Victory Atomistic

Practical Atomic-Scale Simulation
Contents

- TCAD simulation device size continuum
- Commercial tool flow integration
- Full band structure calculations
- Carrier transport device physics
- Summary
TCAD Simulation Continuum

Geometric Models

Large Scale

Physical Models

High Simulation Accuracy

Faster Simulation Turn-Around-Time

Higher

Atomistic Model

Small Scale

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Commercial Tool Flow Integration

- The trusted legacy atomistic simulator, “NEMO” from Purdue University, is now productized and tightly integrated into Silvaco’s TCAD tool flow.

- Leverages atomic level simulation accuracy, into final circuit simulations at the SPICE level.
Commercial Tool Flow Integration

- Uses the familiar Silvaco user interface
- Newly developed in-house atomistic plotting capability with other custom features
- Silvaco style manuals
- Customer support
- Examples
Full Band Structure Calculations

- Victory Atomistic uses calibrated tight binding parameters to calculate accurate band structure.
- Removes the limitation of relying on the constant effective mass approximation.

VA - Band structure of Si
Carrier Transport Device Physics

Complete Nanowire Simulation

• Quantum transport:
  • QTBM ballistic
  • NEGF scattering
  • Electron-phonon self-energy

• Strain dependency
• Schrodinger-Poisson
  • Self-consistent
• Density of states
• Transmission probability
• Optics
Atomistic Simulation Speed for Everyday Use

- Advanced numerical acceleration techniques like mode space and Büttiker probe
- Uses MPI and OpenMP for parallel processing

<table>
<thead>
<tr>
<th></th>
<th>Ballistic I(V)</th>
<th>Scattering I(V)</th>
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<tbody>
<tr>
<td>2x2x20nm</td>
<td>5 min / 30 CPUs</td>
<td>120 min / 30 CPUs</td>
</tr>
<tr>
<td>5x5x20nm</td>
<td>15 min / 120 CPUs</td>
<td>480 min / 240 CPUs</td>
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**Complete Nanowire Simulation**

- *Illustration of Potential*
- 40,000 atoms in a 5x5x20nm wire
- Calculation of Scattering Transport takes Less than one day
Summary

• Novel approaches for greatly reduced simulation time
• Practical whole device simulations now possible
• Efficient hyper-scaling and cloud-based computing
• Supported commercial product with ease of use
• Link atomistic simulations to circuit SPICE models
• Simulate 2D materials, quantum dots, optical devices
• Cutting edge FinFETs, nanowires, slabs, tubes
• Knowledgeable team to assist with your project