

Electronic Design: Maneuvering through the Obstacles with a Grid Computing Solution

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Agenda

- ➔ ■ **Introduction to the Electronic Design Application and its Obstacles**
- **Platform LSF: The Solution Provider**
- **Benefits and Results**
- **Frequently used commands**
- **Conclusion**

Electronic Design Application

- **Characterize the IO library**
 - **Library consists of around 150 cells (of 90nm Technology)**
 - **The IO cells consists of I/P , O/P ,Bi-Directional, OSC, Schmidt trigger etc.**
 - **Characterization needs to be done for Best Case and Worst Case Silicon Process.**
- **Utilize and Optimize the usage of existing set of hardware – Cluster of Linux and Solaris m/c.**
- **Load sharing Software should be able to work with Nanochar, a characterization tool from Synopsys.**
- **Monitor and Control the License usage of tools used in Characterization.**

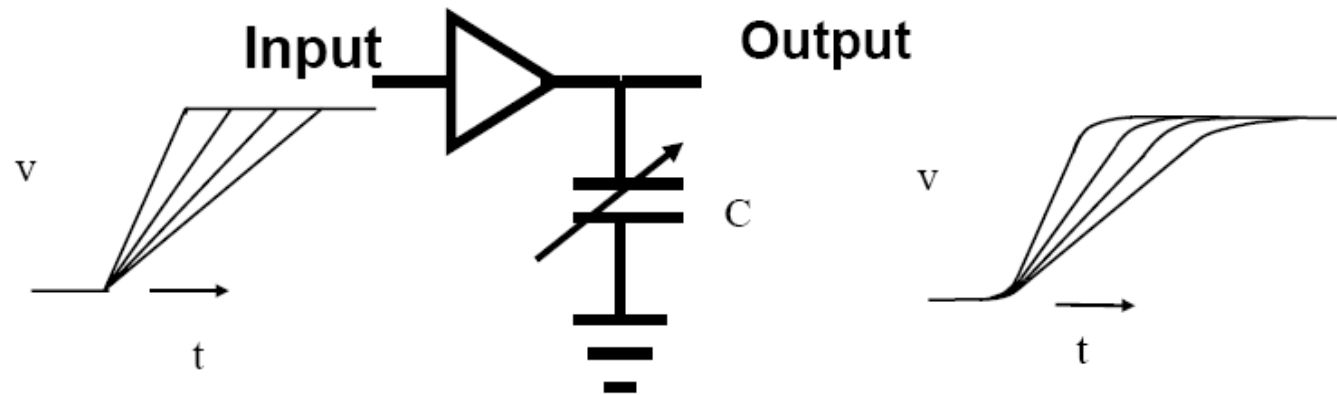
Brief Description of IO Library

<u>No. of I/P Pads</u>	<u>No. of O/P Pads</u>	<u>No. of Bi-Directional Pads</u>
25	25	100

■ Library consists IO cells of 90nm, Extracted Spice Netlist described as follows :-

- Input cells
- O/P cells
- Bi Directional Cells
- Open Drain NFET/PFET resp.
- CMOS
- Tri State
- Different Drive Strengths
- Staggered IO with Pads facing inside or Outside
- Pull up/Pull Down without and with enable control pins

Characterization : What is it..?

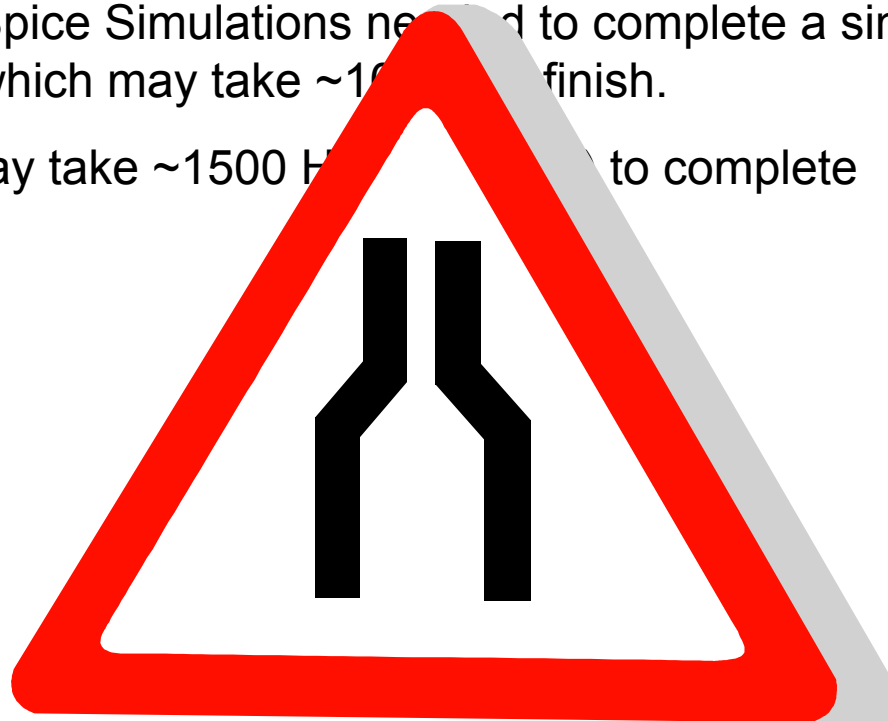


Library Characterization, in Simple Words is :-

Capturing of Delay/Transition from Various Spice simulations by sweeping the Input slew rate and O/P load.

Obstacles of Characterization

- At least 30 Spice Simulations need to be completed to complete a single cell Data acquisition which may take ~10 hours to finish.
- 150 Cells may take ~1500 Hours to complete



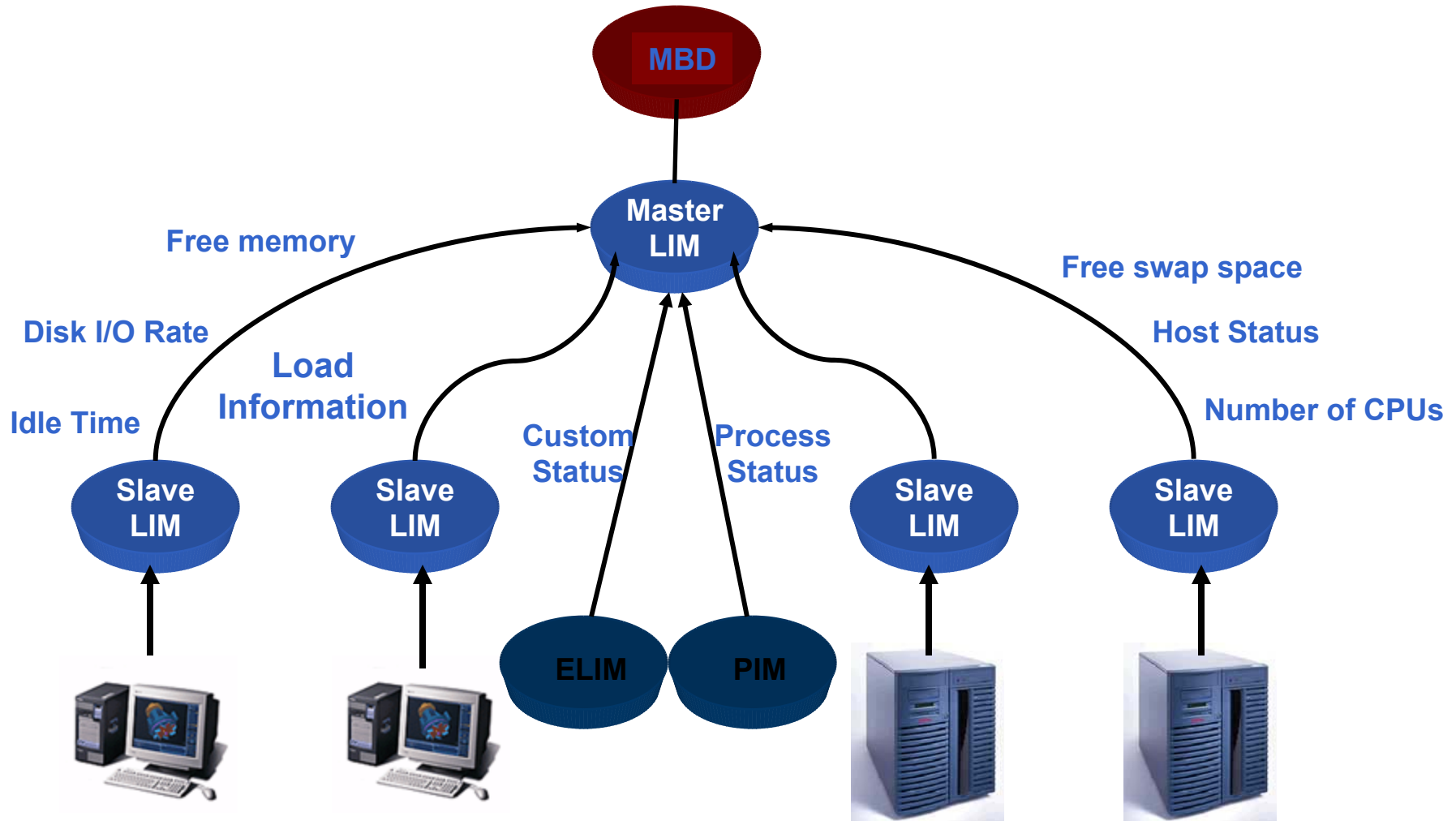
So Data-Acquisition is a BottleNeck....

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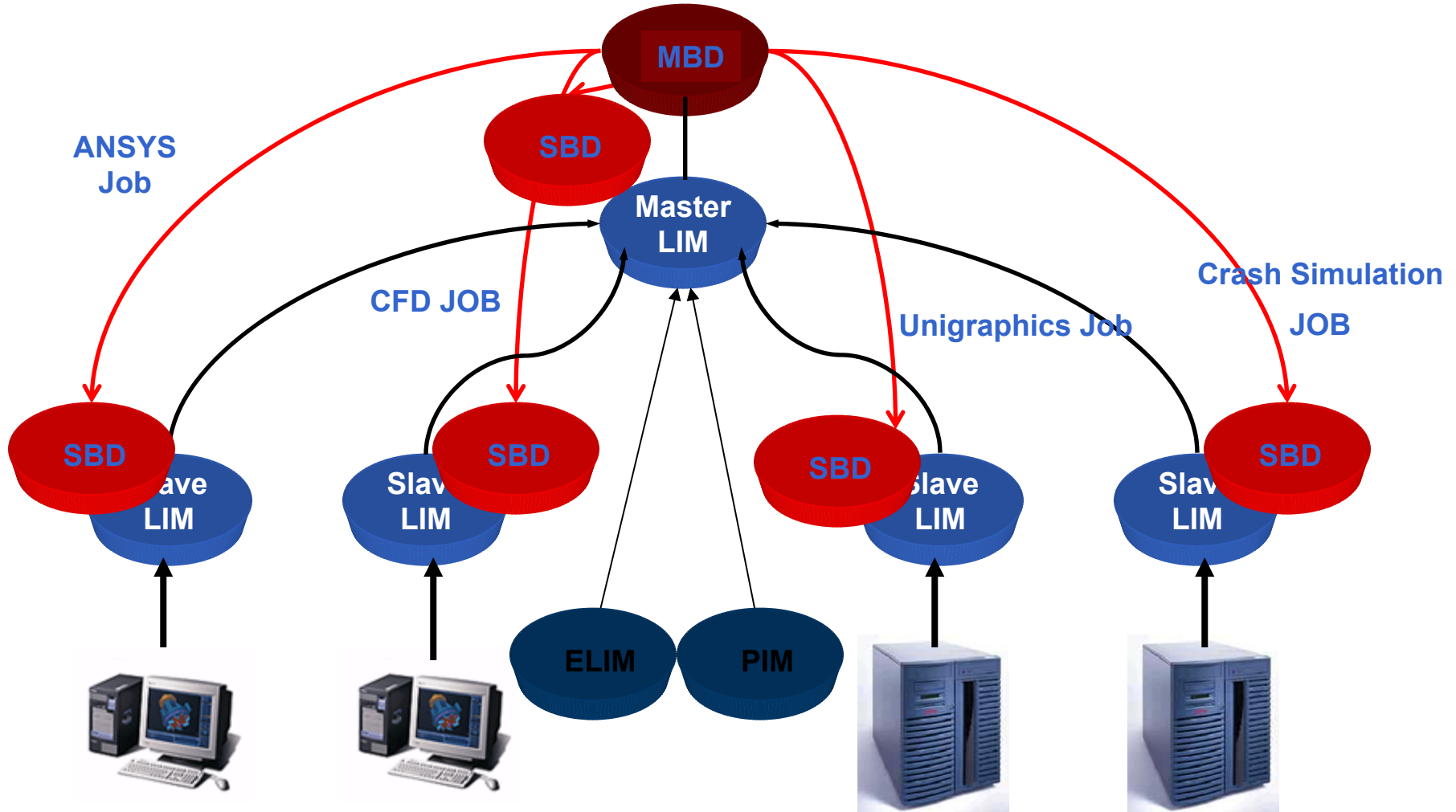
LSF : Solution Provider

Match the Work-Load



LSF : Solution Provider

Schedule the Work-Load



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LSF vs. RSH

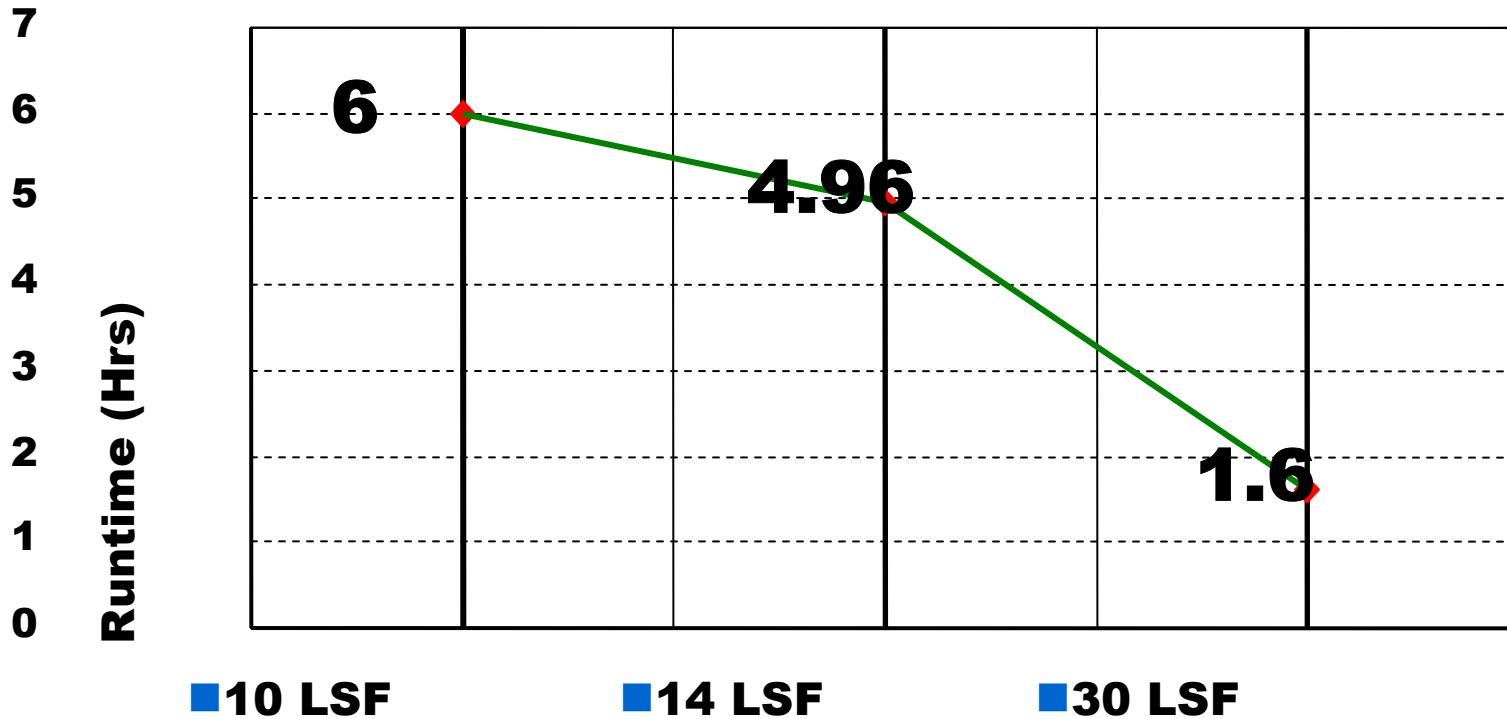
	<u>Platform LSF</u>	<u>RSH</u>
<i>Hspice Licenses used</i>	10 licenses	10 licenses
<i>Machines used</i>	10 m/c at a time (from cluster of Solaris and Linux)	10 Linux m/c (only)
<i>Process corner</i>	Worst (SS)	Worst (SS)
<i>No. Of Cells</i>	20	20
<i>Runtime of 20 cells</i>	120 Hrs (~6 hr /cell)	180 Hrs (~7.5 hr/cell)
STRENGTHS	<ul style="list-style-type: none"> •Helps optimize the CPU and license usage •Utilizes the complete cluster of available m/c (Solaris and Linux mix) •Allows configuration to launch job at specific times (say night or weekend/ restricts the no. of Hspice license usage) •Set-up is easy and does not impact the normal usage of the m/c. Loading is controlled •Works well with Nanochar and Hspice 	<ul style="list-style-type: none"> •Its free and does not require additional license.

Exponential Benefit

	<u>14 LSF</u>	<u>30 LSF</u>
<i>Hspice Licenses used</i>	14 licenses	30 licenses
<i>Machines used</i>	14 m/c at a time (from cluster of Solaris and Linux)	30 Linux m/c (only)
<i>Process corner</i>	Worst (SS)	Worst (SS)
<i>No. Of Cells</i>	150	150
<i>Runtime of 150 cells</i>	31 days (744 Hrs)	10 days (240 Hrs)

Average Runtime per Cell

Average RunTime per Cell (in Hrs)



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Frequently Used Commands

- **bsub**
 - This command allows us to submit job
 - -q option allows us to submit to a specific queue
- **badmin**
 - This command allows to control the machine usage with option hopen[m/c name] or hclose [m/c name]
 - Restart the lim daemons when new license is updated
- **bhosts**
 - This command gives us the status details of all the available hosts.
 - -s option allows us to view the status of reserved application licenses.
- **bjobs**
 - This commands gives information on the m/c where job is running with its ID
- **bhist**
 - This command provides the history of all the jobs
 - -l [Job ID] option displays history for the JOB ID.

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Conclusion

- Platform LSF Load Share Works best with more machines.
” **The more the merrier**”
- Smooth and simple Set-up and installation.
- Integration of additional m/c in the existing System is straight-forward.
- Suggested improvement :-
 - When Platform LSF exists with an exit code, it does not describe the reason except a code which has no meaning. Provide a detail description of Exit codes.
 - This will help in debugging the failures of Platform LSF.