

Dolby® AC-4 Audio System for Next-Generation Broadcast Services

Improving Today
Enabling Tomorrow

Dolby® Digital brought you stereo and 5.1 surround sound.

Dolby Digital Plus™ brought 7.1 audio, visual descriptive services, and Dolby Atmos®.

Dolby AC-4 brings everything from before, and so much more.

Dolby® AC-4 is designed to address the needs of everyone in the entertainment ecosystem —from content creation to playback.

Dolby AC-4 is one of the most exciting developments from a company known for launching next-generation broadcast solutions. It's a modern, elegant architecture that makes it refreshingly easy to solve big challenges.

It provides a creative foundation for breaking new ground in personalization, accessibility and reach. All with industry-leading compression efficiency.

The Push and Pull of Change

We know change is a constant in the broadcast industry.

You can look at change in two ways: pressure to respond and opportunities to advance. That's exactly how we approached the architecture of the Dolby AC-4 audio system for next-generation broadcast services. It's a standard that gives you more levers to pull to respond to change.

The Pull of Rapid Changes

Audience expectations change constantly. Regulatory demands impose time lines that dictate development and delivery. Online sites and mobile services are constantly raising the bar for convenience, innovation and personalization. Responding to these challenges creates the worry of added complexity. Which is why we architected ease of implementation into the design of the Dolby AC-4 audio system.

The Push of New Opportunities

The rapid pace of change makes it imperative to stay agile. Change signals opportunities. Whenever there's movement in the industry, it's an opening to push forward. Get closer to all of your audiences. Outmaneuver the competition. Dazzle advertisers with something different. Reach new audiences. A dynamic industry has an appetite for new offerings. Dolby AC-4 supports your ability to move with speed and efficiency to deliver those offerings.

Decades of Broadcast Innovation

For decades, Dolby has worked alongside broadcasters to push the limits of sight and sound. Together with our partners, we have created ground-breaking and award-winning products and technologies.

To say that Dolby's impact is far-reaching might be an understatement: Dolby technologies can be found in cinemas, professional recording studios, video games, DVDs, mobile media, digital broadcast TV, digital cable, satellite systems and more.

Today, more than one and a half billion certified products incorporating Dolby technology have been tested for quality and reliability.

We are extremely proud that Dolby has won 11 Academy Awards and 14 Emmy Awards—achievements that all of our 1,600 employees around the world have made possible, thanks to their hard work and restless, creative spirits.

Dolby deploys expertly engineered systems, based on close collaboration with industry partners. We are part of a forward-thinking ecosystem of industry leaders, standards bodies, and consortia.

We share a passion with our partners to exceed audience expectations of what entertainment can be.

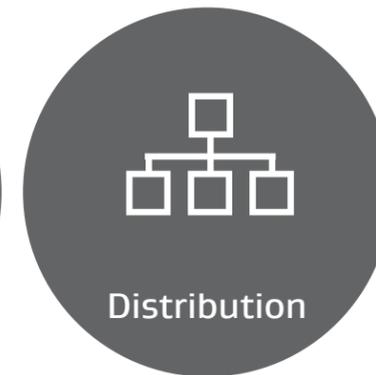
We Design and Build with an End-to-End View

Meeting the letter of a standard is not the same as meeting the intentions and needs of the industry. We strive to be an enabling force for our partners across the ecosystem to use to achieve their technical, business and artistic goals.

Like all of our products, the Dolby AC-4 audio system for next-generation broadcast services is designed from the ground up to meet the needs of our partners. It is a complete, end-to-end solution designed with content creation, distribution and playback all taken into account.



For decades, Dolby has collaborated with big ecosystems to deliver magic in theaters, at home and on the go.



Some of our key partners include:

Cinema

Paramount Pictures, Dreamworks, Sony Pictures, New Line Cinema, 20th Century Fox, Columbia Pictures

Walt Disney, Universal, United International Pictures, Warner Bros, Paché

AMC Theaters, Loews Cineplex, UCI, UCG Europalaces, Regal Cinemas, National Amusements, Medion, Cinemark

Broadcast/OTT

Turner, CCV International, PBS, ORF, Foxtel, ABC, BBC, Netflix, Amazon, 20th Century FOX, Columbia Pictures, Warner Brothers, Dreamworks, Disney, Canal+

DirectTV, Sky, Dish Network, Harmonic, Cisco, Ericsson, Imagine Communications, Microsoft, Amazon Web Services

Apple, Samsung, LG, Microsoft, Amazon, Arris, STMicrosystems, MStar, Cisco, Broadcom, Hewlett Packard, Onkyo, Phillips, Panasonic,

Gaming

DICE, Blizzard, Rockstar, Treyarch, Epic Games, Bungie

Electronic Arts, Activision, Ubisoft, Take-Two Interactive

Microsoft, Sony Computer Entertainment

Active Participation in Industry Standards

Dolby has always recognized the importance of industry standards and actively participates in those that drive the industry.

Standards body memberships

- International Telecommunications Union (ITU-R) WP 6B and 6C
- Advanced Television Systems Committee (ATSC), board member
- Digital Video Broadcasting (DVB) project, CM and TM groups, member of Steering Board
- The European Telecommunications Standards Institute (ETSI)
- Society of Cable Telecommunications Engineers (SCTE), Digital Video Subcommittee member
- Society of Motion Picture and Television Engineers (SMPTE), board member
- International Electrotechnical Commission (IEC) TC-100
- ISO/IEC MPEG

Industry body memberships

- Blu-ray Disc Association (BDA), board member
- EBU working groups including Ploud and BWF
- CableLabs OpenCable™ host device core functional requirements specification
- HDMI Forum
- Digital Entertainment and Content Ecosystem (DECE)
- Consumer Electronics Association (CEA), board member of the Home Audio Division
- Audio Engineering Society (AES)
- Digital Living Room Network Alliance (DLNA)
- DASH and HbbTV industry forums
- Future of Broadcast Television (FoBTV)

Dolby AC-4 Is About Listening

We stepped back to listen to our partners to ensure that your voices and audience needs informed every design decision we made. That's how the architecture of the Dolby AC-4 audio system evolved: as a new audio standard that supports your ability to improve, expand your reach and increase your competitive edge.

The result? An elegant architecture without bloat and complexity. An architecture that's designed for you by us, not by a committee. An architecture designed on our learning with Dolby Atmos, the world's first commercial object-based audio system. So you can have confidence in the performance of Dolby AC-4 from day one.

Do you have questions about Dolby AC-4 and how we can partner with you? We'd love to talk to you: DolbyAC-4Inquiry@dolby.com

Dolby AC-4

Creation tools developed hand-in-hand with worldwide creative leaders
Integration with leading mixing consoles and digital audio workstations



Content Creation

Support for open standardization and next-generation interchange and metadata [ITU-R, SMPTE]

Robust solutions supporting both PCM+Metadata and Mezzanine Compressed workflows (file & real-time)



Professional Interchange

State-of-the-art compression efficiency (e.g., 50% over today's systems)

Support for object and/or channel-based audio programming

Native support for Dialogue Enhancement, Intelligent Loudness & Advanced Dynamic Range Control

Supported by several leading encoder/mix vendors worldwide



Consumer Delivery

Native support for multi-language and description services

Scalability to accommodate optimum playback across a wide range of today's use cases and applications—including extensibility for the future

Seamless compatibility with existing consumer device interfaces interconnects



Playback



High Return, Low Disruption

Are you wondering if you have enough senior engineers on board to start implementing Dolby AC-4 capabilities? The Dolby AC-4 solution enables you to change—now and into the future—without disruptive, high-cost undertakings. In fact, even today’s audio sounds better with Dolby AC-4.

High return is great

- Improve compression efficiency by up to 50%
- Add features without adding complexity to your existing infrastructure and operations
- Simplify the management of next-generation audio

Low disruption is even better

One of the major advantages of Dolby AC-4—based on your feedback—is ease of implementation. You can add capabilities now, without adding to your headcount, with Dolby AC-4’s built-in self-configuration and automation.

Keep Imagining What’s Next

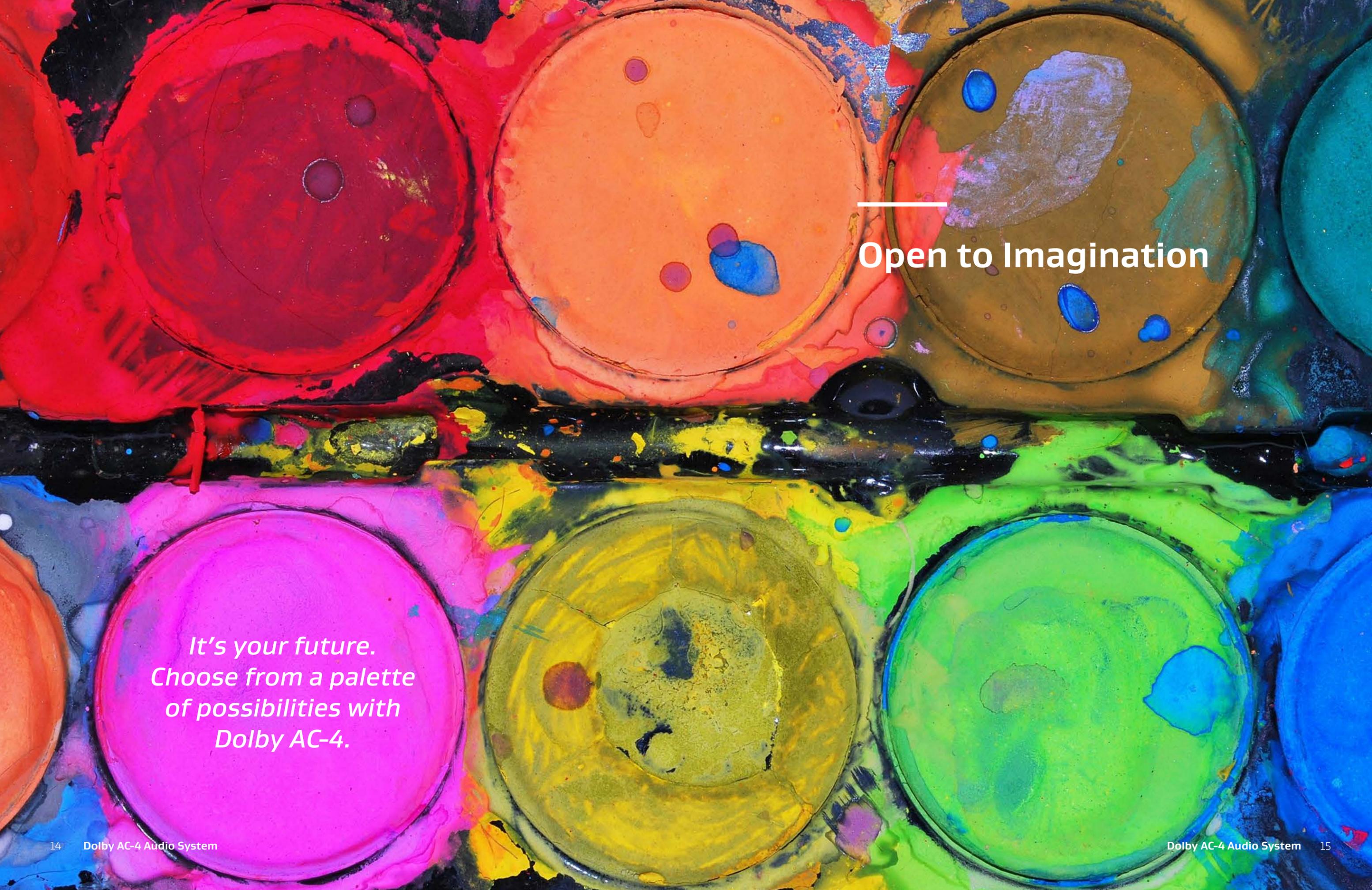
The Dolby AC-4 audio system for next-generation broadcast services helps you get down to business solving the pressing problems of today. It also gives you a clear path to the future of emerging opportunities.

Improve performance today

- Make incremental, non-disruptive changes to fit your strategy
- Transfer information more reliably
- Reduce complexity on every level
- Lower operational costs with built-in self-configuration and automation

Pursue unlimited imagination tomorrow

Dolby AC-4 gives you the ability to deliver The Next Big Thing... at your own pace and in your own way. Think of Dolby AC-4 as a paint palette: it has all the “standard” colors. And we’ve added many more colors for your canvas. You can use familiar colors or experiment with new ones: be as creative as you want!



Open to Imagination

*It's your future.
Choose from a palette
of possibilities with
Dolby AC-4.*

Personalization

Dolby AC-4 was designed from the ground up to go deeper into the world of viewer personalization. It's not bolted onto old technology. It's personalization delivered efficiently and cost-effectively with a modern architecture. No performance penalties, retrofitting, or army of senior engineers required.

From a common experience to a personalized one

As a standard, Dolby AC-4 provides the commonality to work with more systems. As a platform, Dolby AC-4 gives you the freedom to support individuality. Create strategies for personalization around convenience or engagement. Provide the flexibility to adapt to the viewer's needs or transport them deeper into events. Dolby AC-4 gives you more tools and choices for defining and delivering personalized experiences to viewers.

From marketing to everyone to marketing with insights

Viewers like being catered to. They appreciate being seen and treated as individuals, rather than a collective demographic. The better you understand and support individual preferences, the more opportunities you have to create specialized, high-value offerings. As you give people the ability to express their preferences, you can also collect more information for targeted marketing and advertising.



Accessibility

Greater access for all will be part of the future. Our commitment to that goal is reflected in the architecture of Dolby AC-4 that enables better access for people with disabilities. We want to break down the obstacles to doing what is right.

Be inclusive

In the past, people with disabilities have found it especially difficult to enjoy watching TV and going to the movies. They might shun the experience entirely rather than feel even more isolated by a poor experience. This feeling of being marginalized extends to the entire support group of family and friends. So when people with disabilities find a cinema, device or broadcast channel that makes it possible for them to more fully engage, can brand loyalty be far behind?

Expand your audience

Bringing more people into the broadcast experience isn't just a mandate for our partners; it's a belief in inclusion. Providing better audio and visual experiences for people with disabilities spans every demographic. It involves families and friends as well. There are many advocacy and regulatory efforts underway. Dolby AC-4 technology gives you the opportunity to leapfrog from compliance to inspirational.



Reach

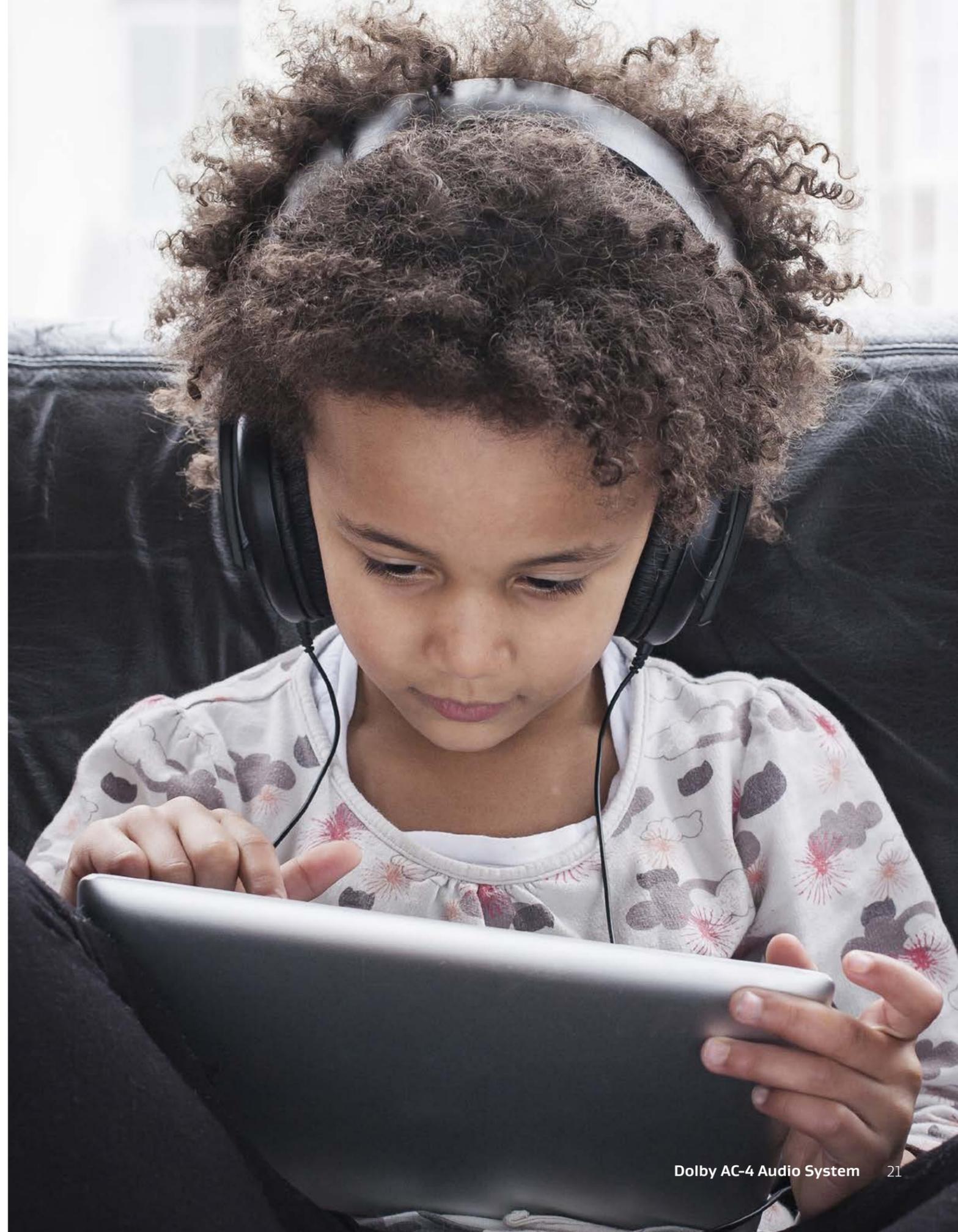
Audiences are increasingly mobile and multicultural. Dolby AC-4 helps ensure that you're never out of step with your audience by accommodating both multiple delivery methods and multiple language needs.

Diverse and on the move

Your audience is constantly evolving and moving. If you want to reach your viewers wherever they are, you're going to have to stay connected—on a TV set at home, on smartphones and tablets on the road, and laptops and desktops at work. Programming is finding its way onto more devices, blurring the source. Immediacy, mobility and convenience are making delivery choices less predictable. You must adapt to your audience—wherever they are and whatever language they speak.

Stay connected

Dolby AC-4 lets you stay in sync with the growing needs and expectations of your audience. By accommodating multiple delivery methods and language options, Dolby AC-4 allows you to keep the viewer experience consistently great from place to place and device to device. When the technology adapts to the environment and language preferences, you become part of the dynamic world of audiences everywhere.



A Sampling of AC-4 Technology

Core Technology

Dolby AC-4 delivers more content with far greater efficiency. You can start easily by optimizing what you're doing today, making your audience a lot happier with their viewing experiences. And then grow to deliver personalized, accessible, "anywhere they are" experiences when you are ready.

The following sections highlight a few of the innovations you'll find at the core of Dolby AC-4 audio system for next-generation broadcast services.

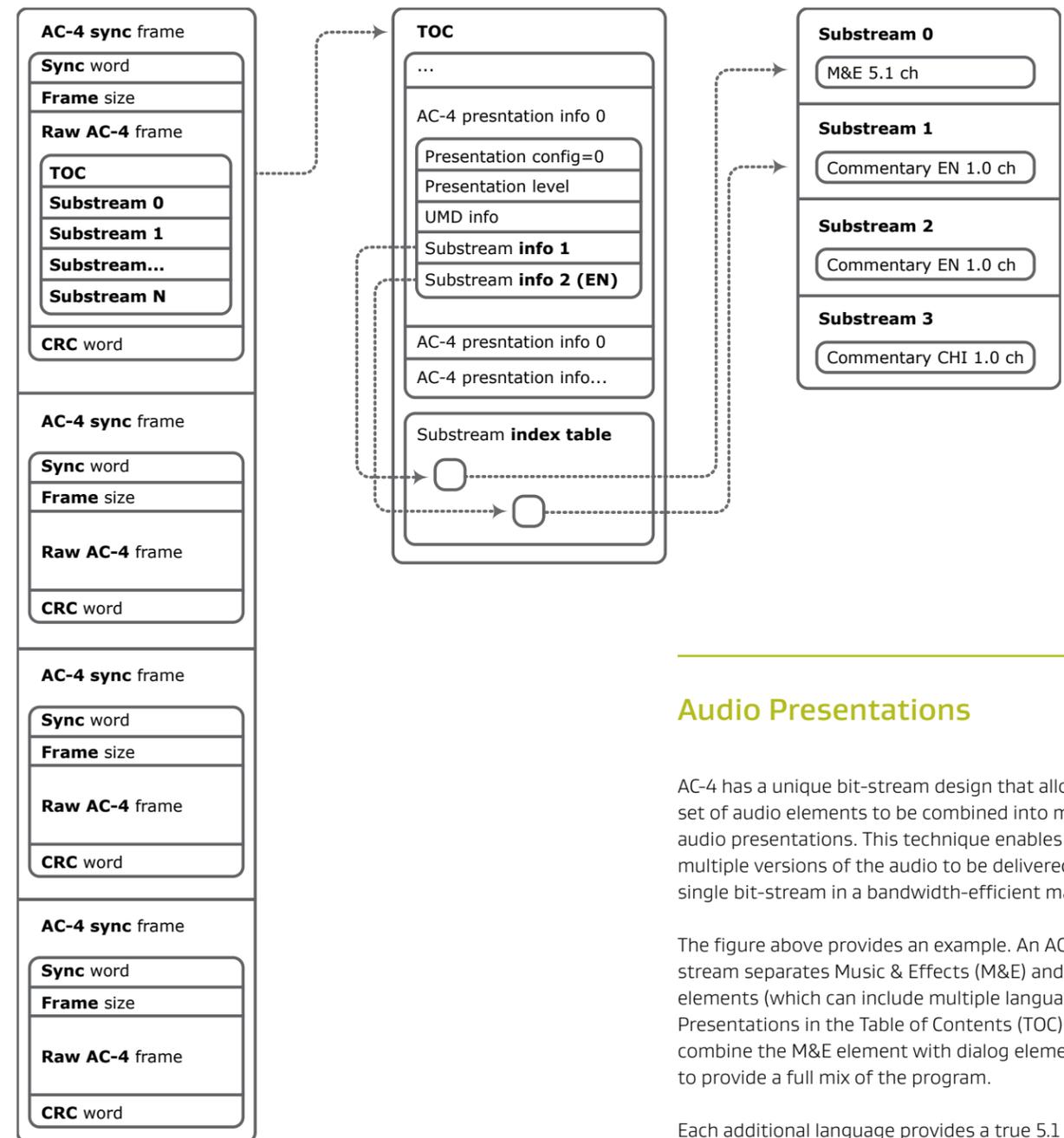
Advanced Joint Object Coding

Object-based audio is a powerful concept that enables audio to adapt to how it's played. People have been talking about this technology—in theory—for years. We've proven the technology with Dolby Atmos in the demanding environments of commercial cinema. Now we've refined it for delivery to all consumer devices.

For playback on low-complexity devices: With Advanced Joint Object Coding, objects are encoded more efficiently, using a layered approach. The original objects are combined into a smaller set of object groups through a reversible process. For example, a low-complexity device that only has a conventional stereo output can decode just this smaller set of object groups to render a stereo output.

For playback on an immersive discrete playback system: On a full-featured device, such as a sound bar, A/V receiver or binaural headphones, Advanced Joint Object Coding data is used during the decoding process to re-create the original set of objects to achieve the highest spatial resolution.

For more information regarding the proposal for the Dolby AC-4 audio system for next-generation broadcast services, please contact us:
DolbyAC-4Inquiry@dolby.com



Audio Presentations

AC-4 has a unique bit-stream design that allows a set of audio elements to be combined into multiple audio presentations. This technique enables multiple versions of the audio to be delivered in a single bit-stream in a bandwidth-efficient manner.

The figure above provides an example. An AC-4 bit-stream separates Music & Effects (M&E) and dialog elements (which can include multiple languages). Presentations in the Table of Contents (TOC) combine the M&E element with dialog elements to provide a full mix of the program.

Each additional language provides a true 5.1 experience, while only requiring the bandwidth of an additional dialog element. This represents a significant savings over the same experience using any technology today.

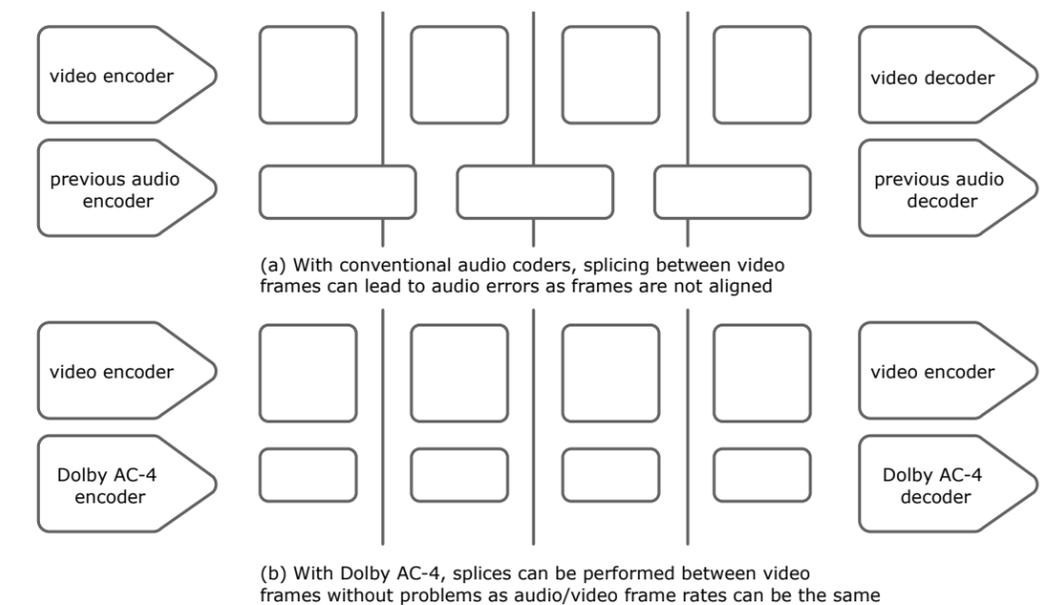
The Dolby AC-4 bit-stream design also provides easy assembly and disassembly of these presentations and elements. This enables elements to be delivered over multiple connections (such as broadcast/broadband hybrid) or played through a second device.

Conventional Approach		Presentation Approach	
Stream	Datarate/kbps	Stream	Datarate/kbps
English 5.1	144	English commentary 1.0	40
Spanish 5.1	144	Spanish commentary 1.0	40
Chinese 5.1	144	Chinese commentary 1.0	40
Commentary - Free 5.1	144	Commentary - Free 5.1	144
Total	576	Total	264
		Saving	54%

Audio Video Frame Alignment

When audio went digital, the nightmares of timing issues with audio and video began. With encoded audio, frames of audio and frames of video were never the same length. When you tried to edit or insert ads, there was always a little bit of audio left over. Trying to keep everything lined up invariably led to synchronization issues. Trying to fix the problem often required completely re-encoding the audio.

Dolby AC-4 takes a new approach that makes encoded audio frames the same length as video frames. By adding a video sync input to the Dolby AC-4 encoder, the system aligns the boundaries of the audio to the video frames. Engineers on the encoding end don't even have to think about "cut points" anymore. And developers of downstream systems no longer have to worry about sync errors and artifacts from trimming or cutting a stream. The Dolby AC-4 audio stays precisely aligned, even when edits or splices are made based on the video frame boundaries.



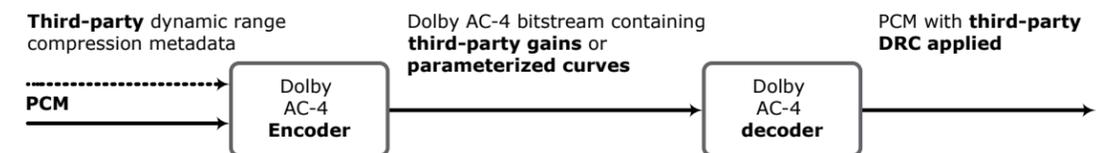
Downstream (Decoder) Technology

Advanced Dynamic Range Control and Intelligent Loudness

Dynamic Range and Loudness Control for audio is a vital part of creating a positive viewer experience—whether it’s getting an audience to lean in to hear a whispered secret or pull back from the roar of an engine.

Viewers and content producers have made their voices heard on the subject of annoying loudness fluctuations and sound quality. Everyone in the ecosystem is eager to respond with a solution that viewers and producers will equally applaud. The current “fix” involves placing single-ended processors at multiple points in the chain: this solution is clunky, expensive, unnecessarily and permanently processes compliant content adding up to compromised sound quality being delivered to viewers. The Intelligent Loudness component of Dolby AC-4 integrates automated loudness control compliant with worldwide regulations that eliminates cascaded broadcaster/programmer and affiliate/operator loudness processing—an industry first.

Dolby’s end-to-end systems approach ensures that compliant programming being delivered from production to the network operation center (or from the network operation center to the affiliates) automatically bypasses additional loudness/dynamics control across the chain. For content from unknown sources without metadata (or for budget-conscious day-to-day operations that do not support metadata), the real-time loudness normalization component of a Dolby AC-4 encoder will automatically ensure transmitted programming remains compliant and with a high level of quality often associated with stand-alone loudness and dynamic range controllers used today.



Dolby AC-4 also includes an Advanced Dynamic Range Control component in the decoder that supports a number of playback modes for adapting the content (under creative control) to a wide range of device types and applications in use today. In addition to the standard playback modes (such as flat panel TVs, home theaters or mobile headphones), the system also supports extensibility to add up to four user-definable playback modes for the future.

Advanced Dynamic Range Control with Intelligent Loudness in Dolby AC-4 not only makes it possible (and easy) to match content to listening preferences, it’s also less complex and more consistent for implementation across a wide range of devices.

8 out of 10

consumers worldwide know the brand and believe Dolby makes all their music, movies, games and TV sound better

Dolby Global Brand Tracker
Conducted by Penn Schoen & Berland, October 2013

*Do you have questions about Dolby AC-4 and how we can partner with you?
We'd love to talk to you:
DolbyAC-4Inquiry@dolby.com*

A Brand Reputation Earned by Performance

In 2015, Dolby celebrates its 50th anniversary. We continue to build technologies that make sight and sound experiences more vibrant, clear and meaningful for audiences worldwide.

Like the immersive audio experience of Dolby Atmos in cinemas, which can “scare the bejeezus out of you” as one critic expressed it. And Dolby Vision, which can transport audiences into a landscape before a word is spoken. Or Dolby Audio 5.1, which makes the sounds of early automobiles and society balls in the 1900s all come alive on Downton Abbey.

Our research is the source of thousands of innovations, a testament to the investment that Dolby makes in staying at the forefront of technology.

Dolby AC-4 audio system for next-generation broadcast services is one of our most important contributions to the future of the entertainment industry. We thank all of our partners for sharing their insights and visions and enabling us to build a platform for today and tomorrow.

Support Trusted by Partners Around the Globe

When technology is constantly changing, support must be rock solid. And that's exactly what our partners have come to expect from Dolby. Our philosophy is that support starts long before the technology is brought to market. We have over 500 development engineers and scientists working closely with partners to understand their requirements for efficient implementation and everyday operation.

We believe in placing resources close to the partner. Which is why we have 20 regional centers around the globe, dedicated to providing technical and engineering support. Partners in each region have convenient access to fully equipped facilities, including product test and interoperability labs, acoustic testing and tuning rooms, and training centers.

