



Using DLNA Functionality in Windows Embedded Compact 7

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Abstract

Windows Embedded Compact 7 provides features that developers can use to create and deploy an OS design that complies with the Digital Living Network Alliance (DLNA) 1.5 guidelines. If your OS design follows these guidelines, you can provide your customers with increased interoperability across networked devices that support DLNA compliance and protocols.

This white paper:

- Assumes you are familiar with Universal Plug and Play (UPnP) technology
- Assumes you already know how to create, deploy, and work with an OS design in Platform Builder
- Provides a general outline for using Platform Builder to add DLNA-compliant functionality to your OS design
- Demonstrates how to use the resulting devices to play media files over a network

Contents

Introduction	3
Windows Media Player and DLNA Compliance.....	4
UPnP and Windows Embedded Compact 7.....	4
SYSGEN Variables for DLNA Devices	5
Adding DLNA-Compliant Functionality to an OS Design	6
Media Renderer (Mediarendere.dll).....	6
Default DLNA Media Profiles	7
Windows Media Player Applications.....	7
Using DLNA-Compliant Functionality.....	8
Using DMR Functionality.....	8
Using DMC Functionality.....	10
Using DMP Functionality.....	11
Conclusion	12
Additional Resources	12

Introduction

Digital Living Network Alliance (DLNA) provides guidelines and protocols that allow devices to share media on a network. Windows Embedded Compact 7 (Compact 7) incorporates DLNA 1.5–compliant functionality to enable device users to share media files among not only Windows-only devices, but also with other DLNA-compliant devices.

To enable a Compact 7 device to use DLNA, an OEM or developer must develop an OS design that includes DLNA functionality. This white paper explains how to do that, and how users of the resulting devices can use the functionality in Windows Media Player applications. A Compact 7 device that has an appropriate DLNA-compliant OS design can act as a Digital Media Controller (DMC), Digital Media Renderer (DMR), or Digital Media Player (DMP).

This white paper assumes that you are familiar with UPnP technology, and that you already know how to create, deploy, and work with an OS design in Platform Builder.

The following table describes the phases of OS design, application development, and device use for a Compact 7 device with DLNA-compliant functionality.

Table 1: Phases in the design and use of a device that has DLNA-compliant functionality

Phase	Resource
OEM creates an OS design that includes DLNA-compliant functionality.	See the section Adding DLNA-Compliant Functionality to an OS Design in this white paper. For general information about creating an OS design, see Developing an OS Design for Windows Embedded (http://go.microsoft.com/fwlink/?LinkId=210187).
Application developer customizes the UI of the Windows Media Player applications (optional).	See Introduction to Application Development with Silverlight for Windows Embedded (http://go.microsoft.com/fwlink/?LinkId=183252), Expression Blend and Silverlight for Windows Embedded (http://go.microsoft.com/fwlink/?LinkId=204753), and Silverlight for Windows Embedded Developer's Guide (http://go.microsoft.com/fwlink/?LinkId=191039).
User pulls media from a second device, pushes media to a second device, or uses the first device to push media from a second device to a third device.	See the section Using DLNA-Compliant Functionality in this white paper.

For more information about the DLNA media device classes and usage scenarios that Compact 7 supports, see the companion white paper, [Support for DLNA Media Devices in Windows Embedded Compact 7](http://go.microsoft.com/fwlink/?LinkId=219841) (<http://go.microsoft.com/fwlink/?LinkId=219841>). For more information about DLNA 1.5 guidelines and the certification process, see the [DLNA website](http://go.microsoft.com/fwlink/?LinkId=213008) (<http://go.microsoft.com/fwlink/?LinkId=213008>).

Windows Media Player and DLNA Compliance

Compact 7 provides the support and features necessary to include Windows Media Player functionality in an OS design. You can use Compact 7 to add Windows Media Player functionality and features that comply with the DLNA 1.5 guidelines. Because the DLNA guidelines use the Universal Plug and Play (UPnP) networking architecture, the following information and SYSGEN details are included to provide an overview of the role that UPnP performs.

UPnP and Windows Embedded Compact 7

The UPnP technology of Windows Embedded Compact 7 provides peer-to-peer network connectivity for personal computers, wireless devices, and other intelligent appliances, in a distributed, open-network architecture. UPnP uses standard protocols, such as Transmission Control Protocol/Internet Protocol (TCP/IP), Hypertext Transfer Protocol (HTTP), and Extensible Markup Language (XML) to seamlessly connect networked devices and manage data transfer among them.

UPnP provides an architectural framework for creating self-configuring, self-describing devices and services. Networks managed by UPnP require no configuration by users or network administrators, because UPnP supports automatic discovery on the network. UPnP allows a device to dynamically join a network, obtain an IP address, and convey its capabilities upon request. Control points can use the UPnP API to detect the presence and capabilities of devices registered on the network. A device can leave a network automatically when it is no longer required. The UPnP AV Framework assists developers in building UPnP AV devices and control points.

Windows Embedded Compact 7 supports the following:

- UPnP control points, by using the UPnP Control Point API
- UPnP devices, by using the UPnP Device Host API
- UPnP Audio/Video (AV) control points and devices, by using the UPnP AV Framework
- The following Windows Media Player applications:
 - Pviewer.exe (for supporting images)
 - Mplayer.exe (for supporting music)
 - Vplayer.exe (for supporting video)

Each of the Windows Media Player applications provides digital media functionalities that adhere to the DLNA 1.5 guidelines. Table 2 describes these functionalities.

Table 2: Digital media functionalities that meet DLNA 1.5 guidelines

DLNA media device class	Description
Digital Media Controller (DMC)	A UPnP control-point device that can discover other devices, such as a Digital Media Server (DMS) and a Digital Media Renderer (DMR), on the network. A DMC can browse media content that is exposed by a DMS, match it to the rendering capacities of a DMR, and set up the connections between the DMS and the DMR. A DMC typically has a UI, through which the user controls the playback experience on the DMR.
Digital Media Player (DMP)	A UPnP control-point device that can discover DMS devices on the same network, browse media content that is exposed by a DMS, and render media content locally. A DMP typically has a UI, through which the user controls the playback experience.
Digital Media Renderer (DMR)	A UPnP media renderer device that can render media items pushed from a DMC device on the same network.

The following table describes the DMS device class that Compact 7 does not support.

Table 3: Unsupported digital media functionality

DLNA media device class	Description
Digital Media Server (DMS)	A UPnP media server device that hosts media items and responds to browse requests and search requests for media items from a DMC.

Important

UPnP in Compact 7 does not support IPv6 addressing. In order for Compact 7 devices to work with UPnP, you must use IPv4 addressing.

SYSGEN Variables for DLNA Devices

The following table describes the SYSGEN variables that you need to set in Platform Builder in order to include the components of a specific device class.

Table 4: SYSGEN variables to set in Platform Builder

Device class	SYSGEN variable to set to 1	OS design image component
DMR	SYSGEN_MEDIAAPPS_MEDIARENDERER	Mediarendrer.dll, which runs as a service and supports the rendering of image, music, and video files.
DMC, DMR, and DMP (for images)	SYSGEN_PHOTO_VIEWER	Pviewer.exe, which supports image media types.
DMC, DMR, and DMP (for music)	SYSGEN_MUSIC_PLAYER	Mplayer.exe, which supports music media types.
DMC, DMR, and DMP (for video)	SYSGEN_VIDEO_PLAYER	Vplayer.exe, which supports video media types.

Adding DLNA-Compliant Functionality to an OS Design

You can add the following types of DLNA-compliant functionality to your OS design:

- Media renderer DLL (Mediarendrer.dll)
- Windows Media Player applications (Pviewer.exe, Mplayer.exe, and Vplayer.exe)

Media Renderer (Mediarendrer.dll)

The Media Renderer DLL (Mediarendrer.dll) included in Compact 7 adheres to DLNA 1.5 guidelines. It implements a DMR device named **Compact: Windows Embedded Media Renderer** that supports the streaming of images, music, and video media files over a network. It does not have a UI, and runs as a service hosted by Servicesd.exe.

The three Windows Media Player applications — Windows Music Player, Windows Photo Viewer, and Windows Video Player — in Compact 7 use the services of the DMR device for an implementation of DMR functionality. However, you can use Mediarendrer.dll without using any of these applications if you set SYSGEN_MEDIAAPPS_MEDIARENDERER to 1. You can set this SYSGEN variable in the OS design **Catalog Item** view by selecting the **Media Renderer** option.

The Platform Builder **Catalog Item** view, as shown in Figure 1, shows the **Media Renderer** option as selected. When you build the OS image, the Mediarendrer.dll is included in the OS image with this option selected.

Figure 1 - Platform Builder Catalog Item view with Media Renderer selected



 **Important**

To change the default name of the DMR, edit the value of the <friendlyName> tag in the %_WINCEROOT%\Public\Mediaapps\Oak\Files\Mediarenderer.xml file.

Default DLNA Media Profiles

On the device, you can view the default DLNA media profiles that the platform supports by opening the following registry file:

%_WINCEROOT%\Public\Mediaapps\Oak\Files\Mediaapps.reg

 **Warning**

To avoid corrupting the OS installation, do not edit this file.

The registry entries in the file are located under the following key:

HKEY_LOCAL_MACHINE\COMM\UPnPDevices\MediaRenderer\SinkProtocolInfo

To overwrite the default values, you can edit the %_TARGETPLATROOT%\Files\Platform.reg file by adding or removing protocol information entries for the registry key. You can edit the text file by using Notepad or another text editor.

To find a list of media profiles and their MIME types for protocol information strings, visit the DLNA Media format guidelines in the [Members Area section of the DLNA website](http://go.microsoft.com/fwlink/?LinkId=220004) (<http://go.microsoft.com/fwlink/?LinkId=220004>).

 **Note**

Microsoft does not support or have any connection to this website; this link is provided for readers' convenience only.

Windows Media Player Applications

Each Windows Media Player application (Pviewer.exe, Mplayer.exe, and Vplayer.exe) works as a DMR, DMC, or DMP device, supporting image, music, and video media files respectively.

When you select the three Windows Media Player applications in Platform Builder **Catalog Item** view (as shown in Figure 2), and after you build the OS image, the files Pviewer.exe, Mplayer.exe, and Vplayer.exe are included in the OS image. They provide the streaming functionality.

 **Note**

When any one of these applications is selected in **Catalog Item** view, the Media Renderer option is automatically selected because the DMR functionality of the player depends on the presence of the Media Renderer option (Mediarenderer.dll).

Figure 2 - Platform Builder Catalog Item view with Windows Media Player applications selected



Note

Using Compact 7, you can build Windows Media Player applications for a small (resolution 640 × 480) screen size or a medium (resolution 800 × 600) screen size. If you set the `IMG_SCREEN_SMALL` environment variable, the application builds for a small screen size. However, the default setting is the medium screen size. The screen shots in the following sections use the medium screen size.

Using DLNA-Compliant Functionality

The following examples demonstrate how to use DMR, DMC, and DMP functionality with Windows Media Player on Compact 7 to enable sharing to and from devices over a network. Your customers might follow these procedures when accessing media files on their Compact 7 devices.

Using DMR Functionality

Digital Media Renderer (DMR) functionality allows other DMCs on the network to push media files to the DMR for rendering. By default, Windows Media Player does not enable DMR functionality, so in order to use it, the end user must enable it. The following procedure outlines the necessary steps for the end user.

To enable DMR functionality

- In Windows Media Player, click **Settings**, click **Share**, and then select the **Receive media on your network** check box (as shown for the video player in Figure 3).

Figure 3 – Allowing other devices to push media to your device

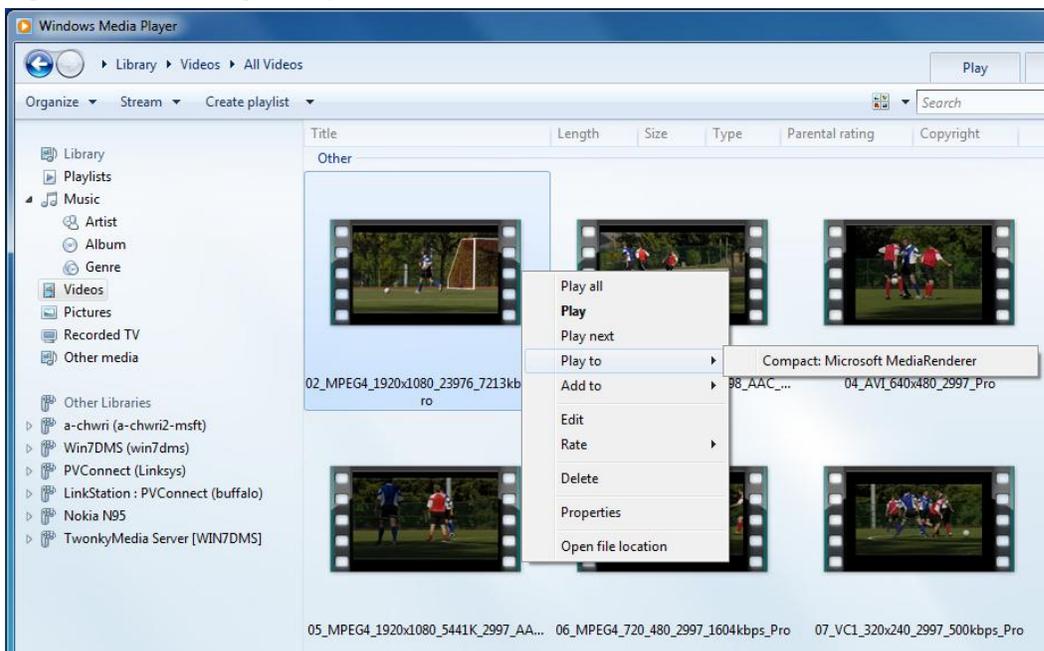


After the DMR becomes available on the network, media files are available to stream to the device from a host Windows Media Player.

▶ **To stream media files from a host to a device**

1. On the host DMS, right-click the media file to display the shortcut menu.
2. Select the **Play To** option, and then choose **Compact: Microsoft MediaRenderer** (as shown in Figure 4). The media item is shared and rendered on the media player DMR of the device.

Figure 4 – The “Play to” option for video files on the shortcut menu of the host machine



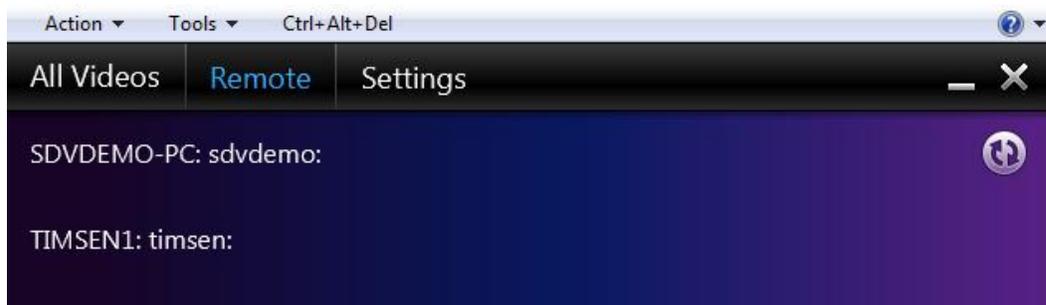
Using DMC Functionality

Digital Media Controller (DMC) functionality enables the user to browse media files from a remote DMS device on the network and to push videos to other DLNA-compliant DMR devices on the same network. In Figure 5, the medium (800 x 600) resolution of the video player application shows a list of DMS devices on the network that are available to stream content to the device's video player application.

▶ To use DMC functionality

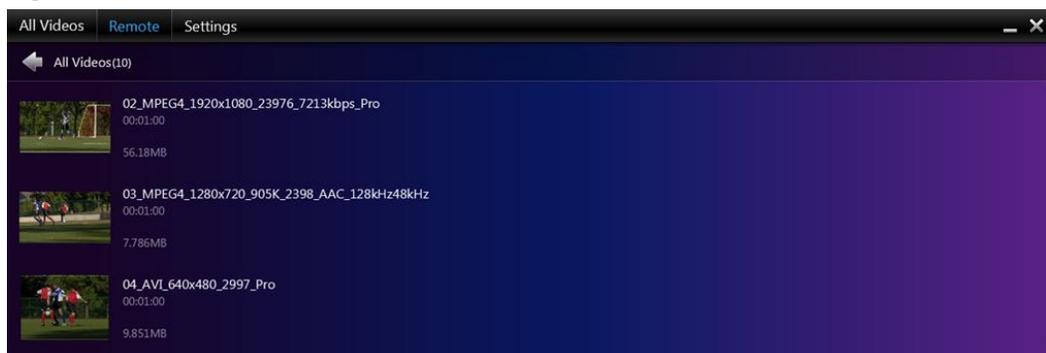
1. In the video application, click a device name to select a host DMS (as shown in Figure 5).
2. From the list of available media files (as shown in Figure 6), left-click and hold the mouse over a file icon.
3. Click the **Play to** icon (as shown in Figure 7).
A new window appears that lists the active DMR devices on the network (as shown in Figure 8).
4. Select a DMR by clicking its name, and then click the **OK** button to invoke Digital Media Controller (DMC) functionality.

Figure 5 – A video player application showing a list of DMS devices



After you select a host DMS by clicking the device name, the screen (see Figure 6) displays all the available files that are shared from the host DMS to the device's Windows Media Player application.

Figure 6 – A list of media files on a DMS



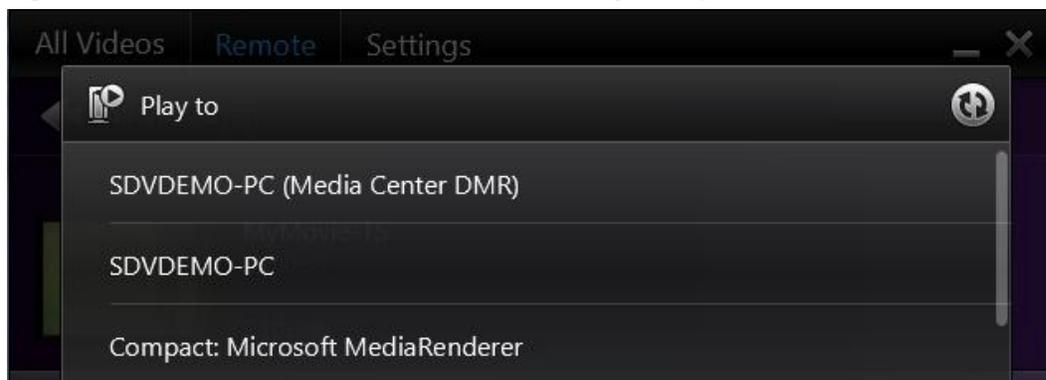
If you left-click and hold the mouse pointer over a file icon, the **Play to** icon (to the right of the file icon) appears.

Figure 7 –A “Play to” option in Windows Media Player



Clicking the **Play to** icon opens a **Play to** window that lists the active DMR devices on the network.

Figure 8 – The list of available DMRs for the “Play to” option



After you select a DMR from the **Play to** window, DMC functionality pushes the media item to the selected DMR device. The DMR device renders the media item from the remote DMS.

Using DMP Functionality

Digital Media Player (DMP) functionality enables end users to browse media files on networked DMS devices. Users can render videos locally in Windows Media Player.

▶ To use DMP functionality

1. Select a host DMS by clicking the device name (as previously shown in Figure 5). The screen displays all the available files that are shared from the host DMS to the device's media player application.
2. From the list of media files on the DMS (as previously shown in Figure 6), click the file icon once. The file renders locally on the device in Windows Media Player.

Figure 9 shows the rendering of a video file by the DMP video player.

Figure 9 – The successful streaming of a video file



Conclusion

You can create and configure a Compact 7 OS design to include functionality and support for the streaming of media files over a network. The SYSGEN variables in Compact 7 adhere to the DLNA 1.5 guidelines, and provide functionality to stream and receive video, music, and image files between devices on a network. Application developers can develop, test, and debug an OS design that is capable of using DMR, DMC, and DMP functionality.

Additional Resources

- [Windows Embedded website](http://go.microsoft.com/fwlink/?LinkID=203338) (http://go.microsoft.com/fwlink/?LinkID=203338)
- [Windows Media Player](http://go.microsoft.com/fwlink/?LinkID=214712) (http://go.microsoft.com/fwlink/?LinkID=214712) (Windows Embedded Compact 7) (http://go.microsoft.com/fwlink/?LinkID=214712)
- [Support for DLNA Media Devices in Windows Embedded Compact 7](http://go.microsoft.com/fwlink/?LinkID=219841) (http://go.microsoft.com/fwlink/?LinkID=219841)
- [DLNA website](http://go.microsoft.com/fwlink/?LinkID=213008) (http://go.microsoft.com/fwlink/?LinkID=213008)

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