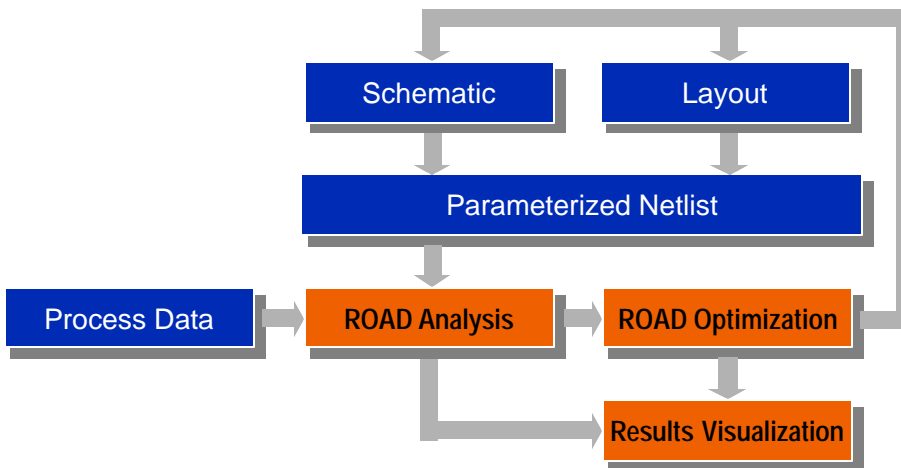


# ROAD™ Statistical Analysis and Optimization

ROAD is a new-generation statistical optimizer and analyzer for analog, memory and digital cells targeted to the most advanced nanometer process nodes. With a new patented algorithm, ROAD delivers a breakthrough in performance and precision. No longer do you have to wait days for optimization, ROAD delivers improvements in just hours.



- ### HIGHLIGHTS
- > Transistor-level statistical characterization of both design and process variables
  - > Device-sizing for yield and performance improvement
  - > 15X speed-up for analysis means orders of magnitude speed-up for optimization
  - > Works standalone or with your analog design environment
  - > For analog / RF, digital standard cells, memories

Figure 1. ROAD works with a transistor-level netlist and process data to improve designs.

## Robust Design

It is difficult to create robust designs with higher operating frequencies and lower power consumption using the latest nanometer processes. These processes exhibit much wider variations than previous generations.

Without a statistical approach, ICs are often over-designed and valuable power and area resources are wasted. Even with over-design it is easy to miss a corner-condition that causes circuit failure.

Statistical analysis eliminates the problems with the corner-based approach. However traditional Monte Carlo analysis can require over thousands runs to determine the behavior of an IC, and the time taken for analysis is too long.

## ROAD Technology Meets Analysis Challenge

ROAD statistical analysis delivers a breakthrough in precision and speed of analysis over other circuit analysis and optimization methods. ROAD accurately analyzes the non-linear behavior of ICs 10X to 15X faster than traditional approaches. Since this analysis step is repeated many times in the optimization process, design teams will have improved and robust designs in hours instead of days or weeks.

ROAD easily handles complex designs with hundreds of process and environment variables or design parameters because of its unique projection method. The means you are achieving optimized designs in the same day.

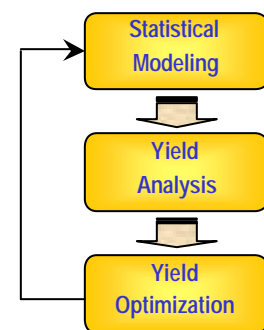


Figure 2. ROAD optimization loop.

## Sensitivity Analysis

ROAD provides various sensitivity values to aid design decisions:

- > Performance vs. design variables (e.g., transistor sizes)
- > Performance vs. variation parameters (e.g.,  $V_{TH}$ ,  $T_{OX}$ , Temp)
- > Worst-case performance vs. design variables
- > Yield vs. design variables
- > Yield vs. specifications

|    | W1    | L1    | W2    | L2    | W3    | L3    | W4    | L4    |
|----|-------|-------|-------|-------|-------|-------|-------|-------|
| P1 | -0.30 | -1.20 | -1.64 | -0.17 | -1.14 | -0.32 | -0.69 | -0.02 |
| P2 | -0.09 | -0.80 | -0.51 | 0.42  | -0.48 | 0.00  | -0.51 | 0.02  |
| P3 | 3.24  | -1.29 | 14.57 | -2.31 | 20.87 | 4.17  | 11.38 | 1.38  |
| P4 | -0.88 | 0.70  | -1.20 | -1.05 | -2.59 | -2.46 | -3.47 | 0.13  |
| P5 | -0.19 | -0.75 | -0.73 | 0.03  | -1.24 | -0.18 | -0.52 | -0.04 |
| P6 | -0.50 | -0.36 | -1.61 | -0.24 | 0.79  | 0.08  | 4.10  | 0.31  |
| P7 | 0.02  | -1.28 | 0.01  | -0.11 | 0.01  | 0.00  | 0.00  | 0.48  |

Figure 3. Example sensitivity of performance vs. transistor size.

## Optimization

ROAD optimizes a wide variety of designs for changes in specifications or in target process or foundry. Examples include:

- > RF LNAs, VCOs, op-amps and mixers
- > Digital standard cell and FF's
- > SRAM leakage and timing

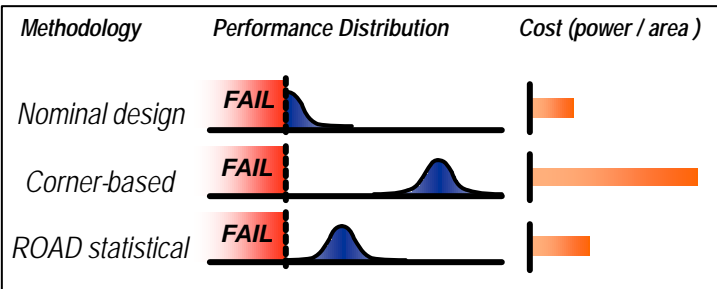


Figure 4. ROAD statistical optimization delivers robust designs and eliminates pessimism of corner-based methods.

## Speed, Accuracy and Capacity

Each ROAD optimization step does a fast, non-linear analysis of the circuit performance. Because of its unique patented projection method, ROAD can handle hundreds of design parameters and process and environment variables. This breakthrough in speed of the analysis step and specification capacity results in circuit optimization occurring orders of magnitude faster (100X+) than traditional methods.

## Results Visualization

ROAD provides a complete set of visualization for analysis results including

- > Circuit performance in 2D and 3D
- > Probability distribution function in 2D and 3D.
- > Scatter plots
- > Yield sensitivity
- > Process, environment and design sensitivities

## Usage and Compatibility

ROAD works with popular SPICE and SPICE-like circuit simulators. It can be used standalone with a circuit netlist or in conjunction with your existing design environment. Optimized netlists, and desired test corner cases can be saved to your design environment.

## Supported Simulators

ROAD interfaces to the following SPICE and SPICE-like simulators:

- > Eldo
- > HSPICE
- > HSPICE
- > Spectre (OCEAN-based)
- > SpectreMDL

## Supported Workstations

ROAD is supported on Linux workstations running RedHat Enterprise 3 or later. LSF distributed simulation to multiple compute servers is also supported.

## Pricing and Availability

For pricing and availability, please contact Extreme DA. Your local sales representative will respond to your inquiry.

Extreme DA  
 3211 Scott Blvd., Suite 103  
 Santa Clara, CA 95054-3009, U.S.A.  
 +1 408-588-1112  
 Sales@Extreme-DA.com  
 www.Extreme-DA.com

©Copyright 2007 Extreme DA. All Rights Reserved. Extreme DA, the Extreme DA logo, and Extreme DA ROAD trademarks of Extreme DA. All other marks are the property of their respective owners. Specifications and features are subject to change without notice.