

# Premium Audio Software Enables OEM-Branded User Experience

Aptiv's solution provides OEMs with the opportunity to differentiate their audio systems quickly and cost-effectively.

Software-defined vehicles open the door for innovation in all areas of user experience. However, to get the best performance from their vehicles' audio systems, OEMs need to be able to address the unique acoustics of a specific vehicle with minimal integration and adapt to different cabin settings and car configurations. Many system-on-chip (SoC) suppliers today originate from the smartphone ecosystem and do not fully leverage digital signal processing (DSP) capabilities for scalable automotive audio algorithms, frameworks and applications.

In 2016, a leading global OEM began leveraging Aptiv's DSP expertise, earned through decades of experience with vehicle infotainment, to co-develop an end-to-end software framework that could deliver premium audio. While the solution spans the entire audio software stack — including DSP, audio management, control logic, and tuning and calibration — the OEM owned the tooling to build a differentiated user experience on top of that core software. By centralizing the audio processing in a cockpit domain controller instead of in audio nodes, Aptiv was able to fully integrate the embedded real-time software and eliminate the need for an external unit for audio processing, leading to a 20 percent cost reduction.

**BY BUILDING ON TOP OF CORE SOFTWARE, UP-INTEGRATING HARDWARE AND TAKING ADVANTAGE OF APTIV'S FLEXIBLE BUSINESS MODEL TO SUPPORT CO-DEVELOPMENT, THE OEM WAS ABLE TO ACCELERATE TIME TO MARKET AND REDUCE THE TOTAL COST OF OWNERSHIP ACROSS GENERATIONS.**



## CHALLENGE

- Deliver premium audio and a unique user experience
- Reduce development costs
- Decouple development and tuning to accelerate speed to market



## SOLUTION

- Codeveloped an end-to-end audio stack
- Delivered a core software framework to enable an OEM to develop a differentiated user experience
- Developed audio software that works across OEMs, platforms and configurations, and supports third-party algorithms



## RESULTS

- Increased scalability and eliminated redundancy by reducing the number of software variants from 40 to one
- Reduced time to market from four years to as little as one year by decoupling hardware and software dependency
- Increased flexibility via a fully configurable development framework
- Reduced costs 20% by up-integrating audio processing into the domain controller
- Reduced labor requirements for supplier coordination by 80%

## Scalable

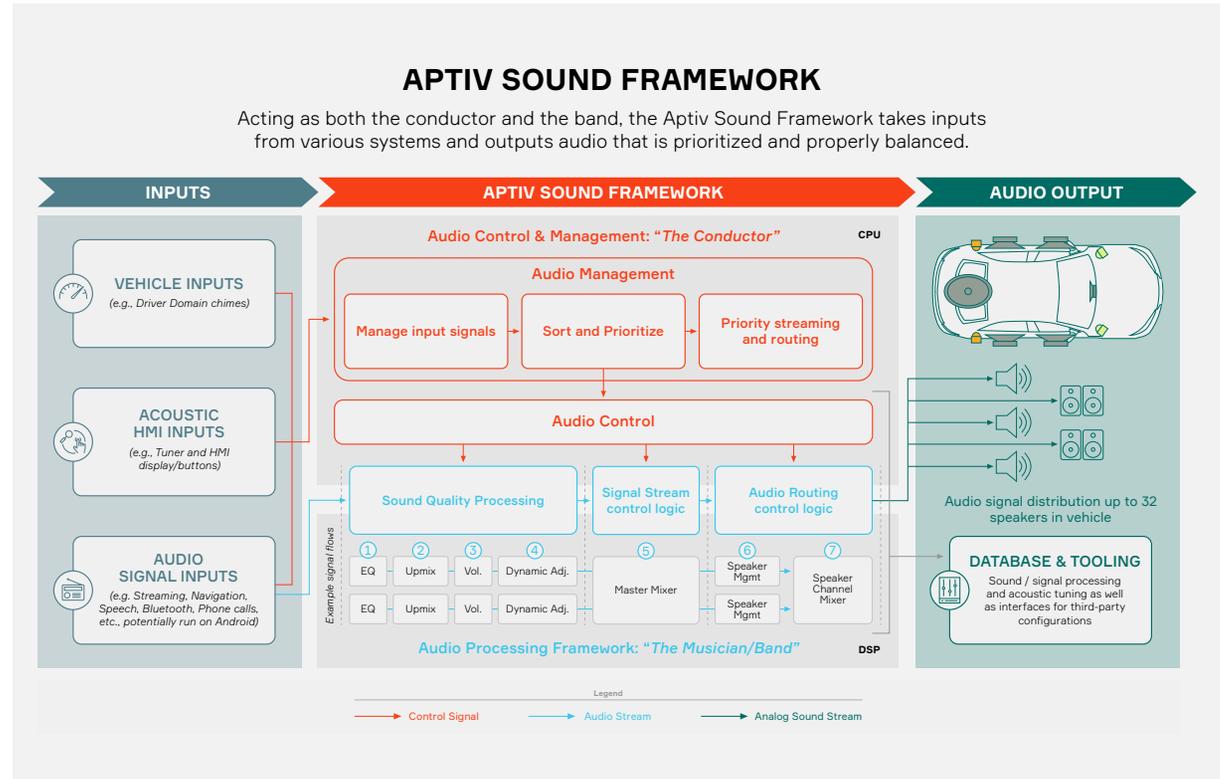
Aptiv created the solution to be highly scalable, from base to premium sound systems. Because the core software is the same for all variants, it is not dependent on any specific hardware or amplifier, and it supports multiple SoCs and digital signal processors. The OEM was able to transition to a new SoC faster and more cost-efficiently and could use the core software across several programs, generations and head units.

## Future-proof

By abstracting the core software — now called Aptiv Sound Framework — from the hardware, we have made it possible to continue building on it. Aptiv can offer OEMs a variety of options, including supplying core software to operate on existing hardware, providing hardware and software together, or supporting the OEM through premium consultancy services ranging from identifying and fixing audio issues to testing and implementing improved solutions.

We welcome collaboration and have the capability to provide hardware solutions that can flexibly integrate any third-party DSP software audio libraries.

Aptiv's decades of experience with audio architecture and our strong focus on reuse enables us to reduce time to market, development costs, the total cost of production and the cost of sustaining engineering — all while delivering better sound quality and performance.



### VERSATILE

- **40 variants supported by one software baseline**



### FAST

- **4x faster implementation**



### END-TO-END

- **DSP**
- **Audio management**
- **Control logic**
- **Tuning and calibration tooling**



### COST-EFFECTIVE

- **20% cost reduction**

