IBIS Summit @ DAC 2005:

Library Characterization & Modeling: Issues, Recommendations and Possible Solutions

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## Sponsors

### Si2’s Design Technology Council (DTC)

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<td>Freescale Semiconductor</td>
<td>Infineon AG</td>
<td>Sun Microsystems</td>
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<tr>
<td>Hewlett Packard</td>
<td>LSI Logic</td>
<td>Intel</td>
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Reality: 90nm onwards!

All tough problems at 130nm are still here,… and there are some new ones at 90nm…
Challenges: 90nm onwards!

- Significant divergence between predicted & measured performance due to variability in process & temperature
  - Requires more complex and accurate libraries, including models for interconnect
- Chips designed with multi-$V_t$ and multi-voltage regions
  - Requires multiple libraries
- Semiconductor processes will get more complex at 65nm ...and beyond... which will lead to...
  - Even more complex libraries
Objective

Modeling & characterization environment:

- Increased accuracy to silicon at 90nm and 65nm
- Extendable to future technology nodes
- Support new capabilities (e.g. statistical timing)
- Maintain consistent modeling methodology
Issues

- Accuracy/consistency of library models
- Gap between requirements and capability
- Cost/Expertise needed to build accurate libraries
- Existing formats cannot express modeling needs
- Design tools closely “linked” to library
Model Accuracy

Requirements:

- Table lookup (piecewise linear)
- Arbitrary polynomials
- Current source models
- User definable equations / models
- Consistency across libraries
Capability Gap

Requirements:

- Delay, power & signal integrity analysis
- Multiple voltage libraries
- Statistical modeling of process & other variations
- Electromigration
Library Cost...

Requirements:

- Automate characterization & modeling flow
- Remove manual processes
- Automate curve-fitting & model generation
- Support hierarchical characterization
Library Format

Requirements:

- Unambiguous syntax and semantics
- Supported by popular industry tools
- Independent of any specific tool
- Community control / evolution
Tool “Linkage”

Requirements:

- Separation of tools from timing data / models
- API interface to modeling information
- Consistent results across all tools
- Silicon calculations defined by library provider
Roadmap

Library support for:

- Statistical timing
- Improved accuracy
  - Timing and noise
  - Leakage and total power
- Temp variation
Modeling System

Process Technology, BSim, and Spice Decks

Characterization System

Simulator control system

Simulator Results

Curve fit & model gen.

Macro block model gen.

Design DB

Legend:
- In-Scope
- External

Design

DB

Static

ECSM/CCS/.lib formats

Dynamic

Model Compilation

IEEE 1481v2 Rules

Tool Flow

Model Compilation

IEEE 1481v2 Rules

Tool Flow
Create New Coalition

Modeled after OpenAccess Coalition

- Collect Requirements
- Define standard interfaces
- Develop characterization subsystem
- Develop migration support
- EDA vendor adoption

Start Coalition
OMC Structure

### Open Modeling Coalition
- Si2 members in good standing
- Chair, Vice-Chair, Secretary
- Owners of reference flow and overall implementation
- Majority voting for decisions

### Technical Steering Group
- Upto 12 members
- Led by 2 chief architects
- 2/3 super-majority voting
- Owns roadmap, implementation plans
- Charters working groups
- Appoints champions for working groups

### Working Groups
- Created and disbanded by TSG
- Champion from TSG is a member
- Participants are from coalition
- Chair appointed by TSG
- Initial list of WG’s:
  - Interface to modeling subsystem
  - Interface for foundry information
  - Statistical timing
  - Static formats
Targeted Participants

- Integrated device manufacturers
- Silicon foundries
- Design automation vendors
- End user companies
- IP or library vendors
Open Library Modeling Meeting

Date: June 15, 2005
Time: 10:00 – 11:30AM
Place: Anaheim Convention Center, Room 202A
Summary

- 8 Letters of intent from DTC members
- 4 companies have submitted technology
- BOD approval at April 7th meeting

Engaging industry players
Moving forward with formation of coalition
Open Modeling Meeting at DAC on 06/15