**Making the Arts Accessible - Transcription**

Episode 12: James Bottrill, audio expert on assistive listening in public spaces.

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AG: In this episode of making the arts accessible I am delighted to be talking today to James Bottrill who is an audio expert and has a long career in all sorts of things connected to audio. But particularly in the area of theatres, public spaces, assistive listening, loops all that kind of thing. So welcome James, and thank you for coming.

JB: Well that's very kind of you to give me that rather flattering introduction and I’m very happy to be speaking with you this morning.

AG: So James maybe you could just expand on your career. I gave it a bit of a potted history. Did you come up through sort of an audio / hi-fi kind of route originally back in the day?

JB: Yes. I started when I was very small. I had a fascination with audio equipment, and I was playing with bits of hi-fi when I was a child, and through my early teens first got into audio seriously. But I think everyone likes bigger and better toys I think, so I thought what’s a bigger version of hi-fi? Well a commercial PA, sound reinforcement system. And there was also an angle into that through being a slightly frustrated/failed musician as well as well…

AG: Never say failed James!

JB: Ha ha, there’s always time! So those were where worlds kind of converged. And I was planning to go into the world of professional audio, live event audio, specifically rock and roll, that was my plan. But things didn't quite go in that direction. In the end, I decided that events wasn't for me and I went to look at working for a manufacturer whose products were orientated towards live events, and that didn’t work out conveniently at the time when I needed employment. And a job came up working for a company called Ampetronic who were a specialist, well at the time it was exclusively in hearing loop products – I’m not entirely sure that anybody when asked as a child what do you want to be when you grow up says I want to be a hearing loop engineer - but it started out just as a job and things went pretty well, and I was there for getting on for twenty years in total.

I started in a technical role and moved into a more commercial role. And over time, that evolved - we weren’t just dealing in hearing loop products, we were looking at other options as well, latterly dealing with five different wireless technologies for assistive listening and other related purposes so it was pretty diverse. I’m now moving on to looking at other things, working on what that’s going to look like, but still have real ties in that world and learnt a couple of things along the way, so hopefully I can provide some useful information for your listeners today.

AG: Yes, I’m sure. And so just for disclosure, we first met when you came to Opera North and we were looking for a mobile Wireless system for audio description and you came up and showed us Wavecast I think it was – a WiFi mobile system – and the demo didn’t go very well. It had a few issues didn’t it, but that was when we first met.

JB: Yes, that’s right. We first distributed a couple of American lines of products over the years so I've sold a couple of different audio over WiFi systems, so one of things we’ll talk about is how it can be tricky to deploy. Forgive me, it was a little while ago – I can’t remember exactly what we concluded the issue was in the end on that occasion, but it was not the greatest demo over.

AG: Well it was funny because we had another company demo another WiFi product which had similar problems - basically connecting and then dropping and reconnecting - so you know that's one of the things we can talk about, that WiFi does have these problems but that was that was a long time ago anyway. So since then, we also talked on a panel together about assistive listening, so it's been good to always share information because there are so many different solutions out there, and they’re getting more affordable, but also not everyone is going down the one route so it feels a bit like the Betamax vs VHS for video – everyone’s waiting to decide what it is.

But maybe could you just give a summary of systems – legacy systems that most theatres have – some of them are really good. What are the options out there, what does the ‘past’ look like, that’s probably still current?

JB: Yes, I think it’s a good idea to start out at where we’ve been, and to some extent where we still are. But I think we should start looking at user devices because a lot of this is about compatibility. What a venue might install is sort of an afterthought so in a way, we should start the conversation about what the user is bringing to the venue because it really has to be centred around the user experience as much as possible.

So historically, and for decades, the only universal open standard way of getting an external signal into a hearing aid, and perhaps I should backpedal – that’s really what all this is about…

AG: Yes, so we’re talking about assistive listening for people with hearing impairment, so we can park audio description, but that uses the same technology but different end user headsets.

JB: Yes, exactly. We can often piggyback the audio description requirement onto the assistive listening – the same technology can serve both purposes, but I think we’ll start with assistive listening. And what you’re essentially looking to do is switch off the inbuilt microphone in the hearing aid and feed in an external signal direct from a microphone that is placed in a more sensible location than on your ear. I mean the concept is simple – you could walk up to anybody in the street with a voice recorder and say I’d like you to record your voice, and they’d probably pick up the microphone and put it somewhere near their mouth – it’s intuitive that a microphone should be close to your mouth. So you can imagine the difficulty somebody has when the mic they’re relying on is built into a hearing aid and they’re at the back of an auditorium, not close to the performers mouth.

AG: And it’s probably micing up the person next to them who might be rustling sweets…

JB: Absolutely. If you speak to people, they will say that their difficulty in hearing is understanding in noise. That’s the most common issue. So that noise as you say may be someone unwrapping a sweet, or shuffling, or muttering to the person next to them. It can be room acoustics, or general noise like air conditioning, or traffic noise outside if there’s open windows. And we can cut out the vast majority of that competing noise, if we move the microphone closer to the source.

And then we need to get that signal direct to the user somehow. And we’ve got these different technologies that can do that. But the basic concept is simple.

So for a long time, the only way of doing that which was remotely standardised, was the telecoil. That was the name for the device in the hearing aid and the letter ‘T’ is often seen on the signage for these systems – T stands for Telecoil. And the funny thing is, it was never actually intended for this purpose. It was a happy accident. It’s called a telecoil because it was originally installed in the device as a telephone coupler. In early hearing aids, the microphone used to be worn round the neck so there wasn’t a microphone near the earpiece so it was really difficult for people to use a telephone. So someone put in this magnetic coupler that couples to the speaker in the telephone handset and you could pick up the telephone hold a conversation.

But then some clever person said, well instead of having a small magnetic field between that the speaker and the telephone handset generates, if we produced a magnetic field the size of a room, we’ve a broadcast system that multiple people can listen to, and hence the loop system was born.

So the telephone aspect has become the niche use, and the majority usage is the hearing loop, so that’s how it came about.

AG: Can you explain the loop system – what is it physically in the building – it’s a loop of wire is that correct?

JB: Yes, technically you could think of it being a little bit like a wireless charger that you use for a toothbrush or your phone except that it’s sending an audio signal, not power. So you’ve got a coil in the room which normally is just a single wire around the room, well for a basic system, that’s like your coil in the desk pad for your wireless charger or the base for your toothbrush, and then you’ve got a receiving coil which is the one in your hearing aid, which is like the one in the back of your phone, or the toothbrush itself. So that’s the technology - we’re using magnetic fields to transfer an audio signal.

And from an installation point of view, at it’s most basic, you’ve got a loop of wire around a room, but most of the time in a commercial setting, we’re looking at multiple loops.

AG: I was going to say, because in a theatre you’ve got different layers – balcony, upper circles – does there have to be a loop on every level?

JB: Normally yes, the field generated is symmetrical vertically, so you can cover up and down, but that assumes the same footprint, so you’re often looking at several loops. And the reason for that is that metal work in the structure – things like reinforcing mesh and concrete and pillars and posts, in commercial buildings you can get metal clad false computer floors and those interfere with it – those interfere with it and you need to use multiple narrow loops instead of one big one. Another factor is overspill, it can be undesirable to have spill outside a room, say a boardroom setting, because you might be able to hear a confidential meeting. But in a theatre, another issue we have is that electric instrument pickups will pick up the loop signal, so you’ve got to try and exclude the loop signal from the stage and orchestra pit as much as you can. And we can use the low spill technology to limit that signal.

The final reason is very relevant to theatres, that you can usually control the interaction between levels if you have a number of small narrow loops rather than one big one.

AG: I wanted to ask, because we often preclude backstage so that’s a barrier for performers with hearing loss. Are you often required to put a hearing loop backstage, but you’ve said there are issues.

JB: Yes it can get really tricky, because there are some venues where you’re unlikely to have instruments with magnetic pickups, like say electric guitars etc. So in which case you can have a loop. Some people say there’s a problem with microphones, but only with the cheapest ones which you shouldn’t really have in a professional environment. Even basic mics are very well shielded from this kind of issue – it’s instrument pickups which are a problem.

So it can be made to work, and we come across this in say a teaching environment where you want to take questions from the floor and if the lecturer has hearing loss, it needs to be a two-way experience and that’s a kind of non-standard environment. Normally it’s just about transmission to the audience, but it can be done. It just adds a bit to the complexity.

AG: So in your experience then, what percentage of theatres have hearing loop systems, and also, weren’t you saying they’re often not very well maintained or in great working order?

JB: I think assistive listening in general is pretty widespread. Theatres are one of loops less common applications because of concern about this issue of crosstalk to instruments. Now some of that concern isn’t that well-founded but it’s tended to push people towards other technologies. But the single biggest downside of loop is that it’s tricky to install, especially on a retrofit basis, and the more complex mechanically your space is, if you’ve got multiple levels, fixed seating, and more contemporary spaces where you have removable seating, that gets tricky from a loop point of view, and those things have pushed people away from it. So it’s more common, certainly in the last couple of decades, to look at things like infrared and radio systems. But we still do see a number of theatres with loop systems, and some venues have multiple options as they know that users will have different preferences.

AG: I was just going to say that, I mean to jump quickly forward to now, often there are issues of the hearing aids not having the telecoils or the ‘T’ switch. So like you’re saying, that’s a legacy system that was quite ubiquitious but now there are also these other systems – radio, infrared. So they came in to counter the difficulty with installation of loop, is that the main differential?

JB: Yes, that was the main motivation. I mean infrared in the UK has historically been the main competitor to loop and it offers probably three key advantages: it’s easier to install, it has inherent containment signal because it uses infrared light as the transmission medium and it doesn’t travel through solid walls, so assuming you’re not talking about a space with glass walls, (and we have had an incident of people not appreciating that their system is not secure if they’ve in a glass walled office for example!, but there are relatively few glass walled theatres I think!), so then you get that control of the signal and if you have venues side by side, they can operate without any difficulty. And then another key point is that loop is a single channel, so you can’t do audio description with loop, it’s easier to use infrared or radio – you can use the same system for both assistive listening and audio description.

The major downside is that there’s no user device that can directly receive the signal from these systems so you have to give every user a receiver from box office or somewhere on their way in, and that’s a barrier to usage, just in terms of it being a fiddle, but there’s also the concern that it singles people out and identifies them as having a hearing impairment, and that’s something that people are sensitive to and would rather avoid. We know from many venues, that people still use the systems, but would probably prefer something that was more discreet. And it’s interesting that there’s almost a direct mirror image pro/con between loop and infrared and radio grouped together, because infrared and radio are easy to install but you’ve got to have a receiver, but with loop, you don’t have to pick up a receiver but it’s difficult to install. It’s unusual for there to be such a mirror image pro/con.

Another thing I want to pick up on that you mentioned is the success rate of loop, and a great deal of effort has gone into trying to improve the quality of loop provision – there are standards – international and British – for the performance of loops, and there’s significant guidance on how these systems should perform and what the correct design steps are, but unfortunately it hasn’t worked as effectively as intended and still a disappointing proportion of loop systems don’t work as well as they should do.

One of the figures we used to use, and I wouldn’t want this to go in any official documentation, but the figures we used to quote to people based on surveys that we would do, were that we weren’t surprised to see about fifty percent of loop systems entirely non-functional: either broken or performing so badly that they did nothing – you wouldn’t be able to receive a useful signal at all. And then the pass rate for compliance with those standards I just mentioned was quite commonly below 5% of systems. So the success of loop for the user has not been great and some people are quite cynical because of that. I mean it should be the best technology for users as you ought to be able to walk in, see the sign, flick a switch on your device and you’re in business, but unfortunately the experience in practice is more disappointing, and I could really get on my soapbox as to why that is, but perhaps I shouldn’t.

AG: It’s interesting but in a way, it feels like people are moving on from this, probably because of the complexity of installation, and the hearing aids themselves often no longer have a telecoil installed. But just to go back to infrared, because it’s line of sight, that brings so many problems, particularly for audio description. It is so frustrating for customers who are sitting end or row because perhaps they have their dog with them, and you might then be near pillars or overhangs so you’re already having difficulty receiving the signal, and then lots of people are filing in front of you to get into their seats and you’re trying to listen to that ten minute pre-show introduction and every person that walks past you causes the signal to cut out and you get these nasty squeaks in your ear, so there are just so many issues with it being line of sight – it frustrates me so much.

But going back to radio, that feels quite solid to me – the systems are quite reliable. But I only know that from the audio description world. How are they in terms of hearing aids? So you have a radio headset probably similar to the infrared one but it just gets the signal via radio waves is that right?

JB: Yes, I mean in many ways they’re really similar. But there’s a couple of interesting points you’ve made there. One is that the quality of infrared products has improved dramatically in recent years. The industry standard products that have been around for 25 plus years now, although very good in their day, were famous for being subject to break-up of the sort that you mentioned – they were really reliant on line-of-sight.

There are a few complicated design premises involved. But if you think of invisible light, we had a much easier job designing infrared systems in places that were reflective, because the infrared light will bounce off the walls so it gives you better coverage because the light can approach you from different angles, and you get an almost amplifying effect. Whereas theatres tend to be darker colours, often matt paint to try and dampen reflections from the stage lighting, so that’s in conflict with what we want from an infrared point of view.

So some of the downsides of IR are really quite theatre-specific. And if you talk about say a lecture theatre which often mechanically is similar to a theatre – raked seating, fixed seating, everyone pointing in the same direction – you can normally make a lecture theatre system work really well reaching hundreds of people. But you need to put in many times that transmission power in a theatre because of the materials as much as anything.

AG: But lecture theatres often have a really good rake as well so you never get that issue of someone tall sitting in front of you…

JB: Yeah, so there are differences. But also, the products have improved, so the receivers themselves are more sensitive to the signal approaching from an angle other than straight ahead, so if something is bouncing off the sides, it can come at you from nearly 90 degrees and still pick it up. And it’s interesting that the receivers are generally sideways compatible. So if you have a venue with an existing IR system, the receivers, because they’re handed out are inevitably subject to wear and tear, so it’s possible for them to replace them with receivers from another manufacturer. And it’s worth mentioning that the product that most people used for many years, if not decades, has been out of production for some time now. So you could just replace the receivers. And they’ll work with the existing transmitter. Having said that, the transmitters do have a lifespan – the output from them drops over time. So you probably want to replace the whole system, but it is useful that you can do it in stages.

AG: Well this is interesting because I audio describe in some places that have really old receivers, and they’re so tight on the head, and so old – they look like they’re made from Bakelite! And I keep saying that they should just buy say five new headsets, and we often don’t get more than five people needing them, so just get five good ones and that would really transform the experience. It doesn’t cost that much. But we do always battle this lack of available money in the theatre world.

JB: So just going back to radio, interestingly the things that make radio good for theatres are also the reasons it hasn’t been taken up in other sectors. In a theatre environment you want the best coverage possible, you want a single transmitter to cover the whole room. But the difficulty with an analogue radio system is that it is unsecured broadcast so if you were in a corporate environment, you could listen in to anyone’s meeting, so what is a pro for a theatre, is a con for other environments.

Radio is very common in the US, but it’s never really caught on in general in the UK because of almost this excessive coverage issue, but ironically it’s a real pro for a theatre environment.

AG: So James can you just recap for me, when someone arrives at the theatre with a hearing aid and they use either an infrared or radio system, do they then have to wear a headset and therefore take their hearing aid out?

JB: That’s a good point. There are two ways you can use an infrared or radio receiver and in some of the products out there, the mechanics of them are essentially exactly the same. So with most products, there is a headphone, earbud or stethoset type option, so either you could plug in your own headphones, or the stethoset ones have earbuds built in. Those in particular are falling out fashion because of issues around hygiene, and they can be sanitised but people don’t know if that’s happening adequately. Also they’re more visible and potentially less comfortable to wear. And as far as I know, there’s only one manufacturer that still makes a stethoset receiver. And we didn’t sell very many.

The more common thing now is a bodypack style receiver, so it looks like a bodypack that goes with a radio microphone that is hidden away when you see people on stage or on telly, so we have that in reverse – so you’ve got a pack – if it’s radio you can hide it away in a pocket, if it’s infrared you can wear it round your neck so it can pick up the signal, say on a lanyard. And that lanyard can also double as a neckloop, so that can couple to your hearing aid locally. The performance usually isn’t quite as good as an installed hearing loop but it’s probably better than taking your hearing aids out and putting headphones on.

Now that might seem like a really low-tech solution, and my observation was that it’s surprisingly effective. But if someone were to turn up who doesn’t have telecoil equipped hearing aids, the first few demos I did, you’re very conscious that someone will turn up with a very expensive, tailored hearing device and that asking them to take it out and wear headphones was a bit insulting, but the recurring theme was that actually people still found it really effective, so it’s not as ridiculous idea as it may seem. If someone has profound hearing loss or is D/deaf, that’s not an option – they’re going to need to use their own device, but for the vast majority of people if their hearing loss is fairly mild, then using headphones will be sufficient. So there are various options, and it does depend on what the individual is bringing to a venue.

AG: So those are the technologies of the past, you haven’t come on to WiFi – are we saving that for the present day?

JB: Yes, that is a good time to segue into the present day, that being a fairly loose concept! We started to see WiFi systems being introduced around a decade ago and so up until a few months ago, we had a fourth system – we had loop, infrared and radio and then WiFi joined the party. And there are two chunks to the present day – what wireless products do the venues have at their disposal, and we also need to talk about what’s happened to the users’ devices. But let’s focus on the transmission and what tools a venue has.

WiFi was brought in with quite a fanfare as it was the first time in a couple of decades that we’d seen a new development in this area. And it had some understandable appeal: it’s quite high-tech, because we’re generally using a smartphone as the means of reception and that feels much more acceptable than handing someone a radio or infrared receiver – it feels like progress, it feels more modern. And I remember dealing with a customer a few years ago who wasn’t really interested in how effective these technologies were, they just wanted the latest thing. And that was undoubtedly a selling point for some people. And a key point was the WiFi option is the only way sensibly that you can get a signal into a Bluetooth equipped hearing aid. Now we’re going to put an asterisk in there because we’re going to come back to this. But in terms of the Bluetooth equipped hearing aids people have today, then WiFi is more or less your only option at the moment, so that’s a major selling point as it does give compatibility.

But unfortunately, there are some downsides. And the thing that’s often talked about is that it’s the only technology we deal with that introduces a significant audio delay. And that’s something that the manufacturers have tried to downplay because as soon as someone says ‘this is a problem’, then you’re into damage limitation. But I have rarely encountered a user who thinks it’s ok. And I did a demo a couple of years ago where a user threw the headphones off within three seconds and said I can’t use that.

So it varies depending on the environment and different products, but it’s unusual for someone to say it’s what they would ideally wish for.

AG: And for audio description, it was really enjoyed as they’re listening to the audio describer, not the show so the delay doesn’t matter, but there were issues with a very popular WiFi system that they couldn’t get the volume high enough, particularly on I-phones because there was some Apple-specific issue. So there are always issues with user’s devices because they’re all so different – some are really old, some are the latest version. They might have other apps on there that conflict, or it might use up all their battery, and for people who need their phone in order to call a cab to get home, suddenly find their phone is out of charge, so yes, lots of issues with having your own device, and issues with WiFi, particularly with latency – and that’s impossible for assistive listening.

JB: Yes, the concept sounded like utopia – you didn’t have the complexity of loop installation, nor did you have to hand out hardware receivers that people didn’t like wearing, so at a glance it was the answer to all our prayers. But the problem was when people started actually trying it. The latency is the most famous problem, but a lot of venues have actually had more problems with the practicalities of it. And I have to tread very carefully here so I don’t offend people. But we run into a tech-savviness issue, and I’m generalising horribly here, but the Ven diagram of need for say hearing assistance, given that the most common cause of hearing loss is the natural effect of aging, and the Ven diagram circle of ‘is a confident smart phone user’ does not have a huge amount of overlap. Don’t get me wrong, I know plenty of people in their 90’s who are very confident smartphone users, and I don’t want to sound ageist here, but on a practical level, venues have struggled when they look at their users’ demographics and getting users up and running with this technology. They found that their venue staff ended up being tech support people.

But a key point is that in order to make these things work, you have to have an app on your phone which is specific to that manufacturer, and there are about half a dozen products, and the danger is that it becomes like those parking apps – I’ve got about ten on my phone and every time you go to a different theatre, you have to use a different parking app. And I think about my Dad, he generally learns techy stuff by rote – we go through something step by step and he memorises it, but trying to do something new, especially under pressure, does not come naturally.

However, I’ve been terribly rude about it. I should make a couple of more positive points – I think it is far more appropriate potentially for audio description, and the other useful application is for translation – the latency doesn’t matter, you can transmit a lot of channels very easily over WiFi, so you could do half a dozen languages. So it’s a great technology, but my experience has been that venues generally struggle with it more than they’re expecting to, so my one-liner is ‘approach with caution’.

AG: Yes, and I think some quite well-known products are not really supported any more. But another thing that was a great point about one of the most popular ones, was that there was this brilliant EQ page where you could EQ it to your perfect hearing option which a lot of other hearing sets don’t have. So yes, some good points, in a fixed environment, not so good for touring because Opera North looked at a particular product for touring and you had to set up your own WiFi network in each theatre because most theatres don’t have good WiFi in the auditorium, and it was so complex and you were arriving in the afternoon for a show that night, and it just wasn’t going to be doable with the amount of time it would take and the people available to do it. So tricky for touring.

JB: Yes, I think you run into a problem that it is fundamentally a software product. You’re buying a box but what’s going on in there is essentially an IT product, so you need to have someone to hand who is capable of working with that. I think some venues got a bit of a shock – they thought you could buy it and switch it on and it was that straight forward.

And another problem is that the world of software changes rapidly and say for instance your phone can be obsolete within a couple of years, and I’ve seen recurring issues – I think the problem you were referring to comes under that heading. There have been several other similar things where a product has been discontinued, and because they rely on app updates, if a new generation of a product comes out and the older one isn’t supported, it stops working after a couple of years. And they’re not cheap. So it feels like shifting sands – just because it works today doesn’t mean it’ll work next week, or work as well. My gut feeling is that there is usually a better option. I appreciate I’ve been a bit rude about WiFi but it’s been quite aggressively marketed, and I think my hopefully balanced one-liner is that venues should cast a critical eye over it.

A key point in its favour is that if you want people to bring your own device, it’s currently the only technology that works on a wide basis like that, other than loop. But I think that’s where we should segue into what’s happening with the user technology, with hearing aids, because that’s the other side of this. What users bring to the party, has to steer everything we do, and this is where I have to try hard to not get on my soapbox…

AG: I think you should get on it!...

JB: *(laughs)* Well ok, maybe I will. So what we’ve seen or at risk of seeing, is that Bluetooth has replaced the telecoil, and that is a common perception. Hearing aids don’t have telecoil, they have Bluetooth instead. Now I’m going to say hang on a minute, it’s not as simple as that, but that’s what I routinely hear venues say - ‘What do we do now we have to deal with Bluetooth?’. Now firstly, I must say there’s no reason why a hearing aid can’t have Bluetooth and a telecoil, and quite a few models do have both. Certainly, we’ve seen a drop in the rate of telecoils. But last time I looked, it’s still the most widely fitted technology, over Bluetooth. But perception says otherwise.

However, the key point is that really Bluetooth isn’t a replacement for the telecoil, and the ideal scenario is that we would see Bluetooth and telecoil co-existing – that is the right solution for the moment. Bluetooth is a personal connectivity technology – you use it to connect your hands-free headset or the hands-free kit in your car to your phone. It’s a point to point, one to one connection, and you mentioned previously that a friend of yours was saying ‘why can’t this venue provide me with something that will Bluetooth stream to my hearing aid?’. And the problem you’ve got is that let’s say you’ve a 2,000 seat auditorium, and I think it’s around 5% of the population who wear a hearing aid, so I’ve set myself a tricky bit of quick maths here…. You’d have to have 100 Bluetooth transmitters in that scenario.

AG: So can’t you have a multi-broadcast system, or is that Auracast?

JB: Well we’re getting there – so the problem with Bluetooth as we know it, is that it is not suitable for this purpose. And the danger is that people have made a leap of logic and think that it is.

There are some further problems with Bluetooth, which are going away in fairness, but the three historical problems are that

1. It’s point to point, so you need a lot of transmitters for a big venue – an unworkable amount – you eventually run out of bandwidth.
2. Battery drain – conventional Bluetooth is very power-hungry
3. Latency – you have an audio delay

So this links us back to the WiFi thing. So because people say that hearing aids now have Bluetooth, so you’ve got to use a WiFi system, and if you do go down that road, you end up with two stacked delays. The WiFi delay to the phone, and the Bluetooth delay from the phone to the hearing aid.

So the power drain and delay are both actually being addressed through advances in Bluetooth technology. For quite a while now, the majority of hearing aids have used Bluetooth Low energy, BLE audio, and the power drain is much lower, I think it’s about 25% of the power drain than conventional Bluetooth. And more recently, there’s a new encoding and decoding process with the audio signal in Bluetooth which has dramatically improved the latency, and that’s a key part of Auracast, but it also applies to the latest iterations of point to point, paired Bluetooth as well.

So some of the historic problems of Bluetooth are going away. But it’s worth mentioning that a lot of the devices people have will not have Low Energy Bluetooth audio and won’t have this new hi-speed codec that improves the delay, they’ll still be on legacy Bluetooth. So it’s all a bit of a red herring. It’s still very useful to have in a hearing aid, you can use it to take phone calls, use as wireless headphones etc, but it doesn’t address the assistive listening need. It arguably partly-addresses the audio description need as the delay is less of an issue, but you’ve still got the problem of the number of connections, and the battery drain.

So it’s useful to have, but was never really intended for this purpose. And this I think brings us on to the future….

AG: ‘The Future’. Tell us about the future with your crystal ball James!

JB: Well unfortunately there is a bit of crystal ball gazing here I’m afraid. And when I say things like the present or the future, these are all very fluid – the present goes back about a decade, and the future is already starting.

So the big development that’s getting a lot of people talking, is Auracast. It’s a Bluetooth trademark so it’s part of the Bluetooth standard, it’s owned by the Bluetooth Special Interests Group, SIG. But they’ve given it a different name to illustrate that it really has a different purpose to conventional Bluetooth. So Auracast is a broadcast version of Bluetooth.

AG: An aural broadcast…

JB: Absolutely. So you can send your audio signal to actually an unlimited number of devices. It is a true broadcast – the transmitter has no ideas how many people are listening – it’s sending out a signal and if you’re there, you can listen. It’s more like a radio station. It’s not linked, not a two-way street.

So that’s pretty exciting. And over time we’re going to see the adoption of Auracast into hearing aids, the same way we’ve seen the adoption of conventional Bluetooth. And it also means that it addresses the first issue (we had point to point, battery drain and delay), and the second two are being worked on.

So it will do everything loop will do without the difficulty of loop installation, which is why realistically if we look into the future, it is almost certainly going to replace loop. Most of the hearing aid manufacturers have made the commitment that they’re going to adopt Auracast, and I think if you were a manufacturer of only loop products, you’d need to be reevaluating your product range rather rapidly.

But there are some important caveats here, because it’s not going to happen overnight, or any time soon. I think it would be good to install in parallel with other technologies, but you’d have to go into it with your eyes open if you were looking at putting it in as your sole technology on day one. The issue is simply that it’s a new technology, there are hardware issues, there are software issues, and older devices are not going to be retrofitted with Auracast. So if you get a new hearing aid, it will start to become an option. There are a small number of devices on the marketing place, but they’re in a minority.

Last time I looked, there was nothing being given out on the NHS yet that was Auracast compatible. I think it’s probably not a million miles away, and I think that’s what will drive Auracast adoption in the UK. But for the moment, as far as I’m aware, it’s only privately dispensed devices. And there is an extended replacement cycle for hearing aids that could be anywhere between 3 and 5 years. So from the point where they start to become available on the NHS, you’ve still got a lag of quite a few years.

I don’t think we’ll see Auracast being the default technology that people will walk into venues demanding, for perhaps as much as a decade, so it’s going to be a long crossover.

AG: If it’s being used for audio description as well, and potentially translation, presumably the consumer still has to pick up a small receiver that they choose a channel on and that then goes to their hearing aid? Or can they use their phone?

JB: Well this is the exciting thing because it is part of the Bluetooth standard, I mean we’ve been focusing on the hearing side of it, but any device that is Auracast compatible will be able to receive that signal so I would identify three types of receiver:

1. A dedicated hearing device – hearing aid or cochlear implant
2. A piece of consumer electronics
3. Hardware receiver

So we still have the option of someone picking up a dedicated receiver if say they don’t have the right kit or aren’t that tech savvy, and they can collect a simple device with just a few tactile buttons on it and that’s nice and simple. But I think the really attractive thing is the bring your own device aspect of it.

Now there there’s a bit of an oddity here: you would think – especially if you’re used to the WiFi systems – that the phone was key to it and that you use the phone as a receiver and it relays it to your device on your ears. But it doesn’t work like that. In order to reduce the delay, the audio goes direct to the device on or in your ears. So it bypasses the phone. And there are products where you can push a button and it connects to an Auracast stream. But for most devices, you are using a phone as like a connection assistant, and it’s simply giving you a nicer user interface so you can pick an audio stream and for example enter security credentials, so for example if it’s a secured stream, you might have a passcode. And for the moment, that looks very much like joining a WiFi network. You get a list of options, you tap one, if it’s secured you put in a passkey, and off you go. But no audio is going through the phone, it’s just managing the connection.

There’s some complicated stuff behind the scenes, but the key thing is that it helps to speed up the transmission process. My understanding is that there’s some oddity of the currently available technology that actually stops you using a phone as a receiver because that would be a really obvious thing to do. And that presents a difficulty because if you have Bluetooth classic, earbuds or hearing aids, you might be able to relay through the phone using the phone as a receiver. But unfortunately you can’t do that. You have to have Auracast compatible devices on or in your ears.

Because as well as hearing aids, they could be headphones, or earbuds. And that makes it accessible to a wide range of people and that’s part of the reason people are getting excited about Auracast. It’s more democratic. So if you have just slight hearing loss and don’t wear a hearing aid, you can bring along your own headphones or earbuds to a performance and just get that uplift. Equally if you need the audio description, you’re not reliant on picking up kit from the venue.

And the final thing I’m going to say is that the method of connection is going to be universal. It’ll be the same experience wherever you go, so there won’t be this barrier of a different app in every venue – it’ll be the same technique to connect to your TV at home as it will be to connect at your local theatre.

AG: Amazing. This has all been fascinating stuff, thank you James. So what we’re saying is Auracast is the future but if you’re a smallish venue now, look at these cheaper options like radio, something to keep you going in the interim, and have a couple of options so people can choose. Perhaps have WiFi so people can bring their own device etc. There are some smaller companies doing great WiFi systems I should say, that actually work really well. They are mobile and nimble and also send captions to your phone, and I’m afraid I didn’t bring captions into this whole conversation. But doing research is key, and let’s hope for Auracast for the customers sake - it’s going to be a game-changer.

One thing I wanted to cover quickly James, is that a lot of people don’t think about the quality of the audio going into the system and I’ve had chats with people who use hearing aids who come to the opera who say there’s a very poor quality of the sound going in – it’s just one mic over the stage – nothing is close mic’d because of course opera performers don’t wear mics. What do you have to say about that, how do you resolve that? Should they have more microphones to pick up the consonants and transmit a really nice mixed sound to the assistive listening system.

JB: Yes absolutely. I mean we’ve spent a long time talking about the wireless transmission part because it’s very complicated, but you’re absolutely right. The old audio term ‘garbage in, garbage out’ applies. I think there is a bit of a perception that there is some sort of magic that goes on in these systems that means you can feed whatever you want in, and it benefits the user. Well they’re just like any other wireless audio transmission system and one of my catchphrases is if you wouldn’t do it for PA sound reinforcement, or for recording, then you shouldn’t do it for assistive listening.

The most basic rules should apply like get the most directional mics you can as close as possible to the performers and that’s going to give you the best result. It’s got to be amplification specific, it has to be designed for what’s going on on the stage. But the risk is you could pay a significant amount of money for a fancy transmission system and then pay lip service to what’s going in, and the results will be poor. And a key part of this is to make sure the venue staff are regularly testing the system, have a clear idea of what it should sound like, ie. it really should be as hi-fi as possible, and to critically assess what they’re doing from an input point of view. If we can get a feed straight off the mixing desk if it’s an amplified performance, then that’s probably going to be the best and least hassle. If it’s an unamplified performance, then how can we best pick up everything that’s going on on the stage and treat it as an audio design exercise every time a performance takes place.

AG: Of course. And most places now make archive recordings, and they’re getting better and better quality, so I’m presuming that’s the audio they’re feeding into the system, because I know that back in the day people said there was just this one mic system. I don’t know what people are doing nowadays – I’m always keen to find out so I’ll keep badgering people!

I think I should wrap it up then James as we’ve rabbited on for ages. But it’s so interesting – I find it fascinating – I hope other people do!

So I always like to finish with this question: what part of your work history do you feel most proud of, of helping make the arts more accessible, what’s a key moment for you when you feel like you made a difference?

JB: You’re putting me on the spot there. I’ve been really lucky to work with a number of famous and prestigious venues and there’s a real thrill in walking into somewhere that’s really well-known. But I think the project I’ve been involved in that was the most interesting technically, and also kind of cool was when, well it’s now as of recently two Popes ago, when the then Pope came to the UK in 2010 and we were asked to provide a giant loop system to cover 20,000 people at the final mass. And the partner who was doing the physical installation was using a plough towed behind a quad bike to cut the cable into the surface of the grass in the park. And we used several kilometres of cable and nine loop amplifiers. And it all worked flawlessly. You hope after they’ve been installing for three days that your maths was all OK and the pressure is on, but it all worked beautifully, so that was a pretty interesting project.

AG: Amazing. And finally, if people want to find out more about you and places you recommend, we can list them, but any you want to mention?

JB: Yes, I mean the best way would be to approach manufacturers, maybe get them to come and do a demo in your venue. I previously worked for Ampetronic and they’re now in a joint business with Listen Technologies, and they offer the full range of all five of the technologies we’ve talked about. But there are some others as well – Williams AV and they make the Wavecast product – they have an interesting large area Infrared system called IR plus, and there are quite a few loop manufacturers too.

One of the things I was keen to explore was whether there was much demand for a more independent consultancy in this area, so I’m going to briefly promote my services here: I’ve been doing this stuff for a long time and am now brand agnostic and can give pretty independent advice on what the options are and which products are good bad and ugly. And how they might be integrated into a particular venue and what the pros and cons might be.

I’m on LinkedIn. Or people can email me on orchard.audio.services@gmail.com.

AG: Thank you so much James. I think we’ll leave it there then. Thank you again, it’s been so interesting.

JB: It’s been a pleasure, thanks for having me.

[music]

*Links:*

James Bottrill - email

orchard.audio.services@gmail.com

Ampetronic

<https://www.ampetronic.com/>

Listen Technologies

<https://www.listentech.com/>

Sennheiser

<https://www.sennheiser.com/>

Williams

<https://williamsav.com/>