

IBM FlashSystem 9100

Flexible NVMe storage powered by IBM Spectrum Virtualize and IBM FlashCore technologies

Highlights

- Accelerate business apps with NVMe and IBM FlashCore technologies
 - Increase storage cost-efficiency with compression and deduplication
 - Leverage AI to optimize storage operations and efficiency
 - Transform IT infrastructure with IBM Spectrum Virtualize
 - Increase ROI with IBM Spectrum Virtualize
 - Extend a rich set of data services across all your storage systems
 - Simplify data reuse and protection with multicloud solutions
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Real-time and AI-based applications are where business is moving—rapidly. In fact, within the next few years, industry analysts predict that half of all enterprise IT infrastructure will employ some form of machine learning or AI capabilities to improve enterprise productivity, manage business risks and drive cost reductions. Also, the majority of Fortune 2000 companies will have at least one mission-critical workload that leverages real-time big data analytics. For both AI and real-time applications, the amount of data that must be rapidly captured and processed will drive the need for the performance of both flash-based storage and solutions leveraging NVMe technologies.¹

For decades, IBM has offered a range of enterprise class high-performance, ultra-low latency storage solutions.² Now, IBM FlashSystem 9100 combines the performance of flash and end-to-end NVMe with the reliability and innovation of IBM FlashCore technology and the rich feature set and high availability of IBM Spectrum Virtualize.

This powerful new storage platform provides:

- The option to use IBM FlashCore modules (FCMs) with inline-hardware compression, data protection and innovative flash management features provided by IBM FlashCore technology, or industry-standard NVMe flash drives.
- The software-defined storage functionality of IBM Spectrum Virtualize with a full range of industry-leading data services such as dynamic tiering, IBM FlashCopy management, data mobility and high-performance data encryption, among many others.

- Innovative data-reduction pool (DRP) technology that includes deduplication and hardware-accelerated compression technology, plus SCSI UNMAP support and all the thin provisioning, copy management and efficiency you'd expect from storage based on IBM Spectrum Virtualize.

Performance and flexibility at the core

IBM FlashSystem 9100 provides petabytes of effective data storage in a very efficient two-rack-unit chassis. A key innovation involves the transformation of IBM FlashCore technology into a standard 2.5-inch solid-state drive (SSD) form factor with NVMe interfaces so that 24 FCMs can form the basis of the storage array. IBM FlashCore technology refers to the IBM innovations that enable IBM FlashSystem solutions to deliver consistent microsecond latency, extreme reliability, and a wide range of operational and cost efficiencies. IBM FlashCore innovations include a hardware-accelerated NVM architecture and advanced flash management features such as IBM Variable Stripe RAID technology, IBM-engineered error-correction codes and proprietary garbage collection algorithms that not only increase flash endurance, but also accelerate performance while reducing latency. IBM FlashSystem 9100 arrays are ready for new storage-class memory technologies as they become available, helping to future-proof your flash solution.



IBM FlashSystem 9100

IBM FlashSystem 9100 now extends its support of the NVMe fast-access protocol with NVMe-oF to compatible hosts for complete end-to-end NVMe support. Combined with the existing NVMe capabilities of the system, it will accelerate workloads and lower latencies to speed application performance and business productivity.

IBM FlashSystem 9100 systems leverage the advantages of IBM FlashCore-enhanced 3D TLC storage media that provides greater flash density and storage capacity than multi-level cell (MLC) solutions. Along with the move to 3D TLC flash, the purpose-engineered FCMs utilize powerful inline, hardware-accelerated data-compression technology that provides consistent,

high-performance data compression across the full range of workloads. The FCMs also are designed to support FIPS 140-2 Level 1 encryption³ with IBM Security Key Lifecycle Manager centralized key management and full hot-swap capabilities.

Flexibility is built into the IBM FlashSystem 9100 architecture. You can choose FCMs in multiple capacities or you can opt for industry-standard NVMe-enabled flash drives, with the capability to support both drive types simultaneously within the array. This means that, using the always-on inline high-performance data compression in the FCMs or DRP technology with the industry-standard drives, effective capacities can range up to two petabytes in a single 2U enclosure.

IBM FlashSystem 9100 is offered in two basic models—IBM FlashSystem 9110 and IBM FlashSystem 9150. Both solutions feature dual controller canisters, dual power supplies and redundant cooling. Both models have two Intel Skylake CPUs per controller canister, with IBM FlashSystem 9110 offering eight cores per CPU while the 9150 model comes with 14 cores per CPU. Up to 768 GB of memory can be configured per controller, so that in a single 2U storage array you can leverage the performance and efficiency of more than a terabyte of memory and multiple petabytes of storage, all moving at NVMe speeds, to tackle even the most demanding real-time analytics or AI application workloads. Clustering technology gives the ability to scale out or scale up capacity and performance to many petabytes and millions of input/output operations per second (IOPS), while maintaining a single point of management. IBM FlashSystem 9152 enables easier ordering of two 9150 control enclosures to reach twice the capacity and performance.

A spectrum of multi-cloud and container capabilities

IBM FlashSystem 9100 offers the unique advantages of IBM FlashCore technology deeply integrated with the software-defined capabilities of IBM Spectrum Storage solutions, including IBM Spectrum Virtualize, Storage Insights, IBM Spectrum Protect Plus Multi-Cloud starter for IBM FlashSystem 9100, IBM Spectrum Copy Data Management Multi-Cloud starter for IBM FlashSystem 9100, IBM Spectrum Virtualize for Public Cloud Multi-Cloud starter for IBM FlashSystem 9100, and IBM Spectrum Connect. These six members of the IBM Spectrum Storage family come as standard components on every IBM FlashSystem 9100 array, while additional IBM FlashSystem 9100 multi-cloud solutions can easily be added either at the time of purchase or as a future upgrade.

IBM Spectrum Virtualize

IBM Spectrum Virtualize provides the data services foundation for every IBM FlashSystem 9100 solution. Its industry-leading capabilities include a wide range of data services that can be extended to over 440 IBM and non-IBM heterogeneous storage systems; automated data movement; synchronous and asynchronous copy services (either on-premises or to the public cloud⁴); encryption; high-availability configurations; storage tiering; remote three-site replication; and data reduction technologies, among many others. IBM FlashSystem 9100 solutions can function as IT infrastructure modernization and transformation engines, thanks to

the IBM Spectrum Virtualize capabilities that allow you to extend a wide range of data services and functionality to all legacy external heterogeneous storage systems under the solution's management, reducing both capital and operational costs while increasing the return on your investments in legacy infrastructure.

The IBM Spectrum Virtualize technology within IBM FlashSystem 9100 arrays offers powerful data-reduction pool capabilities that include block deduplication that works to minimize the number of data copies stored, and hardware-accelerated data compression technology that provides consistent, high-performance results across application workload patterns. IBM FlashSystem 9100 DRP supports the SCSI UNMAP command, which allows software to tell the storage system when it's no longer using portions of storage. This capacity is then returned to the pool to be used to satisfy other requirements. Previously, storage would stay assigned even if it was no longer being used, which wastes capacity.

To further drive your IT transformation, IBM Spectrum Virtualize for Public Cloud offers multiple ways to create hybrid cloud solutions between on-premises private clouds and the public cloud. It enables real-time storage-based data replication and disaster recovery, as well as data migration between local storage and IBM Cloud. And thanks to its software-defined storage nature, IBM Spectrum Virtualize allows storage administration at a cloud service provider's site in the same way as on-premises, regardless of the type of storage.

Container technology enables software to be packaged with all the elements needed to run in any environment. Containers offer the versatility of virtual machines—but at a much smaller footprint and cost. As a result, containerization is a key enabling technology for flexibly delivering workloads to private and public cloud. Together with IBM Spectrum Connect, IBM Spectrum Virtualize enables IBM FlashSystem 9100 solutions to become effective components in container environments, improving flexibility and simplifying deployment, and further lowering costs.

Extended capabilities

IBM FlashSystem 9100 base configurations and system capabilities can easily be extended by adding IBM Spectrum Storage components in one or more of three solution bundles:

- *The Data Reuse, Protection and Efficiency* solution leverages the capabilities of IBM Spectrum Protect Plus and IBM Spectrum Copy Data Management to provide enhanced data protection features for virtual applications with powerful data copy management and reuse functionality both on-premises and in the cloud.
- *The Business Continuity and Data Reuse* solution provides additional options for extending the data protection and disaster recovery capabilities of IBM Spectrum Virtualize into IBM Cloud, as well as all the copy management and data reuse features of IBM Spectrum Copy Data Management.

- *The Private Cloud Flexibility and Data Protection* solution enables simplified deployment of private clouds, provides the technology needed to implement container environments, and includes all the capabilities of IBM Spectrum Copy Data Management to manage copy sprawl and provide data protection for containerized applications.

All three solution bundles for IBM FlashSystem 9100 come with validated blueprints to lower risks, speed deployment and increase return on investment.

Intelligent support

As any storage administrator knows, managing large storage systems requires many hours of monitoring, analysis, decision-making and adjustment. When problems arise, troubleshooting complex storage infrastructure and implementing the most effective solutions can be problematic, to say the least. To address these challenges and reduce both manual labor and mistakes, IBM FlashSystem 9100 solutions come with Storage Insights, an enterprise-proven, AI, cloud-based system insights platform to help you better understand trends in storage capacity and performance and expedite resolution when support is required. Storage Insights monitors the health, capacity and performance of all IBM block storage and external storage under management on a single pane of glass, helping IBM customers understand and plan storage capacity and performance. The program provides proactive best practices and uses AI-based analytics to help identify potential issues before they become problems. When support is needed, Storage Insights helps speed resolution by simplifying opening tickets, automating log uploads to IBM, and providing configuration, capacity and performance information to IBM technicians. The cloud-based solution helps enterprises:

- Keep an eye on storage health, performance and capacity across the entire storage environment
- View 70+ metrics over years to see trends and compare them against best practices to identify anomalies before they impact applications
- Proactive analysis, reporting and assisting with the faster resolution of issues

Storage Insights offers an enhanced user experience, higher systems availability and the confidence of services delivered from one of the world's leading cloud environments.

Peace of mind

In addition to all the benefits, every IBM FlashSystem 9100 implementation includes a package of guarantees, upgrade programs and extended support options that IBM refers to as “Peace of Mind.” These guarantees and support options can help lower deployment and operational risks, reduce maintenance outlays, and enhance infrastructure planning, among many other benefits. Peace of Mind includes:

- **IBM data reduction guarantee.** This program guarantees the level of data reduction you'll see from your IBM FlashSystem 9100 solution. You can get the "Express" version, which guarantees 2:1 data reduction without system analysis, or you can use one of the IBM system analysis tools and choose the "Flexible" option that offers a guarantee of up to 5:1 data reduction based on the results of the analysis.
- **IBM availability guarantee.** IBM will guarantee 100 percent data availability for systems using IBM HyperSwap and deployed by IBM Lab Services.
- **IBM controller upgrade program.** The same innovation that constantly drives remarkable improvements in IT infrastructure also makes that infrastructure potentially obsolete every few years. This forces businesses to consider upgrading in order to remain competitive. With the controller upgrade program, IBM FlashSystem 9100 owners make a one-time investment, then IBM can upgrade the controllers and appropriate related components after three years of ownership for only the cost of ongoing system maintenance.
- **7 year 24x7 support.** Up to seven years of system support services are available for IBM FlashSystem 9100 solutions.
- **Endurance.** FCMs are covered for read/write endurance while the systems are under warranty or maintenance.
- **Migration.** When you deploy your new IBM FlashSystem 9100 solution, you get up to 45 days to migrate data at no extra charge.

Driven by data, NVMe-accelerated, multi-cloud-enabled

IBM FlashSystem 9100 solutions provide a single enterprise-class platform to address the full spectrum of 21st-century data storage requirements. From NVMe-powered all-flash performance and IBM FlashCore reliability, through easy integration and almost unlimited scalability, to data services that can transform and modernize existing systems, IBM FlashSystem 9100 provides extraordinary value and much more.

¹ "IDC FutureScape: Worldwide Enterprise Infrastructure 2018 Predictions," IDC, October 2017.
<https://www.idc.com/getdoc.jsp?containerId=US43137417>

² "Transforming real-time insight into reality," IBM Corporation, September 2.
<https://www.ibm.com/common/ssi/cgi-bin/ssialias?htmlfid=TSW03555USEN&>

³ IBM FlashSystem 9100 FCMs are expected to be submitted to the FIPS validation queue within thirty days of the planned availability date.

⁴ Support for on-premises to Public Cloud copy services require the use of IBM Spectrum Virtualize for Public Cloud, currently supported on IBM Cloud. IBM Cloud bare metal servers, networking and storage purchased separately.

IBM FlashSystem 9100 at a glance

Models	IBM FlashSystem 9110, model AF7 IBM FlashSystem 9150, model AF8
Flash type	IBM-enhanced 3D TLC
Supported drives	<i>2.5-inch NVMe FCMs:</i> 4.8 TB, 9.6 TB and 19.2 TB compressing FCMs <i>2.5-inch NVMe flash drives:</i> 1.92 TB, 3.84 TB, 7.68 TB and 15.36 TB
Management software	IBM Spectrum Virtualize software
Advanced features	Deduplication and compression FlashCopy Remote mirroring External virtualization IBM Easy Tier Data migration
Encryption	Data-at-rest AES-XTS 256
SAS Expansion enclosures	Model AFF 2U 24 drive Model A9F 5U 92 drive <i>2.5-inch flash drives supported:</i> 1.92 TB, 3.2 TB, 3.84 TB, 7.68 TB, 15.36 TB and 30.72 TB
Dimensions	<i>Controller enclosure:</i> Width: 48.3 cm (19.0 in) Depth: 85.0 cm (33.5 in) Height: 8.8 cm (3.5 in)
Weight	46.6 kg (102.5 lb) fully loaded
Capacity	
System size	Single System - 2U enclosure
Maximum NVMe flash capacity	461 TB raw 379 TB usable, DRAID6 758 TB effective (2:1 reduction)
Maximum external storage capacity	External virtualization: Up to 32 PB usable capacity
IOPS (4K cache hit)	3,800,000
IOPS (4K read miss) with hardware compression (IBM FlashSystem 9150)	1,200,000
Bandwidth (256K)	34 GB/s
Host interface	Up to: 24 ports 16 Gb or 32 Gb Fibre Channel (FC, FC-NVMe) 8 ports 10 GbE iSCSI 12 ports 25 GbE iWARP or RoCE
Controller CPU	Model AF7: Four 8-core Model AF8: Four 14-core

IBM FlashSystem 9100 clustering at a glance

	Flash System 9152		
System size	Clustered 2 x AF8 (4U)	Clustered 3 x AF8 (6U)	Clustered 4 x AF8 (8U)
Maximum NVMe flash capacity	922 TB raw 758 TB usable, DRAID6 1.5 PB effective (2:1 reduction)	1.3 PB raw 1.1 PB usable, DRAID6 2.3 PB effective (2:1 reduction)	1.8 PB raw 1.5 PB usable, DRAID6 3.0 PB effective (2:1 reduction)
Maximum external storage capacity	External virtualization: Up to 32 PB usable capacity	External virtualization: Up to 32 PB usable capacity	External virtualization: Up to 32 PB usable capacity
IOPS (4K cache hit)	7,600,000	11,400,000	15,000,000
IOPS (4K read miss) with hardware compression (IBM FlashSystem 9150)	2,400,000	3,600,000	4,800,000
Bandwidth (256K)	68 GB/s	102 GB/s	136 GB/s
Host interface	Up to: 48 ports 16 Gb or 32 Gb Fibre Channel (FC, FC-NVMe) 16 ports 10 GbE iSCSI 24 ports 25 GbE iWARP or RoCE	Up to: 72 ports 16 Gb or 32 Gb Fibre Channel (FC, FC-NVMe) 24 ports 10 GbE iSCSI 36 ports 25 GbE iWARP or RoCE	Up to: 96 ports 16 Gb or 32 Gb Fibre Channel (FC-NVMe) 32 ports 10 GbE iSCSI 48 ports 25 GbE iWARP or RoCE
Controller CPU	Model AF8: Eight 14-core	Model AF8: Twelve 14-core	Model AF8: Sixteen 14-core

Why IBM?

IBM FlashSystem solutions offer innovative all-flash arrays designed to deliver fast, flexible storage, whether on-premises or in cloud or hybrid-cloud environments, with enough speed to support today's virtualization and machine-learning applications. The IBM FlashSystem portfolio offers software-driven flexibility and extensive interoperability, thanks to the IBM Spectrum Storage family of products, which enable efficient use of storage capacity and advanced data management.

For more information

To learn more about IBM FlashSystem 9100, please contact your IBM representative or IBM Business Partner, or visit: ibm.com/us-en/marketplace/flashsystem-9100

Additionally, IBM Global Financing provides numerous payment options to help you acquire the technology you need to grow your business. We provide full lifecycle management of IT products and services, from acquisition to disposition. For more information, visit: ibm.com/financing

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