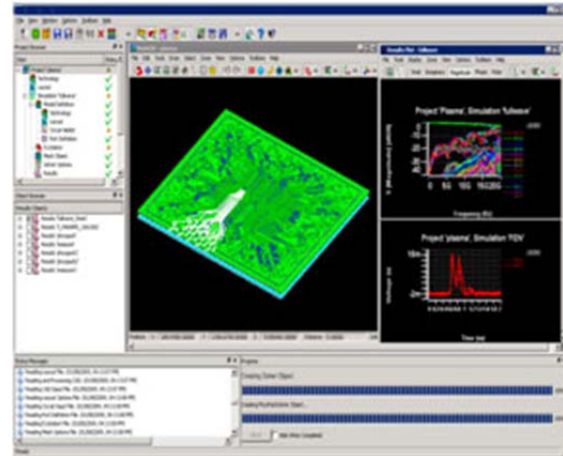


# nWave

3D Full-Wave from Chip to System

**High-Speed, High-Accuracy  
and High-Capacity 3D  
Broadband Full-Wave EM  
Solution for SI, PI and EMI**



## Introduction

nWave is Nimbiç's flagship 3D, broadband, full-wave electromagnetic solver. nWave is based on proprietary accelerated boundary element technology that enables unprecedented speed and capacity, while preserving gold-standard Maxwell accuracy. nWave is built from the ground up to exploit multi-core and hybrid architectures, and to utilize the best of fast solver technology to enable fast simulation on single or many cores.

nWave's integrated solution provides, in a unified interface, multiple options and features that typically are available only in multiple products. Designers can benefit from Signal Integrity, Power Integrity, Simultaneous Switching, and EMI features from this interface that exploits powerful broadband full-wave EM technology.

nWave features chip, package and board import capability from industry standard formats, and merging utilities within an integrated workspace, thereby enabling seamless silicon-package-board co-analysis.

nWave's deep IP and rich feature list enables

users to choose from multiple modes and design-enabling features throughout the design cycle. nWave's high speed and scalability enables designers to perform signoff post-layout verification while a parametric modeling mode allows designers to perform intelligent what-if analysis early in the design cycle to help mitigate significant re-work later in the process. nWave's broadband formulation enables generation of DC to high-frequency S-parameters from a single tool.

Users can obtain S, Y and Z matrices, visualize induced and return currents, improve designs by observing strong coupling paths, create merged chip-package-board 3d models and observe electrical behavior through the integrated system. nWave's powerful EMI features allows users to specify temporal and steady-state voltage and on-chip current noise sources from industry standard formats and observe selected noise spectra, near-field, far-field and EMI/EMC compatibility.

nWave integrates tightly with existing design flows in a seamless fashion, thereby enabling efficient frontend and backend integration.

## Features

---

### 3D Electromagnetic Simulation

- Accelerated boundary element technology
- $O(N)$  memory and time scalability
- Rigorous broadband material and loss models
- Accurate frequency dependent losses, inductance, skin effects, radiation effects
- Current and voltage sources, and multiple plane wave excitations
- Integration with on-chip piecewise linear noise source SPICE models
- Scalable load-balanced multi-threaded matrix solution
- Adaptive fast frequency sweep
- OpenMP-LSF based integrated hybrid computing platform support

### Enhanced Usability and GUI Features

- Package layout editing and healing
- Selection by net, region, and cross annotation
- Cropping by layer and net for 3d tunneling
- Automated port setup
- Intuitive pin-grouping option
- Chip metal layers, redistribution layer, package and board merging from industry-standard file formats from Cadence, Zuken, AutoCAD, and Mentor
- Integrated open ASCII database for complete 3d merged model
- Upon merging multiple databases, automatic and intuitive net-naming and net connectivity check for merged module
- Parametric input through ASCII .bool format

- Estimate memory function for pre-solve check
- PoP, SiP, SoC, MCM, and stacked die support
- User choice for number of cores dedicated for solver, enabling some cores to be left free for other tasks
- Automated refined meshing
- Full 3D control on bond wire, solder ball, solder bump and lead design
- Incorporation of linear passives such as decoupling capacitors directly into the generated model
- QFN / QFP package design wizard
- Windows and Linux, 32-bit and 64-bit

### Visualization and Data Transfer

- S, Y, and Z output, and visualization
- Single-ended as well as mixed mode differential mode and common mode S-parameters
- Touchstone S-parameter import and export (standard and 2.0 version with individual reference impedance)
- Near field and far field plots
- Noise spectrum plots
- Current density plots

### Integration with Frontend and Layout Tools

- Cadence Allegro: .mcm, .brd, .sip, Zuken: .pcb, .rif, Mentor: .hkp, AutoCAD: .dxf, GDS: .gds, .gdsii, .gds2, Other: .cif
- GDS and CIF import

### Integration with Circuit Simulators

- Export models directly to HSPICE, Spectre, SigXP, Allegro SI, Agilent ADS
- Import Touchstone, HSPICE, Spectre and multiple on-chip noise source and chip-package models for co-simulation

### Extended Options

- Enhanced 3D drawing frontend for customized and add-on structures
- LSF support for distributed simulation on clusters
- Extended large number of cores multi-core and multi-CPU engine
- Enhanced passive and causal model tester and SPICE netlist generator

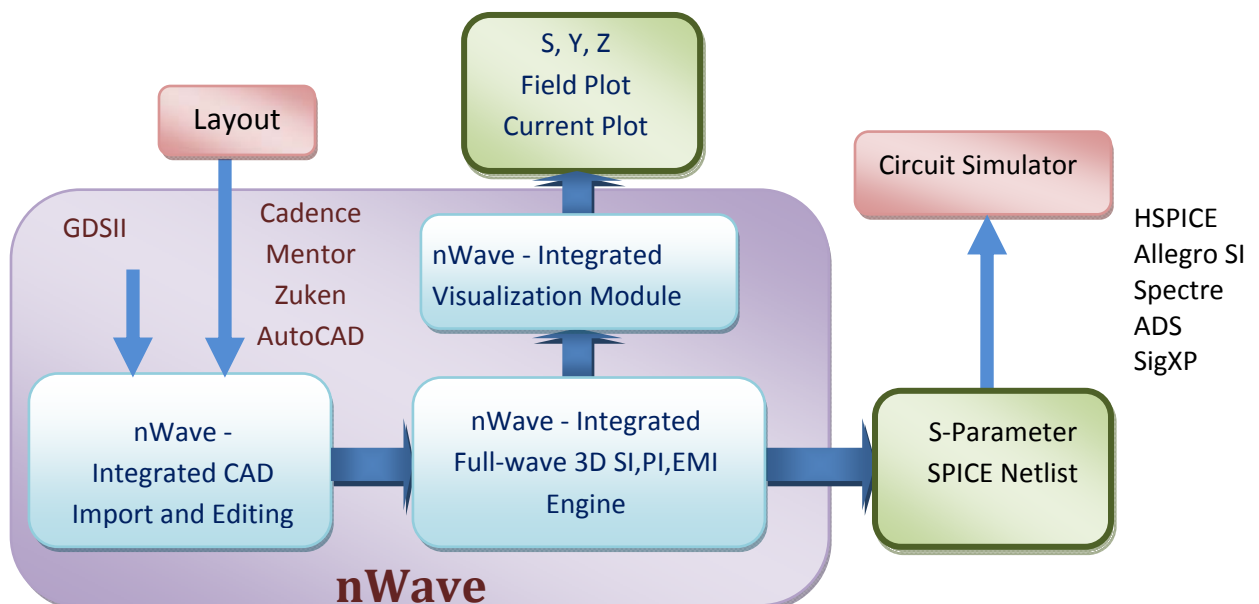
- Systems-in-package and MCMs
- Thru Silicon Via (TSV) modeling
- Multilayered boards
- Coplanar packages
- QFN, QFP, leadframe packages
- SERDES Applications
- DDR memory interfaces
- Embedded passives
- Inductor design
- Detailed via, transition, interconnect, bond-wire, solder ball, and solder bump modeling
- Package and board merged configurations
- Radiation, impedance, and crosstalk
- EMI prediction from board-package configurations
- Stacked die
- Redistribution Layer (RDL) modeling
- Complete power integrity, signal integrity, and EMI analysis
- Power distribution networks
- Signal-power coupling

## Applications

- Complex BGA and bond-wire packages
- Package-on-package configurations

## Design Flow

nWave offers an integrated full-wave 3D SI, PI, EMI solution in a single software framework and seamlessly fits into standard CAD flows. nWave directly imports geometry in widely used CAD formats and produces output models that are compatible with standard circuit simulation engines.



**Nimbic, Inc.**

2063 Landings Dr.  
Mt. View, CA 94043

**Tel:** 800-686-5213

**Fax:** 650-396-4410

**Email:** [info@nimbic.com](mailto:info@nimbic.com)

**Web:** [www.nimbic.com](http://www.nimbic.com)

**Nimbic is a member of Cadence® Connections, Zuken and Synopsys® in-Sync programs.**

The logo for Cadence, featuring the word 'cadence' in a lowercase, bold, black sans-serif font with a red horizontal bar above the 'a'. A trademark symbol (TM) is located to the upper right of the 'e'.The logo for Zuken, featuring the word 'ZUKEN' in a bold, blue, uppercase sans-serif font.The logo for Synopsys, featuring the word 'SYNOPSYS' in a bold, purple, uppercase sans-serif font with a registered trademark symbol (®) to the upper right of the 's'.