How to Build a Livestreaming Capacity in Your Church

I've been asked to provide some advice for churches looking to livestream services from their sanctuaries in the Post-COVID age. I've spent many years live streaming services and events and therefore can offer an overview of different approaches one might take, some best-practices, and even some specific recommendations of equipment and configurations which work well based on your budget. Let's start with the basics.

Audio

Fortunately most churches already have some kind of audio PA system. And the ones that don't are often quite small sanctuaries where voice travels well, anyway. In most situations this PA system can be adapted to provide audio for your livestream. This will almost always work better than using the microphone built into whatever camera you might be using.

Two things to think about in this regard…. 1) Most PA systems in churches are designed solely for amplifying the sound in the room, not for picking up the experience for "broadcasting" the whole of the audio environment. So, for example, there will be a microphone for the Presider but not for the choir. The best practice in such a situation is to put a microphone in a position to "pick-up" the choir, but NOT to send that signal into the mix of sound which goes to the speakers in the church. In other words, to create two separate "mixes": one for amplifying in the room and one for going to the livestream. Many PA systems can be adapted to do this already. Some will require a minor investment in an additional "mixer" or other solution to combine the audio in the optimal way. 2) It's important to "sync" the audio with the video as soon in the process as possible. Even a 10 or 20 microsecond delay in the audio relative to the video can be annoying. The best practice is to connect the audio to the camera to combine the two signals there. That way any slight lag introduced into the system won't affect the audio/video sync.

It is possible to use the microphone in camera or an external mic plugged into the camera, but a good rule of thumb is that the bigger the church the less desirable that option becomes. Keep in mind that if people can't understand what's being said, the service will be unlikely to be engaging. If you have a microphone on the pulpit or on the Presider, figure out how to use it for your streaming. This may mean adding a couple of other mics to your system so that you can include congregational or choir singing, but the effort is worth it. The quality of the audio is absolutely critical to the quality of the broadcast.

Video

There are many approaches to capturing a video image of your worship--much will depend on your budget and what volunteer capacities you have. The first consideration is whether you want to permanently mount the pieces of equipment in place (particularly the cameras) or

whether you want to put them on tripods and set them up each week. Here is a quick pro/con comparison:

Fixed vs Tripods	Pro	Con
Fixed Installation (attached to the wall)	Minimal Sunday set-up time Ideal camera angles Low-profile/non-intrusive to worship	Only useful where installed Can be expensive Harder to upgrade
Cameras-on-Tripods	Maximum flexibility for doing different events in different spaces Can use parishioner's cameras Camera(s) can be moved around depending on needs (e.g. a baptism at the back of the church)	Requires Sunday set-up More operator skill required Easier to experiment/upgrade over time More intrusive to worship Less awesome camera angles

A somewhat related but separate concern is what kind of camera to use. My basic advice on this point is to start with what you have and build up over time. If all you can manage is a smartphone then experiment with how that smartphone is moved through the space as the worship unfolds. But note that a camera placed at the back of the church with an unmoving wide-angle shot of the whole sanctuary will make viewers feel cold and distant, no matter how expensive the camera. What matters most is "framing, framing, framing"--that is, what is in the image frame and how is it placed. If you want viewers to feel like they are "part of the action" then the camera needs to be placed in a position to make them feel that. Yet this concern must be balanced with the practical part of not getting in the way of the people actually present. This is why putting a camera half-way up a side-aisle on a tripod is better than at the back of the church zoomed in to maximum.

Camera Types	Pro	Con
Smartphone/tablet/ laptop	Available/at hand Ubiquitous Pretty reliable (but watch battery) Not tethered to anything (wireless)	Highly intrusive Hard to get a good angle Poor audio quality
Webcam	Plugs into laptop--no capture device	Same cons as smartphone Tethered to a computer
Camcorder	Better video quality Real Zoom Can be set-up anywhere	Sunday set-up required Needs skill Needs capture device
DSLR	Best video quality Good/excellent low-light Compact/portable Can be configured with accessories	Set-up required Needs a lot of skill Expensive if not borrowed Needs capture device

PTZ (pan, tilt, zoom)	Can be installed (fixed) in place Easy to operate Integrates well with any system Non-intrusive No need for a capture device	Moderately expensive Once fixed, can't be moved Harder to upgrade/replace

Encoding

If you use a smartphone/tablet the encoding and streaming is taken care of by the application you are using. The simplicity is attractive, but the options of where you can put it and how you can use it are constrained.

If using a camcorder or other external camera, then once you have a video/audio image that you want to share with the world you need to "encode" that video to stream it to the web. This can be done with either a dedicated hardware device or using software on a computer (most commonly a laptop) with a "capture device." These capture devices convert an HDM video signal into a USB signal that a computer can use.

Hardware devices such as the Teredek VidiU or the Blackmagic ATEM-mini Pro connect to the camera directly and to the internet (best done with a hardwired ethernet cable) directly. The device connects to your streaming service (Youtube, facebook, etc. but NOT zoom) and can be configured with a smartphone. These are very compact and when paired with a camcorder or DSLR make an attractively small package, but the tradeoff is that you can't do all the neat tricks of a software-based approach (like easily adding titles or playing pre-recorded clips). This is also a generally more expensive approach to take.

Another type of hardware based-solution is to use a "video switcher." These switch between one of several video inputs. For example, you could plug in a camera with a wide-angle video of the whole sanctuary and another zoomed in on the pulpit and also a laptop with a powerpoint slides deck all into a switcher and then push a button to switch between (or even combine) the different image sources. An example of such a system is the Black Magic ATEM-mini.

The software route involves using a laptop connected to the camera(s) usually with a capture device. Capture devices are not necessary for Webcams or or some PTZ cameras. Once the computer "sees" the camera it can be processed by software and sent to your streaming service of choice (YouTube, Facebook, Zoom). Several types of software are available, perhaps the most popular is OBS (Open Broadcast System) which is free. OBS and similar software packages are quite powerful and include the ability to combine not only the cameras plugged into the computer, but any resources such as pre-recorded video/audio, powerpoint slides, title slides, and many other possible sources. It's even possible to send video feeds from smartphones to the software over the network to be incorporated. Software can be trickier to learn how to use, but the features are impressive.

A Word about Internet

If at all possible, avoid using Wifi for streaming. Hard-wired internet ("Ethernet") cables are cheap, more reliable, and faster than wifi. And in the case of PTZ cameras you can even run a single "ethernet" cable to the camera which will both share the video image with any networked computer you want, give you control over the camera to pan, tilt, and zoom, AND power the unit with electricity. This makes a very tidy, non-intrusive installation.

Many churches have already invested in Ethernet networks (particularly if they are using Voice-over-IP systems for their telephone) so adding a PTZ Camera or plugging in a laptop for streaming is usually just a matter of running a new cable.

The other thing to consider is how much "bandwidth" you have. You can easily test this with the website https://www.speedtest.net/ . This will measure you "download" and "upload" speed. Obviously the "upload" speed is what really counts for streaming and the more the better. Typically you need a minimum of 500kps to stream successfully, but a range of 1.5Mbps to 4Mbps is much better. Between 3Mbps and 6Mbps is what you need for good HD (1080p) streaming.

Streaming Services

Once you have a video stream you need a platform to distribute it. Many are free. Almost all will allow you to "embed" your video in your own website as well as giving people a link to watch it on theirs. All will also "record" your stream so that it can be viewed later. It's also possible to stream to multiple platforms at once (such as Youtube and Facebook) using either software on your computer (assuming you have the internet bandwidth to match) or a service such as Restream.IO. It also works fine to stream a Zoom session to Youtube or Facebook.

Service	Cost	Comments
YouTubeLive	Free	Streaming from mobile devices requires having a "popular" channel, but streaming with a computer or hardware encoder is fine. You have the highest chance of random people discovering you. The automated copyright system can be annoying.
FaceBook	Free	FB itself can be a barrier, many won't even open a FaceBook link to view a video even if they don't have to join FB to watch. However you can "embed" a FB video on the church website to get around this.
Dacast	$20/mo	No ads or copyright issues, designed for churches
Vimeo	$20-50/mo	Complicated pricing plan
Restream.IO	$19/mo	Sends stream to multiple destinations such as YouTube/FB simultaneously
Zoom	$20/mo	Hard to integrate with an in-person gathering*

*Zoom is really designed to be a video conferencing solution, not a "broadcasting" platform. It's relatively easy to send the worship video to Zoom, but sending the content FROM Zoom back into the assembly is beyond the scope of what this document can consider. Is it possible, yes, of course, but it requires significant problem solving.

What should you do with a budget of….

$0

Get your volunteers to bring their own equipment and cobble together “what’s possible.” Much will depend on how many consistent people you can get for your team. If you are lucky you might have some hobbyists with nice cameras and passion for learning how to use them.

$100
A clip that allows you to attach a smartphone to a tripod can make a much smoother and easier experience than trying to hand-hold a smartphone for an entire service. Attach a “GorillaPod” and you now have “legs” that can wrap around ledges and chair backs or anything else that can serve as an improvised tripod.

$1000
Buy a compact “consumer” style camcorder and a video capture device. Figure out how to connect your PA system to the camera. Plug the camera (via the capture device) into the best laptop you have available and use OBS to stream.

$3000
Buy a “pro” style camcorder and a video capture device. The more expensive camera will have better low-light image quality and more versatility for connecting to your sound system or using external mics. Such cameras are generally “tougher” to stand up to wear and tear and most are just as easy to operate as the consumer models. Consider whether to go down the hardware or software path for switching between different cameras and other content.

$5000
Buy a PTZ camera and have it installed with a nice vantage point and perhaps also get a camcorder+capture device for an alternate angle. A single operator can thus control multiple cameras (one fixed on a tripod and one PTZ) and provide a very high-quality feed.

$10,000
Buy multiple PTZ cameras and perhaps even a hardware-controller for them. Integrate/switch using OBS (free) or WireCast (not free) software. At this point you may need a second person to help. Perhaps one person handles the cameras and the sound board (if you have one) and the other person manages the video switcher (whether hardware or software based).

Particular Pieces of Equipment to Consider

Holder for your iPhone: GorillaPod + Manfrotto Lock Clamp $116

This combination makes it much easier to hold your smartphone with a steady grip, particularly in a horizontal orientation. But you can also use the little legs to wrap around any convenient object to make it into an improvised tripod. This is a great option if you have a limited option and want to move a smartphone around in the church to capture the action.
https://www.amazon.ca/dp/B074WC9YKL/ref=cm_sw_em_r_mt_dp_U_GAz4Eb9YE1ZW1
https://www.amazon.ca/dp/B07K6GHL24/ref=cm_sw_em_r_mt_dp_U_cBz4Eb7SGV07N

Typical “Consumer” style Camcorder: Sony HDRCX675B $679

Small Camcorders like this one usually come with big zooms in a compact package. Usually they aren’t great in low light, but they are pretty easy to use. It is possible to “fix” these to the wall using brackets and then simply plug the power in on Sundays, but this is not an ideal set-up, but it is workable if you are on a budget. Note that a camera like this CAN accept audio from a sound system, but it will require either the right cable or, more likely, a small converter box.
https://www.vistek.ca/store/402967/sony-hdrcx675b-full-hd-handycam-camcorder-32gb-internal-memory

Typical “Professional” style Camcorder: JVC GY-HM180U $1,999.99

A larger image size means better low-light performance with less zoom. But what really distinguishes “pro” camcorders is features like XLR audio inputs to plug directly into external mics and sound systems and lots of buttons to quickly control common settings without needing to thumb through menus on a touch screen.
https://www.vistek.ca/store/433670/jvc-professional-gyhm180u-4kcam-compact-handheld-camcorder-w-inte

Video Capture Device: ClonerAlliance Flint 4KP $211

This device, and ones like it, basically convert any video signal including from a camera or another laptop into a video “input” into a laptop or desktop. From that point any software on the computer can use that external video source as though it were a camera built-in to the computer. This will work for virtually any application including streaming to Zoom, Youtube, Facebook, or any other platform of choice.
https://www.amazon.ca/dp/B07FF52DT4/ref=cm_sw_em_r_mt_dp_U_gjA4EbBW4VDX0

PTZ (Pan Tilt Zoom) Camera: PTZOptics 20x-NDI $3,044

PTZ cameras are designed for being placed where a person can't be, possibly fixed to a wall or mounted on a horizontal surface, and to get a great point-of-view. The camera is plugged into the Ethernet network of your church. An operator can then move the camera around in three axis (pan, tilt, zoom) using either a smartphone/tablet, software on a laptop, or a dedicated hardware-based controller with a joystick. The genius comes when there are pre-programmed saved presets such as "altar" or "pulpit" which will smoothly transition the camera with a single selection. Since the camera is fixed in position an operator needs only to plug a laptop into the network to both control the camera (and any other cameras) and stream the video using their software of choice. The downside is that one is unlikely to remove the camera from the wall to do an event in another part of the church. Note that cameras like this can do "double duty" of working both for Sunday morning worship and as security cameras to watch the sanctuary during the week. However, do NOT attempt to use "security cameras" for broadcast.
https://www.avshop.ca/video-cameras/ptzoptics-20x-ndi-ptz-camera-white

Hardware-based Video Switcher: Blackmagic ATEM-mini $449

The benefit of a switcher like this one is that you can combine multiple video inputs (up to 4 in this case) and switch between them just by pressing a single button. They are extremely easy to use, and models like this one act as their own "video capture devices" by connecting to a laptop via USB. In some ways this is a simpler solution than using a program like OBS. If you get the "ATEM-mini Pro" for $905 you can skip the laptop entirely as it has a streaming encoder built in.

That is, you can connect the “pro” level device directly between camera(s) and the internet and stream directly that way. This approach sacrifices many features of the software-based approach of using a laptop, but gains simplicity of operation and affordability.
https://www.avshop.ca/video/switchers/blackmagic-design-atem-mini-hdmi-switcher-streamer
https://www.avshop.ca/video/switchers/blackmagic-design-atem-mini-pro-switcher-and-streamer

Hardware-based Encoder: Teredek VidiU Pro $1,159.00

A dedicated encoder like this one has one job: to take a video signal from a camera (or switcher) and stream it to the internet. It can be mounted directly to a camera and stream using hard-wired ethernet (recommended) or wifi (not recommended, but sometimes necessary). It’s a bit pricey compared to other options like the ATEM-mini Pro, but for certain applications it can be a very handy piece of kit.
https://www.avshop.ca/video/broadcast-routing-amp-dist-n/teradek-vidiu-pro-wireless-streaming-encoder

A Word about DSLR’s

DSLR cameras look like the old 35mm cameras everyone recognizes, but modern ones by all manufacturers (Canon, Sony, Panasonic, Nikon, etc.) produce gorgeous video images. They use the very best lens you can afford and out-perform even professional “broadcast” cameras in low-light situations. The problem is that they are very expensive. The camera and lens pictured here are 3,399.99 and are considered on the “basic” end of the spectrum. By their nature (because of their large image sensors) such cameras do not “zoom well” without spending extraordinary sums on very large lenses (think of the photographers on the sidelines of sporting events), which means that you end up needing to be fairly close to the “action” to get a good immersive video image. Although all such cameras now have fully automatic modes, in practice you need to actually know a lot more about issues like white balance and exposure and shutter speed in order to get the quality of image you are paying for. However, if you happen to have staff or volunteers that are passionate about videography or who already own such equipment, these kinds of cameras can be extremely effective.
https://www.vistek.ca/store/439914/sony-alpha-a7iii-mirrorless-body-w-fe-2470mm-f40-2-x-extreme-pro

Final Thoughts

It’s easy to look for a technical solution, but much of the challenge of livestreaming is actually a cultural one. You have to ask whether your congregation has a culture to support this method of outreach. Do you have volunteers who will step-up to set-up your equipment. People willing to bring a laptop from home and learn how to use software like OBS. Are people going to get upset if their reading of the scripture from an ambo is visible for all the world to see? Will it bother people if you put a camera on a tripod in the middle of the central aisle? All these questions and more are important to consider before investing in equipment.

Also, before you start making major investments it's wise to start with borrowed or rented equipment to test different configurations. Churches are very different from each other, and until you start to actually work out the problems of your particular circumstance guides like this are only useful to give a direction. At the end of the day the solution you choose will be highly customized based on many factors such as budget, volunteer capacity, and architecture.

If you have any questions or need more advice I’m happy to talk more. My email address is taymoss@churchofthemessiah.ca.