ADMIN SYSTEM

ENCODING MEDIA FILES

RESOURCE GUIDE

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Overview

Digital Rights Management (DRM) protects your content from unauthorized use. The Microsoft Windows Media Encoder is a powerful tool for the conversion of both live and prerecorded audio and video content into Windows Media files or streams. It is a free application provided by Microsoft and has many useful features; use it to apply DRM technology to your files. This document provides conceptual information about the encoding process and shows you how to use the Windows Media Encoder to quickly produce protected files in a Windows Media Format.

Create License Rules (SKUs)

Use the EC Suite Admin System to create SKUs; they are rules that can be associated with the content that you are about to encode. The rules must be followed by consumers who want to purchase and play your encoded media files. During the encrypting process, the Windows Media Encoder will package the file and license it with the selected SKU. Consult the EC Suite online help for detailed information about the License Rules.

Start a Custom Encoding Session

1. Open the **Windows Media Encoder**.
2. The **New Session** window will be displayed.
3. Double-click the **Custom session** icon to start a custom encoding session.

Configure your Sources from Files

1. In the **Session Properties** window, select the **Sources** tab.
2. In the **Source from** field, select the source: Devices, File, or Both.
3. If **File** is selected, use the **Browse** button to find and select the appropriate file. In the File name field, the following file extensions are accepted: .wma, .wmv, .asf, .avi, .wav, .mpg, .mp3, .bmp, and .jpg.

   ***NOTE:** Files that contain images with odd-sized dimensions are not supported. For example, an image that is 300 x 321 pixels is not supported, but an image that is 300 x 320 pixels is supported.*
4. Choose the source type(s) to encode: **Video**, **Audio**, and/or **Script**. For multi-source sessions, it is recommended that you configure your first source to use all three source types.

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If additional sources do not use a source type, you can encode a blank stream for that source type.

***NOTE:** The higher the quality of the source content, the higher the quality of the output content.*

5. Click the **Apply** button.

Configure your Sources from Devices

1. In the **Session Properties** window, the **Sources** tab will be displayed.
2. In the **Source from** field, select the source: **Devices**, **File**, or **Both**.
3. If Devices is selected, you need to choose the source type to encode (video, audio, and scripts). If you are encoding from a digital device, your device must be turned on or it will not be displayed in the list of devices. After you assign a device to a source, you cannot use it for any other source in the session.
4. Check the **Video** source to assign a video source. Use the **Configure** button to review or edit the selected video source.
5. Check the **Audio** source to assign the appropriate audio device to the source. Use the **Configure** button to review or edit the device settings.
6. Check the **Scripts** source to assign a script to the source. Use the **Configure** button to edit the script.
7. Use the **Source** list box on the left to add new sources to the current encoding session, select existing sources to edit the properties, or remove sources that you do not want to include in the session.
8. To rearrange the order in which your sources are displayed in the main window of the encoder, select a source, and then click the **up arrow** button or **down arrow** button.
9. Click the **Apply** button to save the sources.

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Compression

Digital video and audio data consumes a lot of bandwidth when uncompressed. Compression is necessary for efficient broadcasting over Internet bandwidths or saving to a Windows Media file of a reasonable size. You can compress content by applying compression algorithms to the data, taking into account the desired output quality and available bandwidth. Before the content is played, it is decompressed by using decompression algorithms.

Using Windows Media Encoder, you can encode audio and video content at either a constant bit rate (CBR) or a variable bit rate (VBR).

When using CBR encoding, specify the bit rate to be maintained and set the size of the buffer. The bit rate will fluctuate across the stream; however, the fluctuations are constrained by the buffer size. Use CBR for all content that is to be streamed.

When using VBR encoding, choose between **Bit rate-based VBR** and **Quality-based VBR**.

The bit rate-based VBR and quality-based VBR encoding modes are not recommended for use in a streaming scenario as a result of the high bit rate peaks in the content. In a streaming scenario, when all players reach the point in the stream with a high bit rate at approximately the same time, there is a large peak in demand. This peak may exceed the network capacity, resulting in a negative playback experience.

Bit rate-based Compression Configuration

Bit rate-based VBR encoding allows you to specify the desired average bit rate. At any point, the bit rate may exceed the average bit rate but the overall bit rate does not exceed the average bit rate. Bit rate-based VBR encoding uses two-pass encoding: In the first pass, the data is analyzed. In the second pass, the quality level is set to achieve the average bit rate.
The advantage of bit rate-based VBR encoding is that the compressed stream will achieve the highest possible quality level while staying within the expected average bandwidth.

1. In the **Session Properties** window, click on the **Compression** tab, where you can determine the distribution method and encoding settings.

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2. In the **Destination** drop-down window, select a predefined distribution method. Each destination setting takes various requirements into consideration. Your selection determines the items that are available in the **Audio** and **Video** drop-down menus and in the **Bit rates** list. The combination of your choices establishes the settings (for example, the encoding mode, amount of compression, codecs, bit rate, and frame rate) that are used in a session.
3. Click the **Edit** button to display the **Custom Encoding Settings** screen, where you can customize, import, or export a profile. See *Custom Encoding Settings* for further information.
4. In the **Video** drop-down window, select a video format.
5. In the **Audio** drop-down window, select an appropriate audio format.
6. In the **Bit Rates** list, click the bit rate you want to use. If **File archive** or **File download** was selected as destinations, the video quality setting is displayed. If **Windows Media Server** was selected in the **Destination drop-down menu**, more than one bit rate can be selected to set up a multiple-bit-rate session.

   ***NOTE:** When selecting a higher quality Video or Audio format, the Bit Rate and Output Size listed in the Bit rates list are automatically adjusted.*

7. **Two-pass encoding** may be selected by default or become available. With two-pass encoding, content is analyzed during the first pass and then encoded in the second pass. Two-pass encoding can result in better quality content because the encoder evaluates and finds, based on the scene composition, the optimal combination of bit rate, frame rate, buffer size, and image quality, but does require more time as it goes through the content twice.

   ***NOTE:** For streamed events two-pass encoding is not available.*

8. Select **Time compression** to speed up or slow down your content during playback. To set the amount of acceleration or deceleration for the content or to remove pauses from the audio, click **Properties**. It is not possible to apply time compression to a video-only source. If you use time compression in conjunction with the **Limit By Duration** option on the **Output** tab, remember that the limit is placed on the output file and not the source. Consequently, your output file might contain more or less content than you expected. For example, if you chose to limit the output file to 30 minutes and then chose to accelerate the playback of the file by a factor of 2, the output file will last 30 minutes but contain 60 minutes of content.
9. Click the **Apply** button to save the settings.

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Custom Encoding Settings

Use this feature to view or customize settings for a profile. You can also Import an existing profile for editing. To save changes to the profile, click the **Export** button. All profiles have a .prx file name extension.

1. In the **General** tab, enter a name for the profile into the **Name** field.
2. Enter a **Description**.
3. Select a **Language** for the content. The default is the language set on the encoding computer. Encoding content in different languages allows consumers to select their language during playback.
4. The **Media Types** area allows you to specify the combination of source types to be supported by the profile:
   - Select **Audio** to edit the Mode and Codec for the audio portion of the content.
   - Select **Video** to edit the Mode and Codec for the video portion of the content.
   - Select **Script** to insert script commands into a stream while encoding.
   - **Mode** selection: From the list, select the **VBR** mode you want to use for audio and video. VBR (variable bit rate) encoding is recommended when the content will be distributed for downloading and playing either locally or on a device such as a CD or DVD player. When encoding content that is a mix of simple and complex data, e.g., a video that switches between slow and fast motion, VBR is the preferred method. Select the **CBR** mode if you are distributing streamed content. With CBR encoding, the bit rate remains fairly constant and close to the target bit rate over the course of the stream. The **Mode** selection directly impacts the settings in the Per Bit Rate tab.
   - **Codec** selection: Note that not all codecs support the VBR modes or two-pass CBR encoding. To reduce the size of content, compression algorithms are applied to the data. Before the content is played by the consumer, it must be decompressed by using decompression algorithms. These compression and decompression algorithms are called codecs.

     ***NOTE:** DRM encryption is not compatible with all codecs; therefore use Windows Media codecs for DRM encrypted content.*

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5. The **Target bit rates** area lists the bit rates that are currently selected. To create a different bit rate for your content, click the **Add** button. To customize a bit rate, select a bit rate, and then click the **Edit** button. Select at least one bit rate.
6. Select the **Video format**. Specify the format of your source video (either **NTSC** or **PAL**). If you change the frame rate or video size to a nonstandard setting, the format is automatically selected as **Custom**.
    - Select **Allow interlaced processing** if your content is interlaced and you want the encoded output to remain interlaced. **NOTE:** Also select the Maintain interlacing option on the Processing tab.
    - Select **Allow non-square pixel output** if the source video uses rectangular pixels (for example, if your source is from digital video), or if the source video has an aspect ratio that differs from 4:3 and you want to retain the aspect ratio in the encoded output. Note that you can control the aspect ratio on the Video Size tab.

Per Bit Rate Settings

Click on the second tab, it is dynamically named after the Mode that was selected in the **General** tab.

The following settings are applicable to a profile that uses bit rate-based encoding.

1. Select an **Audio format**. This setting determines the target audio bit rate, sampling rate, and whether the audio is intended for playback on mono or stereo speakers. A higher sampling rate yields higher-quality audio but requires more bandwidth or results in a larger file. Ideally, you want to achieve the right balance between bit rate and sampling rate. Remember that the audio stream must share the available network bandwidth with any video or script streams.
2. Enter the **Video size** (in pixels) to be used for the encoded video. Use numbers from 16 through 2000. The frame size of the encoded video will be resized to match the size you specify. Select **Same as video input** to match the frame size of the source video.
3. Enter a **Frame rate** for the video stream. It is measured in frames per second (fps). This value depends on the speed of your computer processor and whether you are encoding high-motion or low-motion video. High-motion video generally looks smoother if you use a higher

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frame rate, but a higher frame rate increases the amount of work the processor must perform. The setting you specify represents the maximum fps. Depending on factors such as the video size setting and available bandwidth, the actual fps you achieve might be lower. Typically, the frame rate is reduced when encoding from devices (i.e. live streams). Converted files usually have within 1% of the expected frame rate.

4. Enter the **Key frame interval**, which is the number of seconds that you want to separate key frames. All frames between key frames are delta frames, which are considerably smaller than key frames but have poor visual quality. If you increase the time between key frames, the size of the video (in bytes) gets smaller because fewer key frames are used. If you decrease the time between key frames, the size of the video increases. Increase the key frame interval for content with a static background, such as cartoons. Decrease the key frame interval for high-motion content, such as a sporting event.

5. Enter the **Video bit rate** (in bits per second) to be used for the video portion of your content. Type K for kilobits, M for megabits, or G for gigabits. The amount does not include the overhead required to accommodate network traffic. Remember that the video stream must share the available network bandwidth with any audio or script streams.

6. Enter the **Buffer size**, which is the number of seconds that you want content to be stored before encoding begins. A larger buffer results in better quality content, but requires more memory. When you encode content, the encoding process is delayed by the amount of time specified in the buffer; the content is also delayed by the same amount of time when streaming to a player. When streaming a broadcast, the content played in the Player runs behind the live event by the amount of time that you specify in **Buffer size**. The default buffer size is 5 seconds.

7. Enter the **Video smoothness** as a number between 0 and 100, with 0 yielding the smoothest image and 100 yielding the clearest image. Video appears smooth when objects move easily from one position to another on the screen and the edges of objects are not jagged. Video appears clear when images and motion are well-defined and clearly delineated. As you increase the clarity, the video becomes less smooth. Keep in mind that increasing the clarity can affect the frame rate, depending on the video. For example, if your video contains a lot of motion, increasing the clarity may decrease the frames per second.

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8. Select the **Decoder complexity**. If you are targeting a hardware device other than a computer, you can specify a category of complexity for the content being encoded. Some hardware devices only support certain categories. The **Complex** option is intended for playback on computers. Typically, you should select **Auto**, which enables the correct complexity setting to be selected automatically during encoding.
9. Enter the **Script bit rate** in bits per second. The value must be between 1,000 bps and 10,000 bps. Type **K** for **kilobits**. This bit rate will be used for scripts.
10. Click the **OK** button to save the changes.

Quality-based Compression Configuration

Quality-based VBR encoding allows you to specify a desired quality level (from 0 to 100). During the encoding process, the bit rate fluctuates according to the complexity of the content; a higher bit rate is used for detailed elements or high motion while a lower bit rate is used for simpler portions. Use quality-based VBR encoding to ensure consistent quality across all content for which you specify the same setting. However, the file size or bandwidth requirements of the encoded content cannot be predicted before encoding. Quality-based VBR encoding uses one-pass encoding which is appropriate for archiving content.

1. In the **Session Properties** window, click on the **Compression** tab, where you can determine the settings that are available in Audio and Video.
2. The combination of your choices determines what settings (for example, the encoding mode, amount of compression, bit rate, and frame rate) are used in the session.
3. In the **Destination** drop-down window, you can select a predefined destination. The encoder includes predefined destination settings that have taken various requirements into consideration. However, if none of the destinations fit your needs, click the **Edit** button to display the Custom Encoding Settings screen, where you can customize the settings.
4. Click on the **Quality-based** tab.
5. Select the quality level you want to maintain from the **Audio format** drop-down menu. This setting determines whether the audio is intended for playback on mono or stereo speakers.

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***NOTE:** A higher-quality setting yields higher-quality audio but increases the size of the output file.*

6. Select the **Video size**. For best possible quality, this size should not exceed your source file. Type the size (in pixels) you want to use for the encoded video. Use numbers from 16 through 2000. The frame size of the encoded video will be resized to match the size you specify. Click the **Same as video input** checkbox to match the frame size of your source video.

   ***NOTE:** Odd-sized images are not supported. An image that is 300 x 321 pixels is not supported and needs to be resized to 300 x 320 pixels.*

7. Enter a **Frame rate**. This is the number of frames per second (fps) for the video content. The amount that you adjust this value to depends on the speed of your computer processor and whether you are encoding high-motion or low-motion video. High-motion video generally looks smoother if you use a higher frame rate, but a higher frame rate increases the amount of work the processor must perform.

   ***EXAMPLE:** Selecting a lower frame rate of 5 will leave you with a clear picture, but the video might not advance smoothly from frame to frame. A frame rate of 60, on the other hand, will produce fluid transitions, but the picture could reveal pixels.*

8. Enter a **Key frame interval**. This is the number of seconds to pass between separate key frames. The frames between key frames are significantly smaller and have poor visual quality. If you increase the time between key frames, the size of the video (in bytes) gets smaller because fewer key frames are used. If you decrease the time between key frames, the size of the video increases. **TIP:** Increase the key frame interval for content with a static background, such as cartoons. Use fewer key frames for high-motion content.

9. Enter the **Video quality**. This is a value between 0 and 100 which specifies the image quality to be maintained. During the encoding process, the bit rate is automatically adjusted to achieve the specified quality level without dropping any frames.

10. Select the **Decoder complexity**. If you are targeting a hardware device other than a computer, you can specify a category of complexity for the content being encoded. Some hardware devices only support certain categories. Select **Complex** if the file is encoded for

playback on computers. Select **Auto** to automatically select the correct complexity setting during encoding.

11. Click the **OK** button to save the settings.
12. Click the Start Encoding button to encode the video.

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Glossary

- **Bit rate** is the frequency at which bits are passing a given point. It is measured in bit per second (bps). The bit rate measures the number of bits/time. When encoding audio/visual data, differences from the original signal can be introduced in form of quality loss. The quality depends on the quality of the input data, the compression scheme, and the encoder power. Minimum standard bit rates are listed below:

  Audio

  8 kbit/s = telephone quality
  32 kbit/s = MW quality
  96 kbit/s = FM quality
  128 kbit/s = CD quality

  Video

  32 kbit/s = videophone quality
  2 Mbit/s = VHS quality
  8 Mbit/s = DVD quality
  55 Mbit/s = HDTV quality

- **CBR** (constant bit rate) uses a constant rate at which output data should be consumed. Therefore, CBR is useful for streaming multimedia content, but is not optimal for media storage as it may waste data on simple sections and not allocate enough data for complex sections, resulting in mediocre quality. The quality of CBR encoded content is not constant; therefore CBR encoding can result in inconsistent quality from one stream to the next. In general, quality variations are more pronounced at lower bit rates.
- **Codec** stands for **Co**der-**Dec**oder. It is a device or program that performs transformations on a data stream or signal. Codecs is used to put a stream or signal into an encoded form for transmission, storage or encryption. Codecs is also used to decode a file for viewing. Codecs are often used to stream media files.
- **Encoding Mode** is either CBR or VBR. The Windows Media Encoder can encode audio and video content at either a constant bit rate (CBR) or a variable bit rate (VBR).
- **Frame Rate** is the number of video frames displayed per second. A higher frame rate will produce smoother movement in the picture.
- **NTSC** is named after the industry-wide standardization body that created it, the National Television System Committee. It is the analog television system currently used in the United States, most of the Americas and some parts of East Asia.
- **PAL** stands for phase-alternating line. It is colour encoding used in broadcast television systems throughout the world, except in most of the Americas and some East Asian countries, which use NTSC. Parts of the Middle East, Eastern Europe, and France use SECAM, though most of them are in the process of adopting PAL.
- The **one-pass encoding method** analyzes and compresses content in the same pass through the encoder.
- The **two-pass encoding method** analyzes the content in the first pass through the encoder, and then compresses the content in the second pass.
- **VBR** (variable bit rate) encoding varies the amount of output data in each time segment based on the complexity of the input data in that segment. During encoding, VBR is used to maintain a constant quality rather than a constant data rate. VBR is preferred for storage (as opposed to streaming) because it makes better use of storage space.

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