

REPORT REPRINT

NGD says it's showtime for ASIC-powered computational storage

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The emerging field of computational storage is set to become a major market, and NGD is one its leading pioneers. The startup has begun shipping a long-promised ASIC-based version of its previously FPGA-powered smart SSD, opening up the market in more ways than one.

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Summary

Driven by the need to boost performance for applications such as AI/ML and analytics, computational storage is an emerging architecture in which data is processed in situ, in storage. The concept is attracting fast-growing interest from big suppliers, and its potential size is indicated by the fact that adoption is starting with very large IT operations, including hyperscalers. One form of computational storage is data processing within flash drives, which 451 Research is calling 'smart SSDs.'

NGD Systems recently announced shipment of its third generation of smart SSDs, powered by an ASIC that was designed by the company itself and replaces the FPGA that powered its previous smart SSDs. While the use of FPGAs in production devices has recently been increasing, unsurprisingly, NGD says the move to an ASIC makes the new drives cheaper, faster, more power-efficient and able to offer even higher data capacities than the already large capacities of their predecessors. The company is also claiming to have broken new ground with a 14nm process size for the ASIC. NGD had long planned to make this switch to an ASIC, and a range of customers have already trialed the previous FPGA-based versions of its devices. Now that it has made the move, the company says it is enjoying a surge in customer PoCs.

451 TAKE

NGD's switch from FPGA to ASIC is a step change for its product, and one that opens up the market. From the start, NGD intended for its smart SSDs to be open and flexible, allowing customers to perform in situ processing using existing application code, running in an OS on the drive itself. This is distinctly different to the approach taken by its rivals, and the release of the ASIC-powered version brings the company into its stride as a supplier. Although NGD's previous products had already attracted a range of PoCs, we think this is the version that potential buyers have been waiting for. Its release is a major development in this fast-moving sector.

Background

Founded in 2013, NGD shipped its first generation of smart SSDs in 2017, and has raised \$28m in two VC rounds. The company is not yet naming customers, but said in 2018 that more than a dozen organizations were completing PoCs, including Microsoft with two projects, French telco Orange, content-distribution network operators, self-driving car developers and government agencies. This diversity of PoC customers reflects the range of applications that NGD is targeting, which includes AI/ML, analytics and image recognition, as well as genomics, Hadoop and other big-data platforms.

NGD was elected as co-chair of an SNIA technical working group for computational storage that was set up in November 2018 to promote device interoperability and define interface standards. The number of companies in the group has grown from about 20 at the beginning of the year to over 32. Large vendors in the group include Arm, Dell, IBM, Inspur, Lenovo, Micron, NetApp, Oracle, Toshiba, Samsung, SK Hynix, VMware, Western Digital and Xilinx.

A flexible platform

From a customer's point of view, NGD's smart SSDs are more flexible than rival devices because they host an OS on a quad-core Arm processor within the ASIC that powers the devices. The OS allows any software that runs on Ubuntu to be used for in situ computing in NGD's drives. If customers want to use code that wasn't compiled for Ubuntu on Arm, they can avoid recompiling it by running it in Docker containers in the OS. This is very flexible, and while NGD names Ubuntu as the OS on its smart SSD, it says it can support others, as well.

Product details

NGD's ASIC is called the Newport platform, and regardless of its Arm cores, NGD says it is the first flash drive controller to be based on a 14nm process size or geometry. The smaller the process size, the more transistors, the higher the processing performance, the smaller the physical size of the chip and the more efficient the power use. All these qualities are especially important when operating at scale. In contrast, FPGAs and other SSD Controller ASICs are currently built on 28nm or larger process sizes, according to NGD.

NGD says it has not finalized the performance numbers for its Newport-based NVMe drives when they are acting simply as flash drives with no in situ data processing. However, the company says that in this respect, the devices are competitive to other drives tailored for the read-centric workloads it is targeting.

NGD also hasn't quantified the overall performance boost given to applications when its Newport drives process data in situ, primarily due to the fact that each workload will have unique acceleration values. However, it says its previous FPGA-powered smart SSD boosted image recognition performance by two orders of magnitude, and accelerated several Hadoop functions by over 40%.

NGD claims its previous drives offered industry-leading capacities, and described that quality as a second string to its bow, separate to in situ processing. The company says this was the result of its system-on-a-chip design skills and its Elastic Flash Translation Layer. This virtue of high density is now set to be amplified by the Newport ASIC because it is physically smaller than the FPGA it replaces, allowing NGD to pack more NAND flash chips into each drive.

The first Newport-based device is now shipping as a U.2 16TB drive – the same capacity as the preceding Catalina 2 drive and unmatched by any other SSD U.2 drive, according to NGD. The company is promising to go further with a Newport U.2 drive that packs 32TB. Newport drives in the smaller M.2 form factor are slated to ship very soon, with capacities up to 8TB. EDSFF ruler format drives are planned, in 16TB short and 32TB long versions. Both of those EDSFF capacities will be achieved using TLC flash, rather than the lower-quality QLC flash used in other vendors' EDSFF drives of the same capacity.

The 16TB U.2 Newport drive consumes a maximum of 12W, which NGD says is the lowest power consumption per TB of any datacenter flash drive. The Arm processor is linked to the flash by 16 data channels – twice as many channels as in the previous FPGA, thereby boosting processing speeds (and echoing the driving principle of computational storage itself, which is to move data in and out of processors faster). The link to the host server is PCIe Gen 3x4, running NVMe 1.3.

Competition

The only other company shipping a smart SSD is fellow startup ScaleFlux, which has been shipping its device since 2017. ScaleFlux says it has 15-20 customers and is engaged with Alibaba. In 2018, Samsung unveiled a device called the Samsung SmartSSD, but that device will not ship for revenue until later this year. For now, the Samsung device is in PoCs and joint development with multiple customers.

The architectures of the ScaleFlux and Samsung devices are not the same, but both companies have taken a different approach to NGD in one key aspect: They have created smart SSDs that do not host an OS, but instead complete in situ data processing using microcode running in FPGAs. This limits the in situ processing to a fixed set of functions, making the devices less flexible than NGD's, and unable to host existing application code. However, ScaleFlux argues that by avoiding a software OS, its approach delivers greater in situ processing power. NGD disputes this, and claims that the processing in its drives is an order of magnitude faster than any NVMe interface can handle.

SWOT Analysis

STRENGTHS

NGD currently has very few direct competitors, and its OS-based in situ platform allows customers more flexibility with software deployments than fixed-function smart SSDs. NGD also claims industry-leading capacities and low power consumption.

WEAKNESSES

This is a very new field, and on the flipside of the previous statement, NGD's bet on flexibility may prove wrong.

OPPORTUNITIES

The need for new ways to boost processing speeds will continue to grow with the adoption of data-intensive and compute-intensive applications such as AI/ML and big-data analytics.

THREATS

Flash giant Samsung is already a stated competitor to NGD, and other big suppliers are likely to enter the arena. The lead in the market could be further impacted as more competition comes online.