IBIS-ISS: What It Is and What It Means to You

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Agenda

- The Problem of SPICE* Model Portability
- The Concept of IBIS-ISS
- What Is and Isn't Supported
- IBIS-ISS and Good SPICE Usage
- Status and Future Work
- Summary and Call for Action!

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?

- Some elements are not supported or do not share a common meaning in all SPICE variants
  - Other non-universal elements include P, W, Y, Z

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*
- 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
- Subcircuit definitions and instantiation
  - .subckt, .ends, X element
- Other basic commands
  - .include, .end, .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
```

Using SPICE* Correctly

- Good SPICE* habits will make IBIS-ISS adoption and use easier
  - Pass parameters explicitly and sparingly
  - Do not rely on global parameter definitions
  - Avoid using global nodes
  - Use modular circuit design
  - Make node, parameter and element names clear and unique
  - Avoid setting engine options in subcircuits
  - Avoid ambiguous units and multipliers (e.g., amps vs. atto-)

Practice using IBIS-ISS rules in your circuits today

Status and Future Work

- Draft v0.7 now in review
- Once drafts are complete, the document will be provided to the IBIS Open Forum for approval
- A parser is under consideration
- 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/

Questions and comments are welcome!

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
- Following principles of good SPICE circuit construction makes IBIS-ISS easy to use

Please study, learn, discuss and comment on the IBIS-ISS draft.

Your contributions are important!