptions on Interface tab

Field	Description	Your Action
Number of pSOS Interface Task Registers	Specifies the number of pSOS Interface Task Registers.	Enter the number of pSOS Interface task registers. **Note**: Default value is 32.

19. Click **Finish**. The target code will be generated into the destination path you defined in step 5 as shown in Figure6_36.
NOTE: If it is not able to generate the target code, the system will throw up an error.

Figure6_36: Target Code Generation Output


Generator Verification

Displays the Information about different activities in Target Code Generation

Create Target Directory

Status: SUCCESS

Description:
Creation of 'c:\tmp\Optimized_code\demo_nucleus' target directory was successful

License Check

Status: SUCCESS

Description:
License is valid

License Check

Status: SUCCESS

Description:
License file contains a valid license for VxWorks 6.x

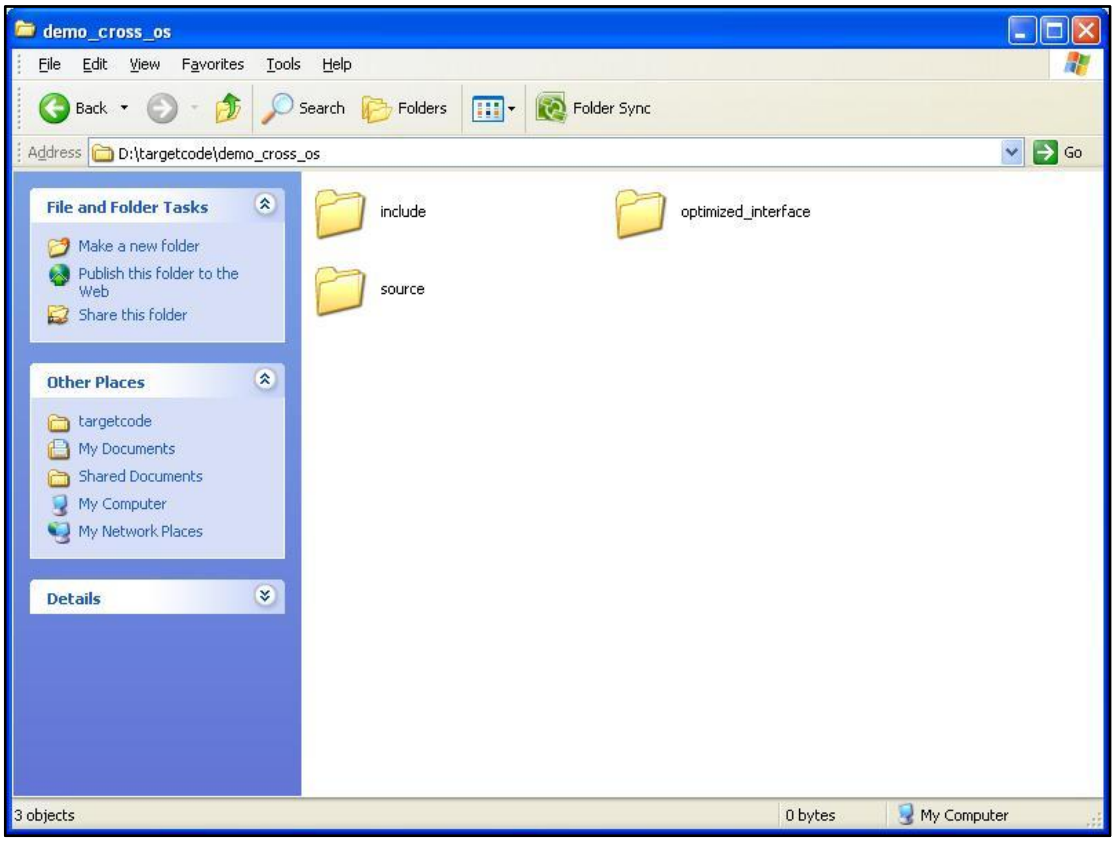
Generate OS Abstractor Interface

Status: SUCCESS

Description:
Generation for OS Abstractor Interface is successful.

You can view the AppCOE generated optimized code in Figure 6_37.

Figure 6_37: AppCOE Generated Example



Generating Project Files for your Target

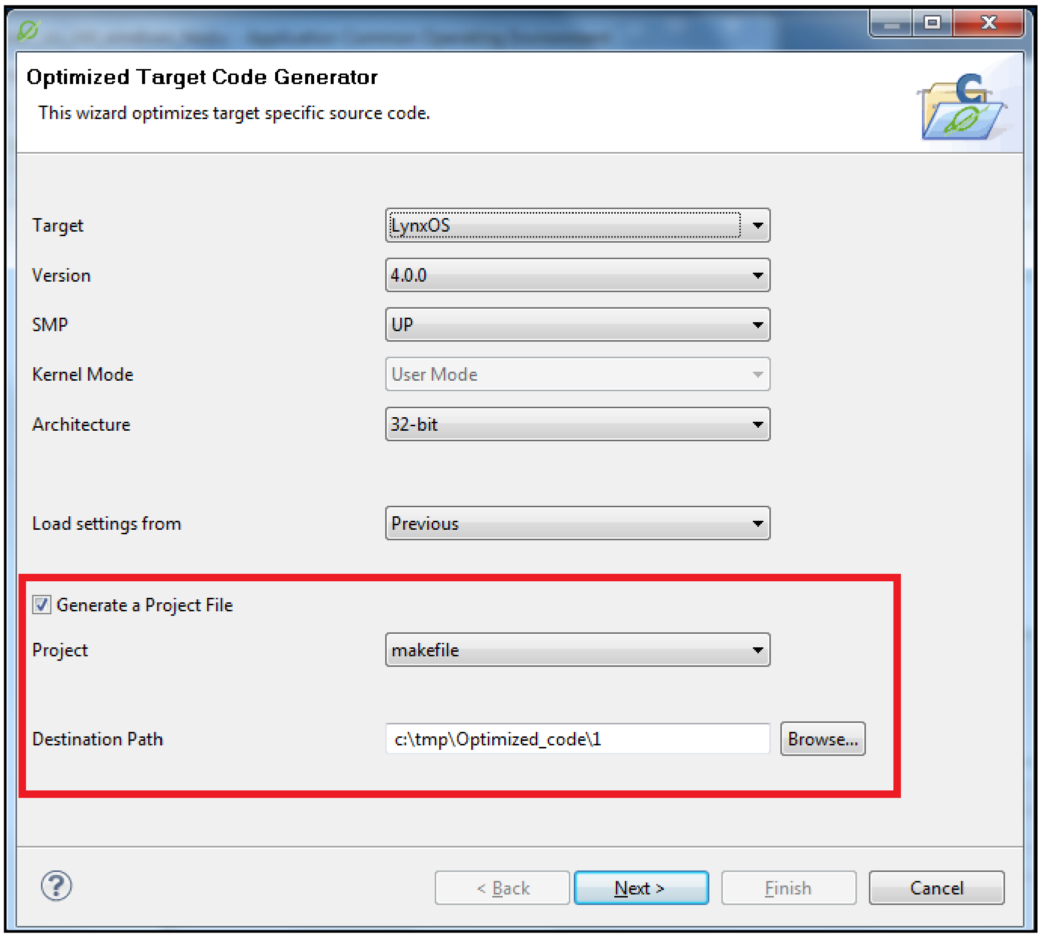
NOTE: This feature requires a target license. Click http://mapusoft.com/contact/ to send a request to receive licenses and documentation.

AppCOE provides the ability to generate project files for project files for the following targets:

- Wind River's Workbench 2.6, 3.1, 3.3
- LynxOS Luminocity 3.0.5
- MQX Code Warrior 10.x
- QNX's Momentics 4.x
- Sun Microsystem's Sun Studio
- Visual Studio.NET 2005
- Micro Soft's Visual Studio 2006
- Micro Soft's Visual Studio .Net 2008
- Micro Soft's Visual Studio .Net 2012
- Eclipse's CDT 4.x
- Makefiles

After Generating Optimized Target Code,select the check box next to **Generate a Project File** and choose your IDE as shown inFigure 6_3.

Figure 6_38: Generating Project Files



Optimized Target Code Generator

This wizard optimizes target specific source code.

Target: LynxOS
Version: 4.0.0
SMP: UP
Kernel Mode: User Mode
Architecture: 32-bit
Load settings from: Previous
[✓] Generate a Project File
Project: makefile
Destination Path: c:\tmp\Optimized_code\1

Inserting Application Code to Run only on Target OS Environment

The user configuration is done by setting up the appropriate value to the pre-processor defines found in the cross_os_usr.h.

NOTE: Make sure the OS Abstractor libraries are re-compiled and newly built whenever configuration changes are made to the cross_os_usr.h when you build your application. In order to re-build the library, you would actually require the full-source code product version (not the evaluation version) of OS Abstractor.

Applications can use a different output device as standard output by modifying the appropriate functions defines in os_target_usr.h along with modifying os_setup_serial_port.c module if they choose to use the format Input/output calls provided by the OS Abstractor.

You can add some application code or target specific things such as memory allocations such as Heap Size and Shared memory which are specific to target environments.

Target OS Selection

Based on the OS you want the application to be built, set the following pre-processor definition in your project setting or make files

Table 6_17: Target OS Selection

Flag and Purpose	Available Options
OS_TARGET To select the target operating system.	The value of the OS_TARGET should be for the OS Abstractor Interface product that you have purchased. For Example, if you have purchased the license for : **OS_NUCLEUS** – Nucleus PLUS® from ATI **OS_THREADX** – ThreadX® from Express Logic **OS_VXWORKS** – VxWorks® from Wind River Systems **OS_ECOS** – eCOS standards from Red Hat **OS_MQX** - Precise/MQX® from ARC International **OS_UITRON** – micro-ITRON standard based OS **OS_LINUX** - Open-source/commercial Linux® distributions **OS_WINDOWS** – Windows 2000, Windows XP®, Windows CE, Windows Vista, Windows 7/8 from Microsoft. If you need to use the OS Abstractor Interface both under Windows and Windows CE platforms, then you will need to purchase additional target license. **OS_TKERNEL** – Japanese T-Kernel® standards based OS **OS_LYNXOS** - LynxOS® from LynuxWorks **OS_QNX** – QNX operating system from QNX **OS_LYNXOS** – LynxOS from LynuxWorks **OS_SOLARIS** – Solaris from SUN Microsystems **OS_ANDROID** – Mobile Operating System running on Linux Kernel **OS_NETBSD** – UNIX like Operating System **OS_UCOS** – UCOS® from Micrium **OS_FREERTOS**-- FreeRTOS® from Real Time Engineers Ltd. For example, if you want to develop for ThreadX, you will define this flag as follows: OS_TARGET = OS_THREADX

Flag and Purpose	Available Options
	PROPRIETARY OS: If you are doing your own porting of OS Abstractor Interface to your proprietary OS, you could add your own define for your OS and include the appropriate OS interface files within os_target.h file. MapuSoft can also add custom support and validate the OS Abstraction solution for your proprietary OS platform

Running AppCOE Generated Code on your Target

NOTE: This feature requires a license and documentation.

Click http://mapusoft.com/contact/ to send a request to receive licenses and documentation.

After Generating Optimized Target Codefor your target OS using the AppCOE Optimized Target Code Generator,

1. Using a cross-compiler, compile, link, and download the AppCOE generated code to your target.
2. Port low level drivers and hardware interrupt code as required (refer to OS Abstractor Interface I/O and device driver APIs sections in the reference manual).
3. Resolve any run time errors.

Chapter 7.App/Platform Profiler

AppCOE provides the Profiler to collect performance data concerning your application and the platform. You can graphically view the data with charts and graphs to find bottlenecks system-wide or for a specific task. It enables you to generate API timing report and also do a comparison for two timing reports.

This chapter contains the following topics:

About App/Platform Profiler

NOTE: This feature requires a license. Click http://mapusoft.com/downloads/**AppCOE-evaluation/** to request an evaluation license.

The App/Platform Profiler is an add-on to the established AppCOE Eclipse based code migration and API optimization technology and is designed to enable data collection.

App/Platform Profiler offers the following:

- The data collected by the Profiler provides feedback concerning the utilization of MapuSoft's APIs in the project.
- The reports allow for performance impact analysis by detailing specific API execution time during a particular time period as well as the average and total API execution times.
- It enables you to collect data pertaining to the MapuSoft API's (Platform API profiling) and profiling user specific functions (Application Profiling).
- Users can analyze the data with the included App/Platform Profiler graphical viewer which offers area, bar, line, pie, and scatter charts, as shown inFigure 7_1.
- Profiler enables you to generate a Timing report to view the performance report for each API.
- App/Platform Profiler now enables you to generate Timing Comparison Report. This compares two different timing reports and compares the performance report for an API at different time and different values.

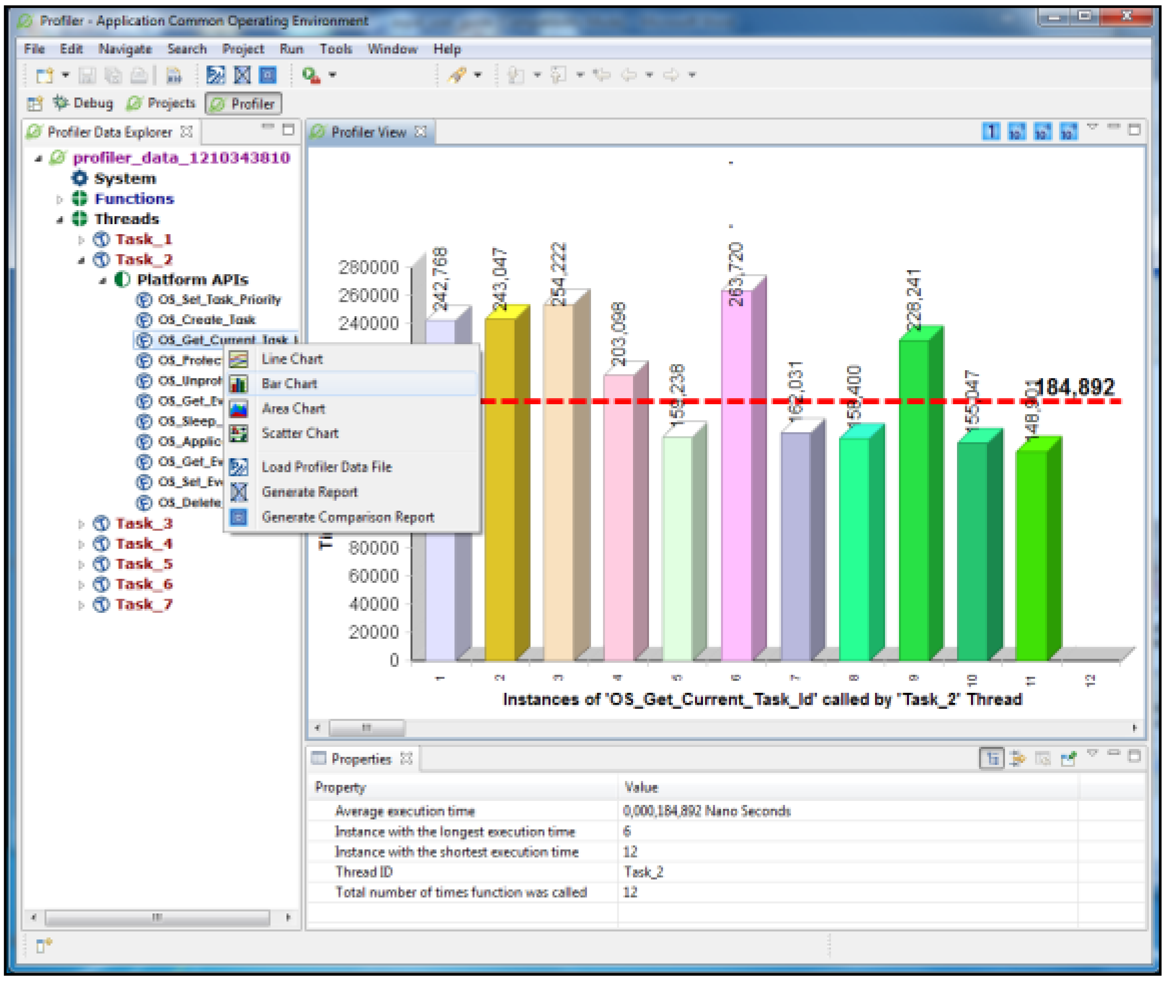
NOTE 1: In the current release, Profiler feature is not supported in ThreadX and Nucleus targets.

NOTE 2:The profiler feature does not generate profiler file XXX.PAL on Solaris target if you do code optimization for demo_cross_os with profiler ON. As a workaround, enter the following command at the prompt prior to running the demo:

```
prctl -n process.max-msg-qbytes -r -v 512KB -i process $$
```

The 512KB is the desired size of the queue and should be sufficient to run this example. If the number of messages is increased in cross_os_usr.h, then obviously this value will need to be adjusted.

Figure 7_1: App/Platform Profiler



Property	Value
Average execution time	0,000,184,892 Nano Seconds
Instance with the longest execution time	6
Instance with the shortest execution time	12
Thread ID	Task_2
Total number of times function was called	12

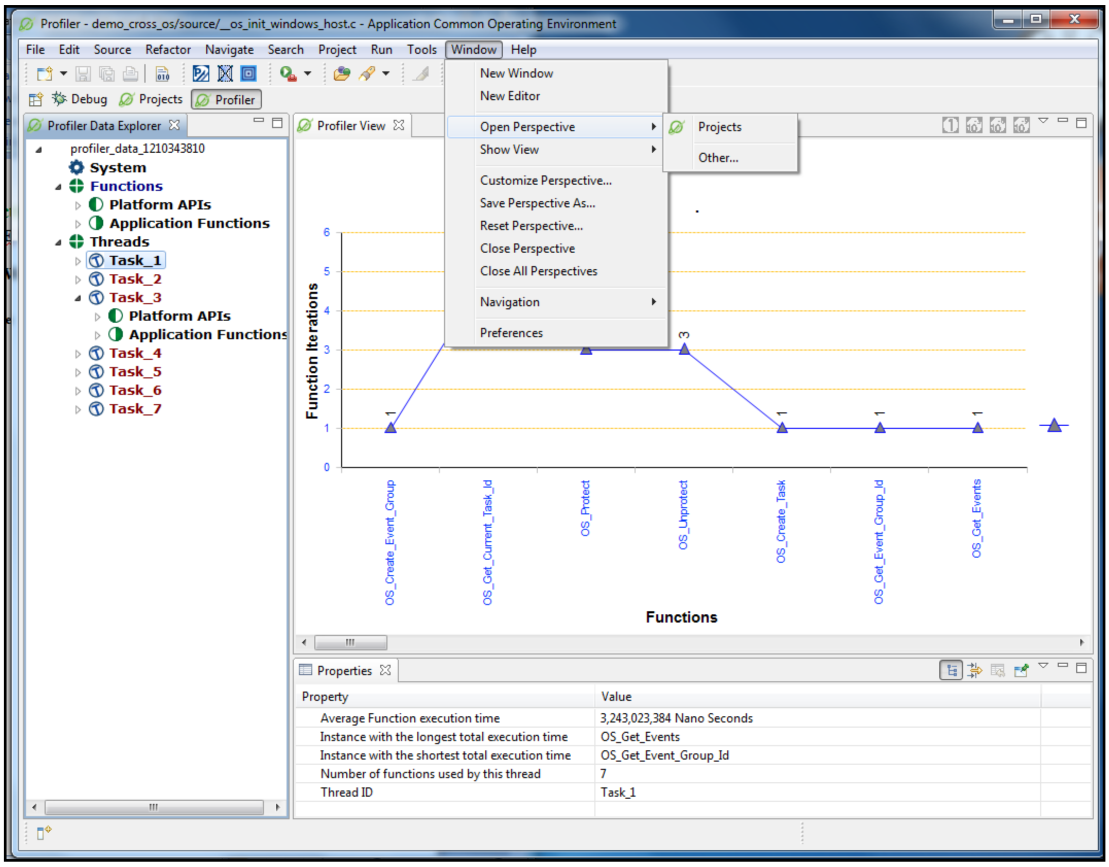
Opening App/Platform Profiler Perspective

From AppCOE main menu, click **App/Platform Profiler** perspective button as highlighted.

Or,

1. On AppCOE main menu, select **Window** > **Open Perspective** > **Other** >**Profiler**as shown inFigure 7_2.

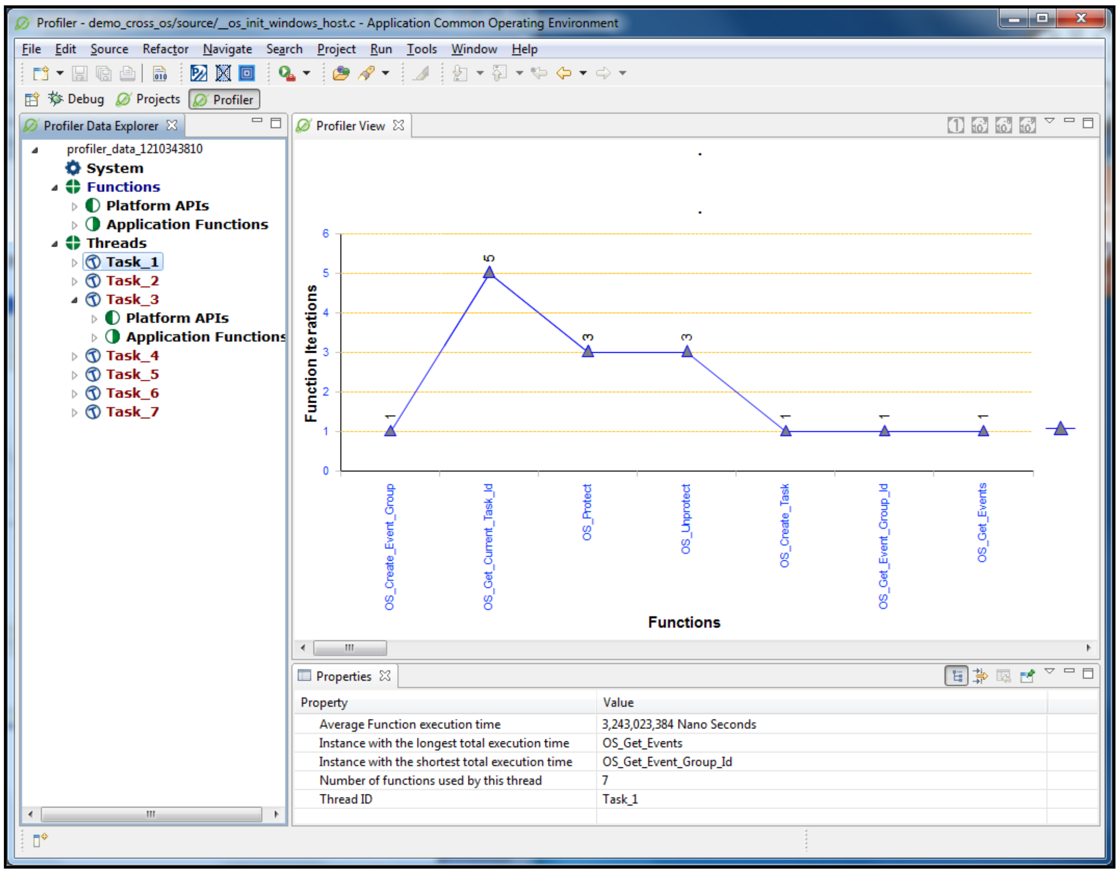
Figure 7_2: Opening App/Platform Profiler Perspective



Property	Value
Average Function execution time	3,243,023,384 Nano Seconds
Instance with the longest total execution time	OS_Get_Events
Instance with the shortest total execution time	OS_Get_Event_Group_Id
Number of functions used by this thread	7
Thread ID	Task_1

You can view App/Platform Profiler Perspective as shown in Figure 7_3.

Figure 7_3: App/Platform Profiler Perspective



Property	Value
Average Function execution time	3,243,023,384 Nano Seconds
Instance with the longest total execution time	OS_Get_Events
Instance with the shortest total execution time	OS_Get_Event_Group_Id
Number of functions used by this thread	7
Thread ID	Task_1

Components on the App/Platform Profiler Window

App/Platform Profiler window contains two panes. The left pane has three Profiler components listed and on the right pane, you can view the respective details and information in a graphical view.

The three main components of App/Platform Profiler are:

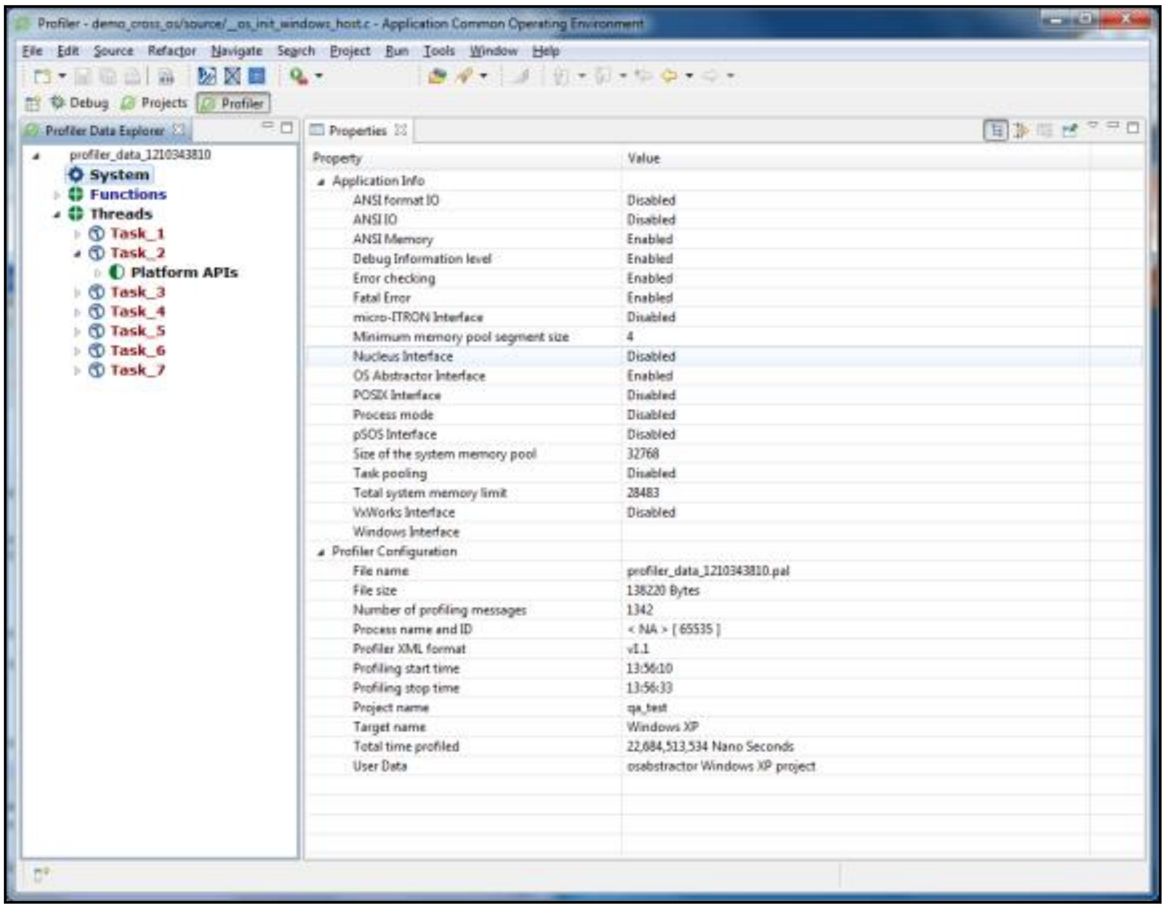
Profiler Data File–This is the generated profiler data file. You can view the performance report of each API. A profiler data file is saved as a .pal file extension. It has the following three components:

1. **System**–This displays the system details of your application as shown inFigure 7_4.

   If you select System tab you have the following details which are displayed on the right pane as shown inFigure 7_4.

   - Application Info–Application property values
   - Profiler Configuration–Profiling Application values

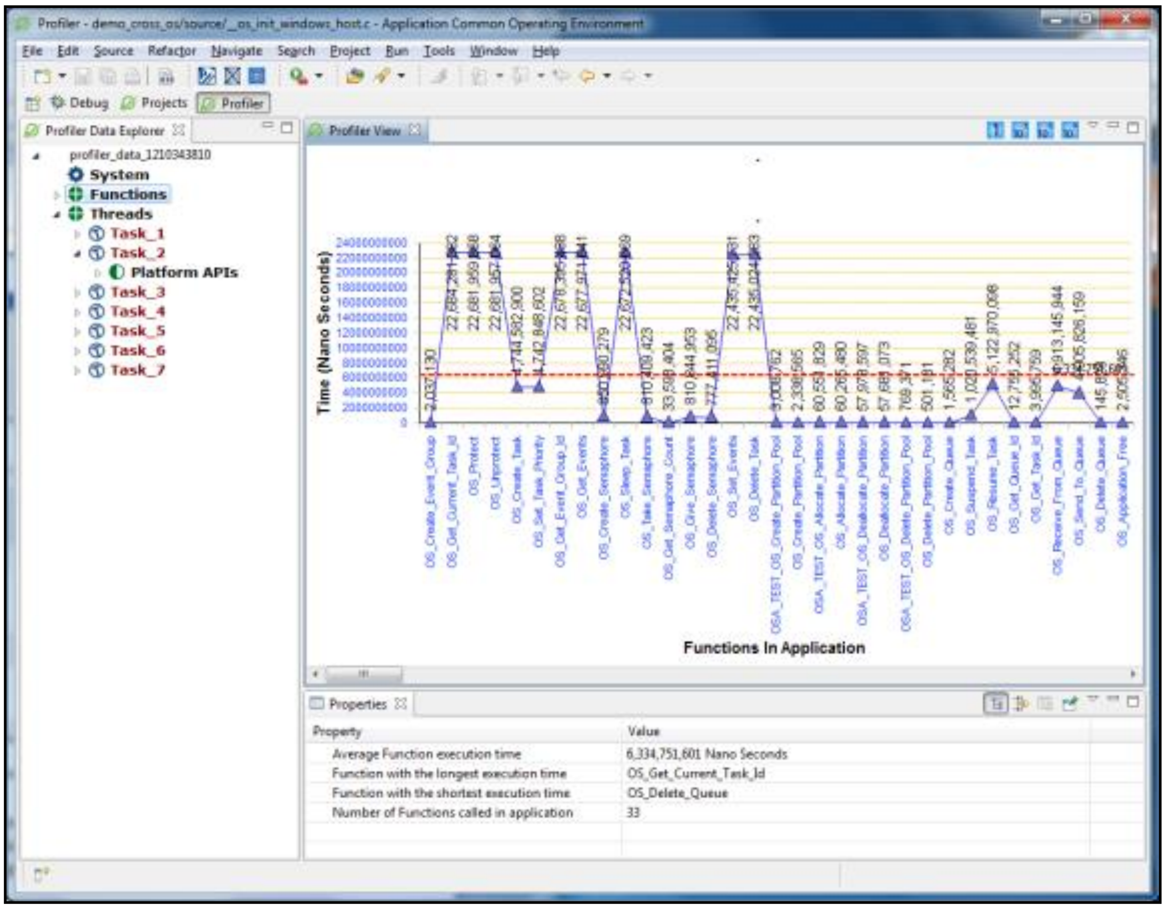
Figure 7_4: App/Platform Profiler - System Details


Profiler - demo_cross_os/source/__os_init_windows_host.c - Application Common Operating Environment
File Edit Source Refactor Navigate Search Project Run Tools Window Help
Debug Projects Profiler
Profiler Data Explorer
profiler_data_1210343810
System
Functions
Threads
Task_1
Task_2
Platform APIs
Task_3
Task_4
Task_5
Task_6
Task_7
Properties

Property	Value
Application Info	
ANSI format IO	Disabled
ANSI IO	Disabled
ANSI Memory	Enabled
Debug Information level	Enabled
Error checking	Enabled
Fatal Error	Enabled
micro-ITRON Interface	Disabled
Minimum memory pool segment size	4
Nucleus Interface	Disabled
OS Abstractor Interface	Enabled
POSIX Interface	Disabled
Process mode	Disabled
pSOS Interface	Disabled
Size of the system memory pool	32768
Task pooling	Disabled
Total system memory limit	28483
VxWorks Interface	Disabled
Windows Interface	
Profiler Configuration	
File name	profiler_data_1210343810.pal
File size	138220 Bytes
Number of profiling messages	1342
Process name and ID	< NA > [65535]
Profiler XML format	v1.1
Profiling start time	13:56:10
Profiling stop time	13:56:33
Project name	qa_test
Target name	Windows XP
Total time profiled	22,684,513,534 Nano Seconds
User Data	osabstractor Windows XP project

2. **Functions**–This displays all the functions called in the application and the time taken to execute these functions as shown in Figure 7_5.

Figure 7_5: App/Platform Profiler System



Property	Value
Average Function execution time	6,334,751,601 Nano Seconds
Function with the longest execution time	OS_Get_Current_Task_Id
Function with the shortest execution time	OS_Delete_Queue
Number of Functions called in application	33

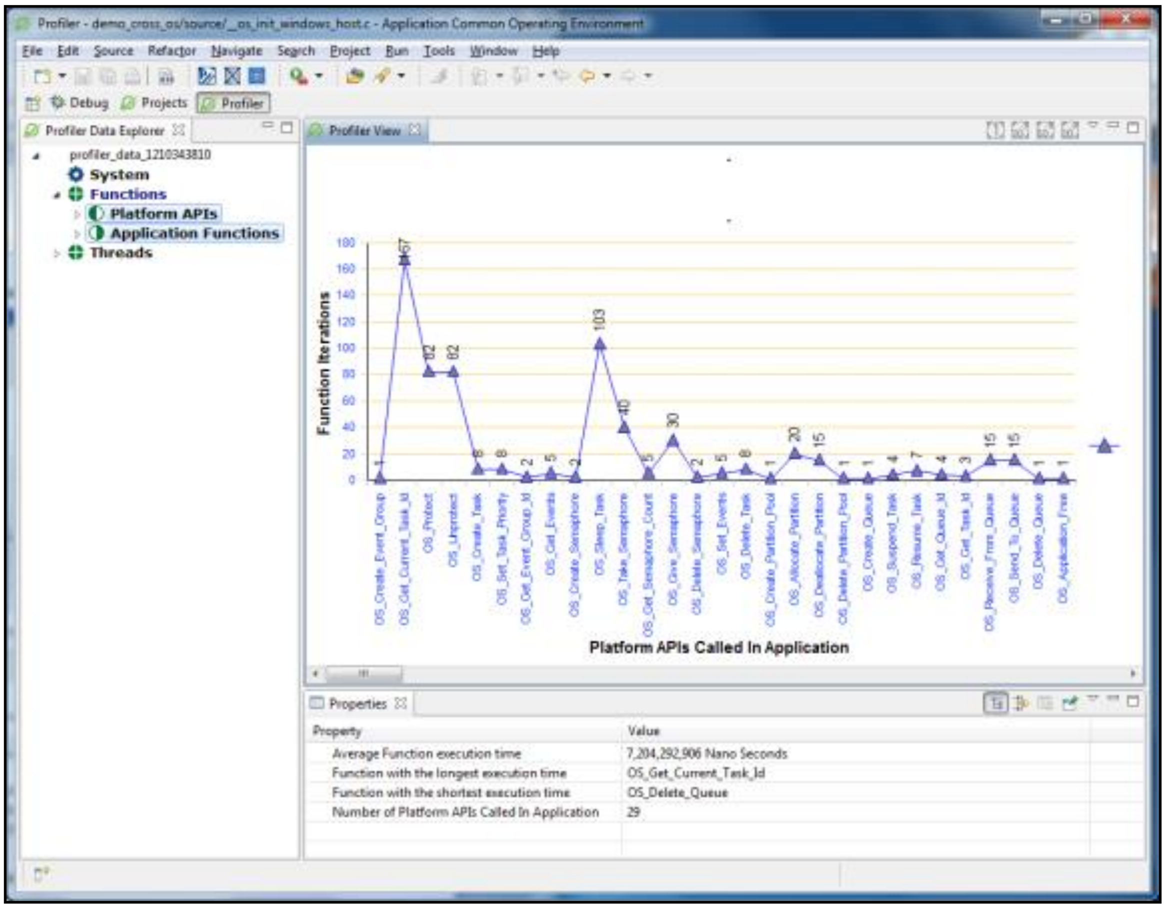
On the bottom of the window, as highlighted, the function properties are displayed such as:

- Average Function execution time
- Function with the longest execution time
- Function with the shortest execution time
- Number of Functions called in application

On the left pane, expand the **Functions** tab. It displays the following information as shown in Figure 7_6.

- Platform APIs
- Application Functions

Figure 7_6: Platform APIs and Application Functions


Profiler - demo_cross_os/source/_os_init_windows_host.c - Application Common Operating Environment
File Edit Source Refactor Navigate Search Project Run Tools Window Help
Debug Projects Profiler
Profiler Data Explorer
profiler_data_1210343810
System
Functions
Platform APIs
Application Functions
Threads
Profiler View
Function Iterations
Platform APIs Called In Application
Properties

Property	Value
Average Function execution time	7,204,292,906 Nano Seconds
Function with the longest execution time	OS_Get_Current_Task_Id
Function with the shortest execution time	OS_Delete_Queue
Number of Platform APIs Called In Application	29

Platform APIs–These are all the OS Abstractor Interface functions called in the application. On the x-axis, all the functions are displayed. On the y-axis, all functions iterations are displayed. On the bottom of the window the function properties are displayed such as:

- Average Function execution time
- Function with the longest execution time
- Function with the shortest execution time
- Number of OS Abstractor Interface Functions called in application

If you expand the Platform APIs, you can view all the platform APIs called in the application as shown inFigure 7_7. On the bottom of the window, the function properties are displayed such as:

- Average execution time
- Instance with the longest execution time The Task _1in square brackets denote that these function properties belong to the Task 1 Thread.
- Instance with the shortest execution time
- Total number of times function was called

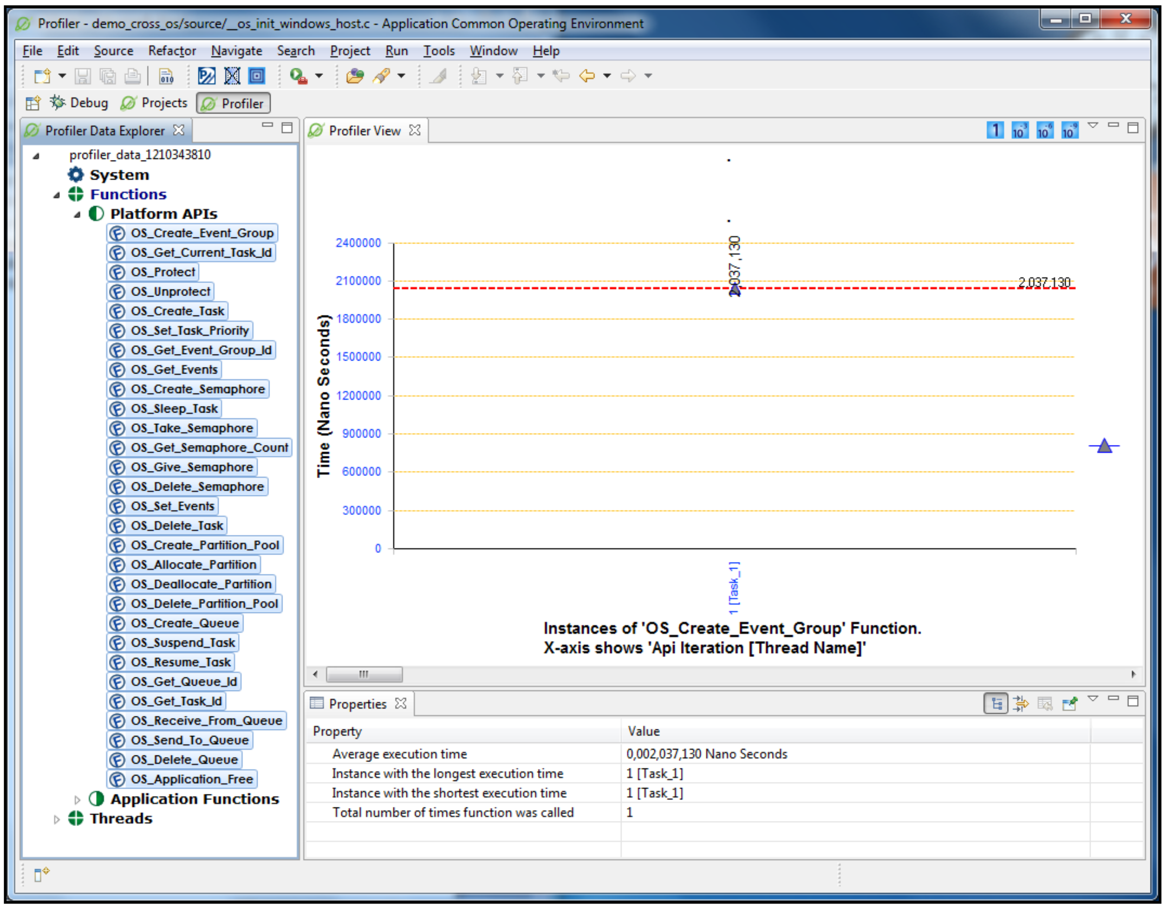
If you click on a Platform API, you can view the number of instances of the specific function on the x-axis and the time taken for each API on the y-axis.

NOTE: On top of the profiler view, you can view different measures of time such as:

- Seconds
- milli seconds
- micro seconds
- nano seconds as highlighted in the Figure 7_7

This is used to capture the time taken for each instance of the function in different time measures. If you click on nano seconds, the time graph will be shown as Time (nano seconds) as shown in the Figure 7_7.

Figure 7_7: Platform APIs


Profiler - demo_cross_os/source/__os_init_windows_host.c - Application Common Operating Environment
File Edit Source Refactor Navigate Search Project Run Tools Window Help
Debug Projects Profiler
Profiler Data Explorer
Profiler View
2400000
2100000
1800000
1500000
1200000
900000
600000
300000
0
Time (Nano Seconds)
2,037,130
2,037,130
1 [Task_1]
Instances of 'OS_Create_Event_Group' Function.
X-axis shows 'Api Iteration [Thread Name]'
Properties

profiler_data_1210343810
- System
- Functions
  - Platform APIs
    - OS_Create_Event_Group
    - OS_Get_Current_Task_Id
    - OS_Protect
    - OS_Unprotect
    - OS_Create_Task
    - OS_Set_Task_Priority
    - OS_Get_Event_Group_Id
    - OS_Get_Events
    - OS_Create_Semaphore
    - OS_Sleep_Task
    - OS_Take_Semaphore
    - OS_Get_Semaphore_Count
    - OS_Give_Semaphore
    - OS_Delete_Semaphore
    - OS_Set_Events
    - OS_Delete_Task
    - OS_Create_Partition_Pool
    - OS_Allocate_Partition
    - OS_Deallocate_Partition
    - OS_Delete_Partition_Pool
    - OS_Create_Queue
    - OS_Suspend_Task
    - OS_Resume_Task
    - OS_Get_Queue_Id
    - OS_Get_Task_Id
    - OS_Receive_From_Queue
    - OS_Send_To_Queue
    - OS_Delete_Queue
    - OS_Application_Free
  - Application Functions
- Threads

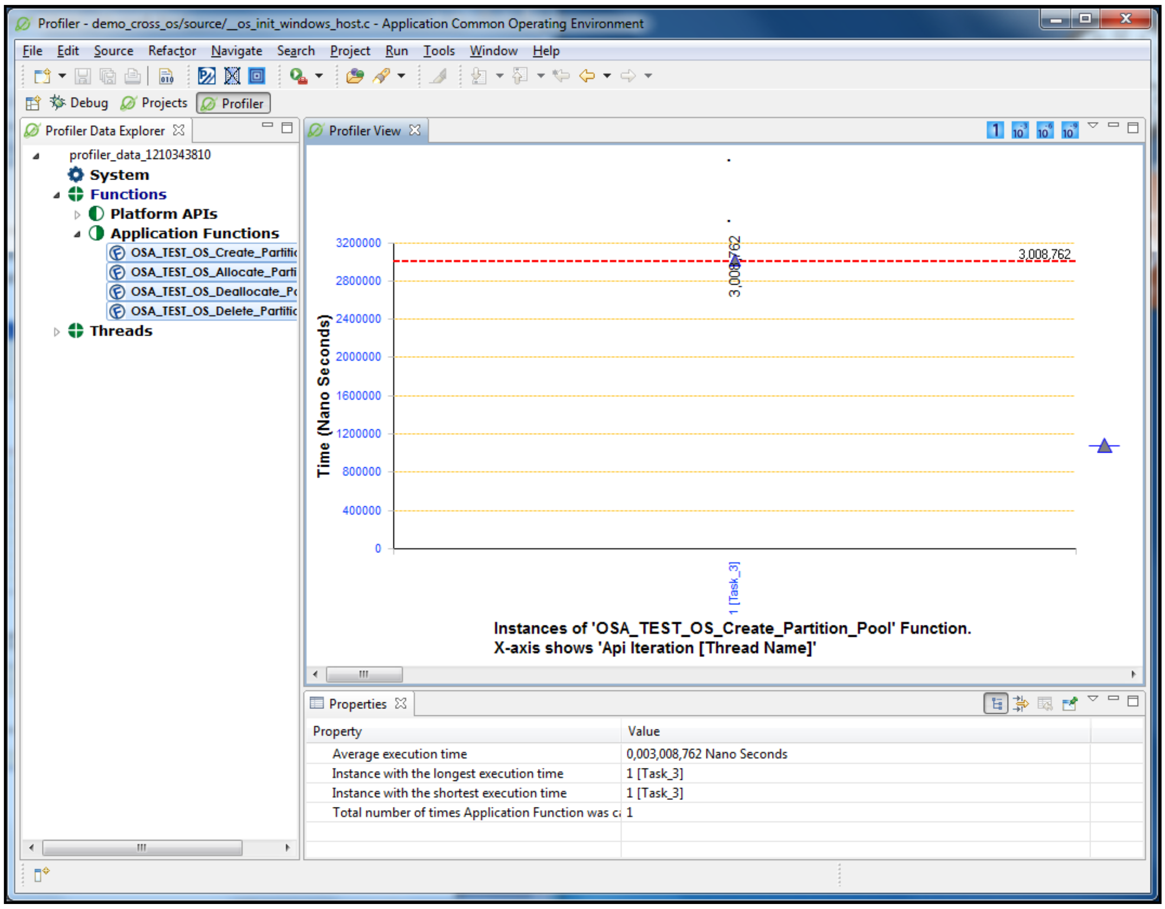
Property	Value
Average execution time	0,002,037,130 Nano Seconds
Instance with the longest execution time	1 [Task_1]
Instance with the shortest execution time	1 [Task_1]
Total number of times function was called	1

Application Functions

These are all the user specific functions called in the application. On the x-axis, all the user specific functions are displayed. On the y-axis, all functions iterations are displayed. On the bottom of the window the function properties are displayed as shown in Figure 7_8 such as:

- Average Function execution time
- Function with the longest execution time
- Function with the shortest execution time
- Number of times Application Functions are called in application

Figure 7_8: Application – Functions

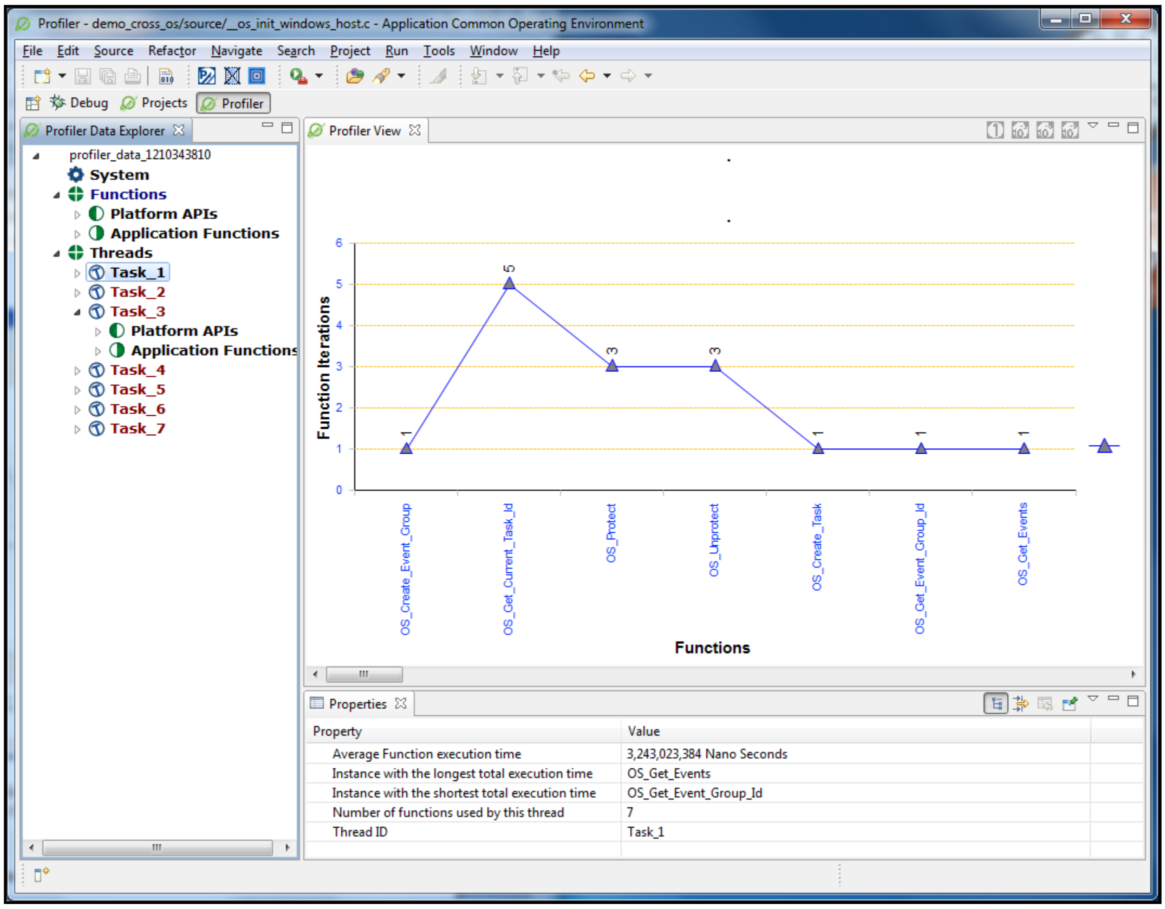

Profiler - demo_cross_os/source/__os_init_windows_host.c - Application Common Operating Environment
File Edit Source Refactor Navigate Search Project Run Tools Window Help
Debug
Projects
Profiler
Profiler Data Explorer
profiler_data_1210343810
System
Functions
Platform APIs
Application Functions
OSA_TEST_OS_Create_Partitic
OSA_TEST_OS_Allocate_Parti
OSA_TEST_OS_Deallocate_Pc
OSA_TEST_OS_Delete_Partitic
Threads
Profiler View
Time (Nano Seconds)
3200000
2800000
2400000
2000000
1600000
1200000
800000
400000
0
3,008,762
3,008,762
1 [Task_3]
Properties

Instances of 'OSA_TEST_OS_Create_Partition_Pool' Function.
X-axis shows 'Api Iteration [Thread Name]'

Property	Value
Average execution time	0,003,008,762 Nano Seconds
Instance with the longest execution time	1 [Task_3]
Instance with the shortest execution time	1 [Task_3]
Total number of times Application Function was c	1

3. **Threads**–Threads are created to execute any function in an application. IN App/Platform Profiler you can view the Thread properties by expanding the Thread tab as shown inFigure 7_9. On the bottom of the window the thread properties are displayed as shown in Figure 7_9such as:
   - Average Function execution time
   - Instance with the longest total execution time
   - Instance with the shortest total execution time
   - Number of Functions used by this thread
   - Thread ID

Figure 7_9: App/Platform Profiler – Threads



Property	Value
Average Function execution time	3,243,023,384 Nano Seconds
Instance with the longest total execution time	OS_Get_Events
Instance with the shortest total execution time	OS_Get_Event_Group_Id
Number of functions used by this thread	7
Thread ID	Task_1

Tasks–These are functions called for each task. If you expand the Task tab, you have the following as already discussed under the Functions tab:

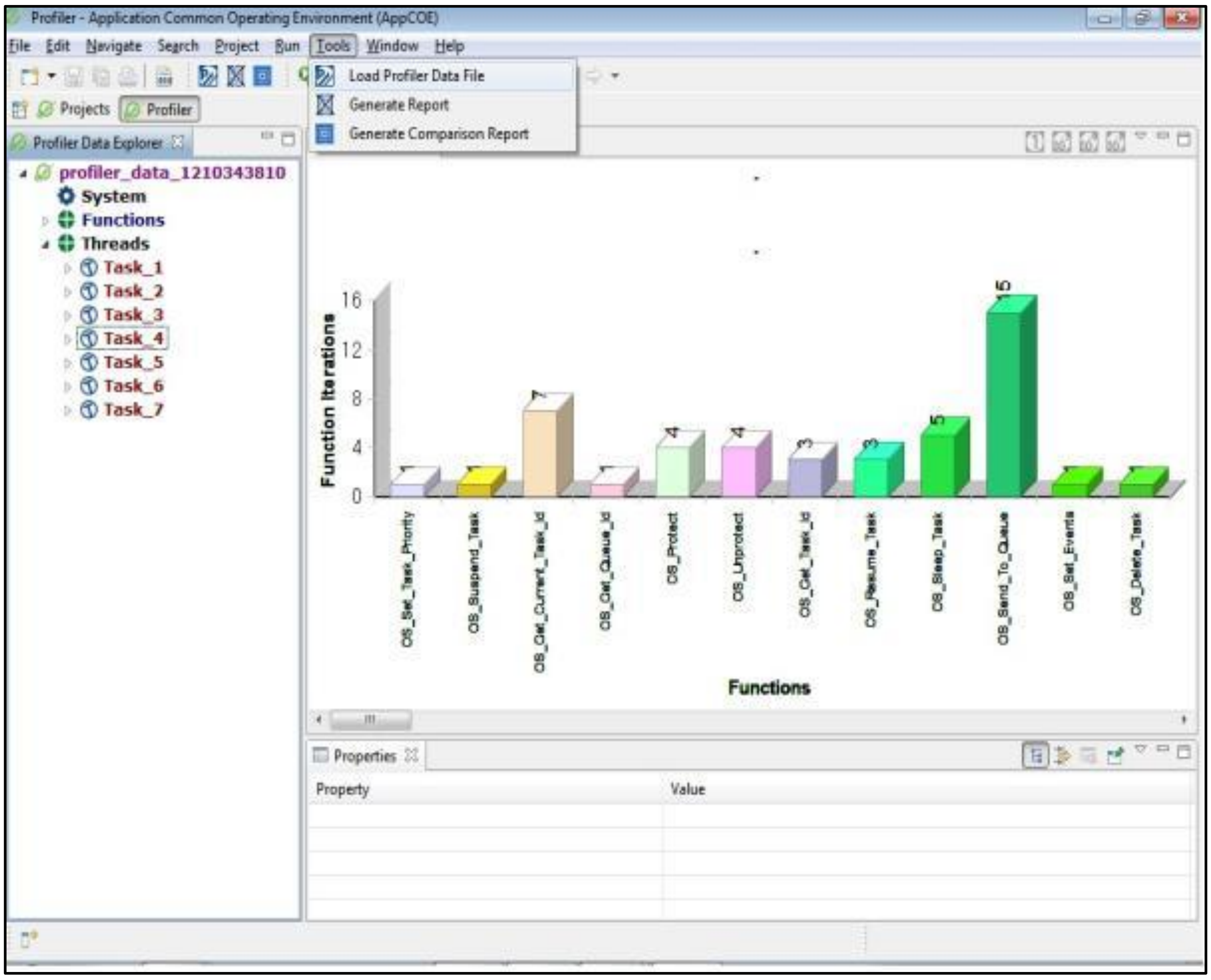
- Platform APIs
- Application Functions

Viewing App/Platform Profiler Data

NOTE: This feature requires a license. Click http://mapusoft.com/downloads/AppCOE-evaluation/ to request an evaluation license.

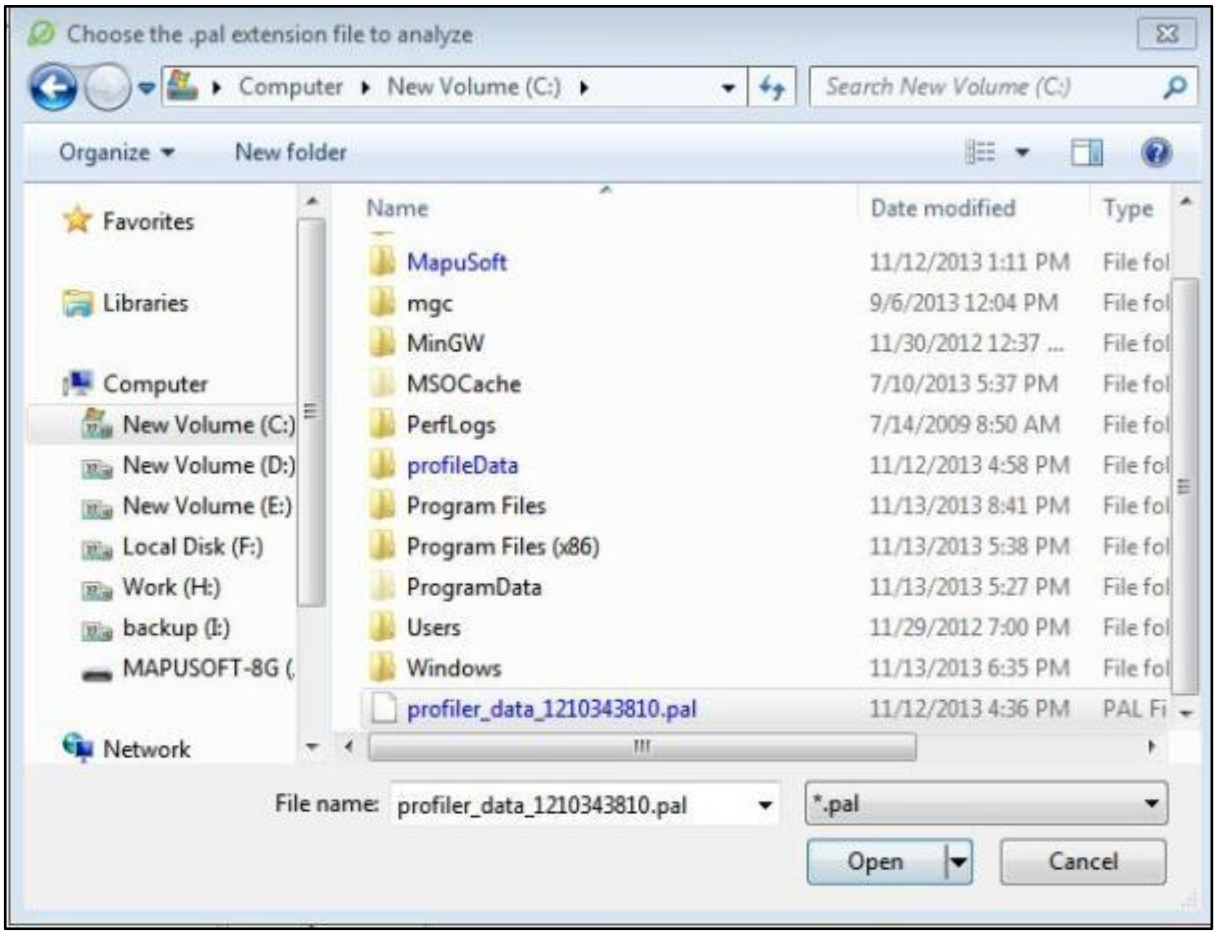
1. Open the App/Platform Profiler perspective.
2. From the AppCOE main menu, select **Tools >Load Profiler Data File** as shown in Figure 7_10.

Figure 7_10: Viewing AppCOE Profiler Data



3. Browse to your saved profiler data file, and click **Open** as shown in Figure 7_11.

Figure 7_11: Selecting the .pal File Extension to Analyze



Choose the .pal extension file to analyze

Computer ▸ New Volume (C:) ▸

Search New Volume (C:)

Organize ▾ New folder

Name	Date modified	Type
MapuSoft	11/12/2013 1:11 PM	File fol
mgc	9/6/2013 12:04 PM	File fol
MinGW	11/30/2012 12:37 ...	File fol
MSOCache	7/10/2013 5:37 PM	File fol
PerfLogs	7/14/2009 8:50 AM	File fol
profileData	11/12/2013 4:58 PM	File fol
Program Files	11/13/2013 8:41 PM	File fol
Program Files (x86)	11/13/2013 5:38 PM	File fol
ProgramData	11/13/2013 5:27 PM	File fol
Users	11/29/2012 7:00 PM	File fol
Windows	11/13/2013 6:35 PM	File fol
profiler_data_1210343810.pal	11/12/2013 4:36 PM	PAL Fi

Favorites, Libraries, Computer, New Volume (C:), New Volume (D:), New Volume (E:), Local Disk (F:), Work (H:), backup (I:), MAPUSOFT-8G (, Network

File name: profiler_data_1210343810.pal

*.pal

Select an API to view the data and right click on **Profiler Data Explorer** tab to view the different graph options as shown in
Figure 7_12.

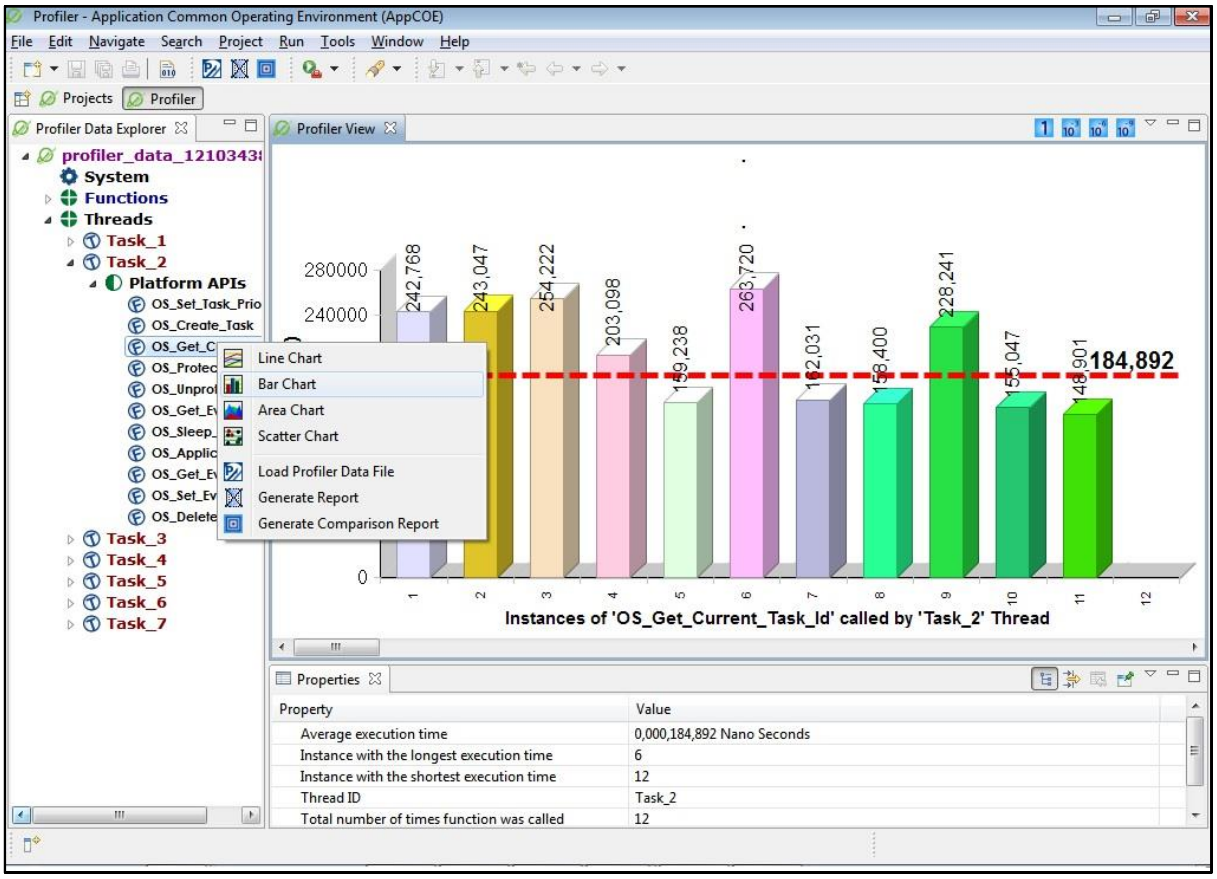
NOTE: You can select an appropriate graphical viewer to view your profiler data. You can view the profiler data in a line chart, bar chart, area chart, or a scatter chart.

NOTE: In case of linux, profiling requires cleaning up the system resources before generating the pal file. Therefore profiler gives the data result for all the required apis.

- **cleanup.pl** could be found in **AppCOE<installdir>/Tools/cleanup/cleanup.pl**.

NOTE: You can select an appropriate graphical viewer to view your profiler data. You can view the profiler data in a line chart, bar chart, area chart, or a scatter chart.

Figure 7_12: Selecting the API to view the Profiler Data



Property	Value
Average execution time	0,000,184,892 Nano Seconds
Instance with the longest execution time	6
Instance with the shortest execution time	12
Thread ID	Task_2
Total number of times function was called	12

Generating API Timing Report

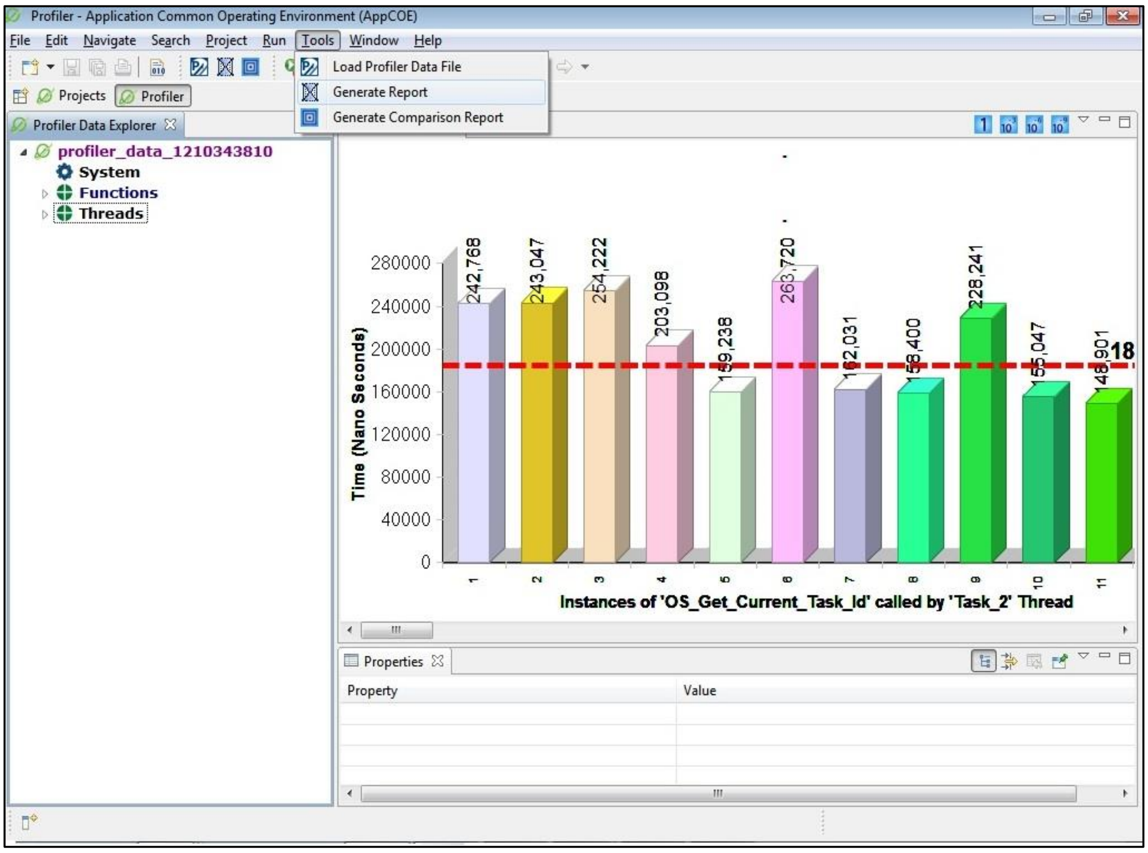
NOTE: This feature requires a license. Click http://mapusoft.com/downloads/AppCOE-evaluation/ to request an evaluation license.

AppCOE now provides you a new feature to view the performance report for each API.

To generate API Timing Report:

1. From the AppCOE main menu, go to Profiler perspective and select any Profiler Data on your left pane to generate the report.
2. Select **Tools > Generate Report**. You can also click on Generate Report button on the AppCOE Tool bar as shown inFigure 7_13.

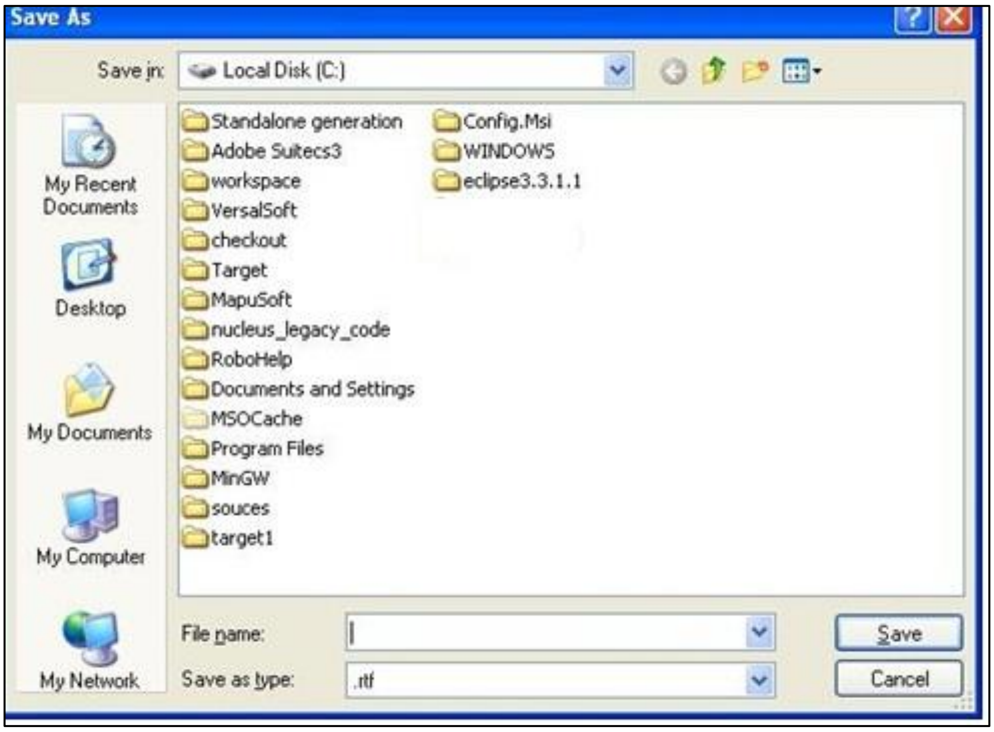
Figure 7_13: Generate Timing Report



A Save As window is displayed. Select the directory where you want to save the report and enter a file name for the report and click **Save** as shown in
Figure 7_14.

NOTE: In Windows Vista and Windows 7 Windows 8, you cannot generate the profiler report on c:\, if UAC is turned on. To turn off UAC, refer to the **Turning Off UAC**. You can generate the Timing report to generate in any sub-folder inside C drive. For Ex: C:\pal_report.rtf.

Figure 7_14: Saving the Timing Report



3. Your Timing Report is successfully generated as an .rtf file extension. The Timing Report displays the following information:

   1. **Timing Information**—The timing information gives a detailed description of the following:

      - Best Time Value – Specifies the minimum time taken to perform the action on each platform API
      - Worst Time Value – Specifies the maximum time taken to perform the action on each platform API
      - Average Time Value – Specifies the average time taken to perform the action on each platform API

   2. **Application Information**—When you perform the application profiling on AppCOE , the report displays the following application property values:
      - Total system memory limit–Specifies the total system memory pool limit of the application.
      - Size of the system memory pool– Specifies the size of the system memory pool of the application.
      - Minimum memory pool segment size– Specifies the minimum size of the memory pool segment of the application.

- OS Changer VxWorks Interface–Specifies if you have enabled OS Changer VxWorks Interface.
- pSOS Interface– Specifies if you have enabled pSOS Interface.
- POSIX/LINUX Interface– Specifies if you have enabled POSIX/LINUX Interface.
- OS Abstractor Interface– Specifies if you have enabled the OS Abstractor Interface.
- Process mode– Specifies if the OS Abstractor Interface process feature is enabled or disabled.
- Task pooling– Specifies if the Task pooling feature is enabled for this application.
- ANSI Memory– Specifies if you want to map ANSImalloc() and free() to OS Abstractor Interface equivalent functions.**Note**: We no longer support this feature in 1.8 AppCOE
- ANSI format IO– Specifies if you want to map ANSIprintf() and sprintf() to OS Abstractor Interface equivalent functions.**Note**: We no longer support this feature in 1.8 AppCOE
- Debug Information level– Specifies if you want to enable the debug output.
- Error checking– Specifies if you want to enable the error checking.
- Fatal Error– Specifies if you want to enable the feature to ignore fatal errors.

3. **Profiler Configuration—**When you perform profiling on AppCOE APIs, the report displays the following profiling application values:
    - File name–Specifies the name of the .pal file generated by OS Abstractor Interface
    - Project name–Specifies the name of your project
    - Target name–Specifies the target OS you have selected for profiling
    - File size–Specifies the size of the file to be profiled
    - Profiler XML format–Specifies the version of the XML used for profiling
    - Process name and ID–Specifies the process name and the ID
    - User Data–Specifies the information provided by the user
    - Profiling start time–Specifies the starting time of profiling
    - Profiling stop time–Specifies the end time of profiling
    - Total time profiled–Specifies the total time taken for profiling.
    - Number of profiling messages– Specifies the number of profiler messages.

Generating Timing Comparison Report

NOTE: This feature requires a license. Click http://mapusoft.com/downloads/AppCOE-evaluation/ to request an evaluation license.

AppCOE now provides you a new feature to view the comparison of two different performance reports for the APIs. You can generate a timing comparison report only when the following preconditions are met:

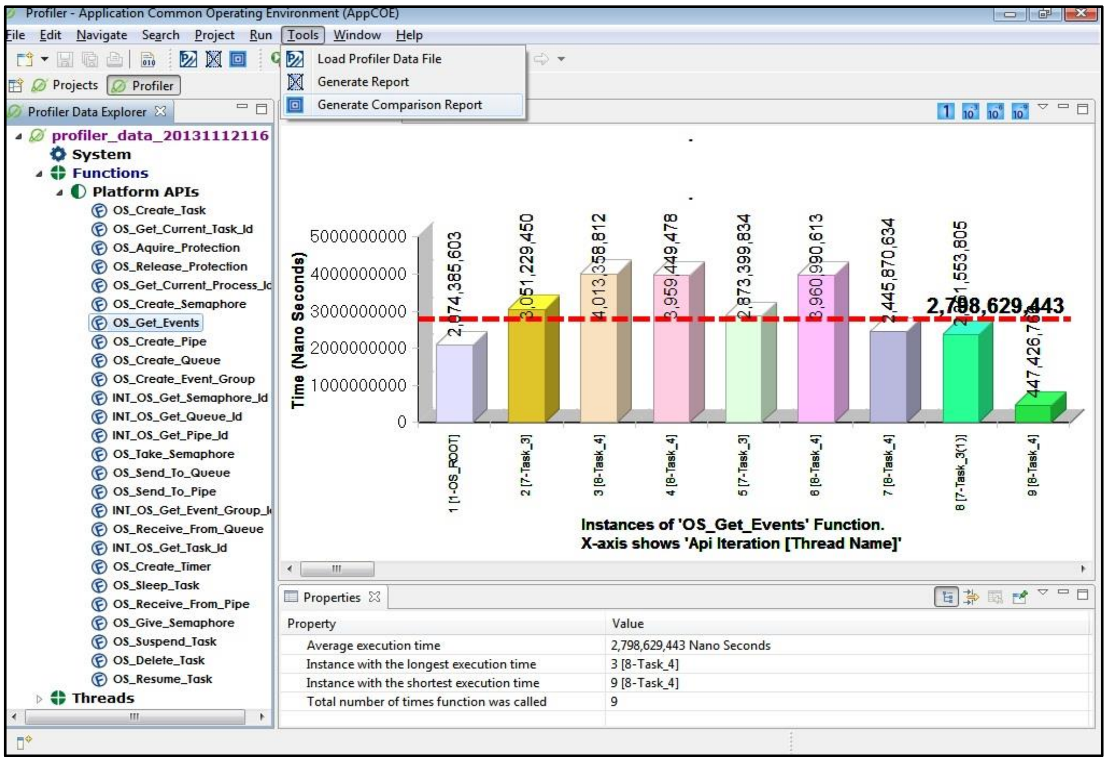
- Both the PAL files must have the same project name.
- Both the PAL files must have a profiling time less than 5 minutes.

Note: Do not generate PAL files within 60 seconds.

To generate Timing Comparison Report:

1. From the AppCOE main menu, go to Profiler perspective and select any Profiler Data on your left pane to generate the report.
2. Select **Tools > Generate Comparison Report**. You can also click on Generate Comparison Report button on the AppCOE Tool bar as shown inFigure 7_15.

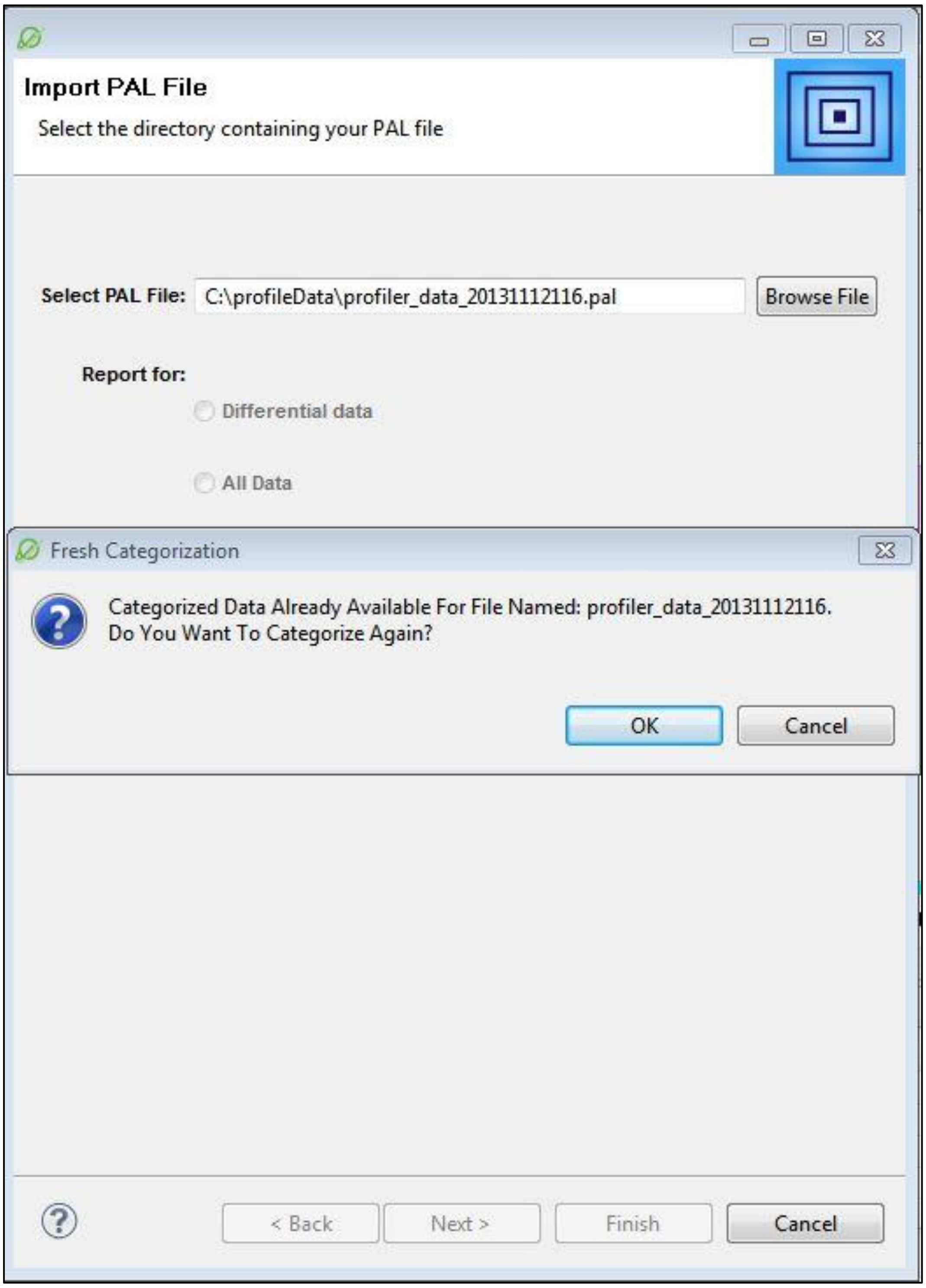
Figure 7_15: Generate Timing Comparison Report



Property	Value
Average execution time	2,798,629,443 Nano Seconds
Instance with the longest execution time	3 [8-Task_4]
Instance with the shortest execution time	9 [8-Task_4]
Total number of times function was called	9

3. An Import PAL file window is displayed. Select the PAL file by clicking on the **Browse** button or entering the second PAL file path in the text box. A Profiler Categorization Dialog box is displayed. **NOTE**: If you comparing the two PAL files for the first time, click **OK**. If you are comparing the same two files for the second time, click **Cancel**. as shown in Figure 7_16.

Figure 7_16: Import PAL File



Import PAL File

Select the directory containing your PAL file

Select PAL File: C:\profileData\profiler_data_20131112116.pal

Report for:

Differential data

All Data

Fresh Categorization

Categorized Data Already Available For File Named: profiler_data_20131112116.
Do You Want To Categorize Again?

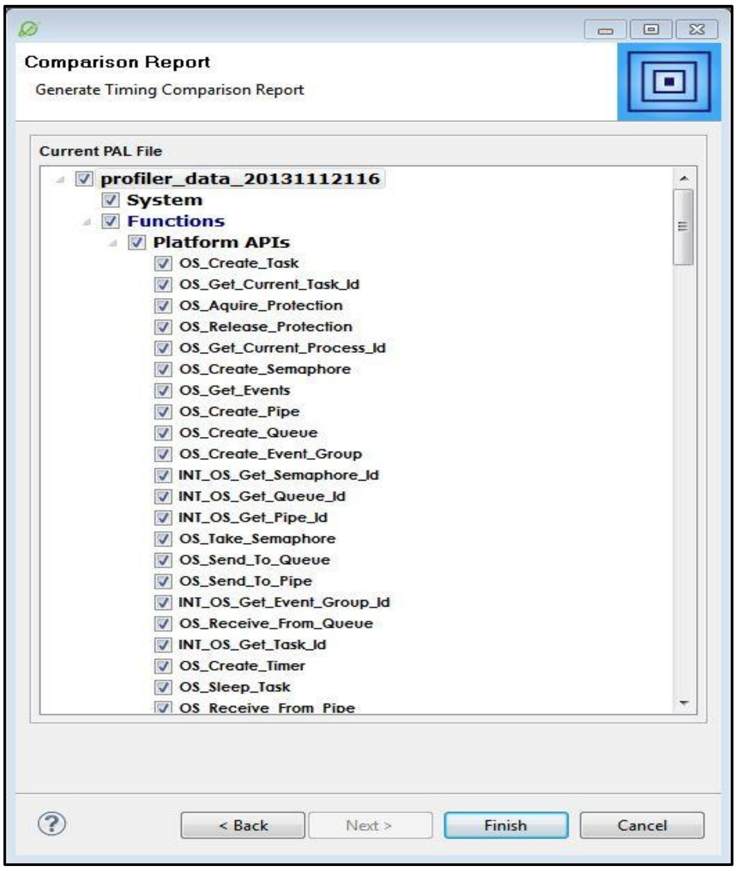
The field descriptions for importing the PAL file are described as follows:

Table 7_1: Field descriptions for importing the PAL file

Field	Description	Your Action
Select PAL File	Specifies you to select the PAL file for which the Timing Comparison Report has to be generated.	To select the PAL file, click **Browse**, and select it from your system.
Report for	Specifies what you are comparing.	You can do any one of the following, and click **Next**: • To compare only the differences, select the radio button before **Differential Data**. **Note**: By default, this feature is disabled. • To compare all the data in the PAL files, select the radio button before **All Data**. **Note**: By default, this feature is disabled.

4. Select the APIs you want to generate the Timing Comparison Report as shown in Figure 7_17,click Finish

Figure 7_17: Selecting the APIs



Comparison Report

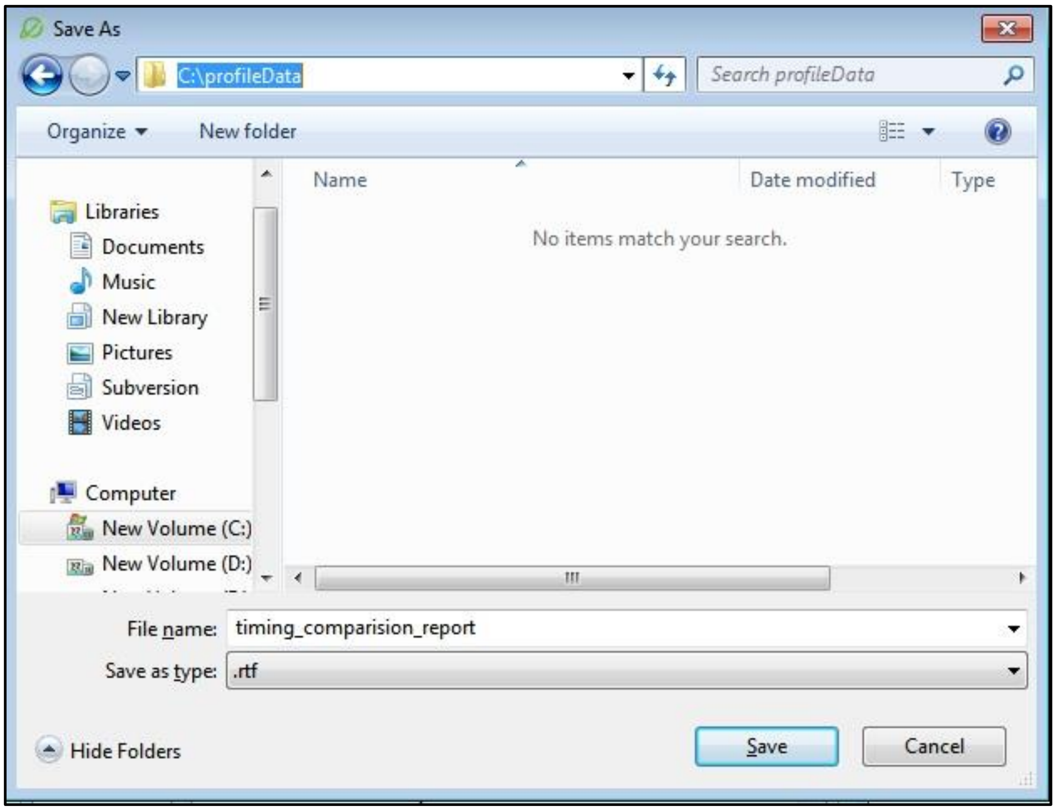
Generate Timing Comparison Report

Current PAL File

- ☑ profiler_data_20131112116
  - ☑ System
  - ☑ Functions
    - ☑ Platform APIs
      - ☑ OS_Create_Task
      - ☑ OS_Get_Current_Task_Id
      - ☑ OS_Aquire_Protection
      - ☑ OS_Release_Protection
      - ☑ OS_Get_Current_Process_Id
      - ☑ OS_Create_Semaphore
      - ☑ OS_Get_Events
      - ☑ OS_Create_Pipe
      - ☑ OS_Create_Queue
      - ☑ OS_Create_Event_Group
      - ☑ INT_OS_Get_Semaphore_Id
      - ☑ INT_OS_Get_Queue_Id
      - ☑ INT_OS_Get_Pipe_Id
      - ☑ OS_Take_Semaphore
      - ☑ OS_Send_To_Queue
      - ☑ OS_Send_To_Pipe
      - ☑ INT_OS_Get_Event_Group_Id
      - ☑ OS_Receive_From_Queue
      - ☑ INT_OS_Get_Task_Id
      - ☑ OS_Create_Timer
      - ☑ OS_Sleep_Task
      - ☑ OS_Receive_From_Pipe

4. **Save As window**will bedisplayed. Select the directory where you want to save the report.Enter a **file**name for the report and click **Save**as shown in Figure 7_18.

Figure 7_18: Saving Timing Comparison Report

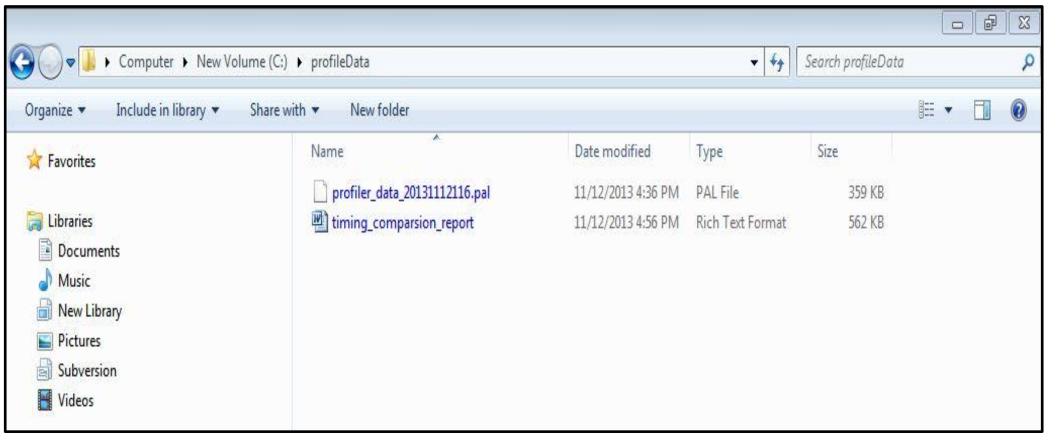


File name: timing_comparision_report

Save as type: .rtf

6. Your Timing Comparison **Report** is successfully generated as an .rtf file extension as shown in Figure 7_19.

Figure 7_19: Generated Timing Comparison Report



Name	Date modified	Type	Size
profiler_data_20131112116.pal	11/12/2013 4:36 PM	PAL File	359 KB
timing_comparsion_report	11/12/2013 4:56 PM	Rich Text Format	562 KB

Chapter 8. Introduction to Ada C/C++ Changer

This chapter contains the following topics:

Ada C/C++ Changer in AppCOE

Note: This feature requires a license. Click http://mapusoft.com/downloads/AppCOE-evaluation to request an evaluation license.

AdaC/C++Changer–allows developers to easily convert software written in Ada code to C/C++ utilizing AppCOE . The resultant C/C++ software can be integrated with the robust OS Abstractor® environment to support a wide variety of host and target OS platforms. The automatic conversion process eliminates the need for costly and tedious code rewrites, providing extensive resource savings. Ada-C/C++ Changer generates ANSI C output as well as certain C++ features while preserving Ada code's comments, files, structures and variable names to ease ongoing code maintenance.

Creating Ada C/C++ Changer Projects

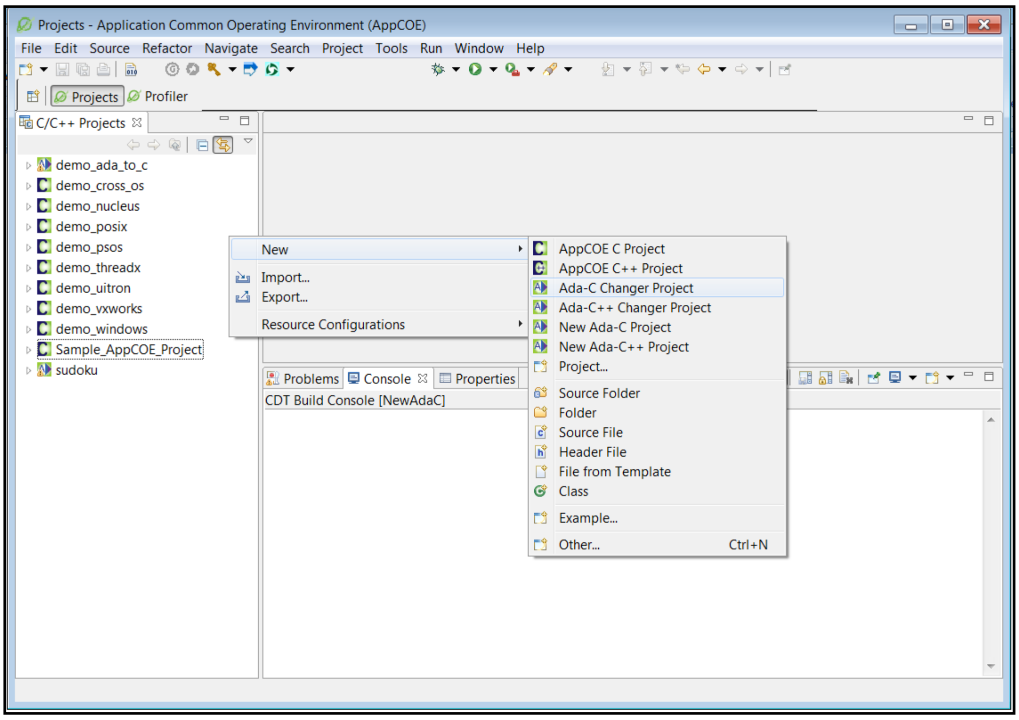
Note: This feature requires a license. Click www.mapusoft.com/downloads/ to request for an evaluation license.

Creating Ada-C Changer project

Ada-C Changer converts Ada 83 or Ada 95 Programs to C Source Code and keeps the C Source Code in Projects.

1. From AppCOE main window, select any project under **C/C++ Projects** tab on the left pane.
2. Select **New > Ada-C Changer Project** as shown inFigure 8_1.

Figure 8_1: Ada-C Changer project

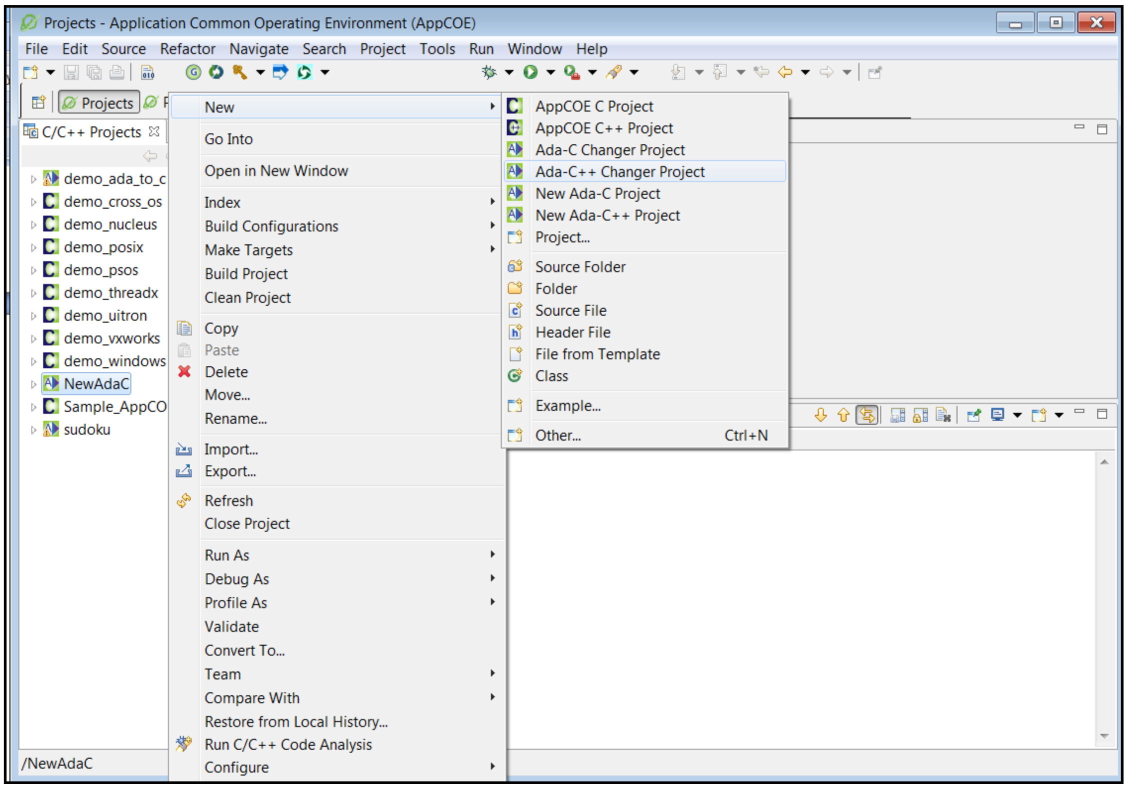


Creating Ada-C++ Changer project

Ada-C++ Changer converts Ada 83 or Ada 95 Programs to C++ Source Code and keeps the C++ Source Code in Projects.

1. From AppCOE main window, select any project under**C/C++ Projects** tab on the left pane.
2. Select **New >Ada-C++ Changer Project** as shown inFigure 8_2.

Figure 8_2: Ada-C++ Changer project



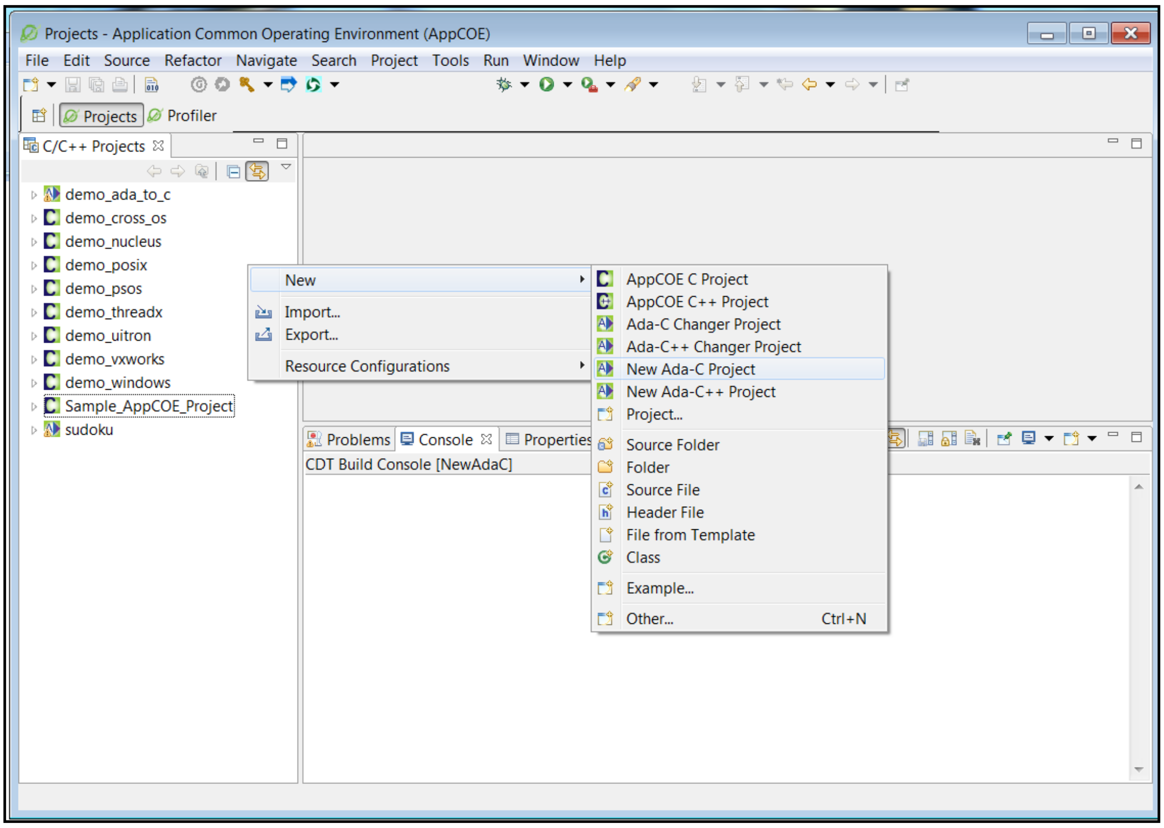
Note 1: win32 and gnat compatibility are not supported under 64 bit AppCOE Build.

Creating New Ada-C Template project:

New Ada-C Template (Hello World)project converts a Hello World Ada Program to C Source Code and keeps the C Source Code in Projects.

1. From AppCOE main window, select any project under**C/C++ Projects** tab on the left pane.
2. Select **New >New Ada-CProject** as shown inFigure 8_3.

Figure 8_3: Create Ada-C Template

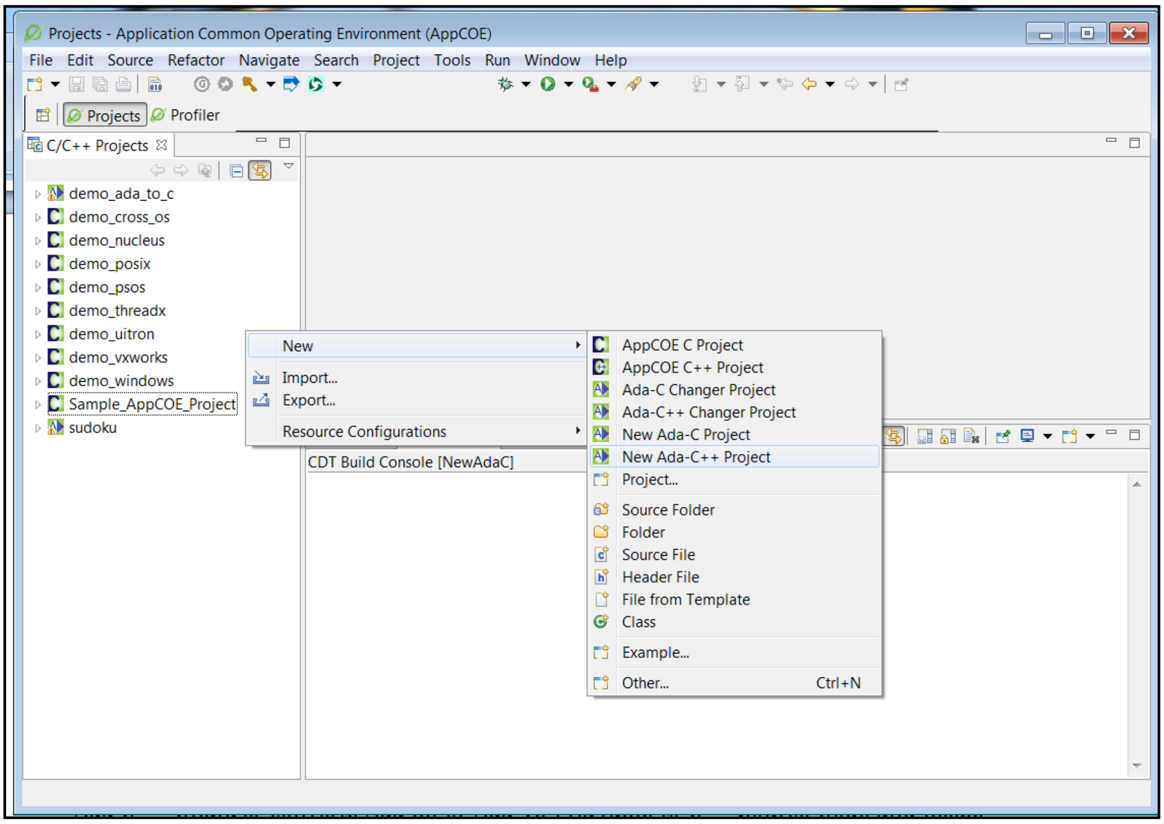


Creating Ada-C++Template project:

Ada-C++ Template (Hello World)project converts a Hello World Ada Program to C++ Source Code and keeps the C++ Source Code in Projects.

1. From AppCOE main window, select any project under**C/C++ Projects** tab on the left pane.
2. Select **New >New Ada-C++ Project** as shown inFigure 8_4.

Figure 8_4: Create Ada-C++ Template

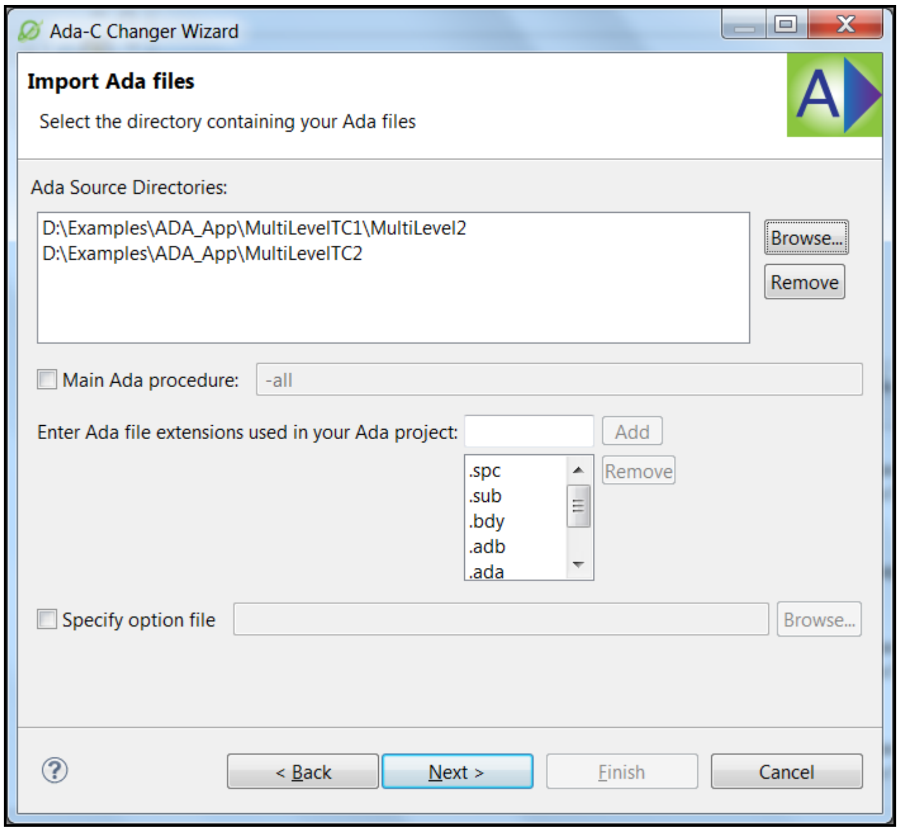


Note 1: win32 and gnat compatibility are not supported under 64 bit AppCOE Build.

Using the Ada Source Directory

The Ada Source directory contains all information needed to support the separate compilation requirements of Ada. The primary contents of the Source directory are Ada source files, all object modules and info files created by the compiler are stored in the AppCOE Projects. Since no intermediate compilation form is saved, the Ada C/C++ Changer performs a semantic analysis of the appropriate source files, as necessary, to handle any separate compilation requirements.

Figure 8_5: Import Ada Files



D:\Examples\ADA_App\MultiLevelTC1\MultiLevel2
D:\Examples\ADA_App\MultiLevelTC2

Main Ada procedure: -all

Enter Ada file extensions used in your Ada project:

.spc
.sub
.bdy
.adb
.ada

Specify option file

This source-based program library model simplifies the use of the **AdaC/C++ Changer** and program builder:

- There are no compilation order requirements for compiling Ada source. As long as the Ada source for depended-upon units is available, it is not necessary to compile them first.
- There are no constraints on the user's approach to file organization or configuration management.
- There are no significant disk storage requirements for the program library beyond that required for the source and object modules.

Ada Source Directory

In Ada Source directory, you inform the library of the location of the Ada source for the program. The source can be in one directory, in multiple directories, or in multiple program libraries. Once this information is provided, the Ada C/C++ Changer and program builder can automatically locate source files containing the required units, as needed. The following subsections describe the program library, with details about how the Ada C/C++ Changer and program builder use this program library.

Two tools are provided for maintaining the program library:

- The program library options tool, adaopts, can be used to display or modify the program library parameters. This creates ADA.LIB.
- The source registration tool, adareg, establishes which units are defined in which source files. A description of the use of these tools follows the description of the program library. This creates UNIT.MAP.

An Ada program library is based in a directory called the program library directory. All information about the program library and all generated files are kept in the program library directory (or unspecified subdirectories).The main contents of the program library are the source files and object modules. There is considerable flexibility with regard to the actual location of the source files. This will be evident in the examples that follow.Configuration with Multiple Source Directories

In a larger program, the source files composing the Ada program are often located in several directories. To support this source configuration, the program library provides a source directory list which points to the directories containing the source. In this configuration, the source can be distributed in any convenient way among any number of source directories.

Configuration with Linked Libraries

For more complex programming efforts, it may be desirable to partition the source code into sub systems, each of which is maintained within a separate program library. To support this model, the Ada program library supports linking to other existing libraries. The user need not know the location of the source for a linked library, just its program library directory. If the linked library is itself linked to another library, that library also needs to be added as a linked library for the current library. The source files and object modules of a linked library may only be referenced in a read-only fashion.

Specifying the Configuration

The program library's configuration is determined by the values of program library parameters. The configuration described above is the default configuration created automatically by the first invocation of the Ada C/C++ Changer. The primary difference between the "multiple source directories" model and the "multiple linked libraries" model is what happens when adabgen discovers that a source file needs to be [re]compiled:

- If the source file is part of this program library, adabgen will recompile it.
- If the source file comes from a linked library, adabgen will refuse to recompile it, and will give an error message.

Therefore, the "multiple source directories" model is more convenient for most projects.

ADA.LIB and UNIT.MAP

An Ada Changer tools contains two files—ADA.LIB and UNIT.MAP. These two files, which are located in the project are automatically created the first time the Ada C/C++ Changer, is invoked. ADA.LIB contains information describing the configuration of the library. UNIT.MAP contains a unit-to-source mapping for use by the compiler and program builder. When the program library is created, if a UNIT.MAP file already exists in the current directory, it will be used for the new program library's UNIT.MAP.

Source Files

The Ada source files in the program library include:

- All Ada source files in the program library directory
- All Ada source files in directories specified in the program library's source directory list.
- Any other source files which have been registered in the UNIT.MAP.
- To be automatically recognized as Ada source files, the files in a directory must have one of the following file extensions: .a, .ada, .adb, .ads, .bdy, .dat, .spc, .sub. You can also use any new extensions of user choice as shown in Figure 9_2.
- There is no naming restriction for source files explicitlyregistered. Source files in the UNIT.MAP of linked libraries are not contained in the current program library, but they are visible for read-only reference by the compiler and program builder.

Generated Files

The Ada C/C++ Changer output also includes files generated by the compiler or program builder. These include:

- Object module files (*.o or *.obj) and information files (*.info) for Ada source files in the program library.
- Executable files (*.exe) for main units in the program library.
- Optional listing files (*.lst).
- Optional cross reference files for use by the cross reference compiler option.
- Other intermediate files, if kept (see the -ke option).

Ada C/C++ Changer Library Interaction

The Ada C/C++ Changer uses the program library to locate the source files needed to handle semantic dependencies during compilation of a specified source file. Some of the situations in which this may occur are the following:

- To locate a with'ed unit or the parent unit for a separate clause or child unit
- To locate the library unit specification, if any, when a library unit body is being compiled
- To locate the body of a generic, if any, when the generic is instantiated
- To locate the body of a subprogram in another library unit to which pragma Inline applies
- To locate the body of a stub contained in a subprogram

This requires a method for locating a source file from a unit name during compilation. This is only required if the needed unit is in a source file that has not yet been analyzed in the current invocation of the compiler.

Locating the Source File

The order of the search for locating a unit during compilation is as follows:

- First, check the UNIT.MAP of the program library;
- Then, check the UNIT.MAP of each linked library in the order of the library search list.

Ada Program Builder/Library Interaction

The Ada program builder uses the Ada program library to locate the object module file and the information file for each unit needed in the main procedure. Since the names of these files are based on the source file name, the unit-to-source correlation is required. The method used to determine this is similar to that used by the compiler.

Locating the Information File and Object Module

To determine the name of the source file, the program builder checks to see if a unit is registered in the program library or any linked library. Thus, the effective order of the search by the program builder is:

- First, check the UNIT.MAP of the program library
- Then, check the UNIT.MAP of each linked library in the order of the library search list

Once the source file name is found, it may be that the corresponding information and object module files do not exist because the source was never compiled, or they are out-of-date because the source file, or some source file on which it depends, has changed. If the missing or out-of-date object module belongs to a source file in one of the linked libraries, the program build will fail because linked libraries are read only. Otherwise, the program builder implicitly invokes the Ada C/C++ Changer to create the needed object module and information file.

Predefined Run Time System

There is 'C' run-time sources that provides I/O, tasking, exception handling, and memory management modules which are normally required by Ada 95 language for the 'C' converted code base. These are called Ada run time system (RTS).

Program Library Options Tool (adaopts)

Overview

The program library options tool (adaopts) supports tailoring the program library to meet the needs of a particular Ada project. For small Ada projects, it is unlikely that this tool will be needed because the behavior of the compiler and builder are, by default, configured for small projects.

For more complex programs, the user may direct the program library options tool to distribute source to multiple directories, create links to existing program libraries, place object modules in a separate subdirectory, etc.

The program library options tool supports the following functions:

- Creating a new program library.
- Listing all or specific values for the program library options.
- Modifying the source directory list, the library search list, the object file subdirectory, the information file subdirectory, or the cross reference file subdirectory.

Listing the source file names or library unit names registered in the program library.

Program Library Options Tool Outputs

The program library options tool modifies the ADA.LIB file in the project directory.

Messages

Messages and displays generated by adaopts are written to standard error.

Source Registration Tool (adareg)

Overview

The source registration tool (adareg) maintains the UNIT.MAP file. The UNIT.MAP file, which is located in the project directory, contains the unit-to-source correlation of all source files that have been registered in the program library. The source registration tool is used to register additional source files in the program library.

The source registration tool provides the following function:

- Explicit registration of a specified source file(s)

Registration is performed by doing a syntax analysis of a source file to determine the name and kind of the units in the file, and then adding that information to the UNIT.MAP. When the source registration tool is invoked with a list of source files or directories containing source files, registration is performed on all files specified on the command line. When the source registration tool is invoked with a directory name, it registers all files with the following extensions: .a, .ada, .adb, .ads, .bdy, .dat, .spc, .sub. This is stored in your newly created Ada C/C++ Changer project

Conflicts during Registration

The following restrictions apply to source file registration:

- Two source files with the same simple file name, exclusive of the directory path, cannot be simultaneously registered.
- Two source files containing the same library unit cannot be simultaneously registered.

If either of these situations arises during source file registration, the source files are said to conflict and one of the source files and its units overrides the other, depending on whether the registration is explicit or automatic. Explicit registration of a source file, either by compiling or by the source registration tool, overrides any previously registered source files with which it conflicts. When a registered source file is overridden, it remains in the UNIT.MAP, but its units are marked as Invalid.

Source Registration Tool Outputs

The source registration tool modifies the UNIT.MAP file in the current directory. All source registration tool messages are written to standard

Adacgen

The Ada-Compiler translates Ada 95 source programs into relocatable object modules and records dependency information for use by the program builder. It optionally generates source listing, assembly listing and debugger information for use by the symbolic debugger. The Ada C/C++ Changer consists of two phases—the front end and the back end. The front end performs syntactic and semantic analysis. It generates C source files as input to the back end. The back endof the Ada C/C++ Changer is an ISO/ANSIC compiler. It performs code generation, applies optimizations, and generates a relocatable object module.

Compiler Inputs

Invocation

```
adacgen [option…] [file…]
```

The adacgen command invokes the Ada C/C++ Changer for one or more files. If the specified source files have semantic dependencies on other units, the source files for those units must be located either in the program library or in one of the linked libraries. If a source file depends on a library unit not yet processed by the current invocation of the compiler, the compiler will find and process that library unit (through the front end only) provided that the source file containing the required library unit has been registered in the program library or is in a linked library. This proceeds recursively, if necessary, until the closure of all depended-upon library units have been processed.

Listing Options

For the listing options, the compiler generates the requested listing for each file specified on the command line.

Table 8_1: Compiler Generates the Requested listing Options for Each File

Listing Options	Description
-lc*	The -lc option causes the compiler to generate a continuous source listing without pagination or headers. Any errors or other compiler-generated messages are interspersed in the listing. The listing is written to file.lst.
-le*	The -le option causes the compiler to generate a source listing only if there are errors. If neither -lc, -lp, or -lr are specified, the listing is generated without pagination or headers, with interspersed error messages, as if -lc had been specified. The listing is written to file.lst.
-lf filename	When used in conjunction with the -lc, -le, -lp, or -lr option, the -lf option causes the compiler to write the listing to filename instead of the default file.lst.
-lp*	The -lp option causes the compiler to generate a line-numbered listing with pagination and a header at the top of each page. The page is 60 lines long and 80 columns wide. Any errors or other compiler-generated messages are interspersed in the listing, which includes all messages generated by the compiler. The listing is written to file.lst.

Listing Options	Description
-lr*	The -lr option causes the compiler to generate a listing containing only those lines for which compiler messages were generated, as well as the compiler messages. The listing is written to file.lst.
-lx*	The -lx option causes the compiler to generate a cross reference listing. This cross reference listing is a line-numbered listing followed by a cross reference table. This listing is written to file.xlst. A binary cross reference file file.ref will also be generated.
-pl length*	This sets the page length for the paginated source listing to length lines. This option has no effect unless used in conjunction with the -lp option.
-pw width*	This sets the page width for the paginated source listing to width columns. This option has no effect unless used in conjunction with the -lp option.
-nh	No headers in listings.
* The marked Adabgen options are already added in Ada-C/C++ Changer. Do not add these in your additional options tab. If you add these options, it will break your application.	
Message Options	
-m msg_kind	This suppresses the display of any messages of msg_kind.
+m msg_kind	This enables the display of any messages of msg_kind.
-mrmsg_kind	This suppresses the display of any messages of msg_kind for the current invocation of the compiler and for any recursive invocation of the compiler.
+mrmsg_kind	This enables the display of any messages of msg_kind for the current invocation of the compiler and for any recursive invocation of the compiler. The valid values for msg_kind are: i. a — all messages, except that "-m a" does not suppress error messages. ii. d— implementation-dependent messages. iii. e— error messages. iv. i— information messages. v. n— not-yet-implemented messages. vi. w— warning messages. vii. r— redundant messages

By default, all messages except information and redundant messages are displayed for the current invocation of the compiler. For recursive invocations, no messages are displayed by default. For convenience, "-m a", will suppress all messages except errors.

Adacgen Options

Table 8_2: adacgen Options

Options	Description
-0	The -0 option identifies the version number of the executable. (That's a zero, not an oh)
-a	If the -a option is specified, compilation will stop after semantic analysis. No output is generated.
-c	If the -c option is specified, compilation will stop after the front end. No output is generated.
-discard_names	This option has the same effect as using pragma Discard_Names.

Options	Description
-e count	The -e count option causes the compiler to report only the first count errors. The default is 100.
-eo	The -eo option enables optimizations that are performed by the front end. This is the default.
-ga	Generate Ada-oriented debugging information. The –ga option causes the compiler to generate the appropriate code and data for operation with the C debugger, but in a way that should cause it to display the Ada source code rather than the C source code.
-gc	Generate C-oriented debugging information. The -gc option causes the compiler to generate the appropriate code and data for operation with the C debugger. This option also causes the intermediate C source files to be saved for use as program source files for the debugger, providing C-source-level debugging.
-help or -h	The -help option shows the different options that can be used with the adacgen command.
-late_inlines	The late-inlines option allows pragma Inline to be specified after a specless subprogram body. This option provides compatibility with Ada 83, and allows more aggressive inlining.
-N check*	Suppresses numeric checks. The check can be one of: • division_check • overflow_check These checks are described in the RM. Using -N reduces the size of the code and increases its speed. Note that there is a related adacgen option, -s, to suppress all checks for a compilation.
-noeo	The -noeo option disables optimizations that are performed by the front end.
-noxr	The -noxr option disables generation of cross reference information by the compiler for use by a browser. This is the default.
-Olevel	The -O option (that's an oh, not a zero) controls the optimizations that are performed by the compiler back end. The accepted values for level are none, all, debug, 1, 2, and 3. These have the following effect: • None— disable all optimizer options. • All— same as -O3 • Debug — disable optimizations that substantially interfere with debugging. No optimizations are specified for the C compiler back end. • 1— pass -O1 to C compiler back end. • 2— pass -O2 to C compiler back end. • 3— pass -O3 to C compiler back end. If the -O option is not specified, -O1is passed to the C compiler back end (e.g. gcc).
-of file*	The -of option causes the compiler to read options and file names from the specified file. These are processed as though the contents of the file were on the command line.
-pB "BE options"	The -pB option passes the specified BE options to the back end. All text within the quotations is passed directly to gcc. These options precede the other options that adacgen generates and passes to gcc.
-prl	Record layout listing for packed record types.

Options	Description
-q*	The -q option specifies quiet mode. It suppresses all nonessential messages.
-rl	Record layout listing for all record types.
-s	The -s option suppresses all automatic runtime checking, including numeric checking. This option is equivalent to using pragma Suppress on all checks.
-sleh	Suppress Language Exception Handlers. If this option is specified, exception handlers that handle predefined exceptions (Constraint_Error, Program_Error, Tasking_Error, and Storage_Error) are removed from the program, if the exception is always propagated.
-speh	Suppress Propagating Exception Handlers. Same as -sleh, but applies to user-defined exceptions as well.
-suppress_aggregate_temps	This option has the same effect as using pragma Suppress_Aggregate_Temps.
-T	The -T option causes the compiler to report timing information for the compilation of each source file specified on the command line.
-v	The -v option specifies verbose mode.
* The marked Adabgen options are already added in Ada-C/C++ Changer. Do not add these in your additional options tab. If you add these options, it will break your application.	

Options for Maintainers

The following options are provided for use by maintainers of the compiler.

Table 8_3: Options For Maintainers

Options	Description
-b	The -b option causes the message file (created by the front end) to be retained; normally it is deleted, as its contents are cryptic.
-f*	The -f option forces the generation of intermediate files even if the compiler finds errors.
-ke*	The -ke option specifies that intermediate files, which are normally deleted, are to be kept.
-ki*	Keep the information file generated by the compiler. The information file is generated by default except when the –a or -c option is used, or if the compilation terminates without generating an object module file.
-ne	The -ne option specifies that the adacgen process will not be restarted on failure. If the -ne option is not specified, the adacgen process will restart upon severe internal error such as a segment violation, bus error, or assertion failure. The process will restart with the file that was being processed when the failure occurred. If the file causes a severe error again, adacgen will restart with the next file to prevent infinite reprocessing of that file.
-nl	The -nl option specifies that the adacgen process will be restarted with the next file after the file that was being processed when the failure occurred. The default behavior without -nl is to restart with the file that caused the failure. (See also -ne.)
-nonr	The -nonr option specifies that the compiler front end may release any heap memory to the current heap.
-nz	The -nz option initializes all heap memory used by the compiler front end to a nonzero value. In hex, the nonzero

Options	Description
	value is BAD1BAD1so it is easy to spot in the debugger, and causes a Bus Error on a Sparc when it is dereferenced.
-pL "L options"	The -pL option passes the specified L options to the lister.
-t	The -t option generates a trace message as each declaration and statement is passed to the emitter phase of the front end.
-xB exe-path	The -xB option overrides the default back end and uses exe-path instead.
-xddir-path	The -xd option overrides the default ADA_MAGIC environment variable and uses dir-path instead.
-xL exe-path	The -xL option overrides the default lister and uses exe-path instead.
+bw	This displays all warning messages generated by the Ada C/C++ Changer back end (e.g. by GCC).
* The marked options are already added in Ada-C/C++ Changer. Do not add these in your additional options tab. If you add these options, it will break your application.	

Compiler Output Files

Files produced by compilations are:

Table 8_4: Compiler Output Files

Output Files	Description
file.info	Information recorded during compilation of a source file which is used by the program builder to determine if the object module is valid.
-file.o or file.obj	Relocatable object module files, one for each source file in the compilation.

These output files are placed according to the program library parameters. Also produced are various intermediate files; these are usually deleted as a matter of course unless the -ke option is specified.

Additional files that may be produced by a compilation are:

Table 8_5: Additional Compiler Output Files

Output Files	Description
file.lst	Source listing if any of the -lp,-lc or -lr options are specified.
file.xlst	Cross reference listing if the -lx option is specified.
file.xref	Cross reference information in a binary format. This is for use by a browser and the cross reference lister.

Compile-Time Messages

All compiler messages are written to AppCOE Console View. When error messages are printed, processing does not proceed beyond the front end. No intermediate files or object code files are produced. Warning and other informational messages do not prevent further processing. The back end (i.e. C compiler) may print error messages as well; however, these will be error messages related to problems internal to the compiler itself. The option "-m a" can be used to suppress all warning and informational messages generated by the compiler. If there is an internal error in the compiler, the options -v and/or -t and/or +mr a can be used to help determine what part of the compiler contains the error; this might help you work around the problem.

The compiler may implicitly perform semantic analysis of other source files in the program library or in a linked library during an invocation in order to handle semantic dependencies on other compilation units. Compile-time messages generated during implicit processing are displayed only if the +mr option is used. Otherwise, compile-time messages are written only for processing of the source file(s) specified in the adacgen command.

Adabgen

The Ada program builder provides the facilities for creating a load module for an Ada program. It finds the object modules needed to build the executable, determines the elaboration order, and invokes the target linker to generate the load module.

In addition, the program builder implicitly invokes the compiler as needed so that all object modules are up-to-date with respect to any source files on which they depend. In fact, it is not necessary for the user to invoke the compiler directly at all — the entire program building process, including compilation, can be handled by the program builder, if desired. The load module generated by the program builder is in the format created by specified linker.

Program Builder Processing

Program builder processing is divided into two phases — prelinking and linking. The prelinking phase handles those Ada 95 requirements that are processed at build time and identifies the list of object modules that make up the program. The linking phase invokes the target linker to combine the object modules to form a load module with all references resolved.

Prelinking

The prelinking phase performs three functions:

- It determines the complete list of units needed for the main procedure;
- It finds or generates all object modules for the units on this list, ensuring that they are up-to date
- It determines an acceptable elaboration order.

To perform these functions, the prelinker uses the information files generated by the Ada C/C++ Changer. These files contain the names of depended-upon and needed units. For a description of how the information files in the program library are found.

Finding the information files results in implicit invocations of the compiler for source files or units in the current program library if:

- The source file containing a needed unit has either never been compiled
- Or has been modified since it was last compiled
- Or a source file on which a unit depends has been modified since the unit was compiled.

The program builder uses time stamps to determine if a source file has been modified.

The prelinking phase handles all of the compilation order and completeness requirements for building the Ada program. If a part of the program is missing, or if the Ada source code contains incorrect dependencies, the prelinking phase will detect and report this.

Linking

The linking phase of the program builder is handled by the linker.The linking phase uses the default C runtime library as well as the Ada run time library.

Adabgen Inputs

Invocation

```
adabgen [option…] [main-procedure-name…]
```

The adabgen command creates an absolute load module for the main procedure. The adabgen command must be invoked in a program library directory. If the current directory is not a program library directory, a program library is automatically created there.

The main-procedure-name must be a procedure for which the Ada source for all needed units is located either in the program library, or in one of the linked libraries. Multiple main procedures may be built in a single invocation of the builder.

NOTE: Do not confuse the name of the source file containing the main unit (e.g. simple.ada) with the main unit name (e.g. simple).

adabgen Options

In addition to the options listed below, adabgen accepts all compiler options. These are applied to all invocations of the compiler that are made by the program builder.

Table 8_5:adabgen Options

Options	Description
-0	The -0 option identifies the version number of the executable. (That's a zero, not an oh)
-f	The -f option forces linking to occur even if there are prelinker errors.
-ga	Generate Ada-oriented debugging information. The -ga option causes the program builder to build an executable containing Ada-oriented debugging information. The -ga option is also applied to any implicit invocations of the compiler during program building.
-gc	Generate C-oriented debugging information. The -gc option causes the program builder to build an executable containing C-oriented debugging information. The -gc option is also applied to any implicit invocations of the compiler during program building.
-h or -help	The -help option shows the options that can be used with the adabgen command.
-ke*	The -ke option specifies that intermediate files, which are normally deleted, are to be kept.
-ll option	The -ll switch passes option to the target linker. For example, to pass "-map foo.map" to the target linker, use "-ll -map -llfoo.map". Options passed via the -ll switch follow the options to the linker that is generated by the Ada program builder.
-nc	The -nc option prevents recompilation. Normally, the Ada C/C++ Changer is invoked by the adabgen command to recompile Ada programs as needed.
-nl	The -nl option prevents calling the linker. The prelinker is called but the target linker is not.
-no	The -no option prevents recompilations to recreate .o files that are out of date.
-o file	The -o option specifies the name of the output file (used instead of the default filename).
-ol file	The -ol file option passes file to the target linker
-q*	The -q option specifies quiet mode.
-r	Use a more "friendly" elaboration order. The default is to use an order that is more likely to fail but which can lead to more portable programs.
-v*	The -v option causes the program builder to print informational messages as processing proceeds. The -v option is also applied to any implicit invocations of the compiler during program building.
* The marked options are already added in Ada-C/C++ Changer. Do not add these in your additional options tab. If you add these options, it will break your application.	

Ada C/C++ Changer Outputs

Output Files

The Ada program builder generates a corresponding load module for eg., main-procedure-name.exe.

Messages

All program builder messages are written to console view.

Main features of Ada C/C++ Changer

The Ada run-time is written in Ada 95, and then translated to C/C++. The run-time is layered, and is re-hostable on various operating systems. As delivered, it depends only on C's native setjmp/longjmp, but is structured to allow re-hosting on POSIX/LINUX-like OS's, or other RTOS's that have support for threads and some kind of "mutex".

Ada C/C++ Changerconverts 100% of the Ada source into C, with no human intervention. Our tool is based on a fully validated Ada C/C++ Changer, which handles the full Ada 95 language. It produces efficient and readable C that exactly matches the semantics of the original Ada program.

A single Ada source file can have any kind of code within it, though some compilers are more restrictive than that and use specific naming conventions (such as Rational's1.ada and 2.ada, or AdaCore's .ads and .adb). Ada Tool is designed to handle any organization of code within source files. Furthermore, even though a source file might contain only a package spec, it might still have code that needs to be executed when the package is "elaborated." This code will be placed in the ".c" file for the package spec. Similarly, even though a file might contain only a package body, it might have "subunits" or "inlined" subprograms that need access to its local declarations, and so those are placed in an ".h" file for the body.

Ada-C/C++ Changer is very portable because the Ada Tool's RTS relies mostly on the standard C run-time. However, C run-time support is not truly "real time" as it uses C "setjmp/longjmp" to accomplish multi-threading, which is not very flexible.

But by adapting the Ada Tool RTS to use the OS Abstractor POSIX/LINUX Interface (Mapusoft) APIs, we can use "true" multithreading, and still be very portable to multiple OS and RTOSs,

Chapter 9.Working with Ada Changer

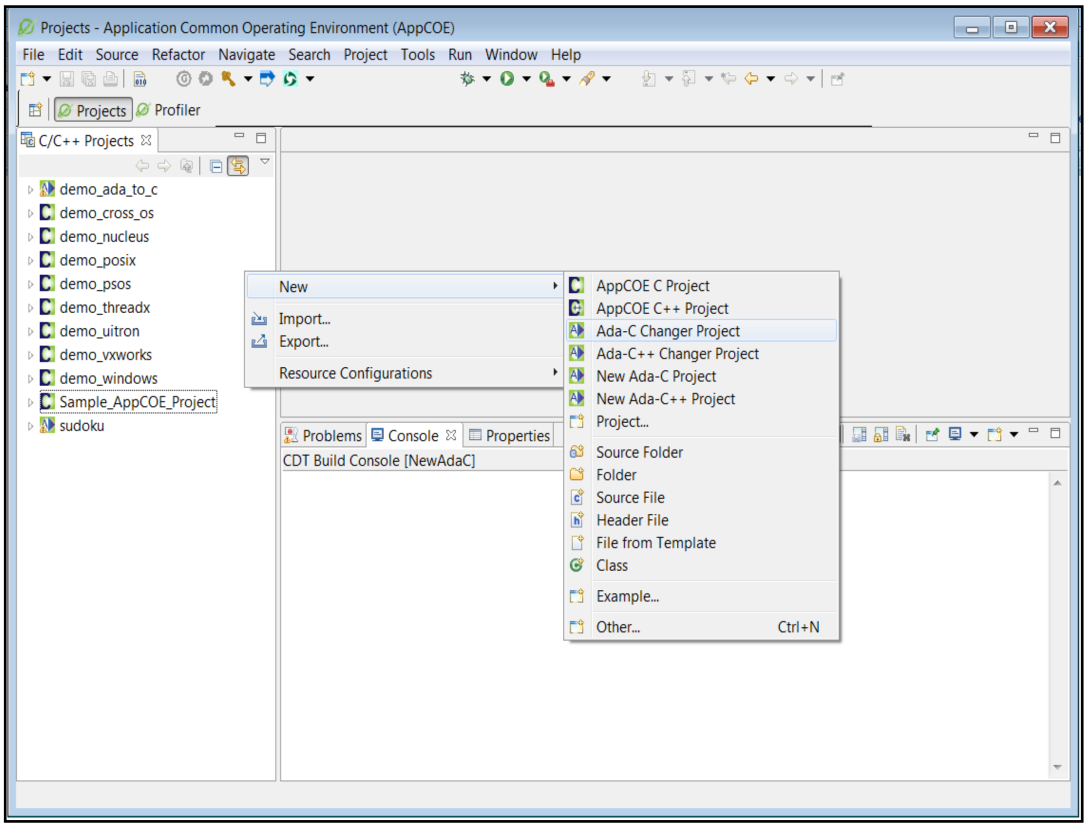
This chapter contains the following topics:

Working with Ada C/C++ Changer Projects

Ada-CChanger converts Ada 83 or Ada 95 Programs to C Source Code and keeps the C Source Code in Projects.

1. From AppCOE main window, select any project under**C/C++ Projects** tab on the left pane.
2. Select **New >Ada-C Changer Project** as shown inFigure 9_1.
3. From AppCOE main window, select any project under C/C++ Projects tab on the left pane.

Figure 9_1: Creating Ada-C Changer Project



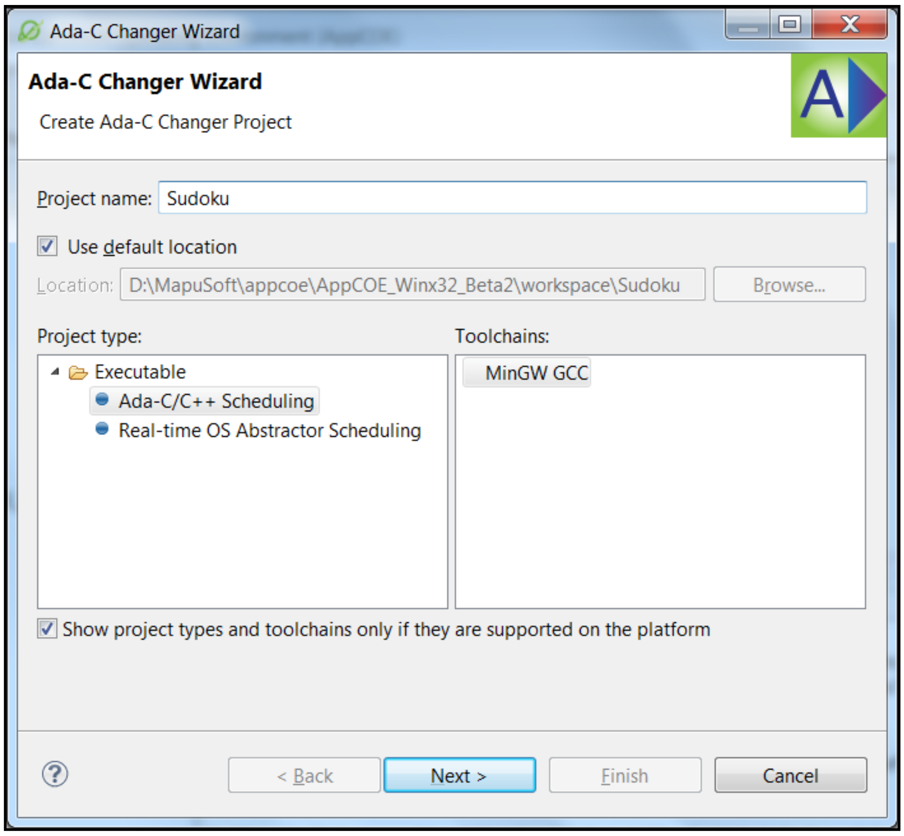
On Ada-C Changer Project Wizard window, type a project name and give a location next to **Project Name** text box.

Note 1: The project name should not be more than 256 characters.

Note 2: Please avoid creating an eclipse workspace in a deeply nested sub-directory.

4. Under Project Types, expand the **Executable** menu. Select **Ada-C/C++ Scheduling** or **Real-time OS Abstractor Scheduling** and click **Next** as shown inFigure 9_2 .

Figure 9_2: Ada-C/C++ Changer Wizard



Project name: Sudoku

☑ Use default location

Location: D:\MapuSoft\appcoe\AppCOE_Winx32_Beta2\workspace\Sudoku

Project type:
- Executable
  - Ada-C/C++ Scheduling
  - Real-time OS Abstractor Scheduling

Toolchains:
- MinGW GCC

☑ Show project types and toolchains only if they are supported on the platform

Ada C Changer Projects with Ada-C/C++ Scheduling

Ada C Changer Projects created with Ada-C/C++ Scheduling will not include OS Abstractor Features.

Ada C Changer Projects with Real-time OS Abstractor Scheduling

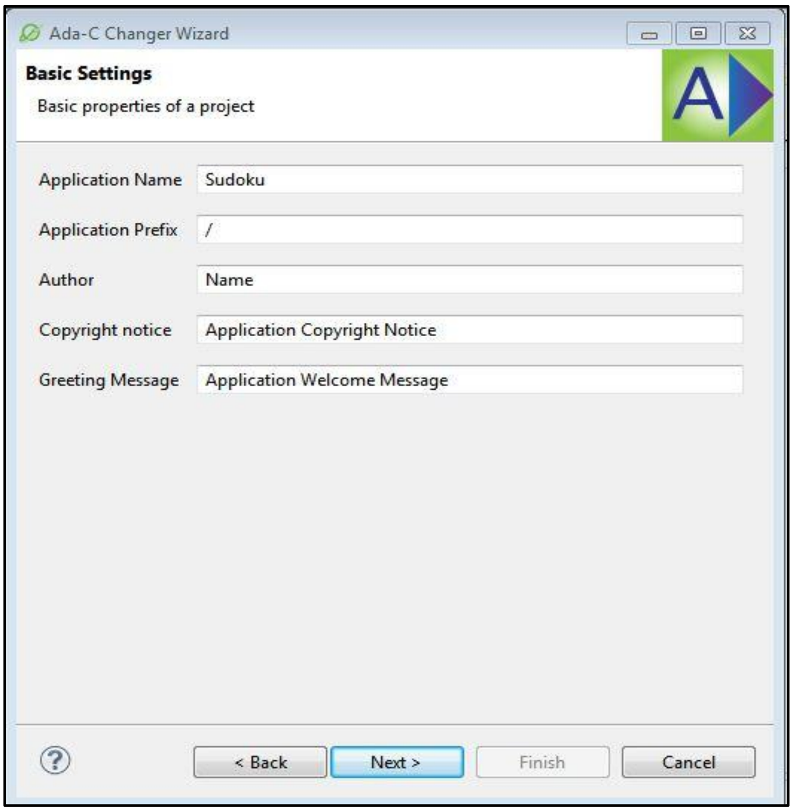
Ada C Changer Projects with the Real-time OS Abstractor Scheduling, will include OS Abstractor Features.

Note 1: If **Real-time OS Abstractor Scheduling** option is selected then proceed to **next step**

Note 2: If **Ada-C/C++ Scheduling option** is selected then**skip step 5.**

5. On Basic Settings window, define the basic properties of your project and click **Next**as shown in Figure 9_3.

Figure 9_3: Basic Settings Window for Ada-C/C++ Changer Project



Basic Settings

Basic properties of a project

Application Name: Sudoku

Application Prefix: /

Author: Name

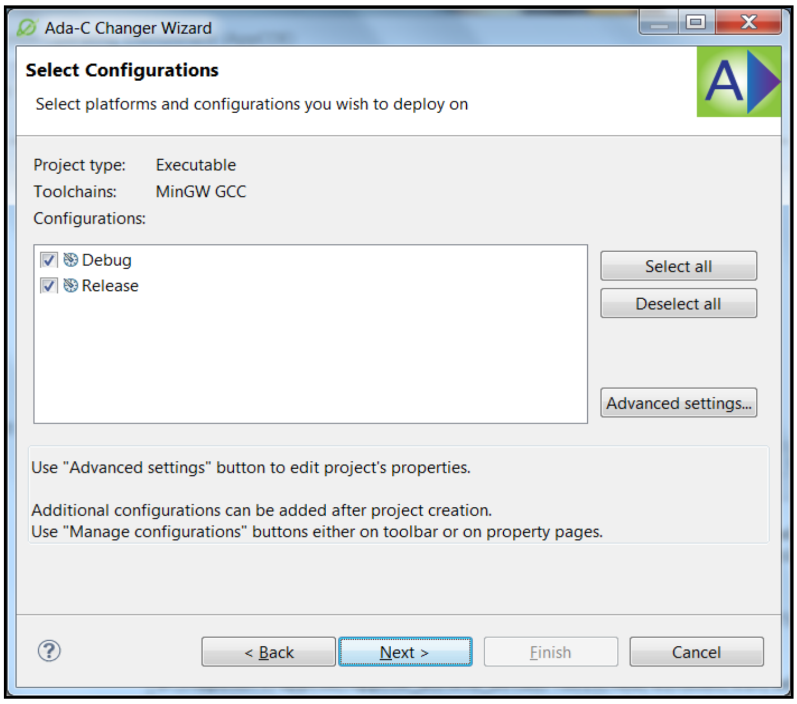
Copyright notice: Application Copyright Notice

Greeting Message: Application Welcome Message

Select Ada-C/C++ Changer build configurations

6. On Select Configurations window, select the platforms and configurations for deployment and click Next as shown in Figure 9_4.

Figure 9_4: Select Ada-C/C++ Changer build configurations



Select Configurations

Select platforms and configurations you wish to deploy on

Project type: Executable

Toolchains: MinGW GCC

Configurations:

- [✓] Debug
- [✓] Release

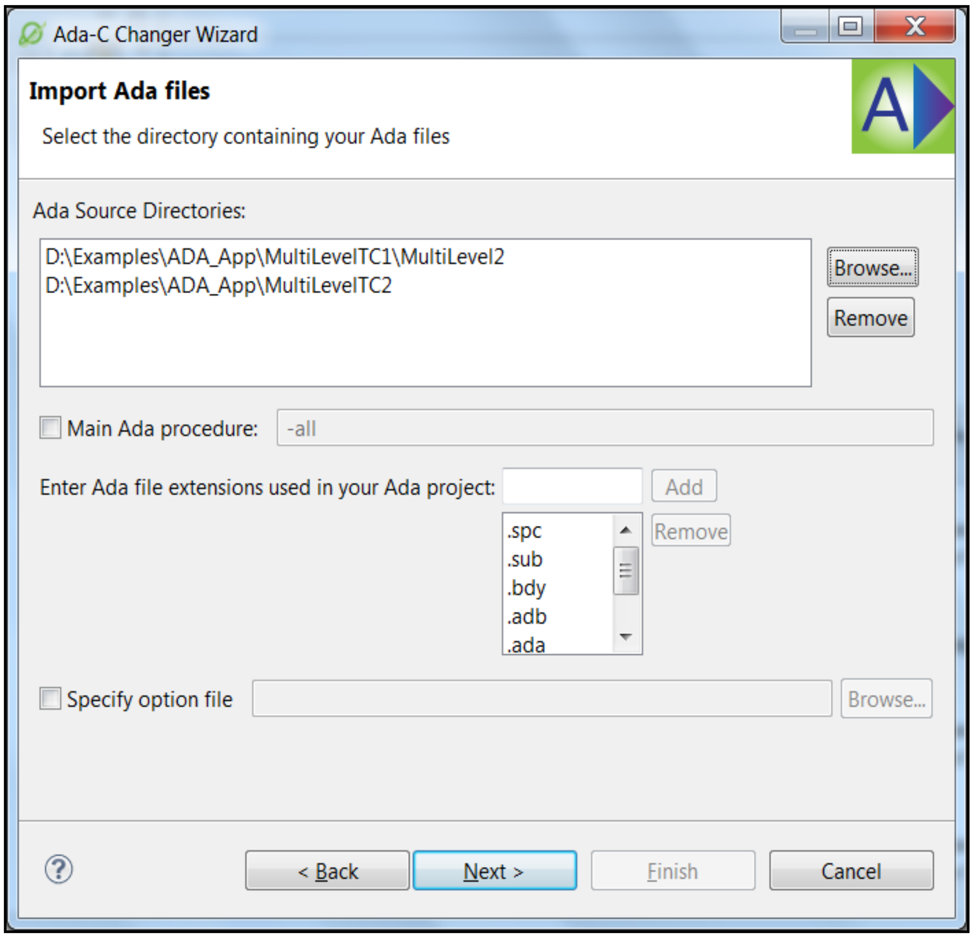
Use "Advanced settings" button to edit project's properties.

Additional configurations can be added after project creation.
Use "Manage configurations" buttons either on toolbar or on property pages.

Import Ada Source files to project

7. On Import Ada Files page, enter the Ada source directories using the **Browse** button as shown in Figure 9_5.

Figure 9_5: Import Ada Source files to project



D:\Examples\ADA_App\MultiLevelTC1\MultiLevel2
D:\Examples\ADA_App\MultiLevelTC2

-all

.spc
.sub
.bdy
.adb
.ada

The field descriptions for Import Ada Files page are as follows:

Table 9_1: Field Descriptions for Import Ada Files

Field	Description	Your Action
Ada Source Directories	The Ada source directories contains Ada source files, all object modules and info files created by the Ada Changer and stored in AppCOE Projects.	Select the Browse Button to add your Ada source directories Select the Remove button to remove any of the Ada Source directories **Note:** To add or remove the source directories after creating the projects, go to **Project > Properties > Ada Changer**
Main Ada procedure	Specifies the main procedure name of the project the user imports that is converted to the main C function that will be started as thread in OS Abstractor or other interfaces.	Select the check box to enter the main Ada procedure name. For example: Sudoku_Test. **Note:** To import a library project use the *-all* option for the main procedure.
Enter Ada File Extensions used in your Ada Project	Specifies the source files that have extensions other than the default extensions listed in the drop down list. The default extensions listed here are: .a, .ada, .adb, .ads, .bdy, .dat, .spc, .sub	You can do any one of the following: • To add a new extension other than the default ones, enter in the text box and click **Add**. **Note**: By default, this is enabled. • To remove an extension, select the extension from the drop down list and click **Remove**. **Note1:** Default extensions already available cannot be removed **Note 2**: Ada Extensions are case sensitive
Specify Option File	Specifies if the user wants to specify any set of options that are needed for the Ada-C/C++Changer. **Note**: This can be created using “space” as delimiter.	To specify an option file, select the check box and click **Browse** and select the option file. **Note**: If option file is specified then Ada configuration options page will open with the specified options in the option file. If not specified, then Ada Configuration options page opens with the default options. User can select or over ride the options in this page.

NOTE: If you create your Eclipse Workspace in a deeply nested subdirectory, you will get an error while creating a project.

ADA C/C++ Changer Configuration Options

On the Ada-C/C++ Changer Configuration Options page, you can set the following configurations:

- C/C++ Output
- Ada Listings
- Ada Messages
- Ada Drivers
- Additional

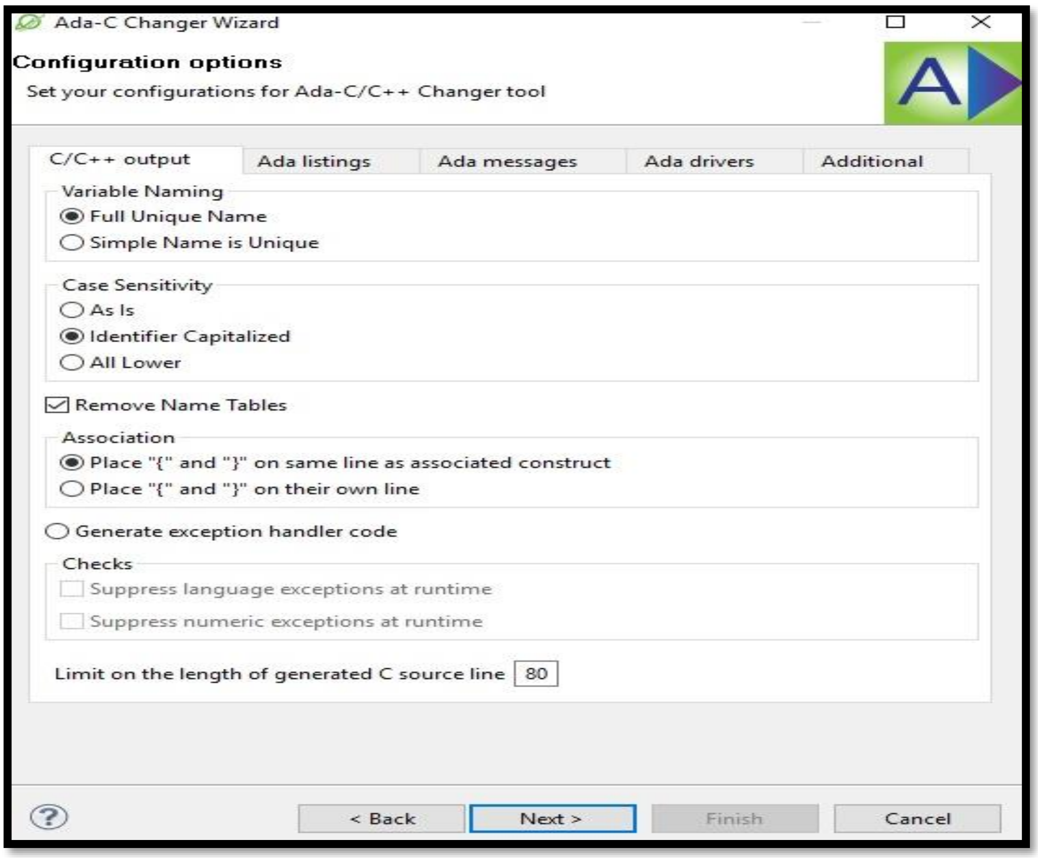
NOTE 1: You can change the configuration options on the Ada-C/C++ Changer Property Page. To go to the Ada C/C++ Changer Property Page, right click on the project and select **Properties>Ada Changer**.

Ada Changer Options Configurations File: Ada Changer options are configurable via an Option's file.

a. Once you have an AdaChanger project and you want to use the same options that you have used.
b. Browse to the workspace directory location and into your project_name directory.
c. You will find a file called "options" file and you can save that file in a different location (you can also rename it if you want) and use it again and again.
d. You can create new Ada Changer projects by passing the file info in the first screen. Ada Changer reads this info and sets up the GUI configuration values accordingly.
e. This way you can create an option file and use it repeatedly as a template. However, if you later want to modify these options after creating the project, you can select the Ada Changer project and right click and choose **Properties** and select **AdaChanger Configurationpage** and change. This will get stored as the new option file for that project. This gives you the flexibility to use the template when you create the project and also let you change if needed.

On C/C++ Output tab page, describe the C Source Options as shown in Figure 9_6.

Figure 9_6: C/C++ Output Page


Ada-C Changer Wizard

Configuration options

Set your configurations for Ada-C/C++ Changer tool

Variable Naming
- (●) Full Unique Name
- ( ) Simple Name is Unique

Case Sensitivity
- ( ) As Is
- (●) Identifier Capitalized
- ( ) All Lower

[✓] Remove Name Tables

Association
- (●) Place "{" and "}" on same line as associated construct
- ( ) Place "{" and "}" on their own line

( ) Generate exception handler code

Checks
- [ ] Suppress language exceptions at runtime
- [ ] Suppress numeric exceptions at runtime

Limit on the length of generated C source line: 80

The field descriptions on C/C++ Output tab are as follows:

Table 9_2: Field Descriptions for C/C++ Output tab

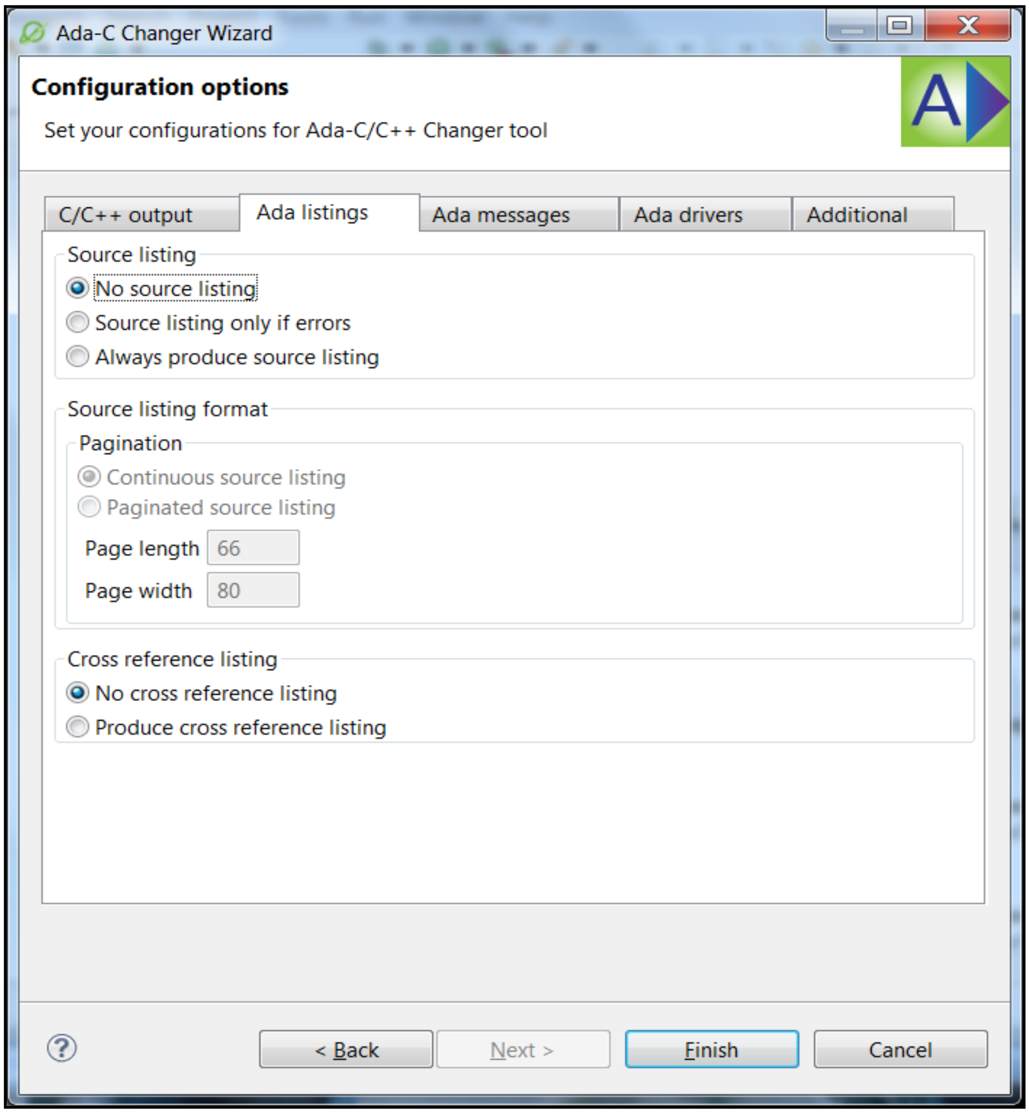
Field	**Description**	**Your Action**
Variable Naming	Specifies if you want to select variable naming.	You can do any one of the following: • "Full Unique Name" means that the first letter of each package name is capitalized, as well as the first letter of the simple identifier. **Note**: By default, this is enabled. • "Simple Name is Unique" means it retains the original simple name.

Case Sensitivity	Specifies if you want to select case sensitivity.	You can do any one of the following: • If "As Is" selected then it preserves the original upper/lower case of the Ada identifier. • "Identifier Capitalized" option means the following depending on the "Variable Naming" selection. - If "Full Unique Name" option is selected, then the first letter of the names of each identifier and also the package is capitalized with rest of the letters in lower case. - If "Simple Name is Unique" option is selected, then the first letter of the name of each identifier is capitalized with rest of the letters in lower case. **Note**: By default, this is enabled. • "All Lower" generates a C name that is all lower case.
Remove Name Tables	Specifies if you want to select remove name tables.	• "Remove name tables" means omit tables necessary for <enum_type>'Image and <enum_type>'Value to work properly, as well as full displayable names for exceptions and object tags.
Association	Specifies the association constructs.	You can do any one of the following: • To place "{" and "}" on same line as associated construct, select the radio button. **Note**: By default, this is enabled. • To place "{" and "}" on its own line, select the radio button.
Generate Exception Handler Code	Specifies if you want to generate the code with exception handler code.	By defaultthe source code generated with suppressed all exceptions. If the radio button ofGenerate Exception Handler Code is selected,then thesource code will begenerated with all exception handler code. If not selected this option then the source code will be generated with suppressed all exceptions.

Checks	Specifies if you want to select the corresponding checks needed.	You can do any one of the following or both: • If you want to do suppress language exception at runtime, then select the check box. • If you want to do suppress numeric exceptions checks (such as division check and overflow check) in generatedsource code at runtime, then select the check box. If you selected both then the language exception and the numeric exceptions will be suppressed at runtime.
Limit on the length of the generated C Source Line	Specifies the length of the line in the generated C Source files. You can change the length as required.	Enter a value to specify the length of the line in the generated C Source files. **Note**: The default value is 80.

8. On Ada Listings tab, set your listing options as shown in the Figure 9_7.

Figure 9_7: Ada Listings Tab



Configuration options

Set your configurations for Ada-C/C++ Changer tool

Source listing

- [✓ No source listing]
- Source listing only if errors
- Always produce source listing

Source listing format

Pagination

- [✓ Continuous source listing]
- Paginated source listing

Page length 66

Page width 80

Cross reference listing

- [✓ No cross reference listing]
- Produce cross reference listing

The field descriptions on Ada Listings tab are as follows:

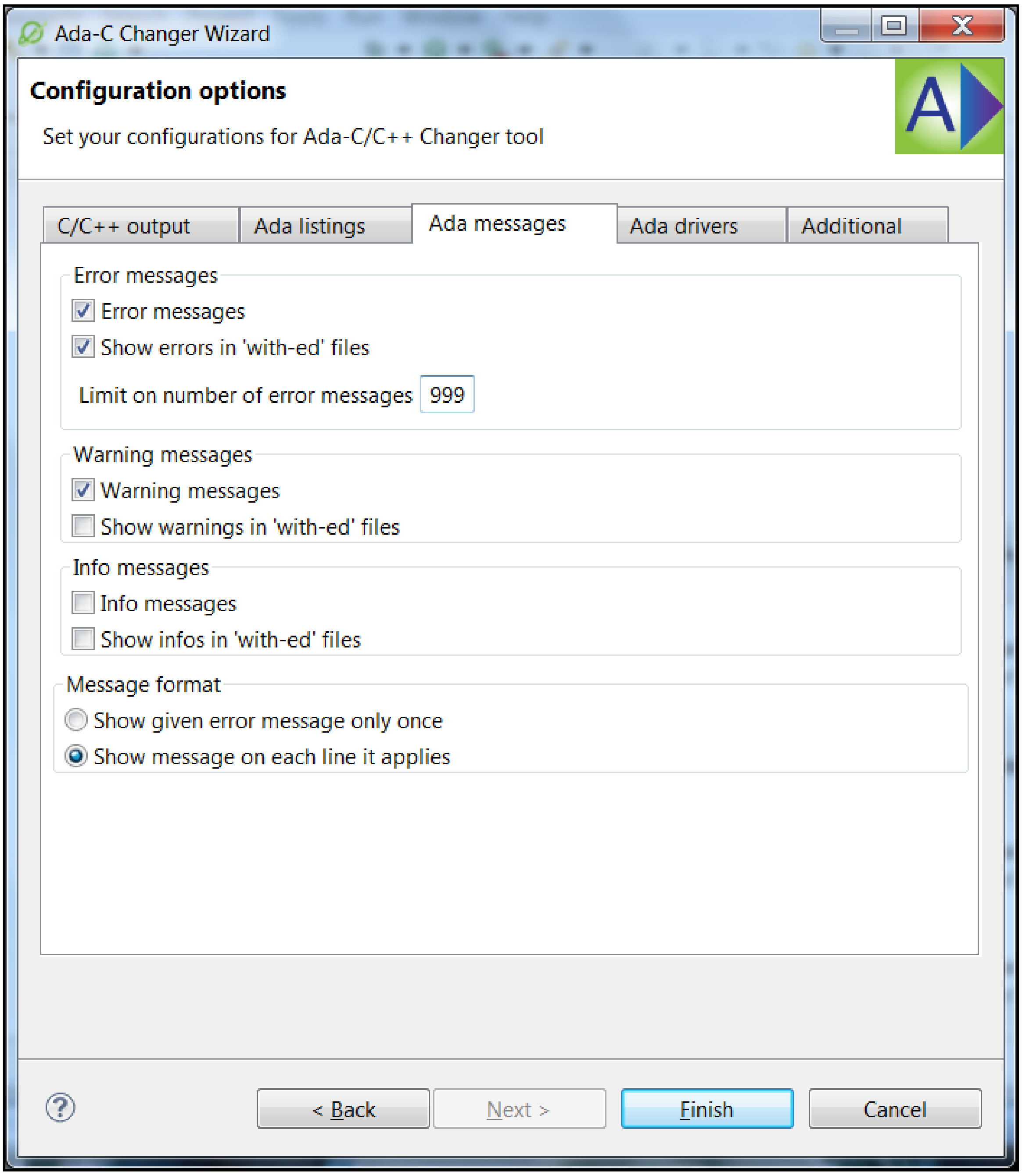
Table 9_3: Field Descriptions for Ada Listings tab

Field	**Description**	**Your Action**
Source Listing	Specifies how you want the Ada source list to be generated or not.	You can do any one of the following: • To not to generate Ada source list, select the radio button. • To do Ada source list only if errors are present, select the radio button. **Note**: By default, this is enabled. • To always produce Ada source list, select the radio button.
Source Listing Format		
Pagination	Specifies the format of the Source Listing.	You can do any one of the following: • For continuous source listing, select the radio button. **Note**: By default, this is enabled. • For listing only of lines with errors

		or warnings, select the radio button. • For paginated source listing, select the radio button.
Page Length	Specifies the length of the page.	Enter a value for the length of the page. **Note**: By default, the value is 66.
Page Width	Specifies the width of the page.	Enter a value for the width of the page. **Note**: By default, the value is 80.
Listing only of lines with errors or warnings	Specifies if you want to list only lines with errors or warnings	Select the check box.
Cross Reference Listing	Specifies if you want to generate a cross reference listing or not.	You can do any one of the following: • To not to generate a cross reference listing, select the radio button. **Note**: By default, this is enabled. • To generate a cross reference listing, select the radio button.

9. On Ada Messages tab, set your message options as shown in Figure 9_8.

Figure 9_8: Ada Messages Tab



Configuration options

Set your configurations for Ada-C/C++ Changer tool

Error messages
- [✓] Error messages
- [✓] Show errors in 'with-ed' files

Limit on number of error messages 999

Warning messages
- [✓] Warning messages
- [ ] Show warnings in 'with-ed' files

Info messages
- [ ] Info messages
- [ ] Show infos in 'with-ed' files

Message format
- ○ Show given error message only once
- ● Show message on each line it applies

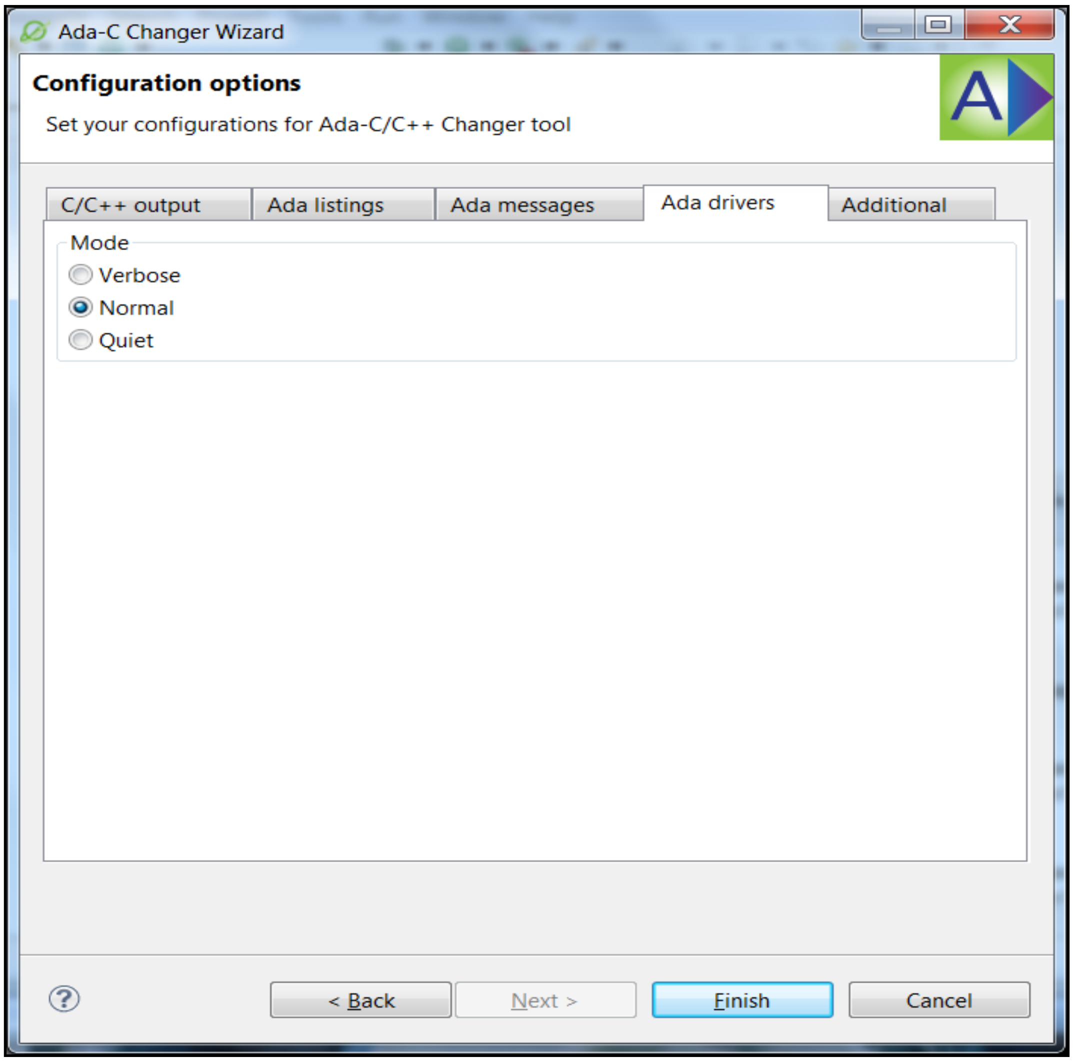
The field descriptions on Ada Messages tab are as follows:

Table 9_4: Field Descriptions for Ada Messages tab

Field	Description	Your Action
Error Messages	Specifies if you want to select error messages.	You can do any one of the following: • To select error messages, select the check box. **Note**: By default, this is enabled. • To show error sin with "ed" files, select the check box.
Limit on number of error messages	Specifies the count of error messages.	Enter a value to specify the limit on number of error messages. **Note**: By default, the value is 999.
Warning Messages	Specifies if you want to select warning messages.	You can do any one of the following: • To select warning messages, select the check box. **Note**: By default, this is enabled. • To show warnings in with "ed" files, select the check box.
Info Messages	Specifies if you want to select the info messages.	You can do any one of the following: • To select info messages, select the check box. • To show information in with "ed" files, select the check box.
Message Format	Specifies the format of the message.	You can do any one of the following: • To show given error message only once, select the radio button. **Note**: By default, this is enabled. • To show message on each line it applies, select the radio button.

10. On Ada Drivers tab, set your driver options as shown in Figure 9_9.

Figure 9_9: Ada Drivers Tab



Mode
Verbose
[✓ Normal]
Quiet

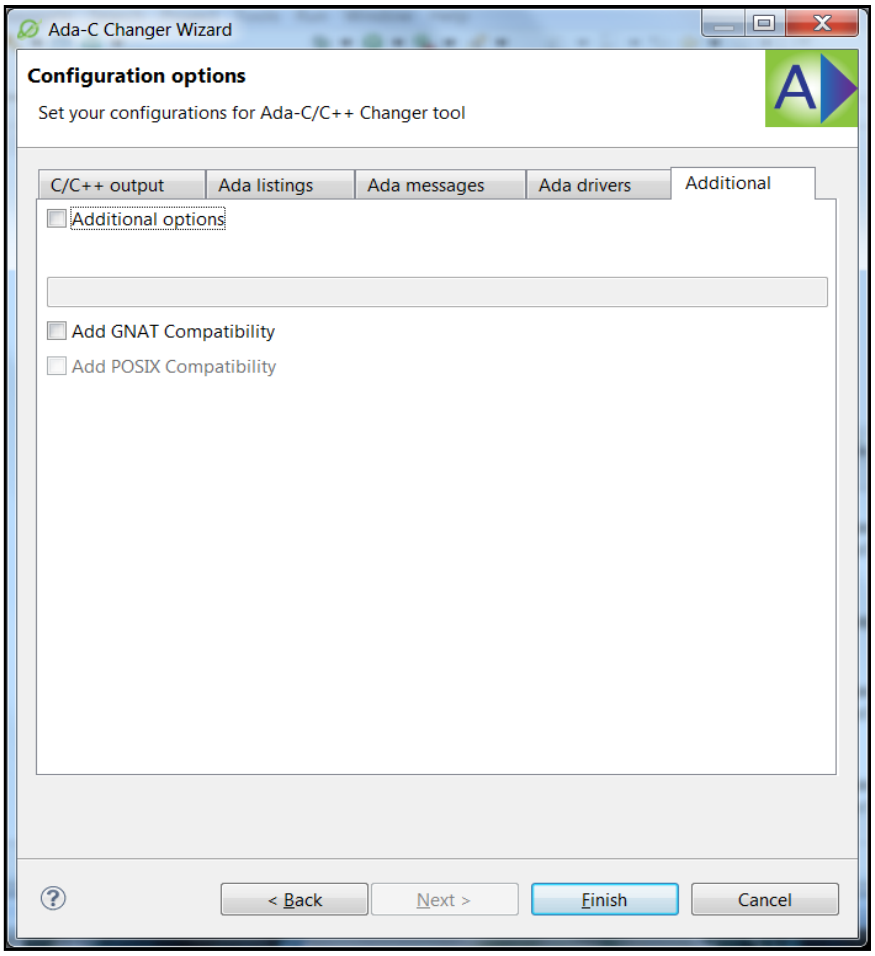
The field descriptions for Ada driver options tab are as follows:

Table 9_5: Field Descriptions for Ada Drivers Options tab

Field	Description	Your Action
Mode	Specifies the required mode for reporting the compiler actions.	You can do any one of the following: • To select the verbose mode, select the radio button. • To select the normal mode, select the radio button. **Note**: By default, this is enabled. • To select the quiet mode, select the radio button.

11. On Additional Options tab, set your miscellaneous options. You can also select the multiple Ada source directories and click **Next** as shown inFigure 9_10.

Figure 9_10: Additional Options Tab



The field descriptions for additional options tab are as follows:

Table 9_6: Field Descriptions for Additional Options tab

Field	**Description**	**Your Action**
Additional Options	Specifies if you want to include any other additional options such as custom or optional.	To specify additional options, select the check box and enter a value in the text box.
Add GNAT Compatibility	Specifies if you want to add GNAT Compatibility.	To add GNAT compatibility, select the check box.
Add POSIX/LINUX Compatibility	Specifies if you want to add POSIX/LINUX Compatibility. **Note**: This feature is not supported on Windows. It is supported on Linux only.	This feature is disabled on Windows. On Linux, to add POSIX/LINUX compatibility, select the check box.

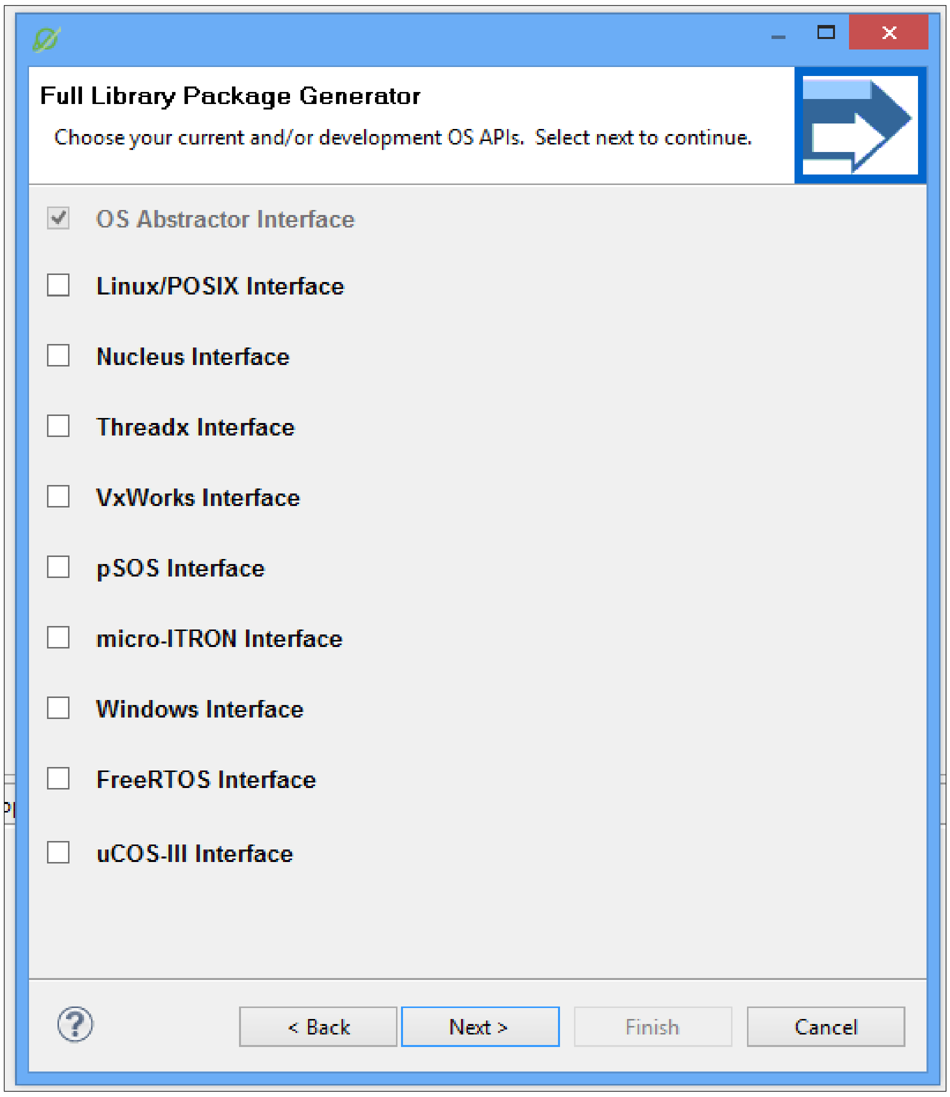
12. On Select APIs Page, select the check box to enable the generated C Source Code use Real-time OS Abstractor Scheduling,along with the corresponding interface support from the available list and click **Finish** as shown inFigure 9_11.

NOTE 1: If Real-time OS Abstractor Scheduling is not chosen in the Ada-C/C++ Changer Wizard,belowpage will be not be displayed

NOTE 2: Real-time OS Abstractor Scheduling allows you to migrate to multiple Operating Systems and enable OS Abstractor Integration for this project after importing to AppCOE.

NOTE 3: If you have enabled the OS Abstractor APIs, you can any time enable the additional development APIs after importing to AppCOE.

Figure 9_11: OS Abstractor Integration Page



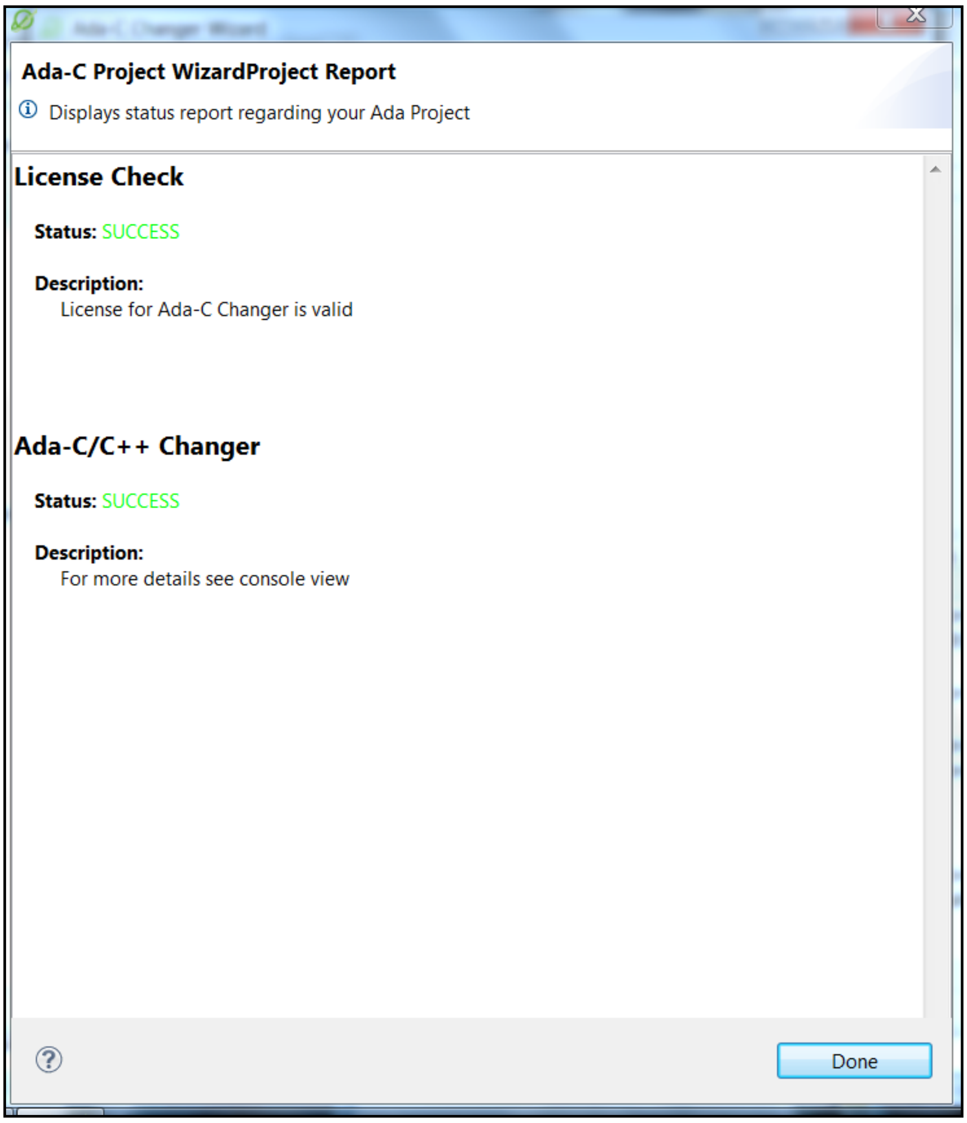
Full Library Package Generator

Choose your current and/or development OS APIs. Select next to continue.

- [✓] OS Abstractor Interface
- [ ] Linux/POSIX Interface
- [ ] Nucleus Interface
- [ ] Threadx Interface
- [ ] VxWorks Interface
- [ ] pSOS Interface
- [ ] micro-ITRON Interface
- [ ] Windows Interface
- [ ] FreeRTOS Interface
- [ ] uCOS-III Interface

13. After successfully creating anAda C/C++ Changer project, a report page is displayed as shown inFigure 9_12. Click **Done** to complete the process. The report gives detailed information on the status of different activities in Ada to C source file generation.

Figure 9_12: Ada-C Project Report Page



Ada-C Project WizardProject Report

Displays status report regarding your Ada Project

License Check

Status: SUCCESS

Description:
License for Ada-C Changer is valid

Ada-C/C++ Changer

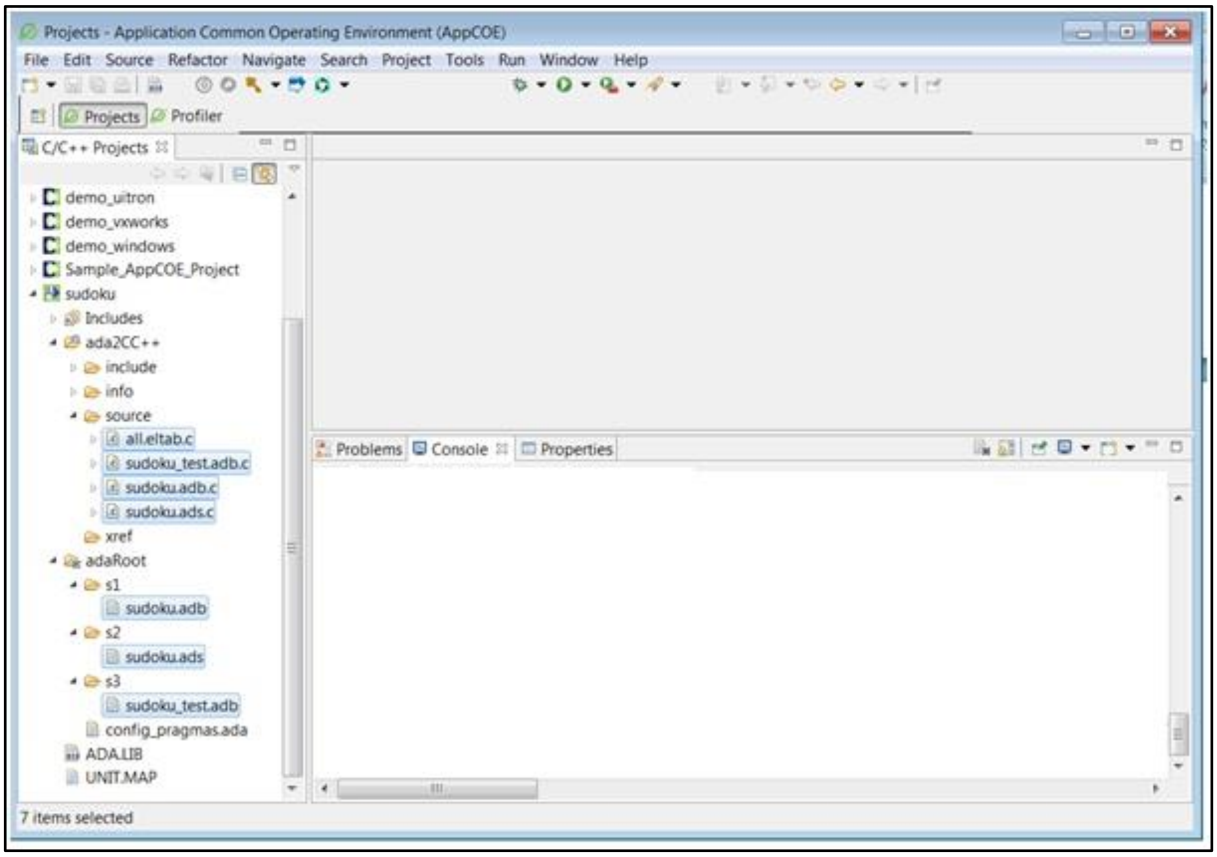
Status: SUCCESS

Description:
For more details see console view

14. You have now successfully created Ada-C/C++ Changer project.

15. To view the C/C++ code, expand the project you have created as shown in the Figure 9_13.

Figure 9_13: Output for Ada-C/C++Changer



Ada Changer project files

The Ada Changer project has the following files:

- **Includes**–This folder contains the header file paths of your project
- **Ada2CC++**–This folder contains all the files generated by Ada tools
    - **Ada Changer Project name**–This folder contains the Ada Changer project related files
        - **Include**–This folder contains the Ada Include folder
        - **Info–**This folder contains information file subdirectory of the program library directory where information files for the object modules are placed.
        - **Source–**This folder contains the converted C/C++ source files. If OS Abstractor is integrated, then you get a folder, **init**, which contains the AppCOE template files.

NOTE: For more information on the Template files, refer to AppCOE C/C++ Project Template Files

Section in this manual

- **xref–**This folder contains the cross-referenced files which are generated by the Ada tools
- **adaRoot–**This folder contains the Ada sources added during your project creation. In case, you need to add or additional sources, you can do so in **Project** > **Property page** >**Ada Source** tab of the respective project.
- **ADA.LIB–**This contains information describing the configuration of the Ada library
- **UNIT.MAP**–This contains a unit-to-source mapping for use by the compiler and program builder
- **.options**–This contains the list of options with which Ada ChangerProject or executable is created. This is a hidden file. You can view this in Navigator view. To view select **Window** > **Show View** > **Other** > **General** > **Navigator**.

NOTE: Host Libraries and include paths are automatically added during project creation. For viewing this information, select **Ada Changer Project** > **Properties** > **C/C++ Build** > **Settings**.

Building Ada C/C++ Changer Projects

Ada C/C++ Changer enables you to build an existing project. This feature enables you to either do an incremental full build or just a C/C++ Changer Build on your Ada 95 sources.

- The Build process will incrementally compile the Ada files that have been modified or added since the last build.

NOTE: To do an incremental build, you should not do **Clean**.

- If any new Ada source files are added, removed, or modified in the project, and want to generate the c-sources again, you can do a full build by first calling **Clean** and then **Build.**

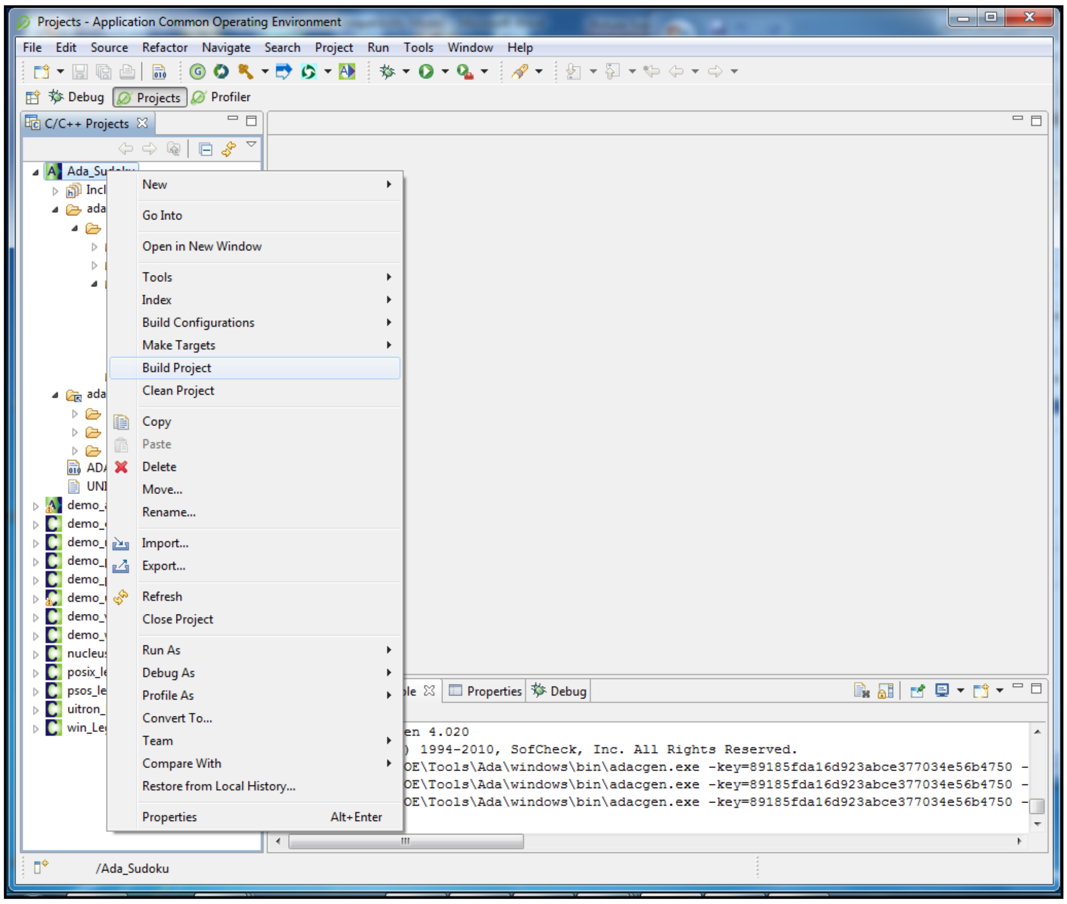
NOTE: Clean will delete all your info files, which will result in a full build.

- You cannot re-build if new directories are created or new files are added with differing extension than what was provided during the project creation. If you have new directories and new extensions, then you must recreate the Ada C/C++ Changer project.
- You will get a build error when you create an Ada C/C++ Changer project with the default "–all" option for the Main Ada Procedure Name.

To do Ada C/C++ Changer Build do the following steps

1. To generate the corresponding executable, right click on the project you have created on the projects pane, and select **Build Project** in project or from the main menu select **Projects**>**Build project** as shown in Figure 9_14.

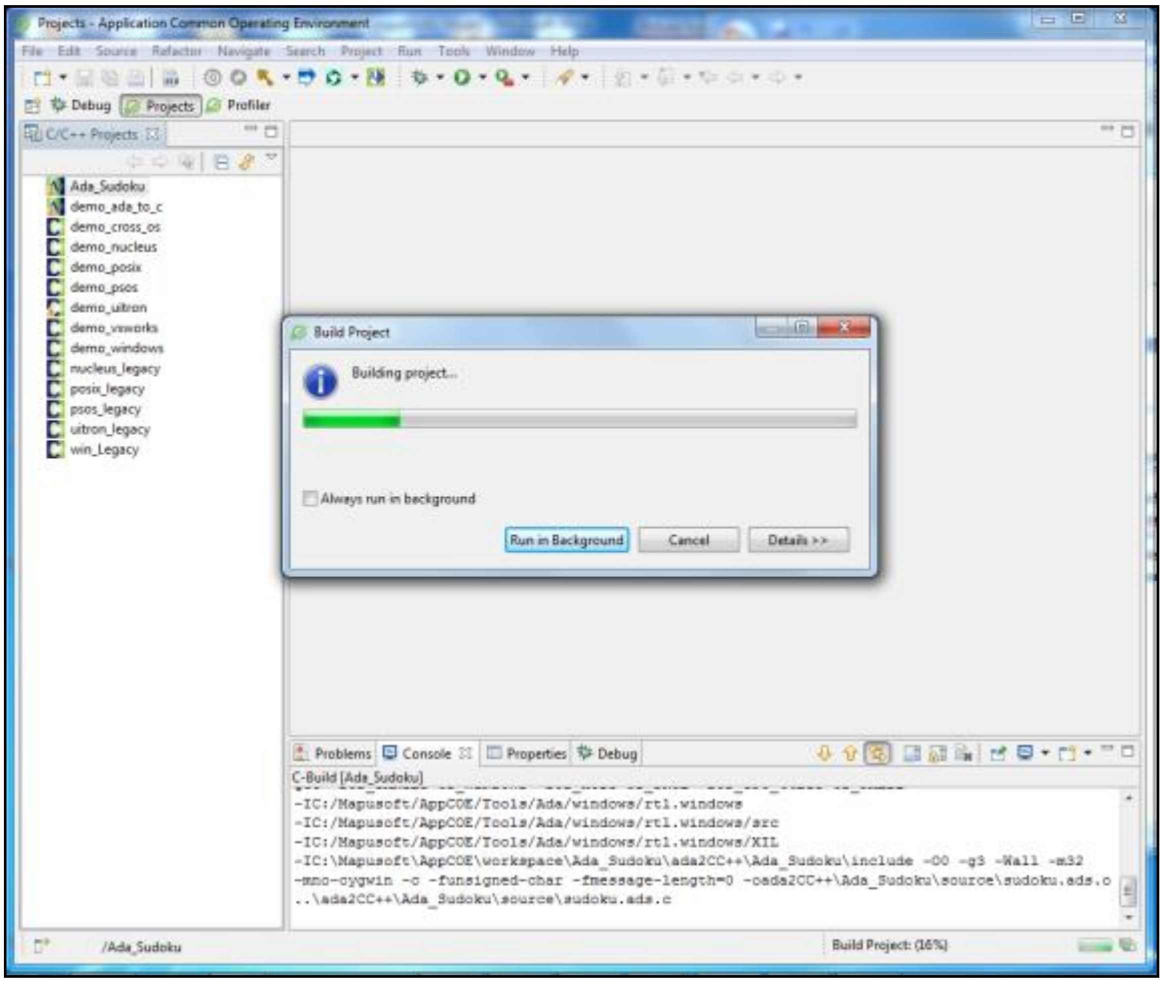
Figure 9_14: Build Project



```
en 4.020
) 1994-2010, SofCheck, Inc. All Rights Reserved.
OE\Tools\Ada\windows\bin\adacgen.exe -key=89185fda16d923abce377034e56b4750 -
OE\Tools\Ada\windows\bin\adacgen.exe -key=89185fda16d923abce377034e56b4750 -
OE\Tools\Ada\windows\bin\adacgen.exe -key=89185fda16d923abce377034e56b4750 -
```

The Ada C/C++ Changer project starts to build and generates the .exe file as shown inFigure 9_15.

Figure 9_15: Building Ada-C/C++Changer project



C-Build [Ada_Sudoku]

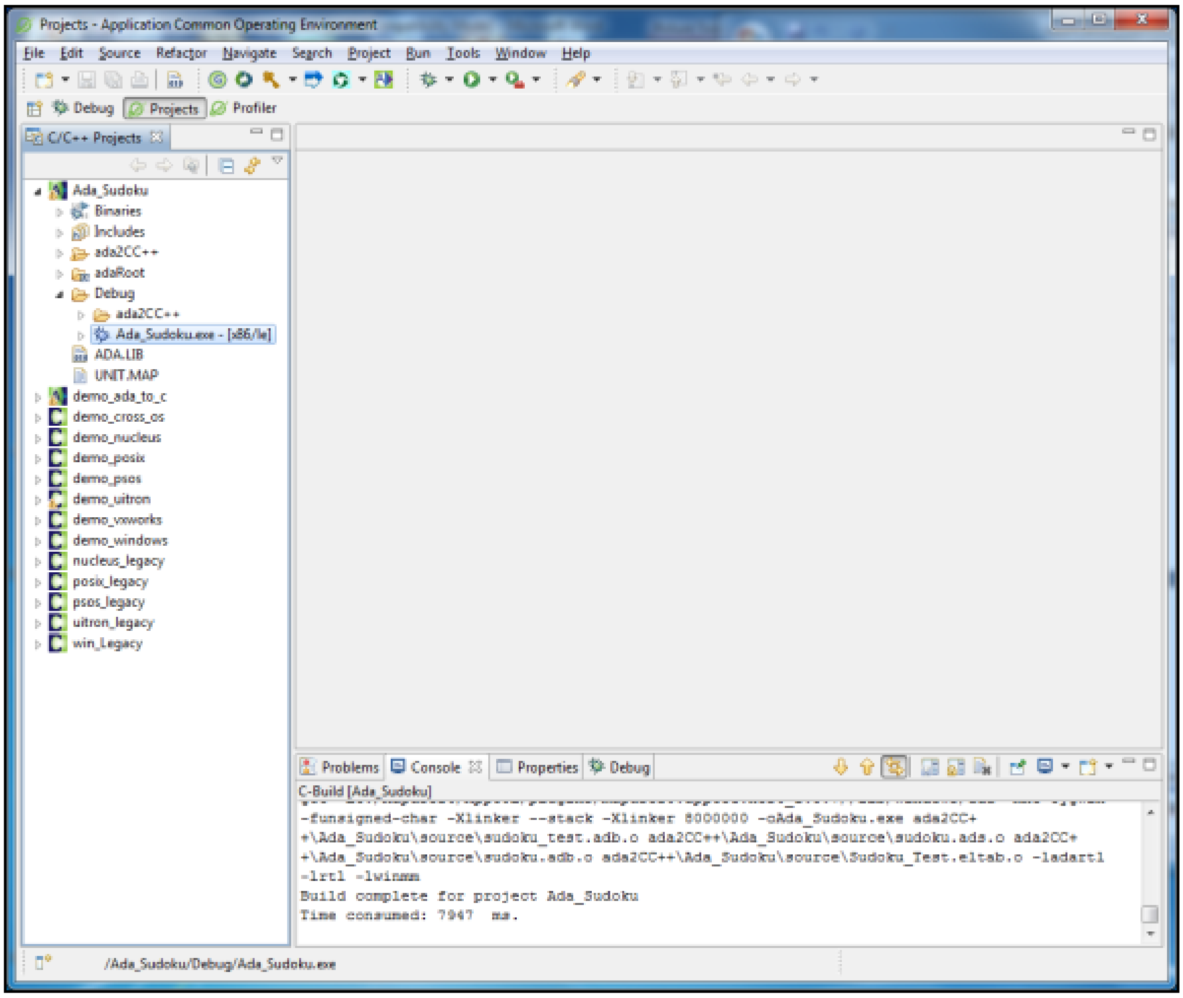
```
-IC:/Mapusoft/AppCOE/Tools/Ada/windows/rtl.windows
-IC:/Mapusoft/AppCOE/Tools/Ada/windows/rtl.windows/src
-IC:/Mapusoft/AppCOE/Tools/Ada/windows/rtl.windows/XIL
-IC:\Mapusoft\AppCOE\workspace\Ada_Sudoku\ada2CC++\Ada_Sudoku\include -O0 -g3 -Wall -m32
-mno-cygwin -c -funsigned-char -fmessage-length=0 -oada2CC++\Ada_Sudoku\source\sudoku.ads.o
..\ada2CC++\Ada_Sudoku\source\sudoku.ads.c
```

NOTE: While running any Ada project after build, the project sometimes will again build the project before running the application. To avoid this do the following configuration:

- Select **Window** > **Preferences** > **Run/Debug** >**Launching**.
- Under **General Options,** deselect the check box for **Build (if required) before launching** flag.

2. You can view the generated .exe file under the project in the **Debug** Folder as shown in the Figure 9_16.

Figure 9_16: Generated .exe File



```
-funsigned-char -Xlinker --stack -Xlinker 8000000 -oAda_Sudoku.exe ada2CC+
+\Ada_Sudoku\source\sudoku_test.adb.o ada2CC++\Ada_Sudoku\source\sudoku.ads.o ada2CC+
+\Ada_Sudoku\source\sudoku.adb.o ada2CC++\Ada_Sudoku\source\Sudoku_Test.eltab.o -ladartl
-lrtl -lwinmm
Build complete for project Ada_Sudoku
Time consumed: 7947  ms.
```

NOTE 1: When you build Ada-C/C++ Changer project, you may get many warnings.

Target Code Generation for Ada C/C++ Changer Projects

AppCOE allows Target Code Generation for AdaC/C++ Changer Projects, when theAda-C/C++Changer projects are created with Real-time OS Abstractor Scheduling or Ada-C/C++Changer Scheduling.

For Ada C/C++ Changer Projects, OS Abstractor interfaces are added directly to the project as target sources, if you have a valid and relevant Full Library Package Generator license. If Target Code Generation is attempted on these projects, all the OS Abstractor functionality, being part of application, is again redefined in cross_os.c. This will give re-definition errors on compile time.

NOTE: For Ada-C/C++ changer projects along with Abstractor, if you do target code generation, it will generate sample project files. You have to generate your own project files to generate binaries.

Manual Modifications to Projects files generated by Target Code Generator

The target code output produced when optimizing Ada projects via the target code optimization process is a little different than that of the standard C/C++ AppCOE project. In this case, the API level optimization process is skipped as the application needs to link-in other required RTL C/C++ libraries and possible other ‘C’ interface libraries. Instead of the OS Abstractor code being included as part of the application, it is added into the target directory as a separate code base that should be built as libraries. There will be separate libraries for the OS Abstractorcomponent as well as any other OS Interface components (like VxWorks, Windows, etc.) included in the project. There will also be a separate Ada Run Time Library(RTL) required to be linked in as well.

For example, if a converted Ada to C/C++ project that was integrated with OS Abstractor and includes the POSIX/Linux Interface were optimized for a windows target it would look like follows:

```
    <target dir>
        cross_os_windows
            source
            include
            specific
        posix_interface
            source
            include
            specific
        include
            include
        rtl
            XIL
            src
            IL
        <app name>
            ada2C++
                <app name>
                    source
                    include
```

The <target_dir> is the directory location where the generated code would be placed. The OS Abstractor and OS AbstractorInterface directories will include project files specific to your target. Project files for the RTL will only be included for Windows and Linux targets. On a Windows target, you will get a project file for the Eclipse IDE and on Linux you will get both Eclipse and make files. For all other targets and toolsets you will need to create an RTL library project. An application project will be created for the target, but it will require some manual modifications to build.

The modifications which need to be made to the application project are as follows:

Header Inclusion

```
    Add include paths for the Ada RTL component.
        <target dir>/rtl
        <target dir>/rtl/src
        <target dir>/rtl/IL

    Add include path for any other 'C' library that you need for your
application

    if your Ada project is integrated with OS Abstractor you will need to
add the following:
        <target dir>/include/include
```

```
<target dir>/cross_os_<target>/include
```

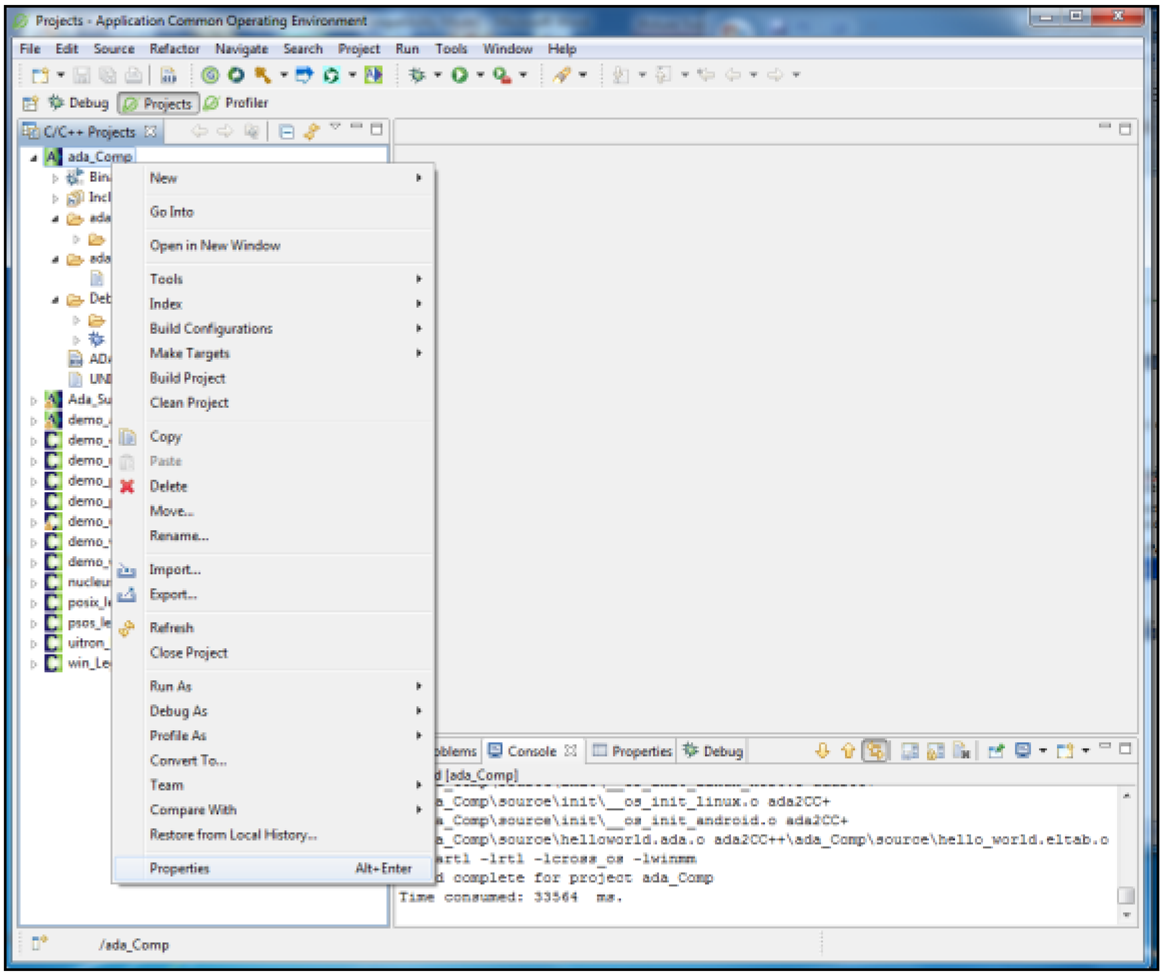
Ada C/C++ Changer Property Page

AdaC/C++ Changer Property Page enables you to change or modify the configuration options you have set for your project.

To go to the property page:

1. On AppCOE Projects pane, select the Ada C/C++ Changer project you have created. Right click on it and select **Properties** and shown in the Figure 9_17.

   Figure 9_17: Ada C/C++ Changer Properties

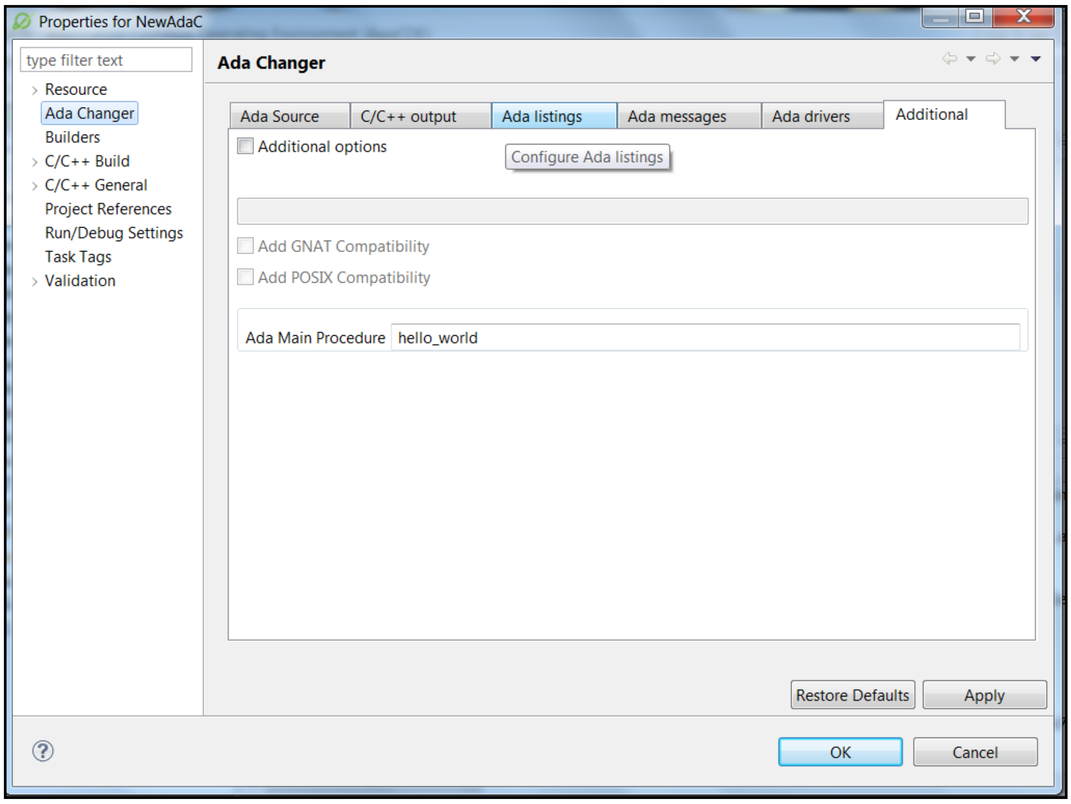


```
d [ada_Comp]
a_Comp\source\init\__os_init_linux.o ada2CC+
a_Comp\source\init\__os_init_android.o ada2CC+
a_Comp\source\helloworld.ada.o ada2CC++\ada_Comp\source\hello_world.eltab.o
artl -lrtl -lcross_os -lwinmm
d complete for project ada_Comp
Time consumed: 33564  ms.
```

2. The Ada C/C++ Changer property page is displayed as shown in the Figure 9_18, Make the necessary changes and click **Apply**.

3. To change the Main Procedure Name, on the AdaC/C++ Changer property page, click on **Additional** tab, and make the necessary changes and click **Apply**.

Figure 9_18: Ada C/C++ Changer Property Page



- [ ] Additional options
- [ ] Add GNAT Compatibility
- [ ] Add POSIX Compatibility

Ada Main Procedure: hello_world

4. When you do an Ada Build, you can re-import files, or import deleted files, remove any files or change the Main procedure name on this page. You can modify on any of the configurations on the property page.

NOTE: You cannot edit or modify the Ada Source Directory location.

ADAC/C++ Changer – Additional Information's

Warning messages

While importing an Ada project, you will receive 3617 warning messages. It appears that most, if not all of them, are associated with the rtl files.

They are as follows:

- Defined but not used variables(3129)
- Return with no value, in function returning non-void (15)
- Assignment from incompatible pointer type (52)
- Comparison is always false due to limited range of data type (94)
- Cast from pointer to integer of different size (3)
- Comparison of distinct pointer types lacks a cast (8)
- Control reaches end of non-void function (71)
- Implicit declaration of function (10)
- Initialization from incompatible pointer type (5)
- Integer constant is so large that it is unsigned (1)
- Left shift count >= width type (1)
- Missing braces around initializer (2)
- Passing arg from incompatible pointer type (114)
- Statement with no effect (28)
- Unused variable (83)
- This decimal constant is unsigned only in ISO C90 (1)

NOTE: When you are working on 64bit architecture, make sure that -m32 flag is added to both the compiler and linker options in project properties to avoid compilation errors.

Additional Ada C/C++ Changer Tools

Ada C/C++ Changer is equipped with following additional tools:

1. **Ada Line Count –** This feature enables you to count the Ada lines of code with a simple program. It just takes a list of file names, and prints out the number of lines of Ada source code, lines of comments, and blank lines, counting lines of code the same way the license checker counts them.

   The application name is: "**ada_line_count.exe**". You have to run this .exe in cmd prompt.

   Command: ada_line_count file1 file2 file3...
2. **POSIX ADA Support (For Linux only) --** Ada C/C++ Changer toolsnow give support to POSIX. You have a separate library with POSIX Ada packages, for Linux only. To make this "linked library" available to a given user, the adaopts command:

   Command: adaopts -p /usr/local/AppCOE/Tools/Ada/linux/posix_ada

   will link the posix-ada library into the "search path" for the current library.
3. **Ada Support for GNAT compatibility compiler –** This feature enables you to link the "gnat compatibility" library into the search path for the currentlibrary. The following commands are used to link:

   Linux Command: adaopts -p /usr/local/AppCOE/Tools/Ada/linux/gnat_compat

   Windows Command: adaopts -p C:\Mapusoft\AppCOE\Tools\Ada\windows\gnat_compat
4. **Ada Support for Win32 –** This feature enables support for Ada on Win32 host**.** The following command is used for the "win32ada" library**:**

   Windows Command: adaopts -p C:\Mapusoft\AppCOE\Tools\Ada\windows\win32ada
5. For Ada C/C++Changer project, from Properties page if you change Ada Main procedure, it will not build the project with that procedure immediately. You need to select the project and refresh 1-2 times and clean the project and then do the build.

Note: On Linux HOST/Environment, you may need to set View/Modify permissions to the Tools folder while creating a project. If the AppCOE installer did not set View/Modify permissions, please follow the below steps to do this.

To set View/Modify permissions:

- Go to the Tools folder.
- Right click on the Tools folder, and select **Properties**>**Permissions**.
- Change the required permissions.

Then provide executable permissions to files under [tools/Ada/linux/bin] folder before creating any Ada project. Otherwise it will give an AppCOE exception while trying to convert Ada to C using Ada-C/C++Changer Options.

To change executable permissions:

- Go to Terminal/Command window.
- Go to the respective folder location by cd AppCOE Source directory/Tools/Ada/Linux/bin.
- Once you are in "bin" folder, run the command like <chmod 777 *>
- Now observe files changes color from black to green.

Revision History

Document Title: Application Common Operating Environment User Manual

Release Number: 1.8.1

Release	Revision	Orig. of Change	Description of Change
1.3.6	0.1	VV	New Manual
1.3.6.1	0.1	VV	Ada sections
1.3.7	0.1	VV	Changes to Ada-C/C++ Changer and Target Code Optimization sections
1.3.8	0.1	VV	Changes to Target Code Optimization sections
1.3.9	0.1	VV	Changes to ThreadX sections Changes to Ada-C/C++ Project Creation
1.3.9.1	0.1	VV	Changed the Release Number
1.3.9.2	0.1	VV	Changed the Release Number
1.4	0.1	VV	Changed the Release Number
1.5	0.1	VV	• ADA new release (adabgen & adacgen-4.031) • Ada GUI Changes for exception handling Functionality • Auto saving on build a C/C++ project
1.6	0.1	VV	• Integrated FreeRTOS Interface • Integrated µC/OS Interface • Ada new release (Adacgen 4.038)
1.7	0.1	VV	• Ada new release (Adacgen 4.041) • Integrated Complex Function in Ada-C/C++ Changer Product
1.8	0.1	VV	• Bug fixes done on previous release • AppCOE has been updated to Eclipse IDE and Installed Features version Mars.2 (4.5.2) for all operating systems. • The Java Runtime Environment (JRE) has been updated to version 1.8 for all operating systems.
1.8.1	0.1	VV	• Bugs from the previous release resolved. • A new project type of "AppCOE" is added for code generation on Windows and Linux targets. • Installer replaced with a new, more advanced, installer which provides better usability, performance, and features.