

Windows Embedded Compact 7: Building Rich, Connected User Experiences for Embedded Devices

Windows Embedded Technical Article

Summary: Windows® Embedded Compact 7 enables developers like you to build devices that can seamlessly interact with the world of Windows. Compact 7 is a high-confidence platform that provides the tools and foundational operating system to enable devices to be a part of compelling user experiences. Compact 7 also works with Digital Living Network Alliance (DLNA)-based devices.

This white paper discusses the following primary features:

- The DirectShow multimedia pipeline
- The Media Library
- The Media Player

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Table of Contents

Introduction	1
Windows Embedded Compact 7 Features	3
DirectShow Multimedia Pipeline	3
Media Library	5
Media Player	6
Windows Embedded Compact 7 and the DLNA Standard	7
Conclusion	8

Introduction

Windows® Embedded Compact 7 enables developers like you to build devices that can seamlessly interact with the world of Windows. Compact 7 provides a highperformance, highly reliable platform for developers to create powerful, connected devices that take advantage of the latest hardware platforms, including support for the ARM7 processor, hardware graphics acceleration, and symmetric multiprocessing (SMP) support. Familiar tools like Microsoft® Visual Studio®, Microsoft Silverlight®, and Microsoft Expression Blend® provide you with a seamless designer experience to create and deliver rich, intuitive user interface (UI) frameworks and connected user experiences.

Note: If you can develop with Silverlight, you can rapidly extend and customize device UIs by using the rich ecosystem available through <u>Silverlight for Windows</u> <u>Embedded</u>.

Examples of rich user experiences include:

- High fidelity browsing experiences like:
 - An updated Windows Internet Explorer® browsing engine.
 - Desktop browsing that supports tabs, panning, and zooming navigation, as well as multitouch capabilities.
 - Access to rich multimedia content with support for Adobe Flash 10.1.
- Immersive experiences with natural input like:
 - Support for touch input.
 - Multitouch browser integration for mobile device experiences.
 - Support for custom user gestures.

Some examples of connected experiences include:

- The ability for devices to connect, consume, and play back rich media with Compact 7 features like:
 - The Microsoft DirectShow® multimedia pipeline that provides richer media streaming support with updated MPEG-2, MPEG-4, HTTP, and high-definition support.
 - Simplified media management with the new Media Library.
 - A flexible plug-in architecture that supports third-party components.

- Seamless connection to the Windows® 7 operating system like:
 - Simplified device management through integration with Device Stage[™].
 - Transfer of user data and media with Windows 7 with Media Transfer Protocol (MTP) support.
 - Play-to functionality to stream multimedia to and from your Windows 7 personal computer.

Compact 7 also works with Digital Living Network Alliance (DLNA)–based devices. DLNA standards define device categories depending on the functionality they perform. A Digital Media Server (DMS) stores and serves the multimedia content and functions like a Network Access Server (NAS). A Digital Media Player (DMP) can directly access this content and stream it locally, like a DLNA-certified television playing content from a Windows 7 laptop. A Digital Media Renderer (DMR) can render content pushed onto it by a Digital Media Controller (DMC) from a DMS, like a DMC remote control pushing pictures from a Windows 7 laptop onto a DLNA-certified digital picture frame (acting as a DMR). As such, developers can now use Compact 7 to create devices that can act as a DMP, DMR, or a DMC.

Note: Using Compact 7 does not guarantee a pre-certified DLNA compatibility solution. In order to certify any devices built using Compact 7, your company must join the DLNA Consortium, and then submit your devices to testing by the Independent Testing laboratory to obtain DLNA certification.

Compact 7 is a high-confidence platform that provides the tools and foundational operating system to enable devices to part of compelling user experience. The "<u>Windows Embedded Compact 7 Features</u>" section of this white paper discusses the following primary features:

- The <u>DirectShow multimedia pipeline</u>, which provides robust playback possibilities using customizable filters and a building-block approach to device creation with Compact 7.
- The <u>Media Library</u>, which provides users with the means to acquire, organize, manage, and retrieve media content.
- The <u>Media Player</u>, which can play local and streaming multimedia files, both on a specific device and across networks.

Figure 1 illustrates the architecture and interoperability that Compact 7 provides.



Figure 1. Compact 7 architecture

Windows Embedded Compact 7 Features

Windows Embedded Compact 7 comes with features designed to help you build devices that provide robust, rich, and connected user experiences. This section discusses three primary Compact 7 features that comprise vital parts of the new Compact 7 architecture: the DirectShow multimedia pipeline, the Media Library, and the Media Player.

DirectShow Multimedia Pipeline

The DirectShow multimedia pipeline available in Compact 7 comes with new capabilities that provide you with more robust playback possibilities. These include:

- A new, robust, and customizable non-ASF source filter built with:
 - A new buffering filter. The buffering filter allocates memory as required and releases it when it is no longer needed. In doing so, the filter makes efficient use of memory and removes the memory management burden from the demultiplexer filter by providing data in always-pull mode.
 - New MPEG-2 and MPEG-4 demultiplexers.

- The MPEG-2 filter splits MPEG-2 transport and program streams delivered to the filter in pull mode.
- The MPEG-4 filter is a pull-mode filter that requests data from an upstream buffering filter and pushes the demultiplexed streams to down-level decoders.

Note: The following decoders are not included with Compact 7: AAC, AC3, MPEG-1, MPEG-2, and H.264. MPEG-2 and MPEG-4. These decoders are also not supported out of the box. A third-party software decoder or the decoder capability of the platform you are already using is required to render MPEG-2 and MPEG-4 content.

- A new HTTP source filter with non-ASF HTTP filtering capability. The HTTP source filter supports HTTP 1.0 and 1.1 on-demand streaming for content. The filter can connect to any HTTP server compliant with W3C HTTP specifications.
- A new video mixing renderer. This renderer filter replaces the DirectShow Video Renderer filter as the default video renderer. The filter uses DirectDraw to provide the following features:
 - True alpha blending of up to 16 input streams.
 - Access to the composited image before it is rendered.
 - A plug-in that you can use to create custom video effects.

Each of the DirectShow filters is customizable. You can pick and choose what you want to use and how you want to use them, as well as how you want to incorporate your own technologies into the components.

• The ability to play and stream MPEG-2 and MPEG-4 content.

Compact 7 supports MPEG-2 and MPEG-4 formats. Based on these formats, you can build devices that:

- Render and play back local MPEG-2 and MPEG-4 container files.
- Stream MPEG-2 and MPEG-4 container files over HTTP.

Media Library

The Media Library in Compact 7 provides users with the means to acquire, organize, manage, and retrieve their media content. The Media Library addresses a number of key user scenarios. For example, with the Media Library, users can use a device to:

- Browse and discover local media content. The Media Library can be used to store and retrieve metadata information for content residing locally on a device.
- Browse and retrieve media content with the Media Player (acting as a DMP). The user can have tens of thousands of media items and still experience no delays in media playback and retrieval for music, videos, and photos.
- Gather metadata, such as artist name, date, and song name, from different file sources, like HTTP and local files. The metadata gathering runs as a background process, which does not affect the performance of the device as it gathers and parses metadata.
- Add, modify, and remove metadata from media files.
 - This is done using a robust and reliable Microsoft SQL Server® CE 3.5 database for storing and retrieving metadata information about a user's media content, regardless of where the content physically resides. This database has a size limit of 4 gigabytes (GB), which ensures excellent performance and a small memory/CPU footprint. Supported file types include:
 - Music: asf, wma, mp3
 - Videos: asf, wmv, avi
 - Photos: jpg, jpeg, png, tif, tiff, bmp, gif

Note: You can also create your own parser plug-ins to extract metadata for a file type that is not natively supported to make the user experience richer.

- Create, modify, and delete playlists, as well as:
 - Store and retrieve Media Player playlists.

The Media Library also provides capabilities that are developer-friendly, like:

- An extensible architecture that supports content from a variety of sources, such as local, network, UPnP, and third-party services. This means you can build next generation experiences where content can come from any source (like the Internet).
- Nimble and easy-to-use programming-based UI and application programming interfaces (APIs). These help you create device UI that is simple and intuitive for browsing and discovering content.
- A plug-in model that supports content from third party services. You can add additional content providers in future releases of your product.
- The ability to create client-side applications that use MTP to transfer content onto the device.

A key strength of the Media Library is that your device can use the built-in Media Library component to provide applications that deliver great end-to-end experiences. You do not have to create a unique Media Library component, saving you time, money, and resources.

Media Player

The Media Player is a versatile feature in Compact 7 that can play local and streaming multimedia files on both local devices and DLNA–compatible devices on a network. In combination with the DirectShow multimedia pipeline, the Media Player can stream these files from locally-stored locations and across networks from a DLNA DMS device. The Media Player is a fully working, source-code available component. You can either use it as is on your device without any further development or customize it to meet your own specific needs.

The Media Player provides the UI to locate, share, and play media content. For example, in a local DMP device situation, a user can use Media Player to browse all the media content available on a DMS-based server in the user's house (including audio, video, and images), select multiple items, and play them on the user's device. The user can also perform different play-based interactivity options (like seek and skip). The Media Player controls for Compact 7 are similar to those in Windows® Media Player for Windows 7. This provides an advantage to users who can use their personal computers as a gateway to their embedded devices. For example, the user can use a personal computer (as a DMC) to browse content on a server (as a DMS), and then send that content to a set-top box running Compact 7 (as a DMR). The personal computer browses the server in the user's home network, and then pushes the content from the server into the Media Library on the user's set-top box. The user can then view the content on a television, which is connected to the user's set-top box, and use the personal computer to control several aspects of the playback experience, including play, stop, pause, and volume control on the television.

Windows Embedded Compact 7 and the DLNA Standard

DLNA is the industry standard for embedded devices and interoperability. It is used by consumer device manufacturers to allow devices in a home-based setting to share content with each other across a home network. The standard was formed in order to try and solve problems inherent in using digital media between different consumer devices.

Windows Embedded Compact 7 now works and interacts with DLNA-related devices, such as Digital Media Renderers (DMRs), Digital Media Players (DMPs), Digital Media Controllers (DMCs), and Digital Media Servers (DMSs), to provide robust, predictable connectivity between devices across a home network.

This ensures:

- Users have seamless experiences while accessing digital media.
- DLNA-related devices are interoperable with other connected DLNA devices in a home network.

This updated functionality in Compact 7 provides seamlessness between these devices and the world of Windows.

Note: Using Compact 7 does not guarantee a pre-certified DLNA compatibility solution. In order to certify any devices built using Compact 7, your company must join the DLNA Consortium, and then submit your devices to testing by the Consortium to obtain DLNA certification.

Compact 7 now supports both the 2-Box and 3-Box Pull System Usages. The 2-Box Pull System Usage pulls DLNA-compliant content from a DMS to be rendered locally by the DMP pulling the content. The 3-Box Pull System Usage uses a DMC to browse and select content on a DMS to then push that content to a DMR for playback. Support for both system usages provides more robust device interaction throughout the DLNA environment.

Conclusion

Windows Embedded Compact 7 provides a high-performance, highly reliable platform to create powerful, connected devices that enable you to build devices that can seamlessly interact with the world of Windows. The tools and foundational operating system of Compact 7 enable devices that run it to be a part of compelling user experience. Compact 7 features include:

- The DirectShow multimedia pipeline, which provides robust playback possibilities using customizable filters, and a building-block approach to device creation with Compact 7.
- The Media Library, which provides users with the means to acquire, organize, manage, and retrieve media content.
- The Media Player, which can play local and streaming multimedia files, both on a specific device and across networks. It can be customized to your needs or left as-is to provide a rich media experience for your device.

Compact 7 now works with and interacts with DLNA-related devices (DMRs, DMPs, DMCs, and DMSs) to provide robust, predictable connectivity between devices across a home network.

For more information:

Windows Embedded website:

http:www.windowsembedded.com