



## Application Notes

# Enable Media Codec Framework on the TI OMAP3 EVM Running Windows CE 6 Operating System

**Document purpose:**

*This Bsquare external document is intended to demonstrate how to build a Windows CE ROM Image with Media Codec Framework enabled.*

TABLE 1. REVISION HISTORY

Revision	Date	By	Purpose
1.0	Feb 10, 2009	Joseph Lee	
1.1	Feb 19, 2009	Kevin Hasley	Added media support
1.2	Feb 24, 2009	Kevin Hasley	Added known issues
1.3	May 28, 2009	Joseph Lee	Updated for BSP 6.10 Release
1.4	May 21, 2010	Joseph Lee	Updated Appendix

## Introduction

Within the TI OMAP35x series of application processors they include a built-in TMS320C64X+ DSP Core that provides advanced hardware accelerated support for media encoding / decoding. In this paper it will explain how to enable the media codec framework to take advantage of this capability in Windows CE.

## Media Codec Framework in Windows CE

The OMAP35x Media Codec Framework for Windows CE comprise of a set of software components integrated in to the Operating System environment:

### 1) DirectShow Filter

Direct Show is the standard media streaming architecture with the Windows CE operating system. The encoding / decoding functions are supplied with the DirectShow Filters, which can be chained up to form a filter graph to provide specific streaming operations.

### 2) Codec Engine

Codec Engine is a framework for creating and interacting with multimedia codecs, running either locally or on another processor (DSP), via a Linux C-callable API that reflects the base XDM interfaces.

#### 2.1) Codec Servers

#### 2.2) Codecs ( Encode / Decode Combo )

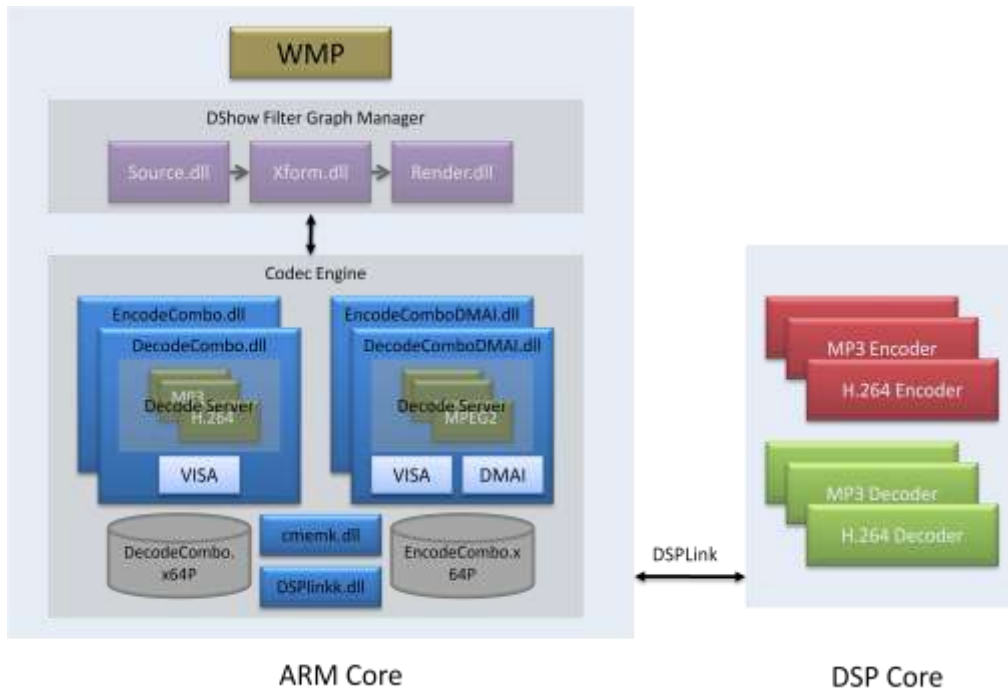
#### 2.3) DSPLink Interface

Codecs on the DSP (i.e. the ones in the DSP server/combo) can be exercised in one of two ways: either through the DirectShow framework in Windows Media Player, or by running independent DMAI (Davinci Multimedia Application Interface) sample applications provided in this release. Not all codecs are supported by DirectShow filters currently. Here's a table that summarizes current support, depending on the codec of interest:

<b>Codec available on the DSP</b>	<b>DirectShow filter available for support in Windows Media Player?</b>	<b>DMAI sample application available?</b>
MPEG2 decoder	Yes	Yes
MPEG4 decoder	Yes	Yes
H.264 decoder	Yes	Yes

For more information, go to

[http://tiexpressdsp.com/wiki/index.php?title=Main\\_Page](http://tiexpressdsp.com/wiki/index.php?title=Main_Page).



## Instructions on Enabling Media Codec Framework Scenario

### Prerequisites

Before proceeding, make sure that the following software has been installed in the development PC:

- Microsoft Visual Studio 2005
- Microsoft Windows Embedded CE 6 R2
- Texas Instruments OMAP35xx BSP for Microsoft Windows Embedded CE 6, version 6.08.00 or later

## Setting up the build environment for enabling Media Codec Framework

### Media Codecs

Three media decoders are supported in the 6.09 release:

#### Video

- H.264 Decoder
- MPEG4 Decoder
- MPEG2 Decoder

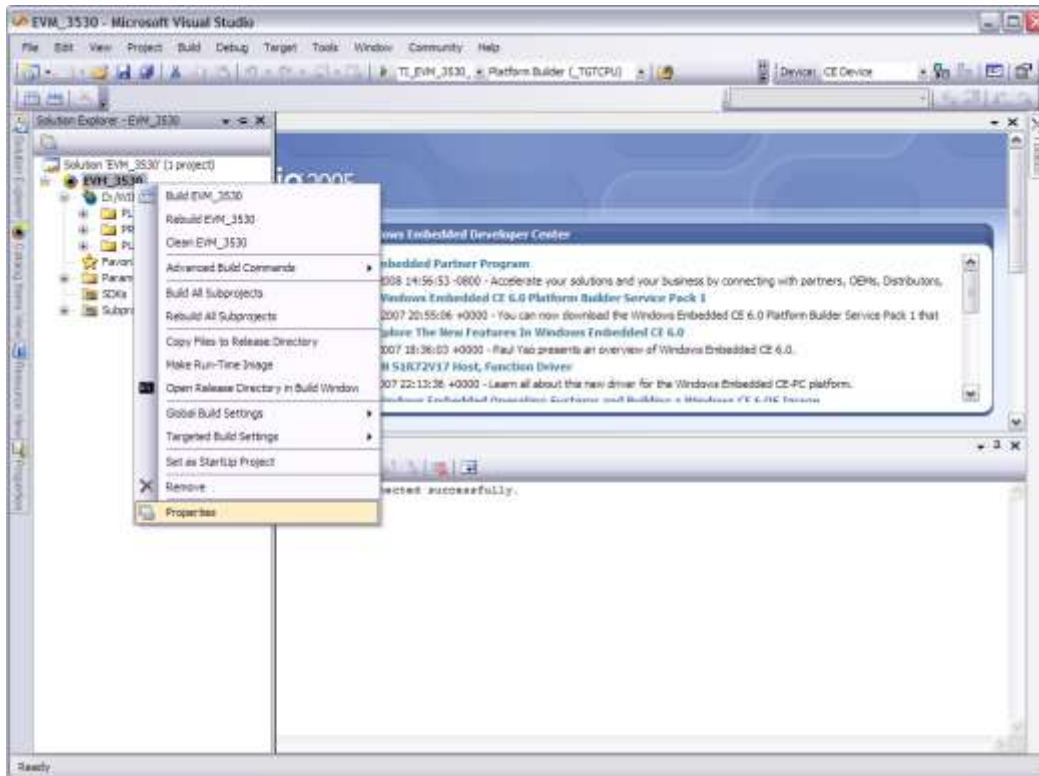
By including a DirectShow filter for the codec selected in the build, the Media Codec Framework will be included automatically as a depended feature.

Each DirectShow filter is tagged with an environment variable:

- BSP\_H264\_DECODE\_FILTER
- BSP\_MPEG4\_DECODE\_FILTER
- BSP\_MPEG2\_DECODE\_FILTER

To add the decoders, simply add the environment variable for the DirectShow filter of the selected codec to the build environment.

- i. After all the required software are installed, launch the sample solution EVM\_3530.sln and navigate to the **Solution Explorer** view, right click on the folder **EVM\_3530** and select **Properties** :



- ii. Select **Environment** in the left pane of the Property page that will bring up the **Environment Variable** window.

In the window enter the following variable and value and click **OK**.

Variable name       = BSP\_MPEG2\_DECODE\_FILTER  
Variable value       = 1



Repeat the previous steps if there are more codecs to be added to the Windows CE Image.

### Rebuilding the solution

To rebuild, launch the Solution View and right click on the solution to reveal the menu. Select **Build EVM\_3530** to rebuild the image. It is recommended to perform a clean build by selecting **Clean EVM\_3530** before the build step.

### Updating the OS Image

Refer to the EVM3530 User Guide, download and upgrade the OS image built from the steps earlier. When completed, cycle the power on the EVM board and the new image will start using DVI out as the output device.

## Appendix

### Reference

1. EVM 3530 User Guide

### Creating Videos

BSQUARE's video application DShow framework current supports accelerated MPEG4, MPEG2, H.264 and MP3 in an AVI wrapped up to D1 (720x480p) @ 30 fps. BSQUARE's framework also plays WMV content, but non-accelerated for support up to 640x480 @ 15 fps. We included several sample video files on our FTP site that can be used to showcase the codec engine framework.

The best videos to use are trailers from <http://www.apple.com/trailers>. Click on any HD 480p trailer and using Quicktime Pro and choose to "save source..." which will copy the clip as a .mov file. After you have the file, you must use a tool to convert .mov file format to a useable format for the system.

We use the tool called Super to convert videos to be played on the OMAP35x EVM. You can download a free copy at <http://www.erightssoft.com/SUPER.html>. Below tables are sample Super configurations for converting the videos for the WinCE BSP on the OMAP35x.

#### Video Wrapper:

<i>Complete name :</i>	video.avi
<i>Format :</i>	AVI
<i>Format/Info :</i>	Audio Video Interleave
<i>Format/Family :</i>	RIFF
<i>Writing application :</i>	FFMPEG

#### MPEG4:

<i>Codec :</i>	DivX 4
<i>Codec/Family :</i>	MPEG-4V
<i>Codec/Info :</i>	Project Mayo DivX 4
<i>Codec profile :</i>	Simple Profile/Level 1
<i>Bit rate :</i>	2064 Kbps
<i>Width :</i>	848 pixels
<i>Height :</i>	480 pixels
<i>Frame rate :</i>	25.000 fps

#### MPEG2:

<i>Codec :</i>	mpg2
<i>Bit rate :</i>	2064 Kbps
<i>Width :</i>	848 pixels

Height :	480 pixels
Display Aspect ratio :	4/3
Frame rate :	25.000 fps

MP3:

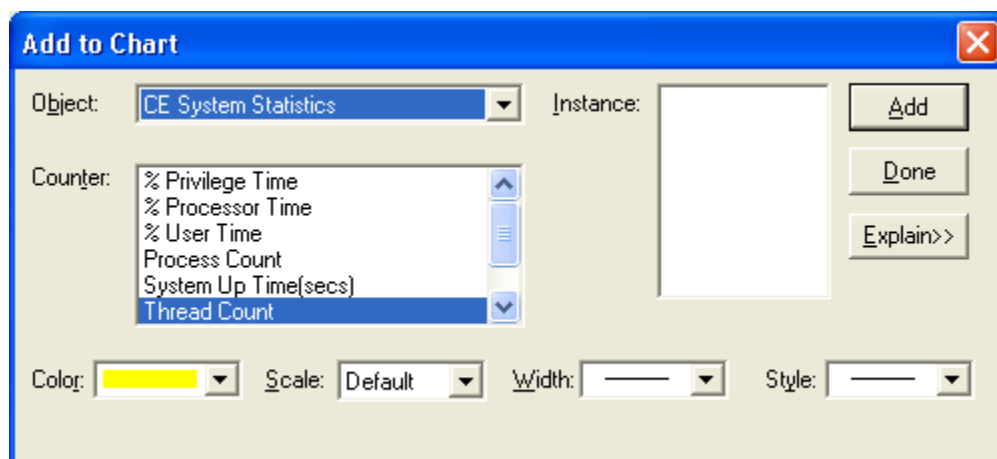
Codec :	MPEG-1 Audio layer 3
Codec profile :	Joint stereo
Bit rate mode :	VBR
Bit rate :	256 Kbps
Channel(s) :	2 channels
Sampling rate :	44.1 KHz
Resolution :	16 bits

### Tips for measuring CPU Performance

Windows CE Platform Builder include a set of remote tools. One of those is Performance Monitor that enables the tracking various performance indicators such as CPU loads with the system.

From the main menu, go to **Target** → **Remote Tools** and select **Performance Monitor**. To connect to a device, go to **Connection** → **Connect to Device**.

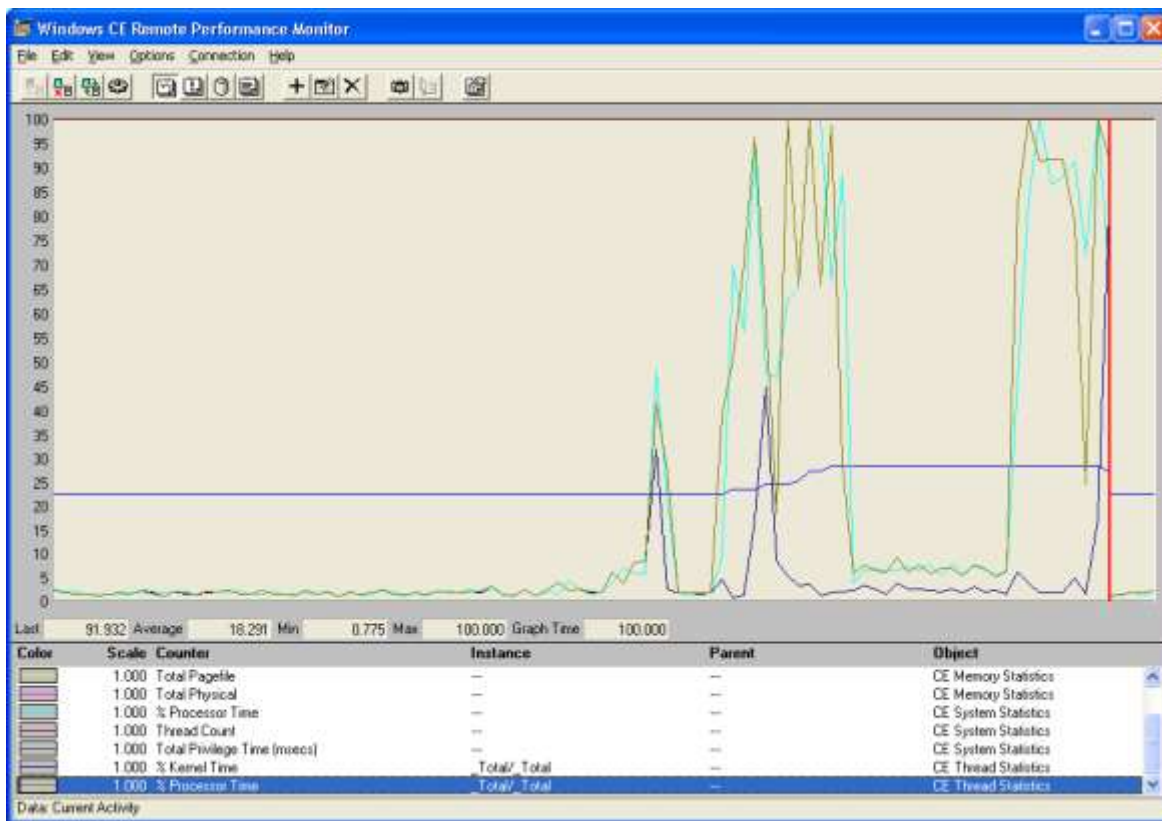
When connected, click on the **+** button and a dialog box will show up allowing users to select the statistical data of the system they want to monitor.



Performance Monitor provides the built in capabilities of monitoring various system statistics. The following can be useful for the developers to fine tune the work loads between the ARM core and the DSP core:

- Memory
- Process
- System

Upon finishing adding the selected data set and click the close button, the data will be displayed real time in the main window:



For further details refer to the following online reference from Microsoft MSDN for more information :

#### Reference

1. [Tools for Performance Tuning](#)
2. [Performance Monitor](#)
3. [Performance Extension DLL Creation](#)
4. [Remote Performance Monitor Extension DLL Authoring](#)