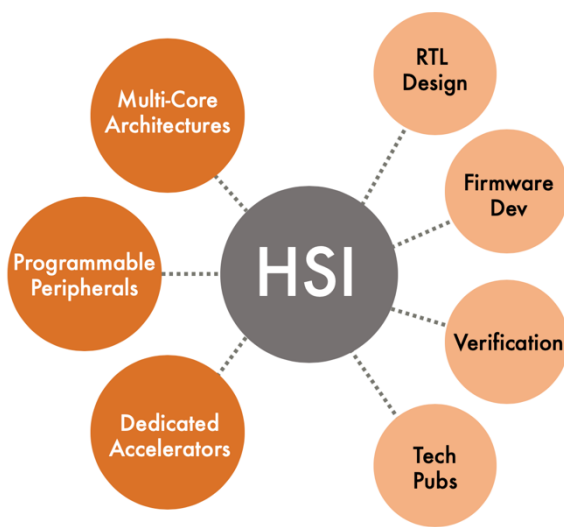


How Semifore Enables Design Team Innovation

Problem Statement

Advanced semiconductor designs have many components, including multi-core architectures, programmable peripherals and purpose-built accelerators. These design elements require a pathway for embedded software to communicate with them. This is the hardware/software interface (HSI) and it forms the foundation for the entire design project.

There are many activities that need information about the HSI. These activities include device drivers and firmware, hardware design and verification, technical documentation, system diagnostics and application software. All of them need accurate, up to date HSI information in many different and specialized formats. A lack of unified, up to date information results in poor collaboration and an increased opportunity for design errors.



Chip design managers need to consider what happens if the HSI is out of date, or if subtle errors are introduced. A recent Wilson Research Group report

summarized the causes of ASIC re-spins. Logic or functional issues topped the list, with design errors, changes in the spec and incorrect/incomplete specs being the leading causes. Many of these issues can be traced back to the HSI. In fact, data has shown that one in seven chip re-spins is due to HSI issues.

Some design teams manage the specification and development of the HSI with a spreadsheet and scripts. As the number of control and status registers exceeds thousands, this approach falls short and project risks grow. Changes made to the HSI as the design matures add another opportunity for error.

Specification languages such as IP-XACT (IEEE 1685-2014) and SystemRDL 2.0 provide options, but these languages can only express a subset of the behaviors and design details needed to specify the HSI. Semifore addresses these challenges with a robust compiler and a domain-specific language.

The Semifore Approach

The CSRCompiler™ system generates high quality synthesizable RTL to build the HSI. It also outputs the detailed HSI formats required by the relevant teams and activities. Through many years of development, CSRCompiler delivers extensive error checking and validation, with over 1,000 checks built in. All inputs are verified for semantic and syntactic correctness. Design practices that can lead to sub-optimal results are also flagged.

CSRCompiler is regularly used to validate IP deliverables expressed in IP-XACT. The result is improved IP consistency and use. This system has also been used to validate releases of IP-XACT and SystemRDL.

Addressing the diverse needs of different teams using the HSI requires supporting many formats. These formats often require customization for a particular application. CSRCompiler supports customization with a robust output tailoring capability that doesn't require scripting. CSRCompiler also runs fast, generating 100,000 registers in seconds. This allows real-time updates as the HSI evolves. One large system OEM runs CSRCompiler thousands of times per day to ensure all teams are using the latest information.

