



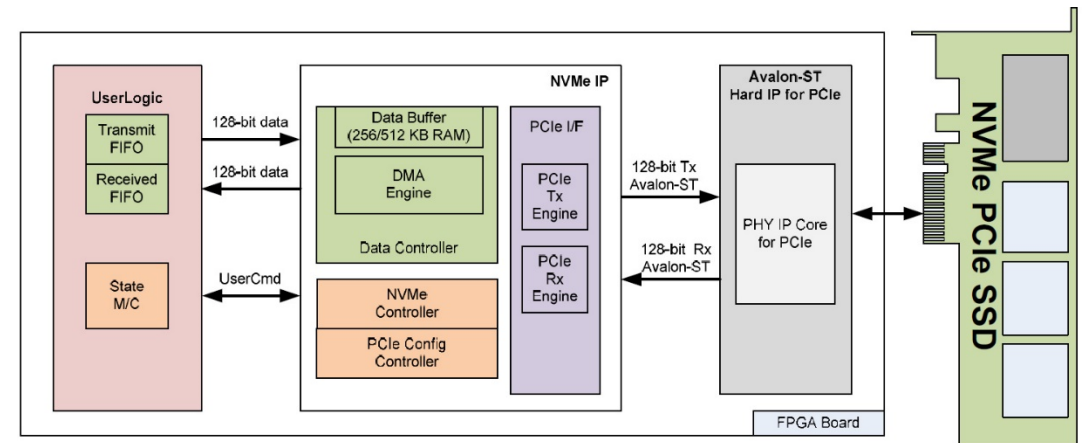
**NVMe IP Core Demo**  
**On REFLEX CES's **ALARIC** Instant-DevKit**  
**ARRIA 10 SoC FMC IDK**

# NVMe-IP Core

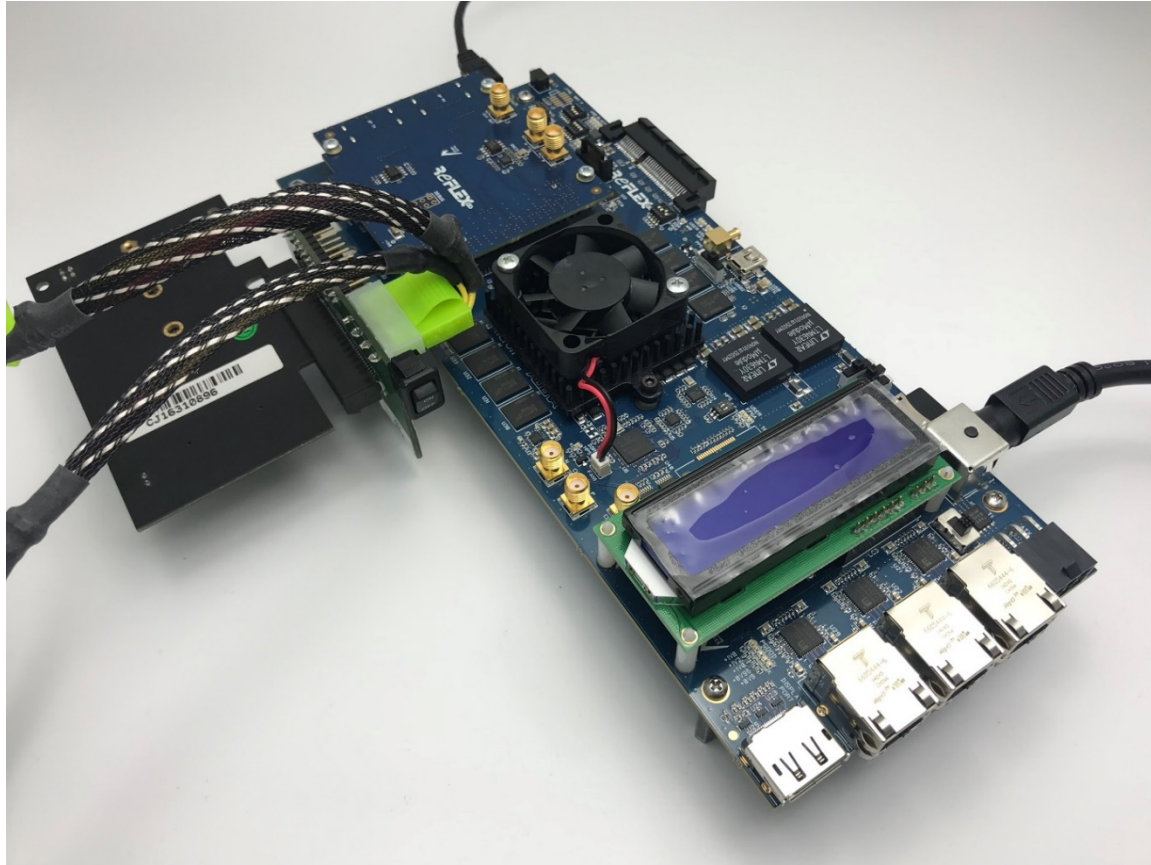
NVMe Host Controller IP is designed to connect directly with Ultra High Speed NVMe SSD without need CPU, OS, Device driver and external DDR memory. It's the best solution for application which requires ultra high speed performance, multi channel NVMe interface and compact system. The IP core license included with the reference design for Reflex CES board to shorten development time.

## Key features

- Implement application layer by pure hardware logic without need CPU/OS
- Support PCIe Gen2 and Gen3 x4 M.2 SSD
- Built-in optimized PCIe Bridge
- Very low FPGA resources, just ~1,200ALMs
- FAT32 IP and Linux reference design available



# NVMe-IP Demo set up



- REFLEX CES's ALARIC Instant-DevKit
- DG's AB16 PCIeXOVR adapter
- Samsung 960 PRO NVMe SSD

# M.2 NVMe SSD connection



- Connect Samsung 960 PRO with M.2 to PCIe x4 adapter card
- Connect AB16's female connector with ALARIC
- Connect PCIe adapter with AB16
- Connect ATX power cable to AB16

# Read/Write Performance

```
/cygdrive/c/altera/16.0
Main menu [Ver = 1.3] ---
[0] : Identify Device
[1] : Write SSD
[2] : Read SSD
2
+++ Read data selected +++
Enter Start LBA : 0 - 0x3B9E120F -> 0
Enter Sector Count : 1 - 0x3B9E12B0 -> 0x8000000
Selected Pattern [0]Inc32 [1]Dec32 [2]A11_0 [3]A11_1 [4]LFSR-> 4
3.254 GB
6.505 GB
9.758 GB
13.014 GB
16.269 GB
19.524 GB
22.782 GB
26.040 GB
29.296 GB
32.550 GB
35.807 GB
39.064 GB
42.321 GB
45.579 GB
48.834 GB
52.089 GB
55.344 GB
58.600 GB
61.857 GB
65.114 GB
68.369 GB
Total = 68[GB] , Time = 21[s] , Transfer speed = 3255[MB/s]

/cygdrive/c/altera/16.0
4.267 GB
6.436 GB
8.585 GB
10.710 GB
12.880 GB
15.025 GB
17.149 GB
19.318 GB
21.465 GB
23.586 GB
25.745 GB
27.883 GB
30.031 GB
32.187 GB
34.313 GB
36.468 GB
38.626 GB
40.753 GB
42.908 GB
45.065 GB
47.182 GB
49.339 GB
51.493 GB
53.620 GB
55.773 GB
57.923 GB
60.061 GB
62.216 GB
64.355 GB
66.502 GB
68.658 GB
Total = 68[GB] , Time = 32[s] , Transfer speed = 2145[MB/s]
```

- Average write speed performance = 2,145MB/s!
- Average read speed performance = 3,225MB/s!