

Die to Die Connectivity

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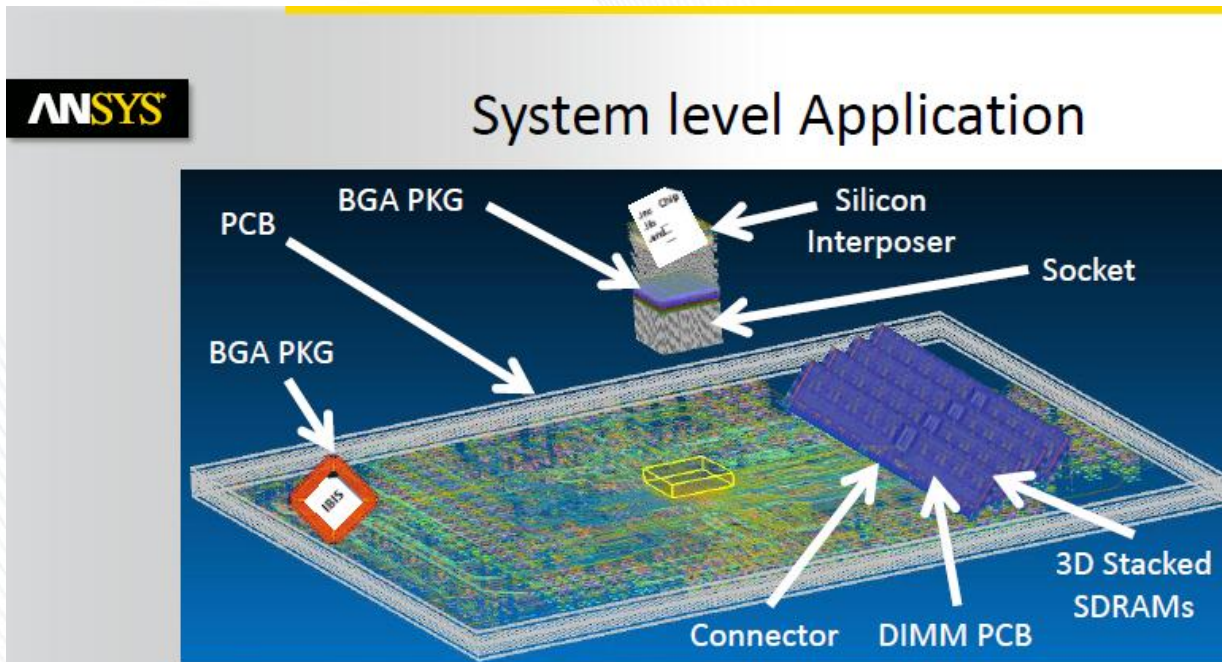
Overview

- A real Die 2 Die problem
- Vendor supplied models
- EDA tool supplies PCB models
- EDA tool supplies connectivity between PCB models and Vendor supplied models
- All of the pieces are now in place to automatically define full post layout Die 2 Die models.
- Conclusion

A Real Die 2 Die Problem

- System consists of
 - Backplane
 - A Number of Line Cards
 - A Number of Switch Cards
 - Twinax cables from Line Card on this system to a Line Card on another similar system
 - Optical cables from Line Card on this system to a Line Card on another similar system
- Die 2 Die Connections (Die Pad to Die Pad)
 - Within a DIMM
 - Within a Line Card or Switch Card
 - Between Line Card and Switch Card in a System
 - Between Line Cards on two Systems

Example Switch Card



- IBIS: Commonly used for DDR simulations
 - DDR4, Wide I/O, Hybrid Memory Cube, ...
- IBIS-AMI: Commonly used for SERDES simulations
 - PCIe, SATA, SAS, HDMI, USB, ...

Modules Not Shown

- Line Card Module
- Backplane Module
- Connectors between Backplane Module and
 - Line Card Module
 - Switch Card Module
- Cables between Line Card Modules
 - Twinax
 - Optical

Vendor Supplied Models

- IC Vendors
 - IBIS file of BGA PKG/Die
 - EMD file of Socket/Interposer/Silicon
 - Connector/Dimm PCB/3D Stacked SDRAMs
- Connector Vendors
 - EMD file of Line Card Connector
 - EMD file of Switch Card Connector
- Cable Vendors
 - EMD file of Twinax Cable
 - EMD file of Optical Cable

EDA Tool Supplies PCB Models

- PCB Board Models
 - Back Plane
 - Line Card
 - Switch Card
- Boards can be from multiple EDA Vendors
- Models can be supplied as EMD files

Intra PCB Module Connectivity is Determined by EDA Tool

- Between PCB and IC Vendor Models
 - Footprints in PCB Data Base have
 - Reference Designator
 - Corporate Part Number
 - Pin Numbers (IBIS Pin_names)
 - EDA tool uses mapping of Corporate Part Numbers to IBIS files (.ibs, .ebd, .emd) and Pin Numbers to define electrical connectivity between PCB and IBIS file.

Inter PCB Connectivity is Determined by EDA Tool

- Between PCB and PCB
 - Each Board instance has a Board Reference Designator
 - Footprints in PCB Data Base have
 - Reference Designator
 - Pin Numbers (IBIS Pin_names)
 - EDA tool has “Connection Data” that has a number of “connections” with the following data:
 - Connector (or Cable) EMD Model
 - For both A and B Side of the Connector
 - Board Reference Designator
 - Footprint Reference Designator
 - Footprint Pin

All of the Pieces are now in Place

- Intra IBIS (EMD) Die to Die
 - EMD supplies this Die to Die model
- Inter IBIS (.ibs, EMD, EBD) Die to Die
 - IBIS supplies Die to IBIS Pin model
 - EDA tool makes connection of IBIS to PCB
 - Inter PCB
 - EDA tool uses PCB connections to finish the job

Conclusion

- Demonstrated that EMD is all that is required to solve the problem of automatically generating post layout interconnect models from Die to Die.
- Assumptions
 - IC Vendors generate EMD files for board level components
 - Connector Vendors generate EMD files for connectors
 - Cable Vendors generate EMD files for cables
 - Connections between PCB and Connectors, Cables and Board Level Components are done by Pin Number (Pin_name). Connection within EMD (e.g. between silicon and interposer, or interposer and package) may use XY coordinates or other techniques.