

FADU ANNAPURNA FLASH MEMORY CONTROLLER



PCIe Gen 3x4 NVMe 1.3 SSD controller

PRODUCT OVERVIEW

The FADU Annapurna is a NVMe SSD controller that provides support for PCIe Gen 3.0x4 host interface and 8 channel NAND interface up to 16 devices per channel. FADU reconstructs entire architecture of SSD to take full advantage of NVMe. Annapurna is the most powerful, the most power efficient, and the most flexible solution in the industry. Annapurna supports all consumer and enterprise features with various form factors from M.2 2280 and M.2 22110 to M.3, and dual port U.2. It will set the new standard of NVMe SSD controller.

HIGHLIGHTS

BEST PERFORMANCE

- 3.5GB throughput
- 900K IOPS
- 4KB LDPC engine

BEST EFFICIENCY

- <1.7W at active (controller)
- <3mW at L1.2 (SSD)
- Eliminate thermal issue

BEST USABILITY

- Dual port support
- Powerful consumer/enterprise features

KEY FEATURES

CATEGORY

Host Interface

FEATURES

- PCIe Gen 3 x 4 lanes (PCIe 3.0 X 2 for Dual port)
- NVMe 1.3 support
- Light NVM / Open Channel SSD support

NAND interface

- Up to 8 NAND channel, each supporting up to 16 CE
- Up to 800 MT/s Toggle and ONFI standards

DRAM Interface

- 32bit DRAM interface
- Support DDR4 / LPDDR4, up to 8GB

Flash Memory Controller

- Extensive hardware automation to maximize the performance
- Out of order execution of both flash controller and host controller
- Budget based throttling
- 4KB LDPC supports 3D NAND MLC / TLC as well as 2D NAND
- Micro-code based architecture enables future NAND & NVM support
- Low power features – ASPM L0s / L1 / L1.2 Latency Tolerance Reporting (LTR)
- Enterprise features – SR-IOV(16ea), Multistream(16ea), Multiple name space(32ea), Dual port
- End-to-end & per stream QoS

Security

- AES 256-bit for User Data Encryption
- TCG/OPAL Support

Peripherals

- Temperature sensor support

Package

- 17x17mm with 0.65 ball pitch 556-ball FBGA

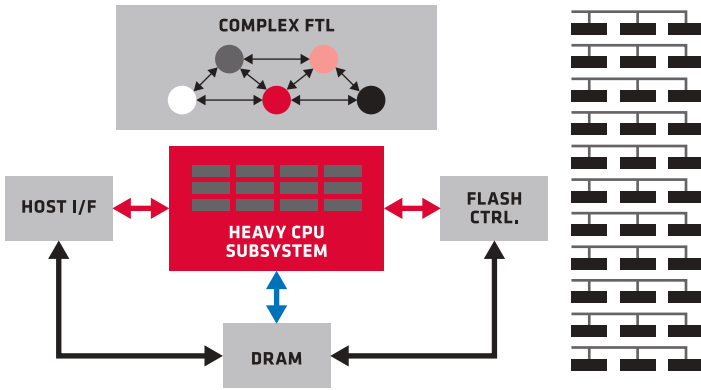


ARCHITECTURE OVERVIEW

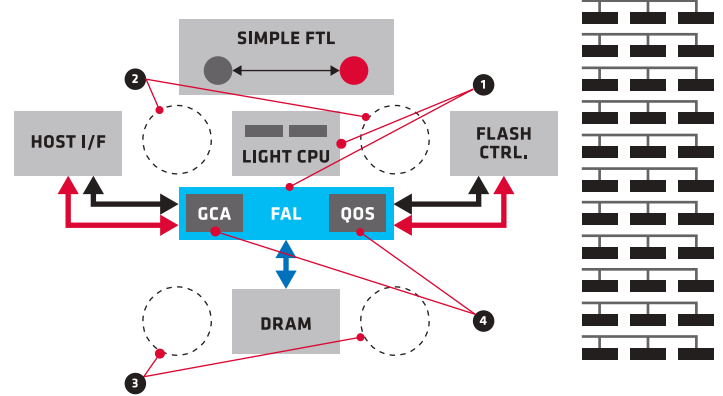
Legacy architecture:
Complex FTL + Heavy RTL with multiple processors

VS

FADU's architecture:
Full hardware automation removing bottlenecks



Control
 Meta data
 User data

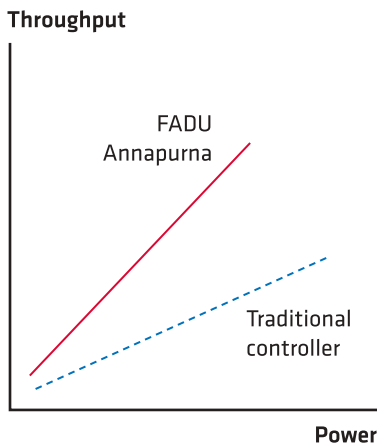


- 1 Power & resource reduction by extensive HW automation via Flash Acceleration Layer (FAL)
- 2 Complete off-loading of common case control mechanism
- 3 Complete DRAM bypassing of data from host
- 4 A series of accelerators and scheduler for quality of service

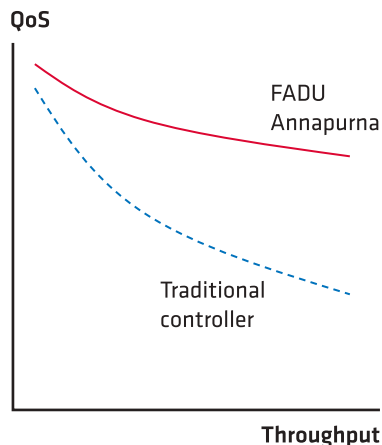
PERFORMANCE AND POWER CONSUMPTION

FADU Annapurna is true next generation SSD controller which solves the dilemma between power and performance. FADU achieves >30% less power consumption with >100% better IOPS.

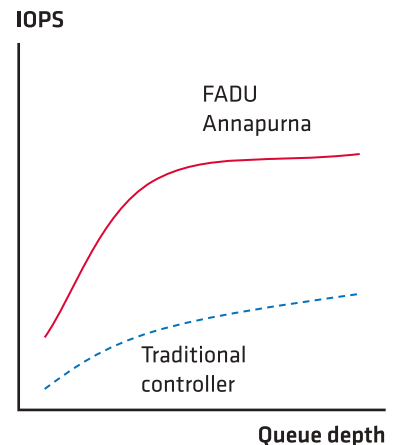
POWER EFFICIENT



RELIABLE QOS



SUPERIOR IOPS



SSD EXECUTION EXAMPLE

		U.2 7MM	M.2
Performance	Sequential Read	3.5 GB/s	3.5 GB/s
	Sequential Write	3.5 GB/s	3.5 GB/s (SLC buffer on)
	4KB Random Read	900 K IOPS (sustained)	900 K IOPS (up to)
	4KB Random Write	290 K IOPS (sustained @ 28% OP)	900 K IOPS (up to @ 0% OP)
Power consumption	Active	Typ. <8W (<1.7W by controller)	Typ. <6W (<1.7W by controller)
	Standby	Typ. <2.5W	
	Idle (PS3)		<50mW (<1ms exit time)
	Sleep (PS4; L1.2)		<3mW (<50ms exit time)

