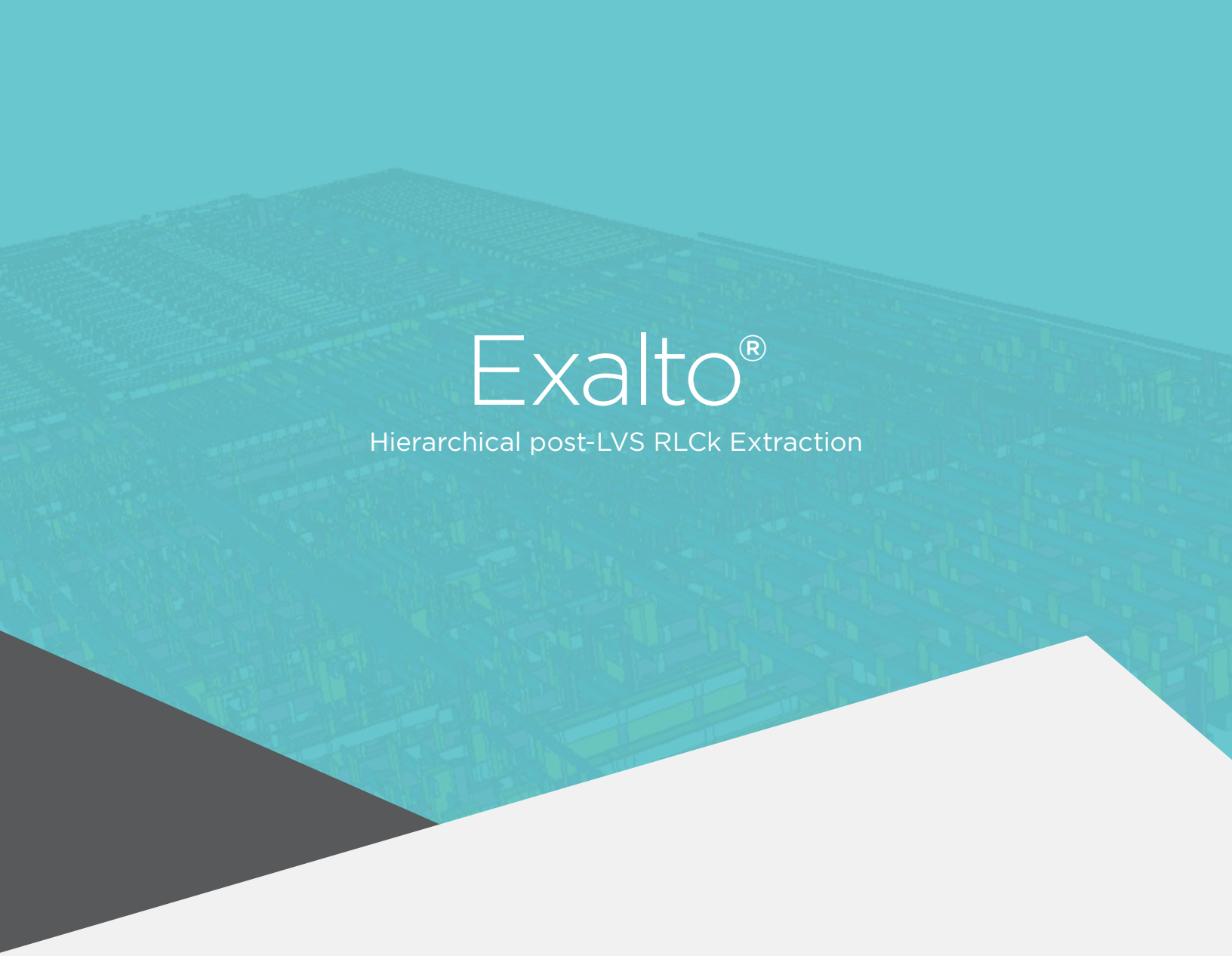


Exalto®

Hierarchical post-LVS RLCk Extraction

Helic®

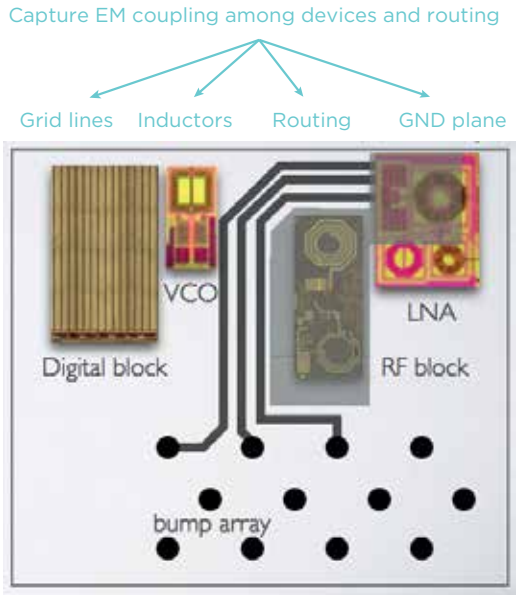
Exalto® is a powerful post-LVS RLCk extraction software for IC design engineers enabling them to accurately predict electromagnetic coupling effects during the sign-off phase.

Exalto can capture unknown crosstalk among different blocks in the design hierarchy by extracting lumped-element parasitics and generating an accurate model for electrical, magnetic and substrate coupling. Exalto interfaces with most LVS tools and can complement the RC extraction tool of your choice.

Identify the root cause of crosstalk including electrical, magnetic and substrate coupling

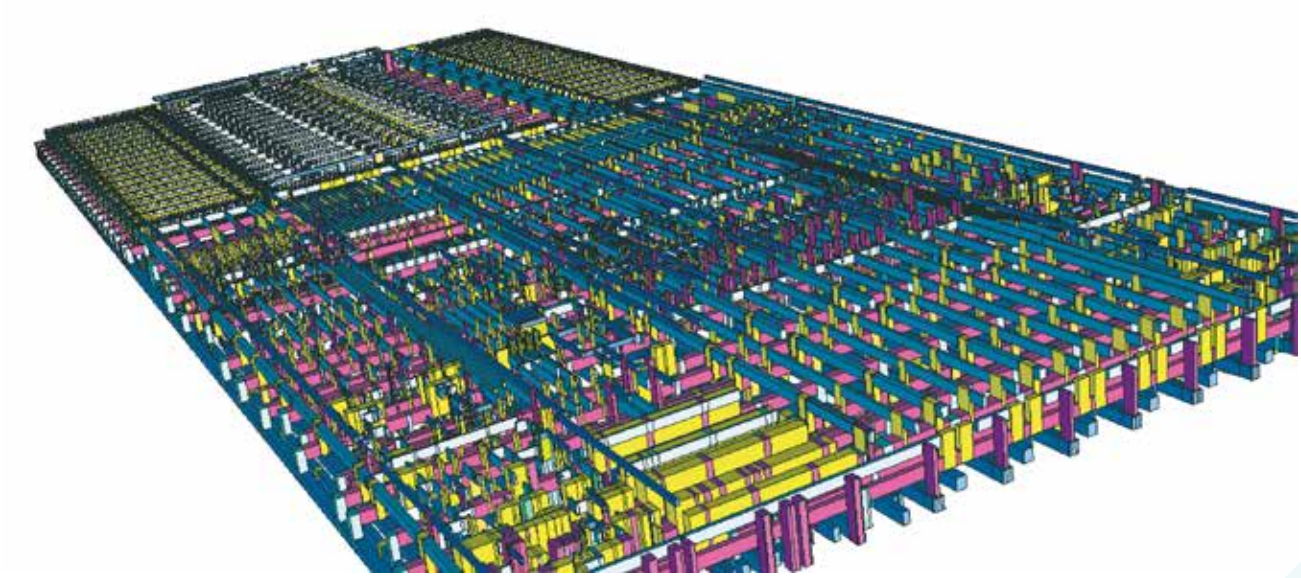
With Exalto you can:

- Investigate crosstalk between high complexity nets and blocks belonging to different design hierarchy levels.
- Run multiple “what-if” scenarios with different sets of critical nets without ever touching your test bench schematic.
- Generate and automatically combine fully coupled electromagnetic models of critical nets/passive devices with the output of the LPE tool of your choice in a single extracted view or netlist.
- Automatically back-annotate the Exalto extracted model to the original schematic or LPE-extracted netlist, whether you extract part of the layout or the entire layout.



Analyze circuits that were previously "too big to analyze"

The unprecedented capacity of the Helic modeling engine at the core of Exalto enables designers to analyze extremely complex layouts with ease. Complex electro-magnetic and substrate coupling scenarios between sensitive RF circuitry with large digital busses/control signals are easily captured. A unique netlist reduction methodology makes the output netlist extremely compact (over 90% reduction in elements and nodes compared to the native netlist) which further extends the size of the problem that can be resolved using Exalto.

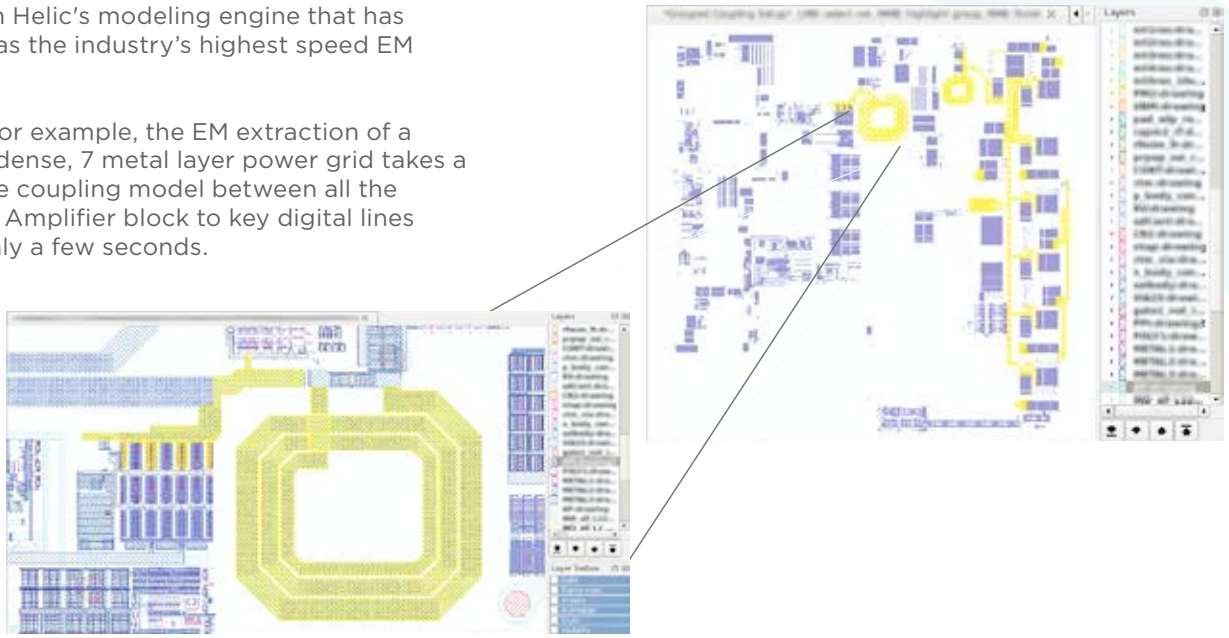


Traditional RC extractors with added high frequency (L/k) options run into a capacity bottleneck due to the fact that the output netlist is too large to simulate. Netlist reduction in Exalto mitigates this issue and increases its capacity by an order of magnitude.

Industry's Fastest and Most Accurate RLCk Extraction Engine

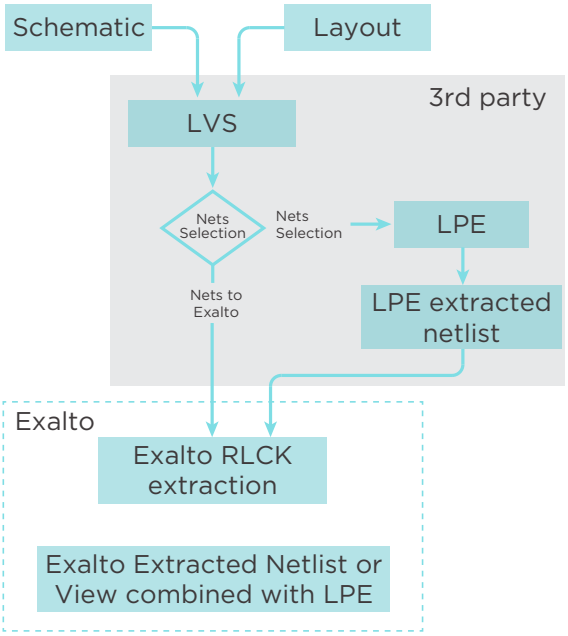
Exalto is built with Helic's modeling engine that has established itself as the industry's highest speed EM engine.

This means that, for example, the EM extraction of a 600umX400um, dense, 7 metal layer power grid takes a few minutes or the coupling model between all the spirals of a Power Amplifier block to key digital lines around it takes only a few seconds.



Integrates smoothly with any post layout verification and extraction flow

Exalto seamlessly integrates into any post layout verification and extraction flow. The software starts with the output database of any 3rd party LVS software, allows the user to specify the critical nets/passive devices they want detailed electromagnetic models for and integrates the output model with the output of any 3rd party LPE tool. Both extracted views and netlists are supported



Output models support all circuit analyses

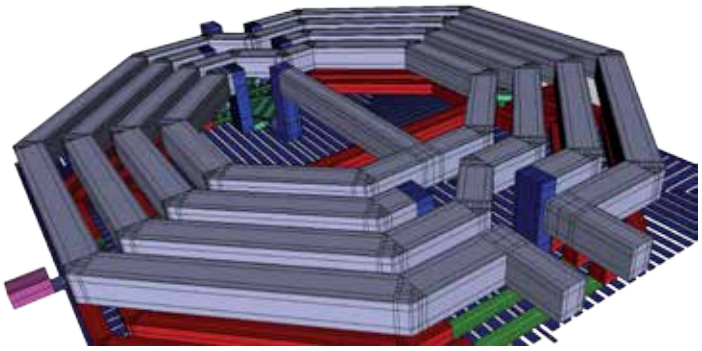
- Exalto produces models that are guaranteed to be causal and passive. The tool produces RLCk netlist models and s-parameter models simultaneously.
- The RLCk netlist is highly compacted and enables very efficient time-domain analyses like transient, noise and shooting analyses.
- The s-parameter models are accurate to DC and are well suited for AC, harmonic balance, SP and other frequency domain analyses.

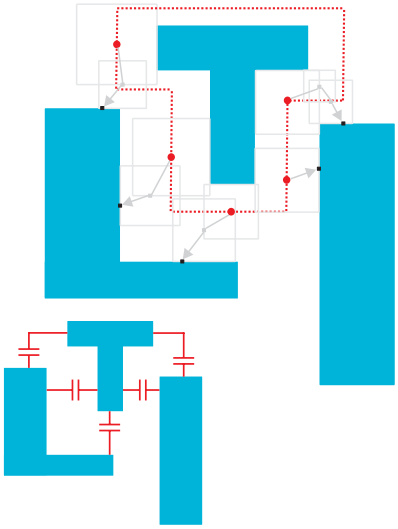
Highest accuracy with Helic's new electromagnetic engine

The RLCk engine that powers the core of VeloceRF pushes the frequency and capacity limits and outperforms any other electromagnetic modeling tool currently available in the market. Helic's RLCk modeling engine comprises the following modules:

Layout Processing

The need to model electromagnetic effects from DC up to mm-wave frequencies calls for special handling of layouts. A novel full 3D meshing algorithm segments the conductors' volume into small cells suitable for accurate modeling of capacitance, inductance and resistance. The engine computes all the Layout Dependent Effects (LDE) before the meshing step.



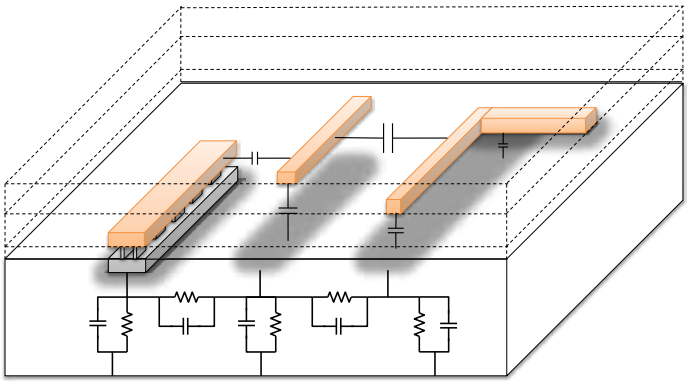


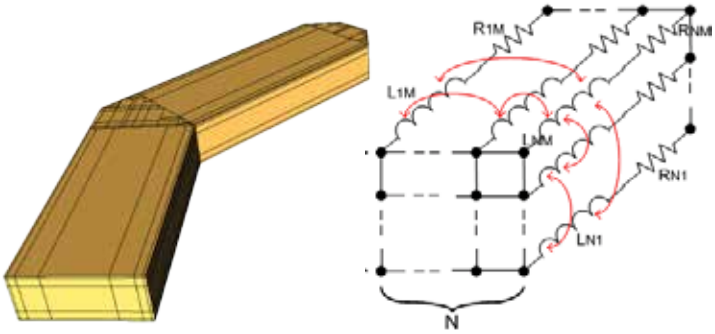
Capacitance Extraction

Helic's 3D capacitance extraction methodology uses a sophisticated stochastic sampling algorithm based on the Random Walk theory for calculating the electric field along the Gaussian surfaces and corresponding coupling capacitances between arbitrary shaped conductors. The solver calculates with the highest accuracy the distributed 3D electric field, using stochastic sampling and a sophisticated numerical solution of the multi-layer Green's function. The method does not use any kind of pattern matching look-up tables or averaging and is free of conductor discretization bottlenecks. It scales way better with circuit size than boundary or volume meshing methods and demonstrates the best computing efficiency since Random Walk is an inherently parallel and extremely fast algorithm.

Substrate Model Extraction

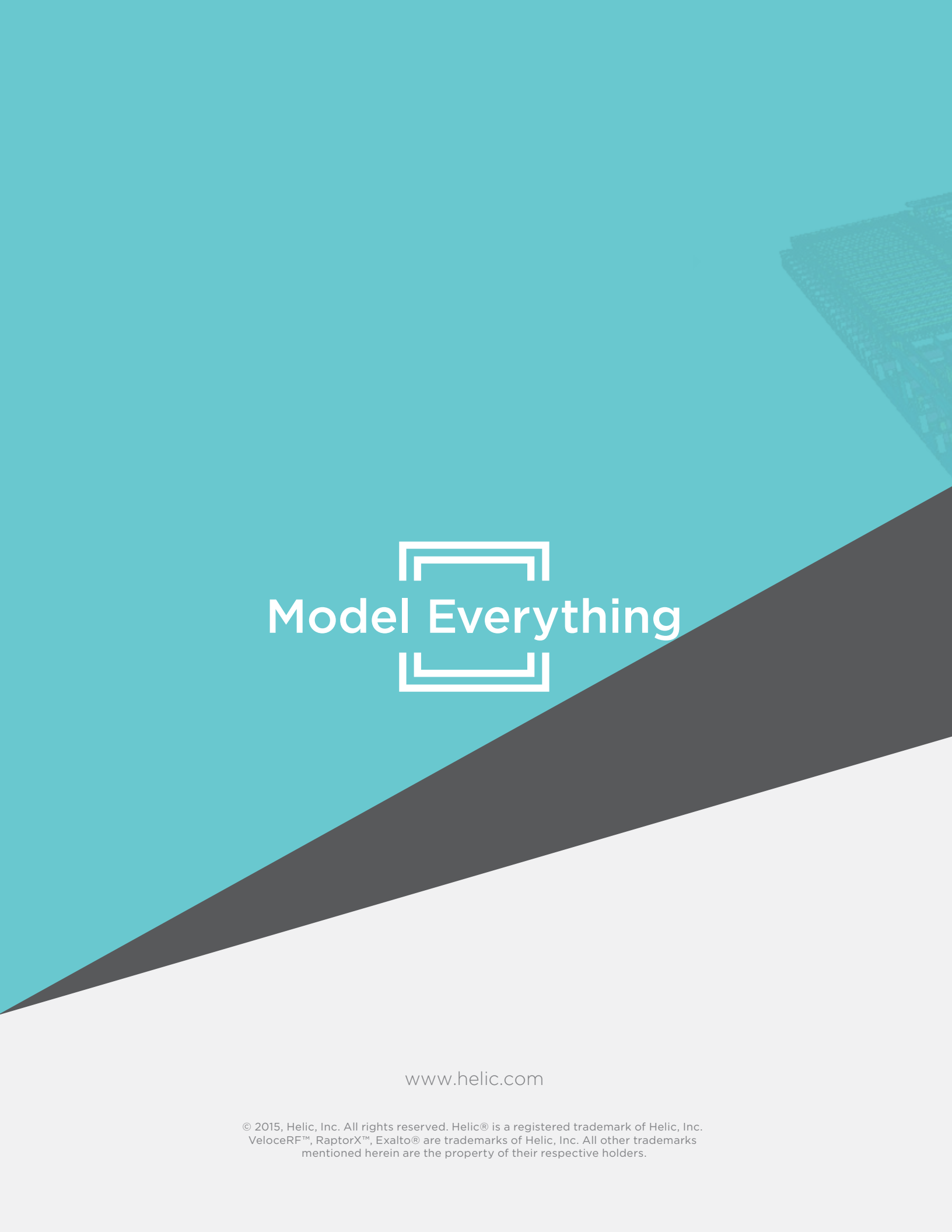
Helic's unique extraction engine models substrate coupling effects with a distributed RC network. A stochastic Monte Carlo based methodology and a 3D substrate model allows for very fast and accurate extraction of the distributed RC substrate network. The method employs a random-walk algorithm that allows characterization of multiple substrate layers using appropriate Green's functions without the need of three-dimensional discretization. The parallel nature of both capacitance and substrate modeling algorithms offers scalability and extraction times superior to any other method.





Inductance and Resistance Modeling

Combines the accuracy of a full-wave electromagnetic (EM) modeling engine with the flexibility and interoperability of spice netlist output. Extracted models fully capture inductance and resistance behavior from DC up to mm-wave frequencies. Extremely accurate, capturing all electromagnetic phenomena, including current distributions, skin and proximity effects.



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