



# **Compliance and Interoperability Testing Before and After**

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# Agenda\*

- Compliance & Interoperability (C&I) program
- Preparing for the C&I Program
- C&I during the workshop
- Key suggestions for workshop
- Beyond the workshop testing

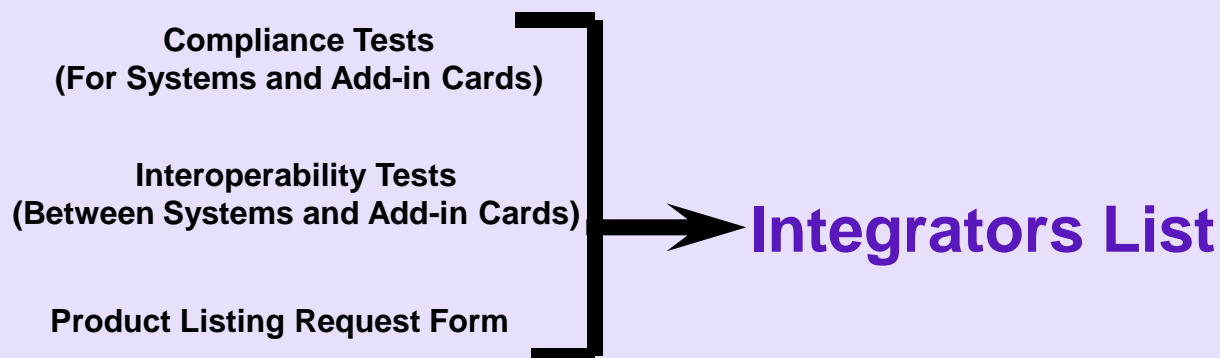
**\*Disclaimer:** Note opinions are from presenter

# C&I Program?

- The PCI-SIG Compliance program offers the latest in PCI device testing, including the opportunity to test your system or add-in card with other members' PCI products
- Testing is done via Compliance workshops
  - ✓ Workshop measure of Compliance and Interoperability
- Ability to be listed on the Integrators list
- PCI Express
  - ✓ Includes PCIe<sup>®</sup> 1.0a, PCIe 1.1, and PCIe 2.0
- PCI and PCI-X Testing
  - ✓ Includes PCI 2.3, PCI 3.0, and PCI-X 2.0a

# Integrators List

- All products that have successfully completed testing at the Compliance Workshop.
- Inclusion on this list is only available to PCI-SIG member companies
- Cannot be used for individual marketing programs
- Companies do refer to the list when making company-to-company purchases.



# Preparing for C&I

- All tests can be done at your lab
- Know the equipment needed for testing
- Ensure you run all test before Compliance workshop
- Know when the workshops are...
  - ✓ <http://www.pcisig.com/events/>



# Preparing for C&I Program

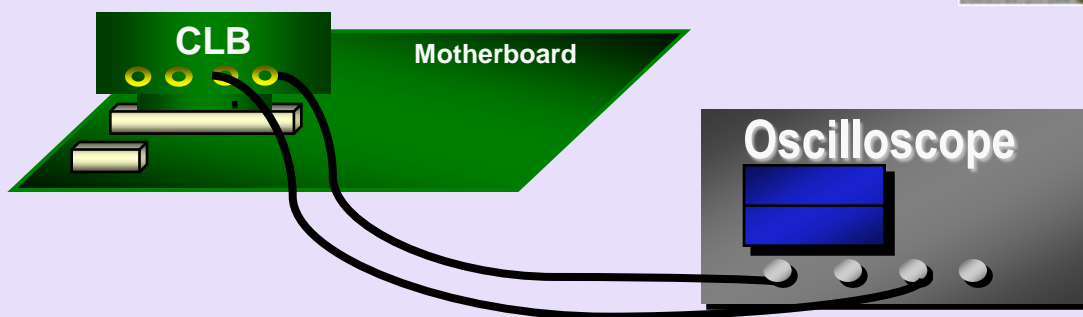
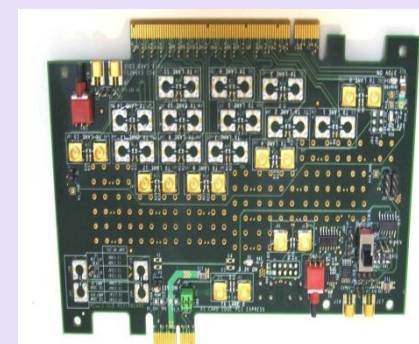
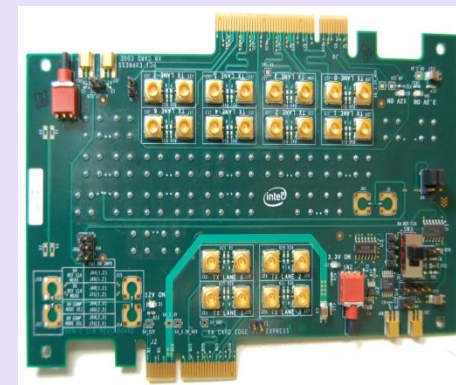
Test	Device Type		
	Endpoint	Root Complex	Switch/Bridge
<b>Physical Layer (electrical)</b> <ul style="list-style-type: none"> <li>- Sigtest 3.1.9</li> <li>- CBB / CLB 2.0</li> <li>- PCI Express PHY Test Spec 2.0</li> <li>- Test Procedures for RT scopes</li> </ul>	Required	Required	Required
<b>PLL Bandwidth Testing</b>	Required		Required
<b>Configuration Testing</b> <ul style="list-style-type: none"> <li>- PCIECV 1.4.6</li> <li>- PCI Express Configuration Test Spec 2.0</li> <li>- PCI Express Configuration Test Procedure 2.0</li> </ul>	Required		Required
<b>Link and Transaction Layer Testing</b> <ul style="list-style-type: none"> <li>- 2.0 PTC</li> <li>- PTC Test Software</li> <li>- PCI Express Link Layer Test Spec 2.0</li> <li>- PCI Express Transaction Layer Test Spec 2.0</li> <li>- PCI Express Link/Transaction Test Procedures 2.0</li> </ul>	Required		Required
<b>Clock Jitter</b> <ul style="list-style-type: none"> <li>- Clock Tool Version 1.3</li> </ul>		FYI Only	
<b>Platform BIOS Tests</b> <ul style="list-style-type: none"> <li>- 1.1 PTC</li> <li>- PCI Express Platform BIOS Test Software v0.90</li> </ul>		Required	

# Electrical Testing / PLL BW

- Examines System and add-in card signal quality
- Requires
  - ✓ Test fixture:
    - Compliance Load Board (CLB) for systems
    - Compliance Base Board (CBB) for cards
  - ✓ Oscilloscope
  - ✓ Sig Test Software
- Covers
  - ✓ Signal Quality Testing
  - ✓ PLL BW Testing
  - ✓ PCI 2.0 5GT/s FYI Receiver Testing

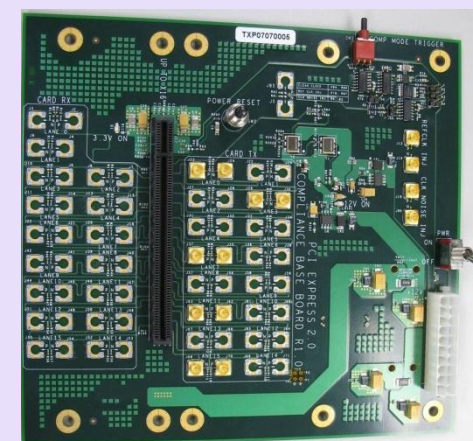
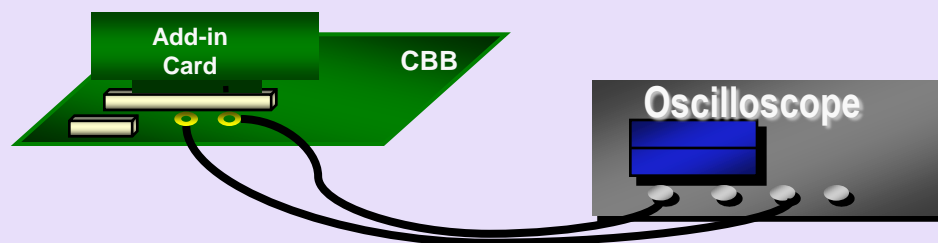
# Electrical Testing - System

- Key points to remember
  - ✓ Can be run in your lab
  - ✓ Can choose from many vendors for oscilloscopes
  - ✓ Compliance Load Board (CLB) purchased from PCI-SIG



# Electrical Testing Card

- Key points to remember
  - ✓ Can be run in your lab
  - ✓ Can choose from many vendors for oscilloscopes
  - ✓ Cards purchased from PCI-SIG



# Electrical Before the Workshop

- Make sure you run the test
- Read through procedures before the workshop
  - ✓ PCI-SIG website has all procedure
- Common Problems with electrical
  - ✓ Compliance pattern not generated
  - ✓ Pattern is not Compliance pattern generated by device / system
  - ✓ Eye diagram is violated
  - ✓ Test was NEVER tried before workshop



## Configuration Testing (Cards only)

- Test checks for implementation of a device's configuration registers and compliance of the registers
- Examples: Read only, Read/Write, Sticky Bit, Write 1 to clear, Default values, etc..
- Test requires
  - ✓ PC
  - ✓ Windows XP
  - ✓ Your device without device drivers
  - ✓ PCIeCV software downloaded from PCI-SIG



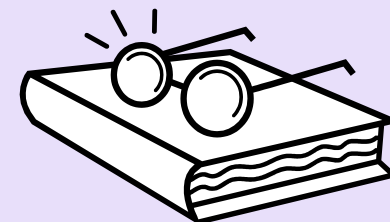
# Configuration Testing Before Workshop

- Download software
- Run test in your lab
- Common issues
  - ✓ System used does not support advanced error reporting (AER)
  - ✓ Test is not run before workshop
  - ✓ Test is run wrong
    - Switch testing require the up and down stream ports tested
    - Switch Requires a device on down stream port
    - User selects wrong device from device list



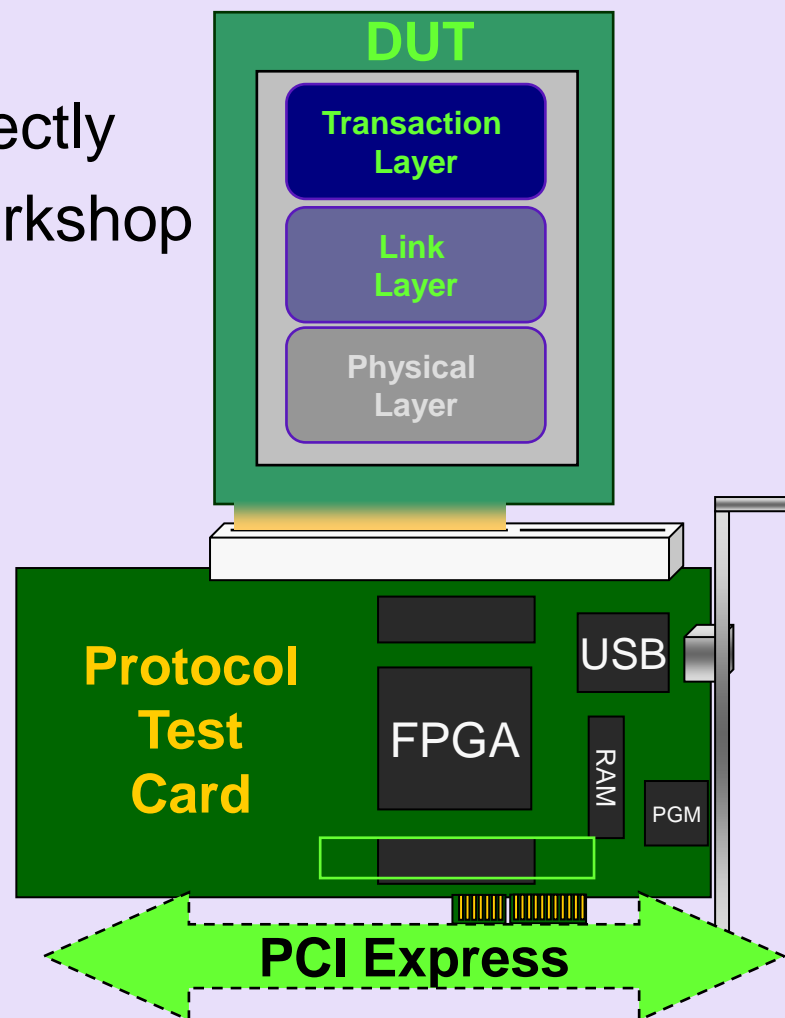
# Card Protocol Testing – Cards Only

- PTC (Protocol Test Card) monitors and acts on traffic while looking at checking protocol and looks at Injects errors
- Test Requires
  - ✓ PTC Card (see PCI-SIG website)
  - ✓ PTC Specific software (PCI-SIG website)
  - ✓ Windows XP
  - ✓ USB connection



# Card Protocol Testing – Cards Only

- Common issues
  - ✓ Error not handled correctly
  - ✓ Test not run before workshop



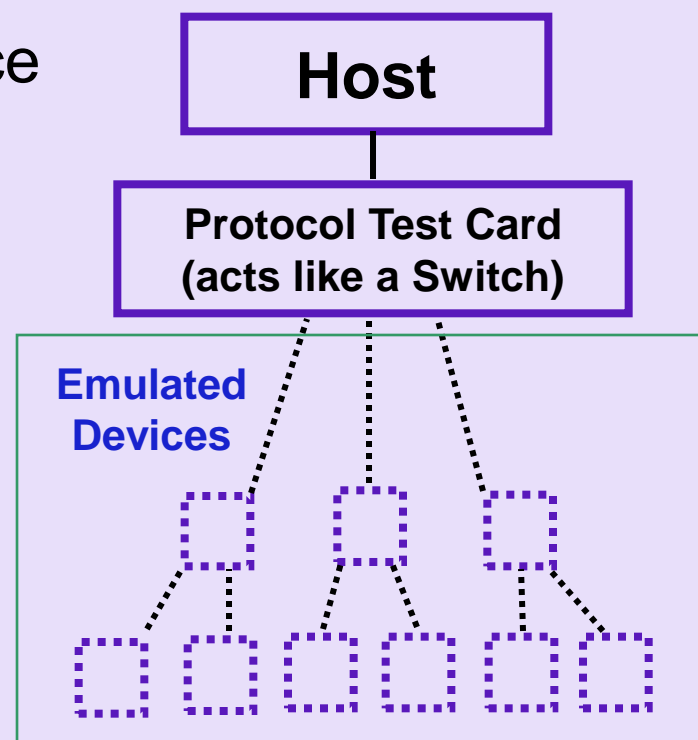
# PCIe System BIOS Testing – System Only

- Cover multiple test cases at boot time and across boot
  - ✓ Device Decodes All Type 0 and Type 1 Configuration Cycles
  - ✓ Different BAR combinations
  - ✓ Bridges With Resource Requests
  - ✓ Complex Multiple Switch and Bridge Topologies
- Test Requirements
  - ✓ PTC Card (see PCI-SIG website)
  - ✓ PCI Express Platform BIOS Testing software (PCI-SIG website)
  - ✓ Windows XP
  - ✓ USB



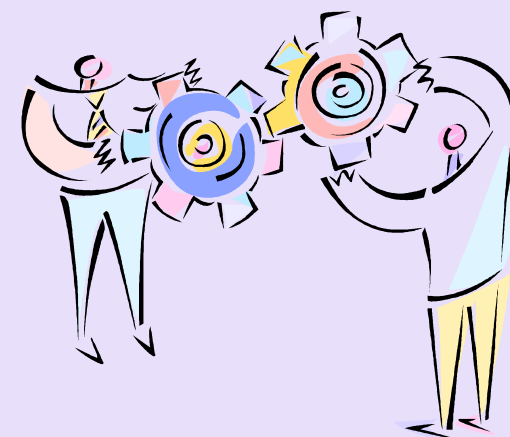
# PCIe System BIOS Testing – System Only

- Common issues
  - ✓ System can't handle 4 GB memory request
  - ✓ System can't enumerate device
  - ✓ Decoding issue
  - ✓ Test not run before workshop



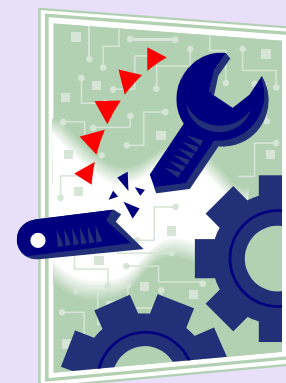
# Interoperability Testing - ALL

- The ability of each attendee to interoperate and prove base functions
- Test Requirements
  - ✓ Windows XP device driver
  - ✓ Application to exercise device (must be more than config read/write)
  - ✓ Device need to be able to plug in system
  - ✓ Must pass 80% of interoperability tests



# Interoperability Testing - ALL

- Common issues
  - ✓ No Windows XP device driver
  - ✓ No application to prove functioning device
  - ✓ Device will not fit in chassis
  - ✓ Device requires more power (need external power supply)



# Product Listing Request Form - ALL

- After passing all test requirements at a workshop, *individual companies wishing to be listed* must fill out...
- Form allows vendor to state how the device / system will be listed
- Vendor may choose to not list
  - ✓ Unreleased product
  - ✓ Defer listing
  - ✓ Wanted FYI testing



# Key Suggestions for Workshop

- Insure you run the test before the workshop!
- Bring more than one device
  - ✓ If you get odd results, test with the backup device
  - ✓ Limited time and you might need to debug at 2 places
  - ✓ Accidents happen...
- Bring anything that you need in your own lab
  - ✓ Power cable, External Power, Adapters, USB, etc...
- Have remote support prearranged
- Insure you have a way to ship back your device
- Don't miss your scheduled time!



# Beyond Workshop

- C&I testing is very focused
- Key areas to cover beyond C&I
  - ✓ Other OS Interoperability
  - ✓ Performance testing
  - ✓ Different loading conditions
  - ✓ Power management
  - ✓ More interoperability
  - ✓ Error injection and recovery



# Beyond Workshop – OS Interoperability

- Current C&I only covers XP
- Test your device under other OS
  - ✓ Desktop OS
  - ✓ Server OS
- Insure different traffic and functions under each OS



# Beyond Workshop – Performance Testing

- C&I is **not** performance or optimization based
- Insure your device is optimized for the OS, device driver, and application
- Use industry standard Benchmark / Performance testing to be able to measure your results



## Beyond Workshop – Different Loading Conditions

- Testing is limited on the type of specific traffic
- Create test and conditions to test more traffic conditions
  - ✓ Limited credits
  - ✓ Recoverable errors during test
  - ✓ Contention on the system for resources
- Insure system and device reponse



# Beyond Workshop – Power Management

- C&I testing does NOT cover power management
- If you support the various power states you need to test through the OS!
  - ✓ Insure device transition and recovery
  - ✓ Insure OS can manage the power states



# Beyond Workshop – More Interoperability

- C&I testing is not exhaustive for interoperability
- More Interoperability
  - ✓ Different Chipsets
  - ✓ Firmware / BIOS vendors
  - ✓ Different spec versions (1.0a, 1.1, 2.0, 2.1, etc..)
  - ✓ More time
- Check error status throughout the testing



## Beyond Workshop – Error Injection and Recovery

- C&I testing has limited error injection and recovery
- One aspects of PCIe is the ability to detect and recover from error and support of Advanced Error Reporting(AER)
  - ✓ AER is optional but provides more robust error reporting
- Insure your using a device and system that supports AER
- Insure expected results
  - ✓ Recoverable vs non-recoverable



# References

- Compliance Workshop Overview

- ✓ Given at each workshop

- PCI-SIG Compliance Program

[http://www.pcisig.com/developers/compliance\\_program/](http://www.pcisig.com/developers/compliance_program/)



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