



How to ensure Advanced Host Controller Interface (AHCI) conformance

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Levels of Conformance

- Device Bring Up
- Protocol Conformance
- Performance





Device Bring Up

- PCIe Information
- AHCI Register Access
- Directed Tests
 - Ensure bios and driver can initialize device
 - Register validation





Protocol Conformance

- Directed Tests
 - AHCI
 - SATA
- Error Injection
 - Protocol level errors
 - Low level errors
- Traffic
- Data Validation





Protocol Conformance -Directed Tests

AHCI and SATA

Device Control 🛛 🍛 IO Exerciser

😜 IO Exerciser

IO Exerciser Conformance Target Config Editor

Enabled	Index	Туре	Revision	Test N	ame	Excl. Lun Acc	Sub-Tests	Passed Cases	Failed Cases	Status	% Co
	0	generic_ahci_sam	0.1	🔹 Initial PCI Header Re	gister Values	×	1	0	0	Idle	0
	1	generic_ahci_sam	0.1	🌸 Initial Generic Host C	Control Register Va	×	1	0	0	Idle	0
	2	generic_ahci_sam	0.1	🐡 Initial Port Register V	√alues	×	32	0	0	Idle	0
	3	generic_ahci_sam	0.1	🕸 Number of Command	d Slots Supported	×	1	0	0	Idle	0
	4	generic_ahci_sam	0.1	Ports Implemented		×	32	0	0	Idle	0
~	5	generic_ahci_sam	0.1	Exchanged Bit Test		×	32	25	7	Complet	100
	6	generic_ahci_sam	0.1	🔹 Unknown FIS Bit		×	1	0	0	Idle	0
	7	generic_ahci_sam	0.1	🔹 PhyRdy Changed Bit		×	32	0	0	Idle	0
2	8	generic_ahci_sam	0.1	Device Detection		×	32	24	8	Complet	100
	9	generic_ahci_sam	0.1	🌸 Interface Speed Sup	port	×	32	0	0	Idle	0
2	10	generic_ahci_sam	0.1	PRD Underflow		×	1	1	0	Complet	100
	11	generic_ahci_sam	0.1	💮 Valid Command List B	Base Address	×	32	0	0	Idle	0
	12	generic_ahci_sam	0.1	💮 Illegal Command List	Base	×	32	0	0	Idle	0
	S	Selected Lun(s):	Stop Tes	st(s)		Loop On Selected	HTML	DT List Mgmt:	Refresh Dt(s)	
Index		Lun Path		Sel Type	Ini	Tgt	# Tgt	t ID IO Stat	e DT Sta	ate	IO Details
		unBasicInitAHCI 0100	V Ye	es SATA	Sys 1.182 - AHCI 01	100 0		Stopped	Stopped		



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Protocol Conformance -Error Injection

- Protocol level errors
 - Malformed Commands
 - Protocol Resets
- Low level errors
 - Power Loss/Recovery
 - PCIe Resets





Protocol Conformance -Traffic

- Everything at once
 - Maximum queue depth
 - Simultaneous mixed commands
 - Mixed mode (FPDMA and non-FPDMA)
 - Error Injection
 - Power Loss/Recovery





Protocol Conformance -Data Validation

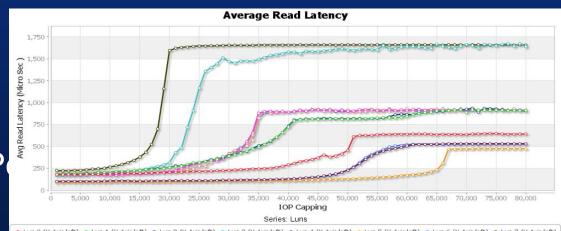
- Verification of existing data after resets and power fails
- Verification of writes leading up to resets/power fails

Arci 0100
🚱 IO Exerciser
IO Exerciser Conformance Target Config Editor
Top Level 10 Traffic Low Level Errors Extra Traffic Power Control 10 Status Policy
IO Range
Validate Data Integrity
Validate Data Integrity Clear All Data Validation Tables in System
Validate Written Data On Link Up Nr Of Last Writes To Validate: 1000
Validate LBA Atomicity
Validate Outstanding IOs
Start Traffic Stop Traffic





- Custom drivers allow truly consistent and repeatable performance measurements
- Industry Leading Performance
 - Achieved greater than 1.3 million IOPS per core
- Deep Analytics
- Power
 - Power versus P



⊶Lun 0 (Y-Axis left) →Lun 1 (Y-Axis left) →Lun 2 (Y-Axis left) →Lun 3 (Y-Axis left) →Lun 4 (Y-Axis left) →Lun 5 (Y-Axis left) →Lun 6 (Y-Axis left) →Lun 7 (Y-Axis left) →Lun 8 (Y-Axis left) →Lun 9 (Y-Axis left) →Lun 10 (Y-Axis left) →Lun 11 (Y-Axis left)





Automation

- Provides a Test Suite for consistent repeatable testing mechanism
 - Initial conditions
 - Vary test parameters
 - Graphing
 - Report Generation
 - HTML
 - CSV

🏶 Device Control 🛛 🥥 IO Exerciser 🍸 🛣 AHCI 0100 🛛 🔮	
指 Test Automation	
(SCSI) SVF_Auto_Test	Setup
	Lun P
	Lun P
	Lun P
└──✓ LOOP: 1.3.1). Iterate On: Read/Write Ratio	Lun P
✓ ACT: 2.1). Disk Format SCSI Lun Path 0 ** Common **	Lun P
r √ TST: 2.2). Latency vs Power	Lun P
SCSI Lun Path 0 ** Common **	Lun P
	Lun P
	Lun P
	Lun P
(Lun P
Automation Status	Lun P
	Lun P
	Lun P







- Advanced toolset to verify conformance through all phases of development
- OakGate AHCI Conformance Suite, developed in partnership with customers, can serve as a useful vehicle to ensure compliance with the AHCI standard

