RAID prototype system introduction

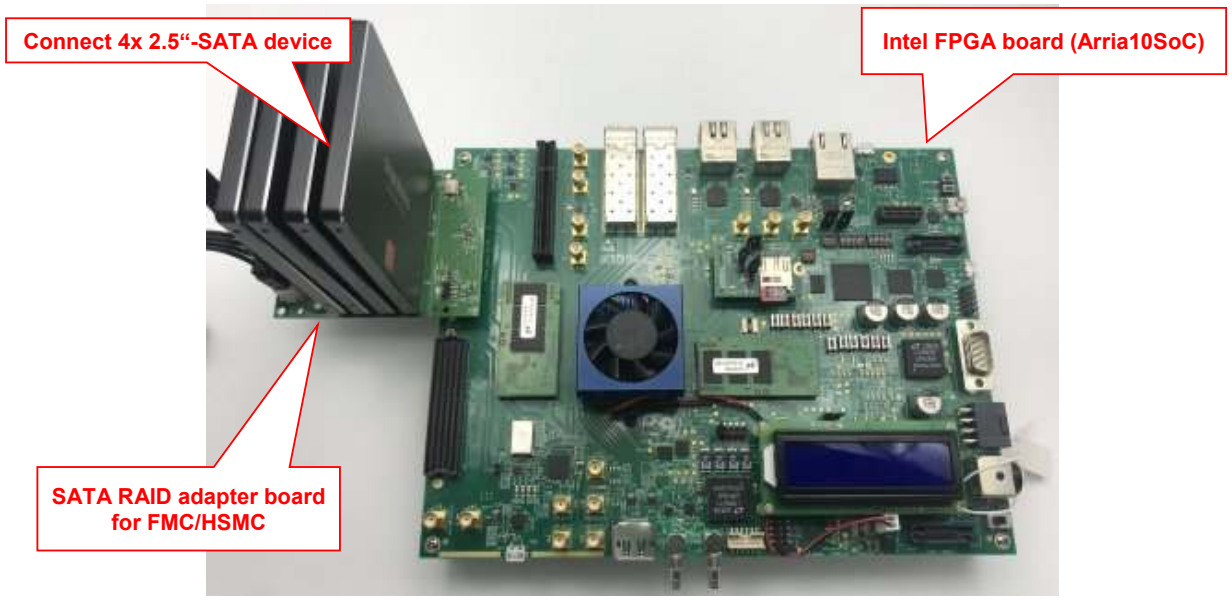
Ver1.3E

SATA-IP RAID prototype system for Intel FPGA

System Summary

- RAID prototype for the latest Intel FPGA.
- Use RAID adapter board (for FMC or HSMC).
- Operate 4-channel RAID0 (parallel access).
- Standard and High Performance version.
- Show read/write result to PC via RS232C.
- Execute test pattern read/write.
- Display measured transfer performance

Prototype System



RAID prototype system using Arria10SoC board

RAID Adapter Board

- FMC(AB09-FMCRAID)/HSMC(AB12-HSMCRAID).
- Mounts 10ch (FMC) or 8ch(HSMC) SATA connector
- 2.5”-SSD/HDD drive direct insertion.
- Drive power supply via standard ATX power connector.
- Available on Mouser website https://www.mouser.com/

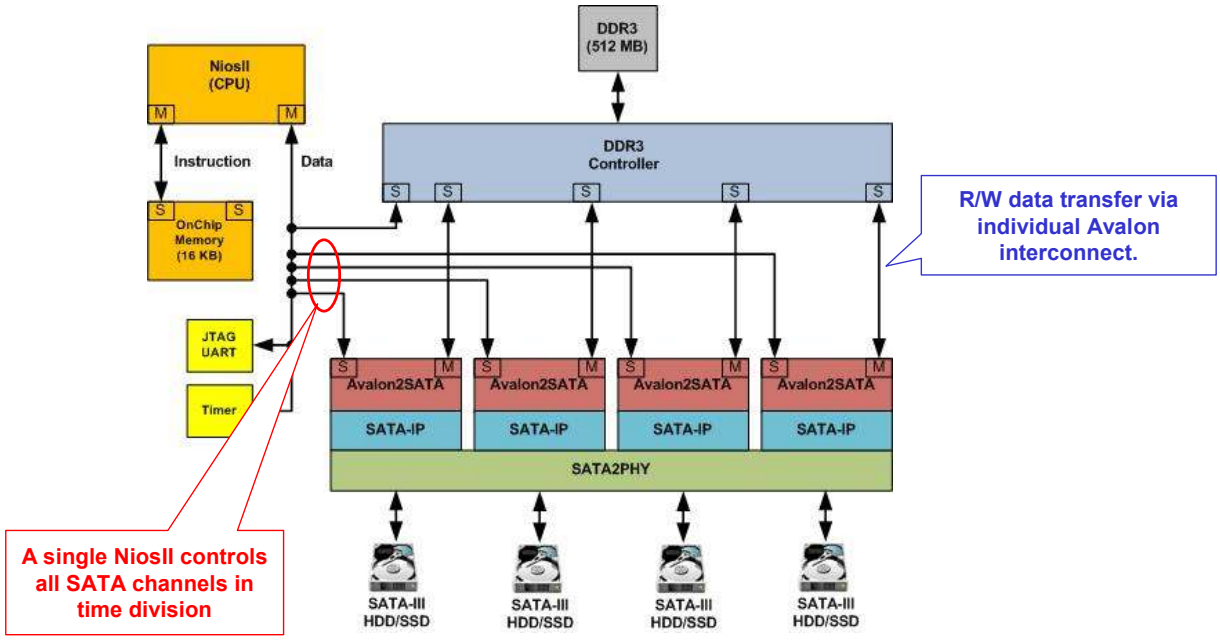
FMC: AB09-FMCRAID

HSMC: AB12-HSMCRAID

Two types RAID design

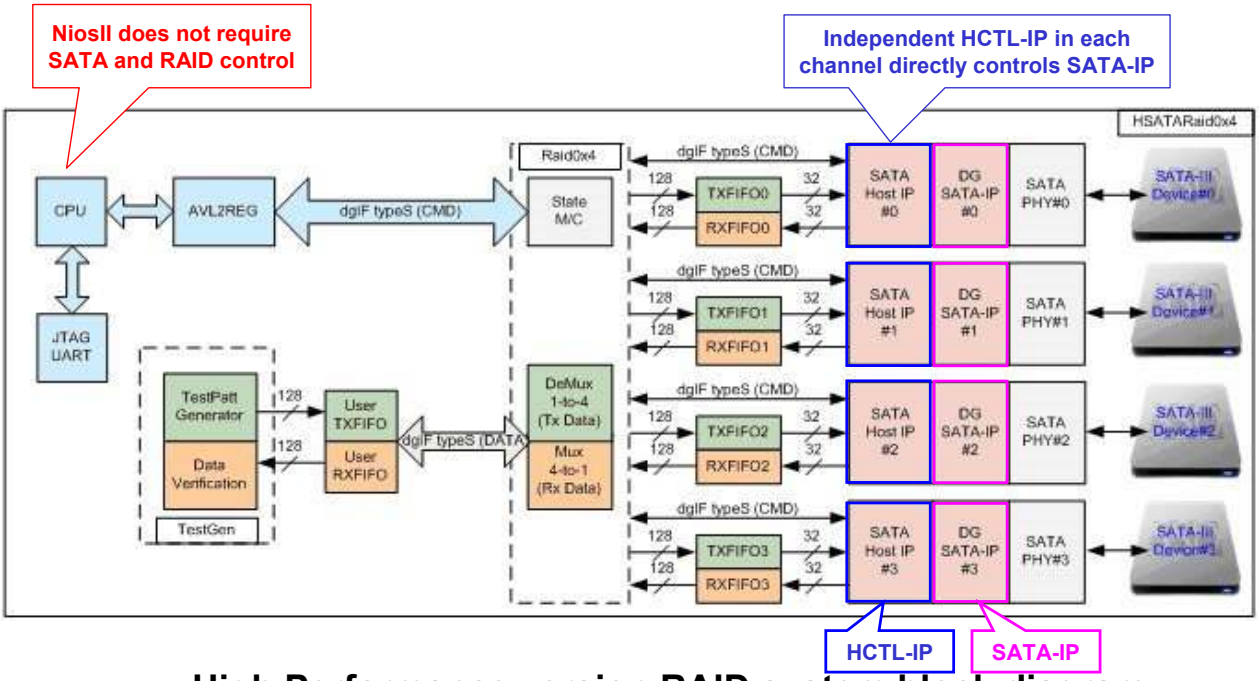
- **Standard Version (NiosII control)**
  - Use NiosII for SATA-IP controller
  - All channel control by time division in NiosII F/W
  - Requires SATA-IP only (no need HCTL-IP)
- **High Performance Version (HCTL-IP control)**
  - Use HCTL-IP core for SATA-IP controller
  - Minimum latency, Maximum performance
  - Requires Both SATA-IP and HCTL-IP core

Standard version Block Diagram



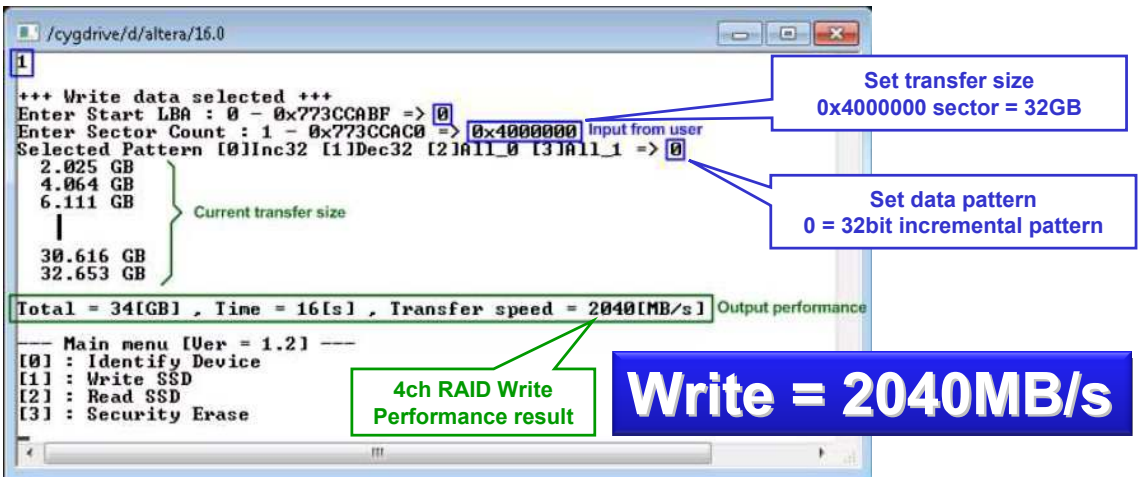
Standard version RAID system block diagram

High Performance version Block Diagram



High Performance version RAID system block diagram

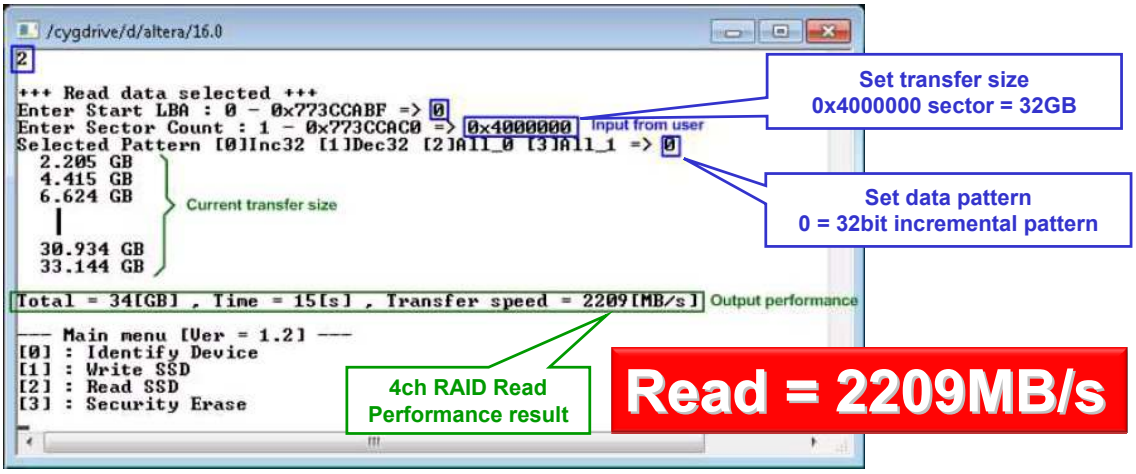
Write Result (High Performance Version)



32GByte Write Result

[Measurement Condition]
FPGA: Arria10SoC board
SSD: Samsung 850PRO x 4
High Performance Version

Read Result (High Performance Version)

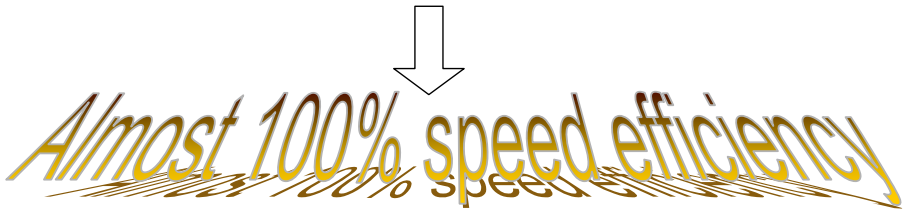


32GByte Read Result

[Measurement Condition]
FPGA: Arria10SoC board
SSD: Samsung 850PRO x 4
High Performance Version

RAID Performance

- **Write speed efficiency=98%**
  - **Single=520MB/s, 4ch-RAID=2040MB/s**
  - **Speed efficiency = 2040/(4 x 520) = 98%**
- **Read speed efficiency=99%**
  - **Single=560MB/s, 4ch-RAID=2209MB/s**
  - **Speed efficiency = 2209/(4 x 560) = 99%**



RAID Design in deliverables

- Quartus project is attached with SATA-IP and/or HCTL-IP product
- Full source code except IP core
  - VHDL for hardware and C for NiosII firmware
- Can save user system development duration
  - Confirm real board operation by original reference design.
  - Then modify a little to approach final user product.
  - Check real operation in each modification step.

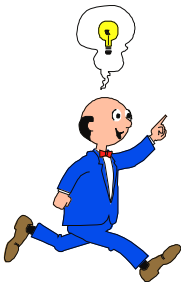
Short-term development is possible without big turn back

Conclusion

- Can build RAID prototype with FPGA & RAID adapter
  - Quick check of RAID system without new board building.
- RAID performance is almost 100% of single drive total.
  - Multiply performance by drive count.
- Prototype design is available for SATA-IP users.
  - Accelerate RAID system development based on this design.

For more detail

- **Detailed technical information available on the web site.**
  - https://www.dgway.com/SATA-IP_A_E.html
- **Contact**
  - **Design Gateway Co,. Ltd.**
  - **sales@design-gateway.com**
  - **FAX: +66-2-261-2290**



Revision History

Rev.	Date	Description
1.0	04-Jun-09	RAID prototype system introduction 1st release
1.3E	03-Sep-18	Added Arria10SoC design and high performance version description

THANK YOU