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FROM ATOMS TO SYSTEMS

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

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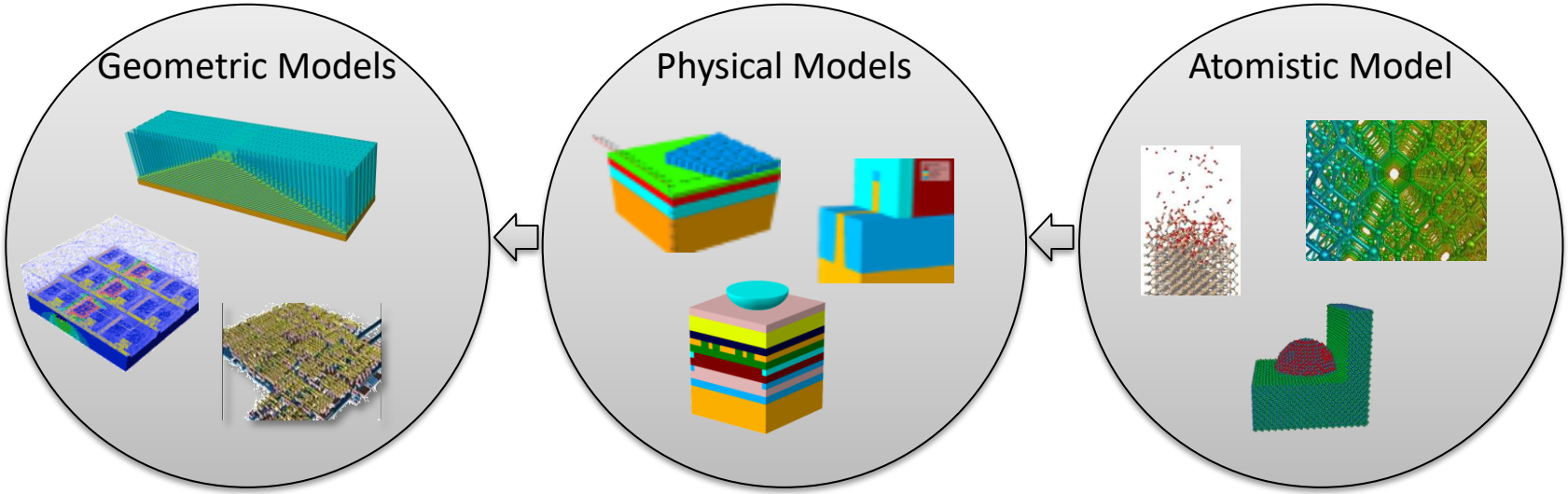
TCAD Simulation Continuum



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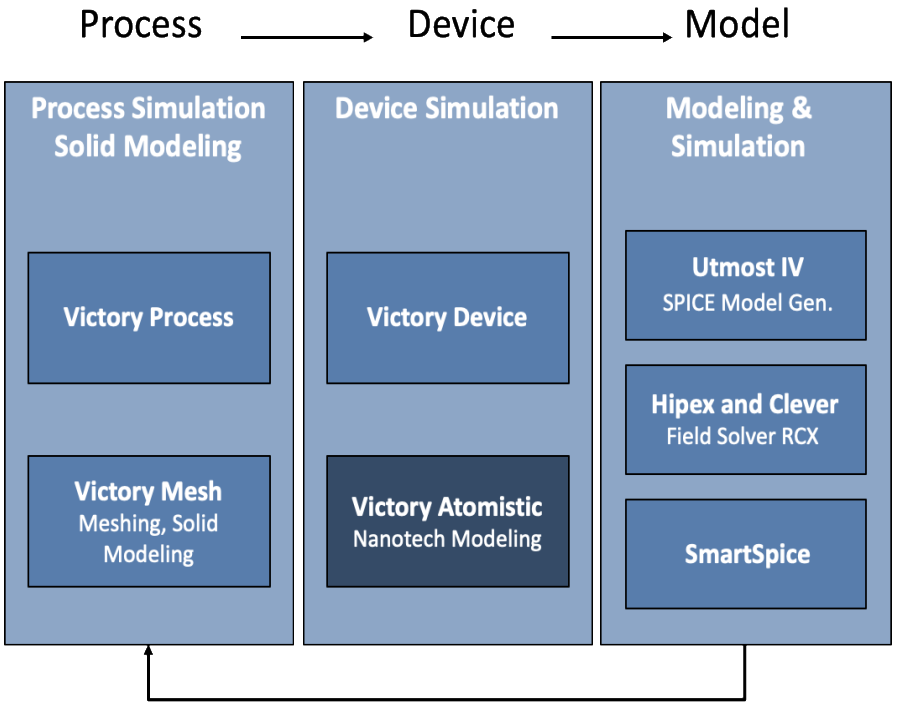
Commercial Tool Flow Integration



- 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.

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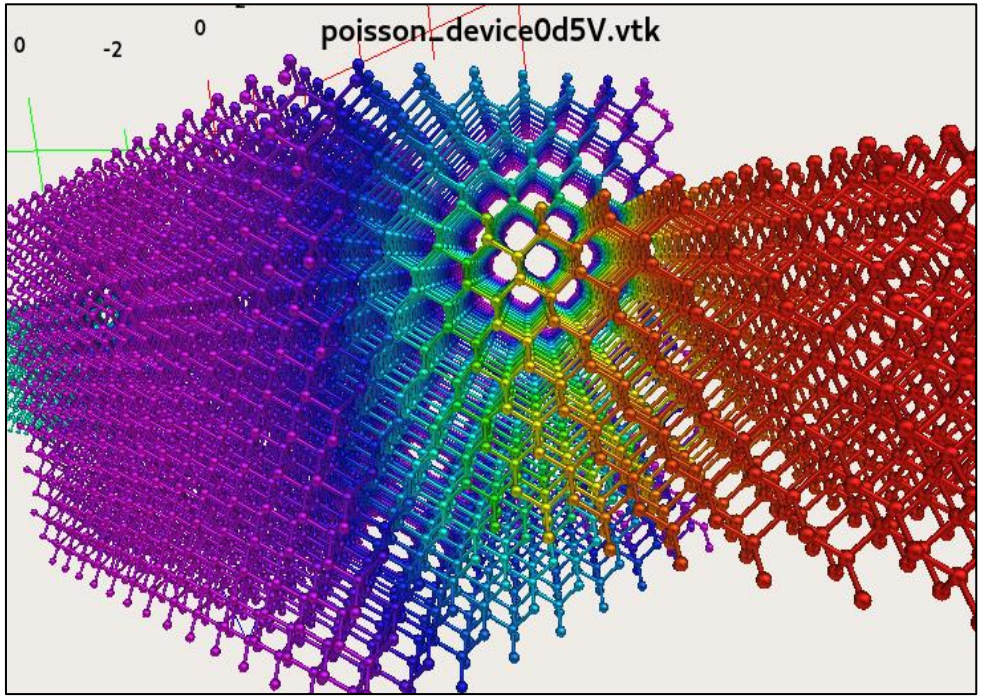
Commercial Tool Flow Integration



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

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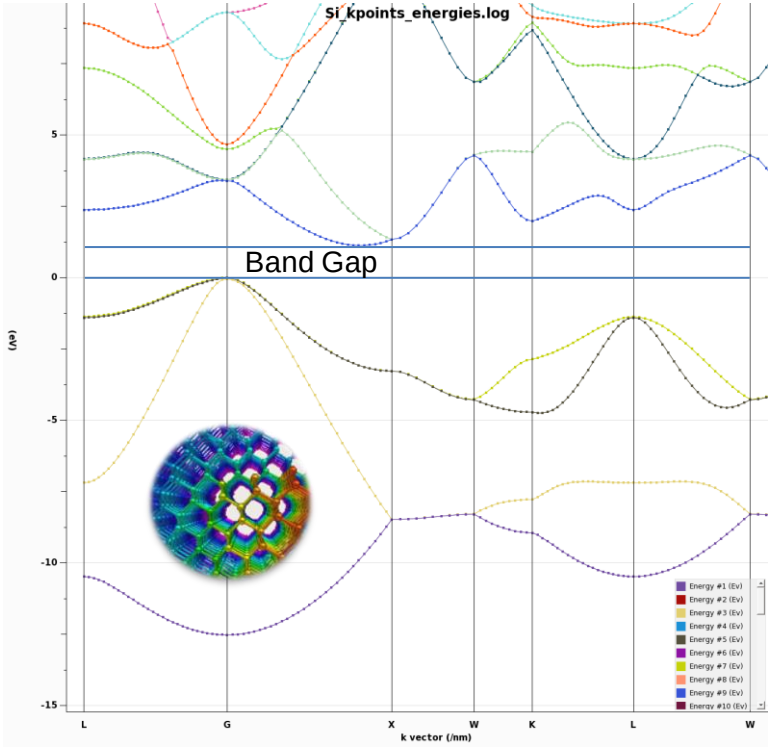
Full Band Structure Calculations



VA - Band structure of Si

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

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Carrier Transport Device Physics

Complete Nanowire Simulation

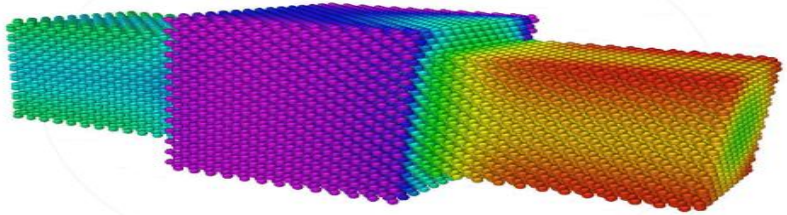
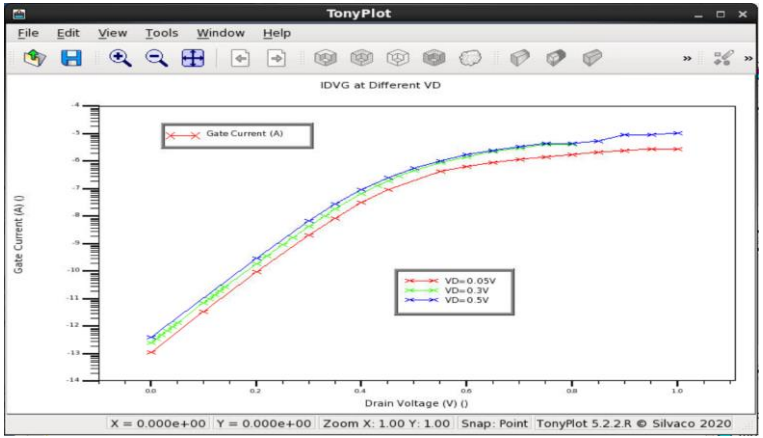


Illustration of Potential



- Quantum transport:
  - QTBM ballistic
  - NEGF scattering
  - Electron-phonon self-energy
- Strain dependency
- Schrodinger-Poisson
  - Self-consistent
- Density of states
- Transmission probability
- Optics

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Atomistic Simulation Speed for Everyday Use

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

Ballistic I(V)

2x2x20nm	**5 min / 30 CPUs**
5x5x20nm	**15 min / 120 CPUs**

Scattering I(V)

2x2x20nm	**120 min / 30 CPUs**
5x5x20nm	**480 min / 240 CPUs**

Complete Nanowire Simulation

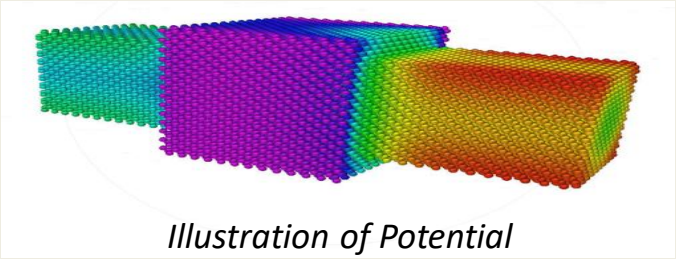

Illustration of Potential

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

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