

SATA AHCI-IP Demo on V/10-series SoC Instruction Rev1.2 22-Aug-23

Hardware Requirement	2
2 Hardware setup	4
2.1 Micro SD Card setup by PC	4
2.2 FPGA board setup to run the demo	5
B Linux Setup	9
Example Linux command	
4.1 Create Disk Partition	
4.2 Format Disk	11
4.3 Mount Disk	11
5 Performance test	
5.1 Performance test by diskTestApp	
5.1.1 Raw Data Mode	
5.1.2 File System Mode	
5.2 Bonnie++ Software	
8 Revision History	



SATA AHCI-IP Demo on V/10-series SoC Instruction

Rev1.2 22-Aug-23

This document describes the instruction to run SATA AHCI-IP on Altera development board, i.e. CycloneV SX SoC, ArriaV ST SoC, and Arria10 SoC development Board. From device limitation, CycloneV SX SoC board can support only SATA-II device while other boards can support SATA-III device. This demo uses Angstrom linux v2014.12 OS, and FPGA can boot and be configured by micro SD Card.

1 Hardware Requirement

As shown in Figure 1-1- Figure 1-3, to run AHCI demo please prepare

- 1) CycloneV SX/ArriaV ST/Arria10 SoC Development Board
- 2) SATA adapter board provided by Design Gateway
 - AB11-HSMCSATA board for CycloneV SX SoC
 - AB09-FMCRAID board for ArriaV ST/Arria10 SoC
- 3) 2.5-inch SATA-II/III Device or other size with adapter cable
 - SATA-II for CycloneV SX
 - SATA-III for ArriaV ST/Arria10 SoC
- 4) Micro SD card with SD card image, downloaded from http://www.dgway.com/SATA-IP_A_E.html
- 5) Mini USB cable



Figure 1-1 SATA AHCI-IP Demo Environment Setup on Cyclone V SX SoC board





22-Aug-23



2 Hardware setup

2.1 Micro SD Card setup by PC

- Extract "sd_card_image_cyclone5/arria5/arria10.bin.tar.gz", and file output will be "sd_card_image_cyclone5/arria5/arria10.bin".
- Connect microSD to PC to dump image to card by using "Win32DiskImager" application.
- Run "Win32DiskImager" to copy "sd_card_image_cyclone5/arria5/arria10.bin" to microSD, as shown in Figure 2-1.

Win32 Disk Imager	
D:/Temp/sd_card_image_cyclone5.bin	
Copy MD5 Hash:	Writing to a physical device can corrupt the device. (Target Device: [E:\] "") Are you sure you want to continue?
Progress	Yes No
Version: 0.9 Cancel Read Write Exit	
1	
😢 Win32 Disk Imager	🛛 🗶 🗞 Complete
-Image File	Device Write Successful.
D:/Temp/sd_card_image_cyclone5.b	in 📔 [E:\] 🗾 💛
Copy MD5 Hash:	OK ⁽⁵⁾
Progress	
Version: 0.9 Cancel	Read Write Exit
Done.	
Figure 2-1 Create SD Card Im	age for SATA AHCI-IP Demo

- (1) Select drive to microSD card drive
- (2) Browse to the path which store "sd_card_image_cyclone5/arria5/arria10.bin"
- (3) Click "Write" to start dump data.
- (4) "Confirm overwrite" window will be displayed. Click "Yes" to confirm data dump.
- (5) Wait until progress status updated from 0% to 100%. "Complete window" with "Write Successful" will be displayed. Click "OK" to complete this step.



2.2 FPGA board setup to run the demo

- Power off FPGA board and adapter board.
- Insert micro SD card to SD card socket
- Connect HDD/SSD to SATA socket on CN0 @ HSMC/FMC SATA adapter board.
 a) For Cyclone V SoC board, insert SATA-II HDD/SSD
 b) For other boards, insert SATA-III HDD/SSD
- For FMC adapter board, connect power to power connector on FMCRAID board.
- Connect SATA adapter board to FPGA board.
 Note: If FPGA board has FMC/HSMC port more than one, use port#A.
- Connect USB mini cable between FPGA board and PC for UART
- Set JTAG enable
 - a) For CycloneV SX and ArriaV ST SoC, set SW4[1]/[2]/[4] = OFF position to enable JTAG of HPS, FPGA, and MAX, as shown in Figure 2-2



Figure 2-2 JTAG Enable for CycloneV SX/ArriaV ST SoC board

b) For Arria10 SoC, set SW3[1]/[2]/[6]/[8] = OFF position to enable JTAG of HPS, FPGA, and MAX, as shown in Figure 2-3





• Enable clock programmable for CycloneV SX SoC board. Set bit2 of SW2 to ON position, as shown in Figure 2-4.



• Set FPGA configuration by HPS for Arria10 SoC board. Set SW4[2]-[4] to OFF position, as shown in Figure 2-5.



Figure 2-5 SW4 Configuration Mode

- Power on FPGA board.
- Open serial monitoring software such as HyperTerminal. Terminal settings is Baud Rate=115,200, Data=8 bit, Non-Parity, and Stop=1.
- On PC serial console, please wait Linux boot-up until login required, as shown in Figure 2-6.





- Power on supply on adapter board
 - a) For HSMC adapter of CycloneV SX, ON power-switch on HSMC adapter after Linux boot up completely.

<u>Note:</u> Do not on power-switch before linux boot-up complete. It needs to wait linux to program clock for SATA to be 150 MHz before SATA AHCI-IP communicates with SATA Device.



b) For FMC adapter, ON power supply which is connected to power connector on the adapter, as shown in Figure 2-8.



• Check LED status on FPGA board now and LED0-1 will turn on while LED2 status depends on SATA speed, as shown in Figure 2-9.





Figure 2-9 LED status after system set up complete on SATA-3/2 speed

		_
LED	ON	OFF
LED0	ОК	TXPLL inside transceiver cannot lock the
		clock. Please check 150 MHz clock source.
LED1	ОК	SATA-IP cannot detect SATA device. Please
		check SATA device and the connection.
LED2	SATA-III for others	SATA-II for CycloneV SX SoC
LED3	SATA AHCI-IP in processing	SATA AHCI-IP in idle
Table 2-1 LED Status of AHCI reference design		



3 Linux Setup

- User login on the demo is follows.
 - Login : root

Password : root (required for ArriaV only)

After login, system is ready to receive user command, as shown in Figure 3-1.



Figure 3-1 Linux Login

- To run SATA AHCI-IP demo,
 - For CycloneV SX SoC board, two modules are required to insert, i.e libahci.ko (common AHCI SATA low-level routines) and dg_ahciDemo.ko (AHCI SATA platform driver).
 - For other boards, libahci_platform.ko is also required to be AHCI SATA platform library. So, three modules are required to insert.

All modules are stored in "/home/root/driver" directory. To insert module, please use following command.

>> insmod dg_ahciDemo/driver/libahci.ko

>> insmod dg_ahciDemo/driver/libahci_platform.ko

(Not used for CycloneV SX SoC board)

>> insmod dg_ahciDemo/driver/dg_ahciDemo.ko

• After insert modules, disk information will be displayed, as shown in Figure 3-2. Now SATA device is ready to use.

ArriaV/Arria10 SoC board	CycloneV SoC board
B COM4 - PuTTY	🛃 COM4 - PuTTY
root@arria5:"# insmod ./dg_ahciDemo/driver/libahci.ko root@arria5:"# insmod ./dg_ahciDemo/driver/libahci_platform.ko root@arria5:"# insmod ./dg_ahciDemo/driver/libahci_platform.ko ahci c0040000.ahci: AHCI 0001.0300 32 slots 1 ports 6 Gbps 0x1 impl platform mode ahci c0040000.ahci: flags: ncq only scsi host0: ahci atal: SATA max UDMA/133 mmio [mem 0xc0040000-0xc005ffff] port 0x100 irq 18 atal: SATA hink up 6.0 Gbps (SStatus 133 SControl 300) atal.00: ATA-9: Samsung SSD 850 PRO 256GB, EXM01B6Q, max UDMA/133 atal.00: ATA-9: Samsung SSD 850 PRO 256GB, EXM01B6Q, max UDMA/133 atal.00: supports DRM functions and may not be fully accessible atal.00: supports DRM functions and may not be fully accessible atal.00: configured for UDMA/133 scsi 0:0:0:0: Direct-Access ATA Samsung SSD 850 1B6Q PQ: 0 ANSI: 5 sd 0:0:0:0: [sda] Write Protect is off sd 0:0:0:0: [sda] Write cache: enabled, read cache: enabled, doesn't support DPO or F sd 0:0:0:0: [sda] Htached SCSL disk	<pre>[TrootRdg_ahciDemo '1\$ insmod dg_ahciDemo/driver/libahci.ko [TrootRdg_ahciDemo '1\$ insmod dg_ahciDemo/driver/dg_ahciDemo.ko ahci ff240000.ahci: HRCT 0001.0300 32 slots 1 ports 6 Gbps 0x1 impl platform mode ahci ff240000.ahci: flags: ncq only scsi0 : ahci.platform atal: SATA nax UUMA/133 nmio [nem 0xff240000-0xff25ffff] port 0x100 imq 75 platform leds.1: Driver leds-gpio requests probe deferral atal: SATA nax UUMA/133 on (Debs (Status 123 SCONTON 1300) atal.00: supports 0RH functions and nay not be fully accessible atal.00: SOUTIB192 sectors, multi 1: LBAH2 MUD1B60, nax UUMA/133 atal.00: supports 0RH functions and nay not be fully accessible atal.00: configured for UUMA/133 scsi 0:0:0:0: Direct-Rccess ATA Samsung SSD 850 EXHO PQ: 0 ANSI: 5 platform leds.1: Driver leds-gpio requests probe deferral sd 0:0:0:0: [sda] Write Protect is off sd 0:0:0:0: [sda] Write cache: enabled, read cache: enabled, doesn't support DPO or FUR</pre>
root@arria5:"#	sda: sda: sd 0:0:0:0:0: (sda) Attached SCSI disk [root8dg_ahciDeno "]\$

Figure 3-2 Insert module to linux kernel



4 Example Linux command

4.1 Create Disk Partition

To create new disk partition, user can follow below steps.

>> fdisk /dev/sda Call the tool to manage disk partition.

>> n Create new partition.

>> p Select primary partition.

Select the option by using default value in the tool such as partition number = 1, first cylinder=1, last cylinder=31130.

>> w Write table to the disk.

Now one partition named sda1 has been created in the disk.

ArriaV/Arria10 SoC board

CycloneV SoC board

COM4 - PUTTY	🛃 COM4 - PuTTY
root@arria5:~ [#] fdisk /dev/sda Device contains neither a valid DOS partition table, nor Sun, SGI, OSF or GPI diskl Building a new DOS disklabel. Changes will renain in nemory only, until you decide to write then. After that the previous content won't be recoverable.	root@cyclone5:"# fdisk /dev/sda The number of cylinders for this disk is set to 31130. There is nothing urong with that, but this is larger than 1024, and could in certain setups cause problems with: 1) software that runs at boot time (e.g., old versions of LILO)
 The number of cylinders for this disk is set to 31138. There is nothing wrong with that, but this is larger than 1824, and could in certain setups cause problems with: 1) software that runs at hoot time (e.g., old versions of LILO) 2) hooting and partitioning software from other OSs (e.g., DOS FDISK, OS/2 FDISK) 	 2) booting and partitioning software from other OSs (e.g., DOS FDISK, OS/2 FDISK) Command (n for help): n Command action e extended p primary partition (1-4)
Command (n for help): n Command action e extended p primary partition (1-4) Partition number (1-4): 1 First cullider (1-4): 1	Partition number (1-4): 1 First cylinder (1-31130, default 1): 1 Last cylinder or *size or *sizeM or *sizeK (1-31130, default 31130): 31130 Command (m for help): u The partition table has been altered. Calling ioctl() to re=read partition table
Last cylinder or +size or +sizeM or +sizeK (1-31130, default 31130): 31130 Command (n for help): W The partition table has been altered. Calling ioctl() to re-read partition table sda: sda1 rootBarria5: "# sda: sda1	sda: sda1 root@cyclone5:"#
root@arria5:"#	

Figure 4-1 fdisk command

<u>Note</u>: User can type 'm' to show all fdisk options.



4.2 Format Disk

To format the disk, user needs to select file system type such as FAT, EXT4. This example shows only the command to format to EXT4 by typing following command. >> mkfs.ext4 /dev/sda1

B COM4 - PuTTY		3
root@arria5:~#_mkfs.ext4_/dev/sda1Format to Ext4 mke2fs 1.42.13 (17-May-2015) Discarding device blocks: done		^
Creating filesystem with 62512923 4k blocks and 15630336 inodes Filesystem UUID: ba745c27-8f0d-4d13-8f9f-116dff07e37c Superblock backups stored on blocks: 32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632	. 2654208,	
4096000, 7962624, 11239424, 20480000, 23887872 Allocating group tables: done Whiting incde tables: done		
Greating journal (32768 blocks): done Writing superblocks and filesystem accounting information: done		
root@arria5:~#		Ψ.

Figure 4-2 Format disk

4.3 Mount Disk

Before running any application to access the disk by file system such as Bonnie++ and diskTestApp in file system mode, disk must be mounted firstly by following command. >> mount /dev/sda1 /media/hdd



Figure 4-3 Mount disk



5 Performance test

This topic shows the example application to test disk performance. Two test applications are used, i.e. diskTestApp and Bonnie++. diskTestApp is the test application developed by Design Gateway to check write/read performance in both raw data format and file system.

5.1 Performance test by diskTestApp

B COM4 - PuTTY	x
root@arria5:~# ./dg_ahciDemo/application/diskTestApp diskTestApp version 1.1	*
Usage: ./diskTestApp [OPTION]	
Options: -r For raw data test -f PATH For file system test root@arria5:~#	-
Figure 5-1 diskTestApp usage	

As shown in Figure 5-1, diskTestApp can run in two data formats, i.e. raw data or file system. *Warning: If running raw data test, file system in that disk partition will be lost.*

5.1.1 Raw Data Mode

Type command "./dg_ahciDemo/application/diskTestApp –r" to run test application in raw data format. Five input parameters are required, i.e.

- 1) Disk selection to select the disk to test performance
- 2) Operation type: '0'-Read disk test, '1'-Write disk test
- 3) Test pattern:
 - '0': Write by dummy data or read without verification

'1': Write or verify by 32-bit increment pattern

- '2': Write or verify by 32-bit decrement pattern
- 4) Disk offset: Disk start address in sector unit to write/read data. 0x prefix is added for hex unit input while default value without prefix is decimal unit.
- 5) Operation length: Transfer length in sector unit to write/read data. 0x prefix is added for hex unit input while default value without prefix is decimal unit.

Figure 5-2 and Figure 5-3 show the example of write test in raw data mode by dummy data and increment data. Figure 5-4 and Figure 5-5 show the example of read test in raw data mode without and with data verification. Comparing to increment/decrement pattern, using dummy mode for both write and read will achieve better performance because CPU resource is not used to fill or verify the data.



ArriaV/Arria10 SoC board

CycloneV SoC board

B COM4 - PuTTY	子 COM4 - PuTTY
root@arria5:~# ./dg_ahciDemo/application/diskTestApp -r	<pre>[root@dg_ahciDemo ~1\$./dg_ahciDemo/application/diskTestApp -r // //</pre>
// List of disk on system. 0) sda	// List of disk on system. D) sda
Select disk (default 0, hit "Ctrl+c" to exit): 0	Select disk (default O, hit "Ctrl+c" to exit): O
Operation type (read(0)/write(1), default 0): 1	Operation type (read(D)/write(1), default D): 1
Pattern type (none(0)/inc(1)/dec(2), default 0): 0	Pattern type (none(0)/inc(1)/dec(2), default 0): 0
Disk's offset <0x0-0x0000000_1dcf32af, default MIN>: 0x0	Disk's offset (0x0-0x00000000_1dcf32af, default MIN): 0x0
Operation length <0x1-0x00000000_1dcf32b0, default MAX>: 0x4000000	Operation length (0x1-0x00000000_1dcf32b0, default MAX): 0x4000000
// *** *** *** *** *** *** // // Your operation. Disk: sda, Opt: Write, Patr: None Addr: 0x0000000000000000-0x00000008_00000000	// *** *** *** *** *** *** *** // // Your operation. Disk: sda, Opt: Write, Patr: None Rddr: 0x00000000_0000000-0x0000008_00000000
[OK] Writing completed @speed = 435.52 MB/s Write performance by 32 GB dummy data	[OK] Writing completed Espeed = 233.57 MB/s
// // // List of disk on system. Ø> sda	// // // List of disk on system. D) sda
Select disk (default 0, hit "Ctrl+c" to exit): 0	Select disk (default D, hit "Ctrl+c" to exit):

Figure 5-2 Write performance in raw data mode by dummy data

ArriaV/Arria10 SoC board

CycloneV SoC board

Putty	B COM4 - PuTTY	
// // // List of disk on system. 0> sda	// // // List of disk on system. D) sda	
Select disk (default 0, hit "Ctrl+c" to exit): 0	Select disk (default 0, hit "Ctrl+c" to exit): 0	
Operation type (read(0)/write(1), default 0): 1	Operation type (read(0)/urite(1), default 0): 1	
Pattern type (none(0)/inc(1)/dec(2), default 0): 1	Pattern type (none(0)/inc(1)/dec(2), default 0): 1	
Disk's offset <0x0-0x00000000_1dcf32af, default MIN>: 0x0	Disk's offset (DxD-DxD0000000_1dcf32af, default HIN): 0x0	
Operation length $(0x1-0x0000000_1dcf32b0, default MAX): 0x400000$	Ø Operation length (0x1-0x00000000_1dcf32b0, default MAX): 0x4000000	
// *** *** *** *** *** *** // // Your operation. Disk: sda, Opt: Write, Patr: Increment Addr: 0x0000000_00000000-0x00000008_00000000	// **** *** *** *** *** *** *** // // Your operation. Disk: sda, Opt: Write, Patr: Increment Addr: 0x00000000_00000000-0x00000008_0000000	
[OK] Writing patterns completed @speed = 99.36 MB/s Write performance by 32 GB with 32-bit increment pattern	[OK] Writing patterns completed @speed = 77.64 MB/s	
// // // List of disk on system. 0> sda	// // // List of disk on system. 0) sda	
Select disk (default 0, hit "Ctrl+c" to exit):	Select disk (default 0, hit "Ctrl+c" to exit):	
Figure 5.2 Write performance in row date mode by 22 bit increment date		

Figure 5-3 Write performance in raw data mode by 32-bit increment data



ArriaV/Arria10 SoC board

CycloneV SoC board

Putty	子 COM4 - PuTTY	
// // // List of disk on system. Ø) sda	// // // List of disk on system. 0) sda	
Select disk (default 0, hit "Ctrl+c" to exit): 0	Select disk (default 0, hit "Ctrl+c" to exit): 0	
Operation type (read(0)/write(1), default 0): 0	Operation type (read(O)/write(1), default O): O	
Pattern type (none(0)/inc(1)/dec(2), default 0): 0	Pattern type (none(0)/inc(1)/dec(2), default 0): 0	
Disk's offset <0x0-0x00000000_1dcf32af, default MIN>: 0x0	Disk's offset (0x0-0x00000000_1dcf32af, default MIN): 0x0	
Operation length <0x1-0x00000000_1dcf32b0, default MAX>: 0x4000000	Operation length (0x1-0x00000000_1dcf32b0, default MAX): 0x4000000	
// *** *** *** *** *** *** // // Your operation. Disk: sda, Opt: Read, Patr: None Addr: 0x0000000_00000000-0x00000008_00000000	// *** *** *** *** *** *** *** // // Your operation. Disk: sda, Opt: Read, Patr: None Rddr: 0x00000000_00000000-0x00000008_00000000	
[OK] Reading completed @speed = 389.91 MB/s Read performance by 32 GB	[OK] Reading completed @speed = 241.42 MB/s	
// // // List of disk on system. 0> sda	// // // List of disk on system. D) sda	
Select disk (default 0, hit "Ctrl+c" to exit):	Select disk (default 0, hit "Ctrl+c" to exit):	
Figure 5-4 Read performance in raw data mode without data verification		

ArriaV/Arria10 SoC board

CycloneV SoC board

B COM4 - PuTTY	子 COM4 - PuTTY
// // // List of disk on system. Ø) sda	// // // List of disk on system. D) sda
Select disk (default 0, hit "Ctrl+c" to exit): 0	Select disk (default 0, hit "Ctrl+c" to exit): 0
Operation type (read(0)/write(1), default 0): 0	Operation type (read(O)/write(1), default O): O
Pattern type <none<0>/inc<1>/dec<2>, default 0>: 1</none<0>	Pattern type (none(0)/inc(1)/dec(2), default 0): 1
Disk's offset <0x0-0x00000000_1dcf32af, default MIN>: 0x0	Disk's offset (0x0-0x0000000_1dcf32af, default MIN): 0x0
Operation length <0x1-0x00000000_1dcf32b0, default MAX>: 0x4000000	Operation length (0x1-0x00000000_1dcf32b0, default MAX): 0x4000000
// *** *** *** *** *** *** // // Your operation. Disk: sda, Opt: Read, Patr: Increment Addr: 0x0000000_00000000-0x00000008_00000000	// *** *** *** *** *** *** // // Your operation. Disk: sda, Opt: Read, Patr: Increment Addr: 0x00000000_0000000-0x00000008_00000000
[OK] Reading and pattern verification completed @speed = 90.47 MB/s	[OK] Reading and pattern verification completed Espeed = 73.83 MB/s
// //Read performance by 32 GB and verified by 32-bit increment pattern0> sdasda	// // // List of disk on system. 0) sda
Select disk (default 0, hit "Ctrl+c" to exit):	Select disk (default D, hit "Ctrl+c" to exit):

Figure 5-5 Read performance in raw data mode and verify by 32-bit increment data



5.1.2 File System Mode

Before run test application in File system mode, user needs to create disk partition, format disk, and mount the disk.

Type "./dg_ahciDemo/application/diskTestApp –f /media/hdd" to run the test in file system mode. Five input parameters are required, i.e.

- 1) File name input: File name to run the test
- 2) Operation type: '0'-Read file test, '1'-Write file test
- 3) Test pattern:

'0': Write by dummy data or read without verification

'1': Write or verify by 32-bit increment pattern

'2': Write or verify by 32-bit decrement pattern

- 4) File number: Total number of files to run write/read file test
- 5) File size: Size of each file in sector unit to run write/read file test

Similar to raw data mode, when write by dummy pattern or read without data verification, performance will be better than increment/decrement pattern, as shown in Figure 5-6 - Figure 5-9.



ArriaV/Arria10 SoC board

CycloneV SoC board

P COM4 - PuTTY File system mode	B COM4 - PuTTY	
root@arria5:~# ./dg_ahciDemo/application/diskTestApp -f /media/hdd/	[root@dg_ahciDemo ~1\$./dg_ahciDemo/application/diskTestApp -f /media/hdd/	
// Test on /media/hdd mounted point	// Test on /media/hdd mounted point	
Base of filename (default IESI, hit "Ctrl+c" to exit): IESI	Base of filename (default TEST, hit "Ctrl+c" to exit): TEST	
Operation type (read(0)/write(1), default 0): 1	Operation type (read(O)/write(1), default O): 1	
Pattern type (none(0)/inc(1)/dec(2), default 0): 0	Pattern type (none(D)/inc(1)/dec(2), default D): D	
File number (1-100, default 1): 1	File number (1-100, default 1): 1	
File size <0x1-0x0000000_1bd7d480, default 0x1>: 0x4000000	File size (0x1-0x00000000_1bd383e0, default 0x1): 0x4000000	
// *** *** *** *** *** *** // // Your operation. Operation Type: Write, Pattern Type: None FileBaseName: TEST, fileNum: 1, fileSize: 0x00000000_04000000	// *** *** *** *** *** *** *** // // Your operation. Operation Type: Write, Pattern Type: None FileBaseName: TEST, fileNun: 1, fileSize: 0x00000000_04000000	
File: /media/hdd/TEST_00.bin	File: /media/hdd/TEST_00.bin	
[OK] Writing completed Ospeed = 427.17 MB/sWrite file performance by 32 GB dummy data	[OK] Hriting completed @speed = 217.10 HB/s	
// // // Test on /media/hdd mounted point	// // // Test on /media/hdd mounted point	
Base of filename (default TEST, hit "Ctrl+c" to exit):	Base of filename (default TEST, hit "Ctrl+c" to exit):	
Figure 5-6 Write file performance by dummy data		

ArriaV/Arria10 SoC board

CycloneV SoC board

B COM4 - PuTTY	🛃 COM4 - PuTTY	
root@arria5:~# ./dg_ahciDemo/application/diskTestApp -f /media/hdd/	<pre>[root@dg_ahciDemo ~1\$./dg_ahciDemo/application/diskTestRpp -f /media/hdd/ // //</pre>	
// Iest on /media/hdd mounted point	// Test on /media/hdd mounted point	
Base of filename (default IESI, hit "Ctrl+c" to exit): IESI	Base of filename (default TEST, hit "Ctrl+c" to exit): TEST	
Operation type (read(0)/write(1), default 0): 1	Operation type (read(O)/write(1), default O): 1	
Pattern type (none(0)/inc(1)/dec(2), default 0): 1	Pattern type (none(0)/inc(1)/dec(2), default 0): 1	
File number (1-100, default 1): 1	File number (1-100, default 1): 1	
File size <0x1-0x0000000_17d6d438, default 0x1>: 0x4000000	File size (0x1-0x00000000_13d383d0, default 0x1): 0x4000000	
// *** *** *** *** *** *** // // Your operation. Operation Type: Write, Pattern Type: Increment FileBaseName: TEST, fileNum: 1, fileSize: 0x0000000_04000000	// *** *** *** *** *** *** // // Your operation. Operation Type: Write, Pattern Type: Increment FileBaseName: TEST, fileNum: 1, fileSize: 0x00000000_04000000	
File: /media/hdd/IESI_00.bin	File: /media/hdd/TEST_00.bin	
[OK] Writing verification completed Write file performance by @speed = 99.30 MB/s 32 GB increment data	[OK] Writing verification completed @speed = 77.12 MB/s	
// // // Test on /media/hdd mounted point	// // // Test on /неdia/hdd нounted point	
Base of filename (default TEST, hit "Ctrl+c" to exit):	Base of filename (default TEST, hit "Ctrl+c" to exit):	
Figure 5-7 Write file performance by 32-bit increment data		

DG

dg_sataahciip_instruction_altera_en.doc

ArriaV/Arria10 SoC board

CycloneV SoC board

B COM4 - PuTTY	B COM4 - PuTTY		
// // // Test on /media/hdd mounted point	// // // Test on /media/hdd mounted point		
Base of filename (default TEST, hit "Ctrl+c" to exit): TEST	Base of filename (default TEST, hit "Ctrl+c" to exit): TEST		
Operation type (read(0)/write(1), default 0): 0	Operation type (read(O)/write(1), default O):O		
Pattern type (none(0)/inc(1)/dec(2), default 0): 0	Pattern type (none(D)/inc(1)/dec(2), default D):D		
File number <1-100, default 1>: 1	File number (1-100, default 1): 1		
// *** *** *** *** *** *** // // Your operation. Operation Type: Read, Pattern Type: None FileBaseName: TEST, fileNum: 1, fileSize: 0x00000000_00000000	// *** *** *** *** *** *** *** // // Your operation. Operation Type: Read, Pattern Type: None FileBaseName: TEST, fileNum: 1, fileSize: 0x00000000_00000000		
File: /media/hdd/TEST_00.bin	File: /media/hdd/TEST_00.bin		
[OK] Reading completed @speed = 386.84 MB/s Read file performance by 32 GB without data verification	IOK] Reading completed espeed = 240.63 MB/s		
// // // Test on /media/hdd mounted point	// // // Test on /media/hdd mounted point		
Base of filename (default TEST, hit "Ctrl+c" to exit):	Base of filename (default TEST, hit "Ctrl+c" to exit):		
Figure 5-8 Read file performance without data verification			

ArriaV/Arria10 SoC board

CycloneV SoC board

COM4 - PuTTY	🗗 COM4 - PuTTY
// // // Test on /media/hdd mounted point	// // // Test on /nedia/hdd nounted point
Base of filename (default TEST, hit "Ctrl+c" to exit): TEST	Base of filename (default TEST, hit "Ctrl+c" to exit): TEST
Operation type (read(0)/write(1), default 0): 0	Operation type (read(O)/write(1), default O): O
Pattern type (none(0)/inc(1)/dec(2), default 0): 1	Pattern type (none(0)/inc(1)/dec(2), default 0): 1
File number (1-100, default 1): 1	File number (1-100, default 1): 1
// *** *** *** *** *** *** // // Your operation. Operation Type: Read, Pattern Type: Increment FileBaseName: TEST, fileNum: 1, fileSize: 0x00000000_00000000	// *** *** *** *** *** *** // // Your operation. Operation Type: Read, Pattern Type: Increment FileBaseName: TEST, fileNum: 1, fileSize: 0x00000000_00000000
File: /media/hdd/TEST_00.bin	File: /media/hdd/TEST_00.bin
[OK] Reading verification completed @speed = 90.46 MB/s Read file performance by 32 GB and verified by 32-bit increment pattern	[OK] Reading verification completed @speed = 73.58 MB/s
// // // Test on /media/hdd mounted point	// // // Test on /media/hdd mounted point
Base of filename (default TEST, hit "Ctrl+c" to exit):	Base of filename (default TEST, hit "Ctrl+c" to exit):

Figure 5-9 Read file performance and verify by 32-bit increment data



5.2 Bonnie++ Software

This topic shows how to test disk performance by using Bonnie++ software. The brief option of Bonnie++ software is belows.

bonnie++ [-d dir] [-s size(MB)[:chunk-size(b)]] [-n number-to-stat(*1024) [:max-size[:min-size] [:num-directories]]] [-m machine-name] [-r ram-size-in-MB] [-x number-of-tests] [-u uid-to-use:gid-to-use] [-g gid-to-use] [-q] [-f size-for-char-io] [-b] [-D] [-p processes | -y p|s] [-z seed-num|-Z random-file]

More details about Bonnie++ user manual can be found from http://linux.die.net/man/8/bonnie++.

The example command to run Bonnie++ is follows. >> bonnie++ -d /media/hdd/ -s 2g -n 0 -m test -f -u root



Figure 5-10 Test performance from Bonnie++ benchmark



6 Revision History

Revision	Date	Description
1.0	11-Jan-16	Initial version release
1.1	3-Mar-16	Support ArriaV SoC board
1.2	1-Aug-16	Support Arria10 SoC board

Copyright: 2016 Design Gateway Co,Ltd.