Audio/voice/speech (AVS) processing covers a very wide range of performance- and power-consumption requirements. On one end of the spectrum is the ultra-low-power “wake-on-voice” processing found in many of today’s smartphones and wearables. On the other end, emerging object-based audio standards, such as Dolby ATMOS and MPEG-H, require home entertainment products to process many more audio data objects transmitted with the audio stream. At the heart of these new AVS innovations is the desire of OEMs to create more compelling, interactive, and immersive experiences with their devices.

Using different processor architectures to handle the breadth of applications in the AVS domain would be very costly in terms of software development and product management. The TensilicaHiFi DSP family for audio, voice, and speech addresses this broad range of requirements, offering low-energy, high-performance processing for the entire spectrum of audio- and voice-processing algorithms and end equipment while maintaining software compatibility across the portfolio. HiFi DSPs can be found in SoCs across all major markets including mobile, automotive, home audio, television, computing, and gaming (see Figure 1). Whether you are optimizing to increase battery life, save thermal power, or save costs, there is a compelling HiFi DSP that meets your audio requirements.

With over 75 licensees, over 95 partners, and 200 software packages and growing, the HiFi DSP instruction set architecture (ISA) is the #1 DSP architecture for SoC designers.
HiFi DSP Family Summary

- HiFi Mini – A superset of the HiFi 2 DSP designed to support lowest area and power for always-listening voice trigger
- HiFi 2 – Good balance for performance and low energy consumption
- HiFi EP – A superset of the HiFi 2 DSP with advanced optimizations for DTS-HD master audio, improved voice pre- and post-processing, and improved cache memory subsystem
- HiFi 3 – Most energy-efficient DSP for a broad range of applications in mobile, wearables, home, and automotive applications
- HiFi 3z DSP – Most energy-efficient DSP for object-based audio, super-wideband voice codecs, and neural network-based automatic speech recognition (ASR)
- HiFi 4 – Highest performance HiFi DSP, for object-based audio, digital assistants, front-end processing, and neural network-based ASR

Low-Power, High-Performance Audio and Voice DSPs

The HiFi DSP ISA is highly optimized for AVS applications. By optimizing more than 200 software packages, the HiFi ISA provides the lowest energy, highest performance DSPs for audio and voice. This performance scales across the entire DSP product family, from the ultra-low-energy 24x24 dual MAC HiFi Mini, to the energy-efficient 24x24 quad MAC HiFi 3, to the high-performance 32x32 quad-MAC HiFi 4.

Audio and Voice Software and Ecosystem

OEMs continue to look to AVS as a means to differentiate their products and provide a compelling user experience, adding features such as voice trigger and advanced voice recognition to their products. In the home audio and voice market, this could mean supporting the latest object-based audio decoder or the latest 3-D and AR/VR-positional audio post-processing suites.
By choosing Cadence’s HiFi DSP family, SoC designers can ensure that the broadest set of codecs and pre-/post-processing software is immediately available to their customers. Currently more than 200 different software packages are available as part of the largest audio and voice ecosystem for any DSP in the market. This means that all of the newest and most innovative audio and voice IP is always available with HiFi DSPs.

**Flexibility**

HiFi DSPs are completely configurable, giving the SoC designer control of numerous pre-defined functions and features, including the memory subsystem, debug, floating point, and many others.

In addition to configuration options, the SoC designer can choose to further improve performance and reduce energy for any given application by adding custom instructions and more I/O bandwidth. This is possible because all HiFi DSPs are based upon the Cadence Tensilica Processor Generator, which allows designers to add value through additional customization while remaining completely compatible with the HiFi software ecosystem (see Figure 2).

**Ease of Programming**

HiFi DSPs offer a key advantage—their simple programming model. Software developers can write audio and voice applications completely in C using efficient, optimized audio and voice instructions, maintaining or surpassing the performance of the same applications built with assembly code.

**Cadence Services and Support**

- Cadence Tensilica application engineers can answer your technical questions and provide technical assistance and custom training.
- Cadence-certified instructors teach a series of courses on Tensilica IP and bring their real-world experience into the classroom.
- Internet Learning Series (iLS) online courses allow you the flexibility of training at your own computer via the Internet.
- The Cadence Tensilica IP support site gives you 24x7 online access to a knowledgebase of the latest solutions, technical documentation, software downloads, and more at ip.cadence.com/support.

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**Figure 2. Tensilica Processor Development Flow**

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