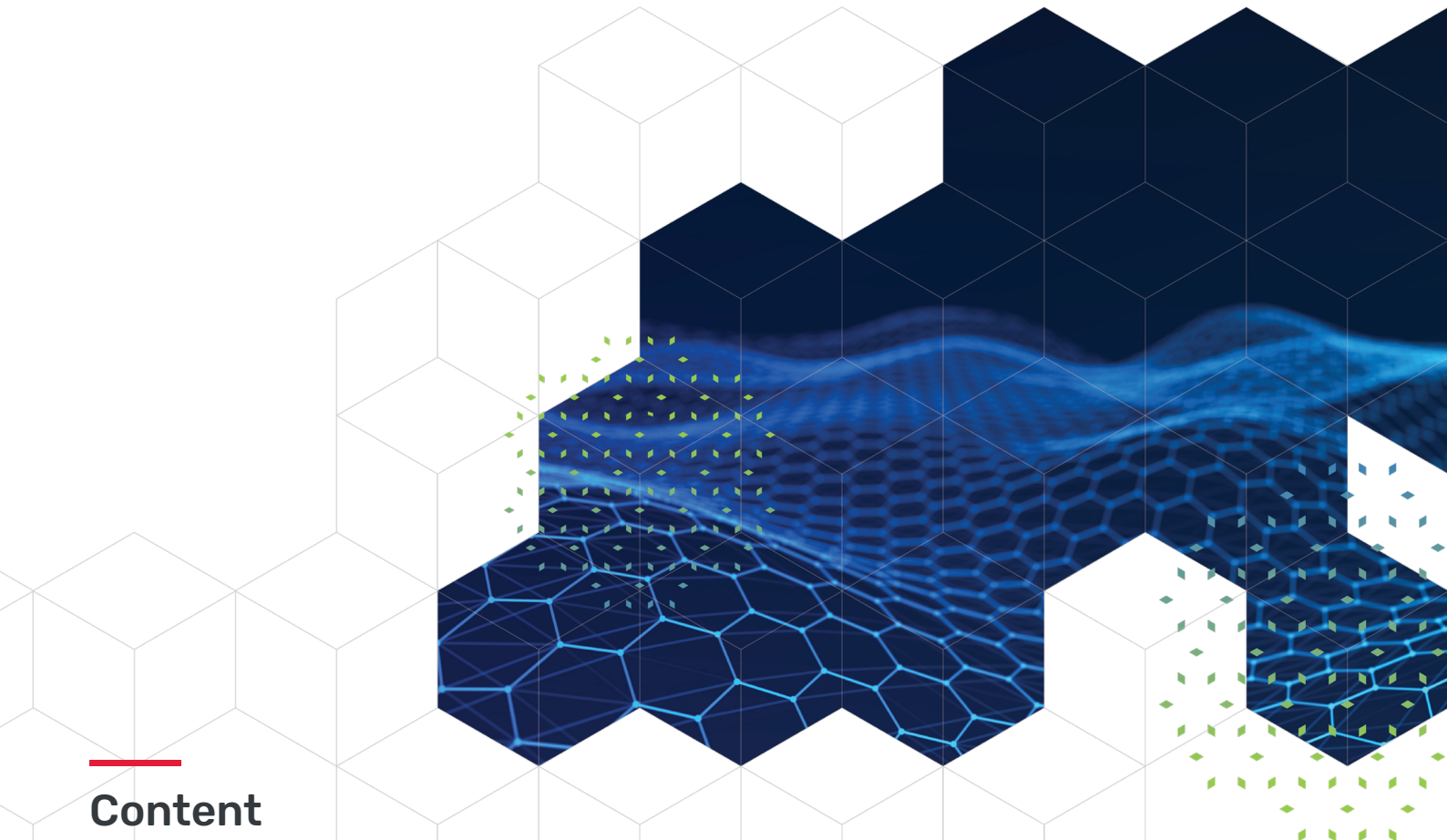


A Guide to Accelerating Your Design Timeline With Electromagnetic Analysis

cādence[®]



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Introduction

An engineer's toolkit contains various solvers, each offering different trade-offs between accuracy and simulation time. It's up to you to decide which resources are necessary at each stage of the design process. 3D planar, or hybrid, solvers may be a sufficient choice when needing to make a quick decision, such as choosing a layer to route on. These solvers allow you to understand the fundamentals of circuit behavior through their rapid assessment and fast handling of a design section. However, modern, full-wave 3D extraction is a key step in identifying SI and PI issues and serves as a critical tool for signoff before sending a design to fabrication.

Three-dimensional finite element method (3D FEM) solvers are notorious for being computationally cumbersome and time-consuming. These challenges force many engineers to segment their design using the cut-and-stitch approach to distribute the modeling task across cores. This approach can be error-prone for those inexperienced with computer-aided design (CAD), as designers may remove too much from the model and miss out on crucial electromagnetic (EM) behaviors, causing it to fail performance requirements. The Clarity 3D solver eliminates the typical time constraints with a parallelized matrix solver, an elastic compute architecture, and cloud-optimized distribution.

This white paper discusses various simulation approaches aimed at accelerating design timelines without compromising result accuracy and details how the Clarity 3D FEM solver shortens the time needed to generate precise models of your entire structure.

The Need for EM Analysis

The complexity of high-speed PCB designs has created the need for specialized electromagnetic analysis tools, which convert the physical description of the conductors in a circuit board into a form that allows for analysis. Such analyses could include a planar analysis, focusing on flat 2D structures or the “meshing” of 3D conductors. 3D meshing enables the use of numerical methods such as the finite element method (FEM) or method of moments (MoM) techniques (**Figure 1**). After the simulation area has been discretized into smaller elements, you can solve it using **Maxwell’s equations**. Ultimately, the analysis yields a model, typically S-parameters, which can be used to verify performance.

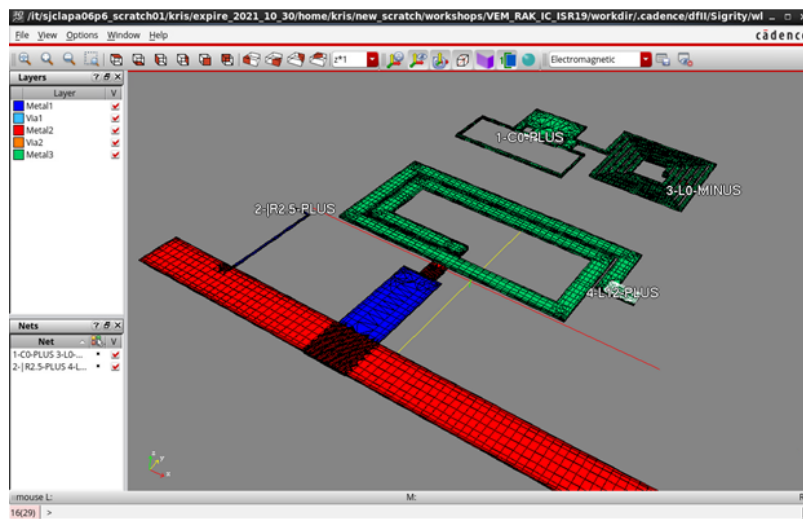


Figure 1: Meshing can accurately represent and analyze the complex 3D geometries from which SI problems often stem. *Source: Cadence*

3D Full-Wave/Arbitrary vs 2D/Hybrid Field Solvers

Figure 2 shows the numerous solvers offered by Cadence to assist with simulation. This section briefly describes the basic 2D cross-section, 3D planar (hybrid), and full-wave 3D FEM solvers.

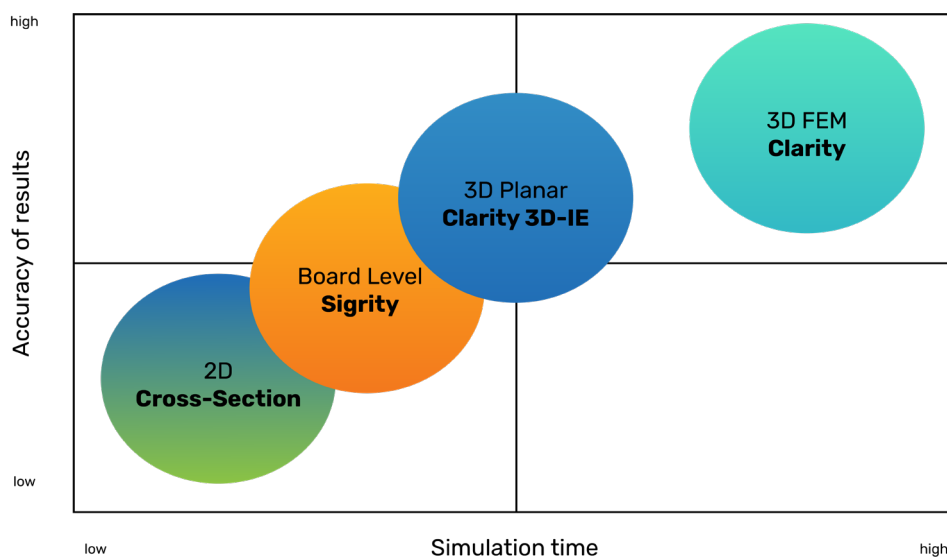


Figure 2: Result accuracy versus simulation time.