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
    - http://www.eda.org/ibis/summits/jun07/mirmak2.pdf

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

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

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

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

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

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
```

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/

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?

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!

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/