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Hardware-Software (HWSW) Co-Verification

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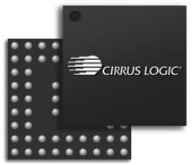
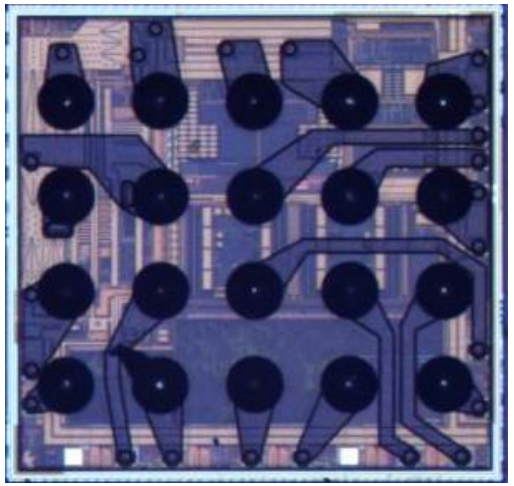
08/06/2022



Advanced Signal Processing Components

Company Overview

- **Fabless Semiconductor company based in Austin, Texas**
- **$1.8 B in revenue**
- **Design centres in Edinburgh, Newbury, London**
  - Around 400 employees in the UK
  - More than 1,500 employees worldwide



CIRRUS LOGIC

Our Technology Bridges the Physical and Digital Worlds

Analog
(The Real World)

Digital
(The World of Data)

Measure, digitize the real world,
process control algorithms,
Convert, boost, amplify, power the output
on single IC

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Our focus - Low Power, Mixed-Signal Processing

Our core products

- Audio Amplifiers
- Smart CODECS
- Haptics Driver
- Audio Headsets
- Custom ASIC

1,100+ Engineers

IC Designers, System and Application Engineers, and Software Experts

3,900+ Patents

pending & issued patents worldwide

$300M in R&D

Spending in the 12 months

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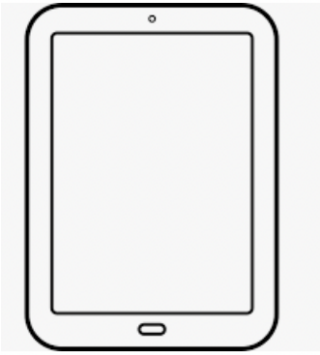
Key Customer Products

#1 customer phone

Galaxy-Z fold 3

Xiaomi 11T Pro

Fitbit Versa 3



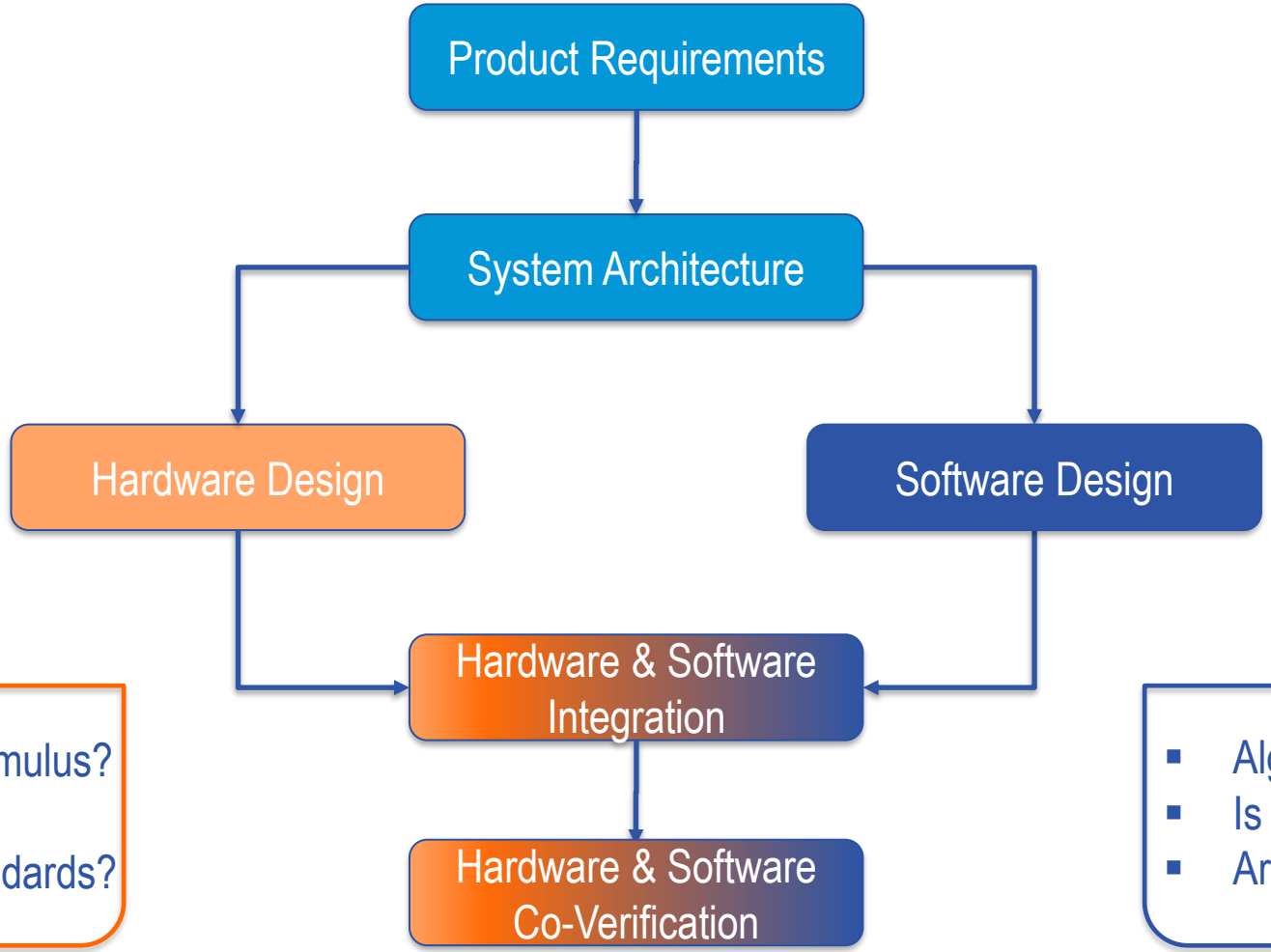
#1 customer tablet

Lenovo
Ultrabook

Harman
Car infotainment

Beats Studio3

What Is HWSW Co-Verification?



HW Verification

- Output correct based on stimulus?
- Are timings within specs?
- Do protocols adhere to standards?

SW Verification

- Algorithms working as expected?
- Is memory allocated correctly?
- Are processing blocks functional?

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What Is HWSW Co-Verification?

HW Verification

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SW Verification

- Algorithms working as expected?
- Is memory allocated correctly?
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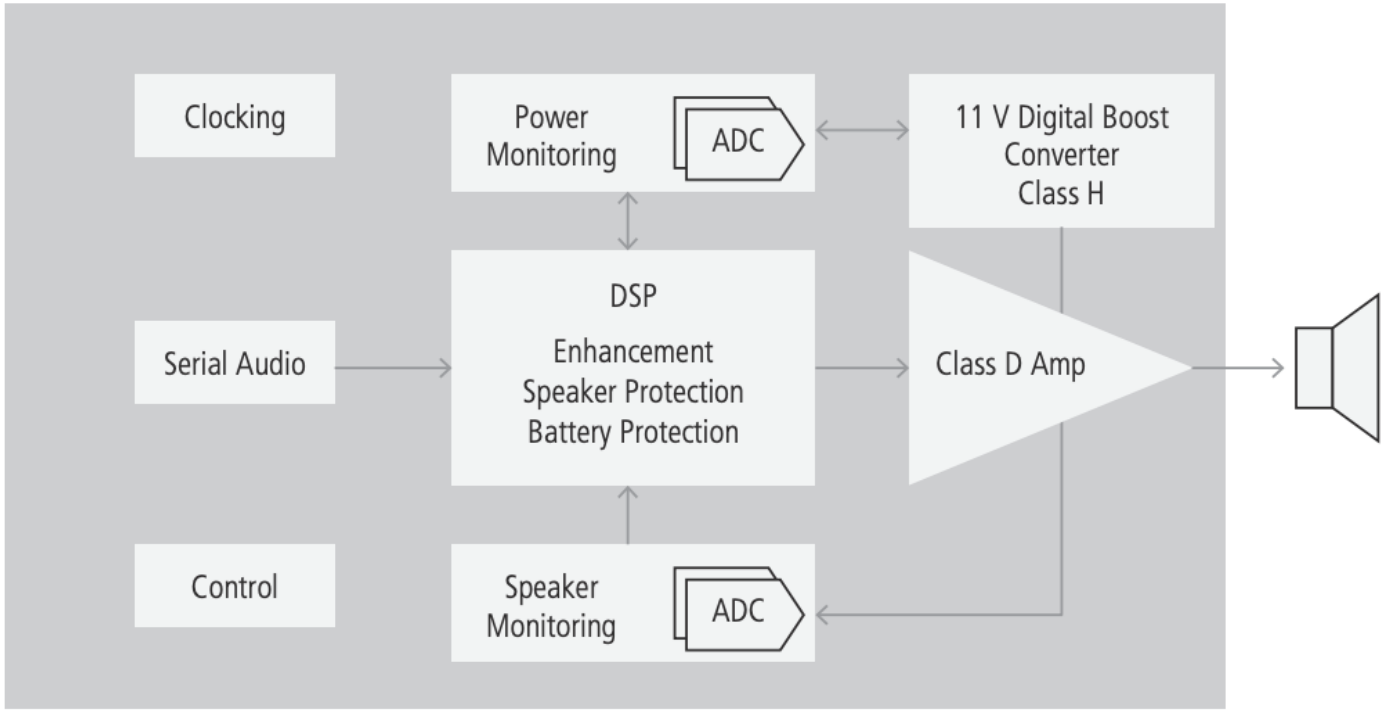
HWSW Co-Verification

- Verify Interaction between HW & SW
  - HW Design matches SW use cases
  - SW executes correctly on HW
- Run SW on simulated HW
- Target features at HW-SW boundary

Modern Chip Example – Audio Amplifier



How Do HW and SW Work **Together?**

- **HW Blocks/Features**
  - Interfaces
  - Signal Converters
  - Amplification
- **SW Blocks/Features - CPU**
  - Audio Processing
  - Speaker/Battery Protection
  - Security

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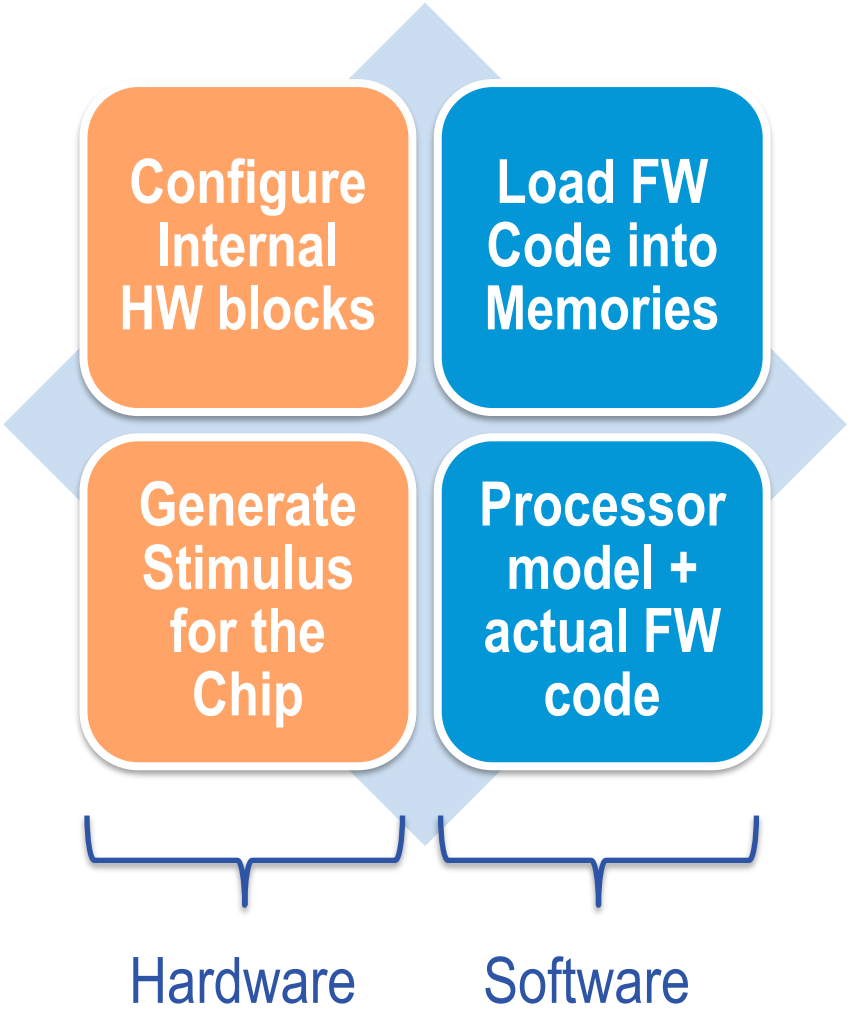
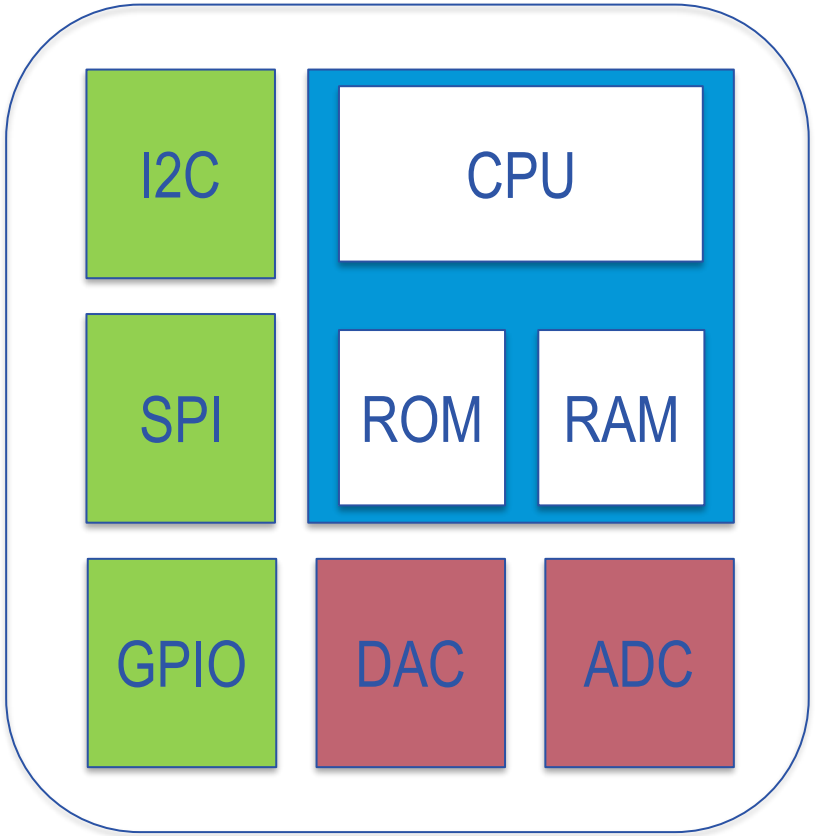
Why We Need HWSW Co-Verification?

- **Parallel HW & SW development**
- **Ensures embedded software (ESW) is bug free**
  - → Increased usage of Read Only Memory (ROM)
- **Ensures hardware is properly designed for ESW usage**
- **Ensures HW and ESW work together seamlessly**
- **Exposes issues that are difficult to reveal on other platforms (eg FPGA)**
  - Clocking reproduced more accurately than on FPGAs
  - More randomisation capabilities than hardware test platforms

How HWSW Co-Verification Works?





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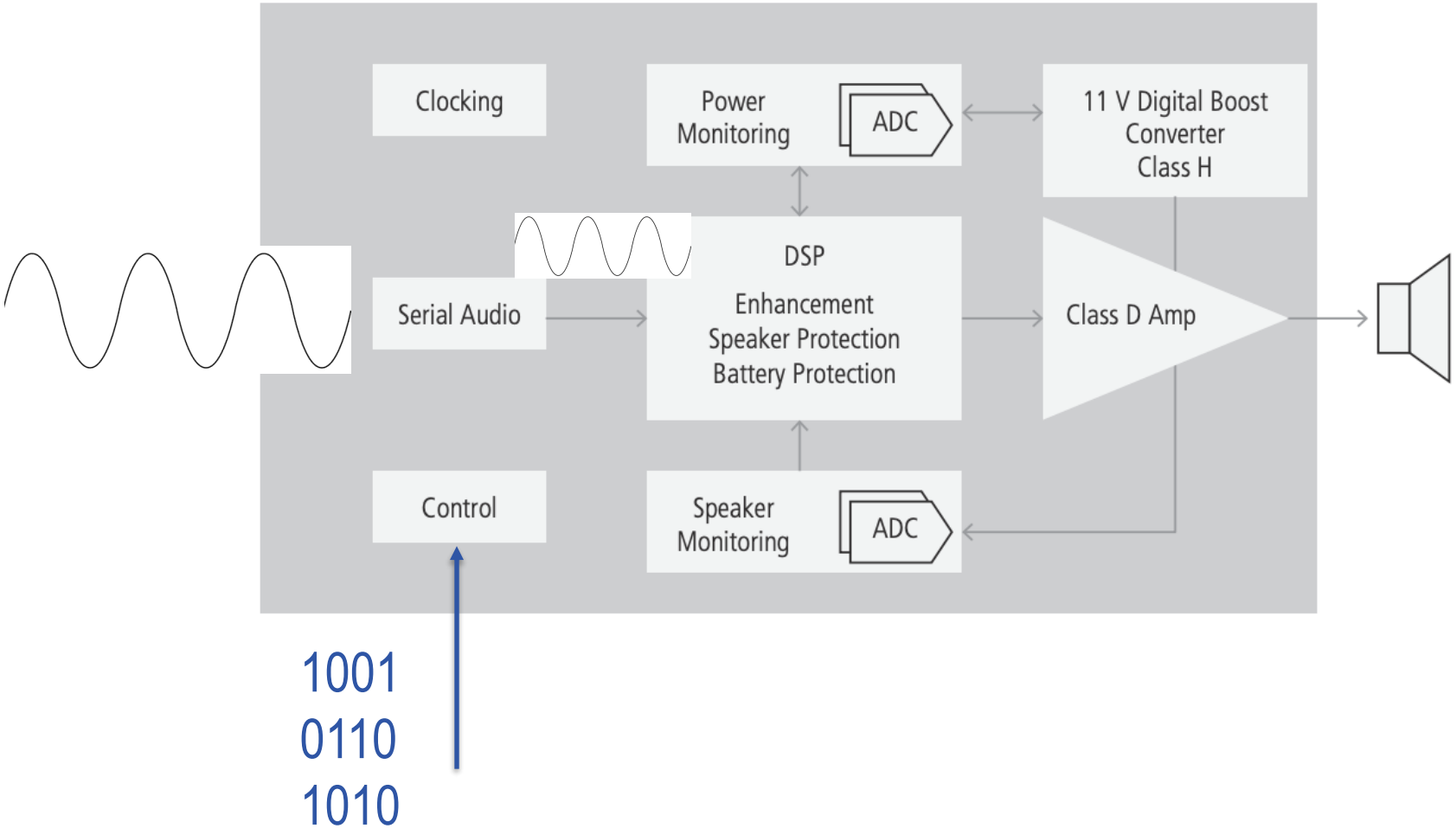
HWSW Scenario – HW Perspective



1. Apply required Clocks
2. Generate an Audio signal from TB
3. Write to HW registers to configure Audio path
4. Signal arrives at DSP input

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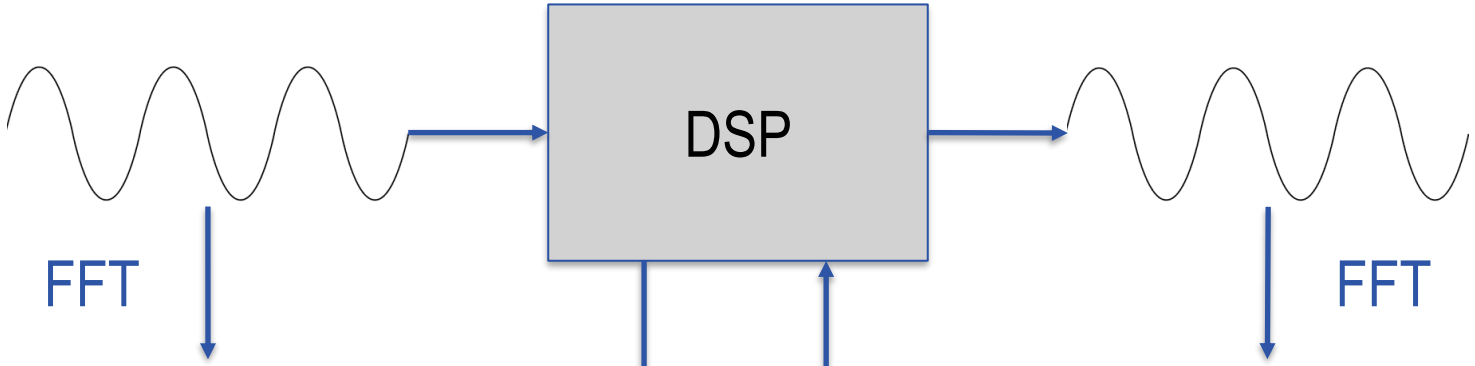
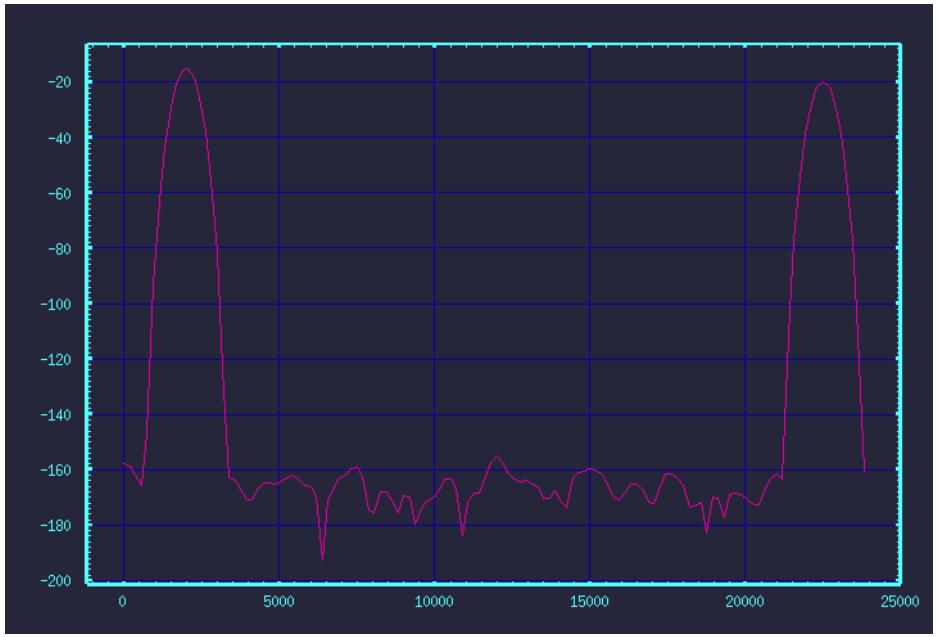
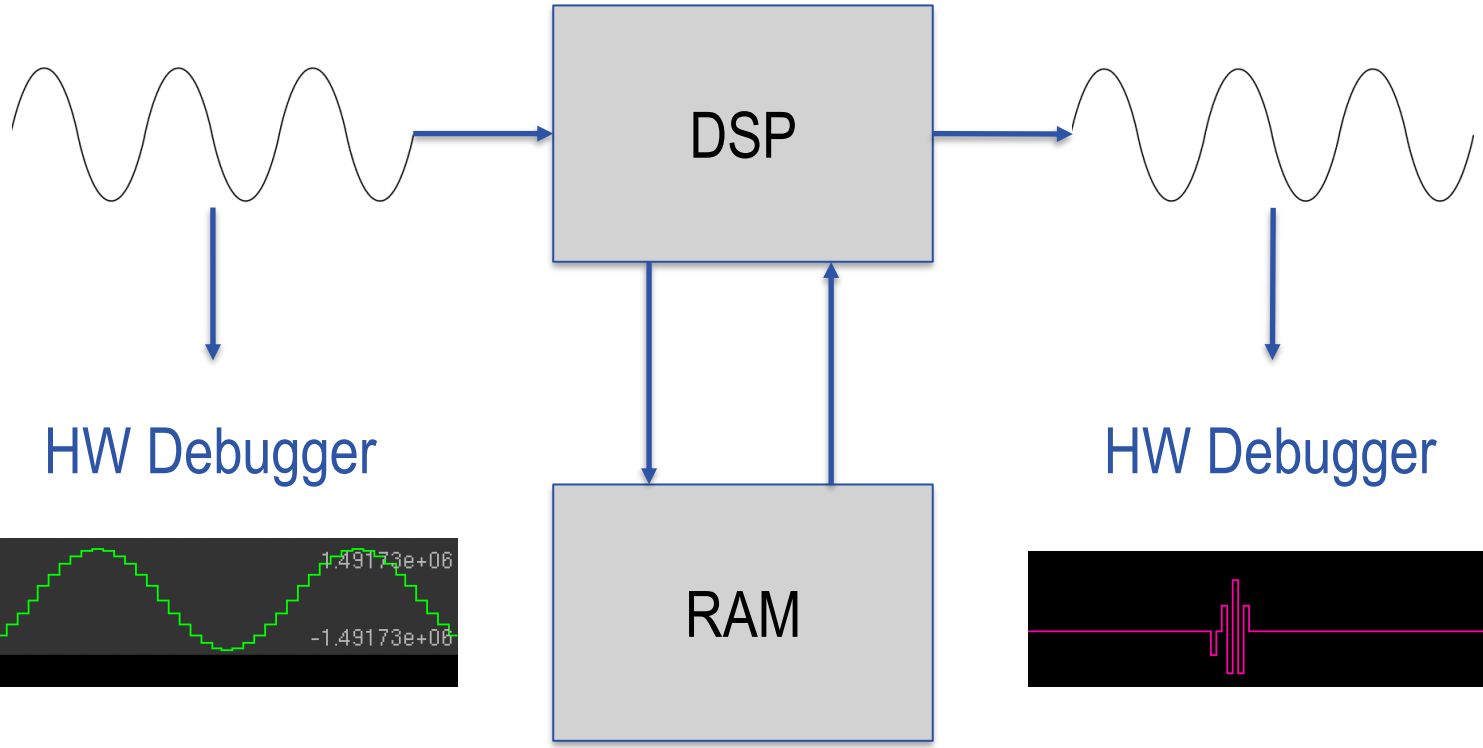
HWSW Scenario – SW Perspective

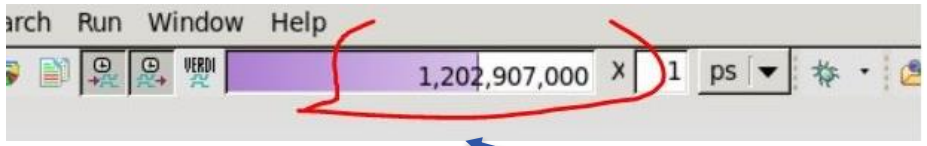




HWSW Scenario – SW Perspective

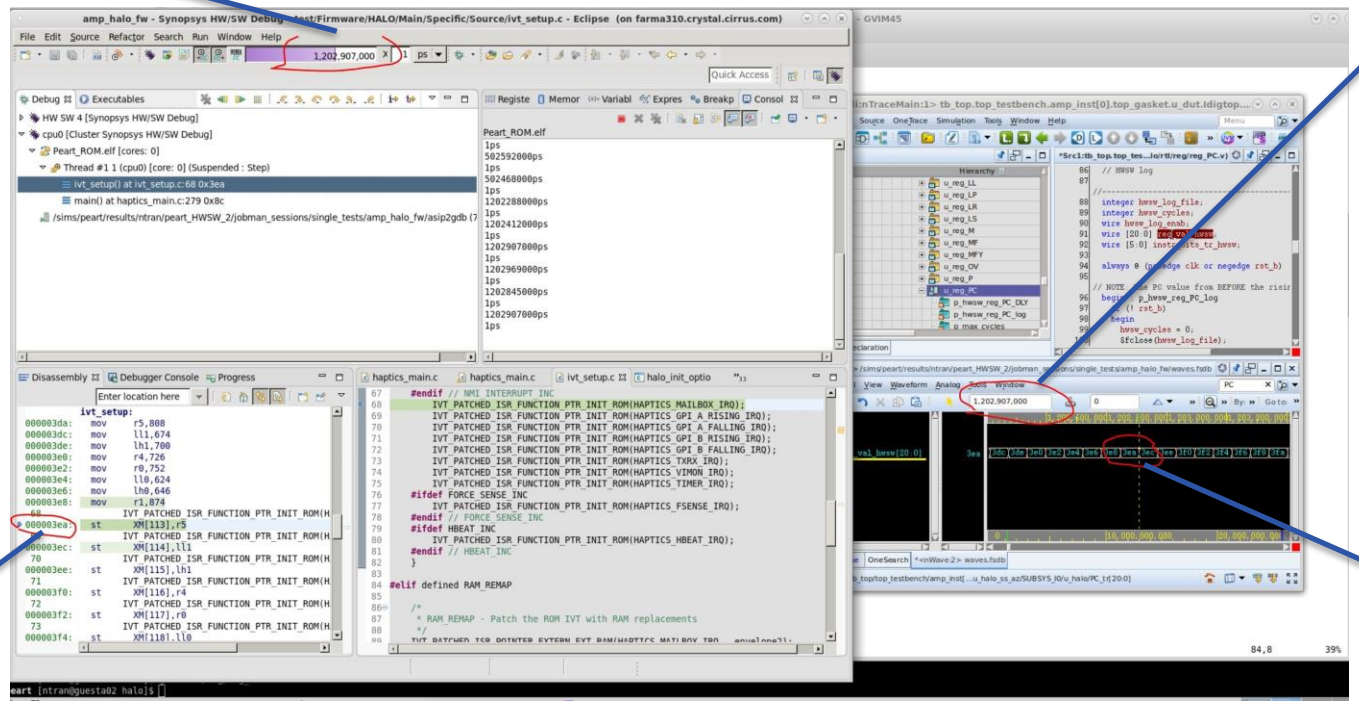


How HWSW Co-Verification Works - Debugging



Eclipse timestamp

Verdi timestamp



Eclipse program counter

Verdi program counter

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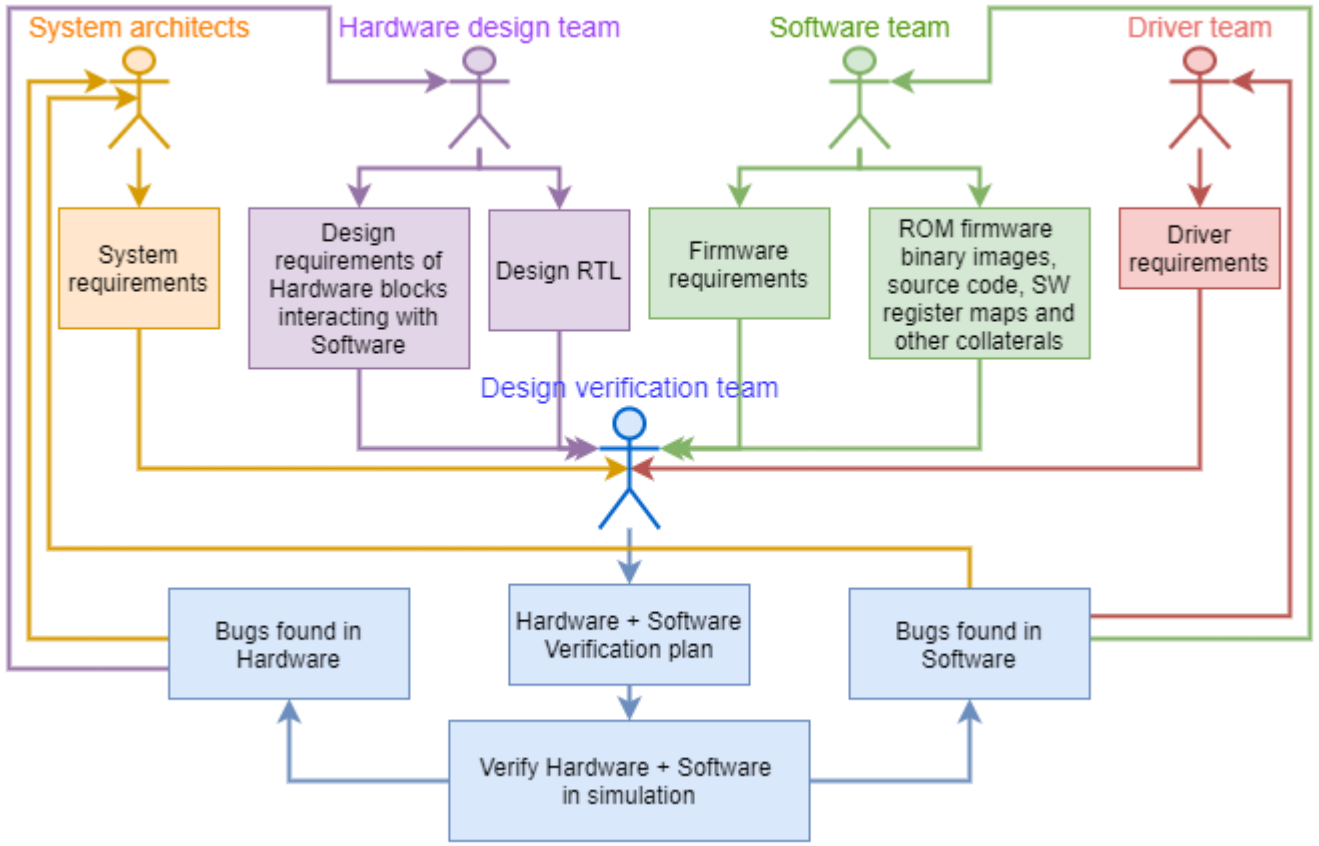
What Makes HWSW Interesting?

- **Multidisciplinary work**
- **Gather info from different teams**
- **Understand full chip**
- **Use various technologies**
  - Testbench – SystemVerilog + UVM
  - Embedded C/C++
  - HW Debugging
  - SW Debugging
  - Scripting



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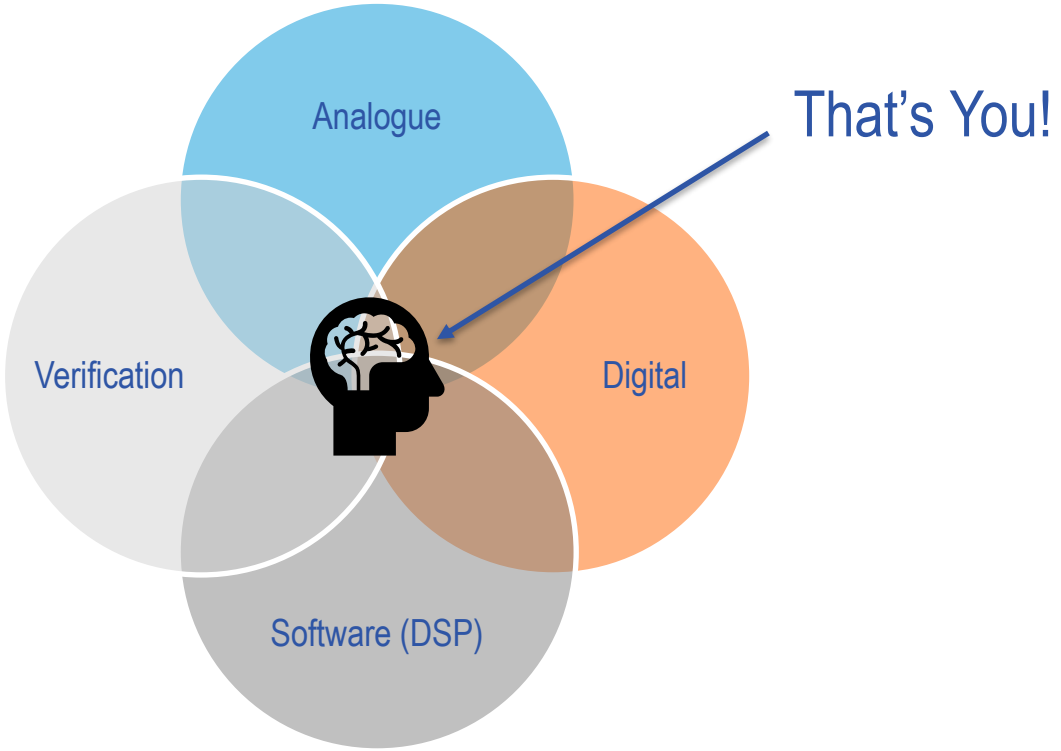
HWSW Co-Verification – Early Careers

- Learn something not taught at universities
- Exposure to Verification, Firmware and Design
- Real responsibility



Our Award-Winning Work Culture

Questions

Past projects | Interviews

Important Dates

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