IBIS-ISS Introduction and Futures
IBIS Interconnect Task Group

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Agenda

• The Problem of SPICE* Model Portability

• The Concept of IBIS-ISS

• What Is and Isn’t Supported

• Status and Future Directions

• Summary
A Standard SPICE* Does Not Exist

• What does the following SPICE* statement do?
  Bexample 1 2 I=sin(V(3,0))

• Results depend on the SPICE tool you use
  – IBIS or non-linear dependent source?

• Ambiguous elements exist across SPICEs
  – Other non-universal elements include P, W, Y, Z
  – Recall “The 3S Proposal” from June 2007 DAC Summit

How do you ensure a model works in your tool or your customers’ tools?

* Other names and brands may be claimed as the property of others
A Solution for SI/PI Interconnects

• SPICE* netlists include interconnects, devices and engine commands
  – e.g., .tran analysis for a driver and receiver on a PCB trace

• IBIS supports portable device models directly

• Engine commands are specific to EDA tools

• How to ensure interconnect models are portable?
  – Package, via, connector, PCB trace, on-die PDN...

**IBIS-ISS: an industry baseline for interconnect modeling in SPICE**

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IBIS-ISS in Simple Terms

• IBIS-ISS: IBIS Interconnect SPICE* Subcircuits

• Defines a limited set of common, basic elements useful for SI interconnect modeling

• Based on documents and concepts donated by Synopsys as seen in Synopsys HSPICE*
  – Originally assembled and edited by Walter Katz, SiSoft

• Developed with SI community through IBIS Interconnect Task Group
  – EDA vendors, IC vendors and system vendors

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What Is (and Is Not) Supported

• Fundamental circuit elements
  – Resistors, Inductors, Capacitors: R, L, K, C
  – Dependent Sources: E, F, G, H
  – Transmission Lines: T, W (including tabular, Foster, etc.)
  – S-parameters: S (Touchstone)

• Subcircuit definitions and instantiation
  – .subckt, .ends, X element

• Other basic commands
  – .include, .param

... but no engine commands, no active device support, and no field solver

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Usage Model

• IBIS-ISS consists entirely of subcircuits and subcircuit definitions
  - IBIS-ISS does not define netlists
  - Subcircuits may be nested or independent

• All parameters are local, and passed explicitly

• Multiple files are supported (.include)

• Compliant tools simply accept IBIS-ISS files
  - Meaning, properly apply IBIS-ISS assumptions within the scope of the top-level subcircuit

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How Does It Work?

.subckt my_trace_group 1 2 3 4 5 6 7 8 ref length=5e-3
* Units are meters
* This is a top-level subcircuit
* The user/system designer will instantiate this circuit in a netlist

Xtrace_a 1 ref 2 ref single_trace local_length=length
Xtrace_b 3 ref 4 ref single_trace local_length=length
Xtrace_c 5 ref 6 ref single_trace local_length=length
Xtrace_d 7 ref 8 ref single_trace local_length=length

* This circuit assumes no crosstalk

.subckt single_trace in local_ref out local_ref local_length=1
  Wsingle in local_ref out local_ref N=1 L='local_length'
  + TABLEMODEL='single_line_table'
.include 'single_line_table.inc'
* This file defines the tabular data using .MODEL
* This file should also be written using ISS rules
.ends

.ends

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Announcement

• Draft 1.0 is officially submitted to the IBIS Open Forum for review and approval as a standard!
  – http://www.eda.org/ibis/ibis-iss_wip/

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Issues and Future Directions

• Items of controversy
  – Independent voltage sources vs. external power ports
  – Replaces ICM?

• Links to other specifications
  – MCP? EMD?
  – IBIS? EBD?
  – Touchstone 2.x and port/node mapping?

• A parser is under consideration

• Possible extensions?
  – IBIS-ISS as basis for behavioral device model format?

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Summary

• If you model interconnects, IBIS-ISS can help ensure usability across SPICE* tools

• If you use SPICE of any kind, IBIS-ISS will be familiar to you

• IBIS-ISS will be reviewed in the next few IBIS Open Forum meetings for official approval

Please study, discuss and comment on the IBIS-ISS draft.
Your contributions are important!

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References

• Documents and background materials on-line:
  – http://www.eda.org/ibis/interconnect_wip/

• Mailing list available for updates and discussion:
  – http://www.freelists.org/list/ibis-interconn/

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