

Asian IBIS Summit
Yokohama, JAPAN
November 16, 2012

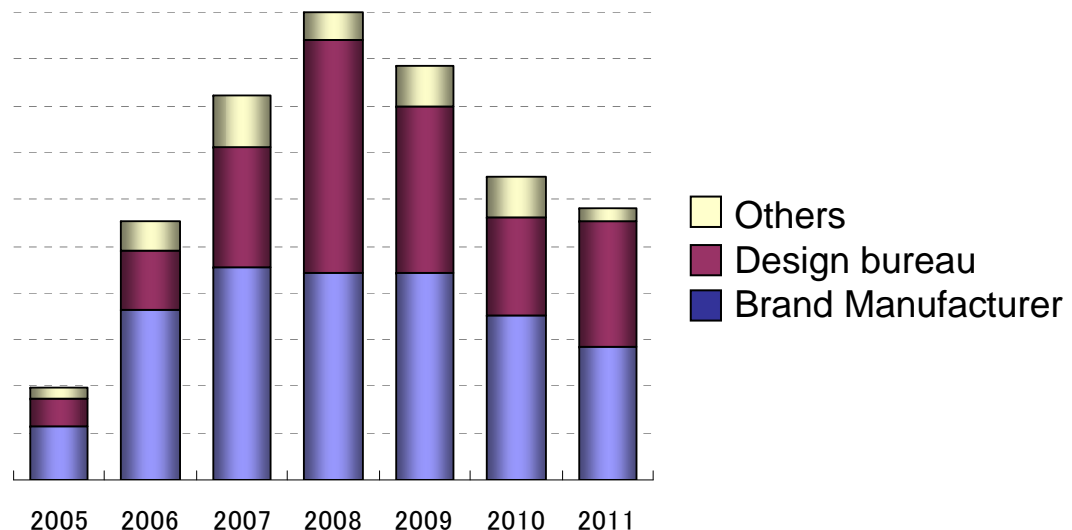
The VOICE from Practical Designing with SI Simulation

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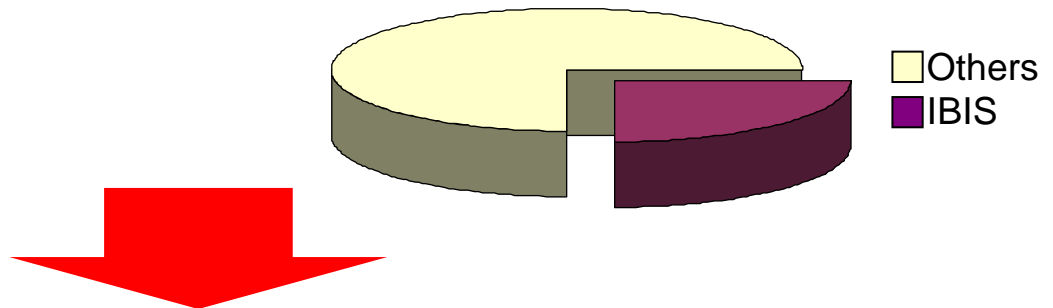
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 - Flight Time and Test load
 - Package Model
 - Buffer Switching Characteristic
 - Different simulators show different results
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Introduction

- EDA vendors always receive questions and voices from customer.
- This figure represents the transition of the number of calls in each business categories.
 - In 2005 and 2006, Brand Manufacturer accounts for a major portion of calls.
 - After 2008, Brand Manufacturer and Design bureau become about the same rate.



- This figure represents the ratio of calls related to IBIS models, you can see calls related to IBIS models is amount a quarter of the ratio.



Recently, It is getting more common for layout designers to consider Signal Integrity, and to increase their usage of IBIS models.

This presentation introduces FAQ (Frequently Asked Questions), which the support center of EDA vender receives from SI and IBIS beginners, related to IBIS models.

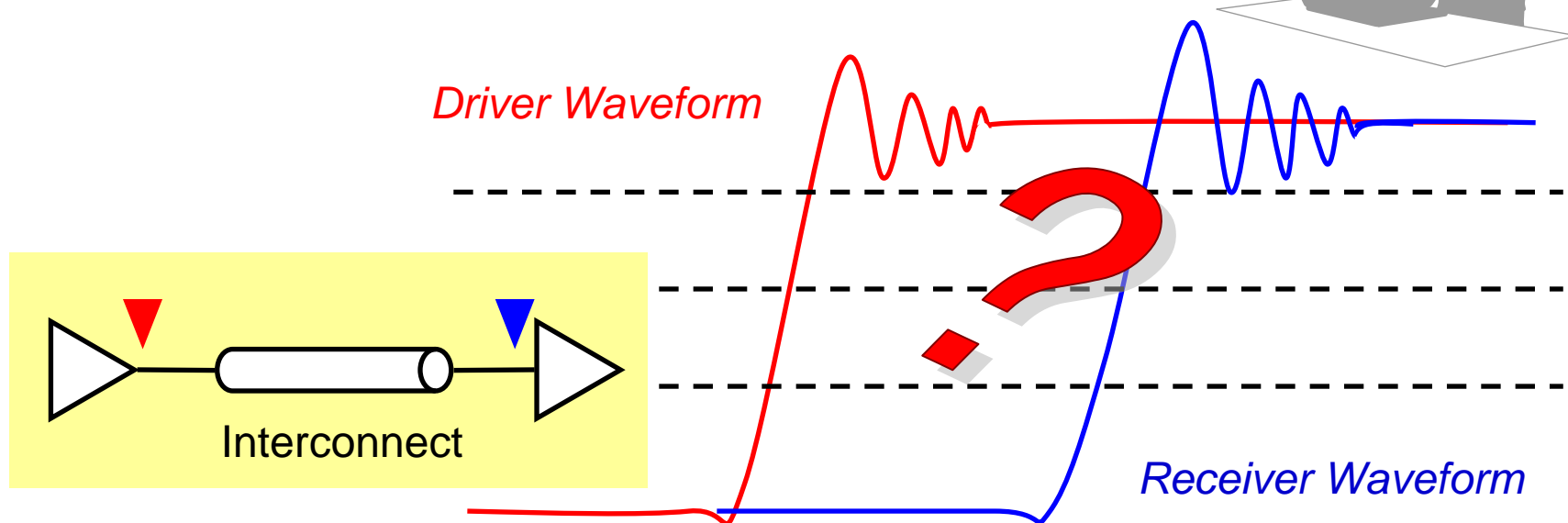
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1. Flight Time and Test load

■ Question1-1:

What is Flight Time?
When Flight Time begins and ends?

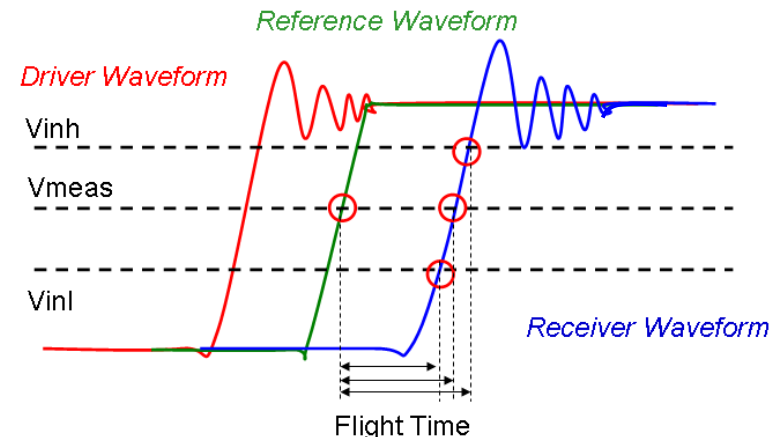
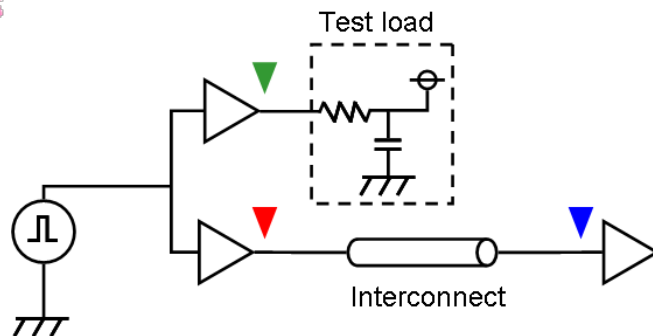


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1. Flight Time and Test load

■ Answer1-1:

Flight Time is the signal delay between reference waveform and receiver waveform.



Reference waveform is generated from Test load (or Unloaded).
IBIS models have Test load value as Cref/ Rref/ Vref.

[Model] buffer
|. . .

Vmeas = 1.5V

Cref = 50pF

Rref = 500

Vref = 0

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1. Flight Time and Test load

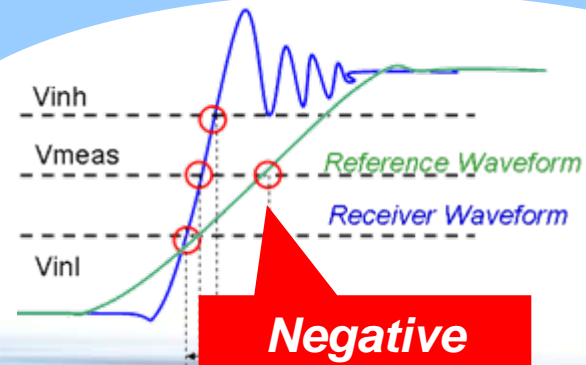
■ Question1-2:

Flight Time shows negative. Why?

■ Answer1-2:

Rising / Falling time of reference waveform is slower than receiver waveform.

- Test load for the delay from clock pad to the output can be heavier than actual loads.
- The interconnect can be very short.

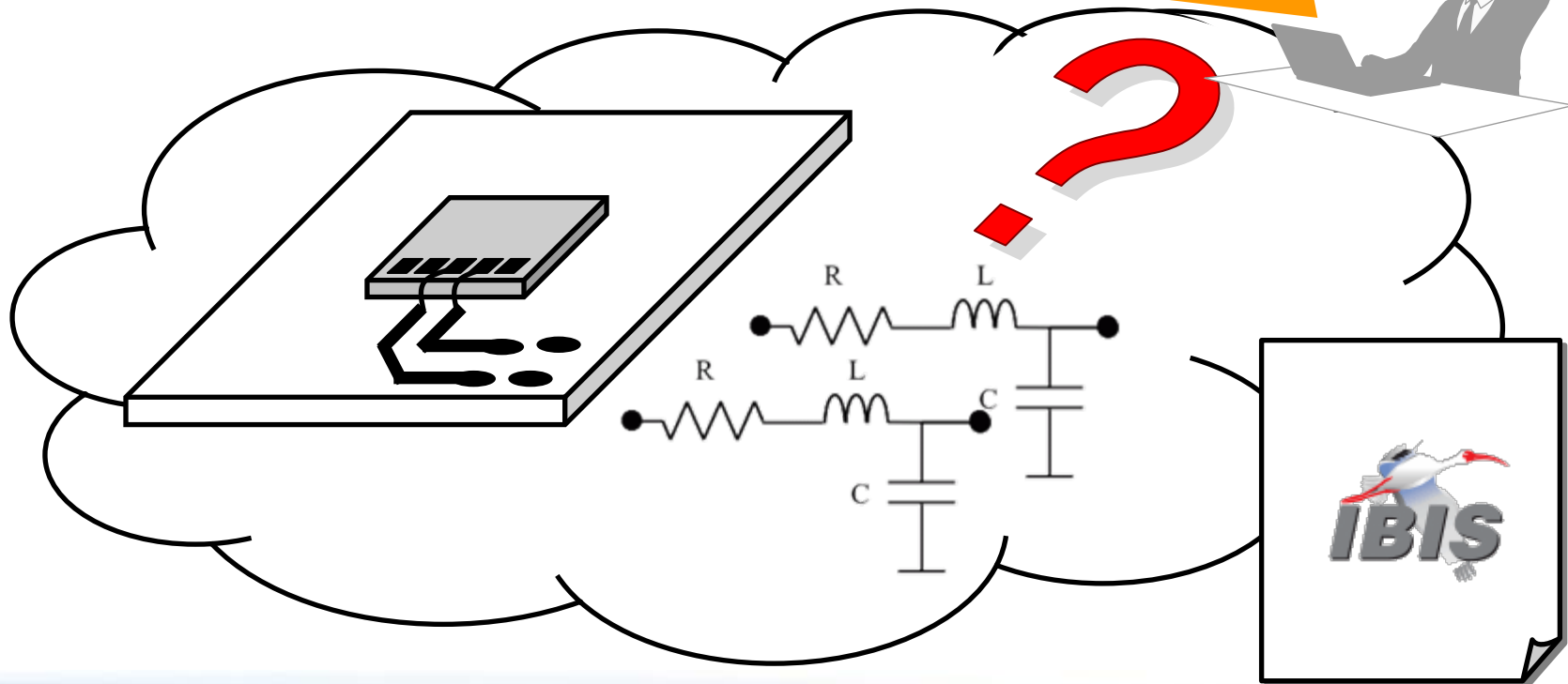


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2.Package Model

■ Question2:


Does this IBIS model take the package R/L/C into account for each individual pins?



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2.Package Model

■ Answer2:



Check whether package R/L/C exist for each individual pins in [Pin] or [Package Model].

The Package R/L/C are provided in an IBIS file as following keywords.

- [Package]
- [Pin]
- [Package Model]

[Package] defines the default package R/L/C.

[Pin] and [Package Model] can define package R/L/C for individual pins.

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2.Package Model

■ *Case Example:*

An IBIS file had [Define Package Model] within itself. However, there was no [Package Model] in component section. Also, the customer didn't notice this condition and ran SI simulation using the IBIS file.

As the result, the value defined in [Package] was used for all pins of the component.

Hence, he got the result which he did not expect.



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3.Buffer Switching Characteristic

■ Question3:

An IBIS file has more than one [Rising Waveform] / [Falling Waveform].

Which [Rising Waveform] / [Falling Waveform] the simulator uses?



[Rising Waveform]

R_fixture = 50

V_fixture = 0.0

V_fixture_min = 0.0

V_fixture_max = 0.0

Time	V(typ)	V(min)	V(max)
0.0	0.0	0.0	0.0
0.1n	3m	1m	10m
0.2n	100m	50m	200m
...			
5n	3	2.7	3.3

[Rising Waveform]

R_fixture = 50

V_fixture = 5.0

V_fixture_min = 4.5

V_fixture_max = 5.5

Time	V(typ)	V(min)	V(max)
0.0	2.2	2.3	2.1
0.1n	2.21	2.301	2.11
0.2n	2.25	2.35	2.2
...			
5n	5	4.5	5.5

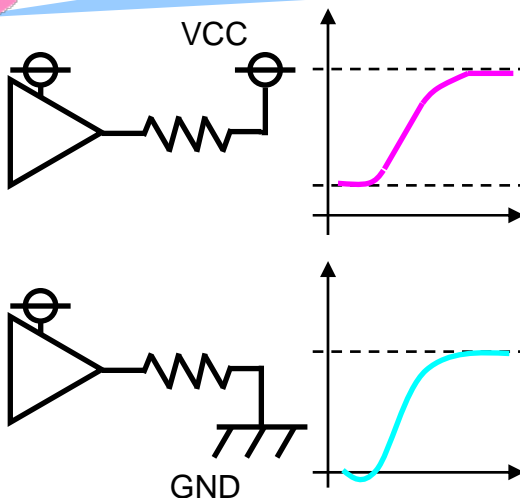
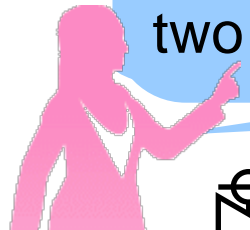
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3.Buffer Switching Characteristic

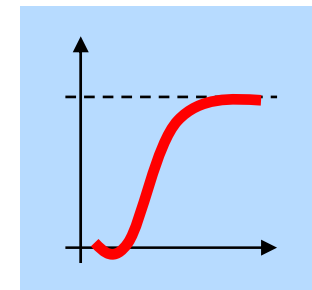
■ Answer3:

Generally, an IBIS file has 4 waveforms (two rising waveforms and two falling waveforms) for accuracy improvement .

SI simulator can generate switching characteristic based on two pair of waveforms using two-waveform algorithm.



**TWO
Waveform
algorithm**

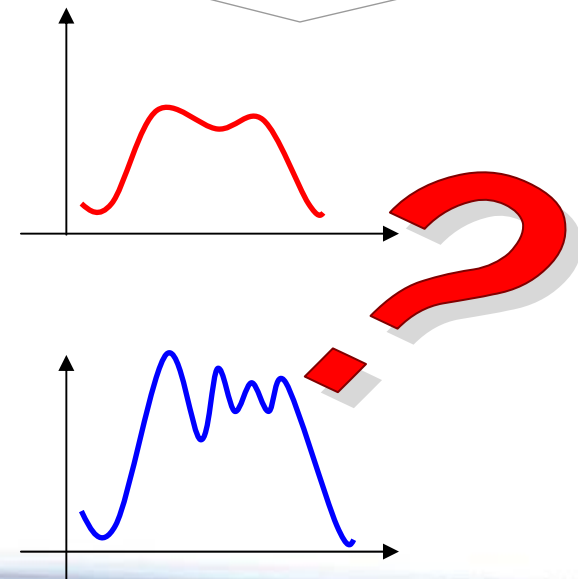
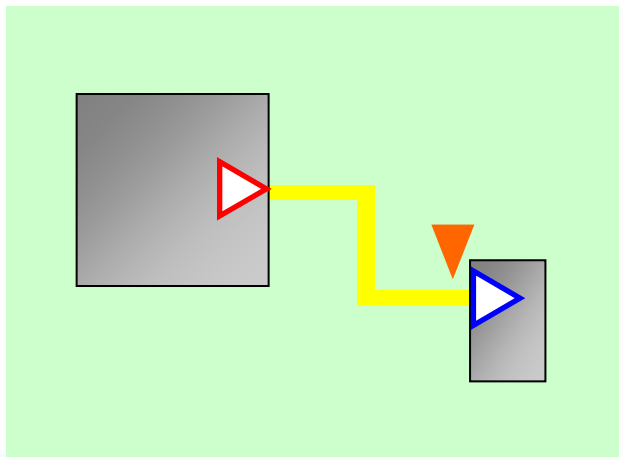


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4. Different simulators show different results

■ Question4:

Simulation result shows big difference
comparing to a result from another simulator...
Both use the same IBIS model and condition
Why such difference happens?



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4. Different simulators show different results

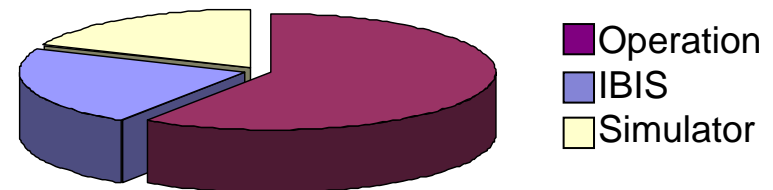
■ Answer4:

We need to find out what is the problem. Operation? IBIS model? Simulator?

First, let us check what status some option settings are, because simulators have many option settings usually and they influence simulation results greatly.



In our calls about simulation results from customers, the problem caused by operation is about 60%.

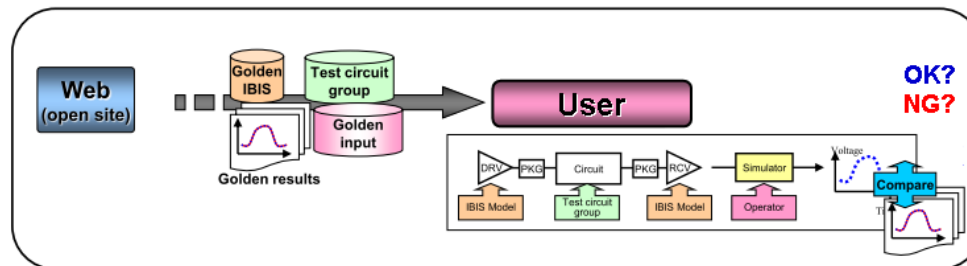


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4. Different simulators show different results

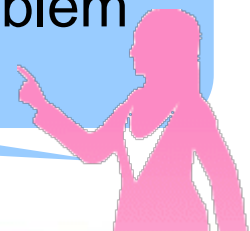
■ Answer4:

As a method to check your operation and find out the problem before calling to support centers, there is “IBIS Quality Framework” provided by JEITA/EC Center. It is useful to find out what is the problem.



IBIS Quality Framework Website:
<http://ec.jeita.or.jp/ibis/procedures.html>

If you define what is the problem (Operation? IBIS model? Simulator?) using the frame work, you can reduce time and effort (calling to several venders) and will solve the problem more quickly.



Conclusion

As IBIS models have become de-facto standard and been constantly-evolving, the users (especially beginners) will not make full use of IBIS model if they don't understand simulators and IBIS models correctly.



We need to create more “frame works” to handle IBIS models correctly as well as to enhance IBIS model.



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