



Encoding Recommendations for Mobile Devices

Encoding using Helix™ Mobile Producer 2.0 powered by Envivio

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1 Introduction

This document gives you recommendations on how to encode media content for specific mobile devices using the Helix™ Mobile Producer 2.0 powered by Envivio. It is recommended that you become familiar with the Helix Mobile Producer User's Guide in order to learn the basics of encoding media before reading this document.

2 Source Formats

The format and quality of your source material is a primary factor in the quality of the final encoded result. Helix Mobile Producer supports both static (file-to-file) encoding and live (device-to-file and device-to-broadcast) encoding. This section discusses the preferred file formats and characteristics, as well as recommended capture hardware.

Encoding from a File

Helix Mobile Producer can read a large number of source file types, including many compressed formats such as MPEG1, MPEG2, MPEG4, DV, Sorenson, M-JPEG, and more. However, using a low-quality compressed source will yield a lower-quality encoded result. This occurs because any artifacts that exist in the source file will also be carried over to the encoded output. Also, since compressed video generally results in a messier image (caused by limitations of bit rate and the codec) the encoder will be forced to waste bits duplicating undesirable artifacts.

For the best possible results, it is recommended you encode from source files in one of the following formats:

- Uncompressed QuickTime (.mov)
- Uncompressed AVI

The native color space of the Helix Mobile Producer is I420, a form of YUV. When possible, produce a source file with this same color space to avoid a "color conversion" during the encoding process. The encoding process will be slightly faster without the encoder performing a color conversion, but there is no adverse effect on the quality of the encoded file so long as you use a 24-bit source.

The quality of the source audio is equally important. For best results, use uncompressed 44.1 kHz 16 bit sources. Using an uncompressed source is particularly important when encoding to a high bit rate output, such as AAC-LC at 32 Kbps or higher. With AAC-LC encoding at this bit rate, there will be a noticeable difference in the audio quality if your source is only 22 kHz or 8 bit. If you are encoding AMR-NB voice, however, there should be no noticeable difference. For audio-only encoding, the recommended source format is a 44.1 kHz 16 bit WAV file.

Capturing from Devices

For the best quality results when capturing from live sources, do not use web cams or standard PC microphones as a source device. You will create a much better quality result using a good quality DV camera connected to an Osprey or other mid-range to high-end capture card. The following capture cards are recommended for use with Helix Mobile Producer:

- Osprey 100 (mid-range)
- Osprey 220 , Osprey 500 DV (high-end)

3 Output Format

This document provides suggested settings for both RealMedia™ (.rm) and 3GPP files with hint tracks (.3gp). Although Helix Mobile Producer is capable of generating ISMA compliant MP4 files, only 3GPP formatted files are compatible with most mobile devices. Some devices, such as the Nokia 3650, have a RealPlayer capable of playing both RealMedia and 3GPP content.

4 Types of Content

Some of the settings you choose for encoding will depend on the nature of the content. For example, for encoding a high-action movie trailer, you will want to use a music audio codec, and probably specify a smoother-motion setting for the encoded video. For a news report, where the video is primarily a talking head, you will create a better result by specifying a voice audio codec and a sharper image. You will also be able to use a lower total bit rate for the same level of quality, since the image will have less motion on a generally static background.

These are only general suggestions. You will have to experiment with different encoding settings to achieve the desired result.

Video Frame Rates

Because mobile devices have limited processing resources, most are only capable of much lower video frame rates than what can be achieved on desktop PCs. For very low bit rates (15 – 20 kbps) a frame rate of 5 or 6 frame per second (fps) is best. Even at higher bit rates (50 kbps) some devices will not be able to process more than 7 or 8 fps. You may need to experiment with your specific mobile devices to determine the best target frame rate.

To avoid jerkiness and gaps in motion, you should always use an encoded frame rate that is evenly divisible by the frame rate of your source. For example, if your source file is 30 fps, you will get a better result if you encode to 6 fps than if you encode to 7 fps. This is because 7 is not evenly divisible by 30, meaning the encoder will need to average it out, which may cause momentary pauses in the motion of the encoded video. Specifying 6 fps will result in a more consistent and overall better encoded result.

5 Network Limitations

If you are encoding content to be streamed over a wireless or wire line network, you must be aware of the practical limitations of that network. The table below summarizes recommended settings for some wireless networks based on a general observation of the real-world capabilities for that type of network. These are general observations; different networks will have varying limitations.

Note that you must verify you are using settings that are appropriate not only for the network, but for the playback device (See Section 6 - Encoding Settings for Mobile Devices).

Recommended **3GPP** Settings for Wireless Networks

Network	Total Bit Rate	Voice Audio	Music Audio	Video	FPS
GPRS	15 - 25 kbps	AMR-NB 4750 - 7950 bps	AAC-LC 8 kbps	H.263 or MPEG4 10 - 20 kbps SQCIF or QCIF	5 - 6
UMTS	50 kbps or less	AMR-NB 10200	AAC-LC 12 - 16 kbps	H.263 or MPEG4 39.8 kbps (voice) 34 - 38 kbps (music) QCIF	6 - 15

Recommended **RealMedia** Settings for Wireless Networks

Network	Total Bit Rate	Voice Audio	Music Audio	Video	FPS
GPRS	15 - 22 kbps	RealAudio® 5 kbps (sivr2) or 6.5 kbps (sivr0)	RealAudio 6 kbps (cook8) or 8 kbps (cook0)	RealVideo® 8 10 - 17 kbps SQCIF or QCIF	5 - 6
UMTS	50 kbps or less	RealAudio 8.5 kbps (sivr1) 16 kbps (sivr3)	RealAudio 11 kbps (cook1) 16 kbps (cook2)	RealVideo 8 34 - 41.5 kbps (voice) 34 - 39 kbps (music) QCIF	6 - 15

GPRS

GPRS networks have a theoretical maximum bit rate of 115 kbps. However, the real-world maximum bit rate will probably be closer to 80 kbps, and reliable streaming will likely be limited to 18 - 22 kbps on most networks.

UMTS

EDGE or UMTS networks have a theoretical maximum bit rate of up to 384 kbps. However, similar to GPRS, the maximum reliable bit rate for streaming will probably be about 50 kbps on most networks.

6 Encoding Setting for Mobile Devices

Mobile devices, such as 2.5 and 3G cell phones and PocketPC PDAs, have more limited capabilities than a desktop computer. When encoding content for these devices, you must use

settings appropriate for the capabilities of the specific device. The table below provides recommended encoding settings for local playback on different devices.

Note that not all codecs are supported on all devices (See Section 7 – Device Interoperability Notes).

Recommended **3GPP** Settings for Local Playback

Device	Total Bit Rate	Voice Audio	Music Audio	Video	FPS
Nokia 3650	34 - 80 kbps	AMR-NB 12200 bps	AMR-NB 12200 bps	H.263, 22 - 68 kbps QCIF	5 - 8
Motorola A830, Sony Ericsson P800 ¹	34 - 80 kbps	AMR-NB 12200 bps	AAC-LC 16 - 32 kbps	H.263, 22 - 68 kbps QCIF	5 - 8
PocketPC	34 - 200 kbps	AMR-NB 12200 bps	AMR-NB 12200 bps	H.263, 22 - 188 kbps QCIF or 240x180	6 - 15

Recommended **RealMedia** Settings for Local Playback

Device	Total Bit Rate	Voice Audio	Music Audio	Video	FPS
Nokia 3650	34 - 80 kbps	RealAudio 8.5 kbps (sipr1), 16 kbps (sipr3)	RealAudio 8 kbps (cook0), 11 kbps (cook1), 16 kbps (cook2), 20 kbps (cook3)	RealVideo 8 25 – 64 kbps (voice) 25 – 60 kbps (music) QCIF	5 - 8
PocketPC with RealOne® Player	34 - 200 kbps	RealAudio 8.5 kbps (sipr1), 16 kbps (sipr3), 32 kbps (cook7)	RealAudio 8 kbps (cook0), 11 kbps (cook1), 16 kbps (cook2), 20 kbps (cook3), 32 kbps (cook4), 44 kbps (cook5)	RealVideo 8 25 – 168 kbps (voice) 25 – 156 kbps (music) QCIF or 240x180	5 - 15

The table below provides recommended encoding settings for streaming playback to different devices. Note that multiple network profiles (sustainable bit rates) are shown for each device. You should select the network profile that most closely matches the capabilities of your network, and develop your own settings based on those recommendations.

Recommended 3GPP Settings for Streaming Playback

Device	Network Profile	Voice Audio	Music Audio	Video	FPS
Nokia 3650	GPRS – 15 kbps	AMR-NB 4750 bps	AMR-NB 4750 bps	H.263, 10250 bps SQCIF	5
	GPRS – 20 kbps	AMR-NB 7950 bps	AMR-NB 7950 bps	H.263, 12050 bps SQCIF or QCIF	5 - 6
	UMTS – 50 kbps	AMR-NB 12200 bps	AMR-NB 12200 bps	H.263, 37800 bps QCIF	6 - 8
Motorola A830, Sony Ericsson P800 ¹	GPRS – 15 kbps	AMR-NB 4750 bps	AMR-NB 4750 bps	H.263, 10250 bps, SQCIF	5
	GPRS – 20 kbps	AMR-NB 7950 bps	AAC-LC 8000 bps	H.263, 12000 bps SQCIF or QCIF	5 - 6
	UMTS – 50 kbps	AMR-NB 12200 bps	AAC-LC 16000 bps	H.263, 37 kbps (v), 34 kbps (m) QCIF	6 - 12
PocketPC with RealOne Player	GPRS – 15 kbps	AMR-NB 4750 bps	AMR-NB 4750 bps	H.263, 10 kbps SQCIF	5
	GPRS – 20 kbps	AMR-NB 7950 bps	AMR-NB 7950 bps	H.263, 12 kbps SQCIF or QCIF	5 - 6
	UMTS – 50 kbps	AMR-NB 12200 bps	AMR-NB 12200 bps	H.263, 37800 bps QCIF	6 - 12

Recommended RealMedia Settings for Streaming Playback

Device	Network Profile	Voice Audio	Music Audio	Video	FPS
Nokia 3650	GPRS – 15 kbps	RealAudio 5 kbps (sivr2)	RealAudio 6 kbps (cook8)	RealVideo 8 10 kbps (v), 9 kbps (m) SQCIF	5
	GPRS – 20 kbps	RealAudio 5 kbps (sivr2)	RealAudio 6 kbps (cook8)	RealVideo 8 15 kbps (v), 14 kbps (m) SQCIF or QCIF	5 - 8
	UMTS – 50 kbps	RealAudio 8.5 kbps (sivr1), 16 kbps (sivr3)	RealAudio 11 kbps (cook1), 16 kbps (cook2)	RealVideo 8 34 - 41 kbps (voice) 34 - 39 kbps (music) QCIF	6 - 8
PocketPC with RealOne Player	GPRS – 15 kbps	RealAudio 5 kbps (sivr2)	RealAudio 6 kbps (cook8)	RealVideo 8 10 kbps (v), 9 kbps (m) SQCIF	5
	GPRS – 20 kbps	RealAudio 5 kbps (sivr2)	RealAudio 6 kbps (cook8)	RealVideo 8 15 kbps (v), 14 kbps (m) SQCIF or QCIF	5 - 8
	UMTS – 50 kbps	RealAudio 8.5 kbps (sivr1), 16 kbps (sivr3)	RealAudio 11 kbps (cook1), 16 kbps (cook2)	RealVideo 8 34 - 41 kbps (voice) 34 - 39 kbps (music) QCIF	10 - 15

7 Device Interoperability Notes

This section contains information on known limitations and interoperability issues with tested devices, and the content produced by the Helix Mobile Producer 2.0 powered by Envivio.

Codec Compatibility

Device	Compatible Codecs	Incompatible Codecs	Notes
Nokia 3650 & 7650 (.3gp and .rm)	H.263, MPEG4 Visual, AMR-NB, RealAudio, RealVideo 8	AAC-LC, RealVideo 9	AAC-LC and RealVideo 9 had not been implemented in this player at the time this document was last updated.
Motorola A830 (.3gp only)	H.263, AMR-NB, AAC-LC	MPEG4 Visual (?), RealAudio, RealVideo 8 & 9	MPEG4 compatibility is pending testing. The A830 did not support RealMedia at the time this document was last updated.
Sony Ericsson P800 (.3gp only)	H.263, MPEG4 Visual, AMR-NB, AAC-LC	RealAudio, RealVideo 8 & 9	See notes below. The P800 did not support RealMedia at the time this document was last updated.
PocketPC with RealOne Player (.3gp and .rm)	H.263, MPEG4 Visual, AMR-NB, RealAudio, RealVideo 8	AAC-LC, RealVideo 9	AAC-LC and RealVideo 9 had not been implemented in this player at the time this document was last updated.

P800 Notes

If you are encoding content that will be played locally on a P800, you need to change one of the default preference settings in the Helix Mobile Producer. By default, the encoder includes additional support information in the header of encoded files. On the P800, this additional metadata can cause a delay of 10 seconds or more at the beginning of the clip before it starts to play. To disable this additional metadata:

1. Open the Mobile Producer GUI, and select the **Preferences** item in the **Options** menu.
2. In the Preferences dialog, uncheck the option at the bottom that says "Include support information in streams".

Additionally, for any presets you use for local playback encoding, be sure that on the Export tab, the "Prepare for Streaming" option is unchecked. This will allow the encoder to generate files that do not include hint tracks, which will make them smaller, and therefore more suitable for downloading and local playback.

Any files encoded this way will start up right away when playing them locally on the P800.