Radical Storage: Flash Core Modules

2½ Inch Storage System Delivers Unprecedented Density, Cost Savings, and Performance

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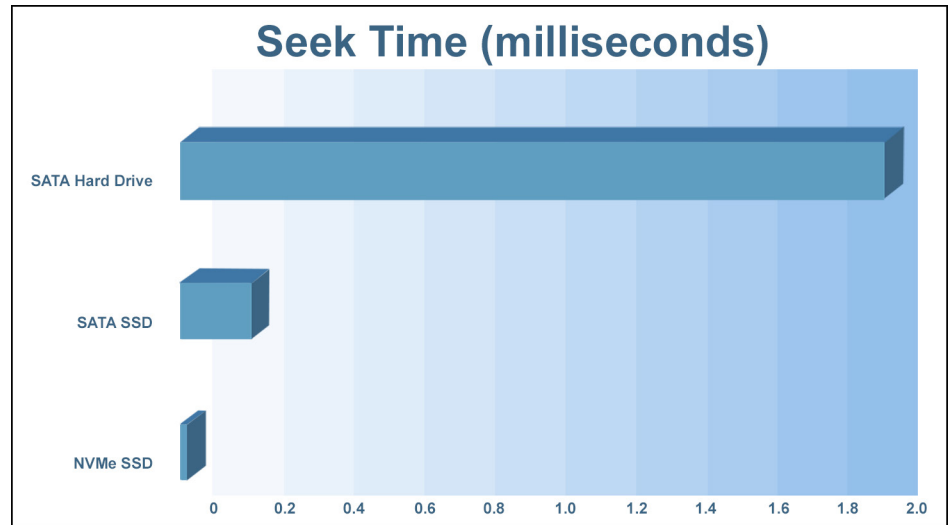
FASTER. CHEAPER. SMALLER. EASIER. TOP RELIABILITY.

That is what every IT team strives for day after day. Typically, you can't get it all so tradeoffs are necessary. Faster is more expensive. Improved reliability is more complex. And so on. That's all changed with a revolutionary storage technology, called Flash Core Modules (FCMs), which provides density, speed, and efficiency improvements never seen before. Developed by IBM and Intel, this third generation of storage is a complete technological leap over first-generation spinning disk and second-generation flash storage.

Does this sound too good to be true? We hear that a lot from our customers until they start using IBM's FlashSystem 9100, V7000 and V5000, the first FCM-enabled entrants to the market. At Jeskell, an IBM Platinum Partner, we've deployed IBM FlashSystem 9100s and V7000s for fourteen end-user enterprise projects since they were introduced only a few months ago.

Traditionally, a flash storage system comprises multiple flash drives and redundant storage controllers. An FCM is an entire miniaturized storage system with a 2 ½ inch form factor that includes RAID data protection, encryption, compression, data reduction, and more. See that little drive popping out in the photo? That is a pluggable

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Seek Time (milliseconds)

SATA Hard Drive	
SATA SSD	
NVMe SSD	

0   0.2   0.4   0.6   0.8   1.0   1.2   1.4   1.6   1.8   2.0

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FCM, which is the size of a single flash drive. Need more capacity? You can plug up to 24 FCMs in a 19 x 3 ½ inch rack unit enclosure, which is equivalent to the same capacity and capabilities of a storage frame that weighs 2,800 pounds and uses at least 30 flash drives.

Aside from the remarkable miniaturization, FCMs deliver eye-popping improvements, such as 6x performance, 8x data reduction, "no performance impact" hardware compression, petabytes of storage in a 1U rack, and 4x resiliency of any other solution based on second-generation flash technology. Combine all this with data center floor space, power, and noise reductions, and simplified management, and you get dramatically lower capex and opex compared to conventional spinning disk and flash storage.

Unlike conventional storage, which enables RAID, compression and other capabilities with microcode running on the controller hardware and in the software, these functionalities are built into each FCM's hardware. That is where the speed and efficiency advantages for FCM come into play. Each rack unit enclosure has power supplies and two storage controllers to connect the FCMs to

servers and switches. Traditionally, storage controllers also handle compression, RAID, and encryption, which is a drag on storage performance. This is not the case with FCMs, where each miniaturized module handles all of that on its own in pure hardware. Now, let's dive deep into why FCMs are so much faster, more efficient and reliable, and easier to manage at a significantly lower cost.

LEAVING SPEED RECORDS IN THE DUST.

In conventional storage, the SCSI-3 protocol runs on top of fiber channel and uses 200 different commands to block data, direct spinning disk heads and platters, and mount, search, and rewind tape drives, and so on. That complexity slows down things—a lot.

The new protocol, Non-Volatile Memory Express (NVMe) only has 13 commands, which are written for flash. As part of an end-to-end fabric, storage controllers communicate NVMe to FCM on one side and to application servers and switches on the other. The result: 6 to 1 speed increases for FCM, switches, and servers over flash with the SCSI-3 protocol.

Consider response time. SATA (spinning disk) delivers 1.9 milliseconds while SATA SSD (flash) knocks it down to .18 milliseconds. Throw in NVMe SSD and you get .08 milliseconds.

Data rate improvements also are stunning. Sustained throughput for SATA hard drive is 150 megabytes per second (MBps) and SATA SSD shoots to 450 MBps. NVMe SSD clocks in at 2,800 MBps—6 times-plus faster. A cluster with four FCMs skyrockets to 136 gigabytes per second or 10 million IOPS—exceeding supercomputer requirements.

DOUBLE YOUR STORAGE SYSTEM FOR THE PRICE OF ONE.

Conventional storage compression is accomplished with software-assisted hardware, which results in a sizable performance hit. Because FCMs run compression 100% in the hardware, there is no performance loss.

IBM guarantees that the FlashSystem 9100 provides a minimum 2xs increase in logical usable storage over

physical storage. For example, the maximum compression ratio for FCM is 4.5:1. In other words, you're getting at least twice as much as you paid for.

In addition, compression is done in small blocks to ensure consistent performance regardless of the workload.

SPACE CRUNCH SOLVED—AND SO MUCH MORE.

One of our customers was running out of space in their nearly 20,000 square foot data center. With more than 15 storage systems from five different vendors, the data center was a spaghetti nightmare of switches, cables, and ports. Costs were high with every new port costing $1,000 and a never-ending cycle of code updates, warranty expirations, and disruptive storage refreshes. So many different GUIs, commands, instructions and manuals to master further stretched the IT team.

Enter FCM and things got a whole lot better. Two rack units and 1.6 petabytes of FCM replaced all storage and freed up thousands of square feet of floor space. This photo says it all.

Because FCMs consume the power of a few light bulbs, our customer saw an 80% drop in power and cooling costs while feeling good about doing right by the environment. In addition, with no more power-hungry storage systems heating the data center, noisy cooling fans disappeared. The data center went silent, which created a more pleasant, relaxing work environment.

GET 500 TERABYTES FOR A 100-TERABYTE PURCHASE.

Data reduction extends the cost efficiency and density of FCMs even further. When creating your pool of IBM FlashSystem 9100, click the boxes for your preferred data reduction technologies, such as advanced data deduplication, thin provisioning, and in-line compression. Or, click a single box for a "Data Reduction Pool" and have it all. Many database workloads achieve 8:1 capacity increase with that single click. Of course, the data has to arrive uncompressed, so image and video files would be excluded.

The new IBM FCM "third generation" FlashSystem typically provides a 5x boost in capacity. In other words, your data requires only 20% of usable capacity. When you consider reduced capex, deployment, maintenance, floor space, and power costs, the savings grow exponentially.

Here's another cost reduction factor to consider: The IBM FCM systems are less expensive than 15K RPM enterprise hard drives. When you apply the patented IBM data reduction technologies with that single, easy click, the cost savings multiply accordingly. And, IBM FlashSystems currently enjoy the lowest list prices of any major competitor in the market. So you start at a lower price point and it only gets better from there.

SIX NINES AVAILABILITY. SERIOUSLY.

FCM data availability increases from five to six nines—a magnitude of improvement. If you use IBM FlashSystem 9100s recommended configurations, IBM guarantees six nines uptime.

Unlike conventional storage, which delivers RAID across the flash drives, the FlashSystem 9100 architecture incorporates variable stripe 2D RAID in each FCM and

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provides 4xs resiliency. Further, instead of copying data from a primary to secondary system, FCMs generate instantaneous flash copy images with locked pointers to original volumes of data at periodic times. Even if data volumes on the original FCM are deleted, pointers can recreate the original blocks of data. This avoids a scenario where a mirrored system automatically deletes data that was inadvertently deleted at the primary site.

For disaster recovery, IBM Spectrum Virtualize Cloud FlashCopy sends local snapshots to the cloud, such as Amazon S3, IBM Cloud, or OpenStack Object Storage (Swift). This makes recovery easy and quick since you can restore cloud snapshots to any location with just a few clicks.

SIMPLE. EASY. DONE.

Traditionally, when storage administrators need to allocate storage to a new user, they must set up the pool, a process that can take up to a day. FCM delivers a "family-centered" approach that dramatically reduces administrative time.

With FCM, the storage administrator sets up a parent pool with the encryption, RAID, snapshots, policies, and other desired functionality. When a user requests storage, the administrator simply allocates a child pool that automatically assumes all attributes of the parent pool. It takes 60 seconds with a few clicks. In fact, setting up a child pool is so easy that IT can allocate the task to users via a self-service model, further freeing time for IT.

GRADUAL, NON-DISRUPTIVE CHANGE.

Because the FlashSystem 9100 separates software from hardware, customers own the software licenses forever. Under the support plan, customers automatically receive code updates, ensuring that they always have the latest generation.

When the three-year support plan expires, customers can choose to renew it for a nominal fee and continue receiving updates. They also can replace the motherboard without any disruption. FCM hardware replacement is completely transparent to the applications and infrastructure because they are communicating with the same FCM software. This clean approach eliminates downtime, obsolescence, migration, forklift upgrades, cabling, IT storage training, and new power connections.

## JESKELL: FCM EARLY ADOPTER AND SYSTEMS INTEGRATOR EXPERT.

If you've read this far, you're probably thinking about trying out the IBM FlashSystem 9100s, V7000s and V5000's. Many of our customers are choosing Jeskell to deploy FCMs at their data centers. It's safe to say that we likely have more hands-on installation experience with FCM at customer sites than any other systems integrator or reseller.

We've already developed FCM best practices on how to effectively create pools and clusters, set up encryption, implement compression and data reduction, and configure to deliver maximum performance and efficiency. If

you're not familiar with Jeskell, here are some of the reasons we've earned enormous respect in the IT industry:

- **Track Record of Success**. Going back 25 years, we have extensive experience in handling complex IT integrations, consulting, and training in federal government and business.
- **Deep Technical Expertise**. We have in-depth knowledge of storage, virtualization, cloud, networking, data migrations, data protection, and regulatory compliance, helping our clients avoid risk and navigate implementation challenges.
- **Exceptional Client Service**. Our customers repeatedly highlight our commitment to solving their challenges and our teams of technical, sales, and acquisition experts who are focused on providing them with exemplary customer experience.

Are you ready to start capturing the mind-bending improvements in storage density, performance, reliability, and affordability of Flash Core Modules? If so, please contact us for a complimentary assessment. We have the most experienced storage architecture team in the industry. We also have the finest workload and capacity modeling tools and know how to use them. Let us work with you to assess your needs and options today.
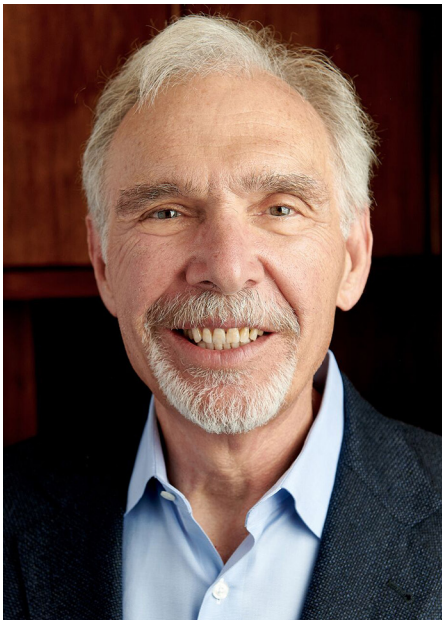
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Russell Schneider is the Storage Systems Practice Director at Jeskell Systems. With more than 30 years as an IT storage specialist, he has deep expertise in industry-leading storage technologies and best practices. Russ is a thought leader, speaker, computer industry entrepreneur, and complex storage architect and implementer. He works tirelessly to educate Jeskell customers on the latest topics and tactics in enterprise storage. Russ frequently speaks on a variety of storage practices ranging from data center workload relocation to backup and recovery to enterprise data encryption, and more.

Schedule a consultation with Jeskell's vice president of sales, Greg Lefelar (GLefelar@jeskell.com), and storage systems practice director, Russell Schneider (rschneider@jeskell.com).