S2C Accelerates Development Timeline of Bluetooth LE Audio SoC

S2C has been shipping FPGA prototyping platforms for SoC verification for almost two decades, and many of its customers are developing SoCs and silicon IP for Bluetooth applications. Prototyping Bluetooth designs before silicon has yielded improved design efficiencies through more comprehensive system validation, and by enabling hardware/software co-design prior to silicon availability. When Bluetooth IP and SoC prototypes can be connected directly to real system hardware, running at hardware speeds, running real software prior to silicon, the resulting design efficiencies enable reduced development times, and higher quality products.

Bluetooth Low Energy (“BLE”) is a wireless communication technology that is used in a wide variety of applications including smart home devices, fitness trackers, and medical devices such as Neuralink’s Brain-Computer Interface – applications that require low-power operation, and short-range wireless connectivity between devices (up to 10 meters). The Bluetooth protocol was originally introduced by the Bluetooth Special Interest Group (“Bluetooth SIG”) in 1998, followed by Bluetooth Low Energy (BLE) in 2009, and most recently the Bluetooth Low Energy Audio (“BLE Audio”) specification was released in 2022. BLE Audio focuses on higher power efficiency than the classic version of Bluetooth, provides for higher audio quality than standard Bluetooth, and introduces new features – and was the largest specification development project in the history of the Bluetooth SIG.

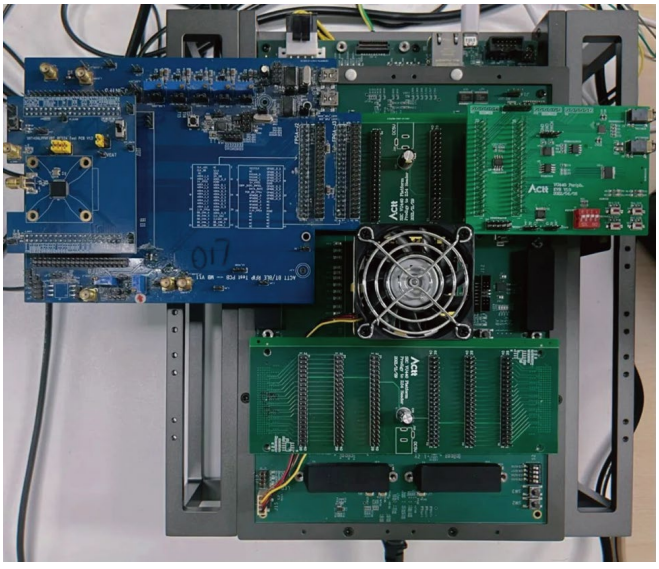
One provider company of silicon IP and SoC design services that chose S2C’s FPGA-based

prototyping solutions for their SoC verification and system validation platform was Analog Circuit Technology Inc. (“ACTT”). ACTT was founded in 2011 and specializes in the development of low power physical IP and full SoC design services. ACCT’s portfolio includes ultra-low power analog/mixed-signal IP, high reliability eNVM, wireless RF IP, and wired interface IP. ACTT’s IP is widely used in 5G, Internet of Things (“IoT”), smart home, automotive, smart power, wearables, medical electronics, and industrial applications.

For one of its BLE projects, ACTT planned for a design verification and system validation platform that would take on several significant challenges;

1. **A System-level Verification** platform for a BLE Audio SoC that would enable comprehensive validation of the entire system's functionality, and would also support industry regulation compliance testing.
2. **A Hardware/Software Co-Design** platform that would provide the software development team with a platform for early software development and hardware/software co-design.
3. **A Stability Testing** platform – and as it turned out, several issues were surfaced by the verification platform that required highly-targeted debugging to ensure product stability and performance standards compliance.

Working together with ACCT on their BLE Audio project, ACCT selected S2C’s VU440 Prodigy Logic System prototyping hardware platform, prototyping software, and debugging tools for a comprehensive FPGA prototyping platform. As part of their complete prototyping solutions, S2C offers a range of versatile daughter cards (“Prototype-Ready IP”), such as I/O expansion boards, peripheral interface boards, RF interface boards, and interconnect cables. S2C’s Prototype-Ready IP supports prototyping interfaces for JTAG, SPI FLASH, UART, I2S, SD/MMC, and RF, with speeds of up to 60MHz. S2C’s off-the-shelf Prototype-Ready IP enables faster time-to-prototyping, and reliable plug-and-play interconnection to S2C prototyping platforms.



ACTT's Deputy General Manager, Mr. Yang, offered an enthusiastic retrospective of ACTT's use of S2C's FPGA-based prototyping platform: "During the development of our BLE Audio SoC, we effectively used S2C's Prodigy Logic System for hardware verification and concurrent hardware/software development. This innovative approach enabled us to complete the software SDK development well ahead of the chip product's tape-out phase, resulting in a remarkable timesaving of approximately 2 to 3 months in our overall product development timeline."

Through committed collaboration with customer-partners, such as ACTT, S2C has a reputation for stimulating independent innovative thinking about SoC verification, and enhancing its customers' competitiveness in their respective markets. By working closely with its customer-partners, S2C fosters a thriving collaborative working environment that encourages the timely exchange of ideas, resources, and SoC development expertise. With a shared vision of success, S2C and its customer-partners strive to achieve successful SoC development outcomes like ACCT's, that delivers compelling value to our customer-partners.

REFERENCES

CNBC; Elon Musk's brain implant company Neuralink announces FDA approval of in-human clinical study; https://www.cnbc.com/2023/05/25/elon-musks-neuralink-gets-fda-approval-for-in-human-study.html

Patients with Neuralink devices will learn to control it using the Neuralink app. Patients will then be able to control external mice and keyboards through a Bluetooth connection, according to the company's website.

ARS Technika; July 12, 2022; What's Bluetooth LE Audio? Explaining the spec and what it means for wireless sound; https://arstechnica.com/gadgets/2022/07/whats-bluetooth-le-audio-explaining-the-latest-wireless-tech-standard/

On Tuesday (July 12, 2022), the Bluetooth Special Interest Group (SIG), the industry group that makes the Bluetooth wireless standard, announced the completion of its latest specification: Bluetooth Low Energy (LE) Audio. Like Bluetooth LE, Bluetooth LE Audio focuses more on power efficiency than the classic version of Bluetooth. It also seeks to provide better audio quality than standard Bluetooth and introduces new features.

Bluetooth SIG today announced the full set of specifications for Bluetooth LE Audio. This is great news because when it first announced Bluetooth LE Audio in January 2020, the expected spec release date was in the first half of 2020. And work on the spec has been ongoing since at least 2015. Apparently, Bluetooth LE Audio was the "largest specification development project in the history of the Bluetooth SIG," according to a statement from Mark Powell, Bluetooth SIG's CEO.