



The Live Streaming Start-up Guide for Live Event Production

Tips, tools and strategies for successful live streams

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The Purpose Behind This Guide

Live streaming is no longer an out-of-the-box marketing tactic. Brands and individuals are looking to connect in meaningful ways with one another. Live video breaks down the barriers and brings audiences that much closer to the brands, teams, companies or governments they are associated with.

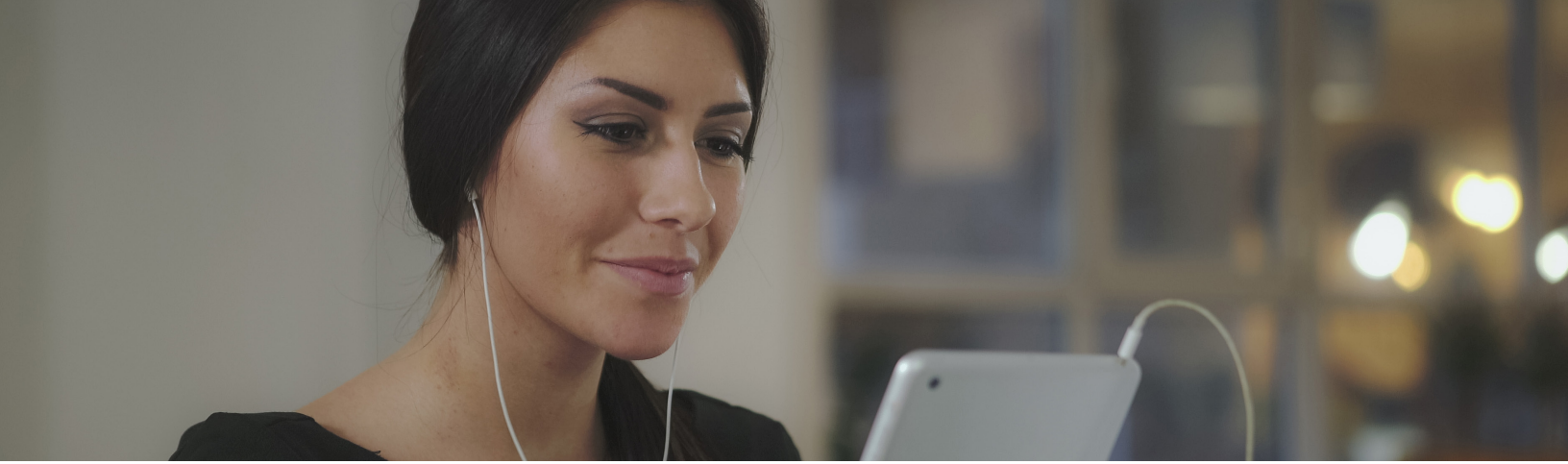
What's more is that customers are entering into a world where they expect live video and interactions. As companies forge ahead and create these live experiences, the technical capabilities and production value of their shows have also increased. This means that while live selfie content used to be acceptable, expectations are shifting higher and companies that don't rise to the occasion and develop professional looking live streams will leave customers wanting more.

While we may think of live streaming as being used for marketing or sports, the use cases transcend that of just reaching

customers or fans. Livestreaming allows teachers to reach students, governments to reach their communities and houses of worship to reach their followers. Whichever sector you are in there is a way to live stream, and this guide will help get you there.

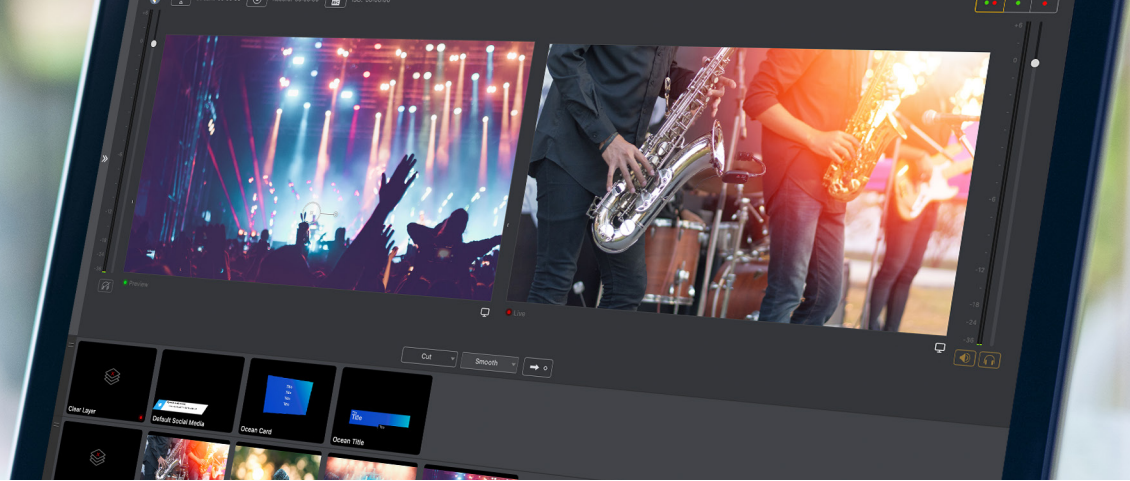
We set out to create this guide to be a one-stop-shop for anyone looking to start (or improve) their live streaming. Our goal is to help you understand why having a live streaming strategy is a must and how to create a strategy so it works for you now, and in the future.

Once everyone is bought in, that's where the fun begins! Follow along to look at typical set-ups, all the tools you'll need for a successful stream and learn from others and how they live stream to reach their audiences whenever and wherever they are!



Why you Should be Live Streaming Events

Live streaming events from conferences to concerts, interviews and more is becoming increasingly more popular. Grow you following both locally and globally by live streaming your events and sharing the content with the world.



Why Everyone Needs a Live Streaming Strategy

Strategies are essential before you begin anything but especially when it comes to live streaming. Since you are reaching your audience in real time and asking them to block out a specific time in their day, it's even more important to make sure you have a set strategy to meet and exceed your audience's expectations.

Creating Your Live Video Strategy

Below we've outlined a few key things to think about when creating your strategy. This is by no means an all-inclusive strategy document, but is a good place to start and get a sense about what sort of production might make sense.

Develop your niche

Who are you?

First determine "who you are." Are you a school trying to reach kids after hours

with a tutoring program? Are you a local government experimenting with live streaming town hall meetings? A church trying to build its community? Maybe you're a company looking to live stream lunch and learns or even a production company live streaming sporting events. Wherever you are in the spectrum it's important to first really look at who you are and what you stand for because it will make what follows much easier.

Who is your audience?

If you have already determined who you are then this question shouldn't be too difficult to answer. The more granular you can get here the better, so really dig deep. Let's use the tutoring example. We've decided you are a school developing an after school live tutoring program. But is it for everyone or only a select group? To really develop a niche, it might make sense that you built the program not for

everyone but specifically for students struggling in geometry. Now that's a small targeted group that you can build great content around. There is nothing stopping you from creating multiple tutoring live streams but each one should be specifically geared towards one group.

What can they expect from you?

By creating a well-defined niche this question answers itself. Your geometry students that you've developed this lesson plan for would be surprised and probably not very happy if instead of math you started talking about history. The message here is to produce what you said you would. Meet the expectation of your audience and build that trust so they know what they can expect when they tune in.

Create your content

Come up with a few categories to give your audience variety. Using the tutoring example again, we've established that the niche and expectation is content suited for students struggling in geometry. But, that doesn't mean you should only even be going over equations. Try to develop a few different content categories to keep students engaged. These might be: a. real world applications of geometry, b. useful equations, c. step-by-step problem solving. Each one of these categories relates

to geometry but it gives students some variation so things don't get repetitive and they be more inclined to focus and learn.

Create a content plan for 2-3 months out Part of creating a strategy also means making a plan. It is our recommendation that you truly plan out live content. It's not something that can or should be done on the fly and requires adequate preparation. Sometimes it can feel like a tactic that requires less rigid planning but to truly succeed it's best to plan content 2-3 months out. This will give you plenty of time to prepare and really exceed the expectations of your audience. Remember, you're asking them to carve out specific chunks of time to watch your live streams so you want to make sure it's always professional.

Don't forget the marketing

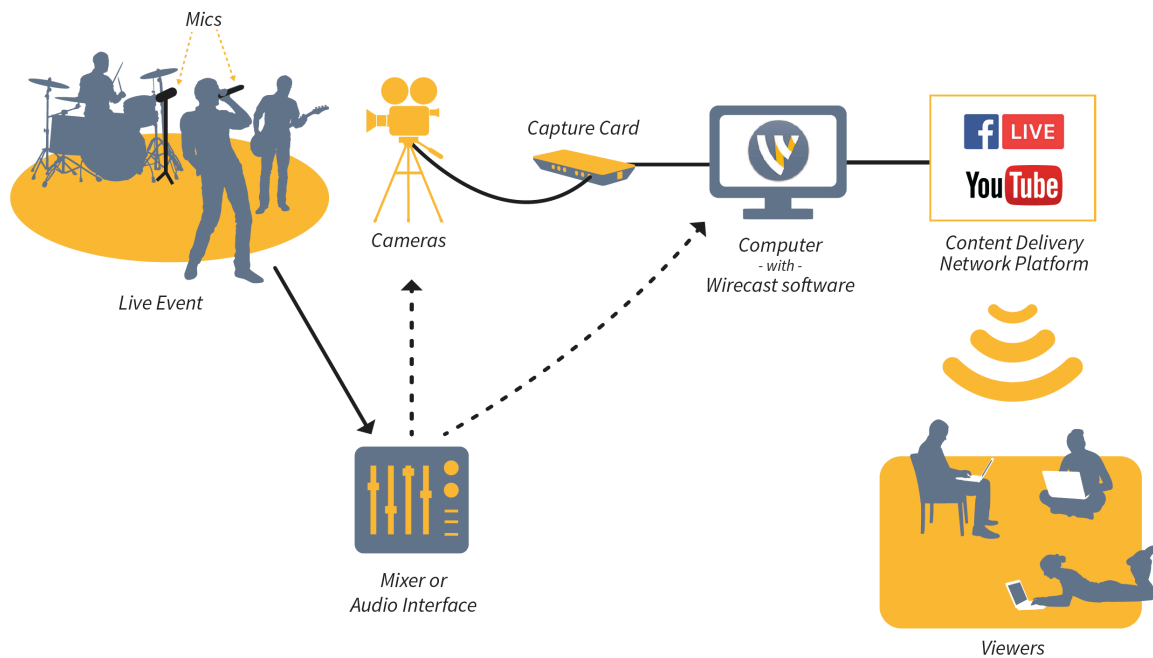
This is key! Don't forget to let everyone know about your live stream. Start posting on social, telling your friends, community etc. send out email reminders and everything you can to get people to mark their calendars. Don't be afraid to send follow up emails either. Once you get into a groove you may need to remind people less, but you will always want to continue to attract new viewers and the best way to do that is through engaging marketing!



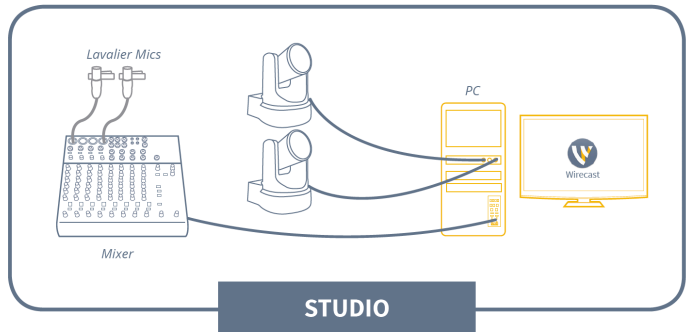
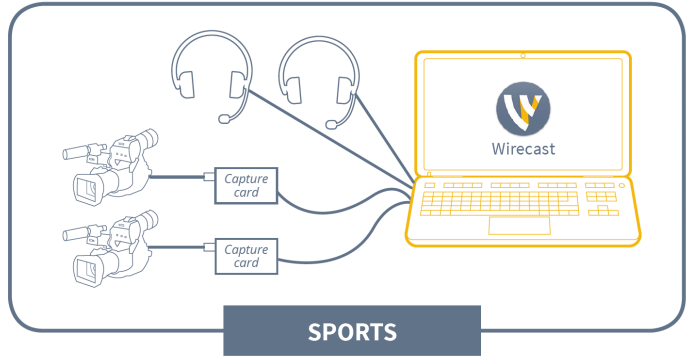
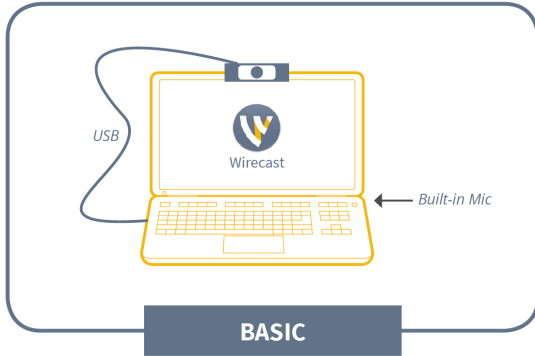
Creating your Set-Up

So, you're convinced! Before we go into all of the equipment you need to live stream we want to show you a few examples of some live streaming set-ups so you can start envisioning your space and where you'll build your studio, or just where you'll place your camera if a studio isn't an option.

A Typical Live Stream Might Look Like This...



Other Typical Setups





Toolkits: Everything you Need to Go Live

Congratulations on taking the first step to streaming your live stream. Where to begin? In this section we are going to go over beginner, intermediate, and advanced live streaming toolkits, what to expect and how to set yourself up for success! Let's get started!

Beginner

The first question you need to ask yourself is will you have a small team, or will you be doing this yourself? For a beginner setup, we recommend making it a solo production or have one other person to help facilitate. The beginner setup is all about getting up and running as quickly as possible and not breaking the bank to do so.

Computer and Camera

Let's talk about the hardware you may need. A desktop or notebook computer

will work just fine for your beginner setup. You'll want to have an i5 processor with 4-8 GB of ram, and enough hard drive space for your programs and recordings – today's computers usually come with at least 1TB of space which should be sufficient. You will also need a camera. If you're using a notebook, you can use the built-in camera to save a few dollars, or if you're on a desktop, you'll need to purchase an external USB webcam.

Lighting

For a beginner setup, lighting is as important as a clear camera. If you're just starting up, you likely don't have a designated studio, but that's OK. No need to spend a lot of money on lighting, just make sure you're in a well-lit room. Today's web cameras have "auto gain" controls that will brighten your picture or they have "backlight" functions to boost the lighting. It's not until you get into a

more intermediate/advanced setup, that you would need to branch off to get some external lighting.

Audio/Cables

Most computers that are notebooks come with built-in microphones, but the audio quality is usually not good enough to use for a broadcast. It can be used for meetings for work, but for a high-quality broadcast, it's not ideal. If your budget is tight, there are a lot of options for a USB microphone that range from \$30-\$300. In order to achieve the best sound, especially if you're not in a soundproof room, look into getting a dynamic microphone. A dynamic microphone is a direct addressing microphone which means you have to speak directly into it for audio to be clear.

NDI/Network Sources

NDI has become a real hot topic in the industry. NDI allows broadcasters to bring in sources from all over the network, to enrich their production. Even as a beginner the need to bring in pictures, websites, PowerPoint presentations is necessary. That's where NDI comes in. It's really simple to use, and there are free NDI scan converters that can be downloaded from many sources. For a beginner setup, look through the free apps before moving to paid because most of the free apps are more than proficient.

Software

Telestream makes a great product called Wirecast. It is a video switcher in software form. Unlike a traditional switcher with a massive learning curve, Wirecast is simple to get up and running. If you can run PowerPoint, you can run Wirecast. For beginners, Wirecast Studio is a great place to start. There are plenty of tools and features to get your feet wet and if you ever feel like you have surpassed the capacity of Studio, you can always upgrade to Wirecast Pro.

Streaming Platform

Now that you have your hardware, software, audio, and camera, it's time to begin your production. How do you know what destination or streaming platform you should stream to? You need to find out which platform is the most used by your followers or that is most relevant to the content you have decided on. This will help you reach the correct viewers. For instance, if you're a gamer, you're not going to stream to churchstreaming.tv when Twitch is geared towards gaming.



Intermediate

An intermediate setup is going to be for those that are interested in bringing multiple cameras or microphones into their live stream and who are willing to spend a bit more money on the components to create a really professional looking setup. Let's get into some of the things that you will need.

Computer

In the beginner setup, you can get away with a notebook computer but as you move towards intermediate, it's recommended you use a desktop mac or pc. Look for something with a high-end i5 processor to a low-end i7 processor. Using a desktop computer will allow you to get multiple cameras ingested into Wirecast as well as allow you to use a discreet graphics card. This will be necessary to utilize Wirecast's GPU acceleration feature.

We suggest a minimum of 8GB of ram and consider using a solid-state drive as the main drive and using a large, secondary drive for file storage. This will increase the performance of your machine because your computer is only as fast as your slowest component. For a graphics card, you would want to look into something like a Nvidia card, but for sure something that supports NVENC. This will allow Wirecast to offload the encoding to the graphics card rather than use the main CPU.

Camera/Capture Card

A capture card is a hardware device that converts the video signal from your camera output into a digital format your computer can recognize (e.g. USB). When you're using a camera that outputs HDMI, HD-SDI, component, etc..., you will need a capture card in order for your computer to recognize your camera(s).

Before you purchase a capture card, you need to determine whether you would like to use a DSLR camera or a camcorder. In the past DSLR's had sensors that would overheat if used for live streaming. Before you buy a DSLR camera, check with the manufacturer to ensure shut-off mid-stream won't happen.

Others prefer to use camcorders – usually a semi-pro camcorder. For an intermediate setup you'll be able to find one in the \$600 - \$1500 range and most will be a mini HDMI to full-size HDMI connection. We are assuming that you won't need to go more than 15 feet with your HDMI cable for an intermediate set up and won't need to do any type of conversions. HDMI works best at 15 feet or less before a loss in quality happens. Once you have your camera, we suggest a single input HDMI connection using a capture card over USB. These are usually plug and play in Mac OS or Windows.

Audio

Now that we have the camera and capture device figured out, next we need to figure out the audio situation. It's likely you're now going to be using multiple microphones – at least one for the speaker and, perhaps, a second microphone for the room to facilitate comments and Q&A. Rather than connecting multiple microphones directly to your streaming computer, it's probably better to consider purchasing a 6 or 8 channel USB audio mixer. This will allow you to plug in multiple sources and, with an audio mixer as your hub, it will give you a lot of control.

Audio Cables

Once you have your mixer picked out and purchased, you need to figure out how many cables are needed. If you have 2 XLR microphones you would need 2 XLR cables. We recommend purchasing 4 as it's always great to have backup of cables just in case. If you're bringing in sources from other computers like projectors and things like that, they may run off a 3.5mm cable which means you'll need to purchase a cable from 3.5mm to 1/4" to use with your mixer. You will also need to determine if the audio is mono or stereo. If it has 1 black ring on the end, it's mono, if it has 2 it's stereo. These will be important factors in purchasing your cables.

Lighting

Next up is lighting. In the beginner's stage we said it was fine to be in a well-lit room. But, now for your intermediate production you'll need more than just office lighting. It will make the entire production look more professional and if you are thinking about using a green screen for background effects, you will definitely need quality lighting. If you don't have a dedicated studio, you can find an isolated room and set up LED light panels. LED lights are great because unlike fluorescent bulbs, they don't get nearly as hot. You can find these light panels for about \$100 – just check the reviews and find the one that will work for your space.

For your first foray into professional lighting, the best place to start is with a three-point lighting setup. The three points are known as the key light, fill light, and back light (sometimes called a “hair light”). The key light is typically the brightest and is positioned to the side of the camera and in front of the subject or scene. The fill light is positioned on the opposite side of the camera from the key light, and its purpose is to fill in the shadows created by the key light. The back light is positioned behind, and often above, the subject to provide depth to the scene.

NDI / Network Sources

In some cases, you may consider using NDI sources in your streaming productions. NDI stands for Network Device Interface and is developed by NewTek. NDI is a free protocol for media over IP, and it is designed to allow distribution of live professional audio, video, and control over existing IP infrastructure, freeing users from hardware constraints (cables).

For corporations specifically, NDI will let you bring in remote Skype or Zoom guests. Having an audio mixer gives you the flexibility to bring in audio from computers, other than your streaming system, running Zoom or Skype, and, with NDI, no capture card will be needed.

Software

Wirecast is always the software of choice, because it’s able to work with NDI sources, the capture cards of your choosing, and USB audio mixers to make one high end, intermediate production. In the lighting section we mentioned the use of a green screen. Wirecast’s real time chroma key will allow you to swap in whatever background you like without any post-editing.

Streaming Platform

With Wirecast, you have a list of destinations you can stream to, and for an intermediate setup, you may want to consider multi-streaming. What is multi-streaming? It’s the ability to stream to more than one platform at any given time. Why is this important? With YouTube and Facebook being the top 2 major destinations, it’s important to reach your audience wherever they are. Two destinations mean twice the viewership. But make sure you check with your internet provider to ensure you have enough bandwidth to handle two destinations based on the encoder settings you choose in Wirecast. For instance. If you are streaming to Facebook and YouTube each at 2mbps, that would make a total of 4mbps. We suggest to always have twice what your streaming actually requires ensuring no buffering issues. So, if you want to stream to Face-

book and YouTube, that means you would need at least 8mbps. Plus, maybe 2mbps for a Zoom or Skype guest. So, you're looking at needing at least 10mbps so keep that in mind when choosing an internet provider – it's not the download that matters, it's the upload.



Advanced

If you're going to use multiple cameras and microphones, bring in multiple guests and require professional lighting, you're going to need an advanced setup.

Computers

For starters you'll want to be using the most powerful computer your budget can buy with a minimum of 16GB of ram, a discreet graphics card, and at least a 512gb SSD drive plus 2 1TB drives for media and backup. You also want to think about getting a secondary computer to

run Zoom or Skype to prevent resources from being used on the main computer. For remote guests, you can use Rendezvous within Wirecast. On this point, some advanced live streams employ multiple computers running Zoom or Skype, for example, to offload the main streaming computer and to separate guests. Should one system supporting a guest live stream experience get into trouble, other guests would not be affected. In addition, using multiple computers for guests yields individual control over each guest feed with respect to video and audio.

And if all of this sounds too complicated, you can always look at acquiring Wirecast Gear, which has everything you'll need for this advanced setup.

Cameras and Capture Cards

For this type of setup, you may want a main camcorder or DSLR with 3 PTZ controlled cameras or all PTZ-controlled cameras. This is going to be a relatively large spend, but greatly worth it. Look at the companies who offer these cameras and see which one works with your budget. We also suggest getting NDI-capable PTZ cameras even though they can also connect with SDI or HDMI. In the intermediate setup, we used HDMI. For this, you can use either, but we highly recommend SDI. SDI will give you longer

range in cable runs and prevent accidental disconnections. To hook these cameras up to your computer you're going to need a 4 input SDI capture card. There are a lot of great companies that make capture cards: Magewell, Blackmagic, AJA, YUAN, just to name a few. Find a card that works best for your budget and is supported by your machine.

Audio

Now it's time to move to a larger board. I recommend a 16-32 channel board depending on the application. For a brand or corporation, 16 will usually be fine. A good way to determine how many channels you need is by looking at how many inputs are required and then doubling that. For example, let's say you need 6 inputs, you would want at least a 12 channel board and just in case you add more equipment it's always a good idea to get a board with a few more inputs so you don't have to keep buying new ones.

Microphones

Finding the right microphone depends on your application. For example, if you're in a conference room, and you have 4 people speaking, you'd likely want to get 4 dynamic microphones. Dynamic microphones will only pick up sound when you are speaking directly into them. If you're streaming all hand meetings or lunch and

learns, you're going to need a mix of dynamic and condenser microphones, which will pick up all sound. Dynamic for the speakers, and the condensers for certain acoustics or picking up people asking questions.

Lighting

LED panels are a must with this setup. You want to find LED light panels that will offer brightness and temperature control. This will allow for cleaner chroma key video as well as work with your PTZ cameras to make you look the best you possibly can look. Don't be surprised to pay \$300 per panel. For a basic non-chroma key setup, you would need 3 lights. With chroma key, depending on how big the green screen is, you could use anywhere from 2-6 lights – 2 lights being a profile picture size green screen, 6 lights being a standing shot green screen.

Cables

This is often an area that is forgotten about. In the intermediate section, we recommend getting backup cables. At this stage in the game, you should have backups for audio and video. Only you can determine what you're going to need, by the setup you choose. It's best to layout on paper how many audio cables you're going to need to connect to the mixer

(input and output) and buy backups for everything. The same is true with your video cables – be sure to have extras in case a cable or connector fails. This is essential for keeping your studio on the air.

NDI/Network sources

Much like the intermediate setup, but now you can bring in those PTZ cameras we spoke about using NDI. The reason for bringing them in NDI is to be able to position cameras where it's not possible to run cables. Because NDI leverages network connectivity and does not require a direct cable connection, camera placement can be optimized for what is best for the production and not limited to where cables can be run. In addition to connecting cameras, it's possible to bring in graphics or social media comments from an external computer. Having NDI will allow you to have all these extra functions to polish off your broadcast.

Software

Wirecast is the complete broadcast solution. Using Wirecast Studio will get you through the intermediate setup but if you're looking for advanced capabilities, it's best to use Pro.

Destinations

To get your message out to the world, using Wirecast, you can stream to your own website and to all the major players in the game such as YouTube, Facebook, Twitter/Periscope, and more. As part of an advanced setup, we recommend looking into using a restreaming service if you intend to stream to multiple destinations simultaneously. This will reduce the load on your computer and conserve upload bandwidth. Wirecast Restream, a cloud-based service for just this purpose, will help you stream to all the platforms you want, without using your computer and upload bandwidth to duplicate your live stream for the purpose of streaming to multiple destinations simultaneously. You simply send your live stream to Wirecast Restream, choose your destinations, and Wirecast Restream will duplicate your live stream in the cloud to all your chosen destinations. You're now maximizing your broadcast.

Quick Start Toolkits

There are a lot of different workflows, gear, and ways of doing things. Not everything is outlined here, but this will at least get you pointed in the right direction to gather the equipment you need for your broadcast.

Cameras

When choosing a camera there are a few things to keep in mind:

- How complex is the event you are streaming?
- Does it require multiple cameras?
- Do you have people to operate one, or many cameras?
- Do you need to zoom in or pan left and right?
- How far do you need cameras to be from your computer?
- How easy/hard is it to run cables, power, or setup network connectivity for your cameras in each location?



DON'T FORGET! Most cameras need a tripod, mount, or stand to hold them steady and keep them out of the way.



There are thousands of cameras out there, but staying within budget can be tricky. Here are a few options to consider:

iOS Devices (iPhones, iPads)

iOS devices can be used as HD video sources. While not necessarily the most inexpensive option, anyone with an iPhone or an iPad can install the free Wirecast Go app, turning an Apple device into a “free” wireless camera.

Webcams

Webcams are the cheapest, lightest and easiest to use, but often lack fine-tuning controls like zoom or focus. They plug directly into your computer, but due to limitations of USB cords, they usually need to be placed within 3-10 feet.

- Logitech C930e (~\$130)
- Microsoft Lifecam Studio (~\$100)



HDMI Cameras

HDMI cameras offer more control and a friendlier user interface, but cost a bit more. They require a capture card (discussed on the next page) which plugs into your computer and converts the video signal to data stream. Typically, you can place HDMI cameras within 50 feet of your computer depending on the length of your cable – or use a wireless converter like the **NewTek Connect Spark** (~\$500) for greater distances.

- Canon Vixia HF R800 (~\$200)



“Cameras” section continued on next page ▼

Cables

All about cables

Whatever camera you select, you will need to consider cabling and connectivity. Not all cables are created equal or can carry signal the same distances.

Cable Range (approximate):

USB 3.0	5 Gbps	3 m	9 ft
USB 2.0	.48 Gbps	5 m	16 ft
HDMI (2.0)	18 Gbps	15 m	45 ft
HD-SDI (3G)	3 Gbps	85 m	255 ft
Ethernet (Cat5e)	1 Gbps	100 m	328 ft
Ethernet (Cat6a)	10 Gbps	100 m	328 ft

Cable Cost (approximate):

HDMI	~ \$0.30 / foot
HD-SDI	~ \$0.50 / foot
Ethernet (Cat5e)	~ \$0.15 / foot
Ethernet (Cat6a)	~ \$0.30 / foot



WHAT ABOUT WI-FI CONNECTED CAMERAS?

Yes! These can be really useful for mobile or handheld cameras. But your most reliable sources will always be cameras connected directly via cables.

Cameras, cont'd

SDI Cameras

SDI cameras are often used by professionals and are more expensive. SDI cables can be run up to 300+ feet, and have locking connectors which help them stay connected (they also require a capture card).

- Canon XA25 (~\$2500)



Pan, Tilt, Zoom (PTZ) Cameras

PTZ cameras are some of the most popular cameras used in houses of worship. This is because they can be controlled remotely and can remember dozens or even hundreds of camera angles presets, which can be activated from your computer, MIDI or lighting board controls. PTZ cameras can be connected to your computer in a variety of ways including via Ethernet, NDI or HDMI or SDI depending on the model.

- PTZOptics 12x-SDI (~ \$1600)

Cables

One cable to rule them all? (Ethernet)

More than ever before, it is becoming possible to replace all your camera cables with just a single Cat5E or Cat6A ethernet cable. Not only can Ethernet transport high-quality, low latency video signals via protocols like NDI, it can enable your software to control the camera (VISCA over IP, NDI PTZ, etc.), it can even provide power using Power-Over-Ethernet (PoE) enabled routers and IT equipment!



Capturing Your Video & Audio Signals

When choosing a capture card, ask yourself:

- Do I need an internal or external capture card?
- What connectors should it have?
- How many channels/sources am I going to capture?
- Do I want the card to output as well as input?
- Does the card work with my computer, motherboard, software?
- Does it support the frame rate and resolution I want to capture?
- Can I capture or output the signal using NDI instead?



TIP! You can use an internal, multi-channel capture card on a Mac if you put it in an external thunderbolt chassis.

Getting your camera, video and audio signals into your computer can be a challenge. USB cameras and microphones are exceptions, since they have a connector that is designed to plug in to your computer's external ports. For other kinds of cameras, microphones or mixers, **capture cards** or **audio and video interfaces** are often required to connect between them and your computer.

External capture cards

External capture cards are interfaces that connect to your HDMI, SDI, DVI video or analog audio sources and convert it to a USB 2.0, USB 3.0, or Thunderbolt connection to plug in to your computer. External capture cards typically are **single channel**, which means they can only capture 1 video source at a time. Some are **bi-directional**, meaning they can either input or output a signal – but usually not at the same time. Mac users typically choose external cards since they cannot easily install internal capture cards.

- Magewell XI100 USB (~ \$300)
- Blackmagic UltraStudio Mini Recorder Thunderbolt (~ \$140)



Internal capture cards

External capture cards are interfaces that can be installed in your computer's PCIe slots. Internal capture cards can be **multi-channel** which means they can capture 2+ video sources at the same time. This is great for live events that need to capture 2, 3, or 4 cameras at the same time. Not all computers or motherboards work with all capture cards, so make sure you check that you have available space in your PCIe slots and that your motherboard will work with the capture card you want to use.

- AJA KONA HDMI 4-Channel (~ \$900)
- Magewell Pro Capture Quad SDI 4-Channel (~ \$900)

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NDI & Network Sources

WebRTC & Video Conferencing

Video conferencing has come a long way, particularly with the widespread use of the low-latency, high-quality codecs and open-source projects like WebRTC. Many video production switchers include built-in video conferencing, like Wirecast Rendezvous.

Web Browser & HTTP Sources

Also on the rise in video production are HTTP-based sources. Make sure your video switcher can display web pages. Great for data overlays, social comments, or widgets like Twitch Widgets. Use these to enhance your broadcasts!



TIP! Cameras coming from different sources (IP, SDI, USB, etc.) will have different latencies. Make sure your switcher has audio/video source syncing.

NDI and network sources

NDI and network sources are becoming more common and are a convenient method to get audio and video signals into your computer. NDI is probably the most widely used standard, and it has been implemented in software like Adobe Premiere, and in cameras like PTZOptics. Sources that transmit via NDI do not require capture cards, just an Ethernet or Wi-Fi connection to your router. You can even install screen capture tools that will capture computer display and transmit it via NDI to any other computer or NDI-enabled software on your network – how cool is that!?



- NewTek NDI Scan Converter (screen capture tool - free)
- NewTek Connect Spark NDI converter for cameras (~\$500 - \$800)

Syphon

Syphon is a similar protocol for sharing video frames across your network, however it is specifically for Macs and Mac OS computer applications. If you are Mac user, you can check the Syphon website to see if it works with your preferred applications at <http://syphon.v002.info/>

IP cameras and remote streams

IP cameras and remote streams are another popular network-based source for video and audio input into live productions. The most common formats and protocols you should make sure your switcher can input are RTSP, MMS, RTMP, HTTP/HLS and MMS. This will allow you to directly decode the stream into your switcher as if it was a camera that was physically connected to your computer. Keep in mind you will usually need login or access credentials to pull in the stream or get its true location.



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Microphones & Mixers

Nothing ruins a great broadcast like bad audio.

Although most cameras come with built in mics, an additional external audio source such as a lavalier, handheld, or podium-mounted microphone will greatly improve the quality, simply by picking up audio closer to the source or speakers.

If your event already has an audio setup, you are ahead of the game! Much like acquiring a video signal with a capture card, using an audio interface to connect your house audio into your computer is a simple process to get great audio mixed into your live stream.



Microphones

Mics do all the work of capturing great audio close to the source. Here are some good options:

- Pyle-Pro PDMIC58 (~\$13) is a low-cost, highly rated XLR (analog) microphone. You'll need to run some cables, or you can attach a transmitter, but it's a good starting price.
- Audio Technica ATR2100 (~\$60) has both USB and XLR (analog) outputs, which makes it handy for going directly into your computer, or routing through your mixer.
- Shure PG185 Lapel Mic and Wireless System (~\$300) wireless systems really free up your speakers or pastors to move around. This is a great lower cost, high quality option. Remember, with wireless systems you'll need to check batteries often and watch out for audio interference and securing the microphone to get the best sound.



Mixers

Audio mixing boards are most useful when you have more than one microphone or audio source to manage. Use them to plug in your microphones, set levels, and balance and "mix" them together to output your "master mix." Some mixers also double as audio interfaces and connect directly to your computer via USB.

- Behringer Xenyx 302USB Mixer (~\$50)
- Soundcraft Signature 12 MTK Mixing Desk (~\$400)

Audio Interfaces

This is your "capture card" for audio signals. They can be very helpful for getting audio from your mixer or microphones into your computer. Here are two simple options:

- Sabrent USB External Audio Stereo Sound Adapter (~\$8.00) A great little doodad for getting audio in and out of your computer.
- Roland Rubix 22 (~\$150) A well-reviewed, 2 channel USB audio interface that can handle microphones or line-input signals professionally and without breaking the bank.



TIP! Don't just assume your "house mix" is usable for your live stream audience. You'll usually need to do some additional mixing and adjustments to get your audio optimized for your streams.

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Computer Hardware & Software

Live video and audio production can require some serious processing power. Well-cooled multi-core computers with a good graphics processing unit (GPU) tend to perform better than the alternatives.

Recommended Computer Specs:

- Mac or Windows
- HD Display(s) – 1920 x 1080 +
- Intel i5 Quad Core Processor (or better: i7, i9, etc.)
- 8+ GB of RAM (or more)
- GPU with 1GB of video RAM (or better)



TIP! If you have an NVidia or Intel graphics processor, you can use hardware accelerated encoding for your streams. This is highly recommended as it will save you a TON of processing power, and keep your machine running smoothly.



Software Switchers, Encoders & Recorders

A computer with a good software program, such as Wirecast, can really do it all. In addition to capturing your audio and video signals through interfaces, it can also *mix* or *switch* them together to produce your live program, then it can *encode* it and *stream* it to your destination or website or *record* it to an .mov or .mp4 file on your desktop. Wirecast Studio or Wirecast Pro is the software switcher and encoder that Telestream makes, and it is used by thousands of producers all over the world to switch and encode their live events and broadcasts.

- Wirecast Studio software (~ \$695)
- X-Keys Controller for Wirecast (~ \$595)

Hardware Switchers, Encoders & Recorders

Many companies make hardware switchers, encoders and recorders. The advantage is they usually do not require a computer to operate and can save precious resources on your computer for other tasks (titles, graphics, audio production, streaming, etc.). *It is common practice to use a hardware switcher for camera switching, then output it to Wirecast or software on their computer for titling, rolling video clips, and streaming and recording.*

- Blackmagic ATEM Television Studio Switcher (~ \$995)
- Atomos Ninja Video Recorder (~ \$695)

All-in-One Systems

All-in-One or Turnkey systems can give you everything you need in a single box. They include the computer, the capture card(s), the software, and the support you need for live productions. This can save a lot of the time and effort required for a DIY setup.

- Wirecast Gear All-in-One Streaming System (~ starting at \$4,995)



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Destinations & Hosts

Bits About Bandwidth:

When it comes to live video streaming, it's all about the upload speed. Unfortunately, many Internet Service Providers (ISPs) can't offer great upload connections.

Minimum Upload Speeds:

- ~ 400 Kbps per audio only stream
- ~ 1 Mbps per 480p video stream
- ~ 2 Mbps per 720p video stream
- ~ 5 Mbps per 1080p video stream

Recommended Upload Speeds:

- 4-5 Mbps for 720p
- 8-10 Mbps for 1080p
- 16+ Mbps for UHD

To test your internet speed, use:
www.speedtest.net or www.testmy.net



TIP! Want to go to multiple destinations? Use a restream service like Wirecast Restream. It will distribute your streams for you and save you a lot of bandwidth and processing power!

Connectivity

Bandwidth is critical for live video streaming. In many locations, particularly rural or remote ones, you just can't get very fast upload speeds. Here are few tips and technologies that can help:

- Scale back – stream SD video instead of HD, or audio only for the live, then upload a recording to YouTube
- Cellular connection with Verizon JetPack (starting at ~ \$99)
- Bonded cellular connection with LiveU Solo (starting at ~ \$995)



Destinations

Where will you stream? It is worth spending some time researching which streaming service works best for you. Free destinations like YouTube and Facebook have many advantages, but allow much less control over the final results, copyright and access. Consider your bandwidth needs, privacy settings and potential services the provider may be able to offer outside of live stream hosting.



YouTube Live
Free and great for long tail search content.



Facebook Live
Better viral sharing and access to existing communities & groups



StreamShark.io
Monthly streaming plans, extensive control, starting at \$50/ month



Wowza Streaming Cloud or Engine
DIY streaming server, total control, in the cloud or on premise starting at \$49/month

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Planning, Setup & Budgeting

Cost & Budget:

As you can see from the previous pages, cost for live streaming is entirely variable, and can run from under \$1000 for a computer, software and a web camera, to many thousands of dollars for cameras, mics, interfaces, lights, connectivity, hosting, etc.

Other costs to think about:

- Gaff Tape & Cable Ties
- Power Strips & Batteries
- Speakers & Headphones
- Camera Mounts
- Tripods
- Lights
- Displays & Monitors
- Adapters & Extenders
- Splitters & Attenuators
- Licensing & Music Rights



TIP! Want it all-in-one?
Get a fully configured system!
[Telestream.net/WirecastGear](https://www.telestream.net/WirecastGear)

Helpful Hints & Tips

- Start simple. You can always add more equipment as you go. See our “example setups” on page 13 for other setup ideas.
- Restreaming your live service from the cloud is a great way to save upload bandwidth. For more information go to telestream.net/wirecast/webservices
- Use a green screen! This simple step can revolutionize your broadcast quality. (see page 14 for details)



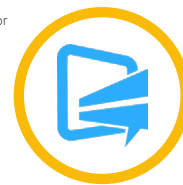
Consent Releases & Disclosure

Not everyone wants to be filmed, and it is important to respect these wishes. When possible, post signs signaling your intent to film proceedings and offer a camera-free space for those who are more comfortable out of the spotlight. Make sure to get consent and release forms for those on camera, when appropriate, or for minors and children.

Deaf & Hard of Hearing Viewers

Captioning your live streams can be extremely important for viewers who may be deaf, hard of hearing or unable to listen to your audio. Fortunately, simple live captioning is affordable and accessible:

- **WebCaptioner.com** is a free open caption option – great for on premise reading
- **Wirecast Live Captions service** (embedded, closed captions starting at ~ \$60 per month)
- **CaptionMaker** for desktop allows you to author your own captions and videos (~ \$1,720)



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Your Live Streaming Checklist

When it comes to live streaming, anything can and probably will go wrong. So, having a checklist to assist with making sure you have all the gear, software, and equipment needed to make the magic happen. We have put together a checklist to make your life that much easier. Take a look at it and determine you have everything you need to be successful!

- Cameras**
 - Quantity: _____
 - Webcam
 - iOS / Mobile
 - PTZ / Remote control
 - Network IP Camera
 - HDMI
 - SDI
 - NDI
- Tripods & mounts**
 - Quantity: _____
- Camera cables / lengths**
 - USB, Qty. ____, Length ____
 - HDMI, Qty. ____, Length ____
 - SDI, Qty. ____, Length ____
 - Ethernet, Qty. ____, Length ____
- Microphones**
 - Quantity: _____
 - USB
 - Wireless/RF
 - XLR
 - Unbalanced
 - Dynamic
 - Condensator
 - Shotgun
 - Studio
 - Lavalier
- Microphone stand** (if applicable)
 - Quantity: _____
- Microphone cables** (if applicable)
 - Quantity: _____, Length(s) _____
- Computer (type/features)**
 - Windows Mac
 - Type: _____
 - Processor, Type/Name _____
 - Cores (4 recommended) Qty. _____
 - ____GB Ram
 - Discreet GPU, Type/Name _____
 - Integrated GPU
 - PCIe slots, Qty. _____
 - USB 3, Qty. _____
 - TB 3, Qty. _____
- Streaming software & production features**
 - Switching
 - Graphics
 - IP sources
 - Titles
 - Screen capture
 - NDI Input
 - NDI Output
 - A/V Sync
 - Stream
 - Chroma Key Filter
 - Record
- Internet connection**
 - _____Mbps upload speed
 - Wi-Fi
 - Ethernet
 - Cell / LTE / Hot Spot
- Live streaming platform / host**
 - Free
 - Paid \$____/mo
 - Adaptive Bitrate Playback
 - DVR / Recording
 - HTML embedding
 - Multi-device playback
- Capture card (type/features)**
 - Single channel
 - Multi channel
 - [Connects to computer via:](#)
 - PCIe USB 3 TB
 - [Connects to camera via:](#)
 - HDMI SDI
 - [Accepts:](#)
 - HD?
 - 4K/UHD?
 - SD?
 - Output / passthrough?
- Audio Mixer**
 - # of channels _____
 - USB
- Audio Interface**
 - # of channels _____



And Action!

Live video is not just the way of the future, it's happening now. We hope this guide was helpful and that you have the resources you need to get streaming. If you have any other questions or need additional resources, please don't hesitate to reach out.

Contact our Team Today



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More Resources

Blog: <http://telestreamblog.telestream.net/>

Trainings and videos: <https://vimeo.com/364098246>

Forum: <https://telestreamforum.forumbee.com/category/wirecast>

Knowledge Base: <http://www.telestream.net/telestream-support/wire-cast/faq.htm>

Ready to Buy?

Buy Wirecast: <https://www.telestream.net/wirecast/>

Buy Wirecast Gear: <https://www.telestream.net/wirecastgear/>

Buy ScreenFlow: <https://www.telestream.net/screenflow/>

