



Interconnect BIRD S-parameter shortcut referenceing

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Objectives and Issues

- Provide an easy manner for an IBIS model developer to include an S-parameter without an ISS wrapper
 - Is this necessary? How much time does it really save?
- Target SI applications
 - These applications are typically measured/simulated and then represented in S-parameter format to apply per-net electrical resolution for references.
 - Some power-aware SI and PI applications may require more per-pin/pad or grouped-pin/pad resolution referencing
- Requirement
 - **Consistent simulation for all EDA tools**
- Complexities
 - N-port S-parameters have N signal terminals and 1 to N additional reference terminals
 - Requiring only 1 reference terminal may not suffice for some SI designs (e.g. DDR<n> with VSS and VSSQ references), unless it is acceptable for such cases to have an ideal short circuit among all reference nets
 - Model generators have no standard manner in which to specify net/terminal information for ports, though some tools now include non-standard info as comments (which may even be encrypted)
 - Model generators do not typically document references

A Possible Approach

- Start with the end requirements and work back to IBIS implementation and implied S-parameter format and generation requirements
 - This presentation only defines the first step of that process
- Uniform EDA tool treatment
 - Strict rules for how references must be implemented by EDA tools
- SI applications
 - Bound the application space
 - Per-net resolution references
 - all pins and all pads of a reference net are mutually connected by ideal short circuits
 - Associate reference with net rather than port, pin or pad
 - No net of type signal may serve as a reference
 - Allow multiple reference nets
 - VSS and VSSQ are not shorted together if both are specified as references
 - A power nets may serve as a reference
 - Power pins/pads/grouped-pins/pads/nets may be included as signal terminals in a shortcut S-parameter, unless the power net is specified as a reference by any shortcut S-parameter

Possible Rules

1. S-parameter model generator must document the reference net for each port
 - The reference could include pin/pad info, but net is necessary and sufficient here
 - This may imply an update to the Touchstone format spec?
2. For shortcut S-parameters each signal_name to which a port terminal is connected through a pin/pad must have a reference specified.
 - One may specify an interconnect-level common reference that applies as a default to all ports of all shortcut S-parameters.
 - For each shortcut S-parameter one may specify a common reference that applies as a default to all ports of that S-parameter and overrides an interconnect-level common reference.
 - One may specify a reference for any signal_name, which overrides any common or interconnect-level common specification.
3. A reference shall be a signal_name of type ground or power.
 - Precludes the 1-port case with which Radek was concerned.
4. Any signal_name specified as a reference may not have a model associated with it.
 - Avoids duplicating parasitics in reference nets.
5. For any net specified as a reference the set of all pins and all pads with that signal_name shall be interconnected by the EDA tool with ideal short circuits.

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