Developing Auracast™ Receivers with an Assistant Application for Legacy Smartphones

This document describes a standards compliant approach for how Auracast™ receivers (earbuds, hearing aids, headphones, and speakers) can be designed to work with a stand-alone Auracast™ assistant application, and satisfy user requirements to join an Auracast™ broadcast using a legacy smartphone. Following this approach can help accelerate the market adoption for Auracast™ broadcast audio and increase the likelihood users can immediately take advantage of Auracast™ broadcast audio with new receivers.

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1. Introduction

The Bluetooth Special Interest Group (SIG) has released a groundbreaking audio innovation that will change the way we engage with each other and the world around us. Auracast™ broadcast audio, enabled by Bluetooth® LE Audio, will support new audio experiences to help the world sound better – from sharing your audio and unmuting silent TVs to helping you hear your best in any environment.

Delivering this new Auracast™ broadcast audio ecosystem will involve many different companies. The new Auracast™ broadcast audio experience requires them to come together to bring this new functionality to both legacy and new devices. To deliver the full experience of Auracast™ broadcast audio, three different elements are necessary:

- Auracast™ receivers (i.e., earbuds, headphones, hearing aids, speakers, etc.)
- Auracast™ transmitters, which can exist in phones, tablets, PCs, TVs, sound systems, and stand-alone systems
- Auracast™ assistants, which let a user choose which Auracast™ audio stream they want to listen to

The first wave of Auracast™ receivers are already appearing in the form of dual-mode devices supporting both Bluetooth Classic Audio profiles and the new Bluetooth LE Audio profiles. This reflects the fact that consumers are more likely to upgrade their earbuds, headphones, and hearing aids when these products are compatible with a user's legacy device.

Auracast™ transmitters for personal and public spaces are also coming to market, initially as stand-alone transmitters which plug into the audio outputs of TVs, A/V equipment, and phones.

The growing number of stand-alone Auracast™ transmitters means that users need a way to find, join, and leave their preferred Auracast™ broadcast. This requires an Auracast™ assistant, which acts as a client for your Auracast™ receiver. In the future, this client functionality will be built into Auracast™ enabled smartphones, tablets, watches, and PCs, but it will take time for these devices to come to market with native capabilities. However, manufacturers of hearing aids, earbuds, and headphones do not need to wait. Auracast™ assistant functionality can be provided by designing earbuds, headphones, and hearing aids to work with stand-alone Auracast™ assistant applications and existing smartphones.

This flexibility means that manufacturers can start supporting Auracast™ products today, confident that they will be interoperable with existing, new, and future products. It adds a slight level of complexity to an Auracast™ receiver design but accelerates the availability of the new Auracast™ audio experiences. It also provides the opportunity for product innovation, especially in Auracast™ transmitters and audio applications.

The attraction of the new Auracast™ use cases cannot be understated. Companies at the forefront of bringing these new audio experiences to market have the potential to become leaders in a new wave of audio applications.

In this document, we will look at how to combine new Auracast™ receivers with applications that can run on legacy smartphones to accelerate the market, letting you ship Auracast™ earbuds today, increasing market reach, and growing user awareness.

1.1 Nomenclature

The Bluetooth LE Audio specifications each introduce different names for the roles taken by the three devices that comprise the Auracast™ ecosystem. As using all of these can be confusing when providing an overview, this document uses the generic, descriptive names of Auracast™ transmitter, Auracast™ receiver, and Auracast™ assistant. These are used to describe both the physical devices and their roles. They are based on the definitions of roles in the Basic Audio Profile, but also encompass the roles identified in various higher-level specifications which are listed in Table 1.1.

The specifications referenced in Table 1.1 are the Basic Audio Profile (BAP) [1], the Public Broadcast Profile (PBP) [2], the Common Audio Profile (CAP) [3], the Telephony and Media Audio Profile (TMAP) [4] and the Hearing Access Profile (HAP) [5].

Name	Includes the role of	Specification
Auracast™ transmitter	Broadcast Source	BAP 2.2.2.1
	Public Broadcast Source	PBP 3.1
	Initiator	CAP 2.1.1
	Broadcast Media Sender	TMAP 3.5.2
Auracast™ receiver	Broadcast Sink	BAP 2.2.2.2
	Public Broadcast Sink	PBP 3.2
	Acceptor	CAP 2.1.2
	Hearing Aid	HAP 3.2
	Broadcast Media Receiver	TMAP 3.5.2
Auracast™ assistant	Broadcast Assistant	BAP 2.2.2.3
	Public Broadcast Assistant	PBP 3.3
	Commander	CAP 2.1.3

Table 1.1 Underlying specification roles covered by the Auracast™ terminology in this document.

2. Auracast™ Assistants – Finding and Joining an Auracast™ Broadcast

Auracast™ receivers need an easy way to find and join an Auracast™ broadcast. Implementing the scanning task of Auracast™ assistant functionality into the receiver provides a way for the user to easily select and join an Auracast™ stream without having to buy a new smartphone.

The basic philosophy behind Auracast™ broadcast audio is that Auracast™ receivers sit in a “sea” of different Auracast™ broadcasts and use an Auracast™ assistant to select which one to listen to, and start, stop, or change reception at any time. It’s similar to the way we change live TV or radio programmes by pressing a button on a remote control or selecting a station on a screen. Each person controls what they receive, without affecting what is being transmitted. The main difference for the user of Auracast™ broadcast audio is the available broadcast will change as they move to a different location or venue.

As earbuds, headphones, and hearing aids generally have a very limited user interface, the easiest way to make a choice is to use another device which has a richer interface. That may be an application on a phone, a remote control, a smartwatch or some other product. These devices use a set of procedures defined in the Bluetooth LE Audio specifications, which are collectively called an Auracast™ assistant.

Figure 2.1 shows how the elements fit together. An Auracast™ assistant and Auracast™ receiver are within range of five different Auracast™ transmitters. In this case, a phone is taking the Auracast™ assistant role, finding and displaying a list of the available Auracast™ transmissions. When the user selects one of these, the Auracast™ assistant acts as a client, instructing the receiver (the headphones) to synchronise to the appropriate broadcast stream from that transmitter, at which point the audio is rendered.

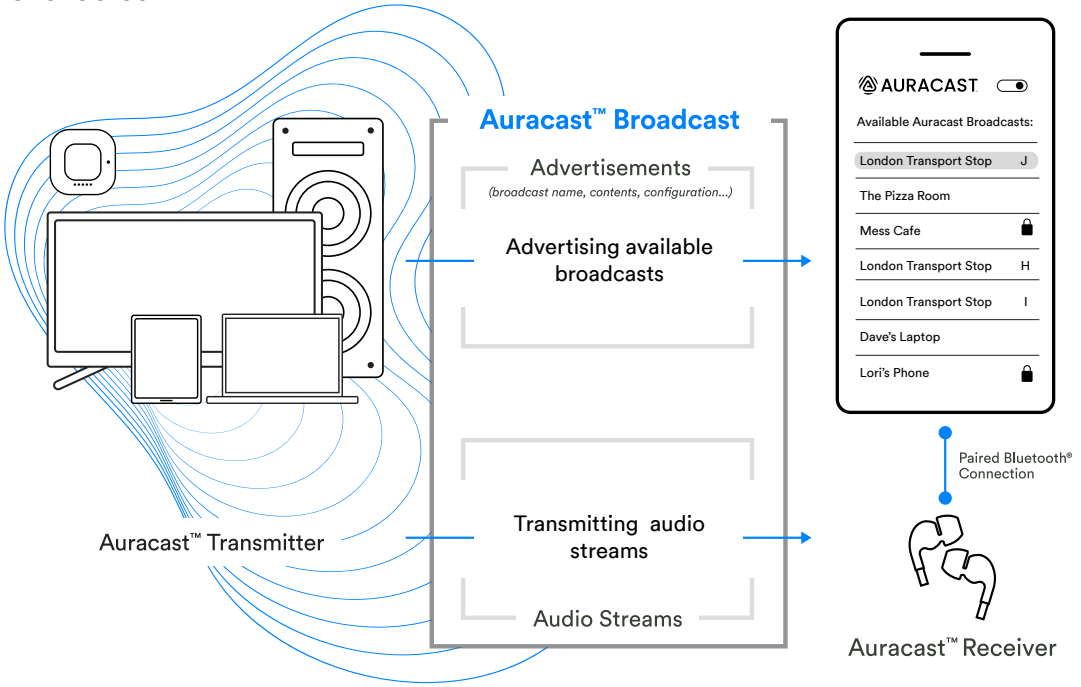

Figure 2.1 The basic Auracast™ topology

At no point does the audio broadcast go through the phone – the broadcast from the transmitter is picked up directly by the receiver. In the case of pairs of receivers, like earbuds, hearing aids and speakers, each device will receive the appropriate stream – either left or right. This topology means the audio stream is totally independent of whatever type or brand of Auracast™ assistant is being used. A secondary advantage of this approach is that the design and implementation of an Auracast™ assistant is very flexible. It can be an application on a smartphone, or a remote control costing just a few dollars. Because of the inherent interoperability within the Bluetooth LE Audio specifications, users can choose whichever works best for them.

If there were only one audio stream within range, receiving it could be a simple and intuitive user experience. However, with Auracast™ broadcast audio we are likely to see venues and locations install multiple Auracast™ transmitters. You can easily imagine a bar or gym having multiple TVs showing different channels, where a user will want to be able to see all the available options and listen to the appropriate audio stream of their choice. At home, your TV might broadcast a dialogue enhanced channel for listeners with hearing loss alongside the standard stereo audio streams. A conference venue could provide alternate language translations in separate streams, as could a corporate hospitality suite in a sport venue, where different language commentaries on the event could be made available to the guests. The flexibility of having a choice of multiple Auracast™ broadcasts is why we need the Auracast™ assistant.

Finding all of the Auracast™ transmitters which are currently broadcasting uses a process called scanning, where a Bluetooth device looks for all of the information that the transmitters are advertising about their audio broadcasts.

Figure 2.1 shows a smartphone doing the scanning, but as we noted in the introduction, it will take time for these devices to come to market with native capabilities, as scanning for this information needs a Bluetooth chip which includes core features introduced in Bluetooth Core Specification version 5.2 [6], along with a qualified Bluetooth LE Audio stack.

In the next sections we will explain the basics of how Bluetooth LE Audio broadcast works, followed by how to design Auracast™ earbuds to support scanning on behalf of legacy smartphones. This allows compelling user interfaces and applications to be developed that will excite customers and accelerate the market for Auracast™ broadcast audio. It's an approach which is fully compatible with future Auracast™ devices.

3. The Basics of Bluetooth LE Audio Broadcast

The key to delivering the Auracast™ experience comes from understanding the functionality which needs to be implemented in earbuds, headphones, hearing aids, and speakers. Bluetooth LE Audio introduced broadcast audio to Bluetooth® technology, enabling an audio transmitter to send audio to an unlimited number of nearby Bluetooth audio receivers. Auracast™ broadcast audio is a specified set of defined configurations of Bluetooth® broadcast audio which are covered within the Public Broadcast Profile (PBP) specification, the Auracast™ Simple Transmitter Best Practices Guide, and the Brand Guide for Bluetooth Trademarks. Broadcast audio may feel difficult to understand, as it is a new concept, but it offers exciting new user experiences which open up a completely new world of audio applications. Before looking at the details of an Auracast™ broadcast audio implementation, we need to provide a bit of background about how Bluetooth LE Audio broadcasts work, as it is totally different from anything that you will have encountered in Bluetooth Classic Audio.

A major difference between Bluetooth LE Audio broadcast and any previous Bluetooth Classic Audio applications is that no connection is required between a broadcaster and the speakers, hearing aids, earbuds, or headphones which receive and render the audio. (In this document, we'll collectively refer to them as Auracast™ receivers for simplicity, but as far as the underlying specifications are concerned, they're all the same.) The Auracast™ transmitter has no idea whether anything is listening to what it sends – any number of Auracast™ receivers can listen at any time – the only requirement is that they are within range of the transmitter.

Because there's no connection between the devices, a new mechanism has been designed to let all of the Auracast™ receivers know that there is something out there to listen to. This is accomplished by the Auracast™ transmitter "advertising" information about itself and its streams, along with information about how an Auracast™ receiver can find the audio streams that it is currently transmitting. These advertisements include information such as the audio content, its language, codec information, the audio quality, whether it's mono or stereo, and so on. Some of this is in the form of human readable text strings, so it can be displayed to let a user make a choice; some of it is internal information about how a receiver can find and synchronise to a stream.

3.1 The Broadcast Advertising Structure

An Auracast™ transmitter can transmit multiple audio streams. They may be mono, stereo, multiple languages, even totally different audio content. The advertisements which carry the information about them are divided into two different types called extended advertisements and periodic advertisements. Between them, they convey all of the information about what the broadcast streams are and where to find them.

The underlying structure of these advertisements is defined in Bluetooth Core Specification version 5.2 or later. What they contain and how they are used is described in the Basic Audio Profile (BAP), the Broadcast Audio Scan Service (BASS) [7] and the Public Broadcast Profile (PBP). Figure 3.1 shows the structure and relationship of these advertisements, as well as which specifications define the

Auracast™ related data elements they contain. The Metadata LTV[1] structures for Program_Info and Language are defined in the Assigned Numbers document [8].

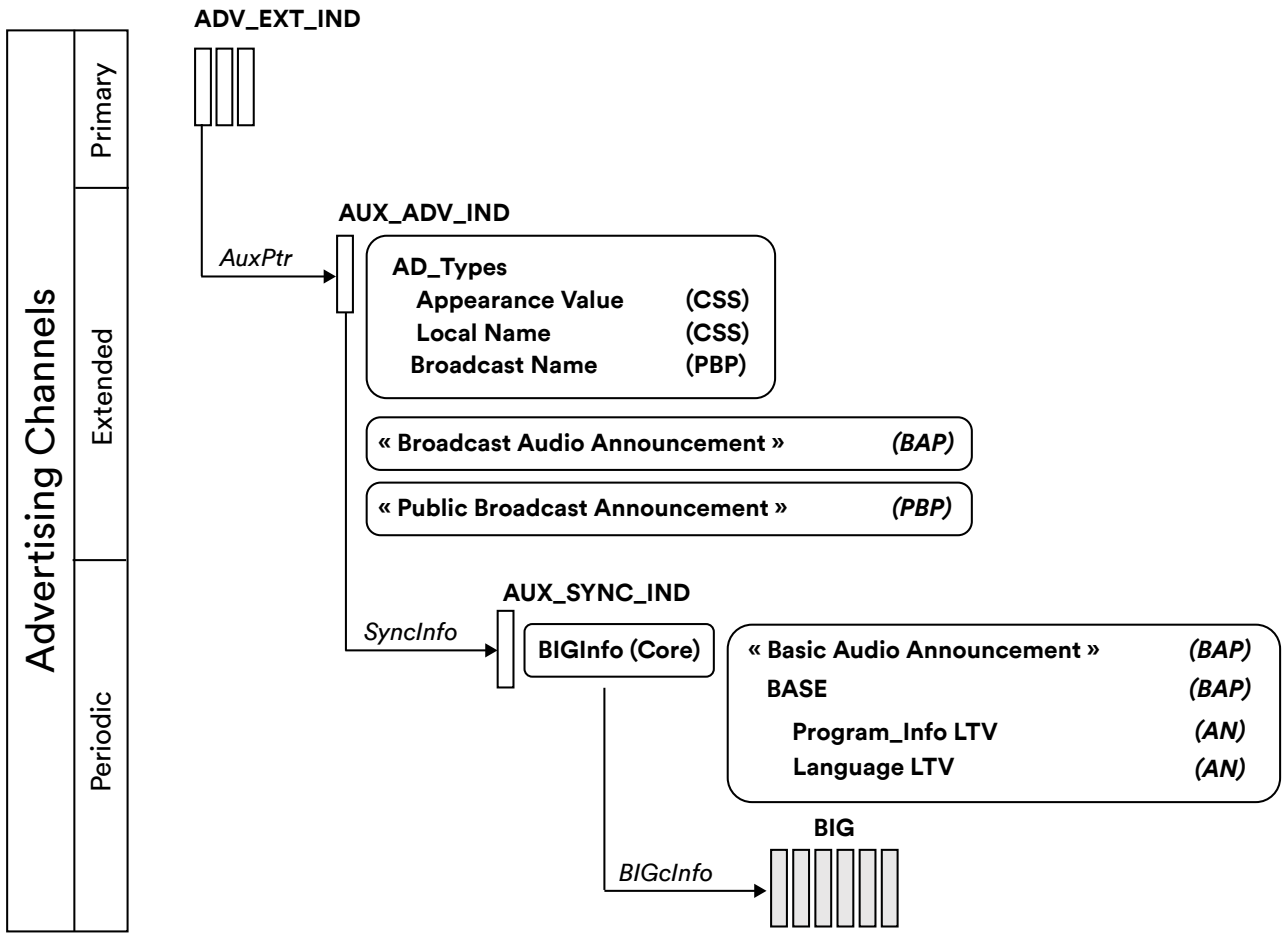

Figure 3.1 The structure of extended and periodic advertisements in Bluetooth LE Audio, showing the key elements used for Auracast™.

Auracast™ receivers wanting to find and listen to an Auracast™ broadcast need to build up a database of relevant broadcasts by scanning for the advertisements. They do this by working through advertisements from Auracast™ transmitters in range, looking at which are relevant, and storing that information. That is illustrated in the flowchart of Figure 3.2.

The Bluetooth LE Audio specifications allow both Auracast™ receivers and Auracast™ assistants to perform the scanning task. An Auracast™ receiver makes the decision about who will do it. It can:

- Delegate the task to Auracast™ assistants which are capable of scanning,
- Do the scanning itself and notify the Auracast™ assistant of the results, or
- Perform any combination of scanning together with one or more Auracast™ assistants

1 *LTV is an industry abbreviation for Length / Type / Value, which is a triplet of structured information used to exchange metadata between devices.*

Normally, the scanning is initiated by a user action, which may be a button press on an earbud, or an action on an Auracast™ assistant application or device. As scanning can be relatively power hungry, it should only be performed when the user initiates it and should be terminated at the point when the user makes a decision to synchronise to an Auracast™ broadcast. If an earbud finds an Auracast™ assistant which is capable of scanning on its behalf, it is recommended to delegate the scanning task to save power. Auracast™ assistants and Auracast™ receivers work together during this process to create a database of available Auracast™ streams.

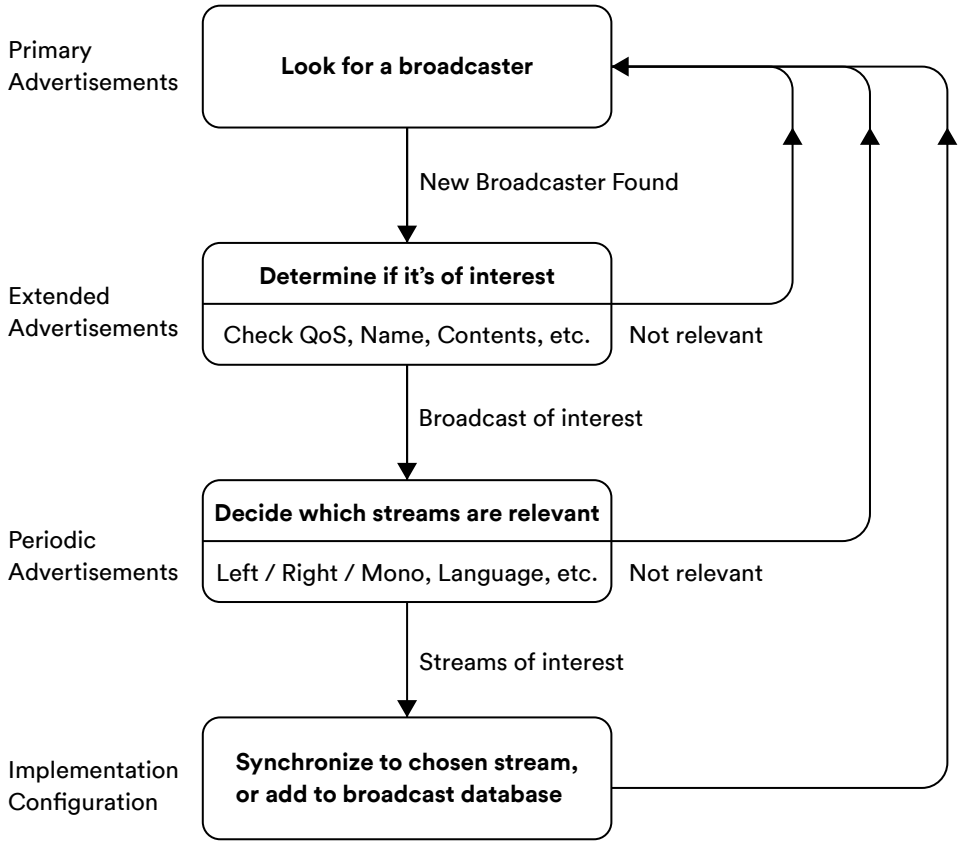

Figure 3.2 The sequence of acquiring information about relevant broadcasts

Each device involved in scanning will start by looking for primary advertisements. If they contain the AuxPtr flag, which confirms the existence and location of an extended advertisement, that indicates the possible presence of an Auracast™ transmitter. They will then look at the related extended advertisement, inspecting the Public Broadcast Announcement to determine if the streams have a format they can decode[2]. If they do, the scanner moves to the periodic advertisement, looking for more details about each stream. Streams which meet policies set by the Auracast™ receiver will then be written to the database before the scanner moves on to look for more Auracast™ broadcasts, or a

2 *The presence of a Public Broadcast Announcement means that a broadcast is present which is likely to meet all of the Auracast™ interoperability requirements. If the Public Broadcast Announcement is not present, the scanner should look for a Broadcast Audio Announcement and then examine the details in the associated periodic announcement to determine if there is a broadcast stream it can receive and render.*

decision is made to synchronise to one of the Auracast™ broadcasts that has been found. The policies applied during this process may be configured in the Auracast™ assistant application or read from the Auracast™ receiver's settings.

The Bluetooth LE Audio specifications define the format of the database where information about the discovered broadcasts is stored. This is located in the Auracast™ receiver, where the information is stored in multiple instances of the Broadcast Receive State characteristic.

3.2 Building an Auracast™ Broadcast Database

Support for the Broadcast Audio Scan Service (BASS), is mandatory on all Auracast™ receivers. It mandates the presence of two characteristics which are implemented to support and populate this database of Auracast™ transmitters – the Broadcast Receive State characteristic and the Broadcast Audio Scan Control Point characteristic. The data itself, along with the current synchronisation status (i.e. which stream the earbud is listening to) is stored in multiple instances of the Broadcast Receive State characteristic. Auracast™ assistants can populate these instances by writing to the Broadcast Audio Scan Control Point characteristic with information on each new Auracast™ transmitter they find. The Auracast™ receiver will write this into a new instance of the Broadcast Receive State characteristic, or update an existing instance if it is already aware of this Auracast™ broadcast stream. If the Auracast™ receiver is scanning, it can populate and update these instances autonomously.

When the Auracast™ assistant is used to choose a stream, it will write to the Broadcast Audio Scan Control Point characteristic to request that the Auracast™ receiver starts or stops listening to that stream. This command modifies the selected Broadcast Receive State characteristic for that particular instance, initiating the synchronisation and rendering process.

Auracast™ assistants can read the Broadcast Receive State characteristic instances at any time to determine the current status of the Auracast™ receiver.

There will always be one instance of the Broadcast Receive State Characteristic for the stream or streams that an Auracast™ receiver is currently rendering. Generally, there will be further instances for streams that it knows about, which it stores in case it wants to swap to one of those in the future. Once an Auracast™ receiver has filled in one or more Broadcast Receive State characteristics, it can select one of them to synchronise to the stream (or streams) which it contains. Once again, it can do this autonomously, or be directed to do it by a selection made on an Auracast™ assistant.

At least one device – either the Auracast™ receiver or an Auracast™ assistant – must be scanning to populate the Broadcast Receive State characteristic instances. However, the operations on the characteristics, either reading them or updating them to start or stop reception, are normal GATT characteristics. This means that any device which supports Bluetooth LE can read and write them, regardless of whether that device is capable of scanning for extended advertisements.

There's a lot of data which is included in each Broadcast Receive State characteristic. Table 3.1 shows the main fields which are important to support the control of an Auracast™ receiver from the perspective of an Auracast™ user interface. (The full list is in Table 3.2 of BASS and all of these fields are mandatory.)

Field	Description
Source_ID[3]	A local, unique reference for each Broadcast Isochronous Group (BIG)[4], generated locally by the Auracast™ receiver. There will be a different instance of the Broadcast Receive State characteristic for each Auracast™ transmitter that the Auracast™ receiver is aware of.
Source_Address	The Bluetooth address of the Auracast™ transmitter.
PA_Sync_State	Identifies whether the Auracast™ receiver is currently receiving a stream from the BIG with this Source_ID. The common values are: 0×00 = Not synchronised to the periodic Advertising train for this BIG 0×02 = Synchronised to the periodic Advertising train for this BIG (Only one instance of the Broadcast Receive State characteristic would normally have this field set as being synchronised, indicating which audio stream is currently being received.)
Encryption	Shows whether the stream is encrypted, and whether the Auracast™ receiver needs a code to decrypt it.
BIS_Sync_State *	Identifies which of the individual streams in the BIG the Auracast™ receiver is currently receiving, e.g. Left, Right, Mono, or Left and Right. (Normally, an Auracast™ receiver will only be receiving audio from one BIG.)
Metadata *	A variety of user readable information, which can be used to populate the user interface of an Auracast™ assistant.
Broadcast_Name	The name of the Auracast™ transmitter, such as Pub TV #1
Program_Info	The content of the audio stream, for example, "Bollywood Films", "Cricket", "Football", etc.
Language	The language of the stream
* The BIS_Sync_State and Metadata are contained in arrays – one for each subgroup in the BIG.	

Table 3.1 The main Auracast™ related components of the Broadcast Receive State characteristic

3 *In the case of a coordinated pair, such as a pair of earbuds, speakers or hearing aids, each will assign their Source_ID values independently. Auracast™ assistants need to keep track of these differences.*

4 *Each Broadcast Receive State characteristic relates to a different Broadcast Isochronous Group (BIG) and includes information about every Broadcast Isochronous Stream (BIS) within that BIG. If an Auracast™ transmitter is broadcasting two different BIGs, then each would be represented by a separate Broadcast Receive State characteristic with a different Source_ID.*

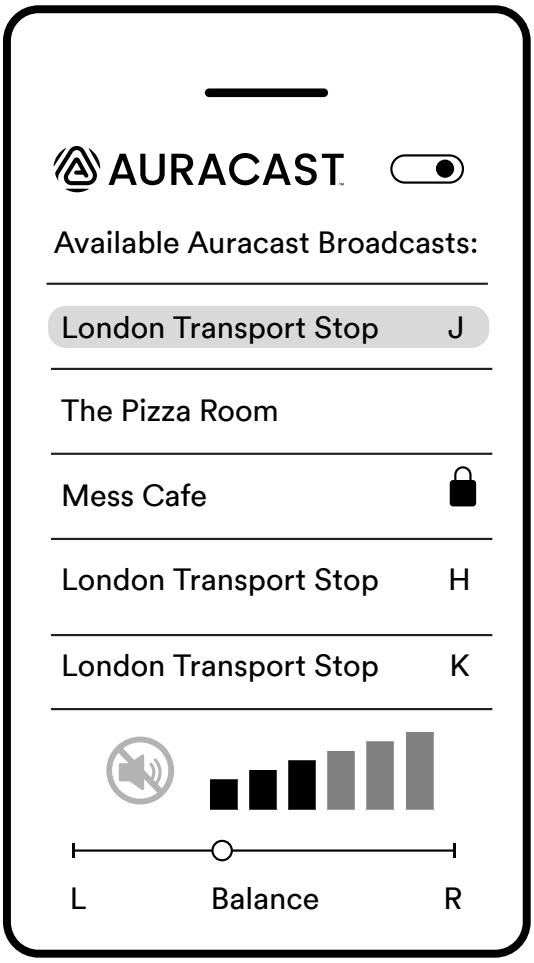

Figure 3.3 A typical user interface for a phone application based Auracast™ assistant

The full set of Broadcast Receive State Characteristics is held in the Auracast™ receiver, but it makes sense for every Auracast™ assistant to keep a local copy, so that they know what the Auracast™ receiver knows. They can periodically read the Broadcast Receive State characteristics, or set the Broadcast Receive State characteristic to notify them whenever the status changes on the Auracast™ receiver. These changes may be triggered if the Auracast™ receiver is scanning independently, or because it has more than one Auracast™ assistant scanning on its behalf.

This may initially seem complicated, but Figure 3.3 shows why this complexity is needed. Figure 3.3 is an example of a possible Auracast™ assistant user interface implemented as a stand-alone phone application. It displays a list of the Auracast™ broadcasts which it has found within range using the human readable metadata elements. Additionally, by reading the Broadcast Receive State characteristics on the Auracast™ receiver, it can determine whether the Auracast™ receivers are currently receiving one of these, and if so, highlight it. The display can also indicate whether any of the streams are encrypted.

If the user wants to make a change, they just need to tap the appropriate Broadcast_Name in the list and the Auracast™ assistant will write to the Broadcast Audio Scan Control Point characteristic, updating the appropriate BIS_Sync_State fields in that Broadcast Receive State characteristic, which will prompt the earbud to change to the new stream. As the number of Auracast™ transmitters increases, more information may need to be presented to the user to make a more informed decision.

The user interface is independent of whether the phone is scanning, or whether the scanning is being done by the Auracast™ receiver. It is purely a display of the information that has been read or notified from the Broadcast Receive State characteristics of the Auracast™ receiver with which it is paired.

Figure 3.3 also highlights the fact that the device which is operating as an Auracast™ assistant can control other features like volume, mute and balance.

3.3 Coordinated Sets – Dealing With Pairs of Earbuds and Speakers

If you have two Auracast™ receivers, as is the case with earbuds, hearing aids, and sets of speakers, the Auracast™ assistant will write to the relevant Broadcast Audio Scan Control Point characteristics of each, as it will know that they are members of a coordinated set. Auracast™ assistants know whether they are dealing with a single headset or a pair of earbuds or hearing aids, because when they first pair with one of them they discover whether they are part of a Coordinated Set. If they are, then the Auracast™ assistant will look for both members and associate with both of them. From that point on, it will always treat them as a pair, making sure they both receive audio streams from the same Auracast™ transmitter.

After pairing, an Auracast™ assistant should also read the Published Audio Capability (PAC) records [9] of each member of the coordinated set, so that it knows which one requires a right stream and which requires a left stream, or whether they would both prefer mono. With this information, an Auracast™ assistant can tell each Auracast™ receiver exactly what it needs to do. In return, each Auracast™ receiver will notify all of its Auracast™ assistants of any changes that occur, so that all of them stay up to date with the current status.

3.4 Building an Auracast™ Assistant for Legacy Devices

It's easy to miss the importance of an Auracast™ assistant. Auracast™ assistants provide most of the user experience by:

- Discovering what, and how many Auracast™ broadcasts are within range
- Determining whether each broadcast is relevant and displaying it to the user
- Providing a simple user interface for a user to start and stop receiving an Auracast™ broadcast
- Adding an easy way to adjust volume.

An Auracast™ enabled smartphone or watch is an obvious choice for an Auracast™ assistant, as it is generally always with the user. However, the functionality can also be shared between earbuds and legacy smartphones. In the next section, we will describe how to accomplish this.

4. Using Legacy Smartphones As Auracast™ Assistants

Manufacturers of hearings aids, earbuds, and headphones should not wait for smartphones to natively support the Auracast™ assistant functionality. The Auracast™ assistant functionality needed by users can be supported in earbuds, headphones, hearing aids, and speakers, interacting with familiar legacy smartphones that do not include native Auracast™ assistant functionality.

To operate with an earlier generation of smartphones, which don't support scanning for advertisements[5], we have to move the scanning task to the Auracast™ receivers. All Auracast™ receivers must be able to scan for these advertisements. That's a mandatory requirement in the Basic Audio Profile specification, because they need to be able to work autonomously. For many users, in places where there is only one Auracast™ transmitter, simple scanning and joining direct from the receiving device may be sufficient. However, as has been noted earlier, it is likely there will soon be multiple Auracast™ broadcast audio streams within range, in a single location.

To use an older phone to display multiple Auracast™ broadcasts that are available, an Auracast™ receiver needs to perform the scanning function and make the information it finds about the streams available to an application on the smartphone. It does this using a simple Bluetooth GATT procedure (which is the basis of all Bluetooth LE applications and is supported by almost every smartphone made in the last ten years).

The phone application can either read the earbud's Broadcast Receive State characteristics or register to be notified of any changes. It will then display the options it has found, let the user select one of them, and then send that decision back to the Auracast™ receivers, which can go and find that particular broadcast, synchronise to it and start rendering it.

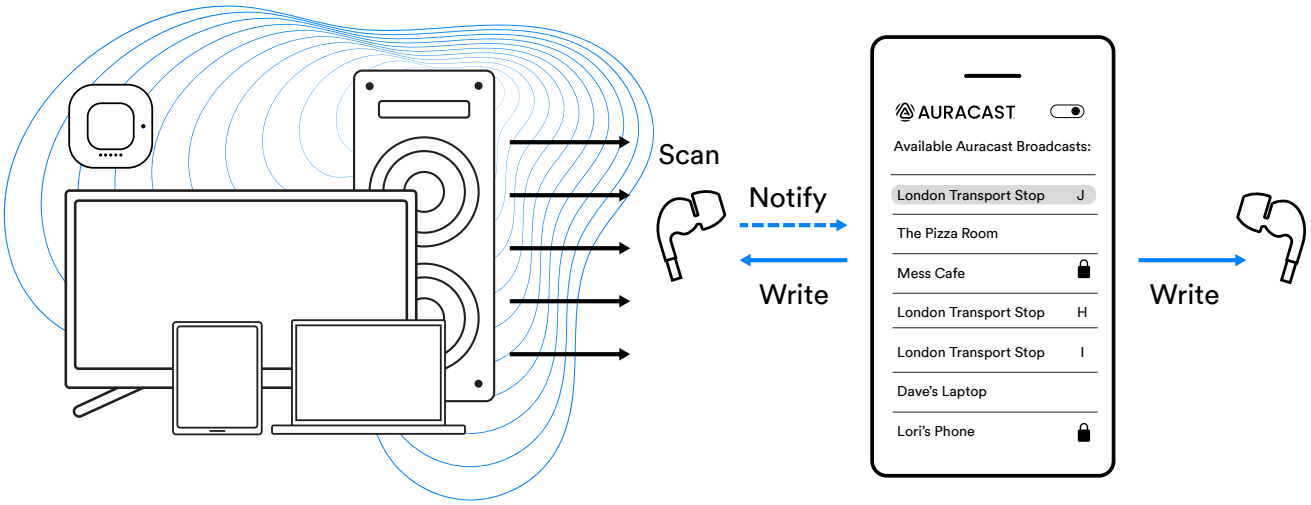

Figure 4.1 Using a legacy phone as Auracast™ assistant for a pair of earbuds

5 *Which means they are using silicon that do not support Bluetooth Core Specification version 5.2 or later, or do not contain a Bluetooth LE Audio host stack.*

Figure 4.1 puts all of this together, showing how a pair of Auracast™ earbuds can use a standalone application on a legacy smartphone to provide a full Auracast™ experience. The earbud to the left of the phone scans and finds four different Auracast™ transmitters. As it finds each one, it stores the information in a new Broadcast Receive State characteristic which it creates, and notifies it, allowing the phone application to replicate and display the list of the Auracast™ transmitters that the earbud has found. When the user finds one which they want to listen to, they select it on the phone application and the phone writes to the Broadcast Audio Control Scan Point on each earbud, instructing them to synchronise to that Auracast™ transmitter.

In this particular example, only one of the earbuds needs to scan, saving the battery on the other. When the earbuds first paired with the Auracast™ assistant application on the phone, the application will have recognised that they are members of a coordinated set, so the application knows that it must send any instructions to both of them. It will also have discovered basic information about each of the earbuds by reading the Published Audio Capability (PAC) records on each of them. These identify whether they expect to receive a left, a right or a mono stream. When the user selects a broadcast stream to listen to, the Auracast™ assistant application on the phone will use this knowledge to select the correct stream information in its Broadcast Audio Control Scan Point write, directing each earbud to the correct broadcast stream.

4.1 Auracast™ Receiver Requirements To Support Older Phones

The industry does not need wait for new smartphones before supporting Auracast™ broadcast audio in new products. To ensure current and future compatibility with applications on smartphones, there are some design requirements which Auracast™ receivers need to adopt, whether they're earbuds, hearing aids, speakers or headphones. These are:

- They need to support more than one Broadcast Receive State characteristic. BASS places a requirement on an Auracast™ receiver, mandating the presence of at least the same number of Broadcast Receive State characteristics as the number of audio streams that it can receive. For an earbud, that is a minimum of just a single instance. To support external selection applications, the Auracast™ assistant should be designed to support a sensible number of Broadcast Receive State characteristics based on applications which are expected to become available. In the short term, only a few devices may be within range, but as the popularity of Auracast™ broadcast audio grows, so will the number of discovered devices. As an Auracast™ transmitter can have a range of 100m or more, it is recommended that at least 10 instances of the Broadcast Receive State characteristic are supported.
- Auracast™ receivers need to consider their power management if they are performing scanning. In most cases, scanning by an Auracast™ receiver should be restricted to a short period after a user action, such as pressing a button. Typically, scanning should be terminated on an Auracast™ receiver once it makes a decision to synchronise to a specific Auracast™ transmitter, whether that decision is made locally, or by an Auracast™ assistant.

- Software application designers should be aware that Auracast™ receivers may not have completed their scan sequence when the application is started. They should register for notification of the Broadcast Receive State characteristic to allow them to dynamically update their displayed information as additional Auracast™ transmitters are discovered by the Auracast™ receiver.
- Auracast™ receivers should check whether fully featured Auracast™ assistants capable of scanning are available. If they are, they should delegate the scanning activity to these Auracast™ assistants to save battery drain, using the Scan Delegator role defined in BAP, after which they can terminate their own scanning.

By following the guidelines above, it's possible to offer a full Auracast™ assistant user experience with phones that do not support the scanning requirements of Bluetooth LE Audio.

Providing a simple phone application means that Auracast™ transmitters can be rolled out in volume now, bringing the benefits of Auracast™ broadcast audio to everyone. The industry just needs to make sure that their Auracast™ receivers can perform Auracast™ scanning and use the information they gather to populate their Broadcast Receive State characteristics. As long as that happens, everyone can get access to all of the benefits of Auracast™ broadcast audio, without having to upgrade their current phone.

The process described above is based on characteristics which must be implemented in every Auracast™ receiver. This means that Auracast™ assistant applications developed according to this approach will be compatible with all Auracast™ receivers which also follow them. The Auracast™ receivers will also be forward compatible with future Auracast™ assistants, without the need for users to make any changes to their devices.

5. Conclusion

In this document, we've explained how Auracast™ receiver manufacturers can bring the Auracast™ experience to market faster, by following a few key design recommendations and building a stand-alone Auracast™ assistant application. With dual-mode receivers, we encourage manufacturers to consider supporting the Auracast™ broadcast audio features first, before integrating support for unicast. This way, users can immediately take advantage of the new capabilities of Auracast™ broadcast audio without the requirement to update their smartphone.

The Auracast™ experience enables a whole new range of audio experiences for users, from the excitement of audio in public spaces to completely new social audio applications supporting personal audio sharing. These can be made available now, and companies can exploit them using legacy phone applications.

The good news is that what we've explored within this document is easy to do, as it builds on mandatory features of the Bluetooth® LE Audio specifications. This means that products supporting the full Auracast™ experience can be implemented within your existing product development timescales.

6. References

[1] Basic Audio Profile (BAP)

[2] Public Broadcast Profile (PBP)

[3] Common Audio Profile (CAP)

[4] Telephony and Media Audio Profile (TMAP)

[5] Hearing Access Profile (HAP)

[6] Core specification 5.2 or later

[7] Broadcast Audio Scan Service (BASS)

[8] Assigned Numbers

[9] Published Audio Capabilities Service (PACS)