IBIS Interconnect Specification

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Current Status

› Draft interconnect spec ICM 1.0 released for review (Yeah!)
  – Available on IBIS website under the "Connector Info" link
  – Comments have been received
› No feature changes from last report
  – Some technical items were clarified
› Critical ICM 1.0 features
  – Specification encompasses both connectors and package style interconnect
  – Frequency dependant effects are captured via S-parameter matrices
  – Both regular and non-regular connectors are supported
› Moving forward...
  – parser development -- funding, contractor, testing
  – integration into multi-lingual modeling proposal??

Overview

› A .icm file supports one (1) interconnect family

 – Each interconnect family includes one or more individual interconnect descriptions

› Individual interconnect descriptions include the following:

 – Basic info like manufacture, description, mating conditions, model limit (max slew rate), etc.

 – The model type (MLM, SLM or S-parameter).

 – A path description, either 'tree' or 'nodal', that describes how the matrices are interconnected.

 – Where applicable, info that allows pin swathing.

 – Mapping between external pins/node of interconnect and the rows of the matrix.

› Matrixes contain either RLGC or S-parameter data (via external Touchstone file).

Overview (cont.)

- › Specification supports three different types of interconnect:
  - Regular (no pins missing) rectangular connectors
    - v Swathable, can use either path description
  - Regular, non-rectangular connectors
    - v Not swathable, can use either path description
  - Irregular connector/interconnect
    - v Not swathable, must use nodal path description
- › Nodal vs. Tree type path descriptions
  - [Tree Path Description] cascades matrices back to back, each row of matrix corresponds to a single pin, same # of pins front and back
  - [Nodal Path Description] connects matrices via explicit node names, can build arbitrary structures with missing pins, different size matrices, etc.

MLM and SLM Models

› MLM = Multi-line (coupled) models
  – Use for including pin-to-pin coupling
  – Spec specifies partial inductance values and Maxwell capacitance values in matrix
  – Intent is to support xtalk and return path simulations.

› SLM = Single lines (un-coupled) models
  – SLM_EvenMode/OddMode/Quiescent models have documented ground return paths(!)
  – SLM_General only documents GSR ratio
  – Spec specifies loop inductance in matrix
  – The intent is to 'bracket' interconnect performance under specific conditions

› S-parameter models
  – By definition are coupled models, unused terminals terminated by reference impedance

Length vs. Multiplier Matrix Specification

› Path description specifies how to interpret the data in an RLGC matrix

   – Len = per-unit-length, intended for distributed transmission line elements. Expansion by multiplication.

   – Mult = lumped elements, intended to be rendered into circuit netlists. Expansion by cascading sections.

   – S-parameter is always lumped, non-cascade

› [Derivation Method] keyword in matrix section provides a cross reference

› Two styles for two different purposes…

   – Per unit length results from a 2-D extraction of parallel structures (I.e. package traces)

   – Unit multiplier results from a 3-D extraction of non-regular structure (I.e. connectors)