Practical Issues in Enabling a Corporate IBIS Library

IBIS Summit / DesignCon West 2005
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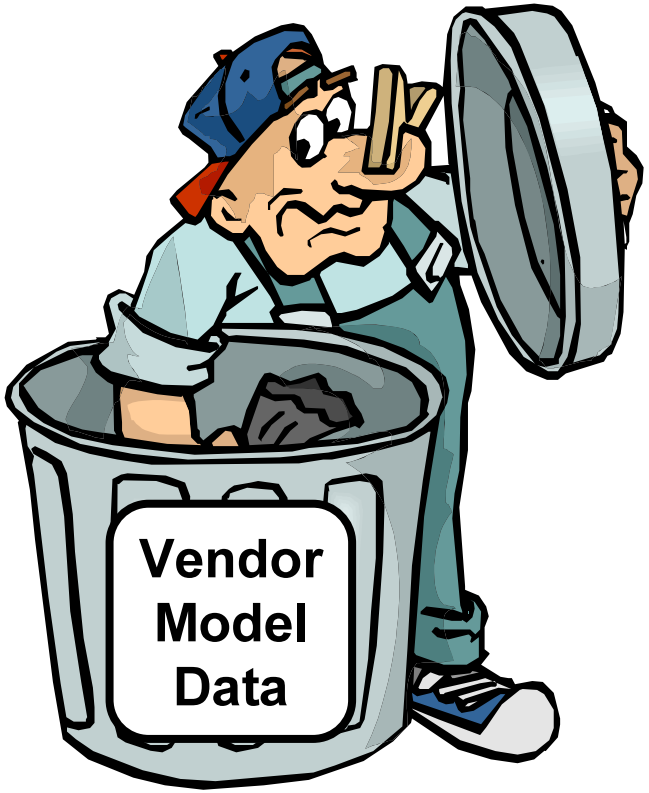
Cisco Systems, Inc.

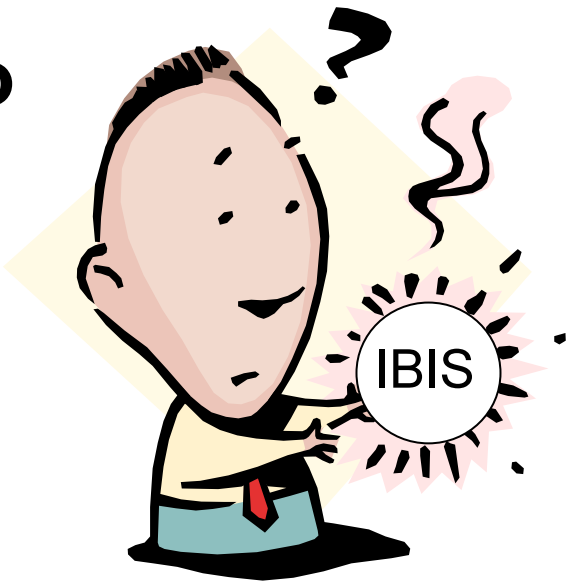
Signal Integrity: Trouble in Paradise

- Many IBIS models have significant quality problems
- Many semiconductor vendors lack expertise to create high quality models
- SI specialists waste time addressing quality issues



Bringing SI to the Masses

- **Most hardware designers lack skills to find/resolve model problems**
- **SI libraries are where CAD libraries were 10-15 years ago**
  - **Ad-hoc library organization is becoming untenable**
  - **A more centralized library strategy is needed**



Corporate SI Library Goals

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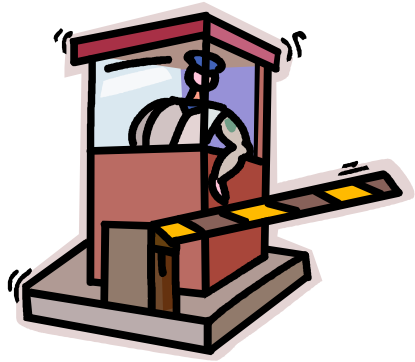
- **Help move SI analysis from the realm of the specialist to the engineer's desktop:**
  - **Centralized, high quality SI library maintained by experts**
  - **Minimal time spent debugging / correcting models**
  - **General purpose library structure (not dictated by the needs of a specific toolset)**
  - **Simplified process to get design databases ready to simulate**

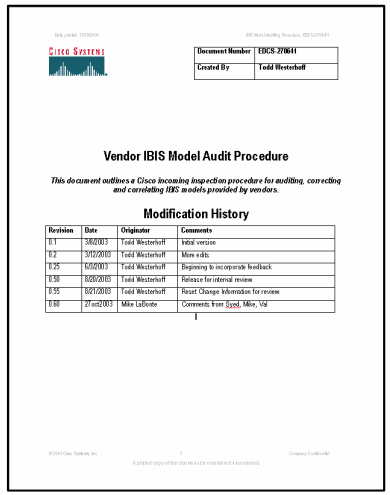
Key Concepts

- Use “incoming inspection process” to identify problem models early
- Organize library for data management, map to structure needed by EDA tools
- Unified model naming convention allows users to find and select components easily
- Automate as much of the overall process as possible

Incoming Inspection Process

- **Flag model problems BEFORE they get used for design work**
  - **Identify models that are poorly constructed or self-inconsistent**
  - **Develop a checklist for identifying common modeling problems**
  - **Re-examine models that have caused problems in past projects**
  - **Incorporate Industry Standards (IBIS Quality Checklist)**
- **Automate inspection process as much as possible**





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Vendor IBIS Model Audit Procedure

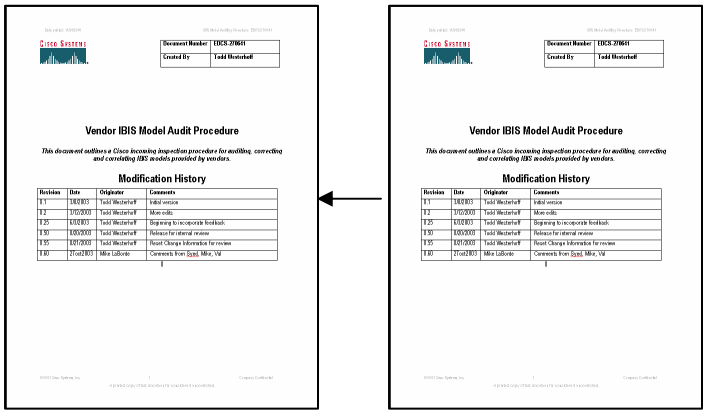
This document outlines a Cisco incoming inspection procedure for auditing, correcting and correlating IBIS models provided by vendors.

Modification History

Revision	Date	Originator	Comments
0.1	3/6/2003	Todd Westerhoff	Initial version
0.2	3/12/2003	Todd Westerhoff	More edits
0.25	5/5/2003	Todd Westerhoff	Beginning to incorporate feedback
0.50	8/20/2003	Todd Westerhoff	Release for internal review
0.55	9/21/2003	Todd Westerhoff	Reset Change Information for review
0.60	27-oct-2003	Mike LaBonte	Comments from Syed, Mike, Vid

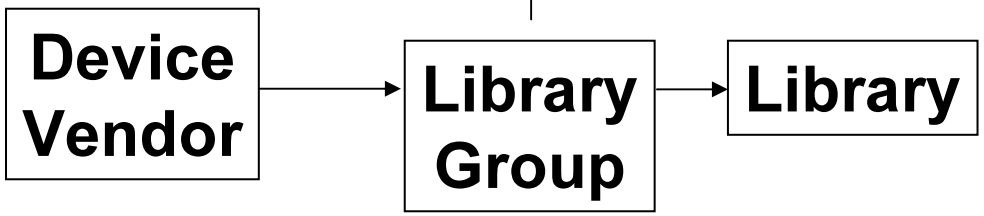
Inspection Process

Driving IBIS Model Quality



Inspection Process

Inspection Process



- **"Fix problem at the source" - drive quality issues back to device vendors through Component Management**
- **Use resources to support process improvement, instead of debugging models**

Managing Library Data

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- Organize data to allow developers and users to find the latest information
- Employ version control and revision histories
- Library / SI tool strategy should handle “second source” components

The Only Authority For a Part Type …

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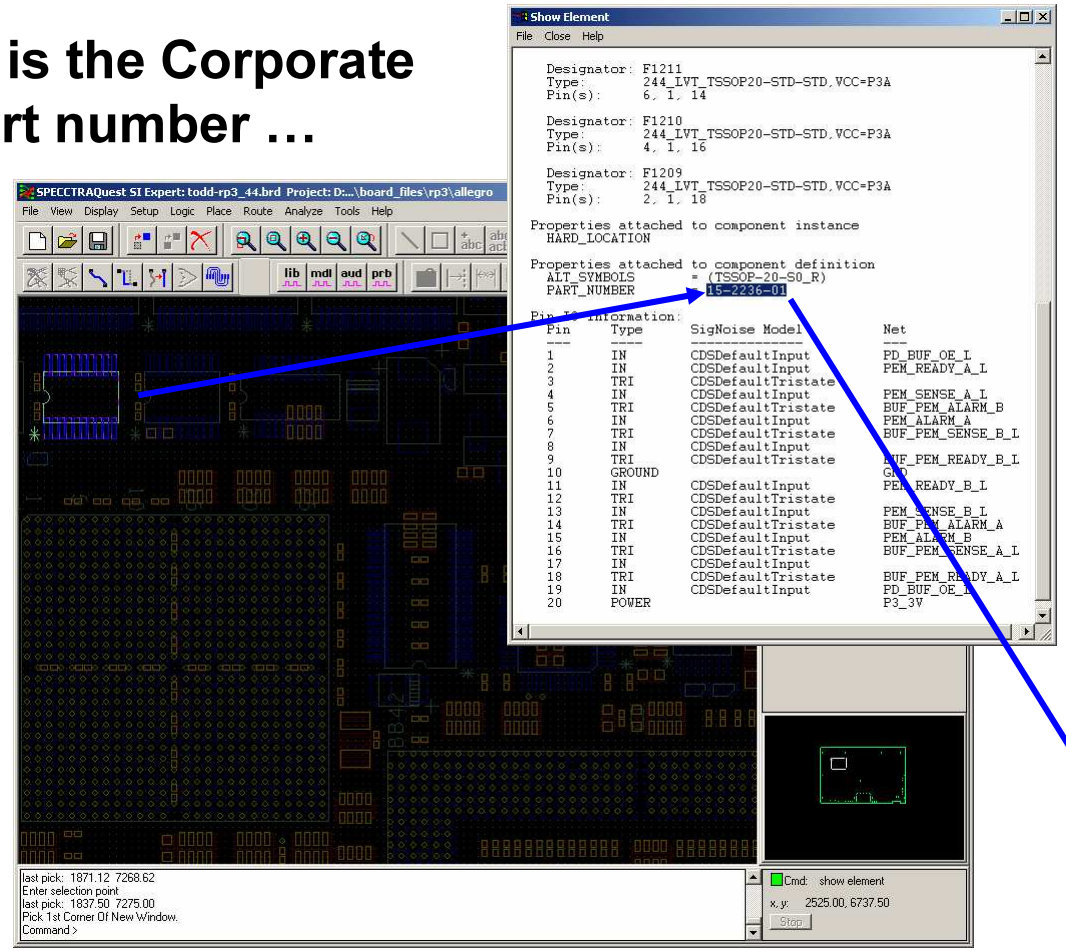
… in the device library …

… is the Corporate part number …

… that points to the AVL list.



Item Detail

Item: 15-2236-01 **Org: GLO(GLOBA**

General Properties		
Description	IC,74LVT244A,BUFR,OCTL,TSSOP20	
User Item Type	PURCHASED ITEM	
Usage Status	Approved	
Network Critical	No	
Buyer	null	
WIP Supply	Vendor	
Lead Time	35 Days	
Standard Cost	0.1163	
Commodity Code		
Risk Factor	4	
Reason Code		

Approved Vendor List

Vendor	Vendor Part Number	MCN Pending	Qualification Status
TEXAS INSTRUMENTS	SN74LVT244APW	No	Qualified
PHILIPS SEMICONDUCTOR	74LVT244APW	Yes	Qualified
TEXAS INSTRUMENTS	SN74LVTH244APW	No	Qualified
FAIRCHILD SEMICONDUCTOR	74LVTH244MTC	No	Qualified
No of records retrieved 4			

Library Directory Structure

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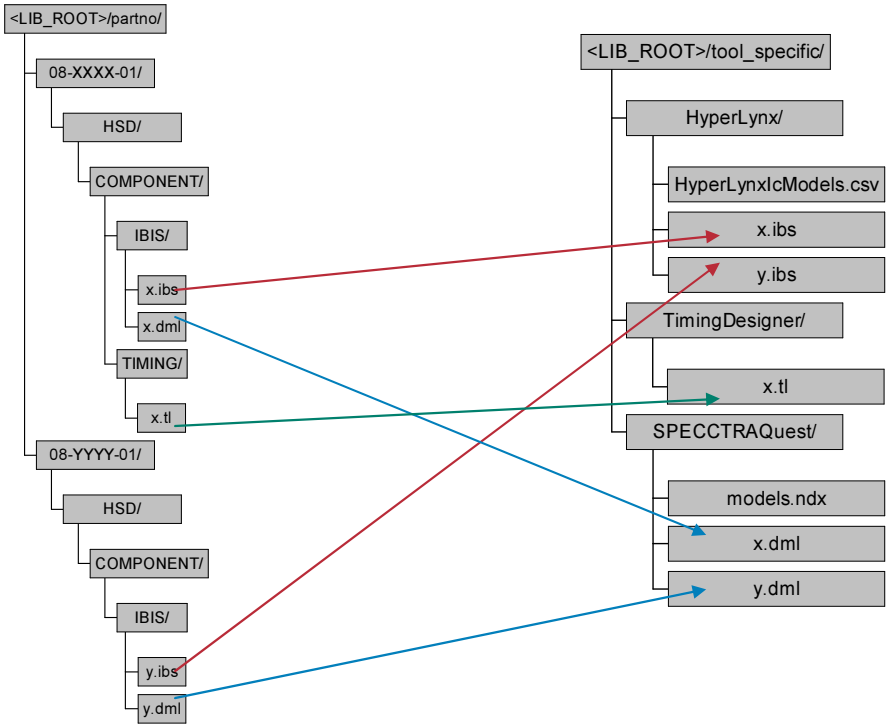
Master Library

EDA Tool View



- Organize master library by Corporate part number
- Create different library "views" for EDA tools
  - Meets goal of tool independent design
- Allows EDA tools to operate efficiently

Naming Strategy

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- IBIS models from different semiconductor vendors will have no unified file, component or buffer naming strategy
- Depending on the EDA tools and models used, name collisions are possible
- Users assigning models interactively will benefit from a consistent naming approach

How To Organize IBIS Model Data?


```
15-2201-01/
…
15-2236-01/
        TI/
           IBIS/
              sn74lvt244apw.ibs
              sn74lvth244apw.ibs
         PHL/
           IBIS/
              74lvt244apw.ibs
         FSI/
           IBIS/
              74lvth244mtc.ibs
```

Library directory structure

} By Corporate part number

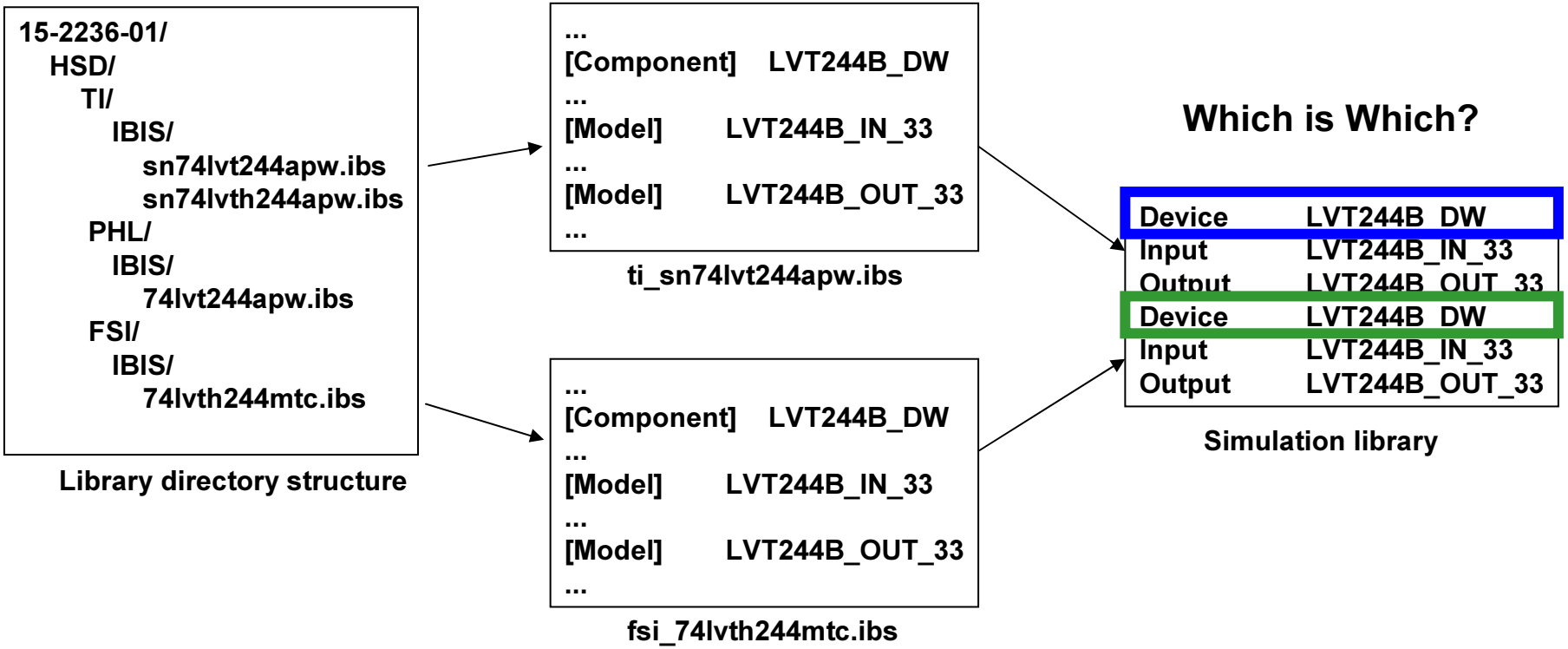
} By vendor

} By model type

} By vendor part number

However ….

… Some IBIS simulators see only the [Component] and [Model] names from the .ibs files



For SI Libraries to Work Properly …

… [Component] names must be unique across the entire device library

```
15-2236-01/
   HSD/
      TI/
         IBIS/
            sn74lvt244apw.ibs
            sn74lvth244apw.ibs
      PHL/
         IBIS/
            74lvt244apw.ibs
      FSI/
         IBIS/
            74lvth244mtc.ibs
```

Library directory structure

```
Device   TI_SN74LVT244APW
Device   TI_SN74LVTH244APW
Device   PHL_74LVT244APW
Device   FSI_74LVTH244MTC
```

Simulation library

One strategy: redefine IBIS [Component] to a 2/3 character vendor ID + vendor part number

An IBIS Naming Convention

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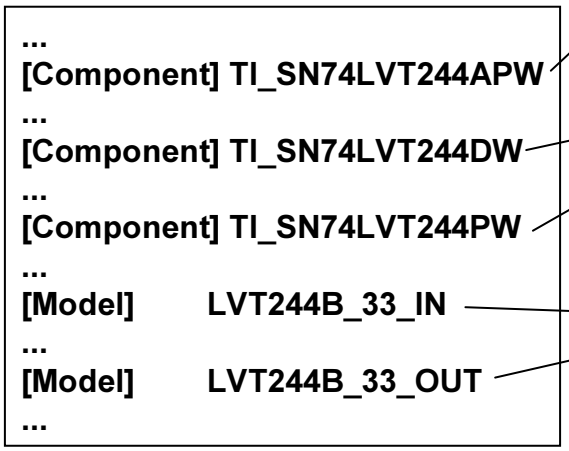


[Component] declaration is 2/3 character vendor identifier + number for the device "function"

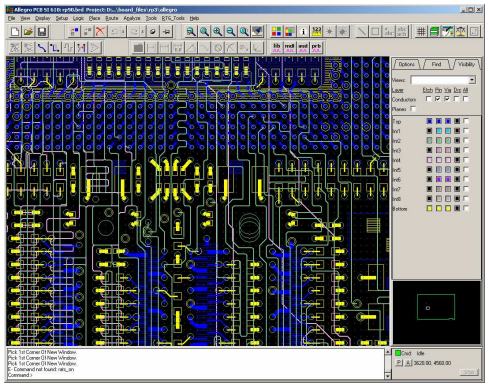
Multiple [Component] declarations can reside in the same IBIS file

Buffer model names end in "_IN, _OUT or _BI" according to their type

ti_sn74lvt244apw.ibs

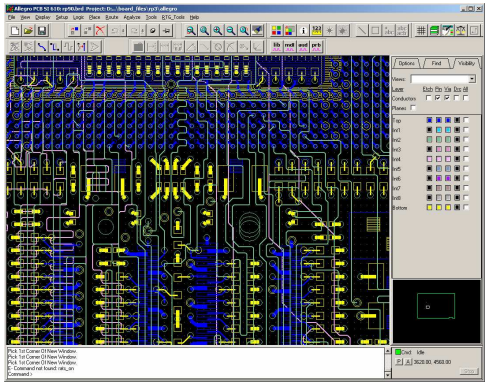
File name is 2/3 character vendor identifier + part number for the main device described in the model

What Users Want …

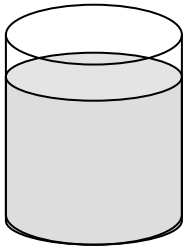


PCB Database

Then a
Miracle Occurs



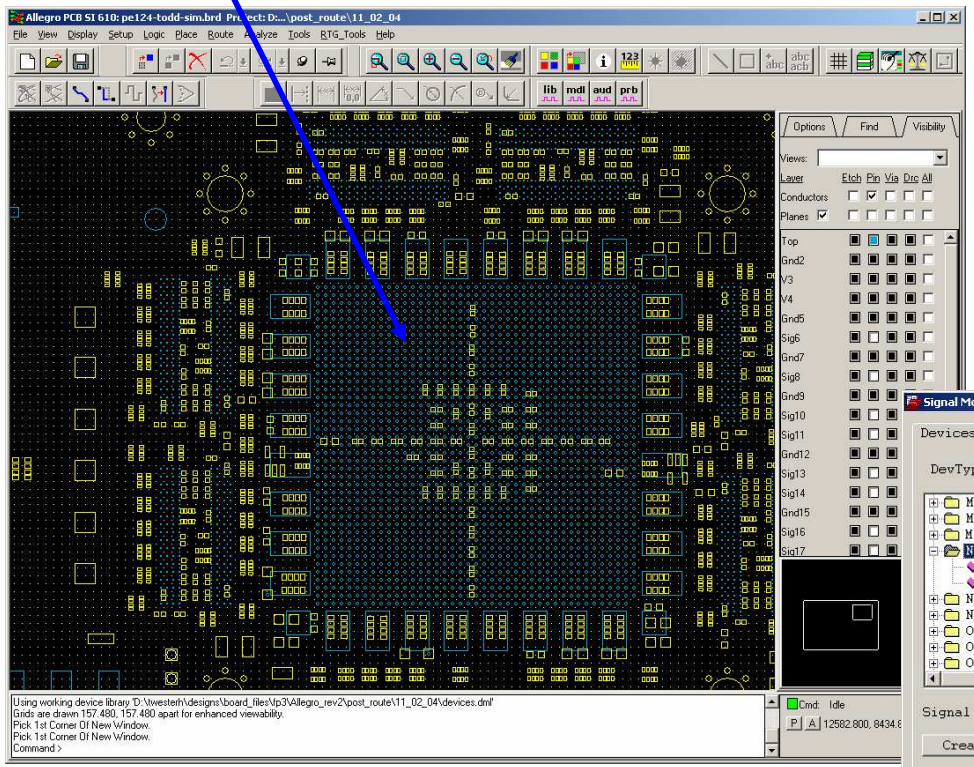
Simulatable Database



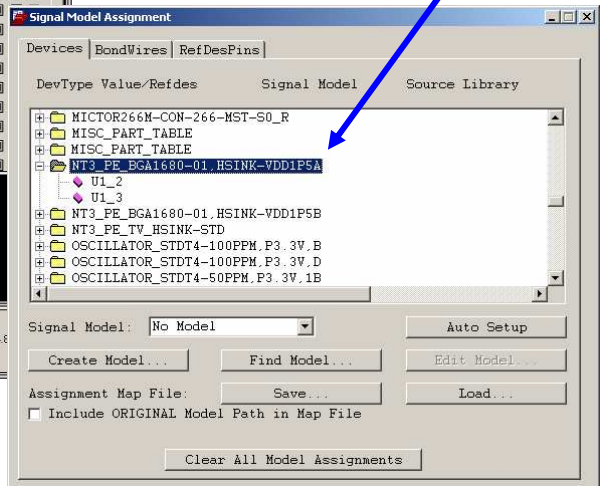
Central
Simulation Library

The User's Question …

1. Do we have a simulation model for this part?

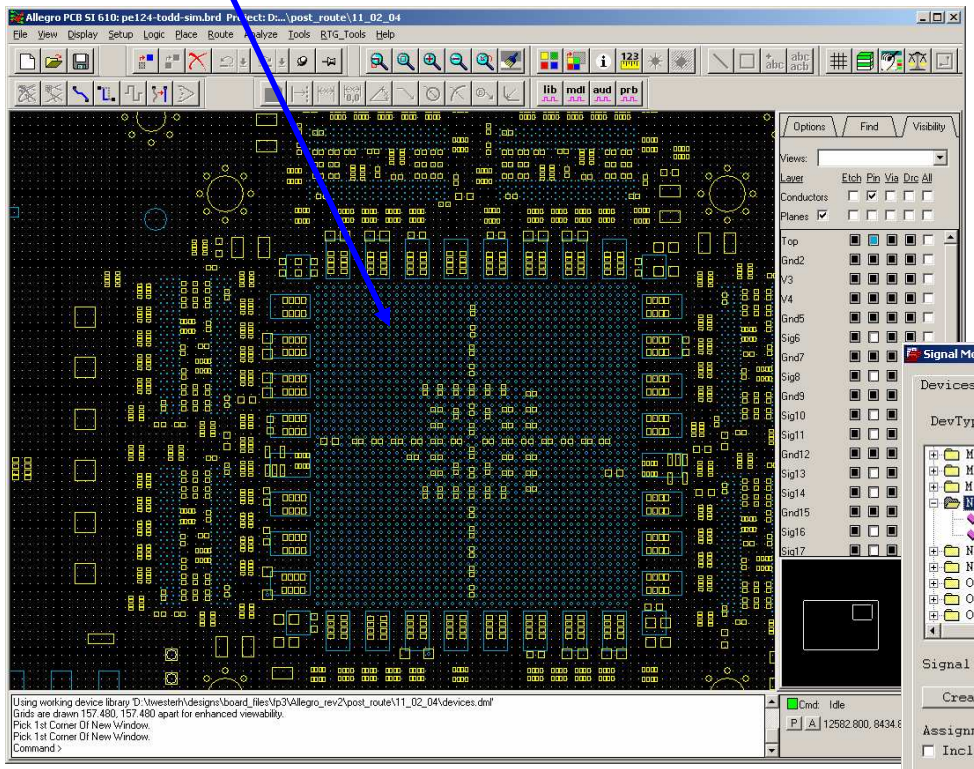


2. What on earth is a NT3_PE_BGA1627-01,HSINK-VDD1P5A?

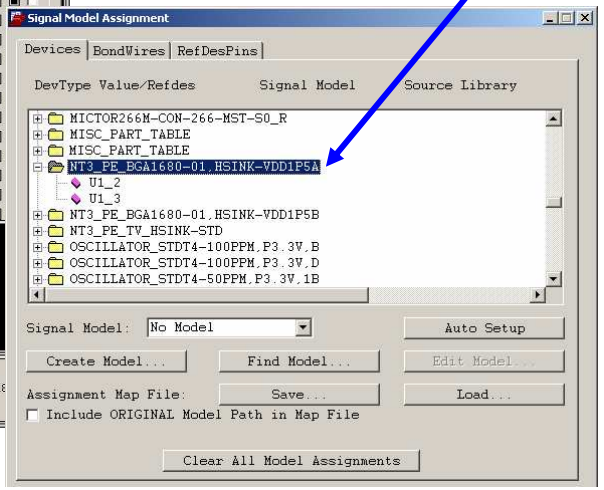


… The Answers

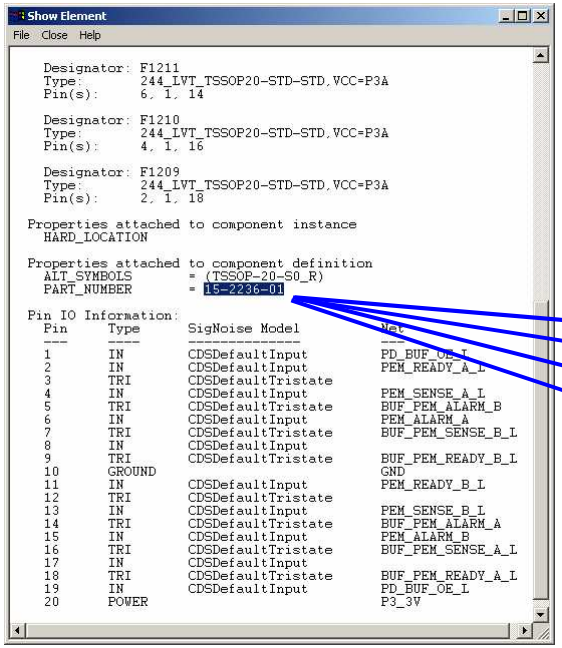
1. Maybe …



2. The concatenation of the DEVICE and VALUE properties for this component



… But One Part Can Have Multiple Models!



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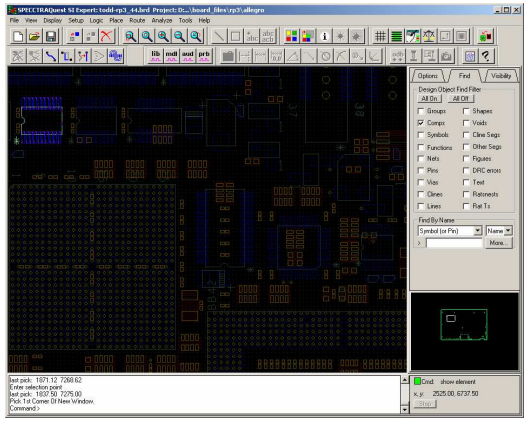
No of records retrieved 4			

… most EDA toolsets have no provision for this

The Role of Scriptware

- Map parts to simulation models
- Assign models for “second source” components
- Identify missing simulation models



PCB Database

240_LVT_TSSOP20-STD-STD,VCC=P3A
244_LVT16_TSSOP48-STD-STD,VCC=A
244_LVTH_TSSOP20-STD-STD,VCC=PA

Device List (From Netlist)

Model Assignment Process

Simulator Default Model	Corp P/N	IBIS Models
244_LVT_TSSOP20-STD-STD,VCC=P3A	15-2236-01	Device TI_SN74LVT244APW Device TI_SN74LVTH244APW Device PHL_74LVT244APW Device FSI_74LVTH244MTC

Device Library Database

244_LVT_TSSOP20-STD-STD,VCC=P3A	TI_SN74LVT244APW

Simulator Mapping File

Conclusion

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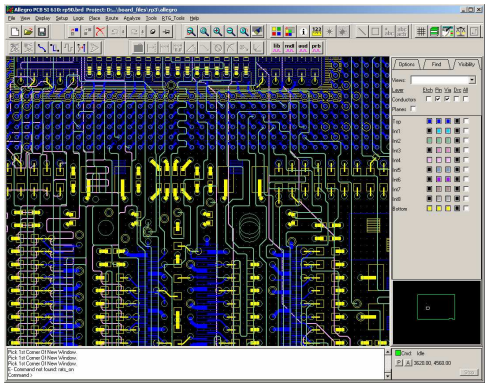
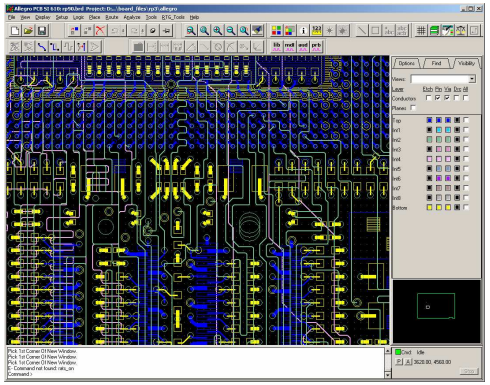
- **Bringing "SI to the masses" will require a centralized library strategy**
  - **Use incoming inspection to identify model problems early**
  - **Library can be organized for management, mapped to views that EDA tools require**
  - **Unified model naming strategy provides consistent component/buffer names to users**
  - **Automating SI model assignment eases the user's burden and manages "second source" simulation models**

… Sometimes Miracles DO Happen!

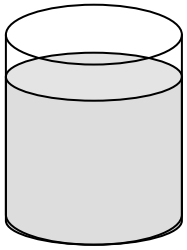


PCB Database

Scriptware



Simulatable Database



Central
Simulation Library