Media Streaming to i.MX31 PDK over Wireless LAN

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1   Introduction

This application note describes how to set up a basic media streaming session (audio, video, and pictures) between a Personal Computer (PC) (with the Microsoft® Windows™ Operating System—OS) and the i.MX31 Product Development Kit (PDK), through a Wireless LAN (Wi-Fi).

The requirements to set up a media streaming session are as follows:

- i.MX31 PDK
- Microsoft Platform Builder for the Microsoft Windows CE™ 5.0 (WinCE 5.0) with the updated patches
- i.MX31 PDK 1.4 and Microsoft WinCE 5.0 Software Development Kit (SDK) or an upgraded version of SDK with the Wireless Local Area Network (WLAN) driver support
- PC compatible with the Microsoft Windows XP™ Service Pack 2

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- Wireless network card for the PC or a separate network router with 802.11 b/g support
- Windows Media Encoder™ (WME) and Windows Media Player™ (WMP)

The application note assumes that the user has a basic understanding of the i.MX31 PDK operation and is familiar with the WinCE platform builder. The important concepts such as building and deploying a WinCE OS image into the i.MX31 PDK are not described in this application note.

2 Streaming

Streaming is a method of data transfer where the data is encoded by a server for the data transfer and decoded by the clients for the data retrieval. Transferring data through streaming is different from the normal file transfer. In a streaming session, the data is processed as a continuous flow and presented to the user in parts. In this process, the client is not required to wait for the complete file to be downloaded.

The increase in the bandwidth available for the data networks and improvement in the media codecs have made streaming one of the most popular and rapidly growing media distribution channels. The streaming technique is the fundamental operational principle in various common scenarios such as watching a video in YouTube™, tuning a TV channel on a web page, watching a movie on demand (Video on Demand—VoD), follow a presentation on a remote computer, and watching TV on a mobile phone.

The key elements in a streaming session are as follows:

- Server—encodes the media (source), builds the stream of data, and uses a public or proprietary network protocol to transfer the data over the network
- Network—serves as a communication channel between the server and client(s)
- Client—uses the same network protocol used by the server and fetches the data stream from the network, decodes the media present in the network, and displays/plays the content to the end user

3 Requirements

The elements required for the streaming session are as follows:

- Server:
  - Hardware—personal computer
  - Operating System—Microsoft Windows XP with the Service Pack 2
  - Application—Microsoft WME 9 series
- Network:

    Hardware—wireless network adapter or network router with 802.11 b/g (Wi-Fi) support
- Client:
  - Hardware—i.MX31 PDK (use the i.MX31 TO2.0 in the CPU card or an upgraded CPU version. Debug board is required only for the set up)
  - Operating System—WinCE 5.0 (use the i.MX31 PDK 1.4 or an upgraded version of the i.MX31 PDK 1.4 with the WLAN driver support)
  - Application—Microsoft WMP with the streaming protocol support (Microsoft Media Server—MMS and Hypertext Transfer Protocol—HTTP)

For building, deploying, and booting a WinCE 5.0 image in the i.MX31 PDK, refer to the accompanying documents of the i.MX31 PDK. The following sections describe how to set up a streaming session between a PC and the i.MX31 PDK using the Microsoft Windows Media Technologies (WMT).

4   Setting Up the Client

For setting up the client, the installed platform builder should be updated with the following software:

- latest Microsoft patches
- i.MX31 SDK 1.4 or an upgraded version of the i.MX31 SDK (refer to the documents included in the SDK 1.4 for help)

After updating the platform builder, the components listed in Table 1 should be added to the WinCE 5.0 OS image. Browse the platform builder catalog to add the WMP, streaming support, media codecs, and Wi-Fi driver.

Table 1. Catalog Items with the Variables

Catalog Item	Sysgen Variable
Windows Media Player	SYSGEN_CEPLAYER
Streaming Media Playback	SYSGEN_STREAMAV
Windows Media Streaming over MMS	SYSGEN_DSHOW_WMT_MMS
Windows Media Streaming over HTTP	SYSGEN_DSHOW_WMT_HTTP
Windows Media Multicast and Multi-Bit Rate	SYSGEN_DSHOW_WMT_MULTI
Windows Media Streaming from Local Storage	SYSGEN_DSHOW_WMT_LOCAL
NSC File Support	SYSGEN_DSHOW_WMT_NSC
ASX v3 File Support	SYSGEN_DSHOW_WMT_ASXV3
ASX v2 File Support	SYSGEN_DSHOW_WMT_ASXV2
ASX v1 and M3U File Support	SYSGEN_DSHOW_WMT_ASXV1
MP3 Codec	SYSGEN_DSHOW_MP3
WMA Codec	SYSGEN_DSHOW_WMA
WMA Voice Codec	SYSGEN_DSHOW_WMA_VOICE
Wave/AIFF/au/snd File Parser	SYSGEN_DSHOW_WAV
WMV/MPEG-4 Video Codec	SYSGEN_DSHOW_WMV
WMA and MP3 Streaming	SYSGEN_STREAMAUDIO

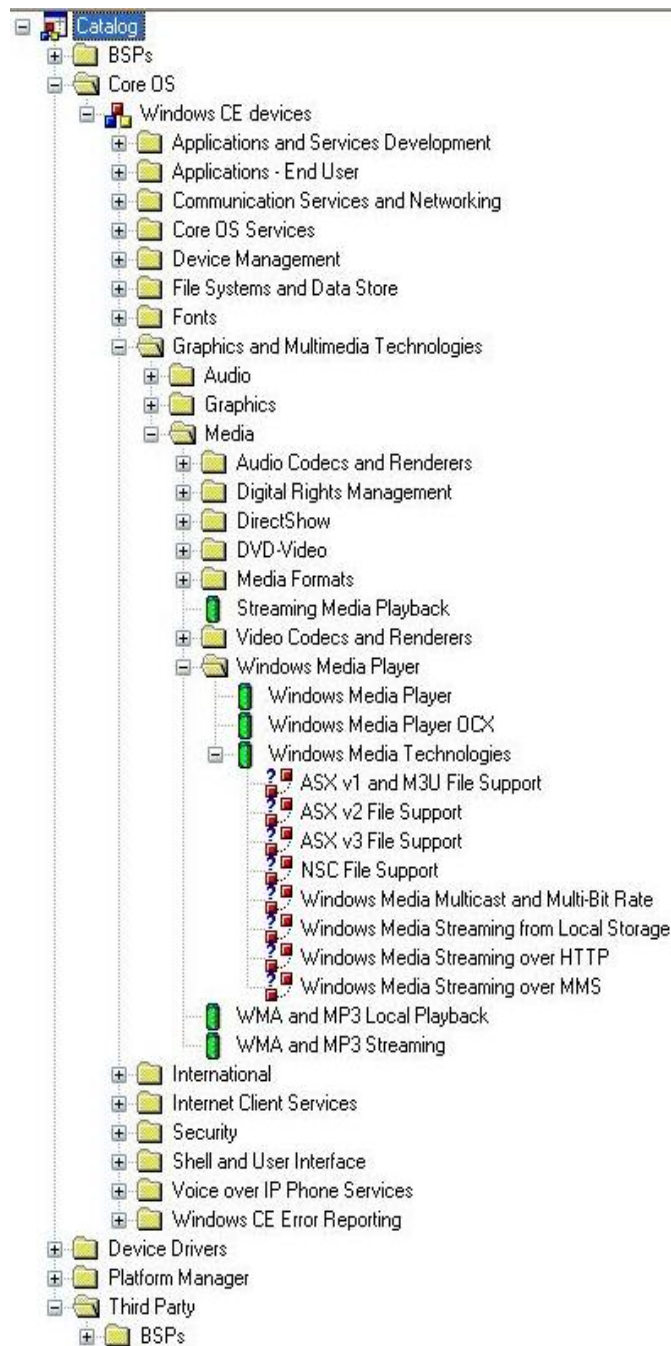The platform builder catalog is shown in Figure 1.

Figure 1. Platform Builder Catalog

Depending on the requirement, any number of supported codecs can be added based on the stream content to be played back or displayed by the i.MX31 PDK. This is described with the following example.

Consider a case where the BMP and JPG image decoders are required to be added. In this case, select the items in Table 2 from the catalog.

Table 2. Catalog Items with the Variables

Catalog Item	Sysgen Variable
Still Image Codec Support (Encode and Decode)	SYSGEN_IMAGING
BMP Decoder	SYSGEN_IMAGING_BMP_DECODE
JPG Decoder	SYSGEN_IMAGING_JPG_DECODE

For more information about the graphics and multimedia technologies for the WinCE 5.0, visit the Microsoft Developer Network (MSDN) website and look for the following:

- MSDN Library > Mobile and Embedded Development
- Windows Embedded > Windows Embedded CE
- Windows CE 5.0 > Product Documentation
- Windows CE Features > Graphic and Multimedia Technologies

In addition to the graphics and multimedia items, the wireless network driver should be added to the OS design. Follow the guidelines in the WLAN Driver chapter in the *i.MX31 PDK 1.4 Windows CE 5.0 Reference Manual* (926-77198) or relevant documents of the WinCE SDK release to add the wireless network driver to the OS. After completing the OS image build, download the OS image to the PDK board and boot the PDK with the OS image.

5 Setting Up the Server

The server configuration is straight forward and the configuration depends only on the WME installation. The WME 9 is available for free at the following link:

http://www.microsoft.com/downloads/details.aspx?FamilyID=5691ba02-e496-465a-bba9-b2f1182cdf24&displaylang=en.

6 Setting Up the Wireless Network

The network connection between the i.MX31 PDK and PC depends on the available hardware. One option is to use a wireless adapter on the PC and configure a point to point wireless network (ad hoc network). Another possible option is to use a network router with the Wi-Fi support. This is useful if a wireless adapter is not available in the PC or more than one client is required to be attached to the media stream.

Ensure the network parameters—IP addresses, subnet masks, and so on—are correctly configured in the PCs and i.MX31 PDK. Verify if the server (PC) and client (PDK) can communicate to each other with a ping or a similar utility.

7 Streaming Session Configuration

The steps to configure the streaming session are as follows:

1. At the server side, open the WME application. By default, the application shows the New Session window at the startup as shown in Figure 2.
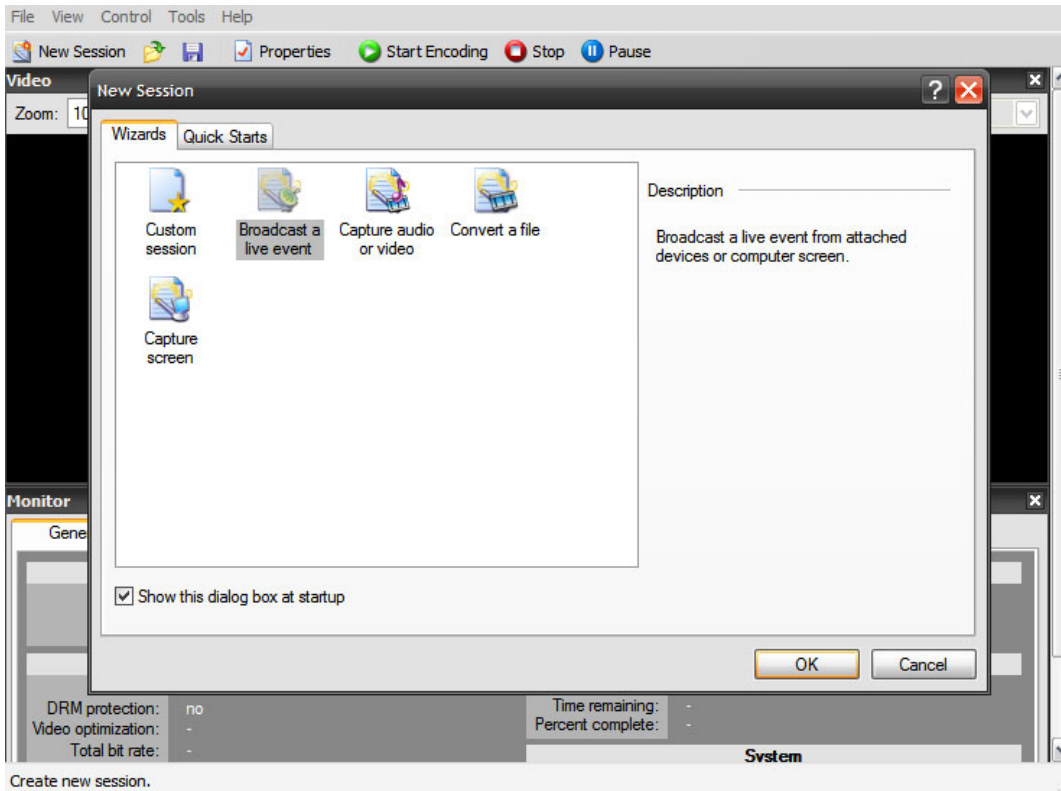

Figure 2. WME Startup Window

2. To create a Custom session, select the corresponding icon and click OK. This opens the Session Properties panel containing several tabs and all the streaming session properties can be configured in this window.

3. Add the three sources of the streaming session—Windows Media Video (WMV), MP3 file, and screen capture with the microphone input—with the Add button and change their names to meaningful ones, such as WMV-Source, MP3-Source, and Screen-Source respectively.

4. Select the WMV-Source, MP3-Source, and Screen-Source and configure them one after the other with the parameters listed in Table 3.

Table 3. Source Parameters

Name	Source	File Name	Video and Audio Options
WMV-Source	File	Look for an WMV file in the PC	Check the Video and Audio options. Leave the Script option unchecked.
MP3-Source	File	Look for an MP3 file in the PC	Though this file contains only the audio signals, the first source file uses both audio and video. Therefore, these options cannot be changed.
Screen-Source	Device	Not available	Video—Screen Capture Audio—select sound card and configure the microphone as input

5. After the sources of the streaming session are configured, move to the Output tab and set the encoder port (the connection is initiated by the server or players) to a free port in the PC.

NOTE

Remember the IP address and server port as these information are required at the client side.

6. Use the following settings to set the Compression to a proper value:
    — Destination—Pocket PC
    — Video—Pocket PC standard video (CBR)
    — Audio—CD quality audio (CBR)
    — Bit rates—259 Kbps
    — Frame Rate—20 fps
    — Output Size—208 × 160

Figure 3 shows the Compression profile.
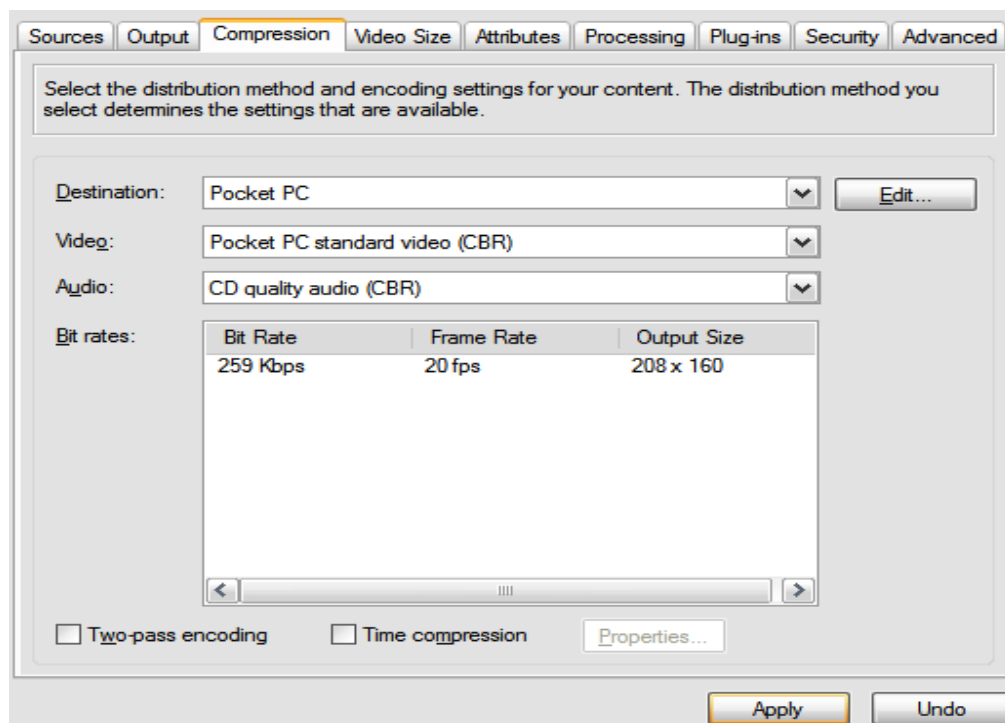
Figure 3. Compression Profile

7. Edit the Compression profile to add more bitrates and to modify the output. This can be done by using the Edit button.

NOTE

While customizing the Compression profile, ensure the selection of the Windows Media Video V8 as the video codec as this is supported by the i.MX31 PDK.

The streaming session is configured. The other streaming session properties are optional.

8   Streaming Media to PDK

The steps for streaming the media to the PDK are as follows:

1. Click Start Encoding as shown in Figure 4.
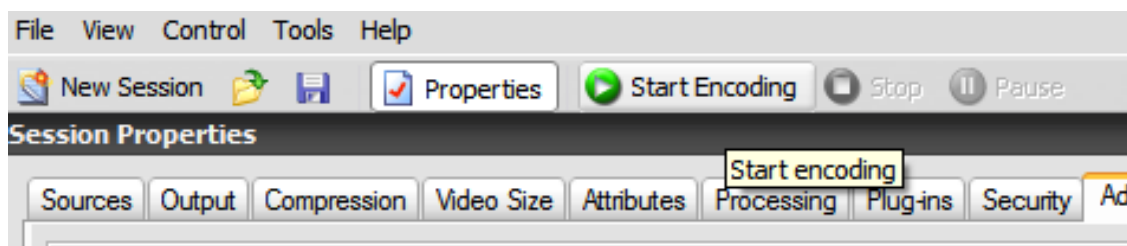
Figure 4. WME Control Tabs

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2. At the PDK, click File > Open as shown in Figure 5 and enter the stream URL in one of the following formats:

— mms://<SERVER_IP>:PORT

— http://<SERVER_IP>:PORT/*

This can be described with the following example. Consider a case where the server IP address is 192.168.0.1 and the port set at the Output tab is 8080. Then, the URL is as follows:

— mms://192.168.0.1:8080

— http://192.168.0.1:8080/*

Figure 5. Windows Media Player at i.MX31 PDK

If the streaming session is set up correctly, the user should be able to see the video output and hear the audio output from the WMV and MP3 files, respectively. Also, the user should be able to see the screen capture display (the display can get distorted due to the codec and low bit rate) and hear its sound that comes from the server microphone.

Figure 6 shows the WME 9 at the server.
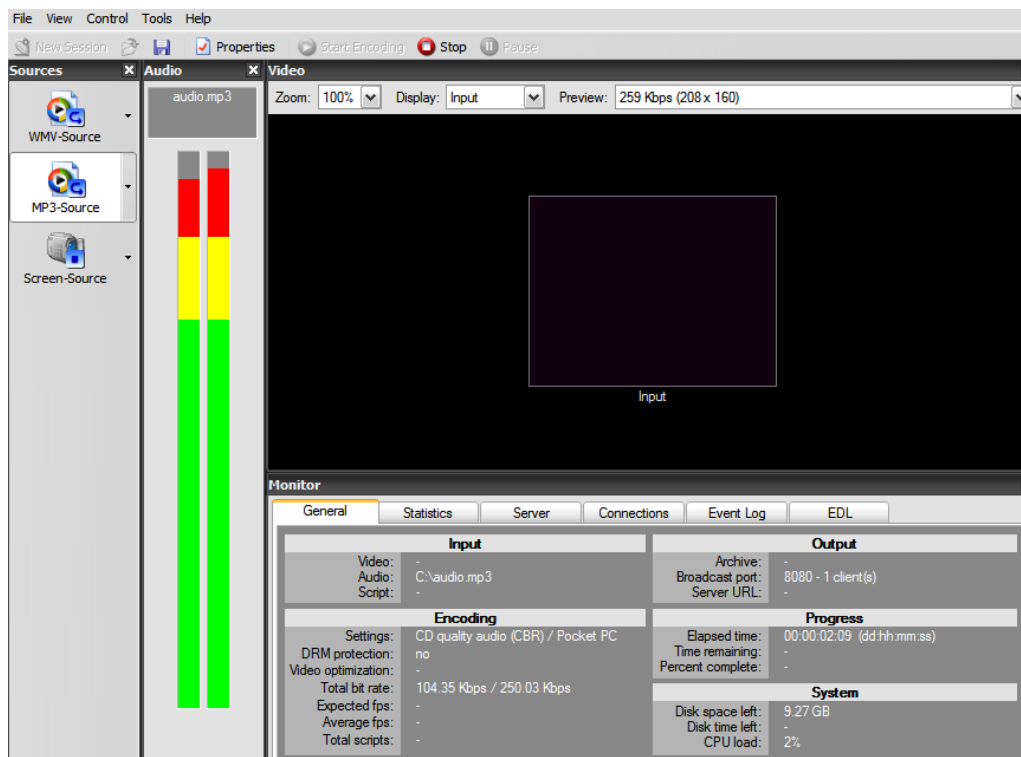
Figure 6. WME 9 at the Server

9   Additional Notes

Now, the user should be able to stream the media content from a host computer to the i.MX31 PDK using the wireless network. If the user intends to build a streaming application (both server and client side) on their own, refer to the Microsoft WME SDK. This software package can save many hours of development as the WME SDK offers ready to use libraries (Dynamic-Link Library—DLLs) and convenient Application Programming Interface (API) for different programming languages, such as Visual Basic, Visual C++, and C#.

This can be described with an example. Figure 7 shows the snapshots taken from an i.MX demo. This demo replicates the WME functionalities and provides customized features and interface to the user.

Figure 7. Streaming Application with WME Functionalities

Figure 8 shows the i.MX31 PDK powered by a battery, displaying the video received from the server.

Figure 8. i.MX31 PDK Displaying Video from Server

10 Conclusion

The user should now be able to set up a streaming session between a Server (PC) and the i.MX31 PDK over Wireless LAN using the Microsoft WMT.

11 Revision History

Table 4 provides a revision history for this application note.

Table 4. Document Revision History

Rev. Number	Date	Substantive Change(s)
0	07/2010	Initial release.

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Document Number: AN4174
Rev. 0
07/2010