



STREAMING BASICS

BY:

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PREFACE

The fastest growing media consumed in the World is streaming. We all know the power and benefits of streaming through the growth of Netflix, YouTube and other streaming networks. But what about live streaming? Millions of people are discovering the benefits of streaming a live event through various platforms. However, the streaming industry is still in the early stages of development, which provides great opportunity for those who want to reach their targeted audience.

This document will help you answer some basic questions about streaming, but more specifically, live streaming. Live streaming is not difficult to learn; but requires more steps than just uploading an existing video. You will learn the various steps and techniques of live streaming. Datavideo provides complete live video production tools for all size productions; however, you don't have to be a Datavideo customer to appreciate the content included in this guide. We will cover the basics of live streaming, which apply to most live streaming applications. Before we jump into the "how to" of live streaming, let's talk about why you would want to stream and clarify the benefits of live streaming.

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CHAPTER 1.

WHY STREAM?

Live streaming is an inexpensive way to share content to a wide audience; that is immediate, interactive and more engaging to users. Today, streaming has become the norm for many live production applications because of the high engagement rate. There is no other type of marketing strategy that allows for this level of interaction. Whether you are a church, educator, or business, there are numerous ways to use live streaming for your next production including:

- Offering live training classes
- Promoting and selling products, services, events
- Sports, performances, distance learning
- Hosting web seminars, online meetings
- Townhall meetings
- Broadcasting original content



THE BENEFITS OF LIVE STREAMING

There are many benefits to streaming live video. Below are just a few reasons why you may want to consider streaming:

LOW COST

Cost is always a factor when delivering a video production. The days of broadcasting a signal through satellite feed or other methods was out of most peoples' budgets other than broadcasters. Now anyone with a camera, an encoder, and an internet connection can broadcast their production. This allows a small business, church, educator, or a small municipality to stream to their audience at a very small investment. Production tools such as cameras, switchers, encoders and streaming platforms have dropped in cost over the last decade. This allows content producers to create professional content at a very affordable cost.

AUDIENCE ENGAGEMENT

Live video streaming engages your audience and encourages your loyal customers who care about your brand and your message to watch and interact with your live broadcast.

LESS TIME TO PRODUCE

Video On Demand (VOD) – Having all of the right tools to do a live production will save you from lengthy post production time. Recording a live video production with graphics, switching camera angles and mixing audio provides great results and the content can be viewed post event on demand.



WHAT IS STREAMING?

HOW DO I GET STARTED?

Streaming means watching a video in real time from a continuous stream of data from a server. How it works is simple. You take a video signal from a camera and audio from a mixer into an encoder. The encoder connects to the Internet, converts signal into a compressed format (ex.

H.264 or H.265) and transmits to a CDN or a content delivery network. Most common public CDN's are Facebook and YouTube but you can also stream to any platform public or secure.

Basic Streaming Workflow



HARDWARE SOFTWARE ENCODERS

VS

The main difference between a hardware and software encoder is that hardware encoders are purpose-built devices with dedicated processing like the Datavideo NVS-33, while a software encoder is a program such as Wirecast or OBS that runs on a computer platform using the CPU for processing the stream data.



The BENEFITS of using a HARDWARE encoder...

Unlike computers, hardware encoders are dedicated to doing one task, which is to encode your video/audio. There is less risk of a hardware encoder freezing or crashing during a production whereas a computer is more susceptible to freezing and crashes. Additionally, you don't have to worry about CPU usage limits, memory, and network security problems when using a hardware encoder.

Dedicated processing power found in hardware encoders provides advantages over a software encoder especially for streaming productions that have multiple cameras. Software encoders are more ideal for streaming single camera productions.



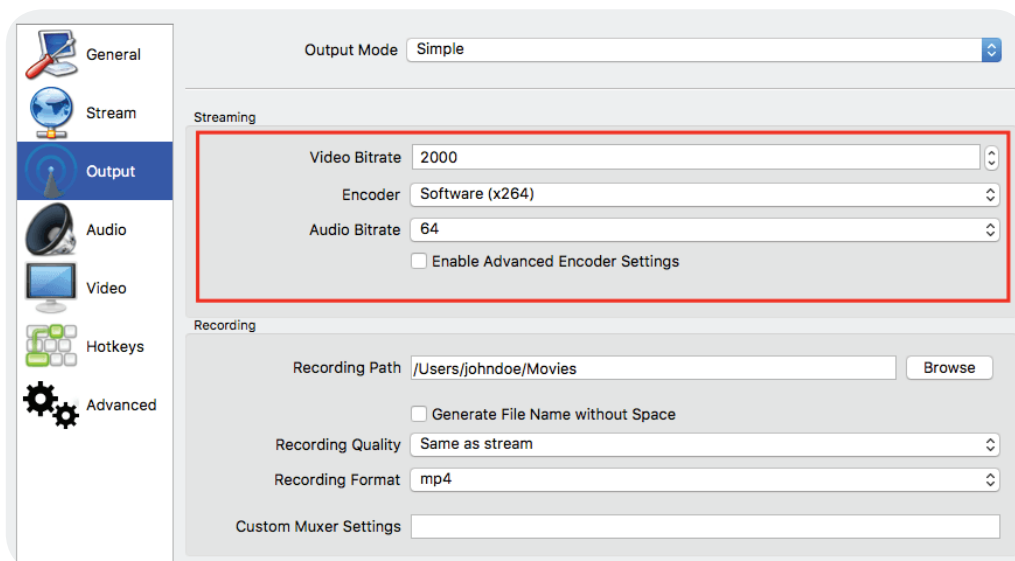
NVS-33 Back Panel



The BENEFITS of using a SOFTWARE encoder...

If you want an inexpensive way to stream your production, using a software encoder is the way to go. OBS (Open Broadcaster Software) is an open source application and it is easy to use. Open source software provides updates/improvements from the user community which can expand

features found in the encoder. If you are a podcaster or a DJ wanting to stream your session from a single camera, using a software encoder could be a cost effective and easy to use solution.



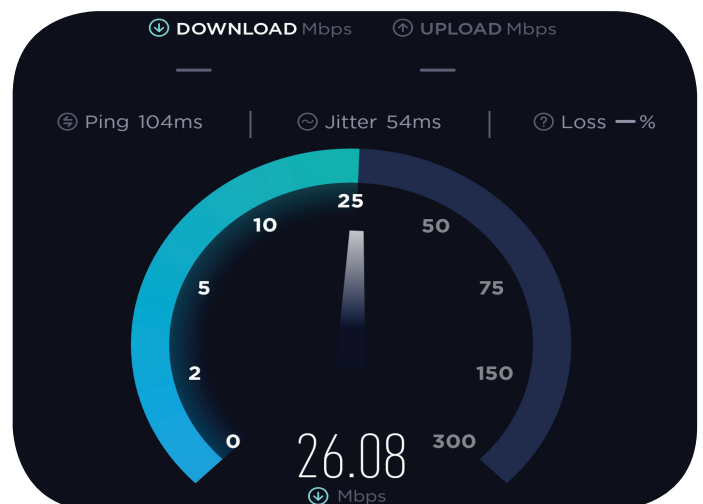
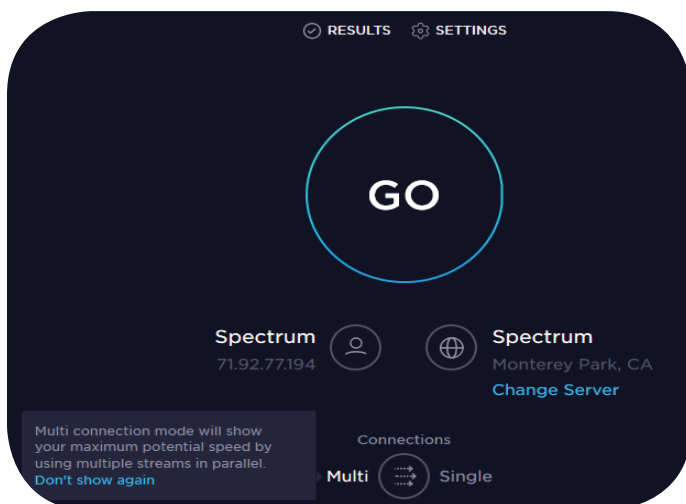
CHAPTER 2.

WHAT IS *NEEDED* TO STREAM?

To stream your production, you need the following: Internet connection, a streaming device, a video source, and a CDN (Content Delivery Network). Streaming requires a fast Internet connection with enough upload bandwidth in order to effectively deliver your stream to the CDN. Check with your Internet provider or do a speed test to find out what your upload speed is. A typical internet service will provide about half of your upload speed compared to what your download speed is. You can also check your

upload speed by using a SPEEDTEST app or website. Your upload speed is measured in megabits per seconds. Best streaming practices suggest that you want your upload speed to be two and a half times of what your streaming bit rate is. For example, Facebook Live recommends that your streaming bit rate is 4 Mbps, so you would want your Internet upload speed to be 10 Mbps. That way, it compensates for any dips in the connection because it's not a constant upload.

SpeedTest Interface



Another thing to consider is whether or not you are sharing that Internet connection. If you are sharing the connection with people in your organization, they can interfere with the connection bandwidth while you are streaming. This can impact your stream negatively or cause your stream to stutter, buffer or your stream to drop. It is recommended to have a dedicated Internet connection for your streaming encoder.

The next thing that you will need is a streaming device. There are different options when it comes to choosing a streaming device. The first option is a camera with a built-in streaming encoder such as the Datavideo BC-50 block camera or PTC-140 PTZ camera. This is a great option if you are doing a single camera production. You can stream straight from your camera without the need for a separate stand-alone encoder.

BC-50 & PTC-140



Another hardware option for streaming is a stand-alone encoder such as the Datavideo NVS-33 and NVS-40. These hardware encoders convert a video signal from a camera or a video switcher (if using multiple cameras) and send the data to a CDN.

NVS-33



NVS-40



Another type of hardware encoder is an encoder within a mobile studio system like a Datavideo HS-1300 or HS-3200. These all-in-one systems are great for productions on the go since you have less equipment to carry.



The last streaming option is a software encoder. As we mentioned in Chapter 1, OBS is an example of a software encoder. There are others such as WireCast and Mimolive.

After you have acquired a solid Internet connection and streaming device, the next thing on the list is a video source. A video source can come from a camera or a video switcher. If you are going to have multiple cameras in your production, you need a video switcher to switch from one camera input to the next. The program output of the switcher is connected to an encoder for streaming. Another type of video source can be from a media player. If you have pre-produced video content that you want to stream, you can use a media player to send the video/audio content into an encoder.

The last thing needed to stream is a CDN or a content delivery network. A CDN is a distribution point for your stream. A CDN is an integral piece to reach a larger

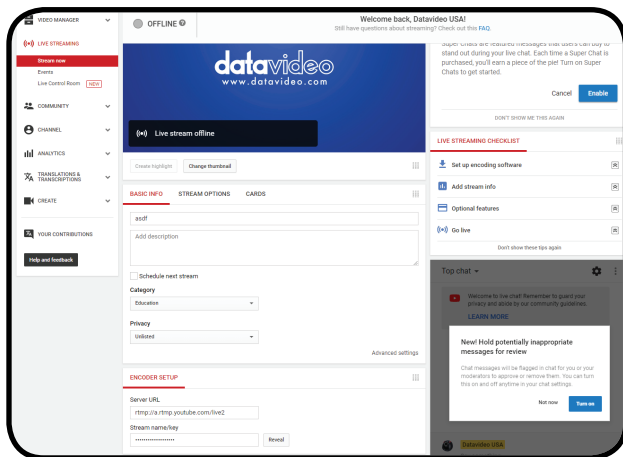
audience. If you are hosting a stream to 100 people on your network, the amount of bandwidth that is needed to push the stream to 100 people is high enough that it is not feasible for most Internet connections. A CDN solves this problem by helping you distribute your stream to a large number of people.

In addition to distributing your stream to a large audience, some CDN's feature chat windows allowing you to interact and engage with your audience. The most common free CDN's are Facebook, YouTube, and Twitch. These platforms provide a cost-effective way to reach your audience and deliver your message.

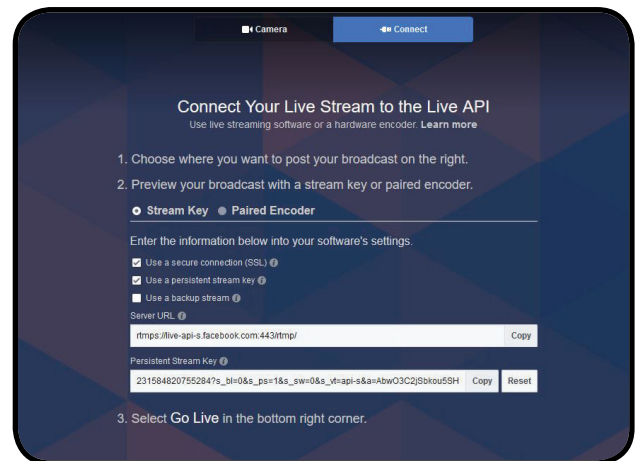
Amazon CloudFront is also another popular CDN which offers several pricing tiers. The free tier includes 50GB of data and 2 million http/https requests. If you are going to be using more than what the free version offers, you can go to the on demand option where you can pay based on actual usage of data and services.

Another popular CDN is WOWZA. WOWZA has different streaming options from software encoding to hardware encoding and cloud servers. Depending on your needs, you can select a service or software that fits your application.

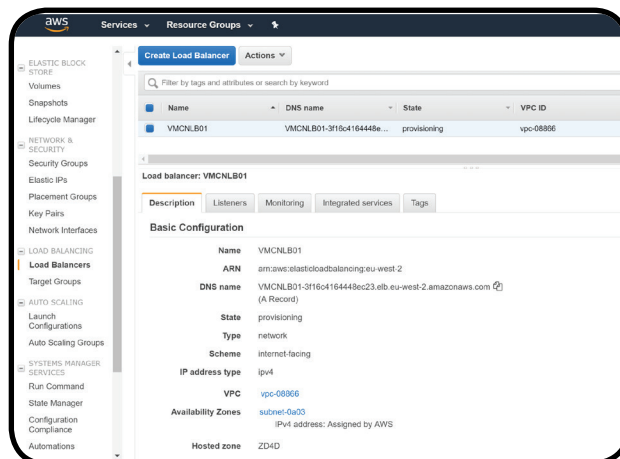
YOUTUBE INTERFACE



FACEBOOK INTERFACE



AMAZON INTERFACE

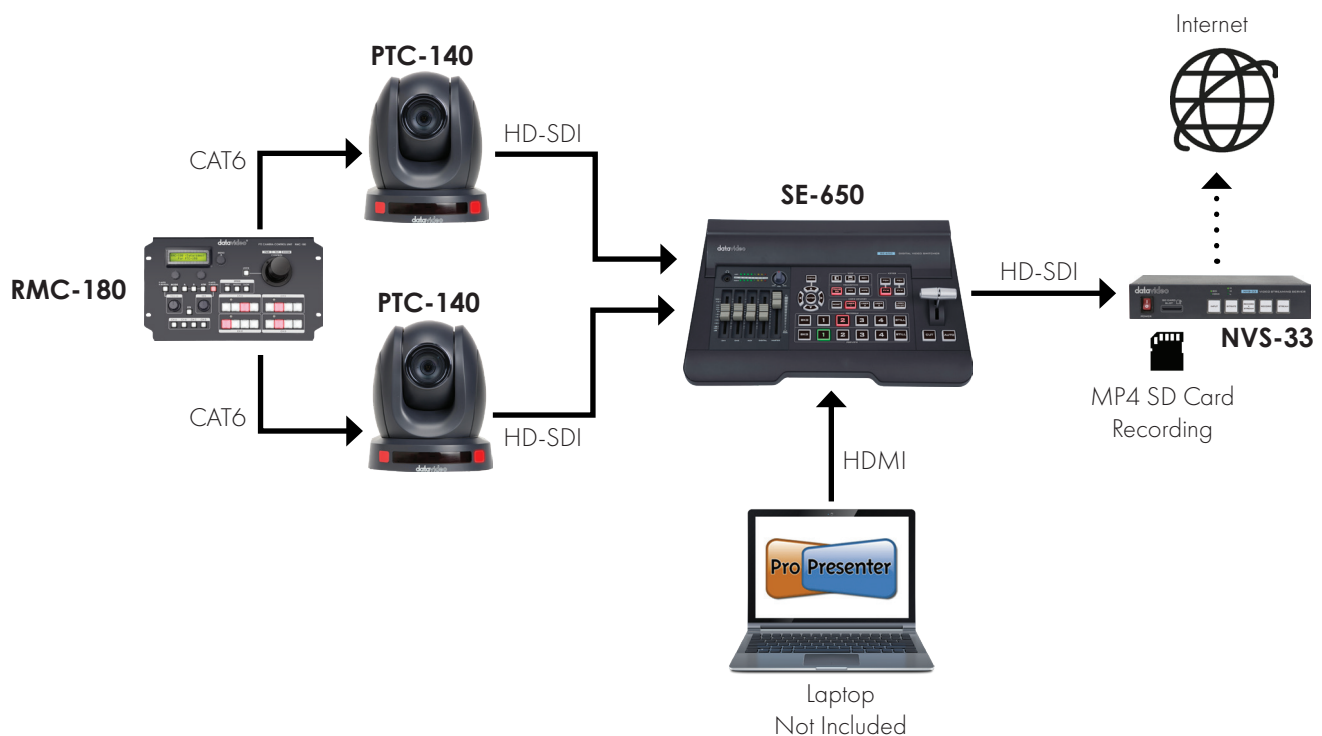


ONE CAMERA VS. MULTI CAMERA PRODUCTION

Earlier, when we were discussing streaming devices, we discussed the benefits of using a hardware encoder for streaming a multi-camera production. Using multiple cameras provides different angles or shots of the production, which adds production value and allows you to tell a better story and keep viewers engaged. A video switcher mixes and processes all your video/audio sources which

could include media players, cameras, and computers. The program out of the switcher simply connects to the hardware encoder for streaming. Although streaming a one camera production is a simpler workflow, streaming a multi-camera production offers a more professional and engaging result. Below is an example of a multi-camera live video production and streaming workflow.

Multi-camera Diagram



WHAT IS AN ENCODER?

HOW DOES IT WORK?

An encoder is a device that converts raw video into a compressed format such as H.264/H.265 or MPEG-4. Once the raw video/audio is compressed, you can stream it to a CDN at various bitrates. Below is a list of recommended bitrates for different video standards.

RECOMMENDED VIDEO BITRATES

- **720p30 – 2500 to 4000**
(Datavideo NVS-33, NVS-40)
- **720p60 – 5300 to 5000**
(Datavideo NVS-33, NVS-40)
- **1080p30 – 3500 to 5000**
(Datavideo NVS-25, NVS-33, NVS-40)
- **1080p60 – 4500 to 6000**
(Datavideo NVS-40)

A common question which often comes up is, “why is streaming content almost always progressive video?” One of the main reasons is that most modern TV’s and monitors are better at displaying progressive video. However, another reason is that the encoder only has to compress one frame of video vs compressing two fields within a video frame. Interlaced video has an even and odd field which is overlapped to make up a single video

frame whereas progressive video only has single frame. Also, for video with fast movements, interlaced video can sometimes display a ghosting effect or video tearing. For these reasons, we recommend using only progressive frame rates for streaming.

There are three typical H.264 profiles which are baseline, main, and high. Typically, high profile provides the best image quality and it is suitable in most cases. However, depending on the device that is used to view the stream, main or baseline profile may be required.

The next thing you need to set on the encoder is a streaming protocol. There are five protocols: RTSP, RTMP, RTMPS, TS, and HLS. Most CDN’s use RTMP or RTMPS (secured reliable transport (SRT) and HLS).



CHAPTER 3.

MULTI-PLATFORM STREAMING

In previous chapters, we learned about streaming, specifically streaming to a single CDN or a platform. Which means you are either streaming to Facebook or YouTube at one time. However, did you know that you can stream to Facebook and YouTube simultaneously? It is called multi-platform streaming.

Why Stream to Multiple Platforms?

Most people need to stream to Facebook and YouTube simultaneously in order to reach a larger audience. It is necessary to stream to multiple streaming platforms because some of your audience might not use Facebook and they may only want to watch it on YouTube or vice

versa. It is always good to give the viewers an option to choose which CDN they prefer to watch your stream on.

How to Stream to Multiple Platforms?

Now that you know why you want to stream to multiple platforms; the next step is to figure out how to do it. It is a lot similar to single platform streaming we talked about in the previous chapters. You would need either a hardware, software, or cloud encoder that can-do multiple platform streaming.

HARDWARE ENCODER FOR MULTI-PLATFORM STREAMING

The Datavideo NVS-40 is an example of a hardware encoder that streams to multiple platforms. The NVS-40 is a 4-channel streaming encoder and recorder that can simultaneously stream to multiple CDNs such as Facebook and YouTube in various bitrates as well as local multi-channel recording of your live stream on a removable SSD drive.

If you are going to use a hardware encoder to do multiple platform streaming, you must make sure to have a high enough upload speed on your Internet connection.

Multi-platform Streaming with Hardware

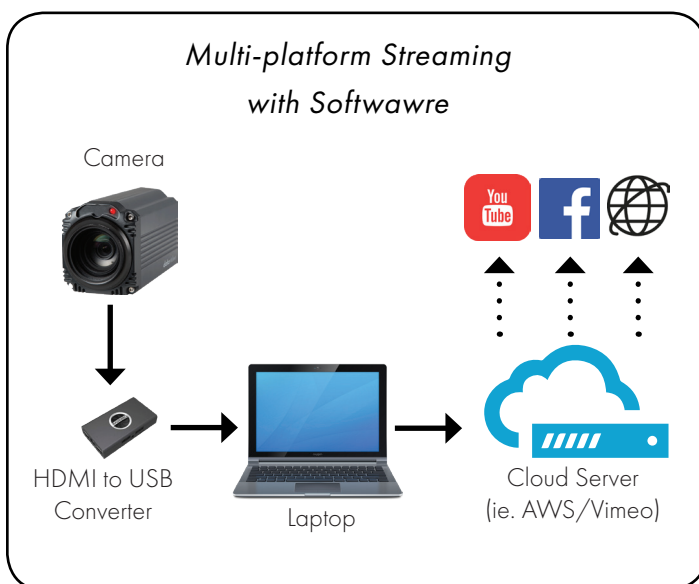
NVS-40



SOFTWARE ENCODER FOR MULTI-PLATFORM STREAMING

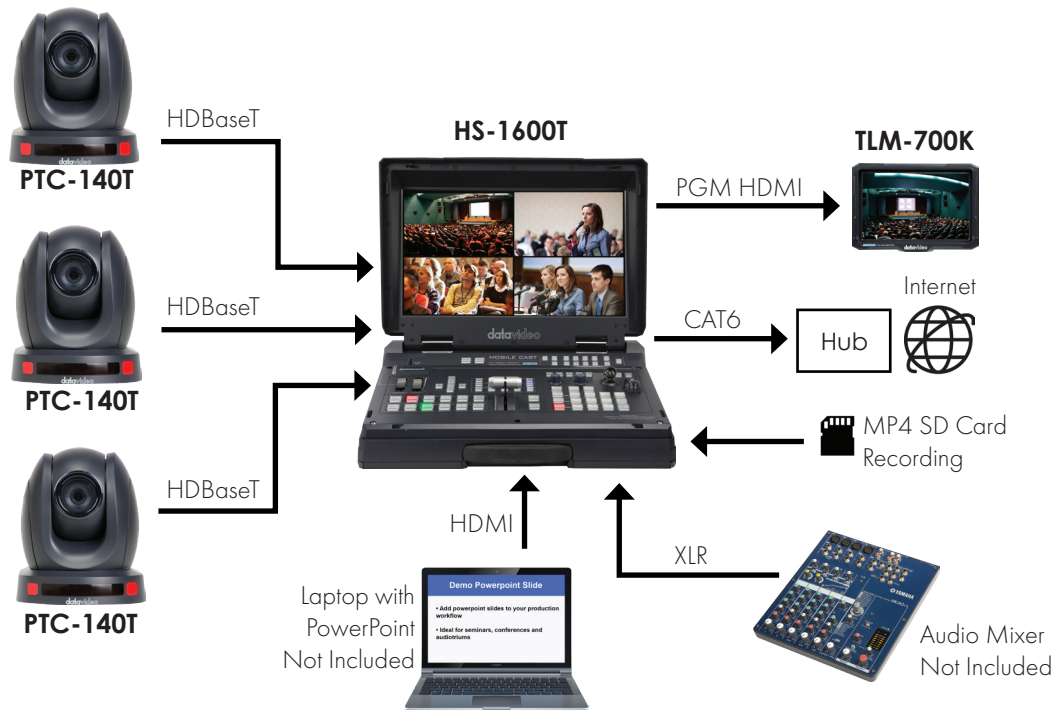
If using a software/cloud encoder for multiple platform streaming, you don't really need to worry about having a large amount of bandwidth on your Internet connection. Streaming servers like AWS, Digital Ocean or Vimeo will take care of that for you depending on the data plan you choose.

Multi-platform Streaming with Software

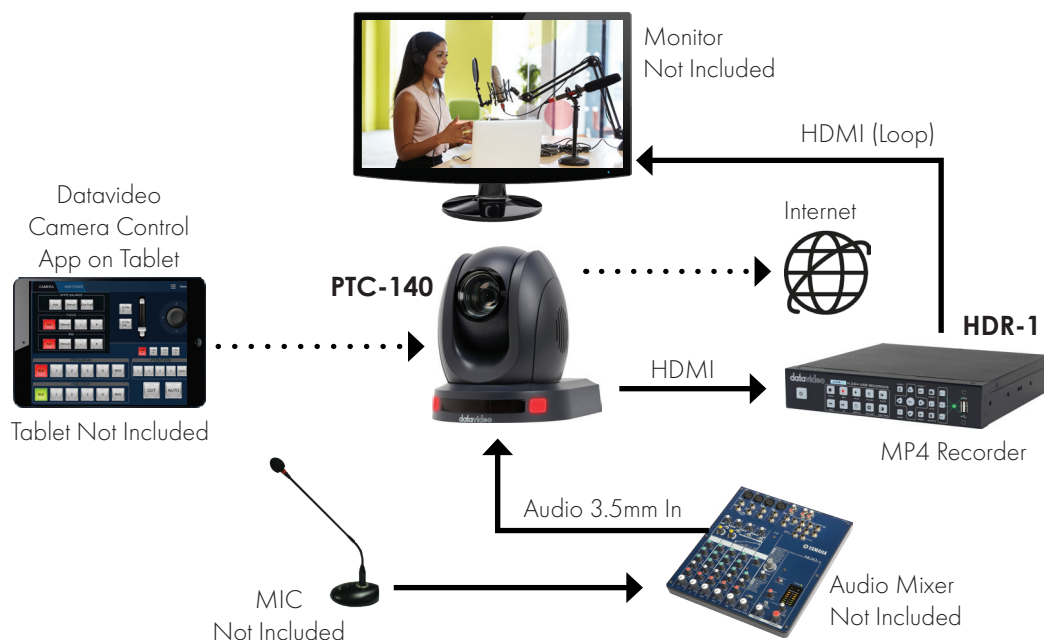


Examples of Streaming Solutions by Datavideo:

3 Camera One Operator Solution



Podcast Workflow



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