LIVE Streaming Manual

Rev 2.3

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1 Considerations before setting up your live stream

There are a few areas, which need to be planned and prepared to be able to broadcast a live stream through the Internet to various outlets.

1.1 Internet Connection

1.1.1 Speed

This area is critical since it has a major impact on the stability and quality of your broadcast.

Usually when ordering an Internet connection, the Internet service provider describes the speed of your connection as "download speed" and "upload speed" in kb/s (kilobits per second) or MB/s (megabits per second). During your broadcast a large amount of data is transferred from your computer to Lightcast's live streaming network, which is why the upload speed is the most important figure.

Depending on the quality and type of your Internet connection (shared or dedicated line) the upload speed mentioned by your Internet service provider may be just a theoretical value. It is important to check your real current upload speed by using a tool like http://www.speedtest.net

1.1.2 Stability

While performing the speed test please be sure that no one except you is using your Internet connection. This check is of course even more important while you are broadcasting, so no one can interrupt your data transfer.

Using wireless networks is also a typical source of instability. We therefore recommend the use of a cable connection.

1.1.3 Your maximum broadcasting bandwidth

In order to configure your broadcast and to select all broadcast parameters you have to know your maximum broadcasting bandwidth. We recommend to determine this value according to the following calculation:

"Maximum broadcasting bandwidth" *= "Upload speed from speedtest.net" / 2*

Example: If your "Upload speed from speedtest.net" is 960 kbit/s then your "Maximum broadcasting bandwidth" will be 480 kbit/s.

This will put you on the safe side regarding volatility of your Internet connection speed and variable bitrate fluctuations of your streams.

1.2 Camera

The simplest way of generating the audio/video signal to broadcast is a consumer camera with built-in microphone, connected to your computer e.g. through firewire.

Of course there are more sophisticated ways like generating a feed from multiple cameras and microphones by using a sound- or video mixing console. If you want to generate a professional broadcast the Lightcast video experts are happy to assist you in choosing and setting up the right equipment.

1.3 Encoder

Since the raw video signal of a camera is too large for Internet broadcast, it needs to be encoded first.

The easiest way to get this job done is to use a computer with the processing power of modern CPUs and a software tool, which encodes the signal and transmits it to Lightcast's live-streaming server network. This option including a guideline for choosing the right computer hardware is discussed under "1.3.1 Software Encoder".

When broadcasting your stream in HD or in 2 or more qualities parallel, software encoders usually come to their limits. If your computer is strong enough you should be able to reach HD quality or even send 2 parallel streams but if you really want to reach great encoding quality in such high performance situations we recommend the use of a hardware encoder discussed in section "1.3.2 Hardware Encoders".

1.3.1 Software Encoder

Most users without special requirements, such as mixing multiple video signals or adding visual effects inside their encoding software, use a free software tool named "Adobe Flash Media Live Encoder". It is available for PC and Mac and does a great encoding job. Download Adobe Flash Media Live Encoder here for free

In section "2. Setting up your live stream" we will provide you with the entire configuration process for this software encoder. There are other recommendable software encoding tools for live broadcasting, such as "Telestream Wirecast", which sometimes offer more features than "Adobe Flash Media Live Encoder", but they usually come with license fees of a few hundred Dollars or more and are rarely better in regards to the broadcast performance. Lightcast recommends the separation of video mixing/video editing/visual effects with dedicated video hardware (mixer, switcher) and the encoding process, through a dedicated encoding PC or Mac, exclusively for the encoding of your "ready-to-broadcast" video feed.

When using a software encoder it is important that your computer has a powerful CPU like an Intel i7 Quad core CPU and at least 4GB of RAM. We recommend using a new computer, dedicated only to streaming and video editing. Try to avoid running any other applications like anti virus scans during your broadcast and make sure your computer has all necessary permissions in your LAN network. Avoid WiFi connections since they are less stable as cable connections and bare additional risks around your WiFi router. Try to setup your computer closely to your camera or video mixer in order to avoid quality losses and risks through avoidable cable distances.

1.3.2 Hardware Encoder

Hardware encoders are devices, which are designed for the special use of high performance video- and audio-encoding, but are usually more expensive than a computer with a software encoding tool. Lightcast is able to provide you with a tailored, pre-configured hardware encoder. Please contact your Lightcast Account Manager or your Lightcast Support Team if you are interested in such a solution.

2 Setting up your live stream

This section describes the configuration process of your live stream. After discussing how to choose the right video and audio codec as well as the right video and audio bitrates we will show an example configuration process with our recommended free software encoding tool "Adobe Flash Media Live Encoder".

2.1 Choosing the right video and audio codecs

While configuring your encoder the software might ask you to select a video- and audio-codec from a list of several options. The Lightcast server network can process all common video codecs such as "h.264 baseline", "h.264 main profile", "h.264 high profile" and "VP6" and the audio codecs "mp3" and "aac".

Lightcast recommends the codec **"h.264 main profile 3.0"** due to its supreme quality/compatibility ratio, as well as its compatibility with mobile platforms including iOS. Please note that your live streams will only be visible on iOS devices (iPhones 3GS or newer) with the **"h.264 main profile 3.0"** video codec and the **"AAC"** audio codec. If you want to support the first generation of iPhones (3G version) as well, please select the h.264 baseline 3.0 video codec.

Lightcast's advanced CDN service and live-streaming technology automatically adapts to each viewer's available bandwidth. Please keep in mind that mobile devices are frequently used with 3G or 4G mobile data connections (in cars, on the road, on the street, in restaurants, cafes, etc...) and therefore have limited data transfer available. This can result in a limited user experience in certain cases, such as a black screen (without video feed), choppy video transmission, re-buffering or audio transmission only.

2.1.1 Video codec

For normal use we suggest to go with the "h.264" as your video codec, since it supports better quality while using a lower bandwidth compared to "VP6".

In some software encoders you can also choose a subprofile for the h.264 codec. The selection of "baseline" gives you the highest compatibility even with older mobile phones like the iphone 3G while "high profile" generates the best quality while lacking in compatibility.

Lightcast recommends the codec **"h.264 main profile**" due to its supreme quality/compatibility ratio.

2.1.2 Audio codec

If your software encoder supports "aac" as an audio codec option, Lightcast recommends using "aac" since it has a slightly better quality/bandwidth ratio than "mp3" and is compatible with iOS. Please contact your Lightcast Account Manager or Lightcast Support Team if you want to support iOS devices since this requires some advanced setup tasks.

"Adobe Flash Media Live Encoder" on Mac comes with a built-in "aac" codec. At this point PCs can use this software only with the "mp3" audio codec. PC users can purchase an "aac" plug-in for "Adobe Flash Media Live Encoder" from MainConcept, containing the HE-AAC, which offers superior quality:

http://www.mainconcept.com/products/apps-plug-ins/plug-ins-for-adobe/aac-encoder.html

Since there is not much difference in the quality/bandwidth ratio of "mp3" and "aac" it is absolutely fine to use "mp3" if you do not want to invest into the aac plug-in.

2.2 Important: Finding the right video and audio bitrates

It is crucial to choose the right bitrates for your stream to enable a seamless transfer of your broadcast to Lightcast's live-streaming server network on one hand and a fluent viewing experience for your audience on the other hand. Therefore the sum of your selected video- and audio-bitrates must be lower then your viewers internet connection download speed so that the viewers can see the video and hear the audio fluently, without interruptions. Also the sum of all your streamed bitrates needs to be lower than your "maximum broadcasting bandwidth" so that they can be transferred seamlessly to Lightcast's live-streaming server network. Please note that the "maximum broadcast bandwidth" is not equal to the "promised upload bandwidth" your Internet service provider promised when selling you their service. Please refer to section "1.1 Internet Connection" for details on this.

Example: If your "maximum broadcasting bandwidth" is 500 kbit/s you can broadcast a video stream of 400 kbit/s and an audio stream of 64 kbit/s, a total of 464 kbit/s, which is lower than 500 kbit/s.

It is a simple calculation if you send a single stream, but Lightcast supports two nice features, which make this calculation a bit more complex.

2.2.1 Backup Stream

Lightcast gives you the option to send your stream either to one "entry point" of Lightcast's media server network or to two independent entry points at the same time. See section "2.2 Example: A step by step introduction of setting up your live stream using Adobe Flash Media Live Encoder / Step 4".

Sending the stream to two independent entry points of Lightcast server network increases the stability in case there is a routing problem to one of the servers – locally in your area or somewhere along the route between your streaming location and the closest Lightcast entry point. The disadvantage is that it doubles the used upload bandwidth at your streaming location.

This means that you should only use this feature if you have enough "maximum broadcasting bandwidth" left for a backup stream!

Example: If your "maximum broadcasting bandwidth" is 1000 kbit/s (meaning that your "upload bandwidth promised by your internet provider" is 2000 kbit/s) you can broadcast a video stream of 400 kbit/s and an audio stream of 64 kbit/s while using the Backup Server feature, which leads to a total of 464 kbit/s x 2 = 928 kbit/s which is lower than 1000 kbit/s.

2.2.2 Streaming two different qualities / bandwidths

If you have enough computing power and enough "maximum broadcasting bandwidth" you can encode two versions of your stream, in two different qualities and bandwidths. This will support viewers with lower Internet connection speeds with a lower quality stream enabling them to watch without interruptions. At the same time, viewers with high Internet connection speeds and powerful CPU or graphics card processor are able to enjoy a high quality stream. When streaming two different qualities please also check the CPU usage on your encoding computer. Two parallel encoded streams can easily max out your CPU, which can lead to interruptions in both streams.

In this case we have to sum up all single bitrates you generate.

Example 1a (without parallel stream to a backup server / 2nd entry point):

Video bitrate of low quality stream:	200 kbit/s (resolution: 320x180, 16:9)
Audio bitrate of low quality stream:	48 kbit/s (mono, 44100Hz)
Video bitrate of high quality stream:	500 kbit/s (resolution: 640x360, 16:9)
Audio bitrate of high quality stream:	96 kbit/s (stereo, 44100Hz)
Total:	**844 kbit/s**

This scenario would work for you if you have a "maximum broadcasting bandwidth" higher than 844 kbit/s (and a "promised upload bandwidth" of at least 1600 kbit/s from your Internet provider).

Example 1b (including parallel stream to backup server):

Video bitrate of low quality stream:	200 kbit/s (resolution: 320x180, 16:9)
Audio bitrate of low quality stream:	48 kbit/s (mono, 44100Hz)
Video bitrate of high quality stream:	500 kbit/s (resolution: 640x360, 16:9)
Audio bitrate of high quality stream:	96 kbit/s (stereo, 44100Hz)
+ sending everything parallel to backup server (x2)	
Total:	**1688 kbit/s**

This scenario would work for you if you have a "maximum broadcasting bandwidth" higher than 1688 kbit/s (and a "promised upload bandwidth" of at least 3200 kbit/s from your Internet provider).

Example 2a (without parallel stream to backup server):

Video bitrate of low quality stream:	200 kbit/s (resolution: 320x180, 16:9)
Audio bitrate of low quality stream:	48 kbit/s (mono, 44100Hz)
Video bitrate of medium quality stream:	500 kbit/s (resolution: 640x360, 16:9)
Audio bitrate of medium quality stream:	96 kbit/s (stereo, 44100Hz)
Video bitrate of high quality stream:	1000 kbit/s (resolution: 960x540, 16:9)
Audio bitrate of high quality stream:	128 kbit/s (stereo, 44100Hz)
Total:	**1972 kbit/s**

This scenario would work for you if you have a "maximum broadcasting bandwidth" higher than 1972 kbit/s (and a "promised upload bandwidth" of at least 4000 kbit/s (or 4 Mbit/s) from your Internet provider).

Example 2b (including parallel stream to backup server):

Video bitrate of low quality stream:	200 kbit/s (resolution: 320x180, 16:9)
Audio bitrate of low quality stream:	48 kbit/s (mono, 44100Hz)
Video bitrate of medium quality stream:	500 kbit/s (resolution: 640x360, 16:9)
Audio bitrate of medium quality stream:	96 kbit/s (stereo, 44100Hz)
Video bitrate of high quality stream:	1000 kbit/s (resolution: 960x540, 16:9)
Audio bitrate of high quality stream:	128 kbit/s (stereo, 44100Hz)
+ sending everything parallel to backup server (x2)	
Total:	**3944 kbit/s**

This scenario would work for you if you have a "maximum broadcasting bandwidth" higher than 3944 kbit/s (and a "promised upload bandwidth" of at least 8000 kbit/s (or 8 Mbit/s) from your Internet provider).

2.2.3 Recommendations

The recommended bitrates depend on your "maximum broadcasting bandwidth" and on the minimum Internet connection speed of your audience. The "maximum broadcast bandwidth" is not equal to the "promised upload bandwidth" your Internet service provider sold you. Please refer to section "1.1 Internet Connection" for details on this.

Provided you have sufficient "maximum broadcast bandwidth" Lightcast recommends the streaming of two different qualities with the settings described in Examples 1a, 1b, 2a and 2b in section "2.2.2 Streaming two different qualities / bandwidths". When streaming two different qualities please also check the CPU usage on your encoding computer. Two parallel encoded streams can easily max out your CPU, which can lead to interruptions in both streams.

If you do not have sufficient "maximum broadcast bandwidth" for using the backup server or the multiple bitrate streams feature, we recommend using 400 kbit/s as video bitrate and 96 kbit/s as audio bitrate with a resolution of 640x360 when using 16:9 screen format. If your primary audience is expected to have poor or volatile Internet connections (e.g. in developing regions or watching with mobile devices via 3G/4G or in public WiFi networks), we recommend to lower the bitrate settings and run some tests with your viewers well in advance of your first major broadcast event.

2.3 Example: A step by step introduction of setting up your live stream using "Adobe Flash Media Live Encoder"

Step 1: Download Adobe's "Flash Media Encoder" and install it on your computer.

Download here for free

- Install the software

- Launch Flash Media Encoder

- Make sure the audio/video capture device is working and is properly connected to the system/capture card.

- If you would like to transmit both audio & video content (which is the case in 99% of all typical live streaming scenarios), verify that both "Audio" and "Video" Device checkboxes are selected.

- On the right side of the Adobe Flash Media Live Encoder interface, next to Preview - please verify that the Input Video, Output Video, and Audio checkboxes are selected so that you can preview the encoded stream.
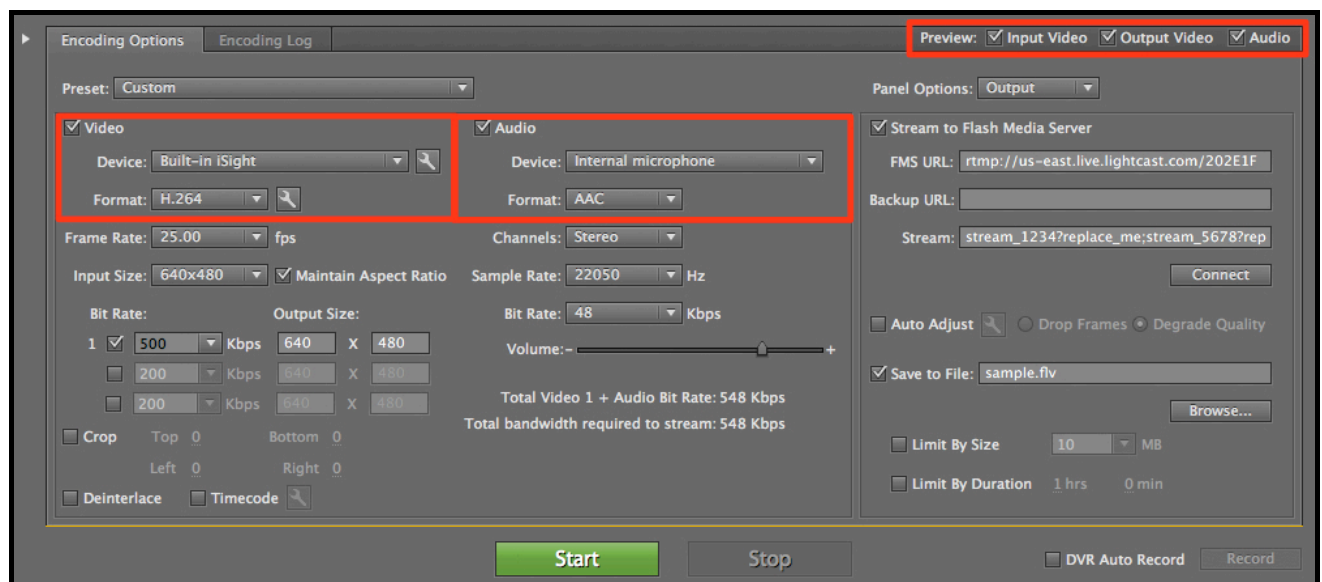
Step 2: Go to the "Control Center" of your Lightcast.com Account (or your "PRO Features" area in your cross.tv profile) and click on your LIVE Channel.

Step 3: Right in the center you will find a link called "Broadcast". Click it in order to retrieve the streaming ID and URL for the connection to Lightcast's server network:

Step 4: Open your Flash Media Encoder and create a connection to our Servers. Please choose the **closest location** as FMS URL**.** If you have sufficient "maximum broadcasting bandwidth" (please see section "1.1 Internet Connection") to broadcast a parallel backup stream to a second entry point in our server network, please add the second closest URL as **Backup URL**.

Set up your Livestream

Please install Adobe Flash Media Live Encoder to send your video signal in high quality to our servers
Download here for free

Launch Adobe Flash Media Live Encoder, enter the values provided below and click on the "Connect" button.

FMS URL & Backup URL:
Please choose the closest location as FMS URL. If you have enough upload bandwidth to broadcast 2 streams, please add a second URL as Backup URL. It gives you more stability when streaming your LIVE events, but only if your available upload bandwith is 50% higher than the total amount of required video and audio bitrate together. If you have enough upload bandwith, please use the second closest URL as Backup URL.

North America / East: rtmp://us-east.live.lightcast.com/202E1F
North America / West: rtmp://us-west.live.lightcast.com/202E1F
Europe: rtmp://europe.live.lightcast.com/202E1F
Australia: rtmp://australia.live.lightcast.com/202E1F

Stream: stream_1234?replace_me

[close]

If you see "lightcast.com" in the URLs and a list of 4 different locations to choose from you are already activated on Lightcast's high performance, high availability CDN. If not, we recommend to upgrade free of charge. Please email to support@lightcast.com with a request for the free upgrade to Lightcast's high performance, high availability CDN for live streaming.
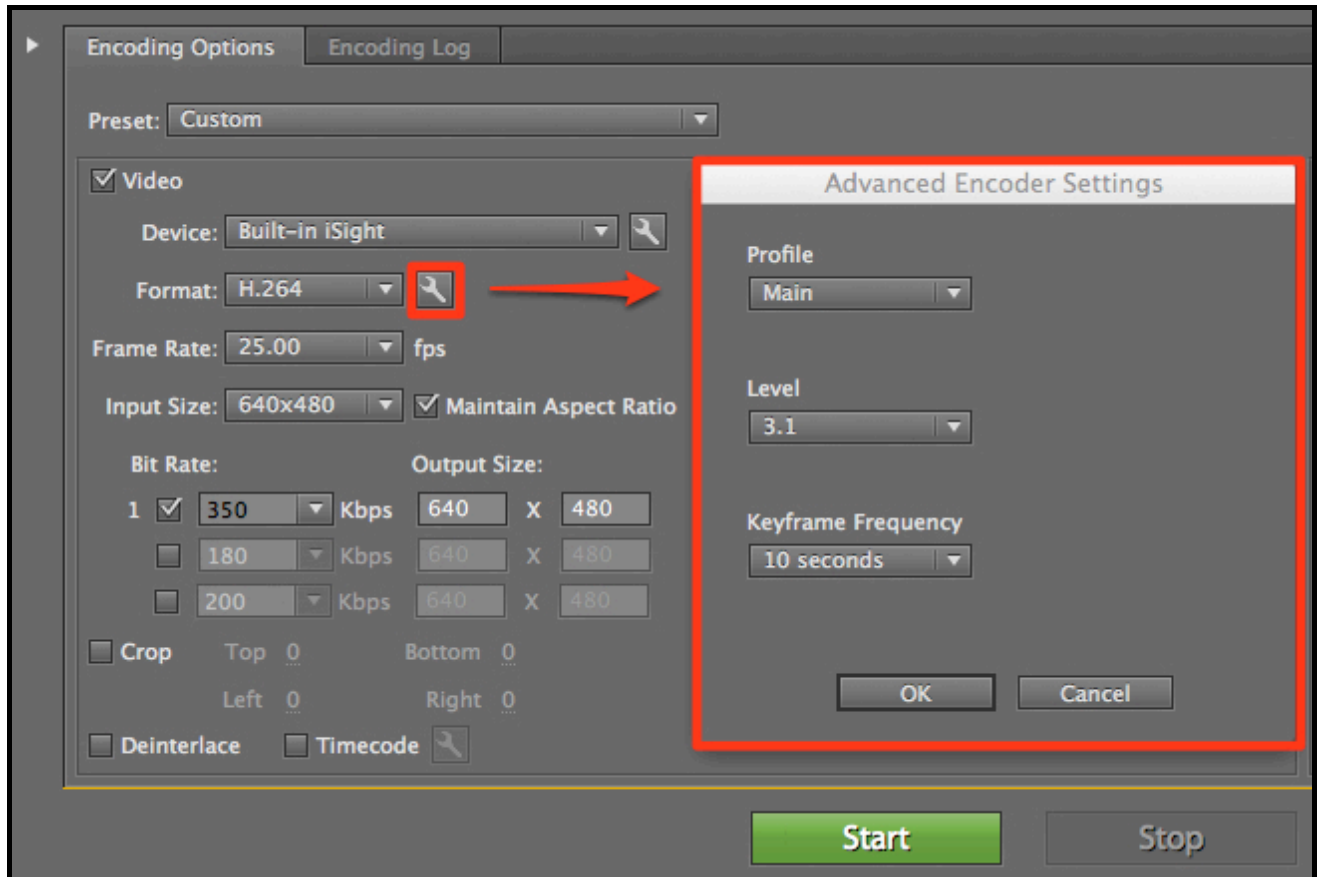
14

Step 5: Choose the right video- and audio bitrates as well as output sizes. We strongly recommend to check section "2.2 Important: Finding the right video and audio bitrates" for more details.

Below the bitrate selection you can crop your video if the captured input format of your camera (e.g. 720x576 = 5:4) differs from the output format (e.g. 640x360 = 16:9). We recommend the use of a 16:9 output size since nowadays most output devices such as tablets, computer monitors and TV-screens have close to a 16:9 aspect ratio. Don't forget to configure your Channel's screen format also in the "LIVE Channel Info Editor" in your "Lightcast LIVE Channel admin" **BEFORE** you embed your players so the embed code will contain the right vertical size.

Below the crop section you can check the "Deinterlace" box if your input signal is interlaced.
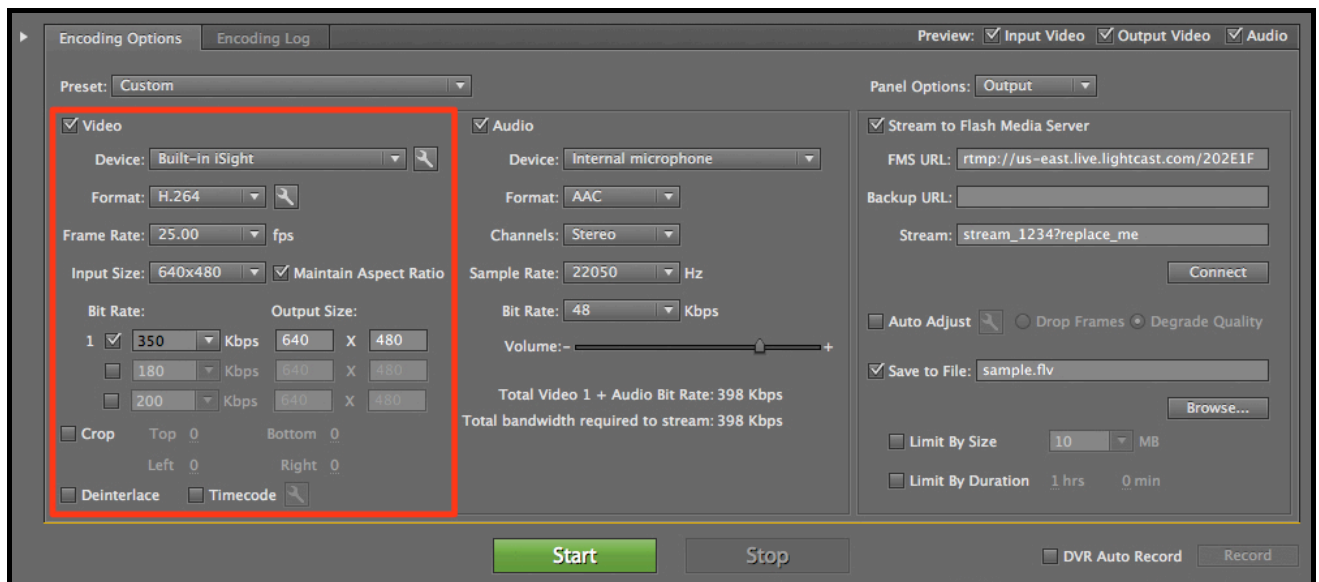
We recommend the selection of "H.264" codec and "Main" profile. For further details on codecs please see section "2.1 Choosing the right video- and audio codecs".

Select the Audio Settings next to the video settings. We recommend to read section "2.2 Important: Finding the right video and audio bitrates" and section "2.1 Choosing the right video- and audio codecs".

Step 7: Check the option **"Save to File"** in the lower right corner if you want to record your LIVE Stream File onto your local hard drive. Choose the folder you want to save your LIVE Stream File to. After the broadcast you can import the recorded file into your video editing software, or upload this file straight to your VOD Channel in order to make it available to your viewers "on demand". You can limit the size or duration of output files to chunk large encoding sessions into multiple files.

Click the **„Start"** Button to start broadcasting and watch the stream in your players.
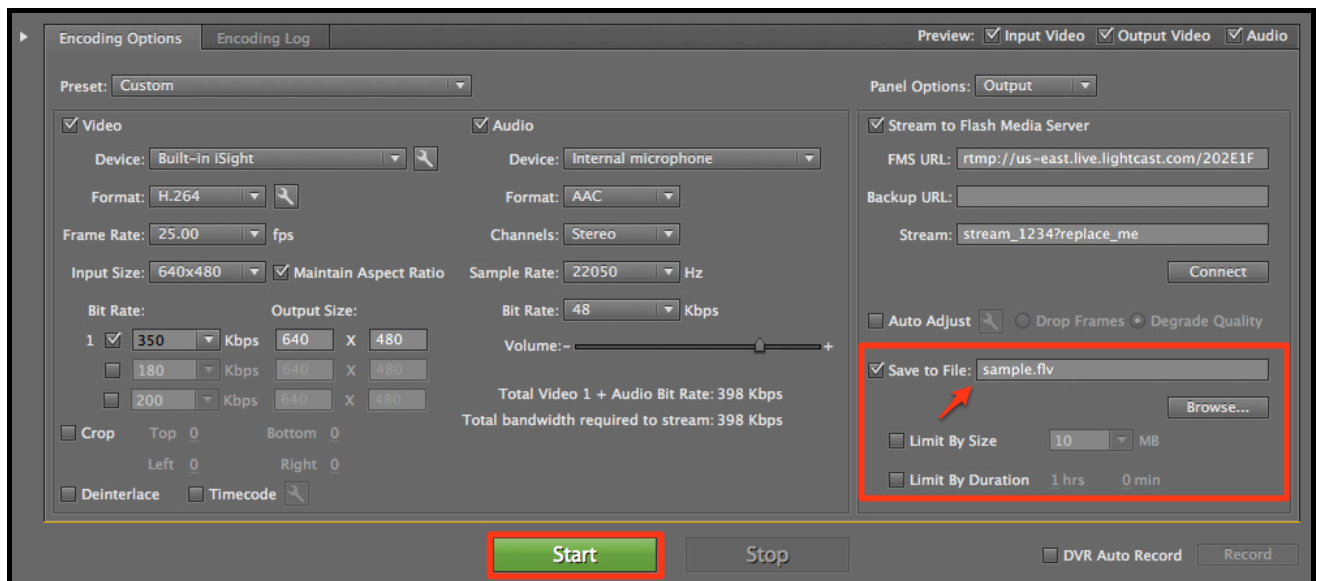
2.4 Optional: Configuring two different qualities / bandwidths

Again, we use "Adobe Flash Media Live Encoder" as software encoder here to demonstrate how to setup a case where you broadcast two streams of different qualities and bandwidths to enable your audience an improved viewing experience. Please read section "2.2.2 Streaming two different Qualities / Bandwidths" for more general information on this topic.

Offering different bandwidths to your viewers to choose from is very simple. You can do this by creating a second LIVE Channel to get an additional streaming ID and the chance to adjust the bitrate of the second channel. Please keep in mind that streaming with two streams requires a higher "maximum broadcast bandwidth".

Step 1: Create a second LIVE Channel in your Lightcast Control Center if you don't have one already:

Step 3: Right in the center you will find a link called "Broadcast". Click it in order to get the needed streaming ID and URL to connect to Lightcast's server network:

Step 4: Copy & Paste the second streaming ID of your second LIVE Channel into your Flash Media Encoder, separated by a semicolon and without using spaces between the first and the second streaming ID (don't delete the streaming ID of your first channel):

Step 5: Choose the **video bitrate** for your additional LIVE stream:

You can embed the second LIVE stream player below your current LIVE player but make sure, that only ONE player streams with "autostart". In order for the viewers to know which stream they should choose, let them know, which bandwidth belongs to which player (e.g. add an information above the player saying "Low Bandwidth" or "High Bandwidth").

Alternatively you can embed the two players on separate pages and place a link below the player (stating "Watch in lower quality" e.g.) to allow users to switch to the other page with the higher or lower quality stream. The viewers will be directed to a page with the player in low bandwidth. We recommend this option because it looks more professional and your player can start with "autostart".
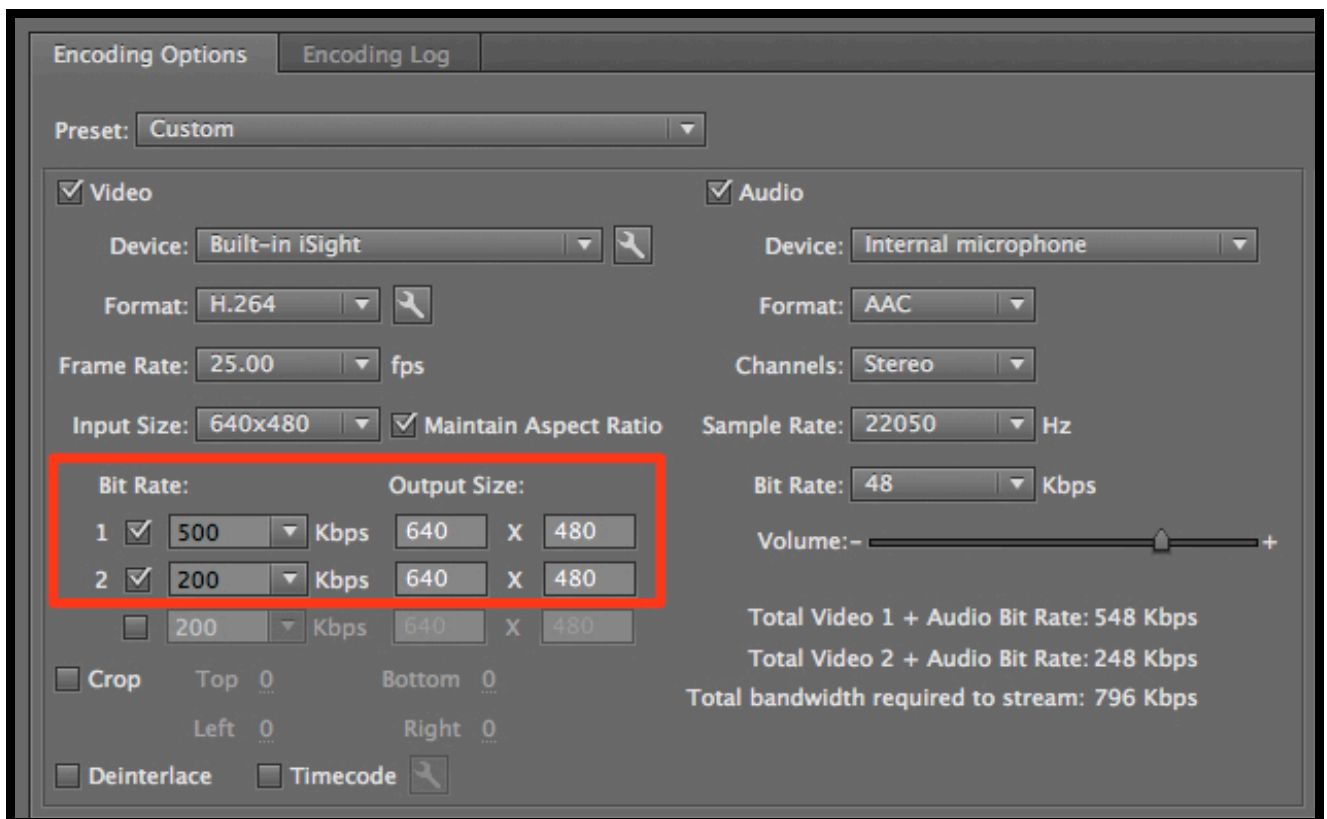
3 Your checklist before starting the stream

- Create **LIVE Events** in your Lightcast LIVE Channel Event Manager. Why is this important? Simply because…

  a.) your events should be announced on the player with a **countdown**.

  b.) you will receive separate viewing stats per LIVE event.

  c.) if you are a CROSS.TV user, your LIVE event will also be published and promoted on CROSS.TV under "Videos – Live Channels" which gives **CROSS.TV Users** the possibility to watch your LIVE event and it increases your audience.

  d.) it gives **search engines** a chance to find and list your events as well.

- **Embed** your LIVE Channel Player on your own Websites, Blog Sites, Facebook and on other Social Sites for maximum exposure.

- Tell your **friends, partners, contacts and members** about your LIVE Stream and ask them to embed your LIVE Channel Player on their Websites and Social Sites as well in order to extend your reach even further.

- Simulate and test your streams as often as possible on location at the event venue under **real event conditions**.

- **Test the Internet connection** a couple of times prior to the event. Open a browser, then go to www.speedtest.net and reassure yourself of the available upload speed on location.

- Ask someone offsite to **check the test stream**. If you are attempting to test the broadcast at the venue by watching it there on location, please keep in mind that you are using the same Internet connection you are broadcasting out with.

- Make sure you have **sufficient Internet bandwidth** available at the time of your event. Even basic Internet activities (web browsing) and e-mail uses vital bandwidth. This is why we recommend a **dedicated broadband connection.**

- Turn off all applications on the encoder PC other than Flash Media Live Encoder. Instant messengers, browser pages, Outlook, virus scans, etc… can drain your PC's/Mac's CPU and RAM resources, as well as limit the Internet bandwidth available to your live stream.

- Make sure you have **enough battery power** if you are using a laptop in battery mode.

- Make sure you have **enough battery** on your cameras if you are using them in battery mode.

- If you are using cameras with a tape recorder, make sure there is a **tape in the camera**, as some camera models require it for flawless operation.

- **Check the sound** quality and volume coming from your audio mixing board, on both the encoding PC and in a Live Channel Player. That way you can make sure that there is no technical factor in your setup, which could potentially distort the sound or lower its volume. Adobe Flash Media Live Encoder displays a volume meter on the left side next to the screen. We recommend using an additional sound compressor or maximizer/limiter in order to deliver a stable volume while avoiding noise of peaking audio signals and overdrive.

- **Check the lighting**: Turn on all stage lights which will be used during the event, hold up a white piece of paper in the center of the stage for thirty seconds and do a white balance on all your cameras.

- **Move distracting objects** behind the speaker (usually in the center of the stage) **to the side** of the stage/out of the picture if at all possible. Especially the area behind the upper body and head of the speaker should not be impaired optically by objects directly behind it which can result in the distraction of users and reduction of the aesthetical value and professional appearance of your picture.

- Make sure the location of the encoder is away from possible obstructions and **high traffic areas**, in order to avoid cable tripping and other accidents.

- Know your surroundings! Whether you broadcast from an indoor or outdoor location - just make sure your surrounding area is **safe for both encoder and for your camera equipment**. Try to set up both camera hardware and your encoder in a safe, guarded place, protected against vibration, theft, weather and accidents caused by event attendants.

- If you choose to purchase more than one LIVE Channel, you have the possibility to stream with **different bandwidths** at the same time. For example 300 kb/s, 500 kb/s and 1 Mbit/s. Streaming with different bandwidths offers your viewers more flexibility in choosing their preferred bandwidth. Keep in mind that you need to have a higher "maximum broadcasting bandwidth" at your streaming location when choosing to stream with different bandwidths than with only one stream. The

"maximum broadcast bandwidth" is not equal to the upload bandwidth promised by your Internet service provider. Please refer to section "1.1 Internet Connection" and "2.2.2 Streaming two different qualities / bandwidths" for further details.

4 Helpful tips for your broadcast

- If you choose to stream with only one camera we recommend to use a simple digital video camera on a stable tripod bringing it to eye-level with the speakers and artists on stage (if necessary use a little platform) and as close to the audio mixer as possible. Many live streaming clients start out with a single or even uncrewed camera, but usually make it a goal to train 2-3 people who can rotate as camera operators and can fully concentrate on their job during the LIVE stream.

- **At the beginning of your event**: start fully zoomed out (long shot) and slowly zoom in on the main actors (speaker, worship team). Towards the end of the event slowly zoom back out again, to show your viewers the venue you are in as well as some live-audience on location.

- **Caution camera operators**: keep thinking ahead! What will the artists/speakers on stage do next? Be prepared to pan, tilt and zoom ahead of time.

- **Focusing on a speaker:** zoom out shortly before the speaker enters the stage and then zoom in on the speaker. Keep the face of the speaker as large as possible throughout 90% of the broadcast ("Close-Up" or "Semi-Close-Up"). Allow for just the right amount of "head space" (apx. 2-5% of the total picture height). Keep in mind that fast moving speakers/artists require additional concentration on the part of the camera operators, in order not to "escape the picture".

- **On-stage language translations:** with a live interpreter present choose to EITHER focus on the main speaker exclusively, or both on main speaker and interpreter. Never "cut" the interpreter "in half".

- **Closing shot:** If possible, slowly fade out both sound and picture. (Slowly close the camera aperture until the picture is black or if you have a video mixer, use it to fade out.)

- **Check if a LIVE Event has already been created** for the following recording. Please note that because of buffer and caching (necessary to increase the streamability for users), it can take up to 60 minutes until the countdown to the next scheduled LIVE Event is displayed on your LIVE Player.

- If you chose to record your live stream to your local hard drive, you can open the saved video file in a video editing software on the same computer (e.g. Final Cut) to add titles, lower third and other graphics as well as an optional opener at the beginning and closing credits at the end of the video. To make the video available on demand **upload** it **into one of your VOD Channels**.

- Optionally you can publish your VOD Channels **"TV Show Channel"** on CROSS.TV (the largest faith-based social media community) and embedded the VOD Channels archived content on as many websites as you like with Lightcast's intelligent VOD Players and Media Center embed tools. New uploads automatically appear on top of the playlist. The order of each VOD Channel's playlist can be modified manually.

- It is recommendable to develop your own TV-Show designs and branding with your TV-Show's name and logo. We encourage every LIVE broadcaster to record live streams locally and to upload them as on-demand video into a VOD Channel even if they are not edited. This allows for your valuable content to be made available to more viewers regionally and worldwide and it enables excited viewers to share the videos (or TV-Show) with friends (thus allowing your content to "go viral"). VOD uploads are just as important as LIVE Streaming and the impact of Video On Demand should not be underestimated, since they attract search engines and increase the search engine and social visibility of websites with integrated VOD content.

5 Troubleshooting

Problem: The live stream watched with the Live Channel Player is interrupted or jerky or it shows no image but only streams the audio signal.

This could have several reasons:

- The sum of your streaming bandwidths (amount of data transmitted to our server network) temporarily exceeds the "maximum broadcasting bandwidth". Please check sections "1.1 Internet Connection" and section "2.2 Important: Finding the right video and audio bitrates" for more details.

- The CPU of the encoding computer could be maxed out. Please open the task manager (or activity monitor) and check your CPU usage. During the encoding process of your live event the CPU load should never exceed 80%.

- The viewer's computer does not have enough available download bandwidth to watch the stream. Let's do a speedtest of the viewers internet connection (check section "1.1 Internet Connection" for a suggested way of doing a speedtest) and compare the download speed of the speedtest with the sum of video- and audio-bitrates you are streaming multiplied by 2 since there can be fluctuations in the internet connection speed or in the variable bitrate encoding.

- The viewer's computer does not have enough CPU power to process the stream and to display the picture fluently. (or the viewer's CPU is maxed out due to parallel running applications on the desktop or mobile device – even if running "unconsciously" in the background.)

Problem: I can't connect to Lightcast's Servers.

Your stream is being transmitted through many different routing points on its way from your location to your selected entry point in the Lightcast server network. The most likely reason is that there is an issue somewhere on this route, or one of our CDN's datacenters is down temporarily.

What to do if your encoding software reports a server connection problem:

Check on the route and on possible routing issues from your location to our servers, by opening a "Terminal" window on Mac or in Windows go to Start > All Programs > Accessories > Command Prompt, or similar, depending on the version of Windows you're using. Type "traceroute" or "tracert" (depending on your

operating system) followed by a space and the server name. The server name can be found in your FMS URL after "rtmp://", so it can be one of these:

- live.cdn01.net

- us-east.live.lightcast.com

- us-west.live.lightcast.com

- europe.live.lightcast.com

- australia.live.lightcast.com

A * in the traceroute output usually indicated the router which has a temporary issue. You are welcome to send this output to support@lightcast.com for further analysis. If the traceroute shows a routing problem or displays a server response issue in the last item of the displayed list, then you can switch to one of the other entry points/Lightcast.com URLs listed above at anytime to bypass the problem. If you are using the cdn01.net URL we recommend to upgrade to Lightcast's high-performance, high-availability CDN free of charge. Please contact support@lightcast.com and mention the free upgrade to Lightcast's high-performance, high-availability CDN for live streaming.

A way of using this bypass automatically is to stream parallel to a backup server. Please check section "2.2.1 Backup Stream" for more details.

Problem: viewers complain about low audio levels

- Try to increase the volume in your Flash Media Live Encoder and check on it while watching your own stream with a separate computer or device.

- Use a compressor or maximizer/limiter device to maximize your audio volume while limiting the risk of distortion through overdrive (peaking).

- Work with the output volume of your audio mixer console.

- Check the volume settings of the audio line input in your operating system and turn it up if necessary.

Problem: the Countdown to the next Live Event is not being displayed.

Please make sure you have created a LIVE Event in your Lightcast Live Channel Admin with the correct time and timezone settings.

Make sure to empty your computer's cache, or allow for an hour or two so your computer can "catch" the new count-down.

Enjoy sending streams around the world!

May your message be heard, your presence impact

lives and your service change the world!