

# VC Z01X Fault Simulation for Functional Safety Verification

## Comprehensive high-speed fault simulation for functional safety verification

### Overview

Electronic systems in automobiles are growing rapidly in size, complexity, and critical functionality. As a result, functional safety verification is emerging as an essential requirement for automotive SoC and IP designs. In order to assure that even the most stringent safety standards are met, fast and comprehensive fault injection and simulation solutions that adheres to the strict set of safety standards as outlined by ISO 26262 and IEC 61508 are required.

### Introduction

Built upon Z01X, the industry-leading fault simulator, and VCS, the fastest functional simulator. Key advantages of VC Z01X functional safety verification solution include:

- Ease-of-use while transitioning from functional verification with VCS to fault simulation in VC Z01X by eliminating logic simulation mismatches
- Superior performance leveraging optimizations in VCS
- Full SystemVerilog/UVM, C/C++ testbench stimulus support
- Integration with VC Formal FuSa in the Unified Fault Platform

Synopsys' VC Z01X functional safety verification solution injects faults throughout automotive devices and simulates the effects to help users develop robust diagnostic tests and verify safety mechanisms to meet the fault injection requirements in the ISO 26262 automotive safety standard, and the IEC 61508 industrial safety standard.

With the most complete fault model set of any available solution, VC Z01X has the speed and capacity to inject faults that represent the random hardware failure types defined in ISO 26262. VC Z01X can model various types of permanent and transient faults. Its innovative simulation management environment (Fault Campaign Manager) and advanced concurrent algorithms are designed to maximize the throughput of fault injection and fault simulation for even the most complex designs.



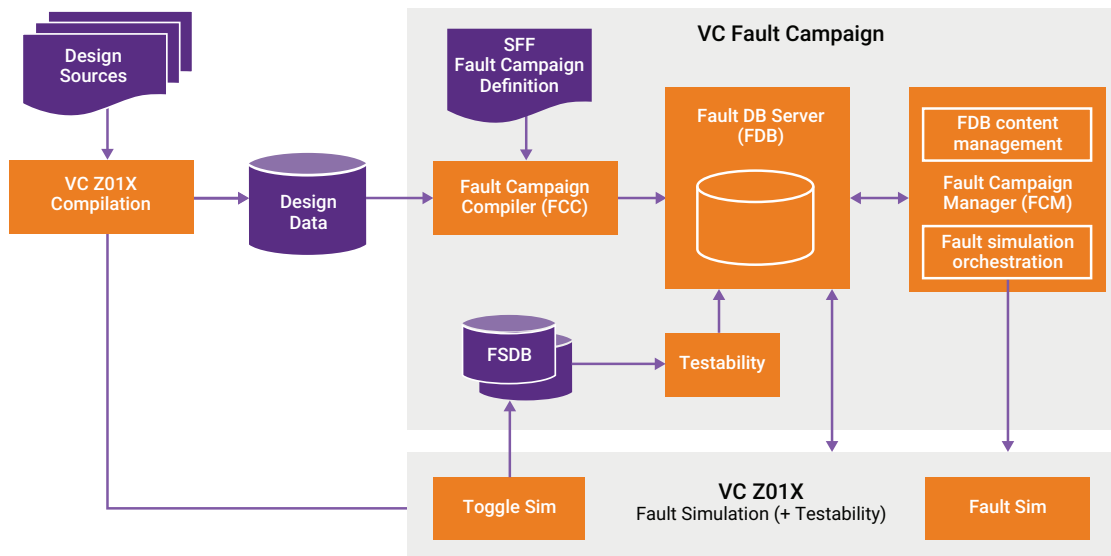


Figure 1: VC Z01X fault simulation solution

## Fastest, Most Comprehensive Fault Simulation Solution

VC Z01X key features:

- Versatile fault simulation: Combining the industry leading simulation performance with the proven concurrent fault engine allows simulation of the most advanced complex designs, like CPUs, GPUs, NPUs, at both RTL and gate level
- Testbench stimulus: Support of SystemVerilog testbenches, like UVM, and eVCD
- Concurrent fault simulation: Proven concurrent fault engine with more than 2000 faults concurrently in a single simulation process, enabling fast fault injection campaign completion with distributed concurrent fault simulations
- Distributed Processing: Distributed fault simulation with the VC Z01X solution can easily be setup using named hosts, Oracle Grid Engine (SGE) or IBM Platform LSF®
- Modeling and Testability:
  - Complete fault modeling for random hardware failure types defined in ISO 26262
    - Permanent (stuck-at) and transient (SEU, SET) faults
    - Variety of fault types (Port, Wire, Assignment, Array, Primitives, Variables)
    - Sampling of fault locations and injection times (fixed number, percentage, confidence level interval)
- Static Testability Analysis: Reducing fault campaign qualification time by pruning which faults to simulate
  - Classifying faults as statically testable or untestable, and simulating only the testable faults
  - Collapsing identical faults under a single prime fault, and simulating only the prime faults
- Dynamic Testability Analysis: Reducing fault campaign qualification time by optimizing faults - tests selection
  - Analyzing which faults are controllable and observable per stimulus testcase
  - Automatic test ordering and redundant test elimination
- User Defined Fault Detection: Ability to detect faults from a variety of safety mechanisms, including hardware redundancies, lock step modes, and software based self-tests
- Integration
  - Fault Campaign Manager: Orchestrates the entire fault injection process with optimized fault simulation scheduling
  - Fault Database Server
- Unified representation of a fault campaign and the qualification results for simulation, emulation and formal
- Parallel read/write access for all qualification technologies in distributed runs (like fault simulations), and multiple users
- Formal Analysis Integration: Integration with the VC Formal FuSa; product to additionally qualify faults as safe, to reduce the faults to simulate or to reduce the non-observed faults by simulation due to missing stimulus

- Verdi Fault Analysis: Analyze the fault coverage and debug faults with Verdi, Synopsys' integrated graphic interface for debug and coverage

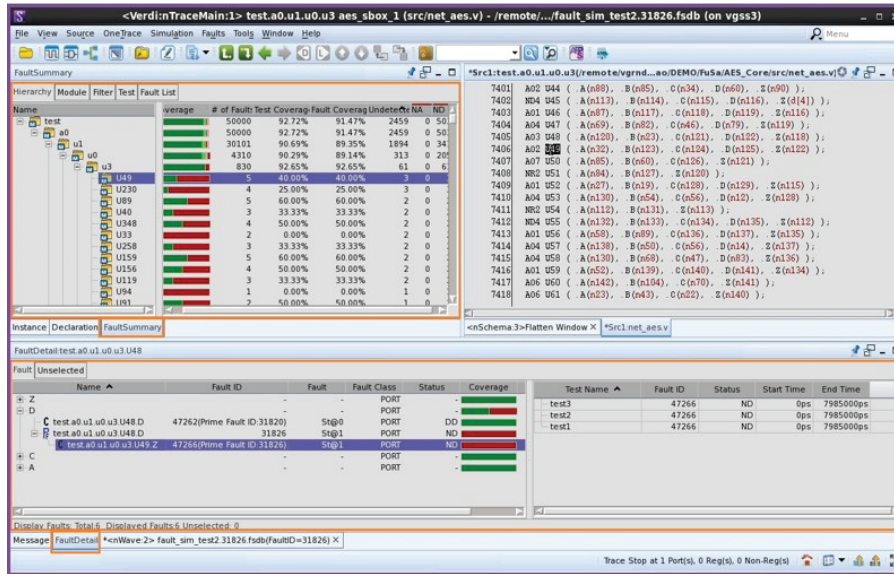


Figure 2: Verdi Fault Analysis

## Fault Simulation for Today's Automotive Verification

Accurate and timely fault injection testing can be essential for ensuring compliance to industrial and automotive safety standards. The VC Z01X fault simulation solution enables SoC design and verification teams to efficiently verify the functional safety of industrial and automotive chips, for the next generations of these devices.

For more information about Synopsys products, support services or training, visit us on the web at: [synopsys.com](https://www.synopsys.com), contact your local sales representative or call 650.584.5000.