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INTRODUCTION

This document explains the codec and file format support in the following versions of Helix Producer encoding products and the Helix Server streaming media server:

• RealProducer, Helix Producer, and Helix Mobile Producer Release 14
• Helix Server and Helix Mobile Server Release 14.2

It covers Helix Server support for various streaming protocols, including RTSP, RTMP, and HTTP Live. It also demonstrates how you can use Helix Producer and Helix Server to reach a large number of media players using a single media stream encoded with the H.264 and AAC codecs.

How This Guide Is Organized

Chapter 1: Helix Producer Encoding Formats
Helix Producer can encode media from a file or live input into a variety of streaming file formats. This chapter introduces you to the codec and file formats available with Helix Producer.

Chapter 2: Helix Server File Formats and Codecs
This chapter provides an overview of the file formats and codecs that Helix Server can stream.

Chapter 3: Helix Server Streaming Protocols
To reach multiple media players, Helix Server supports the most popular streaming protocols. This chapter covers media delivery using RTSP, RTMP, MMS, and HTTP Live.

Chapter 4: Universal Delivery
This chapter walks you through the process of using Helix Producer to encode a clip using the H.264 and AAC codecs and then streaming that clip to different types of media clients using Helix Server.

Appendix A: Streaming Media Tips
This appendix provides tips for creating good streaming presentations.
Conventions Used in this Guide

The following table explains the typographical conventions used in this guide.

<table>
<thead>
<tr>
<th>Convention</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>emphasis</td>
<td>Bold text is used for in-line headings, user-interface elements, URLs, and e-mail addresses.</td>
</tr>
<tr>
<td>terminology</td>
<td>Italic text is used for technical terms being introduced, and to lend emphasis to generic English words or phrases.</td>
</tr>
<tr>
<td>syntax</td>
<td>This font is used for fragments or complete lines of programming syntax (markup).</td>
</tr>
<tr>
<td>syntax emphasis</td>
<td>Bold syntax character formatting is used for program names, and to emphasize specific syntax elements.</td>
</tr>
<tr>
<td>variables</td>
<td>Italic syntax character formatting denotes variables within fragments or complete lines of syntax.</td>
</tr>
<tr>
<td>[options]</td>
<td>Square brackets indicate values that you may or may not need to use. As a rule, when you use these optional values, you do not include the brackets themselves.</td>
</tr>
<tr>
<td>choice 1</td>
<td>choice 2</td>
</tr>
<tr>
<td>...</td>
<td>Ellipses indicate nonessential information omitted from examples.</td>
</tr>
</tbody>
</table>
This chapter explains the basic capabilities of Helix Producer products, focusing on the media encoding formats supported. It explains the types of outputs you can create, listing the audio and video codecs that each output format can use.

**Helix Producer Products**

Helix Producer products can encode media in popular streaming and download formats, including 3GPP, MPEG-4, MP3, and RealMedia. Helix Producer 14 is available in three versions:

- Helix Mobile Producer — The fully featured Helix Mobile Producer addresses the needs of the mobile industry with support for 3GPP Release 6 and Release 5 outputs in addition to MPEG-4, MP3, and RealMedia outputs.
- Helix Producer — Helix Producer encodes MPEG-4, MP3, and RealMedia outputs, addressing the streaming media needs of a wide range of desktop clients.
- RealProducer — RealProducer encodes RealAudio and RealVideo outputs. It is available for free.

For More Information: Refer to your RealNetworks sales representative for pricing information for Helix Mobile Producer and Helix Producer.

**Supported Operating Systems**

All Helix Producer products are available on the following platforms:

- Windows XP with Service Pack 3 (SP3)
- Windows Vista
- Windows 7
- Windows Server 2003 and 2008

**Output Formats and Codecs**

The following table summarizes output format and codec support across Helix Producer products.

<table>
<thead>
<tr>
<th>Format or Codec</th>
<th>Helix Mobile Producer</th>
<th>Helix Producer</th>
<th>RealProducer</th>
</tr>
</thead>
<tbody>
<tr>
<td>3GPP Release 5 and 6 outputs</td>
<td>yes</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>MPEG-4 output</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>ISMA 1 and 2 compliant outputs</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>MP3 audio output</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
</tbody>
</table>

(Table Page 1 of 2)
The following table summarizes general feature availability across Helix Producer products.

### Helix Producer Feature Availability

<table>
<thead>
<tr>
<th>Feature</th>
<th>Helix Mobile Producer</th>
<th>Helix Producer</th>
<th>RealProducer</th>
</tr>
</thead>
<tbody>
<tr>
<td>graphical application</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>command-line application</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>file input (compressed and uncompressed)</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>live capture input</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>network input from RTSP servers</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>network input from MPEG-2 TS encoders</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>unicast output to Helix Server</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>multicast output to Helix Servers</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>unicast output to RTP-based server</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>multicast output to RTP-based servers</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>archive file for broadcasts</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>SNMP monitoring</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
</tbody>
</table>


### Graphical and Command Line Applications

All versions of Helix Producer provide two separate applications that you can use to encode output clips or live broadcasts:

- Graphical Application — The graphical application provides an easy-to-use interface for selecting inputs and setting up outputs. Helix Producer saves your encoding options in an XML-based job file that can be reused, modified, or run from the command line.
Helix Media Delivery Platform Codec and Protocol Support

CHAPTER 1: Input Methods

• Command-Line Application — The command-line application allows you to process a job file or enter all encoding options directly at a Windows command prompt. This allows you to start Helix Producer encoding functions from a batch file or process all input files in a directory using a single job file.

Input Methods

Helix Producer accepts three types of input:

• Network input — Encode the output from MPEG-2 or MPEG-4 network servers.
• File input — Encode a compressed or uncompressed input file into a supported output file format.
• Live input — Encode live input to a file or send it to a broadcast server for live delivery to media clients. Helix Producer supports most capture cards or USB cameras and microphones available for Windows.

Network Input Formats

Helix Producer and Helix Mobile Producer accept MPEG-2 transport stream output from an MPEG-2 encoder over a network connection:

<table>
<thead>
<tr>
<th>Format</th>
<th>Extensions</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>video format:</td>
<td>MPEG-1, MPEG-2, VC-1</td>
<td></td>
</tr>
<tr>
<td>audio format:</td>
<td>MPEG-1 or MPEG-2 Layer 1/2, AC-3 (Dolby Digital), LPCM</td>
<td></td>
</tr>
</tbody>
</table>

Helix Producer, Helix Mobile Producer, and RealProducer also accept MPEG-4 output streaming from an RTSP server:

<table>
<thead>
<tr>
<th>Format</th>
<th>Extensions</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>video format:</td>
<td>H.264, H.263, MPEG-4 Part 2</td>
<td></td>
</tr>
<tr>
<td>audio format:</td>
<td>AAC, AAC+, AMR-NB, AMR-WB, G.711 a-law, G.711 u-law</td>
<td></td>
</tr>
</tbody>
</table>

Note: Encoding from a network input source is available only when you use the Helix Producer command-line application.

Uncompressed File Input Formats

For file inputs, Helix Producer supports a variety of uncompressed formats, including AVI, QuickTime, and WAVE. The following table lists the common file input formats used with Helix Producer.

<table>
<thead>
<tr>
<th>Format</th>
<th>Extensions</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIFF</td>
<td>.aif, .aifc, .aiff</td>
<td>Requires DirectX 9.1 or higher on Windows.</td>
</tr>
<tr>
<td>AU</td>
<td>.au, .snd, .ulw</td>
<td>Requires QuickTime on Windows.</td>
</tr>
<tr>
<td>AVI</td>
<td>.avi</td>
<td>Compressed AVI is available on Windows if DirectX 9.1 or higher is installed.</td>
</tr>
<tr>
<td>DV</td>
<td>.dif, .dv</td>
<td>Requires QuickTime on Windows.</td>
</tr>
</tbody>
</table>

(Table Page 1 of 2)
### Compressed File Input Formats

Using compressed formats as input allows you to transcode clips from streaming formats such as Flash, Windows Media, compressed QuickTime, and most MPEG variants to supported output formats. Typically, any audio or video file that can play in Windows Media Player can be used as an input.

<table>
<thead>
<tr>
<th>Format</th>
<th>Extensions</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>3GPP</td>
<td>.3gp</td>
<td>Release 5 and Release 6 formats supported.</td>
</tr>
<tr>
<td>Flash</td>
<td>.flv</td>
<td>Support for VP6 video. The .f4v file format encoded with H.264 and AAC is <strong>not</strong> accepted as an input.</td>
</tr>
<tr>
<td>MP3</td>
<td>.mp3</td>
<td>Most MP3 files can be used as input sources.</td>
</tr>
<tr>
<td>MPEG-1</td>
<td>.mpeg, .mpg</td>
<td>Most MPEG-1 files and codecs are supported.</td>
</tr>
<tr>
<td>MPEG-2</td>
<td>various</td>
<td>Requires the DirectShow MPEG-2 reader. If you experience problems using MPEG inputs under DirectX on Windows, install QuickTime. Helix Mobile Producer and Helix Producer do <strong>not</strong> read MPEG-2 transport files from disk.</td>
</tr>
<tr>
<td>MPEG-4</td>
<td>.mp4, .m4</td>
<td>Most MPEG-4 file types and codecs are supported.</td>
</tr>
<tr>
<td>QuickTime</td>
<td>.mov</td>
<td>Support for most older codecs such as Sorenson as well as H.264 video and AAC audio.</td>
</tr>
<tr>
<td>Windows Media</td>
<td>.asf, .wm, .wma, .wmv</td>
<td>Most Windows Media formats are supported.</td>
</tr>
</tbody>
</table>

**Tip:** For best results, transcode a clip using encoding settings similar to those of the input clip. For instance, encode the same number of audio channels and use roughly the same audio and video bit rates. For multi-rate clips, the highest streaming bit rate is used as the input.

### Output Formats

When you encode an input with Helix Producer, you choose one or more output formats. The following image illustrates a user choosing a new output type with the **Output** tab of the Helix Producer graphical application.
Creating an Output in Helix Producer

The following sections summarize the output choices you can select in the various versions of Helix Producer. The summary table for each entry indicates the audio and video codecs compatible with that output type.

**Tip:** All Helix Producer products can encode multiple outputs from a single input. For example, you might encode an AVI input as both an MPEG-4 clip and a RealMedia clip. Helix Producer uses one processor core for each output. For example, a server with four processor cores can encode four outputs simultaneously.

### 3GPP Release 5

3GPP Release 5 outputs are designed for older mobile media players that have slower processors. The format supports fewer video and audio codec choices than 3GPP Release 6.

<table>
<thead>
<tr>
<th>encoder</th>
<th>Helix Mobile Producer</th>
</tr>
</thead>
<tbody>
<tr>
<td>players</td>
<td>Media players compliant with the 3GPP R5 standard and the chosen audio and video codecs.</td>
</tr>
<tr>
<td>file type</td>
<td>3GPP Release 5 (.3gp)</td>
</tr>
</tbody>
</table>
| audio         | voice: AMR-NB
                | music: AAC-LC                                              |
| video         | H.263 (profile 0), MPEG-4 Part 2 (Simple profile)          |
| multi-rate    | no                                                         |

### 3GPP Release 6

3GPP Release 6 outputs target newer mobile media players that have faster processors and data connections. This format supports a larger number of video and audio choices than 3GPP Release 5.

<table>
<thead>
<tr>
<th>encoder</th>
<th>Helix Mobile Producer</th>
</tr>
</thead>
<tbody>
<tr>
<td>players</td>
<td>Media players compliant with the 3GPP R6 standard and the chosen audio and video codecs.</td>
</tr>
<tr>
<td>file type</td>
<td>3GPP Release 6 (.3gp)</td>
</tr>
<tr>
<td>audio</td>
<td>voice: AMR-NB, AMR-WB</td>
</tr>
<tr>
<td></td>
<td>music: AAC-LC, AAC+</td>
</tr>
<tr>
<td>video</td>
<td>H.263 (profile 0), H.264 (Baseline profile), MPEG-4 Part 2 (Simple profile)</td>
</tr>
<tr>
<td>multi-rate</td>
<td>yes</td>
</tr>
</tbody>
</table>
**MPEG-4**

MPEG-4 is a general-purpose format supported by a large number of desktop and mobile media players.

<table>
<thead>
<tr>
<th>encoder:</th>
<th>Helix Mobile Producer, Helix Producer</th>
</tr>
</thead>
<tbody>
<tr>
<td>players:</td>
<td>MPEG media players compatible with the chosen audio and video codecs.</td>
</tr>
<tr>
<td>file type:</td>
<td>MPEG-4 (.mp4), MPEG-4 audio (.m4a)</td>
</tr>
<tr>
<td>audio:</td>
<td>voice: AMR-NB, AMR-WB, AAC-LC, AAC+</td>
</tr>
<tr>
<td>video:</td>
<td>H.263 (profiles 0 and 3), H.264 (Baseline, Main, and High profiles), MPEG-4 Part 2 (Simple and Advanced Simple profiles)</td>
</tr>
<tr>
<td>multi-rate:</td>
<td>yes</td>
</tr>
</tbody>
</table>

**ISMA 1**

ISMA 1 is a standardized output based on the MPEG-4 specification. It constrains the audio and video codec choices to support devices that have slower processors and data connections. Helix Producer supports Profiles 0 and 1 of the ISMA 1 standard.

<table>
<thead>
<tr>
<th>encoder:</th>
<th>Helix Mobile Producer, Helix Producer</th>
</tr>
</thead>
<tbody>
<tr>
<td>players:</td>
<td>Media players compliant with the ISMA 1 standard.</td>
</tr>
<tr>
<td>file type:</td>
<td>MPEG-4 (.mp4)</td>
</tr>
<tr>
<td>audio:</td>
<td>AAC-LC</td>
</tr>
</tbody>
</table>
| video: | Profile 0: MPEG-4 Part 2 Simple profile, up to level 1 at 64 Kbps  
Profile 1: MPEG-4 Part 2 Advanced Simple profile, up to level 3b at 1.5 Mbps |
| multi-rate: | no |

**For More Information:** For details about the ISMA standard, refer to the Web site of the Internet Streaming Media Alliance at [http://www.isma.tv/](http://www.isma.tv/).

**ISMA 2**

ISMA 2 is a standardized output based on the MPEG-4 specification. It is designed for streaming at large screen sizes and high bit rates. The format supports more video and audio codec choices than ISMA 1. Helix Producer supports Profiles 2, 3, and 4 of the ISMA 2 standard.

<table>
<thead>
<tr>
<th>encoder:</th>
<th>Helix Mobile Producer, Helix Producer</th>
</tr>
</thead>
<tbody>
<tr>
<td>players:</td>
<td>Media players compliant with the ISMA 2 standard.</td>
</tr>
<tr>
<td>file type:</td>
<td>MPEG-4 (.mp4)</td>
</tr>
<tr>
<td>audio:</td>
<td>Profile 2, 3, 4: AAC-LC, AAC+</td>
</tr>
</tbody>
</table>
| video: | Profile 2: H.264 Baseline or Main profile, up to level 2 at 1.2 Mbps  
Profile 3: H.264 Main profile, up to level 3 at 3.7 Mbps  
Profile 4: H.264 High profile, up to level 4 at 15 Mbps |
| multi-rate: | yes |
MP3

MP3 is the audio layer of the MPEG-1 standard. It is appropriate for encoding downloadable music clips.

| encoder: | Helix Mobile Producer, Helix Producer |
| players: | Any MP3-enabled device. |
| file type: | MP3 (.mp3) |
| audio: | MP3 |
| video: | none |
| multi-rate: | no |

**Note:** Helix Producer does not support the MP3 format for live audio broadcasts or for audio tracks within video clips.

RealMedia

The RealMedia output is a proprietary RealNetworks format. It can be played by the desktop RealPlayer, most Helix-based media players, and any media player that includes the RealMedia codecs.

| encoder: | Helix Mobile Producer, Helix Producer, RealProducer |
| players: | Desktop versions of RealPlayer. Mobile devices based on Helix technology. |
| file type: | RealMedia (.rm, .ra, .rv, .rmvb) |
| audio: | RealAudio |
| video: | RealVideo |
| multi-rate: | yes |

Audio Codecs

The following sections summarize the audio codecs that Helix Producer supports. When you encode an input using the Helix Producer graphical application, your choice of output format automatically determines which audio codec you can choose.

**Audio Codec Selection in the Helix Producer Graphical Application**

**For More Information:** Refer to the table “Helix Producer Output Format and Codec Support” on page 3 for information about which versions of Helix Producer support the various audio encoding formats.
AAC

Advanced Audio Coding (AAC) codecs are widely used to encode audio in 3GPP and MPEG-4 outputs. Helix Producer supports a variety of AAC and AAC+ codecs:

• AAC-LC mono codecs from 8 to 160 Kbps.
• AAC-LC stereo codecs from 24 to 320 Kbps.
• AAC+ mono codecs from 8 to 160 Kbps.
• AAC+ stereo codecs from 24 to 256 Kbps.

**Note:** Helix Producer does not support Enhanced AAC Plus, which is also known as EACC+ and HE-AAC v2.

AMR

The Adaptive Multi-Rate speech codec (AMR) encodes vocal audio input. You can use it in 3GPP and MPEG-4 outputs. You can encode AMR-NB at bit rates of 4.75 to 12.2 Kbps and AMR-WB at rates of 6.6 to 23.84 Kbps.

**Tip:** The Apple iPhone supports AMR only for downloaded files, not for streaming audio.

MP3

Helix Producer encodes MP3 audio as a stand-alone MP3 file (.mp3) suitable for downloading. Bit rates for mono tracks range from 16 to 160 Kbps. Stereo bit rates range from 40 to 320 Kbps.

RealAudio

The following RealAudio codecs are available for audio encoding with the RealMedia output format:

• RealAudio voice codecs from 5 to 64 Kbps.
• RealAudio mono music codecs from 6 to 64 Kbps.
• RealAudio stereo music codecs from 12 to 320 Kbps.
• RealAudio stereo surround music codecs from 44 to 320 Kbps.

Video Codecs

The following sections explain the profiles and levels supported for each available video codec. When you encode using the Helix Producer graphical application, your choice of output format automatically determines which video codec, profile, and level you can choose.
CHAPTER 1: Video Codecs

For More Information: Refer to the table “Helix Producer Output Format and Codec Support” on page 3 for information about which versions of Helix Producer support the various video encoding formats.

H.264

The H.264 codec, also known as MPEG-4 Part 10 or AVC, is widely used for compressing video in 3GPP and MPEG-4 outputs. When encoding video content using the H.264 codec, you can choose the Baseline, Main, or High profile along with one of the levels listed in the following table.

<table>
<thead>
<tr>
<th>Level</th>
<th>Maximum Bit Rate</th>
<th>Maximum Frame Size (Width x Height/256)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>64 Kbps</td>
<td>99</td>
</tr>
<tr>
<td>1b</td>
<td>128 Kbps</td>
<td>99</td>
</tr>
<tr>
<td>1.1</td>
<td>192 Kbps</td>
<td>396</td>
</tr>
<tr>
<td>1.2</td>
<td>384 Kbps</td>
<td>396</td>
</tr>
<tr>
<td>1.3</td>
<td>768 Kbps</td>
<td>396</td>
</tr>
<tr>
<td>2</td>
<td>2 Mbps</td>
<td>396</td>
</tr>
<tr>
<td>2.1</td>
<td>4 Mbps</td>
<td>792</td>
</tr>
<tr>
<td>2.2</td>
<td>4 Mbps</td>
<td>1620</td>
</tr>
<tr>
<td>3</td>
<td>10 Mbps</td>
<td>1620</td>
</tr>
<tr>
<td>3.1</td>
<td>14 Mbps</td>
<td>3600</td>
</tr>
<tr>
<td>3.2</td>
<td>20 Mbps</td>
<td>5120</td>
</tr>
<tr>
<td>4</td>
<td>20 Mbps</td>
<td>8192</td>
</tr>
</tbody>
</table>
The maximum frame size given in the preceding table is defined as the width in pixels multiplied by the height in pixels, divided by 256. Using this formula, the frame size of 352×288 results in a value of 396, requiring the use of level 1.1 or higher.

**Tip:** To stream H.264 clips using Helix Server, use the Baseline or Main profile and keep the maximum video bandwidth below 3 Mbps. For details about Helix Server support for H.264, see “H.264” on page 19.

### H.263

Helix Producer supports profiles 0 and 3 for the H.263 video codec, which is suitable for reaching older media players running on slower processors. Each of the possible encoding levels listed in the following table specifies a maximum frame rate and streaming bit rate. Each higher level typically includes more advanced encoding features. A device may support only certain levels, however.

<table>
<thead>
<tr>
<th>Level</th>
<th>Max. Bit Rate</th>
<th>Video Resolutions</th>
<th>Max. Frame Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>64 Kbps</td>
<td>128 × 96 (SQCIF)</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>176 × 144 (QCIF)</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>128 Kbps</td>
<td>128 × 96 (SQCIF)</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>176 × 144 (QCIF)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>352 × 288 (CIF)</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>384 Kbps</td>
<td>128 × 96 (SQCIF)</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>176 × 144 (QCIF)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>352 × 288 (CIF)</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>2 Mbps</td>
<td>128 × 96 (SQCIF)</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>176 × 144 (QCIF)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>352 × 288 (CIF)</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>128 Kbps</td>
<td>128 × 96 (SQCIF)</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>176 × 144 (QCIF)</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>4 Mbps</td>
<td>352 × 240 or smaller</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>352 × 288 (CIF) or smaller</td>
<td>50</td>
</tr>
</tbody>
</table>

**Note:** Customized video frame sizes are supported only with level 45 and higher.

**Tip:** Many media players are phasing out support for H.263. The Apple iPhone, for instance, supports H.263 only for downloaded files, not for streaming playback.
MPEG-4 Part 2

MPEG-4 Part 2 is a general-purpose video codec that can be used with 3GPP and MPEG-4 outputs. The following table explains the MPEG-4 Part 2 levels available for the Simple profile (ISO/IEC 11172-2), which is supported by most devices capable of playing MPEG-4 files.

<table>
<thead>
<tr>
<th>Level</th>
<th>Max. Bit Rate</th>
<th>Max. Frame Size</th>
<th>Max. Frame Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>64 Kbps</td>
<td>176x144</td>
<td>15</td>
</tr>
<tr>
<td>0b</td>
<td>128 Kbps</td>
<td>1920x1920</td>
<td>15</td>
</tr>
<tr>
<td>1</td>
<td>64 Kbps</td>
<td>1920x1920</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>128 Kbps</td>
<td>1920x1920</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>384 Kbps</td>
<td>1920x1920</td>
<td>30</td>
</tr>
</tbody>
</table>

The MPEG-4 Advanced Simple profile (ISO/IEC 14496-2) supports the following levels.

<table>
<thead>
<tr>
<th>Level</th>
<th>Max. Bit Rate</th>
<th>Max. Frame Size</th>
<th>Max. Frame Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>64 Kbps</td>
<td>1920x1920</td>
<td>30</td>
</tr>
<tr>
<td>1</td>
<td>128 Kbps</td>
<td>1920x1920</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>384 Kbps</td>
<td>1920x1920</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>768 Kbps</td>
<td>1920x1920</td>
<td>30</td>
</tr>
<tr>
<td>3b</td>
<td>1500 Kbps</td>
<td>1920x1920</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>3000 Kbps</td>
<td>1920x1920</td>
<td>30</td>
</tr>
<tr>
<td>5</td>
<td>8000 Kbps</td>
<td>1920x1920</td>
<td>30</td>
</tr>
</tbody>
</table>

RealVideo

All versions of Helix Producer support video encoding using the following RealVideo codecs:

- RealVideo 10 creates the highest-quality RealVideo content.
- RealVideo 9 improves on RealVideo 8 with higher compression and improved visual quality.
- RealVideo 8 requires fewer machine resources to decompress, making it suitable for slower processors.

Output Destinations

Before you encode an output in Helix Producer, you define at least one output destination, which may be either a file or a broadcast server like Helix Server. (You can also set up both a file destination and a broadcast destination to create an archive file for a live event.) Broadcast destinations are supported for live input or streams that originate from a network server such as an MPEG-2 encoder.
The following figure illustrates Helix Producer encoding a single input into two separate outputs at different screen sizes. Each output is broadcast as a live stream while being written simultaneously to an archive file.

**Multiple Outputs Written to Multiple Destinations**

![Diagram showing multiple outputs and destinations](image)

**Tip:** With multiple outputs, machine speed is an important factor, especially during live broadcasts. Consult your RealNetworks representative for guidelines about Helix Producer machine specifications that meet your encoding needs.

**File Destinations**

File destinations are used for file-to-file encoding or to create archive clips for live broadcasts. When you create a file destination, you can choose the following options:

- **Progressive Download** — The progressive download option enables the clip to start playing on the media player while it downloads. This option has no effect on streaming clips.

- **Hint Track** — A hint track provides information about how to stream the clip’s media packets. If the output format allows a hint track, it is good practice to include the track.

**Broadcast Methods**

When the input is live or taken from a network source, Helix Producer can broadcast the encoded stream to a server for rebroadcast to media clients. Helix Producer supports several different broadcast delivery methods:

- **Helix Push** — The Helix Push method is the easiest method for delivering a broadcast stream to Helix Server. You need only define a user name and password in the Helix Server authentication database to verify the encoder connection.

- **Helix Advanced Push** — The Helix Advanced Push destination requires more set-up than the simple Helix Push method. Helix Server must be configured as a receiver that accepts
broadcasts from the Helix Producer transmitter. This broadcast method is more robust, however, allowing you to set more broadcast stream parameters.

- Helix Multicast Push — This method is identical to the Helix Advanced Push method except that it can deliver the stream to multiple Helix Servers on a multicast-enabled network.

- Helix Pull — In a Helix Pull broadcast, Helix Producer transmits the broadcast stream only when a Helix Server requests it. It drops the stream to a particular Helix Server if clients are no longer requesting the stream from that server. This makes the Helix Pull broadcast method useful for applications such as online radio stations.

- RTP Push — The RTP Push delivery method uses an SDP file to transmit the stream to any RTP-based, standards-compliant broadcast server. This allows you to broadcast to servers other than Helix Server.

- RTP Multicast Push — This method is identical to the RTP Push delivery method except that it can deliver the stream to multiple servers on a multicast-enabled network.
Helix Server can stream a wide variety of media types as live broadcasts or on-demand clips. This chapter explains the file formats and codecs that Helix Server can deliver.

**Tip:** Helix Server can stream a larger selection of content than you can encode using Helix Producer. This allows Helix Server to deliver content created by third-party encoders such as Flash and Windows Media encoders.

### File Format Summary

The following table lists common file formats used for audio and video. A **Yes** value in the **Supported?** column means that Helix Server can read this file format. The **Protocol** column indicates the streaming protocol used to deliver the content.

<table>
<thead>
<tr>
<th>File Format</th>
<th>Common File Extensions</th>
<th>Supported?</th>
<th>Protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>3GPP Release 5</td>
<td>.3gp</td>
<td>Yes</td>
<td>RTSP</td>
</tr>
<tr>
<td>3GPP Release 6</td>
<td>.3gp</td>
<td>Yes</td>
<td>RTSP, RTMP</td>
</tr>
<tr>
<td>3GPP2</td>
<td>.3g2</td>
<td>Yes</td>
<td>RTSP</td>
</tr>
<tr>
<td>FLV</td>
<td>.flv</td>
<td>Yes</td>
<td>RTMP</td>
</tr>
<tr>
<td>F4V</td>
<td>.f4v</td>
<td>Yes</td>
<td>RTMP, RTSP</td>
</tr>
<tr>
<td>MP3</td>
<td>.mp3</td>
<td>Yes</td>
<td>RTSP</td>
</tr>
<tr>
<td>MPEG-1</td>
<td>.mpg</td>
<td>No</td>
<td>n/a</td>
</tr>
<tr>
<td>MPEG-2</td>
<td>.m2p,.m2v,.mpv</td>
<td>No</td>
<td>n/a</td>
</tr>
<tr>
<td>MPEG-2 Transport Stream</td>
<td>.ts</td>
<td>Yes</td>
<td>HTTP Live</td>
</tr>
<tr>
<td>MPEG-4</td>
<td>.mp4,.m4a</td>
<td>Yes</td>
<td>RTSP, RTMP</td>
</tr>
<tr>
<td>Qualcomm QCELP</td>
<td>.qcp</td>
<td>No</td>
<td>n/a</td>
</tr>
<tr>
<td>QuickTime</td>
<td>.mov</td>
<td>Yes</td>
<td>RTSP</td>
</tr>
<tr>
<td>Raw AAC</td>
<td>.aac</td>
<td>No</td>
<td>n/a</td>
</tr>
<tr>
<td>Raw AMR</td>
<td>.amr</td>
<td>No</td>
<td>n/a</td>
</tr>
<tr>
<td>RealMedia</td>
<td>.rm,.ra,.rv,.rmvb</td>
<td>Yes</td>
<td>RTSP</td>
</tr>
<tr>
<td>Windows Media</td>
<td>.asf,.wma,.wmv</td>
<td>Yes</td>
<td>MMS, WM-HTTP</td>
</tr>
</tbody>
</table>

**Note:** The preceding table is a guide to file format support, not codec support. For example, although Helix Server does not stream the raw AAC file format (.aac), it can deliver content encoded with AAC codecs into other file formats, such as MPEG-4 (.mp4).

**For More Information:** Chapter 3 provides details about Helix Server protocol support. In addition to streaming protocols, Helix Server supports HTTP
download for any file. Progressive download is supported for file formats that allow it.

**Codec Summary**

The following table summarizes popular codec choices for compressing audio and video data. The second column indicates the file formats typically used with these codecs for on-demand clips.

<table>
<thead>
<tr>
<th>Codec</th>
<th>Common Container Formats</th>
<th>More Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAC</td>
<td>F4V, MPEG-4, 3GPP, 3GPP2, QuickTime, MPEG-2 transport stream</td>
<td>page 18</td>
</tr>
<tr>
<td>AAC Plus</td>
<td>F4V, MPEG-4, 3GPP, 3GPP2, QuickTime, MPEG-2 Transport Stream</td>
<td>page 18</td>
</tr>
<tr>
<td>EAAC Plus</td>
<td>MPEG-4, 3GPP, QuickTime</td>
<td>page 18</td>
</tr>
<tr>
<td>AMR-NB</td>
<td>MPEG-4, 3GPP, 3GPP2, QuickTime</td>
<td>page 18</td>
</tr>
<tr>
<td>AMR-WB</td>
<td>MPEG-4, 3GPP, QuickTime</td>
<td>page 18</td>
</tr>
<tr>
<td>DV14</td>
<td>QuickTime</td>
<td>page 21</td>
</tr>
<tr>
<td>G.711</td>
<td>QuickTime</td>
<td>page 21</td>
</tr>
<tr>
<td>G.722</td>
<td>QuickTime</td>
<td>page 21</td>
</tr>
<tr>
<td>G.726</td>
<td>QuickTime</td>
<td>page 21</td>
</tr>
<tr>
<td>H.261</td>
<td>QuickTime</td>
<td>page 21</td>
</tr>
<tr>
<td>H.263</td>
<td>MPEG-4, 3GPP, 3GPP2, QuickTime</td>
<td>page 19</td>
</tr>
<tr>
<td>H.264</td>
<td>F4V, MPEG-4, 3GPP, 3GPP2, QuickTime, MPEG-2 transport stream</td>
<td>page 19</td>
</tr>
<tr>
<td>MP3</td>
<td>MP3, MPEG-4, QuickTime</td>
<td>page 20</td>
</tr>
<tr>
<td>MPEG-4 Part 2</td>
<td>MPEG-4, 3GPP, 3GPP2, QuickTime</td>
<td>page 20</td>
</tr>
<tr>
<td>QCELP</td>
<td>3GPP2</td>
<td>page 21</td>
</tr>
<tr>
<td>RealAudio</td>
<td>RealMedia</td>
<td>page 21</td>
</tr>
<tr>
<td>RealVideo</td>
<td>RealMedia</td>
<td>page 21</td>
</tr>
<tr>
<td>Sorenson</td>
<td>QuickTime</td>
<td>page 21</td>
</tr>
<tr>
<td>VP6</td>
<td>FLV</td>
<td>page 17</td>
</tr>
<tr>
<td>Windows Media Audio</td>
<td>Windows Media</td>
<td>page 22</td>
</tr>
<tr>
<td>Windows Media Video</td>
<td>Windows Media</td>
<td>page 22</td>
</tr>
</tbody>
</table>

**Flash FLV and F4V**

The Flash media player for desktop and mobile players typically plays the following Flash video formats:

- FLV – Helix Server can deliver the older FLV format (.flv) to Flash Player 8 and higher using the RTMP protocol.
• **F4V** — The newer F4V format (.f4v) is preferred for streaming to Flash Player 9 and higher. It is based on an ISO file format and uses the standards-based H.264 and AAC codecs. Helix Server can stream F4V content to Flash clients using the RTMP protocol.

**Tip:** Helix Server version 14.2 does **not** support live broadcasts in the Flash format. However, you can deliver a live MPEG-4 or 3GPP stream generated by Helix Producer to Flash clients as if it were an F4V stream. See “Codec-Compatible Live Content for Flash Players” on page 28.

**For More Information:** For more about the RTMP protocol, see the section “RTMP” on page 27. Helix Server can also stream F4V content to MPEG-4 and 3GPP players over the RTSP protocol. See “On-Demand Flash F4V Content for RTSP Clients” on page 24.

### AAC

Advanced Audio Coding (AAC) codecs encode mixed audio content for a large range of bit rates. Helix Server can stream AAC-LC (low complexity), AAC Plus (also known as HE-AAC), and Enhanced AAC Plus (also known as EACC+ and HE-AAC v2).

<table>
<thead>
<tr>
<th>audio type:</th>
<th>music</th>
</tr>
</thead>
<tbody>
<tr>
<td>channels:</td>
<td>1 or 2</td>
</tr>
<tr>
<td>file formats:</td>
<td>Flash F4V (.f4v), MPEG-4 (.mp4, .m4a), 3GPP (.3gp), 3GPP2 (.3g2), QuickTime (.mov), MPEG-2 transport stream (.ts)</td>
</tr>
<tr>
<td>hinting:</td>
<td>not required</td>
</tr>
</tbody>
</table>

**Note:** The raw AAC file format (.aac) is **not** supported for streaming by Helix Server. EACC+ is not supported for segmentation into MPEG-2 transport streams.

**For More Information:** The section “AAC” on page 10 lists the range of AAC codecs that Helix Producer includes. Although no versions of Helix Producer include EACC+ support, Helix Server can stream audio encoded with EACC+ codecs that are created by third-party encoders in a supported file format.

### AMR

The Adaptive Multirate speech codec (AMR) encodes voice data at a variety of speeds. The narrowband codec (AMR-NB) encodes at 7.4 to 12.2 Kbps. The AMR-WB codec, also known as G722.2, encodes up to 23.85 Kbps.

<table>
<thead>
<tr>
<th>audio type:</th>
<th>speech</th>
</tr>
</thead>
<tbody>
<tr>
<td>channels:</td>
<td>1</td>
</tr>
<tr>
<td>file formats:</td>
<td>MPEG-4 (.mp4, .m4a), 3GPP (.3gp), 3GPP2 (.3g2), QuickTime (.mov)</td>
</tr>
<tr>
<td>hinting:</td>
<td>not required</td>
</tr>
</tbody>
</table>

**Note:** The raw AMR file format (.amr) is **not** supported for streaming by Helix Server.
H.263

The H.263 video codec is suitable for lower-speed content streamed to mobile devices. Because it requires less processing power to decode than H.264, it is recommended for older devices that have slower processors.

<table>
<thead>
<tr>
<th>Profiles:</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levels:</td>
<td>All</td>
</tr>
<tr>
<td>File formats:</td>
<td>MPEG-4 (.mp4), 3GPP (.3gp), 3GPP2 (.3g2), QuickTime (.mov)</td>
</tr>
<tr>
<td>Hinting:</td>
<td>Not required for levels 0 and 3; required for all other levels</td>
</tr>
</tbody>
</table>

For More Information: The section “H.263” on page 12 explains the encoding support for H.263 in Helix Producer.

H.264

The H.264 codec is also known as MPEG-4 Part 10 and MPEG-4 AVC.

<table>
<thead>
<tr>
<th>Profiles:</th>
<th>Constrained Baseline, Baseline, Main</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levels:</td>
<td>Levels 1 to 3 with maximum speed up to 3 Mbps (3.7 Mbps total for video and audio)</td>
</tr>
<tr>
<td>File formats:</td>
<td>Flash F4V (.f4v), MPEG-4 (.mp4), 3GPP (.3gp), 3GPP2 (.3g2), QuickTime (.mov), MPEG-2 transport stream (.ts)</td>
</tr>
<tr>
<td>Hinting:</td>
<td>Not required</td>
</tr>
</tbody>
</table>

Tip: Helix Producer supports the H.264 High profile in addition to the Baseline and Main profiles. It can also encode streams at greater than 3 Mbps. To stream H.264 clips using Helix Server, however, use the Baseline or Main profile and keep the maximum video bandwidth below 3 Mbps. The section “H.264” on page 11 lists the encoding support for H.264 in Helix Producer.

ISMA Compliance

Helix Server support for H.264 is compliant with ISMA 1.0 as well as with Profile 2 and Profile 3 of ISMA 2.0. Helix Producer can also encode output using the high-speed Profile 4 of the ISMA 2.0 specification. Profile 4 is not compatible with streaming from Helix Server, however.

For More Information: For Helix Producer support for ISMA, see the sections “ISMA 1” and “ISMA 2” on page 8.
H.264 Levels

The following table lists the maximum bit rate and frame size for the H.264 levels that Helix Server can stream. For the bit rate, an asterisk (*) indicates levels where Helix Server streams a maximum bit rate that is lower than the maximum allowed by the H.264 specification.

<table>
<thead>
<tr>
<th>Level</th>
<th>Maximum Bit Rate</th>
<th>Maximum Frame Size (Width x Height/256)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>64 Kbps</td>
<td>99</td>
</tr>
<tr>
<td>1b</td>
<td>128 Kbps</td>
<td>99</td>
</tr>
<tr>
<td>1.1</td>
<td>192 Kbps</td>
<td>396</td>
</tr>
<tr>
<td>1.2</td>
<td>384 Kbps</td>
<td>396</td>
</tr>
<tr>
<td>1.3</td>
<td>768 Kbps</td>
<td>396</td>
</tr>
<tr>
<td>2</td>
<td>2 Mbps</td>
<td>396</td>
</tr>
<tr>
<td>2.1</td>
<td>3 Mbps*</td>
<td>792</td>
</tr>
<tr>
<td>2.2</td>
<td>3 Mbps*</td>
<td>1620</td>
</tr>
<tr>
<td>3</td>
<td>3 Mbps*</td>
<td>1620</td>
</tr>
</tbody>
</table>

The maximum frame size is defined as the width in pixels multiplied by the height in pixels, divided by 256. Using this formula, the frame size of $352 \times 288$ results in a value of 396, requiring the use of level 1.1 or higher.

MP3

The MP3 codec is the audio layer of the MPEG-1 standard.

<table>
<thead>
<tr>
<th>audio type</th>
<th>music</th>
</tr>
</thead>
<tbody>
<tr>
<td>channels</td>
<td>1 or 2</td>
</tr>
<tr>
<td>file formats</td>
<td>MP3 (.mp3), MPEG-4 (.mp4, .m4a), QuickTime (.mov)</td>
</tr>
<tr>
<td>hinting</td>
<td>not applicable with .mp3 format; required for other file formats</td>
</tr>
</tbody>
</table>

Helix Server uses a proprietary stream packetization method when streaming the MP3 file format (.mp3). This makes the stream compatible only with RealPlayer and media players based on Helix DNA. Alternatively, you can generate MP3 content in the QuickTime (.mov) or MPEG-4 (.mp4 or .m4a) format, making the clip compatible with any streaming MP3 player that can read the file format.

MPEG-4 Part 2

Helix Server can stream MPEG-4 Part 2 video in several common file formats.

<table>
<thead>
<tr>
<th>profiles</th>
<th>Simple (ISO/IEC 11172-2), Advanced Simple (ISO/IEC 14496-2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>levels</td>
<td>all</td>
</tr>
<tr>
<td>file formats</td>
<td>MPEG-4 (.mp4), 3GPP (.3gp), 3GPP2 (.3g2), QuickTime (.mov)</td>
</tr>
<tr>
<td>hinting</td>
<td>not required for Simple profile; required for Advanced Simple profile</td>
</tr>
</tbody>
</table>
For More Information: The section “MPEG-4 Part 2” on page 13 lists the encoding support for this codec in Helix Producer.

QCELP

The Qualcomm QCELP codec encodes voice at 14 Kbps (full-rate) or 6.8 Kbps (half-rate).

<table>
<thead>
<tr>
<th>audio type</th>
<th>voice</th>
</tr>
</thead>
<tbody>
<tr>
<td>channels</td>
<td>1</td>
</tr>
<tr>
<td>file formats</td>
<td>3GPP2 (.3g2)</td>
</tr>
<tr>
<td>hinting</td>
<td>required</td>
</tr>
</tbody>
</table>

Note: The raw QCELP file format (.qcp) is not supported for streaming by Helix Server.

QuickTime

QuickTime is a general-purpose format that can be used as the container for a number of standards-based codecs, such as AAC and H.264. Helix Server can also stream QuickTime clips encoded with popular proprietary codecs such as the following:

- Sorenson
- Cinepak
- Qualcomm PureVoice
- Qdesign

Helix Server can typically stream any QuickTime clip that is encoded using a standards-based codec. The following table lists specific codecs that Helix Server can stream when the QuickTime file format is used.

<table>
<thead>
<tr>
<th>Codecs Supported for use with QuickTime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Format</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td>DV14</td>
</tr>
<tr>
<td>G.711</td>
</tr>
<tr>
<td>G.722</td>
</tr>
<tr>
<td>G.726</td>
</tr>
<tr>
<td>H.261</td>
</tr>
<tr>
<td>H.723.1</td>
</tr>
</tbody>
</table>

RealMedia

Helix Server can stream all versions of RealAudio and RealVideo to RealPlayer, as well as to Helix DNA-based media players that include support for the RealMedia formats.
RealAudio

You can use RealAudio as the soundtrack of a RealVideo clip or to encode a stand-alone audio clip.

<table>
<thead>
<tr>
<th>audio type</th>
<th>voice or music</th>
</tr>
</thead>
<tbody>
<tr>
<td>channels</td>
<td>1, 2, 2s, 5.1</td>
</tr>
<tr>
<td>file formats</td>
<td>RealMedia (.rm, .rmvb), RealAudio (.ra), RealVideo (.rv)</td>
</tr>
<tr>
<td>hinting</td>
<td>automatic</td>
</tr>
</tbody>
</table>

RealVideo

Helix Server supports RealVideo clips for streaming or download.

<table>
<thead>
<tr>
<th>profiles</th>
<th>RealVideo 8, RealVideo 9, RealVideo 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>encoding</td>
<td>constant bit-rate (CBR), variable bit rate (VBR)</td>
</tr>
<tr>
<td>file formats</td>
<td>RealMedia (.rm, .rmvb), RealVideo (.rv)</td>
</tr>
<tr>
<td>hinting</td>
<td>automatic</td>
</tr>
</tbody>
</table>

Windows Media

Helix Server provides limited support for streaming the Microsoft Windows Media format to desktop Windows Media players. It also supports on-demand streaming to Silverlight clients in the Windows Media format or H.264/AAC.

Windows Media

Helix Server can deliver live and on-demand audio or video streams in the Microsoft Windows Media format to desktop players only. Streaming of Windows Media to mobile devices (cellular telephones or wireless, handheld devices) is **not** supported.

MMS and HTTP Support

For versions 6.4 through 10 of the desktop Windows Media Player, Helix Server uses the MMS protocol. It delivers streams to Windows Media Player versions 11 and higher using WM-HTTP, which protects the content from proxy caching, browser caching, and HTTP download.

**Note:** Although Windows Media Player versions 11 and higher support RTSP, the Windows Media method for supporting RTSP is **not** available with Helix Server.

**For More Information:** The section “MMS” on page 31 shows an example of the URL used to support Windows Media Player with the MMS or WM-HTTP protocol.

Multiple Bit Rate (MBR) Streams

Helix Server supports multiple bit rate (MBR) encoding of on-demand clips and live streams for Windows Media version 7 only. It does **not** provide streaming capability for MBR clips.
encoded as Windows Media version 9 and later. Single-rate clips encoded in Windows Media version 9 and later are supported, however.

**Silverlight**

Helix Server delivers content to Silverlight clients in the Windows Media or H.264/AAC format. Segmentation of Silverlight content into separate transport files is not supported.

**Windows Media Content**

Windows Media content can be streamed to Silverlight clients using WM-HTTP. HTTPS is not supported. Multi-rate content is supported, but only one stream (typically the highest bandwidth) is used throughout the presentation.

**H.264/AAC Content**

Silverlight clients support the playback of on-demand content encoded using H.264 video and AAC audio in any supported format, such as MP4 or F4V. Helix Server downloads the on-demand content over HTTP. HTTPS, WM-HTTP, and live delivery are not supported.

*Tip:* Single-rate H.264/AAC content is recommended to minimize data transfer. Multi-rate content is supported, but all streams are delivered to the client and only one stream (typically the highest bandwidth) is used throughout the presentation.

### Uncompressed and Older Formats

The following table summarizes uncompressed and older audio formats that Helix Server can stream. These are considered legacy formats that are not recommended for streaming, either because of their large bandwidth requirements or because newer compression technologies are more effective.

<table>
<thead>
<tr>
<th>Format</th>
<th>File Container</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>a-Law</td>
<td>WAV (.wav)</td>
<td>Companding audio algorithm</td>
</tr>
<tr>
<td>AIFF</td>
<td>AIFF (.aiff)</td>
<td>Apple uncompressed audio</td>
</tr>
<tr>
<td>AU</td>
<td>AU (.au)</td>
<td>Sun Microsystems uncompressed audio</td>
</tr>
<tr>
<td>AVI</td>
<td>AVI (.avi)</td>
<td>Microsoft uncompressed video</td>
</tr>
<tr>
<td>Indeo</td>
<td>AVI (.avi)</td>
<td>Intel video codec</td>
</tr>
<tr>
<td>μ-Law</td>
<td>WAV (.wav)</td>
<td>Companding audio algorithm</td>
</tr>
<tr>
<td>PCM</td>
<td>AVI (.avi) or WAV (.wav)</td>
<td>Pulse code modulation for audio or video</td>
</tr>
<tr>
<td>WAV</td>
<td>WAV (.wav)</td>
<td>Microsoft uncompressed audio</td>
</tr>
</tbody>
</table>
CHAPTER 3

HELIX SERVER STREAMING PROTOCOLS

Different media players require the use of different streaming protocols for media delivery. Many mobile and desktop players use RTSP, for example. The Flash media player uses RTMP for streaming. The iPhone and iPad clients use HTTP Live. This chapter explains the Helix Server support for these protocols and illustrates how to stream content from Helix Server using URLs for each protocol.

RTSP

Real-Time Streaming Protocol (RTSP) is an application-level protocol designed for the efficient delivery of media using User Data Protocol (UDP) or Transmission Control Protocol (TCP). The RTSP protocol maintains a constant connection between Helix Server and the media client, allowing the two to exchange messages and modify the stream on-the-fly.

RTSP Media URLs

To receive a media clip or live broadcast over RTSP, the media client requests the stream using an RTSP URL directed toward Helix Server’s RTSP port, which is 554 by default. For example, the following URL is for an MPEG-4 clip stored in a media directory created under the Helix Server default content directory:

rtsp://helixserver.example.com/media/movie.mp4

The URLs to live broadcasts encoded by Helix Producer are similar. They include a /broadcast/ mount point to indicate that the source is a live stream:

rtsp://helixserver.example.com/broadcast/live.mp4

Client Launch Mount Points

For Web pages rendered in browsers that cannot redirect the RTSP link to a media player, links can use the HTTP protocol and include the /sdpgen/ mount point:

http://helixserver.example.com/sdpgen/media/movie.mp4

or:

http://helixserver.example.com/sdpgen/broadcast/live.mp4

The MIME stream in the HTTP response sent by Helix Server causes the user’s browser to launch the media player and pass it the RTSP URL to the clip.

On-Demand Flash F4V Content for RTSP Clients

RTSP-based media players that do not support the Flash file format can still request on-demand Flash F4V content that is encoded with AAC and H.264 codecs. This is because Helix Server does not download the entire F4V clip to the media player. Instead, it streams the clip contents as if the file format were a generic MPEG-4 or 3GPP container.
In the following example, a browser uses HTTP to request an on-demand F4V clip stored in the flash subdirectory of the Helix Server default Content directory. The /sdpgen/ mount point launches the RTSP-based media player, which then plays the H.264/AAC content contained in the F4V file:

http://helixserver.example.com/sdpgen/flash/sports.f4v

An RTSP URL can point directly to this content without needing the /sdpgen/ mount point:

rtsp://helixserver.example.com/flash/sports.f4v

**Features Available with RTSP**

RTSP enables the use of several Helix Server features:

- **Server-side Rate Control** — With server-side rate control, Helix Server can shift between the various encodings of a multi-rate clip based on its model of the media client’s buffering state. This allows for rate shifting that compensates for network congestion with media clients that do not have a client-side mechanism for rate shifting.

- **On-demand Playlists** — Because the RTSP connection remains persistent, Helix Server can send the media client multiple clips that are defined within a playlist. HTTP requests sent out-of-band allow the media client to skip to various parts of the playlist.

- **Live Channel Switching** — Within a persistent RTSP connection, Helix Server can deliver live broadcast streams that the media player can choose using HTTP requests. This allows the client to switch between different live sources without rebuffering.

**Packet Formats for RTSP**

When streaming over RTSP, Helix Server can use either of the following packet formats:

- **RealNetworks Data Transport (RDT)**

  When Helix Server communicates to RealNetworks and Helix-based media players over RTSP, it uses RDT as the packet format. A proprietary format, RDT allows the use of features specific to RealMedia, such as SureStream and Helix rate adaptation.

  **Note:** When RDT is used, Helix Server streams both audio and video content to the player using a single UDP channel.

- **Real-Time Transport Protocol (RTP and RTCP)**

  RTP is a standards-based packet format designed as the companion to the RTSP protocol. Most 3GPP players, for example, use RTP as their packet format. Helix Server fully supports RTP when streaming to an RTP-based client. Helix Server also supports RTCP, a control protocol used for monitoring and control of RTP sessions.

  **Note:** When streaming to RTP-based players, Helix Server sends audio over a contiguous pair of ports (such as ports 7120 and 7121), and video over another contiguous pair (such as 8544 and 8545).
RTSP Proxies

Helix Proxy is designed to proxy any content streamed by Helix Server over RTSP. By adding Helix Proxy to your network, you can preserve Helix Server bandwidth, especially for live broadcasts.

Note: Helix Proxy is an RTSP-only proxy. It does not proxy content for RTMP, HTTP, or MMS connections.

Content Caching

Whenever possible, Helix Proxy caches on-demand clips delivered by Helix Server so that it can proxy them for the client later. The first time a media player requests a media clip from the origin Helix Server, Helix Mobile Proxy acquires and stores that clip, as illustrated in the following figure.

Media Cache Populated with an On-Demand Clip

When a subsequent media player requests the same clip, Helix Proxy checks if a newer version of the clip exists on the origin Helix Server. If it determines that the cached copy is up-to-date, Helix Proxy streams the cached version to the player, as shown in the next figure.

On-Demand Clip Streamed from the Cache

Pull-Splitting

Pull-splitting conserves bandwidth for live broadcasts by replicating a single, live stream from an origin Helix Server. The first time a media player requests a live stream, Helix Proxy replicates the live stream on Helix Server to the media player. Subsequent media players that request the same live stream receive it directly from Helix Proxy.
Pass-Through Delivery

Pass-through delivery is the simplest method of Helix Proxy operation. All content data comes from the origin Helix Server and passes through the proxy, which results in no bandwidth conservation. Pass-through delivery occurs if the origin Helix Server does not allow pull-splitting or caching for requested clips or broadcasts.

RTMP

RTMP is a family of application-level protocols used to stream Flash media (F4V or FLV) to the Flash Player. Helix Server supports the delivery of on-demand Flash content generated by any Flash encoder, such as Adobe’s Flash Media Encoder.

For More Information: See also “Flash FLV and F4V” on page 17.

RTMP Media URLs

On-demand F4V or FLV content is made available to Flash Players using an RTMP URL directed toward Helix Server’s RTMP port, which is 1935 by default. For example, the following on-demand clip resides in the flash subdirectory of the Helix Server Content directory:
Codec-Compatible On-Demand Content for Flash Players

Just as Helix Server can stream H.264/AAC content in the F4V format to RTSP-based players, it can stream H.264/AAC content in an MPEG-4 or 3GPP format to a Flash Player. The Flash client simply requests the content using the RTMP protocol. In the following example, Helix Server streams the H.264/AAC content in the MPEG-4 clip as if it came from an F4V container:

rtmp://helixserver.example.com/media/movie.mp4

For MPEG-4 or 3GPP clips that contain multi-rate content, the /flashgen/ mount point is included in an HTTP URL to the content:

http://helixserver.example.com/flashgen/media/movie.mp4

The /flashgen/ mount point causes Helix Server to generate a SMIL file that lists the multi-rate content as a set of single-rate streams, one for each encoded bandwidth. Using the SMIL file, the Flash Player chooses the appropriate rate based on its bandwidth conditions. It then requests the media using the RTMP protocol.

Codec-Compatible Live Content for Flash Players

Using Helix Producer, you can encode a live broadcast in the MPEG-4 or 3GPP format. A Flash client then requests the broadcast using the /rtmplive/ mount point and either the /broadcast/ or /rtpencoder/ mount point depending on the broadcast method. The following URL is for single-rate content:

rtmp://helixserver.example.com/rtmplive/broadcast/live.mp4

For multi-rate content, the /flashgen/ mount point is included and the URL specifies the HTTP protocol:

http://helixserver.example.com/flashgen/rtmplive/broadcast/live.mp4

Flash Protocol Support

Content streamed to the Flash client uses RTMP or one of its variations. Because RTMP supports only the TCP transport, Helix Server automatically uses TCP when fulfilling all RTMP requests.

RTMP

Helix Server supports RTMP, the preferred protocol used by the Flash client. The default RTMP port is 1935.

RTMPT

RTMPT is a version of cloaked RTMP that allows the Flash Player to receive a stream if access to the RTMP port is blocked by firewalls. To use RTMPT, the Flash Player contacts Helix Server on its HTTP port, which is 80 by default.

RTMPS

RTMPS is a secure version of RTMPT. To use RTMPS, the Flash client contacts Helix Server on port 443.
RTMPE and RTMPTE

Helix Server does not support the use of RTMPE and RTMPTE, which are the encrypted versions of RTMP and RTMPT, respectively.

HTTP and HTTPS

Helix Server can use HTTP or HTTPS for progressive download of any Flash clip.

HTTP Live

HTTP Live delivery is used by Apple iPhone and iPad clients as well as a growing number of mobile and desktop clients. In this delivery method, the media client uses HTTP to request a clip or live broadcast encoded with the H.264 and AAC codecs. On-demand clips can use either a 3GPP or an MPEG-4 file format.

When it receives an HTTP Live request, Helix Server segments the clip or live stream into a series of MPEG-2 transport stream files (.ts). Each .ts file encodes enough data to provide approximately 10 seconds of playback. The presentation thereby consists of a series of .ts files that Helix Server generates automatically when the client requests the source stream.

Tip: In addition to HTTP Live, Helix Server supports HTTP and HTTPS for progressive download of any clip. It also supports WM-HTTP, a variation of HTTP for delivering Windows Media content. For more about WM-HTTP, see “Windows Media” on page 22.

For More Information: For details about HTTP Live delivery and content segmentation, refer to the iOS delivery chapter in Helix Systems Integration Guide.

Segmentation Process

The process of segmenting media is automatic and transparent to the user. The following figure describes the general steps that occur when an Apple iPhone client requests content that has not yet been segmented. The process for segmenting broadcast content is similar, except that the index file is continually updated so that each client joins the presentation in progress.

Steps for Segmenting On-Demand Content

To make on-demand content available for iPhone clients:

1. Helix Producer writes the H.264/AAC content to a supported file format such as MPEG-4 or 3GPP. The finished clip is placed under a Helix Server streaming source directory.
2. The iPhone client places an HTTP or HTTPS request for the clip. The request URL includes the /m3ugen/ mount point.

3. Helix Server generates the index file and begins to reformat the requested contents into transport segments (.ts). The files are written to a directory specifically set up to hold segmented files and playlists.

4. In response to the iPhone client’s initial request, Helix Server returns an index file (.m3u8).

5. The iPhone client uses the index file to make HTTP requests for transport segment files that reside under the segment mount point.

**For More Information:** For more about making a source clip available for segmentation by Helix Server, see “HTTP Live Delivery of the Universal Clip” on page 36.

### Playlists for Segmented Content

As it creates the transport segments, Helix Server automatically generates a text-based index file (.m3u8) that lists the playback order of segment files. It delivers this file to the media client, which uses it to request the .ts files. Data delivery is driven entirely by the client, which determines when to request each transport file in the index based on its current buffering and playback state.

### HTTP Live Media URLs

To receive segmented media, the media client requests the source stream using the /m3ugen/ mount point. The presence of this mount point in the request URL initiates the segmentation process of the source stream if necessary. For example, a media client could request the following MPEG-4 clip that resides in the media subdirectory of the Helix Server Content directory:

http://helixserver.example.com/m3ugen/media/movie.mp4

A request for a live broadcast stream may look like this:

http://helixserver.example.com/m3ugen/broadcast/live.mp4

**Note:** Segmentation occurs only on the first request of a stream that has not been segmented. On subsequent requests for the source clip, Helix Server redirects media clients to the existing playlist and transport files.

### Segment Archives

Helix Server stores segment files and playlists in a directory other than the one that holds the source content. As long as the timestamp on the source content does not change, Helix Server reuses the segmented content on subsequent requests by media clients. Helix Server provides options for automatically purging older content and for maintaining permanent archives for live broadcast content.
Rate Shifting

Media clients such as the iPhone typically support the ability to shift between different bit rates of the same content. If the source clip or live stream is encoded for multiple bandwidths, Helix Server automatically creates the different segment and index files required for the various bandwidths. The client chooses which files to request from the possible options listed in the master index based on its ongoing assessment of the available bandwidth.

**Tip:** In the Apple documentation, this feature is called *stream alternates*.

MMS

The Microsoft Media Services protocol is used for versions of Windows Media Player earlier than version 11. To use it, include the `/asxgen/` mount point in an HTTP URL to Windows Media content. For example:

http://helixserver.example.com/asxgen/media/movie.wmv

The MIME stream in the HTTP response sent by Helix Server launches Windows Media Player and passes it the MMS URL to the media clip. For version 11 and later of Windows Media Player, the HTTP response includes an HTTP link that the player uses to make the request. RTSP is **not** supported for Windows Media Player.

**Note:** The WM-HTTP connection used to deliver Windows Media streams is not managed the same as HTTP requests from browsers. The content is delivered only to the media player. It is protected against browser caching and user download.

**For More Information:** See “Windows Media” on page 22.
This chapter builds on the information in the preceding chapters by illustrating how to use Helix Producer and Helix Server to reach a variety of media players using a single media stream. Using this process, you can deliver content to the following media players without having to encode a separate stream in each media player’s preferred format:

- Flash Player 10
- Desktop RealPlayer
- Desktop MPEG-4 players
- Desktop QuickTime Player
- Apple iPhone and iPad clients
- Mobile media players supporting MPEG-4 streams
- 3GPP Release 6 Media Players (including mobile players based on Helix DNA)

**Note:** This chapter illustrates the encoding and delivery of a single-rate, on-demand stream. Multi-rate encoding and live delivery are also supported for universal delivery. Chapter 3 illustrates URLs for multi-rate and live streams.

### Media Encoding for Universal Delivery

To reach the widest range of media players with a single stream, use Helix Producer to encode content using the H.264 video and AAC audio codecs. For universal delivery, Helix Producer supports H.264/AAC encoding in either the MPEG-4 or 3GPP Release 6 file format. The following sections walk you through the process of using the Helix Producer graphical application to encode a single-rate MPEG-4 (.mp4) clip.

**Tip:** Encode the output using Helix Mobile Producer and the 3GPP Release 6 format if you need to reach media players that support 3GPP Release 6 but not the MPEG-4 file format.

### Create an MPEG-4 Output

The first step for encoding a clip from a file such as an AVI is to select the input file on the Helix Producer **Input** tab. This tab also allows you to apply prefilters to modify the input file. You may want to crop or resize the input, for example, to fit the screens of your intended audiences.

Next, switch to the **Output** tab and add an MPEG-4 output by clicking the **Add** button—. In the context menu, choose an MPEG-4 output type as shown in the following illustration.
Adding an MPEG-4 Output

Add a Template

Helix Producer provides predefined audience templates that use the H.264 and AAC codecs. When you choose an MPEG-4 output, it selects 300 Kbps H.264/AAC encoding by default.

Template Default

If this audience template is not close to your intended streaming speed, highlight the template in the Encoding Settings section and click the Delete button. Then click the Add button in the Encoding Settings section to display the audience template pop-up. Here you can choose a different audience template. The following figure shows the selection of the 100 Kbps H.264/AAC audience template.

Choosing an MPEG-4 Template
Customize the Template

In many cases, you will want to modify the audio and video settings from the template to set the precise characteristics for this audience. To do this, highlight the template in the **Encoding Settings** section and click the **Edit** button—\[\]. This displays the encoding settings pop-up.

**Customizing a Template in the Encoding Settings Pop-up**

![Encoding Settings Pop-up](image)

**H.264 Video**

The **Video** section of the **Encoding Settings** pop-up allows you to change the settings for the H.264 codec. For mobile and desktop media players, video streaming speeds are typically in the range of 80 Kbps to 1 Mbps.

**Tip:** Use the Baseline profile to reach the widest audience. You can set **Level** to Auto to have Helix Producer select the appropriate codec level based on the other output settings.

**For More Information:** The section “H.264” on page 11 explains the support for H.264 video encoding in Helix Producer. See “H.264” on page 19 for information about Helix Server support.

**AAC Audio**

In the **Audio** section of the **Encoding Settings** pop-up, you can change the AAC settings as needed. Streaming speeds typically range from 24 Kbps to 320 Kbps in mono or stereo. All AAC-capable players support AAC-LC, making low-complexity encoding the safest choice.

**Tip:** The Apple iPhone and Flash 10 players support AAC Plus as well. Not all 3GPP media players may support AAC Plus, however.

**For More Information:** The section “AAC” on page 10 explains the support for AAC audio encoding in Helix Producer. See “AAC” on page 18 for information about Helix Server support.
Save the MPEG-4 Clip

In the **Output File** section of the **Output** tab, select the location and name of the output clip. In this chapter, the sample clip is named *universal.mp4*. For streaming delivery, include the hinting option.

### Save the Output as an MPEG-4 Clip

You can then encode the output by clicking the **Start Job** button — — on the Helix Producer toolbar. After the encoding process has finished, the clip is ready to be streamed by Helix Server.

---

**Universal Content Source Path**

Once Helix Producer has encoded the output, move the clip to Helix Server for streaming. The simplest method is to place the clip in the predefined **Content** directory under the main Helix Server installation directory. Flash Players require a path in the URL, however, and the **Content** directory is not included as a path in a request URL. To work around this, create a subdirectory such as **media**. For example, the path might be this on Windows:

C:\Program Files\Real\Helix Server\Content\media

or this on Linux and Solaris:

/usr/local/Real/HelixServer/Content/media

---

**RTSP Streaming of the Universal Clip**

The user of an MPEG-4 media player can request the universal clip using an RTSP URL:

rtsp://helixserver.example.com/media/universal.mp4

If necessary, you can use an HTTP URL that includes the **/sdpgen/** mount point to launch the media player and pass it the stream information. For example:

http://helixserver.example.com/sdpgen/media/universal.mp4

**Tip:** URLs for single-rate and multi-rate content use the same URL structure. Live content includes a broadcast mount point. For details, refer to “RTSP Media URLs” on page 24.

---

**RTMP Streaming of the Universal Clip**

When Flash Player requests the universal clip, Helix Server delivers the H.264/AAC content as if it were in the F4V format. The request URL is similar to the RTSP URL. However, it specifies the RTMP protocol and does not need the **/sdpgen/** mount point:

rtmp://helixserver.example.com/media/universal.mp4
Tip: When the request is for multi-rate content, include the /flashgen/ mount point and use the HTTP protocol. For details, see “RTMP Media URLs” on page 27.

HTTP Live Delivery of the Universal Clip

Helix Server requires a small amount of setup to enable it to segment source clips for HTTP Live delivery. You must enable this feature and define which source paths contain content that can be segmented. For the examples in this chapter, the /media/ subdirectory under the standard Helix Server Content directory is the source path.

In Helix Server, you associate the source path with a directory where the segmented output files (the .ts files and playlists) are stored. For this purpose, Helix Server provides a predefined path named /iPhone/ under its Content directory. This chapter uses the /iPhone/ path for storing the segment files, although you can set up any number of additional paths for storing segmented content.

Tip: Segment files are kept in directories separate from source files because segments are requested using HTTP. The paths to source files such as MPEG-4 clips typically disallow HTTP requests to prevent browsers from downloading and caching the clips.

HTTP Live Setup

In the Helix Server Web-based administrator, you set up HTTP Live delivery under the section Content Management>Media Segmentation.

Enabling HTTP Live Delivery

Sample Helix Server setup for media segmentation:

1. In the drop-down box for Enable Segmentation, select Yes to allow the segmentation of streaming content into transport files.

2. For Server Hostname, enter the Helix Server IP address or DNS name.
3. Add a new path by clicking the "+" icon.
4. Highlight the new path in the Source Paths box.
5. Replace the temporary path value in Edit Source Path box with the actual source path, which for this example is /media/.
6. Select Yes for Enable Source Path to allow Helix Server to segment content under the selected source path.
7. In the Destination Mount Point drop-down list, select an existing mount point, such as /iPhone/, where content from the source path is segmented.
8. Click Apply at the bottom of the browser page.

**HTTP Live URL**

An iOS or similar media client can receive the universal clip as a series of MPEG-2 transport stream files (.ts) by requesting the source clip using an HTTP URL that includes the /m3ugen/ mount point:

http://helixserver.example.com/m3ugen/media/universal.mp4

This appendix provides tips for creating effective streaming media presentations. It covers video screen sizes and multi-rate streams.

**Video Screen Sizes**

Selecting the screen size for video outputs requires careful consideration of your target audiences. Input videos commonly have the 4:3 aspect ratio of standard computer monitors or the 16:9 aspect ratio of widescreen monitors.

**Common Dimensions in 4:3 and 16:9 Aspect Ratios**

The following table lists some of the common dimensions in the 4:3 and 16:9 aspect ratios that work well for different bandwidths. If an input clip is in one of these aspect ratios, you can use Helix Producer to resize the encoded output to a different dimension that preserves the aspect ratio.

<table>
<thead>
<tr>
<th>Bandwidth</th>
<th>Pixel Dimensions (4:3)</th>
<th>Pixel Dimensions (16:9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than 256 Kbps</td>
<td>176x132; 240x180</td>
<td>192x108; 256x144</td>
</tr>
<tr>
<td>256 to 512 Kbps</td>
<td>320x240; 448x336</td>
<td>320x180; 480x270; 512x288</td>
</tr>
<tr>
<td>786 Kbps or higher</td>
<td>448x336; 640x480</td>
<td>768x432; 1280x720</td>
</tr>
</tbody>
</table>

**Tip:** When you encode multiple outputs with Helix Producer, you can resize each output to a different dimension. This allows you to support different screen sizes in the same aspect ratio.

**Mobile Device Screen Sizes**

Many mobile devices use screens that have aspect ratios other than 4:3 or 16:9. Common sizes include the following:

- 176x144 — Quarter Common Intermediate Format (QCIF)
- 352x288 — Common Intermediate Format (CIF)

Some media players can play videos sized at a different aspect ratios from their screens as long as the videos fit within the players’ overall screen dimensions. Playing videos with aspect ratios that do not match their screens can be problematic for other players, however. In these cases, you may need to change the output video’s aspect ratio to match the aspect ratio of the device’s screen.
Modifying Aspect Ratios

Using the Helix Producer cropping filter, you can crop portions of an input video to change the aspect ratio. For example, suppose that an input video has dimensions of 320x240 pixels (4:3 aspect ratio) and the target media player has a screen size of 176x144. Resizing the video while keeping the 4:3 aspect ratio results in a video that is 176x132. To maintain a 144 pixel height, you can crop the video to 292x240, then resize it to 176x144.

*Note:* Cropping is applied to the input, meaning that every output has the same aspect ratio, even though outputs can be resized to different dimensions. To create outputs with different aspect ratios when using Helix Producer, encode the input multiple times. During a live broadcast, you can use multiple instances of Helix Producer to encode the different aspect ratios.

Multi-Rate Streams

Media formats such as RealMedia, MPEG-4, and 3GPP Release 6 can encode a single source stream for multiple bandwidths in an on-demand clip or live presentation. Using Helix Producer, for example, you can create a single 3GPP clip that streams at 100, 500, or 800 Kbps. When a media player requests the clip, one of the encoded streams is delivered based on the available network bandwidth.

**Clip Encoded for Multiple Bandwidths**

Rate Shifting

With some types of multi-rate clips, the media player can switch to different bandwidth encodings as the clip plays. This allows it to compensate for changing network conditions. The following figure illustrates a media session becoming bogged down because of excessive network traffic. The presentation downshifts to a lower-bandwidth stream to prevent the presentation from stalling. When the congestion clears, the presentation upshifts to a higher-bandwidth stream.
**Rate Shifting During Network Congestion**

![Diagram of rate shifting during network congestion]

**Tip:** When you create a rate-shifting clip, choose the audience streaming rates carefully. If rates are too close together, the media player may shift rates continuously, which creates a poor user experience. If rates are too far apart, the media player may not be able to shift rates at points where doing so would be advantageous.

**Media Client Rate Shifting Characteristics**

Various media clients handle rate shifting differently. To create effective rate-shifting clips, research the rate-shifting characteristics of your target media players.

**Mobile 3GPP Clients**

With mobile 3GPP clients receiving media over RTSP, Helix Server implements a server-side rate-shifting mechanism in which it adjusts the stream rate based on its model of the media client’s buffer.

**For More Information:** For details about server-side rate shifting, refer to the rate control chapter of *Helix Systems Integration Guide*.

**Flash Clients**

When serving multi-rate content to Flash Players, the `/flashgen/` mount point in a URL causes Helix Server to generate a SMIL file that indicates the various bandwidth choices. The Flash Player then selects which bandwidth to play.

**For More Information:** See the section “RTMP Media URLs” on page 27.

**HTTP Live Clients**

When you serve a multi-rate stream to HTTP Live clients such as the Apple iPhone, Helix Server generates a separate set of transport files for each bandwidth. The playlist file indicates the available choices, and the media player selects which rate to play. If the available network bandwidth changes, the player can switch rates during the presentation.

**For More Information:** See the section “HTTP Live” on page 29.
Audio and Video Properties for Rate-Shifting Clips

In a rate-shifting clip, you typically must encode all bandwidths using similar audio and video properties. The graphical application of Helix Producer allows you to set the following for each audience bandwidth:

- **Audio and Video Codecs**
  Use the same audio and video codecs for all audiences. For example, do not encode one audience using H.263 video and AAC-LC audio while encoding another audience using H.264 video and AAC+ audio.

- **Audio Channels**
  All audiences in a rate-shifting stream must encode the same number of audio channels, such as mono or stereo.

- **Audio Sample Rate**
  In a rate-shifting clip, all audiences must typically be encoded using the same audio sampling rate. With Helix Producer, you can set the output sampling rate to any rate supported by the audio codec.

- **Video Profile and Level**
  When you use standards-based video codecs such as H.263 or H.264, set all audiences to use the same codec profile and level.

- **Video Frame Size**
  Every audience in the output must use the same video frame size to enable the stream to shift bandwidths during streaming.

Audience Properties for Rate-Shifting Clips in Helix Producer