SYNOPSYS®

Shift Left to Accelerate Your Vehicle Design Process

A Primer on Our Triple Shift Left Methodology

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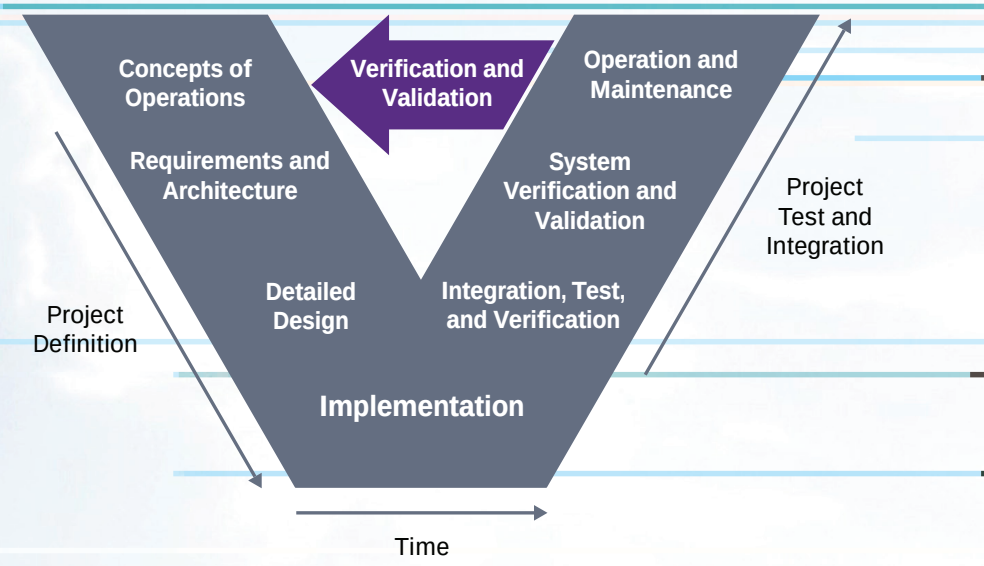
Powering Automotive Innovation—from System to Software and Silicon

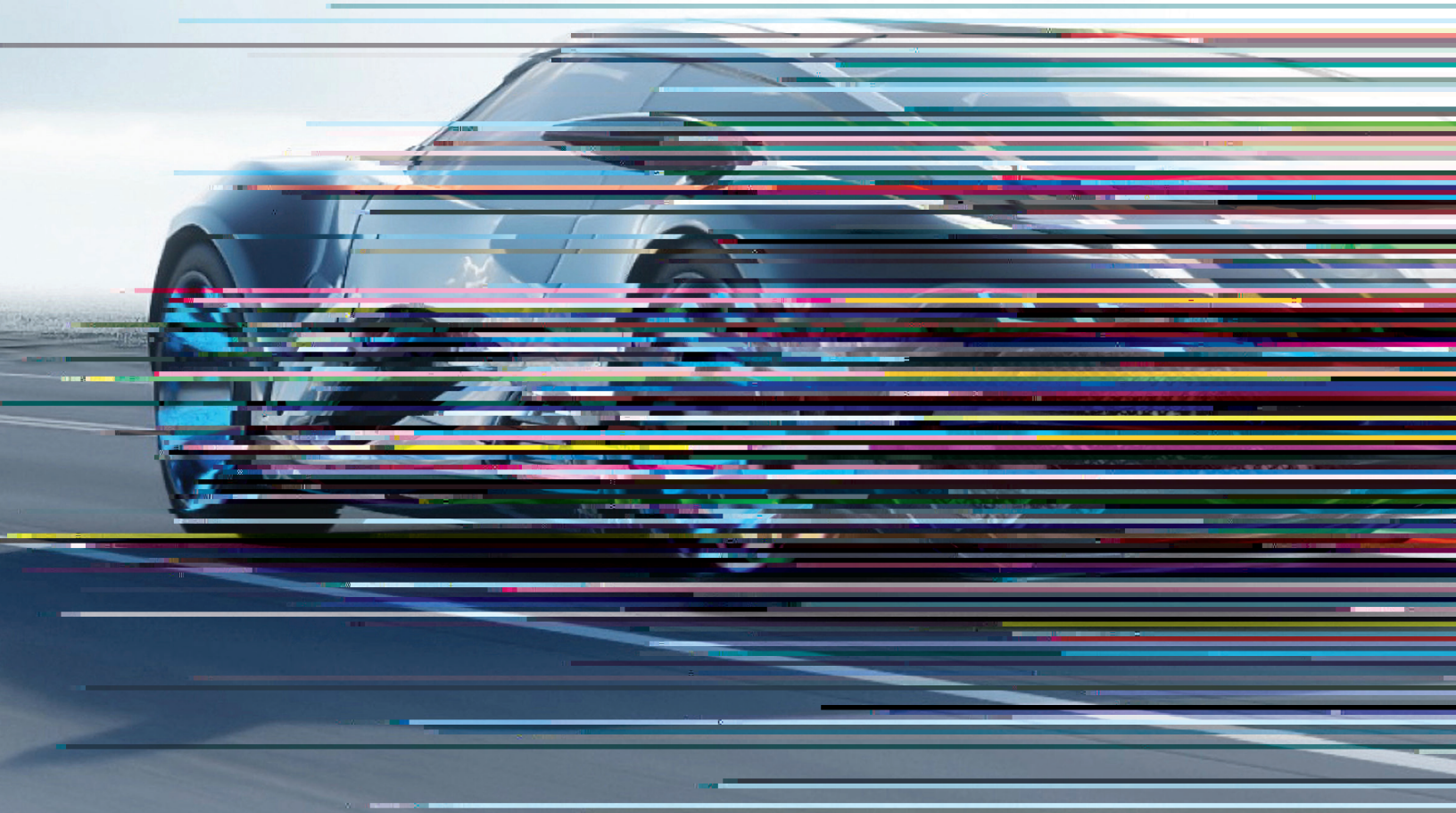
What does it mean to shift left when it comes to automotive design? It's about finding the best solution to your problem and ensuring its feasibility during design as early as possible—well before testing. And delivering safety, security, reliability, and quality across the automotive digital value chain.

Big data and automated capabilities are helping to make cars safer, but they're also presenting a major disruption in the automotive development process. What's more, the constant evolution of automotive architectures, as well as the need for the highest levels of optimized computing power for applications like in-vehicle entertainment and autonomous driving, demand highly integrated, optimized SoCs.

The Synopsys Triple Shift Left methodology presents a way forward by transforming a traditionally serial automotive development process into a parallel one.

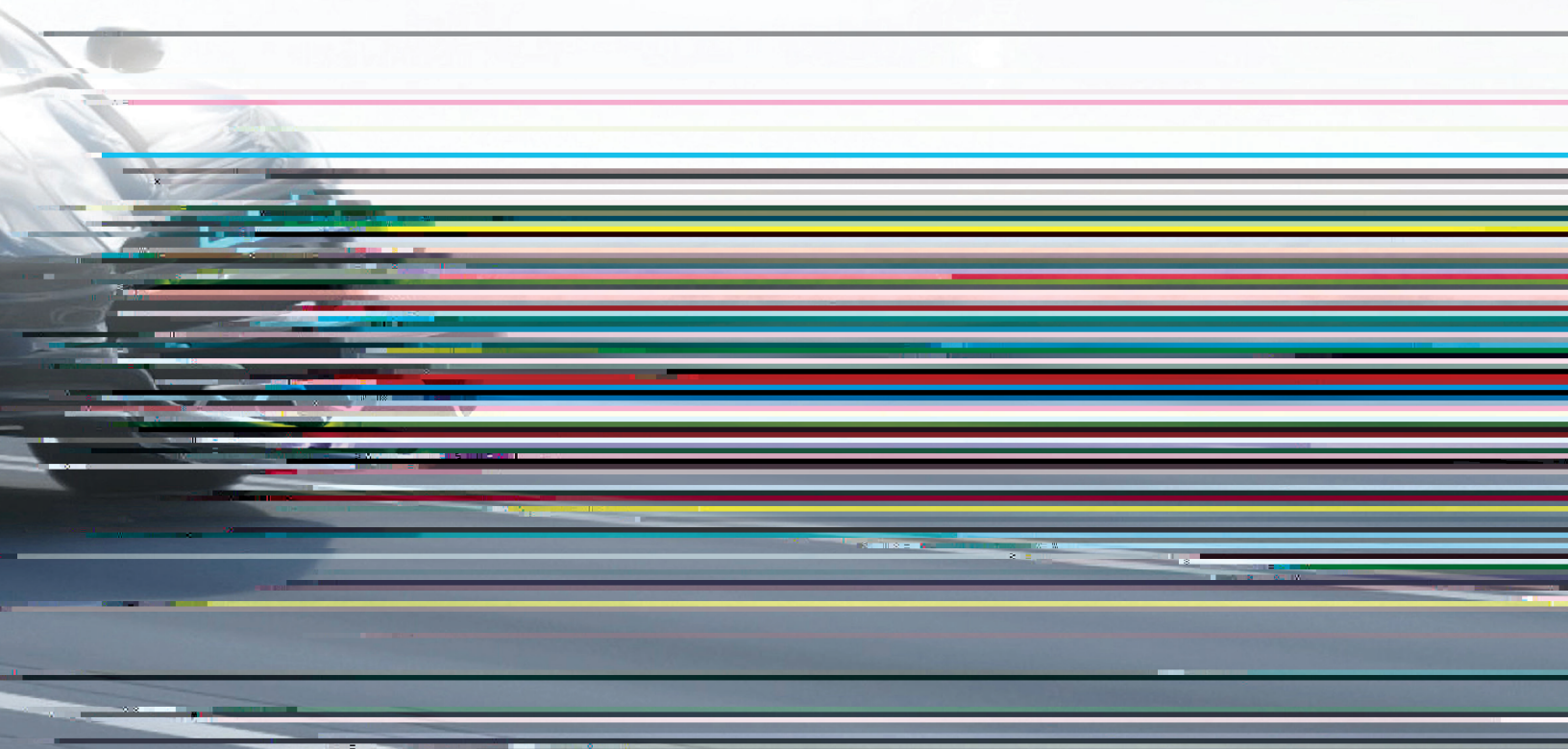
The idea of shifting left comes from the software industry and its drive to improve and optimize prior to testing. Rather than a linear flow, the Synopsys methodology is based on the V-model and agile development process, where each phase of the development lifecycle is tied to its associated testing phase/sprints. The idea is to provide greater flexibility and agility into the cycle, while identifying opportunities for enhancement early on.





Given the high stakes of the semiconductor world, a shift-left approach equips you to address the unique challenges of the automotive industry. Our Triple Shift Left methodology covers three key areas:

- Shift #1 covers the system level, helping you—based on your functional requirements—to explore electrical/electronic (E/E) architectural



performance and power. The Virtualizer™ solution uses advanced modeling tools for accelerated development and deployment of virtual prototypes. Complementing this is the Saber platform for automotive, which lets you design and verify the interaction of multiple technologies (electrical, mechanical, hydraulic, magnetic, software, etc.). With Saber, you can create virtual prototypes of your system, including the wire harness, to reduce the number of design iterations and hardware prototypes.

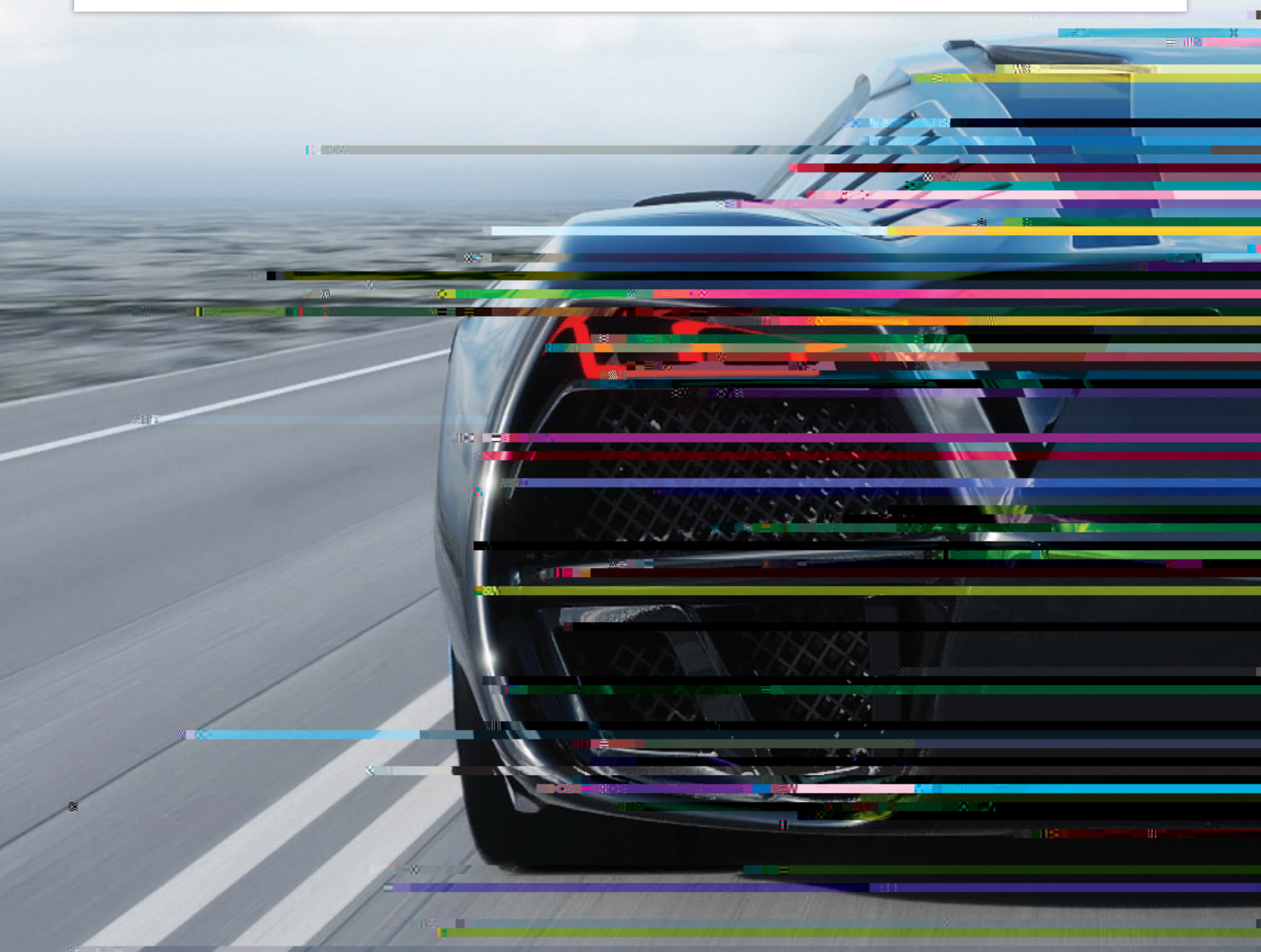
Our Shift #1 approach for system development guides you to meet your design performance requirements while achieving tight time-to-market targets.

Shift #2: Starting Software Development Earlier

Shift #2 is about , with an emphasis on early development of safe and secure software and testing it on virtualized hardware and operating systems. This phase is about increasing coverage, accelerating test cycles, and using automated regression to allow frequent software updates.

Shift #2 Solutions

- Virtualizer virtual prototyping development environment
- VDKs for early software development
- QTronic virtual ECU for fast feedback on automotive application software
- HAPS® FPGA-based prototyping
- Hybrid prototyping
- Virtual prototyping services
- Defensics fuzz testing platform
- Coverity® static application security testing
- Black Duck Open Source management
- CodeDx platform for automating key workflows to enhance speed and security



Through our virtual prototyping solutions and VDKs, Synopsys provides early access to silicon chips and virtual ECUs, so software development can start up to 18 months earlier, well before hardware becomes available. With our virtual models, Synopsys helps you create test platforms for virtual vehicle development. Then, you'll be prepared to engage in extensive verification through static security testing, software composition analysis, interactive security testing, and fuzz testing.

Even after hardware is available, virtualized ECUs boost software integration and regression testing across distributed software development teams. This approach is much more scalable and cost effective than shipping around development boards. In parallel, our software integrity solutions enable you to ensure the highest levels of software safety, security, reliability, and quality through rigorous testing and validation.

With our Shift #2 approach for software development, you can get a head start on building security and quality into all stages of your automotive software lifecycle.

Shift #3: Faster SoC Design and Verification

Shift #3 centers on , prescribing accelerated development of robust, safe, and secure automotive-compliant SoCs with automotive-grade building blocks and design flows. Using pre-designed, pre-verified IP to implement dedicated functions on silicon saves time and effort versus developing these functions from scratch. Tools certified to automotive standards along with flows designed to support product safety compliance help you deliver a safe, secure, and reliable ride.

To support this shift, Synopsys provides IP and design flows, as well as expert services. We accelerate automotive SoC design and qualification by delivering the broadest portfolio of automotive-grade DesignWare® Interface, Processor, Security, and Foundation IP with the highest levels of safety, security, reliability, and quality. Our hardware/software co-design and Verification Continuum® solutions allow you to connect the entire automotive value chain during the SoC development process and avoid unnecessary iterations.

Shift #3 Solutions

- DesignWare IP for automotive
- HAPS FPGA-based prototyping
- Hybrid prototyping
- Hybrid emulation
- Verification Continuum
- Safety-aware solutions