

# 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 <u>netlists</u>
  - 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:
  - <u>http://www.eda.org/ibis/interconnect\_wip/</u>
- Mailing list available for updates and discussion:
   <u>http://www.freelists.org/list/ibis-interconn/</u>

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!

