INTRODUCTION.

In the beginning, things were much more difficult.

I worked at radio stations in the 1970s and 1980s that did remote broadcasts. You called the phone company and paid hundreds of dollars for them to put in a dedicated audio circuit from the studio to the remote location – a circuit you might use for just one day. It could take a week or even longer to get it, test it, and get the phone company to complete any needed fixes. For AM quality audio, you'd order an equalized line at 5 kHz or 8 kHz. High fidelity music remotes required a very expensive matched pair of 15 kHz circuits.
Or, if your station was in relatively flat territory, you could use an RPU – a remote pickup unit – basically a portable VHF or UHF transmitter and a matching receiver at the studio. With favorable antenna locations, you could broadcast live from a location up to 15-20 miles from your studio.

In the 1970s, when I was working at WKAR, the NPR station in mid-Michigan, I lugged around an Ampex AG600 reel-to-reel tape machine to record lectures and other things. Later, at NPR, we used Nagra tape recorders, superb machines that unfortunately ran on a large number of D-cell batteries. Running around town to record interviews, laden with a Nagra, a pile of reels of blank tape, microphones, cables, and a few dozen backup D-cells was... an experience. NPR avoided telephone interviews whenever possible, so we had guests come into the studio if they could. But when it wasn’t possible, we used a technique called a tape sync. The idea was that a host in the studio would talk on the phone to the guest, who might be in their home or office. That was how they heard each other. But the studio engineer would record the host’s voice through the studio microphone and the field engineer would record the guest’s voice using a good microphone and a Nagra. Then we’d physically mail the guest tape to NPR’s Washington headquarters, where engineers would combine the tapes. The end result could be so good that most listeners would think the guest was right there in the studio with the host. The fact that we went through this cumbersome procedure was a testament to NPR’s commitment to putting out the best audio quality possible under the circumstances.

Then came the digital age. If you had money, you could install an ISDN line and buy expensive terminal equipment; this let your studio connect with other studios that also had ISDN capability, enabling you to send high quality audio back and forth. A guest would have to go into the other studio to do the interview.

And then, the internet. Once DSL, cable modems, and even fiber became widely available, we could send audio over the net easily and relatively inexpensively.

But even this faster internet speed didn’t solve the problem: until a few years ago, most methods of doing high-quality interviews over the internet were expensive. Sending high quality, low-latency, bidirectional audio over the net required an expensive double-ended system – meaning that you needed to install specialized hardware boxes at both the host and guest locations. These systems could cost thousands of dollars, so for a one-time interview, you probably wouldn’t want to send one of the boxes through UPS to a guest who, you only hoped, would return it safely.
A few years ago, a company called Comrex – a longtime player in the field of remote broadcasting – released a product called the Opal. It was a single-ended solution, a box that you would connect to your studio console in the same way you’d connect a phone coupler: you’d connect its output to an input channel on your console and feed the Opal with a mix-minus from the console.¹

For an equipment geek, I haven’t kept up with new technology in recent years as much as I should have, but when I discovered the Opal, it seemed revolutionary to me. Here was a box costing less than $2,000 that could give you high-quality, low-latency audio, but with no special equipment needed on the guest end – just a computer with an internet connection and some kind of microphone and headphones.

At OutCasting – at least in non-Covid times – we’ve had guests come into the studio to do their interviews in person whenever possible. But many of our guests live in other

¹ A mix-minus is an audio signal, generated by your studio console, that gets sent to your guest so the guest can hear you (and anything else in the mix the guest might need to hear – other hosts and guests, recorded audio, etc.), but not including the guest’s own audio because that would confuse the phone coupler, reducing the quality of the guest audio. Also, if there are any delays (rarer with older analog technology but very common today), the guest would hear their own voice coming back to them through their headphones delayed by a second or so, making it impossible to carry on a conversation. So the term “mix-minus” comes from the fact that you are sending your full program mix to the caller minus the caller’s own voice. Different consoles and mixers generate mix-minuses in different ways, so your engineer needs to set that up.
parts of the country, so we interviewed them the old-fashioned way – on the phone, using a good quality phone coupler in the studio (a Telos One) and having the guests use only landline phones to keep the audio as clean as possible. (Cellphone audio can range from passable to horrible; we’ve always avoided it.)

But more and more people are dispensing with landlines, going mobile-only, and in any case we wanted to improve the audio quality of interviews, so the Comrex Opal was very tempting for us. I was able to get a quote of about $1,700. By chance, that same day I was talking with a friend who, like me, is a broadcast engineer, and when I told him about the Opal, he said, “I’m about to save you $1,700. Have you ever heard of Cleanfeed?”

I hadn’t, and so he explained it to me. A fully online service, Cleanfeed — https://cleanfeed.net/ — works like the Opal, creating a high quality, low-latency link between the host end and the guest end over the internet – but not only doesn’t it require special equipment at the guest end, it also doesn’t require it at the host end – just a computer running Chrome on each end and an internet connection, plus whatever audio equipment you want to connect.

So we’ve experienced a clear evolution – first, recording interviews over the phone or going through the clunky tape sync process; then using double-ended systems with specialized equipment needed at both ends; then using a single ended system with the Opal box at the studio but just a computer at the far end; and finally, a system using computers we already own on both ends, no specialized hardware, and an entirely online way of connecting the host and guest computers. Remarkable.

**CLEANFEED.** Cleanfeed offers both free and paid professional accounts. (The pro account includes extra features and, with a discount for nonprofits, costs $22 a month.) I’ve only used the free account. It works reliably when both the host and the guest are using Chrome; other browsers may or may not work.

I have to mention that the guys who run it (a Mark and even a Marc!) are very responsive by e-mail even to those of us without paid accounts. Over the past few years, they’ve added features, including one I suggested – being able to route two guests to the left and right outputs of the computer separately so that each guest can show up on a different console fader, enabling us to adjust their levels independently, just as if they were on separate mics in our studio. The free version doesn’t offer this option, but we were able to get the same benefit by using two computers with two free Cleanfeed
accounts in order to have two guests in an interview. (Keep in mind that this was a few years ago; they have continued to add features, and depending on your needs, it may be well worth it to have a paid account. Visit https://cleanfeed.net/ to see whether the paid account features would work well for you.)

Here’s an image of Cleanfeed’s main screen:

![Cleanfeed main screen](image)

So we started using Cleanfeed for all guests who couldn’t come to the studio. The computers in the studio are connected to the console in the same way that phone couplers are. You invite your guest by clicking on “Connect” on the Cleanfeed screen and then entering their e-mail address. Cleanfeed then sends the guest an e-mail with a link; once the guest opens the link in Chrome, Cleanfeed creates a live high fidelity link between your computer and your guest’s. Here’s what the Invite page looks like:

![Invite page](image)
MICROPHONES AND ROOM ACOUSTICS. Having this high fidelity link is just the starting point. To take full advantage of the quality the link can offer, you have to think about microphone quality and room acoustics not just for yourself but also for your guest – which is generally not a concern when you’re interviewing guests over the phone.

At OutCasting, once we started using Cleanfeed, we urged our guests to use at least a USB headset with a microphone. You can get these at office supply stores like Staples for as little as $30; the Microsoft unit we have does a decent job. Here’s it is:

![USB headset with microphone](image)

But not every guest had one or was willing to buy one, so our guest audio quality ranged from good (for those with decent headsets) to fairly bad (for those who were using something else, usually just what they had on hand). The Cleanfeed audio channel itself was always high fidelity, but as is the case with all audio, quality begins with the microphone, how it’s used, and the acoustics of the room it’s in. Some of our guests have been in the NYC area, and I was able to bring one of our good mics (an ElectroVoice RE-16) and a USB mixer to their homes to connect to their computers. The resulting audio quality was very near studio quality. I’ve put links at the end of this document to OutCasting episodes recorded using different technologies – telephone, online, good headset, bad headset, USB mics) so you can hear what they sound like.

Now that we’re unable to gather in the studio because of Covid, we are doing all of our interviews online using Cleanfeed and, more recently, Zencastr – but I’m getting ahead of myself.
In the interviews whose audio quality wasn’t great, there were three contributing factors:

1. The quality of the microphone being used;

2. The acoustics of homes, including a lack of soundproofing (so there were noises from outside the room or the house) and a lack of acoustical treatment (resulting in more reverberation – an “echoey” sound); and

3. Mild internet instability that resulted in minor glitches in the audio.

Let me expand on these points.

1. **Microphone quality.** After some early Cleanfeed interviews in which the quality was not nearly what we had hoped, we invested in a couple of USB microphones that we could send to guests through UPS, USPS, or FedEx. We needed these to be plug-and-play for the guest – no setting anything up, no installation of software or drivers, just plug the mic into the USB port and have it work. Our experience so far has been excellent, with audio quality sometimes so good that unless you know what to listen for, you’d think the guest was right in the room with the host.

If you can afford it, I strongly suggest that you get a real USB mic at least for yourself, if not also one to send to your guests. Here are some suggestions:

   a. **Dynamic or condenser?** There are several decent USB mics in the under-$150 range. If you have a choice between dynamic and condenser mics, opt for **dynamic**. Condenser mics can sound terrific but they pick up everything; dynamic mics are much more forgiving, especially in rooms that don’t have ideal acoustics and soundproofing.

   b. **A key feature.** You need your mics to include a headphone jack right on the mic and a feature called **zero latency monitoring.** When you’re in a broadcast studio, you hear yourself in the headphones in real time (with no delay). But if you plug a mic into the USB port on a computer, the audio from the mic has to be processed by the computer before it gets returned to the computer’s monitor output – and that will introduce a delay in the headphones that will drive you crazy. Mics that have this zero latency monitoring feature feed the mic’s signal directly into the
headphone jack that’s on the mic, so if you plug your headphones into that jack, you can hear yourself without delay.

c. **Test before buying.** If you’re considering the purchase of USB mics, test them first with the online services – Cleanfeed and Zencastr, or whatever you’re planning to use. We found a Røde mic that we really liked, but for some reason, it didn’t work with Cleanfeed. In the end, the mic we purchased for the remote kits we send to guests is the Audio-Technica AT2005USB. Here it is, along with the headphones we send:

![Mic and headphones](image)

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d. Don’t forget to get a windscreen for each mic!

Once the guest receives the remote kit (which includes the USB mic and a pair of closed-back headphones, about which I’ll say more later), we do a test run. Often the guest has to go into their Windows or Apple OS settings to adjust the mic level. Occasionally they have to select the USB mic as the default device. And of course, we experiment with different mic positions relative to the guest, but that’s usually all it takes to get the best quality out of the mic.

Because more people are using smart phones, we purchased USB-to-Lightning adaptors for people with iPhones and iPads and USB-to-Micro-USB for others – but for some reason we’ve never been able to make them work. On the rare occasions when we have done interviews using smartphones, the guest has used earbuds with a microphone on the cord, plugged into the earphone jack on the
phone. (Note that in this situation, we’re using the phone not as a telephone but as a computer running Chrome. With Cleanfeed, some guests with iPhones have been able to connect with Safari and others haven’t. You should consider Chrome to be essential and use it whenever possible.)

2. **Acoustics.** There are two separate components of acoustics: soundproofing and treatment of the interior of the room to reduce reverberation.

   a. **Soundproofing/noise.** As a practical matter, it’s impossible to soundproof a room in a guest’s house. The best you can do is to keep windows and doors closed, minimize other noises in the house, and even record at times when outside noise is less of a problem (sometimes later in the evening – we’ve started some interviews as late as 10:00 PM). You want the room to be as quiet as possible, so you should have the guest turn off fans, air conditioners, and any other sources of noise that they may have control over.

One common issue is the cooling fan in the computer itself, which can create noise through the air as well as vibration that can get transmitted through the tabletop if the computer and the mic are sitting on the same surface. If you’re using a USB mic, it will likely have a cardioid pattern, meaning that it picks up sound most efficiently toward its front and less so to the sides and back. So one trick is just to point the mic away from the computer and set it on the desk as far from the computer as is feasible. As for vibration, putting a folded towel under the mic’s desk stand can help a lot.

**Room tone.** Because there will likely be some constant noise that you just can’t get rid of during the recording, always record at least 10-15 seconds of **room tone** – the sound of the room without the guest talking. We even have the guest hold their breath to make the room as quiet as possible. When you’re editing the interview, you can apply noise reduction, and depending on what software you’re using, the room tone can be used to “teach” the software what noise it should try to reduce. Room tone is also useful to edit into the interview when needed – as when you have to remove a cough between sentences and just fill the time so that the rhythm of the speech remains natural. No room is completely
silent, so you can’t just insert silence – it won’t sound good. Carefully splice in some room tone and nobody will hear the edit.

b. **Interior treatment.** The ideal room to record in (assuming it’s not particularly noisy because of outside noise) is something like a bedroom with heavy drapes on the windows and wall-to-wall carpeting. Beds, drapes, carpeting – those things absorb sound, which you want to do. In a room full of hard surfaces – bare windows, hardwood or tile floors, etc. – the guest’s voice bounces around from surface to surface, decaying only after some period of time has gone by, and the recording will have an unpleasant echoey sound.

So if your guest is planning to do their interview in a hard-surfaced room, first ask if they can easily relocate their computer to a room that’s less reverberant. If they can’t, ask them to bring in anything soft that could absorb sound – blankets, towels, area rugs, bedspreads, things like that – and try to arrange them to make the room as non-reverberant as possible.

I’ve used software that can fairly effectively remove constant noise like fans and air conditioners (though you have to be careful not to be too aggressive with the noise reduction or you’ll get unnatural artifacts), but I haven’t found anything that can get rid of too much reverberation, at least without making it sound quite unnatural, so reducing reverberation in the room is the only practical solution.

3. **Audio glitches.** The glitches we experienced weren’t just a momentary silence and then a resumption where the audio left off; those would have been easy to edit. Instead, some of the audio was just dropped, and even a dropout of a second could result in a missing word or two – enough that we’ve sometimes had to ask the guest to restart the part of the answer they were in. Some experienced guests could do this easily, but others could get flustered and have to go back to the beginning of the entire answer. Sometimes, I just left it as it was and did the best I could to edit the dropout so it was as unobtrusive as possible.

Before I continue, I have to make a transition. Until now, I’ve been mainly describing our pre-Covid situation with hosts in an actual studio and most of our guests at home.
With the pandemic, both you and your guest are likely to be recording at home, so any suggestions and recommendations in this document apply to you as well as your guest.

So let’s get back to these audio glitches. Once we started recording with everyone at home, we functionally had three people on every interview:

- one of our youth participants as the interviewer;
- the guest; and
- me as the producer, rarely heard during the recording and never heard during the edited version of the interview, though always listening and stopping the interview as necessary to clarify a point or expand on something unanticipated.

Because I am the administrator of the Cleanfeed account (and now also Zencastr), I am nominally the “host,” and the interviewer and guest are both “guests.” This brings up an important point: both of these online services allow you to have multiple guests.

When we were still recording in our studio, recording a guest from home via Cleanfeed, the glitches would be only on the guest’s voice. But now, with both the interviewer and the guest connecting via Cleanfeed, glitches can appear in both voices, doubling the problem.

**ZENCASTR.** Then I heard about Zencastr — [https://zencastr.com/](https://zencastr.com/) — another online service. Like Cleanfeed, it creates a high-fidelity, low-latency link between the host and guest(s), so everyone can hear everyone else very clearly. As with Cleanfeed, there can be glitches in the live audio. But here’s the crucial difference: In Cleanfeed, as the host (the account holder), you can record the interview on your computer. The recording includes both your voice and your guest’s, and there’s an option to record the voices in **split-track mode** (“stereo split”), a useful technique about which I’ll talk in a moment. But because the guest’s voice is coming over the internet, any audio glitches in the guest’s voice will be in the recording. In contrast, Zencastr records your voice on your computer and your guest’s voice on their computer. This dual recording creates an important benefit: when internet glitches result in audio dropouts, you and your guest will hear them in your headphones but they won’t show up in the recordings. You end up with two files – one with your voice and one with the guest’s – so as with Cleanfeed, you still get the benefits of split-track recording.
But before we move on to split-track recording, here’s a look at Zencastr’s main screen:

**SPLIT-TRACK RECORDING.** I like to record all interviews in split-track mode. In the studio, this means that you record in stereo, sending the host’s voice only to the left stereo channel and the guest’s voice only to the right. (That’s our convention, but of course there’s no reason you couldn’t do it the other way.) On a studio console, you do this by turning the pan pot for the host mic all the way to the left and the pan pot for the guest mic (or the phone coupler or the computer – whatever device is carrying the guest’s voice) all the way to the right. Here’s a screenshot showing part of an interview in split-track mode:

Split-track recording is beneficial for a number of reasons:

1. **Independent processing.** It allows you to process the audio for the two channels separately. This takes on particular importance when the guest is in
another location – at home, for instance. Let’s say the guest is in a room with some background noise. If you’re recording in mono, both voices are mixed to a single channel, and if you try to filter out the background noise, you’ll also be degrading the host’s audio quality. By recording the guest on a separate channel, you can filter that channel only, reducing the background noise and making the guest’s voice clearer without making the host voice sound worse.

2. **Correcting imbalances.** Split tracking allows you to correct imbalances in the voice levels that may arise during the interview. All of us are used to setting voice levels before the interview starts, and we’ve probably all also experienced guests who talk differently during the interview than they did during the setup. With split tracking, you can adjust the volume levels of the host and guest independently.

3. **Clearer on-screen representation.** Recording in split-track mode also makes it easier to find a particular clip because your editing software will show the host’s voice on one channel and the guest’s on the other, which lets you see where each question and answer begins and ends.

When you download the Zencastr files of your interview, put them in the multitrack editor of your editing software and then set the pan controls accordingly.

Like Cleanfeed, Zencastr also offers free and paid accounts. The difference is that the free account allows only mp3 recording; the paid account, which costs $20 a month, allows wav recording as well as mp3. And that presents me with another opportunity to segue to the next topic.

**WAV VS. MP3 RECORDING.** Unless you have no alternative, you should do your initial recording and all of your editing and production in an uncompressed format (wav in Windows), not in mp3. The mp3 format was designed to make audio files smaller – sometimes much smaller – than wav files. The benefits of smaller files are that they take up less storage space and are faster to transfer over the net. But the mp3 process accomplishes this by discarding part of the audio, perhaps a lot of it. For example, at a sampling frequency of 44.1 kHz, saving your file as mp3 with a bit rate of 128k in mono (256k in stereo) discards more than 80% of your original audio.

This is how mp3 encoding reduces file sizes: The developers of the mp3 format did a series of psychoacoustic studies and found that if two sounds were close enough in
frequency, and one was sufficiently louder than the other, the louder sound would effectively “mask” the softer one and most people wouldn’t hear the difference most of the time if the softer sound were eliminated – so that’s what they did. Imagine striking a very loud Middle C on a piano and a very soft D flat (the next key up on the keyboard). If the D flat were sufficiently softer than the C, the D flat would theoretically be inaudible to most people and would thus be eliminated by the mp3 encoding process.

The mp3 format has been called compression, but that’s a bad word for a couple of reasons: first, it invites confusion with the unrelated concept of audio compression; and second, it may imply that the compression can be uncompressed, restoring all of the original audio. That’s not the case; once a file is saved a single time as an mp3 file, a large part of the audio is eliminated and can never be recovered – not even if you subsequently save the mp3 file to an uncompressed format like wav. The mp3 format is more accurately called a data elimination process.

Now, mp3 files can sound OK – if they’re only encoded once. But it’s possible that during the course of getting your interview to listeners’ ears, it may go through more than one mp3 encoding process. For example, let’s say that you save your original interview recording in mp3 format; that’s one encoding. You subsequently do your production all in wav format, so there’s no further degradation. But then you save your final program to mp3; that’s a second encoding. Stations download it and broadcast it. But let’s say the station has its studio in one location and its transmitter in another; it needs a channel to send its audio to the transmitter using some kind of STL (studio-transmitter link). Large stations with big budgets can afford STLs that don’t data-reduce the audio, but smaller stations may use STLs that encode the audio into mp3 (or another lossy format). So there’s a third time your audio gets cut down. And your audio, which started out so nice and clean, can potentially sound grungy to listeners after all that data elimination.

So if you can afford the $20 a month for the paid Zencastr account, it’s worth it to be able to keep your audio from starting out degraded. If that’s beyond your budget, obviously, you can use the mp3 recordings created in the free version, but make sure to do all your subsequent edits and production in wav and save your program as an mp3 file only at the very end of the production process.

**CLOSING SUGGESTIONS.** I think I’ve covered most of my major points – describing Cleanfeed and Zencastr, USB headsets and mics, soundproofing and
acoustics, recording in split-track mode, and using wav instead of mp3 wherever possible. So I’m going to close up with some suggestions.

Record right on the computer. Both Cleanfeed and Zencastr allow recording directly in the app. This means that you don’t need external recorders.

- In Cleanfeed, the host (and only the host, not the guest) can record the interview. There’s an option to record in split-track mode. When you’re finished, you can save the recording onto your hard drive. As I mentioned, the recording includes both host and guest and it’s in wav format. **Note: you must save it manually before you close the browser tab in which Cleanfeed is running.**

- Zencastr, as I’ve also mentioned, makes separate recordings on the host and guest computers. How do you get those files? Zencastr has made the user experience really easy. Once the host stops the recording, each file is processed and then uploaded automatically to your Dropbox or Google Drive. (You set up the details when you sign up for your account.) An important thing to remember is, as with Cleanfeed, **both the host and the guest must not close the browser tab in which Zencastr is running until the processing and upload are complete.** If the tab is closed before that, the recording may be lost. I like to look at our Google Drive to verify that the files have actually uploaded in full before I tell the interviewer and the guest they can close their browsers.

Shut down unneeded software. I have always been leery about depending on computers to record reliably. Computers are complicated machines running security software and other things while they’re running your Cleanfeed or Zencastr session and recording the audio. So I suggest that both you and your guest shut down any programs on the computer that you don’t need during the recording. Obviously, you don’t want to shut down security software, but you do want to make sure it’s not going to start an automatic scan during the recording or upload. Similarly, you and your guest should close your e-mail programs, chat and calendar apps, any browser tabs that aren’t needed, and so forth. We haven’t used the built-in recorder in Cleanfeed, but in the relatively short time we’ve been using Zencastr, the recordings have not had problems, though on one occasion, we had an upload failure and had to try various things before we were able to manually upload the recording.
**Make backup recordings on external recorders.** As an added layer of protection, I make backup recordings of all of our interviews on at least two dedicated audio recorders – at various times, portable digital recorders, Mini-Discs, and even reel-to-reel tape (the only format that has never failed us). Because we’re not in the studio, I now run two portable digital recorders – a Tascam DR100 Mk II and a Zoom H6. Before I got the H6, the DR100 froze up once during a recording, so having multiple backups gives me peace of mind. You never want to ask a guest to re-record an interview!

Assemble remote kits for guests — mics and headphones. I mentioned earlier the remote kit that we send to guests via UPS, USPS, or FedEx. It includes a USB microphone (Audio-Technica AT2005USB), which comes with a small desk stand and a USB cable, and a pair of headphones. It’s important that you use closed-back headphones; you don’t want to have sound leaking out and getting into the microphone. Keep in mind that there are always short delays when using Cleanfeed and Zencastr. They generally are less than one second. But if your microphone hears the guest’s voice leaking out of your headphones a second after it appears on the guest’s channel, it’s going to be noticeable and you’ll have to manually edit it out wherever it happens. For your own monitoring, you should get a decent set of headphones because you have to listen for audio quality, but if you’re making a remote kit to send to guests, you can get
decency headphones for around $30. One model we use in our remote kits is the Tascam TH-02. And keep the headphone levels turned down to a reasonable volume for the same reason – to make sure the mic doesn’t pick up sound leaking out of the headphones.

**Maximize the quality of the internet connection on both ends – host and guest, and use AC power for the computer.** I’ve mentioned that you need a stable and reasonably fast internet connection on each end. Ideally, you and your guest will both have your computers connected directly to your routers with an ethernet cable. Wifi is less reliable, but if you have to use it, try to ensure that the signal is as strong as possible. At the radio frequencies wifi uses, walls and floors attenuate the signals. So:

1. The best option, again, is having a wired connection between the computer and the router.
2. The second best is wifi with the computer and the router in the same room, ideally with a line of sight between them.
3. Third is wifi with the computer and the router in adjacent rooms on the same floor.
4. Fourth is wifi with the computer in a room directly above or below the room that the router is in.
5. The next-to-worst option is wifi with more than one wall or floor between the computer and the router. Each wall and floor/ceiling reduces the signal strength, so the more surfaces the signal has to go through – and the more distance it has to travel – the weaker it will be.
6. And the very worst is the situation in No. 5 with the computer running on battery power. Make sure the computer is getting its power from a power outlet! If the computer is running on its battery, the battery will run down during the interview; not only will this make the whole computer less stable, potentially endangering your recordings, it’ll also make the wifi signal between the computer and the router weaker, increasing your chances of getting glitches in the audio.

**Using smartphones.** It may be possible for the guest (or both of you) to connect to either Cleanfeed or Zencastr using smartphones. It depends partly on whether Chrome is installed and, for Zencastr, how much free memory the phone has. You should still
use a headset or even the kind of earbuds that have a microphone that dangles down on the cord. If you do this, you should have the guest experiment with holding the mic in different positions to get the best sound quality.

**Using Cleanfeed and Zencastr in the studio.** Both Cleanfeed and Zencastr can be easily integrated into a real studio, so these aren’t just tools to use for home recording during Covid. You would just need to connect your computer to your studio console in the same way you’d connect a phone coupler: the computer’s output would feed into one of the console’s input channels, and the console’s mix-minus output would feed into the computer.

**Add more equipment for more functionality and reliability.** If you want your home recording setup to have more capability, you can connect additional equipment to your computer. For OutCasting, I have:

- a USB mixer (Alesis Multimix 8 USB, about $150);
- a Scarlett Focusrite Solo 3rd Generation USB interface (about $110);
- microphones (two ElectroVoice RE16 dynamic mics and an Audio-Technica AT-2035 condenser mic);
- AKG K240 headphones for critical audio monitoring;
- the two portable digital recorders for backup recording, mentioned earlier;
- a Telos One phone coupler, in case we have to record a guest over the phone; and
- a Pacific Recorders SDA-8 distribution amplifier with true VU meters, a Ward-Beck XTM-4 with VU and PPM meters, and a Dorrough 40A meter that, combined, enable us to more accurately monitor and control audio levels.
This gives me most of the functionality in my living room that you’d find in a real studio.

For our youth participants to record at home, I provided them with an Audio-Technica AT2020USB microphone and an inexpensive pair of headphones.

Again, for our remote kits for guests, we send an Audio-Technica AT2005USB mic and an inexpensive pair of headphones.

If you have to make a choice between a paid version of Cleanfeed or Zencastr and getting a USB mic to send to your guests, I would definitely opt for the USB microphone.

To recap Cleanfeed and Zencastr:

- **Cleanfeed – free version**
  - wav recording
  - split-track but only if you have one guest; if you have more than one, the guests are recorded together in one track
  - audio glitches possible in guest track

- **Cleanfeed – paid version** ($22 a month for non-profits)
  - all of the above plus the ability to send one guest’s voice to the left audio output of the computer and another guest to the right, so you can adjust levels independently if you’re mixing on a console or small mixer
Zencastr – free version

- mp3 recording only
- a separate recording for each participant, giving you maximum ability in post-production to set levels and process each voice independently

Zencastr – paid version ($20 a month)

- All of the above plus wav recording

And finally, as to processing the recording of your interview to reduce noise and otherwise improve the audio, modern software has so many tools that it’s easy to get carried away. Overly aggressive processing can create some really odd-sounding audio. I think it’s better to have a little background noise than to make the audio sound unnatural. In other words, a casual listener should never be able to hear the results of your processing. This is a goal that isn’t always attainable, but keep it in mind.

As I mentioned in the video, if your station isn’t carrying OutCasting or its related programming and you want to, it’s available on Pacifica’s Audiointerport (look for OutCasting Media in the Producer search), on PRX, and directly from us. You can check out our content online at http://outcastingmedia.org or https://mfpg.org.

I’m not going to publish my e-mail address here because it will get found by spammers, but if you’d like more information about OutCasting – or if you have questions about the content of this document and the linked video — please send me an e-mail through the Contact page at our web site.

Thanks for reading!

RECORDINGS MADE WITH THE DIFFERENT TECHNOLOGIES. Following are OutCasting episodes featuring different recording setups in our studio as well as recording from home during Covid. Listening to a bit of the ones made with Cleanfeed and Zencastr will let you know what kind of quality you can expect.

- Standard telephone quality: host in studio, guest on a landline phone:
  OutCasting #45 – gay parenting, with guest Gabriel Blau (recorded over the phone; interviewer in the studio on ElectroVoice 666 microphone; guest on a landline connected through our Telos One phone coupler)
High quality: both host and guest in studio: OutCasting #36/37 – LGBTQ history, with guest Gilbert Baker, creator of the Rainbow Flag (recorded in our studio on with host and guest on ElectroVoice 666 microphones)

Fair quality: Cleanfeed, host in studio, guests on low-quality USB headsets: OutCasting #60 – transgender student sues school over bathroom access (interviewer in studio on Røde K2 microphone; guests on relatively low-quality USB headsets that required a lot of audio processing)

Excellent quality: Cleanfeed, host in studio, guest at home: OutCasting #61-63 – the 50th anniversary of the Stonewall riots (interviewer in studio on Røde K2 microphone; guest at home via Cleanfeed using ElectroVoice RE-16 microphone via Alesis USB mixer)

Excellent quality: Zencastr, host at home in NYC suburb, guest at home in Los Angeles: OutCasting #76-77 – religious liberty as a tool of anti-LGBTQ discrimination (interviewer at home on Audio-Technica AT-2020USB microphone; guest at home in Los Angeles using our remote kit (Audio-Technica AT-2005USB), via Zencastr)