High-performance private cloud toolbox

The Private Cloud Flexibility and Data Protection solution enables high-performance private clouds

Highlights

- Accelerate business-critical applications with Non-Volatile Memory Express (NVMe)-optimized IBM® FlashSystem® 9100 all-flash storage arrays
- Transform IT infrastructure while increasing return on investment (ROI) by extending the power of IBM Spectrum Virtualize™ across all managed systems and into the public cloud
- Leverage the power of IBM Cloud™ Private, IBM Spectrum™ Copy Data Management and IBM Spectrum Access to build agile, high-performance private cloud solutions
- Optimize storage efficiency and enhance customer experience with IBM Storage Insights powered by artificial intelligence (AI)

These days, business wants to go faster—a lot faster. This need for speed is driving the adoption of flash-based storage—especially solutions leveraging NVMe technologies. IBM remains at the forefront of high-performance storage solutions with the introduction of IBM FlashSystem 9100 all-flash storage systems. These new storage arrays combine the performance of flash and NVMe with the reliability and innovation of IBM FlashCore® technology.

Capturing and keeping competitive advantage in the 21st century requires much more than raw speed. IBM research confirms that today, more than three-quarters of enterprises have deployed some type of cloud computing capabilities.[1] Well-constructed private cloud environments are becoming especially attractive because they offer the benefits of a public cloud, including rapid deployment and scalability, plus ease of use and elasticity. Private clouds also offer greater control, greater performance than traditional infrastructure, predictable costs, tighter security and flexible management options. Perhaps most importantly, private clouds can be customized to your unique needs and security requirements.

To enable IBM customers to build agile and powerful private clouds as part of their overall multi-cloud data processing architectures, IBM FlashSystem 9100 storage systems offer private cloud capabilities provided by members of the market-leading IBM Spectrum Storage™ family of software-defined storage solutions. In particular, the *IBM FlashSystem 9100 Solution for Private Cloud Flexibility and Data Protection* is built on a foundation of IBM Spectrum Access, IBM Cloud Private and IBM Spectrum Copy Data Management. This

solution not only enables simplified deployment of private clouds, it also provides the technology needed to implement container environments, plus the powerful capabilities of IBM Spectrum Copy Data Management to manage data copies and provide data protection for containerized applications. With the IBM FlashSystem 9100 Solution for Private Cloud Flexibility and Data Protection, enterprises gain everything needed to build low-risk, high-performance, integrated private cloud infrastructure with leading-edge technologies, capabilities and protection, plus the latest in cognitive support services from IBM. This is the solution for businesses that want to be fast—and smart.

The foundation: IBM FlashSystem 9100

IBM FlashSystem 9100 integrates the performance and efficiency of flash and NVMe with the reliability and innovation of IBM FlashCore technology and the rich feature set of IBM Spectrum Virtualize. The arrays provide a comprehensive storage solution to address the full range of 21st-century business challenges. They provide very high performance, microsecond latency and literally petabytes of capacity in an efficient enclosure. The systems offer simplified infrastructure modernization pathways and enable a range of multi-cloud architectures. Powerful storage efficiency and data reduction features help lower costs. Validated blueprints reduce deployment risks. And AI-enhanced, cloud-based system monitoring and optimization help ensure that IBM FlashSystem 9100 solutions provide outstanding business value.

The all-flash arrays come in two basic models—IBM FlashSystem 9110 and IBM FlashSystem 9150. Both models feature dual controller canisters, dual power supplies and redundant cooling. The systems can provide multiple petabytes of effective data storage in a very efficient two-rack-unit chassis. A key innovation involves the transformation of IBM FlashCore technology into 2.5-inch IBM FlashCore modules (FCMs) with NVMe interfaces, so that 24 FCMs or industry-standard NVMe flash drives can form the basis of the storage array.

IBM FlashSystem 9100 systems leverage the advantages of IBM FlashCore-enhanced 3D triple-level cell (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 IBM FCMs utilize innovative data reduction pool (DRP) technology that includes deduplication and hardware-accelerated compression, plus SCSI UNMAP support and all the thin provisioning and storage efficiency you'd expect from IBM Spectrum Virtualize-based storage. The FCMs also support FIPS 140-2 Level 1 encryption with IBM Security Key Lifecycle Manager centralized key management and full hot-swap capabilities.

Market-leading data services through 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, policy-driven data movement; synchronous and asynchronous copy services; high-availability configurations; storage tiering; and data reduction technologies, among many others. IBM FlashSystem 9100 solutions can function as IT infrastructure modernization and transformation engines, thanks to capabilities that allow you to extend IBM Spectrum Virtualize data services and functionality to existing external heterogeneous storage systems, reducing both capital and operational expenses while increasing the return on your investments in legacy infrastructure.

The IBM Spectrum Virtualize technology within IBM FlashSystem 9100 arrays offers powerful DRP capabilities that include block deduplication that works across all of the storage in each designated DRP and stores just one copy of each unit of data, and hardware-accelerated data-compression technology that provides consistent, high-performance results across application workload patterns. The DRPs use a

log-structured design built on top of the efficient, distributed RAID 6 provided by IBM FlashCore technology.
IBM FlashSystem 9100 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 can waste capacity. The data reduction capabilities work with many operating environments, including VMware, Microsoft Hyper-V, Microsoft Windows and more.

AI-powered systems insight platform

As any storage administrator knows, managing large storage environments requires many hours of monitoring, analysis, decision-making and adjustment. Then, when problems arise, analyzing complex storage infrastructure and implementing the most effective solutions can be labor-intensive. To address these challenges and reduce both manual labor and mistakes, IBM FlashSystem 9100 solutions can take advantage of Storage Insights, an enterprise-proven, AI-enhanced, cloud-based system insights platform that helps you better understand trends in storage capacity and performance and implement best practices. Storage Insights monitors the health, capacity and performance for all IBM block storage and external storage under management through a single user interface, 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
- Speed issue resolution through proactive analysis and reporting

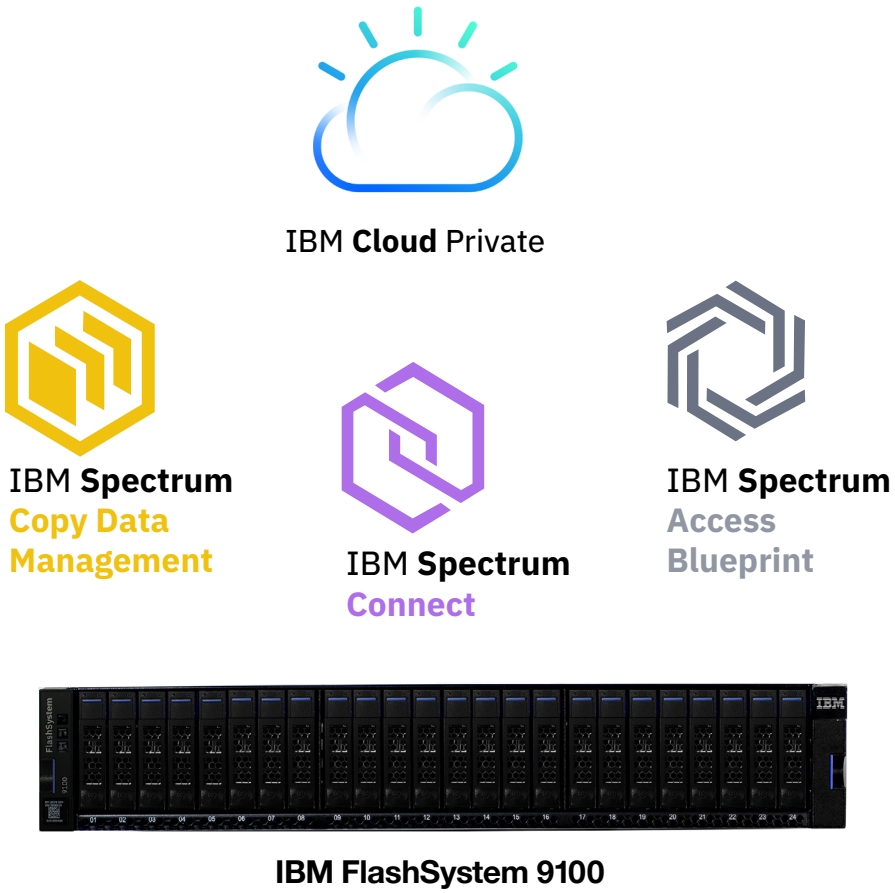
Storage Insights helps provide an enhanced user experience, higher systems availability, faster time to resolution of issues, and the confidence of services delivered from one of the world's leading technology providers.

Simplified private cloud

The IBM FlashSystem 9100 Solution for Private Cloud Flexibility and Data Protection is a suite of IBM Spectrum Storage family members that can be added to an IBM FlashSystem 9100 implementation to enable the construction and management of private cloud environments. It is designed to provide a complete, easy-to-deploy private cloud solution that includes:

- A validated private cloud deployment blueprint in an integrated infrastructure environment provided by IBM Spectrum Access with available IBM Cloud Private
- The AI-enhanced IBM systems management and support program called Storage Insights
- Storage efficiency and data-protection solutions for containerized environments provided by IBM Spectrum Copy Data Management
- A comprehensive suite of storage management features provided by IBM Spectrum Connect

The IBM FlashSystem 9100 Solution for Private Cloud Flexibility and Data Protection enables you to transform your on-premises storage with cloud efficiency while providing the flexibility to implement and manage both virtual machines and containerized environments. It allows you to:



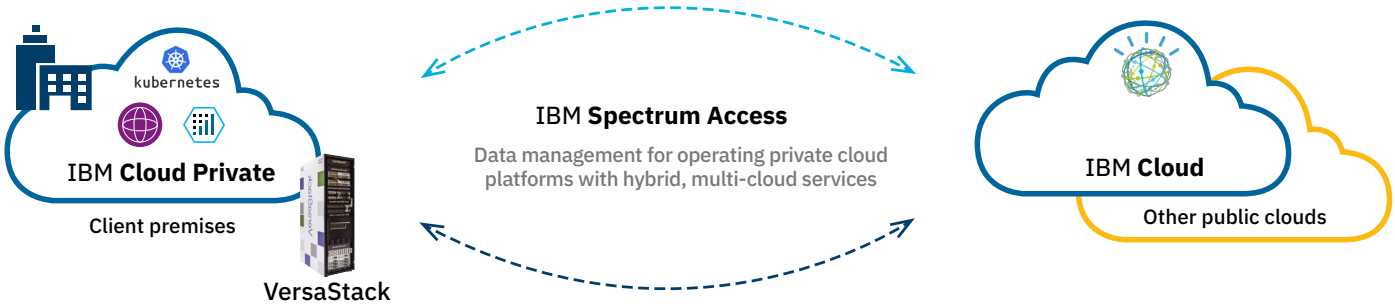
IBM FlashSystem 9100

- Maximize agility when deploying on-premises new generation application environments
- Automate storage provisioning and data protection
- Simplify private cloud deployment with the pre-tested IBM Spectrum Access Blueprint

Validated solution blueprint with IBM Spectrum Access

A key advantage of deploying IBM FlashSystem 9100 with the IBM FlashSystem 9100 Solution for Private Cloud Flexibility and Data Protection is the fact that it comes with a low-risk, pre-tested solution blueprint provided by IBM Spectrum Access. Deployable with VersaStack solutions from IBM and Cisco, IBM Spectrum Access delivers what enterprises need to deploy private clouds built on converged infrastructure. It offers the economics and simplicity of the public cloud with the accessibility, virtualization, security and performance of an on-premises implementation.

Delivered as a validated blueprint, IBM Spectrum Access prescribes how to provision, manage, virtualize and protect data in an IBM Cloud Private deployment. The solution addresses provisioning and managing persistent storage volumes with Docker containers and Kubernetes orchestration.



Containers enable software to be packaged with all the elements needed to run in any environment. They 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 environments.

Together with IBM Spectrum Connect, IBM Spectrum Virtualize enables IBM FlashSystem 9100 solutions to become effective components in container environments, to help improve flexibility, simplify deployment and lower costs. The IBM Spectrum Access storage container service simplifies the containerized environment, and it enables storage administrators to define and delegate storage classes such as gold, silver and bronze for use by application owners with IBM Cloud Private—enabling operational speed and scale.

Container and private cloud toolbox through IBM Cloud Private

IBM Cloud Private is a private cloud platform for developing and running workloads locally. It is an integrated environment available for the IBM FlashSystem 9100 Solution for Private Cloud Flexibility and Data Protection that enables you to design, develop, deploy and manage on-premises, containerized cloud applications behind your firewall. It includes the container orchestrator Kubernetes, a private image repository, a management console and monitoring frameworks.

IBM Cloud Private provides control for how and where applications consume cloud services, and technical and experience consistency with the public IBM Cloud. IBM Cloud Private with IBM Spectrum Access is designed to accelerate the work of enterprise developers by providing access to valuable data and applications behind the firewall through a flexible container-based architecture and application programming interface (API)-based catalog of services. Everything from

best-practice architecture designs to detailed configuration documentation is available to make the solution easier and faster to deploy.

IBM Cloud Private is built with containers and provides integrated operational management and developer services and components, such as IBM MQ messaging for applications in distributed systems, IBM Microservice Builder, IBM Db2® Developer Edition, IBM WebSphere® application server runtime environment and more. Leveraging these services, enterprises can optimize legacy applications with cloud and containers for use with DevOps or analytics, create new cloud-native applications, and open their data centers to work with cloud services.

Data protection and storage efficiency with IBM Spectrum Copy Data Management

Data protection copies can account for more than 60 percent of the data in today's IT infrastructure.[2] You may be storing unneeded or unused data copies on flash storage, certainly not a good strategy for maximizing the benefits or economics of flash. The new IBM Spectrum Copy Data Management solution can help change this equation. IBM Spectrum Copy Data Management as part of your IBM FlashSystem 9100 solution enables you to significantly improve overall data economics by creating the most efficient data protection environments possible. IBM Spectrum Copy Data Management provides a leading-edge suite of services that can simplify copy management and provide data protection solutions for container environments through its leading-edge snapshot capabilities.

IBM Spectrum Copy Data Management catalogs copy data from across your local and off-site cloud infrastructure, identifies duplicates, and compares copy requests to existing copies. Data consumers can use the self-service portal to utilize the copies they need, enabling business agility.

IBM Spectrum Copy Data Management is an easy-to-deploy software platform designed to leverage the existing infrastructure in the IT environment. It works directly with hypervisor and enterprise storage APIs to provide the overall orchestration layer that leverages the copy services of the underlying infrastructure resources. IBM Spectrum Copy Data Management also integrates with Amazon Web Services S3 for cloud-based data retention, as well as with Puppet, IBM Bluemix® and other platforms.

Leading-edge storage monitoring and management with IBM Spectrum Connect

IBM Spectrum Connect is included with every IBM FlashSystem 9100 storage solution. It is designed to simplify multi-cloud deployment across the entire portfolio of IBM storage solutions. Today's organizations demand easy and fast integration of storage in multiple cloud environments. IBM Spectrum Connect leverages existing IBM Storage capabilities and empowers storage teams and other stakeholders by enabling provisioning, monitoring, automating and orchestrating of IBM block storage in containerized, VMware and Microsoft PowerShell environments. It manages the API dialogs for IBM storage systems from one place, providing a single pane of glass for orchestrating between multiple cloud platforms and IBM storage devices. In addition, IBM Spectrum Connect enables the definition of easy-to-consume storage classes, such as by service level agreement or workload, simplifying self-service and providing easy automation of storage provisioning.

The benefits of a high-performance/ high-availability solution

Enterprises can gain many benefits by adding the IBM FlashSystem 9100 Solution for Private Cloud Flexibility and Data Protection to their IBM FlashSystem 9100 deployment, including:

- More value from data assets and greater productivity from business applications and staff thanks to the performance and efficiency of NVMe-optimized flash storage
- Simplified multi-cloud implementation by combining private cloud construction and management capabilities with complementary tools and APIs into a single management environment and user interface
- Greater business agility through streamlined use of containers and microservices
- Easier IT modernization and transformation with increased return on investment in legacy systems through IBM Spectrum Virtualize technology and data services
- Competitive advantage by modernizing existing applications and building new applications using leading-edge processes and tools
- Greater flexibility to deploy applications on private cloud through Kubernetes, containers or traditional virtual machines, while running legacy applications in containers and easily connecting them to off-premises resources
- Higher system availability with multiple disaster-recovery and data-protection options provided through IBM Spectrum Virtualize and IBM Spectrum Copy Data Management
- Lower risk and simplified deployment through validated solution blueprints
- Simplified, more effective and responsive AI-powered customer support

The profitable private cloud

Cloud computing is sweeping through the business world, lowering costs, increasing agility and streamlining infrastructure. Private clouds offer increased security, control and flexibility, especially as part of well-planned and constructed multi-cloud environments. As you address your application performance and system efficiency requirements by deploying NVMe-optimized IBM FlashSystem 9100 all-flash storage arrays, you can gain access to a whole world of powerful new technologies by including the IBM FlashSystem 9100 Solution for Private Cloud Flexibility and Data Protection. It's more than simply a private cloud solution; it's a toolbox for increasing the competitiveness and profitability of your business.

Why IBM?

IBM delivers best-of-breed, enterprise-class storage solutions and storage management solutions, whether on-premises, in the cloud, or in a hybrid cloud format. With expertise in all-flash storage and powerful data control tools, IBM helps IT operations efficiently use their storage resources, and helps enable interoperability with a wide range of storage technologies from both IBM and other vendors. IBM offers flexibility and experience and gives business managers the ability to keep operational costs under control and within budget.

For more information

To learn more about IBM FlashSystem 9100 and the IBM FlashSystem 9100 Solution for Private Cloud Flexibility and Data Protection for building private clouds, please contact your IBM representative or IBM Business Partner, or visit: **ibm.com**/us-en/marketplace/flashsystem-9100

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[1] "Growing up hybrid: Accelerating digital transformation," *IBM Center for Applied Insights*, February 2016. https://www.ibm.com/common/ssi/cgi-bin/ssialias?htmlfid=GMW14087USEN&

[2] "Software-defined business agility," *IBM Corporation*, November 2016. https://www-01.ibm.com/common/ssi/cgi-bin/ssialias?htmlfid=TSW03511USEN

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