

6.4 Bluetooth Audio: From Classic to Auracast™ (Optional)

Legacy Audio (Classic Profiles)

For over two decades, Bluetooth audio has been powered by profiles running on the Bluetooth Classic radio. These profiles are the foundation of the wireless audio market.

- **A2DP (Advanced Audio Distribution Profile):** This is the profile used for high-quality, one-way audio streaming, primarily for music. It defines how stereo audio can be compressed and transmitted from a source (like a smartphone) to a sink (like wireless headphones or speakers). A2DP relies on a mandatory codec called **SBC (Low Complexity Subband Codec)**, which provides decent quality but is less efficient than modern alternatives.
- **HFP (Hands-Free Profile) & HSP (Headset Profile):** These profiles are designed for two-way voice communication, such as phone calls. They enable features like answering calls, redialing, and volume control. To support simultaneous input and output, the audio quality is mono and highly compressed, making it unsuitable for music.

While functional, this legacy audio architecture has limitations: it is relatively power-hungry, the SBC codec is inefficient, and it cannot natively support use cases like True Wireless Stereo earbuds without vendor-specific workarounds.

Introduction to LE Audio

Introduced in the Bluetooth 5.2 specification, **LE Audio** is the next generation of wireless sound, designed to address the limitations of Classic Audio. It is a completely new architecture that operates exclusively on the power-efficient Bluetooth Low Energy (BLE) radio.

LE Audio brings significant benefits:

- **Lower Power Consumption:** Extends the battery life of audio devices.
- **Higher Audio Quality & Efficiency:** Achieved through a new, mandatory codec.
- **Multi-Stream Audio:** Natively supports transmitting multiple, independent, synchronized audio streams to one or more devices. This is the standardized solution for True Wireless Stereo earbuds, improving performance and reliability.
- **Broadcast Audio Capabilities:** Enables entirely new audio sharing use cases.

The LC3 Codec (Low Complexity Communications Codec)

The cornerstone of LE Audio is the **LC3 codec**. It is the new mandatory codec for all LE Audio devices, representing a massive leap in efficiency and flexibility over the classic SBC codec.

The primary advantage of LC3 is its ability to provide high-quality audio at much lower data rates. This gives developers a choice:

1. **Deliver Higher Quality:** At the same data rate as SBC, LC3 provides a significant and noticeable improvement in audio fidelity.
2. **Extend Battery Life:** LC3 can provide the same or slightly better audio quality as SBC but at roughly half the data rate. A lower data rate means the radio is active for less time, drastically reducing power consumption.

This efficiency makes LC3 a superior technology for all wireless audio applications, from high-fidelity headphones to power-constrained hearing aids.

Auracast™ Broadcast Audio

Auracast™ is a revolutionary new capability built on LE Audio that enables a single source device to broadcast audio to an unlimited number of nearby receivers. Think of it as public Wi-Fi, but for audio.

How It Works:

1. An **Auracast™ transmitter** (e.g., a TV in an airport, a laptop in a lecture hall) broadcasts its audio stream.
2. Listeners with **Auracast™ assistants** (e.g., smartphones or smartwatches) can scan for these broadcasts in the area.
3. The assistant presents a list of available Auracast™ streams to the user, who can then select one to join.
4. The audio is then routed to the user's **Auracast™ receiver** (e.g., earbuds, headphones, or hearing aids).

Key Use Cases:

- **Share Your Audio:** A user can share music from their phone with multiple friends, allowing them to listen to the same playlist on their own headphones.
 - **Listen in Public Spaces:** Unmute the silent TVs in public venues like gyms, airport gates, or sports bars by streaming the audio directly to your personal earbuds.
 - **Assistive Listening:** In public spaces like theaters, conference centers, or places of worship, Auracast™ can be used to broadcast a high-quality audio feed directly to visitors with compatible hearing aids or headphones.
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